

# Electricity and Power Supplies - Chapter #4

Amy Hissom

## Key Terms

**Active backplane** — A type of backplane system in which there is some circuitry, including bus connectors, buffers, and driver circuits, on the backplane.

**Alternating current (AC)** — Current that cycles back and forth rather than traveling in only one direction. In the United States, the AC voltage from a standard wall outlet is normally between 110 and 115 V. In Europe, the standard AC voltage from a wall outlet is 220 V.

**Ampere or amp (A)** — A unit of measurement for electrical current. One volt across a resistance of one ohm will produce a flow of one amp.

**AT** — A form factor, generally no longer produced, in which the motherboard requires a full-size case. Because of their dimensions and configuration, AT systems are difficult to install, service, and upgrade. Also called full AT.

**ATX** — The most common form factor for PC systems presently in use, originally introduced by Intel in 1995. ATX motherboards and cases make better use of space and resources than did the AT form factor.

**Baby AT** — An improved and more flexible version of the AT form factor. Baby AT was the industry standard from approximately 1993 to 1997 and can fit into some ATX cases.

**Backplane system** — A form factor in which there is no true motherboard. Instead, motherboard components are included on an adapter card plugged into a slot on a board called the backplane.

**Brownouts** — Temporary reductions in voltage, which can sometimes cause data loss.

**BTX (Balanced Technology Extended)** — The latest form factor expected to replace ATX. It has higher quality fans, is designed for better air flow, and has improved structural support for the motherboard.

**Bus riser** — See riser card.

**Capacitor** — An electronic device that can maintain an electrical charge for a period of time and is used to smooth out the flow of electrical current. Capacitors are often found in computer power supplies.

**Clamping voltage** — The maximum voltage allowed through a surge suppressor, such as 175 or 330 volts.

**Compact case** — A type of case used in low-end desktop systems. Compact cases, also called low profile or slimline cases, follow either the NLX, LPX, or Mini LPX form factor. They are likely to have fewer drive bays, but they generally still provide for some expansion.

**Data line protector** — A surge protector designed to work with the telephone line to a modem.

**Diode** — An electronic device that allows electricity to flow in only one direction. Used in a rectifier

circuit.

**Direct current (DC)** — Current that travels in only one direction (the type of electricity provided by batteries). Computer power supplies transform AC to low DC.

**Display Power Management Signaling (DPMS)** — Energy Star standard specifications that allow for the video card and monitor to go into sleep mode simultaneously. See also Energy Star.

**Doze time** — The time before an Energy Star or “Green” system will reduce 80 percent of its activity.

**Electromagnetic interference (EMI)** — A magnetic field produced as a side effect from the flow of electricity. EMI can cause corrupted data in data lines that are not properly shielded.

**Electrostatic discharge (ESD)** — Another name for static electricity, which can damage chips and destroy motherboards, even though it might not be felt or seen with the naked eye.

**Energy Star** — “Green” systems that satisfy the EPA requirements to decrease the overall consumption of electricity. See also Green Standards.

**Field replaceable unit (FRU)** — A component in a computer or device that can be replaced with a new component without sending the computer or device back to the manufacturer. Examples: power supply, DIMM, motherboard, floppy disk drive.

**FlexATX** — A version of the ATX form factor that allows for maximum flexibility in the size and shape of cases and motherboards. FlexATX is ideal for custom systems.

**Form factor** — A set of specifications on the size, shape, and configuration of a computer hardware component such as a case, power supply, or motherboard.

**Full AT** — See AT.

**Green Standards** — A computer or device that conforms to these standards can go into sleep or doze mode when not in use, thus saving energy and helping the environment. Devices that carry the Green Star or Energy Star comply with these standards.

**Ground bracelet** — A strap you wear around your wrist that is attached to the computer case, ground mat, or another ground so that ESD is discharged from your body before you touch sensitive components inside a computer. Also called static strap, ground strap, ESD bracelet.

**Hard drive standby time** — The amount of time before a hard drive will shut down to conserve energy.

**Intelligent UPS** — A UPS connected to a computer by way of a USB or serial cable so that software on the computer can monitor and control the UPS. Also called smart UPS.

