# Technician License Course
# Chapter 3.2

# Electricity, Components and Circuits
# Lesson Plan Module 6

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# Electronics – Controlling the Flow of Current

- To make an electronic device (like a radio) do something useful (like a receiver), we need to **control and manipulate the flow of current**.
- There are a number of different electronic components that we use to do this.

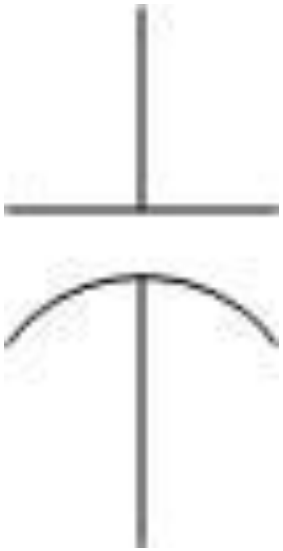
# The Resistor

- The function of the **resistor is to restrict (limit) the flow of current** through it.

- Circuit Symbol

# The Capacitor

- The function of the **capacitor is to temporarily store electric field or charge**.
  - Like a very temporary storage battery.
  - Stores energy in an electrostatic field of electrons.
- Circuit Symbol



# The Inductor

- The function of the **inductor is to temporarily store energy in a magnetic field** around the inductor.
  - Is basically a coil of wire.

- Circuit Symbol

# Resonance

- Because capacitors and inductors store energy in different ways, **the stored energy can actually cancel each other under the right conditions**.
  - Capacitors – electric field
  - Inductors – magnetic field
- Cancelled current = **no reactance**, just **leaving resistance**.

# Resonant Antenna

- If an antenna is designed correctly, the **capacitive reactance cancels the inductive reactance**.
- Theoretically, the resulting **reactance is zero**.
  - Leaving only resistance – meaning minimum impediment to the radio frequency currents flowing in the antenna and sending the radio wave into space.

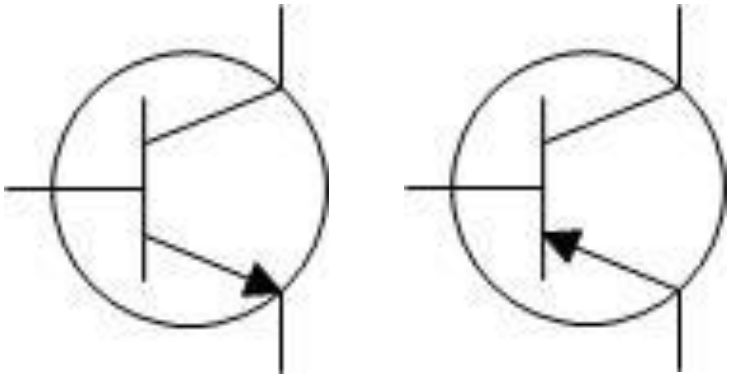
# Antennas are Part Capacitor – Part Inductor – Part Resistor

- **Antennas actually have characteristics of capacitor, inductor and resistor electronic components**.
- Capacitors and inductors, because they store energy in fields, react differently to ac than dc.
  - Special kind of resistance to the flow of ac – called reactance.

# The Transistor

- The function of the **transistor is to variably control the flow of current**.
  - Much like an **electronically controlled valve**.
  - An analogy, the faucet in your sink.

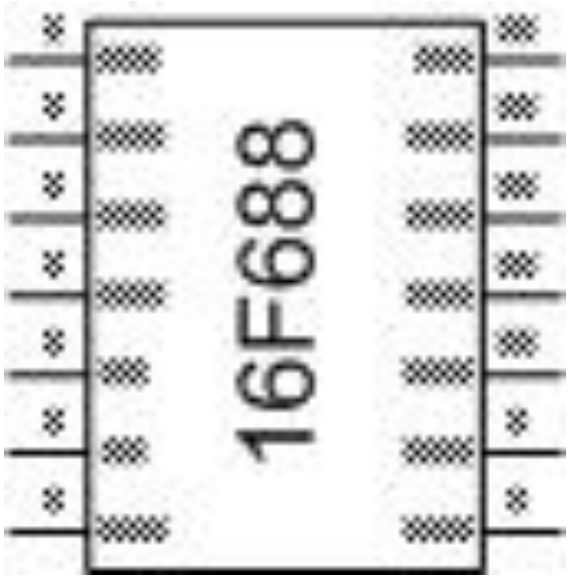
- Circuit Symbol



# The Integrated Circuit

- The **integrated circuit is a collection of components contained in one device** that accomplishes a specific task.
  - Acts like a “black-box”

