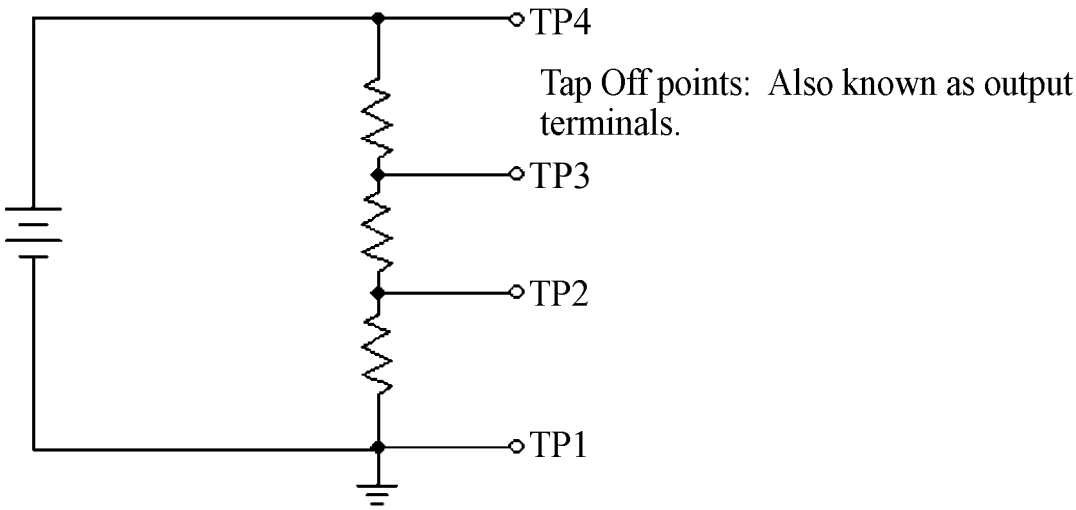
Voltage Dividers

Objectives:

Identify a voltage divider circuit.
Identify a voltage divider circuit as being loaded or unloaded.
Calculate voltage, current, and resistance for loaded and unloaded voltage divider circuits.
Calculate % regulation for a voltage divider circuit.
Measure unloaded voltage divider voltages.
Measure loaded voltage divider voltages.

Voltage Divider: A **series** circuit that takes one voltage and divides it into smaller voltages. Note that the resistors are wired in **series**.

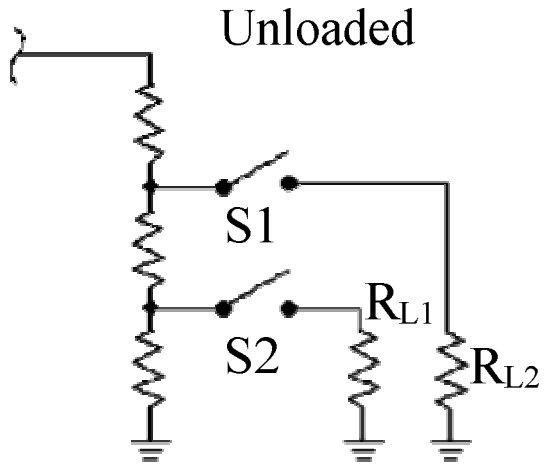


Ground is the zero reference point of a circuit.

If you are looking for the voltage of one of the tap off points and the other point is not specified, assume the other point is ground.

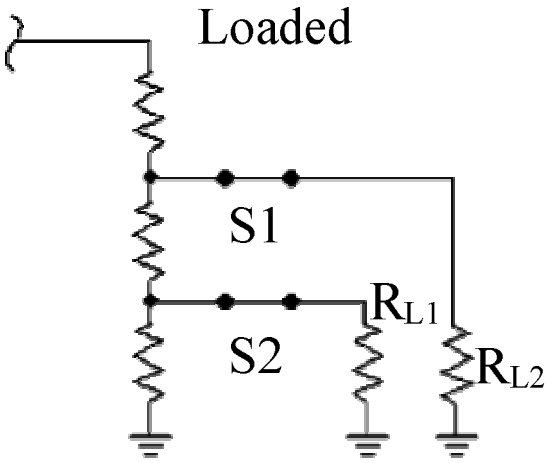
Voltage dividers are either loaded or unloaded.

