Your Complete Guide to

ENERGY EFFICIENT COOLING *with* DUCTLESS HVAC

Meeting Your Cooling Needs with Flexible & Efficient Technology

MICHAEL CAPPUCCIO

Your Complete Guide to Energy Efficient Cooling with Ductless HVAC

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From the Desk of Michael Cappuccio:

Since 1989, N.E.T.R. Inc. has been installing air conditioning systems in Boston and its surrounding areas. In 2001, NETR adopted ductless heating and cooling technology even though other HVAC providers did not see how this could be used in homes and businesses. However, over nearly the past two decades, we've seen how this technology can benefit home and business owners. We believe in the efficiency of ductless technology and have a deep passion for not only helping Boston residents save money with ductless HVAC, but also achieve better comfort in their homes and businesses.

Our philosophy has been a complete dedication to our customers' needs. Over the years, this dedication has helped us to become one of the most respected names in refrigeration and cooling in New England. We are the largest ductless contractor in New England with hundreds and hundreds of ductless system installations in the region.

We hope this eBook gives you the opportunity to learn more about utilizing energy efficient ductless HVAC systems for your cooling needs.

Sincerely,

Michael Cappuccio

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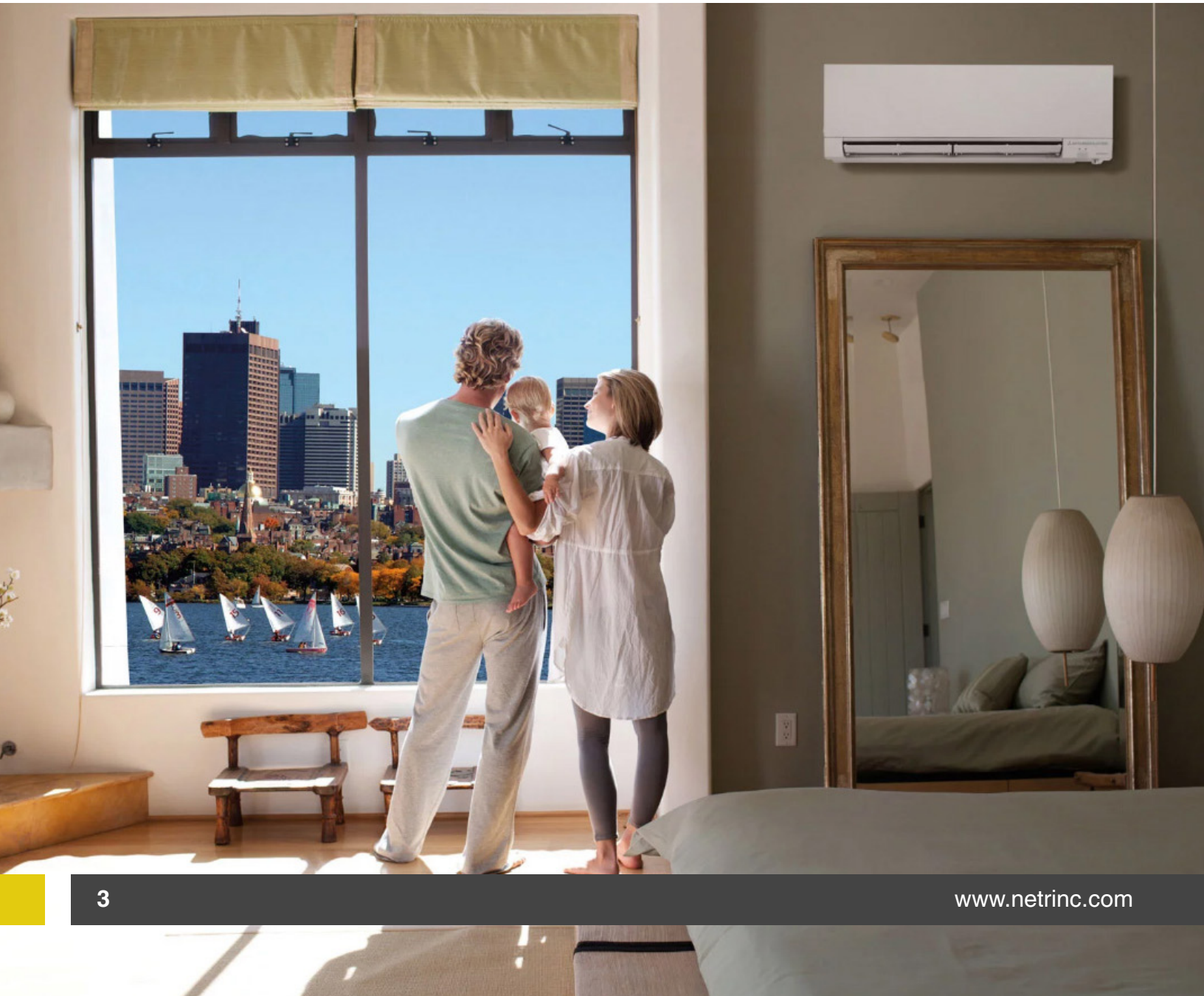
Introduction

Curious about installing a ductless cooling system in your home? The decision to install — or switch to — a ductless cooling system is an easy one, once you understand the ins and outs of a ductless system.

Ductless cooling systems are extremely efficient and will save homeowners, business owners, and building owners money, while also lowering the environmental impact of utilizing a cooling system.

Continue reading to find out about the differences between a variety of cooling systems, including ductless, and how to determine if a ductless system is right for your cooling needs.



How Air Conditioning Systems Work

If you're like most people, you likely know the basics of how air conditioning works, but if the inner workings of the system seem like a mystery to you, you're not alone. These details can be particularly useful if your air conditioner breaks down and you want to be able to understand the repair person's lingo.

So how does an air conditioning system actually deliver cool air to your property? Here is a quick breakdown of how it all works.

