Module 1 / Peripherals and Adapters

### A+ Certification 220-801 Domain Areas % of Exam

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<td>40%</td>
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<td>2.0 Networking</td>
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<td>3.0 Laptops</td>
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#### Domain Objectives / Examples

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<td>1.1 Safety Procedures</td>
<td>5.1 Given a scenario, use appropriate safety procedures. ESD straps • ESD mats • Self-grounding • Equipment grounding • Personal safety (Disconnect power before repairing PC, Remove jewelry, Lifting techniques, Weight limitations, Electrical fire safety, Cable management) • Compliance with local government regulations</td>
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<td>1.2 Motherboard Components</td>
<td>1.2 Differentiate between motherboard components, their purposes, and properties. Sizes (ATX, Micro-ATX, ITX) • RAM slots • CPU sockets • Chipsets (Northbridge, Southbridge, CMOS battery) • Jumpers • Power connections and types • Fan connectors • Front panel connectors (USB, Audio, Power button, Power light, Drive activity lights, Reset button)</td>
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<td>1.3 Power Supplies</td>
<td>1.8 Install an appropriate power supply based on a given scenario. Connector types and their voltages (SATA, Molex, 4/8-pin 12v, PCIe 6/8-pin, 20-pin, 24-pin, Floppy) • Specifications, Wattage, Size, Number of connectors, ATX, Micro-ATX • Dual voltage options</td>
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<tr>
<td>1.4 Connection Interfaces</td>
<td>1.7 Compare and contrast various connection interfaces and explain their purpose. USB connections (1.1 vs. 2.0 vs. 3.0, Speed and distance characteristics, Connector types: A, B, mini, micro) • Firewire connections (400 vs. Firewire 800 speed and distance characteristics) • Other connector types (Serial, Parallel, VGA, HDMI, DVI, Audio) • Analog vs. digital transmission (VGA vs. HDMI)</td>
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<td></td>
<td>1.11 Identify connector types and associated cables. Display connector types (DVI-D, DVI-I, DVI-A, DisplayPort, RCA, HD-15 (DE-15, DB-15), BNC, Mini HDMI, RJ-45, Mini-Din-6) • Display cable types (HDMI, DVI, VGA, Component, Composite, S-video, RGB, Coaxial, Ethernet) • Device connectors and various connector pin-outs (USB, IEE1394, SCSI, PS/2, Parallel, Serial, Audio) • Device cable types (USB, IEE1394, SCSI [68pin vs. 50pin vs. 25pin], Parallel, Serial)</td>
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**Delivery Tips**

The exams no longer have official names but 801 collects most of the hardware topics together while 802 is more focused on the OS.

Each module in the course is designed to correlate to one training day, though you may wish to adjust timings depending on the students' level of existing knowledge and experience.

PC Hardware accounts for 40% of the exam. This content is covered in the first two modules (excepting a few network and wireless content examples, which are dealt with in the Networking module). This module starts with safety procedures then looks at the PC case and motherboard before reviewing the various peripheral and expansion bus technologies.

Make sure students know the functions of the main components of the PC and about the main technologies and standards. When preparing for the exam they should make sure to learn facts such as data transfer rates, cable lengths, pin numbers, and so on.

If you have any queries or suggestions to make about the course, please email them to trainer@gtslearning.com

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| 1.5  | **1.2 Differentiate between motherboard components, their purposes, and properties.**  
     | *Expansion slots (PCI, PCI-X, PCIe, Mini PCI, CNR, AGP2x, AGP4x, AGP8x)*  
     | • Bus speeds  
     | **1.4 Install and configure expansion cards.**  
     | *Serial and parallel cards* • *USB cards* • *Firewire cards* •  
     | *Storage cards* • *Riser cards*  
|      | **1.12 Install and configure various peripheral devices.**  
     | *Input devices (Mouse, Keyboard, Touch screen, KVM, Biometric devices, Game pads, Joysticks, Digitizer)*  
|      | **1.6 Output and Multimedia Devices**  
|      | **1.4 Install and configure expansion cards.**  
     | *Sound cards* • *Video cards* • *TV tuner cards* • *Video capture cards*  
|      | **1.10 Given a scenario, evaluate types and features of display devices.**  
     | *Types (CRT, LCD, LED, Plasma, Projector, OLED)* •  
     | *Refresh rates* • *Resolution* • *Native resolution* •  
     | *Brightness/lumens* • *Analog vs. digital* • *Privacy/antiglare filters* • *Multiple displays*  
|      | **1.12 Install and configure various peripheral devices.**  
     | *Input devices (Microphone)* • *Multimedia devices (Digital cameras, Microphone, Webcam, Camcorder, MIDI enabled devices)* •  
     | *Output devices (Speakers, Display devices)* |
Module 1 / Unit 1
Safety Procedures

