IDENTIFICATION

PRODUCT CODE:	Maindec-08-D2FA-D
PRODUCT NAME:	PDP-8 High Speed Reader Test
DATE CREATED:	October 1, 1966
MAINTAINER:	Diagnostic Group
AUTHOR:	R. Green
PREVIOUS CODE:	Maindec-08-D23A-D

1. ABSTRACT

This is a diagnostic program for the Digitronics 2500 and the PC01 High Speed Paper Tape Readers using Control Logic Type 750C. The program is divided into three parts, the first of which is a test tape generator that punches test tapes for parts two and three on the high speed punch, Part two is a series of specific tests with module isolation provided for error situations. Part three reads a preselected tape pattern with the choice of random or fixed block lengths and stalls between blocks.

2. REQUIREMENTS

2.1 Equipment

Standard PDP-8

Type DT2500 or Type PC01 High Speed Paper Tape Reader and 750C Control Logic.

2.2 Storage

The program uses location 0000 - 3315. The Binary Loader must be stored in locations 7612 - 7755.

2.3 Preliminary Programs (None)

3. LOADING PROCEDURE

3.1 Method

The Binary Loader is used. The test program should be loaded using the Teletype paper tape reader.

4. STARTING PROCEDURE

4.1 Control Switch Settings

4.1.1 Test Tape Generator (Part 1)

SR0	Punch alternate 1s and 0s
SR1	Punch binary count
SR2	Punch all same character as specified by SR4-SR11

4.1.2 Logic Tests (Part 2)

SR0	Stop on error (1) Print on error (0)
SR1	Scope Mode
SR4	Loop on tests 2 - 9
SR5	PC01 (1) DT2500 (0)
SR6	Print reading speed during test 11
SR7	Print tape acceleration time during test 11

4.1.3 Tape Read Test (Part 3)

SR0	Stop on error (1) Print on error (0)
SR1	Scope Mode. Ignore errors
SR2	Print on error (1) Print errors at end of block (0)
SR3	Resync tape if 10 errors in one block
SR6	Select block size (1) Random block size (0)
SR7	Select stall (1) Random stall (0)
SR8	Resync tape at the end of each block
SR9	Read alternate 1s and 0s tape
SR10	Read binary-count tape
SR11	Read a tape of all the same character

4.2 Starting Addresses

0200 Test tape generator

0300 Logic tests

1625 Read binary-count pattern or alternate 1s and 0s pattern

2000 Read all-same-character pattern

4.3 Program and/or Operator Action

4.3.1 Test Tape Generator (Part 1)

a. To punch tape on the Teletype punch instead of the high speed punch enter 6041 into 0221 and 6046 into 0223.

b. Set SR to 0200. Press LOAD ADDRESS. Set SR to desired configuration, then press START. Tape is punched until stopped.

c. To make a closed loop from the test tape, the punched pattern must be maintained at the splice.

4.3.2 Logic Tests (Part 2)

a. Place an all 0s test tape in the high speed reader.

b. Set SR to 0300. Press LOAD ADDRESS. Set SR to desired configuration, then press START.

NOTE: Halt on error switch SR0 applies only to tests 5, 6, and 11 which provide error printouts instead of error halts.

c. The program halts at the completion of Test 1. PC = 0317. This is an illegal instruction test and any tape movement during Test 1 is an error condition. Press CONTINUE to go on. Press START to redo Test 1.

d. The program halts at Test 10. PC = 1127. Press START.

e. When Test 11 is reached, the program loops in this test. This is a sync character recognition test which is a prerequisite to Part 3.

4.3.3 Tape Read Test (Part 3)

a. Load test tape in high speed reader.

b. For tape patterns of all the same character enter the desired character into memory location 0035. Set SR to 2000 and press LOAD ADDRESS. Set SR to desired configuration, then press START. Skip to paragraph e. For other tape patterns omit this paragraph and go to c.

c. Set SR to 1625. Press LOAD ADDRESS. Set SR to desired configuration. If SR6 is a 1 (select block size), enter the desired block size into location 0064 before pressing START. The program reads this block of characters at full speed, then stalls.

If SR7 is a 1 (select stall), enter the desired stall into location 2151 before passing START. This will be the stall between blocks. To calculate the stall length convert the stall number to decimal and multiply by 0.1 msec.

In either case, if no entry is made, the last block size or stall generated by the random number generator is used.

Push START.

d. The program reads the test tape until it finds an all-zero character, then it prints an IN SYNC message and halts.

Press START to resync.

Press CONTINUE to go on.

NOTE: If SR3 is a 1, the program will not halt but will go on as if CONTINUE had been pressed.

5. OPERATING PROCEDURE

See section 4.

6. ERRORS

6.1 Error Halts and Description

6.1.1 Test Tape Generator (Part 1)

None.

6.1.2 Logic Tests (Part 2)

Error Halt	C(PC)	Cause of Error
1	0324	An information transfer was made to the AC following the illegal instructions 6010 and 6377.
2	0331	Flag on, following program start.
3	0424	Flag not on 70 msec after issuing fetch instruction.
4	0427	Flag is on. Either a 6377 or 6010 instruction caused a skip.
5	0437	RRB did not reset flag.
6	0531	RFC did not reset flag.

7	0630	RFC did not clear reader buffer. Failure on first RRB following RFC.
8	0647	Reader buffer not holding reset condition. Failure on second RRB following RFC.
9	0661	No interrupt following RFC. Waited 70 msec.
10	0723	Accelerating too fast. Flag came too soon after RFC.
11	0736	Accelerating too slowly. Flag came too late following RFC.
12	1030	Misadjusted Delays. Late flag following strobe. (DT2500)
13	1043	Misadjusted Delays. Early flag following strobe. (DT2500)
14	1101	Motor protect delay less than 35 msec (PC01).
15	1113	Motor protect delay greater than 65 msec (PC01).
16	1133	Processor START switch did not reset the flag.

Error Printouts	Cause of Error
1 GOOD 000 BAD XXX	Failure during Test 11, Sync Character Recognition Test.
5 GOOD 000 BAD XXX	Failure during Test 5. First attempt at reading an all-zero character.
6 GOOD 377 BAD XXX	Failure during Test 6. Reader buffer not reset following an RFC.

6.1.3 Tape Read Test (Part 3)

Error Printouts

BLK LNG XXX LST STL XXXX GD XXX BD XXX POS XXX

	Explanation
BLK LNG XXX	BLOCK LENGTH where XXX is the octal number of characters in the block being read when the error occurred.
LST STL XXXX	LAST STALL where XXXX is the octal number, in increments of 0.1 msec, which specifies the stall before this block was started.
GD XXX	GOOD where XXX is the correct character.
BD XXX	BAD where XXX is the character read.
POS XXX	POSITION where XXX is the position of the erroneous character in this block.

6.2 Recovery From Errors

6.2.1 Recovery From Errors in Part 2

After an error halt, pressing CONTINUE causes the test to be performed again. The program proceeds to the next test only when the current test is completed successfully. When a problem is encountered, it is suggested the SR1 be set to a 1 before pressing CONTINUE. This causes the program to repeat this test until SR1 is reset whether the test fails or not. This is the scope mode and allows the operator to observe the failing condition easily with an oscilloscope.

After an error printout the test is repeated automatically unless SR0 (halt on error) is a 1. Entering the scope mode eliminates the printout.

In any case, it is suggested that the appropriate modules listed in the following paragraph be changed in a first attempt at fixing the problem.

6.2.2 Recovery From Errors in Part 3

After each error printout the program continues on in sequence. The use of the scope mode here serves only to inhibit error printouts.

