

HOME COOLING



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Low-Tech Ways to Cool Off

- Keep your interior lights low or, if possible, completely off during the daylight hours.
- Wait until the cooler evening hours to use your oven. Or better yet, use a microwave or toaster oven to cook foods whenever possible.
- Use kitchen and bathroom exhaust fans to vent heat and humidity outside.
Caution: Don't use exhaust fans any longer than necessary or they can blow out all the cooled air in your home.
- Close your drapes or window blinds during the daylight hours.

Keeping your cool

Americans spend approximately \$11.9 billion on air conditioning (A/C) each summer. Individual homeowners often spend a significant portion of their summer energy budget on air conditioning.

Fortunately, there are ways to cut the cost of running your A/C unit and still keep your cool. The information in this booklet will cover “low-tech” alternatives to air conditioning, help you use your air conditioner more efficiently and give you tips on upgrading or replacing your existing A/C unit.

We hope you'll find this booklet informative and useful and that you'll look for other Arkansas Energy Unit *Home Series* booklets to help maximize your home's energy efficiency.

Four Basic Steps

Keeping your home cool and comfortable at an affordable cost can be accomplished in four basic steps:

- Reducing the cooling load on your house
- Exploring alternative cooling methods
- Increasing the efficiency of your existing air conditioner
- Buying a new, energy-efficient air conditioner

Cutting the Cooling Load

The best strategy for keeping your house cool in the summer is to prevent it from getting hot in the first place. This means trying to keep the outside heat and the direct sunlight from getting inside; reducing the amount of heat given off by inefficient appliances, lights and unwrapped water heaters and reducing the amount of time you use other heat-generating appliances like your stove.

During Arkansas' hot, humid summers, the greatest energy use goes to cool your home. The major sources contributing to higher cooling energy use are the sunshine that turns to heat after it passes through the windows, the outside heat and humidity that enter through small and large leakage areas, internal heat from lights and appliances, and conduction of heat through the walls and ceiling.

It makes sense to reduce these cooling loads before investing in a new air conditioner. Also, if you can reduce the heat entering your home, you will be able to get by with a smaller, less expensive A/C unit.

“LOW-TECH” ALTERNATIVES



The Hot Spots

Sunlight, or solar energy, hits the roof and comes through the windows, accounting for most of the heat gain inside a house. Therefore, the most important places to use shading are the roof and windows.

Energy conservation measures that block the sun before it strikes the roof or windows are the most effective. Trees and other plants that provide shade are your best long-term investment for reducing cooling costs.

Roofs

Solar heat gain is greatest in homes with dark roofs, inadequate insulation and poor roof ventilation. Heat gain can be reduced by one-third by shading your house with trees, adding insulation and ventilating attics.

Air Leaks

Air leaks in your home can be costly problems if you have air conditioning, especially in humid climates like Arkansas. Measuring air leaks with a blower door test (Page 6) is an effective way to identify where air leaks are in your home.

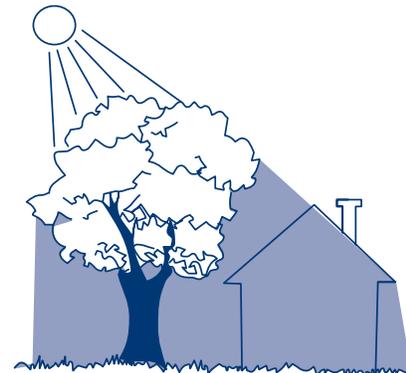
Ducts

If you have central air conditioning, one of the fastest ways to save energy and money is to seal all leaks in the ductwork. Savings on A/C costs of 10% to 25% are typical and 30% to 50% are possible. More information on ducts can be found on page 11.

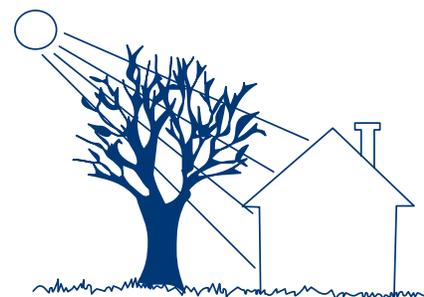
Trees

Trees and landscaping are the most effective measures for blocking solar heat. Well-planned landscaping can reduce an unshaded home's summer A/C costs by 15% to 50% depending on the R-value of the attic insulation.

In fact, the temperatures directly under trees can be up to 25°F cooler than air temperatures around nearby blacktop. Trees also are a good investment. Studies by real estate agents and professional foresters estimate that trees raise a home's resale value 7% to 20%.



Summer



Winter

Figure 1: Deciduous trees provide shade in the summer and warming sun in the winter.

Additionally, the more shade you have, the more effectively you can reduce the size of your air conditioner as well as your cooling costs. Shade makes the air around the house cooler and it prevents solar heat from building up indoors.

