IDENTIFICATION

PRODUCT CODE: MAINDEC-08-DHKPA-B-D

PRODUCT NAME: KP8E POWER FAIL/AUTO RESTART TEST

DATE REVISED: APRIL 6, 1973

MAINTAINER: DIAGNOSTIC GROUP

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DIGITAL EQUIPMENT CORPORATION

MAYNARD, MASS.

1. ABSTRACT

THIS DIAGNOSTIC IS A COMPLETE TEST OF THE PDP8-E POWER FAIL OPTION WITH THE INTERVENTION OF THE OPERATOR.

2. REQUIREMENTS

PDP8-E
KP8E POWER FAIL OPTION

STORAGE

THE MAIN PROGRAM OCCUPIES THE FIRST THREE PAGES IN CORE.

ONE BUFFER WHICH CONTAINS IOT CHAIN STARTING AT LOCATION 1000

TWO ADDITIONAL BUFFERS OF 2000 WORDS EACH

2000 TO 3777 LOWER BUFFER

4000 TO 5777 HIGH BUFFER

3. LOADING PROCEDURE

THE PROCEDURE FOR NORMAL BINARY TAPES SHOULD BE EXERCISED.

4. STARTING PROCEDURE

CONTROL SWITCHES

BITS 0-3 ARE USED FOR TEST SELECTION

0	1	2	3	TEST NUMBER
0	0	0	1	TEST 1
0	0	1	0	TEST 2
0	1	0	0	TEST 3
1	0	0	0	TEST 4

STARTING ADDRESS

THE STARTING ADDRESS FOR ALL TESTS IS LOCATION 200

PROGRAM AND OPERATION ACTION

A; SET SWITCH REGISTER TO 200

B; DEPRESS LOAD ADDRESS

C; SET CONTROL SWITCH TO SELECT DESIRED TEST;
IF A TEST IS NOT SELECTED PROGRAM WILL HALT,
USER MAY THEN SELECT TEST AND PRESS CONTINUE

D; DEPRESS CLEAR AND THEN DEPRESS CONTINUE

E; THE OPERATOR MUST NOW CAUSE POWER TO FAIL; EITHER BY
DIRECTLY TURNING THE POWER KEY OFF AND/OR BY THE USE
OF A POWER INTERRUPTER;

F; WHEN THIS DIAGNOSTIC IS USED ON THE IN HOUSE ACT-8E
SYSTEM,POWER OFF/ON INTERVENTION WILL NOT BE REQUIRED
BY THE OPERATOR SINCE AN IOT HAS BEEN PROVIDED TO
CAUSE POWER TO FAIL;

5; OPERATING PROCEDURE

A METHOD OF RUNNING THE TESTS IN NUMERICAL ORDER IS SUGGESTED;

IF A TEST IS NOT SELECTED, PROGRAM WILL HLT,
USER MAY THEN SELECT TEST AND PRESS CONTINUE

TEST 1

TEST 1 CONTAINS TWO TESTS OF THE INTERRUPT AND SKIP CAPABILITY
OF THE OPTION WHEN OPERATIVE POWER IS LOST;

A;NON-RESTART TEST

1,TURN POWER KEY OFF
2,SWITCH ON POWER FAIL/AUTO RESTART MODULE
SHOULD BE DOWN,
3,TURN POWER KEY ON;
4,EXAMINE LOCATION 0 FOR A HLT;

B;RESTART TEST

1,TURN POWER KEY OFF;
2,SWITCH ON POWER FAIL/AUTO RESTART MODULE
SHOULD BE UP;
3,TURN POWER KEY ON;
4,MACHINE HALTS AT LOCATION 0

TEST 2

TEST 2 IS A TEST TO EVALUATE THE TIME WHICH THE MACHINE HAS
TO STORE ITS ACTIVE REGISTERS. THIS TIME IS DEFINED AS 1 MS
20% TOLERANCE FOR THE PDP8E

A;TURN POWER KEY OFF.
B;SWITCH ON POWER FAIL/AUTO RESTART MODULE
  SHOULD BE IN RESTART POSITION=(UP).
C;TURN POWER KEY ON.
D;TEST 2 HAS PASSED IF PROGRAM HALTS AT LOCATION 464.
  WITH THE A.C;=7777.
E;PRESS CONTINUE AFTER HALT AT LOCATION 464 TO RECYCLE TEST 2;

