M9301/9400

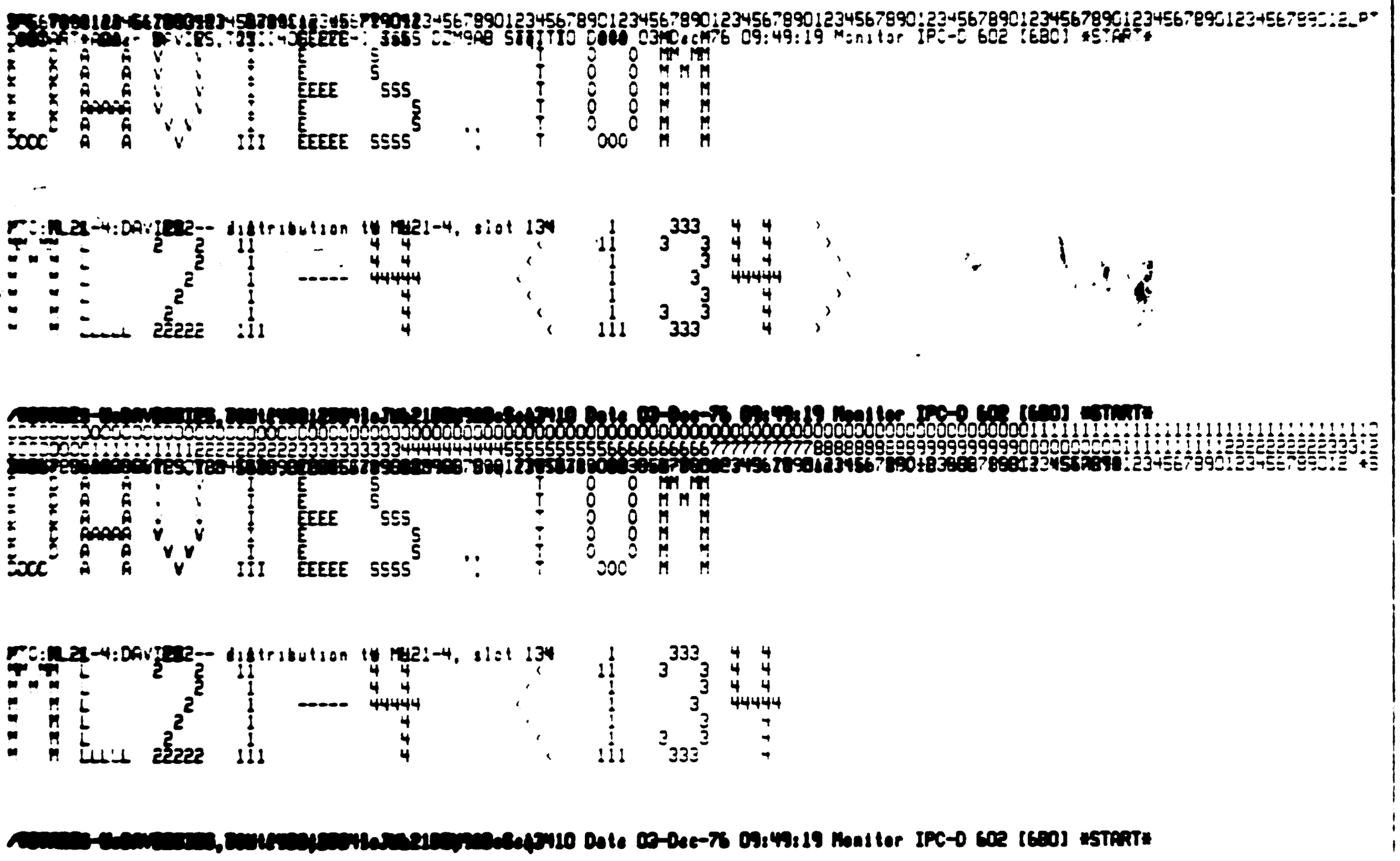
BOOTSTRAP
MD-11-DZM9A-B

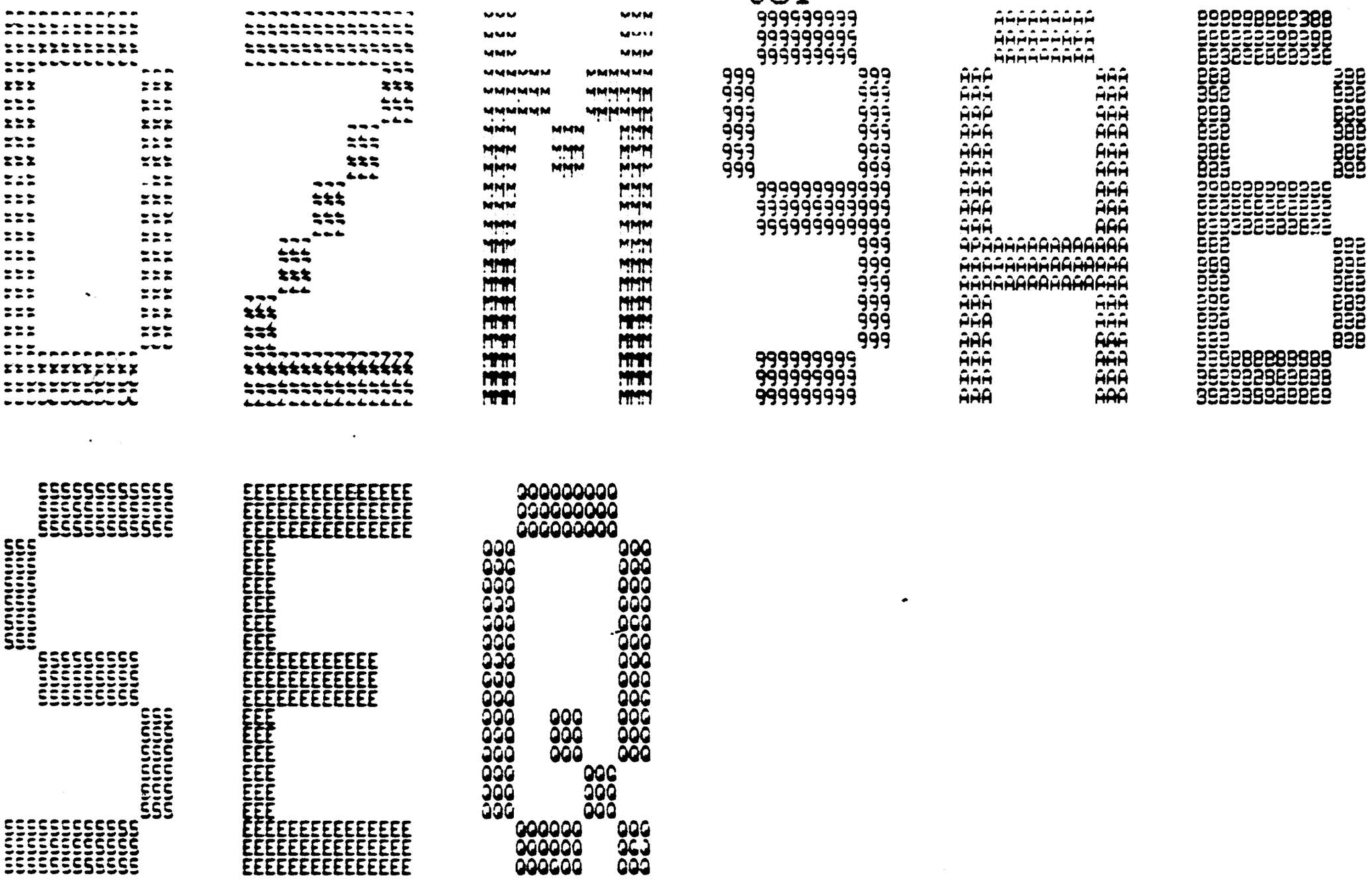
EP-DZM9A-B-DL-B

FICHE 1 OF 1

DEC 1976
digital
MADE IN USA

B01


Date 03-Dec-76 09:49:19 Monitor IPC-D 602 [6B0] *START*
-- distribution to MM21-4, slot 134
Date 03-Dec-76 09:49:19 Monitor IPC-D 602 [6B0] *START*



_R^SP_ Version 6(103344) Running on MTA041
START User DAVIES,TOM [400,2704] Job DZM9AB Seq. 10 Date 03-Dec-76 09:49:19 Monitor IPC-D 602 (6BC) *START*
Request created: 03-Dec-76 09:26:29   /TO:ML21-4:DAVIES -- distribution to ML21-4, slot 134

[illegible] 09:49:28
File will be RENAMEd to .SAV protection

D01

```
DDDDDDDDDDDD         ZZZZZZZZZZZZZZZ      MMM         MMM         999999999            AAAAAAAAA         BBBBBBBBBBBB   
DDDDDDDDDDDD         ZZZZZZZZZZZZZZZ      MMM         MMM         999999999            AAAAAAAAA         BBBBBBBBBBBB   
DDDDDDDDDDDD         ZZZZZZZZZZZZZZZ      MMM         MMM         999999999            AAAAAAAAA         BBBBBBBBBBBB   
DDD         DDD                  ZZZ      MMMMMM   MMMMMM      999         999      AAA         AAA      BBB         BBB
DDD         DDD                  ZZZ      MMMMMM   MMMMMM      999         999      AAA         AAA      BBB         BBB
DDD         DDD                  ZZZ      MMMMMM   MMMMMM      999         999      AAA         AAA      BBB         BBB
DDD         DDD               ZZZ         MMM   MMM   MMM      999         999      AAA         AAA      BBB         BBB
DDD         DDD               ZZZ         MMM   MMM   MMM      999         999      AAA         AAA      BBB         BBB
DDD         DDD               ZZZ         MMM   MMM   MMM      999         999      AAA         AAA      BBB         BBB
DDD         DDD            ZZZ            MMM         MMM         999999999999      AAA         AAA      BBBBBBBBBBBB   
DDD         DDD            ZZZ            MMM         MMM         999999999999      AAA         AAA      BBBBBBBBBBBB   
DDD         DDD            ZZZ            MMM         MMM         999999999999      AAA         AAA      BBBBBBBBBBBB   
DDD         DDD         ZZZ               MMM         MMM                  999      AAAAAAAAAAAAAAA      BBB         BBB
DDD         DDD         ZZZ               MMM         MMM                  999      AAAAAAAAAAAAAAA      BBB         BBB
DDD         DDD         ZZZ               MMM         MMM                  999      AAAAAAAAAAAAAAA      BBB         BBB
DDD         DDD      ZZZ                  MMM         MMM                  999      AAA         AAA      BBB         BBB
DDD         DDD      ZZZ                  MMM         MMM                  999      AAA         AAA      BBB         BBB
DDD         DDD      ZZZ                  MMM         MMM                  999      AAA         AAA      BBB         BBB
DDDDDDDDDDDD         ZZZZZZZZZZZZZZZ      MMM         MMM         999999999         AAA         AAA      BBBBBBBBBBBB   
DDDDDDDDDDDD         ZZZZZZZZZZZZZZZ      MMM         MMM         999999999         AAA         AAA      BBBBBBBBBBBB   
DDDDDDDDDDDD         ZZZZZZZZZZZZZZZ      MMM         MMM         999999999         AAA         AAA      BBBBBBBBBBBB   


   SSSSSSSSSSSS      EEEEEEEEEEEEEEE         QQQQQQQQQ   
   SSSSSSSSSSSS      EEEEEEEEEEEEEEE         QQQQQQQQQ   
   SSSSSSSSSSSS      EEEEEEEEEEEEEEE         QQQQQQQQQ   
SSS                  EEE                  QQQ         QQQ
SSS                  EEE                  QQQ         QQQ
SSS                  EEE                  QQQ         QQQ
SSS                  EEE                  QQQ         QQQ
SSS                  EEE                  QQQ         QQQ
SSS                  EEE                  QQQ         QQQ
   SSSSSSSSS         EEEEEEEEEEEE         QQQ         QQQ
   SSSSSSSSS         EEEEEEEEEEEE         QQQ         QQQ
   SSSSSSSSS         EEEEEEEEEEEE         QQQ         QQQ
            SSS      EEE                  QQQ   QQQ   QQQ
            SSS      EEE                  QQQ   QQQ   QQQ
            SSS      EEE                  QQQ   QQQ   QQQ
            SSS      EEE                  QQQ      QQQ   
            SSS      EEE                  QQQ      QQQ   
            SSS      EEE                  QQQ      QQQ   
SSSSSSSSSSSS         EEEEEEEEEEEEEEE         QQQQQQ   QQQ
SSSSSSSSSSSS         EEEEEEEEEEEEEEE         QQQQQQ   QQQ
SSSSSSSSSSSS         EEEEEEEEEEEEEEE         QQQQQQ   QQQ
```

```
LPTSPL Version 6(100344)  Running on MTA041
 *START* User DAVIES,TOM [400,2704] Job  DZM9AB Seq. 10 Date 03-Dec-76 09:49:19 Monitor IPC-D 602 [683] *START*
Request created: 03-Dec-76  09:26:29     /TO:ML21-4:DAVIES -- distribution to ML21-4, slot 134

[illegible] 09:49:28
File will be RENAMEd to <057> protection
```

```
                000000                          .REPT 0
```

