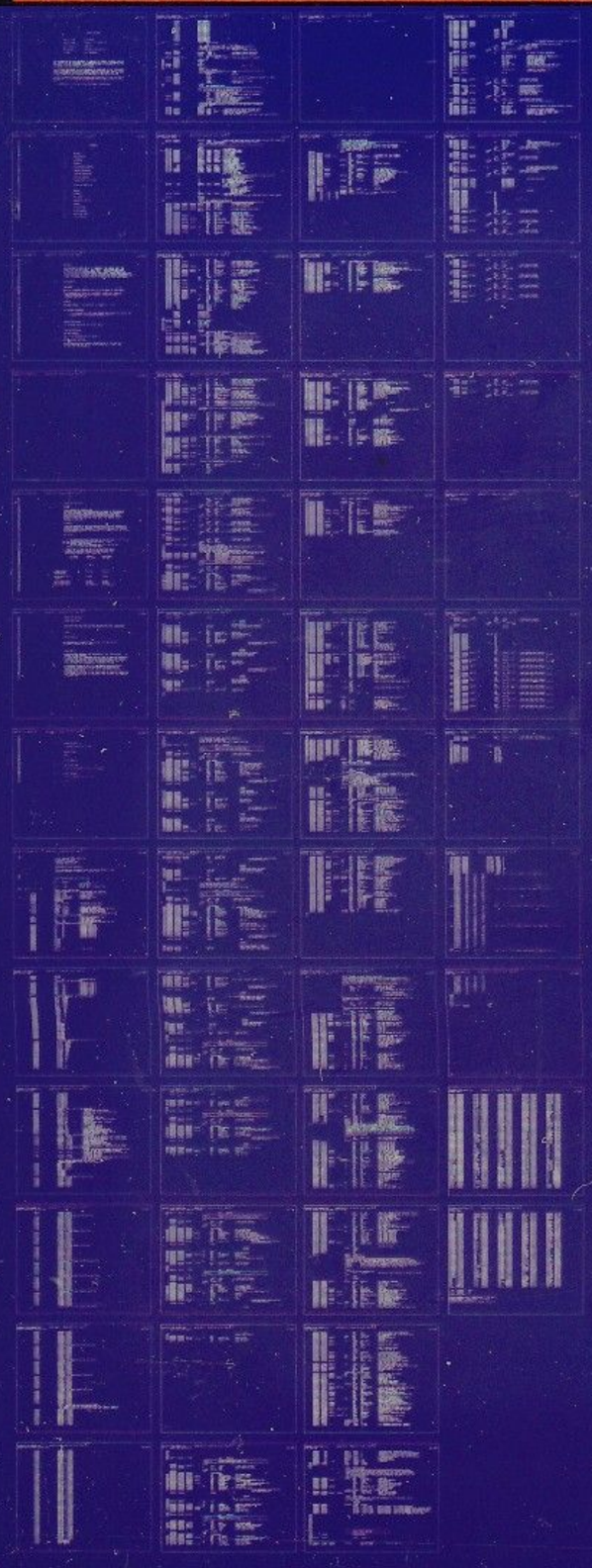
KD11-Z 11/44 POWER FAIL AH-F617B-MC
CKKACB0 FICHE 1 OF 1



```
.REM    %
```

IDENTIFICATION

PRODUCT CODE:	AC-F615B-MC
PRODUCT NAME:	CKKACB0 11/44 POWER FAIL
DATE CREATED:	1-MAR-79
MAINTAINER:	DIAGNOSTIC ENGINEERING
AUTHORS:	CHUCK ROBINSON

CONTENTS

```
                                1.      ABSTRACT

                                        THIS PROGRAM IS MADE UP OF 11  SUBTESTS  TO  CHECK  OUT  THE
                                        POWER  FAIL ON THE 11/44.  THE 2 MSEC.  POWER DOWN AND POWER
                                        UP TIME IS CHECKED ON EACH POWER FAIL.  INITIALLY POWER FAILS
                                        ARE  TRIED IN ALL PROCESSOR MODES THEN UNDER  ERROR CONDITIONS LIKE
                                         STACK OVERFLOW, TIME OUT, AND ODD ADDRESS AND MEMORY MANAGEMENT ABORTS.
                                         FINALLY A MEMORY VOLATILITY TEST IS RUN ON ALL AVAILABLE MEMORY.


                                2.      REQUIREMENTS


                                2.1     EQUIPMENT

                                        PDP11/44 STANDARD COMPUTER WITH UP TO 1M WORDS OF CORE MEMO-
                                        RY.
                                         THIS PROGRAM WILL WORK WITH AUTOMATIC POWER FAIL HARDWARE
                                         (MANUFACTURING ONLY) OR WITH MANUALLY TRIGGERED POWER
                                         FAILURES FOR EACH TEST.


                                2.2     STORAGE

                                        PROGRAM STORAGE - THE ROUTINES USE MEMORY 0 - 10142


                                2.3     PRELIMINARY PROGRAMS

                                              IT IS ASSUMED THAT CPU,TRAPS,MEMORY MANAGEMENT AND UNIBUS MAP
                                              DIAGNOSTICS HAVE BEEN RUN SUCCESSFULLY.



                                3.      LOADING PROCEDURE

                                        USE STANDARD PROCEDURE FOR ''XXDP'' MEDIA.


                                4.      STARTING PROCEDURE

                                4.1     STARTING ADDRESS

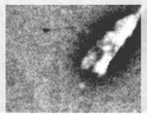
                                         200 IS THE PROGRAM STARTING ADDRESS

                                 4.2    CONTROL SWITCH SETTINGS

                                         SWITCH REGISTER <14> CONTROLS REPEATING OF A  FAILING TEST.
                                         THIS BIT MUST BE SET TO A 1 (AFTER ERROR HALT) EVERY TIME
                                         THE TEST IS TO BE REPEATED.
```

```
147
148
149
```

```
151
152
153
154                          5.        OPERATING PROCEDURE
155
156                          5.1       MANUAL
157
158                                    START PROGRAM AT ADDRESS 200.
159                                    A MESSAGE WILL BE TYPE INDENTIFYING THE NAME OF THE PROGRAM,
160                                    THE SIZE OF MEMORY, AND RUNNING INSTRUCTIONS. THE NUMBER OF
161                                    EACH TEST WILL BE PRINTED AT THE BEGINNING OF EACH TEST.
162                                    MANUALLY POWER DOWN THEN UP AFTER EACH TEST NUMBER APPEARS
163                                    ON THE TTY. DO THIS FOR EACH TEST UNTIL THE END OF PASS
164                                    MESSAGE IS RECEIVED.
165
166                          5.2       AUTOMATIC
167
168                                    START THE PROGRAM AT 200,THE PROGRAM SIZES FOR THE PRESENCE OF
169                                    AUTOMATIC POWER FAIL HARDWARE.IF FOUND,TESTING WILL BE PROCEED
170                                    WITH NO MANUAL INTERVENTION REQUIRED.TEST NUMBERS WILL BE PRINTED
171                                    PRIOR TO EACH TEST.
172
173                          5.3       APT SETUP
174
175
176                                          THE EXECUTION TIMES PROVIDED IN THE APT SCRIPT THAT FOLLOWS
177                                    ARE FOR EXECUTION WITH A 11/44 PROCESSOR,  CACHE,
178                                    16K CORE MEMORY, AND 300 BAUD.
179                                          THE FOLLOWING IS A PROGRAM LOAD FILE USED BY APT:
180                                    1. E TABLE 'A' IS USED FOR APT DUMP MODE.
181
182                                    2. E TABLE 'B' IS USED FOR APT QV AND RUN TIME MODES.
183                                       $ENVM=240 SUPRESSES TYPEOUTS TO THE TERMINAL AND
184                                       $SWREG=4000 INHIBITS TEST ITERATIONS
185
186                                            1ST PASS          LONGEST           ADDITIONAL
187                                            RUN TIME          TEST TIME         RUN TIME
188                                             5                    5                 0
189
190
191                                    ......                    E TABLES          .......
192
193
194                                                              A                 B
195                                    E-MODE/S-MODE             000/000           240/001
196                                    ($ENVM/$ENV)
197
198                                    SWITCH REGISTER 1         000000            004000
199                                    ($SWREG)
200
201                                    SWITCH REGISTER 2         000000            000000
202                                    CPU TYPE/OPTIONS          00/0000           00/0000
203                                    MEMORY MAP CODE 1         000/00000000      000/00000000
204
205
206
207
```



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                        5.4     SUBROUTINE ABSTRACT

                                PDWDWN AND POWUP



                                THESE ROUTINES ARE USED TO SAVE AND RESTORE VITAL  REGISTERS
                                AND  TEST  THE TIME ALLOWED FOR POWER FAIL BY THE PROCESSOR.


                        6.      ERRORS


                        6.1     ERROR PRINTOUT


                               THE PROGRAM WILL IDENTIFY THE FAILING TEST AND PROVIDE
                               PERTENANT INFORMATION ON ERROR.



                        6.2     ERROR HALTS

                                AFTER AN ERROR PRINTOUT,THE PROGRAM WILL HALT AND RETURN
                                CONTROL TO THE CONSOLE.
                                IF USING POWER FAIL HARDWARE AND YOU WISH TO STOP THE PROCESSOR
                                YOU SHOULD USE THE HALT SWITCH ON THE FRONT PANEL,THE CONSOLE
                                CTRL P WILL HANG UP TTY.TO GET IN CONSOLE MODE PUT HALT SWITCH
                                ON,TO GET BACK INTO PROGRAM SET THE SWICTH TO RUN.

                                IF AN ERROR OCCURS IN TEST 11 (THE MEMORY VOLITILITY TEST)
                                THE PHYSICAL ADDRESS OF THE BAD MEMORY LOCATION CAN BE
                                FOUND BY USING PAR.OFF AS BITS <21:6> AND ADDING VIR.ADD
                                LOCATION <12:0> TO IT.
                                IF AN ERROR IS DETECTED IN THE POWER DOWN OR POWER UP SUBROUTINE
                                THEN  CONTINUING AFTER THE ERROR HALT,WILL RESTART THE PROGRAM
                                AT ADDRESS 200.
```

```
247
248
249
250
251                         6.3       ERROR RECOVERY
252
253                                    CONTINUE OR RESTART AT 200
254
255
256                         7.        RESTRICTIONS
257
258                                    NONE
259
260
261                         8.        MISCELLANEOUS
262
263
264                         8.1       EXECUTION TIME
265
266                                    5 SEC IF IN AUTOMATIC , N/A IF IN MANUAL
267
268
269                         8.2       STACK POINTER
270
271                                    STACK IS INITALLY SET TO 1100
272
273
274                               %
```

```
                                .TITLE  CKKACA0 11/44 POWER FAIL
                                ;*COPYRIGHT (C) 1979
                                ;*DIGITAL EQUIPMENT CORP.
                                ;*MAYNARD, MASS. 01754
                                ;*
                                ;*PROGRAM BY CHUCK ROBINSON
                                ;*
                                ;*THIS PROGRAM WAS ASSEMBLED USING THE PDP-11 MAINDEC SYSMAC
                                ;*PACKAGE (MAINDEC-11-DZQAC-C3), JAN 19, 1977.
                                ;*


                                .SBTTL  OPERATIONAL SWITCH SETTINGS
                                ;*
                                ;*      SWITCH                  USE
                                ;*      ------          --------------------
                                ;*        14            LOOP ON TEST
                                ;*        10            INHIBIT BELL AT END-OF-PASS

                                .SBTTL  BASIC DEFINITIONS
                                ;*INITIAL ADDRESS OF THE STACK POINTER *** 1100 ***
001100                          STACK=  1100            ;;FIRST ADDRESS OF THE STACK
001100                          KERSTK= STACK           ;;KERNEL STACK
000700                          SUPSTK= STACK-200       ;;SUPERVISOR STACK
000600                          USESTK= STACK-300       ;;USER STACK
104000                          ERROR=EMT
000004                          SCOPE=IOT
177776                          PS=     177776          ;;PROCESSOR STATUS WORD
177776                          PSW=PS
177774                          STKLMT= 177774          ;;STACK LIMIT REGISTER
177772                          PIRQ=   177772          ;;PROGRAM INTERRUPT REQUEST REGISTER
177570                          DSWR=   177570          ;;HARDWARE SWITCH REGISTER
177570                          DDISP=  177570          ;;HARDWARE DISPLAY REGISTER
177546                          LKS=    177546          ;;LINE CLOCK (KW11-L) STATUS REGISTER
                                ;*MISCELLANEOUS DEFINITIONS
000011                          HT=     11              ;;CODE FOR HORIZONTAL TAB
000012                          LF=     12              ;;CODE LINE FEED
000015                          CR=     15              ;;CODE CARRIAGE RETURN
000200                          CRLF=   200             ;;CODE FOR CARRIAGE RETURN-LINE FEED
                                ;*GENERAL PURPOSE REGISTER DEFINITIONS
000000                          R0=     %0              ;;GENERAL REGISTER
000001                          R1=     %1              ;;GENERAL REGISTER
000002                          R2=     %2              ;;GENERAL REGISTER
000003                          R3=     %3              ;;GENERAL REGISTER
000004                          R4=     %4              ;;GENERAL REGISTER
000005                          R5=     %5              ;;GENERAL REGISTER
000006                          R6=     %6              ;;GENERAL REGISTER
000007                          R7=     %7              ;;GENERAL REGISTER
000000                          R10=R0
000001                          R11=R1
000002                          R12=R2
000003                          R13=R3
000004                          R14=R4
000005                          R15=R5
000006                          SP=     %6              ;;STACK POINTER
000006                          KSP=SP
```

```
000006                  SSP=SP
000006                  USP=SP
000007                  PC=     %7                      ;;PROGRAM COUNTER
                        ;*PRIORITY LEVEL DEFINITIONS
000000                  PR0=    0                       ;;PRIORITY LEVEL 0
000040                  PR1=    40                      ;;PRIORITY LEVEL 1
000100                  PR2=    100                     ;;PRIORITY LEVEL 2
000140                  PR3=    140                     ;;PRIORITY LEVEL 3
000200                  PR4=    200                     ;;PRIORITY LEVEL 4
000240                  PR5=    240                     ;;PRIORITY LEVEL 5
000300                  PR6=    300                     ;;PRIORITY LEVEL 6
000340                  PR7=    340                     ;;PRIORITY LEVEL 7
                        ;*''SWITCH REGISTER'' SWITCH DEFINITIONS
100000                  SW15=   100000
040000                  SW14=   40000
020000                  SW13=   20000
010000                  SW12=   10000
004000                  SW11=   4000
002000                  SW10=   2000
001000                  SW09=   1000
000400                  SW08=   400
000200                  SW07=   200
000100                  SW06=   100
000040                  SW05=   40
000020                  SW04=   20
000010                  SW03=   10
000004                  SW02=   4
000002                  SW01=   2
000001                  SW00=   1
001000                  SW9=SW09
000400                  SW8=SW08
000200                  SW7=SW07
000100                  SW6=SW06
000040                  SW5=SW05
000020                  SW4=SW04
000010                  SW3=SW03
000004                  SW2=SW02
000002                  SW1=SW01
000001                  SW0=SW00
                        ;*DATA BIT DEFINITIONS (BIT00 TO BIT15)
100000                  BIT15=  100000
040000                  BIT14=  40000
020000                  BIT13=  20000
010000                  BIT12=  10000
004000                  BIT11=  4000
002000                  BIT10=  2000
001000                  BIT09=  1000
000400                  BIT08=  400
000200                  BIT07=  200
000100                  BIT06=  100
000040                  BIT05=  40
000020                  BIT04=  20
000010                  BIT03=  10
000004                  BIT02=  4
000002                  BIT01=  2
000001                  BIT00=  1
001000                  BIT9=BIT09
```

