

# ELECTRIC IDEAS

# POWER GUIDE



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# TABLE OF CONTENTS



<b>Introduction</b> .....	2
<b>Safety First</b>	
The nature of electricity .....	3
Staying safe outdoors .....	5
Call before your dig .....	5
Never go near a power line on the ground .....	5
What to do during an electrical storm .....	5
Safety tips for inside your home .....	5
Ground fault circuit interrupter .....	6
Emergency medical tips for electrical accidents .....	6
Trees on your property .....	7
If you have an electrical fire .....	7
What kids should know about electrical safety .....	8
<b>Power Outage</b> (what to do when the lights go out) .....	9
<b>Generators</b> (portable and permanent units) .....	12
<b>Power Quality</b> (for sensitive electronics) .....	14

**SAMPLE**

## USE ENERGY WISELY!

This publication was compiled from information provided by the Northwest Regional Group, a group of electric utilities in the Northwest. For additional information contact your local utility.

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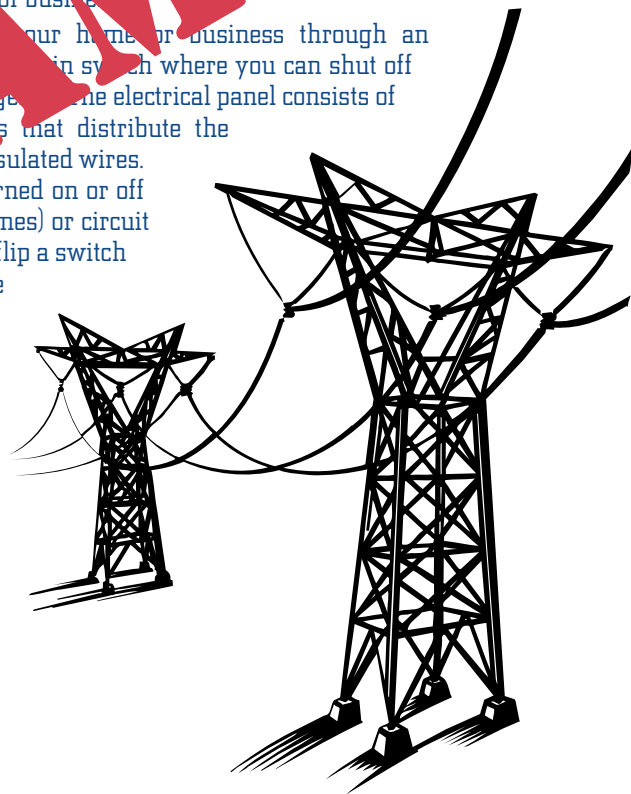
# INTRODUCTION

This Power Guide will help you better understand how the proper use of electricity can make your life safer both indoors and outdoors. Helpful tips are included to assist you in getting through power outages, using generators, protecting sensitive equipment, administering first aid to shock victims, and what you should do if you have an electrical fire.

## At the flick of a switch you have electricity — but where does it come from?

Electricity starts its journey to your home or business from a central generating point, which may be a hydroelectric facility, wind-generating station, power generating plant, or even solar generating panels. It is transmitted over high-voltage lines strung on tall towers for safety. **[High voltage power lines are not insulated and are therefore extremely dangerous.]** When they reach substations, transformers reduce voltage for distribution. From there the electricity follows overhead or underground distribution lines to more transformers, and then on to your home or business.

Electricity enters your home or business through an electrical panel with a main switch where you can shut off all power in an emergency. The electrical panel consists of a number of circuits that distribute the electricity through insulated wires. These circuits are turned on or off by fuses (in older homes) or circuit breakers. When you flip a switch on you complete the circuit, which will activate a light or appliance.



# SAFETY FIRST

*As a utility, safety is a primary concern for all of us — you, your family and neighbors, and our conscientious employees.*

## The Nature of Electricity

Electricity travels through conductors seeking the easiest path to ground (the common term for completing an electrical circuit). Good conductors include water, metal (like copper wire), and people. Why do you get shocked when you touch a wire? Your body is about 79% water. That's why electricity flows through you so easily. Electricity can overload your body's nerves, heart, or breathing, as well as cause severe burns. Secondary injuries resulting from falls or contact with equipment are also common.

