# TVET CERTIFICATE III in COMPUTER SYSTEM TECHNOLOGY



# Credits: 8

Sector: ICT

Sub-sector: Computer maintenance

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**Purpose statement** 

This core module describes the skills, knowledge and attitude required to maintain a computer hardware system. The learner will be able to select and arrange different materials, equipment and tools.

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## Learning Unit 1 – Prepare tools, Material and Equipment

## LO1.1 – Identify tools, Material and equipment

<u>Content/Topic 1: Identification of tools, Material and equipment</u>

Consider this figure there are some tools and equipment we are going to see in this unity



## Hand and safety tools and equipment

A toolkit should contain all of the tools necessary to complete hardware repairs. As you gain experience, you will learn which tools to have available for different types of jobs. Hardware tools are grouped into these four categories:

- ESD tools
- Hand tools
- Cleaning tools
- Diagnostic tools

#### 1. Electro Static Discharge(ESD) Tools

There are two ESD tools: **the antistatic wrist strap** and **the antistatic mat**. The **antistatic wrist strap** protects computer equipment when grounded to a computer chassis. The **antistatic mat** protects computer equipment by preventing from accumulating on the hardware or on the technician.

#### Personal safety equipment

#### What is personal protective equipment?

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Personal protective equipment, commonly referred to as "PPE", is equipment worn to minimize exposure to hazards that cause serious workplace injuries and illnesses. These injuries and illnesses may result from contact with chemical, radiological, physical, electrical, mechanical, or other workplace hazards. Personal protective equipment may include items such as gloves, safety glasses and shoes, earplugs or muffs, hard hats, respirators, or coveralls, vests and full body suits.

If PPE is to be used, a PPE program should be implemented. This program should address the hazards present; the selection, maintenance, and use of PPE; the training of employees; and monitoring of the program to ensure its ongoing effectiveness.

Personal protective equipment (PPE) refers to protective clothing, helmets, goggles, or other garments or equipment designed to protect the wearer's body from injury.



Safety Googles



Labcoat



## 2. Hand Tools

Most tools used in the computer assembly process are small hand tools. They are available individually or as part of a computer repair toolkit. Toolkits range widely in size, quality, and price.

- Screwdrivers
- Needle
- Nose pliers

Some common hand tools and their uses are:

- Flat-head screwdriver: Used to tighten or loosen slotted screws.

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- Phillips-head screwdriver: Used to tighten or loosen cross-headed screws.
- **Torx screwdriver**: Used to tighten or loosen screws that have a star-like depression on the top, a feature that is mainly found on laptops.
- **Hex driver**: Used to tighten or loosen nuts in the same way that a screwdriver tightens or loosens screws (sometimes called a nut driver).
- **Needle-nose pliers**: Used to hold small parts.
- Wire cutters: Used to strip and cut wires.
- **Tweezers**: Used to manipulate small parts.
- Part retriever: Used to retrieve parts from locations that are too small for your hand to fit.
- Flashlight: Used to light up areas that you cannot see well.
- **Wire stripper**: A wire stripper is used to remove the insulation from wire so that it can be twisted to other wires or crimped to connectors to make a cable.
- Crimper: Used to attach connectors to wires.
- **Punch-down tool**: Used to terminate wire into termination blocks. Some cable connectors must be connected to cables using a punch down tool.(ciscopress)

## **3.Cleaning Tools**

Having the appropriate cleaning tools is essential when maintaining and repairing computers. Using the appropriate cleaning tools helps ensure that computer components are not damaged during cleaning. Cleaning tools include the following:

- Soft cloth: Used to clean different computer components without scratching or leaving debris
- **Compressed air**: Used to blow away dust and debris from different computer parts without touching the components
- Cable ties: Used to bundle cables neatly inside and outside of a computer
- **Parts organizer:** Used to hold screws, jumpers, fasteners, and other small parts and prevents them from getting mixed together

#### 4. Diagnostic Tools

Computer diagnostics tools are pieces of software that give you the knowledge you need to be able to potentially repair your own computer. These tools are made to find problems that may be disrupting your computer's normal performance. Once a problem is found, you can then plan your repair.

Diagnostic tools are used to test and diagnose equipment.

#### Diagnostic tools include the following:

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- A digital multimeter is a device that can take many types of measurements. It tests the integrity of circuits and the quality of electricity in computer components. A digital multimeter displays the information on an LCD or LED.



- A loopback adapter, also called a loopback plug, tests the basic functionality of computer ports.
   The adapter is specific to the port that you want to test.
- The toner probe is a two-part tool. The toner part is connected to a cable at one end using specific adapters, such as an RJ-45, coaxial, or metal clips. The toner generates a tone that travels the length of the cable. The probe part traces the cable. When the probe is in near proximity to the cable to which the toner is attached, the tone can be heard through a speaker in the probe



LO1.2 - Test tools, material and equipment

<u>Content/Topic 1: Testing of hand and safety tools</u>

**Testing ESD Tools** 



Electrostatic Discharge test meters (ESD testers) are used to measure the level of electrostatic discharge on a person, surface, or piece of equipment.

Other ESD devices with integrated circuits will be needed to prevent damage that might be caused by sparks from excess ESD.

ESD test meters measure electrostatic discharge by monitoring the surface resistance level to determine whether it is within an acceptable range for safety.

ESD test meters can vary quite widely in their specific function, depending on what they are measuring..

## ✓ Testing ESD wrist strap Tools

Testing the Wrist Strap The best test of the wrist strap system is while it is worn. This includes all three components: the wristband, the ground cord (including resistor), and the interface with the wearer's skin. "Because wrist straps have a finite life, it is important to develop a test frequency that will guarantee integrity of the system. Typical test programs recommend that wrist straps that are used daily should be tested daily. However, if the products that are being produced are of such value that a guarantee of a continuous, reliable ground is needed then continuous monitoring should be considered of even required.

## How do you test an ESD wrist strap with a multimeter?

Use an ohmmeter or multimeter to determine if there is conductivity between the metal part of the wrist strap, and the end part where you connect it to ground. You should see some measurable resistance (indicating good conductivity) if the strap is functioning correctly.

#### ✓ Testing ESD mat Tools

## What Tester do you use for continuity?

The most common and basic way of performing a continuity test is with the help of a resistance tester (any simple Multimeter with this function will do). This is because the resistance of conductors between the two ends is usually very small (less than 100 ohm).

Testing screwdriver: Testing screwdriver, Touch the tip of the tester screwdriver to the wire you're testing, being sure to hold the tester screwdriver's insulated handle. Look at the handle of the screwdriver. If the small neon light in the handle lights up, there is power going to the circuit. Otherwise the circuit is dead.



**Testing screwdriver** 



## ✓ Testing needle

A **needle** is a small, very thin piece of polished metal which is **used** for sewing. It has a sharp point at one end and a hole in the other for a thread to go through. Knitting **needles** are thin sticks that are **used** for knitting.



#### **Testing needle**

#### ✓ Testing pliers

Pliers are a hand tool used to hold objects firmly, possibly developed from tongs used to handle hot metal in Bronze Age Europe. They are also useful for bending and compressing a wide range of materials.



#### **Testing pliers**

#### **Testing diagnostic Tools**

- ✓ Testing multimeter
- There is also another way to examine if a multimeter is capable of measuring voltage. All you will
  need to do is to purchase a new 9 V battery. Now, you should carefully place the red probe to the
  positive terminal of the battery and the black probe to the negative terminal. If the multimeter
  provides a reading of 9 V or very close to it, the multimeter works!
- If you want to find out if your multimeter works at measuring current, you will first need to have a loaded circuit. You could have a battery connected to the resistance. Then, you should place the multimeter in the series to the circuit. If it shows a reading, it works. If it doesn't show a propereading, it doesn't work.





## **Testing multimeter**

## ✓ Testing loopback

## Why do we use loopback test?

A loopback test is a test in which a signal in sent from a communications device and returned (looped back) to it as a way to determine whether the device is working right or as a way to pin down a failing node in a network.

## **Testing adaptor**

Testing your AC adapter is crucial to the longevity of your adapter powered devices.

## Step 1

Disconnect the adapter at both ends. Visually inspect the adapter and cable for physical signs of abuse including broken insulation, housing or plug parts. A physically broken adapter is an electrical shock hazard and should be repaired or discarded.

## Step 2

Inspect for scorch marks, deformed or molten housing or soot indicating an overheated or burnt adapter. Discard the adapter if it indicates damage from overheating or misuse.

#### Step 3

Connect the voltmeter to the outlet powering the adapter. Determine if the outlet is appropriately powering the adapter. Outlets that may be wired to switches or switched circuits may falsely indicate a bad adapter. Verify that the outlet the adapter is connected to is polarized or grounded to match the adapter.

#### Step 4

Read your adapter to determine input and output voltages prior to testing. Switch your voltmeter to the setting corresponding with the adapter output. Switch your power strip off and plug in the AC adapter.

#### Step 5

Attach the voltmeter leads to the adapter. Turn the voltmeter and power strip on. Switch the adapter on, if equipped with a switch.

## Step 6

Read the voltmeter to determine the voltage put out by the AC adapter. Discard the adapter if the voltage indicated on the voltmeter does not correspond with the written rating.



Personal Protective Equipment (PPE) is vital to most Work at Height and will protect personnel from potentially hazardous falls. PPE should be visually inspected once every 6 months, and fully tested for compliance every 12 months by a competent specialist.

#### What is a PPE test?

Personal protective equipment (PPE) test ensures different types of PPE equipment are safe and secure and can protect the wearer as intended. PPE includes clothing and other articles intended to protect the wearer from injury or other health-related risks. Conducting a PPE test is a legal obligation in many jurisdictions, and it also helps R&D teams discover faults early.

#### LO1.3 - Arrange workplace

## • <u>Content/Topic 1: Arranging Workplace.</u>

There isn't a magic formula for how to organize tools. On the contrary, organizing tools can be a very individual thing. In many cases, placement depends on function. Are you a woodworker, a home renovator, a weekend warrior? Each skillset comes with different considerations and a different set of tools. For instance, a woodworker might need smaller tool storage whereas a home renovator might need an easily accessible place to organize their power tools. However, there are some basic tools that most homeowners need to store, and there are several clever ways to get the job done.

## Here are 3 examples tool organization tips to help you clean up your workplace.

#### 1. Create Zones for Different Tools



The first step to organizing tools is to do a thorough inventory. Once you have a general idea of the tools on hand, sort them into like categories. Group all of the power tools, the small hand tools, and so on. Next, create zones and use cabinetry to keep the like items together.

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For instance, here's a DIY storage cabinet designated for table saw equipment. When planning a workshop layout, this cabinet would be hung in close proximity to the table saw. Details like this might seem trivial at first, but they will enhance the ergonomics of the space.

2. Build a Tool Cabinet With Pegboard Backing



The best way to organize tools is to customize storage pieces to fit the space. For instance, purchasing a workbench is not nearly as effective as building one with specific storage spots for the tools you own.

Building a tool cabinet is a smart way to maximize any vertical space you have to spare. Use pegboard as a backing and on the cabinet doors, so you have plenty of surface area to hang tools.



3. Utilize Blank Space on the End of Cabinets

The end of a cabinet or workbench is an ideal spot to add extra tool storage. Before you go out and buy wood for this project, check whether you have any scrap pieces you can use instead.



Remember, this location is ideal for commonly used tools, such as screwdrivers, if it is close to your work area. If the cabinet is on the other end of the workshop, consider storing something else that you won't reach for as often in that location.

The workplace should have safety guidelines to follow to:

- Protect people from injury
- Protect equipment from damage
- Protect the environment from contamination

## What can be done to ensure proper use of personal protective equipment?

All personal protective equipment should be safely designed and constructed, and should be maintained in a clean and reliable fashion. It should fit comfortably, encouraging worker use. If the personal protective equipment does not fit properly, it can make the difference between being safely covered or dangerously exposed. When engineering, work practice, and administrative controls are not feasible or do not provide sufficient protection, employers must provide personal protective equipment to their workers and ensure its proper use. Employers are also required to train each worker required to use personal protective equipment to know:

- When it is necessary
- What kind is necessary
- How to properly put it on, adjust, wear and take it off
- The limitations of the equipment
- Proper care, maintenance, useful life, and disposal of the equipment

## Learning Unit 2 – Describe Computer Hardware

## LO 2.1 – Describe the computer peripherals devices, Cables, Driver and Connectors or Ports

<u>Content/Topic 1: Description of Computer External cables</u>

A cable is referred to as a cord, connector or plug; A cable is one or more wires covered in plastic that transmit power or data between devices or locations.

There are two Categories of computer cables:

- A data cable
- A power cable.

## What is Data Cable?

A data cable transmits information in the form of binary electrical communication signals between systems. This binary data consists of a sequence of ones and zeros as electrical signals.

The type of data cable you need depends on the environment. For example, ethernet cables like cat5e and cat6 cables transfer information between computers in a network. USB and coaxial cables connect peripheral devices like cameras and printers.

These cable types carry signals at different frequencies, and they have unique applications.

#### VGA Cable:

VGA or HD15 is the analog connection used to connect computers and laptops to projectors or additional monitors. In light of Analog Sunset, VGA is considered a legacy connector, and will be replaced with a digital HDMI

#### **DVI Cable:**

Digital Visual Interface (DVI) is a video display interface developed by the Digital Display Working Group (DDWG). The digital interface is used to connect a video source, such as a video display controller, to a display device, such as a computer monitor.

The main difference between VGA and DVI is in picture quality and the way the video signals travel. VGA connectors and cables carry analog signals while DVI can carry both analog and digital. DVI is newer and offers better, sharper display compared to VGA.

➢ Power Cable: A power cable is an electrical cable, an assembly of one or more electrical conductors, usually held together with an overall sheath. The assembly is used for transmission of electrical power

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#### > HDMI Cable: HDMI (High-Definition Multimedia Interface)

is a proprietary audio/video interface for transmitting uncompressed video data and compressed or uncompressed digital audio data from an HDMI-compliant source device, such as a display controller, to a compatible computer monitor, video projector, digital television, or digital audio device.[4] HDMI is a digital replacement for analog video standards.

▶ **USB Cable:** A USB port is a standard cable connection interface for personal computers and consumer electronics devices. USB stands for Universal Serial Bus, an industry standard for short-distance digital data communications. USB ports allow USB devices to be connected to each other with and transfer digital data over USB cables.

- Serial Cable: A serial cable is a cable used to transfer information between two devices using a serial communication protocol
- Parallel Cable: parallel cable. A series of metal wires that enable multiple bits of data to be transferred simultaneously. Parallel cables have mostly given way to serial cables, where data is transferred one bit after another.
- <u>Content/Topic 2: Description of Computer peripheral devices</u>

A *device* is a unit of physical hardware or equipment that provides one or more computing functions within a computer system. It can provide input to the computer, accept output or both. ... Typical hardware includes a computer mouse, speakers, printer and microphone.

➢ Mouse: A computer mouse is a hand-held pointing device that detects two-dimensional motion relative to a surface.

#### Why my mouse is not working?

There may be several issues that cause the mouse not to work properly with Microsoft Windows. Mouse driver outdated or missing. Outdated USB driver. Other USB driver issues.

#### Cause of a Mouse Not Working

Mouse failures source from five sources:

- Irreparable hardware damage.
- Loss of power or connection.
- Interference between the mouse and the work surface.
- Outdated software.
- Operating system glitches or misconfigurations.

## How to Fix a PC or Laptop Mouse That's Not Working

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Since several factors could be at the root of a mouse failing to work properly, troubleshooting the problem is the best way to make it work once more. Try these steps, organized in order of most-common and easiest to most intensive.

- 1. **Inspect the mouse for hardware damage.** A cracked housing, a missing ball, sticky or silent clicking of the finger switches, or a failure of the optical sensor to glow suggest that the device is damaged. Given how inexpensive most mice are, hardware damage usually suggests that replacement, rather than repair, is the optimal solution.
- Clean the mouse. If the pointer moves in jerking motions or is less responsive than usual, clean the mouse to see if it improves the performance. It's easy to clean a wireless mouse or a wired mouse with a rollerball.

While you're cleaning the mouse, make sure there is nothing covering the laser on the bottom of the mouse. Anything that obstructs the laser (like paper, tape, etc.) will interfere with the movement of the mouse/cursor.

3. **Replace the batteries.** Swap the batteries out for a new set, especially if you're still using the batteries that came with the device. Consider using rechargeable batteries. Likewise, verify the batteries are properly installed. Sometimes, closing the panel door before the battery bounces out can be tricky.

Similarly, plug the mouse into its charger for 30 minutes to let it get enough juice to connect. Mice with USB charger ports and non-rechargeable batteries sometimes appear to fail without warning when charge levels decline too much.

4. **Try a different USB port.** There might be a problem with the one you're using, so unplug the mouse or the receiver and try an alternate USB port. Most desktop computers offer ports on the front and back of the computer, so try all of the ports before jumping to a different step. It could also be the case that the plug partially unseated.

5. **Connect the mouse directly to the USB port.** If you use a multi-card reader or an external USB hub, there may be a problem with that device instead of the mouse or USB port. Plug the mouse directly into the computer to see if the problem clears.

6. **Use the mouse on an appropriate surface.** Some mice can be used on (almost) any kind of surface. Many can't. Study your device's limitations—it may require a mouse pad, especially if you're using an older mouse. Some optical mice, for example, cannot track movement on shiny surfaces or surfaces with either very dark or very light colors.

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7. **Update the driver.** Check the manufacturer's website for available driver updates or use driverupdater tools. If your mouse won't do something that the manufacturer promised it would do (side-to-side scrolling, for example), check the manufacturer's website to see if a driver is required. These files are usually free.

8. **Release and re-pair a Bluetooth mouse.** It's not uncommon for Bluetooth devices to either lose pairing status or to be forgotten by the computer if a different Bluetooth mouse is paired with it.

9. **Disable an integrated trackpad.** If your laptop supports an internal trackpad, disable it through your operating system's settings utility. An internal trackpad may conflict with, or override, an external mouse.

#### How to Fix It When Your Mouse Scroll Is Not Working

It's common for a mouse wheel to suddenly stop scrolling. Before you throw your mouse in the trash, there are a few troubleshooting tips you can follow to get it working again.

#### **Causes of Mouse Wheel Not Scrolling**

When the mouse won't scroll, there are two issues that most commonly cause it. The first is dust and dirt causing mechanical issues with the mouse wheel. The second is low battery issues on wireless mice. However, these aren't always the root cause. Other issues include incorrect mouse settings in the OS system settings, corrupt system files, or using a mouse that's incompatible with your operating system.

#### How to Fix a Mouse Wheel That's Not Scrolling

The issues below apply to all computer systems that use mice, including Windows 10 or macOS. In most cases, the fix involves the mouse itself. In other cases, the instructions will include steps for each operating system.

Before you get too far, are you only experiencing an issue with the mouse wheel not scrolling in Excel (a common issue)? If so, make sure the cursor movement direction in Excel is set up properly.

- Reconnect the mouse. Before doing anything, make sure the issue isn't a temporary one. You can do this by disconnecting the mouse from the USB port and plugging it back in. Whenever you plug in a mouse, it restarts the mouse drivers and this alone could resolve the issue. You might even try using a different USB port. If you're using a wireless mouse, make sure you've connected it properly to your PC.
- Replace the batteries. If you're using a wireless mouse, low battery power is the most common cause of strange mouse behavior. Whether the mouse wheel isn't scrolling or the mouse is otherwise acting erratically, swapping the batteries is a very quick and inexpensive way to rule out this cause.



You might also consider switching to rechargeable batteries so that you can always have fully charged batteries on hand that you swap out on a schedule. This way you don't have to wait until your mouse starts acting up before changing them.

- 3. Clean the mouse. Most modern mice don't have rollers to clean anymore, but now the scroll wheel is the one mechanical part. This also means it's the part prone to attracting dirt, dust, and food particles. These slip in through the cracks on the side of the wheel and can lead to the mouse scroll wheel not working. If your mouse is wireless, there are some special wireless mouse cleaning considerations to keep in mind.
- 4. Check the touchpad. Another common issue is mouse interference from something touching the touchpad on your laptop. This could be something as simple as water leaking from a cup nearby. You might even consider temporarily disabling your touchpad just to see if this fixes the problem.
- 5. Check mouse wheel settings. Each OS has unique settings to control the mouse wheel. If these change you could experience the mouse wheel not scrolling. Look through your mouse settings on your Windows 10 or Mac to ensure wheel scrolling is actually enabled and configured properly. If you're using a Mac, also check that the scrolling direction is set up the way you want it to be.
- 6. Update mouse drivers. The most effective way to update your mouse driver is to download and install the latest mouse driver from the manufacturer's website. On a Windows 10 PC, check the Device Manager to ensure there isn't an exclamation mark next to the mouse driver after you've updated. If there is, you'll want to roll back the mouse driver and try something else.

Before moving on to the final step, try using a different mouse to make sure that the issue is actually with your system and not a mouse hardware failure. You wouldn't want to take more drastic measures with your computer if all you need is to buy a new mouse.

- 7. Fix corrupt system files. At this point, it is possible your system files may be corrupt. Before you try anything drastic, make sure you've installed the latest system updates for Windows 10 or your Mac OS updates from the Apple App Store. Next, try to perform an automatic repair for Windows 10. If all else fails, you may need to do a full Windows 10 system restore or a clean install of Windows if you don't have a recovery backup. If you're using a Mac, you may need to do a full Mac OS reinstall.
- Keyboard: A computer keyboard is one of the primary input devices used with a computer that looks similar to those found on electric typewriters, but with some additional keys.Keyboards allow you to input letters, numbers, and other symbols into a computer that can serve as commands or be used to type text

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## How To Fix Windows Keyboard Keys Which Stop Working

A keyboard without working keys may seem like a blow to productivity, but it's possible to repair. If you've been working on your PC and suddenly some or no characters appear on your computer screen, we're going to show you how to fix it.

If you have a desktop PC, it's easy to just swap the keyboard and use a different one. For laptops though, this isn't possible, which makes it a big problem.

It could be that your computer could use some simple hardware or software maintenance, or your keyboard settings are set to use the wrong language or region.

Before you visit the repair shop, buy a new keyboard, or chuck your laptop altogether, try some of the quick fixes below.

**Note:** The instructions below apply to a Windows PC.

## Fix Keyboard Keys Which Stop Working

- Quick checks
- Clean up the keyboard
- Restart your PC
- Use a different keyboard
- Check the region or language settings
- Adjust keyboard input settings
- Run a malware scan
- Reinstall keyboard driver
- Visit a service tech/Replace the keyboard

#### **Quick Checks**

- If you're using a Bluetooth keyboard, check that it's powered on and that it's connected.
- Re-pair the keyboard with your computer (for wireless keyboards).
- Try a different USB port (wired keyboard).
- Check the keyboard's battery level as it may cause performance problems.
- If the keyboard keys still won't work after carrying out these basic checks, try the solutions below.

#### **Clean Up The Keyboard**

It's not easy to clean a standard keyboard, but it's easier to do if you have a wireless or USB keyboard compared to a laptop keyboard. This may not necessarily fix any deep-seated issues with your keyboard keys, but it'll help if debris and dirt are preventing the keyboard keys from working.

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## To clean up the laptop keyboard:

- Shut down the device, turn it upside down and then tap gently on the base to avoid risking damage to the entire unit.
- Run your fingers across the keys to dislodge any debris or dirt that's left and clean the table when you're done.
- Pick up a compressed air can and give it a good blast, or keyboard cleaning putty to remove any dirt that's stuck.
- If the keys are stuck because of liquid spills, pop off the key from the keyboard and try to clean the dried liquid off the key switch as much as you can. To remove a key without breaking it, place the tip of your finger or a flathead screwdriver under a corner of the key and pry it up gently until it pops off. You can dab some soapy water or rubbing alcohol on a rag or cotton swab to clean away any residue.

#### **Restart Your PC**

A reboot helps refresh the system and correct any software glitches that could cause your keyboard keys not to work.

#### Use a Different Keyboard

Try connecting a different USB or wireless keyboard, or use the Windows on-screen keyboard and see if it helps. If it does, then your current keyboard could be defective.

#### **Check the Region Or Language Settings**

When your keyboard's language or layout settings are wrong, you may see different letters on your screen than what's indicated on the keyboard. This happens based on the different characters used in different regions, so the keyboard layouts aren't the same everywhere.



To correct this, change the region or language settings using these steps:

- Click Start>Settings>Time & Language.
- Click **Region** to select your current region.
- Click Language and then click Add a preferred language to choose the right option for your keyboard.
- Click **Next** and then click **Install**.
- Go to the Languages section and select the new language for your keyboard, and then try typing a few characters again to see if it works.
- You can also change your keyboard options by going back to Language, click on the current keyboard language, and then click Options to select the keyboard type. For instance, US users will have English (United States) as their keyboard language, and the US QWERTY keyboard layout option.

#### Adjust Keyboard Input Settings

Your keyboard keys have certain software settings that may cause erratic behavior, even if they're meant to be helpful. You can adjust such input settings like Filter Keys, Sticky Keys, or Repeat Delay settings.

If pressing a particular key types more than one character:

- Click Start>Control Panel and search for Keyboard in the Control Panel search bar.
- Under the **speed** tab, adjust the **Repeat Delay** settings and try typing the characters again.
- If there's a delay between pressing a key and the character showing up on your screen, you need to adjust **Filter Keys**. Type **Ease of Access** in the search bar, and click on it.
- Click Make the keyboard easier to use.
- Uncheck the Filter Keys box if it's on, and click OK. Turn off Sticky Keys in the same menu if your keyboard is acting up.

#### Run a Malware Scan

As crazy as it sounds, it's possible that your keyboard could be infected with a virus. Run a malware scan using your currently installed antivirus software, or try a free online malware scanner just to rule out any potential threats.



#### **Reinstall the Keyboard Driver**

An outdated driver could cause your keyboard keys not to work. However, sometimes the keyboard driver can malfunction especially if you regularly install third-party software, or turn off your computer without using the Shut Down command.

## To reinstall your keyboard driver, take these steps:

- Right-click Start and select Device Manager.
  - Click on Keyboards to expand the list. Here you can check for any entry that could be having a yellow exclamation mark next to it, indicating a problem.
- Right-click your keyboard and select Uninstall Driver.
- Restart your computer, and it'll automatically install the generic keyboard drivers, after which you can check if the keys work again.

Note: You can also go to your computer manufacturer's website and install the latest drivers for the specific keyboard for your model. If it's not available, you can reinstall the USB drivers or chipset.

## **Replace The Keyboard**

If none of these solutions helped, and your computer is still in its warranty period, you can check with the manufacturer for further support and repair, or get it replaced altogether.

If it's a laptop, back up your hard drive or remove it before sending it to a service technician, just so you don't lose your precious data.

> Monitor: A computer monitor is an output device which displays information in pictorial form.

## The most common multi-monitor problems, and how to fix them

If you've followed our guide on how to set up multiple monitors and you're running into difficulties, check out the list below of the most common multi-monitor problems, and how to fix them in Windows 10.

No signal





Although getting no "signal" to your new monitor can be cause for concern, it's arguably the easiest problem to fix. It simply means that the display has power, but it isn't receiving visual data. There are a number of reasons why this happens and plenty of fixes you can try to sort it out.

**Force Windows to detect your monitor** – Maybe Windows didn't recognize your second display's connection. To force it to check again, right-click the desktop and select *Display Settings* from the resulting pop-up menu. In the following window, click the *Detect* button located under the display diagram.

**Turn the screen off and on** – Some connection types don't like hot swapping while a monitor is powered on. Turn the display off and then on again. That may be all it needs to recognize the video feed and start displaying it correctly.

**Verify cable connections** – A loose cable can cause "no signal" errors more often than any other problem. If they do seem well secured, unplug, and plug them in again just to be sure.

**Verify the correct input** – Monitors with multiple input options need you to manually select which cable (port) you're using, like HDMI 1, HDMI 2, DisplayPort, and so on. Use the buttons on your monitor to cycle through the channels and select the correct input from your PC. If you are using an adapter to switch from one type of input to another, this may be causing issues with the other monitor. Try to remove the adapter if possible, or replace with another adapter to see if this fixes the issue.

**Change data cable** – If you're using an older cable standard like VGA or DVI-D, you might want to try a newer alternative like HDMI or DisplayPort. You can also try using a new cable in case the old one has issues (bent pins, a short, exposed wire, etc.).

**Change the graphics port** – If you're using a dedicated graphics card with multiple output ports, try switching to another port. Sometimes ports themselves can go bad or somehow get damaged. Switching to another is all you need to do to correct the problem.

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**Update your drivers** – Windows 10 supports multiple monitors by default, but your current setup may not be configured correctly. Making sure you're running the latest graphics drivers for your system can sometimes fix problems with no signal errors.

If you're still having trouble with the additional monitor, verify that it works by unplugging the primary screen and double-checking the above steps again. If it does, consider running it as the primary display until you determine the root problem. If it doesn't, contact your retailer or manufacturer to discuss a return or replacement.

#### Wrong resolution

Settings	- 🗆 ×
කි Home	Display
Find a setting	Scale and layout
	Change the size of text, apps, and other items
🖵 Display	175% ~
বগ) Sound	Advanced scaling settings
Notifications & actions	Display resolution 2560 × 1440 (Recommended)
∂ Focus assist	Display orientation
🖒 Power & sleep	Landscape ~
🖾 Battery	Multiple displays
😅 Storage	Multiple displays
🖪 Tablet mode	Extend desktop to this display $\sim$
副 Multitasking	Make this my main display
	Connect to a wireless display

If you add a new, higher-resolution monitor to your system and find that it's not displaying correctly, it might be borrowing settings from an older display, or simply trying to match your primary screen.

**Step 1:** Right-click your desktop and select the *Display Settings* option on the resulting pop-up menu.

**Step 2:** The *Settings* app opens with the *Display* panel loaded by default. Click on the secondary display shown in the diagram.

**Step 3:** With your secondary screen highlighted, scroll down to *Scale and Layout* and click the drop-down menu located under *Display Resolution*.

**Step 4:** Select a screen resolution that works best for you. Windows 10 designates one of these resolutions as "recommended" based on the display's hardware.

If this didn't work, make sure your monitor and graphics card can run at your chosen resolution. If you're still running into problems, try updating your graphics drivers.

#### Wrong refresh rate

← Settings			×
命 Advanced	display settings		
Choose display		Generic PnP Monitor and NVIDIA GeForce GTX 1080 Properties	
		Adapter Monitor Color Management	
Select a display to view or	change the settings for it.	Monitor Type	
Display 2: SB220Q	~	Generic PnP Monitor	
Nata 41 397 45 - W.L.		Properties	
Display information		Monitor Settings	
		Screen refresh rate:	
SB220Q		75 Hertz ~ 25 Hertz, Interlaced	
Display 2: Connected	to NVIDIA GEForce GTX 1080	29 Hertz, Interlaced 30 Hertz, Interlaced	
Desktop resolution	1920 × 1080	50 Hertz 59 Hertz	
Active signal resolution	1920 × 1080	60 Hertz 75 Hertz	
Refresh rate (Hz)	74 Hz		
Bit depth	8-bit		
Color format	RGB		
Color space	Standard dynamic range (SDR)	OK Cancel Apply	
Get help			
Give feedback			

If your monitor is set at an incorrect refresh rate, it will display a "no signal" error. That means the PC is outputting a signal the display simply can't handle, requiring you to manually adjust the output in Windows 10.

**Step 1:** Right-click your desktop and select the *Display Settings* option on the resulting pop-up menu.

**Step 2:** The *Settings* app opens with the *Display* panel loaded by default. Scroll down and click the *Advanced Display Settings* link located under *Multiple Displays*.

**Step 3:** On the following screen, click the drop-down menu located under *Choose Display* and select the problematic monitor.

**Step 4:** Under *Display Information*, click the *Display Adapter Properties for Display #* link.

**Step 5:** In the following pop-up window, click the *Monitor* tab.

**Step 6:** Under *Monitor Settings*, use the drop-down menu to select another refresh rate.

You can double-check what refresh rate your monitor is running at with the Testufo tool.

Duplicate or extended





There are a few different ways to display content on two screens, but *Duplicate* is often the default. If your second display merely copies the desktop rather than extend it, here's how to change that view.

**Step 1:** Press the *Windows + P* keys to load the *Project* menu.

**Step 2:** Select the *Extend* option. You can do this by using your mouse, going up or down with the arrow keys and pressing *Enter*, or by pressing the *Windows* + *P* keys to cycle through options.

Alternatively, you can take the long route:

Step 1: Right-click your desktop and select the Display Settings option on the resulting pop-up menu.

**Step 2:** The *Settings* app opens with the *Display* panel loaded by default. Select your secondary monitor shown in the diagram.

**Step 3:** With your second screen highlighted, scroll down to *Multiple Displays* and select *Extend Desktop to This Display* on the drop-down menu.

**Step 4:** Go back up to the diagram and use your mouse to drag your second monitor to the left or right of your primary screen.

These same processes can be used to change to duplicate if you'd prefer it that way.

**Use a third-party app** – Applications like the Dual Monitor Tool can let you lock a mouse pointer to a specific monitor. Just remember to unlock the mouse when you're done.

**Turn off the second screen** – It's a little drastic, but turning off the second screen when playing games that don't need it prevents you from drifting into that extended space mid-game. Simply press the display's power button, or press the *Windows* + *P* keys and select the *PC Screen Only* option.

Now that your multiple monitors are all working correctly, make sure you get a good dual-screen wallpaper for them.

