

Retrofitting a Ceiling Fan

With common-sense wiring and the right hardware, you can replace an existing light fixture with a breeze in almost any room in the house

BY CLIFFORD A. POPEJOY

A ceiling fan is a great way to improve your comfort at home, and one of the most common retrofit projects is one that replaces an existing ceiling light with a fan that includes a light. Ceiling fans are easier than ever to assemble and install; in fact, I recently walked a friend through the process in an afternoon. Easy or not, there are a couple of important safety issues to keep in mind: avoiding electrical shock and getting the fan solidly attached to the ceiling framing.

Before you do anything, find out if the circuit has the capacity to run the new fixture.

Most fan/light fixtures use two to three times more power than a standard light fixture. If the circuit was close to capacity before, you don't want to overload it.

Map out the circuit to determine what's on it. The easiest way is to turn off that particular circuit breaker and see what else no longer works. Add up the wattage of the lights and appliances that are fed by the circuit; be sure to include things that may not be used all the time, such as space heaters. If the total wattage is more than 1800w for a 15-amp circuit or more than 2400w for a 20-amp circuit, the circuit definitely is over-

Choosing the right-size fan

In the interest of proportion and efficiency, you have to match the fan size to the room. The chart below provides the basic guidelines; choose the next largest size if the fan is to be installed in a room with a high ceiling.

Room size (sq. ft.)	Overall blade diameter (in.)
100	36
144	42
225	44-48
400	52-54
500	56-60

INSTALLING A CEILING FAN IS A STRAIGHTFORWARD JOB



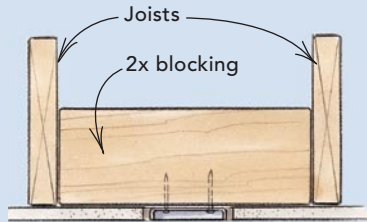
1 Make sure the old fixture is dead.

After cutting power at the service panel, use a contact voltage tester to test the wires in the fixture box. Cover all but the end of the probe with electrical tape, which reduces the chance of shorting the probe to the fixture's shell if the power is not off.

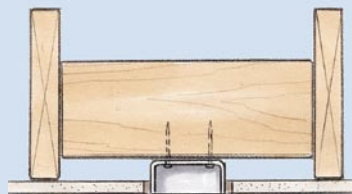


USE A FAN-RATED BOX

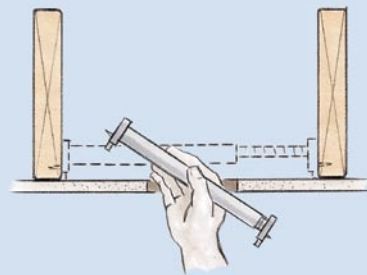
Before installing a ceiling fan, electrical code requires that you use a fan-rated outlet box that will support the extra weight and the motion associated with a fan. A fan-rated box will be labeled as such inside and typically can support up to 70 lb.



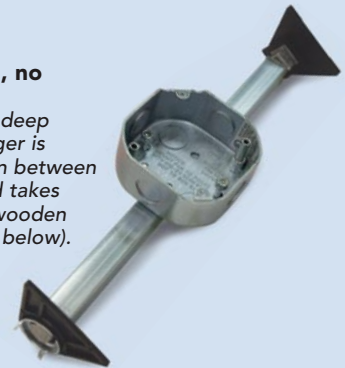
Low profile
A 1/2-in.-deep pancake box is meant to be screwed to a joist or block. It's used if only one cable is coming into the box.



Deeper profile
A 2 1/4-in.-deep box can be attached to blocking between joists and is roomy enough to handle more than one cable. It is also available in a saddle-mount configuration.



No blocking, no problem
Paired with a deep box, this hanger is meant to span between two joists and takes the place of wooden blocking (see below).



2 Install the hanger. After removing the old box, install the new. In this case, we used a fan-rated hanger bar and outlet box. The hanger bar is inserted first, squared up to the joists, and centered in the hole. The bar then is twisted clockwise, which pushes the barbed ends into the joists.

3 Insert the new box. Remove a knockout and insert a plastic cable clamp before attaching the box to the hanger bar. Slip the cables into the cable clamps as you slide the box into the hole.





AN EXTENSION KEEPS THE FAN AT THE RIGHT HEIGHT

A fan is most efficient when its blades are 7 ft. to 9 ft. from the floor. For higher or sloped ceilings, fans typically are suspended from extension rods, available in varying lengths from manufacturers.

loaded. Although not required by code, it's advisable to keep the load below 80% of those figures.

Remove the old box, and check the existing wires

Just shutting off the existing light at the wall switch doesn't guarantee that power is off in the ceiling box (sidebar facing page). The ceiling light's circuit should be turned off at the service panel. Use a voltage tester to confirm that the fixture and all the wires in the box are de-energized, and make sure they'll stay that way while you're working on them. For more information, see the lockout/tagout video tip at *FHB's* Web site (www.finehomebuilding.com).

