A GLOSSARY OF COMMONLY USED POWER TERMS

Alternating current (AC): An electrical system in which voltage polarity and current flow alternates direction on a regular basis. Your home is an example of a system that is powered by AC.

AMP: A unit of electrical flow. In a water system, the flow of millions of water molecules would be expressed in terms of gallons per minute. In an electrical system, the flow of millions of electrons is expressed in terms of amps or amperes.

Apparent Power: The amount of power that is apparently consumed by a load. Apparent power is measure in VA or volt-amperes and is calculated by measuring the current consumed by the load and multiplying it by the voltage powering the load.

Backdoor disturbances: This virus infects your system via a pathway you would least expect: the backdoor. Even though it is not an AC power connection, damaging electrical disturbances can enter electronic systems through modem and phone lines, network connections, and I/O cables. Fiber optic connections are one means of protection, but if your system uses ordinary communications wiring and connections, you need to immunize it against this often unrecognized but very dangerous virus. Once again, NXT POWER is your source for complete protection.

Blackouts: Although they are the most visible—and memorable—of power viruses, blackouts account for comparatively few power disturbances each year. An uninterruptible power supply (or UPS) will keep your system up and running during a blackout, but it will not immunize against the other power viruses. That is why we have made sure NXT POWER systems are compatible with all types of UPS systems—so you can have full immunity, all the time.

Common Mode Voltage: A voltage of any amplitude or frequency that is measured between the phase conductor and the ground conductor or the neutral conductor and the ground conductor. Neutral to ground voltage is a common mode component that frequently causes computer system malfunction. Neutral to ground voltages should always be limited to .5 volts (one half of one volt) or less.

Common-mode voltage problems: Probably the most serious virus facing computer users today, common-mode voltage problems can cause unexplained data losses, glitches, system failures and “no trouble found” service calls. The only way to immunize against common-mode voltage is to install a power conditioner or UPS that has an isolation transformer output. All NXT POWER power quality solutions include an integral isolation transformer for that reason.

Constant Voltage Transformer: Maintains a relatively constant output voltage for variations up to 20% in the input voltage. CVT’s are frequently a ferro-resonant style of transformer in which the voltage is regulated by means of current stored in a magnetic field. CVT’s are generally high impedance devices that are unsuitable for most modern computers with switch mode power supplies.

Current: The “flow” of electricity. Much like water, a current will follow the path of least resistance. As a result, electric current always finds the easiest path to ground. Current is measured in amps or amperes.

Dedicated Circuit: An obsolete method for providing clean, noise free power to a computer system. A dedicated circuit is one in which dedicated phase, neutral, and safety grounding conductors are run continuously from a distribution panel to an electronic load. The conductors may service only the dedicated load and the phase conductor must have its own circuit breaker. Furthermore, the dedicated conductors must run in their own dedicated metallic conduit or raceway with no other conductor's present. The neutral and ground conductors may not be "daisy chained" or shared with any other circuit. The ability of dedicated circuits to guarantee a noise and disturbance free environment is insufficient for the high processing speeds, low operating voltages, and mission critical nature of modern technology.

Direct current (DC): An electrical system in which current flows in one direction only. A battery is an example of a direct current source.

Dip: See "Sag".

Disturbance: Any departure from the nominal values of the power source. Disturbances can include transients, electrical noise, voltage changes, harmonics, outages, etc.

Drop: A slang word sometimes used to describe voltage sags or under voltages.

Electrical Noise: This virus is spread by electrical neighbors such as electronic lighting ballasts, appliances, printers, photocopiers, and even other computers. Over time, and in connection with low-voltage spikes, noise can wear away electrical components and cause them to fail for no apparent reason. Fortunately, an NXT POWER system can eliminate noise and keep your system's health from deteriorating.

Flicker: A voltage variation of short duration but long enough to be noticeable to the human eye as a light flicker. Could be grid switching.

Frequency: In an AC system, the value of the voltage sinewave rises from zero to a maximum, falls to zero, increases to a maximum in the opposite direction, and falls back to zero again. This would describe one complete cycle. The number of complete cycles occurring in one second is called frequency. The General Conference on Weights and Measures has adopted the name hertz (abbreviated Hz) as the measurement of frequency. In North America, the frequency is 60 Hz. In Europe and most of Africa and Asia it is 50 Hz.

Glitch: A slang term for a voltage transient or voltage variation that causes equipment to misbehave.

Grounding Conductor: The physical conductor connecting the chassis of an electrical or electronic device to the electrical system's grounding means. The purpose of the grounding conductor is providing a low impedance pathway for fault current in the event of a short circuit so that a circuit may be quickly de-energized to prevent a fire hazard or electrocution.

Grounded Conductor: Refers to the neutral conductor of the electrical system, which is bonded to the facility's utility field earth reference to reference the facility electrical system to ground. This is done only at the electrical service entrance to the building.

