

Dead Outlets and Dead Circuits: Mid-Pointing

YES Electric • NEC 2026 with NEC 2023 numbers in parentheses

Draft 1 (October 2026). This chapter is under review. Code numbers are NEC 2026. Your local inspector may use an earlier edition, so ask your journeyman which one applies. Boxes marked "Picture coming" will get drawings and photos in a later version.

Phase 2, Troubleshooting and Service Calls. This is the most common service call we run. Learn this procedure until you can do it in order without the book.

Before this module: R2.1 (the service call) and R2.2 (meters and testers). You need the three receptacle readings, the neutral-to-ground continuity test, live-dead-live, and the toner from R2.2.

Code edition. Code references are NEC 2026. Where a section moved, the NEC 2023 number is in parentheses. The local inspector (the AHJ, "authority having jurisdiction") may enforce an earlier edition, so ask your journeyman which one applies before you quote a section to anyone.

Learning Objectives

When you finish this module you will be able to:

1. Work a dead receptacle from the breaker to the device in a fixed order.
 2. Find a tripped GFCI anywhere upstream, including in the garage, outside, the basement, or another bathroom.
 3. Split a dead circuit in half with a meter and keep splitting until you find the break (mid-pointing).
 4. Tell an open hot from an open neutral by the readings and explain why they differ.
 5. Find and repair the failed backstab, loose wire connector, burned terminal, or damaged cable that opened the circuit.
 6. Replace a device with one that meets the replacement rules in NEC 406.12(D) (2023: 406.4(D)).
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Background: Why Outlets Go Dead

How a receptacle circuit is laid out

A 120 V receptacle circuit starts at one breaker. A cable (usually 14/2 or 12/2 NM with ground) runs from the panel to the first box. From there it hops to the next box, and the next, until the last box on the circuit. Electricians usually run the shortest path, so the first box is usually the one closest to the panel and the last is usually the farthest away (Kuhlman, Residential Electrical Troubleshooting, p. 77).

At each box in the middle of the run, two cables come in: one from upstream (toward the panel) and one going downstream (away from the panel). The device in that box either passes power through its terminals, or it is fed from a pigtail splice that also feeds the cable going on.

Picture coming: A simple floor plan of three rooms with a panel in the lower left corner. Six receptacles numbered 1 through 6 in the order a cable visits them, with the cable drawn as a line hopping from the panel to 1, 1 to 2, and so on to 6. An arrow labeled "Upstream (toward panel)" points back toward the panel and another labeled "Downstream (away from panel)" points toward receptacle 6. A switch box between receptacles 3 and 4 shows a third cable branching up to a ceiling light, with a note: "Boxes with three cables make the best split points."

Two facts about older houses change where you look:

- In houses wired before about the 1980s, the power often went to the ceiling light box first and branched from there to the switch and the receptacles. Kuhlman says to keep this in mind for any house with original wiring from before the 1980s (p. 78).
- Older circuits often have hidden splices: a splice in a box buried behind drywall, in an attic under insulation, or in a basement ceiling. Kuhlman warns that hidden splices can make finding the problem nearly impossible without a toner (p. 81).

What breaks

When one or more receptacles go dead with nothing obviously tripped, the circuit has opened somewhere. The common causes, roughly in the order you will find them:

Cause	How common	Where you find it
Tripped GFCI receptacle somewhere upstream	Most common	Garage, outside, bath, kitchen, basement, laundry, behind furniture
Tripped breaker, including a GFCI or AFCI breaker	Very common	Panel
Failed backstab (push-in) connection	Very common	The last working receptacle upstream of the dead ones, or the first dead one
Loose or burned wire connector (wire nut)	Common	Switch boxes, junction boxes, light boxes
Loose terminal screw	Common	Any device
Breaker that looks on but is not passing voltage	Less common	Panel
Damaged cable (nail, screw, staple, pinch)	Less common	Between two boxes, usually after someone hung something or did carpentry
Cable that failed with no damage	Rare	Between two boxes

Kuhlman finds backstab failures so often on no-power calls that when the first receptacle he pulls is backstabbed, he expects it to be the cause (pp. 27, 82). He also had one job where the hot conductor inside a 14/2 cable between two receptacles opened with no visible cause, and he had to fish a new cable (p. 82).

Why GFCIs make it confusing

A GFCI receptacle has LINE terminals (power coming in from the panel) and LOAD terminals (power going on to protect receptacles downstream). One GFCI can protect every receptacle after it. When it trips, it opens both the hot and the neutral going to the LOAD side (Kuhlman, p. 30). The dead receptacles have no buttons and no light, so the customer has no idea a GFCI controls them. Kuhlman's office solves many of these calls over the phone just by telling the customer to find and reset the GFCI (p. 32).

Open hot versus open neutral

A dead receptacle can be dead because the hot is broken or because the neutral is broken. You need to know which before you start opening boxes, because the readings at every box differ.

	Open hot	Open neutral
H-N at dead receptacle	0 V	0 V
H-G at dead receptacle	0 V	About 120 V
N-G at dead receptacle	0 V	0 V with nothing plugged in; near 120 V with a load plugged in downstream
Neutral-to-ground continuity (circuit dead)	Beeps (neutral still connected)	No beep (neutral open)
Which side of the break has voltage to ground on the hot	Upstream only	Everywhere on the circuit
How you find the break	Find the last box where the hot has voltage to ground	Find the last box where hot-to-neutral reads 120 V

The hot-side test and the neutral-side test give different answers at the same box. That is why you name the open before you mid-point.

Picture coming: Open hot vs open neutral at the same receptacle, side by side. Left drawing: a receptacle with an X on the black wire upstream; meter readings under it "H-N 0 V, H-G 0 V, N-G 0 V." Right drawing: the same receptacle with an X on the white wire upstream and a lamp plugged into a receptacle downstream; meter readings "H-N 0 V, H-G 120 V, N-G 120 V (with lamp plugged in)." A note under the right drawing: "White wire downstream of the break is live through the lamp. Treat it as hot."

Part A: The Symptom

The customer says some version of "this outlet doesn't work." Before anything else, size the problem.

1. Plug your receptacle tester or a lamp into the dead receptacle. Confirm it is dead on both halves.
2. Test the receptacles on either side of it, on the same wall and in the same room.
3. Flip the lights in that room and the next room.
4. Decide which of these you have:

Size	Go to
Only this one receptacle, or only one half of it	Part C, Test 4, then Part D
Several receptacles in one area	Part C from Test 1
Every receptacle in a garage, bath, basement, or outdoors	Part C, Test 1 (GFCI hunt) first
About half the house, or every 240 V appliance acting strange	Stop. R2.5.
The whole house	Stop. R2.5.
A brand-new circuit that has never worked	Part C, then Part E (new installation)

The Arc Guide's dead-outlet tree uses the same first split: this outlet only, several outlets in one area, or half the house (Symptom 1, Step 1).

