IDENTIFICATION

PRODUCT CODE:	MAINDEC-08-DKVTA-A-D
PRODUCT NAME:	VT78 MOS MEMORY DIAGNOSTIC
DATE: RELEASED:	JUNE 1977
MAINTAINER:	DIAGNOSTIC GROUP
AUTHOR:	B. J. LECOQ

TABLE OF CONTENTS

1. ABSTRACT

THE VT78 MOS MEMORY TEST IS INTENDED FOR USE ON THE VT78 SYSTEM, ALTHOUGH IT WILL RUN ON MOST PDP-8 SYSTEMS. ALTHOUGH DESIGNED TO TEST 16K OF MOS MEMORY, THE PROGRAM WILL TEST SYSTEMS EQUIPPED WITH FROM 4K TO 32K WORDS OF MOS MEMORY BY CHANGING BITS 6-11 OF HCW1 (LOC 21).
AUTOMATIC PROGRAM RELOCATION IS PROVIDED IN ORDER TO TEST ALL MEMORY FIELDS FROM EACH MEMORY FIELD.

SINCE THE VT78 HAS NO HARDWARE SWITCH REGISTER, THE STANDARD CONSOLE PACKAGE HAS BEEN INCLUDED IN THE PROGRAM. THIS PROVIDES AN INTERFACE BETWEEN THE OPERATOR AND THE DIAGNOSTIC VIA THE VT78 VIDEO DISPLAY-KEYBOARD TERMINAL.

THIS DIAGNOSTIC WILL RUN UNDER APT CONTROL.

2. REQUIREMENTS

2.1 EQUIPMENT

A VT78 VIDEO-KEYBOARD TERMINAL

2.2 STORAGE

THE PROGRAM OCCUPIES CORE LOCATIONS 0000 TO 3177, WITH LOCATIONS 5600 TO 7777 USED AS A BUFFER AREA.

2.3 PRELIMINARY PROGRAMS

THE VT78 RESIDENT CONTROL PANEL PROGRAM AND THE VT78 CPU DIAGNOSTIC MUST HAVE BEEN SUCESSFULLY RUN.

3. LOADING PROCEDURE

THE PROGRAM IS NORMALLY LOADED FROM THE FLOPPY DISKETTE WHICH IS PROVIDED WITH THE RELEASE PACKAGE. THE PROGRAM MAY BE LOADED INTO ANY DESIRED CORE STACK BY HAVING BIN IN THAT CORE STACK.

4. ERRORS

THE CONTENTS OF A GIVEN MEMORY TEST LOCATION SHOULD ALWAYS BE EQUAL TO ITS ADDRESS OR THE COMPLEMENT OF ITS ADDRESS. IF IT IS NOT, A TEST ERROR WILL RESULT. A RELOCATION ERROR WILL OCCUR IF THE RELOCATION COMPARISON CHECK FAILS. FOR THE DYNAMIC TESTS THE MESSAGE "A DYNAMIC ERROR HAS OCCURED IN FIELD X" WILL BE DISPLAYED, WHERE X IS THE FIELD UNDER TEST WHEN THE ERROR OCCURED.

NOTE: THE PURPOSE OF THE DYNAMIC TESTS IS JUST TO DETECT DYNAMIC PROBLEMS IN MOS MEMORY. DUE TO THE NATURE OF THESE TESTS, PROGRAM DIAGNOSIS DOWN TO A CHIP LEVEL IS IMPOSSIBLE. THE ONLY INFORMATION WHICH MAY BE OF USE IN DEBUGGING IS LOCATION 100 OF THE FAILING FIELD. IT MAY CONTAIN THE ADDRESS +1 FROM WHICH THE PROGRAM ENTERED THE ERROR ROUTINE.

4.1 MARCH TEST ERROR TYPEOUTS

FOR THE FIRST ERROR ENCOUNTERED A HEADER WILL BE TYPED OUT FOLLOWED BY THE PERTINENT DATA. FOR ALL SUBSEQUENT ERRORS, ONLY THE PERTINENT DATA WILL BE TYPED. THE FORMAT IS AS FOLLOWS:

```
PR  LOC  ADDR   GOOD  BAD
```

PR LOC = THE PROGRAM ADDRESS WHERE THE ERROR JMS OCCURRED. (INCLUDES FIELD)

ADDR = THE ADDRESS OF THE LOCATION IN ERROR. (INCLUDES FIELD)

GOOD = WHAT THE DATA SHOULD BE.

BAD = WHAT THE DATA IS.

4.2 RELOCATION ERROR TYPEOUTS

ALL RELOCATION ERRORS ARE IN THE FOLLOWING FORMAT:

XXXXX RELOCATION ERROR AT LOCATION YYYYY

XXXXX = THE PROGRAM ADDRESS WHERE THE ERROR JMS OCCURRED. (INCLUDES FIELD)

YYYYY = THE ADDRESS OF THE LOCATION IN ERROR (INCLUDES FIELD)

NOTE: AFTER EACH ERROR PRINT-OUT THE PROGRAM CONTINUES ON WITH THE NEXT SEQUENTIAL MEMORY LOCATION.

5. RESTRICTIONS

5.1 STARTING RESTRICTIONS

THE PROGRAM MAY BE RESTARTED AT ANY TIME FROM LOCAION 0200
OF THE STACK THE PROGRAM IS PRESENTLY IN.

5.2 OPERATING RESTRICTIONS

NONE

6. EXECUTION TIME

THE TIME FOR ONE COMPLETE PASS IS APPROXIMATELY 1 MIN 15 SEC.

7. PROGRAM DESCRIPTION

7.1 GENERAL

THE VT78 MOS MEMORY TEST IS DESIGNED TO DETECT ANY LOCATION THAT
CANNOT BE UNIQUELY ADDRESSED. FUNCTIONAL AND DYNAMIC TEST
ARE PERFORMED BY THE DIAGNOSTIC(SEE 7.2 AND 7.3).
ALL OPERATOR INTERACTION IS DONE USING THE
CONSOLE PACKAGE (SEE SECTION 8).

THE PROGRAM AUTOMATICALLY RELOCATES ITSELF TO EACH MEMORY
FIELD UNDER TEST TO ENSURE THAT ALL FIELDS MAY BE CORRECTLY
REFERENCED FROM ANY FIELD. THE PROGRAM WILL NOT RELOCATE
INTO A KNOWN BAD FIELD.

CONTROL OF THE PROGRAM IS GIVEN TO THE OPERATOR BY MEANS OF THE
PSEUDO SWITCH REGISTER(PSR). THE OPERATOR MAY HALT AFTER ERROR,
INHIBIT ERROR PRINTOUTS, LOOP ON ERROR OR TESTS,
HALT AFTER PASS, SELECT ALL OR ANY OF THE TESTS,
AND AT ANY TIME RESTART THE PROGRAM USING THE CONSOLE PACKAGE.

7.2 FUNCTIONAL TEST

THE TEST USED TO TEST THE FUNCTIONALITY OF
THE MEMORY IS THE MARCH TEST. THE TEST RUNS ALL FIELDS IN THE

SYSTEM REGARDLESS OF OPERATOR SPECIFICATIONS.
THIS TEST ENSURES THAT A ONE AND A ZERO CAN BE WRITTEN
INTO EACH MEMORY CELL.

7.3 DYNAMIC TEST

THE PROGRAM CONTAINS THREE DYNAMIC TESTS WHICH CHECK FOR MULTIPLE SELECTION OF ADDRESS DECODERS, SLOW RECOVERY OF SENSE AMPLIFIERS, AND READ ACCESS TIME.

7.4 PROGRAM RELOCATION

PROGRAM RELOCATION IS CONTROLLED BY THE PROGRAM. THE PROGRAM INITIALLY TESTS ALL STACKS EXCEPT FOR THE ONE IT WAS LOADED IN. IT THEN RELOCATES TO THE NEXT HIGHEST EPROR FREE STACK, AND TEST ALL OTHER STACKS AGAIN. THIS IS REPEATED UNTIL THE PROGRAM HAS BEEN RELOCATED INTO EVERY ERROR FREE STACK. ONCE RESIDING IN THE HIGHEST STACK IN THE SYSTEM THE PROGRAM RELOCATES TO THE LOWEST ERROR FREE STACK.

THE PROGRAM PROVIDES A DEGREE OF PROTECTION FOR ITSELF BY REMEMBERING ALL STACKS WHERE ERRORS OCCUR. WHEN A FAULTY STACK IS NEXT IN SEQUENCE TO CONTAIN THE PROGRAM, THE PROGRM WILL SKIP THE FAULTY STACK AND RELOCATE TO THE NEXT HIGHEST ORDER STACK WHICH IS ERROR FREE. IF ALL OTHER SELECTED STACKS ARE FAULTY, PROGRAM RELOCATION WILL NOT TAKE PLACE.

DURING RELOCATION A COMPARISON CHECK IS MADE TO INSURE NO PROGRAM LOSS

FOR FURTHER UNDERSTANDING OF HOW THE TESTS ARE PERFORMED, REFER TO THE LISTING.

8.0 CONSOLE PACKAGE ADDENDUM

8.1 DESCRIPTION

A CONSOLE PACKAGE HAS BEEN ADDED TO THIS DIAGNOSTIC TO ALLOW THE PROGRAM TO RUN WITH NO HARDWARE SWITCH REGISTER AND TO HAVE COMMUNICATIONS WITH THE DIAGNOSTIC VIA A TERMINAL. THE CONSOLE PACKAGE ALLOWS THE OPERATOR CONTROL OF THE DIAGNOSTIC THROUGH THE TERMINAL. THE DIAGNOSTIC WILL ASK FOR THE VALUE OF THE PSEUDO SWITCH REGISTER BEFORE CONTINUING WITH THE EXECUTION OF THE DIAGNOSTIC. ALL ERRORS AND PASS COMPLETES WILL BE PRINTED AT THE TERMINAL. NO HALTS WILL BE EXECUTED.

8.2 PROGRAM START

THE PROGRAM WILL TYPEOUT A HEADING AND THEN PRINT SR=XXXX. XXXX IS THE VALUE OF THE SWITCH REGISTER USED. SELECT A VALUE TO USE FOR THE SWITCH REGISTER FROM THE SWITCH REGISTER TABLE BELOW AND INPUT THE NUMBER USING THE CONSOLE KEYBOARD. TYPING IN FOUR DIGITS WILL CAUSE THE PROGRAM TO ECHO THE NEW VALUE OF THE SWITCH REGISTER AND START THE PROGRAM. TYPING A CARRIAGE RETURN AFTER INPUTTING A DIGIT WILL ALSO CAUSE THE PROGRAM TO ECHO THE NEW VALUE OF THE SWITCH REGISTER AND START THE PROGRAM. IF IT IS NOT DESIRED TO CHANGE THE SWITCH REGISTER VALUE, A CARRIAGE RETURN CAN BE TYPED AND THE PROGRAM WILL BE STARTED WITHOUT ECHOING THE SWITCH REGISTER VALUE.

PSEUDO SWITCH REGISTER	
4000	BIT 0=1 INHIBIT ERROR HALT
2000	BIT 1=1 LOOP ON ERROR
1000	BIT 2=1 LOOP ON TEST
0400	BIT 3=1 HALT ON COMPLETION OF PROGRAM PASS
0200	BIT 4=1 INHIBIT ERROR TYPEOUT
0100	BIT 5=1 DON'T RUN MARCH TEST
0040	BIT 6=1 DON'T RUN DYNAMIC TESTS
0020	BIT 7=1 RING BELL ON ERROR

8.3 CONTROL CHARACTERS

8.3.1 CONTROL G

TO GAIN CONTROL OF THE CONSOLE SWITCH REGISTER PACKAGE WHILE RUNNING THE PROGRAM, A CONTROL G MUST BE TYPED IN ON THE CONSOLE TERMINAL. WHEN CONTROL G IS TYPED THE PROGRAM WILL RESPOND BY TYPING AN UP ARROW THEN G FOLLOWED BY SR=XXXX. XXXX IS THE PRESENT CONTENTS OF THE PSEUDO SWITCH REGISTER. THE OPERATOR CAN NOW CHANGE THE SETTING OF THE SWITCH REGISTER BY TYPING IN A NEW NUMBER OR NOT CHANGE IT BY TYPING IN A CARRIAGE RETURN. TYPING IN FOUR DIGITS WILL CAUSE THE PROGRAM TO ECHO THE SWITCH REGISTER VALUE TYPED AND CONTINUE THE PROGRAM USING THE VALUE TYPED AS THE NEW SWITCH REGISTER. TYPING IN ONE TO THREE DIGITS FOLLOWED BY A CARRIAGE RETURN WILL ALSO CAUSE THE PROGRAM TO ECHO THE NEW VALUE OF THE SWITCH REGISTER TYPED AND CONTINUE THE PROGRAM. TYPING ONLY A CARRIAGE RETURN WILL CAUSE THE PROGRAM TO CONTINUE WITHOUT CHANGING THE SWITCH REGISTER, AND THE PROGRAM WILL NOT ECHO THE SWITCH REGISTER VALUE. BY TYPING A LINE FEED, THE PROGRAM WILL BE RELOCATED BACK TO THE ORIGINAL PROGRAM FIELD AND RESTARTED.
TYPING A CONTROL C WILL CAUSE THE PROGRAM TO RETURN TO THE OPERATING SYSTEM (OS/8) AT 7600 IN FIELD 0. ILLEGAL CHARACTERS TYPED WILL RESULT IN THE CHARACTER BEING ECHOED FOLLOWED BY A QUESTION MARK AND THE SWITCH REGISTER MESSAGE BEING RETYPED.

8.3.2 CONTROL S

THIS IS A CONTROL CHARACTER TO STOP SENDING DATA TO A TERMINAL. IT IS USUALLY A FUNCTION OF THE TERMINAL AND IS AUTOMATICALLY SENT WHEN THE TERMINAL BUFFER IS FULL. THE BUFFER IS EMPTIED AS THE DATA IS PRINTED. AFTER ALL THE DATA IN THE TERMINAL BUFFER IS PRINTED THE TERMINAL SENDS A CONTROL Q (START SENDING DATA TO TERMINAL). THE CONTROL S IS NOT ECHOED.

BY TYPING A CONTROL S WHILE RUNNING THE DIAGNOSTIC, THE PROGRAM, WHEN THE CONTROL S IS RECOGNIZED, WILL WAIT FOR A CONTROL Q TO CONTINUE THE PROGRAM, A LINE FEED TO RESTART THE PROGRAM, OR A CONTROL C TO RETURN TO THE OPERATING SYSTEM.

8.3.3 CONTROL Q

THIS CONTROL CHARACTER IS TO RESUME SENDING DATA TO THE TERMINAL. IT IS USUALLY SENT AUTOMATICALLY BY A TERMINAL WHEN IT IS READY TO ACCEPT MORE DATA. THIS CONTROL CHARACTER IS NOT ECHOED.

BY TYPING A CONTROL Q AFTER A CONTROL S HAS BEEN TYPED, THE PROGRAM WILL CONTINUE FROM WHERE IT WAS INTERRUPTED FROM.

