

nal screw on the right side of the outlet. (Be careful not to touch the terminals with your fingers or any part of your hand.) You should read about 120 volts ac on the meter. If you do, repeat step “4” or “5” above. If you do not measure voltage at the slots of the outlet, but you do measure voltage at the terminals, the outlet is damaged and should be replaced. Turn OFF the power at the panel before replacing the outlet.

7. Where To Go From Here.

Hopefully by now you have found and fixed the problem. However, if you still do not measure any voltage at the terminal screws on the sides of the outlet, the problem is likely either in the wiring, or the circuit breaker. You should contact a qualified, licensed electrician to troubleshoot and repair the wiring. You can also read the booklet “*How to Troubleshoot Circuit Breakers*” for information on things you can do to check the circuit breaker.



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Electrical #1

Meterman How-to Test it Yourself

Electrical outlets

Problem:

Have you ever plugged a radio or lamp into the wall only to find it didn't work? Your natural reaction may be to assume the radio is broken, but it could also be a faulty outlet, a tripped circuit breaker, broken wiring, or some other failure.

Task Summary:

This booklet will lead you through the steps to safely test for power at a wall outlet then troubleshoot and fix the common causes if there isn't. To properly repair or replace an electrical outlet, first check the outlet for power, then for proper grounding and polarity (making sure the wires are connected to the proper terminals). If the outlet checks out OK, the next step is to check the wiring. Note: These same basic procedures can be used to test ceiling fixtures and wall switches.

Recommended Tools:

For this project you will need a basic digital multimeter (DMM) that measures ac voltage and resistance. You should also consider using a DMM that has a built-in Safety Tester. This is an extra feature that gives a quick indication whether voltage is present or not, even if the DMM batteries are dead. This booklet assumes you already know how to use a DMM to make basic voltage and resistance measurements. If not, read the booklet “Basic DMM Measurements” and your DMM owner's manual before you start this project.

Illustrations of recommended tools (*What tool should be shown?*)

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Step by step troubleshooting:

1. Check the Device.

Before you spend a lot of time troubleshooting the outlet, make sure the device you are plugging in to the outlet is working. Try plugging the device into an outlet that you know is working. If it still doesn't work, the problem is most likely with the device. (See the booklet "How to Troubleshoot Common Household Appliances" for more information.)

2. Check for Damage.

Inspect the outlet for signs of damage, such as burn marks, soot, melted plastic, or cracked or broken plastic. These are indications there may be a short inside the outlet, or that the receptacle is broken. It is best to replace any outlet that shows visible signs of damage. Turn the power OFF at the breaker panel before attempting to replace an outlet.

3. Check for Power.

To check an electrical outlet for power, first make sure the breaker is not tripped. (If the breaker is tripped, or trips again when you reset it, read the booklet "How to Troubleshoot Circuit Breakers" for more information.) If the outlet is controlled by a wall switch, make sure the switch is in the ON position.

