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/HIGH SPEED READER/PUNCH TESTS
/DHPCA VER A MARCH 1977
/1.0    ABSTRACT
/       THE PC8-E HIGH-SPEED READER AND PUNCH TESTS ARE A TEST PACKAGE
/       USED TO TEST THE TYPE PC02 AND PC03 HIGH-SPEED READER-PUNCH WHEN
/       ATTACHED TO A PDP8/E SYSTEM. THE TESTS PERFORM BASIC INPUT AND
/       OUTPUT CONTROL LOGIC TESTS, READER AND PUNCH TESTS, READER AND
/       PUNCH SPEED PRINTOUTS, AND PROVIDE MAINTENANCE LOOPS USEFUL IN
/       ADJUSTING THE READER AND PUNCH
/
/       THE AVAILABLE TEST PROGRAMS ARE:
/
/       PRG0    - BASIC READER AND READER CONTROL LOGIC TESTS
/       PRG1    - BASIC PUNCH AND PUNCH CONTROL LOGIC TEST
/       PRG2    - READER TEST. SPECIAL BINARY COUNT PATTERN
/       PRG3    - PUNCH TEST. SPECIAL BINARY COUNT PATTERN
/       PRG4    - PUNCH VERIFY. SPECIAL BINARY COUNT PATTERN
/       PRG5    - PUNCH TEST. RANDOM CHARACTERS
/       PRG6    - PUNCH VERIFY. RANDOM CHARACTERS
/       PRG7    - COMBINED READER-PUNCH TEST. SPECIAL BINARY
/                 COUNT PATTERN
/       PRG10   - READ AMPLIFIER ADJUSTMENT LOOP. 1'S AND 0'S TAPE
/       PRG11   - PUNCH ANY CHARACTER IN SR LOOP
/       PRG12   - 1'S AND 0'S PUNCH LOOP
/       PRG13   - READER SPEED PRINT LOOP
/       PRG14   - PUNCH SPEED PRINT LOOP
/       PRG15   - READ X CHARACTERS. STALL Y MS LOOP
/
/2.0    REQUIREMENTS
/2.1    EQUIPMENT
/
/       PDP8/E WITH ASR33/35 TELETYPE, PR8-E READER, OR PR8-E PUNCH, OR
/       PC8-E READER/PUNCH. THE FOLLOWING TAPED ARE REQUIRED IN CON-
/       JUNCTION WITH THIS TEST:
/
/       MAINDEC-08-D2G1-PT
/       MAINDEC-08-D2G2-PT
/       MAINDEC-08-D2G4-PT
/
/2.2    STORAGE
/
/       LOCATIONS 0000 THROUGH 4377 ARE USED.
/
/2.3    PRELIMINARY PROGRAMS
/
/       ALL BASIC CPU AND TELETYPE MAINDEC MUST HAVE BEEN RUN SUCCESS-
/       FULLY.
/
/3.0    LOADING PROCEDURE
/
/       THE BINARY LOADER IS USED TO LOAD THE PROGRAM
/
/4.0    USE PROCEDURES
/
/       THE FOLLOWING PAGES EXPLAIN IN DETAIL THE STEPS NECESSARY TO
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                /       RUN EACH PROGRAM
                /
                /4.1    PRG0 USE PROCEDURE
                /
                /       A. INSURE THAT THE TELETYPE IS ONLINE.
                /       B. LOAD READER WITH ALL 0'S TEST TAPE. PREFERABLY THE TAPE
                /          SHOULD BE SPLICED INTO A LOOP.
                /       C. LOAD ADDRSS 0200.
                /       D. SET SR TO 0000. PRESS START.
                /       E. PROGRAM HALTS AT LOC 0242 TO PERMIT SETTING OF SR OPTIONS
                /          SET DESIRED OPTIONS AND PRESS CONTINUE.
                /
                /                       PRG0 SR OPTIONS
                /       SR0     HALT AT ROUTINE END. ROUTINE NUMBER IN AC
                /       SR1     SELECT ROUTINE WHOSE NUMBER IS SET IN SR8-SR11.
                /       SR2     LOOP PROGRAM.
                /       SR3     0=HALT ON ERROR. 1=DO NOT HALT ON ERROR.
                /       SR4     SKIP TEST AFTER ERROR.
                /       SR5     ENTER SCOPE LOOP AFTER ERROR
                /       SR8
                /       THROUGH ROUTINE NUMBER TO BE SELECTED
                /       SR11
                /
                /       F. THE PROGRAM RUNS AND HALTS AT PROGRAM END HALT, AT LOC 0305
                /          UNLESS PREVENTED FROM ENDING BY ERRORS, OR SR OPTIONS.
                /
                /4.2    PRG1 USE PROCEDURE
                /
                /       A. INSURE THAT THE TELETYPE IS ONLINE.
                /       B. MAKE PUNCH READY, INSURING THAT THERE ARE SEVERAL INCHES OF
                /          BLANK LEADER.
                /       C. LOAD ADDRSS 0200.
                /       D. SET SR TO 0001. PRESS START.
                /       E. PROGRAM HALTS AT LOC 0242 TO PERMIT SETTING OF SR OPTIONS
                /          SET DESIRED OPTIONS AND PRESS CONTINUE.
                /
                /                       PRG1 SR OPTIONS
                /       SR0     HALT AT ROUTINE END. ROUTINE NUMBER IN AC
                /       SR1     SELECT ROUTINE WHOSE NUMBER IS SET IN SR8-SR11.
                /       SR2     LOOP PROGRAM.
                /       SR3     0=HALT ON ERROR. 1=DO NOT HALT ON ERROR.
                /       SR4     SKIP TEST AFTER ERROR.
                /       SR5     ENTER SCOPE LOOP AFTER ERROR
                /       SR8
                /       THROUGH ROUTINE NUMBER TO BE SELECTED
                /       SR11
                /
                /       F. THE PROGRAM RUNS AND HALTS AT PROGRAM END HALT, AT LOC 0305
                /          UNLESS PREVENTED FROM ENDING BY ERRORS, OR SR OPTIONS.
                /
                /                       NOTE
                /
                /       THE RESULTING PUNCHED TAPE MUST BE INSPECTED VISUALLY.
                /       EXCEPT FOR TWO 500 CHARACTER BLOCKS CONTAINING PUNCHES
                /       IN ALTERNATE CHANNELS, THE REMAINDER OF THE TAPE SHOULD
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111                /       BE BLANK.
112                /
113                /4.3    PRG2 USE PROCEDURE
114                /
115                /       A. INSURE THAT THE TELETYPE IS ONLINE.
116                /       B. LOAD READER WITH SPECIAL BINARY COUNT PATTERN TEST LOOP.
117                /       C. LOAD ADDRSS 0200.
118                /       D. SET SR TO 0002. PRESS START.
119                /       E. PROGRAM RUNS CONTINUOUSLY UNLESS ERRORS OCCUR.
120                /
121                /                       PRG2 SR OPTIONS
122                /
123                /       SR3     =0-HALT ON ERROR. SR3=1-NO HALT ON ERROR.
124                /       SR6     =0-STALL (RANDOM), SR6=1-RUN FULL SPEED
125                /       SR7     LOCK IN CURRENT STALL (SR6 MUST BE 0)
126                /
127                /4.4    PRG3 USE PROCEDURE
128                /
129                /       A. INSURE THAT THE TELETYPE IS ONLINE.
130                /       B. MAKE PUNCH READY.
131                /       C. LOAD ADDRSS 0200.
132                /       D. SET SR TO 0003. PRESS START.
133                /       E. THE PROGRAM PUNCHES SPECIAL BINARY COUNT PATTERN CONTIN-
134                /          UOUSLY UNTIL STOPPED BY USER.
135                /
136                /                       PRG3 SR OPTIONS
137                /
138                /       SR6     =0-STALL (RANDOM), SR6=1-RUN FULL SPEED
139                /       SR7     LOCK IN CURRENT STALL (SR6 MUST BE 0)
140                /
141                /4.5    PRG4 USE PROCEDURE
142                /
143                /       A. INSURE THAT THE TELETYPE IS ONLINE.
144                /       B. LOAD READER WITH TAPE PUNCHED BY PRG3, BLANK LEADER SHOULD
145                /          BE UNDER READ STATION. WITH "UP" MARKER TO THE LEFT.
146                /       C. LOAD ADDRSS 0200.
147                /       D. SET SR TO 0004. PRESS START.
148                /       E. PROGRAM RUNS CONTINUOUSLY UNLESS ERRORS OCCUR, OR UNTIL
149                /          THE READER RUNS OUT OF TAPE.
150                /
151                /                       PRG4 SR OPTIONS
152                /
153                /       SR3     =0-HALT ON ERROR. SR3=1-NO HALT ON ERROR.
154                /
155                /                       NOTE
156                /
157                /       DISREGARD ERRORS TAHT OCCUR WHEN THE END OF SPECIAL
158                /       BINARY COUNT PATTERN IS REACHED.
159                /
160                /4.6    PRG5 USE PROCEDURE
161                /
162                /       A. INSURE THAT THE TELETYPE IS ONLINE.
163                /       B. MAKE PUNCH READY.
164                /       C. LOAD ADDRSS 0200.
165                /       D. SET SR TO 0005. PRESS START.
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166                /       E. THE PROGRAM PUNCHES RANDOM CHARACTERS CONTINUOUSLY
167                /          UNTIL STOPPED BY USER.
168                /
169                /                       PRG5 SR OPTIONS
170                /
171                /       SR6     =0-STALL (RANDOM), SR6=1-RUN FULL SPEED
172                /       SR7     LOCK IN CURRENT STALL (SR6 MUST BE 0)
173                /
174                /4.7    PRG6 USE PROCEDURE
175                /
176                /       A. INSURE THAT THE TELETYPE IS ONLINE.
177                /       B. LOAD READER WITH TAPE PUNCHED BY PRG5, BLANK LEADER SHOULD
178                /          BE UNDER READ STATION. WITH "UP" MARKER TO THE LEFT.
179                /       C. LOAD ADDRSS 0200.
180                /       D. SET SR TO 0006. PRESS START.
181                /       E. PROGRAM RUNS CONTINUOUSLY UNLESS ERRORS OCCUR, OR UNTIL
182                /          THE READER RUNS OUT OF TAPE.
183                /
184                /                       PRG4 SR OPTIONS
185                /
186                /       SR3     =0-HALT ON ERROR. SR3=1-NO HALT ON ERROR.
187                /
188                /                       NOTE
189                /
190                /       DISREGARD ERRORS TAHT OCCUR WHEN THE END OF SPECIAL
191                /       BINARY COUNT PATTERN IS REACHED.
192                /
193                /4.8    PRG7 USE PROCEDURE
194                /
195                /       A. INSURE THAT THE TELETYPE IS ONLINE.
196                /       B. MAKE PUNCH READY, PUNCH ABOUT 20 INCHES (MAXIMUM) OF BLANK
197                /          LEADER, AND LOAD READER WITH THE BLANK LEADER. THE PUNCH
198                /          TO READER SLACK SHOULD NOT BE EXCESSIVE.
199                /       C. LOAD ADDRSS 0200.
200                /       D. SET SR TO 0007. PRESS START.
201                /       E. THE PROGRAM PUNCHES AND READ CHECKS SPECIAL BINARY COUNT
202                /          PATTERN CONTINUOUSLY UNTIL ERROR OCCURS, OR SUPPLY OF TAPE
203                /          IS EXHAUSTED.
204                /
205                /                       PRG7 SR OPTIONS
206                /
207                /       SR3     =0-HALT ON ERROR. SR3=1-NO HALT ON ERROR.
208                /       SR6     =0-STALL (RANDOM), SR6=1-RUN FULL SPEED
209                /       SR7     LOCK IN CURRENT STALL (SR6 MUST BE 0)
210                /
211                /4.9    PRG10 USE PROCEDURE
212                /
213                /       A. INSURE THAT THE TELETYPE IS ONLINE.
214                /       B. LOAD READER WITH 1'S AND 0'S TEST TAPE LOOP.
215                /       C. LOAD ADDRSS 0200.
216                /       D. SET SR TO 0010. PRESS START.
217                /       E. PROGRAM RUNS CONTINUOUSLY UNTIL STOPPED BY USER. WITH
218                /          THE PROGRAM RUNNING, THE USER CAN ADJUST THE READ
219                /          AMPLIFIERS.
220                /
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/4.10   PRG11 USE PROCEDURE
/
/       A. INSURE THAT THE TELETYPE IS ONLINE.
/       B. MAKE PUNCH READY.
/       C. LOAD ADDRSS 0200.
/       D. SET SR TO 0011. PRESS START.
/       E. THE PROGRAM PUNCHES CONTINUOUSLY THE CODE SET IN SWITCHES
/          4 TO 11. THE SWITCHES MAY BE CHANGED AT ANY TIME.
/
/4.11   PRG12 USE PROCEDURE
/
/       A. INSURE THAT THE TELETYPE IS ONLINE.
/       B. MAKE PUNCH READY.
/       C. LOAD ADDRSS 0200.
/       D. SET SR TO 0012. PRESS START.
/       E. THE PROGRAM PUNCHES 1'S AND 0'S TAPE CONTINUOUSLY.
/
/                       PRG12 SR OPTIONS
/
/       SR6     =0-STALL (RANDOM), SR6=1-RUN FULL SPEED
/       SR7     LOCK IN CURRENT STALL (SR6 MUST BE 0)
/
/4.12   PRG13 USE PROCEDURE
/
/       PRG13 IS USED TO TIME THE HIGH SPEED READER WITH THE AID OF A
/       WATCH WITH SWEEP SECOND HAND. THE READER CAN BE TIMED IN 2
/       WAYS:
/
/       A. 30 SECOND TIMING. USED FOR APPROXIMATE SPEED SETTINGS.
/       B. 300 SECOND TIMING (5 MINUTES) FOR ACCURATE AND FINAL
/          VERIFICATION OF READER SPEED
/
/       TO TIME THE READER PROCEED AS FOLLOWS:
/
/       A. INSURE TELETYPE IS ON-LINE
/       B. LOAD ANY TAPE IN READER
/       C. LOAD ADDRESS 0200
/       D. SET SR TO 0013
/       E. FOR 30 SECOND TIMING, LEAVE SR1=0, FOR 300 SECOND TIMING
/          SET SR1 TO A 1
/       F. PRESS START, READER WILL RUN CONTINUOUSLY
/       G. WHEN THE 30 OR 300 SECOND TIME IS UP, TURN ON SR0, AND THEN
/          TURN IT OFF. THE PROGRAM WILL TYPE OUT THE READER
/          SPEED IN CHARACTERS PER SECOND (CPS)
/       H. PROGRAM HALTS AT LOC 4230 AFTER PRINTOUT
/       I. TO RETIME THE READER, PRESS CONTINUE AFTER MAKING SURE THAT
/          SR0 IS OFF, AND THAT SR1 IS SET TO THE CORRECT TIME BASE
/
/                       NOTE
/
/          ACCURATE READER SPEED MEASUREMENT DEPENDS ON THE USER'S
/          ATTENTION TO THE STARTING AND STOPPING TIMES
/
/4.13   PRG14 USE PROCEDURE
/
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276                /       PRG14 IS USED TO TIME THE HIGH SPEED PUNCH WITH THE AID OF A
277                /       WATCH WITH SWEEP SECOND HANDD. THE PUNCH IS TIMES OVER A PERIOD
278                /       OF 60 SECONDS. TO TIME THE PUNCH, PROCEED AS FOLLOWS:
279                /
280                /       A. INSURE TELETYPE IS ONLINE
281                /       B. MAKE PUNCH READY
282                /       C. LOAD ADDRSS 0200
283                /       D. SET SR TO 0014
284                /       E. PRESS START. PUNCH RUNS CONTINUOUSLY.
285                /       F. AFTER 60 SECONDS TURN ON SR0, AND THEN TURN IT OFF.
286                /          THE PROGRAM WILL TYPE OUT THE PUNCH SPEED IN CHARACTERS
287                /          PER SECOND (CPS).
288                /       G. PROGRAM HALTS AT LOC 4255 AFTER PRINTOUT.
289                /       H. TO REIME THE PUNCH, PRESS CONTINUE AFTER MAKING SURE THAT
290                /          SR0 IS OFF
291                /
292                /                       NOTE
293                /
294                /          ACCURATE READER SPEED MEASUREMENT DEPENDS ON THE USER'S
295                /          ATTENTION TO THE STARTING AND STOPPING TIMES
296                /
297                /4.14   PRG15 USE PROCEDURE
298                /
299                /       A. LOAD ANY TAPE IN READER
300                /       B. LOAD ADDRESS 0200
301                /       C. SET SR TO 0015. PRESS START
302                /       D. PROGRAM HALTS AT LOC 4332
303                /       E. SET SR SWITCHES 0 THROUGH 4 TO NUMBER OF CHARACTERS TO
304                /          READ (1 TO 37 OCTAL)
305                /       F. SET SR SWITCHES 5 THROUGH 11 TO NUMBER OF MILLISECONDS TO
306                /          STALL AFTER READING CHARACTERS (1 TO 177 OCTAL)
307                /       G. PRESS CONTINUE
308                /       H. PROGRAM RUNS CONTINUOUSLY, READING THE SPECIFIED NUMBER OF
309                /          CHARACTERS, AND STALLING FOR THE SPECIFIED NUMBER OF
310                /          MILLISECONDS
311                /
312                /                       NOTE
313                /
314                /          THE NUMBER OF CHARACTERS READ AND/OR THE STALL COUNT CAN
315                /          BE CHANGED AT ANY TIME. THIS PROGRAM DOES NOT CHECK FOR
316                /          CORRECT DATA, IT IS INTENDED PRIMARILY AS AN AID IN
317                /          ADJUSTING READER TIMINGS.
318                /
319                /5.     OPERATING PROCEDURES
320                /
321                /5.1    PROGRAM AND/OR OPERATOR ACTION
322                /
323                /5.1.1  NORMAL HALTS
324                /
325                /       LOC 0242        SR OPTIONS HALT. THIS HALT OCCURS DURING EXECU-
326                /                       TION OF PRG0 AND PRG1 TO PERMIT SETTING OF DE-
327                /                       SIRED OPTIONS. PRESS CONTINUE TO PROCEED.
328                /       LOC 0305        PROGRAM END HALT. OCCURS AT END OF PRG0 AND
329                /                       PRG1. IF "LOOP PROGRAM" OPTION IS NOT SET
330                /                       SET DESIRED OPTIONS, AND PRESS CONTINUE. IF NO
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                /                       OPTIONS ARE SET, THIS HALT REOCCURS.
                /       LOC 0340        ROUTINE END HALT. OCCURS DURING EXECUTION OF
                /                       PRG0 AND PRG1 IF SR0 IS 1.
                /       LOC 4230        THIS HALT OCCURS IN PRG13 AFTER PROGRAM TYPES
                /                       THE READER SPEED IN CHARACTERS PER SECOND. TO
                /                       RETIME THE READER, PRESS CONTINUE AFTER MAKING
                /                       SURE THAT SR0 IS OFF, AND THAT SR1 IS SET TO
                /                       THE CORRECT TIME BASE.
