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**DIPLOMA IN COMPUTER SCIENCE AND ENGINEERING**

REPORT ON

**COMPUTER HARDWARE MAINTAINANCE &  
ADMINISTRATION LAB (20CS32P)**

Submitted By: .....

Register No: .....

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**Document technical specifications of the right hardware components to assemble a computer to meet the given requirement and also necessary safety protocols to be followed.**

To assemble a personal computer, you will need the following components:

1. Central Processing Unit (CPU)
2. Motherboard
3. Memory (RAM)
4. Storage (Hard Drive or Solid State Drive)
5. Power Supply Unit (PSU)
6. Video Card (if not integrated into the motherboard)
7. Optical Drive (if desired)
8. Case

Additionally, you will need peripherals such as a monitor, keyboard, and mouse to interact with the computer.

It's also a good idea to have a screwdriver and thermal paste on hand to properly install the CPU.

To assemble a computer that meets specific requirements, we would need more details about the intended use of the computer, budget constraints, and desired performance. However, I can provide a general overview of the hardware components and safety protocols to consider:

**Hardware Components:**

1. **CPU:** Choose a processor that meets your performance needs and is compatible with the motherboard socket. Popular options include Intel Core i5 or i7, or AMD Ryzen processors.
2. **Motherboard:** Select a motherboard that is compatible with the chosen CPU and has the necessary features and expansion slots for your requirements.
3. **Memory (RAM):** Determine the amount of RAM needed based on the intended use. Aim for at least 8GB for general use, but consider 16GB or more for demanding tasks like gaming or video editing.
4. **Storage:** Choose between a traditional Hard Disk Drive (HDD) or a faster Solid State Drive (SSD) for storage. Consider the capacity required for your files, applications, and operating system.
5. **Power Supply Unit (PSU):** Select a PSU with sufficient wattage to power all the components in your system. Consider its efficiency rating and ensure it has the necessary connectors for your components.
6. **Graphics Card (GPU/Graphics Processing Unit):** If you plan to use the computer for gaming or other graphics-intensive tasks, you may need a dedicated graphics card. Research the requirements of your desired software or games to determine the appropriate GPU.
7. **Optical Drive:** An optical drive is optional, but if you need to read or write CDs/DVDs, choose a compatible DVD-RW or Blu-ray drive.
8. **Case:** Select a case that supports the form factor of your motherboard and has sufficient space for your components. Consider factors such as airflow, cable management, and aesthetics.

**Safety Protocols:**

1. **Ground Yourself:** Before handling any components, ground yourself by touching a grounded metal object or using an anti-static wrist strap. This prevents static electricity from damaging sensitive components.
2. **Power Off:** Ensure that the computer is powered off and unplugged from the electrical outlet before working on it.
3. **Handle Components Carefully:** Avoid touching the gold pins on the bottom of CPUs and RAM modules. Hold them by their edges or use anti-static bags.

4. Proper Installation: Follow the manufacturer's instructions when installing components, such as aligning the CPU correctly, inserting RAM modules into the appropriate slots, and connecting cables securely.
5. Cable Management: Organize and route cables neatly to improve airflow and prevent them from obstructing fans or components.
6. Thermal Paste: Apply a thin layer of thermal paste between the CPU and the heatsink to ensure proper heat transfer.
7. Test Before Final Assembly: Perform a test boot with minimal components (CPU, RAM, GPU) before fully assembling the computer to ensure everything is functioning correctly.
8. Adequate Cooling: Ensure that the case has proper cooling, including fans or liquid cooling solutions, to prevent overheating.

Please note that these are general guidelines, and it is always recommended to consult specific component manuals and follow their instructions for the best results.

### **Demonstrate the configuration and setting up an Administrator for a Windows Operating System.**

To configure and set up an administrator account in Windows 10, follow these steps:

1. Start your computer and log in with an existing user account that has administrative privileges.
2. Click on the "Start" button (Windows logo) in the bottom-left corner of the screen.
3. In the Start menu, click on the gear icon to open the Settings app.
4. In the Settings window, select "Accounts."
5. In the left sidebar, click on "Family & other users."
6. Under the "Other users" section, click on "Add someone else to this PC."
7. On the following screen, click on the "I don't have this person's sign-in information" link.
8. On the next screen, click on the "Add a user without a Microsoft account" link.
9. A form will appear where you can create a new local user account. Enter a username for the new administrator account. You can also set a password and password hint if desired. Click on the "Next" button.
10. Once the account is created, you will be returned to the "Family & other users" settings page. Under the "Other users" section, you should now see the newly created account listed. Click on the account name.
11. In the account settings, click on the "Change account type" button.
12. In the next window, select the "Administrator" option and click on the "OK" button.
13. Close the Settings app.
14. Log out of the current user account by clicking on the "Start" button, selecting the user profile picture at the top left, and choosing "Sign out."
15. On the login screen, you should now see the newly created administrator account. Select it, enter the password (if set), and click on "Sign in."
16. Once logged in, the new account will have administrator privileges, allowing you to install software, make system changes, and perform other administrative tasks.

Remember that administrator accounts have significant control over the system, so use this privilege responsibly and keep your account secure with a strong password.

**Identify the hardware problem and trouble shoot using appropriate diagnostic tools in a given computer following all safety protocols.**

To identify a hardware problem in a computer and troubleshoot it using appropriate diagnostic tools while following safety protocols, you can follow these general steps:

1. Ensure Safety: Before proceeding, make sure you follow safety protocols such as turning off the computer, unplugging it from the power source, and grounding yourself to prevent static discharge.
2. Identify the Problem: Determine the symptoms or issues you are experiencing with the computer. This could include components not functioning correctly, unusual noises, error messages, or system crashes.
3. Perform Visual Inspection: Inspect the computer's hardware components for any visible signs of damage, loose connections, or dust accumulation. Pay attention to components such as cables, power supply, fans, and the motherboard.
4. Diagnostic Tools: Use appropriate diagnostic tools to identify and troubleshoot the hardware problem. Some common tools include:
  - Hardware Monitoring Software: Install and run hardware monitoring software to check the temperature, voltage, and other system health indicators. This can help identify potential overheating or power-related issues.
  - Memory Diagnostic Tools: Use built-in Windows tools like Windows Memory Diagnostic or third-party software to test the computer's memory (RAM) for errors.
  - Hard Drive Diagnostic Tools: Most hard drive manufacturers provide diagnostic tools that can be downloaded from their websites. Use these tools to check for issues with the hard drive, such as bad sectors or imminent failure.
  - PSU Tester: If you suspect a power supply issue, you can use a PSU tester to check the voltage outputs and ensure they are within the acceptable range.
  - GPU Stress Test: If you are experiencing graphics-related issues, you can use GPU stress test tools to put the graphics card under load and check for stability issues or artifacts.
5. Follow Diagnostic Tool Instructions: Follow the instructions provided by the diagnostic tools to run tests, generate reports, and identify any hardware issues. Pay attention to any error messages or warnings that may be displayed.
6. Troubleshoot or Replace: Based on the diagnostic results, you can troubleshoot the specific hardware component by reseating connections, updating drivers, or adjusting settings. If a component is found to be faulty, consider replacing it with a new one.
7. Document and Seek Professional Help: If the issue persists or you are unsure about performing further troubleshooting, document the problem and the steps you have taken so far. Consider seeking assistance from a professional technician or contacting the manufacturer's support for further guidance.

Remember, these are general steps, and the specific diagnostic tools and troubleshooting methods may vary depending on the hardware and the issue at hand. Always consult the documentation and resources specific to your computer and components for the most accurate guidance.

**Identify software issues and troubleshoot them using appropriate diagnostic tools in a computer while ensuring data and applications are backed up.**

1. Backup Data: Before troubleshooting software issues, it's crucial to back up your important data to prevent data loss. Create a backup of your files, documents, and any other critical data onto an external storage device, cloud storage, or another computer.

2. **Identify Software Issues:** Determine the symptoms or problems you are experiencing with the computer. This could include frequent crashes, error messages, slow performance, or specific software applications not functioning correctly.
3. **Update Software:** Ensure that all your software, including the operating system and applications, are up to date. Outdated software can sometimes cause compatibility issues or security vulnerabilities. Update your software using the built-in update mechanisms or by downloading the latest versions from official sources.
4. **Check Event Viewer:** The Event Viewer in Windows logs various system events, including errors and warnings. Open the Event Viewer, examine the logs under "Windows Logs" and "Applications and Services Logs," and look for any error messages or warnings related to the software issues you're experiencing. These logs can provide valuable insights into the causes of the problems.
5. **Use System File Checker (SFC):** The System File Checker is a built-in Windows tool that scans for and repairs corrupted system files. Open a command prompt as an administrator and run the command "sfc /scannow." It will check the integrity of system files and replace any corrupted files with a cached copy from the Windows installation media.
6. **Run Antivirus/Antimalware Scans:** Perform a thorough scan of your computer using reputable antivirus or antimalware software. Update the antivirus software and run a full system scan to detect and remove any malware or viruses that could be causing software-related issues.
7. **Use Disk Cleanup:** The Disk Cleanup utility in Windows can help free up disk space and remove temporary files that may be causing software issues. Search for "Disk Cleanup" in the Start menu, select the drive you want to clean, and follow the prompts to remove unnecessary files.
8. **Use System Restore:** If the software issues started recently, you can try using the System Restore feature in Windows to revert your computer's settings to a previous point in time when it was functioning correctly. Search for "System Restore" in the Start menu, follow the prompts, and select a restore point before the issues occurred.
9. **Uninstall Problematic Applications:** If the software issues are specific to certain applications, consider uninstalling and reinstalling those applications. Use the "Add or Remove Programs" or "Apps & features" feature in Windows to uninstall the problematic applications, then download and reinstall them from official sources.
10. **Seek Help from Support Forums or Communities:** If you're unable to resolve the software issues on your own, consider seeking help from online support forums or communities dedicated to the software or operating system you're experiencing problems with. Provide detailed information about the issues, including any error messages, and ask for assistance from knowledgeable users or experts.

Remember, troubleshooting software issues can sometimes be complex, and there is a risk of data loss. It's crucial to back up your data before attempting any troubleshooting steps. If you're uncertain or uncomfortable with performing software troubleshooting yourself, it's advisable to seek assistance from a professional technician or contact the software/application support for guidance specific to your situation.

Certainly! Here are some additional details to help you further troubleshoot software issues and use diagnostic tools:

11. **Use System Performance Monitoring:** Windows has built-in tools to monitor system performance, such as Task Manager and Resource Monitor. These tools allow you to monitor CPU, memory, disk, and network usage in real-time. By analyzing resource utilization, you can identify if any particular software or process is causing performance issues or consuming excessive resources.
12. **Run Disk Check Utility:** The Disk Check utility, also known as CHKDSK, scans the file system for errors and attempts to fix them. It can help resolve issues related to file corruption, bad sectors on the hard drive, or improper shutdowns. Open a command prompt as an administrator and run the command "chkdsk /f /r" to initiate a thorough disk check. Note that this process may take some time to complete.

13. **Troubleshoot Internet Connectivity:** If you're experiencing internet connectivity issues, use the built-in network troubleshooters in Windows. Go to the "Network & Internet" settings, and under the "Status" section, click on "Network troubleshooter" to diagnose and fix common network problems.

14. **Check Compatibility Mode:** If you have an application that worked fine on an older version of Windows but is now causing compatibility issues, you can try running it in compatibility mode. Right-click on the application's executable file, go to "Properties," and navigate to the "Compatibility" tab. From there, you can select the compatibility mode for a previous version of Windows that worked well with the application.

15. **Utilize System Recovery Options:** Windows provides various system recovery options that can help troubleshoot software issues. These options include Startup Repair, System Restore, and System Image Recovery. You can access these options by restarting your computer and pressing specific keys (such as F8 or F11) during the boot process, depending on your computer's manufacturer and model.

16. **Use Software-Specific Diagnostic Tools:** Some software applications come with their own diagnostic or repair tools. These tools are typically provided by the software developer and can help identify and resolve specific software-related issues. Check the software's documentation or visit the developer's website for any available diagnostic or repair tools.

17. **Update Device Drivers:** Outdated or incompatible device drivers can cause software issues and system instability. Ensure that your device drivers, such as those for the graphics card, network adapter, or sound card, are up to date. You can visit the manufacturer's website for each device and download the latest drivers specifically designed for your operating system.

18. **Clean Boot:** Performing a clean boot allows you to start Windows with only essential services and startup programs, eliminating potential conflicts caused by third-party software. To perform a clean boot, open the System Configuration utility by typing "msconfig" in the Run dialog box, go to the "Services" tab, check the "Hide all Microsoft services" box, and click "Disable all." Then, go to the "Startup" tab and click "Open Task Manager" to disable startup programs. Afterward, restart your computer and see if the software issues persist.

19. **Use Online Troubleshooting Guides:** Many software developers provide online troubleshooting guides or knowledge bases that can help you diagnose and resolve specific software issues. Visit the developer's website or search for the software's name along with keywords related to your problem to find relevant troubleshooting resources.

20. **Reinstall the Operating System:** If all else fails and the software issues persist, reinstalling the operating system can be a last resort. This process involves formatting the system drive and reinstalling the operating system from scratch. Before proceeding with this step, ensure that you have backed up all your data and have the necessary installation media or recovery options available.

## **Hardware Identification**

### **Types of Computer Case & its Features**

1. **Full Tower:** Full-tower cases are generally big with a height that is about or more than 30 inches (more than 76 cm). The number of internal drive bays inside these cases can be between 6 and 10.





2. Mid Tower: Mid-tower cases are the most widely used computer cases. Mid Tower cases are about 18 to 24 (45 to 60 cm) inches high and they usually contain 2 to 4 internal drive bays and a similar number of external bays (for CD/DVD readers and similar).



3. Mini Tower: Mini-tower usually have up to 2 or sometimes 3 internal drive bays. Mini-cases normally stand at a height of 12 to 18 inches (30 to 45 cm). Expandability is a problem with these cases.



4. Slim Line Case: Slim line cases are simply tower cases turned on their sideways. They can hold a monitor on top of the case.



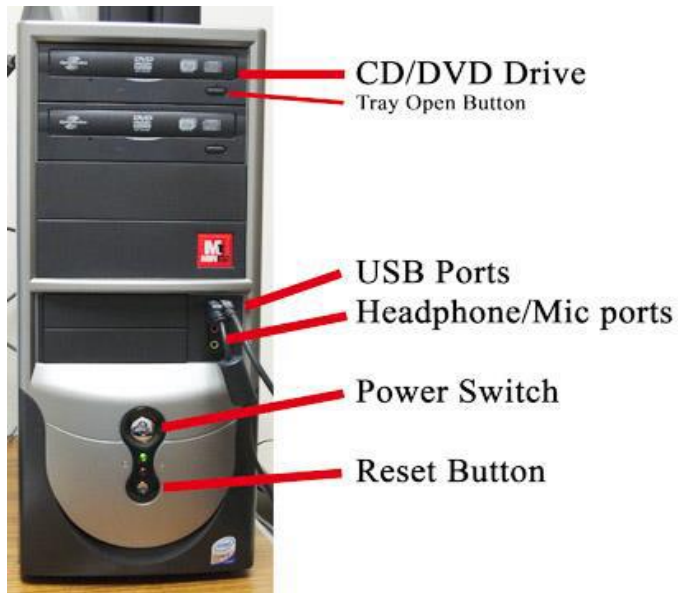
5. Small Form Factor (SFF) Case: Small form factor or SFF cases are custom cases that are designed to minimize the spatial volume of a desktop computer. SFFs are available in a variety of sizes and shapes, including shoe boxes, cubes, and book-sized PCs.



## Panels of Computer

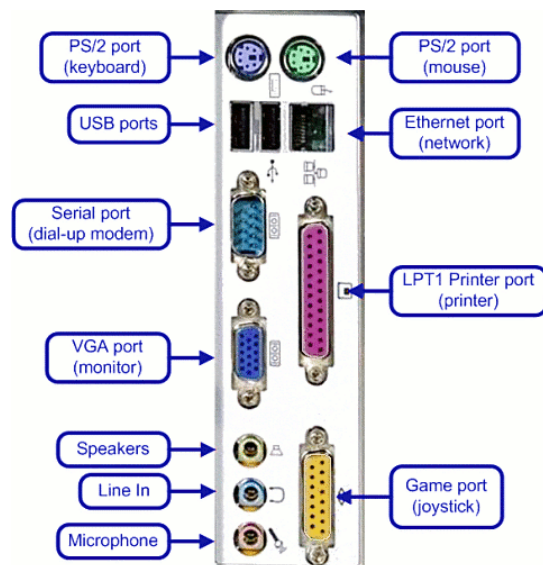
1. Front panel
2. Back panel

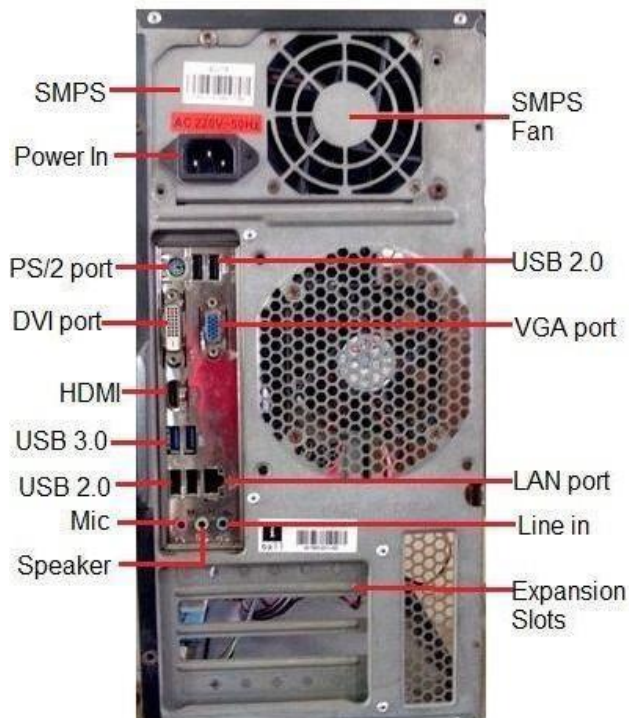
Front panel



Front panel consists of following parts

- DVD-Writer.
- Power-LED:
- HDD LED:
- Reset Switch:
- Front USB.
- Front Audio Ports:
- Power Switch.
- Back panel





Back panel consists of following parts

- SMPS.
- SMPS FAN.
- Power In Socket.
- PS-2 Port.
- USB Port.
- DVI Port.
- HDMI Port.
- 15-pin Female VGA Port.
- LAN Port.
- Audio Ports.
- Expansion Slots:

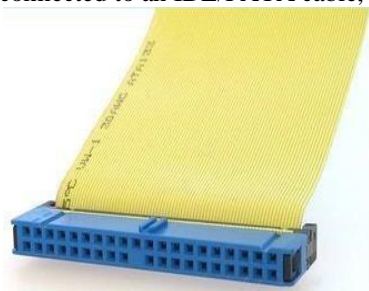
### **Hard drive cables**

There are three main types of cables

1. IDE/PATA (Integrated Drive Electronics /Parallel Advanced Technology Attachment)
2. SATA (Serial Advanced Technology Attachment)
3. SCSI (Small Computer System Interface)

IDE/PATA Cable:

An IDE/PATA hard drive cable is a ribbon cable containing 40 pins. Either one or two devices may be connected to an IDE/PATA cable, and the devices need not be of the same type.



