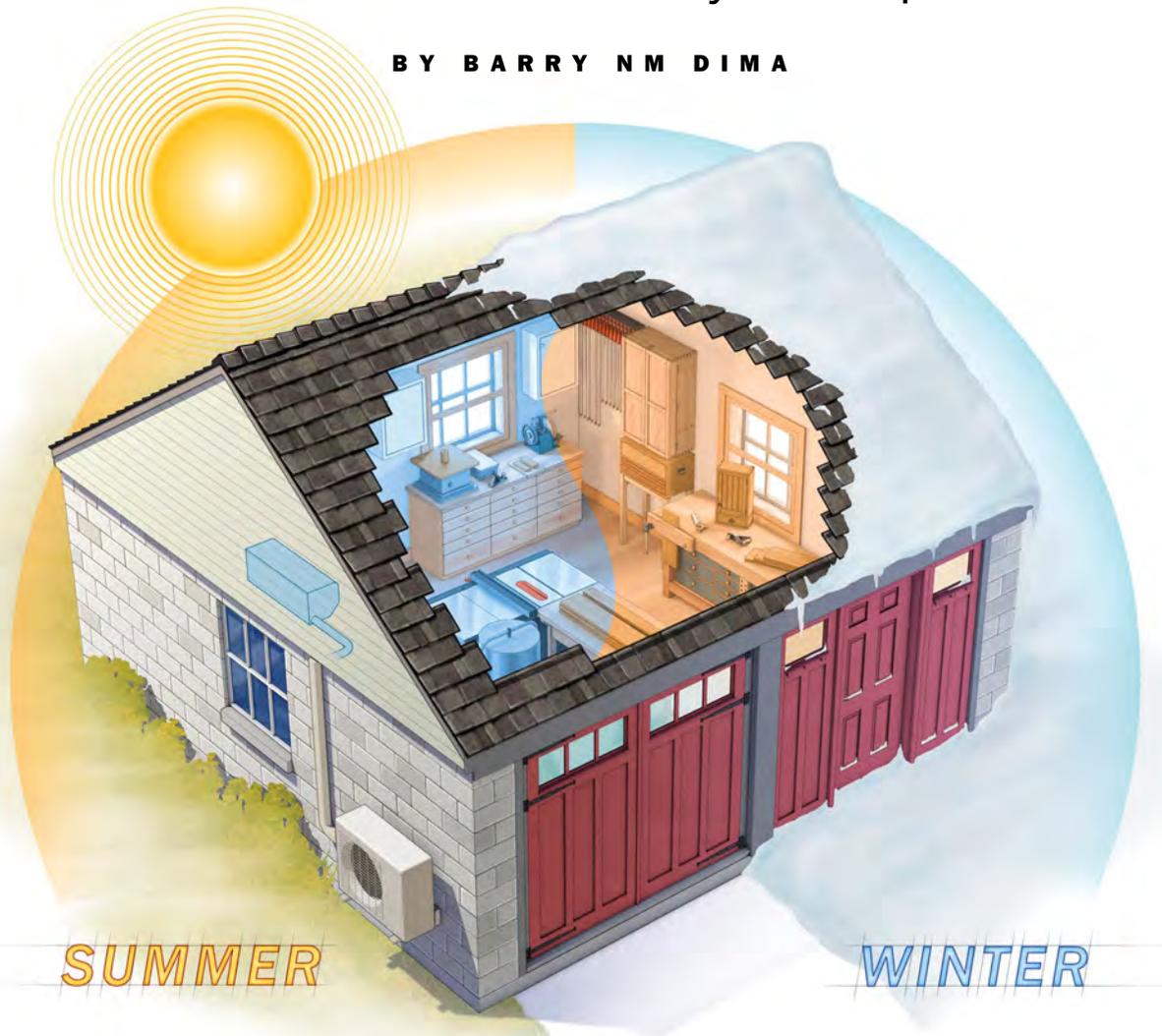


# Heating and Cooling Your Shop

Ductless HVAC systems ensure that the weather doesn't limit your shop time

BY BARRY NM DIMA



A freestanding building can be a fantastic place for a wood shop. But you can't usually hook it up to the heating and cooling systems in your house, and if you live where winter days regularly fall below freezing or humid summer days linger above 90°—or both—the shop will be uncomfortable or unusable for chunks of the year. Plus, weather swings can wreak havoc on tools and materials. If you need to heat and cool a freestanding shop—or a garage that's attached to your house but not to its heating and cooling system—a mini-split or PTAC may be the answer.

