

Knowledge Domain: Electrical Simple
Unit: Connections
Skill: Wire Nuts

Tools and Parts Required:

- 1) 2-4 Wire nuts
- 2) Pliers
- 3) Wire cutters
- 4) Wire strippers
- 5) Continuity Tester or Multimeter
- 6) Solid and stranded wire
- 7) 2 power cords without plugs

Introduction

Sometimes, an electrical connection is necessary, but soldering is not an option. Wire nuts are small plastic pieces with a metal spring inside. Wire nuts are also known as twist-on wire connectors. Two or more wires can be inserted into the nut to make an electrical connection.

Example

Below is a photograph of a power cord before and after connection to the power source using wire nuts:



Identification and Diagnosis

Wire nuts are used for making electrical connections between wires. Wire nuts are made in different colors. The colors indicate different sizes. Colors will vary depending on the manufacturer. Wire nuts can connect solid or stranded wires. Wire nuts can connect many wires together.

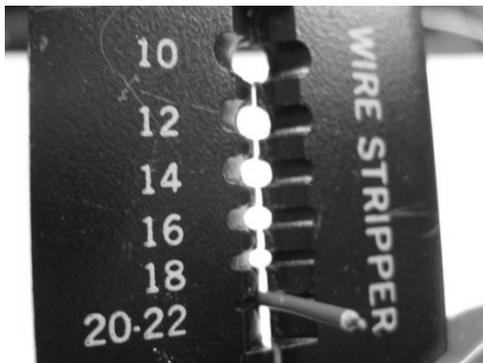
Below are pictures of wire nuts connecting 2, 4, and 8 wires.



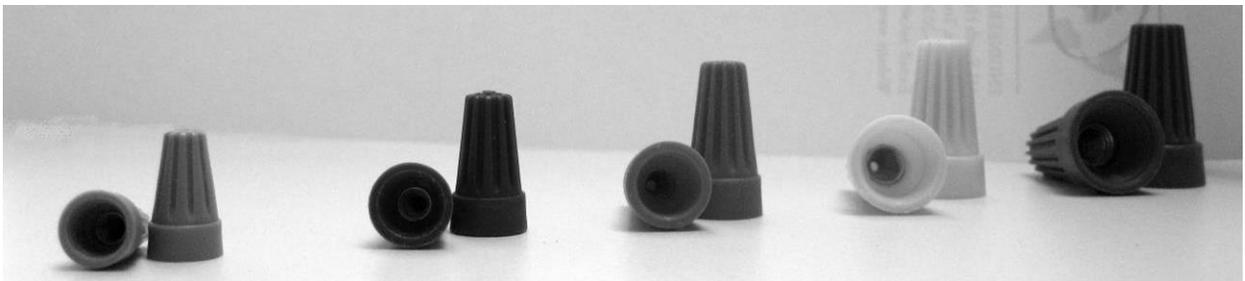
Procedure

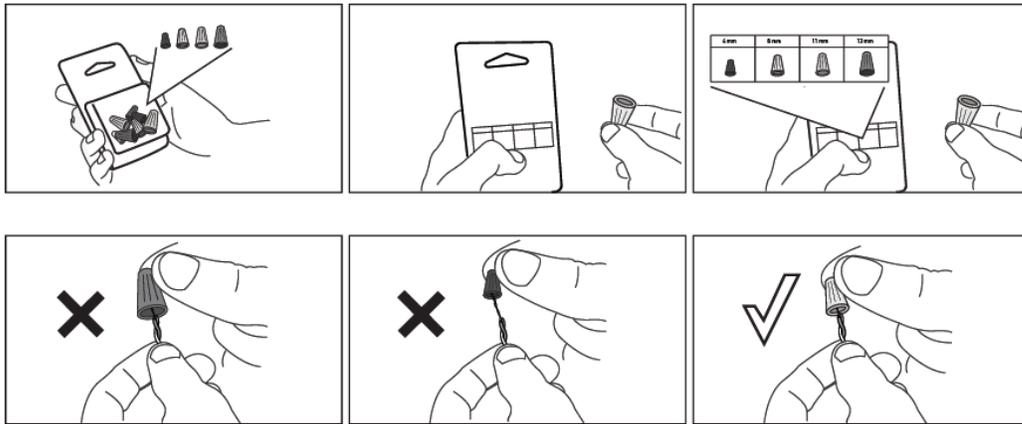
Both solid and stranded wires can be connected using wire nuts.

