PDP11

MEMORY I/O

MD-11-DZQMA-B

EP-DZQMA-B-DL-A

FICHE 1 OF 1

NOV 1976

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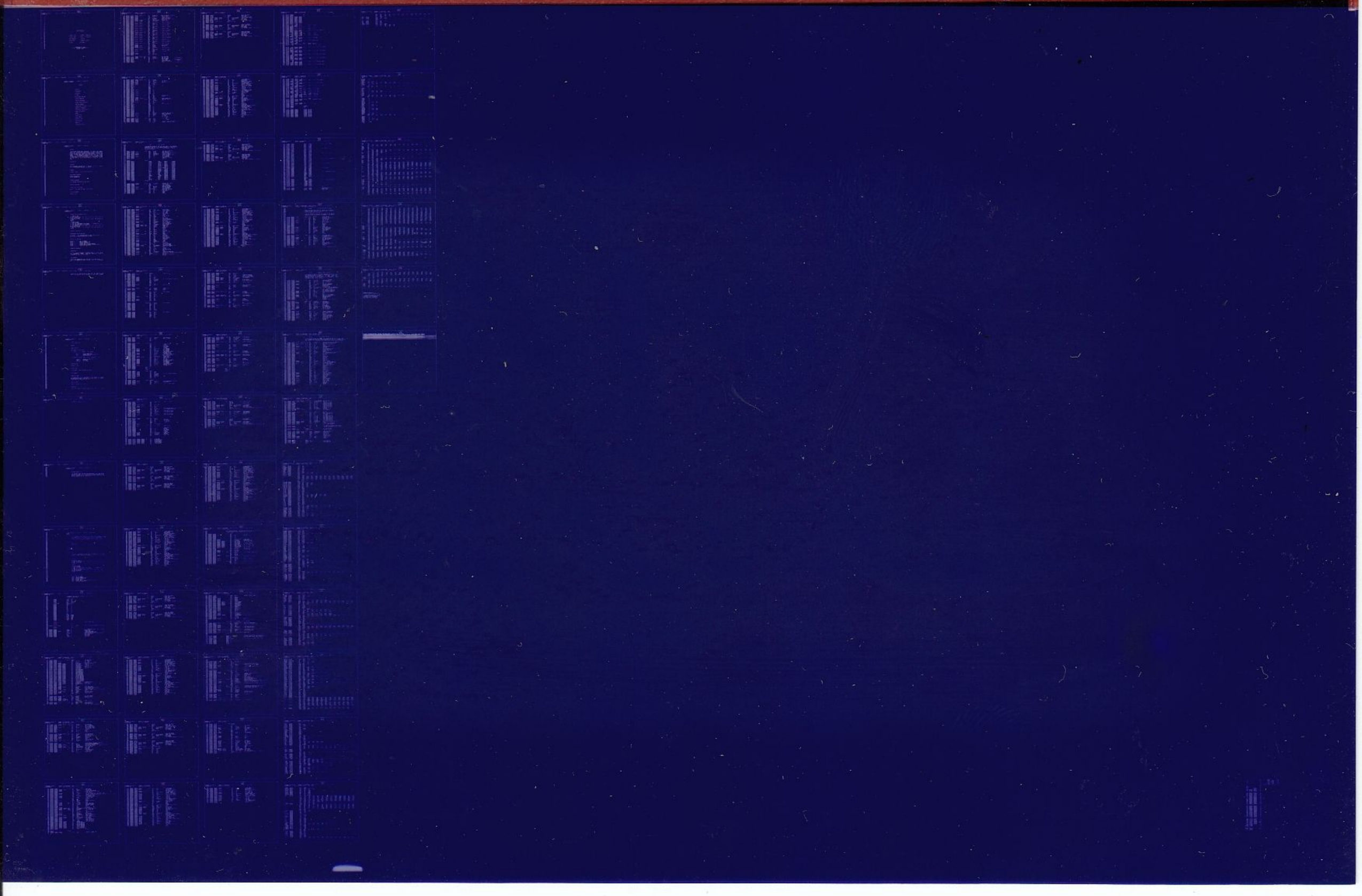

```
                                .REM    %
```

IDENTIFICATION

PRODUCT CODE:	MAINDEC-11-DZQMA-B-D
PRODUCT NAME:	MEMORY I/O EXERCISER
DATE CREATED:	1-DEC-72
MAINTAINER:	DIAGNOSTIC GROUP
AUTHOR:	BOB BRAIN

CONTENTS

1. ABSTRACT

THIS PROGRAM CHECKS BANK SELECTION, EA BITS, AND MEMORY USING ANY NPR DEVICE WITH EA BITS. IT RUNS STAND ALONE OR WITH KT11C OR KT11D TO ACCESS EXTENDED MEMORY. WORST CASE NOISE PATTERNS ARE USED WITH THE NPR DEVICE TO TEST THE MEMORY. IF THE PROGRAM IS STARTED BY ACT11, IT WILL CYCLE THROUGH ALL THE EXISTING DEVICES. IF IT IS STARTED BY DDP2 IN CHAIN MODE, IT WILL CYCLE THROUGH ALL THE DEVICES EXCEPT THE DDP2 DEVICE. IN ALL CASES, DRIVE 1 ON THE TC11 WILL BE USED.

2. REQUIREMENTS

2.1 EQUIPMENT

PDP11 STANDARD COMPUTER WITH A MINIMUM OF 8K OF MEMORY
KT11C/D FOR MEMORY EXPANSION (OPTIONAL)

2.2 STORAGE

PROGRAM STORAGE - THE ROUTINES USE MEMORY 0 - 17776

2.3 PRELIMINARY PROGRAMS

MEMORY DIAGNOSTICS
DEVICE DIAGNOSTICS

3. LOADING PROCEDURE

USE STANDARD PROCEDURE FOR ABS TAPES.

4. STARTING PROCEDURE

4.1 CONTROL SWITCH SETTINGS

SEE 5.1.1 (ALL DOWN FOR WORST CASE TESTING)

4.2 STARTING ADDRESS

START AT 200.

4.3 PROGRAM AND/OR OPERATOR ACTION

1) START AT 200
2) TYPE DEVICE (RF11, RK11, RP11, RC11, TC11, TM11, DM11, OR DR11B) AND RETURN.
3) TEST WILL START (↑C WILL RETURN TO STEP 2 AND RESTORE THE LOADER)
OR
1) START AT 200
2) TYPE A RETURN
3) TYPE THE LOWER BANK TO BE TESTED ... 1=20000-37777 ETC.
4) TYPE THE UPPER BANK TO BE TESTED
5) TYPE DEVICE (RF11, RK11, RP11, RC11, TC11, TM11, DM11, OR DR11B) AND RETURN.
6) TEST WILL START (↑C WILL RETURN TO STEP 2 AND RESTORE THE LOADER)

5. OPERATING PROCEDURE

5.1 OPERATIONAL SWITCH SETTINGS

AT SA 200 .. ALL SWITCHES DOWN IS WORST CASE TESTING. THE BELL WILL RING UPON COMPLETION OF A PASS.

5.1.1 SWITCH SETTINGS ARE:

SW<15> = 1 ..... HALT ON ERROR
SW<14> = 1 ..... HANG ON CURRENT BANK
SW<13> = 1 ..... INHIBIT PRINTOUT
SW<10> = 1 ..... INHIBIT BELL ON PASS COMPLETE
SW<09> = 1 ..... INHIBIT USE OF MEMORY EXPANSION DEVICE
SW<08> = 1 ..... TRACE BANK UNDER TEST

5.2 SUBROUTINE ABSTRACTS

5.2.1 TRAPCATCHER

A ".+2" - "HALT" SEQUENCE IS REPEATED FROM 0 - 776 TO CATCH ANY UNEXPECTED TRAPS. THUS ANY UNEXPECTED TRAPS OR INTERUPTS WILL HALT AT THE VECTOR + 2.

5.2.2 TRAP HANDLER

MOST OF THE SUBROUTINE CALLS ARE DONE VIA A TRAP+N CALL. TO FIND THE SUBROUTINE BEING CALLED, LOOK IN THE COMMENT

```
  200                                   SECTION OF THE TRAP DEFINATION TABLE FOR  THE  NAME  OF  THE
  201                                   TRAP,  THEN SCAN TO THE LEFT MARGIN FOR THE STARTING ADDRESS
```

OF THE SUBROUTINE.

6. ERRORS

6.1 ERROR PRINTOUT

THE FORMAT IS AS FOLLOWS:

```
RF11 ERROR:    CS = 100305    ER = 001000

          RF11 =     DEVICE UNDER TEST
          CS =       CONTROL AND STATUS REGISTER
          ER =       ERROR REGISTER

DATA ERROR AT 401220  TRUE = 177777  RECEIVED = 177757

          401120 =   ADDRESS OF BAD DATA (18 BIT)
          TRUE =     DATA SENT
          RECEIVED = DATA FOUND
```

6.2 ERROR RECOVERY

RESTART AT 200

7. RESTRICTIONS

TO RUN RP02, CHANGE LOC=5456 TO 000002 (RTI).

8. MISCELLANEOUS

8.1 EXECUTION TIME

THE EXECUTATION TIME IS DEPENDANT ON THE AMOUNT OF MEMORY AND THE DEVICE USED. THE BELL SHOULD RING WITHIN 20 MINUTES (USING DMI1 AT 110 BAUD IN 124K.)