**Distortion and artifacts** 

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Sometimes your secondary monitor will work, but it will encounter distortions and artifacting that make it difficult to use or impossible to play games with. If your first monitor does not have these display issues, then the issue is probably related to your hardware. You can usually fix it by trying these steps:

**Check monitor ports** – Make sure all ports on your computer are clean and dust-free. If it's been a while, clean them out very carefully with a few jets of compressed air and make sure there is no damage or debris to the port or cable.

**Buy a new monitor cable for the secondary monitor** – It may be that your cable is old and failing. This is especially true if it isn't shielded and is experiencing interference from Wi-Fi, Bluetooth, and nearby electrical noise. Find a new cable that has great shielding.

**Shorten the cable length** – If possible, pick a new cable that's shorter than the older one. The longer data has to travel through the cable, the more chance of interference, so a shorter cable can cut down on artifacting and similar problems.

**If you are using switch converters or adapters, try connecting without them** – Look for cables that don't need separate adapters or switches to control.

No display or black screen on a computer monitor



Figure 1: Computer with black screen

If your computer monitor displays only a black screen when you turn on your computer, the following steps may help you fix the problem.

Тір

If your monitor initially works and then goes blank when Windows starts, see: How to fix distorted video after increasing resolution in Windows.

Tip



If you have a laptop, see our laptop screen is black page, see: My laptop computer screen is black.

#### Monitor is not on

It may seem obvious, but make sure the monitor is turned on. If you do not see a power LED (blue, green, or orange light) on the front or bottom of the monitor, press the power button again. If no light comes on after several attempts, proceed to the next section.

How to turn on a computer monitor or another display.

#### **Computer is asleep**

If you stepped away from the computer for a bit and returned to a black screen, the computer is likely asleep. Try moving your mouse, clicking the mouse buttons, or pressing any key (e.g., spacebar) to wake it up. If none of those actions work, press the power button.

#### Loose or improper connections

The following steps help you ensure the monitor is connected correctly to the computer.



ComputerHope.com

#### Figure 2: HDMI cable Connector

#### Check the data cable

Ensure the monitor's data transfer cable is connected correctly to the computer. It should be completely inserted and firmly in place. Most new displays utilize a DVI or HDMI cable and port.

#### Check the power cable

Next, verify the monitor has power by looking for a blue, green, or orange light. This light is found on the front or the bottom of the monitor's bezel.

If you see no lights on the monitor, make sure it is connected to a working wall outlet. If the power cord is removable from the back of the monitor, try replacing it with another power cable. If you still cannot turn on the monitor after trying another wall outlet and cable, the monitor is broken and should be replaced.

#### Check the LED status

If the monitor status light is orange or flashing, verify the monitor is not in Standby mode, by moving the mouse or pressing the Esc key. If this doesn't help, reconnect the data cable to the computer and back of the monitor, and then restart your computer.

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#### Try a different cable

If your monitor is getting power, but you still don't see an image, the data cable may be the issue. Try using a different DVI, HDMI, or DisplayPort cable with your monitor.

#### Turn up the brightness and contrast

If you're able to view your monitor's settings menu even though the screen is blank, you likely need to turn up the brightness and contrast.

#### No POST

If the computer doesn't pass POST, it won't turn on, and your monitor remains black. If you hear beeping when you turn on your computer, run through the POST troubleshooting steps to determine the issue.

#### Hardware issue

If you have followed the recommendations above and still have the same issue, your computer may have either a bad monitor, video card, or motherboard. The best method of determining this is to try the suggestions below.

#### Borrow someone else's computer monitor and connect it to your computer

If another monitor works on your computer, it's safe to assume the non-working monitor is bad and should be replaced. While it may be possible to have the monitor serviced, it is often cheaper and easier to purchase a new one.

#### Disconnect your monitor and connect it to another computer

If your monitor works on another computer, the video card is bad. Try removing video card from the affected computer and installing it in another computer. If it does not work in the other computer, the video card is most likely bad and needs to be replaced.

If your monitor and video card work with another computer, your motherboard probably has an issue. You can attempt to troubleshoot motherboard problems using the link below. If you determine the motherboard is bad, or you cannot successfully run any tests, we suggest replacing the motherboard to fix the display problem.

**Scanner:** The computer mouse and scanner fall under the input device category. As the name suggests, input devices are used to send information to the computer. A mouse is used to input the movements of a cursor, while a scanner is used to input physical media into digital format.

Fix scanning problems

Diagnose and fix any of the following scanning problems or error messages using the HP Print and Scan Doctor

An error occurred communicating with the scanning device

An error occurred while communicating with the HP imaging device

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Computer not found

No Computer Detected

Scan to computer is currently unavailable

Scan to computer no longer activated

Scan Unsuccessful

Scanner not found

Scanner Unreachable

The scanner could not be initialized

Scan issues

Is your HP scanner not working? There are many symptoms and error messages that could cause HP scanner problems such as:

- Can't communicate or connect to HP scanner
- Computer can't find HP scan
- HP Printer will not scan to computer or email
- HP scan button not working
- HP scanner keeps disconnecting or freezing
- Computer not found on HP scanner

Resolve HP scanning issues using our HP Print and Scan diagnostic tool or automated HP Virtual Agent or follow manual troubleshooting steps provided below.

✓ Fix: Scanner Not Working

#### Solution 1: Running SFC Scan

This error might be generated because of bad configurations present on your computer. Because of these errors, your computer might not be able to connect properly with the scanner hence making it inaccessible to you. We can try running the SFC scan and check if there are any integrity violations. If there are, we can run the DISM command to fix them.

- Press Windows + R to launch the Run application. Type "taskmgr" in the dialogue box and hit Enter to launch your computer's task manager.
- Now click on File option present at the top left side of the window and select "Run new task" from the list of options available.





3. Now type "**powershell**" in the dialogue box and **check** the option underneath which states "**Create this task with administrative privileges**".

🖾 Crea	ate new task	×
	Type the name of a program, folder, document, or Internet resource, and Windows will open it for you.	
Open:	powershell	~
	Create this task with administrative privileges.	

4. Once in the Windows Powershell, type "**sfc /scannow**" and hit **Enter**. This process may take some time as your entire Windows files are being scanned by the computer and being checked for corrupt phases.



5. If you encounter an error where Windows states that it found some error but was unable to fix them, you should type "**DISM /Online /Cleanup-Image /RestoreHealth**" in the PowerShell. This will download the corrupt files from the Windows update servers and replace the corrupt ones. Do note that this process can also consume some time according to your internet connection. Don't cancel at any stage and let it run.

If an error was detected and was fixed using the above methods, restart your computer and check if the scanner started working normally.

#### Solution 2: Turning off Firewall and other Applications

Another workaround which worked for many people was disabling Firewall applications (including Windows Firewall, Windows Defender, and other Antivirus applications). If you are trying to access the scanner over any network, it is possible that it is the firewall which is blocking some ports and restraining the information from being passed on.

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- 1. Turn off all firewalls. You check our article on how to disable Windows Firewall.
- Turn off your running Antivirus You can either pause it temporarily or if you don't have that option, you
  can uninstall it. Make sure that you have the installation package and your registration keys at hand
  while uninstalling.
- 3. After making all the necessary changes, check if you can make the scanner work as expected.

### Solution 3: Making Sure all Related Processes are Running

There are few processes which drive the operation of the scanner. If these processes are not running or if they are disabled, you will not be able to access the scanner. Make sure that you are logged into an administrator account while carrying out this solution.

- 1. Press Windows + R, type "services.msc" in the dialogue box and press Enter.
- 2. Once in the services window, navigate through the list and locate each of the following processes:
- 3. We need to make sure that all these processes are running and have their startup state set as "Automatic". I will take one service as a reference (Shell Hardware Detection) and show you how to check.
- 4. After identifying the processes, right-click it and select "Properties".



5. Once in the Properties, click on "**Start**" (if the processes are stopped), click the drop-down window and select "**Automatic**". Press Apply to save changes and exit.



seneral	Log On	Recovery Dependenc	les	
Service	name:	ShellHWDetection		
Display	name:	Shell Hardware Detection	n	
Descript	tion:	Provides notifications fo	r AutoPlay hardware ever	nts. 🔨
Path to C:\Wind	executabl	m32 svchost exe k net	SVCS	
Startup	type:	Automatic		~
	14	Automatic (Delayed Sta	d) < 1, 1998 1, 1998	_
Service	status	Manuar Disabled Humming	ation Water	_
S	lart	Stop	Pause Resu	me
You can	n specify t	e start parameters that a	oply when you start the s	ervice
iloui nes		Г		_
Charlen in	I GITTELERS.			

6. Once you have made sure that all the processes are up and running, restart and reconnect with your scanner and see if you can access it as expected.

#### Solution 4: Installing Scanner Patch and Scanner Utility from Manufacturer

Most of the scanners nowadays are simply plug and play. You don't need to install any additional software to run them; you can simply use the inbuilt Microsoft utilities to directly forward the job for scanning.

<b></b>		MF	Toolbox -	Scan Funct	tion	-	
		2			s 20		
Mail	OCR	Save	PDF	Scan-1	Scan-2	Scan-3	Scan-4

However, not all scanners work that way. There are many scanners out there which require that you install the required patch, install scanner software (such as Canon MF Toolbox), and then operate the scanner.



You should input your model into the search engine and look around for any related software which you are meant to install on your computer. After installing the software, restart your computer and check if you can use the functionality of the scanner as expected.

#### Solution 5: Doing a Full Power Cycle

Another workaround which works for a lot of users is power cycling your computer and the scanner utility. Power cycling is an act of turning off a device completely off and then on again. Reasons for power cycling include having an electronic device reinitialize its set of configurations parameters or recover from an unresponsive state or module. It is also used to reset all the network configurations as they are all lost when you turn the device completely turned off.



After **turning off your scanner and computer**, **take out the main power cable** and let them stay idle for a couple of minutes (~10). After the required time, plug in the cables, turn both devices on and try connecting them.

#### Solution 6: Checking the Scanning Program for Updates

Whenever your scanner doesn't work, you automatically assume that the problem lies with the scanner hardware only. That is true in most cases but there are also scenarios where the software you use for managing scanning is out of date or the version is not supported anymore.

These software are mostly multipurpose programs (such as IrfanView) which are used for more than one tasks. Head over to the software developer's website and check if there are any **pending updates** you did not perform. After updating the software, restart your computer and check if this makes any difference.

#### **Solution 7: Updating Scanner Drivers**

If all the above solutions don't work, we can try updating the scanner drivers. You should navigate to the manufacturer's website and download the latest scanner drivers available. Make sure to download the exact drivers meant for your scanner. You can look for the model number present on the front of your scanner or in its box.

Note: There are few cases where a newer driver doesn't work. In that case, download an older version of the driver and install it using the same method described below.

 Press Windows + R to launch the Run Type "devmgmt.msc" in the dialogue box and hit Enter. This will launch your computer's device manager. 2. Navigate through all the hardware, open the sub-menu "Imaging devices", right click on your scanner hardware and select "Update driver".

Note: If your scanner is inbuilt with your printer, you should update the drivers of your printer using the same method explained below. In that case, you should look in the category of 'Print Queues'.



3. Now Windows will pop a dialogue box asking you which way do you want to update your driver. Select the second option (**Browse my computer for driver software**) and proceed.

Select the driver file you downloaded using the browse button when it appears and update it accordingly.

4. Restart your computer and check if the problem gets resolved.

**Note:** If you can't update the drivers manually, you can also select the first option "Search automatically for updated driver software". This option will make Windows search the web automatically and select the best driver out there.

#### Solution 8: Using USB instead of WiFi for connection

Another widespread problem which many users face is connecting to the scanner over a WiFi connection. There are several cases where the scanner works with a USB connection to the computer over a wireless one. Plug in the USB and see if your computer detects the scanner successfully. If it does, it means you have to configure the WiFi connection on both machines (your scanner and your computer).

1. Make sure that your scanner is connected to the wireless network correctly with the correct password. Each scanner configuration is different but you can easily find the wireless network option in its menu. Use the arrows to navigate and make sure that it is connected.



 On your computer, press Windows + S, type "printers and scanners" in the dialogue box and open the first application.

٦F	Ľ	$\oplus$	Filters 🗸
Best n	natch		
ŝ	Printe System	rs & scanners settings	
Settin	gs		

3. Click on "**Add a printer or scanner**" and wait for Windows to detect. After the detection, click on the scanner for the computer to connect.

<ul> <li>← Settings</li> <li>ØEVICES</li> </ul>	
Printers & scanners	Add printers & scanners
Connected devices	Add a printer or scapper
Bluetooth	APPUALS
Mouse & touchpad	Printers & scanners
Typing	Brother DCP-1610W series
AutoPlay	Offline Offline
LICE	Brother DCP-1610W series Printer

4. Send in a test job to check if the scanner is performing all the functionalities correctly.

## Solution 9: Checking Compatibility

Each scanner/printer is designed to target a particular version of the operating system. But after you buy a scanner, its hardware doesn't upgrade itself whereas you might receive major updates on your operating system on your computer. Such is the case with Windows 7 and Windows 10.

There were many reports that some scanners were not compatible with the newer version of Windows (Windows 10), and there was also no support available (for example **PIXMA MX310**). Head over to your manufacturers' website and check if it is compatible with the version of operating system you are running on your computer.



#### Solution 10: Turning off Auto Management by Windows

Windows has an automatic management feature which lets it decide the default printer and manage all the other ones. This might be useful in various scenarios but it can prove to be a menace sometimes when you are installing scanner software on your computer. You can try disabling it using the steps given below and try installing the software again.

- 1. Press Windows + S, type "settings" and open the application.
- 2. Once in settings, click on the subheading of "Devices".



3. Click on "**Printers and scanners**" using the left navigation bar and scroll to the bottom of the page until you find "Let Windows manage my default printer". Make sure it is **unchecked**.




- 4. After making the necessary changes, exit Settings and try installing the software again.
  - Printer: A printer is a device that accepts text and graphic output from a computer and transfers the information to paper, usually to standard size sheets of paper. Printers vary in size, speed, sophistication, and cost. In general, more expensive printers are used for higherresolution color printing

#### **Fixing Printer**

- Windows has an inbuilt collection of troubleshooters meant to troubleshoot problems in various categories. We can try running the printer troubleshooter and check if it detects any problems and fixes them.
- 2. Press Windows + R, type "control panel" in the dialogue box and press Enter.
- 3. Type "troubleshoot" in the search bar of the control panel at the top right side of the window.



4. Select "Troubleshooting" heading from the list of results returned.



Once in the troubleshooting menu, click "**View all**" present on the navigation pane at the left side of the window. Now Windows will populate all the troubleshooters available on your computer.



Troubleshooting



5. Navigate through the options until you find "Printer". Click it.

Power	
Printer	SO I
Program	Compatibility Troubleshooter
Recordin	ng At Name: Printer
To Cearch a	nd Ir Description: Find and fix problems wit

6. Check both the options "**Run as administrator**" and "**Apply repairs automatically**". These options will ensure that you find maximum problems and the repairs are applied fast as well.

¢	Printer
	Troubleshoot and help prevent computer problems
	Find and for problems with printing.
	APPUALS
1	Troubleshooting with administrator permissions might find more issues.
İ	Apply repairs automatically

7. Follow the on-screen instructions and wait for the troubleshooting to complete.

# **Checking Toner Cartridge**

If all above solutions don't give any positive results, you should check your toner cartridge if it is full or not. Sometimes if the cartridge is not full up to the required level, the scanner will not print any pages. You will be inputting blank pages only to receive blank pages in the output.





Check your toner cartridge if it is **inserted correctly** and are the **levels up to the mark**. If not, replace the cartridge and after performing all the necessary checks above, power cycle the scanner (solution 5), and then check if the problem got solved.

# Fix printer connection and printing problems in Windows 10

If you're trying to use your printer and run into problems, here are some steps for common printer problems to try to get things working again.

# Notes:

- If you're running Windows 8.1 or Windows 7, see Fix printer problems in Windows 7 and Windows 8.1.
- If you need help installing your printer in Windows 10, see Install a printer in Windows 10.
- If your PC is running Windows 10 S, some printers might not work with it, or they might have limited functionality. For more info, see Device support on Windows 10 S.
- If a USB printer port is missing, see USB printer port missing after disconnecting printer while Windows 10 (version 1903 or later) is shut down.
- If you're looking for help with a scanner, see Install and use a scanner in Windows 10.

# Step 1. Unplug and restart your printer

Sometimes power cycling your printer can resolve the issue. Turn off your printer and unplug it, wait 30 seconds, plug your printer back in, and then turn the printer back on.

If your printer still doesn't work, continue to step 2.

## Step 2. Check cables or wireless connection

Check the cables (for wired printers). Make sure that the printer's USB cable is properly connected from the printer to your PC. If your USB isn't recognized, see Automatically diagnose and fix Windows USB problems.



## Check the wireless connection (for wireless printers). Do one of the following:

- Make sure the printer's wireless option is turned on and available. Many printers have a button that displays a blue wireless icon when a wireless connection option for the printer is available. To learn where this button is located on your printer and to find instructions about how to turn it on, see the instructions that came with the printer or check the manufacturer's website for instructions.
- Run the printer's wireless connectivity test. Many printers have a menu option to test the printer's wireless connectivity. Read the instructions that came with the printer or check the printer manufacturer's website for instructions about how to do this.
- If those check out and you're still having problems, your PC may not be connecting to your wireless network. To learn more, see Why can't I get online? For more advanced help, see Fix network connection issues in Windows.
- If you're having trouble connecting to a Bluetooth printer, see Fix Bluetooth problems in Windows 10: FAQ.

**Note:** If you use wireless access points, extenders, or multiple wireless routers with separate SSIDs, make sure you're connected to the same network as the printer for your PC.

If your printer still doesn't work, continue to step 3.

## Step 3. Uninstall and reinstall your printer

✓ Try removing and reinstalling the printer.

## **Remove your printer**

- 1. Select the Start button, then select Settings > Devices > Printers & scanners .
- 2. Under Printers & scanners, find the printer, select it, and then select Remove device.

## Reinstall your printer

You'll need to follow different steps to reinstall or add a wireless or local printer. Here's how.

## Reinstall a wireless printer

1. Select the Start button, then select Settings > Devices > Printers & scanners .

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2. Select Add a printer or scanner. Wait for your device to find nearby printers, choose the one you want, and then select Add device.

If your printer is turned on and connected to the network, Windows should find it easily. Available printers can include all printers on a network, such as Bluetooth and wireless printers, or printers that are plugged into another computer and shared on the network. You might need permission to install some printers.

## Notes:

- 1. If you use wireless access points, extenders, or multiple wireless routers with separate SSIDs, make sure you're connected to the same network as the printer for your PC to find and install it.
- If you have a new wireless printer that hasn't been added to your home network, read the instructions that came with the printer and check the printer manufacturer's website to learn more and to get up-to-date software for your printer.

**Tip:** You can print a test page to make sure the printer is working correctly. If you've installed the printer but it doesn't work, check the manufacturer's website for troubleshooting information or driver updates.

## **Reinstall a local printer**

If you want to reinstall or add a local printer, plug the USB cable from your printer into an available USB port on your PC, and then turn on the printer.

- 1. Select the Start button, then select Settings > Devices > Printers & scanners .
- 2. Under Printers & scanners, look for your printer.
- If you see your printer listed, you'll know it's installed.
- If you don't see your printer listed, select Add a printer or scanner. Wait for your device to find available printers, choose the one you want, and then select Add device.

*Tip: You can confirm the printer is working by printing a test page. If you've installed the printer but it doesn't work, check the manufacturer's website for troubleshooting information or driver updates.* 

If your printer still doesn't work, continue to step 4.

## Step 4. Install the latest driver for your printer

Most printers require the latest driver to work well.

If your printer still doesn't work after you install the latest driver for your printer, continue to step 5.

## Step 5. Run the printing troubleshooter

Download and run the printing troubleshooter. It can fix problems with installing and connecting to a printer. (This link should open a browser page and download dialog. Select Open, and follow the steps provided in the troubleshooter.)

If the printing troubleshooter link doesn't open the troubleshooter, in the search box on the taskbar, enter **Printing problem in**, select **Printing problem in** in the list of results, and then select **Troubleshooter** to download it. Select **Open**, and follow the steps provided in the troubleshooter.

If your printer still doesn't work, continue to step 6.

## Step 6. Clear and reset the print spooler

If the previous troubleshooting step is not successful, you may need to clear spooler files and restart the spooler service. The print spooler is a file that manages the printing process. To clear and reset the print spooler:

- 1. In the search box on the taskbar, type **services**, and then select **Services** in the list of results.
- 2. Select the **Standards** tab, and then double-click **Print Spooler** in the list of services.
- 3. Select **Stop**, and then select **OK**.
- In the search box on the taskbar, enter %WINDIR%\system32\spool\printers, select %WINDIR%\system32\spool\PRINTERS in the list of results, and then delete all files in the folder.
- 5. In the search box on the taskbar, search for services, and then select Services in the list of results.
- 6. Select the **Standards** tab, and the double-click **Print Spooler** in the list of services.
- 7. Select Start, select Automatic in the Startup Type box, and then select OK.

If your printer still doesn't work, continue on to step 7.



## Step 7. Fix printer problems after updating Windows 10

If you're having problems printing after upgrading or updating to the latest version of Windows 10, see Fix printer problems after upgrading or updating Windows 10.

If your printer still doesn't work, continue to step 8.

## Step 8. Change a printer's status to "online"

If your printer displays an "offline" status, check out Troubleshooting offline printer problems.

## **10 Biggest Printer Problems -- And How To Fix Them**

Printers: Can't live with them, can't nuke them. You could always toss a misbehaving inkjet or laser out the window, but where would that leave you? Truth be told, we need our printers, despite their maddening quirks. Here's a saner idea: Take a deep breath, channel your inner tech support rep, and repair that which has failed you. (*Cue sitar*.)

We've listed the 10 biggest printer annoyances -- of course, your Top 10 list may vary -- and ways to fix them.

## Problem: Printing is too slow.

Print Quality Fast Draft	at do you want to do? ast/Economical Printing
Fa	ast/Economical Printing
Print Quality Fast Draft	E
Paper Type       Plain paper       Paper Size       Letter       Paper Source       Upper Tray       Print On Both Sides       Off       Pages per Sheet       1 page per sheet       Color Option       Off	
(IP)	



**Solution:** Rev up printer performance--and save ink in the process--by reducing print quality for everyday output. While printer settings vary by model, here's how to switch to draft-printing mode in most Windows apps. Select *Print* and *Properties*, and then look for a setting that reduces print quality. With the HP Photosmart 8450, for instance, change the default print quality setting from *Normal* to *Fast Draft* (click screen-shot at right). Other speedup suggestions: Print pages from websites without graphics, and add RAM to your printer, if possible. Read "Speed Up Everything" for more tips.

Problem: Ink and/or toner costs too much.



**Solution:** PC World has written a lot about the printing industry's sneaky practices over the years. To wit: They snare you with dirt-cheap printers sold at or below cost, and then stick it to you later with ultra-pricey consumables.

Based on our tests, we can't recommend third party vendors' remanufactured or refilled ink cartridges, which may not give you your money's worth. One cost-saving solution is to buy higher-capacity cartridges. If you print a lot, try an ink cartridge with a 250-plus page yield, or a toner cartridge with a 2,000-plus page yield.

**Problem:** Windows is sending print jobs to the wrong printer.





- Solution: For some mysterious reason, Windows may select a new default printer--the one it automatically sends print jobs to. (This happened to me when I upgraded from Vista to Windows 7.)
   To fix this glitch in Windows 7, click *Start* (the Windows icon in the lower-left corner of the screen) and select Devices and Printers. Under Printers and Faxes, right-click the printer you want to make the default, and select Set as default printer.
- If you're using earlier versions of Windows, these steps vary a bit. Here are instructions for Windows XP and Vista users.
- Projector: A projector or image projector is an optical device that projects an image (or moving images) onto a surface, commonly a projection screen. Most projectors create an image by shining a light through a small transparent lens, but some newer types of projectors can project the image directly, by using lasers.

## How to Fix Common Projector Issues

If you're desperately trying to fix projector problems in your school, try some of the following tips from the experts at K-12 Tech.

## 1. Projector Not Turning On

There are a number of reasons that a projector may not be turning on. If your projector doesn't power on, try the following:

- Ensure the projector is properly plugged into a working outlet.
- Check the temperature lights to make sure the device hasn't overheated and shut down.
- If you are using a remote control to turn on the projector, check the batteries.
- Be sure all of the projector latches are closed.
- Try resetting the lamp timer.
- Ensure the projector is not in standby mode.

If after trying all of the above tips the projector is still not turning on, the issue could be something more complex like damage to internal components.

## 2. Projector is Overheating

It is natural for projectors to become hot as they are in use, but sometimes projectors overheat when they need cleaning, maintenance or better air circulation. If your projector is randomly shutting down or displaying a warning message, utilize the following tips to resolve the overheating:

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- Clear the area around the projector.
- Ensure there is nothing blocking the projector vents.
- Clean the filter and vent of any dust.

## 3. Light On Projector is Blinking

There are countless makes and models of projectors –all with different parts and pieces– so it's generally best to refer to the owner's manual to determine the meaning of a blinking projector light. However, these are the most common reasons and solutions to blinking lights on your projector:

- Power Light: If the power button light is green or flashing green, the projector is likely on or warming up. If the power light is orange or flashing orange, the projector might be in standby mode or turning off.
- Lamp Light: If the lamp light is flashing orange or red, this usually means the lamp light is going to burn out soon or needs to be replaced.
- Temperature Light: If the temperature light is flashing orange or red, this typically means your
  projector is overheating or in need of cleaning. Be sure to clear any clutter from around the
  projector and to remove any items that may be blocking its vents.

## 4. Projector Image is Discolored

Projector discoloration can occur for a number of reasons. Below are several of the most common reasons for discoloration and how to fix them.

- Inspect the condition of your VGA cable. If you notice any bent prongs, the VGA cable likely needs to be replaced.
- Optimize the display and color settings for the lighting in the classroom.
- Check if your projector is in need of a lamp replacement.

If none of the above suggestions help with the discoloration, the problem could be more serious. Contact a professional projector repair service to inspect the color wheel or polarizing plates.

## 5. Projector Lamp is Burnt Out

Although lamp life varies from projector to projector, all lamps need to be replaced at some point making this one of the most common projector issues. Signs of a burnt out lamp include:

- Inspect the lamp light. If the light is flashing red or orange, you need to replace the lamp.
- If the projector turns on, but the image doesn't appear, your lamp may be burnt out.

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• If the image being projected is discolored or dim, the lamp may burn out soon.

If you are experiencing any of the above common projector problems or are in need of additional assistance, contact the professionals at K-12 Tech. We specialize in maintenance and repair of school technology ranging from computer and tablets to projectors and more. Through our projector repair services, we can provide onsite repairs, mail-in repairs, and pickup repairs. We look forward to serving your school's technology needs with unmatched repair turnaround time and superior customer service.

Speaker: A device that converts analog audio signals into the equivalent air vibrations in order to make audible sound.

#### Why do my computer speakers not work?

The troubleshooting sections below should be followed in order because they help you identify your problem through the process of elimination.

## Volume issues

If you are experiencing problems with the volume of your computer's audio, following these steps may help you fix the problem.



#### Figure 3:Speaker volume knobs

## Desktop speakers turned down

This step may seem trivial, but problem-solving works best when you start with the basics. Verify that the volume knob on the speakers is turned up enough to produce a sound. Every pair of speakers with knobs increases the volume by turning it left to right, otherwise known as clockwise.



## Laptop speakers turned down



Figure 4:Laptop volume and mute buttons

If you are using a laptop computer with no external speakers connected, make sure the volume is turned up by using controls on the keyboard. The volume controls may be buttons (shown in picture), or a secondary function of another key indicated with blue text. To activate these keys hold the Fn key at the secondary function key at the same time.

# Make sure volume of the software is also turned up

An important aspect of sound on a computer with external speakers is that it's primarily controlled by software. For example, if the volume is lowered or off in the software settings, it won't matter how high the external speakers are turned up. The speakers won't produce sound. Therefore, users should verify the sound settings in the software are properly turned up.

## Mute is on

Another common mistake is for the mute to be accidentally activated on the keyboard. To check if mute is turned on, look in the lower right side of the Taskbar for a symbol resembling a speaker with a "no" sign.

Speakers are not connected properly Some audio problems may be caused by improperly connected speakers. To verify your speakers are connected correctly, follow these steps.

## Laptop computers

If you are troubleshooting a laptop computer, skip this step since you cannot verify the laptop speaker connections.



## **External desktop speakers**



Sound devices connected to the computer have different cables and therefore use different <u>ports</u>. First, check the speaker cable connects to the sound card on the back of the computer. As seen in the picture, the sound card has multiple jacks. Speakers must be plugged into the Line Out connector, which is usually indicated by an image of sound waves with an arrow pointing out. The jack itself is usually green in color. If your speakers connect through USB, plug them into any of the USB ports.

#### Tip

Even if the speakers worked in the past, check the connection since it's not uncommon for cables to become loose or be pulled out of place.

Ensure the power cable connects to the back of the right speaker, or in some cases, the subwoofer. Most speakers have a small LED (light) indicating if the speaker is on or off. Once you've turned the speakers on (usually by using a button or by moving the volume knob from left to right), look for a light. If no LED is visible, or the speakers still don't appear to be getting power, and you've checked the power connections, you may have a faulty power source.

## Default playback device in Windows

If your computer has the Windows operating system, make sure the correct playback device is set as the default device for sound output. If the wrong playback device is set as the default device, the sound doesn't come out of the expected device (i.e., speakers or headphones).

- 1. Open the Control Panel.
- 2. Click or double-click the Hardware and Sound or Sound icon.
- 3. In Windows XP and older, click Manage audio devices under Sound.



- 4. In the Sound window, on the **Playback** tab, find the entry for the speakers connected to your computer.
- 5. Right-click the speaker's entry and select **Set as Default Device**.
- 6. Click OK at the bottom of the Sound window to save the settings change.

## Windows speaker setup

If you are running Microsoft Windows, make sure the speaker setup is

correct by following the steps below.

- 1. Open the Control Panel.
- 2. Select Hardware and sound or Sound in the Control Panel window.
- 3. In Windows XP and older, click **Manage audio devices** under *Sound*.
- 4. On the **Playback** <u>tab</u>, select your speakers, and click the **Configure** button.
- 5. If the speakers still don't work after configuring and testing them, double-click the speakers on the Playback tab to bring up **Speaker Properties**.
- 6. Verify all settings and then Test on the Advanced tab.
- 7. After verifying all settings and making any changes, click **Apply** then **OK** in each of the appropriate windows before closing them.

## Corrupt Windows system files

It is possible for Windows system files to become corrupted for any number of reasons. If system files responsible for sound output become corrupted, the computer can stop producing sound of any kind.

If the computer was producing sound recently but is not now, you can **try restoring Windows to a previous point** when sound was working. If corrupt Windows system files are causing the sound problem, restoring Windows to a point when the sound did work should resolve the issue. For more information,

Make sure to **back up** your important documents before activating a Windows restore point.

# Integrated or onboard audio disabled

If your computer has integrated or onboard audio, it's possible it is disabled in the BIOS. Access the BIOS and find the entry for integrated audio. It may be located in a menu named something similar to *Integrated Peripherals* or *Onboard Devices*, or it may be under the *Advanced* menu.



After you have located the integrated audio entry, check if it's set to *Enabled* or *Disabled*. If set to *Disabled*, change the setting to *Enabled*. Restart the computer and test the sound.

#### Bad sound card

If the issue is not software related, it is likely a hardware issue. Like any other hardware component in a computer, the device producing sound can fail. Make sure the computer sound card works properly by connecting another pair of speakers or headphones to the computer.

#### Note

Do not test the sound through a game or another program. Instead, see if a CD or a sound file works. A program or game may have sound-related problems that don't relate to the sound card.

If another pair of speakers or headphones also don't work, your sound card is likely experiencing issues. See the following page for troubleshooting help.

#### **Bad speakers**

Finally, if none of the recommendations above fix the problem, but connecting a different pair of speakers or headphones did work, the speakers are bad. We recommend you contact the manufacturer of the speakers or computer for a new replacement if they are still under warranty. Otherwise, you can buy a new pair of speakers and connect them to your computer

Microphone: A microphone, colloquially nicknamed mic or mike, is a transducer that converts sound into an electrical signal.

#### Fix microphone problems

If you are having trouble with your microphone features, the following information can help you troubleshoot and resolve issues.

#### Make sure apps have access to the microphone

← Settings		-	х
ᢙ Home	Microphone		
Find a setting	Allow apps to access your microphone		
Privacy			
App permissions	On		
Microphone			
	Choose which Microsoft Store apps can access		
	your microphone		

If your microphone isn't detected after updating Windows 10, you may need to give your apps permission to use it.

- To let apps access the microphone, select Start ,thenselect Settings > Privacy > Microphone .
   Select Change, then turn on Allow apps to access your microphone.
- After allowing access to the microphone, you can choose which Microsoft Store apps can access these
  features under Choose which Microsoft Store apps can access your microphone, and give access to nonMicrosoft-Store desktop apps by ensuring that the switch beneath Allow desktop apps to access your
  microphone is set to On.

