

More Air-Conditioning Info

Questions & Answers

1. Here are some basic rules to follow for keeping cool at minimum cost.

- * Caulk, weather-strip, and insulate (especially the attic) to close air gaps.
- * Plan hot work (washing and drying clothes, baking, cooking) for cooler morning and evening hours.
- * Pull drapes and shades over windows facing the sun.
- * Keep windows and doors closed when the air conditioning is on.
- * Set a thermostat control to automatically increase or decrease home temperatures for daytime/nighttime differences to save money.
- * Set thermostat control at highest comfortable level-- each degree raised reduces energy consumption by 3-4 percent.
- * Clean or replace air filters regularly.
- * With a new system, consider a service contract for a specified period of time.
- * Keep the outside unit free of leaves or other airflow obstructions.
- * Have the air conditioning unit cleaned each spring.

2. How does an air conditioner work?

An air conditioner transfers heat-from the inside of a building, where it is not wanted, to the outside. Refrigerant in the system absorbs the excess heat and is pumped through a closed system of piping to an outside coil. A fan blows outside air over the hot coil, transferring heat from the refrigerant to the outdoor air. Because the heat is removed from the indoor air, the indoor area is cooled.

3. Is central air conditioning better than window units?

This depends largely on individual circumstances-- for example, how large is the area to be air conditioned, how large is the family, what temperatures are required, how well the house is insulated, where the house is located, etc. Central systems require internal ducting; window units take up valuable window space. In many cases, if more than three large rooms need air conditioning, it is best to consider central air conditioning. Your contractor can advise you!

4. Should I augment my central air conditioning system with other air conditioners or ceiling fans?

If you need to use other air conditioners with a central air conditioning system, your central system probably is undersized or the air distribution system is imbalanced. Window air conditioners or split ductless systems may be used in rooms that lack air ducts.

Ceiling fans can be a good idea with some indoor comfort systems because they circulate air that tends to stagnate at the top of rooms with high ceilings.

5. What is the average life of a central air conditioning system?

It can vary; depending on how much the system is used and how regularly it is checked or serviced. Generally, the average life of cooling units built in the 1970s and 1980s is about 15 years, but individual units may vary and last much longer, depending on use and how well they are maintained. Heat pumps have about the same life span-- an ARI survey showed average heat pump life to be about 14 years when recommended maintenance procedures were followed. Newer units are expected to last even longer.

6. What should I do in advance to make sure that my air conditioning system would work efficiently this summer?

The main thing is to have the system checked each year before the peak-cooling season-- by a qualified contractor or service technician. Then, remember to keep the air filter clean and the outdoor unit free of leaves and debris.

7. If my air conditioner is no longer cooling properly, what is the most likely problem?

It could be as simple as replacing a fuse, resetting a circuit breaker or checking to see if the thermostat is set properly. If an electrical problem isn't the cause, the refrigerant may be low if the system still runs but does not cool properly. This can be corrected by having an EPA-certified technician add necessary refrigerant. Most likely, if the problem involves any major part, such as the compressor, you would hear strange noises similar to those of any mechanical equipment not running correctly, or the unit might not run at all.

8. Can homeowners repair their own air conditioners?

In most cases, definitely not, cooling systems today are more complicated to service and usually require expert attention in order to comply with federal regulations, such as the Clean Air Act, which prohibits releasing refrigerants into the atmosphere. An EPA-certified air conditioning contractor or service technician should be called at the first sign of trouble.

9. When do I know it's time to replace my system?

When the system starts giving you more problems than seem cost-effective to fix, particularly when major components such as the compressor start making unusual noises or otherwise indicating need for a service call. When faced with major repairs, consult several contractors for their recommendations. Replacing a compressor is somewhat less expensive than replacing the entire unit, but new units may give you greater efficiency and lower operating costs in the long run.

10. Which is better-- letting a central cooling system wear out before replacing it, or replacing it at some point before it wears out?

Because newer equipment usually is more energy efficient than older central air conditioning or heat pump systems, you might actually save money by replacing your old system before it completely wears out. Contact local contractors and ask for their estimates. In some cases, the money you save in reduced utility costs might pay back your purchase price of a new system years earlier than you might think.

