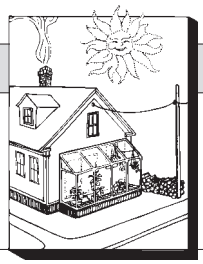


Ductless HVAC Simplifies Installation

by J. D. Ned Nisson

A new type of heating and cooling system has been slowly making its way across the Pacific and into the U.S. and Canadian marketplaces. "Ductless mini-split" air conditioners and heat pumps, which are used in over three-quarters of all new homes in Japan, are now sold in North America by at least eight companies. Most of the systems are Japanese, and most brands have been introduced into the U.S. and Canada within the past five years.

At their current cost of roughly $2,000 per ton of cooling, the mini-splits are probably too expensive to compete with conventional ducted heating and cooling systems for new house construction. But they do provide a quick and easy way to add zoned cooling to a house with non-ducted heat distribution like hydronic-baseboard or radiant-floor heat. Mini-splits also make good sense for small additions.

The largest residential markets for these systems are the Northeast, where hydronic heating is very popular, and California. The largest overall market has been in commercial, institutional, and residential multifamily construction.

What Is a Ductless Mini-Split?

A ductless mini-split is similar to a conventional split-system central air conditioner. However, instead of a large indoor unit that supplies cooling to the whole house via distribution ducts, a ductless system uses a small indoor coil located directly in the living space. No distribution ducts are needed. The outdoor compressor unit is similar to a standard outdoor unit except smaller. The indoor and outdoor units are connected by copper refrigerant lines.

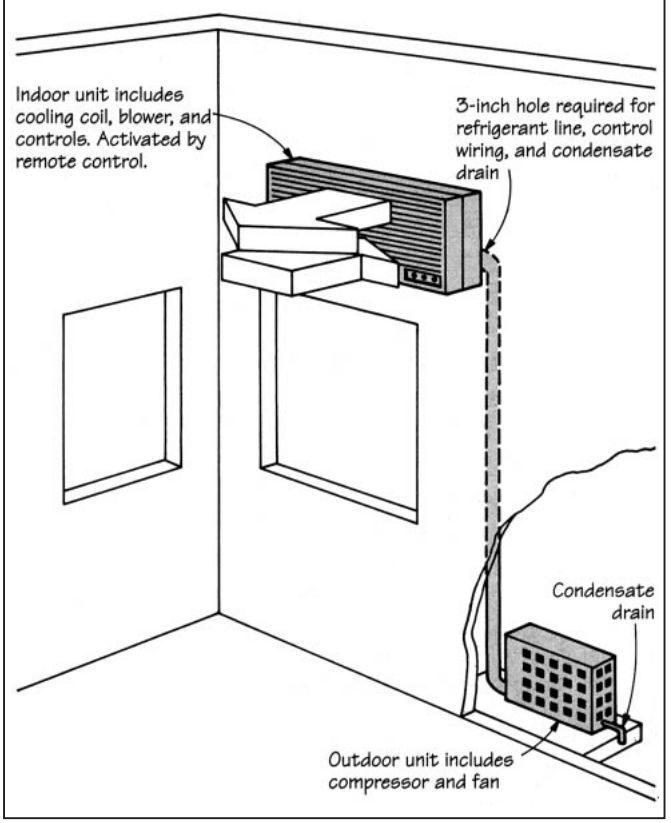
The most basic mini-split is a small, single-zone cooling system that is used instead of a window air conditioner. The mini-splits perform better, but also cost more. (In Japan, the mini-splits have almost completely displaced window air conditioners.) At the other end of the spectrum are high-capacity and multi-zone systems with both heating and cooling capabilities.

Over 60 different mini-split models from eight manufacturers are currently available with cooling capacities ranging from one-half ton to three tons. Heat-pump systems are available with heating capacities ranging from 10,000 Btu/hr to 27,000 Btu/hr.

The most technologically advanced system on the market is a variable-speed inverter heat pump made by Toshiba, which has a special "dry" mode for rapid dehumidification without overcooling.

Manufacturers are constantly revising cabinet designs and accessories for the U.S. and Canadian markets. The most noticeable changes are in the controls. Early systems had wall-mounted thermostats. Now almost every product line includes wireless remote controls with a variety of programmable features.

Ductless Mini-Split Heat Pump



Ductless mini-splits consist of an indoor unit that is hung on a mounting plate on the inside wall and an outdoor unit connected by refrigerant tubing and electrical wiring.

Why Use a Ductless Mini-Split?

How do you add air conditioning to a hydronically heated house in New England? What about an addition to a house in Colorado in which the existing heating/cooling system is not big enough to handle the added load? Compared to each of the alternatives such as a new central-ducted system or a window air conditioner, a ductless system has several distinct advantages, as well as a couple of potential drawbacks.

Extremely quiet. One attractive feature of many mini-splits is the low noise level. Especially at low speed, some indoor units are literally inaudible — far quieter than any window air conditioner and even quieter than many central-ducted systems.

Easy installation. Mini-split systems are easy to install. A 3-inch hole in the exterior wall is the only carpentry required, except for mounting the indoor unit on a wall. System setup is similar to a conventional split-system heat pump, although the control wiring is less complicated.

High efficiency. The better mini-splits compete favorably with all but the top-of-the-line central-ducted air conditioners. Friedrich and Toshiba both make systems with a seasonal energy-efficiency ratio (SEER) greater than 11. Toshiba wins the mini-split efficiency award with its 12.0 SEER variable-speed heat pump (Model RAS-10BAHV2B).

