

RV32I Base Integer Instruction Set

imm				rd	0110111	LUI rd, imm
imm				rd	0010111	AUIPC rd, imm
imm				rd	1101111	JAL rd, ipc
imm		rs1	000	rd	1100111	JALR rd, rs1, imm
imm	rs2	rs1	000	imm	1100011	BEQ rs1, rs2, ipc
imm	rs2	rs1	001	imm	1100011	BNE rs1, rs2, ipc
imm	rs2	rs1	100	imm	1100011	BLT rs1, rs2, ipc
imm	rs2	rs1	101	imm	1100011	BGE rs1, rs2, ipc
imm	rs2	rs1	110	imm	1100011	BLTU rs1, rs2, ipc
imm	rs2	rs1	111	imm	1100011	BGEU rs1, rs2, ipc
imm		rs1	000	rd	0000011	LB rd, imm(rs1)
imm		rs1	001	rd	0000011	LH rd, imm(rs1)
imm		rs1	010	rd	0000011	LW rd, imm(rs1)
imm		rs1	100	rd	0000011	LBU rd, imm(rs1)
imm		rs1	101	rd	0000011	LHU rd, imm(rs1)
imm	rs2	rs1	000	imm	0100011	SB rs2, imm(rs1)
imm	rs2	rs1	001	imm	0100011	SH rs2, imm(rs1)
imm	rs2	rs1	010	imm	0100011	SW rs2, imm(rs1)
imm		rs1	000	rd	0010011	ADDI rd, rs1, imm
imm		rs1	010	rd	0010011	SLTI rd, rs1, imm
imm		rs1	011	rd	0010011	SLTIU rd, rs1, imm
imm		rs1	100	rd	0010011	XORI rd, rs1, imm
imm		rs1	110	rd	0010011	ORI rd, rs1, imm
imm		rs1	111	rd	0010011	ANDI rd, rs1, imm
0000000	shamt	rs1	001	rd	0010011	SLLI rd, rs1, imm
0000000	shamt	rs1	101	rd	0010011	SRLI rd, rs1, imm
0100000	shamt	rs1	101	rd	0010011	SRAI rd, rs1, imm
0000000	rs2	rs1	000	rd	0110011	ADD rd, rs1, rs2
0100000	rs2	rs1	000	rd	0110011	SUB rd, rs1, rs2
0000000	rs2	rs1	001	rd	0110011	SLL rd, rs1, rs2
0000000	rs2	rs1	010	rd	0110011	SLT rd, rs1, rs2
0000000	rs2	rs1	011	rd	0110011	SLTU rd, rs1, rs2
0000000	rs2	rs1	100	rd	0110011	XOR rd, rs1, rs2
0000000	rs2	rs1	101	rd	0110011	SRL rd, rs1, rs2
0100000	rs2	rs1	101	rd	0110011	SRA rd, rs1, rs2
0000000	rs2	rs1	110	rd	0110011	OR rd, rs1, rs2
0000000	rs2	rs1	111	rd	0110011	AND rd, rs1, rs2
0000	pred	succ	00000	000	00000	FENCE
000000000000000000			001	00000	0001111	FENCE.I

RV64I Base Integer Instruction Set (in addition to RV32I)

imm		rs1	110	rd	0000011	LWU rd, imm(rs1)
imm		rs1	011	rd	0000011	LD rd, imm(rs1)
imm	rs2	rs1	011	imm	0100011	SD rs2, imm(rs1)
000000	shamt	rs1	001	rd	0010011	SLLI rd, rs1, imm
000000	shamt	rs1	101	rd	0010011	SRLI rd, rs1, imm
010000	shamt	rs1	101	rd	0010011	SRAI rd, rs1, imm
imm		rs1	000	rd	0011011	ADDIW rd, rs1, imm
0000000	shamt	rs1	001	rd	0011011	SLLIW rd, rs1, imm
0000000	shamt	rs1	101	rd	0011011	SRLIW rd, rs1, imm
0100000	shamt	rs1	101	rd	0011011	SRAIW rd, rs1, imm
0000000	rs2	rs1	000	rd	0111011	ADDW rd, rs1, rs2
0100000	rs2	rs1	000	rd	0111011	SUBW rd, rs1, rs2
0000000	rs2	rs1	001	rd	0111011	SLLW rd, rs1, rs2
0000000	rs2	rs1	101	rd	0111011	SRLW rd, rs1, rs2
0100000	rs2	rs1	101	rd	0111011	SRAW rd, rs1, rs2

RV32M Standard Extension for Integer Multiply and Divide

0000001	rs2	rs1	000	rd	0110011	MUL rd, rs1, rs2
0000001	rs2	rs1	001	rd	0110011	MULH rd, rs1, rs2
0000001	rs2	rs1	010	rd	0110011	MULHSU rd, rs1, rs2
0000001	rs2	rs1	011	rd	0110011	MULHU rd, rs1, rs2
0000001	rs2	rs1	100	rd	0110011	DIV rd, rs1, rs2