## Others can't hear me

Try the following solutions:

- If your headset has a Mute button, make sure it isn't active.
- Make sure that your microphone or headset is connected correctly to your computer.
- Make sure that your microphone or headset is the system default recording device. Here's how to do this in Windows 10:
  - a. Select Start , then select Settings > System > Sound .
  - b. In Input, ensure your microphone is selected in Choose your input device.



c. To test your microphone, speak into it and check **Test your microphone** to make sure Windows is

hearing	you.
---------	------

Sound	
Choose your input device	^
· · · · · · · · · · · · · · · · · · ·	
Test your missenhone	
▲ Troubleshoot	

1. The microphone volume is too low or does not appear to be working at all

Try the following solutions:

- Make sure that the microphone or headset is connected correctly to your computer.
- Make sure that the microphone is positioned correctly.
- Increase the volume of your microphone. Here's how to do this in Windows 10:
  - a. Select Start , then select Settings > System > Sound .
  - b. In Input, ensure your microphone is selected under Choose your input device, then select Device Properties.
  - c. On the **Levels** tab of the Microphone Properties window, adjust the **Microphone** and **Microphone Boost** sliders as needed, then select **OK**.
  - d. Speak into your microphone while checking under **Test your microphone** to make sure your settings work. If you see the line moving from left to right, your microphone is working. If you see no change, the microphone is not picking up sound.

\$ Skype	÷ 🗉 🗙
Settings	AUDIO Microphone Default communications device ~
O Audio & Video	Automatically adjust microphone settings

Make sure that your microphone or headset is the Skype default recording device. Here's how:

- 1. If Skype is not open, select Start , then Skype to open it.
- 2. In the upper right corner of the Contacts List in Skype, select More , then Settings.
- 3. In Audio & Video, under Microphone, make sure your microphone or headset is selected.
- 4. Under Speakers, make sure your preferred speaker or headset is selected
  - Bar code scanner: A bar code reader is an electronic device that can read and output printed barcodes to a computer. Like a flatbed scanner, it consists of a light source, a lens and a light sensor translating optical impulses into electrical ones. Barcodes are integral to your daily workflow, whether you're a business, laboratory, or healthcare institution. For many businesses, they help track and trace inventory; for labs, they're also necessary to identify samples and patient specimens. But what happens when you have problems reading your barcodes, or they fail to scan? Here are some reasons (and solutions) that might help you navigate through this unwanted situation.

#### **Poor label placement**

The most obvious culprit of an unreadable barcode is poor label placement. Imagine wrapping a 1D barcode label around the circumference of 15 mL tube. Now take a <u>scanner</u> and try reading the barcode. There's no way the laser emitting from the scanner can read all the lines of the barcode if it's wrapped around the tube. Unfortunately, samples that are labeled by one user are frequently analyzed by another

later down the road (a nurse who takes a blood sample and delivers it to a medical lab to be processed, for instance), making it difficult for lab personnel to control how samples are labeled.

**Solution:** The best way to avoid a poorly placed barcode is to have a standard operating protocol <u>(SOP)</u> in place that specifies an appropriate methodology for each container that requires labeling, including the type of label, barcode, and label placement. When designing your SOP, be sure to include pictograms that make it clear how each type of tube is supposed to be labeled.

#### Poor barcode/scanner position

A failed barcode scan can be caused by a few things related to the position of the barcode or scanner:

- The barcode might be too close or too far from the scanner, depending on the scanner's optimal focal distance (the distance at which the barcode comes into focus).
- The barcode might be located at a poor angle relative to the scanner. Mounting a scanner perpendicularly to the barcode can cause specular reflection, where light is reflected directly back at the scanner, blinding it to the signal of the barcode.
- The orientation of the barcode might not be compatible with the scanner. For example, laser barcode scanners must be placed such that the laser line is perpendicular to the bars of the barcode for it to be read.

**Solution:** For applications requiring challenging scanning conditions, using readers with built-in autofocus is ideal, as they can adjust to a range of variable barcode distances, angles, and orientations. Employing barcode imagers instead of barcode scanners, which use cameras to read images of codes rather than the signal of the reflective laser, may also be helpful as they are less liable to suffer interference from the reflecting laser and can often read barcodes no matter the orientation. Right-angle mirrors can also reflect the light of the barcode towards the scanner; however, when using right-angle mirrors, it's important to have a scanner that can read flipped images.

#### Damaged barcodes

Barcodes can be exposed to many harsh conditions, such as extreme temperatures and chemical exposure. This can make your barcodes fade or smudge, causing them to become unreadable. Barcodes can also suffer from mechanical damage, like scratches, tears, or crinkling.

**Solution:** Here is where <u>choosing the right label</u> is crucial. Using a label that's appropriate for your application will not only make sure that it stays affixed to your container, but it will also prevent damage to the label (and barcode) from the harsh environment(s) it encounters. Remember, prevention is always

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worth more than a cure, especially when it comes to physically damaged labels. This also applies to the printout; not all types printouts will protect your barcodes. Thermal-transfer printers provide your labels with the greatest resistance against extreme temperatures as well as organic solvents and other chemical substances, ensuring your barcodes won't smudge or fade over time. For the times where physical damage is unavoidable, some high-performance readers can utilize symbol reconstruction technology, which allows them to reform the original barcode from the scan lines that are still intact. Varnishing or laminating your labels will also help protect your barcodes from scratches and other damage.



To properly read a barcode, the scanner must be able to differentiate between the light and dark features of the symbol. However, the contrast between these two elements can vary depending on the type of material the barcode is printed on (e.g. thermoplastic film labels might provide more contrast than printing on metal). The contrast might also be affected if the printed bars—or the surface they're printed on aren't uniform across the entire barcode. If there isn't enough contrast, the scanner won't be able to properly distinguish the marking of the barcode, making it impossible to read. Low-contrast barcodes will also reduce the distance at which a barcode can be read.

**Solution:** Adjusting your printer settings to ensure that ink is distributed evenly across your label (or other surface) is a good first step to avoid low contrast barcodes. It's usually the surface, though, that's the problem. Enhancing the brightness/contrast of the barcode is the best way to deal with low contrast due to uneven or noisy surfaces. Some barcode readers are designed with extra lighting features that, depending on the surface, can employ either diffused lighting (for glossy, flat surfaces) or dark-field lighting (for embossed or engraved barcodes) techniques to read barcodes.

## **Quiet zone infractions**

The quiet zone, or no-print zone, is the area around the barcode that's completely free of markings. This zone makes it possible for the reader to verify the boundaries of the barcode and scan it in its entirety. The

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quiet zone has specific requirements that depend on what kind of barcode you're using. For 1D barcodes, the quiet zone should be at least 10 times the width of the smallest bar on both the right and left ends of the barcode. For 2D barcodes, each type has its own requirement, but it's usually recommended that the quiet zone on each side of the barcode be at least 10% of either the height or width (whichever is smallest) of the symbol. On many occasions, however, markings can bleed into the quiet zone, making the scanner fail to read the barcode appropriately.

**Solution:** Adjusting the settings of your printer to ensure that the quiet zone requirements for your barcodes are met is the simplest solution. Because there is no maximum amount of space for quiet zones, you can always increase their space past the minimum requirements to make sure the barcode is read properly. If the printout frequently bleeds into the quiet zone, you'll want to ensure your printout isn't smudging. Again, using a thermal-transfer printer for your barcodes is ideal, no matter the environment.

#### **Inconsistent printout**

There are many reasons your printer isn't reliably rendering barcodes. For digital printers (inkjet and laser), low ink and toner levels are the main cause of barcode inconsistency. If the ink or toner levels are too low, your barcodes will suffer, as the intensity can start to fluctuate (some printers will even stop you from printing if the ink is too low, but this is undesirable as well, since there could be up to 40% of the cartridge left over. You might also have any number of problems, from your ink not sticking to your label to printer jams and air bubbles in the cartridge.

Solution: Using a thermal-transfer printer solves many of the issues related to inconsistent printouts from digital printers. They employ wax and/or resin ribbons, giving a more uniform printout right until the very end of the ribbon. With that said, it's important to continuously verify the settings of your printer and to properly maintain it. The distance between the printhead and your labels, as well as the integrity of the printheads and the nozzles, should be checked regularly. For those using laser printers, a simple trick is to switch the "Media/Paper Type" in your print settings to "Label" or "Thicker Paper" instead of "Plain Paper" in cases where the ink isn't adhering to your labels.

#### Inappropriately programmed scanner

When programming your scanner, limiting the number of acceptable digits in the data field can make any barcode fail to scan.

**Solution:** Check your scanner and the requirements of the type of barcode you're using! Some symbologies, such as Code 39 and Interleaved Two-of-Five (ITF), encode 13 digits, not 12, and may require some toggling for your scanner to properly read them.

#### **Other considerations**

A few other points to consider is the density of the barcode and the software that you use to print them. Trying to encode too much information will result in a high-density barcode, where the narrow white spaces between bars become too narrow to be detected. Using a barcoding software will help to avoid this issue, while also ensuring you print high-quality customizable barcodes.

It's crucial that barcodes are read in a timely and consistent manner, no matter where you work. Unreadable barcodes can grind your workflow to a halt, especially for industries with regulations on inventory and production, including pharmaceutical, biotech, and medical device companies. Unreadable barcodes can also result in the loss of information associated with patient samples. When employing barcodes, it's important to use ones that have been verified and conform to ISO standards. Verification means assessing and grading your barcodes before they're employed in your operations. Using verified barcodes will make it much more likely that they'll be read consistently and will help save you precious time and money fixing ones that don't scan.

## <u>Content/Topic 3: Description of Computer Connectors/Ports</u>

Are you experiencing problems with PC-attached peripherals, such as your mouse, keyboard, webcam, or another accessory? Whether you're using legacy or USB peripherals, problems could arise at some point. In some cases, peripherals stop working following an update. The good news is that fixing these common problems with PC peripherals is often simple. A shortcut is to use the Windows troubleshooter. The interface may vary from one Windows operating system to another, but the purpose is the same. Click the Start button, open the Hardware and Devices troubleshooter, and then select Troubleshooting. This will automatically check your computer for any problems with hardware and other devices.

## **Common PC Peripheral Problems and How to Solve Them**

The first step is to always check the hardware. The cables may be damaged or the USB hub you're using between your PC and the peripheral may not have power.

#### **#1: Problems with a port**

If the attached peripherals suddenly stop working, check the Device Manager to see if the port itself is to blame. А red exclamation mark (!) means there's an with error the port. Delete a device from the Device Manager and then reboot your computer. Once your PC is up and running again, install the device driver.

#### #2: Problems with the port connectors

Especially with PS/2 ports, one or two of those holes could be clogged with dust, causing a loss in connection with the pins. The same thing could happen when the pins on the peripheral connector are damaged. A USB port can get damaged, too, resulting in no power or connection. A solution would be to use another USB port.

#### #3: USB standards don't match

Newer USB devices may not run on old USB ports. Most of them would need a 3.0 cable for high-speed processing. If the USB port and device are incompatible, attached peripherals will not work.

#### #4: Error with wireless keyboard or mouse

#### **Common Problems with PC Peripherals**

Wireless peripherals often rely on the IR or RF controller to work and communicate with a computer. If it doesn't work the first time you use it, you could be using an old operating system. Most wireless PC peripherals need a newer OS Service Pack. So, if you're still using Windows 95 OS or older, an upgrade will fix the problem.

If you're using the current operating system and the wireless keyboard and mouse still don't work, the problem may be an interference with the line of sight or a weak battery. Use the peripherals on other PCs to help identify the cause of error.

If the wireless device has a reset button, use it to reset the device and refresh the connection. It would also help if you unplug the USB wireless receiver and leave it off for about 10 seconds. This will help reestablish the wireless connection once you plug the receiver back into the port.

#### #5: PS/2 keyboard and mouse not working

See that the device is plugged in the correct port. If the port and cable are color-coded, the keyboard cable should go into the purple-colored port and the mouse into the green-colored port.

Color coding can vary. Try to switch them up and see if doing so helps fix the problem. Follow the same

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process if the PS/2 connectors are identical in color and you need to identify which one is designated for the

#### keyboard and the mouse.

If the cables are on the right parts and the peripherals still don't work, try to use other devices. The keyboard or mouse may need replacement.

#### #6: Blocked keys or sensors

Dirt blocking the keys or sensors prevents PC peripherals from responding to commands. Regardless of how much you click on a mouse or press a key, nothing will happen if contact is not established.

#### **#7: Input devices stop working after updates**

Following an operating system or software update, one or two of your attached PC referrals may no longer work. There are several ways to restore a device's functionality.

#### Switch USB ports

Doing so will force your computer to recognize a device. A computer system usually recognizes a device based on their location or the specific USB port where the device was attached before any updates were made. If the system thinks nothing has changed, it will not reload drivers, resulting in peripherals not working. Thus, the need to switch USB ports.

#### • Start in safe mode

In some cases, a driver in the cache will not load properly after an update. The result is a broken mouse and keyboard ... or so it might appear. With a bit of a system purge in safe mode, the boot will reload drivers and load them properly.

#### Reset the PRAM

During a firmware update, the PRAM settings of your computer, which include peripheral devices, video settings, startup disk, and audio volumes, may be reconfigured. Reset the PRAM to fix the problem. Reboot the system and then press and hold down the option-command-P-R keys at the same time. Wait for your computer to reset and chime a couple of times at reboot before you release the keys.

## • Power cycle the entire system

Faulty settings may occur after an update. Remove a peripheral device from your computer and leave it off for a few minutes. For better results, shut down your computer as well and power cycle it. After 5 to 10 minutes, turn the computer back on and then plug the attached peripherals back in.

## #8: Mouse and keyboard stopped working when the printer is turned on

## Ensure efficient power

This could happen when the USB ports for the keyboard and mouse receive too little power to work because the printer is hogging all of it. Make sure not to connect the printer to a USB hub that is shared by the **keyboard and mouse.** 



Another solution is to plug the devices into different USB ports. Attached peripherals can go at the back of the computer while the printer is plugged in at the front.

## • Fix interference

Do your keyboard, mouse, and printer all use a wireless connection? They could be interfering with one another, even if one is using radio frequency while the other relies on Bluetooth. To avoid conflict and establish different frequencies for different devices, switch off the keyboard and mouse. When you switch them back on, they will be forced to reconnect to your computer using a free frequency.

## • Check driver compatibility

Conflicts between drivers could cause problems with different devices. Communication with your operating system will be effected and will result in devices not working properly. Open Device Manager and check that drivers for peripherals and the printers are updated.

Double click on a device and open the Properties windows. Under Driver tab, check if the option to Update Driver is available. This means a newer version of a driver is available.

## Reinstall devices

If you've done all the steps above and the problem persists, you may need to reinstall devices to resolve the issue.

- 1. Remove the PC-attached peripherals from Device Manager.
- 2. Any related software must be uninstalled from your computer.
- 3. Restart the system.
- 4. Switch on the printer and see that it is connected to your computer and working properly.
- 5. Reconnect the keyboard and mouse like you're using them for the first time. This reinstalls the peripherals and ensures there are no conflicts.

If you're still having issues with these common problems with <u>PC peripherals</u>, check out our guide on <u>how to</u> <u>reset your Windows 10 computer</u> here.

# > VGA Port

VGA port is found in many computers, projectors, video cards and High Definition TVs. It is a D-sub connector consisting of 15 pins in 3 rows. The connector is called as DE-15.

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VGA port is the main interface between computers and older CRT monitors. Even the modern LCD and LED monitors support VGA ports but the picture quality is reduced. VGA carries analogue video signals up to a resolution of 648X480.



With the increase in use of digital video, VGA ports are gradually being replaced by HDMI and Display Ports. Some laptops are equipped with on-board VGA ports in order to connect to external monitors or projectors.

If you're having no signal for your VGA monitor, don't panic! There are solutions to fix VGA no signal problem.

VGA having no signal means that your monitor is powered on but not connected to a video card, so you should make sure the connection is working properly.

# Fix 1: Troubleshoot hardware problems

As you may know, the VGA no signal issue generally comes from the connection faulty, which has something to do with the hardware problems. So you have to ensure that the **connector** has been plugged into the correct port and it can't be pulled out too easily.

Check the **VGA port** and make sure there is no damage, and check if there is something inside the port that can prevent your VGA signal from transmitting.

In addition, make sure the **cables** are working properly. You can try another cable and see if it works.

Try pushing the connector further until you feel the pointy bits on the plug lock it in .

# Fix 2: Restart and reconnect your devices

Since many technical issues can be resolved by restarting, it never hurts to restart your devices and reconnect. Sometimes this is enough to fix issues like VGA no signal.

1) Completely **turn off** your computer and monitor and unplug their power cables.

2) Wait for several minutes.

- 3) Connect the VGA cable back to the monitor and your computer.
- 4) Plug the **power cable** back.
- 5) Turn on your computer and monitor.

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Try and see if the VGA connection works.

# Fix 3: Check if it's in hibernation, sleep or power-saving mode

Sometimes your computer enters hibernation mode, sleep mode, or power-saving mode, so the monitor can't receive any signal even if it's on.

You can press any key (the **Enter** key) on your keyboard, and wait for a while. By doing so, you can wake up your computer and your monitor, then it can fix the VGA no signal problem.

# Fix 4: Update your graphics card driver

A missing or outdated graphics card driver can cause the VGA no signal issue, so you should keep your graphics card driver up to date. If you can't update your graphics card driver with the problematic VGA connection, you should another type of connection, such as HDMI.

You can go to the manufacturer's website, and download and install the latest version of your graphics card driver. This requires time and computer skills.

If you don't have time or patience, you can do it automatically with Driver Easy.

Driver Easy will automatically recognize your system and find the correct drivers for it. You don't need to know exactly what system your computer is running, you don't need to risk downloading and installing the wrong driver, and you don't need to worry about making a mistake when installing.

You can update your drivers automatically with either the **FREE** or the **Pro** version of Driver Easy. But with the Pro version it takes just 2 clicks (and you get full support and a **30-day money back guarantee**):

# USB Port

Universal Serial Bus (USB) replaced serial ports, parallel ports, PS/2 connectors, game ports and power chargers for portable devices.

USB port can be used to transfer data, act as an interface for peripherals and even act as power supply for devices connected to it. There are three kinds of USB ports: Type A, Type B or mini USB and Micro USB.

## Serial Port

Even though the communication in PS/2 and USB is serial, technically, the term Serial Port is used to refer the interface that is compliant to RS-232 standard. There are two types of serial ports that are commonly found on a computer: DB-25 and DE-9.

# How can I make sure my serial port is working in Windows?

To check whether or not an RS-232 serial port is working, perform an RS-232 loopback test by doing the following:

- If your serial port is not female, convert it by taking a female/female cable or gender changer and plugging it into the serial port.
- 2. Take a metal paperclip or wire and cross pins 2 and 3. If you look closely at the female end, the pins should be numbered.
- Open a telnet session on the COM port number of the device that you are testing. To find out the COM port number, refer to the following FAQ: https://www.startech.com/faq/com-port-listingwindows.

**Note:** To open a telnet session on the COM port, you need a telnet client like PuTTY or Hyper Terminal. Windows XP comes with Hyper Terminal.

4. When the session is open, anything you type into it you should see. The loopback test fails when you cannot see what you are typing.

If the loopback test fails, make sure that the serial cable or gender changer that you are using works and that the adapter is in the correct port.

You can check multiple ports at the same time by opening multiple sessions, putting the loopback adapter on one port, and trying to type into each session. When you can see what you are typing, you know that the COM port is working and you can see which port number the physical serial port is. Close the window for the port that you just tested to speed up the testing of the remaining serial ports.

# HDMI Port

HDMI is an abbreviation of High Definition Media Interface. HDMI is a digital interface to connect High Definition and Ultra High Definition devices like Computer monitors, HDTVs, Blu-Ray players, gaming consoles, High Definition Cameras etc. HDMI can be used to carry uncompressed video and compressed or uncompressed audio signals.

# DVI Port



Digital Video Interface (DVI)DVI is a high speed digital interface between a display controller like a computer and a display device like a monitor. It was developed with an aim of transmitting lossless digital video signals and replace the analogue VGA technology.

#### Parallel Port or Centronics 36 Pin Port

Parallel port is an interface between computer and peripheral devices like printers with parallel communication. The Centronics port is a 36 pin port that was developed as an interface for printers and scanners and hence a parallel port is also called as a Centronics port.

Before the wide use of USB ports, parallel ports are very common in printers. The Centronics port was later replaced by DB-25 port with parallel interface.

# Microphone Jack: Audio jacks on most computers are color coded or labeled for easy identification. The Line Out (1) or Headphone jack is typically green, the microphone in (Mic In)jack is typically pink or labeled with a microphone symbol.

#### > Speaker Jack

#### Audio

**RJ45** is a type of

jacks are found on many types of audio equipment and musical instruments that accept external sound sources. In a car or truck, an audio jack, also called a "media jack" or "auxiliary (AUX) jack," is a mini-phone socket that connects any portable music player to the vehicle's amplifier and speakers.

#### Ethernet Port (RJ-45 Connector)

connector commonly used for Ethernet networking. ... Since Ethernet cables have an **RJ45** connector on each end, Ethernet cables are sometimes also called **RJ45** cables. The "**RJ**" in **RJ45** stands for "registered jack," since it is a standardized networking interface.

## <u>Content/Topic 4: Description of Computer Drivers</u>

A disk drive is a device that reads and/or writes data to a disk. The most common type of disk drive is a hard drive (or "hard disk drive"), but several other types of disk drives exist as well. Some examples include removable storage devices, **floppy drives**, and **optical drives**, which read optical media, such as CDs and DVDs.

While there are multiple types of disk drives, they all work in a similar fashion. Each drive operates by spinning a disk and reading data from it using a small component called a drive head. Hard drives and

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removable disk drives use a magnetic head, while optical drives use a laser. CD and DVD burners include a high-powered laser that can imprint data onto discs.

Since hard drives are now available in such large capacities, there is little need for removable disk drives. Instead of expanding a system's storage capacity with removable media, most people now use external hard drives instead. While CD and DVD drives are still common, they have become less used since software, movies, and music can now often be downloaded from the Internet. Therefore, internal hard drives and external hard drives are the most common types of disk drives used today.

A memory card reader is a device for accessing the data on a memory card such as a CompactFlash (CF), Secure Digital (SD) or MultimediaCard (MMC). Most card readers also offer write capability, and together with the card, this can function as a pen drive.

Some printers and Smartphones have a built-in card reader, as do most personal computers and the majority of Tablet computers.(geeksforgeeks)

A multi card reader is used for communication with more than one type of flash memory card. Multi card readers do not have built-in memory capacity, but are able to accept multiple types and styles of memory cards.



**DVD/CD ROOM Driver** 



A CD and DVD room drive are the essentials components in most computers. Users need the access port to watch DVDs, burn discs, copy music files and install software. As with most technology, the devices are sensitive and can malfunction, leading to the need for repair or replacement.

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✓ SD Driver



SD is a type of removable flash memory card used for storing information. SD is an abbreviation of Secure Digital, and microSD cards are sometimes referred to as  $\mu$ SD or uSD. The cards are used in mobile phones and other mobile devices.

# Learning Outcome 2.2: Describe the computer Internal Hardware components

<u>Content/Topic 1: Description of system memories</u>



## A. Primary Memories

The system memory is the place where the computer holds current programs and data that are in use. There are various levels of computer memory, including ROM, RAM, cache, page and graphics, each with specific objectives for system operation. This section focuses on the role of computer memory, and the technology behind it.

Although memory is used in many different forms around modern PC systems, it can be divided into two essential types: RAM and ROM. ROM, or Read Only Memory, is relatively small, but essential to how a computer works. ROM is always found on motherboards, but is increasingly found on graphics cards and some other expansion cards and peripherals. Generally speaking, ROM does not change. It forms the basic instruction set for operating the hardware in the system, and the data within remains intact even when the



computer is shut down. It is possible to update ROM, but it's only done rarely, and at need. If ROM is damaged, the computer system simply cannot function.

RAM, or Random Access Memory, is "volatile." This means that it only holds data while power is present. RAM changes constantly as the system operates, providing the storage for all data required by the operating system and software. Because of the demands made by increasingly powerful operating systems and software, system RAM requirements have accelerated dramatically over time. For instance, at the turn of the millennium a typical computer may have only 128Mb of RAM in total, but in 2007 computers commonly ship with 2Gb of RAM installed, and may include graphics cards with their own additional 512Mb of RAM and more.



# **Classification of computer memory**

• RAM is further classified into two types- SRAM (Static Random Access Memory) and DRAM (Dynamic Random Access Memory).

# Difference between DRAM and SRAM

DRAM	SRAM
1. Constructed of tiny capacitors that leak electricity.	1.Constructed of circuits similar to D flip-flops.
2.Requires a recharge every few milliseconds to maintain its data.	2.Holds its contents as long as power is available.
3.Inexpensive.	3.Expensive.
4. Slower than SRAM.	4. Faster than DRAM.
5. Can store many bits per chip.	5. Can not store many bits per chip.
6. Uses less power.	6.Uses more power.
7.Generates less heat.	7.Generates more heat.
8. Used for main memory.	8. Used for cache.

# Types of Read Only Memory (ROM)

- 1. **PROM (Programmable read-only memory)** It can be programmed by user. Once programmed, the data and instructions in it cannot be changed.
- 2. **EPROM (Erasable Programmable read only memory)** It can be reprogrammed. To erase data from it, expose it to ultra violet light. To reprogram it, erase all the previous data.
- 3. **EEPROM (Electrically erasable programmable read only memory)** The data can be erased by applying electric field, no need of ultra violet light. We can erase only portions of the chip.

# Difference between RAM and ROM

RAM	ROM
1. Temporary Storage.	1. Permanent storage.
2. Store data in MBs.	2. Store data in GBs.
3. Volatile.	3. Non-volatile.
4.Used in normal operations.	4. Used for startup process of computer.
5. Writing data is faster.	5. Writing data is slower.

B. Secondary memory

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Refers to storage devices such as Hard Disk Drives (HDD) and Solid State Drives (SSD). It may also refer to removable storage media, such as USB flash drives, CDs, and DVDs.

Unlike primary memory, secondary memory is not accessed directly by the CPU. Instead, data accessed from secondary memory is first loaded into RAM and is then sent to the processor. The RAM plays an important intermediate role, since it provides much faster data access speeds than secondary memory. By loading software programs and files into primary memory, computers can process data much more quickly.

While secondary memory is much slower than primary memory, it typically offers far greater storage capacity. For example, a computer may have a one terabyte hard drive, but only 16 gigabytes of RAM. That means the computer has roughly 64 times more secondary memory than primary memory. Additionally, secondary memory is non-volatile, meaning it retains its data with or without electrical power. RAM, on the other hand, is erased when a computer is shut down or restarted. Therefore, secondary memory is used to store "permanent data," such as the operating system, applications, and user files.

**NOTE**: Secondary memory may also be called "secondary storage." However, this term is a bit more ambiguous, since internal storage devices are sometimes called "primary storage devices" as well.

There are more memory such as USB flash drives, Floppy disks, Magnetic tape( CD, DVD,...), Paper tape, Punched cards, Standalone RAM disks, Lomega Zip drives, Flash memory

**Paper tape** is a slow, low-capacity, sequential medium for data storage that was used on early communications and computing devices. The paper tape holds data as patterns of punched holes with data being represented by the absence or presence of holes at specific positions.



**The Zip drive** is a removable floppy disk storage system that was introduced by lomega in late 1994. Considered medium-to-high-capacity at the time of its release, Zip disks were originally launched with capacities of 100 MB, then 250 MB, and finally 750 MB.





## **USB flash drives**

A USB flash drive is a device used for data storage that includes a flash memory and an integrated Universal Serial Bus (USB) interface. Most USB flash drives are removable and rewritable. Physically, they are small, durable and reliable. The larger their storage space, the faster they tend to operate. Floppy disks



A floppy disk is a magnetic media and stores and reads data on the floppy disk using a read head. When a 3.5" floppy diskette is inserted into the drive, the metal slide door is opened and exposes the magnetic disk in the floppy diskette.

## Magnetic tape





Magnetic tape is a medium for magnetic recording, made of a thin, magnetizable coating on a long, narrow strip of plastic film. ... A device that stores computer data on magnetic tape is known as a tape drive. Magnetic tape revolutionized sound recording and reproduction and broadcasting.

# **Punched cards**



A punched card (also punch card or punched-card) is a piece of stiff paper that can be used to contain digital data represented by the presence or absence of holes in predefined positions. Digital data can be used for data processing applications or used to directly control automated machinery. Standalone RAM disks




Refers to RAM that has been configured to simulate a disk drive. You can access files on a RAM disk as you would access files on a real disk. RAM disks, however, are approximately a thousand times faster than hard disk drives.

# Lomega Zip drives



The Iomega Zip drive is the low-cost removable storage leader--and Iomega's two latest offerings, the Zip 250 (a SCSI device) and a USB version of the Zip 100, should help maintain its popularity.

## Flash memory

Flash memory, data-storage medium used with computers and other electronic devices. Unlike previous forms of data storage, flash memory is an EEPROM (electronically erasable programmable read-only memory) form of computer memory and thus does not require a power source to retain the data.

## **Cache Memory**





Cache Memory: Cache memory is the small size of RAM inside the processors. This cache memory is SRAM (Static RAM) unlike the DRAM (Dynamic RAM) which we find in normal RAM. This SRAM is quite fast compared to DRAM. In computers, we find different levels of cache memory.

<u>Content/Topic 2: Description of motherboard</u>

The main printed circuit board in a computer is known as the motherboard. Other names for this central computer unit are system board, mainboard, or printed wired board (PWB). The motherboard is sometimes shortened to **MOBO**.





The motherboard is the main component of any branded or assembled PC, laptop, tablet or a mobile phone. Now you must be curious, why it is called the motherboard? The motherboard is a Printed Circuit Board which acts as the main platform for communication between all other components of a system. All the other computer parts are either directly installed or connected to various motherboard components and all the data is transferred between them through the motherboard.

# Types of motherboards:

# **AT Motherboards**

The oldest of the main boards, these motherboards were used in earlier 286/386 or 486 computers. The AT means the board consists of **advanced technology (AT)** power connectors. There are two power connectors of 6 pin each mounted on the AT motherboards. The AT motherboards were available in the early 80's.





**ATX Motherboards** 



The ATX motherboards started in 90's and are still available. The ATX connector on the motherboard consists of a single connector. These boards are used for P2/P3 or P/4 processors.



# **Motherboard Components**

The motherboard consists of various components which have their own role to play in the functioning of a computer. Let us discuss various motherboard components and know their definition and role.

## 4. Expansion Slots

**ISA slots**. These were the oldest expansion slots in the history of motherboards. They were found in AT boards and are identified by black color. Conventional display cards or sound cards were installed in these slots. The full form of ISA is Industry Standard Architecture and is a 16- bit bus.(it4nextgen)

**PCI Slots**. The full form of PCI is Peripheral Component Interconnect. The PCI slot is one of the important motherboard components today and is vastly used to install add-on cards on the motherboard. The PCI supports 64-bit high-speed bus.

**PCI express**. Also known as PCIe, these are the latest and the fastest component of the motherboard to support add-on cards. It supports full duplex serial bus.

**AGP slot**. Accelerated graphics port(AGP) is specifically used to install a latest graphics card. AGP runs on a 32-bit bus and both PCIe and AGP can be used to install high-end gaming display cards.

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## 5. RAM(memory) slots

**SIMM slots**. The full form is a single in-line memory module. These slots were found in older motherboards, up to 486-boards. The SIMM supports 32-bit bus.

**DIMM slots**. The full form of DIMM is a Double inline memory module. These are the latest RAM slots which run on a faster 64-bit bus. The DIMM used on Laptop boards are called SO-DIMM.

# 6. CPU Socket

Another vital motherboard component is the CPU socket which is used to install the processor on the motherboard. Some important sockets are explained below.

Socket7. It is a 321 pin socket that supported older processors like Intel Pentium 1/2/MMX, AMD k5/K6, and Cyrix M2.

Socket370. It is a 370 pin socket that supports Celeron processors and Pentium-3 processors.

Socket 775. It is a 775-pin socket that supports Inter dual core, C2D, P-4 and Xeon processors.

Socket 1156. Found on latest types of motherboards, it is an 1156-pin socket that supports latest Intel i-3, i-5 and i-7 processors.

Socket 1366. The socket is of 1366 pins and supports latest i-7 900 processors.

# 7. BIOS

The full form of BIOS is **Basic Input Output System**. It is a motherboard component in the form of an integrated chip. This chip contains all the information and settings of the motherboard which you can modify by entering the BIOS mode from your computer.

# 8. CMOS Battery

The battery or a cell is a 3.0 Volts lithium type cell. The cell is responsible for storing the information in BIOS and the full form is Complementary Metal Oxide Semi-Conductor.

# 9. Power Connectors

In order to receive power from SMPS, there are connectors mounted on the motherboards.

AT connector. It consists of 2 number of 6 pin male connectors and is found on old types of motherboards.

**ATX connector**. The latest in the series of power connectors, they are either 20 or 24 pin female connectors. Found in all the latest types of motherboards.

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#### **10. IDE connector**

The Integrated Drive Electronics (IDE) connectors are used to interface disk drives. The 40-pin male connector is used to connect IDE hard disk drives and the 34-pin male connector connects to Floppy Disk Drive.

#### 11. SATA connector

Latest in the series, the connectors, Serial Advance Technology Attachment(SATA) are 7-pin connectors to interface latest SATA hard disks or optical drives. They are much faster than IDE interface.

#### 12. Co-Processor

The co-processor is one of the important motherboard components and helps the main processor in mathematical calculations and computer graphics.

## **13.** Cabinet connections

The cabinet in which the motherboard is installed has many buttons that connect to the motherboard. Some of the common connectors are Power Switch, Reset Switch, Front USB, Front Audio, Power indicator(LED) and HDD LED.

Choosing a right type of motherboard that is compatible with other parts of computer is vital step in determining the overall speed of your PC. Once you learn about various motherboard components, you can easily assemble your own PC or solve the basic hardware issues in motherboard

## 14. The Expansion Buses

An expansion bus is an input/output pathway from the CPU to peripheral devices and it is typically made up of a series of slots on the motherboard. Expansion boards (cards) plug into the bus. PCI is the most common expansion bus in a PC and other hardware platforms. Buses carry signals such as data, memory addresses, power, and control signals from component to component. Other types of buses include ISA and EISA.

