

Module: - 01

Class: - 01: OHS

❑ **Introducing Part: -** On the First day of Class, Everyone will introduce themselves.

❑ **Occupational Health and Safety (OHS):**

OHS is a planned system of working to prevent illness and injury where you work by recognizing and identifying hazards and risks. Health and safety procedure is the responsibility of all persons in the computer and technology industries. You must identify the hazards where you are working and decide how dangerous they are. This Module is intended to give you some guidelines and advice on common areas of health and safety problems in the computer industry and to help you gain a general awareness of your responsibilities as a user and technician in a safe environment.

There are different types of hazards, so we need to take steps to manage workplace health and safety.

❑ **Physical Hazards: -**

One of the most common physical hazards involving computers is cables running across the floor. If some trips fall and hurt themselves because of cables you run across the floor. Someone has a serious legal negligence problem. If you need to temporarily run a cable across the floor, place a Danger sign similar to those "wet floor" signs used by cleaning services.

It comes in a wide range of colors, from unobtrusive matte black to hazard warning red. Although it has a strong adhesive, it can be removed easily and cleanly. A wide variety of cable organizing devices like cable ties, cable wraps, and cable raceways can run cable safely along the wall or ceiling for long-term cable routing.

❑ **Mechanical Hazards: -**

You might move your hand past a computer chassis and lose a chunk of flesh because it is razor-sharp. When working on electronic equipment always be alert to any possibility of being hurt by moving parts, hot components, or sharp edges.

❑ **Electric Shock Hazard: -**

Inside computers and electronic equipment, there is a range of voltages from 3.3 volts to 25 volts, most of which are harmless. But at the power supply, you'll find line voltage, which is a lethal 220 volts. Most of the time while working inside computers and electronic equipment, you'll want them unplugged from the wall socket. Remove all jewelry and wristwatches if you need to work on equipment while it is still plugged in or powered up. If you must work inside a line power distribution box, wear an electrician's rubber insulated gloves and safety glasses.

❑ Chemical Hazards: -

There is a wide array of chemicals used with electronic equipment. There are display cleaning chemicals, keyboard cleaning chemicals, compressed gas dirt and dust removers, and many cleaning solvents. Some of these chemicals can be harmful if accidentally swallowed, on bare skin, or in the eyes. Before using any chemicals for electronic equipment always read the warnings and instructions on the label. Also be very careful when dealing with inkjet printer cartridges, or laser printer toner cartridges. Ink and toner can stain skin, clothing, and carpet.

❑ Basic Computer Knowledge:

❖ Definition Of Computer: -

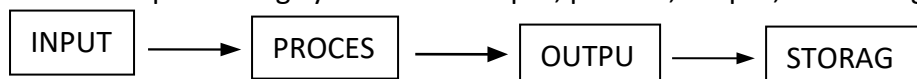
A Computer is an electronic device, operating under the control of instructions stored in its memory, that can accept data, process the data according to specified rules, produce results, and store the results for future use. In other words, a computer can generally be defined as an electronic device that does computation and makes logical decisions according to the instructions and data are given to it. Thus, the phrase “garbage-in-garbage-out.”

❖ Data And Information: -

Computers process data into information. Data can be defined as a collection of unprocessed items or files, which can take text, numbers, images, audio, and video. Information can also be defined as processed or refined data items which convey meaning and is useful to people. Many daily activities either involve the use of or depend on information from a computer.

❖ Information Processing Cycle: -

Computers process data (input) into information (output). Computers carry out processes using instructions, which are the steps that tell the computer how to perform a particular task. A collection of related instructions organized for a common purpose is referred to as Software. A computer often holds data, information, and instructions in storage for future use. Some people refer to the information processing cycle series of input, process, output, and storage activities.



❖ CHARACTERISTICS OF COMPUTER: -

- **SPEED:** The computer can process information many thousand times faster than the human brain. What could take a man some hours to accomplish may take a computer a few seconds
- **ACCURACY:** The probability of error is slim, in most cases, errors output is a result of input by the computer or programmer. Thus, the saying “garbage in garbage out”.
- **DURABILITY:** The computer lasts more than a lifetime. Computers designed and built in the 80s are still functioning today.

- **AUTOMATIC:** Human supervision is usually required for a lot of work processes. The computer does not require human supervision to function.
- **VERSATILITY:** The use of computers is no longer limited to educationists and military operations. Every imaginable profession and business use.
- **LIMITATIONS:** The Computer has some very serious limitations. It is incapable of thought, lacks initiative, and cannot react to unforeseen (un-programmed) events. With the right criteria. It will carry out a deadly function accurately. Where it should produce incremental results and input data has an error, the subsequent incremental output will be hugely erroneous and may have fatal consequences.

❑ **Computer Classification: -**

01. Classification Based on Size
02. Classification Based on Types

❑ **Classification Based on Size:**

Main-frame or Supercomputer: This is the biggest in both size and capacity. It supports many users at a time, committed via a terminal monitor and keyboard. It is very expensive and consumes electric power.

01. **Mini-computer:** This is bigger than the microcomputer and it supports more than one user. It's a bit expensive and used mostly on computers.
02. **Micro-computer:** This computer is the smallest in size it has a very high speed and consumes less electric power, it's made up of microchips and it is a less expensive micro-computer support single-use e.g. (PC or Desktop computer).

❑ **Classification Based on Types:**

01. **Analogue Computer:** It is a computer, which operates on continuous data (data obtained by measurement), usually of physical quantities such as electrical potential, fluid pressures, or mechanical motion. An Analog computer is usually a special purpose computer dedicated to a single task.
02. **Digital Computer:** This is a computer, which operates on discrete data (obtained by counting), by manipulating combinations of binary digits it can perform mathematical calculations, organize and analyze data, control industrial and other processes and simulate dynamic systems.
03. **Hybrid computer:** This is a computer that combines the feature of both Analogue and digital.

Module: - 01

Class: - 02: Basic Tools and Components of a Computer

❑ Basic Tools and Components of a Computer: -

A computer contains many electric, electronic and mechanical components known as hardware. These components include input devices, output devices, a system unit, storage devices, and communications devices. And also, the invisible parts control the computer system's workability. The computer system is classified basically into two major parts:

01. Hardware,

02. Software.

❑ HARDWARE:

Hardware is the physical component of the computer system which you can touch. They are interconnected with cables of various shapes and sizes to facilitate data flow. An example of a piece of hardware is the system unit i.e., the box which houses the central processing unit (CPU) others are a printer, scanner, speaker, mouse, keyboard, etc.

The Primary Components of Computer Hardware are,

01. Input devices/Output devices,

02. Central Processing Unit (CPU),

03. Storage devices,

04. Memory.

At the end of this lesson, we are expected to do the following:

01. Proper Use of Hardware tools.

02. Use appropriate hand tools and test equipment and,

03. Maintain hand tools.

❑ HARDWARE TOOLS: -

To complete hardware repairs, it is important to have a toolkit that should contain all of the necessary tools. As you gain experience, you will learn which tools to have available for different types of jobs.

Hardware tools are grouped into these three categories:

01. Hand tools.

02. Cleaning tools.

03. Diagnostic tools.

❑ Hand Tools:

A hand tool is a device for performing work on a material or a physical system using only hands.

Examples:

- ✓ Flat Screwdriver – used to loosen or tighten slotted screws.
- ✓ Star screwdriver - used to loosen or tighten screws that have a star-like depression on the top, a feature that is mainly found on the laptop.
- ✓ A Hex driver –sometimes called a nut driver, is used to tighten nuts in the same way that a screwdriver tightens screws.
- ✓ Needle-nose plier –used to hold small parts.
- ✓ Wire Cutter –used to strip and cut wires.
- ✓ Tweezers –used to manipulate small parts.

□ Cleaning Tools:

Having the appropriate cleaning tools is essential when maintaining or repairing computers. Using these tools ensures that computer components are not damaged during cleaning.

Examples:

- ✓ Lint-free cloth – used to clean different computer components without scratching or leaving debris.
- ✓ Compressed air –is used to blow away dust and debris from different computer parts without touching the components.
- ✓ Cable ties – used to bundle cables neatly inside and outside of a computer.

□ Diagnostic Tools:

Computers are easier to use and more dependable with each new generation of hardware and operating system update, but that doesn't mean they're problem-free. Here are the most popular tools for diagnosing your computer problems.

Examples:

- ✓ Multi-meter –used to test the integrity of circuits and the quality of electricity in computer components.
- ✓ Adapter – used to test the functionality of computer ports.

Module: 01

Class: - 03: TOOL AND EQUIPMENT MAINTENANCE

❑ Proper Use of Hand Tools:

A technician needs to be able to properly use each tool in the toolkit. This topic covers many of the various hand tools used when repairing computers.