IDENTIFICATION

PRODUCT CODE:	MAINDEC-11-DZM9A-B-D
PRODUCT NAME:	BOOTSTRAP/TERMINATOR (M9301, M9400)
PROGRAM DATE:	DECEMBER 1976
MAINTAINER:	DIAGNOSTIC ENGINEERING
AUTHOR:	GLENN JOHNSON/VIN KALINOWSKI

```
                        ****************************************
                        *                                      *
                        * SUMMARY OF OPERATING INSTRUCTIONS    *
                        *                                      *
                        ****************************************


                        THE FOLLOWING PROCEDURE CAN BE USED TO RUN THIS DIAGNOSTIC
                        IN A DEVICE VERIFICATION MODE.  IF THE PROGRAM DOES NOT
                        RUN SUCCESSFULLY CONSULT THE FOLLOWING DOCUMENT FOR ASSISTANCE.

                        OPERATING PROCEDURE:

                                1.  LOAD THE PROGRAM USING NORMAL PROCEDURES.

                                2.  LOAD ADDRESS 200

                                3.  SET SWITCH REGISTER TO SELECT THE PROPER
                                    VERSION OF THE ROM UNDER TEST.
                                    (SEE INSTRUCTIONS IF A SOFTWARE SWITCH REGISTER
                                    IS TO BE USED.)

                                4.  PRESS START

                                5.  THE PROGRAM SHOULD TAKE ABOUT 1 SEC TO
                                    COMPLETE THE TEST AND PRINT: "END OF TEST".

                                6.  IF THE PROGRAM DOES NOT RUN AS DESCRIBED
                                    ABOVE, CONSULT THE FULL OPERATING INSTRUCTIONS
                                    WHICH FOLLOW.
```

1.0 GENERAL PROGRAM INFORMATION

1.1 PROGRAM PURPOSE

THIS DIAGNOSTIC PROGRAM IS INTENDED TO VERIFY THE
ROM CONTENTS OF THE ROM BOOTSTRAP MODULES. THE PROGRAM
COMPUTES AND CHECKS A CYCLIC REDUNDANCY CHARACTER
AND A LONGITUDINAL PARITY CHARACTER FOR THE CONTENTS
OF THE ROM STORAGE AVAILABLE IN AN M9301 OR M9400 MODULE.

A SEPARATE ROUTINE INCLUDED ALLOWS THE USER TO TYPE
THE CONTENTS OF THE ROM STORAGE ON THE TELETYPE AS
AN AID TO DEBUGGING.

1.2 SYSTEM REQUIREMENTS

1.2.1 HARDWARE

PDP/11 PROCESSOR
TELETYPE OR EQUIVALENT
4K OF MEMORY
M9301 OR M9400 MODULE

1.2.2 SOFTWARE

THIS PROGRAM IS WRITTEN TO BE RUN AS A STAND-ALONE PROGRAM.
HOWEVER, THE PROGRAM IS DESIGNED TO RUN UNDER AUTOMATED
PRODUCT TEST SYSTEM (APT) IN ALL THREE MODES.

THE PROGRAM CAN ALSO BE RUN UNDER THE ACT 11 MONITOR.

1.3 RELATED DOCUMENTS AND STANDARDS

DIAGNOSTIC ENGINEERING STANDARDS AND CONVENTIONS PROGRAMMING PRACTICES
DOCUMENT NO. 175-003-009-00

APT INTERFACE SPECIFICATION, REV. 13

1.4 DIAGNOSTIC HIERARCHY PREREQUISITES

NONE, HOWEVER THE CPU IS ASSUMED TO BE FUNCTIONING

1.5 FAILURE ASSUMPTIONS

THE PROCESSOR IS ASSUMED TO BE FUNCTIONING PROPERLY.

2.0 OPERATING INSTRUCTIONS

2.1 LOADING AND STARTING PROCEDURES

2.1.1 LOADING

USE NORMAL PROCEDURES FOR LOADING DIAGNOSTIC PROGRAMS.

2.1.2 NORMAL START

1. LOAD SOFTWARE SWITCH REGISTER (IF USED) TO SELECT THE ROM VERSION UNDER TEST. (SEE 2.3)
2. LOAD ADDRESS 200
3. SET HARDWARE SWITCH REGISTER (IF AVAILABLE) TO SELECT THE ROM VERSION UNDER TEST (SEE 2.3).
4. START

2.1.3 OPTIONAL START

THE OPTIONAL STARTING ADDRESS IS USED TO TYPE OUT THE CONTENTS OF THE ROM FOR USE IN VISUAL VERIFICATION OR AS A DEBUGGING TOOL.

USE THE SAME PROCEDURE AS A NORMAL START EXCEPT USE ADDRESS 210 IN STEP 2.

2.2 SPECIAL ENVIRONMENTS

THIS PROGRAM IS WRITTEN TO COMPLY WITH ALL THE REQUIREMENTS OF THE APT INTERFACE SPECIFICATION. IT WILL RUN UNDER APT IN EITHER QUICK VERIFY, PROGRAM OR RUN-TIME MODES.

THIS PROGRAM IS WRITTEN TO COMPLY WITH THE ACT11/XXDP INTERFACE REQUIREMENTS.

WHEN RUNNING IN ACT11 QUICK VERIFY OR XXDP CHAIN MODE (LOC. 42 NOT 0), OR APT QUICK VERIFY AND PROGRAM MODE THE PROGRAM ATTEMPTS TO RUN WITHOUT OPERATOR INTERVENTION OR SWITCH REGISTER SELECTION. THE COMPUTED CRC IS COMPARED AGAINST THE CRC FOR ALL KNOWN VERSIONS OF THE ROM BOOTSTRAP. WHEN A MATCH IS FOUND THE VERSION OF THE MODULE IS TYPED FOR VISUAL VERIFICATION.

2.3 PROGRAM OPTIONS

THE PROGRAM AUTOMATICALLY CHECKS FOR THE PRESENCE OF A HARDWARE SWITCH REGISTER. IF NO RESPONSE IS FOUND WHEN ADDRESSING THE HARDWARE SWR (177570), THE ADDRESS OF THE SOFTWARE SWR (176) IS SUBSTITUTED.

FOR PROCESSORS WITH NO HARDWARE SWITCH REGISTER, THE OPERATOR SHOULD SET THE DESIRED SWITCH VALUE IN LOCATION 176 BEFORE STARTING THE PROGRAM.

2.3.1 SWITCH SELECTION

THE SWITCH REGISTER (HARDWARE OR SOFTWARE) IS USED TO SELECT THE VERSION OF THE ROM BOOTSTRAP TO BE TESTED ACCORDING TO THE FOLLOWING TABLE.

SWR	MODULE VERSION
1	M9301-YA
2	M9301-YB
3	M9301-YC
4	M9400-YA (OR YC)
5	M9301-YF

IF THE CRC AND LPC FOR NEW VERSIONS ARE KNOWN BUT NOT IN THE ABOVE TABLE, SET THE SWITCH REGISTER TO ZERO AND ANSWER THE TELETYPE DIALOG.

TO DETERMINE THE CRC AND LPC FOR A NEW VERSION, START THE DIAGNOSTIC AT 200 WITH SWR=0. ANSWER 0 TO THE REQUESTS FOR THE LPC AND CRC. THE RESULTING MESSAGES WILL INDICATE THE CORRECT FUTURE RESPONSES FOR CRC AND LPC PROVIDED THE TEST IS RUN ON A KNOWN-GOOD MODULE.

2.3.2 TELETYPE DIALOG

SEVERAL QUESTIONS ARE ASKED OF THE OPERATOR IN ORDER TO OBTAIN SUFFICIENT INFORMATION FOR TESTING A ROM MODULE NOT PREVIOUSLY SUPPORTED IN THE DIAGNOSTIC. THE DIALOG IS INITIATED IF THE PROGRAM IS STARTED WITH THE SWR = 0. ALL RESPONSES ARE IN OCTAL AND TERMINATED BY A CARRIAGE RETURN.

ALL RESPONSES ARE CHECKED FOR VALID OCTAL NUMBERS. IF AN ILLEGAL CHARACTER IS TYPED, THE PROGRAM WILL TYPE A "?", CARRIAGE RETURN-LINE FEED AND AWAIT THE PROPER INPUT.

IF A MISTAKE IS NOTICED BEFORE THE CARRIAGE RETURN IS USED TO TERMINATE THE INPUT, A RUBOUT CAN BE USED TO DELETE MISTYPED INPUT.

1. TYPE CRC VALUE:
THIS REQUESTS THE VALUE OF THE CYCLIC REDUNDANCY CHECK
PREVIOUSLY CALCULATED FOR THIS VERSION OF THE ROM MODULE.
IT IS THE VALUE AGAINST WHICH THE UNIT UNDER TEST'S CRC
WILL BE COMPARED.

2. TYPE LPC VALUE:
THIS REQUESTS THE VAULE OF THE LONGITUDINAL PARITY CHECK
PREVIOUSLY CALCULATED FOR THIS VERSION OF THE ROM MODULE.
IT IS THE VALUE AGAINST WHICH THE UNIT UNDER TEST'S LPC
WILL BE COMPARED.

3. TYPE STARTING ADDR. OF 1ST ROM ADDR. SPACE:
THIS QUESTION REFERS TO THE FACT THAT THE ROM SPACE IN
A ROM BOOTSTRAP MODULE IS DIVIDED INTO 2 DISTINCT ADDRESS SPACES. TYPE
THE STARTING ADDRESS OF THE 1ST RANGE OF ADDRESSES. THE
STANDARD M9301 & M9400 BEGIN AT 173000.

4. TYPE LENGTH (BYTES) OF 1ST ROM ADDR. SPACE:
THIS REQUESTS THE LENGTH OF THE 1ST GROUP OF ROM ADDRESSES
IN BYTES. THE STANDARD M9301 & M9400 HAVE AN INITIAL ADDRESS SPACE
OF 1000 BYTES. IF THIS SECTION OF ADDRESSES IS NOT
USED BY THIS VERSION, ANSWER 0 TO THIS QUESTION.

5. TYPE STARTING ADDR. OF 2ND ROM ADDR. SPACE:
THIS REFERS TO THE FIRST ADDRESS IN THE SECOND DISTINCT
GROUP OF ROM ADDRESSES. THE RESPONSE FOR A STANDARD
M9301 & M9400 WOULD BE 165000.
6. TYPE LENGTH (BYTES) OF 2ND ROM ADDR. SPACE:
THIS REQUESTS THE LENGTH OF THE 2ND GROUP OF ROM ADDRESSES
IN BYTES. THE STANDARD M9301 & M9400 HAVE A SECOND ADDRESS SPACE
OF 1000 BYTES. IF THIS SECTION OF ADDRESSES IS NOT USED
BY THIS VERSION, ANSWER 0 TO THIS QUESTION.

2.4 EXECUTION TIMES

THE DIAGNOSTIC COMPLETES 1 PASS IN LESS THAN 1 SEC.
ONCE THE INPUT DIALOG HAS BEEN COMPLETED.
THE PROGRAM WILL HALT UPON COMPLETION; HOWEVER, IF RUNNING
UNDER AFT THE PROGRAM WILL CYCLE CONTINUOUSLY.

3.0 ERROR INFORMATION

WHEN THE DIAGNOSTIC DETECTS A DISCREPANCY BETWEEN THE
EXPECTED AND COMPUTED CRC OR LPC BOTH ARE PRINTED
ON THE TELETYPE.

ANY DISCREPANCY IN THE LPC CAN ASSIST IN ISOLATING THE
PROBLEM TO THE ROM IC.

UNDER APT THE ERROR IS INDICATED BY DEPOSITING ERROR INFORMATION
IN THE APT MAILBOX BEFORE HALTING.

