
UPS Glossary



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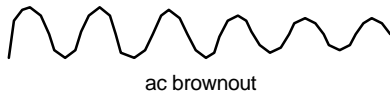
UPS Glossary

A

AC - Abbreviation for alternating current.

AC Blackout - Total loss of distributed commercial ac feed power.

AC Brownout - The condition that exists when the AC line voltage drops below some specified value.



AC Input - Electrical power in the form of alternating current (AC) supplied to the UPS and bypass.

AC Input Impedance - The impedance of the AC input at the input terminals of the UPS with the UPS disconnected.

AC Line - The set of conductors that route AC voltage from one point to another.

AC Line Filter - A circuit filter placed in the AC line to condition or smooth out variations that are higher in frequency than the line frequency.

Actuator Fuse - A fuse incorporating some mechanical means to close a dry (unpowered) contact when the fuse opens, such that an alarm and/or control function may take place.

AH - Abbreviation for ampere hour.

Air Gap - A space in the magnetic core, void of magnetic material, used to lower the permeability and increase the ampere turns before the core saturates (provides the required reluctance to the flux path). The gap is filled with a non-magnetic material other than air.

Alarm - A method or signal of attracting attention to an abnormal condition in the UPS.

Alarm Circuit - A circuit with a primary function of alerting an operator by either a visual and/ or audible signal that an abnormal condition exists.

Alarm Interrupt - Stop of normal UPS operation via activation of an alarm condition having a control function.

Alive (Live) - Electrically connected to a source of voltage or electrically charged so as to have a voltage different from that of earth; the term may be used in place of "current-carrying" where the intent is clear, to avoid repetition of the longer term.

Alternate Source - Secondary or backup AC feed to the static switch of the UPS system which is also termed Bypass Source. Often it is unprotected commercial power *See Commercial AC Power*.

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Alternating Current (AC) - A periodic current the average value of which over a period is zero. Unless distinctly specified otherwise, the term refers to a current that reverses at regularly recurring intervals of time and which has alternately positive and negative values.

Ambient Temperature - The temperature of the environment immediately surrounding the UPS into which the heat of the UPS is dissipated. For forced air-cooled units, the ambient temperature is measured at the air intake. *Also see Operating Temperature, Storage Temperature, Temperature Coefficient.*

American Wire Gauge (AWG) - A standard for sizing cross-sectional areas of wire, and for measuring sheet-metal thicknesses.

Ampacity - Current carrying capacity of electric conductors or devices expressed in amperes.

Ampere (A) - Electron or current flow representing the flow of one coulomb per second past a given point in a circuit.

Ampere-Hour (AH) - A measurement of a quantity of electricity computed as the product of current (in amperes) and time (in hours).

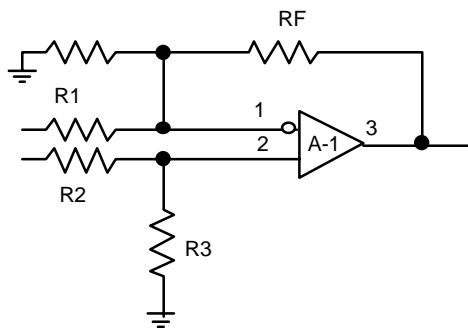
Ampere Hour Capacity - The number of ampere-hours which a storage battery can deliver under specified conditions such as temperature, rate of discharge and final voltage.

Ampere Turns - The S1 unit of electromagnetic force defined as the field produced by the flow of one ampere in a single turn of wire in a coil.

Amplifier - A circuit or element that provides gain.

Amplifier, Comparator - *See Comparator.*

Amplifier, DC - A direct current amplifier that can provide gain for zero-frequency signals.

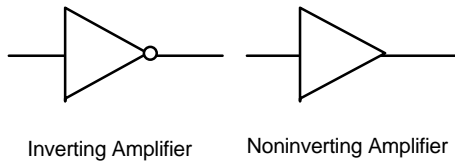


Differential Amplifier

Amplifier, Differential - An amplifier which has available both an inverting and a noninverting input, and whose output signal is proportional to the algebraic difference between the two.

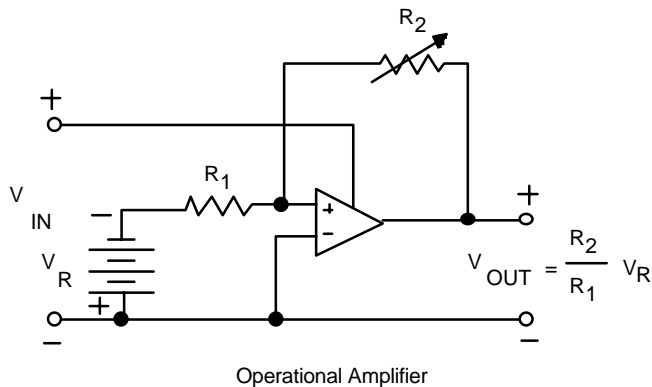
Amplifier, Inverting - An operational amplifier that produces an output signal of nominally equal magnitude and opposite algebraic sign to the input. Such an amplifier can be used with degenerative feedback for stabilization purposes.

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Amplifier, Noninverting - An amplifier whose output is the same algebraic sign as its input.

Amplifier, Operational - A DC amplifier whose gain is sufficiently large so that its characteristics and behavior are substantially determined by its input and feedback elements. Operational amplifiers are widely used for signal processing and computational work.



Anode - The electrode at which an oxidation reaction occurs. During discharge, the negative electrode of the cell is the anode. During charge, the situation reverses and the positive electrode of the cell is the anode.

Anode Terminal - In semiconductor diodes, the terminal that is positive with respect to the other terminal when the diode is biased in the forward direction. The positive terminal, such as the plate in an electron tube.

Apparent Power - The product of the RMS current times the Rms voltage.

Arc - An electric current through air or across the surface of an insulator associated with high voltage. Arcs occur at the time contacts open deenergizing an inductive load or when fault protection devices open. Arcing across a device's contacts will shorten its life.

Arc Quenching - (Electronic *see Surge Arrester*). Mechanical An arc-extinguishing medium to facilitate current interruption.

Arcing Time - Infuses, the time measured from when fuse element melt time ends to when current is interrupted and becomes zero.

Astable Multivibrator - A free-running oscillator circuit using resistors and capacitors for feedback coupling. It has a square wave output whose frequency is determined by circuit constants or by an external synchronizing voltage.

Asymmetrical Waveform - 1) A current or voltage waveform that has unequal excursions above and below the horizontal axis or whose axis of symmetry is offset from the zero axis (DC offset). 2) A

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current or voltage waveform that's negative going half cycle differs in time from its positive going half. cycle.

Asynchronous - A condition where circuit operating frequency is determined independent of a reference source.

Attenuation - Decrease in amplitude or intensity of a signal.

Audible Noise - Frequencies that can be detected by the human ear produced by the battery charger and/or inverter and measured in decibels (a measure of intensity). The acoustical noise.

Auto-retransfer - A transfer from the "alternate source" position of a static switch to the "inverter" position without operator intervention.

Auto-retransfer Circuit - Electronic circuit which simulates the operation of "Inverter to load" pushbutton.

Auto-transfer - A Transfer from the "Inverter." position of a static switch to the alternate source position without operator intervention.

Auto-Transformer - A transformer whose primary and secondary are electrically connected.

Automatic Transfer - A transfer is made by the UPS without operator/user involvement and is usually based upon the status or condition of the input/output AC power.

Auxiliary Contacts - An accessory attached to a circuit breaker or magnetic switch having low ampacity contacts that operate coincident with the on-off-trip operation of the main device and to provide secondary circuit functions, as lights, control signals, or interlocking functions.

Average Value - 1) the value of the function or quantity averaged over a full cycle unless otherwise specified. The value of alternating current or voltage of sine wave form that is found by dividing area under one alternation by distance along X axis between 0 and 180°.

$$E_{AVG} = .637 E_{MAX} \quad E_{AVG} = \frac{1}{T} \int_0^T e(t)dt$$

B

Backup Power Supply - A power supply used to provide alternate system power in the event the primary power source fails or is unable to continue providing adequate system power.

Base Control Circuit - The circuit used to develop and control the timing signals for a transistorized inverter bridge (used in pulse-width modulated inverters).

Battery - One or more electrically connected cells of a device that transforms chemical energy into electrical energy.

Battery Back-up - 1) The inverter/battery combination providing support to maintain function of selected output devices upon loss of commercial power. 2) Quantitatively, the calculated time duration this support is to be available.

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Battery Charger - A device for changing alternating-current power to direct-current power for the purpose of charging a battery.

Battery Jar - One battery unit containing one cell or a number of cells.

Battery Rack - A rigid support of one or more levels (tiers or steps) upon which a bank of stationary batteries are located. Also called a battery stand.

Battery Voltage - The total voltage between the positive and negative terminals of the battery. In lead-acid batteries the nominal open circuit voltage is stated to be two volts per cell.

Bell Alarm - An accessory attached to a circuit breaker having form C contacts that toggle only when the circuit breaker is in the tripped position.

Binary - The numbering system having a radix of two. This system is the foundation for all digital technology since it requires only two conditions for its use--energized vs. deenergized, magnetized vs. demagnetized, some voltage level vs. no voltage, etc. The two numbers used in this system are one and zero, and the position of each digit represents the power of two to which that digit is taken.

Bipolar - Having two poles, polarities or directions.

Bipolar Transistor - A junction transistor having both majority and minority charge carriers.

Blackout - *See AC Blackout.*

Bleeder Resistor - A resistor that allows a small current drain on a power source to discharge filter capacitors or to stabilize an output.

Blocking Diode - A device that prevents the flow of current from the UPS rectifier to the battery, but permits the flow of current from the battery to the UPS inverter.

Boost Charge - charge, generally at high-rate, for a limited period to achieve full capacity in all cells of a battery.

Boost Transformer - May be an isolating transformer or an autotransformer that provides a means of raising a supply line voltage, usually by a small amount of 20% or less.

Branch Circuit - That portion of the wiring installation between the final overcurrent device protecting the circuit and the line connection.

Branch Circuit Protection - An overcurrent protection circuit or device that protects the branch circuit.

Break-Before-Make Switch - A switch which while transferring between two sources goes through a neutral position where momentarily neither source is connected to the output and an interruption occurs on the output.

Break-Before-Make Transfer - A transfer between two sources when a momentary break on the output occurs.

