

**A**

**alternating current**

A periodic current (sine wave) whose average value over a cycle is zero. The current reverses at regular intervals of time and has alternately positive and negative values.

**ambient temperature**

The temperature of the medium in which the heat of a device is dissipated. The ambient temperature is often specified in standards for device performance (such as the UL Standards) as the basis for determining the heat rise of the component.

**ampacity**

The current carrying capacity of a conductor or device.

**ampere** *see coulomb*

1) The classic definition of an ampere is a unit of electric current flow equivalent to the motion of 1 coulomb of charge, or 6.28 X10 18 electrons, past any cross section in 1 second. This is an intuitive way to think about an ampere, it is the flow of a huge number of electrons through a conductor.

2) In 1948 this alternative definition was adopted: A unit of electric current in the meter-kilogram-second system. It is the steady current that when flowing in straight parallel wires of infinite length and negligible cross section, separated by a distance of one meter in free space, produces a force between the wires of  $2 \times 10^{-7}$  newtons per meter of length.

**B**

**battery** *see cell*

Two or more cells connected together. Thus a group of batteries connected together can also be referred to as a battery

**battery bank**

When groups of 6V or 12V batteries are wired in series or parallel or a combination to increase voltage or capacity the entire group is referred to as a battery bank. When batteries are connected in series the amp-hour rating is the same and the voltage is additive. When batteries are connected in parallel the voltage is the same and the amp-hour rating is additive.

**battery state-of-charge**

The term is used to describe and estimate of how much energy the battery is able to deliver. There have been many attempts to develop improved state-of-charge estimates. The most common methods include specific gravity, at-rest open-circuit voltage, and amp-hour measurement.

**branch circuit** *see main*

The portion of the wiring system after the main circuit protection device.

**break (rating)**

The amount of current that can be passing through a set of contacts, such as those in a solenoid, when they open, without damaging the contacts. This can be a rating for a single event or over some number of cycles, generally 1000, 10,000 or 1000,000.

**bus, busbar**

A bus is a group of common connections, often consisting of a strip of copper or brass with a number of screws or bolt studs for the connection of wires. It may be a negative or a positive bus.

**C**

**cascade circuit**

A series arrangement of more than one protector connected between the power source and the load.

**CE (Conformité Européen)**

The CE marking is a conformity marking consisting of the letters "CE". The CE marking is applied to products regulated by certain European health, safety and environmental protection legislation. The CE marking is obligatory for products it applies to. The manufacturer affixes the marking certifying that the product conforms to applicable regulations, in order to be allowed to sell his product in the European market.

**cell**

An electrochemical system that converts chemical energy into electrical energy. Typically consisting of two conductive plates with different galvanic potential immersed in an electrolyte.

**charge**

Classically refers to an accumulation of electrons producing an electrostatic charge. In common use it often refers to restoring energy to a battery. Specifically, it would refer to the part of a multi-stage battery charging cycle when the voltage was held constant at or about the gassing voltage.

**circuit**

A closed path of electrically, or electro-magnetically connected, components or devices that is capable of current flow. Typically consisting of loads, sources, conductors, and circuit protection (circuit breakers and fuses). For example: A battery, fuse, and bilge pump connected together with wire are a circuit. The path must be continuous and closed.

**circuit breaker**

A device that, like a fuse, interrupts a current in an electric circuit when the current becomes too high. Unlike a fuse, a circuit breaker can be reset after it has been tripped. When a high current passes through the circuit breaker, the heat it generates or the magnetic field it creates causes a trigger to rapidly separate the pair of contacts that normally conduct the current.

**circular mils**

A method of specifying wire size mathematically. One Circular Mil is a unit of area equal to that of a circle .001" in diameter.