1. Measure the size of the wires you are connecting. Use a wire gauge or wire strippers to size the wires.



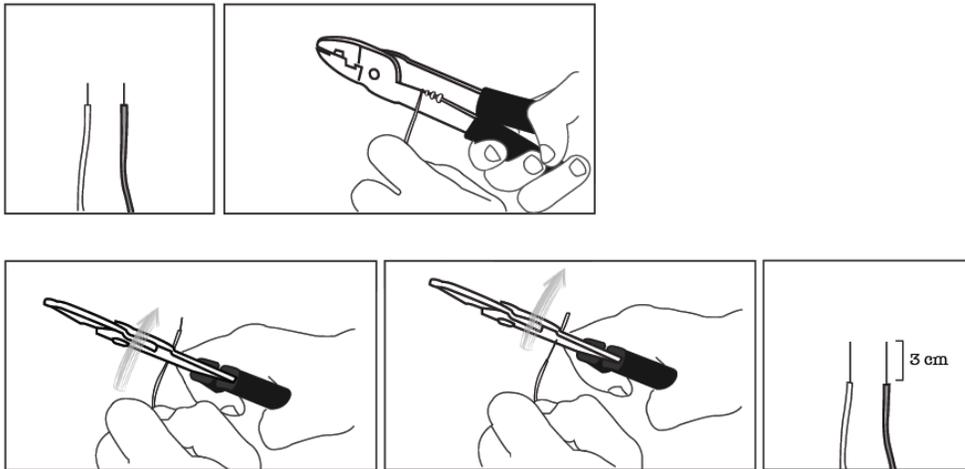
2. Select the correct wire nut size based on the wire gauges. Wire nuts are often color-coded to indicate size. Not all coding is identical. Usually, the wire nut package lists the size range of wires that can be used with the wire nuts. Verify the size requirements of the wire nut before using. If you are connecting more wires, you will need a larger wire nut. A wire nut that is too large will not grip the wires. A wire nut that is too small will not allow for adequate connection.



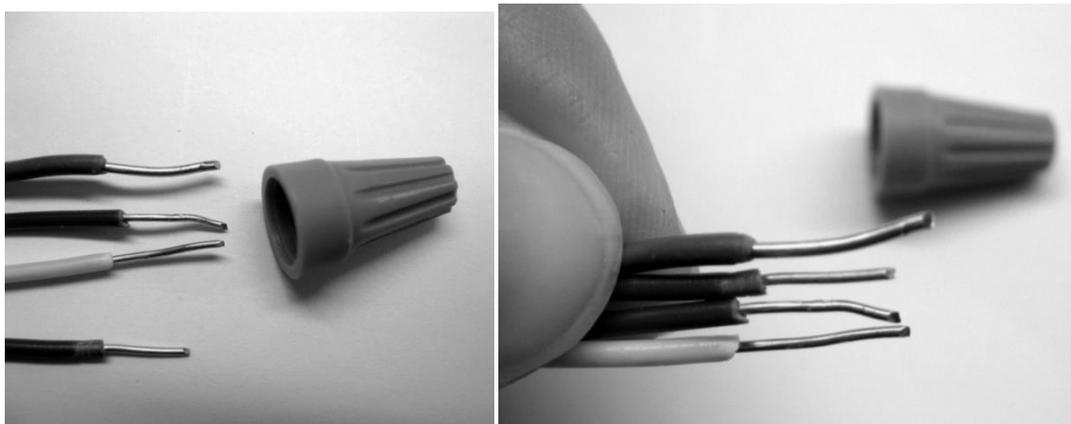


Select the correct size of wire nut

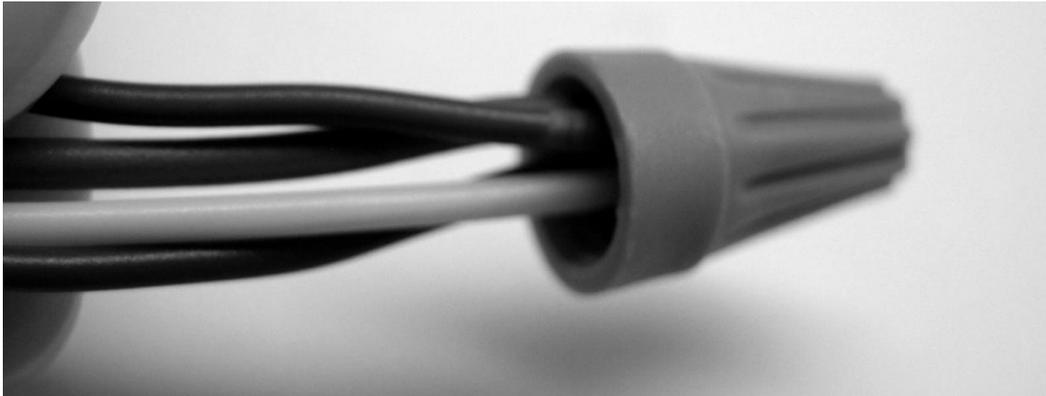
- Strip the ends of the two wires to be connected. Strip off at least 1 centimeter of insulation. Strip more if you are connecting more than 2 wires. Sometimes you may need to connect solid wire and stranded wire. Strip $\frac{1}{2}$ cm more on stranded wires than on solid wires.



