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IDENTIFICATION

PRODUCT NAME: HIGH-SPEED READER/PUNCH TESTS

PRODUCT CODE: MAINDEC-08-DHPCA-A-D

PRODUCT DATE: MARCH 1977

MAINTAINER: DIAGNOSTIC ENGINEERING

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C01

1.0 ABSTRACT

THE PDP8-E HIGH-SPEED READER AND PUNCH TESTS ARE A TEST PACKAGE USED TO TEST THE TYPE 8CC8 AND PCC8 HIGH-SPEED READER-PUNCH WHEN ATTACHED TO A PDP8/E SYSTEMS. THE TESTS PERFORM BASIC INPUT AND OUTPUT CONTROL LOGIC TESTS, READER AND PUNCH TESTS, READER AND PUNCH SPEED PRINTOUTS, AND PROVIDE MAINTENANCE LOOPS USEFUL IN ADJUSTING THE READER AND PUNCH.

THE AVAILABLE TEST PROGRAMS ARE:

PRG0 - BASIC READER AND READER CONTROL LOGIC TEST.
PRG1 - BASIC PUNCH AND PUNCH CONTROL LOGIC TEST.
PRG2 - READER TEST. SPECIAL BINARY COUNT PATTERN.
PRG3 - PUNCH TEST. SPECIAL BINARY COUNT PATTERN.
PRG4 - PUNCH VERIFY. SPECIAL BINARY COUNT PATTERN.
PRG5 - PUNCH TEST. RANDOM CHARACTERS.
PRG6 - PUNCH VERIFY. RANDOM CHARACTERS.
PRG7 - COMBINED READER-PUNCH TEST. SPECIAL BINARY COUNT PATTERN.
PRG10 - READ AMPLIFIER ADJUSTMENT LOOP. 1'S AND 0'S TAPE.
PRG11 - PUNCH ANY CHARACTER IN SR LOOP.
PRG12 - 1'S AND 0'S PUNCH LOOP.
PRG13 - READER SPEED PRINT LOOP.
PRG14 - PUNCH SPEED PRINT LOOP.
PRG15 - READ X CHARACTERS, STALL Y MS LOOP.

2.0 REQUIREMENTS

2.1 EQUIPMENT

PDP8/E WITH ASR33/35 TELETYPE, PR8-E READER, OR PP8-E PUNCH, OR PU8-E READER/PUNCH. THE FOLLOWING TAPES ARE REQUIRED IN CONJUNCTION WITH THIS TEST:

MAINDEC-08-D2G1-PT
MAINDEC-08-D2G2-PT
MAINDEC-08-D2G4-PT

2.2 STORAGE

LOCATIONS 0000 THROUGH 4377 ARE USED.

2.3 PRELIMINARY PROGRAMS

ALL BASIC CPU AND TELETYPE MAINDECS MUST HAVE BEEN RUN SUCCESSFULLY.

3.0 LOADING PROCEDURE

THE BINARY LOADER IS USED TO LOAD THE PROGRAM.

4.0 USE PROCEDURES

THE FOLLOWING PAGES EXPLAIN IN DETAIL THE STEPS NECESSARY TO

RUN EACH PROGRAM.

4.1 PRG0 USE PROCEDURE

A. INSURE THAT THE TELETYPE IS ON-LINE.
B. LOAD READER WITH ALL 0'S TEST TAPE, PREFERABLY THE TAPE SHOULD BE SPLICED INTO A LOOP.
C. LOAD ADDRESS 0200.
D. SET SR TO 0000. PRESS START.
E. PROGRAM HALTS AT LOC 0242 TO PERMIT SETTING OF SR OPTIONS SET DESIRED OPTIONS AND PRESS CONTINUE.

PRG0 SR OPTIONS

SR0 HALT AT ROUTINE END. ROUTINE NUMBER IN AC
SR1 SELECT ROUTINE WHOSE NUMBER IS SET IN SR8-SR11.
SR2 LOOP PROGRAM.
SR3 0=HALT ON ERROR. 1=DO NOT HALT ON ERROR.
SR4 SKIP TEST AFTER ERROR.
SR5 ENTER SCOPE LOOP AFTER ERROR.
SR6
THROUGH ROUTINE NUMBER TO BE SELECTED.
SR11

F. THE PROGRAM RUNS AND HALTS AT PROGRAM END HALT, AT LOC 0305 UNLESS PREVENTED FROM ENDING BY ERRORS, OR SR OPTIONS.

4.2 PRG1 USE PROCEDURE

A. INSURE THAT TELETYPE IS ON-LINE.
B. MAKE PUNCH READY, INSURING THAT THERE ARE SEVERAL INCHES OF BLANK LEADER.
C. LOAD ADDRESS 0200.
D. SET SR TO 0001, PRESS START.
E. PROGRAM HALTS AT LOC 0242 TO PERMIT SETTING OF SR OPTIONS. SET DESIRED OPTIONS AND PRESS CONTINUE.

PRG1 SR OPTIONS

SR0 HALT AT ROUTINE END. ROUTINE NUMBER IN AC.
SR1 SELECT ROUTINE WHOSE NUMBER IS SET IN SR8-SR11.
SR2 LOOP PROGRAM.
SR3 0=HALT ON ERROR. 1=DO NOT HALT ON ERROR.
SR4 SKIP TEST AFTER ERROR.
SR5 ENTER SCOPE LOOP AFTER ERROR.
SR6
THROUGH ROUTINE NUMBER TO BE SELECTED.
SR11

F. THE PROGRAM RUNS TO COMPLETION AND HALTS AT PROGRAM END HALT AT LOC 0305, UNLESS PREVENTED FROM ENDING BY ERRORS, OR SR OPTIONS.

NOTE

THE RESULTING PUNCHED TAPE MUST BE INSPECTED VISUALLY, EXCEPT FOR TWO 500 CHARACTER BLOCKS CONTAINING PUNCHES IN ALTERNATE CHANNELS, THE REMAINDER OF THE TAPE SHOULD BE BLANK.

4.3 PRG2 USE PROCEDURE

A. INSURE THAT TELETYPE IS ON-LINE.
B. LOAD READER WITH SPECIAL BINARY COUNT PATTERN TEST LOOP.
C. LOAD ADDRESS 0200.
D. SET SR TO 0002. PRESS START.
E. THE PROGRAM RUNS CONTINUOUSLY UNLESS ERRORS OCCUR.

PRG2 SR OPTIONS

SR3 =0-HALT ON ERROR, SR3=1-NO HALT ON ERROR.
SR6 =0-STALL (RANDOM), SR6=1-RUN FULL SPEED.
SR7 LOCK IN CURRENT STALL (SR6 MUST BE 0).

4.4 PRG3 USE PROCEDURE

A. INSURE THAT TELETYPE IS ON-LINE.
B. MAKE PUNCH READY.
C. LOAD ADDRESS 0200.
D. SET SR TO 0003, PRESS START.
E. THE PROGRAM PUNCHES SPECIAL BINAY COUNT PATTERN CONTINUOUSLY UNTIL STOPPED BY USER.

PRG3 SR OPTIONS

SR6 =0-STALL (RANDOM), SR=1-RUN FULL SPEED.
SR7 LOCK ON STALL (SR6 MUST BE 0).

4.5 PRG4 USE PROCEDURE

A. INSURE THAT TELETYPE IS ON-LINE.
B. LOAD READER WITH TAPE PUNCHED BY PRG3. BLANK LEADER SHOULD BE UNDER READ STATION, WITH "UP" MARKER TO THE LEFT.
C. LOAD ADDRESS 0200.
D. SET SR TO 0004. PRESS START.
E. THE PROGRAM READS CONTINUOUSLY UNTIL ERRORS OCCUR, OR UNTIL THE READER RUNS OUT OF TAPE.

PRG4 SR OPTIONS

SR3 =0-HALT ON ERROR, SR3=1-NO HALT ON ERROR.

NOTE

DISREGARD ERRORS THAT OCCUR WHEN THE END OF SPECIAL BINARY COUNT PATTERN IS REACHED.

4.6 PRG5 USE PROCEDURE

A. INSURE THAT TELETYPE IS ON-LINE.
B. MAKE PUNCH READY.
C. LOAD ADDRESS 0200.
D. SET SR TO 0005. PRESS START.
E. THE PROGRAM PUNCHES RANDOM CHARACTERS CONTINUOUSLY UNTIL STOPPED BY USER.

PRG5 SR OPTIONS

SR6 =0-STALL (RANDOM), SR6=1-RUN FULL SPEED.
SR7 LOCK ON STALL (SR6 MUST BE 0).

4.7 PRG6 USE PROCEDURE

A. INSURE THAT TELETYPE IS ON-LINE.
B. LOAD READER WITH TAPE PUNCHED BY PRG5. BLANK LEADER SHOULD BE UNDER READ STATION, WITH "UP" MARKER TO THE LEFT.
C. LOAD ADDRESS 0200.
D. SET SR TO 0006. PRESS START.
E. THE PROGRAM READS CONTINUOUSLY UNTIL ERRORS OCCUR, OR UNTIL THE READER RUNS OUT OF TAPE.

PRG6 SR OPTIONS

SR3 =0-HALT ON ERROR. SR3=1-NO HALT ON ERROR.

NOTE

DISREGARD ERRORS THAT OCCUR WHEN THE END OF RANDOM CHARACTER DATA IS REACHED.

4.8 PRG7 USE PROCEDURE

A. INSURE THAT TELETYPE IS ON-LINE.
B. MAKE PUNCH READY, PUNCH ABOUT 20 INCHES (MAXIMUM) OF BLANK LEADER, AND LOAD READER WITH THE BLANK LEADER. THE PUNCH TO READER SLACK SHOULD NOT BE EXCESSIVE.
C. LOAD ADDRESS 0200.
D. SET SR TO 0007. PRESS START.
E. THE PROGRAM PUNCHES AND READ CHECKS SPECIAL BINARY COUNT PATTERN CONTINUOUSLY UNTIL ERROR OCCURS, OR SUPPLY OF TAPE IS EXHAUSTED.

PRG7 SR OPTIONS

SR3 =0-HALT ON ERROR. SR3=1-NO HALT ON ERROR.
SR6 =0-STALL (RANDOM). SR6=1-FULL SPEED RUN.
SR7 LOCK ON CURRENT STALL (SR6 MUST BE 0).

4.9 PRG10 USE PROCEDURE

A. INSURE THAT TELETYPE IS ON-LINE.
B. LOAD READER WITH 1'S AND 0'S TEST TAPE LOOP.
C. LOAD ADDRESS 0200.
D. SET SR TO 0010. PRESS START.
E. THE PROGRAM RUNS CONTINUOUSLY UNTIL STOPPED BY USER. WITH THE PROGRAM RUNNING, THE USER CAN ADJUST THE READ AMPLIFIERS.
A READ ERROR IS INDICATED BY AN ERROR PRINTOUT, DROPPING OF READER FLAG IS INDICATED BY 3 BELLS.

4.10 PRG11 USE PROCEDURE

A. INSURE THAT TELETYPE IS ON-LINE.
B. MAKE PUNCH READY.
C. LOAD ADDRESS 0200.
D. SET SR TO 0011. PRESS START.
E. PROGRAM PUNCHES CONTINUOUSLY THE CODE SET IN SR SWITCHES 4 TO 11. THE SWITCHES MAY BE CHANGED AT ANY TIME.

4.11 PRG12 USE PROCEDURE

A. INSURE TELETYPE IS ON-LINE.
B. MAKE PUNCH READY.
C. LOAD ADDRESS 0200.
D. SET SR TO 0012. PRESS START.
E. PROGRAM PUNCHES 1'S AND 0'S TAPE CONTINUOUSLY.

PRG12 SR OPTIONS

SR6 =0-STALL (RANDOM). SR6=1-RUN FULL SPEED.
SR7 LOCK ON CURRENT STALL (SR6 MUST BE 0).

4.12 PRG13 USE PROCEDURE

PRG13 IS USED TO TIME THE HIGH SPEED READER WITH THE AID OF A WATCH WITH SWEEP SECOND HAND. THE READER CAN BE TIMED IN 2 WAYS:

A. 30 SECOND TIMING. USED FOR APPROXIMATE SPEED SETTINGS.
B. 300 SECOND TIMING (5 MINUTES) FOR ACCURATE AND FINAL VERIFICATION OF READER SPEED.

TO TIME THE READER PROCEED AS FOLLOWS:

A. INSURE TELETYPE IS ON-LINE
B. LOAD ANY TAPE IN READER
C. LOAD ADDRESS 0200
D. SET SR TO 0013
E. FOR 30 SECOND TIMING, LEAVE SR1=0, FOR 300 SECOND TIMING, SET SR1 TO A 1.
F. PRESS START. READER WILL RUN CONTINUOUSLY.
G. WHEN THE 30 OR 300 SECOND TIME IS UP, TURN ON SR0, AND THEN THEN TURN IT OFF. THE PROGRAM WILL TYPE OUT THE READER SPEED IN CHARACTERS PER SECOND (CPS)
H. PROGRAM HALTS AT LOC 4230 AFTER PRINTOUT.
I. TO RETIME THE READER, PRESS CONTINUE AFTER MAKING SURE THAT SR0 IS OFF, AND THAT SR1 IS SET TO THE CORRECT TIME BASE.

NOTE

ACCURATE READER SPEED MEASUREMENT DEPENDS ON THE USER'S ATTENTION TO THE STARTING AND STOPPING TIMES.

4.13 PRG14 USE PROCEDURE

PRG14 IS USED TO TIME THE HIGH SPEED PUNCH WITH THE AID OF A WATCH WITH SWEEP SECOND HAND. THE PUNCH IS TIMED OVER A PERIOD OF 60 SECONDS. TO TIME THE PUNCH, PROCEED AS FOLLOWS:

A. INSURE TELETYPE IS ON-LINE
B. MAKE PUNCH READY
C. LOAD ADDRESS 0200
D. SET SR TO 0014
E. PRESS START. PUNCH RUNS CONTINUOUSLY.
F. AFTER 60 SECONDS TURN ON SR0, AND THEN TURN IT OFF. THE PROGRAM WILL TYPE OUT THE PUNCH SPEED IN CHARACTERS PER SECOND (CPS).

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G. PROGRAM HALTS AT LOC 4255 AFTER PRINTOUT.
H. TO RETIME THE PUNCH, PRESS CONTINUE AFTER MAKING SURE THAT SR0 IS OFF.

NOTE

ACCURATE PUNCH SPEED MEASUREMENT DEPENDS ON THE USER'S ATTENTION TO THE STARTING AND STOPPING TIMES.

4.14 PRG15 USE PROCEDURE

A. LOAD ANY TAPE IN READER.

B. LOAD ADDRESS 0200.

C. SET SR TO 0015, PRESS START.

D. PROGRAM HALTS AT LOC 4332.

E. SET SR SWITCHES 0 THROUGH 4 TO NUMBER OF CHARACTERS TO READ (1 TO 37 OCTAL).

F. SET SR SWITCHES 5 THROUGH 11 TO NUMBER OF MILLISECONDS TO STALL AFTER READING CHARACTERS (1 TO 177 OCTAL).

G. PRESS CONTINUE

H. PROGRAM RUNS CONTINUOUSLY, READING THE SPECIFIED NUMBER OF CHARACTERS, AND THEN STALLING FOR THE SPECIFIED NUMBER OF MILLISECONDS.

NOTE

THE NUMBER OF CHARACTERS READ AND/OR THE STALL COUNT MAY BE CHANGED AT ANY TIME. THIS PROGRAM DOES NOT CHECK FOR CORRECT DATA, IT IS INTENDED PRIMARILY AS AN AID IN ADJUSTING READER TIMINGS.

5. OPERATING PROCEDURES

5.1 PROGRAM AND/OR OPERATOR ACTION

5.1.1 NORMAL HALTS

LOC 0242	SR OPTIONS HALT. THIS HALT OCCURS DURING EXECUTION OF PRG0 AND PRG1 TO PERMIT SETTING OF DESIRED OPTIONS. PRESS CONTINUE TO PROCEED.
LOC 0305	PROGRAM END HALT. OCCURS AT END OF PRG0 AND PRG1 IF "LOOP PROGRAM" OPTION IS NOT SET. SET DESIRED OPTION(S) AND PRESS CONTINUE. IF NO OPTIONS ARE SET, THIS HALT REOCCURS.

LOC 0340	ROUTINE END HALT. OCCURS DURING ECEXUTION OF PRG0 AND PRG1 IF SR0 IS 1.
LOC 4230	THIS HALT OCCURS IN PRG13 AFTER PROGRAM TYPES THE READER SPEED IN CHARACTERS PER SECOND. TO RETIME THE READER, PRESS CONTINUE AFTER MAKING SURE THAT SR0 IS OFF, AND THAT SR1 IS SET TO THE CORRECT TIME BASE.
LOC 4255	THIS HALT OCCURS IN PRG14 AFTER PROGRAM TYPES THE PUNCH SPEED IN CHARACTERS PER SECOND. TO RETIME THE PUNCH, PRESS CONTINUE AFTER MAKING SURE THAT SR0 IS OFF.
LOC 4332	PRG15 SR SET HALT. OCCURS TO PERMIT SETTING OF DESIRED CHARACTER AND STALL COUNT. SET SR0-4 TO NUMBER OF CHARACTERS TO BE READ. SET SR5-11 TO NUMBER OF MILLISECONDS TO STALL AFTER READING CHARACTERS, PRESS CONTINUE.