                /       LOC 4255        THIS HALT OCCURS IN PRG14 AFTER PROGRAM TYPE
                /                       THE PUNCH SPEED IN CHARACTERS PER SECOND. TO
                /                       RETIME THE PUNCH, PRESS CONTINUE AFTER MAKING
                /                       SURE THAT SR0 IS OFF.
                /       LOC 4332        PRG15 SR SET HALT. OCCURS TO PERMIT SETTING OF
                /                       DESIRED CHARACTER AND STALL COUNT. SET SR0-4 TO
                /                       NUMBER OF CHARACTERS TO BE READ. SET SR5-11 TO
                /                       NUMBER OF MILLISECONDS TO STALL AFTER READING
                /                       CHARACTERS, PRESS CONTINUE
                /
                /6.0    ERRORS
                /
                /6.1    ERROR PRINTOUTS ARE IDENTIFIED BY AN ASTERISK (*) PRECEDING THE
                /       PRINTOUT. MOST ERROR PRINTOUTS TAKE THE FORM:
                /
                /               *P00XX R00XXY ZZZZZ
                /       WHERE
                /               P00XX=PROGRAM NUMBER
                /               R00XX=ROUTINE NUMBER IN PROGRAM
                /                   Y=A LETTER. INDICATES WHICH ERROR OCCURRED WITHIN A
                /                     ROUTINE. IF NO LETTER IS PRINTED, ONLY ONE ERROR
                /                     IS POSSIBLE IN THE ROUTINE.
                /               ZZZZZ=ADDITIONAL INFORMATION PRINTOUT
                /
                /       FOLLOWING AN ERROR PRINTOUT THE PROGRAM HALTS IF SR3 (HALT-ON-
                /       ERROR OPTION) IS OFF, AND THE OPTION APPLIES TO THE PROGRAM.
                /
                /               *P0000 R0001
                /
                /       WITH READ FLAG = 1, RSF (IOT011) COMMAND FAILED TO SKIP.
                /
                /               *P0000 R0002
                /
                /       RRB(IOT012) FAILED TO CLEAR FLAG, OR RSF(IOT011) SKIPPED
                /       WITH FLAG=0.
                /
                /               *P0000 R0003
                /
                /       SKIP NOT GENERATED WITH INTERRUPT OFF, OR 6010 (RPE)
                /       MALFUNCTION.
                /
                /               *P0000 R0004
                /
                /       PCE (6020) MALFUNCTION. INTERRUPT ENABLE NOT CLEARED
                /
                /               *P0000 R0005
                /
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386                 /       RRB (IOT012) COMMAND FAILED TO CLEAR FLAG
387                 /
388                 /               *P0000 R0006
389                 /
390                 /       RFC (IOT014) FAILED TO CLEAR FLAG
391                 /
392                 /               *P0000 R0007
393                 /
394                 /       RRB (IOT012) COMMAND RESULTED IN NON-ZERO CHARACTER SET INTO AC.
395                 /       SHOULD BE ALL 0'S. AN ALL 0'S TEST TAPE SHOULD BE IN THE READER
396                 /
397                 /               *P0000 R0010A
398                 /
399                 /       UNEXPECTED INTERRUPT AFTER CLEARING REDER PUNCH, TTY PUNCH,
400                 /       AND TTY READER. TURN OFF INTERRUPTING DEVICE
401                 /
402                 /               *P0000 R0010B
403                 /
404                 /       WITH READER FLAG SET, READER FAILED TO INTERRUPT.
405                 /
406                 /               *P0000 R0011A
407                 /
408                 /       "STOP DELAY" NOT FIRING OR SET FOIR TOO SHORT A DURATION, REFER
409                 /       TO SECTION 9 FOR TEST DESCRIPTION
410                 /
411                 /               *P0000 R0011B
412                 /
413                 /       "STOP DELAY" TIME OUT IS TOO LONG. REFER TO SECTION 9 FOR TEST
414                 /       DESCRIPTION
415                 /
416                 /               *P0001 R0000
417                 /
418                 /       PSF (IOT021) COMMAND SKIPPED WITH FLAG = 0, OR, LESS LIKELY
419                 /       PCF(IOT022) FAILED TO CLEAR FLAG.
420                 /
421                 /               *P0001 R0001
422                 /
423                 /       PSF(IOT021) FAILED TO SKIP WITH FLAG = 1, OR FLAG IS NOT SET.
424                 /
425                 /               *P0001 R0002
426                 /
427                 /       PCF(IOT022) FAILED TO CLEAR FLAG
428                 /
429                 /               *P0001 R0003
430                 /
431                 /       DID NOT SKIP WITH INTERRUPT DISABLED
432                 /
433                 /               *P0001 R0004
434                 /
435                 /       COULD NOT CLEAR INTERRUPT ENABLE FOR PUNCH
436                 /
437                 /               *P0001 R0010A
438                 /
439                 /       UNEXPECTED INTERRUPT AFTER CLEARING PUNCH, READER, TTY PUNCH
440                 /       AND TTY READER. TURN OFF INTERRUPTING DEVICE.
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441                 /
442                 /               *P0001 R0010B
443                 /
444                 /       WITH PUNCH FLAG SET, PUNCH FAILED TO INTERRUPT
445                 /
446                 /               *P0002 R0000    S/B     XXXX    WAS     YYYY
447                 /               *P0004 R0000    S/B     XXXX    WAS     YYYY
448                 /               *P0006 R0000    S/B     XXXX    WAS     YYYY
449                 /               *P0007 R0000    S/B     XXXX    WAS     YYYY
450                 /               *P0010 R0000    S/B     XXXX    WAS     YYYY
451                 /
452                 /       ONE OF THE ABOVE PRINTOUTS OCCURS DURING ITS RESPECTIVE PROGRAM
453                 /       WHEN THE DATA READ FROM PAPER TAPE AND THE EXPECTED DATA DID NOT
454                 /       MATCH. "S/B" (SHOUD/BE) XXXX REPRESENTS THE EXPECTED CHARACTER.
455                 /       "WAS" REPRESENTS THE CHARACTER READ.
456                 /
457                 /               INCORRECT RTN SELECTED
458                 /
459                 /       THIS PRINTOUT OCCURS DURING EXECUTION OF PRG0 AND PRG1 IF A
460                 /       NONEXISTENT ROUTINE IS SELECTED. THE PROGRAM HALTS, SET CORRECT
461                 /       ROUTINE NUMBER IN SR AND PRESS CONTINUE
462                 /
463                 /               UNEXPECTED INTERRUPT
464                 /
465                 /       THIS PRINTOUT OCCURS DURING PRG7 EXECUTION. PRGRAM HALTS.
466                 /       TURN OFF INTERRUPTING DEVICE. PRESS CONTINUE
467                 /
468                 /6.2    ERROR HALTS
469                 /
470                 /       LOC 0201        INCORRECT PRGRAM NUMBER SELECTED. SET SR
471                 /                       TO CORRECT NUMBER AND PRESS CONTINUE.
472                 /
473                 /       LOC 0266        INCORRECT ROUTINE NUMBER SELECTED. PRECEDED
474                 /                       PRINTOUT. SET CORRECT ROUTINE NUMBER IN SR
475                 /                       AND PRESS CONTINUE.
476                 /
477                 /       LOC 0732        UNEXPECTED INTERRUPT. PRECEDED BY PRINTOUT.
478                 /                       OCCURS DURING PRG7 EXECUTION. TURN OFF INTER-
479                 /                       RUPTING DEVICE. PRESS CONTINUE.
480                 /
481                 /       LOC 1347        SYNC ERROR. OCCURS DURING PRG2 AND PRG7, IF
482                 /                       PROGRAM IS UNABLE TO SYNC. PRESS CONTINUE TO
483                 /                       RETRY.
484                 /
485                 /       LOC 1075        COMMON ERROR HALT. OCCURS AFTER ERROR PRINTOUT
486                 /                       IF SR3=0 AND OPTION APPLIES TO PROGRAM BEING
487                 /                       RUN. PRESS CONTINUE
488                 /
489                 /       LOC 3631        PRG7. PUNCH COUNT HAS EXCEEDED 100. READER
490                 /                       IS PROBABLY NOT RUNNING. RESTART PROGRAM.
491                 /
492                 /7.0    RESTRICTIONS
493                 /
494                 /7.1    STARTING RESTRICTIONS
495                 /
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                /       THIS PROGRAM MUST BE STARTED AT LOC 0200.
                /
                /8.0    MISCELLANEOUS
                /
                /8.1    EXECUTION TIME
                /
                /       PRG0    1 MINUTE 50 SECONDS
                /       PRG1    45 SECONDS
                /       PRG2 THROUGH PRG15 ARE CONTINUOUS RUNNING PROGRAMS
                /
                /8.2    TEST TAPES
                /
                /       MAINDEC-00D2G4-PT SPECIAL BINARY COUNT PATTERN TEST TAPE IS
                /       PROVIDED WITH THIS PROGRAM. FOR EASE OF USE, THE TAPE SHOULD BE
                /       SPLICED INTO A LOOP INSURING THAT THE PATTERN IS MATCHED AT THE
                /       SPLICE POINT. THE END OF A PATTERN IS INDICATED BY THE
                /       CHARACTERS: RUBOUT, ALL 0'S CHARACTER, ALL 0'S CHARACTER, AND
                /       THEN ANOTHER RUBOUT.
                /
                /       IT IS DESIRABLE TO SPLICE INTO LOOPS, MAINDEC-00-D2G1-PT AND
                /       MAINDEC-00-D2G2-PT TO FACILITATE TESTING.
                /
                /9.0    PROGRAM DESCRIPTION
                /
                /       THIS PROGRAM CONSISTS OF 14 INDIVIDUAL PROGRAMS NUMBERED FROM
                /       00 TO 15 (OCTAL). PROGRAMS ARE SELECTED BY MEANS OF THE SWITCH
                /       REGISTER (SR).
                /
                /9.1    PRG0 - BASIC READER AND READER CONTROL LOGIC TEST
                /
                /       THIS PROGRAM CONTAINS TEN ROUTINES NUMBERED FOR 0 TO 11 (OCTAL)
                /
                /       RTN0    CHECKS THAT FLAG IS SET 250 MS AFTER ISSUING RFC COMMAND
                /               (IOT014). FAILURE TO SKIP ON FLAG COULD BE CAUSED BY
                /               FLAG NOT SET, OR RSF FAILURE TO SKIP. TEST IS DONE
                /               200 TIMES.
                /
                /       RTN1    CHECKS THAT RSF COMMAND (IOT011) SKIPS WITH FLAG=1.
                /               TEST IS DONE 4095 TIMES.
                /
                /       RTN2    CHECK THAT RSF COMMAND (IOT011) DOES NOT SKIP WITH FLAG
                /               = 0. DONE 4095 TIMES.
                /
                /       RTN3    CHECKS FOR SKIP WITH INTERRUPT OFF. DONE 2047 TIMES.
                /
                /       RTN4    CHECKS THAT INTERRUPT ENABLE CAN BE CLEARED FOR READER.
                /               (DONE 4095 TIMES)
                /
                /       RTN5    CHECKS THAT RRB COMMAND (IOT012) CLEARS THE FLAG. DONE
                /               500 TIMES.
                /
                /       RTN6    CHECKS THAT RFC COMMAND (IOT014) CLEARS THE FLAG. DONE
                /               500 TIMES.
                /
                /       RTN7    CHECKS THE ABILITY TO READ ALL 0'S CHARACTER. DONE 500
```

```
551                /              TIMES.
552                /
553                /       RTN10  CHECKS FOR UNEXPECTED INTERRUPTS, AND THEN CHECKS THAT
554                /              READER IS ABLE TO INTERRUPT.
555                /
556                /       RTN11  THIS ROUTINE CHECKS THAT THE "STOP DELAY" IS NOT LESS
557                /              THAN 10 MS. OR MORE THAN 250 MS. THE TEST SEQUENCE IS:
558                /
559                /              A. RFC (FETCH CHARACTER)
560                /              B. WAIT FOR FLAG 1 (SHOULD SET IMMEDIATELY)
561                /              C. DELAY 19 MS. (STOP DELAY SHOULD FIRE 6 MS AFTER STEP
562                /                 A)
563                /              D. RFC (FETCH CHARACTER, CLEAR FLAG)
564                /              E. DELAY 19 MS.
565                /              F. SKIP ON FLAG. IF SKIP OCCURS, THE "STOP DELAY"
566                /                 DID NOT FIRE, OR IS TOO SHORT.
567                /              G. DELAY ADDITIONAL 212 MILLISECONDS
568                /              H. SKIP ON FLAG. IF NO SKIP OCCURS, THE "STOP DELAY"
569                /                 IS TOO LONG. TEST IS DONE 200 TIMES.
570                /
571                /9.2    PRG1 - BASIC PUNCH AND PUNCH CONTROL LOGIC TEST
572                /
573                /       THIS PROGRAM CONTAINS NINE ROUTINES NUMBERED FROM 0 TO 10
574                /       (OCTAL).
575                /
576                /       RTN0   CHECKS THAT PSF COMMAND (IOT021) DOES NOT SKIP
577                /              WITH FLAG = 0.
578                /
579                /       RTN1   CHECKS THAT PSF COMMAND (IOT021) SKIPS WITH FLAG = 1.
580                /              DONE 4095 TIMES.
581                /
582                /       RTN2   CHECKS THAT PCF COMMAND (IOT022) IS ABLE TO CLEAR THE
583                /              FLAG. DONE 500 TIMES.
584                /
585                /       RTN3   CHECKS FOR SKIP WITH INTERRUPT OFF. DONE 2047 TIMES.
586                /
587                /       RTN4   CHECKS THAT INTERRUPT ENABLE CAN BE CLEARED FOR PUNCH.
588                /              DONE 4095 TIMES.
589                /
590                /       RTN5   TEST DONE 500 TIMES. VISUAL CHECK OF TAPE REQUIRED.
591                /              CHECKS THAT PCF COMMAND (IOT022) IS ABLE TO CLEAR THE
592                /              PUNCH BUFFER. THE TEST SEQUENCE IS:
593                /
594                /              A. ALL 1'S TO PUNCH BUFFER AND PUNCH (PLS).
595                /              B. IMMEDIATELY CLEAR THE PUNCH BUFFER BY ISSUING
596                /                 PCF COMMAND. NO HOLES SHOULD BE PUNCHED EXCEPT
597                /                 FOR FEED HOLE.
598                /
599                /       RTN6   TEST IS DONE 500 TIMES, VISUAL CHECK OF TAPE REQUIRED.
600                /              ROUTINE LOADS PUNCH BUFFER WITH 125 (8) AND PUNCHES.
601                /              ALTERNATE HOLES SHOULD BE PUNCHED.
602                /
603                /       RTN7   TEST IS DONE 500 TIMES, VISUAL CHECK OF TAPE REQUIRED.
604                /              ROUTINE LOADS PUNCH BUFFER WITH 252 (8) AND PUNCHES.
605                /              ALTERNATE HOLES SHOULD BE PUNCHED.
```

```
606                 /
607                 /       RTN10   CHECKS FOR UNEXPECTED INTERRUPTS, AND THEN CHECKS THAT
608                 /               PUNCH IS ABLE TO INTERRUPT.
609                 /
610                 /9.3    PRG2 - READER TEST
611                 /
612                 /       THE READER IS TESTED USING A SPECIAL BINARY COUNT PATTERN TEST
613                 /       TAPE. THE PROGRAM IS CONTINUOUS RUNNING. ERRORS ARE INDICATED
614                 /       BY PRINTOUTS. NORMAL TEST MODE IS WITH RANDOM STALLS AFTER
615                 /       EVERY CHARACTER GROUP READ. SR6=1 GIVES FULL SPEED TESTING.
616                 /       SR7 = 1 LOCKS PROGRAM ON CURRENT STALL. (SR6 MUST BE 0).
617                 /       PROGRAM RESYNCS AFTER 5 ERRORS. THE LENGTH OF A CHARACTER GROUP
618                 /       IS RANDOM, BUT DOES NOT EXCEE 15 CHARACTERS.
619                 /
620                 /9.4    PRG3 - PUNCH TEST, SPECIAL BINARY COUNT PATTERN
621                 /
622                 /       THIS CONTINUOUS RUNNING PROGEAM PUNCHES SPECIAL BINARY COUNT
623                 /       PATTERN. NORMAL TEST MODE IS WITH RANDOM STALLS AFTER EVERY
624                 /       CHARACTER PUNCHED. SR6=1 GIVES FULL SPEED PUNCHING.
625                 /       SR7 = 1 LOCKS PROGRAM ON CURRENT STALL. (SR6 MUST BE 0).
626                 /
627                 /9.5    PRG4 - PUNCH VERIFY, BINARY COUNT PATTERN
628                 /
629                 /       THIS PROGRAM READS AND CHECKS THE TAPE PUNCHED DURING EXECUTION
630                 /       OF PRG3. ERRORS ARE INDICATED BY ERROR PRINTOUTS.
631                 /
632                 /9.6    PRG5 - PUNCH TEST, RANDOM CHARACTERS
633                 /
634                 /       THIS CONTINUOUS RUNNING PROGRAM PUNCHES RANDOM CHARACTERS.
635                 /       NORMAL TEST MODE IS WITH RANDOM STALLS AFTER EVERY
636                 /       CHARACTER PUNCHED. SR6=1 GIVES FULL SPEED PUNCHING.
637                 /       SR7 = 1 LOCKS PROGRAM ON CURRENT STALL. (SR6 MUST BE 0).
638                 /
639                 /9.7    PRG6 - PUNCH VERIFY, RANDOM CHARACTERS
640                 /
641                 /       THIS PROGRAM READS AND CHECKS THE TAPE PUNCHED DURING EXECUTION
642                 /       OF PRG5. ERRORS ARE INDICATED BY ERROR PRINTOUTS.
643                 /
644                 /9.8    PRG7 - COMBINED READER - PUNCH TEST
645                 /
646                 /       THIS CONTINUOUS RUNNING PROGRAM PUNCHES AND READ  -  CHECKS
647                 /       SPECIAL BINARY COUNT PATTERN. THE READER AND PUNCH WORK IN THE
648                 /       INTERRUPT MODE. NORMAL TEST MODE IS WITH RANDOM STALLS AFTER
649                 /       EVERY CHARACTER PUNCHED. SR6=1 GIVES FULL SPEED PUNCHING AND
650                 /       READING. SR7 = 1 LOCKS PROGRAM ON CURRENT STALL. (SR6 MUST
651                 /       BE 0). THE READER RESYNCS ITSELF AUTOMATICALLY AFTER 5 ERRORS.
