

Machine Control or Program Control Instructions / Operations.

These instructions specify Conditions for altering the Sequence of program execution or in other words the Content of PC (Program Counter) Register.

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Most Common Control instructions are :-

BRANCH and JUMP :- may be Conditional or Unconditional.

JUMP is an unconditional branch used to implement simple loops. JNE :- 'Jump Not Equal' is a Conditional branch instruction.

The Conditional branch instructions such as BRP X and BRN X causes a branch to memory location X if the result of the most recent operation is positive or negative respectively.

If the condition is true, PC is loaded with the branch address X and the next instruction is taken from X, otherwise PC is not altered and the next instruction is taken from the location pointed by PC. Diagram on next page you will see an unconditional branch instruction, and a conditional branch instruction if the content of AC is zero.

MBR ← 0 ; Assign 0 to MBR register.

X ← 2001 ; Assume X to be an address location 2001



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READ X : Read a value from memory location 2001 into AC

BRZ 1007 : Branch to Location 1007 IF AC is zero (Conditional Branch on Zero).

ADD MBR : Add the Content of MBR to AC and Store Result to AC

TRAS MBR : Transfers the Content of AC to MBR

INC X : Increment X to point to next location.

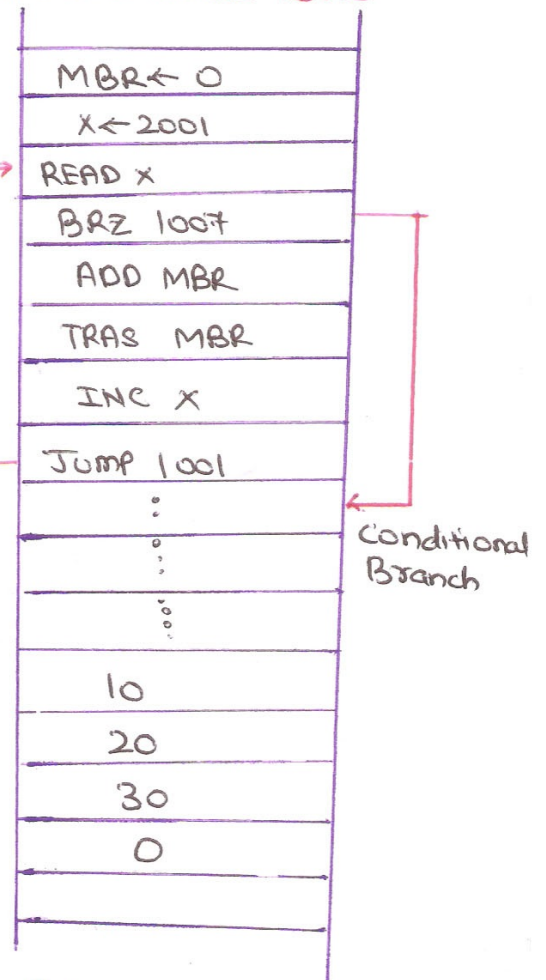
Jump 1001 : Loop back for further processing.



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Unconditional Branch.

0FFF
1000
1001
1002
1003
1004
1005
1006
1007



BRANCH & JUMP Instruction

This program performs addition of numbers stored from locations 2001 onwards till a zero is encountered.

Therefore, X is initialized to 2001, while MBR that stores the result is initialized to zero.

We have assumed that in this machine all the operations are performed using CPU. The programs will execute instructions as:-

1st Cycle 1001 (with location X = 2001 which is value 10) → 1002 → 1003 → 1004 → 1005 (X is incremented 2002) → 1006

2nd Cycle

→ 1001 (with X = 2002 which is 20) → 1002 → 1003 → 1004 → 1005 (X is 2003) → 1006

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1001 (with $x = 2003$ which is 30) \rightarrow 1002 \rightarrow 1003 \rightarrow 1004
 \rightarrow 1005 (x is 2004) \rightarrow 1006

1001 (with $x = 2004$ which is 0) \rightarrow 1002 [AC contains Zero so take a branch to 1007]

1007..... (MBR Contains the Added value)

SKIP instruction :- It is a zero address instruction and skips the next instruction to be executed in sequence. In other words, it increments the value of PC by one instruction length.

CALL and RETN :- used for calling subprograms and returning from them.



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