7. RESTRICTIONS

If the computer has any input/output devices other than the Teletype keyboard/printer with tape punch and reader, high speed reader, and high speed punch, the operator must insure that these devices are off and will not cause a spurious interrupt. The I/O address 37 is assumed to be unused. If a control with this address is connected to the computer, power to this control should be shut off.

8. MISCELLANEOUS

8.1 Execution Time

The test runs until stopped by the operator. When looping on tests 2 - 9 in Part 2, the loop time is 1 sec.

9. PROGRAM DESCRIPTION

Part 2 of the program is provided to find catastrophic type failures. The test begins by testing the basic functions of the device then does as many timing checks as possible by program. If Part 2 runs, probably the only remaining problems are in individual data paths.

Part 3 of the program is designed to show up problems not found in Part 2. The binary-count pattern is provided as the most stringent test when used with random block sizes and stalls. The alternate 1s and 0s tape pattern and the all-same-character tape pattern are intended for use with fixed block lengths and fixed stalls so that scope mode loops will be easier to observe.

10. LISTINGS

```
@ACKFR   1157
ACKSCP   0044
ACNTA    1414
AERHLT   0003
AGNRAN   0062
AMSG1    0026
APTEND   0060
APTNOW   0061
ASCOP    0005
ASTSNC   2152
ATST11   1413
ATST2    0004
ATST3    0043
ATST9    0046
ATYPOT   1162
BACK     3001
BAD1     0105
BAD2     0161
BFPNCH   0213
BGN1     0200
BIN      3210
BLKLNG   0123
BLSTOR   0064
CEK      2225
CHACNT   0057
CKER     1400
CKRESC   2133
CKSCOP   0662
CKSW4    1116
CKTEN    2276
CK1      1037
CLEAR    0517
CNTEN    0065
CON1     0050
CON10    2143
CON2     0051
CON3     0052
CON5     0053
CON6     0054
CON7     2140
CON8     2141
CON9     2142
COUNTA   1160
CRWAIT   3013
C20      1467
DCRSTR   2245
DLY1     0741
DLY10    0740
DLY13    1705
DLY5     0737
DL1      1161
DORRB    1153
DUL      3200
D0       3267
D1       3270
D2       3272
D65MS    1102
END      3025
ERHLT    3050
ERMAX    0734
ERPC0    1077
ERPC01   1111
ERR5     0470
ERR51    0504
ER3      0422
FINUP    3243
FINUP1   3253
FINUP2   3260
FLCK     1032
FLTST    1457
FOUR     1624
GENRAN   1600
GOOD1    0074
GOOD2    0151
HLT6     0623
HLT61    0642
HSKP     2000
IISZ     2101
INF1     0066
INF2     0112
INF3     2600
INF4     2616
INF5     1470
INSYNC   1650
IR1      0011
IR2      0012
ISSZ     2107
ISZZ     2122
ISZ1     1020
ISZ2     1024
JMP5     0045
K0040    1422
K20      3304
LASTAL   0010
LNGLIM   2144
MIN10    0743
MSG1     3000
MSK1     0027
MSK2     0030
MSK3     0031
MSK4     0032
MSK5     0033
M1       2147
M120     2146
M25      3024
M30      2150
M377     0020
M4       3041
M7776    0021
N260     3300
N272     3301
OK       0332
OK10     1134
OK4      0440
ONE      1706
PALT10   0225
PBNCNT   0234
PC01     1045
PC1      0706
POSIT    0172
PR       0630
PRINT1   0024
PRINT2   0025
PRINT3   0006
PRINT4   0007
PRINT5   0335
PRINT6   1710
PRINT8   1421
PROAD    3302
PRTEND   2251
PRTNOW   2200
PSWREG   0241
PUNCH    0220
RANUM    1621
RBERR    0322
READ     2050
RETURN   1066
RFC1     1147
ROTAT3   1347
ROTAT6   1340
RRB2     0454
RSFLG    1114
SAVE1    1416
SAVE2    1417
SAVE3    1420
SCOPE    3042
SETONS   1700
SETUP1   1200
SETUP2   1233
SKPERR   0425
STAL     0023
STALL1   0140
STAL70   3026
STLL     0640
STLSTR   2151
STORLM   0063
STOR1    0034
STOR2    0035
STOR3    0036
STOR4    0037
STOR5    0040
STRSNC   1630
SU1      0041
SU2      0042
SVN4HN   0047
SVN50C   1006
THREE    1622
THRE77   2145
TH77     1707
TIM1     1164
TIM2     1173
TOUT     3305
TSTMAX   0724
TSTMIN   0714
```

```
TSTZRO  1623
TST1    0303
TST10   1123
TST11   1137
TST2    0325
TST3    0400
TST4    0430
TST5    0443
TST5A   0521
TST6    0600
TST7    0651
TST8    0672
TST9    1000
TUSE    3303
TW1     1163
TW5     0536
TW6     1355
TW66    0650
TYPE    2235
TYPOUT  1423
T6      1415
WAIT    0744
WORK    0022
WORK1   0055
WORK2   0056
D
```

```
                /CONSTANTS AND VARIABLES
                *1
0001  7402        HLT                         /INTERRUPT ON ILLEGALLY
0002  5400        JMP I 0
0003  3050    AERHLT,     ERHLT
0004  0325    ATST2,      TST2
0005  3042    ASCOP,      SCOPE
0006  2600    PRINT3,     INF3
0007  2616    PRINT4,     INF4
0010  0000    LASTAL,     0

                /CONSTANTS, VARIABLES, ETC.
                *11
0011  0000    IR1,        0
0012  0000    IR2,        0
0013  0000      0
                *20
0020  7401    M377,       -377
0021  0002    M7776,      -7776
0022  0000    WORK,       0
0023  3026    STAL,       STAL70
0024  0065    PRINT1,     INF1-1
0025  0112    PRINT2,     INF2
0026  3000    AMSG1,      MSG1
0027  0007    MSK1,       7
0030  0070    MSK2,       70
0031  0300    MSK3,       300
0032  0700    MSK4,       700
0033  7000    MSK5,       7000
0034  0000    STOR1,      0                   /STORAGE  FOR BAD CHARACTER
0035  0000    STOR2,      0                   /STORAGE FOR GOOD CHARACTER
0036  0000    STOR3,      0                   /STORAGE FOR BLOCK LENGTH
0037  0000    STOR4,      0                   /STORAGE FOR STALL
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```
0040  0000  STOR5,    0                    /STORAGE FOR POSITION OF BAD CHAR.
0041  1200  SU1,      SETUP1
0042  1233  SU2,      SETUP2
0043  0400  ATST3,    TST3
0044  0662  ACKSCP,   CKSCOP
0045  5444  JMP5,     JMP I ACKSCP
0046  1000  ATST9,    TST9
0047  7400  SVN4HN,   7400
0050  7734  CON1,     -44
0051  7766  CON2,     -12
0052  6545  CON3,     -1233
0053  3536  CON5,     -4242
0054  2377  CON6,     2377
0055  0000  WORK1,    0
0056  0000  WORK2,    0
0057  0000  CHACNT,   0
0060  2251  APTEND,   PRTEND
0061  2200  APTNOW,   PRTNOW
0062  1600  AGNRAN,   GENRAN
0063  0000  STORLM,   0
0064  0000  BLSTOR,   0
0065  0000  CNTEN,    0
0066  0000  INF1,     0
0067  0307    307                  /G
0070  0317    317                  /O
0071  0317    317                  /O
0072  0304    304                  /D
0073  0240    240                  /SPACE
0074  0330  GOOD1,    330                  /X
0075  0330    330                  /X
0076  0330    330                  /X
0077  0240    240                  /SPACE
0100  0240    240                  /SPACE
0101  0302    302                  /B
0102  0301    301                  /A
0103  0304    304                  /D
