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IDENTIFICATION

PRODUCT CODE:	MAINDEC-11-DZCMB-B-D
PRODUCT NAME:	CM11F DIAGNOSTIC TEST WITH THE DOCUMATION OM-200 CARD READER (80 COLUMN)
DATE CREATED:	NOVEMBER 1,1974
MAINTAINER:	DIAGNOSTIC ENGINEERING
AUTHORS:	RICK FADDEN RAYMOND SHOOP

1. ABSTRACT

THIS TEST IS TO BE USED AS A CARD READER DIAGNOSTIC FOR THE
PDP-11 WITH THE CM11F 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

PDP-11 STANDARD COMPUTER
CM-11F CARD CONTROLLER
CM-11FA,FB CARD READER DOCUMATION MODEL OM-200 (80 COLUMN)

2.2 TEST DECKS

MAINDEC-00-DZCMA-A-CA PUNCHED ALPHANUMERIC TEST DECK
MAINDEC-00-DZCMA-A-CB PUNCHED BINARY TEST DECK
MAINDEC-00-DZCMB-A-CO MARKSENSE BINARY TEST DECK
SPARE CARDS FOR THE ERROR FUNCTION TEST

2.3 STORAGE

THE ROUTINE USES MEMORY 0 TO 16000.

3. LOADING PROCEDURE

PROCEDURE FOR NORMAL ABSOLUTE TAPES SHOULD BE FOLLOWED.

4. STARTING PROCEDURE

4.1 CONTROL SWITCH SETTINGS

BASIC SWITCH REGISTER SETTINGS ARE:

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SW15=1 OR UP---HALT ON ERROR
SW14=1 OR UP---SCOPE LOOP
SW13=1 OR UP---INHIBIT PRINT OUT
SW12=1 OR UP---INHIBIT TRACE TRAPPING
SW11=1 OR UP---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 OR UP---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 OR UP---RETURN TO THE BEGINNING OF THE INSTRUCTION TEST
               WHEN CONTINUING FROM ONE DECK TO ANOTHER
SW05=1 OR UP---HALT BETWEEN TEST DECKS
               (SEE 5.2.1 FOR EXPLANATION OF SW5=0)
SW04=1 OR UP---RUN THE PUNCHED BINARY TEST DECK (UNLESS SW03 IS SET)
SW03=1 OR UP---RUN THE MARKSENSE BINARY TEST DECK
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4.2 STARTING ADDRESSES

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200 = INSTRUCTION AND DATA TEST
210 = PICK SUBTEST LOOP
220 = ERROR FUNCTION TEST
240 = SINGLE SUBTEST LOOP
250 = READ SINGLE DATA PATTERN TEST
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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, WAIT FOR RESET LIGHT.
SET SWITCH REGISTER TO STARTING ADDRESS.
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 CM11F)

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, AND IF SW5=1 THE PROGRAM HALTS. 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 A DECK, THE PROGRAM WILL RUN A SET OF TESTS OF OFF-LINE OPERATIONS. 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 CONTINUE WILL RESUME PROGRAM OPERATION AFTER THE HALT. IF ALL OTHER SWITCHES WERE DOWN, FOR EXAMPLE, THE DATA RELIABILITY TEST WOULD THEN BE RUN ON THE NEXT DECK. THE OTHER SWITCHES AFFECT PROGRAM FLOW AS NOTED IN 4.1.

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 DOCUMATION CM-200 CARD READER. CARD READER OFF-LINE, INPUT HOPPER EMPTY, OUTPUT STACKER FULL, FEED ERROR AND MOTION ERROR 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

6.1.1 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, OR MARKSENSE BINARY 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

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.

6.3 ERRORS INVOLVING BIT 8 OF THE CSR

THE CM11 HAS A DELAY WHICH OCCASSIONALLY WILL CAUSE AN ERROR PRINTOUT REFERRING TO BIT 8 TO OCCUR. SOMETIMES ON-LINE TRANSITION WILL SET BEFORE OFF-LINE CLEARS. ALSO, THE OFF-LINE BIT WILL NOT SET IMMEDIATELY WHEN AN ERROR OCCURS WHICH PUTS THE READER OFF-LINE.

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 OFF-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 CM11F'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 CM11 MAY BE TESTED AT ANY ADDRESS ASSIGNED TO IT.

9. PROGRAM DESCRIPTION

THIS SET OF TESTS IS DESIGNED TO CHECK ALL OPERATIONS OF THE CM11
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 DOCUMATION OM-200 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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                        .ABS
                                        .LIST   SEQ,BIN
                                        .NLIST  MD,MC,CND
                                        .TITLE  MD-11-DZCMB-B CM11F DOCUMATION <80 COLUMN> CARD READER
                                ;COPYRIGHT 1973,1974 DIGITAL EQUIPMENT CORP., MAYNARD, MASS. 01754

            177570                      SR=177570
            177776                      PSR=177776
            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      001030                      TRTRAP
000016      000340                      340
            000030                      .=30
000030      011574                      PRINT
000032      000340                      340
000034      012042                      SCOPEC
000036      000340                      340
            000046                      .=46
000046      005650                      LOGICAL

                                ;LOAD STARTING ADDRESS AREA
            000200                      .=200
000200      012706  001000              MOV     #STACK,SP
000204      000167  000740              JMP     BEGIN       ;NORMAL STARTING ADDRESS FOR DOCUMATION OM-200 READER
000210      012706  001000              MOV     #STACK,SP
000214      000167  011054              JMP     DELAY       ;PICK DELAY TEST
000220      012706  001000              MOV     #STACK,SP
000224      000167  007244              JMP     ERCM11      ;STARTING ADDRESS FOR CM11F ERROR FUNCTION TEST
            000240                      .=240
000240      012706  001000              MOV     #STACK,SP
000244      000167  010344              JMP     TESTX       ;STARTING ADDRESS FOR LOOP WHICH CONTINUALLY RUNS
                                                            ;ANY SINGLE SUBTEST
000250      012706  001000              MOV     #STACK,SP
000254      000167  010416              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                      .=.+10              ;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
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001016  177564                  TCSR:   177564                  ;ADDRESS OF TELETYPE STATUS REGISTER
001020  177566                  TDBR:   177566                  ;ADDRESS OF TELETYPE DATA BUFFER
001022  177160                  KCRS:   177160                  ;ADDRESS OF CARD READER STATUS REGISTER
001024  177162                  KCRB1:  177162                  ;ADDRESS OF CARD READER DATA BUFFER
001026  177164                  CRB2:   177164                  ;ADDRESS TO READ ENCODED DATA
001030  000002                  TRTRAP: RTI                     ;RETURN FROM TRACE LOOP (CHANGED TO RTT FOR AN 11/45)
001032  000000                  TRFLG:  0                       ;TOGGLED TO SWITCH BETWEEN TRACE TRAPPING AND NORMAL FLO
001034  000000                  PROC:   0                       ;STORES PROCESSOR STATUS WHEN TRACE TRAP MUST BE CLEARED
                                                                ;IN A SUBTEST
001036  000000                  ERFLG:  0                       ;SET TO ZERO TO OUTPUT DATA ERROR HEADING
001040  177772                  PIRQ:   177772                  ;ADDRESS OF PDP 11/45 PIRQ REGISTER


                                ;INITIALIZE CSR AND DBR POINTERS
001042  012767  000001  011052  SETUP:  MOV     #1,ITMAX        ;SET ITERATION MAXIMUM TO 1 ITERATION
001050  016703  177746          MOV     KCRS,CRS                ;SET UP REGISTER POINTERS
001054  016704  177744          MOV     KCRB1,CRB1
001060  016700  177730          MOV     INTVC,ADINT             ;LOAD ADDRESS OF INTERRUPT VECTOR
001064  005067  177722          CLR     INTFLG                  ;INITIALIZE INTERRUPT FLAG
001070  005067  177736          CLR     TRFLG                   ;INITIALIZE TRACE FLAG
001074  012737  001122  000010  MOV     #TRET,@#10              ;SETUP RESVD INST TRAP RETURN
001102  005037  000012          CLR     @#12
001106  006700                  SXT     R0                      ;SIGN EXTEND INST.
001110  000240                  NOP
001112  012737  000006  001030  MOV     #RTT,@#TRTRAP           ;IF NO TRAP THIS IS AN 11/45 OR 11/40
001120  000404                  BR      .+12
001122  012737  000002  001030  TRET:   MOV     #RTI,@#TRTRAP   ;IF TRAP, NOT AN 11/45 OR 11/40
001130  022626                  CMP     (SP)+,(SP)+             ;RESTORE STACK POINTER
001132  012737  000012  000010  MOV     #12,@#10
001140  012767  000340  176630  MOV     #340,PSR                ;SETUP PROCESSOR STATUS TO LEVEL 7
001146  000207                  RTS     %7                      ;RETURN
001150  004767  177666          BEGIN:  JSR     %7,SETUP        ;INITIALIZE POINTERS AND FLAGS
001154  000417                  BR      TEST                    ;GO TO INSTRUCTION TESTS
001156  012746  000340          RESTRT: MOV     #340,-(SP)      ;PUSH STATUS ON STACK
001162  012746  001214          MOV     #TEST,-(SP)             ;PUSH PC ON STACK
001166  005767  177640          TST     TRFLG                   ;CHECK FLAG
001172  100007                  BPL     PSSET                   ;IF IT IS POSITIVE, CLEAR T BIT
001174  032767  010000  176366  BIT     #10000,SR               ;TRACE TRAPPING INHIBITED?
001202  001003                  BNE     PSSET                   ;BRANCH IF YES
001204  012766  000360  000002  MOV     #360,2(SP)              ;SET T BIT ON STACK
001212  000002                  PSSET:  RTI


                                ;TEST FOR CORRECT INITIALIZATION OF STATUS REGISTER
001214  012767  001224  010704  TEST:   MOV     #TEST1A,RETURN  ;SETUP SCOPE LOOP RETURN ADDRESS
001222  104400                  TEST1:  SCOPE                   ;SO ALL TESTS START WITH SCOPE
001224  004767  010256          TEST1A: JSR     %7,CKBIT8       ;CHECK FOR OFF-LINE SET
001230  004767  010136                  JSR     %7,CLRTR        ;STORE PROCESSOR STATUS AND CLEAR TRACE BIT
001234  005001                  CLR     COUNT                   ;INITIALIZE COUNTER
001236  005201                  INC     COUNT                   ;WAIT TO BE CERTAIN
001240  001376                  BNE     .-2                     ;THAT ALL CARDS ARE
001242  005201                  INC     COUNT                   ;THRU BEFORE ISSUING
001244  001376                  BNE     .-2                     ;INIT
001246  005201                  INC     COUNT
001250  001376                  BNE     .-2
001252  016746  177556          MOV     PROC,-(SP)              ;RESTORE PROCESSOR STATUS
001256  012746  001264          MOV     #TST1B,-(SP)
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                                                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     .+4             ;BRANCH IF OK
                                        HLT                     ;BIT 1 AND/OR BIT 6 DIDN'T CLEAR

                                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
                                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 CARD
                                ;IT SHOULD REMAIN SET UNTIL CARD DONE SETS, WHICH SHOULD CLEAR IT
                                        JSR     %7,CKBIT8       ;CHECK FOR OFF-LINE SET
                                        CLR     @CRS            ;INITIALIZE STATUS REGISTER
                                        INC     @CRS            ;READ A CARD
                                        BIT     #1000,@CRS      ;CHECK BUSY
```

```
689  001446  001002                        BNE     LOOP3           ;BRANCH IF SET
690  001450  104000                        HLT                     ;READING A CARD DIDN'T SET BUSY
691  001452  000417                        BR      TEST4
692  001454  032713  040000      LOOP3:    BIT     #40000,@CRS     ;CHECK CARD DONE
693  001460  001010                        BNE     DONE3           ;BRANCH IF SET
694  001462  032713  001000                BIT     #1000,@CRS      ;CHECK BUSY
695  001466  001372                        BNE     LOOP3           ;BRANCH IF STILL SET
696  001470  032713  040000                BIT     #40000,@CRS     ;CHECK CARD DONE
697  001474  001006                        BNE     TEST4           ;GO TO NEXT TEST IF SET
698  001476  104000                        HLT                     ;BUSY CLEARED BEFORE CARD DONE SET
699  001500  000404                        BR      TEST4
700  001502  032713  001000      DONE3:    BIT     #1000,@CRS      ;CHECK BUSY
701  001506  001401                        BEQ     TEST4           ;GO ON TO NEXT TEST IF CLEAR
702  001510  104000                        HLT                     ;CARD DONE DIDN'T CLEAR BUSY
703
704  001512  104400                TEST4:  SCOPE
705                                ;A TIMING ERROR SHOULD OCCUR IF DATA IS NOT READ AND NEW DATA COMES IN
706                                ;A TIMING ERROR SHOULD SET THE SPECIAL CONDITION BIT WHEN CARD DONE OCCURS
707                                ;COLUMN READY SHOULD BE CLEARED BY THE TIMING ERROR AND PREVENTED FROM RESETTING
708                                ;BITS 11,14, AND 15 SHOULD BE CLEARED BY A DATO TO THE STATUS REGISTER
709
710  001514  004767  007624                JSR     %7,INIT         ;INIT STATUS REGISTER
711  001520  005001                        CLR     COUNT           ;INITIALIZE COUNTER
712  001522  005213                        INC     @CRS            ;INITIATE READ
713  001524  032713  140200      LOOP4:    BIT     #140200, @CRS   ;WAIT FOR SPECIAL CONDITION, CARD DONE,
714                                                                ;OR COLUMN READY
715  001530  001775                        BEQ     LOOP4           ;LOOP IF NONE OCCURRED
716  001532  032713  140000                BIT     #140000, @CRS   ;SPECIAL CONDITION OR CARD DONE?
717  001536  001007                        BNE     CK4             ;YES, BRANCH
718  001540  005201                        INC     COUNT           ;NO, COUNT COLUMN READYS
719  001542  105713      LOOP4B:   TSTB    @CRS            ;WAIT FOR COLUMN READY TO CLEAR
720  001544  100367                        BPL     LOOP4           ;IF CLEAR, RETURN TO LOOP4
721  001546  032713  140000                BIT     #140000, @CRS   ;CHECK FOR SPECIAL CONDITION OR CARD DONE
722  001552  001001                        BNE     CK4             ;BRANCH IF EITHER SET
723  001554  000772                        BR      LOOP4B          ;OTHERWISE, CHECK AGAIN
724  001556  032713  040000      CK4:      BIT     #40000, @CRS    ;CHECK CARD DONE
725  001562  001002                        BNE     .+6             ;BRANCH IF SET
726  001564  104000                        HLT                     ;SPECIAL CONDITION SET BEFORE CARD DONE
727  001566  000403                        BR      CONT4
728  001570  005713                        TST     @CRS            ;CHECK SPECIAL CONDITION
729  001572  100401                        BMI     .+4             ;BRANCH IF SET
730  001574  104000                        HLT                     ;SPECIAL CONDITION WASN'T SET
731  001576  032713  004000      CONT4:    BIT     #4000,  @CRS    ;CHECK TIMING ERROR
732  001602  001001                        BNE     .+4             ;BRANCH IF SET
733  001604  104000                        HLT                     ;TIMING ERROR WASN'T SET
734  001606  005301                        DEC     COUNT           ;CHECK NUMBER OF COLUMN READYS
735  001610  100002                        BPL     .+6             ;BRANCH IF ANY OCCURRED
736  001612  104000                        HLT                     ;COLUMN READY NEVER OCCURRED
737  001614  000402                        BR      .+6
738  001616  001401                        BEQ     .+4             ;BRANCH IF ONLY ONE OCCURRED
739  001620  104000                        HLT                     ;COLUMN READY OCCURRED MORE THAN ONCE
740  001622  105713                        TSTB    @CRS            ;CHECK COLUMN READY
741  001624  100001                        BPL     .+4             ;BRANCH IF NOT SET
742  001626  104000                        HLT                     ;COLUMN READY WASN'T CLEARED
743  001630  005013                        CLR     @CRS            ;CLEAR BITS 11,14, AND 15 VIA DATO
744  001632  032713  144000                BIT     #144000, @CRS   ;CHECK
```

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745  001636  001401                        BEQ     .+4
746  001640  104000                        HLT                     ;BITS 11,14, AND 15 WEREN'T ALL CLEARED
747
748
749  001642  104400              TEST5:    SCOPE
750                              ;SETTING READ SHOULD CAUSE COLUMN READY TO SET 80 TIMES BEFORE CARD DONE SETS
751                              ;READING THE DATA BUFFER SHOULD CLEAR COLUMN READY AND PREVENT A TIMING ERROR
752  001644  004767  007174              JSR     %7,INIT         ;INITIALIZE STATUS REGISTER
753  001650  005001                       CLR     COUNT           ;INITIALIZE COUNTER
754  001652  005213                       INC     @CRS            ;INITIATE READ
755  001654  032713  140200      LOOP5:   BIT     #140200,@CRS    ;WAIT FOR COLUMN READY, CARD DONE
756  001660  001775                       BEQ     .-4             ;OR SPECIAL CONDITION
757  001662  032713  040000              BIT     #40000, @CRS    ;CARD DONE?
758  001666  001015                       BNE     CK5             ;YES, BRANCH
759  001670  005713                       TST     @CRS            ;CHECK BIT 15
760  001672  100002                       BPL     .+6             ;SKIP ERROR HALT IF NOT SET
761  001674  104000                       HLT                     ;BIT 15 WAS SET
762  001676  000437                       BR      TEST6           ;GO TO NEXT TEST
763  001700  020127  000117              CMP     COUNT,#79.      ;CHECK FOR 80
764  001704  100363                       BPL     LOOP5           ;BRANCH IF 80 OR MORE WITHOUT CLEARING READY
765  001706  005201                       INC     COUNT           ;INCREMENT COUNTER
766  001710  005714                       TST     @CRB1           ;CLEAR READY
767  001712  105713                       TSTB    @CRS            ;MAKE SURE IT CLEARED
768  001714  100001                       BPL     .+4             ;BRANCH IF IT DID
769  001716  104000                       HLT                     ;READING DATA BUFFER DIDN'T CLEAR READY
770  001720  000755                       BR      LOOP5           ;LOOP
771  001722  032713  004000      CK5:     BIT     #4000,  @CRS    ;CHECK TIMING ERROR BIT
772  001726  001401                       BEQ     .+4             ;BRANCH IF NOT SET
773  001730  104000                       HLT                     ;TIMING ERROR WAS SET
774                                      ;NOTE THAT IF COLUMN READY SET MORE THAN 80 TIMES
775                                      ;A TIMING ERROR WILL OCCUR AND THE COUNT WILL BE 79
776  001732  000421                       BR      TEST6           ;BRANCH AFTER ERROR
777  001734  020127  000117              CMP     COUNT,  #79.    ;CHECK COUNT
778  001740  001401                       BEQ     .+4             ;BRANCH IF 80 COLUMN READYS OCCURRED
779  001742  104000                       HLT                     ;COLUMN READY DIDN'T OCCUR 80 TIMES
780                                                              ;BEFORE CARD DONE
781  001744  021327  040200              CMP     @CRS,#40200     ;ONLY CARD DONE AND COLUMN READY SHOULD BE SET
782  001750  001401                       BEQ     .+4
783  001752  104000                       HLT                     ;STATUS REGISTER IN WRONG STATE
784  001754  005013                       CLR     @CRS            ;SHOULD CLEAR DONE BUT NOT READY
785  001756  021327  000200              CMP     @CRS,#200       ;CHECK FOR ONLY READY SET
786  001762  001401                       BEQ     .+4             ;BRANCH IF OK
787  001764  104000                       HLT                     ;STATUS REGISTER IN WRONG STATE
788  001766  005714                       TST     @CRB1           ;READING DATA BUFFER SHOULD CLEAR COLUMN READY
789  001770  005713                       TST     @CRS            ;CHECK STATUS REGISTER
790  001772  001401                       BEQ     .+4             ;BRANCH IF ALL BITS ZERO
791  001774  104000                       HLT                     ;STATUS REGISTER NOT EQUAL TO ZERO
792
793  001776  104400              TEST6:   SCOPE
794                              ;TIMING ERROR SHOULD SET BIT 1' BEFORE CARD DONE OCCURS, EVEN IF IT OCCURS AT COLUMN 80
795                              ;A DATOB TO THE LOW BYTE OF THE CRS SHOULD CLEAR BITS 15,14, AND 11
796  002000  004767  007340              JSR     %7,INIT         ;INITIALIZE
797  002004  012701  000115              MOV     #77.,COUNT      ;SETUP COUNTER
798  002010  005213                       INC     @CRS            ;START READING A CARD
799  002012  105713              LOOP6:   TSTB    @CRS            ;WAIT FOR COLUMN READY
800  002014  100376                       BPL     .-2
```

