

S-type Instructions: Store Operations

Purpose:

- S-type instructions are used to store data from a register to memory.

Format:

- *Opcode*: Specifies the operation (e.g., STORE).
- *rs1*: Base address register.
- *rs2*: Source register containing the data to be stored.
- *Immediate*: Specifies the offset from the base address.

Examples:

- *SW (Store Word)*: Stores a 32-bit word from a register to memory.
- *SH (Store Halfword)*: Stores a 16-bit halfword from a register to memory.
- *SB (Store Byte)*: Stores an 8-bit byte from a register to memory.

Example Code:

assembly

Store the value from register x3 into memory at address x5 + 4

SW x3, 4(x5)

B-type Instructions: Branch Operations

Purpose:

- B-type instructions are used for conditional branching based on the comparison of two registers.

Format:

- *Opcode*: Specifies the operation (e.g., BRANCH).
- *rs1*: First source register.
- *rs2*: Second source register.
- *Immediate*: Specifies the offset for the branch target address.

Examples:

- *BEQ (Branch if Equal)*: Branches if the values in two registers are equal.
- *BNE (Branch if Not Equal)*: Branches if the values in two registers are not equal.

- *BLT (Branch if Less Than)*: Branches if the value in the first register is less than the value in the second register.
- *BGE (Branch if Greater or Equal)*: Branches if the value in the first register is greater than or equal to the value in the second register.

Example Code:

Branch to label L1 if the value in x1 is equal to the value in x2

BEQ x1, x2, L1

Format: The immediate value is used to calculate the target address for the branch.

Example Operations:

- ✓ *BEQ x1, x2, L1*: Branches to label L1 if the values in registers x1 and x2 are equal.
- ✓ *BNE x1, x2, L1*: Branches to label L1 if the values in registers x1 and x2 are not equal.
- ✓ *BLT x1, x2, L1*: Branches to label L1 if the value in register x1 is less than the value in register x2.
- ✓ *BGE x1, x2, L1*: Branches to label L1 if the value in register x1 is greater than or equal to the value in register x2.

Key Differences Between S-type and B-type Instructions

Aspect	S-type Instructions	B-type Instructions
Purpose	Store operations	Branch operations
Opcode	STORE	BRANCH
Immediate Field	Split between rs1 and rs2 fields	Split between branch target and offset
Used For	Storing data to memory	Conditional branching
Examples	SW, SH, SB	BEQ, BNE, BLT, BGE