

Appendix A

Glossary of Terms

A

A - Abbreviation for **ampere**, the unit of measurement of current.

Alternating Current (AC) - An electric current whose polarity is constantly cycling between positive and negative (Reverse direction or flow at regular intervals).

Alternator - A type of generator used in automobiles to produce electric current. The AC (Alternating Current) output is internally rectified (changed to DC - Direct Current) through the use of diodes.

Ammeter - An electrical meter used to measure the amount of current flowing in a circuit it reads amperes of current flow. The ammeter must be connected in series with the circuit (positive toward the voltage source, black lead toward ground side of the circuit).

Amperage - The amount of current (amperes) flowing in a circuit.

Ampere - The unit of measure for the flow of electrons or current in a circuit. The amount of current produced by one volt acting against one ohm of resistance.

Analog - Method of transmitting information through an electrical circuit by regulating or changing the current or voltage. Also used to describe older multimeters which use a “needle”.

Anode - Positive terminal or electrode through which current flows in a semiconductor.

B

Base - The center layer of semiconductor material in a transistor. The base circuit of a transistor turns the transistor OFF and ON. The amount of current flow through the base directly affects the amount of current flow through the emitter-collector circuit.

Biasing - Applying voltage to a junction of semiconductor materials.

Breakdown Voltage - Voltage applied to a diode or transistor in the reverse direction from that in which it passes current. The voltage is large enough to cause a massive failure of the diode to hold back current. The term breakdown voltage is also applied to zener diode operation; when it allows a reverse current flow through the diode.

Buss Bar - A solid metal strip, or bar, used as a conductor in a fuse panel.

C

Cable - Conductor made from a number of wires twisted together.

Capacitance - The ability of two conducting surfaces separated by an insulator, to store an electric charge.

Capacitor - Electrical component used to store and release a current through a secondary circuit. Can be used to protect a circuit against surges in current, store and release a high voltage, or smooth out current fluctuations. Also called a condenser.

Cathode - The negative terminal of a semiconductor toward which the current flows.

Charging System - Components used to restore electrical potential in battery and supply current needed to meet the electrical demands of the vehicle.

Circuit - A combination of elements physically connected to provide an unbroken flow of electrical energy from a power source through a conductor to a working device, and through a return conductor back to the power source.

Circuit Breaker - Device used to open an electric circuit when overheated to prevent circuit damage due to excess current flow.

Circuit Diagram - Drawing showing the wires connections and components (loads) in an electric circuit. On Lexus vehicles, this commonly referred to as an EWD (electrical wiring diagram).

Closed Circuit - A circuit which is uninterrupted from the positive and negative terminals of the voltage source.

Collector - The area of a transistor which collects emitted electrons and then passes them on through a conductor completing a circuit.

Color Coding - The use of colored insulation on wire to identify an electrical circuit.

Computer Control - Control of any automotive system using solid state devices and operating with a preprogrammed set of commands (program), sensors to monitor various engine conditions (input), and signals set to affect the function of some component (output). Also holds commands in memory for later use.

Condenser - Electrical component used to store and release voltage. Can be used to protect a circuit against surges in current, store and release a high voltage or smooth out current fluctuations. Also called a capacitor.

Conductor - Any material that allows electric current or heat to flow. Current flows easily through a conductor because there are many free electrons in that material's atomic structure.

Continuity - An electrical connection between any two points in a circuit. When used in a repair manual inspection procedure, continuity usually describes a "low resistance" value.

Conventional Theory - The current flow theory which says electricity flows from positive to negative. Also called positive current flow theory.

Counterelectromotive Force - An induced voltage that opposes the source voltage and any change (increase or decrease) in the current flow. Abbreviated as CEMF.

Current - Flow of electrons through a circuit, measured in amperes.

Cycle - Any series of events repeating continuously. In AC electrical systems, the flow of current alternates first in one direction and then in the opposite direction.

D

Dielectric - The insulating material between the two conductive plates of a capacitor.

Digital - Method of sending information through an electrical circuit by switching the voltage/current ON or OFF.

Diode - A semiconductor device made of P-material and N-material bonded at a junction. It permits current to flow in one direction only and is used in rectification (changing alternating current to direct current).

