A RISC-V Processor Components CircuiTi*k*Z Library

March 13, 2025

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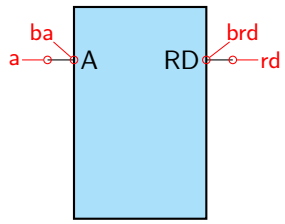
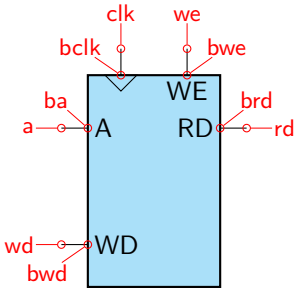
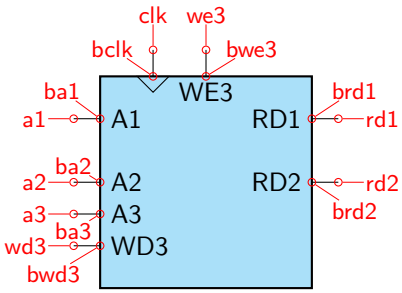
2.1 Memory Components



Instruction memory, type: node, fillable (`node[instrmem]{}`). Class: `processor`.

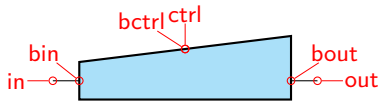


Data Memory, type: node, fillable (`node[datamem]{}`). Class: `processor`.

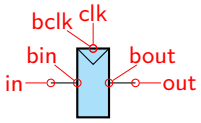


Register File, type: node, fillable (`node[regfile]{}`). Class: `processor`.

2.2 Miscellaneous Components

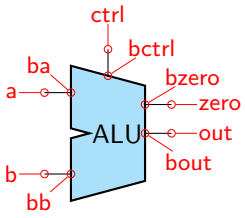


Extend Unit, type: node, fillable (`node[extend]{}`). Class: `processor`.

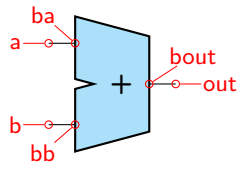


Register, type: node, fillable (`node[reg]{}`). Class: `processor`.

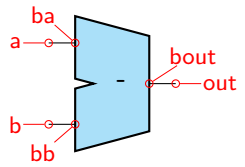
2.3 Arithmetic Components



Arithmetic Logic Unit, type: node, fillable (`node[alu]{ALU}`). Class: `processor`.

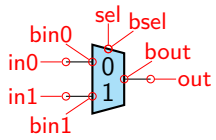


Adder, type: node, fillable (`node[adder]{}`). Class: `processor`.

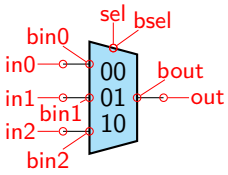


Subtractor, type: node, fillable (`node[subtr]{}`). Class: `processor`.

2.4 Multiplexers

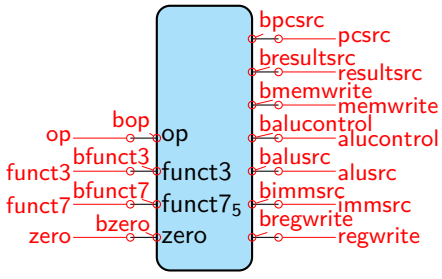


Multiplexer, type: node, fillable (`node[mux]{}`). Class: `processor`.

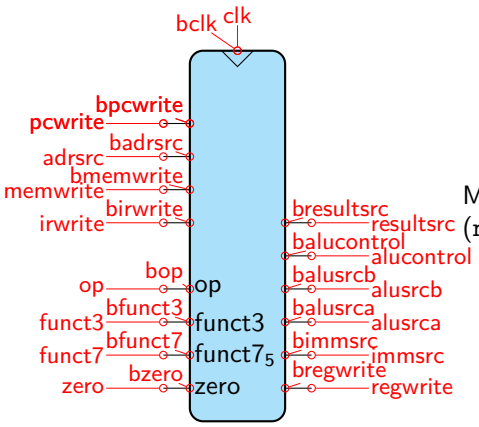


Multiplexer with 3 inputs, type: node, fillable (`node[3mux]{}`). Class: `processor`.

2.5 Control Units



Single-Cycle Control Unit, type: node, fillable (`node[ctrlunitsc]{}`). Class: `processor`.



Multi-Cycle Control Unit, type: node, fillable (`node[ctrlunitmc]{}`). Class: `processor`.

