

Pictorial Glossary

Click on a term to go directly to the definition

AC Drive	Electrically Erasable	Metric Unit Prefix	Sensing Switch
AC Motor	Programmable Read Only	Molded Case Circuit	Service Entrance
Alternating Current (AC)	Memory (EEPROM)	Breaker	Service Factor
Ambient Temperature	Enclosure	Molded Case Switch	Service Head
American National	Encoder	Motor (Electric)	Service Section
Standards Institute	Erasable Programmable	Motor Control Center	Servo Drive
(ANSI)	Read Only Memory	Motor Installation Class	Servo Motor
American Wire Gauge	(EPROM)	Motor Starter	Set Point
(AWG)	Explosion Proof (XP)	Mutual Induction	Short Circuit
Ammeter	Farad	National Electrical	Short Trip
Ampacity	Feedback	Manufacturers Association	Single Quadrant
Ampere (Amp)	Feeder	(NEMA)	Operation
Amplitude	Feeder Sway	National Electrical Code	Slip
Analog	Filler Plates	(NEC)	Solid-State
Analog Input	Four-Quadrant Operation	National Fire Protection	Speed-Torque
Analog Output	Frequency	Association (NFPA)	Curve
Apparent Power	Full-Voltage Starter	NEMA Enclosure Type	Splice Plates, Splice
Arc Fault Assembly	Fuse	NEMA Frame Size	Bars
Arc Fault	Fuse Class	NEMA Motor Design	Starter Ratings
Arc Fault Circuit	German Institute for	Neutral	Stator
Interrupter (AFCI)	Standardization (DIN)	Ohm	Step-down
Autotransformer	Ground	Ohmmeter	Transformer
Binary-Coded Decimal	Ground Fault	Ohm's Law	Step-up Transformer
(BCD)	Ground Fault Circuit	Open Drip Proof (ODP)	Stage
Binary Number	Interrupter (GFCI)	Open-Loop Control	Stage Protection
Bit	Harmonics	Overcurrent	Device (SPD)
Bonding	Harmonic Distortion	Overload	Switchboard
Branch Circuit	Henry	Overload Relay	Switchgear
Btu	Hertz	Overload Relay Class	Synchronous Speed
Btu Bar	Hexadecimal	Pad-Mounted Transformer	Thermal-Magnetic
Btu Pkg	Horsepower	Panelboard	Tripping
Busway	IEEE	Potential Proximity	Tripping
Busway Hangers	Impedance	Switch	Time-Current Curve
Byte	Inductance	Pilot Light	Timing Relay
Capacitance	Inductive Proximity	PLC Scan	Torque
Capacitive Proximity	Switch	Pig-In Busway	Totally Enclosed
Switch	Inductive Reactance	Power	Fan Cooled (TEFC)
Capacitive Reactance	Inductor	Power Factor	Totally Enclosed
Capacitor	Input/Output (I/O) System	Programmable Logic	Non-ventilated
Central Processor Unit (CPU)	Instrument Transformer	Controller (PLC)	(TENV)
Circuit Breaker	Isolated Case Circuit	Proportional Integral	Transformer
Closed-Loop Control	Breaker	Derivative (PID) Control	Transistor
Conductor	Isolated Gate Bipolar	Proximity Sensor	Trim
Contact	Transistor (IGBT)	Pulse Width Modulation	Trip Unit
Contact Relay	Isolator	(PWM)	True Power
Colomb	International	Protection	Solar Proximity
Colomb's Law	Electrotechnical	Random Access Memory	Switch
Commutator EMF	Commission (IEC)	(RAM)	Underwrite
Crest Factor	International Organization	Reactance	Laboratories (UL)
Current	for Standardization (ISO)	Reactive Power	Var
DC Drive	Interrupting Rating	Read Only Memory (ROM)	Variable Frequency
DC Motor	Inverter	Rectifier	Drive
Dead Front	Isolation Transformer	Reduced-Voltage Starter	Variable Speed
Delta	Joule	Resistance	Drive
Digital	Knockout	Resistance Temperature	Vector Control
DIN Rail	Ladder Logic	Device (RTD)	Volt
Disconnect Switch	Limit Switch	Resistor	Voltage
Discrete I/O	Load Center	Root-Mean-Square (RMS)	Voltmeter
Distribution Section	Local Area Network	Valve	Volt-ampere Hertz
Duty Cycle	(LAN)	Rotor	(V/Hz) Operation
Effective Value	Low Voltage Power	Safety Switch	Watt
	Circuit Breaker	Secondary Unit Substation	Word
	Main Breaker	Selective Coordination	Wye
	Main Lug Only	Selective Switch	
	MCM	Semiconductor	