The Main Parts

In the simplest terms, an air conditioner removes warm air from the inside of your home or business and replaces it with cool air. That process involves the following elements:

- Refrigerant
- Compressor
- Condenser
- Metering Device
- Evaporator Coil

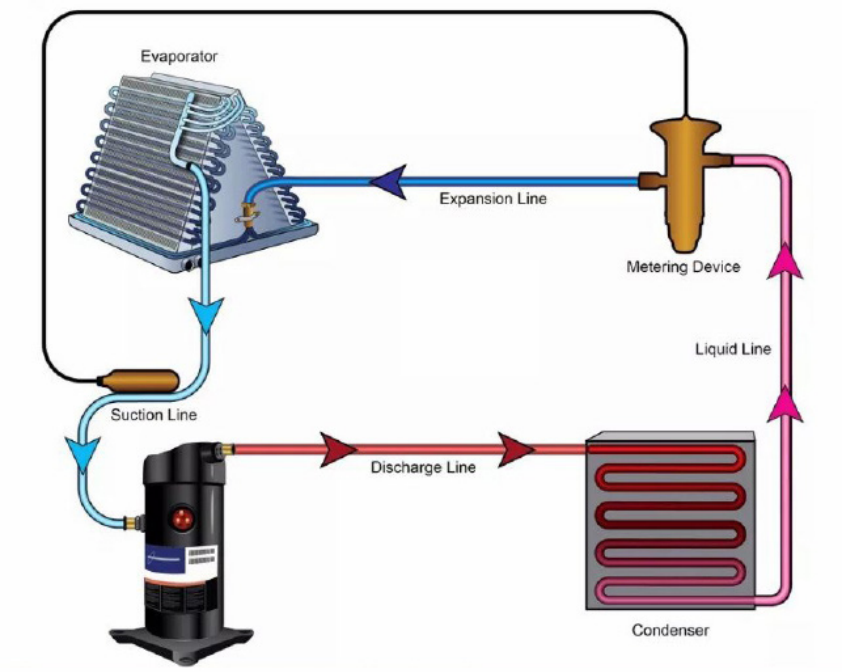
There are many different types of air conditioning systems including window AC units, ductless systems, and central HVAC systems. Despite the differences between all of these systems, they all essentially cool the air in the same way. In fact, air conditioning systems work nearly the same way that your fridge does to keep food cool. To learn more, take a look at how each of these individual elements work together.

Refrigerant

On a basic level, your air conditioner works like a circulatory system, pumping refrigerant instead of blood. As refrigerant moves through the system, it absorbs heat from the indoors and releases it outside. Through this process, the refrigerant has to change states from a vapor to a liquid. Luckily, refrigerant has a low boiling point, and that allows it to change from a liquid to a vapor without creating a lot of excess heat.

Compressor

As the "heart", the compressor pumps the refrigerant through the rest of the system. The cooling cycle starts when the compressor draws in refrigerant gas through the suction line from the evaporator. At this point, the refrigerant is a low-pressure gas that has absorbed the hot air in your home. The motor-driven compressor uses a piston to squeeze the refrigerant to increase its temperature and pressure, and that causes the refrigerant to turn into a hot, high-pressure gas vapor. Then, the refrigerant flows through the discharge line into the condenser.



Condenser

Once the hot refrigerant vapor flows to the outdoor condenser, the condenser fan blows on the refrigerant to cool down the hot gas. As the refrigerant changes temperature again, it turns from a high-pressure gas vapor to a hot liquid, and it begins to move toward the expansion valve.

Expansion Valve

The hot liquid refrigerant passes through a small opening in the valve and emerges as a cool low-pressure mist. This happens because the valve reduces the pressure of the refrigerant, and that speeds up the cooling process. The expansion valve also controls how much refrigerant can flow through the system, and that helps to boost the overall efficiency of the system. After passing through the valve, the low-pressure cool liquid mist moves to the evaporator coil.

Evaporator Coil

The evaporator coil is made of a conductive metal such as copper, aluminum, or steel. First, that metal attracts some of the heat in the room, and then, that heat passes to the refrigerant. During this process, some water vapor from the room also tends to hit the outside of the evaporator coil. When the warm vapor hits the cold coil, it condenses into a liquid. That helps to reduce the humidity in the room, and your AC also deals with that excess water, often by collecting it in a pan.

No matter what type of air conditioning system you have, the parts all need to work together to cool the room. Additionally, they must be regularly maintained to ensure your air conditioning system continues to work as efficiently as possible. If you're not getting cool air, one of these parts may not be working properly and you should contact an HVAC technician as soon as possible.

Best Locations for Ductless Systems

Also called mini splits, ductless cooling systems work in a variety of locations including the following:

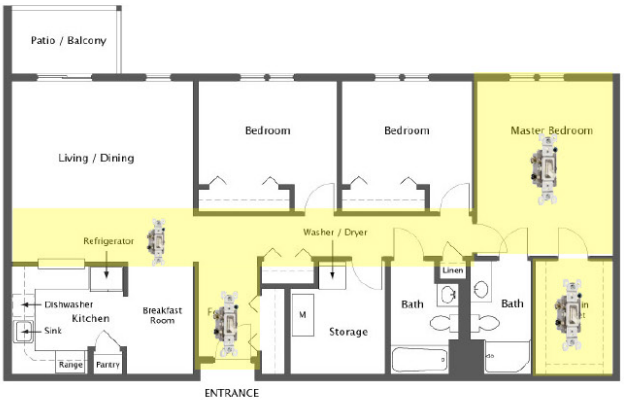
- Additions
- Attics
- Basements
- Entire Homes
- Office Buildings
- Retail Spaces
- Data Centers
- Gyms
- Restaurants
- Multi-Unit Commercial Buildings
- Apartment Buildings
- And More

Essentially, ductless cooling units can work in nearly any residential or commercial space.

Zoned Cooling

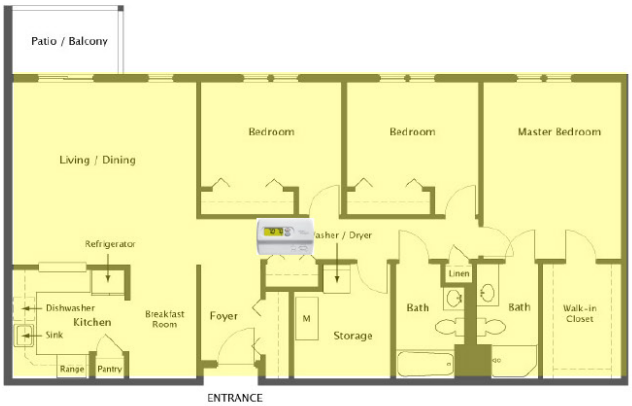
You can control each of the indoor air handling units connected to your ductless cooling system separately. Thanks to programmable controls, you can setup the system so that it automatically adjusts to meet your changing needs throughout the day. For instance, most people don't need the home as cool when they're at work or sleeping, and that helps to save money on cooling costs. However, if you want to override the programmed settings, you can also alter the settings on each unit separately using your remote control. In the picture below, you can see a zoned home on the left and a central HVAC home on the right. In the zoned home, only the rooms that are in use are getting cooled. The other rooms are not using up any energy, because the systems are off in those rooms. On the right, the HVAC home has to cool the entire home to cool the rooms that are in use – this means that energy is being wasted on the rooms that aren't in use.

Zoned



Or

Not Zoned



What is Ductless Cooling?

At NETR, we get a lot of questions about ductless cooling systems. To help you get a sense of the essentials, we've put together this look at the basics of these systems. Welcome to ductless 101.

The Components

Ductless units consist of a handful of basic components. Just like a traditional air conditioner, they have an outdoor unit. They also have one or more indoor air handling units. A conduit runs between these two unit and it holds a tube with refrigerant, electrical wires, and a drain for condensate. Finally, these units have remote controls, so you can adjust the settings, and they may also connect to software that lets you control the system.