#### SATA Cable:

A SATA hard drive cable has seven conductors and is smaller than an IDE/PATA cable. A SATA cable connects a single hard drive to a single connector on the SATA controller, which is usually found on the computer's motherboard.



#### SCSI Cable:

SCSI cables look similar to IDE/PATA cables in that both drives use ribbon cables. However, SCSI cables have more pins than IDE cables. Depending on the SCSI interface, a SCSI cable may have 50 or 68 pins.



## **I/O Devices**

### **Input Devices**

Input devices are hardware components that allow users to provide data and instructions to the computer.

**\*\*Input Devices:\*\***

1. **\*\*Keyboard:\*\***
2. **\*\*Mouse:\*\***
3. **\*\*Touchpad:\*\***
4. **\*\*Trackball:\*\***
5. **\*\*Joystick:\*\***
6. **\*\*Gamepad/Controller:\*\***
7. **\*\*Scanner:\*\***
8. **\*\*Digital Camera:\*\***
9. **\*\*Microphone:\*\***
10. **\*\*Webcam:\*\***
11. **\*\*Touchscreen:\*\***
12. **\*\*Barcode Reader/Scanner:\*\***
13. **\*\*Fingerprint Scanner:\*\***

### **Output Device**

Output devices are hardware components that deliver information and results generated by the computer to the user.

**\*\*Output Devices:\*\***

1. **\*\*Monitor/Display:\*\***
2. **\*\*Printer:\*\***
3. **\*\*Speaker:\*\***
4. **\*\*Headphones/Earphones:\*\***
5. **\*\*Projector:\*\***
6. **\*\*Plotters:\*\***
7. **\*\*LED/LCD/OLED TV:\*\***

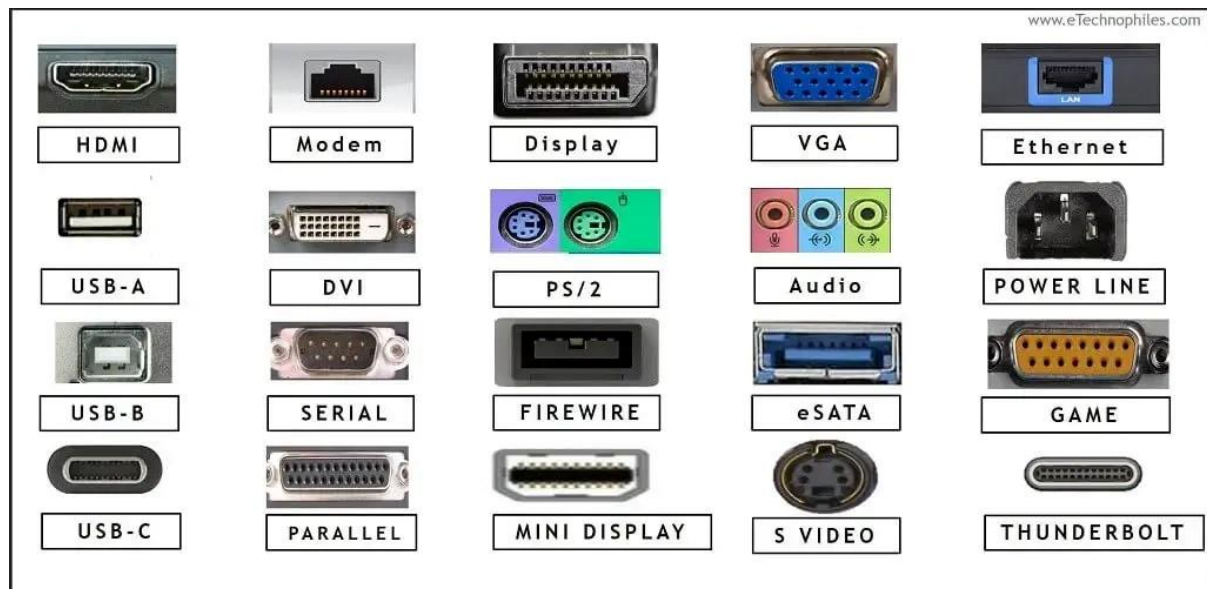
## **Ports**

Computer ports are the physical/virtual connection points that allows for connection between the computer and external devices.

Here are some common types of ports:

1. **\*\*USB Ports (Universal Serial Bus):\*\*** USB ports are among the most prevalent and versatile ports in modern computers. They are used for connecting a wide range of devices, including external hard drives, keyboards, mice, printers, smartphones, and more. USB ports come in different versions (e.g., USB 2.0, USB 3.0, USB-C) with varying data transfer speeds and power capabilities.
2. **\*\*HDMI Port (High-Definition Multimedia Interface):\*\*** HDMI ports are used to connect computers to displays like monitors, TVs, and projectors. They transmit high-definition audio and video signals.
3. **\*\*VGA Port (Video Graphics Array):\*\*** VGA ports are older video ports commonly found on older computers and monitors.
4. **\*\*DisplayPort:\*\*** DisplayPort is a digital video and audio interface used for connecting computers to high-resolution monitors and displays. It offers support for multiple displays and higher resolutions.
5. **\*\*Ethernet Port:\*\*** Ethernet ports are used for wired network connections. They allow computers to connect to local area networks (LANs) and the internet through Ethernet cables.
6. **\*\*Audio Jacks:\*\*** These include headphone and microphone jacks. They are used for connecting headphones, microphones, and external audio devices to the computer.
7. **\*\*Thunderbolt Port:\*\*** Thunderbolt is a high-speed interface that supports data transfer, video output, and power delivery. It is commonly found on Mac computers and some Windows PCs.
8. **\*\*eSATA Port (External Serial Advanced Technology Attachment):\*\*** eSATA ports are used for connecting external hard drives and storage devices, providing faster data transfer speeds than USB.
9. **\*\*Card Reader:\*\*** Many computers have built-in card readers that allow the reading of memory cards from cameras, smartphones, and other devices.
10. **\*\*FireWire Port (IEEE 1394):\*\*** FireWire ports are used for connecting audio and video equipment and external storage devices. They offer high-speed data transfer.

11. **PS/2 Port:** These ports were once used for connecting keyboards and mice, but they have largely been replaced by USB connections.
12. **Serial Port:** Serial ports are older, less common ports used for connecting older equipment such as serial printers and industrial machinery.
13. **Parallel Port:** Parallel ports, like serial ports, are older and used for connecting devices like printers and scanners.
14. **Modem Port:** Modem ports are used for connecting dial-up modems to access the internet over telephone lines.



### Cable Types

Computers use various types of cables to connect to peripherals, networks, and other devices. some of them are,

1. **USB Cable (Universal Serial Bus):** USB cables are one of the most versatile and widely used cable types in computing. They connect a variety of devices, such as keyboards, mice, printers, external hard drives, and smartphones to computers.

2. **HDMI Cable (High-Definition Multimedia Interface):** HDMI cables are used to transmit high-definition audio and video signals between computers, monitors, TVs, projectors, and other display devices.

3. **VGA Cable (Video Graphics Array):** VGA cables transmit analog video signals, though they are becoming less common in favor of digital interfaces like HDMI and DisplayPort.

4. **DisplayPort Cable:** DisplayPort cables are used for connecting computers to high-resolution displays, providing support for multiple monitors and high refresh rates.

5. **Ethernet Cable:** Ethernet cables, including Cat 5e, Cat 6, and Cat 7, are used for wired network connections, enabling computers to connect to local area networks (LANs) and the internet.

6. **Audio Cables:** These include various types of audio cables, such as 3.5mm (1/8-inch) audio cables, RCA cables, and optical audio cables, which connect computers to speakers, headphones, and audio equipment.

7. **DVI Cable (Digital Visual Interface):** DVI cables transmit digital and analog video signals, and they are used for connecting computers to monitors and display devices, especially older ones.

8. **Thunderbolt Cable:** Thunderbolt cables are high-speed cables used to connect devices like external hard drives, monitors, and docking stations to computers, particularly Macs.

9. **eSATA Cable (External Serial Advanced Technology Attachment):** eSATA cables connect external hard drives and storage devices to computers, offering faster data transfer speeds than USB.

10. **SATA Cable:** SATA cables are used internally to connect hard drives, SSDs, and optical drives to the motherboard within a computer.

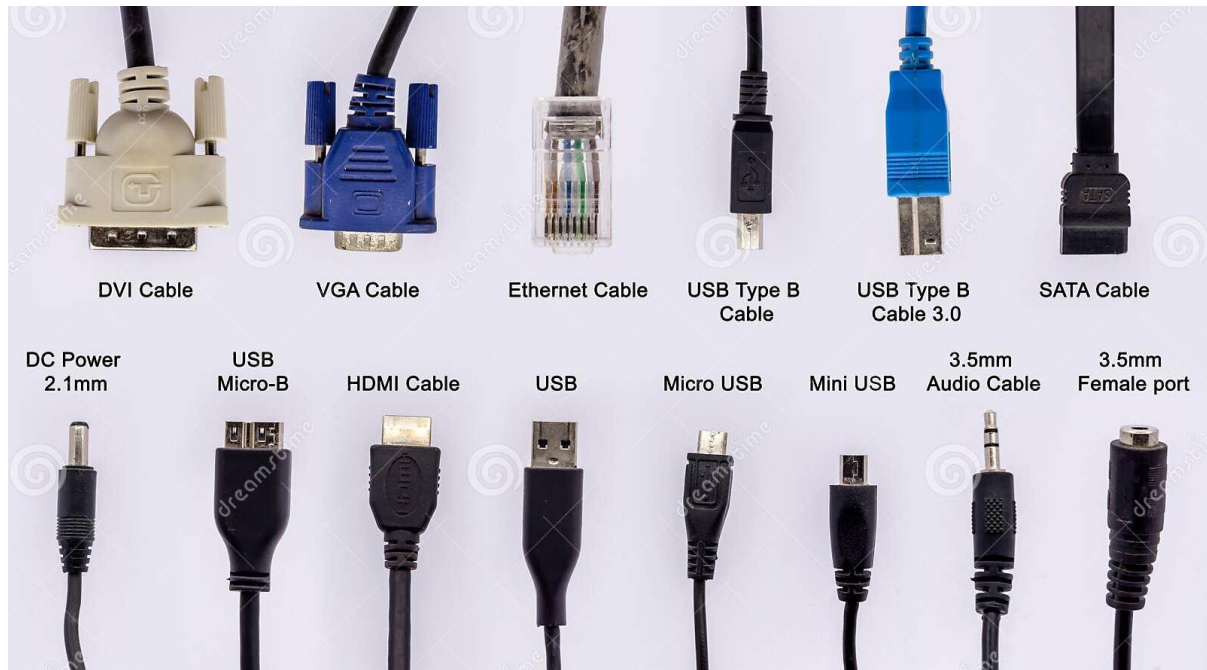
11. **Power Cables:** Power cables, such as the IEC C13 (commonly known as the "kettle lead"), connect computers and monitors to power outlets.

12. **USB-C Cable:** USB-C is a reversible, versatile connector used for a wide range of devices, including laptops, smartphones, and peripherals.

13. **MIDI Cable:** MIDI cables are used for connecting musical instruments and audio equipment to computers for music production and recording.

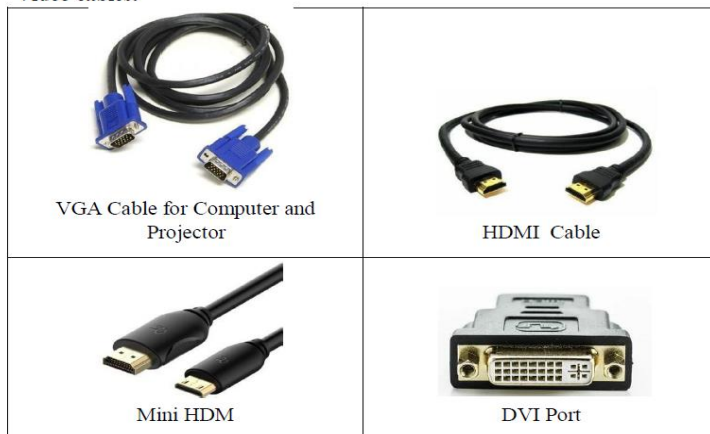
14. **Coaxial Cable:** Coaxial cables are used for cable television and broadband internet connections.

15. **Fiber Optic Cable:** Fiber optic cables use light signals to transmit data and are commonly used in high-speed network connections over long distances.
16. **PS/2 Cable:** PS/2 cables were used for connecting keyboards and mice to older computers, though they are less common today.
17. **Serial Cable:** Serial cables were used for connecting older devices like modems, serial printers, and some industrial equipment.
18. **Parallel Cable:** Parallel cables were used for connecting printers, primarily dot matrix and early laser printers, though they have been largely replaced by USB.






### Video cables:

#### Video cables:





#### Adapters:

 DVI to HDMI Usage: Computers and Laptops and Projectors	 USB to Ethernet Usage: Network Connection
 DVI to VGA Usage: Multimedia, DVD Player, Computer, Monitor, Game Player	

### Difference between Serial port and Parallel port

Following are the important differences between Serial Ports and Parallel Ports.

Sr. No.	Key	Serial Ports	Parallel Ports
1	Purpose	Serial Port is used for serial data transmission.	Parallel Port is used for parallel data transmission.
2	Transmission Speed	Transmission speed of a serial port is slow as compared to a parallel port.	Transmission speed of a parallel port is quite high as compared to a serial port.
3	Redundancy	Bottom-Up model is better suited as it ensures minimum data redundancy and focus is on re-usability.	Top-down model has high ratio of redundancy as the size of project increases.
4	No. Of Wires	Wire connections to serial port are quite less as compared to parallel port.	No. of wires that are connected to parallel port are quite high as compared to serial port.
5	Capability	A serial port is able to transmit a single stream of data at a time.	A parallel port is able to transmit multiple data streams at a time.
6	Data Sending Mechanism	A serial port sends data bit by bit after sending a bit at a time.	A parallel port sends data by sending multiple bits in parallel fashion.
7	Port Type	A serial port uses Male ports.	A parallel port uses Female ports.
8	Applications	Modems, security cameras, device controllers use serial ports.	Printers, Hard Drives, CD drives use parallel ports.

### Importance of USB and HDMI

USB (Universal Serial Bus) and HDMI (High-Definition Multimedia Interface) interfaces are both critically important in modern computing and consumer electronics for various reasons.

#### **\*\*Importance of USB Interfaces:\*\***

1. **\*\*Versatility:\*\*** USB is versatile and supports a wide range of devices, making it a universal standard for connecting peripherals like keyboards, mice, printers, external hard drives, and smartphones. It can even charge devices like smartphones and tablets.
2. **\*\*Plug-and-Play:\*\*** USB is plug-and-play, meaning you can connect and disconnect devices without having to shut down or restart the computer. This convenience simplifies the use of peripherals.
3. **\*\*Data Transfer:\*\*** USB interfaces offer various data transfer speeds, with USB 3.0 and USB-C being especially fast. This makes them suitable for transferring data quickly between devices and backing up or accessing data on external storage.
4. **\*\*Power Delivery:\*\*** USB supports power delivery, allowing not only data transfer but also power supply to devices. USB ports on computers, adapters, and hubs can charge smartphones, tablets, and laptops.
5. **\*\*Standardization:\*\*** USB is a widely accepted standard, ensuring compatibility among a vast range of devices from different manufacturers.



6. **Compact Size:** USB connectors are relatively small, which makes them suitable for smaller devices like laptops and mobile devices.

### **\*\*Importance of HDMI Interfaces:\*\***

1. **High-Definition Video and Audio:** HDMI is crucial for delivering high-definition video and audio signals, making it the standard for connecting computers to monitors, TVs, and projectors. It ensures the best quality for multimedia content.
2. **Digital Transmission:** HDMI is a digital interface, which means it provides a pure and noise-free signal. This is important for maintaining the quality of high-definition content.
3. **Simplicity:** HDMI carries both video and audio in a single cable, simplifying the connections between devices. This is especially important for home entertainment setups where multiple devices are connected to a TV.
4. **Compatibility:** HDMI is a widely adopted standard in consumer electronics, ensuring compatibility among various devices, including computers, gaming consoles, Blu-ray players, and home theater systems.
5. **HDCP Support:** HDMI supports High-bandwidth Digital Content Protection (HDCP), which is crucial for secure transmission of copyrighted content, preventing unauthorized copying or piracy.
6. **Multiple Versions:** HDMI has seen advancements over time, with newer versions providing support for higher resolutions, refresh rates, and additional features like Ethernet over HDMI (HEC).