652                 /
653                 /9.9    PRG10 - READ AMPLIFIER ADJUSTMENT LOOP
654                 /
655                 /       THIS CONTINUOUS RUNNING PROGRAM USES A 1'S AND 0'S TEST TAPE
656                 /       LOOP, AND PROVIDES A MEANS OF DETERMINING THE UPPER AND LOWER
657                 /       LIMITS OF CORRECT OPERATION OF THE READ AMPLIFIER OF THE PAPER
658                 /       TAPE READER.  AFTER OBTAINING THE LIMITS THE POT CAN BE SET TO
659                 /       THE MIDDLE POSITION. READ ERRORS ARE INDICATED BY ERROR PRINT-
660                 /       OUTS. DROPPING OF THE READER FLAG BY OVERDRIVING OF THE FEED-
```

```
661                /       HOLE AMPLIFIER IS INDICATED BY 3 BELLS FROM THE TELETYPE. THE
662                /       READER IS THEN RESTARTED.
663                /
664                /9.10   PRG11 - PUNCH ANY CHARACTER IN SR LOOP
665                /
666                /       THIS PROGRAM LOOP CONTINUOUSLY PUNCHES THE CODE SET IN SR4
667                /       THROUGH SR11. SWITCHES MAY BE CHANGED WHILE RUNNING.
668                /
669                /9.11   PRG12 - ONES AND ZEROS PUNCH LOOP
670                /
671                /       THIS PROGRAM PUNCHES 1'S AND 0'S CONTINUOUSLY. NORMAL MODE IS
672                /       WITH RANDOM STALLS AFTER EVERY CHARACTER PUNCHED. SR6=1 GIVES
673                /       FULL SPEED PUNCHING. SR7 = 1 LOCKS PROGRAM ON CURRENT STALL.
674                /       (SR6 MUST BE 0).
675                /
676                /9.12   PRG13 - READ SPEED PRINT LOOP
677                /
678                /       THIS PROGRAM TYPES THE READER SPEED MEASURED OVER A 30 OR 300
679                /       SECOND PERIOD.  THE USER CONTROLS THE MEASURING TIME WITH THE
680                /       AID OF A WATCH WITH SWEEP SECOND HAND.
681                /
682                /9.13   PRG14 - PUNCH SPEED LOOP
683                /
684                /       THIS PROGRAM TYPES THE PUNCH SPEED MEASURED OVER A 60 SECOND
685                /       PERIOD. THE USER CONTROLS THE MEASURING TIME WITH THE AID OF A
686                /       WATCH WITH SWEEP SECOND HAND.
687                /
688                /9.14   PRG15 - READ X, STALL Y MS LOOP
689                /
690                /       THIS PROGRAM LOOP IS INTENDED AS AN AID IN ADJUSTING THE PAPER
691                /       TAPE READER. THE USER SETS IN SR0 THROUGH SR4 THE NUMBER OF
692                /       CHARACTERS TO BE READ (RANGE: 1 TO 37 OCTAL) AND IN SR5 THROUGH
693                /       SR11 THE NUMBER OF MS TO STALL AFTER READING THE CHARACTERS
694                /       (RANGE: 1 TO 177 OCTAL). THIS LOOP IS USEFUL IN ADJUSTING
695                /       CLOCK TIMING, STROBE, ETC.
696                /
697                /10.0   LISTING
698                /
699                /PC8-E HIGH SPEED READER AND PUNCH TESTS.
700                /MAINDEC-08-DHPCA-A-D
701                /DATE:  MARCH 1977
702                /COPYRIGHT 1977 DIGITAL EQUIPMENT CORP. MAYNARD, MASS. 01754
703                /AUTHORS:  BOB KOLLER/MAIT TAFFEL/MARK SANDLER/STEVE JENSEN
704                /WILLEM VAN DER MARK RETYPED PROGRAM IN 2009
705
706                /PRG0-BASIC READER AND READER CONTROL LOGIC TEST.  ALL 0'S TAPE
707                /PRG1-BASIC PUNCH AND PUNCH CONTROL LOGIC TEST
708                /PRG2-READER TEST, BINARY COUNT PATTERN
709                /PRG3-PUNCH TEST, BINARY COUNT PATTERN
710                /PRG4-PUNCH VERIFY, BINARY COUNT PATTERN
711                /PRG5-PUNCH TEST, RANDOM CHARACTERS
712                /PRG6-PUNCH VERIFY, RANDOM CHARACTERS
713                /PRG7-COMBINED READER-PUNCH TEST, BINARY PATTERN
714                /PRG10-READ AMPLIFIER ADJUSTMENT LOOP, ONES AND ZEROES TAPE
715                /PRG11-PUNCH ANY CHARACTER OR SR LOOP
```

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                        /PRG12-ONES AND ZEROES PUNCH LOOP
                        /PRG13-READER SPEED PRINT LOOP
                        /PRG14-PUNCH SPEED PRINT LOOP
                        /PRG15-READ X,STALL Y MSEC LOOP

                  6000  SKON=6000
                  6003  SRQ=6003
                  6007  CAF=6007
                  6010  RPE=6010
                  6020  PCE=6020
                  6014  RCF=6014
                  6024  PPC=6024

                  0000  *0
00000             0000          0000
00001             5001          JMP 1
00002             0002          2
00003             0003          3
                  0005  *5
00005             5402          JMP I 2
00006             0000          0
                  0020  *20
00020             0000  KSTART, 0
00021             0000  DELAYM, 0
00022             0000  COUNT,  0000
00023             0000  AC,     0
00024             0000  LINK,   0
00025             0270  CHAIN,  CHAINN
00026             0333  SHLT,   SHALT
00027             0447  RANDNO, RANGEN
00030             0000  PRGNUM, 0
00031             2000  PRGTAB, PRG0
00032             3000          PRG1
00033             3462          PRG2
00034             3506          PRG3
00035             3517          PRG4
00036             3537          PRG5
00037             3553          PRG6
00040             3600          PRG7
00041             4000          PRG10
00042             4102          PRG11
00043             4110          PRG12
00044             4200          PRG13
00045             4233          PRG14
00046             4332          PRG15

00047             0616  XTYPST, TYPSTG
00050             0600  UCRLF,  CRLF
00051             1050  UERROR, ERROR
00052             1000  UASCCN, ASCCN
00053             1255  ULPRGN, LPRGN
00054             1273  ULRRGN, LRRGN
00055             1200  UTREAD, TREAD
00056             1207  UTPCH,  TPCH
00057             1214  UPLDR,  PLDR
```

```
 771   00060  1230  UMARK,  MARK
 772   00061  1143  UTCHK,  TCHK
 773   00062  1145  UTSB,   TSB
 774   00063  0324  CRCNT,  CHRCNT
 775   00064  1311  SYNC,   SYNK
 776   00065  1324  SYNCA,  SYNKA
 777   00066  1400  INPATT, INITPT
 778   00067  1412  GETPT,  GETPTT
 779   00070  1435  GETPTR, GTPTRP
 780   00071  0521  CHECK,  CHCK
 781   00072  0513  DLYCNT, DLCNT
 782   00073  0426  UPUNCH, PUNCH
 783   00074  0536  UMOVE,  MOVE
 784   00075  0400  USTCTR, STCTR
 785   00076  0443  URDSR,  RDSR
 786   00077  1111  USTCTA, STCTA
 787   00100  1117  USTCTB, STCTB
 788   00101  1042  USTDLM, STDLYM
 789   00102  0411  UDLYMS, DLYMS
 790   00103  0733  UIOUT,  IOUT
 791   00104  0000  DLYMSK, 0
 792   00105  0000  SRMSK,  0
 793   00106  7354  MIL1,   7354            /CONSTANT FOR MILLISECONDS
 794   00107  0000  CPIC,   0
 795   00110  0000  CHR1,   0
 796   00111  0000  CHR2,   0
 797   00112  0000  CHR3,   0
 798   00113  0000  TEMP,   0
 799   00114  0000  TEMP1,  0
 800   00115  0000  CURTST, 0
 801   00116  0000  RTNNO,  0
 802   00117  0000  NXTST,  0
 803   00120  0000  MSCTR,  0              /STORED NUMBER OF MILLISECONDS TO BE COUNTED
 804   00121  0000  MILCTR, 0              /MILLISECOND TALLY
 805   00122  0000  CTRA,   0
 806   00123  0000  CTRB,   0
 807   00124  0000  CTRC,   0
 808   00125  0000  CTRD,   0
 809   00126  0000  PFLAG,  0
 810   00127  0000  RBUSY,  0
 811   00130  0000  RCHKW,  0              /??
 812   00131  0000  TCHKW,  0
 813   00132  0000  PCHCNT, 0
 814   00133  0000  ACTIND, 0
 815   00134  0000  DELTIM, 0
 816   00135  0000  MILLI,  0
 817   00136  0000  CTR,    0
 818
 819          4000  SR0MSK=4000
 820          2000  SR1MSK=2000
 821          1000  SR2MSK=1000
 822          0400  SR3MSK=0400
 823          0200  SR4MSK=0200
 824          0100  SR5MSK=0100
 825          0040  SR6MSK=0040
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 826          0020  SR7MSK=0020
 827          0017  TSTMSK=0017
 828          0377  PTMSK=0377
 829
 830          4475  SETLOC=JMS I USTCTR
 831          4476  READSR=JMS I URDSR
 832          4477  SETA=JMS I USTCTA
 833          4500  SETB=JMS I USTCTB
 834          4502  DELAY=JMS I UDLYMS
 835          5503  OUT=JMP I UIOUT
 836          0140  A=0140
 837          0240  B=0240
 838          0000  NONE=0000
 839          4040  NOSUF=4040
 840          4501  SETDLM=JMS I USTDLM
 841          4502  DELAY=JMS I UDLYMS
 842          5503  OUT=JMP I UIOUT
 843          0000  OPEN=0000
 844
 845                        /SET INT ENABLE FOR READER AND PUNCH
 846                        /SKIP IF RDR FLAG = 1
 847                        /READ READER BUFFER AND CLEAR FLAG
 848                        /RRB,RCC
 849                        /CLEAR INTERRUPT EANBLE FOR READER AND PUNCH
 850                        /SKIP IF PUNCH FLAG = 1
 851                        /CLEAR FLAG AND BUFFER
 852                        /LOAD BUFFER AND PUNCH CHARACTER
 853                        /PCF,PPC
 854
 855
 856                  /SKIP IF INTERRUPT ON AND TURN INTERRUPT OFF
 857                  /TURN INTERRUPT ON
 858                  /TURN INTERRUPT OFF
 859                  /SKIP ON INTERRUPT REQUEST
 860                  /GET FLAGS
 861                  /RESTORE FLAGS
 862                  /SKIP ON GREATER THAN FLAGS
 863                  /CLEAR ALL FLAGS
 864
 865          0200  *200
 866
 867   00200  7410  STRT,   SKP
 868   00201  7602          HLT CLA          /INCORRECT PRGNUM
 869   00202  7604          LAS              /READ SR
 870   00203  0177          AND [17          /MASK ALL BUT LAST 4 BITS
 871   00204  1176          TAD [-15
 872   00205  7540          SMA SZA          /VALID PROGRAM?
 873   00206  5201          JMP STRT+1       /NO, GO TO ERROR HALT
 874   00207  7604          LAS              /YES, REREAD SR
 875   00210  0177          AND [17
 876   00211  3030          DCA PRGNUM
 877   00212  1030          TAD PRGNUM       /DEVELOP PROGRAM ADDRESS
 878   00213  1175          TAD [PRGTAB
 879   00214  3113          DCA TEMP
 880   00215  1513          TAD I TEMP
```

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 881   00216  3240          DCA PRGADR      /STORE DEVELOPED ADDRESS
 882   00217  4474  INIT,   JMS I UMOVE     /INITIALIZE INTERRUPT
 883   00220  0005          5               /AREAD
 884   00221  0001          1
 885   00222  7776          -2
 886   00223  3113          DCA TEMP        /0 TO TEMP
 887   00224  4474          JMS I UMOVE     /CLEAR WORK AREA
 888   00225  0113          TEMP
 889   00226  0114          TEMP1
 890   00227  7760          -20
 891   00230  4475          SETLOC
 892   00231  1075          ERRORA
 893   00232  7402          7402
 894   00233  1174          TAD [177
 895   00234  3104          DCA DLYMSK
 896   00235  1173          TAD [7640
 897   00236  3572          DCA I [STALL+3
 898   00237  5640          JMP I .+1       /JMP TO SELECTED
 899   00240  0000  PRGADR, 0               /PROGRAM
 900
 901   00241  7602  SRSET,  HLT CLA
 902
 903   00242  7200  GETRDY, CLA
 904   00243  1020          TAD KSTART      /SET ADDRESS OF 1ST ROUTINE
 905   00244  3117          DCA NXTST       /STORE AT NXTST
 906   00245  4307          JMS FORWD
 907   00246  4476          READSR          /READ SR
 908   00247  7006          RTL
 909   00250  7420          SNL             /ROUTINE SELECT? SR1
 910   00251  5515          JMP I CURTST    /NO, START WITH 1ST RTN
 911   00252  4476          READSR          /YES
 912   00253  0177          AND [TSTMSK
 913   00254  7041          CIA
 914   00255  1116          TAD RTNNO
 915   00256  7650          SNA CLA         /IS IT THIS RTN?
 916   00257  5515          JMP I CURTST    /YES, GO DO IT
 917   00260  1117          TAD NXTST       /NO
 918   00261  7001          IAC             /IS THIS LAST RTN?
 919   00262  7640          SZA CLA         /NO
 920   00263  5245          JMP GETRDY+3
 921   00264  4447          JMS I XTYPST
 922   00265  1560          WRTN
 923   00266  7602  INCRTN, HLT CLA         /YES, INCORRECT ROUTINE NO
 924   00267  5242          JMP GETRDY
 925
 926   00270  4426  CHAINN, JMS I SHLT
 927   00271  4476          READSR          /READ SR
 928   00272  7006          RTL
 929   00273  7630          SZL CLA         /ROUTINE SELECT? SR1
 930   00274  5242          JMP GETRDY      /YES
 931   00275  1117          TAD NXTST
 932   00276  7001          IAC
 933   00277  7640          SZA CLA         /LAST ROUTINE?
 934   00300  5245          JMP GETRDY+3    /NO
 935   00301  4476          READSR
```

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 936   00302  7006          RTL
 937   00303  7710          SPA CLA          /LOOP PROGRAM? SR2
 938   00304  5242          JMP GETRDY       /YES
 939   00305  7402  PRGEND, HLT              /END OF PROGRAM HALT
 940   00306  5270          JMP CHAINN
 941   00307  0000  FORWD,   0
 942   00310  7300          CLA CLL
 943   00311  1517          TAD I NXTST      /GET NEXT RTN NO
 944   00312  3116          DCA RTNNO        /STORE AT RTNNO
 945   00313  2117          ISZ NXTST
 946   00314  1117          TAD NXTST        /SET CURRENT
 947   00315  3113          DCA TEMP         /RTN NUMBER
 948   00316  2117          ISZ NXTST
 949   00317  1117          TAD NXTST        /SET CURRENT
 950   00320  3115          DCA CURTST       /RTN ADDR.
 951   00321  1513          TAD I TEMP       /SET NEXT
 952   00322  3117          DCA NXTST        /RTN ADDR.
 953   00323  5707          JMP I FORWD
 954   00324  0000  CHRCNT, 0
 955   00325  4427          JMS I RANDNO     /SET RANDOM NUMBER
 956   00326  0177          AND [17          /REMOVE EXCESS BITS
 957   00327  7450          SNA              /0?
 958   00330  5325          JMP CHRCNT+1     /YES, REPEAT
 959   00331  7041          CIA              /COMPLEMENT
 960   00332  5724          JMP I CHRCNT     /EXIT.
 961   00333  0000  SHALT,   0
 962   00334  4476          READSR           /READ SR
 963   00335  7700          SMA CLA          /HALT? (SR0)
 964   00336  5733          JMP I SHALT
 965   00337  1116          TAD RTNNO
 966   00340  7402          HLT              /UNCONDITIONAL HALT
 967   00341  5733          JMP I SHALT      /EXIT.S/-10L
 968          0400          PAGE
 969   00400  0000  STCTR,   0
 970   00401  7200          CLA
 971   00402  1600          TAD I STCTR      /GET CTR ADDR
 972   00403  3113          DCA TEMP         /AND SAVE AT TEMP
 973   00404  2200          ISZ STCTR
 974   00405  1600          TAD I STCTR      /GET COUNT AND
 975   00406  3513          DCA I TEMP       /STORE PER C(TEMP)
 976   00407  2200          ISZ STCTR
 977   00410  5600          JMP I STCTR      /EXIT
 978   00411  0000  DLYMS,   0
 979   00412  7300          CLA CLL
 980   00413  1021          TAD DELAYM       /GET MS COUNT
 981   00414  3120          DCA MSCTR        /STORE IN MSCTR
 982   00415  5616          JMP I .+1
 983   00416  0417          .+1
 984   00417  1106          TAD MIL1         /GET 1 MS CONSTANT
 985   00420  3121          DCA MILCTR       /STORE IN MILCTR
 986   00421  2121          ISZ MILCTR       /DELAYED 1 MSEC?
 987   00422  5221          JMP .-1
 988   00423  2120          ISZ MSCTR        /DONE DELAYING?
 989   00424  5217          JMP .-5
 990   00425  5611          JMP I DLYMS      /EXIT
```

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 991                /PUNCH/PRINT ONE CHARACTER SUBROUTINE (CHAR IN AC)
 992   00426  0000  PUNCH,  0
 993   00427  2126          ISZ PFLAG       /SET PFLAG
 994   00430  6046          TLS             /PUNCH PRINT
 995   00431  7200          CLA
 996   00432  1126          TAD PFLAG
 997   00433  7640          SZA CLA         /FLAG RESET?
 998   00434  7410          SKP
 999   00435  5240          JMP .+3         /YES
1000   00436  6041          TSF             /DONE PRINTING?
1001   00437  5232          JMP .-5         /NO
1002   00440  6042          TCF             /YES, RESET PRINTER FLAG
1003   00441  3126          DCA PFLAG       /RESET FLAG
1004   00442  5626          JMP I PUNCH
1005   00443  0000  RDSR,   0
1006   00444  7604          LAS
1007   00445  0105          AND SRMSK
1008   00446  5643          JMP I RDSR
1009                /
1010                /RANDOM NUMBER GENERATOR SUBROUTINE
1011   00447  0000  RANGEN, 0
1012   00450  7200          CLA
1013   00451  1311          TAD RANTND
1014   00452  1276          TAD RANDEX
1015   00453  7640          SZA CLA
1016   00454  5264          JMP RANTAD
1017   00455  1300          TAD RANTBL
1018   00456  3276          DCA RANDEX
1019   00457  1277          TAD RANCON
1020   00460  7104          CLL RAL
1021   00461  7430          SZL
1022   00462  7001          IAC
1023   00463  3277          DCA RANCON
1024   00464  1277  RANTAD, TAD RANCON
1025   00465  1676          TAD I RANDEX
1026   00466  3676          DCA I RANDEX
1027   00467  1312          TAD RANSAV
1028   00470  7010          RAR
1029   00471  1676          TAD I RANDEX
1030   00472  2276          ISZ RANDEX
1031   00473  3312          DCA RANSAV
1032   00474  1312          TAD RANSAV
1033   00475  5647          JMP I RANGEN
1034   00476  0511  RANDEX, RANTND
1035   00477  6543  RANCON, 6543
1036   00500  0501  RANTBL, .+1
1037   00501  6543          6543
1038   00502  3210          3210
1039   00503  0765          0765
1040   00504  5432          5432
1041   00505  2107          2107
1042   00506  7654          7654
1043   00507  4321          4321
1044   00510  1076          1076
1045   00511  7267  RANTND, -.