8.3.4 CONTROL C

THIS CONTROL CHARACTER IS USED TO RETURN CONTROL BACK TO AN OPERATING SYSTEM KEYBOARD MONITOR. THE OPERATING SYSTEM SELECTED FOR THE PDP-8 IS THE OS/8 SYSTEM WITH ITS BOOTSTRAP LOCATED IN THE LAST PAGES OF FIELD 0 AND 1. WHEN THIS CONTROL CHARACTER IS RECOGNIZED, THE PROGRAM WILL ECHO THE CONTROL CHARACTER AS AN UP ARROW THEN C, RESTORE THE LAST PAGE OF FIELD 0 AND 1, AND JUMP TO LOCATION 7600 IN FIELD 0.

8.3.5 ILLEGAL CHARACTERS

A CHARACTER TYPED ON THE KEYBOARD, OTHER THAN A CONTROL G, CONTROL S, OR A CONTROL C, WILL RESULT IN THE CHARACTER BEING ECHOED FOLLOWED BY A QUESTION MARK AND THE PROGRAM WILL BE CONTINUED.

8.4 END OF PASS REPORTING

THERE WILL BE AN END OF PASS MESSAGE CONTAINING THE DIAGNOSTIC NAME, THE END OF PASS MESSAGE AND AN OCTAL NUMBER OF PASSES.

9. APT NOTES

ALL OF THE FOLLOWING NOTES APPLY ONLY WHEN THE PROGRAM IS BEING RUN ON AN APT SYSTEM.

1. FOR MORE INFORMATION SEE THE FOLLOWING DOCUMENTS.

   A. STANDARD APT SYSTEM TO PDP8 DIAGNOSTIC INTERFACE.

   B. APT SYSTEM MANAGERS GUIDE.

2. IF BIT 0 OF HCW1(LOC 21) IS A '1' THEN THE PROGRAM WILL BE RUN UNDER APT CONTROL. ALL OUTPUT FROM THE PROGRAM WILL BE SUPPRESSED.

3. APT IS NOTIFIED THAT THE PROGRAM IS RUNNING WITHOUT ERRORS BETWEEN EVERY .2 SECONDS AND 4.0 SECONDS.

4. ERRORS:

   ALL ERRORS CALL APT.
   ONLY THE ERROR PC IS REPORTED TO APT-8.
   THE TYPE OF ERROR CAN BE DETERMINED
   FROM THE CORRESPONDING ADDRESS IN THE
   PROGRAM LISTING.

LISTING

```
                    /DKVTAA MOS MEMORY DIAGNOSTIC  MAINDEC-08-DKVTA-A-D
                    /16K MOS MEMORY TEST FOR VT78 (VER A)
                    /COPYRIGHT 1977 DIGITAL EQUIPMENT CORPORATION, MAYNARD, MASS 01754
                    /PROGRAMMER:  ROBERT J LECOQ
                    /
                    /
                    /
                    /
                    /
                    /
                    /
                    /
                    /IOT COMMANDS
           6201     CDF0=6201          /CHANGE TO DATA FIELD 0
           6211     CDF1=6211          /CHANGE TO DATA FIELD 1
           6221     CDF2=6221          /CHANGE TO DATA FIELD 2
           6231     CDF3=6231          /CHANGE TO DATA FIELD 3
           6203     CBF0=6203          /CHANGE TO DATA AND INSTRUCTION FIELD 0
           6213     CBF1=6213          /CHANGE TO DATA AND INSTRUCTION FIELD 1
           6223     CBF2=6223          /CHANGE TO DATA AND INSTRUCTION FIELD 2
           6233     CBF3=6233          /CHANGE TO DATA AND INSTRUCTION FIELD 3
           6214     RDF=6214           /READ DATA FIELD INTO AC BITS 6-8
           6224     RIF=6224           /READ INSTRUCTION FIELD INTO AC BITS 6-8


           0000     *0
 0000      0301             301
 0001      5001             JMP .

           0020     *20

 0020      0000     PSR,    0                       /PSEUDO SWITCH REGISTER
                                                    /4000 BIT 0=1 INHIBIT ERROR HALT
                                                    /2000 BIT 1=1 LOOP ON ERROR
                                                    /1000 BIT 2=1 LOOP ON TEST
                                                    /0400 BIT 3=1 HALT ON COMPLETION OF PROGRAM PASSES
                                                    /0200 BIT 4=1 INHIBIT ERROR TYPEOUT
                                                    /0100 BIT 5=1 DON'T RUN MARCH TEST
                                                    /0040 BIT 6=1 DON'T RUN DYNAMIC TEST
                                                    /0020 BIT 7=1 BELL ON ERROR
 0021      4017     HCW1,   4017            /APT/ LAST TWO DIGITS INDICATE MEMORY SIZE
 0022      0000     HCW2,   0               /APT/
 0023      7000             NOP

           4424     LISN=JMS I.
 0024      2675             XLISN
           4425     PRNTMS=JMS I.
 0025      3000             MESAGX
           4426     ONEOCT=JMS I.
 0026      2601             ONEOCK
           4427     TWOOCT=JMS I.
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 0027      2611             TWOOCK
           4430     PRNT1=JMS I.
 0030      3066             XPRNT1
           4431     FOROCT=JMS I.
 0031      3037             FOROCK
           4432     PRNT2=JMS I.
 0032      2624             XPRNT2
           4433     PRNT4=JMS I.
 0033      3053             XPRNT4
           4434     SPACE2=JMS I.
 0034      2667             SPACX2
           4435     TYPE=JMS I.
 0035      2635             XTYPE
           4436     CRLF=JMS I.
 0036      2652             XCRLF


                    /
                    /CONSTANTS AND POINTERS
 0037      7777     HEAD1,  7777            /ERROR HEADING CONTROL
 0040      0000     TESTAD, 0               /TEST ADDRESS COUNTER
 0041      0000     TOPSTK, 0               /HIGHEST ACTUAL STACK IN SYSTEM
 0042      0000     STKPIN, 0               /STACK PROG IS IN 00X0
 0043      0000     STKTST, 0               /STACK SEL FOR TEST 00X0
 0044      0000     BDATA,  0               /BAD DATA
 0045      0000     GDATA,  0               /GOOD DATA
 0046      0000     MOVE,   0               /RELOCATION ADDRESS
 0047      0000     COUNT,  0               /ERROR COUNTER
 0050      0000     COLCNT, 0               /COLUMN COUNTER - DYNAMIC TEST
 0051      0200     CONST,  200             /EITHER + OR - 200   DYNAMIC TESTS


 0052      7741     M37,    -37
 0053      7703     M75,    -75
 0054      0002     K2,     2
 0055      0003     K3,     3
 0056      0007     K7,     7
 0057      0010     K10,    10
 0060      0020     K20,    20
 0061      0030     K30,    30
 0062      0077     K77,    77
 0063      0100     K100,   100
 0064      0200     K200,   200
 0065      0207     K207,   207
 0066      0212     K212,   212
 0067      0215     K215,   215
 0070      0240     K240,   240
 0071      0260     K260,   260
 0072      0261     K261,   261
 0073      1000     K1000,  1000
 0074      4000     K4000,  4000
 0075      4060     K4060,  4060
 0076      6201     K6201,  6201            /CDF 0
 0077      6203     K6203,  6203
```

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0100  7577    K7577,  7577
0101  7600    K7600,  7600            /DYNAMIC TEST
0102  7700    K7700,  7700            /DYNAMIC TEST
0103  1713    XSTOP,  STOP            /STOP ROUTINE POINTER


0104  2523    KSFCHK, CHKKSF
0105  2255    IAPTEP, APTER           /APT/
0106  2234    IAPTOK, APTOK           /APT/

      0200    *200
              /
              /VT78 MOS MEMORY TEST
              /

0200  7300    START,  CLA CLL
0201  6002            IOF             /TURN INTERRUPT OFF
0202  1022            TAD HCW2
0203  7710            SPA CLA         /RUN UNDER APT CONTROL?
0204  5777'           JMP XAPT        /YES - SET UP FOR APT
0205  4776'           JMS SAVOS8      /NO - SAVE OS8 HANDLER
0206  6224    XSTRT,  RIF
0207  1076            TAD K6201
0210  3216            DCA PRGSTK      /MAKE INSTR FIELD = DATA FIELD
0211  4425            PRNTMS
0212  0314            TITLE           /TYPEOUT PROGRAM TITLE
              /APT/   IF UNDER APT CONTROL NEXT LOC WILL = NOP,

              APTN00,                         /APT/

0213  4775'           JMS     PSEUDO  /TYPEOUT PSEUDO SWITCH REGISTER
0214  7300    BEGIN,  CLA CLL
0215  4504            JMS I KSFCHK    /CHECK IF CONSOLE ACTIVE
0216  6201    PRGSTK, CDF0
0217  1021            TAD HCW1
0220  0257            AND K34         /SELECT TOP STACK-USUALLY 16K
0221  7012            RTR
0222  3041            DCA TOPSTK
              /APT/   IF UNDER APT CONTROL NEXT LOC WILL = NOP,
              APTN01,
0223  4774'           JMS TSTSYS      /TYPE NUMBER OF STACKS IN SYSTEM
0224  4425            PRNTMS
0225  0331            PREL            /TYPE PROGRAM WILL RELOCATE
0226  3276            DCA PASCNT
0227  4277            JMS INIT        /CLEAR FIELD STATUS LIST
0230  1041    NXTPAS, TAD TOPSTK
0231  7040            CMA

0232  3256            DCA KOUNT
0233  7240            STA
0234  3037            DCA HEAD1       /RESET ERROR HEADING
0235  6224    TEST,   RIF
0236  3042            DCA STKPIN      /SET UP CURRENT PROGRAM FIELD
0237  4425            PRNTMS
0240  0546            PRFLD           /TYPE PROGRAM FIELD MESSAGE
0241  6224            RIF
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0242  7112            RTR CLL
0243  7010            RAR
0244  1071            TAD K260        /FIELD PROGRAM IN
0245  4435            TYPE
0246  4436            CRLF
0247  4773'           JMS MOSTST      /GO EXECUTE MARCH TEST
0250  4772'           JMS DYNTST      /GO EXECUTE DYNAMIC TESTS
0251  4771'           JMS RELO        /GO RELOCATE PROGRAM
0252  2256            ISZ KOUNT       /HAVE WE RELOCATED TO ALL FIELDS YET?
0253  5235            JMP TEST        /NO
0254  4260            JMS PCOUNT      /YES - DONE ONE PASS
0255  5230            JMP NXTPAS
0256  0000    KOUNT,  0
0257  0034    K34,    34


              /
0260  0000    PCOUNT, 0
              /APT/   IF UNDER APT CONROL NEXT LOC WILL = JMS I IAPTOK,

0261  4504    APTOKO, JMS  I  KSFCHK          /THIS LOC OVERLAID IF APT
0262  7000            NOP                     /
0263  4425            PRNTMS                  /PRINT END OF PASS MESSAGE
0264  0345            PASMES                  /POINTER TO MESSAGE
0265  2276            ISZ     PASCNT          /ADD 1 TO THE PASS COUNTER
0266  1276            TAD     PASCNT          /GET THE COUNTER
0267  4433            PRNT4                   /PRINT THE 4 OCTAL DIGITS
0270  4436            CRLF
0271  1020            TAD PSR
0272  0371            AND (400        /HALT ON PASS COMPLETION?
0273  7640            SZA CLA
0274  4775'           JMS PSEUDO      /YES - GO ASK SWITCH REGISTER
0275  5660            JMP I   PCOUNT  /NO - RETURN

0276  0000    PASCNT, 0

              /ROUTINE TO CLEAR FIELD STATUS LIST (FLDLST)
              /
0277  0000    INIT,   0
0300  1313            TAD M7
0301  3312            DCA CLRCNT      /SETUP COUNTER TO MINUS 7
0302  1370            TAD (FLDLST     /GET ADDRESS OF LIST
0303  3311            DCA CLRLST      /SAVE IT
0304  3711            DCA I CLRLST    /CLEAR CONTENTS OF ADDRESS
0305  2311            ISZ CLRLST      /NEXT ADDRESS
0306  2312            ISZ CLRCNT      /ARE WE DONE?
0307  5304            JMP .-3         /NO - DO NEXT ADDRESS
0310  5677            JMP I INIT      /YES - RETURN

0311  0000    CLRLST, 0
0312  0000    CLRCNT, 0       /MINUS NUMBER OF POSSIBLE STACKS
0313  7771    M7,     -7

0314  4343    TITLE,  TEXT            "*#DKVTAA MOS MEMORY TEST#"
0315  0413
```

```
                0316  2624
                0317  0101
                0320  4015
                0321  1723
                0322  4015
                0323  0515
                0324  1722
                0325  3140
                0326  2405
                0327  2324
                0330  4300
  220           0331  2022    PREL,   TEXT                    "PROGRAM WILL RELOCATE##"
                0332  1707
                0333  2201
                0334  1540
                0335  2711
                0336  1414
                0337  4022
                0340  0514
                0341  1703
                0342  0124
                0343  0543
                0344  4300
  221           0345  4304    PASMES, TEXT                    "#DKVTAA - END OF PASS "
                0346  1326
                0347  2401
                0350  0140
                0351  5540
                0352  0516
                0353  0440
                0354  1706
                0355  4020
                0356  0123
                0357  2340
                0360  0000
  222
  223           0370  1725
  224           0371  0400
  225           0372  1010
  226           0373  0600
  227           0374  0523
  228           0375  2440
  229           0376  2267
  230           0377  2277
                0400          PAGE
  231
  232                       /