8.2 STACK POINTER

STACK IS INITALLY SET TO 500

8.3 POWER FAIL

AFTER THE PROGRAM IS STARTED, POWER DOWN THEN UP. THERE

258 SHOULD BE NO ERROR TYPEOUTS.

9. PROGRAM DESCRIPTION

THE PROGRAM SIZES CORE AND TEST SEQUENTIALLY ALL CORE OR ANY SECTION OF CORE IN 4K CHUNKS USING THE DEVICE SPECIFIED AND MEMORY EXPANSION DEVICE. WORST CASE NOISE PATTERNS ARE USED FOR EACH MEMORY TYPE ON EACH PASS.

```
                        %
                .TITLE  MAINDEC-11-DZQMA-B      MEMORY I/O EXERCISER
                .REM*
                Abstract

                        This program checks bank selection, EA bits, and memory using
                        any NPR device with EA bits. It runs stand alone or with
                        KT11C or KT11D to access extended memory. Worst case noise
                        patterns are used with the NPR device to test the memory.


                Requirements

                        PDP-11 with at least 8K of memory (KT11C or KT11D are
                        optional.)


                Storage - First 4K

                Loading - Absolute Loader


                Execution time

                        The time is dependent on the amount of memory and the device
                        which is used. A bell will signify end of pass. Maximum run
                        time is no greater than 5 minutes.


                Starting procedure

                        1) Start at 200
                        2) Type device (RF11, RK11, RP11, RC11, TC11, TM11, DM11, or
                        DR11B) and RETURN.
                        3) Test will start (^C will return to step 2 and restore the
                        loader)
                         or
                        1) Start at 200
                        2) Type a RETURN
                        3) Type the lower bank to be tested ..  1 = 20000-37777 etc.
                        4) Type the upper bank to be tested
                        5) Type device (RF11, RK11, RP11, RC11, TC11, TM11, DM11, or
                        DR11B) and RETURN.
                        6) Test will start (^C will return to step 2 and restore the
                        loader)


                Switch register options - yes

                        SW15 - HALT ON ERROR
                        SW14 - LOOP ON CURRENT BANK
                        SW13 - INHIBIT TYPEOUTS
                        SW10 - INHIBIT BELL
                        SW9  - INHIBIT USE OF MEMORY EXPANTION DEVICE
                        SW8  - TYPE BANK UNDER TEST*
```

```
                                ;COPYRIGHT 1972,DIGITAL EQUIPMENT CORP., MAYNARD MASS.
                                ;PROGRAM BY BOB BRAIN

                104400          SCOPE=  TRAP
                104000          HLT=    EMT
                000004          TYPE=   IOT
                177776          PS=     177776
                177570          SWR=    177570
                177570          DISPLAY=SWR
                000007          BELL=   7
                000000          R0=     %0
                000001          R1=     %1
                000002          R2=     %2
                000003          R3=     %3
                000004          R4=     %4
                000005          R5=     %5
                000005          TTY=    %5
                000006          SP=     %6
                000007          PC=     %7
                000000          N=      0
                040000          SW14=   40000
                020000          SW13=   20000
                010000          SW12=   10000
                004000          SW11=   4000
                002000          SW10=   2000
                001000          SW9=    1000
                000400          SW8=    400

                000000          .=      0                       ;TRAP CATCHER FROM 0 - 776

                000200          .=      200

000200  000137  001024                  JMP     @#BEGIN         ;JUMP TO BEGINING ADDRESS OF PROGRAM

                001000          .=      1000

001000  000000                  ICNT:   0                       ;LH = ITERATION COUNT  ;RH = TEST NO.
001002  000000                  ERRORS: 0                       ;ERROR COUNT
001004  000000  000000          PCNT:   0,0                     ;2 WORD PASS COUNT
001010  000000                  LAD:    0                       ;LOOP ADDRESS FOR SCOPE
001012  000000                  HLTADR: 0                       ;LAST HLT INSTRUCTION ADD. EXECUTED
001014  000000                  MX:     0                       ;BANK UNDER TEST
001016  000000                  MIN:    0                       ;FIRST BANK
001020  000000                  LIMIT:  0                       ;LAST BANK
001022  000000                  OPTION: 0                       ;OPTION - MI = MX11 - GT = KT11
```

```
001024  000005                          BEGIN:  RESET                           ;ZAP THE WORLD
001026  105737  177564                          TSTB    @#177564                ;TTY READY
001032  100375                                  BPL     .-4                     ;NO - WAIT
001034  012706  000500                          MOV     #500,SP                 ;SET STACK TO  ** 500 **
001040  012737  012104  000020                  MOV     #IOT$,@#20              ;LOAD IOT VECTOR
001046  012737  000340  000022                  MOV     #340,@#22               ;LOCK UP
001054  012737  012612  000024                  MOV     #PDOWN$,@#24            ;LOAD PF VECTOR
001062  012737  000340  000026                  MOV     #340,@#26               ;LOCK UP
001070  012737  002716  000034                  MOV     #TRAP$,@#34             ;SET FOR TRAP
001076  012737  000340  000036                  MOV     #340,@#36               ;LOCK UP
001104  012777  000240  010430                  MOV     #240,@RFTRAP+2
001112  012777  000240  010426                  MOV     #240,@RCTRAP+2
001120  012777  000240  010424                  MOV     #240,@RPTRAP+2
001126  012777  000240  010422                  MOV     #240,@RKTRAP+2
001134  012777  000300  010420                  MOV     #300,@TCTRAP+2
001142  012777  000240  010422                  MOV     #240,@TMTRAP+2
001150  012777  000240  010410                  MOV     #240,@DRTRAP+2
001156  012777  004232  010354                  MOV     #TRP.RF,@RFTRAP
001164  012777  004614  010352                  MOV     #TRP.RC,@RCTRAP
001172  012777  005324  010350                  MOV     #TRP.RP,@RPTRAP
001200  012777  005624  010346                  MOV     #TRP.RK,@RKTRAP
001206  012777  006230  010344                  MOV     #TRP.TC,@TCTRAP
001214  012777  007136  010346                  MOV     #TRP.TM,@TMTRAP
001222  012777  010514  010334                  MOV     #TRP.DR,@DRTRAP
001230  012767  012752  176622                  MOV     #READR,60               ;KEYBOARD VECTOR
001236  012767  140000  010474                  MOV     #140000,LOLIM           ;INIT LOLIM
001244  012767  160000  010470                  MOV     #160000,HILIM           ;INIT HILIM
001252  005067  177540                          CLR     MIN
001256  005067  177532                          CLR     MX
001262  012767  000003  010244                  MOV     #3,PSCNT                ;INIT PASS COUNT
001270  005067  002420                          CLR     MEMORY                  ;WHICH MEMORY BEING CHECKED
001274  005067  177522                          CLR     OPTION                  ;TYPE THE OPTION
001300  032737  001000  177570                  BIT     #SW9,@#SWR              ;INHIBIT USE OF MEMORY EXTENTION DEVICE
001306  001030                                  BNE     SIZEIT                  ;SKIP
001310  012737  001330  000004                  MOV     #1$,@#4                 ;SET FOR TIMEOUT
001316  005777  010376                          TST     @SR0                    ;CHECK FOR KT11
001322  105167  177474                          COMB    OPTION                  ;OPTION IS KT11
001326  000415                                  BR      2$

001330  012737  001362  000004  1$:             MOV     #2$,@#4                 ;SET FOR TIMEOUT
001336  005777  010374                          TST     @MXC3                   ;CHECK FOR MX11
001342  105167  177455                          COMB    OPTION+1                ;OPTION IS MX11
001346  012767  000003  177442                  MOV     #3,MIN
001354  012767  000003  177432                  MOV     #3,MX
001362  012737  000006  000004  2$:             MOV     #6,@#4                  ;RESET FOR NEM

001370  005767  177426                  SIZEIT: TST     OPTION                  ;WHICH OPTION AM I
001374  100417                                  BMI     DOMX                    ;MUST HAVE MX11
001376  001037                                  BNE     DOSEG                   ;MUST HAVE MEMORY MANAGEMENT
```

```
  419  001400  012737  001432  000004  DOCORE:  MOV     #2$,@#4         ;SET FOR NEM
  420  001406  012701  017776                   MOV     #17776,R1       ;SET UP ADDRESS
  421  001412  005000                            CLR     R0              ;SET UP BANK COUNT
  422  001414  062701  020000          1$:       ADD     #20000,R1       ;MOVE TO NEXT BANK
  423  001420  005200                            INC     R0              ;INC THE BANK COUNT
  424  001422  005711                            TST     (1)             ;TIMEOUT?
  425  001424  022701  177776                    CMP     #177776,R1      ;END?
  426  001430  001371                            BNE     1$              ;LOOP IF NOT AT THE END
  427  001432  000446                  2$:       BR      TYPEIT          ;TYPE IT
  428
  429  001434  012737  001466  000004  DOMX:     MOV     #2$,@#4         ;SET UP FOR NEM
  430  001442  012700  000003                    MOV     #3,R0           ;SET BANK COUNT
  431  001446  005200                   1$:      INC     R0              ;MOVE TO NEXT BANK
  432  001450  010077  010262                    MOV     R0,@MXC3        ;SET UP MXC3
  433  001454  005737  157776                    TST     @#157776        ;TIMEOUT?
  434  001460  022700  000036                    CMP     #36,R0          ;END?
  435  001464  001370                            BNE     1$              ;LOOP IF NOT END
  436  001466  012777  000006  010242  2$:       MOV     #6,@MXC3        ;MAP INTO SELF
  437  001474  000425                            BR      TYPEIT          ;TYPE IT
  438
  439  001476  104444                  DOSEG:    MAPIT                   ;SETUP MEMORY MANAGEMENT REGISTERS
  440  001500  005277  010214                    INC     @SR0            ;TURN ON MEMORY MANAGEMENT
  441  001504  012737  001534  000004            MOV     #2$,@#4         ;SET TIMEOUT ADDRESS FOR CORE CALCULATIONS
  442  001512  005737  157776          1$:       TST     @#157776        ;TRAP ON NON EX MEM
  443  001516  062777  000200  010202            ADD     #200,@KISAR6    ;GO TO NEXT BANK
  444  001524  022777  007600  010174            CMP     #7600,@KISAR6   ;LAST ONE?
  445  001532  003367                            BGT     1$              ;TRY NEXT
  446  001534  017700  010166          2$:       MOV     @KISAR6,R0      ;SAVE ASR6 IN R0
  447  001540  006300                            ASL     R0              ;  *ASH #-7,R0*
  448  001542  000300                            SWAB    R0              ;KLUDGY ISN'T IT
  449  001544  042700  177740                    BIC     #177740,R0      ;CLEAR JUNK
```

```
                                        TYPEIT: DEC     R0              ;DROP BACK
                                                MOV     #6,@#4          ;SET FOR NEM
                                                MOV     #500,SP         ;CLEAR STACK **500**
                                                INC     #-1             ;TYPE THE OPTION ONLY ONCE
                                                BNE     REDO            ;FIRST TIME?
                                                JSR     7,LODGET        ;GET THE LOADER ONLY THE FIRST TIME
                                                TYPE    .+2             ;.ASCIZ <15><12><12>"MAINDEC-11-DZQMA-B"<15><12><12>"BAN
                                                MOV     R0,TTY          ;TYPE R0 IN OCTAL
                                                JSR     PC,PRINTS       ;AND SUPRESS LEADING ZERO'S
                                                TYPE    .+2             ;.ASCIZ " EXIST"
                                                TST     OPTION          ;WHICH OPTION?
                                                BEQ     REDO            ;NOTHING
                                                BMI     1$              ;MX11
                                                TYPE    ,WITHSG         ;MEMORY MANAGEMENT
                                                BR      REDO            ;SKIP
                                        1$:     TYPE    ,WITHMX         ;MX11
                                        REDO:   MOV     R0,LIMIT        ;SAVE UPPER BANK
                                                JSR     7,LODRES        ;RESTORE LOADER
                                                TST     @#42            ;UNDER A MONITOR?
                                                BEQ     TO              ;NO
                                                CLR     @#PS            ;CLEAR PS
                                        RSIT:   MOV     #DEVTAB-2,DEVADR;SET FOR DEVICE SCAN
                                        ABRT:   ADD     #2,DEVADR       ;GO TO NEXT ONE
                                        NEWDEV: TST     @DEVADR         ;IS IT THE END?
                                                BNE     1$              ;YES
                                                JSR     PC,GETMON       ;GET THE MONITOR
                                                BR      RSIT            ;LOOP
                                        1$:     MOV     DEVADR,R3       ;GET ADDRESS
                                                SUB     #DEVTAB,R3      ;MAKE IT AN OFFSET
                                                CMPB    TAB1(3),@#41    ;SAME DEVICE?
                                                BEQ     ABRT            ;YES - ABORT DEVICE
                                                MOV     @DEVADR,INPUT   ;SET INPUT
                                                MOV     #"11,INPUT+2    ;FOR TYPING
                                                CLR     INPUT+4         ;MAKE TERMINATOR
                                                TYPE    .+2             ;.ASCIZ <15><12>
                                                TYPE    ,INPUT          ;TYPE THE DEVICE
                                                MOV     #BADDEV,@#4     ;SET FOR TIMEOUT
                                                MOV     #TRP.RF,@RFTRAP
                                                MOV     #TRP.RC,@RCTRAP
                                                MOV     #TRP.RP,@RPTRAP
                                                MOV     #TRP.RK,@RKTRAP
                                                MOV     #TRP.TC,@TCTRAP
                                                MOV     #TRP.TM,@TMTRAP
                                                MOV     #TRP.DR,@DRTRAP
                                                BR      RTPF            ;START IT

                                        BADDEV:
                                                TYPE    .+2             ;.ASCIZ " - NONE"
                                                JMP     ABRT            ;GO TO NEXT DEVICE
```

```
  499  002142  012737  002650  000004  TO:     MOV     #NODEV,@#4      ;SET UP TRAP IF NO DEVICE
  500  002150  005037  177776                  CLR     @#177776        ;DROP PRIORITY
  501  002154  000004  002160                  TYPE    .+2             ;.ASCIZ <15><12>"#"
  502  002164  004767  010022                  JSR     PC,READS        ;INPUT DATA FROM TTY
  503  002170  012706  000500          RTPF:   MOV     #500,SP         ;RESET THE STACK  ** 500 **
  504  002174  052737  000100  177560        BIS     #100,@#177560   ;IE THE TTY
  505  002202  022767  041522  010106        CMP     #"RC,INPUT      ;CHECK FOR RC11
  506  002210  001004                        BNE     T1
  507  002212  052777  000100  007376        BIS     #100,@RCCS      ;TURN ON INTERUPT
  508  002220  000503                        BR      WAIT
  509  002222  022767  050122  010066  T1:   CMP     #"RP,INPUT      ;CHECK FOR RP11
  510  002230  001004                        BNE     T2
  511  002232  052777  000100  007370        BIS     #100,@RPCS      ;TURN ON INTERUPT
  512  002240  000473                        BR      WAIT
  513  002242  022767  043122  010046  T2:   CMP     #"RF,INPUT      ;CHECK FOR RF11
  514  002250  001004                        BNE     T3
  515  002252  052777  000100  007324        BIS     #100,@RFCS      ;TURN ON INTERUPT
  516  002260  000463                        BR      WAIT
  517  002262  022767  045522  010026  T3:   CMP     #"RK,INPUT      ;CHECK FOR RK11
  518  002270  001004                        BNE     T4
  519  002272  052777  000100  007344        BIS     #100,@RKCS      ;TURN ON INTERUPT
  520  002300  000453                        BR      WAIT
  521  002302  022767  046524  010006  T4:   CMP     #"TM,INPUT      ;CHECK FOR TM11
  522  002310  001004                        BNE     T5
  523  002312  052777  000100  007350        BIS     #100,@TMCS      ;TURN ON INTERUPT
  524  002320  000443                        BR      WAIT
  525  002322  022767  041524  007766  T5:   CMP     #"TC,INPUT      ;CHECK FOR TC11
  526  002330  001004                        BNE     T6
  527  002332  052777  000100  007316        BIS     #100,@TCCS      ;TURN ON INTERUPT
  528  002340  000433                        BR      WAIT
  529  002342  022767  046504  007746  T6:   CMP     #"DM,INPUT      ;CHECK FOR DM11
  530  002350  001007                        BNE     T7
  531  002352  005777  007322                TST     @DMCS           ;IS IT THERE?
  532  002356  012737  000006  000004        MOV     #6,@#4          ;RESTORE 4
  533  002364  000167  005126                JMP     TRP.DM
  534  002370  022767  051104  007720  T7:   CMP     #"DR,INPUT      ;CHECK FOR DR11
  535  002376  001004                        BNE     T8
  536  002400  052777  000100  007306        BIS     #100,@DRCS      ;TURN ON INTERUPT
  537  002406  000410                        BR      WAIT
  538  002410  105767  007702          T8:   TSTB    INPUT           ;CR ALONE
  539  002414  001420                        BEQ     CRLF
  540  002416  000004  010716                TYPE    .MI
  541  002422  005037  177560                CLR     @#177560        ;ID THE TTY
  542  002426  000645                        BR      TO
  543
  544  002430  012737  000006  000004  WAIT:  MOV     #6,@#4          ;SET NEM TRAP
  545  002436  016704  007276          1$:   MOV     LOLIM,R4        ;SET LOW LIMIT
  546  002442  026704  007274          2$:   CMP     HILIM,R4        ;END OF RANGE
  547  002446  001773                        BEQ     1$              ;YES - RESET
  548  002450  000241                        CLC                     ;CLEAR CARRY BIT
  549  002452  005524                        ADC     (4)+            ;NOP WITH READ/WRITE
  550  002454  000772                        BR      2$              ;LOOP
```

```
**************
*            *
* BACKGROUND *
*    TEST    *
*            *
**************
```

```
002456  012737  000006  000004  CRLF:   MOV     #6,@#4
002464  005037  177560                  CLR     @#177560        ;ID THE TTY
002470  000004  011103                  TYPE    ,M11            ;ASK FOR LOWER LIMIT
002474  004767  007512                  JSR     PC,READ$        ;GET IT
002500  005067  176312                  CLR     MIN
002504  012701  012316                  MOV     #INPUT,R1
002510  105711                  CR1:    TSTB    (1)             ;CR?
002512  001414                          BEQ     CR2
002514  106011                          RORB    (1)
002516  106011                          RORB    (1)
002520  106011                          RORB    (1)
002522  106167  176270                  ROLB    MIN
002526  106111                          ROLB    (1)
002530  106167  176262                  ROLB    MIN
002534  106121                          ROLB    (1)+
002536  106167  176254                  ROLB    MIN
002542  000762                          BR      CR1
002544  005767  176246          CR2:    TST     MIN             ;MIN MUST BE >0
002550  003742                          BLE     CRLF            ;NOPE!
002552  005367  176240                  DEC     MIN
002556  016767  176234  176230          MOV     MIN,MX          ;SAVE LOWER LIMIT
002564  000004  011121          NXTCR:  TYPE    ,M12            ;ASK FOR UPPER LIMIT
002570  004767  007416                  JSR     PC,READ$        ;GET IT
002574  005000                          CLR     R0
002576  012701  012316                  MOV     #INPUT,R1
002602  105711                  CR3:    TSTB    (1)             ;CR?
002604  001411                          BEQ     CR4             ;TEST FOR END
002606  106011                          RORB    (1)
002610  106011                          RORB    (1)
002612  106011                          RORB    (1)
002614  106100                          ROLB    R0
002616  106111                          ROLB    (1)
002620  106100                          ROLB    R0
002622  106121                          ROLB    (1)+
002624  106100                          ROLB    R0
002626  000765                          BR      CR3
002630  020067  176164          CR4:    CMP     R0,LIMIT        ;GREATER THAN THE MAX?
002634  003353                          BGT     NXTCR           ;YES - TRY AGAIN
002636  020067  176154                  CMP     R0,MIN          ;R0 MUST BE > MIN
002642  002705                          BLT     CRLF            ;IT'S NOT
002644  000167  177272                  JMP     T0              ;GET ANOTHER

002650  000004  011137          NODEV:  TYPE    ,M13            ;TYPES NO DEVICE
002654  000004  011137                  TYPE    ,M13
002660  000004  012316                  TYPE    ,INPUT
002664  000004  002670                  TYPE    ,.+2            ;.ASCIZ " DOES NOT EXIST"<15><12>
002712  000167  176106                  JMP     BEGIN           ;RETURN TO TTY INPUT MODE
```

```
                                        ;       STRAP           ;TRAP HANDLER
                                        ;
                                        ;THIS ROUTINE DECODES A TRAP CALL AND JUMPS TO THE APROPRATE
                                        ;SUBROUTINE. THE CALL IS A "TRAP+N" WHERE N IS A MULTIPLE OF 2.
                                        ;THE "SET" MACRO WILL CREATE THE TABLE NEEDED. IT HAS TO
                                        ;FOLLOW THIS MACRO.
                                        ;
002716  011605                  TRAP$:  MOV     (6),R5          ;GET TRAP INSTRUCTION
002720  162705  000002                  SUB     #2,R5           ;BACK UP BY 2
002724  111505                          MOVB    (5),R5          ;GET THE RIGHT BYTE OF TRAP
002726  062705  002750                  ADD     #ADRTAB,R5      ;INDEX TO TABLE
002732  022705  003020                  CMP     #ENDTAB,R5      ;CHECK FOR END OF TABLE
002736  100401                          BMI     .+4             ;OUT OF BOUNDS
002740  000175  000000                  JMP     @(5)            ;GO TO ROUTINE
002744  000000                          HALT                    ;TRAP OUT OF BOUNDS
002746  000776                          BR      .-2             ;HANG UP
                                        ;
002750                          ADRTAB:
002750  003716                          WRADR           ;CORE   =  TRAP+0       (104400)
002752  003754                          WRCADR          ;COMCOR =  TRAP+2       (104402)
002754  004360                          CH.RF           ;CHK.RF =  TRAP+4       (104404)
002756  004742                          CH.RC           ;CHK.RC =  TRAP+6       (104406)
002760  005354                          CH.RP           ;CHK.RP =  TRAP+10      (104410)
002762  005752                          CH.RK           ;CHK.RK =  TRAP+12      (104412)
002764  006322                          CH.TC           ;CHK.TC =  TRAP+14      (104414)
002766  007266                          CH.TM           ;CHK.TM =  TRAP+16      (104416)
002770  010616                          CH.DR           ;CHK.DR =  TRAP+20      (104420)
002772  006566                          S.TC            ;SEARCH =  TRAP+22      (104422)
002774  007174                          RW.TM           ;REWIND =  TRAP+24      (104424)
002776  003364                          CDATA           ;CKDATA =  TRAP+26      (104426)
003000  006322                          CH.TC           ;ERR2   =  TRAP+30      (104430)
003002  003544                          POTS            ;STOP   =  TRAP+32      (104432)
003004  003774                          ER3             ;ERR3   =  TRAP+34      (104434)
003006  003562                          .BEGIN          ;.START =  TRAP+36      (104436)
003010  004070                          SETBAK          ;SETBAK =  TRAP+40      (104440)
003012  003064                          NXT             ;NEXT   =  TRAP+42      (104442)
003014  004160                          MAP             ;MAPIT  =  TRAP+44      (104444)
003016  013022                          PATCH1          ;DUM1   =  TRAP+46      (104446)
003020  013042                          PATCH2          ;DUM2   =  TRAP+50      (104450)
        003020                  ENDTAB=.-2
                                        ;
                                        ;
003022  004767  007006          GETMON: JSR     PC,LODRES       ;RESTORE THE LOADER
003026  000004  000177                  TYPE    ,177            ;TYPE A NULL
003032  000005                          RESET                   ;KILL THE WORLD
003034  010046                          MOV     R0,-(6)         ;PUSH R0 ON STACK
003036  013703  000042                  MOV     @#42,R3         ;GET THE ADDRESS
003042  004713                          JSR     PC,(3)          ;GO TO MONITOR
003044  000240  000240  000240          240,240,240             ;SAVE ROOM FOR ACT11
003052  012600                          MOV     (6)+,R0         ;POP STACK INTO R0
003054  005003                          CLR     R3              ;INIT COUNT
003056  005203                  17$:    INC     R3              ;COUNT
003060  001376                          BNE     17$             ;DOWN
003062  000207                          RTS     PC              ;RETURN
```

```
 652  003064  005067  006446          NXT:    CLR     FLG             ;SET A FLAG
 653  003070  032737  040000  177570          BIT     #SW14,@#SWR     ;LOOP ON BANK?
 654  003076  001126                          BNE     2$              ;YES - GET OUT
 655  003100  126700  175710                  CMPB    MX,R0           ;LAST PAGE?
 656  003104  002450                          BLT     1$              ;NO - SKIP
 657  003106  032737  002000  177570          BIT     #SW10,@#SWR     ;INHIBIT BELL
 658  003114  001002                          BNE     5$              ;YES!
 659  003116  000004  000007                  TYPE    ,BELL           ;RING THE BELL
 660  003122  005367  006406          5$:     DEC     PSCNT           ;3 YET
 661  003126  001020                          BNE     12$             ;NO - SKIP
 662  003130  005267  006402                  INC     FLG             ;RECALL MONITER
 663  003134  013703  000042                  MOV     @#42,R3         ;GET MONITOR ADDRESS
 664  003140  001410                          BEQ     10$             ;SKIP IF 0
 665  003142  062767  000002  006362          ADD     #2,DEVADR       ;GO TO NEXT ONE
 666  003150  005777  006356                  TST     @DEVADR         ;END OF TABLE?
 667  003154  001002                          BNE     10$             ;SKIP MONITOR CALL
 668  003156  004767  177640                  JSR     PC,GETMON       ;GET THE MONITOR
 669  003162  012767  000003  006344  10$:     MOV     #3,PSCNT        ;RESET COUNT
 670  003170  016767  175622  175616  12$:     MOV     MIN,MX          ;RESET MX
 671  003176  005767  000512                  TST     MEMORY          ;CHECK STATE OF FLAG