Deciduous trees — which are leafy during the warm months and bare in winter — can screen out the summer sun, yet allow winter sunshine to come through their branches and warm your home (Figure 1). Trees should be planted on the southeast and west sides of your house for the maximum shading effect. Not only will they help lower your energy costs over the years, but they'll make your home a greener and more beautiful place to live.

Windows

Single-pane, unshaded windows let in about 85% of the heat in the sunlight. The following options can block 60% to 90% of the solar heat that currently enters your windows.

Sun Screens: These are often the least expensive option for maintaining a view and blocking the sun. The fabric absorbs 65% to 70% of the solar heat before it enters the house. The screen must be installed on the exterior of a window to be effective.

Reflective Films: Metalized plastic window films can block 50% to 75% of the solar heat. Because reflective window films block sunlight in addition to solar heat, consumer acceptance has been slow. Newer films on the market transmit more light. Installation is moderately difficult.

Interior Window Treatments: Window treatments that have reflective, metallic or bright-white surfaces, can effectively block solar heat. For example, an opaque roller shade with a white surface facing outward stops roughly 80% of the solar heat. White venetian blinds and white slim shades stop about 40% to 60% of the heat.

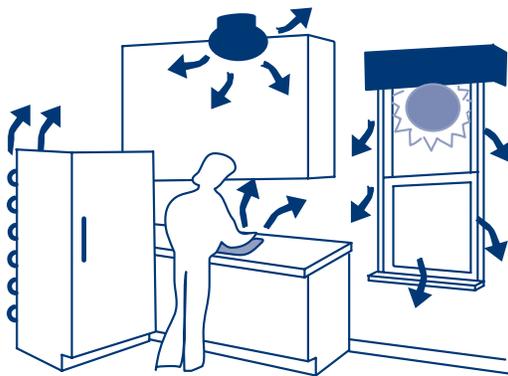


Figure 2: Common heat sources in a house include windows, lights, stoves and appliances.

“Cool” Hot Weather Habits

Making some minor changes in your personal habits during the dog days of summer is another way to reduce your need for air conditioning and add to your energy savings. While the following lifestyle habits may not always be possible, incorporating some or all of them into your summer routine will definitely help you stay cool and save money on your home cooling costs.

- Keep your interior lights low or, if possible, completely off during the daylight hours. Light fixtures generate heat, and therefore add to your cooling costs (Figure 3). Appliances such as TVs and stereos

also generate heat, so it helps to turn them off when no one is using them.

- Wait to use your oven and other heat-generating appliances until the cooler evening hours. A hot oven will quickly heat up your kitchen and the adjoining rooms.
- Microwavable foods, as well as uncooked sandwiches, salads and fruits are good options for keeping your home cooler on hot days.
- If you use your clothes dryer, make sure it vents to the outside; otherwise, the heat and humidity will build up in your house.
- If you are going to use your A/C, use energy-efficient thermostat settings between 74°F and 78°F.
- If it is humid and if you use your A/C regularly, you are better off not opening your windows on cooler days or at night. This is because your A/C unit will have to work extra hard to remove the humidity from your house before it can begin to cool your house.

HOME TIGHTENING



Caulking, weatherstripping and insulation are some of the best tools for preventing unwanted heat and moisture from entering your home in the summer. They are also important in reducing heat loss in the winter months.

There are many places where air can leak into and out of your home. A good rule of thumb is to seal the attic and basement air leaks first with caulk and weatherstripping. The following checklist will help you locate common trouble spots for air leaks.

Air Leak Trouble Spots

THE ATTIC:

- Holes in the attic floor and walls
- Doors and hatches to the attic
- Plumbing stacks
- Attic knee walls/storage drawers

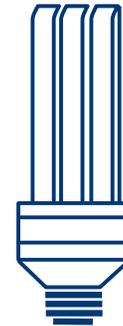


Figure 3: Compact fluorescent lights add less heat to the house than incandescent lights.

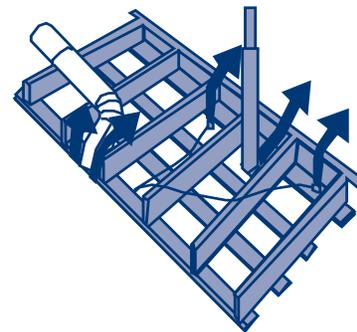


Figure 4: Holes around recessed lights, wiring, pipes and other openings in insulated ceilings can result in a tremendous amount of heat loss.

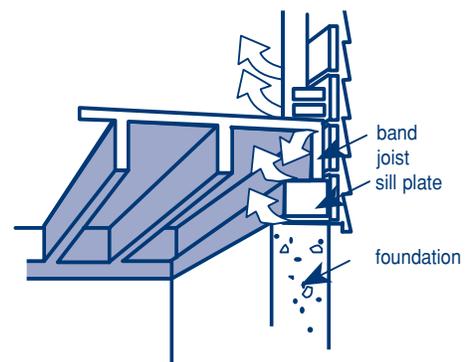


Figure 5: Get rid of drafts along the floor by caulking along the sill plate and band joist in the basement.