Harmonic: A whole multiple of the basic power frequency. On a 60 Hz system the 2nd harmonic is 120 Hz, the third harmonic is 180 Hz, the fourth is 240 Hz and so on.

Harmonic Distortion: The alteration of the normal voltage or current wave shape (sine wave) due to equipment generating frequencies other than the standard 60 cycles per second.

Impedance: Impedance is the opposition offered by a material to the flow of an electrical current in an AC electrical system. Impedance has two parts – resistance and reactance. Impedance is measured in ohms.

Interruption: See “Outage”.

Inverter: Device that converts direct current (DC) power into alternating current (AC) power.

Isolated Ground: An insulated equipment grounding conductor that is run in the same conduit as the supply conductors. This conductor is insulated from the metallic raceway and all ground points throughout its length. An isolated grounding conductor may only be connected to the grounding of the electrical system as a point where the facility neutral (grounded conductor) is bonded to ground. An example would be at the service entrance or at a distribution sub-transformer.

Isolation Transformer: A device that electrically separates and protects sensitive electronic equipment by buffering electrical noise and re-establishing the neutral-to-ground bond. By virtue of the neutral-to-ground bond, isolation transformers eliminate neutral-to-ground voltage – one type of common mode disturbance.

Line Conditioner: A device that provides for the electrical power quality needs of the connected electrical or electronic load. In the case of a linear power supply, a line conditioner might be a voltage regulator. In the case of a switch mode power supply, a line conditioner might be an isolation transformer with a noise filter and surge diverter. In the case of a simple electrical device like a motor, a line conditioner might be as rudimentary as a surge diverter. The term line conditioner is frequently misused. It must be understood that not all line conditioners function alike, and the capabilities of a line conditioner must be matched to the power quality needs of the connected load.

Linear Power Supply: A power supply which converts AC power into the DC power that is needed to operate an electronic circuit. In a linear supply, the AC voltage is first stepped down, then rectified, and then regulated using a series regulation device. Linear supplies obtain their name from the fact that there is a linear relationship between the value of the AC sine wave voltage and the power supply’s consumption of current from the AC circuit. Linear power supplies are generally less efficient because the series regulator dissipates large amounts of heat in the process of producing and regulating the DC output voltages. In addition, linear mode power supplies may require well-regulated AC input voltage. One benefit of linear power supplies is that they produce little electrical noise. A Linear Power Supply also use a transformer in its design.

Mission Critical Load: Devices and equipment identified as important or essential to the safety of personnel or the economic health of a business.

Momentary Outage: A brief interruption in power commonly lasting between 1/30 (2 cycles) of a second and 3 seconds.

Nines of Reliability: The reliability of an electrical system is a combination of both its availability (freedom from outages) as well as its quality (freedom from disturbances). Reliability is expressed in percentages. 99% would be expressed as two 9s of reliability. 99.9% would be three 9s reliable, 99.99% would be four 9s reliable and so forth. The average well managed electrical system in North America has about three 9s of reliability. In a 24 x 7 operation, that translates into about 88 hours per year in which the availability and quality of the electrical system are unsatisfactory to reliably power a mission critical electronic load.

Noise: An unwanted high-frequency electrical signal that alters the normal voltage pattern (sine wave). Noise may be either high amplitude or low amplitude.

Normal (Nominal) Voltage: The normal or contracted voltage assigned to a system for determining voltage class.

Normal Mode Voltage: Any voltage (other than fundamental 50 Hz or 60 Hz) that is measured between the phase conductor and the neutral conductor in a single-phase system or between any two-phase conductors of a three-phase system. Normal mode voltage can be any amplitude or frequency. Normal mode noise voltages can interfere with the reliable operation of a computer system or degrade and destroy components. Normal mode power disturbances should be limited to 10 volts or less.

Ohm: A unit of resistance and impedance.

Ohms Law: The relationship between voltage, current and resistance in a DC circuit. If two values are known the other can be calculated. This relationship is expressed many ways. The basic relationship is voltage (V) is equal to current (I) multiplied by resistance (R). Ohm's law must be applied in a modified way to AC circuits. AC circuits have impedance rather than resistance. Impedance causes AC circuits to exhibit power factor, which must be factored into any calculations

Outage: Complete loss of electrical power.

Overvoltage: An increase in voltage outside the normal voltage levels (10% or greater) for more than one minute.

Phase Relationship: The timing relationship between voltage and current. If voltage and current cross through zero in a cycle at the same time they are said to be in phase. Phase differences are expressed in degrees. A cycle is 360 degrees. In a totally capacitive circuit, current leads voltage by 90 degrees. In a totally inductive voltage leads current by 90 degrees. In a circuit that is purely resistive, voltage and current are in phase.

Power Factor: The ratio between Watts and Volt-Amperes. This ratio is generally expressed as a decimal fraction. A power factor of 1.00 is unity.

