CM11-F

DIAGNOSTIC

MD-11-DZCMB-B

EP-DZCMB-B-DL-A

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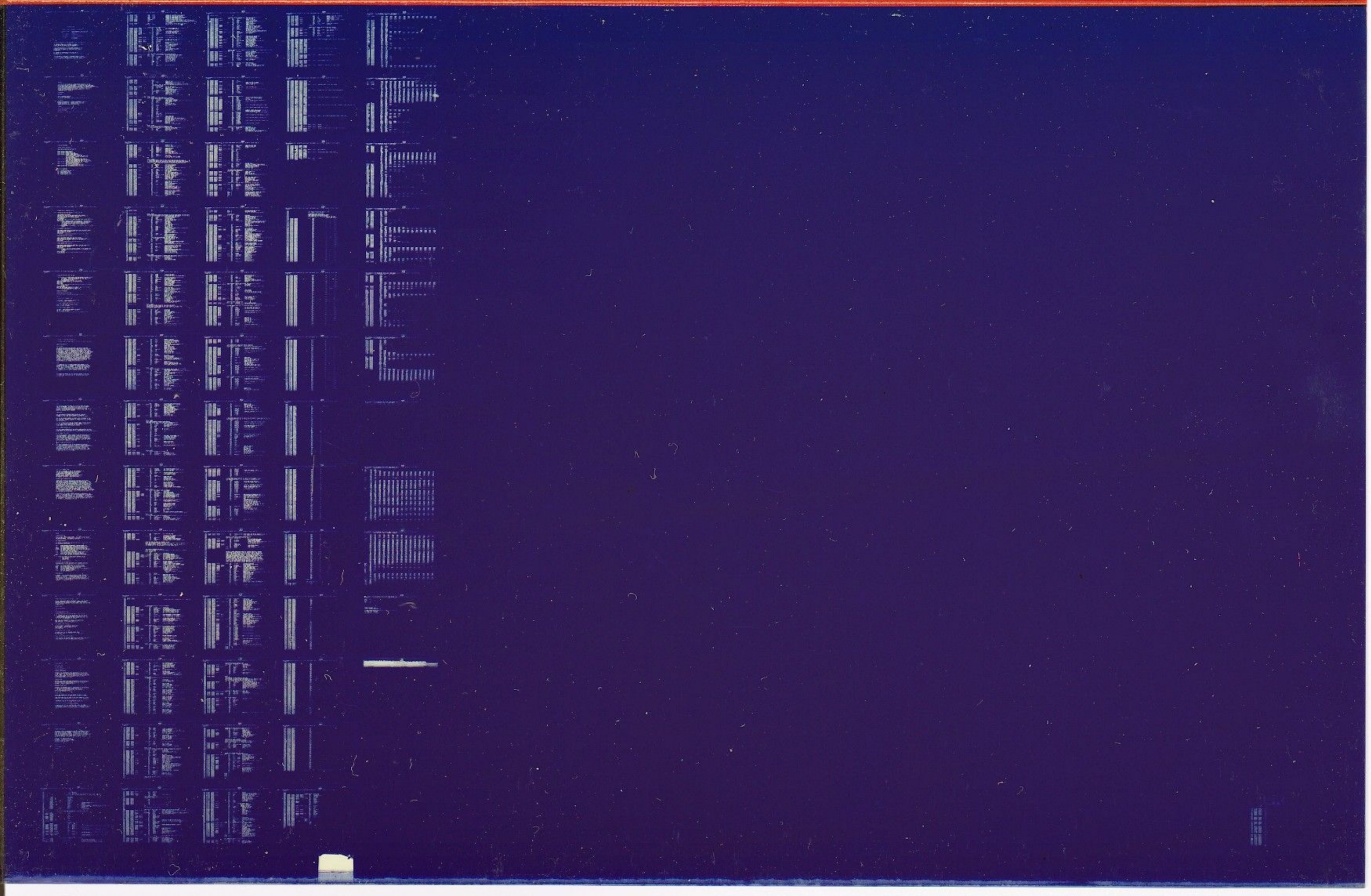

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IDENTIFICATION

PRODUCT CODE:	MAINDEC-11-DZCM8-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 DM-200 (80 COLUMN)