6.0 ERRORS

ERROR PRINTOUTS AND ERROR HALTS ARE USED IN THIS PROGRAM.

6.1 ERROR PRINTOUTS

ERROR PRINTOUTS ARE IDENTIFIED BY AN ASTERISK(*) PRECEDING THE PRINTOUT. MOST ERROR PRINTOUTS TAKE THE FORM:

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*PQQXX RQQYY ZZZZZZZZZ
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WHERE,

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PQQXX=PROGRAM NUMBER
RQQXX=ROUTINE NUMBER IN THE PROGRAM
     Y=A LETTER. INDICATES WHICH ERROR OCCURED WITHIN A
       ROUTINE. IF NO LETTER IS PRINTED, ONLY ONE ERROR
       IS POSSIBLE IN THE ROUTINE.
ZZZZZZ=ADDITIONAL INFORMATION PRINTOUT.
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FOLLOWING AN ERROR PRINTOUT THE PROGRAM HALTS IF SR3 (HALT-ON-ERROR OPTION) IS OFF, AND THE OPTION APPLIES TO THE PROGRAM.

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*P0000 R0000
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250 MS AFTER ISSUING RFC COMMAND (IOT6214) RSF DID NOT SKIP, FLAG IS NOT SET, OR RSF COMMAND FAILED TO SKIP.

*P0000 R0001

WITH READ FLAG = 1, RSF (IOT011) COMMAND FAILED TO SKIP.

*P0000 R0002

RRB(IOT012) FAILED TO CLEAR FLAG, OR RSF(IOT011) SKIPPED WITH FLAG = 0.

*P0000 R0003

SKIP NOT GENERATED WITH INTERRUPT OFF, OP 6010 (RPE) MALFUNCTION.

*P0000 R0004

PCE (6020) MALFUNCTION. INTERRUPT ENABLE NOT CLEARED.

*P0000 R0005

RRB(IOT012) COMMAND FAILED TO CLEAR FLAG.

*R0000 R0006

RFC(IOT014) FAILED TO CLEAR FLAG.

*P0000 R0007

RRB(IOT012) COMMAND RESULTED IN NON-ZERO CHARACTER SET INTO AC. SHOULD BE ALL 0'S. AN ALL 0'S TEST TAPE SHOULD BE IN THE READER.

*P0000 R00010A

UNEXPECTED INTERRUPT AFTER CLEARING READER PUNCH, TTY PUNCH, AND TTY READER, TURN OFF INTERRUPTING DEVICE.

*P0000 R00010B

WITH READER FLAG SET, READER FAILED TO INTERRUPT.

*P0000 R00011A

"STOP DELAY" NOT FIRING OR SET FOR TOO SHORT A DURATION, REFER TO SECTION 9 FOR TEST DESCRIPTION.

*P0000 R00011B

"STOP DELAY" TIME OUT IS TOO LONG. REFER TO SECTION 9 FOR TEST DESCRIPTION.

*P0001 R0000

PSF(IOT021) COMMAND SKIPPED WITH FLAG = 0, OR, LESS LIKELY,

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PCF(IOT022) FAILED TO CLEAR FLAG.

*P0001 R0001

PSF(IOT021) FAILED TO SKIP WITH FLAG = 1, OR FLAG IS NOT SET.

*P0001 R0002

PCF(IOT022) FAILED TO CLEAR FLAG.

*P0001 R00010A

UNEXPECTED INTERRUPT AFTER CLEARING PUNCH, READER, TTY PUNCH, AND TTY READER. TURN OFF INTERRUPTING DEVICE.

*P0001 R00010B

WITH PUNCH FLAG SET, PUNCH FAILED TO INTERRUPT

*P0002 R0000	S/B	XXXX	WAS	YYYY
*P0004 R0000	S/B	XXXX	WAS	YYYY
*P0006 R0000	S/B	XXXX	WAS	YYYY
*P0007 R0000	S/B	XXXX	WAS	YYYY
*P0010 R0000	S/B	XXXX		YYYY

ONE OF THE ABOVE PRINTOUTS OCCURS DURING ITS RESPECTIVE PROGRAM WHEN THE DATA READ FROM PAPER TAPE AND THE EXPECTED DATA DO NOT MATCH. S/B XXXX REPRESENTS THE EXPECTED CHARACTER. WAS YYYY REPRESENTS THE CHARACTER READ.

PCF(IOT022) FAILED TO CLEAR FLAG.

*P0001 R0001

PSF(IOT021) FAILED TO SKIP WITH FLAG = 1. OR FLAG IS NOT SET.

*P0001 R0002

PCF(IOT022) FAILED TO CLEAR FLAG.

*P0001 R0001QA

UNEXPECTED INTERRUPT AFTER CLEARING PUNCH, READER, TTY PUNCH, AND TTY READER. TURN OFF INTERRUPTING DEVICE.

*P0001 R0001QB

WITH PUNCH FLAG SET, PUNCH FAILED TO INTERRUPT.

*P0002 R0000	S/B	XXXX	WAS	YYYY
*P0004 R0000	S/B	XXXX	WAS	YYYY
*P0006 R0000	S/B	XXXX	WAS	YYYY
*P0007 R0000	S/B	XXXX	WAS	
*P0010 R0000	S/B	XXXX	WAS	YYYY

ONE OF THE ABOVE PRINTOUTS OCCURS DURING ITS RESPECTIVE PROGRAM WHEN THE DATA READ FROM PAPER TAPE AND THE EXPECTED DATA DO NOT MATCH. S/B XXXX REPRESENTS THE EXPECTED CHARACTER. WAS YYYY REP- RESENTS THE CHARACTER READ.

INCORRECT RTN SELECTED

THIS PRINTOUT OCCURS DURING EXECUTION OF PRG0 AND PRG1 IF A NONEXISTENT ROUTINE IS SELECTED. THE PROGRAM HALTS, SET CORRECT ROUTINE NUMBER IN SR AND PRESS CONTINUE.

UNEXPECTED INTERRUPT

THIS PRINTOUT OCCURS DURING PRG7 EXECUTION. PROGRAM HALTS, TURN OFF INTERRUPTIG DEVICE. PRESS CONTINUE.

6.2 ERROR HALTS

LOC 0201 — INCORRECT PROGRAM NUMBER SELECTED. SET SR TO CORRECT NUMBER AND PRESS CONTINUE.

LOC 0266 — INCORRECT ROUTINE NUMBER SELECTED, PRECEDED BY PRINTOUT. SET CORRECT ROUTINE NUMBER IN SR AND PRESS CONTINUE.

LOC 0732 — UNEXPECTED INTERRUPT. PRECEDED BY PRINTOUT. OCCURS DURING PRG7 EXECUTION. TURN OFF INTERRUPTING DEVICE. PRESS CONTINUE.

LOC 1347 — SYNC ERROR. OCCURS DURING PRG2 AND PRG7. IF PROGRAM IS UNABLE TO SYNC. PRESS CONTINUE TO RETRY.

LOC 1075 — COMMON ERROR HALT. OCCURS AFTER ERROR PRINTOUT IF SR3=0 AND OPTION APPLIES TO PROGRAM BEING RUN.
PRESS CONTINUE.

LOC 3631 — PRG7. PUNCH COUNT HAS EXCEEDED 100. READER IS PROBABLY NOT RUNNING. RESTART PROGRAM.

7.0 RESTRICTIONS

7.1 STARTING RESTRICTIONS

THIS PROGRAM MUST BE STARTED AT LOC 0200.

8.0 MISCELLANEOUS

8.1 EXECUTION TIME

PRG0 1 MINUTE 50 SECONDS
PRG1 45 SECONDS
PRG2 THROUGH PRG15 ARE CONTINUOUS RUNNING PROGRAMS.

8.2 TEST TAPES

MAINDEC-00-D2G4-PT SPECIAL BINARY COUNT PATTERN TEST TAPE IS PROVIDED WITH THIS PROGRAM. FOR EASE OF USE, THE TAPE SHOULD BE SPLICED INTO A LOOP INSURING THAT THE PATTERN IS MATCHED AT THE SPLICE POINT. THE END OF A PATTERN IS INDICATED BY THE CHARACTERS; RUBOUT, ALL 0'S CHARACTER, ALL 0'S CHARACTER, AND THEN ANOTHER RUBOUT.

IT IS DESIRABLE TO SPLICE INTO LOOPS, MAINDEC-00-D2G1-PT AND MAINDEC-00-D2G2-PT TO FACILITATE TESTING.

9.0 PROGRAM DESCRIPTION

THIS PROGRAM CONSISTS OF 14 INDIVIDUAL PROGRAMS NUMBERED FROM 00 TO 15(OCTAL). PROGRAMS ARE SELECTED BY MEANS OF THE SWITCH REGISTER (SR).

9.1 PRG0 - BASIC READER AND READER CONTROL LOGIC TEST

THIS PROGRAM CONTAINS TEN ROUTINES NUMBERED FROM 0 TO 11 (OCTAL).

RTN0 CHECKS THAT FLAG IS SET 250 MS AFTER ISSUING RFC COMMAND (IOT014). FAILURE TO SKIP ON FLAG COULD BE CAUSED BY FLAG NOT SET, OR RSF FAILURE TO SKIP. TEST IS DONE 200 TIMES.

RTN1 CHECKS THAT RSF COMMAND (IOT011) SKIPS WITH FLAG = 1. TEST IS DONE 4095 TIMES.

RTN2 CHECK THAT RSF COMMAND (IOT011) DOES NOT SKIP WITH FLAG = 0. DONE 4095 TIMES.

RTN3 CHECKS FOR SKIP WITH INTERRUPT OFF. (DONE 2047 TIMES)

RTN4 CHECKS THAT INTERRUPT ENABLE CAN BE CLEARED FOR READER. (DONE 4095 TIMES)

RTN5 CHECKS THAT RRB COMMAND (IOT012) CLEARS THE FLAG. DONE 500 TIMES.

RTN6 CHECKS THAT RFC COMMAND (IOT014) CLEARS THE FLAG. DONE 500 TIMES.

RTN7 CHECKS ABILITY TO READ ALL 0'S CHARACTER. DONE 500 TIMES.

RTN10 CHECKS FOR UNEXPECTED INTERRUPTS, AND THEN CHECKS THAT READER IS ABLE TO INTERRUPT.

RTN11 THIS ROUTINE CHECKS THAT THE "STOP DELAY" IS NOT LESS THAN 10 MS. OR MORE THAN 250 MS. THE TEST SEQUENCE IS:

A. RFC (FETCH CHARACTER)

B. WAIT FOR FLAG 1 (SHOULD BE SET IMMEDIATELY)

C. DELAY 19 MS. (STOP DELAY SHOULD FIRE 6 MS AFTER STEP A.)

D. RFC (FETCH CHARACTER. CLEAR FLAG.)

E. DELAY 19 MS.

F. SKIP ON FLAG. (IF SKIP OCCURS, THE "STOP DELAY" DID NOT FIRE, OR IS TOO SHORT).

G. DELAY ADDITIONAL 212 MILLISECONDS.

H. SKIP ON FLAG. (IF NO SKIP OCCURS, THE "STOP DELAY" IS TOO LONG.) TEST IS DONE 200 TIMES.

9.2 PRG1 - BASIC PUNCH AND PUNCH CONTROL LOGIC TEST

THIS PROGRAM CONTAINS NINE ROUTINES NUMBERED FROM 0 TO 10 (OCTAL).

RTN0 CHECKS THAT PSF COMMAND (IOT021) DOES NOT SKIP WITH FLAG = 0.

RTN1 CHECKS THAT PSF COMMAND (IOT021) SKIPS WITH FLAG = 1. DONE 4095 TIMES.

RTN2 CHECKS THAT PCF COMMAND (IOT022) IS ABLE TO CLEAR THE FLAG. DONE 500 TIMES.

RTN3 CHECKS FOR SKIP WITH INTERRUPT OFF. (DONE 2047 TIMES)

RTN4 CHECKS THAT INTERRUPT ENABLE CAN BE CLEARED FOR PUNCH. (DONE 4095 TIMES)

RTN5 TEST DONE 500 TIMES. VISUAL CHECK OF TAPE REQUIRED. CHECKS THAT PCF COMMAND (IOT022) IS ABLE TO CLEAR THE PUNCH BUFFER. THE TEST SEQUENCE IS:

A. ALL 1'S TO PUNCH BUFFER, AND PUNCH (PLS).
B. IMMEDIATELY CLEAR THE PUNCH BUFFER BY ISSUING PCF COMMAND. NO HOLES SHOULD BE PUNCHED EXCEPT FOR FEED-HOLE.

RTN6 TEST IS DONE 500 TIMES, VISUAL CHECK OF TAPE REQUIRED. ROUTINE LOADS PUNCH BUFFER WITH 125 (8) AND PUNCHES. ALTERNATE HOLES SHOULD BE PUNCHED.

RTN7 TEST IS DONE 500 TIMES. VISUAL CHECK OF TAPE REQUIRED. ROUTINE LOADS PUNCH BUFFER WITH 252(8) AND PUNCHES. ALTERNATE HOLES SHOULD BE PUNCHED.

RTN10 CHECKS FOR UNEXPECTED INTERRUPTS, AND THEN CHECKS THAT PUNCH IS ABLE TO INTERRUPT.

9.3 PRG2 - READER TEST

THE READER IS TESTED USING A SPECIAL BINARY COUNT PATTERN TEST TAPE. THE PROGRAM IS CONTINUOUS RUNNING. ERRORS ARE INDICATED BY PRINTOUTS. NORMAL TEST MODE IS WITH RANDOM STALLS AFTER EVERY CHARACTER GROUP READ. SR6 = 1 GIVES FULL SPEED TESTING. SR7 = 1 LOCKS PROGRAM ON CURRENT STALL. (SR6 MUST BE 0). PROGRAM RESYNCS AFTER 5 ERRORS. THE LENGTH OF A CHARACTER GROUP IS RANDOM, BUT DOES NOT EXCEED 15 CHARACTERS.

9.4 PRG3 - PUNCH TEST, SPECIAL BINARY COUNT PATTERN

THIS CONTINUOUS RUNNING PROGRAM PUNCHES SPECIAL BINARY COUNT PATTERN. NORMAL TEST MODE IS WITH RANDOM STALLS AFTER EVERY CHARACTER PUNCHED. SR6 = 1 GIVES FULL SPEED PUNCHING. SR7 = 1 LOCKS PROGRAM ON THE CURRENT STALL. (SR6 MUST BE 0).

9.5 PRG4 - PUNCH VERIFY, BINARY COUNT PATTERN

THIS PROGRAM READS AND CHECKS THE TAPE PUNCHED DURING EXECUTION OF PRG3. ERRORS ARE INDICATED BY ERROR PRINTOUTS.

9.6 PRG5 - PUNCH TEST, RANDOM CHARACTERS

THIS CONTINUOUS RUNNING PROGRAM PUNCHES RANDOM CHARACTERS. NORMAL TEST MODE IS WITH RANDOM STALLS AFTER EVERY CHARACTER PUNCHED. SR6 = 1 GIVES FULL SPEED PUNCHING. SR7 = 1 LOCKS PROGRAM ON THE CURRENT STALL. (SR6 MUST BE 0).

9.7 PRG6 - PUNCH VERIFY, RANDOM CHARACTERS

THIS CONTINUOUS RUNNING PROGRAM READS AND CHECKS THE TAPE PUNCHED DURING EXECUTION OF PRG5. ERRORS ARE INDICATED BY ERROR PRINTOUTS.

9.8 PRG7 - COMBINED READER - PUNCH TEST

THIS CONTINUOUS RUNNING PROGRAM PUNCHES AND READ - CHECKS SPECIAL BINARY COUNT PATTERN. THE READER AND PUNCH WORK IN THE INTERRUPT MODE. NORMAL TEST MODE IS WITH RANDOM STALLS AFTER EVERY CHARACTER PUNCHED. SR6 = 1 GIVES FULL SPEED PUNCHING AND READING. SR7 = 1 LOCKS PROGRAM ON THE CURRENT STALL. (SR6 MUST BE 0.) THE READER RESYNCS ITSELF AUTOMATICALLY AFTER 5 ERRORS.

9.9 PRG10 - READ AMPLIFIER ADJUSTMENT LOOP

THIS CONTINUOUS RUNNING PROGRAM USES A 1'S AND 0'S TEST TAPE LOOP, AND PROVIDES A MEANS OF DETERMINING THE UPPER AND LOWER LIMITS OF CORRECT OPERATION OF THE READ AMPLIFIER OF THE PAPER TAPE READER. AFTER OBTAINING THE LIMITS THE POT CAN BE SET TO THE MIDDLE POSITION. READ ERRORS ARE INDICATED BY ERROR PRINT-

OUTS. DROPPING OF THE READER FLAG BY OVERDRIVING OF THE FEED-HOLE AMPLIFIER IS INDICATED BY 3 BELLS FROM THE TELETYPE. THE READER IS THEN RESTARTED.

