

# *Graded Exercise*

*Computer Hardware,  
Maintenance and  
Administration -  
20CS32P*

*III Semester  
Computer Science*

# Certificate

**Name** : **Class: III Semester**

**Register Number :**

**Institution** :

This is certified to be the bonafide work of the student in the **Computer Hardware, Maintenance and Administration – 20CS32P** Laboratory during the academic year 20 – 20

*Course Coordinator*

*Examiner Signature*

1. \_\_\_\_\_

2. \_\_\_\_\_

## List of Experiments

## Computer Hardware, Maintenance and Administration – 20CS32P

The computer cases are a visible part of our computers called PC towers and Computer towers. Its function is to serve as a **protective structure** for the rest of the internal components where they will be assembled.

The following are the **computer case sizes and models** available in the market.

### 4 Different Types of Computer Case



#### 1. Full tower

- Full Tower is used to accommodate an **E-ATX or CEB motherboard**. This is very useful for high-performance servers that can use two processors and massive RAM and other storage units at once.
- One big **drawback** to having a Full Tower is that it takes up a lot of space and is difficult to hide. But if you have free space available, then it is not essential for you, then Full Tower can be the best choice for your PC.

#### 2. Mid Tower

- Mid-tower or ATX format is the most popular and widely used computer case that allows you to use many drives and almost all types of motherboards with acceptable overall dimensions in it.
- Inside the mid-tower case, there is more enough space for installing full-size components, such as most extensive video cards over 300 mm long, and this case is capable of using **120, 140, or even 200 mm fans** for a positive effect on cooling the air.
- This type of format includes both those developed for the mini ITX standard and those designed for the micro ATX standard.

### 3. Mini Tower

- These types of computer cases are designed to take up as little physical space and without installing decent-sized graphics cards.
- Their thermal enclosures are not the best on the market, so it is more convenient for you to install low-consumption components rather than high-consumption ones.



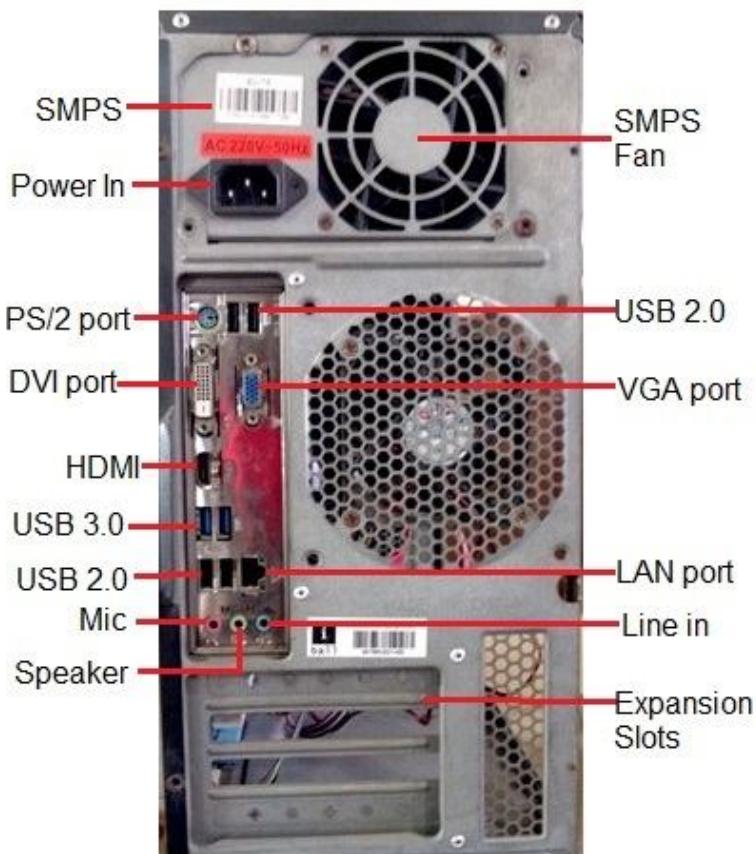
### 4. HTPC and SFF

- HTPC stands ‘**Home theatre PC**’ for and SFF stands for ‘**Small Form Factor**’.
- HTPC is the perfect choice for the computer at your home **multimedia entertainment**. The computing power of this is more than enough to play music and video in any modern format.
- Also, **such a PC will not make a sound – often, you can have passive cooling**.
- SFF takes little space. Due to their small size and lightweight, they can be an excellent alternative to laptops.
- It will also be much easier to repair and improve such a PC than a laptop with the feature of portability.
- It has one drawback that they are most often limited to only one CD drive.



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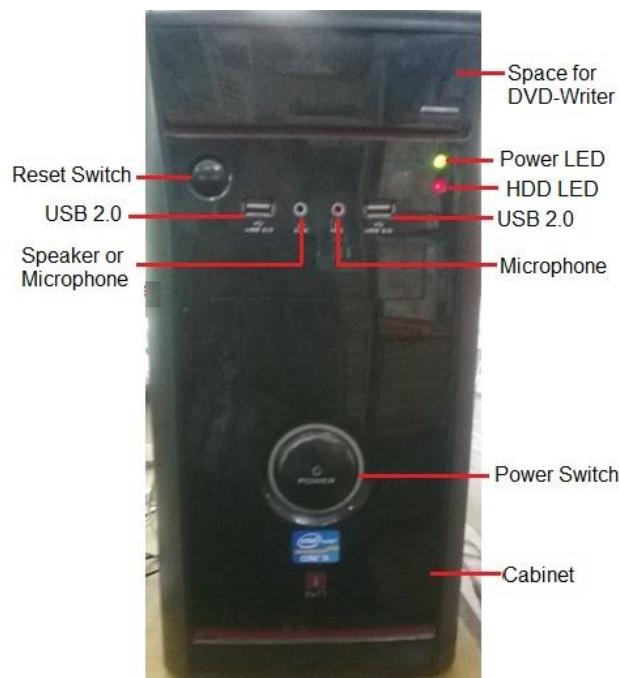
## Back Side Connectors of PC



- **SMPS.** Switch Mode Power Supply uses electronics circuitry that converts the AC input voltage to different values of regulated DC supply which is fed into various color-coded wires fixed to connectors.
- **SMPS FAN.** The fan is fixed inside the SMPS and is used to radiate the internal heat of SMPS to outside.
- **Power In Socket.** This socket is used to input 220V AC to the PC from mains supply when the computer switch on the front side is pressed.
- **PS-2 Port.** You can see two different colored 6-pin round shaped connectors. These connectors are used to connect input devices, keyboard and mouse. Color Coding defines the connector type. The purple connector is dedicated to connect Keyboard and Green color is used for Mouse.
- **USB Port.** The full form is Universal Serial Bus and is used to connect various input and output devices like Mouse,Keyboard, Printers, Webcams etc. USB 3.0 is the latest version which offers high data transfer speed.

- **DVI Port.** Digital Video Interface is a high-speed serial link for connecting output display Devices.
- **HDMI Port.** HDMI stands for high definition multimedia interface. This is a latest interface that helps to get high definition video and multi channel sound. You can connect HDMI enabled blue ray devices, LED's etc.
- **15-pin Female VGA Port.** This is used to connect display devices like Monitor / LCD / LED Display.
- **LAN Port.** The LAN or network port is used to connect to other devices and computers in a network.
- **Audio Ports.** Generally there are 3 number of audio ports on the back side of a PC. These parts are either aligned vertically or in horizontal position. Green color port is dedicated for headphones or speakers, a blue colored port is marked as Line-in and Mic can be inserted in a pink port.
- **Expansion Slots:** These expansion slots are used to connect add-on cards to increase the capabilities of the motherboard.

#### **Front Side buttons on PC**



- **DVD-Writer.** Top slot of the cabinet is reserved to fix CD-ROM or DVD-writer.
- **Power-LED:** The LED glows and indicates that the Input Power is ON

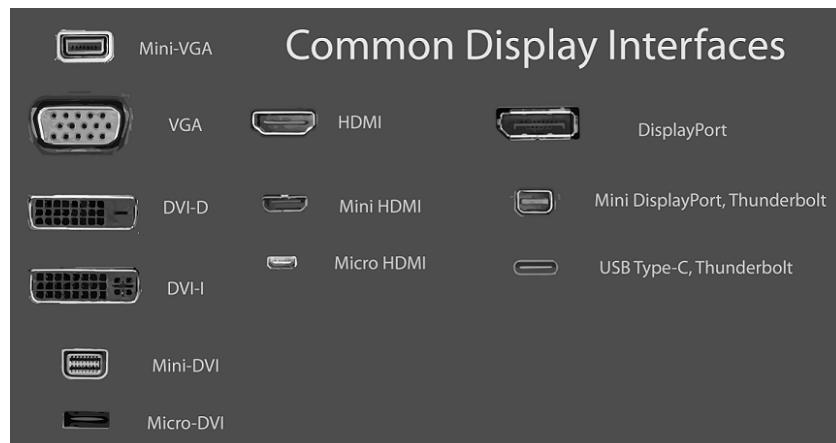
- **HDD LED:** When we are working on the computer, the hard disk is in use , this LED glows and is the indication that the hard disk drive is in use.
- **Reset Switch:** This computer switch is quite handy when the computer is stuck-up and you are not able to work on the computer . Just press this switch, the computer will Re-Boot.
- **Front USB.** Cabinet provides a facility for you to connect USB devices from front-side as it is quite awkward to get to the back side of the computer again and again.
- **Front Audio Ports:** The ports for MIC and HeadPhone at the front are for user quite easy to approach.
- **Power Switch.** It is used to switch-ON the computer.

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**Identify and understand different cables and connectors:**

**Video cables:**

 VGA Cable for Computer and Projector	 HDMI Cable
 Mini HDMI	 DVI Port



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## Hard Drive Cables

There are three main types of cables: IDE/PATA, SATA and SCSI. IDE (Integrated Drive Electronics) drives, also known as PATA (Parallel AT Attachment) drives, are commonly found in personal computers.

There are several types of hard drives, and they all require different data cables. To connect a hard drive to a computer, one must have the proper cables and plug the cables into the appropriate places.

**IDE/PATA Cable:**



IDE/PATA data 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. For example, an IDE/PATA DVD-R drive may be connected along with an IDE/PATA hard drive on the same cable.

**SATA Cable:**



SATA data 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 50-pin cable - by Smial on Wikimedia, Creative Commons Attribution ShareAlike 2.0 Germany.

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 (IDE/PATA drives have 40). Like IDE, multiple SCSI devices can be connected to a single channel through "daisy chaining." Depending on the SCSI interface, as many as 7 or 15 devices may be connected to a single SCSI channel.

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### **Adapters:**

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

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### **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.

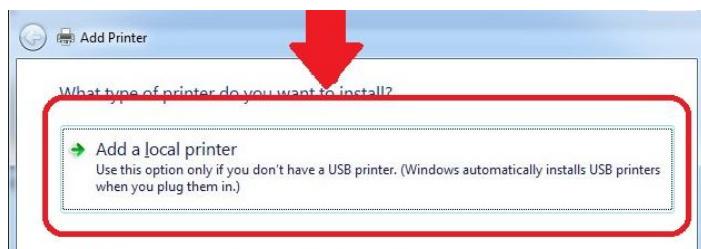
- If you **DO NOT** have the installation CD that came with your printer or added Printer Icon is got removed: proceed to Manual Installation and follow directions (as mentioned below).

### **Installing Manually**

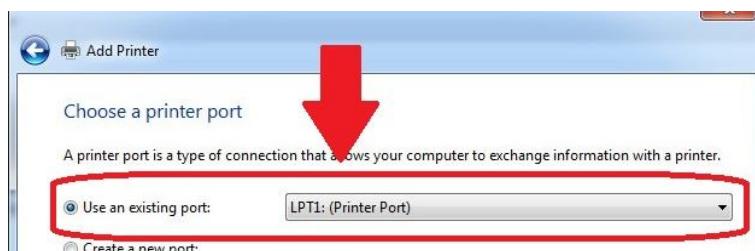
- Click the START button and select DEVICES AND PRINTERS.



- Select "Add a Printer"



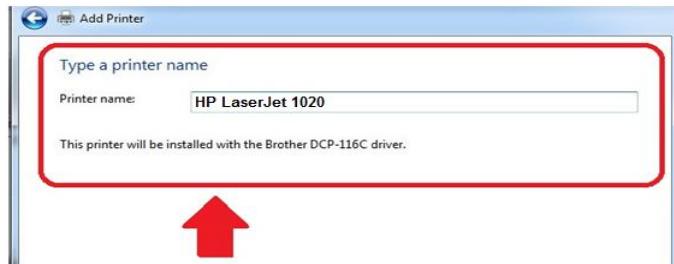
- Select "Add a Local Printer"



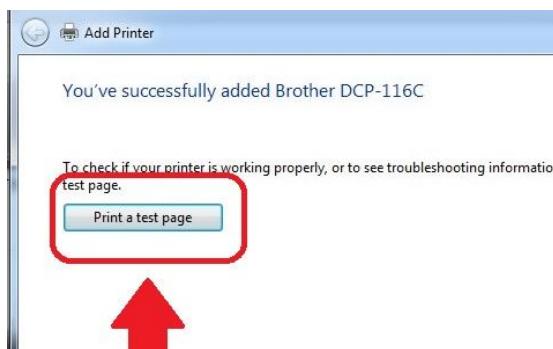
- Choose to "**Use an Existing Port**", and leave as default "LPT1: (Printer Port)"  
If you already have another printer connected to this PC, you may need to change to **USB**



- Select "Windows Update" to populate the list of known printers. This may take several minutes.
  - Then choose your printer from the list. If multiple drivers are listed for your printer, select the one that say HP. For instance: **HP LaserJet 1020**



- Choose a name for your printer. The default name is fine, unless you have multiples of the same printer.



- If you wish to test your printer to make sure it was installed correctly, select "**Print a test page**"
- When you're all done, press "**Finish**"

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## **Installation of Shared Printer through Wired and Wireless Means**

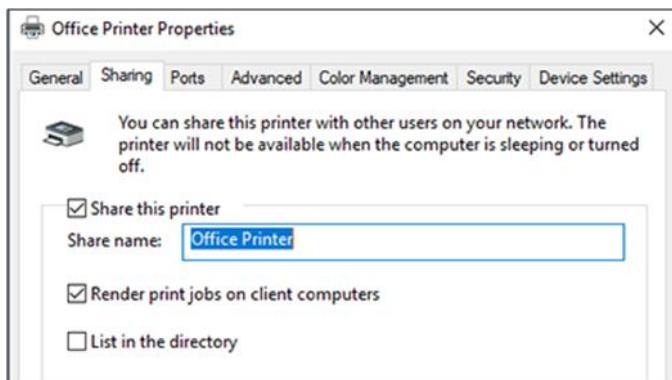
### **Share the printer on the primary PC**

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**.

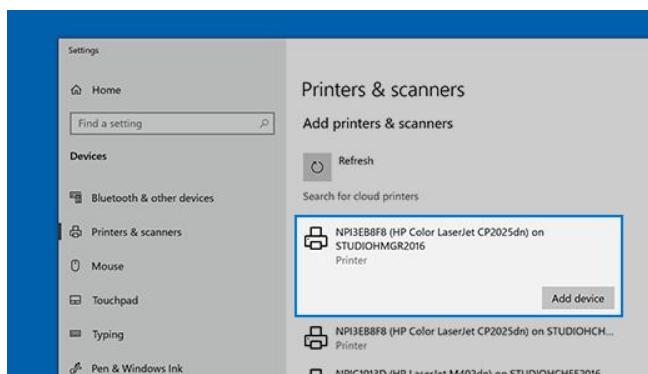
5. If you want, edit the share name of the printer. You'll use this name to connect to the printer from a secondary PC.



### **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**.

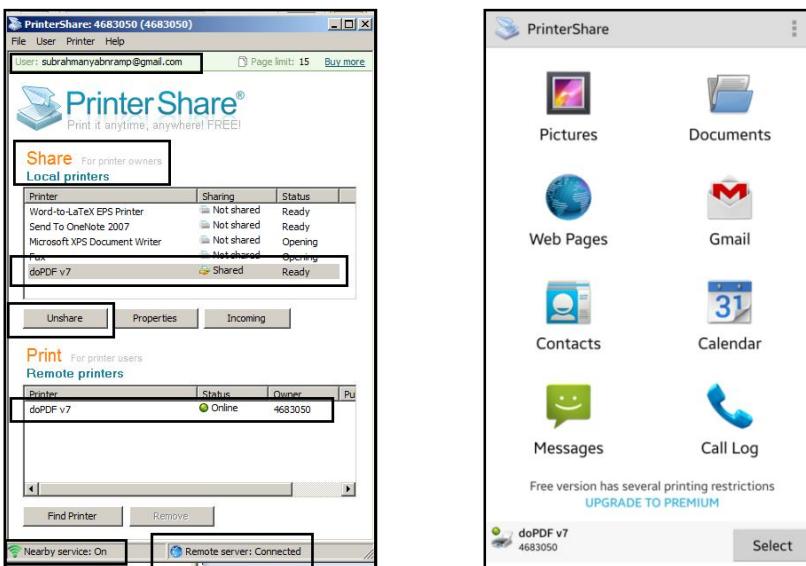


4. If you don't see the printer you want, select **The printer that I want isn't listed**.
5. In the Add printer dialog box, select **Select a shared printer by name**, and then enter the computer or device name of the primary PC and the share name of the printer using one of these formats:
  - o **\computername\printername**
6. When prompted to install the printer driver, select **Next** to complete the installation.
7. Finally, Printer Icon for the Remoter Printer will appear in Devices List.

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### Installing Cloud Printer:

- Download PrinterShare Software (full Version) from  
<http://download.printershare.com/files/PrinterShare2308.exe>
- Install PrinterShare in Personal Computer (Windows OS)
- Launch the PriterShare 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.

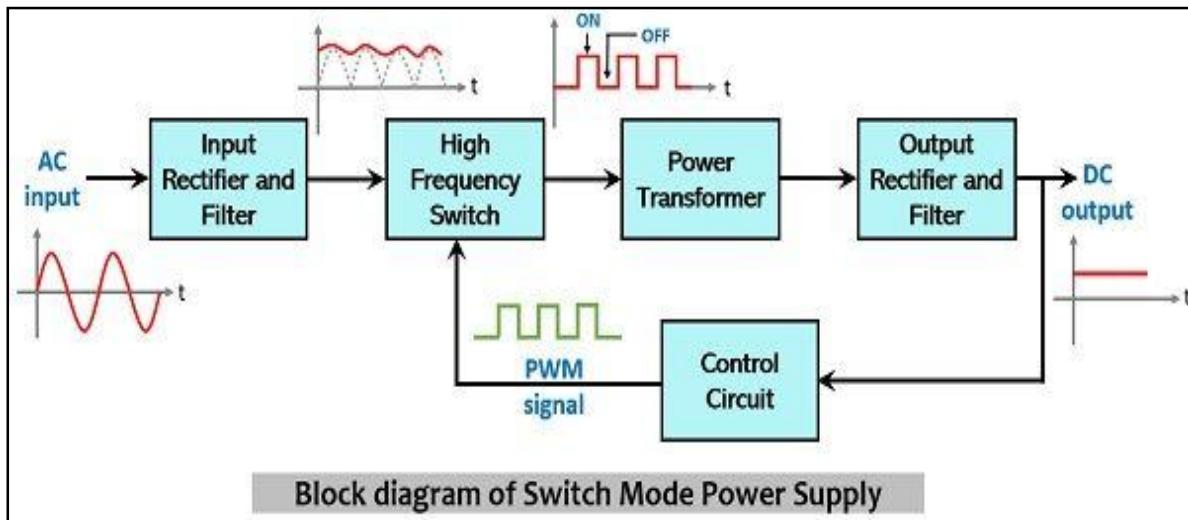
## Power Supply

Inside a computer, a PSU is the device that converts alternate electricity (the electricity from your outlet, normally 220V) to direct current to the components inside the case.

Computer power supplies (PSU) convert AC to low-voltage regulated DC power. Most modern desktop computers conform to the ATX standard, which supplies three positive rails: +3.3V, +5V and +12V.

Wires coming out of an ATX PSU are **Color-Coded** as follows:

- Yellow: +12V
- Red: +5V
- Orange: +3.3V
- Black: Ground
- Purple: 5V SB (standby voltage)
- Green: /PS\_ON (it can be shorted to ground to start PSU)
- Grey: PWR\_OK (status signal generated by PSU to indicate voltages are OK)
- White: -5V (optional on newer ATX-2 PSUs)
- Blue: -12V



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- **+5 Volts:** This voltage is **used to drive motors** present in drives of form factors 2.5 inch and 3.5 inches. Also a 5 Volts green wiring is used to connect the power button to the rest of the circuitry.

- **+12 Volts:** This voltage is used by the cooling systems and cooling fans of the computer. Also, this supply may be used to drive motors which can't run on a +5V DC Supply.
- **-12 Volts:** This voltage is used in the ISA bus slots. Now mostly the work which was carried out earlier by a -12 volts supply, is being taken care of by the +/- 5 Volt supply.
- **+ 3.3 Volts:** The +3.3 Volts orange line is the most basic supply line. Most of the **CPUs and RAM use 3.3 volts**. The PCI Bus is powered with this supply voltage and hence any components attached to it use this voltage line. In addition, a 3.3 Volts line powers up the motherboard and is used to compensate any line losses since every device needs a constant supply voltage.
- The **Power-Good Signal** prevents the computer from attempting to operate on improper voltages and damaging itself.

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### Experiment Conducted on SMPS Voltage Checking Using Multimeter:

#### Checking DC Voltage:

- In SMPS outlet, Short the Green and Black Pins
- Power ON the SMPS and verify SMPS fan is running.
- Set the Multi-meter knob to DC Voltage around (20V range)
- Connect multi-meter Negative Terminal to any one of the Black Outlet.
- Connect multi-meter Positive Terminal to all the pins of Multi-meter outlet and Note down the reading about its permissible range.

#### Checking DC Voltage:

- Remove the POWER Connection from SMPS.
- Power ON the switch from AC Main Wall.
- Set the Multi-meter knob to AC Voltage around (600V range)
- Connect multi-meter Positive and Negative Terminal any one of the Earth, Neutral, Phase pin and Note down the reading about its permissible range.

<b>Wire Color with Theoretical Voltage Value</b>	<b>Voltage Reading in Lab</b>
<b>SMPS DC Voltage Checking</b>	
• <b>Yellow:</b> +12V	
• <b>Red:</b> +5V	
• <b>Orange:</b> +3.3V	
• <b>Black:</b> Ground	
• <b>Purple:</b> 5V SB (standby voltage)	
• <b>Green:</b> /PS_ON (it can be shorted to ground to start PSU)	
• <b>Grey:</b> PWR_OK (status signal generated by PSU to indicate voltages are OK) – <b>Power Good Signal</b>	
• <b>White:</b> -5V (optional on newer ATX-2 PSUs)	
• <b>Blue:</b> -12V	
<b>AC Power Supply Voltage Checking</b>	
• <b>Earth-Neutral</b>	
• <b>Earth-Phase</b>	
• <b>Neutral-Phase</b>	

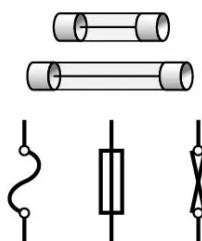
## Electronics Components on Motherboard

### Active and Passive Components on Motherboard:

As a computer professional, you should be familiar with the more common types of electronic components within a power supply.

