

## Room Air Conditioners

A room air conditioner (RAC) cools the air, removes humidity, circulates air, filters out dust, and in some cases also provides heating. Although most RACs are designed for the residential market, about 20 percent of commercial buildings are cooled by them as well.

Building operators and managers purchase RACs for one of several reasons:

- They want to cool selected rooms in an otherwise uncooled building.
- It isn't feasible to install central cooling in their building.
- They want to completely isolate one room from another (to avoid mixing air between rooms, so that each room has complete controls autonomy, so that each room can be billed separately, or all of the above).
- They want to replace a failed RAC.

Commercial and industrial RAC consumers often waste money by not paying attention to efficiency ratings. New RACs in the U.S. range from about \$200 to over \$1,000 and have energy efficiency ratios (EER) that range from 8.0 to 12. More efficient units are often more expensive than less efficient units, but not always. Smart consumers can save money in the long run by accounting for both first cost and operating cost, and then selecting the unit with the lowest lifecycle cost.

### AIR-CONDITIONING TERMS

Here are some terms you may encounter as you're comparing models.

**Capacity** indicates the amount of cooling a unit can produce and is expressed in British thermal units per hour (Btu/h) or in kilowatts (kW). Models on the North American market range from 4,200 to 35,000 Btu per hour.

**Efficiency** in the U.S. and Canada is designated by an energy efficiency ratio (EER), which is calculated by dividing Btu per hour (the measured cooling capacity) by watts (electricity input).

**Coefficient of performance**, another measure of efficiency used in some nations, is the ratio of the rate of heat removal to the rate of energy input.

## WHAT ARE THE OPTIONS?

this section

Most room air conditioners in North America are **installed in windows**. Basic window models are used in ordinary, double-hung windows up to 40 inches wide and can be installed by the user.

**Special-application models** are cooling-only units used in narrow, vertical windows. Installation usually requires removal of a window panel.

**Through-the-wall models** are installed in an outside wall, usually during construction or remodeling, and generally require an experienced installer.

Some manufacturers, including Carrier and Fedders, offer **portable units** that roll on wheels and cool a single room (up to about 450 square feet in some cases). The exhaust hose vents out a window equipped with the manufacturer's sash kit.

**Federal minimum standards.** RACs of the same capacity are available with a wide range of efficiencies. The current U.S. federal standard requires manufacturers to produce equipment at minimum efficiencies, as specified on the [Department of Energy's web site](#) .

## HOW TO MAKE THE BEST CHOICE

this section

To find the most cost-effective RAC for your needs, follow these steps:

**1. Select the right size.** An undersized unit won't be able to cool a large room, while an oversized unit will cycle on and off frequently, which increases electricity consumption and

decreases the unit's overall efficiency. An oversized unit may also cycle off too quickly to extract sufficient humidity from the air. You can calculate appropriate size yourself, have an HVAC contractor do the calculation for you, or use the rules-of-thumb chart that follows ( **Table 1**).

**Table 1: Capacity rules of thumb for room air conditioners**

Rules of thumb for estimating air conditioner size vary by manufacturer. This example, from Carrier, includes the following suggestions for adjustments: If a room is heavily shaded, reduce capacity by 10 percent; if the room is very sunny, increase by 10 percent; and if using the unit in a kitchen, increase capacity by 4,000 Btu per hour.