Depending on your needs, you may have a single outdoor unit with a single indoor unit. That's perfect if you're trying to cool an addition, an attic, or a part of your home that isn't connected to your existing HVAC system. Alternatively, you may have one outdoor unit with multiple indoor units. A single outdoor unit can support up to eight indoor units, but for very large multi-unit commercial buildings or apartment blocks, you may need multiple outdoor units.

The Installation Process

Installation of ductless units is very straight forward. A ductless professional helps you assess the number of indoor units you need and the right capacity for your outdoor unit. Then, they install the outdoor unit, drill small holes in the walls to run the lines through, and connect the indoor unit. For a small residential job, this project often can be completed in one day or less, and even for a large commercial job, installation is relatively quick. For a multi-unit installation, you can opt to have the installation work done zone by zone. For instance, you can do a floor of your building every week until the entire system is installed, or you can install ductless units where they are needed immediately and then install the units in other areas as desired.

Other things in your home are zoned as well, although you might not think of them that way. Your lighting and your faucets, for example, are zoned. To get lighting in your living room, you don't turn on a master lighting system that lights the whole house. You simply turn on the light in the living room. When you turn on your kitchen faucet to wash dishes, the faucets in the bathroom don't also come on – water only goes to the faucet that you're using. With a ductless system, cooling only goes to the room you're using in the same way. With extensive commercial systems, your ductless unit comes with software. You can control each individual unit with the software, or you can set parameters and allow the people near each unit to specify the exact temps they want. You can also sync this software with your building management software so that you can control everything from a central dashboard. With both residential and commercial systems, you can connect the controls to an app for accessibility on the go.

Or

Efficiency Considerations

Thanks to zoned cooling, ductless systems are instantly more efficient than traditional HVAC systems because you don't have to cool areas that aren't in use. You also never have to over-cool one area just to keep another area comfortable. With traditional HVAC systems, you often end up with areas that feel too cold or too warm because all the rooms are connected to a single thermostat.

Ductless units are also designed to be more efficient, and they meet ENERGY STAR guidelines. These features help to reduce your energy bills, and they also reduce your carbon footprint because you end up using less energy. Additionally, if you have a ducted system, you always lose some cold air through the ducts, and that drives up your overall energy usage and costs. Simply removing the ducts makes these units more efficient.

How Ductless Cooling Works

There are many ways to configure this modern and versatile system for all your comfort needs. Highly efficient and effective, a ductless system is the ideal primary cooling solution for your home or business in New England.

Here's How it Works

Ductless splits, also called "Mini-Splits" pump cooled refrigerant directly to the wall or ceiling-mounted air-handling unit, and each unit has its own wireless electronic temperature control system, a.k.a., a remote.

Here's how the system works in a single room application:

1. The indoor unit uses refrigerant to cool air and quietly pushes the chilled air to where you need it in your living space.
2. Refrigerant and electrical lines connect the outdoor unit to the indoor unit through a 3" opening in the exterior wall.
3. The outdoor unit's state-of-the-art heat pump cools refrigerant and sends it back inside to the air handler, which continuously monitors the room for changes in temperature and sends conditioned air to the areas of the room that need it.

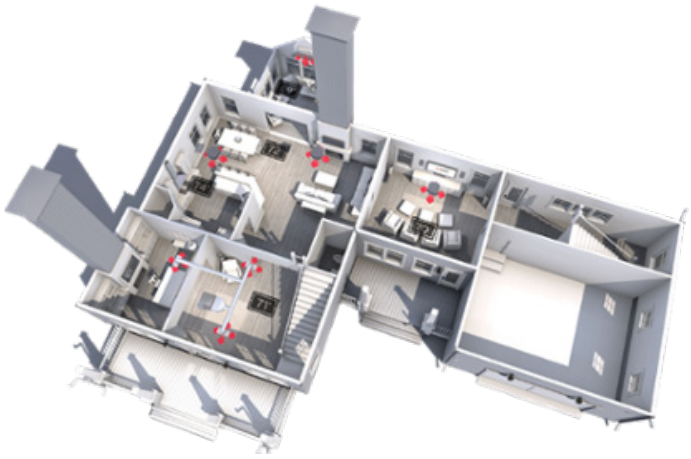
You Can Cool a Single Zone or Multiple Zones, but What's the Difference?

Single Zone

Ductless is a perfect solution for homes with problem rooms that just never feel comfortable. You know, a great room with a high ceiling, or large glass exposure. A sun room or addition. Even a converted attic, or a remodeled room over a garage.

Ductless systems allow you to pinpoint the area of your home you want to condition, which always takes some of the load off your existing HVAC system, saving you money.