#### Fuse

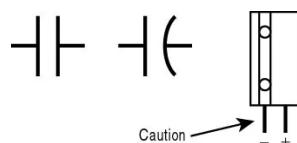
Before the advent of the circuit breaker, fuses were common in the home and office. A fuse serves one purpose-to fail-and thus cut the flow of power in the event of a current load that has exceeded the safe capacity of the system components to absorb.



#### Capacitors

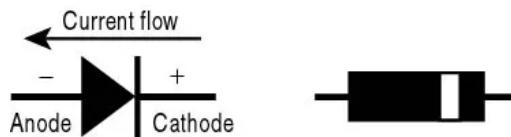
A capacitor is an electrical component used to hold an electrical charge.

In PCs, they are often used to regulate the flow of current to areas of the system circuits for a short period of time. Some are fixed-capacity models, whereas others can absorb or hold variable amounts of power. The amount of electrical current a capacitor can control is called capacitance, measured in microfarads



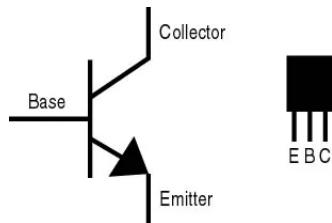
#### Rectifiers and Diodes

Rectifiers are devices that convert AC power into a DC form (rectification). A diode is a device that lets current flow in only one direction (see Figure 13.12). Two or more diodes connected to an AC supply will convert the AC voltage to DC voltage.



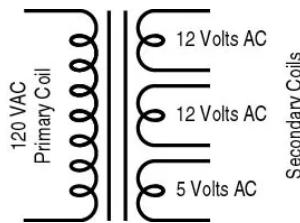
## Transistors

Transistors are basically a pair of diodes connected in series with an "on-off" switch. Varying the voltage sent to a transistor turns the switch on or off.



## Transformers

The most common forms of electrical transformers are step-down or step-up devices. A step-down transformer decreases the transformer's voltage on the output side; a step-up model increases it.



## Inductors (Coils)

Inductors, commonly called coils because of their shape, are loops of conductive wire (see Figure 13.16). Current passing through the inductor sets up a magnetic field. This field reduces any rapid change in current intensity. Inductors can also be used to distinguish between rapidly and slowly changing signals in a circuit.



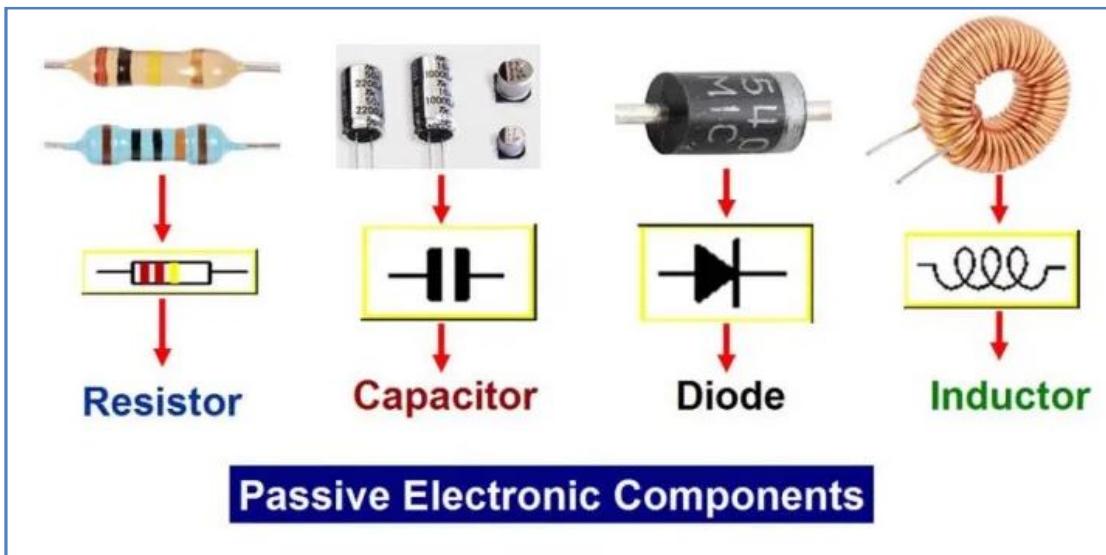
## Types of Electronic Components

These are of 2 types: Passive and Active Components. Both these types of components can be either Through-Hole or SMD.

### 1. Passive Components

These components are those that do not have gain or directionality. They are also called Electrical elements or electrical components.

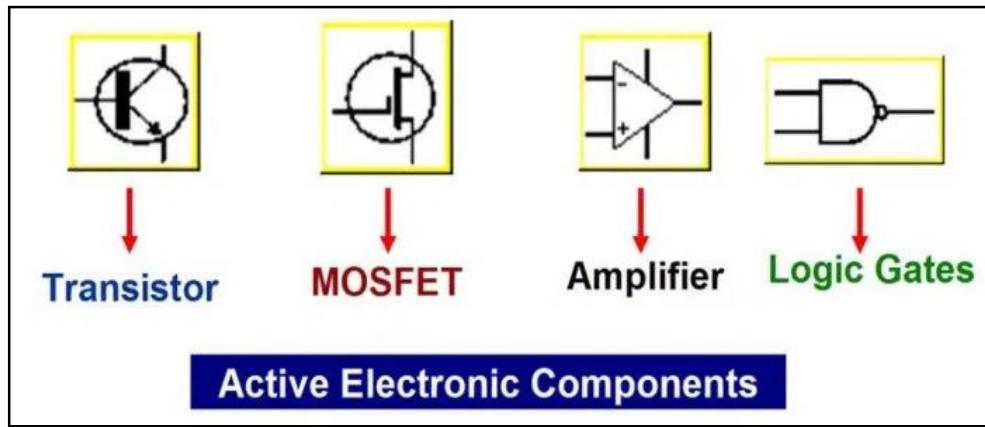
**Example:** Resistors, Capacitors, Diodes, Inductors.



## 2. Active Components

These components are those that have gain or directionality.

**Example:** Transistors, Integrated Circuits or ICs, Logic Gates.

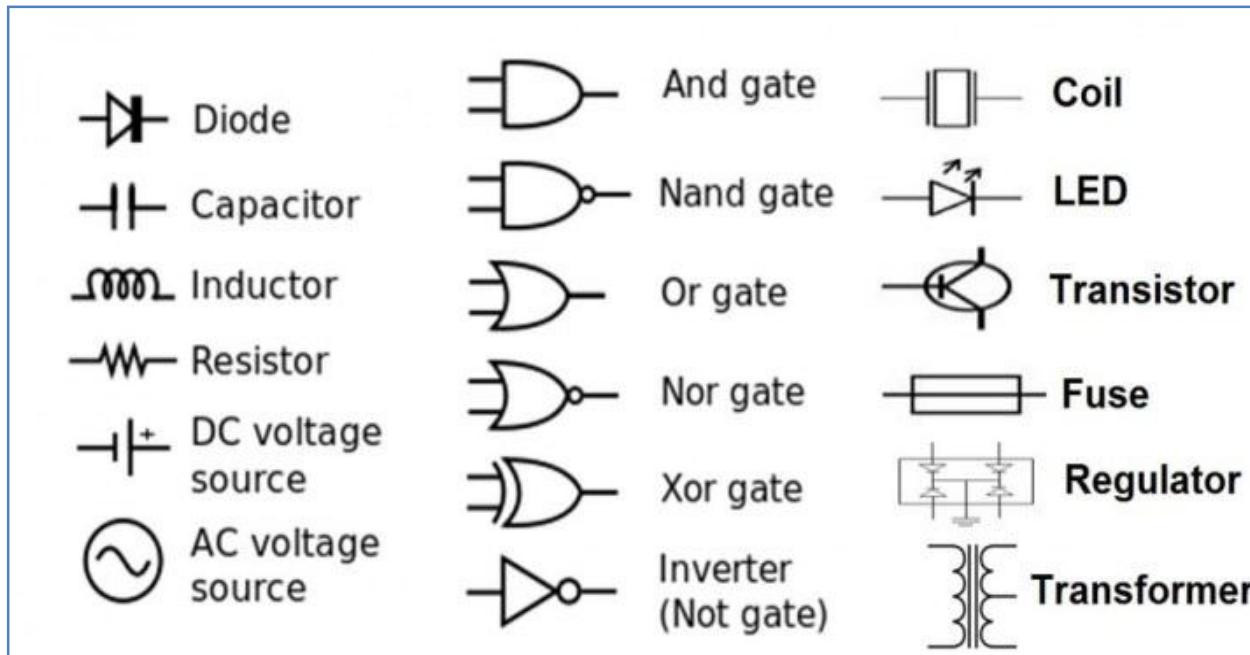


## Function of Basic Electronic Components

- Terminals and Connectors:** Components to make electrical connection.
- Resistors:** Components used to resist current.
- Switches:** Components that may be made to either conduct (closed) or not (open).
- Capacitors:** Components that store electrical charge in an electrical field.
- Magnetic or Inductive Components:** These are Electrical components that use magnetism.
- Network Components:** Components that use more than 1 type of Passive Component.

7. **Piezoelectric devices, crystals, resonators:** Passive components that use piezoelectric effect.
8. **Semiconductors:** Electronic control parts with no moving parts.
9. **Diodes:** Components that conduct electricity in only one direction.
10. **Transistors:** A semiconductor device capable of amplification.
11. **Integrated Circuits or ICs:** A microelectronic computer circuit incorporated into a chip or semiconductor; a whole system rather than a single component.

### Circuit Symbols of Electronic Components



<b>Components</b>	<b>Output Values Measured Or Status of the Device Observed</b>	<b>Components</b>	<b>Output Values Measured Or Status of the Device Observed</b>

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### Motherboard

- The motherboard is generally a thin circuit board that holds together almost all parts of a computer except input and output devices.
- All crucial hardware like CPU, memory, hard drive, and ports for input and output devices are located on the motherboard. It is the biggest circuit board in a computer chassis.
- It allocates power to all hardware located on it and enables them to communicate with each other. It is meant to hold the computer's microprocessor chip and let other components connect to it.
- Each component that runs the computer or improves its performance is a part of the motherboard or connected to it through a slot or port.
- There can be different types of motherboards based on the type and size of the computers. So, a specific motherboard can work only with specific types of processors and memory.

### Components of a Motherboard:

- **CPU Slot:** It is provided to install the CPU. It is a link between a microprocessor and a motherboard. It facilitates the use of CPU and prevents the damage when it is installed or removed. Furthermore, it is provided with a lock to prevent CPU movement and a heat sink to dissipate the extra heat.
- **RAM Slot:** It is a memory slot or socket provided in the motherboard to insert or install the RAM (Random Access Memory). There can be two or more memory slots in a computer.
- **Expansion Slot:** It is also called the bus slot or expansion port. It is a connection or port on the motherboard, which provides an installation point to connect a hardware expansion card, for example, you can purchase a video expansion card and install it into the expansion slot and then can install a new video card in the computer. Some of the common expansion slots in a computer are AGP, AMR, CNR, PCI, etc.
- **Capacitor:** It is made of two conductive plates, and a thin insulator sandwiched between them. These parts are wrapped in a plastic container.
- **Inductor (Coil):** It is an electromagnetic coil made of a conducting wire wrapped around an iron core. It acts as an inductor or electromagnet to store magnetic energy.

- **Northbridge:** It is an integrated circuit that allows communications between the CPU interface, AGP, and memory. Furthermore, it also allows the southbridge chip to communicate with the RAM, CPU, and graphics controller.
- **USB Port:** It allows you to connect hardware devices like mouse, keyboard to your computer.
- **PCI Slot:** It stands for Peripheral Component Interconnect slot. It allows you to connect the PCI devices like modems, network hardware, sound, and video cards.
- **AGP Slot:** It stands for Accelerated Graphics Port. It provides the slot to connect graphics cards.
- **Heat Sink:** It absorbs and disperses the heat generated in the computer processor.
- **Power Connector:** It is designed to supply power to the motherboard.
- **CMOS battery:** It stands for complementary metal-oxide-semiconductor. It is a memory that stores the BIOS settings such as time, date, and hardware settings.

### Motherboard form factors

- A motherboard form factor is a specification for its general shape and size. It helps to prevent incompatibilities between many hardware manufactures.
- It also determines the types of power supply, supported case, the physical layout and organization of the board, and the placement of mounting holes.
- ATX is the most common form factor for desktop computers.

There are different types of form factors of the motherboard, which are as follows:

1. **AT & Baby AT:** The size of AT is 12" wide x 13.8" deep, which is rarely used, and its replaced by ATX and Baby AT.

Baby AT motherboard was introduced by IBM that is a replacement for the AT motherboard, which is also known as BAT. The width of Baby AT is 8.57" and 13.04" deep, which is more similar to the original IBM XT motherboard. It was mainly designed for peripheral devices such as a keyboard and mouse.

2. **ATX:** It stands for **Advanced Technology eXtended**, which was first released by Intel. The size of Standard ATX or Full-ATX is 12" wide x 9.6" deep. There were some improvements in the ATX form factor as well as a single 20-pin connector for power

supply, less overlap between the drive bays and motherboard, and integrated I/O Port connectors soldered directly onto the motherboard.

3. **BTX (Balanced Technology Extended):** The BTX includes features such as a more efficient layout to facilitate cooling, low profile, support for high-mass motherboard components, and a scalable board to accommodate several system sizes. BTX was developed to offer advantages like PCI Express, ATA, and USB 2.0. Furthermore, it uses in-line airflow and allows to switch the places of memory slots and expansion slots. Its main components, such as chipset, graphics controller, and processor, use the same airflow, which decrease the required fans in the system; that's why unnecessary noise reduces. The industry considers the ATX form factor in terms of standard, although legacy AT systems are mainly still used today. The BTX form factor is incompatible with the design of ATX. Thus, it is not a standard for the industry.
4. **DTX:** In telecommunications, it stands for **discontinuous transmission**. It is a method that is used to improve the efficiency of two-way wireless voice communication. In the computer, it is a form factor for motherboards, which is a variation of ATX specification. It was designed for small form factor computers such as home theater PCs with dimensions of  $8 \times 9.6$  inches. It is an open standard declared by AMD and is lower compatible with ATX form factor cases. Furthermore, the Mini-DTX, a smaller version, was also developed that had 8.0-inches by 6.7-inches dimensions. It uses fewer layers of printed circuit board wiring through which it offers a lower cost of manufacturing.
5. **LPX (Low Profile eXtension):** The size of an LPX motherboard is 9" wide and 13" deep. As compared to other motherboards, it has several placements of the video, serial, parallel, and PS/2 ports. It is known as low profile as it contains a big slot for a riser card that gives the permission to the expansion cards to be installed parallel to the motherboard. The computers using low profile motherboards are much slimmer as compared to use a Baby-AT motherboard computer.
6. **microATX:** It is a smaller motherboard that is designed by following the ATX form factor, having the same benefits. But it improved the overall design cost by reducing the physical size of the motherboard. Intel developed the first mATX motherboard. The size of mATX is 9.6" wide x 9.6" deep, which can be reduced to size as 6.75" wide x 6.75" deep. It provides more I/O space at the rear, and with the help of integrated Input/Output, connectors help to reduce the emissions.

7. **NLX:** It is based on the boards, stands for **New Low Profile Extended**. These motherboards can be removed easily, and it was developed to replace the nonstandard LPX design. The size of the NLX motherboard is 9" wide x 13.6" deep maximum to 8" x 10" deep minimum. It includes various features such as provide support for AGP, DIMM, USB, Pentium II, larger memory modules, lower cases, and can reduce cable length. Additionally, it is an actual standard (unlike NLX form factor) that has more component options for repairing and upgrading.

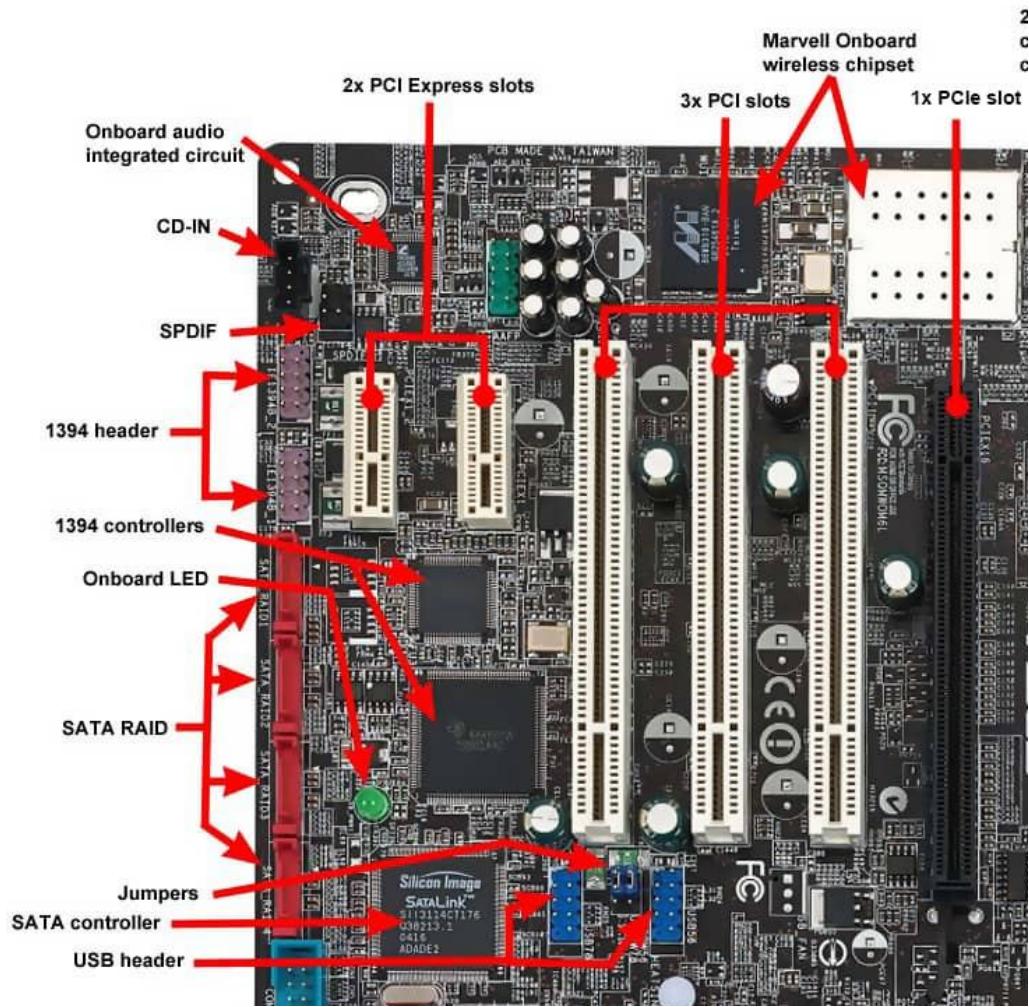
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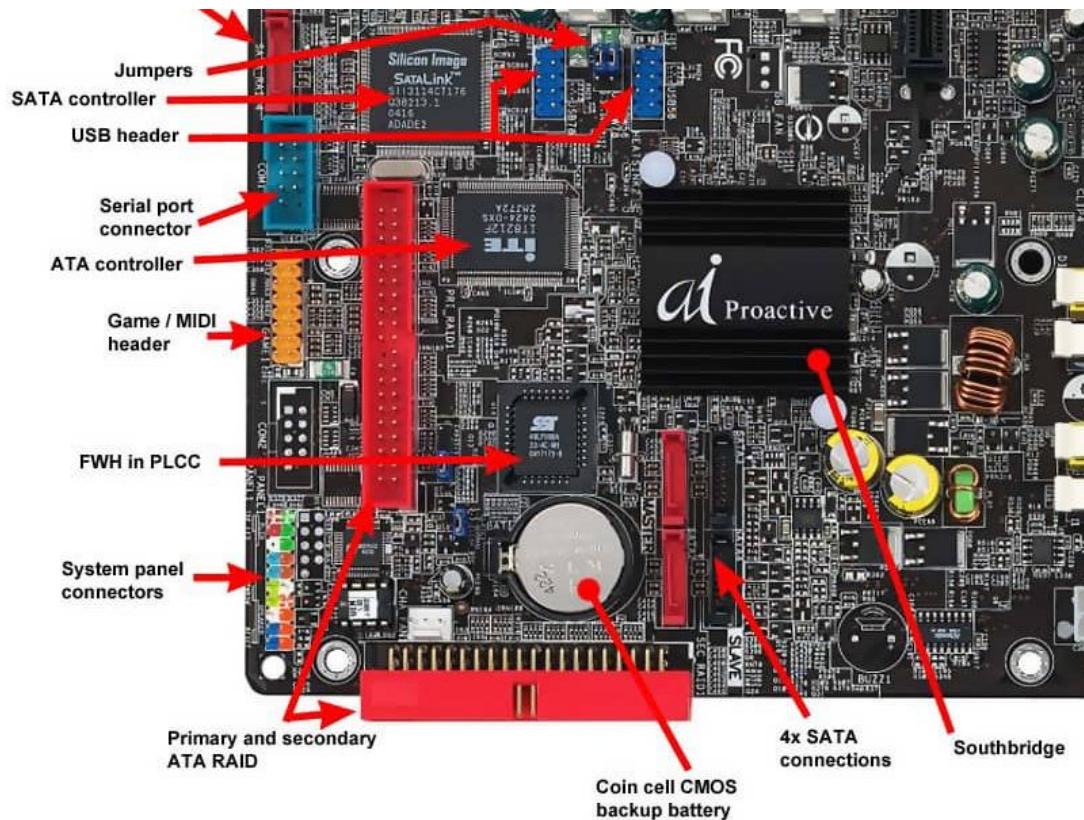
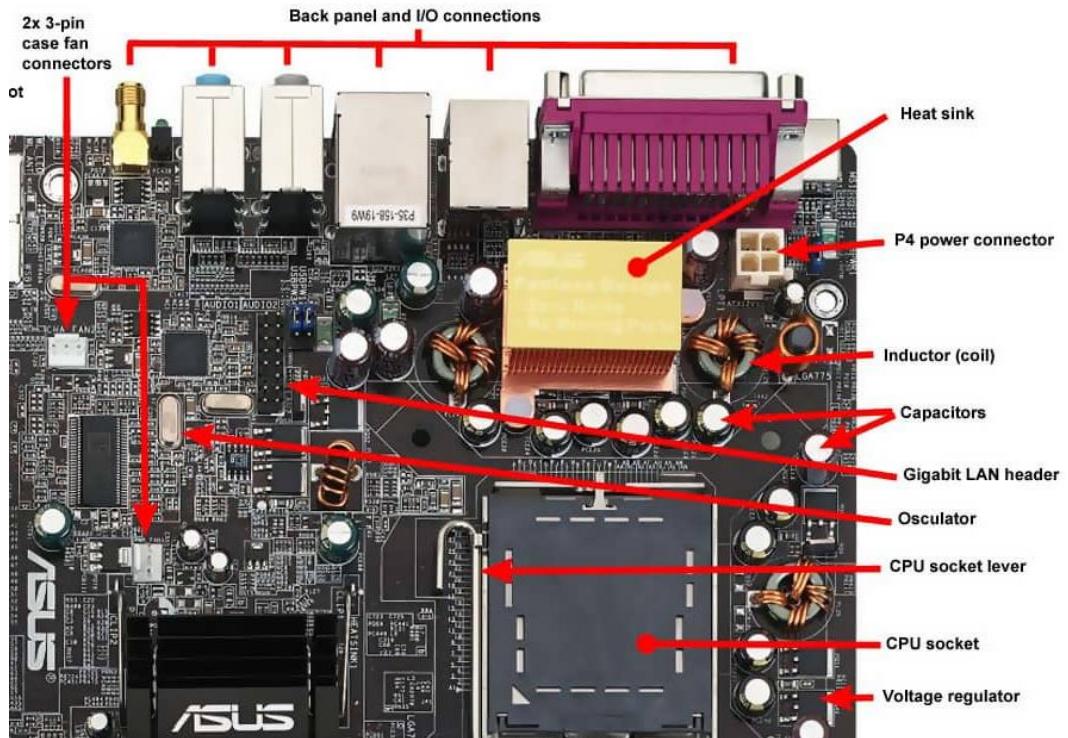
### **Mother Board Example: ASUS P5AD2-E motherboard LGA 775 (Socket T) ATX**

