

My Florida Home Book 2.4: Taking Care of Home Systems¹

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Electrical System

When you first move into your house, find the main electrical shut-off switch. In an emergency, you may have to shut off power to your house. Also, find the electrical control box or circuit breaker box. Locate the electrical meter where the electrical utility company will "read the meter" to determine your power usage.

Electrical Circuits

Electrical circuits (wiring) provide electricity to lighting, appliances, and outlets. Lamps, televisions, computers, and other equipment are plugged into outlets. Too many items plugged into a circuit may overload the circuit. If damage occurs to the equipment or house wiring, a "short circuit" may occur. A "short circuit" is a very dangerous overload to the house electrical system.

Circuit Breakers

A circuit breaker protects a house from overload. The circuit breaker trips a switch before a dangerous temperature is reached in the wire. An electrical control box or circuit breaker box has one circuit breaker for each circuit in the house. Figure 1 is an example of a typical circuit breaker box.

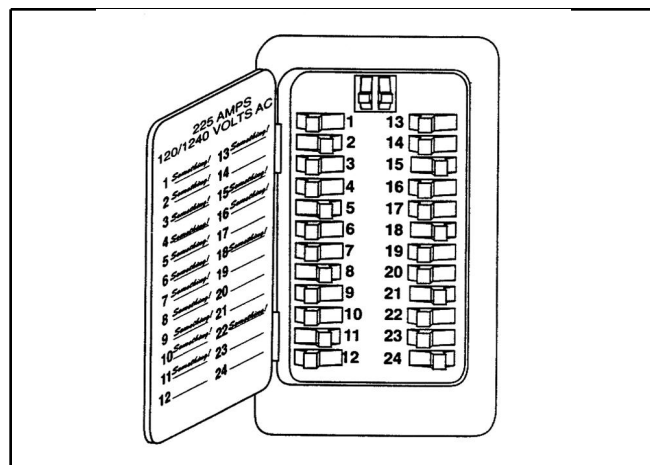


Figure 1. Electric Circuit Breakers

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Look at your electrical control box. Are the circuits labeled? If not, you will need to label each circuit yourself. Here is how to do it:

1. Turn off one circuit breaker switch at a time.
2. Go through the house with a lamp to plug into every outlet.
3. Check which appliances and outlets are not working. Those outlets and appliances are on one circuit.
4. Label that circuit in your electrical control box or circuit breaker box.
5. Repeat for each circuit breaker switch.

Power Outages

If electrical power goes off all over your house, first check if the neighbors are also affected. If so, you may need to report the problem to your power company. If your home is the only one affected, you may have a circuit overload in your house. Here is how to check the problem:

- Look in the electrical control box and find the circuit breaker switch that has tripped. (When a breaker is "tripped," the lever in the circuit breaker panel is halfway between the off and on position.) If any breaker is tripped:
 - Check the circuit breaker switch labels to see which circuit has a problem.
 - Check to see why the circuit breaker switch has tripped. (If too many appliances or equipment are being used at the same time, move one to another circuit.)
 - Reset the breaker tripped by switching it all the way to the "off" position, then back to its "on" position.
- Find the mainline switch for your home (often located under the electrical meter or in your circuit breaker box). Reset the switch by turning it off and on two times.
- Turn all breaker switches to their "on" positions.

- Turn all breakers on inside the panel.
- If electricity does not come back on, call your power company.

If any breaker trips repeatedly, do not reset it since this may signal a serious wiring or equipment problem. Call an electrician for service. If the circuit breaker for your air conditioning system trips, wait five minutes before resetting it to prevent motor damage.

When Simple Solutions Don't Work

Power outages and electrical disturbances can be caused by problems within your home, such as: circuit overloads, electrical short circuits and home wiring damage. If the solutions here don't work, or you suspect you have electrical problems at your home, **contact a qualified electrical contractor or electrician.**

Ground Fault Circuit Interrupter

Ground fault circuit interrupters (GFCIs, Figure 2) are designed to protect people from shock that can happen before a circuit breaker switch trips. For example, a curling iron dropped in a bathtub will electrocute a bather. Even a circuit breaker switch cannot act fast enough to help in such a case. National Electric Code (NEC) requires GFCIs be installed in all receptacles in wet locations including outlets in bathrooms, kitchens, crawl-spaces, garages, boathouses, unfinished basements, outdoors, and within 6 feet (1.8 m) of a wet-bar sink, with limited exceptions.

