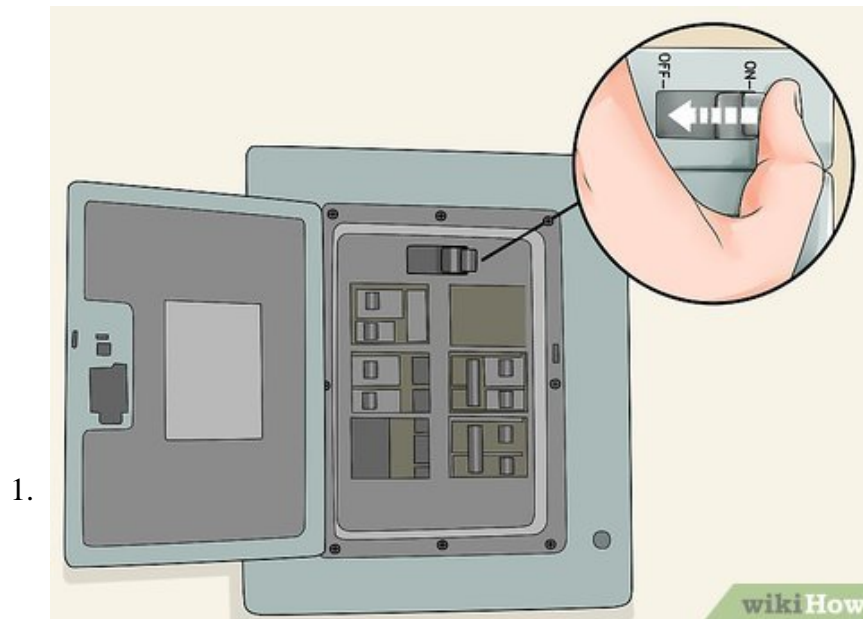


# How to Wire a Breaker Circuit

A breaker automatically turns off power to whatever is connected to it if the electrical load is too large. If you're installing outlets or an appliance that you aren't attaching to another circuit, you'll need to put a new breaker on your...

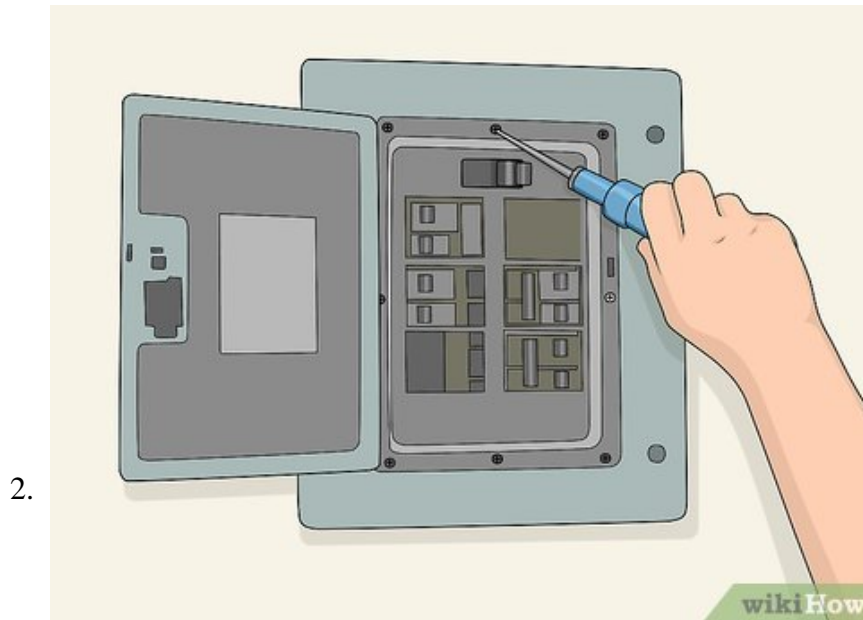
Method 1 of 4:

## Accessing the Breaker Panel



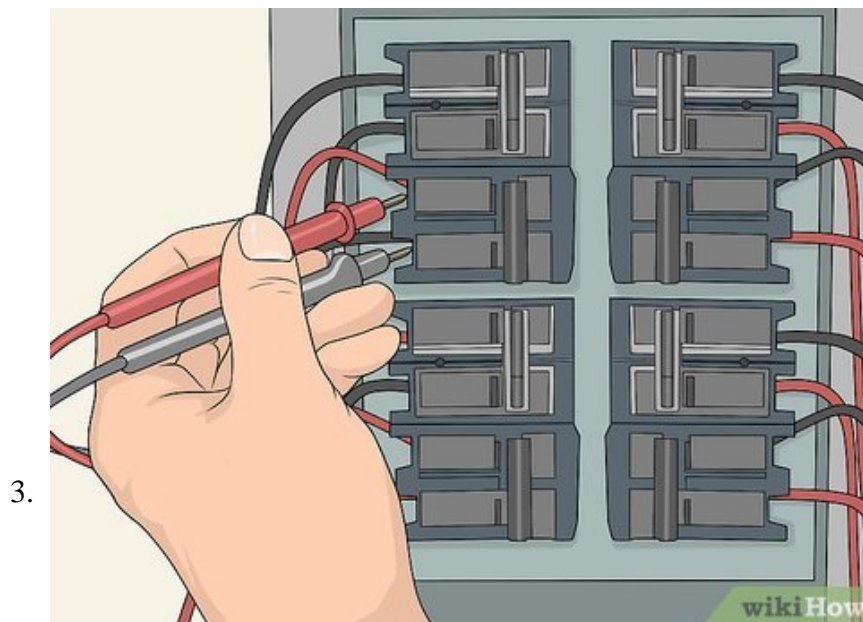
**Turn off the main power to the breaker box.** Locate the metal breaker box in your home, which is usually in a basement, kitchen, or hallway. Open the main door on the breaker box and look for a single switch on the top or side labeled 'Main' or 'Power.' Flip the switch into the Off position to shut off all of the electricity in your home. Once you turn off the power off, the breaker box will be safe to work in.<sup>[1]</sup>

1. You won't be able to use any electricity or outlets while you're installing the breaker.
2. Use a flashlight or a battery-powered light while you're working so you can still see.