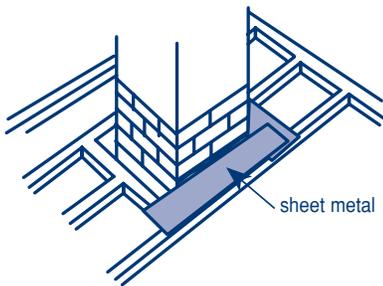


Figure 6: Heat can escape around the chimney if it isn't properly sealed.

THE BASEMENT:

- Around the sill plate and band joists
- Around basement windows
- Ducts
- Openings in the basement walls and ceiling including dryer vents, electrical wiring, plumbing stacks, etc.

THE MAIN LEVEL:

- Around the chimney and fireplace dampers
- Around windows, doors, trim and baseboards
- Electrical outlets and other exterior wall openings

THE OUTSIDE:

- Cracks in exterior siding
- Around windows and doors
- Around outdoor faucets, vents and electrical outlets

A more precise way to find air leaks is to have a blower door test done on your home. A blower door is a device that depressurizes a house, making it possible to measure the amount of air leakage and pinpointing air leaks that cannot otherwise be seen. This test allows you to actually feel where air loss is occurring.

Blower door tests can also identify health hazards created by backdrafting. These tests are also able to project whether your home has enough natural infiltration — the ability to draw in fresh air — to have good indoor air quality. Consult your yellow pages or call the Arkansas Energy Unit at 501-682-7319 or visit our Web site at www.1800ARKANSAS.com/energy/ for a list of certified energy raters.

After you have sealed air leaks in your home, make sure your home is properly insulated. Insulation helps keep homes cool in the summer, and warm in the winter. For more detailed information on caulking, weatherstripping and insulation, consult the *Home Series* issues, *Home Tightening* and *Insulation*.

ATTIC VENTILATION



Your roof can absorb a tremendous amount of heat in the summer, and if the attic isn't properly insulated and ventilated, its temperature can reach as high as 150° F. This is like having a gigantic radiator above your living spaces.

Attic ventilation serves two purposes. First, it cools hot attics during the summer months. Second, it removes moisture from insulation and other building materials that may accumulate in the attic during the winter months.

In the summer, the sun's heat puts a strain on your home's air-conditioning system. This heat builds up in the attic and can be stored there even on cool summer nights. This means higher air-conditioning bills and increased strain on all the components of the air-conditioning system. By ventilating your attic, you can dramatically reduce both of these problems.

Ventilation is needed in two areas to ensure proper air flow through the attic. First, vents are needed at or near the top of the roof using roof, gable, turbine or continuous vents. Second, soffit vents should be at the lower edge of the roof to allow air to circulate naturally. A combination of high and low vents and a combination of continuous soffit vents and continuous ridge vents is the most effective option.

Attics without a ceiling vapor barrier should have a minimum of one square foot of vent area for every 150 square feet of ceiling area.

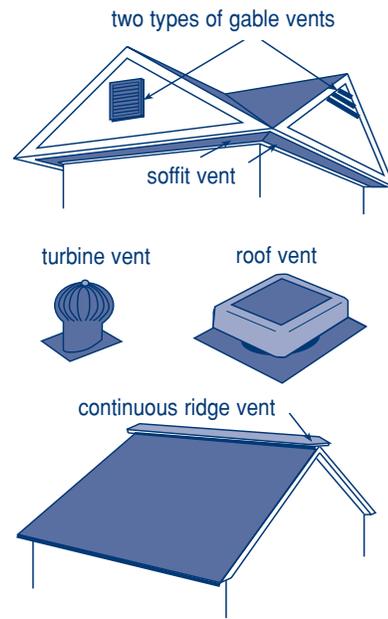


Figure 7: Five common attic vent types.

FANS

Fans do not cool the room they are in. They do, however, create a cooling effect by moving air across the skin. To receive the cost-saving benefit of a floor, table or ceiling fan, turn the thermostat up a few degrees.

- **Ceiling Fans:** These fans are common in southern climates. They are probably the best way to circulate air in rooms, and they're a great way to supplement your air conditioning. Unlike window fans and smaller oscillating fans, ceiling fans are permanent fixtures that operate from a wall switch or pull string. There should be at least seven feet between the fan and the floor for safety, but fans that are too close to the ceiling, such as "ceiling hugging" models, may not provide adequate air flow.