```

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1046   00512  0000  RANSAV, 0
1047                /
1048                /SUBROUTINE TO GENERATE RANDOM DELAY COUNT
1049                /
1050   00513  0000  DLCNT,  0
1051   00514  4427          JMS I RANDNO    /GO GENERATE RANDOM NUMBER
1052   00515  0174          AND [177        /MASK OUT UNDESIRED BITS
1053   00516  7041          CIA             /2'S COMPLEMENT IT
1054   00517  3021          DCA DELAYM
1055   00520  5713          JMP I DLCNT     /EXIT
1056                /
1057                /SUBROUTINE TO COMPARE C(AC) TO CONTENTS STORED AT CALL+1
1058                /
1059   00521  0000  CHCK,   0
1060   00522  3335          DCA WCHK        /STORE AC AT WCHK
1061   00523  1721          TAD I CHCK      /GET COMPARE DATE
1062   00524  7041          CIA             /2'S COMPLEMENT IT
1063   00525  1335          TAD WCHK        /ADD C(WCHK)
1064   00526  2321          ISZ CHCK        /SET UP FOR UNEQUAL
1065   00527  7640          SZA CLA         /EQUAL (AC=0)
1066   00530  5333          JMP .+3         /NO
1067   00531  2321          ISZ CHCK        /YES, SET UP FOR EQUAL
1068   00532  5721          JMP I CHCK      /EQUAL EXIT
1069   00533  1335          TAD WCHK        /RESTORE AC
1070   00534  5721          JMP I CHCK      /UNEQUAL EXIT
1071   00535  0000  WCHK,   0
1072                /
1073                /SUBROUTINE TO MOVE VARIABLE LENGTH DATA FIELDS
1074                /
1075   00536  0000  MOVE,   0
1076   00537  7200          CLA
1077   00540  1736          TAD I MOVE      /GET "FROM ADDR" AND
1078   00541  3361          DCA FADDR       /STORE AT FADDR
1079   00542  2336          ISZ MOVE
1080   00543  1736          TAD I MOVE      /GET "TO ADDR" AND
1081   00544  3362          DCA TADDR       /STORE AT TADDR
1082   00545  2336          ISZ MOVE
1083   00546  1736          TAD I MOVE      /GET "MOVE COUNT" AND
1084   00547  3363          DCA MCTR        /STORE AT MCTR
1085   00550  2336          ISZ MOVE        /SET UP FOR EXIT
1086   00551  7200  MOVEA,  CLA
1087   00552  1761          TAD I FADDR     /GET "FROM" WORD
1088   00553  3762          DCA I TADDR     /STORE AT "TO" LOCATION
1089   00554  2361          ISZ FADDR       /+1 TO "FROM" ADDR
1090   00555  2362          ISZ TADDR       /+1 TO "TO" LOCATION
1091   00556  2363          ISZ MCTR        /ALL WORDS MOVED?
1092   00557  5351          JMP MOVEA       /NO, GO MOVE AGAIN
1093   00560  5736          JMP I MOVE      /YES, EXIT
1094   00561  0000  FADDR,  0
1095   00562  0000  TADDR,  0
1096   00563  0000  MCTR,   0
1097
1098          0600  PAGE
1099   00600  0000  CRLF,   0
1100   00601  7200          CLA             /CRLF SUBROUTINE
```

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1101   00602  1600          TAD I CRLF      /GET NUMBER OF CRLF'S
1102   00603  3215          DCA CRCTR       /AND SAVE
1103   00604  2200          ISZ CRLF
1104   00605  4447          JMS I XTYPST    /GO CRLF
1105   00606  0612          .+4
1106   00607  2215          ISZ CRCTR       /ALL DONE?
1107   00610  5205          JMP .-3         /NO
1108   00611  5600          JMP I CRLF      /YES, EXIT
1109   00612  0015          0015            /CR
1110   00613  0012          0012            /LF
1111   00614  0001          0001            /END CODE
1112   00615  0000  CRCTR,  0
1113   00616  0000  TYPSTG, 0
1114   00617  7200          CLA
1115   00620  1616          TAD I TYPSTG    /GET AND STORE
1116   00621  3300          DCA TEMQ        /INITIAL ADDRESS
1117   00622  3302          DCA FLAG        /CLEAR FLAG
1118   00623  2216          ISZ TYPSTG
1119   00624  1700  TSC1,   TAD I TEMQ      /SET DATA
1120   00625  7012          RTR             /ROTATE RIGHT 6
1121   00626  7012          RTR
1122   00627  7012          RTR
1123   00630  4235          JMS TSC2        /GO TYPE CHARACTER
1124   00631  1700          TAD I TEMQ      /GET DATA
1125   00632  4235          JMS TSC2        /GO TYPE CHARACTER
1126   00633  2300          ISZ TEMQ        /INCR STRING ADDR
1127   00634  5224          JMP TSC1        /GO BACK FOR MORE
1128   00635  0000  TSC2,   0
1129   00636  0171          AND [77         /MASK OFF 6 BITS
1130   00637  3301          DCA TEMR        /SAVE CHARACTER
1131   00640  1302          TAD FLAG
1132   00641  7640          SZA CLA         /TEST FLAG
1133   00642  5252          JMP TYPSP       /SET
1134   00643  1301          TAD TEMR        /NOT SET
1135   00644  7450          SNA             /ZERO?
1136   00645  5250          JMP .+3         /YES, SET FLAG
1137   00646  4271  TYPAT,  JMS PRINT       /NO, PRINT IT
1138   00647  5635          JMP I TSC2      /RETURN
1139   00650  2302          ISZ FLAG        /SET FLAG
1140   00651  5635          JMP I TSC2      /EXIT
1141   00652  3302  TYPSP,  DCA FLAG        /CLEAR FLAG
1142   00653  1301          TAD TEMR
1143   00654  7041          CIA
1144   00655  7450          SNA             /ZERO?
1145   00656  5246          JMP TYPAT       /YES, TYPE "@"
1146   00657  7001          IAC
1147   00660  7650          SNA CLA         /IS IT 01?
1148   00661  5616          JMP I TYPSTG    /YES, EXIT
1149   00662  1170          TAD [SMA        /SMA TO SWITCH
1150   00663  3273          DCA SWITCH
1151   00664  1301          TAD TEMR        /GET CHARACTER
1152   00665  4271          JMS PRINT       /PRINT IT
1153   00666  1167          TAD [SPA        /SPA TO SWITCH
1154   00667  3273          DCA SWITCH
1155   00670  5635          JMP I TSC2
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1156   00671  0000  PRINT,  0
1157   00672  1166          TAD [-40
1158   00673  7510  SWITCH, SPA
1159   00674  1165          TAD [100
1160   00675  1164          TAD [240
1161   00676  4473          JMS I UPUNCH
1162   00677  5671          JMP I PRINT
1163   00700  0000  TEMQ,   0
1164   00701  0000  TEMR,   0
1165   00702  0000  FLAG,   0
1166                /
1167   00703  3023  INTSVC, DCA AC           /SAVE AC
1168   00704  7010          RAR
1169   00705  3024          DCA LINK         /SAVE LINK
1170   00706  6011          RSF              /READER?
1171   00707  5312          JMP .+3          /NO
1172   00710  5711          JMP I .+1
1173   00711  0000  RVCTR,  0
1174   00712  6021          PSF              /PUNCH?
1175   00713  5317          JMP .+4          /NO
1176   00714  4563          JMS I [STALL     /STALL IF DESIRED
1177   00715  5716          JMP I .+1
1178   00716  0000  PVCTR,  0
1179   00717  6031          KSF              /TTY READER/KYBD?
1180   00720  5323          JMP .+3
1181   00721  6032          KCC              /YES
1182   00722  5503          OUT              /TO MAINLINE
1183   00723  6041          TSF              /TTY PRINTER/PUNCH?
1184   00724  5330          JMP .+4          /NO
1185   00725  6042          TCF              /YES
1186   00726  3126          DCA PFLAG
1187   00727  5503          OUT              /TO MAINLINE
1188   00730  4447  UNEXIT, JMS I XTYPST     /PRINT ERROR MESSAGE
1189   00731  1501          UNINT
1190   00732  7602          HLT CLA          /HALT, UNEXPECTED INTERRUPT
1191   00733  7300  IOUT,   CLA CLL
1192   00734  1024          TAD LINK
1193   00735  7004          RAL              /RESTORE LINK
1194   00736  1023          TAD AC           /RESTORE AC
1195   00737  6001          ION
1196   00740  5400          JMP I 0          /EXIT INTERRUPT
1197                /
1198   00741  6022  PCHCLR, PCF
1199   00742  5503          OUT
1200   00743  6012  RDRCLR, RRB
1201   00744  5503          OUT
1202          1000  PAGE
1203   01000  0000  ASCCN,  0                /SUBROUTINE TO CONVERT
1204   01001  7200          CLA              /A WORD TO PRINTABLE ASCII
1205   01002  1600          TAD I ASCCN
1206   01003  3237          DCA WASC
1207   01004  2200          ISZ ASCCN
1208   01005  1600          TAD I ASCCN
1209   01006  3240          DCA SASC
1210   01007  2200          ISZ ASCCN
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1211   01010  1162          TAD [7700
1212   01011  0637          AND I WASC
1213   01012  7112          RTR CLL
1214   01013  7012          RTR
1215   01014  7012          RTR
1216   01015  4224          JMS CNV
1217   01016  2240          ISZ SASC
1218   01017  1162          TAD [7700
1219   01020  7040          CMA
1220   01021  0637          AND I WASC
1221   01022  4224          JMS CNV
1222   01023  5600          JMP I ASCCN
1223   01024  0000  CNV,    0
1224   01025  3241          DCA ASCT
1225   01026  1241          TAD ASCT
1226   01027  7006          RTL
1227   01030  7004          RAL
1228   01031  0161          AND [707
1229   01032  1241          TAD ASCT
1230   01033  0161          AND [707
1231   01034  1160          TAD [6060
1232   01035  3640          DCA I SASC
1233   01036  5624          JMP I CNV
1234   01037  0000  WASC,   0
1235   01040  0000  SASC,   0
1236   01041  0000  ASCT,   0
1237                /
1238   01042  0000  STDLYM, 0               /SET DELAYM SUB
1239   01043  7200          CLA
1240   01044  1642          TAD I STDLYM    /SET DELAYM TO
1241   01045  3021          DCA DELAYM      /NUMBER SPECIFIED
1242   01046  2242          ISZ STDLYM      /AT CALL +1
1243   01047  5642          JMP I STDLYM    /EXIT
1244   01050  0000  ERROR,  0
1245   01051  4452          JMS I UASCCN    /CONVERT PROGRAM
1246   01052  0030          PRGNUM          /NUMBER TO PRINTABLE
1247   01053  1471          PNUMB           /OCTAL
1248   01054  4452          JMS I UASCCN    /CONVERT ROUTINE
1249   01055  0116          RTNNO           /NUMBER TO PRINTABLE
1250   01056  1474          ENUMB           /OCTAL
1251   01057  1650          TAD I ERROR     /GET ERROR SUFFIX AND
1252   01060  3710          DCA I SFADR     /STORE AT SUFX
1253   01061  4447          JMS I XTYPST    /PRINT ERROR NUMBER
1254   01062  1466          ERNUMB
1255   01063  2250          ISZ ERROR
1256   01064  1650          TAD I ERROR     /GET ADDRESS OF ADDITIONAL
1257   01065  7450          SNA             /PRINTOUT. ZERO?
1258   01066  5272          JMP .+4         /YES
1259   01067  3271          DCA .+2
1260   01070  4447          JMS I XTYPST    /NO, PRINT IT
1261   01071  0000          0
1262   01072  4476          READSR
1263   01073  0157          AND [SR3MSK
1264   01074  7650          SNA CLA         /HALT ON ERROR? (SR3)
1265   01075  7402  ERRORA, HLT             /YES
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1266   01076  4476          READSR
1267   01077  0156          AND [SR4MSK
1268   01100  7640          SZA CLA         /SKIP TEST? (SR4)
1269   01101  5425          JMP I CHAIN     /YES
1270   01102  4476          READSR
1271   01103  0165          AND [SR5MSK
1272   01104  7640          SZA CLA         /ENTER SCOPE LOOP? (SR5)
1273   01105  2250          ISZ ERROR       /YES
1274   01106  2250          ISZ ERROR
1275   01107  5650          JMP I ERROR
1276   01110  1476  SFADR,  SUFX
1277   01111  0000  STCTA,  0               /SET CTRA TO
1278   01112  7200          CLA             /NUMBER SPECIFIED
1279   01113  1711          TAD I STCTA     /AT CALL+1
1280   01114  3122          DCA CTRA
1281   01115  2311          ISZ STCTA
1282   01116  5711          JMP I STCTA     /EXIT
1283   01117  0000  STCTB,  0               /SET CTRB TO
1284   01120  7200          CLA             /NUMBER SPECIFIED
1285   01121  1717          TAD I STCTB     /AT CALL+1
1286   01122  3123          DCA CTRB
1287   01123  2317          ISZ STCTB
1288   01124  5717          JMP I STCTB     /EXIT
1289   01125  0000  STALL,  0               /RANDOM STALL SUBROUTINE
1290   01126  4476          READSR
1291   01127  0155          AND [SR6MSK
1292   01130  7640          SZA CLA         /STALL? (SR6)
1293   01131  5725          JMP I STALL     /NO, EXIT
1294   01132  4476          READSR
1295   01133  0154          AND [SR7MSK
1296   01134  7640          SZA CLA         /LOCK ON STALL? (SR7)
1297   01135  7410          SKP             /YES
1298   01136  4472          JMS I DLYCNT    /NO, RANDOM STALL
1299   01137  1021          TAD DELAYM
1300   01140  7440          SZA
1301   01141  4502          DELAY           /STALL
1302   01142  5725          JMP I STALL     /EXIT
1303   01143  0000  TCHK,   0
1304   01144  4471          JMS I CHECK     /CHECK THAT C(AC) AND C(TSB) ARE
1305   01145  0000  TSB,    0
1306   01146  5351          JMP .+3         /ERROR, NOT EQUAL
1307   01147  2343          ISZ TCHK        /EQUAL
1308   01150  5743          JMP I TCHK      /OK
1309   01151  3131          DCA TCHKW       /STORE BAD CHARACTER
1310   01152  4452          JMS I UASCCN
1311   01153  1145          TSB
1312   01154  1604          SB
1313   01155  4452          JMS I UASCCN
1314   01156  0131          TCHKW
1315   01157  1611          WAS
1316   01160  4451          JMS I UERROR
1317   01161  4040          NOSUF
1318   01162  1601          SBWAS
1319   01163  5743          JMP I TCHK      /RETURN
1320   01164  5743          JMP I TCHK      /RETURN
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1321          1200  PAGE
1322   01200  0000  TREAD,  0
1323   01201  6014          RFC
1324   01202  6011          RSF
1325   01203  5202          JMP .-1
1326   01204  7200          CLA
1327   01205  6012          RRB
1328   01206  5600          JMP I TREAD
1329   01207  0000  TPCH,   0
1330   01210  6026          PLS
1331   01211  6021          PSF
1332   01212  5211          JMP .-1
1333   01213  5607          JMP I TPCH
1334   01214  0000  PLDR,   0
1335   01215  4475          SETLOC          /-100 TO PLDRW
1336   01216  1227          PLDRW
1337   01217  7634          -144
1338   01220  7200          CLA
1339   01221  6026          PLS
1340   01222  6021          PSF
1341   01223  5222          JMP .-1
1342   01224  2227          ISZ PLDRW       /DONE?
1343   01225  5220          JMP .-5         /NO
1344   01226  5614          JMP I PLDR      /YES, EXIT
1345   01227  0000  PLDRW,  0
1346                /
1347   01230  0000  MARK,   0
1348   01231  4214          JMS PLDR
1349   01232  4500          SETB
1350   01233  7767          -11
1351   01234  4475          SETLOC          /MARKER ADDRESS
1352   01235  1246          MARKAD          /TO MARKAD
1353   01236  1521          MARKER
1354   01237  7200          CLA
1355   01240  1646          TAD I MARKAD    /GET MARK
1356   01241  4207          JMS TPCH        /PUNCH IT
1357   01242  2246          ISZ MARKAD      /UPDATE
1358   01243  2123          ISZ CTRB        /DONE?
1359   01244  5237          JMP .-5         /NO
1360   01245  5630          JMP I MARK      /YES, EXIT
1361   01246  0000  MARKAD, 0
1362   01247  1233  SEED1,  1233
1363   01250  7622          7622
1364   01251  0000  RANP1,  0
1365   01252  0000  RANP2,  0
1366   01253  0000  RANR1,  0
1367   01254  0000  RANR2,  0
1368   01255  0000  LPRGN,  0
1369   01256  7300          CLL CLA
1370   01257  1251          TAD RANP1
1371   01260  7006          RTL
1372   01261  1252          TAD RANP2
1373   01262  3251          DCA RANP1
1374   01263  1251          TAD RANP1
1375   01264  7006          RTL
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1376   01265  1252          TAD RANP2
1377   01266  7006          RTL
1378   01267  3252          DCA RANP2
1379   01270  1251          TAD RANP1
1380   01271  0153          AND [PTMSK
1381   01272  5655          JMP I LPRGN
1382   01273  0000  LRRGN,  0
1383   01274  7300          CLL CLA
1384   01275  1253          TAD RANR1
1385   01276  7006          RTL
1386   01277  1254          TAD RANR2
1387   01300  3253          DCA RANR1
1388   01301  1253          TAD RANR1
1389   01302  7006          RTL
1390   01303  1254          TAD RANR2
1391   01304  7006          RTL
1392   01305  3254          DCA RANR2
1393   01306  1253          TAD RANR1
1394   01307  0153          AND [PTMSK
1395   01310  5673          JMP I LRRGN
1396   01311  0000  SYNK,   0
1397   01312  4466          JMS I INPATT
1398   01313  4455          JMS I UTREAD    /READ CHARACTER
1399   01314  3110          DCA CHR1        /STORE AT CHR1
1400   01315  4455          JMS I UTREAD    /READ CHARACTER
1401   01316  3111          DCA CHR2        /STORE AT CHR2
1402   01317  4455          JMS I UTREAD    /READ CHAR
1403   01320  3112          DCA CHR3        /STORE
1404   01321  4465          JMS I SYNCA     /GO SYNC
1405   01322  5312          JMP SYNK+1      /NO SYNC, TRY AGAIN
1406   01323  5711          JMP I SYNK      /SYNCED, EXIT
1407   01324  0000  SYNKA,  0
1408   01325  4475          SETLOC          /-512 TO CTSK
1409   01326  1363          CTSK
1410   01327  7000          -1000
1411   01330  4475          SETLOC          /SET CTSK1
1412   01331  1364          CTSK1           /TO -10
1413   01332  7766          -12
1414   01333  4467          JMS I GETPT     /GET BIN CHARACTER
1415   01334  7040          CMA
1416   01335  0110          AND CHR1        /SAME AS CHR1?