Multi-Zone

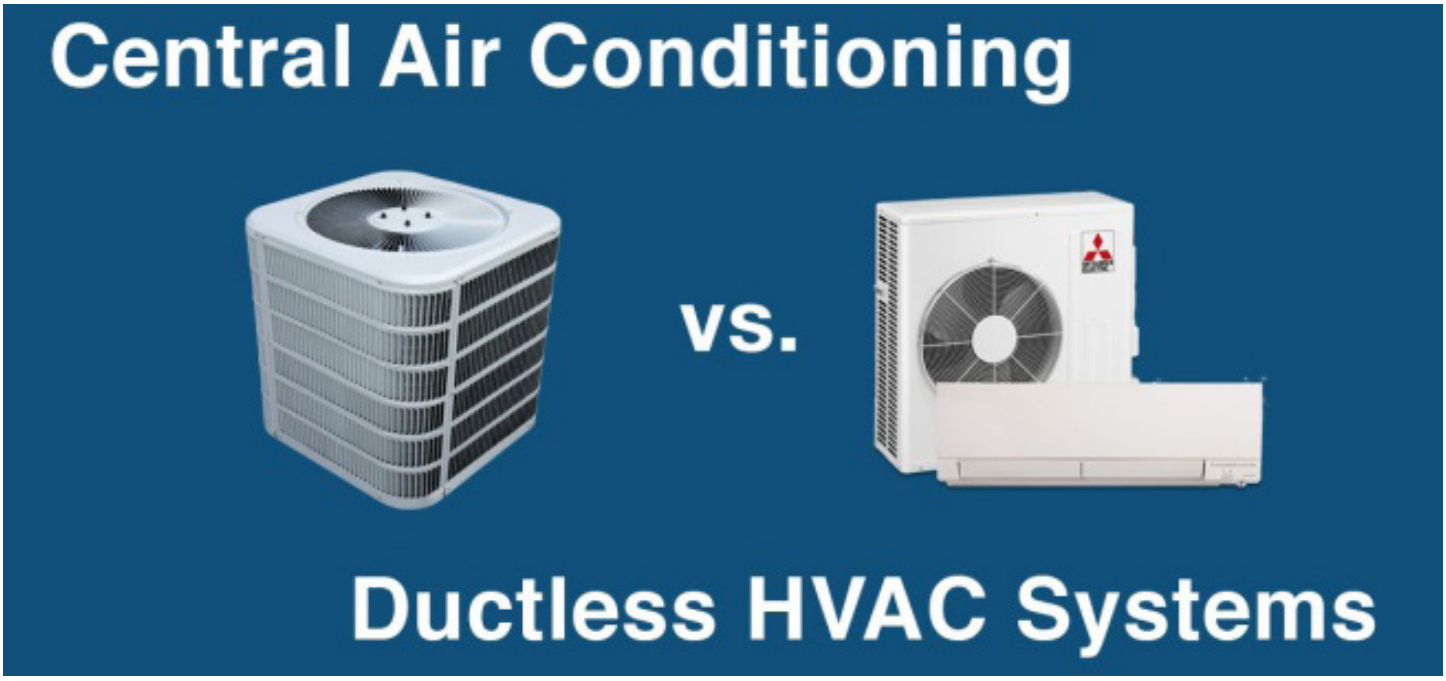


With a ductless system it's easy to choose exactly how much you want to cool each room or zone of your home to accommodate your family's preferences and lifestyle.

Does dad like it cool and mom like it warmer? Kids off to school and spending most of your time in two or three rooms?

With a ductless solution, you can eliminate energy use in the rooms you're not using, or design a climate in your home based on the factors that make you and your home unique.

Central Air Conditioning vs. Ductless HVAC Systems



What is Central Air Conditioning?

There are two types of central air conditioners: Split systems and packaged units. With a split-system central air conditioner, the indoor unit holds the evaporator, while the outdoor unit houses the compressor and condenser. Generally, the indoor unit includes a furnace, and fans blow hot or warm air through the building using a series of ducts.

In a packaged central air conditioner, the condenser, evaporator, and compressor are all located in one cabinet, which is installed outside the home or building. These units may include a natural gas furnace, which eliminates the need for a separate indoor furnace. Again, ducts run from the cabinet to vents that are spread throughout the building, and fans blow hot or cold air through the ducts.

What is a Ductless System?

Ductless systems also feature indoor and outdoor components. One outdoor unit can work with multiple indoor units which is perfect for most situations, but to cool a large multi-story commercial building, you may need more than one outdoor unit.

Unlike central HVAC units, ductless systems don't have ducts. They move refrigerant between the indoor and outdoor units using small tubing that runs through the walls or ceiling cavities, and cool air blows out of the indoor units, rather than out of vents connected to ducts.

Ductless System vs. Central Air Conditioning: Pros and Cons

Here are the most important factors to consider when evaluating the benefits of a ductless system over central air conditioning.

- **Design Flexibility**. With ductless systems, the outdoor unit is small and can be placed in a range of positions such as on the roof, on a ledge, or next to the building. Indoor units come in multiple designs to work with your decor, and you have a lot of flexibility on where to place the units. In contrast, with central HVAC systems, you have limited options on where the vents can go.

- **Energy Savings**. With a ductless system, if you decide that you don't need to use a room on a certain day, you can turn off the cooled air. This provides significant energy savings. Beyond that, ductless systems operate more efficiently than their central cooling counterparts. As air travels through ductwork, it tends to seep into unconditioned areas of the building. For example, if your ducts run through a hot attic, some of the cold air leaks into that space, driving up your overall cooling costs. Due to these issues, a central air conditioning system can result in energy losses of nearly 30%. With a ductless system, there is no ductwork involved, so the problems of leaks and wasted cool air are eliminated completely.

- **Compressor technology**. This means that the speed of the compressor varies based on the temperature in the room. That gets the room to its target temperatures faster, but it also boosts efficiency, saving you money on cooling. On top of that, compressor technology keeps your room at a consistent temperature all year round. You don't have to worry about electrical or computer equipment getting damaged due to excessively high or low temperatures.

- **Easy Installation**. The absence of ductwork makes ductless systems relatively fast and easy to install. There is no need to tear down walls or do major renovations, and most contractors can handle small installations in a day or so. For large installations with multiple indoor and outdoor units, you can even opt to do the installation in zones so that you don't have to shut down all of your operations.

- **Cost**. If you don't have existing ductwork, the cost of ductless is considerably less expensive than putting in a central HVAC system. In cases, where the ductwork is already in place, however, ductless systems may be slightly more expensive than just buying a new central air conditioning. However, installation is only the first cost to consider. You should also consider energy efficiency, and in most cases, ductless systems are cheaper to run long-term. Beyond that, you never have to worry about cleaning the ducts when you have a ductless system, and that adds to the overall savings.

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Window Units vs. Ductless

If you're looking for a new air conditioner, there are a lot of options. If you don't have ducts and don't want to add them, you have two main choices: window units and ductless AC. Both can cool at least one room, neither require ducts, but which is the best option?

Here's a brief guide to the main differences between window units and ductless systems.

What Is a Window Unit?

A window air conditioning unit fits into a window frame or an opening in the wall and it provides cooling for a single room. These units have several temperature and fan settings so you can adjust them according to your needs, and many units let you just use the fan feature without turning on the air conditioning mode. Generally, window AC units have internal thermostats, and they run until they sense that the air in the room has cooled down to the appropriate level. They are relatively easy to install on your own, but they can be noisy and difficult to control accurately.

What is a Ductless System?

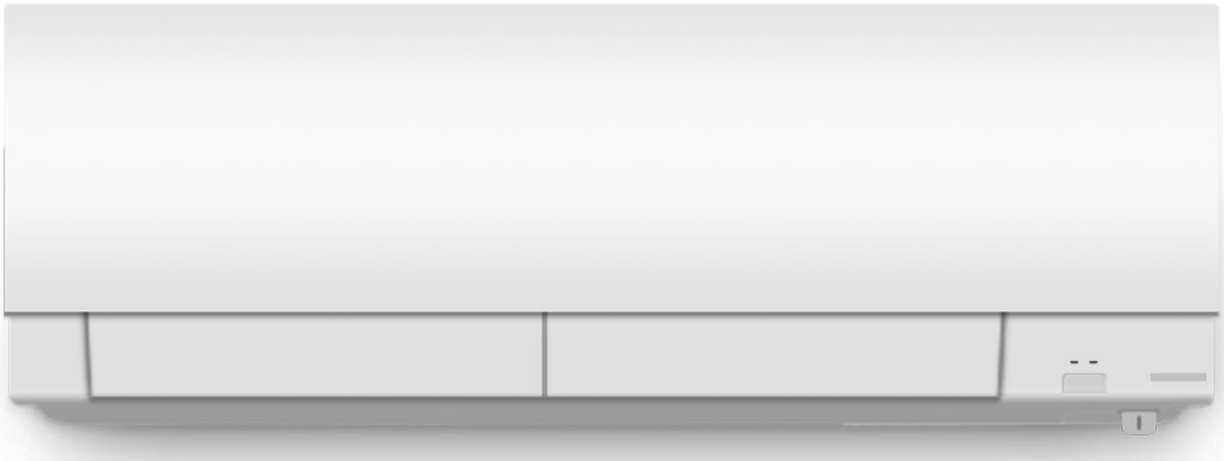
Also called a mini-split, a ductless system consists of both indoor and outdoor components. The outdoor part houses the compressor and the condenser, while the indoor unit handles the cool air. Tubing carries refrigerant, electricity, and communication signals between these two components. Just like all other air conditioners, the refrigerant absorbs heat from inside the building and releases it outside.