Part B: Questions to Ask the Customer

Use the five intake questions from R2.1. For a dead outlet, these are the ones that matter most:

Ask	What the answer tells you
"Which outlets are dead? Can you show me all of them?"	The size of the problem, and a list to test against
"When did they stop? Did anything else happen at the same moment?"	A trip at the moment a hair dryer started points to an overload or a GFCI. A slow fade, or flickering before it died, points to a burned connection.
"Have you pressed RESET on the outlets with the buttons? Where are they?"	Saves you a search if they know, and tells you if they already tried
"Did you turn the breakers off and back on?"	Kuhlman asks owners to do this before he arrives (p. 99). If they did, a plain tripped breaker is less likely.
"Has anybody done any work lately, hung pictures, put up shelves, installed trim, replaced an outlet?"	A nail or screw through a cable, or a device that someone else installed
"Has it rained? Is anything outside on the same outlets, like a post light, landscape lights, or an outdoor outlet?"	Outdoor wiring is a common cause of GFCI trips and shorts
"Do any lights flicker when it happens, or did anything smell hot?"	A burning connection. Go to R2.7 for the heat side of the problem.
"Did these outlets ever work since you've lived here?"	If no, it may be a wiring mistake, not a failure

Write the answers in the job board notes.

Part C: Tests, in Order

Do these tests in this order. Each one either finds the problem or rules out a cause in a few minutes. The Arc Guide's Quick Reference and Symptom 1 tree follow the same order: GFCI, breaker, then the meter at the device (Arc Guide, Quick Reference and Symptom 1).

Picture coming: Dead-receptacle flowchart. Start box: "Receptacle dead (confirmed both halves)." Arrow to "Test 1: GFCI hunt" with its own branch to the right labeled "GFCI branch": "Reset every GFCI receptacle and GFCI breaker → fixed? Done. Won't reset? → Test LINE side for power." Main arrow down to "Test 2: Breaker (tripped? passing voltage?)" → "Test 3: Prove dead, then N-G continuity: beep = open hot / no beep = open neutral or GFCI" → "Test 4: Three readings at the dead receptacle" → "Test 5: Map the circuit" → "Test 6: Mid-point" → "Test 7: Inspect the box at the break" → "Fix → Verify every device on the circuit."

Test 1: The GFCI hunt

Meter setting: none yet. You are pressing buttons.

1. Ask the customer where the GFCIs are. Most will not know.
2. Check every GFCI receptacle in these places: each bathroom, kitchen counters, garage (behind freezers, shelving, workbenches, and the garage door opener receptacle area), each outdoor receptacle (front, back, near the AC unit, on the deck), unfinished basement, crawl space entry, laundry area, wet bar, and next to any sink.
3. At each one, press RESET firmly. Then go back to the dead receptacle and check it.
4. Look in the panel for GFCI breakers and dual-function (AFCI/GFCI) breakers. They have a TEST button. A tripped one sits in the middle position or at OFF. Reset by pushing fully to OFF and then to ON.
5. If a GFCI resets and the dead receptacles come back, you have found it. Go to Test 1A to find out why it tripped.
6. If a GFCI will not reset, go to Test 1B.

Why this order. The NEC requires GFCI protection for receptacles in a long list of dwelling locations, so these are the places a hidden GFCI is likely to be. NEC 210.8(A) lists bathrooms, garages, accessory buildings, outdoors, crawl spaces, basements, kitchens, areas with sinks for food or drink preparation, receptacles within 6 feet of a sink, boathouses, receptacles within 6 feet of a tub or shower, laundry areas, and indoor damp and wet locations. In older houses, a GFCI added later can be anywhere, because whoever added it put it at the first receptacle on the circuit.

Kuhlman says most dead-receptacle calls in garages and unfinished basements end up being a tripped GFCI, sometimes hidden behind a box or furniture where the customer never knew it existed (p. 80). In his "North Andover" call, the owner insisted there was no GFCI. Kuhlman finally traced the garage-and-basement circuit through the basement ceiling to where it went into a finished wall, and found the GFCI on the garage side of that wall behind stacked boxes (pp. 99–100).

Test 1A: The GFCI reset. Why did it trip?

A GFCI that trips once might have done its job on a real fault. Find out before you leave.

1. Ask what was running when it tripped.
2. Press TEST on the GFCI. It should trip. Press RESET.

3. Check every receptacle downstream with the plug-in GFCI tester. Each should trip the same GFCI.
4. Look at every outdoor receptacle on the circuit. Water in an outdoor box, a cracked cover, or a missing in-use cover is a common cause.
5. If it trips again while you are there, go to R2.4 (GFCI nuisance tripping).

Test 1B: A GFCI that will not reset

A modern GFCI will not reset without power on its LINE terminals (Kuhlman, p. 79). So a GFCI that will not reset has either no power coming in, or it has failed.

Meter setting: AC volts.

1. Turn off the breaker you think feeds it. If you cannot identify the breaker, leave it on and work carefully.
2. Remove the cover plate and the two mounting screws. Pull the GFCI out of the box by its mounting ears without touching the terminals.
3. Turn the breaker on if you turned it off.
4. Read from the LINE hot terminal screw to the LINE neutral terminal screw.

Reading at LINE H-N	Meaning	Next
About 120 V	Power is arriving. The GFCI failed, or there is a fault on its LOAD side that trips it instantly.	Step 5
0 V	No power arriving. The problem is upstream.	Test 2 on the breaker, then work upstream

1. Turn off the breaker. Prove dead. Disconnect the wires from the LOAD terminals and cap them separately. Turn the breaker back on. Press RESET.
2. If the GFCI now resets and holds, the fault is downstream on the LOAD wiring. Go to Test 6 and mid-point the LOAD side, or to R2.4 if it is a ground fault.
3. If it still will not reset with LOAD disconnected and 120 V on LINE, replace the GFCI (Part D3).
4. Check that the wires were on the right terminals. If the incoming cable is on LOAD and the outgoing on LINE, the GFCI may not reset or may not protect. The Arc Guide's Job 2 shows how to identify the LINE cable with a non-contact tester on a live circuit: the cable whose black wire lights the tester with the GFCI out of the circuit is LINE.

Safety. Step 4 is a live reading inside an open box. Do it only after your journeyman has watched you do it correctly. Pull the device straight out by the ears, keep your fingers off the terminal screws, and use insulated probes.

Test 2: The breaker

Meter setting: AC volts.

1. Open the panel door. Look for a tripped breaker: handle in the middle, or a trip flag showing.
2. If you find one, push it firmly to OFF, then to ON. If it trips again right away, stop and go to R2.4.
3. If nothing is tripped, find the breaker for the dead area. Use the directory as a guide, not as proof. Kuhlman notes breakers are often marked wrong (p. 100).
4. Turn that breaker off and on once. Some breakers that look on are actually tripped internally and reset when cycled.
5. If the dead receptacles are still dead, check whether breakers are passing voltage. Kuhlman's step for multiple dead outlets is to take the panel cover off and test each breaker's output with your meter (p. 81). With your journeyman's OK, take the dead front off and read from each breaker's terminal screw to the neutral bar.

