

### Electrical Wiring 101

**Understanding Circuitry Basics**

- An electrical circuit is a closed path through which electricity can flow from a source through a hot wire to the device to be powered and then back to the source again through a neutral wire. Along the circuit there may be fixtures, receptacles, and/or switches (protected by housing boxes), connected by either parallel or series wiring.

Wiring may be routed in any of several different ways. For example, the cable for a switch may run through a switch box and then on to the light, or it may run through the light to the switch box via a "switch loop." Other wires may run through either the switch box or the housing box or both, un-switched, on their way to powering different devices down the line.

- Switch wiring**  
Switches, which are installed on hot wires, allow or disallow the flow of current to a light or other device. A knife-blade switch illustrates the position of the switch when it completes a circuit, allowing electricity to power a device. The drawing below it illustrates the position of the switch when it interrupts the flow of current from the hot bus bar, disallowing the flow of electricity to power a device.

- Series wiring**  
This type of wiring is rarely used anymore because it operates along the same principle as old-style Christmas lights (see the drawing below)—when one light burned out, no lights on the string would illuminate. Series wiring routes the hot wire through several devices and then joins the neutral wire, which leads back to the source.

Read and discuss the material on this page. Use the picture to reinforce the text.      Read and discuss the material on this page. Use the picture to reinforce the text.



- The three basic kinds of plugs are: self-connecting, terminal-screw, and three-prong. Lamps and small appliances mostly use self-connecting plugs. The prongs clamp onto the wires of the cord, making an automatic connection. These plugs do not meet National Electrical Code standards.

With terminal-screw plugs, the wires attach to screws inside the cord body; this type of plug is usually found on older appliances. An older terminal-screw plug often has a removable insulating disk covering the terminals and wires. Newer plugs have rigid insulating barriers.

Three-prong plugs are used for larger appliances such as washers, dryers, refrigerators, and power tools, and include a prong that grounds the appliance. When planning where you are going to place a large appliance, be sure you have the appropriate kind of outlet available, or plan to install one. Grounded outlets are required to be installed.

- The two most common types of single conductor wires are THW and THWN/THHN, which are protected by metal or plastic sheathing. The wires themselves can be either solid or stranded. Solid-core wire produces the best connections, but its stiffness makes it more difficult than stranded wire to route through conduit. You can purchase wire by the foot or in spools that range from 50 to 500 feet. Depending on your installation, make sure to check the rating for indoor or outdoor application as well as for temperature tolerance (some wire can withstand heat up to 167 degrees Fahrenheit).

The most common multi-conductor cable is made from metal or plastic and contains a neutral wire, a "hot" wire (or two), and a grounding wire. The neutral and hot wires are insulated by a thermoplastic material; the grounding wire may or may not be insulated. The wires are color-coded to guard against connection errors. Neutral wires are white or gray, grounding wires are green, and hot wires are any other color.

**SINGLE-CONDUCTOR WIRES**  
Solid-core wire  
Stranded wire

**MULTICONDUCTOR CABLES**  
Type NM (nonmetallic sheathed) cable "12-2"  
For interior circuits, installed behind walls, ceilings, floors  
Hot wire  
Neutral wire  
Separation material  
Grounding wire

Type NM (nonmetallic sheathed) cable "14-3"  
For interior circuits, contains two hot wires  
Neutral wire  
Grounding wire  
Hot wires

Read and discuss the material on this page. Use the picture to reinforce the text. Discuss the wires shown here and then explain that the third one from the top is commonly called "Romex" which is, or was, a common brand of NM wire. It is very commonly used in homes.