9.10 PRG11 - PUNCH ANY CHARACTER IN SR LOOP

THIS PROGRAM LOOP CONTINUOUSLY PUNCHES THE CODE SET IN SR4 THROUGH SR11. SR SWITCHES MAY BE CHANGED WHILE RUNNING.

9.11 PRG12 - ONES AND ZEROS PUNCH LOOP

THIS PROGRAM PUNCHES 1'S AND 0'S CONTINUOUSLY. NORMAL MODE IS WITH RANDOM STALLS AFTER EVERY CHARACTER PUNCHED. SR6 = 1 GIVES FULL SPEED PUNCHING. SR7 = 1 LOCKS PROGRAM ON CURRENT STALL. (SR6 MUST BE 0

9.12 PRG13 - READER SPEED PRINT LOOP

THIS PROGRAM TYPES THE READER SPEED MEASURED OVER A 30 OR 300 SECOND PERIOD. THE USER CONTROLS THE MEASURING TIME WITH THE AID OF A WATCH WITH SWEEP SECOND HAND.

9.13 PRG14 - PUNCH SPEED PRINT LOOP

THIS PROGRAM TYPES THE PUNCH SPEED MEASURED OVER A 60 SECOND PERIOD. THE USER CONTROLS THE MEASURING TIME WITH THE AID OF A WATCH WITH SWEEP SECOND HAND.

9.14 PRG15 - READ X, STALL Y MS LOOP

THIS PROGRAM LOOP IS INTENDED AS AN AID IN ADJUSTING THE PAPER TAPE READER. THE USER SETS IN SR3 THROUGH SR4 THE NUMBER OF CHARACTERS TO BE READ (RANGE: 1 TO 37 OCTAL) AND IN SR5 THROUGH SR11 THE NUMBER OF MS TO STALL AFTER READING THE CHARACTERS (RANGE: 1 TO 177 OCTAL). THIS LOOP IS USEFUL IN ADJUSTING CLOCK TIMING, STROBE, ETC.

10.0 LISTING

```
                /PC8-E HIGH SPEED READER AND PUNCH TESTS.
                /MAINDEC-08-DHPCA-A-D
                /DATE:  MARCH 1977
                /COPYRIGHT 1977 DIGITAL EQUIPMENT CORP. MAYNARD, MASS. 01754
                /AUTHORS:  BOB KOLLER/MATT TAFFEL/MARK SANDLER/STEVE JENSEN
                /
                /PRG0-BASIC READER AND READER CONTROL LOGIC TEST.  ALL 0'S TAPE
                /PRG1-BASIC PUNCH AND PUNCH CONTROL LOGIC TEST
                /PRG2-READER TEST. BINARY COUNT PATTERN
                /PRG3-PUNCH TEST. BINARY COUNT PATTERN
                /PRG4-PUNCH VERIFY. BINARY COUNT PATTERN
                /PRG5-PUNCH TEST. RANDOM CHARACTERS
                /PRG6-PUNCH VERIFY. RANDOM CHARACTERS
                /PRG7-COMBINED READER-PUNCH TEST. BINARY COUNT PATTERN
                /PRG10-READ AMPLIFIER ADJUSTMENT LOOP. ONES AND ZEROES TAPE.
                /PRG11-PUNCH ANY CHARACTER OR SR LOOP/
                /PRG12-ONES AND ZEROES PUNCH LOOP.
                /PRG13-READER SPEED PRINT LOOP
                /PRG14-PUNCH SPEED PRINT LOOP
                /PRG15-READ X, STALL Y MSEC LOOP.

         6000   SKON=6000
         6003   SRQ=6003
         6007   CAF=6007
         6010   RPE=6010
         6020   PCE=6020
         6014   RCF=6014
         6024   PPC=6024
         0000   *0
   0000  0000         0000
   0001  5001         JMP 1
   0002  0002         2
   0003  0003         3
         0005   *5
   0005  5402         JMP I 2
   0006  0000         0
         0020   *20
   0020  0000   KSTART, 0                        /USER PROGRAM START.
   0021  0000   DELAYM, 0
   0022  0000   COUNT,  0000
   0023  0000   AC,     0
   0024  0000   LINK,   0
   0025  0270   CHAIN,  CHAINN
   0026  0333   SHLT,   SHALT
   0027  0447   RANDNO, RANGEN
   0030  0000   PRGNUM, 0
   0031  2000   PRGTAB, PRG0
   0032  3000           PRG1
   0033  3462           PRG2
   0034  3506           PRG3
   0035  3517           PRG4
   0036  3537           PRG5
   0037  3553           PRG6
   0040  3600           PRG7
   0041  4000           PRG10
```



```
   0042  4102           PRG11
   0043  4110           PRG12
   0044  4200           PRG13
   0045  4233           PRG14
   0046  4332           PRG15
   0047  0616   XTYPST, TYPSTG
   0050  0600   UCRLF,  CRLF
   0051  1030   UERROR, ERROR
   0052  1000   UASCCN, ASCCN
   0053  1335   ULPRGN, LPRGN
   0054  1373   ULRRGN, LRRGN
   0055  1200   UTREAD, TREAD
   0056  1207   UTPCH,  TPCH
   0057  1214   UPLDR,  PLDR
   0060  1330   UMARK,  MARK
   0061  1143   UTCHK,  TCHK
   0062  1146   UTSB,   TSB
   0063  0024   CRCNT,  CRCNT
   0064  1311   SYNC,   SYNK
   0065  1324   SYNCA,  SYNKA
   0066  1400   INPATT, INITPT
   0067  1412   GETPT,  GETPTT
   0070  1435   GETPTR, GTPTRR
   0071  0521   CHECK,  CHCK
   0072  0513   DLYCNT, DLCNT
   0073  0426   UPUNCH, PUNCH
   0074  0536   UMOVE,  MOVE
   0075  0400   USTCTR, STCTR
   0076  0443   URDSR,  RDSR
   0077  1111   USTCTA, STCTA
   0100  1117   USTCTB, STCTB
   0101  1042   USTDLM, STDLYM
   0102  0411   UDLYMS, DLYMS
   0103  0733   UIOUT,  IOUT
   0104  0000   DLYMSK, 0
   0105  0000   SRMSK,  0
   0106  7354   MILI,   7354                     CONSTANT FOR MILLISECOND CTR
   0107  0000   CPIC,   0
   0110  0000   CHR1,   0
   0111  0000   CHR2,   0
   0112  0000   CHR3,   0
   0113  0000   TEMP,   0
   0114  0000   TEMP1,  0
   0115  0000   CURTST, 0
   0116  0000   RTNNO,  0
   0117  0000   NXTST,  0
   0120  0000   MSCTR,  0                        STORED NUMBER OF MILLISEC TO BE COUNTED
   0121  0000   MILCTR, 0                        MILLISECOND TALLY
   0122  0000   CTRA,   0
   0123  0000   CTRB,   0
   0124  0000   CTRC,   0
   0125  0000   CTRD,   0
   0126  0000   PFLAG,  0
   0127  0000   RBUSY,  0
   0130  0000   [illegible] 0
```

```
0131  0000          TCHKW,  0
0132  0000          PCHCNT, 0
0133  0000          ACTIND, 0
0134  0000          DELTIM, 0
0135  0000          MILLI,  0
0136  0000          CTR,
      4000          SR0MSK=4000
      2000          SR1MSK=2000
      1000          SR2MSK=1000
      0400          SR3MSK=0400
      0200          SR4MSK=0200
      0100          SR5MSK=0100
      0040          SR6MSK=0040
      0020          SR7MSK=0020
      0017          TSTMSK=0017
      0377          PTMSK=0377
      4475          SETLOC=JMS I USTCTR
      4476          READSR=JMS I URDSR
      4477          SETA=JMS I USTCTA
      4500          SETB=JMS I USTCTB
      4502          DELAY=JMS I UDLYMS
      5503          OUT=JMP I UIOUT
      0140          A=0140
      0240          B=0240
      0000          NONE=0000
      4040          NOSUF=4040
      4501          SETDLM=JMS I   TDLM
      4502          DELAY=JMS I   YMS
      5503          OUT=JMP I UIOUT
      0000          OPEN=0000

                            /SET INT ENABLE FOR READER AND PUNCH
                            /SKIP IF RDR FLAG = 1
                            /READ READER BUFFER AND CLEAR FLAG
                            /CLEAR FLAG AND BUFFER AND FETCH CHARACTER
                            /RRB,RCC
                            /CLEAR INTERRUPT ENABLE FOR READER AND PUNCH
                            /SKIP IF PUNCH FLAG = 1
                            /CLEAR FLAG AND BUFFER
                            /LOAD BUFFER AND PUNCH CHARACTER
                            /PCF,PPC

                    /SKIP IF INTERRUPT ON AND TURN INTERRUPT OFF
                    /TURN INTERRUPT ON
                    /TURN INTERRUPT OFF
                    /SKIP ON INTERRUPT REQUEST
                    /GET FLAGS
                    /RESTORE FLAGS
                    /SKIP ON GREATER THAN FLAGS
                            /CLEAR ALL FLAGS

      0200          *200
0200  7410          STRT,   SKP
0201  7602                  HLT CLA                 /INCORRECT PRGNUM
0202  7604                  LAS                     READ SR
```

I02

SEQ 0021

```
0203  0177                  AND [17                 /MASK ALL BUT LAST 4 BITS
0204  1176                  TAD [-15
0205  7540                  SMA SZA                 /VALID PROGRAM?
0206  5201                  JMP STRT+1              /NO, GO TO ERROR HALT.
0207  7604                  LAS                     /YES, REREAD SR
0210  0177                  AND [17
0211  3030                  DCA PRGNUM
0212  1030                  TAD PRGNUM              /DEVELOP PROGRAM ADDRESS
0213  1175                  TAD [PRGTAB
0214  3113                  DCA TEMP
0215  1513                  TAD I TEMP
0216  3240                  DCA PRGADR              /STORE DEVELOPED ADDRESS.
0217  4474          INIT,   JMS I UMOVE             /INITIALIZE INTERRUPT
0220  0005                  5                       /AREA.
0221  0001                  1
0222  7776                  -2
0223  3113                  DCA TEMP                /0 TO TEMP
0224  4474                  JMS I UMOVE             /CLEAR WORK AREA
0225  0113                  TEMP
0226  0114                  TEMP1
0227  7760                  -20
0230  4475                  SETLOC
0231  1075                  ERRORA
0232  7402                  7402
0233  1174                  TAD [177
0234  3104                  DCA DLYMSK
0235  1173                  TAD [7640
0236  3572                  DCA I [STALL+3
0237  5640                  JMP I .+1               /JUMP TO SELECTED
0240  0000          PRGADR, 0                       /PROGRAM
0241  7602          SRSET,  HLT CLA
0242  7200          GETRDY, CLA
0243  1020                  TAD KSTART              /SET ADDRESS OF 1ST ROUTINE
0244  3117                  DCA NXTST               /STORE AT NXTST
0245  4307                  JMS FORWD
0246  4476                  READSR                  READ SR
0247  7006                  RTL
0250  7420                  SNL                     /ROUTINE SELECT? (SR1)
0251  5515                  JMP I CURTST            /NO, START WITH 1ST RTN
0252  4476                  READSR                  /YES
0253  0177                  AND     [TSTMSK
0254  7041                  CIA
0255  1115                  TAD RTNNO
0256  7650                  SNA CLA                 /IS IT THIS RTN?
0257  5515                  JMP I CURTST            /YES, GO DO IT
0260  1117                  TAD NXTST               /NO
0261  7001                  IAC                     /IS THIS LAST RTN?
0262  7640                  SZA CLA                 /NO
0263  5245                  JMP GETRDY+3
0264  4477                  JMS I XTYPST
0265  1560                  WRTN
0266  7602          INCRTN, HLT CLA                 /YES, INCORRECT ROUTINE NO.
0267  5242                  JMP GETRDY
0270  4426          CHAINN, JMS I SHLT              /HALT? (ERO)
0271  4476                  READSR                  /READ SR
```

```
0272  7006          RTL
0273  7630          SZL CLA                 /ROUTINE SELECT? (SR1)
0274  5242          JMP GETRDY              /YES
0275  1117          TAD NXTST
0276  7001          IAC
0277  7640          SZA CLA                 /LAST ROUTINE?
0300  5245          JMP GETRDY+3            /NO.
0301  4476          READSR
0302  7006          RTL
0303  7710          SPA CLA                 /LOOP PROGRAM? (SR3)
0304  5242          JMP GETRDY              /YE
0305  7402  PRGEND,  HLT                    /END OF PROGRAM HALT
0306  5270          JMP CHAINN
0307  0000  FORWD,   0
0310  7300          CLA CLL
0311  1517          TAD I NXTST             /GET NEXT RTN NO
0312  3116          DCA RTNNO               /STORE AT RTNNO
0313  2117          ISZ NXTST
0314  1117          TAD NXTST               /SET CURRENT
0315  3113          DCA TEMP                /RTN NUMBER
0316  2117          ISZ NXTST
0317  1117          TAD NXTST               /SET CURRENT
0320  3115          DCA CURTST              /RTN ADDR.
0321  1513          TAD I TEMP              /SET NEXT
0322  3117          DCA NXTST               /RTN ADDR.
0323  5707          JMP I FORWD             /EXIT
0324  0000  CHRCNT,  0
0325  4427          JMS I RANDNO            /SET RANDOM NUMBER
0326  0177          AND [17                 /REMOVE EXCESS BITS
0327  7450          SNA
0330  5323          JMP CHRCNT+1            /YES, REPEAT
0331  7041          CIA                     /COMPLEMENT
0332  5724          JMP I CHRCNT            /EXIT.
0333  3000  SHALT,   0
0334  4476          READSR                  /READ SR
0335  7700          SMA CLA                 /HALT? (SR0)
0336  5733          JMP I SHALT
0337  1116          TAD RTNNO
0340  7402          HLT                     /UNCONDITIONAL HALT (SR =
0341  5733          JMP I SHALT             /EXIT.S/-IOL
              PAGE
0400  0000  STCTR,   0
0401  7200          CLA
0402  1600          TAD I STCTR             /GET CTR ADDR
0403  3113          DCA TEMP                /AND SAVE AT TEMP
0404  2200          ISZ STCTR
0405  1600          TAD I STCTR             /GET COUNT AND
0406  3513          DCA I TEMP              /STORE PER C(TEMP)
0407  2200          ISZ STCTR
0410  5600          JMP I STCTR             /EXIT
0411  0000  DLYMS,   0
0412  7300          CLA CLL
0413  1021          TAD DELAYM              /GET MS COUNT
0414  3120          DCA MSCTR               /STORE IN MSCTR
0415  7616          JMP .+1
```



```
0416  0417          .+1
0417  1106          TAD MIL1                /GET 1 MS CONSTANT
0420  3121          DCA MILCTR              /STORE IN MILCTR
0421  2121          ISZ MILCTR              /DELAYED 1 MSEC?
0422  5221          JMP .-1
0423  2120          ISZ MSCTR               /DONE DELAYING?
0424  5217          JMP .-5
0425  5611          JMP I DLYMS             /EXIT
              /PUNCH/PRINT ONE CHARACTER SUBROUTINE (CHAR IN AC).
0426  0000  PUNCH,   0
0427  2125          ISZ PFLAG               /SET PFLAG
0430  6046          TLS                     /PUNCH PRINT
0431  7200          CLA
0432  1325          TAD PFLAG
0433  7640          SZA CLA                 /FLAG RESET?
0434  7410          SKP                     /NO
0435  5240          JMP .+3                 /YES.
0436  6041          TSF                     /DONE PRINTING
0437  5236          JMP .-5                 /NO.
0440  6042          TCF                     /YES, RESET PUNCH/PRINTER FLAG
0441  3125          DCA     PFLAG           /RESET FLAG
0442  5626          JMP I PUNCH             /EXIT.
0443  0000  RDSR,    0
0444  7604          LAS
0445  0105          AND SRMSK
0446  5643          JMP I RDSR
0447  0000  RANGEN,  0                      /RANDOM NUMBER GENERATOR SUBROUTINE
0450  7200          CLA
0451  1311          TAD RANTNO
0452  1276          TAD RANDEX
0453  7640          SZA CLA
0454  5264          JMP RANTAD
0455  1300          TAD RANTBL
0456  3276          DCA RANDEX
0457  1277          TAD RANCON
0460  7104          CLL RAL
0461  7430          SZL
0462  7001          IAC
0463  3277          DCA RANCON
0464  1277  RANTAD.  TAD RANCON
0465  1676          TAD I RANDEX
0466  3676          DCA I RANDEX
0467  1312          TAD RANSAV
0470  7010          RAR
0471  1676          TAD I RANDEX
0472  2276          ISZ RANDEX
0473  3312          DCA RANSAV
0474  7010          RAR
0475  5647          JMP I RANGEN
0476  0311  RANDEX,  RANTNO
0477  6543  RANCON,  6543
0500  0501  RANTBL,  .+1
              6543
```

```
0502  3210                 3210
0503  0765                 0765
0504  5432                 5432
0505  2107                 2107
0506  7654                 7654
0507  4321                 4321
0510  1076                 1076
0511  7257     RANTND, .
0512  0000     RANSAV, 0

               /SUBROUTINE TO GENERATE RANDOM DELAY COUNT
               /
0513  0000     DLCNT,  0
0514  4427             JMS I RANDNO         /GO GENERATE RANDOM NUMBER
0515  0174             AND [177             /MASK OUT UNDESIRED BITS.
0516  7041             CIA                  /2'S COMPLEMENT IT
0517  3021             DCA DELAYM
0520  5713             JMP I DLCNT          /EXIT

               /SUBROUTINE TO COMPARE C(AC) TO CONTENTS STORED AT CALL+1
               /
0521  0000     CHCK,   0
0522  3335             DCA WCHK             /STORE AC AT WCHK
0523  1721             TAD I CHCK           /GET COMPARE DATA
0524  7041             CIA                  /2'S COMPLEMENT IT
0525  1335             TAD WCHK             /ADD C(WCHK)
0526  2321             ISZ CHCK             /SET UP FOR UNEQUAL EXIT
0527  7640             SZA CLA              /EQUAL (AC = 0)
0530  5333             JMP .+3              /NO
0531  2321             ISZ CHCK             /YES, SET UP FOR EQUAL EXIT
0532  5721             JMP I CHCK           /EQUAL EXIT
0533  1335             TAD WCHK             /RESTORE AC
0534  5721             JMP I CHCK           /UNEQUAL EXIT
0535  0000     WCHK,   0

               /SUBROUTINE TO MOVE VARIABLE LENGTH DATA FIELDS
0536  0000     MOVE,   0
0537  7200             CLA
0540  1736             TAD I MOVE           /GET "FROM ADDR" AND
0541  3361             DCA FADDR            /STORE AT FADDR
0542  2336             ISZ MOVE
0543  1736             TAD I MOVE           /GET "TO ADDR" AND
0544  3362             DCA TADDR            /STORE AT TADDR.
0545  2336             ISZ MOVE
0546  1736             TAD I MOVE           /GET "MOVE COUNT" AND
0547  3363             DCA MCTR             /STORE AT MCTR.
0550  2336             ISZ MOVE             /SET UP FOR EXIT.
0551  7200     MOVEA,  CLA
0552  1761             TAD I FADDR          /GET "FROM" WORD
0553  3762                     DCA I TADDR          /STORE AT "TO" LOCATION
0554  2361             ISZ FADDR            /+1 TO "FROM" ADDR
0555  2362             ISZ TADDR            /+1 TO "TO" ADDR.
0556  2363             ISZ MCTR             /ALL WORDS MOVED?
0557  5351             JMP MOVEA            /NO, GO MOVE AGAIN
0560  5736             JMP I MOVE           /YES, EXIT
```

