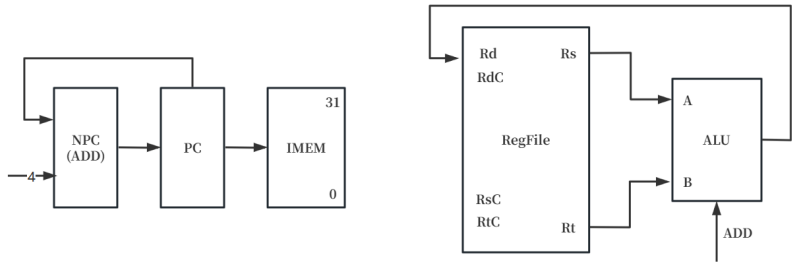


R型指令

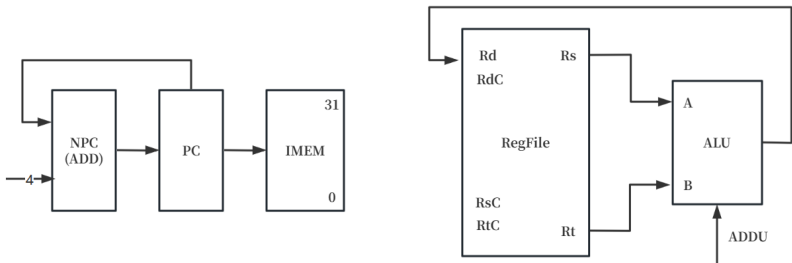
1.ADD



PC → IMEM
PC + 4 → NPC
NPC → PC

Rs → A , Rt → B
(A + B → RES)
RES → Rd

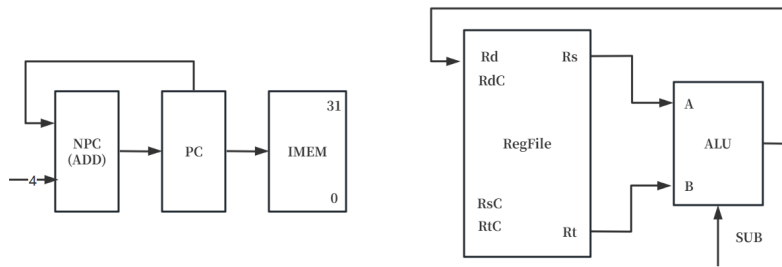
2.ADDU



PC → IMEM
PC + 4 → NPC
NPC → PC

Rs → A , Rt → B
(A + B → RES)
RES → Rd

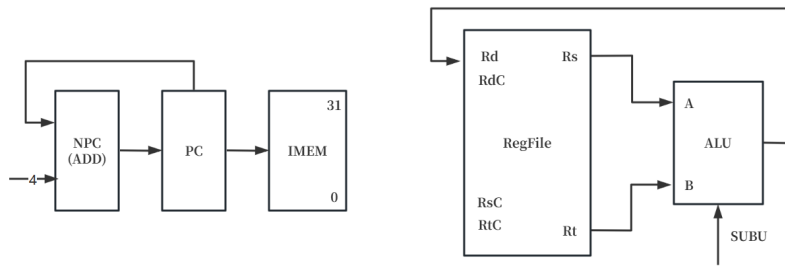
3.SUB



PC → IMEM
 PC + 4 → NPC
 NPC → PC

Rs → A , Rt → B
 (A - B → RES)
 RES → Rd

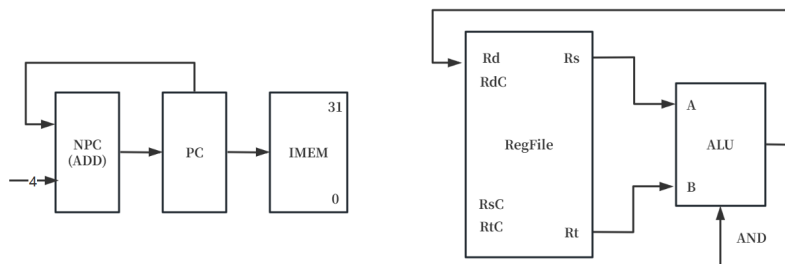
4. SUBU



PC → IMEM
 PC + 4 → NPC
 NPC → PC

Rs → A , Rt → B
 (A - B → RES)
 RES → Rd

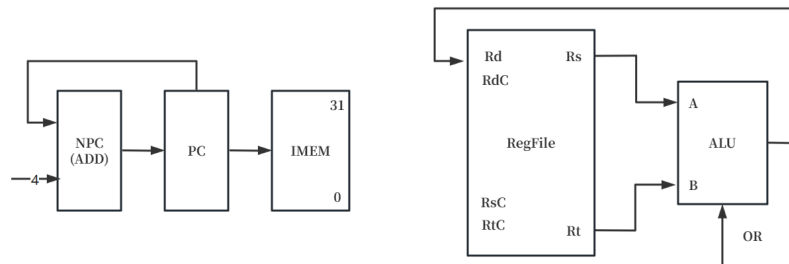
5. AND



PC \rightarrow IMEM