4.0 PROGRESS REPORTS

AT THE END OF EACH PASS THE PROGRAM INCREMENTS TO THE
LOCATION $PASS WHICH IS IN THE APT MAILBOX. THIS
LOCATION WILL ALWAYS CONTAIN THE NUMBER OF PASSES
COMPLETED. $PASS IS RESET WITH EVERY RESTART.

ADDITIONALLY, THE MESSAGE "END OF TEST" IS PRINTED ON THE CONSOLE
TELETYPE AFTER EACH PASS. NORMALLY ONLY ONE PASS NEEDS
TO RUN TO VERIFY THE MODULE.

5.0 TROUBLE SHOOTING

THE ALGORITHM FOR COMPUTING THE CRC IS THE SAME AS THAT
USED ON 9-TRACK MAGNETIC TAPE WITH ODD PARITY. THE
CRC IS CALCULATED ON A BYTE-BY-BYTE BASIS. WHILE THE
ALGORITHM IS SUCCESSFUL IN DETECTING MULTIPLE ERRORS, ITS
USE AS A DEBUGGING AID IS LIMITED.

THE LPC IS CALCULATED BY ASSEMBLING THE XOR OF EVERY
WORD IN THE ROM. WHILE ONLY USEFUL IN CATCHING AN
ODD NUMBER OF ERRORS IN EACH BIT POSITION, IT IS VERY
USEFUL IN ISOLATING THE PROBLEM TO A CHIP. BY LOCATING WHICH
BIT POSITIONS ARE IN DISCREPANCY, THE CORRESPONDING ROM
CHIPS CAN BE ISOLATED.

IF NO OTHER CLUES CAN BE OBTAINED, START THE PROGRAM
AT 210 AND COMPARE THE PRINTOUT OF THE CODE WITH THE
LISTING FOR THE VERSION BEING TESTED.

6.0 LISTING

.ENDR

```
                                .ENABLE ABS
                                .LIST   ME
                                .NLIST  MC,MD,CND
000000                          $SWR=0
                                .SBTTL  BASIC DEFINITIONS

                                ;*INITIAL ADDRESS OF THE STACK POINTER *** 1100 ***
001100                          STACK=  1100
                                .EQUIV  EMT,ERROR       ;;BASIC DEFINITION OF ERROR CALL
                                .EQUIV  IOT,SCOPE       ;;BASIC DEFINITION OF SCOPE CALL

                                ;*MISCELLANEOUS DEFINITIONS
000011                          HT=     11              ;;CODE FOR HORIZONTAL TAB
000012                          LF=     12              ;;CODE FOR LINE FEED
000015                          CR=     15              ;;CODE FOR CARRIAGE RETURN
000200                          CRLF=   200             ;;CODE FOR CARRIAGE RETURN-LINE FEED
177776                          PS=     177776          ;;PROCESSOR STATUS WORD
                                .EQUIV  PS,PSW
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

                                ;*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
000006                          SP=     %6              ;;STACK POINTER
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
                                .EQUIV  SW09,SW9
                                .EQUIV  SW08,SW8
                                .EQUIV  SW07,SW7
                                .EQUIV  SW06,SW6
                                .EQUIV  SW05,SW5
                                .EQUIV  SW04,SW4
                                .EQUIV  SW03,SW3
                                .EQUIV  SW02,SW2
                                .EQUIV  SW01,SW1
                                .EQUIV  SW00,SW0

                                ;*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
                                .EQUIV  BIT09,BIT9
                                .EQUIV  BIT08,BIT8
                                .EQUIV  BIT07,BIT7
                                .EQUIV  BIT06,BIT6
                                .EQUIV  BIT05,BIT5
                                .EQUIV  BIT04,BIT4
                                .EQUIV  BIT03,BIT3
                                .EQUIV  BIT02,BIT2
                                .EQUIV  BIT01,BIT1
                                .EQUIV  BIT00,BIT0

                                ;*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
                000240                     PIRQVEC=240                ;;PROGRAM INTERRUPT REQUEST VECTOR
                000000                             .=0
                                           .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
                000200                     .=200
        000200  005067  000624                     CLR     TYPOUT
        000204  000167  000666                     JMP     START
        000210  012767  000001  000612             MOV     #1,TYPOUT
        000216  000167  000654                     JMP     START

                177776                             PS=177776
                000034                             TRAPVEC=34

                001000                     .=1000
        001000  177570                     SWR:    177570
        001002  177570                     DISPLAY:        177570
        001004  173000                     ROMSA1: 173000
        001006  001000                     DATLN1: 512.
        001010  165000                     ROMSA2: 165000
        001012  001000                     DATLN2: 512.
        001014  000000                     XORS:   0
        001016  000000                     EXCRC:  0
        001020  000000                     EXLPC:  0
        001022  000000                     ACTCRC: 0
        001024  000000                     ACTLPC: 0
        001026  000000                     PARCNT: 0
        001030  000000                     TYPOUT: 0

                                           .SBTTL  ACT11 HOOKS

                                           ;;*************************************************************
                                           ;HOOKS REQUIRED BY ACT11
                001032                             $SVPC=.                    ;SAVE PC
                000046                             .=46
        000046  002042                             $ENDAD                     ;;1)SET LOC.46 TO ADDRESS OF $ENDAD IN .$EOP
                000052                             .=52
        000052  000000                             .WORD   0                  ;;2)SET LOC.52 TO ZERO
                001032                             .=$SVPC                    ;; RESTORE PC
                                           .SBTTL  APT PARAMETER BLOCK

                                           ;;*************************************************************
                                           ;SET LOCATIONS 24 AND 44 AS REQUIRED FOR APT
                                           ;;*************************************************************
                001032                             .$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.
```

```
                        $APTHDR ::POINT TO APT HEADER BLOCK
                        .=.$X   ::RESET LOCATION COUNTER
                ;;*****************************************************************
                ;SETUP APT PARAMETER BLOCK AS DEFINED IN THE APT-PDP11 DIAGNOSTIC
                ;INTERFACE SPEC.

                $APTHD:
001032          $HIBTS: .WORD   0       ;;TWO HIGH BITS OF 18 BIT MAILBOX ADDR.
001032  000000  $MBADR: .WORD   $MAIL   ;;ADDRESS OF APT MAILBOX (BITS 0-15)
001034  001046  $TSTM:  .WORD   2       ;;RUN TIM OF LONGEST TEST
001036  000002  $PASTM: .WORD   2       ;;RUN TIME IN SECS. OF 1ST PASS ON 1 UNIT (QUICK VERIFY)
001040  000000  $UNITM: .WORD   0       ;;ADDITIONAL RUN TIME (SECS) OF A PASS FOR EACH ADDITIONAL UNIT
001042  000014          .WORD   $ETEND-$MAIL/2 ;;LENGTH MAILBOX-ETABLE(WORDS)
                .SBTTL  APT MAILBOX-ETABLE

                ;;*****************************************************************
                .EVEN
001046          $MAIL:                  ;;APT MAILBOX
001046  000000  $MSGTY: .WORD   AMSGTY  ;;MESSAGE TYPE CODE
001050  000000  $FATAL: .WORD   AFATAL  ;;FATAL ERROR NUMBER
001052  000000  $TESTN: .WORD   ATESTN  ;;TEST NUMBER
001054  000000  $PASS:  .WORD   APASS   ;;PASS COUNT
001056  000000  $DEVCT: .WORD   ADEVCT  ;;DEVICE COUNT
001060  000000  $UNIT:  .WORD   AUNIT   ;;I/O UNIT NUMBER
001062  000000  $MSGAD: .WORD   AMSGAD  ;;MESSAGE ADDRESS
001064  000000  $MSGLG: .WORD   AMSGLG  ;;MESSAGE LENGTH
001066          $ETABLE:                ;;APT ENVIRONMENT TABLE
001066  000     $ENV:   .BYTE   AENV    ;;ENVIRONMENT BYTE
001067  000     $ENVM:  .BYTE   AENVM   ;;ENVIRONMENT MODE BITS
001070  000000  $SWREG: .WORD   ASWREG  ;;APT SWITCH REGISTER
001072  000000  $USWR:  .WORD   AUSWR   ;;USER SWITCHES
001074  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
001076          $ETEND:
                .MEXIT

001076  005067  177746          START:  CLR     $FATAL                  ;CLEAR ERROR NO.
001102  005067  177740                  CLR     $MSGTYP                 ;CLEAR MESSAGE TYPE (APT)
001106  012767  000001  177736          MOV     #1,$TESTN               ;SET TEST NO.
                .SBTTL  INITIALIZE THE COMMON TAGS
001114  012706  000500                  MOV     #500,SP         ;;SETUP THE STACK POINTER
                ;;INITIALIZE A FEW VECTORS
001120  012737  004552  000034          MOV     #$TRAP,@#TRAPVEC ;;TRAP VECTOR FOR TRAP CALLS
001126  012737  000340  000036          MOV     #340,@#TRAPVEC+2;LEVEL 7
001134  012737  004374  000024          MOV     #$PWRDN,@#PWRVEC ;;POWER FAILURE VECTOR
001142  012737  000340  000026          MOV     #340,@#PWRVEC+2 ;;LEVEL 7
                ;;SIZE FOR A HARDWARE SWITCH REGISTER. IF NOT FOUND OR IT IS
                ;;EQUAL TO A "-1", SETUP FOR A SOFTWARE SWITCH REGISTER.
001150  013746  000004                  MOV     @#ERRVEC,-(SP)  ;;SAVE ERROR VECTOR
001154  012737  001210  000004          MOV     #64$,@#ERRVEC   ;;SET UP ERROR VECTOR
001162  012767  177570  177E1C          MOV     #DSWR,SWR       ;;SETUP FOR A HARDWARE SWICH REGISTER
```

```
001170  012767  177570  177604          MOV     #DDISP,DISPLAY  ;;AND A HARDWARE DISPLAY REGISTER
001176  022777  177777  177574          CMP     #-1,@SWR        ;;TRY TO REFERENCE HARDWARE SWR
001204  001012                          BNE     66$             ;;BRANCH IF NO TIMEOUT TRAP OCCURRED
                                                                ;;AND  THE HARDWARE SWR IS NOT = -1
001206  000403                          BR      65$             ;;BRANCH IF NO TIMEOUT
001210  012716  001216          64$:    MOV     #65$,(SP)       ;;SET UP FOR TRAP RETURN
001214  000002                          RTI
001216  012767  000176  177554  65$:    MOV     #SWREG,SWR      ;;POINT TO SOFTWARE SWR
001224  012767  000174  177550          MOV     #DISPREG,DISPLAY
001232  012637  000004          66$:    MOV     (SP)+,@#ERRVEC  ;;RESTORE ERROR VECTOR

001236  005067  177612                  CLR     $PASS           ;;CLEAR PASS COUNT
001242  132767  000200  177617          BITB    #APTSIZE,$ENVM  ;;TEST USER SIZE UNDER APT
001250  001403                          BEQ     67$             ;;YES,USE NON-APT SWITCH
001252  012767  001070  177520          MOV     #SSWREG,SWR     ;;NO,USE APT SWITCH REGISTER
001260                  67$:
001260  026727  176556  002042          CMP     42,#SENDAD              ;ACT AUTO MODE?
001266  001402                          BEQ     RESTRT                  ;YIF SO: BR
001270  104401                          TYPE
001272  005026                          TITL

001274  017700  177500          RESTRT: MOV     @SWR,R0                 ;GET SWR
001300  001424                          BEQ     GETIN                   ;IF ZERO: GET INPUT
001302  006300                  ST2:    ASL     R0
001304  016067  004650  177506          MOV     TXLPC(R0),EXLPC         ;FETCH EXPECT. LPC
001312  016067  004626  177476          MOV     TXCRC(R0),EXCRC         ;FETCH EXPECTED CRC
001320  016067  004674  177463          MOV     TDLN1(R0),DATLN1        ;FETCH 1ST LENGTH
001326  016067  004716  177450          MOV     TRMSA1(R0),ROMSA1       ;FETCH 1ST STARTING ADDR.
001334  016067  004740  177450          MOV     TDLN2(R0),DATLN2                ;FETCH 2ND LENGTH
001342  016067  004762  177440          MOV     TRMSA2(R0),ROMSA2       ;FETCH 2ND STARTING ADDR
001350  000450                          BR      CHECK                   ;GO COMPUTE
001352  005767  176464          GETIN:  TST     42                      ;UNDER ACT AUT ACCEPT?
001356  001045                          BNE     CHECK                   ;IF SO; BR USE DEFAULT PARAMETERS
001360  122767  000001  177500          CMPB    #1,$ENV                 ;UNDER APT?
001366  001441                          BEQ     CHECK                   ;IF SO: BR
001370  005767  177434                  TST     TYPOUT                  ;ROM TYPE OPTION
001374  001012                          BNE     GET2                    ;IF SO:  BR
001376  104401                          TYPE
001400  005041                          GETCRC
001402  104407                          RDOCT
001404  012667  177406                  MOV     (SP)+,EXCRC             ;STORE EXPECT. CRC
001410  104401                          TYPE                            ;TYPE LPC INPUT REQUEST
001412  005065                          GETLPC
001414  104407                          RDOCT
001416  012667  177376                  MOV     (SP)+,EXLPC             ;STORE EXPECTED LPC
001422  104401                  GET2:   TYPE
001424  005245                          SA1                             ;REQUEST 1ST ADDRESS SPACE
001426  104407                          RDOCT                           ;INPUT SA
001430  012667  177350                  MOV     (SP)+,ROMSA1
001434  104401                          TYPE                            ;REQUEST LENGTH OF 1ST ADDR. SPACE
001436  005405                          SIZE1
001440  104407                          RDOCT                           ;INPUT LENGTH
001442  012667  177340                  MOV     (SP)+,DATLN1
001446  104401                          TYPE                            ;REQUEST START ADDR. FOR 2ND SPACE
001450  005325                          SA2
001452  104407                          RDOCT                           ;INPUT SA
```

```
                                INITIALIZE THE COMMON TAGS
                                ;
001454  012667  177330          MOV     (SP)+,ROMSA2
001460  104401                  TYPE                    ;REQUEST LENGTH OF 2ND SPACE
001462  005465                  SIZE2
001464  104403                  RDOCT                   ;INPUT LENGTH
001466  012667  177320          MOV     (SP)+,DATLN2
001472  005767  177332  CHECK:  TST     TYPOUT          ;IS TYPOUT REQUESTED?
001476  001402                  BEQ     1$              ;BRANCH IF NOT
001500  000167  000660          JMP     TYPROM          ;GO TYPE OUT POM
001504  005067  177312  1$:     CLR     ACTCRC          ;CLEAR STORAGE FOR ACTUAL CRC
001510  005067  177310          CLR     ACTLPC          ;CLEAR STORAGE FOR ACTULAL LPC
001514  016700  177266          MOV     DATLN1,R0       ;SET LENGTH OF 1ST ROM SPACE
001520  001413                  BEQ     CH0             ;IF NO VERSION SELECTED:  BR
001522  016701  177256          MOV     ROMSA1,R1       ;POINT TO START OF 1ST ROM SPACE
001526  004767  000324          JSR     PC,CRC          ;COMPUTE FIRST HALF OF CRC
001532  016701  177246          MOV     ROMSA1,R1       ;POINT TO START OF 1ST ROM ADDRS.
001536  016700  177244          MOV     DATLN1,R0       ;SET LENGTH OF 1ST ROM ADDRS.
001542  006200                  ASR     R0              ;CONVERT TO WORDS
001544  004767  000556          JSR     PC,LPC          ;COMPUTE FIRST HALF OF CRC
001550  016701  177234  CH0:    MOV     ROMSA2,R1       ;POINT TO 2ND ROM ADDRS.
001554  016700  177232          MOV     DATLN2,R0       ;SET LENGTH OF 2ND ROM ADDRS.
001560  001422                  BEQ     CH1             ;BR IF THIS SPACE NOT USED
001562  004767  000270          JSR     PC,CRC          ;COMPUTE REMAINDER OF CRC
001566  016701  177216          MOV     ROMSA2,R1       ;POINT TO START OF 2ND ROM ADDRS.
001572  016700  177214          MOV     DATLN2,R0       ;SET LENGTH OF 2ND ROM ADDRS.
001576  006200                  ASR     R0              ;CONVERT TO WORDS
001600  004767  000522          JSR     PC,LPC          ;COMPUTE REMAINDER OF LPC
001604  122767  000001  177254  CMPB    #1,$ENV         ;UNDER APT?
001612  001403                  BEQ     1$              ;IF SO:  BR
001614  005767  176222          TST     42              ;UNDER ACT AUTO ACCEPT?
001620  001402                  BEQ     CH1             ;IF NOT:  BR
001622  000167  000656  1$:     JMP     AUTACT
001626  026767  177164  177166  CH1:    CMP     EXCRC,ACTCRC    ;COMPUTED = EXPECTED ?
001634  001431                  BEQ     CK1             ;IF SO:  BR

001636  104401                  TYPE                    ;TYPE CRC ERROR MESG.
001640  005111                  EXCRMG
001642  016746  177150          MOV     EXCRC,-(SP)     ;PUT EXPECT CRC ON STACK
001646  104402                  TYPOC                   ;TYPE EXPECTED CRC
001650  104401                  TYPE                    ;TYPE ACTUAL CRC MESSG
001652  005160                  ACCRMG
001654  016746  177142          MOV     ACTCRC,-(SP)    ;PUT ACTUAL CRC ON STACK
001660  104402                  TYPOC                   ;TYPE ACTUAL CRC
001662  026727  176154  002042  CMP     42,#SENDAD      ;UNDER ACT AUTO MODE?
001670  001404                  BEQ     1$              ;IF SO:  BR
001672  122767  000001  177166  CMPB    #1,$ENV         ;UNDER APT?
001700  001007                  BNE     CK1             ;IF NOT:  BR
001702  012767  000002  177140  1$:     MOV     #2,$FATAL       ;MOVE TO MAILBOX ERROR NO.  ****  2  ****
001710  012767  000001  177130          MOV     #1,$MSGTYP      ;SET MAILBOX FOR FATAL ERROR
001716  000000                  HALT                    ;CRC ERROR

001720  026767  177100  177072  CK1:    CMP     ACTLPC,EXLPC    ;COMPARE EXPT. LPC=ACTUAL LPC
001726  001431                  BEQ     CK2             ;IF SO:  BR
001730  104401                  TYPE                    ;TYPE LPC EPROR MESSG.
001732  005134                  EXLPMG
001734  016746  177060          MOV     EXLPC,-(SP)     ;PUT EXPECTED LPC ON STACK
001740  104402                  TYPOC                   ;TYPE EXPECTED LPC
```

