

Instruction Format

All instructions are 32 bits long. There are four types of instruction format.

- Arithmetic instruction format
- Conditional Branch and Immediate format
- Unconditional Jump format
- Input and Output instruction format

Arithmetic instruction format

2 bits	6 bits	4 bits	4 bits	4 bits	12 bits
00	OPCODE	S-reg	S-reg	D-reg	000

The first two bits are always 00, indicating that the instruction is an Arithmetic or Register transfer type of instruction. S-reg is the source register. D-reg is the destination register. The last 12 bits are always 0, as they are not used.

Conditional Branch and Immediate format

2 bits	6 bits	4 bits	4 bits	16 bits
01	OPCODE	B-reg	D-reg	Address

The first two bits are always 01, indicating that the instruction is a Conditional Branch and Immediate type of instruction. B-reg is the base register. D-reg is the destination register. The last 16 bits may be an address or an immediate data.

- When the last 16 bits contain data, the D-reg is always 0000.
- The Address may at times be treated as data, which is direct addressing.
- An indirect Address is calculated as :

$$\text{Effective Address} = \text{Content (B-reg)} + \text{Address}$$

- Conditional Branch checks for B and D reg to cause a branch, to a specified Address, or not

Unconditional Jump format

2 bits	6 bits	24 bits
10	OPCODE	Address

The first two bits are always 10, indicating that the instruction is an Unconditional Jump type of instruction, with a jump to the specified Address.

Input and Output instruction format

2 bits	6 bits	4 bits	4 bit	16 bits
11	OPCODE	Reg 1	Reg 2	Address

The first two bits are always 11, indicating that the instruction is an Input and Output type of instruction.

- The instruction may read the content of Address/Reg 2 into Reg 1.
- The instruction may write the content of Reg 1 into a specified Address/Reg 2.

Registers

There are 16 registers; each of 32 bit long.

- Reg-0 (0000) being the Accumulator.
- Reg-1(0001) being the Zero register, which contains the value 0.
- All other registers are general purpose register.

Buffers

- Input buffer – containing data read by the program
- Output buffer – containing data produced by the program
- Temp buffer – area in memory to store/retrieve the data temporarily.