❑ Screw Driver: -

Match each screw with the proper screwdriver. Place the tip of the screwdriver on the head of the screw. Turn the screwdriver clockwise to tighten the screw and counterclockwise to loosen the screw. Screws can become stripped if you over-tighten them with a screwdriver. A stripped screw may get stuck in the screw hole, or it may not tighten firmly. Discard stripped screws.

❑ Flat Screw Driver: -

Use a flat-head screwdriver when you are working with a slotted screw. Do not use a flat head screwdriver to remove a Phillips head screw. Never use a screwdriver as a pry bar. If you cannot remove a component, check to see if there is a clip or latch that is securing the component in place.

❑ Star Tipped Screw Driver: -

This is also a commonly used tool, mainly used on the Macintosh brand, though also common on Dell, and Alien ware. If you do not have access to one of these, you can purchase one from your local Auto Parts Store (ask the clerk for assistance in locating one) and you will need the multiple tip pack to allow different sizes for different laptop models.

❑ T8 Screw Driver: -

A T8 Security screwdriver allows you to safely remove or tighten a T8 screw. These Torx T8 screws are one of the most popular sizes and are used on everything from bikes to electrical equipment. While it is sometimes possible to use a flat blade screwdriver to remove these, it's really not advisable. It can easily strip the head of the screw, and any slippages can be dangerous and painful. It's also not a good idea to drill these screws out since it creates mess and is also time-consuming to do. It's much better to get the right tool for the job.



❑ Allen key set: -

Also known as a hex key, an Allen key is an L-shaped tool that's used for the installation and removal of fasteners with



a hexagonal head. They consist of a single piece of material, typically metal, that's formed into a right angle. Both ends of an Allen key are hexagonal. Therefore, you can use either end to install or remove a fastener, assuming it fits.

❑ **Mini Adjustable Pliers: -**

This is a less commonly used tool, though it will be needed at times. I will rarely use this on a DC Jack repair to gently wiggle the jack loose from the de-soldered contact pads. You will find other uses for this tool, which is a good tool to add to your collection.

❑ **Mini Cutting Pliers: -**

I suggest that you buy mini needle-nosed pliers because they are easier to use on the micro-sized components that make up the laptop. The pliers I use are 3 inches long, I find that the normal-sized pliers are way too big and do not reach into certain areas that the mini can.

❑ **Mini Nose Pliers: -**

Their namesake long nose gives excellent control while the cutting edge near the pliers' joint provides "one-tool" convenience. Because of their long shape, they are useful for reaching into small areas where cables or other materials have become stuck or unreachable with fingers.

❑ **Soldering Iron: -**

You can use any brand of these and they are typically disposable. I recommend that you do dispose of the cheaper soldering irons after 10 or so uses or get yourself some Thinner to refresh the tip. I do recommend a 500/600-watt iron for laptop repair.


❑ **D-Soldering Pump / Soldering Sucker: -**

A De-Soldering pump is known as a solder sucker. This manually-operated device is used to remove solder from a printed circuit board.

- **Soldering Lead: -** The average Rosin Core Solder will get you 1.0mm solder, any thicker, and it will apply too heavily.
- **Soldering Wick: -** Soldering "wick" is a pre-fluxed copper braid that is used to remove solder, which allows components to be replaced and excess solder to be removed

- ❑ **AVO Meter/Multi-meter: -** This can be bought at your local Home Improvement store, and you will find a wide variety of quality choices. For a beginner, it is ok to purchase the cheapest multi-meter to learn its uses and familiarize yourself with it.

- ❑ **Hot Gun: -** The better the quality the better the final_results of your repairs will be. On average, you want to use at least a heat gun with switchable settings. One that will produce a temperature of 700 to 800 degrees

- ❑ **Brush:** - Believe it or not, the Tool brush is the second tool in Laptop Repair. Yes. A toothbrush you will use on every laptop you repair. Why do you ask? The toothbrush is used to clean any parts and components in and on the laptop. Cleaning the laptop parts as you repair them is detrimental to the longevity of the laptop's life. It is used to clean the keyboard, the motherboard, and any case part. There are Different sizes of brushes we are used for cleaning.
- 
- ❑ **Scissors:** - The smaller the better when obtaining your scissors. I use haircutting scissors because they are small and the cutting tips are thin and narrow.
 - ❑ **Masking Tape:** - This is used to wrap cables and wires and used to secure or flatten wire or cable tracks on or in the laptop. I try not to use this on wire or cable wrapping if possible because I have found that over time the tape will slowly unravel and can become Sticky on the outer side.
 - ❑ **Circuit Board Cleaning Solution:** - WD40/Thinner This solvent is used to clean the motherboard, and I will clarify its uses throughout this book. WD40 is more readily available to purchase and can suffice. Again, I will also explain how to properly use WD40 to clean components/remove flux, and so forth.
 - ❑ **Hex driver:** - Use a hex driver to loosen and tighten bolts that have a hexagonal (six-sided) head. Hex bolts should not be over-tightened because the threads of the bolts can be stripped. Do not use a hex driver that is too large for the bolt that you are using.
 - ❑ **DC Power Supply:** - A DC power supply supplies a constant DC voltage to its load. Depending on its design, a DC power supply may be powered from a DC source or an AC source such as the power mains.
 - ❑ **BGA Machine:** - Basic Description This BGA machine is widely used in applications such as motherboard, LED lighting products, power supply PCB board repair, and rework. Equipped with a 3-zone of independently heating system, it has a temperature control accuracy within one degree Celsius.



☐ **TOOL AND EQUIPMENT MAINTENANCE:**

All tools and equipment must be properly maintained so that workers are not endangered. Regulations require inspections of tools, machines, and equipment before use. Preventive maintenance is the systematic care and protection of tools, equipment, and machines to keep them in a safe, usable condition, limit downtime and extend productivity. We must always be aware that maintenance tasks themselves are potentially hazardous and can result in injury.

The successful maintenance program is:

- Well organized and scheduled,
- Controls hazards,
- Defines operational procedures, and
- Trains key personnel.

☐ **Benefits:**

- Tools and parts are kept in good condition and are easy to find.
- Costs are reduced.
- Productivity is increased because time is not wasted looking for tools, parts, and equipment.

Module: 02

Class: - 01: Different types of Computer Servicing Tools & Components

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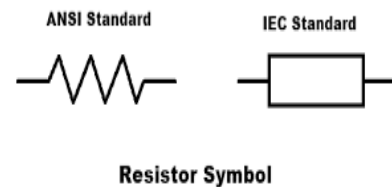
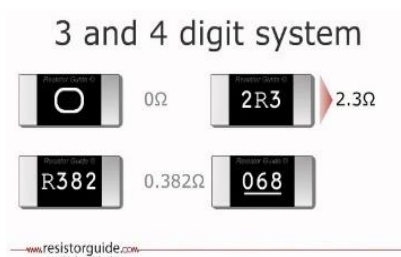
Module: 02

Class: - 02: Different types of Computer MB Servicing Components

❑ Resistor: -

A resistor is an electrical component that limits or regulates the flow of electrical current in an electronic circuit. Resistors can also be used to provide a specific voltage for an active device such as a transistor