TEST 3

TEST 3 IS A TEST TO EVALUATE THE ABILITY OF THE MACHINE TO
EXECUTE IOT'S DURING A POWER FAILURE WITHOUT DESTROYING CORE;

A;TURN POWER KEY OFF.
B;SWITCH ON POWER FAIL/AUTO RESTART MODULE
  SHOULD BE IN RESTART POSITION=(UP).
C;TURN POWER KEY ON.
D;THIS TEST WILL RECYCLE AND HLT ON ERROR;

TEST 4

TEST 4 IS A TEST TO STORE THE ACTIVE REGISTERS (PC,AC, LINK AND
MQ) WHEN POWER FAILS AND RESTORES THEM WHEN POWER BECOMES OPERA-
TIVE;

A;TURN POWER KEY OFF.
B;SWITCH ON POWER FAIL/AUTO RESTART MODULE
  SHOULD BE IN RESTART POSITION=(UP).
C;TURN POWER KEY ON.
D;THIS TEST WILL RECYCLE AND HLT ON ERROR;

BACKGROUND TEST

DURING TESTS, A MEMORY POWER ON/OFF TEST IS BEING EXECUTED; THIS
TEST COMPARES TWO BUFFERS WHICH SHOULD BE THE COMPLEMENT OF EACH
OTHER;

6. ERRORS
    ------

    *IF PROGRAM HALTS AT LOCATION 384, THIS INDICATES AN ILLEGAL
     SPL INTERRUPT OCCURED.

    TEST 1 ERRORS

    A. NON-RESTART CONDITION

        LOCATION 0 CONTAINS ALL ONE'S

        SHOULD CONTAIN A HALT

        REASON: NO INTERRUPT

        1. MALFUNCTION OF POWER FAIL/AUTO RESTART
            MODULE.

    B. RESTART CONDITION

        THE ABOVE CONDITIONS FOR NON-RESTART STILL PREVAIL FOR A
        RESTART CONDITION.

    TEST 2 ERRORS

    IF TEST 2 DOES NOT HALT AT LOCATION 464, O THE MACHINE
    HALTED IN LOCATION 0) INDICATES THE 1 MS DELAY IN THE POWER
    FAIL OPTION IS NOT PROPERLY SET. (LESS THAN 1 MS.)

    TEST 3 ERRORS

    ERROR HALTS WILL OCCUR IN TEST 3 WHEN A LOCATION IN THE IOT
    CHAIN HAS BEEN ALTERED. THE FIRST HALT THE AC CONTAINS THE
    LOCATION OF THE ERROR. DEPRESS CONTINUE AND THE SECOND HALT
    WILL OCCUR. THE AC NOW CONTAINS THE WORD IN ERROR. DEPRESS
    CONTINUE AGAIN AND THE NEXT WORD WILL BE COMPARED.

    TEST 4 ERRORS

    ERROR HALTS WILL OCCUR WHEN AN INCORRECT MEMORY COMPARISON IS
    MADE. THE DATA FROM THE LOWER BUFFER WILL BE DISPLAYED IN THE
    AC. DEPRESS CONTINUE AND THE UPPER BUFFER WILL BE DISPLAYED
    DEPRESS CONTINUE AGAIN AND THE NEXT COMPARISON WILL TAKE PLACE.

    ANOTHER ERROR HALT WILL OCCUR WHEN AN INCORRECT COMPARISON
    TAKES PLACE WITH THE MQ. BY DEPRESSING CONTINUE, THE PROGRAM
    WILL RECOVER.

7. RESTRICTIONS

8. MISCELLANEOUS

IF COMPARISON ERRORS OCCUR FREQUENTLY IN TEST 3 BETWEEN BUFFERS, IT IS SUGGESTED THAT THE OPERATOR REFER TO MEMORY POWER ON/OFF TEST.

9. PROGRAM DESCRIPTION

DUE TO THE FUNCTION OF THE POWER FAIL OPTION, IT BECOMES NECESSARY FOR THE OPERATOR TO TAKE AN ACTIVE PART IN DIAGNOSING THE ERROR IN THE PROGRAM. THE PROGRAM HAS A TWO-FOLD PURPOSE.