The actual area of a Circular Mil is:

$$A = \pi r^2$$

$$A = 3.1428 \times (.0005)^2 \text{ inches}$$

$$A = .0000007857 \text{ square inches}$$

**cold cranking amperes (CCA)** *see marine cranking amperes*

CCA is the discharge load in amps, which a battery can sustain for 30 seconds at 0° F. and not fall below 1.2 volts per cell (7.2V on 12V battery). This battery rating measures a burst of energy that an engine needs to start in a cold environment. This rating is used mainly for rating batteries for engine starting capacity and does not apply to NiCad batteries, NiMH batteries or Alkaline batteries.

**common trip**

A feature on a multi-pole protector in which an overload on any pole will cause all poles to open.

**conductivity**

Conductance is the reciprocal of resistance, which depends on the receptivity constant of the material. Receptivity is the resistance of a conductor having unit cross section and unit length. Conductivity is the reciprocal of the receptivity. Its units are 1/ohm-cm or ohm/cm, or 1/ohm-circular mils/ft

**conductor**

That part of an electrical circuit whose resistance relative to the balance of the circuit is zero. For example, in a circuit consisting of a light bulb and a battery, connected together with wire, the wire is referred to as the conductor.

**converter**

An electrical device that converts one type of electrical energy into another. Battery chargers convert AC power to DC to charge the battery, inverters convert DC power into AC, both are converters. Often used in RV industry to mean a power supply that runs the domestic DC loads when shore power is available.

**coordination**

The ability of the protector with the lowest rating in a cascade arrangement to trip before those with higher ratings (See Cascade Circuit).

**coulomb** *see amperage*

The measurement unit of electric charge, which is determined by the number of electrons in excess (or less than) the number of protons. Classically a charge of 1 coulomb =  $6.25 \times 10^{18}$  electrons. The meter-kilogram-second unit of electrical charge equal to the quantity of charge transferred in one second by a steady current of one ampere.

**cranking (starting)**

Normally associated with "cranking current" which is the current required by the starter circuit prior to engine starting. The cranking current varies significantly during the starting cycle. Initially, there is a large surge of current required to overcome the inertia and compression of the engine. This surge can be two to four times the average cranking current. Once the engine is turning there are peaks and valleys as the pistons go through the compression and exhaust cycles. The cranking current rating is used for sizing batteries, cables, and battery switches.

**current** *see amperage*

Current is a flow of electrical charge carriers, usually electrons or electron-deficient atoms. The common symbol for current is the uppercase letter I. The standard unit is the ampere, symbolized by A. Physicists consider current to flow from relatively positive points to relatively negative points; this is called conventional current or Franklin current. Electrons, the most common charge carriers, are negatively charged. They flow from relatively negative points to relatively positive points. Electric current can be either direct or alternating. Direct current (DC) flows in the same direction at all points in time, although the instantaneous magnitude of the current might vary. In an alternating current (AC), the flow of charge carriers reverses direction periodically. The number of complete AC cycles per second is the frequency, which is measured in hertz. An example of pure DC is the current produced by an electrochemical cell. The output of a power-supply rectifier, prior to filtering, is an example of pulsating DC. The output of common utility outlets is AC.

**current limitation**

A protective device that reduces the available short circuit peak current to a lesser value.

**current rating**

The maximum current in amperes that a device will carry continuously under defined conditions without exceeding specified performance limits.

**current transformer** *see ammeter*

The "CT", as current transformers are commonly referred to, is used by AC ammeters to "sense" current flow in a wire in an AC circuit. It is a toroidal coil of wire through which a wire whose current we wish to measure is passed. It is normally encapsulated and looks like a "doughnut", which is how electrician's commonly refer to it. The doughnut has two wires coming out of it, which are connected to the AC ammeter. As current flows in the AC wire we wish to measure, it induces a current flow in the current transformer. The magnitude of the current varies directly with the current flowing in the AC wire. Current transformers are rated by the number of maximum amps that can flow in the measured wire and the current generated, by the CT, at that current flow. For example: A 50:5 CT is rated for 50 amps flowing in the measured wire, and it generates 5 amps of current as a consequence.

**D**

**delay**

A difference in time between the initiation of an event and its occurrence, or between an event's observation and enunciation of it. This is usually used to refer to the time between the application of overcurrent to a fuse or circuit breaker and the time when the device opens.