Window AC Unit vs. Ductless System

If you are trying to choose between a window air conditioner or a ductless system, here are some of the main factors you should consider:

- **Security**. No matter where you install a window air conditioner, it compromises the security of your home or business. Intruders simply need to hoist the system out of the way to gain entry into the building. With a ductless AC system, the installation contractors only need to drill small holes in your outdoor walls in order to connect the suction lines, refrigerant lines, and power cables. That means that you don't have to worry about your ductless system creating a security risk in any way.
- **Convenience.** When you install a window air conditioner, you lose the benefits of having a window. You can't open the window to bring in fresh air, and you may even have to sacrifice a great view. In contrast, ductless systems can be placed nearly anywhere on your interior wall or ceiling. Additionally, window air conditioners are often considered to be temporary cooling solutions. Even people who use them year after year tend to take them down in the winter, and that can be time consuming and annoying. Ductless units are a permanent feature.
- **Flexibility.** Window air conditioners are designed to cool a single room, and to cool multiple spaces or large areas, you need to buy multiple units. This uses multiple cords and outlets. In contrast, a ductless system let you pair multiple indoor units with a single outdoor unit, and you can control all of the units separately. To increase your options, the indoor units come in a wide range of different designs, so you can customize your set-up to work with your space. They are completely cordless and won't take up valuable outlet space.
- **Energy Efficiency**. When it comes to energy efficiency, ductless systems are clearly the winners. Some window air conditioning units come with ENERGY STAR® ratings, but the SEER ratings on many mini-split systems are much more efficient. In addition, window air conditioners also tend to have a lot of air leaks — gaps between the unit and the window frame are practically unavoidable. Water can leak into your window frames, causing damage to your home and insect problems. Window units are also extremely loud due to the compressor in the unit.
- **Comfort.** Achieving the ideal temperature control settings with a window AC is nearly impossible. The room almost always feels either too hot or too cold. In contrast, ductless systems have specialized sensors that can detect minute changes in air temperatures, and the system adjusts itself accordingly.

- **Cost.** Installing a ductless system is usually more expensive up front than buying a window unit, but when you compare the cost of purchasing multiple units with the cost of a ductless system, the prices start to get a bit closer. However, you should also take into effect long-term operating and maintenance costs. Ductless systems are designed to last longer than window units. In fact, with proper maintenance and care, a ductless system should work for 20 years or more, and that helps to save money over the long run. Additionally, the energy efficiency of ductless systems make them cheaper to run.
- **Air Quality.** If not properly sealed, window units can let in outside air, potentially increasing the presence of allergens, pesticides, and other irritants inside your home or office. Window units have filters which clean the air that passes through them, but over time, these filters tend to get extremely dirty. On the other hand, ductless systems actually help to improve indoor air quality. They feature an allergen filtration system which reduces germs, bacteria, and viruses while absorbing odors at the same time. A trained technician can perform regular maintenance to ensure that your ductless system is working properly and delivering great indoor air quality.
- **Noise Levels.** Window AC units tend to be noisy no matter which settings you choose. On the other hand, a ductless system is designed for quiet operation with indoor decibel levels as low as 19 decibels, which is slightly louder than breathing and slightly quieter than rustling leaves. For many years, window air conditioners have been the most popular choice for cooling one room at a time. They are inexpensive and relatively easy to install. However, now that people are aware of how much they can save in the long run, more people are switching to ductless systems instead.



Indoor Ductless Wall-Mounted Unit

Benefits of Ductless Cooling

Ductless cooling systems have been around since the 1970s, but they've only recently started becoming popular. These systems offer a lot of advantages compared to traditional cooling methods like central ductwork, and their innovative designs offer key benefits to owners of both residential and commercial properties.

1. Easy Installation

The absence of ducts makes these units easier to install than traditional HVAC systems. The set-up consists of an outdoor unit along with one or more indoor air handlers. Flexible piping runs between these units to carry electricity and refrigerant and installing that is relatively non-invasive and hassle free. The contractor just needs to add a few small and discreet holes.

2. Small Footprint

Generally, the outdoor unit with a ductless system has a relatively small footprint, especially compared to many traditional HVAC systems. You can place these units on the roof, in small alleyways, or sometimes even on ledges. The indoor air handling units are also relatively small and discreet, allowing them to fit easily in a range of environments.

3. Great for Additions

If certain areas of your home aren't connected to your central cooling system, you can easily meet your cooling needs by installing a ductless system in these areas. A single unit is ideal for additions, attics, basements, and similar spaces.

4. Scalability

Cooling an extra room is just the beginning. Ductless units can be scaled to meet your needs. You can use them to cool your entire home, business property, or even a multi-unit commercial building.

5. Zoned Cooling

When you install multiple ductless units in a large building, you gain the ability to cool all of these areas separately. If you're not using a certain area, you can turn down the air conditioner to keep your costs low. Similarly, if a certain area needs more cooling, you can turn it up in those areas without making the other areas in your building uncomfortable.

6. Individual Controls

You can control each zone of your ductless system from a central controller, but you can also control each unit individually with its own remote. Feeling a little too hot while working or watching TV? Simply grab the remote and turn up the cooling with getting up.

7. Zoned Installation

In addition to controlling the temperatures separately, you can also install these units zone by zone. In a busy commercial space, this allows you to minimize disruption. This approach to installation also allows you to spread out the total cost over a longer time period.

8. Syncs with Building Management Software

To run multiple units in a commercial or apartment building, you need the right software. The CITY MULTI whole building system comes with software to help you manage multiple indoor units from a single controller. You can also put the controls in your tenants' hands but set parameters so that they don't over use the system. Most importantly, you can sync this software with your building management system.

9. Ability to Track Usage by Zones

You can also track usage by zones. That helps with calculating what your tenants owe for cooling, and it's also a useful way to track how your energy consumption for cooling varies from area to area.

10. Energy Savings

Whether you put a ductless system into a home or commercial building, you will likely notice energy savings. On average, these systems use 40% less energy for cooling than ducted systems. Compared to window cooling units, ductless units are also less susceptible to air gaps which can also compromise efficiency.

