PA611

TYP-11 RDR/PNCH

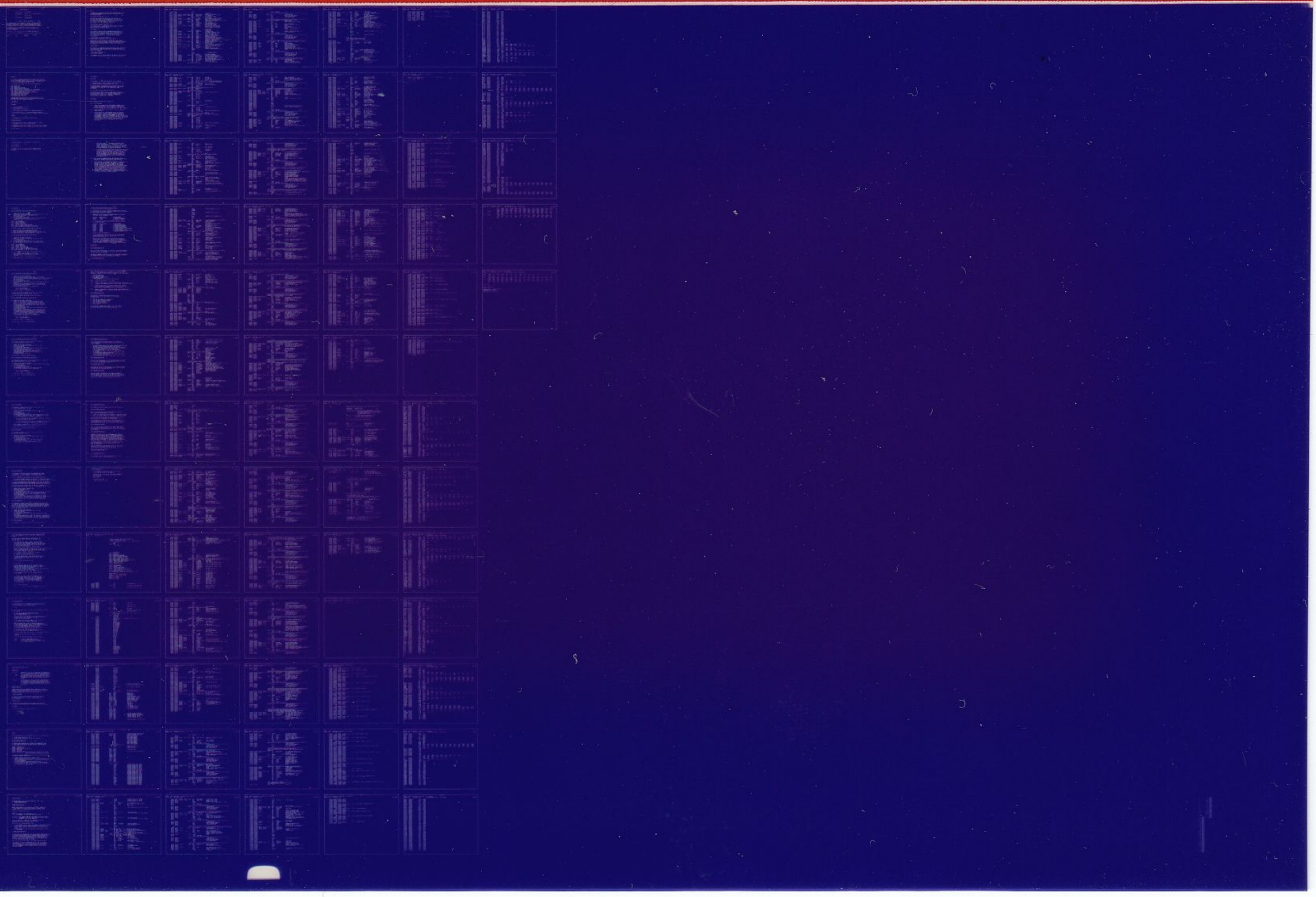
CZPAACO

FICHE 1 OF 1

DEC 1978

digital

MADE IN USA



IDENTIFICATION

PRODUCT CODE: AC-9006C-MC

PRODUCT NAME: CZPAAC0 TYP-11 READER-PUNCH TESTS

DATE: JAN 15, 1972

MAINTAINER: DIAGNOSTIC GROUP

THIS DIAGNOSTIC OBSOLETES MAINDEC - 11 - D2EA

1. ABSTRACT

THE TYPESET-11 READER AND PUNCH TESTS CONSISTS OF A PACKAGE
OF TEST PROGRAMS DESIGNED TO TEST THE PA611 READER LOGIC, READER,
PUNCH LOGIC, PUNCH, AND THE READER AND PUNCH IN COMBINATION.
ALL TESTS ARE INCLUDED IN ONE OBJECT TAPE.

THE AVAILABLE TESTS ARE LISTED HERE IN NUMERICAL ORDER:

PRG0 -READER TEST
PRG1 -PUNCH TEST
PRG2 -PUNCH VERIFY ROUTINE
PRG3 -COMBINED READER-PUNCH TEST
PRG4 -PUNCH TAPE WITH 2 CHARACTERS SET IN SR ROUTINE.
PRG5 -READ AND CHECK TAPE PUNCHED WITH 2 CHARACTERS SET IN SR.
PRG6 -READ X CHARACTERS, THEN STALL Y MSECS.
PRG7 -SPECIAL BINARY COUNT PATTERN TAPE GENERATOR.
PRG10-READER SPEED PRINT ROUTINE.
PRG11-PUNCH SPEED PRINT ROUTINE.
PRG12-PUNCH LOGIC INIT TEST
PRG13-READER LOGIC LIGHT TEST

PROGRAMS PRG0 THROUGH PRG3 ARE THE READER AND PUNCH TESTS.
PROGRAMS PRG4 THROUGH PRG11 ARE UTILITY ROUTINES THAT PRODUCE
TEST TAPES AND AID IN MAKING ADJUSTMENTS.

2. REQUIREMENTS

2.1 EQUIPMENT

A. PDP-11 PROCESSOR. (4K CORE)
B. ASR33/35 TELETYPE
C. PA611 READER(S) AND PUNCH(S).

THE PROCESSOR AND TELETYPE MUST BE IN OPERATING CONDITION.

THE TELETYPE MUST BE AT ITS STANDARD PERIPHERAL ADDRESSES.
SEE SECTION 7.3 FOR OPERATION WITH NON-STANDARD PERIPHERAL ADDRESSES.

2.2 STORAGE

THIS PROGRAM USES LOCATION 00200 THROUGH 015600.

3. LOADING PROCEDURE

THIS PROGRAM'S OBJECT TAPE IS PUNCHED IN ABSOLUTE FORMAT.
THE ABS LOADER IS USED TO LOAD THE PROGRAM.

THE PROGRAM WILL SELF-START IN ORDER TO INITIALIZE FOR THE NUMBER
OF READERS AND PUNCHES IN THE SYSTEM. FOLLOW TYPED INSTRUCTIONS.

3.1 RESTART ADDRESS

THE RESTART ADDRESS OF THIS PROGRAM IS LOCATION 1004.

RESTART ADDRESS: 1004

3.2 START PROCEDURE

IN GENERAL, ALL TESTS ARE INITIATED BY LOADING ADDRESS 200, DEPOSITING TEST # IN SWITCH REGISTER, AND HITTING CONTINUE.

4. USE PROCEDURE

4.1 PRG0 USE PROCEDURE (DESCRIPTION IN SECTION 8.1)

A. INSURE THAT TELETYPE IS ON-LINE
B. LOAD READER WITH SPECIAL BINARY COUNT PATTERN TEST LOOP. IF NOT USING A LOOP, DATA MUST BE UNDER READ HEAD.
C. LOAD ADDRESS 00200.
D. SET SR TO 000000. PRESS START.
E. THE PROGRAM IDENTIFIES ITSELF, TYPES SET UP AND SR OPTION INSTRUCTIONS. SELECT ANY DESIRED OPTIONS.

SR15=1 HALT ON ERROR.
SR14=1 ENTER SCOPE MODE.
SR13=1 INHIBIT ERROR PRINT.
SR11=1 INHIBIT ITERATION.
SR10=1 HALT AT END OF CURRENT ROUTINE.
SR9=1 SELECT A SPECIFIC ROUTINE FOR EXECUTION.
SR7 THROUGH SR0=NUMBER OF ROUTINE TO BE SELECTED.

SECTION 7.2 GIVES A COMPLETE EXPLANATION OF SR OPTIONS.

F. PRESS CONTINUE. FOLLOW PROGRAM INSTRUCTIONS
G. REFER TO SECTION 6.2 IF ANY ERROR PRINTOUTS OCCUR.
H. WHEN THE PROGRAM HAS COMPLETED ONE PASS IT WILL TYPE POOEND.
ONE ERROR-FREE PASS WILL TAKE APPROXIMATELY 10 MINUTES.

4.2 PRG1 USE PROCEDURE (DESCRIPTION IN SECTION 8.2)

A. INSURE THAT TELETYPE IS ON-LINE.
B. INSURE THAT THE PUNCH HAS AN ADEQUATE SUPPLY OF TAPE.
C. LOAD ADDRESS 00200.
D. SET SR TO 000001. PRESS START.
E. THE PROGRAM IDENTIFIES ITSELF AND TYPES INSTRUCTIONS TO SET ANY DESIRED SR OPTIONS. SELECT ANY DESIRED OPTIONS.

SR15=1 HALT ON ERROR.
SR14=1 ENTER SCOPE MODE.
SR13=1 INHIBIT ERROR PRINT.
SR11=1 INHIBIT ITERATION.
SR10=1 HALT AT END OF CURRENT ROUTINE.
SR9=1 SELECT A SPECIFIC ROUTINE FOR EXECUTION.
SR7 THROUGH SR0=NUMBER OF ROUTINE TO BE SELECTED.

A FULL EXPLANATION OF SR OPTIONS IS GIVEN IN SECTION 7.2.

F. PRESS CONTINUE. FOLLOW PROGRAM INSTRUCTIONS.
G. UPON COMPLETION OF A PROGRAM PASS THE PROGRAM WILL TYPE 'P01 END'.
H. REFER TO SECTION 6. IF ANY ERRORS OCCUR.

ONE ERROR-FREE PASS WILL TAKE APPROXIMATELY 10 MINUTES.

4.3 PRG2 USE PROCEDURE (DESCRIPTION IN SECTION 8.3)

A. INSURE THAT TELETYPE IS ON-LINE.
B. LOAD TAPE THAT WAS PUNCHED BY PRG1-PUNCH TEST IN READER.
   LOAD TAPE SO THAT THE FIRST RUBOUT CHARACTER (ALL 1'S) IS ON THE RIGHT EDGE OF THE METAL PLATE OVER THE READ STATION. MAKE READER READY.
C. LOAD ADDRESS 00200.
D. SET SR TO 000002. PRESS START.
E. THE PROGRAM IDENTIFIES ITSELF AND TYPES INSTRUCTIONS TO LOAD THE READER.
F. PRESS CONTINUE. THE PROGRAM WILL READ THE TAPE AND REPORT ANY ERRORS. DISREGARD ANY ERRORS THAT OCCUR WHEN THE READER REACHES THE END OF THE TAPE.
G. THE SR OPTIONS AVAILABLE IN THIS PROGRAM ARE:

    SR15=1 HALT ON ERROR.
    SR13=1 INHIBIT ERROR PRINT.

H. REFER TO SECTION 6. IF ERRORS OCCUR.

PRG2 DOES NOT RESYNC THE READER AT ANY TIME. IT'S INTENT IS TO SHOW EACH AND EVERY ERROR CAUSED BY THE PUNCH.

EXECUTION TIME DEPENDS ON LENGTH OF TAPE TO BE VERIFIED.

4.4 PRG3 USE PROCEDURE (DESCRIPTION IN SECTION 8.4)

A. INSURE THAT TELETYPE IS ON-LINE.
B. INSURE THAT THE PUNCH HAS AN ADEQUATE SUPPLY OF TAPE.
C. USING THE "PUNCH FEED" KEY, PUNCH 2 FEET BLANK LEADER. LOAD A 1" THICK STACK OF PREPUNCHED SPECIAL BINARY COUNT PATTERN TAPE IN READER, AND MAKE READER READY. THE BLANK LEADER PORTION OF THE TAPE MUST BE AT THE READ STATION.
D. LOAD ADDRESS 000200.
E. SET SR TO 000003. PRESS START.
F. THE PROGRAM IDENTIFIES ITSELF AND TYPES INSTRUCTIONS TO PUNCH LEADER AND LOAD READER.
G. PRESS CONTINUE. THE PROGRAM WILL PUNCH A NEW BINARY COUNT PATTERN WHILE READING THE PREPUNCHED TAPE IN THE READER. THE PROGRAM SHOULD RUN ERROR-FREE UNTIL THE READER TAPE IS EXHAUSTED, AT WHICH POINT A READER NOT READY MESSAGE WILL OCCUR. REPLACE THE READER TAPE WITH THE TAPE JUST PUNCHED AND RERUN THE TEST. RUN THE TEST 6 TIMES.
H. THE SR OPTIONS AVAILABLE WITH THIS PROGRAM ARE:

    SR15=1 HALT ON ERROR.
    SR13=1 INHIBIT ERROR PRINT.

I. REFER TO SECTION 6. IF ERRORS OCCUR.

EXECUTION TIME: PRG3 IS CONTINUOUS RUNNING.

4.5 PRG4 USE PROCEDURE (DESCRIPTION IN SECTION 8.5)

THIS PROGRAM CONTINUOUSLY PUNCHES TAPE WITH 2 CHARACTERS
WHOSE CODES HAVE BEEN SET IN SR. TO RUN:

A. INSURE THAT TELETYPE IS ON-LINE.
B. INSURE TAHT THE PUNCH HAS AN ADEQUATE SUPPLY OF TAPE.
C. LOAD ADDRESS 000200
D. SET SR TO 000004. PRESS START.
E. THE PROGRAM IDENTIFIES ITSELF AND TYPES INSTRUCTIONS TO SET SR
TO DESIRED CODES AND PUNCH READY.
F. PRESS CONTINUE. THE PROGRAM WILL PUNCH THE DESIRED
CHARACTERS CONTINUOUSLY UNTIL STOPPED BY USER.
G. THE CHARACTERS TO BE PUNCHED MAY BE CHANGED WHILE THE
PROGRAM IS RUNNING.
H. THIS PROGRAM HAS NO SR OPTIONS.

EXECUTION TIME: CONTINUOUS RUNNING PROGRAM.

4.6 PRG5 USE PROCEDURE (DESCRIPTION IN SECTION 8.6)

THIS PROGRAM READS AND CHECKS A TAPE PUNCHED WITH ANY 2 CHARACTERS
WHOSE CODES HAVE BEEN SET IN THE SR. TO RUN:

A. INSURE THAT TELETYPE IS ON-LINE.
B. LOAD TAPE TO BE READ IN READER. DATA MUST BE UNDER READ STATION.
C. LOAD ADDRESS 000200.
D. SET SR TO 000005. PRESS START.
E. FOLLOW PROGRAM INSTRUCTIONS.
F. THE PROGRAM WILL READ THE TAPE AND REPORT ANY ERRORS.
G. THE SR OPTIONS AVAILABLE WITH THIS PROGRAM ARE:

SR15=1 HALT ON ERROR.
SR13=1 INHIBIT ERROR PRINT.

H. REFER TO SECTION 6. IF ERRORS OCCUR.

EXECUTION TIME: CONTINUOUS RUNNING PROGRAM.

4.7 PRG6 USE PROCEDURE

THIS PROGRAM IS INTENDED AS AN AID IN SCOPING AND ADJUSTING
THE READER AND READER LOGIC. TO RUN:

A. INSURE THAT TELETYPE IS ON-LINE.
B. LOAD ANY TAPE LOOP IN THE READER. ONE'S AND ZEROES LOOP IS
   A GOOD CHOICE.
C. LOAD ADDRESS 000200
D. SET SR TO 000006. PRESS START
E. THE PROGRAM IDENTIFIES ITSELF AND TYPES INSTRUCTIONS TO SET THE
   SR TO NUMBER OF CHARACTERS TO READ AND TO NUMBER OF MILLISECONDS
   TO STALL AFTER READING THE CHARACTERS. PLEASE NOTE:

   1. THE LEFT 8 SWITCHES ARE FOR THE NUMBER OF CHARACTERS TO BE READ.
      THE RANGE IS BETWEEN 1 AND 377(8).

   2. THE RIGHT 8 SWITCHES ARE FOR SETTING THE NUMBER OF MILLISECONDS
      TO STALL AFTER READING THE NUMBER OF CHARACTERS SPECIFIED.

F. PRESS CONTINUE. THE PROGRAM WILL CONTINUOUSLY READ AND STALL
   UNTIL STOPPED BY USER.
G. THE SETTINGS OF THE SR MAY BE CHANGED AT ANY TIME.

EXECUTION TIME: CONTINUOUS RUNNING PROGRAM.

4.8 PRG7 USE PROCEDURE

THIS PROGRAM CONTINUOUSLY PUNCHES A TAPE WITH THE SPECIAL
BINARY COUNT PATTERN. TO RUN:

A. INSURE THAT TELETYPE IS ON-LINE
B. MAKE SURE THAT THE PUNCH HAS AN ADEQUATE SUPPLY OF TAPE.
C. LOAD ADDRESS 000200.
D. SET SR TO 000007. PRESS START
E. THE PROGRAM IDENTIFIES ITSELF, AND TYPES INSTRUCTION
   TO MAKE THE PUNCH READY.
F. PRESS CONTINUE. THE SPECIAL BINARY COUNT PATTERN WILL
   BE PUNCHED UNTIL THE PROGRAM IS STOPPED BY USER.

4.9 PRG10 USE PROCEDURE

THIS PROGRAM IS INTENDED AS AN AID IN DETERMINING THE SPEED
OF THE READER. IT IS NOT INTENDED TO REPLACE REGULAR SCOPING
PROCEDURES FOR SETTING THE READER TO ITS CORRECT SPEED.

WITH THIS PROGRAM THE READER SPEED CAN BE MEASURED IN TWO WAYS:

1. 30 SECOND MEASUREMENT PERIOD. PLUS OR MINUS 10 CHARACTER ACCURACY
2. 300 SECOND (5 MINUTE) MEASUREMENT PERIOD. PLUS OR MINUS 1 CHARACTER ACCURACY

IN EITHER CASE MEASUREMENT ACCURACY DEPENDS ON THE USER'S ATTENTION
TO STARTING AND ENDING TIMES OF MEASUREMENT, AS THE TIME INTERVALS ARE
DETERMINED BY THE USER USING A SWEEP SECOND HAND WATCH OR STOP WATCH.

THE SPECIFIED ACCURACY ASSUMES THAT THE USER WILL TERMINATE THE
MEASURING INTERVAL WITHIN ONE SECOND OF THE MEASUREMENT PERIOD. TO RUN:

A. INSURE THAT TELETYPE IS ON-LINE
B. MOUNT ANY TAPE LOOP IN READER.
C. LOAD ADDRESS 000200.
D. SET SR TO 000010. PRESS START
E. THE PROGRAM IDENTIFIES ITSELF AND TYPES INSTRUCTIONS TO LOAD READER
   AND MAKE READY, AND TO SELECT DESIRED MEASUREMENT PERIOD.
F. PRESS CONTINUE WHEN READY TO START MEASUREMENT. THE READER
   WILL START RUNNING.
G. AT END OF TIME PERIOD, SET SR15 TO A 1 AND BACK TO 0 AGAIN.
   THE PROGRAM WILL TYPE READER SPEED IN CHARACTERS PER SECOND AND HALT.
H. TO REPEAT, SELECT THE DESIRED TIME PERIOD WITH SR14, MAKE
   SURE THAT SR15 IS SET TO 0, AND PRESS CONTINUE WHEN READY.

4.10 PRG11 USE PROCEDURE

THIS PROGRAM IS INTENDED AS AN AID IN DETERMINING THE PUNCH SPEED.
THE SPEED OF THE PUNCH CAN BE MEASURED WITHIN ONE CHARACTER ACCURACY
PROVIDED THE USER PAYS CLOSE ATTENTION TO THE STARTING AND STOPPING
TIME OF THE MEASUREMENT PERIOD. THE MEASUREMENT PERIOD IS CONTROLLED
BY THE USER USING A SWEEP SECOND WATCH OR STOP WATCH. THE PERIOD
USED IS 60 SECONDS. TO RUN:

A. INSURE THAT TELETYPE IS ON-LINE
B. INSURE THAT PUNCH HAS AN ADEQUATE SUPPLY OF TAPE.
C. LOAD ADDRESS 000200.
D. SET SR TO 000011. PRESS START
E. THE PROGRAM IDENTIFIES ITSELF AND TYPES INSTRUCTIONS TO MAKE
   PUNCH READY.
F. PRESS CONTINUE WHEN READY TO START. THE PUNCH WILL START RUNNING.
G. AT END OF TIME PERIOD (60 SECONDS), SET SR15 TO A 1 AND BACK TO 0.
   THE PROGRAM WILL TYPE PUNCH SPEED IN CHARACTER PER SECOND AND HALT.
H. TO REPEAT, MAKE SURE THAT SR15 IS SET TO A 0, AND PRESS CONTINUE.

4.11 PRG12 USE PROCEDURE

THIS PROGRAM IS INTENDED TO BE USED AS AN AID IN CHECKING

OUT THE ADDITIONAL LOGIC ADDED TO THE PUNCH CONTROLLER THAT
ALLOWS THE PROGRAMMER TO ISSUE ''PUNCH RESET'' UNDER SOFTWARE
CONTROL.

SEQ 0009

THIS CODE EXECUTES UNDER OPERATOR INTERVENTION. THE
OPERATOR TRIES TO ''HANG'' THE PUNCH BY PERFORMING THE
FOLLOWING STEPS.

0. FIRST MAKE SURE THE PUNCH IS READY. THE PUNCH KNOB
SHOULD BE SET TO THE ''AVAILABLE'' POSITION. RUN THIS TEST
THE PUNCH WILL START PUNCHING A BINARY BY LOADING ADDRESS
BY LOADING ADDRESS 200, SETTING THE SWITCH REGISTER TO 12
AND HITTING THE START SWITCH.
THE PUNCH WILL START PUNCHING A BINARY PATTERN.

1. REMOVE THE PAPER ROLL FROM IT'S HOLDER AND PLACE IT ON THE RIGHT HAND
SIDE OF THE PUNCH. (DO NOT TEAR THE PAPER TAPE AND MAKE
SURE IT FEEDS CORRECTLY). THE TEST WILL CONTINUE TO PUNCH
OUT AN ENDLESS STREAM OF CHARACTERS.

THIS STREAM OF CHARACTERS CAN ONLY BE INTERRUPTED
BY ''HANGING'' THE PUNCH CONTROL LOGIC.

2. TO HANG THE CONTROL LOGIC, TURN THE PUNCH ''OFF'' VIA THE
''OFFLINE/ONLINE'' KNOB ON THE TOP OF THE PUNCH, WHILE
CHARACTERS ARE BEING PUNCHED OUT. WAIT FOR THE PUNCH
MOTOR TO STOP.

THIS WILL CAUSE THE PUNCH TO SHUTOFF.

5. AT THIS POINT

THE PUNCH SHOULD BE HUNG. TO SEE IF THE PUNCH IS HUNG,
TURN THE CONTROL KNOB BACK TO ''AVAILABLE''. IF TURNING THE
KNOB BACK TO AVAILABLE CAUSES MORE CHARACTERS TO BE
PUNCHED, THEN THE PUNCH IS NOT HUNG.
IF CHARACTERS ARE BEING PUNCHED OUT, THEN THIS SHUT- OFF PROCESS
MUST BE REPEATED UNTIL THE PUNCH HANGS.
IF THE PUNCH DOES NOT HANG, START AGAIN AT STEP #2.

AFTER THE PUNCH IS HUNG, TURN THE CONTROL KNOB BACK
TO ''AVAILABLE''.

6. IF THE PUNCH DOES HANG, THEN THE PROGRAMMABLE INIT
FUNCTION IS READY TO BE TESTED. HITTING ''CONTINUE'' ON
THE PDP-11 CONTROL PANEL WILL CAUSE THE PROGRAMMABLE
INIT TO BE INVOKED. THE PROGRAM WILL CONTINUE TO
PUNCH CHARACTERS IF THE INIT IS WORKING CORRECTLY.
IF THE PUNCH IS STILL HANGING THEN THE PROGRAMMABLE
INIT DID NOT WORK.

7. SWITCH REGISTER OPTIONS:

SR14=1 TO SCOPE LOOP ON THE PROGRAMMABLE INIT FUNCTION

4.12 PRG13 USE PROCEDURE

THIS PROCEDURE IS USED TO DETERMINE IF THE READER LIGHT LOGIC IS WORKING CORRECTLY. IT CHECKS THE ABILITY OF THE READER LIGHT TO BE TURNED OFF UNDER PROGRAM CONTROL.

STEPS:

RUN THIS TEST BY SELECTING IT VIA THE SWITCH REGISTER AND STARTING AT LOCATION 200.

1. PUT SWITCH 8 OF THE SWITCH REGISTER TO ZERO.
   PUT THE READER NUMBER IN THE SWITCH REGISTER
   WHEN THE PROGRAM ASKS FOR IT.

2. AFTER SELECTING A GIVEN READER VIA THE SWITCH REGISTER, TURN THE READER LIGHT "ON" BY PRESSING THE MOMENTARY CONTACT "ON/OFF" SWITCH ON THE READER.

   IF THE READER LIGHT DOES NOT COME ON, THEN EITHER THE LIGHT OR THE SWITCH IS PROBABLY DEFECTIVE.

3. ONCE THE READER LIGHT IS ON, THE OPERATOR SHOULD PUT SWITCH 8 TO A ONE TO TURN IT OFF. THE PROGRAM MONITORS THE POSITION OF SWITCH 8. WHEN SWITCH 8 IS ONE, THE PROGRAMS ISSUES A SOFTWARE COMMAND TO TURN THE LIGHT OFF.
   IF THE LIGHT REMAINS ON AFTER SWITCH 8 HAS BEEN SET TO A ONE, THEN THE READER LOGIC IS DEFECTIVE.

4. IF THE READER LIGHT GOES OFF WHEN SWITCH 8 IS IN THE ONE STATE, THEN THE TEST HAS WORKED CORRECTLY.

   TO SELECT A NEW READER, PUT SWITCH 12 TO A ONE AND HIT CONTINUE.

   TO RE-RUN THE TEST, GO DO STEP 1 AND STEP 2, THEN HIT CONTINUE.

5. SWITCH REGISTER OPTIONS AVAILABLE IN THIS TEST ARE:

SR12=1	TO SELECT A NEW READER TO TEST.
SR 8=1	TO TURN LIGHT OFF ON READER SELECTED.
SR14=1	TO DO A SCOPE LOOP ON THE PROGRAMMABLE READER LIGHT DISABLE FUNCTION.

5. PROGRAM AND/OR OPERATOR ACTION

5.1 NORMAL HALTS

LOC 002502 — COMMON HALT. THIS HALT IS CONTAINED IN A SUBROUTINE THAT IS CALLED BY THOSE PARTS OF THE PROGRAM REQUIRING THAT THE PROCESSOR HALT. THIS HALT NORMALLY OCCURS UPON COMPLETION ON AN INSTRUCTION OR STATUS PRINTOUT. WHEN THE HALT OCCURS, THE CONSOLE DATA LIGHTS DISPLAY THE ADDRESS OF INSTRUCTION THAT GENERATED THE HALT REQUEST.

LOC 002032 — ROUTINE END HALT. THIS HALT OCCURS UPON COMPLETION OF THE CURRENT TEST ROUTINE. WHEN THE HALT OCCURS, THE CONSOLE DATA LIGHTS DISPLAY THE NUMBER OF ROUTINE JUST COMPLETED. THE HALT OCCURS ONLY IF SR10 IS SET TO A 1, FOR THOSE PROGRAMS THAT MAKE USE OF THE OPTION (PRG0,PRG1).

5.2 NORMAL PRINTOUTS

NORMAL PRINTOUTS IN THIS PROGRAM SERVE TO IDENTIFY A STARTING PROGRAM, TO PROVIDE INSTRUCTIONS, TO INDICATE STATUS, OR TO SIGNAL AN OPERATOR ERROR. MOST PRINTOUTS ARE SELF-EXPLANATORY. THOSE PRINTOUTS REQUIRING ADDITIONAL EXPLANATION FOLLOW.

''?INVALID PROGRAM''

THE USER HAS SELECTED FOR EXECUTION A NON-EXISTENT PROGRAM. SET IN SR3 THROUGH SR0 THE CORRECT PROGRAM NUMBER AND PRESS CONTINUE.

''?INVALID TEST''

THE USER HAS SELECTED FOR EXECUTION A NON-EXISTENT ROUTINE. SET CORRECT ROUTINE NUMBER IN SR7 THROUGH SR0 AND PRESS CONTINUE.

''PXX END.''

THE SPECIFIED PROGRAM HAS COMPLETED ONE PASS.

6. ERRORS

ERRORS ARE REPORTED IN THIS PROGRAM BY ONE OF THE FOLLOWING METHODS:

A. UNCONDITIONAL ERROR HALTS, OR
B. ERROR PRINTOUT FOLLOWED BY AN OPTIONAL ERROR HALT.

6.1 UNCONDITIONAL ERROR HALTS

AN UNCONDITIONAL ERROR HALT WILL OCCUR AT THE ADDRESSES LISTED BELOW IF THROUGH HARDWARE OR SOFTWARE FAILURE, PROGRAM CONTROL IS TRANSFERRED TO AN UNEXPECTED AREA BETWEEN 000000 AND 000776.

000002 - RESERVED AREA.
000006 - ERROR TRAP
000012 - RESERVED INSTRUCTION TRAP
000016 - DEBUG TRAP
000022 - IOT TRAP
000026 - POWER FAIL TRAP
000040 THROUGH 000776 - SYSTEM SOFTWARE AND INTERRUPT VECTOR AREA, EXCEPT FOR READERS, PUNCHES,AND TTY VECTORS.