0104  0240    240                  /SPACE
0105  0330  BAD1,     330                  /X
0106  0330    330                  /X
0107  0330    330                  /X
0110  0212    212                  /LF
0111  0215    215                  /CR
0112  0000  INF2,     0
0113  0302    302                  /B
0114  0314    314                  /L
0115  0313    313                  /K
0116  0240    240                  /SPACE
0117  0314    314                  /L
0120  0316    316                  /N
0121  0307    307                  /G
0122  0240    240                  /SPACE
0123  0330  BLKLNG,   330                  /X
0124  0330    330                  /X
0125  0330    330                  /X
0126  0240    240                  /SPACE
0127  0240    240                  /SPACE
0130  0314    314                  /L
0131  0323    323                  /S
0132  0324    324                  /T
0133  0240    240                  /SPACE
0134  0323    323                  /S
```

```
0135  0324    324                        /T
0136  0314    314                        /L
0137  0240    240                        /SPACE
0140  0330  STALL1,     330                        /X
0141  0330    330                        /X
0142  0330    330                        /X
0143  0330    330                        /X
0144  0240    240                        /SPACE
0145  0240    240                        /SPACE
0146  0307    307                        /G
0147  0304    304                        /D
0150  0240    240                        /SPACE
0151  0330  GOOD2,      330                        /X
0152  0330    330                        /X
0153  0330    330                        /X
0154  0240    240                        /SPACE
0155  0240    240                        /SPACE
0156  0302    302                        /B
0157  0304    304                        /D
0160  0240    240                        /SPACE
0161  0330  BAD2,       330                        /X
0162  0330    330                        /X
0163  0330    330                        /X
0164  0240    240                        /SPACE
0165  0240    240                        /SPACE
0166  0320    320                        /P
0167  0317    317                        /O
0170  0323    323                        /S
0171  0240    240                        /SPACE
0172  0330  POSIT,      330                        /X
0173  0330    330                        /X
0174  0330    330                        /X
0175  0212    212                        /LF
0176  0215    215                        /CR


              /TAPE LOOP GENERATOR
              *200
0200  7604  BGN1,       LAS                        /TEST SWITCH REGISTER
0201  7004    RAL                        /FOR TAPE PATTERN
0202  7430    SZL
0203  5225    JMP PALT10                 /PUNCH  ALTERNATE 1'S,0'S
0204  7004    RAL
0205  7430    SZL
0206  5234    JMP PBNCNT                 /PUNCH BANARY COUNT
0207  7004    RAL
0210  7430    SZL
0211  5241    JMP PSWREG                 /PUNCH SPECIFIC CHARACTER
0212  5200    JMP BGN1

              /TAPE PUNCH ROUTINE

0213  0000  BFPNCH,     0
0214  7200    CLA
0215  1213    TAD BFPNCH
0216  3220    DCA PUNCH
0217  5223    JMP .+4
```

```
0220  0000  PUNCH,      0
0221  6021    PSF
0222  5221    JMP .-1
0223  6026    PLS
0224  5620    JMP I PUNCH
              /ALTERNATE ONES AND ZEROS

0225  4213  PALT10,     JMS BFPNCH
0226  7200    CLA
0227  7040    CMA
0230  4220    JMS PUNCH
0231  7200    CLA
0232  4220    JMS PUNCH
0233  5226    JMP PALT10+1

              /BINARY COUNT

0234  4213  PBNCNT,     JMS BFPNCH
0235  7200    CLA
0236  7001    IAC
0237  4220    JMS PUNCH
0240  5236    JMP PBNCNT+2

              /PUNCH SPECIFIC CHARACTER

0241  4213  PSWREG,     JMS BFPNCH
0242  7200    CLA
0243  7604    LAS
0244  4220    JMS PUNCH
0245  5244    JMP .-1
              /
              /HIGH SPEED PAPER TAPE READER DIAGNOSTIC
              /
              /PART 1. INSTRUCTION AND CONTROL TESTING
              /
              *300
                /TEST 1. ILLEGAL INSTRUCTION
0300  1335    TAD PRINT5
0301  3011    DCA IR1
0302  4426    JMS I AMSG1
0303  7200  TST1,       CLA
0304  6010    6010      /NO IOT BITS, INSTRUCTION
                                /SHOULD BE IGNORED
0305  6377    6377
0306  7440    SZA
0307  5322    JMP RBERR

0310  4405    JMS I ASCOP         /CHECK FOR SCOPE MODE
0311  5313    JMP .+2
0312  5303    JMP TST1
0313  2013    ISZ 13
0314  5303    JMP TST1
0315  1020    TAD M377
0316  7402    HLT                       /START TO REDO. CONT TO PROCEED
                                /TAPE SHOULD NOT HAVE MOVED
0317  7450    SNA
0320  5303    JMP TST1
0321  5325    JMP TST2
0322  4405  RBERR,      JMS I ASCOP                          /ERROR.
0323  7402    HLT       /INFORMATION DELIVERED ILLEGALLY
0324  5303    JMP TST1
```

```
                    /TEST 2. TEST FOR FLAG OFF
0325  6011  TST2,      RSF                          /FLAG SHOULD BE OFF
0326  5332    JMP OK                        /SUCCESSFUL TEST
0327  4405    JMS I ASCOP             /CHECK FOR SCOPE MODE
                                      /FAILURE PATH
0330  7402    HLT                           /FLAG IS ON ILLEGALLY
0331  5325    JMP TST2
0332  4405  OK,         JMS I ASCOP          /CHECK FOR SCOPE MODE
0333  5443    JMP I ATST3           /SUCCESS PATH
0334  5325    JMP TST2
0335  0174  PRINT5,     POSIT+2


                   *400
                    /TEST 3. ILLEGAL RSF TEST AND
                   /SET FLAG WITH RFC
                   /SKIP ON RSF

0400  7200  TST3,       CLA
0401  1051    TAD CON2
0402  3013    DCA 13
0403  6014    RFC
0404  4423    JMS I STAL
0405  6010    6010
0406  7410    SKP
0407  5225    JMP SKPERR
0410  6377    6377
0411  7410    SKP
0412  5225    JMP SKPERR
0413  6011    RSF                           /FLAG SHOULD BE SET
0414  5222    JMP ER3
0415  2013    ISZ 13
0416  5205    JMP TST3+5
0417  4405    JMS I ASCOP           /SUCCESS PATH
0420  5230    JMP TST4
0421  5200    JMP TST3
0422  4405  ER3,        JMS I ASCOP           /ERROR PATH
0423  7402    HLT                           /FLAG NOT SETTING AFTER RFC
0424  5200    JMP TST3
0425  4405  SKPERR,     JMS I ASCOP                          /ERROR
0426  7402    HLT                           /ILLEGAL RSF
0427  5200    JMP TST3



                    /TEST 4. RESET FLAG WITH RRB
0430  7200  TST4,       CLA
