CMQ11·K CSS CMQ11·K CD RD DIA AH-S947A·MC
CVCMAAO FICHE 1 OF 1

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IDENTIFICATION

PRODUCT CODE: AC-S945A-MC

PRODUCT NAME: CVCMAA0 CSS CMQ11K CD RD DIA

DATE: 1 JULY 1981

MAINTAINER: COMPUTER SPECIAL SYSTEMS

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1. ABSTRACT

THIS TEST IS TO BE USED AS A CARD READER DIAGNOSTIC FOR THE
LSI-11 WITH THE CMQ11-K CARD READER. IT TESTS ALL LOGIC FUNCTIONS
OF THE CARD READER, AND INCLUDES AN EXERCISER FOR PUNCH ALPHANUMERIC,
PUNCH BINARY, AND MARKSENSE BINARY TEST DECKS. A SEPARATE STARTING ADDRESS
ALLOWS THE ERROR SENSING FUNCTIONS OF THE READER TO BE CHECKED.
ANOTHER STARTING ADDRESS TESTS SPECIAL DECKS WHICH HAVE ALL
COLUMNS AND CARDS PUNCHED OR MARKED IDENTICALLY, TO AID IN
DIAGNOSING SPECIAL PROBLEMS.

2. REQUIREMENTS

2.1 EQUIPMENT

LSI-11 STANDARD COMPUTER
CR11 CARD CONTROLLER
MARKSENSE CARD READER

2.2 TEST DECKS

MAINDEC-11-DZCMF-CA ALPHANUMERIC TEST DECK
MAINDEC-11-DZCMF-CB BINARY TEST DECK
MAINDEC-11-DZCMF-C01 80-COLUMN MARKSENSE TEST DECK
MAINDFC-11-DZCMF-C02 40-COLUMN MARKSENSE TEST DECK
SPARE CARDS FOR THE ERROR FUNCTION TEST

2.3 STORAGE

THE ROUTINE USES MEMORY 0 TO 16202.

3. LOADING PROCEDURE

PROCEDURE FOR NORMAL ABSOLUTE TAPES SHOULD BE FOLLOWED.

4. STARTING PROCEDURE

4.1 CONTROL SWITCH SETTINGS

BASIC SWITCH REGISTER SETTINGS ARE:

SW15=1 ---HALT ON ERROR
SW14=1 ---SCOPE LOOP
SW13=1 ---INHIBIT PRINT OUT
SW12=1 ---INHIBIT TRACE TRAPPING
SW11=1 ---INHIBIT SUB-PROGRAM ITERATION
(NOTE THAT IF SW11 IS SET, THE CARD COUNT
WILL BE ALTERED, CAUSING FAILURES IN THE
DATA TEST SECTION.)
SW07=1 ---LOOP THRU THE INSTRUCTION TEST PORTION
(NOTE THAT THE PROGRAM MAY HANG LEGITIMATELY
WHEN THE INPUT HOPPER GOES EMPTY IF SW7 IS SET)
SW06=1 ---RETURN TO THE BEGINNING OF THE INSTRUCTION TEST
WHEN CONTINUING FROM ONE DECK TO ANOTHER
SW05=1 ---HALT BETWEEN TEST DECKS
(SEE 5.2.1 FOR EXPLANATION OF SW5=0)
SW04=1 ---RUN THE PUNCHED BINARY TEST DECK (UNLESS SW03 IS SET)
SW02=1 ---40 COLUMN CARD DECK
SW02=0 OR DOWN-80 COLUMN CARD DECK
SW03=1 ---RUN THE MARKSENSE BINARY TEST DECK

COMPUTERS WITHOUT A HARDWARE SWITCH REGISTER HAVE A SOFTWARE
SWITCH REGISTER LOCATION IN MEMORY CALLED "SWREG" (LOCATION 176).
THIS LOCATION CAN BE CHANGED TO REFLECT THE DESIRED SWITCH SETTINGS
BY TYPING CONTROL G.

4.2 STARTING ADDRESSES

200 - INSTRUCTION AND DATA TEST
210 = PICK SUBTEST LOOP
220 = ERROR FUNCTION TEST
240 = SINGLE SUBTEST LOOP
250 = READ SINGLE DATA PATTERN TEST

4.3 PROGRAM AND/OR OPERATOR ACTION

4.3.1 INSTRUCTION AND DATA RELIABILITY TEST (SA 200)

LOAD PROGRAM INTO MEMORY.
LOAD ONE TEST DECK IN THE CARD READER INPUT HOPPER.
PRESS RESET ON THE CARD READER, WAI FOR RESET LIGHT.
THE PROGRAM WILL PRINT THE CURRENT CONTENTS OF THE SOFTWARE
SWITCH REGISTER AND WILL WAIT FOR NEW INPUT.
SET THE SOFTWARE SWITCH REGISTER TO DESIRED SETTING.
LOAD ADDRESS.
SET SWITCHES (SEE 4.1)--ALL DOWN FOR WORST CASE, ALPHA TEST DECK.
PRESS START.
WHEN THE INPUT HOPPER IS EMPTY THE PROGRAM WILL HANG WAITING
FOR AN INTERRUPT FROM THE CARD READER. LOAD ONE OR MORE
TEST DECKS INTO THE INPUT HOPPER. PRESSING "RESET"
ON THE CARD READER SHOULD CAUSE PROGRAM EXECUTION
TO RESUME.
THIS ENTIRE SEQUENCE IS NECESSARY TO RUN THE FULL TEST ON THE CARD
READER.

4.3.2 PICK SUBTEST LOOP (SA 210)

LOAD CARDS (SPARE CARDS OR A TEST DECK) INTO THE INPUT HOPPER.
PRESS "RESET" ON THE CARD READER, WAIT FOR THE RESET LIGHT.
LOAD THE STARTING ADDRESS.
PRESS START
AT THE HALT - LOAD SWITCH REGISTER WITH MOTION DELAY SIZE.

4.3.3 ERROR FUNCTION TEST (SA 220)

LOAD A FEW SPARE CARDS INTO THE INPUT HOPPER
PRESS "RESET" ON THE CARD READER, WAIT FOR RESET LIGHT.
LOAD THE STARTING ADDRESS, THEN SET THE DESIRED SWITCH OPTIONS.
PRESS START.
FOLLOW THE INSTRUCTIONS AS THEY ARE PRINTED OUT.

4.3.4 SINGLE SUBTEST LOOP (SA 240)

LOAD CARDS (SPARE CARDS OR A TEST DECK) INTO THE INPUT HOPPER.
PRESS "RESET" ON THE CARD READER, WAIT FOR RESET LIGHT.
LOAD THE STARTING ADDRESS.
PRESS START.
AT THE 1ST HALT, LOAD THE STARTING ADDRESS OF THE DESIRED TEST
(ADDRESS OF THE SCOPE INSTRUCTION AT THE BEGINNING OF
THE TEST.)
PRESS CONTINUE.
AT THE 2ND HALT SET THE SWITCH REGISTER OPTIONS (BIT 11 MUST-0).
PRESS CONTINUE.

4.3.5 SINGLE DATA PATTERN TEST (SA 250)

A SPECIAL DECK (1 OR MORE CARDS) MUST BE PUNCHED OR MARKED TO RUN
THIS TEST. ANY DATA PATTERN MAY BE USED, BUT IT MUST
BE IDENTICAL IN ALL 80 COLUMNS OF ALL THE CARDS (I.E.
ONLY ONE PIECE OF DATA).
LOAD THIS PREPARED DECK INTO THE INPUT HOPPER.
PRESS CARD READER "RESET", WAIT FOR RESET LIGHT.
LOAD SA 250.
PRESS START.
AT THE INITIAL HALT SET THE CARD IMAGE OF THE DATA PATTERN USED
IN SW11-SW00.
PRESS CONTINUE.
WHEN THE CARD READER RUNS OUT OF CARDS IT WILL RING THE BELL.
RELOADING THE DECK AND PRESSING "RESET" ON
THE CARD READER WILL CONTINUE THE TEST.

5. OPERATING PROCEDURE

5.1 OPERATIONAL SWITCH SETTINGS

5.1.1 AT SA 200 (INSTRUCTION AND DATA RELIABILITY TEST)

SEE 4.1

5.1.2 AT SA 210 (PICK SUBTEST LOOP)

AT THE HALT - LOAD THE DELAY BETWEEN CARD
MOTION IN THE SWITCH REGISTER.

5.1.3 AT SA 220 (ERROR FUNCTION TEST FOR CMQ11-K)

SW14-1 TO LOOP THRU THE CURRENT SUBTEST
SW15 1 TO HALT ON ERROR

5.1.4 AT SA 240 (SINGLE SUBTEST LOOP)

1ST HALT - LOAD STARTING ADDRESS OF DESIRED TEST
2ND HALT - SET SR OPTIONS (BIT 11 MUST=0)
SEE 4.1 FOR SR OPTIONS
NOTE THAT T-BIT IS NOT SET WHEN USING THIS STARTING POINT.

5.1.5 AT SA 250 (SINGLE DATA PATTERN TEST)

AT THE HALT-LOAD THE CARD-IMAGE OF THE DATA PATTERN IN SW11-SW00.

5.2 SUBROUTINE ABSTRACTS

5.2.1 BEGIN SA 200

THE INSTRUCTION TESTS ARE RUN FIRST, FOLLOWED BY THE DATA RELIABILITY TESTS ON THE REMAINING CARDS IN THE FIRST TEST DECK. AT THE END OF THE DECK THE BELL WILL RING. IF SW5=1, THE PROGRAM WILL PRINT THE CURRENT CONTENTS OF THE SOFTWARE SWITCH REGISTER AND WILL WAIT FOR THE NEW INPUT.IF YOU DO NOT DESIRE TO CHANGE THE CONTENTS OF THE SOFTWARE SWITCH REGISTER,HIT CARRIAGE RETURN TO CONTINUE.
IF SW5=0,PROGRAM ACTION DEPENDS ON THE NUMBER OF TEST DECKS LOADED.IF THERE ARE STILL CARDS IN THE INPUT HOPPER THE PROGRAM WILL RUN THE DATA RELIABILITY TEST ON THE ENTIRE DECK.IF THE INPUT HOPPER IS EMPTY AT THE END OF THESE TESTS, IT WAITS FOR THE CARD READER TO BE PUT BACK ON LINE.FURTHER CHECKS ARE MADE OF THE OFF-LINE TO ON-LINE OPERATIONS,AND THEN THE DATA RELIABILITY TEST IS RUN ON THE ENTIRE DECK.
IF SW5=1,HITTING CARRIAGE RETURN WILL RESUME PROGRAM OPERATION AFTER PRINTING THE CURRENT CONTENTS OF SOFTWARE SWITCH REGISTER.

5.2.2 SCOPE

THIS SUBROUTINE CALL IS PLACED BETWEEN EACH SUBTEST IN THE INSTRUCTION SECTION. IT RECORDS THE STARTING ADDRESS OF EACH SUB-TEST AS IT IS BEING ENTERED. IF A SCOPE LOOP IS REQUESTED, IT WILL JUMP TO THE START OF THE SUBTEST THAT THE SCOPE LOOP IS REQUESTED FOR. IF SCOPE LOOP IS NOT REQUESTED, THERE WILL BE 1 ITERATION ON THAT SUBTEST BEFORE THE NEXT SUBTEST IS ENTERED. SWITCH 11 ON A 1 INHIBITS ITERATION OF SUBTESTS.

5.2.3 HLT

THIS SUBROUTINE PRINTS OUT THE LOCATION COUNTER AT THE TIME OF FAILURE, AND THE CONTENTS OF THE PROCESSOR STATUS REGISTER. NOTE THAT THE LOCATION COUNTER WILL BE THE ADDRESS OF THE HLT PLUS TWO.

5.2.4 TTRAP

THIS ROUTINE ALLOWS THE TRACE BIT TO BE SET AFTER THE FIRST LOOP OF THE PROGRAM. THE TRACE BIT WILL BE SET ON ALTERNATE LOOPS OF THE INSTRUCTION AND DATA TEST UNLESS SW12 IS SET. THE FIRST INSTRUCTION EXECUTED UPON TRAPPING IS AN "RTI" (OR "RTT") WHICH RETURNS TO THE INTERRUPTED SEQUENCE. THIS CONTINUES UNTIL THE END OF THE PROGRAM LOOP IS REACHED.

5.2.5 TRAPCATCHER

THIS IS A SERIES OF INSTRUCTIONS STARTING AT LOCATION 0 DESIGNED TO DETECT AND ISOLATE UNEXPECTED TRAPS AND INTERRUPTS TO THE TRAP AND INTERRUPT VECTOR AREA OF MEMORY.

EACH VECTOR ENTRANCE ADDRESS IS LOADED WITH THE ADDRESS OF THE NEXT LOCATION. THE NEXT LOCATION IS LOADED WITH A HALT (000000). THUS AN ILLEGAL TRAP OR INTERRUPT WILL CAUSE A HALT AT THE TRAP LOCATION PLUS TWO.

IF A HALT OCCURS IN THE TRAP OR INTERRUPT AREA, EXAMINE REGISTER SIX. IT WILL CONTAIN THE CURRENT STACK ADDRESS. THE CONTENTS OF THE CURRENT STACK ADDRESS IS THE VALUE OF THE LOCATION COUNTER WHEN THE TRAP OR INTERRUPT OCCURRED.

5.2.6 ERCM11 (ERROR FUNCTION TEST)

THIS TEST CHECKS OPERATION OF THE VARIOUS ERROR SENSING FEATURES OF THE MARKSENSE CARD READER. CARD READER OFF-LINE, INPUT HOPPER EMPTY, AND OUTPUT STACKER FULL ARE CHECKED.

5.2.7 TESTX (SINGLE TEST LOOP)

THIS ROUTINE ALLOWS A SINGLE SUBTEST TO BE RUN CONTINUOUSLY FOR SCOPE LOOP PURPOSES. WHILE A SCOPE LOOP SWITCH OPTION EXISTS, IT REQUIRES THAT YOU ARE WITHIN THE TEST IN WHICH YOU WISH TO LOOP. IN SOME CASES (SUCH AS WITH INTERMITTENT FAILURES) THAT'S NOT EASY TO DO. THIS SUBROUTINE ALLOWS YOU TO LOAD THE ADDRESS OF ANY TEST FROM TEST0 THRU TEST24 AND TESTA THRU TESTG AT THE HALT AND THEN GO DIRECTLY TO THAT TEST.

5.2.8 CKSAME (SINGLE DATA PATTERN TEST)

THIS TEST IS DESIGNED TO AID IN THE DIAGNOSIS OF DIFFICULT DATA ERROR PROBLEMS AND FACILITATE SOME CARD READER ADJUSTMENTS. IT CONTINUOUSLY READS CARDS WHICH HAVE ALL COLUMNS PUNCHED OR MARKED IDENTICALLY (AND ALL CARDS MUST BE IDENTICAL), CHECKING THE DATA AGAINST A PATTERN SET UP ON THE SWITCHES INITIALLY. ANY ERRORS ARE PRINTED OUT, ALONG WITH A COUNT OF THE TOTAL NUMBER OF CARDS READ AND THE TOTAL NUMBER OF DATA ERRORS WHICH HAVE OCCURRED SINCE THE TEST WAS STARTED.

5.2.9 DELAY (PICK SUBTEST LOOP)

THIS TEST IS DESIGNED TO AID IN THE DIAGNOSIS OF DIFFICULT DICK PROBLEMS AND FACILITATE REPAIR. IT CONTINUOUSLY MOVES CARDS THRU THE CARD READER AT A RATE DETERMINED BY THE SWITCH REGISTER VALUE. NIETHER DATA OR STATUS REGISTER ARE CHECKED FOR ERRORS. THE PROGRAM WILL CONTINUALLY LOOP UNTIL STOPPED BY THE OPERATOR

5.3 PROGRAM AND/OR OPERATOR ACTION

5.3.1 LOADING AND STARTING AT 200 WITH ALL SWITCHES DOWN IS WORST CASE TESTING. A SINGLE ALPHANUMERIC DECK SHOULD BE RUN. THIS EXECUTES AN INSTRUCTION TEST FOLLOWED BY A DATA RELIABILITY TEST. AT THE END OF THE DECK CHECKS ARE MADE OF THE FLAG SETTINGS WHICH SHOULD BE AFFECTED, AND THE PROGRAM WAITS FOR AN INTERRUPT FROM THE READER COMING BACK ON-LINE. AT THE END OF THE FIRST DECK THE OPERATOR SHOULD LOAD ONE OR MORE DECKS IN THE INPUT HOPPER AND PRESS "RESET" ON THE CARD READER. IF THE CARD READER IS WORKING PROPERLY, THE BELL WILL RING ONCE WHEN "RESET" IS PRESSED AND THE ENTIRE DECK WILL BE RUN THRU THE DATA RELIABILITY PORTION OF THE TEST. IF, AFTER READING 80 CARDS, THE INPUT HOPPER IS NOT EMPTY, THE PROGRAM WILL CONTINUE TO THE NEXT DECK. SWITCH OPTIONS MAY BE USED TO ALTER THIS FLOW AS NOTED IN SECTION 4.1.

5.3.2 TO GO DIRECTLY TO A SINGLE SUBTEST AND RUN IT CONTINUOUSLY, USE SA 240. AT THE FIRST HALT, SET THE SWITCH REGISTER TO THE STARTING ADDRESS OF THE DESIRED SUBTEST (I.E. THE ADDRESS OF THE SCOPE INSTRUCTION AT THE START OF THE TEST), AND CONTINUE. AT THE SECOND HALT, SET THE DESIRED SWITCH REGISTER OPTIONS AND CONTINUE (SW11 MUST BE = 0). THE PROGRAM WILL CONTINUOUSLY LOOP THRU THE DESIRED SUBTEST UNTIL SW11 IS SET OR THE PROCESSOR IS HALTED.

6. ERRORS

6.1 ERROR PRINTOUT

6.1.1 STANDARD PRINTOUT

PRINTOUTS ARE IN A TWO-WORD FORMAT. THE FIRST IS THE PC+2 OF THE DETECTED ERROR. THE SECOND IS THE CONTENTS OF THE PROCESSOR STATUS REGISTER WHEN THE ERROR WAS DETECTED.

6.1.2 DATA ERROR PRINTOUT

THE HEADING IS PRINTED OUT ONCE PER TEST DECK. THE COLUMNS HAVE THE FOLLOWING SIGNIFICANCE:

DECK -EITHER PUNCHED ALPHANUMERIC, PUNCHED BINARY, 80 COLUMN OR 40 COLUMN MARKSENSE DECK, DEPENDING ON SWITCHES 3 AND 4
CARD -THE CARD NUMBER WHERE THE FAILURE OCCURRED <DEC.>
COLUMN -THE COLUMN NUMBER WHERE THE FAILURE OCCURRED <DEC.>
PATTERN -THE CORRECT CARD IMAGE DATA THAT SHOULD HAVE BEEN READ
READ1 -THE CARD IMAGE DATA IS READ TWICE. THIS IS WHAT WAS READ THE FIRST TIME FROM CRB1
READ2 -THIS IS WHAT WAS IN CRB1 AFTER A BRIEF TIMING LOOP. IT SHOULD BE THE SAME AS THE PREVIOUS READING.
CODED -THIS IS WHAT THE DATA SHOULD BE IN ENCODED FORM
READ -THIS IS WHAT WAS READ BY ADDRESSING THE ENCODED BUFFER

DATA ERRORS NOT TRACED TO CARD READER HARDWARE INCLUDE:

A. SW03 AND SW04 NOT SET TO TYPE OF DECK USED
B. CARD MISSING
C. DAMAGED CARD
D. ALPHA OR BINARY TEST DECK NOT IN PROPER SEQUENCE

6.1.3 SINGLE DATA PATTERN PRINTOUT

THE SINGLE DATA PATTERN TEST PRINTS OUT A HEADING WITH EACH ERROR PRINTOUT. THE COLUMNS HAVE THE FOLLOWING SIGNIFICANCE:

COLUMN -THE COLUMN NUMBER WHERE THE FAILURE OCCURRED.
READ1 -DATA IS READ TWICE. THIS IS THE FIRST READING.
READ2 -THIS IS WHAT WAS READ THE SECOND TIME.
CARDS -THE TOTAL NUMBER OF CARDS (IN OCTAL) THAT HAVE BEEN RUN SINCE THE TEST WAS STARTED.
ERRORS -THE TOTAL NUMBER OF ERRORS DETECTED (IN OCTAL) SINCE THE TEST WAS STARTED.

6.2 ERROR RECOVERY

IN GENERAL, TEST FAILURES WILL PRINTOUT AN ERROR MESSAGE AND CONTINUE. IF THE "HALT ON ERROR" SWITCH IS SET, HITTING CONTINUE WILL RECOVER. IF THE PROGRAM HANGS UP IN A LOOP, THE ERROR IS LIKELY TO BE A SIGNAL WHICH WAS NEVER RECEIVED. IF A HALT OCCURS IN THE TRAP AND VECTOR AREA THE PROGRAM MUST BE RESTARTED. IF THE PROGRAM HALTS IN THE MAIN FLOW, CONSULT THE LISTING IF NO MESSAGE IS TYPED OUT.

7. RESTRICTIONS

7.1 STARTING PROCEDURE

NONE

7.2 OPERATIONAL RESTRICTIONS

7.2.1 COMBINED INSTRUCTION AND DATA RELIABILITY TEST (SA 200)

IF A STANDARD TEST DECK IS NOT BEING USED, SW7 MUST BE SET TO INHIBIT RUNNING THE DATA RELIABILITY PORTION OF THE TEST. THE PROCESSOR MAY HANG WHEN THE INPUT HOPPER GOES EMPTY, AND THIS IS NOT TO BE REGARDED AS A FAILURE.

WHEN USING THE STANDARD TEST DECKS, THEY MUST BE IN GOOD CONDITION. IT IS A GOOD IDEA TO LABEL THE CARDS DECKS AS SOON AS THE DECK IS RECEIVED.

7.2.2 PICK SUBTEST LOOP (SA 210)

THE PICK SUBTEST LOOP REQUIRES SPARE CARDS OR TEST DECKS. THE TEST WILL INITILIZE CARD MOTION AT A RATE DETERIMED BY THE SWITCH REGISTER.

7.2.3 ERROR FUNCTION TEST (SA 220)

THE ERROR FUNCTION TEST REQUIRES SPARE CARDS. THE TEST WILL TYPE OUT A REQUEST FOR THE CARDS WHEN THEY ARE NEEDED.

7.2.4 SINGLE DATA PATTERN TEST (SA 250)

A SPECIAL DECK (ONE OR MORE CARDS) MUST BE PREPARED. ALL COLUMNS OF ALL CARDS ARE PUNCHED OR MARKED IDENTICALLY, USING A DATA PATTERN WHICH WILL TEST THE PROBLEM BEING DIAGNOSED.

8. MISCELLANEOUS

8.1 EXECUTION TIME

NOT APPLICABLE

8.2 CARD DECK DESCRIPTION

8.2.1 PUNCHED ALPHANUMERIC

REFERENCE THE ALPHANUMERIC TABLE BEGINNING AT THE TAG ALPCD IN THE LISTING FOR THE CODES PUNCHED FOR EACH OF 80 COLUMNS ON THE CARD). THE FIRST VALUE GIVEN FOR A COLUMN IS THE CARD IMAGE OF THAT COLUMN, WHILE THE SECOND VALUE IS THE ENCODED FORM OF THE SAME PATTERN. EACH SUCCESSIVE CARD IN THE DECK USES THE SAME SEQUENCE OF CODES.

8.2.2 PUNCHED BINARY

REFERENCE THE BINARY DATA TABLE BEGINNING AT THE TAG BINCD IN THE LISTING FOR THE CODES PUNCHED FOR EACH OF THE 80 COLUMNS OF THE CARD. AS WITH THE ALPHANUMERIC DECK EACH SUCCESSIVE CARD HAS THE SAME SEQUENCE OF CODES.

8.2.3 MARKSENSE BINARY DECK

REFERENCE THE MARKSENSE DATA TABLE BEGINNING AT THE TAG MRKCD IN THE LISTING FOR THE CODES PRINTED FOR EACH OF THE 80 COLUMS ON THE CARD. THEY ARE PRINTED RATHER THAN PUNCHED. AS WITH THE ALPHA AND BINARY DECKS EACH SUCCESSIVE CARD HAS THE SAME SEQUENCE OF CODES.

8.3 SPECIAL NOTES

IF THE CARD READER GOES OFF-LINE BEFORE THE END OF A CARD, BUSY REMAINS SET UNTIL THE CARD ACTUALLY CLEARS THE READER.

''CARD DONE ' FROM THE LAST CARD IN THE INPUT HOPPER WILL OCCUR BEFORE THE CARD READER GOES OFFO-LINE DUE TO ''INPUT HOPPER EMPTY.''

CLEARING BIT 0 OF THE CRS AFTER SETTING IT CAN CAUSE THE READER TO NOT READ A CARD IF IT IS DONE RAPIDLY ENOUGH.

8.4 TESTING CMG11-K'S WITH NON-STANDARD ADDRESSES

BY SUBSTITUTING INTO THE LOCATIONS KCRS, KCRB1, AND CRB2 THE ADDRESSES OF THE CRS, CRB1, AND CRB2 OF A CARD READER ASSIGNED A NON-STANDARD ADDRESS, AND SUBSTITUTING ITS INTERRUPT VECTOR ADDRESS INTO INTVC, A CMG11-K MAY BE TESTED AT ANY ADDRESS ASSIGNED TO IT.

9. PROGRAM DESCRIPTION

THIS SET OF TESTS IS DESIGNED TO CHECK ALL OPERATIONS OF THE CMQ11-K CARD READER, WITH THE NECESSARY EXCEPTION THAT TIMING IN MOST CASES IS ONLY PARTIALLY TESTED. A SPECIAL TEST IS INCLUDED TO CHECK OUT THE ERROR FUNCTIONS OF THE CARD READER , WHICH PRINTS OUT DIRECTIONS AS IT GOES ALONG. A TEST IS ALSO INCLUDED TO ISOLATE DIFFICULT DATA ERRORS USING A SPECIAL TEST DECK MADE UP BY THE USER. A TEST IS ALSO INCLUDED TO ISOLATE

DIFFICULT PICK ERRORS USING ANY TEST DECK. IN THIS TEST THE SWITCH REGISTER IS USED AS A DELAY CONSTANT FOR INITILIZING CARD MOTION. NO DATA IS CHECKED IN THE THIS TEST.

10. LISTING

SEE FOLLOWING PAGES.

11. FLOWCHART

NOT APPLICABLE.