0000001	rs2	rs1	101	rd	0110011	DIVU rd, rs1, rs2
0000001	rs2	rs1	110	rd	0110011	REM rd, rs1, rs2
0000001	rs2	rs1	111	rd	0110011	REMU rd, rs1, rs2

RV64M Standard Extension for Integer Multiply and Divide (in addition to RV32M)

0000001	rs2	rs1	000	rd	0111011	MULW rd, rs1, rs2
0000001	rs2	rs1	100	rd	0111011	DIVW rd, rs1, rs2
0000001	rs2	rs1	101	rd	0111011	DIVUW rd, rs1, rs2
0000001	rs2	rs1	110	rd	0111011	REMW rd, rs1, rs2
0000001	rs2	rs1	111	rd	0111011	REMUW rd, rs1, rs2

RV32A Standard Extension for Atomic Instructions

00010	aqrl	00000	rs1	010	rd	0101111	LR.W rd, (rs1)
00011	aqrl	rs2	rs1	010	rd	0101111	SC.W rd, rs2, (rs1)
00001	aqrl	rs2	rs1	010	rd	0101111	AMOSWAP.W rd, rs2, (rs1)
00000	aqrl	rs2	rs1	010	rd	0101111	AMOADD.W rd, rs2, (rs1)
00100	aqrl	rs2	rs1	010	rd	0101111	AMOXOR.W rd, rs2, (rs1)
01000	aqrl	rs2	rs1	010	rd	0101111	AMOOR.W rd, rs2, (rs1)
01100	aqrl	rs2	rs1	010	rd	0101111	AMOAND.W rd, rs2, (rs1)
10000	aqrl	rs2	rs1	010	rd	0101111	AMOMIN.W rd, rs2, (rs1)
10100	aqrl	rs2	rs1	010	rd	0101111	AMOMAX.W rd, rs2, (rs1)
11000	aqrl	rs2	rs1	010	rd	0101111	AMOMINU.W rd, rs2, (rs1)
11100	aqrl	rs2	rs1	010	rd	0101111	AMOMAXU.W rd, rs2, (rs1)

RV64A Standard Extension for Atomic Instructions (in addition to RV32A)

00010	aqrl	00000	rs1	011	rd	0101111	LR.D rd, (rs1)
00011	aqrl	rs2	rs1	011	rd	0101111	SC.D rd, rs2, (rs1)
00001	aqrl	rs2	rs1	011	rd	0101111	AMOSWAP.D rd, rs2, (rs1)
00000	aqrl	rs2	rs1	011	rd	0101111	AMOADD.D rd, rs2, (rs1)
00100	aqrl	rs2	rs1	011	rd	0101111	AMOXOR.D rd, rs2, (rs1)
01000	aqrl	rs2	rs1	011	rd	0101111	AMOOR.D rd, rs2, (rs1)
01100	aqrl	rs2	rs1	011	rd	0101111	AMOAND.D rd, rs2, (rs1)
10000	aqrl	rs2	rs1	011	rd	0101111	AMOMIN.D rd, rs2, (rs1)
10100	aqrl	rs2	rs1	011	rd	0101111	AMOMAX.D rd, rs2, (rs1)
11000	aqrl	rs2	rs1	011	rd	0101111	AMOMINU.D rd, rs2, (rs1)
11100	aqrl	rs2	rs1	011	rd	0101111	AMOMAXU.D rd, rs2, (rs1)

RV32S Standard Extension for Supervisor-level Instructions

[illegible]

RV32F Standard Extension for Single-Precision Floating-Point

imm		rs1	010	rd	0000111	FLW frd, imm(rs1)
imm		rs2	rs1	010	imm	FSW frs2, imm(rs1)
rs3	00	rs2	rs1	rm	rd	FMADD.S frd, frs1, frs2, frs3
rs3	00	rs2	rs1	rm	rd	FMSUB.S frd, frs1, frs2, frs3