 672  003202  100407                          BMI     4$              ;SWAB IT
 673  003204  001403                          BEQ     3$              ;COM IT
 674  003206  005067  000502                  CLR     MEMORY          ;INIT IT
 675  003212  000405                          BR      1$              ;CONTINUE
 676  003214  105167  000475          3$:     COMB    MEMORY+1        ;MAKE IT 177400
 677  003220  000402                          BR      1$              ;SKIP
 678  003222  000367  000466          4$:     SWAB    MEMORY          ;MAKE IT 377
 679  003226  026767  175564  175560  1$:     CMP     MIN,MX          ;FIRST?
 680  003234  001022                          BNE     6$              ;SKIP CRLF
 681  003236  005737  000042                  TST     @#42            ;MONITOR?
 682  003242  001407                          BEQ     14$             ;SKIP LOOPING
 683  003244  005767  006266                  TST     FLG             ;UNDER MONITOR?
 684  003250  001404                          BEQ     14$             ;SKIP EXIT
 685  003252  005037  177776                  CLR     @#PS            ;CLEAR PS
 686  003256  000167  176466                  JMP     NEWDEV          ;LOOP
 687  003262  032737  000400  177570  14$:     BIT     #SW8,@#SWR      ;TRACE?
 688  003270  001404                          BEQ     6$              ;NO - SKIP
 689  003272  000004  003276                  TYPE    .+2             ;.ASCIZ <15><12>
 690  003302  005267  175506          6$:     INC     MX              ;GO TO NEXT BANK
 691  003306  016737  175502  177570          MOV     MX,@#DISPLAY    ;DISPLAY THE BANK IN USE
 692  003314  032737  000400  177570          BIT     #SW8,@#SWR      ;TYPE BANK NUMBER??
 693  003322  001414                          BEQ     2$              ;NO!
 694  003324  000004  003330                  TYPE    .+2             ;.ASCIZ " "
 695  003332  016705  175456                  MOV     MX,TTY          ;SET FOR TYPING
 696  003336  032705  000007                  BIT     #7,TTY          ;MULTIPLE OF 10?
 697  003342  001402                          BEQ     7$              ;YES
 698  003344  042705  177770                  BIC     #177770,TTY     ;CLEAR OUT UPPER BITS
 699  003350  004767  007022          7$:     JSR     PC,PRINTS       ;TYPE MX AND SUPPRESS LEADING ZEROES
 700  003354  104440          2$:     SETBANK                         ;SET MXC
 701  003356  016704  006356                  MOV     LOLIM,R4        ;SET UP FOR BACKGROUND
 702  003362  000002                          RTI                     ;RETURN
```

```
003364  104440                  CDATA:  SETBANK                         ;CHECK DATA
003366  005767  005322                  TST     EX
003372  001401                          BEQ     .+4
003374  000002                          RTI
003376  005067  000306                  CLR     DATA
003402  005067  000304                  CLR     BIT
003406  016702  006326                  MOV     LOLIM,R2                ;SET UP BEGINNING OF BUFFER
003412  004767  000022          1$:     JSR     PC,GDATA
003416  026712  000266                  CMP     DATA,(2)
003422  001401                          BEQ     .+4
003424  104434                          ERR3
003426  005722                          TST     (2)+
003430  026702  006306                  CMP     HILIM,R2                ;CHECK FOR END
003434  001366                          BNE     1$
003436  000002                          RTI

003440  005767  000250          GDATA:  TST     MEMORY                  ;CHECK FLAG
003444  100430                          BMI     T3XOR9                  ;MM11G
003446  003016                          BGT     T8XOR13                 ;MM11F

003450  010203                  T1XOR8: MOV     R2,R3                   ;MM11E MEMORY
003452  000303                          SWAB    R3
003454  006103                          ROL     R3
003456  060203                          ADD     R2,R3
003460  006003                          ROR     R3
003462  066703  000224          ALLOR:  ADD     BIT,R3
003466  006003                          ROR     R3
003470  103404                          BCS     1$
003472  005167  000214                  COM     BIT
003476  005167  000206                  COM     DATA
003502  000207                  1$:     RTS     PC

003504  010203                  T8XOR13:MOV     R2,R3                   ;MM11F MEMORY
003506  010205                          MOV     R2,R5
003510  000303                          SWAB    R3
003512  006105                          ROL     R5
003514  006105                          ROL     R5
003516  006105                          ROL     R5
003520  006105                          ROL     R5
003522  060503                  T3X9:   ADD     R5,R3
003524  000756                          BR      ALLOR

003526  010203                  T3XOR9: MOV     R2,R3                   ;MM11G MEMORY
003530  006003                          ROR     R3
003532  010305                          MOV     R3,R5
003534  000305                          SWAB    R5
003536  006003                          ROR     R3
003540  006003                          ROR     R3
003542  000767                          BR      T3X9
```

```
003544  005037  177776          POTS:   CLR     @#177776                ;DROP PRIORITY
003550  005737  177570                  TST     @#SWR                   ;HALT ON ERROR?
003554  100001                          BPL     .+4
003556  000000                          HALT
003560  000002                          RTI

003562  016705  175226          .BEGIN: MOV     MX,TTY
003566  000241                          CLC                             ; *ASH #13,TTY*
003570  006005                          ROR     TTY                     ;TO GET
003572  006005                          ROR     TTY                     ;THE THREE
003574  006005                          ROR     TTY                     ;UPPER BITS
003576  006005                          ROR     TTY                     ;TO MAKE
003600  042705  017777                  BIC     #17777,TTY              ;THE ADDRESS
003604  017646  000000                  MOV     @(6),-(6)               ;GET ADDRESS
003610  017646  000000                  MOV     @(6),-(6)               ;GET ADDRESS
003614  010576  000000                  MOV     TTY,@(6)                ;LOAD MEMORY ADDRESS
003620  022626                          CMP     (6)+,(6)+               ;RESTORE STACK
003622  062716  000002                  ADD     #2,(6)                  ;INCREMENT STACK
003626  016705  175162                  MOV     MX,TTY                  ;GET UPPER 2 BITS OF MXC
003632  006105                          ROL     TTY                     ;GET INTO POSITION
003634  042705  177717                  BIC     #177717,TTY             ;CLEAR JUNK
003640  022767  041524  006450          CMP     #"TC,INPUT              ;CHECK FOR DTA
003646  001002                          BNE     1$                      ;SKIP IF NOT
003650  052705  000400                  BIS     #400,TTY                ;SET DTA1
003654  057605  000000          1$:     BIS     @(6),TTY                ;GET REST OF COMMAND
003660  062716  000002                  ADD     #2,(6)                  ;INCREMENT STACK
003664  017646  000000                  MOV     @(6),-(6)               ;GET ADDRESS
003670  017646  000000                  MOV     @(6),-(6)               ;GET ADDRESS
003674  010576  000000                  MOV     TTY,@(6)                ;LOAD MEMORY ADDRESS
003700  022626                          CMP     (6)+,(6)+               ;RESTORE STACK
003702  062716  000002                  ADD     #2,(6)                  ;INCREMENT STACK
003706  000002                          RTI
003710  000000                  DATA:   0
003712  000000                  BIT:    0
003714  000000                  MEMORY: 0

003716  104442                  WRADR:  NEXT
003720  005067  177764                  CLR     DATA
003724  005067  177762                  CLR     BIT
003730  016702  006004                  MOV     LOLIM,R2                ;SET THE STARTING ADDRESS
003734  004767  177500          1$:     JSR     PC,GDATA
003740  016722  177744                  MOV     DATA,(2)+
003744  026702  005772                  CMP     HILIM,R2                ;END?
003750  001371                          BNE     1$
003752  000002                          RTI

003754  104440                  WRCADR: SETBANK
003756  016702  005756                  MOV     LOLIM,R2                ;SET UP BEGINNING OF BUFFER
003762  005122                  1$:     COM     (2)+                    ;COMPLIMENT IT
003764  026702  005752                  CMP     HILIM,R2
003770  001374                          BNE     1$                      ;LOOP TIL END OF CORE
003772  000002                          RTI
```

```
804  003774  032737  020000  177570  ER3:    BIT     #SW13,@#SWR     ;INHIBIT TYPEOUTS
805  004002  001401                          BEQ     .+4
806  004004  000002                          RTI
807  004006  022767  041524  006302          CMP     #"TC,INPUT
808  004014  001003                          BNE     1$
809  004016  012777  000001  005632          MOV     #1,@TCCS
810  004024  000004  011032          1$:     TYPE    ,M7
811  004030  010205                          MOV     R2,TTY          ;TYPE R2 WITH MX AS 18 BIT ADDRESS
812  004032  004767  006364                  JSR     PC,PRINTA       ;GO TO ADDRESS PRINTER
813  004036  000004  011053                  TYPE    ,M8
814  004042  016705  177642                  MOV     DATA,TTY        ;TYPE DATA IN OCTAL
815  004046  004767  006314                  JSR     PC,PRINTR       ;TYPE LEADING ZERO'S
816  004052  000004  011065                  TYPE    ,M9
817  004056  011205                          MOV     (2),TTY         ;TYPE (2) IN OCTAL
818  004060  004767  006302                  JSR     PC,PRINTR       ;TYPE LEADING ZERO'S
819  004064  104432                          STOP
820  004066  000002                          RTI
821
822  004070  016705  174720          SETBAK: MOV     MX,TTY
823  004074  005767  174722                  TST     OPTION          ;WHAT AM I
824  004100  001411                          BEQ     2$              ;I'M NOTHING
825  004102  100405                          BMI     1$              ;I'M AN MX11
826  004104  000305                          SWAB    TTY             ; *ASH #7,TTY*
827  004106  006205                          ASR     TTY
828  004110  010577  005612                  MOV     TTY,@KISAR6
829  004114  000002                          RTI
830  004116  010577  005614          1$:     MOV     TTY,@MXC3       ;LOAD THE MXC
831  004122  000002                          RTI
832  004124  000241                  2$:     CLC                     ; *ASH #13,TTY*
833  004126  006005                          ROR     TTY             ;ROTATE
834  004130  006005                          ROR     TTY             ;THE UPPER
835  004132  006005                          ROR     TTY             ;THREE BITS
836  004134  006005                          ROR     TTY             ;TO MAKE
837  004136  042705  017777                  BIC     #17777,TTY      ;CLEAR JUNK
838  004142  010567  005572                  MOV     TTY,LOLIM       ;ADDRESS
839  004146  062705  020000                  ADD     #20000,TTY      ;MAKE UPPER
840  004152  010567  005564                  MOV     TTY,HILIM       ;LIMIT
841  004156  000002                          RTI
842
843
844  004160  012777  000000  005534  MAP:    MOV     #0,@KISAR0
845  004166  012777  077406  005530          MOV     #77406,@KISDR0
846  004174  012777  000200  005524          MOV     #200,@KISAR6
847  004202  012777  077406  005520          MOV     #77406,@KISDR6
848  004210  012777  007600  005514          MOV     #7600,@KISAR7
849  004216  012777  077406  005510          MOV     #77406,@KISDR7
850  004224  000002                          RTI
```

```
                                W.RF:   CHK.RF                  ;CHECK FOR ERRORS
                                        CKDATA                  ;CHECK CORE
                                TRP.RF: CORE                    ;LOAD CORE WITH DATA
004234  012777  004266  005276          MOV     #C.RF,@RFTRAP   ;'CHECK' TRAP ADDRESS
004242  016777  005476  005340          MOV     WRDCNT,@RFWC    ;WORD COUNT
004250  005077  005340                  CLR     @RFDA           ;DSK ADDRESS
004254  104436                          .START                  ;LOAD CURRENT ADDRESS & IE!3 AND GO
004256  011612  000103  011604          RFCA,100!3,RFCS
004264  000002                          RTI

004266  104404                  C.RF:   CHK.RF                  ;CHECK FOR ERRORS
004270  012777  004322  005242          MOV     #R.RF,@RFTRAP   ;'READ' TRAP ADDRESS
004276  016777  005442  005304          MOV     WRDCNT,@RFWC    ;WORD COUNT
004304  005077  005304                  CLR     @RFDA           ;DSK ADDRESS
004310  104436                          .START                  ;LOAD CURRENT ADDRESS & IE!7 AND GO
004312  011612  000107  011604          RFCA,100!7,RFCS
004320  000002                          RTI

004322  104404                  R.RF:   CHK.RF                  ;CHECK FOR ERRORS
004324  104402                          COMCOR                  ;COMPLIMENT CORE
004326  012777  004226  005204          MOV     #W.RF,@RFTRAP   ;'WRITE' TRAP ADDRESS
004334  016777  005404  005246          MOV     WRDCNT,@RFWC    ;WORD COUNT
004342  005077  005246                  CLR     @RFDA           ;DSK ADDRESS
004346  104436                          .START                  ;LOAD CURRENT ADDRESS & IE!5 AND GO
004350  011612  000105  011604          RFCA,100!5,RFCS
004356  000002                          RTI
```

```
004360  005067  004330          CH.RF:  CLR     EX              ;CLEAR ERROR FLAG
004364  005777  005214                  TST     @RFCS           ;ANY ERRORS?
004370  100026                          BPL     1$              ;BRANCH IF NO ERRORS
004372  005267  004316                  INC     EX              ;SET ERROR FLAG
004376  032737  020000  177570          BIT     #SW13,@#SWR     ;INHIBIT ERROR TYPEOUT
004404  001020                          BNE     1$              ;INHIBIT TYPEOUTS
004406  017705  005172                  MOV     @RFCS,TTY       ;SET TTY FOR TYPING
004412  000004  011151                  TYPE    ,RF.M1          ;TYPE DEVICE MESSAGE
004416  000004  011012                  TYPE    ,M3             ;TYPE CS
004422  004767  005740                  JSR     PC,PRINTR       ;TYPE RFCS IN OCTAL
004426  000004  011022                  TYPE    ,M4             ;TYPE ER
004432  017705  005150                  MOV     @RFER,TTY       ;TYPE @RFER IN OCTAL
004436  004767  005724                  JSR     PC,PRINTR       ;TYPE LEADING ZERO'S
004442  104432                          STOP                    ;HALT ON ERROR
004444  000002                          RTI                     ;RETURN
004446  032737  020000  177570  1$:     BIT     #SW13,@#SWR     ;INHIBIT ERROR TYPEOUT
004454  001054                          BNE     2$              ;YES!
004456  117767  005122  004226          MOVB    @RFCS,CHK       ;GET EA BITS
004464  116767  174324  004221          MOVB    MX,CHK+1        ;GET MX BITS
004472  105267  004215                  INCB    CHK+1           ;INCREMENT INTO EA BITS
004476  106067  004210                  RORB    CHK             ;MOVE OVER BY 1
004502  006067  004204                  ROR     CHK             ;MOVE IT
004506  006067  004200                  ROR     CHK             ;INTO
004512  006067  004174                  ROR     CHK             ;POSITION
004516  042767  176374  004166          BIC     #176374,CHK     ;CLEAR JUNK
004524  126767  004162  004161          CMPB    CHK,CHK+1       ;MAKE SURE EA BITS INCREMENT
004532  001425                          BEQ     2$              ;RETURN IF EQUAL
004534  000004  011151                  TYPE    ,RF.M1          ;TYPE DEVICE MESSAGE
004540  000004  011142                  TYPE    ,M15            ;TYPE "BANK"
004544  016705  174244                  MOV     MX,TTY          ;TYPE MX IN OCTAL
004550  004767  005622                  JSR     PC,PRINTS       ;AND SUPRESS LEADING ZERO'S
004554  000004  011053                  TYPE    ,M8             ;TRUE
004560  116705  004127                  MOVB    CHK+1,TTY       ;GET BYTE
004564  004767  005606                  JSR     7,PRINTS        ;TYPE TRUE EA BITS
004570  000004  011065                  TYPE    ,M9             ;RECEIVED
004574  116705  004112                  MOVB    CHK,TTY         ;GET BYTE
004600  004767  005572                  JSR     7,PRINTS        ;TYPE RECEIVED EA BITS
004604  104432                          STOP                    ;WAIT
004606  000002                  2$:     RTI                     ;RETURN
```

```
  916  004610  104406                    W.RC:   CHK.RC                  ;CHECK FOR ERRORS
  917  004612  104426                            CKDATA                  ;CHECK CORE
  918  004614  104400                    TRP.RC: CORE                    ;LOAD CORE WITH DATA
  919  004616  012777  004650  004720            MOV     #C.RC,@RCTRAP   ;'CHECK' TRAP ADDRESS
  920  004624  016777  005114  004770            MOV     WRDCNT,@RCWC    ;WORD COUNT
  921  004632  005077  004770                    CLR     @RCDA           ;DSK ADDRESS
  922  004636  104436                            .START                  ;LOAD CURRENT ADDRESS & IE!3 AND GO
  923  004640  011624  000103  011616            RCCA,100!3,RCCS
  924  004646  000002                            RTI
  925
  926  004650  104406                    C.RC:   CHK.RC                  ;CHECK FOR ERRORS
  927  004652  012777  004704  004664            MOV     #R.RC,@RCTRAP   ;'READ' TRAP ADDRESS
  928  004660  016777  005060  004734            MOV     WRDCNT,@RCWC    ;WORD COUNT
  929  004666  005077  004734                    CLR     @RCDA           ;DSK ADDRESS
  930  004672  104436                            .START                  ;LOAD CURRENT ADDRESS & IE!7 AND GO
  931  004674  011624  000107  011616            RCCA,100!7,RCCS
  932  004702  000002                            RTI
  933
  934  004704  104406                    R.RC:   CHK.RC                  ;CHECK FOR ERRORS
  935  004706  104402                            COMCOR                  ;COMPLIMENT CORE
  936  004710  012777  004610  004626            MOV     #W.RC,@RCTRAP   ;'WRITE' TRAP ADDRESS
  937  004716  016777  005022  004676            MOV     WRDCNT,@RCWC    ;WORD COUNT
  938  004724  005077  004676                    CLR     @RCDA           ;DSK ADDRESS
  939  004730  104436                            .START                  ;LOAD CURRENT ADDRESS & IE!5 AND GO
  940  004732  011624  000105  011616            RCCA,100!5,RCCS
  941  004740  000002                            RTI
```

```
  942  004742  005067  003746          CH.RC:  CLR     EX              ;CLEAR ERROR FLAG
  943  004746  005777  004644                  TST     @RCCS           ;ANY ERRORS?
  944  004752  100026                          BPL     1$              ;BRANCH IF NO ERRORS
  945  004754  005267  003734                  INC     EX              ;SET ERROR FLAG
  946  004760  032737  020000  177570          BIT     #SW13,@#SWR     ;INHIBIT ERROR TYPEOUT
  947  004766  001020                          BNE     1$              ;INHIBIT TYPEOUTS
  948  004770  017705  004622                  MOV     @RCCS,TTY       ;SET TTY FOR TYPING
  949  004774  000004  011174                  TYPE    ,RC.M1          ;TYPE DEVICE MESSAGE
  950  005000  000004  011012                  TYPE    ,M3             ;TYPE CS
  951  005004  004767  005356                  JSR     PC,PRINTR       ;TYPE RCCS IN OCTAL
  952  005010  000004  011022                  TYPE    ,M4             ;TYPE ER
  953  005014  017705  004600                  MOV     @RCER,TTY       ;TYPE @RCER IN OCTAL
  954  005020  004767  005342                  JSR     PC,PRINTR       ;TYPE LEADING ZERO'S
  955  005024  104432                          STOP                    ;HALT ON ERROR
  956  005026  000002                          RTI                     ;RETURN
  957  005030  032737  020000  177570  1$:     BIT     #SW13,@#SWR     ;INHIBIT ERROR TYPEOUT
  958  005036  001054                          BNE     2$              ;YES!
  959  005040  117767  004552  003644          MOVB    @RCCS,CHK       ;GET EA BITS
  960  005046  116767  173742  003637          MOVB    MX,CHK+1        ;GET MX BITS
  961  005054  105267  003633                  INCB    CHK+1           ;INCREMENT INTO EA BITS
  962  005060  106067  003626                  RORB    CHK             ;MOVE OVER BY 1
  963  005064  006067  003622                  ROR     CHK             ;MOVE IT
  964  005070  006067  003616                  ROR     CHK             ;INTO
  965  005074  006067  003612                  ROR     CHK             ;POSITION
  966  005100  042767  176374  003604          BIC     #176374,CHK     ;CLEAR JUNK
  967  005106  126767  003600  003577          CMPB    CHK,CHK+1       ;MAKE SURE EA BITS INCREMENT
  968  005114  001425                          BEQ     2$              ;RETURN IF EQUAL
  969  005116  000004  011174                  TYPE    ,RC.M1          ;TYPE DEVICE MESSAGE
  970  005122  000004  011142                  TYPE    ,M15            ;TYPE "BANK"
  971  005126  016705  173662                  MOV     MX,TTY          ;TYPE MX IN OCTAL
  972  005132  004767  005240                  JSR     PC,PRINTS       ;AND SUPRESS LEADING ZERO'S
  973  005136  000004  011053                  TYPE    ,M8             ;TRUE
  974  005142  116705  003545                  MOVB    CHK+1,TTY       ;GET BYTE
  975  005146  004767  005224                  JSR     7,PRINTS        ;TYPE TRUE EA BITS
  976  005152  000004  011065                  TYPE    ,M9             ;RECEIVED
  977  005156  116705  003530                  MOVB    CHK,TTY         ;GET BYTE
  978  005162  004767  005210                  JSR     7,PRINTS        ;TYPE RECEIVED EA BITS
  979  005166  104432                          STOP                    ;WAIT
  980  005170  000002                  2$:     RTI                     ;RETURN
```

```
  981  005172  104410                    W.RP:   CHK.RP                  ;CHECK FOR ERRORS
  982  005174  104426                            CKDATA                  ;CHECK CORE
  983  005176  104400                    TP.RP:  CORE                    ;LOAD CORE WITH DATA
  984  005200  012777  005232  004342            MOV     #C.RP,@RPTRAP   ;'CHECK' TRAP ADDRESS
  985  005206  016777  004532  004416            MOV     WRDCNT,@RPWC    ;WORD COUNT
  986  005214  005077  004416                    CLR     @RPDA           ;DSK ADDRESS
  987  005220  104436                            .START                  ;LOAD CURRENT ADDRESS & IE!3 AND GO
  988  005222  011634  000103  011630            RPCA,100!3,RPCS
  989  005230  000002                            RTI
  990
  991  005232  104410                    C.RP:   CHK.RP                  ;CHECK FOR ERRORS
  992  005234  012777  005266  004306            MOV     #R.RP,@RPTRAP   ;'READ' TRAP ADDRESS
  993  005242  016777  004476  004362            MOV     WRDCNT,@RPWC    ;WORD COUNT
  994  005250  005077  004362                    CLR     @RPDA           ;DSK ADDRESS
  995  005254  104436                            .START                  ;LOAD CURRENT ADDRESS & IE!7 AND GO
  996  005256  011634  000107  011630            RPCA,100!7,RPCS
  997  005264  000002                            RTI
  998
  999  005266  104410                    R.RP:   CHK.RP                  ;CHECK FOR ERRORS
 1000  005270  104402                            COMCOR                  ;COMPLIMENT CORE
 1001  005272  012777  005172  004250            MOV     #W.RP,@RPTRAP   ;'WRITE' TRAP ADDRESS
 1002  005300  016777  004440  004324            MOV     WRDCNT,@RPWC    ;WORD COUNT
 1003  005306  005077  004324                    CLR     @RPDA           ;DSK ADDRESS
 1004  005312  104436                            .START                  ;LOAD CURRENT ADDRESS & IE!5 AND GO
 1005  005314  011634  000105  011630            RPCA,100!5,RPCS
 1006  005322  000002                            RTI
 1007  005324  012777  000011  004276  TRP.RP:   MOV     #11,@RPCS
 1008  005332  105777  004272                    TSTB    @RPCS
 1009  005336  100375                            BPL     .-4
 1010  005340  005777  004276                    TST     @RPDS
 1011  005344  100375                            BPL     .-4
 1012  005346  005077  004256                    CLR     @RPCS
 1013  005352  000711                            BR      TP.RP
```

```
1014  005354  005067  003334          CH.RP:  CLR     EX              ;CLEAR ERROR FLAG
1015  005360  005777  004244                  TST     @RPCS           ;ANY ERRORS?
1016  005364  100034                          BPL     1$              ;BRANCH IF NO ERRORS
1017  005366  005267  003322                  INC     EX              ;SET ERROR FLAG
1018  005372  032737  020000  177570          BIT     #SW13,@#SWR     ;INHIBIT ERROR TYPEOUT
1019  005400  001026                          BNE     1$              ;INHIBIT TYPEOUTS
1020  005402  017705  004222                  MOV     @RPCS,TTY       ;SET TTY FOR TYPING
1021  005406  000004  011242                  TYPE    ,RP.M1          ;TYPE DEVICE MESSAGE
1022  005412  000004  011012                  TYPE    ,M3             ;TYPE CS
1023  005416  004767  004744                  JSR     PC,PRINTR       ;TYPE RPCS IN OCTAL
1024  005422  000004  011022                  TYPE    ,M4             ;TYPE ER
1025  005426  017705  004206                  MOV     @RPER,TTY       ;TYPE @RPER IN OCTAL
1026  005432  004767  004730                  JSR     PC,PRINTR       ;TYPE LEADING ZERO'S
1027  005436  104432                          STOP                    ;HALT ON ERROR
1028  005440  012777  000001  004162          MOV     #1,@RPCS        ;LOAD A CLEAR
1029  005446  105777  004156                  TSTB    @RPCS           ;WAIT FOR
1030  005452  100375                          BPL     .-4             ;DONE
1031  005454  000002                          RTI                     ;RETURN
1032  005456  032737  020000  177570  1$:     BIT     #SW13,@#SWR     ;INHIBIT ERROR TYPEOUT
1033  005464  001054                          BNE     2$              ;YES!
1034  005466  117767  004136  003216          MOVB    @RPCS,CHK       ;GET EA BITS
1035  005474  116767  173314  003211          MOVB    MX,CHK+1        ;GET MX BITS
1036  005502  105267  003205                  INCB    CHK+1           ;INCREMENT INTO EA BITS
1037  005506  106067  003200                  RORB    CHK             ;MOVE OVER BY 1
1038  005512  006067  003174                  ROR     CHK             ;MOVE IT
1039  005516  006067  003170                  ROR     CHK             ;INTO
1040  005522  006067  003164                  ROR     CHK             ;POSITION
1041  005526  042767  176374  003156          BIC     #176374,CHK     ;CLEAR JUNK
1042  005534  126767  003152  003151          CMPB    CHK,CHK+1       ;MAKE SURE EA BITS INCREMENT
1043  005542  001425                          BEQ     2$              ;RETURN IF EQUAL
1044  005544  000004  011242                  TYPE    ,RP.M1          ;TYPE DEVICE MESSAGE
1045  005550  000004  011142                  TYPE    ,M15            ;TYPE "BANK"
1046  005554  016705  173234                  MOV     MX,TTY          ;TYPE MX IN OCTAL
1047  005560  004767  004612                  JSR     PC,PRINTS       ;AND SUPRESS LEADING ZERO'S
1048  005564  000004  011053                  TYPE    ,M8             ;TRUE
1049  005570  116705  003117                  MOVB    CHK+1,TTY       ;GET BYTE
1050  005574  004767  004576                  JSR     7,PRINTS        ;TYPE TRUE EA BITS
1051  005600  000004  011065                  TYPE    ,M9             ;RECEIVED
1052  005604  116705  003102                  MOVB    CHK,TTY         ;GET BYTE
1053  005610  004767  004562                  JSR     7,PRINTS        ;TYPE RECEIVED EA BITS
1054  005614  104432                          STOP                    ;WAIT
1055  005616  000002                  2$:     RTI                     ;RETURN
```

```