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                .ENABL  ABS,AMA
                .NLIST  MD,MC,CND
                                        .LIST   SEQ,BIN,LOC,ME

                                        .TITLE  CMQ11-K CARD READER TEST        YM-Z110A-AA
                                        ;10 AUGUST 1976
                                        ;R. J. COLLINS
                                ;COPYRIGHT 1973,1974,1975,1976,1977 DIGITAL EQUIPMENT CORP., MAYNARD, MASS. 01754

                177570                  HSR=177570
                000240                  NOP=240
                104000                  HLT=EMT
                104400                  SCOPE=TRAP
                000006                  RTT=6
                000000                  ADINT=%0                ;CONTAINS ADDRESS OF INTERRUPT VECTOR
                000001                  COUNT=%1                ;USED FOR TIMING, ETC.
                000002                  R2=%2                   ;SCRATCH
                000003                  CRS=%3                  ;CONTAINS ADDRESS OF CARD READ STATUS REGISTER
                000004                  CRB1=%4                 ;CONTAINS ADDRESS OF CARD READER BUFFER (12 BIT DATA)
                000005                  R5=%5                   ;SCRATCH
                000006                  SP=%6                   ;STACK POINTER
                000007                  PC=%7                   ;PROGRAM COUNTER

                                ;LOAD TRAP CATCHER INTO LOCATIONS 0 THRU 377
                                ;LOAD TRAP VECTORS FOR HLT AND SCOPE ROUTINES
                000014                  .=14
000014  001052                          TRTRAP
000016  000340                          340
                000030                  .=30
000030  011122                          PRINT
000032  000340                          340
000034  011376                          SCOPEC
000036  000340                          340
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                                ;LOAD STARTING ADDRESS AREA
                        000174          .=174

000174  000000         DISPREG: 0
000176  000000         SWREG:   0

000200  012706  001000          MOV     #STACK,SP
000204  000137  001242          JMP     BEGIN           ;NORMAL STARTING ADDRESS FOR CARD READER
000210  012706  001000          MOV     #STACK,SP
000214  000137  010624          JMP     DELAY           ;PICK DELAY TEST
000220  012706  001000          MOV     #STACK,SP
000224  000137  007142          JMP     ERCM11          ;STARTING ADDRESS FOR CMQ11-K ERROR FUNCTION TEST
                        000240          .=240
000240  012706  001000          MOV     #STACK,SP
000244  000137  010134          JMP     TESTX           ;STARTING ADDRESS FOR LOOP WHICH CONTINUALLY RUNS
                                                        ;ANY SINGLE SUBTEST
000250  012706  001000          MOV     #STACK,SP
000254  000137  010222          JMP     CKSAME          ;STARTING ADDRESS OF TEST TO READ A SINGLE DATA


                                                        ;PATTERN CONTINUOUSLY
                                ;LOAD POINTERS AND GENERAL STORAGE
                        001000          .=1000
001000  000000         STACK:   0                       ;STACK POINTER INITIALIZED TO POINT HERE
                        001012          .=.+1C          ;IN CASE OF STACK OVERFLOW
001012  000000         INTFLG:  0                       ;CONTAINS LEVEL THAT INTERRUPT IS FOUND AT
001014  000230         INTVC:   230                     ;ADDRESS OF CARD READER INTERRUPT VECTOR
001016                 KBCSR:
001016  177560         TKS:     177560                  ;ADDRESS OF KEYBOARD CSR
001020                 KBUF:
001020  177562         TKB:     177562                  ;ADDRESS OF KEYBOARD BUFFER
001022                 TCSR:
001022  177564         TPS:     177564                  ;ADDRESS OF TELETYPE STATUS REGISTER
001024                 TDBR:
001024  177566         TPB:     177566                  ;ADDRESS OF TELETYPE DATA BUFFER
001026  177160         KCRS:    177160                  ;ADDRESS OF CARD READER STATUS REGISTER
001030  177162         KCRB1:   177162                  ;ADDRESS OF CARD READER DATA BUFFER
001032  177164         CRB2:    177164                  ;ADDRESS TO READ ENCODED DATA
001034  177570         SWR:     .WORD   DSWR            ;ADDRESS OF SWITCH REGISTER
001036  177570         DISPLAY: .WORD   DDISP           ;ADDRESS OF DISPLAY REG
001040  000000         APASS:   .WORD   0               ;PASS COUNT
001042  000000         ASWREG:  .WORD   0               ;APT SWITCH REG
001044  000000         AENVM:   .WORD   0               ;ENVIRONMENT REGISTER
001046  000000         AUTOB:   .WORD   0               ;AUTOMATIC MODE INDICATOR
001050  000000         INTAG:   .WORD   0               ;INTERRUPT MODE INDICATOR
                        000004          ERRVEC=4
                        177570          DSWR=177570     ;HARDWARE SWITCH REGISTER
                        177570          DDISP=177570    ;HARDWARE DISPLAY REGISTER
001052  000002         TRTRAP:  RTI                     ;RETURN FROM TRACE LOOP (CHANGED TO RTT FOR AN 11/45)
001054  000000         TRFLG:   0                       ;TOGGLED TO SWITCH BETWEEN TRACE TRAPPING AND NORMAL FLO
001056  000000         PROC:    0                       ;STORES PROCESSOR STATUS WHEN TRACE TRAP MUST BE CLEARED
                                                        ;IN A SUBTEST
001060  000000         ERFLG:   0                       ;SET TO ZERO TO OUTPUT DATA ERROR HEADING
001062  177772         PIRQ:    177772                  ;ADDRESS OF PDP 11/45 PIRQ REGISTER
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                                        ;INITIALIZE CSR AND DBR POINTERS
001064  012737  000001  011460  SETUP:   MOV     #1,ITMAX        ;SET ITERATION MAXIMUM TO 1 ITERATION
001072  013703  001026                   MOV     KCRS,CRS        ;SET UP REGISTER POINTERS
001076  013704  001030                   MOV     KCRB1,CRB1
001102  013700  001014                   MOV     INTVC,ADINT     ;LOAD ADDRESS OF INTERRUPT VECTOR
001106  005037  001012                   CLR     INTFLG          ;INITIALIZE INTERRUPT FLAG
001112  005037  001054                   CLR     TRFLG           ;INITIALIZE TRACE FLAG
001116  012737  001144  000010           MOV     #TRET,@#10      ;SETUP RESERVED ADDRESS TRAP RETURN
001124  005037  000012                   CLR     @#12
001130  006705                           6705                    ;EXTEND R5
001132  000240                           NOP
001134  012737  000006  001052           MOV     #RTT,@#TRTRAP   ;IF NO TRAP THIS IS AN 11/45 OR 11/40
001142  000404                           BR      .+12
001144  012737  000002  001052  TRET:    MOV     #RTI,@#TRTRAP   ;IF TRAP, NOT AN 11/45 OR 11/40
001152  022626                           CMP     (SP)+,(SP)+     ;RESTORE STACK POINTER
001154  012737  000012  000010           MOV     #12,@#10
001162  004737  012520                   JSR     PC,SWRCK
001166  012737  000200  011246           MOV     #200,PRIOR
001174  106437  011246                   MTPS    PRIOR
001200  012737  000050  006426           MOV     #40.,COLSIZ     ;SETUP FOR 40 OR 80
001206  012737  000047  006430           MOV     #39.,COLM1
001214  032777  000004  005210           BIT     #4,@SR          ;SR2=1 FOR 40 COL.
001222  001006                           BNE     1$
001224  062737  000050  006430           ADD     #40.,COLM1
001232  062737  000050  006426           ADD     #40.,COLSIZ
001240  000207                   1$:     RTS     %7              ;RETURN

001242  004737  001064           BEGIN:  JSR     %7,SETUP        ;INITIALIZE POINTERS AND FLAGS
001246  004737  011544                   JSR     PC,CRLF         ;
001252  004737  011702                   JSR     PC,GTSWR        ;
001256  005037  006412                   CLR     DECCYC          ;COUNTS # OF TIMES THROUGH DECK
001262  000443                           BR      TEST            ;GO TO INSTRUCTION TESTS
001264  012746  000340           RESTRT: MOV     #340,-(SP)      ;PUSH STATUS ON STACK
001270  012746  001372                   MOV     #TEST,-(SP)     ;PUSH PC ON STACK
001274  000005                           RESET
001276  004737  011544                   JSR     PC,CRLF         ;
001302  004737  011702                   JSR     PC,GTSWR        ;
001306  005037  006412                   CLR     DECCYC
001312  012737  000050  006426           MOV     #40.,COLSIZ     ;SETUP FOR 40 OR 80
001320  012737  000047  006430           MOV     #39.,COLM1      ;
001326  032777  000004  005076           BIT     #4,@SR          ;
001334  001006                           BNE     1$
001336  062737  000050  006426           ADD     #40.,COLSIZ
001344  062737  000050  006430           ADD     #40.,COLM1
001352                           1$:
001352  005737  001054                   TST     TRFLG           ;CHECK FLAG
001356  100004                           BPL     PSSET           ;IF IT IS POSITIVE, CLEAR T BIT
001360  032777  010000  005044           BIT     #10000,@SR      ;TRACE TRAPPING INHIBITED?
001366  001000                           BNE     PSSET           ;BRANCH IF YES
001370  000002           PSSET:  RTI
                                        ;TEST FOR CORRECT INITIALIZATION OF STATUS REGISTER
001372  012737  001402  011464  TEST:    MOV     #TEST1A,RETURN  ;SETUP SCOPE LOOP RETURN ADDRESS
001400  104400           TEST1:  SCOPE                           ;SO ALL TESTS START WITH SCOPE
001402  004737  011022           TEST1A: JSR     %7,CKBIT8       ;CHECK FOR OFF-LINE SET
001406  004737  010722                   JSR     %7,CLRTR        ;STORE PROCESSOR STATUS AND CLEAR TRACE BIT
```

```
                                        CLR     COUNT           ;INITIALIZE COUNTER
                                        INC     COUNT           ;WAIT TO BE CERTAIN
                                        BNE     .-2             ;THAT ALL CARDS ARE
                                        INC     COUNT           ;THRU BEFORE ISSUING
                                        BNE     .-2             ;INIT
                                        INC     COUNT
                                        BNE     .-2
                                        MOV     PROC,-(SP)      ;RESTORE PROCESSOR STATUS
                                        MOV     #TST1B,-(SP)
                                        RTI
                                TST1B:  RESET                   ;SEND OUT INIT
                                        TST     @CRS            ;CHECK FOR STATUS REGISTER ALL ZERO
                                        BEQ     .+4             ;BRANCH IF OK
                                        HLT                     ;STATUS REGISTER NOT CORRECTLY INITIALIZED
                                ;ONLY BITS 1 AND 6 OF THE STATUS REGISTER SHOULD BE ABLE TO BE SET TO ONE
                                ;AND READ BACK AS ONE
                                        BIS     #177776,@CRS    ;SET ALL BITS BUT 0
                                        CMP     #102,@CRS       ;ONLY BITS 1 AND 6 SHOULD BE SET
                                        BEQ     .+6             ;BRANCH IF OK
                                        HLT                     ;STATUS REGISTER DIDN'T CONTAIN 102
                                        BR      TEST2           ;BRANCH AFTER FAILURE
                                ;CLEARING STATUS REGISTER SHOULD CLEAR BITS 1 AND 6
                                        CLR     @CRS            ;CLEAR BITS 1 AND 6
                                        TST     @CRS            ;CHECK FOR ALL BITS CLEAR
                                        BEQ     TST1C           ;BRANCH IF OK
                                        HLT                     ;BIT 1 AND/OR BIT 6 DIDN'T CLEAR
                                TST1C:  BIT     #10,@SR         ;CHECK FOR MARK SENSE DECK
                                        BEQ     TEST2           ;CONTINUE LOGIC TESTS IF NOT M S DECK
                                        JMP     DATMK           ;OTHERWISE GO TO DATA TEST

                                TEST2:  SCOPE
                                ;START SHOULD CAUSE CARD DONE WITHIN 1 SECOND
                                ;BIT 0 SHOULD ALWAYS READ AS BEING EQUAL TO ZERO
                                        JSR     %7,CKBIT8       ;CHECK FOR OFF-LINE SET
                                        JSR     %7,CLRTR        ;STORE CURRENT PROCESSOR STATUS AND CLEAR TRACE BIT
                                        INC     @CRS            ;START READING A CARD
                                        BIT     #1,@CRS         ;CHECK BIT 0
                                        BEQ     .+4             ;BRANCH IF NOT SET
                                        HLT                     ;BIT 0 READ AS A ONE
                                        CLR     COUNT           ;INITIALIZE COUNTER
                                        INC     COUNT           ;WAIT
                                        BNE     .-2
                                        INC     COUNT
                                        BNE     .-2
                                        INC     COUNT
                                        BNE     .-2
                                        INC     COUNT
                                        BNE     .-2
                                        MOV     PROC,-(SP)      ;RESTORE PROCESSOR STATUS
                                        MOV     #TST2A,-(SP)
                                        RTI
                                TST2A:  BIT     #40000,@CRS     ;CHECK CARD DONE
                                        BNE     CONT2           ;CONTINUE IF SET
                                        HLT                     ;CARD DONE DIDN'T SET WITHIN 400 MS
                                        BR      TEST3           ;NOTE THAT FAILURE COULD BE DUE TO READ
                                                                ;NOT BEING RESET
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                                        CONT2:  BIS     #40000,@CRS     ;DATO TO STATUS REGISTER SHOULD CLEAR
                                                BIT     #40000,@CRS     ;CARD DONE
                                                BEQ     .+4             ;BRANCH IF IT DID
                                                HLT                     ;DATO DIDN'T CLEAR CARD DONE

                                        TEST3:  SCOPE
                                        ;BUSY (BIT 9) SHOULD BE SET BY READING A CAR'
                                        ;IT SHOULD REMAIN SET UNTIL CARD DONE SETS, WHICH SHOULD CLEAR IT
                                                JSR     %7,CKBIT8       ;CHECK FOR OFF-LINE SET
                                                CLR     @CRS            ;INITIALIZE STATUS FEGISTER
                                                INC     @CRS            ;READ A CARD
                                                BIT     #1000,@CRS      ;CHECK BUSY
                                                BNE     LOOP3           ;BRANCH IF SET
                                                HLT                     .READING A CARD DIDN'T SET BUSY
                                                BR      TEST4
                                        LOOP3:  BIT     #40000,@CRS     ;CHECK CARD DONE
                                                BNE     DONE3           ;BRANCH IF SET
                                                BIT     #1000,@CRS      ;CHECK BUSY
                                                BNE     LOOP3           ;BRANCH IF STILL SET
                                                BIT     #40000,@CRS     ;CHECK CARD DONE
                                                BNE     TEST4           ;GO TO NEXT TEST IF SET
                                                HLT                     ;BUSY CLEARED BEFORE CARD DONE SET
                                                BR      TEST4
                                        DONE3:  BIT     #1000,@CRS      ;CHECK BUSY
                                                BEQ     TEST4           ;GO ON TO NEXT TEST IF CLEAR
                                                HLT                     ;CARD DONE DIDN'T CLEAR BUSY

                                        TEST4:  SCOPE
                                        ;A TIMING ERROR SHOULD OCCUR IF DATA IS NOT READ AND NEW DATA COMES IN
                                        ;A TIMING ERROR SHOULD SET THE SPECIAL CONDITION BIT WHEN CARD DONE OCCURS
                                        ;COLUMN READY SHOULD BE CLEARED BY THE TIMING ERROR AND PREVENTED FROM RESETTING
                                        ;BITS 11,14, AND 15 SHOULD BE CLEARED BY A DATO TO THE STATUS REGISTER

                                                JSR     %7,INIT         ;INIT STATUS REGISTER
                                                CLR     COUNT           ;INITIALIZE COUNTER
                                                INC     @CRS            ;INITIATE READ
                                        LOOP4:  BIT     #140200, @CRS   ;WAIT FOR SPECIAL CONDITION, CARD DONE,
                                                                        ;OR COLUMN READY
                                                BEQ     LOOP4           ;LOOP IF NONE OCCURRED
                                                BIT     #140000, @CRS   ;SPECIAL CONDITION OR CARD DONE?
                                                BNE     CK4             ;YES, BRANCH
                                                INC     COUNT           ;NO, COUNT COLUMN READYS
                                        LOOP4B: TSTB    @CRS            ;WAIT FOR COLUMN READY TO CLEAR
                                                BPL     LOOP4           ;IF CLEAR, RETURN TO LOOP4
                                                BIT     #140000, @CRS   ;CHECK FOR SPECIAL CONDITION OR CARD DONE
                                                BNE     CK4             ;BRANCH IF EITHER SET
                                                BR      LOOP4B          ;OTHERWISE, CHECK AGAIN
                                        CK4:    BIT     #40000, @CRS    ;CHECK CARD DONE
                                                BNE     .+6             ;BRANCH IF SET
                                                HLT                     ;SPECIAL CONDITION SET BEFORE CARD DONE
                                                BR      CONT4
                                                TST     @CRS            ;CHECK SPECIAL CONDITION
                                                BMI     .+4             ;BRANCH IF SET
                                                HLT                     ;SPECIAL CONDITION WASN'T  SET
                                        CONT4:  BIT     #4000,  @CRS    ;CHECK TIMING ERROR
                                                BNE     .+4             ;BRANCH IF SET
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                                        HLT                     ;TIMING ERROR WASN'T SET
                                        DEC     COUNT           ;CHECK NUMBER OF COLUMN READYS
                                        BPL     .+6             ;BRANCH IF ANY OCCURRED
                                        HLT                     ;COLUMN READY NEVER OCCURRED
                                        BR      .+6
                                        BEQ     .+4             ;BRANCH IF ONLY ONE OCCURRED
                                        HLT                     ;COLUMN READY OCCURRED MORE THAN ONCE
                                        TSTB    @CRS            ;CHECK COLUMN READY
                                        BPL     .+4             ;BRANCH IF NOT SET
                                        HLT                     ;COLUMN READY WASN'T CLEARED
                                        CLR     @CRS            ;CLEAR BITS 11,14, AND 15 VIA DATO
                                        BIT     #144000, @CRS   ;CHECK
                                        BEQ     .+4
                                        HLT                     ;BITS 11,14, AND 15 WEREN'T ALL CLEARED

                        TEST5:  SCOPE
                        ;SETTING READ SHOULD CAUSE COLUMN READY TO SET 40 OR 80 TIMES BEFORE CARD DONE SETS
                        ;READING THE DATA BUFFER SHOULD CLEAR COLUMN READY AND PREVENT A TIMING ERROR
                                        JSR     %7,INIT         ;INITIALIZE STATUS REGISTER
                                        CLR     COUNT           ;INITIALIZE COUNTER
                                        INC     @CRS            ;INITIATE READ
                        LOOP5:  BIT     #140200,@CRS    ;WAIT FOR COLUMN READY, CARD DONE
                                        BEQ     .-4             ;OR SPECIAL CONDITION
                                        BIT     #40000, @CRS    ;CARD DONE?
                                        BNE     CK5             ;YES, BRANCH
                                        TST     @CRS            ;CHECK BIT 15
                                        BPL     .+6             ;SKIP ERROR HALT IF NOT SET
                                        HLT                     ;BIT 15 WAS SET
                                        BR      TEST6           ;GO TO NEXT TEST
                                        CMP     COUNT,COLM1     ;CHECK FOR 40 OR 80
                                        BPL     LOOP5           ;BRANCH IF 40 OR 80 OR MORE WITHOUT CLEARING READY
                                        INC     COUNT           ;INCREMENT COUNTER
                                        TST     @CRB1           ;CLEAR READY
                                        TSTB    @CRS            ;MAKE SURE IT CLEARED
                                        BPL     .+4             ;BRANCH IF IT DID
                                        HLT                     ;READING DATA BUFFER DIDN'T CLEAR READY
                                        BR      LOOP5           ;LOOP
                        CK5:    BIT     #4000,  @CRS    ;CHECK TIMING ERROR BIT
                                        BEQ     .+4             ;BRANCH IF NOT SET
                                        HLT                     ;TIMING ERROR WAS SET
                                        ;NOTE THAT IF COLUMN READY SET MORE THAN 40 OR 80 TIMES
                                        ;A TIMING ERROR WILL OCCUR AND THE COUNT WILL BE 39 OR 79
                                        BR      TEST6           ;BRANCH AFTER ERROR
                                        CMP     COUNT,COLM1     ;CHECK COUNT
                                        BEQ     .+4             ;BRANCH IF 40 OR 80 COLUMN READYS OCCURRED
                                        HLT                     ;COLUMN READY DIDN'T OCCUR 40 OR 80 TIMES
                                                                ;BEFORE CARD DONE
                                        CMP     @CRS,#40200     ;ONLY CARD DONE AND COLUMN READY SHOULD BE SET
                                        BEQ     .+4
                                        HLT                     ;STATUS REGISTER IN WRONG STATE
                                        CLR     @CRS            ;SHOULD CLEAR DONE BUT NOT READY
                                        CMP     @CRS,#200       ;CHECK FOR ONLY READY SET
                                        BEQ     .+4             ;BRANCH IF OK
                                        HLT                     ;STATUS REGISTER IN WRONG STATE
                                        TST     @CRB1           ;READING DATA BUFFER SHOULD CLEAR COLUMN READY
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                        TST     @CRS            ;CHECK STATUS REGISTER
                        BEQ     .+4             ;BRANCH IF ALL BITS ZERO
                        HLT                     ;STATUS REGISTER NOT EQUAL TO ZERO

TEST6:  SCOPE
;TIMING ERROR SHOULD SET BIT 11 BEFORE CARD DONE OCCURS, EVEN IF IT OCCURS AT COLUMN 40
;A DATOB TO THE LOW BYTE OF THE CRS SHOULD CLEAR BITS 15,14, AND 11
                        JSR     %7,INIT         ;INITIALIZE
                        MOV     #77.,COUNT      ;SETUP COUNTER
                        INC     @CRS            ;START READING A CARD
LOOP6:  TSTB    @CRS            ;WAIT FOR COLUMN READY
                        BPL     .-2
                        TST     @CRB1           ;CLEAR COLUMN READY
                        DEC     COUNT           ;GO THRU LOOP FOR 1ST 78 COLUMN READY'S
                        BPL     LOOP6
                        BIT     #144000,@CPS    ;WAIT FOR CARD DONE OR TIMING ERROR
                        BEQ     .-4             ;OR SPECIAL CONDITION
                        BIT     #40000,@CRS     ;CARD DONE SET?
                        BNE     ERR6            ;YES, 2 POSSIBLE TEST FAILURES
                        BIT     #4000,@CRS      ;CHECK TIMING ERROR
                        BEQ     OFF6            ;IF NOT SET, READER IS PROBABLY OFF-LINE
                        TSTB    @CRS            ;CHECK COLUMN READY
                        BPL     .+4             ;BRANCH IF CLEAR
                        HLT                     ;TIMING ERROR DIDN'T CLEAR READY
                        TST     @CRS            ;WAIT FOR SPECIAL CONDITION
                        BPL     .-2
                        BIT     #40000,@CRS     ;CHECK CARD DONE
                        BEQ     OFF6            ;IF NOT SET, READER IS PROBABLY OFF-LINE
                        CLRB    @CRS            ;DATOB TO LOW BYTE OF CRS
                        BIT     #144000,@CRS    ;CHECK BITS 15,14,11
                        BEQ     TEST7           ;BRANCH IF CLEAR TO NEXT TEST
                        HLT                     ;DATOB TO LOW BYTE OF CRS DIDN'T CLEAR
                                                ;BITS 15,14 AND/OR 11
                        BR      TEST7           ;GO TO NEXT TEST
OFF6:   BIT     #400,@CRS       ;CHECK BIT 8
                        BNE     TEST7           ;BRANCH IF SET
                        HLT                     ;BIT 15 WAS SET, 8 WASN'T
                        BR      TEST7           ;GO TO NEXT TEST
ERR6:   BIT     #4000,@CRS      ;TIMING ERROR SET?
                        BEQ     .+6             ;NO, BRANCH
                        HLT                     ;TIMING ERROR DIDN'T SET BEFORE CARD DONE
                        BR      TEST7           ;GO TO NEXT TEST AFTER ERROR
                        HLT                     ;TIMING ERROR WASN'T SET

TEST7:  SCOPE
;NOT READING THE 40TH OR 80TH COLUMN OF DATA FROM THE BUFFER
;SHOULD CAUSE A TIMING ERROR ON THE FIRST COLUMN OF THE NEXT CARD
;SETTING EJECT SHOULD CLEAR TIMING ERROR, AND BIT 15 SHOULDN'T SET
;INCB SHOULD START A READ