Unloaded voltage divider means a load resistor is not connected.



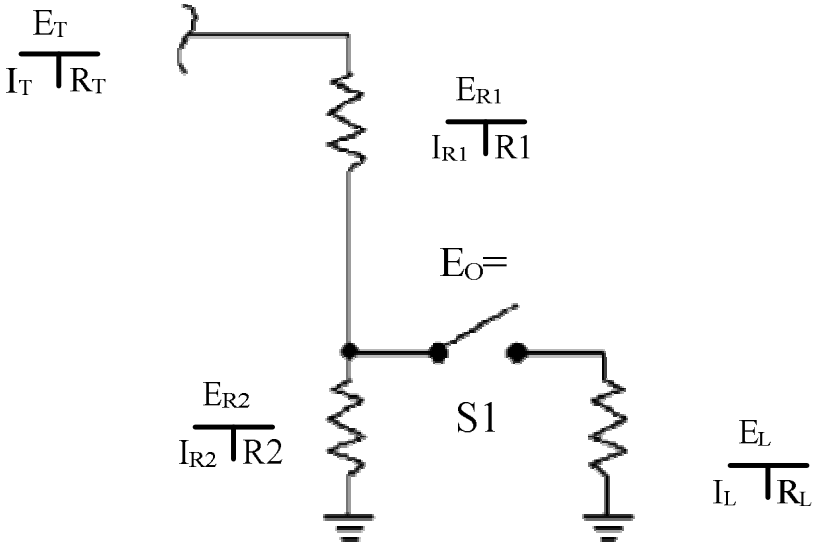
Output at the tap off point is called E_O.

Loaded means a load resistor or other component is connected to the voltage divider.



Output at the tap off point is called E_{OUT}.

Since the switch is opened, ignore R_L.



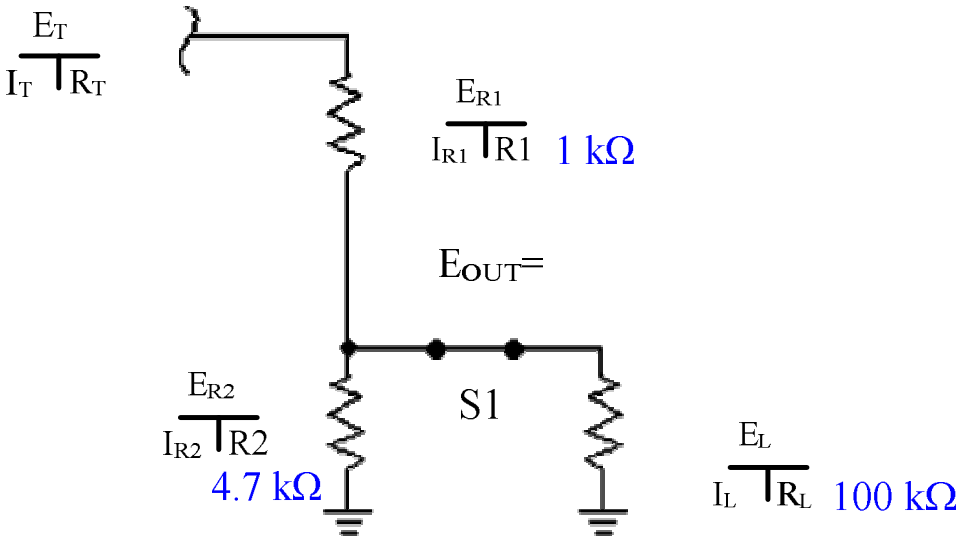
Find R_T.

Find I_T.

Find voltage drops.

Find the output (E_O).

Since the switch is closed, find the R_{REQ} between R_3 & R_L.