M02


```
0561  0000     FADDR,  0
0562  0000     TADDR,  0
0563  0000     MCTR,   0

      0600     PAGE
0600  0000     CRLF,   0                    /CRLF SUBROUTINE
0601  7200             CLA                  /GET NUMBER OF CRLF'S
0602  1600             TAD I CRLF           /AND SAVE
0603  3215             DCA CRCTR
0604  2200             ISZ CRLF
0605  4447             JMS I XTYPST         /GO CRLF
0606  0612             .+4
0607  2215             ISZ CRCTR            /ALL DONE?
0610  5205             JMP .-3              /NO
0611  5600             JMP I CRLF           /YES, EXIT.
0612  0015             0015                 /CR
0613  0012             0012                 /LF
0614  0001             0001                 /END CODE
0615  0000     CRCTR,  0
0616  0000     TYPSTG, 0
0617  7200             CLA
0620  1616             TAD I TYPSTG         /GET AND STORE
0621  3300             DCA TEMQ             /INITIAL ADDRESS
0622  3302             DCA FLAG             /CLEAR FLAG
0623  2216             ISZ TYPSTG
0624  1700     TSC1,   TAD I TEMQ           /SET DATA
0625  7012             RTR                  /ROTATE RIGHT 6.
0626  7012             RTR
0627  7012             RTR
0630  4235             JMS TSC2             /GO TYPE CHARACTER
0631  1700             TAD I TEMQ           /GET DATA
0632  4235             JMS TSC2             /GO TYPE CHARACTER
0633  2300             ISZ TEMQ             /INCR STRING ADDR
0634  5224             JMP TSC1             /GO BACK FOR MORE
0635  0000     TSC2,   0
0636  [illegible]      AND [77              /MASK OFF 6 BITS
0637  3301             DCA TEMR             /SAVE CHARACTER
0640  1302             TAD FLAG             /TEST FLAG
0641  7640             SZA CLA              /SET
0642  5252             JMP TYPSP            /NOT SET
0643  1301             TAD TEMR             /ZERO?
0644  7450             SNA                  /YES, SET FLAG
0645  5250             JMP .+3              /NO, PRINT IT.
0646  4271     TYPAT,  JMS PRINT            /RETURN
0647  5635             JMP I TSC2           /SET FLAG
0650  2302             ISZ FLAG             /EXIT
0651  5635             JMP I TSC2           /CLEAR FLAG
0652  3302     TYPSP,  DCA FLAG
0653  1301             TAD TEMR
0654  7041             CIA                  /ZERO?
0655  7450             SNA                  /YES, TYPE "@"
0656  5246             JMP TYPAT
0657  7001             IAC                  /IS IT 01?
0660  7640             SNA CLA              /YES, EXIT CODE
0661  5616             JMP I TYPSTG
```

```
0561  0000  FADDR,  0
0562  0000  TADDR,  0
0563  0000  MCTR,   0

      0600  PAGE
0600  0000  CRLF,   0
0601  7200          CLA                     /CRLF SUBROUTINE
0602  1600          TAD I CRLF              /GET NUMBER OF CRLF'S
0603  3215          DCA CRCTR               /AND SAVE
0604  2200          ISZ CRLF
0605  4447          JMS I XTYPST            /GO CRLF
0606  0612          .+4
0607  2215          ISZ CRCTR               /ALL DONE?
0610  5205          JMP .-3                 /NO
0611  5600          JMP I CRLF              /YES, EXIT.
0612  0015          0015                    /CR
0613  0012          0012                    /LF
0614  0001          0001                    /END CODE
0615  0000  CRCTR,  0
0616  0000  TYPSTG, 0
0617  7200          CLA
0620  1616          TAD I TYPSTG            /GET AND STORE
0621  3300          DCA TEMQ                /INITIAL ADDRESS
0622  3302          DCA FLAG                /CLEAR FLAG
0623  2216          ISZ TYPSTG
0624  1700  TSC1,   TAD I TEMQ              /GET DATA
0625  7012          RTR                     /ROTATE RIGHT 6.
0626  7012          RTR
0627  7012          RTR
0630  4235          JMS TSC2                /GO TYPE CHARACTER
0631  1700          TAD I TEMQ              /GET DATA
0632  4235          JMS TSC2                /GO TYPE CHARACTER
0633  2300          ISZ TEMQ                /INCR STRING ADDR
0634  5224          JMP TSC1                /GO BACK FOR MORE
0635  0000  TSC2,   0
0636  0171          AND [77                 /MASK OFF 6 BITS
0637  3301          DCA TEMR                /SAVE CHARACTER
0640  1302          TAD FLAG
0641  7640          SZA CLA                 /TEST FLAG
0642  5252          JMP TYPSP               /SET
0643  1301          TAD TEMR                /NOT SET
0644  7450          SNA                     /ZERO?
0645  5250          JMP .+3                 /YES, SET FLAG
0646  4271  TYPAT,  JMS PRINT               /NO, PRINT IT.
0647  5635          JMP I TSC2              /RETURN
0650  2302          ISZ FLAG                /SET FLAG
0651  5635          JMP I TSC2              /EXIT
0652  3302  TYPSP,  DCA FLAG                /CLEAR FLAG
0653  1301          TAD TEMR
0654  7041          CIA
0655  7450          SNA                     /ZERO?
0656  5246          JMP TYPAT               /YES, TYPE "@"
0657  7001          IAC
0660  7650          SNA CLA                 /IS IT 01?
0661  5616          JMP I TYPSTG            /YES, EXIT CODE
```

N02


```
0662  1170          TAD [SMA                /SMA TO SWITCH
0663  3273          DCA SWITCH
0664  1301          TAD TEMR                /GET CHARACTER
0665  4271          JMS PRINT               /PRINT IT
0666  1167          TAD [SPA
0667  3273          DCA SWITCH              /SPA TO SWITCH
0670  5635          JMP I TSC2              /RETURN
0671  0000  PRINT,  0
0672  1166          TAD [-40
0673  7510  SWITCH, SPA
0674  1165          TAD [100
0675  1164          TAD [240
0676  4473          JMS I XPUNCH
0677  5671          JMP I PRINT
0700  [illegible]  TEMQ,   0
0701  0000  TEMR,   0
0702  0000  FLAG,   0

/
0703  3023  INTSVC, DCA AC                  /SAVE AC
0704  7010          RAR
0705  3024          DCA LINK                /SAVE LINK
0706  6011          RSF                     /READER?
0707  5312          JMP .+3                 /NO.
0710  5711          JMP I .+1               /YES
0711  0000  RVCTR,  0
0712  6021          PSF                     /PUNCH?
0713  5317          JMP .+4                 /NO.
0714  4563          JMS I [STALL            /STALL IF DESIRED.
0715  5716          JMP I .+1               /YES.
0716  0000  PVCTR,  0
0717  6031          KSF                     /TTY READER /KYBD?
0720  5323          JMP .+3                 /NO.
0721  6032          KCC                     /YES.
0722  5503          OUT                     /TO MAINLINE
0723  6041          TSF                     /TTY PRINTER/PUNCH?
0724  5330          JMP .+4                 /NO.
0725  6042          TCF                     /YES.
0726  3126          DCA PFLAG
0727  5503          OUT                     /TO MAINLINE
0730  4447  UNEXIT, JMS I XTYPST            /PRINT ERROR MESSAGE
0731  1501          UNINT
0732  7602          HLT CLA                 /HALT, UNEXPECTED INTERRUPT
0733  7300  IOUT,   CLA CLL
0734  1024          TAD LINK
0735  7004          RAL                     /RESTORE LINK
0736  1023          TAD AC                  /RESTORE AC
0737  6001          ION
0740  5400          JMP I 0                 /EXIT INTERRUPT
/
0741  6022  PCHCLR, PCF
0742  5503          OUT
0743  6012  RDRCLR, RRB
0744  5503          OUT
```

```
                1000    PAGE
1000 0000       ASCCN,  0                       /SUBROUTINE TO CONVERT
1001 7200               CLA                     /A WORD TO PRINTABLE ASCII
1002 1600               TAD I ASCCN
1003 3237               DCA WASC
1004 2200               ISZ ASCCN
1005 1600               TAD I ASCCN
1006 3240               DCA SASC
1007 2200               ISZ ASCCN
1010 1163               TAD I7700
1011 0637               AND I WASC
1012 7112               RTR CLL
1013 7012               RTR
1014 7012               RTR
1015 4224               JMS CNV
1016 2240               ISZ SASC
1017 1162               TAD I7700
1020 7040               CMA
1021 0637               AND I WASC
1022 4224               JMS CNV
1023 5600               JMP I ASCCN
1024 0000       CNV,    0
1025 3241               DCA ASCT
1026 1241               TAD ASCT
1027 7006               RTL
1030 7004               RAL
1031 0161               AND I707
1032 1241               TAD ASCT
1033 0161               AND I707
1034 1160               TAD I6060
1035 3640               DCA I SASC
1036 5624               JMP I CNV
1037 0000       WASC,   0
1040 0000       SASC,   0
1041 0000       ASCT,   0
                /
1042 0000       STDLYM, 0                       /SET DELAYM SUB.
1043 7200               CLA
1044 1642               TAD I STDLYM            /SET DELAYM TO
1045 3021               DCA DELAYM              /NUMBER SPECIFIED
1046 2242               ISZ STDLYM              /AT CALL+1
1047 5642               JMP I STDLYM            /EXIT
1050 0000       ERROR,  0
1051 4452               JMS I UASCCN            /CONVERT PROGRAM
1052 0030               PRGNUM                  /NUMBER TO PRINTABLE
1053 1471               PRUMB                   /OCTAL.
1054 4452               JMS I UASCCN            /CONVERT ROUTINE
1055 0116               RTNNO                   /NUMBER TO PRINTABLE
1056 1474               ENUMB                   /OCTAL.
1057 1650               TAD I ERROR             /GET ERROR SUFFIX AND
1060 3710               DCA I SFADR             /STORE AT SUFX
1061 4447               JMS I XTYPST            /PRINT ERROR NUMBER
1062 1466               ERNUMB
1063 2250               ISZ ERROR
1064 1650               TAD I ERROR             /GET ADDRESS OF ADDITIONAL
```



```
1065 7450               SNA                     /PRINTOUT. ZERO?
1066 5272               JMP .+4                 /YES.
1067 3271               DCA .+2
1070 4447               JMS I XTYPST            /NO, PRINT IT.
1071 0000               0
1072 4476               READSR
1073 0157               AND I SR3MSK
1074 7650               SNA CLA                 /HALT ON EROR? (SR3)
1075 7402       ERRORA, HLT                     /YES, (SR3-0)
1076 4476               READSR
1077 0156               AND I SR4MSK
1100 7640               SZA CLA                 /SKIP TEST? (SR4)
1101 5425               JMP I CHAIN             /YES.
1102 4476               READSR
1103 0165               AND I SR5MSK
1104 7640               SZA CLA                 /ENTER SCOPE LOOP?
1105 2250               ISZ ERROR               /YES.
1106 2250               ISZ ERROR
1107 5650               JMP I ERROR
1110 1476       SFADR,  SUFX
1111 0000       STCTA,  0                       /SET CTRA TO
1112 7200               CLA                     /NUMBER SPECIFIED
1113 1711               TAD I STCTA             /AT CALL+1
1114 3122               DCA CTRA
1115 2311               ISZ STCTA
1116 5711               JMP I STCTA             /EXIT
1117 0000       STCTB,  0                       /SET CTRB TO
1120 7200               CLA                     /NUMBER SPECIFIED
1121 1717               TAD I STCTB             /AT CALL+1
1122 3123               DCA CTRB
1123 2317               ISZ STCTB
1124 5717               JMP I STCTB             /EXIT
1125 0000       STALL,  0                       /RANDOM STALL SUBROUTINE
1126 4476               READSR
1127 0155               AND I SR6MSK
1130 7640               SZA CLA                 /STALL? (SR6)
1131 5725               JMP I STALL             /NO, EXIT
1132 4476               READSR
1133 0154               AND I SR7MSK
1134 7640               SZA CLA                 /LOCK ON STALL?
1135 7410               SKP                     /YES.
1136 4472               JMS I DLYCNT            /NO, RANDOM STALL.
1137 1021               TAD DELAYM
1140 7440               SZA
1141 4502               DELAY                   /STALL
1142 5725               JMP I STALL             /EXIT
1143 0000       TCHK,   0
1144 4471               JMS I CHECK             /CHECK THAT C(AC AND C(TSB) ARE
1145 0000       TSB,    0
1146 5351               JMP .+3                 /ERROR, NOT EQUAL
1147 2343               ISZ TCHK                /EQUAL
1150 5743               JMP I TCHK              /OK
1151 3131               DCA TCHKW               /STORE BAD CHARACTER
1152 4452               JMS I UASCCN
1153 1145               TSB
```

```
1154 1604           SB
1155 4452           JMS I UASCCN
1156 0131           TCHKW
1157 1611           WAS
1160 4451           JMS I UERROR
1161 4040           NOSUF
1162 1601           SBWAS
1163 5743           JMP I TCHK             /RETURN
1164 5743           JMP I TCHK             /RETURN

     1200   PAGE
1200 0000   TREAD,  0
1201 6014           RFC
1202 6011           RSF
1203 5202           JMP .-1
1204 7200           CLA
1205 6012           RRB
1206 5600           JMP I TREAD
1207 0000   TPCH,   0
1210 6026           PLS
1211 6021           PSF
1212 5211           JMP .-1
1213 5607           JMP I TPCH
1214 0000   PLDR,   0
1215 4475           SETLOC                 /-100 TO PLDRW
1216 1227           PLDRW
1217 7634           -144
1220 7200           CLA
1221 6026           PLS
1222 6021           PSF
1223 5222           JMP .-1
1224 2227           ISZ PLDRW              /DONE?
1225 5220           JMP .-5                /NO
1226 5614           JMP I PLDR             /YES. EXIT
1227 0000   PLDRW,  0
            /
1230 0000   MARK,   0
1231 4214           JMS PLCR
1232 4500           SETB
1233 7767           -11
1234 4475           SETLOC                 /MARKER ADDRESS
1235 1246           MARKAD                 /TO MARKED
1236 1521           MARKER
1237 7200           CLA
1240 1646           TAD I MARKAD           /GET MARK
1241 4207           JMS TPCH               /PUNCH IT.
1242 2246           ISZ MARKAD             /UPDATE.
1243 2123           ISZ CTRB               /DONE?
1244 5237           JMP .-5                /NO.
1245 5630           JMP I MARK             /YES EXIT.
1246 0000   MARKAD, 0
1247 1233   SEED1,  1233
1250 7622           7622
1251 0000   RANP1,  0
1252 0000   RANP2,  0
```



```
1253 0000   RANR1.  0
1254 0000   RANR2.  0
1255 0000   LPRGN.  0
1256 7300           CLL CLA
1257 1251           TAD RANP1
1260 7006           RTL
1261 1252           TAD RANP2
1262 3251           DCA RANP1
1263 1251           TAD RANP1
1264 7006           RTL
1265 1252           TAD RANP2
1266 7006           RTL
1267 3252           DCA RANP2
1270 1251           TAD RANP1
1271 0153           AND [PTMSK
1272 5655           JMP I LPRGN
1273 0000   LRRGN.  0
1274 7300           CLL CLA
1275 1253           TAD RANR1
1276 7006           RTL
1277 1254           TAD RANR2
1300 3253           DCA RANR1
1301 1253           TAD RANR1
1302 7006           RTL
1303 1254           TAD RANR2
1304 7006           RTL
1305 3254           DCA RANR2
1306 1253           TAD RANR1
1307 0153           AND [PTMSK
1310 5673           JMP I LRRGN
1311 0000   SYNK,   0
1312 4466           JMS I INPATT           /READ CHARACTER
1313 4455           JMS I UTREAD           /STORE AT CHR1
1314 3110           DCA CHR1               /READ CHARACTER
1315 4455           JMS I UTREAD           /STORE AT CHR2
1316 3111           DCA CHR2               /READ CHAR
1317 4455           JMS I UTREAD           /STORE
1320 3112           DCA CHR3               /GO SYNC.
1321 4465           JMS I SYNCA            /NO SYNC. TRY AGAIN.
1322 5312           JMP SYNK+1             /SYNCED. EXIT.
1323 5711           JMP I SYNK
1324 0000   SYNKA,  0                      /-512 TO CTSK
1325 4475           SETLOC
1326 1363           CTSK
1327 7000           -1000                  /SET CTSK1
1330 4475           SETLOC                 /K-10
1331 1364           CTSK1
1332 7766           -12                    /GET BIN CHARACTER
1333 4467           JMS I GETPT
1334 7040           CMA                    /SAME AS CHR1?
1335 0110           AND CHR1
1336 7440           SZA                    /NO.
1337 5333           JMP .-4                /YES. GET ANOTHER BIN CHAR.
1340 4467           JMS I GETPT
1341 7040           CMA
```