INITIALIZE THE COMMON TAGS

```
                                                TYPE                                    ;TYPE ACTUAL LPC MESSG.
                                                ACLPMG
                    177052                      MOV     ACTLPC,-(SP)                    ;PUT ACTUAL LPC ON STACK
                                                TYPOC                                   ;TYPE ACTUAL LPC
                    176062  002042              CMP     42,#SENDAD                      ;UNDER ACT AUTO MODE?
                                                BEQ     1$                              ;IF SO:  BR
                    177074                      CMPB    #1,$ENV                         ;UNDER APT?
                                                BNE     CK2                             ;IF NOT:  BR
                    177046          1$:         MOV     #3,$FATAL                       ;MOVE TO MAILBOX ERROR NO.  ****  3  ****
                    177036                      MOV     #1,$MSGTYP                      ;SET MAILBOX FOR FATAL ERROR
                                                HALT                                    ;LPC ERROR

                    176024  002042  CK2:        CMP     42,#SENDAD                      ;ACT AUTO ACCEPT?
                                                BEQ     1$                              ;IF SO:  BR
                                                TYPE                                    ;TYPE END OF TEST
                                                EOTST
                    177022          1$:         INC     $PASS                           ;BUMP PASS COUNT
                    000042                      MOV     #42,R0                          ;CHECK APT
                                                BEQ     GOAGIN                          ;KEEP GOING
                                                RESET
                                    SENDAD:     JSR     PC,(R0)                         ;ACT HOOKS
                                                NOP
                                                NOP
                                                NOP
                    177216          GOAGIN:     JMP     RESTRT          ;DO AGAIN

                    176740  176730  CRC:        MOV     ACTCRC,XORS
                                    CL0:        MOVB    (R1),R4                         ;GET CHAR.
                    173024                      CMP     #173024,R1                      ;LOCATION EFFECTED BY SWITCHES
                                                BNE     CL3                             ;IF NOT:  BR
                                                DEC     R0                              ;FIX COUNTERS
                                                DEC     R0
                                                TST     (R1)+                           ;FIX POINTER
                                                BR      CL0                             ;CONTINUE
                    000114          CL3:        JSR     PC,PARITY                       ;GO GET PARITY
                    000166                      JSR     PC,XOR                          ;XOR CHAR
                                                CLC
                                                RCR     R4                              ;ROTATE 1 POS. RIGHT
                                                BCC     CL2                             ;IF NO CARRY: BR
                    000400                      BIS     #400,R4                         ;SET BIT NINE
                                                CLC
                                    CL1:        MOV     R4,R5                           ;SAVE CHAR
                    177703                      BIC     #177703,R5
                                                COM     R5
                    177703                      BIC     #177703,R5
                    000074                      BIC     #74,R4
                                                BIS     R5,R4
                    176636          CL2:        MOV     R4,XORS
                                                DEC     R0
                                                BEQ     CLLAST                          ;IF LAST CAR.:  BR
                    177676                      JMP     CL0                             ;GET NEXT CHAR.
                    176622          CLLAST:     MOV     XORS,R4
                    176616                      COM     XORS
                    177050  176610              BIC     #177050,XORS
                    177727                      BIC     #177727,R4                      ;COMPLEMENT ALL BUT BITS 3 4 5
                    176600                      BIS     R4,XORS
```

