



Bill Crutchfield, Founder and CEO

Speaker installation guide: retrofitting

We've developed this in-wall, in-ceiling, and on-wall speaker installation guide to give you step-by-step pointers for a successful do-it-yourself install. Our comprehensive and caring tech support is free with most orders. Or if you'd rather not do it yourself, we can set you up with a professional installer in your area. Please let us know if there's anything else we can do.

Bill Crutchfield

Installing your own in-wall, in-ceiling, or on-wall speakers can be a great way to save money, and still get a good-looking system that blends attractively into your décor. This guide includes detailed information to help you install your speakers in an existing home. Read through these tips, as well as the speaker manual, to get an idea of what's involved. Crutchfield customers can also count on our Tech Support staff for expert answers and help.

Before you get started

Make sure that you have a thorough understanding of local building and fire codes. You should be able to obtain a copy from your local government office. Make sure you know what's behind the wall or ceiling into which you plan to install your speakers and speaker wire. Also, read and follow the safety guidelines on page 2, as well as those in the owner's manual.

Can you install the speakers yourself?

Take a look at the chart below. What kind of installation do you want to do? Do you feel confident with the skills and tools involved?

You should be able to do this...	...if you're comfortable with these household tasks...	...and know how to use these tools.
Installing in-wall, in-ceiling, or on-wall speakers and running your own in-wall wire	<ul style="list-style-type: none"> installing new light fixtures, phone lines, or security wiring wiring a whole-house computer network patching and repairing drywall touch-up painting 	<ul style="list-style-type: none"> fish tape (longer runs may require 2 tapes) drywall saw utility knife power drill and drill bits wire strippers level stud finder electrical tape
Installing in-wall or in-ceiling speakers with pre-run wire	<ul style="list-style-type: none"> mounting shelving cutting drywall 	<ul style="list-style-type: none"> drywall saw utility knife power drill and drill bits (see owner's manual) wire strippers level stud finder
Installing on-wall speakers and running wire outside the walls	<ul style="list-style-type: none"> hanging pictures mounting shelving 	<ul style="list-style-type: none"> power drill and drill bits (see owner's manual) wire strippers level stud finder

See the chart above to determine which tools you'll need to install your own speakers in an existing home. You'll also need a partner to help you with some of the installation steps, particularly routing speaker wire behind walls, between floors, etc.

Jump to the info you need

Topic	Pages
Before you get started	1-2
Preparation and planning.....	2-3
Cutting and drilling into your wall or ceiling	3-4
Routing the speaker wire.....	4-6
Installation and painting	6-7
Drywall repair and clean-up	7-8

Need More Help?

Tech support is free with most orders. You can contact our Tech Support staff 16 hours a day (8 a.m.-midnight, Eastern Time), seven days a week. Their phone number is printed on your invoice.

Lots of people don't feel comfortable with certain aspects of the in-wall or in-ceiling speaker installation process. If you'd prefer not to do it yourself, visit www.crutchfield.com/install

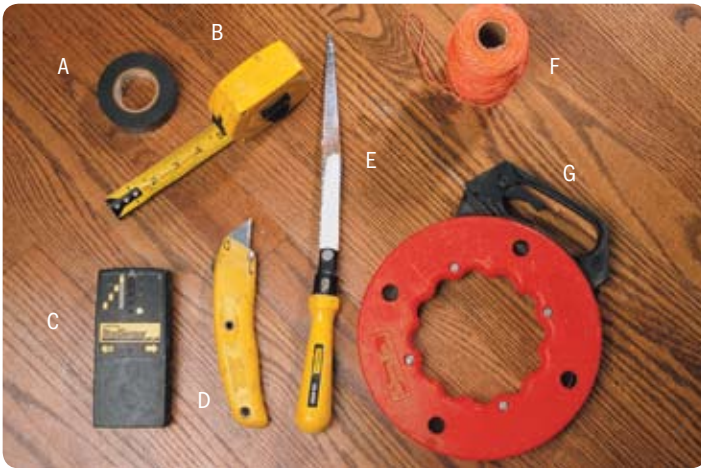
or call us at:
1-800-316-5076

and we'll set you up with a certified professional installer in your area.*

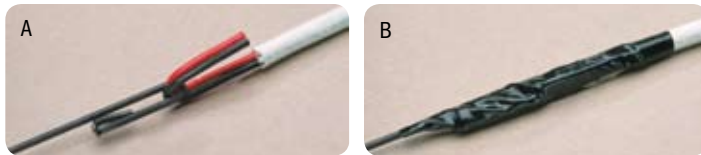
*Installer service available for single-room installs only.

Crutchfield provides information intended to simplify your installation. Because tools, products, materials, techniques, and local codes and regulations vary and change, Crutchfield assumes no liability for omissions, errors, or the outcome of any project. Always exercise caution, and follow all applicable regulations and codes. Consult a licensed professional if you have any doubts about our information.

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Some of the tools you'll need to wire an existing home include: (A) electrical tape; (B) measuring tape; (C) a stud finder; (D) a utility knife; (E) a drywall saw; (F) string (for pulling wire short distances); (G) a fish tape (for pulling wire longer distances)



Fish tape: This tool allows you to pull cable behind existing walls, floors, and ceilings. It's sturdier than speaker wire, making it easier to "fish" through small spaces. In order to pull speaker wire to another location, you'll need to attach the wire to the fish tape: (A) Strip the jacket off the cable. Bend the conductors over the fish hook. (B) Wrap the hook and the cable with electrical tape.