0431  6012    RRB                           /DELIVER CHARACTER FIRST TIME
0432  3034    DCA STOR1
0433  6011    RSF                           /CHECK RESET OF FLAG
0434  5240    JMP OK4
0435  4405    JMS I ASCOP           /ERROR PATH FLAG STILL ON
                                      /CHECK FOR SCOPE MODE
0436  7402    HLT                           /START TO REDO
0437  5230    JMP TST4
0440  4405  OK4,        JMS I ASCOP           /SUCCESS PATH
0441  5243    JMP TST5                      /CHECK FOR SCOPE MODE
0442  5230    JMP TST4
```

```
                /TEST 5. INFORMATION CHECK
0443  7200  TST5,       CLA
0444  3035    DCA STOR2
0445  1336    TAD TW5
0446  3066    DCA INF1
0447  1033    TAD MSK5
0450  3240    DCA OK4
0451  1034    TAD STOR1
0452  7440    SZA
0453  5270    JMP ERR5                    /CHARACTER IN ERROR
0454  6012  RRB2,       RRB                         /READ CHARACTER AGAIN
0455  3034    DCA STOR1
0456  1034    TAD STOR1
0457  7440    SZA
0460  5304    JMP ERR51                           /CHARACTER IN ERROR
0461  4405    JMS I ASCOP
0462  7410    SKP
0463  5200    JMP TST3                    /SCOPE MODE LOOP
0464  7200    CLA
0465  1272    TAD ERR5+2
0466  3240    DCA OK4
0467  5321    JMP TST5A
0470  4403  ERR5,       JMS I AERHLT          /CHECK FOR STOP ON ERROR
0471  7402    HLT                         /CHARACTER IN ERROR ON
                                  /FIRST RRB AFTER FLAG ON
0472  4405    JMS I ASCOP                 /CHECK FOR SCOPE MODE
0473  7410    SKP
0474  5200    JMP TST3
0475  7200    CLA
0476  3035    DCA STOR2
0477  1024    TAD PRINT1
0500  3011    DCA IR1
0501  4441    JMS I SU1
0502  4426    JMS I AMSG1
0503  5200    JMP TST3
0504  4403  ERR51,      JMS I AERHLT          /CHECK FOR STOP ON ERROR
0505  7402    HLT                         /CHARACTER IN ERROR ON 2ND
                                  /RRB AFTER FLAG ON.
0506  4405    JMS I ASCOP
0507  7410    SKP
0510  5317    JMP CLEAR                           /SCOPE MODE LOOP
0511  7200    CLA
0512  3035    DCA STOR2
0513  1024    TAD PRINT1
0514  3011    DCA IR1
0515  4441    JMS I SU1
0516  4426    JMS I AMSG1
0517  7200  CLEAR,      CLA
0520  5254    JMP RRB2


                /TEST 5A. RESET FLAG WITH RFC
0521  6014  TST5A,      RFC                         /SET FLAG
0522  6011    RSF
0523  5322    JMP .-1
0524  6014    RFC                         /RESET FLAG
0525  6011    RSF
0526  5332    JMP .+4
0527  4405    JMS I ASCOP
0530  7402    HLT                         /ERROR. FLAG STILL ON
```

```
0531  5321    JMP TST5A
0532  6011    RSF                     /WAIT FOR FLAG
0533  5332    JMP .-1                 /BEFORE PROCEEDING
0534  5735    JMP I .+1
0535  0600    600
0536  0265  TW5,       265
            *600



            /TEST 6. READ BUFFER RESET CHECK
0600  7200  TST6,      CLA
0601  1250    TAD TW66
0602  3066    DCA INF1
0603  6014    RFC                     /CLEAR READ BUFFER
0604  6012    RRB                     /READ CLEARED BUFFER
0605  3034    DCA STOR1
0606  1034    TAD STOR1
0607  1020    TAD M377
0610  7440    SZA                     /TEST FOR ALL 1'S FROM BUFFER
0611  5223    JMP HLT6                /ERROR
0612  6012    RRB
0613  3034    DCA STOR1
0614  1034    TAD STOR1
0615  1020    TAD M377
0616  7440    SZA                     /TEST FOR ALL 1'S FROM BUFFER
0617  5242    JMP HLT61                       /ERROR
0620  4405    JMS I ASCOP         /CHECK FOR SCOPE MODE
0621  5251    JMP TST7                /ONLY PATH TO TEST 7
0622  5240    JMP STLL                /SCOPE MODE LOOP
0623  4405  HLT6,      JMS I ASCOP         /BUFFER NOT ALL 1'S ON 1ST RRB
0624  7410    SKP                     /TEST FOR SCOPE MODE
0625  5240    JMP STLL                /SCOPE MODE LOOP
0626  4403    JMS I AERHLT
0627  7402    HLT                     /ERROR HALT, 1ST RRB
0630  7200  PR,        CLA
0631  7040    CMA
0632  3035    DCA STOR2                       /STORE CORRECT CHARACTER
0633  1024    TAD PRINT1              /SET UP FOR TTY PRINTOUT
0634  3011    DCA IR1
0635  4441    JMS I SU1
0636  4426    JMS I AMSG1
0637  5200    JMP TST6
0640  4423  STLL,      JMS I STAL              /70MS DELAY
0641  5200    JMP TST6
0642  4405  HLT61,     JMS I ASCOP         /BUFFER NOT ALL 1'S ON 2ND RRB
0643  7410    SKP                     /TEST FOR SCOPE MODE
0644  5240    JMP STLL                /SCOPE MODE LOOP
0645  4403    JMS I AERHLT
0646  7402    HLT                     /ERROR HALT, 2ND RRB
0647  5230    JMP PR
0650  0266  TW66,      266
```

```
                /TEST 7 INTERRUPT TEST
0651  7200  TST7,       CLA
0652  1045    TAD JMP5
0653  3001    DCA 1
0654  6001    ION
0655  6014    RFC
0656  4423    JMS I STAL              /70MS STALL
0657  4405    JMS I ASCOP         /ERROR PATH NO INTERRUPT
0660  7402    HLT
0661  5251    JMP TST7                /SCOPE MODE LOOP
0662  4405  CKSCOP,     JMS I ASCOP         /RETURN FROM INTERRUPT
0663  7410    SKP
0664  5251    JMP TST7                /SCOPE MODE LOOP
0665  6002    IOF
0666  7200    CLA
0667  1260    TAD CKSCOP-2
0670  3001    DCA 1
0671  5344    JMP WAIT


              /TEST 8. ACCELERATION TIME TEST
              /DT2500 (4.35MS<TIME<29.35MS)
              /PC01 (4.35MS<TIME<9.35MS)

0672  7604  TST8,       LAS                     /CHECK FOR PC01 OR DT2500
0673  7006    RTL
0674  7006    RTL
0675  7006    RTL
0676  7430    SZL
0677  5306    JMP PC1
0700  7200    CLA                     /SET DT2500 DELAYS
0701  1337    TAD DLY5
0702  3022    DCA WORK
0703  1340    TAD DLY10
0704  3055    DCA WORK1
0705  5313    JMP TSTMIN-1
0706  7200  PC1,        CLA                     /SET PC01 DELAYS
0707  1337    TAD DLY5
0710  3022    DCA WORK
0711  1341    TAD DLY1
0712  3055    DCA WORK1
0713  6014    RFC
0714  2022  TSTMIN,     ISZ WORK                /SKIP AT END OF MIN DELAY
0715  7410    SKP
0716  5324    JMP TSTMAX
0717  6011    RSF
0720  5314    JMP TSTMIN
0721  4405    JMS I ASCOP         /ERROR
0722  7402    HLT                     /ACCELERATING TO FAST
0723  5344    JMP WAIT
0724  2055  TSTMAX,     ISZ WORK1                       /SKIP AT END OF MAX DELAY
0725  7410    SKP
0726  5334    JMP ERMAX
0727  6011    RSF                                     |
0730  5324    JMP TSTMAX
0731  4405    JMS I ASCOP                     /SUCCESS PATH
0732  5446    JMP I ATST9
0733  5344    JMP WAIT
0734  4405  ERMAX,      JMS I ASCOP         /ERROR
0735  7402    HLT                     /ACCELERATING TOO SLOWLY