2.2 TEST DECKS

MAINDEC-DO-DZCMA-A-CA PUNCHED ALPHANUMERIC TEST DECK
MAINDEC-DO-DZCMA-A-CB PUNCHED BINARY TEST DECK
MAINDEC-DO-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:

```
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 DM-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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577  001016  177564                    TCSR:   177564                  ;ADDRESS OF TELETYPE STATUS REGISTER
578  001020  177566                    TDBR:   177566                  ;ADDRESS OF TELETYPE DATA BUFFER
579  001022  177160                    KCRS:   177160                  ;ADDRESS OF CARD READER STATUS REGISTER
580  001024  177162                    KCRB1:  177162                  ;ADDRESS OF CARD READER DATA BUFFER
581  001026  177164                    CRB2:   177164                  ;ADDRESS TO READ ENCODED DATA
582  001030  000002                    TRTRAP: RTI                     ;RETURN FROM TRACE LOOP (CHANGED TO RTT FOR AN 11/45)
583  001032  000000                    TRFLG:  0                       ;TOGGLED TO SWITCH BETWEEN TRACE TRAPPING AND NORMAL FLO
584  001034  000000                    PROC:   0                       ;STORES PROCESSOR STATUS WHEN TRACE TRAP MUST BE CLEARED
585                                                                    ;IN A SUBTEST
586  001036  000000                    ERFLG:  0                       ;SET TO ZERO TO OUTPUT DATA ERROR HEADING
587  001040  177772                    PIRQ:   177772                  ;ADDRESS OF PDP 11/45 PIRQ REGISTER
588
589
590                                    ;INITIALIZE CSR AND DBR POINTERS
591  001042  012767  000001  011052    SETUP:  MOV     #1,ITMAX        ;SET ITERATION MAXIMUM TO 1 ITERATION
592  001050  016703  177746            MOV     KCRS,CRS                ;SET UP REGISTER POINTERS
593  001054  016704  177744            MOV     KCRB1,CRB1
594  001060  016700  177730            MOV     INTVC,ADINT             ;LOAD ADDRESS OF INTERRUPT VECTOR
595  001064  005067  177722            CLR     INTFLG                  ;INITIALIZE INTERRUPT FLAG
596  001070  005067  177736            CLR     TRFLG                   ;INITIALIZE TRACE FLAG
597  001074  012737  001122  000010    MOV     #TRET,@#10              ;SETUP RESVD INST TRAP RETURN
598  001102  005037  000012            CLR     @#12
599  001106  006700                    SXT     R0                      ;SIGN EXTEND INST.
600  001110  000240                    NOP
601  001112  012737  000006  001030    MOV     #RTT,@#TRTRAP           ;IF NO TRAP THIS IS AN 11/45 OR 11/40
602  001120  000404                    BR      .+12
603  001122  012737  000002  001030    TRET:   MOV     #RTI,@#TRTRAP   ;IF TRAP, NOT AN 11/45 OR 11/40
604  001130  022626                    CMP     (SP)+,(SP)+             ;RESTORE STACK POINTER
605  001132  012737  000012  000010    MOV     #12,@#10
606  001140  012767  000340  176630    MOV     #340,PSR                ;SETUP PROCESSOR STATUS TO LEVEL 7
607  001146  000207                    RTS     %7                      ;RETURN
608  001150  004767  177666            BEGIN:  JSR     %7,SETUP        ;INITIALIZE POINTERS AND FLAGS
609  001154  000417                    BR      TEST                    ;GO TO INSTRUCTION TESTS
610  001156  012746  000340            RESTRT: MOV     #340,-(SP)      ;PUSH STATUS ON STACK
611  001162  012746  001214                    MOV     #TEST,-(SP)     ;PUSH PC ON STACK
612  001166  005767  177640                    TST     TRFLG           ;CHECK FLAG
613  001172  100007                    BPL     PSSET                   ;IF IT IS POSITIVE, CLEAR T BIT
614  001174  032767  010000  176366            BIT     #10000,SR       ;TRACE TRAPPING INHIBITED?
615  001202  001003                    BNE     PSSET                   ;BRANCH IF YES
616  001204  012766  000360  000002            MOV     #360,2(SP)      ;SET T BIT ON STACK
617  001212  000002                    PSSET:  RTI
618
619                                    ;TEST FOR CORRECT INITIALIZATION OF STATUS REGISTER
620  001214  012767  001224  010704    TEST:   MOV     #TEST1A,RETURN  ;SETUP SCOPE LOOP RETURN ADDRESS
621  001222  104400                    TEST1:  SCOPE                   ;SO ALL TESTS START WITH SCOPE
622  001224  004767  010256            TEST1A: JSR     %7,CKBIT8       ;CHECK FOR OFF-LINE SET
623  001230  004767  010136                    JSR     %7,CLRTR        ;STORE PROCESSOR STATUS AND CLEAR TRACE BIT
624  001234  005001                            CLR     COUNT           ;INITIALIZE COUNTER
625  001236  005201                            INC     COUNT           ;WAIT TO BE CERTAIN
626  001240  001376                            BNE     .-2             ;THAT ALL CARDS ARE
627  001242  005201                            INC     COUNT           ;THRU BEFORE ISSUING
628  001244  001376                            BNE     .-2             ;INIT
629  001246  005201                            INC     COUNT
630  001250  001376                            BNE     .-2
631  001252  016746  177556                    MOV     PROC,-(SP)      ;RESTORE PROCESSOR STATUS
632  001256  012746  001264                    MOV     #TST1B,-(SP)
```

```
