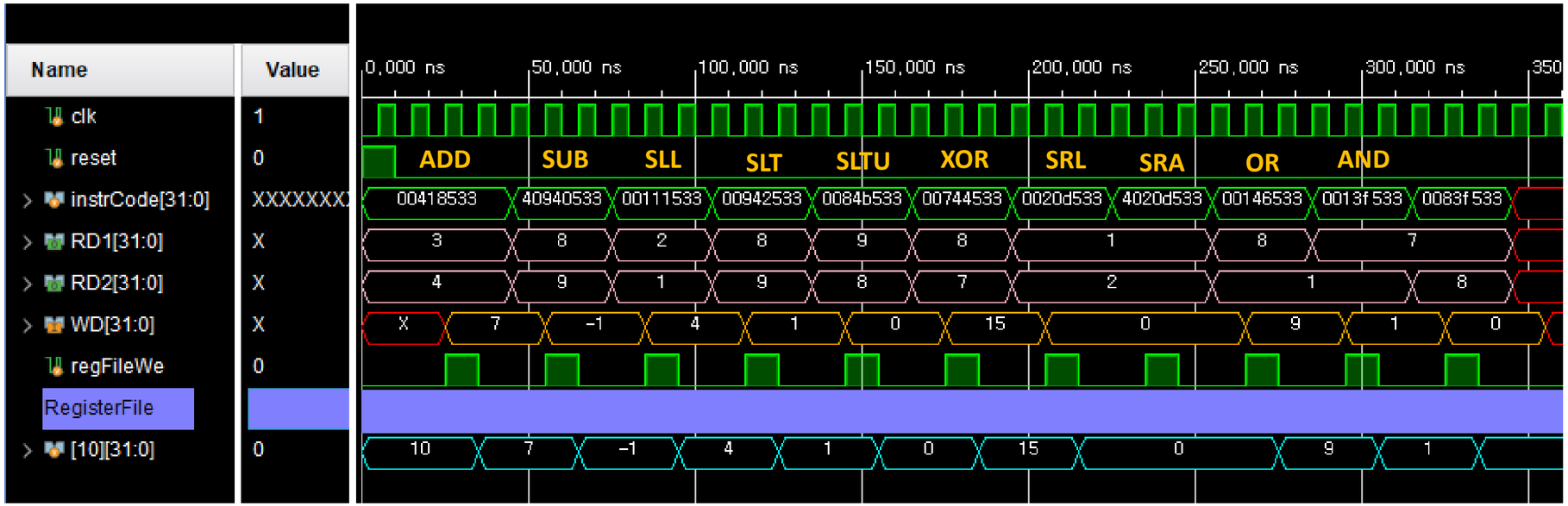
02. RV32I Multi Cycle CPU 명령어별 동작

1. R-type



TYPE	ASSEMBLY	RESULT	ASSEMBLY	RESULT
R-type	add x10, x3, x4	3 + 4 = 7	xor x10, x8, x7	1000 ^ 0111 = 1111 -> 15
	sub x10, x8, x9	8 – 9 = -1	srl x10, x1, x2	0001 >> 2 = 0000 -> 0
	sll x10, x2, x1	0010 << 1 = 0100 -> 4	sra x10, x1, x2	0001 >> 2 = 0000 -> 0
	slt x10, x8, x9	8 < 9 -> 1(참)	or x10, x8, x1	1000 ¦ 0001 = 1001 -> 9
	sltu x10, x9, x8	9 < 8 -> 0(거짓)	and x10, x7, x1	0111 & 0001 = 0001 -> 1