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                                                TST     @CRB1           ;CLEAR COLUMN READY
                                                DEC     COUNT           ;GO THRU LOOP FOR 1ST 78 COLUMN READY'S
                                                BPL     LOOP6
002024 032713 144000                            BIT     #144000,@CRS    ;WAIT FOR CARD DONE OR TIMING ERROR
002030 001775                                   BEQ     .-4             ;OR SPECIAL CONDITION
002032 032713 040000                            BIT     #40000,@CRS     ;CARD DONE SET?
002036 001026                                   BNE     ERR6            ;YES, 2 POSSIBLE TEST FAILURES
002040 032713 004000                            BIT     #4000,@CRS      ;CHECK TIMING ERROR
002044 001416                                   BEQ     OFF6            ;IF NOT SET, READER IS PROBABLY OFF-LINE
002046 105713                                   TSTB    @CRS            ;CHECK COLUMN READY
002050 100001                                   BPL     .+4             ;BRANCH IF CLEAR
002052 104000                                   HLT                     ;TIMING ERROR DIDN'T CLEAR READY
002054 005713                                   TST     @CRS            ;WAIT FOR SPECIAL CONDITION
002056 100376                                   BPL     .-2
002060 032713 040000                            BIT     #40000,@CRS     ;CHECK CARD DONE
002064 001406                                   BEQ     OFF6            ;IF NOT SET, READER IS PROBABLY OFF-LINE
002066 105013                                   CLRB    @CRS            ;DATOB TO LOW BYTE OF CRS
002070 032713 144000                            BIT     #144000,@CRS    ;CHECK BITS 15,14,11
002074 001415                                   BEQ     TEST7           ;BRANCH IF CLEAR TO NEXT TEST
002076 104000                                   HLT                     ;DATOB TO LOW BYTE OF CRS DIDN'T CLEAR
                                                                        ;BITS 15,14 AND/OR 11
002100 000413                                   BR      TEST7           ;GO TO NEXT TEST
002102 032713 000400            OFF6:           BIT     #400,@CRS       ;CHECK BIT 8
002106 001010                                   BNE     TEST7           ;BRANCH IF SET
002110 104000                                   HLT                     ;BIT 15 WAS SET, 8 WASN'T
002112 000406                                   BR      TEST7           ;GO TO NEXT TEST
002114 032713 004000            ERR6:           BIT     #4000,@CRS      ;TIMING ERROR SET?
002120 001402                                   BEQ     .+6             ;NO, BRANCH
002122 104000                                   HLT                     ;TIMING ERROR DIDN'T SET BEFORE CARD DONE
002124 000401                                   BR      TEST7           ;GO TO NEXT TEST AFTER ERROR
002126 104000                                   HLT                     ;TIMING ERROR WASN'T SET

002130 104400                   TEST7:  SCOPE
                                ;NOT READING THE BOTH 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