Safety tips

- Be sure to use wire that meets local building and fire code. Most codes require UL-rated wire labeled CL2 or CL3 for in-wall installations.
- When working in the attic:
 - ◆ If it's not a finished attic, be careful to walk only on ceiling joists.
 - ◆ These areas are often poorly ventilated. Stay hydrated and use a fan to circulate air if you can. Make sure someone knows that you're up there, and take breaks when you need to.
- When working on a ladder:
 - ◆ Place your ladder in a stable position close to where you're working. Don't reach.
 - ◆ Always have one hand on the ladder.
 - ◆ Face the ladder when ascending or descending.
 - ◆ Don't carry heavy items up the ladder that could cause you to lose your balance and fall.
- Turn off the power in areas you'll be drilling to avoid electric shock.
- If there might be live power lines behind the wall around your pilot hole, wrap the exploratory wire with electrical tape.
- Make sure the area behind your wall is clear before cutting.
- If you drill through a fire block or firebreak, patch it with comparable material.
- Before connecting your speakers, be sure to unplug your receiver.

Preparation and Planning

Choosing the right speaker wire

Getting the right kind of speaker wire is important not only to the performance of your speakers, but the safety of your home. The type of speaker wire you use will depend on where you're going to route the wire and how far the signal will have to travel from your receiver or amplifier to the speaker. (We'll talk about speaker placement and

estimating how much wire you'll need in upcoming sections.)

- If you're going to run wire on the outside of your walls, you can use any type of speaker wire. Flat, paintable speaker wire will blend into your décor for a cleaner look. Many home improvement and hardware stores also sell paintable cable management raceways that attach to your wall or baseboard and keep the wires hidden.
- Be sure to check your local building and fire code and buy wire accordingly. If you're going to run cable inside your walls, you'll need UL-rated speaker wire labeled CL2 or CL3. The Underwriters Laboratory (UL) looks at heat generated from current flowing through wire, how quickly the cable will catch and spread fire when exposed to flame, and the wire's susceptibility to damage from external stresses.

Keep in mind that the gauge, or thickness, of your speaker wire should depend on how far the wire has to travel from the receiver to the speaker. The lower the American Wire Gauge (AWG) number, the thicker the wire. Significant power losses can occur over long runs, resulting in lower performance. While this probably won't be a problem in most single-room setups, it could be an issue for multi-room systems. Use the chart below as a guideline for wire gauge selection.

Distance from speaker to amplifier	Gauge
Less than 80 feet	16
80 to 200 feet	14
More than 200 feet	12

You can choose speaker cable with two or four conductors. Two-conductor cable

is all you need to wire one speaker. Four-conductor cable gives you the added convenience of powering two speakers, while you only have to pull one wire. Four-conductor wire is most typically used in multi-room applications with a volume control. For example: If you're going to run wire from a receiver in your living room to a pair of speakers with a volume control in your dining room, you would use four-conductor wire from the receiver to the volume control, and two-conductor wire from the volume control to each speaker.

You may see in-wall speaker cable identified in short-hand that indicates its gauge and its number of conductors. For example:

- 16/2 is 16-gauge wire with 2 conductors
- 14/4 is 14-gauge wire with 4 conductors

Speaker placement

Generally, you'll want to have chosen your speaker locations before your purchase. But if you're still in the process of deciding where to put your in-wall, in-ceiling, or on-wall speakers, or if you want some detailed placement tips, call Tech Support, or check out crutchfield.com/inwallplacement

Planning the wire route

Once you've chosen your speaker locations, the next thing to figure out is where you're going to run the wire. We've listed some common options on the next page. Take a look and consider which one would be the best option for your house and setup. Also, take a look at the illustrations on pages 5-6 to get an idea of what's involved for wire runs in these locations.



Two conductor wire (A) is used when running wire directly to a speaker, while 4-conductor wire (B) is often used for runs to volume controls.

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- inside the wall
- under your carpet
- behind a baseboard, door jamb, or crown molding
- through a heating or air conditioning vent*
- inside cabinetry, bookshelves, drawers, or closets
- through a crawl space, or unfinished basement or attic

* Note: Use wire that meets local building and fire code. If running wire in heating/AC vents, use "plenum-rated" wire — CLP2 or CLP3.

If you can run your speaker wire in places that won't require drywall repair afterwards, you can save yourself lots of time and effort. Also, avoid exterior walls when possible. These walls have extra bracing and insulation which can make installing speakers and running wire more difficult.

Making sure you have enough wire

After planning where you're going to route your wire, calculate how much you'll need. Work your way from point to point, thinking through where the wire will have to turn a corner or go up or down a wall. Do this individually for each speaker you plan to install. Make careful measurements, and double-check your work. Remember that it's better to have too much wire than too little. Here's an example:

- running wire from the receiver to the wall: ...4 feet
- running wire inside wall, up to attic:12 feet
- running wire through joists in attic to speaker location in ceiling:.....8 feet
- slack for speaker installation:.....6 feet
- subtotal:30 feet
- + 15% fudge factor:.....**35 feet total**

