Electrical Current Flow

Electron Flow - From excess to deficient

Conventional Current Flow
- Internal to Source (Battery)
  - Negative to Positive
- External from Source (Battery)
  - Positive to Negative

Voltage Drop - Across a Resistor + to -

Negative Current - Assumed Direction Reversed

Electrical Theory

Ohm's Law

$I = V/R$ (DC) $\quad I = V/Z$ (AC)

Series: $R_{eq} = R_1 + R_2 + R_3$

Parallel: $1/R_{eq} = 1/R_1 + 1/R_2 + 1/R_3$

Kirchoff's Law
- Sum of Loop Voltages = 0
- Sum of Node Currents = 0

Joule's Law

$P = IE = I^2R$ (I Squared R Loss)

Electrical Theory

Quantity	Symbol	Unit	Equation
Charge	Q	coulomb	$Q = \int i\,dt$ $Q = CV$
Current	I	ampere	$I = dQ/dt$
Voltage	V	volt	$V = dW/dQ$
Energy	W	joule	$W = \int V\,dQ = \int P\,dt$
Power	P	watt	$P = dW/dt = IV$

Equivalent Circuits

Thevenin

- Two Terminal Resistor and Battery Circuit
  - Series Voltage Source and Equivalent Resistor
- Voltage Source = Open Circuit Voltage
- Equivalent Resistor = V / Short Circuit Current

Norton

- Two Terminal Resistor and Battery Circuit
  - Parallel Voltage Source and Equivalent Resistor
- Current Source = Short Circuit Current
- Equivalent Resistor = V / Short Circuit Current