PC + 4 \rightarrow NPC
NPC \rightarrow PC

Rs \rightarrow A , Rt \rightarrow B
(A & B \rightarrow RES)
RES \rightarrow Rd

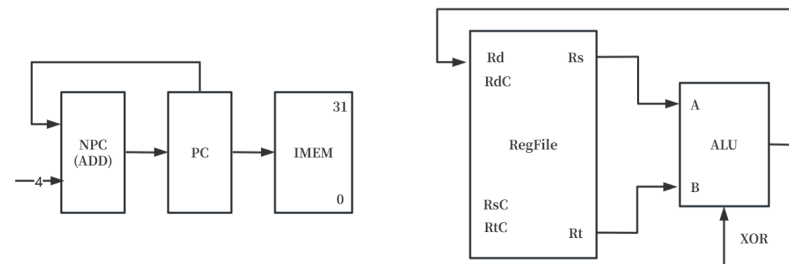
6.OR



PC \rightarrow IMEM
PC + 4 \rightarrow NPC
NPC \rightarrow PC

Rs \rightarrow A , Rt \rightarrow B
(A | B \rightarrow RES)
RES \rightarrow Rd

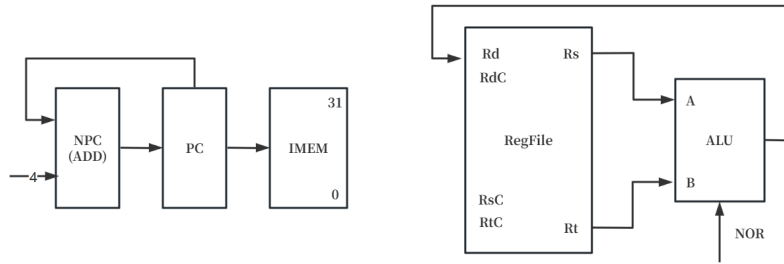
7.XOR



PC \rightarrow IMEM
PC + 4 \rightarrow NPC
NPC \rightarrow PC

Rs \rightarrow A , Rt \rightarrow B
(A \oplus B \rightarrow RES)
RES \rightarrow Rd

8. NOR



PC → IMEM

PC + 4 → NPC

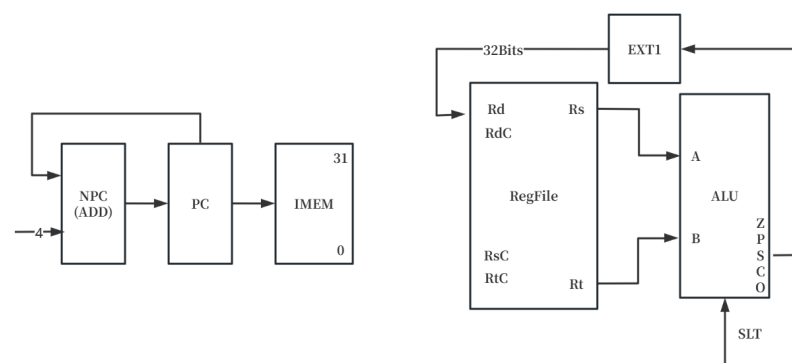
NPC → PC

Rs → A , Rt → B

(A ○ B → RES)