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Break Transfer - As pertaining to a switch or static switch, transfer between two sources where the output momentarily loses continuity to either source and an interruption to the output voltage occurs.

Breakdown Voltage - 1) The voltage level which causes insulation failure. 2) The reverse voltage at which a semiconductor device changes its conductance characteristics.

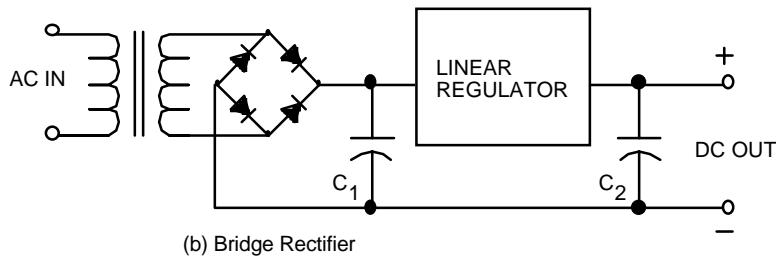
Breaker - A device designed to open and close a complete circuit by nonautomatic means (like a switch), and to open the circuit automatically on a predetermined overload of current, without injury to itself.

Breaker-Automatic - A circuit protection device which will automatically open or break continuity

Bridge Circuit - Circuit with series-parallel groups of components.

Bridge Converter - A power conversion circuit with the active elements connected in a bridge configuration

Bridge Rectifier - Full-wave rectifier circuit employing two or more rectifiers in a bridge configuration.



Linear Power Supply Circuits

Brownout - The condition created during peak usage periods when electric utility companies intentionally reduce their line voltage by approximately 10 to 15 percent to counter excessive demand.

BTU - For British Thermal Units, this is the unit of quantity of thermal energy in the United States, and is the quantity of heat or thermal energy required to raise the temperature of one pound of pure water one degree F. With respect to power, one watt is equal to 3.412 BTU per hour.

Buck Transformer - A transformer that provides a means of lowering a supply line voltage, usually by a small amount such as 20% or less.

Bulk Capacitor - The energy storage capacitor at the front end of a regulator.

Bulk Voltage - The voltage across a bulk capacitor.

Burn In - The operation of newly fabricated units or systems prior to their ultimate application intended to stabilize their characteristics and identify early failures. *See Infant mortality.*

Bus - The common primary conductor of power from a power source to two or more separate circuits.

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Bus Transfer Switch - Any switch (mechanical, electromechanical, or static) used to transfer a load from one source of AC supply power to another, often upon loss of power from the initial source.

Bypass - A path where the Commercial AC Power can be routed from the AC input to the AC output of an UPS, bypassing the Battery/inverter sections.

Bypass Source - See *Alternate Source*.

Bypass Transformer - A transformer that provides alternating current power to the UPS loads when the UPS equipment fails, is temporarily overloaded, or is out of service for maintenance.

C

Capacitance - Inherent property of an electric circuit or device that opposes change in voltage. Property of circuit whereby energy may be stored in an electrostatic field.

Capacitance, Distributed - The capacitance in a circuit resulting from adjacent turns on coils, parallel leads and connections.

Capacitive Coupling - Coupling resulting from the capacitive effect between circuit elements.

Capacitive Reactance (X_c) - Opposition to AC as a result of capacitance.

Capacitor - A device that stores a charge. A simple capacitor consists of two conductors separated by a dielectric.

Capacitor Forming - A process used in manufacture of aluminum electrolytic capacitors to deposit an oxide layer on the anode by application of a specific voltage over a given period of time at elevated temperature.

Capacitor Input Filter - Filter employing capacitor as its input.

Capacitor Shelf Life - Aluminum electrolytic capacitors (chemical condensers) exhibit deterioration and increased leakage current when stored. The stated shelf life differs between manufacturers, but the consensus is about 24 months, extendable to 60 months by periodic "reforming." Reforming is a process where voltage is applied with the capacitor temperature elevated (an oven), and if the capacitor meets certain pass/fail criteria (must have an acceptably low leakage current), it may be returned to storage.

Cathode Terminal - 1) In semi-conductors, the negative terminal by which current leaves the device.
2) In semiconductor diodes, the terminal that is negative with respect to the other terminal when the diode is biased in the forward direction.

Cell - 1) The basic electrochemical unit used to generate or store electrical energy. A cell consists of two electrodes of dissimilar material isolated from one another electronically, in a common ionically conductive electrolyte. 2) An electrochemical system which converts chemical energy into electrical energy and also the reverse for rechargeable units.

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Cell Polarization - The difference between the e voltage of a cell I as a result of current flow, and its voltage at a reference state which may be an equilibrium or steady state value.

Cell Reversal - Reversal of polarity of a cell due to over discharge.

Cell Voltage - The DC voltage potential between the individual positive and negative terminals of a cell in a battery.

Center Tap - Connection made to center of an electronic device.

Charge - 1) The conversion of electrical energy, provided in the form of a current from an external source, into chemical energy within a cell or battery. 2) The potential energy stored in a capacitive electrical device. 3) The conversion of electrical energy to chemical energy in a cell or battery.

Charge/Discharge Cycle - A sequence of a charge and subsequent discharge.

Charge Equalization - Bringing all of the cells in a battery to the same state of charge.

Charge Rate - The current applied to a secondary cell or battery to restore its capacity. This rate is commonly expressed as a multiple of the rated capacity of the cell or battery. For example; the C/10 charge rate of a 500-Ah cell or battery is expressed as: $c/10 \text{ rate} = 500 \text{ Ah}/10 = 50 \text{ A}$

Charge, State of - Condition of cell in terms of the rated capacity remaining in the cell at a given point in time.

Charge Voltage - The voltage applied to a cell during charge.

Charger - Constant voltage or constant current device used to charge a cell or battery.

Charger (Battery) - An electrical device or circuit that is capable of restoring the charge in a storage battery.

Charging - Process of supplying electrical energy for storage.

Charging Temperature Coefficient - The factor by which the charge voltage must be adjusted for a given change in voltage.

Chassis Ground - The voltage potential of the chassis.

Chatter - Intermittent opening and closing of relay contacts resulting from voltage fluctuation to its coil.

Chip - *See Integrated Circuit.*

Choke Coil - An inductor. *k*

Choke, RF - A choke coil with a high impedance at radio frequencies.

Circuit Input Filter - A filter employing an inductor W or an inductor/capacitor (L/C) as its input.

Circular Mil - Cross-sectional area of a conductor one mil. in diameter.

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Circulating Current - *See Ground Loop*

Clamp Circuit - A circuit that biases a voltage waveform to a specified voltage level.

Clamp Diode - A diode in either a clipper or clamp circuit.

Clock - An oscillator producing timing pulses to synchronize various elements of a system. In switching mode power supplies, a clock is used to produce the power pulses that are modulated to control power transfer. In digital interfaces that communicate on a bus (such as the IEEE-0488) a clock is used to synchronize the data transfer and commands.

Closed Loop Gain - In a feedback control circuit, the increase in value of an output signal due to the effects on it of various other components or signals in the circuit. *See also GAIN.*

Closed-Circuit Voltage (CCV) - The potential voltage at the terminals of an electrical device when current is flowing.

Collector - 1) Electronic connection between the cell electrode and the external circuit. 2) In a transistor, the semiconductor section which collects the majority carriers.

COM - *See Commercial AC Power*

Commercial AC Power (COM) - Power furnished by an electric power utility company (also referred to as utility power): when available, it is usually the prime power source. Prime power is that source of supply of electrical energy utilized by the user and is available continuously day and night. Besides utilities, another power source is the user's own generator.

Commercial AC Power - Normal power source used to power the alternate source and rectifier inputs to the UPS. *Also see Alternate Source and Rectifier Input.*

Common-Mode Noise - The component of noise voltage that appears equally and in phase on conductors relative to a common reference.

Commutation - Transfer of unidirectional current between circuit elements. (The transfer of current between various paths of a circuit).

Comparator - A DC amplifier, circuit, having only two logic output states, for comparing the amplitudes of two analog variables, or of such a variable and a constant, such that the logic signal output uniquely determines which input is larger at all times.

Compensation - The addition of circuit elements to assist in stabilization of a control loop.

Component - An element in an electrical circuit.

Conductor - Material that permits free motion of large number of electrons.

Connector - A mechanical device used to link conductors.

Constant Current Charge - 1) A charge during which the current is maintained at a steady state value. 2) A method of charging a cell by applying a nonvarying current to the cell.

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Constant Current Limiting Circuit - Current-limiting circuit that holds output current at some maximum value whenever an overload of any magnitude is experienced.

Constant Current Power Supply - A power supply that regulates its output current, within specified limits, against changes in line, load, ambient temperature and time.

Constant Voltage Charge - 1) A charge during which the voltage across the battery terminals is maintained at a steady state. 2) A method of charging a cell by applying a nonvarying voltage to the cell.

Constant Voltage Power Supply - A power supply that regulates its output voltage within specified limits, against changes in line, load, ambient temperature and time.

Constant Voltage Transformer - Maintains an almost constant voltage ratio over the range from zero to rated output.

Contact Chatter (or Contact Bounce, Switch Bounce) - When two mechanical contacts close, they make and break several times before reaching a stable closed condition. Bounce can also be caused by external vibration or shock.

Contacts - Elements used to mechanically make or break a circuit.

Continuity of Load Power - The availability of load power within the limits specified for the load.

Continuous Duty - A requirement of service that demands operation at a substantially constant load continuously for an indefinitely long time with no off or rest periods. *See also Intermittent Duty*

Control - The means of regulating the operation of a piece of equipment.

Control Circuit - The circuit that carries the electric signals directing the performance of a control device, but that does not carry the power that the device controls.

Control Loop - A feedback circuit used to control an output signal. *See also Loop*

Control Power Supply - The power supply developing the correct voltage at the appropriate current to power the control logic circuits for a system.

Convection-Cooled Power Supply - A power supply cooled exclusively from the natural motion of a gas or a liquid over the surfaces of heat dissipating elements.

Converter - A device that changes the value of a signal or quantity. DC-DC: A device that delivers DC power when energized from a DC source. FLY-BACK: A type of switching power supply circuit. *See also Flyback Converter* -Forward: A type of switching supply circuit. *See also Forward Converter*

Cooling - The process of removing heat dissipated by a power supply during transformation and regulation.

Core - Magnetic material serving as a path for magnetic flux.