002132 004767 007206                            JSR     %7,INIT         ;INITIALIZE
002136 105213                                   INCB    @CRS            ;START READ
002140 012701 000120                            MOV     #80.,COUNT      ;INITIALIZE COUNTER
002144 032713 140200            LOOP7:          BIT     #140200,@CRS    ;TEST FOR ERROR, DONE OR READY
002150 001775                                   BEQ     LOOP7           ;LOOP IF NONE SET
002152 005713                                   TST     @CRS            ;CHECK ERROR
002154 100002                                   BPL     .+6             ;BRANCH IF NOT SET
002156 104000                                   HLT                     ;BIT 15 WAS SET
002160 000455                                   BR      TEST8           ;GO TO NEXT TEST AFTER ERROR
002162 032713 040000                            BIT     #40000,@CRS     ;CHECK FOR CARD DONE
002166 001013                                   BNE     DONE7           ;BRANCH IF SET
002170 005301                                   DEC     COUNT           ;COUNT
002172 001402                                   BEQ     .+6             ;IF BOTH COLUMN READY, BRANCH
002174 005714                                   TST     @CRB1           ;CLEAR DONE
002176 000762                                   BR      LOOP7           ;LOOP
002200 032713 140000                            BIT     #140000,@CRS    ;WAIT FOR DONE OR SPECIAL CONDITION
002204 001775                                   BEQ     .-4
002206 005713                                   TST     @CRS            ;CHECK SPECIAL CONDITION
```

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  857  002210  100002                        BPL     DONE7           ;BRANCH IF NOT SET
  858  002212  104000                        HLT                     ;SPECIAL CONDITION WAS SET
  859  002214  000437                        BR      TEST8           ;GO TO NEXT TEST AFTER ERROR
  860  002216  005701                DONE7:  TST     COUNT           ;TEST FOR 80 COLUMN READY'S
  861  002220  001402                        BEQ     .+6             ;BRANCH IF OK
  862  002222  104000                        HLT                     ;COLUMN READY DID NOT OCCUR 80 TIMES
  863  002224  000423                        BR      TEST8           ;GO TO NEXT TEST AFTER ERROR
  864  002226  105213                        INCB    @CRS            ;START READ
  865  002230  105713                        TSTB    @CRS            ;CHECK COLUMN READY
  866  002232  100401                        BMI     .+4             ;BRANCH IF STILL SET
  867  002234  104000                        HLT                     ;READY DID NOT REMAIN SET
  868  002236  032713  004000                BIT     #4000,@CRS      ;TEST FOR TIMING ERROR
  869  002242  001775                        BEQ     .-4             ;LOOP IF NOT SET
  870  002244  105713                        TSTB    @CRS            ;CHECK COLUMN READY
  871  002246  100L                          BPL     .+6             ;BRANCH IF NOT SET
  872  002250  104UL                         HLT                     ;TIMING ERROR DIDN'T CLEAR READY
  873  002252  000420                        BR      TEST8
  874  002254  112713  000002                MOVB    #2,@CRS         ;SET EJECT
  875  002260  032713  004000                BIT     #4000,@CRS      ;CHECK TIMING ERROR
  876  002264  001402                        BEQ     .+6             ;BRANCH IF CLEARED
  877  002266  104000                        HLT                     ;TIMING ERROR NOT CLEARED BY DATOB
  878  002270  000411                        BR      TEST8           ;GO TO NEXT TEST AFTER ERROR
  879  002272  032713  140000                BIT     #140000,@CRS    ;WAIT FOR DONE OR SPECIAL CONDITION
  880  002276  001775                        BEQ     .-4
  881  002300  032713  000400                BIT     #400,@CRS       ;CHECK BIT 8
  882  002304  001003                        BNE     TEST8           ;BRANCH IF READER OFF-LINE
  883  002306  005713                        TST     @CRS            ;SPECIAL CONDITION SHOULDN'T SET
  884  002310  100001                        BPL     .+4             ;SINCE DATOB CLEARED TIMING ERROR
  885  002312  104000                        HLT                     ;BIT 15 WAS SET, 8 WASN'T
  886
  887
  888  002314  104400                TEST8:  SCOPE
  889                                ;DATA SHOULD BE AVAILABLE IN THE DATA BUFFER FOR AT LEAST 1.0 MILLISECOND
  890  002316  004767  007022                JSR     %7,INIT         ;INITIALIZE STATUS REGISTER
  891  002322  004767  007044                JSR     %7,CLRTR        ;STORE CURRENT PROCESSOR STATUS AND CLEAR TRACE BIT
  892  002326  005213                        INC     @CRS            ;START READ
  893  002330  032713  140200        LOOP8:  BIT     #140200,@CRS    ;WAIT FOR COLUMN READY OR CARD DONE
  894  002334  001775                        BEQ     .-4             ;OR SPECIAL CONDITION
  895  002336  032713  040000                BIT     #40000,@CRS     ;CARD DONE?
  896  002342  001023                        BNE     DBRCK8          ;YES, GO TO CHECK STROBING OF DBR
  897  002344  005713                        TST     @CRS            ;NO, CHECK BIT 15
  898  002346  100002                        BPL     .+6             ;BRANCH IF NOT SET
  899  002350  104000                        HLT                     ;BIT 15 WAS SET
  900  002352  000443                        BR      TEST9           ;GO TO NEXT TEST AFTER ERROR
  901  002354  005013                        CLR     @CRS            ;DATO TO CRS - SHOULDN'T CLEAR BUSY OR READY
  902  002356  022713  001200                CMP     #1200,@CRS      ;CHECK FOR BUSY AND READY
  903  002362  001402                        BEQ     .+6             ;BRANCH IF STILL SET
  904  002364  104000                        HLT                     ;CRS IN WRONG STATE
  905  002366  000435                        BR      TEST9           ;GO TO NEXT TEST AFTER ERROR
  906  002370  011405                        MOV     @CRB1,R5        ;STORE DATA
  907  002372  012701  000300                MOV     #300,COUNT      ;INITIALIZE COUNTER
  908  002376  005301                        DEC     COUNT           ;WAIT FOR 1 MILLISECOND OR LESS
  909  002400  001376                        BNE     .-2
  910  002402  021405                        CMP     @CRB1,R5        ;DATA UNCHANGED?
  911  002404  001751                        BEQ     LOOP8           ;OK, CONTINUE
  912  002406  104000                        HLT                     ;DATA NOT AVAILABLE FOR 1 MILLISECOND
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                                                BR      TEST9           ;GO TO NEXT TEST AFTER FAILURE
002410  000424
002412  017702  176410          DBRCK8: MOV     @CRB2,R2        ;STORE ENCODED DATA IN REGISTER 2
002416  012701  000100                  MOV     #100,COUNT      ;SET UP COUNTER
002422  021405                  CONT8:  CMP     @CRB1,R5        ;READ CARD-IMAGE DATA BUFFER
002424  001402                          BEQ     .+6             ;BRANCH IF UNCHANGED
002426  104000                          HLT                     ;CRB1 READ INCORRECTLY
002430  000407                          BR      REST8           ;BRANCH TO RESTORE PROCESSOR STATUS AND EXIT
002432  027702  176370                  CMP     @CRB2,R2        ;READ ENCODED DATA BUFFER
002436  001402                          BEQ     .+6             ;BRANCH IF UNCHANGED
002440  104000                          HLT                     ;CRB2 READ INCORRECTLY
002442  000402                          BR      REST8           ;BRANCH AFTER FAILURE
002444  005301                          DEC     COUNT           ;COUNT DOWN
002446  001365                          BNE     CONT8           ;LOOP IF NOT DONE
002450  016746  176360          REST8:  MOV     PROC,-(SP)      ;RESTORE PROCESSOR STATUS
002454  012746  002462                  MOV     #TEST9,-(SP)
002460  000002                          RTI


002462  104400                  TEST9:  SCOPE
                                ;EJECT SHOULD PREVENT FURTHER COLUMN READY'S
                                ;CARD DONE SHOULD STILL OCCUR, AND TIMING ERRORS SHOULD BE
                                ;PREVENTED IF THE CURRENT COLUMN READY IS CLEARED
002464  004767  006654                  JSR     %7,INIT         ;INITIALIZE STATUS REGISTER
002470  004767  006676                  JSR     %7,CLRTR        ;SAVE PROCESSOR STATUS AND CLEAR 7 BIT
002474  005213                          INC     @CRS            ;START READ
002476  105713                          TSTB    @CRS            ;WAIT FOR COLUMN READY
002500  001776                          BEQ     .-2
002502  052713  000002                  BIS     #2,@CRS         ;SET EJECT
002506  005714                          TST     @CRB1           ;CLEAR COLUMN READY
002510  005001                          CLR     COUNT
002512  005201                          INC     COUNT           ;WAIT
002514  001376                          BNE     .-2
002516  005201                          INC     COUNT
002520  001376                          BNE     .-2
002522  032713  044200          WAIT9:  BIT     #44200,@CRS     ;CARD DONE, TIMING ERROR, OR
002526  001002                          BNE     CK9             ;COLUMN READY SET?- BRANCH IF YES
002530  104000                          HLT                     ;NO CARD DONE OCCURRED
002532  000411                          BR      REST9           ;CONTINUE AFTER FAILURE
002534  032713  040000          CK9:    BIT     #40000,@CRS     ;CHECK FOR CARD DONE
002540  001006                          BNE     REST9
002542  032713  000200                  BIT     #200,@CRS       ;CHECK COLUMN READY
002546  001402                          BEQ     .+6             ;BRANCH IF NOT SET
002550  104000                          HLT                     ;COLUMN READY WAS SET
002552  000401                          BR      REST9
002554  104000                          HLT                     ;EJECT DID NOT PREVENT A TIMING ERROR
002556  016746  176252          REST9:  MOV     PROC,-(SP)      ;RESTORE PROCESSOR STATUS
002562  012746  002570                  MOV     #TEST10,-(SP)
002566  000002                          RTI


002570  104400                  TEST10: SCOPE
                                ;CARD DONE SHOULD CAUSE AN INTERRUPT
002572  004767  006546                  JSR     %7,INIT         ;INITIALIZE
002576  012710  002652                  MOV     #TINT10,@ADINT  ;LOAD RETURN POINTER
002602  052767  000340  175166          BIS     #340,PSR        ;SET PROCESSOR TO LEVEL 7
002610  016760  175162  000002          MOV     PSR,2(ADINT)    ;LOAD RETURN PROCESSOR STATUS
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  969  002616  042767  000340  175152          BIC     #340,PSR        ;SET PROCESSOR PRIORITY TO 0
  970  002624  012713  000103                  MOV     #103,@CRS       ;SET EJECT, INTERRUPT ENABLE, AND READ
  971  002630  032713  040000                  BIT     #40000,@CRS     ;WAIT FOR CARD DONE
  972  002634  001775                          BEQ     .-4
  973  002636  016067  000002  175132          MOV     2(ADINT),PSR    ;RESTORE PROCESSOR TO HIGHEST PRIORITY
  974  002644  105013                          CLRB    @CRS            ;CLEAR INTERRUPT ENABLE
  975  002646  104000                          HLT                     ;NO INTERRUPT OCCURRED
  976  002650  000414                          BR      CONT10
  977  002652  032713  040000          TINT10: BIT     #40000,@CRS     ;CHECK CARD DONE
  978  002656  001001                          BNE     .+4             ;BRANCH IF SET
  979  002660  104000                          HLT                     ;CARD DONE NOT SET
  980  002662  022626                          CMP     (SP)+,(SP)+     ;RESTORE STACK POINTER
  981  002664  005713                          TST     @CRS            ;MAKE SURE NO ERROR OCCURRED
  982  002666  100001                          BPL     .+4
  983  002670  104000                          HLT                     ;BIT 15 WAS SET
  984  002672  105713                          TSTB    @CRS            ;CHECK COLUMN READY
  985  002674  100001                          BPL     .+4             ;BRANCH IF NOT SET
  986  002676  104000                          HLT                     ;COLUMN READY WAS SET
  987  002700  005013                          CLR     @CRS            ;DISABLE INTERRUPTS
  988  002702  012710  000232          CONT10: MOV     #232,@ADINT     ;CHANGE INTERRUPT RETURN ADDRESS
  989  002706  005037  000232                  CLR     @#232           ;TO CAUSE A HALT IF AN INTERRUPT OCCURS
  990
  991  002712  104400                  TEST11: SCOPE
  992                                  ;EVERY COLUMN READY SHOULD CAUSE AN INTERRUPT
  993  002714  004767  006424                  JSR     %7,INIT         ;INITIALIZE
  994  002720  012701  000120                  MOV     #80.,COUNT      ;CHECK EACH COLUMN
  995  002724  012710  002776                  MOV     #TINT11,@ADINT  ;LOAD RETURN POINTER
  996  002730  052767  000340  175040          BIS     #340,PSR        ;SET PROCESSOR STATUS TO LEVEL 7
  997  002736  016760  175034  000002          MOV     PSR,2(ADINT)    ;LOAD RETURN PROCESSOR STATUS
  998  002744  042767  000340  175024  LOOP11: BIC     #340,PSR        ;SET PROCESSOR PRIORITY TO 0
  999  002752  012713  000101                  MOV     #101,@CRS       ;SET READ AND INTERRUPT ENABLE
 1000  002756  105713                          TSTB    @CRS            ;WAIT FOR COLUMN READY
 1001  002760  100376                          BPL     .-2
 1002  002762  016067  000002  175006          MOV     2(ADINT),PSR    ;RESTORE PROCESSOR TO HIGHEST PRIORITY
 1003  002770  005013                          CLR     @CRS            ;CLEAR INTERRUPT ENABLE
 1004  002772  104000                          HLT                     ;COLUMN READY DID NOT INTERRUPT
 1005  002774  000411                          BR      CONT11
 1006  002776  005013                  TINT11: CLR     @CRS            ;CLEAR INTERRUPT ENABLE
 1007  003000  022626                          CMP     (SP)+,(SP)+     ;RESTORE STACK POINTER
 1008  003002  105713                          TSTB    @CRS            ;MAKE SURE COLUMN READY IS SET
 1009  003004  100402                          BMI     .+6             ;BRANCH IF SET
 1010  003006  104000                          HLT                     ;COLUMN READY WASN'T SET
 1011  003010  000403                          BR      CONT11
 1012  003012  005714                          TST     @CRB1           ;CLEAR READY FLAG
 1013  003014  005301                          DEC     COUNT           ;ALL 40 DONE?
 1014  003016  001352                          BNE     LOOP11          ;NO
 1015  003020  012710  000232          CONT11: MOV     #232,@ADINT     ;YES-CHANGE INTERRUPT RETURN ADDRESS
 1016  003024  005037  000232                  CLR     @#232           ;TO CAUSE A HALT IF ANOTHER INTERRUPT OCCURS
 1017
 1018  003030  104400                  TEST12: SCOPE
 1019                                  ;CARD DONE SHOULDN'T CAUSE AN INTERRUPT IF THE PROCESSOR IS AT LEVEL 7 PRIORITY
 1020  003032  004767  006306                  JSR     %7,INIT         ;INITIALIZE
 1021  003036  012710  003072                  MOV     #TINT12,@ADINT  ;SETUP RETURN
 1022  003042  052767  000340  174726          BIS     #340,PSR        ;SET PROCESSOR TO LEVEL 7 PRIORITY
 1023  003050  016760  174722  000002          MOV     PSR,2(ADINT)    ;LOAD RETURN PROCESSOR STATUS
 1024  003056  012713  000103                  MOV     #103,@CRS       ;SET EJECT, INTERRUPT ENABLE, AND READ
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1025  003062  032713  040000            BIT     #40000,@CRS     ;WAIT FOR CARD DONE
1026  003066  001775                    BEQ     .-4
1027  003070  000402                    BR      .+6             ;CONTINUE IF NO INTERRUPT OCCURRED
1028  003072  104000            TINT12: HLT                     ;AN INTERRUPT OCCURRED
1029  003074  022626                    CMP     (SP)+,(SP)+     ;RESTORE STACK POINTER
1030  003076  005013                    CLR     @CRS            ;CLEAR INTERRUPT ENABLE AND EJECT
1031  003100  012710  000232            MOV     #232,@ADINT     ;CHANGE INTERRUPT RETURN ADDRESS
1032  003104  005037  000232            CLR     @#232           ;TO CAUSE A HALT IF AN INTERRUPT OCCURS
1033
1034                                    ;FIND THE LEVEL AT WHICH AN INTERRUPT OCCURS
1035                                    ;PRINT OUT A MESSAGE STATING THIS LEVEL IF IT IS OTHER THAN THE STANDARD (LEVEL 6)
1036                                    ;MAKE CERTAIN THAT IT ALWAYS OCCURS AT THIS LEVEL
1037                                    ;THE MESSAGE STATING THE LEVEL IS PRINTED ONLY ONCE, AND THE PROGRAM MUST
1038                                    ;BE STARTED OVER AT LOCATION 200 FOR IT TO BE PRINTED AGAIN
1039
1040
1041
1042                                    ;TEST FOR AN INTERRUPT ON LEVEL 6
1043                                    ;SINCE THIS IS WHERE THE CARD READER NORMALLY IS, DON'T PRINT OUT A MESSAGE
1044                                    ;IF IT IS FOUND HERE
1045  003322  104400            TEST14: SCOPE
1046  003324  004767  006014            JSR     %7,INIT         ;INITIALIZE
1047  003330  012710  003440            MOV     #TINT14,@ADINT  ;SETUP RETURN ADDRESS
1048  003334  052767  000340  174434    BIS     #340,PSR        ;SET PROCESSOR PRIORITY TO 7
1049  003342  016760  174430  000002    MOV     PSR,2(ADINT)    ;SETUP RETURN PROCESSOR STATUS
1050  003350  042767  000340  174420    BIC     #340,PSR        ;SET PROCESSOR PRIORITY TO 0
1051  003356  052767  000240  174412    BIS     #240,PSR        ;SET PROCESSOR TO LEVEL 5 PRIORITY
1052  003364  012713  000103            MOV     #103,@CRS       ;SET EJECT, INTERRUPT ENABLE, AND READ
1053  003370  032713  040000            BIT     #40000,@CRS     ;WAIT FOR CARD DONE
1054  003374  001775                    BEQ     .-4
1055  003376  016067  000002  174372    MOV     2(ADINT),PSR    ;RESTORE PROCESSOR TO HIGHEST PRIORITY
1056  003404  005013                    CLR     @CRS            ;DISABLE INTERRUPTS
1057  003406  012710  000232            MOV     #232,@ADINT     ;CHANGE INTERRUPT RETURN ADDRESS
1058  003412  005037  000232            CLR     @#232           ;TO CAUSE A HALT IF AN INTERRUPT OCCURS
1059  003416  005767  175370            TST     INTFLG          ;CHECK TO SEE IF LEVEL ALREADY RECORDED
1060  003422  100034                    BPL     TEST15          ;IF NO, GO TO NEXT TEST
1061  003424  026727  175362  100006    CMP     INTFLG,#100006  ;IF SO, CHECK TO SEE THAT THE
1062  003432  100430                    BMI     TEST15          ;INTERRUPT LEVEL RECORDED IS BELOW
1063                                                            ;THE CURRENT LEVEL
1064  003434  104000                    HLT                     ;INTERRUPT DIDN'T OCCUR WITH
1065                                                            ;STATUS AT LEVEL 5
1066                                                            ;BUT PREVIOUSLY OCCURRED AT OR ABOVE
1067                                                            ;THIS LEVEL
1068  003436  000426                    BR      TEST15
1069  003440  032713  040000    TINT14: BIT     #40000,@CRS     ;MAKE SURE CARD DONE IS SET
1070  003444  001001                    BNE     .+4             ;BRANCH IF SET
1071  003446  104000                    HLT                     ;CARD DONE WASN'T SET
1072  003450  005013                    CLR     @CRS            ;DISABLE FURTHER INTERRUPTS
1073  003452  012710  000232            MOV     #232,@ADINT     ;CHANGE INTERRUPT RETURN ADDRESS
1074  003456  005037  000232            CLR     @#232           ;TO CAUSE A HALT IF AN INTERRUPT OCCURS
1075  003462  022626                    CMP     (SP)+,(SP)+     ;RESTORE STACK POINTER
1076  003464  005767  175322            TST     INTFLG          ;CHECK FOR PREVIOUS FLAG
1077  003470  100404                    BMI     SET14           ;BRANCH IF FLAG SET
1078  003472  012767  100006  175312    MOV     #100006,INTFLG  ;SET FLAG AND LEVEL
1079  003500  000405                    BR      TEST15
1080  003502  026727  175304  100006  SET14:  CMP     INTFLG,#100006  ;CHECK PREVIOUS LEVEL
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1081  003510  100001                        BPL     TEST15
1082  003512  104000                        HLT                             ;INTERRUPT PREVIOUSLY OCCURRED ONLY AT A LOWER LEVEL
1083
1084
1085
1086
1087
1088
1089                                ;A TIMING ERROR SHOULDN'T CAUSE AN INTERRUPT
1090  004776  104400                TEST20: SCOPE
1091  005000  004767  004340                JSR     %7,INIT                 ;INITIALIZE
1092  005004  012710  005056                MOV     #TINT20,@ADINT          ;LOAD RETURN POINTER
1093  005010  052767  000340  172760        BIS     #340,PSR                ;SET PROCESSOR TO HIGHEST PRIORITY
1094  005016  016760  172754  000002        MOV     PSR,2(ADINT)            ;LOAD RETURN PROCESSOR STATUS
1095  005024  012713  000101                MOV     #101,@CRS               ;SET INTERRUPT ENABLE AND READ
1096  005030  032713  004000                BIT     #4000,@CRS              ;WAIT FOR TIMING ERROR TO SET
1097  005034  001775                        BEQ     .-4
1098  005036  042767  000340  172732        BIC     #340,PSR                ;MOVE PROCESSOR TO LOWEST PRIORITY
1099  005044  000240                        NOP                             ;CLOCK INTERRUPT IF IT OCCURRED