  233                       /
  234                       /
  235                       /RELOCATE THE PROGRAM
  236                       /
  237           0400  0000  RELO,   0
  238           0401  7300          CLA CLL
  239           0402  3047          DCA     COUNT           /CLEAR ERROR COUNTER
  240           0403  4243          JMS BADSTK              /GO CHECK IF STACK IS GOOD
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  241           0404  1300          TAD NXSTK               /SETUP STACK TO MOVE INTO
  242           0405  7106          RTL CLL
  243           0406  7004          RAL
  244           0407  1076          TAD K6201
  245           0410  3224          DCA RELO2               /MODIFY CDF INSTRUCTION AT LOC RELO2
  246           0411  1042          TAD STKPIN              /SETUP STACK MOVING FROM
  247           0412  1076          TAD K6201
  248           0413  3222          DCA RELO1
  249           0414  1222          TAD RELO1
  250           0415  3227          DCA RELO3
  251           0416  1224          TAD     RELO2
  252           0417  1054          TAD     K2
  253           0420  3241          DCA     RELO4
  254           0421  3046          DCA     MOVE
  255           0422  6201  RELO1,  CDF0                    /MOVE FROM DATA FIELD
  256           0423  1446          TAD I   MOVE            /GET WORD
  257           0424  6201  RELO2,  CDF0                    /MOVE TO DATA FIELD
  258           0425  3446          DCA I   MOVE            /SAVE IT
  259           0426  1446          TAD I   MOVE
  260           0427  6201  RELO3,  CDF0                    /MOVE FROM DATA FIELD
  261           0430  7041          CIA
  262           0431  1446          TAD I   MOVE            /WAS TRANSFER OK?
  263           0432  7640          SZA CLA                 /YES - SKIP
  264           0433  4777'         JMS     ERRM            /NO - MOVE ERROR
  265           0434  2046          ISZ     MOVE            /DONE 4096 TIMES?
  266           0435  5222          JMP     RELO1           /NO - GET NEXT WORD
  267           0436  1047          TAD     COUNT
  268           0437  7640          SZA CLA                 /SKIP IF NO MOVE ERROR
  269           0440  5600          JMP I RELO      /RETURN -WITHOUT CHANGING TO NEW DATA FIELD
  270           0441  6203  RELO4,  CBF0                    /CHANGE TO NEW PROG FIELD
  271           0442  5600          JMP  I RELO
  272                       /
  273
  274
  275                       /ROUTINE TO INHIBIT RELOCATION INTO BAD STACK
  276                       /
  277
  278           0443  0000  BADSTK, 0
  279           0444  1042          TAD STKPIN      /STACK PROGRAM IS IN
  280           0445  7012          RTR
  281           0446  7010          RAR
  282           0447  3300          DCA NXSTK
  283           0450  1041          TAD TOPSTK      /GET HIGHEST STACK IN SYSTEM
  284           0451  7041          CIA
  285           0452  3301          DCA BADCNT      /SET UP BAD FIELD COUNTER
  286           0453  1041  X,      TAD TOPSTK      /TOP STACK
  287           0454  7041          CIA
  288           0455  1300          TAD NXSTK
  289           0456  7650          SNA CLA         /ARE WE AT HIGHEST STACK
  290           0457  5275          JMP ATTOP       /YES
  291           0460  2300          ISZ NXSTK       /NO
  292           0461  1300          TAD NXSTK
  293           0462  1376  CHECK,  TAD (FLDLST     /LIST CONTAINING STATUS OF FIELDS TESTED
  294           0463  3277          DCA BADPTR      /SAVE POINTER
  295           0464  1677          TAD I BADPTR
```

```
                0465  7650          SNA CLA         /IS FIELD SELECTED GOOD?
                0466  5643          JMP I BADSTK    /YES - RETURN
                                    
                0467  2301          ISZ BADCNT      /NO- SKIP IF ALL FIELDS TEST BAD
                0470  5253          JMP X           /- TRY NEXT STACK
                0471  4425          PRNTMS
                0472  0502          ALLBAD
                0473  4775'         JMS PSEUDO      /GO ASK SW REG QUESTION.
                0474  5201          JMP RELO+1      /TRY AGAIN
                                    
                0475  3300  ATTOP,  DCA NXSTK       /SET FOR FIELD 0
                0476  5262          JMP CHECK
                                    
                0477  0000  BADPTR, 0
                0500  0000  NXSTK,  0
                0501  0000  BADCNT, 0
                                    
                0502  0301  ALLBAD, TEXT            "CANNOT RELOCATE INTO ANY FIELD!!#"
                0503  1616
                0504  1724
                0505  4022
                0506  0514
                0507  1703
                0510  0124
                0511  0540
                0512  1116
                0513  2417
                0514  4001
                0515  1631
                0516  4006
                0517  1105
                0520  1404
                0521  4141
                0522  4300
                                    /
                                    /
                                    /TYPEOUT NUMBER OF STACKS IN SYSTEM
                                    /
                0523  0000  TSTSYS, 0
                0524  1041          TAD     TOPSTK
                0525  1072          TAD K261
                0526  4435          TYPE                    /TYPEOUT NUMBER
                0527  4425          PRNTMS
                0530  0532          STACKS
                0531  5723          JMP I   TSTSYS
                                    
                0532  4023  STACKS, TEXT            " STACKS IN THIS SYSTEM#"
                
                0533  2401
                0534  0313
                0535  2340
                0536  1116
                0537  4024
                0540  1011
                0541  2340
                0542  2331
```



```
                0543  2324
                0544  0515
                0545  4300
                                    
                0546  2022  PRFLD,  TEXT            "PROG FIELD = "
                0547  1707
                0550  4006
                0551  1105
                0552  1404
                0553  4075
                0554  4000
                                    
                0575  2440
                0576  1725
                0577  2000
                0600  PAGE
                                    /
                                    /THE FOLLOWING TEST IS A MARCH PATTERN DEVELOPED FOR TESTING
                                    /THE MS8-C MOS MEMORY, THE TEST RUN ALL FIELDS IN THE SYSTEM.
                                    /
                                    /       THE TEST SELECTED FOR THE MOS MEMORY TESTING IS A TYPICAL MARCH
                                    /       PATTERN, THE TEST BEGINS BY LOADING THE ENTIRE MEMORY WITH
                                    /       A 2525 PATTERN, THEN STARTING AT ADDRESS ZERO OF LOWEST POSSIBLE
                                    /       FIELD THE TEST READS THE CONTENTS, COMPARES IT, AND THEN WRITES BACK
                                    /       THE COMPLIMENT VALUE, THE PROCESS IS REPEATED THROUGHOUT THE ENTIRE
                                    /       MEMORY.
                                    /
                                    /       NEXT THE PROCESS REPEATS FROM MAXIMUN TO MINIMUM, COMPLIMENTING
                                    /       AS IT IS BEING DONE.
                                    /
                                    /       THE ENTIRE SEQUENCE IS THEN REPEATED USING A BACKGROUND OF
                                    /       5252. THIS INSURES THAT A ONE AND A ZERO CAN BE WRITEN INTO
                                    /       EACH MEMORY CELL.
                                    /
                                    /
                0600  0000  MOSTST, 0
                0601  1020          TAD     PSR             /SEE IF MOSTST TO BE RUN
                0602  0063          AND     K100
                0603  7640          SZA CLA                 /MOSTST TO BE RUN
                0604  5600          JMP I   MOSTST          /NO, EXIT
                0605  4425          PRNTMS
                0606  1600          MARCH                   /PRINT MARCH TEST MESSAGE
                0607  7344          CLL CLA CMA RAL         /=2
                0610  3372          DCA     PATCNT          /SET UP LOOP COUNTER FOR BACK GROUND PATTERN
                0611  4777'         JMS     SETPAT          /GO SETUP INITIAL VALUE OF PAT1 & PAT2
                0612  3040  MOSLOD, DCA     TESTAD          /START WITH ADDRESS ZERO
                0613  1041          TAD     TOPSTK          /GET MAX VALUE IN SYSTEM.
                0614  7040          CMA
                0615  3365          DCA     FLDCNT          /SAVE FOR LOOP COUNTER.
                0616  7344          CLL CLA CMA RAL         /=2
                0617  3370          DCA     TSTCNT
                0620  3043          DCA     STKTST          /START WITH FIELD ZERO
                0621  1042          TAD     STKPIN
                0622  1076          TAD     K6201           /SET UP RETURN DATA FIELD
                0623  3234          DCA     MOSFLD
```

```
0624  4776*  MOSLUP, JMS     SAME            /SEE IF STACK SELECTED IS SAME AS
                                              /PROGRAM FIELD.
0625  5243          JMP     STKUPD          /SAME STACK AS PROGRAM, JUST UPDATE THE
                                              /FIELD TO NEXT ONE SELECTED.
0626  1043          TAD     STKTST
0627  1076          TAD     K6201           /SET UP STACK TO LOAD.
0630  3232          DCA     .+2
0631  1373  MEMLOD, TAD     PAT1            /LOAD BACKGROUND PATTERN INTO
                                              /STACK SELECTED.
0632  6201          CDF                     /THIS IS CHANGED TO LOAD STACK.
0633  3440          DCA I   TESTAD
0634  6201  MOSFLD, CDF                     /CHANGED BACK TO STACK OF PROGRAM.
0635  1040          TAD     TESTAD
0636  7001          IAC                     /UPDATE TEST ADDRESS
0637  3040          DCA     TESTAD
0640  1040          TAD     TESTAD
0641  7640          SZA CLA                 /HAS IT GONE BACK TO ZERO YET?
0642  5231          JMP     MEMLOD          /NO, GO BACK AND DO NEXT ADDRESS
                    /NOW UPDATE THE FIELD TO TEST.
                    /
0643  1043  STKUPD, TAD     STKTST
0644  1057          TAD     K10
0645  3043          DCA     STKTST          /SAVE NEW OFFSET
0646  2365          ISZ     FLDCNT          /ALL FIELDS AVAILABLE DONE?
0647  5224          JMP     MOSLUP          /NO, GO DO NEXT.
                    /AT THIS POINT ALL AVAILABLE MEMORY IS FILLED
                    /WITH THE BACKGROUND PATTERN.
                    /
                    /START READING MEMORY.
0650  1057          TAD     K10
0651  3367          DCA     FLDINC          /SET UP INITIAL VALUE
0652  7301          CLL CLA IAC
0653  3366          DCA     ADDINC          /INITIAL ADDRESS VALUE
0654  3043          DCA     STKTST          /START WITH FIELD ZERO
0655  1042          TAD     STKPIN
0656  1076          TAD     K6201           /SET UP PROGRAM RETURN VALUE
0657  3300          DCA     REDFLD
0660  1041          TAD     TOPSTK          /SET UP LOOP COUNTER
0661  7040          CMA
0662  3365          DCA     FLDCNT
0663  4776*  REDLUP, JMS     SAME            /PROGRAM FIELD = TEST FIELD?
0664  5313          JMP     REDUPD          /YES UPDATE TO NEW FIELD
0665  4504          JMS I   KSFCHK          /CHECK IF CONSOLE ACTIVE
0666  1373          TAD     PAT1            /SET UP COMPARE VALUE
0667  3045          DCA     GDATA
0670  1043          TAD     STKTST
0671  1076          TAD     K6201           /SET UP FIELD TO TEST

0672  3273          DCA     .+1
0673  6201          CDF                     /CHANGED TO TEST FIELD
0674  1440          TAD I   TESTAD          /GET VALUE STORED
0675  3044          DCA     BDATA
0676  1374          TAD     PAT2            /CHANGE VALUE IN SELECTED ADDRESS
0677  3440          DCA I   TESTAD
0700  6201  REDFLD, CDF                     /RESTORE TO PROGRAM FIELD
0701  1045          TAD     GDATA
```



```
0702  7041          CIA
0703  1044          TAD     BDATA           /DO COMPARE
0704  7640          SZA CLA                 /ACTUAL = EXPECTED
0705  4775*         JMS     MOSERR          /NO REPORT AN ERROR
0706  1040          TAD     TESTAD
0707  1366          TAD     ADDINC          /UPDATE ADDRESS TO DO
0710  3040          DCA     TESTAD
0711  2371          ISZ     ADDCNT          /4096 LOOPS DONE
0712  5265          JMP     REDLUP+2        /NO GO BACK AND REPEAT FOR ALL FIELDS
0713  1043  REDUPD, TAD     STKTST
0714  1367          TAD     FLDINC          /UPDATE TEST FIELD
0715  3043          DCA     STKTST          /SAVE THE NEW VALUE
0716  2365          ISZ     FLDCNT          /ALL FIELDS DONE YET
0717  5263          JMP     REDLUP          /NO, THEN CONTINUE
0720  1367          TAD     FLDINC
0721  7041          CIA                     /UPDATE OFFSET
0722  3367          DCA     FLDINC
0723  1366          TAD     ADDINC
0724  7041          CIA
0725  3366          DCA     ADDINC          /UPDATE ADDRESS OFFSET
0726  1366          TAD     ADDINC
0727  7700          SMA CLA                 /READING BACKWARDS
0730  5334          JMP     .+4             /NO.
0731  1040          TAD     TESTAD
0732  1366          TAD     ADDINC          /START AT ADDRESS 7777
0733  3040          DCA     TESTAD
0734  1367          TAD     FLDINC
0735  1043          TAD     STKTST          /GET TO STARTING FIELD
0736  3043          DCA     STKTST
0737  1373          TAD     PAT1            /UPDATE PATTERN
0740  7040          CMA
0741  3373          DCA     PAT1
0742  1374          TAD     PAT2
0743  7040          CMA
0744  3374          DCA     PAT2
0745  7000  APTOK1, NOP                     /APT/
0746  2370          ISZ     TSTCNT          /ALL DONE THIS TEST
0747  5260          JMP     REDLUP-3
0750  1373          TAD     PAT1
0751  7040          CMA
0752  3373          DCA     PAT1
0753  1374          TAD     PAT2
0754  7040          CMA
0755  3374          DCA     PAT2            /SET UP NEXT PATTERN
0756  2372          ISZ     PATCNT          /SEE IF ALL DONE?
0757  5212          JMP     MOSLOD          /NO, GO DO NEXT PATTERN
0760  1020          TAD     PSR             /YES
0761  0073          AND     K1000           /TEST BIT 2
0762  7640          SZA CLA                 /LOOP ON TEST?
0763  5207          JMP     MOSLOD-3        /YES - GO BACK TO START OF TEST
0764  5600          JMP I   MOSTST          /NO - RETURN TO PROGRAM.
                    /
0765  0000  FLDCNT, 0
0766  0000  ADDINC, 0
0767  0000  FLDINC, 0
```

```
                0770  0000    TSTCNT, 0
                0771  0000    ADDCNT, 0
                0772  0000    PATCNT, 0
                0773  2525    PAT1,   2525
                0774  5252    PAT2,   5252

                0775  1636
                0776  1144
                0777  1000
                      1000    PAGE
                              /SETUP INITIAL VALUE OF PAT1 AND PAT2
                              /
                1000  0000    SETPAT, 0
                1001  1377            TAD     (2525           /CHECKERBOARD PATTERN
                1002  3776'           DCA     PAT1            /SAVE IT
                1003  1776'           TAD     PAT1
                1004  7040            CMA                     /COMPLEMENT IT
                1005  3775'           DCA     PAT2            /SAVE INVERTED CHECKERBOARD PATTERN
                1006  3774'           DCA     ADDCNT
                1007  5600            JMP I SETPAT            /RETURN TO PROGRAM
                              /
                              /THE FOLLOWING TESTS ARE DYNAMIC TEST WHICH CHECK FOR
                              /MULTIPLE SELECTION OF ADDRESS DECODERS, SLOW
                              /RECOVERY OF SENSE AMPLIFIERS, AND READ ACCESS TIME.
                              /
                              /
                              /
                              /DYNTST 1
                              /       1) LOAD BACKGROUND PATTERN OF 4100 (JMS 100) IN ENTIRE MEMORY
                              /       2) LOAD 5700 (JMP I 100) IN FIRST ADDRESS OF EACH PAGE,
                              /          EXCEPT PAGE ZERO.
                              /       3) LOAD INDIRECT ADDRESSING DATA IN LOC 100 OF EACH PAGE.
                              /       4) LOAD RETURN AND ERROR RETURN CODE INTO EACH FIELD UNDER TEST
                              /       5) AFTER CHECKING IF STACK SELECTED TO BE TESTED IS GOOD,
                              /          NO HARD ERRORS, THE CODE IS EXECUTED IN EACH TEST FIELD.
                              /       6) THIS PROCESS IS REPEATED 63 TIMES, INCREMENTING THE COLUMN
                              /          BITS EACH TIME.
                              /       7) THIS TEST IS ESPECIALLY GOOD FOR CHECKING SLOW RECOVERY
                              /           TIME IN SENSE AMPS OF BITS 6-11.
                              /
                              /DYNTST 2
                              /       1) THIS TEST DOES THE SAME THING AS DYNTST 1 EXCEPT INSTEAD
                              /          OF JUMPING IN A FORWARD DIRECTION, IT JUMPS BACK AND
                              /          FORTH FROM BOTTOM TO TOP OF MEMORY TOWARDS THE MIDDLE.
                              /       2) THIS TEST IS ESPECIALLY GOOD FOR CHECKING ADDRESS
                              /          DECODER OF BITS 0-5.
                              /

