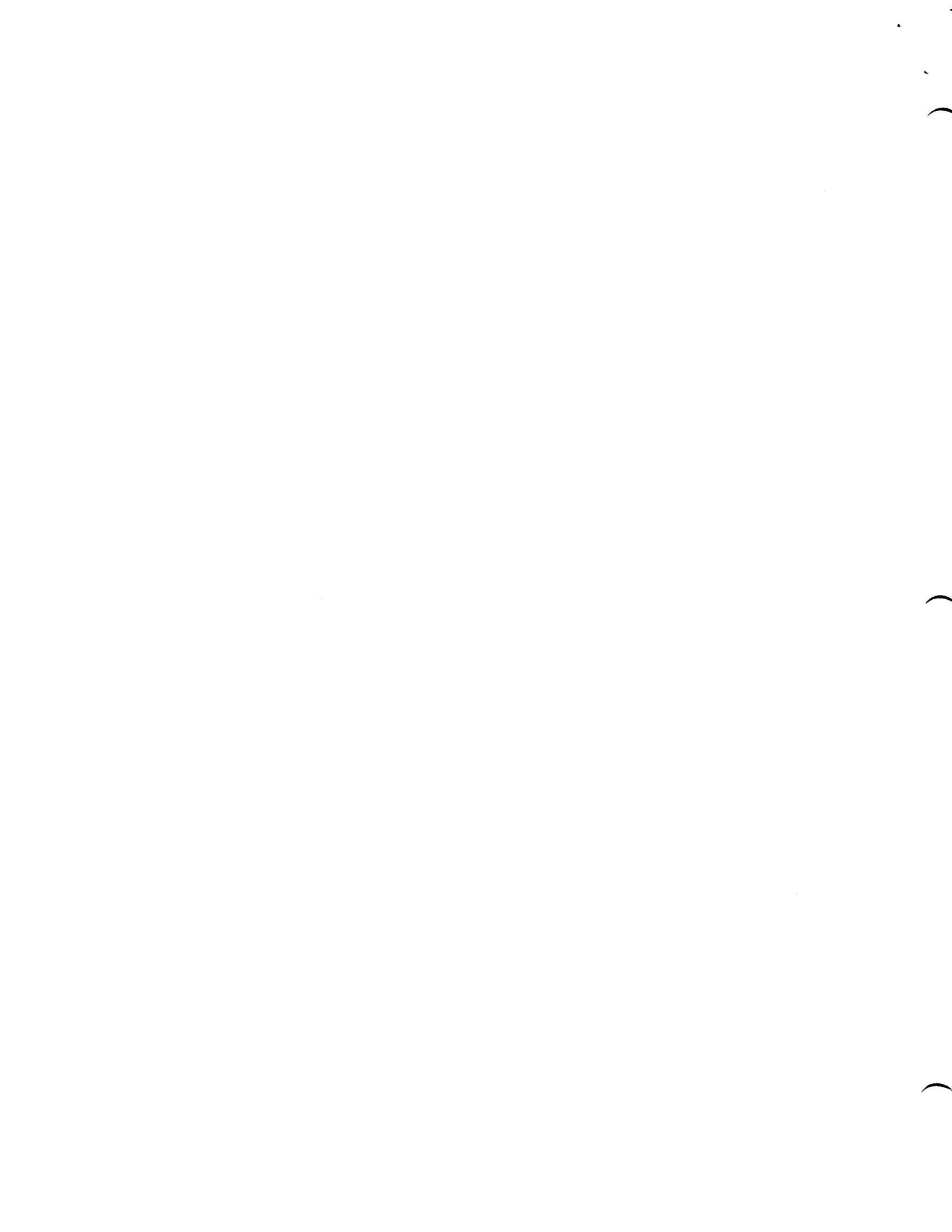


IDENTIFICATION  
-----

PRODUCT CODE: MAINDEC-8E-D00CC-D  
PRODUCT NAME: RANDOM DCA TEST  
DATE CREATED: JUNE 11, 1974  
MAINTAINER: DIAGNOSTIC GROUP  
AUTHOR: BRUCE HANSEN

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1. ABSTRACT  
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THIS PROGRAM TESTS THE DCA INSTRUCTION OF THE PDP-8/E. THE DCA INSTRUCTION ADDRESS, OPERAND ADDRESS, AND OPERANDS ARE TAKEN FROM A RANDOM NUMBER GENERATOR.

2. REQUIREMENTS  
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2.1 EQUIPMENT  
-----

PDP-8/E EQUIPPED WITH TELETYPE.