FIRST TO TEST THE ABILITY OF THE KP8E TO ENABLE THE PROCESSOR TO STORE ITS ACTIVE REGISTERS DURING POWER DOWN. THEN THE ABILITY TO RESTART CORRECTLY.

THE SECOND PURPOSE IS TO VERIFY THE FACT THAT MEMORY WAS UNDISTURBED DURING POWER ON/OFF.

10. LISTING

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                    /POPS-E POWER FAIL/AUTO RESTART TEST
                    /MAINDEC-08-DHKPA-B
                    /COPYRIGHT 71,72,73,DIGITAL EQUIPMENT CORPORATION,MAYNARD,MASS,01754

                    /INSTRUCTION EQUALITIES
          6102      SPL=6102                        /SKIP ON LOW POWER
          7421      MQL=7421                        /LOAD AC INTO MQ
          7501      MQA=7501                        /READ MQ INTO AC
          6007      CAF=6007                        /CLEAR ALL FLAGS



          0000      *0
0000      0000      INT,    0
0001      5001              JMP .                   /CHECK FLAGS FOR INTERRUPT
0002      0002              0002
0003      0003              0003

          0020      *20

                    /CONSTANTS AND REGISTERS

0020      0000      SAV,    0
0021      1000      K1000,  1000
0022      2000      K2000,  2000
0023      4000      K4000,  4000
0024      5252      K5252,  5252
0025      6000      K6000,  6000
0026      0000      COUNT1, 0
0027      0000      COUNT2, 0
0030      1777      LBUF,   1777
0031      3777      UBUF,   3777
0032      0000      SAV1,   0
0033      5460      SAV2,   JMP I ER
0034      5456      SAV3,   JMP I CLFL
0035      5442      PNT1A,  JMP I COU
0036      5445      PNT1B,  JMP I C
0037      5463      PNT1C,  JMP I XPF
0040      5441      PNT2,   JMP I RES
0041      0425      RES,    RESTOR
0042      0447      COU,    COUNT
0043      5252      C1,     5252
0044      2525      C2,     2525
0045      0534      C,      CR
0046      0000      STOR1,  0
0047      0000      STOR2,  0
0050      0000      LINK,   0
0051      0000      AC,     0
0052      0000      PC,     0
0053      0000      MQ,     0
0054      7402      HALT,   HLT
0055      7370      TIME,   7370
                    /TAGS
0056      0302      CLFL,   CLF
```

```
0057  0467    TYPEL,  TYPE
0060  0463    ER,     EM
0061  0207    BELL,   0207
0062  0200    RESTART,        START
0063  0312    XPF,    PF
0064  0400    K0400,  0400
0065  6771    XIOT,   6771
0066  0400    SET,    SETUP
0067  0777    IOBUF,  0777
0070  3000    PONT,   DCA INT
0071  5421    PNT1D,  JMP I K1000
0072  7443    M334,   7443
0073  1074    PNT2AL, TAD PNT2A
0074  5475    PNT2A,  JMP I TIOTL
0075  0501    TIOTL,  TIOT
0076  0000    TST4,   0
0077  7200    ACLA,   CLA


      0200    *200
0200  4466    START,  JMS I SET               /SETUP FOR MEMORY
0201  7240            CLA CMA
0202  3000            DCA INT
0203  1054            TAD HALT                /TRAP FOR ILLEGAL SPL IOT
0204  3304            DCA PNT1                /STORE INTO INTERRUPT ROUTINE
0205  7300            CLA CLL
0206  3027            DCA COUNT2
0207  3076            DCA TST4
0210  1034            TAD SAV3
0211  3001            DCA INT+1
0212  6002            IOF
0213  7604            LAS
0214  3020            DCA SAV
0215  1020            TAD SAV
0216  0064            AND K0400
0217  7640            SZA CLA
0220  5326            JMP TEST1               /SETUP TEST 1
0221  1020            TAD SAV
0222  0021            AND K1000
0223  7640            SZA CLA
0224  5333            JMP TEST2               /SETUP TEST 2
0225  1020            TAD SAV
0226  0022            AND K2000
0227  7640            SZA CLA
0230  5340            JMP TEST3               /SETUP TEST 3
0231  1020            TAD SAV
0232  0023            AND K4000
0233  7640            SZA CLA
0234  5237            JMP TEST4               /SETUP TEST 4
0235  7402            HLT                     /A TEST WAS NOT SELECTED
0236  5200            JMP START               /SELECT TEST AND HIT CONTINUE
0237  1037    TEST4,  TAD PNT1C
0240  3304            DCA PNT1
0241  7200            CLA
```