                              /DYNTST 3
                              /       1) LOADS ALL MEMORY UNDER TEST WITH 4100 (JMS 100).
                              /       2) LOADS LOC'S 0-76 WITH JMP INSTRUCTIONS.
                              /       3) LOADS RETURN AND ERROR RETURN CODE, THEN EXECUTES IT.
                              /       4) DOES ONLY 1 PASS.
                              /       5) THIS TEST IS ESPECIALLY GOOD FOR CHECKING ADDRESS
                              /          DECODER OF BITS 6-11.
                              /
```



```
                              /
                1010  0000    DYNTST, 0
                1011  7300            CLA CLL
                1012  6224            RIF
                1013  1076            TAD     K6201
                1014  3215            DCA     .+1
                1015  6201            CDF                     /MAKE IF FLD= DF FLD
                1016  1020            TAD     PSR             /SEE IF DYNTST TO BE RUN
                1017  0373            AND     (40
                1020  7640            SZA CLA                 /DYNTST TO BE RUN
                1021  5610            JMP I   DYNTST          /NO, EXIT
                1022  4425            PRNTMS
                1023  1606            PRDYN                   /PRINT DYNAMIC TEST MESSAGE
                1024  1072            TAD     K261            /#1
                1025  4435            TYPE
                1026  4436            CRLF
                1027  1372            TAD     (NXTTST         /SETUP TEST POINTER
                1030  3357            DCA     TSTPTR
                1031  1101            TAD     K7600
                1032  3353            DCA     STRTAD          /SETUP START ADDRESS FOR RETURN
                1033  1064            TAD     K200
                1034  3051            DCA     CONST           /SETUP CONSTANT
                1035  1064            TAD     K200
                1036  3360            DCA     TSTORG          /START POINT OF CODE IN TEST FIELD
                1037  3040    XDYN1,  DCA     TESTAD          /START WITH ADDRESS ZERO
                1040  7000    APTOK2, NOP                     /OVERWRITTEN WHEN RUNNING UNDER APT
                1041  3050            DCA     COLCNT          /CLEAR COLUMN COUNTER
                1042  1371            TAD     (5700           /DYNTST 1 AND 2
                1043  3354            DCA     INST            /SETUP INITIAL JMP I INSTRUCTION
                1044  1042            TAD     STKPIN
                1045  1076            TAD     K6201           /SET UP RETURN DATA FIELD
                1046  3770'           DCA     PSTK1
                1047  1041    XDYN2,  TAD     TOPSTK          /GET MAX VALUE IN SYSTEM.
                1050  7040            CMA
                1051  3355            DCA     STKKNT          /SAVE FOR LOOP COUNTER.
                1052  1355            TAD     STKKNT
                1053  3356            DCA     STKKT1
                1054  3043            DCA     STKTST          /START WITH FIELD ZERO
                1055  4344    XDYN3,  JMS     SAME            /SEE IF STACK SELECTED IS SAME AS
                                                              /PROGRAM FIELD.
                1056  5267            JMP     UPSTK           /SAME STACK AS PROGRAM, JUST UPDATE THE
                                                              /FIELD TO NEXT ONE SELECTED.
                1057  1043            TAD     STKTST
                1060  1076            TAD     K6201           /SET UP STACK TO LOAD.
                1061  3767'           DCA     TSTK1
                1062  1360            TAD     TSTORG
                1063  7650            SNA CLA                 /DONE TESTS 1 & 2?
                1064  4766'           JMS     LODFLD          /YES - LOAD PATTERN FOR DYN TEST 3
                1065  4765'           JMS     LODSTK          /GO LOAD PATTERN FOR DYN TEST 1 OR 2
                1066  4764'           JMS     RETCOD          /GO SET UP CODE FOR RETURN
                                                              /FROM TEST FIELD.

                              /NOW UPDATE THE FIELD TO TEST.
                              /
                1067  4504    UPSTK,  JMS I   KSFCHK          /CHECK IF CONSOLE ACTIVE
```

```
                1070  1043            TAD     STKTST
                1071  1057            TAD     K10
                1072  3043            DCA     STKTST          /SAVE NEW OFFSET
                1073  2355            ISZ     STKKNT          /ALL FIELDS AVAILABLE DONE?
                1074  5255            JMP     XDYN3           /NO, GO DO NEXT.

                                /AT THIS POINT ALL AVAILABLE MEMORY IS FILLED
                                /WITH THE TEST PATTERN.
                1075  5763'           JMP     PART2


                                /INCREMENT COLUMN COUNTER AND INST
                1076  2354      NXCOL,  ISZ     INST            /DYN TEST 1 AND 2
                1077  2050            ISZ     COLCNT          /INCREMENT COLUMN COUNTER
                1100  1050            TAD     COLCNT
                1101  0062            AND     K77             /DONE ALL COLUMNS?
                1102  7640            SZA CLA
                1103  5247            JMP     XDYN2           /NO
                1104  1020      DONE3,  TAD     PSR             /GET SWITCH REGISTER
                1105  0073            AND     K1000           /TEST BIT 2
                1106  7640            SZA CLA                 /LOOP ON TEST?
                1107  5237            JMP     XDYN1           /YES
                1110  2357            ISZ     TSTPTR          /SETUP TO DO NEXT TEST
                1111  5757      NXTTST, JMP I   TSTPTR          /JUMP TO NEXT TEST
                1112  5315            JMP     DYNTS2          /= DO DYNAMIC TEST #2
                1113  5331            JMP     DYNTS3          /= DO DYNAMIC TEST #3
                1114  5610            JMP I   DYNTST          /=RETURN TO PROGRAM
                                /DONE DYNAMIC TEST #1
                                /CHANGE CONST FOR DYNTST 2
                1115  1051      DYNTS2, TAD     CONST           /200
                1116  7041            CIA
                1117  3051            DCA     CONST           /=200
                1120  1074            TAD     K4000
                1121  3353            DCA     STRTAD          /START OF RETURN CODE
                1122  4425            PRNTMS
                1123  1606            PRDYN                   /PRINT DYN TEST MESSAGE
                1124  1072            TAD     K261
                1125  7001            IAC                     /#2
                1126  4435            TYPE
                1127  4436            CRLF
                1130  5237            JMP     XDYN1           /
                1131  7300      DYNTS3, CLA CLL
                1132  3360            DCA     TSTORG          /SETUP START POINT
                1133  1362            TAD     (110
                1134  3353            DCA     STRTAD          /START OF RETURN CODE
                1135  4425            PRNTMS
                1136  1606            PRDYN

                1137  1071            TAD     K260
                1140  1055            TAD     K3              /#3
                1141  4435            TYPE
                1142  4436            CRLF
                1143  5237            JMP     XDYN1


                                /RETURN IF PROGRAM IS IN SELECTED STACK
```



```
                                /RETURN +1 IF PROGRAM IS NOT IN SELECTED FIELD
                                /
                                /
                1144  0000      SAME,   0
                1145  1042              TAD STKPIN
                1146  7041              CIA
                1147  1043              TAD STKTST
                1150  7640              SZA CLA
                1151  2344              ISZ SAME        /PROG NOT IN SELECTED STACK
                1152  5744              JMP I SAME

                1153  0000      STRTAD, 0
                1154  0000      INST,   0
                1155  0000      STKKNT, 0
                1156  0000      STKKTI, 0
                1157  0000      TSTPTR, 0
                1160  0000      TSTORG, 0


                1162  0110
                1163  1455
                1164  1400
                1165  1200
                1166  1274
                1167  1341
                1170  1343
                1171  5700
                1172  1171
                1173  0040
                1174  0771
                1175  0774
                1176  0773
                1177  2525
                      1200      PAGE
                                /LOAD BACKGROUN PATTERN AND JMP INSTRUCTIONS
                                /FOR DYNTST 1 OR 2.
                1200  0000      LODSTK, 0
                1201  1050              TAD     COLCNT          /=HAVE ALL TEST FIELDS BEEN
                1202  7740              SZA CLA CLL             /= LOADED WITH BACKGROUND PATTERN?
                1203  5212              JMP     LODJMS          /YES
                                /LOAD ALL LOCATIONS OF TEST FIELD WITH JMS TO LOC. 100
                1204  3040              DCA     TESTAD
                1205  1377      JMSLOD, TAD     (4100           /LOAD BACKGROUND PATTERN INTO
                                                                /STACK SELECTED.
                1206  4340              JMS     CHGFLD          /CHANGE DATA FIELD AND DEPOSIT AC
                1207  2040              ISZ     TESTAD          /DONE 4096 TIMES?
                1210  5205              JMP     JMSLOD          /NO, GO BACK AND DO NEXT ADDRESS
                1211  5227              JMP     LDJMP

                                /REWRITE JMS'S IN ALL LOC THAT WERE CHANGED IN TEST FIELDS
                1212  7340      LODJMS, CLA CLL CMA
                1213  1050              TAD     COLCNT
                1214  1064              TAD     K200
                1215  3040              DCA     TESTAD          /START INITIALLY WITH ADDRESS 200
```

```
                1216  1053            TAD     M75
                1217  3346            DCA     XM75            /SETUP COUNTER
                1220  1377    LDJMS1, TAD     (4100           /GET JMS 100 INST
                1221  4340            JMS     CHGFLD          /DEPOSIT IT IN TEST FIELD
                1222  1040            TAD     TESTAD
                1223  1063            TAD     K100
                1224  3040            DCA     TESTAD          /ADDED 100 TO ADDRESS
                1225  2346            ISZ     XM75            /ARE WE DONE?
                1226  5220            JMP     LDJMS1          /NO
                                /LOAD FIRST LOC OF EACH PAGE,EXCEPT PAGE 0, WITH 5700 = JMP I (XX00
                                /LOC INCREMEMTED BY ONE AFTER EACH COMPLETE PASS BY COLCNT
                1227  7300    LDJMP,  CLA CLL
                1230  1052            TAD     M37
                1231  3350            DCA     XN37            /SETUP COUNTER
                1232  1050            TAD     COLCNT
                1233  1064            TAD     K200
                1234  3040            DCA     TESTAD          /START INITIALLY AT ADDRESS 200
                1235  1776    LDJMP1, TAD     INST            /INITIALLY 5700
                1236  4340            JMS     CHGFLD          /DEPOSIT IT IN TEST FIELD
                1237  1040            TAD     TESTAD
                1240  1064            TAD     K200
                1241  3040            DCA     TESTAD          /ADDED 200 TO ADDRESS
                1242  2350            ISZ     XN37            /DONE?
                1243  5235            JMP LDJMP1              /NO
                                /LOAD LOC 100 OF EACH PAGE, EXCEPT 0, WITH DATA FOR INDIRECT ADDRESSING
                                /LOC INCREMENTED AFTER EACH COMPLETE PASS BY COLCNT
                1244  1063            TAD     K100
                1245  1050            TAD     COLCNT
                1246  3040            DCA     TESTAD          /START INITIALLY AT ADDRESS 200
                1247  1052            TAD     M37
                1250  3347            DCA     XM37            /SETUP COUNTER
                1251  1051            TAD     CONST           /200 FOR DYNTST 1= -200 FOR DYNTST 2
                1252  3345            DCA     DATA            /SETUP DATA
                1253  1050            TAD     COLCNT          /GET COLUMN #
                1254  1051    LDDATA, TAD     CONST           /200
                1255  1345            TAD     DATA
                1256  3345            DCA     DATA            /UPDATE DATA
                1257  1040            TAD     TESTAD          /300 TO 7500 IN INC'S OF 200
                1260  1064            TAD     K200
                1261  3040            DCA     TESTAD          /UPDATED ADDRESS
                1262  1345            TAD     DATA            /DATA IN INCREMENTS OF 200
                1263  4340            JMS     CHGFLD          /DEPOSIT IN TEST FIELD
                1264  1345            TAD     DATA
                1265  0102            AND     K7700
                1266  1074            TAD     K4000           /CHECK IF HALF DONE LOADING FIELD
                1267  7650            SNA CLA                 /HALF DONE?
                1270  4330            JMS     HAFDON          /YES = GO CHECK WHICH TEST IS RUNNING

                1271  2347            ISZ     XM37            /DONE WHOLE FIELD YET?
                1272  5254            JMP     LDDATA          /NO
                1273  5600            JMP I   LDDSTK          /RETURN

                                /LOAD BACKGROUND PATTERN AND JUMP INSTRUCTIONS
                                /FOR DYN TST #3
                1274  0000    LDDFLD, 0
```



```
                1275  7300            CLA CLL
                1276  3040            DCA     TESTAD          /CLEAR TESTAD
                1277  7001            IAC
                1300  3345            DCA     DATA            /SETUP DATA
                1301  1377    LOAD,   TAD     (4100
                1302  4340            JMS     CHGFLD          /STORE IT
                1303  2040            ISZ     TESTAD          /NEXT ADDRESS = DONE 4096 TIMES?
                1304  5301            JMP     LOAD            /NO = DO NEXT ADDRESS
                                /LOAD PAGE ZERO LOC'S 0 TO 76 WITH JUMP INSTRUCTIONS
                1305  1345    AGAIN,  TAD     DATA            /GET JUMP-TO LOCATION DATA
                1306  1351            TAD     M40
                1307  7640            SZA CLA                 /ARE WE AT HALFWAY POINT?
                1310  5314            JMP     .+4             /NO = CONTINUE
                1311  1375            TAD     (5110           /MAKE A JUMP TO 110 INST
                1312  4340            JMS     CHGFLD          /STORE IT
                1313  2040            ISZ     TESTAD          /UP THE ADDRESS
                1314  1345            TAD     DATA            /GET DATA
                1315  7040            CMA                     /COMPLEMENT IT
                1316  0374            AND     (5077           /MAKE JUMP INST
                1317  4340            JMS     CHGFLD          /STORE IT
                1320  2345            ISZ     DATA
                1321  2040            ISZ     TESTAD
                1322  1040            TAD     TESTAD          /CHECK IF DONE
                1323  0062            AND     K77             /ISOLATE BITS 6 TO 11
                1324  7640            SZA CLA                 /DONE?
                1325  5305            JMP     AGAIN           /NO = STORE NEXT INST
                1326  2274            ISZ     LDDFLD          /INCREMENT RETURN
                1327  5674            JMP I   LDDFLD          /YES = RETURN +1