### **Installation of a Local printer**

Steps:

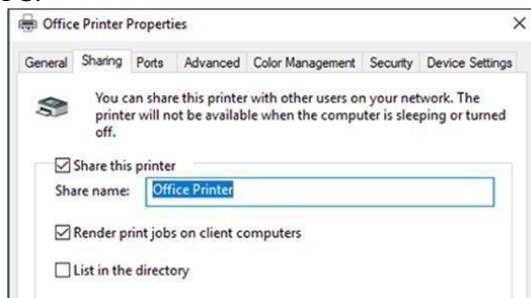
- Get the Installation Disk that come along with purchased Printer. (or Download the proper installable Printer Driver From legal Website).
- Connect the Printer to the PC where Printer to be installed using Printer Data Cable (possibly USB).
- Connect the Printer to the Power supply Slot. And Check the Printer is Turned ON.
- Insert the CD (/Downloaded Installable driver) into your computer. and follow the installation wizard using all defaults.
- If you DO NOT have the installation CD that came with your printer or added Printer Icon is got removed: proceed to Manual Installation.

### **Installation of shared printer**

Steps:

There are two ways to share your printer: using Settings or Control Panel. Share your printer using Settings

1. Select the Start button, then select Settings > Devices > Printers & scanners.
2. Choose the printer you want to share, and then select Manage.
3. Select Printer Properties, and then choose the Sharing tab.
4. On the Sharing tab, select Share this printer.
5. If you want, edit the share name of the printer. You'll use this name to connect to the printer from a secondary PC.

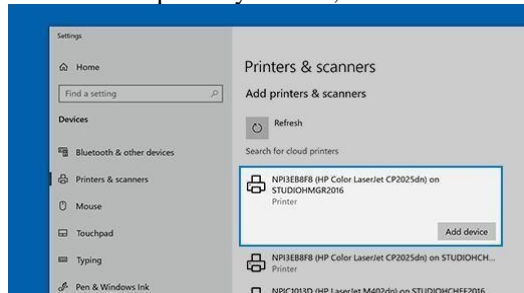


Connect the Shared Printer to another PC

There are two ways to connect a shared printer to another PC: using Settings or Control Panel.

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

2. Under Add printers & scanners, select Add a printer or scanner.
3. Choose the printer you want, and then select Add Device.

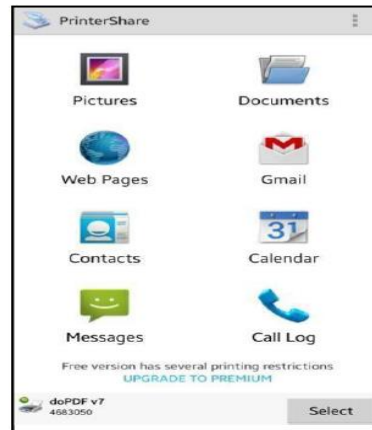
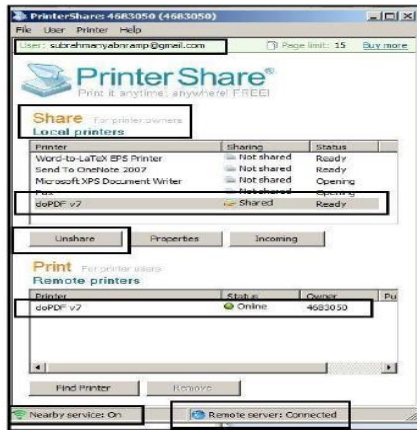


4. In the Add printer dialog box, select Select a shared printer by name, and then enter the computer or device name of the primary PC and the share name of the printer using one of these formats:
  - o \\computername\printername
5. When prompted to install the printer driver, select Next to complete the installation.
6. Finally, Printer Icon for the Remoter Printer will appear in Devices List.

### **Installing Cloud Printer/ wireless Printer:**

Steps:

- Download PrinterShare Software (full Version) from <http://download.printershare.com/files/PrinterShare2308.exe>
- Install PrinterShare in Personal Computer (Windows OS)
- Launch the PritterShare Software at the end of Installation
- Login to PrinterShare Software with valid Gmail Account by Clicking icon at Taskbar (or Search for PrinterShare Console) at TaskBar. Provide password of your own choice.
- Select the Printer which is to be shared (From Share Local Printer Lists)
- Click Share (Which will appear in Remote Printers List after Success)
- Download and Install "PrinterShare" Software Application in Mobile (Another Device) using Google Play Store.
- In Mobile, Login PrinterShare App with Username and Password (Which is available in message sent to gmail account, in case of Forgot Password)
- Select the File to be printed remotely From Mobile Gallery and Click on Print, Select the Shared Printer Name which is Shared in Personal Computer.
- And Click Print.
- Go to Personal Computer, the New Printing job is now available at Personal Computer PrinterShare Application and automatically Prints the file which is sent remotely (through Mobile).



**PrinterShare Software GUI at Desktop and Android Mobile.**

## Static electricity

Static electricity is an imbalance of electric charge on the surface of an object. It occurs when there is an excess or deficiency of electrons on the surface of a material.

### Static electricity can pose several dangers and risks,

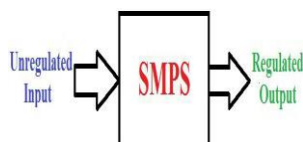
1. **Fire and Explosion Hazard**:
2. **Electronic Component Damage**:
3. **Painful Shocks**:
4. **Workplace Accidents**:
5. **Contamination and Dust Explosions**:
6. **Damage to Chemical Processes**:
7. **Atmospheric and Lightning Hazards**:
8. **Equipment Malfunction**:

### Safety precautions/protocols to be taken for static electricity

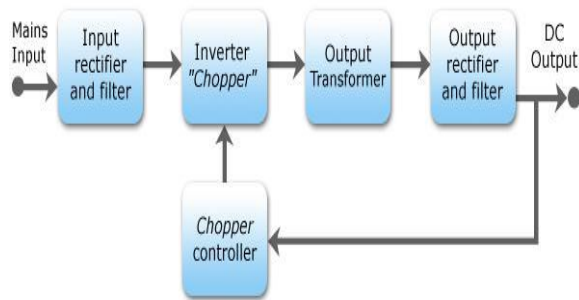
1. **Wear Antistatic Clothing and Footwear**:
2. **Use Antistatic Work Surfaces and Mats**:
3. **Wear Antistatic Wrist Straps**:
4. **Use Antistatic Gloves**:
5. **Maintain proper Humidity Control**:
6. **Grounding**:
7. **Store and transport sensitive electronic components in antistatic packaging materials**:
8. **Use Static Control Ionizers**:
9. **Avoid Synthetic Fabrics**:
10. **Keep the work environment clean and free from dust, which can accumulate static charge. Regular cleaning and maintenance can help reduce static buildup**.
11. **Ensure that all personnel are educated and trained in static electricity safety protocols**.
12. **Grounding of Personnel**:

## SMPS

A Computer SMPS (Switched-Mode Power Supply), also known as a PC power supply or PSU (Power Supply Unit), is a crucial component in a desktop computer. Its primary function is to convert and provide the necessary electrical power to various components within the computer, including the motherboard, CPU, GPU, hard drives, and other peripherals.



## BLOCK DIAGRAM OF SMPS



### Need of SMPS / Key features and functions of a computer SMPS include:

1. **Voltage Conversion**: SMPS converts the alternating current (AC) from the wall outlet into direct current (DC), which is required by computer components. This DC voltage is typically at +3.3V, +5V, and +12V levels.
2. **Regulation**: It provides stable and regulated power outputs to ensure that the computer components receive a constant voltage within specified tolerances, preventing voltage fluctuations and damage to sensitive electronics.
3. **Multiple Output Rails**: A typical computer SMPS provides multiple output voltage rails, including +3.3V, +5V, +12V, -12V, and sometimes other voltages like +5VSB (standby voltage).
4. **Power Rating**: SMPS units come in various power ratings (measured in watts).
5. **Connectors**: SMPS units include a variety of connectors for different components, such as 24-pin or 20+4-pin motherboard connectors, SATA connectors for hard drives and SSDs, PCIe connectors for graphics cards, and peripheral connectors for fans, optical drives, and other devices.
6. **Overcurrent and Overvoltage Protection**:
7. **Cooling**: Most SMPS units have internal fans to dissipate heat generated during operation.

### Measure the Voltage of SMPS using Multimeter by wire colour coding

Measuring / Checking DC Voltage:

1. In SMPS outlet, Short the Green and Black Pins
2. Power ON the SMPS and verify SMPS fan is running.
3. Set the Multi-meter knob to DC Voltage around (20V range)
4. Connect multi-meter Negative Terminal to any one of the Black Outlet.
5. Connect multi-meter Positive Terminal to all the pins of multi-meter outlet and note down the readings.

SL. NO.	WIRE COLOR WITH THEORETICAL VOLTAGE VALUE	MEASURED VOLTAGE
1	<b>Yellow: +12V</b>	
2	<b>Red: +5V</b>	
3	<b>Orange: +3.3V</b>	

4	<b>Black:</b> Ground	
5	<b>Purple:</b> 5V SB (standby voltage)	
6	<b>Green:</b> /PS_ON (it can be shorted to ground to start PSU)	
7	<b>Grey:</b> PWR_OK (status signal generated by PSU to indicate voltages are OK) – <b>Power Good Signal</b>	
8	<b>White:</b> -5V (Optional on newer ATX-2 PSUs)	
9	<b>Blue:</b> -12V	

### **\*\*Mounting the SMPS:\*\***

The term "mounting" in the context of SMPS (Switched Mode Power Supply) generally refers to the physical installation or attachment of the power supply unit in a system.

Precautions to be taken while mounting SMPS

1. **\*\*Power Off\*\***: Before you begin, ensure that the computer is completely powered off and disconnected from the electrical outlet. This is critical to prevent electric shock and damage to the SMPS.
2. **\*\*Anti-Static Measures\*\***: Use antistatic wrist straps or antistatic gloves to prevent electrostatic discharge.
3. **\*\*Proper Positioning\*\***: Ensure the SMPS is oriented correctly before mounting.
4. **\*\*Screw Tightening\*\***: Secure the SMPS firmly in place using the appropriate screws or fasteners provided with your computer case. Ensure it is mounted securely to prevent any movement or vibrations during operation.
5. **\*\*Cable Management\*\***: Neatly route and manage the power cables from the SMPS.

### **\*\*Un-mounting the SMPS:\*\***

The term "unmounting" in the context of SMPS (Switched Mode Power Supply) typically refers to the process of removing or detaching the power supply unit from its installed position in a device or system.

Precautions to be taken while un-mounting SMPS

1. **\*\*Power Off\*\***: Always power off the computer and disconnect it from the electrical outlet before attempting to unmount the SMPS.
2. **\*\*Disconnect Cables\*\***: Carefully disconnect all power cables and connectors from the SMPS. Make a note of where each cable is connected so you can reattach them correctly later.
3. **\*\*Label or Photograph\*\***: If necessary, label or take photographs of the cable connections to help you remember their positions during reassembly.
4. **\*\*Antistatic Precautions\*\***: Just as when mounting, use antistatic wrist straps or gloves to prevent ESD when handling the SMPS.
5. **\*\*Screw Removal\*\***: Carefully remove the screws or fasteners holding the SMPS in place. Keep track of these screws as they will be needed when remounting the new or reinstalled SMPS.
6. **\*\*Handle with Care\*\***: Lift the SMPS from its mounting location with care, avoiding any sudden movements or impacts. Hold it by its edges or handle (if provided).
7. **\*\*Place in a Safe Location\*\***: After removal, place the SMPS in a safe and clean area to avoid contamination or damage. Ensure it is stored securely to prevent it from falling or being bumped.

### **Symptoms of SMPS failure / Common problems from a faulty SMPS**

A failing or malfunctioning SMPS (Switched Mode Power Supply) can exhibit a range of symptoms that can impact the performance and stability of a computer system. Here are common symptoms of SMPS failure:

1. **\*\*No Power:\*\*** The computer fails to turn on when the power button is pressed. This is one of the most obvious signs of a power supply failure.
2. **\*\*Intermittent Power:\*\*** The computer may power on inconsistently, with erratic behavior. It may work one moment and then fail to power up the next.
3. **\*\*Random Shutdowns:\*\*** The computer may power off unexpectedly, often without warning. This can occur during regular operation or while under heavy load.
4. **\*\*Freezing or Locking Up:\*\*** The computer may freeze or become unresponsive, requiring a hard reset. This can be a result of inconsistent power delivery from the SMPS.
5. **\*\*Blue Screen of Death (BSOD):\*\*** Frequent system crashes with blue screen error messages can be indicative of power supply issues, as unstable power can lead to system instability.
6. **\*\*Unusual Fan Behavior:\*\*** The power supply fan may operate at inconsistent speeds or make unusual noises, indicating potential internal issues with the SMPS.
7. **\*\*Overheating:\*\*** Overheating of the computer components, including the CPU and GPU, can occur due to insufficient power or irregular power supply from the SMPS.
8. **\*\*Burning Smell:\*\*** A burnt or acrid smell coming from the power supply area can indicate overheating or damaged components within the SMPS.
9. **\*\*Electrical Noise or Coil Whine:\*\*** Audible electrical noise or coil whine coming from the power supply can suggest issues with the internal components, such as capacitors or coils.
10. **\*\*Voltage Drops:\*\*** Irregular voltage outputs can lead to unstable system performance, data corruption, and hardware damage.
11. **\*\*Inability to Boot:\*\*** The computer may fail to boot into the operating system, displaying error messages or BIOS warnings related to power issues.
12. **\*\*Hard Drive and Component Failures:\*\*** Frequent hard drive failures, data corruption, or other component issues can be caused by unstable power supplied by the SMPS.
13. **\*\*Failure to Power External Devices:\*\*** USB devices, external hard drives, and other peripherals may not receive power or may experience intermittent disconnections.
14. **\*\*Flashing LEDs or LEDs Not Working:\*\*** LEDs on the computer case or motherboard may flash or fail to light up, indicating inconsistent power delivery.

### **Trouble shooting SMPS through SMPS fan**

Troubleshooting an SMPS (Switched Mode Power Supply) through the SMPS fan is a common method to identify issues with the power supply unit.

1. **\*\*Visual Inspection:\*\***
  - Carefully open the computer case to access the SMPS.
  - Examine the power supply fan to check for any physical obstructions, such as dust or cables, that might hinder the fan's operation.
2. **\*\*Power On the Computer:\*\***
  - Turn on the computer while paying close attention to the SMPS fan.
  - Observe whether the fan starts spinning as soon as the computer is powered on. The fan should begin spinning immediately.
3. **\*\*Listen for Unusual Noises:\*\***
  - While the computer is running, listen for any unusual noises emanating from the power supply or the fan. Unusual sounds, such as grinding or rattling, could indicate fan or internal issues.
4. **\*\*Monitor Fan Speed:\*\***
  - Some SMPS units have variable-speed fans that adjust based on system load and temperature. Monitor the fan speed to ensure that it increases when the computer's components generate more heat.
5. **\*\*Overheating Issues:\*\***
  - If the SMPS fan fails to spin at all or remains at a slow speed, it may be a sign of overheating or an internal malfunction.
  - Check if the SMPS unit is unusually hot to the touch, which could indicate overheating.

## **Trouble shooting SMPS through PSU Tester**

Troubleshooting an SMPS (Switched Mode Power Supply) using a PSU tester, also known as a power supply tester, is an effective method to identify power supply issues.

1. **\*\*Acquire a PSU Tester:\*\***
  - Obtain a PSU tester, which is a compact device with multiple connectors and LED displays that check the voltages supplied by the SMPS.
2. **\*\*Prepare the SMPS:\*\***
  - Open the computer case to access the SMPS.
  - Ensure that the power supply is disconnected from the electrical outlet and all components inside the computer.
3. **\*\*Connect the PSU Tester:\*\***
  - Connect the PSU tester to the relevant connectors on the power supply unit.
  - Make sure you connect the tester to the 24-pin ATX connector, which is the primary power connector for the motherboard, and any other relevant connectors such as 4-pin or 8-pin CPU connectors.
4. **\*\*Power On the PSU:\*\***
  - Turn on the power supply unit while leaving the computer turned off. This can often be done by using a paperclip to short the green wire (PS\_ON) and any black wire (COM) in the 24-pin ATX connector.
  - Alternatively, some PSU testers have their own power button.
5. **\*\*Observe LED Displays:\*\***
  - The PSU tester will have LED displays showing voltage readings for each rail, including +3.3V, +5V, +12V, and sometimes others. The LED displays will indicate whether each voltage rail is within an acceptable range.
  - If any voltage rail is significantly out of tolerance (typically  $\pm 5\%$ ), it may indicate a problem with the power supply.
6. **\*\*Listen for Beep Codes:\*\***
  - Some PSU testers also have audible beep codes that indicate the condition of the power supply. Consult the PSU tester's manual for information on interpreting these codes.
7. **\*\*Test Each Connector:\*\***
  - If the PSU tester provides multiple connectors for different types of connectors (e.g., 4-pin CPU, 6-pin PCIe, SATA), use these connectors to check the voltages on specific rails for components like the CPU, graphics card, and hard drives.
8. **\*\*Record and Interpret Results:\*\***
  - Make note of the voltage readings displayed by the PSU tester. Compare the values to the expected voltage ranges specified by the manufacturer.