   633  001262  000002                          RTI
   634  001264  000005          TST1B:  RESET                   ;SEND OUT INIT
   635  001266  005713                  TST     @CRS            ;CHECK FOR STATUS REGISTER ALL ZERO
   636  001270  001401                  BEQ     .+4             ;BRANCH IF OK
   637  001272  104000                  HLT                     ;STATUS REGISTER NOT CORRECTLY INITIALIZED
   638                                   ;ONLY BITS 1 AND 6 OF THE STATUS REGISTER SHOULD BE ABLE TO BE SET TO ONE
   639                                   ;AND READ BACK AS ONE
   640  001274  052713  177776          BIS     #177776,@CRS    ;SET ALL BITS BUT 0
   641  001300  022713  000102          CMP     #102,@CRS       ;ONLY BITS 1 AND 6 SHOULD BE SET
   642  001304  001402                  BEQ     .+6             ;BRANCH IF OK
   643  001306  104000                  HLT                     ;STATUS REGISTER DIDN'T CONTAIN 102
   644  001310  000404                  BR      TEST2           ;BRANCH AFTER FAILURE
   645                                   ;CLEARING STATUS REGISTER SHOULD CLEAR BITS 1 AND 6
   646  001312  005013                  CLR     @CRS            ;CLEAR BITS 1 AND 6
   647  001314  005713                  TST     @CRS            ;CHECK FOR ALL BITS CLEAR
   648  001316  001401                  BEQ     .+4             ;BRANCH IF OK
   649  001320  104000                  HLT                     ;BIT 1 AND/OR BIT 6 DIDN'T CLEAR
   650
   651  001322  104400          TEST2:  SCOPE
   652                                   ;START SHOULD CAUSE CARD DONE WITHIN 1 SECOND
   653                                   ;BIT 0 SHOULD ALWAYS READ AS BEING EQUAL TO ZERO
   654  001324  004767  010156          JSR     %7,CKBIT8       ;CHECK FOR OFF-LINE SET
   655  001330  004767  010036          JSR     %7,CLRTR        ;STORE CURRENT PROCESSOR STATUS AND CLEAR TRACE BIT
   656  001334  005213                  INC     @CRS            ;START READING A CARD
   657  001336  032713  000001          BIT     #1,@CRS         ;CHECK BIT 0
   658  001342  001401                  BEQ     .+4             ;BRANCH IF NOT SET
   659  001344  104000                  HLT                     ;BIT 0 READ AS A ONE
   660  001346  005001                  CLR     COUNT           ;INITIALIZE COUNTER
   661  001350  005201                  INC     COUNT           ;WAIT
   662  001352  001376                  BNE     .-2
   663  001354  005201                  INC     COUNT
   664  001356  001376                  BNE     .-2
   665  001360  005201                  INC     COUNT
   666  001362  001376                  BNE     .-2
   667  001364  005201                  INC     COUNT
   668  001366  001376                  BNE     .-2
   669  001370  016746  177440          MOV     PROC,-(SP)      ;RESTORE PROCESSOR STATUS
   670  001374  012746  001402          MOV     #TST2A,-(SP)
   671  001400  000002                  RTI
   672  001402  032713  040000  TST2A:  BIT     #40000,@CRS     ;CHECK CARD DONE
   673  001406  001002                  BNE     CONT2           ;CONTINUE IF SET
   674  001410  104000                  HLT                     ;CARD DONE DIDN'T SET WITHIN 400 MS
   675  001412  000406                  BR      TEST3           ;NOTE THAT FAILURE COULD BE DUE TO READ
   676                                                           ;NOT BEING RESET
   677  001414  052713  040000  CONT2:  BIS     #40000,@CRS     ;DATO TO STATUS REGISTER SHOULD CLEAR
   678  001420  032713  040000          BIT     #40000,@CRS     ;CARD DONE
   679  001424  001401                  BEQ     .+4             ;BRANCH IF IT DID
   680  001426  104000                  HLT                     ;DATO DIDN'T CLEAR CARD DONE
   681
   682  001430  104400          TEST3:  SCOPE
   683                                   ;BUSY (BIT 9) SHOULD BE SET BY READING A CARD
   684                                   ;IT SHOULD REMAIN SET UNTIL CARD DONE SETS, WHICH SHOULD CLEAR IT
   685  001432  004767  010050          JSR     %7,CKBIT8       ;CHECK FOR OFF-LINE SET
   686  001436  005013                  CLR     @CRS            ;INITIALIZE STATUS REGISTER
   687  001440  005213                  INC     @CRS            ;READ A CARD
   688  001442  032713  001000          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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                                        BEQ     .+4
                                        HLT                     ;BITS 11,14, AND 15 WEREN'T ALL CLEARED


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


                        TEST6:  SCOPE
                        ;TIMING ERROR SHOULD SET BIT 1' BEFORE CARD DONE OCCURS, EVEN IF IT OCCURS AT COLUMN 80
                        ;A DATOB TO THE LOW BYTE OF THE CRS SHOULD CLEAR BITS 15,14, AND 11
                                        JSR     %7,INIT         ;INITIALIZE
                                        MOV     #77.,COUNT      ;SETUP COUNTER
                                        INC     @CRS            ;START READING A CARD
                        LOOP6:          TSTB    @CRS            ;WAIT FOR COLUMN READY
                                        BPL     .-2
```

