

ROUTINE TO UTILIZE RAM TEST - 3 (FC00)

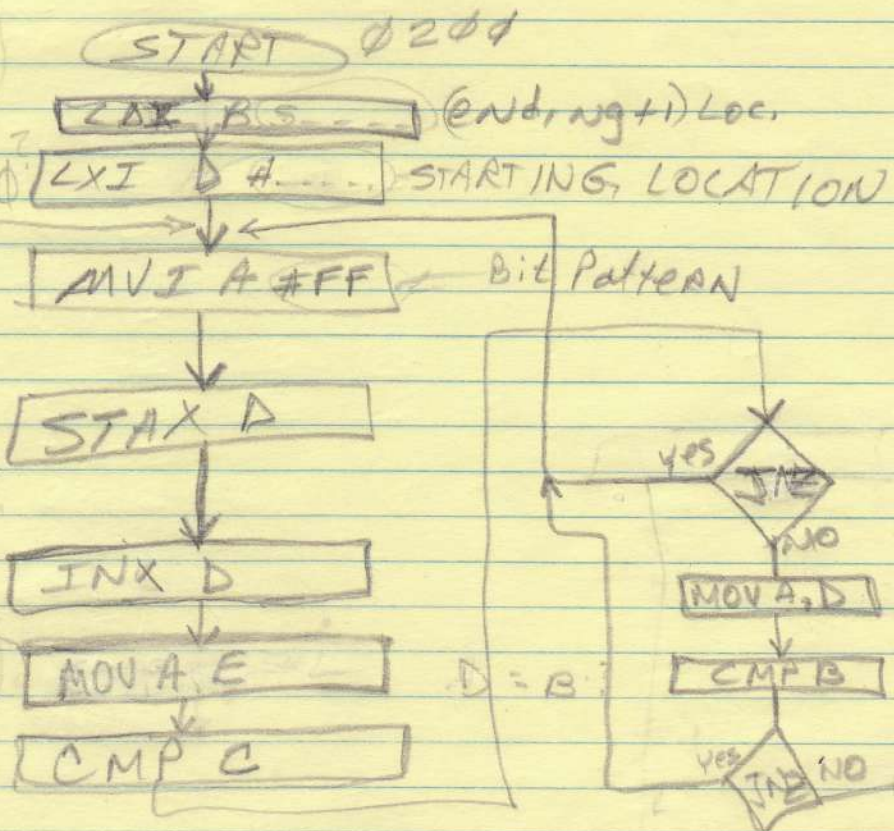


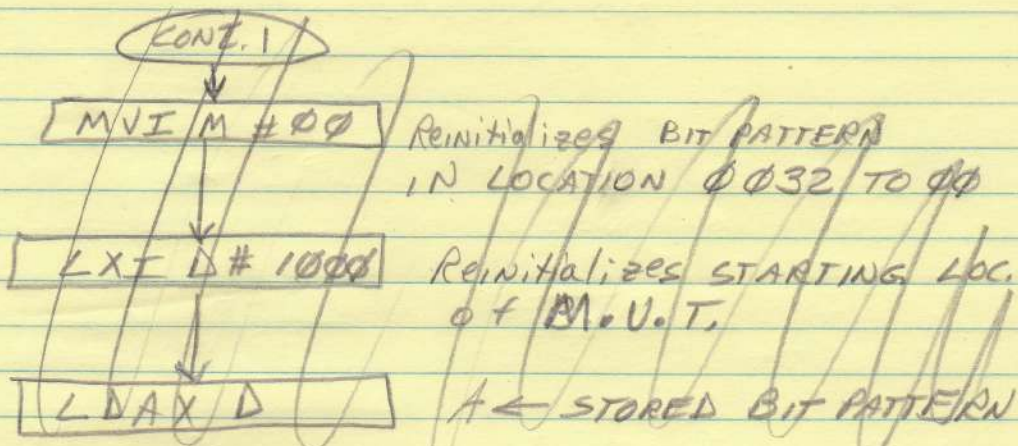
| | | | | |
|------|----|----|----|--------------|
| 0000 | 31 | FF | 01 | LXI SP #01FF |
| 0003 | CD | 00 | FC | call, FC00 |
| 0006 | 76 | | | HLT |
| 0007 | 00 | 00 | | INIT Bcd. |
| 0009 | 00 | 10 | | START CO. |
| 000B | 20 | | | end+1 loc |
| 000C | 00 | | | B.P. |