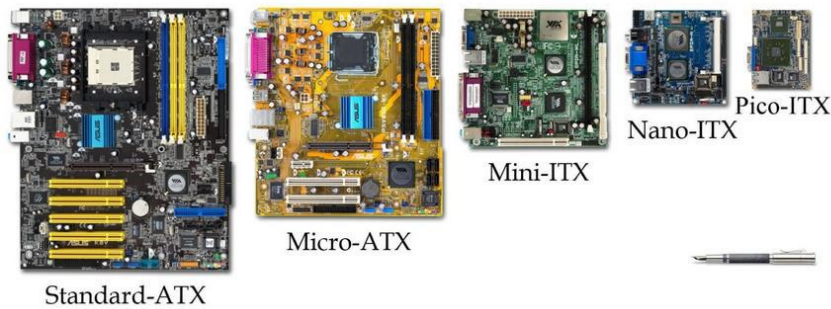
## **Mother Board**

- The motherboard is the main component of a computer. It holds the CPU and memory as well as the connectors for the power supply, hard drives, and other peripheral devices. The motherboard is what connects all these components in a system that functions as a computer. The motherboard is the piece of computer hardware that can be thought of as the "backbone" of the PC.
- The motherboard is generally a thin circuit board that holds together almost all parts of a computer except input and output devices.
- There can be different types of motherboards based on the type and size of the computers.



## Types of Motherboards

Motherboards come in different sizes, known as form factors. The most common motherboard form factor is ATX. Form Factor ATX (Advanced Technology Extended).



### Brief Comparison of the Motherboard Form Factors.

Form Factor	Manufacturer/Date	Dimensions	Applications
Standard-ATX	Intel 1995	12 × 13 in	Workstation/Desktop
Micro-ATX	Intel 1997	9.6 × 9.6 in	Small Form Factor
Mini-ITX	VIA 2001	6.7 × 6.7 in	Small Form Factor
Nano-ITX	VIA 2003	4.7 × 4.7 in	Embedded Systems
Pico-ITX	VIA 2007	3.9 × 2.8 in	Embedded Systems
Mobile-ITX	VIA 2009	2.4 × 2.4 in	Embedded Systems

### Components of a Motherboard:

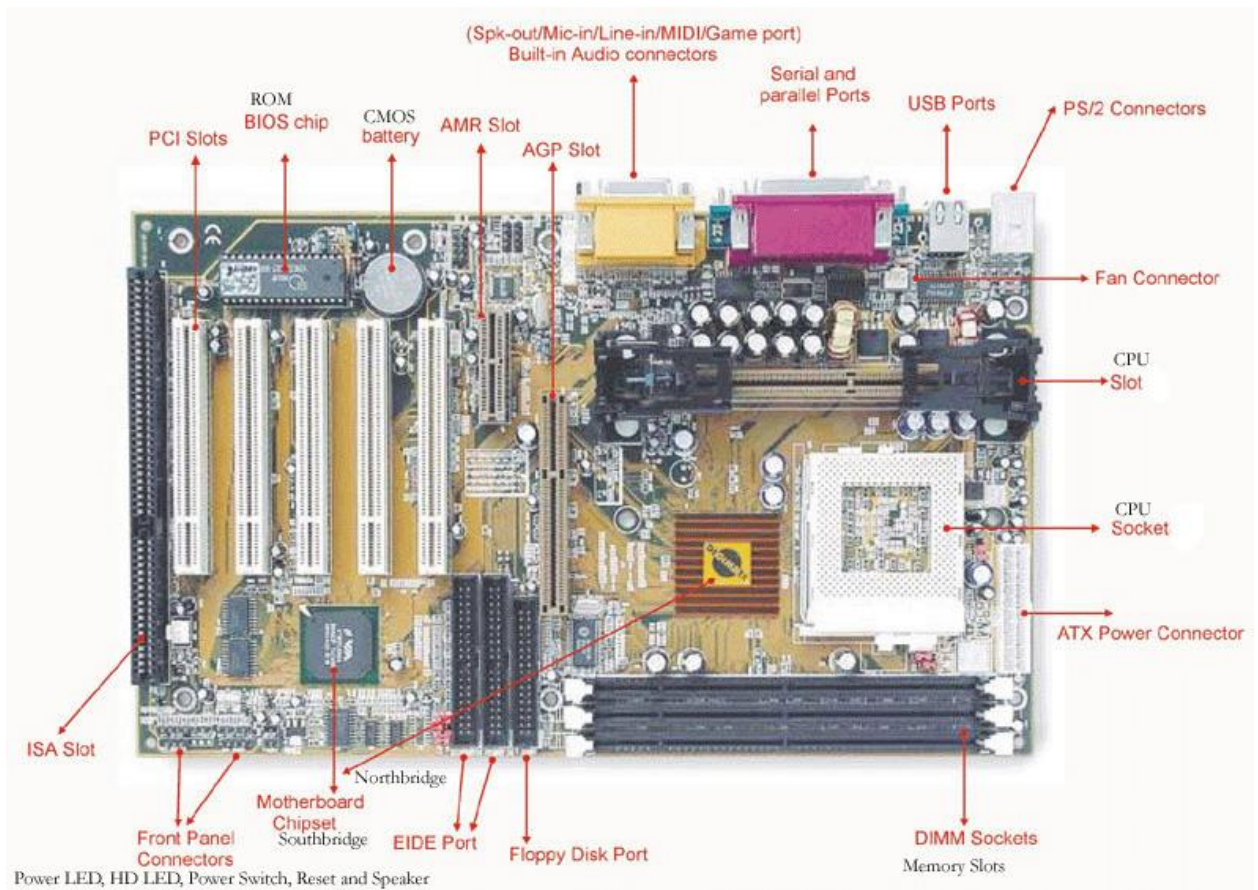
- Keyboard and mouse. There are mainly 2 types of mouse and keyboard connectors. ...
- Universal Serial Bus (USB) The USB port is used for connecting the computer system. ...
- Parallel port.
- CPU chip.
- RAM slots.
- Floppy Controller.
- IDE controller.
- PCI slot.

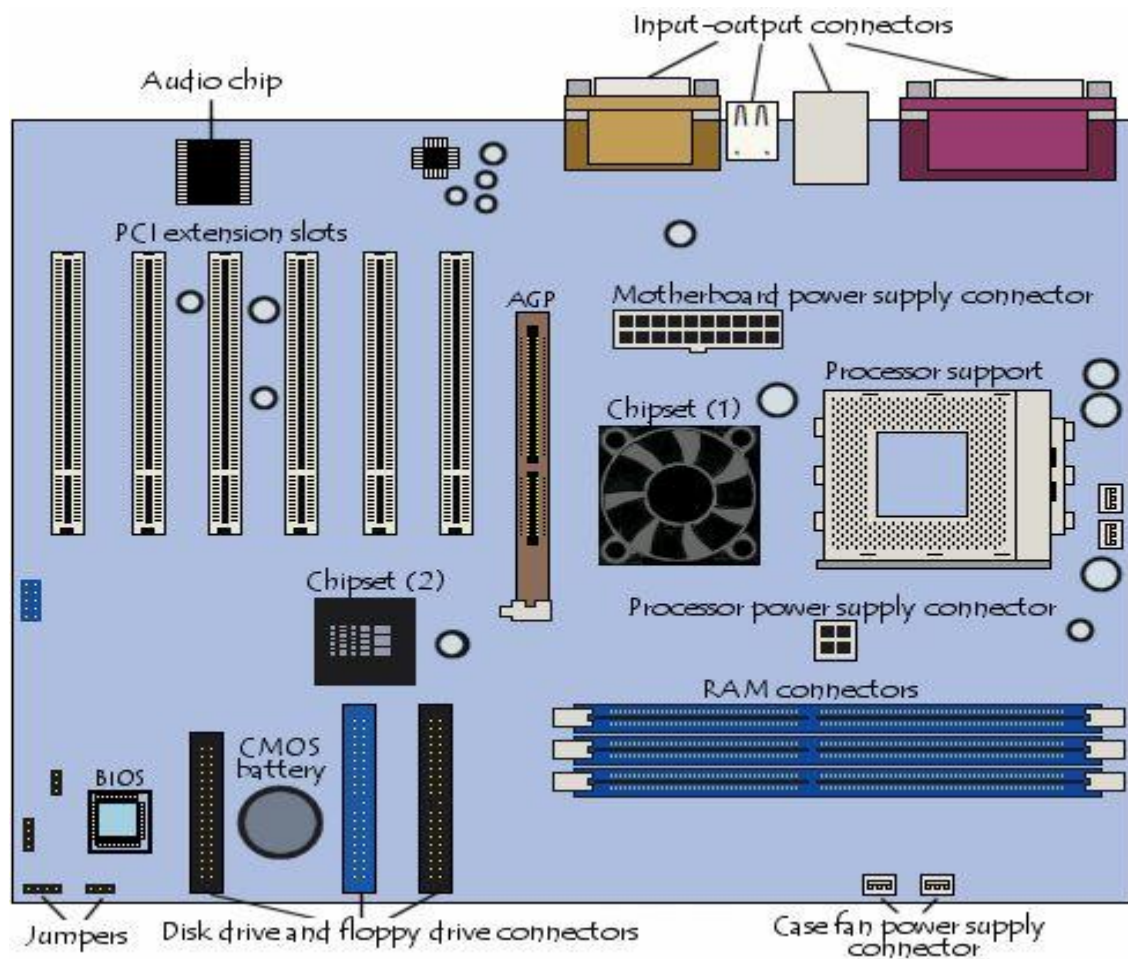
### Here are the main components of a typical motherboard:

1. CPU Socket (Central Processing Unit): The CPU socket is where the processor (CPU) is installed. It provides the necessary electrical connections for the CPU to communicate with other components.



2. **RAM Slots (Random Access Memory):** These slots are for installing RAM modules. RAM is used for temporary storage of data that the CPU needs to access quickly.
3. **Expansion Slots:** These slots allow you to install additional components, such as graphics cards, sound cards, and networking cards. Common types include PCI Express (PCIe) and Peripheral Component Interconnect (PCI) slots.
4. **Chipset:** The chipset is a set of chips on the motherboard that manages communication between the CPU, memory, storage devices, and other peripherals. It typically includes the Northbridge and Southbridge chips.
  - **Northbridge:** Historically, it handled tasks like memory control and high-speed graphics connections. However, in modern systems, many of its functions have been integrated into the CPU or moved to the Southbridge.
  - **Southbridge:** It manages lower-speed peripherals like USB, audio, SATA (Serial ATA), and PCI slots.
5. **BIOS/UEFI Firmware:** The Basic Input/Output System (BIOS) or Unified Extensible Firmware Interface (UEFI) is a firmware that initializes the hardware components of the computer during the boot process. UEFI is a more modern replacement for traditional BIOS.
6. **Power Connectors:** The motherboard has connectors for the power supply unit (PSU). The main power connector is the ATX connector, and there may be additional connectors for supplying power to the CPU (e.g., 4-pin or 8-pin CPU power connectors).
7. **Storage Connectors:** These connectors, such as SATA and M.2, are used for connecting storage devices like hard drives and SSDs.
8. **Peripheral Connectors:** USB ports, audio jacks, Ethernet ports, and other peripheral connectors are located on the motherboard, allowing you to connect external devices.
9. **CMOS Battery:** The CMOS battery powers the CMOS (Complementary Metal-Oxide-Semiconductor) memory, which stores the system's BIOS/UEFI settings and maintains the system clock when the computer is powered off.
10. **Headers and Connectors:** These include various headers for connecting components like fans, front-panel buttons and LEDs, and additional USB or audio connectors.
11. **Graphics Connectors:** Onboard graphics connectors (if available) or slots for dedicated graphics cards are present for video output.
12. **Network Interfaces:** Ethernet ports or, in some cases, wireless networking components may be integrated into the motherboard.





## Micro Architecture of Intel and AMD CPU

### **Intel:**

1. **Skylake:** Introduced in 2015, Skylake was the sixth-generation microarchitecture. It was used in various Intel Core processors.
2. **Kaby Lake:** Released in 2016, Kaby Lake was the seventh-generation microarchitecture, succeeding Skylake.
3. **Coffee Lake:** Introduced in 2017, Coffee Lake was an eighth-generation microarchitecture. It featured increased core counts in mainstream desktop processors.
4. **Cannon Lake:** Cannon Lake was intended to be the first 10nm microarchitecture, but it had limited release, primarily in low-power applications.
5. **Ice Lake:** Launched in 2019, Ice Lake was a 10nm microarchitecture used in certain laptop processors. It introduced new features and improvements over previous generations.
6. **Tiger Lake:** Tiger Lake, released in 2020, is another 10nm microarchitecture designed for laptops, featuring improvements in performance and integrated graphics.
7. **Alder Lake:** Introduced in 2021, Alder Lake is a hybrid microarchitecture that combines high-performance and high-efficiency cores. It is the 12th generation of Intel Core processors.

### **AMD:**

1. **Zen:** Launched in 2017, Zen was a significant departure for AMD and marked the beginning of a new architecture. It was used in first-generation Ryzen processors.
2. **Zen+:** Zen+ was an incremental improvement over Zen and was used in second-generation Ryzen processors. It brought refinements to the original architecture.
3. **Zen 2:** Released in 2019, Zen 2 was a significant update, featuring a 7nm manufacturing process and architectural improvements. It was used in third-generation Ryzen processors.

- |    |        |  |
|----|--------|--|
| 4. | Zen 3: | Launched in 2020, Zen 3 is another 7nm architecture that brought notable performance improvements. It is used in fourth-generation Ryzen processors. |
| 5. | Zen 4: | As of my last update, Zen 4 was on AMD's roadmap for future processors. It was expected to continue the trend of architectural advancements.         |

**Precautions to be taken before removing the mother board from PC cabinet/case:**

- |     |                           |   |
|-----|---------------------------|---|
| 1.  | Power Off and Disconnect: | <ul style="list-style-type: none"><li>• Power off the computer completely and disconnect it from the electrical outlet to prevent electrical hazards.</li><li>• Disconnect all peripherals, cables, and components connected to the motherboard.</li></ul>  |
| 2.  | Anti-Static Measures:     | <ul style="list-style-type: none"><li>• Wear an anti-static wrist strap to discharge any static electricity from your body. Alternatively, touch a grounded metal object to discharge static electricity before handling components.</li><li>• Work in an environment with proper anti-static measures, such as an anti-static mat.</li></ul> |
| 3.  | Document Connections:     | <ul style="list-style-type: none"><li>• Take pictures or make notes of the current cable and component connections to the motherboard. This will help during the reassembly process.</li></ul>  |
| 4.  | Labeling:                 | <ul style="list-style-type: none"><li>• Label cables and connectors if necessary, especially if they are similar in appearance. This makes it easier to identify and reconnect them later.</li></ul>  |
| 5.  | Gentle Handling:          | <ul style="list-style-type: none"><li>• Handle components with care. Avoid applying excessive force or pressure on the motherboard or its components.</li></ul>   |
| 6.  | Remove Components First:  | <ul style="list-style-type: none"><li>• Remove any expansion cards (graphics cards, sound cards, etc.) and memory modules before attempting to remove the motherboard. This provides more space and reduces the risk of damaging these components.</li></ul>  |
| 7.  | Unplug Power Connectors:  | <ul style="list-style-type: none"><li>• Disconnect the main power connector (ATX or EPS) from the motherboard.</li><li>• Unplug any additional power connectors, such as those for fans or peripherals.</li></ul>   |
| 8.  | Unscrew Securely:         | <ul style="list-style-type: none"><li>• Use the correct screwdriver size to unscrew the motherboard from the case. Ensure that you don't strip the screws, and keep track of them for reassembly.</li></ul>   |
| 9.  | Support the Board:        | <ul style="list-style-type: none"><li>• While removing screws, support the motherboard with one hand to prevent it from falling or flexing.</li></ul>   |
| 10. | Check for Obstacles:      | <ul style="list-style-type: none"><li>• Ensure that no cables or components are obstructing the motherboard's removal path. Some cases have cable management features that may need to be loosened.</li></ul>   |
| 11. | Inspect for Damage:       | <ul style="list-style-type: none"><li>• Before proceeding, inspect the motherboard for any signs of damage, such as bent pins, burnt areas, or loose components. Address any issues before reinstalling.</li></ul>  |
| 12. | Store Safely:             | <ul style="list-style-type: none"><li>• If you're not reinstalling the motherboard immediately, store it in an anti-static bag in a safe and dry location.</li></ul>  |

**Using the CPUID CPU-Z tool , find different features of CPU**

To install CPU-Z or a similar CPU identification tool on Windows 10, you can follow these general steps.