Find R_T.

Find I_T.

Find voltage drops.

Find the output (E_{OUT}).

Find % Regulation

$$\% \text{ Regulation} = \frac{E_O - E_{OUT}}{E_{OUT}} \text{ X } 100$$

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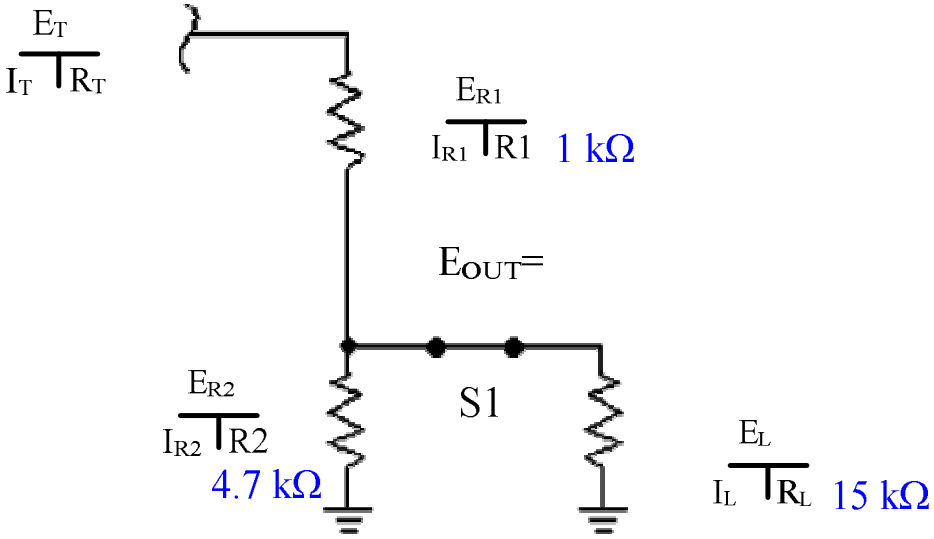

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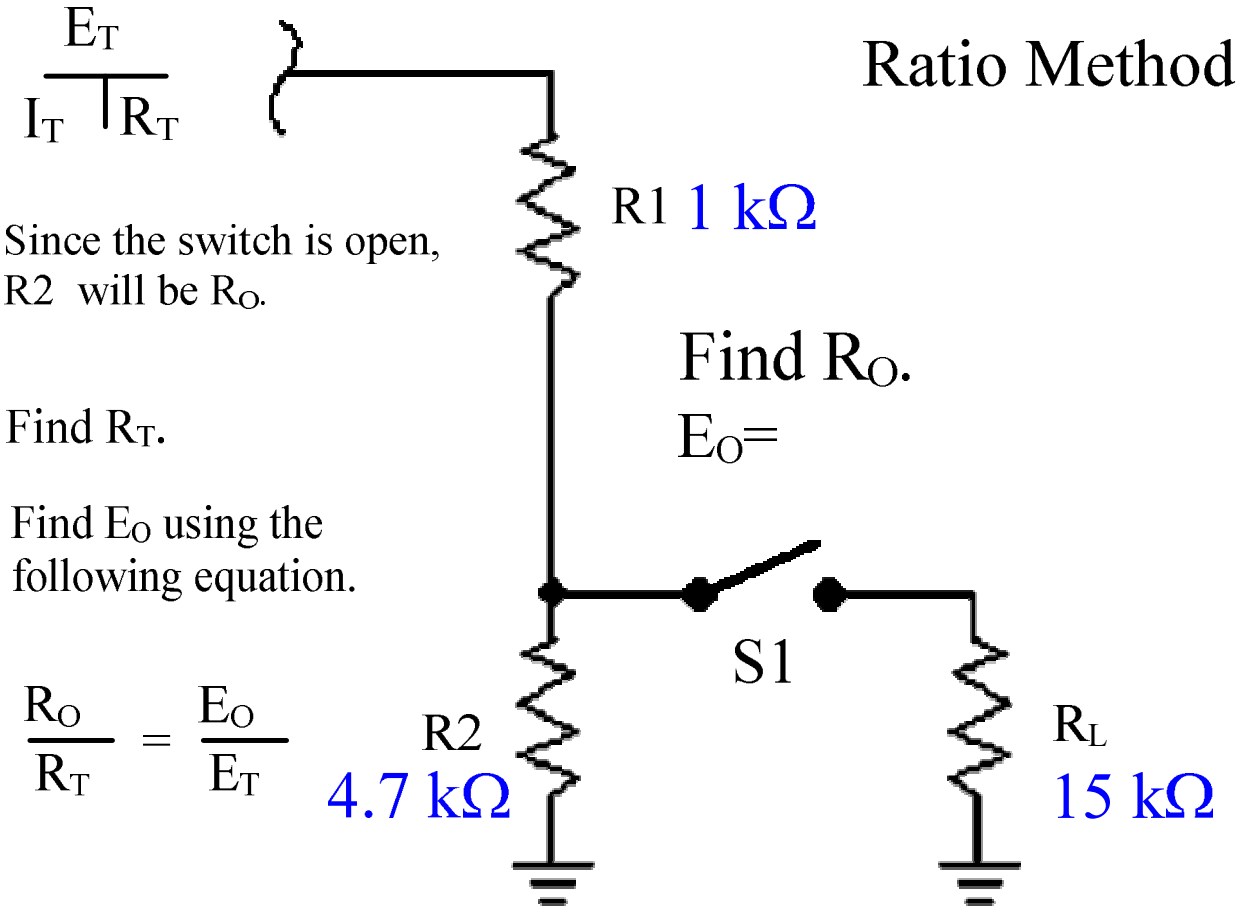
Ratio Method



