

Ministry of Higher Education and Scientific Research
University of Biskra
Faculty of Science and Technology
Department of Electrical Engineering



Practical work $N^{\circ} - 1$

Charge/discharge and control of battery with bi-directional DC/DC converter

1 Manipulation 1

Create the diagram in **Figure1** on a Simulink file:

Setting the Powergui Solver:

Simulation type “discrete (simple Time (s)= $5e^{-6}$) ”;

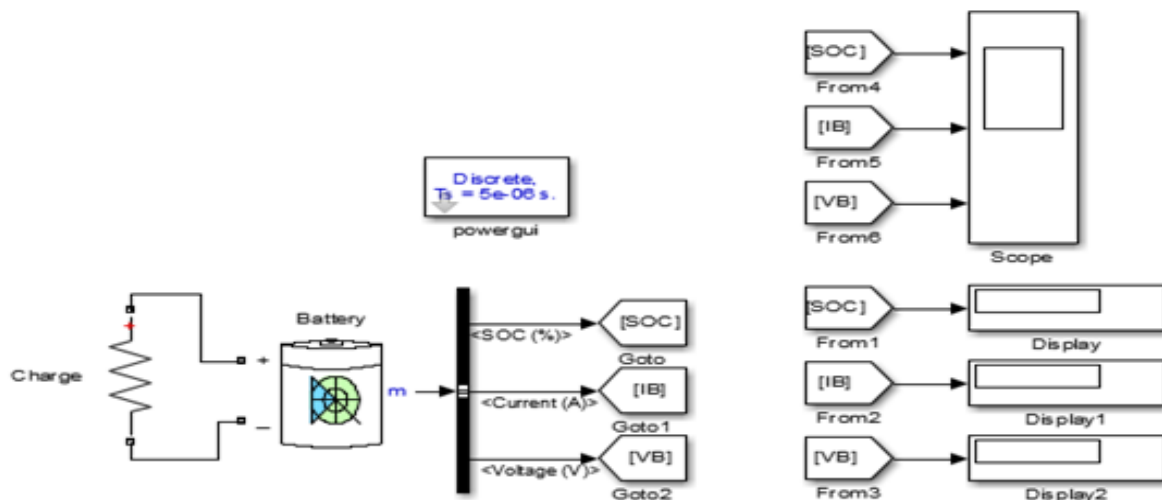


Figure 1: Discharge Battery phase.

Table 1: Battery parameters.

Battery parameters			
Nominal voltage	Rated capacity	Initial state-of-charge	Battery response time
24(V)	10(Ah)	50(%)	$1e^{-4}(s)$

1.1 Discharge phase

We connect a resistor between the battery terminals of $12(\text{Ohms})$ then $2.4(\text{Ohms})$.

- * Explain how the assembly works?
- * Plot and explain the battery characteristics?
- * Compare and conclude the two cases of different resistances?

1.2 Recharging phase

Replace the resistor with a voltage generator with a value of $=27\text{V}$ ' DC Voltage Source '.

- ☞ Answers the same questions as in (Discharge phase).
- ☞ In real mode reduces voltage from (27V to 26.5V and 26 V), with simulation $\approx = inf$, notice and explain how the assembly works.

2 Manipulation 2

Create the diagram shown in figure-1 on a Simulink file:

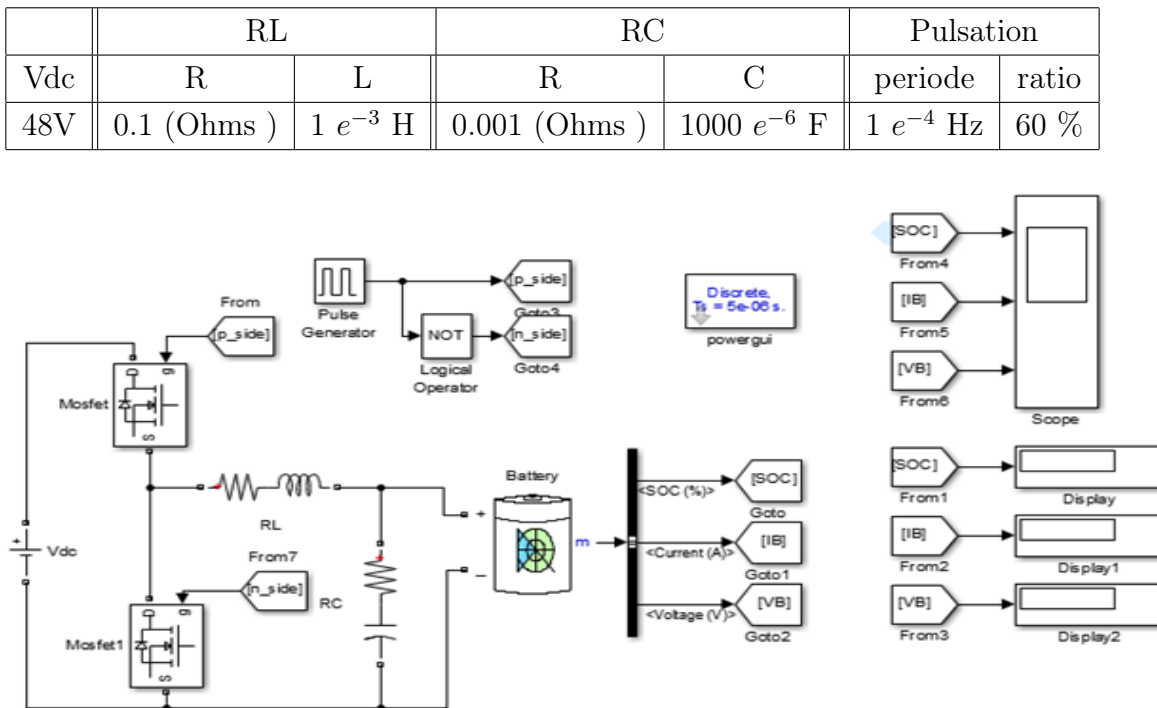


Figure 2: Control of battery with bi-directional DC/DC converter.