Reading at breaker terminal to neutral bar	Meaning
About 120 V	The breaker is passing voltage
0 V with the handle ON	The breaker failed or is not seated on the bus. Replace it with the same brand, type, and rating (Arc Guide, Job 4).

Safety: the dead front comes off a live panel. The service conductors and the main lugs at the top of the panel stay live with the main breaker off (Arc Guide, Job 4). Wear safety glasses. Use insulated tools. Keep your hands below the main breaker area. Touch only the probe to the terminal screw. If you see scorching, melted plastic, rust, or water, stop and go to R2.7.

Test 3: Prove dead, then neutral-to-ground continuity

This test tells you what kind of open you are hunting.

1. **Meter setting:** AC volts. At the dead receptacle, do live-dead-live. Read H-N and H-G. Both should be 0 V. If H-G reads about 120 V, skip ahead: you have an open neutral (Test 4).
2. **Meter setting:** continuity (beeper).
3. Put one probe in the tall slot (neutral) and one in the round hole (ground).
4. Read the result:

Result	Meaning	Next
Beep (near 0 ohms)	The neutral is still connected back to the panel. The hot is the open conductor.	Kuhlman: think tripped breaker, then a broken hot splice (pp. 79–81). Test 5 and mid-point the hot.
No beep (OL)	The neutral is open too. Either a GFCI is tripped upstream (it opens both), or the neutral is broken.	Go back to Test 1 and look harder for a GFCI. If you are sure there is none, mid-point the neutral.
No beep, and the receptacle has no ground wire	You cannot use this test. The round hole is not connected to anything.	Skip to Test 4 readings and Test 5.

This works because, at the main panel, the neutral and the ground are bonded together, so any healthy receptacle shows continuity from neutral to ground (Kuhlman, pp. 43, 79). In a house where the receptacle is fed from a subpanel, the test still works because the subpanel's neutral and ground both go back to the main panel where they are bonded.

Test 4: Three readings at the dead receptacle

Meter setting: AC volts. Breaker on.

1. Read H-N, H-G, and N-G at each half of the dead receptacle.
2. Compare to the patterns in R2.2:

H-N	H-G	N-G	Meaning	Next
0 V	0 V	0 V	No hot arriving	Test 5, then mid-point the hot (Test 6A)
0 V	~120 V	0 V (or ~120 V with a load downstream)	Open neutral	Test 5, then mid-point the neutral (Test 6B)
~120 V	~120 V	0–2 V	Power is there. The receptacle has failed, or the plug is not gripping.	Part D2, replace the receptacle
One half normal, one half 0 V			The tab between the halves is broken off (a split or switched receptacle), or one half failed	Check whether a wall switch controls that half. If not, replace the receptacle.

The Arc Guide's Symptom 1, Step 4 uses the same readings: no voltage on either reading means look for the open hot; hot-to-ground present but no hot-to-neutral means a missing neutral; correct voltage means the device failed.

1. Check the switches in the room. Many living rooms and bedrooms have a "switched receptacle" for a lamp. Before you open anything, flip every switch in the room and read again.

Test 5: Map the circuit

You need to know every device on the circuit and the order the cable visits them before you can find the middle.

Test 5A: If some receptacles on the circuit still work (open neutral, or open hot partway down)

1. Find the breaker for the circuit with a breaker finder plugged into a working receptacle on it, or by switching breakers off one at a time (R2.2, Part B6). Confirm by turning it off and seeing the working receptacles go dead.
2. Leave that breaker off. Walk the house and mark every receptacle, switch, and light that is dead now. Use blue painter's tape with the circuit number. Kuhlman uses painter's tape for the same job (p. 85).
3. Turn the breaker back on.
4. The receptacles that are dead now, with the breaker on, are downstream of the break. The ones that work are upstream of it.
5. On a floor plan or a sketch in the job board notes, draw the panel and every device on the circuit. Guess the order the cable runs, starting nearest the panel.

Kuhlman's method for finding a broken neutral is the same: turn off breakers until the dead receptacles have no power at all, identify everything on that circuit, then look at the nearest upstream device to the dead ones (p. 81).

Test 5B: If nothing on the circuit works (open hot right at the start, or you cannot tell which breaker it is)

This is harder. Kuhlman points out that if there is no power at the dead receptacles, you cannot turn breakers off to find out what is on the circuit (p. 81). Three options, in the order to try them:

1. **Toner.** Turn off any breaker that might be involved, prove the dead receptacle dead, and connect the toner to its hot (black) wire and ground per the toner's instructions. Follow the tone through the walls back toward the panel, marking the path. The first box the tone leads you to is the next box upstream. Kuhlman says most toners will trace through finished walls, though you may lose the signal at some points (p. 81).
2. **Look at the nearest devices.** Without a toner, open the receptacles and switches closest to the dead one and look for the problem (Kuhlman, p. 81). Start with the closest receptacle on the same wall and the switch box nearest it.
3. **Find the neutral at the panel.** This is Kuhlman's last-resort method (pp. 81–82). Your journeyman should do it or watch you do it.
4. Turn off the main breaker. The whole house is off.
5. At the dead receptacle, set the meter to continuity and put the probes on neutral and ground. It should beep.

6. At the panel, with the main off and the panel proven dead below the main, lift one neutral at a time off the neutral bar until the meter at the receptacle stops beeping. You need a helper at the receptacle, or a meter with a loud beep.
7. That neutral belongs to the dead circuit. Find the breaker that the matching hot lands on. Put the neutral back and torque it.
8. Turn the main back on. Kuhlman notes this only works if the circuit has no crossed neutrals and no neutral touching a ground somewhere. He used it once in a house with about 16 circuits and would only do it as a last resort in a house with 40 or more (p. 82).

Safety for option 3. The service conductors at the top of the panel are still live with the main off. Lifting neutrals with the main on is never allowed: a neutral lifted under load can carry voltage and arc. Main off, prove dead below the main, then lift.

Test 6: Mid-pointing

Mid-pointing means you open a box near the middle of the circuit and test it. The result tells you which half has the break. Then you split that half, and keep going. Kuhlman calls it the way to narrow down the problem "instead of shooting in the dark" (p. 76). The Arc Guide's Job 8 lays out the same method for a dead circuit.

With 16 boxes on a circuit, you need at most 4 or 5 box openings to corner the bad one. Opening boxes one at a time from the end takes up to 16.