**Unscrew the panel cover to access the breakers.** Locate the 6–8 screws along the edges of the breaker box's front panel. Turn the screws counterclockwise with a screwdriver to loosen them. Support the bottom of the panel cover as you remove the screws so it doesn't fall off. Carefully lower the panel cover and set it on the ground once you remove all of the screws.<sup>[2]</sup>

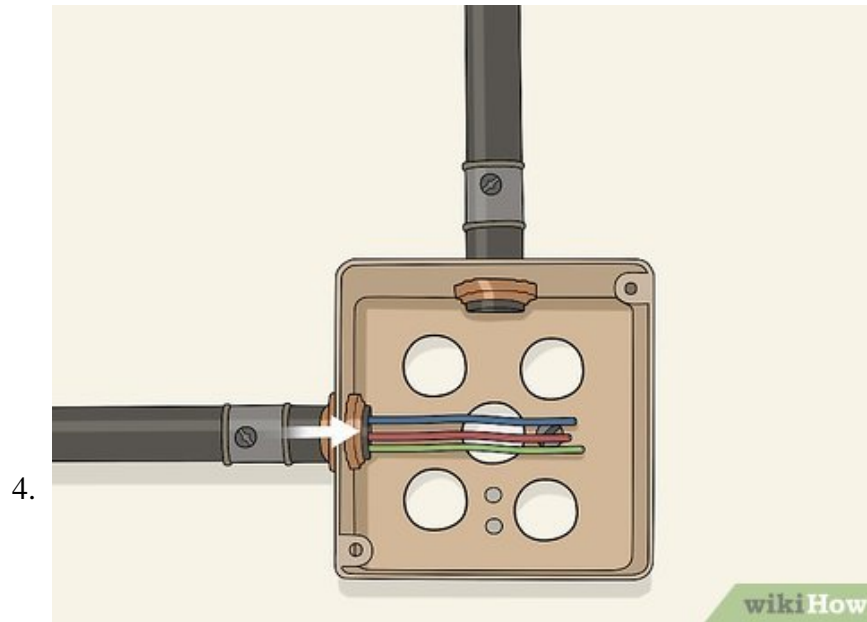
1. Don't remove the panel cover without turning off the power first. There are many exposed wires underneath the panel that could shock or electrocute you.



**Test for voltage on the wires using a multimeter.** Set the multimeter so it measures voltage, and turn the upper limit as high as you're able to. Touch the end of the black probe against the metal bar that has green or bare wires running to it. Press the end of the red probe against one of the black terminal screws on a breaker and check the meter's reading. If the reading is anything other than 0, call an electrician since there's still power running through the breakers.<sup>[3]</sup>

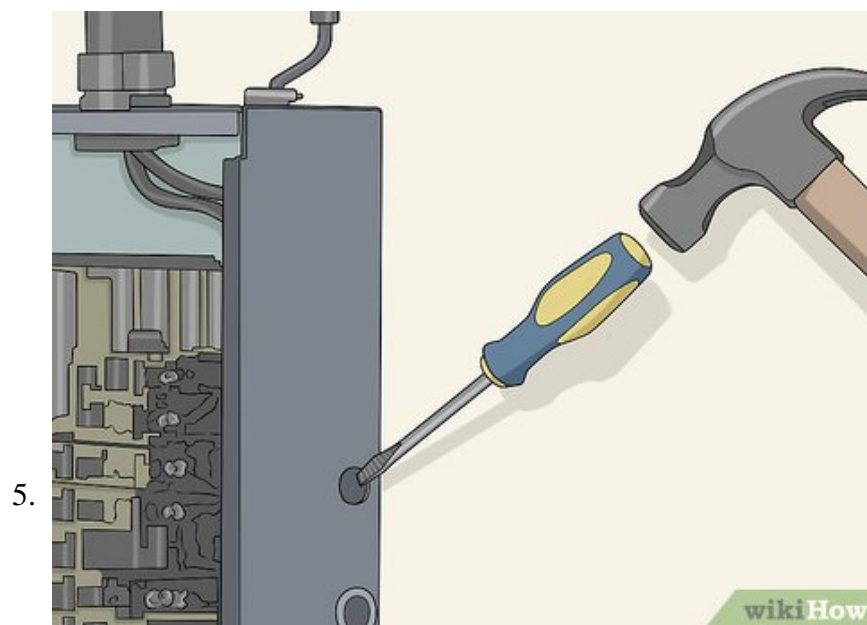
1. Never work on your breaker box while there's still power running.

**Warning:** The main lugs, which are 2 screws attached to a red and black wire near the main power switch, usually stay live even when the power is turned off. Do not touch the main lugs, or else you could suffer from severe electrocution or death.



