

Electronics Resistive Sensors

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Switches in voltage dividers

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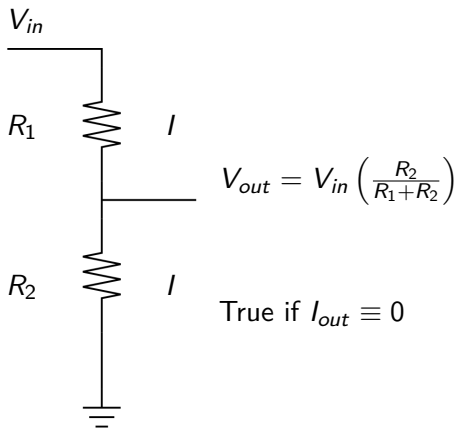
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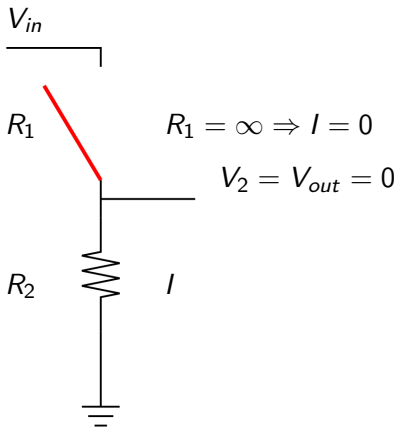
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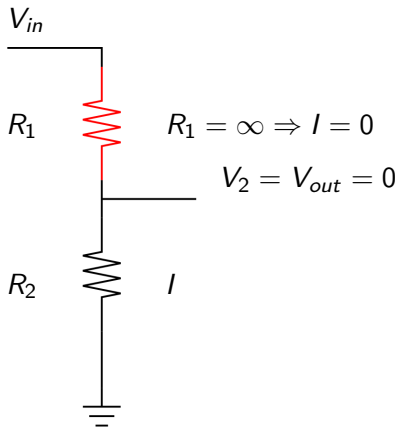
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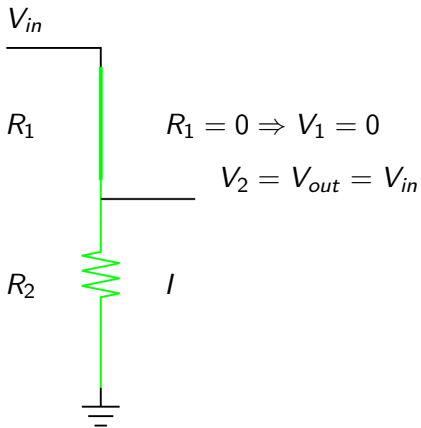
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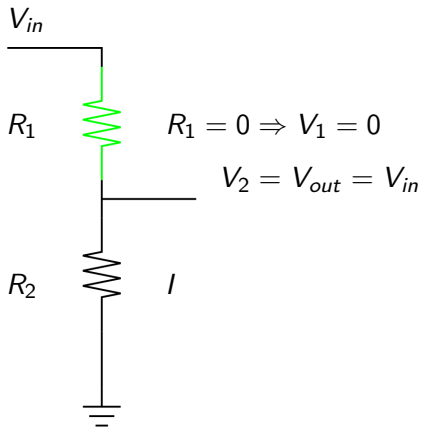
- One of the simplest forms of voltage divider is where one of the elements is a *switch*.
- A switch can be thought of as a resistor which can have a value of either zero or infinity.
- Following is an illustration of a voltage divider where one element is a switch.





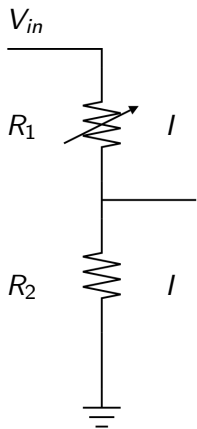






- So if one of the elements is a *switch*, the output varies between 0 and V_{in} .

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- If either resistor in a voltage divider is *variable*, then a range of output voltages is possible.