```

```
0736  5344    JMP WAIT
0737  7100  DLY5,   -700            /4.35 MS DELAY CONSTANT
0740  3074  DLY10,  -4704         /25 MS DELAY CONSTANT
0741  7000  DLY1,       -1000                    /5 MS DELAY CONSTANT
0742  0000    0
0743  7770  MIN10,      -10
0744  7200  WAIT,       CLA                      /LOOPING DELAY
0745  1343    TAD MIN10
0746  3342    DCA DLY1+1
0747  4423    JMS I STAL
0750  2342    ISZ DLY1+1
0751  5347    JMP .-2
0752  5272    JMP TST8

              *1000

                  /TEST 9. TIMING CHECK
1000  7604  TST9,       LAS
1001  7006      RTI
1002  7006      RTL
1003  7006      RTL
1004  7630      SZL CLA
1005  5245      JMP PC01
              /DT2500 TEST FOR PROPER ONE SHOT TIMING
1006  6014  SVN50C,     RFC
1007  7200      CLA
1010  6012      PRB
1011  1047      TAD SVN4HN
1012  7040      CMA
1013  7450      SNA
1014  5207      JMP SVN50C+1
1015  7200      CLA
1016  1050      TAD CON1                 /350 JS DELAY CONSTANT
1017  3022      DCA WORK
1020  2022  ISZ1,       ISZ WORK
1021  5237      JMP CK1          /CHECK FOR EARLY FLAG
1022  1051      TAD CON2                 /100US DELAY CONSTANT
1023  3022      DCA WORK
1024  2022  ISZ2,       ISZ WORK
1025  5232      JMP FLCK                 /CHECK FLAG, EXIT WHEN A 1
1026  4405      JMS I ASCOP      /ERROR PATH, FLAG LATE
1027  7402      HLT              /ERROR HALT, LATE FLAG
1030  4423      JMS I STAL
1031  5206      JMP SVN50C       /SCOPE MODE LOOP
1032  6011  FLCK,       RSF
1033  5224      JMP ISZ2
1034  4405      JMS I ASCOP      /SUCCESS PATH, CHECK  FOR
                                 /SCOPE MODE
1035  5316      JMP CKSW4                /EXIT PATH, SUCCESSFUL TEST
1036  5206      JMP SVN50C       /SCOPE MODE LOOP
1037  6011  CK1,       RSF              /ERROR IF FLAG=1, TO EARLY
1040  5220      JMP ISZ1
1041  4405      JMS I ASCOP      /CHECK FOR SCOPE MODE
1042  7402      HLT              /ERROR, EARLY FLAG
1043  4423      JMS I STAL
1044  5206      JMP SVN50C       /SCOPE MODE LOOP
```

```
                /PC01 TEST FOR MOTOR DELAY
1045  1050  PC01,   TAD CON1                 /FETCH, READ GET UP
1046  3022    DCA WORK                  /TO SPEED, LOOP
1047  6014    RFC
1050  6011    RSF
1051  5250    JMP .-1
1052  7200    CLA
1053  1021    TAD M7776
1054  3056    DCA WORK2
1055  1053    TAD CON5
1056  3055    DCA WORK1
1057  2022    ISZ WORK
1060  5247    JMP PC01+2
1061  1052    TAD CON3                  /WAIT 3MS BEFORE NEXT RFC
1062  3022    DCA WORK                  /SO AS TO EXERCISE THE DELAY
1063  2022    ISZ WORK
1064  5263    JMP .-1
1065  6014    RFC                       /START THE DELAY
1066  6011  RETURN,     RSF
1067  5302    JMP D65MS
1070  7200    CLA
1071  1055    TAD WORK1                       /CHECK 35 MS TIMER
1072  7510    SPA
1073  5277    JMP ERPC0
1074  4405    JMS I ASCOP                     /SUCCESS PATH
1075  5316    JMP CKSW4                       /SKIP TO NEXT TEST
1076  5245    JMP PC01                  /SCOPE MODE LOOP
1077  4405  ERPC0,      JMS I ASCOP          /ERROR. DELAY <35MS
1100  7402    HLT                       /ERROR HALT. DELAY <35 M.S.
1101  5245    JMP PC01                  /SCOPE MODE LOOP
1102  2056  D65MS,      ISZ WORK2                       /CHECK 65 MS TIMER
1103  7410    SKP
1104  5311    JMP ERPC01
1105  2055    ISZ WORK1                       /INCREMENT 35 MS TIMER
1106  5310    JMP .+2
1107  5310    JMP .+1
1110  5266    JMP RETURN
1111  4405  ERPC01,     JMS I ASCOP          /DELAY >65 M.S.
1112  7402    .HLT       /ERROR HALT
1113  5245    JMP PC01
1114  6012  RSFLG,      RRB
1115  5404    JMP I ATST2
1116  7604  CKSW4,      LAS                       /CHECK FOR LOOP ON
1117  7006    RTL                       /TESTS 2-9
1120  7006    RTL                       /SWITCH 4
1121  7510    SPA
1122  5314    JMP RSFLG


                /TEST 10 FLAG RESET TEST
 1123  6014  TST10,      RFC
 1124  6011    RSF
 1125  5324    JMP .-1
 1126  7402    HLT                        /PUSH START TO RESET THE FLAG
 1127  6011    RSF
 1130  5334    JMP OK10
 1131  4405    JMS I ASCOP          /SCOPE MODE CHECK
 1132  7402    HLT                       /ERROR HALT,  THE PROCESSOR
                                   /START SWITCH DID NOT RESET
                                   /THE FLAG
```

```
1133  5323    JMP TST10
1134  4405  OK10,       JMS I ASCOP
1135  7410    SKP
1136  5323    JMP TST10


              /TEST 11. SYNC CHARACTER RECOGNITION TEST
              /AND READER SPEED CHECK
1137  7200  TST11,      CLA                          /SETUP
1140  1363    TAD TW1
1141  3066    DCA INF1
1142  3035    DCA STOR2
1143  3022    DCA WORK
1144  3360    DCA COUNTA
1145  1361    TAD DL1
1146  3055    DCA WORK1
1147  6014  RFC1,       RFC                          /FETCH
1150  2360    ISZ COUNTA                 /COUNT CHARACTERS
1151  5364    JMP TIM1                    .
1152  7402    HLT                        /SHOULD NEVER GET HERE
1153  6012  DORRB,      RRB
1154  7440    SZA
1155  5757    JMP I ACKER          /BAD READ
1156  5347    JMP RFC1
1157  1400  ACKER,      CKER
1160  0000  COUNTA,     0
1161  7523  DL1,    -255             /173 DECIMAL
1162  1423  ATYPOT,     TYPOUT
1163  0261  TW1,        0261

              /*  SECOND TIME LOOP

1164  7000  TIM1,       NOP                          /1   11.25 US LOOP
1165  2022    ISZ WORK                   /2   46.08 MS ISZ LOOP
1166  7410    SKP                        /1
1167  5373    JMP TIM2
1170  6011    RSF                        /2.5
1171  5364    JMP TIM1                   /1
1172  5353    JMP DORRB

1173  2055  TIM2,       ISZ WORK1                                /2   4.5 US LOOP
1174  5364    JMP TIM1                   /1   DO 217 DECIMAL LOOPS
1175  5762          JMP I ATYPOT    /8  SECONDS UP


              /TTY PRINT ROUTINE
              *3000
3000  0000  MSG1,       0
3001  7200  BACK,       CLA
3002  1411    TAD I IR1
3003  6046    TLS
3004  1225    TAD END
3005  7440    SZA
3006  7410    SKP
3007  5213    JMP CRWAIT
3010  6041    TSF
3011  5210    JMP .-1
3012  5201    JMP BACK
3013  1224  CRWAIT,     TAD M25                      /STALL FOR
3014  3055    DCA WORK1                            /CARRIAGE RETURN
3015  1021    TAD M7776
```

```
3016  3022    DCA WORK
3017  2022    ISZ WORK
3020  5217    JMP .-1
3021  2055    ISZ WORK1
3022  5215    JMP CRWAIT+2
3023  5600    JMP I MSG1