11. When is the best time to buy an air conditioner?

Like most businesses in the off-season, contractors have more time to spend with you determining exactly the best options you would want to consider for your individual needs.

12. How do I go about shopping for a new system?

Ask friends and neighbors about the types of systems they have, how much they cost, how long they've had them, and how satisfied they are with them. Then ask for recommendations as to brands and local contractors, or ask several different contractors to take a thorough look at your home, evaluate your overall comfort needs, and recommend the best system for you. Look at all indoor climate control options-the entire spectrum of heating, cooling, air filtration, and humidification equipment.

13. Should I replace both my outdoor condensing unit (which includes the compressor) and the indoor coil on my central air conditioning system at the same time?

In most instances yes, matching a new condensing unit with a new coil is the only reliable way to be certain you are going to get the rated efficiency of the new equipment. Matching a new, high SEER (seasonal energy efficiency ratio) condensing unit with an old indoor coil probably would not result in optimum efficiency.

14. What is the best type of system to meet all indoor comfort needs?

The best system depends on many variables, including family size, house location and design, and utility cost and availability. The optimum indoor comfort system might include high efficiency central air conditioning and heating, a high-efficiency air cleaner, and a central humidifier.

15. If I buy a new system, what is the best kind of control unit?

If you want flexibility to program your temperature changes, a computerized thermostat will probably be best. Manually operated control systems allow you to select a temperature setting, which your unit will maintain.

16. How can I get a high efficiency system that will have minimum operational costs?

Manufacturers publish equipment efficiency ratings, which are available to your contractor. ARI also publishes directories indicating various energy efficiency ratings of specific equipment. It is important that a contractor install a unit that has just the right capacity to cool your home. Units with excess capacity will cycle on and off and work less efficiently, thus increasing your operating costs.

17. How can a homeowner tell if a contractor's price is fair?

Mostly by comparing bids from several contractors, and possibly checking the local Better Business Bureau to be sure the contractor has a good reputation.

18. How easy is it to install central air conditioning in an older home?

Often it is fairly simple, particularly if the older home has existing ductwork or plenty of room for adding ductwork. Homes without air conditioning ducts can consider non-ducted systems, which also provide the advantage of cooling, only selected areas very effectively. An important consideration is how well the older home is sealed and insulated.

19. If I'm buying a house, how can I make sure that the air conditioning system is in good working order?

Just turn on the system and listen for unusual sounds while feeling how cool the air is and how strong the airflow is from the vents. Don't just listen inside the house-- go outside and listen to the condensing unit, too. This personal inspection is a good indicator, but like buying a car, the best way is to then hire an expert-- a contractor-- to come out and inspect the system. It won't cost much, and it could save you lots of money in unanticipated repairs.

20. What is a heat pump?

A heat pump is like a conventional air conditioner except it also can provide heat in winter. In the summer, the heat pump collects heat from the house and expels it outside. In the winter, the heat pump extracts heat from outside air and circulates it inside the house. The heat pump works best when the outdoor temperature is above freezing. Below that, supplementary heat often is needed. A heat pump can save 30 to 60 percent less energy to supply the same heat when compared to an electric furnace with a resistance-heating element.

21. Are air conditioners and heat pumps efficiency rated?

Yes. Central systems are rated by the seasonal energy efficiency ratio (SEER). Many older systems now in use have SEERs of 8 or below.

By 1994, the average SEER for all units shipped by manufacturers in the U.S. improved to 10.61 for central air conditioners and 10.94 for central heat pumps. The higher the rating, the more efficient the system.

22. What are the advantages of buying a system with a high SEER (seasonal energy efficiency ratio)?

You will use less energy to cool your house, resulting in lower electric bills. Sometimes the savings are enough to partially or fully offset the cost of the new equipment within a few years. In all cases, it's an individual calculation, which the homeowner should figure out with the contractor of choice.

23. Is there any law or rule covering air conditioning efficiency ratings?

Yes. The National Appliance Energy Conservation Act of 1987 (Public Law 100-12) sets national standards for residential air-cooled central air conditioners and air-source central heat pumps.