How to pick the middle

1. From your sketch (Test 5), count the boxes from the first working device to the last dead device, or from the panel to the last device.
2. Pick a box in the middle of that list.
3. Prefer a box where cables go in more than one direction, usually a switch box. Kuhlman says switch boxes are often the best mid-points because electricians tend to run receptacles in and out with only two cables, while switch boxes often have three or more (pp. 77–78). A box where the circuit branches can rule out a whole branch in one test.
4. In a pre-1980s house, check the ceiling light boxes as possible branch points (p. 78).

Picture coming: Mid-pointing on a six-device circuit. A horizontal line of six receptacle boxes numbered 1 to 6 from left (panel side) to right. A red X between boxes 4 and 5 marks the hidden break. Split 1: box 3 opened, reading "H-G 120 V on outgoing cable → break is downstream." Split 2: box 5 opened, reading "H-G 0 V on incoming cable → break is upstream of 5." Split 3: box 4 opened, reading "H-G 120 V on incoming, outgoing backstab burned → found." Three numbered arrows show the order of the splits.

Test 6A: Mid-pointing an open hot (live method)

Meter setting: AC volts. Breaker on.

1. At the mid box, turn off the breaker (if you know it) and prove dead, then remove the cover and pull the device out by its ears so you can see the wires. If you do not know the breaker, pull the device out carefully with the circuit on, touching only the ears and the plate.
2. Turn the breaker back on.
3. Identify the cables. One comes from upstream, one or more go downstream. If you are not sure which is which, you will find out from the readings.
4. Read from each black wire (or its terminal screw) to the bare ground in the box.
5. Interpret:

What you read at the mid box	Meaning	Next split
120 V on the incoming black and 120 V on the outgoing black	Hot reaches this box and leaves it	The break is downstream. Split the downstream half.
120 V on the incoming black and 0 V on the outgoing black	The hot dies at this box	The break is here. Test 7.
0 V on every black in the box	No hot reaches this box	The break is upstream. Split the upstream half.

1. Put the device back loosely, with no bare wire touching anything, before you move to the next box. Or turn the breaker off and cap the wires if you leave the box open.
2. Repeat until you find the box where the hot arrives but does not leave, or the two boxes with power at one and none at the other. The break is at the first box (a backstab or terminal) or in the cable between them.

The Arc Guide's Job 8 says the same: if voltage is present at the midpoint, the fault is downstream; if absent, it is between the panel and this box; keep halving until you find the box where voltage disappears.

Test 6B: Mid-pointing an open neutral (live method)

The hot is present everywhere on the circuit, so H-G does not help you. Read hot-to-neutral instead.

Meter setting: AC volts. Breaker on.

1. Unplug every load on the circuit if you can. A load plugged in downstream of the break back-feeds the neutral through the load and confuses the readings. If you cannot unplug everything, note what is plugged in.
2. At the mid box, read from the incoming black to the incoming white, and from the outgoing black to the outgoing white.
3. Interpret:

What you read at the mid box	Meaning	Next split
120 V H-N on incoming and outgoing	The neutral is good through this box	The break is downstream
120 V H-N on incoming, 0 V on outgoing	The neutral dies at this box	The break is here. Test 7.
0 V H-N on everything, but 120 V H-G	The neutral is already open before this box	The break is upstream

Safety: the white wire can be live. Downstream of an open neutral, with any load connected, the white wire carries 120 V to ground through the load. Treat every white wire on this circuit as hot until the neutral is repaired. Do not grab a white wire with bare fingers because "it's just the neutral."

Test 6C: Mid-pointing dead (ohmmeter method)

You can also mid-point with the circuit off, using continuity. Use this when you cannot safely work the box live, or after a trip has left the circuit off.

1. Turn off the breaker. Prove dead at the mid box.
2. Disconnect the downstream cable at the mid box. Cap the wires.
3. At the panel, disconnect the circuit's hot from the breaker (or work from the first box).
4. At the mid box, twist the upstream black to the bare ground (a temporary jumper).
5. At the panel, read continuity from the circuit's black to the ground bar.
6. Beep: the hot is continuous from the panel to this box. The break is downstream. No beep: the break is upstream.
7. Remove the jumper. Reconnect everything you disconnected before you energize.

This method takes longer because of the disconnecting, but no live box work is needed.

Test 7: Inspect the box at the break

When the readings point to one box, or to the connection between two boxes, turn the breaker off, prove dead, and pull the device out fully.

Check each of these, in order. The Arc Guide's Job 8 list and Kuhlman's photos show the same failures (Arc Guide, Job 8; Kuhlman, pp. 123, 125).

Look for	What it looks like
Failed backstab	A wire pushed into a hole in the back of the device. Brown or black insulation at the hole, a wire that slides out with a light tug, or a melted spot on the device body.
Loose terminal screw	A wire that moves under the screw. Sometimes blackened copper and a burned screw.
Loose or burned wire connector	A connector that spins freely, comes off with a tug, or is brown, black, or melted. A wire that was never twisted in.
A wire that is not in the connector at all	An empty connector or one with fewer wires than it should have
Broken conductor	A wire nicked at the strip point that has broken off inside the insulation. Bend it and watch for a hinge.
Burned device	Melted plastic, a cracked face, black marks at the slots
Wire damage at the box entry	A cable clamp crushing the cable, or a sharp metal edge cutting the insulation

Tug each wire in each connector with firm hand pressure. The Arc Guide says to tug-test every wire nut and look for wires that pull out (Job 8).

If everything in the box is tight and clean, but the readings say the hot (or neutral) arrives at one box and does not reach the next, the break is in the cable between them. Look for a nail, screw, or staple in the wall between the two boxes: a picture hook, a shelf bracket, a baseboard nail, a TV mount. Kuhlman's "Billerica" problem turned out to be a cable pinched by a metal post under an addition (p. 98).

Field photo coming: Close-up of a duplex receptacle pulled from a wall box, showing a black wire in the backstab hole with the insulation browned back about ¼ inch from the device, and a black scorch mark on the back of the device around the hole. A second photo shows the same receptacle's replacement with both wires hooked clockwise under the brass screws.

Picture coming: Photo-realistic side-by-side of three connections. Left: a burned backstab with browned insulation and a melted spot on the receptacle body. Center: a melted orange wire connector with one wire pulled half out. Right: a good connection, with wires stripped to the strip gauge, hooked clockwise under a screw terminal, and a wire connector twisted tight with no bare copper showing below the skirt.

Part D: The Fix

Turn the breaker off and prove dead before every repair.

