

# Chapter 12

## Overview

The goal of a preventive maintenance program is to avoid costly computer repairs. This module stresses the importance of preventive maintenance and describes the tools necessary to achieve it. Proper maintenance will help prolong the life of hardware. Software utilities can make a computer system faster and more efficient. This module also discusses important safety guidelines for working on a computer and disposing of components.

## Preventive Maintenance and the Technician

The main goal of any preventive maintenance program is to protect a system from future problems. It is to pre-empt a problem before it happens.

### **Tools and equipment**

A technician toolkit should contain the following:

- Flat-head screwdriver
- Phillips-head screwdriver
- Nut drivers
- Needle-nose pliers
- Diagonals or crosscut pliers
- Mirror to help see in tight places
- Digital multimeter
- Flashlight

A technician toolset should contain a variety of flat-head and Phillips-head screwdrivers. Technicians will encounter many different types of screws and nuts. Certain screws might require different lengths of screwdrivers for a technician to access them. An antistatic vacuum cleaner, canned air, various solvents, and lint-free cloths should also be available.

**Antistatic vacuum cleaners** should be used for computer components, since normal vacuum cleaners generate static. The vacuum cleaner should be specially certified for use with the computer. An average vacuum should not be used to clean toner from a laser cartridge. The fine consistency of toner particles requires a vacuum cleaner with a higher level of filtration.

**Canned air** is one of the most useful tools for cleaning computer components. A can of air will remove dust from the inside of a computer without creating static.

A **Digital Multimeter** should also be included. A DMM combines the functionality of a voltmeter, ohmmeter, and an ammeter into one easy measuring device. A DMM can perform electrical tests and measure voltage, amps, and ohms in both alternating and direct current. A DMM can be used to test power supplies, DC/AC voltage and polarity, resistance, diodes, continuity, coaxial cable, fuses, and batteries.

**Loop-back plugs** provide important diagnostic information for troubleshooting serial and parallel ports. Loop-back testing works by sending out signals and verifying that the correct input is received.

### Environmental Guidelines

Computers and other computing devices will eventually become unusable. This may be because components begin to fail more frequently, the machine is old and uneconomical, it becomes obsolete for the application that it was originally intended or newer machines with improved features replace earlier models. Eventually, the question of how to dispose of old computers or parts will arise.

Computers and peripherals contain some environmentally unfriendly materials. Most computer components are either hazardous or contain some level of hazardous substances. Waste materials are listed as hazardous because they are known to be harmful to human health and the environment when not managed properly.

Computer printed circuit boards consist of plastics, precious metals, fiberglass, arsenic, silicon, gallium, and lead. **Cathode Ray Tube (CRT) monitors** contain glass, metal, plastics, lead, barium, and rare earth metals. **Batteries** from portable systems can contain lead, cadmium, lithium, alkaline manganese, and mercury. **Batteries, CRTs or monitors, chemical solvents or cans, and toner kits or printer cartridges** all have special disposal procedures that comply with environmental guidelines.

to determine if a material is hazardous the technician should consult the Material Safety Data Sheet (MSDS). Read 12.1.6 for more information on this document.

**Q1.** The Goal of preventive maintenance is to prevent a problem \_\_\_\_\_ it happens.

**Q2.** Which of the following would be the best tool to use to clean the inside of a computer case?

- a) Axe
- b) Flame Thrower
- c) Canned Air
- d) Vacuum Cleaner

**Q3.** Which document must be consulted by a technician to determine if a material is hazardous?

\_\_\_\_\_

**Q4.** A useful tool that allows a technician to check if a parallel port is working is called a...

\_\_\_\_\_

### **Environmental guidelines for a server room**

In the server room, temperature is important. The server should never be located near ductwork or next to the air conditioner. Items such as motors and microwaves can cause interference with electrical pull. Electromagnetic interference (EMI) should also be avoided

The area around the server should be kept free of debris and clutter. Ideally, the server should be locked in a closet with limited access and no likelihood of being bumped, jostled, accessed directly, or otherwise disturbed by non-administrators.