1100  005046  016067  000002  172722        MOV     2(ADINT),PSR            ;MOVE PROCESSOR BACK TO HIGHEST PRIORITY
1101  005054  000402                        BR      .+6
1102  005056  104000                TINT20: HLT                             ;TIMING ERROR CAUSED AN INTERRUPT
1103  005060  022626                        CMP     (SP)+,(SP)+             ;RESTORE STACK POINTER
1104  005062  012710  000232                MOV     #232,@ADINT             ;CHANGE INTERRUPT ADDRESS TO CAUSE A
1105  005066  005037  000232                CLR     @#232                   ;HALT IF AN INTERRUPT OCCURS
1106  005072  032713  040000                BIT     #40000,@CRS             ;WAIT FOR CARD DONE
1107  005076  001775                        BEQ     .-4
1108  005100  005013                        CLR     @CRS                    ;CLEAR INTERRUPT ENABLE
1109
1110  005102  104400                TEST21: SCOPE
1111                                ;TEST FOR NO INTERRUPT OCCURING WITH INTERRUPT ENABLE SET AND REST CLEARED
1112  005104  004767  004234                JSR     %7,INIT                 ;INITIALIZE CSR TO ZERO
1113  005110  012710  005160                MOV     #TNINT,@ADINT           ;SETUP RETURN ADDRESS
1114  005114  052767  000340  172654        BIS     #340,PSR                ;SET PROCESSOR TO LEVEL 7
1115  005122  016760  172650  000002        MOV     PSR,2(ADINT)            ;STORE PROCESSOR STATUS
1116  005130  005067  172642                CLR     PSR                     ;SET PROCESSOR TO LEVEL 0
1117  005134  012713  000100                MOV     #100,@CRS               ;ENABLE INTERRUPTS
1118  005140  005001                        CLR     COUNT                   ;INITIALIZE COUNTER
1119  005142  005201                        INC     COUNT                   ;WAIT AWHILE
1120  005144  001376                        BNE     .-2
1121  005146  016067  000002  172622        MOV     2(ADINT),PSR            ;RESTORE PROCESSOR TO LEVEL 7
1122  005154  005013                        CLR     @CRS                    ;DISABLE FURTHER INTERRUPTS
1123  005156  000403                        BR      CONT21
1124  005160  104000                TNINT:  HLT                             ;AN INTERRUPT OCCURRED
1125  005162  022626                        CMP     (SP)+,(SP)+             ;RESTORE STACK
1126  005164  005013                        CLR     @CRS                    ;DISABLE FURTHER INTERRUPTS
1127  005166  005037  000232        CONT21: CLR     @#232                   ;CHANGE INTERRUPT RETURN ADDRESS TO
1128  005172  012710  000232                MOV     #232,@ADINT             ;CAUSE A HALT IF AN INTERRUPT OCCURS
1129
1130  005176  104400                TEST22: SCOPE
1131                                ;CHECK FOR SIMULTANEOUS INTERRUPTS ON MORE THAN ONE LEVEL
1132  005200  004767  004140                JSR     %7,INIT                 ;INITIALIZE CSR TO ZERO
1133  005204  012710  005242                MOV     #T2INT,@ADINT           ;SETUP RETURN ADDRESS
1134  005210  052767  000340  172560        BIS     #340,PSR                ;SET PROCESSOR TO LEVEL 7
1135  005216  016760  172554  000002        MOV     PSR,2(ADINT)            ;STORE PROCESSOR STATUS
1136  005224  042767  000340  172544        BIC     #340,PSR                ;SET PROCESSOR TO LEVEL 0
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1137  005232  012713  000103              MOV     #103,@CRS       ;SET INTERRUPT ENABLE AND EJECT A CARD
1138  005236  000001                      WAIT                    ;WAIT FOR INTERRUPT
1139  005240  000776                      BR      .-2             ;SIT IF TRACE BIT IS SET
1140  005242  022626              T2INT:  CMP     (6)+,(6)+       ;RESTORE STACK POINTER
1141  005244  012710  005266              MOV     #T2INTA,@ADINT  ;CHANGE RETRUN ADDRESS
1142  005250  005067  172522              CLR     PSR             ;SET PROCESSOR TO LEVEL 0
1143  005254  000240                      NOP                     ;WAIT
1144  005256  016067  000002  172512      MOV     2(ADINT),PSR    ;RESTORE PROCESSOR TO LEVEL 7
1145  005264  000402                      BR      CONT22
1146  005266  022626              T2INTA: CMP     (6)+,(6)+       ;RESTORE STACK
1147  005270  104000                      HLT                     ;THE INTERRUPT OCCURRED AT 2 LEVELS
1148  005272  005013              CONT22: CLR     @CRS            ;DISABLE INTERRUPTS
1149  005274  005037  000232              CLR     @#232           ;CHANGE INTERRUPT RETURN ADDRESS TO
1150  005300  012710  000232              MOV     #232,@ADINT     ;CAUSE A HALT IF AN INTERRUPT OCCURS
1151
1152  005304  104400              TEST23: SCOPE
1153                              ;ALL MODES OF ADDRESSING CRB1 OR CRB2 (DATO,DATOB,DATI) SHOULD CLEAR
1154                              ;COLUMN READY
1155  005306  004767  004032              JSR     %7,INIT         ;INITIALIZE
1156  005312  005213                      INC     @CRS            ;START READING A CARD
1157  005314  105713                      TSTB    @CRS            ;WAIT FOR COLUMN READY
1158  005316  100376                      BPL     .-2
1159  005320  005014                      CLR     @CRB1           ;DATO TO CRB1
1160  005322  105713                      TSTB    @CRS            ;CHECK COLUMN READY
1161  005324  100002                      BPL     CNT23A          ;BRANCH IF CLEARED
1162  005326  104000                      HLT                     ;DATO TO CRB1 DIDN'T CLEAR READY
1163  005330  000467                      BR      TEST24          ;GO TO NEXT TEST
1164  005332  105713              CNT23A: TSTB    @CRS            ;WAIT FOR COLUMN READY
1165  005334  100376                      BPL     .-2
1166  005336  105014                      CLRB    @CRB1           ;DATOB TO LOW BYTE OF CRB1
1167  005340  105713                      TSTB    @CRS            ;CHECK COLUMN READY
1168  005342  100002                      BPL     CNT23B          ;BRANCH IF CLEARED
1169  005344  104000                      HLT                     ;DATOB TO CRB1 LOW BYTE DIDN'T CLEAR READY
1170  005346  000460                      BR      TEST24          ;GO TO NEXT TEST
1171  005350  105713              CNT23B: TSTB    @CRS            ;WAIT FOR COLUMN READY
1172  005352  100376                      BPL     .-2
1173  005354  105064  000001              CLRB    1(CRB1)         ;DATOB TO HIGH BYTE OF CRB1
1174  005360  105713                      TSTB    @CRS            ;CHECK COLUMN READY
1175  005362  100002                      BPL     CNT23C          ;BRANCH IF CLEARED
1176  005364  104000                      HLT                     ;LATOB TO CRB1 HIGH BYTE DIDN'T CLEAR READY
1177  005366  000450                      BR      TEST24          ;GO TO NEXT TEST
1178  005370  105713              CNT23C: TSTB    @CRS            ;WAIT FOR COLUMN READY
1179  005372  100376                      BPL     .-2
1180  005374  005714                      TST     @CRB1           ;DATI TO CRB1
1181  005376  105713                      TSTB    @CRS            ;CHECK COLUMN READY
1182  005400  100002                      BPL     CNT23D          ;BRANCH IF CLEARED
1183  005402  104000                      HLT                     ;DATI TO CRB1 DIDN'T CLEAR READY
1184  005404  000441                      BR      TEST24          ;GO TO NEXT TEST
1185  005406  105713              CNT23D: TSTB    @CRS            ;WAIT FOR COLUMN READY
1186  005410  100376                      BPL     .-2
1187  005412  005077  173410              CLR     @CRB2           ;DATO TO CRB2
1188  005416  105713                      TSTB    @CRS            ;CHECK COLUMN READY
1189  005420  100002                      BPL     CNT23E          ;BRANCH IF CLEARED
1190  005422  104000                      HLT                     ;DATO TO CRB2 DIDN'T CLEAR READY
1191  005424  000431                      BR      TEST24          ;GO TO NEXT TEST
1192  005426  105713              CNT23E: TSTB    @CRS            ;WAIT FOR COLUMN READY
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1193  005430  100376                          BPL     .-2
1194  005432  105077  173370                  CLRB    @CRB2           ;DATOB TO LOW BYTE OF CRB2
1195  005436  105713                          TSTB    @CRS            ;CHECK COLUMN READY
1196  005440  100002                          BPL     CNT23F          ;BRANCH IF CLEARED
1197  005442  104000                          HLT                     ;DATOB TO CRB2 LOW BYTE DIDN'T CLEAR READY
1198  005444  000421                          BR      TEST24          ;GO TO NEXT TEST
1199  005446  105713              CNT23F:     TSTB    @CRS            ;WAIT FOR COLUMN READY
1200  005450  100376                          BPL     .-2
1201  005452  016702  173350                  MOV     CRB2,R2         ;LOAD POINTER
1202  005456  105062  000001                  CLRB    1(R2)           ;DATOB TO HIGH BYTE OF CRB2
1203  005462  105713                          TSTB    @CRS            ;CHECK COLUMN READY
1204  005464  100002                          BPL     CNT23G          ;BRANCH IF CLEARED
1205  005466  104000                          HLT                     ;DATOB TO CRB2 HIGH BYTE DIDN'T CLEAR READY
1206  005470  000407                          BR      TEST24          ;GO TO NEXT TEST
1207
1208  005472  105713              CNT23G:     TSTB    @CRS            ;WAIT FOR COLUMN READY
1209  005474  100376                          BPL     .-2
1210  005476  005777  173324                  TST     @CRB2           ;DATI TO CRB2
1211  005502  105713                          TSTB    @CRS            ;CHECK COLUMN READY
1212  005504  100001                          BPL     TEST24          ;BRANCH IF CLEARED
1213  005506  104000                          HLT                     ;DATI TO CRB2 DIDN'T CLEAR READY
1214
1215  005510  104400              TEST24:     SCOPE
1216                              ;SETTING EJECT AFTER A COLUMN READY WITHOUT CLEARING THE COLUMN READY
1217                              ;SHOULD SET TIMING ERROR (WHICH IN TURN SHOULD CLEAR COLUMN READY)
1218  005512  004767  003626                  JSR     %7,INIT         ;INITIALIZE
1219  005516  005213                          INC     @CRS            ;START READING A CARD
1220  005520  105713                          TST3    @CRS            ;CHECK COLUMN READY - WAIT
1221  005522  100376                          BPL     .-2
1222  005524  052713  000002                  BIS     #2,@CRS         ;SET EJECT
1223  005530  105713                          TSTB    @CRS            ;CHECK COLUMN READY
1224  005532  100402                          BMI     CNT24A          ;BRANCH IF STILL SET
1225  005534  104000                          HLT                     ;SETTING EJECT CLEARED COLUMN READY
1226  005536  000421                          BR      END24           ;BRANCH TO WAIT FOR DONE AFTER ERROR
1227  005540  032713  004000      CNT24A:     BIT     #4000,@CRS      ;CHECK TIMING ERROR
1228  005544  001013                          BNE     TIM24           ;BRANCH IF SET
1229  005546  032713  040400                  BIT     #40400,@CRS     ;CHECK CARD DONE AND OFF-LINE
1230  005552  001772                          BEQ     CNT24A          ;LOOP IF NONE SET
1231  005554  032713  040000                  BIT     #40000,@CRS     ;CARD DONE SET?
1232  005560  001003                          BNE     CNT24B          ;YES - BRANCH TO ERROR PRINTOUT
1233  005562  004767  003720                  JSR     %7,CKBIT8       ;NO - BIT 8 WAS SET SO OUTPUT MESSAGE
1234  005566  000415                          BR      ENDCK           ;BRANCH AFTER COMING BACK ON-LINE
1235  005570  104000              CNT24B:     HLT                     ;CARD DONE SET BUT TIMING ERROR DIDN'T
1236  005572  000413                          BR      ENDCK           ;BRANCH TO NEXT SECTION
1237  005574  105713              TIM24:      TSTB    @CRS            ;CHECK COLUMN READY
1238  005576  100001                          BPL     .+4             ;BRANCH IF NOT SET
1239  005600  104000                          HLT                     ;TIMING ERROR DIDN'T CLEAR READY
1240  005602  032713  040400      END24:      BIT     #40400,@CRS     ;WAIT FOR CARD DONE OR OFF-LINE
1241  005606  001775                          BEQ     END24
1242  005610  032713  000400                  BIT     #400,@CRS       ;CHECK OFF LINE
1243  005614  001402                          BEQ     ENDCK           ;BRANCH IF NOT SET
1244  005616  004767  003664                  JSR     %7,CKBIT8       ;OUTPUT ERROR MESSAGE
1245
1246                              ;CHECK SW7 AND RETURN TO TEST1 IF SET, AFTER RINGING BELL
1247                              ;OTHERWISE GO INTO THE DATA TEST
1248  005622  104400              ENDCK:      SCOPE
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1249  005624  032767  000200  171736          BIT     #200,SR
1250  005632  001417                          BEQ     DATST
1251  005634  004767  003560                  JSR     %7,BELL
1252  005640  005167  173166                  COM     TRFLG           ;TOGGLE TRACE FLAG
1253  005644  000167  173306                  JMP     RESTRT
1254                                  ;FAKE LOGICAL END OF TEST
1255                                  ;THIS PROGRAM SHOULD NOT BE EXECUTED IN CHAIN MODE
1256  005650  000240                  LOGICAL:        NOP
1257  005652  000240                          NOP
1258  005654  000240                          NOP
1259  005656  000240                          NOP
1260  005660  000240                          NOP
1261  005662  000240                          NOP
1262  005664  000240                          NOP
1263  005666  000167  173264                  JMP     RESTRT  ;DO LOGIC TEST AGAIN
1264
1265
1266                                  ;DATA RELIABILITY TEST FOR CM11
1267
1268                                  ;CHECK SR FOR TYPE OF DECK BEING TESTED, AND INITIALIZE POINTERS
1269  005672  012767  000056  001202  DATST:  MOV     #56,CDCNT       ;SETUP CARD COUNT TO ENTER TABLE CORRESPONDING TO NEXT C
1270  005700  000402                  BR      DATST2          ;SKIP NEXT INSTRUCTION
1271  005702  005067  001174          DATST1: CLR     CDCNT           ;SETUP CARD COUNT TO ENTER DATA TABLE AT BEGINNING
1272  005706  005067  173124          DATST2: CLR     ERFLG           ;FLAG SET PREVENTS PRINTING OUT ERROR HEADING
1273  005712  032767  000010  171650          BIT     #10,SR          ;CHECK FOR TYPE OF DECK
1274  005720  001412                          BEQ     DATST3
1275  005722  012767  014556  001146          MOV     #MRKCD,TSTART
1276  005730  012767  015260  001142          MOV     #MRKEND,TEND
1277  005736  012767  013344  001130          MOV     #MSG20,DECK
1278  005744  000427                          BR      CONTD
1279  005746  032767  000020  171614  DATST3: BIT     #20,SR          ;CHECK BIT 4 OF SR FOR TYPE OF DECK
1280  005754  001412                          BEQ     ALP1            ;BRANCH IF NOT SET TO LOAD ALPHANUMERIC POINTERS
1281  005756  012767  014056  001112          MOV     #BINCD,TSTART   ;BIT 2 SET, LOAD BINARY TABLE POINTERS
1282  005764  012767  014554  001106          MOV     #BINEND,TEND
1283  005772  012767  013165  001074          MOV     #MSG15,DECK
1284  006000  000411                          BR      CONTD           ;BRANCH AROUND ALPHANUMERIC POINTERS
1285  006002  012767  013356  001066  ALP1:   MOV     #ALPCD,TSTART   ;LOAD ALPHANUMERIC TABLE POINTERS
1286  006010  012767  014054  001062          MOV     #ALPEND,TEND
1287  006016  012767  013154  001050          MOV     #MSG14,DECK
1288  006024  012746  000340  CONTD:  MOV     #340,-(SP)      ;PUSH STATUS ON STACK
1289  006030  012746  006062          MOV     #DCNT1,-(SP)    ;PUSH PC ON STACK
1290  006034  005767  172772          TST     TRFLG           ;CHECK FLAG
1291  006040  100007                  BPL     PSSET1          ;IF IT IS POSITIVE, CLEAR T BIT
1292  006042  032767  010000  171520          BIT     #10000,SR       ;TRACE TRAPPING INHIBITED?
1293  006050  001003                          BNE     PSSET1          ;BRANCH IF YES
1294  006052  012766  000360  000002          MOV     #360,2(SP)      ;SET T BIT ON STACK
1295  006060  000002          PSSET1: RTI
1296  006062  004767  003256  DCNT1:  JSR     %7,INIT         ;INITIALIZE CARD READER STATUS REGISTER
1297
1298                                  ;SET UP INTERRUPT SERVICING, AND START READING
1299  006066  012710  006122          MOV     #SRVC,@ADINT    ;SETUP RETURN POINTER
1300  006072  042767  000340  171676          BIC     #340,PSR        ;SET PROCESSOR TO LEVEL 0
1301  006100  016760  171672  000002          MOV     PSR,2(ADINT)    ;STORE CURRENT STATUS
1302  006106  004767  000706                  JSR     %7,NXCRD        ;ADJUST POINTER AND START READING
1303  006112  052713  000100                  BIS     #100,@CRS       ;ENABLE INTERRUPTS
1304  006116  000001                          WAIT                    ;WAIT FOR INTERRUPTS
```

```
1305  006120  000776                          BR      .-2
1306
1307                                  ;INTERRUPT SERVICE ROUTINE WHICH RUNS DATA RELIABILITY TEST
1308  006122  032713  000400          SRVC:   BIT     #400,@CRS       ;TEST OFF-LINE
1309  006126  001402                          BEQ     .+6             ;BRANCH IF NOT SET
1310  006130  000167  001234                  JMP     OFFSET          ;IF SET, GO CHECK WHY
1311  006134  005713                          TST     @CRS            ;CHECK SPECIAL CONDITION (BIT 15)
1312  006136  100460                          BMI     ERSET           ;BRANCH IF SET
1313  006140  105713                          TSTB    @CRS            ;CHECK COLUMN READY
1314  006142  100402                          BMI     .+6             ;BRANCH IF SET
1315  006144  000167  000466                  JMP     NOTCOL          ;JUMP IF NOT SET
1316  006150  005267  000730                  INC     CLCNT           ;KEEP TRACK OF COLUMN NUMBER
1317  006154  011467  000726                  MOV     @CRB1,DAT1      ;STORE DATA OF FIRST READ
1318  006160  105713                          TSTB    @CRS            ;MAKE SURE COLUMN READY CLEARED
1319  006162  100006                          BPL     SCONT1          ;BRANCH IF IT DID
1320  006164  052767  000340  171604          BIS     #340,PSR        ;SET PROCESSOR TO LEVEL 7
1321  006172  104000                          HLT                     ;READING DATA DIDN'T CLEAR COLUMN READY
1322  006174  000167  000456                  JMP     LASTCK          ;GO TO NEXT CARD AFTER ERROR PRINTOUT
1323  006200  017767  172622  000704  SCONT1: MOV     @CRB2,DATENC    ;STORE ENCODED DATA
1324  006206  012701  000010                  MOV     #10,COUNT       ;WAIT AWHILE
1325  006212  005301                          DEC     COUNT
1326  006214  001376                          BNE     .-2
1327  006216  011467  000666                  MOV     @CRB1,DAT2      ;STORE DATA OF SECOND READ
1328  006222  005067  000666                  CLR     PTOFF           ;CLEAR POINTER OFFSET
1329  006226  026715  000654                  CMP     DAT1,@RS        ;CHECK FIRST DATA READ
1330  006232  001046                          BNE     FAIL            ;PRINTOUT IF WRONG
1331  006234  012767  000002  000652          MOV     #2,PTOFF        ;SET POINTER OFFSET
1332  006242  026725  000642                  CMP     DAT2,(RS)+      ;CHECK SECOND READING OF SAME DATA
1333  006246  001040                          BNE     FAIL            ;BRANCH IF WRONG
1334  006250  012767  000004  000636          MOV     #4,PTOFF        ;SET POINTER OFFSET
1335  006256  026725  000630                  CMP     DATENC,(RS)+    ;CHECK ENCODED DATA
1336  006262  001032                          BNE     FAIL            ;BRANCH IF WRONG
1337  006264  020567  000610                  CMP     RS,TEND         ;CHECK FOR END OF TABLE
1338  006270  100402                          BMI     .+6             ;IF NOT THERE, RTI
1339  006272  016705  000600                  MOV     TSTART,RS       ;MOVE POINTER TO LOOP THRU TABLE
1340  006276  000002                          RTI
1341
1342                                  ;SPECIAL CONDITION BIT 15 WAS SET BUT BIT 8 WASN'T WHEN INTERRUPT SERVICE ROUTINE
1343                                  ;WAS ENTERRED
1344  006300  052767  000340  171470  ERSET:  BIS     #340,PSR        ;LOCK OUT INTERRUPTS
1345  006306  104000                          HLT                     ;SPECIAL CONDITION WAS SET AND OFF LINE WASN'T
1346  006310  032713  000400                  BIT     #400,@CRS       ;OFF-LINE SET NOW?
1347  006314  001002                          BNE     .+6             ;YES-SKIP OVER
1348  006316  000167  000334                  JMP     LASTCK          ;NO-GO START NEXT CARD
1349  006322  022767  000144  000552  ER1:    CMP     #100.,CDCNT     ;CHECK FOR LAST CARD
1350  006330  001002                          BNE     .+6             ;IF NOT,PRINT OUT MESSAGE
1351  006332  000167  000560                  JMP     ALLDON
1352  006336  004767  003144                  JSR     %7,CKBIT8       ;OUTPUT MESSAGE,WAIT FOR ON-LINE
1353  006342  004767  000452                  JSR     %7,NXCRD        ;START NEXT CARD
1354  006346  000002                          RTI
1355
1356                                  ;DATA ERROR WAS DETECTED, OUTPUT ERROR PRINTOUT
1357  006350  052767  000340  171420  FAIL:   BIS     #340,PSR        ;LOCK OUT INTERRUPTS
1358  006356  052713  000002                  BIS     #2,@CRS         ;SET EJECT TO PREVENT TIMING ERROR
1359  006362  005714                          TST     @CRB1           ;MAKE CERTAIN COLUMN READY IS CLEAR
1360  006364  032767  020000  171176          BIT     #20000,SR       ;CK SW13 FOR INHIBIT PRINTOUT
```