D1. Repair a failed backstab

1. Release the wire from the backstab. Many devices have a release slot next to each hole. Push a small flat screwdriver into the slot and pull the wire out (Arc Guide, Job 1, Step 4). If there is no release slot, cut the wire at the device.
2. Look at the wire. If the copper is dark, pitted, or the insulation is brown or brittle, cut back to clean, bright copper and good insulation. You need at least 6 inches of free conductor from where it leaves the cable sheath in the box. If cutting back leaves you short, splice on a pigtail.
3. If the device body is melted, discolored, or cracked, replace the device (D2). A device that has overheated has lost spring tension in its contacts.
4. Strip the wire to the strip gauge on the back of the device, usually about $\frac{3}{4}$ inch.
5. Form a hook with needle-nose pliers and put it under the terminal screw clockwise, so tightening the screw pulls the wire in (Arc Guide, Job 1, Step 6). Use one wire per screw.
6. Torque the screw to the value on the device or its instructions (NEC 110.14(D)). The Arc Guide lists 12 in-lb for receptacle and switch screws with 14 and 12 AWG wire (Part 3), but use the value on the device you are installing.
7. Check the other receptacles on the circuit. Kuhlman says that when he finds one failed backstab on a no-power call, the problem always turns out to be a backstab somewhere in the house (p. 27). Recommend a backstab-conversion pass on the rest of the house on the job board.

Code note on push-in terminals. NEC 406.10(3) allows wiring devices with push-in terminals only on 15 A or smaller branch circuits, and only with 14 AWG solid copper. A backstab on a 20 A circuit or on 12 AWG wire is not allowed. This is a 2026 code rule. Older editions of the NEC left the limit to the device's UL listing, so an older inspector may not cite it as code. Kuhlman notes that modern receptacles' push-in holes will not even accept 12 AWG (p. 27). YES techs do not use push-in terminals on any repair. Use the screw terminals.

D2. Replace a failed receptacle

1. Take a photo of the wiring before you remove anything (Arc Guide, Job 1, Step 3).
2. Remove the wires. Note which cable is upstream (LINE) and which goes on, if this will be a GFCI.
3. Choose the replacement. NEC 406.12(D) (2023: 406.4(D)) sets the rules when you replace a receptacle in a dwelling:

Rule	406.12(D) item	What it means at the box
Grounding-type where a ground exists	(D)(1)	If there is a ground wire or grounded metal box, use a three-prong receptacle and connect the ground
No ground present	(D)(2)	Use a two-prong receptacle, a GFCI receptacle marked "No Equipment Ground," or a three-prong receptacle protected by an upstream GFCI and marked "GFCI Protected" and "No Equipment Ground." Never jumper neutral to ground.
GFCI where now required	(D)(3)	If the location now requires GFCI protection (210.8), the replacement must be GFCI protected. A narrow exception applies only if no GFCI receptacle fits in the box, none fits in any upstream box, and a GFCI breaker cannot provide the protection.
AFCI where now required	(D)(4)	Replacing a receptacle in an area where 210.12 requires AFCI protection, the replacement must be an outlet-branch-circuit AFCI receptacle, protected by one upstream, or protected by a combination AFCI breaker
Tamper-resistant where now required	(D)(5)	Use a listed tamper-resistant receptacle where 406.26 (2023: 406.12) now requires one. The exceptions are a two-prong replacing a two-prong, and a CO/ALR receptacle on aluminum branch wiring.
Weather-resistant where now required	(D)(6)	Outdoors and in damp or wet locations, use a weather-resistant receptacle

1. Match the rating. A 15 A receptacle on a 15 A circuit. On a 20 A circuit with more than one receptacle, either 15 A or 20 A receptacles are allowed under Table 210.21(B)(3), and a single receptacle on its own 20 A circuit must be 20 A.
2. Connect: black to brass, white to silver, ground to green. Use the screw terminals.
3. If more than one cable lands on the receptacle, use pigtails rather than passing power through the device terminals (D4).
4. Torque to the label. Fold the wires into the box. Mount the device straight. Put the plate on.
5. Test with the three-light tester and, if GFCI protected, with the plug-in GFCI tester.

Aluminum wiring. If the wire in the box is silver-colored aluminum, stop. Do not install a standard receptacle on it. Aluminum branch wiring repairs follow the connector or device manufacturer's instructions and are covered in R2.7 and R-OLDHOUSE.

D3. Replace a GFCI receptacle

Same steps as D2, with these additions (Arc Guide, Job 2):

1. Identify LINE. With the breaker on and the GFCI's wires separated and capped, read each black wire to ground. The one with 120 V is the LINE hot. Its white is the LINE neutral. Turn the breaker off and prove dead before connecting.

2. LINE wires go on LINE terminals. Downstream wires, if you are protecting them, go on LOAD. If you are not protecting downstream receptacles, leave the LOAD terminals covered with their factory tape.
3. If you connect LOAD, put "GFCI Protected" labels (included with the GFCI) on the downstream receptacles.
4. Energize. Press RESET. Press TEST: it must trip. Reset. Test every downstream receptacle with the plug-in GFCI tester, if they have a ground.

Kuhlman reports that outdoor weather-resistant GFCIs fail noticeably more often than indoor ones in his company's experience (p. 32). An outdoor GFCI that will not reset with good LINE voltage and nothing on LOAD is usually just failed.

D4. Remake a splice or pigtail a device

1. Cut off the old connector. Cut back any wire that is discolored or nicked.
2. Strip each wire to the length marked on the connector package.
3. For a pigtail, cut a 6-inch piece of the same size and color wire, strip both ends.
4. Hold the wires together with the ends even. Twist the connector on clockwise until the wires twist together behind it and it is tight. No bare copper shows below the connector.
5. Tug each wire. None should move.
6. Connect the pigtail to the device terminal.

Pigtail the hot, neutral, and ground in each mid-run box means the downstream receptacles keep working if one device fails or is removed. The Arc Guide calls a ground run through device terminals a common mistake because removing the device breaks the ground path downstream (Part 10, "Grounding: The 3 Most Common Serious Mistakes").

D5. Check the box fill before you close it

Adding pigtails and a larger GFCI device can overfill a small box. An overfilled box is hard to close without loosening connections. NEC 314.16 sets the limits.

1. Find the box volume, stamped inside a plastic box or listed in Table 314.16(A) for a standard metal box.
2. Add up the allowances using Table 314.16(B)(4) volumes: 2.00 cubic inches for each 14 AWG conductor and 2.25 for each 12 AWG.

Item in the box	Count
Each hot and neutral that comes in from outside the box	1 each
Equipment grounding conductors	Up to 4 entering the box count as 1 together. Each one past 4 adds $\frac{1}{4}$ (NEC 314.16(B)(5)).
Internal cable clamps, any number	1 together
Each device (receptacle, switch) on one yoke	2
Pigtails that start and end inside the box	0 (314.16(B)(1): a conductor no part of which leaves the box is not counted)

Use the volume for the largest conductor in the box for the clamp and device allowances.

Example: a single-gang plastic box stamped 18 cubic inches, with two 14/2 cables, internal clamps, and one receptacle. Hots and neutrals: 4. Grounds: 1. Clamps: 1. Device: 2. Total $8 \times 2.00 = 16$ cubic inches. It fits in 18. A GFCI in the same box with the same wiring has the same count but is physically deeper. If it will not fit without forcing, install a box extender or a deeper box.