```
                        BIT8=BIT08
                        BIT7=BIT07
                        BIT6=BIT06
                        BIT5=BIT05
                        BIT4=BIT04
                        BIT3=BIT03
                        BIT2=BIT02
                        BIT1=BIT01
                        BIT0=BIT00
                        ;*BASIC ''CPU'' TRAP VECTOR ADDRESSES
000004                  ERRVEC= 4               ;;TIME OUT AND OTHER ERRORS
000010                  RESVEC= 10              ;;RESERVED AND ILLEGAL INSTRUCTIONS
000014                  TBITVEC=14              ;;''T'' BIT
000014                  TRTVEC= 14              ;;TRACE TRAP
000014                  BPTVEC= 14              ;;BREAKPOINT TRAP (BPT)
000020                  IOTVEC= 20              ;;INPUT/OUTPUT TRAP (IOT) **SCOPE**
000024                  PWRVEC= 24              ;;POWER FAIL
000030                  EMTVEC= 30              ;;EMULATOR TRAP (EMT) **ERROR**
000034                  TRAPVEC=34              ;;''TRAP'' TRAP
000060                  TKVEC=  60              ;;TTY KEYBOARD VECTOR
000064                  TPVEC=  64              ;;TTY PRINTER VECTOR
000100                  LKVEC=  100             ;;LINE CLOCK (KW11-L) VECTER
000114                  CACHVEC=114             ;;CACHE ERROR INTERRUPT VECTOR
000240                  PIRQVEC=240             ;;PROGRAM INTERRUPT REQUEST VECTOR
000250                  MMVEC=  250             ;;MEMORY MANAGEMENT VECTOR
                        .SBTTL  CACHE   REGISTER DEFINITIONS
177740                  LOADRS = 177740         ;;LOWER 16 BITS OF ADDRESS THAT CAUSED ERROR
177742                  HIADRS = 177742         ;;UPPER SIX BITS OF ADDRESS THAT CAUSED ERROR
177744                  MEMERR = 177744         ;;CACHE ERROR REGISTER
177746                  CONTRL = 177746         ;;MEMORY CONTROL REGISTER
177750                  MAINT  = 177750         ;;MEMORY MAINTENENCE REGISTER
177752                  HITMIS = 177752         ;;HIT MISS REGISTER ''1'' IMPLIES HIT IN CACHE
                        .SBTTL  CPU REGISTER DEFINITIONS
177760                  SIZELO = 177760         ;;MEMORY SIZE REGISTER NUMBER TO PUT INTO A PAR
                                                ;;TO GET TO THE LAST 32 WORDS OF MEMORY
177762                  SIZEHI = 177762         ;;HIGH SIZE REGISTER, RESERVED FOR FUTURE USE
                                                ;;CURRENTLY ALL ZERO
177764                  SYSTID = 177764         ;;SYSTEM ID REGISTER
177766                  CPUERR = 177766         ;;CPU ERROR REGISTER HOLDS CONDITION THAT CAUSED
                                                ;;THE TRAP TO ERRVEC (000004)
                        .SBTTL  MEMORY MANAGEMENT DEFINITIONS
                        ;*MEMORY MANAGEMENT STATUS REGISTER ADDRESSES
177572                  MMR0=   177572
177574                  MMR1=   177574
177576                  MMR2=   177576
172516                  MMR3=   172516
177572                  SR0=MMR0
177574                  SR1=MMR1
177576                  SR2=MMR2
172516                  SR3=MMR3
                        ;*USER ''I'' PAGE DESCRIPTOR REGISTERS
177600                  UIPDR0= 177600
177602                  UIPDR1= 177602
177604                  UIPDR2= 177604
177606                  UIPDR3= 177606
177610                  UIPDR4= 177610
177612                  UIPDR5= 177612
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```
177614                  UIPDR6= 177614
177616                  UIPDR7= 177616
                        ;*USER 'D' PAGE DESCRIPTOR REGISTORS
177620                  UDPDR0= 177620
177622                  UDPDR1= 177622
177624                  UDPDR2= 177624
177626                  UDPDR3= 177626
177630                  UDPDR4= 177630
177632                  UDPDR5= 177632
177634                  UDPDR6= 177634
177636                  UDPDR7= 177636
                        ;*USER 'I' PAGE ADDRESS REGISTERS
177640                  UIPAR0= 177640
177642                  UIPAR1= 177642
177644                  UIPAR2= 177644
177646                  UIPAR3= 177646
177650                  UIPAR4= 177650
177652                  UIPAR5= 177652
177654                  UIPAR6= 177654
177656                  UIPAR7= 177656
                        ;*USER 'D' PAGE ADDRESS REGISTERS
177660                  UDPAR0= 177660
177662                  UDPAR1= 177662
177664                  UDPAR2= 177664
177666                  UDPAR3= 177666
177670                  UDPAR4= 177670
177672                  UDPAR5= 177672
177674                  UDPAR6= 177674
177676                  UDPAR7= 177676
                        ;*SUPERVISOR 'I' PAGE DESCRIPTOR REGISTERS
172200                  SIPDR0= 172200
172202                  SIPDR1= 172202
172204                  SIPDR2= 172204
172206                  SIPDR3= 172206
172210                  SIPDR4= 172210
172212                  SIPDR5= 172212
172214                  SIPDR6= 172214
172216                  SIPDR7= 172216
                        ;*SUPERVISOR 'D' PAGE DESCRIPTOR REGISTERS
172220                  SDPDR0= 172220
172222                  SDPDR1= 172222
172224                  SDPDR2= 172224
172226                  SDPDR3= 172226
172230                  SDPDR4= 172230
172232                  SDPDR5= 172232
172234                  SDPDR6= 172234
172236                  SDPDR7= 172236
                        ;*SUPERVISOR 'I' PAGE ADDRESS REGISTERS
172240                  SIPAR0= 172240
172242                  SIPAR1= 172242
172244                  SIPAR2= 172244
172246                  SIPAR3= 172246
172250                  SIPAR4= 172250
172252                  SIPAR5= 172252
172254                  SIPAR6= 172254
172256                  SIPAR7= 172256
                        ;*SUPERVISOR 'D' PAGE ADDRESS REGISTERS
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```
172260                  SDPAR0= 172260
172262                  SDPAR1= 172262
172264                  SDPAR2= 172264
172266                  SDPAR3= 172266
172270                  SDPAR4= 172270
172272                  SDPAR5= 172272
172274                  SDPAR6= 172274
172276                  SDPAR7= 172276
                        ;*KERNEL "I" PAGE DESCRIPTOR REGISTERS
172300                  KIPDR0= 172300
172302                  KIPDR1= 172302
172304                  KIPDR2= 172304
172306                  KIPDR3= 172306
172310                  KIPDR4= 172310
172312                  KIPDR5= 172312
172314                  KIPDR6= 172314
172316                  KIPDR7= 172316
                        ;*KERNEL "D" PAGE DESCRIPTOR REGISTERS
172320                  KDPDR0= 172320
172322                  KDPDR1= 172322
172324                  KDPDR2= 172324
172326                  KDPDR3= 172326
172330                  KDPDR4= 172330
172332                  KDPDR5= 172332
172334                  KDPDR6= 172334
172336                  KDPDR7= 172336
                        ;*KERNEL "I" PAGE ADDRESS REGISTERS
172340                  KIPAR0= 172340
172342                  KIPAR1= 172342
172344                  KIPAR2= 172344
172346                  KIPAR3= 172346
172350                  KIPAR4= 172350
172352                  KIPAR5= 172352
172354                  KIPAR6= 172354
172356                  KIPAR7= 172356
                        ;*KERNEL "D" PAGE ADDRESS REGISTERS
172360                  KDPAR0= 172360
172362                  KDPAR1= 172362
172364                  KDPAR2= 172364
172366                  KDPAR3= 172366
172370                  KDPAR4= 172370
172372                  KDPAR5= 172372
172374                  KDPAR6= 172374
172376                  KDPAR7= 172376
                        .SBTTL  UNIBUS MAP REGISTER DEFINITIONS
                        ;*THE LOWER 16 BITS OF THE MAP REGISTERS ARE LABELED 'MAPLXX'
                        ;*THE UPPER 6 BITS OF THE MAP REGISTERS ARE LABELED 'MAPHXX'
170200                  MAPL00 = 170200
170202                  MAPH00 = 170202
170204                  MAPL01 = 170204
170206                  MAPH01 = 170206
170210                  MAPL02 = 170210
170212                  MAPH02 = 170212
170214                  MAPL03 = 170214
170216                  MAPH03 = 170216
170220                  MAPL04 = 170220
170222                  MAPH04 = 170222
```

```
170224          MAPL05 = 170224
170226          MAPH05 = 170226
170230          MAPL06 = 170230
170232          MAPH06 = 170232
170234          MAPL07 = 170234
170236          MAPH07 = 170236
170240          MAPL10 = 170240
170242          MAPH10 = 170242
170244          MAPL11 = 170244
170246          MAPH11 = 170246
170250          MAPL12 = 170250
170252          MAPH12 = 170252
170254          MAPL13 = 170254
170256          MAPH13 = 170256
170260          MAPL14 = 170260
170262          MAPH14 = 170262
170264          MAPL15 = 170264
170266          MAPH15 = 170266
170270          MAPL16 = 170270
170272          MAPH16 = 170272
170274          MAPL17 = 170274
170276          MAPH17 = 170276
170300          MAPL20 = 170300
170302          MAPH20 = 170302
170304          MAPL21 = 170304
170306          MAPH21 = 170306
170310          MAPL22 = 170310
170312          MAPH22 = 170312
170314          MAPL23 = 170314
170316          MAPH23 = 170316
170320          MAPL24 = 170320
170320          MAPH24 = 170320
170324          MAPL25 = 170324
170326          MAPH25 = 170326
170330          MAPL26 = 170330
170332          MAPH26 = 170332
170334          MAPL27 = 170334
170336          MAPH27 = 170336
170340          MAPL30 = 170340
170342          MAPH30 = 170342
170344          MAPL31 = 170344
170346          MAPH31 = 170346
170350          MAPL32 = 170350
170352          MAPH32 = 170352
170354          MAPL33 = 170354
170356          MAPH33 = 170356
170360          MAPL34 = 170360
170362          MAPH34 = 170362
170364          MAPL35 = 170364
170366          MAPH35 = 170366
170370          MAPL36 = 170370
170372          MAPH36 = 170372
170374          MAPL37 = 170374
170376          MAPH37 = 170376
170200          MAPL0=MAPL00
170202          MAPH0=MAPH00
170204          MAPL1=MAPL01
```

```
                 170206                  MAPH1=MAPH01
                 170210                  MAPL2=MAPL02
                 170212                  MAPH2=MAPH02
                 170214                  MAPL3=MAPL03
                 170216                  MAPH3=MAPH03
                 170220                  MAPL4=MAPL04
                 170222                  MAPH4=MAPH04
                 170224                  MAPL5=MAPL05
                 170226                  MAPH5=MAPH05
                 170230                  MAPL6=MAPL06
                 170232                  MAPH6=MAPH06
                 170234                  MAPL7=MAPL07
                 170236                  MAPH7=MAPH07
  326                                    .SBTTL  TRAP CATCHER
                 000000                         .=0
                                        ;*ALL UNUSED LOCATIONS FROM 4 - 776 CONTAIN A ''.+2,HALT''
                                        ;*SEQUENCE TO CATCH ILLEGAL TRAPS AND INTERRUPTS
                                        ;*LOCATION 0 CONTAINS 0 TO CATCH IMPROPERLY LOADED VECTORS
                 000174                         .=174
     000174      000000                 DISPREG: .WORD  0               ;;SOFTWARE DISPLAY REGISTER
     000176      000000                 SWREG:   .WORD  0               ;;SOFTWARE SWITCH REGISTER
                                        .SBTTL  STARTING ADDRESS(ES)
     000200      000137  001424                 JMP     @#BEGIN ;;JUMP TO STARTING ADDRESS OF PROGRAM
  327            000500                 STACK1=500
  328            000204                 $SAVPC=.
  329            000030                 .=30
  330 000030     006616                 $ERROR
  331 000032     000340                 340
  332            000204                 .=$SAVPC
  334                                    .SBTTL  ACT11 HOOKS
                                        ;;**************************************************************
                                        ;HOOKS REQUIRED BY ACT11
                 000204                         $SVPC=.                 ;SAVE PC
                 000046                         .=46
     000046      004220                         $ENDAD                  ;;1)SET LOC.46 TO ADDRESS OF $ENDAD IN .$EOP
                 000052                         .=52
     000052      000000                         .WORD   0               ;;2)SET LOC.52 TO ZERO
                 000204                         .=$SVPC                 ;; RESTORE PC
  335            001100                 .=1100
  336                                    .SBTTL  APT PARAMETER BLOCK
                                        ;;**************************************************************
                                        ;SET LOCATIONS 24 AND 44 AS REQUIRED FOR APT
                                        ;;**************************************************************
                 001100                         .$X=.   ;;SAVE CURRENT LOCATION
                 000024                         .=24    ;;SET POWER FAIL TO POINT TO START OF PROGRAM
     000024      000200                         200     ;;FOR APT START UP
                 000044                         .=44    ;;POINT TO APT INDIRECT ADDRESS PNTR.
     000044      001100                         $APTHDR ;;POINT TO APT HEADER BLOCK
                 001100                         .=.$X   ;;RESET LOCATION COUNTER
                                        ;;**************************************************************
                                        ;SETUP APT PARAMETER BLOCK AS DEFINED IN THE APT-PDP11 DIAGNOSTIC
                                        ;INTERFACE SPEC.
     001100                             $APTHD:
     001100      000000                 $HIBTS: .WORD   0       ;;TWO HIGH BITS OF 18 BIT MAILBOX ADDR.
     001102      001114                 $MBADR: .WORD   $MAIL   ;;ADDRESS OF APT MAILBOX (BITS 0-15)
     001104      000005                 $TSTM:  .WORD   5       ;;RUN TIM OF LONGEST TEST
     001106      000005                 $PASTM: .WORD   5       ;;RUN TIME IN SECS. OF 1ST PASS ON 1 UNIT (QUICK VERIFY)
```

```
001110  000000                  $UNITM: .WORD   0       ;;ADDITIONAL RUN TIME (SECS) OF A PASS FOR EACH ADDITIONAL UNIT
001112  000016                          .WORD   $ETEND-$MAIL/2 ;;LENGTH MAILBOX-ETABLE(WORDS)
337                             .SBTTL  APT MAILBOX-ETABLE
                                ;;**************************************************************************
                                .EVEN
001114                          $MAIL:                          ;;APT MAILBOX
001114  000000                  $MSGTY: .WORD   AMSGTY  ;;MESSAGE TYPE CODE
001116  000000                  $FATAL: .WORD   AFATAL  ;;FATAL ERROR NUMBER
001120  000000                  $TESTN: .WORD   ATESTN  ;;TEST NUMBER
001122  000000                  $PASS:  .WORD   APASS   ;;PASS COUNT
001124  000000                  $DEVCT: .WORD   ADEVCT  ;;DEVICE COUNT
001126  000000                  $UNIT:  .WORD   AUNIT   ;;I/O UNIT NUMBER
001130  000000                  $MSGAD: .WORD   AMSGAD  ;;MESSAGE ADDRESS
001132  000000                  $MSGLG: .WORD   AMSGLG  ;;MESSAGE LENGTH
001134                          $ETABLE:                        ;;APT ENVIRONMENT TABLE
001134  000                     $ENV:   .BYTE   AENV    ;;ENVIRONMENT BYTE
001135  000                     $ENVM:  .BYTE   AENVM   ;;ENVIRONMENT MODE BITS
001136  000000                  $SWREG: .WORD   ASWREG  ;;APT SWITCH REGISTER
001140  000000                  $USWR:  .WORD   AUSWR   ;;USER SWITCHES
001142  000000                  $CPUOP: .WORD   ACPUOP  ;;CPU TYPE,OPTIONS
                                ;*                              BITS 15-11=CPU TYPE
                                ;*                                      11/04=01,11/05=02,11/20=03,11/40=04,11/45=05
                                ;*                                      11/70=06,PDQ=07,Q=10
                                ;*                              BIT 10=REAL TIME CLOCK
                                ;*                              BIT  9=FLOATING POINT PROCESSOR
                                ;*                              BIT  8=MEMORY MANAGEMENT
001144  000                     $MAMS1: .BYTE   AMAMS1  ;;HIGH ADDRESS,M.S. BYTE
001145  000                     $MTYP1: .BYTE   AMTYP1  ;;MEM. TYPE,BLK#1
                                ;*                              MEM.TYPE BYTE   --  (HIGH BYTE)
                                ;*                                      900 NSEC CORE=001
                                ;*                                      300 NSEC BIPOLAR=002
                                ;*                                      500 NSEC MOS=003
001146  000000                  $MADR1: .WORD   AMADR1  ;;HIGH ADDRESS,BLK#1
                                ;*                                        MEM.LAST ADDR.=3 BYTES,THIS WORD AND LOW OF ''TYPE'' ABOVE
001150                          $ETEND:
                                .MEXIT
338                             .SBTTL  APT COMMUNICATIONS ROUTINE
                                ;;**************************************************************************
001150  112767  000001  000236  $ATY1:  MOVB    #1,$FFLG        ;;TO REPORT FATAL ERROR
001156  112767  000001  000226  $ATY3:  MOVB    #1,$MFLG        ;;TO TYPE A MESSAGE
001164  000403                  BR      $ATYC
001166  112767  000001  000220  $ATY4:  MOVB    #1,$FFLG        ;;TO ONLY REPORT FATAL ERROR
001174                          $ATYC:
001174  010046                  MOV     R0,-(SP)        ;;PUSH R0 ON STACK
001176  010146                  MOV     R1,-(SP)        ;;PUSH R1 ON STACK
001200  105767  000206          TSTB    $MFLG           ;;SHOULD TYPE A MESSAGE?
001204  001450                  BEQ     5$              ;;IF NOT:  BR
001206  122767  000001  177720  CMPB    #APTENV,$ENV    ;;OPERATING UNDER APT?
001214  001031                  BNE     3$              ;;IF NOT:  BR
001216  132767  000100  177711  BITB    #APTSPOOL,$ENVM ;;SHOULD SPOOL MESSAGES?
001224  001425                  BEQ     3$              ;;IF NOT:  BR
001226  017600  000004          MOV     @4(SP),R0       ;;GET MESSAGE ADDR.
001232  062766  000002  000004  ADD     #2,4(SP)                ;;BUMP RETURN ADDR.
001240  005767  177650          1$:     TST     $MSGTYPE        ;;SEE IF DONE W/ LAST XMISSION?
001244  001375                  BNE     1$              ;;IF NOT:  WAIT
001246  010067  177656          MOV     R0,$MSGAD       ;;PUT ADDR IN MAILBOX
001252  105720                  2$:     TSTB    (R0)+           ;;FIND END OF MESSAGE
```