Generally speaking, the larger the fan's blades are, the greater the air movement and the quieter the fan will be (see Table A). A good ceiling fan should create enough air movement that you will be comfortable at 82°F and 80% relative humidity. If you're using the fan to supplement or circulate air conditioning, you should be able to raise the thermostat of the A/C unit a full 4°F above the standard 78°F setting and still be comfortable. This is significant

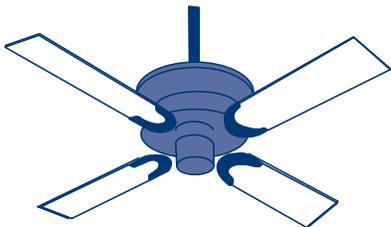
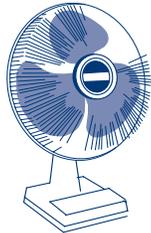
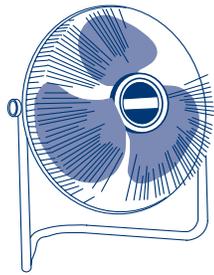


Figure 8: Floor fans, table fans and ceiling fans are the most cost-effective electric cooling devices available. They should be used to create a wind-chill effect while reducing the need for whole-house fans, evaporative coolers or air conditioners.



Figure 9: If possible, locate room air conditioners on a north wall or a wall that is shaded.

because for every degree you raise your air conditioner's thermostat above 78°F, you save about 3% to 5% on your cooling costs.

You should not use both your air conditioner and a ceiling fan unless you first raise the temperature setting on the A/C unit; otherwise, you'll be wasting energy and needlessly increasing your electric bills. For the same reason, you shouldn't leave ceiling fans running in unoccupied rooms.

TABLE A: SIZING YOUR CEILING FAN

Room Area (sq. feet)	Minimum Fan Diameter
100	36 inches
150	42 inches
225	48 inches
375	52 inches
400+	2 fans needed

Sources: Consumer Guide to Home Energy Saving (1995) by the American Council for an Energy Efficient Economy.

- **Oscillating Fans:** These fans have heads that pivot. If you just want to circulate air in a small room, or extend the cooling range of a window-mounted air conditioner, an oscillating fan will probably be sufficient for your needs.
- **Exhaust Fans:** Kitchen exhaust fans mounted above ranges help remove the heat and humidity created during cooking. Bathroom exhaust fans help remove the heat and humidity caused from baths and showers. Make sure that the vent fans are periodically cleaned and that they vent properly to the outside to effectively remove excess heat, moisture and odors. Also, don't leave your exhaust fan on longer, or at a higher speed, than necessary. In just one hour, these fans can blow a house full of cooled air outside. Food odors and oven heat usually can be removed within 15 minutes or less.

There are two important items to consider when selecting a ventilation fan:

1. How many cubic feet per minute (cfm) can the fan push? A 100 cfm fan is typically enough for a kitchen and a 50 cfm fan is usually adequate for the washroom/bathroom.

2. How noisy (rated in “sones”) is the fan? For quiet operation, look for fans with a sone rating not greater than 1.5. Since new homes are being built tighter than in the past, it is important that fans not be oversized. Stoves with built-in fans are inefficient at removing moisture and they remove a tremendous amount of air. This excess air removal pulls in outside air and also might create back drafting of vented gas appliances.

GOOD OPERATING HABITS FOR YOUR A/C

A spring inspection and tune-up of your A/C unit is an important step to improve its efficiency and increase its lifespan. Tune-ups should always be done by a qualified service person. Make sure that you call someone qualified to work on your particular A/C model. The following items should be checked:

- Check thermostat settings to ensure the cooling system turns on and off at the right temperature.
- Clean evaporator and condenser air-conditioning coils. Dirty coils reduce the system’s ability to cool a home and cause the system to run longer, costing you more energy dollars and decreasing the life of the equipment.
- Check refrigerant pressures and adjust charge if necessary. Too much or too little refrigerant charge can damage the compressor in your air conditioner, reducing the life of your equipment and increasing costs.
- Clean and adjust blower components to provide greater comfort levels.
- Measure airflow over the coils. Adequate airflow will improve equipment efficiency and reliability. With inadequate airflow, your system can lose up to 15% of its efficiency.
- Tighten all electrical connections and measure voltage and current on motors. Faulty electrical connections can cause unsafe operation of your system and reduce the life of major components.
- Lubricate all moving parts. Parts that lack lubrication cause friction in motors and increase electrical energy consumption.
- Check and inspect the condensate drain. If plugged, it can cause water damage in the house, affect indoor humidity levels, and breed bacteria.

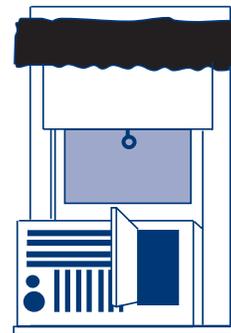


Figure 10: Clean AC air filters regularly.

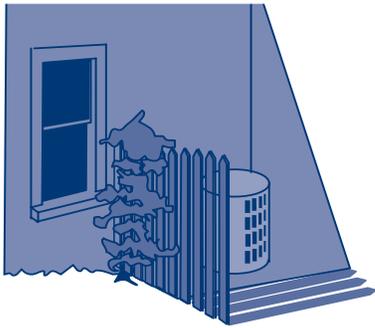


Figure 11: The outside compressor for a central air conditioner should be shaded from direct sun.

