ENCODING SCHEME

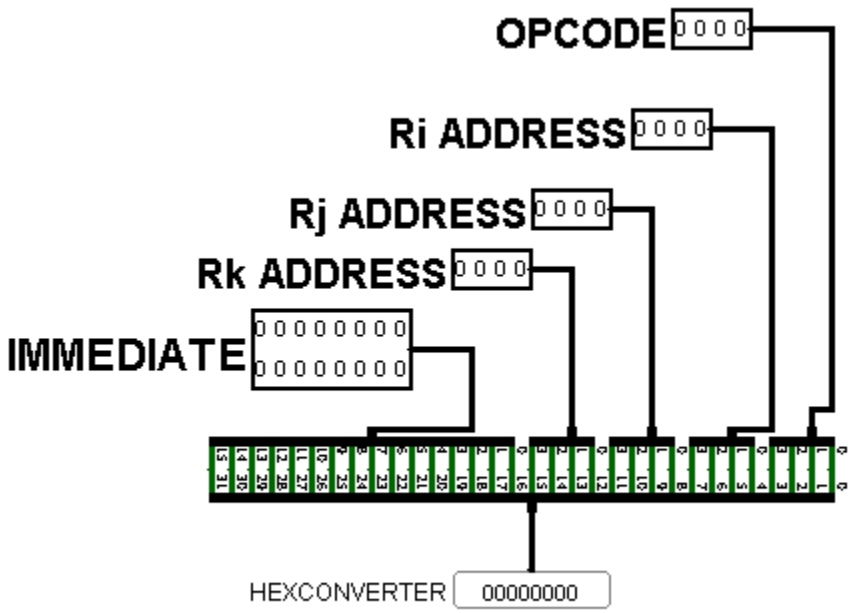
KOLLI JOGENDRA DURGA PRASAD

1) **MOVE Ri , Rj** \\The content of R j is transferred to R i .
2) **MVI R i , Immediate (16-bit)** \\The immediate value (32-bit unsigned extended)
3) **LOAD R i , X (R j)** \\ The content of memory location [[R j] + X] is loaded into R i , where X is a 16-bit unsigned immediate value.
4) **STORE R i , X (R j)** \\ The content of register R i is stored in memory [[R j] + X], where X is a 16-bit unsigned immediate value.
5) **ADD R i , R j , R k** \\ R i = R j + R k .
6) **ADI R i , R j , Immediate (16-bit)** \\ R i = R j + Immediate Value (32-bit unsigned extended)
7) **SUB R i , R j , R k** \\ R i = R j - R k
8) **SUI R i , R j , Immediate (16-bit)** \\ R i = R j - Immediate Value (32-bit unsigned extended)
9) **AND R i , R j , R k** \\ R i = R j AND R k .
10) **ANI R i , R j , Immediate (16-bit)** \\ R i = R j AND Immediate Value (32-bit unsigned extended)
11) **OR R i , R j , R k** \\ R i = R j OR R k .
12) **ORI R i , R j , Immediate (16-bit)** \\ R i = R j OR Immediate Value (32-bit unsigned extended)
13) **HLT** (Stops the execution).

OPCODE ENCODING

INSTRUCTION	OPCODE
MOVE	**0000**
MVI	**0001**
LOAD	**0010**
STORE	**0011**
ADD	**0100**
ADI	**0101**
SUB	**0110**
SUI	**0111**
AND	**1000**
ANI	**1001**
OR	**1010**
ORI	**1011**
HLT	**1100**

The below is the visual diagram of instruction



How Encoding works

1) For each instruction one have to enter the binary code into respective slots in the **hex converter** (which is provided in the circuit)which will convert it into hexadecimal code
2) After converting every binary code into hexadecimal then enter the hexadecimal code into the memory

Example :-

Suppose we have two instructions to perform

LOAD R1,X(R2)(where x is 2)

ADD R1,R2,R3

Step 1:

LOAD R1,X(R2)