rs3	00	rs2	rs1	rm	rd	1001011	FNMSUB.S frd, frs1, frs2, frs3
rs3	00	rs2	rs1	rm	rd	1001111	FNMADD.S frd, frs1, frs2, frs3
0000000		rs2	rs1	rm	rd	1010011	FADD.S frd, frs1, frs2
0000100		rs2	rs1	rm	rd	1010011	FSUB.S frd, frs1, frs2
0001000		rs2	rs1	rm	rd	1010011	FMUL.S frd, frs1, frs2
0001100		rs2	rs1	rm	rd	1010011	FDIV.S frd, frs1, frs2
0010000		rs2	rs1	000	rd	1010011	FSGNJ.S frd, frs1, frs2
0010000		rs2	rs1	001	rd	1010011	FSGNJN.S frd, frs1, frs2
0010000		rs2	rs1	010	rd	1010011	FSGNJX.S frd, frs1, frs2
0010100		rs2	rs1	000	rd	1010011	FMIN.S frd, frs1, frs2
0010100		rs2	rs1	001	rd	1010011	FMAX.S frd, frs1, frs2
010110000000			rs1	rm	rd	1010011	FSQRT.S frd, frs1, frs2
1010000		rs2	rs1	000	rd	1010011	FLE.S frd, rs1, frs2
1010000		rs2	rs1	001	rd	1010011	FLT.S frd, rs1, frs2
1010000		rs2	rs1	010	rd	1010011	FEQ.S frd, rs1, frs2
110000000000			rs1	rm	rd	1010011	FCVT.W.S rd, frs1
110000000001			rs1	rm	rd	1010011	FCVT.W.U.S rd, frs1
110100000000			rs1	rm	rd	1010011	FCVT.S.W frd, rs1
110100000001			rs1	rm	rd	1010011	FCVT.S.WU frd, rs1
111000000000			rs1	000	rd	1010011	FMV.X.S rd, frs1
111000000000			rs1	001	rd	1010011	FCLASS.S rd, frs1
111100000000			rs1	000	rd	1010011	FMV.S.X frd, rs1
00000000001100000010					rd	1110011	FRCSR rd, csr, rs1
00000000001000000010					rd	1110011	FRRM rd, csr, rs1
00000000000100000010					rd	1110011	FRFLAGS rd, csr, rs1
0000000000011		rs1	001	rd	rd	1110011	FSCSR rd, csr, rs1
0000000000010		rs1	001	rd	rd	1110011	FSRM rd, csr, rs1
0000000000001		rs1	001	rd	rd	1110011	FSFLAGS rd, csr, rs1
0000000000010		imm	101	rd	rd	1110011	FSRMI rd, csr, irs1
0000000000001		imm	101	rd	rd	1110011	FSFLAGSI rd, csr, irs1

RV64F Standard Extension for Single-Precision Floating-Point (in addition to RV32F)

1100000000010	rs1	rm	rd	1010011	FCVT.L.S rd, frs1
1100000000011	rs1	rm	rd	1010011	FCVT.LU.S rd, frs1
1101000000010	rs1	rm	rd	1010011	FCVT.S.L frd, rs1
1101000000011	rs1	rm	rd	1010011	FCVT.S.LU frd, rs1

RV32D Standard Extension for Double-Precision Floating-Point

imm			rs1	011	rd	0000111	FLD frd, imm(rs1)
imm		rs2	rs1	011	imm	0100111	FSD frs2, imm(rs1)
rs3	01	rs2	rs1	rm	rd	1000011	FMADD.D frd, frs1, frs2, frs3
rs3	01	rs2	rs1	rm	rd	1000111	FMSUB.D frd, frs1, frs2, frs3
rs3	01	rs2	rs1	rm	rd	1001011	FNMSUB.D frd, frs1, frs2, frs3
rs3	01	rs2	rs1	rm	rd	1001111	FNMADD.D frd, frs1, frs2, frs3
0000001		rs2	rs1	rm	rd	1010011	FADD.D frd, frs1, frs2
0000101		rs2	rs1	rm	rd	1010011	FSUB.D frd, frs1, frs2
0001001		rs2	rs1	rm	rd	1010011	FMUL.D frd, frs1, frs2
0001101		rs2	rs1	rm	rd	1010011	FDIV.D frd, frs1, frs2
0010001		rs2	rs1	000	rd	1010011	FSGNJ.D frd, frs1, frs2
0010001		rs2	rs1	001	rd	1010011	FSGNJN.D frd, frs1, frs2
0010001		rs2	rs1	010	rd	1010011	FSGNJX.D frd, frs1, frs2
0010101		rs2	rs1	000	rd	1010011	FMIN.D frd, frs1, frs2
0010101		rs2	rs1	001	rd	1010011	FMAX.D frd, frs1, frs2
010000000001			rs1	rm	rd	1010011	FCVT.S.D frd, frs1
010000100000			rs1	rm	rd	1010011	FCVT.D.S frd, frs1
010110100000			rs1	rm	rd	1010011	FSQRT.D frd, frs1
1010001		rs2	rs1	000	rd	1010011	FLE.D frd, rs1, frs2
1010001		rs2	rs1	001	rd	1010011	FLT.D frd, rs1, frs2
1010001		rs2	rs1	010	rd	1010011	FEQ.D frd, rs1, frs2
110000100000			rs1	rm	rd	1010011	FCVT.W.D rd, frs1
110000100001			rs1	rm	rd	1010011	FCVT.W.U.D rd, frs1
110100100000			rs1	rm	rd	1010011	FCVT.D.W frd, rs1
110100100001			rs1	rm	rd	1010011	FCVT.D.WU frd, rs1
111000100000			rs1	000	rd	1010011	FMV.X.D rd, frs1