❑ Symbol of Resistor



Different Types of Resistors are shown below

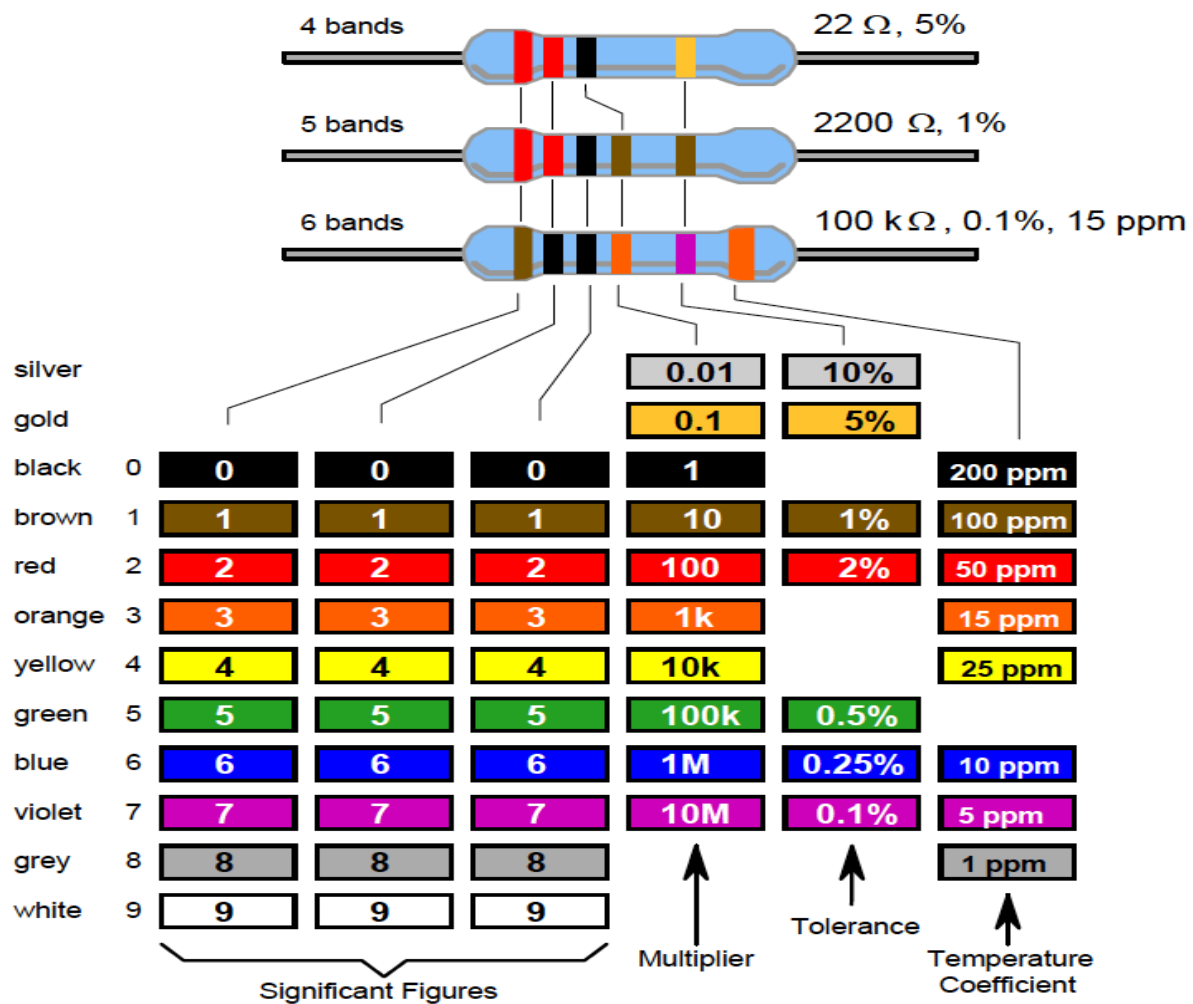
- ✓ Wire wound resistors.
- ✓ Metal film resistors.
- ✓ Thick film and Thin-film resistors.
- ✓ Network and Surface Mount Resistors.
- ✓ Variable Resistors.
- ✓ Special Types of Resistors.

❑ Color Coding of Resistor: -

Generally, a number equivalent to a three-band color code is written on a resistor. Like resistors of a normal terminal, a 4-digit code is provided to denominate tolerance. The First 2 or 3 digits denote the first two or three digits of values of the resistor and the third or last digit represents the number of zero. R is written before or after the value to denote the position of the decimal point in the resistor below the 100hm value. Components and wires are coded with colors to identify their value and function Resistor Colour code uses color bands to quickly identify a resistors resistive value and its percentage of tolerance with the physical size of the resistor

indicating its wattage rating but when a resistor is smaller (Example: ¼ Watt carbon or film type), the print is too small to read, so the specifications must be shown in another way. The resistor color codes can be remembered with the help of the mnemonic device “**BB ROY Good Boy Very Good Worker**,” the capital letters represent the first letters of the colors and their positions in the digit values.

❑ The List of Resistor Colour Code: -



Color	Digit	Multiplier	Tolerance (%)
Black	0	$10^0(1)$	
Brown	1	10^1	1
Red	2	10^2	2
Orange	3	10^3	
Yellow	4	10^4	

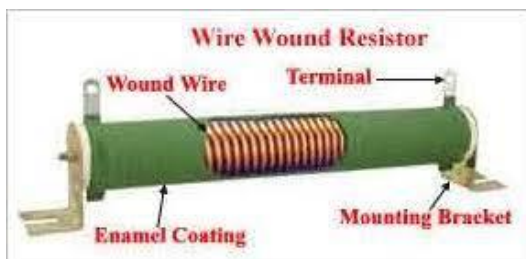
Color	Digit	Multiplier	Tolerance (%)
Green	5	10^5	0.5
Blue	6	10^6	0.25
Violet	7	10^7	0.1
Grey	8	10^8	
White	9	10^9	
Gold		10^{-1}	5
Silver		10^{-2}	10
(none)			20

Module: 02

Class: - 03: Different types of Computer MB Servicing Components

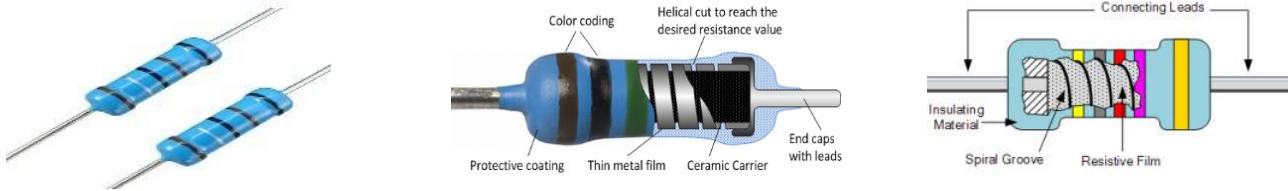
☐ Wire-wound Resistors: -

These resistors vary in physical appearance and size. These wire-wound resistors are commonly a length of wires usually made of an alloy such as nickel-chromium or copper-nickel manganese alloy. These resistors are the oldest type of resistors having excellent properties like high power ratings and low resistive values. During their use, these resistors can become very hot, and for this reason, they are housed in a finned metal case.



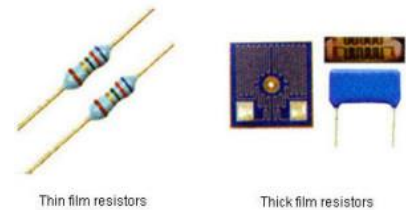
☐ Metal Film Resistors: -

These resistors are made from metal oxide or small rods of ceramic-coated metal. These are similar to carbon-film resistors and their resistivity is controlled by the thickness of the coating layer. The properties like reliability, accuracy, and stability are considerably better for these resistors. These resistors can be obtained in a wide range of resistance values (from a few ohms to millions of ohms).



❑ Thick Film and Thin Film Types of Resistors: -

Thin film resistors are made by sputtering some resistive material onto an insulating substrate (a method of vacuum deposition) and are therefore more expensive than thick film resistors. The resistive element for these resistors is approximately 1000 angstroms. Thin-film resistors have better temperature coefficients, lower capacitance, low parasitic inductance, and low noise. These resistors are preferred for microwave active and passive power components such as microwave power terminations, microwave power resistors, and microwave power attenuators. These are mostly used for applications that require high accuracy and high stability.



Usually, thick film resistors are made by mixing ceramics with powdered resistive materials. These films have tolerances ranging from 1 to 2%, and a temperature coefficient between +200 or +250 and -200 or -250. These are widely available as low-cost resistors and compared with the thin film, the thick film resistive element is thousands of times thicker.

❑ Surface Mount Resistors: -

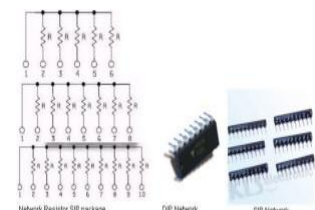
Surface-mount resistors come in a variety of package sizes and shapes agreed by the EIA (Electronics Industry Alliance). These are made by depositing a film of resistive material and don't have enough space for color-coded bands owing to their small size.



The tolerance may be as low as 0.02% and consists of 3 or 4 letters as an indication. The smallest size of the 0201 packages is a tiny 0.60mm x 0.30mm resistor and this three-number code works similarly to the color code bands on wire-ended resistors.

❑ Network Resistors: -

Network resistors are a combination of resistances that give identical values to all pins. These resistors are available in dual inline and single inline packages. Network resistors are commonly used in applications such as ADC (Analog to digital converters) and DAC, pull up or pull down.



❑ Variable Resistors: -

The most commonly used types of variable resistors are potentiometers and pre-sets. These resistors consist of a fixed value of resistance between two



terminals and are mostly used for setting the sensitivity of sensors and voltage division. A wiper (moving part of the potentiometer) changes the resistance that can be rotated with the help of a screwdriver.

These resistors have three tabs, in which the wiper is the middle tab that acts as a voltage divider when all the tabs are used. When the middle tab is used along with the other tab, it becomes a rheostat or variable resistor. When only the side tabs are used, then it behaves as a fixed resistor. Different Types of Variable Resistors are potentiometers, rheostats, and digital resistors.

❑ **Special Types of Resistors: -**

These are classified into two types:

01. Thermistors,
02. Light-Dependent Resistors (LDR)

❑ **Light-Dependent Resistors (LDR): -**

Light-dependent resistors are very useful in different electronic circuits, especially in clocks, alarms, and street lights. When the resistor is in darkness, its resistance is very high (1 Mega Ohm) while in light, the resistance falls to a few kilo Ohms. These resistors come in different shapes and colors. Depending on the ambient light, these resistors are used to turn 'on' or turn 'off' devices.



