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Heat Pumps & Mini-splits

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Learn about heat
pumps and mini-splits

Choose the right
contractor

Receive rebates
and tax credits



Audrey O'Shea

RYCOR Special Edition

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RYCOR specializes in the design, installation, and maintenance of next-generation heat pump heating and cooling systems. A Mitsubishi Electric Diamond Elite Contractor, RYCOR provides expert assistance throughout the mini-split implementation process, including rebates, permits, financing, energy assessments and home sealing. RYCOR is at the vanguard of the exploding demand for clean and cost-efficient home energy solutions, offering 0% financing and a 12-year warranty on both parts and labor. Learn more at rycorhvac.com.



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Heat Pumps & Mini-splits For Dummies®, RYCOR Special Edition

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- » Explaining heat pumps
- » Understanding mini-splits
- » Knowing the HVAC language

Chapter 1

Understanding Heat Pumps and Mini-splits

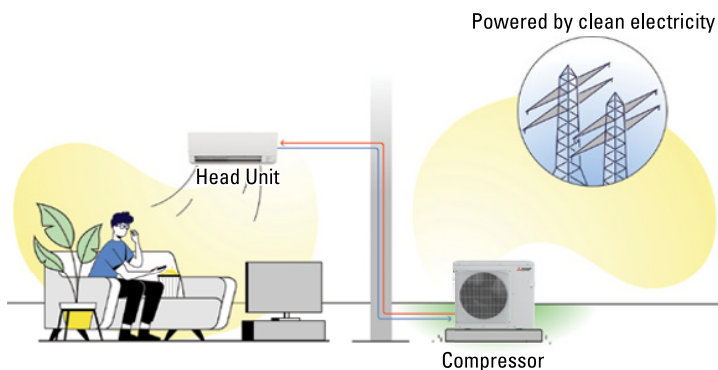
If you're new to the field of HVAC (heating, ventilation, and air conditioning) then you might not be familiar with the terminology surrounding heat pumps and mini-splits, or how they work. I'm here to clear all that up for you!

With a clear understanding of how heat pumps and mini-splits work, you'll be ready to talk to professionals about installing one in your place.

Harnessing Heat to Warm and Cool Your Space

The name *heat pump* only tells half of the story, because heat pumps both heat and cool by moving heat from where it is to where we want it to be. In the summertime we're moving heat from indoors to outdoors, and in winter months heat is extracted from nature and moved indoors.

Figure 1-1 depicts what a heat pump typically looks like.



Courtesy of Mitsubishi Electric Heating & Air Conditioning

FIGURE 1-1: A heat pump transfers heat from outside to inside in winter, and from inside to outside in summer.



REMEMBER

Moving heat rather than creating it makes heat pumps more efficient and better for the environment than other types of heating systems (for example, those that burn fossil fuels).

Heat pumps are classified as geothermal (in-ground), air, or water depending on the heat source. Geothermal and water-sourced heat pumps generally require costly excavation from the heat source (ground or lake) to the home. Air-source heat pumps, on the other hand, obtain heat from the atmosphere.

The heating or cooling generated by a heat pump must then be distributed into the home. This can be done by attaching a heat pump to existing passages (ducts), or by using a ductless mini-split system.

Comparing Heat Pumps and Mini-splits

All mini-splits are heat pumps, but not all heat pumps are mini-splits.

Mini-split systems are a ductless heat pump solution in which an exterior compressor is connected to one or more interior air handling units in various zones of the home. It gets its name from the fact that the system is “split” between two components: an outdoor compressor and indoor air handling units. In this sense, a mini-split is similar to traditional central air conditioning systems, which are also known as *split systems*.

Some mini-split systems use one exterior compressor for each interior air handling unit. These are called one-to-one systems. Other systems may control multiple interior units using a single multi-head exterior compressor. We talk more about these in Chapter 3.

Mini-split systems can heat or cool an entire home, or individual areas (*zones*) that are difficult to heat and cool using an existing system. Minisplits put an end to the all-too-common “thermostat wars” because each zone can be set to a temperature that’s comfortable for the person in it. Unoccupied zones can be turned off, saving on energy.

Because they are a ductless heat pump solution, mini-splits are easier to install and work well where running ductwork is difficult or too expensive, such as older homes, additions, and garages.