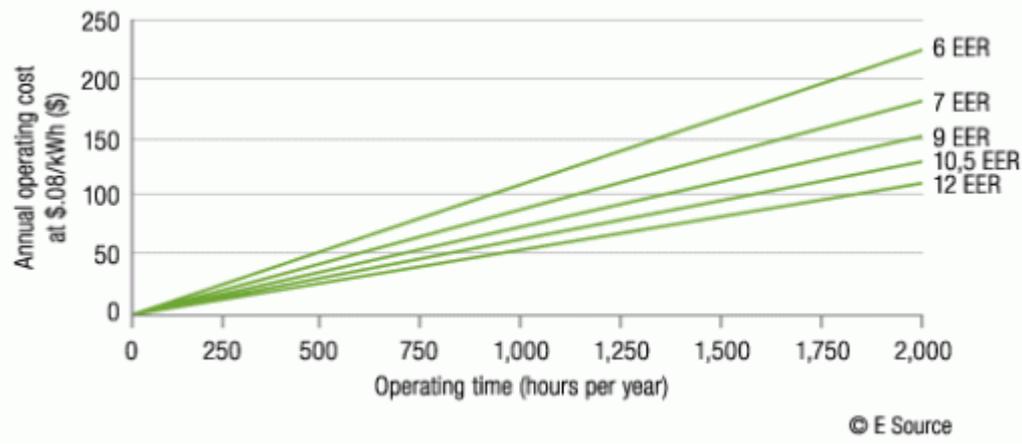
Room area (ft <sup>2</sup> )	Capacity (Btu/h)
100 to 150	5,000
150 to 250	6,000
250 to 300	7,000
300 to 350	8,000
350 to 400	9,000
400 to 450	10,000
450 to 550	12,000
550 to 700	14,000
700 to 1,000	18,000

© E Source

2. Look for high energy efficiency. A unit's efficiency affects its operating cost. In the U.S. and Canada, energy labels that display the energy efficiency ratio (EER) must appear on room air conditioners. Other factors being equal, the higher the EER, the more energy efficient the unit—and the lower the operating cost (**Figure 1**). Energy labels also indicate expected energy cost and show how a product compares to the least and most efficient models available.

**Figure 1: Operating cost for 10,000 Btu per hour room air conditioner**

Other factors being equal, the higher the EER, the lower the operating cost. In addition, savings from higher-efficiency room air conditioners are much more substantial where operating hours are longer.



The Energy Star program, which is jointly operated by the U.S. Environmental Protection Agency and the Department of Energy, establishes an efficiency specification above the federal standards. RACs that meet these specifications are awarded the Energy Star label, which helps consumers and others to readily identify high-efficiency products. Visit the Energy Star web site for room air conditioners to check the product list for models you're considering. This site can also help you calculate the right size for your application.

In addition, the Consortium for Energy Efficiency offers a program known as the Super-Efficient Home Appliances Initiative for Room Air Conditioners (PDF). The initiative's goal is to encourage the use of high-efficiency RACs. As of April 2014, the minimum EER requirements for RACs that qualify for the initiative range from 9.8 to 11.8, depending on their size.

**3. Determine which unit is most cost-effective.** Although you'll want an efficient air conditioner, you may not need the most efficient one on the market, especially if you live in an arid climate with few months of cooling needs. Consider both the initial price and annual operating costs (see sidebar) as you compare models so you can determine the lifecycle cost. If the annual operating cost savings add up in a reasonable number of years to the additional cost of the more efficient unit, the more efficient unit will be the better buy.

Here are some other issues to keep in mind as you're shopping:

- *Look for an "energy-saver" switch.* The energy-saver switch causes the air conditioner's fan and compressor to cycle on and off together, reducing energy use.
- *Verify that you'll get good moisture removal if you live in a humid climate.* Manufacturers label the dehumidifying capacity of room air conditioners according to moisture removal

in pints per hour. An HVAC contractor can calculate how much dehumidifying capacity you'll need. Be aware that increased efficiency can decrease dehumidification capacity.

