


Level 1 Fundamentals


Power Fundamentals



Agenda

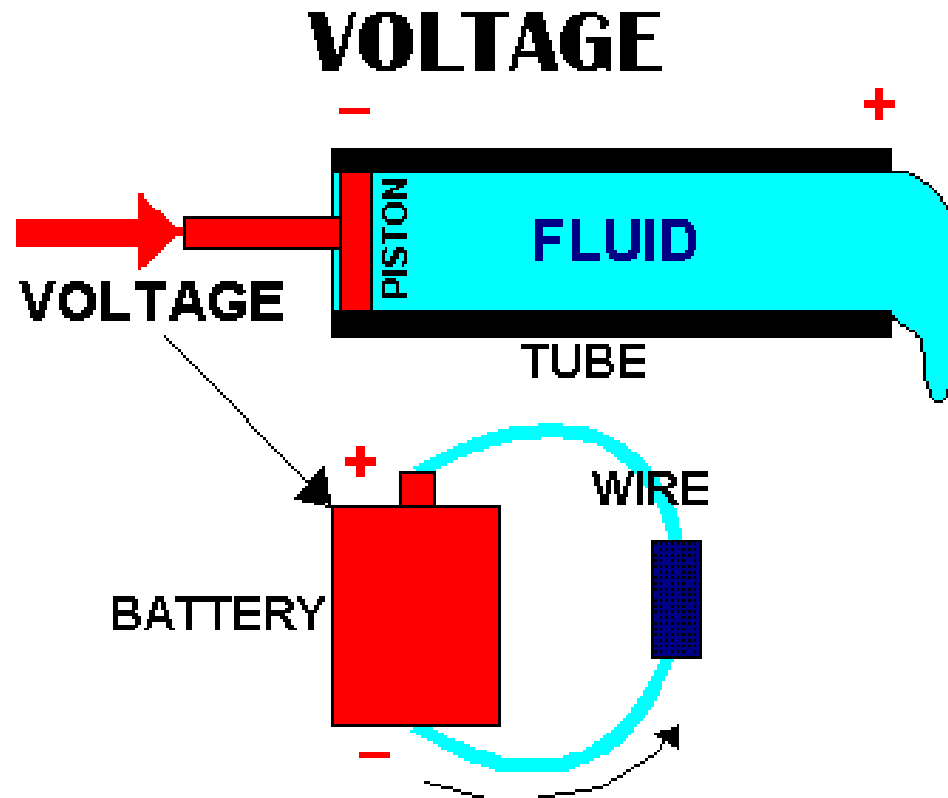
- ▶ Power Theory
 - ▶ Connection types
 - ▶ UPS Sizing
- 

Power Theory

- ▶ Volt (Voltage) – Pressure through a wire
 - ▶ Amp (Amperes) – Current or flow of electricity
 - ▶ Resistance (Ohms) – resistance
 - ▶ Power (Watts) – work done in a circuit
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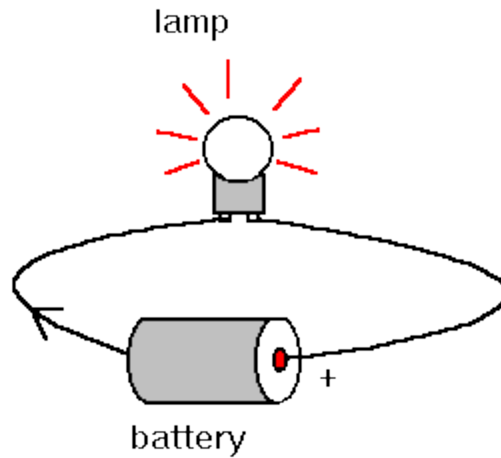
Voltage

A measure of the difference in electric potential between two points in space, a material, or an electric circuit, expressed in volts.