```
001254  001376                          BNE     2$
001256  166700  177646                  SUB     $MSGAD,R0       ;;SUB START OF MESSAGE
001262  006200                          ASR     R0              ;;GET MESSAGE LNGTH IN WORDS
001264  010067  177642                  MOV     R0,$MSGLGT      ;;PUT LENGTH IN MAILBOX
001270  012767  000004  177616          MOV     #4,$MSGTYPE     ;;TELL APT TO TAKE MSG.
001276  000413                          BR      5$
001300  017667  000004  000016  3$:     MOV     @4(SP),4$       ;;PUT MSG ADDR IN JSR LINKAGE
001306  062766  000002  000004          ADD     #2,4(SP)                ;;BUMP RETURN ADDRESS
001314  016746  176456                  MOV     177776,-(SP)    ;;PUSH 177776 ON STACK
001320  004767  004646                  JSR     PC,$TYPE        ;;CALL TYPE MACRO
001324  000000                  4$:     .WORD   0
001326                          5$:
001326  105767  000062          10$:    TSTB    $FFLG           ;;SHOULD REPORT FATAL ERROR?
001332  001416                          BEQ     12$             ;;IF NOT:  BR
001334  005767  177574                  TST     $ENV            ;;RUNNING UNDER APT?
001340  001413                          BEQ     12$             ;;IF NOT:  BR
001342  005767  177546          11$:    TST     $MSGTYPE        ;;FINISHED LAST MESSAGE?
001346  001375                          BNE     11$             ;;IF NOT:  WAIT
001350  017667  000004  177540          MOV     @4(SP),$FATAL   ;;GET ERROR #
001356  062766  000002  000004          ADD     #2,4(SP)                ;;BUMP RETURN ADDR.
001364  005267  177524                  INC     $MSGTYPE        ;;TELL APT TO TAKE ERROR
001370  105067  000020          12$:    CLRB    $FFLG           ;;CLEAR FATAL FLAG
001374  105067  000013                  CLRB    $LFLG           ;;CLEAR LOG FLAG
001400  105067  000006                  CLRB    $MFLG           ;;CLEAR MESSAGE FLAG
001404  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
001406  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
001410  000207                          RTS     PC              ;;RETURN
001412     000          $MFLG:  .BYTE   0               ;;MESSG. FLAG
001413     000          $LFLG:  .BYTE   0               ;;LOG FLAG
001414     000          $FFLG:  .BYTE   0               ;;FATAL FLAG
                                .EVEN
            000200          APTSIZE=200
            000001          APTENV=001
            000100          APTSPOOL=100
            000040          APTCSUP=040
339
340 001416  000000          PFAIL: .WORD 0
341 001420  000000          XYZ: .WORD 0
342         177570          SWR=177570
343         177570          DISPLAY=SWR
344 001422  000002          LRTI:   RTI
345
346 001424                  BEGIN:
                            .SBTTL  INITIALIZE THE COMMON TAGS
    001424  012706  001100          MOV     #STACK,SP       ;;SETUP THE STACK POINTER
                            ;;INITIALIZE A FEW VECTORS
    001430  012737  006544  000034  MOV     #$TRAP,@#TRAPVEC ;;TRAP VECTOR FOR TRAP CALLS
    001436  012737  000340  000036  MOV     #340,@#TRAPVEC+2;LEVEL 7
    001444  005067  177452          CLR     $PASS           ;;CLEAR THE PASS COUNT
    001450  016767  002512  002502  MOV     $ENDCT,$EOPCT   ;;SETUP END-OF-PROGRAM COUNTER
                            ;;SIZE FOR A HARDWARE SWITCH REGISTER. IF NOT FOUND OR IT IS
                            ;;EQUAL TO A "-1", SETUP FOR A SOFTWARE SWITCH REGISTER.
    001456  013746  000004          MOV     @#ERRVEC,-(SP)  ;;SAVE ERROR VECTOR
    001462  012737  001516  000004  MOV     #64$,@#ERRVEC   ;;SET UP ERROR VECTOR
    001470  012767  177570  176072  MOV     #DSWR,SWR       ;;SETUP FOR A HARDWARE SWICH REGISTER
    001476  012767  177570  176064  MOV     #DDISP,DISPLAY  ;;AND A HARDWARE DISPLAY REGISTER
    001504  022777  177777  176056  CMP     #-1,@SWR        ;;TRY TO REFERENCE HARDWARE SWR
```

```
        001512  001012                          BNE     66$             ;;BRANCH IF NO TIMEOUT TRAP OCCURRED
                                                                        ;;AND  THE HARDWARE SWR IS NOT = -1
        001514  000403                          BR      65$             ;;BRANCH IF NO TIMEOUT
        001516  012716  001524          64$:    MOV     #65$,(SP)       ;;SET UP FOR TRAP RETURN
        001522  000002                          RTI
        001524  012767  000176  176036  65$:    MOV     #SWREG,SWR      ;;POINT TO SOFTWARE SWR
        001532  012767  000174  176030          MOV     #DISPREG,DISPLAY
        001540  012637  000004          66$:    MOV     (SP)+,@#ERRVEC  ;;RESTORE ERROR VECTOR
        001544  005067  177352                  CLR     $PASS           ;;CLEAR PASS COUNT
        001550  132767  000200  177357          BITB    #APTSIZE,$ENVM  ;;TEST USER SIZE UNDER APT
        001556  001403                          BEQ     67$             ;;YES,USE NON-APT SWITCH
        001560  012767  001136  176002          MOV     #$SWREG,SWR     ;;NO,USE APT SWITCH REGISTER
        001566                          67$:
    347 001566  012777  004654  003300          MOV     #POWDWN,@DVEC   ;SET UP POWER DOWN VECTOR
    348 001574  012737  004554  000114          MOV     #PARERR,@#CACHVEC ;SET UP PARITY ERROR VECTOR
    349 001602  012737  000001  004556          MOV     #1,@#PARFLG     ;INITIALIZE THE MULTI PARITY ERROR INDICATOR
    350
    351                                 ;DETERMINE THE SIZE OF MEMORY IN SYSTEM USING SYSMAC SIZE
    352                                 ;ROUTINE
    353
    354 001610  005000                          CLR     R0              ;MAKE MSB'S = 0
    355 001612  052767  000200  003430          BIS     #BIT07,$KT11    ;TURN ON MEMORY MANAGMENT
    356 001620  004767  003366                  JSR     PC,$SIZE        ;GET PAR VALUE FOR LAST WORD
    357 001624  062767  000037  003664          ADD     #37,$LSTBK      ;FINE LAST ADDRESS OF MEMORY BANK
    358 001632  016701  003660                  MOV     $LSTBK,R1       ;CHECK LAST BANK WITH R1
    359 001636  005201                          INC     R1              ;SIZE MEMORY
    360 001640  071027  000200                  DIV     #200,R0         ;FORM THE BLOCK NUMBER OF
    361 001644  005300                          DEC     R0              ; THE LAST ADDRESS AND
    362 001646  010067  003232                  MOV     R0,LIMIT        ;SAVE IT.
    363 001652  005200                          INC     R0              ;MULT BY 4
    364 001654  006300                          ASL     R0
    365 001656  006300                          ASL     R0
    366
    367
    368                                 ;THIS ROUTINE SIZE FOR PFAIL HARDWARE,TO AUTOMATIC POWER FAIL THE SYSTEM
    369 001660  012767  177740  177530          MOV     #177740,PFAIL   ;SETUP PFAIL ADDRESS
    370 001666  012767  001710  176110          MOV     #3$,4           ;SET PC
    371 001674  012767  000340  176104          MOV     #340,6          ;SET PSW
    372 001702  005777  177510                  TST     @PFAIL          ;READ PFAIL
    373 001706  000412                          BR      4$              ;POWER FAIL HARDWARE IS IN SYSTEM
    374 001710  012767  000006  176066  3$:     MOV     #6,4            ;TRAP RETURN
    375 001716  005067  176064                  CLR     6
    376 001722  005726                          TST     (SP)+           ;SETUP STACK PC
    377 001724  005726                          TST     (SP)+           ;SETUP STACK PSW
    378 001726  012767  001420  177462          MOV     #XYZ,PFAIL      ;SET UP DUMMY ADDRESS
    379 001734                          4$:
    380 001734  012767  000006  176042          MOV     #6,4            ;RESTORE TRAP VEC
    381 001742  005067  176040                  CLR     6
    382
    383                                 ;IDENTIFY THE PROGRAM AND TYPE INSTRUCTIONS
    384
    385 001746  023767  000042  002244          CMP     @#42,$ENDAD
    386 001754  001547                          BEQ     PRETST
    387 001756  104401                          TYPE
    388 001760  010005                          TITLE
    389 001762  104401                          TYPE
    390 001764  010042                          BOOT
```

```
                                                MOV     R0,-(SP)        ;;SAVE R0 FOR TYPEOUT
                                                TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
                                                TYPE    ,69$            ;;TYPE ASCIZ STRING
                                                BR      68$             ;;GET OVER THE ASCIZ
                                        ;;69$:  .ASCIZ  *-K WORDS OF MEMORY EXIST *
                                        68$:
                                                CMP     PFAIL,#XYZ      ;IS AUTOMATIC POWER FAIL
                                                BNE     APF             ;BRANCH IF YES
                                                TYPE    ,71$            ;;TYPE ASCIZ STRING
                                                BR      70$             ;;GET OVER THE ASCIZ
                                        ;;71$:  .ASCIZ  <CRLF><LF>* MANUALY INTERRUPT THE POWER AFTER EACH TEST # *
                                        70$:
                                                BR      FT
                                        APF:
                                                TYPE    ,65$            ;;TYPE ASCIZ STRING
                                                BR      64$             ;;GET OVER THE ASCIZ
                                        ;;65$:  .ASCIZ  <CRLF><LF>* NO MANUAL INTERVENTION REQUIRED*
                                        64$:
                                                TYPE    ,67$            ;;TYPE ASCIZ STRING
                                                BR      66$             ;;GET OVER THE ASCIZ
                                        ;;67$:  .ASCIZ  <CRLF><LF>* AUTO POWER FAIL TEST HARDWARE EXIST*
                                        66$:

                                        FT:
                                                TYPE    ,65$            ;;TYPE ASCIZ STRING
                                                BR      64$             ;;GET OVER THE ASCIZ
                                        ;;65$:  .ASCIZ  <CRLF>
                                        64$:
                                        PRETST: MOV     #1,$TESTN
                                        ;THIS ROUTINE IS FOR CHECKING 2MS TIMING USING SOB OUT OF SIPARS
                                        ;BRANCH . OUT OF SIPAR0=1.2US
                                        ;SOB HAS ONE MORE MICRO STEP THROUGH EQUAL 1.4US
                                        ;1024 MUL BY 1.4US EQUAL 1.43MS MIN TIME CHECKED FOR ILLUP,ILLDWN
                                                MOV     #12700,@#SIPAR0 ;LOAD PAR0 & 1 WITH MOV #1777,R0
                                                MOV     #1777,@#SIPAR1
                                                MOV     #77001,@#SIPAR2 ;LOAD PAR2 WITH SOB R0,.
                                                MOV     #207,@#SIPAR3   ;LOAD PAR3 WITH RTS PC
                                        ;;**************************************************************
                                        ;*TEST 1         SIMPLE DOWN/UP TEST (KERNAL)
                                        ;;**************************************************************
                                        TST1:
                                                TYPE    ,65$            ;;TYPE ASCIZ STRING
                                                BR      64$             ;;GET OVER THE ASCIZ
                                        ;;65$:  .ASCIZ  *1 *
                                        64$:
                                                TYPE,$ENULL
                                                CLR     @#PS            ;SET KERNAL MODE
                                                MOV     #2$,R3          ;SET POWER UP RETURN
                                                MOV     #1,@PFAIL               ;SET UP TO START POWER FAIL
                                                WAIT                    ;WAIT FOR POWER FAIL
                                        2$:     MOV     SP,R0           ;GET SP
                                                CMP     #STACK-4,R0     ;CHECK SP
                                                BEQ     3$              ;SKIP IF OK
                                                MOV     #1074,EXP.SP1
                                                MOV     R0,REC.SP1
                                                MOV     #STACK1,SP                      ;SETUP RESERVED STACK POINTER
                                                                                        ;FOR ERROR PRINTOUT
```

```
                002416  104000                          ERROR

                                                                        ;ERROR
                                                                        ;-----
421                                                                     ;SP NOT STACK-4
422             002420  007736                          EXP.SP1         ;PRINT EXPECTED STACK POINTER
423             002422  007740                          REC.SP1         ;PRINT  RECEIVED STACK POINTER
424             002424  000000                          0
425             002426  000000                          HALT
426             002430  012706  001100          3$:     MOV     #STACK,SP       ;RESET SP
427             002434  013700  001074                  MOV     @#STACK-4,R0    ;GET RETURN ADDRESS
428             002440  022700  002370                  CMP     #2$,R0          ;CHECK ADDRESS
429             002444  001414                          BEQ     4$              ;SKIP IF OK
430             002446  012767  002370  005256          MOV     #2$,EXP.ADD
431             002454  010067  005254                  MOV     R0,REC.ADD
432             002460  012706  000500                  MOV     #STACK1,SP                      ;SETUP RESERVED STACK POINTER
                                                                                                ;FOR ERROR PRINTOUT
                002464  104000                          ERROR

                                                                        ;ERROR
                                                                        ;-----
433                                                                     ;ADDRESS ON STACK IS WRONG
434             002466  007732                          EXP.ADD         ;PRINT EXPECTED ADDRESS
435             002470  007734                          REC.ADD         ;PRINT RECEIVED ADDRESS
436             002472  000000                          0
437             002474  000000                          HALT
438             002476  013700  001076          4$:     MOV     @#STACK-2,R0    ;GET OLD PS
439             002502  022700  000000                  CMP     #0,R0           ;CHECK OLD PS
440             002506  001414                          BEQ     5$              ;SKIP IF OK
441             002510  012767  000000  005224          MOV     #0,EXP.PSW
442             002516  010067  005222                  MOV     R0,REC.PSW
443             002522  012706  000500                  MOV     #STACK1,SP                      ;SETUP RESERVED STACK POINTER
                                                                                                ;FOR ERROR PRINTOUT
                002526  104000                          ERROR

                                                                        ;ERROR
                                                                        ;-----
444                                                                     ;OLD PS IS WRONG
445             002530  007742                          EXP.PSW         ;PRINT EXPECTED PS
446             002532  007744                          REC.PSW         ;PRINT RECEIVED PS
447             002534  000000                          0
448             002536  000000                          HALT
449             002540                          5$:
                002540  032737  040000  177570          BIT     #SW14,@#SWR     ;LOOP ON TEST?
                002546  001271                          BNE     TST1            ;LOOP TO TST1
450
451
452
```

```
                                        ;
                                        ;TEST ROUTINE TO CHECK RE-START CAPABILITY
                                        ;USING THE BR. INSTRUCTION
                                        ;OPERATOR MUST SET HALT SWITCH TO ENABLE POSITION
                                        ;
002550  005267  176344                  INC     $TESTN
                                        ;;*****************************************************************
                                        ;*TEST 2        POWER FAIL WITH BR. INSTRUCTION
                                        ;;*****************************************************************
002554                                  TST2:
002554  104401  002562                  TYPE    ,65$            ;;TYPE ASCIZ STRING
002560  000402                          BR      64$             ;;GET OVER THE ASCIZ
                                        ;;65$:  .ASCIZ  *2 *
002566                                  64$:
002566  104401  004234                  TYPE,$ENULL
002572  012706  001100                  MOV     #STACK,SP       ;SET UP STACK
002576  012767  000357  175172          MOV     #357,PS                 ;SET UP CONDITION CODES
002604  012703  002620                  MOV     #2$,R3                  ;SET POWER UP RETURN
002610  012777  000001  176600          MOV     #1,@PFAIL               ;SET UP TO START POWER FAIL
002616  000777                  1$:     BR      .                       ;WAIT FOR POWER FAIL
002620  010600                  2$:     MOV     SP,R0                   ;GET SP
002622  012706  001100                  MOV     #STACK,SP               ;SET STACK
002626  022700  001074                  CMP     #STACK-4,R0             ;CHECK STACK POINTER
002632  001414                          BEQ     3$                      ;SKIP IF OK
002634  012767  001074  005074          MOV     #1074,EXP.SP1
002642  010067  005072                  MOV     R0,REC.SP1
002646  012706  000500                  MOV     #STACK1,SP                      ;SETUP RESERVED STACK POINTER
                                                                                ;FOR ERROR PRINTOUT
002652  104000                          ERROR

                                                                        ;ERROR
                                                                        ;-----
                                                                        ;STACK POINTER
                                        EXP.SP1                         ;PRINT RECEIVED SP
                                        REC.SP1                         ;PRINT EXPECTED SP
                                        0
                                        HALT
002664  013700  001076          3$:     MOV     @#STACK-2,R0    ;GET OLD PS
002670  022700  000341                  CMP     #341,R0         ;CHECK OLD PS
002674  001414                          BEQ     4$              ;SKIP IF OK
002676  012767  000341  005036          MOV     #341,EXP.PSW
002704  010067  005034                  MOV     R0,REC.PSW
002710  012706  000500                  MOV     #STACK1,SP              ;SETUP RESERVED STACK POINTER
                                                                        ;FOR ERROR PRINTOUT
002714  104000                          ERROR

