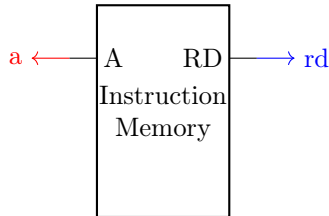


RISC-V Processor CircuiTikZ Library

March 12, 2025

1 Components

1.1 Instruction Memory

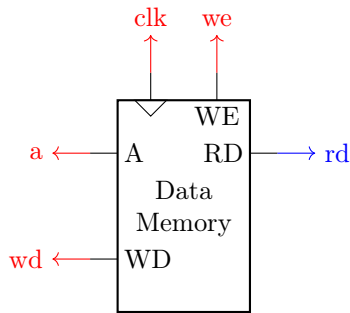


```

1 \begin{circuitikz}
2   \node[instrmem, align=center] (comp) {Instruction
3     \Memory};
4   \draw[->, red] (comp.a) -- ++(-.5, 0) node[left] {
5     a};
6   \draw[->, blue] (comp.rd) -- ++(.5, 0) node[right]
7     {rd};
8 \end{circuitikz}

```

1.2 Data Memory

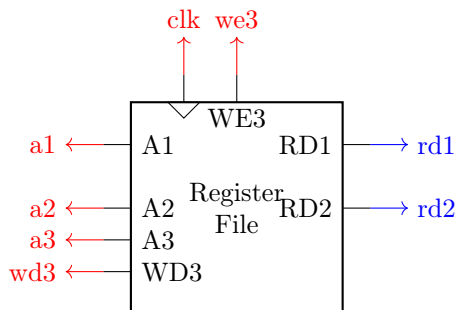


```

1 \begin{circuitikz}[]
2   \node[datamem, align=center] (comp) {Data\Memory};
3   \draw[->, red] (comp.a) -- ++(-.5, 0) node[left] {
4     a};
5   \draw[->, red] (comp.wd) -- ++(-.5, 0) node[left] {
6     wd};
7   \draw[->, red] (comp.clk) -- ++(0, .5) node[above] {
8     clk};
9   \draw[->, red] (comp.we) -- ++(0, .5) node[above] {
10    we};
11  \draw[->, blue] (comp.rd) -- ++(.5, 0) node[right] {
12    rd};
13 \end{circuitikz}

```

1.3 Register File

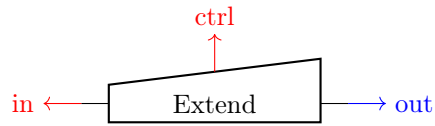


```

1 \begin{circuitikz}[]
2   \node[regfile, align=center] (comp) {
3     Register\
4     File};
5   \draw[->, red] (comp.a1) -- ++(-.5, 0)
6     node[left] {a1};
7   \draw[->, red] (comp.a2) -- ++(-.5, 0)
8     node[left] {a2};
9   \draw[->, red] (comp.a3) -- ++(-.5, 0)
10    node[left] {a3};
11  \draw[->, red] (comp.wd3) -- ++(-.5, 0)
12    node[left] {wd3};
13  \draw[->, red] (comp.clk) -- ++(0, .5)
14    node[above] {clk};
15  \draw[->, red] (comp.we3) -- ++(0, .5)
16    node[above] {we3};
17  \draw[->, blue] (comp.rd1) -- ++(.5, 0)
18    node[right] {rd1};
19  \draw[->, blue] (comp.rd2) -- ++(.5, 0)
20    node[right] {rd2};
21 \end{circuitikz}

```

1.4 Extend Unit

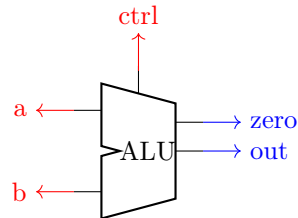


```

1 \begin{circuitikz}[]
2   \node[extend, align=center] (comp) {Extend
3     };
4   \draw[->, red] (comp.in) -- ++(-.5, 0)
5     node[left] {in};
6   \draw[->, red] (comp.ctrl) -- ++(0, .5)
7     node[above] {ctrl};
8   \draw[->, blue] (comp.out) -- ++(.5, 0)
9     node[right] {out};
10  \end{circuitikz}

```

1.5 Arithmetic Logic Unit

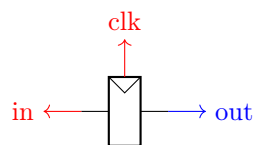


```

1 \begin{circuitikz}[]
2   \node[alu, align=center] (comp) {ALU};
3   \draw[->, red] (comp.a) -- ++(-.5, 0) node[left] {a};
4   \draw[->, red] (comp.b) -- ++(-.5, 0) node[left] {b};
5   \draw[->, red] (comp.ctrl) -- ++(0, .5) node[above] {
6     ctrl};
7   \draw[->, blue] (comp.out) -- ++(.5, 0) node[right] {
8     out};
9   \draw[->, blue] (comp.zero) -- ++(.5, 0) node[right] {
10    zero};
11 \end{circuitikz}