Looking for a Heating and Cooling Solution



TIP

The right HVAC expert can help you from start to finish with a new mini-split system. See Chapter 3 for tips on hiring an expert.

Regardless of the type of system you’re installing, keep these things in mind:

- » There are many benefits and reasons for installing a ductless mini-split system. See Chapter 2.
- » Many rebates or tax credits are available for upgrading heating and cooling systems, including mini-splits. Rebates are usually better if the heat pump is used to *replace* less environmentally friendly systems.
- » When you’re ready to install a mini-split system, seek out a professional contractor. This isn’t a do-it-yourself project!



REMEMBER

Contrary to rumors you may have heard, today’s heat pumps provide reliable heat in even the most brutal sub-zero winter conditions.

OTHER TERMS AND TIDBITS

So far we've defined heat-pumps, mini-splits, air handling units, air-source, geothermal source and water source systems, and ducted and ductless systems. Even what HVAC stands for. You might find the following terms helpful, too, as you speak with an HVAC professional.

- **BTU:** A British Thermal Unit is commonly used to measure heat. One BTU is the amount of energy needed to raise a pound of water one degree Fahrenheit. Some heat pump rebates are calculated based on efficiency as measured in BTUs.
- **Cycling:** When a system is cycling, it's turning on when the temperature isn't at the desired point and turning off when it reaches the set temperature.
- **Ductwork:** The network of passages, often made of sheet metal, that are used to channel air from one place to another within a building.
- **Electrification:** Switching from fossil-fueled systems (gas boilers) to electrically powered systems (heat pumps).
- **Energy Star:** Energy Star is a program run by the federal government that identifies products such as appliances and heaters that meet a required level of efficiency.
- **Head unit:** This is another name for an air handler — also sometimes called a *blower*.
- **Hybrid heat pump:** This is a heat pump that works alongside a traditional heating source, such as a gas or oil furnace. Using internal controls to optimize efficiency, it switches between the heat pump and traditional heating source based on outdoor temperatures and system performance.
- **Lineset covers:** Durable exterior covers to conceal and protect HVAC wiring from compressor to interior.
- **Zone:** An area that can be heated or cooled independently of other areas.

- » Choosing ductless heating
- » Understanding electrification
- » Receiving rebates and credits

Chapter 2

Enjoying Benefits and Rebates

The use of heat pumps for whole-home heating and cooling is skyrocketing. In this chapter, you find information about the benefits that you can see with heat pumps and mini-splits, and rebates and credits that may be available to you.

Enjoying the Benefits of Heat Pumps

I can hear the skeptic in you wondering what these alleged benefits are. Let me run them down for you, and after you see the benefits, you'll understand why mini-splits are a great choice!

Heat pumps have these advantages:

- » **Environmentally minded:** Heat pumps are powered by clean electricity, so they don't create the air and water pollution, smog, and acid rain that burning fossil fuels causes.
- » **Energy efficient:** Heat pumps transfer heat instead of manufacturing heat, lowering fuel bills by as much as 30 percent!

- » **Rebates and subsidies:** The federal government and local utilities and municipalities will subsidize the purchase of clean-energy heat pumps as part of electrification efforts to protect the environment.

Mini-splits, a ductless form of heat pump system, have additional benefits:

- » **Clean:** The ductless system that mini-splits use is cleaner and healthier than ducted heating systems because in a ducted system, dust and debris gathers in the ducts and is blown around your rooms whenever the heating system or air conditioner is running. Mold and other undesirable things grow in ducts. Ductless systems have a filter that catches allergens and dust (with occasional cleaning needed).
- » **Efficient:** Mini-splits output cool or heat as soon as they're asked to, so when it first starts blowing there's no blast of cold air when you want heat, or hot air when you want cool. This isn't the case with ducted systems, where ductwork runs through unconditioned spaces (for example attics, cellars, and crawl spaces) that are often subjected to extreme heat in the summer and cold in winter months.

With a ducted system, as much as 30 percent of the energy expended is used in heating or cooling the ductwork before the system starts heating or cooling your rooms.