Download from the Official Website

1.	Visit the CPU-Z Official Website:	Go to the official CPU-Z website: <a href="https://www.cpuid.com/softwares/cpu-z.html">https://www.cpuid.com/softwares/cpu-z.html</a>
2.	Download the Latest Version:	<ul style="list-style-type: none"> <li>Look for the "Download" section on the website.</li> <li>Download the version compatible with your Windows architecture (32-bit or 64-bit).</li> </ul>
3.	Install CPU-Z:	<ul style="list-style-type: none"> <li>Once the download is complete, run the installer.</li> <li>Follow the on-screen instructions to install CPU-Z on your system.</li> </ul>
4.	Run CPU-Z:	<ul style="list-style-type: none"> <li>After the installation is complete, you can run CPU-Z from the Start menu or desktop shortcut.</li> </ul>

### Information Displayed in CPU-Z

The CPU-Z utility displays detailed information about the memory modules installed in a computer using a feature called Serial Presence Detect. CPU-Z is a freeware that gathers information on some of the main devices of your system :

- Processor name and number, codename, process, package, cache levels.
- Mainboard and chipset.
- Memory type, size, timings, and module specifications (SPD).
- Real time measurement of each core's internal frequency, memory frequency

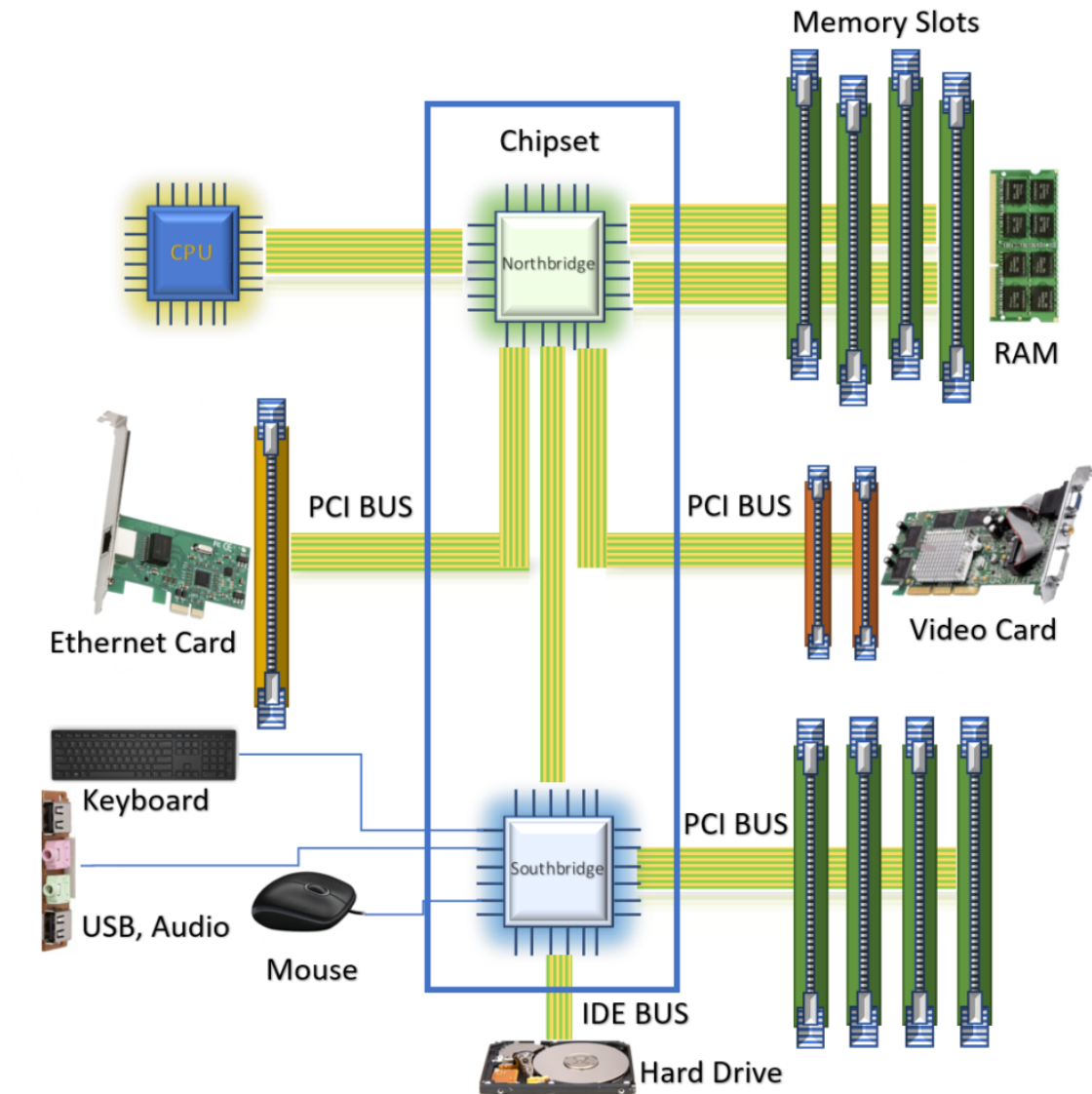
### Chipsets

Chipsets are a set of integrated circuits (chips) that manage the flow of data between the central processing unit (CPU), memory, storage devices, peripherals, and other components on the motherboard. Chipsets play a crucial role in ensuring proper communication and coordination between different parts of a computer system.

### Types of Chipsets

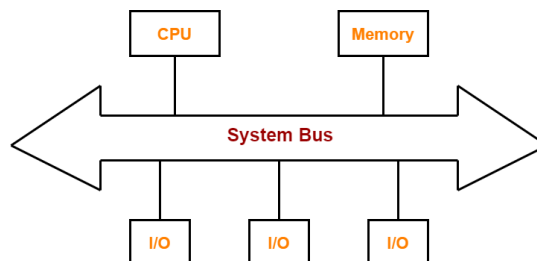
1.	<b>Northbridge:</b>	The Northbridge manages high-speed communication between the CPU ,RAM and the graphics processing unit (GPU). It is directly connected to CPU.
2.	<b>Southbridge:</b>	The Southbridge manages lower-speed I/O functions, including connections to storage devices (SATA), USB ports, PCI slots, and other peripherals. It is connected to CPU via Northbridge.





### **BUS / SYSTEM BUS**

A bus is a set of electrical wires (lines) that connects the various hardware components of a computer system. A bus that connects major components (CPU, memory and I/O devices) of a computer system is called as a System Bus.



The system bus consists of three major components-

1. Data Bus
2. Address Bus
3. Control Bus

#### **Data Bus**

- As the name suggests, data bus is used for transmitting the data / instruction from CPU to memory/I/O and vice-versa.

- It is bi-directional.

#### **Address Bus**

- As the name suggests, address bus is used to carry address from CPU to memory/IO devices.
- It is used to identify the particular location in memory.
- It carries the source or destination address of data i.e. where to store or from where to retrieve the data.
- It is uni-directional.

#### **Control Bus**

- As the name suggests, control bus is used to transfer the control and timing signals from one component to the other component.
- The CPU uses control bus to communicate with the devices that are connected to the computer system.
- The CPU transmits different types of control signals to the system components.
- It is bi-directional.

#### **BIOS Settings:**

- BIOS, or Basic Input/Output System, is the built-in core processor software responsible for booting up your system.
- Typically embedded into your computer as a motherboard chip.
- Programmed on an erasable, programmable, read-only memory (EPROM) chip, BIOS is stored on this memory chip which retains data when the power source is switched off.
- The BIOS system is also responsible for managing data flow between your computer's operating system and any attached devices including a hard drive, keyboard, video adapter, printer, or mouse.
- Each time you power your PC on, BIOS runs through a process called Power-On Self-Test, or POST, that determines whether your attached devices are operating correctly and are in their proper place.
- Once all attachments are allocated and given the OK, your computer startup continues as usual and takes you to your load screen in a matter of seconds.
- If BIOS detects any problems, an error screen will appear or a series of beep codes will sound, effectively indicating to you that something has gone wrong.
- In order to access BIOS on a Windows PC, you must press your BIOS key set by your manufacturer which could be F10, F2, F12, F1, or DEL.

Working with BIOS Settings:

- Change the Boot order
- Create a BIOS password
- Change your Date and Time
- Change Keyboard Typing Speed
- Change System Password.

Basic functions of BIOS:

#### **1.POST**

POST (Power-On Self-Test) that your PC runs through the moment you turn it on. POST tests the hardware of your PC and ensures that there is nothing out of order and no errors present with your operating system.

- If No Problem found, POST will continue as usual and allow your PC to boot normally.
- If there is a detected error, BIOS will issue an error message that may come in the form of displayed text or a series of error-indicating beeps.

**2. CMOS setup** Your PC stores all low-level settings like system time and hardware configuration within its CMOS. This means that every change you make to your BIOS structure is saved on this special memory chip called the Complementary Metal-Oxide Semiconductor, or CMOS. The CMOS setup is responsible for setting your password, time, and date.

## UEFI

UEFI, which stands for Unified Extensible Firmware Interface, is a modern firmware interface that has largely replaced the traditional BIOS (Basic Input/Output System) in many modern computers. UEFI is responsible for initializing the hardware components of a computer during the boot process and providing an interface between the operating system and the computer's firmware. UEFI offers improvements over BIOS in terms of functionality, security, and compatibility with modern hardware and software.

UEFI was developed to allow support for new technologies during the booting process before the operating system loads. UEFI was designed to overcome many limitations of the old BIOS. UEFI supports drive sizes up to 9 zettabytes, whereas BIOS only supports 2.2 terabytes. UEFI provides faster boot time. UEFI offers security like "Secure Boot", which prevents the computer from booting from unauthorized/unsigned applications

Key features and characteristics of UEFI include:

1. Graphical User Interface (GUI):
2. Secure Boot:
3. Support for Larger Storage Devices:
4. Network Capabilities:
5. Modularity and Extensibility:
6. Compatibility with 32-bit and 64-bit Systems:

## CMOS Battery

A CMOS (Complementary Metal-Oxide-Semiconductor) battery is a small, round, coin-cell battery used in computers to provide power to the CMOS memory. The CMOS memory stores various settings and configuration data that the computer needs, even when it is powered off. These settings typically include information about the system's hardware, date and time, boot order, and other system-specific parameters.

### **\*\*Specifications of a CMOS Battery:\*\***

The most common specifications for a CMOS battery are as follows:

1. **\*\*Type:\*\*** CR2032 is one of the most common types of CMOS batteries, but other types, such as CR2025 and CR2016, are also used. The number in the type designation refers to the battery's size and capacity.
2. **\*\*Voltage:\*\*** CMOS batteries usually operate at 3 volts.
3. **\*\*Capacity:\*\*** The capacity of a typical CMOS battery is around 220-240 mAh.
4. **\*\*Chemistry:\*\*** CMOS batteries are often lithium batteries (Lithium-Manganese Dioxide), which provide a long service life and relatively stable voltage.

### **\*\* Consequences / Impact of Removing the CMOS Battery/CMOS Failure from the Motherboard:\*\***

1. **\*\*Loss of BIOS Settings:\*\*** The most immediate impact of removing the CMOS battery is the loss of all the settings stored in the CMOS memory, including date and time, BIOS settings, boot order, and hardware configuration. When the battery is removed, the CMOS memory is essentially "wiped," and the BIOS will revert to default settings.
2. **\*\*Boot Errors:\*\*** After the battery is removed, the computer may not be able to boot properly because it cannot find the necessary settings to initiate the boot process. This can lead to errors or the computer not booting at all.
3. **\*\*Date and Time Issues:\*\*** Without the CMOS battery, the computer will lose track of the date and time. This can affect file timestamps, scheduled tasks, and even security certificates if the date and time are critical for proper operation.



4. **Password Issues:** Some systems may store BIOS or disk encryption passwords in the CMOS memory. Removing the battery could result in the inability to access encrypted data or BIOS settings that are protected by passwords.

5. **Inconvenience:** Users will need to reconfigure the BIOS settings and correct the date and time after replacing the CMOS battery. This can be time-consuming and may require advanced knowledge of the system's configuration.

6. **Loss of System History:** Some systems log hardware events, errors, or other system information in the CMOS memory. Removing the battery will result in the loss of this historical data.

In summary, the CMOS battery is essential for maintaining important system settings and data, even when the computer is powered off. Removing the battery results in the loss of this information and can lead to various issues, including boot errors, date and time problems, and the need to reconfigure BIOS settings.

### **Replacing the CMOS battery in a computer**

is a relatively straightforward process. Here are the general steps to replace the CMOS battery:

**Note:** Before you begin, make sure you have a replacement CR2032 or a compatible coin-cell battery on hand.

**Caution:** Be sure to shut down the computer and disconnect it from the power source before proceeding.

1. **Safety Precautions:**

- Ensure that you are working on a stable and non-static surface.
- Wear an anti-static wrist strap to prevent electrostatic discharge (ESD) that can damage sensitive components.

2. **Open the Computer Case:**

- Depending on the type of computer, you may need to remove a side panel or access a specific compartment to reach the motherboard. Use a screwdriver or follow your computer's manual to open the case.

3. **Locate the CMOS Battery:**

- The CMOS battery is typically a silver coin-cell battery about the size of a nickel (CR2032 or similar) on the computer's motherboard. It may be easily visible or located beneath a clip or plastic holder.

4. **Take Note of the Battery Orientation:**

- Before removing the old battery, observe its orientation, noting which side faces up. The replacement battery should be installed in the same orientation.

5. **Remove the Old Battery:**

- Gently push aside or lift the clip or holder securing the battery. Carefully lift the old battery out of its socket, taking care not to damage any nearby components.

6. **Install the New Battery:**

- Take the new CR2032 or compatible battery and align it in the same orientation as the old one. Press it into the battery holder/socket until it clicks into place. Make sure it's secure.

7. **Replace the Clip or Holder:**

- If there was a clip or holder, gently push it back into place to secure the new battery.

8. **Close the Computer Case:**

- If you removed a side panel, reattach it and secure it with the appropriate screws.

9. **Reconnect Power and Boot:**

- Reconnect the computer to its power source and turn it on. The new CMOS battery should retain the BIOS settings, and the computer should boot as usual.

10. **Check and Reset BIOS Settings (if needed):**

- It's a good practice to enter the BIOS (UEFI) settings after replacing the CMOS battery to ensure that the correct date, time, and other settings are configured. If any settings are incorrect, adjust them as needed.

By following these steps, you can successfully replace the CMOS battery in a computer. It's a simple and relatively quick process that can help maintain proper system functionality and ensure that the computer retains its BIOS settings even when powered off.

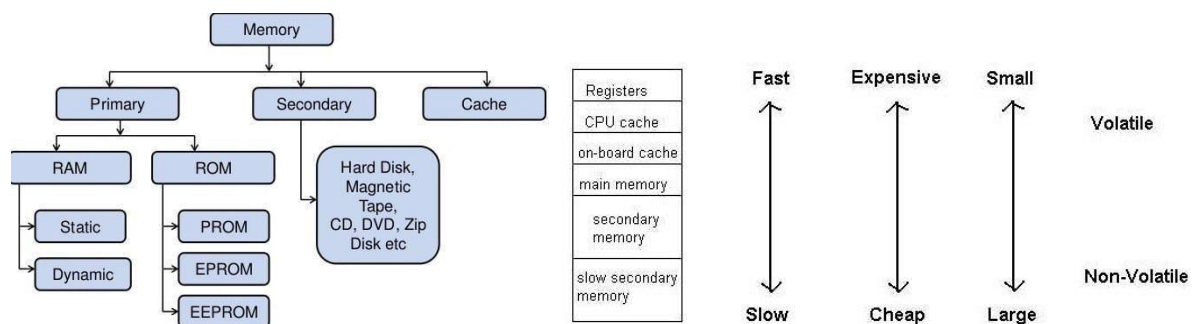
## MEMORY

Computer memory is any physical device capable of storing information temporarily like RAM (random access memory), or permanently, like ROM (read-only memory).

### Memory Units:

Memory units are used to measure and represent data. Some of the commonly used memory units are:

- Bit (b): The computer memory units start from bit. A bit is the smallest memory unit to measure data stored in main memory and storage devices. A bit can have only one binary value out of 0 and 1.
- Byte (B): It is the fundamental unit to measure data. It contains 8 bits or is equal to 8 bits. Thus, a byte can represent 28 or 256 values.
- Kilobyte (KB): A kilobyte contains 1024 bytes.
- Megabyte (MB): A megabyte contains 1024 kilobytes.
- Gigabyte (GB): A gigabyte contains 1024 megabyte.
- Terabyte (TB): A terabyte contains 1024 gigabytes.
- Peta Byte (PB): A Petabyte contains 1024 Terabytes
- Exa Byte (EB): An Exabyte contains 1024 Petabytes
- Zetta Byte (ZB): A Zettabyte contains 1024 Exabytes
- Yotta Byte (YB): A Yottabyte contains 1024 Zettabytes



### Memory Access Methods:

Memory can be accessed through FOUR modes.

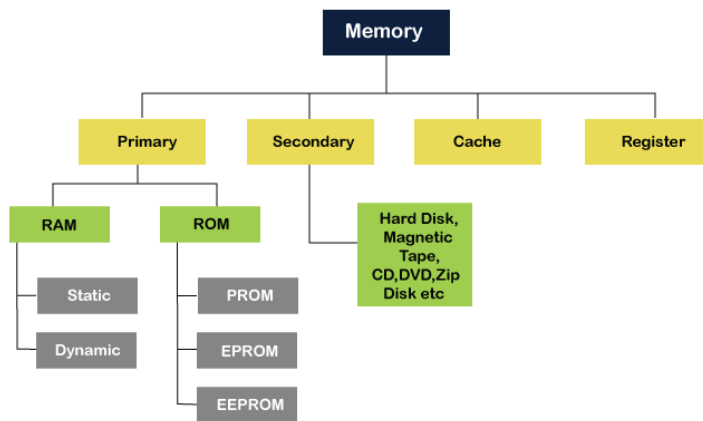
- **DMA:** As the name specifies, Direct Memory Address (DMA) is a method that allows input/output (I/O) devices to access or retrieve data directly or from the main memory.
- **Sequential Access Method:** The sequential access method is used in a data storage device to read stored data sequentially from the computer memory. Whereas, the data received from random access memory (RAM) can be in any order.
- **Random Access Method:** It is a method used to randomly access data from memory. This method is the opposite of SAM. For example, to go from A to Z in random access, we can directly jump to any specified

location. In the Sequential method, we have to follow all intervening from A to Z to reach at the particular memory location.

- **Associative Access Method:** It is a special type of memory that optimizes search performance through defined data to directly access the stored information based on a memory address.

## Classification of Memory

The following figure represents the classification of memory:



Primary memory, also known as main memory or RAM (Random Access Memory), is a type of computer memory that is used to store data and machine code currently being used and processed by a computer. It is called "primary" because it is the main and fastest storage medium that the CPU can access directly. Primary memory is volatile, meaning that it loses its content when the power is turned off.

