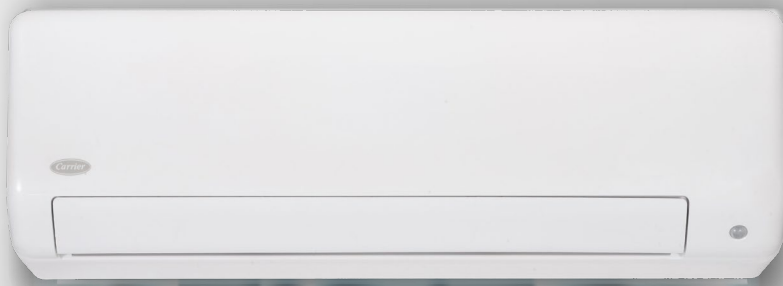




Turn to the experts



INNOVATIVE HVAC SOLUTIONS
WITH CARRIER DUCTLESS



THE ADVANCEMENT OF HVAC SYSTEMS

Although ductless and variable refrigerant flow (VRF) technology is the most widely used HVAC technology in regions such as Asia, Europe and South America, in the U.S. we have our long-standing centralized heating and cooling systems. Few know that it was Willis Carrier of Angola, NY that invented modern air conditioning in 1902, forever impacting how we live and maximize our home comfort.

The centralized system, however, is changing as residential builders and homeowners are rapidly recognizing the benefits that today's advanced technologies provide.

The move to both ductless and VRF technology is increasingly based on greater awareness of green technologies, the threat of airborne contamination, more informed buyers—in particular, efficiency-demanding millennials, the increased use of smart control systems, and very often, by architectural restrictions.

A ductless or VRF system provides a wealth of benefits to homeowners including energy efficiency, quiet operation, space savings, and greater comfort with a VRF technology able to simultaneously cool and heat different zones in a home. What's clear is that the growing number of benefits is rapidly outweighing previous objections for consumers and builders alike.

Where ductless systems are gaining ground

VRF technology already has a solid footing in U.S. commercial buildings and ductless has been playing in both the commercial and residential spaces for many years gaining market share annually. More recently, high-end homeowners and custom home builders have realized that these technologies are an excellent solution to many design challenges when applied as whole home HVAC system or in key portions of a home. For example, on-demand heating and cooling in zones within a house, bringing heating and cooling to home additions, architectural/structural restrictions where installing duct work is difficult, and flex spaces such as airconditioned garages. Today, whole-home applications enable optimal efficiency, expanded use of the home, and reclaimed mechanical space.

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WILLIS CARRIER
The Father of Air Conditioning

Previously, builders experienced objections to units exposed on walls. However, ductless and VRF systems are easily adaptable to recessed ceilings and can be used behind grates in small spaces—a myriad of options exist that make it more aesthetically appealing than ever before.

And why...

Ductless and VRF systems are competitive in price, are easier to install and require less maintenance than conventional HVAC systems. These systems benefit construction in new builds and retrofit projects. For example, refrigerant piping uses substantially less space than traditional HVAC ductwork. An important factor given the COVID-19 pandemic, is that cross-contamination between different areas of a home is greatly reduced with ductless and VRF systems—an important selling point for your customers.

As a builder installing heating and air-conditioning systems in the U.S. for more than 30 years, a lot has changed. When builders started using ductless technology, it was really only used in niche commercial applications. There weren't a lot of tools available that were necessary for installation early

on, so we made our own or improvised. The systems were big and bulky, yet they were extremely energy efficient. In the U.S., however, energy efficiency wasn't as big an issue as it was globally. Energy was fairly inexpensive, and homeowners didn't want to trade aesthetics for lower bills.

At first blush, the initial cost of ductless/VRF systems may be slightly higher, but given lower installation, labor, and operational costs, these systems will usually present a cost advantage. When renovating older homes, ductless/VRF technology enables the preservation of existing architectural designs without major redesign or construction.

While consumer and contractor expectations in the U.S. have been different than the rest of the world, Carrier-engineered ductless and VRF products readily accommodate U.S. expectations rather than having a one-size-fits-all approach using products that are designed for Asia, or South America. The latest Carrier products deliver the best of all worlds, including its flexible Infinity High Wall Indoor 40MPHA Unit. At 42 SEER it provides ultimate efficiency when paired with the companion outdoor single zone 38MPRA unit. Wi-Fi controlled, the combination offers a relative humidity sensor, customizing humidity levels for comfort and an occupancy sensor that senses presence, and can direct airflow either toward or away from that person.