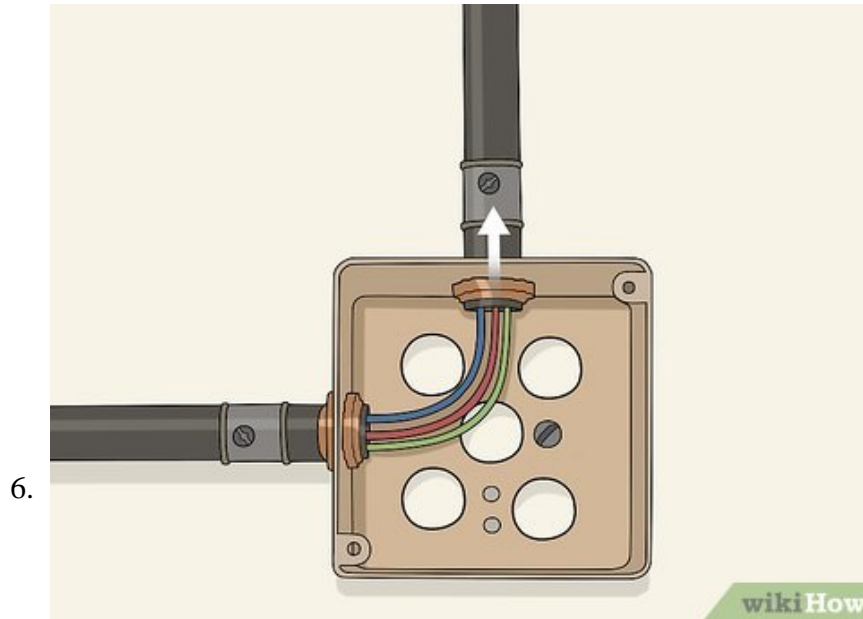
**Run wire conduit from the receptacle to the circuit box.** The type of wire conduit depends on the receptacle you're installing. If you're using a single-pole circuit breaker, then you can use a 14/2 conduit, which has 3 wires that are a 14-gauge diameter. Use a 12/2 wire conduit for a double-pole breaker for appliances or a GFCI breaker, which has 3 wires that are a 12-gauge diameter. Fish the wires through your walls so they end next to your breaker box.<sup>[4]</sup>

1. You can buy wire conduits from your local hardware store.



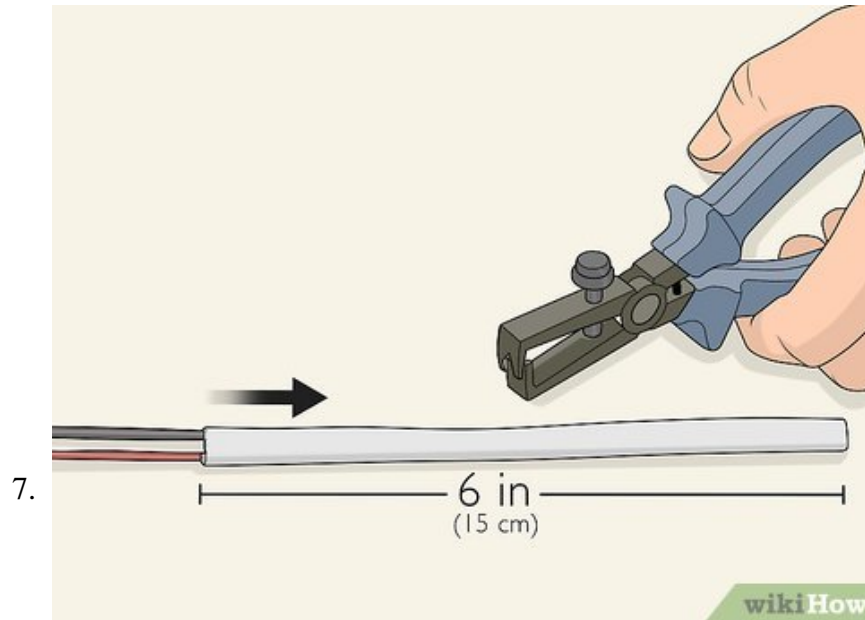
**Remove a circular knockout out from the side of the box closest to the conduit.** Look along the side or top of your breaker box to find perforated circles, also known as knockouts. Choose an empty knockout that's closest to the wire conduit running to the receptacle. Place the edge of your screwdriver against one of the knockouts and lightly tap on the handle with a hammer. Continue hitting the screwdriver until the knockout breaks off of the side.<sup>[5]</sup>

1. Place a layer of cardboard behind the knockout if you don't want to risk damaging any of the other breakers.
2. Don't use the same knockout for multiple sources since you could easily confuse what the wires attach to.
3. If there aren't any knockouts left on your breaker box, you can drill a hole through the side of the box where you want to feed the wires.



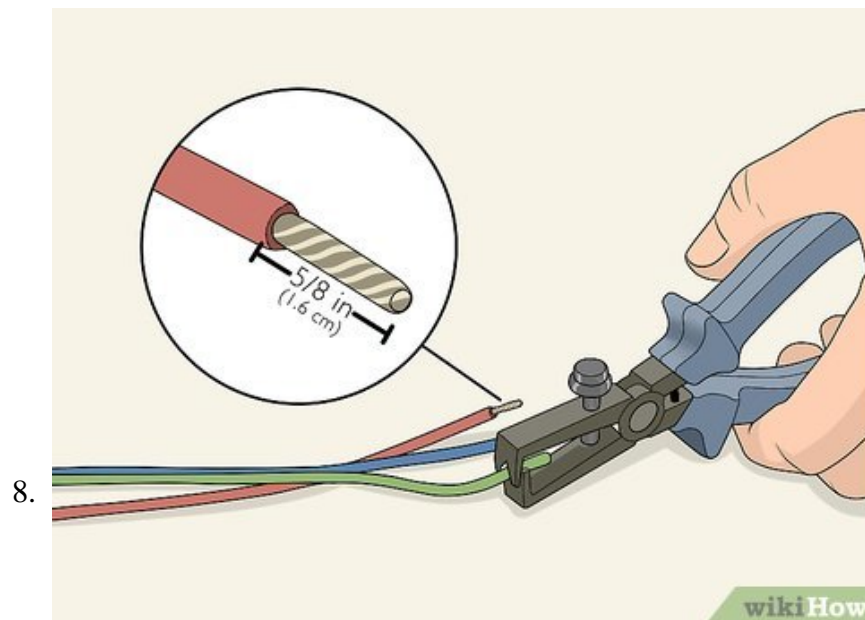
**Run the wire conduit into the circuit box through the hole and secure it in place.** Feed the end of the wire conduit through the knockout hole so you have about 8–10 inches (20–25 cm) inside of the breaker box. Secure the wire inside of the box by wrapping a wire clamp around the knockout hole so it can't pull out on its own.<sup>[6]</sup>