RAM, or Random Access Memory, is a type of computer memory that is used to store data and machine code currently being used and processed by a computer. It is often referred to as "volatile memory" because it loses its content when the power is turned off. RAM is a crucial component of a computer system, providing a high-speed workspace for the CPU to read and write data.

## Types of RAM:

1. Static RAM (SRAM):
2. Dynamic RAM (DRAM):

SRAM	DRAM
It is a static memory as it does not need to be refreshed repeatedly.	It is a dynamic memory as it needs to be refreshed continuously or it will lose the data.
Its memory cell is made of 6 transistors. So its cells occupy more space	Its memory cell is made of one transistor and one capacitor. So, its cells occupy less space
It is more expensive than DRAM	It is less expensive than SRAM
It has a lower access time, it consumes more power.	It has a higher access time it consumes less power.
It is faster than DRAM	It is not as fast as SRAM
Examples: L2 and LE cache	Example: DDR3, DDR4 in mobile

in a CPU.	phones, computers, etc.
Size ranges from 1 MB to 16MB.	Size ranges from 4GB to 16GB in laptops.

### Types of ROM:

ROM, or Read-Only Memory, is a type of non-volatile memory that is used primarily in the startup process of a computer. ROM is a non-volatile memory where the data is permanently written during the manufacturing process and cannot be modified or overwritten by normal computer processes. Here are some common types of ROM:

1. **PROM (Programmable Read-Only Memory):** This type of ROM allows the user to write or program data into the memory once. After programming, the data cannot be modified. PROMs are commonly used in situations where a one-time configuration is required.
2. **EPROM (Erasable Programmable Read-Only Memory):** Unlike PROM, EPROM can be reprogrammed and reused multiple times.
3. **EEPROM (Electrically Erasable Programmable Read-Only Memory):** EEPROM, like EPROM, can be reprogrammed, but it can be erased and reprogrammed electrically.
4. **Flash Memory:** Flash memory is a type of EEPROM that allows for multiple memory locations to be erased or written in one programming operation. It is widely used in various electronic devices such as USB drives, memory cards, and solid-state drives (SSDs).
5. **Mask ROM:** In this type of ROM, the data is permanently encoded during the manufacturing process, and it cannot be modified or rewritten.

### Secondary Memory

Secondary memory, also known as auxiliary or external memory, refers to non-volatile storage devices that store data and programs even when the power is turned off. Unlike primary memory (RAM), which is volatile and loses its contents when the power is cut, secondary memory retains data for the long term. Secondary memory is crucial for storing large amounts of data, applications, and operating systems. Here are some common types of secondary memory:

1. **Hard Disk Drives (HDD):** HDDs are magnetic storage devices with spinning disks or platters coated with a magnetic material. Data is stored on these platters in the form of magnetic patterns. HDDs are widely used for large-scale data storage in computers.
2. **Solid-State Drives (SSD):** SSDs use NAND-based flash memory to store data. Unlike HDDs, SSDs have no moving parts, which makes them faster, more durable, and energy-efficient. SSDs are commonly used for faster access to data and as storage devices in laptops and high-performance computing systems.
3. **USB Flash Drives:** These are small, portable storage devices that use NAND flash memory to store data. USB flash drives are convenient for transferring data between computers and are often used for backup and portable storage.
4. **Memory Cards:** Memory cards, such as SD cards and microSD cards, are small, removable storage devices commonly used in cameras, smartphones, and other portable devices.
5. **CDs and DVDs:** Compact Discs (CDs) and Digital Versatile Discs (DVDs) are optical storage media. Data is encoded on the surface of the disc using pits and lands, which can be read by a laser. CDs and DVDs are used for software distribution, multimedia storage, and backup.
6. **Blu-ray Discs:** Blu-ray discs are another form of optical storage that offers higher storage capacity compared to CDs and DVDs. They are often used for high-definition video storage.
7. **Magnetic Tapes:** While less common in personal computing, magnetic tapes are used in enterprise environments for archival storage due to their high capacity and cost-effectiveness for long-term data retention.

### Identify RAM chips , study their features and note their technical specifications:

RAM is a volatile memory which requires power supply to retain data. When you turn off your PC, the RAM data is lost.

It is further divided into two types, namely, the Dynamic Random-Access Memory (DRAM) and Static Random-Access Memory (SRAM).

- DRAM stores and retains memory data by using capacitors. These capacitors lose charge over time due to leakage, even if the supply voltage is maintained. DRAMs are typically used for computer memory modules.
- SRAM uses transistors instead of capacitors in a cross-coupled flip-flop configuration and does not have leakage. It still requires constant power to maintain the state of charge. SRAMs are designed for processor caching.

Today, most operating systems require at about 1GB RAM for running the system, which means that the system should have at least 4GB or more of system RAM. Typical systems commonly have 8-16 GB RAM.

The amount of RAM in the system is very critical, even to basic users. Having more RAM enables the system to run more applications simultaneously.

- If the system has less ram than required, then it will start using the secondary storage device like hard disks for paging or swap memory which is much slower than ram and will make the system feel very laggy.



**Identify HDD, study their features and note their technical specifications:**

Hard drives (HDDs) come in two basic physical sizes: 2.5-inch and 3.5-inch. These sizes refer to the size of the data platters, not the size of the hard drive mechanism. Traditionally, 2.5-inch drives are used for laptops while 3.5-inch drives are used for desktop computers.



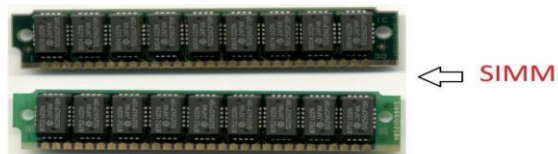
**Identify SSD, study their features and note their technical specifications:**

Solid State Devices (SSDs) have three form factors: 2.5-inch, mSATA, and M.2. The 2.5-inch form factor is used in many desktops and laptops. The mSATA version is commonly used in ultra-thin laptops and compact systems. The M.2 version is commonly used in tablets and ultrabooks.



## Identify SIMM and DIMM memory modules, their number of pins, specs and type

S.NO	SIMM	DIMM
1.	In SIMM, Pins present in either facet are connected.	DIMM pins are freelance.
2.	SIMM supports 32 bit channel for data transferring.	DIMM supports 64 bit channel for data transferring.
3.	SIMM consumes 5 volts of power.	DIMM consumes 3.3 volts of power.
4.	SIMM provides the storage 4 MB to 64 MB.	DIMM provides the storage 32 MB to 1 GB.
5.	The classic or most common pin configuration of the SIMM module is 72 pins.	The foremost common pin configuration of the DIMM module is 168 pins.
6.	SIMMs are the older technology.	DIMMs are the replacement of the SIMMs.
7.	SIMMs are installed in pairs at a time.	DIMMs are installed one at a time.
8.	SIMMs are used by 486 CPU as well as early Pentium computers.	DIMMs are used by modern Pentium computers.
9.	The length and width of SIMM are respectively 4.25 inches and 1 inch.	The length and width of DIMM are respectively 1.67 to 5.25 inches and 1 to 1.75 inches.
10.	There are single notches in SIMMs.	There are two notches in DIMMs.



Synchronous Dynamic Random Access Memory (SDRAM) and Double Data Rate Synchronous Dynamic Random Access Memory (DDR SDRAM or simply DDR) are two different generations of RAM technologies commonly used in computers.

Difference between DDR and SDRAM:

SDRAM	DDR SDRAM
It refers as synchronous dynamic random access memory	It refers as Double data rate SDRAM
SDRAM has 168 pins and two notches at the connector	DDR has 184 pins and a single notch at the connector.
SDRAM was released in 1997	DDR RAM was released in 2000
SDRAM has less speed in comparison DDR	DDR can transfer data at roughly twice the speed of SDRAM.
it's working on 3.3 volts	it's working on 2.5 Volts (standard); 1.8 V (low voltage)
SDRAM speed is considered as 66 MHz, 100 MHz, 133 MHz	DDR working on speed as 200 MHz, 266 MHz, 333 MHz, 400 MHz

SDRAM	DDR SDRAM
SDRAM's Internal rate range is (100 Mhz-166 Mhz)	DDR's Internal rate range is(133 Mhz – 200 Mhz)
Data rate of SDRAM is (0.8-1.3) GB/s	Data rate of DDR is (2.1-3.2)
SDRAM prefetch timing is 1ns	DDR prefetch timing is 2ns

## Types of DDR SDRAM

Double Data Rate Synchronous Dynamic Random Access Memory (DDR SDRAM) has evolved through several generations, each marked by improvements in speed, efficiency, and overall performance. As of my last knowledge update in January 2022, the following are the main DDR types:

1. DDR (DDR1):	<ul style="list-style-type: none"> <li>Introduction: DDR SDRAM, often referred to simply as DDR or DDR1, was the first generation.</li> <li>Data Transfer Rate: It doubled the data transfer rate compared to traditional SDRAM by transferring data on both the rising and falling edges of the clock signal.</li> </ul>
2. DDR2:	<ul style="list-style-type: none"> <li>Introduction: DDR2 SDRAM represented the second generation of DDR memory.</li> <li>Data Transfer Rate: DDR2 improved on DDR1 by providing higher data transfer rates and increased bandwidth.</li> <li>Voltage: DDR2 operated at lower voltage compared to DDR1.</li> </ul>
3. DDR3:	<ul style="list-style-type: none"> <li>Introduction: DDR3 SDRAM continued the trend of performance improvements.</li> <li>Data Transfer Rate: DDR3 provided even higher data transfer rates and improved energy efficiency compared to DDR2.</li> <li>Voltage: DDR3 operated at lower voltage than DDR2, contributing to lower power consumption.</li> </ul>
4. DDR4:	<ul style="list-style-type: none"> <li>Introduction: DDR4 SDRAM is the fourth generation of DDR memory.</li> <li>Data Transfer Rate: DDR4 brought further improvements in data transfer rates and increased bandwidth over DDR3.</li> <li>Voltage: DDR4 operates at a lower voltage than DDR3, contributing to better power efficiency.</li> </ul>
5. DDR5:	<ul style="list-style-type: none"> <li>Introduction: DDR5 is the latest generation of DDR memory as of my last update in January 2022.</li> <li>Data Transfer Rate: DDR5 introduces higher data transfer rates, increased bandwidth, and improved efficiency compared to DDR4.</li> </ul>

## Mass Storage Media

Mass storage media in computers refer to devices or mediums used for the long-term storage of data. These storage devices retain data even when the computer is powered off.

Here are some common types:

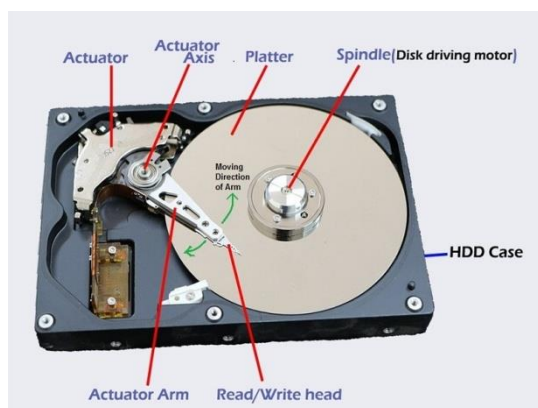
1. Hard Disk Drives (HDDs):	<ul style="list-style-type: none"> <li>Description: HDDs use magnetic storage on rotating disks (platters) to store data.</li> <li>Advantages: Relatively high capacity, cost-effective for large storage needs.</li> <li>Disadvantages: Mechanical parts can lead to slower speeds and potential mechanical failures.</li> </ul>
2. Solid-State Drives (SSDs):	<ul style="list-style-type: none"> <li>Description: SSDs use flash memory (non-volatile memory) to store data, with no moving parts.</li> <li>Advantages: Faster data access, lower power consumption, and more durable compared to HDDs.</li> <li>Disadvantages: Generally more expensive per unit of storage compared to HDDs.</li> </ul>
3. Hybrid Drives (SSHDs):	<ul style="list-style-type: none"> <li>Description: Hybrid drives combine both traditional HDD and SSD technologies in a single unit.</li> <li>Advantages: Offer a balance between the capacity of HDDs and the speed of SSDs.</li> </ul>



	<ul style="list-style-type: none"> <li>Disadvantages: May not provide the same level of performance as dedicated SSDs.</li> </ul>
4. External Hard Drives:	<ul style="list-style-type: none"> <li>Description: Similar to internal HDDs but enclosed in an external casing for portability.</li> <li>Advantages: Portable, easy to use for backup and additional storage.</li> <li>Disadvantages: Relies on external connections (USB, Thunderbolt) for data transfer.</li> </ul>
5. USB Flash Drives:	<ul style="list-style-type: none"> <li>Description: Compact, solid-state storage devices with a USB interface.</li> <li>Advantages: Portable, durable, and convenient for transferring data between computers.</li> <li>Disadvantages: Typically lower in capacity compared to HDDs or SSDs.</li> </ul>
6. Network Attached Storage (NAS):	<ul style="list-style-type: none"> <li>Description: Dedicated storage devices connected to a network, accessible by multiple users or devices.</li> <li>Advantages: Shared storage, often used for centralized backups and file sharing.</li> <li>Disadvantages: Speed may be limited by network bandwidth.</li> </ul>
7. Optical Discs (CDs, DVDs, Blu-ray):	<ul style="list-style-type: none"> <li>Description: Optical media that uses laser technology to read and write data.</li> <li>Advantages: Read-only versions (e.g., DVDs for software distribution), relatively low cost.</li> <li>Disadvantages: Limited capacity compared to other storage options, writeable versions have slower read/write speeds.</li> </ul>
8. Tape Drives:	<ul style="list-style-type: none"> <li>Description: Magnetic tape-based storage devices.</li> <li>Advantages: Cost-effective for long-term archival storage.</li> <li>Disadvantages: Slower access times compared to disk-based storage.</li> </ul>

## Hard Disk Drive (HDD)

A Hard Disk Drive (HDD) is a non-volatile storage device that stores and retrieves digital information. The working of a Hard Disk Drive (HDD) involves several mechanical and magnetic components working together to store and retrieve digital data.



HDD is a magnetic storage device, It stores data on a magnetic disk called Platter. This disk rotates by a driving motor called spindle. Just above the disk there is a metallic arm which moves side wise(Left-right), this arm is called Actuator Arm. This actuator Arm is connected with Actuator which controls its movement. The Read/Write head read or write the data on the disk platter. The arm put the head in correct place of the disk by turning it-self from actuator axis. So basically the Actuator controls the the position of read/write head whether it has to move towards the center of the disk or outwards.

The size of a Hard Disk Drive (HDD) refers to its storage capacity, which is typically measured in gigabytes (GB) or terabytes (TB). The capacity of HDDs has increased significantly over the years as technology has advanced, allowing for higher storage.

## Solid State Drive (SSD)



A Solid-State Drive (SSD) is a type of data storage device that uses NAND-based flash memory to store and retrieve digital data. Unlike traditional Hard Disk Drives (HDDs), which use spinning platters and mechanical read/write heads, SSDs have no moving parts. Instead, they rely on electronic memory cells to store data. This lack of moving parts contributes to the key features and advantages of SSDs, including faster data access times, increased durability, and improved energy efficiency.

### Different Types of SSDs

- **SATA SSDs:** These are the most common type of SSDs and use the same interface as traditional hard drives. They are compatible with most laptops and desktops, but their performance is limited by the SATA interface.
- **NVMe SSDs:** These SSDs use the NVMe (Non-Volatile Memory Express) interface, which provides faster data transfer speeds compared to SATA SSDs. They are ideal for high-performance applications such as gaming, video editing, and data centers.
- **M.2 SSDs:** M.2 SSDs are smaller in size than traditional SATA SSDs and are commonly used in ultra-thin laptops and tablets. They use either the SATA or NVMe interface, depending on the model.
- **PCIe SSDs:** These SSDs use the PCIe (Peripheral Component Interconnect Express) interface, which provides even faster data transfer speeds compared to NVMe SSDs. They are commonly used in high-end gaming PCs and workstations.
- **SAS SSDs:** SAS (Serial Attached SCSI) SSDs are designed for enterprise-level applications that require high reliability, data security, and scalability. They use a SAS interface and are commonly used in data centers and servers.



### Differences Between Hard Disk Drive (HDD) and Solid State Drive (SSD)

Hard Disk Drive	Solid State Drive
HDD has longer Read and Write time.	SSD has a shorter Read and Write time.
HDD has higher latency.	SSD has a lower latency.
HDD supports fewer I/O operations per second (IOPS).	SSD supports more I/O operations per second(IOPS).
Over a longer time, and with larger files stored on an HDD, there is a high chance of fragmentation.	Fragmentation doesn't occur on an SSD drive.
HDD is available in various different capacities.	An SSD drive offers limited storage capacities.
HDD stands for Hard Disk Drive.	SSD stands for Solid State Drive.
HDD offers a slower speed for reading and writing data.	SSD is faster at reading and writing data.
An HDD weighs more.	SDD drives are lighter than HDD drives as they don't have the rotating disks spindle, and mirror.
The performance of HDD drives worsens because of the fragmentation.	SSD drive performance is never impacted by fragmentation.

Hard Disk Drive	Solid State Drive
The moving parts of HDDs make them vulnerable to crashes and damage because of vibration.	SSD drives can tolerate vibration up to 2000Hz, that is more than HDD.
HDD contains moving mechanical parts, like the arm.	SSD does not contain mechanical parts, only electronic parts like ICs.
HDD drive is older and more traditional.	SSD is a newer type of storage drive.
HDD can produce noise due to mechanical movements.	SSD does not produce noise.
HDD are usually 3.5" and 2.5" size for desktop and laptops.	SDD is available in 2.5 inch, 1.8" and 1.0", increasing the available space in a computer, especially desktop or server.
The HDD has moving part and magnetic platters. With more uses they are prone to fail.	The SDD drive has no moving parts. With more uses they are less likely to fail.