Expansion buses enhance the PCs capabilities by allowing users to add missing features in their computers by slotting adapter cards into expansion slots.

## **15. The Computer Chip-sets**

A chipset is a group of small circuits that coordinate the flow of data to and from a PC's key components. These key components include the CPU itself, the main memory, the secondary cache, and any devices

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situated on the buses. A chipset also controls data flow to and from hard disks and other devices connected to the IDE channels.

## **Bridge Controller**

USB Bridge Controller simplifies USB design by eliminating firmware development. ... Connecting your embedded design peripheral to a host using USB connectivity provides an interoperable interface standard delivering seamless communication across all operating systems.

## A computer has got two main chipsets:

**The NorthBridge Controller (also called the memory controller)** is in charge of controlling transfers between the processor and the RAM, which is why it is located physically near the processor. It is sometimes called the GMCH, for Graphic and Memory Controller Hub.

**The SouthBridge Controller (also called the input/output controller or expansion controller)** handles communications between slower peripheral devices. It is also called the ICH (I/O Controller Hub). The term "bridge" is generally used to designate a component which connects two buses.

Chipset manufacturers include SIS, VIA, ALI, and OPTI.

## 16. The Switches and Jumpers

**DIP (Dual In-line Package)** switches are small electronic switches found on the circuit board that can be turned on or off just like a normal switch. They are very small and so are usually flipped with a pointed object, such as the tip of a screwdriver, a bent paper clip, or a pen top. Take care when cleaning near DIP switches, as some solvents may destroy them. Dip switches are obsolete and you will not find them in modern systems.

**Jumper pins** are small protruding pins on the motherboard. A jumper cap or bridge is used to connect or short a pair of jumper pins. When the bridge is connected to any two pins, via a shorting link, it completes the circuit and a certain configuration has been achieved.

**Jumper caps** are metal bridges that close an electrical circuit. Typically, a jumper consists of a plastic plug that fits over a pair of protruding pins. Jumpers are sometimes used to configure expansion boards. By placing a jumper plug over a different set of pins, you can change a board's parameters.

**NOTE:** You can check the jumper pins and jumper cap at the back of an IDE hard disk and a CD/DVD ROM/Writer.

## System Buses

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A system bus is a single computer bus that connects the major components of a computer system, combining the functions of a data bus to carry information, an address bus to determine where it should be sent, and a control bus to determine its operation.

#### **Review questions & Answers**

## Question1: What is the function of the PCI slot?

**Answer:** PCI stands for Peripheral Component Interconnect. This is a computer slot that allows you to insert expansion cards into your computer. These can come in the form of sound cards, RAID cards, SSDs, graphics cards, Coprocessors, and several other functional computer parts. So it enables you to expand the capabilities of the PC by adding what you do not have.

# Question2: How do I identify whether the RAM slots are DDR 1, DDR 2, DDR 3, or DDR 4?

**Answer:** There are a number of ways you can use to determine the kind of RAM slot you have. To begin with, you can check the number of pins. DDR has 184 pins and DDR2 and 3 has 240 pins while DDR4 has 288 pins. The other method is to look at the key notch position. DDR notch is almost at the center but slightly to the right. DDR2 notch is almost at the center as compared to DDR3 which is slightly to the left. DDR4 has a notch slightly to the right but very close to the center of the RAM slot.

# Question3: Which is the most important component of a computer system?

**Answer:** Technically speaking, I would say that each and every component is important. There are those who will be quick to reply that it is the processor. Yes, it is true the processor plays an important role in the computer. But what about the memory, can a computer operate without the memory? That is a big no. What about the power supply? Again can the computer operate without the power supply? That is not possible. So in simple words, all the components of a computer are very important as they are there are there for a reason.

## Question4: What are the functions of the south bridge Chipset?

**Answer:** The Southbridge chipset is the chip that controls all of the computers I/O (input-output) functions, such as USB, audio, serial, the system BIOS, the ISA bus, the interrupt controller and the IDE channels.

## Question5: What is C.M.O.S?

Answer: Looking at the dictionary you will get this definition;

- a) "A technology for making low power integrated circuits.
- b) A chip built using CMOS technology."



That is very true, inside the computer, there are what we call RAM chips normally referred to as the CMOS RAM. CMOS is an acronym for Complementary Metal Oxide Semiconductor. It is a technology used to fabricate or make integrated circuits used in most electronic and electrical fields. These ram chips loose power and hence has to be powered using a battery referred to as the CMOS battery. CMOS devices require very little power to operate. The CMOS RAM is used to store basic Information about the PC's configuration.

#### **Question6: What is RAM?**

**Answer:** RAM or Random Access Memory is a high-speed type of computer memory which temporarily stores all the information your PC needs at the moment. It's where your computer loads up all the things it thinks it will need to find out soon, so you can think of it as a working place of your computer. When it does need something, it fetches it super-fast from the memory which is accessed randomly. Note that RAM is temporary storage; thus when the power goes off or when you switch off your computer, all data held in RAM is lost.

#### Question7: What are beep codes from a motherboard?

**Answer**: Beep codes are audio signals given out by a computer to announce the result of a short diagnostic testing sequence the computer performs when first powering up (called the Power-On-Self-Test or POST). When you power on your computer, it has to test major devices such as RAM, Processor, Keyboard, and Drives among others. If any of the devices are faulty, you will receive a beep sound indicating which device has a problem.

## Question8: Why is thé network card not mentioned?

**Answer:** If you look at the article closely, we are talking about various components found on the motherboard. When it comes to the network card, you will find that most modern computers support an internal network interface controller embedded in the motherboard directly rather than provided as an external component. So, in modern motherboards, you will not find a network card as a device on its own. It will be embedded in a chipset.

#### **Question9: What is BIOS?**

**Answer:** "BIOS" stands for "Basic Input Output System." It is software stored on a small memory chip on the motherboard. This software instructs the computer on how to perform some basic functions such as booting and keyboard control. BIOS is also used to identify and configure the hardware in a computer such as the hard drive, floppy disk drive, optical drive, CPU, memory, etc.

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## Question10: What is the function of IDE under system hardware?

**Answer:** Integrated Drive Electronics (IDE) is a standard interface for connecting a motherboard to storage devices such as hard drives and CD-ROM/DVD drives. In most older motherboards, there used to be 2 IDE channels where drives were connected via a ribbon cable. Each cable carries 2 devices. There is an integrated disk drive controller on the motherboard for controlling the flow of informing from the drive to the motherboard and vice versa.

Modern motherboards make use of SATA technology. A serial advanced technology attachment (serial ATA, SATA or S-ATA) is a computer bus interface used to connect host bus adapters (disk drive controllers) with mass storage devices like optical drives and hard drives.

# • <u>Content/Topic 3: Description of drivers</u>

A driver is a software component that lets the operating system and a device communicate with each other. For example, suppose an application needs to read some data from a device. The application calls a function implemented by the operating system, and the operating system calls a function implemented by the driver. The driver, which was written by the same company that designed and manufactured the device, knows how to communicate with the device hardware to get the data. After the driver gets the data from the device, it returns the data to the operating system, which returns it to the application.



A **driver** communicates with the device through the computer bus or communications subsystem to which the hardware connects. When a calling program invokes a routine in the **driver**, the **driver** issues commands to the device.

## DVD/CD ROOM Driver

> SD Driver:

*SD* Cards should be recognized through your plug and play facility on your PC, but occasionally *SD*Cards experience problems which cause computer errors.

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#### List of Common Driver Problems & Its Fixes

# Problem 1: My device used to work, but now it doesn't

Well, this is a common problem encountered by the Windows users and there is no specific reason responsible for this. To fix this driver problem you need to try various solutions.

**Solutions:** Follow the different solutions:

- Update drivers with the latest update, you can check it on Windows update and click View available updates and see if any update is available.
- If no any new driver update is available then reinstall the software came with the device

## Problem 2: Printer Driver Problem

The printer driver problem is the common driver issue faced by the users and as a result, the printer is unable to works. It doesn't matter which brand printer you are using like **HP**, **Canon**, **Epson**, **Samsung or others**, the driver problem is caused by any of one of them.

Well, there are many reasons responsible for it like outdated or incompatible drivers, or the drivers get corrupted or damaged.

**Solutions:** Well, the solutions are almost the same for various brands printers, however, you need to first check for the outdated drivers and try updating them or contact the customer support of the printer brand.

## **Problem 3: Audio Driver Problem**

Just like printer driver problems, this is another driver issue. Users are found complaining about various driver issues and errors such as:

- MIDI output error detected
- Your audio hardware unable to play files like the current file
- There is no wave device which can play files in the current format is installed
- Realtek High Definition Audio driver issue for Windows 10

Here check out the possible solutions to fix the audio driver problems.

Solutions: Try the solutions given below to fix your audio driver issues.

## 1: Reinstall the Audio Driver - Follow the steps to do so

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- In the search box type device manager > hit Enter
- Then choose the arrow next to Sound, video and game controllers to expand it.
- Next, right-click sound card or audio device listing > choose Uninstall device > choose Delete the driver software for this device checkbox > chooseUninstall.
- And **Restart system**
- As the PC restart, it will automatically prompt to reinstall your audio driver.

I hope this works but if not then try updating the sound driver or else make use of the generic audio driver comes with Windows.

# Problem 4: Windows 10 Upgrade Driver Problem: Error 0x800F092

Many users are getting the error 0x800F092 while installing or updating Windows 10 with the latest anniversary update due to driver issues.

**Solutions**: In order to fix the Windows 10 update error 0x800F092 follow the solutions given in the article: <u>Get Rid of Windows 10 Upgrade Driver Problems</u>: How to Fix Error Code 0X800F0923

# Problem 4: DRIVER\_IRQL\_NOT\_LESS\_OR\_EQUAL Error in Windows 10

The Windows 10 users are encountering the BSOD error **"DRIVER\_IRQL\_NOT\_LESS\_OR\_EQUAL"** due to the computer uses the wrong memory address used by system driver or due to broken or error full network drivers.

Well, this is a very irritating error and faced by the users due to driver problems.

**Solutions:** Check out the article to know more about the error and fix it completely – [Solved] How to Fix DRIVER\_IRQL\_NOT\_LESS\_OR\_EQUAL Windows 10 Error

Problem 5: The Driver WudfRd failed to load for the Device with Event ID 219

The **WudfRd is unable to load with Event ID 219** is faced after upgrading to Windows 10 and when the Windows 10 is updated the drivers are also updated and as a result affected by Microsoft.

And due to this, some driver becomes incompatible with the available hardware and also cause driver problem.

**Solutions:** Read the article to learn about the error and fix the error – [**Fixed**] **The Driver WudfRd failed to load for the Device with Event ID 219** 

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### Problem 6: Dell Broadcom USH Driver Problem

Many **DELL Broadcom USH** users are encountering the driver problem and looking on how to fix driver issues.

Solutions: Follow the solutions give in the article to fix driver issues: How to Fix Dell Broadcom USH Driver Issues

#### **Problem 7: USB Driver Problem**

USB driver problems are common and due to this many users start encountering various errors. Here check out some of the common USB driver errors:

- USB device not recognized
- No USB Drivers Installed
- Windows is unable to initialize the device driver for this hardware
- Windows is unable to start the hardware device because the configuration information is damaged or it is incomplete.
- USB driver not working

Well, there are many error codes and messages that you may come across due to USB driver problems.

**Solutions:** There are many solutions that you need to try to get rid of the USB driver not recognized error. Try updating or reinstalling the device drivers, if this works then well and good but if not then follow the fixes given in the article: **[SOLVED] How to Fix USB Device Not Recognized in Windows 10/8/7** How Do I Fix USB Device Not Recognized?

To fix such type of issue, you should try to remove the other connected USB devices first and after removing all restart the system and then reconnects the removed USB devices to the computer.

## **Problem 8: NVIDIA Driver Problem**

The users who upgraded their Windows OS to the latest Windows 10 or update the Window with the latest update start facing Nvidia's driver problems. Also, some of the updates conflict with the NVIDIA driver and triggers various graphics related issues.

**Solutions**: If you are the one who is also struggling with the NVIDIA driver issues the read the article to follow the complete fixes: **Top 3 Solutions to Get Rid of Windows 10 Nvidia Driver Issues** 

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#### Problem 9: AMD Driver Crashing Windows 10

Well, this driver problem is encountered by the users after updating the **AMD GPU drivers to version 15.7.1**. Well, this is very irritating as the users start encountering various problems like

- AMD driver freezes Windows 10,
- AMD driver crash black screen issues when they boot their Windows computer, crash during install, crashes while playing the game, etc.

Solutions: To get rid of the AMD driver problems read the article and follow the solutions given here: Top 5

#### Solutions to Fix AMD Driver Crashing Windows 10

So, these are various driver problems encountered by the users from time to time with complete fixes.

#### Additional Solutions to Fix any Device Driver Problems Manually

- Go to desktop, select "My Computer Icon" and then right-click on it. After that small pop-up menu will appear > select "properties" and then hit on the hardware tab, > "Device Manager".
- All the list of devices connected to your system will appear. From that list, you look for the yellow triangle, as problematic devices which will have a **yellow triangle** next to their name in the left column.
- After recognizing, right-click on the device which is showing yellow mark and after that select "properties". A window will appear which comprises of tabs under the "resources" tab, check "resources allocation" and "modify resource settings" so that you can avoid conflict problems. After that, hit on the "update driver" button so that to install the updates when the driver is outdated.
- If the driver is corrupted or damaged, then uninstall that driver and reinstall it again. If again you face the same problem then restore the original by selecting "Roll Back Driver"
- Also if the driver manager does not work then just go to the recovery console by inserting the Windows installation disk and then reboot the system. When the welcome screen appears, select R and login with administrator credentials. Next, type in "CD Windows\system32\drivers" and select "Enter."
- Carry on with the recover console mode > type in "Ren Driver\_Name.sys Driver\_Name.old," hit "Enter" > type "copy CD-Drive:\i386 Driver\_Name.sys" and hit "Enter" again. This process will help you to copy the original driver to the driver folder. After finishing this, way out from Recovery console, eject the CD and then reboot your system.

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#### **Automatic Solution To Fix Driver Problem**

So, these are some of the manual solutions that you try to fix common driver problem, but if you are unable to follow the manual solutions to fix the driver issues than simply go for the **Driver Easy**. This is an advanced tool that just by scanning once, detects and updates the entire outdated drivers. Also identify the corrupted, damaged drivers and inform you about them.

#### Get Driver Easy to update the drivers automatically

#### Things You Should Try if the Newly Installed Hardware Device is Not Working Properly.

- Check the **hardware device is compatible** with your computer and Windows version. And if it is not compatible then locate the correct driver. Search for the compatible device on the Microsoft official website or the **manufacturer website**.
- Most of the devices requires special drivers to work appropriately. So make sure you have installed any software discs came with the device.
- Restart your **Windows computer**, as restarting the system is necessary to let the thing settle in the computer.
- If using USB device then disconnect it and **plug it into different USB port**. Windows will detect the device and install the drivers and notifies the users if the device driver won't install properly.
- Check for the driver updates in the **View available updates** to check if an updated driver is available for your device. Or you can also go to the manufacturer website to check for the latest updates.

#### **Conclusion:**

So this is all about different **driver problems and the ways to fix them**. I tried my best to list down entire common driver issues with complete fixes.

Check out the **driver problem** you are facing and follow the solutions given, despite this also try the manual fixes to get rid of the common driver problem.

Hope the article worked for you to resolve the common driver problems but if you are facing any other driver related problem that I missed to list down then visit our **Fix Driver Issues Hub**.

Moreover you can scan your system with the **PC Repair Tool**, to get rid of various computers problems and other errors related to it. It also help you to improve your Windows PC performance.

Also, we love to hear from you if you are having any query, suggestion or comments, then feel free to write down in the comment section below.

#### How to Fix a Non Functioning Driver

Your computer is made up of several devices called hardware. For hardware to function properly with your computer you must have software (Programs) installed called drivers that allow the hardware to

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communicate with you computer. When you experience problem with sound or visuals on your computer, the simplest solution that almost always works is reinstalling the drivers.

Steps
device Manager
File Action View Help
Scan for hardware changes
> 🖣 Audio inputs and outputs
> 🦢 Batteries
> 🚯 Bluetooth
> 💻 Computer
🔉 🕳 Disk drives
> 属 Display adapters
> 🔗 DVD/CD-ROM drives
> 🗛 Human Interface Devices
> 📷 IDE ATA/ATAPI controllers
> 🚠 Imaging devices
> 🔤 Keyboards
> Memory technology devices
Mice and other pointing devices

**1. Determine the cause of the problem:** The first step is to identify the problem. Is it with your sound. Then the problem is most likely with your sound card driver (Just make sure your volume is turned up before you continue). If have problems when playing games or have a strange looking picture when watching videos, then the problem is most likely with your graphics card. And if your problems are with a device that you attach to your computer via USB (A camera, an external hard drive, etc.) there is a problem with your USB drivers.

ieneral	Driver	Details	Events			
	Speakers (Realtek High Definition Audio)					
Driver Provider:			Microsoft			
	Driver Date:		3/17/2017			
Driver Version:		Version:	10.0.15063.0			
	Digital Signer:		Microsoft Windows			
Dri	ver Detai	ls	View details about the installed driver files.			
Update Driver		er	Update the driver for this device.			
Roll Back Driver			If the device fails after updating the driver, roll			

**2.Check for updates for your drivers:** Most computer manufactures have websites for drivers and updates for your computer. Always try updating first before you reinstall the driver. Simply go to the manufactures website and click on the drivers and downloads link. If your manufacture doesn't have a link, you might have to contact support.



**3.Open the Device Manager:** If there are no updates for your drivers or you have updated and the problem persists, you will have to uninstall and then reinstall the driver. To do this you first have to open up device manager. Click start, right click on My Computer and click Properties. If you have Windows XP click on the Devices tab and then click on Device Manager. If you have Windows Vista click on the Device Manager link on the top left (You may have to click allow if prompted).

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🛃 Device Manager
File Action View Help
V 📇 DESKTOP-P579963 Scan for hardware changes
> 📲 Audio inputs and outputs
> 🗃 Batteries
> 🚯 Bluetooth
> 💻 Computer
> 🕳 Disk drives
> 🔜 Display adapters
> 🔐 DVD/CD-ROM drives
> 🚜 Human Interface Devices
> 📷 IDE ATA/ATAPI controllers
> 🚠 Imaging devices
> 🔤 Keyboards
> Memory technology devices
> 🚺 Mice and other pointing devices 🛛 🖉 wilki How to Fix a Non Functioning Driver

**4.Find the driver you need fixed:** Search through the list by clicking the plus button next to each category. Sound drivers are usually under the Sounds category, video drivers are usually under the Video Display category, and USB drivers under the USB Hub category.



**5.Uninstall the Driver:** To uninstall the driver simply right click on it and click the uninstall button. If prompted say yes when asked if you want to uninstall (Windows Vista users may also have to click allow).

📕 Adobe Acrobat XI Pro		Skype	Faceboo
Snagit 11 Editor			
Suggested		store	
Sleep	Free⁺		
Shut down			
Restart		Ps	0
د». *		Photoshop C	Control
123CopyDVDPlatinum	~		
Type here to search	wild	U I I I I I I I I I I I I I I I I I I I	]) C

**6.Restart your computer:** Click start and then click the shutdown button. Once shutdown wait a few minutes and then boot your computer back up. The driver should have reinstalled. Test to make sure the problem is fixed

<u>Content/Topic 4: Description of Power supply types</u>

A power supply is an electronic circuit that converts an AC voltage to DC voltage.



The **power supply unit (PSU)** in a PC regulates and delivers the power to the components in the case.

Standard power supplies turn the incoming 110V or 220V AC (Alternating Current) into various DC (Direct Current) voltages suitable for powering the computer's components.

Power supplies are quoted as having a certain power output specified in Watts, a standard power supply would typically be able to deliver around 350 Watts.(helpwithpcs)

The more components (hard drives, CD/DVD drives, tape drives, ventilation fans, etc) you have in your PC the greater the power required from the power supply.

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By using a PSU that delivers more power than required means it won't be running at full capacity, which can prolong life by reducing heat damage to the PSU's internal components during long periods of use.

Always replace a power supply with an equivalent or superior power output (Wattage).

# There are 3 types of power supply in common use:

- AT Power Supply used in very old PCs.AT power supply, ATX power supply, and SFX (microATX)power supply are picked up as power supplies for computers. ... To start up AT power supply, turn on the switch located in AC input side. However, of late, it does not always mean that AC input is directly turned on or off.
- ATX Power Supply still used in some PCs.ATX (Advanced Technology eXtended) is a motherboard and power supply configuration specification developed by Intel in 1995 to improve on previous de facto standards like the AT design. ... ATX is the most common motherboard design.
- **ATX-2 Power Supply** commonly in use today. The ATX standard has two different versions of the main power cable: the original 20 pin cable, and the the newer 24 pin cable. ... If your power supply main power cable and motherboard main power connector both have the same number of pins then they'll (of course) fit together just fine.

# LO2.3 - Connect and disconnect the computer and peripheries

• <u>Content/Topic 1: Identification of External cables</u>

Computer cables are confusing to most users. Here's a visual guide to help you quickly identify all the common cable and connectors that came bundled with your computers, mobile phones and other electronic gadgets. You may also refer to this guide for ideas on how to hook different devices using commonly available connectors and converters.

## 1. USB Cables

You can use USB cables to connect most new devices to your computer including flash memory sticks, portable media players, internet modems and digital cameras.

Computer accessories like mice, keyboards, webcams, portable hard-drives, microphones, printers, scanners and speakers can also be connected to the computer through USB ports. Additionally, USB cables are also used for charging a variety of gadgets including mobile phones or for transferring data from one computer to another.



The standard USB connector, USB-A, is a rectangular connector. The USB-A end is present on every USB cable as it is the end that connects to your computer.

The other end of the USB cable may have different connectors including USB-B (a square connector commonly used with printers, external hard drives, and larger devices) or smaller connectors such as the Mini-USB and Micro-USB that are commonly used with portable devices such as media players and phones.



Additionally, many other connectors have USB-A connectors at the end that connects to the computer, and a device-specific connector at the other end (e.g. the iPod or a Zune). Then you have USB Male to Female connectors for extending the length of a USB cable.

Many other non-USB cables can also connect to your computer via a USB converter; these cables have the standard USB-A connector on one end while the other end could have connections for other ports such as Ethernet or audio.

# 2. Audio Cables and Connectors

2.1 - 3.5mm headphone jack





Standard 3.5mm audio jack the most common audio cable is the standard headphone jack, otherwise known as a TSR connector. It is available in several sizes, but the most common ones used with computers are the 3.5 mm or 1/8" mini audio jack.

Most speakers and microphones can connect to the computer with these audio cables. The microphone port on your computer is usually pink while the speaker port, where you insert the stereo audio cable, is colored green. Some computers have additional TSR audio ports colored black, grey, and gold; these are for rear, front, and center/subwoofer output, respectively.

# 2.2 - Digital Optical Audio

For high-end audio, like when you want to connect the output of a DVD player or a set-top box to a Dolby home theater, you need the TOSLINK (or S/PDIF) connector.



These are fiber optic cables and can therefore transmit pure digital audio through light. Some laptops and audio equipment have a mini-TOSLINK jack but you can use a converter to connect it to a standard TOSLINK (Toshiba Link) port.

# 3. Video Cables

## 3.1 - VGA



One of the most common video connectors for computer monitors and high-definition TVs is the VGA cable. A standard VGA connector has 15-pins and other than connecting a computer to a monitor, you may also use a VGA cable to connect your laptop to a TV screen or a projector.



Converter cables are also available to let VGA monitors connect to newer computers that only output HDMI or DVI signals. A smaller variant of VGA, Mini-VGA, is available on some laptops but with the help of a converter, you can connect any standard VGA monitor to a Mini-VGA port of your laptop.

# 3.2 - DVI Monitor cable

## **DVI cable**



If you have purchased a computer in the recent past, chances are that it uses DVI instead of VGA. The new breed of "thin" laptops use the smaller variants of DVI like the Mini-DVI and Micro-DVI (first seen in MacBook Air).

A DVI cable has 29 pins, though some connectors may have less pins depending on their configuration. DVI's video signal is compatible with HDMI, so a simple converter can allow a DVI monitor to receive input from an HDMI cable.

Additionally, DVI to VGA converters are also available for connect your new graphics card to old monitor that supports only VGA mode.

## 3.3 - S-Video



S-Video cables, otherwise known as Separate Video or Super Video cables, carry analog video signals and are commonly used for connecting DVD players, camcorders, older video consoles to the television.

Standard S-Video connectors are round in shape and may have anywhere between 4-9 pins.



# 4. Audio and Video Cables

## 4.1 - RCA Connector Cables

RCA connector cables are a bundle of 2-3 cables including Composite Video (colored yellow) and Stereo Audio cables (red for right channel and white or black for the left audio channel).



Sometimes additional cables may be included, offering additional audio channels and/or component video instead of composite. Component video offers better picture than composite because the video signal is split in different signals while in the case of composite, everything is transferred through a single yellow plug.

Uses of RCA Connectors - The RCA cables are usually used for connecting your DVD player, stereo speakers, digital camera and other audio/video equipment to your TV. You can plug-in an RCA cable to the computer



via a video capture card and this will let you transfer video from an old analog camcorder into your computer's hard drive.

## 4.2 - HDMI Cables

HDMI is the new standard that provide both audio and video transmission through a single cable. HDMI support a maximum resolution of 4096×2160p (HD is only 1920×1200) with up to 8 channels of digital audio and are used for connecting Blu-Ray players to an HDTV.



Standard HDMI cables can be up to 5 meters long, but higher quality ones can be up to 15 meters long, and the length can be further increased with amplifiers. HDMI is backwards compatible with DVI so you can use a converter to watch video on a DVI device through the HDMI cable though you will have to use another cable for the audio.

## 4.3 – Display cable



DisplayPort - MacBookA combined digital video and audio cable that is more commonly used in computers is DisplayPort and the smaller derivative Mini DisplayPort. Both support resolutions up to 2560  $\tilde{A}$ — 1600  $\tilde{A}$ — 60 Hz, and additionally support up to 8 channels of digital audio.

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Mini DisplayPort connector is currently used in MacBooks but we could them in other computers as well in the near future.

Standard DisplayPort cables can be up to 3 meters long, but at a lower resolution cables can be up to 15 meters long. DisplayPort connectors are available to connect VGA, DVI video, or HDMI video and audio with a DisplayPort cable or connection. Additionally, converters are available to convert Mini DisplayPort into standard DisplayPort.

# 5. Data Cables

5.1 - Firewire IEEE 1394



Firewire, otherwise known as IEEE 1394, i.LINK, or Lynx, is a faster alternate to USB and is commonly used for connecting digital camcorders and external hard drives to a computer. It is also possible to ad-hoc network computers without a router over FireWire.

Firewire typically has 6 pins in its connector, though a 4 pin variety is common as well.

## 5.2 - eSATA Cables



esata for hard drives While SATA cables are used internally for connecting the hard drive to the computer's motherboard, eSATA cables are designed for portable hard drives, and can transfer data faster than USB or FireWire.

However, the eSATA cable cannot transmit power, so unlike USB, you cannot power an external hard drive with eSATA. The eSATA cable is somewhat different from the internal SATA cable; it has more shielding, and sports a larger connector.

## 4. Networking Related Cables





# 6.1 - Phone RJ11 Cable

The telephone cable, otherwise known as RJ11, is still used around the world for connecting to the Internet through DSL/ADSL modems. A standard phone cable has 4 wires and the connector has four pins.

The connector has a clip at the top to help maintain a tight connection.



# 6.2 - Ethernet Cable

Ethernet is the standard for wired networking around the world. The Ethernet cable, otherwise known as RJ45, is based on Cat5 twisted pair cable and is made from 8 individual wires.



The Ethernet connector, likewise, has 8 pins and looks similar to a phone plug, but is actually thicker and wider. It too has a clip to help maintain a tight connection like a phone connector.

Serial Cable





A serial cable is a cable used to transfer information between two devices using a serial communication protocol. The form of connectors depends on the particular serial port used. A cable wired for connecting two DTEs directly is known as a null modem cable.

#### **Parallel Cable**

A series of metal wires that enable multiple bits of data to be transferred simultaneously. Parallel cables have mostly given way to serial cables, where data is transferred one bit after another.

Parallel ports provide an interface to connect multiple lines to prepare a parallel communication to send large data at a time. Parallel ports are used in connecting printers, hard-drives, CD-drives etc. ... Serial Port is used for serial data transmission. Parallel Port is used for parallel data transmission.

#### **Power Cable**



Alternatively known as a power cable, mains cable or flex, a power cord is the primary cable that provides power to the computer, printer, monitor, and components within a computer. The image is an example of the power cord that is commonly used with computers, monitors, printers, and other peripherals.

<u>Content/Topic 2: Selection of External cables to be used</u>

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Computer cables are used to connect monitors, keyboards, printers, hard drives, and other peripherals to computers.

The IEEE Global Spec Search database contains information about many different types of computer cables. Examples include:

**Parallel ATA (PATA)** cables are used to connect storage devices such as hard drives and CD-ROM drives to a computer's motherboard. These ribbon cables have two or three connectors, only one of which plugs into the motherboard. The remaining 40-pin or 44-pin connectors plug into the drives

**Serial ATA (SATA) cables** are also designed to connect storage devices to motherboards. They provide higher data transfer speeds and have two 8-pin connectors, one on each end.

**Extended SATA (eSATA)** cables are used to connect external hard drives or optical drives. They provide transfer speeds that are approximately three times faster than FireWire 400 and USB 2.0.

**USB cables** use the universal serial bus (USB) protocol to connect standard PC peripherals such as mice and keyboards, as well as mass storage devices and digital cameras. USB versions include USB 1.1, USB 2.0, and USB 3.0.

**FireWire cables** are used to connect PCs to digital camcorders, set-top boxes and other digital devices that use FireWire, an interface standard developed by Apple and adopted by the IEEE. FireWire supports hot swapping and allows the transmission of data, video and audio over a single cable at very high bit rates.

**VGA cables** are used to connect personal computers (PCs) to computer monitors. They have connectors that consist of 15 contacts arranged in three rows. Each row corresponds to a separate channel: red (R), green (G), and blue (B).

**DVI cables** are used to provide high-quality outputs to display devices such as LCD monitors, plasma TVs, and projectors. DVI is faster than VGA.

Engineering360 also allows industrial buyers to search for battery, monitor, and keyboard cables; patch cables and cords; plotter and printer cables; and keyboard, video, mouse (KVM) cables.

#### Connectors

Most connectors today are keyed. A keyed connector is designed to be inserted in only one direction. Each power supply connector uses a different voltage, as shown in Figure 2. Different connectors are used to connect specific components to various ports on the motherboard.

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- A Molex keyed connector connects to optical drives, hard drives, or other devices that use older technology.
- A Berg keyed connector connects to a floppy drive. A Berg connector is smaller than a Molex connector.
- A SATA keyed connector connects to an optical drive or a hard drive. The SATA connector is wider and thinner than a Molex connector.
- A 20-pin or 24-pin slotted connector connects to the motherboard. The 24-pin connector has two rows of 12 pins each, and the 20-pin connector has two rows of 10 pins each.
- A 4-pin to 8-pin auxiliary power connector has two rows of two to four pins and supplies power to all areas of the motherboard. The auxiliary power connector is the same shape as the main power connector but smaller. It can also power other devices within the computer.
- A 6/8-pin PCIe power connector has two rows of three to four pins and supplies power to other internal components.
- Older standard power supplies used two connectors called P8 and P9 to connect to the motherboard.
  P8 and P9 were unkeyed connectors. They could be installed backwards, potentially damaging the motherboard or power supply. The installation required that the connectors be lined up with the black wires together in the middle.

# Content/Topic 3: Identification and selection of I/O Devices (peripheries)

A peripheral device, also sometimes called an auxiliary device, is any connected device, internal or external, that provides a computer with additional functionality.

# Peripheral devices fall into three main categories:

- Input devices, which send data to the computer.
- Output devices, which receive data from the computer.
- Input/output devices, such as storage devices.

Some of the Input devices are:

1. Mouse





A mouse is an input device that uses "point and click" technology to interact with a computer. Modern mice usually have two buttons, the left button and right button, with a scroll wheel in between the two. The device was named a "mouse" because the inventors thought that the wire that connects the device to the computer resembled a mouse tail. Nowadays, mice often connect to the computer using wireless technology.

2. Keyboard



Keyboards are the most common input device. The user enters letters, numbers, and other symbols to give the computer with information and instruction. Using a keyboard to enter a lot of information is called typing. The keyboard works through push buttons or mechanical switches, known as "keys", being pressed, and the resulting signal being sent to the computer. In the past, keyboards used to connect to the computer via a DIN connector, but nowadays they are more likely to connect via a USB port, or be wireless.

# 3. Webcam (Camera)

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These input devices are video cameras that connect to a computer. They can be external or built-in. Webcams are most often used to enable people to see each other when communicating over the internet, or for recording video blogs, or other videos. As well as computers, webcams can also be built into mobile phones. The first webcam was developed in 1991 at the University of Cambridge and pointed at a coffee pot so that researchers from around the Computer Science Department wouldn't make a journey, only to discover it was empty.