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 801  002016  005714                          TST     @CRB1           ;CLEAR COLUMN READY
 802  002020  005301                          DEC     COUNT           ;GO THRU LOOP FOR 1ST 78 COLUMN READY'S
 803  002022  100373                          BPL     LOOP6
 804  002024  032713  144000                  BIT     #144000,@CRS    ;WAIT FOR CARD DONE OR TIMING ERROR
 805  002030  001775                          BEQ     .-4             ;OR SPECIAL CONDITION
 806  002032  032713  040000                  BIT     #40000,@CRS     ;CARD DONE SET?
 807  002036  001026                          BNE     ERR6            ;YES, 2 POSSIBLE TEST FAILURES
 808  002040  032713  004000                  BIT     #4000,@CRS      ;CHECK TIMING ERROR
 809  002044  001416                          BEQ     OFF6            ;IF NOT SET, READER IS PROBABLY OFF-LINE
 810  002046  105713                          TSTB    @CRS            ;CHECK COLUMN READY
 811  002050  100001                          BPL     .+4             ;BRANCH IF CLEAR
 812  002052  104000                          HLT                     ;TIMING ERROR DIDN'T CLEAR READY
 813  002054  005713                          TST     @CRS            ;WAIT FOR SPECIAL CONDITION
 814  002056  100376                          BPL     .-2
 815  002060  032713  040000                  BIT     #40000,@CRS     ;CHECK CARD DONE
 816  002064  001406                          BEQ     OFF6            ;IF NOT SET, READER IS PROBABLY OFF-LINE
 817  002066  105013                          CLRB    @CRS            ;DATOB TO LOW BYTE OF CRS
 818  002070  032713  144000                  BIT     #144000,@CRS    ;CHECK BITS 15,14,11
 819  002074  001415                          BEQ     TEST7           ;BRANCH IF CLEAR TO NEXT TEST
 820  002076  104000                          HLT                     ;DATOB TO LOW BYTE OF CRS DIDN'T CLEAR
 821                                                                  ;BITS 15,14 AND/OR 11
 822  002100  000413                          BR      TEST7           ;GO TO NEXT TEST
 823  002102  032713  000400          OFF6:   BIT     #400,@CRS       ;CHECK BIT 8
 824  002106  001010                          BNE     TEST7           ;BRANCH IF SET
 825  002110  104000                          HLT                     ;BIT 15 WAS SET, 8 WASN'T
 826  002112  000406                          BR      TEST7           ;GO TO NEXT TEST
 827  002114  032713  004000          ERR6:   BIT     #4000,@CRS      ;TIMING ERROR SET?
 828  002120  001402                          BEQ     .+6             ;NO, BRANCH
 829  002122  104000                          HLT                     ;TIMING ERROR DIDN'T SET BEFORE CARD DONE
 830  002124  000401                          BR      TEST7           ;GO TO NEXT TEST AFTER ERROR
 831  002126  104000                          HLT                     ;TIMING ERROR WASN'T SET
 832
 833  002130  104400                  TEST7:  SCOPE
 834                                  ;NOT READING THE BOTH COLUMN OF DATA FROM THE BUFFER
 835                                  ;SHOULD CAUSE A TIMING ERROR ON THE FIRST COLUMN OF THE NEXT CARD
 836                                  ;SETTING EJECT SHOULD CLEAR TIMING ERROR, AND BIT 15 SHOULDN'T SET
 837                                  ;INCB SHOULD START A READ
 838
 839  002132  004767  007206                  JSR     %7,INIT         ;INITIALIZE
 840  002136  105213                          INC     @CRS            ;START READ
 841  002140  012701  000120                  MOV     #80.,COUNT      ;INITIALIZE COUNTER
 842  002144  032713  140200          LOOP7:  BIT     #140200,@CRS    ;TEST FOR ERROR, DONE OR READY
 843  002150  001775                          BEQ     LOOP7           ;LOOP IF NONE SET
 844  002152  005713                          TST     @CRS            ;CHECK ERROR
 845  002154  100002                          BPL     .+6             ;BRANCH IF NOT SET
 846  002156  104000                          HLT                     ;BIT 15 WAS SET
 847  002160  000455                          BR      TEST8           ;GO TO NEXT TEST AFTER ERROR
 848  002162  032713  040000                  BIT     #40000,@CRS     ;CHECK FOR CARD DONE
 849  002166  001013                          BNE     DONE7           ;BRANCH IF SET
 850  002170  005301                          DEC     COUNT           ;COUNT
 851  002172  001402                          BEQ     .+6             ;IF BOTH COLUMN READY, BRANCH
 852  002174  005714                          TST     @CRB1           ;CLEAR DONE
 853  002176  000762                          BR      LOOP7           ;LOOP
 854  002200  032713  140000                  BIT     #140000,@CRS    ;WAIT FOR DONE OR SPECIAL CONDITION
 855  002204  001775                          BEQ     .-4
 856  002206  005713                          TST     @CRS            ;CHECK SPECIAL CONDITION
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                                                        BPL     DONE7           ;BRANCH IF NOT SET
                                                        HLT                     ;SPECIAL CONDITION WAS SET
                                                        BR      TEST8           ;GO TO NEXT TEST AFTER ERROR
                                        DONE7:          TST     COUNT           ;TEST FOR 80 COLUMN READY'S
                                                        BEQ     .+6             ;BRANCH IF OK
                                                        HLT                     ;COLUMN READY DID NOT OCCUR 80 TIMES
                                                        BR      TEST8           ;GO TO NEXT TEST AFTER ERROR
                                                        INCB    @CRS            ;START READ
                                                        TSTB    @CRS            ;CHECK COLUMN READY
                                                        BMI     .+4             ;BRANCH IF STILL SET
                                                        HLT                     ;READY DID NOT REMAIN SET
                                                        BIT     #4000,@CRS      ;TEST FOR TIMING ERROR
                                                        BEQ     .-4             ;LOOP IF NOT SET
                                                        TSTB    @CRS            ;CHECK COLUMN READY
                                                        BPL     .+6             ;BRANCH IF NOT SET
                                                        HLT                     ;TIMING ERROR DIDN'T CLEAR READY
                                                        BR      TEST8
                                                        MOVB    #2,@CRS         ;SET EJECT
                                                        BIT     #4000,@CRS      ;CHECK TIMING ERROR
                                                        BEQ     .+6             ;BRANCH IF CLEARED
                                                        HLT                     ;TIMING ERROR NOT CLEARED BY DATOB
                                                        BR      TEST8           ;GO TO NEXT TEST AFTER ERROR
                                                        BIT     #140000,@CRS    ;WAIT FOR DONE OR SPECIAL CONDITION
                                                        BEQ     .-4
                                                        BIT     #400,@CRS       ;CHECK BIT 8
                                                        BNE     TEST8           ;BRANCH IF READER OFF-LINE
                                                        TST     @CRS            ;SPECIAL CONDITION SHOULDN'T SET
                                                        BPL     .+4             ;SINCE DATOB CLEARED TIMING ERROR
                                                        HLT                     ;BIT 15 WAS SET, 8 WASN'T