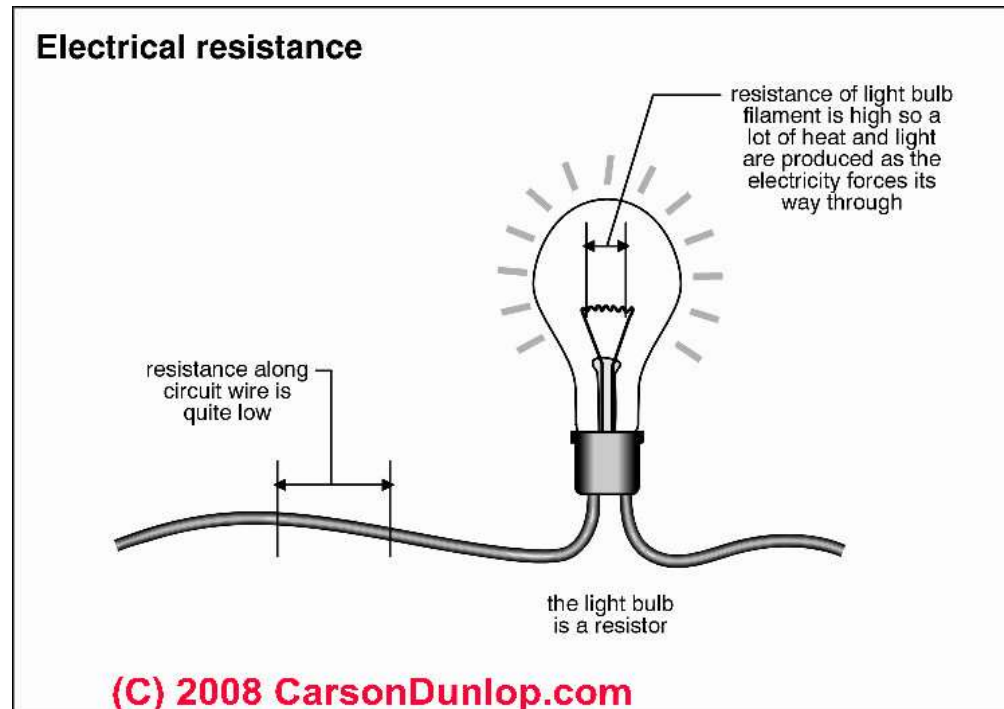
Amps (Current)

The strength of an electric current expressed in amperes.



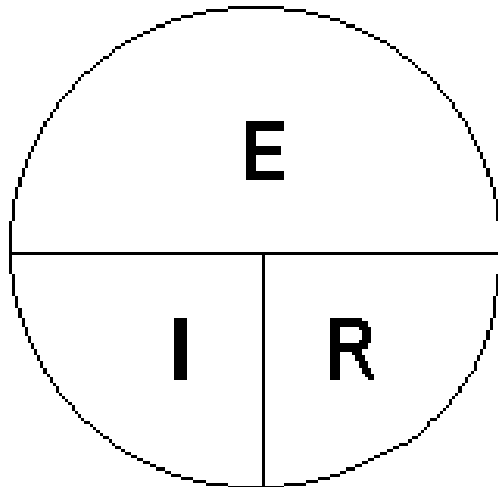
Resistance

The opposition of a body or substance to current passing through it, resulting in a change of electrical energy into heat or another form of energy.