```
0242  1024          TAD K5252
0243  7040          CMA
0244  3024          DCA K5252
0245  1024          TAD K5252
0246  7421          MQL                     /LOAD EAE
0247  6001          ION
0250  1025  PT,     TAD K6000               /2000 LOC,
0251  3026          DCA COUNT1
0252  1030          TAD LBUF                /LOWER LIMIT
0253  3010          DCA 10                  /AUTO INDEX
0254  1031          TAD UBUF                /UPPER LIMIT
0255  3011          DCA 11                  /AUTO INDEX
0256  1410  PT1,    TAD I 10
0257  3046          DCA STOR1
0260  1411          TAD I 11
0261  3047          DCA STOR2
0262  1446          TAD I STOR1             /LOWER ADDRESS
0263  1447          TAD I STOR2             /UPPER ADDRESS
0264  7040          CMA
0265  7440          SZA
0266  5272          JMP .+4                 /ERROR
0267  2026  PT2,    ISZ COUNT1
0270  5256          JMP PT1
0271  5777'         JMP PWRIOT              /ISSUE IN HOUSE IOT
0272  7200          CLA
0273  1446          TAD I STOR1
0274  7402          HLT
0275  7200          CLA
0276  1447          TAD I STOR2
0277  7402          HLT
0300  7200          CLA
0301  5267          JMP PT2


                    /POWER FAIL ROUTINE TO SERVICE
                    /SPL AND GO INTO ONE OF THE FOUR TEST
                    /SERVICE ROUTINES WHILE POWER IS GOING DOWN.
                                            /
                                            /
0302  6102  CLF,     SPL                     /SKIP ON POWER LOW
0303  7410          SKP                     /
0304  7402  PNT1,    HLT                     /HLT SHOULD GET MODIFIED BY TEST SERVICE ROUTINES
0305  6032          KCC                     /CLEAR KEYBOARD FLAG
0306  6042          TCF                     /CLEAR TELEPRINTER FLAG
0307  6001          ION
0310  7300          CLA CLL
0311  5200          JMP START


                    /TEST 4 SERVICE ROUTINES AFTER SPL INTERRUPT
                    /STORE ACTIVE REGISTERS AS POWER FAILS.
                                            /
0312  3051  PF,      DCA AC                  /STORE AC
0313  7010          RAR
0314  3050          DCA LINK                /STORE LINK
```

```
0315  1000          TAD INT
0316  3002          DCA PC                  /STORE PC
0317  7501          MQA                     /LOAD AC WITH MQ
0320  3003          DCA MQ
0321  1040          TAD PNT2                /JMP RESTORE
0322  3000          DCA INT
0323  7200          CLA
0324  7040          CMA                     /SET AC EQUAL TO MINUS ONE
0325  7402          HLT

              /SETUP FOR TEST 1
              /CHECK FOR INTERRUPT AND SKIP CAPABILITY
0326  6001    TEST1,  ION
0327  7300          CLA CLL
0330  1036          TAD PNT1B
0331  3004          DCA PNT1
0332  5250          JMP PT

              /SETUP FOR TEST 2
              /ROUTINE TO DETERMINE THE LENGTH OF TIME BEFORE POWER IS INOPERATIIVE,
0333  6001    TEST2,  ION
0334  7300          CLA CLL
0335  1035          TAD PNT1A
0336  3004          DCA PNT1
0337  5250          JMP PT