The whole ductless and VRF industry is really growing. According to a recent industry report [VRF System Market worth \\$31.9 billion by 2025](#), VRF and ductless systems for residential application are expected to witness the fastest growth rate during the 2020 to 2025 period, and in the U.S., Carrier is at the forefront of that growth, which won't be stopping any time soon. 

Ductless and VRF systems are competitive in price, are easier to install and require less maintenance than conventional HVAC systems.





HVAC EQUIPMENT SELECTION AND INSTALLATION IN AN ULTRA-EFFICIENT HOME

As the envelopes of newly constructed homes becomes tighter and increasingly more efficient, the importance of integrating effective mechanical systems such as HVAC equipment and moisture management/ventilation systems is critical to the overall health and comfort of the living environment within the home.

There are many factors to consider when looking to achieve ultra-efficiency. Newer homes, for example, are built to a substantially higher standard than homes with previously-existing code demands, evidenced by insulation levels that are at least 25% higher and blower-door scores of half or better than code. Ultra-efficient construction can benefit homeowners with potential energy savings, lower operating costs and, of course, a much healthier and more comfortable environment.

One of the most important aspects of achieving this level of efficiency is an investment in HVAC solutions such as ductless or variable refrigerant flow (VRF) systems. When selecting a heating and cooling system for a new home, one of the most common pitfalls that contractors fall victim to is oversizing equipment, which can result in challenges achieving comfort levels and a reduction in the performance and life of the equipment. In tightly-built homes, correctly installing appropriate heating, cooling, and ventilation solutions can more easily meet the needs of the homeowner and optimize comfort.



Establishing requirements

There are substantial advantages with choosing ductless and VRF equipment to increase the efficiency of a new home. Flexible in nature, these systems can be customized and optimized based on the unique comfort needs of the homeowner. For example, home offices, nurseries and garage spaces can be temperature-controlled individually, and mechanical spaces can be recovered and converted to usable square footage. This is a major departure from yesterday's inefficient "one-system-fits-all" centralized heating and cooling approach that tends to deliver inconsistent temperatures across the whole home, making some spaces virtually unusable.

Important Considerations

When making equipment selection decisions, two of the most important factors to consider are load calculation and system sizing. Plus, ductless or VRF systems can also account for non-traditional architectural design features such as vaulted ceilings that central HVAC systems are not necessarily be able to address.



Load calculation is a mathematical procedure that accounts for the home's total square footage, the number of envelope openings, such as doors and windows, insulation R-value, and the number of floors.



Correct system sizing allows the equipment to operate efficiently and maintains a high level of comfort within the home. If a system is too small for the home, it will run constantly to cool or heat, but not reach a comfortable temperature in the home during peak hot and cold weather. Energy bills may increase, as should wear and tear on the HVAC system. A system that is too big wastes energy by constantly turning itself on and off, and an oversized furnace will heat the space too rapidly, resulting in inconsistent hot and cold spots.