                        JSR     %7,INIT         ;INITIALIZE
                        INC     @CRS            ;START READ
                        MOV     COLSIZ,COUNT    ;INITIALIZE COUNTER
LOOP7:  BIT     #140200,@CRS    ;TEST FOR ERROR, DONE OR READY
                        BEQ     LOOP7           ;LOOP IF NONE SET
                        TST     @CRS            ;CHECK ERROR
```

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915  002346  100002                    BPL     .+6             ;BRANCH IF NOT SET
916  002350  104000                    HLT                     ;BIT 15 WAS SET
917  002352  000455                    BR      TEST8           ;GO TO NEXT TEST AFTER ERROR
918  002354  032713  040000            BIT     #40000,@CRS     ;CHECK FOR CARD DONE
919  002360  001013                    BNE     DONE7           ;BRANCH IF SET
920  002362  005301                    DEC     COUNT           ;COUNT
921  002364  001402                    BEQ     .+6             ;IF LAST COLUMN READY, BRANCH
922  002366  005714                    TST     @CRB1           ;CLEAR DONE
923  002370  000762                    BR      LOOP7           ;LOOP
924  002372  032713  140000            BIT     #140000,@CRS    ;WAIT FOR DONE OR SPECIAL CONDITION
925  002376  001775                    BEQ     .-4
926  002400  005713                    TST     @CRS            ;CHECK SPECIAL CONDITION
927  002402  100002                    BPL     DONE7           ;BRANCH IF NOT SET
928  002404  104000                    HLT                     ;SPECIAL CONDITION WAS SET
929  002406  000437                    BR      TEST8           ;GO TO NEXT TEST AFTER ERROR
930  002410  005701            DONE7:  TST     COUNT           ;TEST FOR 40 OR 80 COLUMN READY'S
931  002412  001402                    BEQ     .+6             ;BRANCH IF OK
932  002414  104000                    HLT                     ;COLUMN READY DID NOT OCCUR 40 OR 80 TIMES
933  002416  000433                    BR      TEST8           ;GO TO NEXT TEST AFTER ERROR
934  002420  105213                    INCB    @CRS            ;START READ
935  002422  105713                    TSTB    @CRS            ;CHECK COLUMN READY
936  002424  100401                    BMI     .+4             ;BRANCH IF STILL SET
937  002426  104000                    HLT                     ;READY DID NOT REMAIN SET
938  002430  032713  004000            BIT     #4000,@CRS      ;TEST FOR TIMING ERROR
939  002434  001775                    BEQ     .-4             ;LOOP IF NOT SET
940  002436  105713                    TSTB    @CRS            ;CHECK COLUMN READY
941  002440  100002                    BPL     .+6             ;BRANCH IF NOT SET
942  002442  104000                    HLT                     ;TIMING ERROR DIDN'T CLEAR READY
943  002444  000420                    BR      TEST8
944  002446  112713  000002            MOVB    #2,@CRS         ;SET EJECT
945  002452  032713  004000            BIT     #4000,@CRS      ;CHECK TIMING ERROR
946  002456  001402                    BEQ     .+6             ;BRANCH IF CLEARED
947  002460  104000                    HLT                     ;TIMING ERROR NOT CLEARED BY DATOB
948  002462  000411                    BR      TEST8           ;GO TO NEXT TEST AFTER ERROR
949  002464  032713  140000            BIT     #140000,@CRS    ;WAIT FOR DONE OR SPECIAL CONDITION
950  002470  001775                    BEQ     .-4
951  002472  032713  000400            BIT     #400,@CRS       ;CHECK BIT 8
952  002476  001003                    BNE     TEST8           ;BRANCH IF READER OFF-LINE
953  002500  005713                    TST     @CRS            ;SPECIAL CONDITION SHOULDN'T SET
954  002502  100001                    BPL     .+4             ;SINCE DATOB CLEARED TIMING ERROR
955  002504  104000                    HLT                     ;BIT 15 WAS SET, 8 WASN'T
956
957
958  002506  104400            TEST8:  SCOPE
959                            ;DATA SHOULD BE AVAILABLE IN THE DATA BUFFER FOR AT LEAST 1.0 MILLISECOND
960  002510  004737  010674            JSR     %7,INIT         ;INITIALIZE STATUS REGISTER
961  002514  004737  010722            JSR     %7,CLRTR        ;STORE CURRENT PROCESSOR STATUS AND CLEAR TRACE BIT
962  002520  005213                    INC     @CRS            ;START READ
963  002522  032713  140200    LOOP8:  BIT     #140200,@CRS    ;WAIT FOR COLUMN READY OR CARD DONE
964  002526  001775                    BEQ     .-4             ;OR SPECIAL CONDITION
965  002530  032713  040000            BIT     #40000,@CRS     ;CARD DONE?
966  002534  001023                    BNE     DBRCK8          ;YES, GO TO CHECK STROBING OF DBR
967  002536  005713                    TST     @CRS            ;NO, CHECK BIT 15
968  002540  100002                    BPL     .+6             ;BRANCH IF NOT SET
969  002542  104000                    HLT                     ;BIT 15 WAS SET
970  002544  000443                    BR      TEST9           ;GO TO NEXT TEST AFTER ERROR
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  971  002546  005013                        CLR     @CRS            ;DATO TO CRS - SHOULDN'T CLEAR BUSY OR READY
  972  002550  022713  001200                CMP     #1200,@CRS      ;CHECK FOR BUSY AND READY
  973  002554  001402                        BEQ     .+6             ;BRANCH IF STILL SET
  974  002556  104000                        HLT                     ;CRS IN WRONG STATE
  975  002560  000435                        BR      TEST9           ;GO TO NEXT TEST AFTER ERROR
  976  002562  011405                        MOV     @CRB1,R5        ;STORE DATA
  977  002564  012701  000100                MOV     #100,COUNT      ;INITIALIZE COUNTER
  978  002570  005301                        DEC     COUNT           ;WAIT FOR ~ MILLISECOND OR LESS
  979  002572  001376                        BNE     .-2
  980  002574  021405                        CMP     @CRB1,R5        ;DATA UNCHANGED?
  981  002576  001751                        BEQ     LOOP8           ;OK, CONTINUE
  982  002600  104000                        HLT                     ;DATA NOT AVAILABLE FOR ~ MILLISECOND
  983  002602  000424                        BR      TEST9           ;GO TO NEXT TEST AFTER FAILURE
  984  002604  017702  176222        DBRCK8: MOV     @CRB2,R2        ;STORE ENCODED DATA IN REGISTER 2
  985  002610  012701  000100                MOV     #100,COUNT      ;SET UP COUNTER
  986  002614  021405                CONT8:  CMP     @CRB1,R5        ;READ CARD-IMAGE DATA BUFFER
  987  002616  001402                        BEQ     .+6             ;BRANCH IF UNCHANGED
  988  002620  104000                        HLT                     ;CRB1 READ INCORRECTLY
  989  002622  000407                        BR      REST8           ;BRANCH TO RESTORE PROCESSOR STATUS AND EXIT
  990  002624  027702  176202                CMP     @CRB2,R2        ;READ ENCODED DATA BUFFER
  991  002630  001402                        BEQ     .+6             ;BRANCH IF UNCHANGED
  992  002632  104000                        HLT                     ;CRB2 READ INCORRECTLY
  993  002634  000402                        BR      REST8           ;BRANCH AFTER FAILURE
  994  002636  005301                        DEC     COUNT           ;COUNT DOWN
  995  002640  001365                        BNE     CONT8           ;LOOP IF NOT DONE
  996  002642  013746  001056        REST8:  MOV     PROC,-(SP)      ;RESTORE PROCESSOR STATUS
  997  002646  012746  002654                MOV     #TEST9,-(SP)
  998  002652  000002                        RTI
  999
 1000
 1001  002654  104400                TEST9:  SCOPE
 1002                                  ;EJECT SHOULD PREVENT FURTHER COLUMN READY'S
 1003                                  ;CARD DONE SHOULD STILL OCCUR, AND TIMING ERRORS SHOULD BE
 1004                                  ;PREVENTED IF THE CURRENT COLUMN READY IS CLEARED
 1005  002656  004737  010674                JSR     %7,INIT         ;INITIALIZE STATUS REGISTER
 1006  002662  004737  010722                JSR     %7,CLRTR        ;SAVE PROCESSOR STATUS AND CLEAR T BIT
 1007  002666  005213                        INC     @CRS            ;START READ
 1008  002670  105713                        TSTB    @CRS            ;WAIT FOR COLUMN READY
 1009  002672  001776                        BEQ     .-2
 1010  002674  052713  000002                BIS     #2,@CRS         ;SET EJECT
 1011  002700  005714                        TST     @CRB1           ;CLEAR COLUMN READY
 1012  002702  005001                        CLR     COUNT
 1013  002704  012737  000006  006404        MOV     #6,CNTER                ;SET A COUNT FOR 6 LOOPS
 1014  002712  005201                1$:     INC     COUNT           ;WAIT
 1015  002714  001376                        BNE     .-2
 1016  002716  005337  006404                DEC     CNTER
 1017  002722  001373                        BNE     1$
 1018  002724  032713  044200        WAIT9:  BIT     #44200,@CRS     ;CARD DONE, TIMING ERROR, OR
 1019  002730  001002                        BNE     CK9             ;COLUMN READY SET?- BRANCH IF YES
 1020  002732  104000                        HLT                     ;NO CARD DONE OCCURRED
 1021  002734  000411                        BR      REST9           ;CONTINUE AFTER FAILURE
 1022  002736  032713  040000        CK9:    BIT     #40000,@CRS     ;CHECK FOR CARD DONE
 1023  002742  001006                        BNE     REST9
 1024  002744  032713  000200                BIT     #200,@CRS       ;CHECK COLUMN READY
 1025  002750  001402                        BEQ     .+6             ;BRANCH IF NOT SET
 1026  002752  104000                        HLT                     ;COLUMN READY WAS SET
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1027  002754  000401                        BR      REST9
1028  002756  104000                        HLT                             ;EJECT DID NOT PREVENT A TIMING ERROR
1029  002760  013746  001056          REST9: MOV     PROC,-(SP)              ;RESTORE PROCESSOR STATUS
1030  002764  012746  002772                MOV     #TEST10,-(SP)
1031  002770  000002                        RTI
1032
1033
1034  002772  104400                TEST10: SCOPE
1035                                ;CARD DONE SHOULD CAUSE AN INTERRUPT
1036  002774  004737  010674                JSR     %7,INIT                 ;INITIALIZE
1037  003000  012710  003070                MOV     #TINT10,@ADINT          ;LOAD RETURN POINTER
1038  003004  106737  011246                MFPS    PRIOR
1039  003010  052737  000200  011246        BIS     #200,PRIOR
1040  003016  106437  011246                MTPS    PRIOR
1041  003022  106760  000002                MFPS    2(ADINT)
1042  003026  106737  011246                MFPS    PRIOR
1043  003032  042737  000200  011246        BIC     #200,PRIOR
1044  003040  106437  011246                MTPS    PRIOR
1045  003044  012713  000103                MOV     #103,@CRS               ;SET EJECT, INTERRUPT ENABLE, AND READ
1046  003050  032713  040000                BIT     #40000,@CRS             ;WAIT FOR CARD DONE
1047  003054  001775                        BEQ     .-4
1048  003056  106460  000002                MTPS    2(ADINT)
1049  003062  105013                        CLRB    @CRS                    ;CLEAR INTERRUPT ENABLE
1050  003064  104000                        HLT                             ;NO INTERRUPT OCCURRED
1051  003066  000414                        BR      CONT10
1052  003070  032713  040000          TINT10: BIT     #40000,@CRS             ;CHECK CARD DONE
1053  003074  001001                        BNE     .+4                     ;BRANCH IF SET
1054  003076  104000                        HLT                             ;CARD DONE NOT SET
1055  003100  022626                        CMP     (SP)+,(SP)+             ;RESTORE STACK POINTER
1056  003102  005713                        TST     @CRS                    ;MAKE SURE NO ERROR OCCURRED
1057  003104  100001                        BPL     .+4
1058  003106  104000                        HLT                             ;BIT 15 WAS SET
1059  003110  105713                        TSTB    @CRS                    ;CHECK COLUMN READY
1060  003112  100001                        BPL     .+4                     ;BRANCH IF NOT SET
1061  003114  104000                        HLT                             ;COLUMN READY WAS SET
1062  003116  005013                        CLR     @CRS                    ;DISABLE INTERRUPTS
1063  003120  012710  000232          CONT10: MOV     #232,@ADINT             ;CHANGE INTERRUPT RETURN ADDRESS
1064  003124  005037  000232                CLR     @#232                   ;TO CAUSE A HALT IF AN INTERRUPT OCCURS
1065
1066  003130  104400                TEST11: SCOPE
1067                                ;EVERY COLUMN READY SHOULD CAUSE AN INTERRUPT
1068  003132  004737  010674                JSR     %7,INIT                 ;INITIALIZE
1069  003136  013701  006426                MOV     COLSIZ,COUNT            ;CHECK EACH COLUMN
1070  003142  012710  003230                MOV     #TINT11,@ADINT          ;LOAD RETURN POINTER
1071  003146  106737  011246                MFPS    PRIOR
1072  003152  052737  000200  011246        BIS     #200,PRIOR
1073  003160  106437  011246                MTPS    PRIOR
1074  003164  106760  000002                MFPS    2(ADINT)
1075  003170  106737  011246          LOOP11: MFPS    PRIOR
1076  003174  042737  000200  011246        BIC     #200,PRIOR
1077  003202  106437  011246                MTPS    PRIOR
1078  003206  012713  000101                MOV     #101,@CRS               ;SET READ AND INTERRUPT ENABLE
1079  003212  105713                        TSTB    @CRS                    ;WAIT FOR COLUMN READY
1080  003214  100376                        BPL     .-2
1081  003216  106460  000002                MTPS    2(ADINT)
1082  003222  005013                        CLR     @CRS                    ;CLEAR INTERRUPT ENABLE
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1083  003224  104000                        HLT                     ;COLUMN READY DID NOT INTERRUPT
1084  003226  000411                        BR      CONT11
1085  003230  005013              TINT11:   CLR     @CRS            ;CLEAR INTERRUPT ENABLE
1086  003232  022626                        CMP     (SP)+,(SP)+     ;RESTORE STACK POINTER
1087  003234  105713                        TSTB    @CRS            ;MAKE SURE COLUMN READY IS SET
1088  003236  100402                        BMI     .+6             ;BRANCH IF SET
1089  003240  104000                        HLT                     ;COLUMN READY WASN'T SET
1090  003242  000403                        BR      CONT11
1091  003244  005714                        TST     @CRB1           ;CLEAR READY FLAG
1092  003246  005301                        DEC     COUNT           ;ALL 40 DONE?
1093  003250  001347                        BNE     LOOP11          ;NO
1094  003252  012710  000232      CONT11:   MOV     #232,@ADINT     ;YES-CHANGE INTERRUPT RETURN ADDRESS
1095  003256  005037  000232                CLR     @#232           ;TO CAUSE A HALT IF ANOTHER INTERRUPT OCCURS
1096
1097  003262  104400              TEST12: SCOPE
1098                              ;CARD DONE SHOULDN'T CAUSE AN INTERRUPT IF THE PROCESSOR IS AT LEVEL 7 PRIORITY
1099  003264  004737  010674                JSR     %7,INIT         ;INITIALIZE
1100  003270  012710  003332                MOV     #TINT12,@ADINT  ;SETUP RETURN
1101  003274  106737  011246                MFPS    PRIOR
1102  003300  052737  000200  011246        BIS     #200,PRIOR
1103  003306  106437  011246                MTPS    PRIOR
1104  003312  106760  000002                MFPS    2(ADINT)
1105  003316  012713  000103                MOV     #103,@CRS       ;SET EJECT, INTERRUPT ENABLE, AND READ
1106  003322  032713  040000                BIT     #40000,@CRS     ;WAIT FOR CARD DONE
1107  003326  001775                        BEQ     .-4
1108  003330  000402                        BR      .+6             ;CONTINUE IF NO INTERRUPT OCCURRED
1109  003332  104000              TINT12:   HLT                     ;AN INTERRUPT OCCURRED
1110  003334  022626                        CMP     (SP)+,(SP)+     ;RESTORE STACK POINTER
1111  003336  005013                        CLR     @CRS            ;CLEAR INTERRUPT ENABLE AND EJECT
1112  003340  012710  000232                MOV     #232,@ADINT     ;CHANGE INTERRUPT RETURN ADDRESS
1113  003344  005037  000232                CLR     @#232           ;TO CAUSE A HALT IF AN INTERRUPT OCCURS
1114                              ;A TIMING ERROR SHOULD NOT CAUSE AN INTERRUPT
1115
1116  003350  104400              TEST20: SCOPE
1117  003352  004737  010674                JSR     %7,INIT         ;INITIALIZE
1118  003356  012710  003444                MOV     #TINT20,@ADINT  ;LOAD RETURN POINTER
1119  003362  106737  011246                MFPS    PRIOR
1120  003366  052737  000200  011246        BIS     #200,PRIOR
1121  003374  106437  011246                MTPS    PRIOR
1122  003400  106760  000002                MFPS    2(ADINT)
1123  003404  012713  000101                MOV     #101,@CRS       ;SET INTERRUPT ENABLE AND READ
1124  003410  032713  004000                BIT     #4000,@CRS      ;WAIT FOR TIMING ERROR TO SET
1125  003414  001775                        BEQ     .-4
1126  003416  106737  011246                MFPS    PRIOR
1127  003422  042737  000200  011246        BIC     #200,PRIOR
1128  003430  106437  011246                MTPS    PRIOR
1129  003434  000240                        NOP                     ;CLOCK INTERRUPT IF IT OCCURRED
1130  003436  106460  000002                MTPS    2(ADINT)
1131  003442  000402                        BR      .+6
1132  003444  104000              TINT20:   HLT                     ;TIMING ERROR CAUSED AN INTERRUPT
1133  003446  022626                        CMP     (SP)+,(SP)+     ;RESTORE STACK POINTER
1134  003450  012710  000232                MOV     #232,@ADINT     ;CHANGE INTERRUPT ADDRESS TO CAUSE A
1135  003454  005037  000232                CLR     @#232           ;HALT IF AN INTERRUPT OCCURS
1136  003460  032713  040000                BIT     #40000,@CRS     ;WAIT FOR CARD DONE
1137  003464  001775                        BEQ     .-4
1138  003466  005013                        CLR     @CRS            ;CLEAR INTERRUPT ENABLE
```

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1139
 140  003470  104400                    TEST21: SCOPE
1141                                     ;TEST FOR NO INTERRUPT OCCURING WITH INTERRUPT ENABLE SET AND REST CLEARED
1142  003472  004737  010674                    JSR     %7,INIT          ;INITIALIZE CSR TO ZERO
1143  003476  012710  003556                    MOV     #TNINT,@ADINT    ;SETUP RETURN ADDRESS
1144  003502  106737  011246                    MFPS    PRIOR
1145  003506  052737  000200  011246           BIS     #200,PRIOR
1146  003514  106437  011246                    MTPS    PRIOR
1147  003520  106760  000002                    MFPS    2(ADINT)
1148  003524  005037  011246                    CLR     PRIOR
1149  003530  106437  011246                    MTPS    PRIOR
1150  003534  012713  000100                    MOV     #100,@CRS        ;ENABLE INTERRUPTS
1151  003540  005001                            CLR     COUNT            ;INITIALIZE COUNTER
1152  003542  005201                            INC     COUNT            ;WAIT AWHILE
1153  003544  001376                            BNE     .-2
1154  003546  106460  000002                    MTPS    2(ADINT)
1155  003552  005013                            CLR     @CRS             ;DISABLE FURTHER INTERRUPTS
1156  003554  000403                            BR      CONT21
1157  003556  104000                    TNINT:  HLT                      ;AN INTERRUPT OCCURRED
1158  003560  022626                            CMP     (SP)+,(SP)+      ;RESTORE STACK
1159  003562  005013                            CLR     @CRS             ;DISABLE FURTHER INTERRUPTS
1160  003564  005037  000232            CONT21: CLR     @#232            ;CHANGE INTERRUPT RETURN ADDRESS TO
1161  003570  012710  000232                    MOV     #232,@ADINT      ;CAUSE A HALT IF AN INTERRUPT OCCURS
1162
1163  003574  104400                    TEST22: SCOPE
1164                                     ;CHECK FOR SIMULTANEOUS INTERRUPTS ON MORE THAN ONE LEVEL
1165  003576  004737  010674                    JSR     %7,INIT          ;INITIALIZE CSR TO ZERO
1166  003602  012710  003656                    MOV     #T2INT,@ADINT    ;SETUP RETURN ADDRESS
1167  003606  106737  011246                    MFPS    PRIOR
1168  003612  052737  000200  011246           BIS     #200,PRIOR
1169  003620  106437  011246                    MTPS    PRIOR
1170  003624  106760  000002                    MFPS    2(ADINT)
1171  003630  106737  011246                    MFPS    PRIOR