D6. Fix a loose box

If the box moves when you push the device in, the connections in it get worked loose over time. NEC 314.23 requires boxes to be securely supported. Tighten the box's mounting screws or ears. Replace a broken old-work box with a new one.

D7. Replace a damaged cable section

If the break is in the cable between two boxes:

1. Turn off the breaker and prove dead at both boxes.
2. Confirm the cable is open with the continuity test from R2.2, Part H2.
3. Look for the damage (a nail, screw, or staple in the wall between the boxes).
4. If the cable can be repaired at an accessible point, splice it in a box that will stay accessible. NEC 314.29 requires boxes to be installed so the wiring in them can be reached. Never bury a splice in a wall without a box and cover.
5. If not, abandon the old cable at both boxes (cut it short and cap each conductor) and fish a new cable of the same size and type between the boxes. Kuhlman fished a new 14/2 in his case of a cable that failed between two receptacles (p. 82).
6. Fishing a finished wall is old-work wiring. R1.12 covers it. Fishing is usually extra scope for the office to price (R3.1).

Part E: A New Circuit That Has Never Worked

The Arc Guide's Symptom 11 covers new installations. The causes differ from failures.

1. Confirm the breaker is on and not tripped.
 2. Read voltage at the first box. No voltage at the first box means the problem is at the panel: a breaker not seated, a wire not under the terminal, or the wrong breaker.
 3. Open every box. Check that every connector is tight, no bare copper touches a box or another terminal, every device has its ground, and hot and neutral are not swapped (Symptom 11, Step 2).
 4. With the breaker off, read hot to neutral at the panel end of the circuit with loads disconnected. OL is correct. 0 ohms is a short; find it before energizing (Symptom 11, Step 3).
 5. Read ground continuity from the farthest receptacle's ground to the panel ground bar. Less than 1 ohm is good (Symptom 11, Step 4).
 6. On an AFCI or GFCI breaker, check that the circuit neutral lands on the breaker's neutral terminal and the breaker's white pigtail lands on the neutral bar. A circuit neutral on the bar instead of the breaker trips the breaker or keeps it from resetting (Symptom 11, Step 5; Arc Guide, Job 5).
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Worked Examples

Example 1: Garage and basement dead, "no GFCIs in this house"

Symptom. Two garage receptacles, the garage door opener receptacle, and three basement receptacles are dead. The customer already cycled every breaker.

Questions. It happened two days ago. Nobody has done any work. The customer is sure the house has no GFCIs.

Tests.

1. Test 1: no GFCI receptacle found in the garage or basement in the open areas. Two GFCI breakers in the panel are on and test correctly.
2. Test 2: breaker labeled "Garage/Bsmt Rcpts" is on. With the dead front off, it reads 121 V at its terminal.
3. Test 3: a dead basement receptacle reads 0 V H-N and 0 V H-G. Continuity N-G: no beep. The neutral is open too. That means a GFCI, or a broken neutral and hot together. A GFCI is far more likely.
4. Back to Test 1. With a toner on the dead circuit (breaker off), the tone runs along the basement ceiling and dives into the wall between the basement and the garage, where there is no receptacle on the basement side.

5. In the garage, on the other side of that wall, behind stacked moving boxes, a GFCI receptacle with RESET popped out.

Fix. Reset. All six receptacles and the opener work. The plug-in GFCI tester trips the GFCI from each one. Ask what was running two days ago: a pressure washer plugged in at the garage. Show the customer where the GFCI is and put a "GFCI Protected" label on each downstream receptacle.

This matches Kuhlman's "North Andover" call (pp. 99–100). His lesson was that he should have traced the wire sooner.

Example 2: Four living-room receptacles dead, finished walls

Symptom. Four receptacles along the front wall of the living room are dead. Two receptacles on the side wall work.

Questions. Started Sunday evening while a space heater ran on the side wall. No recent work.

Tests.

1. Test 1: no GFCIs involved.
2. Test 2: no tripped breaker.
3. Test 3 at a dead receptacle: 0 V H–N, 0 V H–G. Continuity N–G: beep. The neutral is connected. The hot is open.
4. Test 5A: a breaker finder in a working side-wall receptacle identifies breaker 12. With breaker 12 off, the two side-wall receptacles, the four dead front-wall receptacles (already dead), and a hall receptacle are on it. With it on, only the side wall and hall work. The break is between the last working side-wall receptacle and the first dead front-wall receptacle.
5. Test 6A: the last working receptacle on the side wall, nearest the corner, is the natural split. Breaker off, proved dead, receptacle pulled. Breaker on. Incoming black to ground: 120 V. Outgoing black (backstabbed) to ground: 0 V. The hot dies here.
6. Test 7: breaker off. The outgoing black slides out of its backstab hole with a light tug. The insulation is brown for $\frac{1}{4}$ inch. The receptacle body is discolored at that hole.

Fix. Replace the receptacle (it overheated). Pigtail the blacks and whites, connect the pigtails to the screw terminals, torque to the label. The location is a living room, so the replacement must be tamper-resistant (406.12(D)(5)) and must be AFCI protected (406.12(D)(4)); breaker 12 is a combination AFCI breaker, so the requirement is met. Box fill: 18 cubic inch box, two 14/2 cables, clamps, one device, pigtails not counted: 16 cubic inches. Fits. All six receptacles on breaker 12 test correctly. The heater runs 10 minutes on the side wall with no warmth at the receptacle plate.

Write-up. Note the space heater on a 15 A shared circuit and recommend the office offer a dedicated circuit. Recommend checking other backstabbed receptacles.

Example 3: An open neutral in a bedroom

Symptom. Two bedroom receptacles and the ceiling fan are dead. A lamp in one of the dead receptacles was left switched on.

Tests.

1. Test 1 and 2: nothing tripped.
2. Test 4 at a dead receptacle: H-N 0 V, H-G 121 V, N-G 118 V with the lamp still plugged in. Open neutral, back-fed through the lamp.
3. Unplug the lamp. N-G drops to 0.4 V.
4. Test 5A: the breaker finder in a working hall receptacle on the same circuit identifies breaker 9. Turning it off kills the hall receptacle and the bedroom hot.
5. Test 6B: the bedroom has a switch box by the door with three cables: one from the hall, one to the receptacles, one to the fan. Breaker off, proved dead, switch pulled out, breaker on. Hall cable black to hall cable white: 121 V. Receptacle cable black to receptacle cable white: 0 V. The neutral dies in this box.
6. Test 7: breaker off. The neutrals from the three cables are spliced under one wire connector, and the white from the receptacle cable has backed out of it. The copper is darkened.

Fix. Cut back to clean copper on all three whites, splice with a new connector sized for three 14 AWG conductors, tug test. Everything on breaker 9 works. Three-light tester correct at each receptacle.