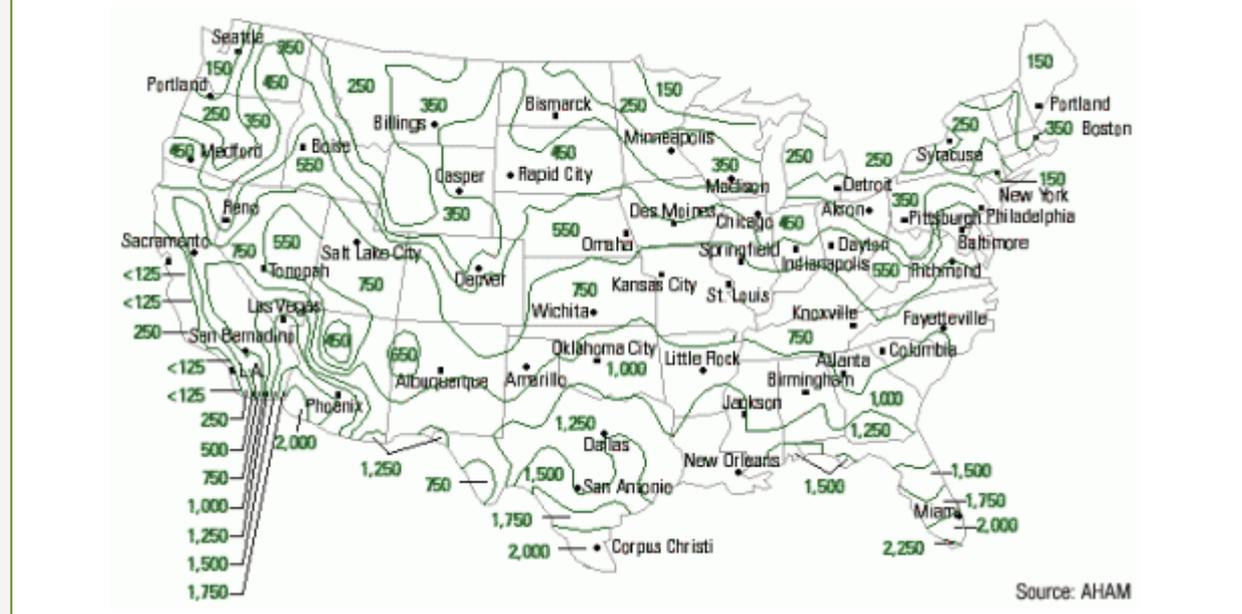
- *Listen.* All room air conditioners make some noise, but levels vary widely. Listen to operating models if possible and check independent consumer guides for information on noise levels of the units you're considering. The [ConsumerSearch web site](#) rates RACs from 5,000 to 15,000 Btu and includes noise among its test categories.

## CALCULATING ANNUAL OPERATING COSTS

To figure out which of two room air conditioners is the better buy, calculate the annual operating cost for each unit: Multiply their capacity (in Btu/hr) times your local electric rate (\$/kWh) times the number of operating hours, and divide by the efficiency (EER) and 1,000 (converting watts to kilowatts). If you don't know the annual operating hours, refer to the map in **Figure 2**.

### Figure 2: Room air conditioner hours of operation in the U.S.

In the continental U.S., RAC hours of operation average 750 hours annually. This map from the Association of Home Appliance Manufacturers can help estimate usage for a specific location.



## WHAT'S ON THE HORIZON?

---

this section

Since the Energy Star program's inception in 1997, Energy Star-qualified RAC sales have grown significantly. As of 2009, the total Energy Star market share of RACs is at 54 percent. Eleven manufacturers now offer Energy Star-qualified RACs, and about half of all the RAC models they sell are Energy Star qualified.

In the future, new federal standards will likely drive RAC efficiency levels higher. A change to the federal standard may also affect the Energy Star program. Look for efficiencies to increase slowly as manufacturers continue to incorporate better compressors, heat exchangers, and fan motors into their products.

## WHO ARE THE MANUFACTURERS?

---

this section

As with other appliances, different brands of room air conditioners may be made by a single manufacturer. The most prominent North American manufacturers are:

- [Fedders](#)
- [Friedrich](#)
- [Frigidaire](#)
- [GE Appliances](#)
- [LG Electronics](#)
- [Sharp](#)
- [Whirlpool](#)
- To search by brand or capacity for other high-efficiency models, visit the [Energy Star](#) site.

Neither this list nor any mention of a specific vendor or product constitutes an endorsement or recommendation by E Source, nor does any content the Business Energy Advisor constitute an endorsement or recommendation, explicit or otherwise, of your service provider's various technology-related programs.

All content copyright © 1986-2017 E Source Companies LLC. All rights reserved.

---

**Source URL:** [https://tva.bizenergyadvisor.com/BEA1/PA/PA\\_Cooling/PA-09](https://tva.bizenergyadvisor.com/BEA1/PA/PA_Cooling/PA-09)