## 4. Microphone



Microphones are audio input devices. The microphone feeds a sound signal to the computer, where it can be recorded, or streamed across the internet. Microphones are often built into laptops, webcams and mobile phones nowadays. The earliest microphones were telephone transmitters invented in the latter half of the 19th century. Various designs were tried, but the first to have reasonable sound quality were (loose-contact) carbon microphones that were developed independently by David Edward Hughes in England, and Emile Berliner and Thomas Edison in the US.(kayako)

#### Scanner



A scanner is a device that captures images from photographic prints, posters, magazine pages, and similar sources for computer editing and display. Scanners come in hand-held, feed-in, and flatbed types and for scanning black-and-white only, or color.

Bar code scanner

#### A barcode scanner





A barcode scanner, also called a point-of-sale (POS) scanner or a price scanner, is a device used to capture and read information contained in a barcode. The scanner consists of a light source, a lens and a light sensor that translates optical impulses into electrical ones.

#### Some of the output devices are:

#### 1. Monitor



The most common output device, monitors enable users to interact with a computer more easily. The monitor essentially displays a signal sent by the computer in a visual format. Monitors look similar to televisions in outward appearance, but typically have a higher display resolution than televisions, enabling greater visual detail, plus they lack a tuner to change channels. As with televisions, modern computer monitors use flat screen technology and have fallen in price in recent years.

#### 2. Speakers

# Page **106** of **217**



A computer speaker is another common type of output device. They typically come in pairs to provide stereo sound and sometimes with a subwoofer unit too in order to enhance bass frequency. Computer speakers usually have built-in amplifiers and therefore require a power supply, either from the mains, batteries, or via a USB port. In the past, speakers normally received their audio signal via a 3.5 mm jack plug, but it's increasingly common nowadays for computer speakers to be wireless and use Bluetooth technology. Altec Lansing claim to have produced the first commercially available computer speakers in 1990.

#### 3. Projector



Projectors are optical output devices that enable a roomful of people to see visuals generated by a single computer. As their name suggests, projectors "project" still or moving images onto a screen, blank wall, or other surface. Digital projectors first came onto the market in the early 2000's and have now almost completely replaced older, pre-digital models. They are typically used for presentations, watching movies, or as a teaching aid, and usually connect to the computer via the HDMI port.

4. Printer





Printers are another common form of output device. They are used to generate hard copies of electronic data stored on a computer, most often text or images onto paper. The first electronic printer to be invented was the EP-101, released by the Japanese company Epson in 1968. Inkjet and laser printers are two of the most common types of printer found today, with modern printers connecting to the computer via the USB port or WI-FI. The rise of other technologies such as email and data storage devices have somewhat diminished the importance of printers in recent years.

## Some of the input/output devices are:

## 1. USB Flash Drive

Also called a thumb drive, gig stick, flash stick, pen drive, USB stick, jump drive, flash-drive, memory stick, or USB memory, the USB flash drive is a data storage device that consists of flash memory with an integrated USB interface. Small and light, USB storage drives are usually removable and rewritable. Since their appearance in the year 2000, these storage devices have gradually increased their storage capacity, while falling in price. They are commonly used for transporting and transferring information and are durable, thanks to a lack of moving parts.

# 2. External Hard Drive

External hard drives are input/output storage devices that usually connect to a computer via USB. They hold relatively large amounts of data and plug and play drive functionality enables them to be easily used with a variety of different computers. There are two categories of external hard drives: portable and desktop. Portable external drives are more compact, usually powered by USB and designed for transportation, whereas the desktop version is usually larger and needs external power bricks for power.

## Page **108** of **217**
# <u>Content/Topic 4: Identification of Connectors or Ports</u>

A connector is a device that terminates a segment of cabling or provides a point of entry for networking devices such as computers, hubs, and routers.

With so many types of **Connectors/Ports**, it's hard to find a singular source of information that highlights the important differences between them all. Here's an overview of the most common computer **Connectors/Ports** types you'll encounter when dealing with computers.

# 1. VGA (Video Graphic Array)

Also known as D-sub cable, analog video cable



Connect one end to: computer monitor, television (PC input port)

Connect other end to: VGA port on computer (see image below)



# 2. DVI connector



Connect one end to: computer monitor

Connect other end to: DVI port on computer (see image below)

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However there are 2 types of DVI, DVI-I and DVI-D.

DVI-D does not have the extra pins around the long pin, this is also a pure digital signal over DVI-I.

# 3. HDMI connector



Connect one end to: computer monitor, television

Connect other end to: HDMI port on computer (see image below)

Note: If you're hooking up a television to your computer, then we would recommend that you use a HDMI cable as your PC cable connection since it is able to transmit both display and sound - So you can not only use your TV screen as a monitor, but also make use of your TV speakers to play PC audio.



4. PS/2 connector



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Connect one end to: PS/2 keyboard, PS/2 mouse

Connect other end to: PS/2 ports on computer (see image below)

- Purple PS/2 port: keyboard
- Green PS/2 port: mouse



# 5. Ethernet

Also known as RJ-45 connector/port



Connect one end to: router, network switch

Connect other end to: Ethernet port on computer (see image below)



#### 6. 3.5mm Audio

Also known as phone connector (since 3.5mm jacks are often found on mobile phones too)





Connect one end to: computer speakers, 3.5mm headphones, 3.5mm microphone

Connect other end to: audio ports on computer (see image below use Green socket)

- Green audio port: computer speakers or headphones
- Pink audio port: microphone
- Blue audio port: MP3 player, CD player, DVD player, turntable, electric guitar etc (line-in port to play and record sounds from the above devices)(computerhope)



#### 7. USB connector

For USB computer cable connections, there are two popular formats: USB 2.0 and the newer USB 3.0

How to tell USB 2.0 and 3.0 cables apart: USB 3.0 cables have a blue tip, and sometimes you can find a SS "Super Speed" label on it.





Since USB was intended to be the one computer cable connection to replace them all, it's no surprise that the possible uses for a USB port are quite mind-blowing. For this computer cable guide, we have listed its more common uses below:

Connect one end to: USB device

- Storage devices: USB flash drive, external hard drive, external optical drive
- Input devices: USB keyboard (wired and wireless), USB mouse (wired and wireless), webcam, scanner, gamepad
- Output devices: printer, all-in-one office machine, USB speaker
- Wireless adapters: network (Wi-Fi) adapter, bluetooth adapter, 3G adapter
- Data (and charging) cable for mobile devices such as mobile phone, tablet, MP3 player

Connect other end to: USB ports on computer (see image below)

How to tell USB 2.0 and 3.0 ports apart: USB 2.0 ports have black tips while USB 3.0 ports come with blue tips. See image below:



USB 3.0 is backwards-compatible... meaning that you can connect a USB 2.0 device to a USB 3.0 port and vice versa (but the USB 3.0 devices hooked up to a USB 2.0 port will perform at lowered rates)

There are also USB cables which connect new external backup drives (see below), these are described as USB-A to Micro-B





# 8. Computer Power Cord (Kettle Plug)

UK Plug AC Power Cord Cable With Fuse



Connect one end to: AC power socket

Connect other end to: power supply unit (see image below), computer monitor

Note: Always turn off your power supply unit (with the 1-0 switch at the back) before connecting a power cord to it.



#### 9. Thunderbolt/USB-C

Mostly seen on laptops and Apple Macs these cables are high speed and are capable of carrying Data, video and other information.

There are 2 current types of Thunderbolt, the older version Thunderbolt 2 is seen below but this can also be confused with Mini Display ports as they look identical and only visual difference is the picture beside the port. Thunderbolt 2 (left) has a lightning symbol and carries Data and video.



The Mini Display Port (right) will only carry Video.



And Thunderbolt 3 also has known as USB-C on Apple Macs.



# 10. Display Port



Display Port is the best to use if you require a fast, high-resolution image.

The cable has better quality over HDMI and is the best option if you have this interface.

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#### Serial Port



In computing, a serial port is a serial communication interface through which information transfers in or out sequentially one bit at a time. This is in contrast to a parallel port, which communicates multiple bits simultaneously in parallel.

Serial ports are also used to connect equipment together, e.g. modems of one type or another (PSTN, 3G, satellite), GPS units, telescopes, sensors, power inverters, and many type of industrial control equipment.

# **Parallel Port**



In computing, a parallel port is a type of interface found on computers (personal and otherwise) for connecting peripherals. The name refers to the way the data is sent; parallel ports send multiple bits of data at once (parallel communication), as opposed to serial communication, in which bits are sent one at a time.

#### **Microphone Jack**



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A microphone jack is a small round outlet, usually on a computer, camcorder, or stereo, into which a microphone cord is plugged. The jack, sometimes called a mic jack, is an input connector that works much like an electrical socket. The microphone jack is how the microphone's cable or cord connects to this technology. Speaker Jack



Speaker or Audio jacks are found on many types of audio equipment and musical instruments that accept external sound sources. In a car or truck, an audio jack, also called a "media jack" or "auxiliary (AUX) jack," is a mini-phone socket that connects any portable music player to the vehicle's amplifier and speakers.

# Content/Topic 5: Connect or disconnect I/O Devices

#### I/O Devices (peripheries)

Mouse: Today, almost all wired and wireless mice use USB as the interface to the computer. However, older computers may utilize PS/2 or serial ports. If your mouse is wireless, it can be communicating over Bluetooth, RF (radio frequency), or IR(infrared). To proceed, select your connection type from the list below and follow the instructions.

Connecting a wireless USB mouse

A cordless mouse has a small receiver that communicates with the

mouse. The receiver connects to the computer via a USB port.

- 1. Look for a USB port in the back or on the side of your computer and plug in the receiver.
- 2. Once the wireless receiver is connected to the computer, Windows should automatically find and install the appropriate drivers as long as you're connected to the Internet.
- 3. Make sure there are batteries in the mouse or that it is charged.
- 4. Next, verify that the mouse is turn on. Many wireless devices have an on and off switch on the bottom of them.



Connecting a wired USB mouse

USB cable and port



Connect the USB cable coming from the mouse to one of the USB ports (shown right) on the back or side of your computer. If you are using a USB port hub, connect the mouse cable to that.

After the mouse is connected, the computer should automatically install the drivers and provide basic functionality. If the mouse you want to change how any special buttons work, additional software may need to be installed.

If the mouse is not functioning, see our mouse troubleshooting section.

Connecting a Bluetooth mouse



A Bluetooth mouse connects to a computer wirelessly using a Bluetooth signal. The computer must have built-in Bluetooth or have a Bluetooth adapter connected to it.

To connect a Bluetooth mouse to your computer, follow the steps below.

 Open the Bluetooth utility on your computer and make sure Bluetooth is turned on. The Bluetooth utility, if enabled, is found in the notification area, with an icon that looks like the Bluetooth symbol.

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- Turn on the mouse if it has an On/Off switch. Check the Bluetooth utility to see if it detects the Bluetooth mouse.
- 3. When the Bluetooth utility finds the Bluetooth mouse, select the mouse in the Bluetooth device list and click the **Pair** button.
- 4. If successful, the mouse connects to the computer.

# Тір

If the Bluetooth utility does not detect the Bluetooth mouse, check the bottom of the mouse or inside the battery compartment for a small button. If found, press the button, as it may be required for the mouse to be discoverable by the computer. If no button is found and the mouse came with a software installation disc, install the mouse software on the computer. After installing, check the Bluetooth utility to see if it detects the Bluetooth mouse.

Connecting a PS/2 mouse

# <mark>Note</mark>

Before connecting or disconnecting the PS/2 mouse, make sure the computer is turned off.



ComputerHope.com

Connect the cable coming from the mouse to the green-colored PS/2 port (shown right) on the back of the computer. If your PS/2 ports are not color-coded, the mouse port is the furthest port from the left side of computer chassis (when viewed from the back).

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After the mouse is connected, the computer should automatically install the drivers and provide basic functionality. If the mouse you want to change how any special buttons work, additional software may need to be installed. If the mouse is not functioning, see our mouse troubleshooting section.

#### Connecting a serial mouse

### <mark>Note</mark>

When connecting or disconnecting a serial mouse, make sure the computer is turned off.



Connect the mouse to the serial port on the back of the computer. If you have more than one serial port on the computer, we recommend connecting the mouse to the first port. Once connected, depending on your computer setup, you may need to configure the mouse COM ports in BIOS setup.

Today, most computers no longer have serial ports. Most serial mice are specialized, so to use one, you need to install the software included with the mouse, or from the mouse manufacturer's website.

If you're having problems connecting a serial mouse because the computer has no serial port or the port is not working, consider using a serial to USB adapter.

#### **BIOS** setup

If you have an older computer (2005 or earlier) with a serial or USB mouse, it may be necessary to configure the ports in BIOS setup. If you have a newer computer, this section can be skipped.

How to enter the BIOS or CMOS setup.



#### Older computers with serial mice

If you're using a serial mouse and it's not detected, verify that the serial ports or <u>COM ports</u> are enabled and properly assigned in BIOS.

### Older computers with USB

If the mouse connects via USB, make sure USB is enabled and if available, also ensure that the USB legacy support is enabled. USB legacy support allows the mouse to work in legacy mode, for example, DOS.

#### Mouse troubleshooting

If your mouse is not working after following the steps above, additional troubleshooting may be required. **Keyboard:** What can I do if my USB keyboard isn't working in Windows?

#### 1. Turn off power saving options

- The power-saving option in Windows allows the computer to disconnect the idle devices to conserve power. However, this can also cause issues with USB devices. Try disabling the option and check for any improvements.
- 2. Press "Windows Key + R" to open Run.
- 3. Type devmgmt.msc and click OK to open the Device Manager.
- 4. Click to expand the **Keyboard** section.



5. Right-click on "HID Keyboard Device" and select "Properties".

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- 6. In the Properties window, click the Power Management
- 7. Uncheck "Allow the computer to turn off the device to save power" option.
- 8. Click **OK** to save the changes.
- 9. Disconnect your keyboard and plug it back in. Check for any improvements.

## 2. Reinstall Universal Serial Bus controller driver

- 1. If the issue persists, you can fix it by reinstalling the USB controller driver from the device manager.
- 2. Open the **Device Manager** by searching for **Device Manager** in the search bar.
- 3. Click on the Universal Serial Bus controllers section to expand it.

4. Now look for the list which is related to your keyboard.



of initiality the arrest for the selected device.

- 5. Right-click on the Keyboard device and select the "Uninstall Device" option.
- 6. Once the device is uninstalled, restart the computer.
- 7. After the restart, Windows will automatically install the device.
- 8. Connect your keyboard to the computer and check for any improvements.

#### 3. Run the hardware troubleshooter

3. Windows 10 comes with a built-in hardware troubleshooter. It can help you to fix any issues with the peripheral devices.

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- 4. Click on Start and select Settings.
- 5. Go to Update and Security > Troubleshoot.
- 6. Scroll down and click on Keyboard.



- 7. Click on Run the Troubleshooter option.
- 8. The troubleshooter will scan the system for any issues. Follow the on-screen instructions to apply any recommended fix.

## 4. Update Windows firmware



- 4. Microsoft releases new updates to fix bugs and security issues periodically. If you haven't updated your computer for a long time now, it may be the right time to do so.
- 5. Click on Start an select Settings.
- 6. Click on Update and Security.
- 7. If no updates are pending, click on **Check Now**.
- 8. Download and install any pending Windows update and reboot the computer.
- 9. After the restart, check if the keyboard disconnecting and reconnecting issue is resolved.

#### Still having issues? Fix them with this tool:

This software will repair common computer errors, protect you from file loss, malware, hardware failure and optimize your PC for maximum performance. Fix PC issues and remove viruses now in 3 easy steps:

- 1. Download this PC Repair Tool rated Great on TrustPilot.com.
- 2. Click **Start Scan** to find Windows issues that could be causing PC problems.
- 3. Click **Repair All** to fix issues with Patented Technologies (Exclusive Discount for our readers).



#### ✓ Monitor:

#### How To Disconnect A Monitor Without Unplugging It

Disconnecting an external monitor is easy; just pull out the VGA or HDMI cord that's connected to your laptop. It's pretty simple but if you don't feel like yanking cords out whenever you want to disconnect a monitor, you need a simpler solution that doesn't force you to repeatedly connect and disconnect cables. We're not saying connecting and disconnecting a cable isn't a viable solution. In fact, it's probably the simplest one that will work every single time and has no side-effects. The only thing is, cables and ports can be damaged if you connect and disconnect them too much, or if you're not careful when you do it. Here are two viable solutions to disconnecting a monitor without unplugging it.

#### **Mirror Your Display**

If you want to disconnect a monitor simply because you don't need an extended desktop for a short period of time, you can just mirror your displays. This will make it so that both internal and external displays show you the exact same thing. There's no selecting which is the primary display, and which is the secondary display. All apps that you open will appear on both screen.

To mirror your display, tap the Win+P keyboard shortcut. From the menu that appears, select the Duplicate option. You can cycle through these options by holding down the Windows key and tapping the P key.



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When you extend your display again, Windows will remember which display was the primary one, and which was the secondary one.

#### **Disconnect A Monitor**

If duplicating the display doesn't do the trick and you need to simulate the display actually being disconnected, consider using the Multi Monitor Tool. It's a free utility by Nirosoft that lets you manage multiple displays. It has quite a few features including an option to turn off or disable any connected display. This tool works only if you have two or more displays.

Run Multi Monitor Tool and from the list of displays that it populates, select your external display. Rightclick it and select either 'Disable selected monitors', or 'Turn Off Monitors'. This will apply only to the monitor you've selected. To turn the monitor back on, select it again, and select the Enable or Turn On option.

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This method has a small problem; when you enable or turn on an external monitor, Windows doesn't remember which was your primary and which was your secondary monitor. The monitor that you connect is always set as the secondary monitor.

You can go to the Settings app on Windows 10 and under System>Display, set your primary and secondary monitors again. If that is too inconvenient, you can instead save your current monitor configuration and load it after enabling your second monitor. This will return your display settings back to the way they were before you disconnected the external monitor.

To save your current monitor configuration, set up your displays exactly how you like them. Open the Multi Monitor Tool and go to File>Save Monitors Configuration. To load a configuration, go to File>Load monitors configuration.

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Scanner: Scanner Error: Cannot Connect to a PC

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Improper communication between your computer and scanner can result in a "Scanner Cannot Connect to PC" error message or no response at all. This can occur on just about any brand of computer and scanner combination for a variety of reasons, including outdated drivers and incorrect installation.

#### **Check Cords and Connections**

One simple reason your computer may not detect the scanner is a loose connection. Check the USB and AC adapter cords and all connections to make sure they're tight and secure. Examine the cables themselves for signs of damage that may prevent them from working properly. Pets can chew on cords or the cables can rub against nearby furniture to wear through the protective outer coating and cause failure. If you're connected through a network, check the various cables and connections at the router.

#### **Follow Directions Exactly**

Scanners can be complicated to install, and often require a careful ballet of multiple steps to do it correctly. If you skip steps or do them out of order, your computer will not see the scanner. Follow all directions exactly for proper installation. Double-check that the scanner works with your operating system, as your scanner may not be compatible with older or the newest versions. Check online at your scanner manufacturer's website for any updates or information for installation problems.

#### Reboot

When it comes to computers, conventional wisdom says to reboot if things seem wonky. Sometimes rebooting helps reset settings that may have gone off, and correct program and operational issues. If your computer suddenly refuses to connect to your scanner -- a scanner you have used in the past without trouble -- restart and see if the problem persists.

#### **Update Drivers**

If your drivers are outdated or corrupted, the computer may have problems detecting or communicating with that device. Check for the newest version of your scanners drivers, and make sure your operating system is updated to promote proper connections. If you've installed a piece of hardware or device before your scanner stopped working, that newcomer may be conflicting with your scanner. Update its driver too, or disconnect it if possible, and see if your scanner works again.

#### **Scanning Problems**

#### Was the connection test successful?

If it fails, verify that there are no problems with the network.

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### Is the IP address set correctly on the computer?

For details on network settings such as the IP address.

# Was the communication disconnected?

If the communication was disconnected during EPSON Scan startup, exit EPSON Scan, and restart after a while. If EPSON Scan cannot restart, turn the printer off and back on, then retry.

Check the **Timeout Setting** in **EPSON Scan Settings**. For details, see the EPSON Scan Help.

# Is the Firewall function active in Windows XP or later, or commercially available security software?

If the Firewall function is active, the search may not work in **EPSON Scan Settings**. In this case, click **EPSON Scan Settings** - **Add** - **Enter address**, and directly enter the IP address.

# Are you scanning a wide range in high resolution?

If a wide range is scanned in high resolution, a communication error may occur. If the scan did not work, lower the resolution.

# Does your computer have more than one network interface?

The scanner may not be able to communicate with computers that have multiple network interfaces. To communicate with the scanner, click **EPSON Scan Settings** - **Add** - **Enter address**, and directly enter the IP address.

# Cannot operate Scan to PC (WSD)

# Is a WSD compatible computer connected to the network?

The Scan to PC (WSD) function is only available for Windows 7/Vista English version computers. Make sure that a computer running Windows 7/Vista English version is connected to the scanner on the same network.

# ✓ Printer :

# Fix printer connection and printing problems in Windows 10

If you're trying to use your printer and run into problems, here are some steps for common printer problems to try to get things working again.

Step 1. Unplug and restart your printer

- Step 2. Check cables or wireless connection
- Step 3. Uninstall and reinstall your printer
- Step 4. Install the latest driver for your printer

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- Step 5. Run the printing troubleshooter
- Step 6. Clear and reset the print spooler
- Step 7. Fix printer problems after updating Windows 10
- Step 8. Change a printer's status to "online"
  - ✓ Projector :

# How to Connect a Projector to a PC

What comes in the projector bag? The projector bag contains the projector, a power cable and a VGA

cable. You are going to need a laptop or any other device that will put a signal out through a VGA port.

# Step 1. Turning on the projector

1. Remove the projector and the power cable from the bag. Find the "AC In" port on the projector and put the correct end of the power cable in to it.

2. Plug the other end of the power cable into the wall outlet or power strip you will be using.

3. Make sure the power switch on the projector is in the correct position. The "Power" LED light will come on once you have completed these steps.

# Step 2. Connecting the Laptop to the Projector

1. Find the VGA cable located in the projector bag.



2. Locate the "RGB In" or VGA In" port on the projector and connect one end of the VGA cable to that.





3. Connect the other end of the VGA cable to the "VGA Out" port on your laptop or other applicable device.

# Step 3. Find the Laptop Signal Using the Projector.

1. Turn on your laptop and get logged in.

2. Turn on the projector using the "Standby/On" button on the top of the projector. At this time the projectors main screen will start to be projected.



3. To force the projector to search for your laptops signal press the "Input" button on top of the projector. You should see "Searching..." on the projection screen. Within a few seconds the projector will find the signal and project your desktop to the projection screen.



4. If the projector does not find your laptops signal you may have to configure the display settings on the laptop. For Windows 7 you will want to press the windows key and the P key together. This will bring up a small menu on the screen. Choose "Duplicate" to project your desktop through the projector.





#### **Disconnecting the Projector**

# Step 1. Turning Off the Projector

1. Once you are finished with the presentation you were using the projector for press the "Standby/On" button. A message will appear on the projection asking if you are sure you want to turn off the projector. If you are sure you want to turn off the projector press the "Standby/On" button again.

2. The projector has now turned off the lamp but the fan will still be running. *Note: It is important to not disconnect the projector from its power supply until the fan has stopped running. Not doing so may cause serious damage to the projector.* 

3. While the projector is cooling down it is safe to remove the VGA cable that is also connected to your laptop and place it back into the projector bag.

# Step 2. Putting the Projector Away

1. Once the projectors internal fan has stopped running it is safe to disconnect it from the power supply.

- 2. Disconnect the power cable from the "AC In" port on the projector.
- 3. Place the power cable and the projector back into the projector bag.

4. Before returning the projector to Media Services please ensure that all parts that came in the bag when you checked it out are returning with the bag when you drop it off. Connect to a projector or PC

When you're in a conference room and need to project, connect your PC using one of the cable connectors in the room, press the **Windows logo key + P**, and then choose one of the four options:

- **PC screen only**. You'll see everything on your PC. (When you're connected to a wireless projector, this option changes to Disconnect.)
- **Duplicate**. You'll see the same things on both screens.
- Extend. You'll see everything across both screens, and you can drag and move items between the two.
- Second screen only. You'll see everything on the connected screen. The other screen will be blank.

Then again, you might not even need a cable. If your PC and the projector both support Miracast, press the **Windows logo key + P**, select **Connect to a wireless display**, choose a projector, and you're set.

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Not sure if your PC has Miracast and can be projected to? Windows will let you know. To check, select the **Start** button, type **Connect**, and then select **Connect** from the list of results.

# ✓ Speaker:

To help you resolve the concern of disconnect and connect sounds playing over and over again, please follow steps below:

- 1. Search for Display Settings and then click it.
- 2. Click Power & sleep.
- 3. Click Additional power settings.
- 4. Click Change plan settings.
- 5. Click Change advanced power settings.
- 6. Click the plus sign (+) beside USB settings.
- 7. Click the plus sign (+) beside USB selective suspend setting
- 8. Set it to Disabled.
- 9. Click Apply, then click OK.

# If the issue is still there you may try the next troubleshooting steps:

1. Right click the sound icon on the bottom right of the desktop screen (near the date and time).

2. Choose **sounds**, when the sound box opens scroll down to you see **device disconnect**, click and highlight it.

Now the bottom left you will see a box with the sound name Windows Hardware Remove, click the arrow on this box. Scroll to the top where you see NONE at the top of the list. Click on apply, and notice the speaker icon symbol is now missing for the device disconnect meaning no sound is chosen.
 Close the sounds box.

Microphone : When you're ready to listen to that important business presentation or audio file, you can connect a headset to your computer to listen to the files rather than using external speakers. Both desktop and laptop computers include the jacks, or small, round outlets, necessary to connect your headset. If your headset features two cylindrical plugs, one plug is for the headphones and the second plug is for the microphone. Your computer also includes USB ports as a possible alternative for connecting your headset. If the cable attached to your headset includes a USB plug, then it is a USB-enabled device and will fit in the USB port.

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### **Standard Headset With Mic**

# Step 1

Locate the headphone and microphone connectors on your computer. These round sockets may be located at the top, front or back of your desktop, or the side or front of your laptop. The panel surrounding the sockets shows tiny symbols for the headphone and microphone.

# Step 2

Examine the headset's metal plugs for thin color bands: the headset plug displays green markings; the microphone plug displays pink markings. The black rubber or plastic part next to the metal plugs displays tiny symbols for the headset and microphone.

# Step 3

Insert the green headphone plug into your computer's headphone jack. Insert the pink mic plug into the microphone jack.

#### **USB** Cable

# Step 1

Locate the USB port on the front, side or back of your computer. This connector features a rectangular slot approximately ½-inch long. A front or side port may offer easier access for connecting and disconnecting the headset.

# Step 2

Insert the headset's USB cable into the USB port. If the cable does not fit one way, rotate the cable plug 180 degrees and try to insert it again. Do not force the plug into the slot. If the slot is horizontal, the plug's USB symbol displaying three wires should face up.

#### Step 3

Wait for your computer to install the headset drivers, if necessary. The confirmation notice will display on the screen.

# Microphone: HP PCs - Resolve Microphone and Audio Line-in Problems (Windows)

# Step 1: Run the audio recording troubleshooter

Automatically identify and fix audio problems with the Windows troubleshooting tool.

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# NOTE:

As an option for device testing, search Windows for and open **Sound recorder**. Click **Start Recording** to create an audio file you can play back to verify functionality.

- 1. In Windows, search for and open Troubleshooting.
- 2. Under Hardware and Sound, click Troubleshoot audio recording.



- 3. Select the device you want to troubleshoot, and then click **Next** to start the troubleshooter.
- 4. If a recommended action displays, select **Apply this fix**, and then test the device.

# Step 2: Check microphone or line-in device status

Check the device status and settings, and then test for an audio signal in Windows sound settings.

- 1. In Windows, search for and open **Control Panel**.
- 2. Click Hardware and Sound, and then click Manage audio devices.
- 3. Click the **Recording** tab and note the status of each device.

#### NOTE:

Available devices differ depending on the computer model and what is currently connected.



cording device b	elow to modify	y its settings:	
Microphone Realtek High I Working	Definition Aud		
<b>Line In</b> Realtek High I Working	Definition Aud	2	
DigitalIn Realtek High I Working	Definition Aud	3	
Stereo Mix Realtek High I Disabled	Definition Aud	• 4	
re	5	et Defauit	Properties
	Microphone Realtek High I Working Line In Realtek High I Working DigitalIn Realtek High I Working Stereo Mix Realtek High I Disabled	Cording device below to modify  Microphone Realtek High Definition Aud Working  DigitalIn Realtek High Definition Aud Working  Stereo Mix Realtek High Definition Aud Disabled  Realtek High Definition Aud Disabled	A set Default

- 1. Microphone port is working and set as Default
- 2. Line In device is working
- 3. Digital In (S/PDIF port) is working
- 4. Stereo Mix (Software mixer) is disabled 🟵
- If multiple microphones or line-in devices are available, select the device you want to use, and then click Set Default.
- If the device contains a small circle with an arrow pointing down, the device is disabled. Right-click the device, and then select Enable.

Click the device name, click **Properties**, and then click the **Levels** tab.

Seneral	Listen	Levels	Enhancen	nents A	dvanced	
Micro	phone	1	0		75	
Micro	phone E	ioost		+20.0	dB	

Adjust the level slider to 75.

Look for any muted icons 💽, and then click the icon to unmute the device.

If **Microphone Boost** is available, adjust to +20.0 dB, and then click **OK**.

Speak into the microphone or start the line-in audio device, and then view the gray bars next to the device name on the **Recording** tab.

#### CAUTION:

To avoid hardware damage when testing a line-in device, start at a low volume and slowly increase it to the desired level. Never turn up volume more than half way to maximum.

Select a	recording	levice below to	o modify its set	tinas:	
	Microg Realte Defau Line In Realte Not pl	shone k High Definit t Device k High Definit ugged in	ion Audio		

- If the bars change to green, the device is detected but you might need to adjust the playback sound settings. Click the Playback tab, select the device used to hear audio, click Properties, adjust volume and mute settings on the Levels tab, and then test the microphone or line-in device.
- If the bars remain gray, test the device on another computer or audio device. If this test fails, the device could be damaged or faulty.
- If the device works with another computer or audio device, continue to the next step.

# Step 3: Check the device connection

Confirm the correct port is used for the connector type on the microphone or line-in device.

Identify the connector type on your microphone or line-in device. Most devices have either a USB connector or a pin connector. There are two types of pin connectors.



- 1. Four-pin connector: Voice and audio devices such as a headset
- 2. Three-pin connector: Audio-only devices such as headphones

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- 2. Identify the compatible computer port for the device. Look for the following icons or color-coded ports.
  - UHeadset port: Many newer computers have one port that supports both three and fourpin connector headsets and headphones.
  - **Headphone port**: Supports headphones only.
  - **Unicrophone port**: Supports microphones only.
  - **Desktop computer ports**: Locate the color coded ports that help identify how to connect the device. Ports and color coding vary by computer model.



Pink (mic) is for microphones.

**Blue** (in) is for audio input devices such as DVD players, tape players, and musical instruments.

Green (out) is for headphones.

Gray, Black and Orange (side, rear, c/sub) are for speakers.

Disconnect and reconnect the device to resolve any connection or device detection issues. If you are using a USB device, try a different USB port on the computer and make sure the device driver is installed.

Test the device.

# Step 4: Check for an updated audio driver

An outdated audio driver can cause sound errors. Check for and install a new driver in Device Manager.

- 1. In Windows, search for and open **Device Manager**.
- 2. Double-click Sound, video and game controllers.
- 3. Right-click the audio device, and then select Update Driver Software.

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- 4. Click Search automatically for updated driver software.
  - If an update is available, install it, and then test the device.
  - If an update is not available, continue to the next step.

# Step 5: Check sound settings in the app or hardware driver where the issue occurs

If the device works in Windows, check audio and voice settings in the app or device driver you are using (such as online meeting apps, games, and webcams). If the microphone or device is configured correctly, check the developer or manufacturer website for app or driver updates.

If the issue persists, contact HP Customer Support, or service the computer.



# Microphone is not working on Windows PC

Whether you are using the microphone built in to your Windows PC, or you've got one plugged in to the analog microphone input you will need to make sure that it's set up correctly.

# Test the microphone on your PC

1. Unplug audio accessories.

Unplug anything unneeded from the audio jacks, and any USB headphones or cameras. Some of these devices may also have microphones that are overriding the microphone you are trying to use.

2. Check the input Settings.

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Right click the sound icon and then click **Open Sound settings**. Make sure the microphone is selected in the **Input** section.

# 3. Test the microphone.

Stay on the sound settings page and speak or make some noise. If the microphone is working correctly, you will see the bar in the **Test your microphone** section move.

✓ Bar code scanner: Barcode scanners can help you manage your inventory and assets, and come in three types: serial scanners connect into a computer's serial port via a serial cable; USB scanners plug into a USB port; and PS/2 scanners plug into a computer's PS/2 port, the port normally used for keyboards, using a PS/2 cable adapter that enables you to plug both the scanner and your keyboard into the port. The barcode scanner is shipped with drivers and other software, so that you can fully utilize the device.

#### Install USB Barcode Scanner

#### Step 1

Plug one end of the included USB cable into the barcode scanner, and then plug the other end into a free USB port on the computer.

### Step 2

Insert the installation CD or DVD that shipped with the device into your computer's CD/DVD drive.

#### Step 3

Click the "Install" option and follow the prompts to install the barcode scanner, including drivers and a barcode application.

#### Step 4

Mount the barcode scanner and secure it in place with brackets or screws, if required. Skip this step if you have a hand-held scanner.

#### Step 5

Open the barcode scanning application that shipped with your scanner.