F03


```
1342  0111              AND CHR2
1343  7450              SNA                     /SAME AS CHR2?
1344  5351              JMP SYNKC               /YES.
1345  2363              ISZ CTSK                /NO, 512 TIMES?
1346  5330              JMP SYNKA+4             /NO
1347  7602    SYNKB,    HLT CLA                 /YES, SYNC ERROR.
1350  5724              JMP I SYNKA             /TRY AGAIN.
1351  4467    SYNKC,    JMS I GETPT             /GET LINE CHARACTER.
1352  7040              CMA
1353  0112              AND CHR3                /SAME AS CHR3?
1354  7440              SZA
1355  5360              JMP .+3                 /NO.
1356  2324              ISZ SYNKA               /YES.
1357  5724              JMP I SYNKA             /EXIT
1360  2364              ISZ CTSK1               /DONE 10 TIMES?
1361  5330              JMP SYNKA+4             /NO.
1362  5347              JMP SYNKB               /YES, SYNC ERROR.
1363  0000    CTSK,     0
1364  0000    CTSK1,    0

      1400              PAGE
1400  0000    INITPT,   0                       /INITIALIZE BINARY
1401  7201              CLA IAC                 /PATTERN ROUTINES
1402  3260              DCA PT0
1403  4474              JMS I UMOVE
1404  1460              PT0
1405  1461              PT1
1406  7775              -3
1407  3264              DCA RIND
1410  3265              DCA PIND
1411  5600              JMP I INITPT
1412  0000    GETPTT,   0                       /BINARY COUNT PATTERN
1413  7200              CLA                     /ROUTINE(SPECIAL)
1414  1260              TAD PT0
1415  3261              DCA PT1
1416  1264              TAD RIND
1417  7040              CMA
1420  3264              DCA RIND
1421  1264              TAD RIND
1422  7650              SNA CLA
1423  5227              JMP .+4
1424  1261              TAD PT1
1425  7040              CMA
1426  5231              JMP .+3
1427  1261              TAD PT1
1430  7041              CIA
1431  0153              AND IPTMSK
1432  3260              DCA PT0
1433  1261              TAD PT1
1434  5612              JMP I GETPTT
1435  0000    GTPTRR,   0                       /BINARY COUNT PATTERN
1436  7200              CLA                     /ROUTINE
1437  1262              TAD PT2
1440  3263              DCA PT3
1441  1265              TAD PIND
```