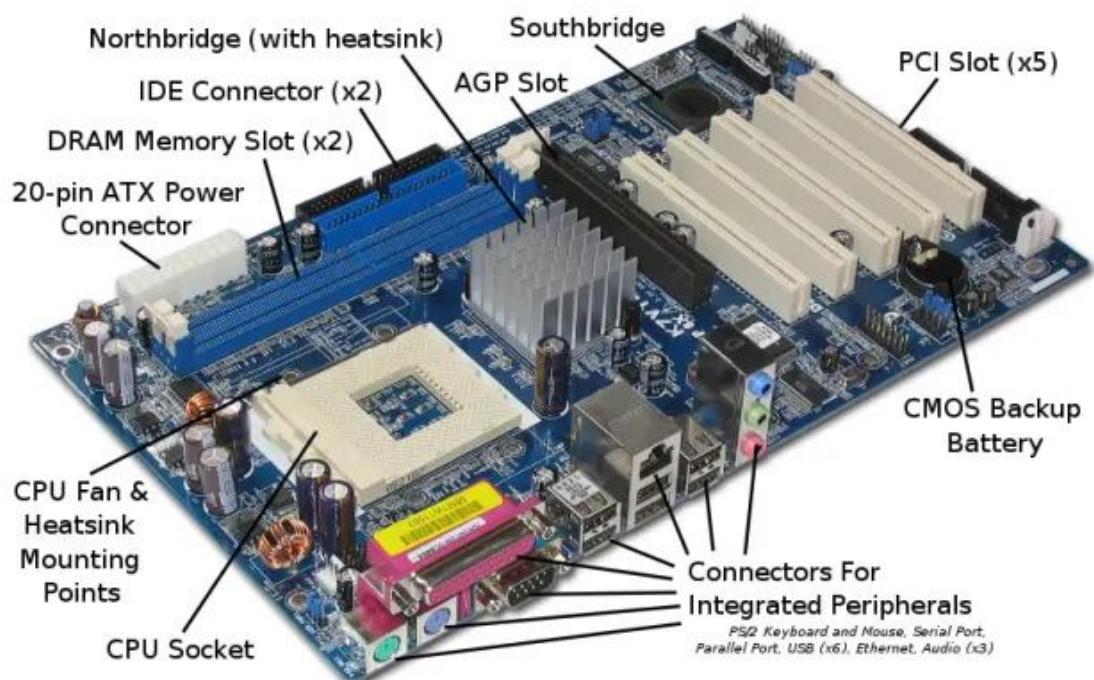
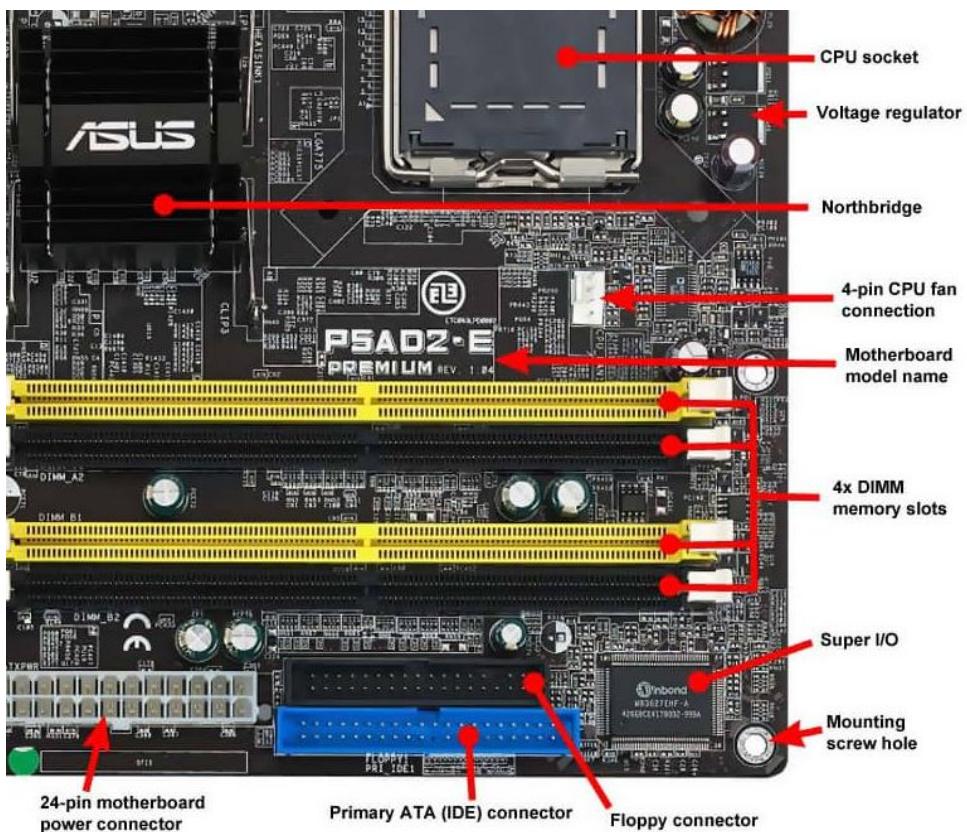
<b>Processor</b>	
Processor manufacturer *	Intel
Processor socket *	LGA 775 (Socket T)
<b>Memory</b>	
Number of memory slots *	4
Maximum internal memory *	4 GB
<b>Internal I/O</b>	
USB 2.0 connectors *	4
Number of SATA connectors	4
Number of Parallel ATA connectors	1
S/PDIF out connector	✓
Front panel audio connector	✓
CD/AUX audio in	✓
ATX Power connector (24-pin)	✓
CPU fan connector	✓
Number of chassis fan connectors	2
Chassis intrusion connector	✓
Number of COM connectors	1
<b>Rear panel I/O ports</b>	
USB 2.0 ports quantity *	4

<b>Rear panel I/O ports</b>	
Ethernet LAN (RJ-45) ports *	2
PS/2 ports quantity	2
Headphone outputs	1
Microphone in	✓
S/PDIF out port	✓
Parallel ports quantity	1
Serial ports quantity	1
<b>Network</b>	
Networking features	Marvell PCIe 88E8053 Gigabit LAN

<b>Features</b>	
Motherboard form factor *	ATX
Power source type	ATX
<b>Expansion slots</b>	
Expansion slots	1 x PCI Express x16 2 x PCI Express x1 3 x PCI
<b>Weight &amp; dimensions</b>	
Width	305 mm
Depth	245 mm
<b>Other features</b>	
Audio output	C-Media High Definition Audio 8-ch CODEC
GAME/MIDI connector	✓







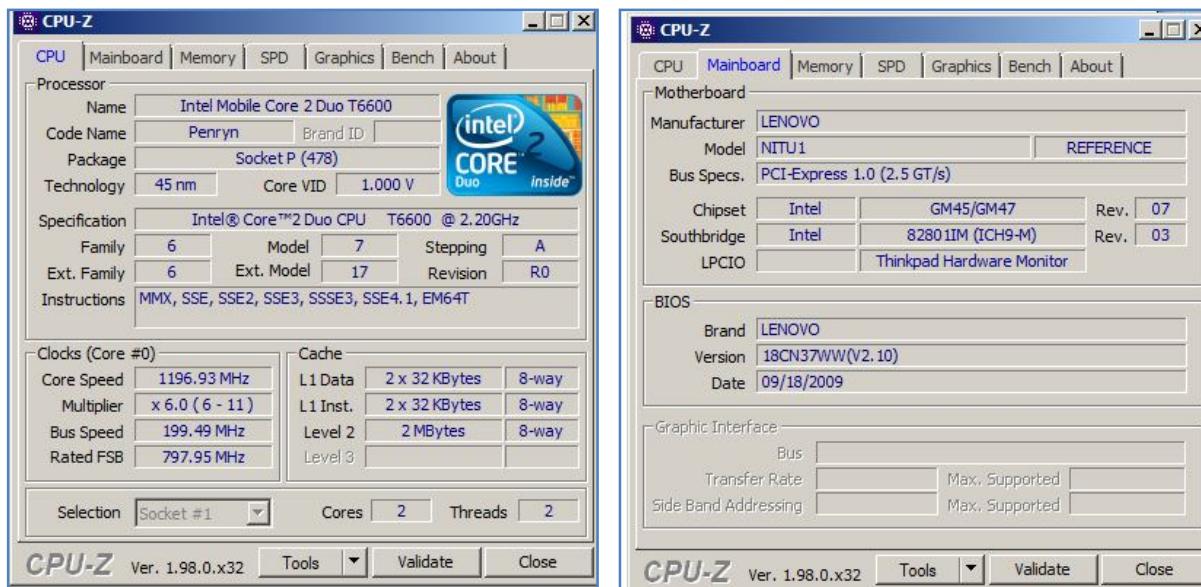
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## CPUID CPU-Z Tool

The CPU-Z utility displays detailed information about the memory modules installed in a computer using a feature called Serial Presence Detect. The "SPD" tab in CPU-Z displays this information, helping you learn more about the computer's configuration and confirm that memory module makes and models are as expected.

### Information Displayed in CPU-Z

- Size, Maximum Speed, Manufacturer, Model Number and Production Date of each memory module in the computer.
- CPU-Z detects whether a module is Registered, Buffered or Error-Correcting.
- CPU-Z displays the Latency Timings that a memory module is compatible with at all supported speeds.
- CPU-Z displays an overview of the Hardware Installed in a computer.
- CPU-Z displays the Brand, Model and Speed of the Processor, the Manufacturer, Model and Chipset of the Motherboard and the Manufacturer and Model of the Video Adapter.
- With CPU-Z Computer System Report can be Generated and Saved.



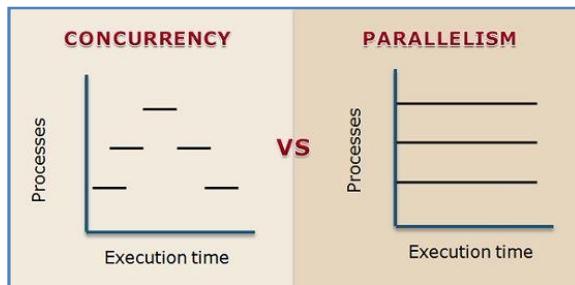
Output Observed in CPU-Z Tool for CPU	
<b>Processor Name and Specification</b>	
<b>Core Speed and BUS Speed</b>	
<b>Number of Cores</b>	
<b>Number of Threads each Core Supports</b>	
<b>Bus Speed</b>	
<b>Cache L1 Data Size</b>	
<b>Cache L1 Inst. Size</b>	
<b>Level-2 Cache Size</b>	
<b>RAM Connection Slot</b>	
<b>GPU Chipset Manufacturer</b>	
<b>Clock Speeds of Cores and Memory</b>	
<b>Type of RAM and Its Size</b>	
<b>BIOS/UEFI Brand Name and Manufacturer</b>	
<b>Instructions the Processor Supports</b>	

<b>South Bridge</b>	
<b>Chipset with Rev.</b>	
<b>North Bridge</b>	
<b>Chipset with Rev.</b>	

==== \* ====

### Few Terms Found in CPU-Z Report:

- **Concurrency or Single Core:** In Operating Systems, concurrency is defined as the ability of a system to run two or more programs in overlapping time phases.
- **Parallel Execution or (Multi-Core):** In parallel execution, the tasks to be performed by a process are broken down into sub-parts, and multiple CPUs (or multiple cores) process each sub-task at precisely the same time.



- **Thread:** A thread is a unit of execution on concurrent programming. Multithreading is a technique which allows a CPU to execute many tasks of one process at the same time.
- **CPU Core:**
  - A CPU core is the part of something central to its existence or character. In the same way in the computer system, the CPU is also referred to as the core.
  - The number of threads you have depends on the number of cores in your CPU. Each CPU core can have two threads. So a processor with two cores will have four threads. A processor with eight cores will have 16 threads.
- **MMX:** The MMX instructions enable **x86 processors to perform single-instruction**, multiple-data(SIMD) operations on packed byte, word, doubleword, or quadword integer operands contained in memory, in MMX registers, or in general-purpose registers.
- **Streaming SIMD Extensions (SSE):** Older processors only process a single data element per instruction. SSE enables the **instruction to handle multiple data elements**.
- **A Cache** is a reserved storage location that collects temporary data to help websites, browsers, and apps load faster.

- Recently used Instructions or upcoming instructions will be made available in **Instruction Cache**
- Recently used Data or upcoming data will be made available in **Data Cache**
- **VID/FID** – Voltage Identification / Frequency Identification
- The **Unified Extensible Firmware Interface (UEFI)** is a publicly available specification that defines a software interface between an operating system and platform firmware.
- The **RAS to CAS** delay determines the time between memory accessing RAS (Row Address Strobe) and CAS (Column Address Strobe). The lower the number, the better.
- **Serial Presence Detect (SPD)** is a standardized way to automatically access information about a memory module.
- **EHCI PCI:** The **Enhanced Host Controller Interface (EHCI)** is a register-level interface that enables a host controller for USB or FireWire hardware to communicate with a host controller driver in software.
- **eXtensible Host Controller Interface (xHCI)** is a computer interface specification that defines a register-level description of a host controller for Universal Serial Bus (USB), which is capable of interfacing with USB 1.x, 2.0, and 3.x compatible devices.
- **Universal Host Controller Interface (UHCI)** was created by Intel as an implementation of the USB 1.0 host controller interface. The UHCI specification defines a set of I/O mapped registers that allow communication between the controller and the operating system.
- **High Definition Audio (HDA):** *High Definition Audio* Specification includes architecture, register and electrical interface, programming model, link protocol, and codec features.
- The **DMI (Desktop Management Interface)** is **an abstraction layer provided by your system management BIOS** that provides information about your computer's hardware to your operating system.
- **Desktop Management Interface (DMI)** is an industry framework for managing and keeping track of hardware and software components in a system of personal computers from a central location.

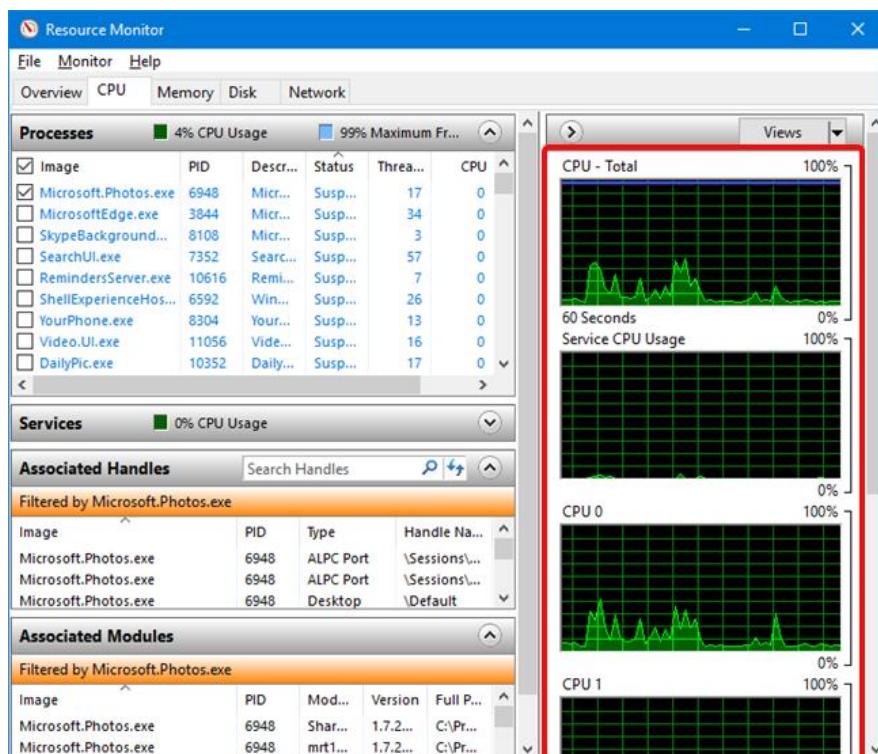
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### Windows Resource Monitor:

- When Windows slows down or freezes, we usually turn to the Task Manager to figure out what is going on. If you need a better understanding of the way Windows and its apps use the resources of your computer, **Resource Monitor** (resmon.exe) is the right tool for the task.
- The information is concise and real-time with graphs and grouping by resources.
- You can monitor the use of the CPU, memory, disk, and network. This tutorial shows what you need to know about Resource Monitor and how to use it:

### How to Start the Resource Monitor in Windows

- An easy way to start Resource Monitor that works in all Windows versions is to search for the name of its executable file **resmon** or for Resource Monitor, and click or tap the search result with the same name.



- Go to CPU and Identify Different Running Processes names for the applications opened:
  - Open applications like Notepad, Ms Paint, Word Pad, Calculator etc. and identify respective process names like Notepad.exe, mspaint.exe, wordpad.exe, calc.exe, explorer.exe
  - Identify CPU usage Percentage.

- Right Click on above processes for **Terminating/Suspending** Processes.
- Identify at least **Five** available Services either Running or Stopped.
  - **Dhcp** – will provide service like dynamically assigning IP address to Client
  - **Eventlog** – will provide service like will record all the events taken place in system after it uptime since OS installation.
  - **PlugPlay** – will provide service like tries to detects external devices automatically as and when connected to external ports of computer.
  - **WSearch** – will provide services like, helps in searching files/contents/folders in disk.
  - **Simptcp** – will provide services required of the network/internet connection, ie. provides TCP/IP Services.
- Right Click on above Services for **Stopping/Restarting/Starting** Services.
- Identify CPU usage Percentage
- Go to the **Memory Tab:**
  - Identify Memory usage Percentage
  - Identify Memory used for any process which is currently running.
  - Identify Total Size of the Installed Memory, Hardware Reserved Memory, Physical Memory in use, Available Memory, Cached Memory Sizes.
- Go to the **Disk Tab:**
  - Identify Disk Input / Output Activity in terms of Kilo Bytes / Sec
- Go to the **Network Tab:**
  - Observe Network activity (if Connected to Internet)
  - Observe Local area Network Message exchange activity (if connected Wireless/Wired Network, by disabling or Enabling the Network Connections.)

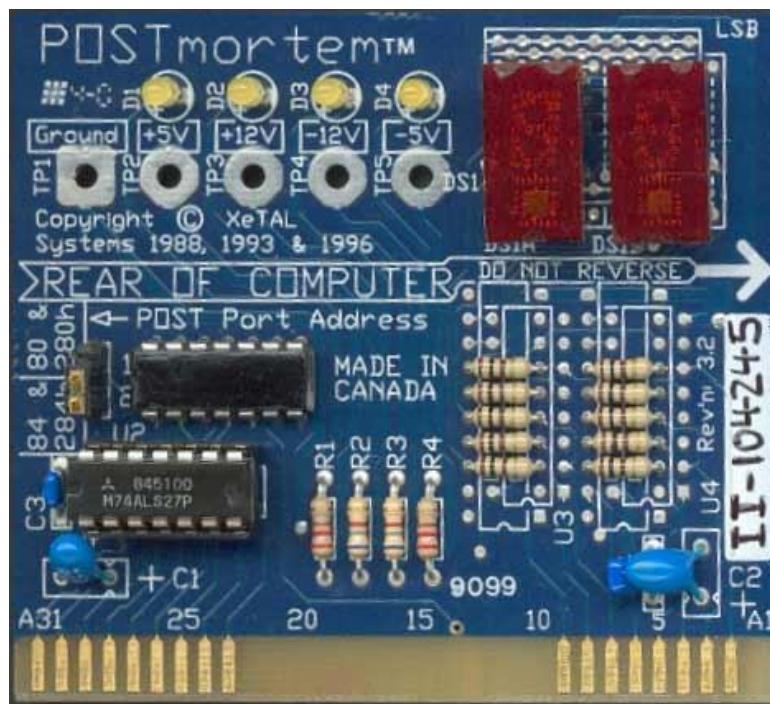
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### Identify System Faults using POST Diagnostics Card.

- Whenever you power on your computer, the ROM BIOS runs a diagnostic test of the hardware, called the Power On Self Test (POST).
- Each stage of testing generates a two-digit hex code. By tracking these codes, you can view a progress report of the boot-up process and diagnose computer problems.
- By monitoring POST codes using a POST diagnostic card, which plugs into a machine's ISA or PCI port, one can troubleshoot a computer right on the bench, without needing to hook up a monitor, keyboard, or even a disk drive.
- These cards allow you to make quick work of fixing components and avoid the usual time-consuming method of swapping them out one at a time and retesting.

### POST Codes verses BIOS beep codes

- Beep codes use audible signals to alert users to computer problems—an especially useful feature if a hardware failure occurs before the video card is initialized.
- While some sets of beep codes, such as those generated by the latest Phoenix BIOSs, can provide extensive troubleshooting information, others are less revealing.
- There may be only 10 beep codes—a tiny subset of the up to 255 two-digit POST codes that can be displayed right on a POST diagnostic card, via digital readouts (**Figure A**).



- This POST diagnostic card, called POSTmortem, plugs into an ISA port. In addition to digital readouts, the POSTmortem also includes four LEDs to diagnose power-supply voltage problems.

