

Receptacles, Switches, and Branch Circuits

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.

YES Electric Residential Electrical Course • Phase 1, Install

Code edition: this module cites NEC 2026. Where a section number changed from NEC 2023, the 2023 number is in parentheses. The local inspector (the AHJ) may enforce an earlier edition, so ask your journeyman which one applies before your first inspection.

Read R1.3 first. R1.3 teaches how to run the cable, size the box, and make up the splices. This module picks up at the device: which receptacle or switch goes in the box, which terminal each wire lands on, and which circuits a house must have. R1.2 shows where these circuits fit in a whole house.

1. Learning Objectives

When you finish this module you can do these things without help:

1. Wire a duplex receptacle, a GFCI receptacle that protects downstream receptacles, a single-pole switch, a pair of three-way switches, a four-way switch, and a dimmer, on the screw terminals.
 2. Say where a house needs GFCI protection, AFCI protection, and tamper-resistant receptacles, and which rooms need their own circuits.
 3. Match the breaker to the wire for 15 A and 20 A circuits, and match the receptacle to the circuit.
 4. Recognize a multi-wire branch circuit, wire it safely, and explain why it needs a two-pole breaker or an identified handle tie.
 5. Lay out the required receptacles in a kitchen, a bedroom, a bathroom, a hallway, and outdoors.
 6. Replace an old receptacle and decide whether the replacement must be GFCI, AFCI, tamper-resistant, or weather-resistant.
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2. Plain-Language Background

2.1 What a branch circuit is

A branch circuit is the wiring from one breaker in the panel out to the outlets it feeds. "Outlet" in the NEC means any point where power is taken: a receptacle, a light, or a hardwired appliance. A 15 A bedroom circuit might feed eight receptacles and two lights. A 20 A dishwasher circuit might feed one appliance.

Each circuit has the same parts:

Part	Color	Job
Hot (ungrounded conductor)	Black, or red	Carries current out from the breaker
Neutral (grounded conductor)	White or gray	Carries current back to the panel
Equipment ground (EGC)	Bare copper or green	Carries no current in normal use. Gives fault current a path back so the breaker trips
Breaker	n/a	Protects the wire from overheating

2.2 The terminal colors on a device

Every receptacle and switch is built so you can't easily mix up the wires, if you read the screws.

Screw color	What lands there
Brass or gold	Hot (black or red)
Silver or nickel	Neutral (white)
Green, hex head	Ground (bare or green)
Black or darker screw on a three-way switch	The common
Two lighter screws on a three-way switch	The travelers

On a duplex receptacle, the neutral slot is the taller slot. A plug's wide blade goes there. If you land the white on the brass screw, the receptacle still powers things, but the switch inside a lamp now opens the neutral instead of the hot, and the lamp socket shell stays live. That is called reversed polarity, and a plug-in tester shows it.

2.3 Why there is a breaker size limit for each wire size

The small-conductor rule in 240.4(D) says copper 14 AWG gets a breaker no bigger than 15 A, and copper 12 AWG gets no bigger than 20 A (240.4(D)(4) and (D)(6)). A 14 AWG wire on a 20 A breaker can carry 20 A all day and never trip the breaker, but the wire's insulation is rated for the heat of 15 A. Over years that wire cooks inside the wall.

Breaker	Copper wire, minimum	Receptacles allowed on a circuit with two or more receptacles (Table 210.21(B)(3))	Max cord-and-plug load on one receptacle (Table 210.21(B)(2))
15 A	14 AWG	15 A only	12 A on a 15 A receptacle
20 A	12 AWG	15 A or 20 A	12 A on a 15 A receptacle; 16 A on a 20 A receptacle
30 A	10 AWG	30 A	24 A

A 15 A duplex receptacle on a 20 A circuit with two or more outlets is legal because the receptacle is really two receptacles, and each one's cord load is limited by the appliance plugged into it. A single receptacle alone on its own circuit must be rated at least as much as the circuit (210.21(B)(1)). That means a single 15 A receptacle on a dedicated 20 A circuit is wrong, and a 20 A single receptacle or a duplex is right.

2.4 GFCI in plain words

A GFCI (ground-fault circuit interrupter) compares the current going out on the hot with the current coming back on the neutral. If they differ by about 5 milliamps, some current is leaking somewhere else, maybe through a person to the ground. The GFCI opens both the hot and the neutral in a fraction of a second (Kuhlman, "Ground Fault Circuit Interrupter (GFCI)," pp. 27–28). Five milliamps is far below what it takes to trip a breaker. A GFCI protects people from shock. A breaker protects the wire from overheating. You need both.

Two facts from Kuhlman are worth learning now because they show up in R2.3:

1. When a GFCI trips, it opens the neutral as well as the hot. So at a dead receptacle downstream of a tripped GFCI, a continuity test from neutral to ground shows no continuity. If a plain breaker is tripped, neutral to ground still shows continuity, because the neutral is still tied to ground at the panel (Kuhlman, pp. 30–31).
2. If neutrals from two different circuits are spliced together in one box, a GFCI on either circuit will trip, because some of its return current comes back on the other circuit's neutral (Kuhlman, p. 28).

2.5 AFCI in plain words

An AFCI (arc-fault circuit interrupter) watches the current for the jagged signal of an arc: a loose backstab, a nail through a cable, a cord crushed under a bed leg. When it sees that pattern, it trips. A combination-type AFCI breaker also detects some ground faults. The NEC requires AFCI protection for most 120 V, 15 A and 20 A circuits in the living parts of a house (210.12(B)).

A dual-function breaker is one breaker that does both GFCI and AFCI. In a kitchen or laundry, where both are required, one dual-function breaker covers the whole circuit (Kuhlman, p. 28, notes that newer kitchens often use dual-function breakers instead of GFCI receptacles).

2.6 Tamper-resistant receptacles

A tamper-resistant (TR) receptacle has spring shutters behind the slots. The shutters open only when both blades push at the same time. A child pushing a key into one slot hits plastic. The letters "TR" are molded on the face. Every 15 A and 20 A, 125 V and 250 V non-locking receptacle in a house, including the garage and accessory buildings, must be TR (406.26(1); 2023: 406.12). The exceptions are receptacles more than 5½ feet above the floor, receptacles that are part of a light or appliance, and a single receptacle in a dedicated appliance space behind something not easily moved (406.26 Exception).

2.7 Backstabs

Most cheap receptacles and switches have holes in the back. You push a stripped 14 AWG wire in and a spring clip holds it. That is a backstab, called a push-in terminal in the code. The spring touches the wire at one small point. Over years of heating and cooling, the contact loosens, heats, and fails. Kuhlman says that whenever he finds one backstabbed receptacle on a no-power call, the fault turns out to be a backstab somewhere in that house (Kuhlman, "Duplex Receptacles," p. 27).