1056   005620  104412                  W.RK:   CHK.RK                  ;CHECK FOR ERRORS
1057   005622  104426                          CKDATA                  ;CHECK CORE
1058   005624  104400                  TRP.RK: CORE                    ;LOAD CORE WITH DATA
1059   005626  012777  005660  003720          MOV     #C.RK,@RKTRAP   ;'CHECK' TRAP ADDRESS
1060   005634  016777  004104  004006          MOV     WRDCNT,@RKWC    ;WORD COUNT
1061   005642  005077  004006                  CLR     @RKDA           ;DSK ADDRESS
1062   005646  104436                          .START                  ;LOAD CURRENT ADDRESS & IE!3 AND GO
1063   005650  011652  000103  011644          RKCA,100!3,RKCS
1064   005656  000002                          RTI
1065
1066   005660  104412                  C.RK:   CHK.RK                  ;CHECK FOR ERRORS
1067   005662  012777  005714  003664          MOV     #R.RK,@RKTRAP   ;'READ' TRAP ADDRESS
1068   005670  016777  004050  003752          MOV     WRDCNT,@RKWC    ;WORD COUNT
1069   005676  005077  003752                  CLR     @RKDA           ;DSK ADDRESS
1070   005702  104436                          .START                  ;LOAD CURRENT ADDRESS & IE!7 AND GO
1071   005704  011652  000107  011644          RKCA,100!7,RKCS
1072   005712  000002                          RTI
1073
1074   005714  104412                  R.RK:   CHK.RK                  ;CHECK FOR ERRORS
1075   005716  104402                          COMCOR                  ;COMPLIMENT CORE
1076   005720  012777  005620  003626          MOV     #W.RK,@RKTRAP   ;'WRITE' TRAP ADDRESS
1077   005726  016777  004012  003714          MOV     WRDCNT,@RKWC    ;WORD COUNT
1078   005734  005077  003714                  CLR     @RKDA           ;DSK ADDRESS
1079   005740  104436                          .START                  ;LOAD CURRENT ADDRESS & IE!5 AND GO
1080   005742  011652  000105  011644          RKCA,100!5,RKCS
1081   005750  000002                          RTI
```

```
1082  005752  005067  002736          CH.RK:  CLR     EX              ;CLEAR ERROR FLAG
1083  005756  005777  003662                  TST     @RKCS           ;ANY ERRORS?
1084  005762  100034                          BPL     1$              ;BRANCH IF NO ERRORS
1085  005764  005267  002724                  INC     EX              ;SET ERROR FLAG
1086  005770  032737  020000  177570          BIT     #SW13,@#SWR     ;INHIBIT ERROR TYPEOUT
1087  005776  001026                          BNE     1$              ;INHIBIT TYPEOUTS
1088  006000  017705  003640                  MOV     @RKCS,TTY       ;SET TTY FOR TYPING
1089  006004  000004  011217                  TYPE    ,RK.M1          ;TYPE DEVICE MESSAGE
1090  006010  000004  011012                  TYPE    ,M3             ;TYPE CS
1091  006014  004767  004346                  JSR     PC,PRINTR       ;TYPE RKCS IN OCTAL
1092  006020  000004  011022                  TYPE    ,M4             ;TYPE ER
1093  006024  017705  003616                  MOV     @RKER,TTY       ;TYPE @RKER IN OCTAL
1094  006030  004767  004332                  JSR     PC,PRINTR       ;TYPE LEADING ZERO'S
1095  006034  104432                          STOP                    ;HALT ON ERROR
1096  006036  012777  000001  003600          MOV     #1,@RKCS        ;LOAD A CLEAR
1097  006044  105777  003574                  TSTB    @RKCS           ;WAIT FOR
1098  006050  100375                          BPL     .-4             ;DONE
1099  006052  000002                          RTI                     ;RETURN
1100  006054  032737  020000  177570  1$:     BIT     #SW13,@#SWR     ;INHIBIT ERROR TYPEOUT
1101  006062  001054                          BNE     2$              ;YES!
1102  006064  117767  003554  002620          MOVB    @RKCS,CHK       ;GET EA BITS
1103  006072  116767  172716  002613          MOVB    MX,CHK+1        ;GET MX BITS
1104  006100  105267  002607                  INCB    CHK+1           ;INCREMENT INTO EA BITS
1105  006104  106067  002602                  RORB    CHK             ;MOVE OVER BY 1
1106  006110  006067  002576                  ROR     CHK             ;MOVE IT
1107  006114  006067  002572                  ROR     CHK             ;INTO
1108  006120  006067  002566                  ROR     CHK             ;POSITION
1109  006124  042767  176374  002560          BIC     #176374,CHK     ;CLEAR JUNK
1110  006132  126767  002554  002553          CMPB    CHK,CHK+1       ;MAKE SURE EA BITS INCREMENT
1111  006140  001425                          BEQ     2$              ;RETURN IF EQUAL
1112  006142  000004  011217                  TYPE    ,RK.M1          ;TYPE DEVICE MESSAGE
1113  006146  000004  011142                  TYPE    ,M15            ;TYPE "BANK"
1114  006152  016705  172636                  MOV     MX,TTY          ;TYPE MX IN OCTAL
1115  006156  004767  004214                  JSR     PC,PRINTS       ;AND SUPRESS LEADING ZERO'S
1116  006162  000004  011053                  TYPE    ,M8             ;TRUE
1117  006166  116705  002521                  MOVB    CHK+1,TTY       ;GET BYTE
1118  006172  004767  004200                  JSR     7,PRINTS        ;TYPE TRUE EA BITS
1119  006176  000004  011065                  TYPE    ,M9             ;RECEIVED
1120  006202  116705  002504                  MOVB    CHK,TTY         ;GET BYTE
1121  006206  004767  004164                  JSR     7,PRINTS        ;TYPE RECEIVED EA BITS
1122  006212  104432                          STOP                    ;WAIT
1123  006214  000002                  2$:     RTI                     ;RETURN
```

```
1124   006216  104414                  W.TC:   CHK.TC                  ;CHECK FOR ERRORS
1125   006220  104426                          CKDATA                  ;CHECK CORE
1126   006222  012777  000001  003426          MOV     #1,@TCCS        ;STOP ALL TRANSPORTS
1127   006230  104400                  TRP.TC: CORE                    ;LOAD WORST CASE NOISE
1128   006232  104422  000010                  SEARCH  ,10             ;SEARCH FOR BLOCK 10
1129   006236  012777  006264  003314          MOV     #R.TC,@TCTRAP   ;TRAP ADDRESS
1130   006244  016777  003474  003410          MOV     WRDCNT,@TCWC    ;WORD COUNT
1131   006252  104436                          .START                  ;LOAD CURRENT ADDRESS & IE!15 AND GO
1132   006254  011664  000115  011656          TCCA,100!15,TCCS
1133   006262  000002                          RTI
1134
1135   006264  104414                  R.TC:   CHK.TC                  ;CHECK FOR ERROR
1136   006266  104402                          COMCOR                  ;COMPLIMENT CORE
1137   006270  104422  000010                  SEARCH  ,10             ;SEARCH FOR BLOCK 10
1138   006274  012777  006216  003256          MOV     #W.TC,@TCTRAP   ;TRAP ADDRESS
1139   006302  016777  003436  003352          MOV     WRDCNT,@TCWC    ;WORD COUNT
1140   006310  104436                          .START                  ;LOAD CURRENT ADDRESS & IE!5 AND GO
1141   006312  011664  000105  011656          TCCA,100!5,TCCS
1142   006320  000002                          RTI
```

```
1143  006322  005067  002366          CH.TC:  CLR     EX              ;CLEAR ERROR FLAG
1144  006326  005777  003324                  TST     @TCCS           ;ANY ERRORS?
1145  006332  100034                          BPL     1$              ;BRANCH IF NO ERRORS
1146  006334  005267  002354                  INC     EX              ;SET ERROR FLAG
1147  006340  032737  020000  177570          BIT     #SW13,@#SWR     ;INHIBIT ERROR TYPEOUT
1148  006346  001026                          BNE     1$              ;INHIBIT TYPEOUTS
1149  006350  017705  003302                  MOV     @TCCS,TTY       ;SET TTY FOR TYPING
1150  006354  000004  011265                  TYPE    ,TC.M1          ;TYPE DEVICE MESSAGE
1151  006360  000004  011012                  TYPE    ,M3             ;TYPE CS
1152  006364  004767  003776                  JSR     PC,PRINTR       ;TYPE TCCS IN OCTAL
1153  006370  000004  011022                  TYPE    ,M4             ;TYPE ER
1154  006374  017705  003260                  MOV     @TCER,TTY       ;TYPE @TCER IN OCTAL
1155  006400  004767  003762                  JSR     PC,PRINTR       ;TYPE LEADING ZERO'S
1156  006404  104432                          STOP                    ;HALT ON ERROR
1157  006406  012777  000001  003242          MOV     #1,@TCCS        ;LOAD A CLEAR
1158  006414  105777  003236                  TSTB    @TCCS           ;WAIT FOR
1159  006420  100375                          BPL     .-4             ;DONE
1160  006422  000002                          RTI                     ;RETURN
1161  006424  032737  020000  177570  1$:     BIT     #SW13,@#SWR     ;INHIBIT ERROR TYPEOUT
1162  006432  001054                          BNE     2$              ;YES!
1163  006434  117767  003216  002250          MOVB    @TCCS,CHK       ;GET EA BITS
1164  006442  116767  172346  002243          MOVB    MX,CHK+1        ;GET MX BITS
1165  006450  105267  002237                  INCB    CHK+1           ;INCREMENT INTO EA BITS
1166  006454  106067  002232                  RORB    CHK             ;MOVE OVER BY 1
1167  006460  006067  002226                  ROR     CHK             ;MOVE IT
1168  006464  006067  002222                  ROR     CHK             ;INTO
1169  006470  006067  002216                  ROR     CHK             ;POSITION
1170  006474  042767  176374  002210          BIC     #176374,CHK     ;CLEAR JUNK
1171  006502  126767  002204  002203          CMPB    CHK,CHK+1       ;MAKE SURE EA BITS INCREMENT
1172  006510  001425                          BEQ     2$              ;RETURN IF EQUAL
1173  006512  000004  011265                  TYPE    ,TC.M1          ;TYPE DEVICE MESSAGE
1174  006516  000004  011142                  TYPE    ,M15            ;TYPE "BANK"
1175  006522  016705  172266                  MOV     MX,TTY          ;TYPE MX IN OCTAL
1176  006526  004767  003644                  JSR     PC,PRINTS       ;AND SUPRESS LEADING ZERO'S
1177  006532  000004  011053                  TYPE    ,M8             ;TRUE
1178  006536  116705  002151                  MOVB    CHK+1,TTY       ;GET BYTE
1179  006542  004767  003630                  JSR     7,PRINTS        ;TYPE TRUE EA BITS
1180  006546  000004  011065                  TYPE    ,M9             ;RECEIVED
1181  006552  116705  002134                  MOVB    CHK,TTY         ;GET BYTE
1182  006556  004767  003614                  JSR     7,PRINTS        ;TYPE RECEIVED EA BITS
1183  006562  104432                          STOP                    ;WAIT
1184  006564  000002                  2$:     RTI                     ;RETURN
```

```
1185  006566  017667  000000  000330  S.TC:   MOV     @(6),TC.TA
1186  006574  062716  000002          ADD     #2,(6)
1187  006600  005767  000320          TST     TC.TA           ;FOWARD OR REVERSE
1188  006604  100064                  BPL     FOWSER          ;LEAVE IT IN REVERSE
1189  006606  005467  000312          NEG     TC.TA           ;GET PLUS BLOCK NUMBER
1190  006612  012777  006652  002740  MOV     #SR1,@TCTRAP    ;TRAP ADDRESS
1191  006620  016767  000300  000274  MOV     TC.TA,WANT
1192  006626  062767  000002  000266  ADD     #2,WANT         ;2 PAST BLOCK
1193  006634  012667  000270          MOV     (6)+,RETURN     ;SAVE RETURN ADDRESS
1194  006640  005726                  TST     (6)+
1195  006642  012777  000503  003006  RETI:   MOV     #503,@TCCS      ;SEARCH FOWARD
1196  006650  000002                  RTI
1197
1198  006652  005777  003000          SR1:    TST     @TCCS           ;CHECK FOR ERROR
1199  006656  100005                  BPL     SR1A            ;NO ERRORS
1200  006660  005777  002774          TST     @TCER           ;CHECK FOR END OF TAPE
1201  006664  100401                  BMI     .+4
1202  006666  104434                  ERR3
1203  006670  000405                  BR      SF1
1204
1205  006672  026777  000224  002766  SR1A:   CMP     WANT,@TCDB      ;ON BLOCK?
1206  006700  002401                  BLT     SF1             ;GO FOWARD
1207  006702  000757                  BR      RETI            ;CONTINUE AS YOU WERE
1208
1209  006704  012777  006722  002646  SF1:    MOV     #SF2,@TCTRAP    ;TRAP ADDRESS
1210  006712  012777  004503  002736  RETR:   MOV     #4503,@TCCS     ;SEARCH REVERSE
1211  006720  000002                  RTI
1212
1213  006722  005777  002730          SF2:    TST     @TCCS           ;ERROR?
1214  006726  100005                  BPL     SF1A            ;NO ERRORS
1215  006730  005777  002724          TST     @TCER           ;END OF TAPE?
1216  006734  100401                  BMI     .+4
1217  006736  104430                  ERR2                    ;NO
1218  006740  000740                  BR      RETI            ;SWITCH DIRECTIONS
1219
1220  006742  026777  000156  002716  SF1A:   CMP     TC.TA,@TCDB     ;RIGHT BLOCK?
1221  006750  001360                  BNE     RETR            ;NO
1222  006752  000177  000152          JMP     @RETURN
```

```
1223  006756  012777  007016  002574  FOWSER: MOV     #SC1,@TCTRAP    ;TRAP ADDRESS
1224  006764  016767  000134  000130          MOV     TC.TA,WANT
1225  006772  162767  000002  000122          SUB     #2,WANT         ;2 PAST BLOCK
1226  007000  012667  000124                  MOV     (6)+,RETURN     ;SAVE RETURN ADDRESS
1227  007004  005726                          TST     (6)+
1228  007006  012777  004503  002642  RETI1:  MOV     #4503,@TCCS     ;SEARCH REVERSE
1229  007014  000002                          RTI
1230
1231  007016  005777  002634          SC1:    TST     @TCCS           ;CHECK FOR ERROR
1232  007022  100005                          BPL     SC1A            ;NO ERRORS
1233  007024  005777  002630                  TST     @TCER           ;CHECK FOR END OF TAPE
1234  007030  100401                          BMI     .+4
1235  007032  104434                          ERR3
1236  007034  000405                          BR      SCF1
1237
1238  007036  026777  000060  002622  SC1A:   CMP     WANT,@TCDB      ;ON BLOCK?
1239  007044  003001                          BGT     SCF1            ;GO REVERSE
1240  007046  000757                          BR      RETI1           ;CONTINUE AS YOU WERE
1241
1242  007050  012777  007066  002502  SCF1:   MOV     #SCF2,@TCTRAP   ;TRAP ADDRESS
1243  007056  012777  000503  002572  RETR1:  MOV     #503,@TCCS      ;SEARCH FOWARD
1244  007064  000002                          RTI
1245
1246  007066  005777  002564          SCF2:   TST     @TCCS           ;ERROR?
1247  007072  100005                          BPL     SCF1A           ;NO ERRORS
1248  007074  005777  002560                  TST     @TCER           ;END OF TAPE?
1249  007100  100401                          BMI     .+4
1250  007102  104430                          ERR2                    ;NO
1251  007104  000740                          BR      RETI1           ;SWITCH DIRECTIONS
1252
1253  007106  026777  000012  002552  SCF1A:  CMP     TC.TA,@TCDB     ;RIGHT BLOCK?
1254  007114  001360                          BNE     RETR1           ;NO
1255  007116  000177  000006                  JMP     @RETURN
1256
1257  007122  000000          WANT:   0
1258  007124  000000          TC.TA:  0
1259  007126  000000          TC.WC:  0
1260  007130  000000          RETURN: 0
```

```
1261  007132  104416                  W.TM:   CHK.TM                  ;CHECK FOR ERROR
1262  007134  104426                          CKDATA
1263  007136  104400                  TRP.TM: CORE                    ;SET UP CORE
1264  007140  104424                          REWIND
1265  007142  012777  007224  002420          MOV     #R.TM,@TMTRAP   ;TRAP ADDRESS
1266  007150  016777  002570  002516          MOV     WRDCNT,@TMBC    ;BYTE COUNT
1267  007156  006377  002512                  ASL     @TMBC           ;MAKE BYTE COUNT
1268  007162  104436                          .START                  ;LOAD CURRENT ADDRESS & IE!60005 AND GO
1269  007164  011676  060105  011670          TMCA,100!60005,TMCS
1270  007172  000002                          RTI
1271
1272  007174  012777  007220  002366  RW.TM:  MOV     #X.TM,@TMTRAP   ;TRAP ADDRESS
1273  007202  012667  000056                  MOV     (6)+,TMRET      ;SAVE ADDRESS
1274  007206  005726                          TST     (6)+            ;RESTORE STACK
1275  007210  012777  060117  002452          MOV     #60117,@TMCS    ;REWIND
1276  007216  000002                          RTI
1277
1278  007220  000177  000040          X.TM:   JMP     @TMRET
1279
1280  007224  104416                  R.TM:   CHK.TM                  ;ANY ERRORS?
1281  007226  104402                          COMCOR                  ;COMPLIMENT CORE
1282  007230  104424                          REWIND
1283  007232  012777  007132  002330          MOV     #W.TM,@TMTRAP   ;TRAP ADDRESS
1284  007240  016777  002500  002426          MOV     WRDCNT,@TMBC    ;BYTE COUNT
1285  007246  006377  002422                  ASL     @TMBC           ;MAKE BYTE COUNT
1286  007252  104436                          .START                  ;LOAD CURRENT ADDRESS & IE!60003 AND GO
1287  007254  011676  060103  011670          TMCA,100!60003,TMCS
1288  007262  000002                          RTI
1289
1290  007264  000000                  TMRET:  0
```

```
1291  007266  005067  001422          CH.TM:  CLR     EX              ;CLEAR ERROR FLAG
1292  007272  005777  002372                  TST     @TMCS           ;ANY ERRORS?
1293  007276  100026                         BPL     1$              ;BRANCH IF NO ERRORS
1294  007300  005267  001410                 INC     EX              ;SET ERROR FLAG
1295  007304  032737  020000  177570         BIT     #SW13,@#SWR     ;INHIBIT ERROR TYPEOUT
1296  007312  001020                         BNE     1$              ;INHIBIT TYPEOUTS
1297  007314  017705  002350                 MOV     @TMCS,TTY       ;SET TTY FOR TYPING
1298  007320  000004  011306                 TYPE    ,TM.M1          ;TYPE DEVICE MESSAGE
1299  007324  000004  011012                 TYPE    ,M3             ;TYPE CS
1300  007330  004767  003032                 JSR     PC,PRINTR       ;TYPE TMCS IN OCTAL
1301  007334  000004  011022                 TYPE    ,M4             ;TYPE ER
1302  007340  017705  002326                 MOV     @TMER,TTY       ;TYPE @TMER IN OCTAL
1303  007344  004767  003016                 JSR     PC,PRINTR       ;TYPE LEADING ZERO'S
1304  007350  104432                         STOP                    ;HALT ON ERROR
1305  007352  000002                         RTI                     ;RETURN
1306  007354  032737  020000  177570  1$:    BIT     #SW13,@#SWR     ;INHIBIT ERROR TYPEOUT
1307  007362  001054                         BNE     2$              ;YES!
1308  007364  117767  002300  001320         MOVB    @TMCS,CHK       ;GET EA BITS
1309  007372  116767  171416  001313         MOVB    MX,CHK+1        ;GET MX BITS
1310  007400  105267  001307                 INCB    CHK+1           ;INCREMENT INTO EA BITS
1311  007404  106067  001302                 RORB    CHK             ;MOVE OVER BY 1
1312  007410  006067  001276                 ROR     CHK             ;MOVE IT
1313  007414  006067  001272                 ROR     CHK             ;INTO
1314  007420  006067  001266                 ROR     CHK             ;POSITION
1315  007424  042767  176374  001260         BIC     #176374,CHK     ;CLEAR JUNK
1316  007432  126767  001254  001253         CMPB    CHK,CHK+1       ;MAKE SURE EA BITS INCREMENT
1317  007440  001425                         BEQ     2$              ;RETURN IF EQUAL
1318  007442  000004  011306                 TYPE    ,TM.M1          ;TYPE DEVICE MESSAGE
1319  007446  000004  011142                 TYPE    ,M15            ;TYPE "BANK"
1320  007452  016705  171336                 MOV     MX,TTY          ;TYPE MX IN OCTAL
1321  007456  004767  002714                 JSR     PC,PRINTS       ;AND SUPRESS LEADING ZERO'S
1322  007462  000004  011053                 TYPE    ,M8             ;TRUE
1323  007466  116705  001221                 MOVB    CHK+1,TTY       ;GET BYTE
1324  007472  004767  002700                 JSR     7,PRINTS        ;TYPE TRUE EA BITS
1325  007476  000004  011065                 TYPE    ,M9             ;RECEIVED
1326  007502  116705  001204                 MOVB    CHK,TTY         ;GET BYTE
1327  007506  004767  002664                 JSR     7,PRINTS        ;TYPE RECEIVED EA BITS
1328  007512  104432                         STOP                    ;WAIT
1329  007514  000002                  2$:    RTI                     ;RETURN
```

```
1330                                    ;DM11 PRIMING ROUTINE.  THIS ROUTINE SETS UP THE DM11 TO TRANSMIT
1331                                    ;A 400(8) BINARY COUNT PATTERN ON ALL 16 LINES.
1332
1333  007516  104442                    TRP.DM: NEXT
1334  007520  016705  171270                    MOV     MX,TTY          ;GET MX
1335  007524  006005                            ROR     TTY             ;*ASH #13.,TTY*
1336  007526  006005                            ROR     TTY
1337  007530  006005                            ROR     TTY
1338  007532  006005                            ROR     TTY
1339  007534  042705  017777                    BIC     #17777,TTY      ;CLEAR JUNK
1340  007540  010567  000410                    MOV     TTY,DMCAT       ;ADDRESS OF CAT
1341  007544  016767  000404  000404  1$:       MOV     DMCAT,DMWCT     ;SET UP WORD COUNT
1342  007552  062767  000040  000376            ADD     #32.,DMWCT
1343  007560  016767  000372  000372            MOV     DMWCT,DMBAT     ;SET BASE ADDRESS
1344  007566  062767  000040  000364            ADD     #32.,DMBAT
1345  007574  016767  000360  000360            MOV     DMBAT,TUMTAB    ;SET UP TUMBLE TABLE
1346  007602  062767  000100  000352            ADD     #64.,TUMTAB
1347  007610  016767  000346  000346            MOV     TUMTAB,BINCNT   ;SET UP BINARY COUNT
1348  007616  062767  000200  000340            ADD     #128.,BINCNT
1349  007624  010246                            MOV     R2,-(6)         ;SAVE R2 & R1
1350  007626  010146                            MOV     R1,-(6)         ;ON THE STACK
1351  007630  016702  002104                    MOV     LOLIM,R2
1352  007634  012701  000020                    MOV     #16.,R1
1353  007640  016722  000320          DMPRIA:   MOV     BINCNT,(2)+     ;LOAD CURRENT ADDRESS TABLE
1354  007644  005301                            DEC     R1
1355  007646  001374                            BNE     DMPRIA
1356  007650  012701  000020                    MOV     #16.,R1
1357  007654  012722  177400          DMPRIB:   MOV     #-400,(2)+      ;LOAD WORD COUNT TABLE
1358  007660  005301                            DEC     R1
1359  007662  001374                            BNE     DMPRIB
1360  007664  062702  000076                    ADD     #62.,R2         ;BUMP TO TUMTAB-2
1361  007670  005022                            CLR     (2)+
1362  007672  012701  000100                    MOV     #64.,R1
1363  007676  005022                  DMPRIC:   CLR     (2)+            ;CLEAR TUMBLE TABLE
1364  007700  005301                            DEC     R1
1365  007702  001375                            BNE     DMPRIC
1366  007704  005001                            CLR     R1
```

```
1367  007706  110122                    DMPRID: MOVB    R1,(2)+         ;GENERATE BINARY COUNT
1368  007710  105201                            INCB    R1              ;THIS WILL BE THE TRANSMITTED DATA
1369  007712  001375                            BNE     DMPRID
1370  007714  005077  001760                    CLR     @DMCS
1371  007720  005077  001756                    CLR     @DMACT
1372  007724  005077  001754                    CLR     @DMBRK
1373  007730  005067  000206                    CLR     DMTDAT
1374  007734  016777  000214  001744            MOV     DMCAT,@DMADR
1375  007742  016767  001772  000174            MOV     LOLIM,DMPTR
1376  007750  062767  000200  000166            ADD     #200,DMPTR
1377  007756  016767  000162  000162            MOV     DMPTR,ENDPTR
1378  007764  062767  000200  000154            ADD     #200,ENDPTR
1379  007772  016701  001576                    MOV     DMRVEC,R1
1380  007776  012721  010166                    MOV     #DMRINT,(1)+
1381  010002  012721  000240                    MOV     #240,(1)+
1382  010006  012721  010064                    MOV     #DMTINT,(1)+
1383  010012  012711  000240                    MOV     #240,(1)
1384  010016  016705  170772                    MOV     MX,TTY
1385  010022  006305                            ASL     TTY
1386  010024  042705  177717                    BIC     #177717,TTY
1387  010030  010577  001644                    MOV     TTY,@DMCS
1388  010034  052777  010105  001636            BIS     #10105,@DMCS
1389  010042  016777  000102  001632            MOV     DMBAIM,@DMACT   ;START TRANSMITTING
1390  010050  012601                            MOV     (6)+,R1
1391  010052  012602                            MOV     (6)+,R2
1392  010054  005037  177776                    CLR     @#177776        ;CLEAR PS
1393  010060  000167  172344                    JMP     WAIT
1394
1395                                    ;DM11 TRANSMITTER INTERRUPT SERVICE ROUTINE
1396
1397  010064  032777  060000  001606    DMTINT: BIT     #60000,@DMCS    ;TEST FOR ERROR FLAGS
1398  010072  001414                            BEQ     DMTINC          ;BRANCH IF NO ERROR FLAGS
1399  010074  000004  011327                    TYPE    ,DM.M1
1400  010100  000004  011012                    TYPE    ,M3
1401  010104  017705  001570                    MOV     @DMCS,TTY       ;TYPE @DMCS IN OCTAL
1402  010110  004767  002252                    JSR     PC,PRINTR       ;TYPE LEADING ZERO'S
1403  010114  104432                            STOP
1404  010116  042777  060000  001554            BIC     #60000,@DMCS    ;CLEAR ERROR FLAGS
1405  010124  005777  001550            DMTINC: TST     @DMCS           ;TEST FOR READY FLAG
1406  010130  100003                            BPL     1$
1407  010132  042777  100000  001540            BIC     #100000,@DMCS   ;CLEAR READY
1408  010140  000002                    1$:     RTI                     ;EXIT
1409
1410
1411  010142  000000                    DMTDAT: 0                       ;STORAGE LOCATION FOR LAST TRANSMITTED CHAR
1412  010144  000000                    DMPTR:  0                       ;DM11 SOFTWARE TUMBLE TABLE POINTER
1413  010146  000000                    ENDPTR: 0
1414  010150  177777                    DMBAIM: 177777                  ;INITIALIZE TO TRANSMIT ON ALL LINES.
1415  010152  177400                    MASK:   177400
1416  010154  000000                    DMCAT:  0
1417  010156  000000                    DMWCT:  0
1418  010160  000000                    DMBAT:  0
1419  010162  000000                    TUMTAB: 0
1420  010164  000000                    BINCNT: 0
```

```
                                        ;DM11 RECEIVER INTERRUPT SERVICE ROUTINE

010166 010246                   DMRINT: MOV     R2,-(6)
010170 016702 177750                    MOV     DMPTR,R2
010174 104440                           SETBANK
010176 005712                           TST     (2)             ;TEST FOR VALID DATA ENTRY
010200 100446                           BMI     DMRINC          ;BRANCH IF VALID DATA ENTRY
010202 000004 011327                    TYPE    ,DM.M1
010206 000004 010212                    TYPE    ,.+2            ;.ASCIZ "  NO DATA RECEIVED"
010236 104432                           STOP
010240 000457                           BR      DMRINX          ;GO TO EXIT

010242 005742                   DMRINB: TST     -(2)            ;CHECK LAST ENTRY
010244 001421                           BEQ     1$              ;OK IF 0
010246 000004 011327                    TYPE    ,DM.M1
010252 000004 010256                    TYPE    ,.+2            ;.ASCIZ "  TABLE OVERFLOW"
010300 012602                           MOV     (6)+,R2         ;RESTORE R2
010302 022626                           CMP     (6)+,(6)+       ;CLEAR RETURN
010304 000167 177206                    JMP     TRP.DM          ;LOOP
010310 005722                   1$:     TST     (2)+            ;MOD POINTER
010312 005712                           TST     (2)             ;VALID DATA ENTRY?
010314 100031                           BPL     DMRINX          ;EXIT IF NO MORE ENTRIES