Lesson. At the switch box, H-G would have read 120 V on every black wire and told you nothing. The neutral readings found it.

Example 4: Dead after a TV was mounted

Symptom. Three receptacles on the family room wall stopped working the day a TV mount went up. The breaker trips when reset.

Tests.

1. Test 2: breaker 15 trips instantly on reset. A breaker that trips instantly means a short or ground fault, not an open. Go to R2.4 for the full procedure. Here is the short version.
2. Breaker off. Hot disconnected at the breaker. Ohms from the hot to the ground bar: 0.3 ohms. Dead short to ground with everything unplugged.
3. Mid-point dead (Test 6C, with the ohmmeter): the receptacle just left of the TV, pulled and disconnected, shows the short is downstream of it.
4. The TV mount is centered between that receptacle and the next one. A lag screw for the mount went through the cable.

Fix. The cable between the two receptacles is damaged. Remove the lag screw. Abandon the damaged section by fishing a new 14/2 between the two boxes on a path that avoids the mount

(D7). Tell the customer the mount needs to be moved or rehung with the cable path marked. Office prices the fishing.

Example 5: An outdoor GFCI that will not reset

Symptom. The back-patio receptacle is dead. RESET will not stay in.

Tests.

1. Test 1B: GFCI pulled out with breaker on. LINE H-N: 0 V. No power coming in.
2. Test 2: breaker 18, "Outside," is tripped. Reset: it holds.
3. Back at the GFCI: LINE H-N 121 V. Press RESET: it holds. The receptacle works.
4. Why did the breaker trip? The GFCI box has a conduit going underground. The customer says it goes to old landscape lights that mostly do not work. Breaker off, LOAD conductors to the landscape run disconnected and tested: 0.2 ohms hot to neutral. A short in the buried run.

Fix. Leave the underground run disconnected and capped at the GFCI. Reinstall the GFCI with only LINE connected. Write up the buried run for the office. The owner can decide whether to repair it. This is Kuhlman's "Lynnfield" call (p. 99).

Common Mistakes

1. **Opening boxes before finding the GFCI.** Check every GFCI location in the house first. It takes 10 minutes and solves the largest share of calls.
2. **Skipping the neutral-to-ground continuity test.** It tells you in 30 seconds whether to hunt a GFCI or a broken hot.
3. **Mid-pointing the hot when the neutral is open.** At a box upstream and downstream of an open neutral, H-G reads 120 V everywhere. Read H-N.
4. **Leaving loads plugged in while hunting an open neutral.** The load back-feeds the neutral and makes the readings lie. Unplug everything on the circuit.
5. **Touching a white wire on an open-neutral circuit.** It can be live through any plugged-in load.
6. **Starting at the end of the circuit and working back one box at a time.** Pick the middle and split.
7. **Ignoring the switch boxes.** They often hold the splices where the circuit branches.
8. **Trusting the directory.** Confirm the breaker with a finder or by switching it off.
9. **Pushing wires back into backstab holes.** Move them to the screw terminals.
10. **Reusing a device that overheated.** Discolored or melted devices go in the trash.
11. **Replacing a receptacle with a plain receptacle where GFCI, AFCI, or tamper-resistant is now required.** Check 406.12(D) on every replacement.
12. **Jumpering neutral to ground when there is no ground.** Use one of the 406.12(D)(2) options.

13. **Fixing the one box and leaving.** Test every device on the circuit.
 14. **Burying a splice in the wall.** Every splice goes in an accessible box with a cover.
-

Field Exercise

Setup. Use a training string of six receptacles wired in a line on the training wall, fed from one breaker, with at least one switch box in the middle. Your journeyman controls the faults and hides them inside boxes where you cannot see them until you open the box.

Round 1: Open hot. The journeyman opens one hot connection somewhere along the string. You do not know where.

1. Do the GFCI hunt and breaker check out loud, even though you know there is no GFCI on the string.
2. At a dead receptacle, take H-N, H-G, and N-G and write them down.
3. Prove dead and do the N-G continuity test. Write the result.
4. Map the string: which receptacles work and which are dead.
5. Mid-point. Write down every box you open, the reading on each cable in it, and your decision about which half to split next.
6. Find the open connection in under 15 minutes from the first reading.
7. Repair it with screw terminals or a new connector, torque, and verify all six receptacles with the three-light tester.

Round 2: Open neutral. The journeyman opens one neutral connection instead. Leave a lamp plugged in at the last receptacle, switched on.

1. Take the three readings at a dead receptacle with the lamp plugged in, then with it unplugged. Write both sets.
2. Explain to your journeyman, out loud, why N-G changed when you unplugged the lamp and why H-G is 120 V even though the receptacle is dead.
3. Mid-point using H-N readings. Write every reading.
4. Find and repair the open neutral in under 15 minutes.
5. Explain why the readings in Round 2 differ from Round 1 at the same boxes.

Round 3: Tripped GFCI in another room. The journeyman puts a GFCI at the first position on a second training string in a different part of the shop, feeds your string from its LOAD terminals, trips it, and covers it with a box. That tripped GFCI is the only fault.

1. Start at a dead receptacle on your string. Take the three readings. Do the continuity test.
2. Say what the continuity result tells you.
3. Find the GFCI without opening any box on your string.
4. Reset it and verify each receptacle with the plug-in GFCI tester.

Pass standard. You pass each round when you found the fault in under 15 minutes, wrote down every reading, used live-dead-live before every dead reading, chose split points that cut the remaining boxes roughly in half each time, never touched a white wire on the open-neutral string as if it were dead, and repaired with screw terminals or new connectors torqued to the label.

NEC 2026 Cross-References

Section	What it says	Why it matters here
210.8(A)	GFCI protection for dwelling receptacles in bathrooms, garages, accessory buildings, outdoors, crawl spaces, basements, kitchens, food/beverage prep areas with sinks, within 6 ft of a sink, boathouses, within 6 ft of a tub or shower, laundry areas, and indoor damp and wet locations	Where the hidden upstream GFCI is likely to be
Article 100, GFCI (Class A) informational note	Class A trips at 6 mA or more, not below 4 mA	Why a GFCI trips on small leakage
406.10(3)	Push-in terminals only on 15 A or smaller circuits with 14 AWG solid copper. New as a code rule in 2026; earlier editions left it to the UL listing.	Why backstabs on 12 AWG or 20 A circuits are wrong
406.12 (2023: 406.4)	General receptacle installation; grounding-type receptacles on 15 A and 20 A circuits	Every receptacle you install
406.12(D) (2023: 406.4(D))	Replacement rules: grounding, no-ground options, GFCI, AFCI, tamper-resistant, weather-resistant	Every receptacle you replace
406.26 (2023: 406.12)	Tamper-resistant receptacles in dwellings	Replacement receptacles in living areas
110.14(D)	Torque terminals to the value on the device or instructions	Every repair
314.16	Box fill. Per-conductor volumes in Table 314.16(B)(4). Up to four equipment grounding conductors count as one allowance, $\frac{1}{4}$ for each additional. Conductors that never leave the box are not counted.	Why the box behind the dead device is often overfilled, and what you can add
314.23	Boxes must be securely supported	A loose box works connections loose
314.29	Boxes must be installed so the wiring in them is accessible	Never bury a splice
240.4(D)	14 AWG copper 15 A, 12 AWG copper 20 A	Matching receptacle ratings to circuits

End-of-Chapter Checklist

Size and ask - [] Confirmed the receptacle is dead on both halves. - [] Tested the receptacles nearby and the lights in the room. - [] Asked when it started, what was running, who worked on anything, whether it rained, and whether anything outside is on the circuit.