NEC 2026 now limits push-in terminals in the code itself: they may be used only on circuits of 15 A or less, and only with 14 AWG solid copper (406.10(3)). Before 2026 the limit came from the device's listing, which is why backstab holes on most devices only accept 14 AWG (Kuhlman, p. 27). YES rule: never backstab. Use the side screws, or the back-wire clamp plates on spec-grade devices where the wire goes in straight and a screw clamps a plate down on it. A back-wire clamp is a screw terminal, not a push-in terminal.

3. Step-by-Step Procedures

SAFETY, for every procedure in this module: turn the breaker off, then prove the device dead before you touch a wire. Use the non-contact tester first, then the meter: hot to neutral, hot to ground, neutral to ground, at the device you are working on (R1.1). A box can hold two circuits. Test every wire in the box, not just the one you think you turned off.

Procedure A: Make a screw-terminal connection

This is the connection every device in this module uses.

1. Strip the wire to the length shown on the strip gauge on the back of the device. For a side screw, that is about 3/4 inch.
2. Bend a hook with the tip of your needle-nose or the hole in your strippers. The hook should wrap about three-quarters of the way around the screw.
3. Put the hook under the screw clockwise. When you tighten a screw clockwise, a clockwise hook gets pulled in under the head. A counterclockwise hook gets pushed out.

4. Keep the insulation close to the screw. No more than about 1/8 inch of bare copper should show past the screw head, and no insulation should be under the head.
5. One wire per screw, unless the device says it accepts two under a clamp plate. If you have two wires to land, make a pigtail: splice the two wires plus a 6-inch piece together with a wire nut, and land only the pigtail.
6. Torque the screw to the value printed on the device or its instruction sheet, with a torque screwdriver (110.14(D)). Leviton's GFCI instruction sheet lists 14 to 18 lb-in for its terminal screws (Leviton, "Installing and Testing a GFCI Receptacle," PK-93792-10-02-2J, <https://leviton.com/content/dam/leviton/digital-marketing/gfci-support-images/PK-93792-10-02-2J-M.pdf>). Other devices list other numbers. Read the one in your hand.
7. Tug each wire. It should not move.
8. Tighten the unused terminal screws down too, so they don't snag a wire when you fold the device in.

Picture coming: Close-up, two panels side by side. Left: a wire pushed into a backstab hole on the back of a duplex receptacle, with a red X and the label "push-in terminal: 15 A, 14 AWG solid only (406.10(3)); YES never uses it." Right: the same receptacle with a black wire hooked clockwise three-quarters around a brass screw, insulation stopping 1/8 inch from the head, an arrow showing the clockwise turn, a torque screwdriver on the screw, label "14-18 lb-in or the value on the device."

Procedure B: Wire a duplex receptacle

1. Turn the breaker off and prove it dead.
2. Make up the box per R1.3: grounds first, then neutrals, then hots. If the box has a cable in and a cable out, use pigtails for the neutral and the ground. Using the receptacle's two silver screws to carry the neutral through to the next receptacle is allowed on an ordinary circuit, but pigtails are better: if that receptacle fails or is removed, the rest of the circuit keeps working. On a multi-wire branch circuit, neutral pigtails are required (Procedure J).
3. Land the ground on the green screw.
4. Land the white on a silver screw.
5. Land the black on a brass screw.
6. Fold the wires in, accordion style, grounds to the back.
7. Mount the receptacle with the two 6-32 screws. The yoke must be held tight to the box or to the plaster ears on the finished wall (406.14(A) and (B)). Use plastic spacers if the box is set back.
8. The face of the receptacle must be flush with or stick out past a plastic faceplate, and stick out at least 0.015 inch past a metal faceplate (406.14(D)). If it sits behind the plate, a plug won't seat all the way and the blades will heat.
9. Turn the breaker on. Test with a plug-in three-light tester. You should see the "correct" pattern. Test both halves of the duplex.

Ground up or ground down: the NEC does not say. YES habit is ground hole up on new work, so a loose metal plate that falls onto a half-pulled plug hits the ground blade first. Match the house on replacements unless the customer asks.

Procedure C: Wire a GFCI receptacle with downstream protection

1. Turn the breaker off and prove it dead.
2. Identify LINE and LOAD. The LINE cable brings power from the panel. The LOAD cable carries power on to other receptacles. If only one cable is in the box, it is the LINE cable (Leviton GFCI instructions, step 4).
3. On an existing box with two cables and the power off, separate the two cables, cap every wire, and stand clear. Turn the breaker on. Use the non-contact tester and the meter to find which black is hot. That cable is LINE. Turn the breaker off and prove it dead again.
4. Mark the LINE wires with a piece of tape.
5. Connect the LINE black to the LINE brass terminal and the LINE white to the LINE silver terminal.
6. Pull off the yellow sticker that covers the LOAD terminals only if you have a LOAD cable. Connect the LOAD black to the LOAD brass and the LOAD white to the LOAD silver.
7. Make the grounds up with a pigtail to the GFCI's green screw.
8. Torque per the GFCI's sheet. Leviton lists 14 to 18 lb-in.
9. A GFCI is deeper than a standard receptacle. Fold the wires in carefully and recheck the box fill in R1.3 if the box is tight.
10. Turn the breaker on. A modern GFCI will not reset if it has no power, if LINE and LOAD are reversed, or if it fails its self-test (Leviton GFCI instructions, Note under section 1). Press RESET. The status light should go off or turn green, depending on the brand.
11. Press TEST. The GFCI must trip and both outlets go dead. Press RESET.
12. Go to every downstream receptacle. Plug in a GFCI tester and push its button. Each one must cut off power, and the GFCI upstream must show tripped. Reset after each test.
13. Label each downstream receptacle "GFCI Protected" with the sticker in the GFCI box, so the next person knows where to reset it.
14. GFCI receptacles must be in a readily accessible place (210.8). Don't put the GFCI that protects the kitchen behind the refrigerator.

SAFETY: the TEST button on the GFCI tests the GFCI. It does not prove the wiring downstream is right. Always push the button on a plug-in tester at each downstream receptacle as well.

Picture coming: Wiring diagram: a panel breaker feeding a 12-2 cable labeled LINE into a GFCI receptacle's LINE terminals. A 12-2 cable labeled LOAD leaves the GFCI's LOAD terminals and daisy-chains to two downstream duplex receptacles, each with a small "GFCI Protected" sticker. Black wires to brass, white to silver, bare grounds pigtailed to every green screw. Text box: "If LINE and LOAD are swapped, the GFCI will not reset."