1172  003634  042737  000200  011246           BIC     #200,PRIOR
1173  003642  106437  011246                    MTPS    PRIOR
1174  003646  012713  000103                    MOV     #103,@CRS        ;SET INTERRUPT ENABLE AND EJECT A CARD
1175  003652  000001                            WAIT                     ;WAIT FOR INTERRUPT
1176  003654  000776                            BR      .-2              ;SIT IF TRACE BIT IS SET
1177  003656  022626                    T2INT:  CMP     (6)+,(6)+        ;RESTORE STACK POINTER
1178  003660  012710  003704                    MOV     #T2INTA,@ADINT   ;CHANGE RETRUN ADDRESS
1179  003664  005037  011246                    CLR     PRIOR
1180  003670  106437  011246                    MTPS    PRIOR
1181  003674  000240                            NOP                      ;WAIT
1182  003676  106460  000002                    MTPS    2(ADINT)
1183  003702  000402                            BR      CONT22
1184  003704  022626                    T2INTA: CMP     (6)+,(6)+        ;RESTORE STACK
1185  003706  104000                            HLT                      ;THE INTERRUPT OCCURRED AT 2 LEVELS
1186  003710  005013                    CONT22: CLR     @CRS             ;DISABLE INTERRUPTS
1187  003712  005037  000232                    CLR     @#232            ;CHANGE INTERRUPT RETURN ADDRESS TO
1188  003716  012710  000232                    MOV     #232,@ADINT      ;CAUSE A HALT IF AN INTERRUPT OCCURS
1189
1190  003722  104400                    TEST23: SCOPE
1191                                     ;ALL MODES OF ADDRESSING CRB1 OR CRB2 (DATO,DATOB,DATI) SHOULD CLEAR
1192                                     ;COLUMN READY
1193  003724  004737  010674                    JSR     %7,INIT          ;INITIALIZE
1194  003730  005213                            INC     @CRS             ;START READING A CARD
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1195  003732  105713                        TSTB    @CRS            ;WAIT FOR COLUMN READY
1196  003734  100376                        BPL     .-2
1197  003736  005714                        TST     @CRB1           ;DATO TO CRB1
1198  003740  105713                        TSTB    @CRS            ;CHECK COLUMN READY
1199  003742  100002                        BPL     CNT23A          ;BRANCH IF CLEARED
1200  003744  104000                        HLT                     ;DATO TO CRB1 DIDN'T CLEAR READY
1201  003746  000467                        BR      TEST24          ;GO TO NEXT TEST
1202  003750  105713              CNT23A:   TSTB    @CRS            ;WAIT FOR COLUMN READY
1203  003752  100376                        BPL     .-2
1204  003754  105714                        TSTB    @CRB1           ;DATOB TO LOW BYTE OF CRB1
1205  003756  105713                        TSTB    @CRS            ;CHECK COLUMN READY
1206  003760  100002                        BPL     CNT23B          ;BRANCH IF CLEARED
1207  003762  104000                        HLT                     ;DATOB TO CRB1 LOW BYTE DIDN'T CLEAR READY
1208  003764  000460                        BR      TEST24          ;GO TO NEXT TEST
1209  003766  105713              CNT23B:   TSTB    @CRS            ;WAIT FOR COLUMN READY
1210  003770  100376                        BPL     .-2
1211  003772  105764  000001                TSTB    1(CRB1)         ;DATOB TO HIGH BYTE OF CRB1
1212  003776  105713                        TSTB    @CRS            ;CHECK COLUMN READY
1213  004000  100002                        BPL     CNT23C          ;BRANCH IF CLEARED
1214  004002  104000                        HLT                     ;DATOB TO CRB1 HIGH BYTE DIDN'T CLEAR READY
1215  004004  000450                        BR      TEST24          ;GO TO NEXT TEST
1216  004006  105713              CNT23C:   TSTB    @CRS            ;WAIT FOR COLUMN READY
1217  004010  100376                        BPL     .-2
1218  004012  005714                        TST     @CRB1           ;DATI TO CRB1
1219  004014  105713                        TSTB    @CRS            ;CHECK COLUMN READY
1220  004016  100002                        BPL     CNT23D          ;BRANCH IF CLEARED
1221  004020  104000                        HLT                     ;DATI TO CRB1 DIDN'T CLEAR READY
1222  004022  000441                        BR      TEST24          ;GO TO NEXT TEST
1223  004024  105713              CNT23D:   TSTB    @CRS            ;WAIT FOR COLUMN READY
1224  004026  100376                        BPL     .-2
1225  004030  005777  174776                TST     @CRB2           ;DATO TO CRB2
1226  004034  105713                        TSTB    @CRS            ;CHECK COLUMN READY
1227  004036  100002                        BPL     CNT23E          ;BRANCH IF CLEARED
1228  004040  104000                        HLT                     ;DATO TO CRB2 DIDN'T CLEAR READY
1229  004042  000431                        BR      TEST24          ;GO TO NEXT TEST
1230  004044  105713              CNT23E:   TSTB    @CRS            ;WAIT FOR COLUMN READY
1231  004046  100376                        BPL     .-2
1232  004050  105777  174756                TSTB    @CRB2           ;DATOB TO LOW BYTE OF CRB2
1233  004054  105713                        TSTB    @CRS            ;CHECK COLUMN READY
1234  004056  100002                        BPL     CNT23F          ;BRANCH IF CLEARED
1235  004060  104000                        HLT                     ;DATOB TO CRB2 LOW BYTE DIDN'T CLEAR READY
1236  004062  000421                        BR      TEST24          ;GO TO NEXT TEST
1237  004064  105713              CNT23F:   TSTB    @CRS            ;WAIT FOR COLUMN READY
1238  004066  100376                        BPL     .-2
1239  004070  013702  001032                MOV     CRB2,R2         ;LOAD POINTER
1240  004074  105762  000001                TSTB    1(R2)           ;DATOB TO HIGH BYTE OF CRB2
1241  004100  105713                        TSTB    @CRS            ;CHECK COLUMN READY
1242  004102  100002                        BPL     CNT23G          ;BRANCH IF CLEARED
1243  004104  104000                        HLT                     ;DATOB TO CRB2 HIGH BYTE DIDN'T CLEAR READY
1244  004106  000407                        BR      TEST24          ;GO TO NEXT TEST
1245
1246  004110  105713              CNT23G:   TSTB    @CRS            ;WAIT FOR COLUMN READY
1247  004112  100376                        BPL     .-2
1248  004114  005777  174712                TST     @CRB2           ;DATI TO CRB2
1249  004120  105713                        TSTB    @CRS            ;CHECK COLUMN READY
1250  004122  100001                        BPL     TEST24          ;BRANCH IF CLEARED
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1251  004124  104000                          HLT                     ;DATI TO CRB2 DIDN'T CLEAR READY
1252
1253  004126  104400                  TEST24: SCOPE
1254                                  ;SETTING EJECT AFTER A COLUMN READY WITHOUT CLEARING THE COLUMN READY
1255                                  ;SHOULD SET TIMING ERROR (WHICH IN TURN SHOULD CLEAR COLUMM READY)
1256  004130  004737  010674                  JSR     %7,INIT         ;INITIALIZE
1257  004134  005213                          INC     @CRS            ;START READING A CARD
1258  004136  105713                          TSTB    @CRS            ;CHECK COLUMN READY - WAIT
1259  004140  100376                          BPL     .-2
1260  004142  052713  000002                  BIS     #2,@CRS         ;SET EJECT
1261  004146  105713                          TSTB    @CRS            ;CHECK COLUMN READY
1262  004150  100402                          BMI     CNT24A          ;BRANCH IF STILL SET
1263  004152  104000                          HLT                     ;SETTING EJECT CLEARED COLUMN READY
1264  004154  000421                          BR      END24           ;BRANCH TO WAIT FOR DONE AFTER ERROR
1265  004156  032713  004000          CNT24A: BIT     #4000,@CRS      ;CHECK TIMING ERROR
1266  004162  001013                          BNE     TIM24           ;BRANCH IF SET
1267  004164  032713  040400                  BIT     #40400,@CRS     ;CHECK CARD DONE AND OFF-LINE
1268  004170  001772                          BEQ     CNT24A          ;LOOP IF NONE SET
1269  004172  032713  040000                  BIT     #40000,@CRS     ;CARD DONE SET?
1270  004176  001003                          BNE     CNT24B          ;YES - BRANCH TO ERROR PRINTOUT
1271  004200  004737  011022                  JSR     %7,CKBIT8       ;NO - BIT 8 WAS SET SO OUTPUT MESSAGE
1272  004204  000415                          BR      ENDCK           ;BRANCH AFTER COMING BACK ON-LINE
1273  004206  104000          CNT24B: HLT                             ;CARD DONE SET BUT TIMING ERROR DIDN'T
1274  004210  000413                          BR      ENDCK           ;BRANCH TO NEXT SECTION
1275  004212  105713          TIM24:  TSTB    @CRS            ;CHECK COLUMN READY
1276  004214  100001                          BPL     .+4             ;BRANCH IF NOT SET
1277  004216  104000                          HLT                     ;TIMING ERROR DIDN'T CLEAR READY
1278  004220  032713  040400          END24:  BIT     #40400,@CRS     ;WAIT FOR CARD DONE OR OFF-LINE
1279  004224  001775                          BEQ     END24
1280  004226  032713  000400                  BIT     #400,@CRS       ;CHECK OFF LINE
1281  004232  001402                          BEQ     ENDCK           ;BRANCH IF NOT SET
1282  004234  004737  011022                  JSR     %7,CKBIT8       ;OUTPUT ERROR MESSAGE
1283
1284                                  ;CHECK SW7 AND RETURN TO TEST1 IF SET, AFTER RINGING BELL
1285                                  ;OTHERWISE GO INTO THE DATA TEST
1286  004240  104400                  ENDCK:  SCOPE
1287  004242  005237  006412                  INC     DECCYC          ;# OF TIMES THROUGH DECK
1288  004246  032777  000200  002156          BIT     #200,@SR
1289  004254  001442                          BEQ     DATST
1290  004256  004737  010726                  JSR     %7,BELL
1291  004262  005137  001054                  COM     TRFLG           ;TOGGLE TRACE FLAG
1292  004266  012706  001000                  MOV     #STACK,SP       ;INITIALIZE STACK
1293  004272  000137  001264                  JMP     RESTRT
1294
1295
1296                                  ;DATA RELIABILITY TEST FOR CMQ11-K
 297
1298                                  ;CHECK SR FOR TYPE OF DECK BEING TESTED, AND INITIALIZE POINTERS
1299  004276  004737  011626          DATMK:  JSR     PC,CKSWR        ;
1300  004302  005037  006420                  CLR     CDCNT           ;CLEAR SPECAIL CARD COUNTER
1301  004306  012737  015310  006414          MOV     #MRKCD,TSTART   ;LOAD PARAMETERS
1302  004314  012737  016006  006416          MOV     #MRKEND,TEND
1303  004322  012705  015310                  MOV     #MRKCD,R5
1304  004326  012737  013555  006402          MOV     #MSG20,DECK
1305  004334  032777  000004  002070          BIT     #4,@SR          ;SR2=1 FOR 40 COL CRD
1306  004342  001437                          BEQ     DATST1
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1307  004344  012737  015546  006416          MOV     #MKND40,TEND
1308  004352  012737  013634  006402          MOV     #MSG23,DECK
1309  004360  000430                          BR      DATST1
1310  004362  004737  011626          DATST:  JSR     PC,CKSWR        ;GET SOFTWARE SWITCH
1311  004366  005037  006410                  CLR     FLAG            ;FLAG INDICATES WETHER TEST CAN BE RUN
1312  004372  022737  000001  006412          CMP     #1,DECCYC       ;HAS ONLY ONE PASS OF TEST BEEN RUN
1313  004400  001003                          BNE     1$              ;BR=NO
1314  004402  005137  006410                  COM     FLAG            ;SET SWITCH RUN TEST
1315  004406  000407                          BR      2$
1316  004410  012702  013576          1$:     MOV     #MSG22,R2               ;REPORT ILLEGAL PROCEDURE(MORE THAN 1 PASS)
1317  004414  004737  011466                  JSR     %7,TOUT         ;PRINT THE MESSAGE
1318  004420  000000                          HALT                    ;MORE THAN 1 TIME THROUGH DECK
1319  004422  000137  001242                  JMP     BEGIN           ;RESTART
1320  004426  012737  000040  006420  2$:     MOV     #40,CDCNT       ;SETUP CARD COUNT TO ENTER TABLE CORRESPONDING TO NEXT C
1321  004434  005227  000000                  INC     #0              ;DEFINE SWTHR
1322          004436                          SWTHR=.-2
1323  004440  000404                          BR      DATST2          ;SKIP NEXT INSTRUCTION
1324  004442  005037  006420          DATST1: CLR     CDCNT           ;SETUP CARD COUNT TO ENTER DATA TABLE AT BEGINNING
1325  004446  005037  004436                  CLR     SWTHR           ;CLEAR SWTHR
1326  004452  005037  001060          DATST2: CLR     ERFLG           ;FLAG SET PREVENTS PRINTING OUT ERROR HEADING
1327  004456  005027  000000                  CLR     #0              ;DEFINE CNTCRD
1328          004460                          CNTCRD=.-2
1329  004462  032777  000020  001742  DATST3: BIT     #20,@SR         ;CHECK BIT 4 OF SR FOR TYPE OF DECK
1330  004470  001430                          BEQ     ALP1            ;BRANCH IF NOT SET TO LOAD ALPHANUMERIC POINTERS
1331  004472  012737  014610  006414          MOV     #BINCD,TSTART   ;BIT 4 SET LOAD BINARY POINTERS
1332  004500  012737  015306  006416          MOV     #BINEND,TEND
1333  004506  005737  006410                  TST     FLAG            ;CAN TEST BE RUN?
1334  004512  100006                          BPL     1$
1335  004514  012705  015010                  MOV     #BINCD2,R5      ;LOAD INDEXED VALUE
1336  004520  012737  015010  006444          MOV     #BINCD2,TABPT
1337  004526  000405                          BR      2$
1338  004530  012705  014610          1$:     MOV     #BINCD,R5       ;BIT 2 SET, LOAD BINARY TABLE POINTERS
1339  004534  012737  014610  006444          MOV     #BINCD,TABPT    ;LOAD CURRENT POINTER(TO VIRTUAL BEG.)OF TABLE,TEND
1340  004542  012737  013551  006402  2$:     MOV     #MSG15,DECK
1341  004550  000433                          BR      CONTD           ;BRANCH AROUND ALPHANUMERIC POINTERS
1342  004552  032777  000010  001652  ALP1:   BIT     #10,@SR         ;TEST FOR MARK SENSE
1343  004560  001027                          BNE     CONTD
1344  004562  012737  014110  006414          MOV     #ALPCD,TSTART   ;BIT 3 SET LOAD ALPHA TABLE POINTERS
1345  004570  012737  014606  006416          MOV     #ALPEND,TEND
1346  004576  005737  006410                  TST     FLAG            ;INDEXED OR NOT
1347  004602  100006                          BPL     1$              ;BR=NO
1348  004604  012705  014310                  MOV     #ALPCD2,R5      ;LOAD THE INDEXED STARTING POINT
1349  004610  012737  014310  006444          MOV     #ALPCD2,TABPT
1350  004616  000405                          BR      2$
1351  004620  012705  014110          1$:     MOV     #ALPCD,R5       ;LOAD ALPHANUMERIC TABLE POINTERS
1352  004624  012737  014110  006444          MOV     #ALPCD,TABPT    ;POINTER TO VIRTUAL BEGIN OF DATA TABLE
1353  004632  012737  013340  006402  2$:     MOV     #MSG14,DECK
1354  004640  012746  000340          CONTD:  MOV     #340,-(SP)      ;PUSH STATUS ON STACK
1355  004644  012746  004676                  MOV     #DCNT1,-(SP)    ;PUSH PC ON STACK
1356  004650  005737  001054                  TST     TRFLG           ;CHECK FLAG
1357  004654  100007                          BPL     PSSET1          ;IF IT IS POSITIVE, CLEAR T BIT
1358  004656  032777  010000  001546          BIT     #10000,@SR      ;TRACE TRAPPING INHIBITED?
1359  004664  001003                          BNE     PSSET1          ;BRANCH IF YES
1360  004666  012766  000360  000002          MOV     #360,2(SP)      ;SET T BIT ON STACK
1361  004674  000002          PSSET1: RTI
1362  004676  004737  010674          DCNT1:  JSR     %7,INIT         ;INITIALIZE CARD READER STATUS REGISTER
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1363
1364                                        ;SET UP INTERRUPT SERVICING, AND START READING
1365  004702  012710  004746                        MOV     #SRVC,@ADINT    ;SETUP RETURN POINTER
1366  004706  106737  011246                        MFPS    PRIOR
1367  004712  042737  000200  011246              BIC     #200,PRIOR
1368  004720  106437  011246                        MTPS    PRIOR
1369  004724  012760  000340  000002              MOV     #340,2(ADINT)   ;STORE CURRENT STATJS
1370  004732  004737  006302                        JSR     %7,NXCRD        ;ADJUST POINTER AND START READING
1371  004736  052713  000100                        BIS     #100,@CRS       ;ENABLE INTERRUPTS
1372  004742  000001                              WAIT                    ;WAIT FOR INTERRUPTS
1373  004744  000776                              BR      .-2
1374
1375                                        ;INTERRUPT SERVICE ROUTINE WHICH RUNS DATA RELIABILITY TEST
1376  004746  032713  000400              SRVC:   BIT     #400,@CRS       ;TEST OFF-LINE
1377  004752  001402                              BEQ     .+6             ;BRANCH IF NOT SET
1378  004754  000137  007014                        JMP     OFFSET          ;IF SET, GO CHECK WHY
1379  004760  005713                              TST     @CRS            ;CHECK SPECIAL CONDITION (BIT 15)
1380  004762  100002                              BPL     1$              ;SKIP
1381  004764  000137  005314                        JMP     ERSET
1382  004770  105713                      1$:     TSTB    @CRS            ;CHECK COLUMN READY
1383  004772  100402                              BMI     .+6             ;BRANCH IF SET
1384  004774  000137  005716                        JMP     NOTCOL          ;JUMP IF NOT SET
1385  005000  005237  006422                        INC     CLCNT           ;KEEP TRACK OF COLUMN NUMBER
1386  005004  011437  006434                        MOV     @CRB1,DAT1      ;STORE DATA OF FIRST READ
1387  005010  105713                              TSTB    @CRS            ;MAKE SURE COLUMN READY CLEARED
1388  005012  100012                              BPL     SCONT1          ;BRANCH IF IT DID
1389  005014  106737  011246                        MFPS    PRIOR
1390  005020  052737  000200  011246              BIS     #200,PRIOR
1391  005026  106437  011246                        MTPS    PRIOR
1392  005032  104000                              HLT                     ;READING DATA DIDN'T CLEAR COLUMN READY
1393  005034  000137  006006                        JMP     LASTCK          ;GO TO NEXT CARD AFTER ERROR PRINTOUT
1394  005040  017737  173766  006440  SCONT1: MOV     @CRB2,DATENC    ;STORE ENCODED DATA
1395  005046  012701  000010                        MOV     #10,COUNT       ;WAIT AWHILE
1396  005052  005301                              DEC     COUNT
1397  005054  001376                              BNE     .-2
1398  005056  011437  006436                        MOV     @CRB1,DAT2      ;STORE DATA OF SECOND READ
1399  005062  005037  006442                        CLR     PTOFF           ;CLEAR POINTER OFFSET
1400  005066  023715  006434                        CMP     DAT1,@R5        ;CHECK FIRST DATA READ
1401  005072  001142                              BNE     FAIL            ;PRINTOUT IF WRONG
1402  005074  012737  000002  006442              MOV     #2,PTOFF        ;SET POINTER OFFSET
1403  005102  023725  006436                        CMP     DAT2,(R5)+      ;CHECK SECOND READING OF SAME DATA
1404  005106  001134                              BNE     FAIL            ;BRANCH IF WRONG
1405  005110  012737  000004  006442              MOV     #4,PTOFF        ;SET POINTER OFFSET
1406  005116  023725  006440                        CMP     DATENC,(R5)+    ;CHECK ENCODED DATA
1407  005122  001126                              BNE     FAIL            ;BRANCH IF WRONG
1408  005124  023727  006420  000036              CMP     CDCNT,#30.      ;OVER 30 CARDS?
1409  005132  003010                              BGT     1$              ;BR=YES CHECK FOR END OF TABLE
1410  005134  032777  000004  001270              BIT     #4,@SR          ;40 COL?
1411  005142  001004                              BNE     1$              ;YES
1412  005144  032777  000010  001260              BIT     #10,@SR         ;M.S.?   & LESS THAN 30 CARDS
1413  005152  001005                              BNE     2$              ;BR =YES M.S. & LESS THAN 30 CARDS
1414  005154  020537  006416          1$:     CMP     R5,TEND         ;NO  ,@ END OF TABLE?
1415  005160  002402                              BLT     2$              ;BR= NO
1416  005162  013705  006414                        MOV     TSTART,R5       ;RESET POINTERS
1417  005166  023737  006426  006422  2$:     CMP     COLSIZ,CLCNT    ;ALL COLUMMS DONE
1418  005174  001015                              BNE     TAGB            ;NO ,JUST RETURN
```

