



EE450 - Electronic Control of Motors

Lab 3 - Simulink Half Wave Rectifier

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Abstract

This lab is the recreation of a half wave rectifier using a video reference as a guide. The results and following modifications are to test the limitations and parameters that are contained within the model. They are used specifically only for analyzation of the model and not used for any other means.

Model Parameters

The following values were preset for the basic model:

Block Parameters: Diode

For most applications the internal inductance should be set to zero.
The Diode impedance is infinite in off-state mode.

Parameters

Resistance R_{on} (Ohms) :
0.001

Inductance L_{on} (H) :
0

Forward voltage V_f (V) :
0.8

Initial current I_c (A) :
0

Snubber resistance R_s (Ohms) :
500

Snubber capacitance C_s (F) :
250e-9

☐ Show measurement port

OK Cancel Help Apply

Figure 1: The basic Parameters of the Diode

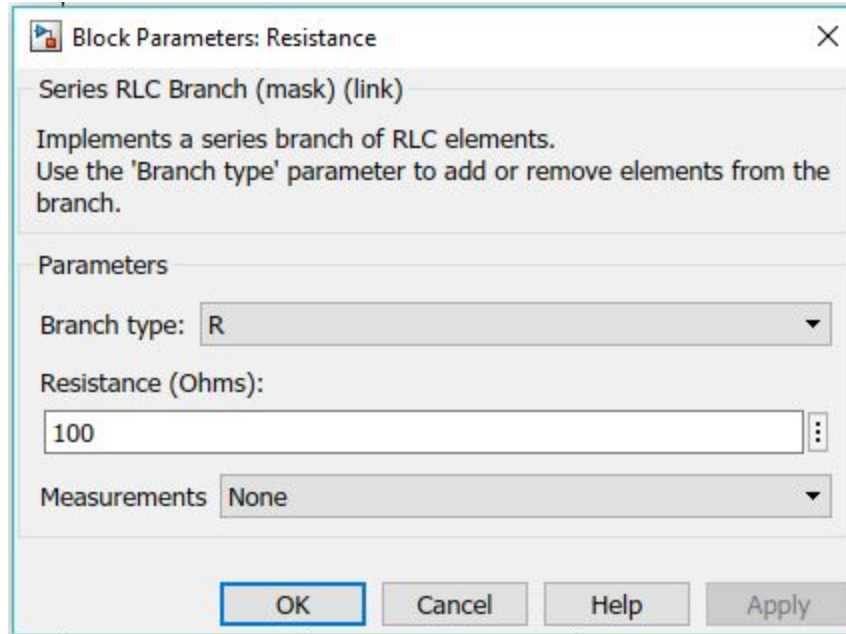


Figure 2: The basic parameters of the Resistor

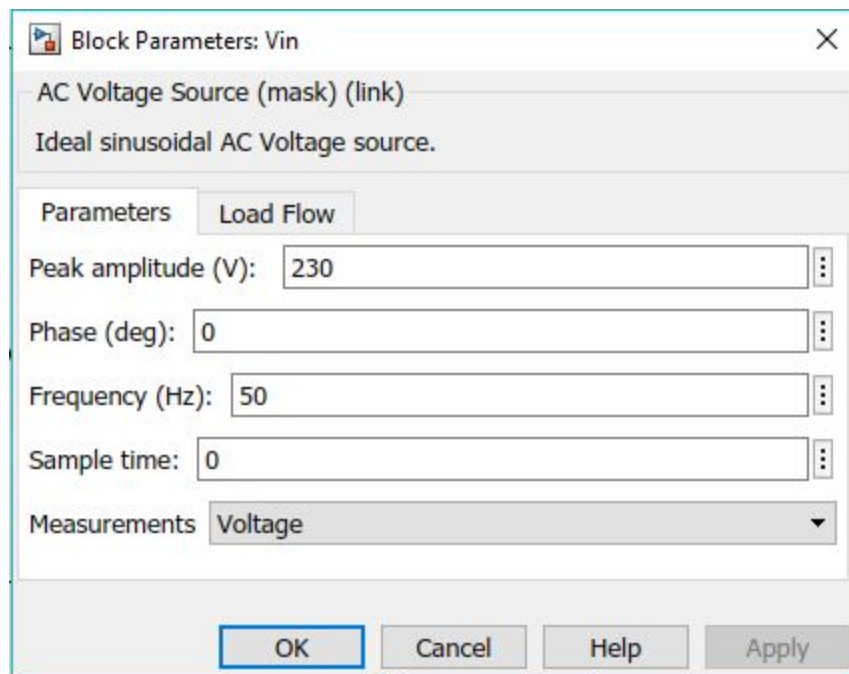


Figure 3: The basic parameters of the Voltage input

Design Model and Results

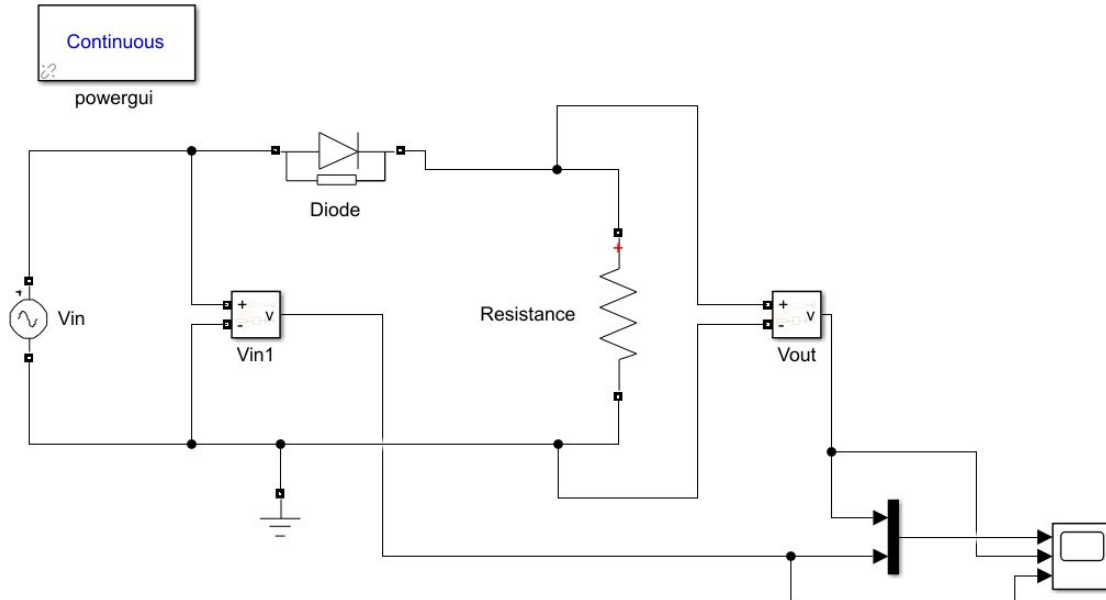


Figure 4: Completed design of the Half wave rectifier

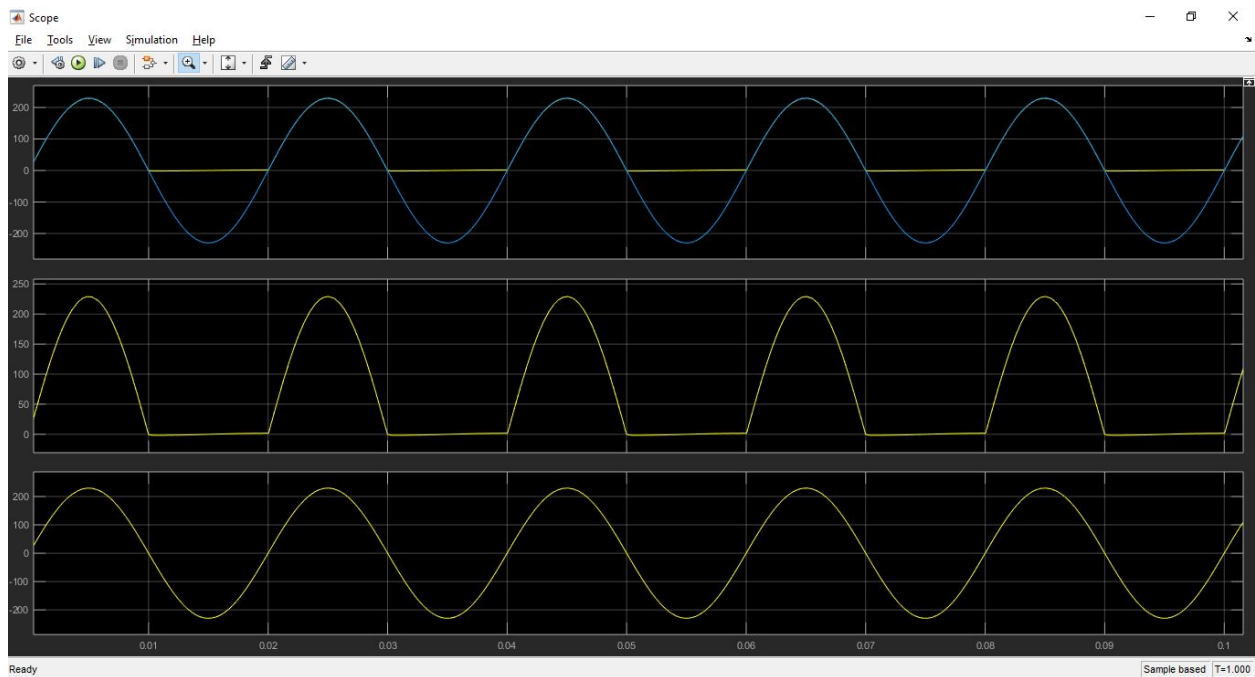


Figure 5: Results of the scope with the top being the combined signal, middle being the output, and the bottom as the input

Design Modification and Results

As to the modifications, we will see significant results with modifying the resistor. The change is only really noticeable and applies only where the resistor value is increased by increment of tenfold. The following figure has the resistance increased to $10\text{K}\Omega$ from 100Ω . As to what is happening and what will