10 Subtraction ROUTINE
DE - BC = HL

ROUTINE STORE BLOCK OF BIT PATTERN

A₃ = H
 A₄ = L
 MIN LOW = C
 MIN HI = B
 Sub LOW = E
 SUB HI = D
 DE - BC = 0
 MOV A, E
 CMA
 ADI, #01
 MOV L, A
 MOV A, D
 CMA
 ACI, #00
 MOV H, A
 MOV A, L
 ADD C
 MOV L, A
 MOV A, H
 MOV B, A
 ADC B, A
 MOV H, A





CODING OF ROUTINE: STORE BLOCK WITH BIT PATTERN

| ADDR | CODE | LABEL | MNEMONIC | COMMENT |
|------|----------|-------|------------------------------|-------------|
| 0200 | 01 00 01 | | LXI B #0100 (ending +1) Loc. | |
| 0203 | 11 CD 00 | | LXI D A000 | START |
| 0206 | 3E FF | STORE | MVI A #FF | BIT PATTERN |
| 0208 | 12 | | STAX D | STORE |
| 0209 | 13 | | INX D | Next Loc. |
| 020A | 7B | | MOV A, E | } DE = Bx? |
| 020B | 89 | | CMP C | |
| 020C | C2 06 02 | | JNZ STORE | |
| 020F | 7A | | MOV A, D | |
| 0210 | B8 | | CMP B | |
| 0211 | C2 06 02 | | JNZ STORE | |
| 0214 | 76 | | HLT | Done |

01'

MEMORY MAP - ALTAIR 8800

| | | |
|------|--|--|
| 0000 | 4K RAM | Passed RAM test-2 4K RAM Bd. #1 MITS 88-SK4 |
| 0FFF | | |
| 1000 | 4K RAM | Passed RAM test-2 4K RAM Bd #2 MITS 88-SK4 |
| 1FFF | | |
| 2000 | 4K RAM | Passed RAM test-2 4K RAM Bd #3 MITS 88-SK4 |
| 2FFF | | |
| 3000 | 4K RAM | Passed RAM test-2 4K RAM - Bd. Godbout |
| 3FFF | | |
| 4000 | 1K RAM | Passed RAM test-2 1K RAM Bd. MITS - STATIC Rev. 0 |
| 43FF | | |
| 4400 | | |
| | Presently not used | |
| | 40K BYTES | |
| | | 10111001 |
| | | EA-1 EB-3 EC-3 FD-1 FE-1 FF-1 |
| DFFF | | |
| E000 | PROGRAMMING. PROG. resides IN E000 - E117 | BYTESAVER 8K EPROM 2708 WITH PROGRAMMER |
| | 8K EPROM | |
| FFFF | | |

E000
FC00

BYTESAVER
8K EPROM 2708
WITH PROGRAMMER

T. Williams
2-28-81

4K RAM TEST-1

40 IN M0031 } all MEMORY CHECKS
 400 IN M0030 }
 OTHERWISE, Locat'ion of Bad MEMORY cell will be there:
 0030 = L BYTE
 0031 = H BYTE

Note: This DOESN'T TEST FOR PATTERN SENSITIVITY

```

LXI H #0030 HL = 0030
MVI M #00 M0030 = 00
INX H HL = 0031
MVI M #40 M0031 = 40
LDI D #1000 DE = 1000
  
```

```

MVI A #88 A = 88
STAX D MDE = 88
INX D DE = DE + 1
MVI A #20 A = 20
CMP D Z↑ if D = 20 (highest addr. has been stored)
JNZ (Yes)
  
```

25 INSTRUCTIONS

ALL MEMORY STORED

```

MVI B #88 B = 88 (MASK)
LXI D #1000 DE = 1000 (STARTING LOC.)
  