RES → Rd

9. SLT



PC → IMEM

PC + 4 → NPC

NPC → PC

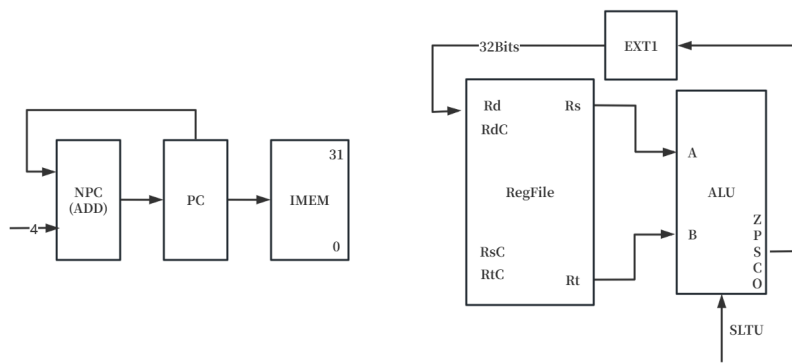
Rs → A , Rt → B

(A - B → RES) //相减判断, 负数则为Rs中数小

SF → EXT1 //注意要做扩展

EXT1_OUT → Rd

10. SLTU



PC \rightarrow IMEM

PC + 4 \rightarrow NPC

NPC \rightarrow PC

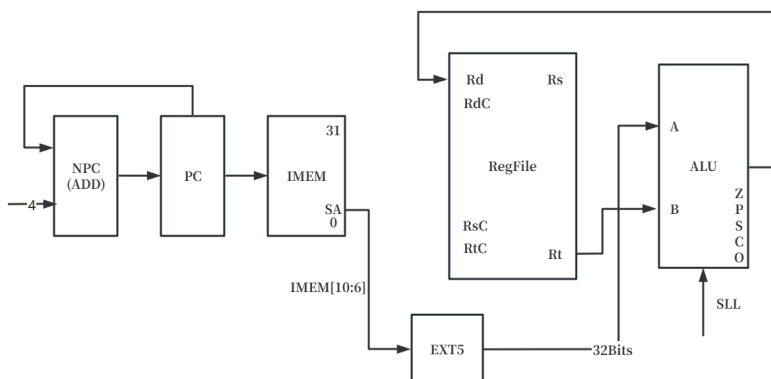
Rs \rightarrow A , Rt \rightarrow B

(A - B \rightarrow RES) //相减判断, 负数则为Rs中数小

SF \rightarrow EXT1 //注意要做扩展

EXT1_OUT \rightarrow Rd

11.SLL



PC \rightarrow IMEM

PC + 4 \rightarrow NPC

NPC \rightarrow PC

IMEM[10:6] \rightarrow EXT5

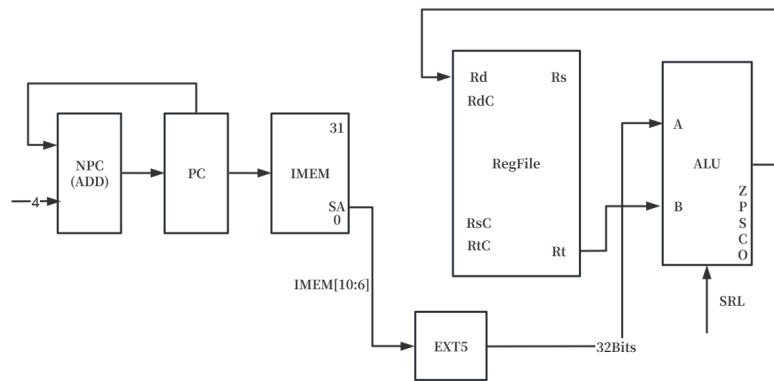
EXT5_OUT \rightarrow A

Rt \rightarrow B

(B << A \rightarrow RES)