                                /CHECKS TO SEE IF DYN TEST #2 IS RUNNING
                                /IF IT IS 200 IS ADDED TO TESTAD TO SET UP PATTERN PROPERLY
                1330  0000    HAFDON, 0
                1331  1051            TAD     CONST
                1332  7700            SMA CLA                 /RUNNING DYN TEST #2?
                1333  5730            JMP I   HAFDON          /NO = RETURN
                1334  1064            TAD     K200            /YES = ADD 200 TO TESTAD
                1335  1040            TAD     TESTAD
                1336  3040            DCA     TESTAD
                1337  5730            JMP I   HAFDON          /RETURN

                1340  0000    CHGFLD, 0
                1341  6201    TSTK1,  CDF             /TEST FIELD
                1342  3440            DCA I   TESTAD
                1343  6201    PSTK1,  CDF
                1344  5740            JMP I   CHGFLD

                1345  0000    DATA,   0
                1346  0000    XM75,   0
                1347  0000    XM37,   0
                1350  0000    XN37,   0
                1351  7724    M40,    -40

                1374  5077
```

```
 1375  5110
 1376  1154
 1377  4100
 1400          PAGE
               /ROUTINE TO SETUP RETURN FROM TEST FIELD
               /
1400  0000    RETCOD, 0
1401  1777'           TAD     STRTAD          /7600 OR 4000 OR 110
1402  1050            TAD     COLCNT
1403  3040            DCA     TESTAD
1404  4232            JMS     XAND            /SETUP AND INSTRUCTION
1405  2040            ISZ     TESTAD          /NEXT ADDRESS
1406  4242            JMS     XCDF            /SETUP CDF INSTRUCTION
1407  2040            ISZ     TESTAD          /NEXT ADDRESS
1410  4247            JMS     XJMPI           /SETUP JMP I .+1 INSTRUCTION
1411  2040            ISZ     TESTAD          /NEXT ADDRESS
1412  1376            TAD     (RETURN         /GET RETURN ADDRESS
1413  4775'           JMS     CHGFLD

1414  1355            TAD     ADRCHK          /LOCATION EQUAL TO COMPLEMENT OF BITS 6-11
1415  3040            DCA     TESTAD          /SETUP ADDRESS
1416  1102            TAD     K7700           /MASKING DATA
1417  4775'           JMS     CHGFLD          /DEPOSIT IN TEST FIELD

               /SETUP ERROR RETURN FROM TEST FIELD
1420  1063            TAD     K100
1421  7001            IAC
1422  3040            DCA     TESTAD          /START AT ADDRESS 101
1423  4242            JMS     XCDF            /SETUP CDF INSTRUCTION
1424  2040            ISZ     TESTAD          /NEXT ADDRESS
1425  4247            JMS     XJMPI           /SETUP JMP I .+1 INSTRUCTION
1426  2040            ISZ     TESTAD          /NEXT ADDRESS
1427  1374            TAD     (REPERR         /GET ADDRESS OF CALL TO ERROR ROUTINE
1430  4775'           JMS     CHGFLD
1431  5600            JMP I   RETCOD


               /ROUTINE TO MAKE AN AND INST, WITH ADDRESS EQUAL
               /TO THE COMPLEMENT OF COLUMN COUNTER.
1432  0000    XAND,   0
1433  1050            TAD     COLCNT          /GET COLUMN COUNTER
1434  7040            CMA                     /COMPLEMENT IT
1435  0062            AND     K77             /
1436  3355            DCA     ADRCHK          /SAVE FOR LATER USE
1437  1355            TAD     ADRCHK
1440  4775'           JMS     CHGFLD
1441  5632            JMP I   XAND


               /MAKE A CDF INST OF CURRENT PROGRAM FIELD
1442  0000    XCDF,   0
1443  1042            TAD     STKPIN
1444  1077            TAD     K6203
1445  4775'           JMS     CHGFLD
1446  5642            JMP I   XCDF
```



```
               /MAKE A JMP I .+1 INST
1447  0000    XJMPI,  0
1450  1040            TAD     TESTAD
1451  0373            AND     (177
1452  1372            TAD     (5601
1453  4775'           JMS     CHGFLD
1454  5647            JMP I   XJMPI

               /CHECK IF STACK SELECTED IS OK TO EXECUTE IN,
               /THEN EXECUTE CODE STORED THERE.

1455  7300    PART2,  CLA CLL
1456  1050            TAD     COLCNT
1457  1771'           TAD     TSTORG          /START POINT OF CODE IN TEST FIELD
1460  3356            DCA     XSTART
1461  3043            DCA     STKTST          /START WITH FIELD ZERO
1462  4770'   TOP,    JMS     SAME            /CHECK IF PROG FLD EQUAL DATA FLD
1463  1057            TAD     K10             /SAME
1464  1043            TAD     STKTST          /NOT SAME
1465  3043            DCA     STKTST
1466  1043            TAD     STKTST
1467  7112            RTR CLL
1470  7010            RAR
1471  3357            DCA     NWFLD           /SAVE TEST FIELD
1472  2767'           ISZ     STKKT1          /ARE WE DONE?
1473  5275            JMP     .+2             /NO - CONT
1474  5323            JMP     CHKTST          /DONE PASS -GO CHECK WHICH TEST IS RUNNING
1475  1357            TAD     NWFLD
1476  1366            TAD     (FLDLST         /LIST OF STATUS OF FIELDS
1477  3360            DCA     PTR
1500  1760            TAD I   PTR
1501  7640            SZA CLA                 /IS FIELD SELECTED GOOD?
1502  5317            JMP     ADD1            /NO - TRY NEXT ONE
1503  1357            TAD     NWFLD           /YES
1504  7106            RTL CLL
1505  7004            RAL
1506  1077            TAD     K6203           /MAKE CDF INST
1507  3310            DCA     .+1
1510  6201            CDF
1511  1101            TAD     K7600           /STORE IN AC
1512  5756            JMP I   XSTART          /GO EXECUTE CODE IN TEST FIELD
               /IF NO ERRORS OCCURRED PROGRAM CONTROL WILL RETURN HERE

1513  7041    RETURN, CIA                     /COMPLEMENT DATA PREVIOUSLY STORED IN AC
1514  1101            TAD     K7600
1515  7740            SZA CLA CLL             /WAS DYN TEST GOOD?
1516  4327    REPERR, JMS     DYNERR          /NO - REPORT AN ERROR

               /SETUP TO EXECUTE IN NEXT FIELD

1517  1043    ADD1,   TAD     STKTST
1520  1057            TAD     K10
1521  3043            DCA     STKTST
1522  5262            JMP     TOP
               /IF DYNTST 3 IS RUNNING JUMP OUT (DOES ONLY ONE PASS)
```

```
                        /IF DYNTST 1 OR 2 IS RUNNING GO INCREMENT TO NEXT COLUMN
                        
1523  1771'   CHKTST,  TAD     TSTORG          /0 IF DYNTST 3
1524  7640              SZA CLA                 /DYNTST 3 RUNNING?
1525  5765'             JMP     NXCOL           /NO - DO NEXT COLUMN
1526  5764'             JMP     DONE3           /YES - DONE DYNTST 3


1527  0000    DYNERR, 0
1530  7000    APTE03, NOP                     /OVERWRITTEN IF UNDER APT
1531  4763'           JMS     BELL            /CHECK FOR BELL- RETURN +1 IF NOBELL
1532  5727            JMP I   DYNERR          /BELL - RETURN TO PROGRAM
1533  1020            TAD     PSR             /CHECK FOR INHIBIT TYPEOUT
1534  0064            AND     K200            /TEST BIT 4
1535  7640            SZA CLA                 /INHIBIT TYPEOUT?
1536  5345            JMP     OVER            /YES -BYPASS TYPEOUT ROUTINE
1537  4425            PRNTMS
1540  1613            DYNER1                  /PRINT ERROR MESSAGE
1541  1357            TAD     NWFLD           /FIELD UNDER TEST
1542  1071            TAD     K260            /   AT TIME OF ERROR
1543  4435            TYPE
1544  4436            CRLF
1545  1020    OVER,   TAD     PSR             /INHIBIT ERROR HALT?
1546  7700            SMA CLA                 /TEST BIT 0
1547  4762'           JMS     PSEUDO          /NO
1550  1020            TAD     PSR             /GET SWITCH REGISTER
1551  7004            RAL                     /TEST BIT 1
1552  7710            SPA CLA                 /LOOP ON ERROR?
1553  5761'           JMP     XDYN1           /YES
1554  5727            JMP I   DYNERR          /RETURN TO PROGRAM


1555  0000    ADRCHK, 0
1556  0000    XSTART, 0               /STARTING ADDRESS-1 OF PROGRAM IN TEST FIELD
1557  0000    NWFLD,  0
1560  0000    PTR,    0


1561  1037
1562  2440
1563  2056
1564  1104
1565  1076
1566  1725

1567  1156
1570  1144
1571  1160
1572  5601
1573  0177
1574  1516
1575  1340
1576  1513
```



```
1577  1153
      1600      PAGE
1600  1501    MARCH,  TEXT            "MARCH TEST#"
1601  2203
1602  1040
1603  2405
1604  2324
1605  4300

1606  0431    PRDYN,  TEXT            "DYN TEST "
1607  1640
1610  2405
1611  2324
1612  4000
1613  0140    DYNER1, TEXT            "A DYNAMIC ERROR HAS OCCURED IN FIELD "
1614  0431
1615  1601
1616  1511
1617  0340
1620  0522
1621  2217
1622  2240
1623  1001
1624  2340
1625  1703
1626  0325
1627  2205
1630  0440
1631  1116
1632  4006
1633  1105
1634  1404
1635  4000