3024  7753  M25,        -25
3025  7563  END,        -215
            /70 M.S. STALL
3026  0000  STAL70,     0
3027  7200    CLA
3030  1241    TAD M4
3031  3022    DCA WORK
3032  1021    TAD M7776
3033  3055    DCA WORK1
3034  2055    ISZ WORK1
3035  5234    JMP .-1
3036  2022    ISZ WORK
3037  5232    JMP STAL70+4
3040  5626    JMP I STAL70
3041  7774  M4,         -4
3042  0000  SCOPE,      0
3043  7604    LAS                     /CHECK FOR SCOPE MODE
3044  7006    RTL
3045  7430    SZL
3046  2242    ISZ SCOPE                       /YES, SCOPE MODE. ICR RETURN
3047  5642    JMP I SCOPE         /RETURN
3050  0000  ERHLT,      0
3051  7604    LAS                     /CHECK FOR HALT ON ERROR
3052  7700    SMA CLA
3053  2250    ISZ ERHLT                       /NO HALT ON ERROR. ICR RETURN
3054  5650    JMP I ERHLT         /RETURN


            /SETUP ROUTINES FOR TTY PRINTOUTS
              /ENTER WITH GOOD CHARACTER IN STOR2
              /AND BAD CHARACTER IN STOR1
            *1200
             ·/PRINT GOOD AND BAD CHARACTER IN OCTAL
1200  0000  SETUP1,     0
1201  7200    CLA
1202  1034    TAD STOR1                       /BAD CHARACTER
1203  0031    AND MSK3
1204  4340    JMS ROTAT6
1205  3105    DCA BAD1
1206  1034    TAD STOR1
1207  0030    AND MSK2
1210  4347    JMS ROTAT3
1211  3106    DCA BAD1+1
1212  1034    TAD STOR1
1213  0027    AND MSK1
1214  1355    TAD TW6
1215  3107    DCA BAD1+2
1216  1035    TAD STOR2                       /GOOD CHARACTER
1217  0031    AND MSK3
1220  4340    JMS ROTAT6
1221  3074    DCA GOOD1
1222  1035    TAD STOR2
1223  0030    AND MSK2
1224  4347    JMS ROTAT3
```

```
1225  3075    DCA GOOD1+1
1226  1035    TAD STOR2
1227  0027    AND MSK1
1230  1355    TAD TW6
1231  3076    DCA GOOD1+2
1232  5600    JMP I SETUP1

              /SAME AS SETUP1 WITH THE BLOCK LENGTH
              /AND STALL
              /BLOCK LENGTH IN STOR3.  STALL IN STOR4.
1233  0000    SETUP2,     0
1234  7300      CLA CLL
1235  1064      TAD BLSTOR                    /BLOCK LENGTH
1236  0032      AND MSK4
1237  4340      JMS ROTAT6

1240  3123      DCA BLKLNG
1241  1064      TAD BLSTOR
1242  0030      AND MSK2
1243  4347      JMS ROTAT3
1244  3124      DCA BLKLNG+1
1245  1064      TAD BLSTOR
1246  0027      AND MSK1
1247  1355      TAD TW6
1250  3125      DCA BLKLNG+2
1251  1010      TAD LASTAL                    /STALL
1252  0033      AND MSK5
1253  7006      RTL
1254  7006      RTL
1255  1355      TAD TW6
1256  3140      DCA STALL1
1257  1010      TAD LASTAL
1260  0032      AND MSK4
1261  4340      JMS ROTAT6
1262  3141      DCA STALL1+1
1263  1010      TAD LASTAL
1264  0030      AND MSK2
1265  4347      JMS ROTAT3

1266  3142      DCA STALL1+2
1267  1010      TAD LASTAL
1270  0027      AND MSK1
1271  1355      TAD TW6
1272  3143      DCA STALL1+3
1273  1040      TAD STOR5                     /CHARACTER POSITION
1274  0032      AND MSK4
1275  4340      JMS ROTAT6
1276  3172      DCA POSIT
1277  1040      TAD STOR5
1300  0030      AND MSK2
1301  4347      JMS ROTAT3
1302  3173      DCA POSIT+1
1303  1040      TAD STOR5
1304  0027      AND MSK1
1305  1355      TAD TW6
1306  3174      DCA POSIT+2
1307  1035      TAD STOR2                     /GOOD CHARACTER
1310  0031      AND MSK3
1311  4340      JMS ROTAT6
```

```
1312  3151    DCA GOOD2
1313  1035    TAD STOR2
1314  0030    AND MSK2
1315  4347    JMS ROTAT3
1316  3152    DCA GOOD2+1
1317  1035    TAD STOR2
1320  0027    AND MSK1
1321  1355    TAD TW6
1322  3153    DCA GOOD2+2
1323  1034    TAD STOR1                          /BAD CHARACTER
1324  0031    AND MSK3
1325  4340    JMS ROTAT6
1326  3161    DCA BAD2
1327  1034    TAD STOR1
1330  0030    AND MSK2
1331  4347    JMS ROTAT3
1332  3162    DCA BAD2+1
1333  1034    TAD STOR1
1334  0027    AND MSK1
1335  1355    TAD TW6
1336  3163    DCA BAD2+2
1337  5633    JMP I SETUP2
1340  0000  ROTAT6,     0
1341  7012    RTR
1342  7012    RTR
1343  7012    RTR
1344  1355    TAD TW6
1345  7100    CLL
1346  5740    JMP I ROTAT6
1347  0000  ROTAT3,     0
1350  7012    RTR
1351  7010    RAR
1352  1355    TAD TW6
1353  7100    CLL
1354  5747    JMP I ROTAT3
1355  0260  TW6,        260
            *1400

            /TEST 11 ERROR CONTROL AND PRINTOUTS

1400  3034  CKER,       DCA STOR1                  /STORE BAD CHARACTER
1401  4405    JMS I ASCOP
1402  7410    SKP
1403  5613    JMP I ATST11        /SCOPE LOOP
1404  4403    JMS I AERHLT
1405  7402    HLT
1406  1024    TAD PRINT1
1407  3011    DCA IR1
1410  4441    JMS I SU1
1411  4426    JMS I AMSG1
1412  5613    JMP I ATST11

1413  1137  ATST11,     TST11
1414  1160  ACNTA,      COUNTA
1415  0260  T6,         260
1416  0000  SAVE1,      0
1417  0000  SAVE2,      0
1420  0000  SAVE3,      0
1421  1470  PRINT8,     INF5
1422  0040  K0040,      40
```

```
1423  7604  TYPOUT,     LAS
1424  0222    AND K0040
1425  7450    SNA
1426  5257    JMP FLTST
1427  7200    CLA
1430  1614    TAD I ACNTA
1431  7006    RTL
1432  7006    RTL
1433  0027    AND MSK1
1434  1215    TAD T6
1435  3271    DCA INF5+1
1436  1614    TAD I ACNTA
1437  7012    RTR
1440  7012    RTR
1441  7012    RTR
1442  0027    AND MSK1
1443  1215    TAD T6
1444  3272    DCA INF5+2
1445  1614    TAD I ACNTA
1446  7012    RTR
1447  7010    RAR
1450  0027    AND MSK1
1451  1215    TAD T6
1452  3273    DCA INF5+3
1453  1221    TAD PRINT8
1454  3011    DCA IR1
1455  4426    JMS I AMSG1
1456  5613    JMP I ATST11
1457  6011  FLTST,      RSF
1460  5257    JMP .-1
1461  7604          LAS
1462  0267          AND C20
1463  7450          SNA
1464  5613    JMP I ATST11
1465  5666          JMP I .+1
1466  3200          3200
1467  0020  C20,    20
1470  0000  INF5,       0          /
1471  0000    0         /X
1472  0000    0         /X
1473  0000    0         /X
1474  0334    334       /SLASH
1475  0323    323       /S
1476  0305    305       /E
1477  0303    303       /C
1500  0240    240       /SPACE
1501  0317    317       /O
1502  0303    303       /C
1503  0324    324       /T
1504  0301    301       /A
1505  0314    314       /L
1506  0212    212       /LF
1507  0215    215       /CR
            /RANDOM NUMBER GENERATOR
            *1600
1600  0000  GENRAN,     0
1601  7200    CLA
```

```
1602  1221    TAD RANUM
1603  7104    RAL CLL
1604  7430    SZL
1605  1222    TAD THREE
1606  3221    DCA RANUM
1607  1221    TAD RANUM
1610  0223    AND TSTZRO
1611  7440    SZA
1612  5216    JMP .+4
1613  1224    TAD FOUR