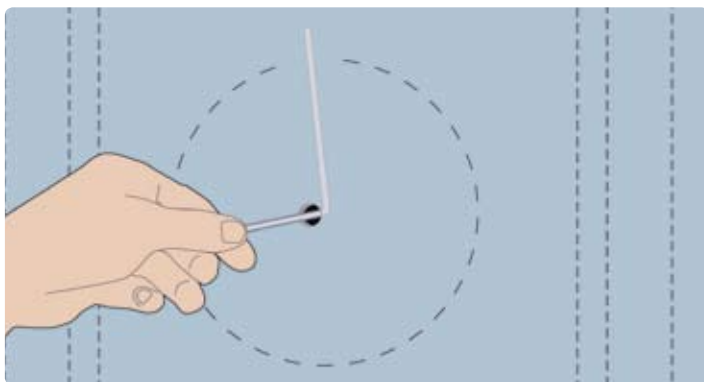
Many professional installers simply take the longest speaker run and use that for every speaker. Why? If the signal travels the same distance to each speaker, it will arrive at each speaker at the same time, which gives you perfectly timed, in-sync audio. However, for relatively small variances in length, most people probably won't be able to hear the difference. Plus, using the longest run for all speakers in a home theater setup could add quite a bit to your wire costs, and leave you with many extra feet of wire to dress and hide inside the wall. For optimum performance, equal lengths of wire are ideal, but you'll have to decide if that makes sense for you.

Cutting and drilling into your wall or ceiling

Making sure your speaker locations will work

After you've chosen your ideal speaker locations, use a stud finder to locate the studs in that area of the wall or ceiling. Remember that in-wall and in-ceiling speakers need to fit between two studs or joists (preferably in the middle of that space for the best performance); on-wall speakers need to be drilled into a stud, or into the wall using an anchor.

Always inspect as much as possible without making a hole. Explore your crawlspace or ceiling in an unfinished segment of your basement.



Use a sturdy wire (such as a bent coat hanger) to explore your pilot holes. Be sure there will be enough room (width, height, and depth) to install your speakers.

Try to detect which way joists run and where empty wall space between studs might be. By inspecting from your crawlspace or attic, you can identify which wall locations are empty of water pipes and electrical wires. However, you still can't know what's behind the wall with absolute certainty. You must be prepared to cut and patch exploratory holes.

In-wall/in-ceiling speakers

- To determine if each of your in-wall or in-ceiling speaker locations will work, you'll need to drill a pilot hole. This is a small hole, drilled in the middle of where you want to place your speaker. Use caution when drilling pilot holes, so you don't plunge your bit into a pipe or electrical conduit. Next, insert a sturdy wire (such as a bent coat hanger) into the pilot hole, and explore the surrounding area, making sure there's enough room for the speaker. Check the mounting dimensions listed in the owner's manual, including any required brackets, and make sure there's enough space in the wall to accommodate the width, height, and depth.

Don't cut any drywall until you've drilled pilot holes and checked all of your desired speaker locations. If one of your locations doesn't work out, you might want to move one or more of the others.

Once you know that each of your speaker locations will work, trace the template that came with your speaker onto the wall or ceiling. Use a level to make sure it's positioned properly. You may want to tape it to the wall to make sure it doesn't move while you work.

On-wall speakers

- It's easier to determine if your on-wall locations will work. If your speaker needs to be mounted to a stud, use your stud finder to locate the studs nearest to your ideal spot, then choose the one that most closely fits. Mark the edges of the stud for reference — when you mount the bracket, you'll want it centered on the stud.

If you're going to secure your speaker to the wall using anchors, mark your ideal locations, and use your stud finder to check for any obstructions. You can find anchors at your local hardware store.

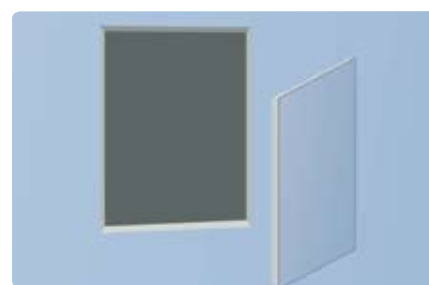
Finding pre-wired speaker wire

If you or someone else pre-wired your house during construction, and you're going to install the speakers yourself, you'll need some kind of documentation to show you where the wire is behind the wall. You can reference photographs of the wire run before the drywall went up, or the wiring plan for your speakers or similar documentation (available from the electrician or custom installer who ran the wire). That way you'll know where to find the wire — as well as where not to cut so you don't damage it.

Hole-saving brackets are your best bet for an easy install. If your speaker has a compatible hole-saving bracket, it can be used as a placeholder. That way, when the drywallers install the drywall, they'll cut holes in the sheetrock around the bracket (just like they do for light fixtures, electrical sockets, etc.). With the speaker hole already cut, and the speaker wire just inside, there's no guesswork.

Cutting drywall

After you've checked all of your speaker locations and traced the templates, you can begin cutting drywall. If it's a rectangular speaker, start by drilling two small holes in opposite corners; if it's round, drill two small holes on opposite sides. Next, using your drywall saw, start from one hole,



Cutting drywall on an inward slant can make it easier to patch later on if you need to.

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and work around the outline to the next. Use a hand-held drywall saw (not an electric one) and cut slowly. Cut the drywall in one piece, on an inward slant, so that it's easier to patch later if necessary. If you don't need to patch the hole, just remove any excess material before installing the speaker. Be sure you know what's behind the drywall before you cut.

Plaster and lath walls

If your house has plaster and lath walls or ceilings, installing your own in-wall, in-ceiling, or on-wall speakers will be more complicated. Plaster tends to crack and crumble easily, so you should be prepared to do some touch-up work. Running hidden, in-wall wire could be particularly challenging — consider running out-of-wall wire, and using carpets, cabinetry, etc. to hide it.