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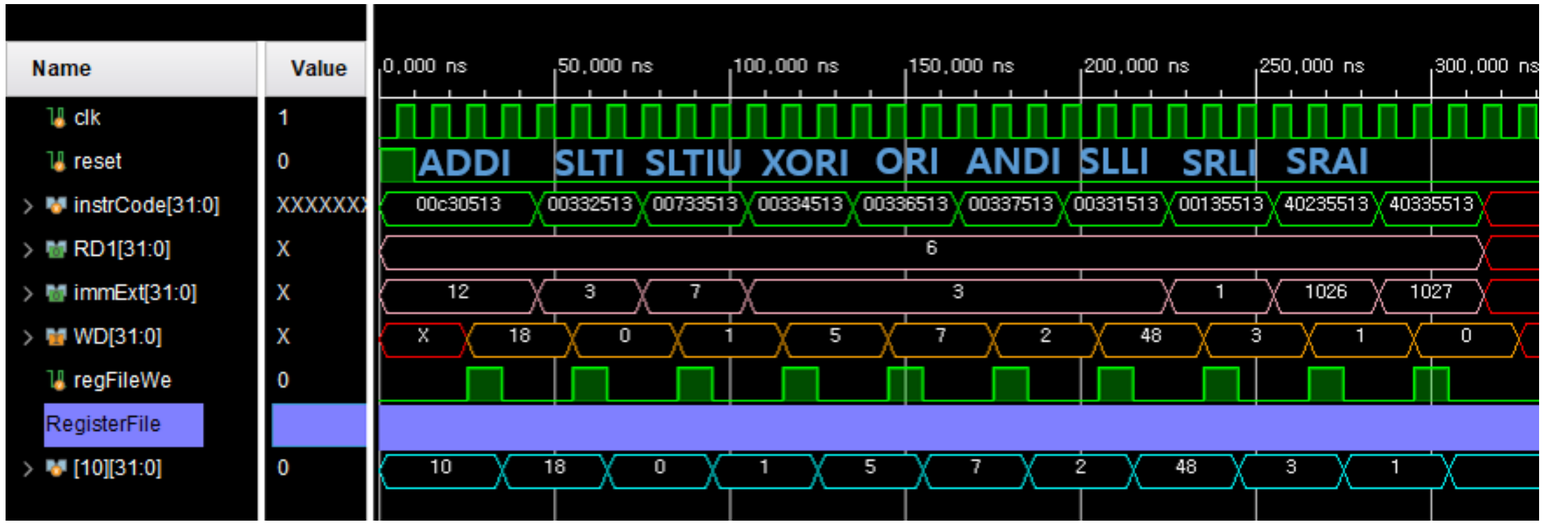
2. I-type



TYPE	ASSEMBLY	RESULT	ASSEMBLY	RESULT
I-type	addi x10, x6, 12	6 + 12 = 18	andi x10, x6, 3	0110 & 0011 = 0010 -> 2
	slti x10, x6, 3	6 < 3 -> 0(거짓)	slli x10, x6, 3	0110 << 3 = 11_0000 -> 48
	sltiu x10, x6, 7	6 < 7 -> 1(참)	srli x10, x6, 1	0110 >> 1 = 0011 -> 3
	xori x10, x6, 3	0110 ^ 0011 = 0101 -> 5	srai x10, x6, 2	0110 >> 2 = 0001 -> 1
	ori x10, x6, 3	0110 ¦ 0011 = 0111 -> 7		