                                                                        ;ERROR
                                                                        ;-----
                                                                        ;OLD PS IS WRONG
                                        EXP.PSW                         ;PRINT EXPECTED OLD PS
                                        REC.PSW                         ;PRINT RECEIVED OLD PS
                                        0
                                        HALT
002726  013700  001074          4$:     MOV     @#STACK-4,R0    ;GET RETURN ADDRESS
002732  022700  002616                  CMP     #1$,R0
002736  001414                          BEQ     5$              ;SKIP IF OK
002740  012767  002616  004764          MOV     #1$,EXP.ADD
```

```
                                                MOV     R0,REC.ADD
                                                MOV     #STACK1,SP              ;SETUP RESERVED STACK POINTER
                                                                                ;FOR ERROR PRINTOUT
        002756  104000                          ERROR

                                                                                ;ERROR
                                                                                ;-----
                                                                                ;ADDRESS ON STACK IS WRONG
                                                EXP.ADD                         ;PRINT EXPECTED ADDRESS
                                                REC.ADD                         ;PRINT RECEIVE ADDRESS
                                                0
                                                HALT
                                        5$:
        002770  032737  040000  177570          BIT     #SW14,@#SWR     ;LOOP ON TEST?
        002776  001266                          BNE     TST2            ;LOOP TO TST2

                                        ;TEST ROUTINE TO CHECK RESTART CAPABILITY
                                        ;USING THE EMULATOR TRAP FOR A WAIT
                                        ;OPERATOR MUST SET HALT SWITCH TO ENABLE POSITION
                                        ;
        003000  005267  176114                  INC     $TESTN
                                        ;;*******************************************************************
                                        ;*TEST 3        POWER FAIL WITH EMT TRAP
                                        ;;*******************************************************************
        003004                          TST3:
        003004  104401  003012                  TYPE    ,65$            ;;TYPE ASCIZ STRING
        003010  000402                          BR      64$             ;;GET OVER THE ASCIZ
                                        ;;65$:  .ASCIZ  *3 *
        003016                          64$:
        003016  104401  004234                  TYPE,$ENULL
        003016                          
        003022  005037  177776                  CLR     @#PS            ;SET KERNAL MODE
        003026  012706  001100                  MOV     #STACK,SP               ;SET UP STACK
        003032  012703  003064                  MOV     #2$,R3                  ;SET POWER UP RETURN
        003036  012767  001422  174764          MOV     #LRTI,EMTVEC            ;SET UP RETURN FROM  EMT TRAP VECTOR
        003044  012767  000005  174760          MOV     #5,EMTVEC+2             ;SET PSW ON POWER FAIL
        003052  012777  000001  176336          MOV     #1,@PFAIL               ;SET UP TO START POWER FAIL
        003060  104000                  3$:     EMT                                     ;WAIT FOR POWER FAIL
        003062  000776                          BR      3$
        003064  010600                  2$:     MOV     SP,R0                   ;GET SP
        003066  012706  001100                  MOV     #STACK,SP
        003072  012767  006616  174730          MOV     #$ERROR,30              ;RESET EMT VECTOR
        003100  022700  001074                  CMP     #STACK-4,R0             ;WAS STACK PUSHED ONLY TWICE
        003104  001461                          BEQ     6$
        003106  022700  001070                  CMP     #STACK-10,R0            ;WAS STACK PUSHED 4 TIMES
        003112  001414                          BEQ     4$
        003114  012767  001070  004614          MOV     #1070,EXP.SP1
        003122  010067  004612                  MOV     R0,REC.SP1
        003126  012706  000500                  MOV     #STACK1,SP                      ;SETUP RESERVED STACK POINTER
                                                                                        ;FOR ERROR PRINTOUT
        003132  104000                          ERROR

                                                                                ;ERROR
                                                                                ;-----
                                                                                ;WAS STACK PUSHED 4 TIMES
                                                EXP.SP1                         ;PRINT EXPECTED STACK POINTER
                                                REC.SP1                         ;PRINT RECEIVED STACK POINTER
                                                0
```

```
                        HALT
004544  013700  001070  4$:   MOV     @#STACK-10,R0
004546  022700  001422        CMP     #LRTI,R0        ;DOES STACK CONTAIN CORRECT INFO
004550  001414                BEQ     5$
004552  012767  001422  004546        MOV     #LRTI,EXP.ADD
004560  010067  004544        MOV     R0,REC.ADD
004564  012706  000500        MOV     #STACK1,SP                      ;SETUP RESERVED STACK POINTER
                                                                        ;FOR ERROR PRINTOUT
004570  104000                ERROR

                                                                ;ERROR
                                                                ;-----
                                                ;IS STACK PUSHED MORE THAN 2 OR LESS THAN 4
004572  007732                EXP.ADD                         ;PRINT EXPECTED ADDRESS
004574  007734                REC.ADD                         ;PRINT RECEIVED ADDRESS
004576  000000                0
004600  000000                HALT
004602  013700  001072  5$:   MOV     @#STACK-6,R0
004606  022700  000005        CMP     #5,R0           ;DOES STACK CONTAIN CORRECT INFO
004612  001414                BEQ     6$
004614  012767  000005  004514        MOV     #5,EXP.PSW
004622  000000  007744        R0,REC.PSW
004626  012706  000500        MOV     #STACK1,SP                      ;SETUP RESERVED STACK POINTER
                                                                        ;FOR ERROR PRINTOUT
004632  104000                ERROR

                                                                ;ERROR
                                                                ;-----
                                                                ;STACK CONTIAN WRONG PSW
004634  007742                EXP.PSW                         ;PRINT EXPECTED PSW
004636  007744                REC.PSW                         ;PRINT RECEIVED PSW
004640  000000                0
004642  000000                HALT
004644                  6$:
004644  032737  040000  177570        BIT     #SW14,@#SWR     ;LOOP ON TEST?
004652  001252                BNE     TST3            ;LOOP TO TST3


004654  005267  175634                INC     $TESTN
                        ;;*******************************************************************
                        ;*TEST 4         POWER FAIL WITH ODD ADDRESS
                        ;;*******************************************************************
004660                  TST4:
004660  104401  004666        TYPE    ,65$            ;;TYPE ASCIZ STRING
004664  000402                BR      64$             ;;GET OVER THE ASCIZ
                        ;;65$:  .ASCIZ  *4 *
004672                  64$:
004672  104401  004230        TYPE,$ENULL
004676  005037  177776        CLR     @#PS            ;SET KERNAL MODE
004702  012737  004722  000004        MOV     #3$,@#ERRVEC    ;SET TRAP VECTOR
004710  012703  004742        MOV     #1$,R3          ;SET RETURN ADDRESS FOR POWER FAIL
004714  012777  000001  176070        MOV     #1,@PFAIL               ;SET UP TO START POWER FAIL
004722  012706  001100  3$:    MOV     #STACK,SP       ;RESET STACK
004726  005737  000003        TST     @#3             ;CAUSE ODD ADDRESS TRAP
004732  012706  000500        MOV     #STACK1,SP                      ;SETUP RESERVED STACK POINTER
                                                                        ;FOR ERROR PRINTOUT
```

```
        003342  104000                          ERROR

                                                                        ;ERROR
                                                                        ;-----
    566 003344  000000                          HALT                    ;ODD ADDRESS TRAP FAILED TO OCCUR
    567 003346  012737  000006  000004  1$:     MOV     #6,@#ERRVEC     ;RESET 4
    568 003354  032737  040000  177570          BIT     #SW14,@#SWR     ;LOOP ON TEST?
        003362  001340                          BNE     TST4            ;LOOP TO TST4
    569
    570
    571 003364  005267  175530                  INC     $TESTN
    572                             ;;**************************************************************
                                    ;*TEST 5         POWER FAIL WITH TIME OUT (KERNAL)
                                    ;;**************************************************************
        003370                      TST5:
        003370  104401  003376                  TYPE    ,65$            ;;TYPE ASCIZ STRING
        003374  000402                          BR      64$             ;;GET OVER THE ASCIZ
                                    ;;65$:  .ASCIZ  *5 *
        003402                      64$:
        003402  104401  004234                  TYPE,$ENULL
    573 003406  012737  003426  000004          MOV     #3$,@#ERRVEC    ;SET TRAP VECTOR
    574 003414  012703  003452                  MOV     #1$,R3          ;SET UP RETURN ADDRESS FOR POWER FAIL
    575 003420  012777  000001  175770          MOV     #1,@PFAIL               ;SET UP TO START POWER FAIL
    576 003426  012706  001100          3$:     MOV     #STACK,SP       ;SET STACK
    577 003432  005037  177776                  CLR     @#PS            ;SET KERNAL MODE
    578 003436  010037  160000                  MOV     R0,@#160000     ;CAUSE A TIMEOUT
    579 003442  012706  000500                  MOV     #STACK1,SP                      ;SETUP RESERVED STACK POINTER
                                                                                        ;FOR ERROR PRINTOUT
        003446  104000                          ERROR

                                                                        ;ERROR
                                                                        ;-----
    580 003450  000000                          HALT                    ;TIME OUT FAILED TO OCCUR
    581 003452  012706  001100          1$:     MOV     #STACK,SP       ;SET STACK
    582 003456  012737  000006  000004          MOV     #6,@#ERRVEC     ;RESET 4
    583 003464  032737  040000  177570          BIT     #SW14,@#SWR     ;LOOP ON TEST?
        003472  001336                          BNE     TST5            ;LOOP TO TST5
```

```
                                        INC     $TESTN
                        ;;*************************************************************
                        ;*TEST 6         POWER FAIL IN THE STACK OVERFLOW (KERNAL)
                        ;;*************************************************************
003500                  TST6:
003500  104401  003506          TYPE    ,65$            ;;TYPE ASCIZ STRING
003504  000402                  BR      64$             ;;GET OVER THE ASCIZ
                        ;;65$:  .ASCIZ  *6 *
003512                  64$:
003512  104401  004234          TYPE,$ENULL
003516  005037  177776          CLR     @#PS            ;SET KERNAL MODE
003522  005067  001354          CLR     FLAG            ;CLEAR THE FLAG
003526  012737  003566  000004  MOV     #2$,@#ERRVEC    ;SET SICK TPAP ADDRESS
003534  012706  000400          MOV     #400,SP         ;SET STACK TO YELLOW ZONE
003540  012703  003562          MOV     #1$,R3          ;SET RETURN ADDRESS FOR POWER FAIL
003544  012777  000001  175644  MOV     #1,@PFAIL               ;SET UP TO START POWER FAIL
003552  000001                  WAIT                    ;WAIT FOR  THE POWER FAIL
003554  012706  000500          MOV     #STACK1,SP                      ;SETUP RESERVED STACK POINTER
                                                                        ;FOR ERROR PRINTOUT
003560  104000                  ERROR

                                                                ;ERROR
                                                                ;-----
003562  000000          1$:     HALT
003564  000407                  BR      4$              ;SKIP SP CHECK
003566  012737  000006  000004  2$:     MOV     #6,@#ERRVEC     ;RESET 4
003574  012703  003604          5$:     MOV     #4$,R3          ;SET RETURN
003600  000002                  RTI                     ;GO TO THE POWER FAIL ROUTINE
003602  000000                  HALT
003604                  4$:
003604  032737  040000  177570  BIT     #SW14,@#SWR     ;LOOP ON TEST?
003612  001332                  BNE     TST6            ;LOOP TO TST6

                                        INC     $TESTN
                        ;;*************************************************************
                        ;*TEST 7         POWER FAIL WITH RESETS
                        ;;*************************************************************
003620                  TST7:
003620  104401  003626          TYPE    ,65$            ;;TYPE ASCIZ STRING
003624  000402                  BR      64$             ;;GET OVER THE ASCIZ
                        ;;65$:  .ASCIZ  *7 *
003632                  64$:
003632  104401  004234          TYPE,$ENULL
003636  005037  177776          CLR     @#PS            ;SET KERNAL MODE
003642  012703  003700          MOV     #1$,R3          ;SET RETURN ADDRESS
003646  012706  001100          MOV     #STACK,SP       ;RESET STACK
003652  012777  000001  175536  MOV     #1,@PFAIL               ;SET UP TO START POWER FAIL
003660  000005          3$:     RESET                   ;RESETS
003662  000005                  RESET                   ;TO WAIT
003664  000005                  RESET                   ;IN
003666  000774                  BR      3$              ;LOOP
003670  012706  000500          MOV     #STACK1,SP                      ;SETUP RESERVED STACK POINTER
                                                                        ;FOR ERROR PRINTOUT
003674  104000                  ERROR

                                                                ;ERROR
```

```
                                                                    ;-----
615                                                                 ;RESET LOOP FAILED
616 003676  000000                      HALT
617 003700  012706  001100          1$: MOV     #STACK,SP           ;RESET STACK
618 003704  032737  040000  177570      BIT     #SW14,@#SWR         ;LOOP ON TEST?
    003712  001342                      BNE     TST7                ;LOOP TO TST7
```

```
                                        INC     $TESTN
                        ;;*************************************************************
                        ;*TEST 10        MEMORY MANAGEMENT ABORT TEST
                        ;;*************************************************************
003720                  TST10:
003720  104401  003726          TYPE    ,65$            ;;TYPE ASCIZ STRING
003724  000402                  BR      64$             ;;GET OVER THE ASCIZ
                        ;;65$:  .ASCIZ  *10 *
003732                  64$:
003732  104401  004234          TYPE,$ENULL
003736  005037  177776          CLR     @#PS            ;SET KERNAL MODE
003742  012737  004016  000004  MOV     #4$,@#ERRVEC    ;SET FOR TIMEOUT
003750  004767  001134          JSR     PC,MAP  ;MAP THE WORLD
003754  012737  004000  000250  MOV     #3$,@#MMVEC     ;SET MEMORY MANAGEMENT VECTOR
003762  012703  004020          MOV     #1$,R3          ;LOAD PF RETURN
003766  012777  000001  175422  MOV     #1,@PFAIL               ;SET UP TO START POWER FAIL
003774  005237  177572          INC     @#MMR0          ;TURN MEMORY MANAGEMENT ON
004000  012706  001100  3$:     MOV     #STACK,SP       ;ZAP STACK
004004  005237  140000          INC     @#140000        ;ACCESS VIOLATION
004010  012706  000500          MOV     #STACK1,SP                      ;SETUP RESERVED STACK POINTER
                                                                        ;FOR ERROR PRINTOUT
004014  104000                  ERROR

                                                                ;ERROR
                                                                ;-----
                                                        ;NO VIOLATION OR TRAP TO 4
004016  000000  4$:     HALT

004020  005037  177572  1$:     CLR     @#MMR0          ;TURN OFF MEMORY MANAGEMENT
004024  012706  001100  2$:     MOV     #STACK,SP       ;MAKE A NEW STACK
004030  012737  000006  000004  MOV     #6,@#ERRVEC     ;RESET 4
004036  032737  040000  177570  BIT     #SW14,@#SWR     ;LOOP ON TEST?
004044  001325                  BNE     TST10           ;LOOP TO TST10

004046  005267  175046                  INC     $TESTN
                        ;;*************************************************************
                        ;*TEST 11        MEMORY VOLATILITY TEST
                        ;;*************************************************************
004052  000240  TST11:  NOP
004054  005037  177776          CLR     @#PS            ;SET KERNAL MODE
004060  004767  000170  4$:     JSR     PC,LOAD         ;LOAD ALL MEMORY WITH 52525
004064  012703  004122          MOV     #1$,R3          ;POWER FAIL RETURN ADDRESS
004070  104401  004076          TYPE    ,65$            ;;TYPE ASCIZ STRING
004074  000402                  BR      64$             ;;GET OVER THE ASCIZ
                        ;;65$:  .ASCIZ  *11 *
004102                  64$:
004102  104401  004234          TYPE,$ENULL
004106  004767  000246  2$:     JSR     PC,CHECK        ;CHECK FOR THE 52525
004112  012777  000001  175276  MOV     #1,@PFAIL               ;SET UP TO START POWER FAIL
004120  000772                  BR      2$              ;LOOP FOR EVER OR POWER FAIL
004122  012706  001100  1$:     MOV     #STACK,SP       ;ZAP THE STACK
004126  004767  000226          JSR     PC,CHECK        ;CHECK ALL MEMORY
004132  032737  040000  177570  BIT     #SW14,@#SWR     ;LOOP ON TEST?
```

```
004140  001344                          BNE     TST11           ;LOOP TO TST11
```

```
END OF PASS ROUTINE

   657                                  .SBTTL  END OF PASS ROUTINE
                                        ;;*****************************************************************
                                        ;*INCREMENT THE PASS NUMBER ($PASS)
                                        ;*INDICATE END-OF-PROGRAM AFTER 1 PASSES THRU THE PROGRAM
                                        ;*TYPE 'END PASS #XXXXX' (WHERE XXXXX IS A DECIMAL NUMBER)
                                        ;*IF THERES A MONITOR GO TO IT
                                        ;*IF THERE ISN'T JUMP TO FT
004142                                  $EOP:
004142  000240                                  NOP
004144  005267  174752                        INC     $PASS           ;;INCREMENT THE PASS NUMBER
004150  042767  100000  174744                BIC     #100000,$PASS   ;;DON'T ALLOW A NEG. NUMBER
004156  005327                                DEC     (PC)+           ;;LOOP?
004160  000001                          $EOPCT: .WORD   1
004162  003022                                BGT     $DOAGN          ;;YES
004164  012737                                MOV     (PC)+,@(PC)+    ;;RESTORE COUNTER
004166  000001                          $ENDCT: .WORD   1
004170  004160                                $EOPCT -
004172  104401  004237                        TYPE    ,$ENDMG         ;;TYPE 'END PASS #''
004176  016746  174720                        MOV     $PASS,-(SP)     ;;SAVE $PASS FOR TYPEOUT
004202  104405                                TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
004204  104401  004234                        TYPE    ,$ENULL         ;;TYPE A NULL CHARACTER
004210  013700  000042                  $GET42: MOV     @#42,R0         ;;GET MONITOR ADDRESS
004214  001405                                BEQ     $DOAGN          ;;BRANCH IF NO MONITOR
004216  000005                                RESET                   ;;CLEAR THE WORLD
004220  004710                          $ENDAD: JSR     PC,(R0)         ;;GO TO MONITOR
004222  000240                                NOP                     ;;SAVE ROOM
004224  000240                                NOP                     ;;FOR
004226  000240                                NOP                     ;;ACT11
004230                                  $DOAGN:
004230  000137                                JMP     @(PC)+          ;;RETURN
004232  002264                          $RTNAD: .WORD   FT
004234     377        377     000     $ENULL: .BYTE   -1,-1,0         ;;NULL CHARACTER STRING
004237     015        012     105     $ENDMG: .ASCIZ  <15><12>/END PASS #/
004242     116        104     040
004245     120        101     123
004250     123        040     043
004253     000
```