TO FIND OUT WHERE THE PROGRAM WAS AT THE TIME THE FAILURE OCCURRED, PERFORM THE FOLLOWING STEPS:

A. EXAMINE CONTENTS OF REGISTER 6 (ADDRESS 177706)
B. TRANSFER THE CONTENTS OF REGISTER 6 TO THE SR, LOAD ADDRESS AND EXAMINE.
C. THE DATA SHOWN IN THE DATA LIGHTS IS THE VALUE OF THE PC WHEN THE FAILURE OCCURRED.
D. LOCATE IN PROGRAM LISTING THE DISPLAYED PC VALUE.
E. THE INSTRUCTION THAT IMMEDIATELY PRECEDES THE ONE REFERENCED BY THE DISPLAYED PC VALUE IS THE INSTRUCTION THAT WAS/WAS BEING EXECUTED WHEN THE FAILURE OCCURRED.

6.2 ERROR PRINTOUTS

ERROR PRINTOUTS IN THIS PROGRAM CAN BE ONE OF TWO TYPES:
A. NORMAL ERROR PRINTOUTS
B. EXTENDED ERROR PRINTOUTS

6.2.1 NORMAL ERROR PRINTOUTS

NORMAL ERROR PRINTOUTS ARE GENERATED BY THE "ERR" SUBROUTINE. THE ERR SUBROUTINE IS CALLED BY AN "ERROR" STATEMENT IN THE PROGRAM LISTING. THE NORMAL ERROR PRINTOUT TAKES THE FORM:

"PXX TYYY PC OZZZZZ ICNT VVVVV."

WHERE:
PXX IS THE NUMBER OF THE PROGRAM BEING RUN,
TYYY IS THE NUMBER OF ROUTINE WHERE FAILURE OCCURRED.

PC OZZZZZ IS THE ADDRESS FROM WHICH THE ERROR CALLED WAS ISSUED.
ICNT VVVVV. IS NUMBER OF TIMES TEST WAS DONE WHEN FAILURE OCCURRED.
MEANINGFUL ONLY IN PRG0 AND PRG1.

AFTER THE PRINTOUT IS COMPLETED, THE PROGRAM WILL HALT AT COMMON ERROR HALT AT LOC 002516 IF SR15 IS SET.

WHEN THIS TYPE OF ERROR PRINTOUT OCCURS:

A. IN THE PROGRAM LISTING, LOOK UP THE ADDRESS REFERENCED BY PCOZZZZZ.
B. OPPOSITE THE PC VALUE AN ERROR STATEMENT WILL BE FOUND, AND IN THE COMMENTS SECTION A DESCRIPTION OF THE FAILURE WILL BE FOUND.
C. AT THE BEGINNING OF THE TEST ROUTINE A DESCRIPTION OF THE TEST WILL BE FOUND.

6.2.2 EXTENDED ERROR PRINTOUTS

IN ADDITION TO THE INFORMATION TYPED BY THE NORMAL ERROR PRINTOUTS, THE EXTENDED ERROR PRINTOUTS TYPE INFORMATION THAT DESCRIBES THE TYPE OF FAILURE. MOST EXTENDED PRINTOUTS CONCERN THEMSELVES WITH DATA PROBLEMS. THE PRINTOUTS ARE GENERATED BY THE "ERRN" SUBROUTINE WHICH IS CALLED BY AN "ERRORN" STATEMENT IN THE PROGRAM LISTING. A TYPICAL PRINTOUT WOULD LOOK AS FOLLOWS:

"P05 T000 PC 011350 ICNT 00000. DATA ERROR S/B:0371 WAS:0071"

THE PROGRAM, TEST AND PC INFORMATION ARE THE SAME AS FOR NORMAL ERROR PRINTOUTS. THE PC VALUE ALTHOUGH HAVING THE SAME MEANING, IS NOT AS MEANINGFUL, SINCE THE ERRN SUBROUTINE MAY BE BEING CALLED BY A COMMON DATA ERROR SUBROUTINE WHICH IS USED BY MORE THAN ONE PROGRAM.

(6.2.2 CONT'D)

THE IMPORTANT INFORMATION IN AN EXTENDED ERROR PRINTOUT IS THE ''EXTENDED'' INFORMATION TYPED. SOME OF THE EXTENDED PRINTOUTS ARE DESCRIBED BELOW:

''DATA ERROR S/B XXXX WAS: YYYY''

DATA READ WITH READER DOES NOT AGREE WITH EXPECTED DATA. S/B XXXX (SHOULD BE) IS THE EXPECTED DATA. WAS YYYY IS THE RECEIVED DATA. DEPENDING ON THE PROGRAM, THE FAILURE COULD BE CAUSED BY THE READER OR THE PUNCH. EXAMINING THE TAPE WILL SHOW IF THE TAPE IS PUNCHED CORRECTLY.

''REREAD ERROR. 1ST READ: XXXX WAS: YYYY''

THIS ERROR PRINTOUT IS GENERATED BY PRG0 TEST14. IT INDICATES THAT A REREAD OF THE READER BUFFER DID NOT AGREE WITH THE ORIGINAL DATA READ FROM THE BUFFER.

''SYNC ERROR''

THIS PRINTOUT INDICATES THAT A PROGRAM WAS UNSUCCESSFUL IN SYNCING UP WITH THE SPECIAL BINARY COUNT PATTERN TAPE IN THE READER, OR IN THE CASE OF PRG2, THAT THE PROGRAM HAS NOT READ A SUFFICIENT NUMBER OF ZEROES BEFORE SYNCING UP WITH THE LEADER CHARACTER (377). IF HALTED, PRESS CONTINUE TO TRY AGAIN.

''LEADER ERROR S/B: 377 WAS: XXXX'' OR
''LEADER ERROR S/B BETWEEN 0 AND 3. WAS: XXXX

ONE OR BOTH OF THESE PRINTOUTS IS GENERATED BY PRG2 WHEN IN READING THE LEADER THAT PRECEDES THE SPECIAL BINARY COUNT PUNCHED BY PRG3 THE DATA DOES NOT AGREE WITH THE EXPECTED DATA. CHECK THAT THE TAPE IS PUNCHED CORRECTLY. REFER TO PRG1 AND PRG2 DESCRIPTION.

''MATCH ERROR''

THIS PRINTOUT IS GENERATED BY PRG5 WHEN UNSUCCESSFUL IN MATCHING UP THE DATA READ FROM THE READER WITH THE EXPECTED DATA AS SPECIFIED BY SR. CHECK THAT THE TAPE IS THE ONE TO BE READ AND RESTART THE PROGRAM.

''FALSE READER INTERRUPT'' OR,
''FALSE PUNCH INTERRUPT''

THE PROGRAM DID NOT FIND THE ERROR OR THE DONE BIT SET FOLLOWING AN INTERRUPT. POSSIBLY NOISE COULD BE CAUSING THE PROBLEM.

7. MISCELLANEOUS

7.1 TEST TAPES

THE FOLLOWING TEST TAPES ARE RELEASED WITH THIS PROGRAM:

A. MAINDEC-00-D2G4-PT SPECIAL BINARY COUNT PATTERN TEST TAPE.
B. MAINDEC-00-D2G2-PT ONES AND ZEROES TEST TAPE.

THE SPECIAL BINARY COUNT PATTERN TAPE IS PUNCHED WITH A PATTERN CONSISTING OF THE NUMBERS 000 THROUGH 377. EACH NUMBER IS IMMEDIATELY FOLLOWED BY ITS ONES COMPLEMENT NUMBER. FOR EXAMPLE:

001, 376, 002, 375, 003, 374, 004, 373, ETC.

THE EASIEST WAY TO MAKE A SPECIAL BINARY COUNT PATTERN TEST LOOP IS TO OVERLAP THE TAPE AT THE POINT WHERE THE CHARACTERS 377,000,000;377. APPEAR. THAT SEQUENCE OF CHARACTERS APPEARS EVERY 512 CHARACTERS. THEREFORE A MINIMUM SIZE TEST LOOP WOULD CONSIST OF 512 CHARACTERS.

7.2 SR OPTIONS

THE STANDARD SR OPTIONS ARE DESCRIBED HERE.

SR15 - HALT ON ERROR.

SR14 - SCOPE. THIS OPTION CAUSES THE PROGRAM TO REMAIN IN THE CURRENT TEST ROUTINE. WHEN THE OPTION IS REMOVED THE PROGRAM PERFORMS THE TEST THE NUMBER OF TIMES SPECIFIED BY ITS ITERATION COUNT, BEFORE GOING ON TO THE NEXT ROUTINE.

SR13 - INHIBIT ERROR PRINT. THIS OPTION IF SET WILL REMOVE ALL ERROR PRINTOUTS.

SR11 - INHIBIT ITERATION. SOME PROGRAMS CONSIST OF INDIVIDUAL TEST ROUTINES. FOR EACH ROUTINE THE FUNCTION BEING TESTED CAN BE TESTED A VARIABLE NUMBER OF TIMES BEFORE THE ROUTINE IS COMPLETED. THE NUMBER OF TIMES THE TEST IS TO BE PERFORMED IS CALLED THE ITERATION COUNT AND IT MAY DIFFER FROM ROUTINE TO ROUTINE. SETTING SR11 WILL CAUSE THE PROGRAM TO PERFORM ONLY ONE ITERATION FOR EACH ROUTINE DURING WHICH THE SWITCH IS SET. TWO POSSIBLE USES OF THIS OPTION ARE:

(7.2 CONT'D)

A. QUICK PASS. WHEN A PROGRAM RUNS FOR SEVERAL MINUTES FOR ONE PROGRAM PASS, THE USER MAY ELECT TO RUN THROUGH THE PROGRAM QUICKLY TO FIND OUT IF ANY FAILURES SHOW UP IMMEDIATELY. A SUCCESSFUL QUICK PASS HOWEVER, DOES NOT GUARANTEE THAT THE SAME PROGRAM WILL RUN ERROR-FREE WHEN PERFORMING A NORMAL ITERATION PASS.

B. SKIP OVER FAILING ROUTINE. WHEN A ROUTINE WITH A MULTIPLE ITERATION COUNT HAS DETECTED A SOLID FAILURE, THE ERROR WILL BE REPORTED MANY TIMES. TO GO ON TO THE NEXT ROUTINE IF DESIRED, THE USER CAN INHIBIT ITERATION. IT WILL BE NECESSARY TO SET SR11 ROUTINE AND HALT, TO CAUSE THE PROGRAM TO STOP AT END OF FAILING ROUTINE. OTHERWISE THE PROGRAM WILL QUICKLY RUN THROUGH THE NEXT ROUTINE ALSO.

SR10 - HALT AT END OF CURRENT ROUTINE. PRG0 AND PRG1 CONSIST OF INDIVIDUALLY NUMBERED TEST ROUTINES. SETTING SR10 WILL CAUSE PROGRAM TO HALT UPON COMPLETION OF CURRENT ROUTINE.

SR9 - SELECT ROUTINE. FOR PROGRAMS THAT CONSIST OF INDIVIDUAL TEST ROUTINES, THE USER MAY ELECT TO RUN ONLY A SPECIFIED ROUTINE. TO SELECT A ROUTINE SR9 MUST BE SET, AND SR7 THROUGH SR0 MUST BE SET TO THE NUMBER OF THE DESIRED ROUTINE. THE SELECTED NUMBER MUST BE A VALID ROUTINE NUMBER FOR THE PROGRAM BEING RUN, OR A USER ERROR PRINTOUT WILL OCCUR. THE PROGRAM WILL RUN THE SELECTED ROUTINE UNTIL THE SELECT ROUTINE OPTION IS CLEARED, OR UNTIL THE SELECTED ROUTINE NUMBER IS CHANGED. IF THE OPTION IS CLEARED, THE PROGRAM WILL PROCEED TO EXECUTE THE REMAINING ROUTINES IN THE PROGRAM. IF THE ROUTINE NUMBER IS CHANGED, THE PROGRAM WILL EXECUTE THE NEWLY SELECTED ROUTINE.

7.3 TESTING AT NON-STANDARD ADDRESSES AND/OR VECTORS

THIS PROGRAM CAN TEST PA611'S ASSIGNED TO NON-STANDARD ADDRESSES. ALL READERS MUST BE ASSIGNED CONSECUTIVE ADDRESSES, AND ALL PUNCHES MUST BE ASSIGNED CONSECUTIVE ADDRESSES.

A. IMMEDIATELY AFTER LOADING THE PROGRAM CHANGE THE FOLLOWING LOCATIONS. REFER TO PROGRAM LISTING.

LOCATION	FROM STANDARD	TO NON-STANDARD
001220	172600	1ST READER CSR ADDRESS
001222	172700	1ST PUNCH CSR ADDRESS

B. IF THE TELETYPE IS ALSO AT NON STANDARD ADDRESSES, PERFORM THE FOLLOWING CHANGES:

LOCATION	FROM STANDARD	TO NON-STANDARD
001224	177560	TTY READER CSR ADDRESS
001226	177562	TTY READER BUFFER ADDRESS
001230	177564	TTY PRINTER CSR ADDRESS
001232	177566	TTY PRINTER BUFFER ADDRESS
001234	000060	TTY READER INTERRUPT VECTOR ADDRESS
001236	000200	TTY READER PRIORITY LEVEL
001240	000064	TTY PRINTER INTERRUPT VECTOR ADDRESS
001242	000200	TTY PRINTER PRIORITY LEVEL

C. PROCEED TO USE THE PROGRAM, OR

D. USING STANDARD DUMP ROUTINES, DUMP OUT THE ENTIRE PROGRAM IN ABSOLUTE FORMAT TO HAVE AN UPDATED OBJECT TAPE THAT REFLECTS YOUR SYSTEM, OR

E. DUMP OUT ONLY LOCATIONS 001224 THROUGH 001242 IN ABSOLUTE FORMAT, AND SPLICE THE TAPE TO THE END OF THE STANDARD OBJECT TAPE. THIS PROCEDURE WOULD REQUIRE THAT THE SHORT LENGTH OF TAPE BE LOADED IMMEDIATELY AFTER THE MAIN PROGRAM IS LOADED, IN ORDER TO OVERLAY LOCATIONS 001224 THROUGH 001242.

8. DESCRIPTION

8.1 PRG0 PROGRAM DESCRIPTION

PRG0 IS THE PA611 READER TEST. IT CONSISTS OF 22 ROUTINES NUMBERED FROM 00 TO 24(8). THE PROGRAM USES A SPECIAL BINARY COUNT PATTERN TEST TAPE LOOP IN ALL ROUTINES.

ROUTINES 00 THROUGH 17 ARE BASIC LOGIC TESTS. ROUTINES 20 THROUGH 24 ARE READER EXERCISER TESTS. IN ROUTINES 20 THROUGH 24 THE READER WILL RESYNC ITSELF AFTER 3 DATA ERRORS HAVE OCCURRED.

8.2 PRG1 PROGRAM DESCRIPTION

PRG1 IS THE PA611 PUNCH TEST. IT CONSISTS OF 16 ROUTINES NUMBERED FROM 00 TO 17(8). ROUTINES 00 THROUGH 13 ARE BASIC LOGIC TESTS. ROUTINES 14 THROUGH 17 EXERCISE THE PUNCH USING THE FOLLOWING FORMAT:

A. 20 BLANK CHARACTERS
B. SYNC CHARACTER RUBOUT.
C. MODE NUMBER (BETWEEN 0 AND 3)
D. 4 BLANK CHARACTERS
E. 512 CHARACTERS OF SPECIAL BINARY COUNT PATTERN.

RTN14 - PUNCHES 5 DATA BLOCKS AT FULL SPEED.

RTN15 - PUNCHES 5 DATA BLOCKS. THE SPECIAL BINARY COUNT PATTERN DATA IS PUNCHED WITH RANDOM STALLS OF UP TO 47 MSECS. AFTER EACH CHARACTER.

RTN16 - PUNCHES 5 DATA BLOCKS. THE SPECIAL BINARY COUNT PATTERN DATA IS PUNCHED WITH RANDOM STALLS OF UP TO 47 MILLISECONDS BETWEEN GROUPS OF CHARACTERS OF UP TO 15 CHARACTERS.

RTN17 - PUNCHES 1 DATA BLOCK. THE SPECIAL BINARY COUNT PATTERN DATA DATA IS PUNCHED WITH A 5 SECOND STALL PRECEDING EACH 32 CHARACTER GROUP PUNCHED.

8.3 PRG2 PROGRAM DESCRIPTION

PRG2 VERIFIES THE PAPER TAPE PRODUCED BY PRG1. THE PROGRAM CONSISTS OF A SINGLE ROUTINE THAT PERFORMS THE FOLLOWING STEPS:

A. LOOK FOR 10 CONSECUTIVE 0 CHARACTERS
B. LOOK FOR SYNC CHARACTER (RUBOUT)
C. LOOK FOR MODE #. BETWEEN 0 AND 3.
D. READ 4 BLANK CHARACTERS
E. READ 512 BINARY CHARACTERS.
F. GO TO STEP A.

THE ROUTINE WILL REPORT EVERY ERROR. IT WILL NOT RESYNC ON THE SPECIAL BINARY COUNT PATTERN, SINCE IT IS INTENDED THAT EVERY ERROR CAUSED BY THE PUNCH BE REPORTED.

8.4 PRG3 COMBINED READER-PUNCH TEST

THIS CONTINUOUS RUNNING PROGRAM EXERCISES THE PUNCH AND READER CONCURRENTLY. THE SPECIAL BINARY COUNT PATTERN IS USED IN THIS PROGRAM,

A. THE PUNCH PUNCHES DATA AT FULL SPEED. WHEN THE CHARACTER COUNT REACHES 20, THE PUNCH ROUTINE ENABLES THE READER.
B. WHEN THE CHARACTER COUNT REACHES 40, THE PUNCH ROUTINE WILL STOP PUNCHING. PUNCHING WILL NOT RESUME UNTIL THE CHARACTER COUNT IS DECREMENTED TO 31 BY THE READ ROUTINE.
C. IF THE CHARACTER COUNT IS OVER 31, THE READER READS AT FULL SPEED.
D. IF THE CHARACTER COUNT IS 31 OR LESS THE READER WILL READ WITH RANDOM STALLS BETWEEN CHARACTERS.
E. IF THE CHARACTER COUNT BECOMES 0, THE READER STOPS READING UNTIL THE COUNT CLIMBS TO 20.
F. THE READ ROUTINE WILL RESYNC AUTOMATICALLY AFTER 3 ERRORS.

8.5 PRG4 PROGRAM DESCRIPTION

PRG4 WILL PUNCH CONTINUOUSLY THE 2 CHARACTERS WHOSE CODES ARE SET IN THE SR. THE ROUTINE IS USED FOR GENERATING ALL 0'S TAPE, ALL 1'S TAPE, ONES AND ZEROES TAPE, ETC.

8.6 PRG5 PROGRAM DESCRIPTION

PRG5 READS AND CHECKS A TAPE PUNCHED WITH THE CHARACTERS WHOSE CODES ARE SET IN THE SR. THIS ROUTINE IS USEFUL IN SETTING UP THE READ PHOTOCELLS AND READ AMPLIFIER.

8.7 PRG6 PROGRAM DESCRIPTION

PRG6 WILL ENABLE THE READER FOR THE NUMBER OF CHARACTERS SPECIFIED IN THE LEFT HALF OF THE SR, AND THEN IT WILL STALL FOR THE NUMBER OF MILLISECONDS SPECIFIED IN THE RIGHT HALF OF THE SR. THIS ROUTINE IS USEFUL IN SETTING UP THE READER CLOCK, ACCELERATOR, STROBE, AND FOR CHECKING THE STOP DELAY.

8.8 PRG7 PROGRAM DESCRIPTION

PRG7 PUNCHES THE SPECIAL BINARY COUNT PATTERN CONTINUOUSLY.

8.9 PRG10 PROGRAM DESCRIPTION

PRG10 IS A ROUTINE USED TO CHECK THE SPEED OF THE READER.
READER SPEED CAN BE MEASURED IN TWO WAYS:

A. COARSE. 30 SECOND TIMING. PLUS OR MINUS 10 CHARACTER ACCURACY.
B. FINE. 300 SECOND TIMING. PLUS OR MINUS 1 CHARACTER ACCURACY.

SR14 INDICATES TO THE ROUTINE THE TIMING PERIOD THE USER IS GOING TO USE. SR14=0 INDICATES 30 SECOND TIMING.

THE USER CONTROLS THE DURATION OF THE TIMING PERIOD BY USING A SWEEP SECOND HAND WATCH OR STOP-WATCH. AT THE END OF THE TIMING PERIOD, SR15 IS SET TO A 1 TO OBTAIN A SPEED PRINTOUT.

8.10 PRG11 PROGRAM DESCRIPTION

PRG11 IS USED TO CHECK THE SPEED OF THE PUNCH. THE ROUTINE USES A 60 SECOND TIMING PERIOD THAT IS CONTROLLED BY THE USER. AT THE END OF THE TIMING PERIOD SR15 IS SET TO A 1 TO OBTAIN A SPEED PRINTOUT.

8.11 PRG12 PROGRAM DESCRIPTION

PROGRAM 12 IS USED TO TEST THE PROGRAMMABLE INIT FEATURE ADDED TO THE PUNCH CONTROL LOGIC. THE PROGRAM PUNCHES AN ENDLESS BINARY PATTERN, WAITING FOR THE OPERATOR TO HANG THE PUNCH UP. THIS CAN USUALLY BE ACCOMPLISHED BY TURNING THE CONTROL SWITCH OFF AND JIGGLING THE TAPE LOW SENSOR SWITCH WHILE THE PUNCH IS PUNCHING. IF THE PUNCH CYCLE HAS NOT BEEN COMPLETED, READY WILL REMAIN LOW AND THE PUNCH WILL HANG.

THE PROGRAM SENSES THIS CONDITION IN A WATCHDOG TIMER LOOP. WHEN THE PROGRAM SEES THAT THE PUNCH IS HUNG, THEN IT TIMES OUT AND HALTS.

WHEN THE OPERATOR HITS THE CONTINUE SWITCH, AN INIT PULSE IS GENERATED BY THE PROGRAM TO RE-INIT THE PUNCH. [THIS INIT PULSE DOES NOT EFFECT OTHER DEVICES ON THE BUS.]

UPON HITTING THE CONTINUE SWITCH,
THE PROCESS REPEATS ITSELF.

8.12 PRG13 PROGRAM DESCRIPTION

THIS PROGRAM IS USED TO CHECK THE ABILITY OF THE READER LIGHT TO BE TURNED OFF UNDER PROGRAM CONTROL.

ASSUMING THAT THE READER LIGHT IS ON, THE STEPS PERFORMED
BY THE PROGRAM ARE:

1. GET THE ADDRESS OF THE READER TO BE TESTED (READER
   IS SELECTED VIA CONSOLE TTY RESPONSE)

2. CHECK SWITCH 8. IF SWITCH 8=1 THEN ISSUE A COMMAND TO
   TURN THE LIGHT OFF. IF SWITCH 8=0 THEN RECHECK THE
   SWITCH AND LOOP
   ON THIS STEP.

3. CHECK SWITCH 12.
   IF SW12=1 THEN GO TO STEP 1.
   IF SW12=0 THEN GO TO STEP 2.

```
                        ;STORED IN DECTAPE LIB12 - MIKE MITCHELL 3/75
                        ;TYPESET 11 READER-PUNCH TESTS
                        ;COPYRIGHT 1972, DIGITAL EQUIPMENT CORP., MAYNARD, MASS.
                                .TITLE  PA611
                                .ABS
                        .ENABLE AMA
                                .LIST   ME
                                .NLIST  MD,SEQ




                                .LIST SRC
                        ;PRG0 - READER TEST
                        ;PRG1 - PUNCH TEST
                        ;PRG2 - PUNCH VERIFY ROUTINE
                        ;PRG3 - COMBINED READER-PUNCH TEST
                        ;PRG4 - PUNCH 2 CHARACTERS FROM SR.
                        ;PRG5 - READ 2 CHARACTERS AS PER SR.
                        ;PRG6 - READ X CHARS, STALL Y MSECS.
                        ;PRG7 - PUNCH SPECIAL BINARY COUNT PATTERN TAPE.
                        ;PRG10 - READER SPEED PRINT ROUTINE.
                        ;PRG11 - PUNCH SPEED PRINT ROUTINE.
                        ;PRG12 - PUNCH INIT TEST
                        ;PRG13 - READER LIGHT TEST.
                        ;
                        ;SR 15 - HALT-ON-ERROR.
                        ;SR 14 - SCOPE.
                        ;SR 13 - INHIBIT ERROR PRINT.
                        ;SR 11 - INHIBIT ITERATION.
                        ;SR 10 - HALT AT END OF CURRENT ROUTINE.
                        ;SR  9 - SELECT ROUTINE.
                        ;SR  8 - TURN READER LIGHT OFF (PRG13 ONLY)
                        ;SR 7 THROUGH SR 0 - NUMBER OF ROUTINE TO BE SELECTED.

                        ;PA611 ADDRESSES:
                        ;PUNCH.............772776-772700
                        ;READER.............772676-772600
                        ;RDR0-------172600
                        ;RDR1-------172604
                        ;RDR2-------172610
                        ;RDR3---------172614


                        ;
    000000                      .=0
000000  000002                  .+2                     ;UNASSIGNED TRAP
000002  000000                  HALT
000004  000006          MACHER: .+2                     ;SP OVERFLOW, BUS ERROR TRAP
000006  000000                  HALT
000010  000012                  .+2                     ;RESERVED INSTRUCTION TRAP
000012  000000                  HALT
```

```
000014  002376                  TRCV:   SV5S                    ;TRACE TRAP
000016  000340                          PRTY7
000020  002426                  IOTV:   RS5S                    ;TRAP TO CALL IOX
000022  000340                          PRTY7
000024  000026                          .+2                     ;POWER FAIL TRAP
000026  000000                          HALT
000030  002176                  EMTV:   EMTINT                  ;EMT TRAP
000032  000340                          PRTY7
000034  000036                  TRPV:   .+2                     ;TRAP TRAP. SIMILAR TO EMT.
000036  000002                          RTI                     ;EXIT TRAP CALL.
        000040                          .=40
                                ;LOCATIONS 40 THROUGH 776 ARE FILLED WITH .+2 AND HALT.
                                        .NLIST  ME
                                        .LIST   ME
                                ;EQUATE STATEMENTS
        177570                          SR=177570
        177776                          PSW=177776
000774  177746                          CACHE: 177746   ; FOR CONTROL REGISTER FOR 11-70
        001200                          SPBOT=1200
        000240                          NOP=240
        000000                          OPEN=0
        100000                          MANUAL=BIT15
        100000                          BIT15=100000
        040000                          BIT14=40000
        020000                          BIT13=20000
        010000                          BIT12=10000
        004000                          BIT11=4000
        002000                          BIT10=2000
        001000                          BIT9=1000
        000400                          BIT8=400
        000200                          BIT7=200
        000100                          BIT6=100
        000040                          BIT5=40
        000020                          BIT4=20
        000010                          BIT3=10
        000004                          BIT2=4
        000002                          BIT1=2
        000001                          BIT0=1
        000000                          R0=%0
        000001                          R1=%1
        000002                          R2=%2
        000003                          R3=%3
        000004                          R4=%4
        000005                          R5=%5
        000006                          R6=%6
        000007                          R7=%7
        000007                          PC=%7
        005746                          PUSH=005746
        024646                          PUSH2=024646
        005726                          POPSP=005726
        022626                          POPSP2=022626
        000340                          PRTY7=340
        000300                          PRTY6=300
        000240                          PRTY5=240
        000200                          PRTY4=200
        000140                          PRTY3=140
```

```
                000100                          PRTY2=100
                000040                          PRTY1=40
                000000                          PRTY0=0
                000007                          BELL=007
                177777                          P0TLST=-1
                177777                          P1TLST=-1
                177777                          TLAST=-1
                000003                          TRC=3
                000040                          I=40
                100000                          A=BIT15
                040000                          B=BIT14
                020000                          C=BIT13
                000100                          IE=BIT6
                000000                          EMTX=0
                000003                          SAV5S=3
                000004                          RST5S=4
                000060                          .=60
     000060     002510                          KBSVC                   ;KEYBOARD VECTOR SETUP.
     000062     000340                          PRTY7                   ;STATUS UPON KEYBOARD INTERRUPT.
                000200                          .=200
     000200     000137  001450                  JMP     START           ;GO TO START OF PROGRAM.
                001000                          .=1000
     001000     000240                          NOP
     001002     000240                          NOP
     001004     005037  001252                  CLR     INITD           ;RESET INIT SWITCH.
     001010     000137  001450                  JMP     START           ;GO TO START OF PROGRAM.
                001200                          .=1200
     001200     000000                  PRS:    OPEN                    ;READER CSR
     001202     000000                  PRB:    OPEN                    ;READER BUFFER
     001204     000000                  PPS:    OPEN                    ;PUNCH CSR
     001206     000000                  PPB:    OPEN                    ;PUNCH BUFFER
     001210     000000                  RDRVTR: OPEN                    ;READER INTERRUPT VECTOR
     001212     000200                  RDRLVL: PRTY4                   ;READER PRIORITY LEVEL
     001214     000000                  PCHVTR: OPEN                    ;PUNCH INTERRUPT VECTOR
     001216     000200                  PCHLVL: PRTY4                   ;PUNCH PRIORITY LEVEL
     001220     172600                  FSTRDR: 172600                  ;ADDR OF 1ST READER.
     001222     172700                  FSTPCH: 172700                  ;ADDR OF 1ST PUNCH.
     001224     177560                  TKS:    177560                  ;LSR CSR
     001226     177562                  TKB:    177562                  ;LSR BUFFER
     001230     177564                  TPS:    177564                  ;LSP CSR
     001232     177566                  TPB:    177566                  ;LSP BUFFER
     001234     000060                  TKVTR:  60                      ;LSR INTERRUPT VECTOR
     001236     000200                  TKLVL:  PRTY4                   ;LSR PRIORITY LEVEL
     001240     000064                  TPVTR:  64                      ;LSP INTERRUPT VECTOR
     001242     000200                  TPLVL:  PRTY4                   ;LSP PRIORITY LEVEL
     001244     000000                  FSTVCT: OPEN
     001246     000000                  RDRLIM: OPEN
     001250     000000                  PCHLIM: OPEN
     001252     000000                  INITD:  OPEN
     001254     000000                  PRGNUM: OPEN                    ;CONTAINS CURRENT PROGRAM#
     001256     000000                  KSTART: OPEN                    ;CURRENT PROGRAM START ADDRESS.
     001260     000000                  CURTST: OPEN                    ;CONTAINS ADDR OF CURRENT TEST.
     001262     000000                  RTNNO:  OPEN                    ;CONTAINS CURRENT TEST #.
     001264     000000                  NXTST:  OPEN                    ;CONTAINS ADDR OF NEXT TEST.
     001266     000000                  ICNT:   OPEN                    ;
     001270     000000                  ICTR:   OPEN                    ;CONTAINS CURRENT ITERATION COUNT
```

```
001272  000000                  SCOPTR: OPEN                    ;CONTAINS CURRENT SCOPE POINTER.
001274  000000                  PRGID:  OPEN                    ;CONTAINS PROGRAM INDICATORS
001276  005244                  PRGTAB: PRG0                    ;PRG0 START ADDRESS
001300  006716                          PRG1                    ;PRG1 START ADDRESS
001302  010206                          PRG2                    ;PRG2 START ADDRESS
001304  010570                          PRG3                    ;PRG3 START ADDRESS
001306  011342                          PRG4                    ;PRG4 START ADDRESS
001310  011414                          PRG5                    ;PRG5 START ADDRESS
001312  011674                          PRG6                    ;PRG6 START ADDRESS
001314  011762                          PRG7                    ;PRG7 START ADDRESS
001316  012034                          PRG10                   ;PRG10 START ADDRESS
001320  012156                          PRG11                   ;PRG11 START ADDRESS
                                ;OPERATOR INTERVENTION TESTS:
001322  012306                          PRG12                   ;PUNCH TEST (OPR INTV.)
001324  012542                          PRG13                   ;READER LIGH TEST
                                                                ;(OPR INTV REQD.)
001326  000000                  ERRT:   OPEN
001330  000000                  RCNT:   OPEN                    ;CHARACTER COUNT
001332  000000                  PCHOUT: OPEN
001334  000000                  CRBUF:  OPEN                    ;HOLDS ONE CHARACTER FROM READER.
001336  000000                  CHR1:   OPEN
001340  000000                  CHR2:   OPEN
001342  000000                  CHR3:   OPEN
001344  000000                  ERCTR:  OPEN
001346  000000                  PCHMSK: OPEN
001350  000000                  RDRMSK: OPEN
001352  000000                  CTRA:   OPEN
001354  000000                  CTRB:   OPEN
001356  000000                  CTRC:   OPEN
001360  000000                  CTRD:   OPEN
001362  000000                  FPC:    OPEN
                                .NLIST  MC
001364
001364  002012                  EMTTAB:
                                        CHAINN                  ;POINTER FOR EMT CALL SCOPE
001366  002452                          SRSETT                  ;POINTER FOR EMT CALL SRESET
001370  002216                          SV03                    ;POINTER FOR EMT CALL SAV03
001372  002316                          RS03                    ;POINTER FOR EMT CALL RST03
001374  002246                          SV05                    ;POINTER FOR EMT CALL SAV05
001376  002346                          RS05                    ;POINTER FOR EMT CALL RST05
001400  002236                          SV05S                   ;POINTER FOR EMT CALL SAV05S
001402  002342                          RS05S                   ;POINTER FOR EMT CALL RST05S
001404  002742                          TYP                     ;POINTER FOR EMT CALL TYPE
001406  003034                          TYPS                    ;POINTER FOR EMT CALL TYPES
001410  004212                          STAL                    ;POINTER FOR EMT CALL STALL
001412  004004                          STPTRV                  ;POINTER FOR EMT CALL STRDRV
001414  004034                          STPTPV                  ;POINTER FOR EMT CALL STPCHV
001416  002566                          ERR                     ;POINTER FOR EMT CALL ERROR
001420  002576                          ERRN                    ;POINTER FOR EMT CALL ERRORN
001422  003344                          OACNVV                  ;POINTER FOR EMT CALL OACNV
001424  003436                          BDCNVV                  ;POINTER FOR EMT CALL BDCNV
001426  003620                          RNGEN                   ;POINTER FOR EMT CALL RNDNUM
001430  003676                          INRNDN                  ;POINTER FOR EMT CALL INRND
001432  003414                          BMOVV                   ;POINTER FOR EMT CALL BMOVE
001434  002542                          CHLT                    ;POINTER FOR EMT CALL CHALT
001436  002554                          EHLT                    ;POINTER FOR EMT CALL EHALT
001440  003130                          INBINN                  ;POINTER FOR EMT CALL INBIN
```