# Step 6

Scan a barcode label to test your device. When the barcode is scanned, the numbers under the barcode on the label should appear in the application window.

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<u>Content/Topic 2: Verification of connected or disconnected devices</u>

### Input, Output, and Hybrid Devices

I/O devices (also called peripherals) can be used solely to input information, to output information, or to act as a hybrid of the two. Let's start with the types of devices used to input information and the various peripherals a technician might see in the field.

The usual suspects include the keyboard, for typing information in Windows or other OS, and the mouse, for manipulating the GUI. These two are known as human interface devices (HID). Some other devices that you might not have worked with yet include touchpads, digital cameras, web cameras, microphones, biometric devices, bar code readers, and MIDI devices. Table 13.5 describes these devices.

#### TABLE 13.5 Description of Various Input Devices and Peripherals

Device	Description	Types and Connections
Keyboard	Used to type text and numbers into a word processor or other application.	101-key keyboard is standard, USB, PS/2, and wireless connections.
Mouse	Used to control the GUI; works in two dimensions. Might have two or more buttons and a scroll wheel to manipulate the OS. The Buttons tab in Mouse Properties is used to change which buttons act as the primary and alternative click buttons.	Optical mouse, USB, PS/2, and wireless connections.
Touchpad	Device used on a laptop to control the cursor on the screen.	These are often integrated to the laptop but can also be connected externally via USB or Wi-Fi.


Device	Description	Types and Connections
Motion sensor	Device used with PCs, Macs, and gaming consoles to allow a user to control the computer by swiping, grabbing, pinching, and so on in mid- air.	Often connected via USB or Wi- Fi, these are controlled with infrared technology. Some devices can also be controlled with voice activation.
Digital cameras/Camcorders	Takes still photographs and/or video using an electronic image sensor. Images are displayed on-screen and can be saved to solid-state media such as SD cards and CompactFlash.	Can be a single device or integrated into smartphones/tablets. Can connect to the PC via USB or Wi-Fi.
Web cameras (webcam)	Enables a user to monitor other areas of a home or building, communicate via video telephony, and take still images.	Can connect to a PC via USB, to a LAN via RJ45, or via Wi-Fi.
Scanner	Used to optically scan images and other objects and convert them into digital images to be stored on the computer.	Can connect via USB, and IEEE 1394, or via Wi-Fi.
Microphones	Enables users to record their voices or other sounds to the computer. Common usages are webcasts, podcasts, for voice-overs while screen capturing, and for gaming.	Can connect to a PC via 1/8-inch (3.5 mm) mini-jack (sound card) or via USB.
Biometric devices	Provides access to systems based on a particular physical characteristic of a user. Used for authentication purposes	Can be integrated to the PC or can be connected via USB, Wi-Fi,

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Device	Description	Types and Connections
	(for example, a fingerprint reader).	or connected to the network.
Barcode readers	Reads barcodes (for example, linear barcodes, 2D barcodes, Post Office barcodes, and such). After physical installation, they need to be programmed to understand these codes.	Connects to the PC via USB, Wi- Fi, PS/2, or might be integrated into handheld computers and smartphones.
Smart card reader	Device that accepts smart cards used for authentication and data storage.	Can be integrated as a slot (for, example to a laptop). Also available in USB versions.
Musical Instrument Digital Interface (MIDI) devices	Enables computers, music keyboards, synthesizers, digital recorders, samplers, and so on to control each other and exchange data.	Uses a 5-pin DIN Connector.
Gamepads and joysticks	Gamepads are game controllers made famous by Nintendo, PlayStation, and Xbox; there are also gamepads for PCs. Joysticks are often used for flight simulator games.	Connects via USB Type A connections. Older versions used the 15-pin gaming port on a sound card.

Troubleshooting any of the devices in Table 13.5 is usually quite easy. Make sure that the device is connected properly to the computer (or has a working wireless connection) and verify within the Device Manager that the latest drivers are installed for the device. Then find out if any additional software is necessary for the device to function. Portions of the software might have to be installed to the device and to the OS.

Keyboards and mice can be especially troublesome. Keyboard errors are commonly caused by jammed keys and defective cables or cable connectors. A common mouse issue is when the cursor jumps around the screen. This could be due to an incorrect mouse driver or perhaps the mouse is on an uneven or nonreflective surface. Also, you might encounter a mouse that stops working after a computer comes out of sleep mode. Make sure that Windows is updated and that the correct and latest driver is being used for the mouse. Use the associated Control Panel apps to troubleshoot the device. Calibrate the device and/or synchronize the device to the system as necessary.

The main output devices you should know for the exams are display devices and speakers (covered in Chapter 12) and printers (to be discussed in Chapter 14). Because they are covered in those chapters, we will not discuss them here.

A few of the hybrid devices you will encounter are touchscreens, KVMs, smart TVs, and set-top boxes. Table 13.6 describes those in brief.

Device	Description	Types and Connections
Touchscreen	A video display that detects the presence of either a finger, stylus, or light pen that enables interaction with the OS. It incorporates a digitizer (the input portion of the device) that converts the tapping on the screen into digital functions.	Used in tablet PCs, AIO PCs, smartphones, and drawing tablets.
KVM switch	Enables a user to control two or more computers from one Keyboard, Video display, and Mouse (KVM).	Passive: works off computer's USB power Active: plugs into an AC outlet.
Smart TV	Combines the functionality of a television with Internet features and streaming of media.	Users can interact with the TV by inputting information via keyboard, gamepad, or remote control.

### TABLE 13.6 Description of Hybrid I/O Devices

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Device	Description	Types and Connections
Set-top box (STB)	Device used by cable TV and satellite-based TV providers to allow access to digital (and possibly encrypted) television stations. Also used as a hybrid device that combines conventional TV with Internet technologies.	These often manifest themselves as small computers offering two-way communications over TCP/IP networks.

# Learning Unit 3 – Repair computer hardware

#### LO3.1 - Diagnose the computer hardware and status

• Content/Topic 1: Identification of the Diagnostic Tools

A wide range of diagnostic tools are necessary to diagnose and repair computer problems. Diagnostic tools are divided into two major types, **hardware** and **software**.

- 1. Hardware diagnostic tools are generally physical devices that are designed to determine the conditions of various computer hardware components. Examples:
  - A power supply tester is a hardware diagnostic tool that is used to determine whether a computer's power supply is working correctly. There are different types that not only work in different ways, but are sometimes built only for specific kinds of power supplies. By plugging the tester directly into the power supply, the user can test computer power supplies and diagnose specific faults, usually via an LCD screen.
  - Another hardware diagnostic tool is the **POST (power-on self-test)** card, or BIOS (basic input-output system) POST card. These are used mainly to figure out why a computer is not booting up. The user can plug the card into a computer's expansion slot, through which it receives a two-digit error code from the BIOS of the computer. These tools will not work if the BIOS of the computer is non-functional.
  - Loop-back plugs, or adapters, are another type of hardware tool. These simple devices are plugs that are designed for many of a computer's specific ports. When plugged in, they will output simple electronic signals that the user can decode to find various computer bugs while running electronic tests. Many more specialized hardware tools exists, some of which only work with only certain computer systems.
- Software diagnostic tools are computer programs that are used, either in or outside of a system, to determine the causes of software and hardware malfunctions within computer software and hardware. Both software and hardware tools must often be used in diagnosing and repairing computers.

A major example of a software diagnostic tool is a type of program that is used on a majority of computers today, the anti-virus program. This is a type of tool that is used to continuously monitor a computer system for viruses and other computer problems, and attempt to fix them should they arise. Anti-spyware programs are similar and will diagnose computers to check if they have any unwanted programs on them that were designed mainly to cause harm.

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Many more computer software diagnostic tools are built to test and regulate many aspects of a computer system. Some, for example, will monitor the temperature of various hardware components and let the user know when they have become too hot, or increase various fan speeds to compensate. Many similar diagnostic tools are running on computers from the time they boot until they are shut down, and many of these are referred to as computer services.

These other system monitoring software tools can check for errors in hard drives, RAM, system registries, and more. When a computer that isn't working needs to be tested with software, it is often run from an outside computer, such as a laptop. A repair technician's laptop is typically loaded with many of these diagnostic tools, so that the diagnosing computer can itself be a diagnostic tool.

### <u>Content/Topic 2: Description of Diagnostic Process steps</u>

Process Refers to the process of reviewing, diagnosing and identifying operational or technical problems within a hardware device or equipment. It aims to resolve physical and/or logical problems and issues within a computing hardware.

#### **Diagnostic Process steps**

- Gathering information from the customer
- Verifying the obvious issues
- Error/fault identification
- Error/fault analysis
- Error/fault Assessment

#### 1. Gathering information from the customer

The first thing that you need to be aware of when troubleshooting a problem is that the symptoms are not the problem. When troubleshooting, it is critical that you actually identify the underlying problem—what's actually causing the symptoms to manifest themselves. To do that, you should question the customer. Ask detailed questions about when the symptoms occurred and why they may have occurred. If the customer can re-create the issue for you, this can be extremely helpful. Determine what, if anything, has changed, which may have caused the problem. Importantly, before you take any action, make a backup copy of the system, so that you can preserve everything as it is.

#### Highlights:

- Question the customer.
- Remember that the symptoms are not the underlying problem.
- Determine what has changed.

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- Make a backup of the system before moving on.

### 2. Verifying the obvious issues

Once you have identified the base problem that is causing the symptoms, you will establish a list of probable causes. Once you have a list of all of the probable causes, use your technical knowledge to prioritize that list. Your list should have the probable causes listed from most likely to least likely. Incidentally, be sure to question the obvious. For instance, if the symptom is a power situation at the workstation, is the power cord plugged in and, if it is plugged in, is the outlet actually getting power? Additionally, if no probable cause can be determined, you will need to escalate the problem to a higher level.

### **Highlights**:

- Make a list of probable causes.
- Using your knowledge, prioritize the list.
- Question the obvious (i.e., if the symptom is a power issue at the workstation, first check to make sure that the power cord is plugged in).
- Escalate to a higher level if a probable cause cannot be determined.

# 3. Error/fault identification

Once you have established your theory of probable cause, you should take a moment to consider whether or not you can troubleshoot the issue on your own, or if escalating it to a higher authority is called for. If it falls within your capabilities, you will need to test your theory to determine if it is, indeed, the actual cause. Your theory was created from the most likely probable cause, so you need to determine how best to test it. If your theory is confirmed, you will move on to the next step. If the theory is disproved, you will need to go back to step two or step one, as needed, and work your way through the troubleshooting methodology.

### **Highlights:**

- Create your theory from the most likely probable cause.
- If the theory is confirmed, move on to the next step.
- If the theory is not confirmed, go back to step two or step one (if needed).

### 4. Error/fault analysis

Once you have determined the actual cause by testing your probable cause, you will need to establish an action plan and then execute that plan. Simple problems will probably only need simple plans. However, if

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it is a complex problem, you may need to write out the plan so that you can be sure to execute it correctly. This is another opportunity to escalate the problem to a more senior level if necessary.

### Highlights:

- Simple problems probably just need simple plans.
- Complex problems may need written out action plans.
- Escalate to a higher level if required.

### 5. Error/fault Assessment

After you have executed your plan, you will need to verify that the system is fully functional. If everything works—that's great. Based on your findings and the issue, you may find that you have the opportunity to implement preventative measures so that the problem does not occur again. If full system functionality has not occurred, you will need to go back to step one and continue to work through the troubleshooting methodology.

### **Highlights:**

- If everything works, great! If applicable, use your findings to implement preventative measures.
- If not everything works, go back to step one.

### 6. Document the process.

Once everything is fully functional, documenting the process becomes important. This is where you document findings, actions, and outcomes. When the problem occurs again, there will be information available to walk someone through the means of troubleshooting and resolving the issue.

This documentation also captures a history of equipment and users so that perpetual issues become known and recorded. An important aspect of this is that both positive and negative outcomes should be documented. This can save time during future troubleshooting and prevent others from taking the same missteps you may have taken.

#### Highlights:

- Capture your findings, actions, and outcomes.
- Issues that need to be troubleshot may occur again.
- Documentation provides a history of equipment and users so that problem issues are known.

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#### LO3.2: Des-Assemble and re-assemble the computer

- <u>Content/Topic 1: Des-Assembling the computer</u>
- **A computer** is an electronic device that can store, retrieve and process data in accordance with the given instructions.
- **A peripheral:** It is a device which is connected to a computer in order to increase its functionality (i.e. printer, scanner, speakers, etc.).
- A computer system: it is a set of four components which make the computer functional (operational).
- **Computer Maintenance:** is the way a computer can be maintained and protected from having any kind of problem.

Within this unity we will be discussing about a computer which is used by many people and at different places such as Offices, Universities, Schools, Cybercafé, etc. This computer is called "PC-Personal Computer".

It is better to note that the objective of studying this unity is to help students to be able to identify the internal components of the CPU case, to know where those components are connected and how they are connected, to disconnect those internal components and reconnecting them without damaging any of them.

We will put our emphasis on the CPU case, without taking into consideration other physical components that make up a computer system such as the screen (Visual Display Unit, VDU), the keyboard and the printer.

#### INTERNAL ELEMENTS OF A CPU CASE:

- 1. CD/DVD Drive
- 2. Floppy Disk Drive (FDD) Connector
- 3. Motherboard which is printed circuit board that connects the various elements on it through the use of traces, or electrical pathways. The motherboard is indispensable to the computer and provides the main computing capability.
- 4. Printer Port Connector
- 5. Front Audio Connector
- 6. CD-IN Connector
- 7. Front Panel Connector:
  - a. Power Switch
  - b. Reset Switch
  - c. Power LED

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- d. HDD LED
- e. Speaker
- 8. Clear CMOS Header
- 9. SATA Connectors (Serial -ATA): Serial Attachment
  - a. Serial ATA Cable
  - b. Serial ATA Power Cable
- 10. PCI-Express x16 Slot
- 11. PCI-Slots
- 12. USB 2.0 Connectors
- 13. IDE Connectors(Integrated Drive Electronics)
  - a. IDE 1: Primary IDE used to connect HDD to motherboard.
  - b. IDE 2: Secondary IDE used to connect CD Drive to motherboard.
- 14. ATX-Power Connector (24 pins)
- 15. Power Connector (4 pins)
- 16. Back Panel I/O Connectors:
  - a. Parallel Port
  - b. Serial Port
  - c. Game Port
  - d. USB Port
  - e. VGA Port
  - f. Audio Port
  - g. PS/2 Port for Mouse: it has a green color.
  - h. PS/2 Port for Keyboard: it has a purple color.
  - i. LAN
- 17. DIMM Slots with the retaining clips: Each DIMM supports 256MB/512MB/1GB/2GB DDR
- 18. CPU FAN HEADER
- 19. **Power Supply:**Most computer power supplies are a square metal box, and have a large bundle of wires emerging from one end. Opposite the wire bundle is the back face of the power supply, with an air vent. The following are the power cables:
- a. PC Main power connector (usually called P1): Is the connector that goes to the motherboard to provide it with power. The connector has 20 or 24 pins. One of the pins belongs to the PS-ON wire (it is usually green).

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- b. **ATX 4 Pin Molex** (P4 Connector): A second connector that goes to the motherboard (in addition to the main 24-pin connector) to supply dedicated power for the processor.
- c. 4 Pin Berg Floppy Drive Power Connector (usually called Mini-connector or "mini-Molex")
- d. 4 Pin Molex Peripheral Connector: Most of them have four wires: two black, one red, and one yellow. Unlike the standard mains electrical wire color-coding, each *black wire* is a ground, the *red wire* is +5 V, and the *yellow wire* is +12 V. In some cases these are also used to provide additional power to PCI cards such as FireWire 800 cards.

#### e. 6 Pin AUX Connector

#### f. Serial ATA power connectors ESD

Static electricity is the buildup of an electric charge resting on a surface. This buildup may zap a component and cause damage. This is known as electrostatic discharge (ESD). ESD can be destructive to the electronics in a computer system.

#### g. ESD Tools

There are two ESD tools: the antistatic wrist strap and the antistatic mat. The antistatic wrist strap protects computer equipment when grounded to a computer chassis. The antistatic mat protects computer equipment by preventing static electricity from accumulating on the hardware or on the technician. Click each of the items in Figure 1 for more information on ESD tools.



Antistatic wrist strap

#### Antistatic mat

#### ESD (Electrostatic Discharge) Protection Recommendations

ESD can cause permanent damage to electrical components. Follow these recommendations to help prevent ESD damage:



- Keep all components in antistatic bags until you are ready to install them.
- Use grounded mats on workbenches.
- Use grounded floor mats in work areas.
- Use antistatic wrist straps when working on computers.

### Steps for Disassembling a computer

The steps to disassemble a computer are the reverse steps of assembling. If you have a computer which is well connected, you can disconnect each of the components by removing the screws using the screwdriver or by simply disconnecting it from the connector.

### $\checkmark$ Open the case

- a. First we shut down the computer, unplug the power cable and then open the CPU case. By using the screw driver we can remove the screws which fix the hard disk to the CPU case and then unplug the IDE data cable from the HDD and from the IDE 1 connector on the motherboard, we have to disconnect the power cable from the power supply. Finally we push the HDD backwards and we move it from the CPU case.
  - ✓ Disconnect and remove the power supply to the computer case
  - ✓ Disconnect the components to the motherboard and remove the motherboard
- b. To disconnect a CD-ROM from a computer, the procedure is simple; we do as we did on the HDD.
- c. The same for a FDD.
- d. For the Primary memory, we have to push outwards the retaining clips which lock the RAM and then we are able to move the RAM from the DIMM slots.
- e. We disconnect the 20-pin power cable and the 4-pin power cable from the motherboard.
  - ✓ Disconnect internal drives and drives in external bays
  - ✓ Disinstall adapter cards
  - ✓ Disinstall and disconnect all internal cables
  - ✓ Disconnect the side panels and disconnect external cables to the computer
- f. We first unsecure the screw which fixes the card to the CPU case and then we move the card from the expansion slot.
  - <u>Content/Topic 2: Assembling the computer</u>

The following are names of needed components for a PC assembling process:

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- 1. Antistatic
- 2. Toolkit
- 3. Computer case with power supply
- 4. Motherboard with manual
- 5. CPU and fan
- 6. RAM
- 7. Video Card
- 8. Hard drive with its appropriate cable.
- 9. Floppy drive with its appropriate cable.
- 10. CD/DVD ROM Drives with their appropriate cable.

### Assembling the Computer

- 1. Start by preparing the case. Lay it down.
- 2. Attach the motherboard stand up on its new location by fixing the screws which will be its support against the case.
- 3. It might be helpful to examine the motherboard to determine the base stand arrows locations.
- 4. The motherboard is to be fixed on the case by the screws. It must be able to hold horizontally, without falling and move above, because other cards will be fixed.
- 5. Stand arrows are small packs made of non-conductive material that are helpful in short-circuit by preventing the motherboard from attaching the case.
- 6. Once they are installed, temporarily move the case aside to work on the motherboard.

### Steps of Re-assembling the computer

### Introduction

Assembling computers is a large part of a technician's job. This Chapter will teach you how to work in a logical, methodical manner when working with computer components. Objectives Open the case. Install the power supply. Attach the components to the motherboard and install the motherboard. Install internal drives, drives in external bays, adapter cards. Connect all internal cables. Re-attach the side panels and connect external cables to the computer. Boot the computer for the first time.

# $\checkmark$ Open the case

Prepare the workspace before opening the computer case. There should be adequate lighting, good ventilation, and a comfortable room temperature. An antistatic mat on the table will help prevent physical and ESD damage to equipment. There are different ways to open a computer case. Most computer cases are opened in following ways.

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- 1. The computer case cover can be removed as one piece.
- 2. The top and/or side panels of the case can be removed.
- 3. The top of the case may need to be removed before the side panels can be removed.

#### ✓ Install the power supply

Most power supplies can only fit one way in the computer case. There are usually three or four screws that attach the power supply to the case. These screws should be properly tightened when installing or else the fan inside it will start vibrating. Following are the power supply installation steps:

- 1) Insert the power supply into the case.
- 2) Align the holes in the power supply with the holes in the case.
- 3) Locate the Power Supply location for your chassis(case)



You may notice the location will have multiple screw locations. Depending on how the Power supply and case are manufactured, the orientation of the power supply may differ.

- 4) Secure the power supply to the case using the proper screws.
- When the PSU is inserted into the location, The holes will line up as shown below; Secure PSU with provided screws.





6) Connect the pins







# $\checkmark$ Attach the components to the motherboard and install the motherboard

The motherboard is the backbone of your desktop computer. All of your components plug into the motherboard, so ensuring that you install it correctly is the first step towards building your own computer or upgrading an old one. Read on after the jump to get a new motherboard installed in your computer case in just a few minutes.

Install a CPU and a heat sink/fan assembly The CPU and the heat sink/fan assembly may be installed on the motherboard before the motherboard is placed in the computer case. Before installing CPU and heat sink/fan know following information about them. CPU The CPU and Motherboard are sensitive to ESD hence Antistatic tools should be used. While handling a CPU, do not touch the CPU pins at any time. The CPU sockets today are ZIF sockets. The CPU is secured to the socket on the motherboard with a locking assembly. Thermal compound applied over the CPU helps to conduct heat away from it. If you are installing a used CPU, clean the CPU surface and the base of heat sink with Isopropyl alcohol.

### Install internal drives and drives in external bays

Heat Sink/Fan It is two-part cooling device. The heat sink draws heat away from the CPU. The fan moves the heat away from the heat sink. The heat sink/fan assembly usually has a 3-pin power connector. Following are the instructions for CPU and heat sink/fan assembly installation. 1. The CPU is secured to the socket on the motherboard with a locking assembly. 2. Place the CPU gently into the socket.

### 1. Memory Installation

- a. Unlock a DIMM slot by pressing the retaining clips outwards. Align a DIMM on the slot such that the notch (cut) on the DIMM matches the break on the slot.
- b. Insert the DIMM vertically and firmly into the slot until the retaining clips snap back in place and the DIMM is properly sat.

The motherboard is now ready to be installed in the case.

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- a. Align the motherboard with the stand arrows inside the case.
- b. The motherboard may need to be pushed back side against the I/O back plate to be fixed correctly.
- c. Once the motherboard is sited, use the proper screws to secure to the case.
- d. Now connect the front panel cables to the motherboard (front panel connector), the proper location for each LD plug, should be outlined in the motherboard user manual.
- e. Position the computer case, so that it is easy to gain access to the drive base.
- f. Locate an empty base cover and push that base cover.

### 2. Floppy Drive Installation

- a. Retrieve the floppy drive and you need to insert it in the open base, slide and slide again until the front of the drive lies at the same level with the computer case.
- b. So let's the screws be fixed in the floppy drive and screw them in both sides.

# 3. Hard drive installation

- a. Now retrieve the hard drive and make sure the jumper is set to the master.
- b. Now lean the hard drive in the lower base and slide the hard drive in until the screw holes match the case wails.
- c. Use proper screws and secure the hard drive to the case.

### 4. CD-ROM Drive Installation

- a. Locate the final place on the front of the case, where to insert the CD-ROM drive.
- b. Push the cover which is at that place and move it.
- c. Retrieve the CD-ROM and make sure the jumper at the back of the drive is set to cable select.
- d. Now slide it in from the front of the case.
- e. Push it back until this matches with the front of the case.
- f. Select the proper screws and secure the CD-ROM to the case.

# Connect the IDE buses and Power cables to installed devices

- a. Locate the proper cable for the floppy drive and attach the end of the cable to the back of the floppy drive.
- b. Take the other end and connect it to the floppy connector on the motherboard. Make sure Pin 1 lies up with the proper Pin on the motherboard connector.
- c. Retrieve the IDE bus for the CD-ROM and attach one end of the cable to the back of the CD-ROM.
- d. Attach the other end to the secondary IDE (IDE 2) connector on the motherboard.

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- e. Retrieve the IDE cable for the hard drive; attach one end of the cable to the back of the hard drive.
- f. And attach the other end to the primary IDE (IDE 1) connector on the motherboard.
- g. Now connect the power to each installed device.
- h. Examine the back of each drive; find the power connectors on the back of each device.
- i. Connect the correct power cables to the CD-ROM drive, the hard drive and the floppy drive.
- j. Connect the 24 Pin ATX power connector to the motherboard (JATXPWR 1).
- k. You can connect a 4 Pin ATX power (JATXPWR 2).

#### ✓ Install adapter cards

#### 5. Video Card (Graphic Card) Installation

- a. Prepare the expansion slot for the video card by removing a slot cover.
- b. Retrieve the video card and insert it into its appropriate slot.
- c. If necessary, lock it generally until it is sat in the slot.
- d. After the video card is seated, screw one hole on the video card with the computer case using a screwdriver.
- e. The PC is now ready to be used for the first time. However, before closing the case, go over everything that has been installed and make sure all connections are secure.
- f. Close the cover and secure with its provided screws.
- g. Plug-in the power cable, the keyboard, the monitor and the mouse.
- h. Turn the PC and the monitor on.
- i. The screen should show the computer running the Power On-Self Test (POST).

#### 6. installing a Sound Card

- a. A computer must be shut down and unplugged before installing the sound card.
- b. Open the computer case and lay it on a flat surface.
- c. Make sure you're wearing an ESD (Electro-Static Discharge)
- d. Locate an empty expansion slot and remove in the screw in hole and the extension cover in place.
- e. Retrieve the sound card from an antistatic bag
- f. Hold the card by the edges.
- g. Place the card edge connector into the expansion slot. Generally sit the Sound Card and then secure with the screw.
- h. Replace the case cover
- i. You have now installed the Sound Card.
- 7. Installation of the Network Interface Card (NIC)

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- a. Unplug and shut down a computer
- b. Open the computer case and the expansion slot in which the NIC card will be placed.
- c. Put on an ESD and attach it to the computer case.
- d. Remove the Network Interface Card from an antistatic bag.
- e. Holding the card by the edges, place the card edge connector into its expansion slot.
- f. Secure the NIC card to the computer case using the screw.

### ✓ Install and connect all internal cables

Align the auxiliary power connector to the auxiliary power socket on the motherboard. Gently press down on the connector until the clip clicks into place. Plug a power connector into the hard disk drive, optical drive, and floppy drive. Ensure that the floppy drive power connector is inserted right side up.



Re-attach the side panels and connect external cables to the computer
Some cases use screws that are inserted with screwdriver some uses knob-type screws that can be tightened by hand. Finally, connect all external cables to the back of the computer for devices like monitor, keyboard, mouse, USB, Ethernet, Power.



✓ Boot the computer for the first time



When the computer is booted, the basic input/output system (BIOS) performs a check on all of the internal components. This check is called a power-on self test (POST). 3.9.1 Identify beep codes During POST, if a device is malfunctioning, an error or a beep code alerts the technician that there is a problem. Each BIOS manufacturer uses different codes to indicate hardware problems. Hence, consult the motherboard documentation to view beep codes for your computer.

#### ✓ Configure BIOS

The configuration data is saved to a special memory chip called a **Complementary Metal Oxide Semiconductor (CMOS)**. CMOS is maintained by the battery in the computer. Hence, if battery dies BIOS setup configuration data will be lost. If this occurs, replace the battery and reconfigure the BIOS settings. To enter the BIOS setup program, you must press the proper key or key sequence during POST.

#### **Configure BIOS elements**

#### 1. Definitions

a. BIOS, in computer science, acronym for Basic Input/Output System, a set of routines that work closely with the computer hardware to support the transfer of information between elements of the system, such as memory, disks and the monitor.

On IBM and compatible computers, the BIOS, or ROM BIOS, is built into the machine's Read Only Memory (ROM).

Although critical to performance, the BIOS is invisible to computers users. The BIOS can, however, be accessed by programmers.

b. BIOS can also be defined as: Control program for basic computer operation: it is a small un-erasable computer program that contains the instructions needed to begin operation and controls the data flow between the operating system, application programs and the hardware devices.

#### The BIOS is composed of two elements:

1. A DIP circuit or a memory flash containing the software part,

2. A CMOS circuit (Complementary Metal Oxide Semiconductor) in which are saved the parameters.

The software part allows us to configure the different hardware elements that compose the PC. We can modify:

- a. The date and the hour
- b. The type of the hard disk(s)

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- c. The type of the floppy drive
- d. The type of display

Several manufacturers conceive some BIOS:

- 1. AM (American Megatrends),
- 2. AWARD
- 3. PHOENIX for the most current.

Some big constructors produce their BIOS house, such as IBM and COMPAQ. Until the 486, the BIOS presented itself under the shape of a circuit DIP non rewritable without specialized tools. Now, a new technology has the tendency to spill, the BIOS flash that is simply one EEPROM capable to be reprogrammed to the means of software.

There are several types of BIOS's, ranging from the motherboard ROM BIOS to adapter BIOS's such as video BIOS, drive controller BIOS, network adapter BIOS, SCSI adapter BIOS, etc...

These BIOS's are the lowest level of software in a computer providing a set of small programs or software routines that allow the hardware of a computer to interact with the operating system by a set of standard calls.

#### 2. Presentation of the BIOS

The BIOS is an essential component of the computer, permitting the control of the material elements. It is about a small software of which a part is in a ROM, that means a memory that cannot be modified, and another part is in an EEPROM (modifiable memory by electric impulses, from where the term flasher to designate the action to modify the EEPROM).

With today's high performance 32 bit operating systems, the BIOS become less used, but it is still there, always interacting with the operating system.

Early OS's, like DOS, worked with the BIOS. DOS relied on the BIOS to perform most functions, like displaying characters on the screen or sending output to the printer, reading input from the keyboard and other essential tasks.

#### 3. Starting of the PC

At the time of the initialization of the PC, the BIOS is going to conduct a certain number of tests, in order to determine if the configuration and working of the PC are correct.

In fact, the BIOS continues its investigation and farther tests most components of the motherboard. In case of mistake, a message is displayed or, if it is not possible, a certain number of beeps are going to permit to determine the type of problem.

If the test ends without problem, a beep sounds, in the other cases, the PC gives out 2 beeps or more. Compaq uses two beeps to signal an initialization.

(a) POST

This procedure is called POST which stands for Power On Self Test. It's a series of individual functions or routines that perform various initialization and tests of the computer's hardware. When the system is put under tension or is started again (reset), the BIOS makes the inventory of the present materials in the computer and do a test (named POST) in order to verify its good working.

BIOS starts with a series of tests of the motherboard hardware. The CPU, math coprocessor, DMA controllers, and IRQ controllers. The order in which these tests are performed varies from motherboard to motherboard.

#### Note: Math coprocessor

8087 Microprocessor, in computer science, a math, coprocessor from Intel for use with the 8086/8088 and 80186/80188 microprocessors. Available in speeds of 5 MHz, 8 MHz, and 10 MHz, the 8087, if supported by the application software, can dramatically improve system performance by offering arithmetic, trigonometric, exponential, and logarithmic instructions for the application to use. Freeing the main microprocessor to perform other tasks.

So ever the POST meets a mistake, it is going to try to continue the starting of the computer. However if the mistake is serious, the BIOS is going to stop the system and display a message on the screen. Once POST is complete and no errors found, the BIOS will begin searching for an operating system.

When the system is put under tension, the BIOS displays a message of copyright on the screen, and then it does the tests of diagnosis and initialization. When all tests have been done, the BIOS displays a message inviting the user to press on one or several keys in order to enter in the setup of the BIOS. Briefly, When Operating System is not there, computer remains under the control of BIOS-ROM chip.

BIOS-ROM chip contains small programs and some data, this data is related to initial computer settings which are called CMOS setup. CMOS setup contains following information:

- a. Number of physical driver connected
- b. Processor type and speed

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- c. RAM capacity
- d. Boot sequence
- e. Machine Password/Start up Password/Power-ON Password
- f. Clock/Time/Day
- g. Power Saving Features

Even if there is no OS in computer, even if there is no hard disk inside computer, user at least can check CMOS settings and can experience initial Boot process which is as following:

- 1. User switches on computer
- 2. BIOS-chip on the motherboard receives power supply
- 3. Keyboard connectivity verified (standard Input device)
- 4. Display adapter card connectivity verified (standard output device)
- 5. CPU status verified
- 6. RAM status verified
- 7. Hard disk connectivity verified
- 8. If user presses 'F1' or 'Del', CMOS settings are shown on monitor. Otherwise Boot Process continues.
- 9. Details about initial configuration (CPU type, speed, RAM size, number of physical driver are displayed on monitor)
- 10. If no media is found, error message is displayed 'No media/Physical drive found'. If some media is connected, boot process continues.
- 11. Boot sequence is checked from CMOS setup and respective drive is searched for any bootable files or operating system files.
- 12. If 1<sup>st</sup> media mentioned in boot sequence contains bootable files, those files are loaded in RAM, control is transferred and respective drive letter (A:/B:/D:) appears on user monitor.
- 13. If 1<sup>st</sup> media mentioned in boot sequence contains complete operating system, important files from OS kernel (not all files) are loaded into RAM and control is transferred to Operating System Now it is OS which starts controlling computer and BIOS stops.
- 14. Operating System Kernel, when loaded into RAM, remains there all the time, when computer is ON. Kernel files can make reference to other OS files which are brought on-demand into RAM, used and again removed from RAM.
- 15. If no bootable files, no Operating System files are found in 1<sup>st</sup> media listed in boot sequence, 2<sup>nd</sup> media is searched, if there are no bootable files or OS in 2<sup>nd</sup> media, 3<sup>rd</sup> media is searched and so on.
- 16. If no media contains bootable files or OS, error message is displayed 'No System Disk Error'.

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Power OnSelf Test

(POST)

We can summarize "The Boot Process" as follows:

To get to the operating system, a computer must first boot from the BIOS. The BIOS performs a number of tasks when a computer is started. From initializing the microprocessor to initializing and testing hardware to starting the operating system.