Objectives
On completion of this unit, you will be able to:

- Understand safety procedures for dealing with hazards associated with PC support.
- Use procedures and tools to reduce the risk of ESD damage when handling computer components.
- Identify appropriate disposal methods for waste equipment.

Health and Safety Laws
When performing PC maintenance work, you may need to take account of compliance with local government regulations. Regulations that typically affect PC maintenance or the installation of new equipment are:

- Health and safety laws - keeping the workplace free from hazards.
- Building codes - ensuring that fire prevention and electrical systems are intact and safe.
- Environmental regulations - disposing of waste correctly.

While specific regulations may vary from country to country and state to state, in general employers are responsible for providing a safe and healthy working environment for their employees. Employees have a responsibility to use equipment in the workplace in accordance with the guidelines given to them and to report any hazards. Employees should also not interfere with any safety systems, including signs or warnings or devices such as firefighting equipment. Employees should not introduce or install devices, equipment, or materials to the workplace without authorization or without making a health and safety assessment of the installation.

A company’s health and safety procedures should be set out in a handbook, possibly as part of an employee’s induction handbook. Health and safety procedures should:

- Identify what to do in the event of a fire or other emergency.
- Identify responsible persons (for example, for overall health and safety, nominated first aiders, fire marshals, and so on).
- Identify hazardous areas in the workspace and precautions to take when entering them.
Describe best practice for use and care of the workspace and equipment within it.

Establish an incident reporting procedure for detecting and eliminating workplace hazards and accidents.

The general procedure for an emergency situation is as follows:

1) Raise the **alarm** and contact the **emergency services**, giving them a description of the emergency and your location.

2) If possible, make the scene **safe**. For example, if faced with a fire, establish that you have an escape route or if faced with electrical shock, disconnect the power (if it is safe for you to do so).

3) If you have **training** and it is **safe** to do so, do what you can to **tackle** the emergency (for example, give first aid or use firefighting equipment).

Of course, circumstances could dictate that you do something differently. It is vital that you keep calm and do not act rashly.

**Electrical Safety**

Electrical equipment can give an **electric shock** if it is broken, faulty, or installed incorrectly. An electric shock can cause severe burns or even kill. Electrical currents can pass through metal and most liquids, so neither should be allowed to come into contact with any electrical device installations.

Always disconnect electrical equipment such as PCs and printers from any power sources (including removing laptop batteries) before cleaning or servicing.

Damaged components or cables are also a risk and should be replaced or isolated immediately. It is important to test electrical devices regularly (the frequency will depend on the environment in which the device is used). **Portable Appliance Testing (PAT)** carried out by a qualified electrician or technician ensures that a device is safe to use.

An electrical device must be fitted with a **fuse** appropriate to its power output. A fuse blows if there is a problem with the electrical supply, breaking the circuit to the power source. Fuses come in different ratings, such as 3A, 5A, and 13A. A device’s instructions will indicate what rating of fuse to use, but most computer equipment is rated at 3A or 5A. If the fuse fitted is rated too low, it will blow too easily; if the rating is too high, it may not blow when it should (it will allow too much current to pass through the device).

If multiple devices need to be attached to a single power point, an appropriate **strip** of sockets should be used. If too many devices are attached to a single point, there is a risk that they will overheat and cause a fire.
"Daisy-chaining" one strip to another is not recommended. Strips may be fitted with a **surge suppressor**, which provides some protection for equipment against surges in the supply.

**Equipment Grounding**

Electrical equipment must also be grounded (or earthed). If there is a fault that causes metal parts in the equipment to become live, a ground provides a "path of least resistance" for the electrical current to flow away harmlessly. Most computer products (PCs, printers, and so on) are connected to the building ground via the power plug. However, the large metal equipment racks often used to house servers and network equipment must also be grounded. Do not disconnect the ground wire. If it has to be removed, make sure it is replaced by a competent electrician.