1. You can buy wire clamps from your local hardware store.



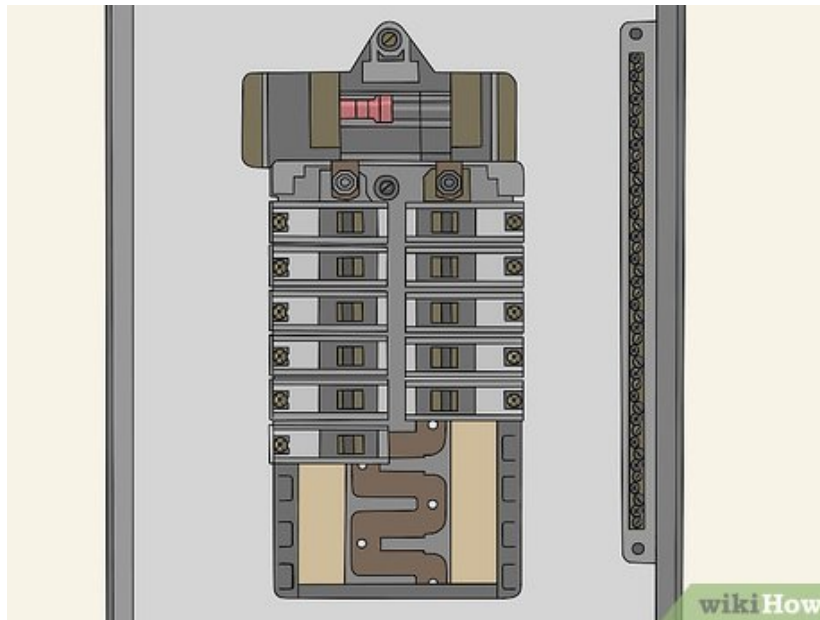
**Strip 6 in (15 cm) the insulation off the wire.** Grip the outside of the wire conduit with a pair of wire strippers so they're 6 inches (15 cm) from the end. Squeeze the handles of the wire strippers together as tightly as you can to clamp onto the insulation. Pull the strippers toward the end of the wire to remove the insulation. Depending on the conduit, you will either see 3 or 4 wires that were hidden inside.<sup>[7]</sup>

1. If you don't have a pair of wire strippers, you can also slice through the insulation with a utility knife. Be careful not to cut through any of the wires inside the conduit.



**Remove  $\frac{5}{8}$  in (1.6 cm) of the internal wires' insulation.** The wires inside the conduit will each have a layer of insulation around them. Grip the wire between the jaws of your wire strippers so it's  $\frac{5}{8}$  inch (1.6 cm) from the end and squeeze the handles together. Pull the strippers toward the end of the wire to remove the insulation.<sup>[8]</sup>

9.

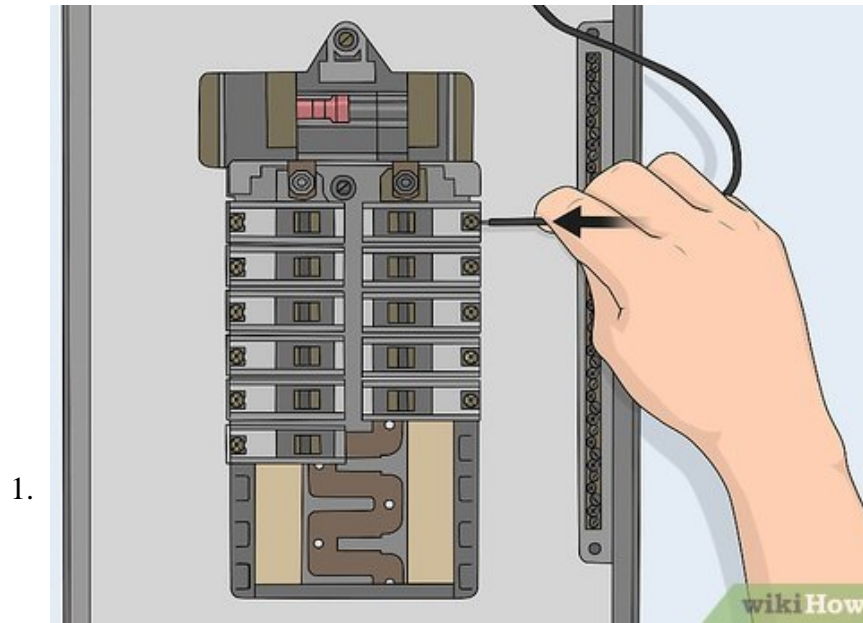


**Press the circuit breaker onto the bus bar to secure it.** Make sure the new breaker you buy matches the current and voltage of what you need for the receptacle. Look for an empty place for the new breaker along the bus bars, which are the metal clips on the back of the box that the breakers attach to. Line up the hook on the breaker with the metal tab on the bus bar and firmly press the breaker until you hear it click into place.<sup>[9]</sup>

1. You can buy new circuit breakers from your local hardware store.
2. The breaker will only stay secured if it's installed the right way. If the breaker doesn't click or it falls out, then try repositioning it along the bus bar.
3. Make sure the breaker switch is in the Off position before you click it into place.