                                        TEST8:  SCOPE
                                        ;DATA SHOULD BE AVAILABLE IN THE DATA BUFFER FOR AT LEAST 1.0 MILLISECOND
                                                        JSR     %7,INIT         ;INITIALIZE STATUS REGISTER
                                                        JSR     %7,CLRTR        ;STORE CURRENT PROCESSOR STATUS AND CLEAR TRACE BIT
                                                        INC     @CRS            ;START READ
                                        LOOP8:          BIT     #140200,@CRS    ;WAIT FOR COLUMN READY OR CARD DONE
                                                        BEQ     .-4             ;OR SPECIAL CONDITION
                                                        BIT     #40000,@CRS     ;CARD DONE?
                                                        BNE     DBRCK8          ;YES, GO TO CHECK STROBING OF DBR
                                                        TST     @CRS            ;NO, CHECK BIT 15
                                                        BPL     .+6             ;BRANCH IF NOT SET
                                                        HLT                     ;BIT 15 WAS SET
                                                        BR      TEST9           ;GO TO NEXT TEST AFTER ERROR
                                                        CLR     @CRS            ;DATO TO CRS - SHOULDN'T CLEAR BUSY OR READY
                                                        CMP     #1200,@CRS      ;CHECK FOR BUSY AND READY
                                                        BEQ     .+6             ;BRANCH IF STILL SET
                                                        HLT                     ;CRS IN WRONG STATE
                                                        BR      TEST9           ;GO TO NEXT TEST AFTER ERROR
                                                        MOV     @CRB1,R5        ;STORE DATA
                                                        MOV     #300,COUNT      ;INITIALIZE COUNTER
                                                        DEC     COUNT           ;WAIT FOR 1 MILLISECOND OR LESS
                                                        BNE     .-2
                                                        CMP     @CRB1,R5        ;DATA UNCHANGED?
                                                        BEQ     LOOP8           ;OK, CONTINUE
                                                        HLT                     ;DATA NOT AVAILABLE FOR 1 MILLISECOND
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                                                BR      TEST9           ;GO TO NEXT TEST AFTER FAILURE
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 T 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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                                                        ;SET PROCESSOR PRIORITY TO 0
                                                        ;SET EJECT, INTERRUPT ENABLE, AND READ
                                                        ;WAIT FOR CARD DONE
                                                        ;RESTORE PROCESSOR TO HIGHEST PRIORITY
                                                        ;CLEAR INTERRUPT ENABLE
                                                        ;NO INTERRUPT OCCURRED
                                                        ;CHECK CARD DONE
                                                        ;BRANCH IF SET
                                                        ;CARD DONE NOT SET
                                                        ;RESTORE STACK POINTER
                                                        ;MAKE SURE NO ERROR OCCURRED
                                                        ;BIT 15 WAS SET
                                                        ;CHECK COLUMN READY
                                                        ;BRANCH IF NOT SET
                                                        ;COLUMN READY WAS SET
                                                        ;DISABLE INTERRUPTS
                                                        ;CHANGE INTERRUPT RETURN ADDRESS
                                                        ;TO CAUSE A HALT IF AN INTERRUPT OCCURS