                        /
                        /MOSTST ERROR ROUTINE
                        /
1636  0000    MOSERR, 0
1637  7300            CLL CLA
1640  7000    APTE01, NOP
1641  2047            ISZ     COUNT
1642  7410            SKP
1643  5241            JMP     .-2
1644  4777'           JMS BELL        /CHECK FOR BELL - RETURN +1 IF NOBELL
1645  5636            JMP I MOSERR    /BELL - RETURN TO PROGRAM
1646  1020            TAD PSR         /NO BELL - CHECK FOR INHIBIT TYPEOUT
1647  0064            AND K200
1650  7640            SZA CLA
1651  5313            JMP STOP        /BYPASS ERROR TYPEOUT ROUTINE
1652  2037            ISZ HEAD1
1653  5256            JMP PERR1
1654  4425            PRNTMS
1655  1735            HEAD            /TYPEOUT ERROR HEADING
1656  1042    PERR1,  TAD STKPIN      /PROGRAM FIELD
1657  7012            RTR
```

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1001    1660  7010            RAR
1002    1661  1071            TAD K260
1003    1662  4435            TYPE
1004    1663  7040            CMA
1005    1664  1236            TAD MOSERR      /PROGRAM LOCATION OF CALL TO SUB
1006    1665  4433            PRNT4
1007    1666  4434            SPACE2
1008    1667  1043            TAD STKTST      /FIELD OF ERROR
1009    1670  7012            RTR
1010    1671  7010            RAR
1011    1672  3323            DCA XFLD        /SAVE # OF FIELD OF ERROR
1012    1673  1323            TAD XFLD
1013    1674  1071            TAD K260
1014    1675  4435            TYPE
1015    1676  1040            TAD TESTAD      /FAILING ADDRESS
1016    1677  4433            PRNT4
1017    1700  1045            TAD GDATA       /GOOD DATA
1018    1701  4433            PRNT4
1019    1702  1044            TAD BDATA       /BAD DATA
1020    1703  4433            PRNT4
1021    1704  4425            PRNTMS
1022    1705  1600            MARCH           /PRINT MARCH TEST
1023    1706  1323            TAD XFLD        /FIELD OF ERROR
1024    1707  1376            TAD (FLDLST
1025    1710  3324            DCA BADFLD
1026    1711  7240            STA
1027    1712  3724            DCA I BADFLD    /LOAD ADDRESS OF BAD FIELD WITH ONES
1028    1713  1020    STOP,   TAD PSR         /INHIBIT ERROR HALT
1029    1714  7700            SMA CLA         /TEST BIT 0
1030    1715  4775'           JMS PSEUDO      /NO
1031    1716  1020            TAD PSR         /LOOP ON ERROR?
1032    1717  7004            RAL             /TEST BIT 1
1033    1720  7710            SPA CLA
1034    1721  5774'           JMP MOSLOD=3    /YES
1035    1722  5636            JMP I MOSERR    /NO - RETURN TO PROGRAM
1036
1037    1723  0000    XFLD,   0
1038    1724  0000    BADFLD, 0
1039
1040    1725  0000    FLDLST, 0       /F0 - ZEROS FOR GOOD STACK, ONES FOR BAD
1041    1726  0000            0       /F1
1042    1727  0000            0       /F2
1043    1730  0000            0       /F3
1044    1731  0000            0       /F4
1045    1732  0000            0       /F5
1046    1733  0000            0       /F6
1047    1734  0000            0       /F7

1048    1735  2022    HEAD,   TEXT            "PR LOC   ADDR   GOOD  BAD#"
        1736  4014
        1737  1703
        1740  4040
        1741  4001
        1742  0404
        1743  2240
        1744  4040
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        1745  0717
        1746  1704
        1747  4040
        1750  0201
        1751  0443
        1752  0000
1049
1050
1051    1774  0607
1052    1775  2440
1053    1776  1725
1054    1777  2056
              2000            PAGE
1055                    /
1056                    /RELOCATION ERROR ROUTINE
1057                    /
1058    2000  0000    ERRM,   0
1059    2001  7200            CLA
1060    2002  7000    APTE02, NOP
1061    2003  2047            ISZ COUNT       /RELO ERROR OCCURED
1062    2004  7410            SKP
1063    2005  5203            JMP .-2
1064    2006  4256            JMS BELL        /CHECK FOR BELL - RETURN +1 IF NO BELL
1065    2007  4600            JMS I ERRM      /BELL - RETURN TO PROGRAM
1066    2010  1020            TAD PSR         /NO BELL - CHECK FOR INHIBIT TYPEOUT
1067    2011  0064            AND K200
1068    2012  7640            SZA CLA
1069    2013  5230            JMP STOP1       /BYPASS TYPEOUT ROUTINE
1070    2014  4425    PERRM,  PRNTMS
1071    2015  2040            RELERR
1072    2016  1043            TAD     STKTST
1073    2017  7112            CLL RTR
1074    2020  7010            RAR
1075    2021  1071            TAD     K260    /FIELD OF ERROR
1076    2022  4435            TYPE
1077    2023  1046            TAD MOVE        /ADDRESS OF ERROR
1078    2024  4433            PRNT4
1079    2025  4436            CRLF
1080    2026  7240            STA
1081    2027  3037            DCA     HEAD1
1082    2030  1020    STOP1,  TAD PSR         /INHIBIT ERROR HALT?
1083    2031  7700            SMA CLA         /TEST BIT 0
1084    2032  4777'           JMS PSEUDO      /NO
1085    2033  1020            TAD PSR         /LOOP ON ERROR?
1086    2034  7004            RAL
1087    2035  7710            SPA CLA
1088    2036  5776'           JMP RELO1=1     /YES
1089    2037  5600            JMP I ERRM      /RETURN TO PROGRAM
1090
1091    2040  5252    RELERR, TEXT                    "***WARNING*** RELO ERR AT "
        2041  5227
        2042  0122
        2043  1611
        2044  1607
        2045  5252
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        2046  5240
        2047  2205
        2050  1417
        2051  4005
        2052  2222
        2053  4001
        2054  2440
        2055  0000
1092
1093    2056  0000    BELL,   0
1094    2057  7300            CLA CLL
1095    2060  1020            TAD PSR         /CHECK FOR BELL ON ERROR
1096    2061  0060            AND K20         /BIT 7
1097    2062  7650            SNA CLA
1098    2063  5270            JMP NOBELL
1099    2064  1065    RBELL,  TAD K207        /BELL CODE
1100    2065  4435            TYPE
1101    2066  4504            JMS I KSFCHK    /CHECK FOR CONSOLE RECEIVE FLAG
1102    2067  5656            JMP I BELL
1103    2070  2256    NOBELL, ISZ BELL        /RETURN +1
1104    2071  5656            JMP I BELL
1105    2176  0421
1106    2177  2440
              2200    PAGE                            /APT/
1107    2200  0000    APTMOD, 0
1108    2201  1377            TAD     (JMS I IAPTOK   /SETUP FOR APT CONTROL
1109    2202  3776'           DCA     APTOK0          /
1110    2203  1377            TAD     (JMS I IAPTOK   /SETUP FOR APT CONTROL
1111    2204  3775'           DCA     APTOK1
1112    2205  1377            TAD     (JMS I IAPTOK   /SETUP FOR APT CONTROL
1113    2206  3774'           DCA     APTOK2
1114    2207  1373            TAD     (7000           /MODIFY SOME LOCS TO:  NOP,
1115    2210  3772'           DCA     APTN00          /
1116    2211  1373            TAD     (7000           /
1117    2212  3771'           DCA     APTN01          /
1118    2213  1373            TAD     (7000
1119    2214  3770'           DCA     APTN02
1120    2215  1373            TAD     (7000           /
1121    2216  3767'           DCA     6505            /OVERWRITES APT CODE
1122    2217  1373            TAD     (7000
1123    2220  3766'           DCA     6523            /OVERWRITES APT CODE
1124    2221  1365            TAD     (JMS I IAPTER   /MODIFY SOME LOCS TO:  JMS I IAPTER,
1125    2222  3764'           DCA     APTE01
1126    2223  1365            TAD     (JMS I IAPTER
1127    2224  3763'           DCA     APTE02
1128    2225  1365            TAD     (JMS I IAPTER
1129    2226  3762'           DCA     APTE03

1130    2227  1361            TAD     (INHMES         /INHIBIT USE OF MESAGX ROUTINE
1131    2230  3760'           DCA     APTMES
1132    2231  1357            TAD     (INHTYP         /INHIBIT USE OF TYPE ROUTINE
1133    2232  3756'           DCA     APTNTP
1134    2233  5600            JMP I APTMOD
1135
1136
1137
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1138
1139                    /APT/   ROUTINE TO 'NOTIFY' APT THAT THE PROGRAM IS RUNNING OK,
1140                    /PROGRAM JUMPS TO APT CODE THAT WAS SAVED IN PROGRAM FIELD
1141
1142    2234  0000    APTOK,  0                       /APT/
1143    2235  6002            IOF                     /APT/
1144    2236  7200            CLA                     /APT/
1145    2237  1251            TAD     APTIMX          /APT/DELAY 100MS,
1146    2240  3253            DCA     APTCTX          /APT/
1147    2241  1252            TAD     APTIMY          /APT/
1148    2242  3254            DCA     APTCTY          /APT/
1149    2243  2254            ISZ     APTCTY          /APT/
1150    2244  5243            JMP     .-1             /APT/
1151    2245  2253            ISZ     APTCTX          /APT/
1152    2246  5241            JMP     .-5             /APT/
1153    2247  4755'           JMS     6500            /APT/CALL APT = 'PROG OK',
1154    2250  5634            JMP I   APTOK           /APT/RTN FROM APT = RTN TO CALL+1,
1155
1156    2251  7776    APTIMX, -2                      /APT/
1157    2252  0000    APTIMY, 0                       /APT/
1158    2253  0000    APTCTX, 0                       /APT/
1159    2254  0000    APTCTY, 0                       /APT/
1160
1161
1162
1163                    /APT/   ROUTINE TO HANDLE ERRORS UNDER APT CONTROL,
1164                    /PROGRAM JUMPS TO APT CODE THAT WAS SAVED IN PROGRAM FIELD
1165
1166    2255  0000    APTER,  0                       /APT/
1167    2256  6002            IOF                     /APT/
1168    2257  7200            CLA                     /APT/
1169    2260  6224            RIF                     /APT/AC=IF,
1170    2261  1076            TAD     K6201           /APT/CREATE A CDF INST,
1171    2262  3265            DCA     .+3             /APT/MODIFY NEXT CDF INST,
1172    2263  7240            CLA CMA                 /APT/
1173    2264  1255            TAD     APTER           /APT/AC=ERROR PC,
1174    2265  6201            CDF                     /APT/(MODIFIED CDF) DF=IF,
1175    2266  5754'           JMP     6520            /APT/CALL APT = 'ERROR',
1176
1177
1178                    /C8/    ROUTINE  TO SAVE PAGE 37 OF FIELD 0 & 1 OR SAVE APT HANDLER
1179
1180                    /SAVE EITHER APT OR OS8 CODE
1181    2267  0000    SAVOS8, 0
1182    2270  1100            TAD K7577       /SETUP OS8 HANDLER POINTER -1
1183    2271  3010            DCA 10  /SAVE IN AUTO INDEX 10
1184    2272  1076            TAD K6201
1185    2273  1057            TAD K10         /FIELD 1
1186    2274  3314            DCA FLD         /SAVE OS8 FIELD 1
1187    2275  4307            JMS SAVFLD      /DO IT
1188    2276  5667            JMP I SAVOS8    /RETURN TO PROGRAM
1189    2277  1353    XAPT,   TAD (5577       /SETUP APT HANDLER POINTER -1
1190
1191    2300  3010            DCA 10          /SAVE IN AUTO INDEX 10
1192    2301  1076            TAD K6201
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1193    2302  1061            TAD K30         /FIELD 3
1194    2303  3314            DCA FLD         /MODIFY CDF INSTRUCTION IN LOC FLD
1195    2304  4307            JMS SAVFLD      /GO SAVE APT HANDLER
1196    2305  4200            JMS APTMOD      /GO MODIFY LOCATIONS FOR APT
1197    2306  5752'           JMP BEGIN
1198
1199    2307  0000    SAVFLD, 0
1200    2310  1751'           TAD PRGSTR      /INSTRUCTION FIELD
1201    2311  3316            DCA PRGFLD      /MODIFY INSTRUCTION AT LOC PRGFLD
1202    2312  1325            TAD STOADD      /GET ADDRESS OF STORAGE ADDRESS
1203    2313  3011            DCA 11  /SAVE IN AUTO INDEX 11
1204    2314  6201    FLD,    CDF0            /CHANGE DATA FIELD
1205    2315  1410            TAD I 10        /GET WORD
1206    2316  6201    PRGFLD, CDF0    /CHANGE DATA FIELD TO PROGRAM FIELD
1207    2317  3411            DCA I 11        /SAVE IN STORE AREA
1208    2320  1010            TAD 10
1209    2321  7040            CMA
1210    2322  7640            SZA CLA         /CHECK TO SEE IF DONE
1211    2323  5314            JMP FLD         /NO = DO NEXT WORD
1212    2324  5707            JMP I SAVFLD    /YES = RETURN
1213
1214    2325  5577    STOADD, 5577
1215    2326  4323    SRMESG, TEXT                    "#SR="
        2327  2275
        2330  0000
1216    2331  7743    QESTMK, TEXT                    "?#"
        2332  0000
1217    2333  3603    UPARRC, TEXT                    ""C#"
        2334  4300
1218    2335  3607    UPARRG, TEXT                    ""G#"
        2336  4300
1219
1220    2351  0216
1221    2352  0214
1222    2353  5577
1223    2354  6520
1224    2355  6500
1225    2356  2637
1226    2357  5635
1227    2360  3002
1228    2361  5600
1229    2362  1530
1230    2363  2002
1231    2364  1640
1232    2365  4505
1233    2366  6523
1234    2367  6505

1235    2370  2524
1236    2371  0223
1237    2372  0213
1238    2373  7000
1239    2374  1040
1240    2375  0745
1241    2376  0261
1242    2377  4506
```



```
                2400    PAGE                            /APT/
1243
1244
1245                    /C8/    ROUTINE TO RESTORE PAGES 37 OF FIELD 0 AND 1
1246
1247    2400  7200    C8RM,   CLA
1248    2401  4425            PRNTMS                  /GO PRINT UPARROW C
1249    2402  2333            UPARRC                  /POINTER TO MESSAGE
1250    2403  6224            RIF                     /GET THE PRESENT DATA  FIELD
1251    2404  1076            TAD     K6201           /GET THE CDF INSTRUCTION
1252    2405  3216            DCA     C8RM0           /SAVE THE NEW CDF INSTRUCTION
1253    2406  1100            TAD     K7577           /SET UP AUTO INDEX FOR RESTORE OF 0
1254    2407  3010            DCA     10              /SAVE IN AUTO INDEX 10
1255    2410  1377            TAD     (5577           /SETUP STORAGE  POINTER
1256    2411  3011            DCA     11              /SAVE IN AUTO INDEX 11
1257    2412  1100            TAD     K7577           /SEUP AUTO INDEX OF RESTORE OF FILD 1
1258    2413  3012            DCA     12              /SAVE IN AUTO INDEX 12
1259    2414  1100            TAD     K7577           /SETUP NEXT POINTER
1260    2415  3013            DCA     13              /SAVE IN AUTO INDEX 13
1261    2416  6201    C8RM0,  CDF                     /MODIFIED CDF INSTRUCTION TO PRG FIELD
1262    2417  1010            TAD     10              /RESTORATION DONE
1263    2420  7040            CMA
1264    2421  7450            SNA                     /SKIP IF NO
1265    2422  5235            JMP     C8RM1           /DONE=GO TO MONITOR AT 7600
1266    2423  7621            7621                    /CLEAR AC AND MQ
1267    2424  1410            TAD  I  10              /GET DATA FROM PROGRAM FIELD
1268    2425  7421            7421                    /PUT IT IN THE MQ
1269    2426  1411            TAD  I  11              /GET DATA TO BE PUT IN FIELD 1
1270    2427  6211            CDF     10              /CHANGE DATA FIELD TO 1
1271    2430  3413            DCA  I  13              /PUT IT IN FIELD 1
1272    2431  7521            7521                    /SWAP AC AND MQ
1273    2432  6201            CDF     00              /CHANGE DATA FIELD TO 0
1274    2433  3412            DCA  I  12              /RESTORE FIELD 0 PAGE 37
1275    2434  5216            JMP     C8RM0           /GO DO NEXT WORD
1276    2435  6203    C8RM1,  CDF     CIF             /CHANGE DATA AND INSTR FIELD TO 0
1277    2436  5637            JMP  I  .+1             /GO TO 7600 OF THAT FIELD
1278    2437  7600            7600                    /MONITOR STARTING ADDRESS
1279
1280
1281                    /ROUTINE USED FOR CONSOLE SWITCH REGISTER CHANGES
1282
1283    2440  0000    PSEUDO, 0
1284    2441  7200            CLA
1285    2442  4425    SRQEST, PRNTMS                  /PRINT SR QUESTION
1286    2443  2326            SRMESG                  /POINTER TO MESSAGE
1287    2444  1020            TAD PSR                 /GET THE VALUE OF THE SWITCH REGISTER
1288    2445  4433            PRNT4                   /PRINT THE 4 DIGITS
1289    2446  7346            CLA CLL CMA RTL         /SETUP A COUNTER TO ACCEPT 4 DIGITS
1290    2447  3322            DCA     TTYCNT          /SAVE THE COUNTER
1291    2450  1376            TAD     (CHARR0         /GET POINTER FOR FIRST CHARACTER
1292    2451  3254            DCA     CHGCHR          /SAVE THE POINTER FOR DIGITS
1293    2452  4424            LISN                    /WAIT FOR KEYBOARD INPUT
1294    2453  0001            1                       /CHECK FOR A OCTAL DIGIT
1295    2454  2472    CHGCHR, CHARR0                  /THIS LOCATION WILL GET MODIFIED
1296    2455  7566            =212                    /CHECK FOR LINE FEED
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1297    2456  3124            RESTRT                  /LINE FEED = RETURN TO START VIA RESTRT
1298    2457  7563            -215                    /CHECK FOR CARRAIGE RETURN
1299    2460  2506            RETYPE                  /RETYPE SR AND CONT IF DIGITS TYPED
1300    2461  7575            -203                    /CHECK FOR A CONTROL C
1301    2462  2400            C8RM                    /CONTROL C TYPED -RETURN TO MONITOR
1302    2463  7555            -223                    /CHECK FOR A CONTROL S
1303    2464  2553            CNTRS                   /WAS CONTROL S WAIT FOR ^Q OR ^C
1304    2465  0000            0                       /NONE OF ABOVE CHARACTERS-ILLEGAL CHAR
1305    2466  2467            .+1                     /GO TO NEXT ADDRESS TO PRINT ?
1306    2467  4425            PRNTMS                  /GO PRINT ?
1307    2470  2331            QESTMK                  /POINTER TO ? MESSAGE
1308    2471  5242            JMP     SRQEST          /RETURN AND ASK QUESTION AGAIN
1309    2472  3020  CHARR0,   DCA     PSR             /SAVE THE LEAST SIGNIFICANT BIT
1310    2473  1375            TAD     (CHARR1         /UPDATA POINTER FOR CHARACTERS 2 3 4
1311    2474  3254            DCA     CHGCHR          /SAVE THE POINTER ADDRESS
1312    2475  5252            JMP     CHGCHR-2        /RETURN FOR NEXT CHARACTER INPUT
1313    2476  3321  CHARR1,   DCA     SAVCHR          /SAVE THE CHARACTER TYPED
1314    2477  1020            TAD     PSR             /GET THE VALUE OF SR
1315    2500  7106            CLL     RTL             /MOVE IT INTO NEXT POSITION
1316    2501  7004            RAL
1317    2502  1321            TAD     SAVCHR          /ADD NEW CHARACTER TO IT
1318    2503  3020            DCA     PSR             /SAVE THE NEW VALUE
1319    2504  2322            ISZ     TTYCNT          /DONE ALL 4 CHARACTERS
1320    2505  5252            JMP     CHGCHR-2        /NO GET NEXT INPUT FROM KEYBOARD
1321    2506  1376  RETYPE,   TAD     (CHARR0         /GET POINTER TO SEE IF SR ECHOED
1322    2507  7041            CIA                     /NEGATE THE POINTER
1323    2510  1254            TAD     CHGCHR          /GET THE POINTER STORED
1324    2511  7650            SNA     CLA             /ECHO VALUE OF SR?
1325    2512  5640            JMP  I  PSEUDO          /NO-ONLY CR WAS TYPED-USE ORIGINAL VALUE
1326    2513  4425            PRNTMS                  /RE-ECHO VALUE TYPED
1327    2514  2326            SRMESG                  /POINTER TO SR MESSAGE
1328    2515  1020            TAD PSR                 /GET VALUE OF SR
1329    2516  4433            PRNT4                   /PRINT THE 4 OCTAL DIGITS
1330    2517  4436            CRLF                    /ISSUE A CR AND LF
1331    2520  5640            JMP  I  PSEUDO          /RETURN TO PROGRAM
1332
1333    2521  0000  SAVCHR,  0
1334    2522  0000  TTYCNT,  0
1335
1336
1337
1338                  /ROUTINE TO CHECK FOR CONSOLE RECEIVE FLAG
1339
1340    2523  0000  CHKKSF,  0
1341    2524  6031  APTNO2,  KSF                     /SKIP  ON CONSOLE RECEIVE FLAG
1342    2525  5723            JMP  I  CHKKSF          /RECEIVE FLAG NOT SET RETURN TO PROGRAM
1343    2526  1022            TAD HCW2                /CHECK TO SEE IF RUNNING UNDER APT?

1344    2527  7700            SMA CLA                 /YES = CLEAR FLAG AND RETURN
1345    2530  5333            JMP     .+3             /NO =CHECK FOR ^C OR ^G
1346    2531  6032            KCC                     /CLEAR CONSOLE RECEIVE FLAG
1347    2532  5723            JMP  I  CHKKSF          /RETURN TO PROGRAM
1348    2533  4424            LISN                    /CHECK THE KEYBOARD CHARACTER
1349    2534  7575            -203                    /CODE FOR ^C
1350    2535  2400            C8RM                    /WAS A CONTROL C-EXIT TO MONITOR
1351    2536  7571            -207                    /CODE FOR ^G
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1352    2537  2547            CNTRLG                  /WAS  ^G ECHO CHAR-ENTER SR QUESTION
1353    2540  7555            -223                    /CHECK FOR A CONTROL S
1354    2541  2555            CNTRS1                  /WAS A CONTROL S WAIT FOR ^Q OR ^C
1355    2542  0000            0                       /CHAR WAS NOT ^C OR ^ G
1356    2543  2544            .+1                     /ECHO CHAR AND QUESTION MARK
1357    2544  4425            PRNTMS                  /PRINT ? AND CR  LF
1358    2545  2331            QESTMK                  /POINTER TO MESSAGE
1359    2546  5723            JMP  I  CHKKSF          /RETURN TO PROGRAM
1360
1361    2547  4425  CNTRLG,   PRNTMS                  /PRINT ^G AND CR LF
1362    2550  2335            UPARRG                  /POINTER  TO MESSAGE
1363    2551  4240            JMS     PSEUDO          /GO ASK THE SR QUESTION
1364    2552  5723            JMP  I  CHKKSF          /RETURN TO THE PROGRAM
1365
1366    2553  4774' CNTRS,    JMS     WAITQC          /GO WAIT FOR A CONTROL Q OR C
1367    2554  5252            JMP     CHGCHR-2        /GO WAIT FOR NEXT CHAR
1368
1369    2555  4774' CNTRS1,   JMS     WAITQC          /WAIT FOR A CONTROL Q OR C
1370    2556  5723            JMP  I  CHKKSF          /RETURN TO PROGRAM
1371
1372
1373    2574  3106
1374    2575  2476
1375    2576  2472
1376    2577  5577
              2600            PAGE
1377
1378
1379
1380    2600  0000  FILLER,   0                       /SET TO NUMBER OF FILLERS REQUIRED
1381
1382                  /INPUT ONE OCTAL NUMBER TO AC 9 THRU 11
1383                  /GOOD RETURN IS JMS+2
1384
1385    2601  0000  ONEOCK,   0                       /CALL BY "ONEOCT"
1386    2602  4424            LISN
1387    2603  0001            1
1388    2604  2607            .+3
1389    2605  0000            0
1390    2606  2610            .+2
1391    2607  2201            ISZ     ONEOCK
1392    2610  5601            JMP I   ONEOCK
1393
1394                  /INPUT TWO OCTAL NUMBERS TO AC 6 THRU 11
1395                  /GOOD RETURN IS JMS+2
1396
1397    2611  0000  TWOOCK,   0                       /CALL BY "TWOOCT"
1398    2612  4201            JMS     ONEOCK
1399    2613  5611            JMP I   TWOOCK
1400    2614  7104            CLL RAL
1401    2615  7006            RTL
1402    2616  3224            DCA     XPRNT2
1403    2617  4201            JMS     ONEOCK
1404    2620  5611            JMP I   TWOOCK
1405    2621  1224            TAD     XPRNT2
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1406    2622  2211          ISZ     TWOOCK
1407    2623  5611          JMP I   TWOOCK
1408
1409                  /PRINT THE TWO OCTAL NUMBERS IN THE AC 6 THRU 11
1410
1411    2624  0000  XPRNT2, 0                       /CALL BY "PRNT2"
1412    2625  3211          DCA     TWOOCK
1413    2626  1211          TAD     TWOOCK
1414    2627  7012          RTR
1415    2630  7010          RAR
1416    2631  4430          PRNT1
1417    2632  1211          TAD     TWOOCK
1418    2633  4430          PRNT1
1419    2634  5624          JMP I   XPRNT2
1420
1421                  /TYPE THE ASCII CHARACTER IN THE AC
1422
1423    2635  0000  XTYPE,  0                       /CALL BY "TYPE"
1424    2636  3251          DCA     CHAR            /SAVE THE CHARACTER
1425    2637  7000  APTNTP, NOP                     /APT
1426    2640  7610          SKP     CLA             /CONSOLE INACTIVE-TYPE THE CHARACTER
1427    2641  4777* 
                    JMS     CNTRLS          /CONSOLE ACTIVE-CHECK FOR CONTROL S
1428    2642  1251          TAD     CHAR            /GET THE CHARACTER SAVED AND PRINT
1429    2643  6046          TLS
1430    2644  7200          CLA
1431    2645  6041          TSF
1432    2646  5245          JMP     .-1
1433    2647  6042          TCF
1434    2650  5635          JMP I   XTYPE
1435
1436    2651  0000  CHAR,   0
1437          5635  INHTYP=JMP I XTYPE
1438
1439
1440
1441                  /TYPE A CR AND LF WITH NUMBER OF FILLERS
1442                  /AS DETERMINED BY LOCATION "FILLER"
1443
1444    2652  0000  XCRLF,  0                       /CALL BY "CRLF"
1445    2653  7200          CLA
1446    2654  1067          TAD     K215
1447    2655  4435          TYPE
1448    2656  1200          TAD     FILLER
1449    2657  7040          CMA
1450    2660  3266          DCA     XORS
1451    2661  1066          TAD     K212
1452    2662  4435          TYPE

1453    2663  2266          ISZ     XORS
1454    2664  5262          JMP     .-2
1455    2665  5652          JMP I   XCRLF
1456
1457    2666  0000  XORS,   0
1458
1459                  /PRINT 2 SPACES
1460
```