And there are many resistors such as

- Fixed Resistors,
- Magneto-resistors,
- Film Type Resistor,
- Carbon Film Resistor,
- Carbon Composition Resistor etc.

The two things which need to keep in mind while using a resistor

01. Power Dissipation as well as,
02. Temperature Coefficients.

❑ **Power Dissipation: -**

When selecting a resistor, power dissipation plays a key role. Always choose a resistor that has less power rating as compared with what you placed through it. So, select a resistor with a power rating of a minimum of two times high.

❑ **Temperature Co-efficients:-**

The most important thing to keep in mind while using resistors is, that it is used with high temperatures otherwise high currents as the resistance flows drastically. The temperature

coefficient of the resistor is two types Negative Temperature coefficient (NTC) & Positive temperature Temperature (PTC). For a negative temperature coefficient, when the temperature around the resistor increases then the resistance will decrease for the resistor. For a positive temperature coefficient, the resistance will increase once the temperature around the resistor increases. So, the same principle also works for some sensors like Thermistors for measuring temperature.

Module: -03

Class: - 01: Different types of Computer MB Servicing Components

☐ SMD Resistor: -

An SMD resistor is a type of resistor that has been designed to be surface mounted. The SMD part of “SMD Resistor” stands for Surface Mounted Device. An SMD is an electronic component that can be mounted directly to a PCB circuit board by using “Surface Mount Technology” (SMT).



☐ Different Types of SMD Resistors: -

- ☐ **Network Resistor:** A combination of more than one resistor group is called a network resistor. They are made in a single package.
- ☐ **Chip Jumper (Zero Ohm) Type Resistor:** This type of chip resistor is used as a jumper in mobile phones.
- ☐ **Thermistor-Type Resistor:** The rating of this type of resistor depends on temperature. It is black on all sides. These resistors are of two types – NTC Thermistor (Negative Temperature Co-efficient type Thermistor) and PTC Thermistor (Positive Temperature (Co-efficient type Thermistor).
- ☐ **LDR (Light Dependent Resistor):** This resistance is dependent upon light. Resistance of an LDR may be several mega Ohms in dark but is reduced to a few Ohms under the light.
- ☐ **SMD Resistor Calculating Formula: -**

Let's the code on SMD resistor be XYZ then, the usual formula to calculate the value of surface mount resistor code,

NOW,



100=?

HERE WE KNOW

$$XYZ \rightarrow XY \times 10^Z$$

$$\rightarrow XY \times 10^Z \Omega$$

Here, X=1(1st digit in the code)

Y = 0 (2nd digit)

Z = 0 (3rd multiplier digit in the code)

Now, 100 $\rightarrow 10 \times 10^0$
 $\rightarrow 10 \times 1\Omega$
 $\rightarrow 10\Omega$

The following examples:

- Code: 330 = 33 Ohm
- Code: 221 = 220 Ohm
- Code: 683 = 68000 Ohm or 68 K Ohm
- Code: 105 = 10,00000 Ohm or 1 M Ohm
- Code: 8R2 = 8.2 Ohm
- Code: 1000 = 100 Ohm
- Code: 4992 = 49900 Ohm or 49.9 K Ohm
- Code: 16234 = 162000 or 162 K Ohm

Module: - 03

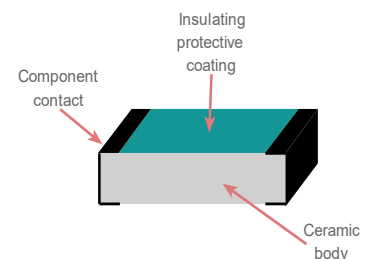
Class: - 02: Different types of Computer Components

□ How Do I Know SMD Resistor? :-

Standard-tolerance SMD resistors are marked with a simple 3-digit code. The first two numbers will indicate the significant digits, and the third will be the multiplier, telling you the power of ten to which the two significant digits must be multiplied (or how many zeros to add).

□ What are SMD Resistors Use for: -

SMD resistors are just one form of component that uses surface mount technology. This form of component technology has now become commonplace for manufacturing electronic equipment as it enables much faster and more reliable construction of electronic printed circuit boards.



□ The Size of SMD resistors: -

The size of SMD resistors is indicated by a numerical code, such as 0603. This code contains the width and height of the package. So, the imperial code 0603 indicates a length of 0.060" and a width of 0.030". The SMD package code can be given in either imperial or metric units.

❑ How to Know If Resistors Are Good or Bad:

Before testing a resistor to see if it's good or bad, you must know its value. Resistors decrease the current flowing through a circuit. Each is made to work under a limited load, with the ability to decrease a specific amount of current. The bands around the components indicate resistor values with a color code. Determine the value of a resistor and then test it to see if it meets that standard. Now.

Step: -01

Turn off the power running through the circuit containing the resistor you need to test. Exhaust the stored power from any capacitors in the circuit by touching both capacitor terminals with the metal blade of an insulated screwdriver to sort out the power.

Step: -02

Look at the color bands around the barrels of the components for the code to determine resistor values. The bands grouped close together represent numbers with the last one being a multiplier. The band slightly separated indicates a tolerance variable. Consult an electronics catalog or use the link in the resources section and click on the resistor color chart to determine the numeric value for each color.

Step: -03

Check resistor values with the color codes. A resistor with red, green, and black bands followed by a yellow multiplier band and a silver tolerance band would indicate 2, 5, and 0, or 250 multiplied by 10,000, which equals 2,500,000. The reading could vary by 10%, plus or minus 250,000.

Step: -04

Remove one end of the resistor from the circuit board to get an accurate reading. Use a soldering iron to melt the solder, holding one end of the resistor. Pull that end up until it is no longer in contact with the board.

Step: -05

Set a digital Multi Meter for "ohms." Set an ohm's range that is equal to or higher than the value of the resistor to be tested. Touch the red lead from the meter to one side, and the black lead to the other. Resistors do not hold a polarity, so it doesn't matter which side gets the red or black lead. Check the reading to determine if the resistor is good. The two-and-a-half million value resistor is good if the meter reads between 2,250,000 and 2,750,000 due to the silver tolerance band figure of plus or minus 10 percent.

❑ How to Check an SMD Resistor with a Multi-meter: -

If the value of a resistor to be checked is 100 Ohm, then place probes of the Multi-meter at both the soldering tips of the resistor and a select knob of the Multi-meter at 200 Ohm. The value of

the resistor is displayed on the display screen of the multi-meter. If only 1 is displayed on the screen, then it means that the resistor is OPEN and if the reading is too high then it means that the resistor is out of order or it is faulty. Resistors do not get shorted. The value of a resistor is considered OK within its tolerance limit.

❑ Identify SMD Resistor and Capacitor: -

- Surface Mount Device (SMD) resistors are marked with their value (except maybe the smallest cases).
- SMD capacitors are never marked with their value.

Module: - 03

Class: - 03: Different types of Computer Components

❑ Capacitor: -

The capacitor is an electric component that can store energy in the form of electrical charges that creates a potential difference, which is a static voltage, much like a small rechargeable battery.

Symbol of Capacitor



❑ Capacitance

The capacitance is the ratio of electric charge (Q) to the voltage (V) and the mathematical expansion is as follows $C = Q/V$

Where,

- ✓ Q is the electric charge in coulombs
- ✓ C is the capacitance in farad
- ✓ V is the voltage between the plates in volts

❑ Different Types of Capacitors:

There are mainly two types of capacitors

01. Polarity Capacitor,
02. Non-Polarity Capacitor.

❑ Polarity Capacitor: -

Polarized capacitors are used mainly in power supplies to filter out the ripple voltage just after the rectifier diodes.

❑ Non-Polarity Capacitor:

A non-polarized capacitor can be connected either way. They are mainly used for signal coupling purposes to isolate an AC voltage riding on a DC level to just an AC voltage with no DC.

And also, there are different types shown below

- Electrolytic Capacitor.
- Mica Capacitor.
- Paper Capacitor.
- Film Capacitor.
- Ceramic Capacitor.

❑ Electrolytic Capacitor: -

Generally, electrolyte capacitors are used when large capacitor values are required. The thin metal film layer is used for one electrode and for the second electrode (cathode) a semi-liquid electrolyte solution which is in jelly or paste is used. The dielectric plate is a thin layer of oxide, it is developed electrochemically in production with the thickness of the film and is less than ten microns.



❑ Mica Capacitor: -

This capacitor is a group of natural minerals and the silver mica capacitors use the dielectric. There are two types of mica capacitors clamped capacitors & silver mica capacitors. Clamped mica capacitors are considered obsolete because of their inferior characteristic. The silver mica capacitors are prepared by sandwiching a mica sheet coated with metal on both sides and this assembly is then encased in epoxy to protect the environment. The mica capacitors used in the design call for a stable, reliable capacitor of relatively small.



