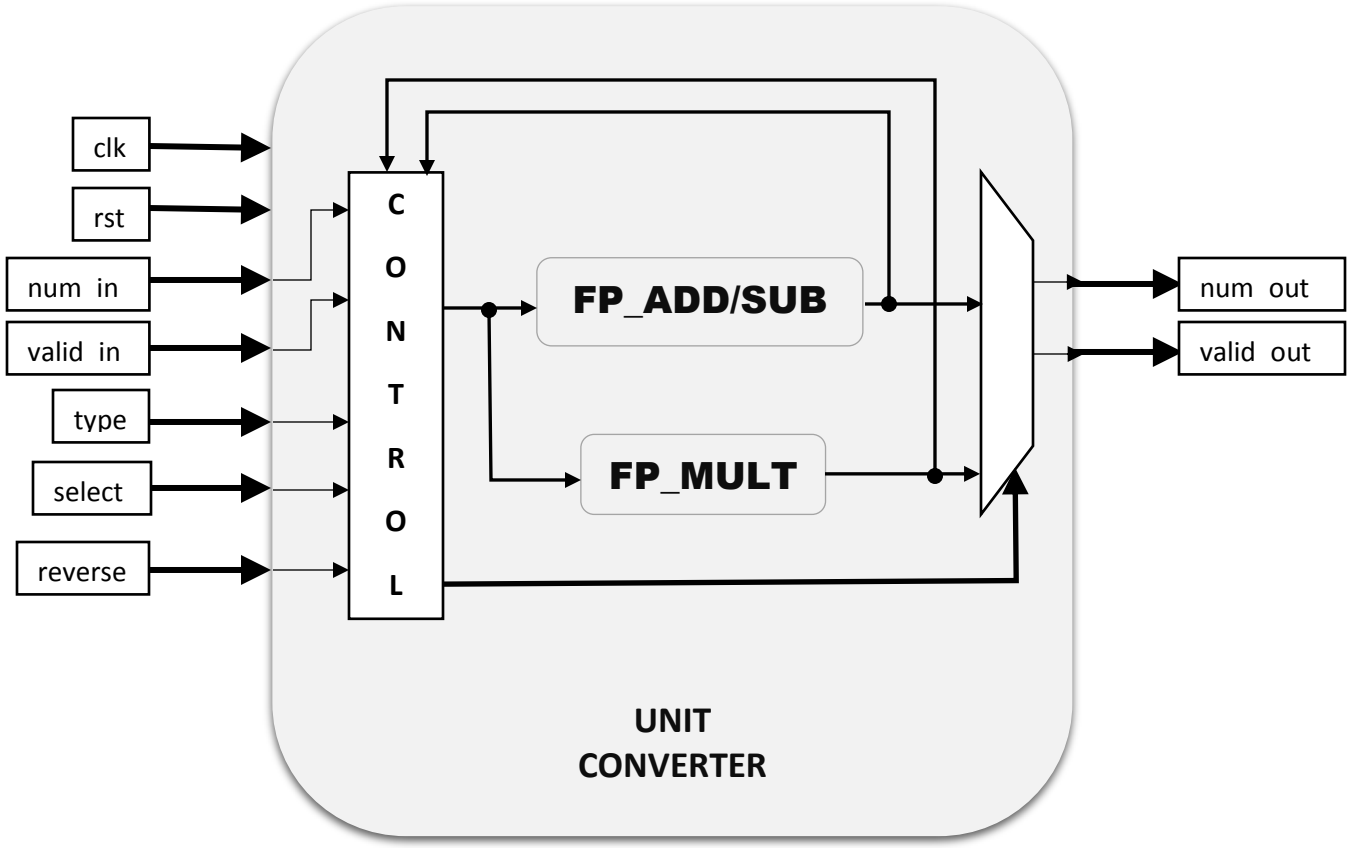
Name	Type	width	Function
clk	Input	1	Input clock
Rst	Input	1	Reset
Num_in	Input	32	Input number in IEEE 754 single precision format
Valid_in	Input	1	Valid pulse to indicate input number is valid and conversion can start
type	Input	2	2'b00: Length conversion 2'b01: Mass Conversion 2'b10 Volume Conversion 2'b11 : Temperature conversion
select	Input	3	Used only when length or mass conversion mode is chosen. When reverse is '1', conversion mode is reversed Length Conversion Modes : 0: inches to millimeter 1: inches to centimeter 2: inches to meter 3:feet to meter 4:feet to kilometer 5:yard to meter 6:yard to kilometer 7:mile to kilometer Volume Conversion modes : 0: cu inch [in^3] to cm^3 1: cu foot [ft^3] to m^3 2:fluid ounce to milliliter 3:fluid ounce to liter 4:pint (16 fl oz) to milliliter 5: pint (16 fl oz) to liter 6: gallon to liter 7:gallon to kiloliter Mass Conversion modes : 0: ounce [oz] to milligram 1: ounce [oz] to gram 2: pound [lb] to gram 3: pound [lb] to kilogram 4: stone to kilogram 5:hundredweight[cwt] to kilogram 6:short ton [US] to kilogram 7:short ton [US] to metric ton Temperature conversion : Imperial (°F) to Metric (°C)
reverse	Input	1	Low : Imperial to metric conversion High : Metric to imperial conversion
num_out	Output	32	Output number in IEEE 754 single precision format
Valid_out	Output	1	Indicates output number is valid and conversion has finished

Signals Description



Description:

The Unit converter converts input numbers given to the converter in IEEE 754 single precision floating point format (can be extended to double precision), from Imperial units (inches, gallons, miles, etc.) To Metric units (millimeters, liters, kilometers, etc.). num_in and valid_in inputs should be driven with the input number and valid pulse for this number w.r.t clk respectively. The type, select and reverse inputs need to be driven to select the type of conversion that needs to be carried out. By default, when reverse is driven to 0, conversion is from Imperial units to metric units, otherwise it's the reverse.

The converter is built using a floating point adder/subtractor and a multiplier along with the glue logic that is used to control the conversion in the top level module. Based on the type, select and reverse inputs, the conversion factors for the adder and multiplier are set inside the top-level module. Only for the temperature conversion, both adder and multiplier are used, so extra routing is done to serialize addition/subtraction → multiplication and vice versa. Otherwise, the multiplier is used with corresponding conversion factors to get the output.

Both the adder/subtractor and multiplier are built using state-machines. They take in two numbers in the IEEE 754 single precision floating point format. Based on the start pulse given as input to the state-machine, done pulse is generated along with the result to indicate completion of operation.