### **Temperature**

Two things control the temperature of the computing environment. During cold weather, the heating system maintains the temperature at a comfortable level. This is applicable to open-office and server room environments. During hot weather, the air conditioning ensures that the server remains under the maximum operating temperature. Most enterprise data centers are air conditioned year round, due to the heat generated by the equipment.

The server room should not exceed 35 degrees C (95 degrees F). If it does, there will probably be a serious problem.

### **Humidity**

Humidity is another important environmental quality for a server to function properly. Moisture resulting from too much humidity in the air can damage the server electronic components. If the environment is too dry, electrostatic discharge (ESD) may occur.

### **Air Quality**

If servers are placed in areas with a lot of dust and debris in the air, this could be an issue. The fans on a server can pull all the dust in the air through the system and deposit it on the components. If the components become covered with dust, this may cause them to overheat and fail. If the equipment is in an area where the air quality is questionable, the network technician should schedule weekly or monthly maintenance to clean out the system using a computer vacuum cleaner or canned air.

**Q5.** Server rooms should have an operating temperature no greater than \_\_\_\_\_.

**Q6.** Name an electrical appliance that might be used to cook things such as Asda's microwavable pudding and custard, and that should not be placed near a computer.

\_\_\_\_\_

### **Preventive Maintenance and Electrostatic Discharge (ESD)**

Static electricity is the build up of an electric charge resting on a surface. This build up may end up zapping something that it can damage. A zap is known as an electrostatic discharge (ESD). ESD is the worst enemy of the fine electronics found in computer systems. This is why it has been discussed in almost every module in this course. As discussed earlier, a cool room with low humidity increases the potential for ESD.

At least 3000 volts must be built up before a person can feel an ESD. If the discharge causes pain or makes a noise, then the charge was probably above 10,000 volts. Most computer chips run on less than five volts of electricity. A computer component could be damaged by less than 3000 volts of static build up.

### **Antistatic bags**

Special packing materials are used with microchips and Printed Circuit Boards (PCBs). These packing materials range from special moulded plastics and foams for microchips to antistatic bags for PCBs. Do not remove any component from special packaging until it is ready to be installed.

Typical examples of components that come in antistatic bags are:

Motherboard  
Processor  
RAM  
Sound Card  
Video Card

### **Grounding wrist straps**

A grounding wrist strap provides a place for the static to go before it attacks a sensitive computer component. A wrist strap should not be worn when working with high-voltage equipment, such as a power supply or a CRT monitor. These components should only be serviced by a certified professional.

**Q7.** ESD stands for \_\_\_\_\_, and is the worst enemy of computer components.

**Q8.** A build up of at least \_\_\_\_\_ volts will allow of person to feel an ESD.

A charge above \_\_\_\_\_ volts will cause pain or make a noise.

**Q9.** Circle the items/components below that would **NOT** come in an antistatic bag?

Motherboard

Monitor

Sandwiches

Sound Card

SD-RAM

**Q10.** Which condition will increase the potential for ESD.

Warm Room, High Humidity

Cold Room, Low Humidity

## Cleaning and maintaining other computer components and peripherals.

### **Monitor.**

Since the display unit is the most visible piece of computer equipment, it should be kept clean for both appearance and functionality. When cleaning a display, make sure the device is unplugged from the wall. Use a damp cloth with a mild detergent to wipe down the entire display unit and remove any dust build up. If liquid drips inside a CRT display while it is being cleaned, it is best to let it evaporate. Never open a CRT display.

### **Mice.**

Mice can be either mechanical or optical. A mechanical mouse may not function properly if it becomes dirty. When dust settles on the mouse pad, it gets swept up into the moving parts of the mouse. This causes a build up on the rollers inside the mouse. The fastest way to clean it is to remove the plate on the bottom of the mouse, remove the ball, and then gently scrape the dust buildup from the rollers. The build up can be removed with a fingernail or another gentle scraping tool. An optical mouse may need to be cleaned with a damp cloth on the optical sensor surface. However, this could damage the mouse and should only be done if absolutely necessary.