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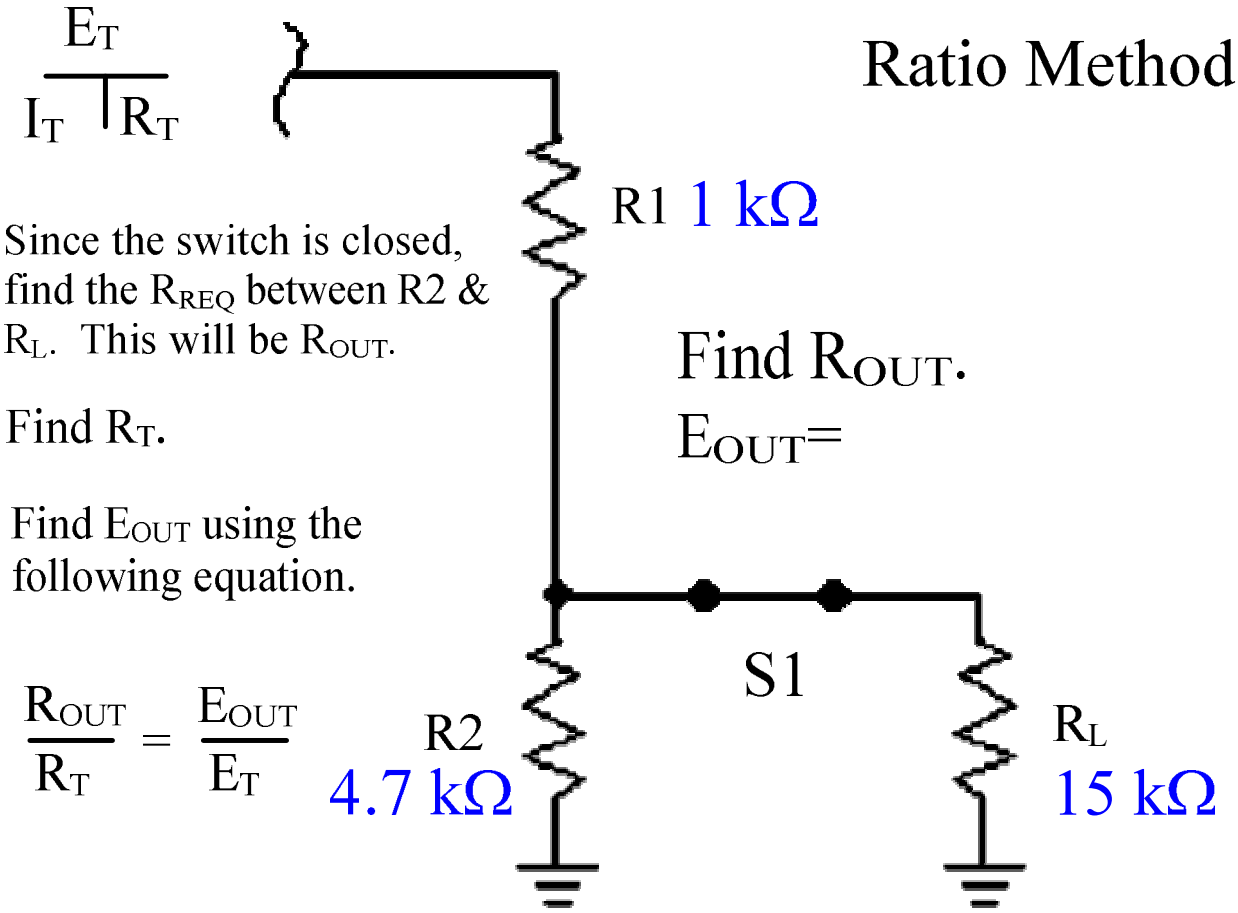