These ductless air conditioners or air-conditioner/heater combos are easy to install compared with ducted systems, don't take up much space, and require only a 220-volt circuit. Plus, they can come with you if you move. Both mini-splits and PTACs (packaged terminal air conditioners) are heat pumps. For cooling, they extract heat from a room and send it outside. If they can heat as well, they flip the operation, pulling warmth from outside and

bringing it in (both are thanks to the seeming magic of refrigerant). Because heat pumps move heat rather than generate it, they can be more efficient than other heating methods, such as electric resistance and, generally, fossil fuels. Some heat pumps have limits: PTACs have trouble drawing warmth from the outside below 35° to 40°. They turn to electric resistance heat in colder temperatures. Mini-splits can handle much colder weather; some as low as -15°F. However, they cost a lot more up front, in part because it's advisable to use a pro for installation. Still, they can keep energy bills lower thanks to their efficiency. To get the most out of either type, your shop should be well insulated and well sealed. (For tips on insulation, see *Shop Design*, pp. 30–33.) If the building is leaky, you might as well slip the dollars through the cracks in your wall instead.

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*Barry NM Dima is an associate editor.*

# Mini-splits More expensive up front, but more efficient

They are still catching on in the United States, but mini-splits have been popular in Asia and Europe for decades, and they're familiar to many woodworkers. Although the up-front cost is high, these units will transform a shop into the most desirable space in your house—and thanks to their efficiency, the energy bill won't short-circuit your budget.

Mini-splits typically don't have ductwork. They instead pair an indoor air handler with an outdoor compressor via two refrigerant lines, a condensate line, and a power cord. A mere 3-in.-dia. hole, which is later weatherproofed, is all that's needed to feed the connections through a wall. Plus, mini-splits are whisper quiet. While they come in a variety of configurations, the version with a wall-mounted air handler is the most popular.

People in especially cold climates should take extra care selecting a unit, since not all mini-splits are rated for use at extremely low outdoor temperatures. Look into units designed for cold climates, such as Mitsubishi's Hyper-Heat models.