Now take a close look at the cables coming into the box; take notes on how they're connected. Sometimes it's helpful to label the wires with masking tape and a felt-tip pen. If the old ceiling box is a 1/2-in.-deep pancake-

style box, removing it is usually just a matter of pulling some nails or a couple of screws. For a side-nailed box, I've found that the best removal tool to use is a hacksaw blade in a holder, or a reciprocating saw outfitted with a thin, short blade to cut the nails. Be careful that you don't chew up the wiring as you cut.

After removing the box, check the wires. If the insulation on the wires is old and deteriorated, use electrical tape or heat-shrink tubing (available in most electronics-supply stores) to insulate them. If the insulation is too cracked and you have access from above, cut back the old wires, install a splice (or junction) box, and run new cables to the fan-box location. If the wiring is armored (BX) cable, make sure the metal jacket is in good condition; if it's rusty or corroded, install a junction box and run new cable.

Finish up with solid support and elementary wiring

During retrofits, the most common mistake is not to upgrade the outlet box. Use a fan-rated outlet box (sidebar p. 109) that's secured to solid blocking or framing. Also, when assembling the fan, be sure to use the rubber isolation pads included with it; they're meant

4 **Clean wires for a better connection.** Use the manufacturer's locknuts to attach the box, then clean the exposed wire ends with a nylon scrubby and make the splices as needed. Here, we used a UL-listed pressure connector because the wires were short and there was no practical way to splice in longer cables.



5 **Save yourself a headache.** Once you've identified all the parts, thread the wires through as you assemble the fan motor, canopy trim ring, canopy, and base. Make sure the parts are assembled in the right order now, rather than later. Don't attach the blades until the fan body is in place.

to reduce wobbling and to stop fan noise from telegraphing to the ceiling.

Follow the manufacturers' instructions on the wiring. Typically, the colors of the wires in the ceiling box are matched with the fixture wires: green or bare copper ground to fixture green, white to white fixture, and black to black fixture.

For a fan with a light, there are two supply wires in the fixture, one for the fan power and one for the light power (often black and blue, or black and black with a blue stripe). If you're controlling the light and the fan with one wall switch, connect both of them to the supply wire (usually black) in the ceiling box.

If there are two wall switches, there will be a three-conductor-with-ground cable (12-3 wg) from the switch box to the ceiling box. I use the black conductor to control the light, and the red to operate the fan. By convention, the switch for the light should be the one located closest to the door.

The light-fixture part of the fan is installed after the fan is hung. Some fan models have a factory-installed modular connector for the light fixture. Remove the cover at the bottom of the fan housing, plug in the light fixture, and fasten the fixture to the fan housing.

Be sure the power is off

In older houses, alternative wiring schemes might literally shock an otherwise careful electrician. For instance, there may be power in the ceiling box even after the light is turned off at the wall switch. In one common scenario, power goes to the ceiling box and a switch loop is dropped to the switch. Or the box is used as a junction box, either for the light circuit, or for the light and a different circuit.

A third possibility is that the wiring is just messed up; for instance, the hot and neutral wires may be reversed. Be sure to test the wiring with a good voltage tester (see "Building Skills," *FHB* #172, pp. 114, 116). Also, use a ground reference—the grounded conductor socket of an extension cord that's plugged into a grounded outlet known to be good—with your voltage tester to check the polarity of wires, especially old ones that may not be color-coded.

On other fan models, the light-fixture wires connect to the corresponding supply wires with twist-on wire connectors. I usually toss those and use the type that have wire springs inside; they make for a better connection.

Some ceiling-fan models have a remote-control unit that fits into a switch box so that no wires are needed between the wall switch and the fan. There must be power at the fan and at the switch, but sometimes, it's a lot easier to get power at those two locations and not have to run a switching cable between them.

The job isn't complete until you've checked the fan to make sure it's balanced. Run the fan at the highest speed; if it shakes or wobbles, check all the mounting hardware, starting with the ceiling box. Are all the screws, washers, and spacers in place, and tight? Then examine the fan blades and arms, and replace any that are bent or warped. □

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6 Hang the motor. After attaching the base or hanging bracket to the fan box with 10/24 or #12 screws, hang the fan body from the hook on the base, and splice the wires together with heavy-duty wire nuts.



7 Secure the motor. Insert two screws into the mounting plate, then lift the fan body onto the screws and secure it to the plate. Add a third screw if included by the manufacturer, and then slide the upper canopy in place.

8 Attach the lights. This model included a light fixture, which attached to the underside of the fan body. The wiring connections usually are made with a snap fitting, and then the fixture is screwed to the fan body.