                                                        ;EVERY COLUMN READY SHOULD CAUSE AN INTERRUPT
                                                        ;INITIALIZE
                                                        ;CHECK EACH COLUMN
                                                        ;LOAD RETURN POINTER
                                                        ;SET PROCESSOR STATUS TO LEVEL 7
                                                        ;LOAD RETURN PROCESSOR STATUS
                                                        ;SET PROCESSOR PRIORITY TO 0
                                                        ;SET READ AND INTERRUPT ENABLE
                                                        ;WAIT FOR COLUMN READY
                                                        ;RESTORE PROCESSOR TO HIGHEST PRIORITY
                                                        ;CLEAR INTERRUPT ENABLE
                                                        ;COLUMN READY DID NOT INTERRUPT
                                                        ;CLEAR INTERRUPT ENABLE
                                                        ;RESTORE STACK POINTER
                                                        ;MAKE SURE COLUMN READY IS SET
                                                        ;BRANCH IF SET
                                                        ;COLUMN READY WASN'T SET
                                                        ;CLEAR READY FLAG
                                                        ;ALL 40 DONE?
                                                        ;NO
                                                        ;YES-CHANGE INTERRUPT RETURN ADDRESS
                                                        ;TO CAUSE A HALT IF ANOTHER INTERRUPT OCCURS