## STAYING SAFE OUTDOORS

### Call Before You Dig

Severed power, phone, cable or gas lines can be very dangerous to you. If you plan to dig, call for a line locate before you start digging. See the back of this power guide for more information.



### Never Go Near a Power Line on the Ground

Remember that coming into contact with a power line can kill you. Walking near one that is energized and laying on the ground can be very dangerous, even when there may be no signs of electricity present. Electricity can jump as much as three feet, so stay well away from the line and keep others away as well. If the downed line has started a fire, never try to put it out with water — the water stream can create a path for the electricity to travel to you.

If a power line falls on your car, stay inside unless the car catches fire. Then jump clear without touching the car and the ground at the same time.

If someone is touching a fallen power line, stay away and call for emergency help. Don't try to rescue the victim. Efforts to pull a shock victim away could make you a victim. Always stay clear of the situation.

Metal fences can become electrified when a live wire falls on them. Don't touch them!

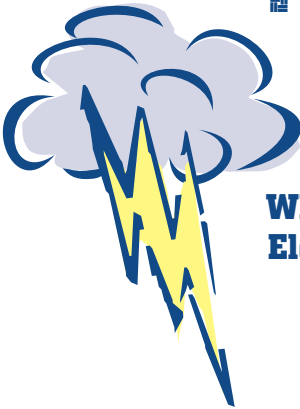
**Don't guess! Assume all downed wires are live. Stay away.**

## More Outdoor Safety Tips

- ☒ Keep ladders, antennas, kites, and poles away from the power lines.
- ☒ Use only outdoor rated lights, fixtures, and extension cords. Plug into outlets with a ground fault circuit interrupter (see page 6 for more information on ground fault circuit interrupters).
- ☒ Never use electric power tools or appliances when it is raining or there is water underfoot.
- ☒ Don't ever climb power poles, transmission towers, or trees near power lines. Don't let anyone shoot at or throw stones at insulators.
- ☒ Pad-mounted transformers are used in underground areas and are enclosed by sturdy metal cabinets that are locked for a reason. Never pry them open. If you find an unlocked door, call your local utility.
- ☒ Never build a swimming pool or other structure under power lines. Keep electrical equipment at least ten feet from a power pole wet surface.
- ☒ Watch for overhead lines when climbing fishing poles, mast fishing poles, or tall radio antennas could contact overhead wires.
- ☒ When skydiving, ballooning, paragliding, hang gliding, or flying model airplanes or kites, always check first for transmission lines and other overhead power lines.
- ☒ Keep power poles clean. Don't use them to attach signs to utility poles. Nails or tacks can cause climbing spikes to slip and create a dangerous situation for anyone, especially during an emergency. They also cause poles to rot prematurely.

## What to Do During an Electrical Storm

Lightning travels from clouds to the ground along the best conductor available and is usually attracted to the highest object. Don't be that conductor!



- ☒ If you are outside in a storm, seek shelter. The best place is a house. Jump in your vehicle, or if you are on a golf course, get in your golf cart.
- ☒ If caught in the open, seek low ground. Sit or lie down...it may be uncomfortable, but it may save your life.

## What Not to Do During an Electrical Storm

- ☒ If you are on a golf course or playing field, don't continue to play. Never hold a metal club or baseball bat in your hand.
- ☒ Don't swim. Get out of the water and if you are in a boat, get to land!
- ☒ Stay away from metal objects, they are lightning conductors.
- ☒ Don't stand under a tree. Instead of providing shelter, a tree can attract lightning. Never stand out in the open during a storm, sit or lie down if you must stay outside.