Procedure D: Wire a single-pole switch

A single-pole switch turns a light on and off from one place. It has two brass terminals and a green ground screw. It does not matter which brass screw gets which wire (Kuhlman, "Single-Pole Switches," p. 13).

Layout 1, power comes to the switch first:

1. A 14-2 comes in from the panel side (always hot). A 14-2 goes out to the light.
2. Ground: splice both bare grounds plus a pigtail. Land the pigtail on the switch's green screw. Switches must be grounded, either by the green screw or by metal mounting screws into a grounded metal box (406.40(B); 2023: 404.9(B)).
3. Neutral: splice the two whites together and fold them in. The neutral passes through the switch box. It never goes to the switch. A switch must never open the neutral (406.30(B); 2023: 404.2(B)).
4. Hot: land the incoming black on one brass screw and the outgoing black (the switched leg) on the other.
5. Mount the switch so ON is up. A switch in an enclosure must show whether it is on or off (406.36), and a toggle installed upside down reads "NO" (Kuhlman, p. 13).

Layout 2, power comes to the light first (switch loop), old way:

1. Older houses often have a 14-2 from the light down to the switch, with the white used as a hot. The white must be re-marked with black or red tape at both ends (200.7(C)(1)(a)).
2. That re-marked white may only be the supply to the switch, never the return from the switch to the light (200.7(C)(1)(b)). So at the light, the white (taped black) connects to the incoming hot, and the black from the switch goes to the light.
3. New work: NEC 2026 requires a neutral at switch locations that control lighting in habitable rooms, bathrooms, hallways, and stairways (406.30(C); 2023: 404.2(C)). Smart switches and occupancy sensors need that neutral to run their electronics. So on new work, run 14-3 from the light to the switch. Black = hot to the switch, red = switched leg back to the light, white = neutral, capped in the switch box for later.

Picture coming: Two single-pole switch drawings. Left: power at the switch, 14-2 in and 14-2 out, whites spliced and folded back, blacks on the two brass screws, ground pigtail to green. Right: power at the light with a 14-3 switch loop: black from the light's hot splice to one brass screw, red from the other brass screw back to the light, white neutral capped in the switch box with a label "required by 406.30(C)."

Procedure E: Wire a pair of three-way switches

A three-way switch has three terminals: one common (the darker screw, sometimes marked COM) and two travelers (lighter screws). Two three-ways control one light from two places. The travelers run between the two switches. At one switch the common gets the hot. At the other switch the common sends the switched hot to the light (Kuhlman, "Three-way switches," pp. 13-14).

Most common layout, power at switch 1, light after switch 2 (Kuhlman, p. 15):

1. Panel → 14-2 → switch 1 box → 14-3 → switch 2 box → 14-2 → light.
2. At switch 1: incoming black (hot) to the common screw. The red and black from the 14-3 go to the two traveler screws. Splice the incoming white to the 14-3's white. Ground pigtail to the green screw.
3. At switch 2: red and black from the 14-3 to the two traveler screws. The black of the 14-2 to the light goes to the common screw. Splice the 14-3's white to the 14-2's white. Ground pigtail to green.
4. At the light: black to the light's hot lead, white to the light's neutral lead, ground to the fixture ground.
5. Turn on the breaker. Test every combination: switch 1 up and switch 2 up, up and down, down and up, down and down. The light must change state every time you flip either switch.

Rules every three-way layout must follow, whichever one you meet in the field:

Rule	Code	Why
Switching is done only in the hots. Neither switch ever opens the neutral	406.30(A), (B) (2023: 404.2(A), (B))	An open neutral leaves the fixture's socket live with the light off
A white used as a hot is taped at both ends and is only the supply to a switch, never the return to the light	200.7(C)(1)	So the next electrician knows it is hot, and the white at the light is never the switched wire
A neutral is present in at least one of the switch boxes on new work	406.30(C)	Electronic switches need it
Never splice the neutrals of two cables that are on the same circuit in two different boxes so that the neutral has two paths back	300.3(B) for conductors kept together (not checked line by line; still being checked against the printed code book)	Kuhlman calls this a parallel neutral and says it is a common mistake when 14-3 runs between two-gang boxes that each have their own feed (Kuhlman, pp. 19-20)

Kuhlman draws five three-way layouts on pp. 15-20, including the "dead-end" layout where the feed and the switch leg are in the same box, and a feed-at-the-light layout that he notes cannot be installed under current code because neither switch box has a neutral (Kuhlman, p. 17). Learn to recognize those on service calls, but on new work use the layout above unless your journeyman says otherwise.

How to find the common on an old switch before you take it off: look for the darker screw or the word COM. Put a piece of tape on the wire landed there before you remove anything (Arc Guide, Job 3, "Three-way switch replacement"). If you mix up the common and a traveler, the light works from one switch only in some positions.

Picture coming: Three-way switch wiring, power at switch 1. Panel feeds 14-2 to switch 1; 14-3 between switch 1 and switch 2 with the black and red travelers drawn in orange and purple so they stand out; 14-2 from switch 2 to a ceiling light. Commons marked "COM" on dark screws. Whites spliced through each box. A second smaller drawing of the same circuit with the light between the two switches and a 14-3 to each switch, for recognition only.

Procedure F: Add a four-way switch

A four-way switch goes between two three-ways. Each four-way adds one more control point. You can add as many four-ways as you want between the two three-ways (Kuhlman, "Four-Way Switches," p. 21).

1. Wire the two three-ways as in Procedure E, but break the traveler run in the middle at the new switch box. You now have a 14-3 from switch 1 to the four-way box and a 14-3 from the four-way box to switch 2.
2. At the four-way: the black and red from one 14-3 go to one pair of terminals. The black and red from the other 14-3 go to the other pair. The four-way is marked to show which two screws are a pair, usually by color (Kuhlman, p. 21). Read the switch.
3. Splice the two whites together at the four-way box. Ground pigtail to the green screw.
4. Test every combination. With three switches, there are eight. The light must change state every time any switch is flipped.
5. If it works from some switches but not others, the most likely fault is that the travelers from one cable got split across the two pairs. Swap one traveler from each cable and test again.

Picture coming: Four-way wiring strip: three-way (power in) → 14-3 → four-way → 14-3 → three-way → 14-2 → light. On the four-way, the two travelers from the left cable land on the two brass screws on the top, the two from the right cable on the two dark screws on the bottom, with a box: "one cable per pair of screws."