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Core Saturation - The tendency of molecules in an iron core to orient in one direction due to the application of direct current.

Counter/Counting circuit - A digital circuit which counts and stores numbers of events.

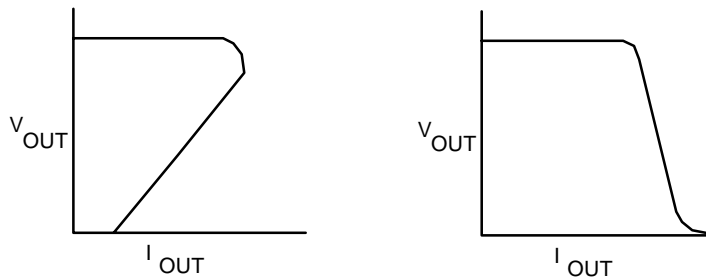
Coupling - The characteristic of isolated circuit elements to interact with one another.

Crest Factor - For a periodic waveform such as a sine wave, it is the ratio of its crest (the peak, maximum) value to its RMS (root-mean-square) value.

Crowbar - An overvoltage protection circuit which rapidly places a low resistance shunt across the power supply output terminals if a predetermined voltage is exceeded.

CSA - Canadian Standards Association, or a product testing and approval agency in Canada.

Current (1) - The rate of transfer of electrical energy measured amperes. (One "international" ampere will deposit silver from a silver nitrate solution at the rate of 0.00111800 grams per second. An "international" ampere, in turn, is defined as 0.99985 OUT "absolute" amperes, one coulomb Current Foldback Limiting and Current Limiting per second.)



Current Foldback Limiting and Current Limiting

Current Limit Knee - The point on the plot of current vs. voltage of a supply at which the current starts to foldback.

Current Limit (Control) - A control function that prevents current from exceeding its prescribed limits.

Current Limiting Circuit - An electronic overload protection circuit that limits the maximum output current to a preset value. Limiting the output current from a circuit invokes a limit on the input current to the circuit as well.

Current Sensing Resistor - A resistor placed in series with the load to develop a voltage proportional to load current.

Current Transformer - 1) instrument Transformer: Intended to have its primary winding connected in series with the conductor carrying the current to be measured or controlled. 2) Metering: Designed for use in the measurement or control of current. Its primary winding may be single turn or bus bar, and is connected in series with the load. 3) Power and Distribution Transformer: Intended to have its primary winding connected in series with the conductor carrying the current to be measured or controlled. (in window type current transformers, the primary winding is provided by the line conductor and is not an integral part of the transformer.)

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Cutoff Voltage - 1) The cell or battery voltage at which the discharge is terminated. The cutoff voltage is specified by the cell manufacturer and is generally a function of discharge rate. 2) Voltage at the end of discharge. Cell voltage below which the UPS will not operate or below which operation is not recommended.

CVT - Abbreviation for Constant Voltage Transformer. *See Ferroresonant.*

CVT Capacitor - Those capacitors in the secondary tank circuit of the CVT, for the purpose of producing ferroresonance.

Cycle - 1) In alternating current, one cycle is one 360° transition of the waveform. 2) One complete battery charge and discharge.

D

DB (db) - A dimensionless unit for representing the ratio between two values of power.

DC Link - The direct-current power interconnection between rectifier or rectifier/charger and inverter sections.

DC Offset Voltage - The measure of the voltage by which a waveforms negative and positive excursions are offset from the zero axis.

Debug - The process of detecting and correcting errors.

Deenergize - Remove power.

Deep Discharge - 1) Withdrawal of at least 80% of the rated capacity of a cell or battery. 2) Discharge of a battery to below the specified voltage cutoff before the battery is replaced or recharged.

Delay on Operate - Electromechanical relay that is normally deenergized and when voltage is applied to its coil, delays by some fixed or adjustable time interval before operating.

Delay on Release - 1) Electromechanical relay that is normally energized and when voltage is supplied to a timing input, drops out after some fixed or adjustable time interval. 2) A relay that energizes the moment voltage is applied then drops out (deenergizes) after some time delay.

Depth of Discharge - 1) The ratio of the quantity of electricity (usually in ampere-hours) removed from a secondary cell or battery on discharge to its rated capacity. 2) The percent of rated capacity to which a cell or battery is discharged. 3) Capacity discharged from a battery in relation to the rated capacity. May be expressed as a percentage. 4) The percent of rated capacity removed from a cell during a discharge.

Deviation - The difference between the actual value of a quantity and the ideal or desired values.

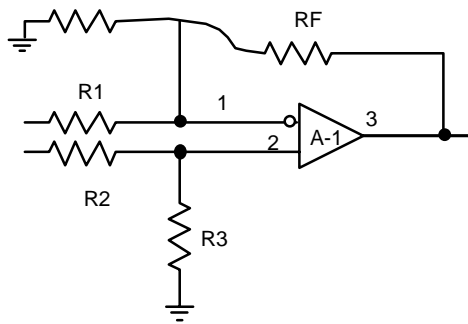
Dielectric - An insulating material between conductors that is resistant to electric current flow.

Dielectric Tests - Tests which consist of the application of a voltage higher than the rated voltage for a specified time to verify the dielectric withstand strength of insulation materials and spacing.

Dielectric Withstand Strength - The specified voltage or potential gradient below which a dielectric material will continue to resist electrical current flow.

Difference Voltage - The voltage difference between two sources. When referring to a static switch operation it is the voltage between one of the phases of the alternate source and the corresponding phase of the inverter. During synchronization the difference voltage between each of the phases of the alternate source and the corresponding inverter source should be at a minimum or null value.

Differential Amplifier - An amplifier whose output signal is proportional to the algebraic difference between two input signals.



Differential Amplifier

Differential Mode Noise - The component of noise, excluding common-mode noise, that is measured between two lines with respect to a common reference point. The value is the difference of the noise components on the two lines.

Differential Voltage - The difference in voltages at two points as measured with respect to a common reference.

Diode - A two-element device containing a cathode and an anode that permits flow in one direction and blocks flow from the other.

Direct Current (DC) - Flow of electrons in one direction. In text, "DC".

Discharge - 1) The conversion of the chemical energy of a cell or battery into electrical energy and withdrawal of the electrical energy into a load. 2) Withdrawal of electrical energy from a cell or battery, usually to operate connected equipment. 3) Characteristic of a capacitive device to release stored energy. 4) The conversion of chemical energy to electrical energy in a cell or battery.

Discharge Rate - 1) The rate, usually expressed in amperes, at which electrical current is taken from the cell or battery. 2) The current at which a cell or battery is discharged. 3) The value of the current in amperes at which a battery is discharged expressed as a fraction or multiple of the rated capacity in ampere-hours of the cell, e.g., C/5 or 5C. 4) See *C/X Rate*. (C=rated capacity; X=hours of discharge).

Displacement Factor - The displacement component of power factor; the ratio of the real power of the fundamental wave to the apparent power of the fundamental wave.

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Drift - A change in output over a period of time independent of input, environment or load.

Duration - The time interval between the first and last instants at which the instantaneous amplitude reaches a stated fraction of the peak pulse amplitude.

Duty Cycle - The ratio of time on to time off in a recurring event.

Dynamic Load - A load that rapidly changes from one level to another. To be properly specified, both the total change and the rate of change must be stated.

E

Earth - An electrical connection to the earth frequently using a grid or rod(s). *See also Ground*

Effective Value - The value of a waveform that has the equivalent heating effect of a direct current. For sine waves, the value is $.707 \times \text{Peak Value}$; for non-sinusoidal waveforms, the Effective Value = RMS (Root Mean Square) Value.

Efficiency - 1) The ratio of output power to input power expressed in percentage. 2) The ratio of the output of a secondary cell or battery on discharge to the input required to restore it to the initial state of charge. (*See also Ampere-Hour Efficiency, Voltage Efficiency and Watt Hour Efficiency.*)

Electricity - Property of fundamental particles of matter that have a force field associated with them to gain or lose electrons.

Electro-Mechanical Switch - An magnetically transferred device such as a relay, contactor, transfer switch, etc.

Electrolyte - The conducting medium within an electrochemical cell that provides the ion transport mechanism between positive and negative electrodes.

Electrolytic Capacitor - A device that contains two electrodes separated by an electrolyte.

Electromagnet - A device consisting of a ferromagnetic core and a coil that produces appreciable magnetic effects only when an electric current exists in the coil.

Electromagnetic Interference (EMI) - Any electronic disturbance that interrupts, obstructs, or otherwise impairs the performance of electronic equipment.

Electromotive Force (EMF) - Force that causes free electrons to move in a conductor. Unit of measurement is the volt.

Electron - Negatively charged particle.

Electron Volt - A measure of energy. The energy acquired by an electron passing through a potential of one volt.

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Electronic Power Converter - An electronic device for changing power in one of the following ways: AC/DC power converters, DC/AC power converters, AC/AC power converters, or DC/DC power converters.

Electronic Power Switch - An electronic device which can be controlled to interconnect power circuits.

Electrostatic Shield - A conductive screen that shunts induced electrical energy to ground.

Emergency Power Off (EPO) - A circuit required by the National Electric Code for certain applications that provides for a remote-controllable disconnecting means to remove power to all equipment in a room.

EMI Filter - A circuit composed of reactive and resistive components for the attenuation of radio frequency components being emitted from a power supply. *See also EMI*

End Voltage - 1) The prescribed voltage at which the discharge (or charge, if end-of-charge voltage) of a cell or battery may be considered complete (also cutoff voltage). 2) The battery or cell voltage at the end of a discharge. The battery is so dimensioned that the end voltage is never less than the lowest voltage at which a system can operate.

Energy - Output capability; ampere-hour capacity times average closed-circuit discharge voltage, expressed as watt-hours.

Equalization - The process of restoring all cells in a battery to an equal state of charge.

Equalizing Charge (Storage Battery) - An extended charge to a predetermined measured value that is given to a storage battery to insure the complete restoration of the active materials in all the plates of all the cells.

Equalizing Charge - An extended charge to ensure complete charging of all the cell in a battery.

Equivalent Circuit - An electrical circuit that models the fundamental properties of a device or circuit.

Equivalent Load - An electrical circuit that models the fundamental properties of a load.

Error Signal - The output voltage of an error amplifier produced by the difference between the reference and the input signal times the gain of the amplifier.

Error Voltage - The output voltage of the error amplifier in a control loop.