For in-wall/in-ceiling speakers: After tracing the pattern of the speaker, protect the plaster from cracking by applying masking tape around the edges. Score the plaster repeatedly with a utility knife, following the pattern you traced. Then, within the outline only, chip the plaster away until you expose the lath underneath. Remove the plaster that's between the lath as well. Next, cut the lath carefully with a keyhole saw, not a powered saw. Powered saws can vibrate the lath many feet away, resulting in large cracks in your plaster.

For on-wall speakers: Finding a stud in these walls is difficult — even some professional-quality stud sensors won't be able to tell the difference between a stud and the lath. If you can find a stud, place an "x" of masking tape over the spot where you plan to drill to help prevent protect the plaster, then slowly and carefully drill the screws into the stud. Another option is to try using a masonry bit to drill a hole. Then insert a wall anchor, and drill the bracket's screws into the anchor. Either way, there's a good chance that the drilling will cause some cracking and crumbling, so be prepared to do some touch-up work.

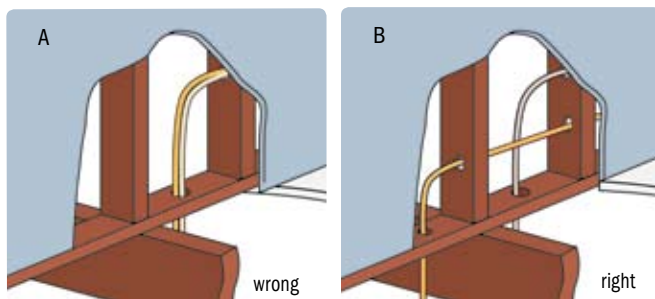
Routing the speaker wire

The rules

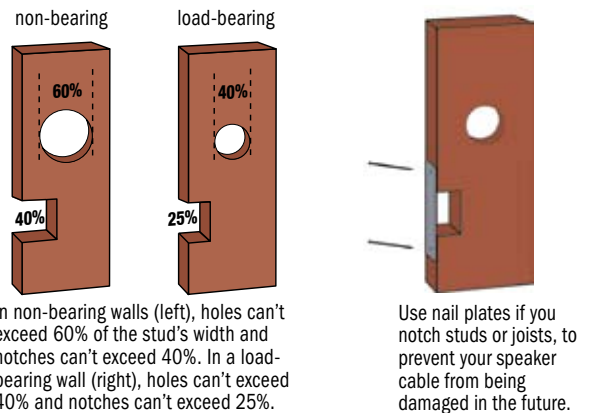
This is the hardest part of the install, not only in terms of skill, but also the physical labor involved. Some parts of retrofitting speaker wire are two-person jobs, so make sure you have someone else to work with.

The following tips offer general guidelines to keep in mind when routing speaker wire through walls and ceilings. For more details and illustrations, see pages 5-6.

- Don't run it close to power cables — this can negatively affect the sound. (You can find out where the power cables are in your home by exploring nearby crawlspaces, or possibly by obtaining a copy of the electrical plan from your builder.) Don't let speaker wire and AC power cable run parallel for more than 5 feet. If they do, keep them a *minimum* of 12 inches apart, but preferably at least 2-3 feet apart. If they cross paths, keep them at 90-degree angles.



(A) Running speaker wire with power cable results in poor speaker performance. (B) For good speaker performance: If speaker cable and power cable run parallel, keep them a minimum of 12" apart, 2-3 feet if possible. If they intersect, keep them at 90-degree angles.



- When drilling or notching studs and joists:
 - ◆ Drill holes in the center of each stud or joist to better avoid nails.
 - ◆ Only drill or notch a hole large enough to pass the speaker wire. (For your wires to pull easily, the diameter of a hole should be about twice as big as the total diameter of all the wires you plan to pull through it.) If you're running multiple wires through one hole or notch, keep in mind:
 - For studs in load-bearing walls, a hole cannot exceed 40 percent of the stud's width; a notch cannot exceed 25 percent of the stud's width.
 - For studs in non-bearing walls, a hole cannot exceed 60 percent of the stud's width; a notch cannot exceed 40 percent of the stud's width.
 - When in doubt, treat the stud as load-bearing.
 - For joists, a hole cannot exceed 1/3 of the joist's depth, and cannot be within 2" of the top or bottom edge. There can be no notches in the middle 1/3 of the joist, and a notch should not be larger than 1/3 of the depth of the joist.
 - ◆ If you notch a stud or joist, use a nail plate to protect the wire.
 - ◆ If you're drilling or punching through steel studs or joists, drill in the middle of the beam, and use plastic grommets to protect the wire from the sharp edges.



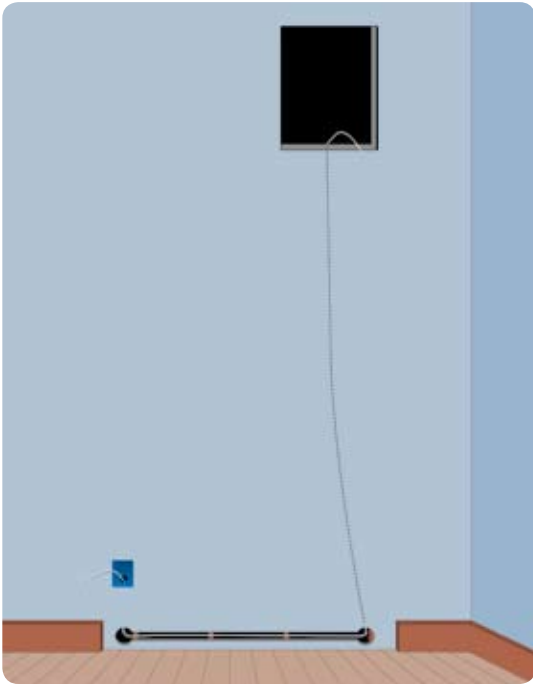
Don't bend the cable; instead, create a smooth, gradual curve. Plastic wire ties should be snug, but not tight enough to pinch the cable.