Reactance: Reactance has two components, capacitive reactance and inductive reactance. The values of reactance are determined by the values of the individual capacitor or inductor as well as the frequency of the current flowing in the circuit.

Real Power: The amount of power that is consumed by the load. Real power is measure in watts and is calculated by measuring the current consumed by the load and multiplying it by the voltage powering the load and then multiplying by the power factor of the load.

Rectifier: A device that converts alternating current (AC) power to direct current (DC) power.

Reactive power: Reactive power is the difference between apparent power and real power. It is calculated by subtracting real power from apparent power. Reactive power is measured in VAR (volt-amps reactive) or kVAR (kilovolt/amps reactive)

Resistance: The opposition offered by a material to the flow of a steady electrical current in a DC circuit. Resistance is measured in ohms.

Sag: Any short-term (less than 1 minute) decrease in voltage.

Spike: See “Transient”.

Standby Generator: An alternate power supply usually driven by a gas or diesel engine.

Surge: A sudden dramatic increase in voltage that typically lasts less than 1/120 of a second.
Surge Protective Device (SPD): A device that is designed to limit instantaneous high voltages. Also known as a surge suppressor, surge arrestor and transient voltage surge suppressor (TVSS). These units are satisfactory for reducing the amplitude of catastrophic events. However, they function by diverting excess voltage to the safety ground of the electrical system. In the process they create a common mode disturbance which can disrupt the function of microprocessor based electronic systems.

Swell: Any short-term (less than one minute) increase in voltage.

Switch Mode Power Supply: A power supply technology in which the AC power is converted into DC power for use by an electronic system. SMPS technology uses switching transistors operating at very high speed to keep a capacitor reservoir sufficiently charged to produce the appropriate DC voltage needed by the electronic circuit. SMPS technology is very efficient because it does not utilize the “lossy” series regulator found in the linear power supply. Current is consumed from the circuit only when the charge state of the capacitor reservoir requires it. SMPS technology is “constant power” in that when line voltage decreases, the supply’s current consumption increases and when line voltage increases, current consumption decreases. SMPS technology is relatively immune to voltage regulation issues. However, the technology does not employ a stepdown transformer on the front end, which means that it does not satisfactorily isolate the electronic system from the electrical supply. SMPS technology produces electrical noise because of the high-speed function of the switching transistors.

Transient: See “Surge”

True Power: See “Real Power”

TVSS: See “Surge Protective Device”

Undervoltage: A decrease in voltage outside the normal voltage levels (10% or greater) for more than one minute.

Uninterruptible Power Supply (UPS): A system designed to automatically provide power if utility power is interrupted. A UPS may be standby, line interactive, or online. A **UPS** is not necessarily a power conditioner, and care must be taken to ensure that the UPS provides all the power quality requirements that are needed.

Volt: A unit of electrical pressure. In a water system pressure might be expressed as pounds per square inch. In an electrical system, the pressure that causes electrons to move is called voltage. The voltage found in most homes is 120 and 240 volts. Businesses will typically utilize voltage at 120 and 208, or 277 and 480 volts.

Volt-Ampere (VA): The product of volts times amps. A kilovolt-ampere (kVA) is equal to one thousand volt-amperes. VA is also known as apparent power.

Voltage: The electrical “pressure” that creates the flow of current.

Voltage Regulator: A device that maintains output within a desired limit despite varying input voltage. These devices usually provide little to no protection against voltage transients or noise.

Voltage regulation: In the past, unregulated voltages wreaked havoc with linear power supplies, making it hard for computer-based equipment to function. Failures were common. But thanks to the switch-mode supplies used in today's computers, today's systems have developed their own immunity to voltage regulation viruses. (This immunity is a by-product of the same technology that makes switch mode supplies smaller and more economical.)
Voltage spikes and impulses: Like electrical noise, this virus is also spread by equipment inside your facility. When elevators, motors or air conditioners stop and start, they can cause sudden large increases in voltage inside the electrical system. Other causes include electric utility switching and lightning strikes (which can cause transients so intense they literally "blow up" sensitive electronics). Unlike surge diverters, which can only slow down or weaken this virus, an NXT POWER system stops it dead by giving you complete protection from small and large transients.

Watt (W): A unit of power equal to the product of the value of current of one ampere flowing in phase with the pressure of one volt. A kilowatt is a thousand watts. Watts are an expression of real or true power.

Watt-Hour (Wh): A unit of energy equal to the power of one watt for one hour. A kilo-watt hour is a thousand watt-hours.

Waveform Distortion: Any power quality variation in the wave shape of the voltage or current.

NXT Power is a team of unparalleled experts dedicated to providing premium power quality solutions for manufacturers of critical electronic equipment. Our products help our customers receive cleaner, more reliable power; avoid destruction, degradation, and disruption; and achieve long-term cost savings through reduced service calls and costly downtime.
Visit www.nxtpower.com for more information.