The NAECA provides for a federal minimum standard of 10.0 seasonal energy efficiency ratio (SEER) for split-system air conditioners and heat pumps, effective Jan. 1, 1992, and 9.7 SEER for single-package air conditioners and heat pumps, effective Jan. 1, 1993.

Heat pumps also are subject to federal standards of 6.8 heating seasonal performance factor (HSPF) for split systems, effective Jan. 1, 1992, and 6.6 HSPF for single packages, effective Jan. 1, 1993.

24. What is the difference between a split system and a single-package central air conditioner or heat pump?

A split system has one of its heat exchangers (which includes the compressor) located outdoors and the other (the indoor coil) located indoors. A single package has both heat exchangers located in the same unit, usually indoors. Most residential central air conditioners and heat pumps are split systems.

25. How can I determine the SEER of my present equipment?

There are three main ways to determine the SEER of equipment: (1) find the model numbers of your present equipment (the outdoor condenser/compressor unit and the indoor evaporator coil unit) and check them with local contractors who handle your brand; (2) estimate the SEER based on the average SEER units produced approximately when your system was installed; or (3) check the energy efficiency label on your outdoor condenser/compressor unit if you have equipment produced after late 1988.

In the first method, contractors can then consult manufacturer data or the ARI unitary equipment certification directory, which lists all models of equipment by manufacturers that certify their equipment SEER ratings.

In the second method, for air conditioners and heat pumps produced in 1981, the first year SEER criteria was used, the average ratings were 7.78 and 7.51 respectively. By 1987, SEERs reached 8.97 and 8.93 respectively. By 1994, ratings increased to 10.61 for air conditioners and 10.94 for heat pumps. In the third method, residential central air conditioners and heat pumps covered under Department of Energy (DOE) test procedures and manufactured on and after June 7, 1988, are required to have labels containing energy efficiency information. For each system, the label will be on the outdoor condenser/compressor unit, and will reflect the SEER achieved by matching the outdoor unit and the indoor evaporator coil unit.

26. How can I find the savings of higher SEER equipment compared to lower SEER equipment?

You'll need to talk with a local contractor to verify what size cooling equipment you now have and what you actually need, then determine the normal cooling load hours for your area, and find your electric rate cost. When cooling, heat pump performance is measured in seasonal energy efficiency ratio (SEER). When heating, it is measured in coefficient of performance (COP) or heating seasonal performance factor (HSPF). In all measurements, the higher the rating the more efficient the system.

The formula is as follows:

$$\frac{\text{Capacity (Btuh)}}{\text{SEER}} \times \frac{\text{Cooling Load Hours}}{1000} \times \text{Electric Rate} = \text{Annual Operating Cost}$$

For example, if a home requires a unit with a capacity of 36,000 British thermal units per hour (Btuh), is located where the cooling load is 1500 hours and the electric rate is .10 cents per kilowatt-hour, here is the calculation for a system with a SEER of 10:

$$\frac{36,000}{10} \times \frac{1500}{1000} \times .10 \text{ cents} = \$540 \text{ per year}$$

The same calculation with a SEER of 12 reveals an annual operating cost of \$360 or \$72 less per season 17 percent savings.

27. What are typical savings to expect from higher SEERs in various parts of the country?

Here are representative operational costs of three SEER levels for a 2,000-square foot split level house in six regions of the United States (actual costs may vary greatly depending on individual circumstances):

REGION	SEER 7	SEER 9	SEER 11
Southeast	\$757	589	482
Southwest	469	365	298
South Central	964	749	613
Northeast	301	234	192
Northwest	100	77	63
North Central	364	282	231

28. What percentage of my utility bill is caused by air conditioning?

It can be surprisingly small on an annual basis, but it depends on how much you use your air conditioning, how efficient your equipment is, and how much you conserve energy by actions ranging from insulating your home to keeping doors and windows closed when the system is operating. Your local electric company is the best source for specifics in your area.

29. Is there any difference in the quality and quantity of cooling and heating from a heat pump and that from other cooling and heating systems?