Heating and Air Conditioning Systems

One of the most expensive systems to replace in your home also happens to be the biggest cost on your utility bill. HVAC, which stands for **H**eating, **V**entilation, and **A**ir **C**onditioning. An air conditioner does two things—it cools the air, and it dehumidifies (or removes moisture from the air). In Florida, both jobs are very important since the state is hot AND humid.

Air conditioners and heat pumps work similarly to provide cooling and dehumidification. In the

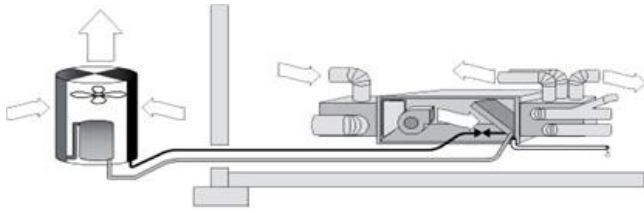


Figure 3. HVAC airflow in a split system Credits: Georgia Environmental Facilities Authority

The second unit is called the air handler and this is where the evaporator coil and blower are housed. This is where the air passes over the coils to cool and dehumidify the air, and then blow it back through the ducts into the home's living spaces. This is also where the condensate pan is located. The condensate pan is where the moisture that is collected from the air waits to be drained to the outside.

Maintaining the efficiency of the system is key to maximizing the system's performance while still keeping your bills as low as possible. To ensure your air conditioning system operates efficiently, it must be properly installed at the beginning. As a result, this is not a do-it-yourself project; rather, leave it to a qualified HVAC professional who will be aware of local building codes.

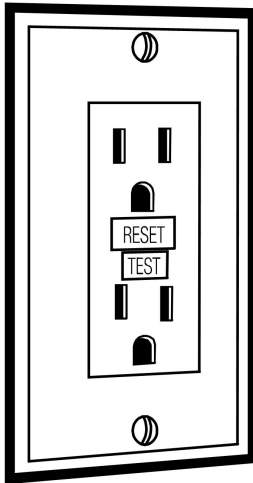


Figure 2. Ground Fault Circuit Interrupter, or GFCI

summer, they extract heat from inside the home and transfer it outside. In winter, a heat pump reverses this process, extracts heat from outside, and transfers it inside.

Unless you have a window unit, most air conditioning systems are installed as split systems. The part that sits outside of the home (usually on a slab on the side or at the rear of the home) is called the condensing unit. (See Figure 3 for a diagram of the airflow in a split system.)

The condensing unit is the noisiest part of the air conditioner and uses the most energy. If possible, try to place this unit in the shade to keep it cool. Planting trees to shade the condenser is helpful, but be aware that it needs to be kept free from plants or other debris that might restrict airflow. To allow the unit to circulate freely, take care not to plant bushes or other vegetation too closely. Thin metal strips called fins direct air into the unit. If these fins become bent, they too will block airflow and cause the unit to work harder. Fins can be straightened with a fin comb.

SEER

SEER stands for **Seasonal Energy Efficiency Ratio**. It is a number that describes how well an air-conditioner works. A higher SEER means better efficiency and lower electric bills. The minimum requirement according to Florida Building code is 13 SEER. The SEER rating only refers to the performance of the condenser and evaporator equipment together. These are not all-in-one systems. Contractors may "mix 'n match" to construct your system. Look for the ENERGY STAR® on cooling equipment, which designates equipment that is more efficient than the government minimum standard. Visit <http://www.energystar.gov> for more information on standards, since they change as technology improves.