F

Failure - The termination of the ability to perform a required function.

Failure Mode - The way in which a device has ceased to meet specified minimum requirements.

Fan Cooled - A method of forced-air cooling used to maintain design temperatures.

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Farad - Unit of measurement of capacitance. A capacitor has a capacitance of one farad when a charge of one coulomb raises its potential one volt. $C=Q/E$

Fault - Partial or total failure of the insulation system.

Fault Current Availability - The current flow that can occur as a result of a zero impedance fault.

FE Change Circuit - FE is for Float/Equalize.

Feedback - The process of returning part of the output signal of a system to its input.

Ferroresonance - 1) The steady-state mode of operation that exists when an alternating voltage of sufficient magnitude is applied to a circuit consisting of capacitance and ferromagnetic inductance causing changes in the ferromagnetic inductance which are repeated each half cycle. 2) The property of a transformer design in which the transformer contains two separate magnetic paths with limited coupling between them. The output contains a resonating tank circuit and draws power from the primary to replace power delivered to the load.

Ferroresonant Power Supply - 1) The effect obtained by the limiting action of the saturation characteristic of the magnetic material in a ferroresonant circuit, which regulates the output voltage over a specified range of input voltages and a specified frequency of excitation. 2) A regulated power supply that uses a resonant circuit, with a capacitor in one of the secondaries that resonates with the inductance of the transformer. Ferroresonant power supplies are designed to operate at a given input frequency.

Field Effect Transistor (FET) - Transistor in which the resistance of the current path from source to drain is modulated by applying a transverse electric field between two electrodes.

Filter - One or more discrete components positioned in a circuit to attenuate signal energy in a specified band of frequencies.

Final Charging Voltage - The voltage which a battery reaches at the end of a charging operation. in the case of constant voltage charging, this voltage is determined by the setting of the charging equipment.

Final Discharge Voltage - The low end voltage to which the batteries are permitted to discharge.

Flame Arresting Vent - A special design of a wet cell vent which provides protection against internal explosion when the cell or battery is exposed to a naked flame or external spark.

Flip Flop - A device or circuit which can maintain either of two stable conditions and with one or more inputs which can cause it to switch over from one of those conditions to the other.

FloatCharge - 1) A method of maintaining a cell or battery in a charged condition by continuous, long-term, constant-voltage charging, at a level sufficient to balance self-discharge. 2) Method of recharging in which a secondary cell is continuously connected to a constant-voltage supply that maintains the cell in fully charged condition. 3) To, maintain the capacity of a cell by applying a constant voltage.

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Float System - A UPS system where the batteries are floated at a regulated DC voltage by a battery charger having sufficient capacity to power the fully loaded UPS and recharge discharged batteries.

Float Voltage - The voltage required for retaining a charged battery in a fully charged condition. This is also known as float charging.

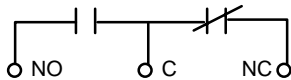
Flooded Cell - A cell design which incorporates an excess amount of electrolyte.

Flux (Greek letter PHI) - Total number of lines of magnetic force.

Flux Density (B) - Number of lines of flux per cross-sectional area of a magnetic circuit in Gauss.

Foldback Current Limiting - A power supply output protection circuit whereby the output current decreases with increasing overload, reaching a minimum at short circuit. This minimizes internal power dissipation under overload conditions. Holdback current limiting is normally used with linear regulators.

Form "C" Contacts - Contacts from an electromechanical relay or switching device which from a Common connection can select either a Normally Open or Normally Closed connection.



Four Wire Output - A two or three phase AC source with four output leads. Refer to Four Wire Input.

Free-running Frequency - The operating frequency of an oscillator circuit which is not being influenced by error correcting signal or whose frequency is determined only by circuit constants.

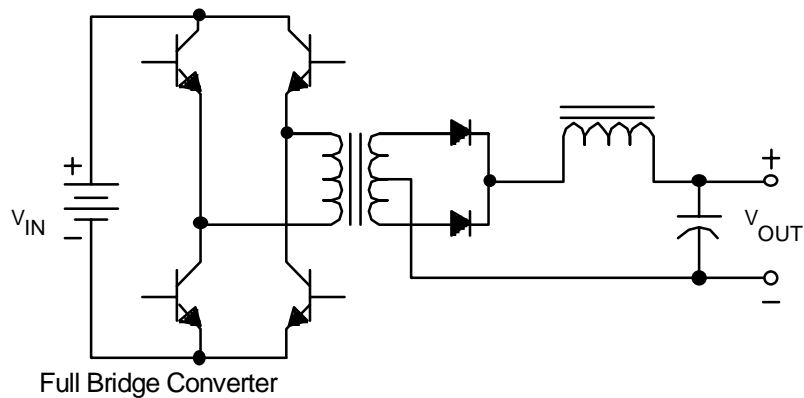
Frequency - Number of cycles per second measured in hertz (Hz).

Frequency Response - Rating of a device indicating its ability to operate over a specified range of frequencies, e.g., gain-frequency characteristics of an amplifier.

Frequency Modulation - The cyclic or random dynamic variation or both, of instantaneous frequency about a mean frequency during steady state electrical system operation.

Frequency Tolerance - A deviation from a standard frequency often expressed in percent.

Full-Bridge Converter - A power switching circuit in which four power switching devices are connected in a bridge configuration to drive a transformer primary.



Full-Bridge Rectifier - A rectifier circuit that employs four diodes per phase.

Full-Wave Rectifier - Rectifier circuit that produces a DC output for each half cycle of applied alternating current.

Functional Unit - A system element that performs a task required for the successful operation of the system.

Fuse - Safety protective device that permanently opens an electric circuit when overloaded. *See also Overcurrent Device, Overcurrent Protective Device.*

Fuse Clearing Curve - The time current characteristic curve that indicates the functions over time of the fuse.

Fuse Coordination - In thyristors, the fuse time-current characteristic curve is selected to protect the semiconductor from damage. In distribution systems, the fuse or circuit breakers are each selected so that interruption of any branch does not interrupt the source.

G

Gap - A non-magnetic segment in the magnetic path in a transformer or choke.

Gassing - The evolution of gas from one or more of the electrodes in a cell. Gassing commonly results from local action (self-discharge) or from the electrolysis of water in the electrolyte during charging.

Gate - 1) A device or element that has the ability to block or pass a signal. 2) A device having one output channel and two or more input channels that performs a logic function. 3) A control electrode in a semiconductor device such as a triac, or FET.

Glitch - 1) An undesired transient voltage spike occurring on a signal. 2) A minor technical problem arising in electrical equipment.

Ground - A conducting connection, whether intentional or accidental, by which an electric circuit or equipment is connected to earth, or to some conducting body that serves in place of earth.

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Ground Bus - A bus to which individual grounds in a system are attached and that in turn is grounded at one or more points. *Also see Single Point Common Ground and Isolated Ground.*

Ground Grid - Interconnected bare conductors arranged in a pattern over a specified area, laid out on or below the earth's surface.

Ground Loop - A condition that causes undesirable voltage levels when two or more circuits share a common electrical return or ground lines. *Also see Neutral Electrical Return.*

Ground Rod - A metallic rod, commonly copper clad, driven into the earth to serve as a ground terminal.

Grounded - Connected to or in contact with earth or connected to some extended conductive body which serves instead of the earth.

Grounding - A permanent and continuous conductive path to earth with sufficient ampacity to carry any fault current liable to be imposed on it, and of a sufficiently low impedance to limit the voltage rise above ground.

H

Half-Wave Rectifier - A circuit element, such as a diode, that rectifies only one-half the input AC wave to produce a pulsating DC output.

Hall Effect - Magnetic fields have an effect on semiconductors in that a magnetic field at a right angle to current will deflect charge carriers toward one surface of the crystal, thereby producing a positive potential on that surface for a p-type semiconductor or a negative potential for an n-type material.

Hiccup - A transient condition that momentarily confuses a control loop.

High Line - Highest specified input operating voltage.

High Rate of Charge - A slightly higher DC voltage supplied to batteries after a discharge to reduce the recharge time interval. Note that this term differs from the term "Equalize" in that a high rate charge may be permitted by the battery manufacturer for a battery type that may not be "equalized" (Sealed maintenance-free types).

Holding Current - A value indicating the minimum load operating current of an electromechanical device, usually stated in milliamperes.

Holdup Time - The time under worst case conditions during which a power supply's output voltage remains within specified limits following the loss or removal of input power. Often called ride-through.

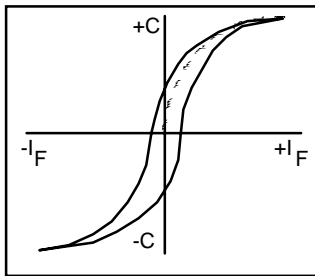
Hum - Audible noise from a magnetic device due to magnetostrictive activity of the core at twice line frequency.

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Humidity - The amount of moisture in the air, measured in percent relative humidity. For UPS 40 to 95% non-condensing relative humidity is the acceptable range, unless otherwise specified.

Hysteresis - 1) The property of a magnetic substance that causes magnetization to lag behind the force that produces it. 2) A variable input voltage threshold determined by the logic state of the output of the circuit.

Hysteresis Loop - A closed curve that 'Shows, for each value of magnetizing force, two values of the magnetic flux density in a cyclically magnetized material: one when the magnetizing force is increasing, the other when it is decreasing.



I IC - See *Integrated Circuit*.

Impedance (Z) - The opposition to the flow of an alternating current. Impedance consists of resistance R, inductive reactance X_L , and capacitive reactance X_C .

In Phase - When comparing two AC sources, the transitions of each phase of one source are in step with the transitions of the corresponding phases of a second source.

Indicating Fuse - See *Actuator Fuse*

Inductance (L) - The inherent reactive property, measured in henrys, of an electric circuit or circuit element that opposes a change in current flow. Hence, inductance causes current changes to lag behind voltage changes. See also *Henry*

Inductive Circuit - Circuit in which an EMF is produced by a changing current.

Inductive Load - Electrical devices that create a magnetic field when energized, such as motors, solenoids, coils, valves, and transformers. An inductive load can exhibit an inrush or lock-rotor current, when energized, many times its normal running or steady state current. When deenergized the magnetic field collapses generating a high voltage transient which can cause arcing across contacts as well as damage to circuits if not suppressed.

Inductive Reactance (X_L) - Opposition to a changing current as a result of inductance. $X_L = 2\pi fL$

Inductor - A coil or component with the properties of inductance.