INITIALIZE THE COMMON TAGS

```
002214  016767  176574  176600          MOV     XORS,ACTCRC
002222  000207                          RTS     PC
002224  005067  176576          PARITY: CLR     PARCNT          ;CLEAR BIT COUNTER
002230  012703  000010                  MOV     #10,R3          ;SET NO. OF BITS
002234  032704  000001          CLP0:   BIT     #1,R4           ;SEE IF ONE BIT
002240  001402                          BEQ     CLP1            ;IF NOT:  BR
002242  005267  176560                  INC     PARCNT          ;BUMP COUNTER
002246  000241                  CLP1:   CLC
002250  006004                          ROR     R4              ;ROTATE TO NEXT BIT
002252  005303                          DEC     R3
002254  001367                          BNE     CLP0            ;CONTINUE FOR ALL BITS
002256  112104                          MOVB    (R1)+,R4
002260  042704  177400                  BIC     #177400,R4
002264  032767  000001  176534          BIT     #1,PARCNT       ;SEE IF ODD # OF ONE BITS
002272  001002                          BNE     CLP2            ;IF SO:  BR
002274  052704  000400                  BIS     #400,R4         ;SET PARITY BIT
002300  000207                  CLP2:   RTS     PC              ;EXIT

002302  010446          XOR:    MOV     R4,-(SP)        ;XOR SUBROUTINE: R4 WITH XORS
002304  046716  176504                  BIC     XORS,(SP)
002310  040467  176500                  BIC     R4,XORS
002314  052667  176474                  BIS     (SP)+,XORS
002320  016704  176470                  MOV     XORS,R4
002324  000207                          RTS     PC

002326  016767  176472  176460  LPC:    MOV     ACTLPC,XORS
002334  012104          LPC1:   MOV     (R1)+,R4
002336  022701  173026                  CMP     #173026,R1      ;LOCATION EFFECTED BY SWITCHES
002342  001402                          BEQ     LPC2            ;IF SO:  SKIP LOC. BY BRANCHING
002344  004767  177732                  JSR     PC,XOR
002350  005300          LPC2:   DEC     R0
002352  001370                          BNE     LPC1
002354  016767  176434  176442          MOV     XORS,ACTLPC
002362  000207                          RTS     PC

002364  104401          TYPROM: TYPE                    ;TYPE HEADER
002366  005553                  TYPHDR
002370  016700  176410                  MOV     ROMSA1,R0       ;POINT AT 1ST ROM SPACE
002374  016701  176406                  MOV     DATLN1,R1       ;PUT LENGTH IN R1
002400  006201                          ASR     R1              ;CONVERT TO WORDS
002402  001402                          BEQ     TYPR1           ;BRANCH IF 1ST ROM SPACE NOT USED
002404  004767  000026                  JSR     PC,TYP          ;GO TYPE 1ST ADDR. SPACE
002410  016700  176374          TYPR1:  MOV     ROMSA2,R0       ;POINT TO 2ND ADDR. SPACE
002414  016701  176372                  MOV     DATLN2,R1       ;PUT LENGTH IN R1
002420  006201                          ASR     R1              ;CONVERT TO WORDS
002422  001402                          BEQ     ENDCT           ;BR IF 2ND ADDR. SPACE NOT USED
002424  004767  000006                  JSR     PC,TYP          ;GO TYPE 2ND ADDR. SPACE
002430  104401          ENDCT:  TYPE
002432  005226                  EOTST
002434  000000                  HALT

002436  104401          TYP:    TYPE
002440  005545                  CRLF
002442  000403                  BR      TYP3
002444  032700  000003  TYP0:   BIT     #3,R0           ;ADDRESS MULTIPLE OF 4?
002450  001006                  BNE     TYP2            ;IF NOT:  BR
```

```
                                TYP3:   TYPE
                                        CARLF
                                        MOV     R0,-(SP)                ;PUT ADDRESS ON STACK
                                        TYPOC                           ;TYPE ADDR.
                                        TYPE
                                        COLON
                                TYP2:   MOV     (R0)+,-(SP)             ;PUT DATA ON STACK
                                        TYPOC                           ;TYP DATA
                                        TYPE                            ;TYPE 2 SPACES
                                        SP2
                                        DEC     R1                      ;FINISHED?
                                        BNE     TYP0                    ;IF NOT:  BR
                                        RTS     PC                      ;RETURN
                                ALTACT: CLR     R0
                                ALT1:   ADD      #2,R0                  ;BUMP TALBE INDEX
                                        CMP     TMSG(R0),#-1            ;CHECKED ALL KNOWN VERSIONS?
                                        BEQ     AUTERR                  ;IF SO:  BR
                                        CMP     TXCRC(R0),ACTCRC        ;DOES THIS CRC AGREE?
                                        BNE     AUT1                    ;IF NOT:  KEEP LOOKING
                                        CMP     @#42,#SENDAD            ;UNDER ACT AUTO ACCEPT?
                                        BEQ     AUT3                    ;IF SO:  BR
                                        MOV     TMSG(R0),AUT2           ;SET UP VERSION MESSAGE
                                        TYPE
                                AUT2:   0
                                ALT3:   MOV     TXCRC(R0),EXCRC         ;SET EXPECTED CRC
                                        MOV     TXLPC(R0),EXLPC         ;SET EXPECTED LPC
                                        JMP     CK1                     ;CHECK LPC

                                AUTERR: TYPE
                                        AUTERM
                                        MOV     #1,$FATAL               ;MOVE TO MAILBOX ERROR NO.  ****  :  ****
                                        MOV     #1,$MSGTYP              ;SET MAILBOX FOR FATAL ERROR
                                        HALT                            ;AUTO ACCEPT FAILED

                                .SBTTL  TTY INPUT ROUTINE

                                ;;*********************************************************************
                                $TKS:   .WORD   177560          ;;TTY KBD STATUS
                                $TKB:   .WORD   177562          ;;TTY KBD BUFFER
                                .ENABL  LSB

                                .DSABL  LSB


                                ;;*********************************************************************
                                ;*THIS ROUTINE WILL INPUT A SINGLE CHARACTER FROM THE TTY
                                ;*CALL:
                                ;*      RDCHR                   ;;INPUT A SINGLE CHARACTER FROM THE TTY
                                ;*      RETURN HERE             ;;CHARACTER IS ON THE STACK
                                ;*                              ;;WITH PARITY BIT STRIPPED OFF
                                ;
                                $RDCHR: MOV     (SP),-(SP)      ;;PUSH DOWN THE PC
                                        MOV     4(SP),2(SP)     ;;SAVE THE PS
                                1$:     TSTB    @$TKS           ;;WAIT FOR
                                        BPL     1$              ;;A CHARACTER
```

```
 .MAIN.  MACY11 27.(006)  27-SEP-76  14:46  PAGE 1*
DZ9AB.P11    27-SEP-76 14:43          TTY INPUT ROUTINE

    842  002640  117766  177754  000004          MOVB    @$TKB,4.SP)     ;;READ THE TTY
    843  002646  042766  177600  000004          BIC     #^C(177.,4(SP)  ;;GET RID OF JUNK IF ANY
    844  002654  026627  000004  000023          CMP     4(SP),#23       ;;IS IT A CONTROL-S?
    845  002662  001013                          BNE     3$              ;;BRANCH IF NO
    846  002664  105777  177726          2$:     TSTB    @$TKS           ;;WAIT FOR A CHARACTER
    847  002670  100375                          BPL     2$              ;;LOOP UNTIL ITS THERE
    848  002672  117746  177722                  MOVB    @$TKB,-(SP)     ;;GET CHARACTER
    849  002676  042716  177600                  BIC     #^C177.,(SP)    ;;MAKE IT 7-BIT ASCII
    850  002702  022627  000021                  CMP     (SP)+,#21       ;;IS IT A CONTROL-Q?
    851  002706  001366                          BNE     2$              ;;IF NOT DISCARD IT
    852  002710  000750                          BR      1$              ;;YES, RESUME
    853  002712  026627  000004  000140  3$:     CMP     4(SP),#140      ;;IS IT UPPER CASE?
    854  002720  002407                          BLT     4$              ;;BRANCH IF YES
    855  002722  026627  000004  000175          CMP     4(SP),#175      ;;IS IT A SPECIAL CHAR?
    856  002730  003003                          BGT     4$              ;;BRANCH IF YES
    857  002732  042766  000040  000004          BIC     #40,4(SP)       ;;MAKE IT UPPER CASE
    858  002740  000002                  4$:     RTI                     ;;GO BACK TO USER
    859                                          ;;*****************************************************************
    860                                          ;*THIS ROUTINE WILL INPUT A STRING FROM THE TTY
    861                                          ;*CALL:
    862                                          ;*      RDLIN                   ;;INPUT A STRING FROM THE TTY
    863                                          ;*      RETURN HERE             ;;ADDRESS OF FIRST CHARACTER WILL BE ON THE STACK
    864                                          ;*                              ;;TERMINATOR WILL BE A BYTE OF ALL 0'S
    865
    866  002742  010346                  $RDLIN: MOV     R3,-(SP)        ;;SAVE R3
    867  002744  005046                          CLR     -(SP)           ;;CLEAR THE RUBOUT KEY
    868  002746  012703  003176          1$:     MOV     #$TTYIN,R3      ;;GET ADDRESS
    869  002752  022703  003206          2$:     CMP     #$TTYIN+80.,R3  ;;BUFFER FULL?
    870  002756  101456                          BLOS    4$              ;;BR IF YES
    871  002760  104405                          RDCHR                   ;;GO READ ONE CHARACTER FROM THE TTY
    872  002762  112613                          MOVB    (SP)+,(R3)      ;;GET CHARACTER
    873  002764  122713  000177          10$:    CMPB    #177,(R3)       ;;IS IT A RUBOUT
    874  002770  001022                          BNE     5$              ;;BR IF NO
    875  002772  005716                          TST     (SP)            ;;IS THIS THE FIRST RUBOUT?
    876  002774  001007                          BNE     6$              ;;BR IF NO
    877  002776  112767  000134  000170          MOVB    #'\,9$          ;;TYPE A BACK SLASH
    878  003004  104401  003174                  TYPE    ,9$
    879  003010  012716  177777                  MOV     #-1,(SP)        ;;SET THE RUBOUT KEY
    880  003014  005303                  6$:     DEC     R3              ;;BACKUP BY ONE
    881  003016  020327  003176                  CMP     R3,#$TTYIN      ;;STACK EMPTY?
    882  003022  103434                          BLO     4$              ;;BR IF YES
    883  003024  111367  000144                  MOVB    (R3),9$         ;;SETUP TO TYPEOUT THE DELETED CHAR.
    884  003030  104401  003174                  TYPE    ,9$             ;;GO TYPE
    885  003034  000746                          BR      2$              ;;GO READ ANOTHER CHAR.
    886  003036  005716                  5$:     TST     (SP)            ;;RUBOUT KEY SET?
    887  003040  001406                          BEQ     7$              ;;BR IF NO
    888  003042  112767  000134  000124          MOVB    #'\,9$          ;;TYPE A BACK SLASH
    889  003050  104401  003174                  TYPE    ,9$
    890  003054  005016                          CLR     (SP)            ;;CLEAR THE RUBOUT KEY
    891  003056  122713  000025          7$:     CMPB    #25,(R3)        ;;IS CHARACTER A CTRL U?
    892  003062  001003                          BNE     8$              ;;BR IF NO
    893  003064  104401  003212                  TYPE    ,$CNTLU         ;;TYPE A CONTROL "U"
    894  003070  000726                          BR      1$              ;;GO START OVER
    895  003072  122713  000022          8$:     CMPB    #22,(R3)        ;;IS CHARACTER A "^R"?
    896  003076  001011                          BNE     3$              ;;BRANCH IF NO
    897  003100  105013                          CLRB    (R3)            ;;CLEAR THE CHARACTER
```

```
.MAIN.  MACY11 27(1006)  27-SEP-76  14:46  PAGE 18
C2^9AB.P11    27-SEP-76 14:43          TTY INPUT ROUTINE


                                       TYPE    ,$CRLF          ;;TYPE A "CR" & "LF"
                                       TYPE    ,$TTYIN         ;;TYPE THE INPUT STRING
                                       BR      2$              ;;GO PICKUP ANOTHER CHACTER
                                4$:    TYPE    ,$QUES          ;;TYPE A '?'
                                       BR      1$              ;;CLEAR THE BUFFER AND LOOP
                                3$:    MOVB    (R3),9$         ;;ECHO THE CHARACTER
                                       TYPE    ,9$
                                       CMPB    #15,(R3)+       ;;CHECK FOR RETURN
                                       BNE     2$              ;;LOOP IF NOT RETURN
                                       CLRB    -1(R3)          ;;CLEAR RETURN (THE 15)
                                       TYPE    ,$LF            ;;TYPE A LINE FEED
                                       TST     (SP)+           ;;CLEAN RUBOUT KEY FROM THE STACK
                                       MOV     (SP)+,R3        ;;RESTORE R3
                                       MOV     (SP),-(SP)      ;;ADJUST THE STACK AND PUT ADDRESS OF THE
                                       MOV     4(SP),2(SP)     ;;       FIRST ASCII CHARACTER ON IT
                                       MOV     #$TTYIN,4(SP)
                                       RTI                     ;;RETURN
                                9$:    .BYTE   0               ;;STORAGE FOR ASCII CHAR. TO TYPE
                                       .BYTE   0               ;;TERMINATOR
                                $TTYIN: .BLKB  8.              ;;RESERVE 8 BYTES FOR TTY INPUT
                                $QUES:  .ASCII  "?"     ;;QUESTION MARK
                                $CRLF:  .ASCII  <15>    ;;CARRIAGE RETURN
                                $LF:    .ASCIZ  <12>    ;;LINE FEED
                                $CNTLU: .ASCIZ  /^U/<15><12>    ;;CONTROL "U"
                                $CNTLG: .ASCIZ  /^G/<15><12>    ;;CONTROL "G"
                                $MSWR:  .ASCIZ  <15><12>/SWR = /
                                $MNEW:  .ASCIZ  /  NEW = /

                                .SBTTL  READ AN OCTAL NUMBER FROM THE TTY

                                ;;*****************************************************************
                                ;*THIS ROUTINE WILL READ AN OCTAL (ASCII) NUMBER FROM THE TTY AND
                                ;*CHANGE IT TO BINARY.
                                ;*THE INPUT CHARACTERS WILL BE CHECKED TO INSURED THEY ARE LEGAL
                                ;*OCTAL DIGITS. IF AN ILLEGAL CHARACTER IS READ A "?" WILL BE TYPED
                                ;*FOLLOWED BY A CARRIAGE RETURN-LINE FEED. THE COMPLETE NUMBER MUST
                                ;*THEN BE RETYPED. THE INPUT IS TERMINATED BY TYPING A CARRIAGE RETURN.
                                ;*CALL:
                                ;*      RDOCT                   ;;READ AN OCTAL NUMBER
                                ;*      RETURN HERE             ;;LOW ORDER BITS ARE ON TOP OF THE STACK
                                ;*                              ;;HIGH ORDER BITS ARE IN $HIOCT

                                $RDOCT: MOV     (SP),-(SP)      ;;PROVIDE SPACE FOR THE
                                        MOV     4(SP),2(SP)     ;;INPUT NUMBER
                                        MOV     R0,-(SP)        ;;PUSH R0 ON STACK
                                        MOV     R1,-(SP)        ;;PUSH R1 ON STACK
                                        MOV     R2,-(SP)        ;;PUSH R2 ON STACK
                                1$:     RDLIN                   ;;READ AN ASCIZ LINE
                                        MOV     (SP)+,R0        ;;GET ADDRESS OF 1ST CHARACTER
                                        MOV     R0,5$           ;;AND SAVE IT
                                        CLR     R1              ;;CLEAR DATA WORD
                                        CLR     R2
                                2$:     MOVB    (R0)+,-(SP)     ;;PICKUP THIS CHARACTER
                                        BEQ     3$              ;;IF ZERO GET OUT
                                        CMPB    #'0,(SP)        ;;MAKE SURE THIS CHARACTER
```

```
003310  003026                          BGT     4$              ;;IS AN OCTAL DIGIT
003312  122716  000067                  CMPB    #'7,(SP)
003316  002423                          BLT     4$
003320  006301                          ASL     R1              ;;*2
003322  006102                          ROL     R2
003324  006301                          ASL     R1              ;;*4
003326  006102                          ROL     R2
003330  006301                          ASL     R1              ;;*8
003332  006102                          ROL     R2
003334  042716  177770                  BIC     #^C7,(SP)       ;;STRIP THE ASCII JUNK
003340  062601                          ADD     (SP)+,R1        ;;ADD IN THIS DIGIT
003342  000756                          BR      2$              ;;LOOP
003344  005726                  3$:     TST     (SP)+           ;;CLEAN TERMINATOR FROM STACK
003346  010166  000012                  MOV     R1,12(SP)       ;;SAVE THE RESULT
003352  010267  000026                  MOV     R2,$HIOCT
003356  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
003360  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
003362  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
003364  000002                          RTI                     ;;RETURN
003366  005726                  4$:     TST     (SP)+           ;;CLEAN PARTIAL FROM STACK
003370  105010                          CLRB    (R0)            ;;SET A TERMINATOR
003372  104401                          TYPE                    ;;TYPE UP THRU THE BAD CHAR.
003374  000000                  5$:     .WORD   0
003376  104401  003206                  TYPE    ,$QUES          ;;"?" "CR" & "LF"
003402  000730                          BR      1$              ;;TRY AGAIN
003404  000000                  $HIOCT: .WORD   0               ;;HIGH ORDER BITS GO HERE
                                .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
                                ;*
003406  105767  000265          $TYPE:  TSTB    $TPFLG          ;;IS THERE A TERMINAL?
003412  100002                          BPL     1$              ;;BR IF YES
003414  000000                          HALT                    ;;HALT HERE IF NO TERMINAL
003416  000430                          BR      3$              ;;LEAVE
003420  010046                  1$:     MOV     R0,-(SP)        ;;SAVE R0
003422  017600  000002                  MOV     @2(SP),R0       ;;GET ADDRESS OF ASCIZ STRING
003426  122767  000001  175432          CMPB    #APTENV,$ENV    ;;RUNNING IN APT MODE
003434  001011                          BNE     62$             ;;NO,GO CHECK FOR APT CONSOLE
003436  132767  000100  175423          BITB    #APTSPOOL,$ENVM ;;SPOOL MESSAGE TO APT
003444  001405                          BEQ     62$             ;;NO,GO CHECK FOR CONSOLE
003446  010067  000004                  MOV     R0,61$          ;;SETUP MESSAGE ADDRESS FOR APT
003452  004767  000230                  JSR     PC,$ATY3        ;;SPOOL MESSAGE TO APT
003456  000000                  61$:    .WORD   0               ;;MESSAGE ADDRESS
```

```
003460  132767  000040  175401  62$:    BITB    #APTCSUP,$ENVM      ;;APT CONSOLE SUPPRESSED
003466  001003                          BNE     60$                 ;;YES,SKIP TYPE OUT
003470  112046                  2$:     MOVB    (R0)+,-(SP)         ;;PUSH CHARACTER TO BE TYPED ONTO STACK
003472  001005                          BNE     4$                  ;;BR IF IT ISN'T THE TERMINATOR
003474  005726                          TST     (SP)+               ;;IF TERMINATOR POP IT OFF THE STACK
003476  012600                  60$:    MOV     (SP)+,R0            ;;RESTORE R0
003500  062716  000002          3$:     ADD     #2,(SP)             ;;ADJUST RETURN PC
003504  000002                          RTI                         ;;RETURN
003506  122716  000011          4$:     CMPB    #HT,(SP)            ;;BRANCH IF <HT>
003512  001430                          BEQ     8$
003514  122716  000200                  CMPB    #CRLF,(SP)          ;;BRANCH IF NOT <CRLF>
003520  001006                          BNE     5$
003522  005726                          TST     (SP)+               ;;POP  <CR><LF> EQUIV
003524  104401                          TYPE                        ;;TYPE A CR AND LF
003526  003207                          $CRLF
003530  105067  000130                  CLRB    $CHARCNT            ;;CLEAR CHARACTER COUNT
003534  000755                          BR      2$                  ;;GET NEXT CHARACTER
003536  004767  000056          5$:     JSR     PC,$TYPEC           ;;GO TYPE THIS CHARACTER
003542  126726  000130          6$:     CMPB    $FILLC,(SP)+        ;;IS IT TIME FOR FILLER CHARS.?
003546  001350                          BNE     2$                  ;;IF NO GO GET NEXT CHAR.
003550  016746  000120                  MOV     $NULL,-(SP)         ;;GET # OF FILLER CHARS. NEEDED
                                                                    ;;AND THE NULL CHAR.
003554  105366  000001          7$:     DECB    1(SP)               ;;DOES A NULL NEED TO BE TYPED?
003560  002770                          BLT     6$                  ;;BR IF NO--GO POP THE NULL OFF OF STACK
003562  004767  000032                  JSR     PC,$TYPEC           ;;GO TYPE A NULL
003566  105367  000072                  DECB    $CHARCNT            ;;DO NOT COUNT AS A COUNT
003572  000770                          BR      7$                  ;;LOOP

                                ;HORIZONTAL TAB PROCESSOR

003574  112716  000040          8$:     MOVB    #' ,(SP)            ;;REPLACE TAB WITH SPACE
003600  004767  000014          9$:     JSR     PC,$TYPEC           ;;TYPE A SPACE
003604  132767  000007  000052          BITB    #7,$CHARCNT         ;;BRANCH IF NOT AT
003612  001372                          BNE     9$                  ;;TAB STOP
003614  005726                          TST     (SP)+               ;;POP SPACE OFF STACK
003616  000724                          BR      2$                  ;;GET NEXT CHARACTER
003620  105777  000044          $TYPEC: TSTB    @$TPS               ;;WAIT UNTIL PRINTER IS READY
003624  100375                          BPL     $TYPEC
003626  116677  000002  000036          MOVB    2(SP),@$TPB         ;;LOAD CHAR TO BE TYPED INTO DATA REG.
003634  122766  000015  000002          CMPB    #CR,2(SP)           ;;IS CHARACTER A CARRIAGE RETURN?
003642  001003                          BNE     1$                  ;;BRANCH IF NO
003644  105067  000014                  CLRB    $CHARCNT            ;;YES--CLEAR CHARACTER COUNT
003650  000406                          BR      $TYPEX              ;;EXIT
003652  122766  000012  000002  1$:     CMPB    #LF,2(SP)           ;;IS CHARACTER A LINE FEED?
003660  001402                          BEQ     $TYPEX              ;;BRANCH IF YES
003662  105227                          INCB    (PC)+               ;;COUNT THE CHARACTER
003664  000000                  $CHARCNT:.WORD  0                   ;;CHARACTER COUNT STORAGE
003666  000207                  $TYPEX: RTS     PC

003670  177564                  $TPS:   .WORD   177564              ;;TTY PRINTER STATUS REG. ADDRESS
003672  177566                  $TPB:   .WORD   177566              ;;TTY PRINTER BUFFER REG. ADDRESS
003674     000                  $NULL:  .BYTE   0                   ;;CONTAINS NULL CHARACTER FOR FILLS
003675     002                  $FILLS: .BYTE   2                   ;;CONTAINS # OF FILLER CHARACTERS REQUIRED
003676     012                  $FILLC: .BYTE   12                  ;;INSERT FILL CHARS. AFTER A "LINE FEED"
003677     000                  $TPFLG: .BYTE   0                   ;;"TERMINAL AVAILABLE" FLAG (BIT<07>=0=YES)
                                .SBTTL  APT COMMUNICATIONS ROUTINE
```