- Circuit Symbol

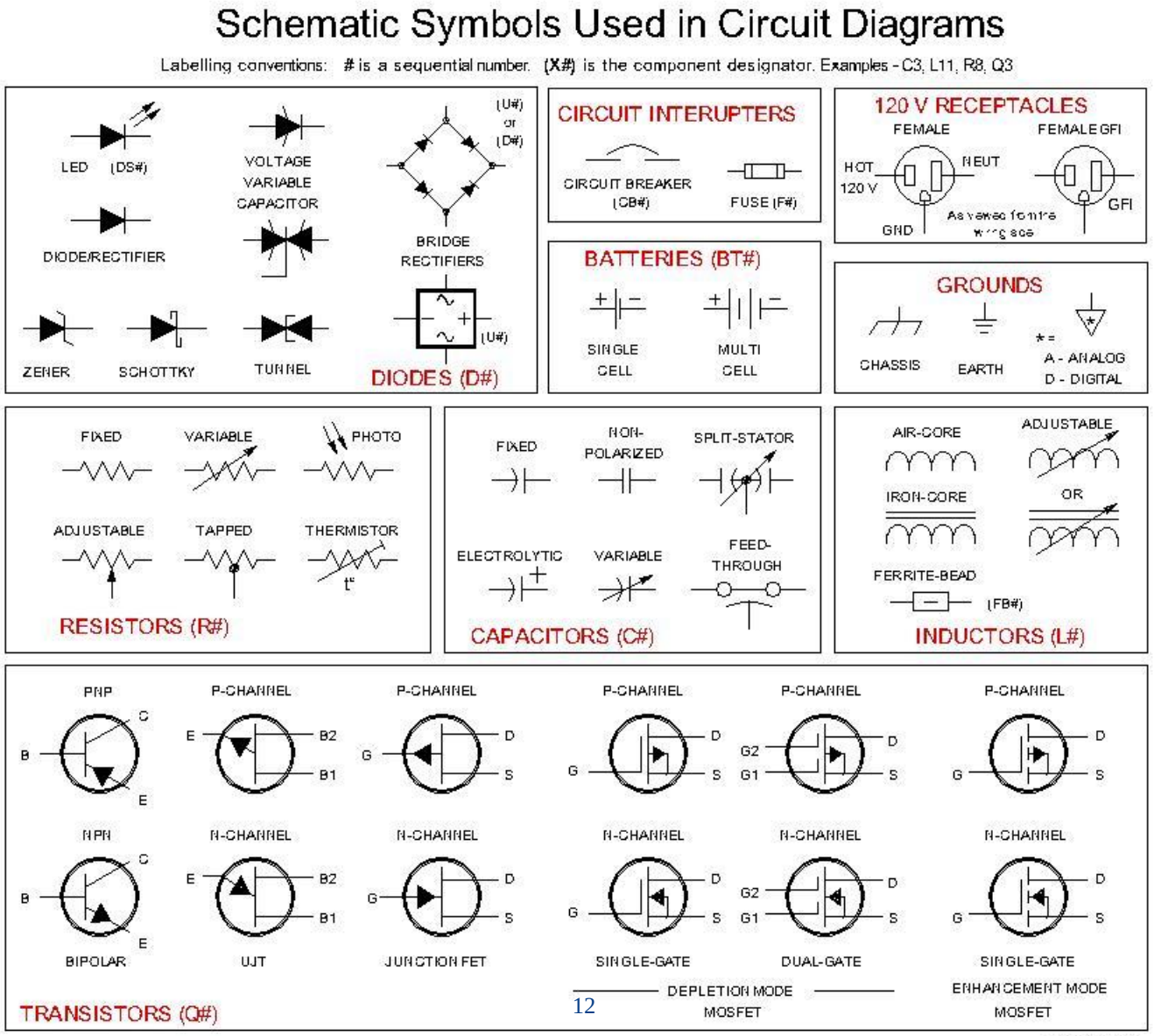


# Protective Components – Intentional Open Circuits

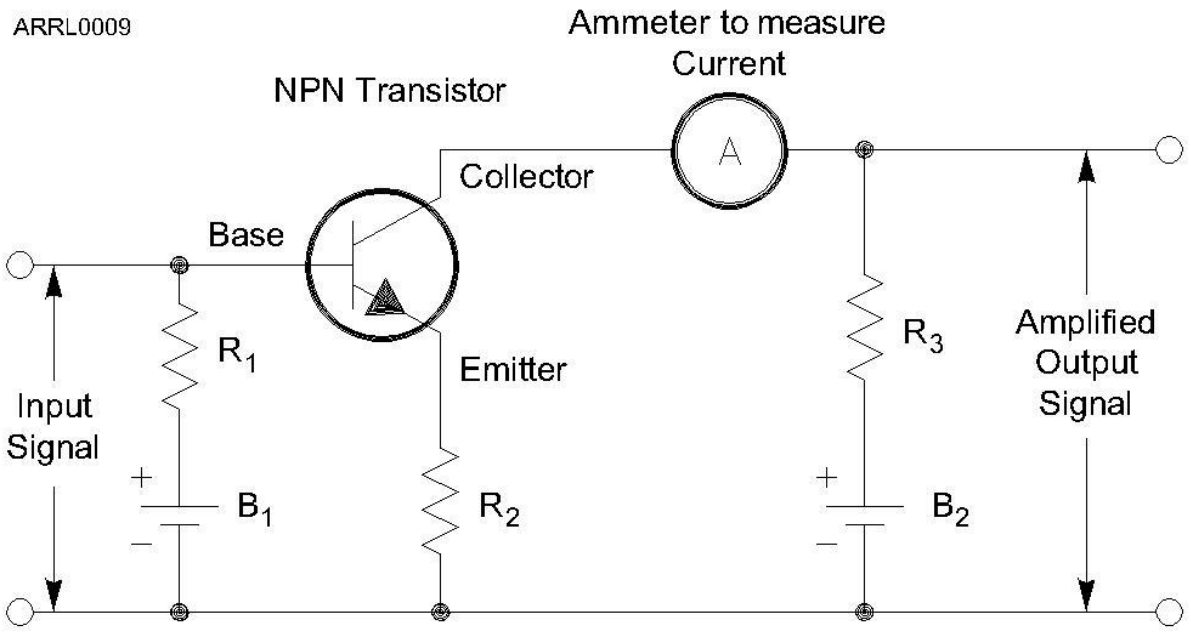
- **Fuses and circuit breakers are designed to interrupt the flow of current** if the current becomes uncontrolled.
  - **Fuses blow** – one time protection.
  - **Circuit breakers trip** – can be reset and reused.

- Circuit Symbol

# Other Circuit Symbols



# Putting It All Together in a Circuit Diagram



# What is the ability to store energy in an electric field called? (T5C01)

* A. Inductance
* B. Resistance
* C. Tolerance
* D. Capacitance

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* A. The farad
* B. The ohm
* C. The volt
* D. The henry

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* B. Capacitance
* C. Resistance
* D. Inductance

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# What is the basic unit of inductance? (T5C04)

* A. The coulomb
* B. The farad
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# What electrical component is used to oppose the flow of current in a DC circuit? (T6A01)

* A. Inductor
* B. Resistor
* C. Voltmeter
* D. Transformer

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# What type of component is often used as an adjustable volume control? (T6A02)