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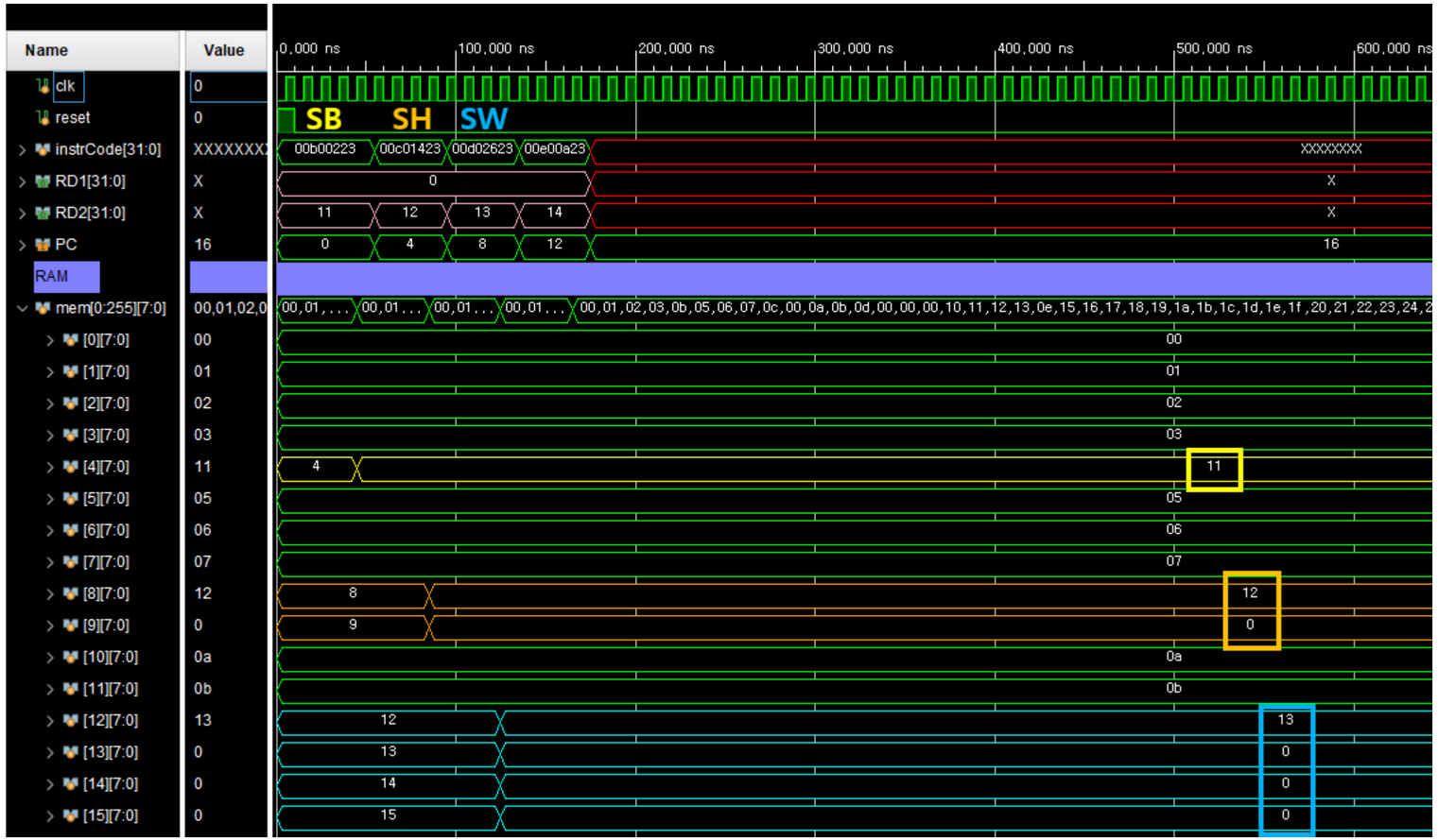
3. S-type



TYPE	ASSEMBLY
S-type	sb x11, 4(x0)
	sh x12, 8(x0)
	sw x13, 12(x0)

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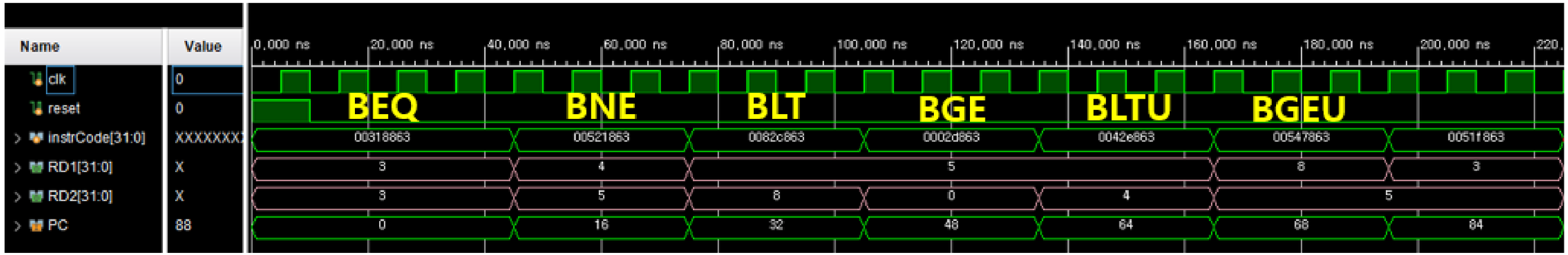
4. B-type