- » **Quiet:** Mini-split systems are quieter than traditional HVAC systems, with indoor units producing about the same decibels of sound as a quiet conversation instead of a vacuum cleaner or worse with traditional ducted systems. Outdoor units are also quiet, running at 47–55 decibels compared to 70–80 decibels for traditional AC compressors.
- » **Zone control:** Using mini-splits enables you to have multiple units to heat and cool so everyone is more comfortable, no matter what their preference.
- » **Lower energy cost and less waste:** Think of the rooms you spend most of your time in. Those are the rooms you want to heat and cool. With traditional heating and cooling systems, you're heating and cooling the whole building. Ductless heating with multiple zones enables you to choose an appropriate temperature for each zone.



REMEMBER

- » **Less maintenance:** Ducted heating systems have many more parts, and more points of failure, than mini-splits do, which means a mini-split system needs less maintenance.
- » **Easier remodels:** A clean and comfortable mini-split system installed in a remodel is faster and less expensive than a ducted system. It doesn't require running ductwork through the attic, crawlspace or walls, and you won't need to cut holes in your floors for ductwork!
- » **BOGO:** Many mini-splits provide both heating and cooling — so if you buy one for AC, you're also getting a heater.

Claiming Rebates and Credits

You may be wondering, “Why are there rebates and tax credits for heat pumps and mini-splits?” Well, the answer is simple. The groups providing those credits and rebates want you to switch from using fossil fuels to using electricity to power your HVAC system. This switch is known as *electrification*. Federal government tax credits for heat pumps apply annually through 2032.

Encouraging electrification

When it comes to electrification (sometimes called *decarbonization*) of heating and cooling systems, environmental concerns are at the top of the list for many groups. We know that burning fossil fuels damages the environment and endangers wildlife and people. Electrification helps reduce those dangerous emissions.

Promoting energy-efficient home systems reduces the strain on the electrical grid making it easier for utilities to manage electrical loads, especially at peak times. Encouraging homeowners and businesses to use clean energy by providing rebates also helps utilities to meet regulations for promoting clean energy use. (Remember that although a heat pump is powered by electricity, a mini-split is not an electric heating system; the heating and cooling mechanism is via the transfer of heat.)

Finally, fossil fuels won't last forever. At the current rate of consumption, we may run out of fossil fuels as soon as 2060, and governments know it's better to be ready for the change than trying to catch up afterward.

Offsetting your costs

Credits and tax rebates are wonderful. Hey, everyone wants a little money back, right? Well, as wonderful as they are, they can also be very complicated. For example, some states require an energy assessment done by a qualified professional prior to energy efficient installations like heat pumps, or they won't pony up the dough in the form of tax credits. They do this because a properly sealed building is more efficient, giving you greater savings in energy and money. The good news is that sometimes the audits are free, and you may qualify for credits or rebates on remediation efforts such as adding insulation.



TIP

When you're looking for an HVAC contractor, make sure they can help you with rebates and credits.

Rebates are usually money that's paid directly to you to reimburse your cost. Rebates have different paperwork and requirements depending on where your system is located, the equipment used, and who's providing the rebate incentive.

Tax credits are not sent to you in a check; instead they reduce your tax bill. You'll need to fill out additional paperwork at tax time to receive those tax credits. The federal Inflation Reduction Act tax credits can reduce your cost by as much as 30 percent and provide up to \$2,000 annually in annual credits for qualified improvements through 2032.

The combination of state and federal tax credits and other rebates can offset much of the cost of a new mini-split system, but you need to follow the rules and regulations to receive them. It's important to hire a contractor who understands those rules and regulations when choosing and sizing components for your system. For example, some rebates are determined based on complex efficiency calculations. A skilled and experienced contractor will design the system to maximize these rebates. See Chapter 3 for tips on how to hire a reputable contractor.



TIP

Ask your contractor if they deduct rebates from the project cost. Some contractors offer to do this, meaning you don't have to wait for the rebates to enjoy their benefits.

IN THIS CHAPTER

- » Interviewing a contractor
- » Exploring your options
- » Determining the best system for your needs

Chapter 3

Choosing the Right Contractors

When it comes to choosing a team to install your new mini-split system, be sure to choose carefully. A great team can make your experience pleasant while hiring the wrong team can be costly. Read along to find out what the major considerations are for choosing well!