# SAFETY TIPS FOR INSIDE YOUR HOME

- Insulation materials make wiring safe, but frayed insulation or a broken wire can cause a dangerous short circuit and possibly start a fire. Touching a faulty appliance, plug, or bare wire can make you part of an electrical circuit and can be a shocking experience! Frayed wires are dangerous anywhere. They should be repaired at once, or better yet replaced by someone who knows how.
- Never overload a circuit. High-wattage appliances can blow fuses, trip circuit breakers, and can cause lighter wiring to overheat to dangerous levels. Check wattage requirements on appliance labels. Don't plug too many appliances into a single circuit.
- People are good conductors of electricity, particularly when water is added to the mix. Never use an electric appliance in the tub or shower. Don't touch an electric cord or appliance with wet hands, or wires you are standing in water or on a damp floor. Showers can be fatal.
- Never insert a metal object into an appliance without disconnecting it first. Metal conducts electricity.
- Turn your appliances off if you go away, particularly your clothes dryer and stoves or ovens. If it leaves energy, it may keep your home from burning down when you're gone.
- Know your appliances and power tools. Read and follow manufacturers' instructions. Be sure they carry the label of a national testing laboratory.
- Observe extension cord safety. Cords are for temporary use. Keep them away from moisture, heat, or metal pipes — and never under rugs.
- If you blow a fuse or trip a circuit breaker find out why. Is it a frayed wire? too many appliances on one outlet? or a defective appliance? If you can't find the answer, call an electrician. **Be sure the trouble is fixed before restoring power!**

## Use Power Tools Safely

- Power tools make life easier and are safe if you follow common sense rules. Check tools for wear or corrosion. Clean them regularly and inspect grounding connections.
- Use heavy-duty wiring with grounded three-pronged plugs.
- Keep your workshop and storage space clean and dry. Sparks can ignite scraps, sawdust, and solvents.

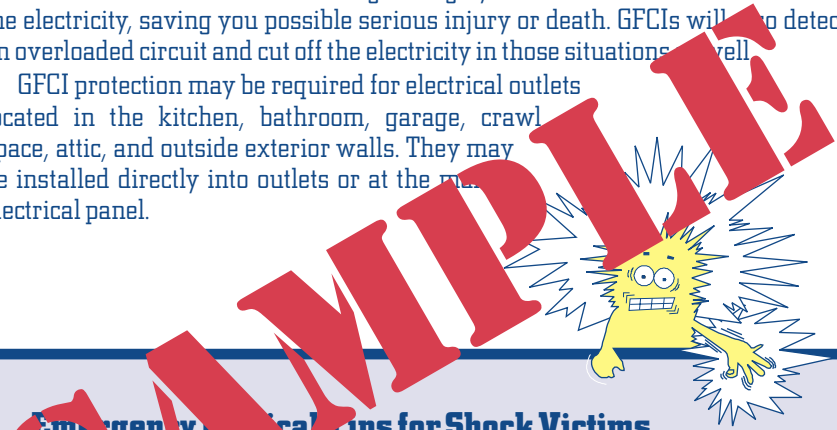


## Ground Fault Circuit Interrupter (GFCI)

A GFCI is a super sensitive switch for 120 volt wiring that will detect a very small change in electrical current and cut off the electricity in less than 1/30th of a second. For example: assume you are operating a power tool in a damp or wet location and your power tool becomes wet or malfunctions – the hot wire from the tool could short to the metal tool case and create a path for electric current through you to ground. A GFCI will sense the current flowing through you and cut off the electricity, saving you possible serious injury or death. GFCIs will also detect an overloaded circuit and cut off the electricity in those situations as well.



GFCI protection may be required for electrical outlets located in the kitchen, bathroom, garage, crawl space, attic, and outside exterior walls. They may be installed directly into outlets or at the main electrical panel.



### Emergency Medical Tips for Shock Victims

If someone is shocked: **DON'T PANIC!** Stay as calm as possible so that you can control the situation.

Don't touch anyone in contact with a power source – you could be shocked as well! If the victim is touching a power line, stay clear! Don't try to move the wire or the victim. **Remember: High-voltage power lines are not insulated. Call 911 for help.**

If the victim is touching a local source that you can control, unplug the equipment, or cut the power at the electrical panel. Then call for medical help and tell them it's an electrical injury.