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1361  006372  001002                        BNE     .+6
1362  006374  004767  000056                JSR     %7,FPRINT
1363  006400  005767  171164                TST     SR              ;CHECK FOR HALT ON ERROR
1364  006404  100001                        BPL     .+4             ;BRANCH IF HALT ON ERROR NOT SET
1365  006406  000000                        HALT                    ;HALT ON ERROR SET
1366  006410  032713  000400        FTEST:  BIT     #400,@CRS
1367  006414  001005                        BNE     FCNT
1368  006416  032713  040000                BIT     #40000, @CRS    ;CHECK FOR CARD DONE
1369  006422  001772                        BEQ     FTEST
1370  006424  000167  000226                JMP     LASTCK          ;INHIBIT PRINTOUT AFTER CARD DONE SET
1371  006430  022767  000144  000444 FCNT:  CMP     #100.,CDCNT
1372  006436  001002                        BNE     .+6
1373  006440  000167  000452                JMP     ALLDON
1374  006444  004767  003036                JSR     %7,CKBIT8
1375  006450  004767  000344                JSR     %7,NXCRD
1376  006454  000002                        RTI
1377
1378                                ;DATA ERROR PRINTOUT ROUTINE
1379  006456  005767  172354        FPRINT: TST     ERFLG           ;TEST FLAG FOR PREVIOUS PRINTOUT
1380  006462  001006                        BNE     NOHD            ;IF SET,  DON'T OUTPUT HEADING
1381  006464  005267  172346                INC     ERFLG           ;SET FLAG
1382  006470  012702  013066                MOV     #MSG13,R2       ;OUTPUT HEADING FOR DATA ERROR PRINTOUT
1383  006474  004767  003430                JSR     %7,TOUT
1384  006500  016702  000370        NOHD:   MOV     DECK,R2         ;OUTPUT TYPE OF DECK
1385  006504  004767  003420                JSR     %7,TOUT
1386  006510  004767  003026                JSR     %7,SPACE
1387  006514  016702  000362                MOV     CDCNT,R2        ;OUTPUT CARD NUMBER WHERE ERROR OCCURRED
1388  006520  004767  006536                JSR     %7,DECPR
1389  006524  004767  003012                JSR     %7,SPACE
1390  006530  016702  000350                MOV     CLCNT,R2        ;OUTPUT COLUMN NUMBER WHERE ERROR OCCURRED
1391  006534  004767  006522                JSR     %7,DECPR
1392  006540  004767  002776                JSR     %7,SPACE
1393  006544  166705  000344                SUB     PTOFF,R5        ;SUBTRACT OFFSET FROM POINTER TO POINT TO
1394                                                                ;ADDRESS OF DESIRED PATTERN
1395  006550  012502                        MOV     (R5)+,R2        ;OUTPUT CORRECT DATA PATTERN (NOT ENCODED)
1396  006552  004767  003136                JSR     %7,PROCT
1397  006556  004767  002760                JSR     %7,SPACE
1398  006562  016702  000320                MOV     DAT1,R2         ;OUTPUT DATA READ ON FIRST READING OF BUFFER
1399  006566  004767  003122                JSR     %7,PROCT
1400  006572  004767  002744                JSR     %7,SPACE
1401  006576  016702  000306                MOV     DAT2,R2         ;OUTPUT DATA READ ONE MILLISECOND LATER
1402  006602  004767  003106                JSR     %7,PROCT
1403  006606  004767  002730                JSR     %7,SPACE
1404  006612  011502                        MOV     @R5,R2          ;OUTPUT CORRECT DATA PATTERN (ENCODED FORM.
1405  006614  004767  003074                JSR     %7,PROCT
1406  006620  004767  002716                JSR     %7,SPACE
1407  006624  016702  000262                MOV     DATENC,R2       ;OUTPUT DATA READ (ENCODED)
1408  006630  004767  003060                JSR     %7,PROCT
1409  006634  000207                        RTS     %7
1410
1411                                ;INTERRUPT NOT DUE TO ERROR OR COLUMN READY
1412  006636  032713  040000        NOTCOL: BIT     #40000,@CRS     ;CHECK FOR CARD DONE
1413  006642  001500                        BEQ     NOTCD           ;BRANCH IF NOT SET
1414  006644  022767  000120  000232        CMP     #80.,CLCNT      ;CHECK COLUMN COUNT
1415  006652  001401                        BEQ     .+4             ;SKIP ERROR HALT IF 80 COLUMNS WERE READ
1416  006654  104000                        HLT                     ;LESS THAN 80 COLUMNS WERE READ
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1417  006656  022767  000144  000216  LASTCK: CMP     #100.,CDCNT     ;CHECK FOR LAST CARD
1418  006664  001403                          BEQ     LASTWT          ;BRANCH IF LAST CARD
1419  006666  004767  000126                  JSR     %7,NXCRD        ;IF NOT LAST CARD
1420  006672  000002                          RTI                     ;GO ON
1421  006674  052767  000340  171074  LASTWT: BIS     #340,PSR
1422  006702  005027  000000                  CLR     #0
1423          006704                          LACNT=.-2
1424  006706  005367  177772                  DEC     LACNT
1425  006712  001375                          BNE     .-4
1426  006714  005367  177764                  DEC     LACNT
1427  006720  001375                          BNE     .-4
1428  006722  005367  177756                  DEC     LACNT
1429  006726  001375                          BNE     .-4
1430  006730  005367  177750                  DEC     LACNT
1431  006734  001375                          BNE     .-4
1432  006736  032713  000400                  BIT     #400,@CRS
1433  006742  001402                          BEQ     .+6
1434  006744  000167  000146                  JMP     ALL.DON
1435
1436  006750  022626                  LASTCD: CMP     (SP)+,(SP)+     ;RESTORE STACK
1437  006752  004767  002442                  JSR     %7,BELL         ;RING BELL TO SIGNIFY "PASS COMPLETE"
1438  006756  032767  000040  170604          BIT     #40,SR          ;CHECK SR FOR CONTINUATION TO ANOTHER DECK
1439  006764  001002                          BNE     .+6             ;BRANCH TO HALT IF SW5 SET
1440  006766  000167  000002                  JMP     DECK+2          ;CONTINUE TO ANOTHER DECK
1441  006772  000000                          HALT                    ;DATA TEST DONE
1442
1443                                  ;WHEN CONTINUING FROM ONE DECK TO ANOTHER, CHECK SW6 FOR TYPE
1444                                  ;OF TESTING TO BE PERFORMED
1445  006774  005167  172032          DECKCK: COM     TRFLG           ;TOGGLE TRACE FLAG
1446  007000  032767  000100  170562          BIT     #100,SR         ;CHECK SW6
1447  007006  001402                          BEQ     .+6             ;BRANCH IF NOT SET
1448  007010  000167  172142                  JMP     RESTRT          ;RERUN COMBINED INSTRUCTION AND DATA TEST
1449  007014  000167  176662                  JMP     DATST1
1450
1451  007020  016705  000052          NXCRD:  MOV     TSTART,R5       ;YES - ALL CARDS IDENTICAL
1452  007024  042713  000002                  BIC     #2,@CRS         ;CLEAR EJECT IF SET
1453  007030  005213                          INC     @CRS            ;READ ANOTHER CARD
1454  007032  005267  000044                  INC     CDCNT           ;KEEP TRACK OF CARD NUMBER
1455  007036  005067  000042                  CLR     CLCNT           ;INITIALIZE COLUMN COUNT
1456  007042  000207                          RTS     %7              ;RETURN
1457                                  ;INTERRUPT NOT CAUSED BY ERROR, COLUMN READY, OR CARD DONE
1458
1459  007044  052767  000340  170724  NOTCD:  BIS     #340,PSR        ;LOCK OUT FURTHER INTERRUPTS
1460  007052  032713  002000                  BIT     #2000,@CRS      ;TEST ON-LINE TRANSITION BIT
1461  007056  001003                          BNE     NOTCD1          ;BRANCH IF SET
1462  007060  104000                          HLT                     ;NO BITS SET TO CAUSE AN INTERRUPT
1463  007062  000167  177570                  JMP     LASTCK          ;START NEXT CARD
1464  007066  104000          NOTCD1: HLT                             ;ON-LINE TRANSITION CAUSED AN INTERRUPT
1465  007070  000167  177562                  JMP     LASTCK          ;START NEXT CARD
1466
1467  007074  000000          DECK:   0                               ;POINTER TO LITERAL "ALPHA" OR "BINARY"
1468  007076  000000          TSTART: 0                               ;STARTING ADDRESS OF DATA TABLE
1469  007100  000000          TEND:   0                               ;END ADDRESS OF DATA TABLE
1470  007102  000000          CDCNT:  0                               ;NUMBER OF CARD BEING READ
1471  007104  000000          CLCNT:  0                               ;NUMBER OF COLUMN BEING CHECKED
1472  007106  000000          DAT1:   0                               ;DATA ON FIRST READ FROM CRB1
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1473  007110  000000                    DAT2:   0                       ;DATA ON SECOND READ OF CRB1
1474  007112  000000                    DATENC: 0                       ;DATA READ FROM CRB2
1475  007114  000000                    PTOFF:  0                       ;OFFSET TO POINTER FOR DATA PRINTOU^
1476
1477                                    ;80 CARDS DONE
1478  007116  004767  002276            ALLDON: JSR     %7,BELL         ;RING BELL
1479  007122  032767  000040  170440            BIT     #40,SR          ;CHECK SR FOR HALT AT END OF DECK
1480  007130  001403                            BEQ     ALCNT           ;CONTINUE IF NOT SET
1481  007132  000000                            HALT                    ;END OF DECK,SWS SET
1482  007134  000167  177634                    JMP     DECKCK          ;CHECK FOR TYPE OF TESTING
1483  007140  005013                    ALCNT:  CLR     @CRS            ;CLEAR ERROR
1484  007142  032713  156377                    BIT     #156377,@CRS    ;ONLY BITS 8, 9 AND 13 MAY STIL^ BE SE^
1485                                                                    ;BIT 9 MAY BE SET SINCE CARD MAY NO^
1486                                                                    ;YET HAVE CLEARED THE READER TO CAUSE
1487                                                                    ;CARD DONE
1488  007146  001401                            BEQ     .+4             ;BRANCH IF OK
1489  007150  104000                            HLT                     ;STATUS REGISTER INCORRECT
1490  007152  032713  020000                    BIT     #20000,@CRS     ;CHECK BIT 13
1491  007156  001001                            BNE     .+4
1492  007160  104000                            HLT                     ;BIT 13 NOT SET
1493  007162  052767  000340  170606            BIS     #340,PSR        ;SET PROCESSOR TO LEVEL 7
1494  007170  016760  170602  000002            MOV     PSR,2(ADINT)    ;SETUP RETURN STATUS
1495  007176  105213                            INCB    @CRS            ;ATTEMPT TO READ- SHOULD RESET ERROR
1496  007200  005713                            TST     @CRS            ;CHECK BIT 15
1497  007202  100402                            BMI     ALLOK           ;BRANCH IF OK
1498  007204  104000                            HLT                     ;SETTING READ DIDN'T RESET ERROR
1499  007206  000416                            BR      ALWAIT          ;BRANCH TO WAIT FOR ON-LINE
1500  007210  012710  007242            ALLOK:  MOV     #SRVC1,@ADINT   ;LOAD INTERRUPT RETURN ADDRESS
1501  007214  005067  170556                    CLR     PSR             ;SET PROCESSOR TO LEVEL 0
1502  007220  012713  000101                    MOV     #101,@CRS       ;ENABLE INTERRUPTS, KEEP ERROR SE^ BY SETTING READ
1503  007224  000240                            NOP                     ;CLOCK IN INTERRUPT
1504  007226  016067  000002  170542            MOV     2(ADINT),PSR    ;SET PROCESSOR TO LEVEL 7
1505  007234  005013                            CLR     @CRS            ;CLEAR INTERRUPT ENABLE AND ERROR
1506  007236  104000                            HLT                     ;BIT 15 DIDN'T CAUSE AN INTERRUPT
1507  007240  000401                            BR      .+4
1508  007242  022626            SRVC1:  CMP     (SP)+,(SP)+             ;RESTORE STACK POINTER
1509  007244  005013            ALWAIT: CLR     @CRS            ;CLEAR INTERRUPT ENABLE AND ERROR
1510  007246  032713  040000                    BIT     #40000,@CRS     ;WAIT FOR CARD DONE
1511  007252  001775                            BEQ     .-4
1512  007254  012710  007312                    MOV     #SRVC2,@ADINT   ;CHANGE INTERRUPT RETURN ADDRESS
1513  007260  112713  000100                    MOVB    #100,@CRS       ;ENABLE INTERRUPTS
1514  007264  042767  000340  170504            BIC     #340,PSR        ;SET PROCESSOR TO LEVEL 0
1515  007272  032713  000400                    BIT     #400,@CRS       ;CHECK OFF-LINE BIT
1516  007276  001375                            BNE     .-4             ;LOOP UNTIL CLEAR
1517  007300  016067  000002  170470            MOV     2(ADINT),PSR    ;SET PROCESSOR TO LEVEL 7
1518  007306  104000                            HLT                     ;NO INTERRUPT OCCURRED
1519  007310  000403                            BR      SRVC2A          ;BRANCH AROUND
1520  007312  004767  002102            SRVC2:  JSR     %7,BELL         ;RING BELL
1521  007316  022626                            CMP     (SP)+,(SP)+     ;RESTORE STACK POINTER
1522  007320  032713  002000            SRVC2A: BIT     #2000,@CRS      ;CHECK BIT 10
1523  007324  001001                            BNE     .+4             ;BRANCH IF SET
1524  007326  104000                            HLT                     ;BIT 10 NOT SET
1525  007330  032713  000400                    BIT     #400,@CRS       ;CHECK BIT 8
1526  007334  001401                            BEQ     .+4             ;BRANCH IF NOT SET
1527  007336  104000                            HLT                     ;BIT 8 WAS SET
1528  007340  032713  030000                    BIT     #30000,@CRS     ;CHECK BITS 12 AND 13
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1529  007344  001401                          BEQ     .+4             ;BRANCH IF NOT SET
1530  007346  104000                          HLT                     ;BIT 12 AND/OR 13 STILL SET IN CRS
1531  007350  005013                          CLR     @CRS            ;DATO TO CRS
1532  007352  032713  002000                  BIT     #2000,@CRS      ;CHECK BIT 10
1533  007356  001401                          BEQ     .+4             ;BRANCH IF NOT SET
1534  007360  104000                          HLT                     ;DATO DIDN'T CLEAR ON-LINE BIT
1535  007362  022626                          CMP     (SP)+,(SP)+     ;RESTORE STACK FROM INITIAL INTERRUP
1536  007364  000167  177404                  JMP     DECKCK          ;RESTART
1537
1538                                   ;WHEN INTERRUPT SERVICE WAS ENTERED, OFF-LINE (BIT 8) WAS SET
1539  007370  022767  000144  177504  OFFSET: CMP     #100.,CDCNT     ;LAST CARD?
1540  007376  001406                          BEQ     OFFS1           ;YES-BRANCH
1541  007400  104000                          HLT                     ;NO,OFF-LINE SET BUT NOT 100TH CARD
1542  007402  004767  002100                  JSR     %7,CKBIT8
1543  007406  004767  177406                  JSR     %7,NXCRD
1544  007412  000002                          RTI
1545  007414  022767  000120  177462  OFFS1:  CMP     #80.,CLCNT      ;LAST COLUMN?
1546  007422  001002                          BNE     .+6             ;NO-SKIP OVER
1547  007424  000167  177466                  JMP     ALLDON          ;YES-GO RUN END OF DECK ROUTINE
1548  007430  104000                          HLT                     ;OFF-LINE SET BEFORE LAST COLUMN OF LAST CARD
1549  007432  004767  001762                  JSR     %7,BELL
1550  007436  032767  000040  170124          BIT     #40,SR
1551  007444  001403                          BEQ     OFFS2
1552  007446  000000                          HALT                    ;HALT AT END OF DECK SET
1553  007450  000167  177320                  JMP     DECKCK          ;START NEW DECK
1554  007454  052767  000340  170314  OFFS2:  BIS     #340,PSR        ;LOCK OUT INTERRUPTS
1555  007462  016760  170310  000002          MOV     PSR,2(ADINT)    ;STORE RETURN STATUS
1556  007470  000167  177550                  JMP     ALWAIT
1557
1558                                   ;SETUP FOR ERROR FUNCTION TEST
1559  007474  004767  171342  ERCM11: JSR     %7,SETUP        ;INITIALIZE REGISTERS
1560  007500  012767  007510  002420          MOV     #TESTA+2,RETURN ;SETUP SCOPE LOOP RETURN ADDRESS
1561
1562                                   ;THE CARD READER GOING OFF-LINE SHOULD SET SPECIAL CONDITION (BIT 15) AND OFF-LINE (BIT
1563  007506  104400                  TESTA:  SCOPE
1564  007510  005067  002406                  CLR     ITMAX           ;RUN EACH ERROR TEST ONCE ONLY
1565  007514  004767  001624                  JSR     %7,INIT         ;INITIALIZE STATUS REGISTER
1566  007520  012702  012414                  MOV     #MSG3,R2
1567  007524  004767  002400                  JSR     %7,TOUT         ;"PRESS CARD READER 'READ STOP'"
1568  007530  012702  012347                  MOV     #MSG2,R2
1569  007534  004767  002370                  JSR     %7,TOUT         ;"THEN HIT 'CONTINUE' ON THE CONSOLE"
1570  007540  004767  002442                  JSR     %7,CRLF         ;MOVE MESSAGE UP ON TTY
1571  007544  004767  002436                  JSR     %7,CRLF
1572  007550  004767  002432                  JSR     %7,CRLF
1573  007554  004767  002426                  JSR     %7,CRLF
1574  007560  000000                          HALT
1575  007562  032713  000400                  BIT     #400,@CRS       ;CHECK BIT 8
1576  007566  001001                          BNE     .+4             ;BRANCH IF SET
1577  007570  104000                          HLT                     ;OFF-LINE (BIT 8) WASN'T SET
1578  007572  005713                          TST     @CRS            ;CHECK BIT 15
1579  007574  100401                          BMI     .+4             ;BRANCH IF SET
1580  007576  104000                          HLT                     ;BIT 15 WASN'T SET
1581  007600  012702  012254                  MOV     #MSG1,R2
1582  007604  004767  002320                  JSR     %7,TOUT         ;"PRESS CARD READER 'RESET'";
1583  007610  012702  012347                  MOV     #MSG2,R2
1584  007614  004767  002310                  JSR     %7,TOUT         ;"THEN HIT 'CONTINUE' ON THE CONSOLE"
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1585  007620  004767  002362                  JSR     %7,CRLF         ;MOVE MESSAGE UP ON TTY
1586  007624  004767  002356                  JSR     %7,CRLF
1587  007630  004767  002352                  JSR     %7,CRLF
1588  007634  004767  002346                  JSR     %7,CRLF
1589  007640  000000                          HALT
1590
1591                                  ;INPUT HOPPER EMPTY SHOULD SET SPECIAL CONDITION
1592                                  ;IN THE 200 M/S CARD READER IT SHOULD ALSO SET CARD SUPPLY ERROR
1593  007642  104400                  TESTB:  SCOPE
1594  007644  004767  001474                  JSR     %7,INIT         ;INITIALIZE STATUS REGISTER
1595  007650  012702  012507                  MOV     #MSG5,R2        ;"REMOVE ALL CARDS FROM THE INPUT HOPPER"
1596  007654  004767  002250                  JSR     %7,TOUT
1597  007660  012702  012347                  MOV     #MSG2,R2        ;"THEN HIT 'CONTINUE' ON THE CONSOLE"
1598  007664  004767  002240                  JSR     %7,TOUT
1599  007670  004767  002312                  JSR     %7,CRLF         ;MOVE MESSAGE JP ON TTY
1600  007674  004767  002306                  JSR     %7,CRLF
1601  007700  004767  002302                  JSR     %7,CRLF
1602  007704  004767  002276                  JSR     %7,CRLF
1603  007710  000000                          HALT
1604  007712  032713  000400                  BIT     #400,@CRS       ;CHECK BIT8
1605  007716  001001                          BNE     .+4             ;BRANCH IF SET
1606  007720  104000                          HLT                     ;OFF-LINE (BIT 8) WASN'T SET
1607  007722  005713                          TST     @CRS            ;CHECK SPECIAL CONDITION BIT
1608  007724  100401                          BMI     .+4             ;BRANCH IF SET
1609  007726  104000                          HLT                     ;SPECIAL CONDITION NOT SET
1610  007730  032713  020000                  BIT     #20000,@CRS     ;YES, TEST BIT 13
1611  007734  001001                          BNE     .+4             ;CONTINUE IF SET
1612  007736  104000                          HLT                     ;CARD SUPPLY ERROR WASN'T SET
1613  007740  012702  012560          RESETB: MOV     #MSG6,R2        ;"RESTORE CARDS IN INPUT HOPPER"
1614  007744  004767  002160                  JSR     %7,TOUT
1615  007750  012702  012254                  MOV     #MSG1,R2        ;"PRESS CARD READER 'RESET'"
1616  007754  004767  002150                  JSR     %7,TOUT
1617  007760  012702  012347                  MOV     #MSG2,R2        ;"THEN HIT 'CONTINUE' ON THE CONSOLE"
1618  007764  004767  002140                  JSR     %7,TOUT
1619  007770  004767  002212                  JSR     %7,CRLF         ;MOVE MESSAGE UP ON TTY
1620  007774  004767  002206                  JSR     %7,CRLF
1621  010000  004767  002202                  JSR     %7,CRLF
1622  010004  004767  002176                  JSR     %7,CRLF
1623  010010  000000                          HALT
1624
1625                                  ;OUTPUT STACKER FULL SHOULD SET BIT 15, AND IN AN MS READER SHOULD ALSO SET BIT 13
1626  010012  104400                  TESTC:  SCOPE
1627  010014  004767  001324                  JSR     %7,INIT         ;INITIALIZE STATUS REGISTER
1628  010020  012702  012624                  MOV     #MSG7,R2        ;"LOWER THE OUTPUT STACKER PRESSURE ARM
1629  010024  004767  002100                  JSR     %7,TOUT         ;
1630  010030  012702  012347                  MOV     #MSG2,R2        ;"THEN HIT 'CONTINUE' ON THE CONSOLE"
1631  010034  004767  002070                  JSR     %7,TOUT
1632  010040  004767  002142                  JSR     %7,CRLF         ;MOVE MESSAGE UP ON TTY
1633  010044  004767  002136                  JSR     %7,CRLF
1634  010050  004767  002132                  JSR     %7,CRLF
1635  010054  004767  002126                  JSR     %7,CRLF
1636  010060  000000                          HALT
1637  010062  032713  000400                  BIT     #400,@CRS       ;CHECK BIT 8
1638  010066  001001                          BNE     .+4             ;BRANCH IF SET
1639  010070  104000                          HLT                     ;OFF-LINE (BIT 8) WASN'T SET
1640  010072  005713                          TST     @CRS            ;CHECK SPECIAL CONDITION BIT
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1641  010074  100401                        BMI     .+4             ;BRANCH IF SET
1642  010076  104000                        HLT                     ;SPECIAL CONDITION NOT SET
1643  010100  032713  020000                BIT     #20000,@CRS     ;YES, TEST BIT 13
1644  010104  001001                        BNE     .+4             ;CONTINUE IF SET
1645  010106  104000                        HLT                     ;CARD SUPPLY ERROR WASN'T SET
1646  010110  012702  012254        RSETC:  MOV     #MSG1,R2
1647  010114  004767  002010                JSR     %7,TOUT         ;"PRESS CARD READER 'RESET'"
1648  010120  012702  012347                MOV     #MSG2,R2
1649  010124  004767  002000                JSR     %7,TOUT         ;"THEN HIT 'CONTINUE' ON THE CONSOLE"
1650  010130  004767  002052                JSR     %7,CRLF         ;MOVE MESSAGE UP ON TTY
1651  010134  004767  002046                JSR     %7,CRLF
1652  010140  004767  002042                JSR     %7,CRLF
1653  010144  004767  002036                JSR     %7,CRLF
1654  010150  000000                        HALT
1655
1656                                  ;A FEED ERROR SHOULD SET BIT 15, AND IN THE MS READER IT SHOULD ALSO SET BIT 12
1657                                  ;THIS ERROR OCCURS WHEN THE FEED MECHANISM FAILS TO DELIVER A CARD TO THE READ STATION
1658  010152  104400                TESTD:  SCOPE
1659  010154  004767  001164                JSR     %7,INIT
1660  010160  012702  012507                MOV     #MSG5,R2        ;"REMOVE ALL CARDS FROM THE INPUT HOPPER"
1661  010164  004767  001740                JSR     %7,TOUT
1662  010170  012702  012347                MOV     #MSG2,R2        ;"THEN HIT 'CONTINUE' ON THE CONSOLE"
1663  010174  004767  001730                JSR     %7,TOUT
1664  010200  012702  012703                MOV     #MSG8,R2        ;"HOLD DOWN THE SWITCH AT THE BOTTOM
1665  010204  004767  001720                JSR     %7,TOUT         ;OF THE INPUT HOPPER"
1666  010210  012702  012254                MOV     #MSG1,R2        ;"PRESS CARD READER 'RESET'"
1667  010214  004767  001710                JSR     %7,TOUT
1668  010220  004767  001762                JSR     %7,CRLF         ;MOVE MESSAGE UP ON TTY
1669  010224  004767  001756                JSR     %7,CRLF
1670  010230  004767  001752                JSR     %7,CRLF
1671  010234  004767  001746                JSR     %7,CRLF
1672  010240  000000                        HALT
1673  010242  032713  002000                BIT     #2000,@CRS      ;WAIT FOR CARD READER TO COME ON-LINE
1674  010246  001775                        BEQ     .-4
1675  010250  004767  001070                JSR     %7,INIT         ;INITIALIZE STATUS REGISTER
1676  010254  012713  000003                MOV     #3,@CRS         ;SET EJECT AND READ
1677  010260  005001                        CLR     COUNT           ;WAIT AWHILE
1678  010262  005201                        INC     COUNT
1679  010264  001376                        BNE     .-2
1680  010266  005201                        INC     COUNT
1681  010270  001376                        BNE     .-2
1682  010272  005201                        INC     COUNT
1683  010274  001376                        BNE     .-2
1684  010276  005201                        INC     COUNT
1685  010300  001376                        BNE     .-2
1686  010302  032713  000400                BIT     #400,@CRS       ;TEST OFF-LINE BIT
1687  010306  001001                        BNE     .+4             ;BRANCH IF SET
1688  010310  104000                        HLT                     ;BIT 8 WAS NOT SET
1689  010312  005713                        TST     @CRS            ;CHECK BIT 15
1690  010314  100401                        BMI     .+4             ;BRANCH IF SET
1691  010316  104000                        HLT                     ;BIT 15 WAS NOT SET
1692  010320  032713  010000                BIT     #10000,@CRS     ;TEST CARD READER CHECK BIT ON MS READERS
1693  010324  001001                        BNE     .+4             ;BRANCH IF SET
1694  010326  104000                        HLT                     ;BIT 12 WASN'T SET
1695  010330  012702  012560        RSETD:  MOV     #MSG6,R2
1696  010334  004767  001570                JSR     %7,TOUT         ;"RESTORE CARDS IN THE INPUT HOPPER"
```

