

RISC-V-8 Instruction Set

Instruction Set Overview

1. Only base RISC-V instructions (no multiplication or division)
2. 8-bit address and data
3. x0 is always set to 0
4. x1-x7 are general purpose registers.
5. Program counter/pc
6. No 4-byte alignment for instructions and data because we have 8-bit data in addresses.
7. No arithmetic exceptions for overflow and underflow (same as RISC-V)
8. Branch instructions use sign comparisons.
9. Sign extend the 5 bit immediate that comes from the 16 bit word

Instruction Formats

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
<i>R-type</i>	rs1	rs1	rs1	rs2	rs2	rs2	x	x	rd	rd	rd	op	op	op	op	op
<i>I-type</i>	rs1	rs1	rs1	Imm	Imm	Imm	Imm	Imm	rd	rd	rd	op	op	op	op	op
<i>U-type</i>	Imm	Imm	Imm	Imm	Imm	Imm	Imm	Imm	rd	rd	rd	op	op	op	op	op
<i>SB-type</i>	rs1	rs1	rs1	rs2	rs2	rs2	Imm	Imm	Imm	Imm	Imm	op	op	op	op	op

Instructions

Instructions	Instruction Format	OPCODE	description
ANDI	I type	00010	Saves bitwise AND of rs1 and immediate into rd
XORI	I type	00100	Saves bitwise XOR of rs1 and immediate into rd
ORI	I type	00011	Saves bitwise OR of rs1 and immediate into rd
ADDI	I type	00001	Adds the sign-extended 12-bit immediate to rs1 and saves to rd
LUI	U type	00101	Loads upper 6immediate into rd
SUB	R type	00111	Subtracts rs2 from rs1 and stores into rd
ADD	R type	00110	Adds rs1 and rs2 and stores it in the rd
AND	R type	01000	Saves bitwise AND of rs1 and rs2 into rd
OR	R type	01001	Saves bitwise OR of rs1 and rs2 into rd
XOR	R type	01010	Saves bitwise XOR of rs1 and rs2 into rd

JALR	I-type	01011	Obtains jump address by adding the sign extended 5-bit immediate to rs1 and stores the current address + 1 into rd
BEQ	S-B type	01100	Takes the branch if rs1 is equal to rs2 and branch address is calculated by pc + sign extended immediate
BNE	S-B type	01101	Takes the branch if rs1 is not equal to rs2 and branch address is calculated by pc + sign extended immediate
BLT	S-B type	01110	Takes the branch if rs1 is less than rs2 (signed comparison) and branch address is calculated by pc + sign extended immediate
BGE	S-B type	01111	Takes the branch if rs1 is greater than or equal to rs2 (signed comparison) and branch address is calculated by pc + sign extended immediate
LW	I type	10000	Loads an 8-bit value into rd from rs1 + the sign-extended immediate.
SW	S-B type	10001	Stores a 8 bit value from rs2 into rs1 + the sign-extended immediate.

Unsupported RISC-V Instructions

- SLTI
- SLTIU
- SLLI
- SRLI
- SRAI
- AUIPC
- SLL
- SRL
- SRA
- SLT
- SLTU
- JAL
- BNE
- BLTU
- BGEU
- LH
- LHU
- LB
- LBU
- SH
- SB