1417   01336  7440          SZA
1418   01337  5333          JMP .-4         /NO
1419   01340  4467          JMS I GETPT     /YES, GET ANOTHER BIN CHAR
1420   01341  7040          CMA
1421   01342  0111          AND CHR2
1422   01343  7450          SNA             /SAME AS CHR2?
1423   01344  5351          JMP SYNKC       /YES
1424   01345  2363          ISZ CTSK        /NO, 512 TIMES?
1425   01346  5330          JMP SYNKA+4     /NO
1426   01347  7602  SYNKB,  HLT CLA         /YES, SYNC ERROR
1427   01350  5724          JMP I SYNKA     /TRY AGAIN
1428   01351  4467  SYNKC,  JMS I GETPT     /GET LINE CHARACTER
1429   01352  7040          CMA
1430   01353  0112          AND CHR3        /SAME AS CHR3?
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1431   01354  7440          SZA
1432   01355  5360          JMP .+3          /NO
1433   01356  2324          ISZ SYNKA        /YES
1434   01357  5724          JMP I SYNKA      /EXIT
1435   01360  2364          ISZ CTSK1        /DONE 10 TIMES?
1436   01361  5330          JMP SYNKA+4      /NO
1437   01362  5347          JMP SYNKB        /YES, SYNC ERROR
1438   01363  0000  CTSK,   0
1439   01364  0000  CTSK1,  0
1440          1400  PAGE
1441   01400  0000  INITPT, 0                /INITIALIZE BINARY
1442   01401  7201          CLA IAC          /PATTERN ROUTINES
1443   01402  3260          DCA PT0
1444   01403  4474          JMS I UMOVE
1445   01404  1460          PT0
1446   01405  1461          PT1
1447   01406  7775          -3
1448   01407  3264          DCA RIND
1449   01410  3265          DCA PIND
1450   01411  5600          JMP I INITPT
1451   01412  0000  GETPTT, 0                /BINARY COUNT PATTERN
1452   01413  7200          CLA              /ROUTINE SPECIAL
1453   01414  1260          TAD PT0
1454   01415  3261          DCA PT1
1455   01416  1264          TAD RIND
1456   01417  7040          CMA
1457   01420  3264          DCA RIND
1458   01421  1264          TAD RIND
1459   01422  7650          SNA CLA
1460   01423  5227          JMP .+4
1461   01424  1261          TAD PT1
1462   01425  7040          CMA
1463   01426  5231          JMP .+3
1464   01427  1261          TAD PT1
1465   01430  7041          CIA
1466   01431  0153          AND [PTMSK
1467   01432  3260          DCA PT0
1468   01433  1261          TAD PT1
1469   01434  5612          JMP I GETPTT
1470   01435  0000  GTPTRP, 0                /BINARY COUNT PATTERN
1471   01436  7200          CLA              /ROUTINE
1472   01437  1262          TAD PT2
1473   01440  3263          DCA PT3
1474   01441  1265          TAD PIND
1475   01442  7040          CMA
1476   01443  3265          DCA PIND
1477   01444  1265          TAD PIND
1478   01445  7650          SNA CLA
1479   01446  5252          JMP .+4
1480   01447  1263          TAD PT3
1481   01450  7040          CMA
1482   01451  5254          JMP .+3
1483   01452  1263          TAD PT3
1484   01453  7041          CIA
1485   01454  0153          AND [PTMSK
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1486   01455  3262          DCA PT2
1487   01456  1263          TAD PT3
1488   01457  5635          JMP I GTPTRP
1489   01460  0000  PT0,     0
1490   01461  0000  PT1,     0
1491   01462  0000  PT2,     0
1492   01463  0000  PT3,     0
1493   01464  0000  RIND,    0
1494   01465  0000  PIND,    0
1495   01466  0015  ERNUMB,  0015            /CR
1496   01467  0012          0012            /LF
1497   01470  5220          5220            /*,P
1498   01471  4040  PNUMB,   4040
1499   01472  4040          4040
1500   01473  4022          4022            /SP,R
1501   01474  4040  ENUMB,   4040
1502   01475  4040          4040
1503   01476  4040  SUFX,    4040
1504   01477  4040          4040            /SP,SP
1505   01500  0001          0001            /END CODE
1506   01501  0015  UNINT,   0015            /CR
1507   01502  0012          0012            /LF
1508   01503  0007          0007            /BELL
1509   01504  4025          4025            /SP,U
1510   01505  1605          1605            /N,E
1511   01506  3020          3020            /X,P
1512   01507  0503          0503            /E,C
1513   01510  2405          2405            /T,E
1514   01511  0440          0440            /D,SP
1515   01512  1116          1116            /I,N
1516   01513  2405          2405            /T,E
1517   01514  2222          2222            /R,R
1518   01515  2520          2520            /U,P
1519   01516  2456          2456            /T,.
1520   01517  0015          0015            /CR
1521   01520  0001          0001            /END CODE
1522   01521  0037  MARKER,  0037
1523   01522  0040          0040
1524   01523  0040          0040
1525   01524  0037          0037
1526   01525  0000          0000
1527   01526  0077          0077
1528   01527  0011          0011
1529   01530  0011          0011
1530   01531  0006          0006
1531   01532  0015  RSPD,    0015            /CR
1532   01533  0012          0012            /LF
1533   01534  4022          4022            /SP,R
1534   01535  0422          0422            /D,R
1535   01536  4023          4023            /SP,S
1536   01537  2005          2005            /P,E
1537   01540  0504          0504            /E,D
1538   01541  4000          4000            /SP
1539   01542  0100          0100            /END CODE
1540   01543  0015  PSPD,    0015            /CR
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1541   01544  0012          0012          /LF
1542   01545  4020          4020          /SP,P
1543   01546  0310          0310          /C,H
1544   01547  4023          4023          /SP,S
1545   01550  2005          2005          /P,E
1546   01551  0504          0504          /E,D
1547   01552  4000          4000          /SP
1548   01553  0100          0100          /END CODE
1549   01554  4003  CPS,    4003          /SP,C
1550   01555  2023          2023          /P,S
1551   01556  0015          0015          /CR
1552   01557  0001          0001          /END CODE
1553   01560  0015  WRTN,    0015          /CR
1554   01561  0012          0012          /LF
1555   01562  4000          4000          /SP
1556   01563  0711          0711          /BELL,I
1557   01564  1603          1603          /N,C
1558   01565  1722          1722          /O,R
1559   01566  2205          2205          /R,E
1560   01567  0324          0324          /C,T
1561   01570  4022          4022          /SP,R
1562   01571  2416          2416          /T,N
1563   01572  4023          4023          /SP,S
1564   01573  0514          0514          /E,L
1565   01574  0503          0503          /E,C
1566   01575  2405          2405          /T,E
1567   01576  0456          0456          /D,.
1568   01577  0015          0015          /CR
1569   01600  0001          0001          /END CODE
1570   01601  4023  SBWAS,  4023          /SP,S
1571   01602  5702          5702          /"/",B
1572   01603  4040          4040          /SP,SP
1573   01604  4040  SB,     4040          /SP,SP
1574   01605  4040          4040          /SP,SP
1575   01606  4040          4040          /SP,SP
1576   01607  2701          2701          /W,A
1577   01610  2340          2340          /S,SP
1578   01611  4040  WAS,    4040          /SP,SP
1579   01612  4040          4040          /SP,SP
1580   01613  0015          0015          /CR
1581   01614  0001          0001          /END CODE
1582   01615  0015  TDOMSG, 0015          /CR
1583   01616  0012          0012          /LF
1584   01617  7005          7005          /8,E
1585   01620  4040          4040          /SP,SP
1586   01621  2331          2331          /SY
1587   01622  2324          2324          /ST
1588   01623  0515          0515          /EM
1589   01624  5640          5640          /.,SP
1590   01625  2305          2305          /SE
1591   01626  2440          2440          /T,SP
1592   01627  2411          2411          /TI
1593   01630  1505          1505          /ME
1594   01631  4004          4004          /SP,D
1595   01632  0514          0514          /EL
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1596   01633  0131          0131           /AY
1597   01634  4003          4003           /SP,C
1598   01635  1716          1716           /ON
1599   01636  2324          2324           /ST
1600   01637  0116          0116           /AN
1601   01640  2440          2440           /T,SP
1602   01641  1116          1116           /IN
1603   01642  4023          4023           /SP,S
1604   01643  2256          2256           /R,.
1605   01644  0015          0015           /CR
1606   01645  0012          0012           /LF
1607   01646  2205          2205           /RE
1608   01647  0605          0605           /FE
1609   01650  2240          2240           /R,SP
1610   01651  2417          2417           /TO
1611   01652  4020          4020           /SP,P
1612   01653  0107          0107           /AG
1613   01654  0523          0523           /ES
1614   01655  4062          4062           /SP,2
1615   01656  4001          4001           /SP,A
1616   01657  1604          1604           /ND
1617   01660  4063          4063           /SP,3
1618   01661  4017          4017           /SP,O
1619   01662  0640          0640           /F,SP
1620   01663  2022          2022           /PR
1621   01664  0740          0740           /G,SP
1622   01665  1411          1411           /LI
1623   01666  2324          2324           /ST
1624   01667  1116          1116           /IN
1625   01670  0756          0756           /G.
1626   01671  0001          0001           /END
1627          2000  PAGE
1628                /PRGRAM 0, BASIC READER AND READER LOGIC CONTROL TEST
1629                /
1630   02000  4475  PRG0,   SETLOC          /SET KSTART TO
1631   02001  0020          KSTART         /INITIAL ROUTINE
1632   02002  2010          P0T0           /ADDRESS
1633   02003  4475          SETLOC         /SET SR MSAK
1634   02004  0105          SRMSK
1635   02005  7717          7717
1636   02006  5607          JMP I .+1      /SET STARTED
1637   02007  0241          SRSET
1638   02010  0000  P0T0,   0
1639   02011  2036          P0T1
1640                /CHECKS THAT FLAG=1 250MS AFTER RFC (IOT014), INDICATING THAT
1641                /READER IS ADVANCING
1642   02012  4477          SETA           /-200 TO CTRA
1643   02013  7470          -310
1644   02014  4501          SETDLM         /-250 TO DELAY
1645   02015  7406          -372
1646   02016  6014  P0T0A,  RFC            /CLEAR FLAG, FETCH CHAR (IOT014)
1647   02017  4502          DELAY          /DELAY 75MS
1648   02020  6011          RSF            /SKIP IF FLAG=1 (IOT011)
1649   02021  5225          JMP P0E0
1650   02022  2122          ISZ CTRA       /DONE?
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1651   02023  5216          JMP P0T0A       /NO, REPEAT
1652   02024  5425          JMP I CHAIN     /YES, CHAIN
1653   02025  4451  P0E0,   JMS I UERROR    /GO TO ERROR SUBROUTINE
1654   02026  4040          NOSUF           /NO PRINTOUT SUFFIX
1655   02027  0000          NONE            /NO PRINTOUT
1656   02030  5222          JMP P0T0A+4     /CONTINUE TEST
1657   02031  4501  P0T0S,  SETDLM          /SCOPE LOOP
1658   02032  7764          -14
1659   02033  6014          RFC             /FETCH CHAR (IOT014)
1660   02034  4502          DELAY           /DELAY 12 MS
1661   02035  5233          JMP .-2
1662   02036  0001  P0T1,   1
1663   02037  2064          P0T2
1664                 /WITH FLAG=1, SKIP ON FLAG 4095 TIMES TO CHECK FOR RELIABLE SKIPPING
1665   02040  4477          SETA            /-4095 TO CTRA
1666   02041  0001          -7777
1667   02042  6014          RFC             /FETCH CHAR (IOT014)
1668   02043  6011          RSF             /SKIP ON FLAG (IOT011)
1669   02044  5243          JMP .-1         /REPEAT
1670   02045  6011  P0T1A,  RSF             /SKIP ON FLAG (IOT011)
1671   02046  5252          JMP P0E1        /ERROR
1672   02047  2122          ISZ CTRA        /DONE 4095 TIMES?
1673   02050  5245          JMP P0T1A       /NO, REPEAT TEST
1674   02051  5425          JMP I CHAIN     /YES, CHAIN
1675   02052  4451  P0E1,   JMS I UERROR    /GO TO ERROR SUBROUTINE
1676   02053  4040          NOSUF           /NO PRINTOUT SUFFIX
1677   02054  0000          NONE            /NO PRINTOUT
1678   02055  5247          JMP P0T1A+2     /CONTINUE TEST
1679   02056  6014  P0T1S,  RFC             /START SCOPE LOOP. FETCH CHAR (IOT014)
1680   02057  6011          RSF             /SKIP ON FLAG (IOT011)
1681   02060  5257          JMP .-1         /REPEAT
1682   02061  6011          RSF             /SKIP ON FLAG (IOT011)
1683   02062  5261          JMP .-1         /REPEAT
1684   02063  5261          JMP .-2         /REPEAT
1685   02064  0002  P0T2,   2
1686   02065  2105          P0T3
1687                 /CHECKS THAT IOT011 DOES NOT SKIP WITH FLAG=0
1688   02066  4477          SETA            /-4095 TO CTRA
1689   02067  0001          -7777
1690   02070  6012          RRB             /CLEAR FLAG
1691   02071  6011  P0T2A,  RSF             /SKIP ON FLAG=1 (IOT011)
1692   02072  5302          JMP P0T2OK      /OK
1693   02073  4451  P0E2,   JMS I UERROR    /ERROR, GO TO ERROR SUB
1694   02074  4040          NOSUF           /NO PRINTOUT SUFFIX
1695   02075  0000          NONE            /NO PRINTOUT
1696   02076  5302          JMP P0T2OK      /CONTINUE TEST
1697   02077  6011  P0T2S,  RSF             /START SCOPE LOOP, SKIP ON FLAG
1698   02100  5277          JMP .-1         /REPEAT
1699   02101  5277          JMP .-2         /REPEAT
1700   02102  2122  P0T2OK, ISZ CTRA        /DONE 4095 TIMES?
1701   02103  5271          JMP P0T2A       /NO, REPEAT
1702   02104  5425          JMP I CHAIN     /YES, CHAIN
1703                 /
1704                 /ROUTINE TO CHECK FOR SKIP WITH INTERRUPT DISABLED
1705   02105  0003  P0T3,   3
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1706   02106  2200          P0T4
1707   02107  1377          TAD (4000
1708   02110  3022          DCA COUNT
1709   02111  1376          TAD (7773
1710   02112  3136          DCA CTR
1711   02113  6002          IOF
1712   02114  7200          CLA
1713   02115  3135          DCA MILLI
1714   02116  2135          ISZ MILLI
1715   02117  5316          JMP .-1
1716   02120  2136          ISZ CTR
1717   02121  5316          JMP .-3
1718   02122  1375          TAD (2260       /4.56 MS CONSTANT
1719   02123  3134          DCA DELTIM
1720   02124  6007          CAF
1721   02125  6014          RCF             /READ
1722   02126  4351          JMS TIM
1723   02127  6011  P0T3A,  RSF             /SKIP IF READER FLAG SET
1724   02130  5337          JMP P0E3        /FLAG DID NOT SET
1725   02131  6010          RPE             /ENABLE INTERRUPT
1726   02132  6003          SRQ             /SHOULD SKIP HERE IF INT REQ
1727   02133  5337          JMP P0E3        /REPORT ERROR
1728   02134  2022          ISZ COUNT
1729   02135  5311          JMP P0T3+4
1730   02136  5425          JMP I CHAIN
1731   02137  4451  P0E3,   JMS I UERROR
1732   02140  4040          NOSUF
1733   02141  0000          NONE
1734   02142  5311          JMP P0T3+4
1735   02143  6002  P0T3S,  IOF
1736   02144  6011          RSF
1737   02145  5344          JMP .-1
1738   02146  6011          RSF
1739   02147  5346          JMP .-1
1740   02150  5346          JMP .-2
1741   02151  0000  TIM,    0
1742   02152  2134          ISZ DELTIM
1743   02153  5352          JMP .-1
1744   02154  5751          JMP I TIM
1745   02175  2260
1746   02176  7773
1747   02177  4000
1748          2200  PAGE
1749                /
1750                /ROUTINE TO CHECK THAT INTERRUPT ENABLE CAN BE CLEARED FOR READER
1751   02200  0004  P0T4,    4
1752   02201  2400          P0T5
1753   02202  6002          IOF
1754   02203  1234          TAD R7770
1755   02204  3235          DCA RCNT2       /INIT # OF ITERATIONS
1756   02205  6007  RLOOP,  CAF
1757   02206  6010          RPE             /ENABLE INTERRUPT
1758   02207  6020          PCE             /DISABLE INTERRUPT
1759   02210  6001          ION
1760   02211  6014          RCF             /READ
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1761   02212  6000          SKON
1762   02213  5224          JMP P0E4        /INTERRUPT NOT ON
1763   02214  6003          SRQ             /SKIP IF INT REQ GENERATED
1764   02215  7410          SKP             /NO INT REQ
1765   02216  5224          JMP P0E4        /INT REQ GENERATED
1766   02217  2022          ISZ COUNT       /RELIABILITY SETUP
1767   02220  5205  P0T4A,  JMP RLOOP       /CONTINUE
1768   02221  2235          ISZ RCNT2
1769   02222  5205          JMP RLOOP
1770   02223  5425          JMP I CHAIN
1771   02224  4451  P0E4,   JMS I UERROR
1772   02225  4040          NOSUF
1773   02226  0000          NONE
1774   02227  5425          JMP I CHAIN
1775   02230  6010  P0T4S,  RPE
1776   02231  4502          DELAY
1777   02232  6020          PCE
1778   02233  5230          JMP .-3
1779   02234  7770  R7770,  7770
1780   02235  7770  RCNT2,  7770
1781          2400  PAGE
1782   02400  0005  P0T5,   5
1783   02401  2430          P0T6
1784                /CHECKS IOT012 (RRB) FOR ABILITY TO CLEAR FLAG
1785   02402  4477          SETA            /-500 TO CTRA
1786   02403  7014          -764
1787   02404  6014  P0T5A,  RFC             /FETCH CHAR (IOT014)
1788   02405  6011          RSF             /WAIT FOR FLAG=1
1789   02406  5205          JMP .-1
1790   02407  6012          RRB             /CLEAR FLAG (IOT012)
1791   02410  6011          RSF             /SKIP ON FLAG=1
1792   02411  5225          JMP P0T5B       /OK
1793   02412  4451  P0E5,   JMS I UERROR    /ERROR, GO TO ERROR SUB
1794   02413  4040          NOSUF
1795   02414  0000          NONE
1796   02415  5225          JMP P0T5B       /CONTINUE TEST
1797   02416  6014  P0T5S,  RFC             /START SCOPE LOOP, FETCH CHAR
1798   02417  6011          RSF             /WAIT FOR FLAG=1
1799   02420  5217          JMP .-1
1800   02421  6012          RRB             /CLEAR FLAG (IOT012)
1801   02422  6011          RSF             /SKIP IF FLAG=1
1802   02423  5216          JMP .-5         /NO, IOT012 CLEARED IT, READ AGAIN
1803   02424  5221          JMP .-3         /IOT012 FAILED, REPEAT
1804   02425  2122  P0T5B,  ISZ CTRA        /DONE?