```

```

LDAX D A ← MDE
INX D DE = DE + 1
CMP B Z↑ if MEMORY IS NOT 88
JNZ (Yes)
  RESTORE ADDR. HL ← DE
  HL → 0030/31
  DEX D
  XCHG
  SHLD
  HALT
  
```

NO. MEMORY cell checks OKAY

```

MVI A #20 A = 20
CMP D Z↑ if D = 20 (highest addr. has been READ AND VERIFIED)
JNZ (Yes)
  HALT
  
```

T. Williams
2-28-81

4K RAM TEST-1

(4000 means all good)
BAD MEMORY CELL LOC.
IN 0030 (L) and
0031 (H)

| ADDR | OP CODE | | | MNEMONIC | COMMENTS |
|------|---------|----|----|-------------|---|
| 0000 | 21 | 30 | 00 | LXI H #0030 | HL = 0030 |
| 0003 | 36 | FF | | MVI M #FF | 00 → 0030 |
| 0005 | 23 | | | INX H | HL = 0031 |
| 0006 | 36 | FF | | MVI M #FF | 40 → 0031 |
| 0008 | 11 | 00 | 10 | LDI D #1000 | DE = 1000 ← START OF M.V.T. |
| 000B | 3E | 88 | | MVI A #88 | 88 → A TEST PATTERN |
| 000D | 12 | | | STAX D | A → M _{DE} implement |
| 000E | 13 | | | INX D | DE = DE + 1 Next LOC |
| 000F | 3E | 20 | | MVI A #20 | A = 20 |
| 0011 | BA | | | CMP D | Z1-TEST for end of STORE |
| 0012 | C2 | 0B | 00 | JNZ | TO STORE NEXT LOC. |
| 0015 | 06 | 88 | | MVI B #88 | ALL DATA STORED, INIT MASK |
| 0017 | 11 | 00 | 10 | LXI D #1000 | re-initialize MEMORY START LOC. |
| 001A | 1A | | | LDAX D | fetch MEMORY TO VERIFY |
| 001B | 13 | | | INX D | NEXT LOC. set UP |
| 001C | B8 | | | CMP B | TEST MEMORY retention |
| 001D | C2 | Z1 | 00 | JNZ | JMP TO BAD Mem. cell ROUTINE |
| 0020 | 3E | 20 | | MVI A #20 | MASK = 20 |
| 0022 | BA | | | CMP D | Z1-TEST for end of READ |
| 0023 | C2 | 1A | 00 | JNZ | TO READ NEXT LOC. |
| 0026 | 76 | | | HLT | DONE - ALL MEMORY GOOD |
| 0027 | 1B | | | DCXD | RESTORE BAD cell addr. |
| 0028 | EB | | | XCHG | set up addr. in HL |
| 0029 | 22 | 30 | 00 | SHLD | STORE ADDR IN 0030 & 0031 |
| 002C | 76 | | | HLT | DONE - BAD CELL |
| 002D | 00 | 00 | 00 | NOP | NOT USED |
| 0030 | | | | | LOC. of L BYTE of Bad cell |
| 0031 | | | | | LOC. of H BYTE of Bad cell |
| | | | | | (FFFF IN LOC. 0030 & 31 indicate all MEMORY GOOD) |