❑ Paper Capacitor: -

The construction of the paper capacitor is between the two tinfoil sheets and they are separated from the paper, or, oiled paper & thin waxed. The sandwich of the thin foils and papers is then rolled into a cylindrical shape and then it is enclosed into the plastic capsule. The two thin foils of the paper capacitors attach to the external load.



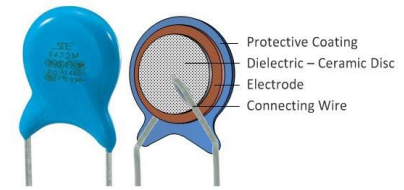
❑ Film Capacitor: -

The film capacitors are also capacitors and they use a thin plastic as the dielectric. The film capacitor is prepared extremely thin using the sophisticated film drawing process. If the film is

manufactured, it may be metalized depending on the properties of a capacitor. To protect from the environmental factor the electrodes are added and they are assembled.

❑ Ceramic Capacitor: -

The ceramic capacitors are the capacitors and use the ceramic material as a dielectric. Ceramics are one of the first materials to use in the production of capacitors as an insulator.

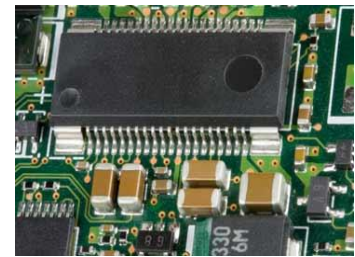


❑ Used Of Capacitor: -

Capacitors are useful to reduce voltage pulsation. When the high voltage is applied to the parallel circuit, the capacitor is charged, and on the other hand, it is discharged with the low voltage. To deal with this, a capacitor is used to correct the ripples and keep the voltage constant.

❑ SMD or SMT Surface Mount Capacitors: -

SMD or SMT surface mount capacitors are used in high volume manufacture - quantities used are numbered in the billions. They are small, leadless, and can be placed onto modern printed circuit boards using pick-and-place machines used in modern manufacturing.



❑ Working Principle of SMD Capacitor: -

You can solder SMD components either using a soldering iron or using a shotgun. To solder with a Hot Gun, you place solder paste onto the pads before you place the components. Then you use your hot gun to place components, which melts the solder paste and fastens the components. The difference between SMD and SMT is that SMD (surface mount device) refers to an electronic component that is mounted on a PCB. In contrast, SMT (surface mount technology) relates to the method used to place electronic components on a printed circuit board.

➤ Types Of SMD: -

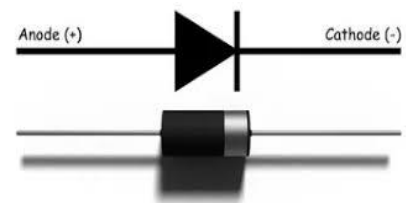
- Small outline integrated circuit (SOIC),
- Small outline package (SOP),
- Quad flat pack (QFP),
- Plastic leaded chip carrier (PLCC),
- Ball grid array (BGA).

Module: - 04

Class: -01: Different types of Computer MB Components

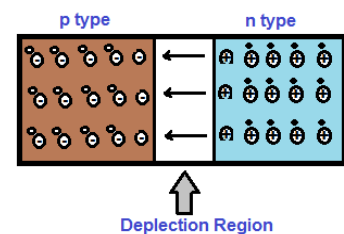
☐ Diode: -

The definition of a diode is an electronic device with two transmitting terminals that allow an electric current to flow in one direction while blocking current in the opposite direction. An example of a diode is a light-emitting diode, an LED. A diode is an electrical component that allows the flow of current in only one direction. In-circuit diagrams, a diode is represented by a triangle with a line across one vertex. The most common type of diode uses a p-n junction.



☐ The Working Principle of Diode: -

A P-n junction diode is a two-terminal single crystal semiconductor device whose one side is doped with acceptors and the other side by donors. Doping with an acceptor creates a P-type semiconductor while doping with donors produces an N-type. Thus, a PN junction is formed in the diode.



☐ Various Types of Diodes: -

01. Rectifier Diode
02. Zenner Diode
03. Light Emitting Diode
04. LASER Diode
05. Schottky Diode
06. Symbol of P-N Junction Diode.

☐ Rectifier Diode: -

A rectifier diode is a two-lead semiconductor that allows current to pass in only one direction. Generally, the P-N junction diode is formed by joining together n-type and p-type semiconductor materials.

There are two types of the rectifier diode

1. Half-wave Rectifier Diode
2. Full-wave Rectifier wave Diode

➤ Half-wave Rectifier Diode: -

A half-wave rectifier is defined as a type of rectifier that allows only one-half cycle of an AC voltage waveform to pass while blocking the other half cycle.

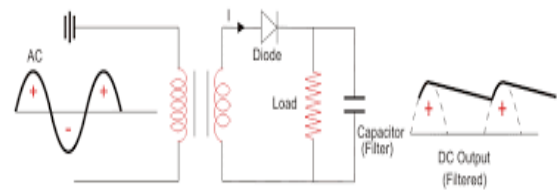
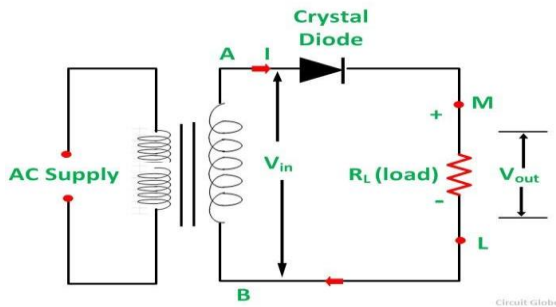


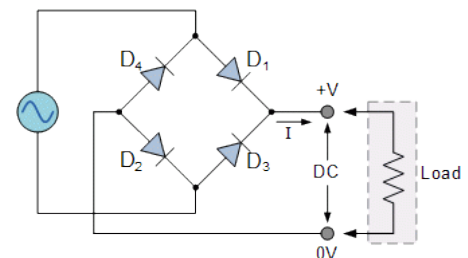
Figure - 6

➤ Full-wave Rectifier are classified into two types: -

01. Full-wave Bridge Rectifier,
02. Full-wave center-tap Rectifier

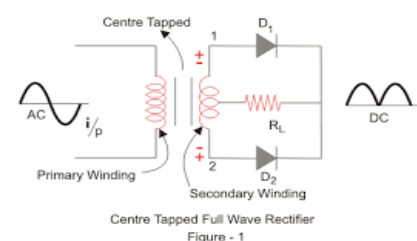
❑ Full-wave Bridge Rectifier: -

A full-wave rectifier is defined as a rectifier that converts the complete cycle of alternating current into pulsating DC. Unlike half-wave rectifiers that utilize only the half-wave of the input AC cycle, full-wave rectifiers utilize the full cycle.



❑ Full-wave center-tap Rectifier: -

A center-tapped full-wave rectifier is a type of rectifier that uses a center-tapped transformer and two diodes to convert the complete AC signal into a DC signal. The center-tapped full wave rectifier is made up of an AC source, a center-tapped transformer, two diodes, and a load resistor.



Centre Tapped Full Wave Rectifier
Figure - 1

SMD Diode: -

A diode is a two-lead electronic device that allows electrical signals to pass in one direction but not in the other. While most diodes have two wires with which to connect them to a circuit board, a surface mount diode has no such wires. Instead, each end of the diode is metallic and solders directly onto a small pad on the circuit board. Diodes find heavy use in electronics to control signal flow and to build various types of voltage regulators and converters.

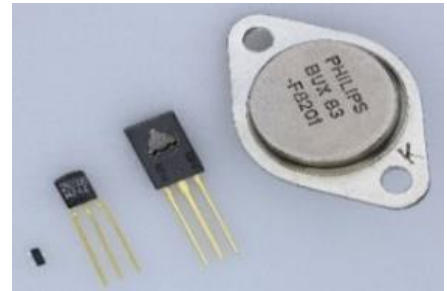


Module: -04

Class: - 02: - Different types of Components of Computer MB

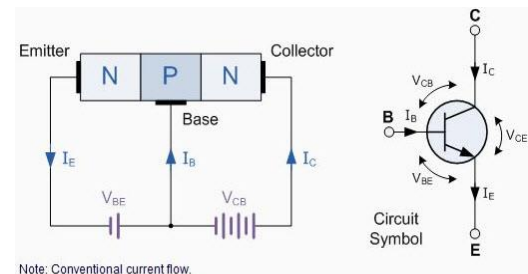
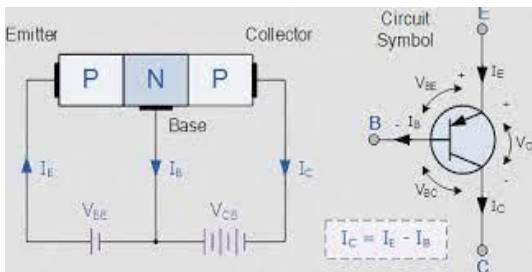
❑ Transistor: -

A transistor is a semiconductor device used to amplify or switch electrical signals and power. Because the controlled (output) power can be higher than the controlling (input) power, a transistor can amplify a signal. Some transistors are packaged individually, but many more are found embedded in integrated circuits. The word transistor is a combination of transfer and resistance. This is because it transfers the resistance from one end of the device to the other end or we can say, transfer of resistance. Hence, the name transistor. Transistors have very high input resistance and very low output resistance.