**derating**

A decrease in a device's rating, usually amperage, due to its application in ambient conditions different from those in which it was tested or for which it was designed originally.

**dielectric strength**

The maximum voltage stress that a material can withstand without rupture.

**digital**

A digital signal is one which has only two valid values denoted as 1 or 0. Commonly these are equated to distinctly different voltage. For example: A voltage of +5V would equal a 1 and a voltage of 0V would equal a 0. A digital meter is one that displays values as numerical values rather than as the position of a meter on a relative scale.

**direct current (DC)**

An electric current that always flows in the same direction. The magnitude may vary but the current direction is always the same. Commonly referred to as DC. Examples of direct current sources are batteries, fuel cells, and photovoltaic cells. DC sources such as battery chargers and alternators actually use rectified AC current as the source.

**discharge**

Refers to the consumption of energy from a battery, or to the electrostatic discharge associated with a lightning bolt, capacitor, etc.

**double pole**

Indicates a switch, relay, or circuit breaker with two separate conductive paths, which are opened or closed when the device is operated.

**duty, continuous**

The requirement that demands operation at a constant load for an indefinite period of time.

**duty, intermittent**

The requirement that demands operation for alternate intervals of (1) load/no load; (2) load/rest; or (3) load/no load/rest.

**E**

**earth**

The third planet from the sun in Astronomy, but in electrical terms it refers to a connection, which is made to a conductor that is connected to the planet Earth. In grounded electrical systems there is a connection, which is a copper rod or some other highly electrically conductive connection, to the actual Earth. This is to ensure a safe conductive path for a short circuit, which in turn helps prevent electrocution.

**electron** *see coulomb*

A negatively charged subatomic particle, that is either free (not attached to any atom), or bound to the nucleus of an atom. In electrical conductors, current flow results from the movement of free electrons from atom to atom individually, and from negative to positive electric poles in general. The charge on a single electron is considered as the unit electrical charge. It is assigned negative polarity. Electrical charge quantity is not usually measured in terms of the charge on a single electron, as this is an extremely small charge. Instead, the standard unit of electrical charge quantity is the coulomb, symbolized by C, representing about  $6.25 \times 10^{18}$  electrons.

## electromotive force (EMF)

Commonly referred to as voltage, electromotive force is the energy per unit of charge that is supplied by a source of electrical energy such as a battery, charger or alternator.

## electromagnetic interference (EMI)

Noise generated by a load (typically by electrical switching action). Usually specified as meeting agency limits for conducted EMI (noise reflected back onto the power bus) or radiated EMI (noise emitted into the area surrounding a device).

## energy *see power*

The classically simple definition is, the capacity to do work. Energy may be manifested as, mechanical motion, thermal heat, or electrical power, which is consumed, radiated, dissipated, or stored over a period of time. The energy in a direct-current circuit is equal to the product of the voltage in volts, the current in amperes, and the time in seconds. The units for energy are Watt-hours. In alternating current (AC) circuits, the expression for energy is more complex.

## effective or RMS value

The value of alternating current that will produce the same amount of energy in a resistance as the corresponding value of direct current.

## F

### fault

A defect in the normal circuit configuration, usually due to unintentional grounding. Commonly referred to as a short circuit.

### fault current

The current that may flow in any part of a system under fault conditions.

### feeder

All circuit conductors between the service entrance equipment and the final branch circuit protector.

### field

Typically refers to a magnetic field. Specifically used when discussing the rotating electro-magnetic field associated with an alternator. By varying the field current, thus its strength, the output of the alternator may be controlled.

### frequency *see hertz*

For an oscillating or varying current, frequency is the number of complete cycles per second in alternating current direction. The standard unit of frequency is the hertz, abbreviated Hz. If a current completes one cycle per second, then the frequency is 1 Hz; 60 cycles per second equals 60 Hz (the standard alternating-current utility frequency).