### **Reasons / Causes of HDD failure**

1. Mechanical Failures:	<ul style="list-style-type: none"> <li>• Head Crash: The read/write heads that hover above the spinning platters can crash into the platter surface, causing physical damage. This can result from sudden impacts, drops, or wear and tear over time.</li> <li>• Motor Failure: The spindle motor that spins the platters may fail, preventing the drive from functioning.</li> <li>• Platter Damage: Damage to the magnetic platters, where data is stored, can occur due to physical trauma or manufacturing defects.</li> </ul>
2. Electronic Failures:	<ul style="list-style-type: none"> <li>• Controller Board Failure: The electronic components on the HDD's controller board, including the PCB (Printed Circuit Board), may fail due to power surges, overheating, or other electrical issues.</li> <li>• Power Supply Issues: Problems with the power supply, such as voltage fluctuations or sudden power outages, can lead to electronic failures.</li> </ul>
3. Firmware Issues:	<ul style="list-style-type: none"> <li>• Corrupted Firmware: Firmware is the software embedded in the HDD that controls its operations. Corruption of the firmware can result in malfunctioning or failure.</li> </ul>
4. Heat and Overheating:	<ul style="list-style-type: none"> <li>• Excessive Heat: Overheating can cause the drive's components to degrade over time. Poor ventilation, fan failure, or using the drive in an environment with high temperatures can contribute to overheating.</li> </ul>
5. Manufacturing Defects:	<ul style="list-style-type: none"> <li>• Faulty Components: Defects in the manufacturing process or the use of subpar components can lead to early failures in HDDs.</li> </ul>
6. Wear and Tear:	<ul style="list-style-type: none"> <li>• Normal Wear: Like any mechanical device, HDDs have a limited lifespan. Continuous usage over an extended period can result in wear and tear, eventually leading to failure.</li> </ul>
7. Vibration and Shock:	<ul style="list-style-type: none"> <li>• Excessive Vibration: Continuous exposure to vibrations, especially in mobile or poorly secured systems, can impact the delicate mechanical components of an HDD.</li> <li>• Physical Shock: Dropping a running HDD or subjecting it to sudden physical shocks can cause damage to the internal components.</li> </ul>
8. Power Surges and Electrical Issues:	<ul style="list-style-type: none"> <li>• Power Surges: Sudden spikes in electrical power can damage the electronic components of an HDD.</li> <li>• Electrostatic Discharge (ESD): Improper handling, such as touching the internal components without proper grounding, can lead to ESD, damaging sensitive electronics.</li> </ul>
9. Age and Usage:	<ul style="list-style-type: none"> <li>• Old Age: As HDDs age, the likelihood of failure increases. The mechanical components, especially moving parts like the read/write heads, may wear out over time.</li> </ul>
10. Software Issues:	

- File System Corruption: Corruption of the file system or critical data structures on the drive can lead to read/write errors and drive failure.
- Malware or Virus Attacks: Malicious software can corrupt data, damage the file system, or cause firmware issues.

### Use CPUID-CPUZ tool to identify capacity, speed, technology, and related features of RAM.

To install CPU-Z or a similar CPU identification tool on Windows 10, you can follow these general steps.

Download from the Official Website

1. Visit the CPU-Z Official Website: Go to the official CPU-Z website: <https://www.cpubid.com/software/cpu-z.html>
2. Download the Latest Version:
  - Look for the "Download" section on the website.
  - Download the version compatible with your Windows architecture (32-bit or 64-bit).
3. Install CPU-Z:
  - Once the download is complete, run the installer.
  - Follow the on-screen instructions to install CPU-Z on your system.
4. Run CPU-Z:
  - After the installation is complete, you can run CPU-Z from the Start menu or desktop shortcut.

### Information Displayed in CPU-Z

The CPU-Z utility displays detailed information about the memory modules installed in a computer using a feature called Serial Presence Detect. CPU-Z is a freeware that gathers information on some of the main devices of your system :

- Processor name and number, codename, process, package, cache levels.
- Mainboard and chipset.
- Memory type, size, timings, and module specifications (SPD).
- Real time measurement of each core's internal frequency, memory frequency

### Query the SPD RAM chip to identify all possible information using CPUID CPUZ.

To query information about the SPD (Serial Presence Detect) RAM chip, you typically use specialized software like CPU-Z rather than CPUID. CPU-Z is a tool that provides detailed information about various hardware components in your system, including information about your RAM modules. Here's how you can use CPU-Z to identify information about your RAM:

1. Download and Install CPU-Z:
  - Go to the official CPU-Z website (<https://www.cpubid.com/software/cpu-z.html>).
  - Download the version appropriate for your operating system (Windows or another supported OS).
  - Install CPU-Z following the on-screen instructions.
2. Open CPU-Z:
  - Launch CPU-Z after installation.
3. Navigate to the Memory Tab:
  - In the CPU-Z interface, go to the "Memory" tab.
4. Identify SPD Information:
  - The SPD tab provides information about each RAM slot on your motherboard. You can switch between slots using the drop-down menu.
5. View SPD Information:

6.	<ul style="list-style-type: none"> <li>Within the SPD tab, you'll find details about your RAM, including: <ul style="list-style-type: none"> <li>Manufacturer: The name of the RAM manufacturer.</li> <li>Part Number: The specific part number of the RAM module.</li> <li>Serial Number: The unique serial number assigned to the RAM module.</li> <li>Capacity: The total capacity of the RAM module.</li> <li>Type: The type of RAM (DDR, DDR2, DDR3, DDR4, etc.).</li> <li>Maximum Bandwidth: The maximum data transfer rate supported by the RAM module.</li> <li>Timing Information: CAS latency (CL), RAS to CAS Delay (tRCD), RAS Precharge (tRP), and Cycle Time (tRAS).</li> </ul> </li> </ul>
	<ul style="list-style-type: none"> <li>CPU-Z also allows you to export or save reports. You can use this feature to create a text file with detailed information about your RAM configuration.</li> </ul>

### **Symbols / Signs of HDD failure**

1.	Strange Noises: <ul style="list-style-type: none"> <li>Clicking, grinding, or whirring sounds that weren't present before can indicate mechanical issues within the drive.</li> </ul>
2.	Slow Performance: <ul style="list-style-type: none"> <li>Frequent and unexplained slowdowns in the system, especially when accessing files or programs, can be a sign of a failing HDD.</li> </ul>
3.	Frequent Freezing or Crashing: <ul style="list-style-type: none"> <li>If your system regularly freezes or crashes, it could be due to the HDD struggling to read or write data.</li> </ul>
4.	File Access Issues: <ul style="list-style-type: none"> <li>Difficulty in accessing certain files or folders, or encountering errors when trying to open files, may indicate problems with the storage medium.</li> </ul>
5.	Disappearing Files or Folders: <ul style="list-style-type: none"> <li>Files or folders disappearing without user intervention can be a sign of data corruption caused by a failing HDD.</li> </ul>
6.	Error Messages: <ul style="list-style-type: none"> <li>Any error messages related to the hard drive, such as "disk boot failure" or "disk not found," should be investigated promptly.</li> </ul>
7.	S.M.A.R.T. Warnings: <ul style="list-style-type: none"> <li>Self-Monitoring, Analysis, and Reporting Technology (S.M.A.R.T.) is a system built into many modern hard drives to monitor their health. If you receive S.M.A.R.T. warnings, it's essential to back up your data immediately.</li> </ul>
8.	Bad Sectors: <ul style="list-style-type: none"> <li>The operating system might report the presence of bad sectors on the hard drive. Bad sectors are areas on the disk that are physically damaged and can't reliably store data.</li> </ul>
9.	Frequent Drive Disconnections: <ul style="list-style-type: none"> <li>If your hard drive frequently disconnects or disappears from the system, it could indicate a failing connection or a problem with the drive itself.</li> </ul>
10.	Overheating: <ul style="list-style-type: none"> <li>Excessive heat can contribute to the deterioration of a hard drive. If the drive is unusually hot, it may be a sign of a problem.</li> </ul>
11.	BIOS/UEFI Issues: <ul style="list-style-type: none"> <li>Problems detected by the system's BIOS or UEFI during the boot process may indicate issues with the hard drive.</li> </ul>

### **Back up and Recovery of Data**

Backing up and recovering data from a hard disk drive (HDD) is crucial to prevent data loss in case of hardware failure, accidental deletion. Here are the steps for both backing up and recovering data.

#### Backing Up Data:

1.	Identify Important Data: <ul style="list-style-type: none"> <li>Determine which files and folders are critical and need to be backed up. Focus on personal documents, photos, videos, and any other irreplaceable data.</li> </ul>
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2.	Choose a Backup Location:	<ul style="list-style-type: none"> <li>Select a secure backup location. This can be an external hard drive, a network-attached storage (NAS) device, cloud storage services, or a combination of these.</li> </ul>
3.	Use Backup Software:	<ul style="list-style-type: none"> <li>Consider using backup software to automate the process. Many operating systems come with built-in backup tools. Additionally, there are third-party applications available for more advanced features.</li> </ul>
4.	Schedule Regular Backups:	<ul style="list-style-type: none"> <li>Set up a regular backup schedule to ensure that your data is consistently and automatically backed up. Daily or weekly backups are common depending on the importance of the data.</li> </ul>
5.	Verify Backups:	<ul style="list-style-type: none"> <li>Periodically check your backups to ensure that the files are being successfully copied and that the backup medium is functioning properly.</li> </ul>
6.	Offsite Backup:	<ul style="list-style-type: none"> <li>For added security, consider storing a copy of your backup in an offsite location. Cloud storage services are a convenient option for offsite backups.</li> </ul>

#### Recovering Data:

1.	Identify the Cause of Data Loss:	<ul style="list-style-type: none"> <li>Determine the cause of data loss. It could be due to accidental deletion, hardware failure, software corruption, or other issues.</li> </ul>
2.	Cease Using the Drive:	<ul style="list-style-type: none"> <li>If you suspect a hardware issue or accidental deletion, stop using the affected drive immediately. Continued use might overwrite data, making recovery more challenging.</li> </ul>
3.	Use Backup:	<ul style="list-style-type: none"> <li>If you have a recent backup, restore your data from the backup source. Follow the steps provided by your backup software or operating system.</li> </ul>
4.	Data Recovery Software:	<ul style="list-style-type: none"> <li>If you don't have a backup, consider using data recovery software. There are various tools available that can help recover deleted or lost files. Examples include Recuva, EaseUS Data Recovery Wizard, or Disk Drill.</li> </ul>
5.	Professional Data Recovery Services:	<ul style="list-style-type: none"> <li>If the data is critical and cannot be recovered using software, consider seeking professional data recovery services. These services specialize in retrieving data from damaged or failed storage devices.</li> </ul>
6.	Replace Faulty Hardware:	<ul style="list-style-type: none"> <li>If the data loss is due to a failing hard drive, replace the faulty hardware. Install a new drive and restore your data from the backup.</li> </ul>

### **Key features of windows 10 OS**

#### 1.Start Menu:

- Windows 10 reintroduced the Start Menu, combining the traditional Start Menu with Live Tiles from Windows 8. It provides quick access to applications, settings, and a customizable layout.

#### 2. Cortana:

- Microsoft's virtual assistant, Cortana, is integrated into Windows 10, offering voice commands, reminders, and personalized assistance.

#### 3. Microsoft Edge:

- Microsoft Edge is the default web browser, featuring a cleaner interface, improved performance, and integration with Cortana and other Windows services.

#### 4. Windows Ink:

- Windows Ink allows users with touch-enabled devices to use a digital pen for writing, drawing, and annotations.

#### 5. Virtual Desktops:

- Windows 10 introduced the ability to create and manage multiple virtual desktops for better organization and multitasking.

#### 6. Task View:

- Task View provides an overview of all open applications and virtual desktops, making it easier to switch between tasks.

#### 7. Action Center:

- The Action Center consolidates notifications and provides quick access to settings like Wi-Fi, Bluetooth, and other system features.

#### 8. Windows Hello:

- Windows Hello offers biometric authentication options, including fingerprint recognition, facial recognition, and iris scanning for enhanced security.

#### 9. DirectX 12:

- DirectX 12 is a graphics API designed for improved gaming performance, better utilization of hardware resources, and enhanced graphics rendering.

#### 10. Security Features:

- Windows Defender: Windows 10 comes with Windows Defender, serving as the default antivirus and anti-malware solution.
- BitLocker: BitLocker encryption is available for securing data on internal and external drives.

#### 11. Windows Update:

- Windows 10 follows a "Windows as a Service" model, providing regular feature updates and security patches through Windows Update.

#### 12. Compatibility:

- Windows 10 is designed to be compatible with a wide range of software and hardware, allowing users to run applications designed for earlier Windows versions.

#### 13. Xbox Integration:

- Windows 10 integrates with Xbox, allowing users to connect their Xbox Live accounts, stream games, and use features like Xbox Game Bar and Game Mode.

#### 14. Microsoft Store:

- The Microsoft Store serves as a centralized location for downloading and installing Universal Windows Platform (UWP) apps.

#### 15. Dark Mode:

- Windows 10 includes a Dark Mode option, providing an alternative color scheme for the user interface.

#### 16. File Explorer Enhancements:

- File Explorer in Windows 10 has various enhancements, including the Quick Access feature, improved search, and the introduction of the OneDrive Files On-Demand feature.

#### 17. Taskbar Customization:

- The taskbar in Windows 10 is customizable, allowing users to pin apps, access the notification center, and use system tray features.

#### 18. Multitasking Features:

- Windows 10 offers improved multitasking with features like Snap Assist for easy window management.

#### 19. High-DPI Support:

- Windows 10 includes better support for high-DPI displays, ensuring a better experience on devices with high-resolution screens.

#### 20. Dynamic Lock:

- Dynamic Lock is a feature that automatically locks your device when you're away, using Bluetooth to detect your proximity.

### **Versions of Windows 10 OS**

#### 1. Windows 10 Home:

- Aimed at home users and includes the core features of Windows 10.
- Suitable for general use, such as web browsing, email, and productivity tasks.

#### 2. Windows 10 Pro:

- Designed for business users and enthusiasts.
- Includes additional features like BitLocker encryption, Hyper-V virtualization, and Remote Desktop.

#### 3. Windows 10 Enterprise:

- Geared towards large organizations and businesses.
- Includes advanced security features and management capabilities not found in Home or Pro.

#### 4. Windows 10 Education:

- Similar to Windows 10 Enterprise but designed for educational institutions.
- Contains features aimed at meeting the needs of schools and universities.

#### 5. Windows 10 Pro for Workstations:

- Targeted at power users and professionals with high-performance hardware.
- Includes features such as Resilient File System (ReFS) and support for high-end hardware configurations.

#### 6. Windows 10 IoT (Internet of Things):

- Tailored for devices in the Internet of Things ecosystem, such as embedded systems and specialized devices.

#### 7. Windows 10 S:

- A streamlined version of Windows 10 designed for security and performance.
- Originally aimed at the education market, it only allows apps from the Microsoft Store.

#### 8. Windows 10 Pro Education:

- Similar to Windows 10 Pro but designed for the unique needs of educational institutions.



## **Pre requisities of windows 10 installation**

### **Minimum System Requirements:**

1. Processor:	<ul style="list-style-type: none"><li>• 1 GHz or faster processor or System on a Chip (SoC)</li></ul>
2. RAM:	<ul style="list-style-type: none"><li>• 1 GB for 32-bit or 2 GB for 64-bit</li></ul>
3. Hard Disk Space:	<ul style="list-style-type: none"><li>• 16 GB for 32-bit OS or 20 GB for 64-bit OS</li></ul>
4. Graphics Card:	<ul style="list-style-type: none"><li>• DirectX 9 or later with WDDM 1.0 driver</li></ul>
5. Display:	<ul style="list-style-type: none"><li>• 800 x 600 resolution</li></ul>
6. Internet Connection:	<ul style="list-style-type: none"><li>• Internet connectivity is necessary to perform updates and to download and take advantage of certain features.</li></ul>

### **Recommended System Requirements:**

1. Processor:	<ul style="list-style-type: none"><li>• 2 GHz or faster multi-core processor</li></ul>
2. RAM:	<ul style="list-style-type: none"><li>• 4 GB or more</li></ul>
3. Hard Disk Space:	<ul style="list-style-type: none"><li>• 64 GB or more free space on the hard drive</li></ul>
4. Graphics Card:	<ul style="list-style-type: none"><li>• DirectX 9 or later with WDDM 1.0 driver</li></ul>
5. Display:	<ul style="list-style-type: none"><li>• 1920 x 1080 resolution or higher</li></ul>
6. Internet Connection:	<ul style="list-style-type: none"><li>• Internet connectivity for updates and to download and take advantage of certain features.</li></ul>

## **Create a system image backup to USB drive on Windows 10**

1. To create a system image backup on Windows 10, use these steps:
2. Open Settings on Windows 10.
3. Click on Update & Security.
4. Click on Backup.
5. Under the “Looking for an older backup” section, click the “Go to Backup and Restore (Windows 7)” option.
6. Click the “Create a system image” option from the left pane.
7. Under the “On a hard disk” setting, select the external USB drive for the full backup of Windows 10.
8. Click the Next button.
9. Select any other drive to include in the Windows 10 full backup (if applicable).
10. Click the Next button.
11. Click the Start backup button.
12. Click the No button.

### **create a recovery drive in Windows 10:**

1. In the search box next to the Start button, search for Create a recovery drive and then select it.  
You might be asked to enter an admin password or confirm your choice.
2. When the tool opens, make sure Back up system files to the recovery drive is selected and then select Next.
3. Connect a USB drive to your PC, select it, and then select Next.
4. Select Create. Many files need to be copied to the recovery drive, so this might take a while.