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Infant Mortality - That early period of equipment life during which the failure rate of some items is decreasing rapidly. This is also called the early failure period or break-in period.

Input Impedance - The impedance of the input terminals of a circuit or device, with the input disconnected.

Input Isolation - Refers to the use of an isolation transformer at the input to the rectifier and/or battery charger section of the UPS. This serves to attenuate noise at the inverter, isolates from surges, and prevents the batteries from being referenced to Ground.

Input Surge - *See Inrush Current*

Input Voltage Range - The range of input voltage values for which a power supply or DC-AC Inverter operates within specified limits.

Inrush Current - 1) A current higher than its steady state value drawn by a device when energized or activated, 2) the peak instantaneous input current drawn by a power supply at turn on, or 3) the maximum current from turn on to a specified limit of duration. 4) Comments: Lamps, electric motors, solenoids, contactors, valves, and capacitors have inrush currents that exceed normal operating current.

Instantaneous Value - The measured value of a signal at a given moment in time.

Insulation Resistance - The value of resistance offered by an insulating material to an impressed voltage. The device used to measure insulation resistance is the Megger, which typically applies 500VDC to the insulation.

Integrated Circuit 00 - A combination of active and passive circuit elements contained on a single semiconductor substrate.

Internal Impedance - The impedance exhibited by a circuit element or component.

Internal Resistance - 1) The resistance exhibited by a circuit element or component. 2) Opposition to direct current flow within a cell, with the cell as source, causing a drop in closed-circuit voltage proportional to the current drain from the cell.

Interruption - Either momentary or long-term ceasing of current flow through an electronic circuit.

Inverter - 1) A machine, device, or system that changes direct-current power to alternating-current power. 2) A circuit, circuit element or device that inverts the input signal.

Isolated Regulated Charger - A battery charger employing an input isolation transformer as well as maintaining a regulated DC output.

Isolation - The electrical separation between two circuits, or circuit elements.

Isolation Transformer - A transformer with a one-to-one turns ratio. *See Also Step-Down Transformer, Step-Up Transformer, Transformer*

J-K-L

KVA - Symbol for Kilovolt Amperes, or thousands of volt amperes.

KW - Symbol for kilowatt.

KWHr - Symbol for kilowatt-hour.

Lagging Angle - Angle current lags voltage in inductive circuit.

Latch - 1) A logic circuit that, once set, maintains the output at some fixed state until reset. 2) In relay logic, a momentary initiation will hold the device energized through a holding contact.

Latching Alarm - A latch initiated by an alarm condition, requiring a reset command before returning to normal operation.

Latching Relay - A relay that mechanically latches until mechanically or electrically reset.

Lead Acid Cell - Secondary cell which uses lead peroxide and sponge lead for plates, and sulfuric acid and water for electrolyte.

Leading Angle - Angle current leads voltage in capacitive circuit.

Light-Emitting Diode (LED) - A semiconductor device that radiates in the visible spectrum when energized by an electric current. Color is determined by the electroluminescent characteristics of the materials used in fabricating the devices, and by the addition of various dopants. For example, copper-doped zinc sulfide emits light in the 620 nanometer (green) range, the area of peak sensitivity of the human eye.

Line Conditioner - A circuit or device designed to improve the quality of an AC line.

Line Frequency Regulation - The percentage change in output for a specified change in the line frequency at specified load values, with all other factors constant.

Line Regulation - The percentage change in output due to the input voltage varying over its specified limits, at specified load values, with all other factors constant.

Line Regulator - Power conversion equipment that regulates and/or changes the voltage of incoming power.

Line Transient - A disturbance outside the specified operating range of an input or supply voltage.

Linear - 1) In a straight line 2) A mathematical relationship in which quantities vary in direct proportion to one another, the result of which, when plotted, forms a straight line.

Linear AC Load - A load whose current waveform is sinusoidal when supplied a sinusoidal voltage.

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Load (AC) - 1) A device or devices which receives power from the AC output of the UPS. 2) Capacitance, resistance, inductance or any combination thereof, which, when connected across a circuit determines current flow and power used.

Load (DQ) - The inverter and discharged batteries are seen as DC loads to the battery charger.

Load Regulation - 1) STATIC The change in output voltage as the load is changed from specified minimum to maximum and maximum to minimum, with all other factors held constant. 2) DYNAMIC The change in output voltage expressed as a percent for a given step change in load current. Initial and final current values and the rates of change must be specified. The rate of change shall be expressed as current/unit of time, e.g., 20 amperes A/u second. The dynamic regulation is expressed as a +/- percent for a worst case peak-to-peak deviation for DC supplies, and worst case RMS deviation for AC supplies.

Load Sharing - The simultaneous supplying of power to a load from two or more sources.

Load Transfer Time - The time required for the transfer of the load from one power source to another.

Logic Ground - Common return or reference point for logic signals. May or may not be referenced to ground.

Logic Inhibit/Enable - 1) A referenced or isolated logic signal that turns a power supply output off or on. 2) A circuit which either locks out or activates another circuit.

Logic Signal - An instruction that executes an operation to perform a specified function.

Low-Voltage System - An electric system having a maximum root-mean-square alternating-current voltage of 1 000V or less.

Low Line - Lowest specified input operating voltage.

Low Voltage Cutoff - The preadjusted voltage point where the inverter will shut itself off during battery discharge to prevent damage to the UPS and to the batteries. This voltage point is equivalent to the end volts per cell as specified by the battery manufacturer.

M

Magnetic Shunt - The section of the core of the ferroresonant transformer that provides the major path for flux generated by the primary winding current that does not link the secondary winding. In addition, the shunts provide a major path for the flux resulting from the output and resonating winding currents that do not link the primary winding.

Maintenance Bypass Switch - A switch which either partially or totally isolates the UPS system from the AC power source (Alternate source), but at the same time may or may not maintain continuous alternate source feed to the load, depending on design.

Maintenance Free Battery - 1) A secondary battery which does not require periodic "topping up" to maintain electrolyte volume. 2) A battery, which during its specified working life needs no

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maintenance other than charging, provided normal operating conditions are experienced. 3) A term used for a type of cell which may be operated without adding water to the electrolyte during its recommended life.

Make-Before-Break Switch - A switch, which while transferring between two sources, momentarily shorts the two so that the continuity between the output and one of the two sources is never interrupted.

Make-Before-Break Transfer - A transfer between two sources; no interruption or loss of continuity to the load occurs.

Manual Bypass Switch - See *Maintenance Bypass Switch*.

Manual Transfer - 1) A transfer made by the operator/user, generally by the movement of a switch from one position to another. 2) A transfer from the "inverter" position to the alternate source position or vice-versa, which is initiated by operator.

Master/Slave Operation - Interconnection of two or more regulated supplies in which one (the master) controls the other (the slave).

Maximum Load - 1) The highest allowable output rating specified for any or all outputs of a power supply under specified conditions including duty cycle, period and amplitude. 2) The highest specified output power rating of a supply specified under worst case conditions.

Mean Time Between Failure (MTBF) - The arithmetic average of operating times between failures. An established method of calculating MTBF is described in Mil Handbook 217.

Mean Time To Repair (MTTR) - The arithmetic average of time required to complete a repair activity.

Mega - A prefix for millions, such as megohms.

Micro - A prefix for one millionth, such as microfarads or microseconds.

Milli - A prefix for one thousandth, such as millisecond or millihenrys.

Motor Generator - A machine made up of a gasoline, diesel, or other type of motor mechanically coupled to and driving a generator.

MTBF - Abbreviation for MEAN TIME BETWEEN FAILURE

MTTR - Abbreviation for MEAN TIME TO REPAIR

Multimeter - A meter capable of measuring current, voltage and resistance.

Multiple Output Power Supply - A power supply with two or more outputs.

Multivibrator - A circuit capable of assuming either one of two stable states at a given time.

N

NC - Normally closed. (*See Normally Closed*)

NO - Normally open. (*See Normally Open*)

Negative Electrode - The electrode acting as an anode when a cell or battery is discharging.

Negative Rail - The more negative of the two conductors at the output of a power supply.

Negative Temperature Coefficient - A decreasing function with increasing temperature. The function may be resistance, capacitance, voltage, etc.

Neutral - The AC return sometimes connected to ground, but which should not be used for ground because it is a current-carrying path.

No Load Voltage - Terminal voltage of battery or supply when no current is flowing in external circuit. *Also see Open Circuit Voltage.*

Noise - The aperiodic random component on the power source output which is unrelated to source and switching frequency. Unless specified otherwise, noise is expressed in peak-to-peak units over a specified bandwidth.

Nominal Value - The value used to designate or identify a component, device, equipment, or parameter.

Nominal Voltage - The stated or objective value of a given voltage, which may not be the actual value measured.

Nonlinear load - 1) A load whose crest factor is greater than 1.414. 2) A load with such characteristics that with an applied sinusoidal voltage the load current is not sinusoidal.

Normally Closed (NQ) - The electric contact of a device that is mechanically shorted to the device Common (C) connection when the device is in the deenergized mode of operation.

Normally Open (NO) - The electric contact of a device that is mechanically separated from the device Common (C) connection when the device is in the deenergized mode of operation.

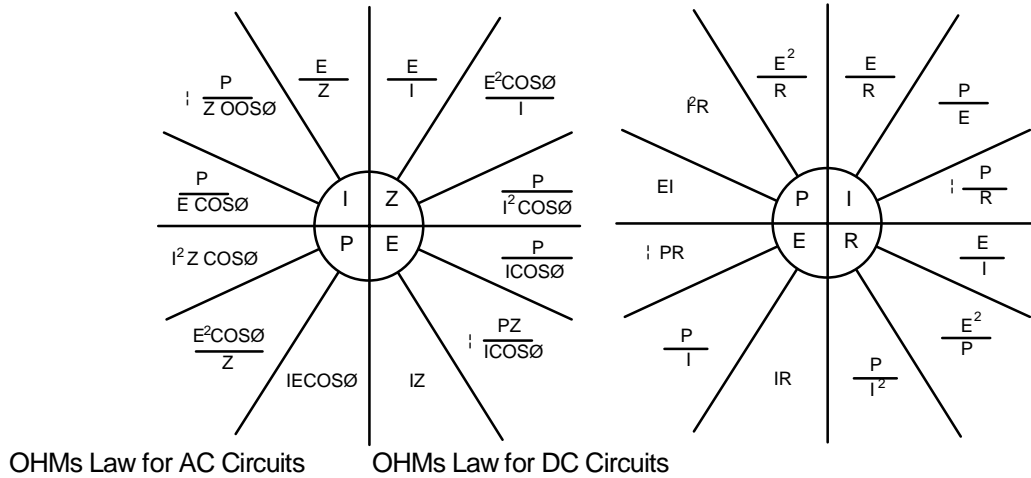
Null Voltage - When the voltage between two in-phase or synchronized sources is minimum. These sources normally are of approximately equal amplitude so that to minimize their difference is to adjust their phase shift to a negligible point.