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Click on a term to go directly to the definition

Electrically Erasable Programmable Read Only Memory (EEPROM) Enclosure Encoder Erasable Programmable Read Only Memory (EPROM) Explosion Proof (XP) Farad Feedback Feeder Feeder Busway Filler Plates Four-Quadrant Operation Frequency Full-Voltage Starter Fuse Fuse Class German Institute for Standardization (DIN) Ground Ground Fault Ground Fault Circuit Interrupter (GFCI) Harmonics Harmonic Distortion Henry Hertz Hexadecimal Horsepower IEEE Impedance Inductance Inductive Proximity Switch Inductive Reactance Inductor Input/Output (I/O) System Instrument Transformer Insulated Case Circuit Breaker Insulated Gate Bipolar Transistor (IGBT) Insulator International Electrotechnical Commission (IEC) International Organization for Standardization (ISO) Interrupting Rating Inverter Isolation Transformer Joule Knockout Ladder Logic Limit Switch Load Center Local Area Network (LAN) Low Voltage Power Circuit Breaker Main Breaker Main Lug Only MCM

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Metric Unit Prefix Molded Case Circuit Breaker Molded Case Switch Motor (Electric) Motor Control Center Motor Insulation Class Motor Starter Mutual Induction National Electrical Manufacturers Association (NEMA) National Electrical Code (NEC) National Fire Protection Association (NFPA) NEMA Enclosure Type NEMA Frame Size NEMA Motor Design Neutral Ohm Ohmmeter Ohm's Law Open Drip Proof (ODP) Open-Loop Control Overcurrent Overload Overload Relay Overload Relay Class Pad-Mounted Transformer Panelboard Photoelectric Proximity Switch Pilot Light PLC Scan Plug-in Busway Power Power Factor Programmable Logic Controller (PLC) Proportional Integral Derivative (PID) Control Proximity Sensor Pulse Width Modulation (PWM) Pushbutton Random Access Memory (RAM) Reactance Reactive Power Read Only Memory (ROM) Rectifier Reduced-Voltage Starter Resistance Resistance Temperature Device (RTD) Resistor Root-Mean-Square (RMS) Value Rotor Safety Switch Secondary Unit Substation Selective Coordination Selector Switch Semiconductor AC Drive

Sensing Switch AC Motor

Service Entrance

Alternating Current (AC)

Service Factor Ambient

Temperature

Service Head American

National

Service Section Standards

Institute

Servo Drive (ANSI)

Servo Motor American Wire

Gauge

Set Point (AWG)

Short Circuit Ammeter

Shunt Trip Ampacity

Single Quadrant Ampere

(Amp)

Operation Amplitude

Slip Analog

Solid-State Analog Input

Speed-Torque Analog

Output

Chute Assembly	Curve Apparent Power
	Splice Plates, Splice Arc
	Bars Arc Fault
Circuit	Starter Ratings Arc Fault
	Stator Interrupter (AFCI)
	Step-down Autotransformer
Decimal	Transformer Binary-Coded
	Step-up Transformer (BCD)
	Surge Binary Number
Bar	Surge Protection Bit
	Device (SPD) Bonding
	Switchboard Branch Circuit
Plug	Switchgear Bus
	Synchronous Speed Bus
	Thermal-Magnetic Bus
Proximity	Thermistor Busway
	Thyristor Busway Hangers
	Time-Current Curve Byte
Capacitive Reactance	Timing Relay Capacitance
	Torque Capacitive
	Totally Enclosed Switch
Processor Unit (CPU)	Fan Cooled (TEFC)
	Totally Enclosed Capacitor
	Non-ventilated Central
Control	(TENV) Circuit Breaker
	Transformer Closed-Loop
	Transistor Conductor
	Trim Contactor
	Trip Unit Control Relay
	True Power Coulomb
	Sonar Proximity Coulomb's

Law

Switch Counter EMF
Underwriters Crest Factor
Laboratories (UL) Current
Var DC Drive
Variable Frequency DC

Motor

Drive Dead Front
Variable Speed Delta
Drive Digital
Vector Control DIN Rail
Volt Diode
Voltage Direct Current (DC)
Voltmeter Disconnect

Switch

Volts power Hertz Discrete

I/O

(V/Hz) Operation

Distribution Section

Watt Duty Cycle
Word Effective Value

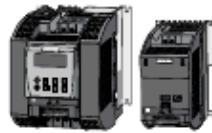
Wye

Pictorial Glossary

The pictorial glossary includes definitions and illustrations for many terms that are frequently used in the electrical industry. Terms that are underlined and italicized are included in the glossary as a separate definition.