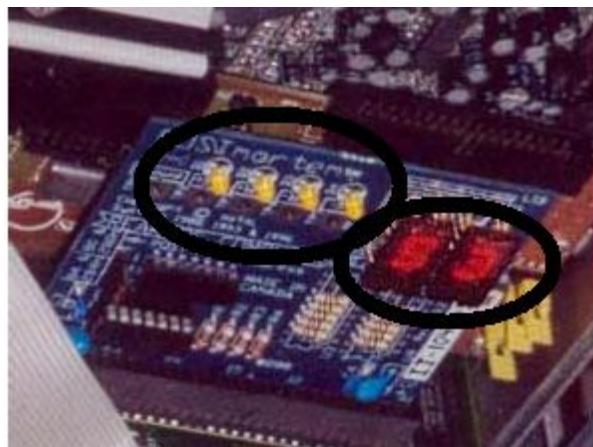
### **POST card quick facts**

- POST codes are most often sent to port 80h (although some manufacturers use different ports, Compaq, for example, uses port 84h.) POST cards either automatically detect the port or contain jumpers for setting it manually.
- In addition to providing digital readouts of POST codes, these cards typically include LEDs for troubleshooting power-supply voltages. For example, the POSTmortem ISA card pictured above contains four LEDs for testing +5V, +12V, -12V, and -5V power supplies, as well as five contacts for testing these voltages with a probe.
- For a more complete troubleshooting solution, get an ISA card if possible. (Your motherboard will likely have an ISA legacy port.)
- Sometimes PCI ports do not show all the available codes, for two reasons.
  - 1. ISA busses are initialized before PCIs—the PCI bus will only receive the codes that are generated after it is initialized.
  - 2. ISA busses connect to the South Bridge chip; motherboards with damaged North Bridge chips may not be able to send codes to the PCI bus at all.
- Before using a POST diagnostic card, you'll need a code manual.

### **POST Card Usage**

- As simple as POST cards are to use, they do require some care. Not all models, the POSTmortem included, have protection circuits built in. Therefore, be careful not to install these cards in reverse or upside down. Doing so could burn out the card. A marker shows which way to orient the card. After you plug in the card, power up the machine and follow the progress of the POST test.
- The code you'll see is sent to the card just prior to the start of each test.
- In above Figure, the code displayed (53) indicates the start of a video display ROM test. The four lit LEDs indicate normal power from the power supply.
- Should the computer fail during the POST, the failing test number will be the last one displayed. Consider the failed test as only a possible indicator of the real problem at

hand—another component may, in fact, be the culprit. For example, a failed memory test could indicate a badly seated chip or a motherboard problem.



### POST Codes:

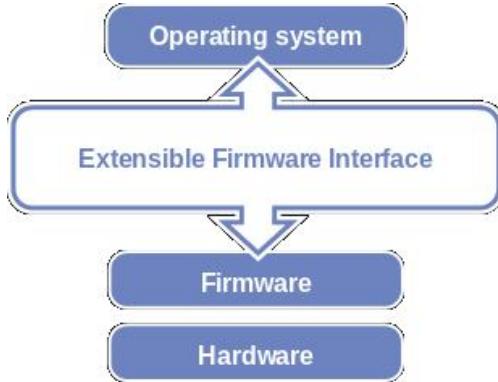
Code	Description
E6h	Enabling floppy drive controller, timer IRQs and internal cache memory
Edh	Initializing floppy drive
Efh	Read error—floppy drive in A:
07h	Initializing CPU
08h	Calculating CMOS checksum
14h	Timer test
30h	Display memory read/write test passed
49h	Verified memory below 1MB
4Eh	Running memory test
50h	Memory below 1MB passed test, initialized

Code	Description
62h	DMA page register test passed
80h	Start keyboard test
81h	Keyboard reset error or stuck key
82h	Keyboard controller test passed
84h	Checking for memory size mismatch
85h	Memory test passed
8Dh	Resetting hard disk controller
8Fh	Passed; configuring floppy disk controller
9Dh	Coprocessor initialized
Abh	Performing DMI POST test

Table: AMIBIOS POST codes (Sample Selection)

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## Unified Extensible Firmware Interface (UEFI)



- The **Unified Extensible Firmware Interface (UEFI)** is a publicly available specification that defines a software interface between an operating system and platform firmware.
- UEFI replaces the legacy Basic Input/Output System (BIOS) firmware interface originally present in all IBM PC-compatible personal computers, with most UEFI firmware implementations providing support for legacy BIOS services.
- UEFI can support remote diagnostics and repair of computers, even with no operating system installed.
- Intel developed the original **Extensible Firmware Interface (EFI)** specifications. Some of the EFI's practices and data formats mirror those of Microsoft Windows.
- The Unified EFI Forum is the industry body that manages the UEFI specifications throughout.

### EFI Services:

EFI defines two types of services: *boot services* and *runtime services*.

- **Boot services** are available only while the firmware owns the platform (i.e., before the ExitBootServices() call), and they include text and graphical consoles on various devices, and bus, block and file services.
- **Runtime services** are still accessible while the operating system is running; they include services such as date, time and NVRAM access.

### UEFI booting

- Unlike the legacy PC BIOS, UEFI does not rely on boot sectors, defining instead a boot manager as part of the UEFI specification.

- When a computer is powered on, the boot manager checks the boot configuration and based on its settings, then executes the specified OS boot loader or operating system kernel (usually boot loader).
- The boot configuration is defined by variables stored in NVRAM, including variables that indicate the file system paths to OS loaders or OS kernels.
- OS boot loaders can be automatically detected by UEFI, which enables easy booting from removable devices such as USB flash drives.

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### **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.

==== \* ===

### **Basic Functions of BIOS:**

BIOS's functionality can be broken down into four key responsibilities.

## **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.

## **3. Bootstrap loader**

- The program that lives within your computer's EPROM or ROM, the bootstrap loader is tasked with reading your PC's hard drive boot sector to move along the complete operating system load.
- When you restart your PC, the bootstrap loader activates the POST, then loads Windows-10 into memory.
- Newer PCs have replaced the bootstrap loader with an EFI, or Extensible Firmware Interface.

## **4. BIOS drivers**

- BIOS drivers are the many programs stored in your computer's many memory chips.
- These low-level drivers are used to boot your system and prompt basic operational controls on your PC.

### **Working with Settings:**

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

- Change System Password.

==== \* ===

### When to replace CMOS battery?

- Computer is losing its time or date settings.
- An error or alert message, like the following, is displayed when the computer boots.
- **CMOS Read Error**
- **CMOS Checksum Error**
- **CMOS Battery Failure**
- **System battery voltage is low**



### Steps:

#### Locate CMOS battery

- Open the computer case and find the battery on the motherboard.
- Verify it is accessible and can be removed. Today, most computers use a coin cell CMOS battery (like the CR2032 battery shown in the picture).

#### Note:

- Some CMOS batteries may be held down by a metal clip or bar. The battery can be removed by sliding it out from under the clip. Do not bend this clip to get the battery out, as a bent clip can result in the new battery not staying in the socket.
- With some computers, you may need to disconnect cables, remove drives, or remove other parts of the computer to get full access to the CMOS battery.

#### Obtain battery information

- Once the battery is located, it is recommended writing down its specifications (voltage, chemistry, wiring). If possible, remove the battery and take it to a retail location.

## Removing the battery

- If a computer uses a coin cell battery, removing the battery is relatively simple. Use fingers to grab the edge of the battery and pull it up and out of the socket holding it in place.
  - Some motherboards have a clip holding the battery down. If computer's motherboard has this clip, it is necessary to use one hand to move the clip up and the other hand to pull the battery out.
  - Unfortunately, not all CMOS batteries are removable. Some manufacturers only allow a replacement battery to be added.
  - If computer's motherboard does not have a removable battery, you need to set a jumper on the motherboard to install the new battery.

## Insert the new battery

- After purchasing a new battery, remove the old battery and replace it with the new battery.
  - Some computers may not have a removable battery, for these computers insert the new battery into the secondary battery socket on the motherboard.

## Enter CMOS values

- Once the battery has been replaced, turn on the computer and reset the CMOS values to the defaults.
- After the values have all been entered, make sure to save the settings before exiting. Many CMOS setups allow you to press a key, such as F10, to save values and exit with one action.

## Bad hardware

- If you continue to receive the error after following all the steps above, this is a sign of a more serious issue. The most likely causes are a bad power supply or bad motherboard.

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**Nonvolatile BIOS memory** refers to a small memory on PC motherboards that is used to store BIOS settings.

- It is traditionally called **CMOS** RAM because it uses a volatile, low-power complementary metal-oxide-semiconductor (CMOS) SRAM powered by a small "CMOS" battery when system and standby power is off.

- It is referred to as non-volatile memory or NVRAM because, after the system loses power, it does retain state by virtue of the CMOS battery.
- The typical NVRAM capacity is 256 bytes.
- The CMOS RAM and the real-time clock have been integrated as a part of the southbridge chipset and it may not be a standalone chip on modern motherboards.
- In turn, the southbridge have been integrated into a single Platform Controller Hub

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### CMOS battery



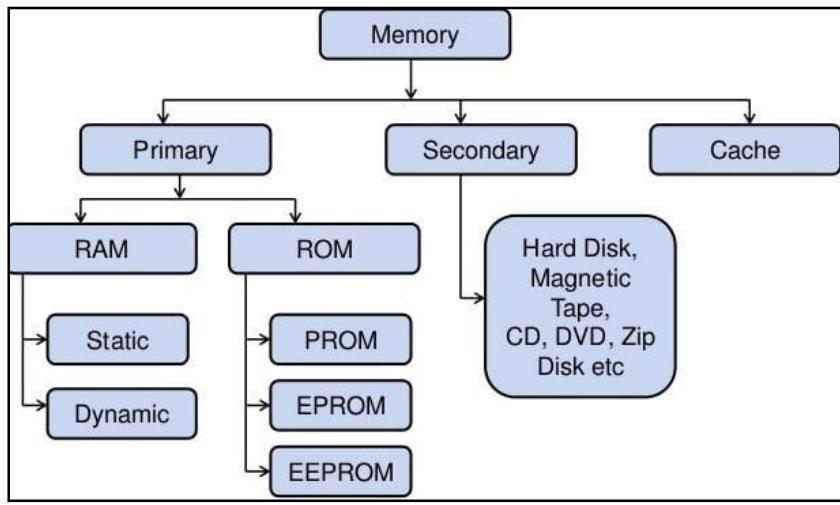
- Type CR2032 button cell, the most common CMOS battery.
- The memory battery (CMOS, real-time clock (RTC), clock battery) is generally a CR2032 lithium coin cell.
- This cell battery has an estimated life of 3 years when power supply unit (PSU) is unplugged or when the PSU power switch is turned off. This battery type, unlike the Lithium-ion battery, is not rechargeable and trying to do so may result in an explosion.
- Motherboards have circuitry preventing batteries from being charged and discharged when a motherboard is powered on. Other common battery cell types can last significantly longer or shorter periods, such as the smaller CR2016 which will generally last about 40% less time than CR2032.
- Higher temperatures and longer power-off time will shorten battery cell life. When replacing the battery cell, the system time and CMOS BIOS settings may revert to default values.

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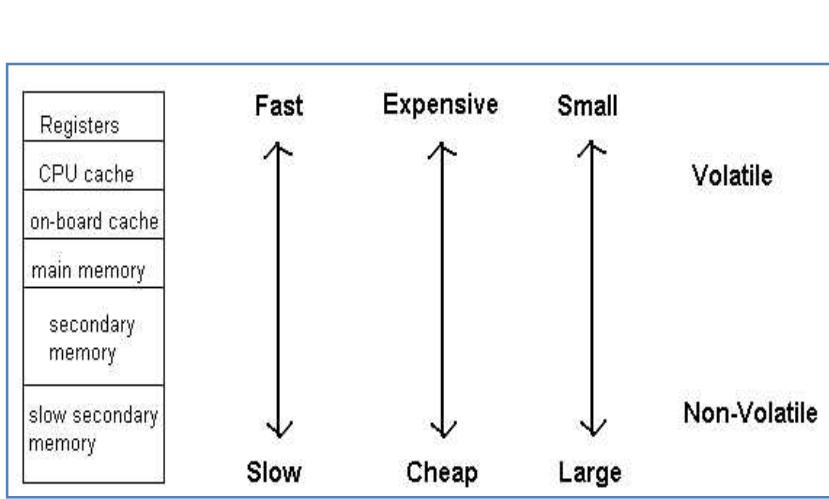
## Memory

**Computer memory** is any physical device capable of storing information temporarily like RAM (random access memory), or permanently, like ROM (read-only memory). Memory devices utilize integrated circuits and are used by operating systems, software, and hardware.

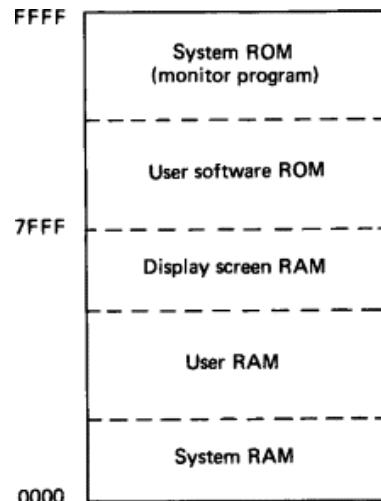
### Types of Memory



==== \* ===



Comparison and Hierarchy of Memory



Memory Locations

### Memory Units

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

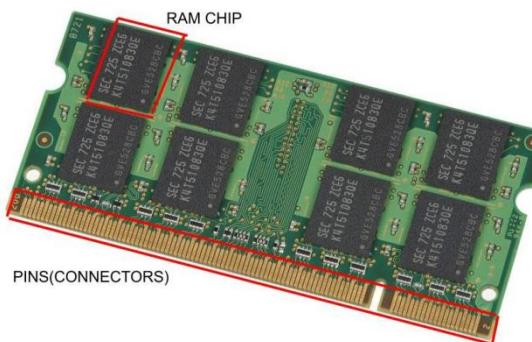
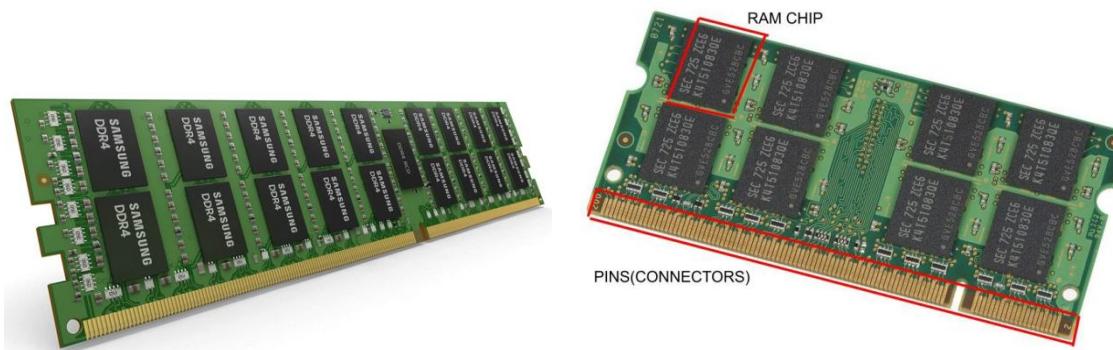
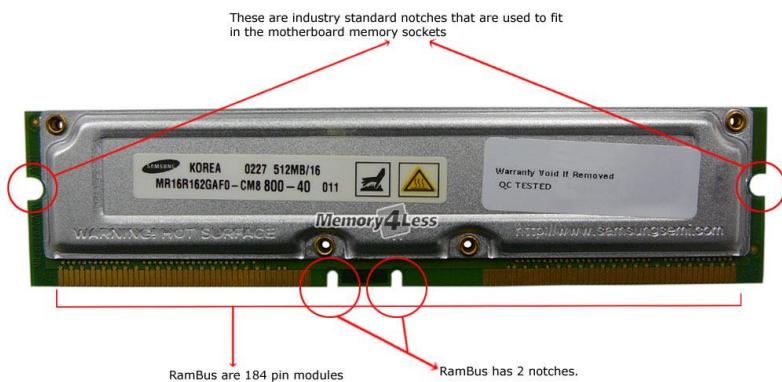
- **Bit:** The computer memory units start from bit. A bit is the smallest memory unit to measure data stored in main memory and storage devices. A bit can have only one binary value out of 0 and 1.
- **Byte:** It is the fundamental unit to measure data. It contains 8 bits or is equal to 8 bits. Thus a byte can represent  $2^8$  or 256 values.
- **Kilobyte:** A kilobyte contains 1024 bytes.
- **Megabyte:** A megabyte contains 1024 kilobytes.
- **Gigabyte:** A gigabyte contains 1024 megabytes.
- **Terabyte:** A terabyte contains 1024 gigabytes.
- **Peta Byte:** A Petabyte contains 1024 Terabytes
- **Exa Byte:** A Exabyte contains 1024 Petabytes
- **Zetta Byte:** A Zettabyte contains 1024 Exabytes
- **Yotta Byte:** A Yottabyte contains 1024 Zettabytes

==== \* ===

### Difference between SIMM and DIMM

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.

S.NO	SIMM	DIMM
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.



==== \* ===

### How to Install RAM:



- Make sure to use a static-free work area when beginning any component change in your computer, and make sure the computer is unplugged.
- Clear away any paper, tape, and electrical devices (including your smartphone) from the area.
- Always touch the metal chassis of your computer to ground yourself and draw away any static electricity

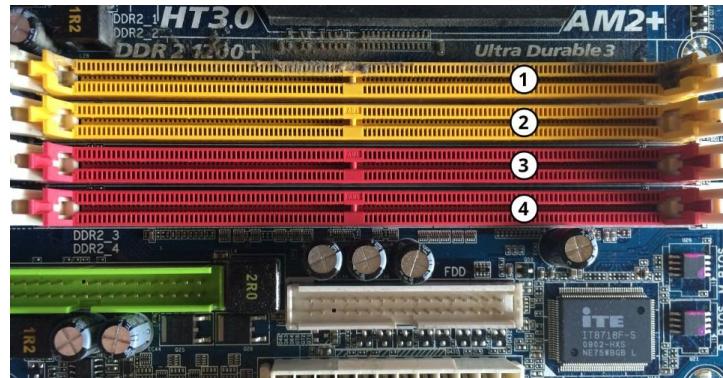


The RAM slots, at the right, are red and yellow.

Find out how much memory your computer can handle, and how much you want to add.

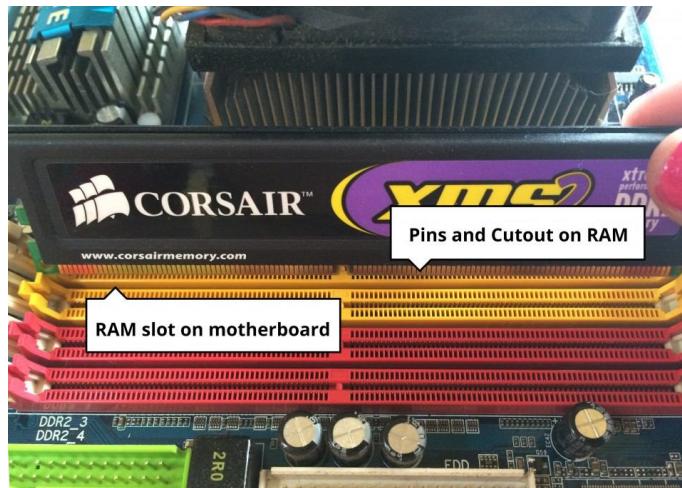
- Step 1: right-click on My Computer (or go to Control Panel > System and Security and under System, click on View Amount of RAM and processor speed))
- Step 2: use some Tool that will scan your system and return a report that tells you how much RAM your system can take, how much RAM you currently have, how many slots

you have—both available and occupied—and even suggest which RAM to buy to upgrade.

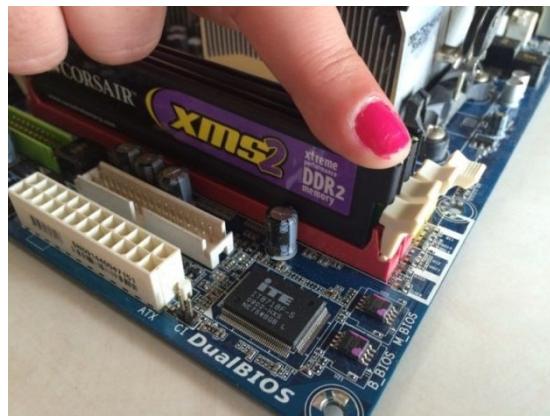


There are four RAM slots here.

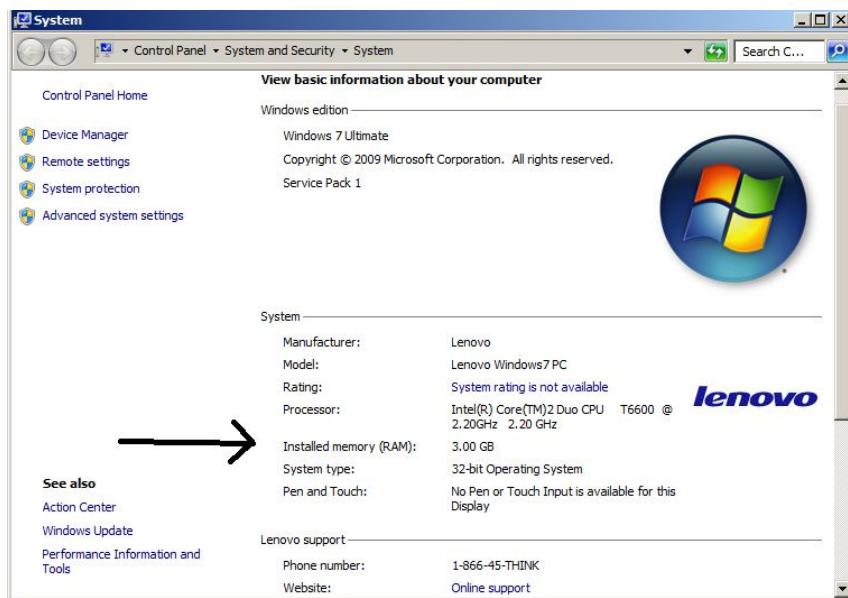
- If using unbalanced RAM (a 2GB and a 4GB module, for instance) pair up RAM in slots 1 and 3 or 2 and 4. If there is old RAM here and you are going to use it, pair the new RAM correctly. Try not to put three modules in a 4 module slot. It will be less effective
- Unhinge the clips (on some motherboards, there is one clip, on others there are two—one on each end). Unseat the old RAM by pulling on each end, wiggling it up and down just a bit. Do not wiggle it from side to side.



Make sure that the pins and cutout on the RAM match the slot before placing the new RAM (if you purchased it according to the steps above, they should match). Never force a RAM module into a slot that doesn't match the notch on the module.



Make sure the RAM is seated securely; it takes a slight amount of force. If positioned properly, it usually snaps the retaining hinge into place. Unseated RAM is the major cause of the RAM not being recognized by the computer OS.



Plug the computer back in and start it up. On Windows 7 computers, click on the Windows tab, and right-click on My Computer (or go to Control Panel > System and Security > and under System, click on View Amount of RAM and processor speed), on Windows 8.1, right-click on the Windows tab, click System. Your new RAM should be seen immediately.