O

Off Line Power Supply - 1) A power supply in which the AC line voltage is rectified and filtered without using a line frequency isolation transformer. 2) A power supply switched into service upon line loss to provide power to the load without significant interruption. Distinguished from UNINTERRUPTIBLE POWER SUPPLY.

Ohm (Symbol: Omega) - Unit of measure of resistance.

Ohm's Law - The fundamental mathematical relationship between current (I), voltage (E) and resistance (R) discovered by George Simon Ohm. The passage of one Ampere through one Ohm produces one Volt. $I=E/R$ $E=IR$ $R=E/I$ (Reference the figures following)



On-Line Power Supply - A power supply that continuously provides output power to the load without any interruption. *See also Uninterruptible Power Supply.*

Op-Amp - Abbreviation for operational amplifier.

Open Loop - A signal path without feedback.

Open-Circuit Voltage (OCV) - 1) The difference in potential between the terminals of a cell or voltage when the circuit is open (no-load condition). 2) The no load voltage of a cell or battery measured with a high resistance voltmeter. 3) The cell voltage in its stabilized idle state. The voltage across the terminals of a cell or battery when no external current is flowing. 4) *See No Load Voltage*

Operating Temperature - The range of ambient, baseplate or case temperatures through which a power supply is specified to operate safely and to perform within specified limits. *See also Ambient Temperature, Storage Temperature.*

Operational Amplifier (Op-Amp) - A high gain amplifier designed to be used with external circuit elements to provide a specific operation or function.

Out-of-Phase - When comparing two AC sources, the transitions of each phase of one source is out of step with the transition of the corresponding phases of the second source.

Output - The energy or information delivered from or through a circuit or device.

Output Choke - The inductor in the LC filter of the output.

Output Current - The RMS current (unless otherwise specified for a particular load) from the output terminals.

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Output Current Limiting - A protective feature that keeps the output current of a power supply within predetermined limits during overload to prevent damage to the supply and the load.

Output Filter - One or more discrete components used to attenuate output ripple and noise.

Output Filter Capacitor - The capacitor(s) across the output terminals of a power supply.

Output Impedance - The impedance presented by the UPS output terminals to the load.

Output LC Filter - The low pass filter in the secondary of a switching power supply that smoothes the rectified output to its average value. Also called an averaging filter.

Output Power - The power delivered by a UPS to the load.

Output Range - The specified range over which the value of a stabilized output quantity (voltage, current, or frequency) can be adjusted.

Output Ripple and Noise - *See Periodic And Random Deviation*

Output Voltage - The root-mean-square (RMS) voltage (unless otherwise specified for a particular load) between the output terminals.

Overcurrent Protection - *See Output Current Limiting.*

Overload - When the full current or power rating of a power supply is exceeded.

Overload Protection - A feature that senses and responds to current or power overload conditions.
See also Output Current Limiting

Overshoot - A transient change in output voltage in excess of specified output regulation limits, which can occur when a power supply is turned on or off, or when there is a step change in line or load.

Overvoltage - The potential difference between the equilibrium of an electrode and that of the electrode under an imposed polarization current. 2) A voltage that exceeds specified limits.

Overvoltage Protection (OVP) - A feature that senses and responds to a high voltage condition.
See also Overvoltage, Crowbar

P-Q

Parallel - 1) Term used to describe the interconnection of power sources in which like terminals are connected such that the combined currents are delivered to a single load. The connection of components or circuits in a shunt configuration.

Parallel Operation - The connection of two or more power sources of the same output voltage to obtain a higher output current. Special design considerations may be required for parallel operation of power sources.

Peak - Maximum value of a waveform reached during a particular cycle or operating time.

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Peak Inverse Voltage (PIV) - Maximum value of voltage applied in a reverse direction.

Peak Inverse Voltage Rating - The maximum rated voltage that can be applied in the reverse direction across a semiconductor.

Peak Output Current - The maximum current value delivered to a load under specified pulsed conditions.

Peak-To-Peak - The measured value of a waveform from peak in a positive direction to peak in a negative direction.

Periodic and Random Deviation (PARD) - The sum of all ripple and noise components measured over a specified band width and stated, unless otherwise specified, in peak-to-peak values.

Periodic Output Voltage Modulation - 1) The periodic variation of output voltage amplitude at frequencies other than the fundamental output frequency. 2) The cyclic or random dynamic variation or both of instantaneous voltage about a mean voltage during steady state operation.

Phase Angle (Greek Letter THETA) - 1) The angle (usually expressed in electrical degrees) between reference points on one or more AC wave forms. 2) The angle that a voltage waveform leads or lags the current waveform.

Phase Locked Loop (PLL) - A circuit that produces a signal with a variable frequency.

Phase Rotation - The lead-lag relationship of the three phases in a 3 ϕ source. Example: A leads B leads C is Clockwise rotation and A lags B lags C is Counterclockwise rotation.

Phase Shift - The difference between corresponding points on input and output signal waveforms (not affected by magnitude) expressed as degrees lead or lag.

Phase Unbalance - Used in reference to three phase UPS specifications where percentage limits are placed on the phase voltage unbalance under conditions of phase current unbalance. Load current unbalance is computed as the worst case difference current for any two of the three outputs divided by the average output current and times 100. Output voltage unbalance is given by dividing the difference of the output line voltage and the average line voltage by the average line voltage times 100.

PI Filter - A filter consisting of two line-to-line capacitors and a series inductance in a "pi" configuration used to attenuate noise and ripple.

Pilot Cell - A representative cell of a battery utilized to assess the average state of the battery or a somewhat undersized cell that is used as an indicator of the depth of discharge.

Plus (+) - Positive terminal of a circuit, circuit element or power source.

Polarity - Property of device or circuit to have poles such as north and south or positive and negative.

Positive Rail - The most positive of the two output conductors of a power supply.

Pot - Abbreviation for potentiometer.

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Power (P) - 1) The time rate of transferring or transforming energy. 2) Measured in watts, $P = IE$, $12 R \text{ or } E^2/R$. One watt equals one joule/second and one joule equals one watt-second; joule's Law mathematically describes the heating effect of the flow of current as a result of losses, commonly, $12R \text{ losses}$ ". 3) In a resistive circuit, power is the product of the in-phase components voltage and current (volt-amperes). *See also Apparent Power, True Power*

Power Factor - The ratio of true to apparent power expressed as a decimal, frequently specified as lead or lag of the current relative to voltage. 2) The ratio of total watts to the total root-mean-square (RMS) volt-amperes. $[\Theta]$ is the symbol used to represent the phase angle between the voltage and the current.

Power Factor Correction - 1) Technique of forcing current draw to approach being in-phase with the voltage in an AC circuit. 2) Addition of capacitors to an inductive circuit to offset reactance.

Power FET - Specialized field effect transistor designed for high current of high power applications.

Power Rating - Power available at the output terminals of a power source based on the manufacturers' specifications.

Power Source - Any device that furnishes electrical power, including a generator, cell, battery, power pack, power supply, solar cell, etc.

Power Supply - A device for the conversion of available power of one set of characteristics to another set of characteristics to meet specified requirements. Typical applications of power supplies include to convert raw input power to a controlled or stabilized voltage and/or current for the operation of electronic equipment.

Power Warning Feature (PWF) - A feature for use primarily by IBM System 38 computers whereby a signal is sent to the computer to warn of a utility power outage, giving the computer an opportunity to finish jobs in process before an organized shut-down, with an IBM user programmable delay based upon battery back-up time.

Primary Winding - A driven coil in a transformer.

Prime Power - The power normally continuously available which is usually supplied by electrical utility company but sometimes by the user's own generation.

Pulsating Direct Current - DC voltage containing an AC voltage ripple component.

Pulsating Load - A load current waveform having sudden changes of brief duration imposed upon it (where the average current is not zero).

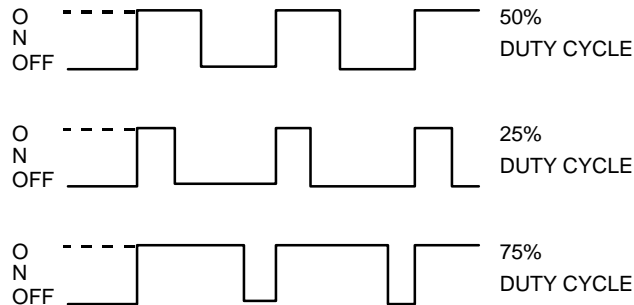
Pulse - A step rise, a level, and a step fall of voltage or current. Characteristics of a pulse are: rise time, duration and fall time.

Pulse-Width Modulation (PWM) - A method of regulating the output voltage of a switching power supply by varying the duration, but not the frequency or amplitude, of a train of pulses that drives a power switch.

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Pulse-Width Modulator (PWM) - An integrated 0 =L 25% discrete circuit used in switching-type power OFF DUTY CYCLE supplies, to control the conduction time of pulses produced by the clock.

PWM - Variously, the abbreviation for pulse- width-modulation, pulse-width modulator.



R

Ramp Generator - An electronic circuit which has linearly increasing or decreasing output voltage during periodically repeating time intervals.

Rated Capacity - 1) The number of ampere-hours a cell or battery can deliver under specific conditions (rate of discharge, end voltage, temperature); usually the manufacturer's rating. 2) The average capacity delivered by a cell or battery on a specified load and temperature to a voltage cutoff point, as designated by the manufacturer; usually an accelerated test approximating the cell or batteries capacity in typical use.

Rated Output Current - The maximum continuous load current a power supply is designed to provide under specified operating conditions.

Rating - The whole of the electrical and mechanical quantities assigned to the machine, apparatus, etc. by the designer to, define its working in specified conditions indicated in the rating nameplate.

Reactance M - opposition to alternating current as result of inductance or capacitance.