If the victim is not breathing, apply mouth-to-mouth resuscitation or cardiopulmonary resuscitation\* (CPR). Then cover victim with a blanket, keep their head low, and get medical treatment as soon as possible.

Check for burns. Cool minor burns with cold, running water. Don't touch the burn, break blisters, or remove burned clothing. Cover minor burns with a sterile bandage. Don't use ointment, butter, or ice. Get medical help, electrical burn damage may not be immediately apparent.

\*If you don't know how to apply CPR, call the hospital or contact the Red Cross for information about where to get instruction.

# TREES ON YOUR PROPERTY

Storms can bring trees and limbs down on power lines disrupting service and creating very hazardous conditions. Most unscheduled power outages are caused by storms. Even in good weather a tree growing too close to a power line can endanger lives. **Report any hazardous conditions to your utility.**

## Selecting and Planting Trees Near Power Lines

Selecting “power-friendly” trees helps reduce unscheduled power outages and saves countless hours of pruning. When planting near power lines, choose trees that will grow no higher than 25 feet at maturity. Larger trees should be planted more than 30 feet away from power lines. If there are underground lines in your area, call for a line locate before you dig – see the back page for more information.

If you have internet access, log-on to the website [www.powerfriendly.org](http://www.powerfriendly.org). You will find an interactive page that lets you explore options for tree shape and size, and fruit. Or, you can call your nursery for their suggestions.



## Staying Alive

If you need to trim or fall a tree growing into or near a power line, call your utility to make arrangements to de-energize the power line while you do so.

Any object near a power line can be dangerous – especially ladders and pruning tools. Take special care when carrying ladders underneath power lines, and avoid leaning ladders against limbs – the weight of a ladder or a person on it could bring a tree limb in contact with a power line.

Always assume that a line is energized. And remember that high-voltage power lines are not insulated. Any object touching them – including tree branches – can conduct a lethal electric charge. Objects coming too close to a line can also cause electricity to “arc” across the gap.



## If You Have an Electrical Fire

If an electrical fire starts in an appliance, pull the plug out by the cord or turn off the power at the electrical panel. If an electrical fire starts in a wall outlet or in the wall itself, turn off the power at the electrical panel.

If the fire is very small, use your home CO<sub>2</sub> fire extinguisher or baking soda. Never put water on an electrical fire.

If you're in doubt, **CALL 911**, give them your address and tell them it's an electrical fire, then get out – and take everyone with you.

Once the fire situation is controlled, call a qualified repair person to correct the electrical problem. **Do not turn the power back on until the problem has been fixed!**

# WHAT KIDS SHOULD KNOW ABOUT ELECTRICAL SAFETY!

First and foremost, make sure they understand the basics of electricity. In a simple way, teach them about where electricity comes from, how it gets to your home (see the information on page 2), and the rules of conductivity (see page 3 under The Nature of Electricity). If they understand why and how they can be shocked, there is a better chance that they will take the proper steps to keep that from happening.



## Flying Kites, Model Airplanes, and Balloons

- Play in an open field, never near overhead lines. Never use anything made of metal in a kite or model airplane.
- Never fly a kite on a day with a wet string or when conduct lightning.
- Never try to move a kite, model airplane, or balloon that is snagged on a power line.

## Climbing

Kids love climbing, but they are asking for trouble if they climb utility poles. There are no second chances with high-voltage power lines. Remind them that electricity can arc, and even if they don't touch a power line, they can still suffer a fatal shock.

- Climbing trees only where there are absolutely no wires present. Trees conduct electricity quite well. Even if a tree is not touching the lines, a child's weight on a branch can bring it into contact with live wires.

## Stay Away and Stay Alive

- Stay away from substation fences or electrical equipment. Don't use insulators on electrical equipment for target practice.
- Don't go near power equipment for any reason, even to get a toy. Tell them to ask an adult to call the electric company.
- Stay away from any fallen lines.