1614  1221    TAD RANUM
1615  5600    JMP I GENRAN
1616  7200    CLA
1617  1221    TAD RANUM
1620  5600    JMP I GENRAN
1621  2371  RANUM,      2371
1622  0003  THREE,      3
1623  0177  TSTZRO,     177
1624  0004  FOUR,       4
            /TAPE LOOP SYNC ROUTINE
1625  1310    TAD PRINT6
1626  3011    DCA IR1
1627  4426    JMS I AMSG1
1630  1021  STRSNC,     TAD M7776
1631  3305    DCA DLY13
1632  6014    RFC                     /CHECK FOR SYNC CHARACTERS
1633  6011    RSF
1634  5233    JMP .-1
1635  7200    CLA
1636  6012    RRB
1637  7450    SNA                     /TEST CHARACTER READ
1640  5250    JMP INSYNC
1641  2305    ISZ DLY13                       /13 SECOND TIMER
1642  5232    JMP STRSNC+2
1643  7200    CLA
1644  1006    TAD PRINT3                  /TIME OUT
1645  3011    DCA IR1
1646  4426    JMS I AMSG1
1647  5230    JMP STRSNC
1650  7200  INSYNC,    CLA                     /SYNC CHARACTER DETECTED
1651  1007    TAD PRINT4
1652  3011    DCA IR1
1653  4426    JMS I AMSG1
1654  7604    LAS                     /CHECK SW3
1655  7006    RTL
1656  7006    RTL
1657  7430    SZL
1660  5265    JMP .+5
1661  1020    TAD M377
1662  7402    HLT                         /START TO RESYNC
                                  /CONTINUE TO GO ON
                                  /IF SELECTING BLOCK LENGTH
                                  /OR STALL, LOAD PARAMETERS.
                                  /IF READING ALL SAME
                                  /CHAR. PUT IT IN STOR2
1663  7450    SNA
1664  5230    JMP STRSNC
1665  7604    LAS                     /SET UP 1ST CHAR. COMPARE
1666  7010    RAR
1667  7430    SZL
```

```
1670  5704    JMP I SETONS+4
1671  7012    RTR
1672  7430    SZL
1673  5300    JMP SETONS
1674  7200    CLA
1675  1306    TAD ONE
1676  3035    DCA STOR2
1677  5704    JMP I SETONS+4
1700  7240  SETONS,     CLA CMA
1701  0307    AND TH77
1702  3035    DCA STOR2
1703  5704    JMP I .+1
1704  2000    2000
1705  0000  DLY13,      0
1706  0001  ONE,       1
1707  0377  TH77,      377
1710  0174  PRINT6,    POSIT+2

            /BETWEEN BLOCK HOUSEKEEPING
            *2000
2000  7200  HSKP,      CLA                          /SET ERRORED CHAR
2001  1350    TAD M30                    /STORAGE LIMIT
2002  3063    DCA STORLM
2003  7604    LAS
2004  7012    RTR
2005  7012    RTR
2006  7012    RTR
2007  7430    SZL
2010  5214    JMP .+4
2011  4462    JMS I AGNRAN         /GET RANDOM BLOCK LENGTH
2012  0344    AND LNGLIM                /MAX LENGTH 177
2013  3064    DCA BLSTOR
2014  7200    CLA
2015  1064    TAD BLSTOR
2016  7041    CIA
2017  3036    DCA STOR3
2020  7604    LAS
2021  7012    RTR
2022  7012    RTR
2023  7010    RAR
2024  7430    SZL
2025  5230    JMP .+3
2026  4462    JMS I AGNRAN         /GET RANDOM STALL
2027  3351    DCA STLSTR
2030  7200    CLA
2031  1351    TAD STLSTR
2032  7041    CIA                       /MAX STALL 2 SEC
2033  3037    DCA STOR4
2034  1346    TAD M120                  /CLEAR ERROR STORAGE
2035  3022    DCA WORK
2036  1054    TAD CON6
2037  3012    DCA IR2
2040  3412    DCA I IR2
2041  2022    ISZ WORK
2042  5240    JMP .-2
2043  1054    TAD CON6
2044  3012    DCA IR2
2045  3057    DCA CHACNT
2046  1051    TAD CON2
2047  3065    DCA CNTEN
```

```
                /READ-COMPARE LOOP
2050  6014  READ,       RFC
2051  6011    RSF
2052  5251    JMP .-1
2053  2057    ISZ CHACNT
2054  7200    CLA
2055  6012    RRB                     /READ NEXT CHARACTER
2056  3034    DCA STOR1
2057  1034    TAD STOR1
2060  7041    CIA
2061  1035    TAD STOR2
2062  7440    SZA                     /SKIP IF COMPARE
2063  4461    JMS I APTNOW        /BAD
2064  7604    LAS                     /GOOD
2065  7010    RAR                     /SET UP NEXT
2066  7430    SZL                     /GOOD CHARACTER
2067  5307    JMP ISSZ                /ALL SAME
2070  7010    RAR
2071  7430    SZL
2072  5301    JMP IISZ                /BINARY COUNT
2073  7200    CLA
2074  1035    TAD STOR2
2075  7040    CMA
2076  0345    AND THRE77
2077  3035    DCA STOR2
2100  5307    JMP ISSZ
2101  2035  IISZ,       ISZ STOR2                       /INCREMENT COUNT
2102  7000    NOP
2103  7200    CLA
2104  1035    TAD STOR2
2105  0345    AND THRE77              /MASK OUT 8 BITS
2106  3035    DCA STOR2
2107  2036  ISSZ,       ISZ STOR3                       /CHECK FOR END BLOCK
2110  5250    JMP READ                /NOT AT END
2111  7200    CLA                     /CHECK FOR STORED ERRORS
2112  1054    TAD CON6
2113  3012    DCA IR2
2114  1412    TAD I IR2
2115  7510    SPA                     /SKIP IF NO ERROR
2116  4460    JMS I APTEND        /PRINT ERRORS, END BLOCK
2117  7200    CLA
2120  1351    TAD STLSTR
2121  3010    DCA LASTAL
2122  2037  ISZZ,       ISZ STOR4                       /STALL IN INCREMENTS
2123  7410    SKP                     /OF 100 US,
2124  5333    JMP CKRESC
2125  7200    CLA

2126  1340    TAD CON7                /100US STALL
2127  3022    DCA WORK
2130  2022    ISZ WORK
2131  5330    JMP .-1
2132  5322    JMP ISZZ
2133  7604  CKRESC,     LAS                     /CHECK FOR RESYNC
2134  0343    AND CON10
2135  7440    SZA
2136  5752    JMP I ASTSNC
2137  5200    JMP HSKP                /START NEW BLOCK
```

```
                /CONSTANTS AND VARIABLES

2140  7750  CON7,       -30
2141  0020  CON8,       20
2142  0040  CON9,       40
2143  0010  CON10,      10
2144  0177  LNGLIM,     177
2145  0377  THRE77,     377
2146  7660  M120,       -120
2147  7777  M1,         -1
2150  7750  M30,        -30
2151  0000  STLSTR,     0
2152  1630  ASTSNC,     STRSNC
                /READ - COMPARE LOOP SUBROUTINES
                *2200
                  /ERROR ROUTINE
2200  0000  PRTNOW,     0
2201  4405    JMS I ASCOP
2202  7410    SKP
2203  5600    JMP I PRTNOW
2204  7604    LAS                         /ERROR REPORTING NOW
2205  7006    RTL                         /OR LATER
2206  7004    RAL
2207  7430    SZL
2210  5230    JMP TYPE-5                      /PRINT NOW
2211  7200    CLA                         /STORE ERRORS, PRINT LATER
2212  2063    ISZ STORLM
2213  7410    SKP
2214  5245    JMP DCRSTR                      /LIMIT REACHED
2215  1033    TAD MSK5                    /PUT ERR CHAR IN STORAGE
2216  3412    DCA I IR2
2217  1034    TAD STOR1
2220  3412    DCA I IR2
2221  1035    TAD STOR2
2222  3412    DCA I IR2
2223  1057    TAD CHACNT
2224  3412    DCA I IR2
2225  4403  CEK,        JMS I AERHLT          /SKIP FOR NO HALT ON ERROR