256 RAM TEST-1

BAD MEMORY CELL LOC.
STORED IN 0030 (L)
AND 0031 (H). FFFF
MEANS ALL MEMORY GOOD

| ADDR | OP | CODE | MNEMONIC | COMMENTS |
|------|----|-------|--------------|--|
| 0000 | 21 | 30 00 | LXI H # 0030 | HL = 0030 |
| 0003 | 36 | FF | MVI M # FF | 00 → 0030 |
| 0005 | 23 | | INX H | HL = 0031 |
| 0006 | 36 | FF | MVI M # FF | 40 → 0031 |
| 0008 | 11 | 00 01 | LDI D # 0100 | DE = START LOC OF M.U.T. |
| 000B | 3E | 88 | MVI A # 88 | A = TEST DATA BYTE |
| 000D | 12 | | STAX D | A → MDE (IMPLEMENT WRITE) |
| 000E | 13 | | INXD | INC. TO NEXT LOCATION |
| 000F | 3E | 02 | MVI A # 02 | MEMORY END + MASK (STARTS) |
| 0011 | BA | | CMP D | Z↑ - TEST FOR END OF WRITE |
| 0012 | C2 | 0B 00 | JNZ | |
| 0015 | 06 | 88 | MVI B # 88 | ALL DATA STORED, INIT. PATTERN MASK |
| 0017 | 11 | 00 01 | LXI D # 0100 | reinit. START LOC OF M.U.T. |
| 001A | 1A | | LDAX D | fetch MEMORY TO VERIFY |
| 001B | 13 | | INXD | INC TO NEXT LOCATION |
| 001C | B8 | | CMP B | TEST MEMORY RETENTION |
| 001D | C2 | 27 00 | JNZ | Go to Bad MEMORY cell ROUTINE |
| 0020 | 3E | 02 | MVI A # 02 | MEMORY END + 1 MASK |
| 0022 | BA | | CMP D | Z↑ - TEST FOR END OF READ |
| 0023 | C2 | 1A 00 | JNZ | Go to Read next Loc. |
| 0026 | 76 | | HLT | DONE - ALL MEMORY good |
| 0027 | 1B | | DCXD | Restore BAD cell addre. |
| 0028 | EB | | XCHG | set up addr. in HL |
| 0029 | 22 | 30 00 | SHLD | STORE ADDR IN 0030 & 0031 |
| 002C | 76 | | HLT | DONE - BAD cell Identified |
| 002D | 00 | 00 00 | NOP | NOT USED |
| 0030 | | | | Loc. of L BYTE of BAD cell |
| 0031 | | | | Loc. of H BYTE of BAD cell (FFFF, in loc's indicate all MEMORY good) |

T. Williams
 2-28-81
 uses - HL, DE, EC, A
 M 0007-000C

PUSH PSW
 PUSH #
 PUSH D
 PUSH B

- STORES BAD CELL LOC. IN 0007(L) and 0008(H).
 - PICKS UP STARTING LOC. OF M.U.T. AT 0009(L) and 000A(H).
 - PICKS UP (ENDING+1) ADDR. IN 000B(H). THIS PROG. TESTS MEMORY IN 256 BYTE BLOCKS ONLY.
 - B.P. IN 000C

RAM TEST.3
 TO BE IN EPROM FC00x

```

LXI H # 0007
MVI M, # FF
INX H
MVI M, # FF
  
```

INITIALIZES 0007 AND 0008 TO FF

```

LHLD 0009
  
```

HL = STARTING LOC.

```

XCHG
  
```

LOADS D.E. WITH STARTING ADDRESS

```

LXI B, # 000B
  
```

LOC. OF M.U.T.

```

LXI H # 000C
  
```

HL = 0005

```

MVI M, # 00
  
```

INITIALIZES B.P. IN 0004 TO 00

sets BE to loc. of end+1 addr.

```

MOV A, M
STAX D
LDAX D
CMP M
  
```

A = CURRENT B.P.

STORES B.P. IN M.U.T.

READS BACK B.P. IN M.U.T.

checks for correct retention

SNZ

Yes (correct)

HL = Bad Cell Loc A 0007

```

XCHG
  
```

```

SHLD
  
```

J to Ret. ROUTINE

Bad cell loc. IN 0007(L) and 0008(H). B.P. IS IN 000C

```

INR M
  
```

goes to next B.P.

```

INR A
  
```

puts current B.P. in Acc.

```

CPI # 00
  
```

checks to see if all 256 BIT PATTERNS have been stored and verified for the current loc. of M.U.T.