No. In its cooling mode, a heat pump supplies exactly the same kind of cooling as all electric air conditioners. In its heating mode, the temperature of the air supplied by a heat pump is not as hot as the air supplied by a fossil fuel furnace, but the end result is the same: a warm, comfortable home. Air temperature from a heat pump at room outlets normally is about 100 degrees Fahrenheit compared to about 120 to 130 degrees from a fossil fuel furnace.

The heat pump warming effect thus is something like warming your bath water more gradually and uniformly by turning the hot water faucet to a moderately warm setting rather than turning the faucet all the way to maximum hot water.

30. Do all heat pumps come with supplemental heat?

Virtually all heat pumps are available with supplemental electrical heat. Some heat pumps are used in conjunction with a fossil fuel heating system such as gas or oil. Whether supplemental heating is necessary depends on your climate and home location. Your local contractors can advise you as to whether supplemental heat is necessary, and what type of heat pump might be best for your needs.

31. Should I install a heat pump instead of a regular air conditioner if I have a gas or oil heating system?

A heat pump can be a worthwhile consideration no matter what heating system is used in a home. In many areas, a heat pump with gas or oil supplementary heat is the most economical system and offers excellent performance and comfort.

However, check with local contractors who can determine the best systems for use in your area that meet your comfort needs.

32. How often should I change the air filter in my system?

Check it at least every month during peak use, and replace it when it looks dirty enough to significantly impair the airflow through it. Some filters, such as media filters or electronic air cleaners, are washable; others are disposable and must be replaced.

33. Will I get cleaner air by shutting up my house and running my central air conditioner or heating system, or by opening up my house as much as possible to let in fresh air?

As you might suspect, this depends primarily on the quality of air outside your home, the quality of air inside your home, and your home's indoor comfort equipment. Indoor air quality varies greatly from building to building. Factors may include everything from emissions by the materials used in your home's construction to the kind of cleaning products you use for personal and household needs, to possibly even radon from the ground or water in some areas.

Optimum air quality is a matter of personal preference, as is deciding when it is best to air out the home, and when it is best to rely primarily on the cooling/heating equipment. Research on indoor air quality is gaining momentum, but it may be years before comprehensive analysis of the spectrum of variables affecting indoor air quality is widely available to households nationwide.

Using a high efficiency air cleaner on the central cooling/heating system remains one of the best ways to help maintain a clean indoor environment. High efficiency air cleaners can remove particles smaller than the eye can see.

34. How, and how often, should I clean my air conditioning registers and ducts?

Duct outlets and registers should be cleaned as part of your regular home cleaning routine. It's the filters in the system-and to a lesser degree the grilles and registers at the duct outlets-that collect most of the dust, and therefore need changing or cleaning.

Ducts usually don't require cleaning, especially if filters are kept clean. You can occasionally check ducts by removing a few registers and inspecting the ducts from the inside with a flashlight (be sure to look at return air ducts). If the insides of ducts need cleaning, some contractors provide this service.

35. Should my home be humidified?

That depends largely on your climate and personal needs. Humidification is definitely helpful in many homes and businesses. Particularly during cold weather, insufficient moisture in the air often is responsible for such assorted problems as stuffy noses, sore throats, even more dust than usual, cracks and dried-out joints in wood furniture, wilted plants, and static electricity which jolts hair, clothes, and computer disks. Indoor relative humidity may fall to around 7 percent, much drier than even the 25 percent relative humidity of the Sahara Desert! Ideal indoor relative humidity is between 30 to 50 percent.

36. Is there any advantage to letting the air conditioner or heat pump fan run all the time (the "on" setting on the thermostat) instead of periodically (the "auto" or "automatic" setting on the thermostat)?

If you live in a very humid climate you may not want to run the fan continuously because this reduces dehumidification. Otherwise, there are some potential advantages.

Continuously circulating the air keeps the temperature more even throughout the house by alleviating temperature stratification. It keeps air circulating through the comfort system's air filter, which depending on filter type and efficiency-can keep the home cleaner and the air fresher to breathe. When the fan is operating continuously, the compressor continues to periodically cycle on and off automatically to cool and dehumidify your home just as it does on the "auto" setting.