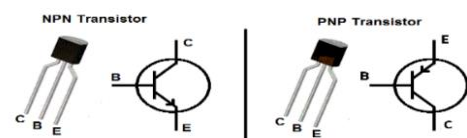
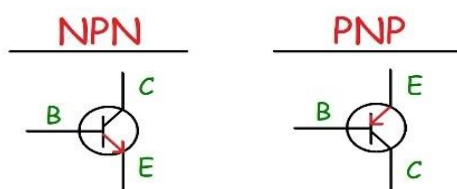


There are two types of transistors

1. PNP
2. NPN



Intro to Transistors



Also, there are many types of transistors

1. MOSFET (Metal Oxide Field Effect Transistor)
2. FET (Field Effect Transistor).
3. BJT (Bipolar junction transistor) and
4. UJT (Unipolar Junction Transistor) etc.

Module: -04

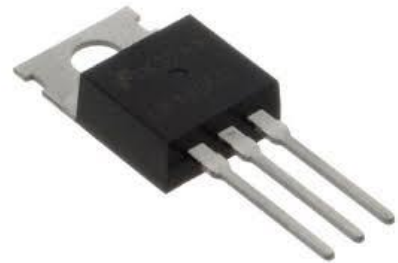
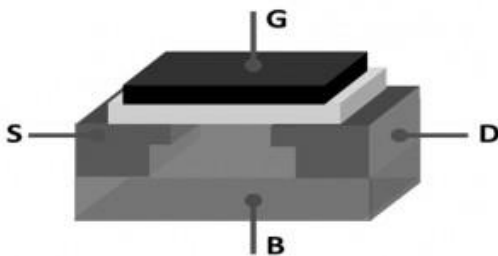
Class: - 03: - Different types of Computer Components

☐ MOSFET (Metal Oxide Field Effect Transistor):

The MOSFET (Metal Oxide Semiconductor Field Effect Transistor) transistor is a semiconductor device that is widely used for switching purposes and the application of electronic signals in electronic devices. A MOSFET is either a core or integrated circuit where it is designed and fabricated in a single chip because the device is available in very small sizes. The introduction of the MOSFET device has brought a change in the domain of switching in electronics. Let us go with a detailed explanation of this concept.

☐ What is MOSFET?

A MOSFET is a four-terminal device having source(S), gate (G), drain (D), and body,(B) terminals. In general, the body of the MOSFET is in connection with the source terminal thus forming a three-terminal device such as a field-effect transistor. MOSFET is generally considered a transistor employed in both analog and digital circuits. This is the basic introduction to MOSFET. And the general structure of this device is as below:



From the above MOSFET structure, the functionality of MOSFET depends on the electrical variations happening in the channel width along with the flow of carriers (either holes or electrons). The charge carriers enter the channel through the source terminal and exit via the drain.

The width of the channel is controlled by the voltage on an electrode which is called the gate and it is located in between the source and the drain. It is insulated from the channel by an extremely thin layer of metal oxide. The MOS capacitance that exists in the device is the crucial section where the entire operation is across this.

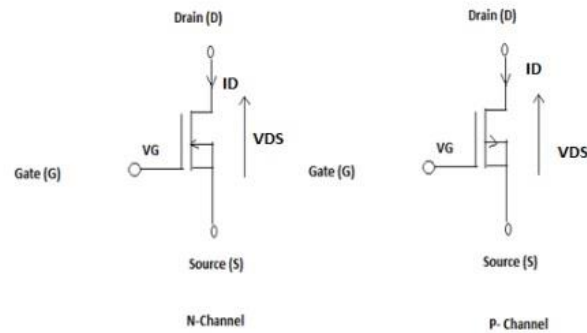
A MOSFET can function in two ways.

01. Depletion Mode,
02. Enhancement Mode.

☐ Depletion Mode: -

When there is no voltage across the gate terminal, the channel shows its maximum conductance. Whereas when the voltage across the gate terminal is either positive or negative, then the channel conductivity decreases.

For Example

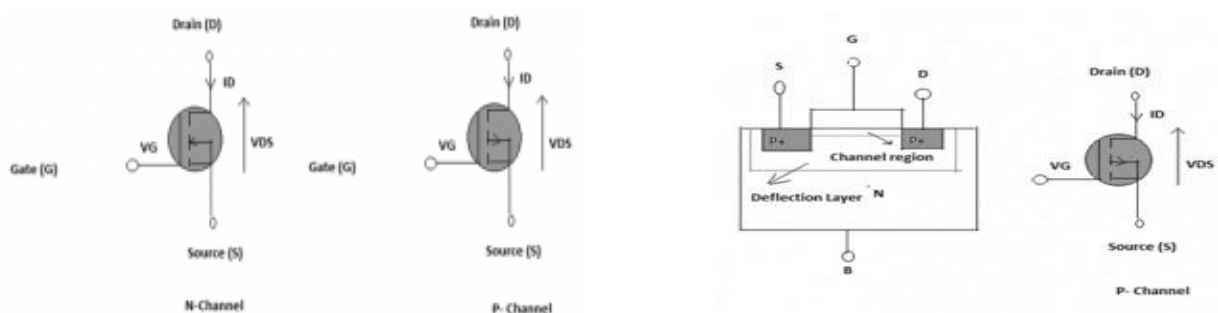


❑ Working Principle of MOSFET: -

The main principle of the MOSFET device is to be able to control the voltage and current flow between the source and drain terminals. It works almost like a switch and the functionality of the device is based on the MOS capacitor. The MOS capacitor is the main part of MOSFET. The semiconductor surface at the below oxide layer which is located between the source and drain terminal can be inverted from p-type to n-type by the application of either a positive or negative gate voltage respectively. When we apply a repulsive force for the positive gate voltage, then the holes present beneath the oxide layer are pushed downward with the substrate. The depletion region is populated by the bound negative charges which are associated with the acceptor atoms. When electrons are reached, a channel is developed. The positive voltage also attracts electrons from the n+ source and drains region into the channel. Now, if a voltage is applied between the drain and source, the current flows freely between the source and drain and the gate voltage controls the electrons in the channel. Instead of the positive voltage, if we apply a negative voltage, a hole channel will be formed under the oxide layer.

❑ P-Channel MOSFET: -

The P- channel MOSFET has a P- Channel region located in between the source and drain terminals. It is a four-terminal device having the terminal gate, drain, source, and body. The drain and source are heavily doped p+ region and the body or substrate is of n-type. The flow of current is in the direction of positively charged holes.

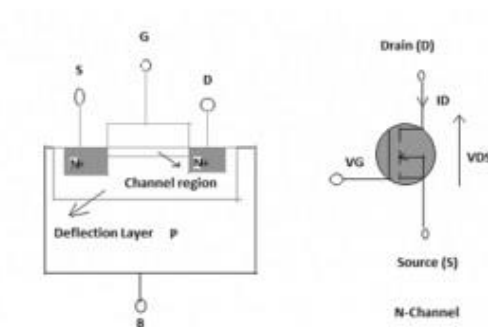


When we apply the negative voltage with repulsive force at the gate terminal, then the electrons present under the oxide layer are pushed downwards into the substrate. The depletion region populated is by the bound positive charges which are associated with the donor atoms. The negative gate voltage also attracts holes from the p+ source and drain region into the channel region.

❑ N- Channel MOSFET: -

The N-Channel MOSFET has an N- channel region located in between the source and drain terminals. It is a four-terminal device having the terminal gate, drain such, as the source, the body. In this type of Field Effect Transistor, the drain and source are heavily doped n+ region and the substrate or body are of P-type.

The current flow in this type of MOSFET happens because of negatively charged electrons. When we apply the positive voltage with repulsive force at the gate terminal then the holes present under the oxide layer are pushed downward into the substrate. The depletion region is populated by the bound negative charges which are associated with the acceptor atoms. Upon the reach of electrons, the channel is formed. The positive voltage also attracts electrons from the n+ source and drains region into the channel. Now, if a voltage is applied between the drain and source the current flows freely between the source and drain and the gate voltage controls the electrons in the channel. Instead of positive voltage if we apply negative voltage then a hole channel will be formed under the oxide layer.