```
1697  010340  012702  012254                MOV     #MSG1,R2
1698  010344  004767  001560                JSR     %7,TOUT         ;"PRESS CARD READER 'START'"
1699  010350  012702  012347                MOV     #MSG2,R2        ;"THEN HIT 'CONTINUE' ON THE CONSOLE"
1700  010354  004767  001550                JSR     %7,TOUT
1701  010360  004767  001622                JSR     %7,CRLF         ;MOVE MESSAGE UP ON TTY
1702  010364  004767  001616                JSR     %7,CRLF
1703  010370  004767  001612                JSR     %7,CRLF
1704  010374  004767  001606                JSR     %7,CRLF
1705  010400  000000                        HALT
1706
1707                                ;A MOTION ERROR SHOULD SET BIT 15, AND IN THE MS READER IT SHOULD SET BIT 12
1708                                ;THIS ERROR OCCURS WHEN A CARD JAM OCCURS AT THE READ STATION
1709  010402  104400                TESTE:  SCOPE
1710  010404  004767  000734                JSR     %7,INIT         ;INITIALIZE STATUS REGISTER
1711  010410  012702  012414                MOV     #MSG3,R2        ;"PRESS CARD READER 'READ STOP'"
1712  010414  004767  001510                JSR     %7,TOUT
1713  010420  012702  012347                MOV     #MSG2,R2        ;"THEN HIT 'CONTINUE' ON THE CONSOLE"
1714  010424  004767  001500                JSR     %7,TOUT
1715  010430  012702  012761                MOV     #MSG9,R2        ;"BLOCK THE CARD READER STATION TO
1716  010434  004767  001470                JSR     %7,TOUT         ;PREVENT A CARD GOING THRU, AND"
1717  010440  012702  012254                MOV     #MSG1,R2        ;"PRESS CARD READER 'START'"
1718  010444  004767  001460                JSR     %7,TOUT
1719  010450  004767  001532                JSR     %7,CRLF         ;MOVE MESSAGE UP ON TTY
1720  010454  004767  001526                JSR     %7,CRLF
1721  010460  004767  001522                JSR     %7,CRLF
1722  010464  004767  001516                JSR     %7,CRLF
1723  010470  000000                        HALT
1724  010472  032713  002000                BIT     #2000,@CRS      ;MONITOR ON-LINE TRANSITION (BIT 10)
1725  010476  001775                        BEQ     .-4             ;CONTINUE WHEN CARD READER COMES ON-LINE
1726  010500  012713  000003                MOV     #3,@CRS         ;READ A CARD AND SET EJECT
1727  010504  032713  140000                BIT     #140000,@CRS    ;CHECK DONE AND SPECIAL CONDITION BITS
1728  010510  001775                        BEQ     .-4             ;WAIT
1729  010512  005713                        TST     @CRS            ;CHECK SPECIAL CONDITION BIT
1730  010514  100401                        BMI     .+4             ;CONTINUE IF SET
1731  010516  104000                        HLT                     ;SPECIAL CONDITION NOT SET
1732                                                                ;NOTE THAT IF THE CARD GETS PAST
1733                                                                ;THE READ STATION THIS TEST
1734                                                                ;WILL FAIL- MAKE CERTAIN THAT THE CARD
1735                                                                ;DIDN'T MAKE IT THRU  BEFORE
1736                                                                ;CONSIDERING THIS A CARD READER FAILURE
1737  010520  032713  010000                BIT     #10000,@CRS     ;YES, CHECK BIT 12
1738  010524  001001                        BNE     .+4             ;BRANCH IF SET
1739  010526  104000                        HLT                     ;CARD READER CHECK NOT SET
1740  010530  012702  012254                MOV     #MSG1,R2        ;"PRESS CARD READER 'RESET'"
1741  010534  004767  001370                JSR     %7,TOUT
1742  010540  012702  012347                MOV     #MSG2,R2        ;"THEN HIT 'CONTINUE' ON THE CONSOLE"
1743  010544  004767  001360                JSR     %7,TOUT
1744  010550  004767  001432                JSR     %7,CRLF         ;MOVE MESSAGE UP ON TTY
1745  010554  004767  001426                JSR     %7,CRLF
1746  010560  004767  001422                JSR     %7,CRLF
1747  010564  004767  001416                JSR     %7,CRLF
1748  010570  000000                        HALT
1749
1750  010572  104400                TESTG:  SCOPE
1751  010574  004767  000620                JSR     %7,BELL         ;IF SET, RING BELL AND
1752  010600  000000                        HALT                    ;HALT
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1753  010602  012767  007510  001316          MOV     #TESTA+2,RETURN ;SETUP SCOPE LOOP RETURN ADDRESS TO LOOP THRU TESTS
1754  010610  000167  176672                  JMP     TESTA           ;START ERROR TESTS OVER ON CONTINUING
1755
1756                                  ;ROUTINE TO LOOP THRU A SINGLE INSTRUCTION TEST
1757                                  ;NOTE THAT SW11 MUST BE DOWN AFTER 2ND HALT
1758  010614  004767  170222          TESTX:  JSR     %7,SETUP                ;SETUP POINTERS AND FLAGS
1759  010620  000000                          HALT                            ;WAIT FOR STARTING ADDRESS
1760  010622  016767  166742  000044          MOV     SR,RETRNX               ;STORE STARTING ADDRESS
1761  010630  062767  000002  000036          ADD     #2,RETRNX               ;CHANGE TO FIRST ADDRESS AFTER SCOPE INSTRUCTION
1762  010636  000000                          HALT                            ;SET SR OPTIONS (BIT 11 MUST = 0)
1763  010640  005067  001260                  CLR     ITCNT                   ;CLEAR ITERATION COUNTER
1764  010644  012767  004000  001250          MOV     #4000,ITMAX
1765  010652  012767  010664  001246          MOV     #XLOOP,RETURN           ;LOAD RETURN ADDRESS
1766  010660  000177  000010                  JMP     @RETRNX                 ;JUMP TO TEST
1767  010664  005067  001234          XLOOP:  CLR     ITCNT                   ;KEEP ITERATION COUNTER AT ZERO
1768  010670  000177  000000                  JMP     @RETRNX                 ;JUMP TO TEST
1769  010674  000000                  RETRNX: 0
1770
1771
1772                                  ;ROUTINE TO CHECK CARDS WHICH HAVE ALL COLUMNS IDENTICALLY PUNCHED.
1773                                  ;THIS ROUTINE ALLOWS SPECIFIC TYPES OF DATA FAILURES TO BE STUDIED
1774                                  ;EASILY.  THE ROUTINE HALTS ONCE AT THE START.  SET THE CORRECT CARD
1775                                  ;IMAGE PATTERN IN SW11-SW00, THEN HIT CONTINUE (AFTER THE DECK IS
1776                                  ;LOADED AND CARD READER IS ON-LINE).  THE PATTERN IS STORED, AND THEN
1777                                  ;EACH COLUMN OF EACH CARD IS READ TWICE AND COMPARED WITH IT.  IF A
1778                                  ;DISCREPANCY OCCURS, THE ERROR IS PRINTED OUT ALONG WITH THE TOTAL
1779                                  ;NUMBER OF CARDS READ AND THE TOTAL NUMBER OF DATA ERRORS DISCOVERED
1780                                  ;UP TO THAT POINT (ALL PRINTOUTS ARE IN OCTAL).  WHEN THE INPUT HOPPER
1781                                  ;IS EMPTY, THE ROUTINE RINGS THE BELL AND WAITS FOR MORE CARDS TO BE
1782                                  ;LOADED AND THE CARD READER TO BE PUT BACK ON-LINE.
1783                                  ;SW15=1 CAUSES A HALT AFTER AN ERROR, AND SW13=1 INHIBITS ERROR PRINTOUTS.
1784
1785  010676  004767  170140          CKSAME: JSR     %7,SETUP        ;INITIALIZE POINTERS
1786  010702  000000                          HALT                    ;WAIT FOR CARD IMAGE PATTERN
1787  010704  016767  166660  000360          MOV     SR,CARDIM       ;STORE PATTERN
1788  010712  042767  170000  000352          BIC     #170000,CARDIM  ;CLEAR UPPER BITS OF PATTERN
1789  010720  005067  000344                  CLR     TOTCRD          ;INITIALIZE CARD COUNT
1790  010724  005067  000336                  CLR     TOTERR          ;INITIALIZE ERROR COUNT
1791  010730  005067  170102                  CLR     ERFLG           ;CLEAR FLAG FOR PRINTING ERROR HEADING
1792  010734  005067  176144          CKLOOP: CLR     CLCNT           ;INITIALIZE COLUMN COUNT
1793  010740  032713  000400                  BIT     #400,@CRS       ;CHECK BIT 8
1794  010744  001017                          BNE     CKSIT           ;BRANCH IF SET TO WAIT FOR READER TO COME ON-LINE.
1795  010746  005213                          INC     @CRS            ;START READING CARD
1796  010750  005267  000314                  INC     TOTCRD          ;INCREMENT CARD COUNT
1797  010754  105713          CKLP1:  TSTB    @CRS            ;CHECK COLUMN READY
1798  010756  100426                          BMI     CKCOL           ;BRANCH IF SET
1799  010760  032713  040000                  BIT     #40000,@CRS     ;CHECK CARD DONE
1800  010764  001015                          BNE     CKCRD           ;BRANCH IF SET
1801  010766  005713                          TST     @CRS            ;CHECK SPECIAL CONDITION
1802  010770  100371                          BPL     CKLP1           ;LOOP IF NOT SET
1803  010772  032713  000400                  BIT     #400,@CRS       ;CHECK BIT 8
1804  010776  001002                          BNE     CKSIT           ;BRANCH IF SET TO WAIT FOR READER ON-LINE.
1805  011000  104000                          HLT                     ;SPECIAL CONDITION SET, BIT 8 CLEAR
1806  011002  000754                          BR      CKLOOP
1807
1808  011004  004767  000410          CKSIT:  JSR     %7,BELL         ;RING BELL TO SIGNIFY READER OFF-LINE
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1809  011010  032713  000400          CKSIT1: BIT     #400,@CRS       ;CHECK BIT 8
1810  011014  001375                          BNE     CKSIT1          ;LOOP IF STILL SET
1811  011016  000746                          BR      CKLOOP          ;START NEXT CARD
1812  011020  022767  000120  176056  CKCRD:  CMP     #80.,CLCNT      ;CHECK FOR 80 COLUMNS READ
1813  011026  001742                          BEQ     CKLOOP          ;START NEXT CARD IF OK
1814  011030  104000                          HLT                     ;FINAL COLUMN COUNT WASN'T 80
1815  011032  000740                          BR      CKLOOP          ;START NEXT CARD
1816  011034  011467  176046          CKCOL:  MOV     @CRB1,DAT1      ;READ DATA BUFFER
1817  011040  005267  176040                  INC     CLCNT           ;COUNT COLUMNS
1818  011044  105713                          TSTB    @CRS            ;CHECK COLUMN READY
1819  011046  100002                          BPL     .+6             ;BRANCH IF OK
1820  011050  104000                          HLT                     ;READING DBR DIDN'T CLEAR READY
1821  011052  000730                          BR      CKLOOP          ;START NEXT CARD AFTER ERROR
1822  011054  012701  000200                  MOV     #200,COUNT      ;WAIT AWHILE
1823  011060  005301          CKLP2:  DEC     COUNT
1824  011062  001376                          BNE     CKLP2
1825  011064  011467  176020                  MOV     @CRB1,DAT2      ;READ CRB1 AGAIN
1826  011070  026767  176012  000174          CMP     DAT1,CARDIM     ;COMPARE FIRST DATA TO PATTERN
1827  011076  001005                          BNE     CKFAIL          ;BRANCH IF FAILURE
1828  011100  026767  176004  000164          CMP     DAT2,CARDIM     ;COMPARE SECOND READING TO PATTERN
1829  011106  001001                          BNE     CKFAIL          ;BRANCH IF FAILURE
1830  011110  000721                          BR      CKLP1           ;WAIT FOR NEXT COLUMN OR END OF CARD
1831  011112  005267  000150  CKFAIL: INC     TOTERR          ;COUNT ERRORS
1832  011116  032767  020000  166444          BIT     #20000,SR       ;CHECK FOR INHIBITING PRINTOUT
1833  011124  001047                          BNE     CKHLT           ;BRANCH AROUND PRINTOUT IF SET
1834  011126  005767  167704                  TST     ERFLG           ;TEST FLAG TO PRINT HEADING
1835  011132  001006                          BNE     CKNOHD          ;BRANCH IF ALREADY DONE
1836  011134  005267  167676                  INC     ERFLG           ;PRINT HEADING ONCE ONLY
1837  011140  012702  013301                  MOV     #MSG19,R2       ;OUTPUT HEADING
1838  011144  004767  000760                  JSR     %7,TOUT
1839  011150  004767  001032          CKNOHD: JSR     %7,CRLF         ;OUTPUT CARRIAGE RETURN, LINEFEED
1840  011154  016702  175724                  MOV     CLCNT,R2        ;PRINT COLUMN NUMBER
1841  011160  004767  004076                  JSR     %7,DECPR
1842  011164  004767  000352                  JSR     %7,SPACE
1843  011170  016702  175712                  MOV     DAT1,R2         ;PRINT FIRST READING
1844  011174  004767  000514                  JSR     %7,PROCT
1845  011200  004767  000336                  JSR     %7,SPACE
1846  011204  016702  175700                  MOV     DAT2,R2         ;PRINT SECOND READING
1847  011210  004767  000500                  JSR     %7,PROCT
1848  011214  004767  000322                  JSR     %7,SPACE
1849  011220  016702  000044                  MOV     TOTCRD,R2       ;PRINT TOTAL NUMBER OF CARDS READ
1850  011224  004767  000464                  JSR     %7,PROCT
1851  011230  004767  000306                  JSR     %7,SPACE
1852  011234  016702  000026                  MOV     TOTERR,R2       ;PRINT TOTAL NUMBER OF DATA ERRORS
1853  011240  004767  000450                  JSR     %7,PROCT
1854  011244  005767  166320          CKHLT:  TST     SR              ;CHECK SW15 TO HALT ON ERROR
1855  011250  100002                          BPL     CKDONE          ;BRANCH IF NOT SET
1856  011252  000000                          HALT                    ;HALT ON ERROR
1857  011254  000627                          BR      CKLOOP          ;CONTINUE
1858  011256  032713  140000          CKDONE: BIT     #140000,@CRS    ;WAIT FOR SPECIAL CONDITION OR DONE
1859  011262  001775                          BEQ     CKDONE
1860  011264  000623                          BR      CKLOOP          ;START NEXT CARD AFTER CHECKING BIT 8
1861  011266  000000          TOTERR: 0
1862  011270  000000          TOTCRD: 0
1863  011272  000000          CARDIM: 0
1864                          ;READ A CARD AND EXECUTE A PROGRAM
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1865                                    ;DELAY BEFORE READING ANOTHER CARD
1866                                    ;THIS WILL AID IN TESTING FOR 'PICK ERRORS'
1867  011274  004767  167542            DELAY:  JSR     %7,SETUP        ;SETUP POINTERS
1868  011300  000000                            HALT                    ;WAIT FOR OPR.
1869  011302  016767  166262  000030    1$:     MOV     SR,DLAYO        ;READ SR
1870  011310  005213                            INC     @CRS            ;MOVE CARD
1871  011312  005267  000022                    INC     DLAYO
1872  011316  005067  000020                    CLR     DLAYI           ;CLEAR SECOND COUNTER
1873  011322  005367  000014            2$:     DEC     DLAYI           ;DELAY
1874  011326  001375                            BNE     2$
1875  011330  005367  000004                    DEC     DLAYO           ;DELAY FINISHED ?
1876  011334  001372                            BNE     2$              ;BR IF NOT
1877  011336  000761                            BR      1$              ;BR IF YES
1878
1879  011340  000001                    DLAYO:  1
1880  011342  000000                    DLAYI:  0
1881                                    ;ISSUE MESSAGE IF CARD READER IS OFF-LINE
1882                                    ;WAIT FOR BUSY TO CLEAR IN CASE CARD READER IS STILL READING A CARD
1883                                    ;INITIALIZE STATUS REGISTER AND USE ERROR HALT IF IT DOESN'T CLEAR PROPERLY
1884                                    ;NOTE THAT PROGRAM WILL HANG HERE IF BUSY REMAINS SET
1885  011344  004767  000136            INIT:   JSR     %7,CKBIT8       ;SEE IF OFF-LINE BIT IS SET
1886  011350  032713  001000                    BIT     #1000,@CRS      ;WAIT FOR BUSY TO CLEAR, IN CASE
1887  011354  001375                            BNE     .-4             ;A CARD IS STILL BEING READ
1888  011356  005013                            CLR     @CRS            ;INITIALIZE STATUS REGISTER
1889  011360  005714                            TST     @CRB1           ;READ DATA BUFFER TO CLEAR COLUMN READY
1890  011362  005713                            TST     @CRS            ;MAKE SURE INITIALIZATION OK
1891  011364  001401                            BEQ     .+4             ;BRANCH IF ALL BITS ZERO
1892  011366  104000                            HLT                     ;NOT ALL BITS OF STATUS REGISTER ARE ZERO
1893  011370  000207                            RTS     %7              ;RETURN
1894
1895                                    ;SUBROUTINE TO SAVE STATUS AND CLEAR T BIT
1896  011372  016767  166400  167434    CLRTR:  MOV     PSR,PROC        ;SAVE STATUS
1897  011400  011646                            MOV     (SP),-(SP)      ;PUSH RETURN PC
1898  011402  016766  166370  000002            MOV     PSR,2(SP)       ;SETUP STATUS WITH T BIT CLEAR
1899  011410  042766  000020  000002            BIC     #20,2(SP)
1900  011416  000002                            RTI                     ;RETURN
1901
1902                                    ;BELL ON PASS COMPLETE
1903  011420  105777  167372            BELL:   TSTB    @TCSR           ;WAIT FOR TTY READY
1904  011424  100375                            BPL     .-4
1905  011426  012777  000207  167364            MOV     #207,@TDBR      ;RING BELL
1906  011434  013702  000042                    MOV     @#42,R2
1907  011440  001416                            BEQ     END
1908  011442  105777  167350                    TSTB    @TCSR
1909  011446  100375                            BPL     .-4
1910  011450  012777  000000  167342            MOV     #0,@TDBR
1911  011456  105777  167334                    TSTB    @TCSR
1912  011462  100375                            BPL     .-4
1913  011464  000005                            RESET
1914  011466  004712                    LOGIC:  JSR     %7,(R2)
1915  011470  000240                            NOP
1916  011472  000240                            NOP
1917  011474  000240                            NOP
1918  011476  012767  000001  000416    END:    MOV     #1,ITMAX        ;MAKE CERTAIN ITERATION MAXIMUM IS CORRECT
1919  011504  000207                            RTS     %7              ;RETURN
1920
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1921                                        ;SUBROUTINE TO CHECK FOR BIT 8 (OFF-LINE) BEING SET IN CARD
1922                                        ;READER CSR, AND PRINT OUT A MESSAGE IF IT IS
1923  011506  032713  000400          CKBIT8: BIT     #400,@CRS       ;CHECK BIT 8
1924  011512  001001                          BNE     .+4             ;BRANCH IF SET
1925  011514  000207                          RTS     %7              ;RETURN IF NOT SET
1926  011516  012702  013261                  MOV     #MSG18,R2       ;OUTPUT MESSAGE
1927  011522  004767  000402                  JSR     %7,TOUT         ;"BIT 8 WAS SET"
1928  011526  012702  013176                  MOV     #MSG17,R2       ;"REMEDY THE ERROR CONDITION
1929  011532  004767  000372                  JSR     %7,TOUT         ;AND PRESS 'CONTINUE'"
1930  011536  000000                          HALT                    ;WAIT FOR CONTINUE
1931  011540  000762                          BR      CKBIT8          ;CHECK AGAIN
1932
1933                                        ;SUBROUTINE TO ISSUE N SPACES
1934                                        ;N IS ONE PLUS VALUE CONTAINED IN SPACEX
1935                                        ;SPACEX IS CLEARED WITHIN THE SUBROUTINE, SO THAT A CALL ON
1936                                        ;SPACE WITHOUT LOADING SPACEX ISSUES ONLY ONE SPACE
1937  011542  105777  167250          SPACE:  TSTB    @TCSR           ;WAIT FOR TTY READY
1938  011546  100375                          BPL     .-4
1939  011550  012777  000240  167242          MOV     #240,@TDBR      ;OUTPUT A SPACE
1940  011556  005367  000010                  DEC     SPACEX          ;DECREMENT COUNT
1941  011562  100367                          BPL     SPACE           ;LOOP IF NOT DONE
1942  011564  005067  000002                  CLR     SPACEX          ;RESET COUNT TO ZERO
1943  011570  000207                          RTS     %7              ;RETURN
1944  011572  000000                  SPACEX: 0
1945
1946
1947
1948                                        ;ENTERED WITH SYSTEM TRAP CALL (HLT)
1949                                        ;PRINT OUT THE ERROR PC AND STATUS REGISTER
1950  011574  036727  165770  020000  PRINT:  BIT     SR,     #20000  ;TEST FOR INHIBIT PRINT OUT
1951  011602  001401                          BEQ     .+4             ;BRANCH TO PRINT
1952  011604  000431                          BR      B.CK            ;INHIBIT, CHECK FOR HALT
1953  011606  012667  000076                  MOV     (6)+,   SAVPC   ;PC OF FAILING ROUTINE
1954  011612  012667  000074                  MOV     (6)+,   SAVPSR  ;PSR OR ERROR CONDITION
1955  011616  024646                          CMP     -(6),   -(6)    ;RESTORE STACK
1956  011620  004767  000362                  JSR     %7,CRLF         ;OUTPUT CARRIAGE RETURN, LINEFEED
1957  011624  010267  000052                  MOV     %2,     SAVR2   ;SAVE R2
1958  011630  016702  000054                  MOV     SAVPC,  %2
1959  011634  004767  000054                  JSR     %7,     PROCT   ;PRINT PC+2 IN OCTAL
1960  011640  105777  167152                  TSTB    @TCSR           ;WAIT FOR TTY READY
1961  011644  100375                          BPL     .-4
1962  011646  012777  000240  167144          MOV     #240,   @TDBR   ;OUTPUT A SPACE
1963  011654  016702  000032                  MOV     SAVPSR, %2
1964  011660  004767  000030                  JSR     %7,     PROCT   ;PRINT PROCESSOR STATUS AT TIME OF FAILURE
1965  011664  016702  000012                  MOV     SAVR2,  %2      ;RESTORE REGISTER 2
1966  011670  005767  165674          B.CK:   TST     SR              ;CHECK SR FOR HALT SWITCH
1967  011674  100001                          BPL     .+4             ;BRANCH IF NOT SET
1968  011676  000000                          HALT                    ;HALT ON ERROR UP
1969  011700  000002                          RTI                     ;RETURN TO MAIN LINE
1970  011702  000000                  SAVR2:  0
1971  011704  000000                  SAVR3:  0
1972  011706  000000                  SAVR4:  0
1973  011710  000000                  SAVPC:  0
1974  011712  000000                  SAVPSR: 0
1975
1976  011714  010367  177764          PROCT:  MOV     %3,SAVR3        ;SAVE R3
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 1977  011720  012467  177762                MOV     %4,SAVR4        ;SAVE R4
 1978  011724  005004                        CLR     %4              ;CLEAR R4 TO USE AS COUNTER
 1979  011726  005001                        CLR     COUNT           ;CLEAR COUNT TO USE AS CARRY FLAG
 1980  011730  012703  000260                MOV     #260,   %3      ;SETUP ASCII ZERO IN R3
 1981  011734  005702                        TST     %2              ;CHECK BIT 15 OF DESIRED NUMBER
 1982  011736  100001                        BPL     .+4             ;BRANCH IF NOT SET
 1983  011740  005203                        INC     %3              ;CHANGE TO ASCII ONE
 1984  011742  006102                        ROL     %2              ;ROTATE INTO RIGHTMOST BIT
 1985  011744  006102                        ROL     %2              ;TO PREPARE FOR LOOP
 1986  011746  005501                        ADC     COUNT           ;STORE CARRY
 1987  011750  105777  167042        C.WAIT: TSTB    @TCSR           ;WAIT FOR TTY READY
 1988  011754  100375                        BPL     C.WAIT
 1989  011756  010367  167036                MOV     %3,     @TDBR   ;OUTPUT ASCII
 1990  011762  005204                        INC     %4              ;COUNT CHARACTERS OUTPUT
 1991  011764  020427  000006                CMP     %4,     #6      ;CHECK FOR DONE
 1992  011770  001005                        BNE     C.CONT          ;BRANCH IF NOT DONE
 1993  011772  016703  177706                MOV     SAVR3,%3        ;RESTORE REGISTER 3
 1994  011776  016704  177704                MOV     SAVR4,%4        ;RESTORE REGISTER 4
 1995  012002  000207                        RTS     %7              ;RETURN
 1996  012004  000241        C.CONT: CLC                             ;CLEAR CARRY
 1997  012006  005701                        TST     COUNT           ;TEST CARRY FLAG
 1998  012010  001402                        BEQ     .+6             ;BRANCH IF NOT SET
 1999  012012  005001                        CLR     COUNT           ;CLEAR FLAG
 2000  012014  000261                        SEC                     ;SET CARRY
 2001  012016  006102                        ROL     %2              ;ROTATE NEXT 3 BITS INTO RIGHTMOST 3
 2002  012020  006102                        ROL     %2
 2003  012022  006102                        ROL     %2
 2004  012024  005501                        ADC     COUNT           ;STORE CARRY
 2005  012026  010203                        MOV     %2,     %3      ;MOVE DATA FOR OUTPUT
 2006  012030  042703  177770                BIC     #177770,%3      ;CLEAR ALL BUT RIGHTMOST 3 BITS
 2007  012034  052703  000260                BIS     #260,   %3      ;SET TO ASCII EQUIVALENT
 2008  012040  000743                        BR      C.WAIT          ;LOOP
 2009                          ;SCOPE AND/OR ITERATION LOOP FOR EACH TEST 2 TIMES
 2010  012042  032767  040000  165520  SCOPEC: BIT     #40000, SR      ;TEST SR FOR SCOPE
 2011  012050  001012                        BNE     D.1             ;YES,SCOPE
 2012  012052  032767  004000  165510        BIT     #4000,SR        ;NO- TEST FOR ITERATION
 2013  012060  001013                        BNE     D.2             ;INHIBIT ITERATION
 2014  012062  026767  000036  000032        CMP     ITCNT,ITMAX     ;CHECK FOR ITERATIONS COMPLETE
 2015  012070  100007                        BPL     D.2             ;EXIT-DONE
 2016  012072  005267  000026                INC     ITCNT           ;INCREMENT COUNT
 2017  012076  022606                D.1:    CMP     (6)+,   %6      ;REPOSITION STACK POINTER
 2018  012100  012667  165672                MOV     (6)+    PSR     ;RESTORE PROCESSOR STATUS
 2019  012104  000177  000016                JMP     @RETURN         ;RETURN TO RERUN TEST
 2020  012110  005067  000010        D.2:    CLR     ITCNT           ;CLEAR COUNTER
 2021  012114  011667  000006                MOV     @%6,    RETURN  ;SAVE SCOPE RETURN POINTER
 2022  012120  000002                        RTI                     ;RETURN INLINE-NEXT TEST
 2023  012122  000001                ITMAX:  1                       ;MAX NUMBER OF ITERATIONS
 2024  012124  000000                ITCNT:  0                       ;COUNT LOCATION FOR ITERATION LOOP
 2025  012126  001224                RETURN: TEST1+2                 ;ADDRESS OF LAST TEST
 2026
 2027                          ;MOV ADDRESS OF MESSAGE TO REGISTER 2
 2028                          ;THEN JSR %7, TOUT
 2029  012130  142777  000177  166660  TOUT:   BICB    #177,   @TCSR   ;CLEAR INT FLAG
 2030  012136  111267  000042                MOVB    @%2,    L.EOMK  ;MOVE IN EOM MARKER
 2031  012142  005202                L.INC:  INC     %2              ;MOVE DATA POINTER TO NEXT BYTE
 2032  012144  121267  000034        L.TOUT: CMPB    @%2,    L.EOMK  ;COMPARE FOR EOM
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2033  012150  001001                        BNE     .+4             ;BRANCH IF NOT END OF MESSAGE
2034  012152  000207                        RTS     %7              ;RETURN IF EOM
2035  012154  121227  000100                CMPB    @%2,    #'@     ;CHECK FOR CR,LF REQUEST
2036  012160  001003                        BNE     .+10            ;BRANCH IF NOT
2037  012162  004767  000020                JSR     %7,CRLF         ;OUTPUT CARRIAGE RETURN, LINEFEED
2038  012166  000765                        BR      L.INC           ;LOOP
2039  012170  105777  166622                TSTB    @TCSR           ;WAIT FOR TTY
2040  012174  100375                        BPL     .-4
2041  012176  112277  166616                MOVB    (2)+,   @TDBR   ;OUTPUT NEXT CHARACTER
2042  012202  000760                        BR      L.TOUT          ;CONTINUE
2043  012204  000000                L.EOMK: 0
2044
2045                                        ;SUBROUTINE TO ISSUE CARRIAGE RETURN AND LINEFEED
2046  012206  105777  166604        CRLF:   TSTB    @TCSR           ;WAIT FOR TTY READY
2047  012212  100375                        BPL     .-4
2048  012214  112777  000215  166576        MOVB    #215,   @TDBR   ;SEND CARRIAGE RETURN
2049  012222  105777  166570                TSTB    @TCSR           ;WAIT FOR TTY
2050  012226  100375                        BPL     .-4
2051  012230  112777  000212  166562        MOVB    #212,   @TDBR   ;SEND LINE FEED
2052  012236  105777  166554                TSTB    @TCSR
2053  012242  100375                        BPL     .-4
2054  012244  012777  000000  166546        MOV     #0,@TDBR        ;OUTPUT FILLER
2055  012252  000207                        RTS     %7              ;RETURN
2056
2057
2058  012254  040057  051120  051505  MSG1:   .ASCII ;/@PRESS CARD READER 'RESET' AND WAIT FOR THE 'RESET' LIGHT/;
2059  012262  020123  040503  042122
2060  012270  051040  040505  042504
2061  012276  020122  051047  051505
2062  012304  052105  020047  047101
2063  012312  020104  040527  052111
2064  012320  043040  051117  052040
2065  012326  042510  023440  042522
2066  012334  042523  023524  046040
2067  012342  043511  052110     057
2068  012347     057  052100  042510  MSG2:   .ASCII  ;/@THEN HIT 'CONTINUE' ON THE CONSOLE/;
2069  012354  020116  044510  020124
2070  012362  041447  047117  044524
2071  012370  052516  023505  047440
2072  012376  020116  044124  020105
2073  012404  047503  051516  046117
2074  012412  027505
2075  012414  040057  051120  051505  MSG3:   .ASCII  ;/@PRESS CARD READER 'READ STOP'/;
2076  012422  020123  040503  042122
2077  012430  051040  040505  042504
2078  012436  020122  051047  040505
2079  012444  020104  052123  050117
2080  012452  027447
2081  012454  040057  044124  020105  MSG4:   .ASCII  ;/@THE INTERRUPT LEVEL WAS /;
2082  012462  047111  042524  051122
2083  012470  050125  020124  042514
2084  012476  042526  020114  040527
2085  012504  020123     057
2086  012507     057  051100  046505  MSG5:   .ASCII  :/@REMOVE ALL CARDS FROM THE INPUT HOPPER :
2087  012514  053117  020105  046101
2088  012522  020114  040503  042122
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2089  012530  020123  051106  046517
2090  012536  052040  042510  044440
2091  012544  050116  052125  044040
2092  012552  050117  042520  027522
2093  012560  040057  042522  052123  MSG6:   .ASCII  ;/@RESTORE CARDS IN THE INPUT HOPPER/;
2094  012566  051117  020105  040503
2095  012574  042122  020123  047111
2096  012602  052040  042510  044440
2097  012610  050116  052125  044040
2098  012616  050117  042520  027522
2099  012624  040057  047514  042527  MSG7:   .ASCII  ;/@LOWER THE OUTPUT HOPPER STACKER PRESSURE ARM :