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1461    2667  0000  SPACX2, 0       /CALL BY "SPACE2"
1462    2670  4425          PRNTMS
1463    2671  2673          .+2
1464    2672  5667          JMP I SPACX2
1465    2673  4040          4040
1466    2674  0010          0010    /USED BY LISN
1467
1468
1469                  /COMPARE INPUT TO LIST FOLLOWING CALL
1470                  /INPUT ONE CHARACTER IF AC=0
1471                  /USE TAD PSRT INPUT IF AC NON ZERO
1472
1473    2675  0000  XLISN,  0                       /CALL BY "LISN"
1474    2676  7640          SZA CLA
1475    2677  5325          JMP     LISN1           /USE TAD PSRT INPUT SINCE AC NOT ZERO
1476    2700  6031          KSF
1477    2701  5300          JMP     .-1
1478    2702  6036          KPB
1479    2703  0357          AND     K177
1480    2704  1064          TAD     K200
1481    2705  3267          DCA     SPACX2
1482    2706  1267          TAD     SPACX2
1483    2707  1361          TAD     M212
1484    2710  7450          SNA                     /IS IT A LF?
1485    2711  5315          JMP     .+4             /YES
1486    2712  1360          TAD     M3
1487    2713  7640          SZA CLA                 /IS IT A CR?
1488    2714  5317          JMP     .+3             /NO
1489    2715  4436          CRLF
1490    2716  5325          JMP     LISN1
1491    2717  1267          TAD     SPACX2          /GET THE CHAR
1492    2720  1376          TAD     (-223           /CHECK FOR A CONTROL S
1493    2721  7650          SNA     CLA             /WAS IT A CONTROL S
1494    2722  5325          JMP     LISN1           /YES-DO NOT ECHO CHARACTER
1495    2723  1267          TAD     SPACX2
1496    2724  4435          TYPE                    /PRINT THE CHARACTER
1497    2725  1675  LISN1,  TAD I   XLISN           /GET COMPARE VALUE
1498    2726  2275          ISZ     XLISN
1499    2727  7450          SNA                     /EXIT?
1500    2730  5336          JMP     LISN3           /YES
1501    2731  7500          SMA
1502    2732  5346          JMP     LISNUM          /LOOK FOR OCTAL NUMBER
1503    2733  1267          TAD     SPACX2          /COMPARE
1504    2734  7640          SZA CLA                 /EQUAL?
1505    2735  5343          JMP     LISN2           /NO
1506    2736  3266  LISN3,  DCA     XORS
1507    2737  1675          TAD I   XLISN
1508    2740  3275          DCA     XLISN
1509    2741  1266          TAD     XORS
1510    2742  5675          JMP I   XLISN          /AC IS ZERO UNLESS OCTAL NUMBER
1511    2743  7200  LISN2,  CLA
1512    2744  2275          ISZ     XLISN
1513    2745  5325          JMP     LISN1
1514    2746  7200  LISNUM, CLA                     /LOOK FOR OCTAL NUMBER
1515    2747  1267          TAD     SPACX2
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1516    2750  1354            TAD     M270
1517    2751  7500            SMA                     /IS IT LESS THAN 8?
1518    2752  5343            JMP     LISN2           /NO, SO NOT AN OCTAL NUMBER
1519    2753  1057            TAD     K10
1520    2754  7510    M270,   SPA                     /IS IT GREATER THAN ZERO?
1521    2755  5343            JMP     LISN2           /NO, SO NOT A NUMBER
1522    2756  5336            JMP     LISN3
1523    2757  0177    K177,   0177
1524    2760  7775    M3,     7775
1525    2761  7566    M212,   7566
1526
1527
1528
1529
1530    2776  7555
1531    2777  3073
              3000    PAGE
1532
1533
1534
1535                    /PRINT PACKED ASCII TEXT TERMINATED BY
1536                    /SIX-BIT 00
1537
1538    3000  0000    MESAGX, 0                       /CALL BY "MESAGE"
1539    3001  7200            CLA
1540    3002  7000    APTMES, NOP                     /APT
1541    3003  1600            TAD I   MESAGX
1542    3004  3237            DCA     FOROCK
1543    3005  2200            ISZ     MESAGX          /SET UP RETURN
1544    3006  1637            TAD I FOROCK
1545    3007  7012            RTR
1546    3010  7012            RTR
1547    3011  7012            RTR
1548    3012  4217            JMS     MESAGF
1549    3013  1637            TAD I FOROCK
1550    3014  4217            JMS     MESAGF
1551    3015  2237            ISZ     FOROCK
1552    3016  5206            JMP     .-10
1553    3017  0000    MESAGF, 0
1554    3020  0062            AND     K77
1555    3021  7450            SNA                     /TERMINATOR (00)?
1556    3022  5600            JMP I   MESAGX          /YES
1557    3023  1236            TAD     M43
1558    3024  7450            SNA                     /CRLF?
1559    3025  5234            JMP     .+7             /YES
1560    3026  1055            TAD     K3
1561    3027  7510            SPA                     /200 OR 300