### fuse

Safety device, consisting of a strip of low-melting-point alloy, which is inserted in an electric circuit to prevent excess current from flowing. If the current becomes too high the alloy strip melts, opening the circuit.

## G

### generator

A rotating machine capable of generating electrical power. In the narrow definition generator refers to a DC machine and alternator refers to an AC machine. However, in common use the term generator is used to refer to AC machines as well.

### green wire

The green wire is the non-current carrying safety grounding wire in an AC system in the United States. It is connected to an exposed metal part in the electrical system to provide a path for fault current in the case of a short circuit.

### ground fault

#### GFI (Ground Fault Interruptor)

GFI is generic term referring to both GFCI and GFP

#### GFCI (Ground Fault Circuit Interruptor) *see GFI*

A device intended for the protection of personnel that functions to de-energize a circuit, or portion thereof, within an established period of time when a current to ground exceeds some predetermined value that is less than that required to operate the overcurrent protective device of the supply circuit.

#### GFP (Ground Fault Protector) *see GFI*

A device intended to protect equipment by interrupting the electric current to the load when a fault current to ground exceeds some predetermined value that is less than that required to operate the overcurrent protection device of that supply circuit.

### ground, ground conductor

A point in a circuit which is at zero potential with respect to the Earth, or which is at the lowest potential in the system, (as with a floating ground).

grounding, grounding conductor

The AC conductor, not normally carrying current, used to connect the metallic non-current carrying parts of electrical equipment to the AC system and engine negative terminal, or its bus, and to the shore AC grounding conductor through the shore power cable. This term can also refer to the normally non-current carrying conductor used to connect metallic non-current carrying parts of direct current devices to the engine negative terminal, or its bus, to minimize stray current corrosion.

### grounded

The AC current carrying conductor that is intentionally maintained at ground potential, also called neutral.

## H

### hertz *see frequency*

Hertz is a unit of frequency of one cycle per second. It replaces the earlier term of "cycle per second (cps)." The abbreviation for Hertz is Hz.

### high inrush (HI-INRUSH)

A load that exhibits, upon application of power, a steep wave front transient of very high current amplitude for a short duration.

### hot

Hot usually refers to the ungrounded current carrying conductors in an AC system. These would typically have a voltage of 120V or 240V in the United States. The term Hot is also used to describe a circuit that is energized, and has a potential greater than ground.

## I

### inductance

An effect in electrical systems in which electrical currents store energy temporarily in magnetic fields before that energy is returned to the circuit.

### instantaneous trip

Indicates that no intentional delay is purposely introduced in the opening time of a protector.

### interrupt rating (AIC)

The fault current that a device, normally a fuse or circuit breaker is capable of interrupting without damage.

## interrupting capacity

The maximum fault current that can be interrupted by a protective device without failure of the device.

## inverter

An inverter converts DC power stored in a battery to AC power which is used by most household appliances.

## IP ignition protection

Devices, which operate in a potentially explosive environment, must be ignition protected. This would include engine rooms with gasoline engines. There is a very specific set of tests which a device must pass to claim ignition protection. They include operating safely in an explosive mixture of propane and air.

## isolation transformer

A transformer that is inserted in series with the incoming AC power to provide a magnetic coupling for power between the ship's systems and the AC grid. By magnetically coupling the power there is no direct connection by wires, which isolates the ships AC system from the AC grid.

## L

### let-through current

The actual fault current passing through a protective device as compared to the current available to the device.

### line *see load*

The conductors that are at the supply of energy to a circuit. Line normally refers to the current carrying non-grounded conductor.

### line loss *see voltage drop*

The power loss that occurs due to amperage flowing through the resistance of conductors over their length.

### listed (UL Listed)

Indicates that a device or component has met certain specifications as set forth by Underwriters Laboratory. Further, it means that the device or component has been tested for conformance and 'listed' with UL so it can use the UL logo and claim conformance to the specification.

### load *see line*

A device that consumes power and does work.

## M

### make (rating)

The current that a breaker, switch, or relay can connect without damaging the device.