              /SET UP FOR TEST 3
              /IOT CHAIN
0340  6001    TEST3,  ION
0341  1072          TAD M334                /# OF IOTS
0342  3026          DCA COUNT1              /STORE COUNT
0343  1067          TAD IOBUF               /ADDRESS OF CHAIN
0344  3010          DCA 10                  /AUTO INDEX
0345  1077          TAD ACLA
0346  3410          DCA I 10
0347  1073          TAD PNT2AL              /RESTART ADDRESS
0350  3410          DCA I 10
0351  1070          TAD PONT                /STORE
0352  3410          DCA I 10
0353  1065          TAD XIOT                /IOT FOR STRING
0354  3410          DCA I 10                /LOAD WORD
0355  2026          ISZ COUNT1              /+1 COUNT
0356  5353          JMP .-3                 /FETCH NEXT WORD
0357  1054          TAD HALT                /FETCH HALT
0360  3410          DCA I 10
0361  1071          TAD PNT1D               /LOC. OF STRING
0362  3004          DCA PNT1
0363  5250          JMP PT
0377  0540
      0400    *400
              /SETUP FOR MEMORY TEST
0400  0000    SETUP,  0
0401  7300          CLA CLL
0402  1025          TAD K6000               /2000 LOC
0403  3026          DCA COUNT1
```

```
0404  1038          TAD LBUF          /LOWER BUFFER
0405  3010          DCA 10
0406  1043          TAD C1            /PATTERN 1
0407  3410          DCA I 10
0410  2026          ISZ COUNT1
0411  5206          JMP .-3
0412  7300          CLA CLL
0413  1025          TAD K6000         /2000 LOC
0414  3026          DCA COUNT1
0415  1031          TAD UBUF          /HIGHER BUFFER
0416  3010          DCA 10
0417  1044          TAD C2            /PATTERN 2
0420  3410          DCA I 10
0421  2026          ISZ COUNT1
0422  5217          JMP .-3
0423  7300          CLA CLL
0424  5600          JMP I SETUP       /CONTINUE


                                      /ROUTINE TO RESTORE ACTIVE
                                      /REGISTERS
0425  6007  RESTOR, CAF               /CLEAR ALL FLAGS
0426  1050          TAD LINK          /RESTORE LINK
0427  7004          RAL
0430  7200          CLA
0431  1053          TAD MQ
0432  7041          CIA
0433  1024          TAD K5252
0434  7440          SZA
0435  7402          HLT               /INCORRECT MQ
0436  7200          CLA
0437  1053          TAD MQ            /RESTORE MQ
0440  7421          MQL               /LOAD MQ FROM AC
0441  1052          TAD PC            /RESTORE PC
0442  3000          DCA INT
0443  1051          TAD AC            /RESTORE AC
0444  2076          ISZ TST4
0445  6001          ION
0446  5400          JMP I INT


                                      /TEST 2 SERVICE ROUTINE
                                      /ROTATE TO DETERMINE LENGTH
                                      /OF OPERATIVE POWER
0447  7300    COUNT, CLA CLL
0450  1052          TAD PC
0451  3052          DCA PC            /STORE PC
0452  1054          TAD HALT
0453  3000          DCA INT           /
0454  1055          TAD TIME          /ONE MILLISECOND
0455  3032          DCA SAV1
0456  2032          ISZ SAV1
0457  5256          JMP .+1
0460  1033          TAD SAV2
0461  3000          DCA INT           /STORE JMP MESSAGE
```

```
0462  7402          HLT



                    /RETURN HERE AND HLT IF TEST2 HAS PASSED ONE MILLISECOND DELAY
                    /HIT CONTINUE TO RESTART TESTS
0463  7240    EM,   CLA CMA
0464  7402    EM1,  HLT                     /RETURN HLT TO INDICATE TEST 2 HAS PASSED
0465  7300          CLA CLL
0466  5462          JMP I   RESTART         /HIT CONTINUE TO RESTART

                                            /
                                            /ERROR REPORT PRINT OUT
                                            /ROUTINE
0467  0000    TYPE, 0
0470  7200          CLA
0471  1413          TAD I 13                /CLEAR TELEPRINTER FLAG
0472  7450          SNA
0473  5667          JMP I TYPE
0474  6046          TLS                     /YES
0475  6041          TSF                     /LOAD WORD
0476  5275          JMP .-1
0477  6042          TCF
0500  5270          JMP TYPE+1