### **Printers.**

Printers have many moving parts within them. Therefore, they require a higher level of maintenance. Printers produce impurities that collect on the components within the device. Over time, these impurities need to be cleaned out. Otherwise, they may cause the printer to malfunction.

When working with dot matrix printers, the roller surfaces should be cleaned with a damp cloth. The power cord should be unplugged before applying a damp cloth.

On an inkjet printer, the paper-handling mechanism may collect particles of paper over time. This can be removed with a damp cloth when the unit is unplugged.

Laser printers are usually low maintenance unless they are in a dusty area or are older units. When cleaning a laser printer, a special vacuum cleaner must be used for a toner mess.

**Q11.** A \_\_\_\_\_ and \_\_\_\_\_ can be used to clean a monitor.

**Q12.** If any liquid drops in to a monitor during cleaning, circle which you think is the best way to dry the monitor out

Use a special “**water vacuum**” to suck out the moisture.

Open the monitor with a **Philips Monitor Screw-Driver™** and lick out the liquid making sure to drink bottled spring water at regular intervals.

Allow the moisture to evaporate.

Use a mop and bucket with hot soapy water and an axe to hack away the water particles.

**Q13.** To clean a mechanical mouse you can either use a gentle scraping tool or your \_\_\_\_\_.

**Q14.** Printers must be cleaned more regularly because they have \_\_\_\_\_ and also have a build up of \_\_\_\_\_.

## **Software Utilities**

There are several utilities included with DOS and Windows that help maintain system integrity. If used on a regular basis, the following utilities can increase system speed and efficiency:

**ScanDisk** – This utility is used to check the integrity of files and folders or to thoroughly check the system by scanning the disk for physical errors.

**Defrag** – When a program is installed on a computer, it may be stored in more than one place on the hard drive. This is known as fragmentation. Fragmentation lowers the performance of a drive. This utility optimizes space on the hard drive to allow programs to execute faster.

**CHKDSK /f** – files and folders or to thoroughly check the system by scanning the disk for physical errors.

**REGEDIT** – The Registry is a database that holds configuration data about the hardware and environment of the PC. It provides access to the Registry in a view similar to Windows Explorer.

## **User responsibilities**

There are several things a computer user can do to make the system work properly. System utilities can be used to enhance performance in the following ways:

### **Managing Applications**

When installing applications, use the Add/Remove Programs utility. Certain applications may not use an install shield, and if the setup program crashes in the middle of the install, it could cause the system to fail. The Add/Remove Programs utility can also be used to completely remove an application from the system.

### **Managing Files and Folders**

The file management system of an operating system is designed to keep data in a hierarchical tree. The hard drives should be organized with work files and programs in different locations. This makes it easier to find and back up files.

### **Backing up the Work**

Since a system could fail at any time, personal files should be backed up regularly. The best way to back up data is to copy it onto a form of removable media such as a floppy disk, CD, or zip drive.

**Q15.** What software utility allows you to access the registry? \_\_\_\_\_.

**Q16.** What option should you use in Control Panel to uninstall a program? \_\_\_\_\_.

**Q17.** Fragmentation lowers the performance of a drive. What utility optimizes space on the hard drive to allow programs to execute faster.

\_\_\_\_\_

## Firewall

Many people are beginning to take advantage of the always-on feature of broadband technologies. Broadband users must be aware of the security risks associated with connecting a computer to the outside world. Security breaches on a home computer may allow a hacker to steal stored data or use the computer to hack into other computers.

Many steps can be taken to minimize the security risk of connecting a computer to the Internet. A home firewall can be used to prevent hacker attacks on a home computer. Firewalls are the most popular method of protecting corporate LANs from outside intruders. A firewall is a hardware or software system that is used to prevent unauthorized people from accessing sensitive data. A home firewall is normally located at the interface between the local devices and the high-speed broadband connection. All data, video, and voice traffic between these two networks is examined by the firewall. A typical home firewall system also includes the following features:

- Closes the broadband connection after detecting any attempts to hack into a digital appliance
- Allows different family members to set their own levels of security
- Records all broadband Internet access events

After installing a firewall, certain ports will need to be opened to use e-mail and the Internet. SMTP uses port **25** and POP3 uses port **110** to transmit and receive e-mail. Port **80** will also need to be opened for HTTP, the standard protocol that supports the exchange of information on the World Wide Web.