```

1.6 Register

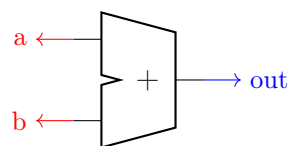


```

1 \begin{circuitikz}[]
2   \node[reg, align=center] (comp) {};
3   \draw[->, red] (comp.in) -- ++(-.5, 0) node[left] {in};
4   \draw[->, red] (comp.clk) -- ++(0, .5) node[above] {clk
5     };
6   %\draw[->, red] (comp.en) -- ++(0, -.5) node[below] {en
7     };
8   \draw[->, blue] (comp.out) -- ++(.5, 0) node[right] {out
9     };
10 \end{circuitikz}

```

1.7 Adder

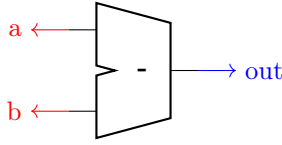


```

1 \begin{circuitikz}[]
2   \node[adder, align=center] (comp) {};
3   \draw[->, red] (comp.a) -- ++(-.5, 0) node[left] {a};
4   \draw[->, red] (comp.b) -- ++(-.5, 0) node[left] {b};
5   \draw[->, blue] (comp.out) -- ++(.5, 0) node[right] {
6     out};
7 \end{circuitikz}

```

1.8 Subtractor

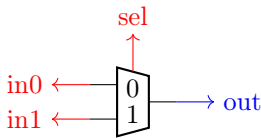


```

1 \begin{circuitikz}[]
2 \node[sub, align=center] (comp) {};
3 \draw[->, red] (comp.a) -- ++(-.5, 0) node[left] {a};
4 \draw[->, red] (comp.b) -- ++(-.5, 0) node[left] {b};
5 \draw[->, blue] (comp.out) -- ++(.5, 0) node[right] {
6 out};
7 \end{circuitikz}

```

1.9 Multiplexer

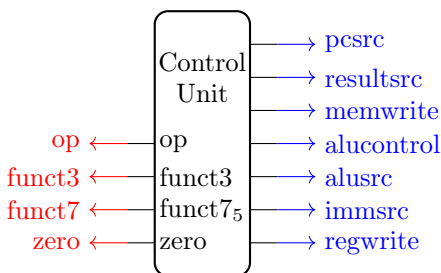


```

1 \begin{circuitikz}[]
2 \node[mux, align=center] (comp) {};
3 \draw[->, red] (comp.in0) -- ++(-.5, 0) node[left] {in
4 0};
5 \draw[->, red] (comp.in1) -- ++(-.5, 0) node[left] {in
6 1};
7 \draw[->, red] (comp.sel) -- ++(0, .5) node[above] {sel
8 };
9 \draw[->, blue] (comp.out) -- ++(.5, 0) node[right] {
10 out};
11 \end{circuitikz}

```

1.10 Single-Cycle Control Unit



```

1 \begin{circuitikz}[]
2 \node[ctrlunitsc, align=center] (comp) {
3 Control\\Unit};
4 \draw[->, red] (comp.op) -- ++(-.5, 0)
5 node[left] {op};
6 \draw[->, red] (comp.funct3) -- ++(-.5,
7 0) node[left] {funct3};
8 \draw[->, red] (comp.funct7) -- ++(-.5,
9 0) node[left] {funct7};
10 \draw[->, red] (comp.zero) -- ++(-.5, 0)
11 node[left] {zero};
12 \draw[->, blue] (comp.pcsrc) -- ++(.5, 0)
13 node[right] {pcsrc};
14 \draw[->, blue] (comp.resultsrc) --
15 ++(.5, 0) node[right] {resultsrc};
16 \draw[->, blue] (comp.memwrite) -- ++(.5,
17 0) node[right] {memwrite};
18 \draw[->, blue] (comp.alucontrol) --
19 ++(.5, 0) node[right] {alucontrol};
20 \draw[->, blue] (comp.alusrc) -- ++(.5,
21 0) node[right] {alusrc};
22 \draw[->, blue] (comp.immsrc) -- ++(.5,
23 0) node[right] {immsrc};
24 \draw[->, blue] (comp.regwrite) -- ++(.5,
25 0) node[right] {regwrite};
26 \end{circuitikz}

```

2 Single-Cycle RISC-V Processor