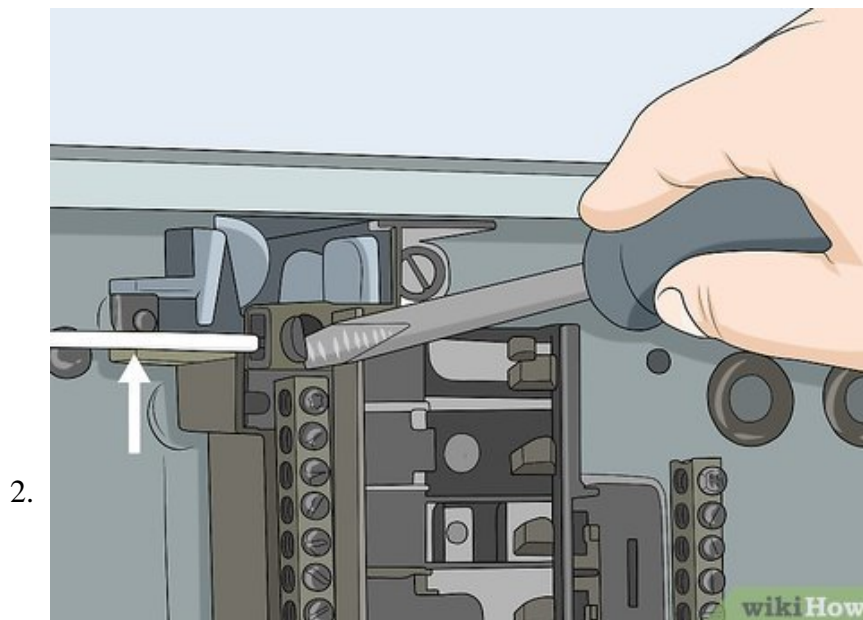
Method 2 of 4:

## Connecting a Single-Pole Circuit



**Push the end of the black wire into the 'hot' port on the breaker.** Locate the black wire that's running into your breaker box from the hole you knocked out. Take the end of the black wire and feed it into the port on the breaker labeled 'hot' or 'power' as far as you're able to. Use a screwdriver to tighten the screw over the port to secure the wire to the breaker.<sup>[10]</sup>

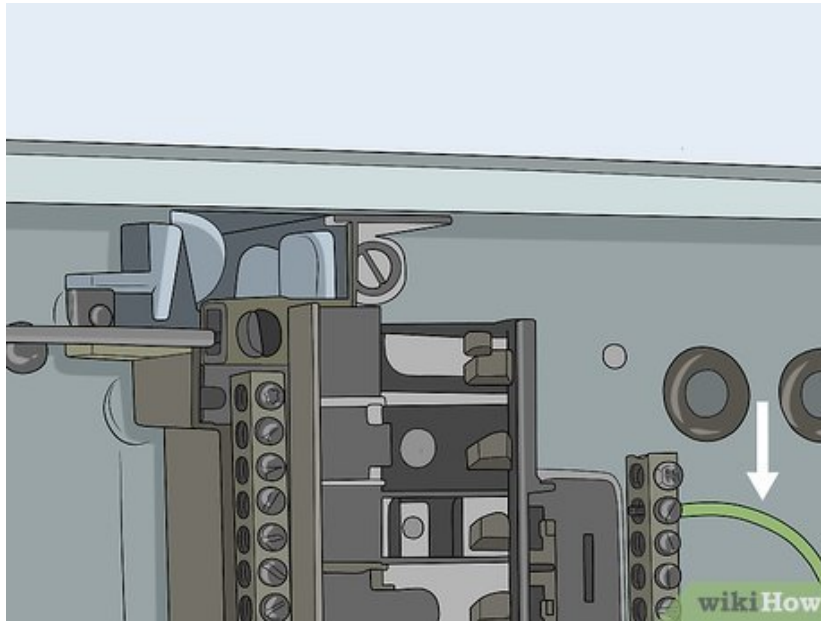
1. A single-pole circuit will only have 1 port and 1 screw.
2. The black wire will have full current and voltage running through it when you turn the power on.



**Secure the end of the white wire to a screw on the neutral bar.** The neutral bar is a metal terminal inside your breaker box with multiple screws attached to other white wires. Turn one of the empty screws counterclockwise on the neutral bar to loosen it and slide the end of the white wire underneath it. Tighten the screw again to secure the wire in place so it doesn't move around.<sup>[11]</sup>

1. The neutral bar helps keep the current balanced so it's less likely to overload.

3.



**Attach the green wire to an empty screw on the ground bar.** Locate the ground bar, which is usually painted green and has multiple screws with other green or bare wires attached to them. Loosen one of the empty screws on the ground bar and slide the end of the green wire under the screw head. Turn the screw clockwise to tighten it and connect the ground wire.<sup>[12]</sup>