L02


```
                                ;;*****************************************************************
003700  112767  000001  000236  $ATY1:  MOVB    #1,$FFLG        ;;TO REPORT FATAL ERROR
003706  112767  000001  000226  $ATY3:  MOVB    #1,$MFLG        ;;TO TYPE A MESSAGE
003714  000403                   BR      $ATYC
003716  112767  000001  000220  $ATY4:  MOVB    #1,$FFLG        ;;TO ONLY REPORT FATAL ERROR
003724                           $ATYC:
003724  010046                   MOV     R0,-(SP)        ;;PUSH R0 ON STACK
003726  010146                   MOV     R1,-(SP)        ;;PUSH R1 ON STACK
003730  105767  000206           TSTB    $MFLG           ;;SHOULD TYPE A MESSAGE?
003734  001450                   BEQ     5$              ;;IF NOT:  BR
003736  122767  000001  175122   CMPB    #APTENV,$ENV    ;;OPERATING UNDER APT?
003744  001031                   BNE     3$              ;;IF NOT:  BR
003746  132767  000100  175113   BITB    #APTSPOOL,$ENVM ;;SHOULD SPOOL MESSAGES?
003754  001425                   BEQ     3$              ;;IF NOT:  BR
003756  017600  000004           MOV     @4(SP),R0       ;;GET MESSAGE ADDR.
003762  062766  000002  000004   ADD     #2,4(SP)                ;;BUMP RETURN ADDR.
003770  005767  175052           1$:     TST     $MSGTYPE        ;;SEE IF DONE W/ LAST XMISSION?
003774  001375                   BNE     1$              ;;IF NOT:  WAIT
004000  010067  175060           MOV     R0,$MSGAD       ;;PUT ADDR IN MAILBOX
004004  105720                   2$:     TSTB    (R0)+           ;;FIND END OF MESSAGE
004006  001376                   BNE     2$
004010  166700  175050           SUB     $MSGAD,R0       ;;SUB START OF MESSAGE
004014  006200                   ASR     R0              ;;GET MESSAGE LNGTH IN WORDS
004016  010067  175044           MOV     R0,$MSGLGT      ;;PUT LENGTH IN MAILBOX
004022  012767  000004  175020   MOV     #4,$MSGTYPE     ;;TELL APT TO TAKE MSG.
004026  000413                   BR      5$
004030  017667  000004  000016   3$:     MOV     @4(SP),4$       ;;PUT MSG ADDR IN JSR LINKAGE
004036  062766  000002  000004   ADD     #2,4(SP)                ;;BUMP RETURN ADDRESS
004044  016746  177726           MOV     177776,-(SP)    ;;PUSH 177776 ON STACK
004050  004767  177332           JSR     PC,$TYPE        ;;CALL TYPE MACRO
004054  000000                   4$:     .WORD   0
004056                           5$:
004056  105767  000062           10$:    TSTB    $FFLG           ;;SHOULD REPORT FATAL ERROR?
004062  001416                   BEQ     12$             ;;IF NOT:  BR
004064  005767  174776           TST     $ENV            ;;RUNNING UNDER APT?
004070  001413                   BEQ     12$             ;;IF NOT:  BR
004072  005767  174750           11$:    TST     $MSGTYPE        ;;FINISHED LAST MESSAGE?
004076  001375                   BNE     11$             ;;IF NOT:  WAIT
004100  017667  000004  174742   MOV     @4(SP),$FATAL   ;;GET ERROR #
004106  062766  000002  000004   ADD     #2,4(SP)                ;;BUMP RETURN ADDR.
004114  005267  174726           INC     $MSGTYPE        ;;TELL APT TO TAKE ERROR
004120  105067  000020           12$:    CLRB    $FFLG           ;;CLEAR FATAL FLAG
004124  105067  000013           CLRB    $LFLG           ;;CLEAR LOG FLAG
004130  105067  000006           CLRB    $MFLG           ;;CLEAR MESSAGE FLAG
004134  012601                   MOV     (SP)+,R1        ;;POP STACK INTO R1
004136  012600                   MOV     (SP)+,R0        ;;POP STACK INTO R0
004140  000207                   RTS     PC              ;;RETURN
004142  000                      $MFLG:  .BYTE   0               ;;MESSG. FLAG
004143  000                      $LFLG:  .BYTE   0               ;;LOG FLAG
004144  000                      $FFLG:  .BYTE   0               ;;FATAL FLAG
004146                                   .EVEN
000200                           APTSIZE=200
000001                           APTENV=001
000100                           APTSPOOL=100
000040                           APTCSLF=040
```

```
                                BINARY TO OCTAL (ASCII) AND TYPE

                                .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

004146  017646  000000          $TYPOS: MOV     @(SP),-(SP)     ;;PICKUP THE MODE
004152  116667  000001  000211          MOVB    1(SP),$OFILL    ;;LOAD ZERO FILL SWITCH
004160  112667  000207                  MOVB    (SP)+,$OMODE+1  ;;NUMBER OF DIGITS TO TYPE
004164  062716  000002                  ADD     #2,(SP)         ;;ADJUST RETURN ADDRESS
004170  000406                          BR      $TYPON
004172  112767  000001  000171  $TYPOC: MOVB    #1,$OFILL       ;;SET THE ZERO FILL SWITCH
004200  112767  000006  000165          MOVB    #6,$OMODE+1     ;;SET FOR SIX(6) DIGITS
004206  112767  000005  000154  $TYPON: MOVB    #5,$OCNT        ;;SET THE ITERATION COUNT
004214  010346                          MOV     R3,-(SP)        ;;SAVE R3
004216  010446                          MOV     R4,-(SP)        ;;SAVE R4
004220  010546                          MOV     R5,-(SP)        ;;SAVE R5
004222  116704  000145                  MOVB    $OMODE+1,R4     ;;GET THE NUMBER OF DIGITS TO TYPE
004226  005404                          NEG     R4
004230  062704  000006                  ADD     #6,R4           ;;SUBTRACT IT FOR MAX. ALLOWED
004234  110467  000132                  MOVB    R4,$OMODE       ;;SAVE IT FOR USE
004240  116704  000125                  MOVB    $OFILL,R4       ;;GET THE ZERO FILL SWITCH
004244  016605  000012                  MOV     12(SP),R5       ;;PICKUP THE INPUT NUMBER
004250  005003                          CLR     R3              ;;CLEAR THE OUTPUT WORD
004252  006105                  1$:     ROL     R5              ;;ROTATE MSB INTO "C"
004254  000404                          BR      3$              ;;GO DO MSB
004256  006105                  2$:     ROL     R5              ;;FORM THIS DIGIT
004260  006105                          ROL     R5
004262  006105                          ROL     R5
004264  010503                          MOV     R5,R3
004266  006103                  3$:     ROL     R3              ;;GET LSB OF THIS DIGIT
004270  105367  000076                  DECB    $OMODE          ;;TYPE THIS DIGIT?
004274  100016                          BPL     7$              ;;BR IF NO
004276  042703  177770                  BIC     #177770,R3      ;;GET RID OF JUNK
004302  001002                          BNE     4$              ;;TEST FOR 0
004304  005704                          TST     R4              ;;SUPPRESS THIS 0?
004306  001403                          BEQ     5$              ;;BR IF YES
```

```
1178  004310  005204                  4$:     INC     R4                      ;;DON'T SUPPRESS ANYMORE 0'S
1179  004312  052703  000060                  BIS     #'0,R3                  ;;MAKE THIS DIGIT ASCII
1180  004316  052703  000040          5$:     BIS     #' ,R3                  ;;MAKE ASCII IF NOT ALREADY
1181  004322  110367  000040                  MOVB    R3,8$                   ;;SAVE FOR TYPING
1182  004326  104401  004366                  TYPE    ,8$                     ;;GO TYPE THIS DIGIT
1183  004332  105367  000032          7$:     DECB    $OCNT                   ;;COUNT BY 1
1184  004336  003347                          BGT     2$                      ;;BR IF MORE TO DO
1185  004340  002402                          BLT     6$                      ;;BR IF DONE
1186  004342  005204                          INC     R4                      ;;INSURE LAST DIGIT ISN'T A BLANK
1187  004344  000744                          BR      2$                      ;;GO DO THE LAST DIGIT
1188  004346  012605                  6$:     MOV     (SP)+,R5                ;;RESTORE R5
1189  004350  012604                          MOV     (SP)+,R4                ;;RESTORE R4
1190  004352  012603                          MOV     (SP)+,R3                ;;RESTORE R3
1191  004354  016666  000002  000004         MOV     2(SP),4(SP)             ;;SET THE STACK FOR RETURNING
1192  004362  012616                          MOV     (SP)+,(SP)
1193  004364  000002                          RTI                             ;;RETURN
1194  004366     000                  8$:     .BYTE   0                       ;;STORAGE FOR ASCII DIGIT
1195  004367     000                          .BYTE   0                       ;;TERMINATOR FOR TYPE ROUTINE
1196  004370     000                  $OCNT:  .BYTE   0                       ;;OCTAL DIGIT COUNTER
1197  004371     000                  $OFILL: .BYTE   0                       ;;ZERO FILL SWITCH
1198  004372  000000                  $OMODE: .WORD   0                       ;;NUMBER OF DIGITS TO TYPE
1199                                  .SBTTL  POWER DOWN AND UP ROUTINES
1200
1201                                  ;;**************************************************************
1202                                  ;POWER DOWN ROUTINE
1203  004374  012737  004534  000024  $PWRDN: MOV     #$ILLUP,@#PWRVEC        ;;SET FOR FAST UP
1204  004402  012737  000340  000026          MOV     #340,@#PWRVEC+2         ;;PRIO:7
1205  004410  010046                          MOV     R0,-(SP)                ;;PUSH R0 ON STACK
1206  004412  010146                          MOV     R1,-(SP)                ;;PUSH R1 ON STACK
1207  004414  010246                          MOV     R2,-(SP)                ;;PUSH R2 ON STACK
1208  004416  010346                          MOV     R3,-(SP)                ;;PUSH R3 ON STACK
1209  004420  010446                          MOV     R4,-(SP)                ;;PUSH R4 ON STACK
1210  004422  010546                          MOV     R5,-(SP)                ;;PUSH R5 ON STACK
1211  004424  017746  174350                  MOV     @SWR,-(SP)              ;;PUSH @SWR ON STACK
1212  004430  010667  000104                  MOV     SP,$SAVR6               ;;SAVE SP
1213  004434  012737  004446  000024          MOV     #$PWRUP,@#PWRVEC        ;;SET UP VECTOR
1214  004442  000000                          HALT
1215  004444  000775                          BR      .-2                     ;;HANG UP
1216
1217                                  ;;**************************************************************
1218                                  ;POWER UP ROUTINE
1219  004446  012737  004534  000024  $PWRUP: MOV     #$ILLUP,@#PWRVEC        ;;SET FOR FAST DOWN
1220  004454  016706  000060                  MOV     $SAVR6,SP               ;;GET SP
1221  004460  005067  000054                  CLR     $SAVR6                  ;;WAIT LOOP FOR THE TTY
1222  004464  005267  000050          1$:     INC     $SAVR6                  ;;WAIT FOR THE INC
1223  004470  001375                          BNE     1$                      ;;OF  WORD
1224  004472  012677  174302                  MOV     (SP)+,@SWR              ;;POP STACK INTO @SWR
1225  004476  012605                          MOV     (SP)+,R5                ;;POP STACK INTO R5
1226  004500  012604                          MOV     (SP)+,R4                ;;POP STACK INTO R4
1227  004502  012603                          MOV     (SP)+,R3                ;;POP STACK INTO R3
1228  004504  012602                          MOV     (SP)+,R2                ;;POP STACK INTO R2
1229  004506  012601                          MOV     (SP)+,R1                ;;POP STACK INTO R1
1230  004510  012600                          MOV     (SP)+,R0                ;;POP STACK INTO R0
1231  004512  012737  004374  000024          MOV     #$PWRDN,@#PWRVEC        ;;SET UP THE POWER DOWN VECTOR
1232  004520  012737  000340  000026          MOV     #340,@#PWRVEC+2         ;;PRIO:7
1233  004526  10  01                         TYPE                            ;REPORT THE POWER FAILURE
```