Procedure G: Install a dimmer for LED lights

1. Read the light's package or spec sheet. It lists which dimmers work with it. Kuhlman's rule is to always go by the lighting maker's list (Kuhlman, "Dimmers," p. 23).
2. Check the lamp. A lamp marked "non-dimmable" will flicker or buzz on any dimmer. Replace the lamp or don't use a dimmer.
3. Check the load rating. A dimmer lists a maximum wattage for incandescent and a lower one for LED. Add up the wattage of every lamp on that switch. Stay under the LED rating.
4. Ganging dimmers: when two or more dimmers sit side by side in one box, you break off the side fins (tabs). Each fin you break off lowers the rating. Kuhlman's example is a 600 W incandescent dimmer that drops to 500 W with one side removed and 400 W with both sides removed (Kuhlman, p. 23). Read the derating table on the dimmer's package.
5. Wire it like the switch it replaces: single-pole dimmer in a single-pole spot, three-way dimmer in one of a three-way pair (the other location stays a three-way switch or a matching remote). Most LED dimmers need the neutral (406.30(C) is why it is there).

6. Turn on and run the dimmer from top to bottom. If the light flickers or shuts off at the low end, set the low-end trim adjustment on the dimmer (many LED dimmers have a small slide or dial behind the plate; Kuhlman, p. 23, describes this feature on the Lutron DVCL-153P).
7. A dimmer gets warm. That is normal. A plate too hot to keep your hand on means the dimmer is overloaded (Kuhlman, p. 26).
8. Never put a dimmer on a receptacle. General-use dimmers are only for permanently connected loads such as lights (406.46(D)).

R1.7 covers LED drivers, leading-edge vs trailing-edge dimmers, and low-voltage lighting in depth.

Procedure H: Replace an existing receptacle (the replacement rules)

Every time you replace a receptacle in a house, the new one has to meet today's rules for that spot. 406.12(D) (2023: 406.4(D)) lists them. Work this checklist before you buy the part.

Question	If yes	Code
Does the box have a ground (bare wire, or a grounded metal box)?	Use a grounding-type receptacle and connect the ground	406.12(D) (1)
No ground in the box?	Three legal choices: another two-prong receptacle; a GFCI receptacle marked "No Equipment Ground"; or a three-prong receptacle fed from a GFCI, marked "GFCI Protected" and "No Equipment Ground." R1.6 covers adding a ground	406.12(D) (2)
Is this a spot where GFCI is required today (kitchen, bath, garage, outdoors, laundry, basement, within 6 ft of a sink)?	The replacement must be GFCI protected	406.12(D) (3)
Is this a room listed for AFCI in 210.12(B) (bedroom, living room, kitchen, hallway, etc.)?	The replacement must be an AFCI receptacle, or be protected by an upstream AFCI receptacle or a combination AFCI breaker	406.12(D) (4)
Is TR required here today?	Use a TR receptacle. Exceptions: replacing a two-prong with a two-prong, or aluminum wire landed on a CO/ALR receptacle	406.12(D) (5)
Is it outdoors or in a damp or wet location?	Use a WR (weather-resistant) receptacle	406.12(D) (6), 406.9

The GFCI replacement rule has a narrow exception when no GFCI receptacle fits in the box, no upstream box can take one, and a GFCI breaker can't do it (406.12(D)(3) Exception). Ask your journeyman before you use it.

Steps for the replacement itself:

1. Turn the breaker off. Prove it dead at both halves of the receptacle with the meter.
2. Take off the plate and the two mounting screws. Pull the receptacle out by the yoke.
3. Photograph the wiring before you disconnect anything (Arc Guide, Job 1, Step 3).
4. Note the number of cables. One cable means end of run or the first outlet. Two cables means the circuit passes through.
5. Release backstabbed wires by pushing a small screwdriver into the release slot next to the wire. Never cut a backstab off flush unless there is plenty of wire left. Box wire is never long enough.
6. Inspect the wire ends. Cut back burned, nicked, or blackened copper and restrip. If there isn't 6 inches left in the box, splice on a pigtail (R1.3, 300.16).
7. Land the new receptacle with screw terminals per Procedure A, with pigtails where two wires would share a screw.
8. Torque, fold, mount, and plate.
9. Test with the plug-in tester, and with a GFCI tester if the spot needs GFCI.

Picture coming: Backstab vs side-wire close-up for the replacement: the old receptacle with two backstabbed blacks, one with a browned insulation end, and a small screwdriver in the release slot; next to it the new TR receptacle with a black pigtail hooked clockwise on the brass screw and a wire nut joining the pigtail to the two blacks.

Procedure I: Lay out the required circuits and receptacles

R1.2 lays out a whole house. These are the rules you check room by room.

Required circuits (210.11(C)):

Circuit	Size	Serves	Code
Small-appliance circuits	Two or more, 20 A	All receptacles in the kitchen, pantry, breakfast room, dining room, and countertops in those rooms, and the refrigerator receptacle. No other outlets. A countertop must be fed by at least two of them. One small-appliance circuit may not feed two kitchens	210.11(C)(1), 210.52(B)
Laundry	At least one 20 A	The laundry receptacles. No other outlets	210.11(C)(2)
Bathroom	At least one 20 A	Bathroom receptacles and countertop receptacles. No other outlets, except a circuit that feeds only one bathroom may also feed other equipment in that same bathroom	210.11(C)(3) and Exception
Garage	At least one 20 A	Receptacles in an attached garage, or a detached garage with power. No other outlets	210.11(C)(4)

Kitchen allowances in 210.52(B): a clock receptacle, and a receptacle for the igniter and lights of a gas range, may sit on a small-appliance circuit. A receptacle for one specific appliance may be on its own circuit of 15 A or more (210.52(B)(1) Exception No. 2). That exception is how a refrigerator gets its own 15 A or 20 A circuit.

Receptacle spacing in general rooms (210.52(A)): kitchens, family rooms, dining rooms, living rooms, bedrooms, dens, sunrooms, rec rooms, and similar rooms.

1. No point along the floor line of any wall space may be more than 6 feet from a receptacle (210.52(A)(1)). That is the "6-foot rule." It comes from the length of a lamp cord. If no point is more than 6 feet away, nobody needs an extension cord.
2. A wall space is any stretch of wall 2 feet wide or wider, unbroken by doors, fireplaces, or fixed cabinets. Measure around corners (210.52(A)(2)).
3. Floor receptacles count only if they are within 18 inches of the wall (210.52(A)(3)).
4. Receptacles more than 5½ feet above the floor, inside cabinets, part of a light or appliance, or switched under 210.70 Exception 1 don't count toward the requirement (210.52 opening paragraph).