2.2 STORAGE  
-----

THE DIAGNOSTIC PROGRAM IS STORED IN LOCATIONS 0000 THROUGH 0407. THE PROGRAM USES 0410 THROUGH 7600 FOR A TEST AREA. THE BINARY LOADER MUST BE STORED IN THE LAST MEMORY PAGE.

2.3 PRELIMINARY PROGRAMS  
-----

MAINDEC-8E-D0A(N), AND MAINDEC-8E-D0B(N)

3. LOADING PROCEDURE  
-----

3.1 METHOD  
-----

THE STANDARD BINARY LOADER IS USED.

4. STARTING PROCEDURE  
-----

4.1 CONTROL SWITCH SETTINGS  
-----

SR0 (0) HALT AFTER ERROR PRINTOUT.  
SR1 (1) BYPASS ERROR PRINTOUT  
SR2 HOLD "FROM" CONSTANT (1). SELECT RANDOM "FROM" (0).  
SR3 HOLD "OPERAND ADDRESS" CONSTANT (1). SELECT RANDOM "OPERAND ADDRESS" (0).  
SR4 HOLD "OPERAND" CONSTANT (1). SELECT RANDOM "OPERAND" (0).

4.2 STARTING ADDRESS  
-----

0200

4.3 OPERATOR ACTION  
-----

1. SET SR TO 0200.
2. PRESS LOAD ADDRESS
3. SET SR TO 0000
4. PRESS CLEAR THEN CONTINUE

5. OPERATING PROCEDURE  
-----

SAME AS SECTION 4.

6. ERRORS  
-----

6.1 ERROR PRINTOUTS  
-----

F XXXX A YYYY O NNNN  
L RRRR C MMMM  
E

FROM, F XXXX WHERE XXXX = ADDRESS OF THE DCA  
INSTRUCTION

ADDRESS, A YYYY WHERE YYYY = ADDRESS WHERE DCA WILL  
DEPOSIT OPERAND

OPERAND O NNNN WHERE NNNN = THE OPERAND TO BE DEPOSITED.

LOCATION, L RRRR WHERE RRRR = A NONZERO LOCATION SOME-  
WHERE IN THE TEST FIELD.

CONTENTS, C MMMM WHERE MMMM = CONTENTS OF LOCATION RRRR.

END, E THIS LETTER IS TYPED TO INFORM THAT THE  
ENTIRE TEST AREA HAS BEEN SEARCHED FOR  
NONZERO OPERANDS.

A. THE FOLLOWING IS A TYPICAL ERROR PRINTOUT:

```
F 4972 A 0205 0 2525
L 0205 C 2527
E
```

LINE 1 IS SIMPLY A STATEMENT OF THE PROBLEM. IT SAYS THAT A DCA INSTRUCTION LOCATED AT 4972 TRIED TO DEPOSIT THE OPERAND 2525 INTO LOCATION 0205.

LINE 2 SAYS THAT INSTEAD OF FINDING A 2525 IN LOCATION 0205, THE PROGRAM FOUND A 2527. BIT 10 WAS "PICKED UP." THE E SIGNIFIES THAT A SEARCH OF THE TEST AREA SHOWED ONLY THE ABOVE PRINTED LOCATIONS DIFFERING FROM WHAT THEY SHOULD BE.

B. THE FOLLOWING IS A TYPICAL ERROR PRINTOUT:

```
F 4972 A 0205 0 2525
L 0215 C 2525
E
```

LINE 1 IS A STATEMENT OF THE PROBLEM AS IN THE PREVIOUS EXAMPLE. LINE 2 SAYS THAT LOCATION 0215 CONTAINS 2525, AND THE E ON LINE 3 SAYS THAT NO OTHER LOCATIONS WERE DISTURBED. IT IS APPARENT THEN THAT THE DCA INSTRUCTION DEPOSITED ITS OPERAND NOT INTO LOCATION 0205, BUT INTO LOCATION 0215. BIT 8 WAS "PICKED UP".

### 6.3 ERROR RECOVERY

TO ENTER A SCOPE MODE LOOP, SET SR0 TO A 0. WHEN A HALT OCCURS FOLLOWING AN ERROR, SET SWITCHES 1, 2, 3, AND 4 AND PUSH CONTINUE. A SCOPE MODE LOOP IS ENTERED USING THE CONDITIONS DESCRIBED BY THE LAST ERROR PRINTOUT.