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001442  003274                          GTBINR                  ;POINTER FOR EMT CALL GETBNR
001444  003216                          GTBINP                  ;POINTER FOR EMT CALL GETBNP
001446  003064                          DLYN                    ;POINTER FOR EMT CALL DELAY
                                        .LIST   MC
001450  012706  001200          START:  MOV     #SPBOT,R6       ;SET BOTTOM OF SP STACK.
001454  005737  001252                  TST     INITD           ;SEE IF PROGRAM IS INITIALIZED.
001460  001041                          BNE     STRTA           ;BR IF YES.
001462  104010                          TYPE                    ;TYPE TITLE.
001464  012752                          PGTIT
001466  104011                          TYPES                   ;TYPE INSTRUCTIONS TO SET RDR 0 VECTOR.
001470  013035                          MSVCTR
001472  014041                          IM23
001474  177777                          -1
001476  104024                          CHALT
001500  013737  177570  001244          MOV     SR,FSTVCT       ;SAVE RDR0 VECTOR.
001506  104011                          TYPES                   ;TYPE INSTRUCTIONS TO SET # OF READERS.
001510  013067                          SELRDR
001512  014041                          IM23
001514  177777                          -1
001516  104024                          CHALT
001520  113737  177570  001246          MOVB    SR,RDRLIM       ;SAVE # OF READERS.
001526  104011                          TYPES                   ;TYPE INSTRUCTIONS TO SET # OF PUNCHES.
001530  013120                          SELPCH
001532  014041                          IM23
001534  177777                          -1
001536  104024                          CHALT
001540  113737  177570  001250          MOVB    SR,PCHLIM       ;SAVE # OF PUNCHES.
001546  012737  177777  001252          MOV     #-1,INITD       ;INITIALIZATION COMPLETE.
001554  104010                          TYPE                    ;RESTART MESSAGE.
001556  013013                          RUNINS
001560  104024                          CHALT
001562  000776                          BR      .-2
001564  013746  000004          STRTA:  MOV @#4,-(SP)    ;SAVE CONTENTS OF ADDRESS 4
001570  013746  000006                  MOV @#6, -(SP) ;        SAVE CONTENTS OF ADDRESS 6
001574  012737  001612  000004          MOV #CCHE, @#4  ;LOAD FOR TIMEOUT WITH NON CACHE PROCESSOR
001602  052737  000014  000774          BIS #14, @#CACHE        ;DISABLE CACHE
001610  000401                          BR AROUND       ; BRANCH AROUND FOR CACHE PROCESSORS
001612  022626                  CCHE:   CMP (SP)+, (SP)+        ; CLEAN UP THE STACK FOR NON CACHE PROC.
001614  012637  000006          AROUND: MOV (SP)+,@#6   ;RESTORE CONTENTS OF 6
001620  012637  000004                  MOV (SP)+, @#4  ;RESTORE CONTENTS OF 4
001624  012737  000340  177776          MOV  #PRTY7, PSW        ;SET PRIORITY 7
001632  004737  005174                  JSR  PC, CLNUP          ;GO DO CLEAN-UP
001636  013700  177570                  MOV     SR,R0           ;GET PROGRAM NUMBER.
001642  042700  177760                  BIC     #177760,R0
001646  020027  000013                  CMP     R0,#13          ;VALID PROGRAM NUMBER?
001652  101404                          BLOS    STRTB           ;BR IF YES.
001654  104010                          TYPE                    ;TYPE INCORRECT PROGRAM MESSAGE.
001656  012641                          CM2
001660  104024                          CHALT
001662  000740                          BR      STRTA           ;TRY AGAIN.
001664  010037  001254          STRTB:  MOV     R0,PRGNUM       ;SAVE PROGRAM NUMBER.
001670  006300                          ASL     R0              ;R0 TIMES 2.
001672  104001                          SRESET                  ;SYSTEM RESET.
001674  000170  001276                  JMP     @PRGTAB(0)      ;GO TO SELECTED PROGRAM.
001700  104011                  SRSET:  TYPES                   ;TYPE SR OPTION MESSAGE.
001702  012704                          ASETSR
```