```
1419  005176  001400                          BEQ     FADJ            ;BR=END OF CARD
1420  005200  032777  000004  001224  FADJ:   BIT     #4,@SR          ;40 COL?
1421  005206  001005                          BNE     TAGA            ;YES
1422  005210  032777  000010  001214          BIT     #10,@SR         ;MARK SENSE TEST?+ADJ. ON FAILURE
1423  005216  001406                          BEQ     TAGD            ;NO KEEP ON TESTING
1424  005220  000404                          BR      TAGC            ;IF NOT TRY
1425  005222  013705  006414          TAGA:   MOV     TSTART,R5       ;LOAD DATA TABLE POINTER
1426  005226  000421                          BR      TAGZ            ;FEED ANOTHER CARD
1427  005230  000002                  TAGB:   RTI
1428  005232  000773                  TAGC:   BR      TAGA            ;IF LESS THAN AND NOT = TO DONT ADJ
1429
1430                                          ;ADJUST POINTER TO DATA TABLE SO THAT 1ST COLUMN ON
1431                                          ;NEXT CARD IS 2ND COLUMN OF PREVIOUS.
1432                                          ;*****ADJUST***** THIS IS AN END OF CARD ,TABLE ADJUSTMENT
1433
1434  005234  062737  000004  006444  TAGD:   ADD     #4,TABPT        ;UPDATE BY 2 WORDS/COLUMN
1435  005242  023737  006444  006416          CMP     TABPT,TEND      ;HAVE WE EXCEED THE TABLE?
1436  005250  003406                          BLE     TA              ;IF NOT GET NEXT CARD
1437  005252  013737  006414  006444          MOV     TS      TABPT   ;IF YES SET POINTER BACK>BEGIN
1438  005260  013705  006414                  MOV     TST     R5      ;RELOAD DATA TABLE POINTER
1439  005264  000240                          NOP             ;PICK NEXT CARD
1440  005266  013705  006444          TAGE:   MOV     TABPT,R5        ;PUT NEW POINTER IN R5
1441  005272  023737  006424  006420  TAGZ:   CMP     DEKSIZ,CDCNT    ;REACHED ALL CARDS YET?
1442  005300  001002                          BNE     TAGF
1443  005302  000137  006446                  JMP     ALLDON          ;YES TAKE CARE OF IT
1444  005306  004737  006302          TAGF:   JSR     %7,NXCRD        ;GET NEXT CARD
1445  005312  000002                          RTI                     ;GO AND AWAIT INT.FROM NEXT CARD
1446
1447
1448                                          ;SPECIAL CONDITION BIT 15 WAS SET BUT BIT 8 WASN'T WHEN INTERRUPT SERVICE ROUTINE
1449                                          ;WAS ENTERRED
1450  005314  004737  011626          ERSET:JSR       PC,CKSWR
1451  005320  106737  011246                  MFPS    PRIOR
1452  005324  052737  000200  011246          BIS     #200,PRIOR
1453  005332  106437  011246                  MTPS    PRIOR
1454  005336  104000                          HLT                     ;SPECIAL CONDITION WAS SET AND OFF LINE WASN'T
1455  005340  032713  000400                  BIT     #400,@CRS       ;OFF-LINE SET NOW?
1456  005344  001002                          BNE     .+6             ;YES-SKIP OVER
1457  005346  000137  006006                  JMP     LASTCK          ;NO-GO START NEXT CARD
1458  005352  023737  006424  006420  ER1:    CMP     DEKSIZ,CDCNT    ;CHECK FOR LAST CARD
1459  005360  001002                          BNE     .+6             ;IF NOT,PRINT OUT MESSAGE
1460  005362  000137  006446                  JMP     ALLDON
1461  005366  004737  011022                  JSR     %7,CKBIT8       ;OUTPUT MESSAGE,WAIT FOR ON-LINE
1462  005372  004737  006302                  JSR     %7,NXCRD        ;START NEXT CARD
1463  005376  000002                          RTI
1464
1465                                          ;DATA ERROR WAS DETECTED, OUTPUT ERROR PRINTOUT
1466  005400  106737  011246          FAIL:   MFPS    PRIOR
1467  005404  052737  000200  011246          BIS     #200,PRIOR
1468  005412  106437  011246                  MTPS    PRIOR
1469  005416  023737  006422  006426          CMP     CLCNT,COLSIZ    ;;CHECK FOR LAST COL.
1470  005424  001402                          BEQ     1$              ;;DO NOT EJECT IF CRD DONE IS SET
1471  005426  052713  000002                  BIS     #2,@CRS         ;SET EJECT TO PREVENT TIMING ERROR
1472  005432  005714                  1$:     TST     @CRB1           ;MAKE CERTAIN COLUMN READY IS CLEAR
1473  005434  032777  020000  000770          BIT     #20000,@SR      ;CK SW13 FOR INHIBIT PRINTOUT
1474  005442  001002                          BNE     .+6
```

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1475  005444  004737  005536                  JSR     %7,FPRINT
1476  005450  005777  000756                  TST     @SR             ;CHECK FOR HALT ON ERROR
1477  005454  100001                          BPL     .+4             ;BRANCH IF HALT ON ERROR NOT SET
1478  005456  000000                          HALT                    ;HALT ON ERROR SET
1479  005460  032713  000400          FTEST:  BIT     #400,@CRS
1480  005464  001007                          BNE     FCNT
1481  005466  032713  040000                  BIT     #40000, @CRS    ;CHECK FOR CARD DONE
1482  005472  001772                          BEQ     FTEST
1483  005474  005237  004460                  INC     CNTCRD          ;COUNT CARD
1484  005500  000137  006006                  JMP     LASTCK          ;INHIBIT PRINTOUT AFTER CARD DONE SET
1485  005504  023737  006424  006420  FCNT:   CMP     DEKSIZ,CDCNT
1486  005512  001002                          BNE     .+6
1487  005514  000137  006446                  JMP     ALLDON
1488  005520  004737  011022                  JSR     %7,CKBIT8               ;WAIT FOR OFF-LINE TO CLEAR
1489  005524  000137  005200                  JMP     FADJ            ;MAKE PROPER ADJUSTMENT AND GET
1490                                                                  ;NEXT CARD
1491  005530  004737  006302                  JSR     %7,NXCRD
1492  005534  000000                          HALT            ;SOMETHING WRONG RCB
1493
1494                          ;DATA ERROR PRINTOUT ROUTINE
1495  005536  005737  001060          FPRINT: TST     ERFLG           ;TEST FLAG FOR PREVIOUS PRINTOUT
1496  005542  001006                          BNE     NOHD            ;IF SET,  DON'T OUTPUT HEADING
1497  005544  005237  001060                  INC     ERFLG           ;SET FLAG
1498  005550  012702  013252                  MOV     #MSG13,R2       ;OUTPUT HEADING FOR DATA ERROR PRINTOUT
1499  005554  004737  011466                  JSR     %7,TOUT
1500  005560  013702  006402          NOHD:   MOV     DECK,R2         ;OUTPUT TYPE OF DECK
1501  005564  004737  011466                  JSR     %7,TOUT
1502  005570  004737  011070                  JSR     %7,SPACE
1503  005574  013702  006420                  MOV     CDCNT,R2        ;OUTPUT CARD NUMBER WHERE ERROR OCCURRED
1504  005600  004737  016010                  JSR     %7,DECPR
1505  005604  004737  011070                  JSR     %7,SPACE
1506  005610  013702  006422                  MOV     CLCNT,R2        ;OUTPUT COLUMN NUMBER WHERE ERROR OCCURRED
1507  005614  004737  016010                  JSR     %7,DECPR
1508  005620  004737  011070                  JSR     %7,SPACE
1509  005624  163705  006442                  SUB     PTOFF,R5        ;SUBTRACT OFFSET FROM POINTER TO POINT TO
1510                                                                  ;ADDRESS OF DESIRED PATTERN
1511  005630  012502                          MOV     (R5)+,R2        ;OUTPUT CORRECT DATA PATTERN (NOT ENCODED)
1512  005632  004737  011250                  JSR     %7,PROCT
1513  005636  004737  011070                  JSR     %7,SPACE
1514  005642  013702  006434                  MOV     DAT1,R2         ;OUTPUT DATA READ ON FIRST READING OF BUFFER
1515  005646  004737  011250                  JSR     %7,PROCT
1516  005652  004737  011070                  JSR     %7,SPACE
1517  005656  013702  006436                  MOV     DAT2,R2         ;OUTPUT DATA READ ONE MILLISECOND LATER
1518  005662  004737  011250                  JSR     %7,PROCT
1519  005666  004737  011070                  JSR     %7,SPACE
1520  005672  011502                          MOV     @R5,R2          ;OUTPUT CORRECT DATA PATTERN (ENCODED FORM)
1521  005674  004737  011250                  JSR     %7,PROCT
1522  005700  004737  011070                  JSR     %7,SPACE
1523  005704  013702  006440                  MOV     DATENC,R2       ;OUTPUT DATA READ (ENCODED)
1524  005710  004737  011250                  JSR     %7,PROCT
1525  005714  000207                          RTS     %7
1526
1527                          ;INTERRUPT NOT DUE TO ERROR OR COLUMN READY
1528  005716  032713  040000  NOTCOL: BIT     #40000,@CRS     ;CHECK FOR CARD DONE
1529  005722  001002                          BNE     1$              ;BRANCH IF  SET
1530  005724  000137  006336                  JMP     NOTCD           ;
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1531  005730  023737  006426  006422  1$:     CMP     COLSIZ,CLCNT    ;CHECK COLUMN COUNT
1532  005736  001401                          BEQ     .+4             ;SKIP ERROR HALT IF 40 OR 80 COLUMNS WERE READ
1533  005740  104000                          HLT                     ;LESS THAN 40 OR 80 COLUMNS WERE READ
1534  005742  032777  000010  000462          BIT     #10,@SR         ;CHECK SR3
1535  005750  001416                          BEQ     LASTCK          ;SKIP IF CLEAR
1536  005752  005237  004460                  INC     CNTCRD          ;COUNT CARD
1537  005756  023737  004460  006424          CMP     CNTCRD,DEKSIZ   ;ALL CARDS?
1538          005762                          NUMCRD=.-2
1539  005764  101410                          BLOS    LASTCK          ;SKIP IF OK
1540  005766  106737  011246                  MFPS    PRIOR
1541  005772  052737  000200  011246          BIS     #200,PRIOR
1542  006000  106437  011246                  MTPS    PRIOR
1543  006004  104000                          HLT                     ;MORE THAN 3 DATA CARDS READ
1544  006006  023737  006424  006420  LASTCK: CMP     DEKSIZ,CDCNT    ;CHECK FOR LAST CARD
1545  006014  001005                          BNE     1$              ;SKIP
1546  006016  032713  000400                  BIT     #400,@CRS       ;CHECK FOR OFFLINE
1547  006022  001775                          BEQ     .-4             ;WAIT
1548  006024  000137  007014                  JMP     OFFSET          ;DONE
1549  006030  000137  005200          1$:     JMP     FADJ            ;ADJUST POINTER AND PROCEED
1550  006034  106737  011246          LASTWT: MFPS    PRIOR
1551  006040  052737  000200  011246          BIS     #200,PRIOR
1552  006046  106437  011246                  MTPS    PRIOR
1553  006052  005737  004436                  TST     SWTHR           ;CHECK PASS  SW
1554  006056  001005                          BNE     1$              ;SKIP IF PASS 1
1555  006060  023737  005762  004460          CMP     NUMCRD,CNTCRD   ;CORRECT NUMBER OF CARDS?
1556  006066  101401                          BLOS    1$              ;SKIP IF OK
1557  006070  104000                          HLT                     ;NOT ENOUGH DATA CARDS READ
1558  006072  005027  000000          1$:     CLR     #0
1559          006074                          LACNT=.-2
1560  006076  005337  006074                  DEC     LACNT
1561  006102  001375                          BNE     .-4
1562  006104  005337  006074                  DEC     LACNT
1563  006110  001375                          BNE     .-4
1564  006112  005337  006074                  DEC     LACNT
1565  006116  001375                          BNE     .-4
1566  006120  005337  006074                  DEC     LACNT
1567  006124  001375                          BNE     .-4
1568  006126  032713  000400                  BIT     #400,@CRS
1569  006132  001402                          BEQ     .+6
1570  006134  000137  006446                  JMP     ALLDON
1571
1572  006140  022626                  LASTCD: CMP     (SP)+,(SP)+     ;RESTORE STACK
1573  006142  004737  010726                  JSR     %7,BELL         ;RING BELL TO SIGNIFY 'PASS COMPLETE'
1574  006146  032777  000040  000256          BIT     #40,@SR         ;CHECK SR FOR CONTINUATION TO ANOTHER DECK
1575  006154  001002                          BNE     .+6             ;BRANCH TO HALT IF SW5 SET
1576  006156  000137  006172                  JMP     DECKCK          ;CONTINUE TO ANOTHER DECK
1577  006162  004737  011544                  JSR     PC,CRLF
1578  006166  004737  011702                  JSR     PC,GTSWR        ;
1579
1580                                  ;WHEN CONTINUING FROM ONE DECK TO ANOTHER, CHECK SW6 FOR TYPE
1581                                  ;OF TESTING TO BE PERFORMED
1582  006172  005137  001054          DECKCK: COM     TRFLG           ;TOGGLE TRACE FLAG
1583  006176  032777  000100  000226          BIT     #100,@SR                ;CHECK SW6
1584  006204  001404                          BEQ     1$              ;BRANCH IF NOT SET
1585  006206  012706  001000                  MOV     #STACK,SP       ;ADJUST STACK
1586  006212  000137  001264                  JMP     RESTRT          ;RERUN COMBINED INSTRUCTION AND DATA TEST
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1587  006216  005037  006410          1$:     CLR     FLAG            ;NO TABLE INDEXING NEEDED
1588  006222  012737  000050  006426          MOV     #40.,COLSIZ     ;SETUP FOR 40 OR 80
1589  006230  012737  000047  006430          MOV     #39.,COLM1      ;
1590  006236  032777  000004  000166          BIT     #4,@SR          ;SR2=1 FOR 40 COL
1591  006244  001006                          BNE     3$
1592  006246  062737  000050  006426          ADD     #40.,COLSIZ     ;
1593  006254  062737  000047  006430          ADD     #39.,COLM1      ;
1594  006262                          3$:
1595
1596  006262  032777  000010  000142          BIT     #10,@SR         ;CHECK FOR MARK SENSE TEST
1597  006270  001402                          BEQ     2$              ;NOT THERE
1598  006272  000137  004276                  JMP     DATMK           ;GO TO M.S. ENTRY POINT
1599  006276  000137  004442          2$:     JMP     DATST1
1600
1601  006302  000240                  NXCRD:  NOP                     ;ALL CARDS ARE NOT IDENTICAL
1602                                                                  ;ADJUSTMENT IS DONE IN ISR3T
1603  006304  004737  011626                  JSR     PC,CKSWR        ;GET SOFTWARE SWITCH
1604  006310  032713  001000          1$:     BIT     #1000,@CRS      ;WAIT FOR
1605  006314  001375                          BNE     1$              ;BUSY TO GO AWAY
1606  006316  042713  000002                  BIC     #2,@CRS         ;CLEAR EJECT IF SET
1607  006322  005213                          INC     @CRS            ;READ ANOTHER CARD
1608  006324  005237  006420                  INC     CDCNT           ;KEEP TRACK OF CARD NUMBER
1609  006330  005037  006422                  CLR     CLCNT           ;INITIALIZE COLUMN COUNT
1610  006334  000207                          RTS     %7              ;RETURN
1611                                  ;INTERRUPT NOT CAUSED BY ERROR, COLUMN READY, OR CARD DONE
1612
1613  006336  004737  011626          NOTCD:  JSR     PC,CKSWR
1614  006342  106737  011246                  MFPS    PRIOR
1615  006346  052737  000200  011246          BIS     #200,PRIOR
1616  006354  106437  011246                  MTPS    PRIOR
1617  006360  032713  002000                  BIT     #2000,@CRS      ;TEST ON-LINE TRANSITION BIT
1618  006364  001003                          BNE     NOTCD1          ;BRANCH IF SET
1619  006366  104000                          HLT                     ;NO BITS SET TO CAUSE AN INTERRUPT
1620  006370  000137  006006                  JMP     LASTCK          ;START NEXT CARD
1621  006374  104000                  NOTCD1: HLT                     ;ON-LINE TRANSITION CAUSED AN INTERRUPT
1622  006376  000137  006006                  JMP     LASTCK          ;START NEXT CARD
1623
1624  006402  000000                  DECK:   0                       ;POINTER TO LITERAL ''ALPHA'' OR 'BINARY''
1625  006404  00000C                  CNTER:  0       ;LOOP (TIME) COUNTER
1626  006406  000000                  CNTER1: 0
1627  006410  000000                  FLAG:   0                       ;INDICATES DECK MUST BE INDEXED @START
1628  006412  000000                  DECCYC: 0                       ;# OF PASSES THROUGH DECK DONE
1629  006414  000000                  TSTART: 0                       ;STARTING ADDRESS OF DATA TABLE
1630  006416  000000                  TEND:   0                       ;END ADDRESS OF DATA TABLE
1631  006420  000000                  CDCNT:  0                       ;NUMBER OF CARD BEING READ
1632  006422  000000                  CLCNT:  0                       ;NUMBER OF COLUMN BEING CHECKED
1633  006424  000120                  DEKSIZ: 80.
1634  006426  000120                  COLSIZ: 80.
1635  006430  000117                  COLM1:  79.
1636  006432  177570                  SR:     177570
1637  006434  000000                  DAT1:   0                       ;DATA ON FIRST READ FROM CRB1
1638  006436  000000                  DAT2:   0                       ;DATA ON SECOND READ OF CRB1
1639  006440  000000                  DATENC: 0                       ;DATA READ FROM CRB2
1640  006442  000000                  PTOFF:  0                       ;OFFSET TO POINTER FOR DATA PRINTOUT
1641  006444  000000                  TABPT:  0                       ;CURRENT TABLE STARTING POINT
1642
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1643                                    ;ALL CARDS DONE
1644  006446  004737  011626            ALLDON: JSR     PC,CKSWR
1645  006452  004737  010726                    JSR     %7,BELL         ;RING BELL
1646  006456  032777  000040  177746            BIT     #40,@SR         ;CHECK SR FOR HALT AT END OF DECK
1647  006464  001412                            BEQ     ALCNT           ;CONTINUE IF NOT SET
1648  006466  032777  000100  177736            BIT     #100,@SR        ;
1649  006474  001004                            BNE     1$              ;
1650  006476  004737  011544                    JSR     PC,CRLF
1651  006502  004737  011702                    JSR     PC,GTSWR        ;
1652                                                                    ;END OF DECK,SW5 SET
1653  006506  000137  006172            1$:     JMP     DECKCK          ;CHECK FOR TYPE OF TESTING
1654  006512  032713  040000            ALCNT:  BIT     #40000,@CRS     ;WAIT FOR CARD DONE
1655  006516  001775                            BEQ     .-4
1656  006520  005013                            CLR     @CRS            ;CLEAR ERROR
1657  006522  032713  156377                    BIT     #156377,@CRS    ;ONLY BITS 8, 9 AND 13 MAY STILL BE SET
1658                                                                    ;BIT 9 MAY BE SET SINCE CARD MAY NOT
1659                                                                    ;YET HAVE CLEARED THE READER TO CAUSE
1660                                                                    ;CARD DONE
1661  006526  001401                            BEQ     .+4             ;BRANCH IF OK
1662  006530  104000                            HLT                     ;STATUS REGISTER INCORRECT
1663  006532  012737  000020  006406            MOV     #20,CNTER1      ;;LOAD OUTER COUNT
1664  006540  012737  004000  006404    11$:    MOV     #4000,CNTER     ;RUN A LOOP AND WAIT SOME TIME FOR BIT13
1665  006546  005337  006404            1$:     DEC     CNTER
1666  006552  001404                            BEQ     12$             ;BR=BIT 13 (HOPPER CHECK) FAILED TO SET YET
1667  006554  032713  020000                    BIT     #20000,@CRS     ;TEST BIT 13 SET
1668  006560  001772                            BEQ     1$              ;BR=13 NOT SET
1669  006562  000404                            BR      3$              ;OK GO ON
1670  006564  005337  006406            12$:    DEC     CNTER1          ;;LOWER OUTER COUNT
1671  006570  001363                            BNE     11$             ;;KEEP CHECKING UNTIL CNTER1-0
1672  006572  104000                    2$:     HLT                     ;BIT 13 NOT SET
1673  006574  106737  011246            3$:     MFPS    PRIOR
1674  006600  052737  000200  011246            BIS     #200,PRIOR
1675  006606  106437  011246                    MTPS    PRIOR
1676  006612  106760  000002                    MFPS    2(ADINT)
1677  006616  105213                            INCB    @CRS            ;ATTEMPT TO READ- SHOULD RESET ERROR
1678  006620  005713                            TST     @CRS            ;CHECK BIT 15
1679  006622  100402                            BMI     ALLOK           ;BRANCH IF OK
1680  006624  104000                            HLT                     ;SETTING READ DIDN'T RESET ERROR
1681  006626  000417                            BR      ALWAIT          ;BRANCH TO WAIT FOR ON-LINE
1682  006630  012710  006664            ALLOK:  MOV     #SRVC1,@ADINT   ;LOAD INTERRUPT RETURN ADDRESS
1683  006634  005037  011246                    CLR     PRIOR
1684  006640  106437  011246                    MTPS    PRIOR
1685  006644  012713  000101                    MOV     #101,@CRS       ;ENABLE INTERRUPTS, KEEP ERROR SET BY SETTING READ
1686  006650  000240                            NOP                     ;CLOCK IN INTERRUPT
1687  006652  106460  000002                    MTPS    2(ADINT)
1688  006656  005013                            CLR     @CRS            ;CLEAR INTERRUPT ENABLE AND ERROR
1689  006660  104000                            HLT                     ;BIT 15 DIDN'T CAUSE AN INTERRUPT
1690  006662  000401                            BR      .+4
1691  006664  022626            SRVC1:  CMP     (SP)+,(SP)+     ;RESTORE STACK POINTER
1692  006666  042713  100100            ALWAIT: BIC     #100100,@CRS            ;CLEAR INTERRUPT ENABLE AND ERROR
1693  006672  012710  006736                    MOV     #SRVC2,@ADINT   ;CHANGE INTERRUPT RETURN ADDRESS
1694  006676  112713  000100                    MOVB    #100,@CRS       ;ENABLE INTERRUPTS
1695  006702  106737  011246                    MFPS    PRIOR
1696  006706  042737  000200  011246            BIC     #200,PRIOR
1697  006714  106437  011246                    MTPS    PRIOR
1698  006720  032713  000400                    BIT     #400,@CRS       ;CHECK OFF-LINE BIT
```

```
1699  006724  001375                          BNE     .-4                 ;LOOP UNTIL CLEAR
1700  006726  106460  000002                  MTPS    2(ADINT)
1701  006732  104000                          HLT                         ;NO INTERRUPT OCCURRED
1702  006734  000403                          BR      SRVC2A              ;BRANCH AROUND
1703  006736  004737  010726          SRVC2:  JSR     %7,BELL             ;RING BELL
1704  006742  022626                          CMP     (SP)+,(SP)+         ;RESTORE STACK POINTER
1705  006744  032713  002000          SRVC2A: BIT     #2000,@CRS          ;CHECK BIT 10
1706  006750  001001                          BNE     .+4                 ;BRANCH IF SET
1707  006752  104000                          HLT                         ;BIT 10 NOT SET
1708  006754  032713  000400                  BIT     #400,@CRS           ;CHECK BIT 8
1709  006760  001401                          BEQ     .+4                 ;BRANCH IF NOT SET
1710  006762  104000                          HLT                         ;BIT 8 WAS SET
1711  006764  032713  030000                  BIT     #30000,@CRS         ;CHECK BITS 12 AND 13
1712  006770  001401                          BEQ     .+4                 ;BRANCH IF NOT SET
1713  006772  104000                          HLT                         ;BIT 12 AND/OR 13 STILL SET IN CRS
1714  006774  005013                          CLR     @CRS                ;DATO TO CRS
1715  006776  032713  002000                  BIT     #2000,@CRS          ;CHECK BIT 10
1716  007002  001401                          BEQ     .+4                 ;BRANCH IF NOT SET
1717  007004  104000                          HLT                         ;DATO DIDN'T CLEAR ON-LINE BIT
1718  007006  022626                          CMP     (SP)+,(SP)+         ;RESTORE STACK FROM INITIAL INTERRUPT
1719  007010  000137  006172                  JMP     DECKCK              ;RESTART
1720
1721                                  ;WHEN INTERRUPT SERVICE WAS ENTERED, OFF-LINE (BIT 8) WAS SET
1722  007014  023737  006424  006420  OFFSET: CMP     DEKSIZ,CDCNT        ;LAST CARD?
1723  007022  001406                          BEQ     OFFS1               ;YES-BRANCH
1724  007024  104000                          HLT                         ;NO,OFF-LINE SET BUT NOT 80TH CARD
1725  007026  004737  011022                  JSR     %7,CKBIT8
1726  007032  004737  006302                  JSR     %7,NXCRD
1727  007036  000002                          RTI
1728  007040  032777  000010  177364  OFFS1:  BIT     #10,@SR             ;MARKSENSE?
1729  007046  001402                          BEQ     1$                  ;NO
1730  007050  000137  006446                  JMP     ALLDON              ;YES
1731  007054  023737  006426  006422  1$:     CMP     COLSIZ,CLCNT        ;LAST COLUMN?
1732  007062  001002                          BNE     .+6                 ;NO-SKIP OVER
1733  007064  000137  006446                  JMP     ALLDON              ;YES-GO RUN END OF DECK ROUTINE
1734  007070  104000                          HLT                         ;OFF-LINE SET BEFORE LAST COLUMN OF LAST CARD
1735  007072  004737  010726                  JSR     %7,BELL
1736  007076  032777  000040  177326          BIT     #40,@SR
1737  007104  001403                          BEQ     OFFS2
1738  007106  000000                          HALT                        ;HALT AT END OF DECK SET
1739  007110  000137  006172                  JMP     DECKCK              ;START NEW DECK
1740  007114  106737  011246          OFFS2:  MFPS    PRIOR
1741  007120  052737  000200  011246          BIS     #200,PRIOR
1742  007126  106437  011246                  MTPS    PRIOR
1743  007132  106760  000002                  MFPS    2(ADINT)
1744  007136  000137  006666                  JMP     ALWAIT
1745
1746                                  ;SETUP FOR ERROR FUNCTION TEST
1747  007142  004737  001064          ERCM11: JSR     %7,SETUP            ;INITIALIZE REGISTERS
1748  007146  004737  011626                  JSR     PC,CKSWR            ;
1749  007152  012737  007162  011464          MOV     #TESTA+2,RETURN     ;SETUP SCOPE LOOP RETURN ADDRESS
1750
1751                                  ;THE CARD READER GOING OFF-LINE SHOULD SET SPECIAL CONDITION (BIT 15) AND OFF-LINE (BIT
1752  007160  104400                  TESTA:  SCOPE
1753  007162  005037  011460                  CLR     ITMAX               ;RUN EACH ERROR TEST ONCE ONLY
1754  007166  004737  010674                  JSR     %7,INIT             ;INITIALIZE STATUS REGISTER
```