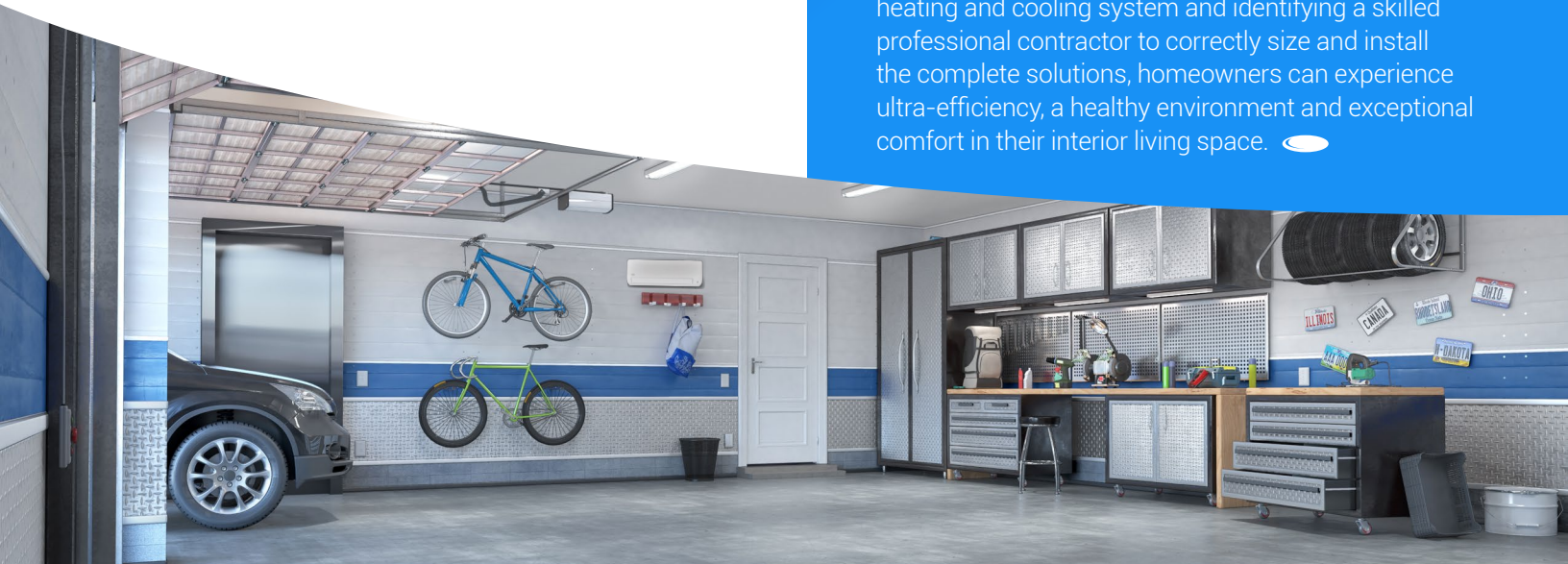
“When making equipment selection decisions, two of the most important factors to consider are load calculation and system sizing.”

Success in implementation depends on proper equipment selection, design of the ductwork and a thorough appreciation of the individual application at hand, as well as geographic climate factors. Identifying an HVAC contractor that is trained on advanced equipment, is an expert on high-performance homes, and follows the necessary installation processes correctly, is critical to that success.

A properly installed HVAC system will operate efficiently, allow for flexibility, provide longevity of equipment life, and keep the home comfortable, while providing the homeowner with a healthy environment for generations.

Tying it all together

Ultimately, the most important consideration is homeowner experience. How will the homeowner interface with their HVAC system and how can the system be created and sized to provide optimal comfort and efficiency? By selecting a high-end ductless or VRF heating and cooling system and identifying a skilled professional contractor to correctly size and install the complete solutions, homeowners can experience ultra-efficiency, a healthy environment and exceptional comfort in their interior living space.





STOP DRIVING YOUR HVAC EQUIPMENT TO FULL RPMS

Inverter technology has forever changed the HVAC industry. An inverter is a part of an electrical heating and cooling system that controls and modulates electrical current in the compressor's motor. Simply put, the inverter adjusts the speed at which the motor runs. Without an inverter, compressors either run at 100%, or are turned off. A compressor with an inverter soft-starts and ramps up in small increments until it matches the capacity of the heating or cooling load, optimizing the comfort of the space being conditioned in the home.

While it's true that inverter technology decreases noise and humidity in the home while providing greater comfort and improving air circulation providing constant filtration; its greatest benefit is the significantly increased efficiency it delivers. When a non-inverter driven HVAC system switches on, there's a considerable burst of energy required to move