G03


```
1442  7040              CMA
1443  3265              DCA PIND
1444  1265              TAD PIND
1445  7650              SNA CLA
1446  5252              JMP .+4
1447  1263              TAD PT3
1450  7040              CMA
1451  5254              JMP .+3
1452  1263              TAD PT3
1453  7041              CIA
1454  0153              AND IPTMSK
1455  3262              DCA PT2
1456  1263              TAD PT3
1457  5635              JMP I GTPTRR
1460  0000    PT0,      0
1461  0000    PT1,      0
1462  0000    PT2,      0
1463  0000    PT3,      0
1464  0000    RIND,     0
1465  0000    PIND,     0
1466  0015    ERNUMB,   0015                    /CR
1467  0012              0012                    /LF
1470  5220              5220                    /*,P
1471  4040    PNUMB,    4040
1472  4040              4040
1473  4022              4022                    /SPC,R
1474  4040    ENUMB,    4040
1475  4040              4040
1476  4040    SUFX,     4040
1477  4040              4040                    /SP,SP
1500  0001              0001                    /END CODE.
1501  0015    LNINT,    0015                    /CR
1502  0012              0012                    /LF
1503  0007              0007                    /BELL
1504  4025              4025                    /SPC,U
1505  1605              1605                    /N,E
1506  3020              3020                    /X,P
1507  0503              0503                    /E,C
1510  2405              2405                    /T,E
1511  0440              0440                    /D,SPC
1512  1116              1116                    /I,N
1513  2405              2405                    /T,E
1514  2222              2222                    /R,R
1515  2520              2520                    /U,P
1516  2456              2456                    /T,↑
1517  0015              0015                    /CR
1520  0001              0001                    /END CODE
1521  0037    MARKER,   0037
1522  0040              0040
1523  0040              0040
1524  0037              0037
1525  [illegible]       [illegible]
1526  [illegible]       [illegible]
1527  [illegible]       [illegible]
1530  [illegible]       [illegible]
```

```
             0006                /CR
RSPC.        0015                /LF
             0012                /SP,R
             4022                /O,R
             0422                /SP,S
             4023                /P,E
             2005                /ED
             0504                /SP
             4000                /END CODE
             0100                /CR
PSPC.        0015                /LF
             0012                /SP,P
             4020                /C,H
             0310                /SP,S
             4023                /P,E
             2005                /E,D
             0504                /SP
             4000                /END CODE
             0100                /SP,C
CPS.         4003                /P,S
             2023                /CR
             0015                /END CODE
             0001                /CR
WRTN.        0015                /LF
             0012                /SPC BELL
             4000                /I
             0711                /N,C
             1603                /O,R
             1722                /R,E
             2205                /C,T
             0324                /SPC,S
             4022                /T,N
             2416                /SPC,S
             4023                /E,[illegible]
             0514                /E,[illegible]
             0503                /T,E
             2405                /D,.
             0456                /CR
             0015                /END CODE.
             0001                /SPC,S
SBWAS.       4023                /*,B
             5702                /SPC,SPC
             4040                /SPC,SPC
SB.          4040                /SPC,SPC
             4040                /SPC,SPC
             [illegible]         /W,A
             [illegible]         /S,SPC
             [illegible]         /SPC,SPC
WAS.         [illegible]         /SPC,SPC
             [illegible]         /CR
             [illegible]         /END CODE
TOCMSG.      [illegible]         /R
             [illegible]         /E
             [illegible]         /BE
```



```
     4040          4040                /SP,SP
     2331          2331                /CY
     2324          2324
     0515          0515                /EM SP
     5640          5640                /SP
     2305          2305
     2440          2440
     [illegible]   [illegible]         /[illegible] D
     [illegible]   [illegible]         /SP C
     [illegible]   [illegible]         /SP
     [illegible]   [illegible]         /P E
     [illegible]   [illegible]         /RE
     [illegible]   [illegible]         /FE
     [illegible]   [illegible]         /R SP
     [illegible]   [illegible]         /SP P
     [illegible]   [illegible]         /AG
     [illegible]   [illegible]         /ES
     [illegible]   [illegible]         /SP [illegible]
     [illegible]   [illegible]         /ND
     [illegible]   [illegible]         /SP 3
     [illegible]   [illegible]         /SP
     [illegible]   [illegible]         /PR
     1662          [illegible]         /G SP
1663 0740          0740                /I
1664 1411          1411
1665 2324          2324                /N
1666 [illegible]   [illegible]         /G.
1667 [illegible]   0756                /END
1670 0756          0001
1671 0001

     2000          PAGE
                   /PROGRAM 0. BASIC READER AND READER LOGIC CONTROL TEST
                   /
                   PPG0.      SETLOC               /SET KSTART TO
2000 4475                     KSTART               /INITIAL ROUTINE
2001 0020                     POTO                 /ADDRESS
2002 20[illegible]            SETLOC               /SET SR MASK
2003 4475                     SRMSK
2004 0105                     7717
2005 [illegible]              JMP I .+1            /SET STARTED.
2006 5007                     SRSET
2007 02[illegible]
2010 0000          POTO.      0
```

```
                        POT1
                /CHECKS THAT FLAG=1 250MS. AFTER RFC (IOTO14), INDICATING THAT
                /READER IS ADVANCING.
2012  4477          SETA                    /-200 TO CTRA
2013  7470          -310
2014  4501          SETDLM                  /-250 TO DELAY
2015  7406          -372
2016  6014  POT0A,  RFC                     /CLEAR FLAG, FETCH CHAR (IOTO14)
2017  4502          DELAY                   /DELAY 75 MS.
2020  6011          RSF                     /SKIP IF FLAG=1 (IOTO11)
2021  5225          JMP POE0
2022  2122          ISZ CTRA                /DON?
2023  5216          JMP POT0A               /NO, REPEAT
2024  5425          JMP I CHAIN             /YES, CHAIN
2025  4451  POE0,   JMS I UERROR            /GO TO ERROR SUBROUTINE
2026  4040          NOSUF                   /NO PRINTOUT SUFFIX
2027  0000          NONE                    /NO PRINTOUT
2030  5222          JMP POT0A+4             /CONTINUE TEST
2031  4501  POT0S,  SETDLM                  /SCOPE LOOP
2032  7764          -14
2033  6014          RFC                     /FETCH CHAR (IOTO14)
2034  4502          DELAY                   /DELAY 12 MS.
2035  5233          JMP .-2
2036  0001  POT1,   1
2037  2064          POT2
                /WITH FLAG=1, SKIP ON FLAG 4095 TIMES TO CHECK FOR RELIABLE SKIPPING
2040  4477          SETA                    /-4095 TO CTRA
2041  0001          -7777
2042  6014          RFC                     /FETCH CHAR (OITO14)
2043  6011          RSF                     /SKIP ON FLAG (IOTO11)
2044  5243          JMP .-1                 /REPEAT
2045  6011  POT1A,  RSF                     /SKIP ON FLAG (IOTO11)
2046  5255          JMP POE1                /ERROR
2047  2122          ISZ CTRA                /DONE 4095 TIMES?
2050  5245          JMP POT1A               /NO, REPEAT TEST
2051  5425          JMP I CHAIN             /YES, CHAIN
2052  4451  POE1,   JMS I UERROR            /GO TO ERROR SUBROUTINE
2053  4040          NOSUF                   /NO PRINTOUT SUFFIX
2054  0000          NONE                    /NO PRINTOUT
2055  5247          JMP POT1A+2             /CONTINUE TEST
```



```
2056  6014  POT1S,  RFC                     /START SCOPE LOOP, FETCH CHAR (IOTO14)
2057  6011          RSF                     /SKIP ON FLAG (IOTO11)
2060  5257          JMP .-1                 /REPEAT
2061  6011          RSF                     /SKIP ON FLAG (IOTO11)
2062  5261          JMP .-1                 /REPEAT
2063  5261          JMP .-2                 /REPEAT
2064  0002  POT2,   2
2065  2105          POT3
                /CHECKS THAT IOTO11 DOES NOT SKIP WITH FLAG=0.
2066  4477          SETA                    /-4095 TO CTRA
2067  0001          -7777
2070  6012          RRB                     /CLEAR FLAG
2071  6011  POT2A,  RSF                     /SKIP ON FLAG=1(IOTO11)
2072  5303          JMP POT20K              /OK
2073  4451  POE2,   JMS I UERROR            /ERROR, GO TO ERROR SUB
2074  4040          NOSUF                   /NO PRINTOUT SUFFIX
2075  0000          NONE                    /NO PRINTOUT
2076  5303          JMP POT20K              /CONTINUE TEST
2077  6011  POT2S,  RSF                     /START SCOPE LOOP, SKIP ON FLAG
2100  5277          JMP .-1                 /REPEAT
2101  5277          JMP .-2                 /REPEAT
2102  2122  POT20K, ISZ CTRA                /DONE 4095 TIMES?
2103  5271          JMP POT2A               /NO, REPEAT
2104  5425          JMP I CHAIN             /YES, CHAIN

                /ROUTINE TO CHECK FOR SKIP WITH INTERRUPT DISABLED
2105  0003  POT3,   3
2106  2200          POT4
2107  1377          TAD (4000
2110  3022          DCA COUNT
2111  1375          TAD (7773
2112  3136          DCA CTR
2113  6552          IOF
2114  7200          CLA
2115  3135          DCA MILLI
2116  2135          ISZ MILLI
2117  5316          JMP .-1
2120  2136          ISZ CTR
2121  5315          JMP .-3
2122  1376          TAD (2260               /4.56 MS CONSTANT
2123  3134          DCA DELTIM
2124  6007          CAF
2125  6016          RCF                     /READ
2126  4351          JMS TIM
2127  6011  POT3A,  RSF                     /SKIP IF READER FLAG SET
2130  5337          JMP POE3                /FLAG DID NOT SET
2131  6010          RPE
2132  6003          SRQ                     /SHOULD SKIP HERE IF INT REQ
2133  5337          JMP POE3                /REPORT ERROR
2134  2022          ISZ COUNT
2135  5311          JMP POT3+4
2136  5425          JMP I CHAIN
2137  4451  POE3,   JMS I UERROR
2140  4040          NOSUF
2141  0000          NONE
```

```
1031    2142  5311          JMP POT3+4
1032    2143  6002    POT3S, IOF
1033    2144  6011          RSF
1034    2145  5344          JMP .-1
1035    2146  6011          RSF
1036    2147  5346          JMP .-1
1037    2150  5346          JMP .-2
1038    2151  0000    TIM,  0
1039    2152  2134          ISZ DELTIM
1040    2153  5352          JMP .-1
1041    2154  5751          JMP I TIM
1042
1043    2175  2260
1044    2176  7773
1045    2177  4000
              2200    PAGE
1046                  /ROUTINE TO CHECK THAT INTERRUPT ENALBE CAN BE CLEARED FOR READER.
1047    2200  0004    POT4, 4
1048    2201  2400          POTS
1049    2202  6002          IOF
1050    2203  1234          TAD     R7770
1051    2204  3235          DCA     RCNT2           /INIT. # OF ITERATIONS
1052    2205  6007    RLOOP, CAF
1053    2206  6010          RPE                     /ENABLE INTERRUPT
1054    2207  6020          PCE
1055    2210  6001          ION
1056    2211  6014          RCF                     /READ
1057    2212  6000          SKON
1058    2213  5224          JMP POE4                /INTERRUPT NOT ON
1059    2214  6003          SRQ                     /SKIP IF INT REQ GENERATED
1060    2215  7410          SKP                     /NO INT REQ
1061    2216  5224          JMP POE4                /INT REQ GENERATED
1062    2217  2022          ISZ COUNT               /RELIABILITY SETUP
1063    2220  5205    POT4A, JMP RLOOP              /CONTINUE
1064    2221  2235          ISZ     RCNT2
1065    2222  5205          JMP     RLOOP
1066    2223  5425          JMP I CHAIN
1067    2224  4451    POE4, JMS I UERROR
1068    2225  4040          NOSUF
1069    2226  0000          NONE
1070    2227  5425          JMP I CHAIN
1071    2230  6010    POT4S, PPE
1072    2231  4502          DELAY
1073    2232  6020          PCE
1074    2233  5230          JMP .-3
1075
1076    2234  7770    R7770, 7770
1077    2235  7770    RCNT2, 7770
1078
1079          2400    PAGE
1080    2400  0005    POTS, 5
1081    2401  2430    POTS
1082                  /CHECKS IOTD12 (RRB) FOR ABILITY TO CLEAR FLAG.
1083    2402  4477          SETA                    /-500 TO CTRA
1084    2403  7014          -764
```



```
1085    2404  6014    POT5A, RFC                    /FETCH CHAR (IOTD14)
1086    2405  6011          RSF                     /WAIT FOR FLAG-1
1087    2406  5205          JMP .-1
1088    2407  6012          RRB                     /CLEAR FLAG (IOTD12)
1089    2410  6011          RSF                     /SKIP ON FLAG=1
1090    2411  5225          JMP POT5B               /OK.
1091    2412  4451    POE5, JMS I UERROR            /ERROR, GO TO ERROR SUB.
1092    2413  4040          NOSUF                   /NO PRINTOUT SIFFIX
1093    2414  0000          NONE                    /NO PRINTOUT
1094    2415  5225          JMP POT5B               /CONTINUE TEST
1095    2416  6014    POT5S, RFC                    /START SCOPE LOOP. FETCH CHAR
1096    2417  6011          RSF                     /WAIT FOR FLAG=1
1097    2420  5217          JMP .-1
1098    2421  6012          RRB                     /CLEAR FLAG (IOTD12)
1099    2422  6011          RSF                     /SKIP IF FLAG=1
1100    2423  5216          JMP .-5                 /NO, IOTD12 CLEARED IT. READ AGAIN
1101    2424  5221          JMP .-3                 /IOTD12 FAILED, REPEAT IMTD12.
1102    2425  2132    POT5B, ISZ CTRA               /DONE?
1103    2426  5204          JMP POT5A               /NO, REPEAT
1104    2427  5425          JMP I CHAIN             /YES, CHAIN
1105    2430  0006    POT6, 6
1106    2431  2600          POT7
1107                  /CHECKS THAT IOTD14 CLEARS FLAG.
1108    2432  4477          SETA                    /-500 TO CTRA.
1109    2433  7014          -764
1110    2434  6014          RFC                     /FETCH CLEAR (IOTD14)
1111    2435  6011    POT6A, RSF                    /WAIT FOR FLAG=1.
1112    2436  5235          JMP .-1
1113    2437  6014          RFC                     /CLEAR FLAG WITH IOTD14
1114    2440  6011          RSF                     /SKIP IN FLAG=1.
1115    2441  5253          JMP POT6B               /OK FLAG IS 0.
1116    2442  4451    POE6, JMS I UERROR            /ERROR, FLAG=1. GO TO ERROR SUB.
1117    2443  4040          NOSUF                   /NO PRINTOUT SUFFIX
1118    2444  0000          NONE                    /NO PRINTOUT
1119    2445  5253          JMP POT6B               /CONTINUE TEST
1120    2446  4502    POT6S, DELAY                  /START SCOPE LOOP, DELAY 20 MS.
1121    2447  6014          RFC                     /FETCH CHAR (IOTD14)
1122    2450  6011          RSF                     /WAIT FOR FLAG=1.
1123    2451  5250          JMP .-1
1124    2452  5247          JMP .-3                 /GO CLEAR FLAG AND FETCH CHAR.
1125    2453  2132    POT6B, ISZ CTRA               /DONE?
1126    2454  5235          JMP POT6A               /NO, REPEAT
1127    2455  5425          JMP I CHAIN             /YES, CHAIN
1128
1129          2600    PAGE
1130    2600  0007    POT7, 7
1131    2601  2637          POT10
1132                  /CHECKS ABILITY TO READ ALL 0'S CHARACTERS
1133    2602  4477          SETA                    /-500 TO CTRA
1134    2603  7014          -764
1135    2604  6014    POT7A, RFC                    /FETCH CHAR (IOTD14)
1136    2605  6011          RSF                     /WAIT FOR FLAG=1.
1137    2606  5205          JMP .-1
1138    2607  7200          CLA
1139    2610  6012          RRB                     READ BUFFER
```

```
2404  6014    POT5A,  RFC                     /FETCH CHAR (IOT014)
2405  6011            RSF                     /WAIT FOR FLAG-1
2406  5205            JMP .-1
2407  6012            RRB                     /CLEAR FLAG (IOT012)
2410  6011            RSF                     /SKIP ON FLAG=1
2411  5225            JMP POT5B               /OK.
2412  4451    POE5,   JMS I UERROR            /ERROR, GO TO ERROR SUB.
2413  4040            NOSUF                   /NO PRINTOUT SIFFIX
2414  0000            NONE                    /NO PRINTOUT
2415  5225            JMP POT5B               /CONTINUE TEST
2416  6014    POT5S,  RFC                     /START SCOPE LOOP. FETCH CHAR
2417  6011            RSF                     /WAIT FOR FLAG=1
2420  5217            JMP .-1
2421  6012            RRB                     /CLEAR FLAG (IOT012)
2422  6011            RSF                     /SKIP IF FLAG=1.
2423  5216            JMP .-5                 /NO, IOT012 CLEARED IT. READ AGAIN
2424  5221            JMP .-3                 /IOT012 FAILED, REPEAT IMT012.
2425  2122    POT5B,  ISZ CTRA                /DONE?
2426  5204            JMP POT5A               /NO, REPEAT
2427  5425            JMP I CHAIN             /YES, CHAIN
2430  0006    POT6,   6
2431  2600            POT7
              /CHECKS THAT IOT014 CLEARS FLAG.
2432  4477            SETA                    /-500 TO CTRA.
2433  7014            -764
2434  6014            RFC                     /FETCH CLEAR (IOT014)
2435  6011    POT6A,  RSF                     /WAIT FOR FLAG=1.
2436  5235            JMP .-1
2437  6014            RFC                     /CLEAR FLAG WITH IOT014
2440  6011            RSF                     /SKIP IN FLAG=1.
2441  5253            JMP POT6B               /OK FLAG IS 0.
2442  4451    POE6,   JMS I UERROR            /ERROR, FLAG=1, GO TO ERROR SUB.
2443  4040            NOSUF                   /NO PRINTOUT SUFFIX
2444  0000            NONE                    /NO PRINTOUT
2445  5253            JMP POT6B               /CONTINUE TEST
2446  4502    POT6S,  DELAY                   /START SCOPE LOOP, DELAY 20 MS.
2447  6014            RFC                     /FETCH CHAR (IOT014)
2450  6011            RSF                     /WAIT FOR FLAG=1.
2451  5250            JMP .-1
2452  5247            JMP .-3                 /GO CLEAR FLAG AND FETCH CHAR.
2453  2122    POT6B,  ISZ CTRA                /DONE?
2454  5235            JMP POT6A               /NO, REPEAT
2455  5425            JMP I CHAIN             /YES, CHAIN

      2600    PAGE
2600  0007    POT7,   7
2601  2637            POT10
              /CHECKS ABILITY TO READ ALL 0'S CHARACTERS
2602  4477            SETA                    /-500 TO CTRA
2603  7014            -764
2604  6014    POT7A,  RFC                     /FETCH CHAR (IOT014)
2605  6011            RSF                     /WAIT FOR FLAG=1.
2606  5205            JMP .-1
2607  7200            CLA
2610  6012            RRB                     /READ BUFFER
```



```
2511  3236            DCA POT7WB              /SAVE
2512  1236            TAD POT7WB
2513  7640            SZA CLA                 /RESULT 0?
2514  5220            JMP POE7                /ERROR, DID NOT READ 0'S CHAR.
2515  2122    POT7B,  ISZ CTRA                /DONE?
2616  5204            JMP POT7A               /NO, REPEAT
2517  5425            JMP I CHAIN             /YES CHAIN
2620  4462    POE7,   JMS I UASCCN
2621  2635            POT7WA
2622  1504            S3
2623  4462            JMS I UASCCN
2624  2636            POT7WB
2625  1511            WAS
2626  4451            JMS I UERROR            /GO TO ERROR SUBROUTINE
2627  4040            NOSUF                   /NO SUFFIX
2630  4501            S3WAS                   /PRINT S/3 AND WAS.
2631  5215            JMP POT7B               /CONTINUE TEST
2632  7200    POT7S,  CLA
2633  6012            RRB                     /READ BUFFER, AC S/B 7400
2634  5232            JMP .-2                 /REPEAT
2635  0000    POT7WA, 0000
2636  0000    POT7WB, 0000
2637  0010    POT10,  10
2640  2717            POT11
              /CHECKS ABILITY OF READER FLAG TO CAUSE AN INTERRUPT.
2641  4475            SETLOC                  /SET INTERRUPT RETURN TO
2642  0002            2                       /POE10A
2643  2654            POE10A
2644  6032    POT10A, KCC                     /CLEAR TTY READER FLAG.
2645  6042            TCF                     /CLEAR TTY PRINTER FLAG.
2646  6022            PCF                     /CLEAR PUNCH FLAG
2647  6012            RRB                     /CLEAR READER FLAG.
2650  6001            ION                     /ENABLE INTERRUPT
2651  7000            NOP                     /NO OP.
2652  6002            IOF                     /TURN OFF INTERRUPT
2653  5261            JMP POT10B
2654  4451    POE10A, JMS I UERROR            /GO TO ERROR SUB.
2655  0140            A                       /SUFFIX A
2656  0000            NONE                    /NO PRINTOUT.
2657  5244            JMP POT10A              /REPEAT TEST.
2660  5244            JMP POT10A              /REPEAT TEST.
2661  4477    POT10B, SETA                    /-4095 TO CTRA
2662  0001            -7777
2663  4475            SETLOC                  /SET INTERRUPT RETURN
2664  0002            2                       /POT10E.
2665  2713            POT10E
2666  6010            RPE                     /SET INTERRUPT ENABLE
2667  6014            RFC                     /FETCH CHAR (IOT014)
2670  6011            RSF                     /WAIT FOR FLAG-1.
2671  5270            JMP .-1
2672  6001    POT10C, ION                     /ENABLE INTERRUPT
2673  7000            NOP
2674  6002            IOF                     /TURN OFF INTERRUPT
2675  4451            JMS I UERROR            /GO TO ERROR SUB
2676  0240            B                       /SUFFIX B.
```

```
                                                    10:03
JNCH TESTS.          PAL10   V142A   4-FEB-77

   NONE                          /CONTINUE TEST
   JMP POT10E                    /SET INTERRUPT RETURN TO
:. SETLOC                        /POT10D.
   2
   POT10D                        /FETCH CLEAR
   RFC                           /WAIT FOR FLAG=1
   RSF
   JMP .-1                       /ENABLE INTERRUPT
   ION
   NOP
   JMP .-2
   JMP .-3                       /DONE?
DD. ISZ CTRA                     /NO, REPEAT.
.DE JMP POT10C                   /CLEAR INTERRUPT ENABLE
   PCE                           /YES, CHAIN.
   JMP I CHAIN
OP DELAY TEST                    /TEST #
'11,  11                         /LAST TEST.
   7777                          /-200 TO CTRA
   SETA
   -310                          /INITIAL DELAY.
T11A. JMS DLY250                 /-19 TO DELAYM
   SETDLM
   -23                           /FETCH CHAR.
   RFC                           /WAIT FOR FLAG.
   RSF
   JMP .-1                       /DELAY 19 MSECS TO CAUSE
   DELAY                         /"STOP DELAY" TO FIRE. FETCH CHAR.
   RFC                           /DELAY 19 MORE MSECS.
   DELAY                         /CHECK FLAG.
   RSF                           /FLAG NOT UP. OK
   JMP POT11B                    /ERROR. FLAG SHOULD NOT BE UP
   JMS I UERROR                  /38 MSECS AFTER "STOP DELAY"
   A                             /FIRES.
   NONE                          /CONTINUE TEST.
   JMP POT11A                    /GO TO SCOPE LOOP.
   JMP POT11S                    /DELAY ADDITIONAL 212 MSECS.
   JMS DLY212                    /FLAG UP?
POT11B, RSF                      /NO, ERROR.
   JMP .+4                       /DONE 500 TIMES?
POT11C, ISZ CTRA                 /NO, REPEAT.
   JMP POT11A                    /YES, CHAIN.
   JMP I CHAIN                   /ERROR, FLAG NOT UP 250 MSECS
   JMS I UERROR                  /AFTER "STOP DELAY" FIRED.
   B
   NONE
   JMP POT11C                    /SET DELAYM FOR 15 MSECS.
POT11S, SETDLM
   -17                           /FETCH CHAR.
   RFC                           /FLAG 1?
   JMP .-1                       /YES, DELAY 15 MSECS.
   DELAY                         /FETCH CHAR.
   RFC                           /WAIT FOR FLAG.
   RSF
   JMP .-1
```

SEQ 0041

```
                                        C04
                                                        10:03   PAGE 2-5
ED READER AND PUNCH TESTS.      PAL10   V142A   4-FEB-77
                                                 /REPEAT.
                  JMP .-4
     5361   DLY212, 0                            /-212 TO DELAYM
     0000          SETDLM                        /DELAY 212 MSECS.
     4501          -324
     7454          DELAY                         /EXIT.
     4502          JMP I DLY212
     5766   DLY250, 0                            /DELAY 250 MSECS.
     0000          SETDLM
     4501          -372
     7406          DELAY                         /EXIT.
     4502          JMP I DLY250
     5773
                    /PROGRAM 1, BASIC PUNCH AND CONTROL LOGIC TEST
     3000   PAGE
            /                                    /SET KSTART TO
            PRG1,  SETLOC                        /INITIAL ROUTINE
00   4475          KSTART                        /ADDRESS.
01   0020          P1T0                          /SET SR MASK
02   3010          SETLOC
03   4475          SRMSK
04   0105          7717                          /GET STARTED
005  7717          JMP I .+1
006  5607          SRSET
3007 0241   P1T0,  0
3010 0000          P1T1
3011 3032   /CHECKS THAT PSF (IOT021) DOES NOT SKIP WITH FLAG = 1
                   SETA                          /-4095 TO CTRA
3012 4477          -7777
3013 0001   P1T0A, PCF                           /CLEAR FLAG
3014 6022          PSF                           /SKIP IF FLAG=1 (IOT021)
3015 6021          JMP P1T0B                     /NO SKIP, OK
3016 5227   P1E0,  JMS I UERROR                  /SKIP. ERROR, GO TO ERROR SUB
3017 4451          NOSUF                         /NO SUFFIX
3020 4040          NONE                          /NO PRINTOUT
3021 0000          JMP P1T0B                     /CONTINUE TEST.
3022 5227   P1T0S, PCF                           /CLEAR FLAG
3023 6022          PSF                           /SKIP IF FLAG=1
3024 6021          JMP .-1
3025 5224          JMP .-2
3026 5224   P1T0B, ISZ CTRA                      /DONE?
3027 2122          JMP P1T0A                     /NO, REPEAT
3030 5214          JMP I CHAIN                   /YES, CHAIN
3031 5425   P1T1,  1
3032 0001          P1T2
3033 3063   /CHECKS THAT PSF (IOT021) SKIPS WITH FLAG=1 IF FLAG=1.
                   SETA                          /-4095 TO CTRA
3034 4477          -7777
3035 0001          SETDLM                        /-4095 TO DELAYM
3036 4501          -7777
3037 0001          CLA CLL
3040 7300          PCF                           /CLEAR PUNCH FLAG, LOAD BUFFER
3041 6022          PPC                           /LOAD BUFFER AND PUNCH
3042 6024          DELAY                         /DELAY 4095 MILLISECONDS
3043 4502          PSF                           /SKIP IF FLAG=1. (SHOULD BE 1)
3044 6021   P1T1A, JMP P1E1                      /NO, SKIP, ERROR.
3045 5251
```

```
      2122   P1T1B,  ISZ CTRA               /DONE?
      5244           JMP P1T1A              /NO, REPEAT
      5425           JMP I CHAIN            /YES, CHAIN
      4451   P1E1,   JMS I UERROR           /GO TO ERROR SUBROUTINE
      4040           NOSUF                  /NO SUFFIX
      0000           NONE                   /NO PRINTOUT
      5246           JMP P1T19              /CONTINUE TEST
      7200   P1T1S,  CLA
      6022           PCF                    /CLEAR FLAG AND BUFFER
      6024           PPC                    /SKIP IF FLAG 1
      6021           PSF                    /LOAD AND PUNCH
      5260           JMP .-1                /REPEAT
      5260           JMP .-2                /REPEAT
      0002   P1T2,   2
      3115           P1T3
             /CHECKS THAT PCF (IOT022) IS ABLE TO CLEAR THE FLAG
      4477           SETA                   /-500 TO CTRA
      7014           -764
      7200   P1T2A,  CLA
    0 6026           PLS                    /CLEAR, LOAD AND PUNCH
    1 602.           PSF                    /WAIT FOR FLAG-1
    2 5271           JMP .-1
    3 6022           PCF                    /CLEAR FLAG (IOT022)
    4 6021           PSF                    /SKIP IF FLAG=1
    5 5312           JMP P1T2B              /NO SKIP, OK.
    6 4451   P1E2,   JMS I UERROR           /SKIP ERROR GO TO ERRCR SUB
    7 4040           NOSUF
   00 0000           NONE
   01 5312           JMP P1T2B              /CONTINUE TEST.
   02 7200   P1T2S,  CLA
   03 6026           PLS                    /CLEAR, LOAD, AND PUNCH
   04 6021           PSF                    /WAIT FOR FLAG
   05 5304           JMP .-1
   06 6022           PCF                    /CLEAR FLAG
   07 6021           PSF                    /SKIP IF FLAG=1
  .10 5302           JMP .-6                /CLEARED.
  .11 5306           JMP .-3                /NOT CLEAR.
  112 2122   P1T2B,  ISZ CTRA               /SAVE?
  113 5267           JMP P1T2A              /NO, REPEAT
  114 5425           JMP I CHAIN            /YES, CHAIN
             /ROUTINE TO CHECK FOR SKIP WITH INTERRUPT DISABLED
  115 0003   P1T3,   3
  116 3200           P1T4
  117 1377           TAD (4000
 3120 3022           DCA COUNT
 3121 1376           TAD (7773
 3122 3136           DCA CTR
 3123 6002           IOF
 3124 7200           CLA
 3125 3135           DCA MILLI
 3126 2135           ISZ MILLI
 3127 5326           JMP .-1
 3130 2136           ISZ CTR
 3131 5325           JMP .-3
 3132 1375           TAD (0001              /16 MS CONSTANT
```

```
4000
4100
4200
4300
4400
4500
4600
4700
5000
5100
5200
5300
5400
5500
5600
5700
6000
6100
6200
6300
6400
6500
6600
6700
7000
7100
7200
7300
7400
7500
7600
```