RES \rightarrow Rd

12.SRL

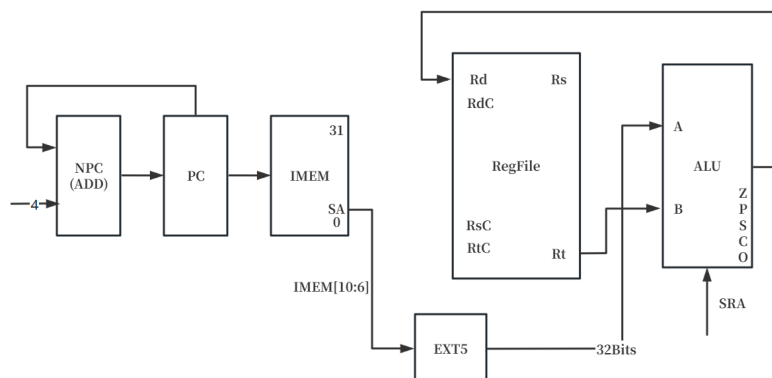


PC \rightarrow IMEM
 PC + 4 \rightarrow NPC
 NPC \rightarrow PC

IMEM[10:6] \rightarrow EXT5
 EXT5_OUT \rightarrow A

Rt \rightarrow B
 (B >> A \rightarrow RES)
 RES \rightarrow Rd

13. SRA

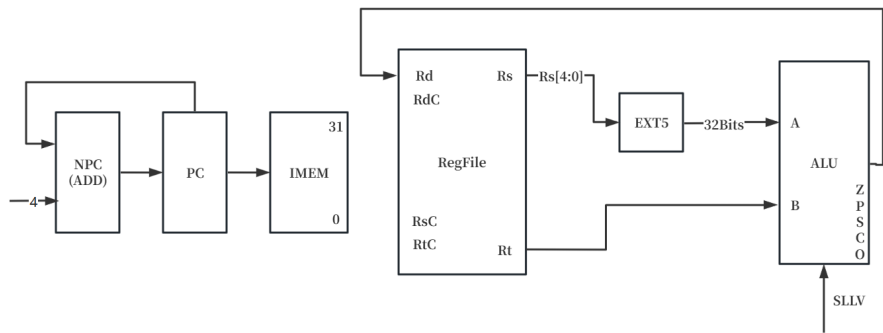


PC \rightarrow IMEM
 PC + 4 \rightarrow NPC
 NPC \rightarrow PC

IMEM[10:6] \rightarrow EXT5
 EXT5_OUT \rightarrow A

Rt \rightarrow B
 (B >> A \rightarrow RES)
 RES \rightarrow Rd

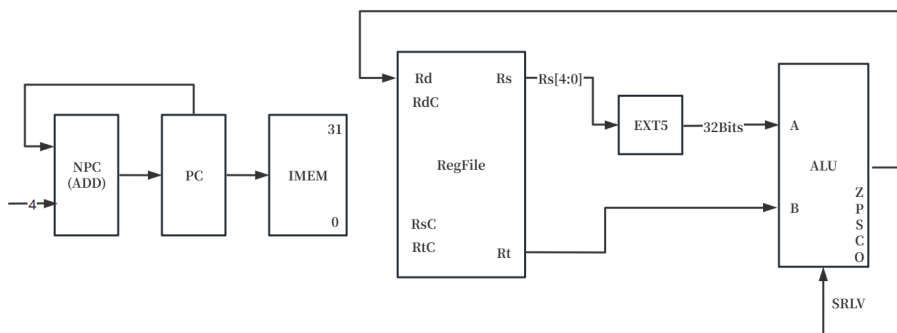
14. SLLV



PC \rightarrow IMEM
 PC + 4 \rightarrow NPC
 NPC \rightarrow PC

Rs[4:0] \rightarrow EXT5
 EXT5_OUT \rightarrow A
 Rt \rightarrow B
 (B << A \rightarrow RES)
 RES \rightarrow Rd

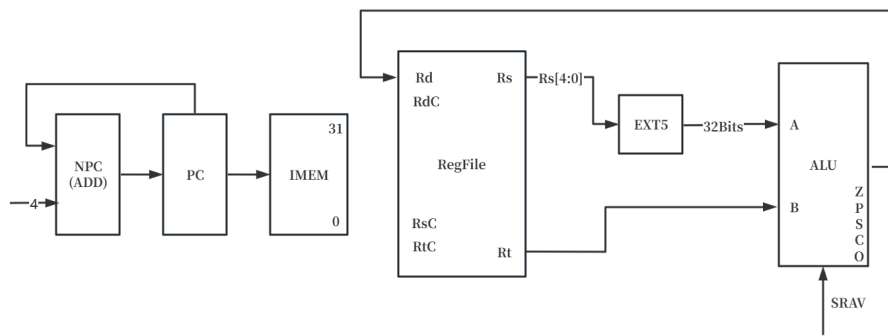
15. SRLV



PC \rightarrow IMEM
 PC + 4 \rightarrow NPC
 NPC \rightarrow PC

Rs[4:0] \rightarrow EXT5
 EXT5_OUT \rightarrow A
 Rt \rightarrow B
 (B >> A \rightarrow RES)
 RES \rightarrow Rd

16. SRAV



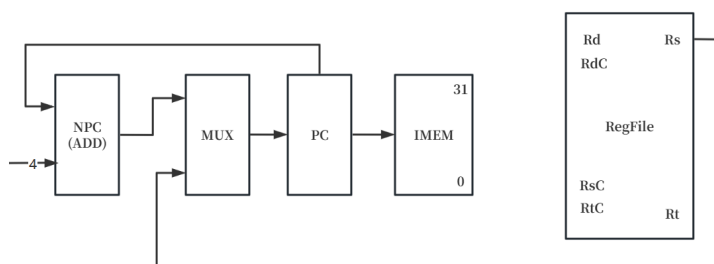
```

PC → IMEM
PC + 4 → NPC
NPC → PC

Rs[4:0] → EXT5
EXT5_OUT → A
Rt → B
(B>>A → RES)
RES → Rd