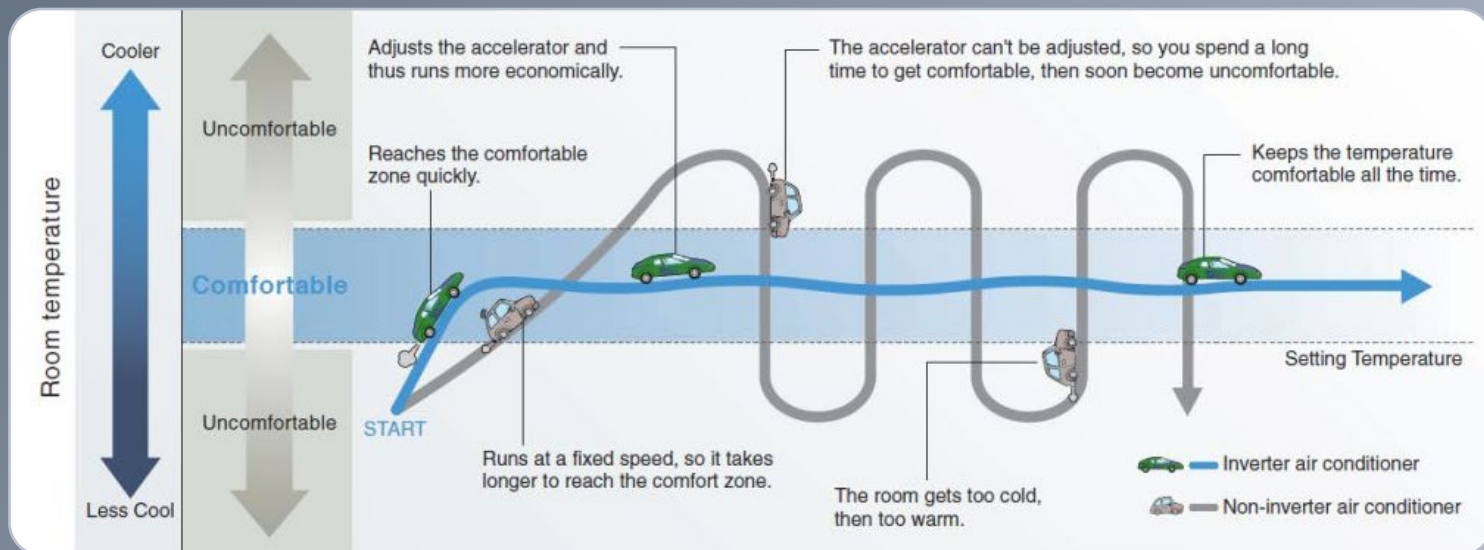
the compressor motor straight from 0 to 100%. Inverter technology does not use an initial burst of energy, it allows the machine to efficiently ramp up to the necessary level of capacity.

If Ductless Inverter Technology was a Car

An easy way to grasp the concept of inverter technology is to consider the analogy of a car. For example, how efficient would your vehicle be if it only was able to run at zero mph or at maximum speed? How long would that vehicle last without breaking down if running at maximum RPMs 100% of the time that you were driving?

These questions describe exactly what happens with a traditional single-stage HVAC system. It's full speed ahead, or off, and the wear and tear on the system is considerable. Inverter products have the equivalent of a gas pedal, the ability to downshift and of course, to apply pressure on the brake.





COMPARING INVERTER AND NON-INVERTER AIR CONDITIONING TO CARS

The advantages of inverter control

Inverter technology enables a ductless system to incrementally reduce its capacity well below 50% and continually modulating while matching the load in the space being conditioned, or any increment along the way. When systems run slower, they use less energy (or pressure on the gas pedal) to achieve the desired temperature. And, since the equipment can run at varying degrees of capacity as necessary, the equipment tends to have a longer life.

Traditional HVAC Systems vs. Ductless and VRF Inverter Systems

Ductless and VRF inverter systems provide a wide range of operating capacity based on demand, which means that a homeowner doesn't need a 5-ton, single-stage HVAC system to run at 100% capacity every time heating or cooling is needed.

Ductless systems include one or more indoor units powered by a single outdoor compressor and connected by refrigerant tubing and electrical wiring. The indoor units are installed in single or multiple "zones" within the home that are independently controlled. The outdoor unit delivers the proper capacity to meet the demand or load within each zone, providing greater flexibility and comfort control, while reducing energy consumption.

When applied and installed correctly Ductless and VRF systems can meet virtually any heating and cooling need, while providing comfort in areas where traditional ducted systems can't reach. However, not all ductless and VRF inverter systems are created equal. It's important to choose a manufacturer whose product is at the forefront of ductless inverter technology innovation. 

WHY CARRIER?

Carrier has been innovating heating and cooling solutions since 1902—when its founder, Willis Carrier, developed the first modern air conditioning system and changed the way we work and live. For more than 100 years, Carrier has been leading the industry with innovative ideas, pursuing excellence in heating and cooling solutions for homeowners all over the world. Our products have changed lives, and our commitment to technological excellence has set the standard for the industry. Carrier inverter ductless systems have become known for their efficiency and have Seasonal Energy Efficiency Ratio (SEER) ratings up to 42.0, the highest in the industry.