Hiring an Expert

Perhaps you've waited for this system for years, and you'll be living with it for decades, so you don't want it installed by your neighborhood know-it-all who thinks they know everything about everything. Here are some points to consider before you choose who's going to install your new system:

- » **Credentials:** Many rebate or tax credits require that your system is installed by a contractor who is certified or approved, or you won't qualify for those rebates. An unqualified installer can make simple mistakes that could cost you considerable time and money to correct. Consider this before making a mini-split heat pump your next DIY project.

- » **Knowledge of rebates:** While we're on the topic of rules and regulations, do they know them? Do they know what needs to be done to get the highest rebates and/or credits possible? Will they help you with the required paperwork? Better yet, will they front the value of the rebates?
- » **Financing options:** Does the contractor offer financing options and even 0 percent interest for a period of time?
- » **Use understandable language:** Look for a contractor who can explain what they're proposing in simple language that a non-contractor can understand. They should explain exactly how the system works and lowers your heating costs. You're letting these people install something that impacts your comfort and financial well-being, so they need to educate you on the process, the system, and its advantages.
- » **System sizing:** A qualified contractor knows how to size a system properly, so it functions well. Ask the contractor about their process for sizing the system. System size also impacts the rebates or credits available to you, so they should explain that as well.
- » **Experience and focus:** Mini-split heat pumps are relatively new, so ask the person at the company that you're considering just how many of these systems they've installed. Is it done by one person, or do they have a team who are experienced with the product and process. Does the company specialize in mini-split heat pump installation or are they a generalist when it comes to HVAC, installing all sorts of systems. Problems with mini-splits are usually caused by poor-quality installation or wiring, so you'll want a company that focuses on mini-splits and does many, many of them.
- » **Aesthetics:** Can they show you pictures of systems they've installed? It's your home, so aesthetics is important! And with that in mind, do they obsess over every detail and talk with you during the process, before they cut holes in your walls? Do they use line covers to conceal and protect exterior wiring?
- » **Excellent feedback:** They should be able to provide you with recommendations or feedback from prior customers they've worked with and show you their excellent online ratings.
- » **Cleanliness:** Do they wear booties to protect your floors, and clean up when they're done, so the only way someone would know they were there is by the nice new system and the comfort it provides?

- » **Maintenance and warranty:** Does the company remind you when it's time for routine maintenance, and offer a 12-year warranty on parts, labor, or both?
- » **Done by dinner:** How long does the process take? If they have an experienced team, the time they disrupt your home should only be a day or so. After all, there's no time-consuming ductwork to install.
- » **Sales process:** If they're using high-pressure sales tactics to get your signature on the bottom line, you might want to politely escort them to the door.



TIP

For the best experience, ensure that the company you choose to work with meets all the criteria of experts in mini-split installations.

Engineering for Success

Heating and cooling systems are not one-size-fits-all solutions. Determining the right type, size, and configuration of components is paramount to having efficient and effective heating and cooling throughout a home. Let's consider the different types of heating and cooling systems.

Drop-in central heating and cooling

If you have an existing ducted fossil fuel heating system, you may be tempted to install a drop-in central air system. There are some disadvantages to doing that. Drop-in systems distribute the cool air using the current duct system, which was sized for an existing, likely older and inefficient heating system. Ductwork is full of dust and debris that gets blown around your home. Also, it takes a few minutes to condition the ductwork to the right temperature before it begins blowing warm or cool air into your rooms.

Multi-zone mini-split systems

Multi-zone mini-split systems use a single multi-head exterior compressor connected to multiple interior mini-split air handling units. When considering this type of system, remember that

- » **Wiring can be invasive and complicated.** All the interior zones must snake back to a single exterior compressor.

- » **The compressor unit is a single point of failure.** If it fails, all interior units are affected and can cause an emergency situation in areas where temperatures drop below freezing or rise above 100 degrees Fahrenheit.
- » **They may be less efficient as measured by BTUs per kilowatt hour of electricity and because refrigerant is always flowing to every connected head unit.** A multi-zone unit is cranking up a big machine for what may be only a small task, like cooling an especially sunny room.
- » **Less zone control:** For example, the same head-end unit cannot support heating in one zone and cooling in another.



REMEMBER

Your contractor should use mathematical formulas to engineer the best solution for your situation and not guess at what you need.