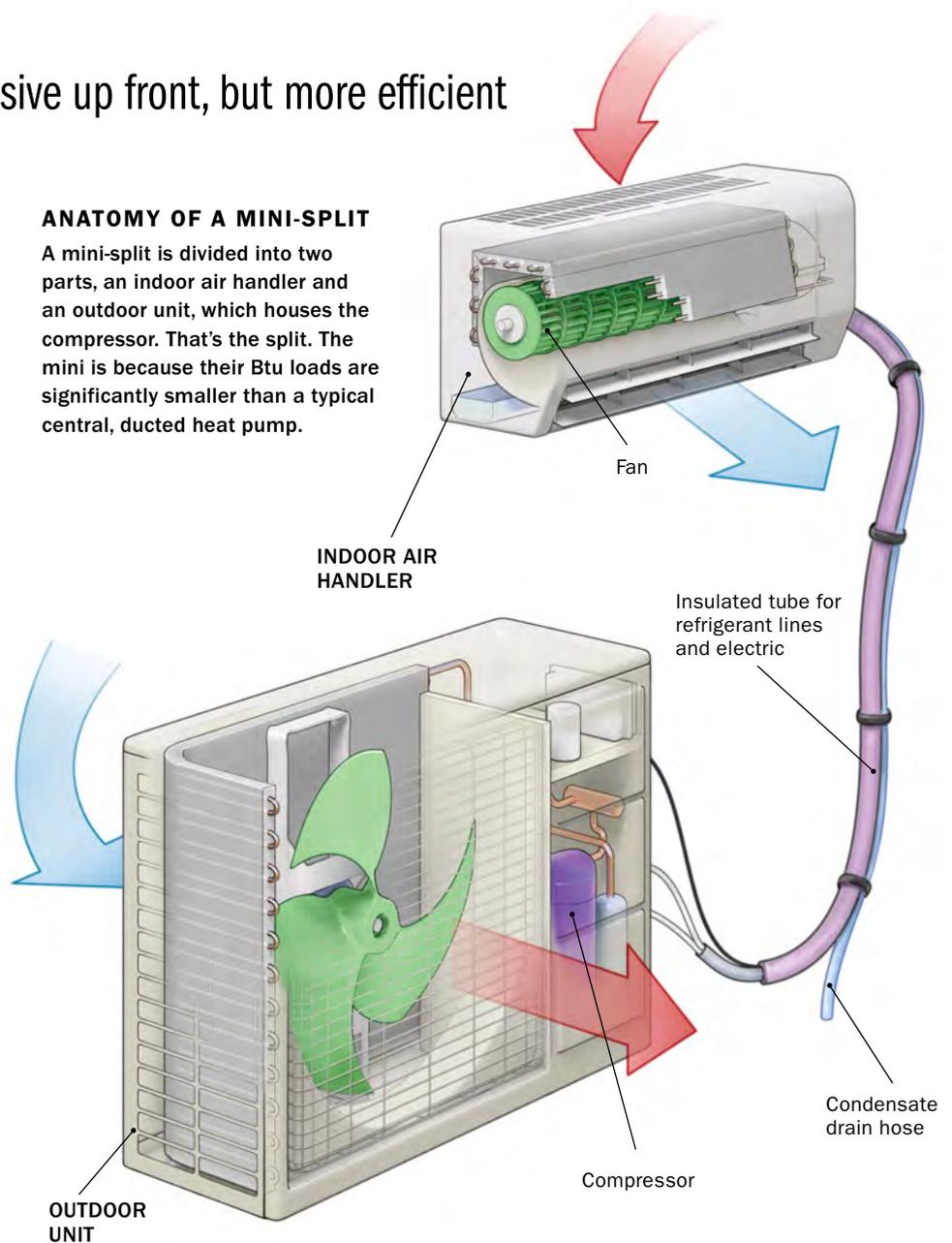
## Top-notch efficiency

Mini-splits are incredibly efficient. They typically use inverter compressors—not rotary compressors—to regulate temperature. Inverter technology makes small adjustments to maintain the set temperature within a narrow range. Rotary compressors, on the other hand, cycle on and off, meaning big swings in temperature that require lots of extra energy.

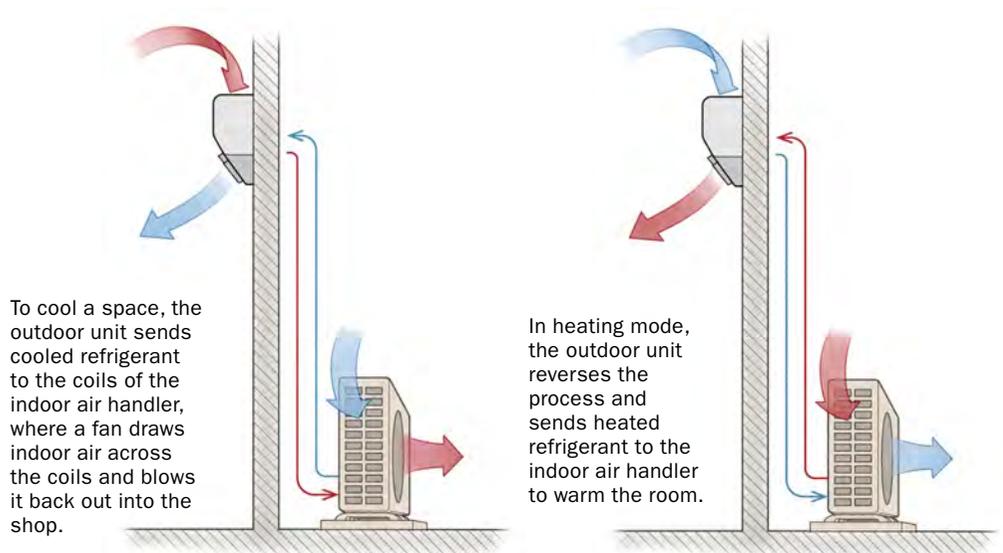
This efficiency means a mini-split should keep utility bills down. Martin Holladay, a senior editor at *Fine Homebuilding* and *Green Building Advisor*, says that while generalizations can be tricky because energy costs vary by region, heating with a mini-split is typically cheaper compared with propane or fuel oil and can be up to a third cheaper to run than electric resistance heat. Consult your local energy prices to determine what to expect for your area—especially considering how cheap natural gas has been recently.