**Line conditioner** — A device that regulates, or conditions, power, providing continuous voltage during brownouts and spikes.

**Line-interactive UPS** — A variation of a standby UPS that shortens switching time by always keeping the inverter that converts AC to DC working, so that there is no charge-up time for the inverter.

**Low-profile case** — See compact case.

**LPX** — A form factor in which expansion cards are mounted on a riser card that plugs into a motherboard.

The expansion cards in LPX systems are mounted parallel to the motherboard, rather than perpendicular to it as in AT and ATX systems.

**MicroATX** — A recent version of the ATX form factor. MicroATX addresses some new technologies that have been developed since the original introduction of ATX.

**Mini-ATX** — A smaller ATX board that can be used with regular ATX cases and power supplies.

**Mini-LPX** — A smaller version of the LPX motherboard.

**NLX** — A low-end form factor that is similar to LPX but provides greater support for current and emerging processor technologies. NLX was designed for flexibility and efficiency of space.

**Ohm (  $\Omega$  )** — The standard unit of measurement for electrical resistance. Resistors are rated in ohms.

**P1 connector** — Power connection on an ATX motherboard.

**P8 connector** — One of two power connectors on an AT motherboard.

**P9 connector** — One of two power connectors on an AT motherboard.

**Passive backplane** — A type of backplane system in which the backplane contains no circuitry at all. Passive backplanes locate all circuitry on a mothercard plugged into a backplane.

**Power conditioner** — A line conditioner that regulates, or conditions, power, providing continuous voltage during brownouts.

**Rectifier** — An electrical device that converts AC to DC. A PC power supply contains a rectifier.

**Resistor** — An electronic device that resists or opposes the flow of electricity. A resistor can be used to reduce the amount of electricity being supplied to an electronic component.

**Riser card** — A card that plugs into a motherboard and allows for expansion cards to be mounted parallel to the motherboard. Expansion cards are plugged into slots on the riser card.

**Sags** – See Brownouts.

**Sleep mode** — A mode used in many “Green” systems that allows them to be configured through CMOS to suspend the monitor or even the drive, if the keyboard and/or CPU have been inactive for a set number of minutes. See also Green Standards.

**Slimline case** — See compact case.

**Smart UPS** – See intelligent UPS.

**Soft power** — See soft switch.

**Soft switch** — A feature on an ATX system that allows an OS to power down the system and allows for activity such as a keystroke or network activity to power up the system. Also called soft power.

**Spikes** — Temporary surges in voltage, which can damage electrical components.

**Standby time** — The time before a “Green” system will reduce 92 percent of its activity. See also Green Standards.

**Static electricity** — See ESD.

**Surge protector or surge suppressor** — A device or power strip designed to protect electronic equipment from power surges and spikes.

**Surge suppressor or surge protector** — A device or power strip designed to protect electronic equipment from power surges and spikes.

**Suspend time** — The time before a “Green” system will reduce 99 percent of its activity. After this time, the system needs a warm-up time so that the CPU, monitor, and hard drive can reach full activity.

**Swells** – See spikes.

**Tower case** — The largest type of personal computer case. Tower cases stand vertically and can be as high as two feet tall. They have more drive bays and are a good choice for computer users who anticipate making significant upgrades.

**Transformer** — A device that changes the ratio of current to voltage. A computer power supply is basically a transformer and a rectifier.

**Transistor** — An electronic device that can regulate electricity and act as a logical gate or switch for an electrical signal.

**UPS (uninterruptible power supply)** — A device designed to provide a backup power supply during a power failure. Basically, a UPS is a battery backup system with an ultrafast sensing device.

**Volt (V)** — A measure of potential difference in an electrical circuit. A computer ATX power supply usually provides five separate voltages: +12V, – 12V, +5V, –5V, and +3.3V.

**Watt (W)** — The unit used to measure power. A typical computer may use a power supply that provides 200W.

## REVIEWING THE BASICS

1. Volts are a measure of what characteristic of electricity?

**Potential Difference**

2. What is the normal voltage of house electricity in the U.S.?

**110-volt**

3. Hot wires in home wiring are normally colored **black** and ground wires in computers are normally colored **green or bare**.