```
                                                .SBTTL  LOAD MEMORY WITH DATA PATTERN
004254  004767  000630                LOAD:   JSR     PC,MAP          ;SET UP MEMORY MANAGEMENT REGISTERS
004260  016704  000620                        MOV     LIMIT,R4        ;GET BANK COUNT
004264  016705  000616                        MOV     DATA,R5         ;GET THE DATA PATTERN
004270  012737  004320  000250              MOV     #2$,@#MMVEC     ;SET UP FOR MEMORY MANAGEMENT ABORTS
004276  012700  010220                        MOV     #END,R0         ;FORM ADDRESS OF WHERE TO START WRITING THE DATA
004302  062700  120000                        ADD     #120000,R0      ;USE KIPAR5 FOR ADDRESSING
004306  012737  000001  177572              MOV     #1,@#MMR0       ;TURN ON MEMORY MANAGEMENT
004314  010520                      1$:     MOV     R5,(R0)+        ;WRITE THE DATA
004316  000776                              BR      1$
004320  005304                      2$:     DEC     R4              ;LAST BANK WRITTEN?
004322  100411                              BMI     3$              ;BRANCH IF YES
004324  012700  120000                        MOV     #120000,R0      ;RESET ADDRESSING REGISTER
004330  062737  000200  172352              ADD     #200,@#KIPAR5   ;SIZE NEXT 4K BANK
004336  012737  000001  177572              MOV     #1,@#MMR0       ;CLEAR MEMORY MANAGEMENT ERRORS
004344  000002                              RTI                     ;RETURN TO CONTINUE WRITING
004346  005037  177572              3$:     CLR     @#MMR0          ;TURN OFF MEMORY MANAGEMENT
004352  062706  000004                        ADD     #4,SP           ;CLEAN UP THE STACK
004356  000207                              RTS     PC              ;RETURN TO CALLER
```

```
                                        .SBTTL  CHECK MEMORY FOR CORRECT DATA PATTERN
                                        
004360  004767  000524          CHECK:  JSR     PC,MAP          ;SET UP MEMORY MANAGEMENT REGISTERS
004364  016704  000514                  MOV     LIMIT,R4        ;GET BANK COUNT
004370  016705  000512                  MOV     DATA,R5         ;GET DATA PATTERN
004374  012737  004514  000250          MOV     #2$,@#MMVEC     ;SET UP FOR MEMORY MANAGEMENT ABORTS
004402  012700  010220                  MOV     #END,R0         ;ADDRESS OF WHERE DATA PATTERN STARTS
004406  062700  120000                  ADD     #120000,R0      ;USE KIPAR5 FOR ADDRESSING
004412  012737  000001  177572          MOV     #1,@#MMR0       ;TURN ON MEM. MANAGEMENT
004420  012001                  1$:     MOV     (R0)+,R1        ;READ THE DATA
004422  020501                          CMP     R5,R1           ;IS IT GOOD?
004424  001775                          BEQ     1$              ;BRANCH IF YES
004426  010067  003314                  MOV     R0,VIR.ADD
004432  162767  000002  003306          SUB     #2,VIR.ADD
004440  042767  160000  003300          BIC     #160000,VIR.ADD
004446  013767  172352  003274          MOV     @#KIPAR5,PAR.OFF
004454  010567  003246                  MOV     R5,EXPDAT
004460  010167  003244                  MOV     R1,RECDAT
004464  012706  000500                  MOV     #STACK1,SP                      ;SETUP RESERVED STACK POINTER
                                                                                ;FOR ERROR PRINTOUT
004470  104000                          ERROR

                                                                              ;ERROR
                                                                              ;-----
004472  007746                          VIR.ADD                 ;PRINT VIRTUAL ADDRESS
004474  007750                          PAR.OFF                 ;PRINT PDR OFFSET
004476  007726                          EXPDAT                  ;PRINT EXPECTED DATA
004500  007730                          RECDAT                  ;PRINT RECEIVED DATA
004502  000000                          0
004504  000000                          HALT
004506  010560  177776                  MOV     R5,-2(R0)       ;WRITE GOOD DATA
004512  000742                          BR      1$              ;GO READ THE NEXT WORD
004514  005304                  2$:     DEC     R4              ;LAST BANK COMPARED?
004516  100411                          BMI     3$              ;BRANCH IF YES
004520  012700  120000                  MOV     #120000,R0      ;RESET ADDRESSING REGISTER
004524  062737  000200  172352          ADD     #200,@#KIPAR5   ;SIZE NEXT 4K BANK
004532  012737  000001  177572          MOV     #1,@#MMR0       ;CLEAR MEMORY MANAGEMENT ERRORS
004540  000002                          RTI                     ;CONTINUE TESTING
004542  005037  177572          3$:     CLR     @#MMR0          ;TURN OFF MEM. MANAGEMENT
004546  062706  000004                  ADD     #4,SP           ;CLEAN UP THE STACK
004552  000207                          RTS     PC              ;RETURN FOR CALL
```

```
                                        .SBTTL  PARITY ERROR HANDLER

004554  005327                  PARERR: DEC     (PC)+           ;FIRST TIME IN?
004556  000001                  PARFLG: .WORD   1
004560  002002                          BGE     2$              ;BRANCH IF YES
004562  000000                  1$:     HALT                    ;NO--ANOTHER PARITY ERROR OCCURRED WHILE
004564  000776                          BR      1$              ;PROCESSING THE FIRST ONE.
004566  032767  000077  173146  2$:     BIT     #77,HIADRS      ;MSB'S OF PARITY ERROR ADDRESS=0?
004574  001006                          BNE     4$              ;BRANCH IF NO
004576  023727  177740  010220          CMP     @#LOADRS,#END   ;LSB'S ABOVE THE PROGRAM?
004604  101002                          BHI     4$              ;BRANCH IF YES
004606  000000                  3$:     HALT                    ;PARITY ERROR IS IN THE PROGRAM
004610  000776                          BR      3$
004612  000000                  4$:     HALT                    ;DATA PARITY ERROR OCCURRED
004614  005737  177744                  TST     @#MEMERR        ;DID AN ABORT OCCUR?
004620  100405                          BMI     5$              ;BRANCH IF YES
004622  162700  000002                  SUB     #2,R0           ;BACKUP BY ONE WORD
004626  012705  000002                  MOV     #BIT01,R5
004632  074500                          XOR     R5,R0           ;
004634  010320                  5$:     MOV     R3,(R0)+        ;REWRITE THE BAD DATA
004636  013737  177744  177744          MOV     @#MEMERR,@#MEMERR ;CLEAR ERROR INDICATORS
004644  012767  000001  177704          MOV     #1,PARFLG       ;INITIALIZE PARITY ERROR FLAG
004652  000002                          RTI                     ;CONTINUE TESTING
```

```
                                .SBTTL  POWER FAIL ROUTINE
004654  012767  177777  000220  POWDWN: MOV     #-1,FLAG        ;FIRST INSTRUCTION FLAG
004662  005067  000214          CLR     FLAG            ;NOW CLEAR IT
004666  012777  005042  000174  MOV     #ILLUP,@UVEC    ;IF TOO FAST
004674  011667  000166          MOV     (SP),ERRAD      ;SET THE ERROR ADDRESS
004700  022706  000400          CMP     #400,SP         ;YELLOW OR RED?
004704  100402                  BMI     1$              ;NO
004706  012706  001100          MOV     #STACK,SP       ;SET EMERGENCY STACK
004712  010046          1$:     MOV     R0,-(6)         ;PUT
004714  010146          MOV     R1,-(6)         ;THE
004716  010246          MOV     R2,-(6)         ;REGISTERS
004720  010346          MOV     R3,-(6)         ;ON
004722  010446          MOV     R4,-(6)         ;THE
004724  010546          MOV     R5,-(6)         ;STACK
004726  010667  000146  MOV     SP,SAV6         ;SAVE THE STACK POINTER
004732  004737  172240  JSR     PC,@#SIPAR0     ;SET TIME FACTOR
004736  012777  004750  000124  MOV     #POWUP,@UVEC    ;RESET THE UP VECTOR
004744  000000          HALT                    ;WAIT FOR POWER DOWN
004746  000240          NOP

004750  012777  005054  000116  POWUP:  MOV     #ILLDWN,@DVEC   ;SET TOO FAST DOWN VECTOR
004756  016706  000116          MOV     SAV6,SP         ;RESET SP
004762  012737  012700  172240  MOV     #12700,@#SIPAR0 ;LOAD PAR0 & 1 WITH MOV #1777,R0
004770  012737  001777  172242  MOV     #1777,@#SIPAR1
004776  012737  077001  172244  MOV     #77001,@#SIPAR2 ;LOAD PAR2 WITH SOB R0,.
005004  012737  000207  172246  MOV     #207,@#SIPAR3   ;LOAD PAR3 WITH RTS PC
005012  004737  172240          JSR     PC,@#SIPAR0     ;SET TIME FACTOR
005016  012605          MOV     (6)+,R5         ;TAKE
005020  012604          MOV     (6)+,R4         ;THE
005022  012603          MOV     (6)+,R3         ;REGISTERS
005024  012602          MOV     (6)+,R2         ;FROM
005026  012601          MOV     (6)+,R1         ;THE
005030  012600          MOV     (6)+,R0         ;STACK
005032  012777  004654  000034  MOV     #POWDWN,@DVEC   ;RESET THE DOWN VECTOR
005040  000113          JMP     (R3)            ;JUMP INDIRECT TO R3

005042  104401          ILLUP:  TYPE                    ;POWER UP BEFORE POWER DOWN COMPLETE
005044  010105          UPF
005046  000000          HALT
005050  000167  173124  JMP     200
005054  104401          ILLDWN: TYPE                    ;POWER DOWN BEFORE UP COMPLETE
005056  010155          DOWN
005060  000000          HALT
005062  000167  173112  JMP     200


005066  000000          ERRAD:  0                       ;RETURN ADDRESS FROM POWER FAIL

005070  000024  000026  UVEC:   24,26                   ;UP ADDRESS PAIR
005074  000024  000026  DVEC:   24,26                   ;DOWN ADDRESS PAIR
005100  000000          SAV6:   0                       ;SOME PLACE TO PUT THE SP
005102  000000          FLAG:   0                       ;1 INSTRUCTION DOWN FLAG
005104  000000          LIMIT:  0                       ;TOP OF MEMORY
005106  052525          DATA:   52525                   ;WHAT IS TO BE WRITTEN INTO MEMORY
```

```
                                        .SBTTL  SETUP MEMORY MANAGMENT REGISTERS

005110  012737  000000  172340  MAP:    MOV     #0,@#KIPAR0     ;SETUP PAR0 FOR 1ST 4K
005116  012737  077406  172300          MOV     #77406,@#KIPDR0 ;4K, R/W, EXPAND UP
005124  012737  000000  172352          MOV     #0,@#KIPAR5     ;SET UP PAR5 FOR 1ST 4K
005132  012737  077406  172312          MOV     #77406,@#KIPDR5 ;4K, R/W, ED=UP
005140  012737  000200  172354          MOV     #200,@#KIPAR6   ;SET UP PAR6 FOR 2ND 4K
005146  012737  000000  172314          MOV     #0,@#KIPDR6     ;ABORT ALL REFERENCES
005154  012737  177600  172356          MOV     #177600,@#KIPAR7  ;SET UP PAR7 FOR I/O PAGE
005162  012737  077406  172316          MOV     #77406,@#KIPDR7 ;4K, R/W, ED=UP
005170  012737  000020  172516          MOV     #BIT04,@#MMR3   ;SET UP FOR 22-BIT MAPPING
005176  012737  005206  000250          MOV     #MMERR,@#MMVEC  ;SET UP MEMORY MANAGEMENT VECTOR
005204  000207                          RTS     PC              ;RETURN FROM CALL
005206  000000          MMERR:  HALT                    ;MEMORY MANAGEMENT ERROR
005210  000776                  BR      MMERR
                                        .SBTTL ROUTINE TO SIZE MEMORY
                                        .SBTTL  ROUTINE TO SIZE MEMORY
                                        ;;**************************************************************************
                                        ;*CALL:
                                        ;*      JSR     PC,$SIZE
                                        ;*      RETURN
                                        ;*$LSTAD WILL CONTAIN:
                                        ;*      WITH KT11 OPTION        -- LAST VIRTUAL ADDRESS OF THE LAST BANK
                                        ;*      WITHOUT KT11 OPTION     -- LAST ABSOLUTE ADDRESS OF AVAILABLE MEMORY
                                        ;*$LSTBK WILL CONTAIN THE LAST BANK AS A SAF
                                        ;*$KT11 IS THE MEMORY MANAGEMENT KEY
                                        ;*BIT07 = 0 DON'T USE MEMORY MANAGEMENT
                                        ;*      MUST BE SETUP BEFORE THE CALL
                                        ;*BIT15 = 0 DON'T HAVE MEMORY MANAGEMENT OPTION
                                        ;*      DETERMINED BY ROUTINE
005212  010046          $SIZE:  MOV     R0,-(SP)        ;;SAVE R0 ON THE STACK
005214  010146                  MOV     R1,-(SP)        ;;SAVE R1 ON THE STACK
005216  010246                  MOV     R2,-(SP)        ;;SAVE R2 ON THE STACK
005220  010346                  MOV     R3,-(SP)        ;;SAVE R3 ON THE STACK
005222  013746  000004          MOV     @#ERRVEC,-(SP)  ;;SAVE PRESENT ERROR VECTOR PS & PC
005226  013746  000006          MOV     @#ERRVEC+2,-(SP)
005232  010600                  MOV     SP,R0           ;;SAVE THE STACK POINTER
                                ;;SET THE ERRVEC PS TO THE PRESENT PS
005234  104400                  TRAP                    ;;PUSH OLD PSW AND PC ON STACK
005236  012637  000006          MOV     (SP)+,@#ERRVEC+2        ;;SAVE THE PSW IN @#ERRVEC+2
005242  012701  003776          MOV     #3776,R1        ;;SETUP ADDRESS
005246  105727                  TSTB    (PC)+           ;;USE MEMORY MANAGEMENT?
005250  000200          $KT11:  .WORD   200             ;;SET TO USE MEMORY MANAGEMENT
005252  100062                  BPL     $CORE           ;;BR IF NO
005254  012737  005412  000004  MOV     #$KTNEX,@#ERRVEC ;;SET FOR TIMEOUT
005262  005737  177572          TST     @#SR0           ;;KT11 ARE YOU THERE?
005266  052767  100000  177754  BIS     #100000,$KT11   ;;YES--SET KT11 KEY
005274  005046                  CLR     -(SP)           ;;INITIALIZE FOR 'PAR' LOADING
005276  012702  172340          MOV     #KIPAR0,R2      ;;ADDRESS OF FIRST 'PAR'
005302  012703  000010          MOV     #^D8,R3         ;;LOAD EIGHT 'PAR.'S' AND EIGHT 'PDR.'S'
005306  012762  077406  177740  1$:     MOV     #77406,-40(R2)  ;;PDR = 4K, UP, READ/WRITE
005314  011622                  MOV     (SP),(R2)+      ;;LOAD 'PAR'
005316  062716  000200          ADD     #200,(SP)       ;;UPDATE FOR NEXT 'PAR'
005322  077307                  SOB     R3,1$           ;;LOOP UNTIL ALL EIGHT ARE LOADED
005324  012742  177600          MOV     #177600,-(R2)   ;;SETUP KIPAR7 FOR I/O
005330  005042                  CLR     -(R2)           ;;SETUP KIPAR6 FOR TESTING
005332  012737  005350  000004  MOV     #2$,@#ERRVEC    ;;CATCH TIMEOUT IF NO SR3
```