TYPE	ASSEMBLY	RESULT
B-type	beq x3, x3 16	3 = 3 -> (참) 0 ~ 16 JUMP
	bne x4, x5, 16	4 ~= 5 -> (참) 16 ~ 32 JUMP
	blt x5, x8, 16	5 < 8 -> (참) 32 ~ 48 JUMP
	bge x5, x0, 16	5 > 0 -> (참) 48 ~ 64 JUMP
	bltu x5, x4, 16	5 < 4 -> (거짓) 64 ~ 68 JUMP(x)
	bgeu x8, x5 16	8 > 5 -> (참) 68 ~ 84 JUMP

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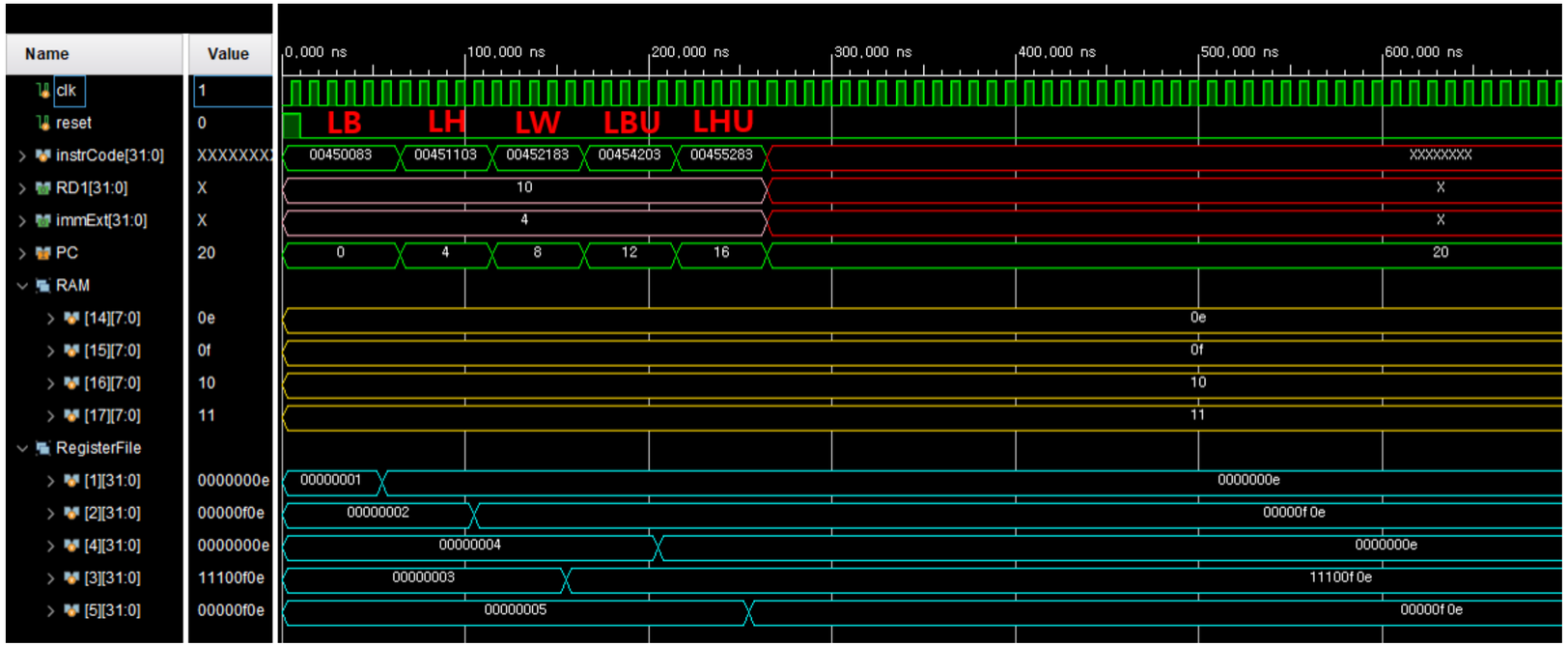
5. L-type