                                                        ;CARD DONE SHOULDN'T CAUSE AN INTERRUPT IF THE PROCESSOR IS AT LEVEL 7 PRIORITY
                                                        ;INITIALIZE
                                                        ;SETUP RETURN
                                                        ;SET PROCESSOR TO LEVEL 7 PRIORITY
                                                        ;LOAD RETURN PROCESSOR STATUS
                                                        ;SET EJECT, INTERRUPT ENABLE, AND READ
```

```
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
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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 _INE 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
```

```
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,CKBITS
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 NOT
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 UP 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          RSETE:  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$:       MOV     SR,DLAYO          ;READ SR
1870  011310  005213                           INC     @CRS              ;MOVE CARD
1871  011312  005267  000022                   INC     DLAYO
1872  011316  005067  000020                   CLR     DLAY1             ;CLEAR SECOND COUNTER
1873  011322  005367  000014          2$:      DEC     DLAY1             ;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          DLAY1:  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  010467  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  010377  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  02010A  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 I
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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2217  013516  002002          2002            ;25     Q       11 8
2218  013520  000110          110
2219  013522  002001          2001            ;26     R       11 9
2220  013524  000120          120
2221  013526  002202          2202            ;27     :       11 8 2
2222  013530  000112          112
2223  013532  002102          2102            ;28     $       11 8 3
2224  013534  000113          113
2225  013536  002042          2042            ;29     *       11 8 4
2226  013540  000114          114
2227  013542  002022          2022            ;30     )       11 8 5
2228  013544  000115          115
2229  013546  002012          2012            ;31     ;       11 8 6
2230  013550  000116          116
2231  013552  002006          2006            ;32     BLANK   11 8 7
2232  013554  000117          117
2233  013556  001000          1000            ;33     0       0
2234  013560  000040          40
2235  013562  001400          1400            ;34     /       0 1
2236  013564  000041          41
2237  013566  001200          1200            ;35     S       0 2
2238  013570  000042          42
2239  013572  001100          1100            ;36     T       0 3
2240  013574  000043          43
2241  013576  001040          1040            ;37     U       0 4
2242  013600  000044          44
2243  013602  001020          1020            ;38     V       0 5
2244  013604  000045          45
2245  013606  001010          1010            ;39     W       0 6
2246  013610  000046          46
2247  013612  001004          1004            ;40     X       0 7
2248  013614  000047          47
2249  013616  001002          1002            ;41     Y       0 8
2250  013620  000050          50
2251  013622  001001          1001            ;42     Z       0 9
2252  013624  000060          60
2253  013626  001202          1202            ;43             0 8 2
2254  013630  000052          52
2255  013632  001102          1102            ;44     .       0 8 3
2256  013634  000053          53
2257  013636  001042          1042            ;45     %       0 8 4
2258  013640  000054          54
2259  013642  001022          1022            ;46     -       0 8 5
2260  013644  000055          55
2261  013646  001012          1012            ;47     >       0 8 6
2262  013650  000056          56
2263  013652  001006          1006            ;48     ?       0 8 7
2264  013654  000057          57
2265  013656  000000          0000            ;49             BLANK
2266  013660  000000          0
2267  013662  000400          0400            ;50     1       1
2268  013664  000001          1
2269  013666  000200          0200            ;51     2       2
2270  013670  000002          2
2271  013672  000100          0100            ;52     3       3
2272  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
 2319  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
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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
```