## ANATOMY OF A MINI-SPLIT

A mini-split is divided into two parts, an indoor air handler and an outdoor unit, which houses the compressor. That's the split. The mini is because their Btu loads are significantly smaller than a typical central, ducted heat pump.



## HOW A MINI-SPLIT HEATS AND COOLS



To cool a space, the outdoor unit sends cooled refrigerant to the coils of the indoor air handler, where a fan draws indoor air across the coils and blows it back out into the shop.

In heating mode, the outdoor unit reverses the process and sends heated refrigerant to the indoor air handler to warm the room.



**Up and away.** Wall-mounted mini-splits, like this one in contributing editor Christian Becksvoort's shop, go high on the wall, so they don't take up valuable shop space.



**Strategically placed.** Because of the outdoor compressor, the air handler is best placed on an exterior wall to simplify installation. Also, since the outdoor unit is exposed to the elements, it needs to be off the ground. If it snows in your area, the unit must be above the anticipated snow level and under a roof that still allows for ventilation. If it gets buried, it could stop functioning.



**Easy to live with.** In the three years since buying his mini-split, the only maintenance Becksvoort has done is to blast the filter with compressed air every Saturday.

### How much for a mini-split?

The cost for the units themselves and their installation is another consideration. For a 400- to 600-sq.-ft. space, expect to spend \$1,000 to \$1,500 for a unit that only cools. Tack on at least \$300 for one that heats as well. Installation costs can vary depending on the space—how complicated it is to run the hoses, for example.

We invited Dean DeMague, president of Connecticut's High Performance Energy Solutions, a company that installs Mitsubishi mini-splits, to visit a well-insulated two-car garage shop in Connecticut and assess the cost of a mini-split system. DeMague estimated all-in installation—meaning parts and labor—for an 18,000-Btu unit would cost \$3,500 to

\$4,500. Thanks to their efficiency, though, mini-splits may qualify for state and federal refunds and tax credits. Go to [dsireusa.org](http://dsireusa.org) to check.

According to DeMague, although you can do some of the installation yourself, it's likely not worth it. "Our track record with self-installations is that we spend a lot of time and money fixing them," he says. The issue is that beyond the simpler installation tasks, the risk greatly outweighs the reward. "If you get the refrigeration part of the install wrong, lights out. You might as well start over." Plus, you could void your warranty if you're not a certified HVAC professional.

Holladay agrees: "For one person installing one unit, hire a pro."

Also, a professional can pick the appropriate size mini-split for your shop and choose where to put it—both important factors affecting a mini-split's performance. Lastly, you must keep combustible vapors away from the indoor units. Considering possible finishing regimens, hiring a pro is an important step in keeping your shop safe.

When choosing an installer in the United States, Wood Whisperer and mini-split user Marc Spagnuolo advises, "Find an HVAC person who doesn't hesitate to install it" since the technology still isn't as prevalent here as traditional, ducted systems. Spagnuolo also advises buyers to pick a trusted brand.

# PTACs Not just for hotel rooms

**F**or some, the up-front cost of a mini-split may be too much to bear even considering the back-end savings. If that's you, look into a PTAC, or packaged terminal air conditioner. Unlike mini-splits, these units aren't at all novel in the United States. If you've stayed in a hotel, you're familiar with them. In cooling mode, these heat pumps operate just like mini-splits. But for warming a room, PTACs rely on electric resistance heat. People in chillier climates may want to invest in a PTHP model—a packaged terminal heat pump—whose heat pump can both warm and cool. It only uses electric resistance heat when temperatures drop too low for the heat pump to operate well.