AC Drive

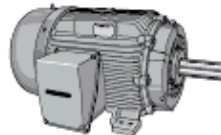
An electronic device used to control the speed of an AC motor. Also called a variable frequency drive and an inverter. The term variable speed drive applies to both AC Drives and DC Drives.



SINAMICS G110 AC Drives

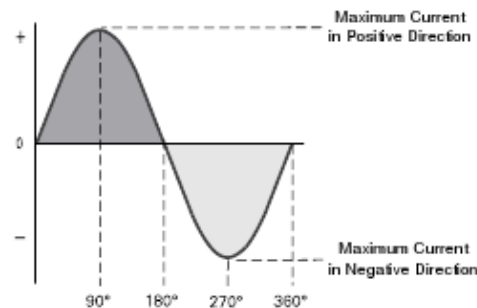
AC Motor

A motor that uses alternating current to convert electrical energy into mechanical energy. Many AC motors used in industrial applications are three-phase induction motors.



Alternating Current (AC)

Current that periodically reverses direction.



Pictorial Glossary

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AC Drive An electronic device used to control the speed of an AC motor.

Also called a variable frequency drive and an inverter. The term variable speed drive applies to both AC Drives and DC Drives.

FN

JOG P 1 2 3 4 5 6 7 8 9 10

PE L1 L2/N L3

1 2 3 4 5 6 7 8 9 10

SINAMICS G110 AC Drives

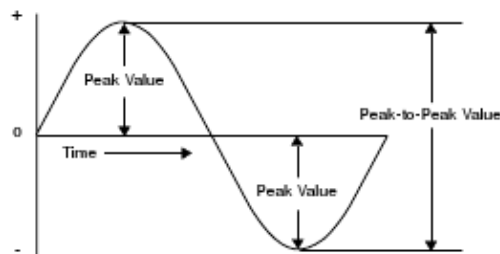
AC Motor A motor that uses alternating current to convert electrical energy into mechanical energy. Many AC motors used in industrial applications are three-phase induction motors.

Alternating Current (AC) Current that periodically reverses direction.

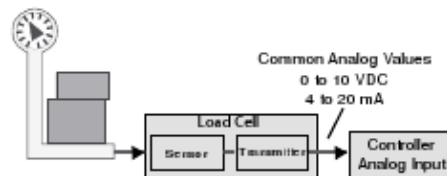
Maximum Current in Positive Direction

Maximum Current in Negative Direction

Ambient Temperature	The temperature of the medium (air, water, etc.) surrounding a device.
American National Standards Institute (ANSI)	A nongovernmental organization that promotes and coordinates the development of standards and accredits the procedures of other organizations that develop standards.
American Wire Gauge (AWG)	A common method of specifying wire size (cross-sectional area). Larger numbers represent smaller wires. After AWG No. 1, the largest sizes are AWG No. 0, AWG No. 00, AWG No. 000, and AWG 0000. AWG No. 0 is called one-aught, AWG No. 00 is called two-aught, etc.
Ammeter	A meter designed to measure <u>current</u> .
Ampacity	The continuous <u>current</u> rating in <u>amperes</u> for a conductor.
Ampere, Amp	The basic unit for <u>current</u> . An ampere, also called an amp, is equal to a current of 1 <u>Coulomb</u> per second. The symbol for ampere is "A."
Amplitude	The total variation of a waveform. Amplitude can be expressed as a peak value, peak-to-peak value, or <u>effective value</u> .



Analog	A value that is continuously variable. Also used to describe circuits that work with analog signals.
Analog Input	An input to a system that can continuously vary over a range of <u>current</u> or <u>voltage</u> such as 4 to 20 milliamps or 0 to 10 volts.



device.

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, the largest sizes are AWG No. 0, AWG No. 00, AWG No. 000, and AWG 0000. AWG No. 0 is called one-aught, AWG No. 00 is called two-aught, etc.