1562    3030  1063            TAD     K100            /300
1563    3031  1070            TAD     K240            /200
1564    3032  4435            TYPE
1565    3033  5617            JMP I MESAGF
1566    3034  4436            CRLF
1567    3035  5617            JMP I   MESAGF
1568    3036  7735    M43,    7735
1569          5600    INHMES=JMP I MESAGX
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1570
1571
1572                    /INPUT 4 OCTAL NUMBERS TO AC
1573                    /GOOD RETURN IS CALL+2
1574
1575    3037  0000    FOROCK, 0                       /CALL BY "FOROCT"
1576    3040  4427            TWOOCT
1577    3041  5637            JMP I   FOROCK
1578    3042  7106            CLL RTL
1579    3043  7006            RTL
1580    3044  7006            RTL
1581    3045  3253            DCA     XPRNT4
1582    3046  4427            TWOOCT
1583    3047  5637            JMP I   FOROCK
1584    3050  1253            TAD     XPRNT4
1585    3051  2237            ISZ     FOROCK
1586    3052  5637            JMP I   FOROCK
1587
1588                    /PRINT FOUR OCTAL NUMBERS IN AC 11 THRU 0 FOLLOWED
1589                    /BY TWO SPACES
1590
1591    3053  0000    XPRNT4, 0                       /CALL BY "PRNT4"
1592    3054  3237            DCA     FOROCK
1593    3055  1237            TAD     FOROCK
1594    3056  7012            RTR
1595    3057  7012            RTR
1596    3060  7012            RTR
1597    3061  4432            PRNT2
1598    3062  1237            TAD     FOROCK
1599    3063  4432            PRNT2
1600    3064  4434            SPACE2
1601    3065  5653            JMP I   XPRNT4
1602                    /
1603                    /PRINT THE OCTAL NUMBER IN AC 9 THRU 11
1604    3066  0000    XPRNT1, 0                       /CALL BY "PRNT1"
1605    3067  0056            AND     K7
1606    3070  1071            TAD     K260
1607    3071  4435            TYPE
1608    3072  5666            JMP I   XPRNT1
1609
1610
1611                    /ROUTINE TO CHECK FOR A CONTROL S WHILE TYPING OUT MESSAGES
1612                    /TO EXIT ROUTINE IF A CONTROL S WAS TYPED-A CONTROL Q OR C MUST BE
1613                    /INPUTTED ON THE KEYBOARD
1614
1615    3073  0000    CNTRLS, 0
1616    3074  6031            KSF                     /SKIP ON CONSOLE KEYBOARD FLAG
1617    3075  5673            JMP  I  CNTRLS          /RETURN TO TYPE ROUTINE-FLAG NOT SET
1618    3076  6034            KRS                     /READ THE CHARACTER STATICALLY
1619    3077  0377            AND     (177            /MASK TO 7 BIT ASCII
1620    3100  1376            TAD     (-23            /CHECK FOR A CONTROL S
1621    3101  7640            SZA     CLA             /WAS IT A CONTROL S
1622    3102  5673            JMP  I  CNTRLS          /NO-RETURN WITH KEYBOARD FLAG STILL SET
1623    3103  6032            KCC                     /CLEAR KEYBOARD FLAG FROM "S
1624    3104  4306            JMS     WAITQC          /WAIT FOR CONTROL Q OR C
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 1625    3105  5673           JMP  I  CNIRLS          /RETURN TO PRINT MESSAGE BEING TYPED
 1626
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 1627    3106  0000    WAITQC, 0                      /ROUTINE TO WAIT FOR CONTROL Q OR C
 1628    3107  5306            JMP     .-1
 1629    3110  6036            KRB                    /READ THE CHARACTER TYPED
 1630    3111  0377            AND     (177           /MASK TO 7 BIT ASCII
 1631    3112  1375            TAD     (-3            /CHECK FOR A CONTROL C
 1632    3113  7450            SNA                    /WAS IT A CONTROL C?
 1633    3114  5774'           JMP     C8RM           /YES-RESTORE MONITOR AND RETURN
 1634    3115  1373            TAD     (-7            /CHECK FOR A LINE FEED CHARACTER
 1635    3116  7450            SNA                    /WAS IT A LINE FEED
 1636    3117  5324            JMP     RESTRT         /YES GO RESTART THE PROGRAM
 1637    3120  1373            TAD     (-7            /CHECK FOR A CONTROL Q -"Q
 1638    3121  7640            SZA     CLA            /WAS IT A CONTROL Q
 1639    3122  5307            JMP     WAITQC+1       /NO-WAIT FOR APPROPRIATE KEY
 1640    3123  5706            JMP  I  WAITQC         /RETURN TO WHENCE IT CAME
 1641
 1642                  /ROUTINE TO RELOCATE PROGRAM TO ORIGINAL PROGRAM FIELD
 1643                  /AND RESTART PROGRAM.
 1644    3124  6224    RESTRT, RIF
 1645    3125  1076            TAD     K6201
 1646    3126  3337            DCA     RST1           /MAKE CDF INSTRUCTIONS
 1647    3127  1337            TAD     RST1
 1648    3130  3344            DCA     RST3
 1649    3131  1772'           TAD     PRGSTK         /ORIGINAL PROGRAM FIELD
 1650    3132  3341            DCA     RST2
 1651    3133  1341            TAD     RST2
 1652    3134  1054            TAD     K2
 1653    3135  3353            DCA     RST4           /MAKE CBF INST
 1654    3136  3046            DCA     MOVE           /CLEAR IT
 1655    3137  6201    RST1,   CDF0                   /MOVE FROM CURRENT PROGRAM FIELD
 1656    3140  1446            TAD I   MOVE
 1657    3141  6201    RST2,   CDF0                   /MOVE TO ORIGINAL PROGRAM FIELD
 1658    3142  3446            DCA I   MOVE
 1659    3143  1446            TAD I   MOVE
 1660    3144  6201    RST3,   CDF0                   /MOVE FROM CURRENT PROGRAM FIELD
 1661    3145  7041            CIA
 1662    3146  1446            TAD I   MOVE           /WAS TRANSFER OK?
 1663    3147  7640            SZA CLA                /YES - SKIP
 1664    3150  4771'           JMS     ERRM           /NO - REPORT AN ERROR
 1665    3151  2046            ISZ     MOVE           /DONE 4096 TIMES?
 1666    3152  5337            JMP     RST1           /NO
 1667    3153  6203    RST4,   CBF0                   /CHANGE TO NEW PROG FIELD
 1668    3154  5770'           JMP     XSTRT          /RESTART PROGRAM
 1669
 1670
 1671    3170  0206
 1672    3171  2000
 1673    3172  0216
 1674    3173  7771
 1675    3174  2400
 1676    3175  7775
 1677    3176  7755
 1678    3177  0177
               5600    *5600
 1679
 1680                  /LOC'S 5600 TO 7777 USED TO SAVE EITHER APT OR OS8 HANDLERS
```

```
1681
1682          0200    *200                    /FOR BINARY LOADER
1683
1684                          $
```



```
0000  11000000  00000000  11111111  11111111  11111111  11111111  11111111  11111111
0100  11111110  00000000  00000000  00000000  00000000  00000000  00000000  00000000

0200  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
0300  11111111  11111111  11111111  11111111  11111111  11111111  10000000  11111111

0400  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
0500  11111111  11111111  11111111  11111111  11111111  11111000  00000000  00001111

0600  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
0700  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111


1000  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
1100  11111111  11111111  11111111  11111111  11111111  11111111  10111111  11111111

1200  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
1300  11111111  11111111  11111111  11111111  11111111  11000000  00000000  00001111

1400  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
1500  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111

1600  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
1700  11111111  11111111  11111111  11111111  11111111  11100000  00000000  00001111


2000  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11000000
2100  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000011

2200  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
2300  11111111  11111111  11111111  11111110  00000000  01111111  11111111  11111111

2400  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
2500  11111111  11111111  11111111  11111111  11111111  11111110  00000000  00001111

2600  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
2700  11111111  11111111  11111111  11111111  11111111  11111111  11000000  00000011


3000  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
3100  11111111  11111111  11111111  11111111  11111111  11111000  00000000  11111111

3200
3300

3400
3500

3600
3700
```

```
4000
4100

4200
4300

4400
4500

4600
4700


5000
5100

5200
5300

5400
5500

5600
5700


6000
6100

6200
6300

6400
6500

6600
6700


7000
7100

7200
7300


7400
7500

7600
7700
```



```
ADD1    1517        CLRLST  0311        K34     0257        PART2   1455
ADDCNT  0771        CNTRLG  2547        K4000   0074        PASCNT  0276
ADDINC  0766        CNTRLS  3073        K4060   0075        PASMES  0345
ADRCHK  1555        CNTRS   2553        K6201   0076        PAT1    0773
AGAIN   1305        CNTRS1  2555        K6203   0077        PAT2    0774
ALLRAD  0502        COLCNT  0050        K7      0056        PATCNT  0772
APTCTX  2253        CONST   0051        K7577   0100        PCOUNT  0260
APTCTY  2254        COUNT   0047        K7600   0101        PERR1   1656
APTER01 1640        CRLF    4436        K77     0062        PERRM   2014
APTER02 2002        DATA    1345        K7700   0102        PRDYN   1606
APTER03 1530        DONE3   1104        KOUNT   0256        PREL    0331
APTERR  2255        DYNER1  1613        KSFCHK  0104        PRFLD   0546
APTTMX  2251        DYNERR  1527        LDDATA  1254        PRGFLD  2316
APTTMY  2252        DYNTS2  1115        LDJMP   1227        PRGSTK  0216
APTMES  3002        DYNTS3  1131        LDJMP1  1235        PRNT1   4430
APTMOD  2200        DYNTST  1010        LDJMS1  1220        PRNT2   4432
APTN00  0213        ERRM    2000        LISN    4424        PRNT4   4433
APTN01  0223        FILLER  2600        LISN1   2725        PRNTMS  4425
APTN02  2524        FLD     2314        LISN2   2743        PSEUDO  2440
APTNTP  2637        FLDCNT  0765        LISN3   2736        PSR     0020
APTOK   2234        FLDINC  0767        LISNUM  2746        PSTK1   1343
APTOK0  0261        FLDLST  1725        LOAD    1301        PTR     1560
APTOK1  0745        FOROCK  3037        LODFLD  1274        QESTMK  2331
APTOK2  1040        FOROCT  4431        LODJMS  1212        RBELL   2064
ATTOP   0475        GDATA   0045        LODSTK  1200        RDF     6214
BADCNT  0501        HAFDON  1330        M212    2761        REDFLD  0700
BADFLD  1724        HCW1    0021        M270    2754        REDLUP  0663
BADPTR  0477        HCW2    0022        M3      2760        REDUPD  0713
BADSTK  0443        HEAD    1735        M37     0052        RELERR  2040
BDATA   0044        HEAD1   0037        M40     1351        RELO    0400
BEGIN   0214        IAPTER  0105        M43     3036        RELO1   0422
BELL    2056        IAPTOK  0106        M7      0313        RELO2   0424
CERM    2400        INHMES  5600        M75     0053        RELO3   0427
CERM0   2416        INHTYP  5635        MARCH   1600        RELO4   0441
CERM1   2435        INIT    0277        MEMLOD  0631        REPERR  1516
CRF0    6203        INST    1154        MESAGF  3017        RESTRT  3124
CRF1    6213        JMSLOD  1205        MESAGX  3000        RETCOD  1400
CRF2    6223        K10     0057        MOSERR  1636        RETURN  1513
CRF3    6233        K100    0063        MOSFLD  0634        RETYPE  2506
CDF0    6201        K1000   0073        MOSLOD  0612        RIF     6224
CDF1    6211        K177    2757        MOSLUP  0624        RST1    3137
CDF2    6221        K2      0054        MOSTST  0600        RST2    3141
CDF3    6231        K20     0060        MOVE    0046        RST3    3144
CHAR    2651        K200    0064        NOBELL  2070        RST4    3153
CHARR0  2472        K207    0065        NWFLD   1557        SAME    1144
CHARR1  2476        K212    0066        NXCOL   1076        SAVCHR  2521
CHECK   0462        K215    0067        NXSTK   0500        SAVFLD  2307
CHGCHR  2454        K240    0070        NXTPAS  0230        SAVOS8  2267
CHGFLD  1340        K260    0071        NXTTST  1111        SETPAT  1000
CHKKSF  2523        K261    0072        ONEOCK  2601        SPACE2  4434
CHKTST  1523        K3      0055        ONEOCT  4426        SPACX2  2667
CLRCNT  0312        K30     0061        OVER    1545        SRMESG  2326
```

```
SRQFST  2442
STACKS  0532
START   0200
STKKNT  1155
STKKT1  1156
STKPIN  0042
STKTST  0043
STKUPD  0643
STOADD  2325
STOP    1713
STOP1   2030
STRTAD  1153
TEST    0238
TESTAD  0040
TITLE   0314
TOP     1462
TOPSTK  0041
TSTCNT  0770
TSTK1   1341
TSTORG  1160
TSTPTR  1157
TSTSYS  0523
TTYCNT  2522
TWOOCK  2611
TWOOCT  4427
TYPE    4435
UPAPRC  2333
UPARRG  2335
UPSTK   1067
WAITQC  3106
X       0453
XAND    1432
XAPT    2277
XCDF    1442
XCRLF   2652
XDYN1   1037
XDYN2   1047
XDYN3   1055
XFLD    1723
XJMPI   1447
XLISN   2675
XM37    1347
XM75    1346
XN37    1350
XORS    2666
XPRNT1  3066
XPRNT2  2624

XPRNT4  3053
XSTART  1556
XSTOP   0103
XSTRT   0206
XTYPE   2635
```



```
ERRORS DETECTED: 0

LINKS GENERATED: 70

RUN-TIME:  4 SECONDS

3K CORE USED
```

```
,L1777     989    1054#
,L2176    1088    1105#
,L2177    1084    1106#
,L2351    1200    1220#
,L2352    1197    1221#
,L2353    1189    1222#
,L2354    1175    1223#
,L2355    1153    1224#
,L2356    1133    1225#
,L2357    1132    1226#
,L2360    1131    1227#
,L2361    1130    1228#
,L2362    1129    1229#
,L2363    1127    1230#
,L2364    1125    1231#
,L2365    1124    1126    1128    1232#
,L2366    1123    1233#
,L2367    1121    1234#
,L2370    1119    1235#
,L2371    1117    1236#
,L2372    1115    1237#
,L2373    1114    1116    1118    1120    1122    1238#
,L2374    1113    1239#
,L2375    1111    1240#
,L2376    1109    1241#
,L2377    1108    1110    1112    1242#
,L2574    1366    1369    1373#
,L2575    1310    1374#
,L2576    1291    1321    1375#
,L2577    1255    1376#
,L2776    1492    1530#
,L2777    1427    1531#
,L3170    1668    1671#
,L3171    1664    1672#
,L3172    1649    1673#
,L3173    1634    1637    1674#
,L3174    1633    1675#
,L3175    1631    1676#
,L3176    1620    1677#
,L3177    1619    1630    1678#
,V0040     644     675#
,V0110     634     666#
,V0177     867     970#    1619    1630    1678#
,V0206    1668    1671#
,V0213    1115    1237#
,V0214    1197    1221#
,V0216    1200    1220#    1649    1673#
,V0223    1117    1236#
,V0261    1109    1241#

,V0400     173     195     224#
,V0421    1088    1105#
,V0523     151     227#
,V0600     171     226#



,V0607    1034    1051#
,V0745    1111    1240#
,V0771     499     676#
,V0773     495     496     678#
,V0774     498     677#
,V1000     361     490#
,V1010     172     225#
,V1037     948     960#
,V1040    1113    1239#
,V1076     923     964#
,V1104     924     963#
,V1111     652     674#
,V1144     372     412     489#    880     967#
,V1153     816     974#
,V1154     717     811#
,V1156     888     966#
,V1160     877     921     968#
,V1200     584     669#
,V1274     583     670#
,V1340     826     831     842     854     861     869     972#
,V1341     580     671#
,V1343     567     672#
,V1400     585     668#
,V1455     599     667#
,V1513     825     973#
,V1516     841     971#
,V1530    1129    1229#
,V1636     430     488#
,V1640    1125    1231#
,V1725     207     223#    293     331#    892     965#    1024    1053#
,V2000     264     332#    1664    1672#
,V2002    1127    1230#
,V2056     930     962#    989     1054#
,V2267     131     229#
,V2277     130     230#
,V2400    1633    1675#
,V2440     141     197     228#    303     330#    944     961#    1030    1052#    1084    1106#
,V2472    1291    1321    1375#
,V2476    1310    1374#
,V2524    1119    1235#
,V2525     494     679#
,V2637    1133    1225#
,V3002    1131    1227#
,V3073    1427    1531#
,V3106    1366    1369    1373#
,V4100     688     702     759     812#
,V4505    1124    1126    1128    1232#
,V4506    1108    1110    1112    1242#
,V5077     773     809#
,V5110     768     810#
,V5577    1189    1222#    1255    1376#
,V5600    1130    1228#
,V5601     868     969#
```

,V5635	1132	1226#				
,V5700	563	673#				
,V6500	1153	1224#				
,V6505	1121	1234#				
,V6520	1175	1223#				
,V6523	1123	1233#				
,V7000	1114	1116	1118	1120	1122	1238#
,V7555	1492	1530#				
,V7755	1620	1677#				
,V7771	1634	1637	1674#			
,V7775	1631	1676#				