2100  012632  020122  044124  020105
2101  012640  052517  050124  052125
2102  012646  044040  050117  042520
2103  012654  020122  052123  041501
2104  012662  042513  020122  051120
2105  012670  051505  052523  042522
2106  012676  040440  046522      057
2107  012703      057 052100  042510  MSG8:   .ASCII  ;/@THEN GENTLY DEPRESS THE HOPPER EMPTY SWITCH/;
2108  012710  020116  042507  052116
2109  012716  054514  042040  050105
2110  012724  042522  051523  052040
2111  012732  042510  044040  050117
2112  012740  042520  020122  046505
2113  012746  052120  020131  053523
2114  012754  052111  044103      057
2115  012761      057 052100  042510  MSG9:   .ASCII  ;/@THEN FIRMLY HOLD THE BOTTOM CARD TO PREVENT A CARD GOING THRU, AND :
2116  012766  020116  044506  046522
2117  012774  054514  044040  046117
2118  013002  020124  044124  020105
2119  013010  047502  052124  046517
2120  013016  041440  051101  020104
2121  013024  047524  050040  042522
2122  013032  042526  052116  040440
2123  013040  041440  051101  020104
2124  013046  047507  047111  020107
2125  013054  044124  052522  020054
2126  013062  047101  027504
2127  013066  040057  042504  045503  MSG13:  .ASCII  ;/@DECK   CARD COLUMN PATTERN READ1 READ2  CODED  READ :
2128  013074  020040  041440  051101
2129  013102  020104  047503  052514
2130  013110  047115  050040  052101
2131  013116  042524  047122  051040
2132  013124  040505  030504  051040
2133  013132  040505  031104  020040
2134  013140  047503  042504  020104
2135  013146  051040  040505  027504
2136  013154  040057  046101  044120  MSG14:  .ASCII  ;/@ALPHA /;
2137  013162  020101      057
2138  013165      057 041100  047111  MSG15:  .ASCII  ;/@BINARY/;
2139  013172  051101  027531
2140  013176  040057  042522  042515  MSG17:  .ASCII  ;/@REMEDY THE ERROR CONDITION AND PRESS 'CONTINUE'@ :
2141  013204  054504  052040  042510
2142  013212  042440  051122  051117
2143  013220  041440  047117  044504
2144  013226  044524  047117  040440
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2145  013234  042116  050040  042522
2146  013242  051523  023440  047503
2147  013250  052116  047111  042525
2148  013256  040047     057
2149  013261     057  041100  052111  MSG18:  .ASCII  ;/@BIT 8 WAS SET/;
2150  013266  034040  053440  051501
2151  013274  051440  052105     057
2152  013301     057  041500  046117  MSG19:  .ASCII  ;/@COLUMN READ1 READ2  CARDS ERRORS/;
2153  013306  046525  020116  042522
2154  013314  042101  020061  042522
2155  013322  042101  020062  041440
2156  013330  051101  051504  042440
2157  013336  051122  051117  027523
2158  013344  040057  045503  041122  MSG20:  .ASCII  ;/@CKRBRD/;
2159  013352  042122     057
2160          013356                          .EVEN
```

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2161
2162                                    ;DATA TABLES FOR DATA RELIABILITY TESTS
2163
2164                                    ;ALPHANUMERIC DECK DATA TABLE
2165                                    ;FIRST VALUE FOR A COLUMN IS THE DIRECT
2166                                    ;CARD IMAGE FOR THAT COLUMN ON CARD 1
2167                                    ;THE SECOND VALUE IS THE ENCODED FORM OF THAT DATA
2168                                                                    ;COLUMN CHAR HOLLERITH
2169  013356  004000                    ALPCD:  4000                    ;1      &       12
2170  013360  000200                            200
2171  013362  004400                            4400                    ;2      A       12 1
2172  013364  000201                            201
2173  013366  004200                            4200                    ;3      B       12 2
2174  013370  000202                            202
2175  013372  004100                            4100                    ;4      C       12 3
2176  013374  000203                            203
2177  013376  004040                            4040                    ;5      D       12 4
2178  013400  000204                            204
2179  013402  004020                            4020                    ;6      E       12 5
2180  013404  000205                            205
2181  013406  004010                            4010                    ;7      F       12 6
2182  013410  000206                            206
2183  013412  004004                            4004                    ;8      G       12 7
2184  013414  000207                            207
2185  013416  004002                            4002                    ;9      H       12 8
2186  013420  000210                            210
2187  013422  004001                            4001                    ;10     I       12 9
2188  013424  000220                            220
2189  013426  004202                            4202                    ;11     CENT    12 8 2
2190  013430  000212                            212
2191  013432  004102                            4102                    ;12     .       12 8 3
2192  013434  000213                            213
2193  013436  004042                            4042                    ;13     <       12 8 4
2194  013440  000214                            214
2195  013442  004022                            4022                    ;14     (       12 8 5
2196  013444  000215                            215
2197  013446  004012                            4012                    ;15     +       12 8 6
2198  013450  000216                            216
2199  013452  004006                            4006                    ;16     |       12 8 7
2200  013454  000217                            217
2201  013456  002000                            2000                    ;17     -       11
2202  013460  000100                            100
2203  013462  002400                            2400                    ;18     J       11 1
2204  013464  000101                            101
2205  013466  002200                            2200                    ;19     K       11 2
2206  013470  000102                            102
2207  013472  002100                            2100                    ;20     L       11 3
2208  013474  000103                            103
2209  013476  002040                            2040                    ;21     M       11 4
2210  013500  000104                            104
2211  013502  002020                            2020                    ;22     N       11 5
2212  013504  000105                            105
2213  013506  002010                            2010                    ;23     O       11 6
2214  013510  000106                            106
2215  013512  002004                            2004                    ;24     P       11 7
2216  013514  000107                            107
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013516  002002          2002            ;25     Q       11 8
013520  000110          110
013522  002001          2001            ;26     R       11 9
013524  000120          120
013526  002202          2202            ;27     :       11 8 2
013530  000112          112
013532  002102          2102            ;28     $       11 8 3
013534  000113          113
013536  002042          2042            ;29     *       11 8 4
013540  000114          114
013542  002022          2022            ;30     )       11 8 5
013544  000115          115
013546  002012          2012            ;31     ;       11 8 6
013550  000116          116
013552  002006          2006            ;32     BLANK   11 8 7
013554  000117          117
013556  001000          1000            ;33     0       0
013560  000040          40
013562  001400          1400            ;34     /       0 1
013564  000041          41
013566  001200          1200            ;35     S       0 2
013570  000042          42
013572  001100          1100            ;36     T       0 3
013574  000043          43
013576  001040          1040            ;37     U       0 4
013600  000044          44
013602  001020          1020            ;38     V       0 5
013604  000045          45
013606  001010          1010            ;39     W       0 6
013610  000046          46
013612  001004          1004            ;40     X       0 7
013614  000047          47
013616  001002          1002            ;41     Y       0 8
013620  000050          50
013622  001001          1001            ;42     Z       0 9
013624  000060          60
013626  001202          1202            ;43             0 8 2
013630  000052          52
013632  001102          1102            ;44     .       0 8 3
013634  000053          53
013636  001042          1042            ;45     %       0 8 4
013640  000054          54
013642  001022          1022            ;46     -       0 8 5
013644  000055          55
013646  001012          1012            ;47     >       0 8 6
013650  000056          56
013652  001006          1006            ;48     ?       0 8 7
013654  000057          57
013656  000000          0000            ;49             BLANK
013660  000000          0
013662  000400          0400            ;50     1       1
013664  000001          1
013666  000200          0200            ;51     2       2
013670  000002          2
013672  000100          0100            ;52     3       3
013674  000003          3
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2273  013676  000040                        0040                    ;53     4       4
2274  013700  000004                        4
2275  013702  000020                        0020                    ;54     5       5
2276  013704  000005                        5
2277  013706  000010                        0010                    ;55     6       6
2278  013710  000006                        6
2279  013712  000004                        0004                    ;56     7       7
2280  013714  000007                        7
2281  013716  000002                        0002                    ;57     8       8
2282  013720  000010                        10
2283  013722  000001                        0001                    ;58     9       9
2284  013724  000020                        20
2285  013726  000202                        0202                    ;59     :       8 2
2286  013730  000012                        12
2287  013732  000102                        0102                    ;60     #       8 3
2288  013734  000013                        13
2289  013736  000042                        0042                    ;61     A       8 4
2290  013740  000014                        14
2291  013742  000022                        0022                    ;62     '       8 5
2292  013744  000015                        15
2293  013746  000012                        0012                    ;63     =       8 6
2294  013750  000016                        16
2295  013752  000006                        0006                    ;64     "       8 7
2296  013754  000017                        17
2297  013756  004000                        4000                    ;65     &       12
2298  013760  000200                        200
2299  013762  004400                        4400                    ;66     A       12 1
2300  013764  000201                        201
2301  013766  004200                        4200                    ;67     B       12 2
2302  013770  000202                        202
2303  013772  004100                        4100                    ;68     C       12 3
2304  013774  000203                        203
2305  013776  004040                        4040                    ;69     D       12 4
2306  014000  000204                        204
2307  014002  004020                        4020                    ;70     E       12 5
2308  014004  000205                        205
2309  014006  004010                        4010                    ;71     F       12 6
2310  014010  000206                        206
2311  014012  004004                        4004                    ;72     G       12 7
2312  014014  000207                        207
2313  014016  004002                        4002                    ;73     H       12 8
2314  014020  000210                        210
2315  014022  004001                        4001                    ;74     I       12 9
2316  014024  000220                        220
2317  014026  004202                        4202                    ;75     CENT    12 8 2
2318  014030  000212                        212
2319  014032  004102                        4102                    ;76     .       12 8 3
2320  014034  000213                        213
2321  014036  004042                        4042                    ;77     <       12 8 4
2322  014040  000214                        214
2323  014042  004022                        4022                    ;78     (       12 8 5
2324  014044  000215                        215
2325  014046  004012                        4012                    ;79     +       12 8 6
2326  014050  000216                        216
2327  014052  004006                        4006                    ;80     |       12 8 7
2328  014054  000217              ALPEND:   217
```

```
 2329
 2330
 2331  014056  002577          BINCD:  2577            ;1   CARD COLUMN
 2332  014060  000137                  137
 2333  014062  007252                  7252            ;2
 2334  014064  000356                  356
 2335  014066  005777                  5777            ;3
 2336  014070  000277                  277
 2337  014072  006777                  6777            ;4
 2338  014074  000337                  337
 2339  014076  000000                  0000            ;5
 2340  014100  000000                  0
 2341  014102  003777                  3777            ;6
 2342  014104  000177                  177
 2343  014106  005777                  5777            ;7
 2344  014110  000277                  277
 2345  014112  007737                  7737            ;8
 2346  014114  000377                  377
 2347  014116  007757                  7757            ;9
 2348  014120  000377                  377
 2349  014122  007767                  7767            ;10
 2350  014124  000377                  377
 2351  014126  003773                  3773            ;11
 2352  014130  000177                  177
 2353  014132  006775                  6775            ;12
 2354  014134  000327                  327
 2355  014136  007776                  7776            ;13
 2356  014140  000357                  357
 2357  014142  002001                  2001            ;14
 2358  014144  000120                  120
 2359  014146  003002                  3002            ;15
 2360  014150  000150                  150
 2361  014152  004404                  4404            ;16
 2362  014154  000207                  207
 2363  014156  004210                  4210            ;17
 2364  014160  000206                  206
 2365  014162  002120                  2120            ;18
 2366  014164  000107                  107
 2367  014166  002040                  2040            ;19
 2368  014170  000104                  104
 2369  014172  004120                  4120            ;20
 2370  014174  000207                  207
 2371  014176  004210                  4210            ;21
 2372  014200  000206                  206
 2373  014202  002404                  2404            ;22
 2374  014204  000107                  107
 2375  014206  003002                  3002            ;23
 2376  014210  000150                  150
 2377  014212  007777                  7777            ;24
 2378  014214  000377                  377
 2379  014216  000000                  0000            ;25
 2380  014220  000000                  0
 2381  014222  006000                  6000            ;26
 2382  014224  000300                  300
 2383  014226  003001                  3001            ;27
 2384  014230  000160                  160
```

```
2385  014232  004402                  4402            ;28
2386  014234  000211                  211
2387  014236  004204                  4204            ;29
2388  014240  000207                  207
2389  014242  002110                  2110            ;30
2390  014244  000107                  107
2391  014246  002060                  2060            ;31
2392  014250  000105                  105
2393  014252  004060                  4060            ;32
2394  014254  000205                  205
2395  014256  004110                  4110            ;33
2396  014260  000207                  207
2397  014262  002204                  2204            ;34
2398  014264  000107                  107
2399  014266  002402                  2402            ;35
2400  014270  000111                  111
2401  014272  005001                  5001            ;36
2402  014274  000260                  260
2403  014276  007777                  7777            ;37
2404  014300  000377                  377
2405  014302  007777                  7777            ;38
2406  014304  000377                  377
2407  014306  000000                  0000            ;39
2408  014310  000000                  0
2409  014312  000577                  0577            ;40
2410  014314  000037                  037
2411  014316  007252                  7252            ;41
2412  014320  000356                  356
2413  014322  000777                  0777            ;42
2414  014324  000037                  37
2415  014326  001000                  1000            ;43
2416  014330  000040                  40
2417  014332  006000                  6000            ;44
2418  014334  000300                  300
2419  014336  002477                  2477            ;45
2420  014340  000137                  137
2421  014342  001777                  1777            ;46
2422  014344  000077                  77
2423  014346  006537                  6537            ;47
2424  014350  000337                  337
2425  014352  005757                  5757            ;48
2426  014354  000277                  277
2427  014356  002767                  2767            ;49
2428  014360  000137                  137
2429  014362  005773                  5773            ;50
2430  014364  000277                  277
2431  014366  002775                  2775            ;51
2432  014370  000127                  127
2433  014372  005776                  5776            ;52
2434  014374  000257                  257
2435  014376  002001                  2001            ;53
2436  014400  000120                  120
2437  014402  005002                  5002            ;54
2438  014404  000250                  250
2439  014406  002404                  2404            ;55
2440  014410  000107                  107
```

```
2441  014412  005210                          5210            ;56
2442  014414  000246                          246
2443  014416  002120                          2120            ;57
2444  014420  000107                          107
2445  014422  005040                          5040            ;58
2446  014424  000244                          244
2447  014426  002120                          2120            ;59
2448  014430  000107                          107
2449  014432  005210                          5210            ;60
2450  014434  000246                          246
2451  014436  002404                          2404            ;61
2452  014440  000107                          107
2453  014442  003002                          3002            ;62
2454  014444  000150                          150
2455  014446  007777                          7777            ;63
2456  014450  000377                          377
2457  014452  000000                          0000            ;64
2458  014454  000000                          0
2459  014456  006000                          6000            ;65
2460  014460  000300                          300
2461  014462  003001                          3001            ;66
2462  014464  000160                          160
2463  014466  004402                          4402            ;67
2464  014470  000211                          211
2465  014472  004204                          4204            ;68
2466  014474  000207                          207
2467  014476  002110                          2110            ;69
2468  014500  000107                          107
2469  014502  002060                          2060            ;70
2470  014504  000105                          105
2471  014506  004060                          4060            ;71
2472  014510  000205                          205
2473  014512  004110                          4110            ;72
2474  014514  000207                          207
2475  014516  002204                          2204            ;73
2476  014520  000107                          107
2477  014522  002402                          2402            ;74
2478  014524  000111                          111
2479  014526  005001                          5001            ;75
2480  014530  000260                          260
2481  014532  007777                          7777            ;76
2482  014534  000377                          377
2483  014536  007777                          7777            ;77
2484  014540  000377                          377
2485  014542  002525                          2525            ;78
2486  014544  000127                          127
2487  014546  005252                          5252            ;79
2488  014550  000256                          256
2489  014552  007777                          7777            ;80
2490  014554  000377              BINEND:     377
2491
2492                              ;MARK SENSE CARD TABLE
2493
2494  014556  007777              MRKCD:      7777
2495  014560  000377                          377
2496  014562  007777                          7777
```

```
2497  014564  000377                  377
2498  014566  004000                  4000
2499  014570  000200                  200
2500  014572  002000                  2000
2501  014574  000100                  100
2502  014576  001000                  1000
2503  014600  000040                  40
2504  014602  000400                  400
2505  014604  000001                  1
2506  014606  000200                  200
2507  014610  000002                  2
2508  014612  000100                  100
2509  014614  000003                  3
2510  014616  000040                  40
2511  014620  000004                  4
2512  014622  000020                  20
2513  014624  000005                  5
2514  014626  000010                  10
2515  014630  000006                  6
2516  014632  000004                  4
2517  014634  000007                  7
2518  014636  000002                  2
2519  014640  000010                  10
2520  014642  000001                  1
2521  014644  000020                  20
2522  014646  003777                  3777
2523  014650  000177                  177
2524  014652  005777                  5777
2525  014654  000277                  277
2526  014656  006777                  6777
2527  014660  000337                  337
2528  014662  007377                  7377
2529  014664  000377                  377
2530  014666  007577                  7577
2531  014670  000377                  377
2532  014672  007677                  7677
2533  014674  000377                  377
2534  014676  007737                  7737
2535  014700  000377                  377
2536  014702  007757                  7757
2537  014704  000377                  377
2538  014706  007767                  7767
2539  014710  000377                  377
2540  014712  007773                  7773
2541  014714  000377                  377
2542  014716  007775                  7775
2543  014720  000367                  367
2544  014722  007776                  7776
2545  014724  000357                  357
2546  014726  005252                  5252
2547  014730  000256                  256
2548  014732  002525                  2525
2549  014734  000127                  127
2550  014736  005252                  5252
2551  014740  000256                  256
2552  014742  002525                  2525
```

```
2553  014744  000127                  127
2554  014746  005252                  5252
2555  014750  000256                  256
2556  014752  002525                  2525
2557  014754  000127                  127
2558  014756  005252                  5252
2559  014760  000256                  256
2560  014762  002525                  2525
2561  014764  000127                  127
2562  014766  005252                  5252
2563  014770  000256                  256
2564  014772  002525                  2525
2565  014774  000127                  127
2566  014776  005252                  5252
2567  015000  000256                  256
2568  015002  002525                  2525
2569  015004  000127                  127
2570  015006  005252                  5252
2571  015010  000256                  256
2572  015012  002525                  2525
2573  015014  000127                  127
2574  015016  007777                  7777
2575  015020  000377                  377
2576  015022  007777                  7777
2577  015024  000377                  377
2578  015026  004000                  4000
2579  015030  000200                  200
2580  015032  002000                  2000
2581  015034  000100                  100
2582  015036  001000                  1000
2583  015040  000040                  40
2584  015042  000400                  400
2585  015044  000001                  1
2586  015046  000200                  200
2587  015050  000002                  2
2588  015052  000100                  100
2589  015054  000003                  3
2590  015056  000040                  40
2591  015060  000004                  4
2592  015062  000020                  20
2593  015064  000005                  5
2594  015066  000010                  10
2595  015070  000006                  6
2596  015072  000004                  4
2597  015074  000007                  7
2598  015076  000002                  2
2599  015100  000010                  10
2600  015102  000001                  1
2601  015104  000020                  20
2602  015106  003777                  3777
2603  015110  000177                  177
2604  015112  005777                  5777
2605  015114  000277                  277
2606  015116  006777                  6777
2607  015120  000337                  337
2608  015122  007377                  7377
```

```
 2609  015124  000377                          377
 2610  015126  007577                          7577
 2611  015130  000377                          377
 2612  015132  007677                          7677
 2613  015134  000377                          377
 2614  015136  007737                          7737
 2615  015140  000377                          377
 2616  015142  007757                          7757
 2617  015144  000377                          377
 2618  015146  007767                          7767
 2619  015150  000377                          377
 2620  015152  007773                          7773
 2621  015154  000377                          377
 2622  015156  007775                          7775
 2623  015160  000367                          367
 2624  015162  007776                          7776
 2625  015164  000357                          357
 2626  015166  005252                          5252
 2627  015170  000256                          256
 2628  015172  002525                          2525
 2629  015174  000127                          127
 2630  015176  005252                          5252
 2631  015200  000256                          256
 2632  015202  002525                          2525
 2633  015204  000127                          127
 2634  015206  005252                          5252
 2635  015210  000256                          256
 2636  015212  002525                          2525
 2637  015214  000127                          127
 2638  015216  005252                          5252
 2639  015220  000256                          256
 2640  015222  002525                          2525
 2641  015224  000127                          127
 2642  015226  005252                          5252
 2643  015230  000256                          256
 2644  015232  002525                          2525
 2645  015234  000127                          127
 2646  015236  005252                          5252
 2647  015240  000256                          256
 2648  015242  002525                          2525
 2649  015244  000127                          127
 2650  015246  005252                          5252
 2651  015250  000256                          256
 2652  015252  002525                          2525
 2653  015254  000127                          127
 2654  015256  000000                          0              ;END MARK SENSE DIAG TABLE
 2655  015260  000000                MRKEND:   0
```

```
2656
2657                                                    .PRINT DECIMAL VALUE IN R2
2658  015262  012767  177773  000146  DECPR:  MOV     #-5,DIGCNT
2659  015270  012767  015444  000144          MOV     #DECPNT+2,DECPNT
2660  015276  012767  000040  000134          MOV     #40,ZERO
2661  015304  012767  177777  000122  TYPT1:  MOV     #-1,DIGIT
2662  015312  005267  000116          TYPT2:  INC     DIGIT
2663  015316  167702  000120                  SUB     @DECPNT,%2
2664  015322  100373                          BPL     TYPT2
2665  015324  067702  000112                  ADD     @DECPNT,%2
2666  015330  004767  000020                  JSR     %7,DECOUT
2667  015334  005267  000076                  INC     DIGCNT
2668  015340  001001                          BNE     TYPT3
2669  015342  000207                          RTS     %7
2670  015344  062767  000002  000070  TYPT3:  ADD     #2,DECPNT
2671  015352  000754                          BR      TYPT1
2672  015354  005767  000054          DECOUT: TST     DIGIT
2673  015360  001010                          BNE     DEC1
2674  015362  022767  177777  000046          CMP     #-1,DIGCNT
2675  015370  001404                          BEQ     DEC1
2676  015372  016767  000042  000034          MOV     ZERO,DIGIT
2677  015400  000406                          BR      DEC2
2678  015402  012767  000060  000030  DEC1:   MOV     #60,ZERO
2679  015410  052767  000060  000016          BIS     #60,DIGIT
2680  015416  105777  163374          DEC2:   TSTB    @TCSR
2681  015422  100375                          BPL     .-4
2682  015424  016777  000004  163366          MOV     DIGIT,@TDBR
2683  015432  000207                          RTS     %7
2684  015434  000000                  DIGIT:  0
2685  015436  000000                  DIGCNT: 0
2686  015440  000040                  ZERO:   40
2687  015442  015444                  DECPNT: .+2
2688  015444  023420                          10000.
2689  015446  001750                          1000.
2690  015450  000144                          100.
2691  015452  000012                          10.
2692  015454  000001                          1.
2693
2694          000001                          .END
```