### make before break

Describes a switch action that connects the new circuit before disconnecting the old. This type of switch action is required for battery switches in order to avoid an open circuit for the engine alternator, which can cause extreme voltages that can damage the alternator and accessory electronics.

## N

### NEC *see National Electrical Code*

### NEMA

National Electrical Manufacturers Association

### National Electrical Code (NEC)

The NEC is developed and maintained by the National Fire Protection Association which describes how residential, commercial, and RV electrical systems must be installed. The NEC is adopted, sometimes with revision, by states that also adopt the Uniform Building Code. Electrical inspections required by most building permits follow the NEC. While not required aboard boats, the NEC is a valuable guide to safe electrical systems. The goal of the NEC is personal safety and fire prevention.

### neutral (ground) *see single phase*

The grounded current carrying conductor in a single phase, four wire, 120/240V AC system.

### neutral-to-ground bonding

Connecting the ground and the neutral together via an electrical conductor.

### nuisance trip

A circuit breaker or fuse, which trips or blows without the circuit actually being overloaded. This may be due to a surge current which requires a slow tripping breaker or a slow blow fuse.

## O

### ohm

The unit for resistance equals  $V/I = \text{volt/current}$ . The unit of resistance is the ohm, symbol  $\Omega$ , the Greek letter Omega.

### Ohm's law

States that the ratio of the EMF (Electromotive Force) applied to a closed circuit to the current in the circuit is a constant. That constant is the resistance of the circuit. It may be stated as  $V = IR$  (or  $E = IR$ , using E as the abbreviation of EMF whose units are volts). The unit of resistance is the ohm.

### open

Indicates a condition in an electric circuit in which there is a break in the conductive path. The break may be intentional such as an open switch or relay or it may be unintentional such as a broken wire or a blown fuse. In any case, the continuous conductive path required for an electric circuit is not available.

### overcurrent

When the current in a circuit exceeds the rating of the devices or conductors in it. Fuses and circuit breakers protect from overcurrent by opening the circuit if such a condition exists and persists.

### overload current

The current value in excess of the rated current of the protective device.

### overload rating (OL)

Designates whether the protector or family of protectors has been tested for general use or motor-starting applications:

OLO - tested at 1.5 times amp rating for general use

OL1 - tested at 6 times sac rating or 10 times DC rating for motor starting application.

## P

### panelboard

A collection of circuit breakers, switches, and instrumentation installed into a panel, which provides the central point for power distribution and monitoring for the electrical system. May also refer to a smaller panel, which is located remotely from the main panel, which is used to supply loads in the adjacent area. "Panelboard" is a term generally used only by NEC. In the marine industry they are usually called "panels", or "circuit breaker panels", or "distribution panels".

### parallel circuit

An electrical circuit in which the positive connections are all in common and the negative connections are all in common. The voltage of the system appears across each branch of the circuit. The current varies as required by each load or source.

**pigtail**

Wires which protrude from a device to connect it to the circuit. Often used in encapsulated products. Sometimes refers to a method of hooking up circuits in which a group of conductors are connected together and then one wire is connected to the circuit, this is done in order to simplify wiring.

**polarity**

Refers to the electrical charge, which may be positive or negative. It also refers to the positive and negative terminals of a battery or load in a DC system. In AC systems it refers to the connections made to the hot and neutral. There is often a reverse polarity light that indicates if the neutral and hot are reversed.

**polarized system**

An electrical system in which the positive and negative or the hot and neutral must be connected in a particular way and cannot be switched. Sometimes there are mechanical preventions to insure the correct polarity. For example, in an AC plug the physical configuration of the plug and receptacle force a polarized connection.

**pole** *see toggle*

Indicates a conductive path in a switch or relay. Switches that are single pole have one conductive path; switches that are two pole have two conductive paths. Also refers to the magnetic poles on an electromagnet or a permanent magnet

**potential**

The voltage across a circuit element. Implies the potential to do work.

