

3.1 Electricity

Current

Current is the flow of electrons in an electric circuit.
The symbol for current is a capital I.

The unit of current is the Ampere.
The abbreviations for Ampere are a capital A or the word Amp.

Types of current

Current that flows only in one direction is direct current.
Direct current is abbreviated DC or dc.

Current that reverses direction on a regular basis is alternating current.
Alternating current is abbreviated AC or ac.

Voltage

Voltage is the force that pushes the electrons and causes them to flow.
Voltage is also called electromotive force or electric potential.
The symbol for voltage is a capital E.

The unit of voltage is the Volt.
The abbreviation for Volt is a capital V.

Resistance

Resistance is the opposition to the flow of current.
The symbol for resistance is a capital R.

The unit of resistance is the Ohm.
The abbreviation for Ohm is the Greek letter omega Ω .

Impedance

Impedance is a measure of the opposition to AC current flow in a circuit.
The symbol for impedance is a capital Z.

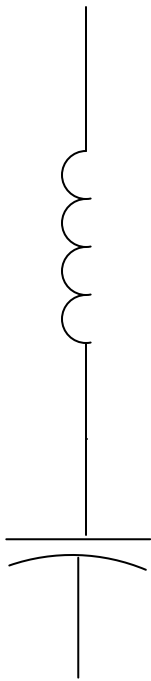
The unit of impedance is the Ohm.
The abbreviation for Ohm is the Greek letter omega Ω .

Circuits

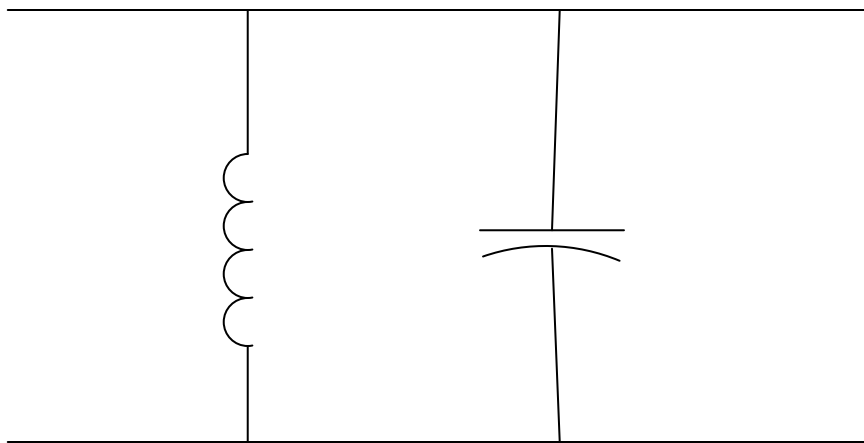
A circuit is a path through which current can flow.

If the components are connected end to end, they are connected in series.

If the components are connected across each other, they are connected in parallel.



Connected in series.



Connected in parallel.

Ohm's Law

Ohm's Law is the relationship between current, voltage, and resistance.

Voltage equals current times resistance.

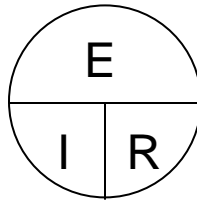
$$E = I \times R$$

Current equals voltage divided by resistance.

$$I = \frac{E}{R}$$

Resistance equals voltage divided by current.

$$R = \frac{E}{I}$$



Power

Power is the rate at which electrical energy is used.
The symbol for power is a capital P.

The unit of power is the Watt.
The abbreviation for Watt is a capital W.

Power equals current times voltage.

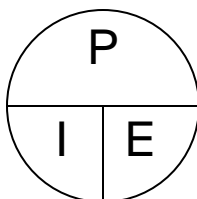
$$P = I \times E$$

Current equals power divided by voltage.

$$I = \frac{P}{E}$$

Voltage equals power divided by current.

$$E = \frac{P}{I}$$



Electrical Test Instruments

An ammeter is used to measure current.

A voltmeter is used to measure voltage.

An ohmmeter is used to measure resistance.

A multimeter combines an ammeter, a voltmeter, and an ohmmeter in one instrument. A multimeter is also called a VOM (volt-ohm-meter) or a DVM (digital volt meter).

Voltage and resistance measurements are commonly made using a multimeter.

To measure current, an ammeter or multimeter must be connected in series with the circuit. To connect it in series, the circuit must be disconnected at some point and the ammeter or multimeter connected in the circuit. If an ammeter or multimeter is connected in parallel when measuring current, it will be damaged or destroyed.

To measure voltage, a voltmeter or multimeter must be connected in parallel with the circuit. To connect it in parallel, the probes are placed across the component to be measured.

When measuring high voltages with a voltmeter, ensure that the voltmeter and leads are rated for use at the voltages to be measured.

To measure resistance, an ohmmeter or multimeter must be connected in parallel with the resistance to be measured. There must be absolutely no power in the circuit being measured. If an ohmmeter is connected to a circuit with power, it will be damaged or destroyed.

Attempting to measure voltage or current when using the resistance setting of a multimeter will damage or destroy the multimeter.

When an ohmmeter, connected across an unpowered circuit, initially indicates a low resistance and then shows an increasing resistance with time, the circuit contains a large capacitor.

Conductors and Insulators

Materials which allow current to flow easily are called conductors. Copper is a good electrical conductor.

Materials which oppose the flow of current are called insulators. Glass is a good electrical insulator.

For the Technician Class Question Pool expiring June 30, 2018:

Current is the flow of electrons in an electric circuit.

Electrical current is measured in Amperes.

Voltage is also called electromotive force or electric potential.

Voltage (electromotive force) causes the electrons to flow.

The unit of voltage (electromotive force) is the Volt.

Copper is a good electrical conductor.

Glass is a good electrical insulator.

You have to know Ohm's Law and be able to solve problems using Ohm's Law.

Power is the rate at which electrical energy is used.

Electrical power is measured in Watts.

You have to know the relationship between power, current, and voltage and be able to use it to solve problems.

Direct current flows only in one direction.

Alternating current reverses direction on a regular basis.

An ammeter is used to measure electric current.

An ammeter is connected in series with the circuit.

A voltmeter is used to measure electric potential or electromotive force.

A voltmeter is connected in parallel with the circuit.

When measuring high voltages with a voltmeter, ensure that the voltmeter and leads are rated for use at the voltages to be measured.

An ohmmeter is used to measure resistance.

Ensure that the circuit is not powered when measuring circuit resistance with an ohmmeter.

Voltage and resistance measurements are commonly made using a multimeter.

Attempting to measure voltage or current when using the resistance setting will damage or destroy a multimeter.

When an ohmmeter, connected across an unpowered circuit, initially indicates a low resistance and then shows an increasing resistance with time, the circuit contains a large capacitor.