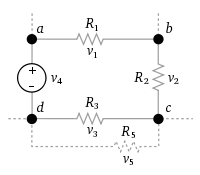
Kirchhoff's voltage law (KVL)[[edit](http://en.wikipedia.org/w/index.php?title=Kirchhoff%27s_circuit_laws&action=edit&section=4)]

[](http://en.wikipedia.org/wiki/File:Kirchhoff_voltage_law.svg)

[http://bits.wikimedia.org/static-1.22wmf21/skins/common/images/magnify-clip.png](http://en.wikipedia.org/wiki/File:Kirchhoff_voltage_law.svg)

The sum of all the voltages around the loop is equal to zero. v1 + v2 + v3 - v4 = 0

This law is also called **Kirchhoff's second law**, **Kirchhoff's loop (or mesh) rule**, and**Kirchhoff's second rule**.

Similarly to KCL, it can be stated as:

\sum_{k=1}^n V_k = 0

Here, *n* is the total number of voltages measured. The voltages may also be complex:

\sum_{k=1}^n \tilde{V}_k = 0

This law is based on one of the Maxwell equations, namely the [Maxwell-Faraday law of induction](http://en.wikipedia.org/wiki/Faraday%27s_law_of_induction#Maxwell.E2.80.93Faraday_equation), which states that the voltage drop around any closed loop is equal to the rate-of-change of the flux threading the loop. The amount of flux depends on the area of the loop and on the magnetic field strength. KVL states the loop voltage is zero. The Maxwell equations tell us that the loop voltage will be *small* if the area of the loop is small, the magnetic field is weak, and/or the magnetic field is slowly changing.

Routine engineering techniques -- such as the use of coaxial cable and twisted pairs -- can be used to minimize stray magnetic fields and minimize the area of vulnerable loops. Utilization of these techniques creates an *arrangement,* whereby KVL becomes a useful approximation for situations where its application was imprecise.