```
005340  012737  000020  172516          MOV     #20,@#SR3       ;;ENABLE 22 BIT MODE
005346  000401                          BR      3$              ;;THIS PDP-11 HAS A SR3 REGISTER
005350  022626                  2$:     CMP     (SP)+,(SP)+     ;;CLEAN OFF THE STACK--NO SR3
005352  005237  177572          3$:     INC     @#SR0           ;;TURN ON MEMORY MANAGEMENT
005356  012737  005402  000004          MOV     #$KTOUT,@#ERRVEC ;;SET FOR TIME OUT
005364  005737  143776          4$:     TST     @#143776        ;;TRAP ON NON-EX-MEM
005370  062712  000040                  ADD     #40,(R2)        ;;MAKE A 1K STEP
005374  023712  172356                  CMP     @#KIPAR7,(R2)   ;;LAST ONE?
005400  101371                          BHI     4$              ;;NO--TRY IT
005402  011202          $KTOUT: MOV     (R2),R2         ;;GET LAST BANK+1
005404  005037  177572                  CLR     @#SR0           ;;TURN OFF MEMORY MANAGEMENT
005410  000421                          BR      $SIZEX
005412  042767  100000  177630  $KTNEX: BIC     #100000,$KT11   ;;KT11 NON-EXISTENT
005420  012737  005450  000004  $CORE:  MOV     #$CROUT,@#ERRVEC ;;SET FOR TIMEOUT
005426  005002                          CLR     R2              ;;SET UP BANK
005430  062701  004000          1$:     ADD     #4000,R1        ;;INCREMENT BY 1K
005434  062702  000040                  ADD     #40,R2          ;;1K STEP
005440  005711                          TST     (R1)            ;;TRAP ON TIME OUT
005442  022701  177776                  CMP     #177776,R1      ;;LAST ONE
005446  001370                          BNE     1$              ;;NO--TRY AGAIN
005450  162701  004000  $CROUT: SUB     #4000,R1
005454  162702  000040  $SIZEX: SUB     #40,R2          ;;DROP BACK
005460  010006                          MOV     R0,SP           ;;RESTORE THE STACK
005462  012637  000006                  MOV     (SP)+,@#ERRVEC+2 ;;RESTORE ERROR VECTOR
005466  012637  000004                  MOV     (SP)+,@#ERRVEC
005472  010167  000016                  MOV     R1,$LSTAD       ;;LAST ADDRESS
005476  010267  000014                  MOV     R2,$LSTBK       ;;LAST BANK
005502  012603                          MOV     (SP)+,R3        ;;RESTORE R3
005504  012602                          MOV     (SP)+,R2        ;;RESTORE R2
005506  012601                          MOV     (SP)+,R1        ;;RESTORE R1
005510  012600                          MOV     (SP)+,R0        ;;RESTORE R0
005512  000207                          RTS     PC
005514  000000          $LSTAD: .WORD   0               ;;CONTAINS THE LAST ADDRESS
005516  000000          $LSTBK: .WORD   0               ;;CONTAINS THE LAST BANK
815
816
```

```
818                                     .SBTTL  BINARY TO OCTAL (ASCII) AND TYPE
                                        ;;*****************************************************************
                                        ;*THIS ROUTINE IS USED TO CHANGE A 16-BIT BINARY NUMBER TO A 6-DIGIT
                                        ;*OCTAL (ASCII) NUMBER AND TYPE IT.
                                        ;*$TYPOS---ENTER HERE TO SETUP SUPPRESS ZEROS AND NUMBER OF DIGITS TO TYPE
                                        ;*CALL:
                                        ;*      MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
                                        ;*      TYPOS                   ;;CALL FOR TYPEOUT
                                        ;*      .BYTE   N               ;;N=1 TO 6 FOR NUMBER OF DIGITS TO TYPE
                                        ;*      .BYTE   M               ;;M=1 OR 0
                                        ;*                                      ;;1=TYPE LEADING ZEROS
                                        ;*                                      ;;0=SUPPRESS LEADING ZEROS
                                        ;*
                                        ;*$TYPON----ENTER HERE TO TYPE OUT WITH THE SAME PARAMETERS AS THE LAST
                                        ;*$TYPOS OR $TYPOC
                                        ;*CALL:
                                        ;*      MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
                                        ;*      TYPON                   ;;CALL FOR TYPEOUT
                                        ;*
                                        ;*$TYPOC---ENTER HERE FOR TYPEOUT OF A 16 BIT NUMBER
                                        ;*CALL:
                                        ;*      MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
                                        ;*      TYPOC                   ;;CALL FOR TYPEOUT
005520  017646  000000          $TYPOS: MOV     @(SP),-(SP)     ;;PICKUP THE MODE
005524  116667  000001  000211          MOVB    1(SP),$OFILL    ;;LOAD ZERO FILL SWITCH
005532  112667  000207                  MOVB    (SP)+,$OMODE+1  ;;NUMBER OF DIGITS TO TYPE
005536  062716  000002                  ADD     #2,(SP)         ;;ADJUST RETURN ADDRESS
005542  000406                          BR      $TYPON
005544  112767  000001  000171  $TYPOC: MOVB    #1,$OFILL       ;;SET THE ZERO FILL SWITCH
005552  112767  000006  000165          MOVB    #6,$OMODE+1     ;;SET FOR SIX(6) DIGITS
005560  112767  000005  000154  $TYPON: MOVB    #5,$OCNT        ;;SET THE ITERATION COUNT
005566  010346                          MOV     R3,-(SP)        ;;SAVE R3
005570  010446                          MOV     R4,-(SP)        ;;SAVE R4
005572  010546                          MOV     R5,-(SP)        ;;SAVE R5
005574  116704  000145                  MOVB    $OMODE+1,R4     ;;GET THE NUMBER OF DIGITS TO TYPE
005600  005404                          NEG     R4
005602  062704  000006                  ADD     #6,R4           ;;SUBTRACT IT FOR MAX. ALLOWED
005606  110467  000132                  MOVB    R4,$OMODE       ;;SAVE IT FOR USE
005612  116704  000125                  MOVB    $OFILL,R4       ;;GET THE ZERO FILL SWITCH
005616  016605  000012                  MOV     12(SP),R5       ;;PICKUP THE INPUT NUMBER
005622  005003                          CLR     R3              ;;CLEAR THE OUTPUT WORD
005624  006105                  1$:     ROL     R5              ;;ROTATE MSB INTO "C"
005626  000404                          BR      3$              ;;GO DO MSB
005630  006105                  2$:     ROL     R5              ;;FORM THIS DIGIT
005632  006105                          ROL     R5
005634  006105                          ROL     R5
005636  010503                          MOV     R5,R3
005640  006103                  3$:     ROL     R3              ;;GET LSB OF THIS DIGIT
005642  105367  000076                  DECB    $OMODE          ;;TYPE THIS DIGIT?
005646  100016                          BPL     7$              ;;BR IF NO
005650  042703  177770                  BIC     #177770,R3      ;;GET RID OF JUNK
005654  001002                          BNE     4$              ;;TEST FOR 0
005656  005704                          TST     R4              ;;SUPPRESS THIS 0?
005660  001403                          BEQ     5$              ;;BR IF YES
005662  005204                  4$:     INC     R4              ;;DON'T SUPPRESS ANYMORE 0'S
005664  052703  000060                  BIS     #'0,R3          ;;MAKE THIS DIGIT ASCII
005670  052703  000040          5$:     BIS     #' ,R3          ;;MAKE ASCII IF NOT ALREADY
```

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005674  110367  000040                  MOVB    R3,8$           ;;SAVE FOR TYPING
005700  104401  005740                  TYPE    ,8$             ;;GO TYPE THIS DIGIT
005704  105367  000032          7$:     DECB    $OCNT           ;;COUNT BY 1
005710  003347                          BGT     2$              ;;BR IF MORE TO DO
005712  002402                          BLT     6$              ;;BR IF DONE
005714  005204                          INC     R4              ;;INSURE LAST DIGIT ISN'T A BLANK
005716  000744                          BR      2$              ;;GO DO THE LAST DIGIT
005720  012605                  6$:     MOV     (SP)+,R5        ;;RESTORE R5
005722  012604                          MOV     (SP)+,R4        ;;RESTORE R4
005724  012603                          MOV     (SP)+,R3        ;;RESTORE R3
005726  016666  000002  000004          MOV     2(SP),4(SP)     ;;SET THE STACK FOR RETURNING
005734  012616                          MOV     (SP)+,(SP)
005736  000002                          RTI                     ;;RETURN
005740     000                  8$:     .BYTE   0               ;;STORAGE FOR ASCII DIGIT
005741     000                          .BYTE   0               ;;TERMINATOR FOR TYPE ROUTINE
005742     000                  $OCNT:  .BYTE   0               ;;OCTAL DIGIT COUNTER
005743     000                  $OFILL: .BYTE   0               ;;ZERO FILL SWITCH
005744  000000                  $OMODE: .WORD   0               ;;NUMBER OF DIGITS TO TYPE
819                             .SBTTL  CONVERT BINARY TO DECIMAL AND TYPE ROUTINE
                                ;;**************************************************************
                                ;*THIS ROUTINE IS USED TO CHANGE A 16-BIT BINARY NUMBER TO A 5-DIGIT
                                ;*SIGNED DECIMAL (ASCII) NUMBER AND TYPE IT. DEPENDING ON WHETHER THE
                                ;*NUMBER IS POSITIVE OR NEGATIVE A SPACE OR A MINUS SIGN WILL BE TYPED
                                ;*BEFORE THE FIRST DIGIT OF THE NUMBER. LEADING ZEROS WILL ALWAYS BE
                                ;*REPLACED WITH SPACES.
                                ;*CALL:
                                ;*      MOV     NUM,-(SP)       ;;PUT THE BINARY NUMBER ON THE STACK
                                ;*      TYPDS                   ;;GO TO THE ROUTINE
005746                          $TYPDS:
005746  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
005750  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
005752  010246                          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
005754  010346                          MOV     R3,-(SP)        ;;PUSH R3 ON STACK
005756  010546                          MOV     R5,-(SP)        ;;PUSH R5 ON STACK
005760  012746  020200                  MOV     #20200,-(SP)    ;;SET BLANK SWITCH AND SIGN
005764  016605  000020                  MOV     20(SP),R5       ;;GET THE INPUT NUMBER
005770  100004                          BPL     1$              ;;BR IF INPUT IS POS.
005772  005405                          NEG     R5              ;;MAKE THE BINARY NUMBER POS.
005774  112766  000055  000001          MOVB    #'-,1(SP)       ;;MAKE THE ASCII NUMBER NEG.
006002  005000                  1$:     CLR     R0              ;;ZERO THE CONSTANTS INDEX
006004  012703  006162                  MOV     #$DBLK,R3       ;;SETUP THE OUTPUT POINTER
006010  112723  000040                  MOVB    #' ,(R3)+       ;;SET THE FIRST CHARACTER TO A BLANK
006014  005002                  2$:     CLR     R2              ;;CLEAR THE BCD NUMBER
006016  016001  006152                  MOV     $DTBL(R0),R1    ;;GET THE CONSTANT
006022  160105                  3$:     SUB     R1,R5           ;;FORM THIS BCD DIGIT
006024  002402                          BLT     4$              ;;BR IF DONE
006026  005202                          INC     R2              ;;INCREASE THE BCD DIGIT BY 1
006030  000774                          BR      3$
006032  060105                  4$:     ADD     R1,R5           ;;ADD BACK THE CONSTANT
006034  005702                          TST     R2              ;;CHECK IF BCD DIGIT=0
006036  001002                          BNE     5$              ;;FALL THROUGH IF 0
006040  105716                          TSTB    (SP)            ;;STILL DOING LEADING 0'S?
006042  100407                          BMI     7$              ;;BR IF YES
006044  106316                  5$:     ASLB    (SP)            ;;MSD?
006046  103003                          BCC     6$              ;;BR IF NO
006050  116663  000001  177777          MOVB    1(SP),-1(R3)    ;;YES--SET THE SIGN
006056  052702  000060          6$:     BIS     #'0,R2          ;;MAKE THE BCD DIGIT ASCII
```