- Check controls of the system to ensure proper and safe operation.
- Check the starting cycle of the equipment to assure the system starts, operates and shuts off properly.

There are also some types of routine cleaning that you can do to keep your A/C unit running smoothly. They include the following:

- Clean or replace filters monthly.
- Clean the blower's fan blades.
- Carefully clean the outside condenser coils as often as necessary (when dirt is visible).
- Remove debris from around the outside compressor.

MAKE THE MOST OF YOUR A/C



In addition to the annual checkup and routine cleaning, there are many things that you can do throughout the summer to ensure that your A/C unit works efficiently.

- **Efficient thermostat settings** are one of the easiest and most effective ways to save money on cooling costs. For each degree Fahrenheit you raise your thermostat, you can reduce your A/C unit's energy use by 3% to 5%. For example, if you raise your thermostat from 74° F to 78° F (the setting recommended by the Department of Energy), you'll automatically save 12% to 20% on cooling costs. You should never set the thermostat any lower than 72° F. If you must leave your A/C unit on overnight, set the thermostat slightly higher than usual (ideally 78° F to 80° F).
- **Choose a good location** for the outside portion of your central A/C unit or window unit. Avoid unshaded areas on the south or west sides of your home. It's best to put this unit on the north or east side of your home, where it will be shielded from intense sunlight. Doing this will automatically increase its efficiency by 10%.

If it isn't possible to place your A/C unit in one of these locations, shrubs or trees can be planted by the unit to provide natural shade. Be careful, however, not to plant shrubs too close. Leave four to five feet of open air between any shrubs or trees and the unit to ensure proper ventilation.

- **Keep the grass around central A/C trimmed** so that air can circulate properly. When mowing around the unit, be careful not to blow debris or grass clippings into it.

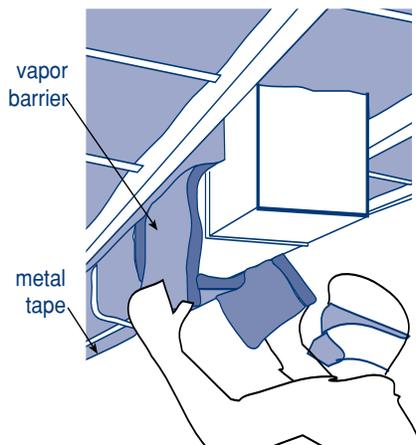


Figure 12: Seal joints on ducts with mastic or an approved tape. Then wrap insulation around the duct.

- **Avoid locating the indoor thermostat near windows or heat-generating appliances** like ovens and refrigerators. Also, keep lamps and televisions away from your thermostat. The heat from these can “trick” your A/C unit into thinking that your house is warmer than it actually is, thus forcing the unit to run more often than necessary. The ideal location for the thermostat is in the room where you spend the most time.
- **Clean and/or replace the filters on your A/C unit.** This can dramatically increase your savings and reduce the load on your A/C. Dirty filters cause your A/C unit to work harder when circulating air and leads to both higher energy bills and a shortened life span. Some types of filters can be rinsed out and reused.
- **Check your air ducts for leaks and obstructions.** A recent study of residential central A/C systems found that almost 100% of homes had leaky ductwork, which means that there’s a good chance that your A/C system is losing some of its cooled air. Duct system leaks can account for up to 25% of the energy your central heating and cooling system uses if your ducts run through an unheated basement, attic or under a trailer home.

Most air leaks in central A/C units occur in the return air plenum. Plenums are the large ducts above or below the air handler. When these leaks occur, warm air is pulled into the system and the cooled air is heated up. If your central A/C system is unable to cool your home satisfactorily, leaky ducts may be the cause. Ducts can be sealed and insulated and thus improve your A/C systems efficiency (Figures 12 and 13).

- **Use the correct refrigerant charge.** This can greatly affect your air conditioner’s efficiency. A system that is undercharged by 10% may have a drop in efficiency of 20%. By the same token, the refrigerant should never be overcharged because it can cause the refrigerant and oil to flood and damage the A/C unit.

Only a professional service person should check and recharge your air conditioner’s refrigerant. Refrigerants never “wear out” and refrigerant coils are completely sealed, closed systems. Therefore, if your refrigerant coils were properly charged during installation, but later need to be recharged, you have a leak in the system. Failure to repair the leak has two consequences: First, it allows refrigerants to leak into the atmosphere and damage the ozone layer. Second, moisture can enter the A/C system and combine with the chlorine and fluorine in the refrigerant to form acids which, over time, will damage the A/C’s compressor and coils.

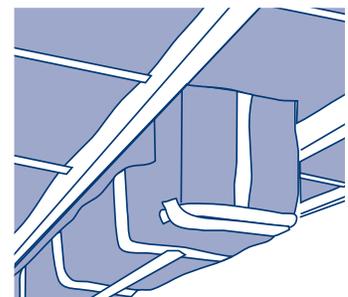


Figure 13: Create a continuous vapor barrier on the ducts by sealing the insulation seams with metal tape.