### (b) The access in the BIOS

According to the mark of the BIOS it can be about F2 key, the F10 key, the DEL key (on the French keyboards: "Suppr"), or on one of the following key sequences:

- Ctrl+Alt+S
- Ctrl+Alt+Esc
- Ctrl+Alt+Ins
- F1
- Ctrl+Esc.

To reach an AMI BIOS or Award BIOS, it is necessary to press on one of the keys above or combination of keys.

On the Award BIOS the following message is displayed at the time of the POST:

TO ENTER SETUP BEFORE BOOT PRESS CTRL-ALT-ESC HOWEVER DEL KEY. This message means "PRESS CTRL-ALT-ESC" or the "DEL" key to enter in the SETUP before the starting of the PC.

### 4. TO RESET THE BIOS

In so far as the setup of the BIOS permits to modify material parameters, it can arrive that the system becomes unsteady, don't start again or even more. Thus, when it arrives, it becomes necessary to annul the modifications brought to the BIOS and to put back the parameters by default.

If the computer starts and the access to the BIOS setup is possible, this one generally offers the possibility to re-establish the parameters by default.

On the BIOS of the type PHOENIX, the support on the F9 key permits to re-establish the parameters by default of the constructor.

On the BIOS of the type Award, the support on the F5 key re-establishes the previous parameters. The support on F6 re-establishes the values by default of the Award BIOS. Finally, the F7 key permits to re-establish the parameters by default provided by the constructor of the motherboard.

If the access in the BIOS is impossible by the standard procedure, most motherboards are provided with a rider (jumper) allowing them to re-establish the values by default. It is sufficient to change the rider's position and to let maintained it in this new position during about ten seconds.

### 5. TO ERASE THE CONTENT OF THE CMOS

If the parameters present in the CMOS pose big problems and that you don't manage to enter the setup, it is necessary for you to erase the content of the CMOS. By removing the jumper and putting it back. All values will be written by default.

### To erase the password

If you lost the passwords of the BIOS unintentionally, there exist different simple methods. It is sufficient for you to cut the electric food of the CMOS. For it, to disconnect the battery or the accumulator merely, every information is lost.

If you don't have access to the battery of the PC, make these some manipulations:

Put yourselves under DOS. Use DEBUG:

HIT:

7020 Entry

### 7166 Entry

### 6. THE MENUS OF THE BIOS SETUP

All the BIOS have the same functions, which are sometimes presented differently:

- 1. Standard CMOS setup
- 2. Advanced CMOS setup
- 3. Advanced Chipset
- 4. Power Management
- 5. Peripheral Setup
- 6. Restore BIOS default values
- 7. Change Password
- 8. Hard disk utility
- 9. Save Settings to CMOS
- 10. Exit

For some BIOS, you have a list of help which enables you to know how to change a value, to enter in the menu, to move from a menu, to navigate in menus and finally to save the changes done on the BIOS.

#### Example:

- a. Help: F1
- b. To change values: you use '+' or '-' sign.
- c. To enter in the menu (Execute a command): you first select the menu and then press enter key.
- d. To move from a menu (Exit): you use Esc (Echap).
- e. Select Item: (<sup>1</sup>, <del>1</del>)
- f. Select Menu ( $\leftarrow$ ,  $\rightarrow$ )
- g. Setup Defaults for the Phoenix BIOS: F9

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h. To save the changes and Exit: you press F10 and press 'Y' for Yes and 'N' for No.

### LO3.3: Blow and clean the computer and Peripheries

Content/Topic 1: Cleaning the Case and Internal Components

Internal components need to remain dust-free to remain adequately cooled and to prevent a significant reduction in their lifespan. Peripherals, on the other hand, should be kept clean mostly for hygienic reasons.

The followings are steps to follow while cleaning computer and peripheries.

- 1. Remove the dust from fan intakes
- 2. Remove dust from power supply
- 3. Remove dust from components inside the computer
- 4. Clean mouse and keyboard
- 5. Check and secure any loose cables

Dust regularly on both sides of the grille using a vacuum-cleaner brush attachment, or a lambswool duster. Make sure the fan is unplugged and clean the blades and inner workings with a hair dryer or a can of compressed air.

This guide will be devoted to this: helping you keep your gaming setup clean and operational. But what do you use to clean your PC? And more importantly, how can you clean it safely and properly?

#### The Computer Case



Cleaning a computer case is rather simple. You will only be using compressed air, any sort of cloth and brush, and a screwdriver to open the case. You may also need cotton swabs and some alcohol for casemounted fans.

- 1. Remove the left side panel by unscrewing the screws on the back. Some cases come with screws that include special rubber or plastic caps to allow the user to remove them by hand.
- 2. The dirtiest parts of a case are usually at the top and bottom, as the majority of the dust will end up settling there. Use a cloth to wipe this dust away. If the bottom of the case has gathered up a significant amount of dust, you may want to use a vacuum cleaner.
- 3. Getting dust out of the hard-to-reach places is easily achieved with the help of a can of compressed air. You can use it to blow dust out of the drive racks and fan grilles on either the front or the back.
- 4. If your case is equipped with dust filters, you will want to clean those too. This can be easily done with a can of compressed air or a brush.
- 5. If your case has <u>fans mounted on it</u>, the biggest problem will be getting rid of the dust stuck to the fan blades. You may need to remove the fans from the case if they are hard to reach. To clean them, simply dip a cotton swab in alcohol and rub away!

### The Hardware

In this section, we will take a look at how to clean a <u>CPU</u>, a <u>GPU</u>, and a power supply, along with everything else that's inside your <u>computer case</u>.

### What You Will Need

Let's quickly go over the tools that you'll need to clean your PC thoroughly. These are as follows:

- A **screwdriver**, used for cleaning but for removing individual components or disassembling the entire PC, if needed. Either a slot or a cross-slot screwdriver will be fine.
- <u>A can of compressed air</u> is the best way to get built-up dust out of a heatsink and out of hard to reach places. It should not be shaken, and it should always be held in an upright position to prevent liquid air from escaping. If you want to clean your PC without compressed air, that is doable, although it can be more tedious.
- A **soft brush** will be used for getting the dust off of circuit boards and heatsinks.
- Cotton swabs and rubbing alcohol will get rid of stubborn pockets of dust in tight spots.

#### **The Cleaning Process**

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First of all, you should unplug the power supply. It is essential that the PC is not powered and has had time to cool off before you start cleaning.

# **Cleaning the CPU**



While the CPU itself doesn't need cleaning, the cooler and the socket do. Here's how you should do it:

- Disconnect the cooler from the motherboard and take it out of the case. Pushpins are the most common way of keeping <u>a CPU cooler</u> in place, but if you have a different one, be sure to check the manufacturer's site or the guide on how to remove it properly.
- 2. Hold the fan blades in place while you use the compressed air to blow out the dust from the heatsink. The high air pressure forcing the fan to spin might damage the bearing.
- 3. Brush out remaining dust from the fan itself.
- 4. Use the cotton swabs and alcohol to get rid of any dust that stuck to the fan blades.

After this, use the brush to clean out the dust on and around the socket before putting the cooler back. You don't need to remove the CPU to do this.

### **Cleaning the Graphics Card**

Cleaning your graphics card is even simpler than cleaning the CPU. You can do it without actually having to remove the card from the case, but we recommend doing so if you want to clean it thoroughly.

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If you want to remove the card from the case:

- 1. Remove the safety screws on the case and pull the card out with both hands. Also, make sure that the PCIe slot's safety bracket is not holding the card in place.
- 2. As before, hold the fan(s) to prevent them from spinning while you blow out the dust with the compressed air can. If it is a graphics card with a blower fan, it is best to blow the air through the back of the card.
- 3. Use the brush to clean the backplate. If you have a card without a backplate, be sure to brush gently so as not to damage the circuit board.
- 4. Once again, use the cotton swabs and rubbing alcohol to remove the remaining dust from the fan blades.

On the other hand, if you don't want to remove the graphics card from its slot, simply use the compressed air can to blow air into the back of the card and watch the built-up dust from inside the heatsink fly right out. When doing this, **make sure that the can remains in an upright position so that no liquid air escapes**, **as it may damage the graphics card**.

### **Cleaning the Power Supply**



The PSU can be cleaned with or without removing it from the case, and also with or without opening it.

#### **Removing the PSU:**



- Disconnect all the power connectors from other components. When disconnecting connectors, make sure that they are not held in place by a safety pin. If you're having trouble getting the connector to come loose, try wiggling it gently left and right while holding the motherboard down.
- 2. Remove the safety screws and take the PSU out of the case.

# Cleaning the PSU without opening it:

- 1. Push the screwdriver through the fan grille to prevent the fan from spinning.
- 2. Use the compressed air can to blow out the dust.
- 3. Make sure to do so from different angles several times to ensure that no dust remains trapped inside.

# **Opening and cleaning the PSU:**

- 1. Remove the screws holding the PSU cover in place and remove it.
- 2. Use the brush or compressed air can to get rid of the dust built up inside.
- 3. Use cotton swabs with alcohol to get rid of the dust on the fan blades and in any hard-to-reach places.

# **Cleaning the Motherboard**



The motherboard itself doesn't need much cleaning since its usually vertical positioning prevents the dust from building up anywhere but on top of the heatsinks, as well as on top of the protruding PCIe and RAM slots, as well as on top of the rear panel ports. As such, if your motherboard is positioned vertically, and all you need to do is a bit of light brushing.

If your motherboard is positioned horizontally, then dust is likely to have built up inside some of the unused PCIe and RAM slots. In this case, you only need the brush once again. Gently brush the ports to get

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the dust out. You may also use compressed air or blow the air out yourself, but this is hardly ever necessary.

### **Other Components**

As for the other components:

- HDD/SSD Neither hard-disk drives nor solid-state drives need internal airflow to remain cool, so all that you need to do is brush away any dust that has gathered on them.
- RAM modules Once again, RAM doesn't have any active cooling apart from the heatsink, which is easy to clean with just a brush.
- PCIe expansion cards If you have a sound card, a network card, or any other type of PCIe expansion card, they can also be cleaned easily with just a brush. In the unlikely case that it is a large card with an active fan, you can clean it the same way as you did the graphics card.

#### **The Peripherals**

Luckily, the peripherals are much easier to clean than the internal components are, mainly because you do not need to handle any sensitive hardware.

#### What You Will Need

What you will need here are:

- A can of compressed air
- Cotton swabs
- A soft brush
- A regular piece of cloth
- A microfiber cloth
- Rubbing alcohol or distilled water
- Screen wipes

**The Cleaning Process** 

The Keyboard



Cleaning a <u>membrane keyboard</u> and a <u>mechanical keyboard</u> comes down to a mostly identical process, and you can do it with or without removing the keys. Whatever the case, you will need a piece of cloth, rubbing alcohol, cotton swabs, and a can of compressed air.

- 1. Hold the keyboard upside down as you use the compressed air to blow out any dust and debris.
- 2. Dip the cloth in alcohol and rub the main body of the keyboard clean, including the space between individual keys, as well as the keys themselves.
- 3. Optionally, if you want to clean the area under the keys (which might be a good idea if you haven't cleaned your keyboard in a while), you will need to remove the keys first. This can be done by pushing any thin object underneath a key to dislodge it be it a screwdriver, a ruler, or even a knife.
- 4. Once the keys are off, use cotton swabs dipped in alcohol to clean the area.

### The Mouse

The mouse is perhaps the easiest peripheral to clean. All you will need is a piece of cloth and rubbing alcohol. Simply dip the fabric in alcohol and scrub the mouse clean. You may once again use a thin object to get any built-up dirt out of the mouse's crevices.

### The Monitor



For cleaning the <u>monitor</u>, you will need a special microfiber cloth so that the screen doesn't get scratched. Apart from that, you might also need rubbing alcohol or distilled water to get rid of any persistent clumps of dirt. Alternatively, you can use a special screen wipe, which is quite cheap and that you can buy in almost any tech store.

If you intend to use microfiber cloth:

- Use the microfiber cloth to gently wipe away the dust with straight vertical or horizontal movements.
- 2. If you encounter clumps of dirt that won't come off, **do not use force**. That is a straightforward way to damage the screen. Instead, dip a tiny bit of cloth in alcohol or distilled water and gently rub the hardened debris until it comes off.

3. You can use any type of cloth or brush to wipe the dust off the other parts of the monitor.

If you use screen wipes:

- 1. As above, use a screen wipe to wipe away the dust with vertical or horizontal movements.
- 2. Based on the type of screen wipes, you may need to use a microfiber cloth to dry the screen since some solutions do not evaporate immediately and might cause smudging.

# **Other Peripherals**

As for other peripherals such as <u>speakers</u>, <u>headphones</u>, or microphones, you can simply use a brush to get rid of dust, potentially scrubbing any persistent dirt buildups with a cloth and alcohol.

### The Final Word



And there you have it, a complete step-by-step guide on how to clean a PC! If you stick to the above steps, you will be able to clean your PC quickly, and with no risk of damaging any of the sensitive parts. Brush away and enjoy what will feel like a completely new computer: cooler, quieter, and faster.

### LO3.4: Fix fault identified during diagnosis phase

### <u>Content/Topic 1: Selection of tools to be used</u>

CAUTION: Do not wear the antistatic wrist strap when repairing power supplies or CRT monitors. Only experienced technicians should attempt to repair power supplies and CRT monitors.

Some printer parts become hot during use, and other parts might contain high voltage. Check the printer manual for the location of high-voltage components. Some components retain a high voltage even after the printer is turned off. Make sure that the printer has had time to cool before making the repair.

Electrical devices have certain power requirements. For example, AC adapters are manufactured for specific laptops. Exchanging power cords with a different type of laptop or device may cause damage to both the AC adapter and the laptop.

#### FIRE SAFETY

- 1. Follow these safety procedures:
- 2. Never fight a fire that is out of control or not contained.
- 3. Always have a planned fire escape route before beginning any work.
- 4. Get out of the building quickly.
- 5. Contact emergency services for help.
- 6. Locate and read the instructions on the fire extinguishers in your workplace before you have to use them.

#### **EQUIPMENT DISPOSAL**

#### **Batteries**

Batteries often contain rare earth metals that can be harmful to the environment.



Recycling batteries should be a standard practice for a technician. All batteries, including lithium-ion, nickel-cadmium, nickel-metal hydride, and lead-acid, are subject to disposal procedures that comply with local environmental regulations.

### Monitors

- 1. Monitors contain glass, metal, plastics, lead, barium, and rare earth metals.
- 2. Handle CRT monitors with care. Extremely high voltage can be stored in CRT monitors, even after being disconnected from a power source.
- 3. Toner Kits, Cartridges, and Developers
- 4. Used printer toner kits and printer cartridges must be disposed of properly or recycled.
- 5. Chemical Solvents and Aerosol Cans
- 6. Contact the local sanitation company to learn how and where to dispose of the chemicals and solvents used to clean computers.

# Hardware tools are grouped into four categories:

### ESD tools

There are two ESD tools: the antistatic wrist strap and the antistatic mat. The antistatic wrist strap protects computer equipment when grounded to a computer chassis. The antistatic mat protects computer equipment by preventing static electricity from accumulating on the hardware or on the technician.

### Hand tools

Most tools used in the computer assembly process are small hand tools



### **Cleaning tools**

Having the appropriate cleaning tools is essential when maintaining and repairing computers. Using the appropriate cleaning tools helps ensure that computer components are not damaged during cleaning.



#### **Diagnostic tools**

Digital Multimeter: It tests the integrity of circuits and the quality of electricity in computer components.

**Loopback Adapter:** tests the basic functionality of computer ports. The adapter is specific to the port that you want to test.

Toner Probe: The toner probe is used to trace cables.

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#### **External Hard Drive Enclosure**

It is often used when diagnosing and repairing computers. The customer hard drive is placed into the external enclosure for inspection, diagnosis, and repair using a known-working computer. Backups can also be recorded to a drive in an external enclosure to prevent data corruption during a computer repair.

#### **Protection software tools**



#### **PREVENTIVE MAINTENANCE**

Preventive maintenance is implemented via a plan. While there are several considerations for preventive maintenance needs, preventive maintenance plans are developed based on at least two factors:

**Computer location or environment** - Computers that are exposed to dusty environments, such as those used on construction sites, as shown in the figure, require more attention than computers located in an office environment.

**Computer use - High-traffic networks**, such as a school network, might require additional scanning and removal of malicious software and unwanted files.

Preventive maintenance also offers these benefits:

- Improves data protection
- ✓ Extends the life of the components
- Improves equipment stability
- ✓ Reduces the number of equipment failures

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### **Preventive maintenance**

### Hardware

- ✓ Use these tasks as a guide to creating a hardware maintenance program:
- ✓ Remove dust from fan intakes.
- ✓ Remove dust from the power supply.
- Remove dust from the components inside the computer and peripheral equipment such as printers.
- ✓ Clean the mouse, keyboard, and display.
- ✓ Check for and secure any loose cables.

# Software

- ✓ Review and install the appropriate security updates.
- ✓ Review and install the appropriate software updates.
- ✓ Review and install the appropriate driver updates.
- ✓ Update the virus definition files.
- ✓ Scan for viruses and spyware.
- ✓ Remove unwanted or unused programs.
- ✓ Scan hard drives for errors.
- ✓ Defragment non-SSD hard drives
- <u>Content/Topic 1: Identification and fixation of problem during diagnosis phase</u>

Here are the steps to identify and fix problem:

- ✓ Identification of fault fixation method
- ✓ Identification of fault fixation techniques
- ✓ Steps of fixing the error/fault
- ✓ Trying quick solutions first.
- ✓ Evaluating the problem and implementing the solution

CAUTION: Always perform a backup before beginning any troubleshooting. You must protect data before beginning any work on a customer's computer.

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Step 1. Identify the Problem			
Customer Information	<ul> <li>Company Name</li> <li>Contact Name</li> <li>Address</li> <li>Phone Number</li> </ul>		
Computer Configuration	<ul> <li>Manufacturer and Model</li> <li>Operating System</li> <li>Network Environment</li> <li>Connection Type</li> </ul>		
Problem Description	<ul> <li>Open-ended Questions</li> <li>Closed-ended Questions</li> </ul>		
Error Messages			
Beep Sequences			
LEDs			
POST			

# Step 2. Establish a Theory of Probable Cause

- · Device is powered off
- · Power switch for an outlet is turned off
- · Surge protector is turned off
- Loose external cable connections
- Non-bootable disk in floppy drive
- Incorrect boot order in BIOS setup

### Step 3. Test the Theory to Determine Cause

Common steps to determine cause	<ul> <li>Ensure the device is powered on.</li> <li>Ensure the power switch for an outlet is turned on.</li> <li>Ensure the surge protector is turned on.</li> <li>Ensure external cable connections are secure.</li> <li>Ensure that there are no disks in the floppy drive.</li> <li>Verify the boot order in BIOS setup.</li> </ul>
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# Step 4: Establish a Plan of Action to Resolve the Problem and Implement the Solution

If no solution is achieved in the previous step, further research is needed to implement the solution.	<ul> <li>Helpdesk Repair Logs</li> <li>Other Technicians</li> <li>Manufacturer FAQs</li> <li>Technical Websites</li> <li>News Groups</li> <li>Computer Manuals</li> <li>Device Manuals</li> <li>Online Forums</li> <li>Internet Search</li> </ul>
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# Step 5: Verify Full System Functionality and if Applicable Implement Preventive Measures

- Reboot the computer.
- · Ensure multiple applications work properly.
- Verify network and Internet connections.
- Print a document from one application.
- Ensure all attached devices work properly.
- Ensure no error messages are received.

# Step 6: Document Findings, Actions, and Outcomes

- · Discuss the solution implemented with the customer.
- Have the customer verify that the problem has been solved.
- Provide the customer with all paperwork.
- Document the steps taken to solve the problem in the work order and in the technician's journal.
- Document any components used in the repair.
- Document the amount of time spent to resolve the problem.

Common Problems and Solutions for Storage Devices				
Identify the Problem	Probable Causes	Possible Solutions		
The computer does not recognize a storage device.	<ul> <li>The power cable is loose.</li> <li>The data cable is loose.</li> <li>The jumpers are set incorrectly.</li> <li>The storage device has failed.</li> <li>The storage device settings in BIOS are incorrect.</li> </ul>	<ul> <li>Secure the power cable.</li> <li>Secure the data cable.</li> <li>Reset the jumpers.</li> <li>Replace the storage device.</li> <li>Reset the storage device settings in BIOS.</li> </ul>		
The floppy disk drive will not read media or the drive light stays on constantly.	<ul> <li>The power cable or the data cable connection is loose.</li> <li>Pin 1 on the data cable is not connected to Pin 1 on the drive.</li> <li>The FDD settings in BIOS are incorrect.</li> <li>The disc is bad or not formatted.</li> <li>The disc is inserted upside down.</li> </ul>	<ul> <li>Secure the power cable or the data cable to the drive and the motherboard.</li> <li>Correctly connect the data cable.</li> <li>Reset the FDD settings in BIOS.</li> <li>Try another disc or format the disc.</li> <li>Re-insert the disc correctly.</li> </ul>		

# **Common Problems and Solutions for Storage Devices**

The computer fails to recognize an optical disc.	<ul> <li>The optical drive is faulty.</li> <li>The disc is inserted upside down.</li> <li>There is more than one disc inserted in the drive.</li> <li>The disc is damaged.</li> <li>The disc is the wrong format.</li> </ul>	<ul> <li>Replace the optical drive.</li> <li>Insert the disc correctly.</li> <li>Ensure that there is only one disc inserted in the drive.</li> <li>Replace the disc.</li> <li>Use the correct type of disc.</li> </ul>
The computer will not eject the optical disc.	<ul> <li>The optical drive is jammed.</li> <li>The optical drive has been locked by software.</li> <li>The optical drive is faulty.</li> </ul>	<ul> <li>Insert a pin in the small hole next to the eject button on the drive to open the tray.</li> <li>Reboot the computer.</li> <li>Replace the optical drive.</li> </ul>
The computer does not recognize a SCSI drive.	<ul> <li>The SCSI drive has an incorrect SCSI ID.</li> <li>The SCSI termination is not set correctly.</li> <li>The external SCSI drive was not powered on prior to booting the computer.</li> </ul>	<ul> <li>Reconfigure the SCSI ID.</li> <li>Ensure that the SCSI chain is terminated at the correct end points.</li> <li>Turn on the drive before booting the computer.</li> </ul>
The computer does not recognize a removable external drive.	<ul> <li>The removable external drive is faulty.</li> <li>The removable external drive is not seated properly.</li> <li>The external ports are disabled in the BIOS settings.</li> </ul>	<ul> <li>Replace the removable external drive.</li> <li>Remove and re-insert the drive.</li> <li>Enable the ports in the BIOS settings.</li> </ul>
A media reader cannot read a memory card that works properly in the camera.	<ul> <li>The media reader does not support the memory card type.</li> <li>The media reader is not connected correctly.</li> <li>The media reader is not configured properly in the BIOS settings.</li> <li>The media reader is faulty.</li> </ul>	<ul> <li>Use a different memory card type.</li> <li>Ensure the media reader is connected correctly in the computer.</li> <li>Reconfigure the media reader in the BIOS settings.</li> <li>Install a known good media reader.</li> </ul>

Common Problems and Solutions for Motherboards and Internal Components			
Identify the Problem	Probable Causes	Possible Solutions	
The clock on the computer is no longer keeping the correct time or the BIOS settings are changing when the computer is rebooted.	<ul> <li>The CMOS battery may be loose.</li> <li>The CMOS battery may be failing.</li> </ul>	<ul> <li>Secure the battery.</li> <li>Replace the battery.</li> </ul>	
Retrieving or saving data from the USB flash drive is slow.	<ul> <li>The motherboard does not support USB 3.0.</li> <li>The USB flash drive does not support USB 3.0.</li> <li>The port is set to full speed in the BIOS setting.</li> </ul>	<ul> <li>Update the motherboard or USB flash drive to support USB 3.0.</li> <li>Set the port speed in the BIOS setting to high speed.</li> </ul>	
g.			
After updating the BIOS firmware, the computer will not start.		Contact the motherboard manufacturer to obtain a new BIOS chip. (If the motherboard has two BIOS chips, the second BIOS chip can be used.)	
<ul> <li>The computer displays the incorrect CPU information when the computer boots.</li> <li>The motherboard has incorrect jumper settings.</li> <li>The CPU settings are not correct in the advanced BIOS settings.</li> <li>BIOS does not properly recognize the CPU.</li> </ul>		<ul> <li>Set the appropriate CPU jumper settings on the motherboard.</li> <li>Set the advanced BIOS settings correctly for the CPU.</li> <li>Update the BIOS.</li> </ul>	
The hard drive LED on the front of the computer does not light.	<ul> <li>The hard drive LED cable is not connected or is loose.</li> <li>The hard drive LED cable is incorrectly oriented to the front case panel connections.</li> </ul>	<ul> <li>Reconnect hard drive LED cable to motherboard.</li> <li>Correctly orient the hard drive LED cable to the front case panel connection and reconnect.</li> </ul>	

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The built-in NIC has stopped working on a computer.	The NIC hardware has failed.	Add a new NIC to an open expansion slot.	
The computer does not display any video after installing a new PCIe video card.	<ul> <li>BIOS settings are set to use the built-in video.</li> <li>The cable is still connected to the built-in video.</li> <li>The new video card is faulty.</li> </ul>	<ul> <li>Disable the built-in video in the BIOS settings.</li> <li>Connect the cable to the new video card.</li> <li>Install a known good video card.</li> </ul>	
The new sound card does not work.	<ul> <li>The speakers are not connected to the correct jack.</li> <li>The audio is muted.</li> <li>The sound card is faulty.</li> <li>BIOS settings are set to use the on-board sound device</li> </ul>	<ul> <li>Connect the speakers to the correct jack.</li> <li>Unmute the audio.</li> <li>Install a known good sound card.</li> <li>Disable the on-board audio device in the BIOS settings.</li> </ul>	

Identify the Problem	Probable Causes	Possible Solutions	
The computer will not turn on.	<ul> <li>The computer is not plugged in to the AC outlet.</li> <li>The AC outlet is faulty.</li> <li>The power cord is faulty.</li> <li>The power supply switch is not turned on.</li> <li>The power supply switch is set to the incorrect voltage.</li> <li>The power button is not connected correctly to the front panel connector.</li> <li>The power supply has failed.</li> </ul>	<ul> <li>Plug the computer into a known good AC outlet.</li> <li>Use a known good power cord.</li> <li>Turn on the power supply switch.</li> <li>Set the power supply switch to the correct voltage setting.</li> <li>Correctly orient the power button to the fror case panel connector and reconnect.</li> <li>Install a known good power supply.</li> </ul>	
The computer reboots, turns off unexpectedly; or there is smoke or the smell of burning electronics.	The power supply is starting to fail.	Replace the power supply.	

Identify the Problem	Probable Causes	Possible Solutions	
The computer will not boot or it locks up.	<ul> <li>The CPU has overheated.</li> <li>The CPU fan is failing.</li> <li>The CPU has failed.</li> </ul>	<ul> <li>Reinstall the CPU.</li> <li>Replace the CPU fan.</li> <li>Add fan(s) to the case.</li> <li>Replace the CPU.</li> </ul>	
The CPU fan is making an unusual noise.	The CPU fan is failing.	Replace the CPU fan.	
The computer reboots without warning, locks up, or displays error messages.	<ul> <li>The front-side bus is set too high.</li> <li>The CPU multiplier is set too high.</li> <li>The CPU voltage is set too high.</li> </ul>	<ul> <li>Reset to the factory default settings for the motherboard.</li> <li>Lower the front-side bus settings.</li> <li>Lower the multiplier settings.</li> <li>Lower the CPU voltage settings.</li> </ul>	
After upgrading from a single core CPU to a dual core CPU, the computer runs more slowly and only shows one CPU graph in the Task Manager.	The BIOS does not recognize the dual core CPU.	Update the BIOS firmware to support the dual core CPU.	
A CPU will not install onto the motherboard.	The CPU is the incorrect type.	Replace the CPU with a CPU that matches the motherboard socket type.	
The computer does not recognize the RAM that was added.	<ul> <li>The new RAM is faulty.</li> <li>The incorrect type of RAM was installed.</li> <li>The new RAM is loose in the memory slot.</li> </ul>	<ul> <li>Replace the RAM.</li> <li>Install the correct type of RAM.</li> <li>Secure the RAM in the memory slot.</li> </ul>	
After upgrading Windows, the computer runs very slowly.	<ul> <li>The computer does not have enough RAM.</li> <li>The video card does not have enough memory.</li> </ul>	<ul> <li>Install additional RAM.</li> <li>Install a video card that has more memory.</li> </ul>	
A computer with both DDR2 and DDR3 RAM installed only recognizes DDR3 RAM.	The motherboard does not support the installation of both DDR2 and DDR3 RAM.	Check the motherboard manual to see if the computer will support both types of RAM simultaneously.	

# LO3.5: Test of the computer hardware

• Content/Topic 1: Description of Hardware testing Methods

Functionality testing can be performed on hardware or software products to verify that your product

functions as designed. The general purpose of hardware and software functionality testing is to verify if the

product performs as expected and documented, typically in technical or functional specifications.

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- Black box testing
- White box testing
- Grey Box Testing
  - A. Black-box testing

Black-box testing is a method of software testing that examines the functionality of an application without peering into its internal structures or workings. This method of test can be applied virtually to every level of software testing: unit, integration, system and acceptance.

Black box testing involves testing a system with no prior knowledge of its internal workings. A tester provides an input, and observes the output generated by the system under test. ... Black box testing is a powerful testing technique because it exercises a system end-to-end.

Black box testing involves testing a system with no prior knowledge of its internal workings. A tester provides an input, and observes the output generated by the system under test. This makes it possible to identify how the system responds to expected and unexpected user actions, its response time, usability issues and reliability issues.

Black box testing is a powerful testing technique because it exercises a system end-to-end. Just like end-users "don't care" how a system is coded or architected, and expect to receive an appropriate response to their requests, a tester can simulate user activity and see if the system delivers on its promises. Along the way, a black box test evaluates all relevant subsystems, including UI/UX, web server or application server, database, dependencies, and integrated systems.

An example of a security technology that performs black box testing is Dynamic Application Security Testing (DAST), which tests products in staging or production and provides feedback on compliance and security issues.



	Pros	Cons
1.	Testers do not require technical knowledge,	Difficult to automate
	programming or IT skills	
2.	Testers do not need to learn implementation details	Requires prioritization, typically infeasible to test all
	of the system	user paths
3.	Tests can be executed by crowdsourced or	Difficult to calculate test coverage
	outsourced testers	
4.	Low chance of false positives	If a test fails, it can be difficult to understand the
		root cause of the issue
5.	Tests have lower complexity, since they simply model	Tests may be conducted at low scale or on a non-
	common user behavior	production-like environment

# Types of Black Box Testing

Black box testing can be applied to three main types of tests: functional, non-functional, and regression testing.

# 1. Functional Testing

Black box testing can test specific functions or features of the software under test. For example, checking that it is possible to log in using correct user credentials, and not possible to log in using wrong credentials.

Functional testing can focus on the most critical aspects of the software (smoke testing/sanity testing), on integration between key components (integration testing), or on the system as a whole (system testing).

# 2. Non-Functional Testing

Black box testing can check additional aspects of the software, beyond features and functionality. A non-functional test does not check "if" the software can perform a specific action but "how" it performs that action.

Black box tests can uncover if software is:

- Usable and easy to understand for its users
- Performant under expected or peak loads
- Compatible with relevant devices, screen sizes, browsers or operating systems

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Exposed to security vulnerabilities or common security threats

# 3. Regression Testing

Black box testing can be used to check if a new version of the software exhibits a regression, or degradation in capabilities, from one version to the next. Regression testing can be applied to functional aspects of the software (for example, a specific feature no longer works as expected in the new version), or non-functional aspects (for example, an operation that performed well is very slow in the new version).

### **Black Box Testing Techniques**

### 1. Equivalence Partitioning

Testers can divide possible inputs into groups or "partitions", and test only one example input from each group. For example, if a system requires a user's birth date and provides the same response for all users under the age of 18, and a different response for users over 18, it is sufficient for testers to check one birth date in the "under 18" group and one date in the "over 18" group.

### 2. Boundary Value Analysis

Testers can identify that a system has a special response around a specific boundary value. For example, a specific field may accept only values between 0 and 99. Testers can focus on the boundary values (-1, 0, 99 and 100), to see if the system is accepting and rejecting inputs correctly.

# 3. Decision Table Testing

Many systems provide outputs based on a set of conditions. Testers can then identify "rules" which are a combination of conditions, identify the outcome of each rule, and design a test case for each rule.

For example, a health insurance company may provide different premium based on the age of the insured person (under 40 or over 40) and whether they are a smoker or not. This generates a decision table with four rules and up to four outcomes—below is an example with three possible outcomes.

Conditions	Rule 1	Rule 2	Rule 3	Rule 4
Under 40	False	False	True	True
Smoker	False	True	False	True
OUTCOMES				
1: High premium				



2: Medium premium		
3: Low premium		

In this case four use cases (one for each rule) would be sufficient to fully test the system.

# 4. State Transition Testing

In some systems, significant responses are generated when the system transitions from one state to another. A common example is a login mechanism which allows users to authenticate, but after a specific number of login attempts, transition to a different state, locking the account.

If testers identify a state transition mechanism, they can design test cases that probe the system when it transitions states. For example, for a system that locks the account after five failed login attempts, a test case can check what happens at the sixth login attempt.