```
001704  014041                          IM23
001706  177777                          -1
001710  104024                          CHALT                   ;COMMON HALT.
001712  013737  001256  001264  GETRDY: MOV     KSTART,NXTST    ;ADDR OF 1ST ROUTINE TO NXTST
001720  012737  000340  177776  GTRDYX: MOV     #PRTY7,PSW      ;SET PRIORITY 7.
001726  012706  001200                  MOV     #SPBOT,R6       ;SET BOTTOM OF STACK.
001732  104001                          SRESET                  ;ISSUE RESET.
001734  004737  002136          GTRDYA: JSR     R7,FORWD        ;ROLL FORWARD TO "NEXT" ROUTINE.
001740  032737  001000  177570  GTRDYB: BIT     #BIT9,SR        ;CHECK SELECT ROUTINE SWITCH
001746  001002                          BNE     GTRDYC          ;BRANCH IF SELECT ROUTINE SWITCH IS SET.
001750  000177  177304          GORUN:  JMP     @CURTST         ;GO RUN CURRENT ROUTINE.
001754  013700  177570          GTRDYC: MOV     SR,R0           ;(SR) TO R0
001760  042700  177600                  BIC     #177600,R0      ;MASK UNDESIRED BITS
001764  123700  001262                  CMPB    RTNNO,R0        ;COMPARE RTNNO TO (R0)
001770  001767                          BEQ     GORUN           ;BR IF ROUTINE FOUND.
001772  022737  177777  001264  GTRDYD: CMP     #-1,NXTST       ;NO. CHECK FOR LAST ROUTINE.
002000  001355                          BNE     GTRDYA          ;BRANCH IF NOT LAST ROUTINE.
002002  104010                          TYPE                    ;TYPE INCORRECT RTN SELECTED.
002004  012664                          CM3
002006  104024                          CHALT                   ;COMMON HALT.
002010  000740                          BR      GETRDY          ;START OVER.
002012  012706  001200          CHAINN: MOV     #SPBOT,R6       ;RESTORE STACK.
002016  005237  001266                  INC     ICNT            ;INCREMENT ITERATION COUNT.
002022  001002                          BNE     CHNAC           ;BR IF RESULT NOT 0.
002024  005137  001266                  COM     ICNT            ;RESULT 0. RESET ICNT TO -1.
002030  032737  040000  177570  CHNAC:  BIT     #BIT14,SR       ;CHECK FOR SCOPE OPTION.
002036  001402                          BEQ     CHNA            ;BRANCH IF SCOPE SW NOT SET.
002040  000177  177226          CHNAB:  JMP     @SCOPTR         ;RETURN TO ROUTINE.
002044  032737  004000  177570  CHNA:   BIT     #BIT11,SR       ;TEST INHIBIT ITERATION SWITCH
002052  001003                          BNE     CHNAA           ;BRANCH IF INHIBIT ITERATION SW SET.
002054  005337  001270                  DEC     ICTR            ;DECREMENT ITERATION COUNT.
002060  001367                          BNE     CHNAB           ;BRANCH IF COUNT NOT 0.
002062  032737  002000  177570  CHNAA:  BIT     #BIT10,SR       ;ROUTINE END HALT SW SET? (SR10)
002070  001403                          BEQ     CHNB            ;BRANCH IF NOT SET.
002072  013700  001262                  MOV     RTNNO,R0        ;TEST # TO R0.
002076  000000                          HALT                    ;ROUTINE END HALT. TEST # IN LIGHTS.
002100  032737  001000  177570  CHNB:   BIT     #BIT9,SR        ;CHECK SELECT ROUTINE SWITCH
002106  001301                          BNE     GETRDY          ;BRANCH IF SELECT RTN SW SET
002110  022737  177777  001264          CMP     #-1,NXTST       ;LAST TEST?
002116  001300                          BNE     GTRDYX          ;BRANCH IF NOT LAST TEST.
002120  104017                          OACNV                   ;CONVERT PROGRAM NUMBER TO ASCII.
002122  001254                          PRGNUM
002124  012631                          APN
002126  000002                          2
002130  104010                          TYPE                    ;TYPE PROGRAM END BELL.
002132  012626                          APGEND
002134  000666                          BR      GETRDY          ;GO REPEAT PROGRAM.
002136  013705  001264          FORWD:  MOV     NXTST,R5        ;ADDR OF NEXT ROUTINE TO R5.
002142  012537  001262                  MOV     (5)+,RTNNO      ;GET NEXT ROUTINE NUMBER.
002146  012537  001264                  MOV     (5)+,NXTST      ;GET ADDR OF NEXT "NEXT" ROUTINE.
002152  012537  001270                  MOV     (5)+,ICTR       ;GET ITERATION COUNT.
002156  012537  001272                  MOV     (5)+,SCOPTR     ;GET SCOPE LOOP ENTRY POINTER.
002162  010537  001260          FORWDA: MOV     R5,CURTST       ;ADDR OF NOW CURRENT TEST TO CURTST.
002166  012737  000001  001266          MOV     #1,ICNT         ;PRESET ICNT TO 1.
002174  000207                          RTS     R7              ;EXIT FORWD SUBROUTINE.
                        ;EMT INTERPRETER ROUTINE.
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002176  010046                  EMTINT: MOV     R0,-(6)          ;PUSH R0.
002200  016600  000002                  MOV     2(6),RC          ;GET EMT PC.
002204  014000                          MOV     -(0),R0          ;GET EMT CALL.
002206  006300                          ASL     R0               ;TIMES 2.
002210  016000  171364                  MOV     EMTTAB-10000(0),R0       ;FORM EMT ROUTINE ADDR.
002214  000200                          RTS     R0               ;GO TO EMT ROUTINE; RESTORE R0.
                                ;SAVE REGS 0 TO 3 SUBROUTINE.
002216  012666  177766          SV03:   MOV     (6)+,-10.(6)     ;MOVE PC UPSTACK.
002222  012666  177766                  MOV     (6)+,-10.(6)     ;MOVE STATUS UPSTACK.
002226  012737  000002  002302          MOV     #RTI,SV05C
002234  000415                          BR      SV05B
                                ;SUB TO SAVE REGS 0 TO 5 AND PLACE EMT PC IN R5.
002236  012737  000240  002302  SV05S:  MOV     #NOP,SV05C
002244  000403                          BR      SV05A
                                ;SUB TO SAVE REGS 0 TO 5.
002246  012737  000002  002302  SV05:   MOV     #RTI,SV05C
002254  012666  177762          SV05A:  MOV     (6)+,-14.(6)     ;MOVE PC AND PSW UPSTACK.
002260  012666  177762                  MOV     (6)+,-14.(6)
002264  010546                          MOV     R5,-(6)
002266  010446                          MOV     R4,-(6)
002270  010346                  SV05B:  MOV     R3,-(6)
002272  010246                          MOV     R2,-(6)
002274  010146                          MOV     R1,-(6)
002276  010046                          MOV     R0,-(6)
002300  024646                          PUSH2
002302  000002                  SV05C:  RTI                      ;RTI OR NOP.
002304  016605  000020                  MOV     16.(6),R5        ;EMT PC TO R5.
002310  010504                          MOV     R5,R4
002312  005744                          TST     -(4)
002314  000002                          RTI                      ;EXIT.
                                ;RESTORE REGS 0 TO 3 SUBROUTINE.
002316  022626                  RS03:   POPSP2
002320  012600                          MOV     (6)+,R0          ;RESTORE REGS 0 TO 4.
002322  012601                          MOV     (6)+,R1
002324  012602                          MOV     (6)+,R2
002326  012603                          MOV     (6)+,R3
002330  016646  177766                  MOV     -10.(6),-(6)     ;MOVE PC AND PSW DOWN STACK.
002334  016646  177766                  MOV     -10.(6),-(6)
002340  000002                          RTI                      ;EXIT.
                                ;SUB TO SET R5 IN EMT PC AND RESTORE REGS 0 TO5.
002342  010566  000020          RS05S:  MOV     R5,16.(6)        ;SET EMT PC TO R5 CONTENTS.
                                ;SUB TO RESTORE REGS 0 TO 5.
002346  022626                  RS05:   POPSP2
002350  012600                          MOV     (6)+,R0
002352  012601                          MOV     (6)+,R1
002354  012602                          MOV     (6)+,R2
002356  012603                          MOV     (6)+,R3
002360  012604                          MOV     (6)+,R4
002362  012605                          MOV     (6)+,R5
002364  016646  177762                  MOV     -14.(6),-(6)     ;MOVE PC AND PSW DOWNSTACK.
002370  016646  177762                  MOV     -14.(6),-(6)
002374  000002                          RTI                      ;EXIT.
002376  012666  177772          SV5S:   MOV     (6)+,-6(6)       ;PC AND PSW UPSTACK.
002402  012666  177772                  MOV     (6)+,-6(6)
002406  010546                          MOV     R5,-(6)          ;SAVE R5.
002410  010446                          MOV     R4,-(6)          ;SAVE R4.
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002412  024646                          PUSH2
002414  016605  000010                  MOV     8.(6),R5        ;EMT PC TO R5.
002420  010504                          MOV     R5,R4           ;EMT PC TO R4.
002422  005744                          TST     -(4)
002424  000002                          RTI                     ;EXIT EMT SUB.
002426  010566  000010          RS5S:   MOV     R5,8.(6)        ;R5 TO EMT PC.
002432  022626                          POPSP2
002434  012604                          MOV     (6)+,R4         ;RESTORE R4.
002436  012605                          MOV     (6)+,R5         ;RESTORE R5.
002440  016646  177772                  MOV     -6(6),-(6)
002444  016646  177772                  MOV     -6(6),-(6)
002450  000002                          RTI                     ;EXIT.
                        ;ROUTINE TO ISSUE RESET  AND ENABLE KEYBOARD INTERRUPTS.
002452  104004          SRSETT: SAV05
002454  012700  052525                  MOV     #52525,R0       ;DATA TO R0.
002460  005100                          COM     R0              ;COMPLEMENT (R0).
002462  010037  002[illegible]          MOV     R0,SRSETT+4     ;(R0) TO SRSETT+4.
002466  000005                          RESET                   ;RESET. R0 IS DISPLAYED.
002470  104005                          RST05
002472  005737  000042                  TST     @#42            ;LOADED FROM DECTAPE?
002476  001403                          BEQ     SRSETA          ;BR IF NOT.
002500  052777  000100  176516          BIS     #BIT6,@TKS      ;ENABLE KEYBOARD INTERRUPTS.
002506  000002          SRSETA: RTI                             ;EXIT.
                        ;KEYBOARD SERVICE ROUTINE.
002510  017727  176512  000000  KBSVC:  MOV     @TKB,#0         ;READ KEYBOARD BUFFER.
002516  042737  000200  002514          BIC     #BIT7,KBSVC+4   ;CLEAR PARITY BIT.
002524  022737  000003  002514          CMP     #3,KBSVC+4      ;IS IT CTRL C?
002532  001401                          BEQ     .+4             ;BR IF YES.
002534  000002                          RTI                     ;NO. EXIT.
002536  013707  000042                  MOV     @#42,PC         ;EXIT TO DECTAPE MONITOR.
                        ;COMMON HALT ROUTINE
002542  104006          CHLT:   SAV05S
002544  010400                          MOV     R4,R0           ;DEVELOP ADDR OF CALLER.
002546  000000                          HALT                    ;HALT CALL ADDR IN DATA LIGTHS.
002550  104007                          RST05S
002552  000002                          RTI                     ;EXIT.
                        ;CONDITIONAL ERROR HALT ROUTINE.
002554  005737  177570          EHLT:   TST     SR              ;CHECK FOR HALT ON ERROR.
002560  100001                          BPL     EHLTA           ;BRANCH IF NO HALT DESIRED.
002562  000000                          HALT                    ;HALT.
002564  000002          EHLTA:  RTI                             ;IN DATA LIGHTS.
002566  012737  000406  002716  ERR:    MOV     #406,ERRNB      ;SET UP FOR SINGLE MESSAGE.
002574  000403                          BR      ERRN+6
002576  012737  000240  002716  ERRN:   MOV     #NOP,ERRNB      ;SET UP FOR MULTIPLE MESSAGES.
002604  010437  001362                  MOV     R4,FPC          ;CONVERT CALL ADDR OF SUB CALLING.
002610  104017                          OACNV
002612  001362                          FPC
002614  015072                          AFPC
002616  000006                          6
002620  000003                          SAV5S                   ;SAVE REG 5S
002622  010537  002714                  MOV     R5,ERRB         ;DETERMINE CALLING ADDR.
002626  162737  000002  002714          SUB     #2,ERRB
002634  104017                          OACNV                   ;CONVERT CALLING ADDR TO ASCII.
002636  002714                          ERRB
002640  015040                          APC
002642  000006                          6
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002644  104017                          OACNV                   ;CONVERT PROGRAM # TO ASCII.
002646  001254                          PRGNUM
002650  015024                          APNUMB
002652  000002                          2
002654  104017                          OACNV                   ;CONVERT TEST # TO ASCII.
002656  001262                          RTNNO
002660  015031                          ATNUMB
002662  000003                          3
002664  104020                          BDCNV                   ;CONVERT ICNT TO DECIMAL ASCII.
002666  001266                          ICNT
002670  015055                          AICNT
002672  000005                          5
002674  012737  015021  002714         MOV     #EM0,ERRB       ;TYPE ERR HEADER MSG IF NOT INHIBITED.
002702  032737  020000  177570 ERRNA:  BIT     #BIT13,SR       ;INHIBIT ERR PRINT?
002710  001002                          BNE     ERRNB           ;BR TO INHIBIT.
002712  104010                          TYPE                    ;TYPE MSG.
002714  000000                 ERRB:    OPEN                    ;DESIRED MSG ADDR GOES HERE.
002716  000000                 ERRNB:   OPEN                    ;NOP OR 406
002720  012537  002714                  MOV     (5)+,ERRB       ;GET ADDR OF NEXT MSG.
002724  022737  177777  002714         CMP     #-1,ERRB        ;TERMINATOR?
002732  001363                          BNE     ERRNA           ;GO TYPE IF NOT TERMINATOR.
002734  104025                 ERRNC:   EHALT                   ;END OF MSGS. HALT IF REQUIRED.
002736  000004                          RST5S                   ;RESTORE REG 5S.
002740  000002                          RTI                     ;EXIT EMT SUB.
                        ;SUBROUTINE TO OUTPUT ASCII MESSAGE ON TELETYPE PRINTER.
002742  104006                 TYP:     SAV05S
002744  012500                          MOV     (5)+,R0         ;ADDRESS OF MESSAGE TO R0.
002746  112001                 TYPA:    MOVB    (0)+,R1         ;GET CHARACTER
002750  122701  000100                  CMPB    #100,R1         ;CHECK FOR'@''CHARACTER
002754  001002                          BNE     TYPC            ;BRANCH IF NOT'@''.
002756  104007                          RST05S
002760  000002                          RTI                     ;TERMINATOR CHAR. DONE. EXIT.
002762  122701  000045         TYPC:    CMPB    #45,R1          ;CHECK FOR'%''.
002766  001411                          BEQ     TYPF            ;BRANCH IF'%''
002770  004737  002776                  JSR     R7,TYPD         ;TYPE CHAR IN R1
002774  000764                          BR      TYPA
002776  110177  176230         TYPD:    MOVB    R1,@TPB         ;OUTPUT CHARACTER TO PRINTER
003002  105777  176222                  TSTB    @TPS            ;WAIT FOR DONE FLAG.
003006  100375                          BPL     .-4
003010  000207                          RTS     R7              ;EXIT
003012  112701  000015         TYPF:    MOVB    #15,R1          ;MOVE CARRIAGE RETURN CODE TO R1
003016  004737  002776                  JSR     R7,TYPD         ;GO TYPE CHAR.
003022  112701  000012         TYPG:    MOVB    #12,R1          ;MOVE LF CODE TO R1.
003026  004737  002776                  JSR     R7,TYPD         ;GO TYPE CHAR.
003032  000745                          BR      TYPA
                        ;SUBROUTINE TO OUTPUT A SERIES OF ASCII MESSAGES ON TELETYPE PRINTER
003034  000003                 TYPS:    SAV5S
003036  012537  003060                  MOV     (5)+,TYPSB      ;ADDR OF MESSAGE TO TYPSB.
003042  022737  177777  003060         CMP     #-1,TYPSB       ;CHECK FOR TERMINATOR
003050  001002                          BNE     TYPSA           ;BRANCH IF NOT TERMINATOR.
003052  000004                          RST5S
003054  000002                          RTI                     ;TERMINATOR, EXIT
003056  104010                 TYPSA:   TYPE                    ;CALL ON TYP SUB TO TYPE MESSAGE
003060  000000                 TYPSB:   OPEN                    ;ADDRESS OF MESSAGE GOES HERE
003062  000765                          BR      TYPS+2          ;GO PROCESS NEXT MESSAGE
                        ;SUBROUTINE TO DELAY A SPECIFIED NUMBER OF MILLISECONDS
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003064  011637  003124          DLYN:   MOV     (6),DLCNT       ;GET EMT PC.
003070  062716  000002                  ADD     #2,(6)          ;SET UP EXIT PC.
003074  104002                          SAV03                   ;SAVE REGS
003076  017700  000022                  MOV     @DLCNT,R0       ;DELAY COUNT TO R0.
003102  001406                          BEQ     DLYCN           ;BR IF 0.
003104  012701  000303          DLYAN:  MOV     #303,R1         ;1 MSEC COUNT TO R1.
003110  005301                  DLYBN:  DEC     R1              ;DECREMENT 1 MSEC COUNT.
003112  001376                          BNE     DLYBN           ;BR IF NOT 0.
003114  005300                          DEC     R0              ;DECREMENT DELAY COUNT.
003116  001372                          BNE     DLYAN           ;BR IF NOT DONE DELAYING.
003120  104003                  DLYCN:  RST03
003122  000002                          RTI                     ;EXIT.
003124  000000                  DLCNT:  OPEN
003126  000000                  DLCTR:  OPEN
                                ;SUBROUTINE TO INITIALIZE BINARY COUNT PATTERNS
003130  012737  177777  003176  INBINN: MOV     #-1,RIND        ;SET ALL VARIABLES
003136  013737  003176  003200          MOV     RIND,PIND
003144  013737  003176  003202          MOV     RIND,PT0
003152  013737  003176  003204          MOV     RIND,PT1
003160  013737  003176  003206          MOV     RIND,RT0
003166  013737  003176  003210          MOV     RIND,RT1
003174  000002                          RTI                     ;EXIT.
003176  000000                  RIND:   OPEN
003200  000000                  PIND:   OPEN
003202  000000                  PT0:    OPEN
003204  000000                  PT1:    OPEN
003206  000000                  RT0:    OPEN
003210  000000                  RT1:    OPEN
003212  000000                  BINR:   OPEN
003214  000000                  BINP:   OPEN
                                ;SPECIAL BINARY COUNT PATTERN SUBROUTINE (PUNCH)
003216  013737  003202  003204  GTBINP: MOV     PT0,PT1         ;PREVIOUS BIN CHAR TO PT1
003224  005137  003204                  COM     PT1
003230  005137  003200                  COM     PIND
003234  001002                          BNE     .+6
003236  005237  003204                  INC     PT1
003242  043737  001346  003204          BIC     PCHMSK,PT1
003250  013737  003204  003202          MOV     PT1,PT0         ;SAVE BIN CHAR IN PT0
003256  013737  003204  003214          MOV     PT1,BINP        ;BIN CHAR TO BINP.
003264  013737  003204  001332          MOV     PT1,PCHOUT
003272  000002                          RTI                     ;EXIT.
                                ;SPECIAL BINARY COUNT PATTERN SUBROUTINE (READER)
003274  013737  003206  003210  GTBINR: MOV     RT0,RT1         ;PREVIOUS BIN CHAR TO RT1.
003302  005137  003210                  COM     RT1
003306  005137  003176                  COM     RIND
003312  001002                          BNE     .+6
003314  005237  003210                  INC     RT1
003320  043737  001350  003210          BIC     RDRMSK,RT1
003326  013737  003210  003206          MOV     RT1,RT0         ;SAVE BIN CHAR IN RT0.
003334  013737  003210  003212          MOV     RT1,BINR        ;BIN CHAR TO BINR.
003342  000002                          RTI                     ;EXIT.
                                ;EMT SUB TO CONVERT OCTAL TO ASCII.
003344  104006                  OACNVV: SAV05S                  ;SAVE REGS.
003346  013500                          MOV     @(5)+,R0        ;GET OCTAL VALUE.
003350  012501                          MOV     (5)+,R1         ;GET DESTINATION ADDR.
003352  012502                          MOV     (5)+,R2         ;GET CONVERT COUNT.
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003354  060201                          ADD     R2,R1           ;DEVELOP ADDR TO STORE 1ST CHAR.
003356  010003                  OACNVA: MOV     R0,R3
003360  042703  177770                  BIC     #177770,R3      ;ISOLATE LEAST SIGNIFICANT DIGIT.
003364  062703  000060                  ADD     #60,R3          ;CONVERT DIGIT TO ASCII.
003370  110341                          MOVB    R3,-(1)         ;STORE ASCII CHARACTER.
003372  042700  000007                  BIC     #7,R0
003376  006000                          ROR     R0
003400  006000                          ROR     R0
003402  006000                          ROR     R0
003404  005302                          DEC     R2              ;DONE ALL DIGITS?
003406  001363                          BNE     OACNVA          ;BRANCH IF NOT DONE.
003410  104007                          RST05S                  ;RESTORE REGS.
003412  000002                          RTI                     ;DONE. EXIT.
                        ;EMT SUB TO MOVE VARIABLE NUMBER OF BYTES.
003414  104006                  BMOVV:  SAV05S                  ;SAVE REGS.
003416  012501                          MOV     (5)+,R1         ;GET 'FROM' ADDRESS
003420  012502                          MOV     (5)+,R2         ;GET 'TO' ADDRESS
003422  012503                          MOV     (5)+,R3         ;GET COUNT
003424  112122                  BMOVA:  MOVB    (1)+,(2)+       ;MOVE BYTE
003426  005303                          DEC     R3              ;DECREMENT COUNT
003430  001375                          BNE     BMOVA           ;BRANCH IF NOT DONE.
003432  104007                          RST05S                  ;RESTORE REGS.
003434  000002                          RTI                     ;DONE. EXIT.
                        ;EMT SUB TO CONVERT BINARY TO DECIMAL ASCII.
003436  104006                  BDCNVV: SAV05S                  ;SAVE REGS.
003440  012700  003612                  MOV     #DECVAL,R0      ;SET UP ADDR TO STORE DECIMAL ASCII IN R0
003444  013501                          MOV     @(5)+,R1        ;BINARY VALUE TO R1.
003446  012537  003522                  MOV     (5)+,BDCNVC     ;DESTINATION ADDR TO BDCNVC.
003452  012537  003524                  MOV     (5)+,BDCNVD     ;CHAR COUNT TO BDCNVD.
003456  012702  003600                  MOV     #ADTENP,R2      ;ADDR OF TEN POWER STRING TO R2.
003462  012737  000005  003572          MOV     #5,CNVCTR       ;SET UP FOR 5 POWER CONVERSIONS.
003470  012237  003576          BDCNVA: MOV     (2)+,TENPWR     ;MOVE POWER OF TEN VALUE TO TENPWR.
003474  004737  003532                  JSR     R7,SUBTEN       ;PERFORM CONVERSION
003500  005337  003572                  DEC     CNVCTR          ;DONE 5 CONVERSIONS?
003504  001371                          BNE     BDCNVA          ;BRANCH IF NOT YET 5.
003506  163700  003524                  SUB     BDCNVD,R0
003512  010037  003520                  MOV     R0,BDCNVB
003516  104023                          BMOVE
003520  000000                  BDCNVB: OPEN
003522  000000                  BDCNVC: OPEN
003524  000000                  BDCNVD: OPEN
003526  104007                          RST05S                  ;RESTORE REGS.
003530  000002                          RTI                     ;YES. EXIT.
003532  005037  003574          SUBTEN: CLR     DIGIT           ;CLEAR DIGIT
003536  163701  003576          SUBTNA: SUB     TENPWR,R1       ;SUBTRACT TEN POWER FROM BINARY VALUE.
003542  103403                          BCS     SUBTNB          ;BRANCH IF UNSUCCESSFUL SUBTRACTION.
003544  005237  003574                  INC     DIGIT
003550  000772                          BR      SUBTNA
003552  063701  003576          SUBTNB: ADD     TENPWR,R1       ;RESTORE SUBTRACTED VALUE.
003556  062737  000060  003574          ADD     #60,DIGIT       ;CONVERT (DIGIT) TO ASCII
003564  113720  003574                  MOVB    DIGIT,(0)+      ;MOVE ASCII CHAR TO DECVAL FIELD.
003570  000207                          RTS     R7              ;EXIT.
003572  000000                  CNVCTR: OPEN
003574  000000                  DIGIT:  OPEN
003576  000000                  TENPWR: OPEN
003600  023420                  ADTENP: 10000.
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003602  001750                          1000.
003604  000144                          100.
003606  000012                          10.
003610  000001                          1
003612    040     040     040   DECVAL: .BYTE   040,040,040,040,040,040
003615    040     040     040
                                ;EMT RANDOM NUMBER GENERATOR. NUMBER IS STORED AT LOC AFTER SUB CALL.
003620  104006                  RNGEN:  SAV05S
003622  013700  003672                  MOV     RP1,R0
003626  006100                          ROL     R0
003630  006100                          ROL     R0
003632  063700  003674                  ADD     RP2,R0
003636  010037  003672                  MOV     R0,RP1
003642  006100                          ROL     R0
003644  006100                          ROL     R0
003646  063700  003674                  ADD     RP2,R0
003652  006100                          ROL     R0
003654  006100                          ROL     R0
003656  010037  003674                  MOV     R0,RP2
003662  013725  003672                  MOV     RP1,(5)+        ;STORE # AT LOC AFTER SUB CALL.
003666  104007                          RST05S
003670  000002                          RTI                     ;EXIT.
003672  001233                  RP1:    1233
003674  007622                  RP2:    7622
                                ;EMT SUB TO INITIALIZE RANDOM NUMBER GENERATOR.
003676  012737  001233  003672 INRNDN: MOV     #1233,RP1
003704  012737  007622  003674         MOV     #7622,RP2
003712  000002                          RTI                     ;EXIT.
                                ;ROUTINE TO FETCH A CHARACTER
003714  105277  175260          AREAD:  INCB    @PRS            ;READER ENABLE.
003720  104031                          DELAY                   ;WAIT 12 MSECS FOR READER DONE.
003722  000014                          12.
003724  105777  175250                  TSTB    @PRS            ;DONE SET?
003730  100411                          BMI     ARDB            ;BR IF YES.
003732  104031                          DELAY                   ;WAIT ADDT'L 18 MSECS.
003734  000022                          18.
003736  105777  175236                  TSTB    @PRS            ;READER DONE NOW?
003742  100404                          BMI     ARDB            ;BR IF YES.
003744  104016                          ERRORN                  ;ERROR. NO READER RESPONSE.
003746  015377                          EM7
003750  177777                          -1
003752  000760                          BR      AREAD           ;TRY AGAIN.
003754  005777  175220          ARDB:   TST     @PRS            ;ERROR BIT SET?
003760  100401                          BMI     ARDC            ;BR IF YES.
003762  000207                          RTS     %7              ;NO. EXIT.
003764  004737  003772          ARDC:   JSR     %7,TSM2         ;TYPE READER ERROR MESSAGE.
003770  000751                          BR      AREAD           ;TRY AGAIN.
003772  104016                  TSM2:   ERRORN                  ;TYPE READER ERROR MESSAGE.
003774  014635                          SM1
003776  013243                          IM6
004000  177777                          -1
004002  000207                          RTS     %7              ;EXIT
                                ;ROUTINE TO SET READER INTERRUPT VECTOR AND PRIORITY
004004  017637  000000  004024 STPTRV: MOV     @(6),STPRA+2    ;MOVE VECTOR ADDR TO STPRA+2
004012  062716  000002                  ADD     #2,@%6          ;SET UP EXIT
004016  013701  001210                  MOV     RDRVTR,%1
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004022  012721  000000          STPRA:  MOV     #OPEN,(1)+      ;SET VECTOR ADDRESS
004026  013721  001212                  MOV     RDRLVL,(1)+     ;SET PRIORITY
004032  000002                          RTI                     ;EXIT
                                ;ROUTINE TO SET PUNCH INTERRUPT VECTOR AND PRIORITY.
004034  017637  000000  004054  STPTPV: MOV     @(6),STPPA+2    ;MOVE VECTOR ADDR TO STPPA+2
004042  062716  000002                  ADD     #2,@%6          ;SET UP EXIT
004046  013701  001214                  MOV     PCHVTR,%1
004052  012721  000000          STPPA:  MOV     #OPEN,(1)+      ;SET VECTOR ADDRESS.
004056  013721  001216                  MOV     PCHLVL,(1)+     ;SET PRIORITY
004062  000002                          RTI                     ;EXIT.
                                ;SUBROUTINE TO READ CHARACTER FROM READER USING INTERRUPT.
004064  104013                  BREAD:  STRDRV                  ;SET READER VECTOR
004066  004146                          BREADB                  ;TO BREADB
004070  052777  000101  175102          BIS     #101,@PRS       ;ENABLE PTR AND PTRI.
004076  005037  177776                  CLR     PSW             ;SET UP PRTY0.
004102  012737  072460  004210          MOV     #30000.,BRCTR   ;DELAY APPROX. 150 MSECS.
004110  005337  004210                  DEC     BRCTR
004114  001375                          BNE     .-4
004116  005077  175056                  CLR     @PRS            ;CLEAR PTRI ENABLE.
004122  104016                          ERRORN                  ;TYPE NO PTR RESPONSE
004124  015377                          EM7                     ;MESSAGE
004126  177777                          -1
004130  000755                          BR      BREAD           ;TRY AGAIN.
004132  005077  175042          BREADA: CLR     @PRS            ;CLEAR READER CSR.
004136  017737  175040  001334          MOV     @PRB,CRBUF      ;CHAR READ TO CRBUF.
004144  000207                          RTS     %7              ;EXIT SUBROUTINE.
004146  022626                  BREADB: POPSP2                  ;RESTORE STACK.
004150  012737  000340  177776          MOV     #PRTY7,PSW      ;SET UP PRTY7.
004156  005777  175016                  TST     @PRS            ;TEST FOR ERROR.
004162  100003                          BPL     BREADC          ;BRANCH IF NO ERROR.
004164  004737  003772                  JSR     PC,TSM2         ;
004170  000735                          BR      BREAD           ;
004172  105777  175002          BREADC: TSTB    @PRS            ;TEST FOR DONE BIT.
004176  100755                          BMI     BREADA          ;BRANCH IF DONE BIT SET.
004200  104016                          ERRORN                  ;ERROR.FALSE READER INTERRUPT.
004202  015421                          EM10
004204  177777                          -1
004206  000726                          BR      BREAD
004210  000000                  BRCTR:  OPEN
                                ;SUBROUTINE TO STALL A RANDOM NUMBER OF MILLISECONDS. MAXIMUM STALL
                                ;DETERMINED BY CONTENTS OF LOC STLMSK.
004212  104021                  STAL:   RNDNUM                  ;GET RANDOM NUMBER.
004214  000000                  STLA:   OPEN                    ;NUMBER GOES HERE.
004216  043737  004242  004214          BIC     STLMSK,STLA     ;APPLY STALL MASK.
004224  001405                          BEQ     STALB           ;BRANCH IF RESULT IS 0.
004226  013737  004214  004236          MOV     STLA,STALA
004234  104031                          DELAY                   ;DELAY
004236  000000                  STALA:  OPEN                    ;DELAY COUNT
004240  000002                  STALB:  RTI                     ;DONE. EXIT.
004242  000000                  STLMSK: OPEN                    ;STALL MASK.
                                ;SUBROUTINE TO GENERATE RANDOM CHARACTER COUNT (1-77)
004244  104021                  GRCNT:  RNDNUM                  ;GET RANDOM NUMBER.
004246  000000                  GRCNTA: OPEN                    ;NUMBER GOES HERE.
004250  043737  004270  004246          BIC     RCMSK,GRCNTA    ;APPLY MASK.
004256  001772                          BEQ     GRCNT           ;TRY AGAIN IF RESULT 0
004260  013737  004246  004272          MOV     GRCNTA,RNCNT    ;COUNT TO RNCNT
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004266  000207                          RTS     %7              ;EXIT.
004270  000000                  RCMSK:  OPEN                    ;RANDOM CHARACTER MASK.
004272  000000                  RNCNT:  OPEN                    ;RANDOM CHARACTER COUNT.
                                ;SUB TO COMPARE DATA READ FROM READER AGAINST EXPECTED DATA AND REPORT ERRORS.
004274  104027                  BCHECK: GETBNR                  ;GET BIN CHARACTER
004276  023737  003212  001334          CMP     BINR,CRBUF      ;COMPARE BINR TO DATA IN CRBUF
004304  001001                          BNE     .+4             ;BRANCH IF NOT SAME(ERROR).
004306  000207                          RTS     %7              ;OK.EXIT.
004310  104017                          OACNV
004312  003212                          BINR
004314  015126                          ASB
004316  000004                          4
004320  104017                          OACNV
004322  001334                          CRBUF
004324  015141                          AWAS
004326  000004                          4
004330  104016                          ERRORN
004332  015103                          EM1
004334  177777                          -1
004336  005337  001344                  DEC     ERCTR           ;DECREMENT ERROR COUNTER
004342  001002                          BNE     .+6             ;BRANCH IF NO THIRD ERROR
004344  004737  004352                  JSR     %7,BSYNC        ;RESYNC THE READER.
004350  000207                          RTS     %7              ;EXIT.
                                ;SUBROUTINE TO SYNC THE READER TO A SPECIAL BINARY COUNT PATTERN TEST TAPE.
004352  104026                  BSYNC:  INBIN                   ;INITIALIZE BINARY PATTERN
004354  004737  004064                  JSR     %7,BREAD        ;READ CHAR.
004360  004737  004064                  JSR     %7,BREAD        ;READ CHAR.
004364  004737  004064                  JSR     %7,BREAD        ;READ CHAR AND STORE AT CHR1
004370  013737  001334  001336          MOV     CRBUF,CHR1
004376  004737  004064                  JSR     %7,BREAD        ;READ CHAR AND STORE AT CHR2
004402  013737  001334  001340          MOV     CRBUF,CHR2
004410  004737  004064                  JSR     %7,BREAD        ;READ CHAR AND STORE AT CHR3.
004414  013737  001334  001342          MOV     CRBUF,CHR3
004422  004737  004440                  JSR     %7,SYNCA        ;GO SYNC
004426  000751                          BR      BSYNC           ;NO SYNC. TRY AGAIN.
004430  012737  000003  001344          MOV     #3,ERCTR
004436  000207                          RTS     %7              ;SUCCESS.EXIT.
004440  104004                  SYNCA:  SAV05
004442  012700  001000                  MOV     #512.,R0        ;SET UP FOR 512 TRIES.
004446  104027                  SYNCB:  GETBNR                  ;GET BIN CHAR.
004450  013701  003212                  MOV     BINR,R1         ;STORE AT R1.
004454  104027                          GETBNR                  ;GET BIN CHAR.
004456  013702  003212                  MOV     BINR,R2         ;STORE AT R2.
004462  104027                          GETBNR                  ;GET BIN CHAR.
004464  013703  003212                  MOV     BINR,R3         ;STORE AT R3.
004470  020137  001336                  CMP     R1,CHR1         ;MATCH ON 1ST WORD?
004474  001012                          BNE     SYNCC           ;BR IF NOT.
004476  020237  001340                  CMP     R2,CHR2         ;MATCH ON 2ND WORD?
004502  001007                          BNE     SYNCC           ;BR IF NOT.
004504  020337  001342                  CMP     R3,CHR3         ;MATCH ON 3RD WORD?
004510  001004                          BNE     SYNCC           ;BR IF NOT.
004512  104005                          RST05
004514  062716  000002                  ADD     #2,(6)          ;SET UP SINCED EXIT.
004520  000207                          RTS     PC              ;EXIT.
004522  005300                  SYNCC:  DEC     R0              ;TRIED 512 TIMES?
004524  001350                          BNE     SYNCB           ;BR IF NOT.
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004526  104016                          ERRORN                  ;YES. SYNC ERROR.
004530  015220                          EM3
004532  177777                          -1
004534  104005                          RST05
004536  000207                          RTS     PC              ;SYNC ERROR EXIT.
                                ;SUBROUTINE TO CHECK FOR PUNCH READY.
004540  005777  174440          CPRDY:  TST     @PPS            ;TEST FOR ERROR BIT.
004544  100404                          BMI     CPRDYA          ;BRANCH IF ERROR BIT SET.
004546  105777  174432                  TSTB    @PPS            ;TEST FOR READY BIT.
004552  100001                          BPL     CPRDYA          ;BRANCH IF READY NOT SET.
004554  000207                          RTS     %7              ;OK. EXIT.
004556  104011                  CPRDYA: TYPES                   ;TYPE NOT READY MESSAGE.
004560  014707                          SM3
004562  013314                          IM16
004564  177777                          -1
004566  104024                          CHALT
004570  000763                          BR      CPRDY
                                ;SUBROUTINE TO PUNCH CHARACTER IN LOC PCHOUT.
004572  004737  004540          HSPCH:  JSR     %7,CPRDY        ;GO CHECK FOR PUNCH READY.
004576  043737  001346  001332          BIC     PCHMSK,PCHOUT
004604  013777  001332  174374          MOV     PCHOUT,@PPB     ;LOAD PUNCH BUFFER.
004612  105777  174366                  TSTB    @PPS            ;WAIT FOR DONE.
004616  100375                          BPL     .-4
004620  000207                          RTS     %7              ;DONE. EXIT.
                                ;SUBROUTINE TO SELECT PUNCH TO BE TESTED/USED.
004622  104011                  PCHSEL: TYPES                   ;TYPE SELECT PUNCH MESSAGE.
004624  015547                          SPCHM
004626  014041                          IM23
004630  177777                          -1
004632  104024                          CHALT                   ;WAIT FOR USER.
004634  123737  177570  001250          CMPB    SR,PCHLIM       ;VALID PUNCH NUMBER?
004642  103403                          BLO     PCHSLA          ;BR IF YES.
004644  104010                          TYPE                    ;NO. TYPE MESSAGE, AND
004646  015616                          INVRP
004650  000764                          BR      PCHSEL          ;GO TRY AGAIN.
004652  013737  177570  001204  PCHSLA: MOV     SR,PPS          ;DEVELOP PCH CSR ADDR.
004660  006337  001204                  ASL     PPS
004664  006337  001204                  ASL     PPS
004670  063737  001222  001204          ADD     FSTPCH,PPS
004676  013737  001204  001206          MOV     PPS,PPB         ;DEVELOP PCH BUFFER ADDR.
004704  062737  000002  001206          ADD     #2,PPB
004712  013737  001246  001214          MOV     RDRLIM,PCHVTR   ;DEVELOP PCH VECTOR ADDR.
004720  005237  001214                  INC     PCHVTR          ;IF RDRLIM WAS ODD INCR TO MAKE IT EVEN.
004724  006037  001214                  ROR     PCHVTR
004730  006337  001214                  ASL     PCHVTR
004734  063737  177570  001214          ADD     SR,PCHVTR
004742  006337  001214                  ASL     PCHVTR
004746  006337  001214                  ASL     PCHVTR
004752  063737  001244  001214          ADD     FSTVCT,PCHVTR
004760  012737  177400  001346          MOV     #177400,PCHMSK  ;SET UP PUNCH MASK FOR 8 LEVEL.
004766  005737  177570                  TST     SR              ;8 LEVEL PUNCH?
004772  100003                          BPL     PCHSLB          ;BR IF YES.
004774  012737  177700  001346          MOV     #177700,PCHMSK  ;NO. SET UP 6 LEVEL MASK.
005002  104017                  PCHSLB: OACNV                   ;CONVERT SELECTED PCH NUMBER TO ASCII.
005004  177570                          SR
005006  015670                          APCHID
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005010  000002                          2
005012  104010                          TYPE                    ;TYPE PCH SELECTED MESSAGE.
005014  015663                          PCHIDM
005016  000207                          RTS     PC              ;EXIT.
                                ;SUBROUTINE TO SELECT READER TO BE TESTED/USED.
005020  104011                  RDRSEL: TYPES                   ;TYPE SELECT READER MESSAGE.
005022  015500                          SRDRM
005024  014041                          IM23
005026  177777                          -1
005030  104024                          CHALT                   ;WAIT FOR USER.
005032  123737  177570  001246          CMPB    SR,RDRLIM       ;VALID READER?
005040  103403                          BLO     RDRSLA  ;BR IF YES.
005042  104010                          TYPE                    ;NO. TYPE MESSAGE AND TRY AGAIN.
005044  015616                          INVRP
005046  000764                          BR      RDRSEL
005050  013737  177570  001200  RDRSLA: MOV     SR,PRS          ;DEVELOP RDR CSR ADDR.
005056  006337  001200                  ASL     PRS
005062  006337  001200                  ASL     PRS
005066  063737  001220  001200          ADD     FSTRDR,PRS
005074  013737  001200  001202          MOV     PRS,PRB         ;DEVELOP READER BUFFER ADDR.
005102  062737  000002  001202          ADD     #2,PRB
005110  013737  177570  001210          MOV     SR,RDRVTR       ;DEVELOP RDR VECTOR ADDR.
005116  006337  001210                  ASL     RDRVTR
005122  006337  001210                  ASL     RDRVTR
005126  063737  001244  001210          ADD     FSTVCT,RDRVTR
005134  012737  177400  001350          MOV     #177400,RDRMSK  ;SET UP 8LEVEL READER MASK.
005142  005737  177570                  TST     SR              ;8 LEVEL READER?
005146  100003                          BPL     RDRSLB          ;BR IF YES.
005150  012737  177700  001350          MOV     #177700,RDRMSK  ;NO. SET UP 6 LEVEL MASK.
005156  104017                  RDRSLB: OACNV                   ;CONVERT SELECTED RDR NUMBER TO ASCII.
005160  177570                          SR
005162  015646                          ARDRID
005164  000002                          2
005166  104010                          TYPE                    ;TYPE RDR SELECTED MESSAGE.
005170  015641                          RDRIDM
005172  000207                          RTS     PC              ;EXIT.
005174  005037  001266          CLNUP:  CLR     ICNT            ;CLEAR ITERATION COUNT.
005200  005037  001262                  CLR     RTNNO           ;CLEAR CURRENT ROUTINE NUMBER.
005204  012737  000003  001344          MOV     #3,ERCTR        ;SET ERROR COUNT TO 3.
005212  012701  000300                  MOV     #300,R1         ;CLEAR INTERRUPT VECTORS.
005216  012702  000302                  MOV     #302,R2
005222  010221                  CLNUPA: MOV     R2,(1)+
005224  005021                          CLR     (1)+
005226  020237  001000                  CMP     R2,1000
005232  001403                          BEQ     CLNUPB
005234  062702  000004                  ADD     #4,R2
005240  000770                          BR      CLNUPA
005242  000207                  CLNUPB: RTS     PC              ;EXIT.
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                                ;PRG0 - READER TESTS
            177777                      X=-1
            000000                      Y=0
005244  012737  005266  001256  PRG0:   MOV     #POT0,KSTART    ;ADDR OF 1ST ROUTINE TO KSTART.
005252  104010                          TYPE                    ;TYPE TITLE.
005254  013267                          TITL0
005256  004737  005020                  JSR     PC,RDRSEL       ;SELECT READER.
005262  000137  001700                  JMP     SRSET           ;GO GET STARTED.
005266                                  TSTA    P0A,1000.
005266                                  TSTAA   P0A,1000.,\X+1,\X+2,\Y
                                ;*************************************************************************
005266  000000                  POT0:   0                       ; PRG0 ROUTINE 0                        *
005270  005316                          POT1                    ;ADDRESS OF NEXT ROUTINE                *
005272  001750                          1000.                   ;TEST ITERATION COUNT                   *
005274  005304                          P0AA                    ;SCOPE ENTRY POINT                      *
            000000                      X=X+1
                                ;*************************************************************************
                                ;TEST ABILITY TO REFERENCE THE READER STATUS WORD
005276  012737  005312  000004          MOV     #P0AE,MACHER    ;SET UP MACHINE ERROR TRAP.
005304  005777  173670          P0AA:   TST     @PRS            ;REFERENCE READER STATUS WORD.
005310  104000                          SCOPE                   ;SCOPE
005312  104015                  P0AE:   ERROR                   ;ERROR. TRAPPED WHEN REFERENCING READER
005314  104000                          SCOPE                   ;STATUS WORD (PRS).
005316                                  TSTA    P0B,1000.
005316                                  TSTAA   P0B,1000.,\X+1,\X+2,\Y
                                ;*************************************************************************
005316  000001                  POT1:   1                       ; PRG0 ROUTINE 1                        *
005320  005346                          POT2                    ;ADDRESS OF NEXT ROUTINE                *
005322  001750                          1000.                   ;TEST ITERATION COUNT                   *
005324  005334                          P0BA                    ;SCOPE ENTRY POINT                      *
            000001                      X=X+1
                                ;*************************************************************************
                                ;TEST ABILITY TO REFERENCE THE READER BUFFER.
005326  012737  005342  000004          MOV     #P0BB,MACHER    ;SET UP MACHINE ERROR TRAP.
005334  005777  173642          P0BA:   TST     @PRB            ;REFERENCE READER BUFFER
005340  104000                          SCOPE                   ;SCOPE
005342  104015                  P0BB:   ERROR                   ;ERROR. TRAPPED WHEN REFERENCING
005344  104000                          SCOPE                   ;READER BUFFER. (PRB)
005346                                  TSTA    P0D,1000.
005346                                  TSTAA   P0D,1000.,\X+1,\X+2,\Y
                                ;*************************************************************************
005346  000002                  POT2:   2                       ; PRG0 ROUTINE 2                        *
005350  005422                          POT3                    ;ADDRESS OF NEXT ROUTINE                *
005352  001750                          1000.                   ;TEST ITERATION COUNT                   *
005354  005356                          P0DA                    ;SCOPE ENTRY POINT                      *
            000002                      X=X+1
                                ;*************************************************************************
                                ;TEST ABILITY TO SET AND CLEAR THE ID BIT (INTERRUPT ENABLE (BIT 6))
                                ;IN READER STATUS WORD
005356  052777  000100  173614  P0DA:   BIS     #BIT6,@PRS      ;SET ID BIT (BIT 6) IN READER PRS
005364  032777  000100  173606          BIT     #BIT6,@PRS      ;CHECK ID BIT IN PRS
005372  001002                          BNE     P0DB            ;ID BIT SET?
005374  104015                          ERROR                   ;NO. ERROR. FAILED TO SET ID BIT (BIT 6)
                                                                ;IN PRS.
005376  104000                          SCOPE
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005400  042777  000100  173572  P0DB:   BIC     #BIT6,@PRS      ;CLEAR ID BIT IN PRS.
005406  032777  000100  173564          BIT     #BIT6,@PRS      ;CHECK ID BIT IN PRS
005414  001401                          BEQ     .+4             ;BRANCH IF BIT CLEAR.
005416  104015                          ERROR                   ;ERROR. ID BIT IN PRS FAILED TO CLEAR.
005420  104000                          SCOPE
005422                                  TSTA    P0E,100.
005422                                  TSTAA   P0E,100.,\X+1,\X+2,\Y
                        ;*****************************************************************************
005422  000003          P0T3:   3                               ; PRG0 ROUTINE 3                        *
005424  005456                  P0T4                            ;ADDRESS OF NEXT ROUTINE                *
005426  000144                  100.                            ;TEST ITERATION COUNT                   *
005430  005432                  P0EA                            ;SCOPE ENTRY POINT                      *
        000003                  X=X+1
                        ;*****************************************************************************
                        ;TEST ABILITY TO CLEAR ID BIT (BIT 6) WITH RESET INSTRUCTION
005432  052777  000100  173540  P0EA:   BIS     #BIT6,@PRS      ;SET ID BIT IN PRS
005440  104001                          SRESET                  ;RESET
005442  032777  000100  173530          BIT     #BIT6,@PRS      ;TEST ID BIT
005450  001401                          BEQ     .+4             ;BRANCH IF ID BIT IS CLEAR.
005452  104015                          ERROR                   ;ERROR. RESET INSTRUCTION FAILED TO
005454  104000                          SCOPE                   ;CLEAR ID BIT IN READER PRS.
005456                                  TSTA    P0F,100.
005456                                  TSTAA   P0F,100.,\X+1,\X+2,\Y
                        ;*****************************************************************************
005456  000004          P0T4:   4                               ; PRG0 ROUTINE 4                        *
005460  005510                  P0T5                            ;ADDRESS OF NEXT ROUTINE                *
005462  000144                  100.                            ;TEST ITERATION COUNT                   *
005464  005466                  P0FA                            ;SCOPE ENTRY POINT                      *
        000004                  X=X+1
                        ;*****************************************************************************
                        ;TEST THAT DONE BIT (BIT 7 OF PRS) IS SET NO LATER THAN 100 MSECS AFTER RDR ENB.
005466  005277  173506  P0FA:   INC     @PRS                    ;ENABLE READER
005472  104031                  DELAY                           ;WAIT APPROX 100 MILLISECS.
005474  000144                  100.
005476  105777  173476          TSTB    @PRS                    ;TEST FOR DONE (BIT 7)
005502  100401                  BMI     P0FB                    ;BRANCH IF DONE BIT WAS SET..
005504  104015                  ERROR                           ;ERROR, 100 MSECS AFTER READER
                                                                ;ENABLE, DONE BIT WAS NOT SET.
005506  104000          P0FB:   SCOPE                           ;SCOPE
005510                          TSTA    P0G,1000.
005510                          TSTAA   P0G,1000.,\X+1,\X+2,\Y
                        ;*****************************************************************************
005510  000005          P0T5:   5                               ; PRG0 ROUTINE 5                        *
005512  005542                  P0T6                            ;ADDRESS OF NEXT ROUTINE                *
005514  001750                  1000.                           ;TEST ITERATION COUNT                   *
005516  005520                  P0GA                            ;SCOPE ENTRY POINT                      *
        000005                  X=X+1
                        ;*****************************************************************************
                        ;TEST ABILITY TO READ DONE BIT (BIT 7 OF PRS) RELIABLY
005520  005277  173454  P0GA:   INC     @PRS                    ;ENABLE READER
005524  104031                  DELAY                           ;WAIT APPROX 100 MILLISECS
005526  000144                  100.
005530  105777  173444          TSTB    @PRS                    ;TEST DONE BIT (BIT 7 OF PRS)
005534  100401                  BMI     .+4                     ;BRANCH IF DONE BIT  SET
005536  104015                  ERROR                           ;ERROR. DONE BIT NOT SET, OR FAILED
005540  104000                  SCOPE                           ;TO READ IT.
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005542                          TSTA    POH,100.
005542                          TSTAA   POH,10C.,\X+1,\X+2,\Y
                        ;*******************************************************************************
005542  000006          POT6:   6                       ; PRG0 ROUTINE 6                            *
005544  005612                  POT7                    ;ADDRESS OF NEXT ROUTINE                    *
005546  000144                  100.                    ;TEST ITERATION COUNT                       *
005550  005552                  POHA                    ;SCOPE ENTRY POINT                          *
        000006                  X=X+1
                        ;*******************************************************************************
                        ;TEST THAT RESET COMMAND CLEARS DONE BIT (BIT 7 OF PRS)
005552  005277  173422  POHA:   INC     @PRS            ;ENABLE READER
005556  104031                  DELAY                   ;DELAY APPROX 50 MILLISECONDS
005560  000062                  50.
005562  105777  173412          TSTB    @PRS            ;TEST FOR DONE BIT
005566  100005                  BPL     POHB            ;BRANCH IF DONE BIT NOT SET
005570  000005                  RESET                   ;RESET
005572  105777  173402          TSTB    @PRS            ;TEST DONE BIT
005576  100403                  BMI     POHC            ;BRANCH IF DONE BIT STILL SET.
005600  104000                  SCOPE                   ;SCOPE
005602  104015          POHB:   ERROR                   ;ERROR 1. DONE BIT NOT SET.
005604  104000                  SCOPE
005606  104015          POHC:   ERROR                   ;ERROR 2. DONE BIT NOT RESET BY
005610  104000                  SCOPE                   ;RESET INSTRUCTION.
005612                          TSTA    POI,100.
005612                          TSTAA   POI,100.,\X+1,\X+2,\Y
                        ;*******************************************************************************
005612  000007          POT7:   7                       ; PRG0 ROUTINE 7                            *
005614  005654                  POT10                   ;ADDRESS OF NEXT ROUTINE                    *
005616  000144                  100.                    ;TEST ITERATION COUNT                       *
005620  005622                  POIA                    ;SCOPE ENTRY POINT                          *
        000007                  X=X+1
                        ;*******************************************************************************
                        ;TEST THAT DONE BIT (BIT 7 OF PRS) IS CLEARED WHEN ENABLING THE READER
005622  104001          POIA:   SRESET                  ;RESET
005624  005277  173350          INC     @PRS            ;ENABLE READER
005630  105777  173344          TSTB    @PRS            ;TEST FOR DONE BIT
005634  100375                  BPL     .-4             ;BRANCH IF DONE BIT NOT SET
005636  005277  173336          INC     @PRS            ;ENABLE READER AGAIN
005642  105777  173332          TSTB    @PRS            ;TEST DONE BIT AGAIN
005646  100001                  BPL     .+4             ;BRANCH IF DONE BIT IS RESET
005650  104015                  ERROR                   ;READER ENABLE DID NOT CLEAR DONE BIT
005652  104000                  SCOPE                   ;SCOPE
005654                          TSTA    POJ,100.
005654                          TSTAA   POJ,100.,\X+1,\X+2,\Y
                        ;*******************************************************************************
005654  000010          POT10:  10                      ; PRG0 ROUTINE 10                           *
005656  005714                  POT11                   ;ADDRESS OF NEXT ROUTINE                    *
005660  000144                  100.                    ;TEST ITERATION COUNT                       *
005662  005664                  POJA                    ;SCOPE ENTRY POINT                          *
        000010                  X=X+1
                        ;*******************************************************************************
                        ;TEST THAT DONE BIT IS CLEARED BY REFERENCING READER BUFFER (PRB)
005664  005277  173310  POJA:   INC     @PRS            ;ENABLE READER
005670  105777  173304          TSTB    @PRS            ;TEST FOR DONE BIT
005674  100375                  BPL     .-4             ;BRANCH IF DONE BIT NOT SET.
005676  005777  173300          TST     @PRB            ;REFERENCE READER BUFFER (PRB)
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005702  105777  173272                  TSTB    @PRS            ;TEST FOR DONE BIT
005706  100001                          BPL     .+4             ;BRANCH IF DONE BIT IS CLEAR.
005710  104015                          ERROR                   ;ERROR 1. DONE BIT WAS NOT CLEARED
005712  104000                          SCOPE                   ;BY REFERENCING READER BUFFER.
005714                                  TSTA    P0M,100.
005714                                  TSTAA   P0M,100.,\X+1,\X+2,\Y
                                ;*****************************************************************************
005714  000011                  P0T11:  11                      ; PRG0 ROUTINE 11                           *
005716  006016                          P0T12                   ;ADDRESS OF NEXT ROUTINE                    *
005720  000144                          100.                    ;TEST ITERATION COUNT                       *
005722  005724                          P0MA                    ;SCOPE ENTRY POINT                          *
        000011                          X=X+1
                                ;*****************************************************************************
                                ;TEST ABILITY TO READ READER BUFFER RELIABLY.
005724  012700  000144          P0MA:   MOV     #100.,%0        ;SET COUNT TO 100 IN R0
005730  004737  003714                  JSR     %7,AREAD        ;GET CHARACTER
005734  017737  173242  001336          MOV     @PRB,CHR1       ;C(PRB) TO CHR1
005742  017737  173234  001340  P0MB:   MOV     @PRB,CHR2       ;C(PRB) TO CHR2
005750  023737  001336  001340          CMP     CHR1,CHR2       ;COMPARE CHR1 AND CHR2.
005756  001003                          BNE     P0MC            ;BRANCH IF R1 AND R2 DON'T MATCH
005760  005300                          DEC     %0
005762  001367                          BNE     P0MB
005764  104000                          SCOPE                   ;SCOPE
005766  104017                  P0MC:   OACNV                   ;CORRECT 1ST READ DATA TO ASCII
005770  001336                          CHR1
005772  015200                          ORGRD
005774  000004                          4
005776  104017                          OACNV
006000  001340                          CHR2
006002  015213                          SUBRD
006004  000004                          4
006006  104016                          ERRORN                  ;ERROR. REREAD OF PRB DID NOT MATCH
006010  015146                          EM2                     ;INITIAL DATA READ FROM PRB.
006012  177777                          -1
006014  104000                          SCOPE
006016                                  TSTA    P0N,100.
006016                                  TSTAA   P0N,100.,\X+1,\X+2,\Y
                                ;*****************************************************************************
006016  000012                  P0T12:  12                      ; PRG0 ROUTINE 12                           *
006020  006060                          P0T13                   ;ADDRESS OF NEXT ROUTINE                    *
006022  000144                          100.                    ;TEST ITERATION COUNT                       *
006024  006026                          P0NA                    ;SCOPE ENTRY POINT                          *
        000012                          X=X+1
                                ;*****************************************************************************
                                ;TEST THAT READER BUFFER (PRB) IS CLEARED BY READER ENABLE
006026  104001                  P0NA:   SRESET                  ;RESET
006030  004737  003714                  JSR     %7,AREAD        ;GET CHARACTER
006034  005777  173142                  TST     @PRB            ;TEST CONTENTS OF READER BUFFER.
006040  001772                          BEQ     P0NA            ;GO GET ANOUTHER CHAR IF 0.
006042  005277  173132                  INC     @PRS            ;NOT 0. ENABLE READER
006046  005777  173130                  TST     @PRB            ;CHECK PRB
006052  001401                          BEQ     .+4             ;BRANCH IF PRB IS  RESET
006054  104015                          ERROR                   ;ERROR. PRB NOT RESET BY READER ENABLE.
006056  104000                          SCOPE
006060                                  TSTA    P00,100.
006060                                  TSTAA   P00,100.,\X+1,\X+2,\Y
```

