R32V2020 Programmer's Reference Card
2019-06-12

Category	Name	Format	Syntax
System	No Operation	NO_ARGS	nop
	Halt and Catch Fire		hcf
Arithmetic	Add	BIN_DEST	add rd,rs2,rs1
	Multiply	BIN_DEST	mul rd,rs2,rs1
Logical	OR	BIN_DEST	or rd,rs2,rs1
	AND	BIN_DEST	and rd,rs2,rs1
	XOR	BIN_DEST	xor rd,rs2,rs1
Shift	Shift left by 1	UN_DEST	sl1 rd,rs1
	Shift left by 8	UN_DEST	sl8 rd,rs8
	Shift right by 1	UN_DEST	sr1 rd,rs1
	Shift right by 8	UN_DEST	sr8 rd,rs8
	Rotate left by 1	UN_DEST	rol1 rd,rs1
	Rotate right by 1	UN_DEST	ror1 rd,rs1
	Arithmetic Shift right by 1	UN_DEST	asr rd,rs1
Compare	Compare	BIN_CMP	cmp rs2,rs1
Swap	Swap Endian	UN_DEST	ens rd,rs1
Immediate	Load immediate lower	IMM_DEST	lil rd,imm
	Load immediate upper	IMM_DEST	liu rd,imm
	Load immediate extended	IMM_DEST	lix rd,imm
Load/Stores Data	Load Data Byte	R6_DEST	ldb rd
	Load Data Short	R6_DEST	lds rd
	Load Data Long	R6_DEST	ldl rd
	Store Data Byte	UN_R6_DEST	sdb rs1
	Store Data Short	UN_R6_DEST	sds rs1
	Store Data Long	UN_R6_DEST	sdl rs1
Load/Stores Peripheral	Load Peripheral Byte	R5_DEST	lpb rd
	Load Peripheral Short	R5_DEST	lps rd
	Load Peripheral Long	R5_DEST	lpl rd
	Store Peripheral Byte	UN_R5_DEST	spb rs1
	Store Peripheral Short	UN_R5_DEST	sps rs1
	Store Peripheral Long	UN_R5_DEST	spl rs1
Stack	Push to stack	UN_R4_DEST	pss rs1
	Pull from stack	R5_DEST	pus rd
	Store to stack	UN_R4_DEST	sss rs1
	Load from stack	R5_DEST	lss rd

Branches	Branch Always	ADDR	bra addr
	Branch if equal to zero (ALU)	ADDR	bez addr
	Branch if equal to one (ALU)	ADDR	be1 addr
	Branch if not zero (ALU)	ADDR	bnz addr
	Branch if carry clear (ALU)	ADDR	bcc addr
	Branch if carry set (ALU)	ADDR	bcs addr
	Branch if less than (cmp)	ADDR	blt addr
	Branch if greater than (cmp)	ADDR	bgt addr
	Branch if equal (cmp)	ADDR	beq addr
	Branch if not equal (cmp)	ADDR	bne addr
	Branch to subroutine	ADDR	bsr addr

Instruction Format

Format	**D31..D24**	**D23..D20**	**D19..D16**	**D15..D12**	**D11..D00**
ADDR	OPCODE	Sign-Extended Offset (24-bits) *			
BIN_CMP	OPCODE	X	rs2	rs1	X
BIN_DEST	OPCODE	X	rs2	rs1	X
IMM_DEST	OPCODE	rd	Signed-Extended Immed (20-bits) **		
NO_ARGS	OPCODE	X	X	X	X
R4_DEST	OPCODE	rd	X	(r4)	X
R5_DEST	OPCODE	rd	X	(r5)	X
R6_DEST	OPCODE	rd	X	(r6)	X
R7_DEST	OPCODE	rd	X	(r7)	X
UN_DEST	OPCODE	rd	X	rs1	X
UN_R4_DEST	OPCODE	(r4)	X	rs1	X
UN_R5_DEST	OPCODE	(r5)	X	rs1	X
UN_R6_DEST	OPCODE	(r6)	X	rs1	X

* 24-bit range = -8,388,608 to 8,388,607
** 20-bit range = -524,288 to 524,287
(rN) = register as pointer to address space

Register Aliases

r0 = ZERO (0x00000000)	r4 = SAR (Stack Pointer)
r1 = ONE (0x00000001)	r5 = PAR (Peripheral Pointer)
r2 = MINUS 1 (0xFFFFFFFF)	r6 = DAR (Data Pointer)
r3 = Condition Code Register	R7 = PX (Program Counter)

r8-r15 = General Purpose Registers