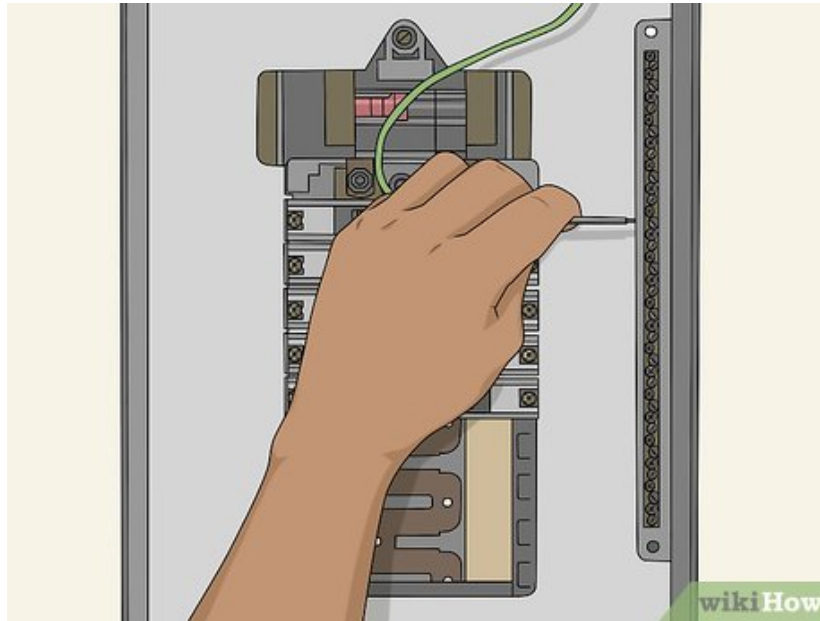
1. The ground wire may not have any insulation on it.
2. The ground wire helps protect your electronics in case of a power surge by directing the current to a grounded point.

**Warning:** Don't attach the ground wire to a terminal screw that already has another wire attached to it since you could damage the other wires.

Method 3 of 4:

## Wiring a Double-Pole Appliance Breaker

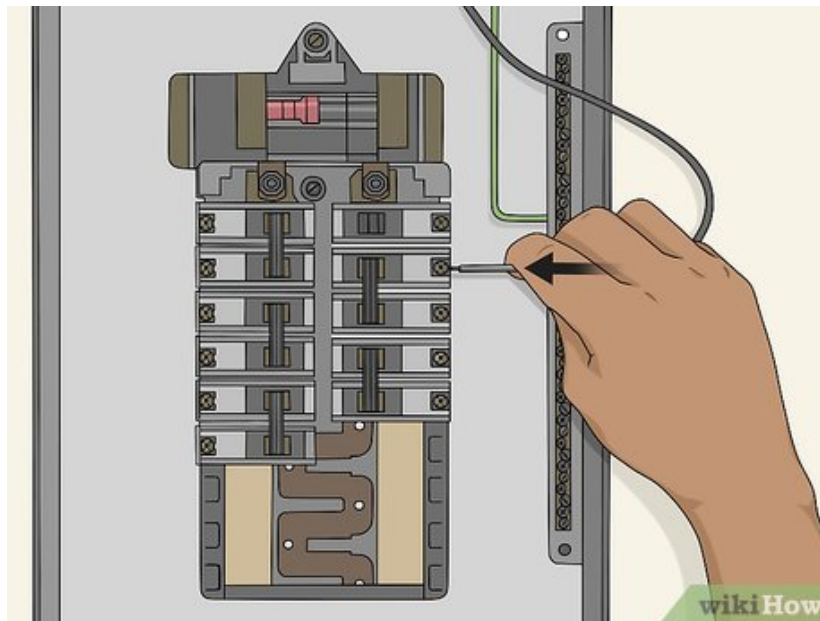
1.



**Run the green wire to a terminal screw on the ground bar.** Locate the bar on the side or bottom of the breaker box that has multiple screws with green and bare wires attached to them. Loosen an empty screw along the ground bar so you can slide the end of the green wire underneath it. Tighten the screw by turning it clockwise so the wire doesn't pull out of place.<sup>[13]</sup>

1. The ground wire inside the conduit may not have insulation.

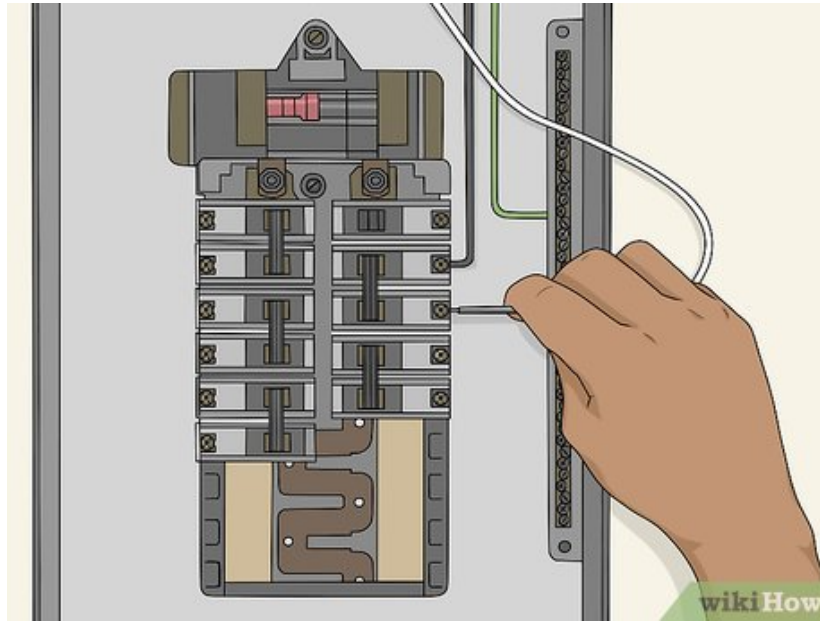
2.