TYPE	ASSEMBLY
L-type	lb x1, 4(x10)
	lh x2, 4(x10)
	lw x3, 4(x10)
	lbu x4, 4(x10)
	lhu x5, 4(x10)

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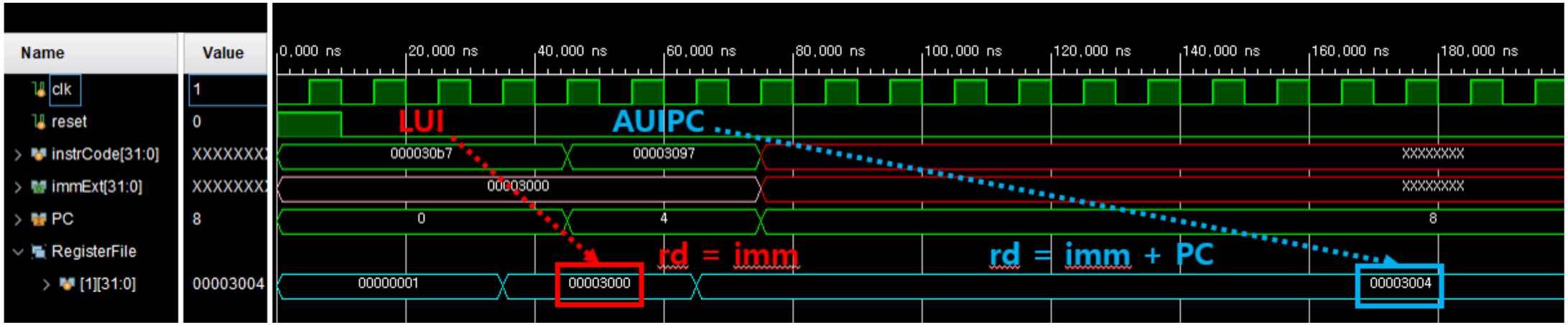
6. U-type



TYPE	ASSEMBLY	RESULT
U-type	lui x1, 3	rd = 3000
	auipc x1, 3	rd = 3000 + 4

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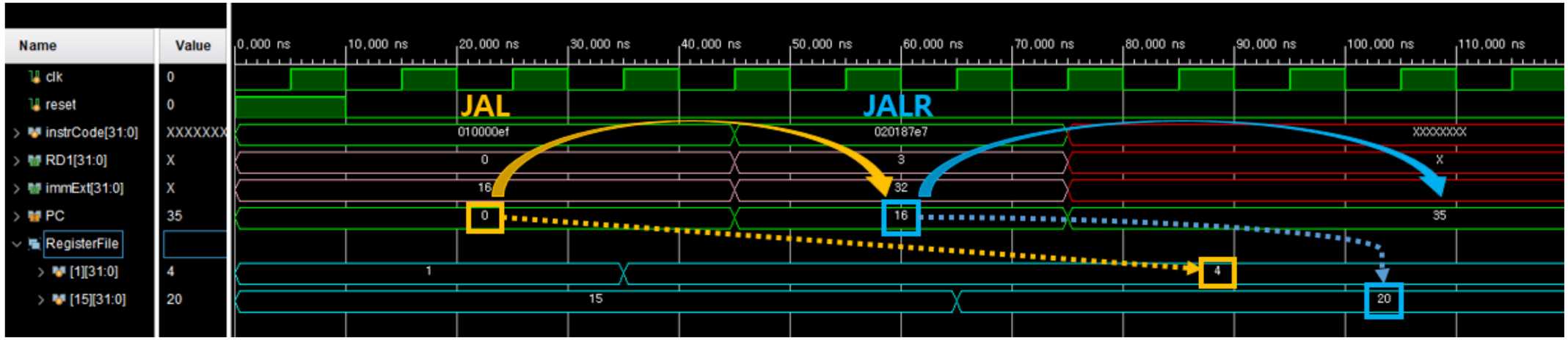
7. J-type



TYPE	ASSEMBLY	DESCRIPT
J-type	jal x1, 16	rd = 0 + 4; PC = 0 ~ 16 JUMP
	jalr x15, 32(x3)	rd = 16 + 4; PC = 16 ~ 36 JUMP