11. Quiet Operation

In addition to being energy efficient, ductless units are also quiet. The indoor units make about as much noise as wind rustling trees, and even the largest outdoor units make less noise than the average dishwasher.

12. Improves Indoor Air Quality

With a ductless system, you don't have to worry about dust or allergens building up in the ducts and then blowing out into your living or working space, and of course, you don't have to pay for cleaning your ducts either. Additionally, ductless systems feature multi-stage filtration systems that help to remove pollutants and small particulates from your air, giving your indoor air quality a boost.

13. Design Flexibility

With a ductless system, you have a lot of options. As indicated above, you can put ductless systems in both commercial and residential units. When you select your indoor handling unit, you can also choose from a variety of designs, and you can also locate your indoor unit in a variety of places on the wall or ceiling.

14. High-Quality Manufacturing

When you choose a ductless system from a quality company such as Mitsubishi, you also ensure that you get quality parts. That helps to reduce breakdowns and keep the system running longer.

What Does Ductless Cooling Cost?

Here in the Greater Boston area, ductless cooling in a single zone configuration, fully installed and ready to turn on starts at $2,800, and the price goes up from there depending on a number of factors.

Buyer Beware

You may have found websites that claim it costs $1,867 to purchase a new ductless mini split, and $159 to have it professionally installed. As you can imagine, that price is not only the cheapest, least efficient unit on the market, but I don't know a contractor worth allowing into your home who would charge that little for labor. Proceed with caution.

Installation Cost

The financial incentives associated with ductless technology have made it one of the fastest growing home comfort solutions for residential air conditioning replacements.

The price of a ductless system is determined by four primary factors:

- The size of the unit
- The type of unit
- The number of areas (or zones) being conditioned
- The degree of difficulty of the installation (How far the indoor and outdoor units are from each other, the construction of the outer wall to be drilled to carry the line sets, etc.)

Single Zone Mitsubishi Ductless Installation

Professional installation of the most basic, or single zone, configuration (consisting of one wall unit and condenser) will cost between $2,800 and $4,500. This layout is ideal for many kinds of applications like conditioning the air in a sun room, garage, attic, and some smaller homes.

Multi-Zone Mitsubishi Ductless Installation

Some New England homeowners need only one ductless unit, while other applications are better served by 2-8 units. It all depends on the layout of the home and what works best for you.

A two to three zone ductless system typically runs between $7,500 and $12,000. A four to eight zone system can run from $15,000 to $25,000.

We can run as many as eight indoor units with a single outdoor condenser, and we can come back to add indoor units at a later date if you want to have your system designed for future expansion as budgets allow.

Is Ductless a Good Value for My Money?

At first glance, the cost of ductless air conditioning can seem steep, however, the benefits in energy efficiency will save you a lot in the long run.

Since there are no ducts, you don't waste energy through leaky ductwork.

Typical forced air systems experience duct losses equivalent to about 20% of the system's energy consumption. Often, it's over 30%.

Ductless systems are also less expensive to maintain than traditional systems.

When you add in attractive rebate programs and 0% payment plans, ductless solutions wind up shaking out as a net *cost savings* to most homeowners.

A multi-zone configuration comes with an additional energy saving benefit. You can control the temperature independently in every room where an air handler is installed.

So, if you're not using a room, you won't have to keep it cooled the same as the rest of the house.

Rebates and Cost Savings for Ductless Cooling Systems

Massachusetts oil and gas companies, including Berkshire Gas, Blackstone Gas Company, Cape Light Compact, Columbia Gas of Massachusetts, Eversource, Liberty Utilities, National Grid, and Unitil have collaborated together to make energy efficient upgrades available to communities, businesses, and residents in Massachusetts. The group offers a wide range of training programs, information, incentives, services, and rebates.

The rebate program is funded by a service charge on customers' energy bills, and it is administered by electric and gas sponsors that work closely with the Massachusetts Department of Energy Resources. The goal is to help residents of Massachusetts save energy and money. This joint collaboration has helped Massachusetts become the most energy efficient state in the nation according to the American Council for an Energy Efficient Economy (ACEEE).

The Early Heating and Cooling Replacement program has very specific qualification requirements, but the rebates are much higher. To qualify, you must also have a home site visit to assess eligibility, but for the early air conditioner or heat pump rebates, you can schedule an appointment with an AC Check Trained Contractor instead of working directly with Mass Save.

Applying for these rebates is easy. You can either go online to www.masssave.com/rebates and fill out the online form, or you can download the mail-in form. The form is fairly simple to fill out. You need your personal info and energy account info, and you may also need to upload supporting documentation.

Generally, it takes approximately six to eight weeks to process your application. Make sure your form is completely filled out to avoid any delays in processing.

We can help you with this process!

We've helped hundreds of residents all over the greater Boston area take advantage of this free money to make the transition to super-efficient ductless cooling. Not only are there state rebates available, manufacturer rebates may also be available at certain times of the year.

Commercial Cooling with Ductless HVAC

WHOLE BUILDING DUCTLESS HVAC

Dubbed the big brother of the mini-split ductless unit, the CITY MULTI is a ductless HVAC system made by Mitsubishi HVAC and designed for large commercial buildings. The intelligent system is fully customizable — you get to choose the number and style of indoor units you need, and once the system is installed, you can control each zone separately. Beyond that, the system offers superior, consistent cooling, quiet operation, and a wide range of additional benefits.

Basic Components

This commercial HVAC system consists of a network of variable refrigerant flow zoning (VRFZ) technology along with the advanced CITY MULTI Controls Network (CMNC). The system consists of the following components:

- One outdoor unit can support up to 32 indoor units
- A main controller (typically, a branch circuit (BC) controller for the R-2 series and a manifold for the Y-series units)
- Zone controllers
- Software

Superior Cooling

The CITY MULTI system perfectly balances energy efficiency with distributing the necessary amount of capacity between the indoor units. In fact, the capacity of the R-2 Series can be up to 150% of the capacity of the outdoor unit due to the load diversity of the different zones and the system's ability to heat and cool at the same time.

Installation

The CITY MULTI whole building system doesn't need ducts. Instead, it uses refrigerant lines, which give a lot of design flexibility; this system can work with both new and existing buildings. You don't have to compromise ceiling height with ductwork and the installation process is a lot simpler.

The lightweight outdoor unit boasts a small footprint for easy placement on roofs, in tight alleyways, on ledges, and or in other small spots. Additionally, the indoor units come in a variety of styles including wall-mounted, floor-mounted, ceiling-concealed, suspended, or recessed to work with almost any design objectives.

Thanks to the system's modular design, it can be installed zone by zone. That means you don't have to shut down the whole building for installation, and you don't even have to convert the whole building all at once.

Zone Cooling

With zone cooling, you can control each area separately, which promotes efficiency and helps you lower the bills in your building. To make this possible, each indoor unit has an electronic expansion valve. That allows the area to get the exact amount of cooling that it needs.