E04


```
3133  3134           DCA DELTIM
3134  6007           CAF
3135  6024           PPC                    /PUNCH
3136  4361           JMS TIM1
3137  6021   P1T3A,  PSF                    /SKIP IF PUNCH FLAG SET
3140  5347           JMP P1E3
3141  6010           RPE
3142  6003           SRQ                    /SHOULD SKIP HERE FOR INT REQ
3143  534.           JMP P1E3               /REPORT ERROR
3144                 ISZ COUNT
3145                 JMP P1T3+4
3146  5425           JMP I CHAIN
3147  4451   P1E3,   JMS I UERROR
3150  4040           NOSUF
3151  0000           NONE
3152  5321           JMP P1T3+4
3153  6002   P1T3S,  IOF
3154  6021           PSF
3155  [illegible]    JMP .-1
3156  [illegible]    [illegible]
3157  5356           JMP .-1
3160  5356           JMP .-2
3161  0000   TIM1,   0                      /44 MILLISEC TIME OUT
3162  2134           ISZ DELTIM
3163  5362           JMP .-1
3164  1374           TAD (0500
3165  3134           DCA DELTIM
3166  2134           ISZ DELTIM
3167  5366           JMP .-1
3170  2134           ISZ DELTIM
3171  5370           JMP .-1
3172  5761           JMP I TIM1             /RETURN

3174  0500
3175  0001
3176  7773
3177  4000
      3200           PAGE
             /ROUTINE TO CHECK THAT INTERRUPT ENABLE CAN BE CLEARED FOR PUNCH.
3200  0004   P1T4,   4
3201  3234           P1T5
3202  6002           IOF
3203  1302           TAD     P7770
3204  3301           DCA     PCNT2          /INIT. COUNTER
3205  6007   PLOOP,  CAF
3206  6010           RPE                    /ENABLE INTERRUPT
3207  6020           PCE
3210  6001           ION
3211  6024           PPC
3212  6000           SKON                   /PUNCH
3213  5224           JMP P1E4               /ERROR -- NO ION
3214  6003           SRQ                    /SKIP IF INT REQ GENERATED
3215  7410           SKP                    /NO INT REQ
3216  5224           JMP P1E4               /ERROR -- INT REQ GENERATED
3217  2022           ISZ COUNT              /RELIABILITY SETUP
```

```
P1T4A,  JMP PLOOP
        ISZ PCNT2
        JMP PLOOP
        JMP I CHAIN
P1E4,   JMS I UERROR
        NOSUF
        NONE
        JMP I CHAIN
P1T4S,  RPE
        DELAY
        PCE
        JMP .-3
P1T5,   5
        P1T6
/USED TO CHECK ABILITY OF (IOT022) TO CLEAR BUFFER. VISUAL CHECK
        SETA                    /-500 TO CTRA
        -764
P1T5A,  CLA CMA                 /7777 TO AC
        PLS                     /CLEAR, LOAD, AND PUNCH
        CLA
        PLS                     /CLEAR BUFFER CONTENTS PRIOR
                                /TO PUNCHING
        PSF
        JMP .-1
        ISZ CTRA                /DONE?
        JMP P1T5A               /NO, REPEAT
        JMP I CHAIN             /YES, CHAIN
P1T6,   6
        P1T7
/CHECKS ABILITY OF IOT024 TO SET BUFFER TO 125 AND PUNCH IT
        SETA                    /-500 TO CTRA
        -764
P1T6A,  CLA
        TAD I125
        PLS                     /CLEAR, LOAD AND PUNCH
        PSF                     /WAIT FOR FLAG 1
        JMP .-1
        ISZ CTRA                /DONE?
        JMP P1T6A               /NO, REPEAT
        JMP I CHAIN             /YES, CHAIN
P1T7,   7
        P1T10
/CHECKS ABILITY OF IOT024 TO SET BUFFER TO 252 AND PUNCH IT
        SETA                    -500 TO CTRA
        -764
P1T7A,  CLA
        TAD I252
        PLS                     /CLEAR LOAD AND PUNCH.
        PSF                     /WAIT FOR FLAG 1
        JMP .-1
        ISZ CTRA                /DONE?
        JMP P1T7A               /NO, REPEAT
        JMP I CHAIN             YES, CHAIN

PCNT2,  7770
```



```
P7770,  7770

        PAGE
P1T10,  10
        7777
/CHECKS ABILITY OF PUNCH FLAG TO CAUSE AN INTERRUPT
        SETLOC                  /SET INTERRUPT RETURN
        2                       /TO P1E10A.
        P1E10A
P1T10A, KCC                     /CLEAR TTY READER
        TOF                     /CLEAR READER
        RRB                     /CLEAR READER
        PCF                     /CLEAR PUNCH FLAG
        ION                     /ENABLE INTERRUPT
        NOP
        IOF                     /TURN OFF INTERRUPT
        JMP P1T10B
P1E10A, JMS I UERROR
        4
        NONE
        JMP P1T10A
        JMP P1T10A
P1T10B, SETA                    /-4095 TO CTRA
        -7777
        SETLOC                  /SET INTERRUPT RETURN
        2                       /TO P1T10E
        P1T10E
        CLA
        RPE                     /SET INTERRUPT ENABLE
        PLS                     /CLEAR, LOAD AND PUNCH
        PSF                     /WAIT FOR FLAG 1.
        JMP .-1
P1T10C, ION
        NOP
        IOF
P1E10B, JMS I UERROR
        10
        NONE
        JMP P1T10E
P1T10S, SETLOC                  /SET INTERRUPT
        2                       /RETURN TO P1T10D
        P1T10D
        CLA
        PLS                     /CLEAR, LOAD AND PUNCH
        PSF                     /WAIT FOR FLAG 1.
        JMP .-1                 /ENABLE INTERRUPT
        ION
        IOF
        JMP .-2
P1T10D, JMP .-2
P1T10E, ISZ CTRA                /DONE?
        JMP P1T10C              /NO, REPEAT
        PCF                     /CLEAR INTERRUPT ENABLE
        JMP I CHAIN             /YES, CHAIN
```

```
/PROGRAM 2, READER TEST. SPECIAL BINARY COUNT PATTERN
PRG2,   SETLOC                  /SET SR
        SRMSK                   /MASK TO
        0460                    /0460
P2A,    JMS I SYNC              /SYNC READER
        SETA
        -5
P2B,    JMS I CRCNT             /GET RANDOM CHAR
        DCA CTRB                /COUNT IN CTRB.
P2C,    JMS I GETPT             /GET BINARY CHARACTER
        DCA I UTSB              /STORE IT
        JMS I UTREAD            /GO READ CHARACTER
        JMS I UTCHK             /GO CHECK IT
        JMP P2E                 /ERROR
P2D,    ISZ CTRB                /GROUP DONE?
        JMP P2C                 /NO.
        JMS I ISTALL            /YES, STALL
        JMP P2B                 /REPEAT
P2E,    ISZ CTRA                /5 ERRORS?
        JMP P2D                 /NO, CONTINUE
        JMP P2A                 /RESYNC

/PROGRAM 3, PUNCH TEST. SPECIAL BINARY COUNT PATTERN
PRG3,   JMS I UMARK             /MARK TAPE
        JMS I UPLDR             /PUNCH LEADER
        JMS I INPATT            /INITIALIZE BINARY PATTERN
        TAD I60
        DCA SRMSK
P3A,    JMS I GETPT             /GET BINARY CHARACTER
        JMS I UTPCH             /PUNCH IT
        JMS I ISTALL
        JMP P3A                 /REPEAT.

PRG4,   JMS I INPATT            /INITIALIZE BINARY PATTERN
        SETLOC                  /400 TO
        SRMSK                   /SR MASK
        0400
        JMS I GETPT             /GET BINARY CHARACTER
        DCA I UTSB              /STORE IT
        JMS I UTREAD            /READ CHARACTER
        SZA                     /ZERO?
        JMP P4B                 /NO.
        JMP -3                  /YES, REPEAT READ.
P4A,    JMS I GETPT             /GET BINARY CHARACTER
        DCA I UTSB              /STORE IT
        JMS I UTREAD            /READ CHARACTER
P4B,    JMS I UTCHK             /GO CHECK IT
        NOP                     /ERROR
        JMP P4A                 /REPEAT.

/PROGRAM 5, PUNCH TEST. RANDOM CHARACTER PATTERN.
PRG5,   JMS I UMARK             /MARK TAPE
        JMS I UPLDR             /PUNCH LEADER
        JMS I UMOVE             /INITIALIZE RANDOM
        SEED1                   /CHARACTER ROUTINE.
```



```
ED READER AND PUNCH TESTS.      PAL10   V142A   4-FEB-77        10:03   PAGE 2-11

        RANP1
        -4
        TAD I60
        DCA SRMSK
P5A,    JMS I ULPRGN            /GET RANDOM CHARACTER
        JMS I UTPCH             /PUNCH IT
        JMS I ISTALL
        JMP P5A                 /REPEAT

/PROGRAM 6, PUNCH VERIFY, RANDOM CHARACTER PATTERN
PRG6,   JMS I UMOVE             /INITIALIZE RANDOM
        SEED1                   /CHARACTER ROUTINE
        RANP1
        -4
        SETLOC                  /400 TO
        SRMSK                   /SR MASK
        0400
        JMS I ULPRGN            /GET RANDOM CHARACTER.
        DCA I UTSB              /STORE IT
        JMS I UTREAD            /READ CHARACTER
        SZA                     /ZERO.
        JMP P6B                 /NO.
        JMP -3                  /YES.
P6A,    JMS I ULPRGN            /GET RANDOM CHARACTER
        DCA I UTSB              /STORE IT
        JMS I UTREAD            /READ CHARACTER
P6B,    JMS I UTCHK             /GO CHECK IT
        NOP                     /ERROR
        JMP P6A

        PAGE
/PROGRAM 7, COMBINED READER-PUNCH TEST, SPECIAL BINARY COUNT PATTERN.
PRG7,   SETLOC                  /SET SR MASK TO 0460
        SRMSK
        0460
        SETLOC
        RSYMSK
        -7
        JMS I INPATT            /INITIALIZE BINARY PATTERN
        ISZ ACTINC              /SET ACTIVE INDICATOR
        SETLOC                  /SET INTERRUPT
        2                       /SERVICE ADDRESS
        JMS I INTSVC
        SETLOC                  /SET PUNCH SERVICE ADDRESS
        PVCTR
        PBIN
        SETLOC                  /SET READER SERVICE ADDRESS
        RVCTR
        WNZERO
        JMS I GPCH              /PUNCH CHAR.
        ION                     /ENABLE INTERRUPT
        JMP .                   /IDLE
P8TN,   ISZ PCHCNT              /INCREMENT PUNCH COUNT
        TAD PCHCNT              /COMPARE PUNCH COUNT
        TCC I0177               /TO 100.
```

```
7710            SPA CLA                 /GREATER THAN 100?
5233            JMP .+3                 /NO, OK
7402            HLT                     /YES, ERROR. HALT
5231            JMP .-1
4246            JMS CPCH                /PUNCH BIN CHARACTER
1127            TAD RBUSY               /READER BUSY?
7640            SZA CLA                 /YES, EXIT
5503            OUT                     /GET PUNCH COUNT
1132            TAD PCHCNT              /SUBTRACT SLACK COUNT
1146            TAD [-12                /POSITIVE?
7710            SPA CLA                 /NO, EXIT
5503            OUT                     /YES, START READER
6014            RFC                     /SET READER BUSY
2127            ISZ RBUSY               /EXIT.
5503            OUT
0000    CPCH,   0                       /GET BIN CHAR.
4470            JMS I GETPTR            /ENABLE PUNCH
6026            PLS                     /CLEAR AC
7200            CLA                     /EXIT
5646            JMP I CPCH
0000    CREAD,  0
7200            CLA                     /READ CHARACTER
6012            RRB                     /STORE IT
3131            DCA TCHKW               /GET PUNCH COUNT
1132            TAD PCHCNT              /MINUS 1.
1146            TAD [-1                 /STORE IT
3132            DCA PCHCNT
1132            TAD PCHCNT              /0?
7640            SZA CLA                 /NO,
5267            JMP .+3                 /YES, CLEAR READER BUSY
3127            DCA RBUSY               /EXIT.
5653            JMP I CREAD             /FETCH NEXT CHARACTER
6014            RFC                     /EXIT
5653            JMP I CREAD             /READ CHARACTER
4253    WNZERO, JMS CREAD
1131            TAD TCHKW               /IS IT 0?
7650            SNA CLA                 /YES.
5503            OUT                     /SET INTERRUPT SERVICE
4475            SETLOC                  /TO RBIN.
0711            RVCTR                   /TO RBIN.
3703            RBIN                    /-5 TO CTRA
4477            SETA
7773            -5
7410            SKP                     /READ CHARACTER
4253    RBIN,   JMS CREAD               /GET BINARY CHARACTER
4467            JMS I GETPT
3462            DCA I UTSB              /GET CHARACTER READ
1131            TAD TCHKW               /GO CHECK IT
4451            JMS I UTCHK             /ERROR
7410            SKP                     /NO.
5503            OUT                     /5 ERRORS?
2122            ISZ CTRA                /NO, TO MAILLINE
5603            OUT                     /YES, SET READER SERVICE
4475    RBINA,  SETLOC                  /TO RESYNC TAPE.
0711            RVCTR
```



```
3720            .+2
5503            OUT                     /READ CHARACTER
4253            JMS CREAD
1131            TAD TCHKW               /STORE.
3131            DCA     CHR1            /SET READER SERVICE
4475            SETLOC
0711            RVCTR
3720            .+2
5503            OUT                     /READ CHAR.
4253            JMS     CREAD
1131            TAD     TCHKW
3133            DCA     CHR2
4475            SETLOC                  /SET RDR
0711            RVCTR                   /SERVICE
3720            .+2
5503            OUT                     /READ CHAR.
4253            JMS     CREAD
1131            TAD     TCHKW           /STORE AT CHR3
3135            DCA CHR3                /GO SYNC
4465            JMS I SYNCA             /SYNC ERROR. TRY AGAIN
5314            JMP RBINA               /YES, -5 TO CTRA.
4477            SETA                    /RESTORE READER SERVICE
7773            -5                      /TO RBIN
4475            SETLOC                  /TO MAINLINE.
0711            RVCTR
5503            RBIN
                OUT

        4000    PAGE
                /PROGRAM IO, READ AMPLIFIER ADJUSTMENT LOOP
4000    4475    PRG10,  SETLOC                  /SET INTERRUPT SERVICE
4001    0000            2                       /TO INTSVC.
4002    4475            INTSVC                  /SET PUNCH SERVICE ADDRESS
4003    0711            SETLOC                  /TO PCHCLR.
4004    4475            PVCTR
4005    0711            PCHCLR                  /SET READER SERVICE ADDRESS
4006    4475            SETLOC                  /TO AMPRDA
4007    4010            RVCTR
4010    4475            AMPRDA
4011    4476            SETLOC
4012    1076            ERRORA
4013    7000            7000
4014    1044            TAD [NOP
4015    3572            DCA I [STALL+3          /0 TO SRMSK
4016    3105            DCA SRMSK               /GO READ CHARACTER
4017    4553    RAMPA,  JMS AMPRD               /ZERO?
4020    7440            SZA                     /NO.
4021    7410            SKP                     /GO READ CHARACTER.
4022    4553    RAMPB,  JMS AMPRD
4023    7041            CIA
4024    1045            TAD [PTMSK              /ALL 1'S?
4025    7640            SZA CLA                 /NO, ERROR.
4026    5217            JMP RAMPC               /YES, GO READ
4027    4553            JMS AMPRD               /ZERO?
4030    7640            SZA CLA
```

```
5242            JMP RAMPD               /NO, ERROR.
5223            JMP RAMPB               /YES, REPEAT
4452  RAMPC,   JMS I UASCCN            /CONVERT EXPECTED CHARACTER
4052            RAMPF                   /TO PRINTABLE ASCII
1604            SB
4452            JMS I   UASCCN          /CONVERT BAD CHARACTER TO
4074            RAMPWA
1611            WAS
5246            JMP RAMPE
4452  RAMPD,   JMS I   UASCCN          /CONVERT EXPECTED CHARACTER TO
4075            RAMPWB                  /PRINTABLE ASCII
1604            SB
5236            JMP RAMPD-4
4451  RAMPE,   JMS I UERROR            /GO PRINT ERROR.
4040            NOSUF
1601            SBWAS
5217            JMP RAMPA               /TRY AGAIN.
0377  RAMPF,   377
0000  AMPRD,   0
4501            SETDLM                  /-75 TO DELAYM
7665            -113
6014            RFC                     /FETCH CHARACTER
6001            ION                     /ENABLE INTERRUPT
4502            DELAY                   /DELAY 75 MSEC.
6002            IOF
6011            RSF                     /FLAG 1?
7410            SKP                     /NO, FLAG DROPPED
5270            JMP AMPRDA              /YES.
4447            JMS I XTYPST            /RING BELL 3 TIMES
4076            BELL3
5217            JMP RAMPA               /TRY AGAIN
6012  AMPRDA,  RRB
3274            DCA RAMPWA
1274            TAD RAMPWA
5653            JMP I AMPRD
0000  RAMPWA,  0
0000  RAMPWB,  0
0007  BELL3,   0007                    /BELL
0007            0007                    /BELL
0007            0007                    /BELL
0001            0001                    /END CODE.
                /
                /PROGRAM 11, PUNCH ANY CHARACTER IN SR, CONTINUOUSLY
7604  PRG11,   LAS                     /READ SR
0153            AND [PTMSK
6026            PLS                     /PUNCH CHARACTER
6021            PSF                     /FLAG 1?
5305            JMP .-1                 /NO,
5301            JMP .-5                 /YES, REPEAT
                /
                /PROGRAM 12, PUNCH 1'S AND 0'S LOOP
4475  PRG12,   SETLOC
0105            SRMSK
0075            0075
7240  PRG12A,  CLA CMA
```



```
0153            AND [PTMSK
4456            JMS I UTPCH             /PUNCH ALL 1'S
4463            JMS I [STALL
7200            CLA
4456            JMS I UTPCH             /PUNCH ALL 0'S
4463            JMS I [STALL
5313            JMP PRG12A              /REPEAT.

                PAGE
PRG13,          CLA
                DCA CTRB                /CLEAR CTRB
                LAS                     /READ SR
                RAL
                SMA CLA                 /LONG OR SHORT?
                TAD [-416               /LONG
                TAD [-36                /SHORT
                DCA TKN                 /STORE AT TKN
                JMS TSTRL
TSTRD,          RSR                     /START READER
                RSF                     /WAIT FOR
                JMP .-1                 /FLAG
                ISZ CTRA                /INCREMENT CTRA.
                JMP TSTRC               /NO,
                ISZ CTRB                /YES, INCREMENT CTRB
                NOP
TSTRL,          TAD TKN                 /LOAD CTRA
                DCA CTRA
TSTRC,          LAS                     /READ SR
                SMA CLA                 /PRINT SPEED?
                JMP TSTRD               /NO, CONTINUE READING
                JMS I XTYPST            /YES.
                RSPD
                JMS TSTRPC
                HLT
                JMP PRG13
TKN,            OPEN
                /
PRG14,          CLA
                DCA CTRB                /CLEAR CTRB
                JMP TSTPL
TSTPP,          PLS
                PSF
                JMP .-1
                ISZ CTRA                /60?
                JMP TSTPC               /NO,
                ISZ CTRB                /YES, INCREMENT CTRB
                NOP
TSTPL,          TAD [-74                /LOAD -60 IN CTRA
                DCA CTRA
TSTPC,          LAS                     /READ SR
                SMA CLA                 /PRINT SPEED? (AFTER 60 SECONDS)
                JMP TSTPP               /NO, CONTINUE
                JMS I XTYPST            /YES.
                RSPD
                JMS TSTRPC
```

```
0799  4114  0153          AND [PTMSK
0800  4115  4456          JMS I UTPCH             /PUNCH ALL 1'S
0801  4116  4563          JMS I [STALL
0802  4117  7200          CLA
0803  4120  4456          JMS I UTPCH             /PUNCH ALL 0'S
0804  4121  4563          JMS I [STALL
0805  4122  5313          JMP PRG12A              /REPEAT.
0806
0807        4200    PAGE
0808  4200  7200    PRG13,  CLA
0809  4201  3123          DCA CTRB                /CLEAR CTRB
0810  4202  7604          LAS                     /READ SR
0811  4203  7104          CLL RAL
0812  4204  7710          SPA CLA                 /LONG OR SHORT?
0813  4205  1143          TAD [-416               /LONG
0814  4206  1142          TAD [-36                /SHORT
0815  4207  3232          DCA TKN                 /STORE AT TKN
0816  4210  5220          JMP TSTRL
0817  4211  6014    TSTRD,  RFC                     /START READER
0818  4212  6011          RSF                     /WAIT FOR
0819  4213  5212          JMP .-1                 /FLAG
0820  4214  2122          ISZ CTRA                /INCREMENT CTRA.
0821  4215  5222          JMP TSTRC               /NO.
0822  4216  2123          ISZ CTRB                /YES, INCREMENT CTRB
0823  4217  7000          NOP
0824  4220  1232    TSTRL,  TAD TKN                 /LOAD CTRA
0825  4221  3122          DCA CTRA
0826  4222  7604    TSTRC,  LAS                     /READ SR
0827  4223  7700          SMA CLA                 /PRINT SPEED?
0828  4224  5211          JMP TSTRD               /NO, CONTINUE READING
0829  4225  4447          JMS I XTYPST            /YES.
0830  4226  1532          RSPD
0831  4227  4257          JMS TSTRPC
0832  4230  7402          HLT
0833  4231  5200          JMP PRG13
0834  4232  0000    TKN,    OPEN
0835
0836  4233  7200    PRG14,  CLA
0837  4234  3123          DCA CTRB                /CLEAR CTRB
0838  4235  5245          JMP TSTPL
0839  4236  6026    TSTPP,  PLS
0840  4237  6021          PSF
0841  4240  5237          JMP .-1
0842  4241  2122          ISZ CTRA                /60?
0843  4242  5247          JMP TSTPC               /NO.
0844  4243  2123          ISZ CTRB                /YES, INCREMENT CTRB
0845  4244  7000          NOP
0846  4245  1141          TSTPL,  TAD [-74                /LOAD -60 IN CTRA
0847  4246  3122          DCA CTRA
0848  4247  7604    TSTPC,  LAS                     /READ SR
0849  4250  7700          SMA CLA                 /PRINT SPEED? (AFTER 60 SECONDS)
0850  4251  5236          JMP TSTPP               /NO, CONTINUE
0851  4252  4447          JMS I XTYPST            /YES.
0852  4253  1543          PSPD
0853  4254  4257          JMS TSTRPC
```



```
0854  4255  7402          HLT
0855  4256  5233          JMP PRG14
0856
0857  4257  0000    TSTRPC, 0
0858  4260  4265          JMS BDCNV               /TYPE C(CTRB) IN DECIMAL
0859  4261  0123          CTRB
0860  4262  4447          JMS I XTYPST            /TYPE "CPS"
0861  4263  1544          CPS
0862  4264  5657          JMP I TSTRPC            /EXIT.
0863  4265  0000    BDCNV,  0                       /BINARY TO DECIMAL CONVERT
0864  4266  6046          SETLOC                  /AND PRINT SUBROUTINE
0865  4267  4331          CNVCTR
0866  4270  7774          -4
0867  4271  1322          TAD ADDRZA              /INITIALIZE ARROW.
0868  4272  3303          DCA ARROW
0869  4273  1665          TAD I BDCNV             /GET AND STORE BINARY
0870  4274  2265          ISZ BDCNV               /NUMBER. STORE IT AT VALUE.
0871  4275  3330          DCA DIGIT
0872  4276  1730          TAD I DIGIT
0873  4277  3327          DCA VALUE
0874  4300  3330          DCA DIGIT               /0 TO DIGIT.
0875  4301  7100          CLL
0876  4302  1327          TAD VALUE
0877  4303  1323    ARROW,  TAD TENPWR
0878  4304  7420          SNL
0879  4305  5311          JMP .+4
0880  4306  2330          ISZ DIGIT
0881  4307  3327          DCA VALUE
0882  4310  5301          JMP ARROW-2
0883  4311  7200          CLA
0884  4312  1330          TAD DIGIT
0885  4313  1140          TAD [260
0886  4314  4473          JMS I UPUNCH
0887  4315  7300          CLA CLL
0888  4316  2303          ISZ ARROW
0889  4317  2331          ISZ CNVCTR
0890  4320  5300          JMP ARROW-3
0891  4321  5665          JMP I BDCNV
0892  4322  1323    ADDRZA, TAD TENPWR
0893  4323  6050    TENPWR, -1750
0894  4324  7634          -144
0895  4325  7766          -12
0896  4326  7777          -1
0897  4327  0000    VALUE,  0
0898  4330  0000    DIGIT,  0
0899  4331  0000    CNVCTR, 0
0900
0901                /PROGRAM 15, READ X CHARACTERS, STALL Y MS, LOOP (TO ADJUST TIMINGS)
0902  4332  7603    PRG15,  HLT CLA                 /HALT TO SET SR
0903  4333  7604          LAS                     /READ SR
0904  4334  0174          AND [177                /MASK OFF EXCESS BITS
0905  4335  7041          CIA
0906  4336  3341          DCA DELAYM              /STORE STALL COUNT
0907  4337  7604          LAS                     /READ SR
0908  4340  0137          AND [7600               /MASK OFF EXCESS BITS
```

```
7006          RTL
7006          RTL
7041          CIA
3347          DCA .+2
4477  P15A,   SETA                  /-X TO CTRA.
0000          0
6014  P15B,   RFC                   /FETCH CHARACTER
6011          RSF                   /FLAG 1?
5351          JMP .-1               /NO
2333          ISZ CTRA              /READ X CHARS?
5350          JMP P15B              /NO
4502          DELAY                 /YES DELAY "Y" MS..
5333          JMP PRG15+1           /REPEAT
      $

7600
0260
7704
7742
7362
7000
7777
7766
7634
0060
0252
0125
0377
0020
0040
0200
0400
6060
0707
7700
1125
0240
0100
66 7740
67 7510
70 7500
71 0077
72 1130
73 7640
74 0177
75 0031
76 7763
77 0017
```



```
10110  00000000  11111111  11111111  11111111  11111111  11111111  11111111
11111  11111111  11111111  11111111  11111111  11111111  11111111  11111111

11111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
11111  11111111  11111111  11111111  11000000  00000000  00000000  00000000

11111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
11111  11111111  11111111  11111111  11111111  11111111  11110000  00000000

11111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
11111  11111111  11111111  11111111  11111000  00000000  00000000  00000000

[illegible]  11111111  11111111  11111111  11111111  11111111
[illegible]  11111111  11111111  11111111  11111000  00000000

[illegible]  11111111  11111111  11111111  11111111  11111111
[illegible]  11111111  11111111  11111111  11111000  00000000

1111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
1111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111

1111111  11111111  11111111  11111111  11111111  11111111  11111111  11000000
0000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000

1111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
1111111  11111111  11111111  11111111  11111111  11111000  00000000  00000111

1111111  11111111  11111111  11111100  00000000  00000000  00000000  00000000
0000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000

1111111  11111111  11111111  11111111  11111111  11111100  00000000  00000000
0000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000

1111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
1111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111

1111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
1111111  11111111  11111111  11111111  11111111  11111111  11111111  11101111

1111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
1100000  00000000  00000000  00000000  00000000  00000000  00000000  00000000

1111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
1111111  11111111  11111111  11111111  11111111  11111111  11111111  11111100

1111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
```

```
0000  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
0100  11111111  11111111  11100000  00000000  00000000  00000000  00000000  00000000

4200  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
4300  11111111  11111111  11111111  11111111  11111111  11111110  00000000  00000000

4400
4500

4600
4700

5000
5100

5200
5300

5400
5500

5600
5700

6000
6100

6200
6300

6400
6500

6600
6700

7000
7100

7200
7300

7400
7500

7600
```