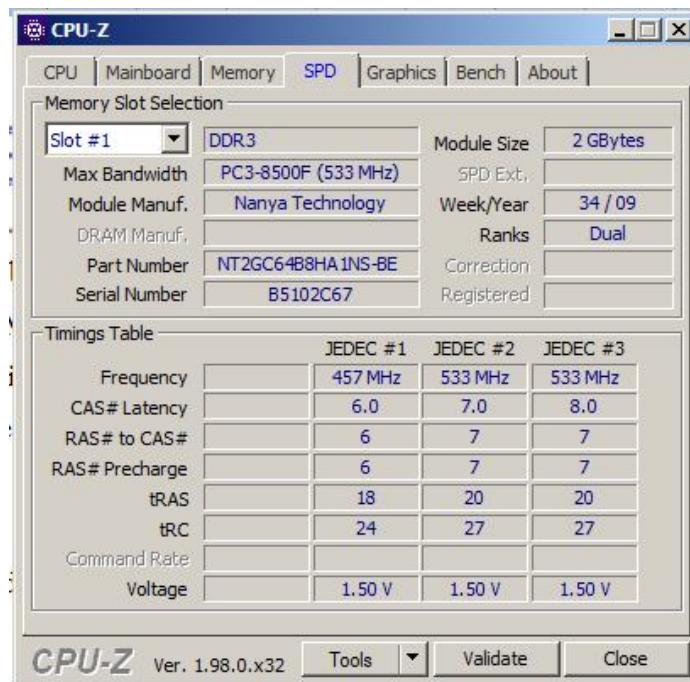
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### Serial Presence Detect (SPD)

Serial presence detect (SPD) is information stored on an EEPROM chip when a computer is booted. It is located on an SDRAM memory module and communicates to the BIOS the module size, data width, speed and voltage, which are used to configure the module memory controller for maximum reliability and performance.

The manufacturer of the memory module will put the SPD information on the EEPROM chip. When a computer is turned on, if the BIOS is not provided with SPD, it will assume the memory module information, which presents no problem to some memory modules.

Parallel presence detect (PPD) data was used in earlier 72-pin SIMMs. However, the standard changed to SPD with the later model 168-pin DIMM. SPD encodes much more information.



**Output Observed in CPU-Z Tool for Memory Module (MM)**

<b>Maximum Bandwidth of MM</b>	
<b>Manufacturer of MM</b>	
<b>Size of the MM</b>	
<b>Slot Number of MM</b>	

<b>Clock Speeds of Cores and Memory</b>			
<b>CAS Latency</b>		<b>tRAS</b>	
<b>RAS to CAS (tRCD)</b>		<b>tRC</b>	
<b>Voltages</b>			

- **Column Address Strobe (CAS) latency**, or CL, is the delay in clock cycles between the READ command and the moment data is available.
- **tRP (RAS Precharge):**
  - tRP refers to the **length of time between disabling access to one line and initiating access to another line**. The Precharge command is issued once data is collected from a given row. It closes the row that was used and allows for a new one to be activated.
- **RAS to CAS Delay (tRCD):**
  - tRCD is the number of clock cycles it takes to open a row and access a column.
- **Row Active Time (tRAS):**
  - “The minimum number of clock cycles required between a row active command and issuing the precharge command.
- **tRC - Row Cycle Time**
  - The minimum time interval between successive ACTIVE commands to the same bank is defined by tRC.

**Note:**

- Every stick of RAM contains information baked into EEPROM (Electrically Erasable Programmable Read Only Memory), including some safe timing/frequency profiles-- these can be viewed in the [SPD](#) tab of CPU-Z under the JEDEC header.
- The [JEDEC](#) (Joint Electron Device Engineering Council) Solid State Technology Association is an organization that publishes standards for DDR4, DDR5, SSDs, mobile memory, ESD, GDDR6, and more. They are responsible for standardizing and defining everything from abbreviations to the entire concept of DDR4.

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## Installation: Windows 10

**1. Check your device meets the Windows 10 system requirements.** The minimum specs needed to run Windows 10, so check your device is capable:

**CPU:** 1GHz or faster processor

**RAM:** 1GB for Windows 10 32-bit or 2GB for Windows 10 64-bit

**Storage:** 32GB of space or more

**GPU:** DirectX 9 compatible or later with WDDM 1.0 driver

**Display:** 800x600 resolution or higher

**2. Create USB installation media.** Visit Microsoft's Windows 10 download page and select “**Download tool now**” under the “create Windows 10 installation media” section. Transfer the downloaded installer tool to a USB drive.

**3. Run the installer tool.** Open the installer tool by clicking on it. Accept Microsoft’s terms, and then select “**Create installation media for another PC**” on the “**What do you want to do?**” page. After **selecting** which language you want Windows 10 to run in, and **which edition** you want as well (**32-bit or 62-bit**), you’ll be asked what type of media you want to use.

*Installing from a USB drive is definitely the preferred option but you can also install from a CD or ISO file.* Once you choose your device, the installer tool will download the required files and put them onto your drive.

**4. Use your installation media.** Insert your installation media into your device and then **access the computer’s BIOS or UEFI**. These are the systems that allow you to control your computer’s core hardware.

The process of accessing these systems is unique to each device, but the manufacturer’s website should be able to give you a helping hand here. Generally, you'll need to **press the F2, F12 or Delete keys** as your computer boots up.

**5. Change your computer's boot order.** Once you have access to your computer’s BIOS/UEFI you’ll need to locate the settings for boot order. You need the Windows 10 installation tool to be higher up on the list than the device’s current current boot drive: this is the SSD or HDD that your existing OS is stored on. You should **move the drive with the installer files to the very top of the boot order menu**. Now, when you restart your device the Windows 10 installer should load up first.

**6. Restart your device.** Save your settings in the BIOS/UEFI and reboot your device.

**7. Complete the installation.** Your device should now load up the Windows 10 installation tool on restart. This will guide you through the rest of the installation process.

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### **Installation - Upgrading to Windows 10: Upgrading from an older version of Windows**

If you're upgrading to Windows 10 from Windows 7 or Windows 8, the process is much easier.

**1. Download the installer tool.** Visit Microsoft's Windows 10 download page and select “**Download tool now**” under the “**create Windows 10 installation media**” section.

**2. Run installer tool.** You can just upgrade your version of Windows directly from the installer tool, without creating separate installation media. When you reach the “**what do you want to do?**” section, select “**Upgrade this PC now.**”

**3. Complete Windows 10 installation.** Now the installer tool will guide you through the rest of the process. Just follow the steps to complete the installation process and you'll have Windows 10 installed on your device at the end of it.

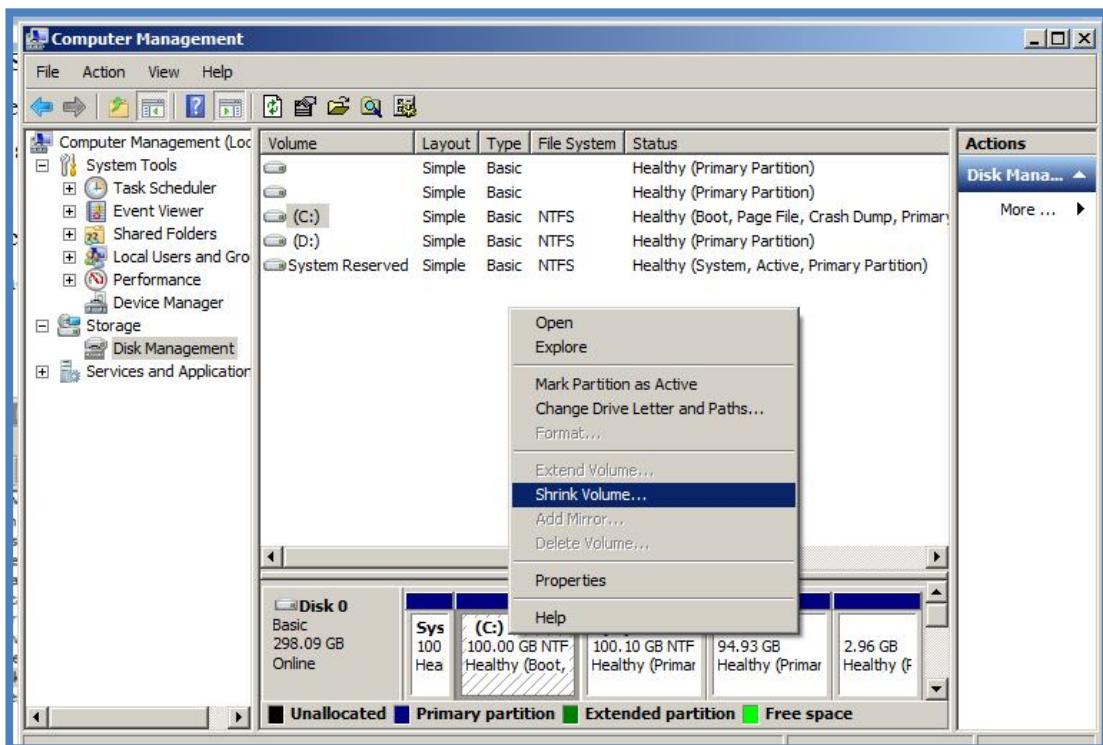
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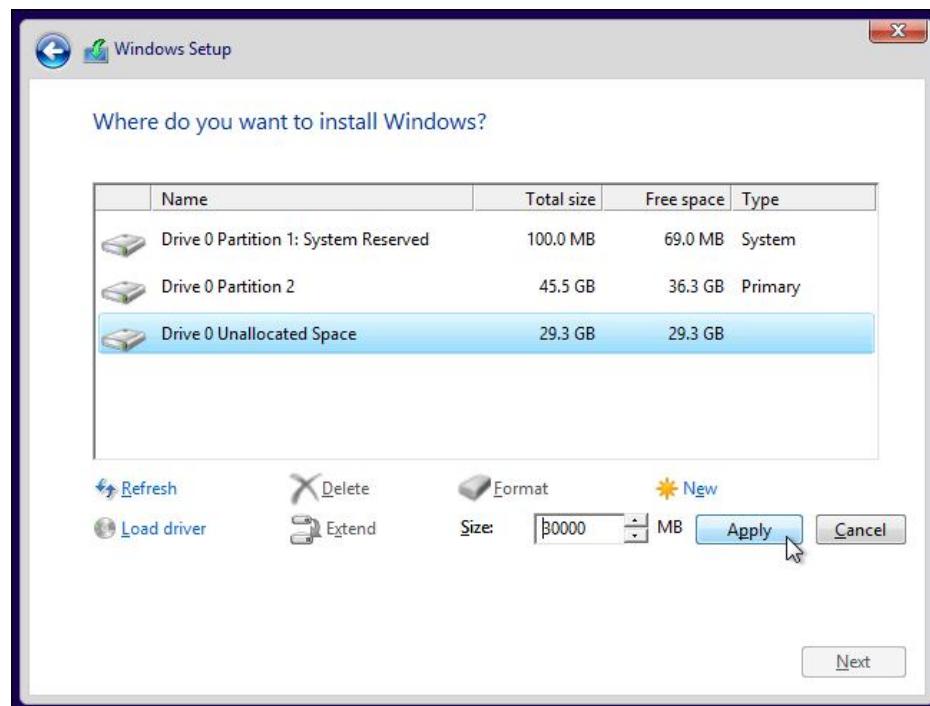
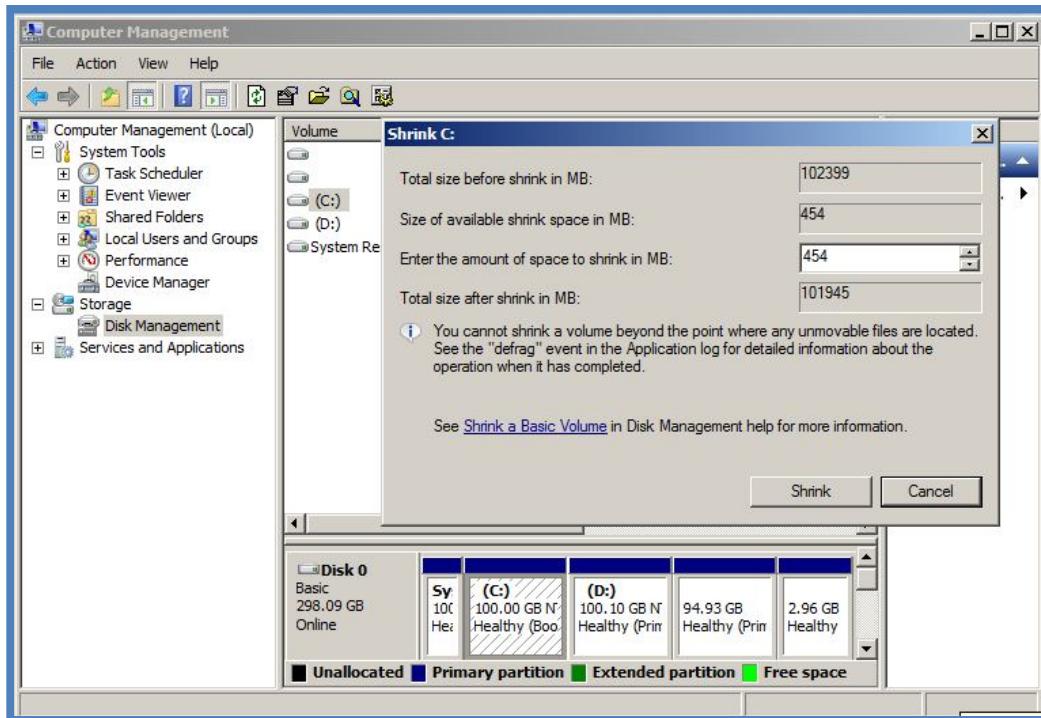
## Preparing the System for Dual-Booting

Different operating systems have different uses and advantages. Having more than one operating system installed allows you to quickly switch between two and have the best tool for the job. It also makes it easier to dabble and experiment with different operating systems.

If Separate Disk space is allocated for the installation of another Operating System, use that space during second Operating System.

If separate space is NOT allocated, then go to the existing operating system Device Manager, Select the Drive and Right Click and Apply Shrink Volume, it will ask the amount of Disk Space required for the new Operating System. Set the correct space for new operating system and restart the PC for loading new operating system as usual like loading from DVD/Pen Drive.



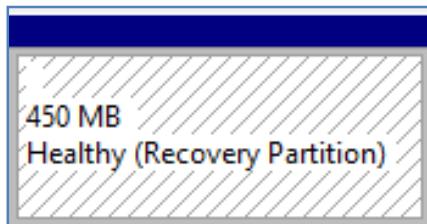


After Successful installation, the system will ask for choosing operating system to get load

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### Working on Recovery Partition

A recovery partition is a partition on the disk that helps to restore the factory settings of the OS (operating system) if there is some kind of system failure. This partition has no drive letter, and you can use only Help in Disk Management.



**The recovery partition has two varieties:**

- The first of the varieties is the most widespread and installed with the Windows operating system on a GPT disk and occupies a negligible amount of disk space.
- The second is set by the computer manufacturer (like Lenovo, Dell or HP). It occupies a significant amount of disk space since it is this part of the recovery partition that contains the manufacturer settings for application drivers and other things that allow you to restore these default settings. This partition is also called the OEM section.

**New Recovery Partitions get created after every Windows Upgrade.**

- A curious thing is that every time you update Windows, a new recovery partition is created. This happens due to a lack of free space in your recovery partition or in system reserved partition. As a result, you will get as many recovery partitions as you update your system.
- When you get a new recovery partition on your disk, the old recovery partition can be removed without worries, as it is nonfunctional. That's how you can get a bit of free space.

**Deleting Recovery Partitions:**

- Use Disk Manager, and select Old recovery Disk Partitions and delete (if sure)
- Use Diskpart utility to remove old recovery Disk Partitions with suitable commands
  - Diskpart → list disk → Select disk 0 (Assume Disk 0 is Listed) → list volume → select volume 1 (Assume Volume 1 is Recovery Partition) → Delete Volume 1

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## Ten Windows Registry Tweaks

Start the Settings of Windows Registry opening the Registry Editor

- Hit **Win+R**
- Type **regedit**
- Click **OK.**

### 1. Add “Open with Notepad” to the context menu

When you right-click on your desktop the appeared list is called the **Context menu**. There are a few options available in the context menu but if you want you can even customize it accordingly and one such customization adding the **Open with Notepad** option.

- Navigate using the following route:-
  - Computer\HKEY\_CLASSES\_ROOT\\*\shell
- Right-click on **Shell> New> Key**. Then rename it to **Open With Notepad**.
- Right-click on **Open with Notepad> New> Key**. Then rename it to **Command**.
- Double-click on **Default** from the right panel of the Window, in the **Value data** section type “**notepad.exe %1**” and click **OK**.
- Now, close the Registry Editor, right-click on the file that you want to open with **Notepad**, and select the “**Open with Notepad**” option.

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### 2. Change your Logon Screen Background

Changing the wallpaper on your desktop is one of the easiest things to do in Windows. But if you can have that display any image you want, why not do the same with your logon screen?

Go to the Key:

- HKEY\_LOCAL\_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\Authentication\LogonUI\Background
  - Double click on “OEMBackground” to open it.
  - Change the value in the “Value data” field to 1.
  - Click OK.
- 
- Using Windows Explorer, navigate to your Windows directory and go to the path C:\Windows\System32\oobe

- If there's a folder in here called “**info**,” go into it; if there's a folder inside of that one called “**backgrounds**,” go into that. If neither exists, you'll need to create them both first.
- Copy the image (it must be a JPEG, and smaller than 256KB in size) you want to use as your logon screen background into the **info\backgrounds** folder.
- Rename the image **backgroundDefault.jpg**

The next time you **restart** your computer, or **log out**, see this image as the new logon screen.

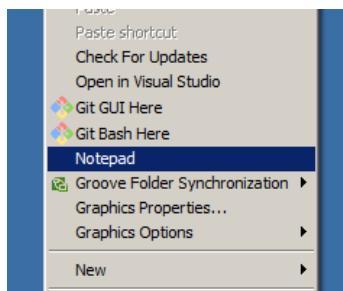
- If you chose an image that prevents the buttons and text from looking their best on the logon screen, you can adjust their appearance as well.
- HKEY\_LOCAL\_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\Authentication\LogonUI (Now **NOT** going into **Background** this time).
- Add a DWORD value called “**ButtonSet**.”
- Change its value to either **1** (darker text shadows and lighter buttons, intended for lighter backgrounds) or **2** (no text shadows and opaque buttons, for darker backgrounds); **0 is the Windows default.**

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### 3. Adding Applications to the Desktop Context Menu: Adding Notepad

Go to the Key:

- HKEY\_CLASSES\_ROOT\Directory\Background\shell
- Right-click on **Shell** → **New** → **Key**. Then rename it to **Notepad**
- Right Click on **Notepad** → **New** → **Key**. Then rename it to **Command**
- Select the **Command**. Double Click on **Default** on Right Pane. Set the **Value data** to “**notepad.exe**”
- Go to the Desktop → Right Click. Popup Menu will display **Notepad**

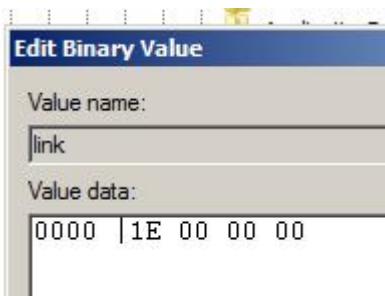


==== \* ===

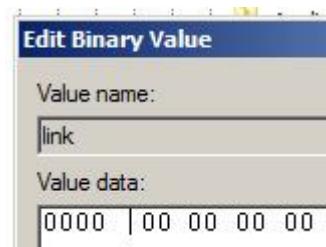
#### 4. Remove the “- Shortcut” Text by Editing the Registry Manually

Go to the Key:

- HKEY\_CURRENT\_USER\Software\Microsoft\Windows\CurrentVersion\Explorer
- On the right-hand side, scroll down and locate a value named **link**. (If it is not there, create it by right-clicking the **Explorer** key, choosing **New → Binary Value**, and then Renaming the New value “**link**”)
- Double click on link. In the “**Value data**” box, replace the current value with “**00 00 00 00**”. (Note that the current value will depend on what version and edition of Windows running. It doesn’t matter what’s there already. Just replace it with all zeroes.)

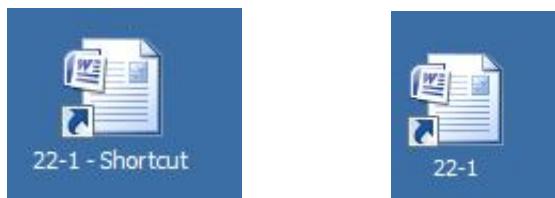


Old values in **Value data**



New values in **Value data**

- Sign out and back in (or Restart your computer) to complete the change.
- Test it out by creating a new shortcut. Windows should no longer add the “- Shortcut” text.
- If you want to **reverse the changes**, just head back into the Registry and **delete the link value**.
  - This will work whether the value was already there or you created it yourself. Windows will recreate the value with the default setting when it needs to.

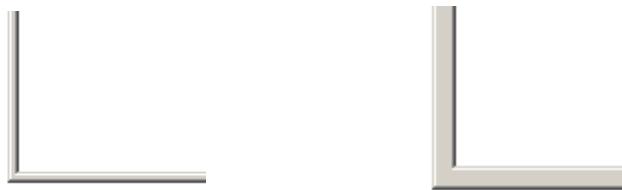


Output Before and After Registry Settings

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## 5. Change the Width of Window

- Navigate to HKEY\_CURRENT\_USER\Control Panel\Desktop\WindowMetrics
- Scroll to find the “**BorderWidth**” entry. (If it’s not there, create it. Right click in the right pane, select **New**, then Select “**String Value**,” and name the object **BorderWidth**.)
- Double click **BorderWidth** to open it. (Note down the number in that for recovery)
- Change the number in the “**Value Data**” field to the width you want to allot to the window (say -150).
- Click OK.
- Sign out and back in (or Restart your computer) to complete the change.