With the G-50A controller, you can manage up to 50 indoor units from a single controller. Using TG-2000 software or a Local Area Network (LAN) and Internet Explorer, you can manage up to 40 G-50A controllers from a single location, which allows you to control up to 2,000 individual units at once. For total control of your whole building, you can sync the CITY MULTI system to your Building Management System (BMS) using LonWorks® or BACnet®.

If you have residential or business tenants, you can let them manage their own zones, and you can set parameters to prevent misuse. With the TG-2000 software, you can also monitor the usage of individual units and generate bills for each tenant.

Quiet Systems

Ideal for schools, libraries, offices, recording studios, and multiple other spaces, CITY MULTI indoor units operate at about 24 decibels on low to 47 decibels on high. That's about the same noise level as a whisper or rustling tree leaves. The outdoor unit operates at about 56 decibels, which is about as loud as an electric toothbrush or a dishwasher from the next room.

Healthy Ventilation

Often overlooked, the ventilation component of HVAC systems is critical to indoor air quality. With the CITY MULTI, Lossnay Energy Recovery Ventilators (ERVs) bring in outside air and manage energy recovery. That makes your building a healthier overall environment. On top of that, you don't have to worry about dust or debris building up in the ductwork and potentially degrading indoor air quality.

Easy Maintenance

Owning the system is also designed to be relatively worry-free with easy maintenance. With ductless systems, you don't have to clean any ducts. Additionally, the outdoor unit has a diagnostic display, and the four-digit fault code makes it easy to troubleshoot potential issues. We can also set you up with a service program, where our technicians come to your facility and perform routine maintenance to keep the system running as efficiently as possible and to help you avoid emergency HVAC repairs.

RETAIL AND OFFICE HVAC

A commercial ductless HVAC system provides up to 42,000 Btu/h of cooling or heating. Its energy efficient design is ideal for retail stores, small office buildings, medical facilities, waiting rooms, research labs, churches, and similar spaces. INVERTER-driven compressor technology allows the system to reach target temperatures faster, and it maintains temperatures more consistently, so you don't have to worry about uncomfortable ups and downs in temperature levels.

Benefits of Ductless HVAC for Retail Environments

Ductless HVAC helps to keep you, your employees, and your customers comfortable in all kinds of weather. The system offers the following benefits:

- High speed cooling
- Low ambient cooling
- Consistent temperatures
- Quiet operation
- Zone control
- Advanced microprocessor controls
- Dehumidifying capabilities
- Environmentally friendly refrigerant
- Ductless style for easy installation
- Easy to maintain

Zone Control

With zone control, you can customize the settings for different zones, so you don't have to waste energy on areas that don't need to be cooled. Commercial ductless HVAC comes with the option of single or dual controllers, and if you want the ability to alter settings from anywhere, you can pair wireless controls with the P-series ceiling-mounted units. For ease of use, all controllers boast a large mode display and a weekly timer. You can lock your settings to prevent unwanted adjustments, and the auto restart function saves the settings in case of a power outage.

Low-Ambient Wind Baffle

The addition of a wind baffle to this commercial HVAC unit allows for spaces to be cooled when the outside temperature is as low as 0 degrees. Essentially, the baffle prevents high winds from turning the outdoor unit's fan in the opposite direction and disrupting cooling. This feature is essential for cooling spaces such as electronic equipment rooms, telecom substations, mechanical rooms, restaurant kitchens, fitness centers, and any other spaces that generate a lot of heat and need to be cooled even when the outside temperature is low.

Environmentally Friendly

Zone technology and programmable controls help to reduce wasted energy. On top of that, the system uses R410A refrigerant, an environmentally friendly alternative to traditional refrigerants with zero Ozone Depletion Potential (ODP).

Inverter Technology

With inverter technology, the temperature in the room impacts the speed of the inverter. This quickly brings the room to target temperatures, but it also increases efficiency, reducing cooling costs. Inverter technology allows a room to be kept at the same temperature year-round, without the concern of computer or electrical equipment being affected.

Easy Installation

Whether you're designing a new building or retrofitting an HVAC system to an existing building, ductless units are always easier to install. Additionally, ductless HVAC has a wiring design that expressly helps avoid installation errors. The system has just three polarity sensitive wires, two non-polar wires, and a ground conductor that connects the outdoor and indoor units for power and communication.

Flexible Installation Options

With ductless HVAC, you can choose wall-mounted, ceiling recessed, or ceiling suspended indoor units, which makes it easy to meet your cooling and your aesthetic needs. Indoor units can be attached to the front, rear, right, or bottom of the outdoor unit and placed in a variety of distances from the outdoor unit. With the PUY(Z) model, you can install 12 to 18 indoor units up to 100 feet from the outdoor unit, or 24 to 42 indoor units up to 165 feet from the outdoor unit. Note that installation charges vary based on the number of units and their distance from the outdoor unit.

Easy Maintenance

If something goes wrong with the system, the expanded fault codes make diagnostics easy, and the service call number also displays on the controller's screen. The ductless design of our retail HVAC units mean you don't have to worry about cleaning or repairing ducts, and the easy-to-access panels simplify maintenance for the outdoor unit.

We also offer service plans which include routine and preventative maintenance that helps to avoid inconvenient breakdowns and costly emergency HVAC repairs. Additionally, when you choose NETR for your installation needs, you receive a two-year extended parts warranty on your ductless system.

CONTROLLED ENVIRONMENT AND CLEAN ROOMS

Many commercial spaces require constant cooling, even when the temps are cold outside. In particular, server rooms, data centers, electronic equipment rooms, telecom substations, mechanical rooms, restaurant kitchens, and fitness centers all house equipment and activities that generate a lot of heat. To safeguard your equipment and keep occupants comfortable, you need a cooling system that can work in all temperatures. Thanks to its low-ambient cooling abilities, the commercial ductless HVAC system by Mitsubishi is perfect for these environments.

Quiet

Whether you own a fitness studio, an office full of computer equipment, or a data center, you don't want the sound of your HVAC system to drown out your staff or your customers. Luckily, commercial ductless runs extremely quietly. Both the indoor and outdoor units operate at noise levels that range between the gentling rustling of leaves in a forest and the sound of a quiet dishwasher in the next room.

Dehumidification

Commercial ductless HVAC units also have dehumidifying properties. This creates drier air in your facility, which improves indoor air quality and reduces the risks of mold or mildew. Additionally, drier air is safer for your equipment, as it protects electronic and metal components from unnecessary moisture. At the same time, however, you can control humidity levels to reduce static electricity.

Advanced Microprocessor Controls

Microprocessor controls give you more control over your HVAC system. These built-in electronics ensure efficiency, provide optimal performance, and give you the comfort you need. You can use the system's remote controls to set temperature ranges and humidity levels, and in addition to creating a pre-set schedule, you can manually adjust these settings as desired throughout the day.