A	0140	ERRORA	1075	POT10E	2713	P1T10E	3456
AC	0023	FADDR	0561	POT10S	2701	P1T10S	3443
ACTIND	0133	FLAG	0702	POT11	2717	P1T1A	3044
ADDRZA	4322	FORWD	0307	POT11A	2723	P1T1B	3046
AMPRD	4053	GETPT	0067	POT11B	2743	P1T1S	3055
AMPRDA	4070	GETPTR	0070	POT11C	2746	P1T2	3063
ARROW	4303	GETPTT	1412	POT11S	2755	P1T2A	3067
ASCCN	1000	GETRDY	0242	POT1A	2045	P1T2B	3112
ASCT	1041	GTPTRR	1435	POT1S	2056	P1T2S	3102
B	0240	INCRTN	0266	POT2	2064	P1T3	3115
BDCNV	4255	INIT	0217	POT2A	2071	P1T3A	3107
BELL3	4076	INITPT	1400	POT2OK	2102	P1T3S	3153
CRF	6007	INPATT	0066	POT2S	2077	P1T4	3200
CHAIN	0325	INTSVC	0703	POT3	2105	P1T4P	3220
CHAINN	0270	IOUT	0733	POT3A	2127	P1T4S	3230
CHCK	0521	KSTART	0020	POT3S	[illegible]	P1T5	3234
CHECK	0071	LINK	0024	POT4	2200	P1T5A	3240
CHR1	0110	LPRGN	1255	POT4A	2220	P1T6	3251
CHR2	0111	LRRGN	1273	POT4S	2230	P1T6A	3255
CHR3	0112	MARK	1230	POT5	2400	P1T7	3265
CHRCNT	0324	MARKAD	1246	POT5A	2404	P1T7A	3271
CNV	1024	MARKEP	1321	POT5B	2425	P2A	3465
CNVCTR	4331	MCTR	0563	POT5S	2416	P2B	3470
COUNT	0022	MILI	0106	POT6	2430	P2C	3472
CPCH	3646	MILCTR	0121	POT6A	2435	P2D	3477
CPID	0107	MILLI	0135	POT6B	2453	P2E	3503
CPS	1554	MOVE	0536	POT6S	2446	P3A	3513
CRCNT	0063	MOVEA	0551	POT7	2600	P4A	3531
CRCTR	3515	MSCTR	0120	POT7A	2604	P4B	3534
CREAD	3553	NONE	0000	POT7B	2615	P5A	3547
CRLF	0600	NOSUF	4040	POT7S	2632	P6A	3570
CTR	0136	NXTST	0117	POT7WA	2635	P6B	3573
CTRA	0122	OPEN	0000	POT7WB	2636	P7770	3302
CTRB	0123	OUT	5503	P15A	4346	PBIN	[illegible]
CTRC	0124	POE0	2025	P15B	4350	PCE	6020
CTRD	0125	POE1	2052	P1E0	3017	PCHCLR	[illegible]
CTSK	1363	POE10A	2654	P1E1	3051	PCHCNT	0132
CTSK1	1364	POE2	2073	P1E10A	3415	PCNT2	[illegible]
CURTST	0115	POE3	2137	P1E10B	3437	PFLAG	0126
DELAY	4502	POE4	2224	P1E2	3076	PIND	[illegible]
DELAYM	0021	POE5	2412	P1E3	3147	PLDR	[illegible]
DELTIM	0134	POE6	2442	P1E4	3224	PLDRW	1227
DIGIT	4330	POE7	2620	P1T0	3010	PLOOP	3205
DLCNT	0513	POT0	2010	P1T0A	3014	PNUMB	[illegible]
DLY212	2766	POT0A	2016	P1T0B	3027	PPC	[illegible]
DLY250	2773	POT0S	2031	P1T0S	3023	PRG0	2000
DLYCNT	0072	POT1	2036	P1T1	3032	PRG1	3000
DLYMS	[illegible]	POT10	[illegible]	P1T10	3400	PRG10	4000
DLYMSK	0104	POT10A	2644	P1T10A	3405	PRG11	[illegible]
ENUMB	1474	POT10B	2661	P1T10B	[illegible]	PRG12	[illegible]
ERNUMB	1466	POT10C	[illegible]	P1T10C	[illegible]	PRG12A	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	P1T10D	[illegible]	PRG13	[illegible]