                    /ROUTINE TO CHECK IOT CHAIN
                    /AFTER POWER FAILURE
                    /
0501  7300    TIOT, CLA CLL
0502  1067          TAD IOBUF               /ADDRESS OF IOT CHAIN
0503  7001          IAC                     /+1
0504  7001          IAC
0505  7001          IAC                     /+1
0506  3010          DCA 10                  /STORE ADDRESS
0507  1072          TAD M334                /# OF IOTS
0510  3026          DCA COUNT1              /STORE  WORD
0511  7200    TIOT1, CLA
0512  1410          TAD I 10
0513  3051          DCA AC
0514  1051          TAD AC
0515  7041          CIA
0516  1065          TAD XIOT                /FETCH IOT
0517  7640          SZA CLA
0520  5324          JMP .+4                 /ERROR
0521  2026    TIOT2, ISZ COUNT1
0522  5311          JMP TIOT1
0523  5462          JMP I RESTART           /EXIT
0524  7240          CLA CMA
0525  1010          TAD 10                  /FETCH ADDRESS OF ERROR
0526  7402          HLT                     /DISPLAY IN AC
0527  7200          CLA
0530  1051          TAD AC                  /DISPLAY WORD
```

```
0531  7402          HLT
0532  7200          CLA
0533  5321          JMP TIOT2               /COMPARE NEXT WORD

                /TEST 1 SERVICE ROUTINE

0534  7380    CR,   CLA CLL
0535  1854          TAD HALT                /FETCH HALT
0536  3000          DCA INT
0537  7402          HLT


0540  7300    PWRIOT, CLA CLL
0541  1876          TAD TST4
0542  7440          SZA
0543  5462          JMP I RESTART
0544  7200          CLA
0545  1027          TAD COUNT2
0546  7450          SNA
0547  7000          NOP                     /IN HOUSE POWER ON/OFF IOT
0550  2027          ISZ COUNT2
0551  5353          JMP RESET
0552  5462          JMP I RESTART
0553  4200    RESET, JMS SETUP
0554  5777'         JMP PT
              $
0577  0250
```

```
0000  11110000  00000000  11111111  11111111  11111111  11111111  11111111  11111111
0100  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000

0200  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
0300  11111111  11111111  11111111  11111111  11111111  11111111  11110000  00000001

0400  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
0500  11111111  11111111  11111111  11111111  11111111  11110000  00000000  00000001

0600
0700


1000
1100

1200
1300

1400
1500

1600
1700


2000
2100

2200
2300

2400
2500

2600
2700


3000
3100

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
```

AC	0051	SAV1	0032
ACLA	0077	SAV2	0033
BELL	0061	SAV3	0034
C	0045	SET	0066
C1	0043	SETUP	0400
C2	0044	SPL	6102
CAF	6007	START	0200
CLF	0302	STOR1	0046
CLFL	0056	STOR2	0047
COU	0042	TEST1	0326
COUNT	0447	TEST2	0333
COUNT1	0026	TEST3	0340
COUNT2	0027	TEST4	0237
CR	0534	TIME	0055
EM	0463	TIOT	0501
EM1	0464	TIOT1	0511
ER	0060	TIOT2	0521
HALT	0054	TIOTL	0075
INT	0000	TST4	0076
IOBUF	0067	TYPE	0467
K0400	0064	TYPEL	0057
K1000	0021	UBUF	0031
K2000	0022	XIOT	0065
K4000	0023	XPF	0063
K5252	0024		
K6000	0025		
LBUF	0030		
LINK	0050		
M334	0072		
MQ	0053		
MQA	7501		
MQL	7421		
PC	0052		
PF	0312		
PNT1	0304		
PNT1A	0035		
PNT1B	0036		
PNT1C	0037		
PNT1D	0071		
PNT2	0040		
PNT2A	0074		
PNT2AL	0073		
PONT	0070		
PT	0250		
PT1	0256		
PT2	0267		
PWRIOT	0540		
RES	0041		
RESET	0553		
RESTAR	0062		
RESTOR	0425		
SAV	0020		

ERRORS DETECTED: 0

LINKS GENERATED: 2

RUN=TIME: 3 SECONDS

2K CORE USED