```

17. JR



```

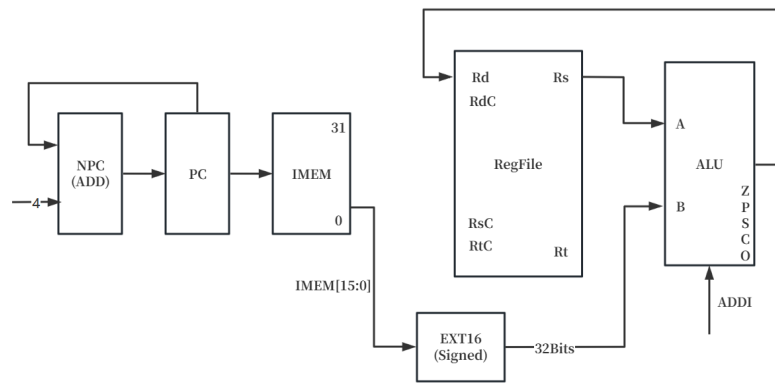
PC → IMEM
PC + 4 → NPC    //无关指令
Rs → MUX
MUX_OUT → PC

NPC → MUX       //无关指令

```

I型指令

18. ADDI



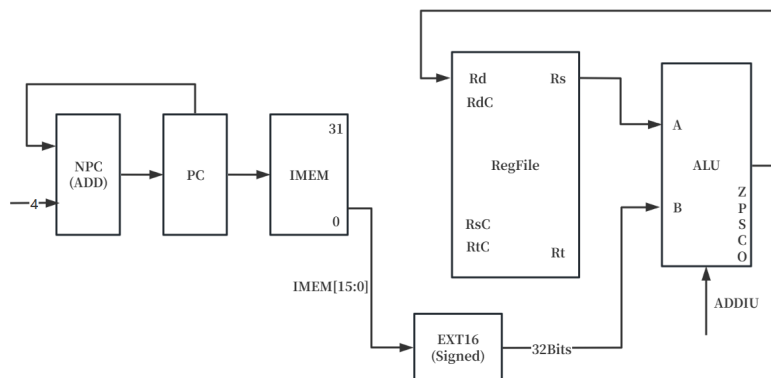
```

PC → IMEM
PC + 4 → NPC
NPC → PC

IMEM[15:0] → EXT16
EXT16_OUT → B
Rs → A
(A + B → RES)
RES → Rd

```

19.ADDIU



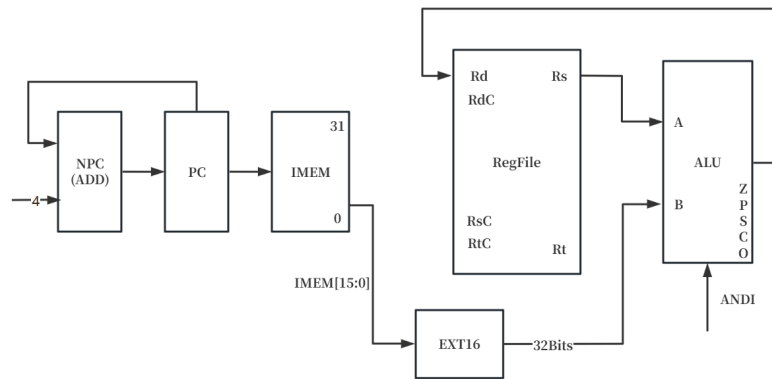
```

PC → IMEM
PC + 4 → NPC
NPC → PC

IMEM[15:0] → EXT16
EXT16_OUT → B
Rs → A
(A + B → RES)
RES → Rd

```

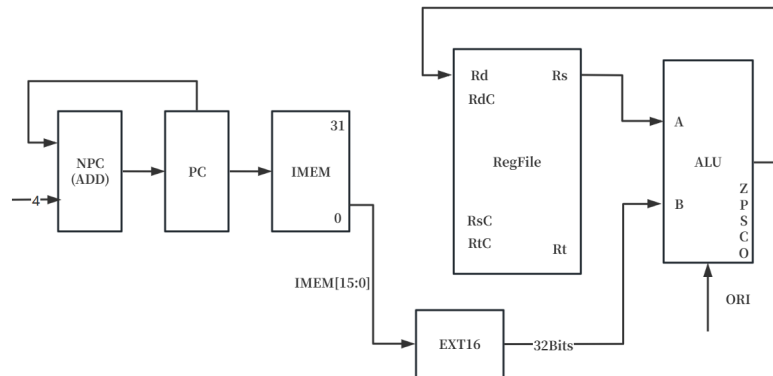
20.ANDI



```
PC → IMEM
PC + 4 → NPC
NPC → PC

IMEM[15:0] → EXT16
EXT16_OUT → B
Rs → A
(A & B → RES)
RES → Rd
```

