JUICE GOOSE™

POWER UP TERMS
for AC Power Management

AC Receptacles (15 amp versus 20 amp) = In order to prevent a mismatch between power loads and electric power sources, various styles of AC receptacles are designated for specific applications. There are many receptacle configurations, each designed for a specific voltage, current load or single or three phase application. Those configurations most commonly encountered in residential and light commercial installations are the NEMA 5-15 and NEMA 5-20. The suffix "P" following the NEMA designation indicates the connector is a plug (male). The suffix "R" indicates a receptacle (female).

The NEMA 5-15 is rated for a maximum current load of fifteen amps, and is the type of wall outlet commonly found in a home. It has two parallel blades, one for hot and one for neutral. The NEMA 5-20 is rated at twenty amps and has one blade at a right angle to the other. "Hybrid" receptacles which are rated at 20 amps but have a "T" shaped slot to allow use with either a fifteen amp or twenty amp plug are often also called NEMA 5-20.

Other, less frequently encountered AC power connectors are the locking or "twist-lock" variety indicated with a prefix "L" (e.g. L5-20R) and a range of thirty amp connectors (e.g. L5-30R). Note, almost always a thirty amp connector will be the locking variety.

Alternating Current (AC) = The flow of electricity changes direction on a systematic basis. For US power utilities this direction change occurs sixty times per second (60 Hz) which is referred to as its frequency.

Amp Hour = A current of one ampere continuing for one hour. This is the standard measure of the amount of available current in a battery. (For example: A seven amp-hour battery can maintain a seven ampere current for one hour, or a one ampere current for seven hours.)

Ampere ("Amp") = This is the internationally recognized measurement of the amount of an electrical charge passing a specific point in a circuit. The definition of the size of one ampere is based on the force exerted between two wires in a circuit under very specific circumstances.

Amperage = The capacity of a device to either create or conduct the flow of a current. This term is often encountered relative to the maximum current rating of a conductor, receptacle or other component (e.g. 15 amp circuit). In this case a better term than "amperage" might be "ampacity".

Battery Back Up = See UPS

Direct Current (DC) = The flow of electricity is in a single direction as opposed to alternating directions as with "AC". Batteries produce direct current.

Frequency (Hz) = In the electric power sense, frequency refers to the rate at which alternating current changes direction. The US standard is sixty times per second (i.e 60 Hz).

Impedance = This is the force which opposes current flow in an AC circuit. While the resistance in a DC circuit is solely a function of the length and size of the conductors in the circuit, impedance in an AC circuit also takes into account the nature of the load or work being done. The inductance or capacitance of that load or work will effect the impedance of the circuit and, therefore, the amount of real power available for given values of voltage and amperage.

Isolated Ground (IG) = On a **standard** AC receptacle, the hole for the third pin safety ground is physically tied to the metal bracket that can secure the receptacle to a metal housing inside a wall or other mounting location. When that metal housing is connected to physical earth by means of a ground lead, so is the third pin on the receptacle. On an **isolated ground** receptacle there is no such connection between the third pin and the mounting bracket.

Both isolated and non-isolated receptacles have a ground screw that can be used to attach a grounded conductor. However, only the non-isolated device also makes a grounding connection by way of its mounting bracket. All orange receptacles have isolated grounds. Isolated ground receptacles come in other colors. But, all such devices are marked with an orange triangle.

Line Filtration = Standard US utility power is produced with voltage and current alternating at a frequency of sixty times per second (60 Hz). However, other power impulses can ride on the power line at much higher frequencies. There are many potential sources of these impulses including electric motors (e.g. pumps and fans), neon lights, light dimmers, switching power supplies and actual radio broadcasts. This noise can travel between line and neutral (normal mode) or line and ground (common mode). This electronic “noise” may be converted to actual audible or visible noise in a sound or video component. There are a variety of inductor and capacitor circuit designs that clean up this high frequency noise and leave mostly the 60 Hz. When considering such a filter device check that the model addresses both normal mode and common mode noise. The manufacturer should produce performance statistics for both.

Power Conditioning = Often the term “power conditioner” is interpreted with its broadest meaning, referring to anything that produces a systematic, intentional, predictable change in the condition of AC current the utility company provides. Consider this broad meaning in a fashion similar to “air conditioner” which cools the air, but also circulates fresh air and filters it. Within that broad definition of power conditioning there are several sub categories of devices which address one or more specific feature of utility power. These include line filtration, surge or spike protection and voltage regulation.