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# What electrical parameter is controlled by a potentiometer? (T6A03)

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* B. Resistance
* C. Capacitance
* D. Field strength

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# What electrical component stores energy in an electric field? (T6A04)

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* C. Inductor
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# What type of electrical component consists of two or more conductive surfaces separated by an insulator? (T6A05)

* A. Resistor
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* C. Oscillator
* D. Capacitor

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# What type of electrical component stores energy in a magnetic field? (T6A06)

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* B. Capacitor
* C. Inductor
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# What electrical component is usually composed of a coil of wire? (T6A07)

* A. Switch
* B. Capacitor
* C. Diode
* D. Inductor

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# What electrical component is used to connect or disconnect electrical circuits? (T6A08)

* A. Zener diode
* B. Switch
* C. Inductor
* D. Variable resistor

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# What electrical component is used to protect other circuit components from current overloads? (T6A09)

* A. Fuse
* B. Capacitor
* C. Shield
* D. Inductor

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# What class of electronic components is capable of using a voltage or current signal to control current flow? (T6B01)

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# What electronic component allows current to flow in only one direction? (T6B02)

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# Which of these components can be used as an electronic switch or amplifier? (T6B03)

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# Which of these components is made of three layers of semiconductor material? (T6B04)

* A. Alternator
* B. Bipolar junction transistor
* C. Triode
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* B. Variable resistor
* C. Electrolytic capacitor
* D. Multi-cell battery

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# How is a semiconductor diode's cathode lead usually identified? (T6B06)

* A. With the word "cathode"
* B. With a stripe
* C. With the letter "C"
* D. All of these choices are correct

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# What does the abbreviation “LED” stand for? (T6B07)

* A. Low Emission Diode
* B. Light Emitting Diode
* C. Liquid Emission Detector
* D. Long Echo Delay

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# What does the abbreviation “FET” stand for? (T6B08)

* A. Field Effect Transistor
* B. Fast Electron Transistor
* C. Free Electron Transition
* D. Field Emission Thickness

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# What are the names of the two electrodes of a diode? (T6B09)

* A. Plus and minus
* B. Source and drain
* C. Anode and cathode
* D. Gate and base

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# Which semiconductor component has an emitter electrode? (T6B10)

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# Which semiconductor component has a gate electrode? (T6B11)

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# What is the term that describes a transistor's ability to amplify a signal? (T6B12)

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* B. Forward resistance
* C. Forward voltage drop
* D. On resistance

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# What is the name for standardized representations of components in an electrical wiring diagram? (T6C01)

* A. Electrical depictions
* B. Grey sketch
* C. Schematic symbols
* D. Component callouts

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# Which of the following is accurately represented in electrical circuit schematic diagrams? (T6C13)

* A. Wire lengths
* B. Physical appearance of components
* C. The way components are interconnected
* D. All of these choices are correct

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# Which of the following devices or circuits changes an alternating current into a varying direct current signal? (T6D01)

* A. Transformer
* B. Rectifier
* C. Amplifier
* D. Reflector

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# Which best describes a relay? (T6D02)

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# Which of the following can be used to display signal strength on a numeric scale? (T6D04)

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* C. Meter
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# What component is commonly used to change 120V AC house current to a lower AC voltage for other uses? (T6D06)

* A. Variable capacitor
* B. Transformer
* C. Transistor
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# Which of the following is commonly used as a visual indicator? (T6D07)

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# Which of the following is used together with an inductor to make a tuned circuit? (T6D08)

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# What is the name of the device that combines several semiconductors and other components into one package? (T6D09)

* A. Transducer
* B. Multi-pole relay
* C. Integrated circuit
* D. Transformer

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# What is the purpose of a fuse in an electrical circuit? (T0A04)

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* B. To interrupt power in case of overload
* C. To limit current to prevent shocks
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# Why is it unwise to install a 20-ampere fuse in the place of a 5 ampere fuse? (T0A05)

* A. The larger fuse would be likely to blow because it is rated for higher current
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