SHR

In Florida, selection of SEER rating must also be balanced with the **Sensible Heat Ratio/Fraction (SHR, or SHF)**, which is the air conditioner's ability to remove moisture from the air. Some high SEER air conditioners may not provide sufficient dehumidification for our hot and humid climate. The information about SHR is not typically in the normal

product literature, so have your HVAC professional check the equipment specification sheet. For most Florida homes, University of Florida/IFAS (Porter, Lee & Ruppert, 2008) recommends a SHR of .70, which means that 70% of the air conditioner's energy is going into cooling the air and 30% of its energy is going into removing moisture.

Sizing

Correct sizing of the air conditioner is important in ensuring the unit runs long enough to dehumidify and properly cool your home without frequent stops and starts. Your HVAC installation professional should use *Manual J* as well as other standard guidelines for the calculating the cooling load required for your home. Not only is proper sizing important for comfort, but the purchase price of air conditioning units increases with size (which is measured in tons). Consequently, a home requiring less tonnage will not only cost you less to buy, it will also perform better. Do not rely on rule-of-thumb methods to size HVAC equipment, and do not hire a contractor who relies on these methods. The heating and cooling load calculations used in the *Manual J* and companion texts take into account the exact area and type of construction, as well as other considerations like number of people occupying the house, number of lights, type of appliances and other equipment, etc. Assessing all of these factors will go a long way towards selecting the right system for you.

Location

If you plan to have a new HVAC installed, remember that location of its primary components will affect the system's efficiency. The Consortium for Advanced Residential Buildings has tested homes with HVAC systems in multiple locations to determine the best ways to increase efficiency and reduce waste. According to their results, an HVAC system placed in the home's center is closer to the rooms it is intended to cool, requires less ductwork, has shorter distances for the conditioned air to travel, reduces heat transfer losses, and costs less to operate.

When considering location and design of your HVAC system, you should know that

- if a unit is placed in the garage is insufficiently sealed, it may actually pull the pollutants into the house;
- a unit placed in the attic increases the energy consumption and is more difficult to access for maintenance; and,
- if a malfunction occurred with the condensate pan (of a unit in the attic), it would cause damage to ceilings and walls.

Ductwork

Ductwork is the delivery system for the cooled or heated air throughout the home. It can be made of sheet metal, fiberglass board, or a flexible plastic and wire composite. Ensure tight ducts to help your air-conditioner work at its peak and to prevent pollutants from entering your home. Ducts need to be sealed properly using special mastic (UL 181 approved) that seals and joins two pieces of material together and remains flexible over time. Mastic looks like a drywall joint compound. Duct tape should never be used to seal ductwork as it loses its adhesive properties and falls away in high heat situations like an attic. Duct insulation does not provide an airtight seal. An efficient duct layout contains one or more central supply trunks with multiple take-offs and foregoes the octopus-looking layout.

Filters

Filters are another component of the air conditioning system. Filters screen the air that passes over the coils. If the air that flows over the coils is dirty, it may deposit the debris on the coils. A layer of dust and dirt will make it harder to transfer the heat and thus will cause the equipment to work harder, costing you more money! This filter is for the equipment's sake, so change it at least monthly, if not more frequently. A good filter will be pleated and will list its dust spot test results that indicate the filter's ability to catch particles in the air. The higher the percentage, the better removal ability the filter provides. Medium-efficiency filters catch 30–50% of air particles, and high-efficiency filters 50–95%. "Absolute" filtration is a class by itself where dust spot efficiency is always above 95%. Don't rely just on the word "arrestance" on a label to determine

whether it is a good filter. The HVAC unit is one of the more costly pieces of equipment in your home, so careful selection of your filters will help to protect your investment.

Programmable Thermostats

These are a great invention as they allow setback temperatures during times when the home is unoccupied. They must, however, be programmed in order to work. The thermostat should be centrally located but should not be placed near an item producing heat, directly in sunlight, or the airflow coming from a duct. When using air conditioning, the higher the temperature the more money you will save—if you set the thermostat just two degrees warmer and use ceiling fans to circulate the air while you are at home, you will save a good amount on your monthly utility bills (see the following section on ceiling fans below). When you are away from the home, set the temperature five degrees up from the occupied setting. It should not take long to bring the temperature back to your comfort zone once you return.