## Don't Be a Conductor

- Electrical outlets are for electrical plugs only. Never play with electric cords and plugs. They can be dangerous. Never play with wires, plugs, switches, or anything electrical. Tell them to report any hazards to an adult.
- Water and electricity don't mix. Be careful with electric appliances, especially near water! Never play an electric radio or TV near a bathtub or sink. Never touch anything that runs on electricity when your hands are wet. If you are in the bathtub or standing on a wet floor, never touch anything electrical.

# POWER OUTAGES

*When the lights go out – don't be afraid of the dark!*

The mission of your utility is to provide you with safe reliable service – day and night. Employees are constantly at work maintaining or replacing worn equipment, trimming and removing trees from the power lines, and upgrading the utility's power system.

Even with a modern and well-maintained system every electric utility still experiences an occasional service interruption. Vehicle accidents, construction, animals, and equipment failures can cause a power outage.

Despite our best efforts, severe and unusual natural events can wreak havoc and cause a power outage that can last for hours or days. Snow and ice, high winds, lightning, and flooding are a few examples of natural conditions that can seriously damage power equipment in a wide area. Even with crews working around the clock, repairs are time-consuming, difficult, and often dangerous.

Your utility has gathered some suggestions that can help you cope during the loss of power. Included are ideas on how to stay warm, cook meals, and be safe. Review this information as the storm season approaches.



## BE PREPARED

Put together an emergency kit that is easily accessible in case of a lengthy power outage or other natural events. Supplies should include:

**Flashlights, Radio, and Fresh Batteries.** Keep a supply of fresh unused batteries on hand for emergency use.

**Lanterns, Candles, and Matches.** Be sure to use lanterns and candles on a flat, stable, non-flammable surface. Extinguish flames before going to sleep.

**Bottled Drinking Water.** Have at least one gallon per person per day. If a storm is forecast, fill the bathtub with water so bathroom facilities can still be used by pouring a bucket of water down the toilet to flush.

**Fireplaces or Wood Stoves.** If you have a fireplace or wood stove, keep kindling and firewood on hand. To keep warm, wear extra layers of clothing and cover your head with a hat. Have sleeping bags and blankets handy too.

**Easy to Prepare Food.** Purchase food items that don't require much cooking such as canned or instant soups, stews or chili, and packaged freeze-dried meals. Protein or breakfast bars are also good to have on hand.

**Gas Camp Stoves or Barbecues.** Have a supply of fuel on hand for cooking outdoors. **Never use a camp stove or barbecue indoors!**

**Prescription Medications.** Have an ample supply of your essential prescription medications and over-the-counter drugs. During a storm, road travel may not be possible for several days.

**First Aid Kit.** Periodically take an inventory of your first aid kit so you will always have an adequate supply on hand.

**Games.** A deck of cards or board games help pass the time.

## What to Do, and What Not to Do, When the Power Goes Out

If the power goes out, know what steps to take to be comfortable, safe, and help your utility restore service quickly.

**Check Your Electrical Panel.** Look for tripped breakers or blown fuses. Try to reset the breakers by switching them OFF to ON, and replace blown fuses.

**Call Your Utility.** If the power does not return after checking the electrical panel, report it to your utility. Report any flashes or bangs, or any trees in the lines that can help repair crews assess the damage. If the lines are busy, please try back later.

**Turn Off Major Appliances.** The water heater and heating system breakers should be turned off to avoid overloading the utility's electrical system when power is restored. Unplug voltage-sensitive equipment and install surge protectors (see page 15 and 16 for more information on protecting voltage-sensitive equipment.)

**Switch Off an Outside Light.** If visible from the street, an outside light will help repair crews tell if the power has been restored late into the night.

**Refrigerator and Freezer Doors.** Keep the refrigerator and freezer doors closed. Food in a refrigerator will last for 12 to 24 hours if kept cool. A full freezer can last for 24 to 48 hours.

**Radio Reports.** During a long outage, please listen to the local radio stations for updates and information.

**Never go near or touch a downed power line.**

**Never try to wire a generator into your electrical panel, use a licensed electrician.**

## Important Tips

Remember these tips during an extended outage – it's easier on everyone involved.