Reactive - A component that exhibits the property of either capacitance or inductance.

Recovery Time - The time interval between a change in a parameter and when the stabilized value of the parameter returns to and stays within the steady state tolerance.

Rectification - The process of changing an alternating current to a unidirectional current. See *Full-Wave Rectifier, Half-Wave Rectifier*

Rectifier - 1)A device or assembly of devices that converts AC power into DC power to supply the input power to an inverter but not a battery. 2) A component that passes current only in one direction, e.g., a diode.

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Rectifier Type UPS System - A UPS employing both an unregulated rectifier to supply DC power to the inverter, but also a trickle-charge battery charger of insufficient size to power the inverter but solely keeping the batteries fully charged.

Redundancy - The existence of more than one means for performing a given function.

Reference Ground - Defined point in a circuit or system from which potential measurements shall be made.

Reference Voltage - The defined or specified voltage to which other voltages are compared.

Regenerative - In a device whose information storage may deteriorate, the process of restoring or refreshing to the undeteriorated condition. Regenerative feedback is a sample of the output being returned to the input.

Regulated Power Supply - A device that maintains within specified limits a constant output voltage or current for specified changes in line, load, temperature or time.

Regulated Rectifier - A rectifier employing phase controlling or other type of voltage regulating circuitry to supply DC output voltage regulation to a much tighter percentage than the tolerance of the AC input voltage.

Regulating Transformer - A transformer capable of controlling its output voltage within specified limits by compensating for variations in input voltage and load.

Regulation - The process of holding constant selected parameters, the extent of which is expressed as a percent.

Relay - A magnetic component or solid state device that opens or closes an isolated switch(es) when a voltage is applied to the control terminals.

Remote Sensing - A technique for regulating the output voltage of a power supply at the load by connecting the regulator error-sensing leads directly to the load. Remote sensing compensates for specified maximum voltage drops in the load leads. Care should be exercised to avoid opening load handling leads to avoid damaging the power supply. Polarity must be observed when connecting sense leads to avoid damaging the system.

Reset Signal - A signal used to return a circuit to a desired state.

Resistance (Ω) - Property of a material that opposes the flow of current.

Resonance - 1) The state in which the natural response frequency of a circuit coincides with the frequency of an applied signal, or vice versa, yielding intensified response. 2) The state in which the natural vibration frequency of a body coincides with an applied vibration force, or vice versa, yielding reinforced vibration of the body.

Resonant Circuit - A circuit in which inductive and capacitive elements are in resonance at an operating frequency.

Resonant Frequency - The natural frequency at which a circuit oscillates or a device vibrates. In an L-C circuit, inductive and capacitive reactances are equal at the resonant frequency.

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Response Time - The time required for the output of a power supply or circuit to reach a specified tolerance after a step change or disturbance.

Restored Energy Time - The time required by the energy storage means of the UPS to be charged to provide a second rated stored energy time after providing rated stored energy time.

Return - The name for the common terminal of the output of a power supply; it carries the return current for the outputs.

Reverse Polarity - A connection that is opposite to that which is specified or intended.

RFI - Abbreviation for Radio Frequency Interference.

Ride-Through - The time interval that load will be powered by an output after the input has ceased, i.e. the time the ferroresonant or output transformer will carry load once the inverter bridge has stopped operating (largely dependent on the size of the output filter arrangement).

Ringling Peak - In a forced-com mutated inverter circuit, the SCR's are forced to resume a blocking state by the discharge of a commutating capacitor causing the collapse of a large magnetic field which developed in the commutating choke. The capacitor is recharged to an extent by the decaying field, and again discharges into the choke, causing a ringling to occur. The first peak of this ringling is significant because it is the highest voltage peak, and may not exceed the rating of the bridge semiconductors.

Ripple - The periodic AC component at the power source output harmonically related to source or switching frequencies. Unless specified otherwise, it is expressed in peak-to-peak units over a specified band width.

Ripple and Noise - *See Periodic And Random Deviation (Pard)*

Ripple Voltage - The periodic AC component of the DC output of a power supply.

Rise Time - The time required for a pulse to rise from 10 percent to 90 percent of its maximum amplitude.

RMS - Abbreviation for root mean square value. In text, use lower case: rms.

Root Mean Square Value (RMS) - For a sine wave, $.707 \times E_{PEAK}$

S

Safety Ground - A conductive path from a chassis, panel or case to earth to help prevent injury or damage to personnel and equipment.

Sag - Momentary decrease in line voltage usually caused by in-rush loads.

Reactor - A magnetic component with a square loop hysteresis curve. The saturable reactor when driven in and out of saturation functions as a magnetic amplifier or switch.

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Saturation (Magnetic) - A condition in a magnetic material in which an increase in flux density (B) will no longer produce an appreciable increase in field intensity (H).

Scott "IT" - Transformer connection whereas 30 voltages are developed by using only two transformers.

SCR - Abbreviation for SILICON CONTROLLED RECTIFIER

Sealed Cell - A cell which is sealed under normal conditions, but allows the escape of gas if the internal pressure exceeds a critical value.

Secondary - A cell or battery designed to be recharged. *See also, Secondary Output, Secondary Winding*

Secondary Winding - A coil that receives energy from the primary winding by mutual induction and delivers energy to the load is the secondary winding.

Self Protective Action - Any equipment alarm function employing a control function such as partial shut-down or transfer, in order to prevent damage to its circuit.

Sequencing - The process that forces the order of turn on and turn off of individual outputs of a multiple output power supply.

Series - 1) The interconnection of two or more power sources such that alternate polarity terminals are connected so their voltages sum at a load. 2) The connection of circuit components end to end to form a single current path.

Series-Parallel - A circuit having a combination of series and parallel components.

Service Life - The period of useful life of a primary cell or battery before a predetermined end-point voltage is reached. 2) Period of useful life of a power supply before a predetermined end of life point is reached. Service life may be significantly increased by the replacement of select components.

Shelf Life - The duration of storage under specified conditions at the end of which a component or device retains the ability to give a specified performance.

Short-Circuit - A direct connection that provides a virtually zero resistance path for current.

Short-Circuit Current (SCC) - 1) The initial value of the current obtained from a power source in a circuit of negligible resistance. 2) The current which flows from the UPS into zero impedance load.

Short-Circuit Protection - A protective feature that limits the output current of a power supply to prevent damage.

Shunt - 1) A parallel conducting path in a circuit. 2) A low value precision resistor used to monitor current. *See Magnetic Shunt.*

Shunt Trip - An accessory device attached to a circuit breaker to enable control circuitry to remotely trip the breaker.

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SI - The *Standard International* system of units.

Signal Ground - The common return or reference point for analog or digital signals.

Silicon-Controlled Rectifier - A unit-directional, four-layer (PNPN) junction device in which conduction is initiated by the application of a gate current. Conduction will continue until the current is reduced to some minimum value.

Sine Wave - A wave form of a single frequency alternating current whose displacement is the sine of an angle proportional to time or distance. *Also see Sinosoidal.*

Single Phase - A two or three wire AC source which has 180° vector displacement between its output leads.

Single Point Ground - The one point in a system that connects multiple grounds and returns. Also known as star ground, or holy point ground.

Sinusoidal - The waveform derived by rotating a vector counterclockwise at a linear rate (frequency) and plotting the sine function of its angular displacement.

Slave - A power supply which uses the reference in another power supply, the master, as its reference.

Slew Rate - The change in frequency of a periodic waveform from one period to the immediately subsequent period divided by the average of the two periods.

Snubber - An RC network used to reduce the rate of rise of voltage in switching applications.

Snubber Network - A circuit that uses a RC network and a diode in unipolar switching applications.

Soft Starts - Controlled (ramped) turn on to reduce inrush currents.

Solidstate Relay - A completely electronic switching device with no moving parts or contacts.

Solidstate Switch - A switch that uses no moving parts. *Also see Static Switch.*

Source - Origin of the input power, e.g., generator, utility lines, mains, batteries, etc.

Specific Gravity - The specific gravity of a solution is the ratio of the weight of the solution to the weight of an equal volume of water at a specified temperature.

Spike - A short duration, high frequency overvoltage transition.

Square Wave - 1) In digital circuits, a waveform characterized by only two voltage levels, very fast transitions from one level to the other, and equal periods of time at each level. 2) The inverter bridge waveform in ferroresonant inverters. 3) By waveform analysis, the sum of a fundamental frequency sine wave with all of its odd harmonics.

Standby Power - The power intended to replace prime power in case of prime power failure. *See Alternate Source.*

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Start-up Delay - The time delay between either applying power or a remote "on" and the time at which the outputs are in regulation.

Start-up Sequence - The order of events that occur in a power supply during start up.

Static Converter - A unit that employs static switching devices, such as controlled rectifiers, transistors, or magnetic amplifiers.

Static (Transfer) Switch - A Solidstate switch used in Standby Power Supply (SPS) and Uninterruptible Power Supply (UPS) systems for transferring the load between the primary AC power and secondary AC power.

Static Load - A load that remains constant over a given time period.

Stationary Battery - A secondary battery designed for use in a fixed location.

Status Signals - Logic signals that indicate normal or abnormal conditions of operation, including AC low, AC ok, over temperature, under temperature, DC low, DC ok, overvoltage, overcurrent.

Steadystate - The condition in which some value, such as amplitude periodicity or rate of change, exhibits negligible change over an arbitrary long interval of time.

Step-Down Transformer - A transformer with a turns ratio more than one. The output voltage is less than the input voltage. *See also, Isolation Transformer, Step-Up Transformer, Transformer*

Step-Up Transformer - A transformer with a turns ratio less than one. The output voltage is greater than the input voltage. *See also, ISOLATION TRANSFORMER, STEP-DOWN TRANSFORMER, TRANSFORMER*

Step Change - An abrupt and sustained change in one of the influence or control quantities of a power supply.

Step Load Change - The instantaneous addition or removal of electrical loads to a power source.

Storage Battery - A galvanic battery which once discharged may be recharged by passing a direct current through the cell in the opposite direction to the discharge current, designed for use in a fixed location.

Storage Temperature - A range of ambient temperature through which an inoperative power supply can remain in storage without degrading its subsequent operation. *See Ambient Temperature, Operating Temperature.*

Stored Energy Time - The minimum time that the UPS will provide continuity of load power (under specified service conditions starting with a fully charged energy storage means) in the absence of AC input power.

Surge - A sudden, strong overvoltage transition.