Output Before and After Registry Settings

==== \* ===

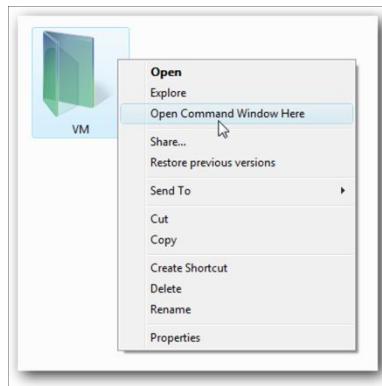
## 6. Disable Short cut Key Win-X (Test Win+D for Desktop, and Win+E for Explorer)

- Navigate to  
HKEY\_CURRENT\_USER\Software\Microsoft\Windows\CurrentVersion\Policies\Explorer
- Right Click on Explorer → New → Key → Create a **32-bit DWORD**. Rename it to value called **NoWinKeys**.
- Double Click on **NoWinKeys** and set the **Value data** to 1.
- Click Ok
- Sign out and back in (or Restart your computer) to complete the change.
- Try Win+D (by opening many application) and Win+E to go to Explorer – See the Changes.
- To **reverse** the changes, go to the Registry key, and delete **NoWinKeys** and Sign out/Restart

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## 7. Make " Open Command Window Here" Always Display for Folders or Drives

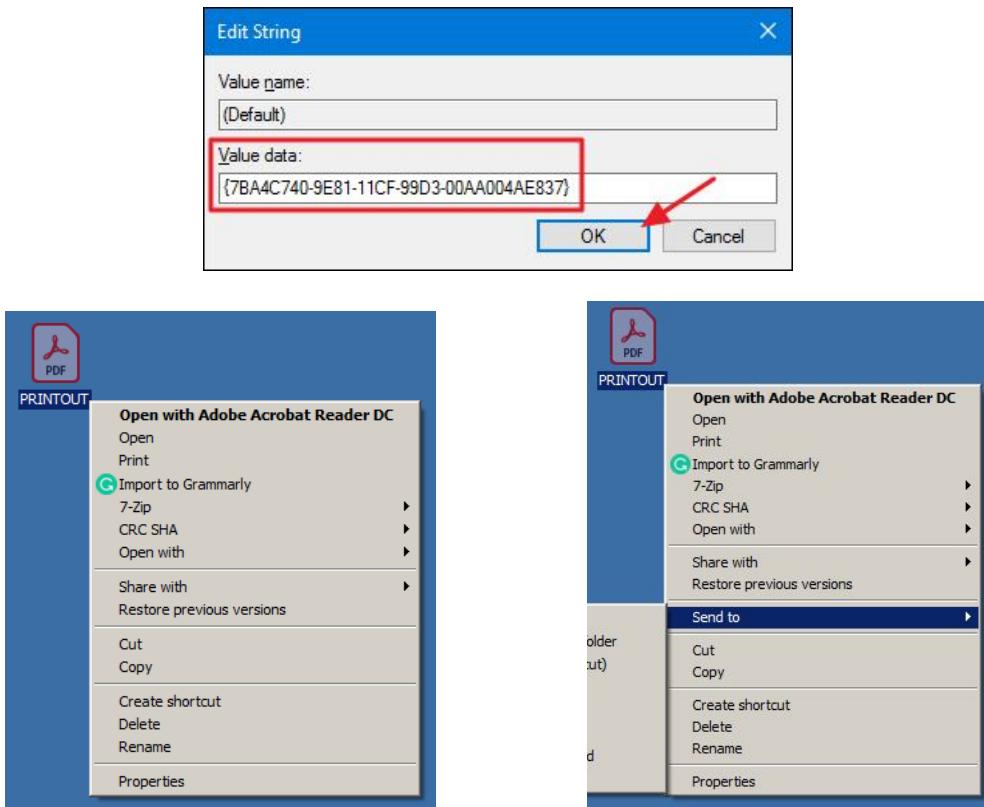
- Navigate to HKEY\_CLASSES\_ROOT\Directory\shell\cmd
- Select **cmd**. On Right Pane, Rename Key “**Extended**” to “**Extended-Orig**”
- Go to any Folder and Right Click on Folder, will get “**Open Command Window Here**”, with this one can work with Command Prompt.
- Do the Same thing for **Drive** by Navigating to HKEY\_CLASSES\_ROOT\Drive\shell\cmd
- Select **cmd**. On Right Pane, Rename Key “**Extended**” to “**Extended-Orig**”
- Go to any Drive in My Computer and Right Click on Drive, will get “**Open Command Window Here**”, with this one can work with **Command Prompt**.



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## 8. Remove “Send To” from Menu in Windows

- Navigate to HKEY\_CLASSES\_ROOT\AllFilesystemObjects\shellex\ContextMenuHandlers\Send To
- Select **SendTo**, in Right Pane Double Click on **Default**
- Note down the data (numbers) in **Value data** (Required for Value Recovery).
- Clear the Contents of Value data
- Click OK.
- To Test, Go to Desktop, Right on any File, “Send To” will not be visible.
- To reverse, the task, just head back into the Registry and Restore the “SendTo” Value data to Original Value i.e. {7BA4C740-9E81-11CF-99D3-00AA004AE837}
- To Test, Go to Desktop, Right on any File, “Send To” will be visible now.

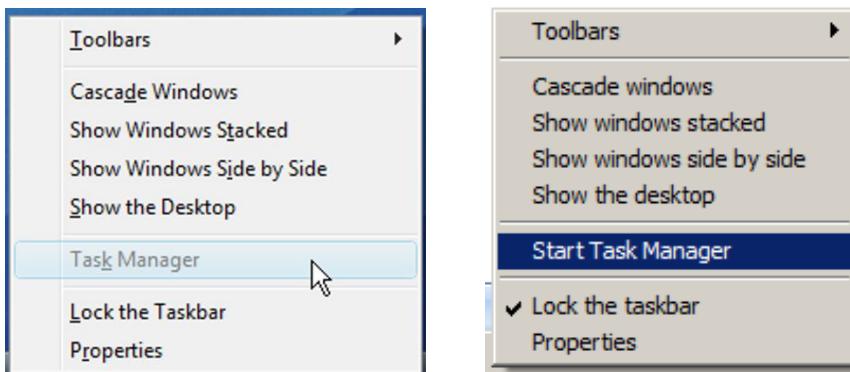


Output Before and After Registry Settings

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## 9. Enable and Disable Task Manager in Windows

- Navigate to  
HKEY\_CURRENT\_USER\Software\Microsoft\Windows\CurrentVersion\Policies
- If System is not found Create New Key **System**
- Right-click on **Policies** → **New** → **Key**. Then rename it to **System**
- Right Click on **System** → **New** → **DWORD (32bit)**. Then rename it to **DisableTaskMgr**
- Double Click on **DisableTaskMgr**, Set the Value data to 1 (For Disabling Task Manager)
- Click OK,
- Test it by right Click on Task bar.
- If you want to **reverse the changes**, just head back into the Registry and set the Value data of **DisableTaskMgr** to 0.



Output Before and After Registry Settings

==== \* ===

## 10. Change the Title Bar Text Color and Button Text Colors

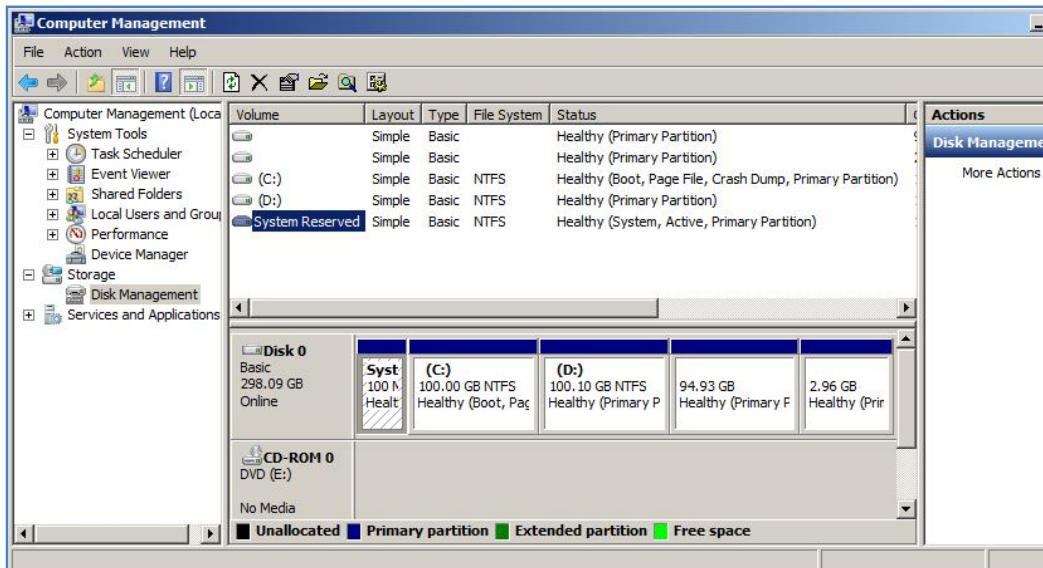
- Navigate to  
HKEY\_CURRENT\_USER\Control Panel\Colors
- Select **Colors**, and on Right Pane Select **TitleText**
  - Set the **Value data** for **TitleText** to Color of your Choice in RGB format (Original Value is 255 255 255, it means Text appeared in Title bar is in pure **White** Color).
  - Set the color to 0 0 0 (means Title bar Text appears in Black Color)
- Select **Colors**, and on Right Pane Select **ButtonText**
  - Set the **Value data** for **ButtonText** to Color of your Choice in RGB format (Original Value is 0 0 0, it means Text appeared in Buttons is in pure **Black** Color).
  - Set the color to 0 0 255 (means Button Text appears in Blue Color)
- Click OK,
- Sign out and back in (or Restart computer) to complete the change.

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## Disk Management Utilities

Disk Management is a system utility in Windows that enables you to perform advanced storage tasks. Here are some of the things Disk Management is good for:

- To setup a **new drive**.
- To **extend a volume** into space that's not already part of a volume on the same drive
- To **shrink a partition**, usually extend a neighboring partition
- To **change a drive letter** or assign a new drive letter.
- **Format** the Drives



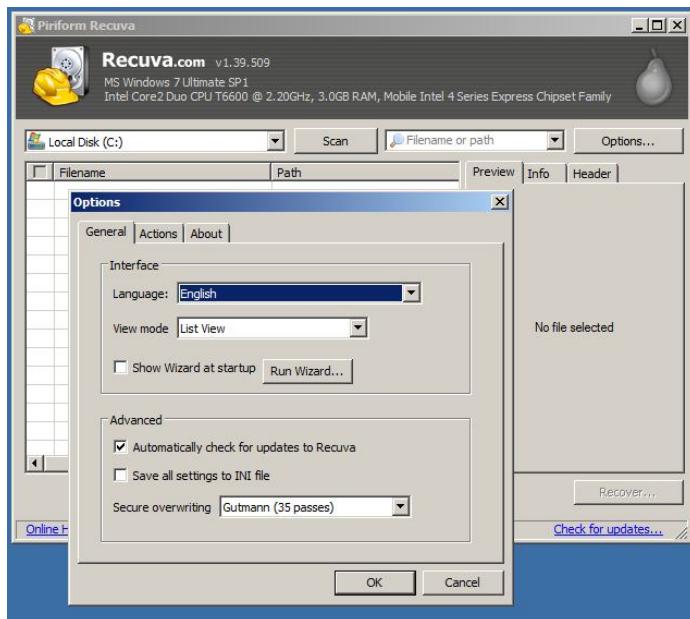
Here are some common tasks but that use other tools in Windows:

- **To free up disk space**
- **To defragment your drives.**
- **To take multiple hard drives and pool them together, similar to a RAID**

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## Recuva: Data Recovery Software

- **Superior file recovery:** Recuva can recover pictures, music, documents, videos, emails or any other file type you've lost. And it can recover from any rewriteable media you have: memory cards, external hard drives, USB sticks and more!
- **Recovery from damaged disks:** Unlike most file recovery tools, Recuva can recover files from damaged or newly formatted drives. Greater flexibility means greater chance of recovery.
- **Deep scan for buried files:** For those hard to find files, Recuva has an advanced deep scan mode that scours your drives to find any traces of files you have deleted.
- **Securely delete files:** Sometimes you want a file gone for good. Recuva's secure overwrite feature uses industry- and military-standard deletion techniques to make sure your files stay erased.



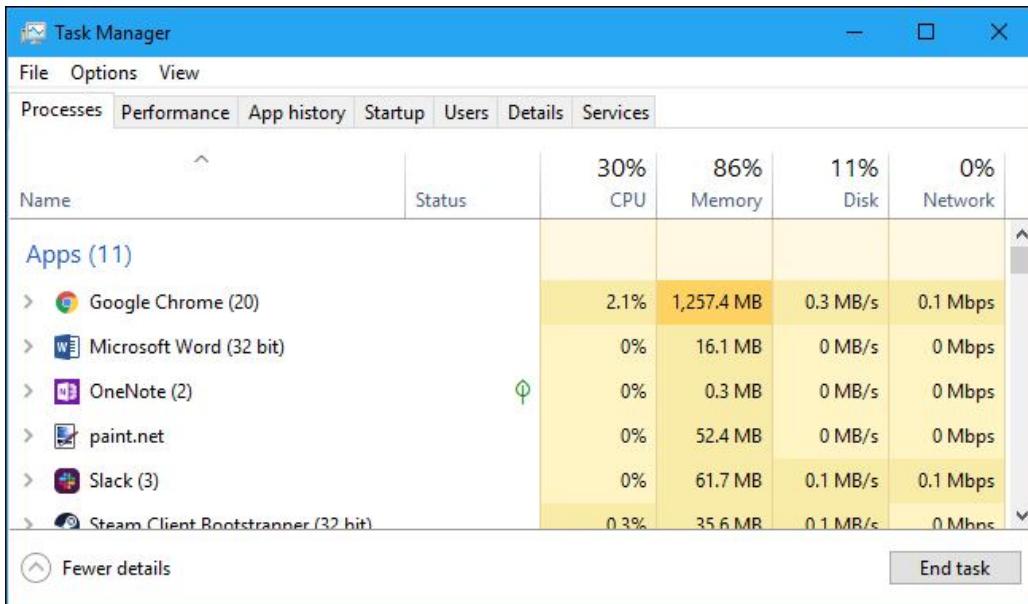
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## Working with Task Manager

- Task Manager displays the programs, processes, and services that are currently running on your computer.
- Task Manager can be used to monitor your computer's performance or to close a program that's not responding.

Way to Open Task Manager:

- Press Ctrl+Shift+Esc to open the Task Manager with a keyboard shortcut
- Right-Click the Windows taskbar and select “Task Manager.”



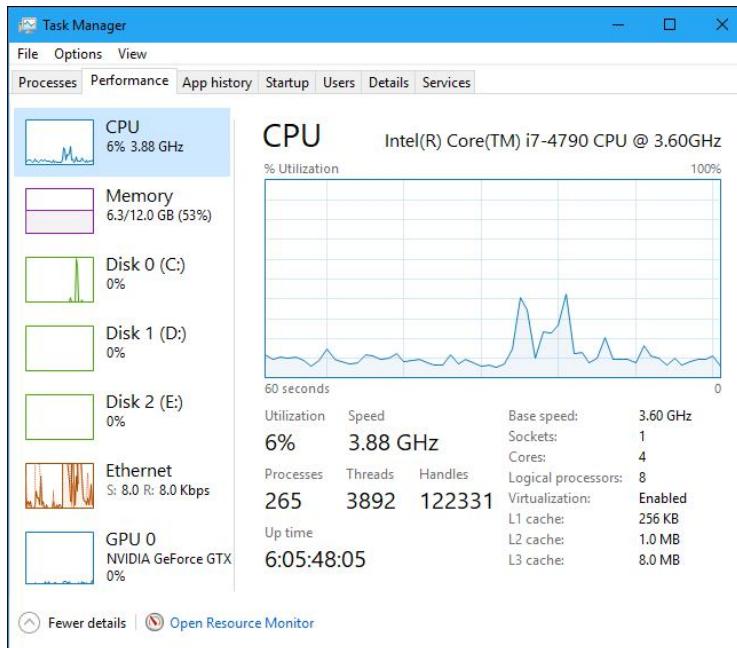
Name	Status	30% CPU	86% Memory	11% Disk	0% Network
<b>Apps (11)</b>					
> Google Chrome (20)		2.1%	1,257.4 MB	0.3 MB/s	0.1 Mbps
> Microsoft Word (32 bit)		0%	16.1 MB	0 MB/s	0 Mbps
> OneNote (2)	∅	0%	0.3 MB	0 MB/s	0 Mbps
> paint.net		0%	52.4 MB	0 MB/s	0 Mbps
> Slack (3)		0%	61.7 MB	0.1 MB/s	0.1 Mbps
> Steam Client Bootstrapper (32 bit)		0.3%	35.6 MB	0.1 MB/s	0 Mbps
<a href="#">Fewer details</a>		<a href="#">End task</a>			

The Task Manager includes the following tabs:

- **Processes:** A list of running applications and background processes on your system along with CPU, memory, disk, network, GPU, and other resource usage information.
- **Performance:** Real-time graphs showing total CPU, memory, disk, network, and GPU resource usage for your system. Many other details like computer's IP address, model names of your computer's CPU and GPU etc. can be obtained here.
- **App History:** Information about how much CPU and network resources apps have used for your current user account. This only applies to new Universal Windows Platform (UWP) apps—in other words, Store apps—and not traditional Windows desktop apps (Win32 applications.)

- **Startup:** A list of your startup programs, which are the applications Windows automatically starts when you sign into your user account. You can disable startup programs from here, although you can also do that from Settings > Apps > Startup.
- **Users:** The user accounts currently signed into your PC, how much resources they're using, and what applications they're running.
- **Details:** More detailed information about the processes running on your system. This is basically the traditional “Processes” tab from the Task Manager on Windows 7.
- **Services:** Management of system services. This is the same information you'll find in services.msc, the Services management console.

### Performance Information in Task Manager:



- The Performance tab shows real-time graphs displaying the usage of system resources like CPU, memory, disk, network, and GPU.
- If multiple disks, network devices, or GPUs are present that could be viewed all of them separately.
- The small graphs in the left pane shows resource usage over the last 60 seconds.

In addition to resource information, the Performance page shows information about system's hardware. Some different panes are:

- **CPU:** The name and model number of CPU, its speed, the number of cores it has, and whether hardware virtualization features are enabled and available. It also shows system's "uptime," which is how long system has been running since it last booted up.
- **Memory:** How much RAM the system has, its speed, and how many of the RAM slots on motherboard are used. It also shows how much of memory is currently filled with cached data.
- **Disk:** The name and model number of disk drive, its size, and its current read and write speeds.
- **Wi-Fi or Ethernet:** Windows shows a network adapter's name and its IP addresses (both IPv4 and IPv6 addresses) here. For Wi-Fi connections, it also shows the Wi-Fi standard in use on the current connection—for example, 802.11ac.
- **GPU:** The GPU pane shows separate graphs for different types of activity—for example, 3D vs. video encoding or decoding. The GPU has its own built-in memory, so it also shows GPU memory usage. It shows the name and model number of GPU here and the graphics driver version it's using.

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### **Working with Task Manager:**

- Identify Running Applications and its associated Process Names.
- Load New Application and identify its associate Process Name
  - Example: Load Notepad Editor, identify its process notepad.exe
- Identify different Services available like Running/Stopped
  - Example: Dhcp, Eventlog, PlugPlay, WSearch, Simptcp
- Note down the Process id of any running application and end the process either manually or through command
- Identify Different users currently logged in and try to Disconnect or Log off the users from the system

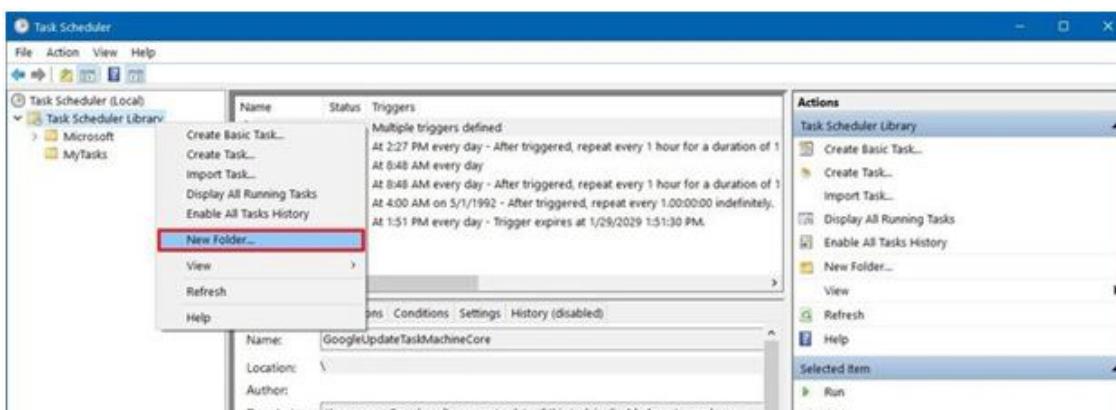
## Working with Task Scheduler

- Task Scheduler is a tool that allows you to create and run virtually any task automatically.
- Task Scheduler works by keeping tabs of the time and events on your computer and executes the task as soon as the condition is met.

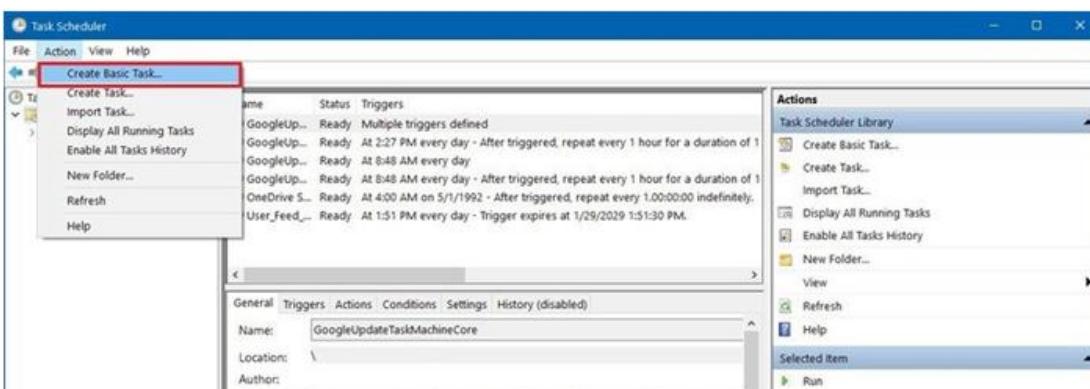
### How to create a Basic Task using Task Scheduler

To create a task using basic settings on Windows 10, use these steps:

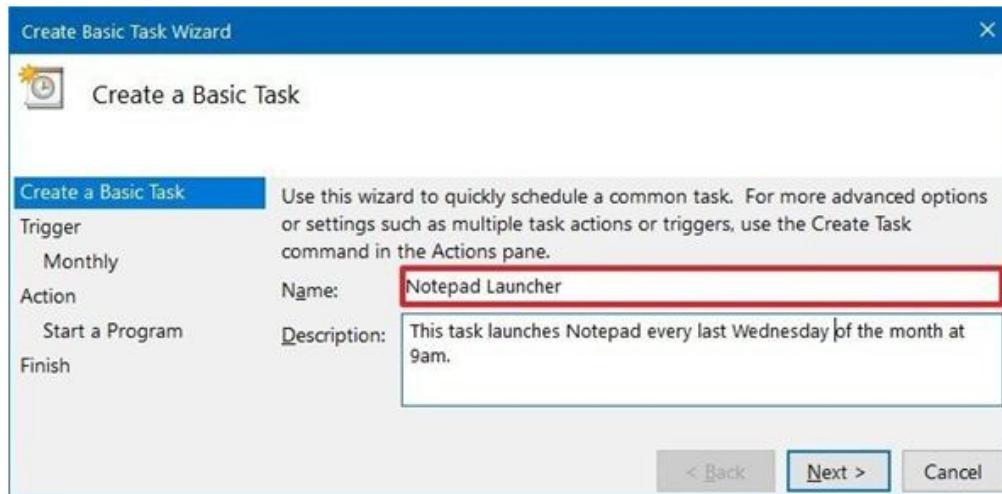
1. Open **Start**.
2. Search for **Task Scheduler**, and click the top result to open the experience.
3. Right-click the "Task Scheduler Library" branch, and select the **New Folder** option.



4. Type a name for the folder. For example, MyTasks. (This step isn't a requirement, but it's a recommended step to keep your tasks separate from the system and apps tasks.)
5. Click the **OK** button.
6. Expand the "Task Scheduler Library" branch, and select the **MyTasks** folder.
7. Click the **Action** menu.
8. Select the **Create Basic Task** option.