A junction box or "J-box" provides a clean-looking and safe interface for your in-wall speaker cable to exit your wall and run to your receiver. J-boxes made for retrofit installation have rotating tabs that secure them to your drywall. If you're installing a J-box to run speaker wires to your receiver, mount it at the same height as AC outlets for a clean, uniform look. If you're installing one for an IR sensor or volume control, mount it at the same height as light switches.

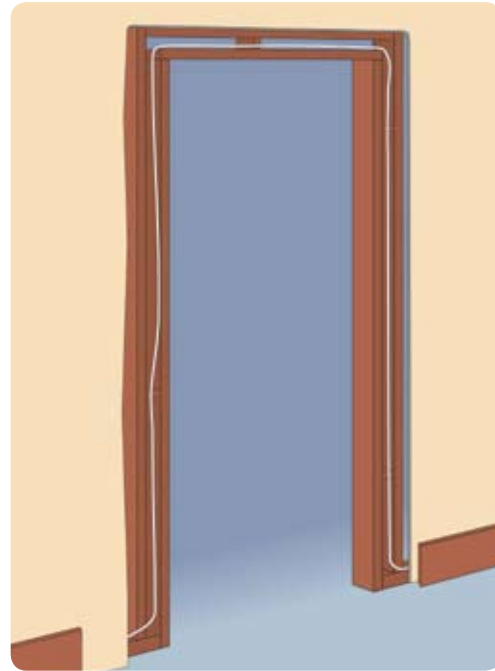
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Additional wire routing tips



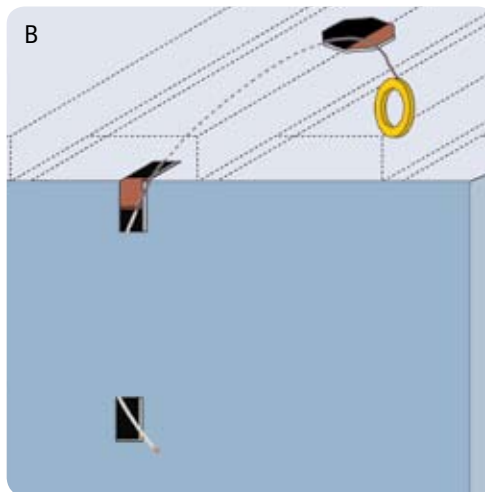
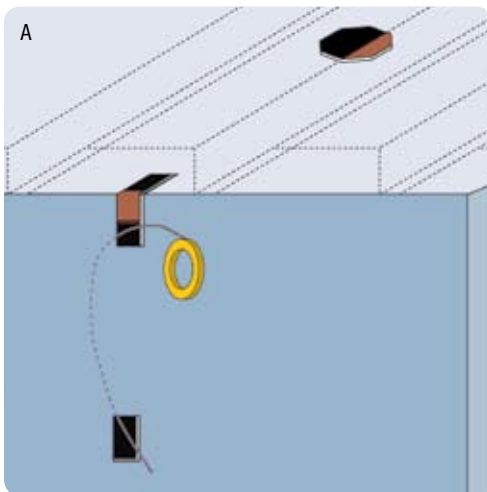
Routing wire horizontally along a baseboard

Carefully pry off the baseboard with a small crowbar. Cut the wire channel by scoring and chiseling the studs (be sure that the baseboard will conceal the channel). Fish your tape from one hole to the other and pull the wire through. Tuck the wire into the channel and install nail plates at each stud. Re-install the baseboard — no drywall patching required.



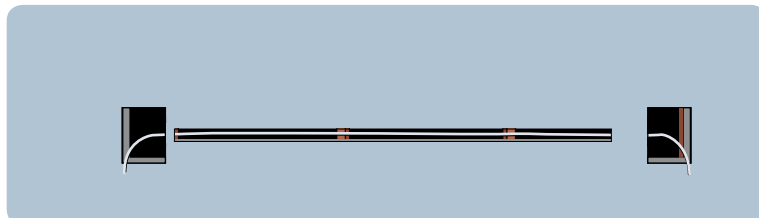
Routing wire around a door frame

Carefully pry the molding away from the doorway using a chisel, small crowbar, or putty knife. Run the wire between the frame and the jamb. (You might need to chisel out channels for the wire in the frame, so that it doesn't get pinched or compressed when you replace the molding.) Reattach the molding, being careful not to damage the speaker wire.