Surge Arrester - A protection device for limiting surge voltages on equipment by discharging or bypassing surge current; it prevents continued flow of follow current to ground, and is capable of repeating these functions as specified.

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Symmetrical - A current or voltage waveform having the same magnitude above & below the zero, axis.

Sync - Abbreviation for synchronize.

Sync Null - *See Nuli Voltage.*

Synchronization - The act of being synchronized.

Synchronous (Synchronized) - 1) The transitions of the Commercial AC Power waveform (sine wave) are in step with the transitions of the AC Power waveform from the Battery/inverter of the UPS. 2) The state where AC systems operate at the same frequency and where the phase-angle displacements between voltages are constant.

Synchronous - When two sources are operating with their voltage transitions in step.

T

Takeover voltage - A voltage source developed from the inverter bridge square wave. it is used to power the oscillator and static switch control boards at all times except during the starting of the inverter.

Tap-Changer - A line voltage regulating equipment employing a multiple winding transformer where voltage regulation is achieved by controls selecting the appropriate transformer taps. *Also see Regulating Transformer.*

Temperature Coefficient - The average percent change in output voltage per degree Centigrade change in ambient temperature over a specified temperature range. *See also Ambient Temperature.*

Termination - The hardware used to make the electrical input, output, and feed through connections.

Thermal Runaway - 1) A condition whereby a cell or battery on charge or discharge will destroy itself through internal heat generation caused by high overcharge or over discharge current or another abusive condition. 2) The critical condition arising during constant potential charging, in which charging current and electrolyte temperature produce a commutative self-reinforcing effect to further increase current and electrolyte temperature. 3) A condition in which a cell or battery on constant-potential charge can destroy itself through internal heat generation. 4) A condition in a power source or component where an increase in temperature increases current flow causing a further increase in temperature, the spiraling effect of which leads to failure.

Three Phase - A three or four wire AC source which usually has 120° vectoral displacement between three of its leads and if there is a fourth wire, 180° displacement between each of the three leads to this common fourth lead.

Three Wire Output - A single, two or three phase AC source with three output leads.

Three-Phase - Three electromotive forces (voltages) that differ in phase by 1/3 of a cycle, that is 120°. Voltage levels are usually the same.

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Thyristor - A Solidstate device that has bistable electrical characteristics. Three common thyristor devices are diacs, silicon controlled rectifiers (SCR's) and triacs.

Time Constant (RC) - Time period required for the voltage of a capacitor in an RC circuit to increase to 63.2 percent of maximum value or decrease to 36.7 percent of maximum value.

Tolerance - The total permissible variation of a quantity from a designated value.

Total Harmonic Distortion (THD) - The ratio of the root-mean-square (RMS) value of all the harmonics to the root-mean-square (RMS) value of the fundamental usually expressed in percent.

Total Regulation Bank - The range of combined regulation tolerances such as the effects of input voltage variation, output load variation, temperature variation, drift and other specified variables. It is expressed as a plus/minus percent from nominal. Also called accuracy limits.

Transfer - To switch the output between two or more sources of prime power. in the UPS, the sources are Commercial AC Power and the Battery (AC output power from the Battery via the Inverter).

Transfer Switch - A switch used to transfer a load from one power source to another.

Transformer - Device which transfers energy from one circuit to another by electromagnetic induction. *See Isolation Transformer, Step-Down Transformer, Step-Up Transformer*

Transient - An excursion in a given parameter, typically associated with input voltage or output loading. That part of the variation which ultimately disappears in a quantity during transition from one steady-state operating condition to another.

Transient Effect - The result of a step change in an influence quantity on the steady state values of a circuit.

Transient Recovery Time - The time required for the output voltage of a power supply to settle within specified output accuracy limits following a transient.

Transient Response - Response of a circuit to a sudden change in an input or output quantity.

Transient Response Time - The interval between the time a transient is introduced and the time it returns and remains within a specified amplitude range.

Transient Voltage - Transient voltage is generated when loads energize and deenergize, particularly inductive loads. UPS systems serve to isolate critical loads from the negative results of such transients, such as the peak voltage, the rate of rise of the transient, DV/DT, and the duration of the transient.

Triac - A bi-directional silicon-controlled switch.

Trickle Charge - 1) A charge at low rate, balancing losses through local action and/or periodic discharge, to maintain a cell or battery in a fully charged condition. 2) A method of recharging in which a secondary cell is either continuously or intermittently connected to a constant-current supply that maintains the cell in a fully or near fully charged condition. 3) The method of long time

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keeping a charged battery in fully charged state by applying a low constant charge current. 4) A method of maintaining the capacity of the cell by applying a small, constant current to the cell.

Trip Curve - Similar to time-current characteristic curve for fuses except that circuit breakers will often indicate more than one specific region of operation due to the additional features of magnetic trip and thermal trip.

True Power - Actual power generated or consumed in a circuit.

True RMS Meter - A meter that measures the RMS voltage rather than average or some other value.

Tuned Circuit - Circuit containing capacitance, inductance and (optionally) resistance, connected in series or parallel, which when energized at a specific frequency known as its resonant frequency, an interchange of energy occurs between the coil and the capacitor.

Turn-off Time - The length of time that an SCR must be reverse biased to guarantee its turn off.

Turns Ratio - Ratio of the number of turns on the primary winding of a transformer to the number of turns on the secondary winding.

Two Phase - A two wire or three wire AC source which exists between two of the leads; vectoral displacement other than 180°.

Two Wire Output - A single or two phase AC source which uses two output leads.

U

Undervoltage Protection - A circuit that inhibits the power supply when output voltage falls below a specified minimum, and that sometimes has an audible/visual alarm.

Uninterruptible Power Supply System (UPS) - A system that converts unregulated input power to voltage and frequency controlled filtered AC power that continues without interruption even with the deterioration of the input AC power. It is commonly referred to as UPS. *See also Off Line Power Supply, On Line Power Supply.*

Unregulated Rectifier - A device that receives an unregulated AC voltage and rectifies but does not regulate it.

UPS Switch - A switch (electronic or mechanical, depending on required continuity of power) used to connect, interrupt, isolate, or transfer power flow within a UPS.

Utility Power - The commercially available AC feed power from the utility company.

V

Variation - The change in the value of a quantity from its mean or typical value.

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Vital Loads - Vital instrumentation and control power systems identified in ANSI/IEEE Std. 308.1980 or other loads as specified that are important to plant operation or personnel safety, or both.

Volt - Unit of measurement of electromotive force or potential difference. Symbol E, in electricity; symbol V in semiconductor circuits.

Volt-Ampere - Measurement unit of apparent power.

Voltage - A derivative electrical quantity, E, measured in the unit Volts and defined in terms of the independently obtained Ampere, I, and the unit of resistance, Ohm (R) by Ohms Law $E = IR$.

Voltage Divider - Tapped or series resistance or impedance across a source voltage to produce multiple voltage.

Voltage Drop - Difference in potential between two points in a passive component or circuit.

Voltage Imbalance Factor - The ratio of the amplitudes of the negative-sequence component to the positive-sequence component of the line-to-line output voltage.

Voltage Limit - Maximum or minimum value in a voltage range.

Voltage Monitor - A circuit or device that determines whether or not an output voltage is within some specified limits.

Voltage Regulation - 1) The process of holding voltage constant between selected parameters, the extent of which is expressed as a percent. 2) The relative percent change of voltage during (cell/battery) discharge. *See also Regulation*

Voltage Regulator - A device that controls output voltage within a specific range when the input voltage and connected load are within specified ranges.

Voltage Source - A power source that tends to deliver constant voltage.

W-X-Y-Z

Walk-in - A controlled power increase by the UPS from the AC input into the UPS.

Warm-up Time - The time required after a power supply is initially turned on before it operates according to specified performance limits.

Warm-up - Process of approaching thermal equilibrium after turn on.

Warm-up Drift - The change in output voltage current or frequency of a power source from turn on until it reaches thermal equilibrium at specified operating conditions.

Wave - Any form of disturbance that exhibits a periodic (repeating) pattern.

Waveform - A representation or expression used to describe the shape of a wave disturbance as observed on a display instrument.

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Watt - Unit of measurement of power equal to 1 joule/sec. ($W=EI$)

Watt-Hour - Unit of energy measurement, equal to one watt per hour (3600 joules).

Winding - A conductor wrapped onto a magnetic core or core for, e.g., a transformer primary or secondary.

Worst Case Condition - A set of conditions where the combined influences on a system or device are most detrimental.

Wye Connection - In a three-phase alternating-current system, a wye connection is a method of interconnection the windings of a transformer to a common point. The configuration gets its name from the fact that, in a schematic diagram, it appears like a capital letter Y.

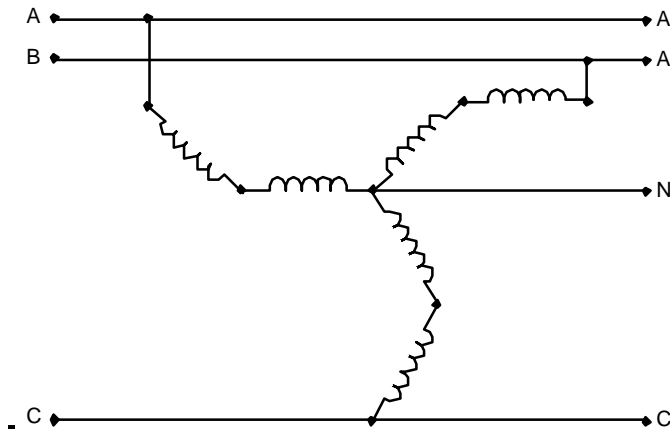
Yearly Average Temperature L The time average of bulk air temperature taken over a period of one year.

Zener Diode - A diode that makes use of the breakdown properties of a PN junction. If a reverse voltage across the diode is progressively increased, a point will be reached when the current will greatly increase beyond its normal cut-off value to maintain a relatively constant voltage. Either voltage point is called the Zener voltage. The breakdown maybe either the lower voltage Zener effect or the higher voltage avalanche effect.

Zener Voltage - The reverse voltage at which breakdown occurs in a zener diode.

Zero Break - Transfer -A transfer between two sources whereas no loss of continuity or interruption occurs to the output.

Zig-Zag Transformer Configuration - The connection in star of polyphase windings, each branch of which is made up of windings that generate phase-displaced voltage.



Zig zag arrangement used to generate a neutral.