010316 032712 017000            DMRINC: BIT     #17000,(2)      ;DATA ON LINE 0?
010322 001013                           BNE     DMRIND          ;BRANCH IF DATA RECEIVED ON OTHER THAN LINE 0
010324 146712 177622                    BICB    MASK,(2)        ;CLEAR NON TRANSMITTED BITS
010330 016767 177606 173352             MOV     DMTDAT,DATA
010336 121267 173346                    CMPB    (2),DATA        ;COMPARE RECEIVED & TRANSMITTED DATA
010342 001401                           BEQ     1$
010344 104434                           ERR3
010346 105267 177570            1$:     INCB    DMTDAT          ;FORM WHAT NEXT RECEIVED CHAR. SHOULD BE
010352 005022                   DMRIND: CLR     (2)+            ;CLEAR TUMBLE TABLE ENTRY
010354 020267 177566                    CMP     R2,ENDPTR       ;IS POINTER AT THE END OF THE TABLE
010360 001004                           BNE     1$
010362 016702 001352                    MOV     LOLIM,R2
010366 062702 000200                    ADD     #200,R2
010372 010267 177546            1$:     MOV     R2,DMPTR        ;RESTORE POINTER
010376 000721                           BR      DMRINB          ;LOOK AT NEXT ENTRY

010400 012602                   DMRINX: MOV     (6)+,R2         ;RESTORE R0
010402 005777 001274                    TST     @DMACT
010406 001003                           BNE     BICX
010410 022626                           CMP     (6)+,(6)+
010412 000167 177100                    JMP     TRP.DM

010416 042777 000200 001254     BICX:   BIC     #200,@DMCS      ;CLEAR DONE FLAG
010424 000002                           RTI
```

```
 1467  010426  104440                  SET.DR: SETBANK
 1468  010430  104420                          CHK.DR
 1469  010432  005767  000256                  TST     EX              ;ANY ERRORS
 1470  010436  001026                          BNE     TRP.DR          ;YES
 1471  010440  016702  001274                  MOV     LOLIM,R2        ;SET ADDRESS
 1472  010444  012767  000001  173236          MOV     #1,DATA         ;SET DATA
 1473  010452  026712  173232          NX.DR:  CMP     DATA,(2)        ;CHECK FIRST WORD
 1474  010456  001401                          BEQ     .+4             ;SAME?
 1475  010460  104434                          ERR3                    ;NO
 1476  010462  062702  000002                  ADD     #2,R2           ;INC ADDRESS
 1477  010466  026712  173216                  CMP     DATA,(2)        ;SECOND WORD OK?
 1478  010472  001401                          BEQ     .+4
 1479  010474  104434                          ERR3                    ;NO
 1480  010476  062702  000002                  ADD     #2,R2           ;UP IT
 1481  010502  005267  173202                  INC     DATA            ;GET NEXT DATA
 1482  010506  026702  001230                  CMP     HILIM,R2        ;END?
 1483  010512  001357                          BNE     NX.DR           ;NO?
 1484  010514  104442                  TRP.DR: NEXT
 1485  010516  005037  177776                  CLR     @#177776        ;CLR PS
 1486  010522  016702  001212                  MOV     LOLIM,R2        ;SET ADDRESS
 1487  010526  012767  000001  173154          MOV     #1,DATA         ;SET DATA
 1488  010534  016722  173150          NX1.DR: MOV     DATA,(2)+       ;SET UP DATA
 1489  010540  005167  173144                  COM     DATA            ;- NEXT DATA
 1490  010544  016722  173140                  MOV     DATA,(2)+       ;LOAD IT
 1491  010550  005467  173134                  NEG     DATA            ;MAKE IT POSITIVE
 1492  010554  026702  001162                  CMP     HILIM,R2        ;END?
 1493  010560  001365                          BNE     NX1.DR          ;NO?
 1494  010562  012737  000240  177776          MOV     #240,@#177776   ;LOCK AGAIN
 1495  010570  012777  010426  000766          MOV     #SET.DR,@DRTRAP ;SET VECTOR
 1496  010576  016777  001142  001104          MOV     WRDCNT,@DRWC    ;SET WORD COUNT
 1497  010604  104436                          .START                  ;LOAD CURRENT ADDRESS & IE!10001 AND GO
 1498  010606  011712  010101  011714          DRCA,100!10001,DRCS
 1499  010614  000002                          RTI
```

```
1500  010616  005067  000072            CH.DR:  CLR     EX              ;CLEAR ERROR FLAG
1501  010622  005777  001066                    TST     @DRCS           ;ANY ERRORS?
1502  010626  100030                          BPL     1$              ;BRANCH IF NO ERRORS
1503  010630  005777  001054                    TST     @DRWC           ;IS IT BANK 7?
1504  010634  001425                          BEQ     1$              ;YES - GET OUT
1505  010636  005267  000052                    INC     EX              ;SET ERROR FLAG
1506  010642  032737  020000  177570            BIT     #SW13,@#SWR     ;INHIBIT ERROR TYPEOUT
1507  010650  001017                          BNE     1$              ;INHIBIT TYPEOUTS
1508  010652  017705  001036                    MOV     @DRCS,TTY       ;SET TTY FOR TYPING
1509  010656  000004  011345                    TYPE    ,DR.M1          ;TYPE DEVICE MESSAGE
1510  010662  000004  011012                    TYPE    ,M3             ;TYPE CS
1511  010666  004767  001474                    JSR     PC,PRINTR       ;TYPE DRCS IN OCTAL
1512  010672  000004  011022                    TYPE    ,M4             ;TYPE ER
1513  010676  017705  001014                    MOV     @DRER,TTY       ;TYPE @DRER IN OCTAL
1514  010702  004767  001460                    JSR     PC,PRINTR       ;TYPE LEADING ZERO'S
1515  010706  104432                          STOP                    ;HALT ON ERROR
1516  010710  000002                  1$:     RTI                     ;RETURN
```

```
1517  010712  000000                    CHK:    0
1518  010714  000000                    EX:     0
1519  010716  005015  041522  030461    M1:     .ASCII  <15><12>"RC11,RP11,RF11,RK11,TM11,TC11,DR11B, OR DM11 AND "
1520  010724  051054  030520  026061
1521  010732  043122  030461  051054
1522  010740  030513  026061  046524
1523  010746  030461  052054  030503
1524  010754  026061  051104  030461
1525  010762  026102  047440  020122
1526  010770  046504  030461  040440
1527  010776  042116     040
1528  011001     074  042522  052524          .ASCIZ  "<RETURN>"
1529  011006  047122  000076
1530  011012  020040  051503  036440  M3:     .ASCIZ  "  CS = "
1531  011020  000040
1532  011022  020040  051105  036440  M4:     .ASCIZ  "  ER = "
1533  011030  000040
1534  011032  005015  040504  040524  M7:     .ASCIZ  <15><12>"DATA ERROR AT "
1535  011040  042440  051122  051117
1536  011046  040440  020124     000
1537  011053     040  052040  052522  M8:     .ASCIZ  "  TRUE = "
1538  011060  020105  020075     000
1539  011065     040  051040  041505  M9:     .ASCIZ  "  RECEIVED = "
1540  011072  044505  042526  020104
1541  011100  020075     000
1542  011103     114  053517  051105  M11:    .ASCIZ  "LOWER BANK = "
1543  011110  041040  047101  020113
1544  011116  020075     000
1545  011121     125  050120  051105  M12:    .ASCIZ  "UPPER BANK = "
1546  011126  041040  047101  020113
1547  011134  020075     000
1548  011137     015  000012          M13:    .ASCIZ  <15><12>
1549  011142  041040  047101  020113  M15:    .ASCIZ  "  BANK  "
1550  011150     000
1551
1552  011151     015  051012  030506  RF.M1:  .ASCIZ  <15><12>"RF11 DISK ERROR:"
1553  011156  020061  044504  045523
1554  011164  042440  051122  051117
1555  011172  000072
1556  011174  005015  041522  030461  RC.M1:  .ASCIZ  <15><12>"RC11 DISK ERROR:"
1557  011202  042040  051511  020113
1558  011210  051105  047522  035122
1559  011216     000
1560  011217     015  051012  030513  RK.M1:  .ASCIZ  <15><12>"RK11 DISK ERROR:"
1561  011224  020061  044504  045523
1562  011232  042440  051122  051117
1563  011240  000072
1564  011242  005015  050122  030461  RP.M1:  .ASCIZ  <15><12>"RP11 DISK ERROR:"
1565  011250  042040  051511  020113
1566  011256  051105  047522  035122
1567  011264     000
1568  011265     015  042012  041505  TC.M1:  .ASCIZ  <15><12>"DECTAPE ERROR:"
1569  011272  040524  042520  042440
1570  011300  051122  051117  000072
1571  011306  005015  040515  052107  TM.M1:  .ASCIZ  <15><12>"MAGTAPE ERROR:"
1572  011314  050101  020105  051105
```

```
 1573  011322  047522  035122     000
 1574  011327     015  042012  030515  DM.M1:   .ASCIZ  <15><12>"DM11 ERROR:"
 1575  011334  020061  051105  047522
 1576  011342  035122     000
 1577  011345     015  042012  030522  DR.M1:   .ASCIZ  <15><12>"DR11 ERROR:"
 1578  011352  020061  051105  047522
 1579  011360  035122     000
 1580  011363     015  005012  052113  SEGA:    .ASCIZ  <15><12><12>"KT11 ERROR:"
 1581  011370  030461  042440  051122
 1582  011376  051117  000072
 1583  011402  005015  051123  020060  SEG1:    .ASCIZ  <15><12>"SR0 = "
 1584  011410  020075     000
 1585  011413     015  051412  030522  SEG2:    .ASCIZ  <15><12>"SR1 = "
 1586  011420  036440  000040
 1587  011424  005015  051123  020062  SEG3:    .ASCIZ  <15><12>"SR2 = "
 1588  011432  020075     000
 1589  011435     077  005015     000  QUES:    .ASCIZ  "?"<15><12>
 1590  011441     040  044527  044124  WITHSG:  .ASCIZ  " WITH KT11"
 1591  011446  045440  030524  000061
 1592  011454  053440  052111  020110  WITHMX:  .ASCIZ  " WITH MX11"
 1593  011462  054115  030461     000
 1594          011470                  .EVEN
 1595  011470  041522  043122  045522  DEVTAB:  .ASCII  "RCRFRKRPTCTMDRDM"
 1596  011476  050122  041524  046524
 1597  011504  051104  046504
 1598  011510  000000                  0
 1599  011512  177777  177777  000002  TAB1:    -1,-1,2,3,-1,4,-1,-1
 1600  011520  000003  177777  000004
 1601  011526  177777  177777
 1602  011532  000000                  DEVADR:  0
 1603  011534  000003                  PSCNT:   3
 1604  011536  000000                  FLG:     0
 1605
 1606  011540  000204  000206          RFTRAP:  204,206
 1607  011544  000210  000212          RCTRAP:  210,212
 1608  011550  000254  000256          RPTRAP:  254,256
 1609  011554  000220  000222          RKTRAP:  220,222
 1610  011560  000214  000216          TCTRAP:  214,216
 1611  011564  000124  000126          DRTRAP:  124,126
 1612  011570  000224  000226          TMTRAP:  224,226
 1613  011574  000330  000332          DMRVEC:  330,332
 1614  011600  000250  000252          SEGVEC:  250,252
```

```
 1615  011604  177460                RFCS:   177460          ;RF11  DISK  (256K)
 1616  011606  177470                RFER:   177470
 1617  011610  177462                RFWC:   177462
 1618  011612  177464                RFCA:   177464
 1619  011614  177466                RFDA:   177466
 1620  011616  177446                RCCS:   177446          ;RC11  DISK  (64K)
 1621  011620  177444                RCER:   177444
 1622  011622  177450                RCWC:   177450
 1623  011624  177452                RCCA:   177452
 1624  011626  177442                RCDA:   177442
 1625  011630  176714                RPCS:   176714          ;RP11  DISK  (PACK)
 1626  011632  176716                RPWC:   176716
 1627  011634  176720                RPCA:   176720
 1628  011636  176724                RPDA:   176724
 1629  011640  176712                RPER:   176712
 1630  011642  176710                RPDS:   176710
 1631  011644  177404                RKCS:   177404          ;RK11  DISK  (CARTRIDGE)
 1632  011646  177402                RKER:   177402
 1633  011650  177406                RKWC:   177406
 1634  011652  177410                RKCA:   177410
 1635  011654  177412                RKDA:   177412
 1636  011656  177342                TCCS:   177342          ;TC11  DECTAPE
 1637  011660  177340                TCER:   177340
 1638  011662  177344                TCWC:   177344
 1639  011664  177346                TCCA:   177346
 1640  011666  177350                TCDB:   177350
 1641  011670  172522                TMCS:   172522          ;TM11 MAGTAPE
 1642  011672  172520                TMER:   172520
 1643  011674  172524                TMBC:   172524
 1644  011676  172526                TMCA:   172526
 1645  011700  175000                DMCS:   175000          ;DM11  ASYNCRONOUS MODEM
 1646  011702  175002                DMACT:  175002
 1647  011704  175004                DMBRK:  175004
 1648  011706  175006                DMADR:  175006
 1649  011710  172410                DRWC:   172410          ;DR11
 1650  011712  172412                DRCA:   172412
 1651  011714  172414                DRCS:   172414
 1652  011716                        DRER:
 1653  011716  172416                DRDB:   172416
 1654  011720  177572                SR0:    177572          ;KT11 - MEMORY MANAGEMENT
 1655  011722  172340                KISAR0: 172340
 1656  011724  172300                KISDR0: 172300
 1657  011726  172354                KISAR6: 172354
 1658  011730  172314                KISDR6: 172314
 1659  011732  172356                KISAR7: 172356
 1660  011734  172316                KISDR7: 172316
 1661  011736  177604                MXC3:   177604          ;MX11
 1662
 1663  011740  140000                LOLIM:  140000          ;BEGINNING OF BANK
 1664  011742  160000                HILIM:  160000          ;END OF BANK
 1665  011744  170000                WRDCNT: -10000          ;WORD COUNT
```

```
                                        ;       $LOADR          GET AND RESTORE THE LOADER
                                        ;THESE ROUTINES FIRST FIND THE LOADER (TOP OF HIGHEST
                                        ;4K BANK IN 28K) AND SAVE IT AT TAG "ENDP:". ENTRY FOR
                                        ;THIS ROUTINE IS "JSR PC,LODGET".
                                        ;"JSR PC,LODRES" WILL RESTORE THE LOADER IN ITS ORIGONAL
                                        ;LOCATION. ".LOD:" CONTAINS THE ADDRESS OF THE LOADER.
011746  005767  167050          LODGET: TST     OPTION          ;WHICH OPTION?
011752  003402                          BLE     3$              ;NO MEMORY MANAGEMENT
011754  005077  177740                  CLR     @SR0            ;TURN OFF MM
011760  010001                  3$:     MOV     R0,R1           ;GET THE BANK
011762  022701  000006                  CMP     #6,R1           ;IS IT > 6?
011766  100002                          BPL     1$              ;SKIP IF LES THAN 6
011770  012701  000006                  MOV     #6,R1           ;IF > 7 MAKE 7
011774  006001                  1$:     ROR     R1              ;GET THE
011776  006001                          ROR     R1              ;UPPER
012000  006001                          ROR     R1              ;THREE
012002  006001                          ROR     R1              ;BITS
012004  042701  017777                  BIC     #17777,R1       ;CLEAR JUNK
012010  012702  013062                  MOV     #ENDP,R2        ;GET SAVE ADDRESS
012014  060201                          ADD     R2,R1           ;MAKE OTHER ONE
012016  010167  000060                  MOV     R1,.LOD         ;SAVE ADDRESS
012022  012122                  2$:     MOV     (1)+,(2)+       ;MOVE WORD
012024  022702  020000                  CMP     #20000,R2       ;END?
012030  001374                          BNE     2$              ;NO!
012032  000207                          RTS     PC              ;RETURN

012034  005767  166762          LODRES: TST     OPTION          ;WHICH OPTION?
012040  003402                          BLE     2$              ;NO MEMORY MANAGEMENT
012042  005077  177652                  CLR     @SR0            ;TURN OFF MM
012046  012702  013062          2$:     MOV     #ENDP,R2        ;GET END OF PROGRAM
012052  016701  000024                  MOV     .LOD,R1         ;GET SAVE ADDRESS
012056  012221                  1$:     MOV     (2)+,(1)+       ;RESTORE WORD
012060  022702  020000                  CMP     #20000,R2       ;END?
012064  001374                          BNE     1$              ;LOOP
012066  005767  166730                  TST     OPTION          ;WHICH OPTION?
012072  003402                          BLE     3$              ;NO MEMORY MANAGEMENT
012074  005277  177620                  INC     @SR0            ;TURN ON MM
012100  000207                  3$:     RTS     PC              ;RETURN

012102  000000                  .LOD:   0                       ;STARTING ADDRESS OF LOADER
```

```
                                        ;       $TYPE           MESSAGE TYPEOUT ROUTINE
                                        ;
                                        ;THIS ROUTINE IS USE TO TYPE ASCII MESSAGES ON THE TTY. THE
                                        ;CALL CAN BE IN ONE OF 3 FORMS: 1) "TYPE ,ADR" - TYPES THE
                                        ;MESSAGE STARTING IN LOCATION "ADR:", 2) "TYPE ,CHAR" - TYPES
                                        ;THE ASCII "CHAR", AND 3) "PRINT <<15><12>"MESSAGE"> - TYPES
                                        ;THE MESSAGE WHICH IS INLINE ASCII.
                                        ;
012104 010546                   IOT$:   MOV     TTY,-(6)        ;SAVE TTY RS=TTY
012106 017605 000002                    MOV     @2(6),TTY       ;GET ADDRESS TO BE TYPED
012112 032705 177400                    BIT     #177400,TTY     ;IS IT A TYPEM?
012116 001004                           BNE     1$              ;NO
012120 010567 000064                    MOV     TTY,.TYPE       ;GET THE CHARACTER
012124 012705 012210                    MOV     #.TYPE,TTY      ;FUDGE THE ADDRESS
012130 105715                   1$:     TSTB    (TTY)           ;TERMINATOR?
012132 001406                           BEQ     2$              ;GET OUT IF SO
012134 112537 177566                    MOVB    (TTY)+,@#177566 ;LOAD AND TYPE THE CHARACTER
012140 105737 177564                    TSTB    @#177564                ;IS THE PRINTER READY
012144 100375                           BPL     .-4             ;WAIT UNTIL IT IS
012146 000770                           BR      1$              ;GET THE NEXT CHARACTER
012150 017646 000002            2$:     MOV     @2(6),-(6)      ;GET ADDRESS TO BE TYPED
012154 062766 000002 000004             ADD     #2,4(6)         ;ADD 2 TO THE ADDRESS
012162 022666 000002                    CMP     (6)+,2(6)       ;IS IT .+2?
012166 001006                           BNE     3$              ;NO
012170 062705 000002                    ADD     #2,TTY          ;ADD 2 TO THE ADDRESS
012174 042705 000001                    BIC     #1,TTY          ;BACK UP TO AN EVEN BYTE
012200 010566 000002                    MOV     TTY,2(6)        ;RESTORE ADDRESS
012204 012605                   3$:     MOV     (6)+,TTY        ;RESTORE TTY
012206 000002                           RTI                     ;RETURN
012210 000000                   .TYPE:  0                       ;CHARACTER TYPE LOCATION
                                        ;
012212 010346                   READ$:  MOV     R3,-(6)         ;SAVE R3
012214 012703 012316            1$:     MOV     #INPUT,R3       ;GET ADDRESS
012220 022703 012336            2$:     CMP     #INPUT+20,R3    ;BUFFER FULL?
012224 001412                           BEQ     4$              ;YES - TYPE "?"
012226 105737 177560                    TSTB    @#177560        ;WAIT FOR
012232 100375                           BPL     .-4             ;A CHARACTER
012234 113713 177562                    MOVB    @#177562,(3)    ;GET CHARACTER
012240 142713 000200                    BICB    #200,(3)        ;GET RID OF JUNK
012244 122713 000177                    CMPB    #177,(3)        ;IS IT A RUBOUT
012250 001005                           BNE     3$              ;SKIP IF NOT
012252                          4$:
012252 000004 012256                    TYPE    .+2             ;.ASCIZ "?"<15><12>
012262 000754                           BR      1$              ;ZAP THE BUFFER AND LOOP
012264 111367 177720            3$:     MOVB    (3),.TYPE       ;SET UP FOR TYPING
012270 000004 012210                    TYPE    .TYPE           ;ECHO IT
012274 122723 000015                    CMPB    #15,(3)+        ;CHECK FOR RETURN
012300 001347                           BNE     2$              ;LOOP IF NOT RETURN
012302 105063 177777                    CLRB    -1(3)           ;ZAP RETURN (THE 15)
012306 000004 000012                    TYPE    ,12             ;TYPE A LINE FEED
012312 012603                           MOV     (6)+,R3         ;RESTORE R3
012314 000207                           RTS     PC              ;RETURN
012316 000020                   INPUT:  .BLKW   20              ;TTY INPUT AREA
```

```
                                        ;       $OCTAL          OCTAL TYPEOUT ROUTINE
                                        ;
                                        ;THIS ROUTINE IS USED TO TYPE AN OCTAL NUMBER ON THE TTY. IT WILL TYPE
                                        ;ALL 6 CHARACTERS, SUPPRESS LEADING ZEROES, TYPE AN 18 BIT ADDRESS, OR TYPE
                                        ;THE 16 BITS. IT IS CALLED VIA THE DUMP, SDUMP, DUMP18, OR BITYPE MACRO'S.
012356  012767  170101  000202  BITYP$: MOV     #170101,.PR     ;SET BIT FLAG ANS 16. CHARACTER COUNT
012364  000411                  BR      .PTIT           ;NOW TYPE IT IN BIT FORM
012366  112767  000001  000172  PRINTR: MOVB    #1,.PR          ;SET ZERO FILL SWITCH
012374  000402                  BR      .+6             ;SKIP
012376  005067  000164          PRINTS: CLR     .PR             ;SUPRESS LEADING ZERO'S
012402  112767  177772  000157          MOVB    #-6,.PR+1       ;SET COUNT
012410  010446                  .PTIT:  MOV     R4,-(6)         ;SAVE R4
012412  012704  012570                  MOV     #.PR+2,R4       ;SET POINTER TO FIRST ASCII CHAR.
012416  105014                          CLRB    (4)             ;CLEAR FIRST BYTE
012420  000432                          BR      .PRF            ;ROTATE FIRST BIT
012422  010446                  PRINTA: MOV     R4,-(6)         ;SAVE R4
012424  012704  012570                  MOV     #.PR+2,R4       ;SET UP POINTER TO OUTPUT AREA
012430  116714  166360                  MOVB    MX,(4)          ;MX CONTAINS UPPER 5 BITS
012434  006305                          ASL     TTY             ;GET RID
012436  006305                          ASL     TTY             ;OF 3
012440  006305                          ASL     TTY             ;JUNK BITS
012442  106214                          ASRB    (4)             ;GET BIT13
012444  006005                          ROR     TTY             ;PACK IT
012446  106214                          ASRB    (4)             ;GET BIT14
012450  006005                          ROR     TTY             ;PACK IT
012452  152724  000060                  BISB    #'0,(4)+        ;MAKE IT ASCII
012456  012767  175401  000102          MOV     #175401,.PR     ;-5,,1 - 5 BYTES AND FILL
012464  105014                  .PRL:   CLRB    (4)             ;CLEAR BYTE OF CHARACTER
012466  032767  000100  000072          BIT     #100,.PR        ;BIT TYPING MODE?
012474  001004                          BNE     .PRF            ;YES - SKIP 2 ROTATES
012476  006105                          ROL     TTY             ;ROTATE BIT INTO C
012500  106114                          ROLB    (4)             ;PACK IT
012502  006105                          ROL     TTY             ;ROTATE BIT INTO C
012504  106114                          ROLB    (4)             ;PACK IT
012506  006105                  .PRF:   ROL     TTY             ;ROTATE BIT INTO C
012510  106114                          ROLB    (4)             ;PACK IT
012512  105714                          TSTB    (4)             ;IS IT ZERO?
012514  001402                          BEQ     .+6             ;SKIP INC
012516  105267  000044                  INCB    .PR             ;SET FILL SWITCH
012522  105767  000040                  TSTB    .PR             ;CHECK FILL SWITCH
012526  001402                          BEQ     .+6             ;SKIP BITSET
012530  152724  000060                  BISB    #'0,(4)+        ;MAKE INTO ASCII CHAR
012534  105267  000027                  INCB    .PR+1           ;INC COUNT
012540  001351                          BNE     .PRL            ;REPEAT
012542  022704  012570                  CMP     #.PR+2,R4       ;EMPTY BUFFER?
012546  001002                          BNE     .+6             ;SKIP IF NOT
012550  112724  000060                  MOVB    #'0,(4)+        ;LOAD 1 ZERO
012554  105014                          CLRB    (4)             ;NULL TERMINATOR
012556  000004  012570                  TYPE    .PR+2           ;TYPE IT
012562  012604                          MOV     (6)+,R4         ;RESTORE R4
012564  000207                          RTS     PC              ;RETURN
012566  000012                  .PR:    .BLKW   12              ;COUNT, SWITCH, AND OUTPUT BUFFER
```

```
1815  012612  012777  012740  000126  PDOWN$:  MOV     #ILLUP,@PUVEC$  ;SET FOR FAST UP
1816  012620  012777  000340  000122           MOV     #340,@PUVEC$+2  ;PRIO:7
1817  012626  010046                           MOV     R0,-(6)         ;PUSH R0 ON STACK
1818  012630  010146                           MOV     R1,-(6)         ;PUSH R1 ON STACK
1819  012632  010246                           MOV     R2,-(6)         ;PUSH R2 ON STACK
1820  012634  010346                           MOV     R3,-(6)         ;PUSH R3 ON STACK
1821  012636  010446                           MOV     R4,-(6)         ;PUSH R4 ON STACK
1822  012640  010546                           MOV     R5,-(6)         ;PUSH R5 ON STACK
1823  012642  010667  000076                   MOV     SP,.SAVR6       ;SAVE SP
1824  012646  012777  012656  000072           MOV     #PUP$,@PUVEC$   ;SET UP VECTOR
1825  012654  000000                           HALT                    ;WAIT FOR PF
1826
1827  012656  016706  000062           PUP$:   MOV     .SAVR6,SP       ;GET SP
1828  012662  005001                           CLR     R1              ;WAIT LOOP FOR THE TTY
1829  012664  005201                   1$:     INC     R1              ;WAIT FOR THE INC
1830  012666  001376                           BNE     1$              ;OF  WORD
1831  012670  012605                           MOV     (6)+,R5         ;POP STACK INTO R5
1832  012672  012604                           MOV     (6)+,R4         ;POP STACK INTO R4
1833  012674  012603                           MOV     (6)+,R3         ;POP STACK INTO R3
1834  012676  012602                           MOV     (6)+,R2         ;POP STACK INTO R2
1835  012700  012601                           MOV     (6)+,R1         ;POP STACK INTO R1
1836  012702  012600                           MOV     (6)+,R0         ;POP STACK INTO R0
1837  012704  012737  012612  000024           MOV     #PDOWN$,@#24    ;SET UP THE POWER DOWN VECTOR
1838  012712  012737  000340  000026           MOV     #340,@#26       ;PRIO:7
1839  012720  000004  012724                   TYPE    .+2             ;.ASCIZ <15><12>"POWER"
1840  012734  000167  167230                   JMP     RTPF            ;JMP TO USER ADDRESS
1841
1842  012740  000000                   ILLUP:  HALT                    ;THE POWER UP SEQUENCE WAS STARTED
1843  012742  000776                           BR      .-2             ; BEFORE THE POWER DOWN WAS COMPLETE
1844
1845  012744  000000                   .SAVR6: 0                       ;PUT THE SP HERE
1846  012746  000024  000026           PUVEC$: 24,26                   ;POWER UP VECTOR
1847
1848  012752  116767  164604  177336   READR:  MOVB    177562,INPUT    ;READ THE CHARACTER
1849  012760  142767  000200  177330           BICB    #200,INPUT      ;CLEAR JUNK
1850  012766  122767  000003  177322           CMPB    #3,INPUT        ;IS IT A ↑C?
1851  012774  001401                           BEQ     .+4             ;SKIP IF ↑C
1852  012776  000002                           RTI                     ;RETURN IF NOT
1853  013000  000004  013004                   TYPE    .+2             ;.ASCIZ "↑C"<177>
1854  013010  005037  000042                   CLR     @#42            ;DO NOT LOOP
1855  013014  000137  001024                   JMP     @#BEGIN         ;RESTART
1856
1857  013020  000000                   SAV6:   0
1858  013022  000010                   PATCH1: .BLKW   10              ;PATCH AREA #1
1859  013042  000010                   PATCH2: .BLKW   10              ;PATCH AREA #2
1860  013062  000000                   ENDP:   0                       ;LAST LOC OF PROGRAM
1861           000001                   .END
```