Ammeter A meter designed to measure current.

Ampacity The continuous current rating in amperes for a conductor.

Ampere, Amp The basic unit for current. An ampere, also called an amp, is equal to a current of Coulomb per second. The symbol for ampere is "A."

Amplitude The total variation of a waveform. Amplitude can be expressed as a peak value, peak-to-peak value, or effective value.

+

Peak Value

Time

Peak Value

-

Analog A value that is continuously variable. Also used to describe circuits that work with analog signals.

Analog Input An input to a system that can continuously vary over a range of current or voltage such as 4 to 0 milliamps or 0 to 0 volts.

Load Cell

Sensor Transmitter

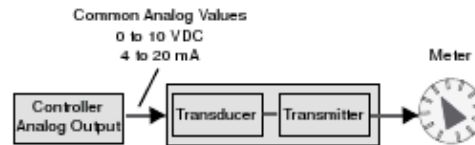
Peak-to-Peak Value 0

Common Analog Values 0 to 10 VDC 4 to 20 mA

Controller Analog Input

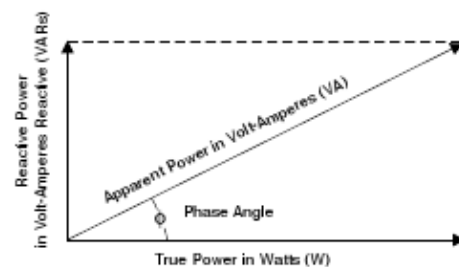
Analog Output

An output from a system that can continuously vary over a range of current or voltage such as 4 to 20 milliamps or 0 to 10 volts.



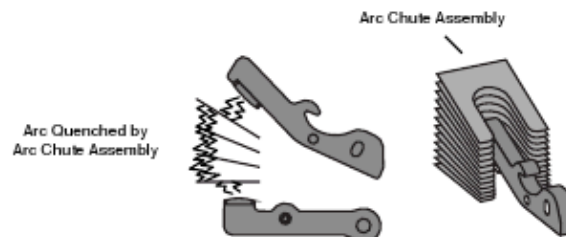
Apparent Power

The vector sum of true power and reactive power. Apparent power is calculated by multiplying current times voltage. The unit for apparent power is the volt-ampere, abbreviated "VA."



Arc Chute Assembly

An assembly of metal plates surrounding circuit breaker or contactor contacts. Arc chutes are used to reduce contact damage by quickly extinguishing the arc created when contacts open.



Arc Fault

An electrical arc which causes current to flow in unintended ways, but often not in sufficient amounts to cause a standard circuit breaker to trip. Arc faults result from worn or damaged insulation and are a common cause of fires.

range of current or voltage such as 4 to 0 milliamps or 0 to 0 volts.

Common Analog Values 0 to 10 VDC

4 to 20 mA Meter

Transducer Transmitter

Apparent Power The vector sum of true power and reactive power. Apparent power is calculated by multiplying current times voltage. The unit for apparent power is the volt-ampere, abbreviated "VA."

R

Controller Analog Output

)

Phase Angle

True Power in Watts (W)

Arc Chute Assembly An assembly of metal plates surrounding circuit breaker or contactor contacts. Arc chutes are used to reduce contact damage by quickly extinguishing the arc created when contacts open.

Arc Chute Assembly

Arc Quenched by Arc Chute Assembly

Arc Fault An electrical arc which causes current to flow in unintended ways, but often not in sufficient amounts to cause a standard circuit breaker to trip. Arc faults result from worn or damaged insulation and are a common cause of fires.

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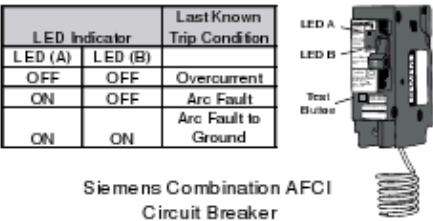
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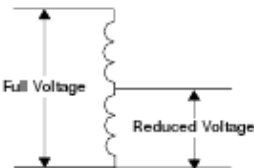
Arc Fault Circuit Interrupter (AFCI)

A circuit breaker designed to provide protection from the effects of an arc fault by recognizing the characteristics unique to arcing and de-energizing the circuit when an arc fault is detected. The most effective AFCI circuit breakers are combination AFCIs which provide protection against all three known types of arc faults.