SNZ

Yes (all have been checked) (B.P. has turned over 00)

```

INX D
LDAX B
CMP D
  
```

A = END+1 LOC. (H)

SNZ

Yes (Yes they have all been tested)

J to Ret. ROUTINE

Ret. ROUTINE

```

POP B
POP D
POP H
POP PSW
RET
  
```

T. Williams
3-1-81

Tests for bit pattern
sensitivity & retention

RAM TEST 3

- STORES BAD CELL LOC. OF
M.U.T. IN 0009(L) and
0008(H).
- PICKS UP START. LOC. OF
M.U.T. AT 0009(L) and
000A(H).

- off ending B.P.
IN 000C

- PICKS UP (END+1)
LOC. OF M.U.T. at
000B(H). This prog.
TEST MEM. IN 256 BYTE BLOCKS ONLY

| Addr. | OP CODE | LABEL | MNEMONIC | COMMENTS |
|-------|----------|--------|--------------|--|
| FC00 | F5 | | PUSH PSW | } SAVES REG. THAT ARE USED ON STACK |
| FC01 | E5 | | PUSH H | |
| FC02 | D5 | | PUSH D | |
| FC03 | C5 | | PUSH B | |
| FC04 | 00 | | NOP | |
| FC05 | 21 07 00 | | LXI H #0007 | } INITIALIZES 0007 AND 0008 TO FF |
| FC08 | 36 FF | | MVI M, #FF | |
| FC0A | 23 | | INX H | |
| FC0B | 36 FF | | MVI M, #FF | |
| FC0D | 00 | | NOP | |
| FC0E | 2A 09 00 | | LHLD 0009 | HL = STARTING ADDR. |
| FC11 | EB | | XCHG | DE = START. LOC. OF M.U.T. |
| FC12 | 01 0B 00 | | LXI B, #000B | BE = LOC. OF (END+1) ADDR. |
| FC15 | 21 0C 00 | | LXI H, #000C | HL = LOCATION OF B.P. |
| FC18 | 36 00 | | MVI M #00 | INIT. B.P. IN 000C TO 00 |
| FC1A | 00 | | NOP | |
| FC1B | 7E | STORE | MOVA, M | A = CURRENT B.P. |
| FC1C | 12 | | STAX D | STORES B.P. IN M.U.T. |
| FC1D | 1A | | LDAX D | READS BACK B.P. IN M.U.T. |
| FC1E | BE | | CMP M | CHECKS FOR CORRECT RETENTION |
| FC1F | C2 32 FC | | JNZ ERROR | J if there was an error |
| FC22 | 34 | | INRM | INC. TO NEXT B.P. |
| FC23 | 3C | | INRA | PUTS UPDATED B.P. IN A |
| FC24 | FE 00 | | CMP I #00 | all 256 B.P.'S verified for ^{this} loc. |
| FC26 | C2 1B FC | | JNZ STORE | J if all have not |
| FC29 | 13 | | INXD | INC TO NEXT LOC. OF M.U.T. |
| FC2A | 0A | | LDAX B | A = (END+1) LOC. (H) OF M.U.T. |
| FC2B | BA | | CMP D | all loc's tested |
| FC2C | C2 1B FC | | JNZ STORE | J if all have not |
| FC2F | C3 36 FC | | JMP RETURN | if they have, then J to ret. |
| FC32 | EB | ERROR | XCHG | HL = BAD CELL LOCATION |
| FC33 | 22 07 00 | | SHLD #0007 | STORES BAD LOC. IN 0007(L) & 0008(H) |
| FC36 | C1 | RETURN | POP B | } Restores registers used |
| FC37 | D1 | | POP D | |
| FC38 | E1 | | POP H | |
| FC39 | F1 | | POP PSW | |
| FC3A | C9 | | RET | RETURNS |
| FC3B | 00 | | NOP | |
| FC3C | 76 | | HLT | |