DZQMAB.CMB CROSS REFERENCE TABLE -- USER SYMBOLS

```
ABRT    001742            472#   480    498
ADRTAB  002750            608    615#
ALLOR   003462            728#   743
BADDEV  002122            486    496#
BEGIN   001024            357    370#   597   1855
BELL  = 000007            334#   659
BICX    010416           1461   1465#
BINCNT  010164           1347*  1348*  1353  1420#
BIT     003712            708*   728    731*   785#   790*
BITYPS  012356           1768#
CDATA   003364            627    703#
CHK     010712            894*   895*   896*   897*   898*   899*   900*   901*   902    909    912    959*   960*
                          961*   962*   963*   964*   965*   966*   967    974    977   1034*  1035*  1036*  1037*
                         1038*  1039*  1040*  1041*  1042   1049   1052  1102*  1103*  1104*  1105*  1106*  1107*
                         1108*  1109*  1110   1117   1120   1163*  1164*  1165*  1166*  1167*  1168*  1169*  1170*
                         1171   1178   1181   1308*  1309*  1310*  1311*  1312*  1313*  1314*  1315*  1316   1323
                         1326   1517#
CHK.DR= 104420            624#  1468
CHK.RC= 104406            619#   916    926    934
CHK.RF= 104404            618#   851    861    869
CHK.RK= 104412            621#  1056   1066   1074
CHK.RP= 104410            620#   981    991    999
CHK.TC= 104414            622#  1124   1135
CHK.TM= 104416            623#  1261   1280
CH.DR   010616            624   1500#
CH.RC   004742            619    942#
CH.RF   004360            618    877#
CH.RK   005752            621   1082#
CH.RP   005354            620   1014#
CH.TC   006322            622    628   1143#
CH.TM   007266            623   1291#
CKDATA= 104426            627#   852    917    982   1057   1125   1262
COMCOR= 104402            617#   870    935   1000   1075   1136   1281
CORE  = 104400            616#   853    918    983   1058   1127   1263
CRLF    002456            539    551#   569    590
CR1     002510            557#   567
CR2     002544            558    568#
CR3     002602            576#   586
CR4     002630            577    587#
C.RC    004650            919    926#
C.RF    004266            854    861#
C.RK    005660           1059   1066#
C.RP    005232            984    991#
DATA    003710            707*   711    732*   784#   789*   793    814   1446*  1447   1472*  1473   1477   1481*
                         1487*  1488   1489*  1490   1491*
DEVADR  011532            471*   472*   473    477    481    665*   666   1602#
DEVTAB  011470            471    478   1595#
DISPLA= 177570            333#   691*
DMACT   011702           1371*  1389*  1460   1646#
DMADR   011706           1374*  1648#
DMBAIM  010150           1389   1414#
DMBAT   010160           1343*  1344*  1345   1418#
DMBRK   011704           1372*  1647#
DMCAT   010154           1340*  1341   1374   1416#
DMCS    011700            531   1370*  1387*  1388*  1397   1401   1404*  1405  1407*  1465*  1645#
DMPRIA  007640           1353#  1355
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DMPRIB  007654          1357#   1359
DMPRIC  007676          1363#   1365
DMPRID  007706          1367#   1369
DMPTR   010144          1375*   1376*   1377    1412#   1424    1456*
DMRINB  010242          1433#   1457
DMRINC  010316          1427    1443#
DMRIND  010352          1444    1451#
DMRINT  010166          1380    1423#
DMRINX  010400          1431    1442    1459#
DMRVEC  011574          1379    1613#
DMTDAT  010142          1373*   1411#   1446    1450*
DMTINC  010124          1398    1405#
DMTINT  010064          1382    1397#
DMWCT   010156          1341*   1342*   1343    1417#
DM.M1   011327          1399    1428    1435    1574#
DOCORE  001400           419#
DOMX    001434           417     429#
DOSEG   001476           418     439#
DRCA    011712          1498    1650#
DRCS    011714           536*   1498    1501    1508    1651#
DRDB    011716          1653#
DRER    011716          1513    1652#
DRTRAP  011564           386*    393*    493*   1495*   1611#
DRWC    011710          1496*   1503    1649#
DR.M1   011345          1509    1577#
DUM1   = 104446           635#
DUM2   = 104450           636#
ENDP    013062          1687    1698    1860#
ENDPTR  010146          1377*   1378*   1413#   1452
ENDTAB= 003020           609     637#
ERRORS  001002           362#
ERR2   = 104430           628#   1217    1250
ERR3   = 104434           630#    713    1202    1235    1449    1475    1479
ER3     003774           630     804#
EX      010714           704     877*    880*    942*    945*   1014*   1017*   1082*   1085*   1143*   1146*   1291*   1294*
                        1469    1500*   1505*   1518#
FLG     011536           652*    662*    683    1604#
FOWSER  006756          1188    1223#
GDATA   003440           710     719#    792
GETMON  003022           475     640#    668
HILIM   011742           396*    546     715     794     801     840*   1482    1492    1664#
HLT    = 104000           329#
HLTADR  001012           365#
ICNT    001000           361#
ILLUP   012740          1815    1842#
INPUT   012316           481*    482*    483*    485     505     509     513     517     521     525     529     534     538
                         556     575     595     773     807    1741    1742    1761#   1848*   1849*   1850
IOT$    012104           374    1717#
KISAR0  011722           844*   1655#
KISAR6  011726           443*    444     446     828*    846*   1657#
KISAR7  011732           848*   1659#
KISDR0  011724           845*   1656#
KISDR6  011730           847*   1658#
KISDR7  011734           849*   1660#
LAD     001010           364#
LIMIT   001020           368#    466*    587
```

```
LODGET  011746          455    1675#
LODRES  012034          467     640    1695#
LOLIM   011740          395*    545     701     709     791     799     838*    1351    1375    1454    1471    1486    1663#
MAP     004160          634     844#
MAPIT = 104444          439     634#
MASK    010152         1415#   1445
MEMORY  003714          400*    671     674*    676*    678*    719     786#
MIN     001016          367#    397*    412*    555*    562*    564*    566*    568     570*    571     589     670     679
MX      001014          366#    398*    413*    571*    655     670*    679     690*    691     695     758     770     822
                        895     906     960     971    1035    1046    1103    1114    1164    1175    1309    1320    1334
                       1384    1780    1815
MXC3    011736          410     432*    436*    830*   1661#
M1      010716          540    1519#
M11     011103          553    1542#
M12     011121          572    1545#
M13     011137          593     594    1548#
M15     011142          905     970    1045    1113    1174    1319    1549#
M3      011012          885     950    1022    1090    1151    1299    1400    1510    1530#
M4      011022          887     952    1024    1092    1153    1301    1512    1532#
M7      011032          810    1534#
M8      011053          813     908     973    1048    1116    1177    1322    1537#
M9      011065          816     911     976    1051    1119    1180    1325    1539#
N       000052          344#    616     617#    618#    619#    620#    621#    622#    623#    624#    625#    626#    627#
                        628#    629#    630#    631#    632#    633#    634#    635#    636#    637#
NEWDEV  001750          473#    686
NEXT  = 104442          633#    788    1333    1484
NODEV   002650          499     593#
NXT     003064          633     652#
NXTCR   002564          572#    588
NX.DR   010452         1473#   1483
NX1.DR  010534         1488#   1493
OPTION  001022          369#    401*    406*    411*    416     460     823    1675    1695    1703
PATCH1  013022          635    1858#
PATCH2  013042          636    1859#
PC    =%000007          343#    458*    475*    502*    554*    573*    640*    645*    651*    668*    699*    710*    733*
                        792*    812*    815*    818*    886*    889*    907*    951*    954*    972*   1023*   1026*   1047*
                       1091*   1094*   1115*   1152*   1155*   1176*   1300*   1303*   1321*   1402*   1511*   1514*   1693*
                       1706*   1760*   1813*
PCNT    001004          363#
PDOWNS  012612          376    1815#   1837
POTS    003544          629     752#
PRINTA  012422          812    1778#
PRINTR  012366          815     818     886     889     951     954    1023    1026    1091    1094    1152    1155    1300
                       1303    1402    1511    1514    1770#
PRINTS  012376          458     699     907     910     913     972     975     978    1047    1050    1053    1115    1118
                       1121    1176    1179    1182    1321    1324    1327    1772#
PS    = 177776          331#    470*    685*
PSCNT   011534          399*    660*    669*   1603#
PUPS    012656         1824    1827#
PUVECS  012746         1815*   1816*   1824*   1846#
QUES    011436         1589#
RCCA    011624          923     931     940    1623#
RCCS    011616          507*    923     931     940     943     948     959    1620#
RCDA    011626          921*    929*    938*   1624#
RCER    011620          953    1621#
RCTRAP  011544          381*    388*    488*    919*    927*    936*   1607#
```