Power Factor = The ratio of real electric power to apparent power in an alternating current (AC) circuit. Apparent power equals volts x amps. Reactive loads with low power factors (such as motors) require more “juice” to do a comparable amount of work than do resistive or higher power factor loads (such as light bulbs). In a purely resistive load application, current and voltage change direction (see Alternating Current) at the same time. The more reactive a load is the more the timing of those direction changes differs. The greater the difference in that timing the lower the power factor and the less work is done per unit of electrical input.

Resistance (R) = A force that opposes the flow of current in a wire or other electrical conductor. Resistance is increased with an increase in the distance current travels and is reduced with an increase in the size of the conductor. Therefore, the longer the wire the larger the wire diameter should be to maintain lower resistance. The main consequences of excess resistance are a drop in voltage and generation of heat in the conductor. The power losses in a conductor are a product of the square of the current and the resistance of the conductor. That means when transmitting a fixed power on a given wire, if the current is doubled, the power loss will be four times greater.

In the strictest sense, “resistance” refers to the current opposing force in a DC circuit. “Impedance” refers to the current opposing force in an AC circuit.

Surge, Spike = These terms refer to very short duration, high energy events where voltage can rise to many times the specified 120 VAC level and then normalize. (Generally speaking, a surge is a longer term event than a spike.) The most expected source of voltage spikes is lightning. Other sources of surges and spikes include industrial machinery turning on an off and power line balancing by the utility. There are many opinions about the best way to provide protection against damaging voltage surges and spikes and several commonly accepted practices. The better technologies tend to be more expensive. Yet affordable options are available. Be sure any device you are considering using provides both normal mode (i.e. line to neutral) and common mode (i.e. neutral to ground) protection.

UPS = It is a widely held misconception that **any** UPS is the best form of power conditioner available. That is simply not true. The main function of a UPS is to provide a brief period of power continuation during a utility power failure. It is intended (or recommended) that during this period any open digital files be saved and processors be shut down in an orderly fashion. Standard battery run times are around 5 to 10 minutes under these circumstances. Some UPS models can be connected to external battery packs for extended run time. There are three main varieties of UPS.

A "**stand-by"** UPS operates equipment off utility wall power until voltage drops, as in the case of a blackout. The UPS then switches the power source to the battery. The level of power conditioning provided with these UPSs varies from model to model. Generally, this type of product is designed and produced to be economical. So, the level of power protection can be questioned in many of these inexpensive units.

"**Line interactive**" UPS models pass utility power through a voltage regulating transformer to correct high or low voltage within a certain range. Most such models also provide conditioning and protection against voltage spikes. The level of that protection will vary from model to model.

"On-Line" models earned the great reputation UPS have for power conditioning. This type of UPS uses utility power only to charge the UPS battery. Battery power, which is DC (direct current), is then converted back to AC to power the connected equipment. This "double conversion" process completely isolates powered equipment from incoming utility current eliminating any interference, voltage spike hazards or voltage level problems and thereby eliminating the need for a power line conditioner.

Volt Amp (VA) = The size of electrical capacity or electrical load expressed as the product of circuit voltage and its ampacity. (Volts x amps = volt amps) This is also equal to the apparent power of AC current.

Voltage (V) = The measure of potential energy of an electric field which causes an electric current in a conductor. Voltage is the "force" that causes current to flow. Standard US electrical utility power is 120 volts (alternating current), single phase, for most residential and commercial use.

Voltage Regulation = US electric utility power is standardized at 120 volts (sometimes referred to as VAC), 60 hertz (Hz) (i.e 60 cycles per second). Electricity suppliers aim to keep most customers supplied between 114 and 126 V most of the time. However variations in the peak or average voltage do occur. When the RMS voltage exceeds the nominal correct voltage by a certain margin, the event may be called a "swell". A "dip", "sag" (short duration) and "brown out" (long duration) are low voltage events that are observable. Low voltage events are more common than high ones. A voltage regulator can accept this voltage variance within a limited range and produce correct voltage output. Line interactive and on line UPSs provide voltage regulation.

Watt (W) = A measure of work performed. Wattage equals volts x amps x power factor. Because power factors are usually less than 1, the wattage specifications for AC current are usually less than the volt amp (VA) rating.