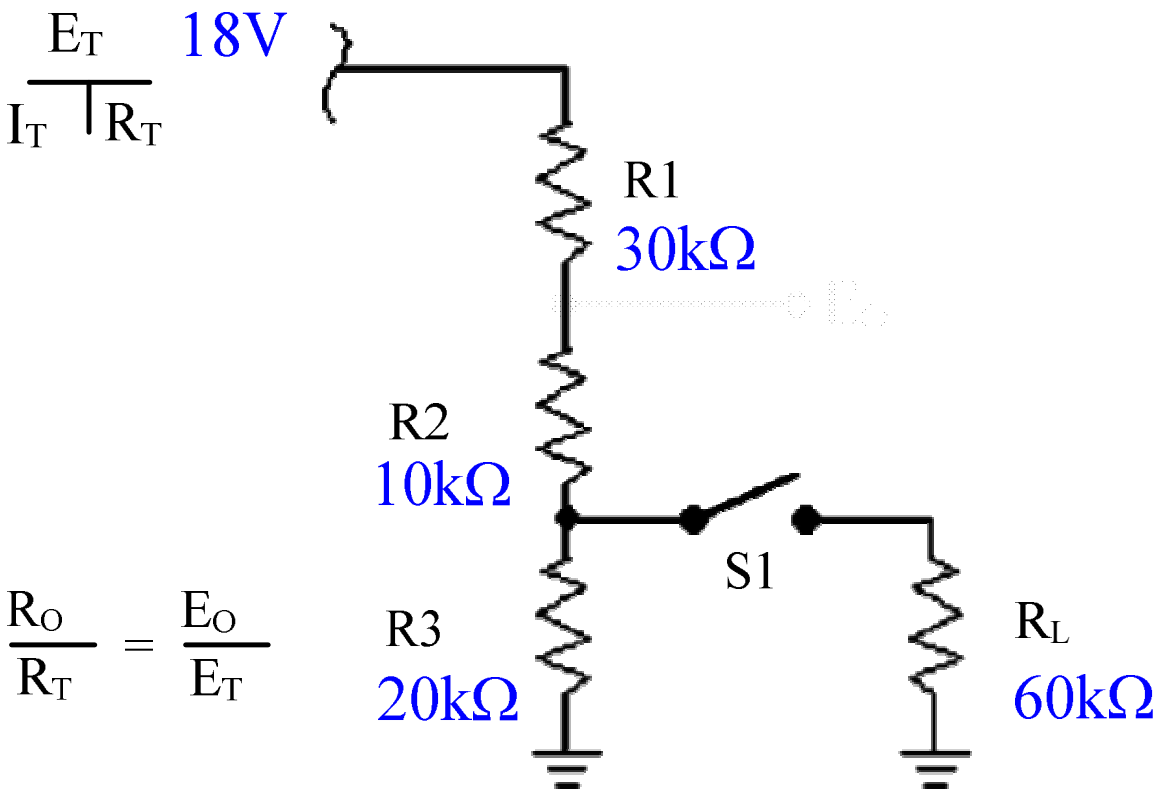
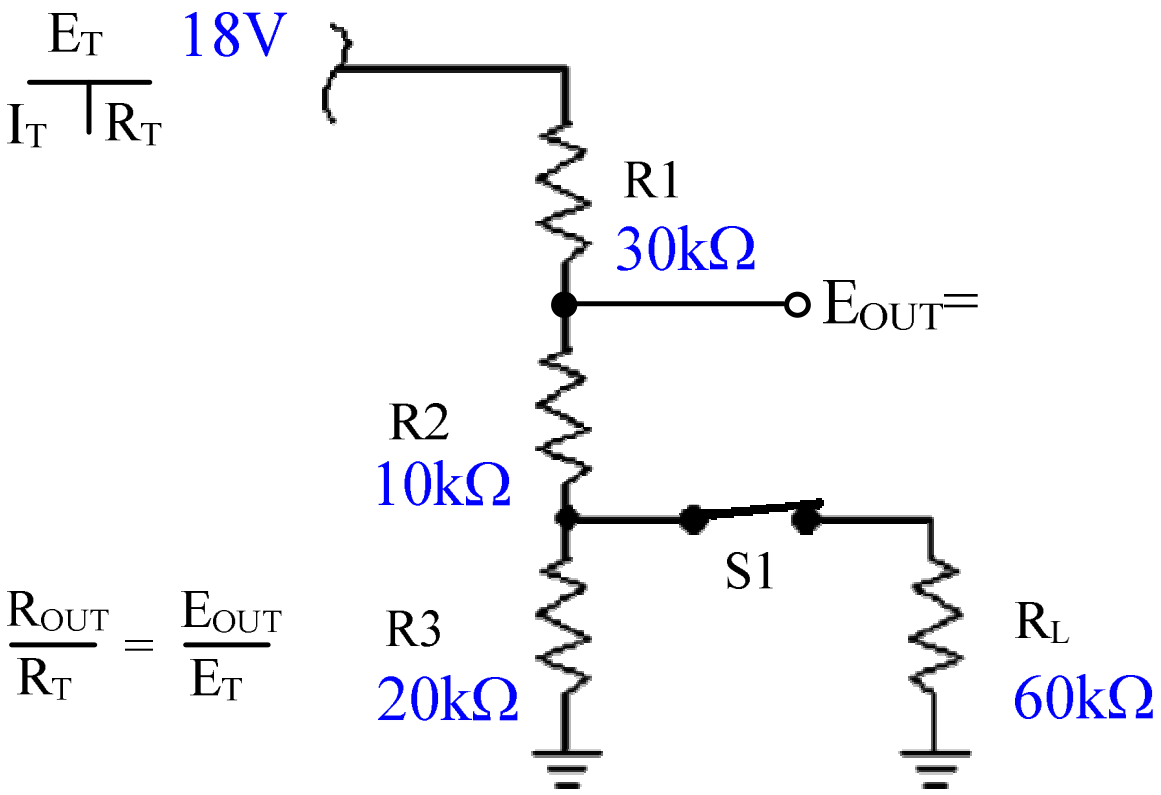




$$\frac{R_O}{R_T} = \frac{E_O}{E_T}$$



$$\frac{R_{OUT}}{R_T} = \frac{E_{OUT}}{E_T}$$