**Personal Safety**

The human body is an electrical conductor and a resistor, so a current will pass through it and make it heat up, manifesting as a burn if the current is strong enough. A current can interfere with the body's nervous system, which also uses electrical signals. This might manifest as spasm or paralysis (an electric shock) or in a severe case cause a heart attack.

- High voltages (over about 30V) are more dangerous because they have the power to push more current through you (skin's resistance drops dramatically at higher voltages), but it is the current that causes the actual damage (this is why static electricity is not dangerous to you, despite the high voltages). More current will flow if a larger area of your body is exposed.

- Do not work on electrical systems (especially an energized circuit) unless you have a good understanding of the risks and appropriate safety procedures.

- Disconnect the power to a circuit if you must handle it and always test live parts with a multimeter to ensure that no voltage is present.
Before performing work within a PC, always remove the power cord. After removing the cord, hold down the power button for a few seconds to ensure that the circuits are de-energized. Similarly, before opening the chassis of a laptop, remove the AC adapter and the battery.

- Always use properly insulated tools and never grip a tool by its metal parts.

It is especially important not to touch the live parts of multimeter probes, as these may be connected to an energized circuit. Handle the probes by the insulated sheaths only.

- Take care not to touch any part of a circuit with both hands to reduce the risk of a serious shock (the "hand in pocket" rule - this reduces the chance that the current will pass through your chest).

- Make sure your hands and the surrounding area are dry (sweat can make your hands more conductive). Do not leave any spill hazards in the vicinity.

- Do not wear jewelry or a wrist watch or other items such as name badges that may dangle from your neck or wrist and cause a short circuit or become trapped by moving parts.

### CRT Safety

Power supplies such as those inside the system unit, CRT monitors, LCD displays (inverter), and laser printers can carry extremely high levels of voltage. Charges held in capacitors can persist for hours after the power supply is turned off. You should not open up these units unless you have been specifically trained to do so. Adhere to all printed warnings, and never remove or break open any safety devices that carry such a warning.

### Electrical Fire Safety

Faulty electrical equipment can pose a fire risk. If the equipment allows more current to flow through a cable than the cable is rated for, the cable will heat up. This could ignite flammable material close to the cable. If an electrical wire does start a fire, it is important to use the correct type of extinguisher to put it out. Many extinguishers use water or foam, which can be dangerous if used near live electrical equipment. The best type to use is a Carbon Dioxide (CO2) gas extinguisher. CO2 extinguishers have a black label. Dry powder extinguishers can also be used, though these can damage electronic equipment.

You should also ensure that the electricity supply is turned off. This should happen automatically (the fuses for the circuit should trip) but make sure you know the location of the power master switches for a building.

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1 Care must be taken in confined spaces as the CO2 plus smoke from the fire will quickly replace the available oxygen making it hard to breathe.
Cable Management and Lifting Techniques

A trip hazard is caused by putting any object in people’s path. When installing equipment, ensure that cabling is secured, using cable ties or cable management products if necessary. Check that cables running under a desk cannot be kicked out by a user’s feet. Do not run cabling across walkways.

When servicing equipment, do not leave devices (PC cases for instance) in walkways or near the edge of a desk (where it could be knocked off). Be careful about putting heavy or bulky equipment down (ensure that it cannot topple).

Built-in cable management such as on this HP LCD display make it less likely trailing wires will cause an accident.

Lifting a heavy object in the wrong way can damage your back, but lifting and manual handling risks are not limited to particularly heavy objects. An object that is large or awkward to carry could cause you to trip over or walk into something else. An object that has sharp or rough edges or contains a hot or corrosive liquid could cause you to cut or hurt yourself. If necessary, you should obtain protective clothing (gloves and possibly goggles).

To lift a heavy object safely, plant your feet around the object with one foot slightly toward the direction in which you are going to move. Bend your knees to reach the object while keeping your back as straight as is possible and comfortable and your chin up. Find a firm grip on the object then lift smoothly by straightening your legs - do not jerk the object up. Carry the object while keeping your back straight. To lower an object, reverse the lifting process; keep your chin up and bend at the knees. Take care not to trap your fingers or to lower the object onto your feet.