37. How do I know my equipment is ARI certified?

Equipment certified by manufacturers to ARI as being accurately rated is subject to ARI verification testing. An ARI certification seal on the outdoor unit of the equipment or on its operating instructions normally identifies this equipment. If no seal is evident, ask your contractor or contact ARI. Ask your contractor to show you the appropriate ARI product certification directory that lists the units you are considering. Then have your contractor go over the various ratings with you.

38. Can my cooling or heating system reduce or eliminate radon or other "sick building" problems?

As a gas emanation primarily from soil or rocks, radon can be detected and measured by relatively inexpensive monitors that are becoming increasingly available to the general public. Considerable research is being done on measures to control radon and its health effects as typically found in indoor building environments-residential and commercial. At present, most conventional home central cooling and heating systems appear to have little, if any, effect on radon.

"Sick building" essentially refers to some buildings that have excessive concentrations of pollutants. Such pollutants may range from cigarette smoke to chemical emanations from materials used in furniture or building construction, to biological contaminants such as fungi (e.g., molds and mildew) and bacteria growing in areas where moisture may collect and stagnate. This may occur in such diverse locations as improperly maintained or damaged ceiling tiles, dishwashers, carpeting and air conditioning drain pans.

Most problems allegedly have occurred in commercial buildings. Cleanliness and adequate ventilation are major considerations. If you believe you may have a problem, you should seek the advice of a qualified contractor.

For more information about radon and sick building problems, contact the local American Lung Association state radiation protection office, or Environmental Protection Agency regional office.

39. Is there any relationship between my home air-conditioning system and chlorofluorocarbon (CFC) refrigerants and the ozone layer?

An international protocol limits future worldwide production and consumption of the fully halogenated CFCs 11, 12, 113, 114, and 115.

Virtually all of the refrigerant used in residential central air-conditioning systems is called HCFC-22, which has some ozone-depletion potential, but only one-twentieth that of CFCs. This is because HCFC-22 breaks down fairly rapidly when released into the lower atmosphere, and most of it never reaches the ozone layer at high altitudes.

HCFC-22 will be phased out of production for use in new equipment by the year 2010 and for servicing existing equipment in 2020. After its phase-out, there will still be some of this refrigerant available for servicing existing equipment. Manufacturers are beginning to produce units that use alternative refrigerants. Consumers can thus enjoy their air conditioning and help protect the environment at the same time by following a few simple guidelines:

- * A central air conditioner is a closed system and will not release refrigerant into the atmosphere as long as it is maintained properly. Have your system checked by a service person once a year before the cooling season. Make sure the technician checks for refrigerant leaks.
- * After July 1, 1992, intentional venting of refrigerant is against the law. All refrigerant from units must be recovered.
- * Only patronize service companies that practice refrigerant recovery and recycling and have the proper equipment to do so.

40. Is there anything dangerous about the refrigerant in my central air conditioning or heat pump system?

The refrigerant (HCFC-22) in residential central air conditioning and heat pump systems is nontoxic, nonflammable, odorless, and sealed within the system. Nonetheless, like any substance, it can be abused. You should be aware that some people have died from deliberately inhaling or "sniffing" pure gas (e.g., after buying and "sniffing" cans of refrigerant like those used to recharge automobile air conditioners). Inhaling such concentrated refrigerant vapor can cause cardiac irregularities and cardiac arrest—a fatal heart attack.

Although a large release of refrigerant vapor could displace oxygen available for breathing and cause suffocation, this is virtually impossible with residential systems because of the relatively small amount of refrigerant used in the 24,000 to 36,000 Btuh (2-ton to 3-ton) units of most residential central air conditioning systems.

41. In hot weather, should I turn my thermostat up when I leave for work in the morning?

If your house is going to be empty for more than about four hours, it's a good idea to turn your thermostat up to about 82 degrees or so instead of the 78 usually recommended. Keep the house closed to minimize heat build-up. When you come home, don't set the thermostat any lower than the temperature you actually want. Your air conditioning system wouldn't cool any faster and might easily waste money by cooling your home more than needed.