.COUNT =.000000		533#	594#	966#	968#	973	988#	995#	997#	1002	1015#	1021#	1023#	1031#
		1041#	1047#	1049#	1055	1057#	1073#	1084#	1085#	1086#	1087#	1088#	1092#	1094#
		1100	1104#	1113#	1115#	1121	1128#	1133#	1135#	1141#	1144	1150#	1299#	1301#
		1494#	1500#	1504	1512#	1517	1555#							
ALCNT	007140	1480	1483#											
ALCON	007116	1351	1373	1434	1478#	1547								
ALLOK	007210	1497	1500#											
ALPCO	013356	1285	2169#											
ALPEND	014054	1286	2328#											
ALP1	006002	1280	1285#											
ALWAIT	007244	1499	1509#	1556										
BEGIN	001150	558	608#											
BELL	011420	1251	1437	1478	1520	1549	1751	1808	1903#					
BINCO	014056	1281	2331#											
BINEND	014554	1282	2490#											
B.CK	011670	1952	1966#											
CARDIM	011272	1787#	1788#	1826	1828	1863#								
CDCNT	007102	1269#	1271#	1349	1371	1387	1417	1454#	1470#	1539				
CKBITB	011506	622	654	685	1233	1244	1352	1374	1542	1885	1923#	1931		
CKCOL	011034	1798	1816#											
CKCRD	011020	1800	1812#											
CKDONE	011256	1855	1858#	1859										
CKFAIL	011112	1827	1829	1831#										
CKHLT	011244	1833	1854#											
CKLOOP	010734	1792#	1806	1811	1813	1815	1821	1857	1860					
CKLP1	010754	1797#	1802	1830										
CKLP2	011060	1823#	1824											
CKNOMD	011150	1835	1839#											
CKSAME	010676	568	1785#											
CKSIT	011004	1794	1804	1808#										
CKSIT1	011010	1809#	1810											
CK4	001556	717	722	724#										
CK5	001722	758	771#											
CK9	002534	948	951#											
CLCNT	007104	1316#	1390	1414	1455#	1471#	1545	1792#	1812	1817#	1840			
CLRTR	011372	623	655	891	936	1896#								
CNT23A	005332	1161	1164#											
CNT23B	005350	1168	1171#											
CNT23C	005370	1175	1178#											
CNT23D	005406	1182	1185#											
CNT23E	005426	1189	1192#											
CNT23F	005446	1196	1199#											
CNT23G	005472	1204	1208#											
CNT24A	005540	1224	1227#	1230										
CNT24B	005570	1232	1235#											
CONTD	006024	1278	1284	1288#										
CONT10	002702	976	988#											
CONT11	003020	1005	1011	1015#										
CONT2	001414	673	677#											
CONT21	005166	1123	1127#											
CONT22	005272	1145	1148#											
CONT4	001576	727	731#											
CONT8	002422	916#	925											
COUNT =.000001		534#	624#	625#	627#	629#	660#	661#	663#	665#	667#	711#	718#	734#
		753#	763	765#	777	797#	802#	841#	850#	860	907#	908#	915#	934#
		942#	943#	945#	994#	1013#	1118#	1119#	1324#	1325#	1677#	1678#	1680#	1683#

```
                    1684*  1822*  1823*  1979*  1986*  1997   1999*  2004*
CRB1  =%000004       537#   593*   766    788    801    852    906    910    916    941   1012   1159*  1166*
                    1173*  1180   1317   1327   1359   1816   1825   1889
CRB2    001026       581#   914    920   1187*  1194*  1201   1210   1323
CRLF    012206      1570   1571   1572   1573   1585   1586   1587   1588   1599   1600   1601   1602   1619
                    1620   1621   1622   1632   1633   1634   1635   1650   1651   1652   1653   1668   1669
                    1670   1671   1701   1702   1703   1704   1719   1720   1721   1722   1744   1745   1746
                    1747   1839   1956   2037   2046#
CRS   =.000003       536#   592*   635    640*   641    646*   647    656*   657    672    677*   678    686*
                     687*   688    692    694    696    700    712*   713    716    719    721    724    728
                     731    740    743*   744    754*   755    757    759    767    771    781    784*   785
                     789    798*   799    804    806    808    810    813    815    817*   818    823    827
                     840*   842    844    848    854    856    864*   865    868    870    874*   875    879
                     881    883    892*   893    895    897    901#   902    937#   938    940#   947    951
                     953    970*   971    974*   977    981    984    987*   999*  1000   1003*  1006*  1008
                    1024*  1025   1030*  1041*  1052*  1053   1056*  1069   1072*  1084*  1085*  1086*  1087*
                    1088*  1095*  1096   1106   1108*  1117*  1122*  1126*  1137*  1148*  1156*  1157   1160
                    1164   1167   1171   1174   1178   1181   1185   1188   1192   1195   1199   1203   1208
                    1211   1219*  1220   1222*  1223   1227   1229   1231   1237   1240   1242   1303*  1308
                    1311   1313   1318   1346   1358*  1366   1368   1412   1432   1452*  1453*  1460   1483*
                    1484   1490   1495*  1496   1502*  1505*  1509*  1510   1513*  1515   1522   1525   1528
                    1531*  1532   1575   1578   1604   1607   1610   1637   1640   1643   1673   1676*  1686
                    1689   1692   1724   1726*  1727   1729   1737   1793   1795*  1797   1799   1801   1803
                    1809   1818   1858   1870*  1886   1888*  1890   1923
C.CONT  012004      1992   1996#
C.WAIT  011750      1987#  1988   2008
DATENC  007112      1323*  1335   1407   1474#
DATST   005672      1250   1269#
DATST1  005702      1271#  1449
DATST2  005706      1270   1272#
DATST3  005746      1274   1279#
DAT1    007106      1317*  1329   1398   1472#  1816*  1826   1843
DAT2    007110      1327*  1332   1401   1473#  1825*  1828   1846
DBRCKB  002412       896    914#
DCNT1   006062      1289   1296#
DECK    007074      1277*  1283*  1287*  1384   1467#
DECKCK  006774      1440   1445#  1482   1536   1553
DECOUT  015354      2666   2672#
DECPNT  015442      2659*  2663   2665   2670*  2687#
DECPR   015262      1388   1391   1841   2658#
DEC1    015402      2673   2675   2678#
DEC2    015416      2677   2680#
DELAY   011274       560   1867#
DIGCNT  015436      2658*  2667*  2674   2685#
DIGIT   015434      2661*  2662*  2672   2676*  2679*  2682   2684#
DLAY0   011340      1869*  1871*  1875*  1879#
DLAY1   011342      1872*  1873*  1880#
DONE3   001502       693    700#
DONE7   002216       849    857    860#
D.1     012076      2011   2017#
D.2     012110      2013   2015   2020#
END     011476      1907   1918#
ENDCK   005622      1234   1236   1243   1248#
END24   005602      1226   1240#  1241
ERCM11  007474       562   1559#
ERFLG   001036       586#  1272*  1379   1381*  1791*  1834   1836*
```

```
ERR6    002114            807    827#
ERSET   006300           1312   1344#
ERI     006322           1349#
FAIL    006350           1330   1333    1336    1357#
FCNT    006430           1367   1371#
FPRINT  006456           1362   1379#
FTEST   006410           1366#  1369
HL    = 104000            530#   537     643     649     659     674     680     690     698     702     726     730     733
                          736    739     742     746     761     769     773     779     783     787     791     812     820
                          825    829     831     846     858     862     867     872     877     885     899     904     912
                          918    922     949     955     957     975     979     983     986    1004    1010    1028    1041
                         1064   1071    1082    1084    1085    1086    1087    1088    1102    1124    1147    1162    1169
                         1176   1183    1190    1197    1205    1213    1225    1235    1239    1321    1345    1416    1462
                         1464   1489    1492    1498    1506    1518    1524    1527    1530    1534    1541    1548    1577
                         1580   1606    1609    1612    1639    1642    1645    1688    1691    1694    1731    1739    1805
                         1814   1820    1892
INIT    011344            710    752     796     839     890     935     965     993    1020    1041    1046    1084    1085
                         1086   1087    1088    1091    1112    1132    1155    1218    1296    1565    1594    1627    1659
                         1675   1710    1885#
INTFLG  001012            575#   595*   1041*   1059    1061    1076   1078*   1080   1084*   1085*   1086*   1087*   1088*
INTVC   001014            576#   594
ITCNT   012124           1763#  1767*   2014    2016*   2020*   2024#
ITMAX   012122            591*  1564*   1764*   1918*   2014    2023#
KCRBI   001024            580#   593
KCRS    001022            579#   592
LACNT = 006770           1423#  1424*   1426*   1428*   1430*
LASTCD  006750           1436#
LASTCK  006656           1322   1348    1370    1417#   1463    1465
LASTWT  006674           1418   1421#
LOGIC   011466           1914#
LOGICA  005650            553   1256#
LOOP11  002744            998#  1014
LOOP3   001454            689    692#    695
LOOP4   001524            713#   715     720
LOOP4B  001542            719#   723
LOOP5   001654            755#   764     770
LOOP6   002012            799#   803
LOOP7   002144            842#   843     853
LOOP8   002330            893#   911
L.EOMK  012204           2030*  2032    2043#
L.INC   012142           2031#  2038
L.TOUT  012144           2032#  2042
MRKCD   014556           1275   2494#
MRKEND  015260           1276   2655#
MSG1    012254           1581   1615    1646    1666    1697    1717    1740    2058#
MSG13   013066           1382   2127#
MSG14   013154           1287   2136#
MSG15   013165           1283   2138#
MSG17   013176           1928   2140#
MSG18   013261           1926   2149#
MSG19   013301           1837   2152#
MSG2    012347           1568   1583    1597    1617    1630    1648    1662    1699    1713    1742    2068#
MSG20   013344           1277   2158#
MSG3    012414           1566   1711    2075#
MSG4    012454           1041   1084    1085    1086    1087    1088    2081#
MSG5    012507           1595   1660    2086#
```

```
MSG6    012560          1613    1695    2093#
MSG7    012624          1628    2099#
MSG8    012703          1664    2107#
MSG9    012761          1715    2115#
NOHD    006500          1380    1384#
NOP   = 000240           529#
NOTCD   007044          1413    1459#
NOTCD1  007066          1461    1464#
NOTCOL  006636          1315    1412#
NXCRD   007020          1302    1353    1375    1419    1451#   1543
OFFSET  007370          1310    1539#
OFFS1   007414          1540    1545#
OFFS2   007454          1551    1554#
OFF6    002102           809     816     823#
PC    =%000007           540#
PIRQ    001040           587#
PRINT   011574           548    1950#
PROC    001034           584#    631     669     926     958    1896*
PROCT   011714          1041    1084    1085    1086    1087    1088    1396    1399    1402    1405    1408    1844    1847
                        1850    1853    1959    1964    1976#
PSP   = 177776           528#    606*    967*    968     969*    973*    996*    997     998#    1002*   1022*   1023    1041*
                        1046*   1049    1050*   1051*   1055*   1084*   1085*   1086*   1087*   1088*   1093*   1094    1098*
                        1100*   1114*   1115    1116*   1121*   1134*   1135    1136*   1143*   1144*   1300*   1301    1320*
                        1344*   1357*   1421*   1459*   1493*   1494    1501*   1504*   1514*   1517*   1554*   1555    1896
                        1898    2018*
PSSET   001212           613     615     617#
PSSET1  006060          1291    1293    1295#
PTOFF   007114          1328*   1331*   1334*   1393    1475#
RESETB  007740          1612#
RESTRT  001156           610#   1253    1263    1448
REST8   002450           919     923     926#
REST9   002556           950     952     956     958#
RETRNX  010674          1760*   1761*   1766    1768    1769#
RETURN  012126           620*   1560*   1753*   1765*   2019    2021*   2025#
RSETC   010110          1646#
RSETD   010330          1695#
RSETE   010530          1740#
RTT   = 000006           532#    601
R0    =%000000           599*
R2    =%000002           535#    914*    920    1041*   1084*   1085*   1086*   1087*   1088*   1201*   1202*   1382*   1384*
                        1387*   1390*   1395*   1398*   1401*   1404*   1407*   1566*   1568*   1581*   1583*   1595*   1597*
                        1613*   1615*   1617*   1628*   1630*   1646*   1648*   1660*   1662*   1664*   1666*   1695*   1697*
                        1699*   1711*   1713*   1715*   1717*   1740*   1742*   1837*   1840*   1843*   1846*   1849*   1852*
                        1906*   1914    1926*   1928*
R5    =%000005           538#    906*    910     916    1329    1332    1335    1337    1339*   1393*   1395    1404    1451*
SAVPC   011710          1953*   1958    1973#
SAVPSR  011712          1954*   1963    1974#
SAVR2   011702          1957*   1965    1970#
SAVR3   011704          1971#   1976*   1993
SAVR4   011706          1972#   1977*   1994
SCONT1  006200          1319    1323#
SCOPE = 104400           531#    621     651     682     704     749     793     833     888     931     963     991    1018
                        1041    1045    1084    1085    1086    1087    1088    1090    1110    1130    1152    1215    1248
                        1563    1593    1626    1658    1709    1750
SCOPEC  012042           550    2010#
SETUP   001042           591#    608    1559    1758    1785    1867
```

```
SET1    004764          1088#
SET14   003502          1077    1080#
SET2    004552          1087#
SET3    004340          1086#
SET4    004126          1085#
SET5    003714          1084#
SET*    003310          1041#
SP    =%000006           539#   557#   559#   561#   564#   567#   604    610#   611#   616#   631#   632#   669#
                         670#   926#   927#   958#   959#   980    1007   1029   1041   1075   1084   1085   1086
                        1087    1088   1103   1125   1288#  1289#  1294#  1436   1508   1521   1535   1897#  1898#
                        1899#
SPACE   011542          1386    1389   1392   1397   1400   1403   1406   1842   1845   1848   1851   1937#  1941
SPACEX  011572          1940#   1942#  1944#
SR    = 177570           527#    614   1249   1273   1279   1292   1360   1363   1438   1446   1479   1550   1760
                        1787    1832   1854   1869   1950   1966   2010   2012
SRVC    006122          1299    1308#
SRVC1   007242          1500    1508#
SRVC2   007312          1512    1520#
SRVC2A  007320          1519    1522#
STACK   001000           557     559    561    564    567    573#
TCSR    001016           577#   1903   1908   1911   1937   1960   1987   2029#  2039   2046   2049   2052   2680
TDBR    001020           578#   1905#  1910#  1939#  1962#  1989#  2041#  2048#  2051#  2054#  2682#
TEND    007100          1276#   1282#  1286#  1337   1469#
TEST    001214           609     611    620#
TESTA   007506          1560    1563#  1753   1754
TESTB   007642          1593#
TESTC   010012          1626#
TESTD   010152          1658#
TESTE   010402          1709#
TESTG   010572          1750#
TESTX   010614           565    1758#
TEST1   001222           621#   2025
TEST1A  001224           620     622#
TEST10  002570           959     963#
TEST11  002712           991#
TEST12  003030          1018#
TEST13  003110          1041#
TEST14  003322          1041    1045#
TEST15  003514          1060    1062   1068   1079   1081   1084#
TEST16  003726          1084    1085#
TEST17  004140          1085    1086#
TEST18  004352          1086    1087#
TEST19  004564          1087    1088#
TEST2   001322           644     651#
TEST20  004776          1088    1090#
TEST21  005102          1110#
TEST22  005176          1130#
TEST23  005304          1152#
TEST24  005510          1163    1170   1177   1184   1191   1198   1206   1212   1215#
TEST3   001430           675     682#
TEST4   001512           691     697    699    701    704#
TEST5   001642           749#
TEST6   001776           762     776    793#
TEST7   002130           819     822    824    826    830    833#
TEST8   002314           847     859    863    873    878    882    888#
TEST9   002462           900     905    913    927    931#
```

```
TIM24   005574          1228    1237#
TINT10  002652           966     977#
TINT11  002776           995    1006#
TINT12  003072          1021    1028#
TINT13  003226          1041#
TINT14  003440          1047    1069#
TINT15  003632          1084#
TINT16  004044          1085#
TINT17  004256          1086#
TINT18  004470          1087#
TINT19  004702          1088#
TINT20  005056          1092    1102#
TNINT   005160          1113    1124#
TO.CRD  011270          1789#   1796#   1849    1862#
TOTERR  011266          1790#   1831#   1852    1861#
TOUT    012130          1041    1084    1085    1086    1087    1088    1383    1385    1567    1569    1582    1584    1596
                        1598    1614    1616    1618    1629    1631    1647    1649    1661    1663    1665    1667    1696
                        1698    1700    1712    1714    1716    1718    1741    1743    1838    1927    1929    2029#
TRET    001122           597     603#
TRFLG   001032           593#    596#    612    1252#   1290    1445#
TRTRAP  001030           545     582#    601#    603#
TSTART  007076          1275#   1281#   1285#   1339    1451    1468#
TST1B   001264           632     634#
TST2A   001402           670     672#
TYPT1   015304          2661#   2671
TYPT2   015312          2662#   2664
TYPT3   015344          2668    2670#
T2INT   005242          1133    1140#
T2INTA  005266          1141    1146#
WAIT9   002522           947#
XLOOP   010664          1765    1767#
ZERO    015440          2660#   2676    2678#   2686#
.       = 015456           543     544#    547#    552#    556#    563#    572#    574#    602     626     629     630     636
                           642     648     658     662     664     666     668     679     725     729     732     735     737
                           738     741     745     756     760     768     772     778     782     786     790     800     805
                           811     814     828     845     851     855     861     866     869     871     876     880     884
                           894     898     903     909     917     921     939     944     946     954     972     978     982
                           985    1001    1009    1026    1027    1041    1054    1070    1084    1085    1086    1087    1088
                          1097    1101    1107    1120    1139    1158    1165    1172    1179    1186    1193    1200    1209
                          1221    1238    1305    1309    1314    1326    1338    1347    1350    1361    1364    1372    1415
                          1423    1425    1427    1429    1431    1433    1439    1447    1488    1491    1507    1511    1516
                          1523    1526    1529    1533    1546    1576    1579    1605    1608    1611    1638    1641    1644
                          1674    1679    1681    1683    1685    1687    1690    1693    1725    1728    1730    1738    1819
                          1887    1891    1904    1909    1912    1924    1938    1951    1961    1967    1982    1998    2033
                          2036    2040    2047    2050    2053    2160#   2681    2687
```

DZCMBB.P11 CROSS REFERENCE TABLE -- PERMANENT SYMBOLS

```
.MACR    1040
.NLIST      1     523
.REM        1
.REPT     543
.TITLE    524
```

```
ERRORS DETECTED:  0
DEFAULT GLOBALS GENERATED:  0

*DZCMBB,DZCMBB.SEQ/SOL/CRF/DS:ERFZ/EN:ABS=DSKM:DZCMBB.P11
RUN-TIME:  9 19  4 SECONDS
RUN-TIME RATIO: 87/33=2.6
CORE USED:  8K  (16 PAGES)
```