If you cannot lift an object because it is too awkward or heavy, get help. If you need to carry an object for some distance, make sure that the route is unobstructed and that the pathway (including stairs or doorways) is wide and tall enough.
Static Electricity and ESD

Static electricity is a very high-voltage (potential difference) stored in an insulated body. Although the voltage is high, the amount of ElectroStatic Discharge (ESD) current that it can sustain is very low so static electricity is not that harmful. It can, however, be slightly painful; you may have felt a small shock when reaching for a metal door handle².

The human body is mostly water and so does not generate or store static electricity very well. Unfortunately, our clothes are often made of synthetic materials, such as nylon and polyester, which act as good generators of static electricity and provide insulating layers that allow charges to accumulate. Humidity and climate also affect the likelihood of ESD. The risk increases significantly during dry, cool conditions when humidity is low. In humid conditions, such as before or during a storm, the residual charge will bleed into the environment before it can increase sufficiently to be harmful to electrical components.

An electronic component, such as a memory or logic chip, is composed of fine, conductive metal oxides deposited on a small piece of silicon. Its dimensions are measured in fractions of a micron (one millionth of a millimeter). Any static electricity discharged into this structure will flash-over (spark) between the conductive tracks, damaging or even vaporizing them³. This may make the chip completely unusable. If not, it is likely to fail at some later time. Damage occurring in this way can be hidden for many months and may only manifest itself in occasional failures.

To protect components and equipment from ESD damage, make sure that your body and clothing are drained of static electricity before starting work. If possible, work in an uncarpeted area. The simplest (but least effective) means of self-grounding is to touch an unpainted metal part of the PC (such as the power supply unit) before you handle a sensitive component. This is only a temporary solution and a static charge could build up again.

Do not leave the PC plugged in if you open the case for servicing. Your safety is more important than the risk of damaging some PC components.

Where possible, handle vulnerable components by holding the edges of the plastic mounting card and avoid touching the surfaces of the chips themselves.

Using an anti-ESD wrist strap can dissipate static charges more effectively. The wrist band should fit snugly around your wrist to maximize contact with the skin. Do not wear it over clothing. The wrist strap ground is made either using a grounding plug that plugs into a wall socket or a crocodile clip that attaches to a grounded point or an unpainted part of the computer's metal chassis.

² You can feel a discharge of over about 2500V. A discharge of 20,000V or more could produce a visible spark. Walking over an untreated carpet in dry conditions could create a charge of around 35,000V.
³ A transistor designed to work with 1-3V can be damaged by a charge of under 100V (though most have ESD protection circuits that improves this tolerance). CMOS can typically withstand a charge of 2000-5000V.
Ensure that the strap has a working current-limiting resistor for safety (straps should be tested daily). Do not use a grounding plug if there is any suspicion of a fault in the socket or in the building’s electrical wiring or if the wiring is not regularly inspected and tested.

An anti-ESD service mat is also useful. Sensitive components can be placed on the mat safely.
Review Questions / Module 1 / Unit 1 / Safety Procedures

Answer the following questions. The correct answers are in the accompanying "Labs and References" manual.

1) What component helps to protect users of electrical equipment against a short circuit?
   A fuse.

2) What care should you take when lifting a heavy object?
   The main concern is damaging your back. Lift slowly using your legs for power not your back muscles.

3) What should you do before transporting a bulky object?
   Check that there is a clear path to the destination point. If you cannot carry the object safely, get help.

4) In which atmospheric conditions is the risk of ESD highest?
   During cool, dry conditions when humidity is low. When humidity is high, the static electricity can dissipate through the moisture present in the air.

5) Will damage caused to a chip by ESD be immediately apparent?
   Not necessarily. It is sometimes not apparent until some time later, when the chip becomes unstable.

6) Describe the equipment you should use to prevent static electricity on your body from damaging the equipment on which you are working:
   An anti-ESD service kit comprised of an anti-ESD wrist strap, grounding cord and plug, and a conductive mat. The grounding plug should be connected to an earthed point.

7) If static electricity is not harmful to humans, why is it damaging to electronic components?
   These components are designed to work at very low voltages; a static discharge is very high voltage. No damage occurs to humans because the current is very small but electronic circuits are more fragile.

8) You have to service a PC but anti-static protection is not available. You know that you can ground yourself by touching the metal chassis of the PC, but should you do this before or after unplugging the PC from mains power?
   For safety reasons, always unplug the PC from mains power before opening the case.