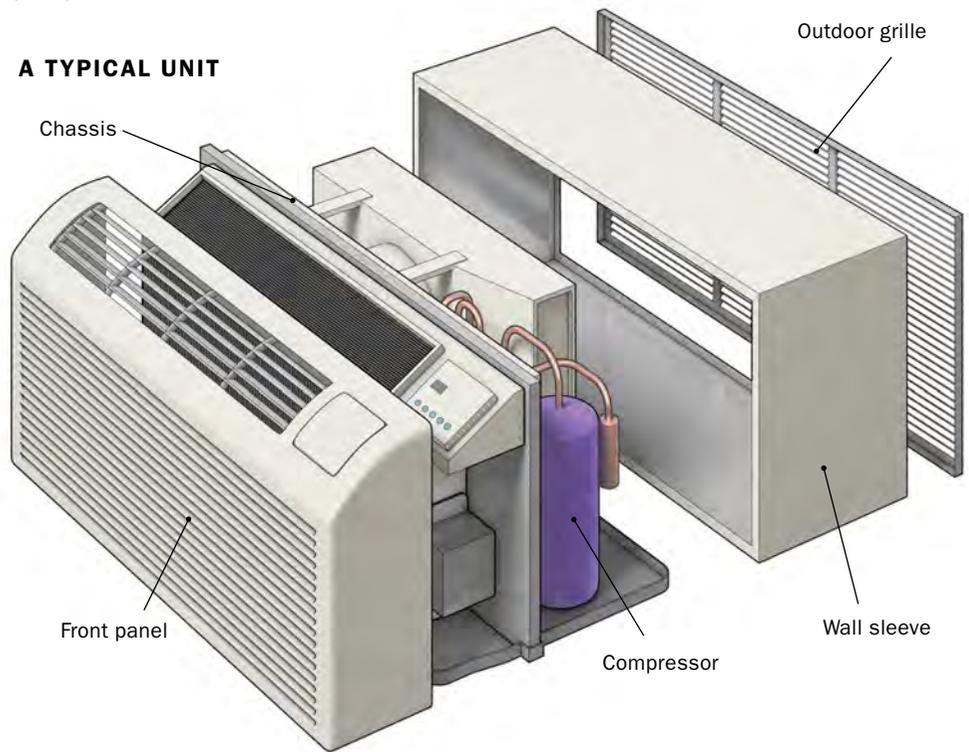
The knocks on PTACs are that they are considerably less efficient overall than mini-splits—sometimes by half—and require an opening about 42 in. long by 16 in. tall through the wall so they can vent. The unit will probably stick out into your shop at least 8 in., and since they have to be mounted low, the space lost will likely be more valuable. Also, some people find them frustratingly noisy. PTACs have one big advantage, though: They'll likely run you about \$1,000 or less, including the necessary components beyond the unit itself, which are a sleeve to support it in the wall and an exterior grille.

## Do it yourself to save dough

Maybe the biggest place you can save money on a PTAC is if you install it yourself. Just like with a mini-split, a pro can help you choose the appropriate unit for your space—possibly saving you money and headaches—but you can stop there. PTACs are literally plug and go, so all you have to do is get one through the wall.

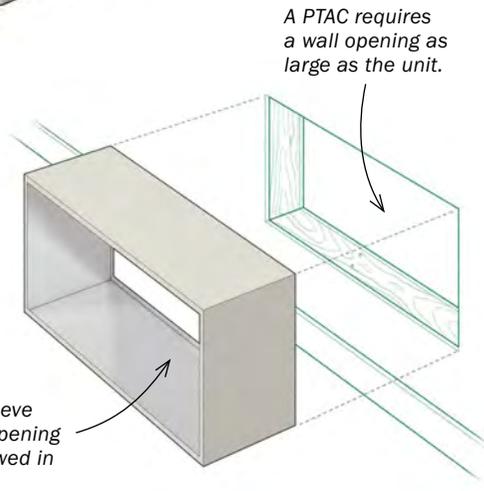
The process is a lot less fussy if you settle on a PTAC before the shop is built, since the plans can simply account for the proper opening and support. Ray Finan, a furniture maker in Vermont, did just that