POWER DOWN AND UP ROUTINES

```
                                SPWRMG: .WORD   SPOWER          ;;POWER FAIL MESSAGE POINTER
                                        RTI
                                $ILLUP: HALT                    ;;THE POWER UP SEQUENCE WAS STARTED
                                        BR      .-2             ;; BEFORE THE POWER DOWN WAS COMPLETE
                                $SAVR6: 0                       ;;PUT THE SP HERE
                                SPOWER: .ASCIZ  <15><12>"POWER"

                                        .EVEN
                                .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.

                                $TRAP:  MOV     R0,-(SP)        ;;SAVE R0
                                        MOV     2(SP),R0        ;;GET TRAP ADDRESS
                                        TST     -(R0)           ;;BACKUP BY 2
                                        MOVB    (R0),R0         ;;GET RIGHT BYTE OF TRAP
                                        ASL     R0              ;;POSITION FOR INDEXING
                                        MOV     $TRPAD(R0),R0   ;;INDEX TO TABLE
                                        PTS     R0              ;;GO TO ROUTINE


                                ;;THIS IS USE TO HANDLE THE "GETPRI" MACRO

                                $TRAP2: MOV     (SP),-(SP)      ;;MOVE THE PC DOWN
                                        MOV     4(SP),2(SP)     ;;MOVE THE PSW DOWN
                                        RTI                     ;;RESTORE THE PSW

                                .SBTTL  TRAP TABLE

                                ;*THIS TABLE CONTAINS THE STARTING ADDRESSES OF THE ROUTINES CALLED
                                ;*BY THE "TRAP" INSTRUCTION.

                                :       ROUTINE
                                :       -------
                                $TRPAD: .WORD   $TRAP2
                                        $TYPE   ;;CALL=TYPE     TRAP+1(104401)  TTY TYPEOUT ROUTINE
                                        $TYPOC  ;;CALL=TYPOC    TRAP+2(104402)  TYPE OCTAL NUMBER (WITH LEADING ZEROS)
                                        $TYPOS  ;;CALL=TYPOS    TRAP+3(104403)  TYPE OCTAL NUMBER (NO LEADING ZEROS)
                                        $TYPON  ;;CALL=TYPON    TRAP+4(104404)  TYPE OCTAL NUMBER (AS PER LAST CALL)

                                        $RDCHR  ;;CALL=RDCHR    TRAP+5(104405)  TTY TYPEIN CHARACTER ROUTINE
                                        $RDLIN  ;;CALL=RDLIN    TRAP+6(104406)  TTY TYPEIN STRING ROUTINE
                                        $RDOCT  ;;CALL=RDOCT    TRAP+7(104407)  READ AN OCTAL NUMBER FROM TTY

                                TYCRC:  -1
                                        571             ;M9301 - YA VERSION
                                        457             ;M9301 - YB VERSION
                                        243             ;M9301 - YC VERSION
                                        635             ;M9400 - YA(OR YC) VERSION
                                        420             ;M9301 - YF VERSION
                                        -1
```

```
1290  004644  177777                    -1
1291  004646  177777                    -1
1292
1293  004650  177777          TXLPC:    -1
1294  004652  133725                    133725          ;M9301 - YA VERSION
1295  004654  017563                    17563           ;M9301 - YB VERSION
1296  004656  141744                    141744          ;M9301 - YC VERSION
1297  004660  047613                    47613           ;M9400 - YA(ORYC) VERSION
1298  004662  075747                    75747           ;M9301 - YF VERSION
1299  004664  177777                    -1
1300  004666  177777                    -1
1301  004670  177777                    -1
1302  004672  177777                    -1
1303
1304  004674  177777          TDLN1:    -1
1305  004676  001000                    1000            ;M9301 - YA VERSION
1306  004700  001000                    1000            ;M9301 - YB VERISION
1307  004702  001000                    1000            ;M9301 - YC VERSION
1308  004704  001000                    1000            ;M9400 - YA(OR YC) VERSION
1309  004706  001000                    1000            ;M9301 - YF VERSION
1310  004710  177777                    -1
1311  004712  177777                    -1
1312  004714  177777                    -1
1313
1314  004716  177777          TRMSA1:   -1
1315  004720  173000                    173000          ;M9301 - YA VERSION
1316  004722  173000                    173000          ;M9301 - YB VERSION
1317  004724  173000                    173000          ;M9301 - YC VERSION
1318  004726  173000                    173000          ;M9400 - YA(OR YC) VERSION
1319  004730  173000                    173000          ;M9301 - YF VERSION
1320  004732  177777                    -1
1321  004734  177777                    -1
1322  004736  177777                    -1
1323
1324  004740  177777          TDLN2:    -1
1325  004742  001000                    1000            ;M9301 - YA VERSION
1326  004744  001000                    1000            ;M9301 - YB VERSION
1327  004746  001000                    1000            ;M9301 - YC VERSION
1328  004750  001000                    1000            ;M9400 -YA(OR YC) VERSION
1329  004752  001000                    1000            ;M9301 -YF VERSION
1330  004754  177777                    -1
1331  004756  177777                    -1
1332  004760  177777                    -1
1333
1334  004762  177777          TRMSA2:   -1
1335  004764  165000                    165000          ;M9301 - YA VERSION
1336  004766  165000                    165000          ;M9301 - YB VERSION
1337  004770  165000                    165000          ;M9301 - YC VERSION
1338  004772  165000                    165000          ;M9400 - YA(OR YC) VERSION
1339  004774  165000                    165000          ;M9301 - YF VERSION
1340  004776  177777                    -1
1341  005000  177777                    -1
1342  005002  177777                    -1
1343
1344  005004  177777          TMSG:     -1
1345  005006  005636                    MSG1
```

```
                                                        MSG2
                                                        MSG3
                                                        MSG4
                                                        MSG5
                                                        -1
                                                        -1
                                                        -1

                    005026  005015  030122  020115  TITL:   .ASCIZ  <15><12>/ROM TEST/
                    042524  052123      000
                       015  052012  050131  GETCRC: .ASCIZ  <15><12>/TYPE CRC VALUE:  /
                    020105  051103  020103
                    040526  052514  035105
                    020040      000
                       015  052012  050131  GETLPC: .ASCIZ  <15><12>/TYPE LPC VALUE:  /
                    020105  050114  020103
                    040526  052514  035105
                    020040      000
                       015  042412  050130  EXCRMG: .ASCIZ  <15><12>/EXPECTED CRC =  /
                    041505  042524  020104
                    051103  020103  020075
                    000040
                    005015  042412  050130  EXLPMG: .ASCIZ  <15><12><12>/EXPECTED LPC =  /
                    041505  042524  020104
                    050114  020103  020075
                    000040
                    005015  047503  050115  ACCRMG: .ASCIZ  <15><12>/COMPUTED CRC =  /
                    052125  042105  041440
                    041522  036440  020040
                       000
                       015  041412  046517  ACLPMG: .ASCIZ  <15><12>/COMPUTED LPC =  /
                    052520  042524  020104
                    050114  020103  020075
                    000040
                    005015  042412  042116  EOTST:  .ASCIZ  <15><12><12>/END OF TEST/
                    047440  020106  042524
                    052123      000
                       015  052012  050131  SA1:    .ASCIZ  <15><12>/TYPE STARTING ADDR. OF 1ST ROM ADDR. SPACE:  /
                    020105  052123  051101
                    044524  043516  040440
                    042104  027122  047440
                    020106  051461  020124
                    047522  020115  042101
                    051104  020056  050123
                    041501  035105  020040
                       000
                       015  052012  050131  SA2:    .ASCIZ  <15><12>/TYPE STARTING ADDR. OF 2ND ROM ADDR. SPACE:  /
                    020105  052123  051101
                    044524  043516  040440
                    042104  027122  047440
                    020106  047062  020104
                    047522  020115  042101
                    051104  020056  050123
                    041501  035105  020040
                       000
```