Kitchen countertops (210.52(C)):

1. Every countertop or work surface 12 inches wide or wider gets receptacles.
2. No point along the wall line of the counter may be more than 24 inches from a receptacle (210.52(C)(1)). That rule makes a receptacle every 4 feet, plus one within 2 feet of every end.
3. Behind a sink or range, the space is exempt from the wall line in the cases shown in Figure 210.52(C)(1) (12 inches or 18 inches depending on the setup).
4. The receptacle goes on or above the counter, no more than 20 inches above it, or in the counter using a receptacle assembly listed for countertops (210.52(C)(3)).
5. Islands and peninsulas: if you serve them, follow 210.52(C)(3). If you don't put a receptacle there, you must leave provisions (a box or a stubbed circuit) at the island for one later (210.52(C)(2)).
6. Receptacles below the counter can't be within 24 inches of the countertop (210.52(C)(4)).
7. Countertop receptacles don't count toward the 6-foot wall rule (210.52(C)).

Other required receptacles:

Place	Rule	Code
Bathroom	At least one receptacle within 3 ft of the outside edge of each sink, on the wall next to the sink, on the counter, or on the side or face of the sink cabinet, and not more than 12 in. below the countertop	210.52(D)
Bathroom, tub and shower	No receptacle inside the tub or shower or within 3 ft horizontally and 8 ft vertically of it	406.9(C)(1)
Outdoors, one- and two-family	At least one at the front and one at the back, readily accessible from grade, not more than 6½ ft above grade	210.52(E)(1)
Decks, porches, balconies within 4 in. of the house	At least one, reachable from the deck, not more than 6½ ft above its floor	210.52(E)(3)
Laundry	At least one	210.52(F)
Garage	At least one in each vehicle bay, not more than 5½ ft above the floor	210.52(G)(1)
Unfinished basement	At least one in each separate unfinished part	210.52(G)(3)
Hallway	At least one if the hallway is 10 ft or longer	210.52(H)
Foyer	Over 60 sq ft: one in each wall space 3 ft or wider	210.52(I)
HVAC equipment	A 125 V, 15 A or 20 A receptacle within 25 ft, on the same level, not on the load side of the equipment disconnect	210.63(A)

Required lighting (210.70(A)):

1. At least one wall-switched lighting outlet in every habitable room, kitchen, laundry area, and bathroom. The switch goes near the room's entrance (210.70(A)(1)).
2. In rooms other than kitchens and bathrooms, a switched receptacle can stand in for the light (210.70(A)(1) Exception No. 1).
3. An interior stairway with six or more risers needs a switch at each floor level and each landing with an entry (210.70(A)(2)(3)).
4. Attics, crawl spaces, utility rooms, and basements used for storage or with equipment that needs service need a light with a switch at each entry (210.70(C)).

Picture coming: A kitchen floor plan, about 12 by 14 feet, with an L-shaped counter, a sink under a window, a range on the long wall, a refrigerator space, a dishwasher, and a 6-foot island. Every countertop receptacle drawn as a duplex symbol with 24-inch reach arcs overlapping along the wall line. Labeled circuits: SA-1 (20 A) and SA-2 (20 A) alternating along the counter; dedicated circuits for the refrigerator (20 A), dishwasher (20 A), disposal (20 A), microwave (20 A). The island shows one receptacle on SA-2. Labels show "≤ 20 in. above counter" and "≤ 24 in. from any point on the wall line."

Procedure J: Multi-wire branch circuits (MWBC)

A multi-wire branch circuit is two hots from opposite legs of the panel sharing one neutral. In a house, it is usually a 12-3 or 14-3 with black on one breaker, red on the breaker next to it, and one white. Kitchens built from the 1970s to the 2000s often have one. Some split-wired receptacles (top half on one circuit, bottom on the other) are fed this way.

How it works: the two hots are 180 degrees apart (R1.2 covers split-phase). The neutral only carries the difference between the two hot currents. If black carries 15 A and red carries 10 A, the neutral carries 5 A. That is why one neutral can serve two circuits.

The danger: if the two hots are on the same leg of the panel, the neutral carries the sum. 15 A plus 10 A puts 25 A on a 14 AWG or 12 AWG neutral with no breaker watching it. If the neutral opens, the loads on both circuits end up in series across 240 V. The side with the smaller load gets more than 120 V and burns up electronics. R2.5 covers the lost-neutral call.

Rules:

1. Both hots must come from the same panel as the neutral (210.4(A)).
2. Both hots must be disconnected at the same time where the circuit starts (210.4(B)). Use a two-pole breaker, or two single-pole breakers with an identified handle tie (240.15(B)(1)). A nail or a wire through the handles is not identified.
3. Land the two hots on opposite legs. In a standard load center, two breakers next to each other on the same side are on opposite legs, and a two-pole breaker always is. Verify with your meter: 240 V between the two hots means opposite legs. 0 V means same leg.
4. An MWBC may only supply line-to-neutral (120 V) loads, unless it supplies only one piece of equipment, or all hots are opened together by the breaker (210.4(C)).
5. The neutral must never depend on a device. Splice the neutral with a pigtail to each receptacle. Don't use a receptacle's two silver screws to pass it through (300.15(B); 2023: 300.13(B)). If the receptacle were removed with power on, the neutral for everything downstream would open, and the lost-neutral problem above happens.
6. Group the hots and neutral of each MWBC together in the panel with a wire tie, unless the cable makes the grouping obvious (210.4(D)).
7. AFCI and GFCI on an MWBC: use a two-pole AFCI, GFCI, or dual-function breaker made for it. Two single-pole GFCI or AFCI breakers can't share a neutral, because each one sees the other's return current as a fault.

SAFETY: on an MWBC, turning off one breaker does not make the neutral dead. The neutral can still carry current from the other circuit. Turn off both breakers (that is why the handle tie is there), then prove the neutral dead at the box before you open the splice.

Picture coming: Panel and box drawing of an MWBC: a 2-pole 20 A breaker feeding 12-3, black on leg A, red on leg B, one white. At a split-wired kitchen receptacle, the brass tab between the hot screws is broken off; black to the top hot screw, red to the bottom; the white is pigtailed to one silver screw (tab intact on the neutral side). A current arrow table: "Black 15 A, Red 10 A, Neutral 5 A." A second panel in red: "Same leg: Neutral 25 A — never."

4. Worked Examples

Example 1: Breaker, wire, and receptacle for four circuits

Circuit	Load	Wire	Breaker	Receptacle	Why
Bedroom receptacles and lights	General use	14-2	15 A AFCI	15 A TR duplex	240.4(D)(4); 210.12(B); 406.26
Kitchen countertop	Small appliance	12-2	20 A dual-function	15 A or 20 A TR duplex; first one GFCI if not using a GFCI breaker	210.11(C)(1); 210.8(A)(7); Table 210.21(B)(3)
Dedicated freezer in the garage, single receptacle	One appliance	12-2	20 A GFCI	20 A single receptacle (not 15 A)	210.21(B)(1); 210.8(A)(2)
Bathroom	Hair dryer, etc.	12-2	20 A	GFCI receptacle at the first outlet, TR	210.11(C)(3); 210.8(A)(1)

The freezer line shows the trap. A single receptacle on an individual 20 A circuit must be rated at least 20 A. A duplex would also work, because a duplex is two receptacles.