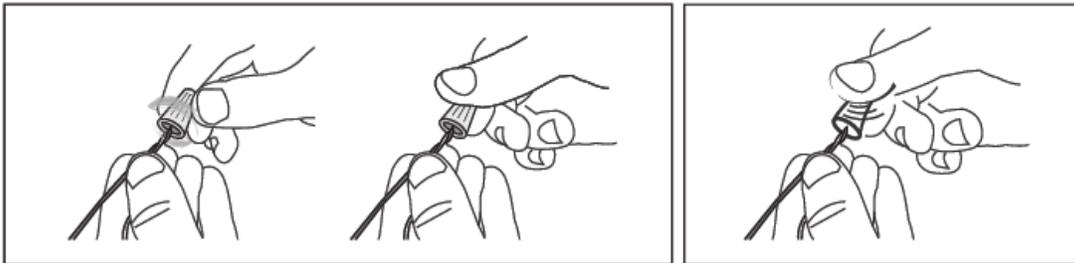
- Hold the wire ends parallel (side-by-side).



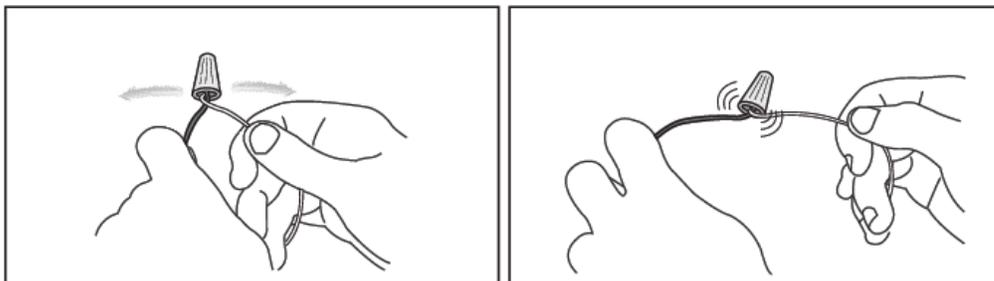
5. Place the wire nut over the bare ends of the wires. Push wires as far as possible into the wire nut.



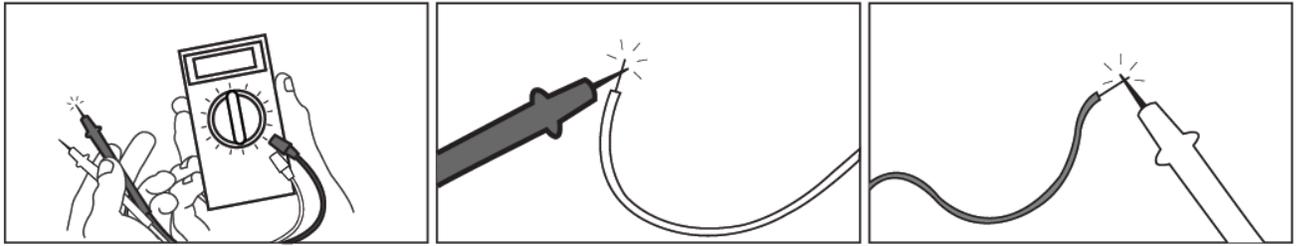
6. Push firmly as you twist the nut clockwise.



7. Pull on each wire to ensure that it is secure.



8. Verify the electrical connections with a multimeter or continuity tester.



9. Wire nuts can be easily removed. Twist the wire nut counterclockwise. Pull the wires out.



Exercise

Practice using wires to connect different types of wires using wire nuts. Be sure to connect all three combinations: (1) solid to solid, (2) stranded to stranded, and (3) solid to stranded wire. Try connecting multiple wires. Verify electrical continuity using a continuity tester or multimeter.

Optional Lab Exercise:

This exercise will use wire nuts to connect two cables. Your instructor will provide you with two cables that have equal number of conductors. These cables may be power cords, extension cords, or other cables from broken medical equipment. Using 2 wire nuts (3 if the cord is grounded), connect the ends of the conductors. Verify the electrical connection using a continuity tester or multimeter.

Your instructor must verify your work before you continue.

Preventative Maintenance and Calibration

Wire nuts should only be used for electrical connections. Wire nut connections do not create mechanical connections.

It can be difficult to connect stranded wires. Strip a longer length of wire to ensure a secure connection when using stranded wire.

Poor electrical connections and even fire can result from bad connections. Always verify electrical connections before returning medical devices to use.