❑ Ideal Switch Characteristics: -

When a MOSFET is supposed to function as an ideal switch, it should hold the below properties and those are

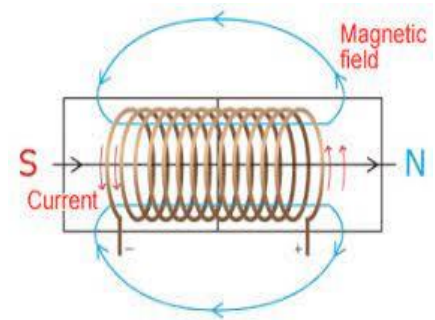
- ✓ In the ON condition, there has to be the current limitation that it carries
- ✓ In the OFF condition, blocking voltage levels should not hold any kind of limitations
- ✓ When the device functions in the ON state, the voltage drop value should be null
- ✓ The resistance in the OFF state should be infinite.
- ✓ There should be no restrictions on the speed of operation.

Module: -05

Class: - 01: Different types of Computer Components

□ Inductor: -

An inductor is defined as a passive component that is used in most electrical circuits to store energy in the form of magnetic energy when electric current flows through it. It is also known as the coil, chokes, or reactor. It is a two-terminal electrical component that is characterized by its inductance. In other words, its existence of it suggests a particular resistance to the flow of the current. Thus, the magnetic inductance formula defines the proportion between the magnetic flux in the element plus the electric current which circulates through the element. Therefore, the equation will be $L = \Phi N/I$.



Types of Inductors and Applications

- ✓ Air Core Inductor.
- ✓ Iron Core Inductor.
- ✓ Ferrite Core Inductor. Soft Ferrite. Hard Ferrite.
- ✓ Iron Powder Inductor.
- ✓ Laminated Core Inductor.
- ✓ Bobbin bobbin-based.
- ✓ Toroidal Inductor.
- ✓ Multi-layer Ceramic Inductors.

□ Working Principle of Inductor: -

When current flows through an inductor with conductors wrapped around it in the same direction, the magnetic field generated around the wire is bound together and becomes an electromagnet (Figure 1). Conversely, it is also possible to generate an electric current from the magnetic force.

□ Transformer: -

The definition of a transformer is a person or thing that changes, or a device with two or more coils of wire that transfer alternating current energy from one coil to another at the same frequency but with changed voltage. A transformer is an electrical device that trades voltage for current in a circuit, while not affecting the total electrical power. Transformers can be used either to increase the voltage also



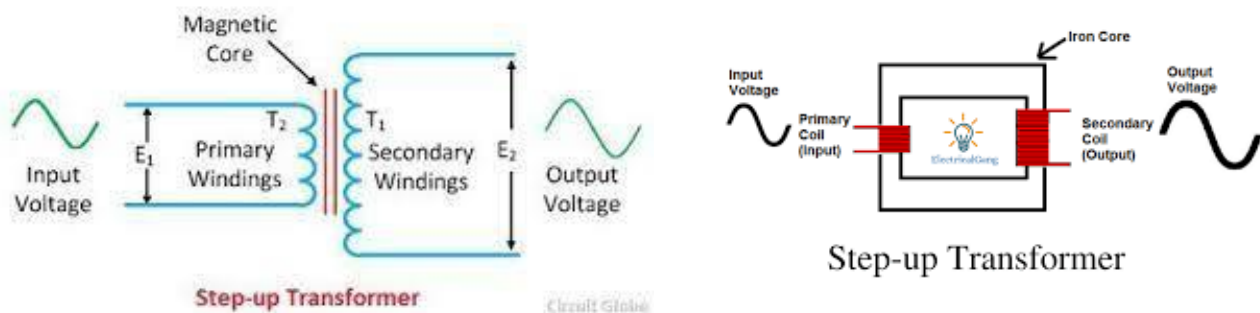
known as stepping up the voltage, or they can decrease the voltage also known as stepping down the voltage.

There are mainly two types of Transformers

01. Step-Up Transformer.
02. Step-Down Transformer.

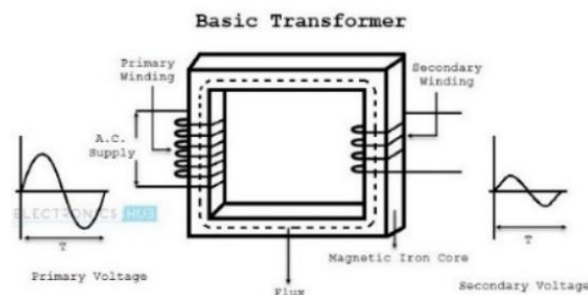
□ Step-Up Transformer: -

A step-up transformer is a transformer that step-ups the voltage from the primary winding to the secondary winding while keeping the power the same in both the windings at the rated frequency. ... The step-up transformers are generally used in generating stations and other power transmission applications.



□ Step-Down Transformer: -

A step-down transformer is a type of transformer that converts the high voltage (HV) and low current from the primary side of the transformer to the low voltage (LV) and high current value on the secondary side of the transformer. That means energy flows from the High Voltage (HV) to the Low Voltage (LV) side.



And also, there are many types of transformers shown below

1. Isolation Transformer,
2. Iron Core Transformer,
3. Ferrite Core Transformer,
4. Tori-dial Core Transformer,
5. Air-Core transformer.

❑ SMPS: -

A switched-mode power supply (SMPS) is an electronic circuit that converts power using switching devices that are turned on and off at high frequencies, and storage components such as inductors or capacitors to supply power when the switching device is in its non-conduction state



❑ Working principles of SMPS: -

In the SMPS device, the switching regulators are used which switch on and off the load current to maintain and regulate the voltage output. Suitable power generation for a system is the mean voltage between off and on. Unlike the linear power supply, the SMPS carries transistor switches among low dissipation, full-on and full-off phases, and spends much less time in high dissipation cycles, which decreases depleted strength.

❑ Benefits of SMPS: -

- ✓ The switch-mode power source is small in scale.
- ✓ The SMPS is very lightweight.
- ✓ SMPS power consumption is typically 60 to 70 percent, which is ideal for use.
- ✓ SMPS is strongly anti-interference.
- ✓ The SMPS production range is large.
- ✓ The complexity of SMPS is very large.
- ✓ The production reflection is high and its control is weak in the case of SMPS.
- ✓ The use of SMPS can only be a step-down regulator.
- ✓ In SMPS, the voltage output is just one.

❑ The voltage of SMPS: -

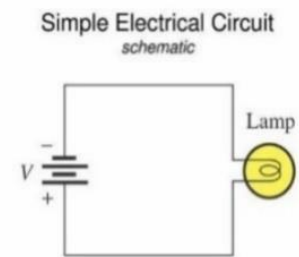
SMPS (Switched Mode Power Supply). It's a module that consists of multiple inductors, capacitors, and semiconductor devices such as diodes and MOSFETs. It converts AC Voltage to DC Voltage. We use it instead of a linear supply/power adapter because it gives better efficiency.

Lesson: - 05

Class: - 02: Circuit

☐ Circuit: -

The network of transistors, transformers, capacitors, connecting wires, and other electronic components within a single device such as a radio is also an electric circuit. Such complex circuits may be made up of one or more branches in combinations of series and series-parallel arrangements.



There are mainly two types of circuits:

1. Series Circuit,
2. Parallel Circuit.

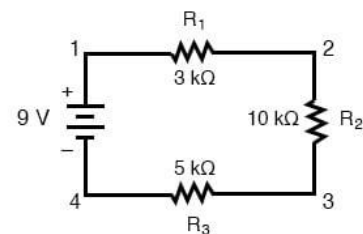
Also, there are many types of circuits:

1. Closed Circuit,
2. Open Circuit,
3. Short Circuit.

Each type of circuit is designed to create a conductive path of current or electricity.

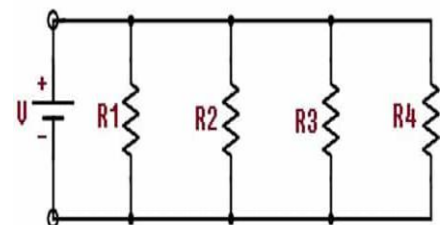
☐ Series Circuit: -

A series circuit is one with all the loads in a row. There is only ONE path for the electricity to flow. If this circuit was a string of light bulbs, and one blew out, the remaining bulbs would turn off.



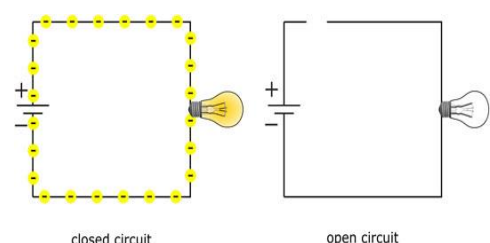
☐ Parallel Circuit: -

The current in a Parallel-Circuit has two or more paths to flow through it. The most common example of a Parallel-Circuit is the wiring of car headlights. In case the car headlights were in series, then if one of the lights fails, the other would also turn off which means the safety factor is lost.