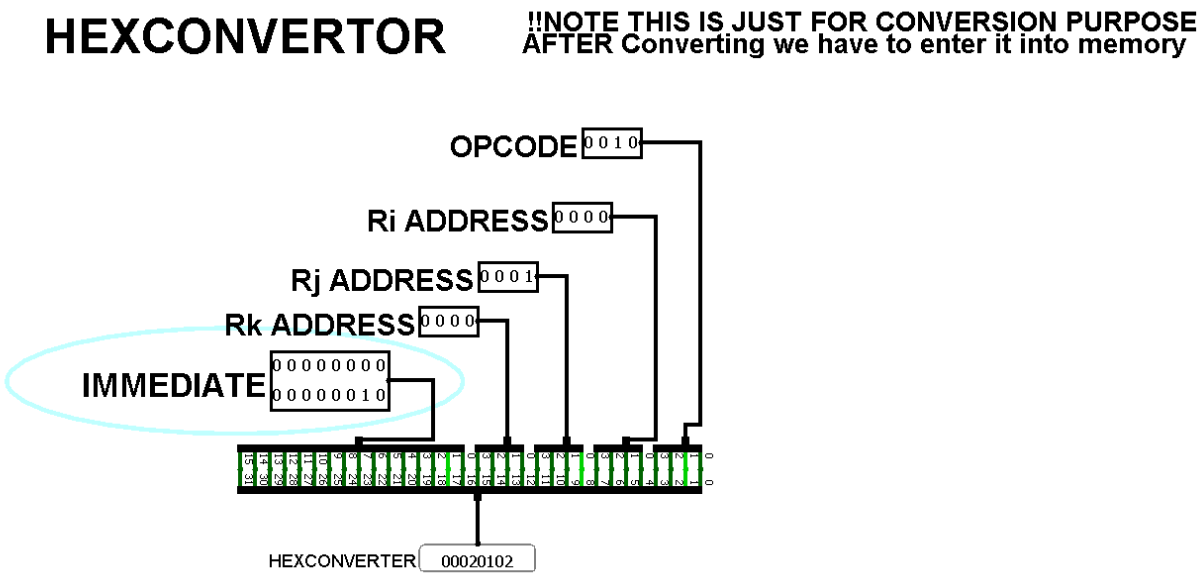
LOAD-->0010

Ri ADDRESS=R1=0000(fill it in the Ri ADDRESS slot in Hex converter)

Rj ADDRESS=R2=0001(fill it in the Rj ADDRESS slot in Hex converter)

Rk ADDRESS=Not present=keep it as 0000(fill it in the Rk ADDRESS slot in Hex converter) (It is not used any way)

Immediate =X=00000010(fill it in the immediate slot in Hex converter)



ADD R1,R2,R3

ADD-->0100

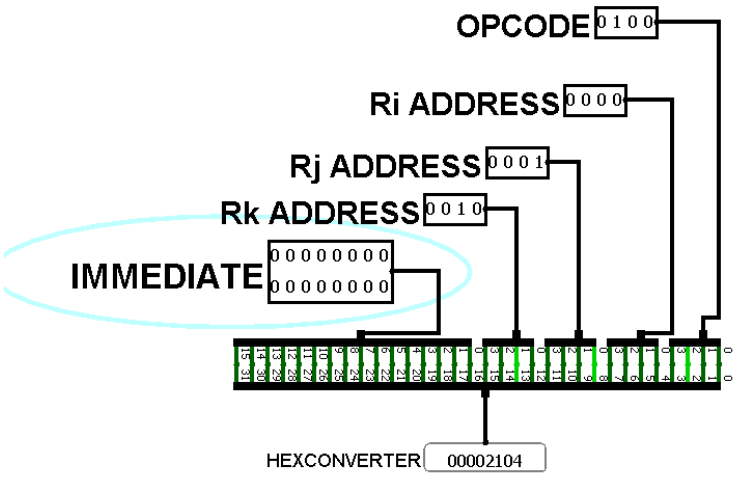
Ri ADDRESS=R1=0000(fill it in the Ri ADDRESS slot in Hex converter)

Rj ADDRESS=R2=0001(fill it in the Rj ADDRESSslot in Hex converter)

Rk ADDRESS=R3=0010(fill it in the Rk ADDRESS slot in Hex converter)

Immediate =not present=keep it as 00000000(fill it in the immediate slot in Hex converter)

HEXCONVERTOR **!!NOTE THIS IS JUST FOR CONVERSION PURPOSE AFTER Converting we have to enter it into memory**



Points to be noted

1) **If we don’t use a certain slot in the converter then make sure it is filled with only zero’s**
2) **Ex:- suppose in hlt we only use opcode slot ,so remaining all slots should be zeros.**
3) **Ex2:- In MVI we use Ri and immediate slots, so remaining all slots should be only filled with zeros**

STEP 2:

After converting everything into hexadecimal code enter it into memory(we have entered 0020102 and 0002104 which we have got earlier from hex converter for LOAD and ADD instructions)

----------MEMORY------