Most Common Problems for Central A/C Systems

- A/C equipment sized incorrectly
- Ductwork leaky or improperly sized
- Dirty condenser coils
- Improper refrigerant charge
- Location is in direct sun
- Trees and shrubs too close to unit
- Dirty filters

- **Clean the indoor and outdoor coils of your central A/C system.** These coils are the heat exchangers between the refrigerant and the surrounding air. The indoor coil is cold, and as air moisture condenses on it, it filters out impurities which can build up very quickly and hamper the coil's performance. A recent study found that indoor coils lose about 8% of their efficiency each year due to dirt buildup. Indoor coils are sometimes difficult to find and access and extremely fragile. However they can be cleaned with a soft cloth and warm, soapy water. Outdoor (condenser) coils are easier to reach and can be cleaned the same way. Both types of coils need to be treated gently. If you have any questions on your A/C unit's care, consult the manufacturer's recommendations.

BUYING A NEW COOLING UNIT

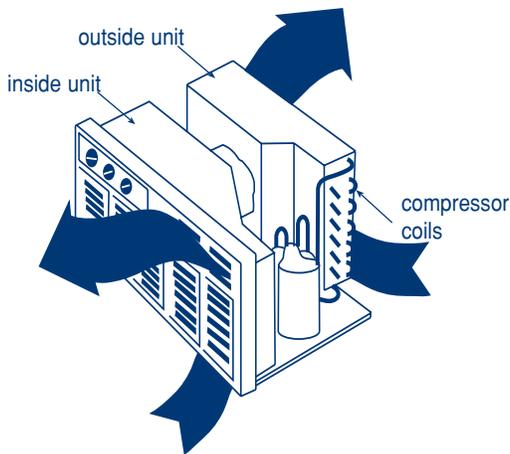


Figure 14: Room air conditioner.

If your existing A/C unit is more than 15 years old, it's probably inefficient and you should consider replacing it with a newer unit. This is also true if your current system has compressor problems, or if the cost of repairs approaches the cost of a newer unit.

When buying a new home-cooling system, there are three primary considerations to keep in mind: efficiency, type and size. In Arkansas, there are two prevalent types of air conditioners used: room air conditioners and central air conditioners.

Heat pumps and ground-source systems are other options to consider. These units provide high-efficiency cooling, as well as heating. As heat-pump technology has developed, their reliability and popularity have increased.

Common Types of Air Conditioners

Room air conditioners, also called window units, are small units that mount into a window frame or a hole cut in a wall (Figure 14). Room A/C units are designed to cool one room at a time, and multiple units may be required to cool an entire house. Room A/Cs are a good choice if you only need to cool one or two rooms regularly, if you live in an apartment, or if you live in a small, well-insulated home.

- **Pros:** They're moderately inexpensive and easy to install, though some models require special mounting brackets. In most cases, you can do the installation yourself. They can be less costly to run than a full-sized central A/C unit if their use is limited.

- **Cons:** If the unit is not mounted in a wall, you'll lose the light, view and natural ventilation from the window in which the unit is mounted. The openings around the unit, whether it's mounted in a window or a wall, must be sealed to prevent air leaks. Additionally, because the compressor is integrated into the unit, room A/Cs can be fairly noisy. Also, the thermostat control doesn't accurately reflect the room temperature, so manual control is needed to prevent over-cooling. Finally, two window units can be more expensive to operate than an efficient central air unit.

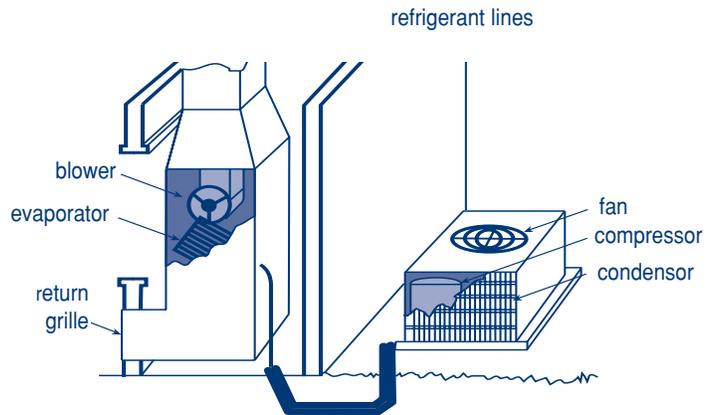


Figure 15: Central Air Conditioner.

Central air conditioners are larger and have components both inside and outside the house (Figure 15). They are permanent home appliances. A central A/C unit is designed to cool an entire house and often uses the existing heating duct system to circulate the cooled air. They are advantageous if you need to cool at least three or four rooms regularly.