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1755  007172  012702  013645                MOV     #MSG25,R2
1756  007176  004737  011466                JSR     %7,TOUT         ;'PRESS CARD READER 'HALT' AND WAIT FOR THE RESET LIGHT
1757  007202  012702  013000                MOV     #MSG3,R2
1758  007206  004737  011466                JSR     PC,TOUT         ;TO LIGHT''
1759  007212  012702  012725                MOV     #MSG2,R2
1760  007216  004737  011466                JSR     %7,TOUT         ;''THEN HIT 'CONTINUE' ON THE CONSOLE''
1761  007222  004737  011544                JSR     %7,CRLF         ;MOVE MESSAGE UP ON TTY
1762  007226  004737  011544                JSR     %7,CRLF
1763  007232  004737  011544                JSR     %7,CRLF
1764  007236  004737  011544                JSR     %7,CRLF
1765  007242  004737  011612                JSR     PC,TTSTAL               ;WAIT FOR TTI
1766  007246  032713  000400                BIT     #400,@CRS       ;CHECK BIT 8
1767  007252  001001                        BNE     .+4             ;BRANCH IF SET
1768  007254  104000                        HLT                     ;OFF-LINE (BIT 8) WASN'T SET
1769  007256  005713                        TST     @CRS            ;CHECK BIT 15
1770  007260  100401                        BMI     .+4             ;BRANCH IF SET
1771  007262  104000                        HLT                     ;BIT 15 WASN'T SET
1772  007264  012702  012632                MOV     #MSG1,R2
1773  007270  004737  011466                JSR     %7,TOUT         ;'PRESS CARD READER 'RESET' AND WAIT FOR THE RESET LIGHT
1774  007274  012702  013013                MOV     #MSG24,R2
1775  007300  004737  011466                JSR     PC,TOUT         ;TO GO OUT''
1776  007304  012702  012725                MOV     #MSG2,R2
1777  007310  004737  011466                JSR     %7,TOUT         ;''THEN HIT 'CONTINUE' ON THE CONSOLE''
1778  007314  004737  011544                JSR     %7,CRLF         ;MOVE MESSAGE UP ON TTY
1779  007320  004737  011544                JSR     %7,CRLF
1780  007324  004737  011544                JSR     %7,CRLF
1781  007330  004737  011544                JSR     %7,CRLF
1782  007334  004737  011612                JSR     PC,TTSTAL               ;WAIT FOR TTI
1783
1784                                ;INPUT HOPPER EMPTY SHOULD SET SPECIAL CONDITION
1785                                ;IN THE PDI CARD READER IT SHOULD ALSO SET CARD SUPPLY ERROR
1786  007340  104400                TESTB:  SCOPE
1787  007342  004737  010674                JSR     %7,INIT         ;INITIALIZE STATUS REGISTER
1788  007346  012702  013062                MOV     #MSG5,R2        ;'REMOVE ALL CARDS FROM THE INPUT HOPPER''
1789  007352  004737  011466                JSR     %7,TOUT
1790  007356  012702  012725                MOV     #MSG2,R2        ;''THEN HIT 'CONTINUE' ON THE CONSOLE''
1791  007362  004737  011466                JSR     %7,TOUT
1792  007366  004737  011544                JSR     %7,CRLF         ;MOVE MESSAGE UP ON TTY
1793  007372  004737  011544                JSR     %7,CRLF
1794  007376  004737  011544                JSR     %7,CRLF
1795  007402  004737  011544                JSR     %7,CRLF
1796  007406  004737  011612                JSR     PC,TTSTAL               ;WAIT FOR TTI
1797  007412  032713  000400                BIT     #400,@CRS       ;CHECK BIT8
1798  007416  001001                        BNE     .+4             ;BRANCH IF SET
1799  007420  104000                        HLT                     ;OFF-LINE (BIT 8) WASN'T SET
1800  007422  005713                        TST     @CRS            ;CHECK SPECIAL CONDITION BIT
1801  007424  100401                        BMI     .+4             ;BRANCH IF SET
1802  007426  104000                        HLT                     ;SPECIAL CONDITION NOT SET
1803  007430  032713  020000                BIT     #20000,@CRS     ;YES, TEST BIT 13
1804  007434  001001                        BNE     .+4             ;CONTINUE IF SET
1805  007436  104000                        HLT                     ;CARD SUPPLY ERROR WASN'T SET
1806  007440  012702  013133        RESETB: MOV     #MSG6,R2        ;'RESTORE CARDS IN INPUT HOPPER''
1807  007444  004737  011466                JSR     %7,TOUT
1808  007450  012702  012632                MOV     #MSG1,R2        ;'PRESS CARD READER 'RESET' AND WAIT FOR THE RESET LIGHT
1809  007454  004737  011466                JSR     %7,TOUT
1810  007460  012702  013013                MOV     #MSG24,R2
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1811  007464  004737  011466                  JSR     PC,TOUT         ;TO GO OUT''
1812  007470  012702  012725                  MOV     #MSG2,R2        ;''THEN HIT 'CONTINUE' ON THE CONSOLE''
1813  007474  004737  011466                  JSR     %7,TOUT
1814  007500  004737  011544                  JSR     %7,CRLF         ;MOVE MESSAGE UP ON TTY
1815  007504  004737  011544                  JSR     %7,CRLF
1816  007510  004737  011544                  JSR     %7,CRLF
1817  007514  004737  011544                  JSR     %7,CRLF
1818  007520  004737  011612                  JSR     PC,TTSTAL               ;WAIT FOR TTI
1819
1820                                  ;OUTPUT STACKER FULL SHOULD SET BIT 15, AND IN THE PDI READER IT SHOULD ALSO SET BIT 13
1821  007524  104400                  TESTC:  SCOPE
1822  007526  004737  010674                  JSR     %7,INIT         ;INITIALIZE STATUS REGISTER
1823  007532  012702  013177                  MOV     #MSG7,R2        ;'RAISE THE OUTPUT STACK HEIGHT ARM
1824  007536  004737  011466                  JSR     %7,TOUT         ;
1825  007542  012702  012725                  MOV     #MSG2,R2        ;''THEN HIT 'CONTINUE' ON THE CONSOLE''
1826  007546  004737  011466                  JSR     %7,TOUT
1827  007552  004737  011544                  JSR     %7,CRLF         ;MOVE MESSAGE UP ON TTY
1828  007556  004737  011544                  JSR     %7,CRLF
1829  007562  004737  011544                  JSR     %7,CRLF
1830  007566  004737  011544                  JSR     %7,CRLF
1831  007572  004737  011612                  JSR     PC,TTSTAL               ;WAIT FOR TTI
1832  007576  032713  000400                  BIT     #400,@CRS       ;CHECK BIT 8
1833  007602  001001                          BNE     .+4             ;BRANCH IF SET
1834  007604  104000                          HLT                     ;OFF-LINE (BIT 8) WASN'T SET
1835  007606  005713                          TST     @CRS            ;CHECK SPECIAL CONDITION BIT
1836  007610  100401                          BMI     .+4             ;BRANCH IF SET
1837  007612  104000                          HLT                     ;SPECIAL CONDITION NOT SET
1838  007614  032713  020000                  BIT     #20000,@CRS     ;YES, TEST BIT 13
1839  007620  001001                          BNE     .+4             ;CONTINUE IF SET
1840  007622  104000                          HLT                     ;CARD SUPPLY ERROR WASN'T SET
1841  007624  012702  012632          RSETC:  MOV     #MSG1,R2
1842  007630  004737  011466                  JSR     %7,TOUT         ;'PRESS CARD READER 'RESET' AND WAIT FOR THE RESET LIGHT
1843  007634  012702  013013                  MOV     #MSG24,R2
1844  007640  004737  011466                  JSR     PC,TOUT         ;''TO GO OUT''
1845  007644  012702  012725                  MOV     #MSG2,R2
1846  007650  004737  011466                  JSR     %7,TOUT         ;''THEN HIT 'CONTINUE' ON THE CONSOLE''
1847  007654  004737  011544                  JSR     %7,CRLF         ;MOVE MESSAGE UP ON TTY
1848  007660  004737  011544                  JSR     %7,CRLF
1849  007664  004737  011544                  JSR     %7,CRLF
1850  007670  004737  011544                  JSR     %7,CRLF
1851  007674  004737  011612                  JSR     PC,TTSTAL               ;WAIT FOR TTI
1852                                  ;FEED ERROR SHOULD SET BIT 15, AND IN THE PDI CARD READER IT
1853                                  ;SHOULD ALSO SET BIT 12
1854
1855  007700  104400                  TESTD:  SCOPE
1856  007702  004737  010674                  JSR     PC,INIT         ;INIT STATUS REGISTER
1857  007706  012702  013737                  MOV     #MSG26,R2
1858  007712  004737  011466                  JSR     PC,TOUT         ;'PLACE PRESSURE ON CARDS IN THE INPUT HOPPER
1859  007716  012702  014015                  MOV     #MSG27,R2
1860  007722  004737  011466                  JSR     PC,TOUT         ;TO INHIBIT A NORMAL FEED''
1861  007726  004737  011544                  JSR     PC,CRLF         ;MOVE MESSAGE UP ON TTY
1862  007732  004737  011544                  JSR     PC,CRLF
1863  007736  004737  011544                  JSR     PC,CRLF
1864  007742  005000                          CLR     R0
1865  007744  012701  000024                  MOV     #20.,R1
1866  007750  005200          11$:    INC     R0
```

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1867  007752  001376                      BNE     11$
1868  007754  005301                      DEC     R1
1869  007756  001374                      BNE     11$             ;STALL
1870  007760  004737  006302              JSR     PC,NXCRD        ;PICK A CARD
1871  007764  005000                      CLR     R0
1872  007766  012701  000024              MOV     #20.,R1
1873  007772  005713              12$:    TST     @CRS
1874  007774  100405                      BMI     13$             ;SKIP IF ERROR IS SET
1875  007776  005200                      INC     R0
1876  010000  001374                      BNE     12$
1877  010002  005301                      DEC     R1
1878  010004  001372                      BNE     12$
1879  010006  104000                      HLT                     ;FEED ERROR DID NOT SET BIT 15
1880  010010  005000              13$:    CLR     R0
1881  010012  005200              14$:    INC     R0
1882  010014  001376                      BNE     14$
1883  010016  032713  010000              BIT     #10000,@CRS     ;CHECK BIT 12
1884  010022  001001                      BNE     15$             ;SKIP IF SET
1885  010024  104000                      HLT                     ;FEED ERROR DID NOT SET BIT 12
1886  010026              15$:
1887  010026  012702  014050      RSETD:  MOV     #MSG30,R2
1888  010032  004737  011466              JSR     PC,TOUT         ;'RESTACK CARDS IN INPUT HOPPER
1889  010036  012702  012632              MOV     #MSG1,R2
1890  010042  004737  011466              JSR     PC,TOUT         ;PRESS CARD READER 'RESET' AND WAIT
1891                                                              ;FOR THE 'RESET' LIGHT
1892  010046  012702  013013              MOV     #MSG24,R2
1893  010052  004737  011466              JSR     PC,TOUT         ;TO GO OUT''
1894  010056  012702  012725              MOV     #MSG2,R2
1895  010062  004737  011466              JSR     PC,TOUT         ;''THEN HIT 'CONTINUE' ON THE CONSOLE''
1896  010066  004737  011544              JSR     PC,CRLF         ;MOVE MESSAGE UP ON T E CONSOLE
1897  010072  004737  011544              JSR     PC,CRLF
1898  010076  004737  011544              JSR     PC,CRLF
1899  010102  004737  011544              JSR     PC,CRLF
1900  010106  004737  011612              JSR     PC,TTSTAL               ;WAIT FOR TTI
1901  010112  104400              TESTG:  SCOPE
1902  010114  004737  010726              JSR     %7,BELL         ;IF SET, RING BELL AND
1903  010120  000000                      HALT                    ;HALT
1904  010122  012737  007162  011464      MOV     #TESTA+2,RETURN ;SETUP SCOPE LOOP RETURN ADDRESS TO LOOP THRU TESTS
1905  010130  000137  007160              JMP     TESTA           ;START ERROR TESTS OVER ON CONTINUING
1906
1907                                      ;ROUTINE TO LOOP THRU A SINGLE INSTRUCTION TEST
1908                                      ;NOTE THAT SW11 MUST BE DOWN AFTER 2ND HALT
1909  010134  004737  001064      TESTX:  JSR     %7,SETUP                ;SETUP POINTERS AND FLAGS
1910  010140  004737  011626              JSR     PC,CKSWR
1911  010144  000000                      HALT                            ;WAIT FOR STARTING ADDRESS
1912  010146  017737  176260  010220      MOV     @SR,RETRNX              ;STORE STARTING ADDRESS
1913  010154  062737  000002  010220      ADD     #2,RETRNX               ;CHANGE TO FIRST ADDRESS AFTER SCOPE INSTRUCTION
1914  010162  000000                      HALT                            ;SET SR OPTIONS (BIT 11 MUST = 0)
1915  010164  005037  011462              CLR     ITCNT                   ;CLEAR ITERATION COUNTER
1916  010170  012737  004000  011460      MOV     #4000,ITMAX
1917  010176  012737  010210  011464      MOV     #XLOOP,RETURN           ;LOAD RETURN ADDRESS
1918  010204  000177  000010              JMP     @RETRNX                 ;JUMP TO TEST
1919  010210  005037  011462      XLOOP:  CLR     ITCNT                   ;KEEP ITERATION COUNTER AT ZERO
1920  010214  000177  000000              JMP     @RETRNX                 ;JUMP TO TEST
1921  010220  000000              RETRNX: 0
1922
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1923
1924                                    ;ROUTINE TO CHECK CARDS WHICH HAVE ALL COLUMNS IDENTICALLY PUNCHED.
1925                                    ;THIS ROUTINE ALLOWS SPECIFIC TYPES OF DATA FAILURES TO BE STUDIED
1926                                    ;EASILY.  THE ROUTINE HALTS ONCE AT THE START.  SET THE CORRECT CARD
1927                                    ;IMAGE PATTERN IN SW11-SW00, THEN HIT CONTINUE (AFTER THE DECK IS
1928                                    ;LOADED AND CARD READER IS ON-LINE).  THE PATTERN IS STORED, AND THEN
1929                                    ;EACH COLUMN OF EACH CARD IS READ TWICE AND COMPARED WITH IT.  IF A
1930                                    ;DISCREPANCY OCCURS, THE ERROR IS PRINTED OUT ALONG WITH THE TOTAL
1931                                    ;NUMBER OF CARDS READ AND THE TOTAL NUMBER OF DATA ERRORS DISCOVERED
1932                                    ;UP TO THAT POINT (ALL PRINTOUTS ARE IN OCTAL).  WHEN THE INPUT HOPPER
1933                                    ;IS EMPTY, THE ROUTINE RINGS THE BELL AND WAITS FOR MORE CARDS TO BE
1934                                    ;LOADED AND THE CARD READER TO BE PUT BACK ON-LINE.
1935                                    ;SW15=1 CAUSES A HALT AFTER AN ERROR, AND SW13=1 INHIBITS ERROR PRINTOUTS.
1936
1937  010222  004737  001064          CKSAME: JSR     %7,SETUP        ;INITIALIZE POINTERS
1938  010226  004737  011626                  JSR     PC,CKSWR        ;
1939  010232  000000                          HALT                    ;WAIT FOR CARD IMAGE PATTERN
1940  010234  017737  176172  010622          MOV     @SR,CARDIM      ;STORE PATTERN
1941  010242  042737  170000  010622          BIC     #170000,CARDIM  ;CLEAR UPPER BITS OF PATTERN
1942  010250  005037  010620                  CLR     TOTCRD          ;INITIALIZE CARD COUNT
1943  010254  005037  010616                  CLR     TOTERR          ;INITIALIZE ERROR COUNT
1944  010260  005037  001060                  CLR     ERFLG           ;CLEAR FLAG FOR PRINTING ERROR HEADING
1945  010264  005037  006422          CKLOOP: CLR     CLCNT           ;INITIALIZE COLUMN COUNT
1946  010270  032713  000400                  BIT     #400,@CRS       ;CHECK BIT 8
1947  010274  001017                          BNE     CKSIT           ;BRANCH IF SET TO WAIT FOR READER TO COME ON-LINE.
1948  010276  005213                          INC     @CRS            ;START READING CARD
1949  010300  005237  010620                  INC     TOTCRD          ;INCREMENT CARD COUNT
1950  010304  105713          CKLP1:  TSTB    @CRS            ;CHECK COLUMN READY
1951  010306  100426                          BMI     CKCOL           ;BRANCH IF SET
1952  010310  032713  040000                  BIT     #40000,@CRS     ;CHECK CARD DONE
1953  010314  001015                          BNE     CKCRD           ;BRANCH IF SET
1954  010316  005713                          TST     @CRS            ;CHECK SPECIAL CONDITION
1955  010320  100371                          BPL     CKLP1           ;LOOP IF NOT SET
1956  010322  032713  000400                  BIT     #400,@CRS       ;CHECK BIT 8
1957  010326  001002                          BNE     CKSIT           ;BRANCH IF SET TO WAIT FOR READER ON-LINE.
1958  010330  104000                          HLT                     ;SPECIAL CONDITION SET, BIT 8 CLEAR
1959  010332  000754                          BR      CKLOOP
1960
1961  010334  004737  010726          CKSIT:  JSR     %7,BELL         ;RING BELL TO SIGNIFY READER OFF-LINE
1962  010340  032713  000400          CKSIT1: BIT     #400,@CRS       ;CHECK BIT 8
1963  010344  001375                          BNE     CKSIT1          ;LOOP IF STILL SET
1964  010346  000746                          BR      CKLOOP          ;START NEXT CARD
1965  010350  023737  006426  006422  CKCRD:  CMP     COLSIZ,CLCNT    ;CHECK FOR ALL COLUMNS READ
1966  010356  001742                          BEQ     CKLOOP          ;START NEXT CARD IF OK
1967  010360  104000                          HLT                     ;FINAL COLUMN COUNT WASN'T 40 OR 80
1968  010362  000740                          BR      CKLOOP          ;START NEXT CARD
1969  010364  011437  006434          CKCOL:  MOV     @CRB1,DAT1      ;READ DATA BUFFER
1970  010370  005237  006422                  INC     CLCNT           ;COUNT COLUMNS
1971  010374  105713                          TSTB    @CRS            ;CHECK COLUMN READY
1972  010376  100002                          BPL     .+6             ;BRANCH IF OK
1973  010400  104000                          HLT                     ;READING DBR DIDN'T CLEAR READY
1974  010402  000730                          BR      CKLOOP          ;START NEXT CARD AFTER ERROR
1975  010404  012701  000100                  MOV     #100,COUNT      ;WAIT AWHILE
1976  010410  005301          CKLP2:  DEC     COUNT
1977  010412  001376                          BNE     CKLP2
1978  010414  011437  006436                  MOV     @CRB1,DAT2      ;READ CRB1 AGAIN
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1979  010420  023737  006434  010622          CMP     DAT1,CARDIM     ;COMPARE FIRST DATA TO PATTERN
1980  010426  001005                          BNE     CKFAIL          ;BRANCH IF FAILURE
1981  010430  023737  006436  010622          CMP     DAT2,CARDIM     ;COMPARE SECOND READING TO PATTERN
1982  010436  001001                          BNE     CKFAIL          ;BRANCH IF FAILURE
1983  010440  000721                          BR      CKLP1           ;WAIT FOR NEXT COLUMN OR END OF CARD
1984  010442  005237  010616          CKFAIL: INC     TOTERR          ;COUNT ERRORS
1985  010446  032777  020000  175756          BIT     #20000,@SR      ;CHECK FOR INHIBITING PRINTOUT
1986  010454  001047                          BNE     CKHLT           ;BRANCH AROUND PRINTOUT IF SET
1987  010456  005737  001060                  TST     ERFLG           ;TEST FLAG TO PRINT HEADING
1988  010462  001006                          BNE     CKNOHD          ;BRANCH IF ALREADY DONE
1989  010464  005237  001060                  INC     ERFLG           ;PRINT HEADING ONCE ONLY
1990  010470  012702  013512                  MOV     #MSG19,R2       ;OUTPUT HEADING
1991  010474  004737  011466                  JSR     %7,TOUT
1992  010500  004737  011544          CKNOHD: JSR     %7,CRLF         ;OUTPUT CARRIAGE RETURN, LINEFEED
1993  010504  013702  006422                  MOV     CLCNT,R2        ;PRINT COLUMN NUMBER
1994  010510  004737  016010                  JSR     %7,DECPR
1995  010514  004737  011070                  JSR     %7,SPACE
1996  010520  013702  006434                  MOV     DAT1,R2         ;PRINT FIRST READING
1997  010524  004737  011250                  JSR     %7,PROCT
1998  010530  004737  011070                  JSR     %7,SPACE
1999  010534  013702  006436                  MOV     DAT2,R2         ;PRINT SECOND READING
2000  010540  004737  011250                  JSR     %7,PROCT
2001  010544  004737  011070                  JSR     %7,SPACE
2002  010550  013702  010620                  MOV     TOTCRD,R2       ;PRINT TOTAL NUMBER OF CARDS READ
2003  010554  004737  011250                  JSR     %7,PROCT
2004  010560  004737  011070                  JSR     %7,SPACE
2005  010564  013702  010616                  MOV     TOTERR,R2       ;PRINT TOTAL NUMBER OF DATA ERRORS
2006  010570  004737  011250                  JSR     %7,PROCT
2007  010574  005777  175632          CKHLT:  TST     @SR             ;CHECK SW15 TO HALT ON ERROR
2008  010600  100002                          BPL     CKDONE          ;BRANCH IF NOT SET
2009  010602  000000                          HALT                    ;HALT ON ERROR
2010  010604  000627                          BR      CKLOOP          ;CONTINUE
2011  010606  032713  140000          CKDONE: BIT     #140000,@CRS    ;WAIT FOR SPECIAL CONDITION OR DONE
2012  010612  001775                          BEQ     CKDONE
2013  010614  000623                          BR      CKLOOP          ;START NEXT CARD AFTER CHECKING BIT 8
2014  010616  000000                  TOTERR: 0
2015  010620  000000                  TOTCRD: 0
2016  010622  000000                  CARDIM: 0
2017                                  ;READ A CARD AND EXECUTE A PROGRAM
2018                                  ;DELAY BEFORE READING ANOTHER CARD
2019                                  ;THIS WILL AID IN TESTING FOR 'PICK ERRORS'
2020  010624  004737  001064          DELAY:  JSR     %7,SETUP        ;SETUP POINTERS
2021  010630  000000                          HALT                    ;WAIT FOR OPR.
2022  010632  017737  175574  010670  1$:     MOV     @SR,DLAY0       ;READ SR
2023  010640  005213                          INC     @CRS            ;MOVE CARD
2024  010642  005237  010670                  INC     DLAY0
2025  010646  005037  010672                  CLR     DLAY1           ;CLEAR SECOND COUNTER
2026  010652  005337  010672          2$:     DEC     DLAY1           ;DELAY
2027  010656  001375                          BNE     2$
2028  010660  005337  010670                  DEC     DLAY0           ;DELAY FINISHED ?
2029  010664  001372                          BNE     2$              ;BR IF NOT
2030  010666  000761                          BR      1$              ;BR IF YES
2031
2032  010670  000001                  DLAY0:  1
2033  010672  000000                  DLAY1:  0
2034                                  ;ISSUE MES.    IF CARD READER IS OFF-LINE
```

```
2035                                    ;WAIT FOR BUSY TO CLEAR IN CASE CARD READER IS STILL READING A CARD
2036                                    ;INITIALIZE STATUS REGISTER AND USE ERROR HALT IF IT DOESN'T CLEAR PROPERLY
2037                                    ;NOTE THAT PROGRAM WILL HANG HERE IF BUSY REMAINS SET
2038  010674  004737  011022          INIT:   JSR     %7,CKBIT8       ;SEE IF OFF-LINE BIT IS SET
2039  010700  032715  001000                  BIT     #1000,@CRS      ;WAIT FOR BUSY TO CLEAR, IN CASE
2040  010704  001375                          BNE     .-4             ;A CARD IS STILL BEING READ
2041  010706  005013                          CLR     @CRS            ;INITIALIZE STATUS REGISTER
2042  010710  005714                          TST     @CRB1           ;READ DATA BUFFER TO CLEAR COLUMN READY
2043  010712  005713                          TST     @CRS            ;MAKE SURE INITIALIZATION OK
2044  010714  001401                          BEQ     .+4             ;BRANCH IF ALL BITS ZERO
2045  010716  104000                          HLT                     ;NOT ALL BITS OF STATUS REGISTER ARE ZERO
2046  010720  000207                          RTS     %7              ;RETURN
2047
2048                                    ;SUBROUTINE TO SAVE STATUS AND CLEAR T BIT
2049  010722  000240                  CLRTR:  NOP
2050  010724  000207                          RTS     PC
2051
2052                                    ;BELL ON PASS COMPLETE
2053  010726  105777  170070          BELL:   TSTB    @TCSR           ;WAIT FOR TTY READY
2054  010732  100375                          BPL     .-4
2055  010734  012777  000207  170062          MOV     #207,@TDBR      ;RING BELL
2056  010742  013702  000042                  MOV     @#42,R2
2057  010746  001416                          BEQ     END
2058  010750  105777  170046                  TSTB    @TCSR
2059  010754  100375                          BPL     .-4
2060  010756  012777  000000  170040          MOV     #0,@TDBR
2061  010764  105777  170032                  TSTB    @TCSR
2062  010770  100375                          BPL     .-4
2063  010772  000005                          RESET
2064  010774  004712                  LOGIC:  JSR     %7,(R2)
2065  010776  000240                          NOP
2066  011000  000240                          NOP
2067  011002  000240                          NOP
2068  011004  105777  170012          END:    TSTB    @TCSR           ;WAIT FOR TTY DONE BEFORE LEAVING
2069  011010  100375                          BPL     .-4
2070  011012  012737  000001  011460          MOV     #1,ITMAX        ;MAKE CERTAIN ITERATION MAXIMUM IS CORRECT
2071  011020  000207                          RTS     %7              ;RETURN
2072
2073                                    ;SUBROUTINE TO CHECK FOR BIT 8 (OFF-LINE) BEING SET IN CARD
2074                                    ;READER CSR, AND PRINT OUT A MESSAGE IF IT IS
2075  011022  004737  011626          CKBIT8: JSR     PC,CKSWR        ;GET SOFTWARE SWITCH REGISTER
2076  011026  032713  000400                  BIT     #400,@CRS       ;CHECK BIT 8
2077  011032  001001                          BNE     .+4             ;BRANCH IF SET
2078  011034  000207                          RTS     %7              ;RETURN IF NOT SET
2079  011036  012702  013472                  MOV     #MSG18,R2       ;OUTPUT MESSAGE
2080  011042  004737  011466                  JSR     %7,TOUT         ;'BIT 8 WAS SET''
2081  011046  012702  013362                  MOV     #MSG17,R2       ;'REMEDY THE ERROR CONDITION
2082  011052  004737  011466                  JSR     %7,TOUT         ;AND PRESS 'CONTINUE'''
2083  011056  004737  011612                  JSR     PC,TTSTAL       ;WAIT FOR TTI
2084  011062  004737  011626                  JSR     PC,CKSWR        ;GET SOFTWARE REGISTER
2085  011066  000755                          BR      CKBIT8          ;CHECK AGAIN
2086
2087                                    ;SUBROUTINE TO ISSUE N SPACES
2088                                    ;N IS ONE PLUS VALUE CONTAINED IN SPACEX
2089                                    ;SPACEX IS CLEARED WITHIN THE SUBROUTINE, SO THAT A CALL ON
2090                                    ;SPACE WITHOUT LOADING SPACEX ISSUES ONLY ONE SPACE
```

```
2091  011070  105777  167726          SPACE:  TSTB    @TCSR           ;WAIT FOR TTY READY
2092  011074  100375                          BPL     .-4
2093  011076  012777  000240  167720          MOV     #240,@TDBR      ;OUTPUT A SPACE
2094  011104  005337  011120                  DEC     SPACEX          ;DECREMENT COUNT
2095  011110  100367                          BPL     SPACE           ;LOOP IF NOT DONE
2096  011112  005037  011120                  CLR     SPACEX          ;RESET COUNT TO ZERO
2097  011116  000207                          RTS     %7              ;RETURN
2098  011120  000000                  SPACEX: 0
2099
2100
2101
2102                                  ;ENTERED WITH SYSTEM TRAP CALL (HLT)
2103                                  ;PRINT OUT THE ERROR PC AND STATUS REGISTER
2104  011122  004737  011626          PRINT:  JSR     PC,CKSWR        ;GET SOFTWARE SWITCH REGISTER
2105  011126  032777  020000  175276          BIT     #20000,@SR      ;TEST FOR INH. PNTOUT
2106  011134  001401                          BEQ     .+4             ;BRANCH TO PRINT
2107  011136  000431                          BR      B.CK            ;INHIBIT, CHECK FOR HALT
2108  011140  012637  011242                  MOV     (6)+,   SAVPC   ;PC OF FAILING ROUTINE
2109  011144  012637  011244                  MOV     (6)+,   SAVPSR  ;PSR OR ERROR CONDITION
2110  011150  024646                          CMP     -(6),   -(6)    ;RESTORE STACK
2111  011152  004737  011544                  JSR     %7,CRLF         ;OUTPUT CARRIAGE RETURN, LINEFEED
2112  011156  010237  011234                  MOV     %2,     SAVR2   ;SAVE R2
2113  011162  013702  011242                  MOV     SAVPC,  %2
2114  011166  004737  011250                  JSR     %7,     PROCT   ;PRINT PC+2 IN OCTAL
2115  011172  105777  167624                  TSTB    @TCSR           ;WAIT FOR TTY READY
2116  011176  100375                          BPL     .-4
2117  011200  012777  000240  167616          MOV     #240,   @TDBR   ;OUTPUT A SPACE
2118  011206  013702  011244                  MOV     SAVPSR, %2
2119  011212  004737  011250                  JSR     %7,     PROCT   ;PRINT PROCESSOR STATUS AT TIME OF FAILURE
2120  011216  013702  011234                  MOV     SAVR2,  %2      ;RESTORE REGISTER 2
2121  011222  005777  175204          B.CK:   TST     @SR             ;CHECK SR FOR HALT SWITCH
2122  011226  100001                          BPL     .+4             ;BRANCH IF NOT SET
2123  011230  000000                          HALT                    ;HALT ON ERROR UP
2124  011232  000002                          RTI                     ;RETURN TO MAIN LINE
2125  011234  000000                  SAVR2:  0
2126  011236  000000                  SAVR3:  0
2127  011240  000000                  SAVR4:  0
2128  011242  000000                  SAVPC:  0
2129  011244  000000                  SAVPSR: 0
2130  011246  000000                  PRIOR:  0
2131
2132  011250  010337  011236          PROCT:  MOV     %3,SAVR3        ;SAVE R3
2133  011254  010437  011240                  MOV     %4,SAVR4        ;SAVE R4
2134  011260  005004                          CLR     %4              ;CLEAR R4 TO USE AS COUNTER
2135  011262  005001                          CLR     COUNT           ;CLEAR COUNT TO USE AS CARRY FLAG
2136  011264  012703  000260                  MOV     #260,   %3      ;SETUP ASCII ZERO IN R3
2137  011270  005702                          TST     %2              ;CHECK BIT 15 OF DESIRED NUMBER
2138  011272  100001                          BPL     .+4             ;BRANCH IF NOT SET
2139  011274  005203                          INC     %3              ;CHANGE TO ASCII ONE
2140  011276  006102                          ROL     %2              ;ROTATE INTO RIGHTMOST BIT
2141  011300  006102                          ROL     %2              ;TO PREPARE FOR LOOP
2142  011302  005501                          ADC     COUNT           ;STORE CARRY
2143  011304  105777  167512          C.WAIT: TSTB    @TCSR           ;WAIT FOR TTY READY
2144  011310  100375                          BPL     C.WAIT
2145  011312  010377  167506                  MOV     %3,     @TDBR   ;OUTPUT ASCII
2146  011316  005204                          INC     %4              ;COUNT CHARACTERS OUTPUT
```