## A TYPICAL UNIT

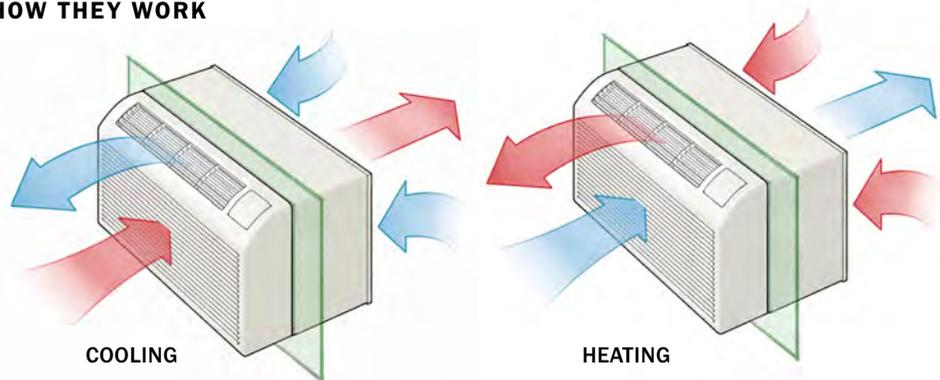


## INSTALLATION IS SIMPLE

Cut the appropriate-size hole in an exterior wall and mount the sleeve in the opening. Then slide in the chassis. A few screws hold everything in place. Just be sure the wall can support the PTAC's weight.



## HOW THEY WORK



Since they're also heat pumps, PTACs transfer heat in and out of a space the same way a mini-split does. The technology is a little less advanced, though, as they lack compressors with inverter technology and fall off faster as the temperature falls.



**Space stealer.** You'll have to work around a PTAC, because the units are typically mounted low on the wall and extend about 8 in. into a room. Ray Finan placed his as out of the way as possible while still keeping it effective. Wall-mounted clamp racks make good use of the space above the unit.



**All in one.** A PTAC's controls are a part of the chassis, making the most of its low placement.

when building his very well insulated, free-standing shop two years ago and hasn't looked back since—even in the state's severe winters. His PTHP model, made by Gree, cost about \$800, and having his electrician run a 220-volt circuit for it was a bit extra. Finan, whose 624-sq.-ft. shop has 9½-ft. ceilings, says the electricity bill for his shop increases by about 50% during February and March, although he admittedly doesn't run the unit much from late May through late October.

Retrofitting a PTAC or PTHP in an existing space is a bit more difficult, but still "easier than installing a window," says Matthew Teague, a woodworker in Nashville, Tenn., and a former managing editor with *Fine Woodworking*. He should know. He started with one in his shop, replaced it after about 10 years, and added one to his basement in between. Teague notes you'll probably want a buddy to help with the installation, though. The units weigh around 100 lb. or more, and because of their size, they can be unwieldy. He had a friend support one end while he drove the two screws to secure his Amana 15,000 Btu PTAC to the sleeve, which houses the unit in the wall. Just be sure you know what you're doing when you choose the location,



**Choose your cover.** The outdoor grille is an accessory, meaning you have to buy it separately. Frustrating, maybe, but this allows you to pick the grille that looks best.

and make sure it's an exterior wall that can support the unit's weight. Chopping into a wall without having a sound plan is definitely not advisable. If doing the installation at all disquiets you, consult a qualified professional for at least some guidance.

As for the 10 years Teague got out of the first unit, he thinks he came out on the right side of that deal. His unit was about \$700, so he concludes he paid about \$70 per year for a machine that kept his shop comfortable year-round. And as he points

out, shop conditions are tough on any appliance, and he had his on 24/7. Plus, he went from cleaning it daily for the first five to six years to almost never after that. Cleaning, Teague notes, is nevertheless simple and fast: Just vacuum the filter.

Shop time is precious. Luckily, mini-splits and PTACs are viable solutions, albeit with key differences, that can keep Mother Nature from limiting your shop time. If one fits in your shop and your budget, you've cleared a big hurdle to getting your projects done.