```
                                ;*****************************************************************************
006060  000013                P0T13:  13                      ; PRG0 ROUTINE 13                           *
006062  006130                        P0T14                   ;ADDRESS OF NEXT ROUTINE                    *
006064  000144                        100.                    ;TEST ITERATION COUNT                       *
006066  006074                        P00A                    ;SCOPE ENTRY POINT                          *
        000013                        X=X+1
                                ;*****************************************************************************
                                ;TEST THAT READER IS ABLE TO INTERRUPT. IF INTERRUPT IS SERVICED, IT WILL
                                ;HAVE OCCURRED AT CORRECT VECTOR.
006070  104013                        STRDRV                  ;SET UP READER INTERRUPT VECTOR
006072  006126                        P00B
006074  012737  000000  177776 P00A:  MOV     #PRTY0,PSW      ;SET PROCESSOR PRIORITY TO 0
006102  042777  000100  173070        BIC     #BIT6,@PRS      ;DISABLE READER INTERRUPT.
006110  004737  003714                JSR     %7,AREAD        ;GO READ CHARACTER.
006114  052777  000100  173056        BIS     #BIT6,@PRS      ;ENABLE READER INTERRUPT.
006122  000240                        NOP                     ;NO OP
006124  104015                        ERROR                   ;ERROR. READER FAILED TO INTERRUPT.
006126  104000                P00B:   SCOPE                   ;SCOPE
006130                                TSTA    P0P,100.
006130                                TSTAA   P0P,100.,\X+1,\X+2,\Y
                                ;*****************************************************************************
006130  000014                P0T14:  14                      ; PRG0 ROUTINE 14                           *
006132  006204                        P0T15                   ;ADDRESS OF NEXT ROUTINE                    *
006134  000144                        100.                    ;TEST ITERATION COUNT                       *
006136  006144                        P0PA                    ;SCOPE ENTRY POINT                          *
        000014                        X=X+1
                                ;*****************************************************************************
                                ;TEST THAT READER DOES NOT INTERRUPT WITH PROCESSOR AT SAME PRIORITY
                                ;LEVEL AS READER.
006140  104013                        STRDRV                  ;SET UP READER INTERRUPT VECTOR
006142  006200                        P0PE
006144  013737  001212  177776 P0PA:  MOV     RDRLVL,PSW      ;SET PROCESSOR PRIORITY SAME AS READER PRIORITY.
006152  005077  173022                CLR     @PRS            ;DISABLE READER INTERRUPT.
006156  004737  003714                JSR     %7,AREAD        ;GO READ A CHARACTER.
006162  052777  000100  173010        BIS     #BIT6,@PRS      ;ENABLE READER INTERRUPT.
006170  000240                        NOP                     ;OK IF NO INTERRUPT OCCURS.
006172  005077  173002                CLR     @PRS            ;DISABLE READER INTERRUPT.
006176  104000                        SCOPE                   ;SCOPE
006200  104015                P0PE:   ERROR                   ;ERROR. READER ERRONEOUSLY INTERRUPTED
                                                              ;WITH PROCESSOR AT SAME PRIORITY LEVEL AS
                                                              ;THE READER, OR THE READER IS AT HIGHER
006202  104000                        SCOPE                   ;PRIORITY LEVEL THAN SPECIFIED AT RDRLVL.
006204                                TSTA    P0Q,100.
006204                                TSTAA   P0Q,100.,\X+1,\X+2,\Y
                                ;*****************************************************************************
006204  000015                P0T15:  15                      ; PRG0 ROUTINE 15                           *
006206  006262                        P0T16                   ;ADDRESS OF NEXT ROUTINE                    *
006210  000144                        100.                    ;TEST ITERATION COUNT                       *
006212  006220                        P0QA                    ;SCOPE ENTRY POINT                          *
        000015                        X=X+1
                                ;*****************************************************************************
                                ;TEST THAT READER INTERRUPTS WITH PROCESSOR AT PRIORITY 1 LEVEL LOWER
                                ;THAN READER'S
006214  104013                        STRDRV                  ;SET UP READER INTERRUPT VECTOR
006216  006260                        P0QB
006220  013737  001212  177776 P0QA:  MOV     RDRLVL,PSW      ;SET PROCESSOR PRIORITY ONE LEVEL LOWER
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006226  162737  000040  177776          SUB     #40,PSW         ;THAN READER PRIORITY
006234  042777  000100  172736          BIC     #BIT6,@PRS      ;DISABLE READER INTERRUPT
006242  004737  003714                  JSR     %7,AREAD        ;GO READ A CHARACTER.
006246  052777  000100  172724          BIS     #BIT6,@PRS      ;ENABLE READER INTERRUPT
006254  000240                          NOP                     ;NOP
006256  104015                          ERROR                   ;READER FAILED TO INTERRUPT WITH
                                                                ;PROCESSOR PRIORITY ONE LEVEL LOWER THAN
                                                                ;READER.  THEREFORE, READER PRIORITY MUST BE
006260  104000                  P0QB:   SCOPE                   ;LOWER THAN SPECIFIED AT RDRLVL
006262                          P0QB:   TSTA    P0R,100.
006262                                  TSTAA   P0R,100.,\X+1,\X+2,\Y
                        ;*****************************************************************************
006262  000016                  P0T16:  16                      ; PRG0 ROUTINE 16                      *
006264  006354                          P0T17                   ;ADDRESS OF NEXT ROUTINE               *
006266  000144                          100.                    ;TEST ITERATION COUNT                  *
006270  006272                          P0RA                    ;SCOPE ENTRY POINT                     *
        000016                          X=X+1
                        ;*****************************************************************************
                        ;TEST THAT READER DOES NOT REINTERRUPT AFTER RTI WHEN DONE BIT IS NOT CLEARED
006272  104013                  P0RA:   STRDRV                  ;SET READER INTERRUPT VECTOR
006274  006330                          P0RC
006276  012737  000000  177776          MOV     #PRTY0,PSW      ;SET PROCESSOR TO PRIORITY 0
006304  005077  172670                  CLR     @PRS            ;DISABLE READER INTERRUPT.
006310  004737  003714                  JSR     %7,AREAD        ;GO READ A CHARACTER.
006314  052777  000100  172656          BIS     #BIT6,@PRS      ;ENABLE READER INTERRUPT
006322  000240                          NOP
006324  104015                          ERROR                   ;ERROR 1.  READER FAILED TO INTERRUPT
006326  104000                          SCOPE                   ;SCOPE
006330  012777  006350  172652  P0RC:   MOV     #P0RE,@RDRVTR   ;CHANGE INTERRUPT VECTOR TO P0RE
006336  012716  006344                  MOV     #P0RD,@%6
006342  000002                          RTI                     ;RETURN FROM INTERRUPT
006344  000240                  P0RD:   NOP
006346  104000                          SCOPE
006350  104015                  P0RE:   ERROR                   ;ERROR 2. READER REINTERRUPTED AFTER
006352  104000                          SCOPE                   ;RTI WITH DONE BIT LEFT ON
006354                          P0RE:   TSTA    P0S,1000.
006354                                  TSTAA   P0S,1000.,\X+1,\X+2,\Y
                        ;*****************************************************************************
006354  000017                  P0T17:  17                      ; PRG0 ROUTINE 17                      *
006356  006424                          P0T20                   ;ADDRESS OF NEXT ROUTINE               *
006360  001750                          1000.                   ;TEST ITERATION COUNT                  *
006362  006370                          P0SA                    ;SCOPE ENTRY POINT                     *
        000017                          X=X+1
                        ;*****************************************************************************
                        ;TEST THAT READER INTERRUPTS IMMEDIATELY UPON LOWERING CP PRIORITY TO 0.
006364  104013                          STRDRV                  ;SET READER INTERRUPT VECTOR TO
006366  006422                          P0SB
006370  005077  172604          P0SA:   CLR     @PRS            ;DISABLE PTRI.
006374  004737  003714                  JSR     %7,AREAD        ;READ A CHARACTER.
006400  052777  000100  172572          BIS     #BIT6,@PRS      ;ENABLE PTRI
006406  005037  177776                  CLR     PSW             ;LOWER PRIORITY TO 0.
006412  012737  000340  177776          MOV     #PRTY7,PSW      ;RAISE PRIORITY BACK TO 7.
006420  104015                          ERROR                   ;ERROR. READER FAILED TO INTERRUPT IMMEDIATELY
                                                                ;AFTER LOWERING PRIORITY TO 0
006422  104000                  P0SB:   SCOPE                   ;INTERRUPTS TO HERE IF SUCCESSFUL.
006424                          P0SB:   TSTA    P0T,10000.
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006424                                          TSTAA   POT,10000.,\X+1,\X+2,\Y
                                        ;*****************************************************************************
006424  000020                          POT20:  20                      ; PRG0 ROUTINE 20                           *
006426  006452                                  POT21                   ;ADDRESS OF NEXT ROUTINE                    *
006430  023420                                  10000.                  ;TEST ITERATION COUNT                       *
006432  006440                                  POTA                    ;SCOPE ENTRY POINT                          *
        000020                                  X=X+1
                                        ;*****************************************************************************
                                        ;READ AND CHECK 10000 CHARACTERS OF SPECIAL BINARY COUNT PATTERN. FULL SPEED.
006434  004737  004352                          JSR     %7,BSYNC        ;SYNC READER; SET ERROR COUNTER.
006440  004737  004064                  POTA:   JSR     %7,BREAD        ;GO READ CHARACTER
006444  004737  004274                          JSR     %7,BCHECK       ;GO CHECK CHARACTER READ.
006450  104000                                  SCOPE                   ;SCOPE
006452                                          TSTA    POU,500.
006452                                          TSTAA   POU,500.,\X+1,\X+2,\Y
                                        ;*****************************************************************************
006452  000021                          POT21:  21                      ; PRG0 ROUTINE 21                           *
006454  006510                                  POT22                   ;ADDRESS OF NEXT ROUTINE                    *
006456  000764                                  500.                    ;TEST ITERATION COUNT                       *
006460  006474                                  POUA                    ;SCOPE ENTRY POINT                          *
        000021                                  X=X+1
                                        ;*****************************************************************************
                                        ;READ AND CHECK 500 CHARACTERS OF SPECIAL BINARY COUNT PATTERN.
                                        ;RANDOM STALL BETWEEN CHARACTERS (0 TO 7 MSECS).
006462  012737  177770  004242                MOV     #177770,STLMSK
006470  004737  004352                        JSR     %7,BSYNC        ;SYNC READER; SET ERROR COUNTER
006474  104012                          POUA:   STALL                   ;RANDOM STALL (0 TO 7 MSECS)
006476  004737  004064                        JSR     %7,BREAD        ;GO READ CHARACTER
006502  004737  004274                        JSR     %7,BCHECK       ;GO CHECK CHARACTER READ
006506  104000                                SCOPE                   ;SCOPE
006510                                          TSTA    POV,1000.
006510                                          TSTAA   POV,1000.,\X+1,\X+2,\Y
                                        ;*****************************************************************************
006510  000022                          POT22:  22                      ; PRG0 ROUTINE 22                           *
006512  006562                                  POT23                   ;ADDRESS OF NEXT ROUTINE                    *
006514  001750                                  1000.                   ;TEST ITERATION COUNT                       *
006516  006532                                  POVA                    ;SCOPE ENTRY POINT                          *
        000022                                  X=X+1
                                        ;*****************************************************************************
                                        ;READ 1000 GROUPS OF 3 CHARS EACH. STALL (0 TO 31 MSECS) BEFORE EACH GROUP.
006520  012737  177740  004242                MOV     #177740,STLMSK  ;LIMIT STALLS TO 31 MSECS.
006526  004737  004352                        JSR     %7,BSYNC        ;SYNC READER.  SET ERROR COUNTER
006532  012737  000003  004272          POVA:   MOV     #3,RNCNT        ;SET CHAR COUNT TO 3.
006540  104012                                  STALL                   ;RANDOM STALL (0 TO 31 MSECS).
006542  004737  004064                  POVB:   JSR     %7,BREAD        ;GO READ CHARACTER.
006546  004737  004274                          JSR     %7,BCHECK       ;GO CHECK CHARACTER READ.
006552  005337  004272                          DEC     RNCNT           ;3 CHARS READ?
006556  001371                                  BNE     POVB            ;BR IF NOT 3 CHARS YET.
006560  104000                                  SCOPE                   ;SCOPE
006562                                          TSTA    POX,1000.
006562                                          TSTAA   POX,1000.,\X+1,\X+2,\Y
                                        ;*****************************************************************************
006562  000023                          POT23:  23                      ; PRG0 ROUTINE 23                           *
006564  006640                                  POT24                   ;ADDRESS OF NEXT ROUTINE                    *
006566  001750                                  1000.                   ;TEST ITERATION COUNT                       *
006570  006612                                  POXA                    ;SCOPE ENTRY POINT                          *
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                000023                          X=X+1
                                        ;*****************************************************************************
                                        ;READ AND CHECK 1000 CHARACTER GROUPS OF RANDOM LENGTH (1 TO 15).
                                        ;RANDOM STALL (0 TO 31 MSECS) BETWEEN GROUPS.
006572  012737  177740  004242          MOV     #177740,STLMSK  ;LIMIT STALLS TO 31 MSECS.
006600  012737  177760  004270          MOV     #177760,RCMSK   ;LIMIT MAY CHAR COUNT TO 15 CHARS.
006606  004737  004352                  JSR     %7,BSYNC        ;SYNC READER.  SET ERROR COUNTER.
006612  004737  004244          P0XA:   JSR     %7,GRCNT        ;GENERATE RANDOM CHAR COUNT.
006616  104012                          STALL
006620  004737  004064          P0XB:   JSR     %7,BREAD        ;GO READ CHARACTER.
006624  004737  004274                  JSR     %7,BCHECK       ;GO CHECK CHARACTER.
006630  005337  004272                  DEC     RNCNT           ;ALL CHARS READ?
006634  001371                          BNE     P0XB            ;BRANCH IF NOT.
006636  104000                          SCOPE                   ;SCOPE
006640                                  TSTAA   P0Y,1000.,\X+1,LST,\Y
                                        ;*****************************************************************************
006640  000024                  P0T24:  24                      ; PRG0 ROUTINE 24                                *
006642  177777                          P0TLST                  ;ADDRESS OF NEXT ROUTINE                         *
006644  001750                          1000.                   ;TEST ITERATION COUNT                            *
006646  006670                          P0YA                    ;SCOPE ENTRY POINT                               *
                000024                  X=X+1
                                        ;*****************************************************************************
                                        ;READ AND CHECK 1000 CHARACTER GROUPS OF SPECIAL BINARY COUNT PATTERN.
                                        ;RANDOM LENGTH
                                        ;GROUPS (BETWEEN 1 AND 77). RANDOM STALL BETWEEN GROUPS (0 TO 31 MSECS).
006650  012737  177740  004242          MOV     #177740,STLMSK
006656  012737  177700  004270          MOV     #177700,RCMSK
006664  004737  004352                  JSR     %7,BSYNC        ;SYNC READER; SET ERROR COUNTER.
006670  004737  004244          P0YA:   JSR     %7,GRCNT        ;GENERATE RANDOM CHARACTER COUNT.
006674  104012                          STALL                   ;RANDOM STALL (0 TO 31MSECS)
006676  004737  004064          P0YB:   JSR     %7,BREAD        ;GO READ CHARATER
006702  004737  004274                  JSR     %7,BCHECK       ;GO CHECK CHARACTER READ
006706  005337  004272                  DEC     RNCNT           ;DECREMENT RANDOM CHAR COUNT
006712  001371                          BNE     P0YB            ;GO READ AGAIN IF COUNT NOT 0.
006714  104000                          SCOPE                   ;SCOPE
                                ;PRG1 - PUNCH TESTS
                177777                  X=-1
                000001                  Y=1
006716  012737  006740  001256  PRG1:   MOV     #P1T0,KSTART    ;ADDR OF 1ST ROUTINE TO KSTART
006724  104010                          TYPE                    ;TYPE TITLE.
006726  013151                          TITL1
006730  004737  004622                  JSR     PC,PCHSEL       ;SELECT PUNCH.
006734  000137  001700                  JMP     SRSET           ;GO GET STARTED.
006740                                  TSTA    P1A,1000.
006740                                  TSTAA   P1A,1000.,\X+1,\X+2,\Y
                                        ;*****************************************************************************
006740  000000                  P1T0:   0                       ; PRG1 ROUTINE 0                                 *
006742  006770                          P1T1                    ;ADDRESS OF NEXT ROUTINE                         *
006744  001750                          1000.                   ;TEST ITERATION COUNT                            *
006746  006756                          P1AA                    ;SCOPE ENTRY POINT                               *
                000000                  X=X+1
                                        ;*****************************************************************************
                                        ;TEST ABILITY TO REFERENCE THE PUNCH STATUS WORD (PPS)
006750  012737  006764  000004          MOV     #P1AB,MACHER
006756  005777  172222          P1AA:   TST     @PPS            ;REFERENCE PUNCH STATUS WORD
006762  104000                          SCOPE                   ;SCOPE
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006764  104015                  P1AB:   ERROR                   ;ERROR. TRAPPED WHEN REFERENCING PUNCH
006766  104000                          SCOPE                   ;STATUS WORD (PPS).
006770                                  TSTA    P1B,1000.
006770                                  TSTAA   P1B,1000.,\X+1,\X+2,\Y
                                ;*******************************************************************************
006770  000001                  P1T1:   1                       ; PRG1 ROUTINE 1                              *
006772  007020                          P1T2                    ;ADDRESS OF NEXT ROUTINE                      *
006774  001750                          1000.                   ;TEST ITERATION COUNT                         *
006776  007006                          P1BA                    ;SCOPE ENTRY POINT                            *
        000001                          X=X+1
                                ;*******************************************************************************
                                ;TEST ABILITY TO REFERENCE THE PUNCH BUFFER (PPB)
007000  012737  007014  000004          MOV     #P1BB,MACHER    ;SET UP MACHINE ERROR TRAP.
007006  005777  172174          P1BA:   TST     @PPB            ;REFERENCE PUNCH BUFFER.
007012  104000                          SCOPE                   ;SCOPE
007014  104015                  P1BB:   ERROR                   ;TRAPPED WHEN REFERENCING
007016  104000                          SCOPE                   ;PUNCH BUFFER (PPB)
007020                                  TSTA    P1C,1000.
007020                                  TSTAA   P1C,1000.,\X+1,\X+2,\Y
                                ;*******************************************************************************
007020  000002                  P1T2:   2                       ; PRG1 ROUTINE 2                              *
007022  007074                          P1T3                    ;ADDRESS OF NEXT ROUTINE                      *
007024  001750                          1000.                   ;TEST ITERATION COUNT                         *
007026  007030                          P1CA                    ;SCOPE ENTRY POINT                            *
        000002                          X=X+1
                                ;*******************************************************************************
                                ;TEST ABILITY TO SET AND CLEAR ID BIT (BIT 6) IN PPS
007030  052777  000100  172146  P1CA:   BIS     #BIT6,@PPS      ;SET ID BIT IN PPS (BIT 6)
007036  032777  000100  172140          BIT     #BIT6,@PPS      ;CHECK ID BIT IN PPS
007044  001002                          BNE     P1CB            ;BRANCH IF BIT SET
007046  104015                          ERROR                   ;ERROR. FAILED TO SET ID BIT (BIT 6) IN
007050  104000                          SCOPE                   ;PPS
007052  042777  000100  172124  P1CB:   BIC     #BIT6,@PPS      ;CLEAR ID BIT IN PPS
007060  032777  000100  172116          BIT     #BIT6,@PPS      ;CHECK ID BIT IN PPS
007066  001401                          BEQ     .+4             ;BRANCH IF BIT IS CLEAR
007070  104015                          ERROR                   ;ERROR. ID BIT IN PPS FAILED TO CLEAR
007072  104000                          SCOPE
007074                                  TSTA    P1D,100.
007074                                  TSTAA   P1D,100.,\X+1,\X+2,\Y
                                ;*******************************************************************************
007074  000003                  P1T3:   3                       ; PRG1 ROUTINE 3                              *
007076  007130                          P1T4                    ;ADDRESS OF NEXT ROUTINE                      *
007100  000144                          100.                    ;TEST ITERATION COUNT                         *
007102  007104                          P1DA                    ;SCOPE ENTRY POINT                            *
        000003                          X=X+1
                                ;*******************************************************************************
                                ;TEST ABILITY TO CLEAR ID BIT (6) IN PPS
007104  052777  000100  172072  P1DA:   BIS     #BIT6,@PPS      ;SET ID BIT IN PPS.
007112  104001                          SRESET                  ;RESET.
007114  032777  000100  172062          BIT     #BIT6,@PPS      ;TEST ID BIT IN PPS.
007122  001401                          BEQ     .+4             ;BRANCH IF ID BIT IS CLEAR
007124  104015                          ERROR                   ;ERROR. RESET INSTRUCTION FAILED TO
007126  104000                          SCOPE                   ;CLEAR ID BIT (BIT 6) IN PPS.
007130                                  TSTA    P1E,1000.
007130                                  TSTAA   P1E,1000.,\X+1,\X+2,\Y
                                ;*******************************************************************************
```