1805   02426  5204          JMP P0T5A       /NO, REPEAT
1806   02427  5425          JMP I CHAIN     /YES, CHAIN
1807
1808   02430  0006  P0T6,   6
1809   02431  2600          P0T7
1810                /CHECKS THAT IOT014 CLEARS FLAG
1811   02432  4477          SETA            /-500 TO CTRA
1812   02433  7014          -764
1813   02434  6014          RFC             /FETCH CLEAR (IOT014)
1814   02435  6011  P0T6A,  RSF             /WAIT FOR FLAG=1
1815   02436  5235          JMP .-1
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1816   02437  6014          RFC             /CLEAR FLAG WITH IOT014
1817   02440  6011          RSF             /SKIP ON FLAG=1
1818   02441  5253          JMP P0T6B       /OK, FLAG IS OFF
1819   02442  4451  P0E6,   JMS I UERROR    /ERROR, FLAG=1, GO TO ERROR SUB
1820   02443  4040          NOSUF
1821   02444  0000          NONE
1822   02445  5253          JMP P0T6B
1823   02446  4502  P0T6S,  DELAY           /START SCOPE LOOP, DELAY 20 MS
1824   02447  6014          RFC             /FETCH CHAR (IOT014)
1825   02450  6011          RSF             /WAIT FOR FLAG=1
1826   02451  5250          JMP .-1
1827   02452  5247          JMP .-3         /GO CLEAR FLAG AND FETCH CHAR
1828   02453  2122  P0T6B,  ISZ CTRA        /DONE?
1829   02454  5235          JMP P0T6A       /NO, REPEAT
1830   02455  5425          JMP I CHAIN     /YES, CHAIN
1831          2600  PAGE
1832
1833   02600  0007  P0T7,   7
1834   02601  2637          P0T10
1835                /CHECKS ABILITY TO READ ALL 0'S CHARACTERS
1836   02602  4477          SETA            /-500 TO CTRA
1837   02603  7014          -764
1838   02604  6014  P0T7A,  RFC             /FETCH CHAR (IOT014)
1839   02605  6011          RSF             /WAIT FOR FLAG=1
1840   02606  5205          JMP .-1
1841   02607  7200          CLA
1842   02610  6012          RRB             /READ BUFFER
1843   02611  3236          DCA P0T7WB      /SAVE
1844   02612  1236          TAD P0T7WB
1845   02613  7640          SZA CLA         /RESULT 0?
1846   02614  5220          JMP P0E7        /ERROR, DID NOT READ 0'2 CHAR
1847   02615  2122  P0T7B,  ISZ CTRA        /DONE?
1848   02616  5204          JMP P0T7A       /NO, REPEAT
1849   02617  5425          JMP I CHAIN     /YES, CHAIN
1850   02620  4452  P0E7,   JMS I UASCCN
1851   02621  2635          P0T7WA
1852   02622  1604          SB
1853   02623  4452          JMS I UASCCN
1854   02624  2636          P0T7WB
1855   02625  1611          WAS
1856   02626  4451          JMS I UERROR
1857   02627  4040          NOSUF
1858   02630  1601          SBWAS
1859   02631  5215          JMP P0T7B
1860   02632  7200  P0T7S,  CLA
1861   02633  6012          RRB
1862   02634  5232          JMP .-2
1863   02635  0000  P0T7WA, 0000
1864   02636  0000  P0T7WB, 0000
1865
1866   02637  0010  P0T10,  10
1867   02640  2717          P0T11
1868                /CHECKS ABILITY OF READER FLAG TO CAUSE AN INTERRUPT
1869   02641  4475          SETLOC          /SET INTERRUPT TO RETURN TO
1870   02642  0002          2               /P0E10A
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1871   02643  2654          P0E10A
1872   02644  6032  P0T10A, KCC             /CLEAR TTY READER FLAG
1873   02645  6042          TCF             /CLEAR TTY PRINTER FLAG
1874   02646  6022          PCF             /CLEAR PUNCH FLAG
1875   02647  6012          RRB             /CLEAR READER FLAG
1876   02650  6001          ION             /ENABLE INTERRUPT
1877   02651  7000          NOP             /NO OP
1878   02652  6002          IOF             /TURN OFF INTERRUPT
1879   02653  5261          JMP P0T10B
1880   02654  4451  P0E10A, JMS I UERROR    /GO TO ERROR SUB
1881   02655  0140          A               /SUFFIX A
1882   02656  0000          NONE            /NO PRINTOUT
1883   02657  5244          JMP P0T10A      /REPEAT TEST
1884   02660  5244          JMP P0T10A      /REPEAT TEST
1885   02661  4477  P0T10B, SETA            /-4095 TO CTRA
1886   02662  0001          -7777
1887   02663  4475          SETLOC          /SET INTERRUPT RETURN TO
1888   02664  0002          2               /P0T10E
1889   02665  2713          P0T10E
1890   02666  6010          RPE             /SET INTERRUPT ENABLE
1891   02667  6014          RFC             /FETCH CHAR (IOT014)
1892   02670  6011          RSF             /WAIT FOR FLAG=1
1893   02671  5270          JMP .-1
1894   02672  6001  P0T10C, ION             /ENABLE INTERRUPT
1895   02673  7000          NOP
1896   02674  6002          IOF             /TURN OFF INTERRUPT
1897   02675  4451          JMS I UERROR    /GO TO ERROR SUB
1898   02676  0240          B               /SUFFIX B
1899   02677  0000          NONE
1900   02700  5313          JMP P0T10E      /CONTINUE TEST
1901   02701  4475  P0T10S, SETLOC          /SET INTERRUPT RETURN TO
1902   02702  0002          2               /P0T10D
1903   02703  2712          P0T10D
1904   02704  6014          RFC             /FETCH CLEAR
1905   02705  6011          RSF             /WAIT FOR FLAG=1
1906   02706  5305          JMP .-1
1907   02707  6001          ION             /ENABLE INTERRUPT
1908   02710  7000          NOP
1909   02711  5307          JMP .-2
1910   02712  5307  P0T10D, JMP .-3
1911   02713  2122  P0T10E, ISZ CTRA        /DONE?
1912   02714  5272          JMP P0T10C      /NO, REPEAT
1913   02715  6020          PCE             /CLEAR INTERRUPT ENABLE
1914   02716  5425          JMP I CHAIN     /YES, CHAIN
1915                 /STOP DELAY TEST
1916   02717  0011  P0T11,  11
1917   02720  7777          7777            /LAST TEST
1918   02721  4477          SETA            /-200 TO CTRA
1919   02722  7470          -310
1920   02723  4373  P0T11A, JMS DLY250      /INITIAL DELAY
1921   02724  4501          SETDLM          /-19 TO DELAYM
1922   02725  7755          -23
1923   02726  6014          RFC             /FETCH CHAR
1924   02727  6011          RSF             /WAIT FOR FLAG
1925   02730  5327          JMP .-1
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1926   02731  4502          DELAY           /DELAY 19 MS TO CAUSE
1927   02732  6014          RFC             /"STOP DELAY" TO FIRE, FETCH CHAR
1928   02733  4502          DELAY           /DELAY 19 MORE MS
1929   02734  6011          RSF             /CHECK FLAG
1930   02735  5343          JMP P0T11B      /FLAG NOT UP, OK
1931   02736  4451          JMS I UERROR    /ERROR, FLAG SHOULD NOT BE UP
1932   02737  0140          A               /38 MS AFTER "STOP DELAY"
1933   02740  0000          NONE            /FIRES
1934   02741  5323          JMP P0T11A      /CONTINUE TEST
1935   02742  5355          JMP P0T11S      /GO TO SCOPE LOOP
1936   02743  4366  P0T11B, JMS DLY212      /DELAY ADDITIONAL 212 MS
1937   02744  6011          RSF             /FLAG UP?
1938   02745  5351          JMP .+4         /NO, ERROR
1939   02746  2122  P0T11C, ISZ CTRA        /DONE 500 TIMES?
1940   02747  5323          JMP P0T11A      /NO, REPEAT
1941   02750  5425          JMP I CHAIN     /YES, CHAIN
1942   02751  4451          JMS I UERROR    /ERROR, FLAG NOT UP 250 MS
1943   02752  0240          B               /AFTER "STOP DELAY" FIRED
1944   02753  0000          NONE
1945   02754  5346          JMP P0T11C
1946   02755  4501  P0T11S, SETDLM          /SET DELAYM FOR 15 MS
1947   02756  7761          -17
1948   02757  6014          RFC             /FETCH CHAR
1949   02760  5357          JMP .-1         /FLAG 1?
1950   02761  4502          DELAY           /YES DELAY 15 MS
1951   02762  6014          RFC             /FETCH CHAR
1952   02763  6011          RSF             /WAIT FOR FLAG
1953   02764  5363          JMP .-1
1954   02765  5361          JMP .-4         /REPEAT
1955   02766  0000  DLY212, 0
1956   02767  4501          SETDLM          /-212 TO DELAYM
1957   02770  7454          -324
1958   02771  4502          DELAY
1959   02772  5766          JMP I DLY212
1960   02773  0000  DLY250, 0
1961   02774  4501          SETDLM          /DELAY 250 MS
1962   02775  7406          -372
1963   02776  4502          DELAY
1964   02777  5773          JMP I DLY250
1965
1966          3000  PAGE
1967                /PROGRAM 1, BASIC PUNCH AND CONTROL LOGIC TEST
1968                /
1969   03000  4475  PRG1,   SETLOC          /SET KSTART TO
1970   03001  0020          KSTART          /INITIAL ROUTINE
1971   03002  3010          P1T0            /ADDRESS
1972   03003  4475          SETLOC
1973   03004  0105          SRMSK
1974   03005  7717          7717
1975   03006  5607          JMP I .+1       /GET STARTED
1976   03007  0241          SRSET
1977   03010  0000  P1T0,   0
1978   03011  3032          P1T1
1979                /CHECKS THAT PSF (IOT021) DOES NOT SKIP WITH FLAG=0
1980   03012  4477          SETA            /-4095 TO CTRA
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1981   03013  0001          -7777
1982   03014  6022  P1T0A,  PCF             /CLEAR FLAG
1983   03015  6021          PSF             /SKIP IF FLAG=1
1984   03016  5227          JMP P1T0B       /NO SKIP, OK
1985   03017  4451  P1E0,   JMS I UERROR    /SKIP ERROR, GO TO ERROR SUB
1986   03020  4040          NOSUF           /NO SUFFIX
1987   03021  0000          NONE            /NO PRINTOUT
1988   03022  5227          JMP P1T0B       /CONTINUE TEST
1989   03023  6022  P1T0S,  PCF             /CLEAR FLAG
1990   03024  6021          PSF             /SKIP IF FLAG=1
1991   03025  5224          JMP .-1
1992   03026  5224          JMP .-2
1993   03027  2122  P1T0B,  ISZ CTRA        /DONE?
1994   03030  5214          JMP P1T0A       /NO, REPEAT
1995   03031  5425          JMP I CHAIN     /YES, CHAIN
1996   03032  0001  P1T1,   1
1997   03033  3063          P1T2
1998                 /CHECKS THAT PSF (IOT021) SKIPS WITH FLAG=1
1999   03034  4477          SETA            /-4095 TO CTRA
2000   03035  0001          -7777
2001   03036  4501          SETDLM          /-4095 TO DELAYM
2002   03037  0001          -7777
2003   03040  7300          CLA CLL
2004   03041  6022          PCF             /CLEAR PUNCH FLAG, LOAD BUFFER
2005   03042  6024          PPC             /LOAD BUFFER AND PUNCH
2006   03043  4502          DELAY
2007   03044  6021  P1T1A,  PSF             /SKIP IF FLAG=1, SHOULD BE 1
2008   03045  5251          JMP P1E1        /NO SKIP, ERROR
2009   03046  2122  P1T1B,  ISZ CTRA        /DONE?
2010   03047  5244          JMP P1T1A       /NO, REPEAT
2011   03050  5425          JMP I CHAIN     /YES, CHAIN
2012   03051  4451  P1E1,   JMS I UERROR    /GO TO ERROR SUB
2013   03052  4040          NOSUF
2014   03053  0000          NONE
2015   03054  5246          JMP P1T1B       /CONTINUE TEST
2016   03055  7200  P1T1S,  CLA
2017   03056  6022          PCF             /CLEAR FLAG AND BUFFER
2018   03057  6024          PPC             /LOAD AND PUNCH
2019   03060  6021          PSF             /SKIP IF FLAG
2020   03061  5260          JMP .-1
2021   03062  5260          JMP .-2
2022   03063  0002  P1T2,   2
2023   03064  3115          P1T3
2024                 /CHECKS THAT PCF (IOT022) IS ABLE TO CLEAR FLAG
2025   03065  4477          SETA            /-500 TO CTRA
2026   03066  7014          -764
2027   03067  7200  P1T2A,  CLA
2028   03070  6026          PLS             /CLEAR, LOAD AND PUNCH
2029   03071  6021          PSF             /WAIT FOR FLAG
2030   03072  5271          JMP .-1
2031   03073  6022          PCF             /CLEAR FLAG (IOT022)
2032   03074  6021          PSF             /SKIP IF FLAG=1
2033   03075  5312          JMP P1T2B       /NO SKIP OK
2034   03076  4451  P1E2,   JMS I UERROR    /SKIP ERROR, GO TO ERROR SUB
2035   03077  4040          NOSUF
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2036   03100  0000          NONE
2037   03101  5312          JMP P1T2B       /CONTINUE TEST
2038   03102  7200  P1T2S,  CLA
2039   03103  6026          PLS             /CLEAR LOAD AND PUNCH
2040   03104  6021          PSF             /WAIT FOR FLAG
2041   03105  5304          JMP .-1
2042   03106  6022          PCF             /CLEAR FLAG
2043   03107  6021          PSF             /SKIP IF FLAG
2044   03110  5302          JMP .-6         /CLEARED
2045   03111  5306          JMP .-3         /NOT CLEARED
2046   03112  2122  P1T2B,  ISZ CTRA        /DONE?
2047   03113  5267          JMP P1T2A       /NO, REPEAT
2048   03114  5425          JMP I CHAIN     /YES, CHAIN
2049                 /ROUTINE TO CHECK FOR SKIP WITH INTERRUPT DISABLED
2050   03115  0003  P1T3,   3
2051   03116  3200          P1T4
2052   03117  1377          TAD (4000
2053   03120  3022          DCA COUNT
2054   03121  1376          TAD (7773
2055   03122  3136          DCA CTR
2056   03123  6002          IOF
2057   03124  7200          CLA
2058   03125  3135          DCA MILLI
2059   03126  2135          ISZ MILLI
2060   03127  5326          JMP .-1
2061   03130  2136          ISZ CTR
2062   03131  5326          JMP .-3
2063   03132  1375          TAD (0001
2064   03133  3134          DCA DELTIM
2065   03134  6007          CAF
2066   03135  6024          PPC             /PUNCH
2067   03136  4361          JMS TIM1
2068   03137  6021  P1T3A,  PSF             /SKIP IF PUNCH FLAG
2069   03140  5347          JMP P1E3
2070   03141  6010          RPE             /R/P INTERRUPT ON
2071   03142  6003          SRQ             /SHOULD SKIP HERE FOR INT REQ
2072   03143  5347          JMP P1E3        /REPORT ERROR
2073   03144  2022          ISZ COUNT
2074   03145  5321          JMP P1T3+4
2075   03146  5425          JMP I CHAIN
2076   03147  4451  P1E3,   JMS I UERROR
2077   03150  4040          NOSUF
2078   03151  0000          NONE
2079   03152  5321          JMP P1T3+4
2080   03153  6002  P1T3S,  IOF
2081   03154  6021          PSF
2082   03155  5354          JMP .-1
2083   03156  6011          RSF
2084   03157  5356          JMP .-1
2085   03160  5356          JMP .-2
2086   03161  0000  TIM1,   0               /44 MS TIME OUT
2087   03162  2134          ISZ DELTIM
2088   03163  5362          JMP .-1
2089   03164  1374          TAD (0500
2090   03165  3134          DCA DELTIM
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2091   03166  2134          ISZ DELTIM
2092   03167  5366          JMP .-1
2093   03170  2134          ISZ DELTIM
2094   03171  5370          JMP .-1
2095   03172  5761          JMP I TIM1
2096   03174  0500
2097   03175  0001
2098   03176  7773
2099   03177  4000
2100          3200  PAGE
2101                /ROUTINE TO CHECK THAT INTERRUPT ENABLE CAN BE CLEARED FOR PUNCH
2102   03200  0004  P1T4,   4
2103   03201  3234          P1T5
2104   03202  6002          IOF
2105   03203  1302          TAD P7770
2106   03204  3301          DCA PCNT2       /INT COUNTER
2107   03205  6007  PLOOP,  CAF
2108   03206  6010          RPE             /ENABLE INTERRUPT
2109   03207  6020          PCE             /CLEAR INTERRUPT
2110   03210  6001          ION
2111   03211  6024          PPC             /PUNCH
2112   03212  6000          SKON
2113   03213  5224          JMP P1E4        /ERROR , NO ION
2114   03214  6003          SRQ             /SKIP IF INT REQ GENERATED
2115   03215  7410          SKP             /NO INT REQ
2116   03216  5224          JMP P1E4        /ERROR, INT REQ GENERATED
2117   03217  2022          ISZ COUNT       /RELIABILITY SETUP
2118   03220  5205  P1T4A,  JMP PLOOP
2119   03221  2301          ISZ PCNT2
2120   03222  5205          JMP PLOOP
2121   03223  5425          JMP I CHAIN
2122   03224  4451  P1E4,   JMS I UERROR
2123   03225  4040          NOSUF
2124   03226  0000          NONE
2125   03227  5425          JMP I CHAIN
2126   03230  6010  P1T4S,  RPE
2127   03231  4502          DELAY
2128   03232  6020          PCE
2129   03233  5230          JMP .-3
2130   03234  0005  P1T5,   5
2131   03235  3251          P1T6
2132                /USED TO CHECK ABILITY OF IOT022 TO CLEAR BUFFER. VISUAL CHECK
2133   03236  4477          SETA            /-500 TO CTRA
2134   03237  7014          -764
2135   03240  7240  P1T5A,  CLA CMA         /7777 TO AC
2136   03241  6026          PLS             /CLEAR, LOAD AND PUNCH
2137   03242  7200          CLA
2138   03243  6026          PLS             /CLEAR BUFFER CONTENTS PRIOR TO PUNCHING
2139   03244  6021          PSF
2140   03245  5244          JMP .-1
2141   03246  2122          ISZ CTRA        /DONE?