- **Pros:** A central A/C is fairly quiet when in use because the compressor unit is located outside. If you already have a forced air heating system, you can connect the central A/C unit to the existing ductwork. They are easy to control with a wall thermostat. You don't lose any light or ventilation from your windows.
- **Cons:** Central A/Cs require installation by a qualified contractor. Proper sizing is critical. If you don't already have a forced-air heating system, ductwork will have to be installed. The existing ductwork must be properly sized and free of leaks and obstructions for the system to work efficiently.

Heat pumps are like conventional air conditioners except they also can provide heat in the winter. There are a variety of types of heat pump technologies on the market.

Ground-source heat pumps (GSHP) provide cooling, heating and hot water. GSHP are extremely efficient and have documented efficiencies up to 400%. That means for every dollar of energy spent, a GSHP supplies \$4 worth of cooling or heating. They have a high first cost but are extremely durable, if properly installed, require little maintenance and can last up to 20 years. A GSHP does not burn fuel to make its heat; rather, it moves heat from the earth into the home in the

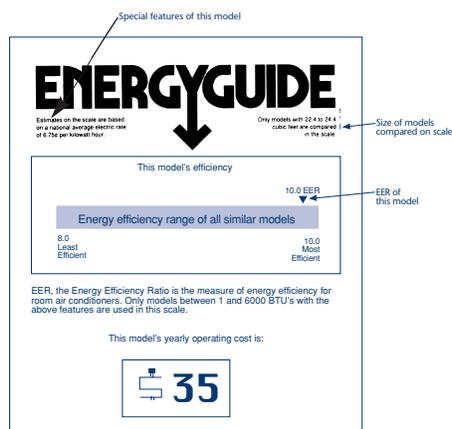


Figure 16: Sample EnergyGuide.

wintertime and from a home into the ground in the summertime. GSHP are relatively expensive to install, and their payback periods vary according to local electric costs.

Air-to-air and add-on air-to-air heat pumps are another high-efficiency option to consider that is less expensive than ground-source heat pumps. When added to your present furnace, these heat pumps can cool your house in the summer and help with the heating load in the winter. These types of heat pumps collect heat from the house in the summer and expel it outside. In the winter, the heat pump extracts heat from outside air and circulates that heat inside the house. These types of heat pumps work best when the outdoor temperature is above freezing. Below that temperature, supplementary heat often is needed. Over the past few years, heat-pump technology has become more reliable, and as a result, a growing number of homeowners in Arkansas are switching to heat-pump technology to cool and heat their homes.

Bigger Isn't Necessarily Better

Once you've settled on the type of air conditioner you want, choosing the right size unit for your needs is very important. The size of most A/C units is measured in terms of BTUs per hour, though some central A/C units and heat pumps may also be rated for tons of cooling capacity (a ton is equal to 12,000 BTUs per hour). Air conditioners are designed to cool a fixed amount of space efficiently. Oversizing a residential A/C system by 50% will cause a 10% increase in energy consumption. Not only do oversized units consume more energy, but they also remove less moisture from your home.

The best way to reduce the required amount of cooling capacity, and the size and cost of the A/C unit needed, is to tighten your home with caulk and weatherstripping and have it properly insulated. Ask your heating and cooling contractor to perform a Manual J calculation to correctly size the system for your home.

Efficient Models Save Money

Along with the type and size, energy efficiency is an important consideration. Buying an inefficient model will guarantee high electric bills over the unit's lifetime, which could be many years.

Look for the yellow **EnergyGuide** label on all new A/C units (Figure 16). For room air conditioners, these labels display the efficiency rating in terms of the unit's EER, or Energy Efficiency Ratio. This is a measurement of the A/C unit's cooling efficiency based on the ratio between the cooling output (in BTUs per hour) and the electrical

power input (watts). Most new room air conditioners have EERs of 9.5 to 10.5. An EER of 11 to 12 represents very high efficiency. **EnergyGuides** are useful for general comparison, but note that the stated energy costs may not accurately represent your energy costs as your A/C usage and lifestyle and comfort zone may vary.

To further increase energy savings, look for ENERGY STAR[®] labeled products.

ENERGY STAR[®] labeled room air conditioners and central air conditioners can help save money on utility bills through superior designs that require less money and energy to keep your home cool and comfortable.

ENERGY STAR[®] labeled room air conditioners feature high-efficiency compressors, fan motors and heat-transfer surfaces. In an air conditioner, air is cooled when it passes over refrigerant coils, which have fins similar to an automobile radiator. The compressor sends cooled refrigerant through the coils, which draw heat from the air as it is forced over the coils. By using advanced heat-transfer technologies, more heat from the air is transferred into the coils than in conventional models, saving energy required to compress the refrigerant. ENERGY STAR[®] labeled room air conditioners must exceed minimum federal standards for energy consumption by at least 10%.