3 Keys

3.1 CircuiTi*k*Z keys

The desired CircuiTi*k*Z key can be set via `\ctikzset{processor/<key>=value}`. E.g. if one whishes to set the line width of all components to 4, the line `\ctikzset{processor/thickness=4}` would have to be included in the specific circuitikz picture. A list of all CircuiTi*k*Z keys can be found in Table ??. A list of component families can be found in Table ??.

Key	Description	Default value
`scale`	Sets scale for all processor components.	`1`
`thickness`	Sets line width for all processor components.	`2`
`font`	Sets font family for all labels of processor components.	`\rmfamily`
`memory/height`	Sets height for all memory components.	`2`
`memory/width`	Sets width for all memory components except `regfile`.	`1.25`
`control/heightsc`	Sets height for `ctrlunitsc`.	`2.5`
`control/heightmc`	Sets height for `ctrlunitmc`.	`3.5`
`control/width`	Sets width for control components.	`0.9`
`control/radius`	Sets border radius for control components.	`5`
`arith/height`	Sets height for arithmetic components.	`0.9`
`arith/width`	Sets height for arithmetic components.	`0.7`
`arith/slope`	Sets slope for arithmetic components in degrees.	`15`
`extend/height`	Sets height for big side of extend components.	`0.6`
`extend/width`	Sets height for extend components.	`2`
`extend/slope`	Sets slope for extend components in degrees.	`7`
`mux/slope`	Sets slope for multiplexers in degrees.	`15`
`misc/smallheight`	Sets height for small components.	`0.65`
`misc/smallwidth`	Sets width for small components. Also affects the CLK input triangle.	`0.3`
`misc/leadlen`	Sets length for input and output leads.	`0.25`

Table 1: List of CircuiTi*k*Z keys

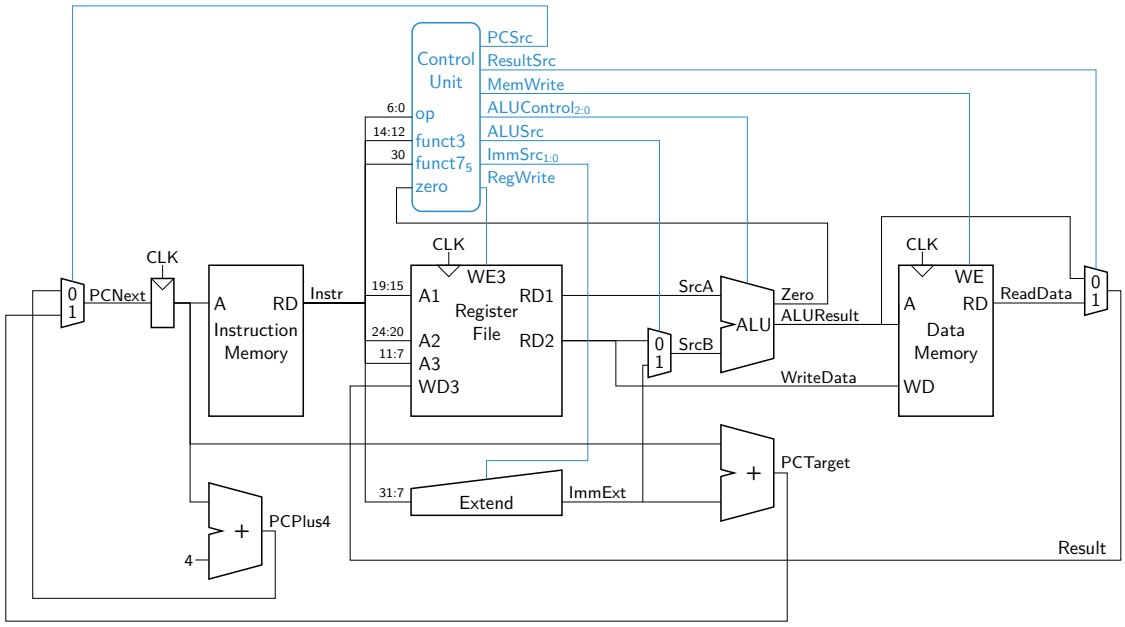
Component family	Component list
memory components	`instrmem`, `datamem`, `regfile`
control components	`ctrlunitsc`, `ctrlunitmc`
arithmetic components	`alu`, `add`, `sub`
extend components	`extend`
small components	`mux`, `reg`

Table 2: List of component families

3.2 Special node keys

4 Examples

4.1 Single-Cycle RISC-V Processor



4.2 Multi-Cycle RISC-V Processor