Ohm's Law

OHM's LAW



E = Electromotive Force
measured in **VOLTS**

I = Current
measured in **AMPS**

R = Resistance
measured in **OHM's**

$$E = I \times R \quad I = E \div R \quad R = E \div I$$

HINT: The letters are placed on the circle in alphabetical order

Power Calculations

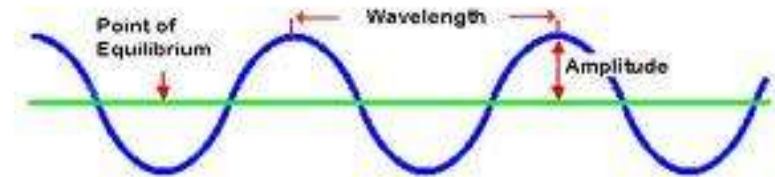
Power equations

$$P = I E \qquad P = \frac{E^2}{R} \qquad P = I^2 R$$

AC and DC

- ▶ AC – Alternating Current

- Home and Industry
- Reference frequency




Basic Structure of a Wave

- ▶ DC – Direct Current

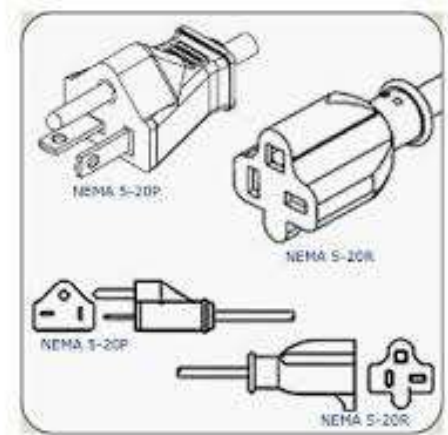
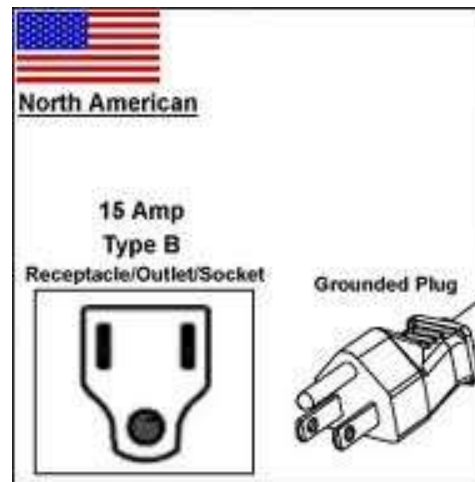
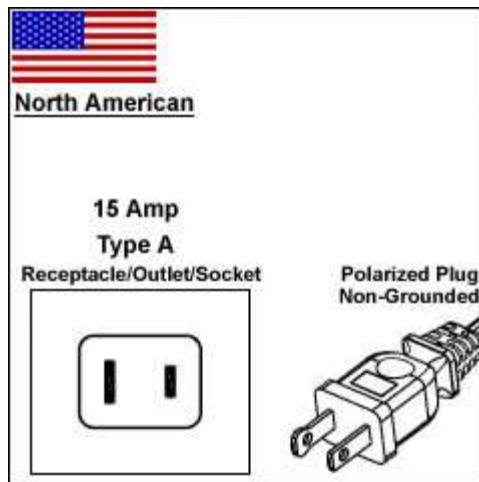
- Car and batteries

Definitions

- ▶ NEMA – National Electrical Manufacturing Association
 - ▶ IEC – International Electrotechnical Commission
 - ▶ BTU – British thermal unit
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Connection Types

- ▶ NEMA 1-15R or P
- ▶ NEMA 5-15R or P
- ▶ NEMA 5-20R or P



Connection Types

- ▶ NEMA 6-20R or P
- ▶ NEMA 6-30R or P



Connection Types

- ▶ IEC 320 C13 – Female
- ▶ IEC 320 C14 – Male
- ▶ IEC 320 C19 – Female
- ▶ IEC 320 C20 – Male



NEMA Markings

▶ NEMA 5-15R ← R - Receptical

5 - 110V

15 - 15 amps

▶ NEMA L6-30P ← P - Plug

L - Locking

6 - 220V

30 - 30 amps

UPS Sizing - 110V

Output

Output Power Capacity 2700 Watts / 2880 VA

Max Configurable Power 2700 Watts / 2880 VA

Nominal Output Voltage 120V

Output Voltage Distortion Less than 5%

Output Frequency (sync to mains) 50/60Hz +/- 3 Hz

Topology Line Interactive

Waveform Type Sine wave

Output Connections (6) NEMA 5-15R



(2) NEMA 5-20R



Input

Nominal Input Voltage 120V

Input Frequency 50/60 Hz +/- 3 Hz (auto sensing)

Input Connections NEMA L5-30P




Cord Length 8 feet (2.44 meters)

Input voltage range for main operations 82 - 144V


Input voltage adjustable range for mains operation 75 - 154V

UPS Sizing - 220V

Output

Output Power Capacity	2700 Watts / 3000 VA
Max Configurable Power	2700 Watts / 3000 VA
Nominal Output Voltage	208V
Output Voltage Distortion	Less than 5%
Output Frequency (sync to mains)	50/60Hz +/- 3 Hz
Topology	Line Interactive
Waveform Type	Sine wave
Output Connections	(2) NEMA L6-20R 

Input

Nominal Input Voltage	208V
Input Frequency	50/60 Hz +/- 3 Hz (auto sensing)
Input Connections	NEMA L6-20P 
Cord Length	8 feet (2.44 meters)
Input voltage range for main operations	141 - 255V
Input voltage adjustable range for mains operation	131 - 268V

UPS Sizing

- ▶ APC UPS Sizing Tool
- ▶ http://www.apc.com/tools/ups_selector/
- ▶ Tripp Lite UPS Sizing Tool
- ▶ <http://www.tripplite.com/en/lp/application/ups-sizing.cfm>

ANY
QUESTIONS
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