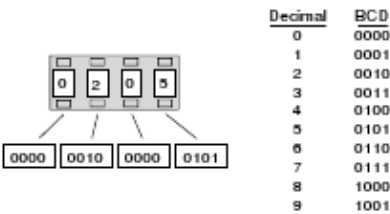
Autotransformer

A type of transformer in which the secondary coil is part of the primary coil. Often the secondary voltage is adjustable via a movable tap.



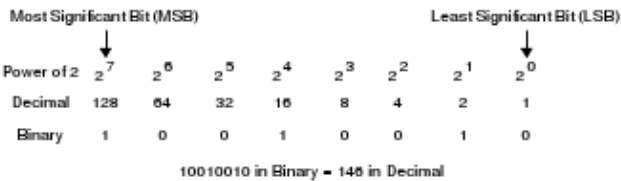
Binary-Coded Decimal (BCD)

Usually refers to the 8-4-2-1 code where four bits are used to represent decimal digits 0 through 9.



Binary Number

A number made up only of 1's and 0's that represent powers of two (2). Digital equipment uses binary numbers to represent numerical values and the on or off condition of devices.



(AFCI) effects of an arc fault by recognizing the characteristics

unique to arcing and de-energizing the circuit when an arc fault is detected. The most effective AFCI circuit breakers are combination AFCIs which provide protection against all three known types of arc faults.

Last Known LED Indicator

Trip Condition

LED A

TYPE QAFH

40 C

ARC FAULT GND LED (A) LED (B)

LED B

HACR

Circuit Breaker Combination Ty AFC OFF OFF Overcurrent

AFCI

ON OFF Arc Fault

Test Button

10707150001

ON ON

Siemens Combination AFCI Circuit Breaker

Autotransformer A type of transformer in which the secondary coil is part of the primary coil. Often the secondary voltage is adjustable via a movable tap.

Full Voltage

Reduced Voltage

Binary-Coded Decimal Usually refers to the 8-4-- code where four bits are used to (BCD) represent decimal digits 0 through 9.

0 2 0 5

0000 0010 0000 0101

SWD

15 O Interrupting Rating 22kA 120V Max. RMS Sym. 50/60 Hz

TEST Arc Fault to Ground

Decimal BCD

0 1 2 3 4 5 6 7 8 9

0000 0001 0010 0011 0100 0101 0110 0111 1000 1001

Binary Number A number made up only of 's and 0's that represent powers

of two (). Digital equipment uses binary numbers to represent numerical values and the

on or off condition of devices.

Most Significant Bit (MSB)

2

32 16

0

Least Significant Bit (LSB)

Power of 2

7

2

6

2

5

2

4

2

3

2

2

2

1

2

0

Decimal

128 64 8 4 2 1

Binary

1 0 1 0 0 1 0

10010010 in Binary = 146 in Decimal

4

QUE QUE QUE

Bit

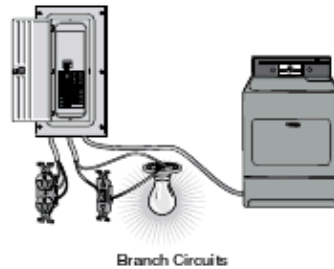
A 1 or 0 representing one position in a binary number.

Bonding

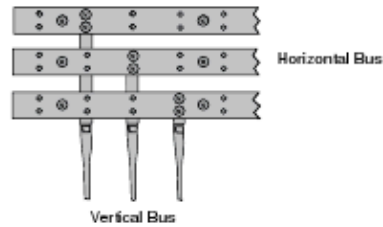
The permanent joining of metal parts to form an electrically conductive path.

Branch Circuit

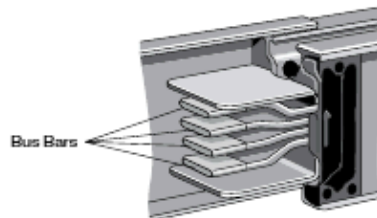
A part of a power distribution system extending beyond the final overcurrent protection device.

**Bus**

A group of conductors used to supply power, data, or control signals.

**Bus Bar**

A conductor that serves as a common connection for two or more circuits.



Bit A or 0 representing one position in a binary number.

Bonding The permanent joining of metal parts to form an electrically conductive path.

Branch Circuit A part of a power distribution system extending beyond the final overcurrent protection device.