**power**

Electrical power is the rate at which electrical energy is converted to another form, such as motion, heat, or an electromagnetic field. The common symbol for power is the uppercase letter P. The standard unit is the watt, symbolized by W. In utility circuits, the kilowatt (kW) is often specified instead; 1 kW = 1000 W. Power in a direct current (DC) circuit is equal to the product of the voltage in volts and the current in amperes. This rule also holds for low-frequency alternating current (AC) circuits in which energy is neither stored nor released. At high AC frequencies, in which energy is stored and released (as well as dissipated or converted), the expression for power is more complex. In a DC circuit, a source of V volts, delivering I amperes, produces P watts according to the formula:  $P = VI$  When a current of I amperes passes through a resistance of R ohms, then the power in watts dissipated or converted by that component is given by:  $P = I^2 R$  When a potential difference of V volts appears across a component having a resistance of R ohms, then the power in watts dissipated or converted by that component is given by:  $P = V^2 / R$

**power factor**

In an AC circuit loads other than resistance shift the phase angle between the voltage and the current. This shift is the result of energy being stored and released in an inductor for example. To calculate the power consumed one must consider this phase shift. We do so by using the following formula  $P = VI \cos \phi$ , where  $\phi$  is the difference in phase angle between the voltage and current. Cosine  $\phi$  is called the power factor. For resistive loads the power factor is equal to 1 because the phase angle equals 0. For pure inductive loads the power factor is 0 because the phase angle is +90°.

**R**

**recognized (UL recognized)**

A device that is UL Recognized differs from a device that is UL Listed. A Recognized device is expected to be installed within a larger assembly by a manufacturer, not in the field, and this larger assembly is then expected to be tested by UL. The UL Recognition then allows UL to skip testing of the specific embedded Recognized component. UL Recognition has little value for end users installing devices in the field.

**rectifier**

A device that allows current to flow in only one direction, such as a diode. Used to convert, or rectify AC current into DC.

**regulator (voltage regulator)**

A device, which uses a feedback loop to control the output of an alternator or other source. By measuring the output voltage and controlling the alternator field current, for example, the regulator is able to continuously adjust the alternator output to the desired voltage.

**resistance**

The opposition to the flow of current in an electric circuit as defined by Ohm's law. The unit of resistance is the ohm, symbol  $\Omega$ , the Greek letter Omega.

**reverse polarity**

Describes a situation where the neutral and hot wires of an AC system are reversed. Most AC panels have an indicator to annunciate this condition, as it can be very dangerous.

**RMS (Root-mean-square)**

Root-mean-square (RMS) refers to the most common mathematical method of defining the effective voltage or current of an AC wave. To determine RMS value, three mathematical operations are carried out on the function representing the AC waveform:

- (1) The square of the waveform function (usually a sine wave) is determined.
- (2) The function resulting from step (1) is averaged over time.
- (3) The square root of the function resulting from step (2) is found.

In a circuit whose impedance consists of a pure resistance, the RMS value of an AC wave is often called the effective value or DC-equivalent value. For example, if an AC source of 100 volts RMS is connected across a resistor, and the resulting current causes 50 watts of heat to be dissipated by the resistor, then 50 watts of heat will also be dissipated if a 100-volt DC source is connected to the resistor. For a sine wave, the rms value is 0.707 times the peak value, or 0.354 times the peak-to-peak value. Household utility voltages are expressed in RMS terms. A so-called "117-volt" AC circuit has a voltage of about 165 volts peak (pk), or 330 volts peak-to-peak (pk-pk).

**S**

**safety green (ground) wire**

The non-current carrying conductor in a three wire 120V or four wire 240V AC circuit, it provides a safe path for fault current. See also green ground wire.

**self-limiting**

A device whose ability to limit output power regardless of input power is intrinsic to its design.

**short circuit**

A conductive path of zero resistance. Typically refers to an unintentional connection between two conductors of opposite polarity. If a voltage is applied to a short circuit the current becomes very large and can start a fire, thus the need for short circuit, or overcurrent, protection in the form of fuses or circuit breakers.