```
007130  000004                  P1T4:   4                       ; PRG1 ROUTINE 4                        *
007132  007152                          P1T5                    ;ADDRESS OF NEXT ROUTINE                *
007134  001750                          1000.                   ;TEST ITERATION COUNT                   *
007136  007140                          P1EA                    ;SCOPE ENTRY POINT                      *
        000004                          X=X+1
                                ;*******************************************************************************
                                ;TEST THAT READY BIT (BIT 7) IS SET FOLLOWING A RESET INSTRUCTION, AND
                                ;THAT THE READY BIT CAN BE READ RELIABLY.
007140  105777  172040          P1EA:   TSTB    @PPS            ;TEST PPS
007144  100401                          BMI     .+4             ;BRANCH IF READY BIT  SET
007146  104015                          ERROR                   ;ERROR. RESET FAILED TO SET READY BIT,
007150  104000                          SCOPE                   ;OR FAILED TO READ READY BIT.
007152                                  TSTA    P1F,100.
007152                                  TSTAA   P1F,100.,\X+1,\X+2,\Y
                                ;*******************************************************************************
007152  000005                  P1T5:   5                       ; PRG1 ROUTINE 5                        *
007154  007210                          P1T6                    ;ADDRESS OF NEXT ROUTINE                *
007156  000144                          100.                    ;TEST ITERATION COUNT                   *
007160  007162                          P1FA                    ;SCOPE ENTRY POINT                      *
        000005                          X=X+1
                                ;*******************************************************************************
                                ;TEST THAT READY BIT (BIT 7) OF PPS IS RESET BY LOADING PUNCH BUFFER (PPB)
007162  104001                  P1FA:   SRESET                  ;RESET
007164  004737  004540                  JSR     %7,CPRDY        ;CHECK FOR PUNCH READY
007170  112777  000000  172010          MOVB    #0,@PPB         ;LOAD 0 INTO PUNCH BUFFER (PPB)
007176  105777  172002                  TSTB    @PPS            ;TEST PPS
007202  100001                          BPL     .+4             ;BRANCH IF READY BIT CLEAR
007204  104015                          ERROR                   ;ERROR. LOADING PUNCH BUFFER (PPB)
007206  104000                          SCOPE                   ;FAILED TO RESET READY BIT IN PPS
007210                                  TSTA    P1G,100.
007210                                  TSTAA   P1G,100.,\X+1,\X+2,\Y
                                ;*******************************************************************************
007210  000006                  P1T6:   6                       ; PRG1 ROUTINE 6                        *
007212  007252                          P1T7                    ;ADDRESS OF NEXT ROUTINE                *
007214  000144                          100.                    ;TEST ITERATION COUNT                   *
007216  007220                          P1GA                    ;SCOPE ENTRY POINT                      *
        000006                          X=X+1
                                ;*******************************************************************************
                                ;TEST THAT READY BIT (BIT 7) IS NOT RESET BY BYTE LOADING PPB+1.
007220  104001                  P1GA:   SRESET                  ;RESET
007222  004737  004540                  JSR     %7,CPRDY        ;CHECK FOR PUNCH READY.
007226  013700  001206                  MOV     PPB,%0
007232  005200                          INC     %0
007234  112710  000000                  MOVB    #0,@%0          ;LOAD PPB+1
007240  105777  171740                  TSTB    @PPS            ;TEST PPS
007244  100401                          BMI     .+4             ;BRANCH IF READY BIT NOT RESET.
007246  104015                          ERROR                   ;ERROR. LOADING PPB+1 CLEARED READY BIT.
007250  104000                          SCOPE                   ;SCOPE
007252                                  TSTA    P1H,1000.
007252                                  TSTAA   P1H,1000.,\X+1,\X+2,\Y
                                ;*******************************************************************************
007252  000007                  P1T7:   7                       ; PRG1 ROUTINE 7                        *
007254  007320                          P1T10                   ;ADDRESS OF NEXT ROUTINE                *
007256  001750                          1000.                   ;TEST ITERATION COUNT                   *
007260  007266                          P1HA                    ;SCOPE ENTRY POINT                      *
        000007                          X=X+1
```

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                                ;*************************************************************************
                                ;TEST THAT PUNCH (READY BIT) IS ABLE TO INTERRUPT. IF THE INTERRUPT IS
                                ;SERVICED, IT WILL HAVE OCCURRED AT CORRECT VECTOR.
007262  104014                          STPCHV                  ;SET UP PUNCH INTERRUPT VECTOR.
007264  007316                          P1HB
007266  005037  177776          P1HA:   CLR     PSW             ;SET PRTY TO 0.
007272  004737  004540                  JSR     %7,CPRDY        ;CHECK FOR PUNCH READY.
007276  042777  000100  171700          BIC     #BIT6,@PPS      ;DISABLE PUNCH INTERRUPT
007304  052777  000100  171672          BIS     #BIT6,@PPS      ;ENABLE PUNCH INTERRUPT
007312  000240                          NOP
007314  104015                          ERROR                   ;ERROR. FAILURE TO INTERRUPT WITH
                                                                ;PUNCH READY BIT SET.
007316  104000                  P1HB:   SCOPE                   ;INTERRUPT VECTOR POINTS HERE.
007320                                  TSTA    P1I,1000.
007320                                  TSTAA   P1I,1000.,\X+1,\X+2,\Y
                                ;*************************************************************************
007320  000010                  P1T10:  10                      ; PRG1 ROUTINE 10                       *
007322  007412                          P1T11                   ;ADDRESS OF NEXT ROUTINE                *
007324  001750                          1000.                   ;TEST ITERATION COUNT                   *
007326  007330                          P1IA                    ;SCOPE ENTRY POINT                      *
        000010                          X=X+1
                                ;*************************************************************************
                                ;TEST THAT PUNCH DOES NOT REINTERRUPT AFTER RTI WHEN READY BIT IS NOT RESET.
007330  104014                  P1IA:   STPCHV                  ;SET UP PUNCH INTERRUPT VECTOR
007332  007366                          P1IB
007334  005037  177776                  CLR     PSW             ;SET PRTY TO 0.
007340  004737  004540                  JSR     %7,CPRDY        ;CHECK FOR PUNCH READY.
007344  042777  000100  171632          BIC     #BIT6,@PPS      ;DISABLE PUNCH INTERRUPT
007352  052777  000100  171624          BIS     #BIT6,@PPS      ;ENABLE PUNCH INTERRUPT
007360  000240                          NOP
007362  104015                          ERROR                   ;ERROR. PUNCH FAILED TO INTERRUPT.
007364  104000                          SCOPE                   ;SCOPE
007366  012777  007406  171620  P1IB:   MOV     #P1ID,@PCHVTR   ;CHANGE INTERRUPT VECTOR TO P1ID
007374  012716  007402                  MOV     #P1IC,@%6       ;CHANGE INTERRUPT RETURN ADDRESS.
007400  000002                          RTI                     ;RETURN FROM INTERRUPT.
007402  000240                  P1IC:   NOP
007404  104000                          SCOPE
007406  104015                  P1ID:   ERROR                   ;ERROR2. PUNCH REINTERRUPTED AFTER RTI WITH
007410  104000                          SCOPE                   ;READY BIT LEFT ON. POP THE STOCK TWICE
007412                                  TSTA    P1J,1000.
007412                                  TSTAA   P1J,1000.,\X+1,\X+2,\Y
                                ;*************************************************************************
007412  000011                  P1T11:  11                      ; PRG1 ROUTINE 11                       *
007414  007466                          P1T12                   ;ADDRESS OF NEXT ROUTINE                *
007416  001750                          1000.                   ;TEST ITERATION COUNT                   *
007420  007426                          P1JA                    ;SCOPE ENTRY POINT                      *
        000011                          X=X+1
                                ;*************************************************************************
                                ;TEST THAT THE PUNCH DOES NOT INTERRUPT WITH PROCESSOR AT SAME PRIORITY
                                ;LEVEL AS THE PUNCH.
007422  104014                          STPCHV                  ;SET UP PUNCH INTERRUPT VECTOR.
007424  007462                          P1JB
007426  013737  001216  177776  P1JA:   MOV     PCHLVL,PSW      ;SET PROCESSOR PRIORITY SAME AS PUNCH.
007434  005077  171544                  CLR     @PPS            ;DISABLE PUNCH INTERRUPT.
007440  004737  004540                  JSR     %7,CPRDY        ;CHECK FOR PUNCH READY.
007444  052777  000100  171532          BIS     #BIT6,@PPS      ;ENABLE PUNCH INTERRUPT.
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007452  000240                          NOP                     ;OK IF NO INTERRUPT OCCURS.
007454  005077  171524                  CLR     @PPS            ;DISABLE PUNCH INTERRUPT.
007460  104000                          SCOPE                   ;SCOPE
007462  104015                  P1JB:   ERROR                   ;ERROR. PUNCH ERRONEOUSLY INTERRUPTED
                                                                ;WITH PROCESSOR AT SAME PRIORITY LEVEL
                                                                ;AS THE PUNCH, OR THE PUNCH IS AT HIGHER
007464  104000                          SCOPE                   ;PRIORITY LEVEL THAN SPECIFIED AT PCHLVL.
007466                                  TSTA    P1K,1000.
007466                                  TSTAA   P1K,1000.,\X+1,\X+2,\Y
                                ;*******************************************************************************
007466  000012                  P1T12:  12                      ; PRG1 ROUTINE 12                              *
007470  007544                          P1T13                   ;ADDRESS OF NEXT ROUTINE                       *
007472  001750                          1000.                   ;TEST ITERATION COUNT                          *
007474  007502                          P1KA                    ;SCOPE ENTRY POINT                             *
        000012                          X=X+1
                                ;*******************************************************************************
                                ;TEST THAT PUNCH INTERRUPTS WITH PROCESSOR AT PRIORITY 1 LEVEL LOWER
                                ;THAN THE PUNCH PRIORITY.
007476  104014                          STPCHV                  ;SET UP PUNCH INTERRUPT VECTOR
007500  007542                          P1KB
007502  013737  001216  177776  P1KA:   MOV     PCHLVL,PSW      ;SET PROCESSOR PRIORITY ONE LEVEL LOWER
007510  162737  000040  177776          SUB     #40,PSW         ;THAN PUNCH PRIORITY.
007516  042777  000100  171460          BIC     #BIT6,@PPS      ;DISABLE PUNCH INTERRUPT
007524  004737  004540                  JSR     %7,CPRDY        ;CHECK FOR PUNCH READY.
007530  052777  000100  171446          BIS     #BIT6,@PPS      ;ENABLE PUNCH INTERRUPT.
007536  000240                          NOP
007540  104015                          ERROR                   ;PUNCH FAILED TO INTERRUPT WITH PROCESSOR
                                                                ;PRIORITY ONE LEVEL LOWER THAN PUNCH.
                                                                ;THEREFORE, PUNCH PRIORITY MUST
                                                                ;BE LOWER THAN SPECIFIED AT PCHLVL.
007542  104000                  P1KB:   SCOPE                   ;HERE IF INTERRUPT OCCURS.
007544                                  TSTA    P1L,1000.
007544                                  TSTAA   P1L,1000.,\X+1,\X+2,\Y
                                ;*******************************************************************************
007544  000013                  P1T13:  13                      ; PRG1 ROUTINE 13                              *
007546  007616                          P1T14                   ;ADDRESS OF NEXT ROUTINE                       *
007550  001750                          1000.                   ;TEST ITERATION COUNT                          *
007552  007560                          P1LA                    ;SCOPE ENTRY POINT                             *
        000013                          X=X+1
                                ;*******************************************************************************
                                ;TEST THAT PUNCH INTERRUPTS IMMEDIATELY UPON LOWERING CP PRIORITY TO 0.
007554  104014                          STPCHV                  ;SET UP PUNCH INTERRUPT VECTOR
007556  007614                          P1LB
007560  004737  004540          P1LA:   JSR     %7,CPRDY        ;CHECK FOR PUNCH READY.
007564  042777  000100  171412          BIC     #BIT6,@PPS      ;DISABLE PUNCH INTERRUPT
007572  052777  000100  171404          BIS     #BIT6,@PPS      ;ENABLE PUNCH INTERRUPT
007600  005037  177776                  CLR     PSW             ;LOWER PRTY TO 0.
007604  012737  000340  177776          MOV     #PRTY7,PSW      ;RAISE CP PRIORITY BACK TO 7.
007612  104015                          ERROR                   ;ERROR. PUNCH FAILED TO INTERRUPT IMMEDIATELY
                                                                ;AFTER CP PRIORITY WAS LOWERED TO 0.
007614  104000                  P1LB:   SCOPE                   ;HERE IF INTERRUPT OCCURS.
007616                                  TSTA    P1M,5
007616                                  TSTAA   P1M,5,\X+1,\X+2,\Y
                                ;*******************************************************************************
007616  000014                  P1T14:  14                      ; PRG1 ROUTINE 14                              *
007620  007662                          P1T15                   ;ADDRESS OF NEXT ROUTINE                       *
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007622  000005                          5                       ;TEST ITERATION COUNT                   *
007624  007626                          P1MA                    ;SCOPE ENTRY POINT                      *
        000014                          X=X+1
                                ;*******************************************************************************
                                ;PUNCH SPECIAL BINARY COUNT PATTERN IN PUNCH MODE 0 (FULL SPEED)
007626  012737  001000  001330  P1MA:   MOV     #512.,RCNT      ;SET CHARACTER COUNT TO 512
007634  004537  010122                  JSR     %5,PFRNT        ;GO PUNCH FRONT END AND MODE 0
007640  000000                          0                       ;INDICATOR
007642  104026                          INBIN           ;INITIALIZE SPECIAL BINARY COUNT
007644  104030                  P1MB:   GETBNP                  ;GET BINARY CHARACTER
007646  004737  004572                  JSR     %7,HSPCH        ;GO PUNCH THE CHARACTER
007652  005337  001330                  DEC     RCNT            ;DECREMENT CHAR COUNT.
007656  001372                          BNE     P1MB            ;BRANCH IF COUNT NOT YET 0 YET.
007660  104000                          SCOPE                   ;SCOPE
007662                                  TSTA    P1N,5
007662                                  TSTAA   P1N,5,\X+1,\X+2,\Y
                                ;*******************************************************************************
007662  000015                  P1T15:  15                      ; PRG1 ROUTINE 15                       *
007664  007736                          P1T16                   ;ADDRESS OF NEXT ROUTINE                *
007666  000005                          5                       ;TEST ITERATION COUNT                   *
007670  007700                          P1NA                    ;SCOPE ENTRY POINT                      *
        000015                          X=X+1
                                ;*******************************************************************************
                                ;PUNCH SPECIAL BINARY COUNT PATTERN IN PUNCH MODE 1 (RANDOM STALLS AFTER
                                ;PUNCHING EACH CHARACTER. MAXIMUM STALL 47 MILLISECONDS)
007672  012737  177720  004242          MOV     #177720,STLMSK  ;SET STALL MASK FOR 57(8) MAX
007700  012737  001000  001330  P1NA:   MOV     #512.,RCNT      ;SET CHARACTER COUNT TO 512.
007706  004537  010122                  JSR     %5,PFRNT        ;GO PUNCH FRONT END, AND MODE 1
007712  000001                          1                       ;INDICATOR
007714  104026                          INBIN           ;INITIALIZE SPECIAL BINARY COUNT.
007716  104030                  P1NB:   GETBNP                  ;GET BINARY CHARACTER.
007720  004737  004572                  JSR     %7,HSPCH        ;GO PUNCH THE CHARACTER.
007724  104012                          STALL                   ;RANDOM STALL.
007726  005337  001330                  DEC     RCNT            ;DECREMENT CHAR COUNT.
007732  001371                          BNE     P1NB            ;BRANCH IF COUNT NOT YET 0.
007734  104000                          SCOPE                   ;SCOPE
007736                                  TSTA    P10,5
007736                                  TSTAA   P10,5,\X+1,\X+2,\Y
                                ;*******************************************************************************
007736  000016                  P1T16:  16                      ; PRG1 ROUTINE 16                       *
007740  010034                          P1T17                   ;ADDRESS OF NEXT ROUTINE                *
007742  000005                          5                       ;TEST ITERATION COUNT                   *
007744  007762                          P10A                    ;SCOPE ENTRY POINT                      *
        000016                          X=X+1
                                ;*******************************************************************************
                                ;PUNCH SPECIAL BINARY COUNT PATTERN IN PUNCH MODE 2.
                                ;(RANDOM STALL BEFORE PUNCHING RANDOM LENGTH GROUP OF CHARACTERS).
                                ;MAXIMUM STALL 47 MILLISECONDS, MAXIMUM GROUP LENGTH -15)
007746  012737  177720  004242          MOV     #177720,STLMSK  ;SET STALL MASK FOR 57(8) MAX.
007754  012737  177760  004270          MOV     #177760,RCMSK   ;SET CHAR GROUP MASK FOR 17(8) MAX).
007762  012737  001000  001330  P10A:   MOV     #512.,RCNT      ;SET CHARACTER COUNT TO 512.
007770  004537  010122                  JSR     %5,PFRNT        ;GO PUNCH FRONT END AND MODE 2
007774  000002                          2                       ;INDICATOR
007776  104026                          INBIN           ;INITIALIZE SPECIAL BINARY COUNT.
010000  004737  004244          P10B:   JSR     %7,GRCNT        ;GENERATE RANDOM CHARACTER COUNT
010004  104012                          STALL                   ;RANDOM STALL.
```

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010006  104030                  P10C:   GETBNP                  ;GET BINARY CHARACTER.
010010  004737  004572                  JSR     %7,HSPCH        ;PUNCH THE CHARACTER.
010014  005337  001330                  DEC     RCNT            ;DECREMENT CHAR COUNT
010020  001404                          BEQ     P10D            ;BRANCH IF COUNT IS 0.
010022  005337  004272                  DEC     RNCNT           ;NOT 0. DECREMENT RANDOM CHAR COUNT.
010026  001367                          BNE     P10C            ;BRANCH IF COUNT NOT YET 0.
010030  000763                          BR      P10B            ;BRANCH IF COUNT 0.
010032  104000                  P10D:   SCOPE                   ;SCOPE
010034                                  TSTAA   P1P,1,\X+1,LST,\Y
                        ;*****************************************************************************
010034  000017                  P1T17:  17                      ; PRG1 ROUTINE 17                      *
010036  177777                          P1TLST                  ;ADDRESS OF NEXT ROUTINE               *
010040  000001                          1                       ;TEST ITERATION COUNT                  *
010042  010044                          P1PA                    ;SCOPE ENTRY POINT                     *
        000017                          X=X+1
                        ;*****************************************************************************
                        ;PUNCH SPECIAL BINARY COUNT PATTERN IN PUNCH MODE 3.
                        ;STALL 10 SECONDS, PUNCH 32 CHARACTERS, UNTIL THE ENTIRE PATTERN IS
                        ;COMPLETED.
010044  012737  001000  001330  P1PA:   MOV     #512.,RCNT      ;SET CHARACTER COUNT TO 512.
010052  004537  C10122                  JSR     %5,PFRNT        ;GO PUNCH FRONT END AND MODE 3
010056  000003                          3                       ;INDICATOR.
010060  104026                          INBIN           ;INITIALIZE SPECIAL BIN COUNT
010062  104031                  P1PB:   DELAY                   ;STALL 10 SECONDS
010064  023420                          10000.
010066  012737  000040  004272          MOV     #32.,RNCNT      ;SET GROUP COUNT TO 32.
010074  104030                  P1PC:   GETBNP                  ;GET BINARY CHARACTER
010076  004737  004572                  JSR     %7,HSPCH        ;PUNCH CHARACTER
010102  005337  001330                  DEC     RCNT            ;DECREMENT CHAR COUNT
010106  001404                          BEQ     P1PD            ;BRANCH IF COUNT IS 0
010110  005337  004272                  DEC     RNCNT           ;DECREMENT GROUP COUNT
010114  001367                          BNE     P1PC            ;BRANCH IF COUNT NOT YET 0.
010116  000761                          BR      P1PB            ;BRANCH IF COUNT 0.
010120  104000                  P1PD:   SCOPE                   ;SCOPE

                        ;SUBROUTINE TO PUNCH FRONT END AND MODE CODE (USED BY PRG3).
010122  012701  000024          PFRNT:  MOV     #20.,%1         ;PUNCH 20 BLANK CHARACTERS (000)
010126  005037  001332                  CLR     PCHOUT          ;CLEAR PCHOUT.
010132  004737  004572                  JSR     %7,HSPCH        ;PUNCH CHAR.
010136  005301                          DEC     %1              ;DECREMENT R1
010140  001374                          BNE     .-6             ;BRANCH IF NOT 20 CHARCTERS YET.
010142  012737  000377  001332          MOV     #377,PCHOUT     ;PUNCH RUBOUT CHAR (SYNC CHAR).
010150  004737  004572                  JSR     %7,HSPCH
010154  012537  001332                  MOV     (5)+,PCHOUT     ;MOVE MODE CODE TO PCHOUT
010160  004737  004572                  JSR     %7,HSPCH        ;PUNCH MODE CODE.
010164  012701  000004                  MOV     #4,%1           ;PUNCH 4 BLANK CHARACTERS.
010170  005037  001332                  CLR     PCHOUT
010174  004737  004572                  JSR     %7,HSPCH
010200  005301                          DEC     %1
010202  001374                          BNE     .-6
010204  000205                          RTS     %5              ;EXIT

                        ;PRG2 - PUNCH VERIFY PROGRAM
                        ;THIS PROGRAM VERIFIES TAPE PRODUCED BY PRG1.
                        ;ANY ERRORS FOUND ARE REPORTED.
010206  104010                  PRG2:   TYPE                    ;TYPE TITLE
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010210  013514                          TITL2
010212  004737  005020                  JSR     PC,RDRSEL       ;SELECT READER.
010216  104011                          TYPES
010220  013547                          IM2
010222  013243                          IM6
010224  014041                          IM23
010226  177777                          -1
010230  104024                          CHALT                   ;WAIT FOR USER.
010232  012737  000372  001352  ETOA:   MOV     #250.,CTRA      ;250 TO CTRA.(TOTAL CHAR COUNT).
010240  012737  000012  001354  ETOB:   MOV     #10.,CTRB
010246  004737  004064          ETOC:   JSR     %7,BREAD        ;READ CHAR
010252  005737  001334                  TST     CRBUF
010256  001007                          BNE     ETOD            ;BRANCH IF NON-ZERO CHAR.
010260  005337  001354                  DEC     CTRB            ;0 CHAR. DECREMENT CTRB
010264  001413                          BEQ     ETOF            ;BRANCH IF 10 CONSECUTIVE 0'S READ.
010266  005337  001352                  DEC     CTRA            ;NO. DECREMENT CTRA.
010272  001365                          BNE     ETOC            ;BRANCH IF NOT YET 250 CHARS READ.
010274  000403                          BR      ETOE            ;250 CHARS READ. SYNE ERROR.
010276  005337  001352          ETOD:   DEC     CTRA            ;DECREMENT CTRA
010302  001356                          BNE     ETOB            ;BRANCH IF NOT 250 CHARS READ YET.
010304  104016                  ETOE:   ERRORN                  ;SYNC ERROR. 250 CHARS READ WITHOUT
010306  015220                          EM3                     ;A SUCCESSFUL SYNC.
010310  177777                          -1
010312  000747                          BR      ETOA            ;GO TRY AGAIN.
010314  004737  004064          ETOF:   JSR     %7,BREAD        ;READ CHAR
010320  005737  001334                  TST     CRBUF
010324  001004                          BNE     ETOG            ;BRANCH IF NON-ZERO CHAR.
010326  005337  001352                  DEC     CTRA            ;DECREMENT CTRA
010332  001370                          BNE     ETOF            ;BRANCH IF NOT 250 CHARS READ YET.
010334  000763                          BR      ETOE            ;250 CHARS READ. SYNC ERROR.
010336  012737  000377  001326  ETOG:   MOV     #377,ERRT
010344  043737  001350  001326          BIC     RDRMSK,ERRT
010352  023737  001326  001334          CMP     ERRT,CRBUF      ;COMPARE CHAR READ TO 377.
010360  001414                          BEQ     ETOH            ;377.OK.
010362  104017                          OACNV                   ;ERROR TYPEOUT.
010364  001326                          ERRT
010366  015262                          ESB
010370  000004                          4
010372  104017                          OACNV
010374  001334                          CRBUF
010376  015275                          EWAS
010400  000004                          4
010402  104016                          ERRORN                  ;LEADER ERROR. SHOULD BE 377.
010404  015235                          EM4
010406  177777                          -1
010410  000710                          BR      ETOA            ;START OVER
010412  004737  004064          ETOH:   JSR     %7,BREAD        ;READ CHAR.
010416  023727  001334  000003          CMP     CRBUF,#3        ;COMPARE CHAR READ TO 3.
010424  101410                          BLOS    ETOI            ;BRANCH IF SAME OR LOWER.
010426  104017                          OACNV                   ;ERROR. CONVERT DATA READ TO ASCII.
010430  001334                          CRBUF                   ;SET UP FOR TYPEOUT.
010432  015354                          FWAS
010434  000004                          4
010436  104016                          ERRORN                  ;LEADER ERROR. SHOULD BE BETWEEN
010440  015302                          EM5                     ;0 AND 3.
010442  177777                          -1
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010444  000672                          BR      ETOA            ;START OVER.
010446  012737  000004  001352  ETOI:   MOV     #4,CTRA         ;4 TO CTRA (CHAR COUNT)
010454  005037  003212                  CLR     BINR            ;CLEAR BINR. EXPECTED CHAR IS 0.
010460  004737  004064          ETOJ:   JSR     %7,BREAD        ;READ CHAR.
010464  004737  010530                  JSR     %7,ECHK         ;GO CHECK CHAR READ.
010470  005337  001352                  DEC     CTRA            ;DECREMENT CTRA
010474  001371                          BNE     ETOJ            ;BRANCH IF NOT 4 CHARS READ YET.
010476  104026                          INBIN           ;INITIALIZE SPECIAL BINARY COUNT.
010500  012737  001000  001352          MOV     #512.,CTRA      ;SET CHAR COUNT TO 512.
010506  004737  004064          ETOK:   JSR     %7,BREAD        ;READ CHAR.
010512  104027                          GETBNR                  ;GET BIN CHAR.
010514  004737  010530                  JSR     %7,ECHK         ;GO CHECK CHAR READ.
010520  005337  001352                  DEC     CTRA            ;DECREMENT CHAR COUNT
010524  001370                          BNE     ETOK            ;BRANCH IF NOT 512 CHARS READ YET.
010526  000641                          BR      ETOA            ;DONE. START OVER.
010530  023737  001334  003212  ECHK:   CMP     CRBUF,BINR      ;COMPARE CHAR READ AGAINST EXPECTED CHAR.
010536  001413                          BEQ     ECHKA           ;BRANCH IF EQUAL.
010540  104017                          OACNV                   ;CONVERT EXPECTED DATA TO ASCII.
010542  003212                          BINR
010544  015126                          ASB
010546  000004                          4
010550  104017                          OACNV                   ;CONVERT DATA READ TO ASCII.
010552  001334                          CRBUF
010554  015141                          AWAS
010556  000004                          4
010560  104016                          ERRORN                  ;ERROR. DATA ERROR.
010562  015103                          EM1
010564  177777                          -1
010566  000207                  ECHKA:  RTS     %7              ;EXIT
                                ;PRG3 - COMBINED READER-PUNCH TEST
                                ;USES SPECIAL BINARY COUNT PATTERN.
010570  104010                  PRG3:   TYPE                    ;TYPE TITLE.
010572  014505                          TITL3
010574  004737  005020                  JSR     PC,RDRSEL       ;SELECT READER
010600  004737  004622                  JSR     PC,PCHSEL       ;SELECT PUNCH.
010604  104011                          TYPES
010606  014551                          IM3
010610  013243                          IM6
010612  014041                          IM23
010614  177777                          -1
010616  104024                          CHALT
010620  104026                          INBIN           ;INITIALIZE BINARY COUNTS.
010622  012737  177620  004242          MOV     #177620,STLMSK  ;SET MAX. STALL DELAY.
010630  005037  011124                  CLR     PCHCNT          ;CLEAR PUNCH COUNT
010634  005037  011126                  CLR     RBUSY           ;CLEAR READER BUSY INDICATOR
010640  104013                          STRDRV                  ;SET PTRI VECTOR.
010642  011130                          WNZERO
010644  104014                          STPCHV                  ;SET PTPI VECTOR.
010646  010676                          PBIN
010650  104030                          GETBNP                  ;GET BIN CHARACTER
010652  013777  003214  170326          MOV     BINP,@PPB       ;PUNCH IT
010660  052777  000100  170316          BIS     #BIT6,@PPS      ;ENABLE PTPI
010666  005037  177776                  CLR     PSW             ;SET PRIORITY 0.
010672  104400                          TRAP                    ;TRAP CALL TO CAUSE NOISE.
010674  000776                          BR      .-2
010676  005777  170302          PBIN:   TST     @PPS            ;TEST FOR ERROR.
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010702  100004                          BPL     PBNA            ;BRANCH IF NO ERROR.
010704  104010                          TYPE                    ;TYPE PUNCH NOT READY
010706  014707                          SM3                     ;MESSAGE.
010710  104024                          CHALT
010712  000771                          BR      PBIN            ;RECHECK FOR ERROR.
010714  105777  170264          PBNA:   TSTB    @PPS            ;CHECK FOR DONE.
010720  100403                          BMI     PBNB            ;BRANCH IF DONE SET.
010722  104016                          ERRORN                  ;ERROR.FALSE PUNCH INTERRUPT.
010724  015451                          EM11
010726  177777                          -1
010730  005237  011124          PBNB:   INC     PCHCNT          ;INCREMENT PUNCH COUNT.
010734  104030                          GETBNP                  ;GET BINARY CHARACTER
010736  013777  003214  170242          MOV     BINP,@PPB       ;ENABLE PUNCH
010744  023727  011124  000144          CMP     PCHCNT,#100.    ;NOT BUSY. PUNCH COUNT 100 YET?
010752  103001                          BHIS    .+4             ;BRANCH IF YES..
010754  000002                          RTI                     ;NOT YET. EXIT INTERRUPT
010756  105737  011126                  TSTB    RBUSY           ;READER BUSY?
010762  100406                          BMI     PBNC            ;BR IF YES.
010764  052737  000200  011126          BIS     #BIT7,RBUSY     ;SET READER BUSY
010772  052777  000101  170200          BIS     #101,@PRS       ;ENABLE PTRI AND READER.
011000  023727  011124  000146  PBNC:   CMP     PCHCNT,#102.    ;PUNCH COUNT 102?
011006  101402                          BLOS    PBND            ;BR IF NOT.
011010  005077  170170                  CLR     @PPS            ;STOP PUNCH.
011014  104012                  PBND:   STALL
011016  000002                          RTI                     ;EXIT INTERRUPT.
011020  005777  170154          CREAD:  TST     @PRS            ;CHECK FOR ERROR.
011024  100003                          BPL     CRDA            ;BRANCH IF NO ERROR.
011026  004737  003772                  JSR     %7,TSM2         ;ERROR.TYPE MESSAGE.
011032  000772                          BR      CREAD
011034  105777  170140          CRDA:   TSTB    @PRS            ;TEST FOR DONE.
011040  100403                          BMI     CRDAA           ;BRANCH IF DONE SET.
011042  104016                          ERRORN                  ;ERROR. FALSE READER INTERRUPT.
011044  015421                          EM10
011046  177777                          -1
011050  017737  170126  001334  CRDAA:  MOV     @PRB,CRBUF      ;CHARACTER READ TO CRBUF
011056  005337  011124                  DEC     PCHCNT
011062  001015                          BNE     CREADC          ;BR IF NOT 0.
011064  032777  000100  170112          BIT     #BIT6,@PPS      ;NO. PTPI ENABLED?
011072  001003                          BNE     CREADA          ;BR IF YES.
011074  052777  000100  170102          BIS     #BIT6,@PPS      ;NO. ENABLE PTPI.
011102  042737  000200  011126  CREADA: BIC     #BIT7,RBUSY     ;YES. CLEAR READER BUSY.
011110  005077  170064                  CLR     @PRS            ;DISABLE PTRI.
011114  000207                          RTS     %7              ;EXIT.
011116  005277  170056          CREADC: INC     @PRS            ;ENABLE READER
011122  000207                          RTS     %7              ;EXIT.
011124  000000                  PCHCNT: OPEN
011126  000000                  RBUSY:  OPEN
011130  004737  011020          WNZERO: JSR     %7,CREAD        ;READ CHARACTER
011134  005737  001334                  TST     CRBUF           ;CHECK CHARACTER
011140  001001                          BNE     .+4             ;BRANCH IF NON-ZERO CHAR.
011142  000002                          RTI                     ;ZERO. EXIT INTERRUPT.
011144  012777  011162  170036          MOV     #RBIN,@RDRVTR   ;SET READER VECTOR TO READ BINARY
011152  012737  000003  001344          MOV     #3,ERCTR        ;COUNT. SET ERROR COUNTER TO 3.
011160  000402                          BR      RBINA
011162  004737  011020          RBIN:   JSR     %7,CREAD        ;READ CHARACTER.
011166  104027                  RBINA:  GETBNR                  ;GET BINARY CHARACTER
```

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011170  023737  003212  001334          CMP     BINR,CRBUF      ;COMPARE AGAINST CHAR READ.
011176  001001                          BNE     RBINB           ;BRANCH IF NOT SAME.
011200  000002                          RTI                     ;SAME EXIT INTERRUPT.
011202  104017                  RBINB:  OACNV                   ;CONVERT EXPECTED CHAR TO ASCII
011204  003212                          BINR
011206  015126                          ASB
011210  000004                          4
011212  104017                          OACNV                   ;CONVERT RECEIVED CHAR TO ASCII
011214  001334                          CRBUF
011216  015141                          AWAS
011220  000004                          4
011222  104016                          ERRORN                  ;ERROR MESSAGE. DATA ERROR.
011224  015103                          EM1
011226  177777                          -1
011230  005337  001344                  DEC     ERCTR           ;3RD ERROR?
011234  001001                          BNE     RBINC           ;YES.
011236  000002                          RTI                     ;NO. EXIT INTERRUPT.
011240  052737  100000  011126  RBINC:  BIS     #BIT15,RBUSY    ;DISABLE STALLS.
011246  012777  011270  167734          MOV     #RBIND,@RDRVTR  ;SET PTR VECTOR TO RBIND.
011254  012737  000004  001344          MOV     #4,ERCTR        ;USE ERCTR AS CHARACTER COUNTER.
011262  012700  001334                  MOV     #CRBUF,%0       ;ADDR OF CRBUF TO %0
011266  000002                          RTI                     ;EXIT INTERRUPT
011270  004737  011020          RBIND:  JSR     %7,CREAD        ;READ CHARACTER
011274  013720  001334                  MOV     CRBUF,(0)+      ;STORE CHARACTER STARTING AT CHR1
011300  005337  001344                  DEC     ERCTR           ;3RD CHARACTER?
011304  001401                          BEQ     .+4             ;YES.
011306  000002                          RTI                     ;EXIT INTERRUPT. NOT 3RD YET.
011310  004737  004440                  JSR     %7,SYNCA        ;GO SYNC THE READER.
011314  000751                          BR      RBINC           ;NO SYNC. TRY AGAIN.
011316  012777  011162  167664          MOV     #RBIN,@RDRVTR   ;SYNCED. SET READER VECTOR TO RBIN.
011324  012737  000003  001344          MOV     #3,ERCTR        ;SET ERROR COUNT TO 3.
011332  042737  100000  011126          BIC     #BIT15,RBUSY    ;ENABLE STALLS.
011340  000002                          RTI                     ;EXIT INTERRUPT.
                        ;PRG4 - PUNCHES 2 CHARACTERS SET IN SR.
011342  104010                  PRG4:   TYPE                    ;TYPE TITLE.
011344  013620                          TITL4
011346  004737  004622                  JSR     PC,PCHSEL       ;SELECT PUNCH.
011352  104011                          TYPES
011354  013663                          IM4
011356  013314                          IM16
011360  014041                          IM23
011362  177777                          -1
011364  104024                          CHALT                   ;COMMON HALT. WAIT FOR USER.
011366  113737  177570  001332  PRG4A:  MOVB    SR,PCHOUT       ;PUNCH FIRST CHARACTER.
011374  004737  004572                  JSR     %7,HSPCH
011400  113737  177571  001332          MOVB    SR+1,PCHOUT     ;PUNCH SECOND CHARACTER.
011406  004737  004572                  JSR     %7,HSPCH
011412  000765                          BR      PRG4A           ;REPEAT.
                        ;PRG5 - READS-CHECKS TAPE PUNCHED WITH CODES SET IN SR
011414  104010                  PRG5:   TYPE                    ;TYPE TITLE.
011416  013723                          TITL5
011420  004737  005020                  JSR     PC,RDRSEL       ;SELECT READER.
011424  104011                          TYPES
011426  014004                          IM5
011430  013243                          IM6
011432  014041                          IM23
```