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2147  011320  020427  000006                  CMP     %4,     #6      ;CHECK FOR DONE
2148  011324  001005                          BNE     C.CONT          ;BRANCH IF NOT DONE
2149  011326  013703  011236                  MOV     SAVR3,%3        ;RESTORE REGISTER 3
2150  011332  013704  011240                  MOV     SAVR4,%4        ;RESTORE REGISTER 4
2151  011336  000207                          RTS     %7              ;RETURN
2152  011340  000241              C.CONT:     CLC                     ;CLEAR CARRY
2153  011342  005701                          TST     COUNT           ;TEST CARRY FLAG
2154  011344  001402                          BEQ     .+6             ;BRANCH IF NOT SET
2155  011346  005001                          CLR     COUNT           ;CLEAR FLAG
2156  011350  000261                          SEC                     ;SET CARRY
2157  011352  006102                          ROL     %2              ;ROTATE NEXT 3 BITS INTO RIGHTMOST 3
2158  011354  006102                          ROL     %2
2159  011356  006102                          ROL     %2
2160  011360  005501                          ADC     COUNT           ;STORE CARRY
2161  011362  010203                          MOV     %2,     %3      ;MOVE DATA FOR OUTPUT
2162  011364  042703  177770                  BIC     #177770,%3      ;CLEAR ALL BUT RIGHTMOST 3 BITS
2163  011370  052703  000260                  BIS     #260,   %3      ;SET TO ASCII EQUIVALENT
2164  011374  000743                          BR      C.WAIT          ;LOOP
2165                              ;SCOPE AND/OR ITERATION LOOP FOR EACH TEST 2 TIMES
2166  011376  004737  011626      SCOPEC:JSR      PC,CKSWR
2167  011402  032777  040000  175022          BIT     #40000,@SR      ;TEST SR FOR SCOPE
2168  011410  001012                          BNE     D.1             ;YES,SCOPE
2169  011412  032777  004000  175012          BIT     #4000,@SR       ;NO- TEST FOR ITERATION
2170  011420  001012                          BNE     D.2             ;INHIBIT ITERATION
2171  011422  023737  011462  011460          CMP     ITCNT,ITMAX     ;CHECK FOR ITERATIONS COMPLETE
2172  011430  100006                          BPL     D.2             ;EXIT-DONE
2173  011432  005237  011462                  INC     ITCNT           ;INCREMENT COUNT
2174  011436  022606              D.1:        CMP     (6)+,   %6      ;REPOSITION STACK POINTER
2175  011440  106426                          MTPS    (6)+
2176  011442  000177  000016                  JMP     @RETURN         ;RETURN TO RERUN TEST
2177  011446  005037  011462      D.2:        CLR     ITCNT           ;CLEAR COUNTER
2178  011452  011637  011464                  MOV     @%6,    RETURN  ;SAVE SCOPE RETURN POINTER
2179  011456  000002                          RTI                     ;RETURN INLINE-NEXT TEST
2180  011460  000001              ITMAX:      1                       ;MAX NUMBER OF ITERATIONS
2181  011462  000000              ITCNT:      0                       ;COUNT LOCATION FOR ITERATION LOOP
2182  011464  001402              RETURN:     TEST1+2                 ;ADDRESS OF LAST TEST
2183
2184                              ;MOV ADDRESS OF MESSAGE TO REGISTER 2
2185                              ;THEN JSR %7, TOUT
2186  011466  142777  000177  167326  TOUT:    BICB    #177,   @TCSR   ;CLEAR INT FLAG
2187  011474  111237  011542                  MOVB    @%2,    L.EOMK  ;MOVE IN EOM MARKER
2188  011500  005202              L.INC:      INC     %2              ;MOVE DATA POINTER TO NEXT BYTE
2189  011502  121237  011542      L.TOUT:     CMPB    @%2,    L.EOMK  ;COMPARE FOR EOM
2190  011506  001001                          BNE     .+4             ;BRANCH IF NOT END OF MESSAGE
2191  011510  000207                          RTS     %7              ;RETURN IF EOM
2192  011512  121227  000100                  CMPB    @%2,    #'@     ;CHECK FOR CR,LF REQUEST
2193  01 516  001003                          BNE     .+10            ;BRANCH IF NOT
2194  011520  004737  011544                  JSR     %7,CRLF         ;OUTPUT CARRIAGE RETURN, LINEFEED
2195  011524  000765                          BR      L.INC           ;LOOP
2196  011526  105777  167270                  TSTB    @TCSR           ;WAIT FOR TTY
2197  011532  100375                          BPL     .-4
2198  011534  112277  167264                  MOVB    (2)+,   @TDBR   ;OUTPUT NEXT CHARACTER
2199  011540  000760                          BR      L.TOUT          ;CONTINUE
2200  011542  000000              L.EOMK:     0
2201
2202                              ;SUBROUTINE TO ISSUE CARRIAGE RETURN AND LINEFEED
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2203  011544  105777  167252          CRLF:   TSTB    @TCSR           ;WAIT FOR TTY READY
2204  011550  100375                  BPL     .-4
2205  011552  112777  000215  167244          MOVB    #215,   @TDBR   ;SEND CARRIAGE RETURN
2206  011560  105777  167236                  TSTB    @TCSR           ;WAIT FOR TTY
2207  011564  100375                  BPL     .-4
2208  011566  112777  000212  167230          MOVB    #212,   @TDBR   ;SEND LINE FEED
2209  011574  105777  167222                  TSTB    @TCSR
2210  011600  100375                  BPL     .-4
2211  011602  012777  000000  167214          MOV     #0,@TDBR        ;OUTPUT FILLER
2212  011610  000207                  RTS     %7              ;RETURN
2213
2214                                  ;ROUTINE TO WAIT FOR A CONSOLE KEY TO BE HIT
2215
2216  011612                          TTSTAL:
2217  011612  105777  167200                  TSTB    @KBCSR          ;WAIT FOR
2218  011616  100375                  BPL     TTSTAL          ;KEYBOARD INPUT
2219  011620  005777  167174                  TST     @KBUF           ;CLEAR FLAG
2220  011624  000207                  RTS     PC              ;EXIT
2221
2222                                  ;
2223                                  ;*SOFTWARE SWITCH REGISTER CHANGE ROUTINE.
2224                                  ;*ROUTINE IS ENTERED FROM TRAP HANDLERR,AND WILL
2225                                  ;*SERVICE THE TEST FOR CHANGE IN SOFTWARE SWITCH REGISTER TRAP CALL
2226                                  ;*WHEN OPERATING IN TTY FLAG MODE.
2227  011626  022737  000176  006432  CKSWR:  CMP     #SWREG,SR       ;IS THE SOFT-SWR SELECTED?
2228  011634  001105                          BNE     K15             ;BRANCH IF NO
2229  011636  105777  167154                  TSTB    @TKS             ;CHAR THERE?
2230  011642  100102                          BPL     K15                     ;IF NO,DON'T WAIT AROUND
2231  011644  117746  167150                  MOVB    @TKB,-(SP)      ;SAVE THE CHAR
2232  011650  042716  177600                  BIC     #^C177,(SP)     ;STRIP OFF THE ASCII
2233  011654  022726  000007                  CMP     #7,(SP)+      ;IS IT A CONTROL G?
2234  011660  001073                          BNE     K15             ;NO RETURN TO USER
2235  011662  123727  001046  000001          CMPB    AUTOB,#1        ;ARE WE RUNNING IN AUTO-MODE?
2236  011670  001467                          BEQ     K15             ;BRANCH IF YES
2237  011672  012702  012157                  MOV     #CNTLG,R2       ;
2238  011676  004737  011466                  JSR     PC,TOUT         ;
2239  011702  012702  012164          GTSWR:  MOV     #MSWR,R2        ;TYPE CURRENT CONTENTS
2240  011706  004737  011466                  JSR     PC,TOUT         ;
2241  011712  013746  000176                  MOV     SWREG,-(SP)     ;SAVE SWREG FOR TYPEOUT
2242  011716  004737  012240                  JSR     PC,TYPOC        ;GO TYPE-OCTAL ASCII(ALL DIGITS)
2243  011722  012702  012173                  MOV     #MNEW,R2        ;
2244  011726  004737  011466                  JSR     PC,TOUT         ;
2245  011732  005046                  K19:    CLR     -(SP)           ;CLEAR COUNTER
2246  011734  005046                          CLR     -(SP)           ;NEW SWR
2247  011736  105777  167054          K7:     TSTB    @TKS            ;CHAR THERE?
2248  011742  100375                          BPL     K7              ;IF NOT TRY AGAIN
2249  011744  117746  167050                  MOVB    @TKB,-(SP)       ;PICK UP CHAR
2250  011750  042716  177600                  BIC     #^C177,(SP)     ;MAKE IT 7-BIT ASCII
2251  011754  021627  000025          K9:     CMP     (SP),#25        ;IT IS A CONTROL-U?
2252  011760  001007                          BNE     K10             ;BRANCH IF NOT
2253  011762  012702  012152                  MOV     #CNTLU,R2
2254  011766  004737  011466                  JSR     PC,TOUT         ;
2255  011772  062706  000006          K20:    ADD     #6,SP           ;IGNORE PREVIOUS INPUT
2256  011776  000755                          BR      K19             ;LET'S TRY IT AGAIN
2257  012000  021627  000015          K10:    CMP     (SP),#15        ;IS IT A <CR>?
2258  012004  001022                          BNE     K16             ;BRANCH IF NO
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2259  012006  005766  000004                          TST     4(SP)           ;YES,IS IT THE FIRST CHAR?
2260  012012  001403                                  BEQ     K11             ;BRANCH IF YES
2261  012014  016677  000002  174410                  MOV     2(SP),@SR       ;SAVE NEW SWR
2262  012022  062706  000010                  K11:    ADD     #10,SP           ;CLEAR UP STACK
2263                                          ;TTY INPUT ROUTINE
2264                                          ;
2265  012026  004737  011544                  K14:    JSR     PC ,CRLF         ;ECHO <CR> AND <LF>
2266  012032  123727  001050  000001                  CMPB    INTAG,#1        ;RE-ENABLE TTY KBD INTERRUPTS
2267  012040  001003                                  BNE     K15             ;BRANCH IF NOT
2268  012042  012777  000100  166746                  MOV     #100,@TKS       ;RE-ENABLE TTY KBD INTERRUPTS
2269  012050  000207                          K15:    RTS     PC              ;RETURN
2270  012052  004737  012450                  K16:    JSR     PC,TYPEC        ;ECHO CHAR
2271  012056  021627  000060                          CMP     (SP),#60        ;CHAR < 0?
2272  012062  002420                                  BLT     K18             ;BRANCH IF YES
2273  012064  021627  000067                          CMP     (SP),#67        ;CHAR > 7?
2274  012070  003015                                  BGT     K18             ;BRANCH IF YES
2275  012072  042726  000060                          BIC     #60,(SP)+       ;STRIP-OFF ASCII
2276  012076  005766  000002                          TST     2(SP)           ;IS THIS THE FIRST CHAR
2277  012102  001403                                  BEQ     K17             ;BRANCH IF YES
2278  012104  006316                                  ASL     (SP)            ;NO SHIFT PRESENT
2279  012106  006316                                  ASL     (SP)            ;CHAR OVER TO MAKE
2280  012110  006316                                  ASL     (SP)            ;ROOM FOR NEW ONE
2281  012112  005266  000002                  K17:    INC     2(SP)           ;KEEP COUNT OF CHARACTER
2282  012116  056616  177776                          BIS     -2(SP),(SP)     ;SET IN NEW CHAR
2283  012122  000705                                  BR      K7              ;GET THE NEXT ONE
2284  012124  012702  012206                  K18:    MOV     #QUES,R2         ;TYPE ?<CR><LF>
2285  012130  004737  011466                          JSR     PC,TOUT
2286  012134  000716                                  BR      K20             ;SIMULATE CONTROL-U
2287  012136  000014                          TTYN:   .BLKB   12.              ;RESERVE 12 BYTE FOR TTYT
2288                                                                           ;Y INPUT
2289
2290  012152  040057  052536     057          CNTLU:  .ASCII  ;/@^U/;   ;CONTROL "U"
2291  012157     057  057100  027507          CNTLG:  .ASCII  ;/@^G/;   ;CONTROL "G"
2292  012164  051457  051127  020075          MSWR:   .ASCII  ;/SWR= /;
      012172     057
2293
2294  012173     057  020100  047040          MNEW:   .ASCII  ;/@  NEW = /;
      012200  053505  036440  027440
2295
2296  012206  040057  027477                  QUES:   .ASCII  ;/@?/;            ;QUESTION MARK
2297  012212  000012                          LF:     .ASCIZ  <12>             ;LINE FEED
2298                                          ;*****************************************************
2299
2300                                          ;THIS ROUTINE IS USED TO CHANGE A 16-BIT BINARY NUMBER TO
2301                                          ;*A 6-DIGIT OCTAL (ASCII) NUMBER AND TYPE IT
2302                                          ;*TYPOS---ENTER HERE TO SETUP SUPPRESS ZEROS AND NUMBER OF
2303                                          ;*DIGITS TO TYPE
2304                                          ;*CALL:
2305                                          ;*      MOV     NUM,-(SP)       ;NUMBER TO BE TYPED
2306                                          ;*      TYPOS                   ;CALL FOR TYPE OUT
2307                                          ;*      .BYTE   N               ;N=1 TO 6 FOR NUMBER OF DIGITS
2308                                                   ;*TO TYPE
2309                                                   ;*       .BYTE   M                ;M=1  OR 0
2310                                                                                     ;1=TYPE LEADING ZEROS
2311                                                                                     ;0=SUPPRESS LEADING ZEROS
2312                                                   ;*
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                                                        ;*TYPON----ENTER HERE TO TYPE OUT WITH THE SAME PARAMETERS
                                                        ;*THE LAST
                                                        ;*TYPOS OR TYPOC
                                                        ;*CALL:
                                                        ;*      MOV     NUM,-(SP)       ;NUMBER TO BE TYPED
                                                        ;*      TYPON                   ;CALL FOR TYPEOUT
                                                        ;*
                                                        ;*TYPOC---ENTER HERE FOR TYPEOUT OF A 16 BIT NUMBER
                                                        ;*CALL:
                                                        ;*      MOV     NUM,-(SP)       ;NUMBER TO BE TYPED
                                                        ;*      TYPOC                   ;CALL FOR TYPEOUT
                                                .EVEN
012214  017646  000000                          TYPOS:  MOV     @(SP),-(SP)     ;PICKUP THE MODE
012220  116637  000001  012445                          MOVB    1(SP),FILL0     ;LOAD ZERO FILL SWITCH
012226  112637  012447                          MODE0+1 MOVB    (SP)+,MODE0+1   ;NUMBER OF DIGIT TO TYPE
012232  062716  000002                          NUM     ADD     #2,(SP)          ;ADJUST RETURN ADDRESS
012236  000406                                  TYPOC   BR      TYPON
012240  112737  000001  012445                  TYPOC:  MOVB    #1,FILL0         ;SET THE ZERO FILL SWITCH
012246  112737  000006  012447                          MOVB    #6,MODE0+1       ;SET FOR SIX(6) DIGITS
012254  112737  000005  012444                  TYPON:  MOVB    #5,CNT0          ;SET THE ITERATION COUNT
012262  010346                                          MOV     R3,-(SP)         ;SAVR R3
012264  010446                                          MOV     R4,-(SP)         ;SAVE R4
012266  010546                                          MOV     R5,-(SP)         ;SAVE R5
012270  113704  012447                                  MOVB    MODE0+1,R4       ;GET THE NUMBER OF DIGIT TO TYPE
012274  005404                                          NEG     R4
012276  062704  000006                                  ADD     #6,R4            ;SUBSTRACT IT FOR MAX.ALLOWED
012302  110437  012446                                  MOVB    R4,MODE0         ;SAVE IT FOR USE
012306  113704  012445                                  MOVB    FILL0,R4         ;GET THE ZERO FILL SWITCH
012312  016605  000010                                  MOV     10(SP),R5        ;PICK UP THE INPUT NUMBER
012316  005003                                          CLR     R3               ;CLEAR THE OUTPUT WORD
012320  006105                                  A1:     ROL     R5               ;ROTATE MSB INTO "C"
012322  000404                                          BR      A3               ;GO TO MSB
012324  006105                                  A2:     ROL     R5               ;FORM THIS DIGIT
012326  006105                                          ROL     R5
012330  006105                                          ROL     R5
012332  010503                                          MOV     R5,R3
012334  006103                                  A3:     ROL     R3               ;GET LSB OF THIS DIGIT
012336  105337  012446                                  DECB    MODE0            ;TYPE THIS DIGIT?
012342  100024                                          BPL     A7              ;BR IF NO
012344  042703  177770                                  BIC     #177770,R3       ;GET RID OF JUNK
012350  001002                                          BNE     A4               ;TEST FOR 0
012352  005704                                          TST     R4                      ;SUPPRESS THIS 0?
012354  001403                                          BEQ     A5               ;BR IF YES
012356  005204                                  A4:     INC     R4               ;DON'T SUPPRESS ANYMORE 0'S
012360  052703  000060                                  BIS     #'0,R3           ;MAKE THIS DIGIT ASCII
012364  052703  000040                          A5:     BIS     #' ,R3           ;MAKE ASCII IF NOT ALREA
012370  110337  012442                                  MOVB    R3,A8             ;SAVE FOR TYPING
012374  010446                                          MOV    R4,-(SP)
012376  010546                                          MOV     R5,-(SP)         ;
012400  012702  012441                                  MOV     #A11,R2          ;
012404  004737  011466                                  JSR     PC,TOUT          ;
012410  012605                                          MOV     (SP)+,R5
012412  012604                                          MOV     (SP)+,R4
012414  105337  012444                          A7:     DECB    CNT0              ;COUNT BY ONE
012420  003341                                          BGT     A2               ;BRANCH IF MORE TO DO
012422  002402                                          BLT     A6               ;BRANCH IF DONE
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2369  012424  005204                                  INC     R4              ;INSURE LAST DIGIT IS NOT A BLANK
2370  012426  000736                                  BR      A2
2371  012430  012605                          A6:     MOV     (SP)+,R5        ;RESTORE R5
2372  012432  012604                                  MOV     (SP)+,R4        ;RESTORE R4
2373  012434  012603                                  MOV     (SP)+,R3        ;RESTORE R3
2374  012436  000207                                  RTS     PC
2375  012440     000                                  .BYTE   0
2376  012441     057                          A11:    .BYTE   057
2377  012442     000                          A8:     .BYTE    0              ;STORAGE FOR ASCII DIGIT
2378  012443     057                                  .BYTE    057            ;TERMINATOR FOR TYPE ROUTINE
2379  012444     000                          CNTO:    .BYTE    0             ;OCTAL DIGIT COUNTER
2380  012445     000                          FILLO:  .BYTE   0               ;ZERO FILL SWITCH
2381  012446  000000                          MODEO:  .WORD   0               ;NUMBER OF DIGIT TO TYPE
2382                                                  ;
2383                                                  ;
2384                                                  ;
2385  012450  105777  166346                  TYPEC:  TSTB    @TPS            ;WAIT UNTIL THE PRINTER IS READY
2386  012454  100375                                  BPL     TYPEC
2387  012456  116677  000002  166340                  MOVB    2(SP),@TPB      ;LOAD CHARACTER TO BE TYPED INTO DATA RE
2388  012464  122766  000015  000002                  CMPB    #15,2(SP)       ;IS CHAR CARRIAGE RETURN?
2389  012472  001003                                  BNE     B1
2390  012474  105037  012514                          CLRB    CHARCNT         ;YES CLEAR CHAR COUNT
2391  012500  000406                                  BR      TYPEX           ;EXIT
2392  012502  122766  012212  000002          B1:     CMPB    #LF,2(SP)       ;IS CHAR LINE FEED?
2393  012510  001402                                  BEQ     TYPEX           ;BRANCH IF YES
2394  012512  105227                                  INCB    (PC)+           ;COUNT THE CHARS
2395  012514  000000                          CHARCNT:.WORD   0               ;CHARACTER COUNT SPACE
2396  012516  000207                          TYPEX:   RTS    PC
2397
2398                                                  ;SIZE FOR A HARDWARE SWITCH REGISTER. IF NOT FOUND OR IT IS
2399                                                  ;EQUAL TO A "-1", SETUP FOR A SOFTWARE SWITCH REGISTER.
2400  012520  013746  000004                  SWRCK:  MOV     @#ERRVEC,-(SP)  ;SAVE ERROR VECTOR
2401  012524  012737  012560  000004                  MOV     #RT1,@#ERRVEC    ;SET UP ERROR VECTOR
2402  012532  012737  177570  006432                  MOV     #DSWR,SR        ;SET UP FOR HARDWARE SWR
2403  012540  012737  177570  001036                  MOV     #DDISP,DISPLAY   ;AND A HARDWARE DISPLAY REGISTER
2404  012546  022777  177777  173656                  CMP     #-1,@SR         ;TRY TO REFERENCE HARDWARE SWR
2405  012554  001012                                  BNE     RT3              ;BRANCH IF NO TIME OUT TRAP OCCURED
2406                                                                           ;AND THE HARDWARE SWR IS NOT = -1
2407  012556  000403                                  BR      RT2              ;BRANCH IF NO TIME OUT
2408  012560  012716  012566                  RT1:    MOV     #RT2,(SP)        ;SET UP FOR TRAP RETURN
2409  012564  000002                                  RTI
2410  012566  012737  000176  006432          RT2:    MOV     #SWREG,SR       ;POINT TO SOFTWARE SWR
2411  012574  012737  000174  001036                  MOV     #DISPREG,DISPLAY
2412  012602  012637  000004                  RT3:    MOV     (SP)+,@#ERRVEC   ;RESTORE ERROR VECTOR
2413  012606  005037  001040                          CLR     APASS            ;CLEAR PASS COUNT
2414  012612  132737  000200  001044                  BITB    #200,AENVM       ;TEST USER SIZE UNDER APT
2415  012620  001403                                  BEQ     RT4              ;YES,USE NON-APT SWITCH
2416  012622  012737  001042  006432                  MOV     #ASWREG,SR      ;NO,USE APT SWITCH REGISTER
2417  012630  000207                                  RT4:    RTS     PC
2418
2419
2420  012632  040057  051120  051505  MSG1:   .ASCII ;/@PRESS CARD READER 'RESET' AND WAIT FOR THE 'RESET' LIGHT/;
      012640  020123  040503  042122
      012646  051040  040505  042504
      012654  020122  051047  051505
      012662  052105  020047  047101
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                012670  020104  040527  052111
                012676  043040  051117  052040
                012704  042510  023440  042522
                012712  042523  023524  046040
                012720  043511  052110    057
 2421           012725    057   052100  042510  MSG2:   .ASCII  ;/@THEN HIT ANY KEY ON THE CONSOLE TERMINAL/;
                012732  020116  044510  020124
                012740  047101  020131  042513
                012746  020131  047117  052040
                012754  042510  041440  047117
                012762  047523  042514  052040
                012770  051105  044515  040516
                012776  027514
 2422           013000  040057  047524  046040  MSG3:   .ASCII  ;/@TO LIGHT/;
                013006  043511  052110    057
 2423           013013    057   052100  020117  MSG24:  .ASCII  ;/@TO GO OUT/;
                013020  047507  047440  052125
                013026    057
 2424           013027    057   052100  042510  MSG4:   .ASCII  ;/@THE INTERRUPT LEVEL WAS /;
                013034  044440  052116  051105
                013042  052522  052120  046040
                013050  053105  046105  053440
                013056  051501  027440
 2425           013062  040057  042522  047515  MSG5:   .ASCII  ;/@REMOVE ALL CARDS FROM THE INPUT HOPPER/;
                013070  042526  040440  046114
                013076  041440  051101  051504
                013104  043040  047522  020115
                013112  044124  020105  047111
                013120  052520  020124  047510
                013126  050120  051105    057
 2426           013133    057   051100  051505  MSG6:   .ASCII  ;/@RESTORE CARDS IN THE INPUT HOPPER/;
                013140  047524  042522  041440
                013146  051101  051504  044440
                013154  020116  044124  020105
                013162  047111  052520  020124
                013170  047510  050120  051105
                013176    057
 2427           013177    057   051100  044501  MSG7:   .ASCII  ;/@RAISE THE OUTPUT HOPPER STACK HEIGHT ARM/;
                013204  042523  052040  042510
                013212  047440  052125  052520
                013220  020124  047510  050120
                013226  051105  051440  040524
                013234  045503  044040  044505
                013242  044107  020124  051101
                013250  027515
 2428           013252  040057  042504  045503  MSG13:  .ASCII  ;/@DECK   CARD COLUMN PATTERN READ1 READ2  CODED  READ/;
                013260  020040  041440  051101
                013266  020104  047503  052514
                013274  047115  050040  052101
                013302  042524  047122  051040
                013310  040505  030504  051040
                013316  040505  031104  020040
                013324  047503  042504  020104
                013332  051040  040505  027504
 2429           013340  040057  046101  044120  MSG14:  .ASCII  ;/@ALPHA /;
                013346  020101    057
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2430  013351  000057  041100  047111  MSG15:  .ASCII  ;/@BINARY/;
      013356  051101  027531
2431  013362  040057  042522  042515  MSG17:  .ASCII  ;/@REMEDY THE ERROR CONDITION AND PRESS ANY KEY ON THE CONSOLE TERMINAL@
      013370  054504  052040  042510
      013376  042440  051122  051117
      013404  041440  047117  044504
      013412  044524  047117  040440
      013420  042116  050040  042522
      013426  051523  040440  054516
      013434  045440  054505  047440
      013442  020116  044124  020105
      013450  047503  051516  046117
      013456  020105  042524  046522
      013464  047111  046101  027500
2432  013472  040057  044502  020124  MSG18:  .ASCII  ;/@BIT 8 WAS SET/;
      013500  020070  040527  020123
      013506  042523  027524
2433  013512  040057  047503  052514  MSG19:  .ASCII  ;/@COLUMN READ1 READ2  CARDS ERRORS/;
      013520  047115  051040  040505
      013526  030504  051040  040505
      013534  031104  020040  040503
      013542  042122  020123  051105
      013550  047522  051522  000057
2434  013555  000057  046500  020113  MSG20:  .ASCII  ;/@MK SEN/;
      013562  042523  027516
2435  013566  040057  046102  047101  MSG21:  .ASCII  ;/@BLANK/;
      013574  027513
2436  013576  040057  046111  042514  MSG22:  .ASCII  ;/@ILLEGAL DECK SEQ. PROCEDURE/;
      013604  040507  020114  042504
      013612  045503  051440  050505
      013620  020056  051120  041517
      013626  042105  051125  027505
2437  013634  040057  030064  041440  MSG23:  .ASCII  ;/@40 COL/;
      013642  046117  000057
2438  013645  000057  050100  042522  MSG25:  .ASCII  ;/@PRESS CARD READER 'HALT' AND WAIT FOR THE 'RESET' LIGHT/;
      013652  051523  041440  051101
      013660  020104  042522  042101
      013666  051105  023440  040510
      013674  052114  020047  047101
      013702  020104  040527  052111
      013710  043040  051117  052040
      013716  042510  023440  042522
      013724  042523  023524  046040
      013732  043511  052110  000057
2439  013737  000057  050100  040514  MSG26:  .ASCII  ;/@PLACE PRESSURE ON CARDS IN THE INPUT HOPP R/;
      013744  042503  050040  042522
      013752  051523  051125  020105
      013760  047117  041440  051101
      013766  051504  044440  020116
      013774  044124  020105  047111
      014002  052520  020124  047510
      014010  050120  051105  000057
2440  014015  000057  052100  020117  MSG27:  .ASCII  ;/@TO INHIBIT A NORMAL FEED/;
      014022  047111  044510  044502
      014030  020124  020101  047516
      014036  046522  046101  043040
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                014044  042505  027504
2441            014050  040057  042522  052123  MSG30:  .ASCII  ;/@RESTACK CARDS IN INPUT HOPPER/;
                014056  041501  020113  040503
                014064  042122  020123  047111
                014072  044440  050116  052125
                014100  044040  050117  042520
                014106  027522
2442                                            .EVEN
2443
2444                                    ;DATA TABLES FOR DATA RELIABILITY TESTS
2445
2446                                    ;ALPHANUMERIC DECK DATA TABLE
2447                                    ;FIRST VALUE FOR A COLUMN IS THE DIRECT
2448                                    ;CARD IMAGE FOR THAT COLUMN ON CARD 1
2449                                    ;THE SECOND VALUE IS THE ENCODED FORM OF THAT DATA
2450                                                                    ;COLUMN CHAR HOLLERITH
2451    014110  004000                  ALPCD:  4000                    ;1      &       12
2452    014112  000200                          200
2453    014114  004400                          4400                    ;2      A       12 1
2454    014116  000201                          201
2455    014120  004200                          4200                    ;3      B       12 2
2456    014122  000202                          202
2457    014124  004100                          4100                    ;4      C       12 3
2458    014126  000203                          203
2459    014130  004040                          4040                    ;5      D       12 4
2460    014132  000204                          204
2461    014134  004020                          4020                    ;6      E       12 5
2462    014136  000205                          205
2463    014140  004010                          4010                    ;7      F       12 6
2464    014142  000206                          206
2465    014144  004004                          4004                    ;8      G       12 7
2466    014146  000207                          207
2467    014150  004002                          4002                    ;9      H       12 8
2468    014152  000210                          210
2469    014154  004001                          4001                    ;10     I       12 9
2470    014156  000220                          220
2471    014160  004202                          4202                    ;11     CENT    12 8 2
2472    014162  000212                          212
2473    014164  004102                          4102                    ;12     .       12 8 3
2474    014166  000213                          213
2475    014170  004042                          4042                    ;13     <       12 8 4
2476    014172  000214                          214
2477    014174  004022                          4022                    ;14     (       12 8 5
2478    014176  000215                          215
2479    014200  004012                          4012                    ;15     +       12 8 6
2480    014202  000216                          216
2481    014204  004006                          4006                    ;16     1       12 8 7
2482    014206  000217                          217
2483    014210  002000                          2000                    ;17     -       11
2484    014212  000100                          100
2485    014214  002400                          2400                    ;18     J       11 1
2486    014216  000101                          101
2487    014220  002200                          2200                    ;19     K       11 2
2488    014222  000102                          102
2489    014224  002100                          2100                    ;20     L       11 3
2490    014226  000103                          103
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2491  014230  002040                    2040            ;21     M       11 4
2492  014232  000104                    104
2493  014234  002020                    2020            ;22     N       11 5
2494  014236  000105                    105
2495  014240  002010                    2010            ;23     O       11 6
2496  014242  000106                    106
2497  014244  002004                    2004            ;24     P       11 7
2498  014246  000107                    107
2499  014250  002002                    2002            ;25     Q       11 8
2500  014252  000110                    110
2501  014254  002001                    2001            ;26     R       11 9
2502  014256  000120                    120
2503  014260  002202                    2202            ;27     :       11 8 2
2504  014262  000112                    112
2505  014264  002102                    2102            ;28     $       11 8 3
2506  014266  000113                    113
2507  014270  002042                    2042            ;29     *       11 8 4
2508  014272  000114                    114
2509  014274  002022                    2022            ;30     )       11 8 5
2510  014276  000115                    115
2511  014300  002012                    2012            ;31     ;       11 8 6
2512  014302  000116                    116
2513  014304  002006                    2006            ;32     BLANK   11 8 7
2514  014306  000117                    117
2515  014310  001000            ALPCD2: 1000            ;33     0       0
2516  014312  000040                    40
2517  014314  001400                    1400            ;34     /       0 1
2518  014316  000041                    41
2519  014320  001200                    1200            ;35     S       0 2
2520  014322  000042                    42
2521  014324  001100                    1100            ;36     T       0 3
2522  014326  000043                    43
2523  014330  001040                    1040            ;37     U       0 4
2524  014332  000044                    44
2525  014334  001020                    1020            ;38     V       0 5
2526  014336  000045                    45
2527  014340  001010                    1010            ;39     W       0 6
2528  014342  000046                    46
2529  014344  001004                    1004            ;40     X       0 7
2530  014346  000047                    47
2531  014350  001002                    1002            ;41     Y       0 8
2532  014352  000050                    50
2533  014354  001001                    1001            ;42     Z       0 9
2534  014356  000060                    60
2535  014360  001202                    1202            ;43             0 8 2
2536  014362  000052                    52
2537  014364  001102                    1102            ;44     ,       0 8 3
2538  014366  000053                    53
2539  014370  001042                    1042            ;45     %       0 8 4
2540  014372  000054                    54
2541  014374  001022                    1022            ;46     -       0 8 5
2542  014376  000055                    55
2543  014400  001012                    1012            ;47     >       0 8 6
2544  014402  000056                    56
2545  014404  001006                    1006            ;48     ?       0 8 7
2546  014406  000057                    57
```