Routing wire from a J-box to an in-ceiling speaker

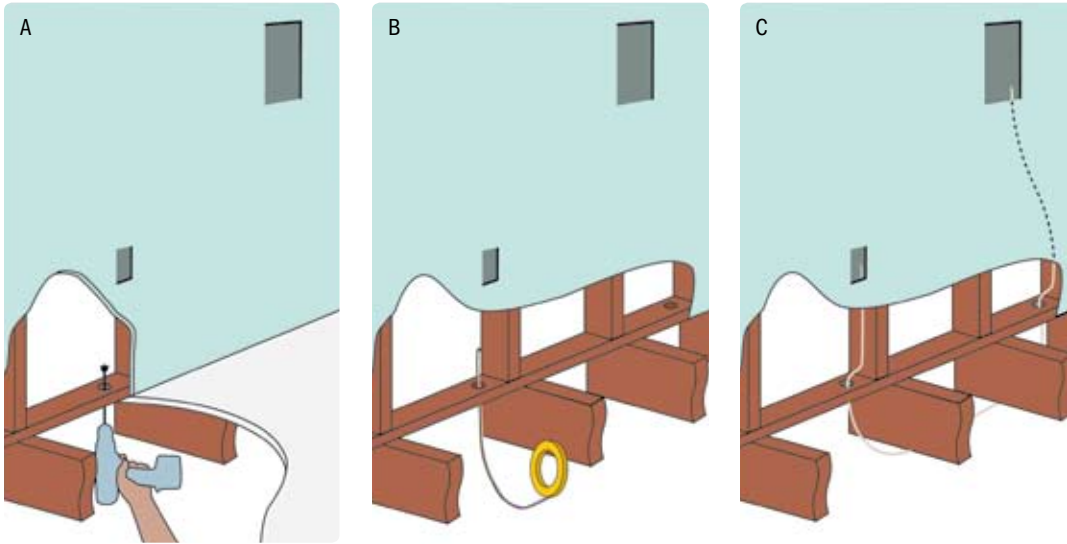
- A. Cut the holes for the speaker and the J-box. Cut two adjoining holes at the wall/ceiling junction, exposing the beams at the top of the wall, or "top plates." Fish down to the J-box and attach the wire to the fish tape. Pull the wire through the hole in the top of the wall, and remove it from the fish tape.
- B. Fish from the speaker hole to wall/ceiling hole. Re-attach the wire to the fish tape and pull the wire through the hole in the top of the wall, and notch the top plates and insert the wire in the notch. Affix a nail plate and patch the holes.



Routing wire horizontally through the wall

If you're working with a relatively short wire run, cut a narrow channel of drywall in one piece, using a utility knife. Ensure that the channel begins and ends at a stud, so that patching is easier afterwards. Drill holes in the stud with a spade bit. Pull wire and patch, using the piece of drywall you cut out. For longer runs, cut a series of smaller wire channels, each beginning and ending at a stud.

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Routing wire through an unfinished basement

- Cut the holes for a J-box and in-wall speaker. Next, drill two holes in your basement ceiling to route the speaker wire. You can either measure the distance to the J-box and speaker from an adjoining wall, referencing a copy of your blueprints, or measure the distance from a visible landmark that runs straight through the wall to the floor below, such as a plumbing pipe.
- Once you've drilled the holes, use a fish tape to pull the wire up to the J-box location.
- Next, fish the wire up to the speaker location.

- Keep the cable fairly taut, but don't pull it tight enough to create tension. Stretching the center conductor or dielectric can damage the wire, and negatively affect its performance.
- Secure the cable with plastic wire ties every 4½ feet. When running wire in a basement or attic crawlspace, don't just lay the cable on joists. Fix cable brackets or hooks every 4½ feet.
- Don't create any sharp bends in the cable, or tie it down too tightly, since this can pinch the cable and impair performance.
- Don't run it through holes occupied by other cables, unless they're also low-voltage wires, such as security or phone lines.
- You'll need to install an open-backed junction box (or "J-box") or P-ring near your receiver. This is where the speaker wire will exit the wall. The J-box or P-ring will also need a face plate — either with a hole that allows the speaker cable to pass through the wall, or with connectors that link the in-wall cable to the out-of-wall cable.

What if you can't avoid a hidden obstruction?

You'll probably encounter some in-wall obstacles while routing your speaker wire, such as additional bracing or a fire block. If that happens:

- Use your stud finder to estimate the position of the block behind the drywall.
- Drill small pilot holes and use a piece of "L" shaped wire to determine the dimensions of the block.
- Using your drywall saw, remove a rectangular piece of drywall around the obstacle. Cut on an inward slant so that it's easier to patch the drywall when you're done.
- Notch the block or drill a small hole for the speaker wire. If you notch the block, don't forget to cover it with a nail plate.

Fishing cable through insulation

Insulation is most commonly found on exterior walls, but you might run into it when fishing wire through interior walls too. The key here is not to fish the wire through the insulation, but around it.

Many types of insulation will have a paper or plastic covering. Try to fish your wire between that covering and the drywall. Alternatively, fish the wire along a stud, using the stud as your guide. In this case, if you have fish tape that's wound on a spool, keep the tape curved in towards the surface of the stud, so that it's less likely to stray into the insulation.

You can also check your local hardware store for different kinds of fish tape designed to be more effective with difficult runs like these.

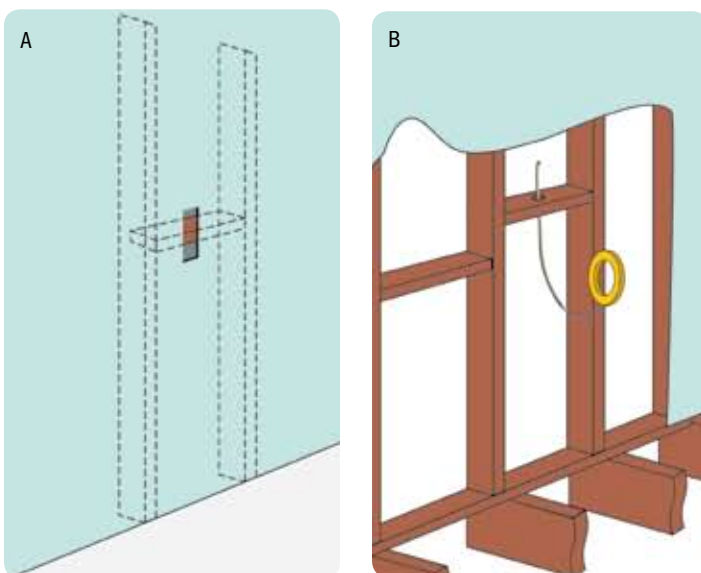
Note: Wear gloves and protection for your mouth, nose, and eyes before handling insulation that contains fiberglass.