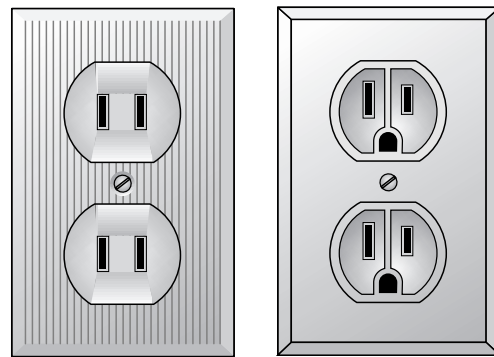


figure 1

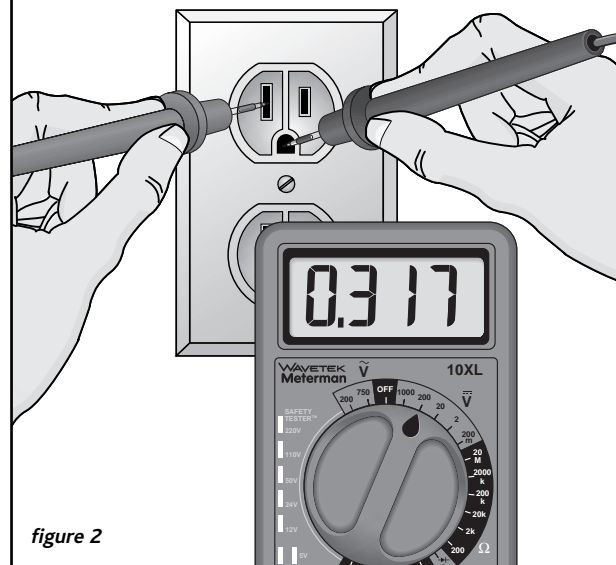


figure 2

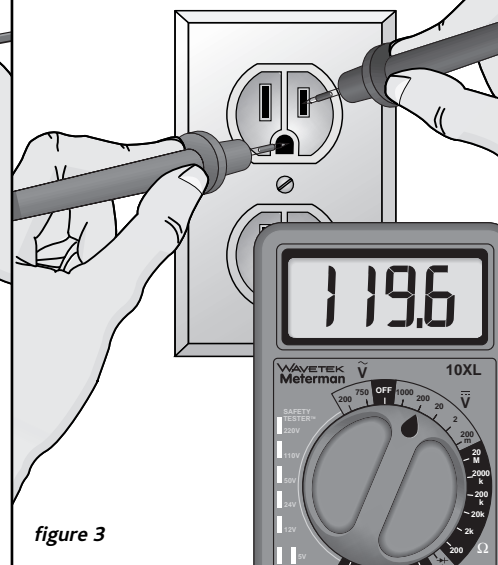


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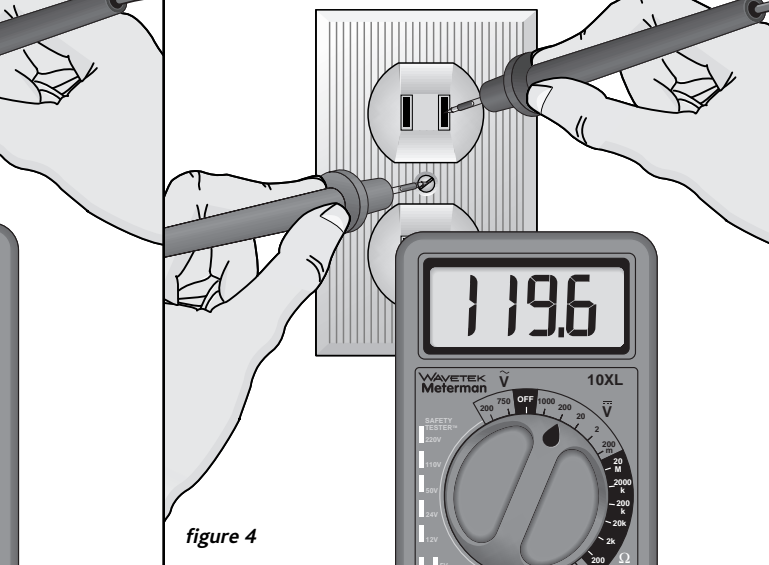


figure 4

How-to safely test electrical outlets

4. Testing for Grounding and Polarity on a 3-Slot Outlet:

A 3-slot outlet has a "hot" slot, a neutral slot and a grounding slot as shown in Figure 2. The short slot should be the hot, the long slot should be the neutral, and the U-shaped slot should be the ground. Incorrect wiring on an electrical outlet not only leads to problems with electronic equipment and appliances, it can also present a safety hazard.

With the meter set to the 200 volt ac range, place one probe in the U-shaped slot and the other in the long slot. The meter should read less than 1 volt. Move the probe from the long slot to the short one. (See Figure 3) The meter should now show about 120 volts. If your readings are the opposite, the

hot and neutral wires are reversed. Turn OFF the power at the panel and re-wire the outlet.

5. Testing for Grounding and Polarity on a 2-Slot Outlet:

While most homes are equipped with 3-slot electrical outlet, some older homes still have 2-slot. In these homes the outlet box should be grounded. In order to test for grounding and polarity you'll have to make sure that there is no paint on the cover plate screw (if the screw has paint on it, temporarily replace it with an unpainted screw to conduct this test).

With the meter set to the 200 volt ac range, place one probe in the long slot. Hold the other probe on the screw head. You should read less than 1 volt.

Move the probe from the long slot to the short one. You should now read about 120 volts on the meter. (See Figure 4) If your readings are the opposite, the hot and neutral wires are reversed. Turn OFF the power at the panel and re-wire the outlet.

6. Check the Wiring.

If your readings so far still show no voltage, you'll have to test the wiring inside the junction box. First, turn OFF the power at the circuit breaker panel. Remove the outlet cover plate and remove the screws at the top and bottom of the outlet bracket. If your DMM has a Safety Tester™ feature, use it to check for voltage at the screw terminals on either side of the outlet to make sure the power is turned OFF. Otherwise use your meter in the

200 volt ac range and probe the screw terminals to verify that power is OFF. Carefully pull the outlet out of the junction box. Look for broken or loose wires going to the receptacle. Tighten any loose connections on the outlet or in the wire nuts inside the junction box. Replace any broken wires.

Set the outlet aside making sure the side terminal screws are not touching anything inside or outside the junction box. Turn ON the power at the circuit breaker panel (remember to also turn on the wall switch if there is one). With the meter set to the 200 volt ac range, place one probe on the head of the terminal screw on the left side of the receptacle. Touch the other probe on the head of the termi-

Work safely!



Electricity can be dangerous. Protect yourself and your home by remembering to follow a few simple rules when working with electrical circuits:

- Always turn the power off at the electrical panel before handling wires or terminals. Don't assume that you know which wire is hot! Use your meter to verify the power is off before handling any wires or terminals.
- Make sure your meter is working with a 3-point check: Measure a known live circuit, next measure the circuit you're working on and finally re-check the known live circuit.
- Use caution when measuring live circuits. Don't stand in water, use one hand to probe whenever possible, and don't wear metal jewelry.
- Only use a meter that has the proper voltage ranges for the job at hand and make sure the meter has the proper safety ratings and protection.

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