```
CMQ1
CVCM

PROC
PROC
PSSE
PSSE
PTOF
QUES
RESE
REST
REST
REST
RETR
RETU
RSET
RSET
RTT
RT1
RT2
RT3
RT4
SAVP
SAVP
SAVR
SAVR
SAVR
SCON
SCOP

SCOP
SETU
SPAC
SPAC
SR


SRVC
SRVC
SRVC
SRVC
STAC
SWR
SWRC
SWRE
SWTH
TABP
TAGA
TAGB
TAGC
TAGD
TAGE
TAGF
TAGZ
```

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2547  014410  000000                0000                ;49          BLANK
2548  014412  000000                0
2549  014414  000400                0400                ;50     1    1
2550  014416  000001                1
2551  014420  000200                0200                ;51     2    2
2552  014422  000002                2
2553  014424  000100                0100                ;52     3    3
2554  014426  000003                3
2555  014430  000040                0040                ;53     4    4
2556  014432  000004                4
2557  014434  000020                0020                ;54     5    5
2558  014436  000005                5
2559  014440  000010                0010                ;55     6    6
2560  014442  000006                6
2561  014444  000004                0004                ;56     7    7
2562  014446  000007                7
2563  014450  000002                0002                ;57     8    8
2564  014452  000010                10
2565  014454  000001                0001                ;58     9    9
2566  014456  000020                20
2567  014460  000202                0202                ;59     :    8 2
2568  014462  000012                12
2569  014464  000102                0102                ;60     #    8 3
2570  014466  000013                13
2571  014470  000042                0042                ;61     A    8 4
2572  014472  000014                14
2573  014474  000022                0022                ;62     '    8 5
2574  014476  000015                15
2575  014500  000012                0012                ;63     =    8 6
2576  014502  000016                16
2577  014504  000006                0006                ;64     ''   8 7
2578  014506  000017                17
2579  014510  004000                4000                ;65     &    12
2580  014512  000200                200
2581  014514  004400                4400                ;66     A    12 1
2582  014516  000201                201
2583  014520  004200                4200                ;67     B    12 2
2584  014522  000202                202
2585  014524  004100                4100                ;68     C    12 3
2586  014526  000203                203
2587  014530  004040                4040                ;69     D    12 4
2588  014532  000204                204
2589  014534  004020                4020                ;70     E    12 5
2590  014536  000205                205
2591  014540  004010                4010                ;71     F    12 6
2592  014542  000206                206
2593  014544  004004                4004                ;72     G    12 7
2594  014546  000207                207
2595  014550  004002                4002                ;73     H    12 8
2596  014552  000210                210
2597  014554  004001                4001                ;74     I    12 9
2598  014556  000220                220
2599  014560  004202                4202                ;75     CENT 12 8 2
2600  014562  000212                212
2601  014564  004102                4102                ;76     .    12 8 3
2602  014566  000213                213
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2603  014570  004042                        4042                ;77   <     12 8 4
2604  014572  000214                        214
2605  014574  004022                        4022                ;78   (     12 8 5
2606  014576  000215                        215
2607  014600  004012                        4012                ;79   +     12 8 6
2608  014602  000216                        216
2609  014604  004006                        4006                ;80   1     12 8 7
2610  014606  000217              ALPEND:   217
2611
2612
2613  014610  005225              BINCD:    5225          ;1
2614  014612  000267                        267
2615  014614  005737                        5737          ;2
2616  014616  000277                        277
2617  014620  000552                        0552          ;3
2618  014622  000017                        17
2619  014624  005245                        5245          ;4
2620  014626  000267                        267
2621  014630  005717                        5717          ;5
2622  014632  000277                        277
2623  014634  002552                        2552          ;6
2624  014636  000117                        117
2625  014640  006245                        6245          ;7
2626  014642  000327                        327
2627  014644  004717                        4717          ;8
2628  014646  000237                        237
2629  014650  002552                        2552          ;9
2630  014652  000117                        117
2631  014654  006245                        6245          ;10
2632  014656  000327                        327
2633  014660  004727                        4727          ;11
2634  014662  000237                        237
2635  014664  002562                        2562          ;12
2636  014666  000117                        117
2637  014670  006245                        6245          ;13
2638  014672  000327                        327
2639  014674  005327                        5327          ;14
2640  014676  000277                        277
2641  014700  003162                        3162          ;15
2642  014702  000157                        157
2643  014704  006245                        6245          ;16
2644  014706  000327                        327
2645  014710  005327                        5327          ;17
2646  014712  000277                        277
2647  014714  003172                        3172          ;18
2648  014716  000157                        157
2649  014720  006251                        6251          ;19
2650  014722  000326                        326
2651  014724  005323                        5323          ;20
2652  014726  000277                        277
2653  014730  003572                        3572          ;21
2654  014732  000157                        157
2655  014734  0^6451                        6451          ;22
2656  014736  000327                        327
265   014740  005123                        5123          ;23
2658  014742  000277                        277
```

```
2659  014744  003572                    3572            ;24
2660  014746  000157                    157
2661  014750  006451                    6451            ;25
2662  014752  000327                    327
2663  014754  005125                    5125            ;26
2664  014756  000267                    267
2665  014760  003574                    3574            ;27
2666  014762  000147                    147
2667  014764  006451                    6451            ;28
2668  014766  000327                    327
2669  014770  005225                    5225            ;29
2670  014772  000267                    267
2671  014774  003674                    3674            ;30
2672  014776  000147                    147
2673  015000  002451                    2451            ;31
2674  015002  000127                    127
2675  015004  001225                    1225            ;32
2676  015006  000067                    67
2677  015010  003676            BINCD2: 3676            ;33
2678  015012  000157                    157
2679  015014  002452                    2452            ;34
2680  015016  000117                    117
2681  015020  001224                    1224            ;35
2682  015022  000047                    47
2683  015024  003736                    3736            ;36
2684  015026  000157                    157
2685  015030  002512                    2512            ;37
2686  015032  000117                    117
2687  015034  005224                    5224            ;38
2688  015036  000247                    247
2689  015040  005736                    5736            ;39
2690  015042  000257                    257
2691  015044  000512                    0512            ;40
2692  015046  000017                    17
2693  015050  005225                    5225            ;41
2694  015052  000267                    267
2695  015054  005737                    5737            ;42
2696  015056  000277                    277
2697  015060  000552                    0552            ;43
2698  015062  000017                    17
2699  015064  005245                    5245            ;44
2700  015066  000267                    267
2701  015070  005717                    5717            ;45
2702  015072  000277                    277
2703  015074  002552                    2552            ;46
2704  015076  000117                    117
2705  015100  006245                    6245            ;47
2706  015102  000327                    327
2707  015104  004717                    4717            ;48
2708  015106  000237                    237
2709  015110  002552                    2552            ;49
2710  015112  000117                    117
2711  015114  006245                    6245            ;50
2712  015116  000327                    327
2713  015120  004727                    4727            ;51
2714  015122  000237                    237
```

```
2715  015124  002562                  2562            ;52
2716  015126  000117                  117
2717  015130  006245                  6245            ;53
2718  015132  000327                  327
2719  015134  005327                  5327            ;54
2720  015136  000277                  277
2721  015140  003162                  3162            ;55
2722  015142  000157                  157
2723  015144  006245                  6245            ;56
2724  015146  000327                  327
2725  015150  005327                  5327            ;57
2726  015152  000277                  277
2727  015154  003172                  3172            ;58
2728  015156  000157                  157
2729  015160  006251                  6251            ;59
2730  015162  000326                  326
2731  015164  005323                  5323            ;60
2732  015166  000277                  277
2733  015170  003572                  3572            ;61
2734  015172  000157                  157
2735  015174  006451                  6451            ;62
2736  015176  000327                  327
2737  015200  005123                  5123            ;63
2738  015202  000277                  277
2739  015204  003572                  3572            ;64
2740  015206  000157                  157
2741  015210  006451                  6451            ;65
2742  015212  000327                  327
2743  015214  005125                  5125            ;66
2744  015216  000267                  267
2745  015220  003574                  3574            ;67
2746  015222  000147                  147
2747  015224  006451                  6451            ;68
2748  015226  000327                  327
2749  015230  005225                  5225            ;69
2750  015232  000267                  267
2751  015234  003674                  3674            ;70
2752  015236  000147                  147
2753  015240  002451                  2451            ;71
2754  015242  000127                  127
2755  015244  001225                  1225            ;72
2756  015246  000067                  67
2757  015250  003676                  3676            ;73
2758  015252  000157                  157
2759  015254  002452                  2452            ;74
2760  015256  000117                  117
2761  015260  001224                  1224            ;75
2762  015262  000047                  47
2763  015264  003736                  3736            ;76
2764  015266  000157                  157
2765  015270  002512                  2512            ;77
2766  015272  000117                  117
2767  015274  005224                  5224            ;78
2768  015276  000247                  247
2769  015300  005736                  5736            ;79
2770  015302  000257                  257
```

```
2771  015304  000512                    0512            ;80
2772  015306  000017            BINEND: 17
2773
2774
2775                              ;MARK SENSE CARD TABLE
2776
2777  015310  005252            MRKCD:  5252    ;1
2778  015312  000256                    256
2779  015314  002525                    2525    ;2
2780  015316  000127                    127
2781  015320  007777                    7777    ;3
2782  015322  000377                    377
2783  015324  004000                    4000    ;4
2784  015326  000200                    200
2785  015330  002000                    2000    ;5
2786  015332  000100                    100
2787  015334  001000                    1000    ;6
2788  015336  000040                    40
2789  015340  000400                    400     ;7
2790  015342  000001                    1
2791  015344  000200                    200     ;8
2792  015346  000002                    2
2793  015350  000100                    100     ;9
2794  015352  000003                    3
2795  015354  000040                    40      ;10
2796  015356  000004                    4
2797  015360  000020                    20      ;11
2798  015362  000005                    5
2799  015364  000010                    10      ;12
2800  015366  000006                    6
2801  015370  000004                    4       ;13
2802  015372  000007                    7
2803  015374  000002                    2       ;14
2804  015376  000010                    1(
2805  015400  000001                    1       ;15
2806  015402  000020                    20
2807  015404  000002                    2       ;16
2808  015406  000010                    10
2809  015410  000004                    4       ;17
2810  015412  000007                    7
2811  015414  000010                    10      ;18
2812  015416  000006                    6
2813  015420  000020                    20      ;19
2814  015422  000005                    5
2815  015424  000040                    40      ;20
2816  015426  000004                    4
2817  015430  000100                    100     ;21
2818  015432  000003                    3
2819  015434  000200                    200     ;22
2820  015436  000002                    2
2821  015440  000400                    400     ;23
2822  015442  000001                    1
2823  015444  001000                    1000    ;24
2824  015446  000040                    40
2825  015450  002000                    2000    ;25
2826  015452  000100                    100
```

```
2827  015454  004000                          4000    ;26
2828  015456  000200                          200
2829  015460  004000                          4000    ;27
2830  015462  000200                          200
2831  015464  004000                          4000    ;28
2832  015466  000200                          200
2833  015470  004000                          4000    ;29
2834  015472  000200                          200
2835  015474  002000                          2000    ;30
2836  015476  000100                          100
2837  015500  002000                          2000    ;31
2838  015502  000100                          100
2839  015504  002000                          2000    ;32
2840  015506  000100                          100
2841  015510  002000                          2000    ;33
2842  015512  000100                          100
2843  015514  001000                          1000    ;34
2844  015516  000040                          40
2845  015520  001000                          1000    ;35
2846  015522  000040                          40
2847  015524  001000                          1000    ;36
2848  015526  000040                          40
2849  015530  001000                          1000    ;37
2850  015532  000040                          40
2851  015534  000400                          400     ;38
2852  015536  000001                          1
2853  015540  000400                          400     ;39
2854  015542  000001                          1
2855  015544  000400                          400     ;40
2856  015546  000001              MKND40:     1
2857  015550  000400                          400     ;41
2858  015552  000001                          1
2859  015554  000200                          200     ;42
2860  015556  000002                          2
2861  015560  000200                          200     ;43
2862  015562  000002                          2
2863  015564  000200                          200     ;44
2864  015566  000002                          2
2865  015570  000200                          200     ;45
2866  015572  000002                          2
2867  015574  000100                          100     ;46
2868  015576  000003                          3
2869  015600  000100                          100     ;47
2870  015602  000003                          3
2871  015604  000100                          100     ;48
2872  015606  000003                          3
2873  015610  000100                          100     ;49
2874  015612  000003                          3
2875  015614  000040                          40      ;50
2876  015616  000004                          4
2877  015620  000040                          40      ;51
2878  015622  000004                          4
2879  015624  000040                          40      ;52
2880  015626  000004                          4
2881  015630  000040                          40      ;53
2882  015632  000004                          4
```

```
2883  015634  000020                    20      ;54
2884  015636  000005                    5
2885  015640  000020                    20      ;55
2886  015642  000005                    5
2887  015644  000020                    20      ;56
2888  015646  000005                    5
2889  015650  000020                    20      ;57
2890  015652  000005                    5
2891  015654  000010                    10      ;58
2892  015656  000006                    6
2893  015660  000010                    10      ;59
2894  015662  000006                    6
2895  015664  000010                    10      ;60
2896  015666  000006                    6
2897  015670  000010                    10      ;61
2898  015672  000006                    6
2899  015674  000004                    4       ;62
2900  015676  000007                    7
2901  015700  000004                    4       ;63
2902  015702  000007                    7
2903  015704  000004                    4       ;64
2904  015706  000007                    7
2905  015710  000004                    4       ;65
2906  015712  000007                    7
2907  015714  000002                    2       ;66
2908  015716  000010                    10
2909  015720  000002                    2       ;67
2910  015722  000010                    10
2911  015724  000002                    2       ;68
2912  015726  000010                    10
2913  015730  000002                    2       ;69
2914  015732  000010                    10
2915  015734  000001                    1       ;70
2916  015736  000020                    20
2917  015740  000001                    1       ;71
2918  015742  000020                    20
2919  015744  000001                    1       ;72
2920  015746  000020                    20
2921  015750  000001                    1       ;73
2922  015752  000020                    20
2923  015754  000000                    0       ;74
2924  015756  000000                    0
2925  015760  000000                    0       ;75
2926  015762  000000                    0
2927  015764  000000                    0       ;76
2928  015766  000000                    0
2929  015770  000000                    0       ;77
2930  015772  000000                    0
2931  015774  000000                    0       ;78
2932  015776  000000                    0
2933  016000  007777                    7777    ;79
2934  016002  000377                    377
2935  016004  004001                    4001    ;80
2936  016006  000220          MRKEND:   220             ;END MARK SENSE TABLE
2937                          ;PRINT DECIMAL VALUE IN R2
2938
```

```
2939  016010  012737  177773  016164  DECPR:  MOV     #-5,DIGCNT
2940  016016  012737  016172  016170          MOV     #DECPNT+2,DECPNT
2941  016024  012737  000040  016166          MOV     #40,ZERO
2942  016032  012737  177777  016162  TYPT1:  MOV     #-1,DIGIT
2943  016040  005237  016162          TYPT2:  INC     DIGIT
2944  016044  167702  000120                  SUB     @DECPNT,%2
2945  016050  100373                          BPL     TYPT2
2946  016052  067702  000112                  ADD     @DECPNT,%2
2947  016056  004737  016102                  JSR     %7,DECOUT
2948  016062  005237  016164                  INC     DIGCNT
2949  016066  001001                          BNE     TYPT3
2950  016070  000207                          RTS     %7
2951  016072  062737  000002  016170  TYPT3:  ADD     #2,DECPNT
2952  016100  000754                          BR      TYPT1
2953  016102  005737  016162          DECOUT: TST     DIGIT
2954  016106  001010                          BNE     DEC1
2955  016110  022737  177777  016164          CMP     #-1,DIGCNT
2956  016116  001404                          BEQ     DEC1
2957  016120  013737  016166  016162          MOV     ZERO,DIGIT
2958  016126  000406                          BR      DEC2
2959  016130  012737  000060  016166  DEC1:   MOV     #60,ZERO
2960  016136  052737  000060  016162          BIS     #60,DIGIT
2961  016144  105777  162652          DEC2:   TSTB    @TCSR
2962  016150  100375                          BPL     .-4
2963  016152  013777  016162  162644          MOV     DIGIT,@TDBR
2964  016160  000207                          RTS     %7
2965  016162  000000                  DIGIT:  0
2966  016164  000000                  DIGCNT: 0
2967  016166  000040                  ZERO:   40
2968  016170  016172                  DECPNT: .+2
2969  016172  023420                          10000.
2970  016174  001750                          1000.
2971  016176  000144                          100.
2972  016200  000012                          10.
2973  016202  000001                          1.
2974
2975          000001                          .END
```

```
AENVM   001044   622#  2414
ALCNT   006512  1647  1654#
ALLDON  006446  1443  1460  1487  1570  1644#  1730  1733
ALLOK   006630  1679  1682#
ALPCD   014110  1344  1351  1352  2451#
ALPCD2  014310  1348  1349  2515#
ALPEND  014606  1345  2610#
ALP1    004552  1330  1342#
ALWAIT  006666  1681  1692#  1744
APASS   001040   620#  2413*
ASWREG  001042   621#  2416
AUTOB   001046   623#  2235
A1      012320  2343#
A11     012441  2362  2376#
A2      012324  2345#  2367  2370
A3      012334  2344  2349#
A4      012356  2353  2356#
A5      012364  2355  2358#
A6      012430  2368  2371#
A7      012414  2351  2366#
A8      012442  2359*  2377#
BEGIN   001242   587   663#  1319
BELL    010726  1290  1573  1645  1703  1735  1902  1961  2053#
BINCD   014610  1331  1338  1339  2613#
BINCD2  015010  1335  1336  2677#
BINEND  015306  1332  2772#
B.CK    011222  2107  2121#
B1      012502  2389  2392#
CARDIM  010622  1940*  1941*  1979  1981  2016#
CDCNT   006420  1300*  1320*  1324*  1408  1441  1458  1485  1503  1544  1608*  1631#  1722
CHARCN  012514  2390*  2395#
CKBIT8  011022   689   724   755  1271  1282  1461  1488  1725  2038  2075#  2085
CKCOL   010364  1951  1969#
CKCRD   010350  1953  1965#
CKDONE  010606  2008  2011#  2012
CKFAIL  010442  1980  1982  1984#
CKHLT   010574  1986  2007#
CKLOOP  010264  1945#  1959  1964  1966  1968  1974  2010  2013
CKLP1   010304  1950#  1955  1983
CKLP2   010410  1976#  1977
CKNOHD  010500  1988  1992#
CKSAME  010222   597  1937#
CKSIT   010334  1947  1957  1961#
CKSIT1  010340  1962#  1963
CKSWR   011626  1299  1310  1450  1603  1613  1644  1748  1910  1938  2075  2084  2104  2166
                2227#
CK4     001750   787   792   794#
CK5     002114   828   841#
CK9     002736  1019  1022#
CLCNT   006422  1385*  1417  1469  1506  1531  1609*  1632#  1731  1945*  1965  1970*  1993
CLRTR   010722   690   725   961  1006  2049#
CNTCRD= 004460  1328#  1483*  1536*  1537  1555
CNTER   006404  1013*  1016*  1625#  1664*  1665*
CNTER1  006406  1626#  1663*  1670*
CNTLG   012157  2237  2291#
CNTLU   012152  2253  2290#
```

```
CNT0     012444  2332* 2366* 2379#
CNT23A   003750  1199  1202#
CNT23B   003766  1206  1209#
CNT23C   004006  1213  1216#
CNT23D   004024  1220  1223#
CNT23E   004044  1227  1230#
CNT23F   004064  1234  1237#
CNT23G   004110  1242  1246#
CNT24A   004156  1262  1265# 1268
CNT24B   004206  1270  1273#
COLM1    006430   656*  659*  675*  679*  833   847   1589* 1593* 1635#
COLSIZ   006426   655*  660*  674*  678*  911   1069  1417  1469  1531  1586* 1592* 1634# 1731
                 1965
CONTD    004640  1341  1343  1354#
CONT10   003120  1051  1063#
CONT11   003252  1084  1090  1094#
CONT2    001606   743   747#
CONT21   003564  1156  1160#
CONT22   003710  1183  1186#
CONT4    001770   797   801#
CONT8    002614   986#  995
CRB2     001032   617#  984   990   1225  1232  1239  1248  1394
CRLF     011544   664   671   1577  1650  1761  1762  1763  1764  1778  1779  1780  1781  1792
                 1793  1794  1795  1814  1815  1816  1817  1827  1828  1829  1830  1847  1848
                 1849  1850  1861  1862  1863  1896  1897  1898  1899  1992  2111  2194  2203#
                 2265
C.CONT   011340  2148  2152#
C.WAIT   011304  2143# 2144  2164
DATENC   006440  1394* 1406  1523  1639#
DATMK    004276   719  1299# 1598
DATST    004362  1289  1310#
DATST1   004442  1306  1309  1324# 1599
DATST2   004452  1323  1326#
DATST3   004462  1329#
DAT1     006434  1386* 1400  1514  1637# 1969* 1979  1996
DAT2     006436  1398* 1403  1517  1638# 1978* 1981  1999
DBRCK8   002604   966   984#
DCNT1    004676  1355  1362#
DDISP =  177570   619   627#  2403
DECCYC   006412   666*  673*  1287* 1312  1628#
DECK     006402  1304* 1308* 1340* 1353* 1500  1624#
DECKCK   006172  1576  1582# 1653  1719  1739
DECOUT   016102  2947  2953#
DECPNT   016170  2940* 2944  2946  2951* 2968#
DECPR    016010  1504  1507  1994  2939#
DEC1     016130  2954  2956  2959#
DEC2     016144  2958  2961#
DEKSIZ   006424  1441  1458  1485  1537  1544  1633# 1722
DELAY    010624   589  2020#
DIGCNT   016164  2939* 2948* 2955  2966#
DIGIT    016162  2942* 2943* 2953  2957* 2960* 2963  2965#
DISPLA   001036   619#  2403* 2411*
DISPRE   000174   583#  2411
DLAY0    010670  2022* 2024* 2028* 2032#
DLAY1    010672  2025* 2026* 2033#
DONE3    001674   763   770#
```

```
DONE7   002410   919   927   930#
DSWR  = 177570   618   626#  2402
D.1     011436  2168  2174#
D.2     011446  2170  2172   2177#
END     011004  2057  2068#
ENDCK   004240  1272  1274   1281   1286#
END24   004220  1264  1278#  1279
ERCM11  007142   591  1747#
ERFLG   001060   632#  1326*  1495   1497*  1944*  1987   1989*
ERRVEC= 000004   625#  2400   2401*  2412*
ERR6    002306   877   897#
ERSET   005314  1381  1450#
ER1     005352  1458#
FADJ    005200  1419  1420#  1489   1549
FAIL    005400  1401  1404   1407   1466#
FCNT    005504  1480  1485#
FILIO   012445  2326* 2330*  2340   2380#
FLAG    006410  1311* 1314*  1333   1346   1587*  1627#
FPRINT  005536  1475  1495#
FTEST   005460  1479# 1482
GTSWR   011702   665   672   1578   1651   2239#
HLT   = 104000   550#  704    710    716    729    744    750    760    768    772    796    800    803
                 806   809    812    816    831    839    843    849    853    857    861    882    890
                 895   899    901    916    928    932    937    942    947    955    969    974    982
                 988   992   1020   1026   1028   1050   1054   1058   1061   1083   1089   1109   1132
                1157  1185   1200   1207   1214   1221   1228   1235   1243   1251   1263   1273   1277
                1392  1454   1533   1543   1557   1619   1621   1662   1672   1680   1689   1701   1707
                1710  1713   1717   1724   1734   1768   1771   1799   1802   1805   1834   1837   1840
                1879  1885   1958   1967   1973   2045
HSR   - 177570   548#
INIT    010674   780   822    866    909    960   1005   1036   1068   1099   1117   1142   1165   1193
                1256  1362   1754   1787   1822   1856   2038#
INTAG   001050   624#  2266
INTFLG  001012   605#  641*
INTVC   001014   606#  640
ITCNT   011462  1915* 1919*  2171   2173*  2177*  2181#
ITMAX   011460   637* 1753*  1916*  2070*  2171   2180#
KBCSR   001016   607#  2217
KBUF    001020   609#  2219
KCRB1   001030   616#  639
KCRS    001026   615#  638
K10     012000  2252  2257#
K1      012022  2260  2262#
K14     012026  2265#
K15     012050  2228  2230   2234   2236   2267   2269#
K16     012052  2258  2270#
K17     012112  2277  2281#
K18     012124  2272  2274   2284#
K19     011732  2245# 2256
K20     011772  2255# 2286
K7      011736  2247# 2248   2283
K9      011754  2251#
LACNT - 006074  1559# 1560*  1562*  1564*  1566*
LASTCD  006140  1572#
LASTCK  006006  1393  1457   1484   1535   1539   1544#  1620   1622
LASTWT  006034  1550#
```

```
LF      012212          2297#   2392
LOGIC   010774          2064#
LOOP11  003170          1075#   1093
LOOP3   001646           759     762#    765
LOOP4   001716           783#    785     790
LOOP4B  001734           789#    793
LOOP5   002046           825#    834     840
LOOP6   002204           869#    873
LOOP7   002336           912#    913     923
LOOP8   002522           963#    981
L.EOMK  011542          2187*   2189    2200#
L.INC   011500          2188#   2195
L.TOUT  011502          2189#   2199
MKND40  015546          1307    2856#
MNEW    012173          2243    2294#
MODE0   012446          2327*   2331*   2336    2339*   2350*   2381#
MRKCD   015310          1301    1303    2777#
MRKEND  016006          1302    2936#
MSG1    012632          1772    1808    1841    1889    2420#
MSG13   013252          1498    2428#
MSG14   013340          1353    2429#
MSG15   013351          1340    2430#
MSG17   013362          2081    2431#
MSG18   013472          2079    2432#
MSG19   013512          1990    2433#
MSG2    012725          1759    1776    1790    1812    1825    1845    1894    2421#
MSG20   013555          1304    2434#
MSG21   013566          2435#
MSG22   013576          1316    2436#
MSG23   013634          1308    2437#
MSG24   013013          1774    1810    1843    1892    2423#
MSG25   013645          1755    2438#
MSG26   013737          1857    2439#
MSG27   014015          1859    2440#
MSG3    013000          1757    2422#
MSG30   014050          1887    2441#
MSG4    013027          2424#
MSG5    013062          1788    2425#
MSG6    013133          1806    2426#
MSG7    013177          1823    2427#
MSWR    012164          2239    2292#
NOHD    005560          1496    1500#
NOP     000240           549#
NOTCD   006336          1530    1613#
NOTCD1  006374          1618    1621#
NOTCOL  005716          1384    1528#
NUMCRD= 005762          1538#   1555
NXCRD   006302          1370    1444    1462    1491    1601#   1726    1870
OFFSET  007014          1378    1548    1722#
OFFS1   007040          1723    1728#
OFFS2   007114          1737    1740#
OFF6    002274           879     886     893#
PIRQ    001062           633#
PRINT   011122           574    2104#
PRIOR   011246           653*    654*   1038*   1039*   1040*   1042*   1043*   1044*   1071*   1072*   1073*   1075*   1076*
                        1077*   1101*   1102*   1103*   1119*   1120*   1121*   1126*   1127*   1128*   1144*   1145*   1146*
```

```
                    1148* 1149* 1167* 1168* 1169* 1171* 1172* 1173* 1179* 1180* 1366* 1367* 1368*
                    1389* 1390* 1391* 1451* 1452* 1453* 1466* 1467* 1468* 1540* 1541* 1542* 1550*
                    1551* 1552* 1614* 1615* 1616* 1673* 1674* 1675* 1683* 1684* 1695* 1696* 1697*
                    1740* 1741* 1742* 2130#
PROC     001056      630#  698   739   996  1029
PROCT    011250     1512  1515  1518  1521  1524  1997  2000  2003  2006  2114  2119  2132#
PSSET    001370      682   684   685#
PSSET1   004674     1357  1359  1361#
PTOFF    006442     1399* 1402* 1405*  1509  1640#
QUES     012206     2284  2296#
RESETB   007440     1806#
RESTRT   001264      668#  1293  1586
REST8    002642      989   993   996#
REST9    002760     1021  1023  1027  1029#
RETRNX   010220     1912* 1913* 1918  1920  1921#
RETURN   011464      687* 1749* 1904* 1917*  2176  2178* 2182#
RSETC    007624     1841#
RSETD    010026     1887#
RTT    = 000006      552#   647
RT1      012560     2401  2408#
RT2      012566     2407  2408  2410#
RT3      012602     2405  2412#
RT4      012630     2415  2417#
SAVPC    011242     2108* 2113  2128#
SAVPSR   011244     2109* 2118  2129#
SAVR2    011234     2112* 2120  2125#
SAVR3    011236     2126# 2132* 2149
SAVR4    011240     2127# 2133* 2150
SCONT1   005040     1388  1394#
SCOPE  = 104400      551#   688   721   752   774   819   863   903   958  1001  1034  1066  1097
                    1116  1140  1163  1190  1253  1286  1752  1786  1821  1855  1901
SCOPEC   011376      576  2166#
SETUP    001064      637#   663  1747  1909  1937  2020
SPACE    011070     1502  1505  1508  1513  1516  1519  1522  1995  1998  2001  2004  2091#  2095
SPACEX   011120     2094* 2096* 2098#
SR       006432      657   676   683   717  1288  1305  1329  1342  1358  1410  1412  1420  1422
                    1473  1476  1534  1574  1583  1590  1596  1636#  1646  1648  1728  1736  1912
                    1940  1985  2007  2022  2105  2121  2167  2169  2227  2261* 2402* 2404  2410*
                    2416*
SRVC     004746     1365  1376#
SRVC1    006664     1682  1691#
SRVC2    006736     1693  1703#
SRVC2A   006744     1702  1705#
STACK    001000      586   588   590   593   596   603#  1292  1585
SWR      001034      618#
SWRCK    012520      652  2400#
SWREG    000176      584#  2227  2241  2410
SWTHR  = 004436     1322# 1325* 1553
TABPT    006444     1336*  339* 1349* 1352* 1434* 1435  1437* 1440  1641#
TAGA     005222     1421  1425# 1428
TAGB     005230     1418  1427#
TAGC     005232     1424  1428#
TAGD     005234     1423  1434#
TAGE     005266     1436  1440#
TAGF     005306     1442  1444#
TAGZ     005272     1426  1441#
```

TCSR	001022	611#	2053	2058	2061	2068	2091	2115	2143	2186*	2196	2203	2206	2209
		2961												
TDBR	001024	613#	2055*	2060*	2093*	2117*	2145*	2198*	2205*	2208*	2211*	2963*		
TEND	006416	1302*	1307*	1332*	1345*	1414	1435	1630#						
TEST	001372	667	669	687#										
TESTA	007160	1749	1752#	1904	1905									
TESTB	007340	1786#												
TESTC	007524	1821#												
TESTD	007700	1855#												
TESTG	010112	1901#												
TESTX	010134	594	1909#											
TEST1	001400	688#	2182											
TEST1A	001402	687	689#											
TEST10	002772	1030	1034#											
TEST11	003130	1066#												
TEST12	003262	1097#												
TEST2	001514	711	718	721#										
TEST20	003350	1116#												
TEST21	003470	1140#												
TEST22	003574	1163#												
TEST23	003722	1190#												
TEST24	004126	1201	1208	1215	1222	1229	1236	1244	1250	1253#				
TEST3	001622	745	752#											
TEST4	001704	761	767	769	771	774#								
TEST5	002034	819#												
TEST6	002170	832	846	863#										
TEST7	002322	889	892	894	896	900	903#							
TEST8	002506	917	929	933	943	948	952	958#						
TEST9	002654	970	975	983	997	1001#								
TIM24	004212	1266	1275#											
TINT10	003070	1037	1052#											
TINT11	003230	1070	1085#											
TINT12	003332	1100	1109#											
TINT20	003444	1118	1132#											
TKB	001020	610#	2231	2249										
TKS	001016	608#	2229	2247	2268*									
TNINT	003556	1143	1157#											
TOTCRD	010620	1942*	1949*	2002	2015#									
TOTERR	010616	1943*	1984*	2005	2014#									
TOUT	011466	1317	1499	1501	1756	1758	1760	1773	1775	1777	1789	1791	1807	1809
		1811	1813	1824	1826	1842	1844	1846	1858	1860	1888	1890	1893	1895
		1991	2080	2082	2186#	2238	2240	2244	2254	2285	2363			
TPB	001024	614#	2387*											
TPS	001022	612#	2385											
TRET	001144	643	649#											
TRFLG	001054	629#	642*	681	1291*	1356	1582*							
TRTRAP	001052	571	628#	647*	649*									
TSTART	006414	1301*	1331*	1344*	1416	1425	1437	1438	1629#					
TST1B	001442	699	701#											
TST1C	001500	715	717#											
TST2A	001574	740	742#											
TTSTAL	011612	1765	1782	1796	1818	1831	1851	1900	2083	2216#	2218			
TTYN	012136	2287#												
TYPEC	012450	2270	2385#	2386										
TYPEX	012516	2391	2393	2396#										
TYPOC	012240	2242	2330#											

```
TYPON   012254          2329    2332#
TYPOS   012214          2325#
TYPT1   016032          2942#   2952
TYPT2   016040          2943#   2945
TYPT3   016072          2949    2951#
T2INT   003656          1166    1177#
T2INTA  003704          1178    1184#
WAIT9   002724          1018#
XLOOP   010210          1917    1919#
ZERO    016166          2941*   2957    2959*   2961*
.     = 016204           568     570#    573#    580#    592#    602#    604#    648     693     695     697     703     709
                         728     732     734     736     738     749     795     799     802     805     807     808     811
                         815     826     830     838     842     848     852     856     860     870     875     881     884
                         898     915     921     925     931     936     939     941     946     950     954     964     968
                         973     979     987     991    1009    1015    1025    1047    1053    1057    1060    1080    1088
                        1107    1108    1125    1131    1137    1153    1176    1196    1203    1210    1217    1224    1231
                        1238    1247    1259    1276    1322    1328    1373    1377    1383    1397    1456    1459    1474
                        1477    1486    1532    1538    1547    1559    1561    1563    1565    1567    1569    1575    1655
                        1661    1690    1699    1706    1709    1712    1716    1732    1767    1770    1798    1801    1804
                        1833    1836    1839    1972    2040    2044    2054    2059    2062    2069    2077    2092    2106
                        2116    2122    2138    2154    2190    2193    2197    2204    2207    2210    2287#   2962    2968

. ABS.  016204     000

 ERRORS DETECTED:  0

 CVCMAA,CVCMAA.LST/CRF-CVCMAA.SRC
 RUN-TIME: 11 24 2 SECONDS
 RUN-TIME RATIO: 211/38-5.4
 CORE USED:  8K  (15 PAGES)
```