BASIC INFORMATION ABOUT UPSs
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In this context "UPS" refers to Uninterruptible Power Supply, often called "battery back-up". Due to an obvious and increasing convergence of computer technology with just about every other category of electrical or electronic device - including audio and video equipment - UPSs are seen more frequently in a required equipment list for sophisticated and mission critical systems. You can devise your own definition of "mission critical". But, consider anything with memory or presets or any communications device. Following is some useful information to consider when contemplating the purchase or specification of a battery back-up device.

It is a widely held misconception that any UPS is the best form of power conditioner available. While one specific type, the "on-line" variety, of UPS provides pure, stable power, a broad and unqualified endorsement of UPSs for power conditioning is misleading. As useful as they are, the main function of UPSs is to provide a brief period of power continuation during a utility power failure (i.e "blackout"). In this situation, using battery power, digital files can be saved and processors and peripheral devices can be shut down in an orderly fashion.

When considering purchase or specification of a UPS there are several features to consider. Keep in mind that, as with most electronic devices, the model you can buy for $99 won't match the performance of a higher grade, commercial model. But, the $99 unit may be all you need.

Run Time

"Run time" refers to the amount of time a UPS will provide power once the main utility power is interrupted. Standard battery run time for a common UPS is around 5 to 10 minutes under full load and about twice that under half load. (Run times are often quoted as minutes under full and half load.) The battery run time during a power outage is a function of the current load placed on the battery and the size of the battery. The demand for current by the equipment being powered is expressed in "amps". The amount of "juice" stored in a battery is expressed in terms of "amp-hours". (One amp-hour is a current flow of one amp for one hour.) If you want to know how long a given set of equipment will operate off a UPS battery, add up the current in amps that the equipment will pull and divide the amp hours of the UPS by that number. (e.g. A ½ amp load on a 2 amp-hour battery will run for 4 hours.) So, it makes sense that the smaller the load relative to the size of the battery the longer the run time. Over-sizing a UPS relative to the load is one way to get extended run time. For some brands a single battery size is used for two or more sizes of UPS. In this case the run time may be much longer for the smaller unit. These figures are almost always published by the manufacturer.

Be aware of the fact that a battery will not provide full voltage through its entire rated amp-hour life. Some reduction in voltage will occur at the end of the functional operation of the battery, just as a flashlight becomes dim but still works. Some UPSs will provide automatic shutdown or alarm when this voltage decline is imminent. So, if you have a specific required battery run time in case of a power outage, it's best to have a bit of amp-hour head room on top of what you calculate.

"Middle market" and top of the line UPSs have replaceable batteries. Since even continually charged

batteries have a limited life, being able to replace them is a nice feature. UPS batteries are the sealed lead acid type. They pose no danger with normal operation. But, they should be disposed of properly. Although there have been great recent advances in battery technology, these components are still heavy. A 600 watt UPS weighs around 30 pounds. A 2200 watt unit weighs around 80 pounds. More sophisticated UPSs allow for additional battery packs to be connected to the UPS for additional run time. Typically, these just plug into the back of the UPS.

Simple and sophisticated UPSs alike have warning indicators for loss of main utility power and for low battery power. A warning will also indicate when the battery is reaching the end of its useful life and needs to be replaced.

Current Capacity

As already mentioned, the current capacity of a UPS is expressed in terms of amperage. Most manufacturers also state the wattage capacity of their models. Because of the inefficiency of certain electrical loads it is probably best to select a UPS size based on the wattage of the UPS and the equipment to be powered. Both of these amperage and wattage figures should stated by the UPS manufacturer. If only the amperage rating is available multiply it by the voltage (120) and power factor (approx. 0.7) to calculate the wattage that a UPS can produce. Select a UPS with a wattage rating a bit larger than the load. For extended battery run time select a UPS much larger than needed for the subject load.

Communication

While most A-V applications don't require monitoring of the UPS or automated UPS control of connected equipment, most of these battery devices can have a communication link to a PC. This link allows automated processor shutdown as UPS power begins to drop. In more sophisticated systems it also allows integration of the UPS into a data network via SNMP communications protocol.

UPS Design

Here's where you can see a big difference between UPS designs. There are three main categories of UPS technology: stand-by, line-interactive and on-line. Each occupies a different price point and provides different functions. All provide battery support in case of a black out.

With a stand-by UPS connected equipment is powered directly by the utility power until a blackout occurs. Then the UPS switches over to battery power. The quality of power conditioning provided by such a UPS prior to a blackout varies from model to model and is most certainly a function of the price of the unit. Stand-by models are generally the least expensive of these three groups of designs.

Line-interactive UPSs provide automatic voltage regulation. These models are designed to boost or decrease incoming voltage should it vary below or above the specified level. This process is almost always performed by way of a "buck - boost" transformer and a voltage sensing circuit. Of course, this feature will provide more stable voltage which is good for connected equipment. Further, in cases of low utility voltage, this feature can increase the voltage range in which a UPS can operate without switching to the battery. Line-interactive UPSs are usually priced in the middle range of the UPS market.

An on-line UPS powers connected equipment directly off the UPS batteries 100% of the time. DC battery voltage is converted to 120 volt AC current by an inverter in the UPS. Utility wall power is used only to charge the batteries. In this way, the batteries serve as a complete buffer to isolate the load powered by the UPS from any and all interference that may exist in the outside world. This double conversion process provides the cleanest, most stable power available regardless of the level of incoming power.

When considering a selection among these three product types, consider the importance of the equipment being powered. And, consider any information about the quality of the utility power at the specific location. If the power conditioning ability of a UPS is a concern to you, check the manufacturer's specifications. If they don't provide power conditioning performance specs for normal and common mode (i.e on the ground line), don't rely too heavily on the UPS to clean up the utility AC power. Also check that the AC output when running on the battery closely simulates the sine wave of normal utility AC power.

Mounting

Most manufacturers have floor or table top models as well as rack mounted ones. As an option, the rack mounted models can be set into a stand and used in a mini tower configuration. Because of their weight rack mounting requires special consideration and hardware. Most rack mounted UPSs require an additional mounting shelf (not included with the UPS). Because of their weight, they should always be mounted to front and back mounting rails - probably as low in the rack as possible. Larger, higher current, three phase models are free standing.

Installation

For most UPS models, installation is as simple as plugging the UPS into the wall and plugging your equipment into it. Taking advantage of the monitoring and communications features of more sophisticated models requires some software loading and linking with a PC. Auxiliary battery modules come with instructions for connecting them to a UPS. Industrial sized units require professional installation and start up which is usually available from the manufacturer or third party vendor.

What to Power with a UPS

When the primary objective of a UPS is to provide temporary power during a complete "black out", you need not worry about equipment that will be useless when the lights are off. In an office computer setting printers probably don't need to be on a UPS. In a theater setting, the PA amplifiers probably need not have battery support. However, digital signal processors or audio consoles may need battery support. In addition, consider communications systems such as phone and pager systems, anything with memory or interconnected components. When power quality is an important part of the need for a UPS, when an on-line UPS is selected to ensure a high level of AC power quality, connect to if anything that has a tendency to lock up during power "glitches".

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