Installation and painting

Installing an in-wall/in-ceiling speaker

The basic idea behind all in-wall and in-ceiling speakers is that the speaker is held in place by sandwiching the drywall. A frame around the speaker conceals the cutout in the drywall and presses against the front of the wall. Behind the wall, the speaker has either a set of flip-out "dog ear" brackets or a bracket that screws into the frame. You should read and follow the manufacturer's instructions precisely. Here are some tips that may help (if they don't conflict with your speaker's owner's manual):

- Put some insulation in the wall cavity before you install the speaker. The insulation will improve the sound. Put the same amount of insulation in each speaker cavity. Don't pack it tightly in one and loosely in another.
- Check for any tone controls on the speaker. If the speaker is within a foot of a corner, set the bass controls to the "minus" or "cut"



Routing wire through a hidden obstruction

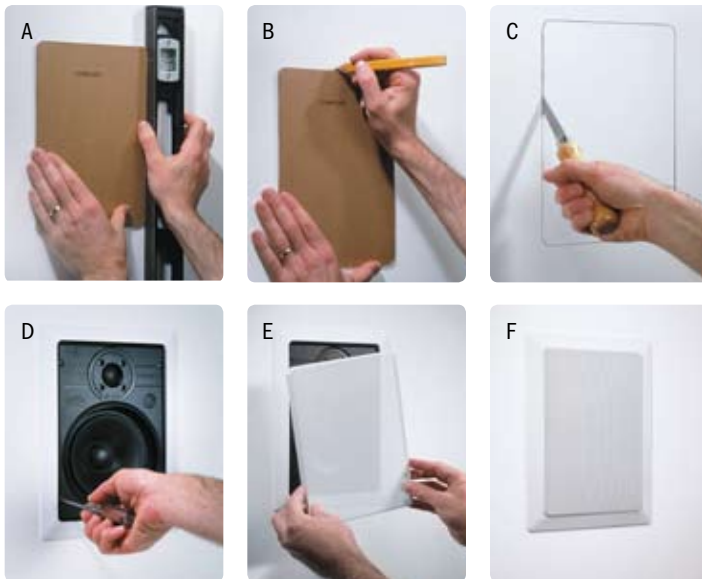
- Cut a rectangular piece of drywall around the obstacle.
- Notch the block or drill a small hole for the speaker wire. Use your fish tape to route the wire through the hole.

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position. If the room is very “live,” without rugs or a lot of upholstered furniture to absorb sound, set the treble control to the “minus” or “cut” position.

- Don't over-tighten the screws. If you over-tighten the screws, the speaker frame may bend, or the drywall may crack. If you use a powered screwdriver, set the torque setting on low. Let the powered screwdriver do most of the work, then do the final tightening by hand.
- If the speaker has any tone controls or has a pivoting tweeter, leave the grille off until you can listen to the speaker. Once you have adjusted the speaker, install the grille.
- Be careful handling the grilles. If they get bent, it's very difficult to use them. Grilles friction-fit into the installed speakers. Do not use excessive force to install them. If the grille does not slip in, try loosening the mounting screws before resorting to muscle to install them. Work a little in at a time, starting at one corner and gradually moving around the speaker.



Once you've confirmed that each of your speaker locations will work (see “Making sure your speaker locations will work”), follow these steps: **A.** Level the template. **B.** Trace the template. **C.** Cut the drywall out in one piece, and pull your speaker wire through the hole. **D.** After you connect the wires to the speaker, screw the speaker and frame into the wall, but not too tightly or the grille won't fit properly. **E.** Gently place the grille into the frame. **F.** Enjoy the finished product.

Painting speaker frames and grilles

If you're going to paint the speaker frames and grilles, here are some tips:

- If your speakers are already installed, remove the grille from the speaker. They must be painted separately with paint that's been thinned. Only use thinners recommended by the paint manufacturer.
- Clean surfaces with a damp cloth before masking.
- Protect the speaker drivers. The woofer and tweeter cannot be painted. You must mask them off. Some speakers come with paint



Many speakers come with paint masks to protect the drivers.

masks in the box. If not, use paper and masking tape to create your own mask. Mask off the entire baffle (the area behind the grille). Don't use tape directly on the drivers.

- If you're painting an on-wall speaker and bracket, mask off the speaker wire connections, and any threaded parts on the speaker and the bracket.
- Use a primer for best paint adhesion.
- It's best to apply the paint in several light coats, and spraying the paint on will work better than using a paint brush. When you paint the grilles, use thinner paint and take care not to clog the holes of the grille.
- Wait until paint is completely dry before removing any masking.

Installing an on-wall speaker

On-wall speaker brackets will need to be drilled directly into a stud, or possibly drilled into the wall using wall anchors (as discussed previously in “Making sure your speaker locations will work”). If you're using in-wall wire, you'll need to make a small hole close to the speaker bracket for the wire to exit the wall. Since the speaker wire will be coming out of the wall directly behind the on-wall speaker, this hole will most likely be concealed by the bracket. For this reason, many people choose not to mount a wall plate. You'll just need a hole large enough to pass your speaker wire without pinching it.