$$V_{out} = V_{in} \left(\frac{R_2}{R_1 + R_2} \right)$$

True if $I_{out} \equiv 0$

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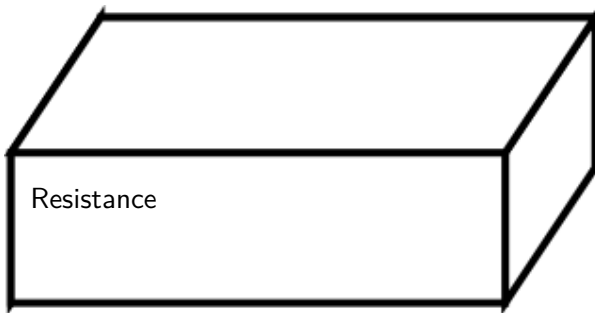
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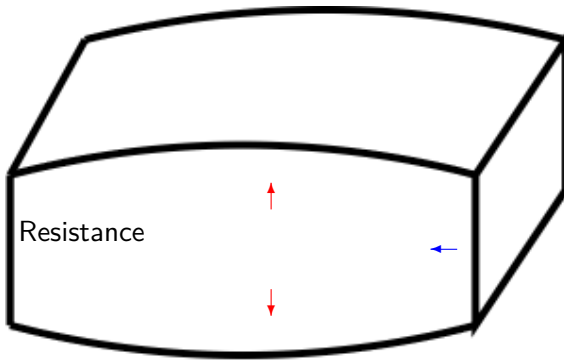
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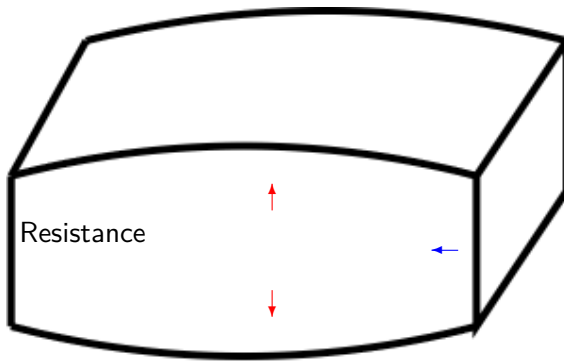
- Potentiometer; the resistance varies with *physical movement*
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- Thermistor; the resistance varies with *heat*
- Strain gauge (or gage); the resistance varies with *stress* or *compression*
- Force-dependent resistor; the resistance varies with *applied pressure*

Here's an example of how a strain gauge works.

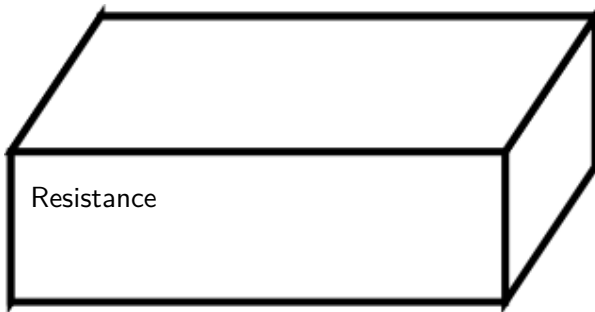


$$R = \rho \frac{L}{A}$$

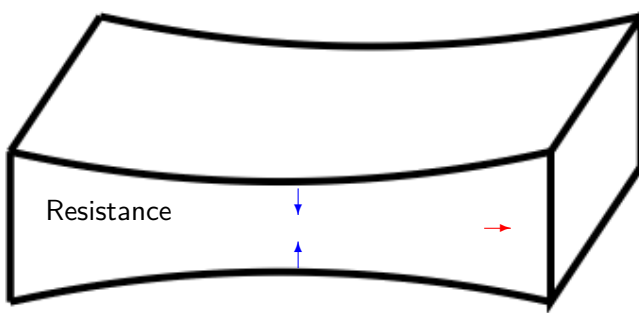


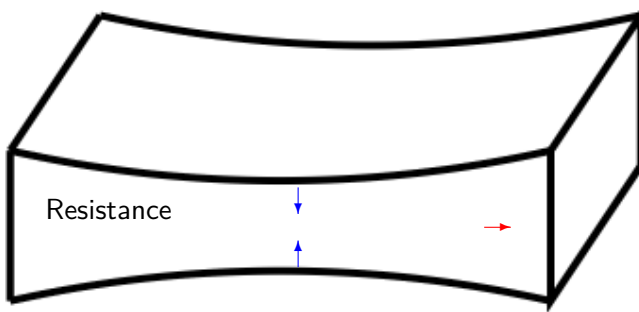


$$R' = \rho \frac{(L - \Delta L)}{(A + \Delta A)} < R$$

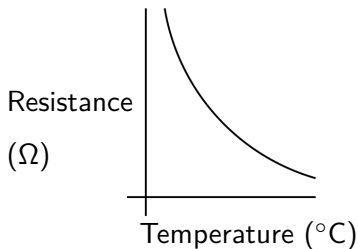


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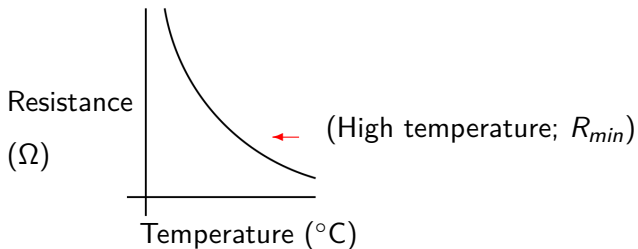




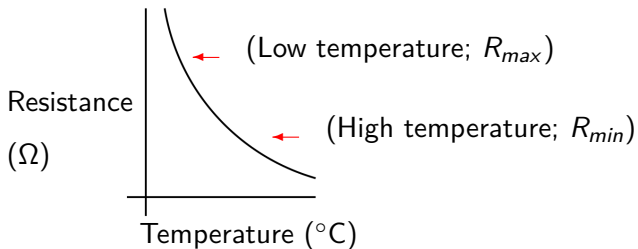
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$$R = \sqrt{R_{min} \times R_{max}}$$