Example 2: Counting countertop receptacles

A straight countertop runs 11 feet along one wall from a refrigerator to a corner. A 30-inch range sits in the middle, set 2 feet from the wall end at its left edge, so it splits the counter into a 4-foot piece on the left and a 4-foot 6-inch piece on the right.

Rule: no point along the wall line more than 24 inches from a receptacle. The space behind the range is exempt only under the Figure 210.52(C)(1) conditions; assume it is a freestanding range against the wall, so the counter is treated as two separate pieces.

Counter piece	Length	Receptacles needed	Placement
Left of range	4 ft (48 in.)	1	Centered at 24 in. covers 0 to 48 in.
Right of range	4 ft 6 in. (54 in.)	2	One at 24 in. covers 0–48 in.; the last 6 in. is beyond 24 in. of that receptacle, so a second is needed, for example at 48 in. to cover 24–54 in.
Total		3	Alternate between SA-1 and SA-2

If you moved the first receptacle on the right piece to 30 inches, it would cover 6 to 54 inches but leave the first 6 inches uncovered. One receptacle can cover at most 48 inches of counter. Any piece longer than 48 inches needs two.

Example 3: Bedroom wall-space count

A 12-by-14-foot bedroom. The door is on a 12-foot wall, 3 feet wide, starting 1 foot from the corner. The closet door is on a 14-foot wall, 5 feet wide, centered. The rest is plain wall.

Walk the room with the 6-foot rule: every point on the floor line within 6 feet of a receptacle, so receptacles can be no more than 12 feet apart along a wall space.

Wall	Wall spaces (2 ft or wider)	Receptacles
Wall A, 12 ft with entry door	1 ft (less than 2 ft, not a wall space) + door + 8 ft	1 on the 8-ft space, near its middle
Wall B, 14 ft plain	14 ft, plus the 8 ft from Wall A wraps around the corner	1 near the corner shared with Wall A can serve both; then 1 more within 12 ft along Wall B
Wall C, 12 ft plain	12 ft, continuous around the corner from Wall B	1 near the middle
Wall D, 14 ft with 5-ft closet door	4½ ft + closet + 4½ ft	1 on each 4½-ft space, because the closet door breaks the wall line
Total		5 to 6, depending on corner placement

Draw it on paper and swing 6-foot arcs from each receptacle along the floor line. Every inch of wall space must be inside an arc. Then add one more where the customer will put the bed, so cords don't run under it.

Example 4: MWBC neutral current

A 20 A MWBC feeds a kitchen. At dinner the black side runs a 1,500 W toaster oven (12.5 A at 120 V). The red side runs a 1,200 W coffee maker (10 A).

Case	Black	Red	Neutral
Hots on opposite legs (correct)	12.5 A	10 A	$12.5 - 10 = 2.5 \text{ A}$
Hots on the same leg (wrong)	12.5 A	10 A	$12.5 + 10 = 22.5 \text{ A}$ on a 12 AWG neutral rated 20 A, with no breaker on it

Example 5: Which protection does this outlet need?

Outlet	GFCI?	AFCI?	TR?	WR?
Bedroom receptacle	No	Yes, 210.12(B)(8)	Yes	No
Kitchen countertop receptacle	Yes, 210.8(A)(7)	Yes, 210.12(B)(1)	Yes	No
Bathroom receptacle	Yes, 210.8(A)(1)	Not listed in 210.12(B)	Yes	No
Garage receptacle	Yes, 210.8(A)(2)	Not listed in 210.12(B)	Yes	No
Front porch receptacle	Yes, 210.8(A)(4)	Not listed	Yes	Yes, plus an in-use cover (406.9(B))
Laundry receptacle	Yes, 210.8(A)(12)	Yes, 210.12(B)(13)	Yes	No
Unfinished basement receptacle	Yes, 210.8(A)(6) (all basements)	Not listed	Yes	No
Hallway receptacle	No	Yes, 210.12(B)(12)	Yes	No
Receptacle within 6 ft of a wet bar sink in the den	Yes, 210.8(A)(9)	Yes, 210.12(B)(7)	Yes	No
Dishwasher (hardwired or plugged)	Yes, 210.8(D)(7)	Yes if in the kitchen, 210.12(B)(1)	n/a if hardwired	No

NEC 2020 210.8(D) also requires GFCI for the circuit or outlet feeding electric ranges, wall ovens, cooktops, clothes dryers, microwave ovens, and sump pumps. R1.13 covers those appliance circuits.

5. Common Mistakes

Mistake	What goes wrong	Fix
Backstabbing receptacles	Connection loosens over years, overheats, and kills everything downstream	Side screws or back-wire clamps only (406.10(3) limits push-ins to 15 A, 14 AWG solid)
Hook wrapped counterclockwise	Wire squeezes out as you tighten	Clockwise, three-quarters around
"Snug plus a quarter turn"	Too loose or too tight; doesn't meet 110.14(D)	Use a torque screwdriver to the value on the device. The Arc Guide's "snug plus a quarter turn" fallback is not a code-compliant method
White landed on brass	Reversed polarity; lamp shells stay live	White to silver, black to brass. Check with a plug-in tester
GFCI LINE and LOAD swapped	GFCI won't reset (modern units)	Find the line cable with a meter before landing
Using the GFCI's TEST button as the only test	Downstream receptacles might not be protected	Plug-in GFCI tester at every downstream receptacle
15 A single receptacle on a dedicated 20 A circuit	Violates 210.21(B)(1)	20 A single or a duplex
14 AWG pigtail on a 20 A circuit	Pigtail is undersized for the breaker	Pigtail with the same size as the circuit wire, 12 AWG on 20 A
Neutral switched instead of hot	Fixture is live with the switch off	Switch the hot only (406.30(B))
Re-marked white used as the switched return to the light	Violates 200.7(C)(1)(b); confuses the next person	White (taped) is supply to the switch only
No neutral at a new switch box	Smart switch can't be installed; violates 406.30(C) on new work	Run 14-3 to the switch, cap the white
Two neutrals from different circuits spliced together	GFCIs trip; neutral can overload	Keep each circuit's neutral with its own hot (Kuhlman, p. 28)
Neutrals spliced in two boxes so a three-way circuit has a parallel neutral	Code violation; currents split unpredictably	Cap the redundant white (Kuhlman, p. 20)
MWBC on two unhandle-tied single-pole breakers	Someone turns off one breaker, opens the box, and gets shocked by the neutral	Two-pole breaker or identified handle tie (210.4(B))
MWBC neutral passed through receptacle screws	Removing one receptacle opens the neutral for the rest	Pigtail the neutral (300.15(B))
Dimmer on a non-dimmable LED	Flicker, buzz, early lamp failure	Dimmable lamp and a listed-compatible dimmer

Mistake	What goes wrong	Fix
Dimmer controlling a receptacle	Not allowed (406.46(D))	Switch it with a standard switch, or don't
Non-TR receptacle in a bedroom	Fails inspection; child safety	TR everywhere in the house (406.26)
Outdoor receptacle with a flip cover that only closes with nothing plugged in	Water gets in when in use	Extra-duty in-use (bubble) cover, WR receptacle (406.9(B))

6. Field Exercise (from the outline, written out in full)

Time: about 5 hours on the training wall. Your journeyman watches and signs each part.