DZQMAB.CMB CROSS REFERENCE TABLE -- USER SYMBOLS

```
RCWC    011622          920*    928*    937*   1622#
RC.M1   011174          949     969     1556#
READR   012752          394     1848#
READ$   012212          502     554     573    1740#
REDO    001712          454     461     464     466#
RETI    006642         1195#   1207    1218
RETI1   007006         1228#   1240    1251
RETR    006712         1210#   1221
RETR1   007056         1243#   1254
RETURN  007130         1193*   1222    1226*   1255   1260#
REWIND= 104424          626#   1264    1282
RFCA    011612          858     866     875    1618#
RFCS    011604          515*    858     866     875    878    883    894    1615#
RFDA    011614          856*    864*    873*   1619#
RFER    011606          888    1616#
RFTRAP  011540          380*    387*    487*    854*   862*   871*   1606#
RFWC    011610          855*    863*    872*   1617#
RF.M1   011151          884     904     1552#
RKCA    011652         1063    1071    1080    1634#
RKCS    011644          519*   1063    1071    1080   1083   1088   1096*  1097   1102   1631#
RKDA    011654         1061*   1069*   1078*   1635#
RKER    011646         1093    1632#
RKTRAP  011554          383*    390*    490*   1059*  1067*  1076*  1609#
RKWC    011650         1060*   1068*   1077*   1633#
RK.M1   011217         1089    1112    1560#
RPCA    011634          988     996     1005   1627#
RPCS    011630          511*    988     996    1005   1007*  1008   1012*  1015   1020   1028*  1029   1034   1625#
RPDA    011636          986*    994*   1003*   1628#
RPDS    011642         1010    1630#
RPER    011640         1025    1629#
RPTRAP  011550          382*    389*    489*    984*   992*   1001*  1608#
RPWC    011632          985*    993*   1002*   1626#
RP.M1   011242         1021    1044    1564#
RSIT    001734          471#    476
RTPF    002170          494     503#   1840
RW.TM   007174          626    1272#
R.RC    004704          927     934#
R.RF    004322          862     869#
R.RK    005714         1067    1074#
R.RP    005266          992     999#
R.TC    006264         1129    1135#
R.TM    007224         1265    1280#
R0      =%000000        335#    421*    423*    430*   431*   432    434    446*   447*   448*   449*   450*   457
                        466     574*    581*    583*   585*   587    589    643    647*   655    1678   1817   1836*
R1      =%000001        336#    420*    422*    425    556*   575*   1350   1352*  1354*  1356*  1358*  1362*  1364*
                       1366*   1367    1368*   1379*  1390*  1678*  1679   1681*  1682*  1683*  1684*  1685*  1686*
                       1688*   1689    1699*   1818   1828*  1829*  1835*
R2      =%000002        337#    709*    715     723    726    735    736    745    791*   794    799*   801    811
                       1349    1351*   1360*   1391*  1423   1424*  1437*  1452   1454*  1455*  1456   1459*  1471*
                       1476*   1480*   1482    1486*  1492   1687*  1688   1691   1698*  1701   1819   1834*
R3      =%000003        338#    477*    478*    644*   648*   649*   663*   723*   724*   725*   726*   727*   728*
                        729*    735*    737*    742*   745*   746*   747    749*   750*   1740   1741*  1742   1759*
                       1820    1833*
R4      =%000004        339#    545*    546     701*   1774   1775*  1778   1779*  1807   1812*  1821   1832*
R5      =%000005        340#    605*    606*    607*   608*   609    736*   738*   739*   740*   741*   742    747*
                        748*   1822    1831*
```

```
SAV6     013020          1857#
SCF1     007050          1236    1239    1242#
SCF1A    007106          1247    1253#
SCF2     007066          1242    1246#
SCOPE  = 104400           328#
SC1      007016          1223    1231#
SC1A     007036          1232    1238#
SEARCH=  104422           625#    1128    1137
SEGA     011363          1580#
SEGVEC   011600          1614#
SEG1     011402          1583#
SEG2     011413          1585#
SEG3     011424          1587#
SETBAK   004070           632     822#
SETBAN=  104440           632#    700     703     798     1425    1467
SET.DR   010426          1467#   1495
SF1      006704          1203    1206    1209#
SF1A     006742          1214    1220#
SF2      006722          1209    1213#
SIZEIT   001370           403     416#
SP     =%000006           342#    373*    452*    503*    1823    1827*
SR0      011720           405     440*   1654#   1677*   1697*   1705*
SR1      006652          1190    1198#
SR1A     006672          1199    1205#
STOP   = 104432           629#    819     890     914     955     979     1027    1054    1095    1122    1156    1183    1304
                         1328    1403    1430    1515
SWR    = 177570           332#    333     402     653     657     687     692     753     804     881     892     946     957
                         1018    1032    1086    1100    1147    1161    1295    1306    1506
SW10   = 002000           349#    657
SW11   = 004000           348#
SW12   = 010000           347#
SW13   = 020000           346#    804     881     892     946     957     1018    1032    1086    1100    1147    1161    1295
                         1306    1506
SW14   = 040000           345#    653
SW8    = 000400           351#    687     692
SW9    = 001000           350#    402
S.TC     006566           625    1185#
TAB1     011512           479    1599#
TCCA     011664          1132    1141    1639#
TCCS     011656           527*    809*   1126*   1132    1141    1144    1149    1157*   1158    1163    1195*   1198    1210*
                         1213    1228*   1231    1243*   1246    1636#
TCDB     011666          1205    1220    1238    1253    1640#
TCER     011660          1154    1200    1215    1233    1248    1637#
TCTRAP   011560           384*    391*    491*   1129*   1138*   1190*   1209*   1223*   1242*   1610#
TCWC     011662          1130*   1139*   1638#
TC.M1    011265          1150    1173    1568#
TC.TA    007124          1185*   1187    1189*   1191    1220    1224    1253    1258#
TC.WC    007126          1259#
TMBC     011674          1266*   1267*   1284*   1285*   1643#
TMCA     011676          1269    1287    1644#
TMCS     011670           523*   1269    1275*   1287    1292    1297    1308    1641#
TMER     011672          1302    1642#
TMRET    007264          1273*   1278    1290#
TMTRAP   011570           385*    392*    492*   1265*   1272*   1283*   1612#
TM.M1    011306          1298    1318    1571#
TP.RP    005176           983#   1013
```