Ceiling Fans

The least energy demanding cooling systems are air movers. Ceiling fans cool the body by increasing airflow across your skin, which aids the body's evaporative cooling process. The cooling effect of a fan is directly related to the speed of the air, which increases the evaporative cooling. Using ceiling fans in the summer helps you feel 2–4 degrees cooler. If you are not in the room, turn off the fans as they do not cool the air, they only move it around.

Servicing

- Coils are made from aluminum. Aluminum is the third most reactive metal on the element chart, so cleaning becomes a critical task when it comes to protecting your expensive equipment. There is a condensing coil on the condensing unit (outside) and an evaporator coil on the air-handling unit. A service contract to clean during the spring and/or fall is recommended. It usually takes a couple of hours because the coils are hard to reach. They should be cleaned carefully with a mild, non-corrosive chemical solution and a soft brush.

- Air leakage can occur through the walls where windows and doors are framed, where brick or siding overlaps the foundation wall, around any penetrations of the outside wall (faucets, electrical outlets, water pipes, etc.), and where chimneys join the outside wall. It can also occur through the attic where insulation is inadequate or not installed properly. Besides wasting dollars on energy bills, leakage can create poor indoor air quality, provide an entrance for hot, dirty, moist air as well as pests, and can also increase the spread of fire. Utilize expanding foam sealant, insulation, weather-stripping, and caulking to prevent air leakage into the home.
- If you measure the temperature of the air coming out of a duct and the air temperature being drawn into the air handler, it should be a difference of 14–20°F. If there is a smaller difference, a service call is needed.
- Evaporator pans can be made out of metal or plastic. Be aware that metal rusts and plastic succumbs to "age fatigue." Ask your HVAC professional about the cost for a secondary drain pan.
- Be sure a clothes dryer is not vented within 10 feet of the outdoor unit. The lint will clog the fins and cling to the condensing coil.

Water Heater

Maintenance

Your water heater works 24 hours a day, 365 days a year. These appliances may use gas or electricity. Water heaters require periodic, routine maintenance for the best performance and longest life.

Drain the water heater tank twice a year.

When sediment builds up inside the water heater tank, it makes the water heater less efficient: the unit has to work harder to heat the water; wasting energy and costing more money. Drain the tank every six months.

- If you have an electric water heater, turn off the electricity to it. If yours is a gas water heater, turn the gas switch to pilot.
- Shut off the cold-water inlet.
- Attach a garden hose to the spigot near the bottom of the water heater tank.
- Run the hose outside the house or into a bucket.
- Open the pressure relief valve and the drain valve and drain the tank completely.

If the pilot light of your gas heater is difficult or impossible to light, you may need to call your gas company to repair.

Check the pressure relief valve twice a year.

A pressure relief valve is a safety device installed on both electric and gas heaters. This valve automatically opens and releases the pressure in case of a tank over-pressurizing. By doing so, it prevents explosion of the water heater. So, it is very important to check if it is working properly. Test the pressure relief valve every six months.

- If you have an electric water heater, turn off the electricity to it. If yours is a gas water heater, turn the gas switch to pilot.
- Shut off the cold-water inlet.
- Place a bucket for any water spills from the valve.
- Pull the trip lever on the valve. If you don't hear any slight rush of air, or observe water or vapor coming through the valve, you need to replace the valve.

Safety

When checking the pressure relief valve or draining the water tank, ensure your safety. Wear protective clothing such as gloves and goggles to prevent burning. Also, if you own a gas water heater, install carbon monoxide alarms near every sleeping space to prevent carbon monoxide poisoning.

Temperature Settings

Check the thermostat setting for your water heater. Water heaters are either gas or electric. High temperatures increase the chances of accidental burns to your skin. High temperatures cause more hard water deposits, which may shorten the life of the heater. The normal or medium setting (120 F) is usually adequate. Families with small children or older adults may want the setting lower. If you have a dishwasher, you may wish to increase the temperature to 135 F.

Plumbing System

Main Water Cut-Off

When you first move into your house, find the water main shut-off. Learn how to use the main shut-off in case of a plumbing emergency.

The main water shut-off valve in my home is located:
_____.