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006062  052702  000040          7$:     BIS     #' ,R2          ;;MAKE IT A SPACE IF NOT ALREADY A DIGIT
006066  110223                          MOVB    R2,(R3)+        ;;PUT THIS CHARACTER IN THE OUTPUT BUFFER
006070  005720                          TST     (R0)+           ;;JUST INCREMENTING
006072  020027  000010                  CMP     R0,#10          ;;CHECK THE TABLE INDEX
006076  002746                          BLT     2$              ;;GO DO THE NEXT DIGIT
006100  003002                          BGT     8$              ;;GO TO EXIT
006102  010502                          MOV     R5,R2           ;;GET THE LSD
006104  000764                          BR      6$              ;;GO CHANGE TO ASCII
006106  105726                  8$:     TSTB    (SP)+           ;;WAS THE LSD THE FIRST NON-ZERO?
006110  100003                          BPL     9$              ;;BR IF NO
006112  116663  177777  177776        MOVB    -1(SP),-2(R3)   ;;YES--SET THE SIGN FOR TYPING
006120  105013                  9$:     CLRB    (R3)            ;;SET THE TERMINATOR
006122  012605                          MOV     (SP)+,R5        ;;POP STACK INTO R5
006124  012603                          MOV     (SP)+,R3        ;;POP STACK INTO R3
006126  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
006130  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
006132  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
006134  104401  006162                TYPE    ,$DBLK          ;;NOW TYPE THE NUMBER
006140  016666  000002  000004        MOV     2(SP),4(SP)     ;;ADJUST THE STACK
006146  012616                          MOV     (SP)+,(SP)
006150  000002                          RTI                     ;;RETURN TO USER
006152  023420                  $DTBL:  10000.
006154  001750                          1000.
006156  000144                          100.
006160  000012                          10.
006162                          $DBLK:  .BLKW   4
    820                         .SBTTL  TYPE ROUTINE
                                ;;**************************************************************
                                ;*ROUTINE TO TYPE ASCIZ MESSAGE. MESSAGE MUST TERMINATE WITH A 0 BYTE.
                                ;*THE ROUTINE WILL INSERT A NUMBER OF NULL CHARACTERS AFTER A LINE FEED.
                                ;*NOTE1:         $NULL CONTAINS THE CHARACTER TO BE USED AS THE FILLER CHARACTER.
                                ;*NOTE2:         $FILLS CONTAINS THE NUMBER OF FILLER CHARACTERS REQUIRED.
                                ;*NOTE3:         $FILLC CONTAINS THE CHARACTER TO FILL AFTER.
                                ;*
                                ;*CALL:
                                ;*1) USING A TRAP INSTRUCTION
                                ;*      TYPE    ,MESADR         ;;MESADR IS FIRST ADDRESS OF AN ASCIZ STRING
                                ;*OR
                                ;*      TYPE
                                ;*      MESADR
                                ;*
006172  105767  000335          $TYPE:  TSTB    $TPFLG          ;;IS THERE A TERMINAL?
006176  100002                          BPL     1$              ;;BR IF YES
006200  000000                          HALT                    ;;HALT HERE IF NO TERMINAL
006202  000430                          BR      3$              ;;LEAVE
006204  010046                  1$:     MOV     R0,-(SP)        ;;SAVE R0
006206  017600  000002                  MOV     @2(SP),R0       ;;GET ADDRESS OF ASCIZ STRING
006212  122767  000001  172714        CMPB    #APTENV,$ENV    ;;RUNNING IN APT MODE
006220  001011                          BNE     62$             ;;NO,GO CHECK FOR APT CONSOLE
006222  132767  000100  172705        BITB    #APTSPOOL,$ENVM ;;SPOOL MESSAGE TO APT
006230  001405                          BEQ     62$             ;;NO,GO CHECK FOR CONSOLE
006232  010067  000004                  MOV     R0,61$          ;;SETUP MESSAGE ADDRESS FOR APT
006236  004767  172714                  JSR     PC,$ATY3        ;;SPOOL MESSAGE TO APT
006242  000000                  61$:    .WORD   0               ;;MESSAGE ADDRESS
006244  132767  000040  172663  62$:    BITB    #APTCSUP,$ENVM  ;;APT CONSOLE SUPPRESSED
006252  001003                          BNE     60$             ;;YES,SKIP TYPE OUT
006254  112046                  2$:     MOVB    (R0)+,-(SP)     ;;PUSH CHARACTER TO BE TYPED ONTO STACK
```

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006256  001005                          BNE     4$              ;;BR IF IT ISN'T THE TERMINATOR
006260  005726                          TST     (SP)+           ;;IF TERMINATOR POP IT OFF THE STACK
006262  012600                  60$:    MOV     (SP)+,R0        ;;RESTORE R0
006264  062716  000002            3$:    ADD     #2,(SP)         ;;ADJUST RETURN PC
006270  000002                          RTI                     ;;RETURN
006272  122716  000011            4$:    CMPB    #HT,(SP)        ;;BRANCH IF <HT>
006276  001430                          BEQ     8$
006300  122716  000200                  CMPB    #CRLF,(SP)      ;;BRANCH IF NOT <CRLF>
006304  001006                          BNE     5$
006306  005726                          TST     (SP)+           ;;POP  <CR><LF> EQUIV
006310  104401                          TYPE                    ;;TYPE A CR AND LF
006312  006535                          $CRLF
006314  105067  000200                  CLRB    $CHARCNT        ;;CLEAR CHARACTER COUNT
006320  000755                          BR      2$              ;;GET NEXT CHARACTER
006322  004767  000056            5$:    JSR     PC,$TYPEC       ;;GO TYPE THIS CHARACTER
006326  126726  000200            6$:    CMPB    $FILLC,(SP)+    ;;IS IT TIME FOR FILLER CHARS.?
006332  001350                          BNE     2$              ;;IF NO GO GET NEXT CHAR.
006334  016746  000170                  MOV     $NULL,-(SP)     ;;GET # OF FILLER CHARS. NEEDED
                                                                ;;AND THE NULL CHAR.
006340  105366  000001            7$:    DECB    1(SP)           ;;DOES A NULL NEED TO BE TYPED?
006344  002770                          BLT     6$              ;;BR IF NO--GO POP THE NULL OFF OF STACK
006346  004767  000032                  JSR     PC,$TYPEC       ;;GO TYPE A NULL
006352  105367  000142                  DECB    $CHARCNT        ;;DO NOT COUNT AS A COUNT
006356  000770                          BR      7$              ;;LOOP
                        ;HORIZONTAL TAB PROCESSOR
006360  112716  000040            8$:    MOVB    #' ,(SP)        ;;REPLACE TAB WITH SPACE
006364  004767  000014            9$:    JSR     PC,$TYPEC       ;;TYPE A SPACE
006370  132767  000007  000122          BITB    #7,$CHARCNT     ;;BRANCH IF NOT AT
006376  001372                          BNE     9$              ;;TAB STOP
006400  005726                          TST     (SP)+           ;;POP SPACE OFF STACK
006402  000724                          BR      2$              ;;GET NEXT CHARACTER
006404  105777  000114        $TYPEC:   TSTB    @$TPS           ;;WAIT UNTIL PRINTER IS READY
006410  100375                          BPL     $TYPEC
006412  116677  000002  000106          MOVB    2(SP),@$TPB     ;;LOAD CHAR TO BE TYPED INTO DATA REG.
006420  105777  000114                  TSTB    @$TKS           ;;SEE IF KEYBOARD IS TALKING.
006424  100021                          BPL     2$              ;;BRANCH IF IT ISN'T.
006426  017746  000110                  MOV     @$TKB,-(SP)     ;;PUSH CHARACTER ONTO STACK.
006432  042716  177600                  BIC     #177600,(SP)    ;;BIT CLEAR TOP BYTE AND PARITY BIT.
006436  022726  000023                  CMP     #23,(SP)+       ;;SEE IF THIS IS A ^S.
006442  001012                          BNE     2$              ;;BRANCH TO CONTINUE IF IT ISN'T.
006444  105777  000070            3$:   TSTB    @$TKS           ;;WAIT FOR ANOTHER INPUT.
006450  100375                          BPL     3$              ;;BRANCH BACK IF NOT READY.
006452  017746  000064                  MOV     @$TKB,-(SP)     ;;PUSH NEXT CHARACTER ON STACK.
006456  042716  177600                  BIC     #177600,(SP)    ;;BIT CLEAR TOP BYTE AND PARITY BIT.
006462  022726  000021                  CMP     #21,(SP)+       ;;SEE IF THIS IS A ^Q.
006466  001366                          BNE     3$              ;;BRANCH BACK FOR MORE WAIT IF NOT.
006470  122766  000015  000002  2$:     CMPB    #CR,2(SP)       ;;IS CHARACTER A CARRIAGE RETURN?
006476  001003                          BNE     1$              ;;BRANCH IF NO
006500  105067  000014                  CLRB    $CHARCNT        ;;YES--CLEAR CHARACTER COUNT
006504  000406                          BR      $TYPEX          ;;EXIT
006506  122766  000012  000002  1$:     CMPB    #LF,2(SP)       ;;IS CHARACTER A LINE FEED?
006514  001402                          BEQ     $TYPEX          ;;BRANCH IF YES
006516  105227                          INCB    (PC)+           ;;COUNT THE CHARACTER
006520  000000          $CHARCNT:.WORD  0                       ;;CHARACTER COUNT STORAGE
006522  000207          $TYPEX: RTS     PC
006524  177564          $TPS:   .WORD   177564                  ;;TTY PRINTER STATUS REG. ADDRESS
006526  177566          $TPB:   .WORD   177566                  ;;TTY PRINTER BUFFER REG. ADDRESS
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        006530     000                  $NULL:  .BYTE   0               ;;CONTAINS NULL CHARACTER FOR FILLS
        006531     002                  $FILLS: .BYTE   2               ;;CONTAINS # OF FILLER CHARACTERS REQUIRED
        006532     012                  $FILLC: .BYTE   12              ;;INSERT FILL CHARS. AFTER A 'LINE FEED'
        006533     000                  $TPFLG: .BYTE   0               ;;'TERMINAL AVAILABLE' FLAG (BIT<07>=0=YES)
        006534     077                  $QUES:  .ASCII  '?'             ;;QUESTION MARK
        006535     015                  $CRLF:  .ASCII  <15>            ;;CARRAIGE RETURN
        006536     012          000     $LF:    .ASCIZ  <12>            ;;LINEFEED
    821 006540  177560                  $TKS:   .WORD   177560
    822 006542  177562                  $TKB:   .WORD   177562
    823
    824                                 .SBTTL  TRAP DECODER
                                        ;;*****************************************************************
                                        ;*THIS ROUTINE WILL PICKUP THE LOWER BYTE OF THE 'TRAP' INSTRUCTION
                                        ;*AND USE IT TO INDEX THROUGH THE TRAP TABLE FOR THE STARTING ADDRESS
                                        ;*OF THE DESIRED ROUTINE. THEN USING THE ADDRESS OBTAINED IT WILL
                                        ;*GO TO THAT ROUTINE.
        006544  010046                  $TRAP:  MOV     R0,-(SP)        ;;SAVE R0
        006546  016600  000002                  MOV     2(SP),R0        ;;GET TRAP ADDRESS
        006552  005740                          TST     -(R0)           ;;BACKUP BY 2
        006554  111000                          MOVB    (R0),R0         ;;GET RIGHT BYTE OF TRAP
        006556  006300                          ASL     R0              ;;POSITION FOR INDEXING
        006560  016000  006600                  MOV     $TRPAD(R0),R0   ;;INDEX TO TABLE
        006564  000200                          RTS     R0              ;;GO TO ROUTINE
                                        ;;THIS IS USE TO HANDLE THE 'GETPRI' MACRO
        006566  011646                  $TRAP2: MOV     (SP),-(SP)      ;;MOVE THE PC DOWN
        006570  016666  000004  000002          MOV     4(SP),2(SP)     ;;MOVE THE PSW DOWN
        006576  000002                          RTI                     ;;RESTORE THE PSW
                                        .SBTTL  TRAP TABLE
                                        ;*THIS TABLE CONTAINS THE STARTING ADDRESSES OF THE ROUTINES CALLED
                                        ;*BY THE 'TRAP' INSTRUCTION.
                                        ;       ROUTINE
                                        ;       -------
        006600  006566                  $TRPAD: .WORD   $TRAP2
        006602  006172                          $TYPE   ;;CALL=TYPE     TRAP+1(104401)  TTY TYPEOUT ROUTINE
        006604  005544                          $TYPOC  ;;CALL=TYPOC    TRAP+2(104402)  TYPE OCTAL NUMBER (WITH LEADING ZEROS)
        006606  005520                          $TYPOS  ;;CALL=TYPOS    TRAP+3(104403)  TYPE OCTAL NUMBER (NO LEADING ZEROS)
        006610  005560                          $TYPON  ;;CALL=TYPON    TRAP+4(104404)  TYPE OCTAL NUMBER (AS PER LAST CALL)
        006612  005746                          $TYPDS  ;;CALL=TYPDS    TRAP+5(104405)  TYPE DECIMAL NUMBER (WITH SIGN)
    825
    826
    827
    828
    829
    830
    831
    832
    833
    834                                 ;-----------------------------------------
    835                                 ;       ERROR PRINT ROUTINE
    836                                 ;-----------------------------------------
    837         104000                  ERROR=104000
    838
    839 006614  000000                  ERRPC:  .WORD   0
    840
    841
    842 006616  010067  000026  $ERROR:          MOV R0,SAVR0            ;SAVE R0 THRU R5
    843 006622  010167  000024                  MOV R1,SAVR1
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                                                                    B 4
    844 006626  010267  000022                  MOV R2,SAVR2
    845 006632  010367  000020                  MOV R3,SAVR3
    846 006636  010467  000016                  MOV R4,SAVR4
    847 006642  010567  000014                  MOV R5,SAVR5
    848 006646  000406                          BR TITL
    849 006650  000000                  SAVR0:  .WORD
    850 006652  000000                  SAVR1:  .WORD
    851 006654  000000                  SAVR2:  .WORD
    852 006656  000000                  SAVR3:  .WORD
    853 006660  000000                  SAVR4:  .WORD
    854 006662  000000                  SAVR5:  .WORD
    855
    856 006664  011601          TITL:           MOV (SP),R1             ;R1 CONTAINS ADDRESS FLLOWING ERRPC ADDRESS
    857 006666  162701  000002              SUB #2,R1
    858 006672  010167  177716              MOV R1,ERRPC            ;GET ADDRESS OF ERROR MESSAGE:ERRPC
    859 006676  104401  006704              TYPE    ,65$            ;;TYPE ASCIZ STRING
        006702  000411                      BR      64$             ;;GET OVER THE ASCIZ
                                    ;;65$:  .ASCIZ  <CRLF><CRLF>/TESTNO    ERRPC/
        006726                      64$:
    860 006726  005721          3$:     TST (R1)+               ;R1 POINTS TO NEXT ARGUEMENT
    861
    862 006730  012702  007702              MOV #PRTABL,R2          ;ADDRESS OF START OF PRINT TABLE LIST
    863 006734  012703  007156              MOV #PRTITL,R3          ;ADDRESS OF STERT OF TITLES
    864 006740  005711                      TST (R1)                ;END OF ARGUEMENTS?
    865 006742  001405                      BEQ DAT                 ;YES,GO PRINT DATA
    866 006744  005723          2$:         TST (R3)+               ;INDEX THRU TITLES
    867 006746  021122                      CMP (R1),(R2)+          ;SEARCH PRINT TABLE LIST FOR TITLE
    868 006750  001375                      BNE 2$                  ;NO; CHECK NEXT LOCATION IN LIST
    869
    870 006752  004753                      JSR PC,@-(R3)           ;FOUND IT; GO PRINT TITLE
    871                                                             ;CODE ERROR ROUTINE
    872 006754  000764                      BR 3$
    873
    874
    875 006756                  DAT:
        006756  104401  006764              TYPE    ,65$            ;;TYPE ASCIZ STRING
        006762  000401                      BR      64$             ;;GET OVER THE ASCIZ
                                    ;;65$:  .ASCIZ  <CRLF>
        006766                      64$:
    876 006766  016746  172126              MOV     $TESTN,-(SP)    ;;SAVE $TESTN FOR TYPEOUT
        006772  104403                      TYPOS                   ;;GO TYPE--OCTAL ASCII
        006774     006                      .BYTE   6               ;;TYPE 6 DIGIT(S)
        006775     000                      .BYTE   0               ;;SUPPRESS LEADING ZEROS
    877 006776  104401  007004              TYPE    ,67$            ;;TYPE ASCIZ STRING
        007002  000402                      BR      66$             ;;GET OVER THE ASCIZ
                                    ;;67$:  .ASCIZ  /  /
        007010                      66$:
    878 007010  016746  177600              MOV     ERRPC,-(SP)     ;;SAVE ERRPC FOR TYPEOUT
        007014  104402                      TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
    879 007016  104401  004234              TYPE ,$ENULL
    880
    881 007022  011601                      MOV (SP),R1             ;R1 CONTAINS ADDRESS FOLLOWING ERRORPC ADDRESS
    882 007024  162701  000002              SUB #2,R1
    883 007030  005721          3$:         TST (R1)+               ;R1 POINTS TO NEXT ARGUEMENT
    884 007032  012702  007702              MOV #PRTABL,R2          ;ADDRESS OF START OF PRINT TABLE LIST
    885 007036  012703  007536              MOV #PRDATA,R3          ;ADDRESS OF STERT OF PRINT DATA
    886 007042  005711                      TST (R1)                ;END OF ARGUEMENTS?
```

```
                                        BEQ FIN                 ;YES
                                2$:     TST (R3)+               ;INDEX THRU DATA PRINTS
                                        CMP (R1),(R2)+          ;SEARCH PRINT TABLE LIST FOR TITLE
                                        BNE 2$                  ;NO; CHECK NEXT LOCATION IN LIST
                                        TYPE    ,69$            ;;TYPE ASCIZ STRING
                                        BR      68$             ;;GET OVER THE ASCIZ
                                ;;69$:  .ASCIZ  /   /
                                68$:
                                        JSR PC,@-(R3)           ;
                                        TYPE ,$ENULL
                                        TYPE    ,71$            ;;TYPE ASCIZ STRING
                                        BR      70$             ;;GET OVER THE ASCIZ
                                ;;71$:  .ASCIZ  /   /
                                70$:
                                        BR 3$

                                FIN:    TST (R1)+               ;R1 NOW CONTAINS RETURN ADDRESS
                                        MOV R1,(SP)             ;SETUP RETURN ADDRESS IN STACK
                                        TYPE    ,65$            ;;TYPE ASCIZ STRING
                                        BR      64$             ;;GET OVER THE ASCIZ
                                ;;65$:  .ASCIZ  <CRLF>
                                64$:

                                        MOV SAVR0,R0            ;RESTORE REGISTERS
                                        MOV SAVR1,R1
                                        MOV SAVR2,R2
                                        MOV SAVR3,R3
                                        MOV SAVR4,R4
                                        MOV SAVR5,R5

                                        RTI                     ;RETURN

                                PRTITL: 1$
                                        2$
                                        3$
                                        4$
                                        5$
                                        6$
                                        7$
                                        10$
                                        11$
                                        12$
                                        1$:
                                        TYPE    ,65$            ;;TYPE ASCIZ STRING
                                        BR      64$             ;;GET OVER THE ASCIZ
                                ;;65$:  .ASCIZ  /   EXPDAT   /
                                64$:
                                        RTS PC
                                        2$:
                                        TYPE    ,67$            ;;TYPE ASCIZ STRING