E03


```
1402  005405  015     052012  050131  SIZE1:  .ASCIZ  <15><12>/TYPE LENGTH (BYTES) OF 1ST ROM ADDR. SPACE:  /
1403  005412  020105  042514  043516
1404  005420  044124  024040  054502
1405  005426  042524  024523  047440
1406  005434  020106  051461  020124
1407  005442  047522  020115  042101
1410  005450  051104  020056  050123
1411  005456  041501  035105  020040
1412  005464  000
1413  005465  015     052012  050131  SIZE2:  .ASCIZ  <15><12>/TYPE LENGTH (BYTES) OF 2ND ROM ADDR. SPACE:  /
1414  005472  020105  042514  043516
1415  005500  044124  024040  054502
1416  005506  042524  024523  047440
1417  005514  020106  047062  020104
1420  005522  047522  020115  042101
1421  005530  051104  020056  050123
1422  005536  041501  035105  020040
1423  005544  000
1424  005545  015     000012          CARLF:  .ASCIZ  <15><12>
1425  005550  020040  000             SP2:    .ASCIZ  /  /
1426  005553  015     040412  042104  TYPHDR: .ASCIZ  <15><12>/ADDRESS                DATA/
1427  005560  042522  051523  020040
1430  005566  020040  020040  020040
1431  005574  020040  020040  020040
1432  005602  042040  052101  000101
1433  005610  020072  000040          COLON:  .ASCIZ  /: /
1434  005614  005015  047125  047113  AUTERM: .ASCIZ  <15><12>/UNKNOWN MODULE /
1435  005622  053517  020116  047515
1436  005630  052504  042514  000040
1437
1440  005636  005015  034515  030063  MSG1:   .ASCIZ  <15><12>/M9301 - YA/
1441  005644  020061  020055  040531
1442  005652  000
1443  005653  015     046412  031471  MSG2:   .ASCIZ  <15><12>/M9301 - YB/
1444  005660  030460  026440  054440
1445  005666  000102
1446  005670  005015  034515  030063  MSG3:   .ASCIZ  <15><12>/M9301 - YC/
1447  005676  020061  020055  041531
1450  005704  000
1451  005705  015     046412  032071  MSG4:   .ASCIZ  <15><12>/M9400 - YA,YC/
1452  005712  030060  026440  054440
1453  005720  026101  041531  000
1454  005725  015     046412  031471  MSG5:   .ASCIZ  <15><12>/M9301 - YF/
1455  005732  030460  026440  054440
1456  005740  000106
1457          000001          .END
```

```
.MAIN.  MACY11 27.1006   27-SEP-76  14:46  PAGE 29
DZ9RB.P11    27-SEP-76 14:43          SYMBOL TABLE

ABASE = 000000
ACCRMG  005160
ACDW1 = 000000
ACDW2 = 000000
ACLPMG  005203
ACPUOP= 000000
ACTCRC  001022
ACTLPC  001024
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
APRIOR= 000000
APTCSU= 000040
APTENV= 000001
APTSIZ= 000200
APTSPD= 000100
ASWREG= 000000
ATESTN= 000000
AUNIT = 000000

ALSWR = 000000
AUTACT  002534
AUTERM  005614
AUTERR  002574
AUT1    002506
AUT2    002552
AUT3    002554
AVECT1= 000000
AVECT2= 000000
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
BPTVEC= 000014
CARLF   005545
CHECK   001472
CH0     001550
CH1     001626
CK1     001720
CK2     002012
CLLAST  002166
CLP0    002234
CLP1    002246
CLP2    002300
CL0     002064
CL1     002130
CL2     002152
CL3     002104
COLON   005610
CR    = 000015
CRC     002056

CRLF  = 000200
DATLN1  001006
DATLN2  001012
DDISP = 177570
DISPLA  001002
DISPRE  000174
DSWR  = 177570
EMTVEC= 000030
ENDOT   002430
EOTST   005226
ERRVEC= 000004
EXCRC   001016
EXCRMG  005111
EXLPC   001020
EXLPMG  005134
GETCRC  005041
GETIN   001352
GETLPC  005065
GET2    001422
GOAGIN  002052
HT    = 000011
IOTVEC= 000020
LF    = 000012
LPC     002326
LPC1    002334
LPC2    002350
MSG1    005636
MSG2    005653
MSG3    005670
MSG4    005705
MSG5    005725
PARCNT  001026
PARITY  002224
PIRQ  = 177772
PIRQVE= 000240
PR0   = 000000
PR1   = 000040
PR2   = 000100
PR3   = 000140
PR4   = 000200
PR5   = 000240
PR6   = 000300
PR7   = 000340
PS    = 177776
PSW   = 177776
PWRVEC= 000024
RDCHR = 104405
RDLIN = 104406
RDOCT = 104407
RESTRT  001274
RESVEC= 000010
ROMSA1  001004
ROMSA2  001010

R6    =%000006
R7    =%000007
SA1     005245
SA2     005325
SIZE1   005405
SIZE2   005465
SP2     005550
STACK = 001100
START   001076
STKLMT= 177774
ST2     001302
SWR     001000
SWREG   000176
SW0   = 000001
SW00  = 000001
SW01  = 000002
SW02  = 000004
SW03  = 000010
SW04  = 000020
SW05  = 000040
SW06  = 000100
SW07  = 000200
SW08  = 000400
SW09  = 001000
SW1   = 000002
SW10  = 002000
SW11  = 004000
SW12  = 010000
SW13  = 020000
SW14  = 040000
SW15  = 100000
SW2   = 000004
SW3   = 000010
SW4   = 000020
SW5   = 000040
SW6   = 000100
SW7   = 000200
SW8   = 000400
SW9   = 001000
TBITVE= 000014
TDLN1   004674
TDLN2   004740
TITL    005026
TKVEC = 000060
TMSG    005004
TPVEC = 000064
TRAPVE= 000034
TRMSA1  004716
TRMSA2  004762
TRTVEC= 000014
TXCRC   004626
TXLPC   004650
TYP     002436

TYPE  = 104401
TYPHDR  005553
TYPOC = 104402
TYPON = 104404
TYPOS = 104403
TYPOUT  001030
TYPROM  002364
TYPR1   002410
TYP0    002444
TYP2    002466
TYP3    002452
XOR     002302
XORS    001014
$APTHD  001032
$ATYC   003724
$ATY1   003700
$ATY3   003706
$ATY4   003716
$CHARC  003664
$CNTLG  003217
$CNTLU  003212
$CPUOP  001074
$CRLF   003207
$DEVCT  001056
$ENDAD  002042
$ENV    001066
$ENVM   001067
$ETABL  001066
$ETEND  001076
$FATAL  001050
$FFLG   004144
$FILLC  003676
$FILLS  003675
$HISTS  001032
$HIOCT  003404
$ILLUP  004534
$LF     003210
$LFLG   004143
$MAIL   001046
$MBADR  001034
$MFLG   004142
$MNEW   003235
$MSGAD  001062
$MSGLG  001064
$MSGTY  001046
$MSWR   003224
$NULL   003674
$OCNT   004370
$OMODE  004372
$PASS   001054
$PASTM  001040
$POWER  004542
$PWRDN  004374
```

```
.MAIN.  MACY11 27.1006  27-SEP-76  14:46  PAGE 30
DZM9A8.P11    27-SEP-76 14:43          SYMBOL TABLE

$PWRMG  004530          $SETUP= 000014          $TPB    003672          $TTYIN  003176          $UNITM  001042
$PWRUP  004446          $STUP = 177777          $TPFLG  003677          $TYPE   003406          $USWR   001072
$QUES   003206          $SVPC = 001032          $TPS    003670          $TYPEC  003620          $CFILL  004371
$RDCHR  002622          $SWR  = 000000          $TRAP   004552          $TYPEX  003666          .       = 005742
$RDLIN  002742          $SWREG  001070          $TRAP2  004574          $TYPOC  004172          .$Y     = 001032
$RDOCT  003246          $TESTN  001052          $TRP    = 000010        $TYPON  004206
$RDSZ = 000010          $TKB    002620          $TRPAD  004606          $TYPOS  004146
$SAVR6  004540          $TKS    002616          $TSTM   001036          $UNIT   001060

. ABS.  005742      000

  ERRORS DETECTED:  0
  DEFAULT GLOBALS GENERATED:  0

  DZM9A8,DZM9A8/SOL=DZM9A8
  RUN-TIME:  37  13  1 SECONDS
  RUN-TIME RATIO:  117/52=2.2
  CORE USED:  20K  (39 PAGES)
```

Spooler runtime 5 Seconds, 27 KCS, 128 disk reads, 4 disk writes, 29 pages