Carrier ductless inverter solutions are typically 40%-60% smaller and up to 130 pound lighter than traditional systems. The size and weight reductions associated with Carrier ductless, allow for expanded application options and ease of installation over traditional ducted equipment. Additionally, Carrier ductless is engineered specifically to meet North American installation, application, and service expectations making these products easier to install in many applications and more consumer friendly than other ductless options on the market. Not only do they provide the ultimate comfort in heating and cooling, but these units also provide better control because they operate longer at lower speeds and use less energy. They also pull more humidity out of the air than models with a single-stage compressor.

Carrier ductless inverter systems deliver unprecedented efficiency and comfort compared to traditional ducted non-inverter systems. On the road to achieving that efficiency and comfort, just like your vehicle, your HVAC equipment should also be driven at variable speeds.



HOW CARRIER DELIVERS UNRIVALED EFFICIENCY

Ductless Systems: Inverter Technology

Advanced Inverter technology from Carrier lets the compressor continually adjust its speed to maintain room temperature. Less energy use, less noise, more precise comfort.

Industry-Leading SEER

SEER (Seasonal Energy Efficiency Ratio) is an efficiency rating, and there is simply nothing more efficient than our 42 SEER Ductless system.*

Leading Heat Pump Technology

Carrier® Ductless systems deliver comfort during extreme outdoor temperatures, with heating down to -22 degrees and cooling up to 122 degrees Fahrenheit.

Mix-And-Match Flexibility

Carrier single- or multi-zone outdoor units are compatible not only with high wall units but also ducted (or “slim duct”), floor console and ceiling cassette indoor units, allowing you to customize systems for comfort and efficiency

*According to system ratings maintained by AHRI as of August 1, 2019, in accordance with the AHRI Unitary Small Equipment Operations Manual. The 9,000 Btu/h single-zone Ductless has a 42 SEER Rating.

VRF Systems: Extensive Product Catalog

With two-pipe and three-pipe options, plus heat recovery, heat pump, Single-phase VRF and VRF Rooftop offerings, Carrier has the product depth that lets you create the most efficient solution.

Ease of Installation

Modular and non-modular offerings provide installation flexibility while quick connects, single-point electrical connections and seamless integration with controls and Carrier i-Vu® help make installs quick and easy.

Design Flexibility

Long piping lengths, along with modular and non-modular offerings, enable greater design flexibility with minimum space requirements.

Solutions for Virtually Any Application

Carrier's heat recovery products are ideal for buildings with diverse thermal zones, such as offices and assisted living facilities, while heat pump options deliver efficient comfort for large common areas such as gyms and lobbies. The VRF Rooftop offering from Carrier can accommodate retrofits, and Single-phase VRF options are ideal for mixed-use facilities (such as large residential and small office). 

PRODUCT OVERVIEW



OUTDOOR SINGLE ZONE 38MBRB DUCTLESS SYSTEMS

Available as heat pump sizes 36K & 48K, these new systems feature the backward compatibility with current Cassette 40MBCQ, Ducted 40MBDQ, Console 40MBFQ and the new air handler 40MBAA. Can match 2Ton with the 40MBAA and is available with the 38MARB condensing unit.

Features

- Outdoor sizes 36K and 48K
- Inverter Compressor
- Built-in basepan heater
- Piping length 213 ft. (65m)
- Flexible installation
- Quiet outdoor operation
- Anti-corrosive fin coating
- Condenser high-temperature protection
- Refrigerant leakage detection
- Cooling operating range -13~122°F (-25~50°C)
- Heating operating range -22~86°F (-30~30°C)
- Compatible with the 38MGR multi zone

AIR HANDLER 40MBAA DUCTLESS SYSTEMS

Available as heat pump sizes 24K, 36K, 48K, these new systems feature an improved performance up to 20 SEER and up to 10.4 HSPF (size dependent).

Features

- Indoor sizes 24, 36 and 48
 - > Only Size 24 is available for multi-zone applications.
- Multi Poise Installation (Up Flow, Down Flow, Horizontal Right, Horizontal Left)
- 24V interface for third-party thermostat compatibility
- Total system static pressure up to 0.8 in. W.C.
- Less than 2% air leakage when tested in accordance with ASHRAE standard 193
- Optional Electric Heater Kits available 5kW, 10kW, 15kW & 20kW

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Turn to the experts