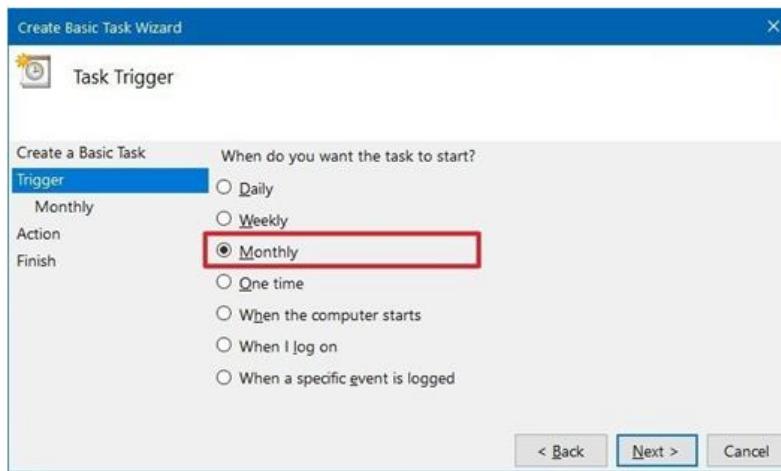
9. In the "Name" field, type a short descriptive name for the task. For example, Notepad Launcher.



10. (Optional) In the "Description" field, create a description for the task.

11. Click the **Next** button.

12. Select the **Monthly** option.

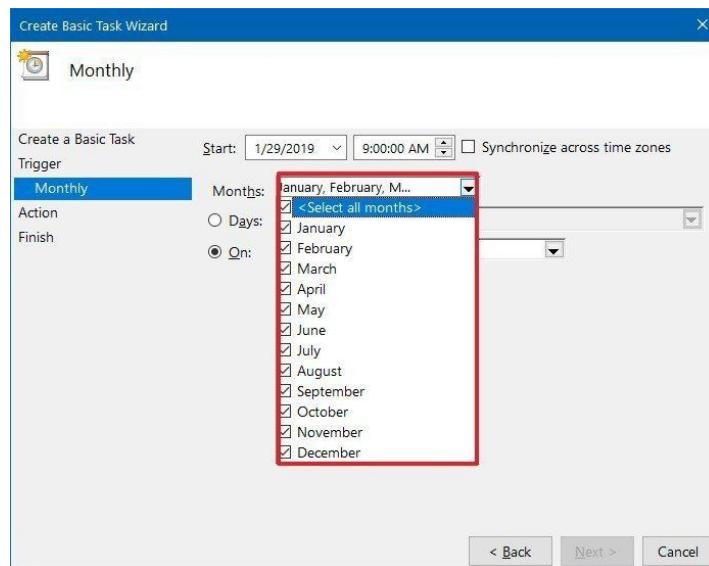


Task Scheduler allows you to select from a number of triggers, including on a specific date, during startup, or when you or a particular user signs in. Depending on your requirements, you'll need to configure additional parameters. In this case, we'll be selecting the option to run a task every month.

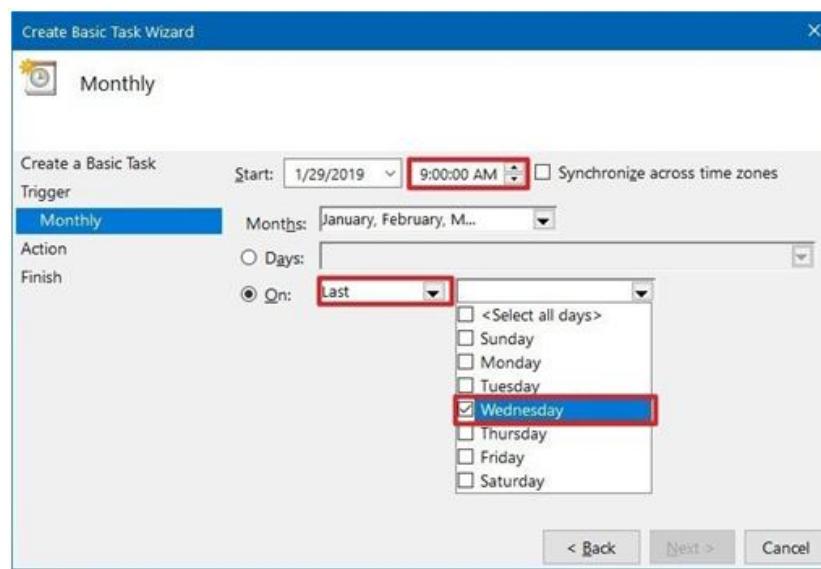
13. Click the **Next** button.

14. Using the "Start" settings, specify when the task should start running and the time (very important).

15. Use the "Monthly" drop-down menu to the months of the year that you want to run the task.

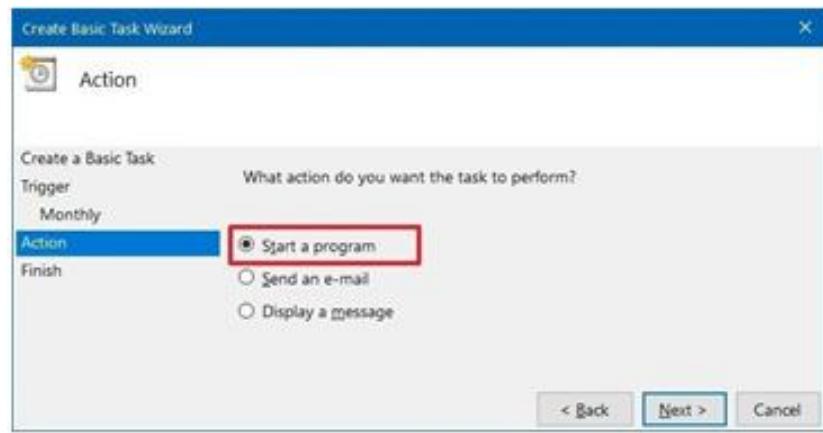


16. Use the "Days" or "On" drop-down menu to specify the days that the task will run.



**Quick Tip:** Using the "On" setting may be your best option if you're planning to run a task during a specific day of the week.

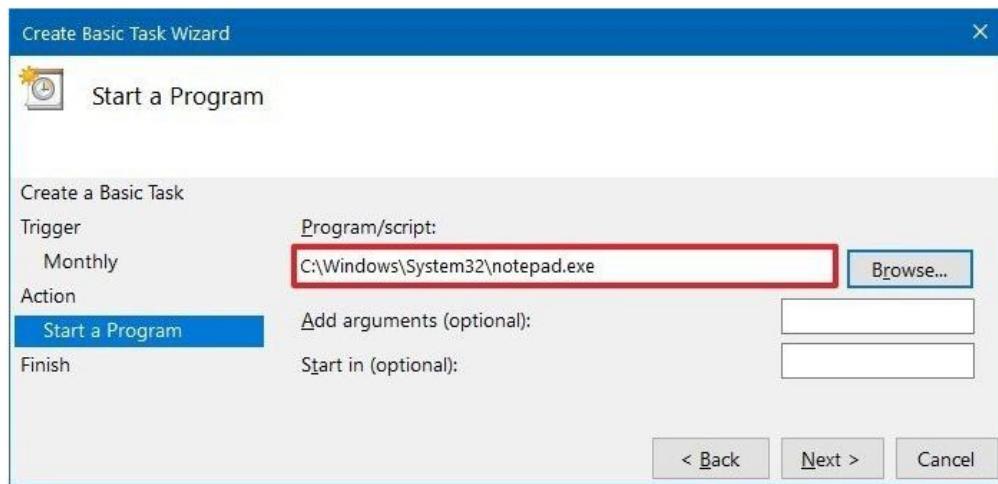
17. Click the **Next** button.
18. Select the **Start a program** option to launch an app, run a command, or execute a script file.



You can select the **Send an e-mail** or **Display a message** option, but these are deprecated features, which means that they may or may not work because Microsoft is no longer maintaining them.

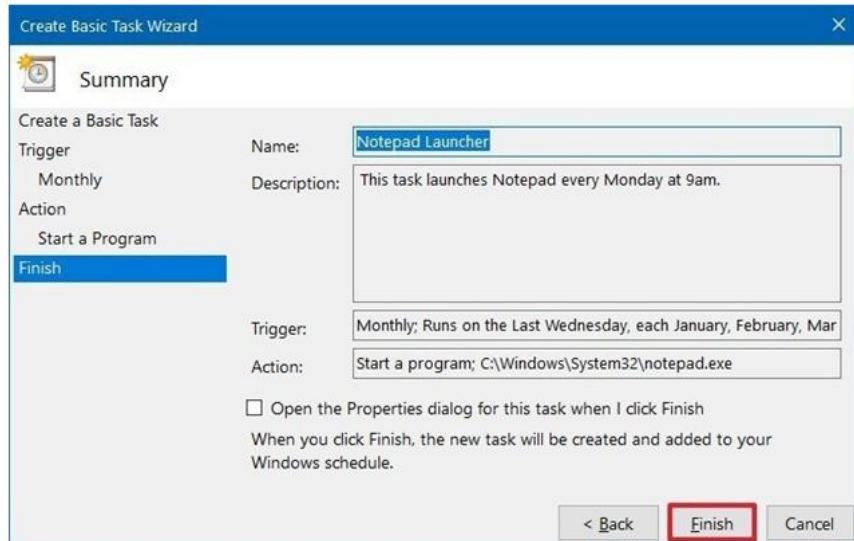
- **Send an e-mail:** Triggers an email notification with a custom message on schedule, but it requires to specify an email server to work.
- **Display a message:** Allows to display a text message on the screen on schedule.

19. In the "Program/script" field, specify the path for the application.



**Quick Tip:** If you don't know the path of the app, click the **Browse** button to find it.

20. (Optional) In the "Add arguments" field, you can specify arguments to run the task with special instructions.
21. (Optional) In the "Start in" field, specify the folder in which the program will start. (Usually, you can leave this setting empty.)
22. Click the **Finish** button.



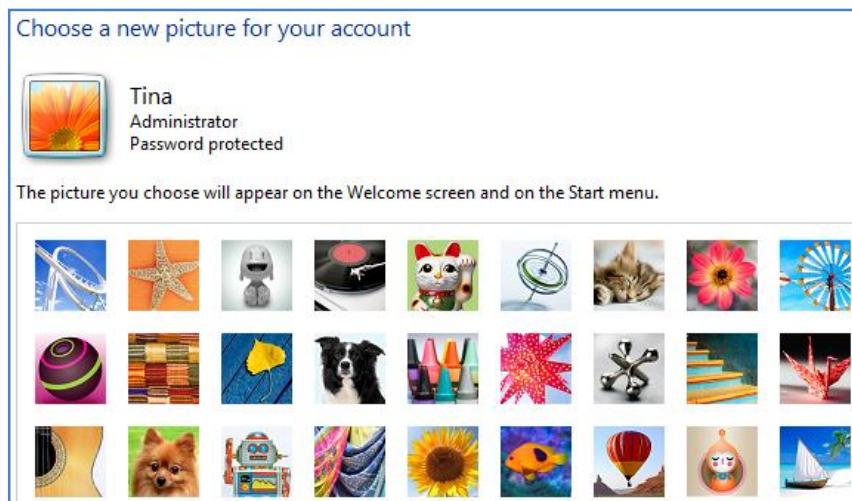
Once you've completed the steps, the task will be saved, and it'll run automatically on the schedule you specified.

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## Customize Windows Desktop

### 1. Change the Welcome Screen

- There are two basic things you can change that will affect the welcome screen. First of all, you can change your profile picture. Secondly, you can apply a hack or software to change the background image.
- To change your profile picture, go to > Start and type > User Accounts into the bar that says > Search programs and files, then open the respective entry under > Control Panel. Next, select > Change your picture. You can now choose a default image or click > Browse for more pictures... at the bottom of the list to access your own files.
- Once you have selected an image click the > Change Picture button and you're done.



### 2. Add Desktop Gadgets

Gadgets are tiny tools that sit on your desktop. They add functionality and quickly let you complete tasks without launching a large program. Some of my three favorite Windows gadgets are:

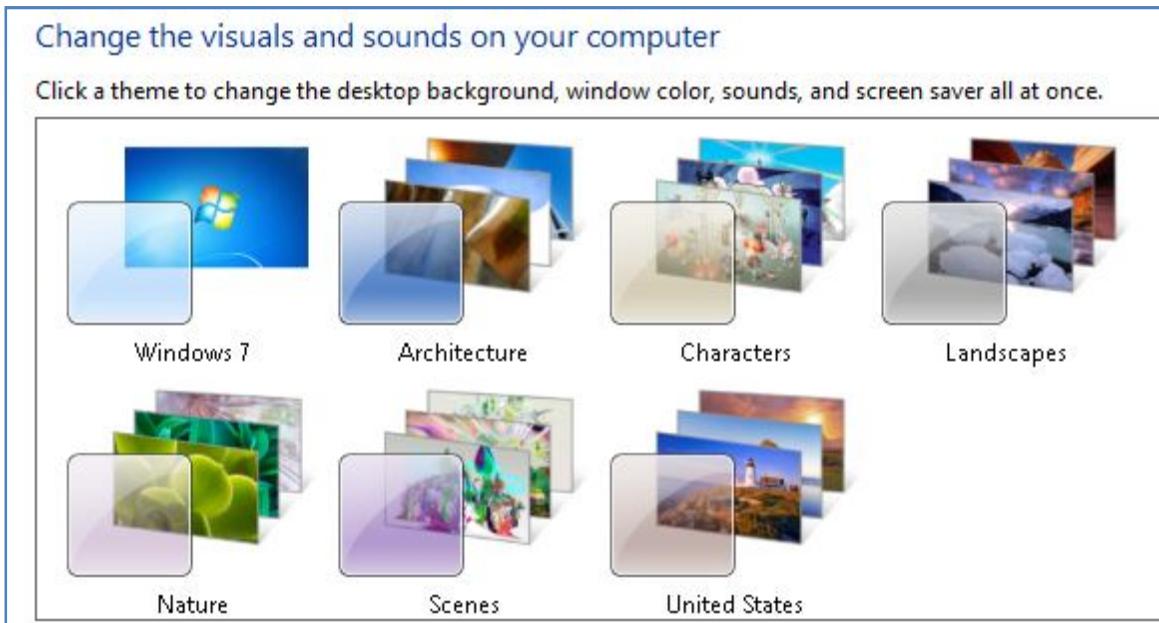
- Clipboard Manager - Manage your clipboard history, search entries, store favorite clips, and more.
- Skype Gadget - Keep a minimized Skype interface on your desktop and save space.
- The Magic Folder - Automatically sort files into pre-defined folders based on their file extension.



To browse, discover, and install gadgets, visit the Windows Live Gadget Gallery. To launch existing gadgets, go to > Start and type > Desktop Gadgets into the bar that says > Search programs and files, then open the respective entry under > Control Panel.

### 3. Change the Windows Theme

Changing the theme will have the greatest impact on your system in terms of look and feel. And you'll be surprised how easy it is. > Right-click desktop and select > Personalize..

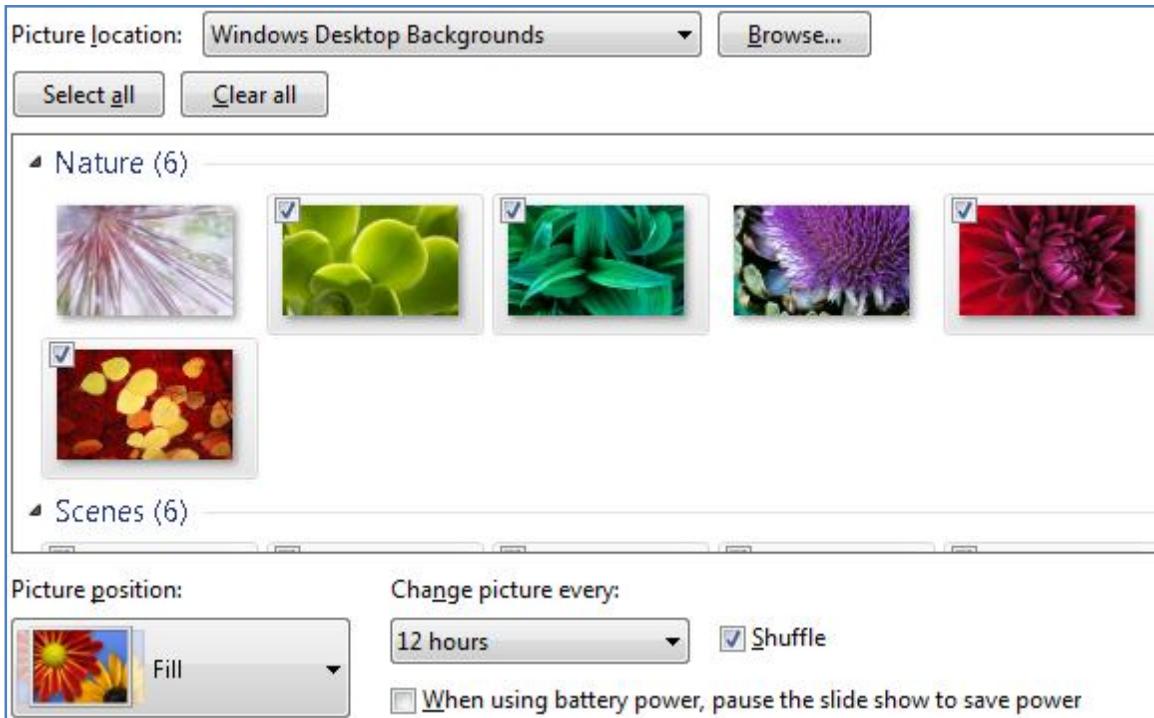


### 4. Create a Custom Desktop Slideshow

To add some variety to your desktop or showcase your own photos, you can create a custom desktop slideshow that will regularly change your wallpaper.

> Right-click desktop, select > Personalize, and click on > Desktop Background. To create a slideshow, you need to select any entry from the > Picture location drop-down menu other than the default 'Solid Colors'. Now > Browse for the folder that holds your pictures, > Select the ones

you like, choose a > *Picture position* and time interval to > *Change picture*. Finally click the > *Save changes* button and enjoy.

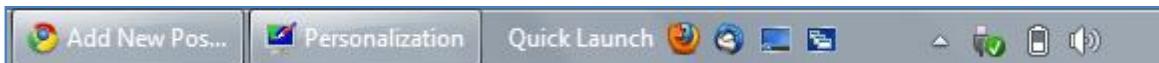


Like the > *Desktop Background* you can also customize > *Window Color* and > *Sounds* and so create your own custom theme. Don't forget to > *Save theme*!

## 5. Add Toolbars to Taskbar & Enable Quick Launch Bar

A toolbar located in your taskbar can provide instant access to often used programs, for example iTunes. Simply > right click Taskbar, expand > *Toolbars*, and check the ones you would like to see.

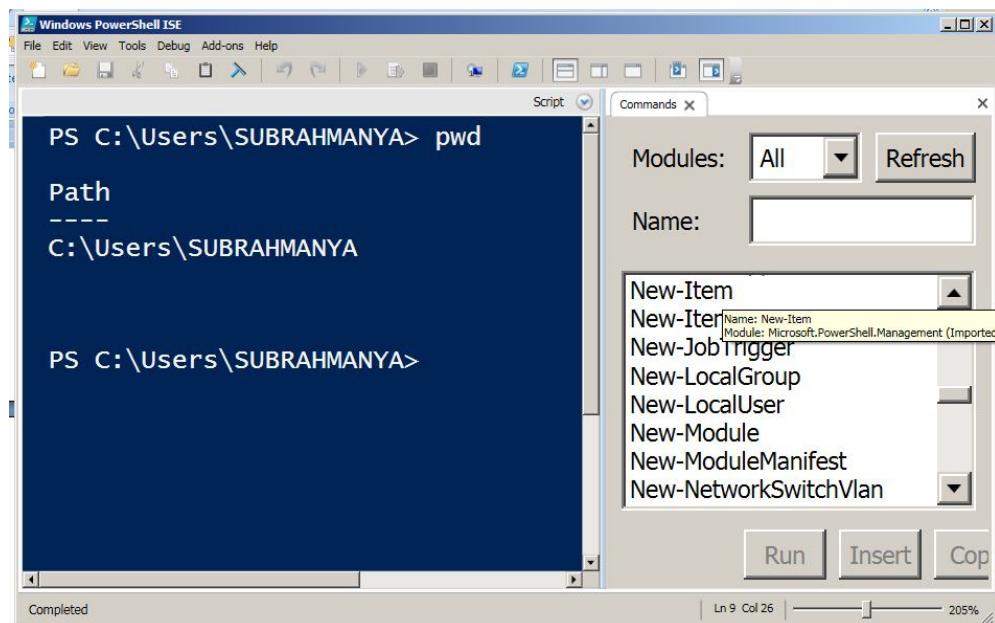
Follow the same steps outlined above and select > *New toolbar...*, enter the following path > %userprofile%\AppData\Roaming\Microsoft\Internet Explorer\Quick Launch and click > *Select Folder*. The Quick Launch bar will appear, but it needs more customization. > Right-click *Quick Launch* and uncheck > *Show title* and > *Show Text* to make it more compact. You can also uncheck > *Lock the taskbar* and then > *drag and drop Quick Launch* into place.



## PowerShell ISE

- The Windows PowerShell Integrated Scripting Environment (ISE) is a host application for Windows PowerShell.
- In Windows PowerShell ISE, one can run commands and write, test, and debug scripts in a single Windows-based graphic user interface with multiline editing, tab completion, syntax coloring, selective execution, context-sensitive help, and support for right-to-left languages.
- One can use menu items and keyboard shortcuts to perform many of the same tasks that you would perform in the Windows PowerShell console. For example, when you debug a script in the Windows PowerShell ISE, to set a line breakpoint in a script, right-click the line of code, and then click Toggle Breakpoint.
- To open it you just go to Start - Search and then Type - PowerShell
- Command-line shell and scripting language built on the .NET Framework Designed specifically for system administration
  - Automate tasks on local and remote Windows machines
  - Originally designed as a replacement for the current command environment and BATCH files

==== \* ===



## Start PowerShell by typing powershell

- Looks like command prompt, but with PS in front

- For help use:

`get-help <cmdlet name>`

- For help on all the possible get commands use:

`get-help -Name get-*`

==== \* ===

**Execute basic commands in Windows using command prompt and PowerShell like listing the drives in a system, creating a new file, removing a file or directory, retrieving the list of processes and services**

## Basic Commands in Windows using Command Prompt:

Command to be Practiced	Description
<b>dir</b>	Listing Files and Folders
<b>md <i>FolderName</i></b>	To make the Directory
<b>rd <i>FolderName</i></b>	To remove Directory
<b>cd <i>NextFolderName</i></b>	Change Directory to successor Directory
<b>cd ..</b>	Change Directory to Previous Directory
<b>cd</b>	Display Current Working Directory
<b>del <i>FileName</i></b>	Deleting File
<b>ren <i>Oldfilename Newfilename</i></b>	Renaming Old File with New Name
<b>copy con <i>FileName</i></b>	Create New file and Adding Contents, Copying Contents on the Console to File
<b>echo <i>Text to be Displayed</i></b>	To Display the typed Text
<b>tasklist</b>	List of Processes running
<b>taskkill -pid <i>Taskid</i></b>	End particular Process
<b>prompt <i>UserPromptText</i></b>	To display the Prompt with user Defined Text
<b>cls</b>	Clear the contents in Console
<b>type <i>FileName</i></b>	Display the Contents of the File
<b>exit</b>	Close the Command Prompt

<b>copy</b> <i>OriginalFile Copyoffile</i>	Copies the Contents of <i>OriginalFile</i> to <i>Copyoffile</i>
<b>move</b> <i>FilePath1 FilewithAnotherPath</i>	File which is one path will be moved to another path with same or different name.
<b>attrib [+h] [-h] [+r][-r]</b> <i>FileName</i>	Attach the attributes to the File like, add hidden, remove hidden, add Read Only, Remove Read only

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**Simple DOS Command based Example:**

- Create Folder named DTE
- Create **Four** Folders inside DTE as, Engineering, Diploma, Office, Polytechnic
- Create file named **diplomofile.txt** with initial Content “**Hardware Lab**” inside Diploma Folder
- Create file named **enggfile.txt** with initial Content “**Hello,** ” inside Engineering Folder
- Create file named **officefile.txt** with initial Content “**Welcome to** ” inside Office Folder
- Create file named **polytechnicfile.txt** inside the Polytechnic Folder in such a way that, the Final Content of the diplomofile.txt should be “**Hello, Welcome to Hardware Lab**”, which is obtained by placing of contents of respective files inside the Folders inside the DTE Folder.
- Create one **Command.cmd** and execution of this file should create above task automatically in Current Directory in one go.