Materials: 12-2 and 14-2 and 14-3 NM-B; one 20 A GFCI receptacle; two 20 A or 15 A TR duplex receptacles; two three-way switches; one four-way switch; one LED-rated dimmer; one non-dimmable LED lamp and one dimmable LED lamp; one lampholder; one backstabbed receptacle salvaged from a job (or one you backstab for the exercise); boxes per R1.3; wire nuts; a plug-in three-light tester with a GFCI test button; a torque screwdriver; the meter.

Part 1: 20 A kitchen countertop circuit with GFCI and two downstream receptacles

1. Mount three single-gang boxes 4 feet apart, 44 inches above the floor, to stand in for a countertop wall.
2. Run 12-2 from the training panel's 20 A breaker to box 1 (LINE). Run 12-2 from box 1 to box 2, and from box 2 to box 3.
3. Wire the GFCI in box 1: LINE cable to LINE terminals, LOAD cable (to box 2) to LOAD terminals. Grounds pigtailed.
4. Wire TR duplex receptacles in boxes 2 and 3 with screw terminals and pigtails.
5. Torque every terminal to the value on the device.
6. Energize. Reset the GFCI. Test box 1, 2, and 3 with the three-light tester: all should read correct.
7. At box 2, push the tester's GFCI button. Box 2 must go dead, and the GFCI in box 1 must show tripped. Reset.
8. Repeat at box 3.
9. Apply "GFCI Protected" stickers to boxes 2 and 3.
10. Swap LINE and LOAD on purpose (power off first). Energize and try to reset. Write down what happens. Put it back.

Part 2: Three-way, then a four-way

1. Mount two switch boxes about 10 feet apart and a light box between or past them.

2. Wire a three-way pair with the power at switch 1 (Procedure E). 14-2 in, 14-3 between switches, 14-2 to the lampholder.
3. Test all four switch combinations. Write them in a table: S1, S2, light.
4. Turn off the power. Add a third box between the two switches. Cut the 14-3 traveler run and install the four-way (Procedure F).
5. Test all eight combinations. Write them in a table.
6. Have your journeyman swap one traveler on you while you are out of the room. Find it with the meter and fix it.

Part 3: Dimmer and LED

1. Replace switch 1 with a single-pole circuit and the LED dimmer (or use a separate single-pole circuit to a lampholder).
2. Put the non-dimmable LED in the lampholder. Run the dimmer through its range. Write down what you see and hear.
3. Swap in the dimmable LED from the dimmer's compatibility list. Run the dimmer again.
4. If the low end still flickers, set the dimmer's low-end trim. Write down the setting.

Part 4: Backstab to side-wire

1. Install the backstabbed receptacle in a box on a live training circuit, then turn the circuit off and prove it dead.
2. Release each backstabbed wire with a small screwdriver in the release slot.
3. Inspect the wire ends. Cut and restrip if needed.
4. Land the wires on the side screws, clockwise hooks, and torque to the value on the device with the torque screwdriver.
5. Energize and test.

Part 5: Tamper-resistant receptacle in a bedroom

1. On a 15 A AFCI training circuit marked "bedroom," install a TR duplex receptacle.
2. Show the journeyman the "TR" mark on the face.
3. Try to push a small screwdriver into one slot (power off). The shutter should block it.
4. Energize and test with the plug-in tester.

Part 6: Paper layout

1. On a blank kitchen plan from your journeyman, mark every countertop receptacle, the small-appliance circuits, and the dedicated circuits. Mark GFCI and AFCI.
2. On a bedroom plan, draw the 6-foot arcs and place every receptacle.

Sign-off: the journeyman checks terminal hooks, torque, GFCI tests at each downstream outlet, three-way and four-way truth tables, the dimmer notes, and the two plans, then initials the checklist in Section 9.

7. NEC Cross-References

All section numbers are NEC 2026, checked in the local NEC 2026 text. NEC 2023 numbers are in parentheses where they differ.

Section	What it covers
110.14(D)	Terminal torque to the marked value with an approved means such as a torque tool
200.7(C)(1)	Re-identifying a white as a hot in cable; supply to switch only
210.4	Multi-wire branch circuits: same panel, simultaneous disconnect, line-to-neutral loads, grouping
210.8(A)	Dwelling GFCI locations: bathrooms, garages, accessory buildings, outdoors, crawl spaces, basements, kitchens, food-prep sinks areas, within 6 ft of sinks, boathouses, within 6 ft of tubs and showers, laundry areas, indoor damp and wet locations
210.8(D)	GFCI for specific appliances including dishwashers, ranges, wall ovens, cooktops, dryers, microwaves, sump pumps
210.8(E)	GFCI for the 210.63 service receptacle
210.8(F)	Dwelling outdoor outlets, GFCI
210.11(C)	Required small-appliance, laundry, bathroom, and garage circuits
210.12(A)	Means of AFCI protection (breaker, outlet AFCI with limits)
210.12(B)	Dwelling AFCI locations
210.12(E)	AFCI when existing branch-circuit wiring is modified, replaced, or extended; 6-ft extension exception
210.21(B)	Receptacle ratings; Tables 210.21(B)(2) and (B)(3)
210.52	Dwelling receptacle outlets: wall spacing, small-appliance, countertops, bathrooms, outdoors, laundry, garage, basements, hallways, foyers
210.63	HVAC service receptacle within 25 ft
210.70	Required lighting outlets and switches
240.4(D)	15 A on 14 AWG, 20 A on 12 AWG, 30 A on 10 AWG copper
240.15(B)(1)	Identified handle ties for MWBCs
300.15(B) (2023: 300.13(B))	MWBC neutral continuity not dependent on devices
406.9	Damp, wet, and bathtub and shower locations; WR, extra-duty in-use covers
406.10(3)	Push-in terminals: 15 A circuits, 14 AWG solid copper only
406.12 (2023: 406.4)	Receptacle installation; 406.12(D) replacements
406.14	Receptacle mounting and face position
406.26 (2023: 406.12)	Tamper-resistant receptacles
406.30 (2023: 404.2)	Switch connections: no switched neutral; neutral at switch locations