                                        BR      66$             ;;GET OVER THE ASCIZ
                                ;;67$:  .ASCIZ  /   RECDAT   /
                                66$:
                                        RTS PC
                                        3$:
                                        TYPE    ,69$            ;;TYPE ASCIZ STRING
                                        BR      68$             ;;GET OVER THE ASCIZ
                                ;;69$:  .ASCIZ  /   EXP.ADD   /
```

```
                007302
    924 007302  000207                    68$:
                                                RTS PC
    925 007304                                  4$:
                007304  104401  007312             TYPE    ,71$            ;;TYPE ASCIZ STRING
                007310  000407                     BR      70$             ;;GET OVER THE ASCIZ
                                            ;;71$:  .ASCIZ  /   REC.ADD   /
                007330                      70$:
    926 007330  000207                          RTS PC
    927 007332                                  5$:
                007332  104401  007340             TYPE    ,73$            ;;TYPE ASCIZ STRING
                007336  000407                     BR      72$             ;;GET OVER THE ASCIZ
                                            ;;73$:  .ASCIZ  /   EXP.SP1   /
                007356                      72$:
    928 007356  000207                          RTS PC
    929 007360                                  6$:
                007360  104401  007366             TYPE    ,75$            ;;TYPE ASCIZ STRING
                007364  000407                     BR      74$             ;;GET OVER THE ASCIZ
                                            ;;75$:  .ASCIZ  /   REC.SP1   /
                007404                      74$:
    930 007404  000207                          RTS PC
    931 007406                                  7$:
                007406  104401  007414             TYPE    ,77$            ;;TYPE ASCIZ STRING
                007412  000407                     BR      76$             ;;GET OVER THE ASCIZ
                                            ;;77$:  .ASCIZ  /   EXP.PSW   /
                007432                      76$:
    932 007432  000207                          RTS PC
```

```
934 007434                              10$:
    007434  104401  007442              TYPE    ,79$            ;;TYPE ASCIZ STRING
    007440  000407                      BR      78$             ;;GET OVER THE ASCIZ
                                ;;79$:  .ASCIZ  /   REC.PSW   /
    007460                      78$:
935 007460  000207                      RTS PC
936 007462                              11$:
    007462  104401  007470              TYPE    ,81$            ;;TYPE ASCIZ STRING
    007466  000407                      BR      80$             ;;GET OVER THE ASCIZ
                                ;;81$:  .ASCIZ  /   VIR.ADD   /
    007506                      80$:
```

```
    938 007506  000207                          RTS PC
```

```
                                                12$:
    940 007510                                  TYPE    ,83$            ;;TYPE ASCIZ STRING
        007510  104401  007516                  BR      82$             ;;GET OVER THE ASCIZ
        007514  000407                  ;;83$:  .ASCIZ  /   PAR.OFF   /
        007534                          82$:
    941 007534  000207                          RTS PC
    942                                         .EVEN
    943
    944
    945
    946 007536  007562                  PRDATA: 1$
    947 007540  007572                          2$
    948 007542  007602                          3$
    949 007544  007612                          4$
    950 007546  007622                          5$
    951 007550  007632                          6$
    952 007552  007642                          7$
    953 007554  007652                          10$
    954 007556  007662                          11$
    955 007560  007672                          12$
    956 007562                                  1$:
        007562  016746  000140                  MOV     EXPDAT,-(SP)    ;;SAVE EXPDAT FOR TYPEOUT
        007566  104402                          TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
    957 007570  000207                          RTS PC
    958 007572                                  2$:
        007572  016746  000132                  MOV     RECDAT,-(SP)    ;;SAVE RECDAT FOR TYPEOUT
        007576  104402                          TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
    959 007600  000207                          RTS PC
    960 007602                                  3$:
        007602  016746  000124                  MOV     EXP.ADD,-(SP)   ;;SAVE EXP.ADD FOR TYPEOUT
        007606  104402                          TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
    961 007610  000207                          RTS PC
    962 007612                                  4$:
        007612  016746  000116                  MOV     REC.ADD,-(SP)   ;;SAVE REC.ADD FOR TYPEOUT
        007616  104402                          TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
    963 007620  000207                          RTS PC
    964 007622                                  5$:
        007622  016746  000110                  MOV     EXP.SP1,-(SP)   ;;SAVE EXP.SP1 FOR TYPEOUT
        007626  104402                          TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
    965 007630  000207                          RTS PC
    966 007632                                  6$:
        007632  016746  000102                  MOV     REC.SP1,-(SP)   ;;SAVE REC.SP1 FOR TYPEOUT
        007636  104402                          TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
    967 007640  000207                          RTS PC
    968 007642                                  7$:
        007642  016746  000074                  MOV     EXP.PSW,-(SP)   ;;SAVE EXP.PSW FOR TYPEOUT
        007646  104402                          TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
    969 007650  000207                          RTS PC
    970 007652                                  10$:
        007652  016746  000066                  MOV     REC.PSW,-(SP)   ;;SAVE REC.PSW FOR TYPEOUT
        007656  104402                          TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
    971 007660  000207                          RTS PC
    972 007662                                  11$:
        007662  016746  000060                  MOV     VIR.ADD,-(SP)   ;;SAVE VIR.ADD FOR TYPEOUT
        007666  104402                          TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
    973 007670  000207                          RTS PC
    974 007672                                  12$:
```

```
        007672  016746  000052                  MOV     PAR.OFF,-(SP)   ;;SAVE PAR.OFF FOR TYPEOUT
        007676  104402                          TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
    975 007700  000207                          RTS PC
    976
    977
    978 007702                          PRTABL:
    979 007702  007726                          EXPDAT
    980 007704  007730                          RECDAT
    981 007706  007732                          EXP.ADD
    982 007710  007734                          REC.ADD
    983 007712  007736                          EXP.SP1
    984 007714  007740                          REC.SP1
    985 007716  007742                          EXP.PSW
    986 007720  007744                          REC.PSW
    987 007722  007746                          VIR.ADD
    988 007724  007750                          PAR.OFF
    989
```

```
  992 007726  000000                    EXPDAT: .WORD   0
  993 007730  000000                    RECDAT: .WORD   0
  994 007732  000000                    EXP.ADD: .WORD  0
  995 007734  000000                    REC.ADD: .WORD  0
  996 007736  000000                    EXP.SP1: .WORD  0
  997 007740  000000                    REC.SP1: .WORD  0
  998 007742  000000                    EXP.PSW: .WORD  0
  999 007744  000000                    REC.PSW: .WORD  0
 1000 007746  000000                    VIR.ADD: .WORD  0
 1001 007750  000000                    PAR.OFF: .WORD  0
 1002 007752     015     012     103            PNAME: .ASCIZ <15><12>+CKKACA0 11/44 POWER FAIL+
      007755     113     113     101
      007760     103     101     060
      007763     040     061     061
      007766     057     064     064
      007771     040     120     117
      007774     127     105     122
      007777     040     106     101
      010002     111     114     000
 1003 010005     015     012     103            TITLE: .ASCIZ <15><12>+CKKACA0 11/44 POWER FAIL+<15><12>
      010010     113     113     101
      010013     103     101     060
      010016     040     061     061
      010021     057     064     064
      010024     040     120     117
      010027     127     105     122
      010032     040     106     101
      010035     111     114     015
      010040     012     000
 1004 010042     015     012     102            BOOT:  .ASCIZ <15><12>+BOOT ENABLE SWITCH MUST BE OFF+<15><12>
      010045     117     117     124
      010050     040     105     116
      010053     101     102     114
      010056     105     040     123
      010061     127     111     124
      010064     103     110     040
      010067     115     125     123
      010072     124     040     102
      010075     105     040     117
      010100     106     106     015
      010103     012     000
 1005 010105     015     012     120            UPF: .ASCIZ <15><12>+POWER UP BEFORE POWER DOWN COMPLETE+<15><12>
      010110     117     127     105
      010113     122     040     125
      010116     120     040     102
      010121     105     106     117
      010124     122     105     040
      010127     120     117     127
      010132     105     122     040
      010135     104     117     127
      010140     116     040     103
      010143     117     115     120
      010146     114     105     124
      010151     105     015     012
      010154     000
 1006
 1007 010155     015     012     120            DOWN: .ASCIZ <15><12>+POWER DOWN BEFORE UP COMPLETE+<15><12>
```

```
            010160      117     127     105
            010163      122     040     104
            010166      117     127     116
            010171      040     102     105
            010174      106     117     122
            010177      105     040     125
            010202      120     040     103
            010205      117     115     120
            010210      114     105     124
            010213      105     015     012
            010216      000
    1008
    1009
    1010
    1011
    1012
    1013                                    .EVEN
    1014    010220  000000                  END:    0
    1015            000001                  .END
```

```
ABASE = 000000
ACDW1 = 000000
ACDW2 = 000000
.ACPUOP= 000000
ADDW0 = 000000
ADDW1 = 000000
ADDW10= 000000
ADDW11= 000000
ADDW12= 000000
ADDW13= 000000
ADDW14= 000000
ADDW15= 000000
ADDW2 = 000000
ADDW3 = 000000
ADDW4 = 000000
ADDW5 = 000000
ADDW6 = 000000
ADDW7 = 000000
ADDW8 = 000000
ADDW9 = 000000
ADEVCT= 000000
ADEVM = 000000
AENV  = 000000
AENVM = 000000
AFATAL= 000000
AMADR1= 000000
AMADR2= 000000
AMADR3= 000000
AMADR4= 000000
AMAMS1= 000000
AMAMS2= 000000
AMAMS3= 000000
AMAMS4= 000000
AMSGAD= 000000
AMSGLG= 000000
AMSGTY= 000000
AMTYP1= 000000
AMTYP2= 000000
AMTYP3= 000000
AMTYP4= 000000
APASS = 000000
APF     002134
APRIOR= 000000
APTCSU= 000040
APTENV= 000001
APTSIZ= 000200
APTSPO= 000100
ASWREG= 000000
ATESTN= 000000
AUNIT = 000000
AUSWR = 000000
AVECT1= 000000
AVECT2= 000000
BEGIN   001424
BIT0  = 000001
BIT00 = 000001
BIT01 = 000002
BIT02 = 000004
BIT03 = 000010
BIT04 = 000020
BIT05 = 000040
BIT06 = 000100
BIT07 = 000200
BIT08 = 000400
BIT09 = 001000
BIT1  = 000002
BIT10 = 002000
BIT11 = 004000
BIT12 = 010000
BIT13 = 020000
BIT14 = 040000
BIT15 = 100000
BIT2  = 000004
BIT3  = 000010
BIT4  = 000020
BIT5  = 000040
BIT6  = 000100
BIT7  = 000200
BIT8  = 000400
BIT9  = 001000
BOOT    010042
BPTVEC= 000014
CACHVE= 000114
CHECK   004360
CONTRL= 177746
CPUERR= 177766
CR    = 000015
CRLF  = 000200
DAT     006756
DATA    005106
DDISP = 177570
DISPLA= 177570
DISPRE  000174
DOWN    010155
DSWR  = 177570
DVEC    005074
EMTVEC= 000030
END     010220
ERRAD   005066
ERROR = 104000
ERRPC   006614
ERRVEC= 000004
EXPDAT  007726
EXP.AD  007732
EXP.PS  007742
EXP.SP  007736
FIN     007110
FLAG    005102
FT      002264
HIADRS= 177742
HITMIS= 177752
HT    = 000011
ILLDWN  005054
ILLUP   005042
IOTVEC= 000020
KDPAR0= 172360
KDPAR1= 172362
KDPAR2= 172364
KDPAR3= 172366
KDPAR4= 172370
KDPAR5= 172372
KDPAR6= 172374
KDPAR7= 172376
KDPDR0= 172320
KDPDR1= 172322
KDPDR2= 172324
KDPDR3= 172326
KDPDR4= 172330
KDPDR5= 172332
KDPDR6= 172334
KDPDR7= 172336
KERSTK= 001100
KIPAR0= 172340
KIPAR1= 172342
KIPAR2= 172344
KIPAR3= 172346
KIPAR4= 172350
KIPAR5= 172352
KIPAR6= 172354
KIPAR7= 172356
KIPDR0= 172300
KIPDR1= 172302
KIPDR2= 172304
KIPDR3= 172306
KIPDR4= 172310
KIPDR5= 172312
KIPDR6= 172314
KIPDR7= 172316
KSP   =%000006
LF    = 000012
LIMIT   005104
LKS   = 177546
LKVEC = 000100
LOAD    004254
LOADRS= 177740
LRTI    001422
MAINT = 177750
MAP     005110
MAPH0 = 170202
MAPH00= 170202
MAPH01= 170206
MAPH02= 170212
MAPH03= 170216
MAPH04= 170222
MAPH05= 170226
MAPH06= 170232
MAPH07= 170236
MAPH1 = 170206
MAPH10= 170242
MAPH11= 170246
MAPH12= 170252
MAPH13= 170256
MAPH14= 170262
MAPH15= 170266
MAPH16= 170272
MAPH17= 170276
MAPH2 = 170212
MAPH20= 170302
MAPH21= 170306
MAPH22= 170312
MAPH23= 170316
MAPH24= 170320
MAPH25= 170326
MAPH26= 170332
MAPH27= 170336
MAPH3 = 170216
MAPH30= 170342
MAPH31= 170346
MAPH32= 170352
MAPH33= 170356
MAPH34= 170362
MAPH35= 170366
MAPH36= 170372
MAPH37= 170376
MAPH4 = 170222
MAPH5 = 170226
MAPH6 = 170232
MAPH7 = 170236
MAPL0 = 170200
MAPL00= 170200
MAPL01= 170204
MAPL02= 170210
MAPL03= 170214
MAPL04= 170220
MAPL05= 170224
MAPL06= 170230
MAPL07= 170234
MAPL1 = 170204
MAPL10= 170240
MAPL11= 170244
MAPL12= 170250
MAPL13= 170254
MAPL14= 170260
MAPL15= 170264
MAPL16= 170270
MAPL17= 170274
MAPL2 = 170210
MAPL20= 170300
MAPL21= 170304
MAPL22= 170310
MAPL23= 170314
MAPL24= 170320
MAPL25= 170324
MAPL26= 170330
MAPL27= 170334
MAPL3 = 170214
MAPL30= 170340
MAPL31= 170344
MAPL32= 170350
MAPL33= 170354
MAPL34= 170360
MAPL35= 170364
MAPL36= 170370
MAPL37= 170374
MAPL4 = 170220
MAPL5 = 170224
MAPL6 = 170230
MAPL7 = 170234
MEMERR= 177744
MMERR   005206
MMR0  = 177572
MMR1  = 177574
MMR2  = 177576
MMR3  = 172516
MMVEC = 000250
PARERR  004554
PARFLG  004556
PAR.OF  007750
PFAIL   001416
PIRQ  = 177772
PIRQVE= 000240
PNAME   007752
POWDWN  004654
POWUP   004750
PRDATA  007536
PRETST  002274
PRTABL  007702
PRTITL  007156
PR0   = 000000
PR1   = 000040
PR2   = 000100
PR3   = 000140
PR4   = 000200
PR5   = 000240
PR6   = 000300
PR7   = 000340
PS    = 177776
PSW   = 177776
PWRVEC= 000024
RECDAT  007730
REC.AD  007734
REC.PS  007744
REC.SP  007740
RESVEC= 000010
R10   =%000000
R11   =%000001
R12   =%000002
R13   =%000003
R14   =%000004
R15   =%000005
R6    =%000006
R7    =%000007
SAVR0   006650
SAVR1   006652
SAVR2   006654
```

```
SAVR3   006656        STACK1= 000500        TST5    003370        XYZ     001420        $MSGAD  001130
SAVR4   006660        STKLMT= 177774        TST6    003500        $APTHD  001100        $MSGLG  001132
SAVR5   006662        SUPSTK= 000700        TST7    003620        $ATYC   001174        $MSGTY  001114
SAV6    005100        SWR   = 177570        TYPDS = 104405        $ATY1   001150        $MTYP1  001145
SCOPE = 000004        SWREG   000176        TYPE  = 104401        $ATY3   001156        $NULL   006530
SDPAR0= 172260        SW0   = 000001        TYPOC = 104402        $ATY4   001166        $NWTST= 000001
SDPAR1= 172262        SW00  = 000001        TYPON = 104404        $CHARC  006520        $OCNT   005742
SDPAR2= 172264        SW01  = 000002        TYPOS = 104403        $CORE   005420        $OMODE  005744
SDPAR3= 172266        SW02  = 000004        UDPAR0= 177660        $CPUOP  001142        $PASS   001122
SDPAR4= 172270        SW03  = 000010        UDPAR1= 177662        $CRLF   006535        $PASTM  001106
SDPAR5= 172272        SW04  = 000020        UDPAR2= 177664        $CROUT  005450        $QUES   006534
SDPAR6= 172274        SW05  = 000040        UDPAR3= 177666        $DBLK   006162        $RTNAD  004232
SDPAR7= 172276        SW06  = 000100        UDPAR4= 177670        $DEVCT  001124        $SAVPC= 000204
SDPDR0= 172220        SW07  = 000200        UDPAR5= 177672        $DOAGN  004230        $SETUP= 000024
SDPDR1= 172222        SW08  = 000400        UDPAR6= 177674        $DTBL   006152        $SIZE   005212
SDPDR2= 172224        SW09  = 001000        UDPAR7= 177676        $ENDAD  004220        $SIZEX  005454
SDPDR3= 172226        SW1   = 000002        UDPDR0= 177620        $ENDCT  004166        $STUP = 177777
SDPDR4= 172230        SW10  = 002000        UDPDR1= 177622        $ENDMG  004237        $SVPC = 000204
SDPDR5= 172232        SW11  = 004000        UDPDR2= 177624        $ENULL  004234        $SWR  = 040000
SDPDR6= 172234        SW12  = 010000        UDPDR3= 177626        $ENV    001134        $SWREG  001136
SDPDR7= 172236        SW13  = 020000        UDPDR4= 177630        $ENVM   001135        $TESTN  001120
SIPAR0= 172240        SW14  = 040000        UDPDR5= 177632        $EOP    004142        $TKB    006542
SIPAR1= 172242        SW15  = 100000        UDPDR6= 177634        $EOPCT  004160        $TKS    006540
SIPAR2= 172244        SW2   = 000004        UDPDR7= 177636        $ERROR  006616        $TN   = 000012
SIPAR3= 172246        SW3   = 000010        UIPAR0= 177640        $ETABL  001134        $TPB    006526
SIPAR4= 172250        SW4   = 000020        UIPAR1= 177642        $ETEND  001150        $TPFLG  006533
SIPAR5= 172252        SW5   = 000040        UIPAR2= 177644        $FATAL  001116        $TPS    006524
SIPAR6= 172254        SW6   = 000100        UIPAR3= 177646        $FFLG   001414        $TRAP   006544
SIPAR7= 172256        SW7   = 000200        UIPAR4= 177650        $FILLC  006532        $TRAP2  006566
SIPDR0= 172200        SW8   = 000400        UIPAR5= 177652        $FILLS  006531        $TRP  = 000006
SIPDR1= 172202        SW9   = 001000        UIPAR6= 177654        $GET42  004210        $TRPAD  006600
SIPDR2= 172204        SYSTID= 177764        UIPAR7= 177656        $HD   = 000000        $TSTM   001104
SIPDR3= 172206        TBITVE= 000014        UIPDR0= 177600        $HIBTS  001100        $TYPDS  005746
SIPDR4= 172210        TITL    006664        UIPDR1= 177602        $KTNEX  005412        $TYPE   006172
SIPDR5= 172212        TITLE   010005        UIPDR2= 177604        $KTOUT  005402        $TYPEC  006404
SIPDR6= 172214        TKVEC = 000060        UIPDR3= 177606        $KT11   005250        $TYPEX  006522
SIPDR7= 172216        TPVEC = 000064        UIPDR4= 177610        $LF     006536        $TYPOC  005544
SIZEHI= 177762        TRAPVE= 000034        UIPDR5= 177612        $LFLG   001413        $TYPON  005560
SIZELO= 177760        TRTVEC= 000014        UIPDR6= 177614        $LSTAD  005514        $TYPOS  005520
SR0   = 177572        TST1    002332        UIPDR7= 177616        $LSTBK  005516        $UNIT   001126
SR1   = 177574        TST10   003720        UPF     010105        $MADR1  001146        $UNITM  001110
SR2   = 177576        TST11   004052        USESTK= 000600        $MAIL   001114        $USWR   001140
SR3   = 172516        TST2    002554        USP   =%000006        $MAMS1  001144        $$GET4= 000000
SSP   =%000006        TST3    003004        UVEC    005070        $MBADR  001102        $OFILL  005743
STACK = 001100        TST4    003264        VIR.AD  007746        $MFLG   001412        .$X   = 001100

. ABS.  010222     000
        000000     001
ERRORS DETECTED:  0

VIRTUAL MEMORY USED:  31896 WORDS  ( 125 PAGES)
DYNAMIC MEMORY:  20536 WORDS  ( 78 PAGES)
ELAPSED TIME:  00:01:18
CKKACA.BIN,CKKACA.SEQ=CKKACA.MLB/ML,CKKACA.P11
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