Super Cool Facts About Your Air Conditioner

25 Super Cool Facts You Never Knew About Your Air Conditioner

When you think of cooling and ventilation, “fun” usually isn’t the first word that pops to mind, but after you read this list, it will be. To learn about the history of air conditioning and comfort cooling, check out these fun facts. They’re so cool, they’ll make you hot.

The Interesting History of Air Conditioning

1. Arguably, the world’s first commercial cooling systems were created in 180 AD by Ting Huan, a famed inventor from the Han dynasty. The fan featured seven ten-foot diameter wheels, cranked by a single person. It could cool a large hall full of people.
2. In the 1840s, Dr. John Gorrie used ice from northern lakes to cool his hospital rooms in Florida. He believed that cooling was critical for reducing diseases such as malaria, and eventually, he invented a machine that created ice using water, wind, horses, and steam. That set the stage for modern cooling.
3. Before air conditioning was invented, people used a variety of architectural styles to keep their homes semi-cool. One style, popular in the South, was the dogtrot house. This design featured a small cooking cabin separate from the main house but connected with an open-air corridor.
4. In 1882, Schuyler Skaats Wheeler invented the electric fan.
5. In 1902, just 20 years later, Willis Carrier went a step further and invented the first air conditioner. The 26-year-old got the idea while looking at fog on a train platform in Pittsburgh. He founded the Carrier Engineering Corporation 1 years later in 1915.
6. In 1903, the New York Stock Exchange became one of the first famous buildings to use air conditioning.
7. In the United States, the first residential air conditioning system was in the Charles Gates mansion. Built in 1913, this Minneapolis home was 38,000 square feet, and surprisingly, it was demolished in 1933 after the original owner died and no one wanted (or could afford) to buy a palatial home with AC.
8. Prior to the invention of modern air conditioning, people used to cool their homes or businesses with ice, which was often harvested in one-ton blocks. As air conditioning manufacturers began

to advertise their products, they wanted to use terms their customers could understand so they used the phrase "ice power" or referred to their systems as one-ton ACs. An air conditioner with a one-ton capacity essentially produces as much cooling as a melting ton of ice. To put it in modern terms, that's equivalent to 12,000 BTUs.

9. Summer blockbuster movies got their start thanks to air conditioning. In the summer, people often went to movie theaters to enjoy the air conditioning. Production companies took advantage of this fact, and they began to release their biggest hits in the summer. Although many people now have air conditioning in their homes and they no longer have to seek refuge from the heat at the theaters, the tradition continues today.

10. Carrier Engineering Company installed the first air conditioning system in the West Wing of the White House in 1930, during Herbert Hoover's presidency. In 1933, while Franklin D. Roosevelt was president, air conditioning units were installed in the private quarters of the White House.

11. In 1932, inventors H.H. Schultz and J.Q. Sherman began to sell the first window air conditioning units. Due to high prices, sales were slow.

12. In 1939, the automobile manufacturer Packard began installing air conditioning systems (called "weather conditioners") in its vehicles. This was the first car manufacturer to offer AC, but there was a company in New York that retrofitted ACs for cars as far back as 1933.

13. By the 1960s, air conditioning was affordable and widespread. People took advantage of comfort cooling, and they started to move to hot states such as Arizona and Florida.

Fun Air Conditioning Energy Facts

14. If all the electric resistant heating systems in the United States were replaced with heat pumps accompanied by ductless cooling systems, that would reduce the total residential energy usage by 2%.

15. Although it varies significantly by area and home size, the average American family spends about $2,200 on energy costs every year, and approximately 48% of those costs are for heating and cooling. Heating accounts for 42% of the total, while cooling only takes up just 6% of the average family's energy budget.

16. Annually, the average American household uses 40.4 million BTUs for heating and only 9.3 million BTUs for cooling. That means that contrary to popular belief, cooling has a much smaller carbon footprint than heating.

17. The world's largest HVAC system is in the Holy Mosque in Makkah (Mecca), Saudi Arabia. To cool a space that sees

up to 1 million visitors a month in a climate where temperatures frequently top 100 degrees, the system has 135,000 tons of refrigeration capacity.

18. Since 2000, over 95% of new homes in the United States come with air conditioning. Prior to 1940, the rate was less than a third.

19. Installation quality directly affects efficiency. According to research from 2012, New York City building owners lose between $130 and $180 million per year in energy costs related to poorly installed cooling systems.

20. Energy Star ductless heating and cooling systems help homeowners reduce their cooling costs by about 30% to 40% or more compared to forced air HVAC systems. Many home and business owners are starting to make this leap.

More Cool AC Facts

21. Homes with low humidity levels tend to feel cooler than homes with high humidity. That's because the dry air causes the moisture on your skin to evaporate, helping to cool you down.

22. Air conditioning saves lives. An analysis of suicides in Toronto, Ontario and Jackson, Mississippi indicates that suicide rates increase with heat waves. Additionally, when people don't have access to cooling, they become more likely to die. Tragically, 739 people who didn't have AC died during a Chicago heat wave in 1995.

23. Excessive heat also reduces productivity. Based on research from NASA, telegraph operators make an extra five mistakes per hour when the temperature is 80 degrees and a stunning 60 mistakes per hour when the temperature is 95 degrees. Over time, the rate of errors increases, and at 95 degrees, operators start to make 138 mistakes per hour by the third hour in the heat.

24. Ductless cooling systems can be retrofitted into any home or business, with minimal disruption. Residential installation can take less than a day, while large commercial jobs can be done piecemeal or zone by zone to avoid interruptions to productivity.

25. Over the next 30 years, demand for air conditioning is set to triple. Analysts predict that 5.6 billion buildings will have AC by 2050, and to make that happen, consumers need to buy 10 new air conditioners every second for the next 30 years. That's the equivalent of 600 air conditioners every minute and 3,600 air conditioners every hour.

Conclusion

For years, central HVAC systems were the default option, but recently, the popularity of ductless systems has surged. Ductless systems are popular in homes that don't have ductwork, but due to the efficiency of these systems, people are also choosing to replace their ducted systems with ductless options.

NETR Inc. provides expert ductless system installation, repair, and maintenance to homes and businesses throughout the greater Boston area. When you work with us, we'll make sure that you get a cooling system that will deliver the level of temperature control, energy efficiency, and other features you need.

About

N.E.T.R. Inc. is guided by our principles. We demonstrate an unwavering dedication to our customers' complete satisfaction. We are here for our customers before, during, and after the installation process.

N.E.T.R. Inc. is committed to providing reliable cooling and heating solutions for our customers. To accomplish this, we work closely with our customers to understand their very specific needs.

Our trained comfort consultant arrives on time and is seriously prepared to help solve each and every cooling problem our customers may have.

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