2.1 Questions

- ① What is the goal of the this manipulation?
- ② What is the role of DC/DC converters?
- ③ Visualize and interpret the curves?
- ④ Why is the battery current negative?
- ⑤ Give your conclusion?

3 Manipulation 3

Realize and visualize all curves.(Simulation time 280000 s).

3.1 Questions

- ❶ What is the role of battery 1 and battery 2?
- ❷ Explain how this block works?
- ❸ What the oscilloscope shows you ?
- ❹ Interpret and conclude the results

```
function [LoadOn, ChargingOn]=fcn(SOC)
LoadOn=1;
ChargingOn=0;
if (SOC)>=95
LoadOn=1;
ChargingOn=0;
end
if (SOC)<90
LoadOn=0;
ChargingOn=1;
end
```

Figure 3: Matlab function program

Type: Lithium-Ion Temperature ☐ Simulate temperature effect Nominal voltage (V) 12 Rated capacity (Ah) 10 Initial state-of-charge (%) 95 Battery response time (s) 30	Type: Lithium-Ion Temperature ☐ Simulate temperature effect Nominal voltage (V) 16 Rated capacity (Ah) 15 Initial state-of-charge (%) 100 Battery response time (s) 30
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Figure 4: Battery data

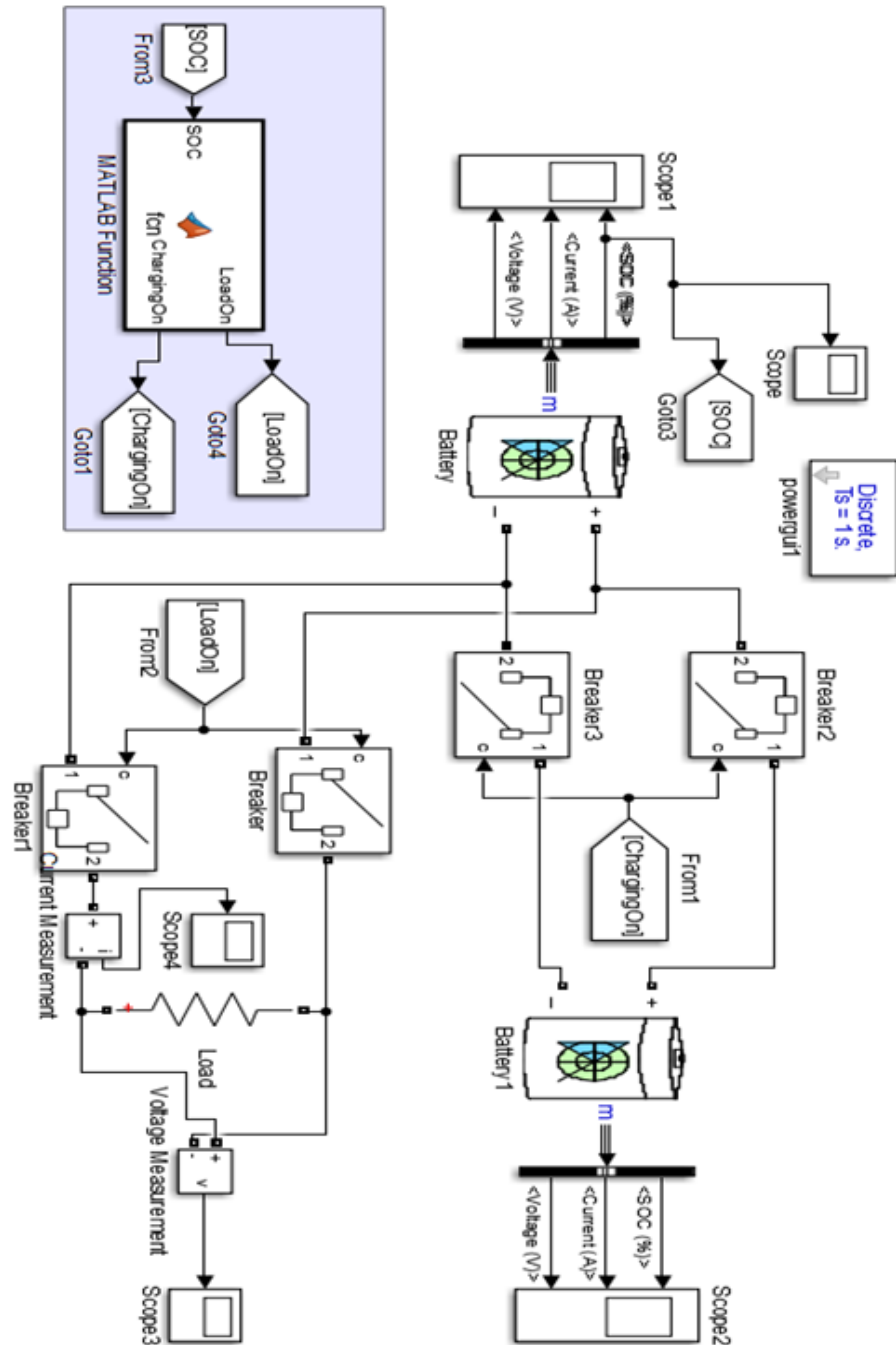


Figure 5: Charging and discharging batteries