continue to happen for the figure, the yellow output, will present itself as increasing voltage leakage. This voltage leakage is shown in the rising step shown on the top and middle diagrams.

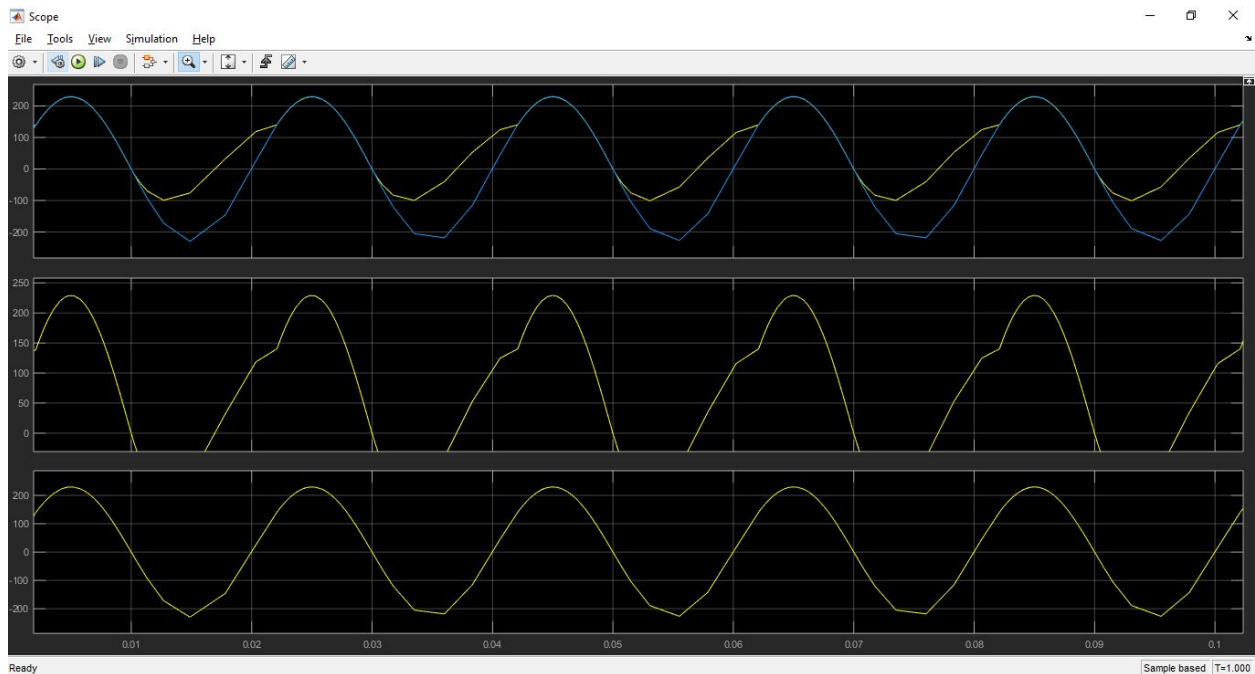


Figure 6: Results of the scope as the resistor value is increased from 100Ω to $10\text{K}\Omega$

Conclusion

The result of this simulation presented the half wave rectifier in a simple construction. This allowed for variants of the components to be modified and adjusted for optimization. The modification found that as values increased, the more voltage leakage became apparent and noticeable. The system as it is, right now with 100Ω , proved to have a solid and clean result in terms of creating a pure half wave rectifier. If any modifications are additionally made, the system will be showing values equating to time scaled delayed and eventual power loss.