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011434  177777                          -1
011436  104024                          CHALT                   ;COMMON HALT. WAIT FOR USER.
011440  113737  177570  001356          MOVB    SR,CTRC         ;STORE EXPECTED CHARACTERS.
011446  113737  177571  001360          MOVB    SR+1,CTRD       ;IN CTRC AND CTRD.
011454  004737  004064          HTOA:   JSR     %7,BREAD        ;MATCH CHARS ON TAPE AGAINST EXPECTED CHARS.
011460  013737  001334  001336          MOV     CRBUF,CHR1      ;READ CHAR INTO CHR1
011466  004737  004064                  JSR     %7,BREAD        ;READ CHAR
011472  013737  001334  001340          MOV     CRBUF,CHR2      ;INTO CHR2
011500  023737  001336  001356          CMP     CHR1,CTRC       ;(CHR1)=(CTRC)?
011506  001041                          BNE     HTOE            ;NO.
011510  023737  001340  001360          CMP     CHR2,CTRD       ;YES. (CHR2)=(CTRD)?
011516  001062                          BNE     HTOG            ;NO. MATCH ERROR.
011520  005037  001354                  CLR     CTRB            ;YES. NEXT CHAR SHOULD = (CTRC) (CTRB=0)
011524  012737  000003  001344  HTOB:   MOV     #3,ERCTR        ;3 TO ERROR COUNTER.
011532  004737  004064          HTOC:   JSR     %7,BREAD        ;READ CHAR
011536  005137  001354                  COM     CTRB            ;COMPLEMENT CHAR INDICATOR
011542  001437                          BEQ     HTOF            ;BRANCH IF EXPECTED CHAR SHOULD = (CTRD)
011544  023737  001334  001356          CMP     CRBUF,CTRC      ;(CRBUF) = (CTRC)?
011552  001767                          BEQ     HTOC            ;YES.
011554  104017                          OACNV                   ;NO. (CTRC) TO ASB IN ASCII FORM.
011556  001356                          CTRC
011560  015126                          ASB
011562  000004                          4
011564  104017                  HTOD:   OACNV                   ;(CRBUF) TO AWAS IN ASCII FORM.
011566  001334                          CRBUF
011570  015141                          AWAS
011572  000004                          4
011574  104016                          ERRORN                  ;ERROR 1 CALL. TYPE DATA ERROR MESSAGE.
011576  015103                          EM1
011600  177777                          -1
011602  005337  001344                  DEC     ERCTR           ;3 ERRORS?
011606  001722                          BEQ     HTOA            ;YES. START ALL OVER.
011610  000750                          BR      HTOC            ;NO. CONTINUE READING.
011612  023737  001336  001360  HTOE:   CMP     CHR1,CTRD       ;(CHR1) = (CTRD)?
011620  001021                          BNE     HTOG            ;NO. MATCH ERROR.
011622  023737  001340  001356          CMP     CHR2,CTRC       ;YES. (CHR2) = (CTRC)?
011630  001015                          BNE     HTOG            ;NO. MATCH ERROR.
011632  012737  177777  001354          MOV     #-1,CTRB        ;YES. NEXT CHAR SHOULD = (CTRD)
011640  000731                          BR      HTOB            ;GO START READING.
011642  023737  001334  001360  HTOF:   CMP     CRBUF,CTRD      ;(CRBUF) = (CTRD)?
011650  001730                          BEQ     HTOC            ;YES. OK. CONTINUE READING.
011652  104017                          OACNV                   ;NO. (CTRD) TO ASB IN ASCII FORM.
011654  001360                          CTRD
011656  015126                          ASB
011660  000004                          4
011662  000740                          BR      HTOD            ;GO GENERATE ERROR MESSAGE.
011664  104016                  HTOG:   ERRORN                  ;MATCH ERROR. UNABLE TO MATCH UP
011666  015361                          EM6                     ;2 CONSECUTIVE CHARACTERS FROM READER
011670  177777                          -1
011672  000670                          BR      HTOA            ;TO CHARACTERS READ FROM SR.

                                ;PRG6 - READ X CHARACTERS, STALL Y MILLISECONDS.
011674  104010                  PRG6:   TYPE                    ;TYPE TITLE AND INSTRUCTIONS.
011676  013337                          TITL6
011700  004737  005020                  JSR     PC,RDRSEL       ;SELECT READER.
011704  104010                          TYPE
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011706  013371                          IM17
011710  104024                          CHALT
011712  005037  011754          ITA:    CLR     ITY
011716  005037  011760                  CLR     ITX
011722  113737  177570  011754          MOVB    SR,ITY          ;MOVE STALL COUNT TO ITY.
011730  113737  177571  011760          MOVB    SR+1,ITX        ;MOVE CHAR COUNT TO ITX.
011736  001405                          BEQ     ITC             ;BR IF COUNT 0.
011740  004737  003714          ITB:    JSR     %7,AREAD        ;FETCH CHARACTER.
011744  105337  011760                  DECB    ITX             ;DECREMENT CHAR COUNT.
011750  001373                          BNE     ITB             ;BRANCH IF COUNT NOT 0.
011752  104031                  ITC:    DELAY                   ;READ CHARS. STALL NOW.
011754  000000                  ITY:    OPEN                    ;STALL COUNT IN MSECS.
011756  000755                          BR      ITA             ;REPEAT
011760  000000                  ITX:    OPEN
                                ;PRG7. PUNCH SPECIAL BINARY COUNT PATTERN TEST TAPE
011762  104010                  PRG7:   TYPE                    ;TYPE TITLE.
011764  013175                          TITL7
011766  004737  004622                  JSR     PC,PCHSEL       ;SELECT PUNCH.
011772  104011                          TYPES
011774  013314                          IM16
011776  177777                          -1
012000  104024                          CHALT                   ;WAIT FOR USER.
012002  012746  000024                  MOV     #20.,-(6)       ;PUNCH 20 BLANK CHAR. LEADER
012006  005037  001332                  CLR     PCHOUT
012012  004737  004572          PRG7A:  JSR     %7,HSPCH
012016  005316                          DEC     @%6
012020  001374                          BNE     PRG7A
012022  104026                          INBIN           ;INITIALIZE SPECIAL BINARY COUNT
012024  104030                  PRG7B:  GETBNP                  ;GET BINARY CHARACTER.
012026  004737  004572                  JSR     %7,HSPCH        ;PUNCH CHARACTER
012032  000774                          BR      PRG7B           ;REPEAT.
                                ;PRG10 - READER SPEED PRINT LOOP
012034  104010                  PRG10:  TYPE                    ;TYPE TITLE
012036  014062                          TITL10
012040  004737  005020                  JSR     PC,RDRSEL       ;SELECT READER.
012044  104011                          TYPES
012046  014113                          IM10
012050  014302                          IM24A
012052  177777                          -1
012054  104024                          CHALT                   ;HALT. WAIT FOR USER.
012056  005037  001356          KTA:    CLR     CTRC            ;CLEAR WORK REGISTERS
012062  005037  001354                  CLR     CTRB
012066  032737  040000  177570          BIT     #BIT14,SR       ;DETERMINE WHETHER 30 OR
012074  001403                          BEQ     KTB             ;300 SECOND TIMING IS DESIRED
012076  012737  000416  001356          MOV     #270.,CTRC      ;SET UP FOR DESIRED TIME BASE.
012104  062737  000036  001356  KTB:    ADD     #30.,CTRC
012112  000407                          BR      KTD
012114  004737  004064          KTC:    JSR     %7,BREAD        ;READ CHARACTER.
012120  005337  001352                  DEC     CTRA            ;DECREMENT CTRA
012124  001005                          BNE     KTE             ;BRANCH IF CTRA NOT 0.
012126  005237  001354                  INC     CTRB            ;CTRA0.+1 TO CTRB.
012132  013737  001356  001352  KTD:    MOV     CTRC,CTRA       ;RELOAD CTRA.
012140  005737  177570          KTE:    TST     SR              ;TIME UP?
012144  100363                          BPL     KTC             ;NO.
012146  004537  012254          KTF:    JSR     %5,CPKPL        ;GO TYPE OUT DEVICE SPEED.
012152  014732                          SM4
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012154  000737                          BR      KTA-2           ;GO HALT.
                        ;PRG11 - PUNCH SPEED PRINT LOOP
012156  104010          PRG11:  TYPE                            ;TYPE TITLE.
012160  014454                  TITL11
012162  004737  004622          JSR     PC,PCHSEL       ;SELECT PUNCH.
012166  104011                  TYPES
012170  013314                  IM16
012172  014302                  IM24A
012174  177777                  -1
012176  104024                  CHALT                           ;HALT. WAIT FOR USER.
012200  005037  001354  LTA:    CLR     CTRB            ;CLEAR WORK AREAS.
012204  005037  001332          CLR     PCHOUT
012210  000407                  BR      LTC
012212  004737  004572  LTB:    JSR     %7,HSPCH        ;PUNCH A 0
012216  005337  001352          DEC     CTRA            ;DECREMENT CTRA
012222  001005                  BNE     LTD             ;BRANCH IF CTRA NOT 0
012224  005237  001354          INC     CTRB            ;INCREMENT CTRB.
012230  012737  000074  001352  LTC:    MOV     #60.,CTRA       ;MOVE 60 TO CTRA
012236  005737  177570  LTD:    TST     SR              ;TIME UP?
012242  100363                  BPL     LTB             ;NO.
012244  004537  012254  LTE:    JSR     %5,CPKPL        ;GO TYPE OUT DEVICE SPEED.
012250  014754                  SM5
012252  000751                  BR      LTA-2           ;GO HALT AND READY UP FOR NEXT TIME.
012254  012537  012272  CPKPL:  MOV     (5)+,CPKPLA     ;MOVE ADDR OF 1ST MESSAGE TO CPKPLA.
012260  104020                  BDCNV                   ;CONVERT (CTRB) TO DECIMAL ASCII.
012262  001354                  CTRB
012264  014775                  ACPS
012266  000003                  3
012270  104011                  TYPES                           ;TYPE DEVICE SPEED.
012272  000000  CPKPLA: OPEN
012274  014775                  ACPS
012276  177777                  -1
012300  000205                  RTS     %5              ;EXIT.
                        ;
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```
                                ;
                                ;PA611 ADDITIONAL CODE TO CHECK PUNCH LOGIC AND READER LIGHTS
                                ;
                                ;MODIFIED:      MARCH 15, 1975
                                ;PROGRAMMER:    MIKE MITCHELL
                                ;
                                ;PROBLEM CORRECTED: PUNCH GETS HUNG WHEN RUNNING OUT OF TAPE
                                ;                   AND OPERATOR TURNS PUNCH OFF.  THIS PREVENTS
                                ;                   THE PUNCH FROM FINISHING THE PUNCH CYCLE
                                ;                   BY KEEPING READY LOW.
                                ;
                                ;PROBLEM FIX:   ADDITIONAL LOGIC ALLOWS PUNCH TO BE
                                ;               RE-INITED UNDER PROGRAM CONTROL.
                                ;
                                ;
                                ;THIS CODE RUNS UNDER OPERATOR INTERVENTION.
                                ;
                                ;
012302  177777                  MONE:   177777                  ;BINARY ONE PATTERN
012304  000000                  ZERO:   0                       ;ZERO PATTERN
                                ;
                                ;PROGRAM 12---HIGH SPEED PUNCH PROGRAMMABLE INIT TEST
                                ;
012306  104010                  PRG12:  TYPE
012310  015705                          TITL12                  ;TEXT '%%PRG12--PROGRAMMABLE INIT TEST@'
012312  004737  004622                  JSR     PC,PCHSEL       ;SELECT THE PUNCH
012316  104011                          TYPES
012320  013314                          IM16                    ;TEXT 'MAKE PUNCH READY'
012322  014041                          IM23                    ;TEXT 'HIT CONTINUE'
012324  177777                          -1
012326  104024                          CHALT                   ;WAIT FOR OPERATOR.

012330  042777  000006  166646  PG12B:  BIC     #6,@PPS         ;DISABLE PUNCH INTERRUPT.
012336  004737  012444                  JSR     PC,TSTPUN       ;CHECK FOR PUNCH READY.
012342  113737  012302  001332  PG12A:  MOVB    MONE,PCHOUT     ;PUNCH BINARY 1 PATTERN.
012350  004737  012372                  JSR     PC,HSPCH1       ;DO IT HERE.
012354  113737  012304  001332          MOVB    ZERO,PCHOUT     ;PUNCH BINARY ZERO PATTERN.
012362  004737  012372                  JSR     PC,HSPCH1
012366  000137  012342                  JMP     PG12A           ;LOOP
                                ;
                                ;HIGH SPEED PUNCH ROUTINE
                                ;
                                ;
012372  000240                  HSPCH1: NOP                     ;DEBUG.
                                ;PUNCH THE CHARACTER
012374  043737  001346  001332          BIC     PCHMSK,PCHOUT
012402  013777  001332  166576          MOV     PCHOUT,@PPB     ;LOAD PUNCH BUFFER.
                                                                ;WAIT FOR DONE
012410  004737  012476                  JSR     PC,TIMER        ;IN A TIMEOUT LOOP.
012414  000000                          HALT                    ;TIMED-OUT RETURN
012416  052777  000400  166560  1$:     BIS     #400,@PPS       ;RE-INIT PUNCH.
012424  032737  040000  177570          BIT     #BIT14,SR               ;SCOPE LOOP ENABLED???
012432  001371                          BNE     1$              ;YES,LOOP UNTIL SR14=0.
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012434  004737  012476                  JSR PC, TIMER           ;RE-CHECK THE DONE BIT.
012440  000000                          HALT                    ;FATAL ERROR: DONE BIT WAS NO
                                                                ;RESET BY THE INIT INSTRUCTION.

                                                                ;ELSE RETURN IS TO THE NEXT INSTRUCTION.


012442  000207                  RTS     PC                      ;EXIT
                        ;OUTPUT ERROR MESSAGE OF PUNCH NOT READY

                        ;IF ERROR BIT 15 SET OR BIT 7 NOT SET.
                        ;
012444  005777  166534  TSTPUN: TST     @PPS
012450  100404                  BMI     HSPCH2
012452  105777  166526          TSTB    @PPS
012456  100001                  BPL     HSPCH2
012460  000207                  RTS     PC
012462  104011          HSPCH2: TYPES
012464  014707                  SM3                             ;'PUNCH NOT READY''
012466  013314                  IM16                            ;'MAKE PUNCH READY''
012470  177777                  -1                              ;TERMINATOR
012472  104024                  CHALT
012474  000763                  BR      TSTPUN                  ;LOOP AGAIN
                        ;
                        ;TIMER ROUTINE FOR HIGH SPEED PUNCH
                        ;
                        ;WAITS FOR READY FLAG IN  LOOP
                        ;IF READY COMES UP WITHIN ALLOWABLE TIME ; RETURN IS TO CALL+2
                        ;ELSE INIT IS ISSUED TO HSP AND PROGRAM HALTS AT CALL+1

012476  012737  177200  001354  TIMER:  MOV     #-600,CTRB              ;MAXIMUM=600 MS DELAY
012504  000240          TIMER1: NOP
012506  005237  001354          INC     CTRB                    ;UP COUNTER
012512  001406                  BEQ     TIMER2                  ;TIMED-OUT...ERROR..
012514  105777  166464          TSTB    @PPS                    ;READY BIT SET?
012520  100405                  BMI     TIMER3                  ;YES, OK

                        ;READY NOT SET, SO DELAY 10 MS AND CHECK AGAIN.
012522  104031                  DELAY
012524  000012                  10.                             ;10 MILLI SE DELAY.
012526  000766                  BR      TIMER1                  ;GO CHECK AGAIN.

012530  000240          TIMER2: NOP
012532  000207                  RTS     PC                      ;RETURN TO CALL+1

012534  062716  000002  TIMER3: ADD     #2,(SP)                 ;RETURN TO CALL+2 IF NO ERROR
012540  000207                  RTS     PC
                        ;
                        ;
                        ;ADDITIONAL CODE TO PROVIDE READER LIGHT TEST UNDER OPERATOR
                        ;INTERVENTION.
                        ;USE SWITCH 8 TO TURN READER LIGHT OFF.
                        ;USE SWITCH 12(1) TO SELECT NEW READER TO TEST.

                        ;
                        ;
```

```
012542  104010                  PRG13:  TYPE                    ;OUTPUT TEST HEADER.
012544  015753                          TITL13                  ;TEXT 'PRG13--READER LIGHT TEST''
012546  004737  005020          PRG13C: JSR     PC,RDRSEL       ;SELECT READER VIA SWR.
012552  104011                  PRG13B: TYPES                   ;OUTPUT MESSAGE:
012554  016005                          IM13A                   ;TEXT 'TURN LIGHT ON VIA RDR SWITCH''
012556  016066                          IM13B                   ;TEXT 'USE SW8 TO TURN LIGHT
012560  177777                          -1                      ;       OFF''
                                ;SW8=1 TO TURN LIGHT OFF.
012562  013700  177570          PG13A:  MOV     SR,R0
012566  032700  000400                  BIT     #400,R0         ;CHECK BIT 8.
012572  001773                          BEQ     PG13A           ;SWITCH DOWN, NO ACTION REQUIRED.
012574  052777  000400  166376  1$:     BIS     #400,@PRS       ;ELSE TURN LIGHT OFF.
012602  032737  040000  177570          BIT     #BIT14,SR               ;IS SCOPE LOOP SET?
012610  001371                          BNE     1$              ;YES, LOOP UNTIL SR14=0.
012612  000000                          HALT                    ;WAIT FOR OPR TO HIT CONTINUE
012614  032737  010000  177570          BIT     #10000,SR       ;CHECK FOR SELECT NEW READER.
012622  001351                          BNE     PRG13C          ;YES, SELECT NEW READER.
012624  000752                          BR      PRG13B
```

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        012626  022445     120          APGEND: .ASCII  '%%P'
```

```
012631     040  020040  047105  APN:    .ASCII  '   END.@'
012636  027104     100
012641     045  037445  047111  CM2:    .ASCII  '%%?INVALID PROGRAM@'
012646  040526  044514  020104
012654  051120  043517  040522
012662  040115
012664  022445  044477  053116  CM3:    .ASCII  '%%?INVALID TEST@'
012672  046101  042111  052040
012700  051505  040124
012704  022445  042523  020124  ASETSR: .ASCII  '%%SET SR OPTIONS. NORMAL SR IS 000000@'
012712  051123  047440  052120
012720  047511  051516  020056
012726  047516  046522  046101
012734  051440  020122  051511
012742  030040  030060  030060
012750  040060
012752  022445  054524  042520  PGTIT:  .ASCII  '%%TYPESET 11 READER-PUNCH TESTS%@'
012760  042523  020124  030461
012766  051040  040505  042504
012774  026522  052520  041516
013002  020110  042524  052123
013010  022523     100
013013     045  042522  052123  RUNINS: .ASCII  '%RESTART PROGRAM.@'
013020  051101  020124  051120
013026  043517  040522  027115
013034     100
013035     045  042523  020124  MSVCTR: .ASCII  '%SET SR WITH RDR0 VECTOR.@'
013042  051123  053440  052111
013050  020110  042122  030122
013056  053040  041505  047524
013064  027122     100
013067     045  042523  020124  SELRDR: .ASCII  '%SET # OF READERS IN SR.@'
013074  020043  043117  051040
013102  040505  042504  051522
013110  044440  020116  051123
013116  040056
013120  051445  052105  021440  SELPCH: .ASCII  '%SET # OF PUNCHES IN SR.@'
013126  047440  020106  052520
013134  041516  042510  020123
013142  047111  051440  027122
013150     100
013151     045  050045  043522  TITL1:  .ASCII  '%%PRG1. PUNCH TEST.@'
013156  027061  050040  047125
013164  044103  052040  051505
013172  027124     100
013175     045  050045  043522  TITL7:  .ASCII  '%%PRG7. COUNT PATTERN TAPE GENERATOR.@'
013202  027067  041440  052517
013210  052116  050040  052101
013216  042524  047122  052040
013224  050101  020105  042507
013232  042516  040522  047524
013240  027122     100
013243     045  040515  042513  IM6:    .ASCII  '%MAKE READER READY.@'
013250  051040  040505  042504
013256  020122  042522  042101
013264  027131     100
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013267     045  050045  043522  TITL0:  .ASCII  '%%PRG0. READER TEST.@'
013274  027060  051040  040505
013302  042504  020122  042524
013310  052123  040056
013314  046445  045501  020105  IM16:   .ASCII  '%MAKE PUNCH READY.@'
013322  052520  041516  020110
013330  042522  042101  027131
013336     100
013337     045  050045  043522  TITL6:  .ASCII  '%%PRG6 - READ X, STALL Y.@'
013344  020066  020055  042522
013352  042101  054040  020054
013360  052123  046101  020114
013366  027131     100
013371     045  042523  020124  IM17:   .ASCII  '%SET SR15 TO SR8 TO NO. OF CHARS TO READ,'
013376  051123  032461  052040
013404  020117  051123  020070
013412  047524  047040  027117
013420  047440  020106  044103
013426  051101  020123  047524
013434  051040  040505  026104
013442  051445  052105  051440          .ASCII  '%SET SR7 TO SR0 TO NO. OF MSECS TO STALL.@'
013450  033522  052040  020117
013456  051123  020060  047524
013464  047040  027117  047440
013472  020106  051515  041505
013500  020123  047524  051440
013506  040524  046114  040056
013514  022445  051120  031107  TITL2:  .ASCII  '%%PRG2. PUNCH VERIFY TEST.@'
013522  020056  052520  041516
013530  020110  042526  044522
013536  054506  052040  051505
013544  027124     100
013547     045  047514  042101  IM2:    .ASCII  '%LOAD READER WITH TAPE PRODUCED '
013554  051040  040505  042504
013562  020122  044527  044124
013570  052040  050101  020105
013576  051120  042117  041525
013604  042105     040
013607     102  020131  051120          .ASCII  'BY PRG1.@'
013614  030507  040056
013620  022445  051120  032107  TITL4:  .ASCII  '%%PRG4. PUNCHES 2 CODES SET IN SR.@'
013626  020056  052520  041516
013634  042510  020123  020062
013642  047503  042504  020123
013650  042523  020124  047111
013656  051440  027122     100
013663     045  042523  020124  IM4:    .ASCII  '%SET CODES TO BE PUNCHED IN SR.@'
013670  047503  042504  020123
013676  047524  041040  020105
013704  052520  041516  042510
013712  020104  047111  051440
013720  027122     100
013723     045  050045  043522  TITL5:  .ASCII  '%%PRG5. READS TAPE PUNCHED WITH CODES SET IN SR.@'
013730  027065  051040  040505
013736  051504  052040  050101
013744  020105  052520  041516
```

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013752  042510  020104  044527
013760  044124  041440  042117
013766  051505  051440  052105
013774  044440  020116  051123
014002  040056
014004  051445  052105  041440  IM5:    .ASCII  '%SET CODES TO BE READ IN SR.@'
014012  042117  051505  052040
014020  020117  042502  051040
014026  040505  020104  047111
014034  051440  027122     100
014041     040  051120  051505  IM23:   .ASCII  ' PRESS CONTINUE.@'
014046  020123  047503  052116
014054  047111  042525  040056
014062  022445  051120  030507  TITL10: .ASCII  '%%PRG10. RDR SPEED TEST.@'
014070  027060  051040  051104
014076  051440  042520  042105
014104  052040  051505  027124
014112     100
014113     045  047514  042101  IM10:   .ASCII  '%LOAD ANY TAPE LOOP IN READER '
014120  040440  054516  052040
014126  050101  020105  047514
014134  050117  044440  020116
014142  042522  042101  051105
014150     040
014151     101  042116  046440          .ASCII  'AND MAKE READY.'
014156  045501  020105  042522
014164  042101  027131
```

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014170  051445  052105  051440          .ASCII  '%SET SR14 TO A 1 FOR 300 SEC '
014176  030522  020064  047524
014204  040440  030440  043040
014212  051117  031440  030060
014220  051440  041505     040
014225     124  046511  047111          .ASCII  'TIMING, OR SET IT TO 0 FOR 30 '
014232  026107  047440  020122
014240  042523  020124  052111
014246  052040  020117  020060
014254  047506  020122  030063
014262     040
```

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014263     123  041505  047117          .ASCII  'SECOND TIMING.@'
014270  020104  044524  044515
014276  043516  040056
```

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014302  050045  042522  051523  IM24A:  .ASCII  '%PRESS CONTINUE TO START TIMING.'
014310  041440  047117  044524
014316  052516  020105  047524
014324  051440  040524  052122
014332  052040  046511  047111
014340  027107
014342  051445  052105  051440          .ASCII  '%SET SR 15 TO A 1 AT END OF '
014350  020122  032461  052040
014356  020117  020101  020061
014364  052101  042440  042116
014372  047440  020106
014376  044524  044515  043516          .ASCII  'TIMING PERIOD TO OBTAIN DEVICE SPEED '
014404  050040  051105  047511
014412  020104  047524  047440
014420  052102  044501  020116
014426  042504  044526  042503
014434  051440  042520  042105
014442     040
014443     124  050131  047505          .ASCII  'TYPEOUT.@'
014450  052125  040056
014454  022445  051120  030507  TITL11: .ASCII  '%%PRG11. PCH SPEED TEST.@'
014462  027061  050040  044103
014470  051440  042520  042105
014476  052040  051505  027124
014504     100
014505     045  050045  043522  TITL3:  .ASCII  '%%PRG3. COMBINED READER-PUNCH TEST.@'
014512  027063  041440  046517
014520  044502  042516  020104
014526  042522  042101  051105
014534  050055  047125  044103
014542  052040  051505  027124
014550     100
014551     045  040515  042513  IM3:    .ASCII  '%MAKE PUNCH READY, PUNCH BLANK LEADER, '
014556  050040  047125  044103
014564  051040  040505  054504
014572  020054  052520  041516
014600  020110  046102  047101
014606  020113  042514  042101
014614  051105  020054
014620  047514  042101  051040          .ASCII  'LOAD READER.@'
014626  040505  042504  027122
014634     100
014635     045  042522  042101  SM1:    .ASCII  '%READER ERROR BIT SET.@'
014642  051105  042440  051122
014650  051117  041040  052111
014656  051440  052105  040056
014664  051045  040505  042504  SM2:    .ASCII  '%READER NOT READY.@'
014672  020122  047516  020124
014700  042522  042101  027131
014706     100
```