Direct Current (DC) - A steady flow of current moving continuously in one direction in a conductor from a point of high potential to a point of lower potential.

E

Effective Resistance - All electrical and inductive losses of a circuit.

Electrical Charge - Property of electrons and protons that give a substance its electrical characteristics. A deficiency of electrons in the outer ring of atoms of a substance will give it a positive charge. An excess will give the substance a negative charge.

Electrical Symbols - Simple drawings used to represent different parts of an electrical circuit.

Electricity - The controlled movement of electrons in a conductor.

Electrochemical Device - A device that operates on both electrical and chemical principles (a lead acid storage battery, for example).

Electrolyte - A solution of sulfuric acid and water used in a storage battery that, through chemical reaction with the dissimilar metal plates, produces electric potential.

Electromagnetic Field - The invisible field of force which surrounds a charged conductor or coil.

Electromagnetic Induction - The creation of a voltage within a conductor when relative motion exists between the conductor and a magnetic field.

Electron Flow Theory - Belief that current flow consists of electrons flowing from a point with a high potential of free electrons (negative) to a point with fewer electrons (positive).

Electronic - Any system using integrated circuits or semiconductors to control the flow of current.

Emitter - Region in a transistor that emits (NPN) or collects (PNP) a large number of electrons as a small number of electrons are taken from or added to the base.

Equivalent Resistance - The total resistance of a parallel circuit. The single mathematical equivalent of all parallel resistances.

F

Farad - The unit of measurement of capacitance.

Feedback System - Electronic system in which sensors monitor the output of various automotive systems and provides input to control the operation of the system and change the output. It is a self-correcting system.

Filament - A resistance in an electric light bulb which heats up and glows producing light when an adequate current (bombardment by electrons) is sent through it.

Flux - The lines of magnetic force flowing in a magnetic field.

Forward Bias - The application of a voltage to produce current flow across the junction of a semiconductor.

Frequency - Number of times every second an alternating current goes through a complete cycle. Measured in the unit Hertz (Hz).

Full-Wave Rectification - A process by which all of an AC voltage wave is rectified and allowed to flow as DC.

Fuse - A device containing a soft piece of metal which melts and opens the circuit when current flow exceeds a specified amount.

Fusible Link - Performs a similar function as a fuse, but for higher amperage applications. Can be a special wire soldered into a circuit, or located in a plastic housing.

G

Ground - The return path for current flow in a circuit. In automotive use, the circuit ground path is usually the vehicle frame and metal body parts.

Ground Cable - The battery cable that provides a ground connection from the vehicle chassis to the battery.

Grounded Circuit (Unintentional) - A type of circuit malfunction in which the current in the circuit is accidentally shunted, or diverted to ground. Also called a short-to-ground. Usually, this condition bypasses a load. When a load is bypassed, it reduces the resistance of the circuit and can cause wiring to overheat, fuses to blow, etc.

Ground Terminal - The terminal of the battery connected to the metal frame and chassis of the vehicle for the return path of current flow back to the battery, usually to the negative terminal.

H

High Resistance - A type of circuit malfunction in which a loose, dirty, or corroded connection limits current flow below specifications. The result can be dim lamps, or intermittent or inoperative devices.

I

Induced Voltage - The voltage which appears in a conductor when relative motion exists between it and magnetic flux lines.

Induction - Producing a voltage in one conductor or coil by moving the conductor or coil through a magnetic field or by moving the magnetic field past the conductor or coil.

Infinite Resistance - A reading (∞) on an ohmmeter that indicates an open circuit, broken wire, defective component. On digital meters, infinite resistance is represented by “OL” on the display. With this much resistance, no current can move through. Usually, this indicates that the circuit is broken with no complete path for current flow.

Input - Generally used to refer to data or sensor information given which is received by an ECU. The ECU uses this information to determine what operations to perform.

Insulators - Materials that will not conduct electricity because of too many bound electrons in its atomic structure.

Integrated Circuit - An electronic circuit containing many transistors, diodes, resistors, and capacitors that is manufactured on a single semiconductor chip.

J

Jumper Wire - A test device or tool used by technicians to create a temporary bypass for current in a circuit. A jumper wire may be used to ground a circuit, to bridge a broken wire or switch or to complete a circuit for test purposes.