Single zone mini-split systems

Single zone (one to one) mini-splits have one exterior condenser for each internal head that heats or cools a single area. For most situations they're the best solution, and they have several advantages over other types of systems:

- » **Efficiency:** Like multi-zone systems there's no ductwork to heat or cool, so room temperature can be changed quickly. They're more efficient than multi-zone systems because each compressor can completely shut down when its corresponding interior zone is not in use.
- » **Tidier installation:** Because each compressor is connected to only one interior air handling unit, there is less invasive wiring. There is also greater flexibility in where each interior unit is placed.
- » **Redundancy:** A single condenser failure doesn't cause an emergency, because other condensers are running.
- » **Longevity:** Individual systems only run when they're needed, not all the time, so they have a longer lifespan.
- » **Affordable upgrades:** When technology changes there's no need to upgrade the entire system at once. They can be done one at a time.

Chapter 4

Ten Mini-split Facts to Remember

Short on time? Here's the quick list of important facts and advantages about the amazing world of mini-split heat pumps.

- » **Clean source of energy:** Mini-split heat pumps transfer heat from outside to inside in winter, and from inside to outside in summer, instead of manufacturing heat as boilers and furnaces do. With no fossil fuels and no ducts, mini-splits are a cleaner source of energy.
- » **Not your grandparents' heat pump:** Today's mini-splits are not like the mini-splits of old. They're efficient and effective even when the temperature dips well below zero.
- » **Healthier than fossil fuels:** Mini-splits are cleaner and kinder to your indoor environment than a fossil fuel-based system. There're no combustibles or carbon monoxide in your basement, and no dust or allergens coming from the ductwork. They're also kinder to the outdoor environment because they don't pollute it like burning fossil fuels does.
- » **Room-to-room comfort:** Single zone mini-splits enable a homeowner to choose what temperature is best for each area of their home. This saves money because you're not heating unused rooms, and everyone from grandma to your toddler is comfortable.

- » **Low maintenance:** Mini-splits are very low maintenance and one-to-one mini-split systems additionally offer high levels of redundancy — if one unit malfunctions, the rest remain in operation. You never need to call for a fuel refill, and providers offer warranties on parts (and sometimes labor) as long as 12 years. All of this means less stress for you.
- » **Saves money:** Mini-splits recycle heat from the environment so they're more energy efficient (less costly to operate) than other heating and cooling options. They enable you to heat or cool only the zones you need, which saves you even more money.
- » **Rebates and credits:** The government and local utilities want to give you money to offset the costs of mini-splits, because the more people engage in electrification of heating and cooling systems, the better the impact on our environment and the less fossil fuel we'll need in the future.

Federal tax credits are available in every state. Rebates depend on the size of the system (BTU displacement) and the type of system installed.

The professionals at RYCOR know the ins and outs of rebates and will ensure that you qualify for the largest possible rebates.



TIP

- » **Solution for unique spaces:** Some places, especially in older homes or additions or garages, may be difficult to reach with a traditional ducted HVAC system. Mini-splits provide the solution for those areas.
- » **Installation timeline:** Because they are ductless, a mini-split installation can generally be installed in just one day.
- » **Hire a professional:** Simple mistakes in installation can be costly to correct later. Hire a professional to install your system. One that specializes in single-zone mini-splits and are perfectionists who obsess over details to ensure you're happy and comfortable for years to come.

CHILL. WE MAKE UPGRADING TO MINI-SPLITS EASY.



WE KNOW HOW.

As your one point-of-contact, RYCOR'S Concierge is the mini-split expert who handles everything from permitting to installation. Besides answering any questions and organizing all your appointments, they'll even help you save as much as you can by guiding you through the entire rebate process.



**With RYCOR'S Concierge, switching to energy-efficient
mini-splits has never been easier.**

Upgrade your heating and cooling system

People everywhere are switching from fossil fuel based heating and cooling to cleaner, more economical mini-splits. Regardless of where you live, even in cool climates, today's heat pumps will keep you comfortable year 'round, with rebates and tax credits to reduce your costs. Let this book be your guide to learning about today's mini-split heat pumps, their benefits, and choosing the right contractor for your unique situation.

Inside...

- Understand today's heat pumps
- Learn how electrification benefits you
- Find professional contractors
- The pitfalls of ducted systems
- Make the switch to ductless
- Ten facts about mini-splits

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Audrey O'Shea is a technical writer and former educator teaching courses including electrical theory and practice for energy workers, and information technology topics.

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