Sewer System Clean Out Opening(s)

When you first move into your house, find the sewer system clean out opening(s). Usually, these are outside on walls closest to the bathrooms.

The clean out opening(s) are _____.

Water Supply

A water main supplies water to your house. The water main connects to a water meter near the point where the supply line enters your property. A water meter records the number of gallons coming into the house. The meter may be either underground outside the house with a metal cover for access, or inside where the supply pipe comes into the house. Close to the meter is the main water shut-off valve. It shuts off all the water coming into the house. **You should learn how to shut off the water.** Call the utility company or city water department if you need help doing this.

If your home has a well, you will need a pump to supply water and add pressure. Except for no water meter, all the rest of the basic information provided here about your water supply system is the same.

Plumbing

Sinks, toilets, showers, and bathtubs are the standard plumbing fixtures in a house. Most of these fixtures have individual shut-off valves near each fixture. Find them so that you will not have to shut off water at the main shut-off when making a repair on only one fixture.

Vents and Drainage

The drainage system carries used water and waste from the house into a sewer line. The sewer line goes to the city sewer system or your septic tank. Other parts of the drainage system include air vents, traps, and cleanouts.

Proper venting is important. If air vents are clogged or blocked, having no air in the drain could cause too much water to rush out of a trap. Then sewer gas can backup into a house.

Curved pipes under sink drains are called traps. When the sink is emptied, the water has enough force to push through the trap and into the drainpipe. Water is still left in the trap and provides a seal against sewer gas backup.

Some traps have cleanout plugs that allow easier access to clogs (hair, grease) than traps without cleanouts.

Safety System

Smoke Alarms

Homes that have smoke alarms warn family members of smoke and fire hazards.

The location of my smoke alarm is _____.

- **Battery-operated** smoke alarms work with regular alkaline batteries. The battery must be changed at least once every year. As a general rule of thumb, change the battery/batteries on the same day you have to change your clocks every autumn and spring.
- **Hard-wired** smoke alarms are part of the house electrical system, just as your electrical outlets are. *Hardwired smoke alarms will not work if your home is without power.*

- **Since heat and smoke rises**, smoke alarms should be positioned in high locations such as on or near the ceiling.

Here's how to check your smoke alarm for proper operation:

- Make sure the light is blinking about once a minute.
- Check the alarm by pressing the test button on the alarm for 5 seconds. The alarm should sound.
- Never use a flame to test the smoke alarm. It could damage the alarm and render it ineffective.

Carbon Monoxide (CO) Alarms

Carbon monoxide (CO) is a colorless, odorless and tasteless gas that can be very dangerous to people and pets (See *My Florida Home Book 2.2: Keeping Your Home Healthy - Indoor Environments and Health of Household Members*). CO alarms look similar to smoke detectors. You can purchase CO alarms in most hardware or discount stores for \$20–50. When shopping for a CO alarm, make sure you choose one with a UL label, which mean the device passed qualification testing by Underwriters Laboratory. Install CO alarms within 10 feet of every sleeping area, and each level of a multi-level home.

Florida building code (9B-3.0472) requires installation of CO alarms in every new building (construction permit issued on or after July 1, 2008) with a heater or appliance powered by fossil fuels, a fireplace, or an attached garage. The requirement states that new structures shall have an operational CO alarm installed within 10 feet of each room used for sleeping purposes. In new construction, the CO alarms should receive their primary power from the building wiring when such wiring is served from the local power utility, but in addition, such alarms must have battery back-up. If you have CO alarms that are powered by batteries, replace the batteries every six months or as directed in the product instructions to ensure proper operation of the devices.

When you hear CO alarm sounds:

- Get outside right away.

- Call 911 using any phone outside your home to report the situation. Do not come back into your home to make the phone call.
- Seek medical attention immediately for the proper treatment.
- Do not return to your home until all problems are fixed and professionals confirm your safety.

References

Porter, W. A., H. Lee, & K.C. Ruppert. (2008). Energy efficient homes: Air conditioning (EDIS FCS3262). Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL. <http://edis.ifas.ufl.edu/FY1026>