**Portable Generators.** If not used correctly, these can cause fatal accidents involving the workers on the power lines. Plug appliances directly into the generator. DO NOT connect household circuits to the generator without a "transfer switch" installed by a licensed electrician. (See the section on Generators, page 12).

**Emergency Water Sources.** Runoff from rooftops can be collected and used for washing, but do not drink it. A water heater can supply drinking water. Be sure the breaker is OFF before you drain it, and be sure to fill it before turning the breaker back on.

**Keep the Freezer Full.** Milk jugs filled with water and placed in a half-full freezer can be a supply of both water and ice in an emergency. Also, it will keep the freezer colder longer if it is full. Check into purchasing dry ice to help prevent spoilage.

**Let Repair Crews Do Their Job.** It's tempting to stop crews and ask questions about when the power is going to be restored, but that only delays the restoration process. Remember that while the crews want to be helpful, they also want to restore your power quickly.

**Be a Good Neighbor.** Severe storms usually increase the number of accidents and medical problems. Remember this increase in the response time of service agencies. You may want to organize people in your area to check on each other and lend assistance.

## Power Restoration

Power is brought back up according to a system that enables us to restore power to the largest group of people in the least amount of time. The power must be restored in the following sequence because individual services cannot receive electricity until all of the previous steps have been taken.

**1. Transmission lines.** Assure that these lines are supplying power to the substations.

**2. Substations.** Make any repairs necessary to get the substations operational.

**3. Main distribution lines (feeders).** These lines leave the substation and supply power to the majority of customers.

**4. Tap lines.** These lines come off of the distribution feeders and supply groups of homes and businesses.

**5. Individual services.** Generally these lines serve only one customer. Most often these are the lines which go directly to a house from the pole.

# GENERATORS

*Generators are very handy to have if the power goes out because of a storm or other event. They are a good back-up system for heaters, freezers, well pumps, and lights.*

There are two popular types of generators – portable and permanent. Both are a ready source of electrical power for critical needs, as well as providing some comfort and relief during a power outage.

If you plan to run a generator during a power outage, please let your utility know so line crews won't pass you by when they are in your area.



## PORTABLE GENERATORS

Portable generators are a relatively inexpensive way to provide quick electrical power when the utilities system shuts down. There are many models to choose from, some are suited for light-duty residential use, while others are rated for heavier commercial or industrial use.

No permits are needed and operation is immediate. Appliances can be plugged directly into the generator and operated as needed.

## PERMANENTLY INSTALLED GENERATORS

Permanent generators are fully automatic units that can be installed in a fixed location next to a home or business. They are usually wired directly into the main electrical panel and can be set up to fully or partially provide electrical power to the facility. If there is a power failure, they turn on automatically.

Although more expensive to purchase, permanent units offer the most responsive emergency electrical power and are the easiest to operate.

Permanent generators should be installed only by qualified electricians. The electrician will get the necessary permits and see that the generator is properly connected to your electrical panel through a transfer switch. This enables you to manually or automatically turn on the generator and have specific circuits continue to operate during a power outage.

**VERY IMPORTANT NOTE:** The main breaker in your electrical panel does not qualify as a transfer switch under the National Electrical Safety Code. Using it in such a manner will



### Generator Safety

Emergency generators pose safety hazards you may not be aware of. Transfer switches are required because electricity from the generator can be sent out through the meter base and into the distribution lines. This could cause a life threatening hazard to workers or neighbors in the vicinity of a downed line.

When power is restored, if a generator does not have approved safety switching, electricity can flow back to your home, and cause serious damage

**Be safe! Read and understand all operating instructions.**

# POWER QUALITY

*Most electronic equipment and appliances today depend on micro-processors or computer chips that require an exceptionally consistent supply of electrical power.*

Power quality is the measure of how usable electrical energy is when it reaches an application. A power quality problem occurs when an interruption or distortion of electricity results in damage to or malfunction of voltage-sensitive equipment.