2142   03247  5240          JMP P1T5A       /NO, REPEAT
2143   03250  5425          JMP I CHAIN     /YES, CHAIN
2144   03251  0006  P1T6,   6
2145   03252  3265          P1T7
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2146                /CHECKS ABILITY OF IOT024 TO SET BUFFER TO 125 AND PUNCH IT
2147   03253  4477          SETA            /-500 TO CTRA
2148   03254  7014          -764
2149   03255  7200  P1T6A,  CLA
2150   03256  1152          TAD [125
2151   03257  6026          PLS             /CLEAR, LOAD AND PUNCH
2152   03260  6021          PSF             /WAIT FOR FLAG
2153   03261  5260          JMP .-1
2154   03262  2122          ISZ CTRA        /DONE?
2155   03263  5255          JMP P1T6A       /NO, REPEAT
2156   03264  5425          JMP I CHAIN     /YES, CHAIN
2157   03265  0007  P1T7,   7
2158   03266  3400          P1T10
2159                /CHECKS ABILITY OF IOT024 TO SET BUFFER TO 252 AND PUNCH IT
2160   03267  4477          SETA            /-500 TO CTRA
2161   03270  7014          -764
2162   03271  7200  P1T7A,  CLA
2163   03272  1151          TAD [252
2164   03273  6026          PLS             /CLEAR, LOAD AND PUNCH
2165   03274  6021          PSF             /WAIT FOR FLAG
2166   03275  5274          JMP .-1
2167   03276  2122          ISZ CTRA        /DONE?
2168   03277  5271          JMP P1T7A       /NO, REPEAT
2169   03300  5425          JMP I CHAIN     /YES, CHAIN
2170   03301  7770  PCNT2,  7770
2171   03302  7770  P7770,  7770
2172          3400  PAGE
2173   03400  0010  P1T10,  10
2174   03401  7777          7777            /END OF TESTS
2175                /CHECKS ABILITY OF PUNCH FLAG TO CAUSE AN INTERRUPT
2176   03402  4475          SETLOC          /SET INTERRUPT RETURN
2177   03403  0002          2               /TO P1E10A
2178   03404  3415          P1E10A
2179   03405  6032  P1T10A, KCC             /CLEAR TTY READER
2180   03406  6042          TCF             /CLEAR TTY PUNCH
2181   03407  6012          RRB             /CLEAR READER
2182   03410  6022          PCF             /CLEAR PUNCH
2183   03411  6001          ION             /ENABLE INTERRUPT
2184   03412  7000          NOP
2185   03413  6002          IOF             /TURN OFF INTERRUPT
2186   03414  5222          JMP P1T10B
2187   03415  4451  P1E10A, JMS I UERROR
2188   03416  0140          A
2189   03417  0000          NONE
2190   03420  5205          JMP P1T10A
2191   03421  5205          JMP P1T10A
2192   03422  4477  P1T10B, SETA            /-4095 TO CTRA
2193   03423  0001          -7777
2194   03424  4475          SETLOC          /SET INTERRUPT RETURN
2195   03425  0002          2               /TO P1T10E
2196   03426  3456          P1T10E
2197   03427  7200          CLA
2198   03430  6010          RPE             /SET INTERRUPT ENABLE
2199   03431  6026          PLS             /CLEAR, LOAD AND PUNCH
2200   03432  6021          PSF             /WAIT FOR FLAG
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2201   03433  5232          JMP .-1
2202   03434  6001  P1T10C, ION
2203   03435  7000          NOP
2204   03436  6002          IOF
2205   03437  4451  P1E10B, JMS I UERROR
2206   03440  0240          B
2207   03441  0000          NONE
2208   03442  5256          JMP P1T10E
2209   03443  4475  P1T10S, SETLOC          /SET INTERRUPT RETURN
2210   03444  0002          2               /TO P1T10D
2211   03445  3455          P1T10D
2212   03446  7200          CLA
2213   03447  6026          PLS             /CLEAR, LOAD AND PUNCH
2214   03450  6021          PSF             /WAIT FOR FLAG
2215   03451  5250          JMP .-1
2216   03452  6001          ION             /ENABLE INTERRUPT
2217   03453  7000          NOP
2218   03454  5252          JMP .-2
2219   03455  5252  P1T10D, JMP .-3
2220   03456  2122  P1T10E, ISZ CTRA        /DONE?
2221   03457  5234          JMP P1T10C      /NO, REPEAT
2222   03460  6020          PCE             /CLEAR INTERRUPT ENABLE
2223   03461  5425          JMP I CHAIN     /YES, CHAIN
2224                 /PROGRAM 2, READER TEST, SPECIAL BINARY COUNT PATTERN
2225   03462  4475  PRG2,   SETLOC          /SET SR
2226   03463  0105          SRMSK           /MASK TO
2227   03464  0460          0460            /0460
2228   03465  4464  P2A,    JMS I SYNC      /SYNC READER
2229   03466  4477          SETA
2230   03467  7773          -5
2231   03470  4463  P2B,    JMS I CRCNT     /GET RANDOM CHAR
2232   03471  3123          DCA CTRB        /COUNT IN CTRB
2233   03472  4467  P2C,    JMS I GETPT     /GET BINARY CHAR
2234   03473  3462          DCA I UTSB      /STORE IT
2235   03474  4455          JMS I UTREAD    /GO READ CHAR
2236   03475  4461          JMS I UTCHK     /GO CHECK IT
2237   03476  5303          JMP P2E         /ERROR
2238   03477  2123  P2D,    ISZ CTRB        /GROUP DONE?
2239   03500  5272          JMP P2C         /NO
2240   03501  4563          JMS I [STALL    /YES, STALL
2241   03502  5270          JMP P2B         /REPEAT
2242   03503  2122  P2E,    ISZ CTRA        /5 ERRORS?
2243   03504  5277          JMP P2D         /NO, CONTINUE
2244   03505  5265          JMP P2A         /RESYNC
2245                 /
2246                 /PROGRAM 3, PUNCH TEST, SPECIAL BINARY COUNT PATTERN
2247   03506  4460  PRG3,   JMS I UMARK     /MARK TAPE
2248   03507  4457          JMS I UPLDR     /PUNCH LEADER
2249   03510  4466          JMS I INPATT    /INITIALIZE BINARY PATTERN
2250   03511  1150          TAD [60
2251   03512  3105          DCA SRMSK
2252   03513  4467  P3A,    JMS I GETPT     /GET BINARY CHAR
2253   03514  4456          JMS I UTPCH     /PUNCH IT
2254   03515  4563          JMS I [STALL
2255   03516  5313          JMP P3A
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2256                    /PROGRAM 4, PUNCH VERIFY, SPECIAL BINARY COUNT PATTERN
2257   03517  4466  PRG4,   JMS I INPATT    /INITIALIZE BINARY PATTERN
2258   03520  4475          SETLOC          /400 TO
2259   03521  0105          SRMSK           /TO SR MASK
2260   03522  0400          0400
2261   03523  4467          JMS I GETPT     /GET BINARY CHAR
2262   03524  3462          DCA I UTSB      /STORE IT
2263   03525  4455          JMS I UTREAD    /READ CHARACTER
2264   03526  7440          SZA             /ZERO?
2265   03527  5334          JMP P4B         /NO
2266   03530  5325          JMP .-3         /YES, REPEAT READ
2267   03531  4467  P4A,    JMS I GETPT     /GET BINARY CHAR
2268   03532  3462          DCA I UTSB      /STORE IT
2269   03533  4455          JMS I UTREAD    /READ CHAR
2270   03534  4461  P4B,    JMS I UTCHK     /GO CHECK IT
2271   03535  7000          NOP
2272   03536  5331          JMP P4A         /REPEAT
2273                    /PROGRAM 5, PUNCH TEST, RANDOM CHARACTER PATTERN
2274   03537  4460  PRG5,   JMS I UMARK     /MARK TAPE
2275   03540  4457          JMS I UPLDR     /PUNCH LEADER
2276   03541  4474          JMS I UMOVE     /INITIALIZE RANDOM
2277   03542  1247          SEED1           /CHARACTER ROUTINE
2278   03543  1251          RANP1
2279   03544  7774          -4
2280   03545  1150          TAD [60
2281   03546  3105          DCA SRMSK
2282   03547  4453  P5A,    JMS I ULPRGN    /GET RANDOM CHAR
2283   03550  4456          JMS I UTPCH     /PUNCH IT
2284   03551  4563          JMS I [STALL
2285   03552  5347          JMP P5A         /REPEAT
2286                    /PROGRAM 6, PUNCH VERIFY, RANDOM CHARACTER PATTERN
2287   03553  4474  PRG6,   JMS I UMOVE     /INITIALIZE RANDOM
2288   03554  1247          SEED1           /CHARACTER ROUTINE
2289   03555  1251          RANP1
2290   03556  7774          -4
2291   03557  4475          SETLOC          /400 TO
2292   03560  0105          SRMSK           /SR MASK
2293   03561  0400          0400
2294   03562  4454          JMS I ULRRGN    /GET RANDOM CHAR
2295   03563  3462          DCA I UTSB      /STORE IT
2296   03564  4455          JMS I UTREAD    /READ CHAR
2297   03565  7440          SZA             /ZERO?
2298   03566  5373          JMP P6B         /NO
2299   03567  5364          JMP .-3
2300   03570  4454  P6A,    JMS I ULRRGN    /GET RANDOM CHAR
2301   03571  3462          DCA I UTSB      /STORE IT
2302   03572  4455          JMS I UTREAD    /READ CHAR
2303   03573  4461  P6B,    JMS I UTCHK     /GO CHECK IT
2304   03574  7000          NOP             /ERROR
2305   03575  5370          JMP P6A
2306          3600  PAGE
2307                    /PROGRAM 7, COMBINES READER-PUNCH TEST, SPECIAL BINARY COUNT PATTERN
2308   03600  4475  PRG7,   SETLOC          /SET SR MASK TO 0460
2309   03601  0105          SRMSK
2310   03602  0460          0460
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2311   03603  4475          SETLOC
2312   03604  0104          DLYMSK
2313   03605  0077          77
2314   03606  4466          JMS I INPATT    /INITIALIZE BINARY PATTERN
2315   03607  2133          ISZ ACTIND      /SET ACTIVE INDICATOR
2316   03610  4475          SETLOC          /SET INTERRUPT
2317   03611  0002          2               /SERVIE ADDRESS
2318   03612  0703          INTSVC
2319   03613  4475          SETLOC          /SET PUNCH SERVICE ADDRESS
2320   03614  0716          PVCTR
2321   03615  3624          PBIN
2322   03616  4475          SETLOC          /SET READER SERVICE ADDRESS
2323   03617  0711          RVCTR
2324   03620  3671          WNZERO
2325   03621  4246          JMS CPCH        /PUNCH CHAR
2326   03622  6001          ION             /ENABLE INTERRUPT
2327   03623  5223          JMP .           /IDLE
2328   03624  2132  PBIN,   ISZ PCHCNT      /INCREMENT PUNCH COUNT
2329   03625  1132          TAD PCHCNT      /COMPARE PUNCH COUNT
2330   03626  1147          TAD [-144       /TO 100
2331   03627  7710          SPA CLA         /GREATER THAN 100?
2332   03630  5233          JMP .+3         /NO, OK
2333   03631  7402          HLT             /YES, ERROR HALT
2334   03632  5231          JMP .-1
2335   03633  4246          JMS CPCH        /PUNCH BIN CHAR
2336   03634  1127          TAD RBUSY
2337   03635  7640          SZA CLA         /READER BUSY?
2338   03636  5503          OUT             /YES, EXIT
2339   03637  1132          TAD PCHCNT      /GET PUNCH COUNT
2340   03640  1146          TAD [-12        /SUBTRACT SLACK COUNT
2341   03641  7710          SPA CLA         /POSITIVE?
2342   03642  5503          OUT             /NO, EXIT
2343   03643  6014          RFC             /YES, START READER
2344   03644  2127          ISZ RBUSY       /SET READER BUSY
2345   03645  5503          OUT             /EXIT
2346   03646  0000  CPCH,   0
2347   03647  4470          JMS I GETPTR    /GET BIN CHAR
2348   03650  6026          PLS             /ENABLE PUNCH
2349   03651  7200          CLA             /CLEAR AC
2350   03652  5646          JMP I CPCH      /EXIT
2351   03653  0000  CREAD,  0
2352   03654  7200          CLA
2353   03655  6012          RRB             /READ CHAR
2354   03656  3131          DCA TCHKW       /STORE IT
2355   03657  1132          TAD PCHCNT      /GET PUNCH COUNT
2356   03660  1145          TAD [-1         /MINUS 1
2357   03661  3132          DCA PCHCNT      /STORE IT
2358   03662  1132          TAD PCHCNT
2359   03663  7640          SZA CLA         /0?
2360   03664  5267          JMP .+3         /NO
2361   03665  3127          DCA RBUSY       /YES, CLEAR READER BUSY
2362   03666  5653          JMP I CREAD     /EXIT
2363   03667  6014          RFC             /FETCH NEXT CHAR
2364   03670  5653          JMP I CREAD     /EXIT
2365   03671  4253  WNZERO, JMS CREAD       /READ CHAR
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2366   03672  1131          TAD TCHKW
2367   03673  7650          SNA CLA         /IS IT 0?
2368   03674  5503          OUT             /YES
2369   03675  4475          SETLOC          /SET INTERRUPT SERVICE
2370   03676  0711          RVCTR           /TO RBIN
2371   03677  3703          RBIN
2372   03700  4477          SETA            /-5 TO CTRA
2373   03701  7773          -5
2374   03702  7410          SKP
2375   03703  4253  RBIN,   JMS CREAD       /READ CHAR
2376   03704  4467          JMS I GETPT     /GET BINARY CHAR
2377   03705  3462          DCA I UTSB
2378   03706  1131          TAD TCHKW       /GET CHAR READ
2379   03707  4461          JMS I UTCHK     /GO CHECK IT
2380   03710  7410          SKP             /ERROR
2381   03711  5503          OUT             /NO
2382   03712  2122          ISZ CTRA        /5 ERRORS?
2383   03713  5503          OUT             /NO, TO MAINLINE
2384   03714  4475  RBINA,  SETLOC          /YES, SET READER SERVICE
2385   03715  0711          RVCTR           /TO RESYNC TAPE
2386   03716  3720          .+2
2387   03717  5503          OUT
2388   03720  4253          JMS CREAD       /READ CHAR
2389   03721  1131          TAD TCHKW
2390   03722  3110          DCA CHR1        /STORE
2391   03723  4475          SETLOC          /SET READER SERVICE
2392   03724  0711          RVCTR
2393   03725  3727          .+2
2394   03726  5503          OUT
2395   03727  4253          JMS CREAD       /READ CHAR
2396   03730  1131          TAD TCHKW
2397   03731  3111          DCA CHR2
2398   03732  4475          SETLOC          /SET READER SERVICE
2399   03733  0711          RVCTR
2400   03734  3736          .+2
2401   03735  5503          OUT
2402   03736  4253          JMS CREAD       /READ CHAR
2403   03737  1131          TAD TCHKW
2404   03740  3112          DCA CHR3
2405   03741  4465          JMS I SYNCA     /GO SYNC
2406   03742  5314          JMP RBINA       /SYNC ERROR, TRY AGAIN
2407   03743  4477          SETA            /YES, -5 TO CTRA
2408   03744  7773          -5
2409   03745  4475          SETLOC          /RESTORE READER SERVICE TO
2410   03746  0711          RVCTR           /TO RBIN
2411   03747  3703          RBIN
2412   03750  5503          OUT
2413          4000  PAGE
2414                /PROGRAM 10, READ AMPLIFIER ADJUSTMENT LOOP
2415   04000  4475  PRG10,  SETLOC          /SET INTERRUPT SERVICE
2416   04001  0002          2               /TO INTSVC
2417   04002  0703          INTSVC
2418   04003  4475          SETLOC          /SET PUNCH SERVICE ADDRESS
2419   04004  0716          PVCTR           /TO PCHCLR
2420   04005  0741          PCHCLR
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2421   04006  4475          SETLOC          /SET READER SERVICE ADDRESS
2422   04007  0711          RVCTR           /TO AMPRDA
2423   04010  4070          AMPRDA
2424   04011  4475          SETLOC
2425   04012  1075          ERRORA
2426   04013  7000          7000
2427   04014  1144          TAD [NOP
2428   04015  3572          DCA I [STALL+3
2429   04016  3105          DCA SRMSK       /0 TO SR MASK
2430   04017  4253  RAMPA,  JMS AMPRD       /GO READ CHAR
2431   04020  7440          SZA             /ZERO?
2432   04021  7410          SKP             /NO
2433   04022  4253  RAMPB,  JMS AMPRD       /GO READ CHAR
2434   04023  7041          CIA
2435   04024  1153          TAD [PTMSK
2436   04025  7640          SZA CLA         /ALL 1'S?
2437   04026  5233          JMP RAMPC       /NO, ERROR
2438   04027  4253          JMS AMPRD       /YES, GO READ
2439   04030  7640          SZA CLA         /ZERO?
2440   04031  5242          JMP RAMPD       /NO, ERROR
2441   04032  5222          JMP RAMPB       /YES, REPEAT
2442   04033  4452  RAMPC,  JMS I UASCCN    /CONVERT EXPECTED CHAR
2443   04034  4052          RAMPF           /TO PRINTABLE ASCII
2444   04035  1604          SB
2445   04036  4452          JMS I UASCCN    /CONVERT BAD CHAR TO
2446   04037  4074          RAMPWA          /TO PRINTABLE ASCII
2447   04040  1611          WAS
2448   04041  5246          JMP RAMPE
2449   04042  4452  RAMPD,  JMS I UASCCN    /CONVERT EXPECTED CHAR
2450   04043  4075          RAMPWB          /TO PRINTABLE ASCII
2451   04044  1604          SB
2452   04045  5236          JMP RAMPD-4
2453   04046  4451  RAMPE,  JMS I UERROR    /GO PRINT ERROR
2454   04047  4040          NOSUF
2455   04050  1601          SBWAS
2456   04051  5217          JMP RAMPA       /TRY AGAIN
2457   04052  0377  RAMPF,  377
2458   04053  0000  AMPRD,  0
2459   04054  4501          SETDLM          /-75 TO DELAYM
2460   04055  7665          -113
2461   04056  6014          RFC             /FETCH CHAR
2462   04057  6001          ION             /ENABLE INTERRUPT
2463   04060  4502          DELAY           /DELAY 75 MS
2464   04061  6002          IOF
2465   04062  6011          RSF             /FLAG 1?