Buy the right size:

Many people buy an air conditioner that is too large for the space, thinking it will cool better. An oversized air conditioner is actually less effective than a correctly sized unit and wastes energy at the same time. Air conditioners remove heat AND humidity from the air. If the unit is too large, it will cool the room quickly, but remove only a portion of the humidity. This leaves the room with a damp, clammy feeling. A properly sized unit will remove humidity effectively as it cools. Running a smaller unit for a longer time will use less energy to completely condition a room than running a larger unit for a shorter time.

Adjustments to make:

- If the room is heavily shaded, reduce capacity by 10%.
- If the room is very sunny, increase capacity by 10%.
- If more than two people regularly occupy the room, add 600 BTU/hr for each additional person.
- If the unit is for a kitchen, increase capacity by 4,000 BTU/hr.



Area to be Cooled (Sq. Ft.)	Capacity (Btu/Hr)
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
500 to 700	14,000
700 to 1000	18,000



ENERGY STAR[®] estimates that, on average, a properly sized and installed **ENERGY STAR**[®] labeled central air conditioner uses 20% less electricity than a standard, new, central air conditioner, or about \$50 per year or \$650 over its lifetime. However, results will vary based on use and climate, with warmer regions likely realizing greater savings.

Studies show that one-third to one-half of home air-conditioners don't work the way they should because they are oversized. Since energy use creates pollution, by increasing the efficiency of our central air-conditioning units being installed, and by properly sizing our equipment, we can dramatically reduce energy consumption, reduce pollution and utility bills.

To find out more about **ENERGY STAR**[®] — labeled products, call the **ENERGY STAR**[®] Hotline toll-free at 1-888-STAR-YES (1-888-782-7937) or visit <http://www.energystar.gov>.

What's a SEER?

The SEER is a central A/C unit's Seasonal Energy Efficiency Rating. Unlike the EER, the SEER estimates a unit's performance over an entire cooling season, rather than measuring its performance at a given temperature and humidity level. In short, it measures the seasonal performance of the unit based on the cooling accomplished (in BTUs of energy) divided by the electricity consumed (in kwh).

$$\text{SEER} = \frac{\text{BTUs cooling provided}}{\text{seasonal kwh consumed}}$$

A minimum SEER of 10.0 for central air conditioners is required by the National Appliance Efficiency Standards. There is a wide selection of units available with SEERs up to 17.

You can save a lot of money and energy by upgrading an older, less-efficient system. For example, replacing a 1970's vintage central air conditioning unit (SEER = 6) with a new unit having a SEER of 12 should cut your air-conditioning costs in half.

Depending on the use, cost of electricity and the temperature, these savings can actually pay back the cost of a new system within a few years. In general, central A/C systems are more efficient than room A/C units. Once again, however, an oversized system will waste money and energy.

Shopping Tips

It's a good idea to ask your neighbors and friends with a similar lifestyle and home style about their systems, how long they've had them and how much they cost to run. Check the consumer review publications at your local library, as well as your local utility, to find the most energy-efficient models. Then shop around for an air conditioning contractor to install a central A/C system, or a reputable dealer for a room A/C unit. If you're having a central system installed, get bids from three or more contractors and check their references.

Disposal and Recycling of Your Old A/C Unit

In the past, discarded appliances were often dumped in landfills or even in ditches and creek beds. Very few were recycled and the hazardous materials in discarded appliances contaminated the soil and ground water. Today, appliances must be disposed of in accordance with state and federal guidelines. In particular, refrigerators and air conditioners require special handling during the disposal process.

This is because the refrigerant used in these older appliances contain CFCs (chlorofluorocarbons). Once released into the atmosphere, CFCs damage the ozone layer that shields us from the sun's radiation. Since 1989, CFCs have been phased out and banned throughout the industrial world, and all new refrigerators and A/C units must use non-CFC refrigerants.

Disposing of an air conditioner involves the careful removal of CFCs by a certified technician. The oil from the compressor crank case also needs to be removed. The motor and copper tubing can then be removed for separate recycling. A/C units manufactured before 1978 may have oil-filled capacitors contaminated with toxic PCBs (Polychlorinated biphenyls), a substance now banned in the U.S. These components must be removed and taken to a hazardous-waste facility before further processing can occur. Finally, there may be temperature gauges and switches that contain small amounts of mercury, another extremely toxic substance. Once these hazards are removed, the remaining materials are segregated and recovered according to the recyclability of their materials.

If you have an old A/C system that you want to dispose of safely, and to properly dispose of any large appliances in Arkansas, check with your city or county solid waste director or local elected official. Arrangements can be made to pick up the appliance. This will ensure that the appliance will be properly recycled.

INFORMATION SOURCES



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Wilson, Alex and John Morrill. *Consumer Guide to Home Energy Saving*. American Council for an Energy Efficient Economy, 1995, pp. 113-142.

ADDITIONAL RESOURCES



- U.S. DOE Energy Star: <http://www.energystar.gov>
- ADED Energy Unit: www.1800ARKANSAS.com/energy/
- Florida Solar Energy Center: FSEC www.fsec.ucf.edu

This is an Iowa Energy Center publication.



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