Branch Circuits

Bus A group of conductors used to supply power, data, or control signals.

Horizontal Bus

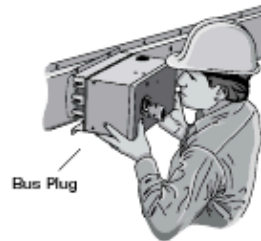
Vertical Bus

Bus Bar A conductor that serves as a common connection for two or more circuits.

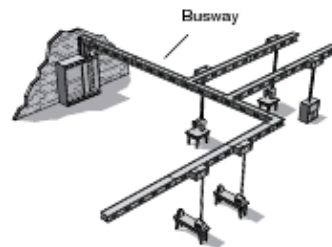
Bus Bars

Bus Plug

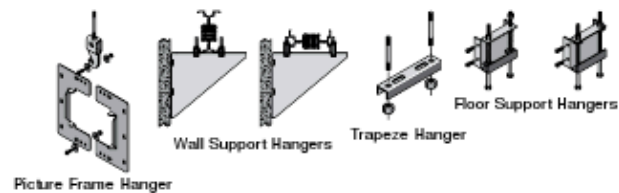
A device used with plug-in busway to provide power connections close to the intended load.

**Busway**

A prefabricated electrical distribution system that uses bus bars in a protective enclosure.

**Busway Hangers**

Devices used to suspend busway from a ceiling or mount it to a wall.

**Byte**

Eight consecutive bits.

Capacitance

The property of a circuit or device that allows it to store an electrical charge. The symbol for capacitance is "C." The unit for capacitance is the farad.

connections close to the intended load.

Bus Plug

Busway A prefabricated electrical distribution system that uses bus bars in a protective enclosure.

Busway

Busway Hangers Devices used to suspend busway from a ceiling or mount it to a wall.

Wall Support Hangers

Picture Frame Hanger

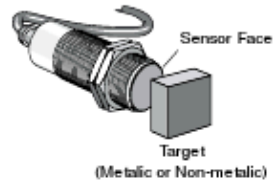
Floor Support Hangers

Byte Eight consecutive bits.

Capacitance The property of a circuit or device that allows it to store an electrical charge. The symbol for capacitance is "C." The unit for capacitance is the farad.

Trapeze Hanger

Capacitive Proximity Switch A type of sensing switch that produces an electrostatic field to detect the presence of an object without touching the object.

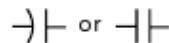


Capacitive Reactance The opposition to alternating current resulting from circuit capacitance. Capacitive reactance is inversely proportional to frequency (f) and capacitance (C). The symbol for capacitive reactance is "X_c." The unit for capacitive reactance is the ohm.

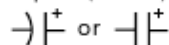
$$X_c = \frac{1}{2\pi fc}$$

Capacitor A device manufactured to have a specific capacitance.

Capacitor (Non-Polarized)



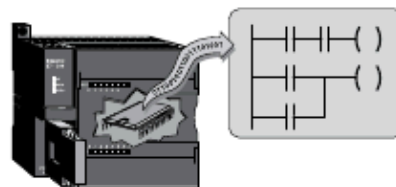
Capacitor (Polarized)



$$C = k \frac{A}{d}$$

A – Area of the plates
 d – Distance between plates
 k – Dielectric constant

Central Processor Unit (CPU) The decision-making part of a computer. May also be used to describe the processing circuits together with memory and other circuits needed for processing information.



to

detect the presence of an object without touching the object.

Sensor Face

Target (Metalic or Non-metalic)

Capacitive Reactance The opposition to alternating current resulting from circuit capacitance. Capacitive reactance is inversely proportional to frequency (f) and capacitance (C). The symbol for capacitive reactance is “X

C

.” The unit for capacitive reactance is the ohm.

Xc

=

$$2\pi f c 1$$

Capacitor A device manufactured to have a specific capacitance.

Capacitor (Non-Polarized)

or

$$C = k$$

A d Area of the plates

Distance between plates Capacitor + or

(Polarized) +

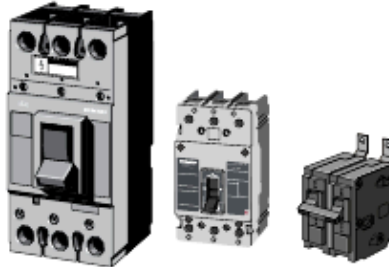
Dialectric constant

Central Processor Unit (CPU) The decision-making part of a computer. May also be used to

describe the processing circuits together with memory and other circuits needed for processing information.