2466   04063  7410          SKP             /NO, FLAG DROPPED
2467   04064  5270          JMP AMPRDA      /YES
2468   04065  4447          JMS I XTYPST    /RING BELL 3 TIMES
2469   04066  4076          BELL3
2470   04067  5217          JMP RAMPA       /TRY AGAIN
2471   04070  6012  AMPRDA, RRB
2472   04071  3274          DCA RAMPWA
2473   04072  1274          TAD RAMPWA
2474   04073  5653          JMP I AMPRD
2475   04074  0000  RAMPWA, 0
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2476   04075  0000  RAMPWB, 0
2477   04076  0007  BELL3,  0007            /BELL
2478   04077  0007          0007            /BELL
2479   04100  0007          0007            /BELL
2480   04101  0001          0001            /END CODE
2481                /
2482                /PROGRAM 11, PUNCH ANY CHAR IN SR CONTIUOUSLY
2483   04102  7604  PRG11,  LAS             /READ SR
2484   04103  0153          AND [PTMSK
2485   04104  6026          PLS             /PUNCH CHAR
2486   04105  6021          PSF             /FLAG 1?
2487   04106  5305          JMP .-1
2488   04107  5301          JMP .-6         /YES, REPEAT
2489                /
2490                /PROGRAM 12, PUNCH 1'S AND 0'S LOOP
2491   04110  4475  PRG12,  SETLOC
2492   04111  0105          SRMSK
2493   04112  0075          0075
2494   04113  7240  PRG12A, CLA CMA
2495   04114  0153          AND [PTMSK
2496   04115  4456          JMS I UTPCH     /PUNCH ALL 1'S
2497   04116  4563          JMS I [STALL
2498   04117  7200          CLA
2499   04120  4456          JMS I UTPCH     /PUNCH ALL 0'S
2500   04121  4563          JMS I [STALL
2501   04122  5313          JMP PRG12A      /REPEAT
2502          4200  PAGE
2503                /PROGRAM 13, READER SPEED PRINT LOOP
2504   04200  7200  PRG13,  CLA
2505   04201  3123          DCA CTRB        /CLEAR CTRB
2506   04202  7604          LAS             /READ SR
2507   04203  7104          CLL RAL
2508   04204  7710          SPA CLA         /LONG OR SHORT?
2509   04205  1143          TAD [-416       /LONG
2510   04206  1142          TAD [-36        /SHORT
2511   04207  3232          DCA TKN         /STORE AT TKN
2512   04210  5220          JMP TSTRL
2513   04211  6014  TSTRD,  RFC             /START READER
2514   04212  6011          RSF             /WAIT FOR
2515   04213  5212          JMP .-1         /FLAG
2516   04214  2122          ISZ CTRA        /INCREMENT CTRA
2517   04215  5222          JMP TSTRC
2518   04216  2123          ISZ CTRB        /INCREMENT CTRB
2519   04217  7000          NOP
2520   04220  1232  TSTRL,  TAD TKN         /LOAD CTRA
2521   04221  3122          DCA CTRA
2522   04222  7604  TSTRC,  LAS             /READ SR
2523   04223  7700          SMA CLA         /PRINT SPEED?
2524   04224  5211          JMP TSTRD       /NO, CONTINUE
2525   04225  4447          JMS I XTYPST    /YES
2526   04226  1532          RSPD
2527   04227  4257          JMS TSTRPC
2528   04230  7402          HLT
2529   04231  5200          JMP PRG13
2530   04232  0000  TKN,    OPEN
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2531                /PROGRAM 14, PUNCH SPEED PRINT LOOP
2532   04233  7200  PRG14,  CLA
2533   04234  3123          DCA CTRB        /CLEAR CTRB
2534   04235  5245          JMP TSTPL
2535   04236  6026  TSTPP,  PLS
2536   04237  6021          PSF
2537   04240  5237          JMP .-1
2538   04241  2122          ISZ CTRA        /60?
2539   04242  5247          JMP TSTPC       /NO
2540   04243  2123          ISZ CTRB        /YES, INCREMENT CTRB
2541   04244  7000          NOP
2542   04245  1141  TSTPL,  TAD [-74
2543   04246  3122          DCA CTRA        /LOAD -60 IN CTRA
2544   04247  7604  TSTPC,  LAS             /READ SR
2545   04250  7700          SMA CLA         /PRINT SPEED (AFTER 60 SECONDS)
2546   04251  5236          JMP TSTPP       /NO, CONTINUE
2547   04252  4447          JMS I XTYPST    /YES
2548   04253  1543          PSPD
2549   04254  4257          JMS TSTRPC
2550   04255  7402          HLT
2551   04256  5233          JMP PRG14
2552   04257  0000  TSTRPC, 0
2553   04260  4265          JMS BDCNV       /TYPE C(CTRB) IN DECIMAL
2554   04261  0123          CTRB
2555   04262  4447          JMS I XTYPST    /TYPE "CPS"
2556   04263  1554          CPS
2557   04264  5657          JMP I TSTRPC    /EXIT
2558   04265  0000  BDCNV,  0               /BINARY TO DECIMAL CONVERT
2559   04266  4475          SETLOC          /AND PRINT SUBROUTINE
2560   04267  4331          CNVCTR
2561   04270  7774          -4
2562   04271  1322          TAD ADDRZA      /INITIALIZE ARROW
2563   04272  3303          DCA ARROW
2564   04273  1665          TAD I BDCNV     /GET AND STORE BINARY
2565   04274  2265          ISZ BDCNV       /NUMBER, SORE IT AT VALUE
2566   04275  3330          DCA DIGIT
2567   04276  1730          TAD I DIGIT
2568   04277  3327          DCA VALUE
2569   04300  3330          DCA DIGIT       /0 TO DIGIT
2570   04301  7100          CLL
2571   04302  1327          TAD VALUE
2572   04303  1323  ARROW,  TAD TENPWR
2573   04304  7420          SNL
2574   04305  5311          JMP .+4
2575   04306  2330          ISZ DIGIT
2576   04307  3327          DCA VALUE
2577   04310  5301          JMP ARROW-2
2578   04311  7200          CLA
2579   04312  1330          TAD DIGIT
2580   04313  1140          TAD [260
2581   04314  4473          JMS I UPUNCH
2582   04315  7300          CLA CLL
2583   04316  2303          ISZ ARROW
2584   04317  2331          ISZ CNVCTR
2585   04320  5300          JMP ARROW-3
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2586   04321  5665          JMP I BDCNV
2587   04322  1323  ADDRZA, TAD TENPWR
2588   04323  6030  TENPWR, -1750
2589   04324  7634          -144
2590   04325  7766          -12
2591   04326  7777          -1
2592   04327  0000  VALUE,  0
2593   04330  0000  DIGIT,  0
2594   04331  0000  CNVCTR, 0
2595                /
2596                /PROGRAM 15, READ X CHARACTERS, STALL Y MS, LOOP TO ADJUST TIMINGS
2597   04332  7602  PRG15,  HLT CLA         /HALT TO SET SR
2598   04333  7604          LAS             /READ SR
2599   04334  0174          AND [177        /MASK OFF EXCESS BITS
2600   04335  7041          CIA
2601   04336  3021          DCA DELAYM      /STORE STALL COUNT
2602   04337  7604          LAS             /READ SR
2603   04340  0137          AND [7600       /MASK OFF EXCESS BITS
2604   04341  7106          CLL RTL
2605   04342  7006          RTL
2606   04343  7006          RTL
2607   04344  7041          CIA
2608   04345  3347          DCA .+2
2609   04346  4477  P15A,   SETA            /-X TO CTRA
2610   04347  0000          0
2611   04350  6014  P15B,   RFC             /FETCH CHAR
2612   04351  6011          RSF             /FLAG 1?
2613   04352  5351          JMP .-1
2614   04353  2122          ISZ CTRA        /READ X CHARS?
2615   04354  5350          JMP P15B        /NO
2616   04355  4502          DELAY           /YES, DELAY Y MS
2617   04356  5333          JMP PRG15+1     /REPEAT
2618                /WOW! I MADE IT...
2619                $
2620   00137  7600
2621   00140  0260
2622   00141  7704
2623   00142  7742
2624   00143  7362
2625   00144  7000
2626   00145  7777
2627   00146  7766
2628   00147  7634
2629   00150  0060
2630   00151  0252
2631   00152  0125
2632   00153  0377
2633   00154  0020
2634   00155  0040
2635   00156  0200
2636   00157  0400
2637   00160  6060
2638   00161  0707
2639   00162  7700
2640   00163  1125
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2641   00164  0240
2642   00165  0100
2643   00166  7740
2644   00167  7510
2645   00170  7500
2646   00171  0077
2647   00172  1130
2648   00173  7640
2649   00174  0177
2650   00175  0031
2651   00176  7763
2652   00177  0017
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A	0140	GETPT	0067	PRG4	3517	P0T6A	2435
AC	0023	GETPTR	0070	PRG5	3537	P0T6B	2453
ACTIND	0133	GETPTT	1412	PRG6	3553	P0T6S	2446
ADDRZA	4322	GETRDY	0242	PRG7	3600	P0T7	2600
AMPRD	4053	GTPTRP	1435	PRINT	0671	P0T7A	2604
AMPRDA	4070	INCRTN	0266	PSPD	1543	P0T7B	2615
ARROW	4303	INIT	0217	PTMSK	0377	P0T7S	2632
ASCCN	1000	INITPT	1400	PT0	1460	P0T7WA	2635
ASCT	1041	INPATT	0066	PT1	1461	P0T7WB	2636
B	0240	INTSVC	0703	PT2	1462	P1E0	3017
BDCNV	4265	IOUT	0733	PT3	1463	P1E1	3051
BELL3	4076	KSTART	0020	PUNCH	0426	P1E10A	3415
CHAIN	0025	LINK	0024	PVCTR	0716	P1E10B	3437
CHAINN	0270	LPRGN	1255	P0E0	2025	P1E2	3076
CHCK	0521	LRRGN	1273	P0E1	2052	P1E3	3147
CHECK	0071	MARK	1230	P0E10A	2654	P1E4	3224
CHRCNT	0324	MARKAD	1246	P0E2	2073	P1T0	3010
CHR1	0110	MARKER	1521	P0E3	2137	P1T0A	3014
CHR2	0111	MCTR	0563	P0E4	2224	P1T0B	3027
CHR3	0112	MILCTR	0121	P0E5	2412	P1T0S	3023
CNV	1024	MILLI	0135	P0E6	2442	P1T1	3032
CNVCTR	4331	MIL1	0106	P0E7	2620	P1T1A	3044
COUNT	0022	MOVE	0536	P0T0	2010	P1T1B	3046
CPCH	3646	MOVEA	0551	P0T0A	2016	P1T1S	3055
CPIC	0107	MSCTR	0120	P0T0S	2031	P1T10	3400
CPS	1554	NONE	0000	P0T1	2036	P1T10A	3405
CRCNT	0063	NOSUF	4040	P0T1A	2045	P1T10B	3422
CRCTR	0615	NXTST	0117	P0T1S	2056	P1T10C	3434
CREAD	3653	OPEN	0000	P0T10	2637	P1T10D	3455
CRLF	0600	OUT	5503	P0T10A	2644	P1T10E	3456
CTR	0136	PBIN	3624	P0T10B	2661	P1T10S	3443
CTRA	0122	PCHCLR	0741	P0T10C	2672	P1T2	3063
CTRB	0123	PCHCNT	0132	P0T10D	2712	P1T2A	3067
CTRC	0124	PCNT2	3301	P0T10E	2713	P1T2B	3112
CTRD	0125	PFLAG	0126	P0T10S	2701	P1T2S	3102
CTSK	1363	PIND	1465	P0T11	2717	P1T3	3115
CTSK1	1364	PLDR	1214	P0T11A	2723	P1T3A	3137
CURTST	0115	PLDRW	1227	P0T11B	2743	P1T3S	3153
DELAY	4502	PLOOP	3205	P0T11C	2746	P1T4	3200
DELAYM	0021	PNUMB	1471	P0T11S	2755	P1T4A	3220
DELTIM	0134	PRGADR	0240	P0T2	2064	P1T4S	3230
DIGIT	4330	PRGEND	0305	P0T2A	2071	P1T5	3234
DLCNT	0513	PRGNUM	0030	P0T2OK	2102	P1T5A	3240
DLYCNT	0072	PRGTAB	0031	P0T2S	2077	P1T6	3251
DLYMS	0411	PRG0	2000	P0T3	2105	P1T6A	3255
DLYMSK	0104	PRG1	3000	P0T3A	2127	P1T7	3265
DLY212	2766	PRG10	4000	P0T3S	2143	P1T7A	3271
DLY250	2773	PRG11	4102	P0T4	2200	P15A	4346
ENUMB	1474	PRG12	4110	P0T4A	2220	P15B	4350
ERNUMB	1466	PRG12A	4113	P0T4S	2230	P2A	3465
ERROR	1050	PRG13	4200	P0T5	2400	P2B	3470
ERRORA	1075	PRG14	4233	P0T5A	2404	P2C	3472
FADDR	0561	PRG15	4332	P0T5B	2425	P2D	3477
FLAG	0702	PRG2	3462	P0T5S	2416	P2E	3503
FORWD	0307	PRG3	3506	P0T6	2430	P3A	3513

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P4A     3531    SR1MSK 2000    ULRRGN 0054
P4B     3534    SR2MSK 1000    UMARK  0060
P5A     3547    SR3MSK 0400    UMOVE  0074
P6A     3570    SR4MSK 0200    UNEXIT 0730
P6B     3573    SR5MSK 0100    UNINT  1501
P7770   3302    SR6MSK 0040    UPLDR  0057
RAMPA   4017    SR7MSK 0020    UPUNCH 0073
RAMPB   4022    STALL  1125    URDSR  0076
RAMPC   4033    STCTA  1111    USTCTA 0077
RAMPD   4042    STCTB  1117    USTCTB 0100
RAMPE   4046    STCTR  0400    USTCTR 0075
RAMPF   4052    STDLYM 1042    USTDLM 0101
RAMPWA 4074     STRT   0200    UTCHK  0061
RAMPWB 4075     SUFX   1476    UTPCH  0056
RANCON 0477     SWITCH 0673    UTREAD 0055
RANDEX 0476     SYNC   0064    UTSB   0062
RANDNO 0027     SYNCA  0065    VALUE  4327
RANGEN 0447     SYNK   1311    WAS    1611
RANP1  1251     SYNKA  1324    WASC   1037
RANP2  1252     SYNKB  1347    WCHK   0535
RANR1  1253     SYNKC  1351    WNZERO 3671
RANR2  1254     TADDR  0562    WRTN   1560
RANSAV 0512     TCHK   1143    XTYPST 0047
RANTAD 0464     TCHKW  0131
RANTBL 0500     TDOMSG 1615
RANTND 0511     TEMP   0113
RBIN    3703    TEMP1  0114
RBINA   3714    TEMQ   0700
RBUSY   0127    TEMR   0701
RCF     6014    TENPWR 4323
RCHKW   0130    TIM    2151
RCNT2   2235    TIM1   3161
RDRCLR 0743     TKN    4232
RDSR    0443    TPCH   1207
READSR 4476     TREAD  1200
RIND    1464    TSB    1145
RLOOP   2205    TSC1   0624
RSPD    1532    TSC2   0635
RTNNO   0116    TSTMSK 0017
RVCTR   0711    TSTPC  4247
R7770   2234    TSTPL  4245
SASC    1040    TSTPP  4236
SB      1604    TSTRC  4222
SBWAS   1601    TSTRD  4211
SEED1   1247    TSTRL  4220
SETA    4477    TSTRPC 4257
SETB    4500    TYPAT  0646
SETDLM 4501     TYPSP  0652
SETLOC 4475     TYPSTG 0616
SFADR   1110    UASCCN 0052
SHALT   0333    UCRLF  0050
SHLT    0026    UDLYMS 0102
SRMSK   0105    UERROR 0051
SRSET   0241    UIOUT  0103
SR0MSK 4000     ULPRGN 0053
```

ERRORS DETECTED: 0
LINKS GENERATED: 0

```
P0T6B     1818  1822  1828#
P0T6S     1823#
P0T7      1809  1833#
P0T7A     1838# 1848
P0T7B     1847# 1859
P0T7S     1860#
P0T7WA    1851  1863#
P0T7WB    1843  1844  1854  1864#
P1E0      1985#
P1E1      2008  2012#
P1E10A    2178  2187#
P1E10B    2205#
P1E2      2034#
P1E3      2069  2072  2076#
P1E4      2113  2116  2122#
P1T0      1971  1977#
P1T0A     1982# 1994
P1T0B     1984  1988  1993#
P1T0S     1989#
P1T1      1978  1996#
P1T1A     2007# 2010
P1T1B     2009# 2015
P1T1S     2016#
P1T10     2158  2173#
P1T10A    2179# 2190  2191
P1T10B    2186  2192#
P1T10C    2202# 2221
P1T10D    2211  2219#
P1T10E    2196  2208  2220#
P1T10S    2209#
P1T2      1997  2022#
P1T2A     2027# 2047
P1T2B     2033  2037  2046#
P1T2S     2038#
P1T3      2023  2050# 2074  2079
P1T3A     2068#
P1T3S     2080#
P1T4      2051  2102#
P1T4A     2118#
P1T4S     2126#
P1T5      2103  2130#
P1T5A     2135# 2142
P1T6      2131  2144#
P1T6A     2149# 2155
P1T7      2145  2157#
P1T7A     2162# 2168
P15A      2609#
P15B      2611# 2615
P2A       2228# 2244
P2B       2231# 2241
P2C       2233# 2239
P2D       2238# 2243
P2E       2237  2242#
P3A       2252# 2255
P4A       2267# 2272
P4B       2265  2270#
P5A       2282# 2285
P6A       2300# 2305
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UMARK      771# 2247  2274
UMOVE      783#  882   887  1444  2276  2287
UNEXIT    1188#
UNINT     1189  1506#
UPLDR      770# 2248  2275
UPUNCH     782# 1161  2581
URDSR      785#  831
USTCTA     786#  832
USTCTB     787#  833
USTCTR     784#  830
USTDLM     788#  840
UTCHK      772# 2236  2270  2303  2379
UTPCH      769# 2253  2283  2496  2499
UTREAD     768# 1398  1400  1402  2235  2263  2269  2296  2302
UTSB       773# 2234  2262  2268  2295  2301  2377
VALUE     2568  2571  2576  2592#
WAS       1315  1578# 1855  2447
WASC      1206  1212  1220  1234#
WCHK      1060  1063  1069  1071#
WNZERO    2324  2365#
WRTN       922  1553#
XTYPST     762#  921  1104  1188  1253  1260  2468  2525  2547  2555
_00137    2603
_00140    2580
_00141    2542
_00142    2510
_00143    2509
_00144    2427
_00145    2356
_00146    2340
_00147    2330
_00150    2250  2280
_00151    2163
_00152    2150
_00153    1380  1394  1466  1485  2435  2484  2495
_00154    1295
_00155    1291
_00156    1267
_00157    1263
_00160    1231
_00161    1228  1230
_00162    1211  1218
_00163    1176  2240  2254  2284  2497  2500
_00164    1160
_00165    1159  1271
_00166    1157
_00167    1153
_00170    1149
_00171    1129
_00172     897  2428
_00173     896
_00174     894  1052  2599
_00175     878
_00176     871
_00177     870   875   912   956
_02175    1718
_02176    1709
_02177    1707
```

_03174 2089
_03175 2063
_03176 2054
_03177 2052

V5A