2226  7402    HLT                         /READ ERROR
2227  5600    JMP I PRTNOW
2230  7604    LAS
2231  7006    RTL
2232  7006    RTL
2233  7430    SZL
2234  4276    JMS CKTEN
2235  7200  TYPE,       CLA                         /PRINT BAD AND GOOD
2236  1057    TAD CHACNT
2237  3040    DCA STOR5
2240  1025    TAD PRINT2
2241  3011    DCA IR1
2242  4442    JMS I SU2
2243  4426    JMS I AMSG1
2244  5225    JMP CEK
2245  7200  DCRSTR,     CLA
2246  7040    CMA
2247  3063    DCA STORLM
2250  5600    JMP I PRTNOW
```

```
                /PRINT ERRORS AT END BLOCK
2251  0000  PRTEND,     0
2252  7200    CLA
2253  1035    TAD STOR2
2254  3000    DCA AERHLT-3
2255  1412    TAD I IR2                    /PUT BAD CHAR IN STOR1
2256  3034    DCA STOR1
2257  1412    TAD I IR2                    /PUT GOOD CHAR IN STOR2
2260  3035    DCA STOR2
2261  1412    TAD I IR2                    /PUT POSITION IN STOR5
2262  3040    DCA STOR5
2263  1025    TAD PRINT2
2264  3011    DCA IR1
2265  4442    JMS I SU2
2266  4426    JMS I AMSG1
2267  1412    TAD I IR2
2270  7710    SPA CLA
2271  5255    JMP PRTEND+4
2272  7200    CLA
2273  1000    TAD AERHLT-3
2274  3035    DCA STOR2
2275  5651    JMP I PRTEND
2276  0000  CKTEN,      0
2277  2065    ISZ CNTEN
2300  5676    JMP I CKTEN
2301  5702    JMP I .+1
2302  1630    STRSNC
                /TTY PRINTOUTS
                *2600
2600  0000  INF3,       0
2601  0303    303                        /C
2602  0301    301                        /A
2603  0316    316                        /N
2604  0316    316                        /N
2605  0317    317                        /O
2606  0324    324                        /T
2607  0240    240                        /SPACE
2610  0323    323                        /S
2611  0331    331                        /Y
2612  0316    316                        /N
2613  0303    303                        /C
2614  0212    212                        /LF
2615  0215    215                        /CR
2616  0000  INF4,       0
2617  0311    311                        /I
2620  0316    316                        /N
2621  0240    240                        /SPACE
2622  0323    323                        /S
2623  0331    331                        /Y
2624  0316    316                        /N
2625  0303    303                        /C
2626  0256    256                        /.
2627  0240    240                        /SPACE
2630  0323    323                        /S
2631  0324    324                        /T
2632  0301    301                        /A
2633  0322    322                        /R
2634  0324    324                        /T
2635  0240    240                        /SPACE
2636  0324    324                        /T
```

```
2637  0317    317                     /0
2640  0240    240                     /SPACE
2641  0322    322                     /R
2642  0305    305                     /E
2643  0323    323                     /S
2644  0331    331                     /Y
2645  0316    316                     /N
2646  0303    303                     /C
2647  0240    240                     /SPACE
2650  0303    303                     /C
2651  0317    317                     /0
2652  0316    316                     /N
2653  0324    324                     /T
2654  0256    256                     /.
2655  0240    240                     /SPACE
2656  0324    324                     /T
2657  0317    317                     /0
2660  0240    240                     /SPACE
2661  0307    307                     /G
2662  0317    317                     /0
2663  0240    240                     /SPACE
2664  0317    317                     /0
2665  0316    316                     /N
2666  0212    212                     /LF
2667  0215    215                     /CR
            *3200
3200  7200  DUL,     CLA
3201  1300          TAD N260
3202  3272          DCA D2
3203  1300          TAD N260
3204  3270          DCA D1
3205  1300          TAD N260
3206  3267          DCA D0
3207  6014          RFC
3210  6011      BIN,RSF
3211  7610          SKP CLA
3212  5305          JMP TOUT
3213  1272          TAD D2
3214  7001          IAC
3215  3272          DCA D2
3216  1272          TAD D2
3217  7041          CIA
3220  1301          TAD N272
3221  7640          SZA CLA         /SKIP IF A CARRY
3222  5243          JMP FINUP
3223  1300          TAD N260
3224  3272          DCA D2
3225  1270          TAD D1
3226  7001          IAC
3227  3270          DCA D1
3230  1270          TAD D1
3231  7041          CIA
3232  1301          TAD N272
3233  7640          SZA CLA         /SKIP IF CARRY
3234  5253          JMP FINUP1
3235  1267          TAD D0
3236  7001          IAC
3237  3267          DCA D0
3240  1300          TAD N260
3241  3270          DCA D1
```

```
3242  5260           JMP FINUP2
3243  0000  FINUP,    AND Ø
3244  0000           AND Ø
3245  0000           AND Ø
3246  0000           AND Ø
3247  0000           AND Ø
3250  0000           AND Ø
3251  0000           AND Ø
3252  0000          AND Ø
3253  0000  FINUP1,  AND Ø
3254  0000           AND Ø
3255  0000           AND Ø
3256  0000           AND Ø
3257  0000           AND Ø
                                    /63.75 US, 42.5 CYCLES
                                    /TO HERE.
3260  7200  FINUP2,  CLA
3261  1303           TAD TUSE
3262  7000           NOP
3263  3022           DCA WORK          /+9 MORE US
3264  2022           ISZ WORK          /2 CYCLES       DO 6
3265  5264           JMP .-1           /1 CYCLE      LOOPS FOR 27 US
3266  5210           JMP BIN           /99.75US LOOP TOTAL
                                    /LETS CALL IT .1MS

3267  0260  DØ,      260               /X
3270  0260  D1,      260               /X
3271  0256           256               /.
3272  0260  D2,      260               /X

3273  0240           240               /SPACE
3274  0315           315               /M
3275  0323           323               /S
3276  0212           212          /LF
3277  0215           215          /CR

3300  0260  N260,    260
3301  0272  N272,    272
3302  3266  PROAD,   DØ-1
3303  7772  TUSE,    -6
3304  0020  K20,     20
3305  1302  TOUT,    TAD PROAD
3306  3011           DCA IR1
3307  4426           JMS I AMSG1
3310  7604           LAS
3311  0304           AND K20
3312  7440           SZA
3313  5200           JMP DUL
3314  5715  JMP I .+1
3315  1137           TST11
```