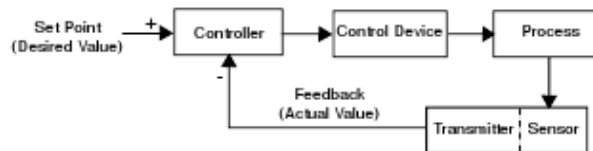
Circuit Breaker

A device that can be used to open or close a circuit manually and also opens a circuit automatically when it senses an overcurrent.



Closed-Loop Control

A control technique that compares a *feedback* signal representative of an actual value with a desired value and responds to minimize the error.



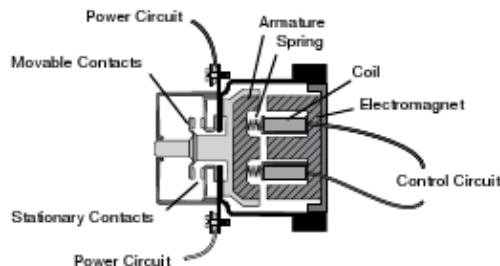
Conductor

A material that permits electrons to easily move through it. Copper, silver, and aluminum are examples of materials that are good conductors. Also used generically to refer to a wire, cable, or bus bar that is made from a conducting material.



Contactor

Usually refers to a device with large contacts that close when current is applied to its electromagnet; however, solid state contactors are also available. Contactors are used to control the power applied to motors, lights, or heating components.



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Closed-Loop Control A control technique that compares a feedback signal representative of an actual value with a desired value and responds to minimize the error.



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Insulator

Conductor

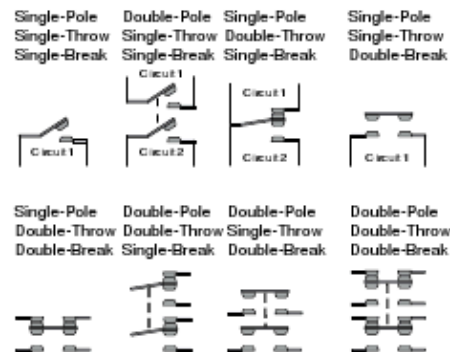
Contactors Usually refers to a device with large contacts that close when current is applied to its electromagnet; however, solid state contactors are also available. Contactors are used to control the power applied to motors, lights, or heating components.

Power Circuit



Control Relay

Usually refers to a device with contacts that open and close electromagnetically, but solid state control relays are also available. Control relays typically handle smaller currents than contactors, but are capable of switching more rapidly.



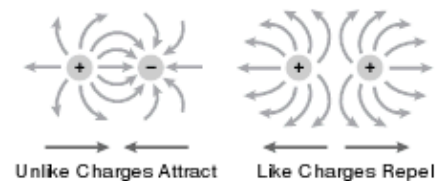
Control Relay Contact Types

Coulomb

A unit of electrical charge moved in 1 second by a current of 1 ampere. This is equal to approximately 6.24×10^{18} electrons.

Coulomb's Law

A law that states that charged objects attract or repel each other with a force that is directly proportional to the product of their charges and inversely proportional to the square of the distance between them.



Counter EMF

A voltage created in an inductive circuit that opposes a change in current flow. EMF stands for electromotive force.

electromagnetically, but solid state control relays are also available. Control relays typically handle smaller currents than contactors, but are capable of switching more rapidly.

Single-Pole Single-Throw Single-Break

Circuit 1

Double-Pole Single-Throw Single-Break

Circuit 2

Single-Pole Double-Throw Single-Break

Single-Pole Single-Throw Double-Break

Circuit 1

Single-Pole Double-Throw Double-Break

Circuit 1

Circuit 1

Circuit 2

Double-Pole Double-Throw Single-Break

Double-Pole Single-Throw Double-Break

Double-Pole Double-Throw Double-Break

Control Relay Contact Types

Coulomb A unit of electrical charge moved in second by a current of ampere. This is equal to approximately $.4 \times 10^8$

8

electrons.

Coulomb's Law A law that states that charged objects attract or repel each other with a force that is directly proportional to the product of their charges and inversely proportional to the square of the distance between them.

Unlike Charges Attract Like Charges Repel

Counter EMF A voltage created in an inductive circuit that opposes a change in current flow. EMF stands for electromotive force.