Windows XP has a built in firewall called Internet Connection Firewall (ICF), which is shown in Figure . ICF is a software component that blocks unsolicited traffic from the Internet. ICF monitors all the outbound and inbound communications of a computer. If ICF does not recognize a packet being sent or received, the packet is dropped. Windows XP can create a plain-text log of all events such as packets being dropped. ICF will block all unsolicited incoming packets by default.

<p><b>Q18.</b> Which of these ports should be opened on a firewall?</p> <p>15                      25                      112                      110                      80                      6669</p>
<p><b>Q19.</b> What is ICF? _____</p> <p>_____</p>
<p><b>Q20.</b> A firewall will automatically closes the connection if _____ is detected. It can either be _____ or _____ and examines all _____ and _____ data, video and voice traffic.</p>
<p><b>Q21.</b> IICF will block all _____ by default.</p>

## Power Issues.

Computers components are vulnerable to various kinds of electrical fluctuations. The delicate internal components can be damaged by electrical discharges. Computers can be damaged or destroyed by high levels of electrical releases such as lightning or low levels such as static electricity. The following types of power interruptions can cause a system to malfunction or fail:

**Blackouts** – Complete loss of power for any amount of time, as shown in Figure . They are usually caused by weather-related events such as high winds, lightning, or earthquakes.

**Brownouts or Sags** – A drop in power. A sag is a brownout that lasts less than a second. These incidents occur when voltage on the power line falls below 80 percent of the normal voltage. This can be caused by overloaded circuits. Sags and brownouts account for a large proportion of the power problems that affect networks and computing devices.

**Noise** – Caused by interference from radio broadcasts, generators, Noise results in unclean power, which can cause errors in a computer system.

**Spikes** – Sudden increases in voltage that are much higher than normal levels. For example, if the event lasts one or two seconds, it is called a spike. These are usually caused by lightning strikes but can also occur when the utility system comes back online after a blackout.

**Power Surge** – A dramatic increase in voltage above the normal flow of electrical current. Power surges are also referred to as transient voltage. Surge suppressors can help protect delicate computer compo-

## Surge suppressor and power supplies

### **Surge suppressors**

Surge suppressors, which are also called protectors, can help guard against electrical surges and spikes by diverting extra voltage to the ground. Surge suppressors use a component called a Metal Oxide Varistor (MOV) to divert the over-voltage. A clamping voltage triggers the MOV. If the voltage is above the minimum, it is diverted to the MOV and bypasses the computer components. This ensures that the voltage going to a device stays below a certain level. Protectors are mainly used to stop spikes from zapping the hardware. They also prevent high-voltage power surges from damaging computer equipment. Surge suppressors usually have a built-in fuse that prevents excess amounts of power from flowing through the unit. However, a surge suppressor is useless during brownouts or blackouts.

### **Standby Power Supplies (SPSs)**

A standby power supply (SPS) has a backup battery to supply power when the incoming voltage drops below the normal level. The battery is on standby during the normal operation of the unit. When the voltage slips, the battery provides DC power to a power inverter, which converts it to AC power for the computer. The problem with this device is the time it takes to switch over to the battery. If the switching device fails, the battery will not be able to supply power to the computer.

### **Uninterruptible Power Supplies (UPSs)**

An uninterruptible power supply (UPS) is comparable to SPS. However, a UPS requires battery power to operate. The power entering the unit recharges the batteries while they are in use. The power from the battery is sent to an inverter, which sends AC power to the computer. This device protects against AC power issues. A UPS provides a limited supply of power during a power failure. A UPS usually provides enough time to save and exit before the lack of power causes the machine to turn off. A UPS can also help guard against power sags or brownouts. Most people prefer to use a UPS over an SPS because of the switching time involved with an SPS. A UPS provides a steady stream of power with no delay.

**Q22.** What is the difference between an SPS and a UPS?

**Q23.** Which of the above would be unsuitable to use during a blackout?