DZQMAB.CMB CROSS REFERENCE TABLE -- USER SYMBOLS

```
TRAP$   002716   378   605#
TRP.DM  007516   533  1333#  1439  1463
TRP.DR  010514   393   493   1470  1484#
TRP.RC  004614   388   488    918#
TRP.RF  004232   387   487    853#
TRP.RK  005624   390   490   1058#
TRP.RP  005324   389   489   1007#
TRP.TC  006230   391   491   1127#
TRP.TM  007136   392   492   1263#
TTY    =000005   341#  457*   695*   696   698*   758*  760*  761*  762*  763*  764*   767   770*
                 771*  772*   775*   776*  780    811*  814*  817*  822*  826*  827*   828   830
                 833*  834*   835*   836*  837*   838   839*  840   883*  888*  906*   909*  912*
                 948*  953*   971*   974*  977*  1020*  1025* 1046* 1049* 1052* 1088*  1093* 1114*
                1117* 1120*  1149*  1154* 1175*  1178*  1181* 1297* 1302* 1320* 1323*  1326* 1334*
                1335* 1336*  1337*  1338* 1339*  1340   1384* 1385* 1386* 1387  1401*  1508* 1513*
                1717  1718*  1719   1721  1722*  1723   1725  1733* 1734* 1735  1736*  1781* 1782*
                1783* 1785*  1787*  1793* 1795*  1797*
TUMTAB  010162  1345* 1346*  1347   1419#
TYPE   = 000004  330#  456    459    463   465    484   485  497  501  540  553   572   593
                 594   595    596    641   659    689   694  810  813  816  884   885   887
                 904   905    908    911   949    950   952  969  970  973  976   1021  1022
                1024  1044   1045   1048  1051   1089  1090 1092 1112 1113 1116  1119  1150
                1151  1153   1173   1174  1177   1180  1298 1299 1301 1318 1319  1322  1325
                1399  1400   1428   1429  1435   1436  1509 1510 1512 1751 1754  1758  1811
                1839  1853
TYPEIT  001550   427   437    450#
TO      002142   469   499#   542   591
T1      002222   506   509#
T1XOR8  003450   723#
T2      002242   510   513#
T3      002262   514   517#
T3XOR9  003526   720   745#
T3X9    003522   742#  751
T4      002302   518   521#
T5      002322   522   525#
T6      002342   526   529#
T7      002370   530   534#
T8      002410   535   538#
T8XOR1  003504   721   735#
WAIT    002430   508   512    516   520    524   528   537   544#  1393
WANT    007122  1191* 1192*  1205  1224*  1225* 1238  1257#
WITHMX  011454   465  1592#
WITHSG  011441   463  1590#
WRADR   003716   616   788#
WRCADR  003754   617   798#
WRDCNT  011744   855   863    872   920    928   937   985   993  1002 1060  1068  1077  1130
                1139  1266   1284  1496   1665#
W.RC    004610   916#  936
W.RF    004226   851#  871
W.RK    005620  1056# 1076
W.RP    005172   981# 1001
W.TC    006216  1124# 1138
W.TM    007132  1261# 1283
X.TM    007220  1272  1278#
.      = 013064   353#  354    355#  359#   372   456   457#  459  460#  484  485#  497   501
                 596   610    613   637    689   690#  694   705  712  754  805   1009  1011
```

```
BITYPE      1#    344#
BLKBLK      1#
BUFHDR      1#
DECML       1#    344#
DEVCHK    370#    877     942    1014    1082    1143    1291
DUMP        1#    344#    814     817     888     953    1025    1093    1154    1302    1401    1513
DUMP1B      1#    271#    811
FILBLK      1#
GO        370#    857     865     874     922     930     939     987     995    1004    1062    1070    1079    1131    1140
         1268    1286    1497
LNKBLK      1#
ODT11       1#
ODT11X      1#
POP         1#    344#    647    1831
PRINT       1#    344#    456     459     484     496     501     596     689     694    1429    1436    1750    1839    1853
PUSH        1#    344#    643    1817
SCOPE.      1#
SCOP.       1#
SDUMP       1#    344#    457     906     971    1046    1114    1175    1320
SET       598#    616     617     618     619     620     621     622     623     624     625     626     627     628     629
          630     631     632     633     634     635     636
TRACE       1#
TRNBLK      1#
TYPEM       1#
WRITE       1#
$CATCH      1#    271#    353
$CMTAG      1#    271#    359
$DECML      1#
$END        1#    271#
$EQUAT      1#    271#    328
$HLT        1#    271#
$KRAT       1#
$LOADR      1#    271#   1666
$OCTAL      1#    271#   1762
$POWER      1#    271#   1815
$RAND       1#
$RAND4      1#
$READ       1#    271#   1740
$SCOPE      1#    271#
$SET      598#    616     617     618     619     620     621     622     623     624     625     626     627     628     629
          630     631     632     633     634     635     636
$SETUP      1#
$SRAT       1#
$SWOOC      1#    271#
$TRAP       1#    271#    598
$TYPE       1#    271#   1709
$URAT       1#
.SCOP       1#
.SCOPE      1#
```

```
ADC      549
ADD      422   443   472   608   665   726   728   742   769   777   782   839  1186  1192  1342
        1344  1346  1348  1360  1376  1378  1455  1476  1480  1688  1730  1733
ASL      447  1267  1285  1385  1781  1782  1783
ASR      827
ASRB    1784  1786
BCS      730
BEQ      461   469   480   539   547   558   577   664   673   682   684   688   693   697   705
         712   805   824   903   968  1043  1111  1172  1317  1398  1434  1448  1474  1478  1504
        1724  1743  1800  1803  1851
BGT      445   588   721  1239
BIC      449   698   764   772   837   901   966  1041  1109  1170  1315  1339  1386  1404  1407
        1465  1686  1734
BICB    1445  1747  1849
BIS      504   507   511   515   519   523   527   536   775   776  1388
BISB    1788  1804
BIT      402   653   657   687   692   696   804   881   892   946   957  1018  1032  1086  1100
        1147  1161  1295  1306  1397  1443  1506  1719  1791
BLE      569  1676  1696  1704
BLT      590   656  1206
BMI      417   462   610   672   720   825  1201  1216  1234  1249  1427
BNE      403   418   426   435   454   474   506   510   514   518   522   526   530   535   650
         654   658   661   667   680   716   774   795   802   808   882   893   947   958  1019
        1033  1087  1101  1148  1162  1221  1254  1296  1307  1355  1359  1365  1369  1444  1453
        1461  1470  1483  1493  1507  1692  1702  1720  1732  1749  1756  1792  1806  1808  1830
BPL      372   754   879   944  1009  1011  1016  1030  1084  1098  1145  1159  1188  1199  1214
        1232  1247  1293  1406  1442  1502  1680  1727  1745
BR       407   427   437   464   476   494   508   512   516   520   524   528   537   542   550
         567   586   613   675   677   743   751  1013  1203  1207  1218  1236  1240  1251  1431
        1457  1728  1752  1769  1771  1777  1843
CLC      548   759   832
CLR      397   398   400   401   421   470   483   500   541   552   555   574   648   652   674
         685   707   708   752   789   790   856   864   873   877   921   929   938   942   986
         994  1003  1012  1014  1061  1069  1078  1082  1143  1291  1361  1363  1366  1370  1371
        1372  1373  1392  1451  1485  1500  1677  1697  1772  1828  1854
CLRB    1757  1776  1790  1810
CMP      425   434   444   505   509   513   517   521   525   529   534   546   587   589   609
         679   711   715   768   773   781   794   801   807  1205  1220  1238  1253  1438  1452
        1462  1473  1477  1482  1492  1679  1691  1701  1731  1742  1807
CMPB     479   655   902   967  1042  1110  1171  1316  1447  1748  1755  1850
COM      731   732   800  1489
COMB     406   411   676
DEC      450   570   660  1354  1358  1364
EMT      329
HALT     354   612   755  1825  1842
INC      423   431   440   453   649   662   690   880   945  1017  1085  1146  1294  1481  1505
        1705  1829
INCB     896   961  1036  1104  1165  1310  1368  1450  1801  1805
IOT      330
JMP      357   498   533   591   597   611   686  1222  1255  1278  1393  1439  1463  1840  1855
JSR      455   458   467   475   502   554   573   640   645   668   699   710   792   812   815
         818   886   889   907   910   913   951   954   972   975   978  1023  1026  1047  1050
        1053  1091  1094  1115  1118  1121  1152  1155  1176  1179  1182  1300  1303  1321  1324
        1327  1402  1511  1514
MOV      373   374   375   376   377   378   379   380   381   382   383   384   385   386   387
         388   389   390   391   392   393   394   395   396   399   404   409   412   413   414
```

```
            419   420   429   430   432   436   441   446   451   452   457   466   471   477   481
            482   486   487   488   489   490   491   492   493   499   503   532   544   545   551
            556   571   575   605   643   644   647   663   669   670   691   695   701   709   723
            735   736   745   747   758   765   766   767   770   778   779   780   791   793   799
            809   811   814   817   822   828   830   838   840   844   845   846   847   848   849
            854   855   862   863   871   872   883   888   906   919   920   927   928   936   937
            948   953   971   984   985   992   993  1001  1002  1007  1020  1025  1028  1046  1059
           1060  1067  1068  1076  1077  1088  1093  1096  1114  1126  1129  1130  1138  1139  1149
           1154  1157  1175  1185  1190  1191  1193  1195  1209  1210  1223  1224  1226  1228  1242
           1243  1265  1266  1272  1273  1275  1283  1284  1297  1302  1320  1334  1340  1341  1343
           1345  1347  1349  1350  1351  1352  1353  1356  1357  1362  1374  1375  1377  1379  1380
           1381  1382  1383  1384  1387  1389  1390  1391  1401  1423  1424  1437  1446  1454  1456
           1459  1471  1472  1486  1487  1488  1490  1494  1495  1496  1508  1513  1678  1681  1687
           1689  1690  1698  1699  1700  1717  1718  1721  1722  1729  1735  1736  1740  1741  1759
           1768  1774  1775  1778  1779  1789  1812  1815  1816  1817  1818  1819  1820  1821  1822
           1823  1824  1827  1831  1832  1833  1834  1835  1836  1837  1838
MOVB        607   894   895   909   912   959   960   974   977  1034  1035  1049  1052  1102  1103
           1117  1120  1163  1164  1178  1181  1308  1309  1323  1326  1367  1725  1746  1753  1770
           1773  1780  1809  1848
NEG        1189  1491
RESET       370   642
ROL         725   738   739   740   741   771  1793  1795  1797
ROLB        562   563   564   565   566   581   582   583   584   585  1794  1796  1798
ROR         727   729   746   749   750   760   761   762   763   833   834   835   836   898   899
            900   963   964   965  1038  1039  1040  1106  1107  1108  1167  1168  1169  1312  1313
           1314  1335  1336  1337  1338  1682  1683  1684  1685  1785  1787
RORB        559   560   561   578   579   580   897   962  1037  1105  1166  1311
RTI         702   706   717   756   783   796   803   806   820   829   831   841   850   859   867
            876   891   915   924   932   941   956   980   989   997  1006  1031  1055  1064  1072
           1081  1099  1123  1133  1142  1160  1184  1196  1211  1229  1244  1270  1276  1288  1305
           1329  1408  1466  1499  1516  1737  1852
RTS         651   733  1693  1706  1760  1813
SUB         478   606  1225
SWAB        448   678   724   737   748   826
TRAP        328   616   617   618   619   620   621   622   623   624   625   626   627   628   629
            630   631   632   633   634   635   636
TST         405   410   416   424   433   442   460   468   473   531   568   666   671   681   683
            704   714   719   753   823   878   943  1010  1015  1083  1144  1187  1194  1198  1200
           1213  1215  1227  1231  1233  1246  1248  1274  1292  1405  1426  1433  1440  1441  1460
           1469  1501  1503  1675  1695  1703
TSTB        371   538   557   576  1008  1029  1097  1158  1723  1726  1744  1799  1802
.ASCII     1519  1595
.ASCIZ      457   460   485   498   502   597   690   695  1430  1437  1528  1530  1532  1534  1537
           1539  1542  1545  1548  1549  1552  1556  1560  1564  1568  1571  1574  1577  1580  1583
           1585  1587  1589  1590  1592  1752  1840  1854
.BLKW      1761  1814  1858  1859
.ENABL        1   271
.END       1861
.ENDC       344   884   891   949   956  1021  1031  1089  1099  1150  1160  1298  1305  1679  1699
           1706  1723  1738  1743  1762  1790  1815  1823  1831  1840  1841
.EVEN       457   460   485   498   502   597   690   695  1430  1437  1594  1752  1840  1854
.IF         344   884   891   949   956  1021  1028  1089  1096  1150  1157  1298  1305  1675  1695
           1703  1719  1729  1742  1761  1762  1778  1815  1823  1831  1839  1840
.IFF       1679  1699  1738  1743  1762  1840
.IIF       1761  1815
.IRP        643   647  1817  1831
```

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

*,DZQMAB.SEQ=DZQMAB.SML,DZQMAB.CMB
RUN-TIME: 17 23 3 SECONDS
RUN-TIME RATIO: 286/44=6.4
CORE USED:  22K  (43 PAGES)
```

GO5

Spooler runtime 8 Seconds, 36 KCS, 199 disk reads, 3 disk writes, 57 pages