111000100000	rs1	001	rd	1010011	FCLASS.D rd, frs1
111100100000	rs1	000	rd	1010011	FMV.D.X frd, rs1

RV64D Standard Extension for Double-Precision Floating-Point (in addition to RV32D)

110000100010	rs1	rm	rd	1010011	FCVT.L.D rd, frs1
110000100011	rs1	rm	rd	1010011	FCVT.LU.D rd, frs1
110100100010	rs1	rm	rd	1010011	FCVT.D.L frd, rs1
110100100011	rs1	rm	rd	1010011	FCVT.D.LU frd, rs1

RV32C Standard Extension for Compressed Instructions

0000000000000000	000	imm			rd'	00	C.ADDI4SPN rd, rs1, imm
0000000000000000	001	imm	rs1'	imm	rd'	00	C.FLD frd, imm(rs1)
0000000000000000	010	imm	rs1'	imm	rd'	00	C.LW rd, imm(rs1)
0000000000000000	011	imm	rs1'	imm	rd'	00	C.FLW frd, imm(rs1)
0000000000000000	101	imm	rs1'	imm	rs2'	00	C.FSD frs2, imm(rs1)
0000000000000000	110	imm	rs1'	imm	rs2'	00	C.SW rs2, imm(rs1)
0000000000000000	111	imm	rs1'	imm	rs2'	00	C.FSW frs2, imm(rs1)
0000000000000000	0000000000000001						C.NOP
0000000000000000	000	imm	rs1/rd	imm		01	C.ADDI rd, imm
0000000000000000	001	imm				01	C.JAL ipc
0000000000000000	010	imm	rs1/rd	imm		01	C.LI rd, imm
0000000000000000	011	imm	rd	imm		01	C.LUI rd, imm
0000000000000000	011	imm	rs1/rd	imm		01	C.ADDI16SP rd, rs1, imm
0000000000000000	100	imm	imm	rs1'/rd'	imm	rs2'	C.SRLI ipc
0000000000000000	100	imm	imm	rs1'/rd'	imm	rs2'	C.SRAI ipc
0000000000000000	100	imm	imm	rs1'/rd'	imm	rs2'	C.ANDI ipc
0000000000000000	100011		rs1'/rd'	00	rs2'	01	C.SUB rs1, rs2
0000000000000000	100011		rs1'/rd'	01	rs2'	01	C.XOR rs1, rs2
0000000000000000	100011		rs1'/rd'	10	rs2'	01	C.OR rs1, rs2
0000000000000000	100011		rs1'/rd'	11	rs2'	01	C.AND rs1, rs2
0000000000000000	100111		rs1'/rd'	00	rs2'	01	C.SUBW rs1, rs2
0000000000000000	100111		rs1'/rd'	01	rs2'	01	C.ADDW rs1, rs2
0000000000000000	101	imm				01	C.J ipc
0000000000000000	110	imm	rs1'	imm		01	C.BEQZ ipc
0000000000000000	111	imm	rs1'	imm		01	C.BNEZ ipc
0000000000000000	000	imm	rd	imm		10	C.SLLI rd, imm
0000000000000000	001	imm	rd	imm		10	C.FLDSP frd, imm(rs1)
0000000000000000	010	imm	rd	imm		10	C.LWSP rd, imm
0000000000000000	011	imm	rd	imm		10	C.FLWSP frd, imm(rs1)
0000000000000000	1000		rs1	0000010			C.JR rs1, rs2
0000000000000000	1000		rd	rs2		10	C.MV rs1, rs2
0000000000000000	1001000000000010						C.EBREAK
0000000000000000	1001		rs1	0000010			C.JALR rs1, rs2
0000000000000000	1001		rd	rs2		10	C.ADD rs1, rs2
0000000000000000	101	imm			rs2	10	C.FSDSP frs2, imm(rs1)
0000000000000000	110	imm			rs2	10	C.SWSP rs2, imm(rs1)
0000000000000000	111	imm			rs2	10	C.FSWSP frs2, imm(rs1)

RV64C Standard Extension for Compressed Instructions (in addition to RV32C)

0000000000000000	011	imm	rs1'	imm	rd'	00	C.LD rd, imm(rs1)
0000000000000000	111	imm	rs1'	imm	rs2'	00	C.SD rs2, imm(rs1)
0000000000000000	001	imm	rs1/rd	imm		01	C.ADDIW rd, imm
0000000000000000	011	imm	rs1/rd	imm		10	C.LDSP rd, imm(rs1)
0000000000000000	111	imm			rs2	10	C.SDSP rs2, imm(rs1)