```
ACINT =: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#
ALCDON  007116   1351  1373  1434  1478#  1547
ALLOK   007210   1497  1500#
ALPCD   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#
BINCD   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
CKMOMD  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#
CONTB   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#  924#
                 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
DBRCK8  002412   896  9148
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    1094    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#
KCRB1   001024          580#   593
KCRS    001022          579#   592
LACNT = 006700         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  184?
                1850  1853  1959  1964  1976#
PSP   = 177776   528#   606*  967*  968   969*  973*  996*  997   998*  1002*  1022*  1023  1041*
                1045*  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
```

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SET1    004764          1088#
SET14   003502          1077    1080#
SET2    004552          1087#
SET3    004340          1086#
SET4    004126          1085#
SET5    003714          1084#
SET6    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    2025*   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#
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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    1971    1987    1992    1998    2033
                          2036    2040    2047    2050    2053    2160#   2681    2687
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INT 1040# 1041 1084 1085 1086 1087 1088

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ADC     1986  2004
ADD     1761  2665  2670
BEQ      636   642   648   658   679   701   715   738   745   756   772   778   782   786   790
         805   809   816   819   828   843   851   855   861   869   876   880   894   903   911
         917   921   939   954   972  1026  1041  1054  1084  1085  1086  1087  1088  1097  1107
        1230  1241  1243  1250  1274  1280  1309  1369  1413  1415  1418  1433  1447  1480  1488
        1511  1526  1529  1533  1540  1551  1674  1725  1728  1813  1859  1891  1907  1951  1998
        2675
BIC      969   998  1041  1050  1084  1085  1086  1087  1088  1098  1136  1300  1452  1514  1788
        1899  2006
BICB    2029
BIS      640   677   940   967   996  1022  1041  1048  1051  1084  1085  1086  1087  1088  1093
        1114  1134  1222  1303  1320  1344  1357  1358  1421  1459  1493  1554  2007  2679
BIT      614   657   672   678   688   692   694   696   700   712   716   721   724   731   744
         755   757   771   804   806   808   815   818   823   827   842   848   854   868   875
         879   881   893   895   947   951   953   971   977  1025  1041  1053  1069  1084  1085
        1086  1087  1088  1096  1106  1227  1229  1231  1240  1242  1249  1273  1279  1292  1308
        1346  1360  1366  1368  1412  1432  1438  1446  1460  1479  1484  1490  1510  1515  1522
        1525  1528  1532  1550  1575  1604  1610  1637  1643  1673  1686  1692  1724  1727  1737
        1793  1799  1803  1809  1832  1858  1886  1923  1950  2010  2012
BMI      729   866  1009  1041  1062  1077  1084  1085  1086  1087  1088  1224  1312  1314  1338
        1497  1579  1608  1641  1690  1730  1798
BNE      615   626   628   630   662   664   666   668   673   689   693   695   697   717   722
         725   732   758   807   824   849   882   896   909   925   944   946   948   952   978
        1014  1041  1070  1084  1085  1086  1087  1088  1120  1228  1232  1293  1326  1330  1333
        1336  1347  1350  1361  1367  1372  1380  1425  1427  1429  1431  1439  1461  1491  1516
        1523  1546  1576  1605  1611  1638  1644  1679  1681  1683  1685  1687  1693  1738  1794
        1800  1804  1810  1824  1827  1829  1833  1835  1874  1876  1887  1924  1992  2011  2013
        2033  2036  2668  2673
BPL      613   720   735   741   760   764   768   800   803   811   814   845   857   871   884
         898   982   985  1001  1041  1060  1081  1084  1085  1086  1087  1088  1158  1161  1165
        1168  1172  1175  1179  1182  1186  1189  1193  1196  1200  1204  1209  1212  1221  1239
        1291  1319  1364  1802  1819  1855  1904  1909  1912  1938  1941  1961  1967  1982  1988
        2015  2040  2047  2050  2053  2664  2681
BR       602   609   644   675   691   699   723   727   737   762   770   776   822   826   830
         847   853   859   863   873   878   900   905   913   919   923   950   956   976  1005
        1011  1027  1041  1068  1079  1084  1085  1086  1087  1088  1101  1123  1139  1145  1163
        1170  1177  1184  1191  1198  1206  1226  1234  1236  1270  1278  1284  1305  1499  1507
        1519  1806  1811  1815  1821  1830  1857  1860  1877  1931  1952  2008  2038  2042  2671
        2677
CLC     1996
CLR      595   596   598   624   646   660   686   711   743   753   784   901   942   987   989
        1003  1006  1016  1030  1032  1041  1056  1058  1072  1074  1084  1085  1086  1087  1088
        1105  1108  1116  1118  1122  1126  1127  1142  1148  1149  1159  1187  1271  1272  1328
        1422  1455  1483  1501  1505  1509  1531  1564  1677  1763  1767  1789  1790  1791  1792
        1872  1888  1942  1978  1979  1999  2020
CLRB     817   974  1166  1173  1194  1202
CMP      604   641   763   777   781   785   902   910   916   920   980  1007  1029  1041  1061
        1075  1080  1084  1085  1086  1087  1088  1103  1125  1140  1146  1329  1332  1335  1337
        1349  1371  1414  1417  1436  1508  1521  1535  1539  1545  1812  1826  1828  1955  1991
        2014  2017  2674
CMPB    2032  2035
COM     1252  1445
DEC      734   802   850   908   924  1013  1325  1424  1426  1428  1430  1823  1873  1875  1940
EMT      530
HALT     543  1365  1441  1481  1552  1574  1589  1603  1623  1636  1654  1672  1705  1723  1745
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INC      625   627   629   656   661   663   665   667   687   712   718   754   765   798   840
         892   937   943   945  1119  1156  1219  1316  1381  1453  1454  1678  1680  1682  1684
        1795  1796  1817  1831  1836  1870  1871  1983  1990  2016  2031  2662  2667
INCB     864  1495
JMP      558   560   562   565   568  1253  1263  1310  1315  1322  1348  1351  1370  1373  1434
        1440  1448  1449  1463  1465  1482  1536  1547  1553  1556  1754  1766  1768  2019
JSR      608   622   623   654   655   685   710   752   796   839   890   891   935   936   965
         993  1020  1041  1046  1084  1085  1086  1087  1088  1091  1112  1132  1155  1218  1233
        1244  1251  1296  1302  1352  1353  1362  1374  1375  1383  1385  1386  1388  1389  1391
        1392  1396  1397  1399  1400  1402  1403  1405  1406  1408  1419  1437  1478  1520  1542
        1543  1549  1559  1565  1567  1569  1570  1571  1572  1573  1582  1584  1585  1586  1587
        1588  1594  1596  1598  1599  1600  1601  1602  1614  1616  1618  1619  1620  1621  1622
        1627  1629  1631  1632  1633  1634  1635  1647  1649  1650  1651  1652  1653  1659  1661
        1663  1665  1667  1668  1669  1670  1671  1675  1696  1698  1700  1701  1702  1703  1704
        1710  1712  1714  1716  1718  1719  1720  1721  1722  1741  1743  1744  1745  1746  1747
        1751  1758  1785  1808  1838  1839  1841  1842  1844  1845  1847  1848  1850  1851  1853
        1867  1885  1914  1927  1929  1956  1959  1964  2037  2666
MOV      557   559   561   564   567   591   592   593   594   597   601   603   605   606   610
         611   616   620   631   632   669   670   797   841   906   907   914   915   926   927
         958   959   966   968   970   973   988   994   995   997   999  1002  1015  1021  1023
        1024  1031  1041  1047  1049  1052  1055  1057  1073  1078  1084  1085  1086  1087  1088
        1092  1094  1095  1100  1104  1113  1115  1117  1121  1128  1133  1135  1137  1141  1144
        1150  1201  1269  1275  1276  1277  1281  1282  1283  1285  1286  1287  1288  1289  1294
        1299  1301  1317  1323  1324  1327  1331  1334  1339  1382  1384  1387  1390  1395  1398
        1401  1404  1407  1451  1494  1500  1502  1504  1512  1517  1555  1560  1566  1568  1581
        1583  1595  1597  1613  1615  1617  1628  1630  1646  1648  1660  1662  1664  1666  1676
        1695  1697  1699  1711  1713  1715  1717  1726  1740  1742  1753  1760  1764  1765  1787
        1816  1822  1825  1837  1840  1843  1846  1849  1852  1869  1896  1897  1898  1905  1906
        1910  1918  1926  1928  1939  1953  1954  1957  1958  1962  1963  1965  1976  1977  1980
        1989  1993  1994  2005  2018  2021  2054  2658  2659  2660  2661  2676  2678  2682
MOVB     874  1513  2030  2041  2048  2051
MOP      600  1099  1143  1256  1257  1258  1259  1260  1261  1262  1503  1915  1916  1917
RESET    634  1913
ROL     1984  1965  2001  2002  2003
RTI      582   603   617   633   671   928   960  1295  1340  1354  1376  1420  1544  1900  1969
        2022
RTS      607  1409  1456  1893  1919  1925  1943  1995  2034  2055  2669  2683
SEC     2000
SUB     1393  2663
SXT      599
TRAP     531
TST      612   635   647   728   759   766   788   789   801   813   844   852   856   860   883
         897   941   981  1012  1041  1059  1076  1084  1085  1086  1087  1088  1180  1210  1290
        1311  1359  1363  1379  1496  1578  1607  1640  1689  1729  1801  1834  1854  1889  1890
        1966  1981  1997  2672
TSTB     719   740   767   799   810   865   870   938   984  1000  1008  1157  1160  1164  1167
        1171  1174  1178  1181  1185  1188  1192  1195  1199  1203  1208  1211  1220  1223  1237
        1313  1318  1797  1818  1903  1908  1911  1937  1960  1987  2039  2046  2049  2052  2680
WAIT    1138  1304
.ABS     521
.ASCII  2058  2068  2075  2081  2086  2093  2099  2107  2115  2127  2136  2138  2140  2149  2152
        2158
.END    2694
.EVEN   2160
.LIST      :   523
```

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)
```