K

k - Prefix used in the metric system of measurement to mean 1000 times the stated value. Abbreviation for kilo. In automotive applications, it is used for ignition system voltages (kV) and for large amounts of resistance ($k\Omega$)

Kilowatt - Unit of power in the metric system. One kilowatt is equal to about 1.341 horsepower. Also used to describe 1000 watts of electrical power.

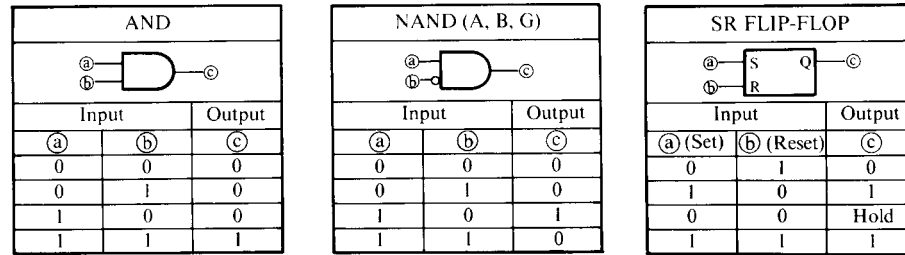
L

Light Emitting Diode (LED) - A semiconductor diode designed so light is emitted when forward current is applied to the diode.

Lines of Force - Imaginary lines representing the direction of magnetism around a conductor or from the end of a magnet.

Liquid Crystal Display (LCD) - Uses a polarized light principle and a liquid crystal to display numbers and characters.

Logic Gates - These devices are designed to control current flow in electronic modules of various types. Here are some basic gate types:



Consult the 1990 LS 400 New Car Features for more information

M

Magnet - Any material with the property of attracting iron and steel.

Magnetic Flux - The invisible directional lines of force which make up a magnetic field.

Magnetic Induction - Producing magnetism in a magnetic body by bringing it near a magnetic field.

Magnetic Pole - Point where the lines of force enter and leave a magnet.

Magnetism - A form of energy caused by the alignment of atoms within certain materials. The ability of a metal to attract iron.

Mega - Metric prefix for "one million." DMMs display large amounts of resistance in MW.

Memory - Part of a microprocessor or microcomputer in which instructions or data are stored as electrical impulses.

Micro - Prefix of measurement meaning one millionth of a part.

Microprocessor - Set of integrated circuits that can be programmed with stored instructions to perform given functions. These small computers containing a central processing unit (CPU), instructions stored in a read only memory (ROM), and a random access memory (RAM) for receiving data and instructions. On Lexus vehicles, they are also called ECUs or ECMs.

Milli - Prefix of measurement meaning one thousandth of a part.

Millisecond - Unit of measurement for time, meaning one thousandth of a second.

Motor - An electromagnetic device used to convert electrical energy into mechanical energy.

Mutual Induction - Creation of voltage in one conductor by the rise and collapse of the magnetic field surrounding another conductor. Magnitude or strength of induced voltage depends on the ratio of turns between one coil and the other and the strength of current causing the induced voltage.

N

Nanosecond - One billionth of a second. A unit of measurement usually referring to the speed the circuit in a microcomputer can work. Electricity traveling at the speed of light will travel about 11.8 inches in one nanosecond. In comparison the same electricity will travel about 930 feet in one microsecond (millionth of a second).

Negative Temperature Coefficient - The property of any substance in which the electrical resistance increases as the temperature of the substance decreases. Most “temperature sensors” used on the vehicle (such as THW and THA) are negative temperature coefficient resistors.

Negative Terminal - The battery terminal closest to the negative potential in the battery.

N-Material - A semiconductor material that has excess free electrons because of the type of impurity added. It has a negative charge and will repel additional electrons.

North Pole - The area of a magnet from which the lines of force are said to leave the magnet. The end of a magnet that will point toward the north if freely suspended.

NPN Transistor - Transistor with two layers of N-type material separated by a layer of P-type material. Base circuit must be positive relative to the emitter for current to flow through the collector circuit.