IF IT IS DESIRED TO ENTER A SCOPE MODE LOOP USING A SPECIFIC SET OF CONDITIONS, STOP THE PROGRAM AND MAKE THE FOLLOWING ENTRIES:

- A. ENTER DESIRED FROM ADDRESS INTO MEMORY LOCATION 0167.
- B. ENTER DESIRED OPERAND ADDRESS INTO MEMORY LOCATION 0166.
- C. ENTER DESIRED OPERAND INTO MEMORY LOCATION 0170.

RESTART THE PROGRAM USING A CONTROL SWITCH SETTING OF 3600.

7. RESTRICTIONS (NONE)  
-----

8. MISCELLANEOUS  
-----

8.1 EXECUTION TIME  
-----

3904 RANDOM TESTS/PASS  
7 PASSES/BELL  
27,328 RANDOM TESTS/PASS

9. PROGRAM DESCRIPTION  
-----

MEMORY LOCATIONS 0410 THROUGH 7600 ARE DESIGNATED AS TEST LOCATIONS, AND ZEROS ARE DEPOSITED INTO EACH AT THE BEGINNING OF THE PROGRAM. THE PROGRAM NOW SELECTS A LOCATION FOR THE DCA INSTRUCTION, THIS SELECTED LOCATION MAY BE SPECIFIED OR RANDOM, DEPENDING UPON THE SWITCH REGISTER SETTING. THE OPERAND AND OPERAND ADDRESS ARE SELECTED IN A SIMILAR MANNER. THE PROGRAM NOW JUMPS TO THE TEST DCA, PERFORMS THE INSTRUCTION, THEN JUMPS BACK TO A CHECKING ROUTINE. THE CHECKING ROUTINE VERIFIES THAT THE OPERAND WAS DEPOSITED CORRECTLY. IF AN ERROR IS DETECTED, THE ERROR ROUTINE SEARCHES THE TEST AREA AND PRINTS THE CONTENTS OF ANY NONZERO LOCATION EXCEPT FOR THE TEST DCA INSTRUCTION. UPON COMPLETION OF THIS SCAN THROUGH THE TEST AREA, AN E IS PRINTED AND A NEW TEST IS BEGUN.

THE TELETYPE BELL RINGS AFTER 7 PASSES OF 3904 TEST/PASS.

/RANDOM DCA TEST  
 /SR0(0)=HALT ON ERROR  
 /SR1(1)=NO PRINTOUTS  
 /SR2(1)=CONSTANT FROM  
 /SR3(1)=CONSTANT OPERAND ADDRESS  
 /SR4(1)=CONSTANT OPERAND  
 \*0

0000  
 0001  
 0002  
 0003  
 0004  
 0005  
 0006  
 0007  
 0010  
 0011  
 0012  
 0013  
 0014

0  
 JMP 1  
 2  
 3  
 0  
 0  
 7771  
 CNT2,  
 PSUB, SUB  
 WORK, 0  
 CNT, 0  
 M7500, -7500  
 BEL, 207  
 THREE, 3

/CLEAR MEMORY

0020  
 0021  
 0022  
 0023  
 0024  
 0025  
 0026  
 0027

#20  
 START, TAD LIMLO  
 DCA WORK  
 DCA I WORK  
 TAD WORK  
 CIA  
 TAD LIMHI  
 SEA CLA  
 JMP START+2

/CHECK FOR CONSTANT FROM

0030  
 0031  
 0032  
 0033

CK1,  
 LAS  
 RTL  
 SPA  
 JMP CK2

/GET FROM ADDRESS

0034  
 0035  
 0036  
 0037  
 0040  
 0041  
 0042  
 0043  
 0044  
 0045  
 0046  
 0047  
 0050  
 0051

JMS GENRAN  
 DCA FROM  
 TAD FROM  
 SPA  
 JMP +6  
 CIA  
 TAD LIMLO  
 SPA CLA  
 JMP CK2  
 JMP CK1+4  
 CIA  
 TAD LIMHI  
 SPA CLA  
 JMP CK1+4

/CHECK FOR CONSTANT OPERAND ADDRESS

0052 7604  
0053 7006  
0054 7004  
0055 7510  
0056 3075

LAS  
RTL  
RAL  
SPA  
JMP CK3

/GET OPERAND ADDRESS

0057 4154  
0060 3166

JMS GENRAN  
DCA OPAD

0061 1166  
0062 7510  
0063 5071  
0064 7041  
0065 1175  
0066 7710  
0067 5075  
0070 5057  
0071 7041  
0072 1174  
0073 7710  
0074 5057