Tests in order - [] Test 1: checked every GFCI location in the house and every GFCI or dual-function breaker. - [] Test 1B: for a GFCI that won't reset, read LINE voltage and isolated LOAD. - [] Test 2: checked for a tripped breaker and, with journeyman OK, read breaker output. - [] Test 3: proved dead and did N-G continuity to name the open. - [] Test 4: took H-N, H-G, and N-G at the dead receptacle and checked the room's switches. - [] Test 5: mapped the circuit with the breaker off and on, and sketched the order. - [] Test 6: mid-pointed with H-G for an open hot or H-N for an open neutral, with loads unplugged. - [] Test 7: inspected the box at the break, tug-tested every wire.

Fix - [] Moved backstabbed wires to screw terminals, cutting back to clean copper. - [] Replaced any device that overheated. - [] Used a replacement that meets 406.12(D): grounding or no-ground option, GFCI, AFCI, tamper-resistant, weather-resistant. - [] Pigtailed where more than one cable lands on a device. - [] Checked box fill. - [] Torqued to the label. - [] Replaced damaged cable sections with no buried splices.

Verify and document - [] Tested every receptacle on the circuit with the three-light tester. - [] Tested every GFCI-protected receptacle with the plug-in GFCI tester. - [] Ran the load that caused the complaint, if it was safe. - [] Wrote every reading, the cause, and the fix on the job board with photos. - [] Recommended a backstab pass if one backstab failed.

Sources

- Jesse Kuhlman, Residential Electrical Troubleshooting (2019). Pages cited: 27 (backstab failures; push-in holes accept 14 AWG only), 30 (GFCI opens hot and neutral), 32 (GFCI calls by phone; outdoor WR GFCI failures), 43 (neutral and ground joined at the main panel), 76–78 ("Mid-Pointing," circuit layout, switch boxes as split points, older homes fed at lights), 79 (unfinished basement or garage receptacle not working; continuity test; GFCIs won't reset without power), 80–82 (receptacle not working in a finished area; finding a broken neutral or hot splice; toner; finding the neutral in the panel; backstab pro-tip; failed cable between boxes), 85 (painter's tape to mark devices), 98 (Billerica), 99–100 (Lynnfield and North Andover stories), 100 (breakers marked wrong), 123 and 125 (photos of burned splices). All paraphrased.
- Arc Workforce, Residential Electrical Field Guide. Quick Reference; Symptom 1 (Dead Outlet); Symptom 9 (Partial Power Loss); Symptom 11 (New Installation Doesn't Work); Jobs 1, 2, 4, 5, and 8 (Tracing a Dead Circuit, Mid-Pointing); Part 3 (torque table); Part 10 ("The Hopscotch Method," "Grounding: The 3 Most Common Serious Mistakes," "Box Fill"). Its code citations are NEC 2020; this chapter uses NEC 2026 numbers.

- YES Electric commercial course, Module 2.3 (dead receptacle, GFCI line/load isolation, open-neutral signature).
 - NFPA 70, National Electrical Code, 2026 edition, sections listed above.
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Videos to watch

These videos are made by other electricians and companies, not YES Electric. Watch each one after you read the section it goes with. Where a video does something differently from this module, the caution line says so. Follow this module and your journeyman, not the video. Click a title to open it on YouTube.

Section	Video
Part C, Test 1 The GFCI hunt; Part D, D3 Replace a GFCI receptacle	GFCI receptacle / breaker Tripping or not working. Electrical Troubleshooting Electrician Electrical Code Coach • 6:23 Electrical Code Coach explains the three reasons a GFCI is dead or keeps tripping and warns that a failed GFCI can show no power at the face while its screw terminals are still hot. Caution: Talking-head video; no meter work shown. He mentions 'jiggling' breakers to find a tripped one; YES reads the handle position and resets fully off, then on.
Part C, Test 2 The breaker	Multiple Outlets Not Working - Breaker is Not Tripped Apartment Maintenance Pro • 7:49 On a dead basement circuit with no tripped breaker, the tech puts one probe on the neutral bar and reads each breaker's output, finds one at 0 V that looks on, and proves the breaker bad with a continuity test. Caution: He pulls and installs the breaker with the panel energized and only 'recommends' shutting off the main; at YES the main is off. He is a maintenance tech, not a licensed electrician.
Part C, Test 5 Map the circuit	How to Identify the First Outlet on Any Electrical Circuit Top Homeowner • 5:39 Shows how to find the first and last receptacle on a circuit: trip or open one device, then see which others lose power, and use cable counts in the box (one cable means end of run). Caution: Homeowner channel. He turns the power back on with wires capped in an open box to test; that is fine only with the conductors capped and nobody touching the box.
Part C, Tests 4 and 7 Three readings, then inspect the box at the break	How to Fix an Open Neutral Receptacle When the Problem is Upstream in the Circuit Sparky Channel • 9:08 A plug-in tester reads open neutral at an end-of-run receptacle; the box is fine, so the tech goes one box upstream and finds a neutral that was never landed in the splice. Caution: Uses Wago lever nuts and an NCV for proving dead; YES confirms dead with a meter. The video description is a long list of affiliate links.
Part C, Tests 4 and 7 on a real call; Part D, D1 Repair a failed termination	Troubleshooting a lighting and receptacle circuit Electrician Ron • 7:31 A licensed electrician in a 130-year-old house checks breaker output at the panel, reads open neutral with a plug-in tester, and finds the neutral snapped off at the receptacle terminal in the first box he opens. Caution: He reconnects the neutral with the circuit apparently still energized; YES turns it off and proves dead first.

Part C, Test 6 Mid-pointing (finding the break with a tracer)

[How to Trace an Open Circuit Caused by Broken Wires](#)

Sparky Channel • 5:01

A circuit tracer's receiver is run along a raceway and the signal drops to zero exactly where the wire is broken, which shows how a tracer finds an open between two boxes without opening the wall.

Caution: Demonstration board in PVC, not a house. True mid-pointing (opening the middle box and halving the run) is not shown; the closest real-call example is the box-by-box split in the R2.4 video TRiibyY7ib0.