Your utility makes every effort to ensure that the electricity you receive adheres to strict standards. Occasionally, circumstances beyond a utility's control can cause power disturbances.



## **Causes of power disturbances**

### **Outside**

- Operation of an interconnected system
- Equipment malfunction at a generating plant
- Vehicle running into a utility pole
- Insulator flash-over or damage by vandalism
- Voltage disturbance on one line affecting another
- Storm damage to equipment
- Bird or small animal contact with wires or equipment
- Lightning strike to equipment
- Digging into underground line

### **Within a home or business:**

- Wiring or grounding problems
- Undersized circuits
- Faulty appliance design
- Using an appliance for something other than its intended purpose
- Major equipment or appliance start-up or shut-down
- Noise and harmonic disturbances from operation of equipment
- Appliance use from neighboring homes or offices

# SENSITIVE ELECTRONICS

A significant percentage of all electricity produced is used to power sophisticated electronic equipment.

## Voltage sensitive equipment includes:

- |                          |                            |
|--------------------------|----------------------------|
| Answering machines       | Computers                  |
| Cordless phones          | Fax machines               |
| Microwave ovens          | Satellite receivers        |
| Security systems         | Televisions                |
| Video cassette recorders | Garage door openers        |
| Stereo systems           | Electronic cash registers  |
| Electronic clocks        | Process controls           |
| Robotics and automation  | Copiers and laser printers |

## Examples of power quality related problems:

- |                       |                           |
|-----------------------|---------------------------|
| Automatic resets      | Distorted waveforms       |
| Equipment failure     | Low circuit board voltage |
| Loss of memory        | Power surges and lockups  |
| Power supply problems |                           |

## Solutions for Power Quality Disturbance Problems

Whether you want to minimize your exposure to potential power disturbances or solve an existing power quality problem, there are steps you can take. The following information provides solutions to help you ensure the safety and reliability of your electronic appliances, avoiding the cost of replacement.

### Plan

If you have, or plan to purchase voltage-sensitive equipment, here are some tips to minimize or prevent power quality disturbances:

- Be sure the electrical wiring in your home or business is properly grounded and that all voltage sensitive equipment is grounded as well. Improper grounding is a major cause of damage to voltage sensitive equipment.
- Purchase electronic equipment with a back-up battery or capacitor to retain settings if a momentary power disturbance occurs.
- Minimize interference from motors and other electrical loads by placing sensitive equipment on separate circuits.
- Protect losing information by backing up data periodically.
- Install power conditioning equipment to protect your equipment from power quality disturbances.

## Power Conditioners

The addition of equipment designed to condition or stabilize your power supply can be an economical solution. Here are some systems for consideration:

- Surge suppressors designed to lower the momentary high voltage of a surge or spike.

- Filters for noise reduction.
- Voltage regulators to maintain voltage output within narrow limits.
- Isolation transformers to prevent noise on a circuit from being passed to your equipment.
- UPS (Uninterruptible Power Supply) to maintain power to critical loads during power outages.

## Surge Protection

One of the best ways to protect your equipment from spikes or surge damage is to install high-quality surge suppressors. Here are some tips for finding the right surge protector for your needs:

- Make sure the suppressor has 3-way protection and is UL (Underwriters Laboratory) listed for compliance with the 1449 TVSS (Transient Voltage Surge Suppressor) standard.
- Features of the plug-in surge protector include multiple outlets, on/off switches, surge terms, indicator lights to determine if the suppressor is working, and connections for telephones and cable lines.
- Some manufacturers offer guarantees on their products that not only cover damage to their unit, but any equipment that is plugged into their unit as well.
- Choose the correct voltage rating for the equipment you want to protect. A clamping level is the voltage level at which the suppressor will react. The lower the clamping level, the better the protection. Lower-rated units (clamping level of 200) should be used to protect expensive electronic equipment.



**Contact your local utility** for more detailed information on power quality problems. Some utilities are offering high-quality surge protectors for sale, or can recommend the right applications for your needs and a purchase location.



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