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014707     045  050045  047125  SM3:    .ASCII  '%%PUNCH NOT READY.@'
014714  044103  047040  052117
014722  051040  040505  054504
014730  040056
014732  022445  042522  042101  SM4:    .ASCII  '%%READER SPEED : @'
014740  051105  051440  042520
014746  042105  035040  040040
014754  022445  052520  041516  SM5:    .ASCII  '%%PUNCH SPEED : @'
014762  020110  050123  042505
014770  020104  020072     100
014775     040  020040  020040  ACPS:   .ASCII  '     CHARS PER SEC.@'
015002  044103  051101  020123
015010  042520  020122  042523
015016  027103     100
015021     045  050045          EM0:    .ASCII  '%%P'
015024  020040  020040     124  APNUMB: .ASCII  '    T'
015031     040  020040  020040  ATNUMB: .ASCII  '     PC'
015036  041520
015040  020040  020040  020040  APC:    .ASCII  '        ICNT '
015046  020040  041511  052116
015054     040
015055     040  020040  020040  AICNT:  .ASCII  '     .@'
015062  040056
015064  020040  050106  020103  FPCMSG: .ASCII  '  FPC '
015072  020040  020040  020040  AFPC:   .ASCII  '       %@'
015100  022440     100
015103     040  042040  052101  EM1:    .ASCII  '  DATA ERROR  S/B: '
015110  020101  051105  047522
015116  020122  051440  041057
015124  020072
015126  020040  020040  020040  ASB:    .ASCII  '      WAS: '
015134  040527  035123     040
015141     040  020040  040040  AWAS:   .ASCII  '    @'
015146  051040  051105  040505  EM2:    .ASCII  ' REREAD ERROR.  1ST READ: '
015154  020104  051105  047522
015162  027122  020040  051461
015170  020124  042522  042101
015176  020072
015200  020040  020040  020040  ORGRD:  .ASCII  '      WAS: '
015206  040527  035123     040
015213     040  020040  040040  SUBRD:  .ASCII  '    @'
015220  051440  047131  020103  EM3:    .ASCII  ' SYNC ERROR.@'
015226  051105  047522  027122
015234     100
015235     045  042514  042101  EM4:    .ASCII  '%LEADER ERROR.  S/B: '
015242  051105  042440  051122
015250  051117  020056  051440
015256  041057  020072
015262  020040  020040  020040  ESB:    .ASCII  '      WAS: '
015270  040527  035123     040
015275     040  020040  040040  EWAS:   .ASCII  '    @'
015302  046045  040505  042504  EM5:    .ASCII  '%LEADER ERROR. S/B BETWEEN '
015310  020122  051105  047522
015316  027122  051440  041057
015324  041040  052105  042527
015332  047105     040
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015335     060  040440  042116          .ASCII  '0 AND 3. WAS : '
015342  031440  020056  040527
015350  020123  020072
015354  020040  020040     100  FWAS:   .ASCII  '    @'
015361     040  040515  041524  EM6:    .ASCII  ' MATCH ERROR.@'
015366  020110  051105  047522
015374  027122     100
015377     045  047516  051040  EM7:    .ASCII  '%NO RDR RESPONSE.@'
015404  051104  051040  051505
015412  047520  051516  027105
015420     100
015421     040  040506  051514  EM10:   .ASCII  ' FALSE READER INTERRUPT@'
015426  020105  042522  042101
015434  051105  044440  052116
015442  051105  052522  052120
015450     100
015451     040  040506  051514  EM11:   .ASCII  ' FALSE PUNCH INTERRUPT@'
015456  020105  052520  041516
015464  020110  047111  042524
015472  051122  050125  040124
015500  051445  052105  051040  SRDRM:  .ASCII  '%SET RDR # IN SR. SET SR15 IF 6 LEVEL.@'
015506  051104  021440  044440
015514  020116  051123  020056
015522  042523  020124  051123
015530  032461  044440  020106
015536  020066  042514  042526
015544  027114     100
015547     045  042523  020124  SPCHM:  .ASCII  '%SET PCH # IN SR. SET SR15 IF 6 LEVEL.@'
015554  041520  020110  020043
015562  047111  051440  027122
015570  051440  052105  051440
015576  030522  020065  043111
015604  033040  046040  053105
015612  046105  040056
015616  037445  047111  040526  INVRP:  .ASCII  '%?INVALID RDR/PCH.@'
015624  044514  020104  042122
015632  027522  041520  027110
015640     100
015641     045  042122  020122  RDRIDM: .ASCII  '%RDR '
015646  020040  051440  046105  ARDRID: .ASCII  '   SELECTED.@'
015654  041505  042524  027104
015662     100
015663     045  041520  020110  PCHIDM: .ASCII  '%PCH '
015670  020040  051440  046105  APCHID: .ASCII  '   SELECTED.@'
015676  041505  042524  027104
015704     100
015705     045  050045  043522  TITL12: .ASCII  '%%PRG12--PROGRAMMABLE INIT PUNCH TEST@'
015712  031061  026455  051120
015720  043517  040522  046515
015726  041101  042514  044440
015734  044516  020124  052520
015742  041516  020110  042524
015750  052123     100
015753     045  051120  030507  TITL13: .ASCII  '%PRG13--READER LIGHT TEST@'
015760  026463  051055  040505
015766  042504  020122  044514
```

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016774  044107  020124  042524
016002  052123     100
016005     045  052045  051125  IM13A:  .ASCII  '%%TURN LIGHT OF READER ON VIA RDR CONTROL SWITCH@'
016012  020116  044514  044107
016020  020124  043117  051040
016026  040505  042504  020122
016034  047117  053040  040511
016042  051040  051104  041440
016050  047117  051124  046117
016056  051440  044527  041524
016064  040110
016066  050045  052125  051440  IM13B:  .ASCII  '%PUT SW8 TO 1 TO TURN LIGHT OFF.@'
016074  034127  052040  020117
016102  020061  047524  052040
016110  051125  020116  044514
016116  044107  020124  043117
016124  027106     100
        001450                          .END    START
```

```
A      = 100000  122#
ACPS     014775  2036    2040    2389#
ADTENP   003600   590     616#
AFPC     015072   440    2403#
AICNT    015055   459    2400#
APC      015040   447    2397#
APCHID   015670   840    2478#
APGEND   012626   326    2175#
APN      012631   323    2176#
APNUMB   015024   451    2394#
ARDB     003754   650     654    659#
ARDC     003764   660     662#
ARDRID   015646   872    2474#
AREAD    003714   646#    658    663   1073   1104   1127   1147   1172   1193   1218   1961
AROUND   001614   261     263#
ASB      015126   739    1749   1847   1919   1941   2409#
ASETSR   012704   280    2185#
ATNUMB   015031   455    2395#
AWAS     015141   743    1753   1851   1923   2411#
B      = 040000  123#
BCHECK   004274   733#   1237   1254   1271   1292   1313
BDCNV  = 104020   219#    457   2034
BDCNVA   003470   592#    595
BDCNVB   003520   597*    599#
BDCNVC   003522   588*    600#
BDCNVD   003524   589*    596    601#
BDCNVV   003436   218     585#
BELL   = 000007   116#
BINP     003214   534#    543*  1780   1798
BINR     003212   533#    554*   734    738    769    771    773   1732*  1745   1748   1842   1846
BIT0   = 000001    94#
BIT1   = 000002    93#
BIT10  = 002000    84#    313
BIT11  = 004000    83#    309
BIT12  = 010000    82#
BIT13  = 020000    81#    124    462
BIT14  = 040000    80#    123    306   1996   2098   2169
BIT15  = 100000    78      79#   122   1859   1873
BIT2   = 000004    92#
BIT3   = 000010    91#
BIT4   = 000020    90#
BIT5   = 000040    89#
BIT6   = 000100    88#    125    414    940    941    946    947    961    963   1126   1128   1148   1171
                  1173   1194   1219   1365   1366   1370   1371   1385   1387   1457   1458   1477   1478
                  1505   1528   1530   1550   1551   1781   1823   1825
BIT7   = 000200    87#    418   1804   1826
BIT8   = 000400    86#
BIT9   = 001000    85#    289    317
BMOVA    003424   579#    581
BMOVE  = 104023   222#    598
BMOVV    003414   221     575#
BRCTR    004210   688*    689*   711#
BREAD    004064   684#    695    704    710    754    755    756    758    760   1236   1253   1270   1291
                  1312   1684   1698   1720   1733   1739   1902   1904   1912   2001
BREADA   004132   696#    706
BREADB   004146   685     699#
```

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BREADC  004172            702    705#
BSYNC   004352            750    753#   763   1235  1251  1267  1288  1309
C     = 020000            124#
CACHE   000774             74#   260*
CCHE    001612            259    262#
CHAINN  002012            202    302#
CHALT = 104024            223#   238    244    250   255   273   283   300   800   814   850   1681  1770
                         1789   1884   1899   1955  1975  1993  2019  2076  2121
CHLT    002542            222    424#
CHNA    002044            307    309#
CHNAA   002062            310    313#
CHNAB   002040            308#   312
CHNAC   002030            304    306#
CHNB    002100            314    317#
CHR1    001336            189#   757*   774   1074* 1076  1082  1903* 1906  1931
CHR2    001340            190#   759*   776   1075* 1076  1086  1905* 1908  1933
CHR3    001342            191#   761*   778
CLNUP   005174            266    877#
CLNUPA  005222            882#   887
CLNUPB  005242            885    888#
CM2     012641            272    2178#
CM3     012664            299    2182#
CNVCTR  003572            591*   594*   613#
CPKPL   012254           2008   2030   2033#
CPKPLA  012272           2033*  2039#
CPRDY   004540            791#   801    803   1417  1434  1456  1476  1504  1529  1549
CPRDYA  004556            792    794    796#
CRBUF   001334            188#   697*   734    742   757   759   761   1685  1699  1706  1713  1721  1724
                         1745   1752   1820*  1834  1842  1850  1862  1865  1903  1905  1915  1922  1937
CRDA    011034           1812   1815#
CRDAA   011050           1816   1820#
CREAD   011020           1811#  1814   1833   1840  1864
CREADA  011102           1824   1826#
CREADC  011116           1822   1829#
CTRA    001352            195#  1682*  1689*  1692* 1701* 1731* 1735* 1738* 1742* 2002* 2005* 2024* 2027*
CTRB    001354            196#  1683*  1687*  1910* 1913* 1935* 1995* 2004* 2020* 2026* 2035  2130* 2132*
CTRC    001356            197#  1900*  1906   1915  1918  1933  1994* 1998* 1999* 2005
CTRD    001360            198#  1901*  1908   1931  1937  1940
CURTST  001260            164#   291    333*
DECVAL  003612            586    621#
DELAY = 104031            228#   647    651    719   978   996   1013  1641  1964  2138
DIGIT   003574            604*   607*   610*   611   614#
DLCNT   003124            505*   508    517#
DLCTR   003126            518#
DLYAN   003104            510#   514
DLYBN   003110            511#   512
DLYCN   003120            509    515#
DLYN    003064            227    505#
ECHK    010530           1734   1741   1745#
ECHKA   010566           1746   1758#
EHALT = 104025            224#   470
EHLT    002554            223    430#
EHLTA   002564            431    433#
EMTINT  002176             63    337#
EMTTAB  001364            201#   341
EMTV    000030             63#
```

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EMTX  = 000032   126# 203# 204# 205# 206# 207# 208# 209# 210# 211# 212# 213# 214#
                 215# 216# 217# 218# 219# 220# 221# 222# 223# 224# 225# 226# 227#
                 228#
EM0     015021   461  2393#
EM1     015103   746  1756  1854  1926  2405#
EM10    015421   708  1818  2446#
EM11    015451  1794  2451#
EM2     015146  1090  2412#
EM3     015220   786  1695  2420#
EM4     015235  1717  2423#
EM5     015302  1728  2430#
EM6     015361  1945  2439#
EM7     015377   656   693  2442#
ERCTR   001344   192#  748*  764*  879*  1838*  1856*  1861*  1866*  1872*  1911*  1928*
ERR     002566   215   434#
ERRB    002714   443*  444*  446   461*  465#  467*  468
ERRN    002576   216   435   436#
ERRNA   002702   462#  469
ERRNB   002716   434*  436*  463   466#
ERRNC   002734   470#
ERROR = 104015   216#  912   927   943   949   965   982   1000  1021  1023  1042  1060  1110
                 1130  1152  1175  1196  1203  1222  1338  1353  1368  1373  1389  1404  1421
                 1440  1460  1480  1487  1509  1532  1554
ERRORN= 104016   217#  655   664   692   707   745   785   1089  1694  1716  1727  1755  1793
                 1817  1853  1925  1944
ERRT    001326   185#  1704* 1705* 1706  1709
ESB     015262  1710  2427#
ETOA    010232  1682#  1697  1719  1730  1744
ETOB    010240  1683#  1693
ETOC    010246  1684#  1690
ETOD    010276  1686  1692#
ETOE    010304  1691  1694#  1703
ETOF    010314  1688  1698#  1702
ETOG    010336  1700  1704#
ETOH    010412  1707  1720#
ETOI    010446  1722  1731#
ETOJ    010460  1733#  1736
ETOK    010506  1739#  1743
EWAS    015275  1714  2429#
FORWD   002136   288   328#
FORWDA  002162   333#
FPC     001362   199#  437*  439
FPCMSG  015064  2402#
FSTPCH  001222   149#  823
FSTRDR  001220   148#  859
FSTVCT  001244   158#  239*  833   865
FWAS    015354  1725  2438#
GETBNP= 104030   227#  1571  1592  1618  1644  1779  1797  1982
GETBNR= 104027   226#  733   768   770   772   1740  1841
GETRDY  001712   284#  301   318   327
GORUN   001750   291#  295
GRCNT   004244   724#  727   1289  1310  1616
GRCNTA  004246   725#  726*  728
GTBINP  003216   226   536#
GTBINR  003274   225   547#
GTRDYA  001734   288#  297
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GTRDYB  001740            289#
GTRDYC  001754            290     292#
GTRDYD  001772            296#
GTRDYX  001720            285#    320
HSPCH   004572            803#    1572    1593    1619    1645    1656    1660    1662    1665    1886    1888    1978    1983
                          2023
HSPCH1  012372            2081    2083    2090#
HSPCH2  012462            2113    2115    2117#
HTOA    011454            1902#   1929    1947
HTOB    011524            1911#   1936
HTOC    011532            1912#   1916    1930    1938
HTOD    011564            1921#   1943
HTOE    011612            1907    1931#
HTOF    011642            1914    1937#
HTOG    011664            1909    1932    1934    1944#
I       =  000040          121#
ICNT    001266            167#    303*    305*    334*    458     877*
ICTR    001270            168#    311*    331*
IE      =  000100          125#
IM10    014113            1990    2306#
IM13A   016005            2161    2493#
IM13B   016066            2162    2502#
IM16    013314            798     1881    1973    2016    2073    2119    2236#
IM17    013371            1954    2245#
IM2     013547            1677    2264#
IM23    014041            236     242     248     281     812     848     1679    1768    1882    1897    2074    2298#
IM24A   014302            1991    2017    2329#
IM3     014551            1766    2361#
IM4     013663            1880    2278#
IM5     014004            1895    2293#
IM6     013243            666     1678    1767    1896    2228#
INBIN   =  104026         225#    753     1570    1591    1615    1640    1737    1771    1981
INBINN  003130            224     520#
INITD   001252            137*    161#    230     252*
INRND   =  104022         221#
INRNDN  003676            220     642#
INVRP   015616            818     854     2469#
IOTV    000020            59#
ITA     011712            1956#   1966
ITB     011740            1961#   1963
ITC     011752            1960    1964#
ITX     011760            1957*   1959*   1962*   1967#
ITY     011754            1956*   1958*   1965#
KBSVC   002510            130     417#    418*    419
KSTART  001256            163#    284     894*    1320*
KTA     012056            1994#   2010
KTB     012104            1997    1999#
KTC     012114            2001#   2007
KTD     012132            2000    2005#
KTE     012140            2003    2006#
KTF     012146            2008#
LTA     012200            2020#   2032
LTB     012212            2023#   2029
LTC     012230            2022    2027#
LTD     012236            2025    2028#
LTE     012244            2030#
```

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MACHER  000004            53#   909*  924*  1335*  1350*
MANUAL= 100000            78#
MONE    012302          2063#  2080
MSVCTR  013035           235   2202#
NOP   = 000240            76#   349   436
NXTST   001264           166#   284*  296   319    328    330*
OACNV = 104017           218#   321   438   445    449    453   737   741   838   870   1081  1085  1708
                        1712   1723  1747  1751   1845   1849  1917  1921  1939
OACNVA  003356           562#   571
OACNVV  003344           217    557#
OPEN  = 000000            77#   140   141   142    143    144   146   158   159   160   161   162   163
                         164    165   166   167    168    169   170   185   186   187   188   189   190
                         191    192   193   194    195    196   197   198   199   465   466   502   517
                         518    527   528   529    530    531   532   533   534   599   600   601   613
                         614    615   673   680    711    715   720   722   725   730   731   1831  1832
                        1965   1967  2039
ORGRD   015200          1083   2417#
PBIN    010676          1778   1785#  1790
PBNA    010714          1786   1791#
PBNB    010730          1792   1796#
PBNC    011000          1803   1806#
PBND    011014          1807   1809#
PCHCNT  011124          1773*  1796*  1799  1806   1821*  1831#
PCHIDM  015663           843   2477#
PCHLIM  001250           160#   251*  815
PCHLVL  001216           147#   681   1502  1526
PCHMSK  001346           193#   541   804   834*   837*   2092
PCHOUT  001332           187#   544*  804*  805    1655*  1659*  1661*  1664*  1885*  1887*  1977*  2021*  2080*
                        2082*  2092*  2093
PCHSEL  004622           810#   819   1323  1764   1878   1971   2014   2071
PCHSLA  004652           816    820#
PCHSLB  005002           836    838#
PCHVTR  001214           146#   679   826*  827*   828*   829*   830*   831*   832*   833*   1482*
PFRNT   010122          1568   1589  1613  1638   1654#
PGTIT   012752           233   2192#
PG12A   012342          2080#  2084
PG12B   012330          2078#
PG13A   012562          2165#  2167
PIND    003200           521*   528#  538*
POPSP = 005726           106#
POPSP2= 022626           107#   368   379   399    699
PPB     001206           143#   805*  824*  825*   1351   1418*  1435   1780*  1798*  2093*
PPS     001204           142#   791   793   806    820*   821*   822*   823*   824    1336   1365*  1366   1370*
                        1371   1385*  1387  1402   1419   1438   1457*  1458*  1477*  1478*  1503*  1505*  1507*
                        1528*  1530*  1550*  1551*  1781*  1785   1791   1808*  1823   1825*  2078*  2097*  2112
                        2114   2134
PRB     001202           141#   697   860*  861*   925    1057   1074   1075   1105   1108   1820
PRGID   001274           170#
PRGNUM  001254           162#   275*  322   450
PRGTAB  001276           171#   278
PRG0    005244           171    894#
PRG1    006716           172   1320#
PRG10   012034           179   1986#
PRG11   012156           180   2012#
PRG12   012306           182   2069#
PRG13   012542           183   2157#
```

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PRG13B  012552          2160#   2174
PRG13C  012546          2159#   2173
PRG2    010206           173    1673#
PRG3    010570           174    1761#
PRG4    011342           175    1876#
PRG4A   011366          1885#   1889
PRG5    011414           176    1891#
PRG6    011674           177    1950#
PRG7    011762           178    1969#
PRG7A   012012          1978#   1980
PRG7B   012024          1982#   1984
PRS     001200           140#    646*    649     653     659     686*    691*    696*    701     705     856*    857*    858*
                         859*    860     910     940*    941     946*    947     961*    963     977*    980     995*    998
                        1012*   1015    1018    1036*   1037    1039*   1040    1054*   1055    1058    1107*   1126*   1128*
                        1146*   1148*   1150*   1171*   1173*   1192*   1194*   1217*   1219*   1805*   1811    1815    1827*
                        1829*   2168*
PRTY0 = 000000           115#   1125    1191
PRTY1 = 000040           114#
PRTY2 = 000100           113#
PRTY3 = 000140           112#
PRTY4 = 000200           111#    145     147     155     157
PRTY5 = 000240           110#
PRTY6 = 000300           109#
PRTY7 = 000340            58      60      64     108#    131     265     285     700    1221    1553
PSW   = 177776            73#    265*    285*    687*    700*   1125*   1145*   1169*   1170*   1191*   1220*   1221*   1455*
                        1475*   1502*   1526*   1527*   1552*   1553*   1782*
PT0     003202           522*   529#     536     542*
PT1     003204           523*   530#     536*    537*    540*    541*    542     543     544
PUSH  = 005746           104#
PUSH2 = 024646           105#    361     393
P0AA    005304           905     910#
P0AE    005312           909     912#
P0BA    005334           920     925#
P0BB    005342           924     927#
P0DA    005356           935     940#
P0DB    005400           942     946#
P0EA    005432           957     961#
P0FA    005466           973     977#
P0FB    005506           981     984#
P0GA    005520           991     995#
P0HA    005552          1008    1012#
P0HB    005602          1016    1021#
P0HC    005606          1019    1023#
P0IA    005622          1031    1035#
P0JA    005664          1050    1054#
P0MA    005724          1068    1072#
P0MB    005742          1075#   1079
P0MC    005766          1077    1081#
P0NA    006026          1099    1103#   1106
P0OA    006074          1118    1125#
P0OB    006126          1124    1131#
P0PA    006144          1138    1145#
P0PE    006200          1144    1152#
P0QA    006220          1162    1169#
P0QB    006260          1168    1178#
P0RA    006272          1185    1189#
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P0RC    006330          1190    1198#
P0RD    006344          1199    1201#
P0RE    006350          1198    1203#
P0SA    006370          1211    1217#
P0SB    006422          1216    1224#
P0TA    006440          1231    1236#
P0TLST= 177777           117#   1299
P0T0    005266           894     902#
P0T1    005316           903     917#
P0T10   005654          1029    1047#
P0T11   005714          1048    1065#
P0T12   006016          1066    1096#
P0T13   006060          1097    1115#
P0T14   006130          1116    1135#
P0T15   006204          1136    1159#
P0T16   006262          1160    1182#
P0T17   006354          1183    1208#
P0T2    005346           918     932#
P0T20   006424          1209    1228#
P0T21   006452          1229    1242#
P0T22   006510          1243    1259#
P0T23   006562          1260    1278#
P0T24   006640          1279    1298#
P0T3    005422           933     954#
P0T4    005456           955     970#
P0T5    005510           971     988#
P0T6    005542           989    1005#
P0T7    005612          1006    1028#
P0UA    006474          1245    1252#
P0VA    006532          1262    1268#
P0VB    006542          1270#   1273
P0XA    006612          1281    1289#
P0XB    006620          1291#   1294
P0YA    006670          1301    1310#
P0YB    006676          1312#   1315
P1AA    006756          1331    1336#
P1AB    006764          1335    1338#
P1BA    007006          1346    1351#
P1BB    007014          1350    1353#
P1CA    007030          1361    1365#
P1CB    007052          1367    1370#
P1DA    007104          1381    1385#
P1EA    007140          1397    1402#
P1FA    007162          1412    1416#
P1GA    007220          1429    1433#
P1HA    007266          1448    1455#
P1HB    007316          1454    1462#
P1IA    007330          1469    1473#
P1IB    007366          1474    1482#
P1IC    007402          1483    1485#
P1ID    007406          1482    1487#
P1JA    007426          1495    1502#
P1JB    007462          1501    1509#
P1KA    007502          1519    1526#
P1KB    007542          1525    1536#
P1LA    007560          1543    1549#
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P1LB    007614            1548    1556#
P1MA    007626            1563    1567#
P1MB    007644            1571#   1574
P1NA    007700            1582    1588#
P1NB    007716            1592#   1596
P1OA    007762            1604    1612#
P1OB    010000            1616#   1624
P1OC    010006            1618#   1623
P1OD    010032            1621    1625#
P1PA    010044            1631    1637#
P1PB    010062            1641#   1650
P1PC    010074            1644#   1649
P1PD    010120            1647    1651#
P1TLST= 177777             118#   1629
P1T0    006740            1320    1328#
P1T1    006770            1329    1343#
P1T10   007320            1446    1466#
P1T11   007412            1467    1492#
P1T12   007466            1493    1516#
P1T13   007544            1517    1540#
P1T14   007616            1541    1560#
P1T15   007662            1561    1579#
P1T16   007736            1580    1601#
P1T17   010034            1602    1628#
P1T2    007020            1344    1358#
P1T3    007074            1359    1378#
P1T4    007130            1379    1394#
P1T5    007152            1395    1409#
P1T6    007210            1410    1426#
P1T7    007252            1427    1445#
RBIN    011162            1837    1840#   1871
RBINA   011166            1839    1841#
RBINB   011202            1843    1845#
RBINC   011240            1857    1859#   1870
RBIND   011270            1860    1864#
RBUSY   011126            1774*   1802    1804*   1826*   1832#   1859*   1873*
RCMSK   004270             726     730#   1287*   1308*   1611*
RCNT    001330             186#   1567*   1573*   1588*   1595*   1612*   1620*   1637*   1646*
RDRIDM  015641             875    2473#
RDRLIM  001246             159#    245*    826     851
RDRLVL  001212             145#    674    1145    1169
RDRMSK  001350             194#    552     866*    869*   1705
RDRSEL  005020             846#    855     897    1675    1763    1893    1952    1988    2159
RDRSLA  005050             852     856#
RDRSLB  005156             868     870#
RDRVTR  001210             144#    672     862*    863*    864*    865*   1198*   1837*   1860*   1871*
RIND    003176             520*    521     522     523     524     525     527#    549*
RNCNT   004272             728*    731#   1268*   1272*   1293*   1314*   1622*   1643*   1648*
RNDNUM= 104021             220#    714     724
RNGEN   003620             219     624#
RP1     003672             625     629*    636     639#    642*
RP2     003674             628     632     635*    640#    643*
RST03 = 104003             206#    515
RST05 = 104005             208#    411     780     788
RST05S= 104007             210#    427     479     572     582     602     637
RST5S = 000004             128#    471     499
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RS03     002316              205     368#
RS05     002346              207     379#
RS05S    002342              209     377#
RS5S     002426               59     398#
RTNNO    001262              165#    294     315     329*    454     878*
RT0      003206              524*    531#    547     553*
RT1      003210              525*    532#    547*    548*    551*    552*    553     554
RUNINS   013013              254    2198#
SAV03  = 104002              205#    507
SAV05  = 104004              207#    406     766
SAV05S = 104006              209#    424     474     557     575     585     624
SAV5S  = 000003              127#    442     495
SCOPE  = 104000              203#    911     913     926     928     945     950     966     984    1001    1020    1022    1024
                            1043    1061    1080    1092    1111    1131    1151    1155    1178    1197    1202    1204    1224
                            1238    1255    1274    1295    1316    1337    1339    1352    1354    1369    1374    1390    1405
                            1422    1441    1462    1481    1486    1488    1508    1512    1536    1556    1575    1597    1625
                            1651
SCOPTR   001272              169#    308     332*
SELPCH   013120              247    2212#
SELRDR   013067              241    2207#
SM1      014635              665    2371#
SM2      014664             2375#
SM3      014707              797    1788    2118    2379#
SM4      014732             2009    2383#
SM5      014754             2031    2386#
SPBOT  = 001200               75#    229     286     302
SPCHM    015547              811    2462#
SR     = 177570               72#    239     245     251     267     289     292     306     309     313     317     430     462
                             815     820     830     835     839     851     856     862     867     871    1885    1887    1900
                            1901    1958    1959    1996    2006    2028    2098    2165    2169    2172
SRDRM    015500              847    2455#
SRESET=  104001              204#    277     287     962    1035    1103    1386    1416    1433
SRSET    001700              279#    898    1324
SRSETA   002506              413     415#
SRSETT   002452              203     406#    409*
STAL     004212              212     714#
STALA    004236              718*    720#
STALB    004240              717     721#
STALL  = 104012              213#    1252    1269    1290    1311    1594    1617    1809
START    001450              133     138     229#    2508
STLA     004214              715#    716*    718
STLMSK   004242              716     722#   1250*   1266*   1286*   1307*   1587*   1610*   1772*
STPCHV=  104014              215#    1453    1473    1500    1524    1547    1777
STPPA    004052              677*    680#
STPRA    004022              670*    673#
STPTPV   004034              214     677#
STPTRV   004004              213     670#
STRDRV=  104013              214#    684     1123    1143    1167    1189    1215    1775
STRTA    001564              231     257#    274
STRTB    001664              270     275#
SUBRD    015213             1087    2419#
SUBTEN   003532              593     604#
SUBTNA   003536              605#    608
SUBTNB   003552              606     609#
SV03     002216              204     344#
SV05     002246              206     352#
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SV05A   002254              350     353#
SV05B   002270              347     357#
SV05C   002302              346*    349*    352*    362#
SV05S   002236              208     349#
SV5S    002376               57     389#
SYNCA   004440              762     766#   1869
SYNCB   004446              768#    784
SYNCC   004522              775     777     779     783#
TENPWR  003576              592*    605     609     615#
TIMER   012476             2095    2100    2130#
TIMER1  012504             2131#   2140
TIMER2  012530             2133    2142#
TIMER3  012534             2135    2145#
TITL0   013267              896    2232#
TITL1   013151             1322    2217#
TITL10  014062             1987    2301#
TITL11  014454             2013    2349#
TITL12  015705             2070    2481#
TITL13  015753             2158    2488#
TITL2   013514             1674    2259#
TITL3   014505             1762    2354#
TITL4   013620             1877    2272#
TITL5   013723             1892    2284#
TITL6   013337             1951    2240#
TITL7   013175             1970    2221#
TKB     001226              151#    417
TKLVL   001236              155#
TKS     001224              150#    414*
TKVTR   001234              154#
TLAST = 177777              119#
TPB     001232              153#    485*
TPLVL   001242              157#
TPS     001230              152#    486
TPVTR   001240              156#
TRC   = 000003              120#
TRCV    000014               57#
TRPV    000034               65#
TSM2    003772              662     664#    703     1813
TSTPUN  012444             2079    2112#   2122
TYP     002742              210     474#
TYPA    002746              476#    484     493
TYPC    002762              478     481#
TYPD    002776              483     485#    490     492
TYPE  = 104010              211#    232     253     271     298     325     464     501     817     842     853     874     895
                           1321    1673    1761    1787    1876    1891    1950    1953    1969    1986    2012    2069    2157
TYPES = 104011              212#    234     240     246     279     796     810     846    1676    1765    1879    1894    1972
                           1989    2015    2038    2072    2117    2160
TYPF    003012              482     489#
TYPG    003022              491#
TYPS    003034              211     495#    503
TYPSA   003056              498     501#
TYPSB   003060              496*    497     502#
WNZERO  011130             1776    1833#
X     = 000017              892#    900     906#    915     921#    930     936#    952     958#    968     974#    986     992#
                           1003    1009#   1026    1032#   1045    1051#   1063    1069#   1094    1100#   1113    1119#   1133
                           1139#   1157    1163#   1180    1186#   1206    1212#   1226    1232#   1240    1246#   1257    1263#
```

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                    1276    1282#   1296    1302#   1318#   1326    1332#   1341    1347#   1356    1362#   1376    1382#
                    1392    1398#   1407    1413#   1424    1430#   1443    1449#   1464    1470#   1490    1496#   1514
                    1520#   1538    1544#   1558    1564#   1577    1583#   1599    1605#   1626    1632#
Y       = 000001     893#    900     915     930     952     968     986    1003    1026    1045    1063    1094    1113
                    1133    1157    1180    1206    1226    1240    1257    1276    1296    1319#   1326    1341    1356
                    1376    1392    1407    1424    1443    1464    1490    1514    1538    1558    1577    1599    1626
ZERO    012304      2064#   2082
.       = 016127      50#     51      53      55      61      65      67#     70     129#    132#    134#    139#    256
                     420     487     539     550     690     735     749     807     948     964     999    1038    1041
                    1056    1059    1109    1372    1388    1403    1420    1439    1658    1667    1784    1800    1835
                    1867
```