If you're running wire on the outside of the wall, you'll probably want secure it to the wall within 2-3" of the speaker for a clean look. Use flat or round cable clamps (depending on the shape of your cable). These plastic clamps nail easily to your wall.

Finally, it's time to attach the bracket to the wall, wire your speaker, and attach your speaker to the bracket. This process can vary slightly between different mounting brackets, so be sure to follow the installation instructions in the owner's manual.



Drywall repair and clean-up tips

If your hole isn't much larger than the holes you cut for your speakers (roughly 70 square inches), all you'll need is some drywall tape (paper or mesh — mesh is easier to work with), a putty knife, joint compound, and either a damp cloth or some sand paper (60-grain and 100-grain).

1. Place the piece back in the wall. Cut strips of tape, and apply them to each seam. If you're using paper tape, apply some joint

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compound to the seam, gently press the tape into it, and smooth it by firmly drawing a clean spackle knife across the compound and tape. Make sure there are no air bubbles. If you're using mesh tape, just apply the sticky side to the seam.

2. Apply thin layers of joint compound over the tape (probably 2-3), until you have a smooth, flush surface. Thin layers dry more quickly than thick layers, and will probably require less sanding later on since it's easier to keep them more flush with the wall.
3. Gently smooth the surface. You can do this with a damp cloth or with sand paper. If you use a damp cloth, make sure it's a smooth, non-textured material. Work in short spurts, then let the joint compound dry and observe your work. If you rub the compound with too much pressure or for too long, you'll have to reapply.

If you use sandpaper, start off with 60-grain. Sand the compound until you can't see the lines from the putty or spackle knife any more. Next, use 100-grain to get a smoother finish. If you've got a lot of sanding to do, you might consider using a belt sander — but be careful that you don't sand off too much, or you'll have to reapply. Another labor-saving option is to use a sanding block. You can make one of these yourself: just take a strip of sand paper, wrap it around a piece of 2" x 4", staple the two ends of the paper together on the back side, and sand with the flat front side.

4. If you have primer, apply a coat before applying paint. Then paint the patch to match the rest of the wall.

If you need to cut a new piece of drywall to patch one or more of your holes, you'll need a utility knife, joint compound, and either a damp cloth or some sand paper (60-grain and 100-grain).

1. If this hole was cut on an inward slant, start by removing any excess material. If it's not a square or rectangular hole, remove material around it in a square or rectangular shape.
2. Trace the shape of the hole onto cardboard, or measure the length and width of the hole. Trace that shape onto the drywall, then add a 2" border on each side.
3. Carefully score the drywall along the lines you just traced. Make sure you don't damage the paper on the other side — this paper will act as your drywall tape. Peel or chip away the drywall around the scored square, leaving the paper on the opposite side intact.
4. Apply a thick layer of joint compound to the area around the hole, as well as to the patch (on the side where you just scored and peeled the drywall). Use plenty of joint compound to avoid air bubbles.
5. Turn the patch around so that the intact paper is facing you, and place the remaining drywall rectangle into the hole. Smooth it by firmly drawing a clean spackle knife across the patch. This should be a close fit, but not too tight. If you need some extra room, just chip a little more drywall off of your patch, or expand your hole slightly. Let the compound dry overnight.
6. Smooth a thin layer of joint compound over the edges. You'll probably need 2-3 layers, or enough that the joint compound fully covers the seams and is smooth and flush with the surrounding wall.
7. Follow the sanding and finishing instructions above.

If you cut a large hole that will require additional backing to support your patch, or if you're patching a hole in the ceiling, you'll need some wooden slats (2" x 4"), drywall tape (paper or mesh — mesh is easier to work with), a putty knife, joint compound, and either a damp cloth or some sand paper (60-grain and 100-grain).

1. Do you still have the drywall you had cut out before to use as a patch, or do you need to cut a new piece? See the previous two processes for instructions.
2. Cut a piece of 2" x 4", about 6-8" longer than the length across the hole (but short enough that you're still able to maneuver it inside the hole). If it's a very wide or tall hole, you might need to cut more than one piece.
3. Place the 2" x 4" in the hole. Secure it to the existing drywall using drywall screws. Drill the screws in enough to make a slight dent in the drywall paper, but not enough to tear surrounding material. These screws will be covered up later.
4. Place your patch of drywall in the hole, and secure it to the 2" x 4" with drywall screws.
5. Apply mesh or paper tape to all 4 seams (see previous instructions).
6. Using several (at least 2-3) thin coats of drywall compound, cover the tape and fill in the screw holes. Build up a smooth, flush surface, allowing each coat to dry completely.
7. Follow the sanding and finishing instructions above.

Additional tips

- Cover your floor, and any nearby electronic equipment or furniture before you begin — spilled joint compound and drywall dust can make quite a mess, and you don't want to have clean that up afterwards.
- Joint compound can dry quickly. Wash your tools as soon as you're finished with them, and dry them to prevent rusting.
- Sanding joint compound with sand paper (instead of using a damp cloth) creates lots of dust. While not harmful, it can be irritating to the eyes and sinuses. Some people might be more comfortable using protective eye, mouth, and nose gear.
- If you use a damp cloth to sand, work carefully and slowly so you don't remove all your work.
- Be patient. Joint compound may need to dry overnight before it's ready for another coat or for sanding.