TAD OPAD  
SPA  
JMP .+6  
CIA  
TAD LIMLO  
SPA CLA  
JMP CK3  
JMP CK2+5  
CIA  
TAD LIMHI  
SPA CLA  
JMP CK2+5

/CHECK FOR CONSTANT OPERAND  
CK3,

0075 7604  
0076 7006  
0077 7006  
0100 7710  
0101 5104

LAS  
RTL  
RTL  
SPA CLA  
JMP CK4

/GET OPERAND

0102 4154  
0103 3170

JMS GENRAN  
DCA OPER

/CHECK FOR FROM+1=OPERAND ADDRESS  
/CHECK FOR FROM#OPERAND ADDRESS

0104 1167  
0105 7041  
0106 1166  
0107 7450  
0110 5030  
0111 7041  
0112 7040  
0113 7650  
0114 5030

TAD FROM  
CIA  
TAD OPAD  
SNA  
JMP CK1  
CIA  
CMA  
SNA CLA  
JMP CK1

/PLACE THE INSTRUCTIONS

0115 1171  
0116 3567  
0117 1167  
0120 7001  
0121 3173  
0122 1172

TAD DCA1  
DCA I FROM  
TAD FROM  
IAC  
DCA FROMP1  
TAD JMP1



0123 3573  
 0124 1170  
 0125 7000  
 0126 5567  
 0127 7402

DCA I FROMP1  
 TAD OPER  
 NOP  
 JMP I FROM  
 HLT

/GO OUT TO TEST  
 /JMP FAILURE

0130 1566  
 0131 7041  
 0132 1170  
 0133 7640  
 0134 4577  
 0135 3566  
 0136 3567  
 0137 3573

/RETURN FROM TEST  
 BACK, TAD I OPAD  
 CIA  
 TAD OPER  
 SEA CLA  
 JMS I AERR  
 DCA I OPAD  
 DCA I FROM  
 DCA I FROMP1

/RING BELL AFTER 7 PASSES OF 3904 TEST PER PASS

0140 1011  
 0141 7001  
 0142 3011  
 0143 1011  
 0144 1012  
 0145 7640  
 0146 5030  
 0147 3011  
 0150 2006  
 0151 5030  
 0152 4407  
 0153 5030

TAD CNT  
 IAC  
 DCA CNT  
 TAD CNT  
 TAD M7500  
 SEA CLA  
 JMP CK1  
 DCA CNT  
 ISZ CNT2  
 JMP CK1  
 JMS I PSUB  
 JMP CK1

/RANDOM NUMBER GENERATOR

0154 0000  
 0155 7200  
 0156 1165  
 0157 7104  
 0160 7430  
 0161 1014  
 0162 3165  
 0163 1165  
 0164 5554  
 0165 2525

GENRAN, 0  
 CLA  
 TAD RANUM  
 RAL CLL  
 SEL  
 TAD THREE  
 DCA RANUM  
 TAD RANUM  
 JMP I GENRAN  
 RANUM, 2525

/CONSTANTS AND VARIABLES

0166 3000  
 0167 3001  
 0170 2525  
 0171 3566  
 0172 5130  
 0173 3002  
 0174 7600  
 0175 0410  
 0176 0000  
 0177 0201

OPAD, 3000  
 FROM, 3001  
 OPER, 2525  
 DCA1, DCA I OPAD  
 JMP1, JMP BACK  
 FROMP1, 3002  
 LIMHI, 7600  
 LIMLO, 410  
 WORK1, 0  
 AERR, ERR

0200  
 0200 5020  
 0201 0000  
 0202 7604  
 0203 7004  
 0204 7710  
 0205 5601  
 0206 4265  
 0207 1175  
 0210 5010  
 0211 1410  
 0212 7640  
 0213 4233  
 0214 1010  
 0215 7041  
 0216 1174  
 0217 7640  
 0220 0211  
 0221 1374  
 0222 4351  
 0223 1375  
 0224 4351  
 0225 1376  
 0226 4351  
 0227 7604  
 0230 7700  
 0231 7402  
 0232 5601

\*200  
 /DCA ERROR, CHECK ALL MEMORY  
 JMP START  
 ERR, 0  
 LAS  
 RAL  
 SPA CLA  
 JMP I ERR  
 JMS PHD  
 TAD LIMLO  
 DCA WORK  
 TAD I WORK  
 SZA CLA  
 JMS ER1  
 TAD WORK  
 CIA  
 TAD LIMHI  
 SZA CLA  
 JMP -7  
 TAD E  
 JMS PRINT  
 TAD CR  
 JMS PRINT  
 TAD LF  
 JMS PRINT  
 LAS  
 SMA CLA  
 HLT  
 JMP I ERR  
 /HALT ON ERROR