Section	What it covers
406.36	Switch ON/OFF indication
406.38	Switch accessibility, 6 ft 7 in. max height, 300 V between adjacent devices
406.40(B) (2023: 404.9(B))	Switch grounding
406.46 (2023: 404.14)	Switch rating and use; dimmers only on permanently connected loads

Other sources used:

- Kuhlman, Residential Electrical Troubleshooting (2019): "Single-Pole Switches," p. 13; "Three-way switches," pp. 13–20; "Four-Way Switches," pp. 21–22; "Two-Pole Switches," p. 22; "Dimmers," pp. 22–26; "Duplex Receptacles," p. 27; "Ground Fault Circuit Interrupter (GFCI)," pp. 27–32. Paraphrased.
- Arc Workforce, Residential Electrical Field Guide: Job 1 (duplex receptacle), Job 2 (GFCI), Job 3 (single-pole and three-way switch), Part 10 "Backstabbed Outlets." Its code citations are NEC 2020; use the numbers in this module. Its push-in statement is updated here by 406.10(3).
- Leviton, "Installing and Testing a GFCI Receptacle," PK-93792-10-02-2J: <https://leviton.com/content/dam/leviton/digital-marketing/gfci-support-images/PK-93792-10-02-2J-M.pdf>
- navedtra-14026-basic.pdf, Chapter 5, and us-army-interior-wiring-manual-no13-1920.pdf for additional three-way and four-way drawings.

9. End-of-Chapter Checklist

- [] I land black on brass, white on silver, ground on green, every time.
- [] I hook clockwise, one wire per screw, and torque to the device's value with a torque screwdriver.
- [] I never backstab, and I know 406.10(3) limits push-ins to 15 A circuits with 14 AWG solid.
- [] I can match breaker, wire, and receptacle for 15 A, 20 A, and 30 A circuits.
- [] I know a single receptacle on its own circuit must be rated for the full circuit.
- [] I can wire a GFCI with LINE and LOAD and test every downstream receptacle with a plug-in tester.
- [] I can list the 210.8(A) GFCI locations in a house from memory.
- [] I can list the 210.12(B) AFCI locations in a house from memory.
- [] I know every 15 A and 20 A receptacle in a house must be TR, and the three exceptions.
- [] I can wire a single-pole switch with power at the switch and with a 14-3 switch loop.
- [] I know a switch never opens the neutral, and new switch boxes for lighting get a neutral.
- [] I can wire a three-way pair and add a four-way, and test every combination.
- [] I can find the common on an old three-way before I remove it.
- [] I can pick an LED dimmer, derate it for ganging, and set its low end.

- [] I can work through the replacement checklist (ground, GFCI, AFCI, TR, WR) before I buy a part.
 - [] I know the required circuits: two small-appliance, laundry, bathroom, garage.
 - [] I can lay out countertop receptacles with the 24-inch rule and wall receptacles with the 6-foot rule.
 - [] I can recognize an MWBC, verify the hots are on opposite legs, and pigtail its neutral.
 - [] I turn off both breakers before I touch an MWBC neutral.
 - [] My journeyman signed off the field exercise.
-

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
Procedure A: Make a screw-terminal connection; Procedure H: Replace an existing receptacle	How to Change Out a Receptacle - The Right Way! Electrician U • 12:23 Tests the receptacle with a plug-in tester, NCV, and meter (hot-neutral, hot-ground, neutral-ground), kills the breaker, then lands ground, neutral (silver), and hot (brass) with hooks wrapped clockwise under the screws. Caution: Filmed in a commercial building with a metal box and colored wires; he tapes around the terminals, which YES does not require. After turning the breaker off he does not show the full meter live-dead-live check; use R1.1 §3.2. He briefly says 'counterclockwise' before showing the correct clockwise wrap.
Procedure C: Wire a GFCI receptacle with downstream protection	GFCI Outlet Wiring HandyDadTV • 8:06 Replaces a receptacle with a GFCI on the LINE terminals, then adds a downstream receptacle from the LOAD terminals, pigtails the grounds, resets the GFCI, and proves the downstream outlet trips with the test button. Caution: DIY channel, not a licensed electrician. He does not put a 'GFCI Protected' sticker on the downstream receptacle; R1.4 and 406.4(D) require it. Uses the GFCI's back-wire clamp terminals, which are screw terminals, not push-ins.
Procedure D: Wire a single-pole switch	How to Wire a Single-Pole Switch Sparky Channel • 5:49 Power-at-the-switch layout in a metal box: ground pigtail to the box and the switch's green screw, neutrals spliced and folded back, line and load blacks on the two brass screws. Caution: Uses Wago lever nuts for splices (listed lever connectors are allowed per R1.2 §4.4) and tapes the switch terminals, which is optional. Uses a 12 AWG circuit; a 15 A lighting circuit is 14 AWG.
Procedure E: Wire a pair of three-way switches; Procedure F: Add a four-way switch	How to Wire a 4-Way Switch System Sparky Channel • 20:58 Builds a full three-location system on 4-in. square boxes: 12-2 line cable, 12-3 traveler cables, 3-way switches at each end, 4-way in the middle, common screws identified, and a meter check for 0 V before he starts. Caution: Uses 12 AWG; R1.4's example uses 14-3 on a 15 A lighting circuit. Proves dead with the meter after turning the breaker off but does not re-prove the meter on a live source; follow R1.1 §3.2.

Procedure G: Install a dimmer for LED lights	Tips for dimming LEDs Regency Supply (Regency Lighting) • 6:43 Explains non-dimmable vs dimmable LEDs, why older dimmers fight LED drivers, how to check a dimmer compatibility list, and demonstrates the low-end trim adjustment behind the plate on three different lamps. Caution: Made by a lighting supplier and features one Lutron model; no wiring is shown. Check the specific lamp or fixture against the dimmer maker's compatibility list as R1.4 Procedure G says.
Procedure J: Multi-wire branch circuits (MWBC)	Neutral Imbalance in Multiwire Branch Circuits (Two Hots, One Neutral) Electrician U • 16:41 Whiteboard explanation of why a shared neutral carries only the difference when the two hots are on opposite legs, and why two hots on the same leg double the neutral current. Caution: Mentions the common handle tie but does not show the neutral pigtail at each receptacle that R1.4 Procedure J requires (300.15(B)).