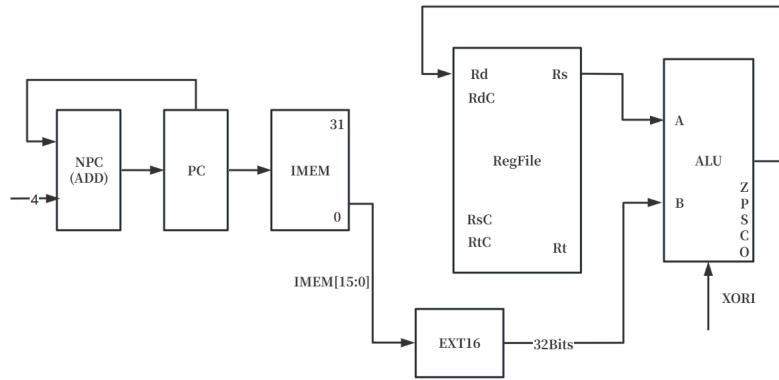
21.ORI



```
PC → IMEM
PC + 4 → NPC
NPC → PC

IMEM[15:0] → EXT16
EXT16_OUT → B
Rs → A
(A | B → RES)
RES → Rd
```

22.XORI

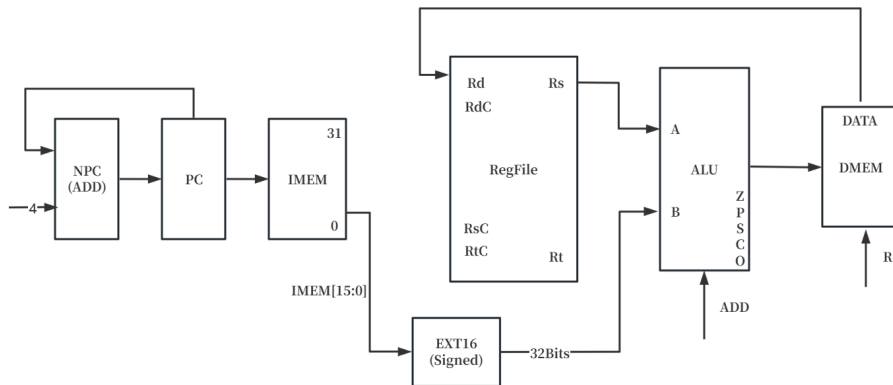


```

PC → IMEM
PC + 4 → NPC
NPC → PC

IMEM[15:0] → EXT16
EXT16_OUT → B
Rs → A
(A ⊕ B → RES)
RES → Rd
    
```

23.LW

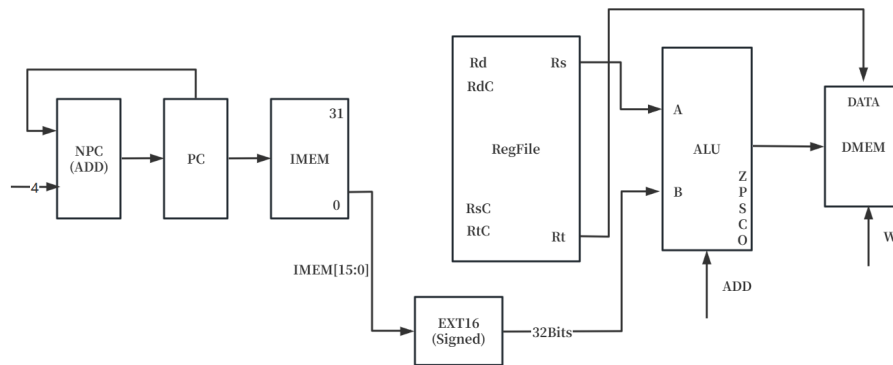


```

PC → IMEM
PC + 4 → NPC
NPC → PC

IMEM[15:0] → EXT16
EXT16_OUT → B
Rs → A
(A + B → RES)
RES → DMEM_ADDR
DMEM_OUT → Rd
    
```

24. SW



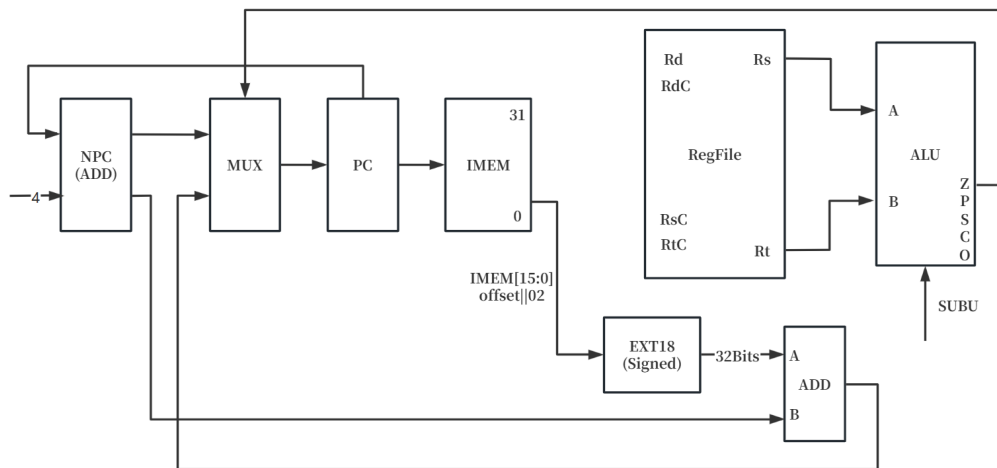
```

PC → IMEM
PC + 4 → NPC
NPC → PC

IMEM[15:0] → EXT16
EXT16_OUT → B
Rs → A
(A + B → RES)
Rt → DMEM
RES → DMEM_ADDR