N-Type Material - Semiconductor material with an excess of free electrons because of some impurity added. It has a negative charge and will repel additional electrons.

O

Ohm - The standard unit for measuring the resistance to current flow. One ohm of resistance will limit current flow to one ampere when one volt of pressure is applied. Represented by the symbol “ Ω ”.

Ohm's Law - The mathematical relationship between voltage, current, and resistance. The pressure of one volt applied to one ohm of resistance will cause one ampere of current to flow. Amps equal volts divided by ohms ($I = E/R$). Volts equal amps times ohms ($E=I \times R$) Ohms equal volts divided by amps ($R=E/I$).

Ohmmeter - An electrical meter used to measure the resistance to current flow in a circuit or working load in ohms. The ohmmeter can only be connected across a circuit or device with the power removed. This meter has its own battery and can be damaged if connected to a circuit that has power applied to it.

Open Circuit - When there is an incomplete path for current flow. The open circuit may be caused deliberately by a switch that is OFF or it may be caused by a break in the conductor. An open circuit can occur on either side of the load.

Open Circuit Voltage - A voltage measurement taken when there is no current flow through the circuit. This measurement indicates continuity to the voltage source, but cannot detect if there is any unwanted resistance in the circuit.

Overload - Carrying a greater load than the device, machine, or electric circuit was designed to carry.

P

Parallel Circuit - A circuit in which there are multiple loads each having a separate current path.

Parasitic Load - An electrical load which is unswitched and ON all the time. Typically, the parasitic load from ECUs and other electronic devices on the vehicle is around 20 to 30 mA. Some vehicles may go as high as 50mA or more.

Peak Inverse Voltage - Highest reverse bias voltage that can be applied to a junction of a diode before the semiconductor material breaks down and allows current to flow in that opposite direction.

Photoelectricity - Voltage caused by the energy of light as it strikes certain materials.

Piezoelectricity - Voltage caused by physical pressure applied to the faces of certain crystals.

PN Junction - Dividing line in a semiconductor between P-type material and N-type material. Electrons can flow from N to P but not from P to N.

PNP Transistor - Transistor with two layers of P-type material separated by a layer of N-type material. Base circuit must be negative relative to the emitter for current to flow through the collector circuit.

Polarity - The quality or condition in a body that has opposite properties or directions. A collective term applied to the positive(+) and negative (-) ends of a magnet or electrical component such as a battery or coil.

Positive Temperature Coefficient (PTC) - Resistor or heating element in which the resistance increases with temperature or heat created by current flowing through it. Eventually the resistance will get so high that it will oppose all current flow. Then, the resistor or heating element will cool down until current can begin to flow again, increasing the temperature.

Positive Terminal - The battery terminal to which electrons flow in a complete electrical circuit.

Potential - The pressure (voltage) existing between two points available to force electrons through the circuit as current.

Potentiometer - Electrical component that can vary the amount of resistance placed in a circuit by turning or sliding a contact on the resistance wire windings.

Power - Rate at which work is done. Common unit of measure for power is horsepower. Power is also measured by kilowatt (kW). About three-fourths of a kilowatt equal one horsepower.

Power Feed Circuit - Wires that carry current from the positive terminal of the battery to the electrical components of the vehicle. These circuits are sometimes referred to as the +B or Power side of the circuit.

Pull-in Winding - The coil of large diameter wire in a solenoid that creates a magnetic field to pull the solenoid plunger into the coil.

Protocol - a set of rules that governs the transmission of information between control units.

R

Random Access Memory (RAM) - Part of a microprocessor or computer into which information can be written and read.

Reactance - Property of an electrical device or conductor to impede change in current passing through it or voltage exerted on it.

Read Only Memory (ROM) - Part of a microprocessor or computer where information and instructions are permanently integrated into the circuits and can only be read by the processor. Usually used to store the program or instructions for the processing unit to act on.

Rectifier - Device used to change alternating current to direct current.

Regulator - Device in the charging system used to control alternator output to prevent excessive voltage from being fed to the battery or to the electrical components in a vehicle.

Relay - An electromagnetic switch. A relay uses a small amount of current flow to control the flow of a larger amount of current through a separate circuit.

Reluctance - The tendency of some materials to resist penetration by magnetic flux lines.