### **Installation of Windows 10 OS**

1. Check System Requirements:	<ul style="list-style-type: none"><li>• Ensure that your computer meets the minimum system requirements for Windows 10.</li></ul>
2. Create a Windows 10 Installation Media:	<ul style="list-style-type: none"><li>• Download the Windows 10 Media Creation Tool from the official Microsoft website.</li><li>• Run the tool and follow the on-screen instructions to create a bootable USB flash drive or DVD.</li></ul>
3. Boot from Installation Media:	<ul style="list-style-type: none"><li>• Insert the USB drive or DVD into your computer.</li><li>• Restart your computer and enter the BIOS/UEFI settings.</li><li>• Set the boot order to prioritize the USB drive or DVD.</li></ul>
4. Install Windows 10:	<ul style="list-style-type: none"><li>• Follow the on-screen instructions to start the Windows 10 installation process.</li><li>• Choose your language, time, and keyboard input preferences.</li><li>• Select "Install Now."</li></ul>
5. Enter Product Key:	<ul style="list-style-type: none"><li>• Enter the product key when prompted. This step may be skipped if you're upgrading from a previous version of Windows.</li></ul>
6. Select Installation Type:	<ul style="list-style-type: none"><li>• Choose "Custom: Install Windows only (advanced)."</li><li>• Select the drive where you want to install Windows and click "Next."</li></ul>
7. Install Windows:	<ul style="list-style-type: none"><li>• Wait for the installation process to complete. Your computer may restart several times.</li></ul>
8. Set Up Windows:	<ul style="list-style-type: none"><li>• Follow the on-screen prompts to personalize your settings, create a user account, and connect to the internet.</li></ul>
9. Complete Installation:	<ul style="list-style-type: none"><li>• Once the setup is complete, you'll see the Windows desktop.</li></ul>

### **Customizing Windows Desktop**

*Personalization Settings in Windows 10* allow the users to make quite a lot of changes to the computing experience. The users can personalize the Windows 10 desktop, theme, lock screen, window colors, and more. The look and feel of the Windows 10 experience can be totally customized with a wide range of settings. To open the Personalization Settings in Windows 10, click on *Start menu* > *Windows Settings* > *Personalization* or right-click anywhere on the desktop, then select Personalize from the drop-down menu. The Personalization settings will appear.

The Personalization settings window will open, and you will see several tabs or sections in the left pane.

- Background
- Colors
- Lock screen

- Themes
- Fonts
- Start
- Taskbar

### **Demonstrate the configuration and setting up an Administrator for a Windows Operating System.**

To configure and set up an administrator account in Windows 10, follow these steps:

1. Start your computer and log in with an existing user account that has administrative privileges.
2. Click on the "Start" button (Windows logo) in the bottom-left corner of the screen.
3. In the Start menu, click on the gear icon to open the Settings app.
4. In the Settings window, select "Accounts."
5. In the left sidebar, click on "Family & other users."
6. Under the "Other users" section, click on "Add someone else to this PC."
7. On the following screen, click on the "I don't have this person's sign-in information" link.
8. On the next screen, click on the "Add a user without a Microsoft account" link.
9. A form will appear where you can create a new local user account. Enter a username for the new administrator account. You can also set a password and password hint if desired. Click on the "Next" button.
10. Once the account is created, you will be returned to the "Family & other users" settings page. Under the "Other users" section, you should now see the newly created account listed. Click on the account name.
11. In the account settings, click on the "Change account type" button.
12. In the next window, select the "Administrator" option and click on the "OK" button.
13. Close the Settings app.
14. Log out of the current user account by clicking on the "Start" button, selecting the user profile picture at the top left, and choosing "Sign out."
15. On the login screen, you should now see the newly created administrator account. Select it, enter the password (if set), and click on "Sign in."
16. Once logged in, the new account will have administrator privileges, allowing you to install software, make system changes, and perform other administrative tasks.

Remember that administrator accounts have significant control over the system, so use this privilege responsibly and keep your account secure with a strong password.

### **File**

a file is a collection of data or information that is stored and treated as a single unit. Files can take various forms, such as text documents, images, videos, spreadsheets, or program executable files.

Each file is identified by a filename and a file extension that indicates the type or format of the data it contains.

Common file operations include creating, opening, editing, saving, and deleting files.

A file system is a method used by computers and operating systems to organize and store files on storage devices, such as hard drives, solid-state drives, or external storage media. It provides a structured way to store, retrieve, and manage data.

### File Properties

1. File Name:	<ul style="list-style-type: none"><li>The unique identifier assigned to the file. The file name, along with its extension, helps distinguish one file from another.</li></ul>
2. File Extension:	<ul style="list-style-type: none"><li>The part of the file name that indicates the type or format of the file. For example, ".txt" for text files, ".jpg" for image files, etc.</li></ul>
3. File Size:	<ul style="list-style-type: none"><li>The size of the file, typically measured in bytes, kilobytes (KB), megabytes (MB), gigabytes (GB), etc.</li></ul>
4. File Type:	<ul style="list-style-type: none"><li>The category or type of file, such as text, image, audio, video, executable, etc.</li></ul>
5. Location or Path:	<ul style="list-style-type: none"><li>The location of the file within the file system. This includes the directory (or folder) structure leading to the file.</li></ul>
6. Date Created:	<ul style="list-style-type: none"><li>The timestamp indicating when the file was originally created.</li></ul>
7. Date Modified:	<ul style="list-style-type: none"><li>The timestamp indicating when the file was last modified. This includes changes to the file's content.</li></ul>
8. Date Accessed:	<ul style="list-style-type: none"><li>The timestamp indicating when the file was last accessed or opened.</li></ul>
9. Attributes:	<ul style="list-style-type: none"><li>Flags or properties that provide additional information about the file. This may include read-only, hidden, system, or archive attributes.</li></ul>
10. Permissions:	<ul style="list-style-type: none"><li>Access control settings that determine which users or system processes are allowed to perform specific actions on the file (e.g., read, write, execute).</li></ul>
11. Owner:	<ul style="list-style-type: none"><li>The user account that owns the file. This is relevant in multi-user environments where different users may have different levels of access to files.</li></ul>
12. Version Information:	<ul style="list-style-type: none"><li>For certain types of files, especially in version-controlled environments, information about the file's version may be included.</li></ul>

### File Types

1. Text Files:	<ul style="list-style-type: none"><li>Plain Text: .txt</li><li>Rich Text Format: .rtf</li><li>Markdown: .md</li></ul>
2. Document Files:	<ul style="list-style-type: none"><li>Microsoft Word Document: .doc, .docx</li><li>PDF (Portable Document Format): .pdf</li><li>OpenDocument Text: .odt</li></ul>
3. Spreadsheet Files:	<ul style="list-style-type: none"><li>Microsoft Excel Spreadsheet: .xls, .xlsx</li><li>CSV (Comma-Separated Values): .csv</li></ul>
4. Presentation Files:	<ul style="list-style-type: none"><li>Microsoft PowerPoint Presentation: .ppt, .pptx</li><li>OpenDocument Presentation: .odp</li></ul>
5. Image Files:	<ul style="list-style-type: none"><li>JPEG Image: .jpg, .jpeg</li></ul>

	<ul style="list-style-type: none"> <li>• PNG Image: .png</li> <li>• GIF Image: .gif</li> <li>• Bitmap Image: .bmp</li> <li>• TIFF Image: .tiff, .tif</li> </ul>
6. Audio Files:	
	<ul style="list-style-type: none"> <li>• MP3 Audio: .mp3</li> <li>• WAV Audio: .wav</li> <li>• MIDI Audio: .midi, .mid</li> </ul>
7. Video Files:	
	<ul style="list-style-type: none"> <li>• MP4 Video: .mp4</li> <li>• AVI Video: .avi</li> <li>• MKV Video: .mkv</li> </ul>
8. Executable Files:	
	<ul style="list-style-type: none"> <li>• Windows Executable: .exe</li> <li>• Linux/Unix Executable: (No specific extension; often no extension at all)</li> <li>• macOS Application: .app</li> </ul>
9. Archive Files:	
	<ul style="list-style-type: none"> <li>• ZIP Archive: .zip</li> <li>• RAR Archive: .rar</li> <li>• Tarball Archive: .tar.gz</li> </ul>
10. Database Files:	
	<ul style="list-style-type: none"> <li>• Microsoft Access Database: .mdb, .accdB</li> <li>• SQLite Database: .sqlite, .db</li> </ul>
11. Web Files:	
	<ul style="list-style-type: none"> <li>• HTML Document: .html, .htm</li> <li>• CSS Stylesheet: .css</li> <li>• JavaScript: .js</li> </ul>
12. Configuration Files:	
	<ul style="list-style-type: none"> <li>• INI Configuration: .ini</li> <li>• XML Configuration: .xml</li> <li>• JSON Configuration: .json</li> </ul>
13. Font Files:	
	<ul style="list-style-type: none"> <li>• TrueType Font: .ttf</li> <li>• OpenType Font: .otf</li> </ul>
14. System Files:	
	<ul style="list-style-type: none"> <li>• Windows System File: .dll, .sys</li> <li>• Linux/Unix System File: (No specific extension; often no extension at all)</li> <li>• macOS System File: .kext</li> </ul>
15. 3D Model Files:	
	<ul style="list-style-type: none"> <li>• STL (Stereolithography): .stl</li> <li>• OBJ (Wavefront Object): .obj</li> </ul>

## Task Manager

Task Manager is a system monitoring utility in Windows operating systems that provides information about the performance of the computer and the programs and processes running on it. It offers a range of features for monitoring, managing, and troubleshooting system resources. Here are some common features found in Task Manager:

### Here are some common features found in Task Manager:

To access Task Manager in Windows, you can type task manager in search place or you can right-click on the taskbar and select "Task Manager" or use the keyboard shortcut "Ctrl + Shift + Esc." Alternatively, you can press "Ctrl + Alt + Delete" and choose "Task Manager" from the menu.

1. Processes Tab:	
	<ul style="list-style-type: none"> <li>• Displays a list of currently running processes, including applications and background processes.</li> </ul>

	<ul style="list-style-type: none"> <li>Provides information about the CPU and memory usage of each process.</li> <li>Allows users to end, suspend, or prioritize processes.</li> </ul>
2. Performance Tab:	
	<ul style="list-style-type: none"> <li>Offers a real-time overview of the computer's performance, including CPU, memory, disk, and network usage.</li> <li>Graphs and charts illustrate the usage patterns over time.</li> </ul>
3. App History Tab:	
	<ul style="list-style-type: none"> <li>Displays resource usage statistics for Windows Store apps.</li> </ul>
4. Startup Tab:	
	<ul style="list-style-type: none"> <li>Lists programs that start automatically with Windows.</li> <li>Allows users to enable or disable startup programs.</li> </ul>
5. Users Tab:	
	<ul style="list-style-type: none"> <li>Shows the users currently logged into the system.</li> <li>Provides information on their activity and resource usage.</li> </ul>
6. Details Tab:	
	<ul style="list-style-type: none"> <li>Provides a more detailed view of running processes, including the full path to the executable, CPU usage, and memory usage.</li> <li>Allows users to set process priorities and affinity.</li> </ul>
7. Services Tab:	
	<ul style="list-style-type: none"> <li>Lists system services and their status (running, stopped, etc.).</li> <li>Allows users to start, stop, pause, resume, or restart services.</li> </ul>
8. Networking Tab:	
	<ul style="list-style-type: none"> <li>Displays network usage for each network adapter.</li> <li>Provides details about the data usage of running processes.</li> </ul>
9. Users Tab:	
	<ul style="list-style-type: none"> <li>Shows a list of users currently logged into the system.</li> <li>Provides information about their session status and resource usage.</li> </ul>
10. Resource Monitor:	
	<ul style="list-style-type: none"> <li>Offers more detailed insights into CPU, memory, disk, and network usage.</li> <li>Allows users to identify resource-intensive processes.</li> </ul>
11. Performance Graphs:	
	<ul style="list-style-type: none"> <li>Displays real-time graphs for CPU, memory, disk, and network usage on the main Task Manager window.</li> </ul>

### **Command Prompt ( DOS commands)**

Execute basic commands in Windows using command prompt.

To navigate to the Command Prompt on a Windows operating system, you can follow these steps:

1. Using the Start Menu:	<ul style="list-style-type: none"> <li>Click on the Start button (Windows icon) in the bottom-left corner of the screen.</li> <li>In the search bar, type "Command Prompt" or "cmd".</li> <li>Press Enter, and the Command Prompt window should open.</li> </ul>
2. Using Run Dialog:	<ul style="list-style-type: none"> <li>Press the Windows key + R to open the Run dialog.</li> <li>Type "cmd" or "cmd.exe" in the dialog box.</li> <li>Press Enter, and the Command Prompt will open.</li> </ul>

Basic Commands in Windows using Command Prompt:

Commands	Description
dir	Listing Files and Folders/Directories

md <i>FolderName</i>	To make the Folder/Directory
rd <i>FolderName</i>	To remove Folder/Directory
cd <i>NextFolderName</i> cd .. cd	Change Directory to successor Directory Change Directory to Previous Directory Current Working Directory
del <i>FileName</i>	Deleting File
ren <i>OldFilename NewFilename</i>	Renaming Old File with New Name
copy con <i>FileName</i>	Create New file and Adding Contents, Copying Contents on the Console to File
echo <i>Text to be Displayed</i>	To Display the typed Text
tasklist	List of Processes running
taskkill -pid <i>Taskid</i>	End Process (pid)
prompt <i>UserPromptText</i>	To display the Prompt with user Defined Text
cls	Clear the contents in Console

type <i>FileName</i>	Display the Contents of the File
exit	Close the Command Prompt
copy <i>OriginalFile CopyofFile</i>	Copies the Contents of <i>OriginalFile</i> to <i>CopyofFile</i>
move <i>FileWithPath1 FilewithAnotherPath</i>	File which is one path will be moved to another path with same or different name.
attrib [+h] [-h] [+r][-r] <i>FileName</i>	Attach the attributes to the File like, add hidden, remove hidden, add Read Only, Remove Read only
ping <ip or domain>	The ping command sends packets of data to a specific IP address (or domain) on a network and then lets you know how long it took to transmit that data and get a response. Checks if Server is Reachable.
ipconfig	ipconfig will provide ip address along with your local network.



driverquery	Lists Installed Drivers in the PC.
systeminfo	Basic information about pc's hardware, like – motherboard, processor & ram
cls	To clear the existing commands in prompts.

## **Power Shell**

Execute basic commands in Windows using Power Shell.

You can navigate to PowerShell on a Windows operating system using various methods:

### 1. Using the Start Menu:

- Click on the Start button (Windows icon) in the bottom-left corner of the screen.
- In the search bar, type "PowerShell."
- Press Enter, and PowerShell will open.

### 2. Using Run Dialog:

- Press the Windows key + R to open the Run dialog.
- Type "powershell" in the dialog box.
- Press Enter, and PowerShell will open.

Basic Commands in Windows using Power Shell.

Command	Description
Get-PSDrive	Listing Drives in System
pwd	Get Preset Working Directory
ls	List all the Files and Folders in Drive
New-Item <i>FileName</i>	Create a new text file
Set-Content <i>FileName</i> " <i>Content to Overwrite</i> "	Putting content to the File
Get-Content <i>FileName</i>	Reading contents of the File
Add-Content <i>FileName</i> " <i>Content to be Added</i> "	Adding Content to a File

Get-Content test.txt   measure-object -character -line -word	Display Number of Characters, Words and Lines in a File
---	---

Clear-Content <i>FileName</i>	Erasing content of the File
New-Item <i>FolderName</i> -ItemType Directory	Create a New Folder
Remove-Item <i>FolderName</i>	Delete the Created Folder
Remove-Item <i>FolderName</i> - Recursive	Delete the Created Folder and its included folders Recursively
Cipher /e <i>FileName</i>	Encrypt File or Folder
Cipher /d <i>FileName</i>	Decrypt File or Folder
Cipher <i>FileName</i>	To View all the Encrypted or Decrypted Files / Folders
Get-Process	To get list of Processes
Get-Service	To get list of Services

#### **Verify the comparison between Desktop and Laptop**

S. No.	DESKTOP	LAPTOP
1.	It needs external devices to be fully functional.	It is an all-in-one computer system.
2.	It is large.	While it is small in size.
3.	It can have multiple internal drives.	It can have limited internal drives.
4.	It is not portable.	While it is easily portable.
5.	It runs only on the main power supply.	While it can run on battery, AC supply, and main power supply too.
6.	External keyboard and mouse are necessary to work.	The keyboard and mouse are in-built. However external keyboard and mouse also can be used.
7.	It has a more powerful processor.	It has a less powerful processor except for gaming laptops.
8.	It has a wide range of screen sizes.	While the range of screen sizes in laptops is limited.
9.	The repairing of desktops is easy to work as compared to laptops.	While the repairing of laptops is a little complex.
10.	Components of the desktop can be easily removed.	The components of laptops are not easily removable.

S. No.	DESKTOP	LAPTOP
11.	The number of data ports are more in desktops.	The number of data ports are less in laptops.
12.	It is relatively heavier than laptop.	It is lighter as compared to desktop.
13.	It is used in homes or offices.	You can carry laptop while travelling as it is packaged as a single entire unit.
14.	It costs less compared to a laptop.	It costs more.
15.	Maintenance is not as high as on laptops.	Maintenance is high because of the built-in components. Expertise is required to manage the issues.
16.	Setting up of desktop takes time and is more cumbersome than laptop.	It does not take much time to setup and run.
17.	Screen size can be 19" or more.	Screen size ranges from 10" to 17".
18.	Power consumption is high compared to a laptop.	Power consumption is less.
19.	Easy to upgrade because of the removable components.	Usually memory and hard drive can only be upgraded in laptop as rest of the components are either built-in or cannot be removed.