**Contents of file Command.cmd**

- set path=%cd%
- md %path%\DTE %path%\DTE\Engineering %path%\DTE\Diploma  
%path%\DTE\Office %path%\DTE\Polytechnic
- echo Welcome to > %path%\DTE\Office\officefile.txt
- echo Hello, > %path%\DTE\Engineering\enggfile.txt
- echo Hardware Lab > %path%\DTE\Diploma\diplomofile.txt
- type %path%\DTE\Engineering\enggfile.txt %path%\DTE\Office\officefile.txt  
%path%\DTE\Diploma\diplomofile.txt >  
%path%\DTE\Polytechnic\polytechnicfile.txt

==== \* ===

**Experiments on Command Prompt Commands Executed:**

<b>Commands List</b>	<b>Command Issued</b>

==== \* ===

## Basic Commands in Windows using PowerShell Prompt

<b>Get-PSDrive</b>	Listing Drives in System
<b>pwd</b>	Get Preset Working Directory
<b>ls</b>	List all the Files and Folders in Drive
<b>New-Item</b> <i>FileName</i>	Create a new text file
<b>Set-Content</b> <i>FileName</i> “Content to Overwrite”	Putting content to the File
<b>Get-Content</b> <i>FileName</i>	Reading contents of the File
<b>Add-Content</b> <i>FileName</i> “Content to be Added”	Adding Content to a File
<b>Get-Content</b> test.txt   <b>measure-object</b> -character -line -word	Display Number of Characters, Words and Lines in a File
<b>Clear-Content</b> <i>FileName</i>	Erasing content of the File
<b>New-Item</b> <i>FolderName</i> - <b>ItemType</b> <b>Directory</b>	Create a New Folder
<b>Remove-Item</b> <i>FolderName</i>	Delete the Created Folder
<b>Remove-Item</b> <i>FolderName</i> - <b>Recursive</b>	Delete the Created Folder and its included folders Recursively
<b>Cipher</b> /e <i>FileName</i>	Encrypt File or Folder
<b>Cipher</b> /d <i>FileName</i>	Decrypt File or Folder
<b>Cipher</b> <i>FileName</i>	To View all the Encrypted or Decrypted Files / Folders
<b>Get-Process</b>	To get list of Processes
<b>Get-Service</b>	To get list of Services

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### **Experiments on Power Shell: Commands Executed:**

Commands List	Command Issued

## Antivirus Software

- Software that is created specifically to help detect, prevent and remove malware (malicious software).
- Antivirus is a kind of software used to prevent, scan, detect and delete viruses from a computer. Once installed, most antivirus software runs automatically in the background to provide real-time protection against virus attacks.
- Comprehensive virus protection programs help protect your files and hardware from malware such as worms, Trojan horses and spyware, and may also offer additional protection such as customizable firewalls and website blocking.

### Example:

- Norton Antivirus
- McAfee Antivirus
- AVG Antivirus
- Avast Antivirus
- Kaspersky Antivirus

**Avast Premium Security:** comes with all the features included in Avast Free Antivirus, and additionally includes Real Site, Sandbox, Remote Access Shield, Sensitive Data Shield, Webcam Shield, Password Protection, Data Shredder, and Advanced Firewall Features.

### How to Install Avast Free Antivirus

- Go to the official site and download the software by specifying your OS version.
- Wait till the download process is complete and then run the file by following how to install antivirus software step by step guide.
- Click the Avast Security option on the next page and follow the prompts displayed to install the avast Antivirus software on your system.
- The app will launch once the installation process is complete.
- Go to the Status Menu available on the left panel of the window.
- Tap the Start button available near the Full System Scan option. Once the scan process is over, follow the Antivirus Setup prompts to rectify the threats detected.

## Difference between Desktop and Laptop

<b>Desktop</b>	<b>Laptop</b>
It needs external devices to be fully functional.	It is all-in-one computer system.
It is large in size.	While it is small in size.
It can have multiple internal drives.	It can have limited internal drives.
It is not portable.	While it is easily portable.
It runs only on main power supply.	While it can run on battery, AC supply and main power supply too.
External keyboard and mouse are necessary to work.	Keyboard and mouse are in-built. However external keyboard and mouse also can be used.
It has more powerful processor.	It has less powerful processor except gaming laptops.
It has wide range of screen size.	While the range of screen size in laptops is limited.
The repairing of desktops is easy work as compared to laptops.	While the repairing of laptops is little complex.
Components of desktop can be easily removed.	Components of laptops are not easily removable.
The number of data ports are more in desktops.	The number of data ports are less in laptops.

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### **Laptop Is Plugged In But Not Charging:**

Laptop is plugged in but not charging and suddenly the computer informs that the battery is nearly dead. Once the power is connected, it is may be going good.

- Sometimes, the power cable is plugged in the AC adapter, and still get nothing. No glowing lights, no brightened display, and no "battery charging" icon in the corner.
- There are numerous ways to take care of your battery, but between the wall outlet and your computer there are several things that can fail. Some are easy to fix with a software

tweak or a new battery, but other problems may require a visit to a repair shop, or even a full-blown system replacement.

### Are You Plugged In?



- It sounds silly, but need to make sure the laptop is actually plugged in. This is a major reason a computer may not even start. No software tweak or hardware repair can make a disconnected laptop magically power on.
- Check the AC adapter brick and verify that any removable cords are fully inserted. Next, make sure the battery is properly seated in its compartment, and that there is nothing wrong with either the battery or laptop contact points.
- Finally, find out whether or not the problem even has anything to do with the laptop at all. Try plugging the power cord into a different outlet to see if you've got a short or a blown fuse. If it's plugged into a surge protector or power strip, take it out and plug it directly into the wall.
- At this point, if it still doesn't work, confirmed that it's not just user error causing the problem. There is a real issue with powering the laptop; now it's simply a matter of figuring out where the problem may be. That begins with eliminating where it isn't.

### Most common and easy-to-address issues.

#### Lose the Battery



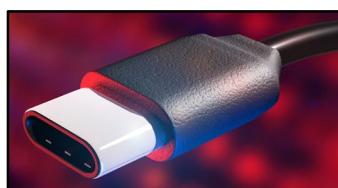
- First, check the integrity of the battery. If your laptop comes with a removable battery, take it out, and hold the power button down for about 15 seconds to drain any residual power from the device. Then, with the battery still removed, plug in the power cable and turn the laptop on.
- If the laptop powers on properly, that means the power adapter is working properly and the problem is likely a bum battery. One can always re-install the battery and try again—maybe the battery was just poorly seated.
- If your laptop doesn't have a visible battery compartment on the bottom, it may be built into the laptop (like most Macs are), and you'll either have to open it up yourself or take it to a repair specialist to test the battery.

### Make Sure You're Using the Right USB-C Port



- USB-C is a popular cross-platform standard for connecting peripherals, transferring data, and charging your battery. The new standard allows for thinner devices, but might also cause some confusion. Some manufacturers have opted to make certain USB-C ports data-only, so they won't charge your device.
- In some cases, you may find a device with two USB-C ports: one that can be used for charging or data transfer, and one that is only designated for data transfer. If you run into a non-charging issue, make sure you are connected to the correct USB-C port. You may even be able to see a little icon on the side that indicates which port is meant for charging.

### Is Your Charger Powerful Enough?



- Similarly, just because a power adapter fits into your laptop's charging port doesn't mean it's powerful enough to charge your computer. This goes for any type of charger, but it's an especially common problem with laptops that charge over USB-C—you can technically plug in any USB-PD charger, but some may have too low a wattage to properly charge.
- Check the wattage of the charger that came with your laptop—if it came with a 45W charger, you'll probably want to stick with a 45W charger (or higher) to power it, and so on. A lower-wattage charger might keep the battery from draining while you use it, but it won't be enough to charge it any higher.
- It is generally recommended sticking with the manufacturer's official charger. Cheap, no-brand chargers can be low quality or even dangerous, so if you have one of those, try charging with the laptop's official charger instead.

### Breaks, Burnouts, and Shorts



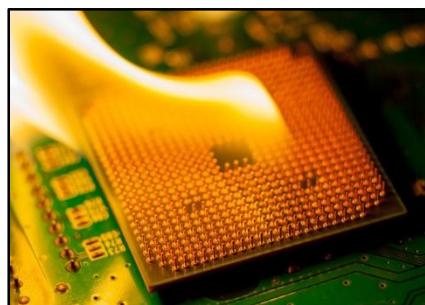
- Feel along the length of the power cord, bending and flexing as you go, to check for any kinks or breaks. Check the ends for any broken connections, such as plugs pulling loose or spots that may have gotten chewed by a pet or caught in a vacuum cleaner.
- Inspect the AC brick. Is it discolored? Are any parts warped or expanded? Give it a sniff—if it smells like burnt plastic, that's likely where the trouble lies. You may need to replace the power connector. Contact the manufacturer and see if they'll send you a new one under warranty.

### Check the Connector



- When you plug in the laptop's power connector, the connection should be fairly solid. If there's dust or other build-up inside the jack, it may not be able to make a clean connection. Try cleaning out the jack with a toothpick, and plugging in again.
- In more extreme cases, you may find the jack is wobbly or loose, or gives when it should stay firm. This could mean the power jack has broken inside the chassis, and you'll need to take your computer to a repair shop (or, if you're comfortable opening it up, doing some at-home repairs).

## Beat the Heat

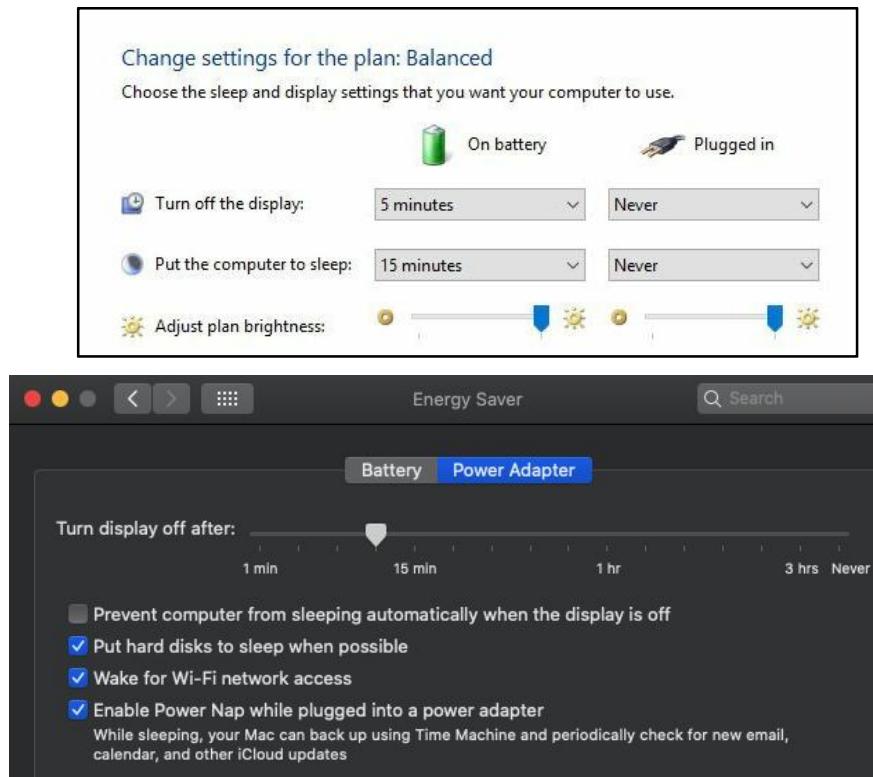


- Batteries are susceptible to heat, so if your laptop is overheating, that could cause a problem. As the temperature rises, the battery sensor may misfire, telling the system that the battery is either fully charged or missing completely, causing the charging problems. You may even find that your system shuts down to prevent overheating a battery and causing a fire.
- These problems become far more likely when dealing with older laptops, which have lower-quality cooling than more modern devices—or if you tend to use the laptop on the couch or in bed, which can block the cooling vents. Turn the system off, give it some time to cool down, and take a moment to make sure the air vents are free of dust and unobstructed by blankets.

## Check Your Settings in Windows

- In Windows 10, open the Start menu and search for "Power & Sleep Settings," then click the **Additional power settings** link. (On older versions of Windows, open the Control Panel and search for "Power Options.") Click **Change Plan Settings** and visually check that all are properly set.

- Be on the lookout for incorrect settings for the battery, display, and sleep options. For example, your battery settings may cause trouble if you set the computer to shut down when the battery level drops too low or set the low battery level at too high a percentage.
- You can also assign actions like sleep and shut down when your lid is closed or the power button is pressed. If these settings have been changed, it's easy to suspect a power malfunction even though there's no physical problem with the battery or charging cable. The easiest way to make sure that your settings aren't causing problems is to restore the power profile to default settings.



- Mac users can open **System Preferences > Energy Saver**, then review your preferences. Mac settings are adjusted with a slider, letting you select the amount of time the computer can sit idle until it goes to sleep. If the interval is too short, you might suspect battery issues when settings are the true culprit.
- Don't forget to check these settings for both battery power and wall power. You may want to revert back to the default settings to see if a change in settings is causing the problem.

## Update Your Drivers



- Open the Start menu and search for "Device Manager." Under **Batteries**, you should see a few items: usually one for the charger and one listed as Microsoft ACPI Compliant Control Method Battery, though there may be others. Right-click each item and choose **Update Driver**.
- Once the drivers are all up to date, reboot the laptop and plug it in again. If this doesn't resolve the problem, you may want to download the latest drivers from the manufacturer's website. You can also try uninstalling Microsoft ACPI Compliant Control Method Battery completely and rebooting, which should prompt Windows to reinstall the driver from scratch.
- On a Mac, you'll need to try resetting the System Management Controller (SMC). For laptops with removable batteries, this is as simple as shutting down power, removing the battery, disconnecting power, and pressing the power button for five seconds. Reinsert the battery, connect power, and fire up the laptop.
- For newer Macs with batteries sealed into the chassis, shut down the computer but leave the power adapter connected. With the power off, press and hold the power button while pressing **Shift + Control + Option** on the left-hand side of the keyboard. Release the keys and power button simultaneously, then attempt to power on the laptop.

## Swap Out the Cord and Battery

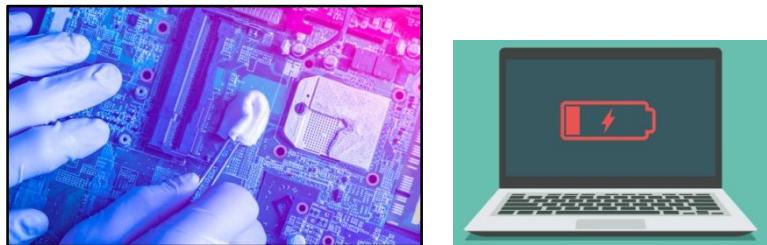
- If the above software tricks don't work, and you aren't able to fix the problem with the parts you have on hand, you may have to buy a new battery or power adapter (which one

will depend on what you were able to narrow down with the above troubleshooting steps).

- You may be able to find a replacement power cable or battery on Amazon, but again, make sure it's a legitimate part from the original manufacturer. Using third-party replacements for the real thing is never recommended, especially when it comes to power.
- Your best bet is to contact the manufacturer directly and order a replacement part, if you can. It will be a little more expensive, but you'll know you're getting a quality component.



### **Problems Inside**



- When all of your options are exhausted—you've tried other power cables and batteries, checked and rechecked your settings, fixed any potential software problems—the problem is likely found inside the machine. This is probably a good time to contact tech support.
- Several internal parts can cause problems when they malfunction or fail. Common culprits include a faulty motherboard, damaged charging circuits, and malfunctioning battery sensors. Your particular make and model of laptop will likely have its own unique issues, and a seasoned tech support operator will have seen all of them.
- The person you talk to will likely walk you through many of the steps outlined above, but will also be aware of software and hardware issues specific to your configuration, such as what bits of hardware commonly fail.

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## What is E-waste and E-waste Recycling?

**E-waste** is short for electronic waste. That is, trash generated from broken, obsolete, and surplus electronic devices.

Typically, these electronics often contain toxic chemicals and hazardous materials. And improper disposing of these electronics can cause the release of toxic substances into our environment.

**E-waste recycling** then refers to the reprocessing and re-use of these electronic wastes. It is simple. It is a process that seeks to recover material from electronic waste.

- These electronic wastes may be in the form of home appliances like your air conditioners, televisions, electric cookers, air condoners, heater, DVDs, fans, microwaves, and radios. They may also be in the form of information tech equipment like your computers, laptops, mobile phones, batteries, hard disks, circuit boards, monitors.
- E-waste is quite crucial because electronics have a short useful life. As such, they become electronic waste at a swift pace.
- E-waste recycling is important to reduce environmental hazards and pollution. There is also the fact that it can protect our lives as humans and other life forms existing in our world. E-waste recycling is the reuse and reprocessing of electrical and electronic equipment of any type that has been discarded or regarded as obsolete.
- Recycling of e-waste is a growing trend and was initiated to protect human and environmental health mainly due to the widespread environmental pollution impacts of e-waste.
- Only 12.5% of e-waste is recycled.

### Components of E-waste that Can be Recycled

Plastic, Metal, Glass, Mercury, Circuit Boards, Hard Disk, Toner and Ink Cartridges, Batteries

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### Step-by-Step Process of E-waste Recycling

This is because e-scaps are typically sophisticated and manufactured from diverse elements such as metals, plastics, and glass. While this process often varies, there is a general process.

**Step 1: Collecting and Transporting:** This is the first stage of recycling e-waste. Here, recyclers place take-back booths or collection bins in specific places. When these bins get filled, the recyclers then transport the e-wastes to recycling facilities and plants.

**Step 2: Shredding and Sorting:** After collecting and transporting, the next step is to shred and sort the e-waste. The success of subsequent separation relies on shredding. And this is why efficiency is essential at this stage.

Shredding involves breaking e-waste into smaller pieces for proper sorting. With the use of hands, these tiny pieces get sorted and then manually dismantled. This is typically labor-intensive as waste items are, at this stage, separated to retrieve different parts.

After this, the materials get categorized into core materials and components. Then, these items get sorted into various categories. Typically, these category includes items that you can re-use as they are and those that require further recycling processes.

In any case, e-wastes are often manually sorted, while compounds such as fluorescent light, batteries, UPS batteries, and toner cartridges should not be crushed or shredded by hand.

**Step 3: Dust Extraction:** The tiny waste particles get smoothly spread via a shaking process on the conveyor belt. The smoothly spread e-waste pieces then get broken down even further. At this point, the dust gets extracted and discarded in an environmentally compliant manner. This way, there is no environmental degradation.

**Step 4: Magnetic Separation:** After this, a strong overhead magnet helps you separate steel and iron from other wastes. This way, you have successfully recycled the steel from the waste stream.

However, some mechanical processes may sometimes be required to separate circuit board, copper, and aluminum from other wastes particles. And this is especially where they are mostly plastic.

**Step 5: Water Separation:** After this, water separation tech becomes relevant to separate the glass from the plastic. You can then send leads that contain glass to smelters to use in the production of batteries, x-ray tubes, and new CRTs.

**Step 6: Purification of Waste Stream:** The next thing is locating and extracting leftover metals from plastics to purify the waste stream further.

**Step 7: Preparing Recycled Materials For Sale:** The final stage is preparing recycled materials for sale. Here, the materials separated during SSS get prepared for sale as raw materials to produce new electronics.



### **Benefits of E-waste Recycling**

#### **1. E-waste Recycling Helps to Conserve Available Natural Resources**

E-waste recycling helps recover valuable materials from electronic products that are either old or no longer used. In turn, this saves and conserves natural resources.

This is because manufacturers can now obtain raw materials from recycled waste. Consequently, there is less need to go to earth for raw materials.

So, yes, there is less need to get copper or lead or metal from mother nature. You will need to remember that these materials are not inexhaustible to realize how much good this represents.

#### **2. It Prioritizes Environmental Protection**

As you may have observed from the processes explained above, e-waste recycling prioritizes environmental protection. It seeks to prioritize properly handling, processing and managing hazardous and toxic substances such as lead, mercury, and cadmium. All substances you may find in your e-waste stream.

As you have read, as one of the sub-steps of e-waste processing, any dust sorted from shredded particles must be disposed of in an environmentally friendly manner. This way, the hazards that these elements usually pose to our environment get substantially reduced, thanks to e-waste recycling.

### **3. Creates Jobs**

E-waste recycling is creating new jobs for persons such as professional recyclers. What's more is that, by so doing, it has created a secondary market where recycled materials are the primary commodity.

The Environmental Protection Agency released findings that show the magnitude of economic benefits that comes from e-waste recycling. Guess what. This even beats the results derived at the REI Study earlier in 2016.

In a year, the US's recycling activities provided 757,000 jobs, \$6.7 billion tax revenues, and \$36.6 billion as wages.

By implication, for every thousand tons you recycle, there's 1.57 job created, \$ 76,000 wages paid, and \$ 14,101 tax revenues. It seems like a lot of benefit coming from trash, right? But there's more.

For a million laptops you recycle, you will have saved the equivalent of electric power capable of running 3657 households for one year. More, for a million cell phones, you can recover gold weighing 75 pounds, silver of 772 pounds, copper of 35,274 pounds, and palladium of 33 pounds. Amazing, right?

### **4. Saves Landfills and Reduces Global Warming**

Usually, uncollected e-wastes get dumped at incinerators and landfills. By recycling e-waste, we are reducing the amount of e-wastes piling up at these places.

This is because two-thirds of waste on landfills are biodegradable and capable of breaking down and returning to their natural elements. As these wastes break down and decompose, they produce harmful gases (Methane and CO<sub>2</sub>) – greenhouse gases – which heavily contribute to global warming.

Since landfills also pollute the water and soil in our local environment, activities like e-waste recycling, which seek to reduce these environmental concerns are not merely beneficial, but also life-saving.

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