# 5. Error Guessing

This technique involves testing for common mistakes developers make when building similar systems. For example, testers can check if the developer handled null values in a field, text in a numeric field or numbers in a text-only field, and sanitization of inputs—whether it is possible to submit user inputs that contain executable code, which has security significance.

A specific type of error guessing is testing for known software vulnerabilities that can affect the system under test.

# B. White Box Testing

White box testing is an approach that allows testers to inspect and verify the inner workings of a software system—its code, infrastructure, and integrations with external systems. White box testing is an essential part of automated build processes in a modern Continuous Integration/Continuous Delivery (CI/CD) development pipeline.

White box testing is often referenced in the context of Static Application Security Testing (SAST), an approach that checks source code or binaries automatically and provides feedback on bugs and possible vulnerabilities.







White box testing provides inputs and examines outputs, considering the inner workings of the code

### White Box Testing Pros and Cons

	Pros	Cons	
1.	Ability to achieve complete code coverage	Requires a large effort to automate	
2.	Easy to automate	automate Sensitive to changes in code base, automation	
		requires expensive maintenance	
3.	Reduces communication overhead	Cannot test expected functionality that does	
	between testers and developers	not exist in the codebase	
4.	Allows for continuous improvement of	Cannot test from the user's perspective	Black Box and
	code and development practices		White Box Testing

Many practitioners combine black box testing with white box testing. <u>White box testing</u> involves testing an application with detailed inside information of its source code, architecture and configuration. It can expose issues like security vulnerabilities, broken paths or data flow issues, which black box testing cannot test comprehensively or at all.

By combining black box and white box testing, testers can achieve a comprehensive "inside out" inspection of a software application and increase coverage of quality and security issues.

White box testing is often contrasted with <u>black box testing</u>, which involves testing an application from the user's perspective without any knowledge of its implementation:

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- White box testing can uncover structural problems, hidden errors and problems with specific components.
- Black box testing checks that the system as a whole is working as expected.



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Comparison between black box testing and white box testing

Criteria	Black Box Testing	White Box Testing
Definition	Black Box Testing is a software testing method in which the internal structure/ design/ implementation of the item being tested is NOT known to the tester	White Box Testing is a software testing method in which the internal structure/ design/ implementation of the item being tested is known to the tester.
Levels Applicable To	Mainly applicable to higher levels of testing: Acceptance Testing, System Testing	Mainly applicable to lower levels of testing: Unit Testing, Integration Testing
Responsibility	Generally, independent Software Testers	Generally, Software Developers
Programming Knowledge	Not Required	Required
Implementation Knowledge	Not Required	Required
Basis for Test Cases	Requirement Specifications	Detail Design

### C. Grey Box Testing

While white box testing assumes the tester has complete knowledge, and black box testing relies on the user's perspective with no code insight, <u>grey box testing</u> is a compromise. It tests applications and environments with partial knowledge of internal workings. Grey box testing is commonly used for penetration testing, end-to-end system testing, and integration testing.

You can perform grey box testing using Interactive Security Testing (IAST) tools. IAST tools combine DAST and <u>Static</u> <u>Application Security Testing</u> (SAST), which is used in white box testing to evaluate static code. IAST tools enable you to

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combine the work of testers and developers and increase test coverage efficiently. For example, you are able to perform more directed tests which focus on areas or user paths that are most likely to contain flaws.

By combining these two testing methods you can ensure that tests:

- Apply knowledge of application structure to identify vulnerabilities and bugs
- Evaluate the application objectively and uncover UI/UX issues, as a real user would
- Cover all aspects of an applications functionality
  - <u>Content/Topic 2: Hardware Testing Techniques</u>

Many people involved in computer hardware testing, myself included, fell into that role as part of testing systems that consist of both hardware and software, while having primarily a software background. While I did take some electrical, electronics, circuit, and engineering courses in college, I certainly don't consider myself a computer hardware or electronics engineer. However, I've found that, armed with a few basic concepts, those of us with extensive software test management experience can usually manage hardware testing as well, provided the right people are put in charge of the actual testing.

**Comparison Testing** — It is a Software Testing method that analyses the functionality of a software/application without knowing much about the internal structure/design of the item that is being tested and compares the input value with the output value. The main focus in Black Box Testing is on the functionality of the system as a whole.

**Model-based testing** is an approach where test cases are automatically generated from application models. It is a modern software testing approach that uses a secondary, lightweight implementation of a software build which is called a model.

# **Examples of**

# the model are:

- Data Flow.
- Control Flow.
- Dependency Graphs.
- Decision Tables.
- State transition machines.



# • Content/Topic 3: Knowing factors impacting computer performance

You may be wondering why your computer is slow at times and there are other times when it is fast in processing. This could be caused by a number of factors.

They include:

- The speed of the CPU
- The space on the hard disk
- The size of the RAM
- The type of the graphics card
- The speed of the hard disk
- If the computer is multitasking
- The defragmenting files

# 1) The speed of the CPU

The speed of the CPU is also known as the clock speed of the CPU. The clock speed of the CPU is the frequency of which the processor executes instructions or the frequency by which data is processed by the CPU. It is measured in millions of cycles per second or megahertz (MHz). If the Clock speed of the CPU is fast then definitely the performance of the computer will be affected positively, in other words the computer will carry out processing functions at a faster pace.

# 2) The size of the RAM (Random Access Memory)

The RAM is referred to as the active part of the computer. This is because the RAM has the capability of storing data that the computer is currently using, because of the fact that it is fast to retrieve data stored in the RAM. With the definition above, a large RAM size will mean a faster computer performance and a smaller RAM size will result to slower computer performance.

# 3) The speed of the hard disk

The hard disk speed is defined as the rate at which material and content can be read and written on it. The hard disk speed of different hard disks is not consistent because they vary by manufacturer, drive type and the use of the hard disk. It therefore means that the higher the speed of the hard disk the faster the performance of the computer and vice versa.

# 4) Hard disk space

The bigger the space on the hard disk will result to faster performance of the computer. The smaller the space on the hard disk will result in a slower performance of the computer. The hard disk is filled with data this will use most of the memory leaving less memory for the operations of the processor.

# 5) Multiple applications running on the computer

Multi-tasking tends to slow down the performance of the computer because memory is used to support more than one applications compared to when one application has all the memory to itself. This means that the more applications that are running the slower the computer will perform. Likewise if less or one application is running the performance of the computer will be faster.

# 6) Type of graphic card

When it comes to quality of pictures and animations graphic cards are the main factors. So if a machine processes many graphics and it has a weak graphic card it will perform slower. This means that the more powerful the graphic card is the faster the performance of the computer.

# 7) Defragmenting files

Files that are broken or it takes long to read them will mean that the computer will have to defragment them first. This will slow down the performance of the computer.

<u>Content/Topic 4: Naming common hardware tools to be used and uses</u>

Before one really sets out to work on a computer system, it's important to make sure you have the proper set of tools. In the middle of building a system or even doing a repair job, it's a major distraction to have to go searching for another item you need to complete the task.

With that in mind, here is some of our guide to tools that are important to have on hand when doing work on a computer.

- IT toolkit
- Network toolkit
- Cuter wire
- Crimping tool
- Cable tester
- Etc...

A computer houses lots of components that are sensitive to electrostatic discharge, which can <u>cause</u> <u>your computer to fail</u>. It's best to try and get tools that are designed to prevent this.



# **Phillips Screwdriver (Non-Magnetic)**

This tool is probably the most important to have. Pretty much all computer parts are fastened to the computer through some form of a screw. It's important that the screwdriver not have a magnetic tip. Having a magnetized object inside of the <u>computer case</u> can damage some circuits or drives. It's not likely, but best not to take the chance.

If you plan to work on a notebook computer, they typically use a smaller style of a screw. For this, you want to look for a Philips jeweler's screwdriver or a 3mm sized model. This much smaller version will fit the tiny screws. A few companies use a fastener called a Torx that is pointed star, but usually, these are not meant to be removed by the user.

# **Zip Ties**

The use of small plastic zip ties can make all the difference between a jumbled mess of wires and a professional-looking build. Organizing the cables into bundles or routing them through specific paths can have two major benefits.



First, it will make it much easier to work inside of the case. Second, it can aid in the airflow inside the computer. Some reusable options are also available, such as hook-and-loop straps and large external cable management ideas.

Be careful if you make a mistake and need to cut the zip tie to avoid damaging wires and components.

### **Hex Driver**

Not many people have seen these outside of a computer toolkit. A hex driver looks like a screwdriver except it has a head like a socket wrench. You can find two typical sizes of hex screws inside computers: 3/16" and 1/4". The 3/16" one is more common. The smaller hex driver usually installs the brass screw standoffs inside of the case that the <u>motherboard</u> resides on.

# Tweezers

The most frustrating aspect of building a computer is dropping a screw inside the case, especially if it rolls into the tightest corner so you can't reach it. Tweezers are helpful when working in tight spots or for retrieving that lost screw inside of a computer case.

Another area where they're handy is for removing jumpers from motherboards and <u>drives</u>. Sometimes small gripper devices that feature a set of small wires in a sort of claw can really help. A plunger at the top of the device opens and closes the claw to easily pick up a screw in a tight spot.

# Isopropyl Alcohol (99%)

Isopropyl alcohol is probably one of the most important cleaners to use with a computer. It's a high-quality rubbing alcohol that you can find in most drug stores. It does an excellent job of cleaning off thermal compounds without leaving a residue that could impact future compounds.

You typically use alcohol on the <u>CPU</u> and heatsink to make sure they're clean before you mate them together. It can also be useful for cleaning contacts that have begun to corrode. It is typically used in conjunction with the next couple of items.

# Lint-Free Cloth

Lint and dust can cause lots of problems inside of computers. In particular, they build up inside the case and deposit on fans and air slots. These contaminants will directly impact the flow of air inside the computer and can lead to overheating and failure of components.

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It also has the potential of shorting a circuit if the material is conductive. Using a lint-free cloth to wipe down the case or components will help prevent the build-up of dust.

# **Cotton Swabs**

It is amazing how dirty computers can get with the dust and grime from use. The problem is that some of these small cracks and surfaces can be hard to reach. This is where a cotton swab can come in handy.

Be careful about using swabs. If the swab is too loose, or there happens to be a sharp edge that it can snag on, fibers may end up inside the computer where they can cause problems. This tool is best used only for cleaning exposed contacts or general surfaces.(pctechguide)

# **New Plastic Zip Bags**

The most obvious use for plastic bags is to store all those loose parts after the computer is finished or even to hold the spare screws while you are working on it. It helps prevent the loss of these small parts.

Another area where it is useful is for spreading thermal compounds. Thermal compounds are directly impacted by the oils from the human body. By putting your hand inside the bag before touching the compound for spreading, you keep the compounds free of contamination and thus better suited to conducting heat.

# **Grounding Strap**

Static electricity can cause severe damage to electrical components due to the short, high-voltage burst of a discharge. The easiest way to deal with this risk is to use a grounding strap. This tool is generally a strap with a metal contact fixed to a wire that you clip to an external metal part to help discharge any static charge that may build up on your body.

# **Canned Air/Vacuum**

Again, dust is a major problem for computer systems over time. If this dust gets bad enough, it can cause overheating and potential part failures.

Most computer stores sell cans of compressed air that are useful for blowing dust out of parts like a power supply. However, they aren't a perfect solution because they tend to just spread the dust around instead of removing it. In general, a vacuum is best because it pulls the dust off the components and out of the environment.

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Specially designed computer vacuums or blowers are nice, but a standard house vacuum with a decent set of hose attachments can work just as well.

If conditions are hot and dry, avoid using a vacuum; it can generate a lot of static electricity.

### **Prebuilt Tool Kits**

Of course, if you don't want to try and put together your own kit, plenty of computer toolkits are available on the market. Some of the best are from iFixIt, which is a company that specializes in instructing consumers on how to repair their computers.

They offer two kits: an Essential Electronics Tool Kit and Pro-Tech Tool Kit, which offers the basics or just about any tool you might need for any type of computer or electronic device.

it's kits only include tools and don't contain some of the other, more disposable items in this article.

• <u>Content/Topic 5: Familiarizing with basic computer copyright laws and security issues</u>

### **Computer copyright laws**

Like any original work, software is also protected by Copyright laws. Copying or installing software you have not purchased is a breach of Copyright and a criminal offense. All software you use should be fully licensed for each computer and user using the program.(bcs)

(1) Copyright laws don't actually serve their intended purpose of "helping" the public.

(2) The laws are so overly broad that they actually stifle an individual's creativity rather than encourage it.(3) The laws are so complicated and unclear that they can be easily abused by companies with access to lawyers.

A Copyright is a protection for any published work that helps to prevent that work from being used without prior authorization. A Copyright may be indicated by the word "Copyright," or a C surrounded by a circle (©). The Copyright might also be followed by the published date and the author of the work.

When work is Copyrighted, it may not be reproduced in any fashion unless the owner of the work grants proper rights. Computer Hope is not meant for legal representation, and how a Copyright is interpreted could vary. If you have additional questions or concerns about legalities, consult a legal consultant or attorney.

### **Computer security issues**

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A computer security risk is really anything on your computer that may damage or steal your data or allow someone else to access your computer, without your knowledge or consent. There are a lot of different things that can create a computer risk, including malware, a general term used to describe many types of bad software. We commonly think of computer viruses, but, there are several types of bad software that can create a computer security risk, including viruses, worms, ransomware, spyware, and Trojan horses. Misconfiguration of computer products as well as unsafe computing habits also pose risks

### Viruses, Worms, & Ransomware

Viruses are malware that are attached to other files in your system and may be used to destroy your data. Viruses have many capabilities, but, unlike worms, they usually require human interaction to spread from system to system, even if the user is unaware they are spreading it.

Worms are like viruses, but, they have the ability to spread themselves from computer to computer, all on their own. They know how to attach themselves to portable storage devices, like USB drives or removable hard drives, or to move through the network by automatically moving to connected machines.

**Ransomware** is a relatively new term for malware that, when installed on your system, makes all of your files unreadable, holding your data hostage until you pay the hacker the ransom. Ransomware may be delivered by a virus or by a worm and there is no guarantee that, even if you pay the ransom, you'll get your data restored.

### **Spyware & Trojan Horses**

Spyware is malware that steals your data and may be used to spy on you by using your webcam or microphone without your knowledge. Once spyware is installed, it may steal your sensitive data by recording the login information you use or looking for sensitive files on your computer, then sending that data back to an attacker. In recent months, hackers have been able to access the webcam and microphone of computers and use pictures, video, or audio recordings to blackmail their victims.

Trojan Horses are a special kind of virus. Like the famed wooden horse used by the Greeks to infiltrate the walled city of Troy, Trojan horse viruses are used to deliver other types of malware by hiding them inside programs or files that look legitimate.

### Misconfiguration

Most operating systems today come with some sort of built-in firewall, and there are many third-party tools, normally referred to as 'end-point protection' suites, to protect your computer. These suites of tools usually incorporate different tools to help defend against the risks we've mentioned so far.

Computer security risks can be created by malware, bad software that can infect your computer, destroy your files, steal your data, or allow an attacker to gain access to your system without your knowledge or authorization.

# LO 4.1: Document the review process

Here are the lists of necessary activities to be performed while documenting the work done

- Description of computer status before
- Describe problems found
- Review of user manual and previous report
- Suggestion of solutions on problems found
- Description of solution implementation
- Description of procedures of the task accomplished
- Equipment and materials used
- Description of the Computer status after work
- Write Technical journal and recommendation report

# <u>Content/Topic 1: Description of computer hardware before and after work</u>

Providing accurate and up-to-date product documentation is important to both internal and external customers. Here's what you need to know to improve the technical accuracy of the documentation produced by your development team.

The accuracy of your organization's technical documentation benefits your company and customers by offering a credible resource for how to use your product. Inaccurate and outdated documentation can hobble internal development efforts, and negatively affect external customers as well, when they cannot resolve their own issues by consulting the documentation that accompanies your product. Your company's credibility is also damaged, because the customer develops doubts about the product, thanks to the inaccuracies encountered in the documentation.

A lack of accurate and accessible information also increases the learning curve for new developers and other technical staff. Here are some tips to help improve the technical accuracy of the documentation produced by your development team:

# Tip 1: Develop a technical review checklist

Many developers and managers lack experience in how to technically review a document. Here are some points to include in a review checklist to keep the reviewers on track and focused on the technical accuracy of the documentation:

- Focus on the technical facts to verify that the technology works as documented. A technical review is not an editorial review.
- Verify the technical accuracy of all procedural steps included in the document.
- Verify the technical accuracy of all screen captures in the document.

# Tip 2: Build accountability into the document review process

One of the reasons technical reviews are often disregarded is because no accountability is built into project plans for technical reviews. Strategies for building accountability into technical documentation reviews include:

- Add the name of the author(s) and technical reviewer(s) to the documentation. Some companies have
  a policy against naming staff, but including author and reviewer names promotes communication with
  internal staff. For external audiences, such as user guides for commercial, off-the-shelf software,
  including the author and reviewer names recognizes the contributions of the development team.
- Make technical reviews of documentation part of the annual review process for developers.
- Assign technical reviewers for documentation in the project plan.

# Tip 3: Raise the accuracy bar for technical writers

While the job title technical writer is subjective in many organizations, the persons in these positions must have a stake in the technical accuracy of the documentation they develop, since it is their primary task.

Managers should set the appropriate technical accuracy level that writers are expected to maintain. While some technical writers may balk at increased expectations about their understanding of the technology, increasing their stake in the project is a win for everybody. If the writers are not able to meet the higher standards, you may need to review the role of your technical writers as compared with your corporate strategy and client requirements.

To assist technical writers, you need to level the playing field by enabling writers to dig deeper into the technology: Managers should:

- Involve the technical writers in design and development meetings about the product.
- Involve technical writers in the development of technical requirements, functional specifications, and design documents.
- Include technical writers on any development group mailing lists.

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- Provide access to internal releases of the product during the documentation development cycle. It can
  be easy to become cloistered as a technical writer and rely only on interviewing the experts, but
  enabling them to become "hands-on" with the product can provide a new perspective that developers
  and project managers may not be able to see for themselves.
- Encourage the technical writers to read more about the technologies behind your products. For example, if you develop Java-based applications, encourage the technical writers to become more fluent in the Java programming language.

# Tip 4: Set priorities for busy, but key, developers

There always seems to be the "alpha wolf" developer that holds a lot of information in his head about the project but is involved with multiple projects. Even though his or her schedule is tight, the product knowledge held by this developer is necessary to ensure accuracy in the documentation.

While many of us have to do more with fewer resources these days, these developers were spread thin even when times were good, due to their exemplary knowledge and work ethic. Here are some tips on how to manage the documentation review you need from these busy developers and ensure their knowledge benefits the documentation:

- Forget about having them review the documentation from cover to cover.
- Work with the document authors to identify the sections of the document that absolutely must be reviewed by this person.
- Work with them and their management to obtain some uninterrupted blocks of time to review the document.
- Provide the reviewer who has a stretched schedule with a list of exactly what you need them to review in the document. Assure them that other team members are reviewing the rest of the document, and their review input is absolutely necessary for the sections that relate to their direct area of technical expertise.

# Building the better technical review

A thorough technical documentation review benefits both external and internal customers. While some technical staff consider conducting these reviews a chore, managers face the challenge of setting priorities to enable a thorough review process while maintaining critical development efforts.

# LO4.2: Report the procedures of the task accomplished are in place and used

<u>Content/Topic 1: Reporting the work done</u>

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A report is a document that presents information in an organized format for a specific audience and purpose. Although summaries of reports may be delivered orally, complete reports are almost always in the form of written documents.

According to the Business Dictionary, a report is a document containing information organized in a narrative, graphic, or tabular form that is prepared on periodic, regular, or as required basis.

Types of reports include memos, minutes, lab reports, book reports, progress reports, justification reports, compliance reports, annual reports, and policies and procedures.

Here are the main sections of the standard report writing format:

- Title Section: The title of report is necessary to orient the reader. This includes the name of the author(s) and the date of report preparation.
- Summary: There needs to be a summary of the major points, conclusions, and recommendations. It needs to be short as it is a general overview of the report. Some people will read the summary and only skim the report, so make sure you include all the relevant information. It would be best to write this last so you will include everything, even the points that might be added at the last minute.
- Introduction: The first page of the report needs to have an introduction. You will explain the problem and show the reader why the report is being made. You need to give a definition of terms if you did not include these in the title section, and explain how the details of the report are arranged.
- Experimental details: This is the part that you need to state every detail of the experiment, starting from the equipment that you used to the procedure for the test.
- Results: This is where you are expected to explain the results that you obtained. You should give clear explanation so that the reader cannot ask themselves any question on your results.
- Body: This is the main section of the report. There needs to be several sections, with each having a subtitle. Information is usually arranged in order of importance with the most important information coming first.
- Conclusion: This is where everything comes together. Keep this section free of jargon as most people will read the Summary and Conclusion.
- Recommendations: This is what needs to be done. In plain English, explain your recommendations, putting them in order of priority.
- Appendices: This includes information that the experts in the field will read. It has all the technical details that support your conclusions.

Remember that the information needs to be organized logically with the most important information coming first.

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# Learning Outcome 4.3 Write technical journal and recommendation

• Content/Topic 1: Writing technical journal and recommendation

One of the main forms of communication in engineering is the technical report. In the workplace, the report is a practical working document written by engineers for clients, managers, and other engineers.

This means every report has a purpose beyond the simple presentation of information. Some common purposes are:

- To convince the reader of something. For example:
  - to convince a government agency of the effect of a particular course of action
  - o to convince a client that your solution will fulfill their needs
  - to convince the public that a proposed project will bring benefits
- To persuade the reader to do something. For example:
  - to persuade a government or council to adopt a particular course of action
  - o to persuade a client to choose one design over another
  - o to persuade an organisation to partner with your company on a project
- To inform the reader about something (usually for a further purpose). For example:
  - to provide a government department with information they will base policy on
  - $\circ$  to instruct other engineers who will work from your plans
  - to present the outcomes of a project to stakeholders

# **Basic report structure**

Most reports contain the sections listed below. Where each report will differ is in the body; the sections you decide to include will depend on the type of report and the specific topic. You will usually be expected to decide on the structure of the body yourself. The best way is to put yourself in the place of the reader. Ask yourself:

- What does the reader need to know first?
- What is the most logical way to develop the story of the project?

A report usually has the following components.

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- <u>Title page</u>
- <u>Summary</u>
- Table of contents
- Introduction
- Body of the report
- <u>Conclusions and recommendations</u>
- <u>References and appendices</u>

# Title page

This page gives:

- the title of the report
- the authors' names and student IDs
- the unit name and code, the department, and university
- the date of submission.

The title of the report should indicate exactly what the report is about. The reader should know not only the general topic, but also the specific aspect of the topic addressed in the report. Compare the following pairs of report titles:

Weak titles	Strong titles			
Bridge analysis	Analysis of a pre stressed concrete bridge			
Internet based	An evaluation of Internet based Automated Traveler			
ATIS	Information Systems			

# Summary

The Summary is usually written last of all. It provides a brief overview of the substance of the report. It is a stand-alone document generally used by busy managers who might not have time to read the full report. That's why it is usually referred to as the Executive Summary in the workplace.

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The Summary is not an introduction to the topic. It should focus on what you did, how you did it, and the main outcomes and significance of your work.

# The Summary:

- states the topic of the report
- briefly outlines your approach to the task (if applicable)
- focuses on the results or outcome of the project, the findings of your investigation: or the key
  aspects of your design
- states the significance or implications of the results.

The Summary does NOT:

- provide background information on the topic
- explain the motivation for the project
- refer to figures, tables or references contained in the report.

Length: ¼ to ½ a page is sufficient for most undergraduate reports.

# How NOT to write the summary

A common mistake is to describe the type of information in the report, rather than summarise the information itself.

# Acknowledgements

In major projects you will possibly need assistance or advice from others, such as industry mentors or laboratory staff, who may have made an extra effort to help you. You may acknowledge such assistance in a short paragraph on the page after the Summary.

- Give the person's full name, position and affiliation.
- State their contribution clearly and briefly.
- Use formal language.



Thanks to my supervisor Dr. Hessami for being so patient and to Rod from the chemical engineering lab for putting me right on how to use the equipment. Without your help this project might never have got off the ground.

I would like to thank my supervisor, Dr. Josie Carberry for her encouragement and guidance throughout the project, and also Mr Rafiq Bakti, Supervisor Monash University Wind Tunnel for his help setting up my experiments.

# **Table of contents**

The Contents page sets out the sections and subsections of the report and their corresponding page numbers. It should clearly show the structural relationship between the sections and subsections. A reader looking for specific information should be able to locate the appropriate section easily from the table of contents.

Sections are numbered using the decimal point system. Section numbers appear on the left margin, page numbers on the right.

Here is an example from a final year project report.

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# CONTENTS

1.0	INTRODUCTION1
2.0	PROJECT REQUIREMENTS
3.0	SYSTEM SPECIFICATIONS
4.0	SETTING UP A LINUX BASED VIDEO CAPTURE SYSTEM
4.1.	SELECTING AND INSTALLING THE OPERATING SYSTEM
4.2.	INSTALLING FEDORA CORE 1
4.3.	INSTALLING VIDEO CAPTURE DRIVERS VIA THE LINUX KERNEL
4.4.	IMPLEMENTING THE VIDEO4LINUX API
4.5.	INSTALLING OPENGL AND GLUT
4.6.	CREATING SIMPLE GLUT PROGRAMS FOR VIDEO OUTPUT
4.7.	USING GLUI TO CREATE GUIS
5.0	IDENTIFYING THE TARGET IN A FRAME 19
5.1.	OBJECT RECOGNITION FROM COLOUR
5.2.	SEGMENTATION FOR NOISE REDUCTION
5.3.	EDGE DETECTION AND SEPARATING MULTIPLE OBJECTS
6.0	DETERMINING ATTITUDE
6.1.	DISTINGUISHING BETWEEN OBJECTS
6.2.	LOCATING THE CENTRE OF AN OBJECT
6.3.	USING CORRELATIONS TO EXTRACT 3D INFORMATION
7.0	RECOMMENDED IMPROVEMENTS
8.0	CONCLUSIONS
9.0	REFERENCES

# Introduction

The Introduction tells the reader what the report is about. It sets the project in its wider context, and provides the background information the reader needs to understand the report.

The Introduction:

- introduces the topic of the report in context
- explains the problem and/or motivation for the project
- states the aim/s of the project
- indicates the purpose of the report
- briefly outlines the report structure (not necessary in a short report).

Length: ½ to ¾ of a page is sufficient for most undergraduate reports.

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In a short report, the technical background necessary to understand the problem may be included in the Introduction. In longer reports this may be summarized in the Introduction and presented in detail in a separate section.

When writing the Introduction, take care not to confuse the report with the project. The project is the work you did; it had an aim, motivation and an outcome. The report is the mode of communicating that work to the reader.

# Body of the report

The Introduction and Conclusions act as a frame for the body of the report, which is where you present your own work. The information should be organised so that the reader can follow the development of your project. You will therefore need to put some thought into ordering the sections and choosing concise but informative headings and subheadings.

The body of the report:

- presents the information from your research, both real world and theoretical, or your design
- organises information logically under appropriate headings
- conveys information in the most effective way for communication by means of:
  - o figures and tables
  - o bulleted or numbered lists
  - o formatting to break up large slabs of text.

Presentation conventions and section headings

# Provide informative headings

Headings should tell the reader exactly what type of information is contained in the section. They should be specific and content-focused rather than just labels. Devising informative headings as opposed to label headings right from the planning stage will help you to clarify exactly what you want to achieve in each section and subsection.



Compare these pairs of headings:

Uninformative headings	Informative headings		
Consumption patterns	Changes in water consumption patterns		
Survey results	Turning movement survey results		
Overview	Overview of the organisation		
Management	Management style and method		

# **Conclusions and recommendations**

The Conclusions and Recommendations may be combined or, in long reports, presented in separate sections. If there are no recommendations to be made as a result of the project, just call this section **Conclusions.** 

The Conclusions section sums up the key points of your discussion, the essential features of your design, or the significant outcomes of your investigation. As its function is to round off the story of your project, it should:

- be written to relate directly to the aims of the project as stated in the Introduction
- indicate the extent to which the aims have been achieved
- summarise the key findings, outcomes or information in your report
- acknowledge limitations and make recommendations for future work (where applicable)
- highlight the significance or usefulness of your work.

The conclusions should relate to the aims of the work:

# Recommendations

Recommendations are often included with a report's conclusion, although they serve different purposes. Whereas a conclusion offers you the opportunity to summarize or review your report's main ideas, recommendations suggest actions to be taken in response to the findings of a report. You can regard recommendations as a prompt to action for your readers. As you have seen from your planning, your report structure should lead up to the recommendations and provide justification for them. Just as a Page 213 of 217 proposal grows from your project's goals and objectives, a report should actually grow backwards from your recommendations. Having your recommendations accepted then becomes part of your purpose.

What makes a good recommendation? Effective recommendations:

- describe a suggested course of action to be taken to solve a particular problem; 0
- are written as action statements without justification; 0
- are stated in clear, specific language; 0
- should be expressed in order of importance; 0
- are based on the case built up in the body of the report; are written in parallel structure. 0

A word of caution about writing recommendations: you should always consider your relationship with the reader first. If you have no authority to make recommendations, the reader may be hostile to their presence.

Have a look at the following examples from different types of reports. Many of the recommendations included here are well written but a few contain some significant shortcomings. Position your cursor over the excerpts to see our comments.

# Example of recommendations



tablets, nearly half own an iPad and nearly half an Android tablet, most consider themselves expert users of their tablets, and more than two- thirds already use them in the clinical setting; by a slim margin, they would prefer a hospital-supplied model for tablet use to a BYOD model. Our research on the two models for making tablets available also found more advantages and fewer disadvantages to the hospital-supplied model.	3	
Our principal finding regarding tablets themselves is that the best tablets for our use would be those designed and built for health-care applications. These tablets are rugged and easy to disinfect, and they offer a wealth of hardware and software options that would streamline our daily tasks without introducing any risks either to patient care or to data privacy. Unfortunately, purchasing enough of these tablets for all clinical staff would exceed our budget. To determine whether any of the general- purpose tablets meet all our needs, we would need to conduct hands-on testing regarding disinfection, battery life, durability, and several other technical criteria.		
We recommend, first, that we reassess whether the budget will permit consideration of any of the health-care-specific tablets. If that is not possible, we recommend that we ask manufacturers of a small set of general-purpose tablets to let us test their products and invite our clinical staff to demo them. This option would yield data that would help us decide how to proceed.		Notice the writers' use of the phrase "we recommend." Repeating key terms in this way helps readers understand the logic of a report and concentrate on the technical information it contains.
In the following sections, we provide additional details about our research methods, the results we obtained, the conclusions we drew from those results, and our recommendation.		An advance organizer for the rest of the report.

# **References and appendices**

# ✓ References

All information, methods, data, diagrams and maps, whether obtained or based on the work of others, must be acknowledged using one of the referencing styles recommended for engineering.

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Appendices contain material that is too detailed to include in the main report, such as long mathematical derivations or calculations, detailed technical drawings, or tables of raw data. The content should be summarised and referred to at the appropriate point in the the body of the report.

# The conventions for appendices are as follows:

- each appendix must be labelled with a number (or letter) and title
- the appendix numbers and titles must be listed on the Contents page under the heading Appendices (if more than one) or Appendix (if only one)
- Each appendix must be referred to by number (or letter) at the relevant point in the text.

# **Reference(s):**

- Author(s): . (n.d.). Retrieved from Andrew 'bunnie' Huang Principles of Computer Hardware ,Oxford University Press .2008.
- 2. 2. bcs. (n.d.). /content/conWebDoc/7256 . Retrieved from http://www.bcs.org.
- ciscopress. (n.d.). /articles/article.asp?p=2086239&seqNum=7. Retrieved from https://www.ciscopress.com.
- 4. computerhope. (n.d.). /issues/ch001422.htm. Retrieved from https://www.computerhope.com.
- geeksforgeeks. (n.d.). /random-access-memory-ram-and-read-only-memory-rom/. Retrieved from https://www.geeksforgeeks.org.


- helpwithpcs. (n.d.). /hardware/power-supply-basics-inc-pinouts.php. Retrieved from https://www.helpwithpcs.com.
- 7. it4nextgen. (n.d.). /motherboard-components/. Retrieved from https://www.it4nextgen.com.
- 8. kayako. (n.d.). /article/66-computer-cable-types-and-descriptions. Retrieved from https://hardsoftsupport.kayako.com.
- 9. Author(s): Andrew 'bunnie' Huang Principles of Computer Hardware ,Oxford University Press .2008
- 10. Pc hardware a beginner's guide .ron gilster Copyright © 2001 by The McGraw-Hill Companies.
- 11. McLaughlin,Robert, Sasser,Susan, Ralston,Mary.Fix Your Own PC.Philippine Graphic Arts, Inc Tandang Sora St.Caloocan City. 2009
- 12. http://dl.acm.org/citation.cfm?id=518138
- 13. pctechguide. (n.d.). /computer

memory#:~:text=The%20system%20memory%20is%20the,specific%20objectives%20for%20system %20operation. Retrieved from https://www.pctechguide.com.

14. techterms. (n.d.).

/definition/secondary\_memory#:~:text=Secondary%20memory%20refers%20to%20storage,access ed%20directly%20by%20the%20CPU. Retrieved from https://techterms.com.

15. turbofuture. (n.d.). /computers/the-motherboard-

components#:~:text=The%20main%20printed%20circuit%20board,is%20known%20as%20the%20 motherboard.&text=Numerous%20major%20components%2C%20crucial%20for,every%20part%20 of%20the%20PC. Retrieved from https://turbofuture.com.