0233 0000  
 0234 1010  
 0235 7041  
 0236 1167  
 0237 7650  
 0240 5633  
 0241 1010  
 0242 7041  
 0243 1173  
 0244 7650  
 0245 5633  
 0246 1372  
 0247 4351  
 0250 1010  
 0251 4310  
 0252 1010  
 0253 3176  
 0254 1373  
 0255 4351  
 0256 1576  
 0257 4310

/MEMORY LOCATION WRONG (MAYBE)  
 ER1, 0  
 TAD WORK  
 CIA  
 TAD FROM  
 SNA CLA  
 JMP I ER1  
 TAD WORK  
 CIA  
 TAD FROMP1  
 SNA CLA  
 JMP I ER1  
 TAD L  
 JMS PRINT  
 TAD WORK  
 JMS TYPAC  
 TAD WORK  
 DCA WORK1  
 TAD C  
 JMS PRINT  
 TAD I WORK1  
 JMS TYPAC  
 /FORGET IT. THIS IS LOC FROM  
 /FORGET IT. THIS IS LOC FROM+1

0260 1375  
 0261 4351  
 0262 1376  
 0263 4351  
 0264 5653

TAD CR  
 JMS PRINT  
 TAD LF  
 JMS PRINT  
 JMP I ER1

/PRINT FIRST LINE OF ERROR

0265 0000  
 0266 7200  
 0267 1367  
 0270 4351  
 0271 1167  
 0272 4310  
 0273 1371  
 0274 4351  
 0275 1166  
 0276 4310  
 0277 1377  
 0300 4351  
 0301 1170  
 0302 4310  
 0303 1375  
 0304 4351  
 0305 1376  
 0306 4351  
 0307 5665

PHD,  
 0  
 CLA  
 TAD F  
 JMS PRINT  
 TAD FROM  
 JMS TYPAC  
 TAD A  
 JMS PRINT  
 TAD OPAD  
 JMS TYPAC  
 TAD O  
 JMS PRINT  
 TAD OPER  
 JMS TYPAC  
 TAD CR  
 JMS PRINT  
 TAD LF  
 JMS PRINT  
 JMP I PHD

/TYPE AC CONTENTS IN OCTAL

0310 5310  
 0311 3366  
 0312 1366  
 0313 7012  
 0314 7010  
 0315 3365  
 0316 1365  
 0317 7012  
 0320 7010  
 0321 3364  
 0322 1364  
 0323 7012  
 0324 7010  
 0325 3363  
 0326 1370  
 0327 4351  
 0330 1357  
 0331 3360

TYPAC,  
 JMP  
 DCA SAVE+3  
 TAD SAVE+3  
 RTR  
 RAR  
 DCA SAVE+2  
 TAD SAVE+2  
 RTR  
 RAR  
 DCA SAVE+1  
 TAD SAVE+1  
 RTR  
 RAR  
 DCA SAVE  
 TAD SPACE  
 JMS PRINT  
 TAD FOUR  
 DCA CTR

0332 1363  
 0333 0361  
 0334 1362

LUP,  
 TAD SAVE  
 AND MSK7  
 TAD TM6

0335 4351 JMS PRINT  
 0336 1364 TAD SAVE+1  
 0337 3363 DCA SAVE  
 0340 1365 TAD SAVE+2  
 0341 3364 DCA SAVE+1  
 0342 1366 TAD SAVE+3  
 0343 3365 DCA SAVE+2  
 0344 2360 ISE CTR  
 0345 5332 JMP LUP  
 0346 1370 TAD SPACE  
 0347 4351 JMS PRINT  
 0350 5710 JMP I TYPAC  
 0351 0000 PRINT,  
 0352 0046 TLB  
 0353 6041 TSF  
 0354 5353 JMP .-1  
 0355 7200 CLA  
 0356 5751 JMP I PRINT

/CONSTANTS

0357 7774 FOUR, -4  
 0360 0000 CTR, 0  
 0361 0007 MSK7, 7  
 0362 0260 TW6, 0260  
 0363 0000 SAVE, 0  
 0364 0000 0  
 0365 0000 0  
 0366 0000 0  
 0367 0306 F, 306  
 0370 0240 SPACE, 240  
 0371 0301 A, 301  
 0372 0314 L, 314  
 0373 0303 C, 303  
 0374 0305 E, 305  
 0375 0215 CR, 215  
 0376 0212 LF, 212  
 0377 0317 O, 317  
  
 0400 \*400  
 0401 SUB,  
 0402 TAD PASS  
 0403 DCA CNT2  
 0404 TAD BEL  
 0405 TLS  
 0406 CLA  
 0407 JMP I SUB  
 0408 7771  
 0409 \$