**Attach the black wire to either port on the breaker.** A double-pole breaker has 2 hot ports that supply power to an appliance or heavy-duty receptacle. Feed the end of the black wire into one of the ports on the breaker so it goes underneath the screw. Turn the screw clockwise to secure the wire in the port so it doesn't fall out. Lightly tug the wire to make sure it doesn't come undone.<sup>[14]</sup>

1. If the wire doesn't push into the port on the breaker, you may need to loosen the screw above the port first.

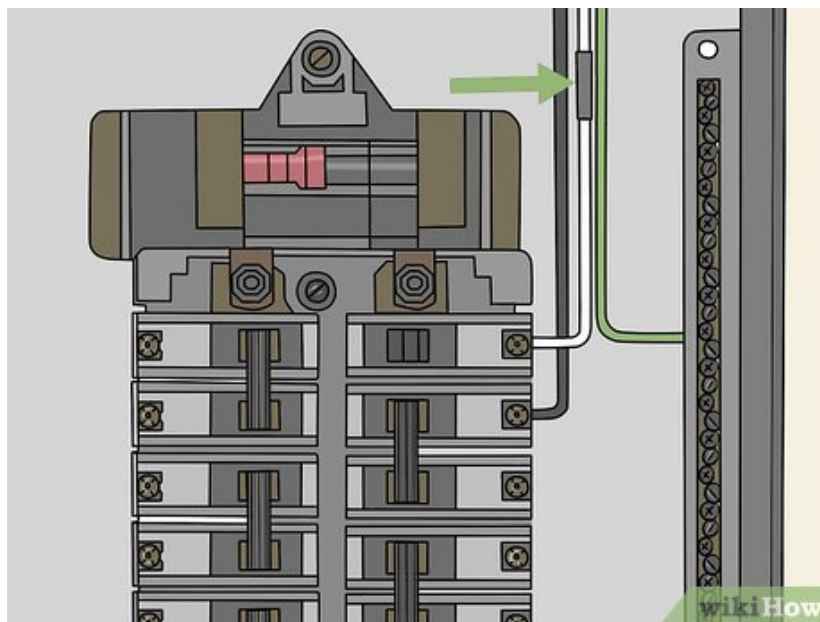
3.



**Connect the white wire to the second port.** Unlike a single-pole breaker, the white wire carries full power back to the receptacle rather than being neutral. Locate the second port on the breaker, which is usually right next to the first one, and feed the white wire into the port. Tighten the screw over the port so the wire stays in place.<sup>[15]</sup>

1. The wire conduit may instead contain a red wire instead of a white one. Use the red wire in the second port if that's the case.

4.



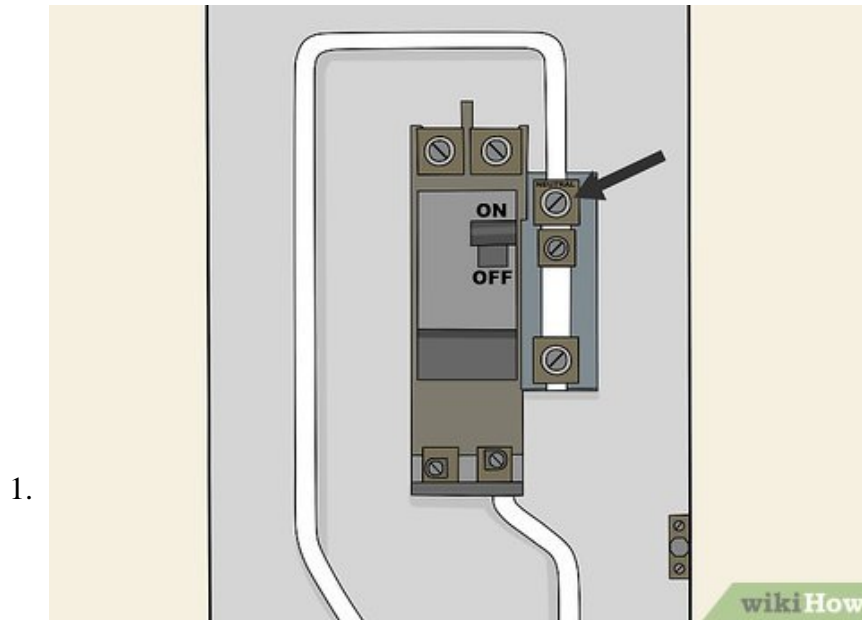
**Put electrical tape around the white wire to mark it as hot.** Since white wires are normally neutral, you need to mark it so you know that it's hot on the breaker. Wrap a piece of electrical tape about 1 inch (2.5 cm) away from where it attaches to the breaker so you can easily tell that it's hot. Press the tape firmly onto the wire so it doesn't fall off.<sup>[16]</sup>

1. If the wire was red, you don't need to mark it with tape.

**Tip:** Mark the white wire inside the receptacle or outlet with tape as well so you can easily tell which wires are hot on either end.

Method 4 of 4:

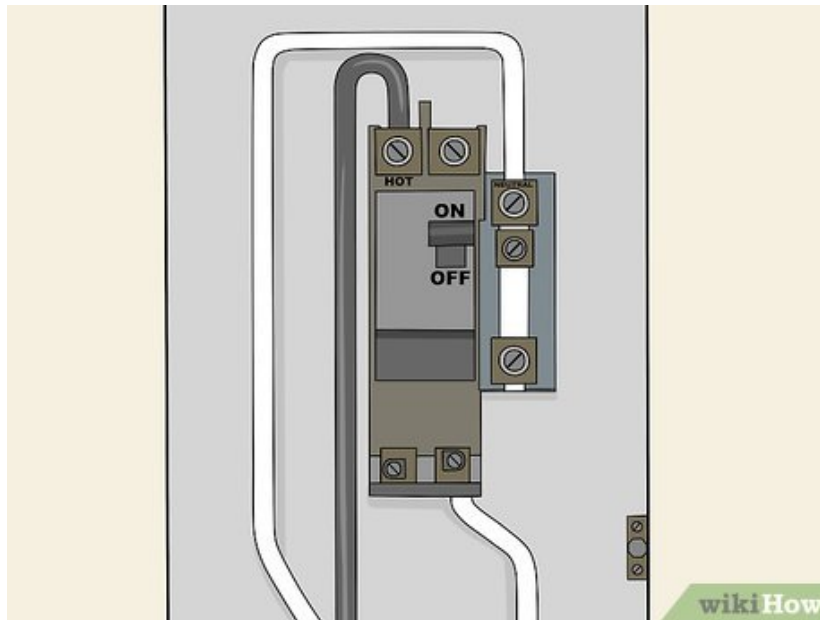
## Installing a GFCI Breaker



**Attach the white wire to the breaker port labeled 'Neutral.'** The neutral port on a GFCI breaker usually has a silver screw above it and is clearly labeled. Feed the end of the white wire from the conduit so the exposed end is completely in the port. Turn the screw clockwise to secure it so it can't get pulled out.<sup>[17]</sup>

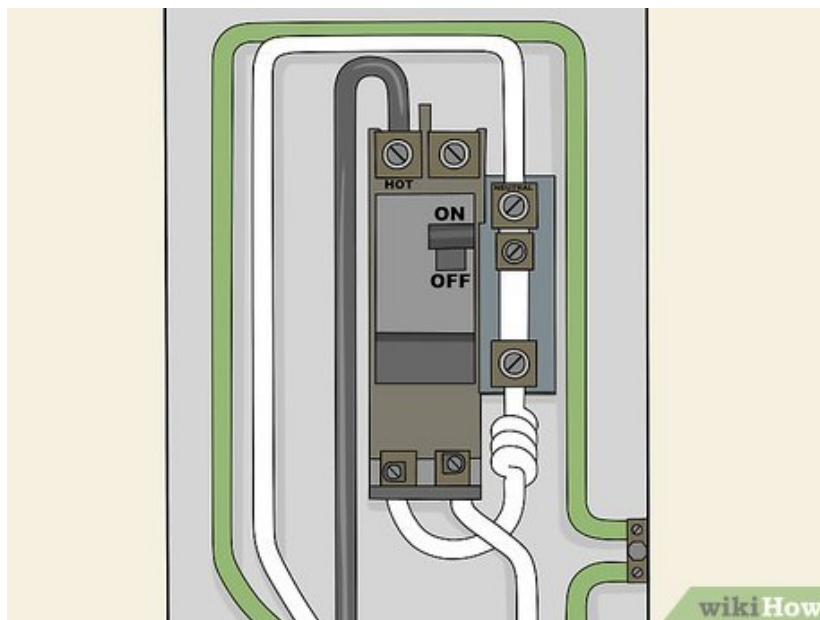
1. You don't need to attach the white wire from the conduit to the neutral bar.
2. You do not have to label or mark the white wire since it's still plugged into a neutral port on the breaker.

2.



**Secure the black wire in the port labeled 'Hot' or 'Power.'** Look for a black screw on the breaker and find the port that's directly underneath it. Place the exposed end of the black wire in the port and tighten the screw to make a firm connection. Give the wire a light tug to make sure it doesn't slip out from the port.<sup>[18]</sup>

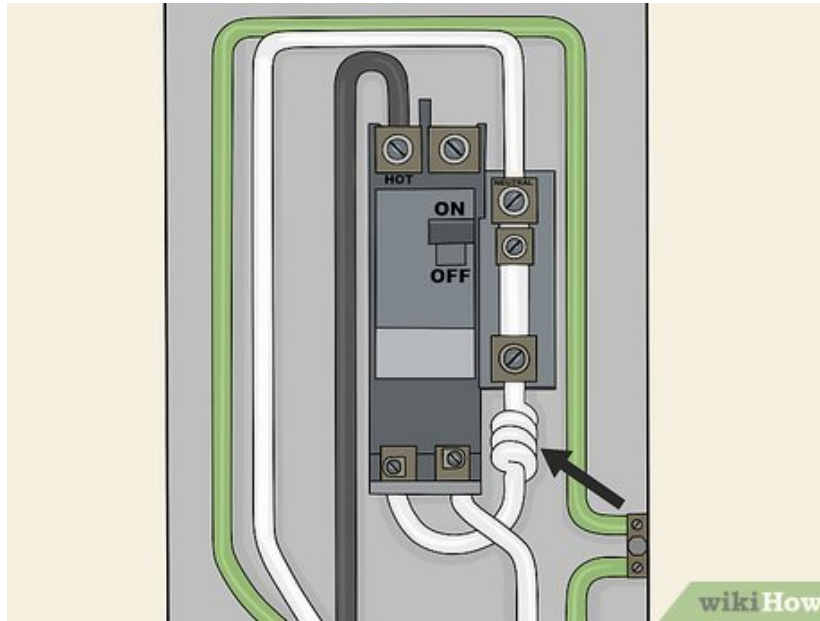
3.



**Run the green wire to a screw on the ground bar.** Locate the bar inside your breaker box that has a row of screws attached to green or bare wires. Loosen one of the empty screws on the bar so you're able to slide the green wire from the conduit underneath. Use your screwdriver to tighten the screw again so the wire holds securely underneath it.<sup>[19]</sup>

1. The ground wire from the conduit may be bare rather than having green insulation.

4.



**Connect the white pigtail wire to a screw on the neutral bar.** GFCI breakers have a curly white wire attached to them that's used to carry neutral current. Locate the bar inside of the breaker box that has a row of screws connected to multiple white wires. Unscrew an empty screw on the neutral bar and position the end of the pigtail wire underneath the head. Turn the screw clockwise to tighten it and secure the wire.<sup>[20]</sup>

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