```

25. BEQ



```

PC → IMEM
PC + 4 → NPC
NPC → MUX

IMEM[15:0] || 02 → EXT18
EXT18_OUT → ADD_A
NPC → ADD_B
(ADD_A + ADD_B → ADD_OUT)
ADD_OUT → MUX

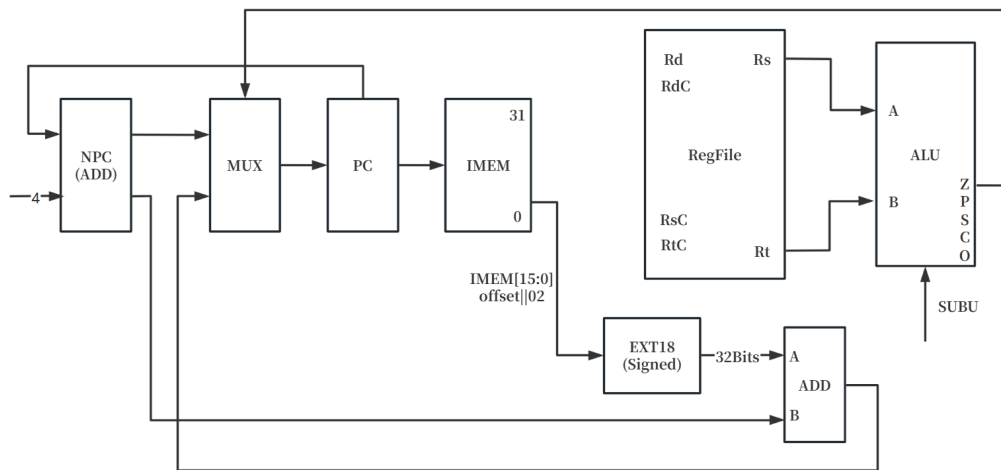
Rs → A
Rt → B
(A + B → RES)

```

Z → MUX

MUX → PC

26. BNE



PC → IMEM

PC + 4 → NPC

NPC → MUX

IMEM[15:0] || 02 → EXT18

EXT18_OUT → ADD_A

NPC → ADD_B

(ADD_A + ADD_B → ADD_OUT)

ADD_OUT → MUX

Rs → A

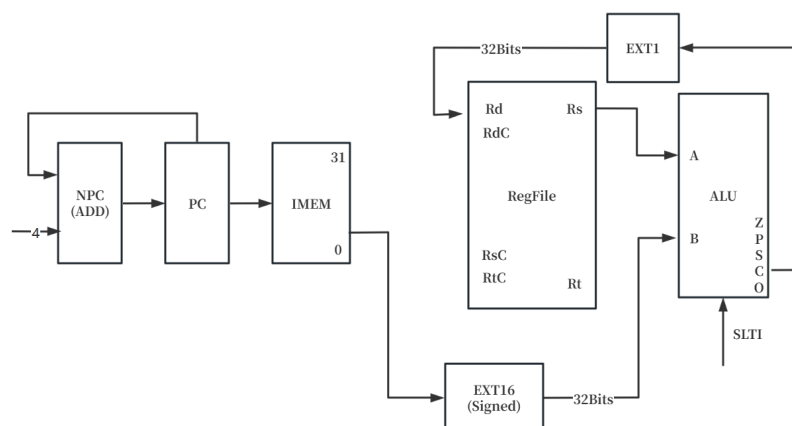
Rt → B

(A + B → RES)