Like other hvac equipment, ductless mini-splits are subject to the minimum efficiency requirements of the National Appliance Energy Conservation Act (NAECA). For split-system air conditioners produced or imported after January 1, 1992, the minimum SEER is 10.0. Only about half of the 61 models currently on the market meet the new federal requirements.

Joys of zoned cooling. Zoned cooling by any means provides better comfort control plus potentially higher energy savings. Though unpredictable, the energy savings with mini-splits should exceed those for ducted systems because of the lower distribution losses (no duct leaks or conductive losses in attics and crawlspaces). The only distribution losses with mini-splits are from the copper refrigerant lines.

Drawbacks

Two drawbacks of ductless mini-splits are looks and cost.

That thing on the wall. Except for models that are recessed into suspended ceilings (mostly commercial applications), mini-split indoor units are very visible. Typical wall units are about 30 to 40 inches long, 12 to 15 inches high, and 5 to 9 inches thick. The styles have changed over the past few years, but unless manufacturers find a way to recess the units completely into a wall or closet, ductless mini-splits will probably be aesthetically objectionable to some homeowners.

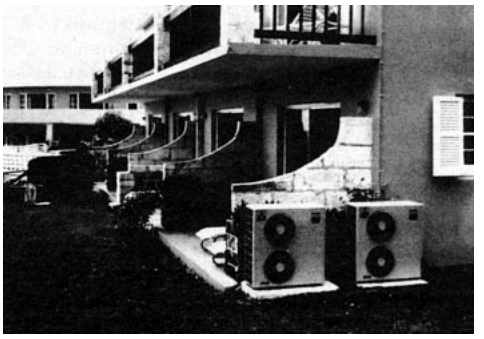
Another aesthetic consideration is condensate disposal during cooling. The condensate drain line must either run inside the wall cavity or down the outside of the house.

Cost. For residential applications, high cost is probably the most critical drawback of ductless mini-splits. Typical retail costs range between $1,500 and $2,000 per ton of cooling. For example, the Sanyo 12,000 Btu/hr (1-ton) cooling-only mini-split (Model 12KS11) has a list price of $1,872 and Sanyo's 34,000 Btu/hr (3-ton) cooling only unit (Model 36KS12) lists for $4,434.

Multi-zone systems cost more. For example, Sanyo's Tri-Zone Model 32KM11 (32,000 Btu/hr cooling only) lists for $4,949. A similar system from Friedrich lists for $4,674.

Heat-pump systems that can heat as well as cool typically cost

The indoor unit of a ductless mini-split is located directly in the space to be cooled or heated. Some indoor units are barely audible at low speeds.



The outdoor compressor units for ductless mini-splits are typically smaller and quieter than those for central air conditioners. With a few exceptions, most outdoor units supply cooling for only one indoor fan-coil unit.

between $200 and $500 more than comparably-sized, cooling-only models. Friedrich's 12,000 Btu/hr and 18,000 Btu/hr heat pumps list for $1,994 and $2,772 respectively.

The most expensive system on the market (for its size) is the variable-speed, inverter-controlled Toshiba heat pump (Model RAS-10BAHV2B). This relatively small (9,900 Btu/hr cooling, 12,500 Btu/hr heating) system typically costs around $2,000 installed. The same unit without the variable-speed feature sells for roughly $200 less.

Shopping Tips

As more models become available, selecting a mini-split system gets more complex. Here are a few things to look for:

Size and appearance of both indoor and outdoor units. Indoor unit dimensions vary considerably, especially in depth or thickness. Mitsubishi Electric makes the slimmest units — about 5 inches. Most indoor units are between 6 and 8 inches, with a few larger units as thick as 10 to 12 inches.

Outdoor units vary in size, too.. The smaller Sanyo and Mitsubishi electric outdoor units are only 10 inches deep.

Wireless remote features. Wireless remotes also vary considerably. Sanyo boasts 22 functions for its controller, while Mitsubishi takes the opposite approach, selling simplicity and ease of use for its two-function "I Feel" controller. Choose one that fits your client's tastes.

Maximum refrigerant line length. All split systems are limited in the distance that the indoor fan coil can be separated from the outdoor unit. Although it is not likely to be a problem for most typical residential installations, check the maximum length. For multistory applications, the maximum vertical separation is also important.

Distribution and service. Unless, or until, mini-splits become more widespread, parts and service will likely be somewhat of a problem. Toshiba has addressed this problem by distributing their hardware through Lennox and Carrier dealers. Other manufacturers are setting up distribution networks of their own. ■

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Ductless Mini-Split Manufacturers

Burnham Corp.
P.O. Box 3079
Lancaster, PA 17604
717/397-4701

Heat Controller
(Comfort-Aire)
Jackson, MI 49203
517/787-2100

Friedrich Air Conditioning Co.
P.O. Box 1540
San Antonio, TX 78295
512/225-2000

Mitsubishi Electronics America
5757 Plaza Dr.
Cypress, CA 90630-0007
714/220-4640

Mitsubishi Heavy
Industries America
3030 East Victoria St.
Rancho Dominguez, CA 90221
213/635-8111

Sanyo Fisher USA
21350 Laasen St.
Chatsworth, CA 91311
818/998-7322
ext. 750

Slant/Fin Corporation
100 Forest Dr. at East Hills
Greenvale, NY 11548
516/484-2600

Toshiba America
Consumer Products
1010 Johnson Dr.
Buffalo Grove, IL 60089-6900
708/541-9400

Hupp Industries
(Typhoon)
1135 Ivanhoe Rd.
Cleveland, OH 44110
216/851-6200