**short-circuit current rating (SC)**

The short-circuit current rating in kiloamperes (kA), followed by a letter and number designating the test conditions and any calibration following the short-circuit test as defined below:

- C - a short circuit test was conducted with series overcurrent protection
- U - a short circuit test was conducted without series overcurrent protection
- 1 - a recalibration test and dielectric strength test were not conducted as part of short circuit testing

1a - the supplementary protector was permanently open after the short -circuit test. A dielectric strength test and a voltage withstand test were conducted. (CSA only)

2 - a recalibration test and dielectric strength test were conducted as part of short-circuit testing

3 - a recalibration test, dielectric strength test and voltage withstand test were conducted as part of short circuit testing. (CSA only) Note: The C3 rating is not available.

**sine wave**

A waveform that can be expressed as the graph of the equation  $y = \sin x$ . The utility AC power is a sine wave.

**single phase**

The typical 120/240V AC system in the United States is a single phase system, meaning that the current flow in the two conductors is in phase or that they both cross zero at the same time.

**stray current**

Unwanted current flows which occur due to a partial short circuit.

**surge**

A large amount of current during the initial starting phase of a motor for example.

**surge capacity**

The measurement of the ability to withstand surge currents without damage.

**switch**

An electro-mechanical device that is intended to open an electrical circuit and thus turn a load or source on or off.

**switchboard** *see panel board*

**T**

**terminal**

A connection point or device for an electrical circuit. A terminal strip is a series of screws which may or may not be in common to which wires are connected. Also refers to the connecting device which may be crimped on the end of a wire to enable it to be connected to the circuit with a screw, such as a ring terminal.

**terminal studs**

A threaded bolt onto which ring terminals may be placed and then fastened with a nut. Normally used for high current connections.

**thermal**

Thermal most commonly refers to a thermal circuit breaker, which uses the thermal effect of excess current flow to create differential expansion in a bi-metallic blade to open a circuit.

**time-current curve** *see delay*

A curve which depicts the relationship between the amount of current a fuse or breaker can withstand with respect to time.

**time delay**

The introduction of an intentional delay to the opening function of a protective device.

**toggle** *see pole*

A switch which has a handle type actuator that can be placed in, at the most, three positions.

**total clearing time**

The time elapsing from initiation of overload current to final current interruption.

**transfer switch, AC** *see selector switch, source isolation*

An electrical relay or manual switch which selects an AC source alternative, such as a generator, shore power, or inverter.

**transformer, isolation** *see isolation transformer*

**trip free**

A circuit breaker designed to trip when subjected to a fault current, even if the reset lever is held in the ON position.

**tripping current (TC)**

Tripping current is coded as a percentage of the amp rating. Codes for UL & CSA products:

- TC0 - tripping current is less than 125% of amp rating
- TC1 - tripping current is between 125 and 135% of amp rating
- TC2 - tripping current is more than 135% of amp rating
- TC3 - tripping current is standardized at 135% and at 200% of amp rating (CSA only)

**U**

**ultimate trip current**

The minimum value of current that will cause tripping of a protective device.

**ungrounded conductor**

Any conductor that is not connected to the Earth ground system.

**V**

**volt (voltage)**

The unit of electric potential and electromotive force, equal to the difference of electric potential between two points on a conducting wire carrying a constant current of one ampere when the power dissipated between the points is one watt.

**voltage drop**

Conductor's voltage reduction due to resistance.

**voltage rating**

The maximum voltage at which a device is designed to operate.

**voltage trip**

A protective device that is factory calibrated to trip at a predetermined voltage value.

**W**

**watt**

The measurement of electrical power. One watt is equal to one ampere of current flowing at one volt. Watts are typically rated as amps x volts; however, amps x volts, or volts-amps (v-a) ratings and watts are only equivalent when powering devices that absorb all the energy such as electric heating coils or incandescent light bulbs.

**wire sizing**

The process of selecting the appropriate sized conductor for the amount of current to be carried while considering the length of the circuit.

**withstand voltage**

The maximum voltage level that can be applied between circuits or components without causing a breakdown.