Z → MUX

MUX → PC

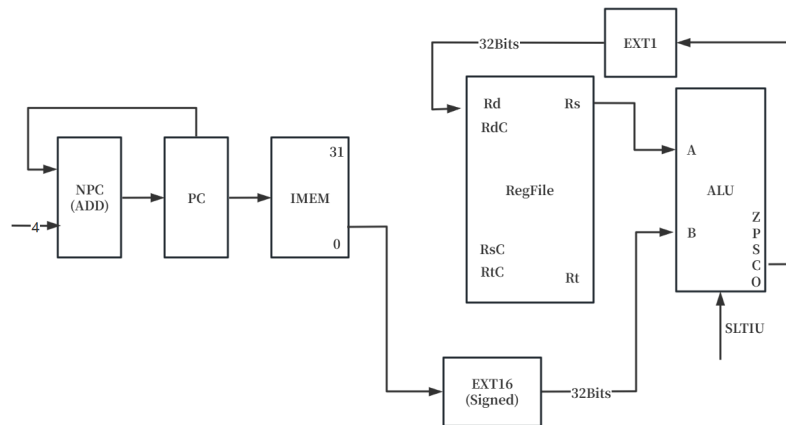
27. SLTI



PC → IMEM
PC + 4 → NPC
NPC → PC

IMEM[15:0] → EXT16
EXT16_OUT → B
Rs → A
(A - B → RES)
CF → EXT1
EXT1_OUT → Rd

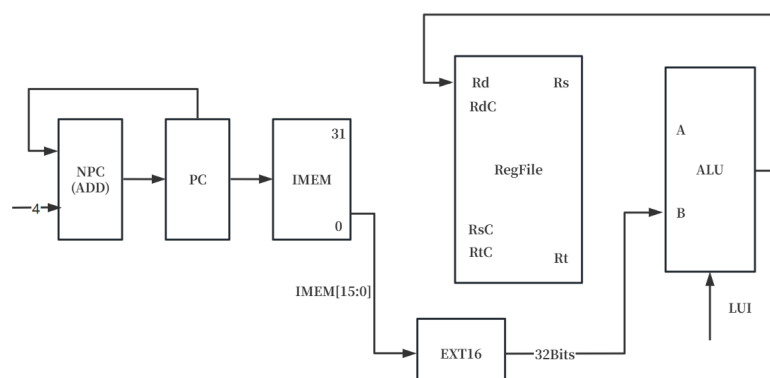
28. SLTIU



PC → IMEM
PC + 4 → NPC
NPC → PC

IMEM[15:0] → EXT16
EXT16_OUT → B
Rs → A
(A - B → RES)
CF → EXT1
EXT1_OUT → Rd

29. LUI

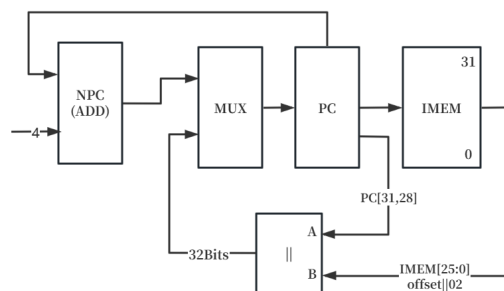


PC \rightarrow IMEM
 PC + 4 \rightarrow NPC
 NPC \rightarrow PC

IMEM[15:0] \rightarrow EXT16
 EXT16_OUT \rightarrow B
 RES \rightarrow Rd

J型指令

30.J

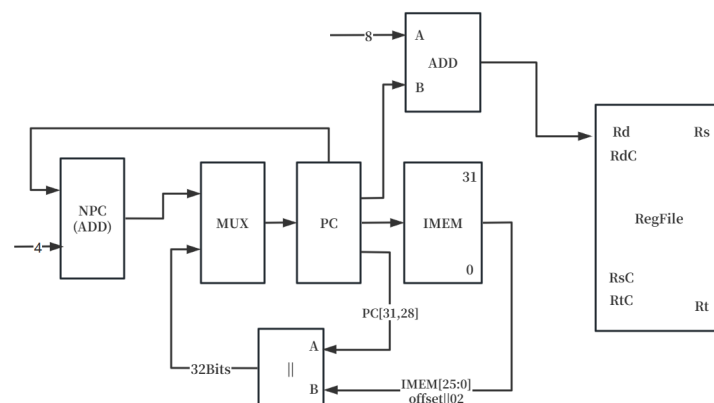


PC \rightarrow IMEM
 PC + 4 \rightarrow NPC
 NPC \rightarrow MUX

PC[31:28] \rightarrow ||_A
 IMEM[25,0] || 02 \rightarrow ||_B
 ||_OUT \rightarrow MUX

MUX_OUT \rightarrow PC

31.JAL



PC \rightarrow IMEM
 PC + 4 \rightarrow NPC
 NPC \rightarrow MUX

8 → ADD_A
PC → ADD_B
(ADD_A + ADD_B → ADD_OUT)
ADD_OUT → Rd

PC[31:28] → ||_A
IMEM[25,0] || 02 → ||_B
||_OUT → MUX

MUX_OUT → PC