Resistance - The opposition to the free flow of an electric current which is measured in ohms.

Resistor - A device made of carbon or wire that presents a resistance to current flow. Any device in a circuit that produces work, loads the circuit, and causes a voltage drop acts as a resistor.

Reverse Bias - Polarity of voltage applied to the junctions of a diode or transistor so that no current will flow across the junction.

Reverse Breakdown Voltage - The reverse voltage beyond which a diode cannot hold back reverse current.

Rheostat - A variable resistor for regulating a current flow.

S

Schematic Diagram - A graphic representation of a circuit. On Lexus vehicles, this is referred to as an Electrical Wiring Diagram or System Circuit Diagram.

Semiconductor - Popular name associated with almost any solid state circuit or component. Materials with four electrons in the outer ring of the atom which show the properties of a conductor or a non-conductor under different conditions.

Sending Unit - Sensor which converts a mechanical condition (oil pressure or coolant temperature) into an electrical value.

Series Circuit - A circuit in which the loads are connected end to end with a positive pole to a negative pole, so that only one path is available for all current flow.

Series Motor - A motor that has only one path for current flow through the field and armature windings. These motors are commonly used for starter motors.

Series-Parallel Circuit - The connection of several loads in a circuit in such a way that current must flow through some loads but can't flow to one or more other loads without affecting the rest of the circuit. A series-parallel circuit is simply a circuit containing elements of both a series circuit and a parallel circuit.

Short Circuit - A type of circuit malfunction in which two or more wires touch each other accidentally in such a way that the circuit(s) are completed wrong. A short circuit between two different circuits interconnects the two in such a way that if either circuit is electrically energized, both will function.

Short-to-Ground - Circuit problem in which a connection is unintentionally made to ground. If the ground is before the load, a blown fuse will result. If the ground is after the load, and +B is present at the + side of the load, the load will operate.

Shunt - An electrical connection or branch in parallel with another branch circuit or connection.

Solenoid - Electromechanical device used to produce mechanical movement by drawing a plunger into a current carrying coil.

Stranded Wires - Wires or cables made of a number of smaller wires twisted or braided together.

Switch - A device used to control the current flow (off or on) in a circuit.

System Circuit Diagram - Term used to describe the schematic or wiring diagram in the Lexus EWD.

T

Terminal - Metal device attached to the end of a wire or load which makes the connection to the conductor.

Transducer - A device which changes one form of energy into another. In electrical systems, we look at “sensor” as transducers, converting a mechanical energy into electrical energy.

Transformer - Device used to change AC current into a different voltage. Consists of two or more coils, one with more windings than the other, that induce voltage in one coil while current flows through the other.

Transistor - A semiconductor device with three connections. A small current at the base is used to control the current flow through the emitter collector circuit. Acts as a solid state relay, or as an amplifier.

U

Unwanted Parasitic Load - A load which continuously draws an excessive current from the battery when the key is off. Typically, a parasitic load in over 50 to 100 mA can be considered “excessive”, resulting in a dead battery after the vehicle has been parked overnight or longer.

V

V - Abbreviation for **volt**, a unit of measurement for electrical potential.

Volt - The electromotive force that causes current flow. One volt of pressure causes one ampere to flow through one ohm of resistance.

Voltage - The electromotive force that causes current flow. The potential difference between two points when one is negatively charged and one is positively charged.

Voltage Drop - Voltage measurement made by placing a voltmeter in parallel to a circuit that has current flow going through it.

Voltmeter - An electrical meter used to measure the difference in voltage between two points in a circuit.

W

W - Abbreviation for a **watt**, a unit of measurement for power.

Watt - The unit of measurement for electrical power. One way to measure the rate of doing work. Watts equals voltage drop times amperage.

Wire Gauge - Wire size numbers based upon the cross-sectional area of the conductor. The larger the wire is, the smaller the gauge number.

Wiring Harness - A bundle of wires enclosed in a plastic cover and routed to various areas of the vehicle. Most harnesses end in plug-in connectors.

Z

Zener Diode - A semiconductor made so as to allow reverse current flow without damage at a voltage above a specific value. Used frequently in voltage regulator circuits.



Notes