JUMP INSTRUCTIONS

SAP-2 has four jump instructions, these can change the program sequence. The computer may jump or branch to another part of the program.

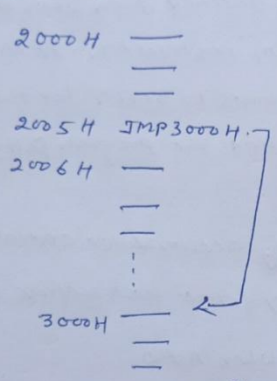
JMP. JMP is the mnemonic for Jump. The computer to get the next instruction from the memory location.

Every JMP instruction includes an address that is loaded into the program counter.

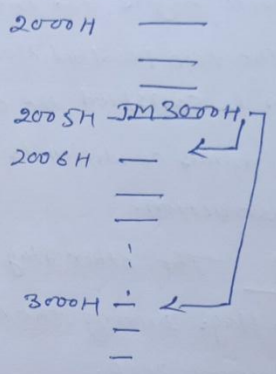
for example

JMP 3000H

the computer to get the next instruction from memory location 3000H.



Unconditional JMP



Conditional.

JM, JZ, JNZ

Suppose JMP 3000H is stored at 2005H,

~~then~~ the program counter contains

PC = 2006H

During the execution cycle, the JMP 3000H loads the program counter with the address

PC = 3000H

JM. SAP-2 has two flags called the sign flag and the zero flag. During the execution of some instruction, these flags will be set or reset, depending to the accumulator contents.

If the accumulator contents become negative, the sign flag will be set, otherwise, the sign flag is cleared.

$$S = \begin{cases} 0 & \text{if } A \geq 0 \\ 1 & \text{if } A < 0 \end{cases}$$

JM is a mnemonic for Jump if minus; the computer will go Jump to address if and only if the sign flag is set.

Suppose – JM 3000H is store 2005H

After this instruction has been fetched,

PC = 2006H

If S=1 the execution of JM 3000H loads the program Counter with PC = 3000H

Since the program counter now points to 3000H, the next instruction will come from 3000H

If the jump condition is not set (S=0, the program counter is unchanged during the execution cycle. Therefore when the next fetch cycle begins, the instruction is fetched from 2006H

The two possibilities for a JM instruction. If the minus condition is satisfied, the computer Jumps to 3000H for the next instruction. If the minus condition is not satisfied, the program falls through to the next instruction.

JZ The other flag affected by accumulator operations is the zero flag. During the execution of some instructions, the accumulator will become zero.

$$Z = \begin{cases} 0 & \text{when } A \neq 0 \\ 1 & \text{when } A = 0 \end{cases}$$

JZ is the mnemonic for Jump if zero. The computer to Jump to the address only if the zero flag is set.

Suppose JZ 3000H is stored at 2005H

If Z=1 during the execution of JZ 3000H, the next instruction is fetched from 3000H.

If Z=0, the next instruction will come from 2006H.

JNZ – JNZ stands for Jump if not-zero. In this case, we get a Jump when the zero flag is clear and no Jump when it is set.

Suppose JNZ 7800H is stored at 2100H,

If Z=0, the next instruction will come from 7800H.

If Z=1 the program falls through to the instruction at 2100H.

CALL and RET

CALL is the mnemonic for call the Subroutine.

For example –

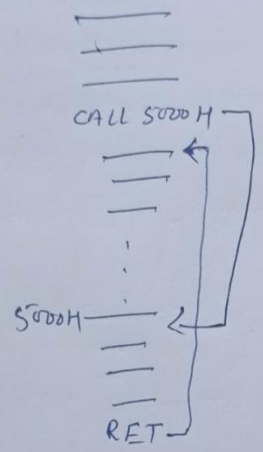
If a square root subroutine starts at address 5000H and a logarithm subroutine at 6000H, the execution of

CALL 5000H

will jump to the square root subroutine.

RET for return, it is used at the end of every subroutine to the computer to go back to the original program.

A RET instruction is to a subroutine as a HLT is to a program



CALL Instruction

LOGIC INSTRUCTIONS

Following the SAP-2 logical instructions –

CMA "complement the accumulator"

The execution of a CMA inverts each bit in the accumulator.

ANA – ANA means to AND the accumulator contents with register. The results is stored in the accumulator

for example – ANA B

AND the contents of the accumulator with the B register.

For example A = 1100 1100

The execution of an ANA B results in

A = 1100 0000

ORA is the mnemonic for OR the accumulator with the register. The two ORA instructions in SAP-2 are ORA, B and ORA C.

for example

If accumulator and B register contents are given by

then executing ORA B gives

A = 1111 1101

XRA