4. What is the difference between a transformer and a rectifier? Which are found in a PC power supply?  
**A transformer is a device that changes the ratio of current to voltage and a rectifier is a device that converts alternating current to direct current.**

5. What are the five voltages produced by an ATX power supply?

**+12V, -12V, +5V, -5V, and +3.3V.**

6. What are the four voltages produced by an AT power supply?

**+5, -5, +12, and -12**

7. When working inside a computer, why is important to not stack boards on top of each other?

**You could accidentally dislodge a chip.**

8. Describe the purpose of the ground line in a house circuit. Show the electrical symbol for ground.

**It serves as an escape route for out-of-control electricity.**



9. What is the basic electronic building block of an integrated circuit?

**The transistor**

10. Why is a power supply dangerous even after the power is disconnected?

**Because it can still hold a dangerous level of electricity which can be enough power to kill you.**

11. What is the symbol for a diode?



12. What is a simple way to detect EMI?

**Using an inexpensive AM radio by turning the dial away from a station into a low-frequency range. With the radio on, you can hear the static that EMI produces. You can try putting the radio next to several electronic devices to detect the EMI they emit.**

13. What is an unintended, high-current, closed connection between two points in a circuit called?

14. Which form factors use a riser card on the edge of the motherboard?

**NLX, LPX, and Mini-LPX**

15. List five types of computer case form factors. What is the most popular type of form factor for PCs today?

**Desktop Cases, Slimline Desktop, Notebook Cases, and Tower Cases which include; Minitower, Mid-size tower, and full-size Tower**

16. List three advantages an ATX system has over a baby AT system.

- **Easier to add and remove components**
- **Greater support for I/O devices and processor technology**
- **Lower costs**
- **Improved positioning of components**

17. List four computer symptoms that indicate a faulty power supply.

- **The Pc sometimes halts during booting. After several tries, it boots successfully.**
- **Error codes or beeps occur during booting, but they come and go.**

- **The computer stops or hangs for no reason. Sometimes it might even reboot.**
- **Memory errors appear intermittently.**
- **The keyboard stops working at odd times.**
- **The power supply overheats and becomes hot to the touch.**

18. How much power can a device use in sleep mode if it complies with Green Standards?  
**No more than 30 watts of power.**

19. Name one thing that can be set in CMOS that pertains to power management.  
**PM Timers, Power Up Control, Fan Monitor, Thermal Monitor, and Voltage Monitor**

20. How can you easily tell if a computer is designed to comply with Green Standards?  
**Besides the Green Star logo, the computer should have a standby program that switches the device to sleep mode when it is not in use.**

21. Name two surge suppressor specifications.

- **UL (underwriters Laboratory) logo, which ensures that the laboratory, a provider of product safety certification, has tested the device.**
- **Three prong plug**

22. What are the two main types of uninterruptible power supplies?  
**Line-interactive UPS and Intelligent (Smart) UPS**

23. How does a smart UPS differ from one that is not smart?  
**A smart UPS comes with utility software that you can use to diagnose the UPS, monitor electricity, battery weakness, etc.**

24. If you are asked to identify the form factor of a motherboard, what are two criteria you can use to help you identify the board?  
**Size and configuration of hardware components**

25. What are three motherboard form factors that can be used with a compact case?  
**Size, shape, and general makeup of a hardware component.**

## THINKING CRITICALLY

1. How much power is consumed by a load drawing 5 A with 120 V across it?  
**600 VA**

2. You suspect that a power supply is faulty, but you use a multimeter to measure its voltage output and find it to be acceptable. Why is it still possible that the power supply may be faulty?  
**Because power problems can be intermittent.**

3. Someone asks you for help with a computer that hangs out at odd times. You turn it on and work for about 15 minutes, and then the computer freezes and powers down. What do you do first?

- Replace the surge protector
- Replace the power supply
- Turn the PC back on, go to CMOS setup, and check the temperature reading.**
- Install an additional fan

4. In figure 4-24, which motherboard is an AT board? An ATX board?  
**Motherboard A**