☐ Closed Circuit: -

The definition of a closed circuit is a system where video or other media is transmitted through connected cables and wires, not through the air. When you have a video camera directly connected to a TV on the property that shows images from the video camera, this is an example of a closed-circuit TV.



❑ Open Circuit: -

An example of an open circuit is a string of electric lights that don't work if one bulb goes out. A signal path, line, or channel that is available for use. An incomplete electrical circuit through which no current can flow. Turning the switch to "off" makes it an open circuit.

❑ Short Circuit: -

A short circuit is an abnormal connection between two nodes of an electric circuit intended to be at different voltages. This results in an electric current limited only by the Thevenin equivalent resistance of the rest of the network which can cause circuit damage, overheating, fire or explosion.

Lesson: - 05

Class: - 03: IC (Integrated Circuit)

❑ IC (Integrated Circuit): -

An integrated circuit or an IC is defined as a microchip on which thousands and hundreds of electrical components, such as resistors, capacitors, and transistors, are fabricated. An IC functions as an oscillator, amplifier, microprocessor, timer, or as computer memory.

➤ Classification of ICs:

IC can be classified based on their chip size as given below

01. Small Scale Integration (SSI) — 3 to 30 gates/chip.
02. Medium Scale Integration (MSI) — 30 to 300 gates/chip.
03. Large Scale Integration (LSI)—300 to 3,000 gates/chip.

Types of ICs can be divided into three classes:

01. Thin and thick film ICS
02. Monolithic ICS
03. Hybrid or multichip ICS

❑ Thin and Thick ICs: -

In thin or thick film ICs, passive components such as resistors, and capacitors are integrated but the diodes and transistors are connected as separate components to form a single and complete circuit. Thin and thick ICs that are produced commercially are merely the combination of integrated and discrete (separate) components.

Thick and thin ICs have similar characteristics, and similar appearance except for the method of film deposition. Method of deposition of films distinguished Thin ICs from Thick ICs.

Thin-film ICs are made by depositing films of conducting material on a glass surface or a ceramic base. By varying the thickness of the films deposited on the materials having different resistivity, Passive electronic components like resistors and capacitors can be manufactured.

In Thick film ICs, the silk printing technique is used to create the desired pattern of the circuit on a ceramic substrate. Thick-film ICs are sometimes referred to as printed thin-film.

The screens are made of fine stainless steel wire mesh and the links (connections) are pastes having conductive, resistive, or dielectric properties. The circuits are fired in a furnace at a high temperature to fuse the films to the substrate after printing.

❑ **Monolithic ICs: -**

In monolithic ICs, the discrete components, the active and the passive, and also the interconnections between them are formed on a silicon chip. The word monolithic is derived from two Greek words “mono” meaning one or single and Lithos meaning stone. Thus, the monolithic circuit is a circuit that is built into a single crystal.

❑ **Hybrid or Multi-chip ICs: -**

As the name implies, “Multi”, more than one individual chip is interconnected. The active components that are contained in this kind of ICs are diffused transistors or diodes. The passive components are the diffused resistors or capacitors on a single chip. And also, there are another two types of ICs.

❑ **Digital Integrated Circuits: -**

These types of ICs work on the basic digital system i.e., two defined levels which are 0's and 1's (in other words, Low and High or ON and OFF respectively). Microprocessors and Microcontrollers are examples of Digital ICs which contain millions of flip-flops and logic gates.

❑ **Analog Integrated Circuits: -**

Analog ICs work by processing continuous signals i.e., Analog signals. OP-AMP (Operational Amplifier), NE 555 Timers, and Sensors are examples of Analog ICs. These types of ICs are used for amplification, filtering, modulation, demodulation, etc.

Lesson: 06

Class: - 01: About IC

❑ **Advantages and Applications of ICs: -**

ICs have advantages over those that are made by interconnecting discrete components some of which are their small size. It is a thousand times smaller than discrete circuits. It is an all-in-one (components and the interconnections are on a single silicon chip). It has little weight.

Its cost of production is also low. It is reliable because there are no soldered joints. It consumes little energy and can easily be replaced when the need arises. It can be operated at a very high temperature. Different types of ICs are widely applied in our electrical devices such as high-power amplifiers, voltage regulators, TV receivers and computers, etc.

❑ **Limitations for different types of ICs:**

Despite the advantages that ICs provide us with, they have limitations some of which are:

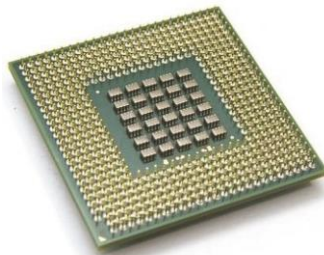
- ✓ Limited power rating
- ✓ It operates at low voltage

- ✓ A high grade of PNP is not possible
- ✓ It produces noise during operation
- ✓ Its components such as resistors and capacitors are voltage-dependent

It is delicate i.e., it cannot withstand rough handling, etc.

❑ **Chip: -**

A microchip (also called a chip, a computer chip, an integrated circuit, or IC) is a set of electronic circuits on a small flat piece of silicon. On the chip, transistors act as miniature electrical switches that can turn a current on or off. A small piece of semiconducting material (usually silicon) on which an integrated circuit is embedded. A typical chip is less than -square inches and can contain millions of electronic components (transistors). Computers consist of many chips placed on electronic boards called printed circuit boards.



➤ There are two major types of microchips:

01. Logic chips: Logic chips are the 'brains' of electronic devices – they process information to complete a task.
02. Memory chips: A memory chip is an integrated circuit made out of millions of capacitors and transistors that can store data or can be used to process code. Memory chips can hold memory either temporarily through random access memory (RAM), or permanently through read-only memory (ROM).

❑ **BIOS: -**

BIOS (basic input/output system) is the program a computer's microprocessor uses to start the computer system after it is powered on. It also manages data flow between the computer's operating system (OS) and attached devices, such as the hard disk, video adapter, keyboard, mouse, and printer.

❑ **There are two different types of BIOS: -**

1. UEFI (Unified Extensible Firmware Interface) BIOS - Any modern PC has a UEFI BIOS.
2. Legacy BIOS (Basic Input/Output System) - Older motherboards have legacy BIOS firmware for turning on the PC.

❑ The four main functions of a PC BIOS: -

- ❖ **POST (BIOS Power on Self-Test):** - Test the computer hardware and make sure no errors exist before loading the operating system. Additional information on the POST is available on our POST and beep codes page.
- ❖ **Bootstrap Loader:** - Locate the operating system. If a capable operating system is located, the BIOS will pass control to it.
- ❖ **BIOS drivers:** - Low-level drivers that give the computer basic operational control over your computer's hardware.
- ❖ **BIOS setup or CMOS setup:** - Configuration program that allows you to configure hardware settings including system settings, such as date, time, and computer passwords.

Lesson:06

Class: 02: - The Components of a Full PC Build

❑ PC Component:

There is the list of the components of the full PC assembly is shown below.

01. Motherboard,
02. Processor,
03. RAM,
04. Hard Disk,
05. Monitor,
06. Power Supply,
07. VGA Cable,
08. HDMI Cable,
09. Power Cable,
10. Keyboard,
11. Mouse,
12. Casing,
13. UPS(Optional)
14. Graphics Card (Optional).

❑ Motherboard: -

The motherboard is also known as the logic board, baseboard, system board, mainboard, main circuit board, and planar board. It is a non-conductive plastic sheet that has the necessary circuit and places holder like sockets/slots to connect components and provide logistics for all the components to work in a coordinated manner. Thin narrow layers of Aluminum or Copper printed on the plastic sheet of the board act to make a circuit that connects various components. It is a chassis in which all the components are fitted in the designated place and they are all powered and well interfaced with each other.

There are different series MB Model is shown below.

01. (Socket-1155) => H61, H67, series. MB
02. (S-1150) => MB Model: H81,85,87 Series.
03. (S=1151) => MB Model=H110, B150, B250 Series.

- 04. (S-1151) => H310,360 Serie.
- 05. (S=1200) => MB Model=H410 etc.
- 06. (S=LGA 1700) =>MB Model=ASUS Prime H610M-E D4.
- 07. AM3=>MB Model=78LMT,68LMT Series.
- 08. AM4=>Ryzen.

A typical Motherboard contains the following Ports/interfaces and components: -

- 01. ATX 12V,
- 02. ATX-24 Pin Connectors,
- 03. Processor/CPU socket,
- 04. RAM Slots,
- 05. Graphics Slot,
- 06. PCI peripheral component interconnect slots,
- 07. SATA Port/connector (Storage),
- 08. M.2 SSD Port,
- 09. CPU Rear fan connector,
- 10. F Panel/JFP1 Power connector,
- 11. System Fan Connector,
- 12. Front USB ports/Connectors,
- 13. Back USB Port,
- 14. PS2 Port,
- 15. CMOS battery header,
- 16. LPT Port-Line Printer Port,
- 17. VGA Port,
- 18. LAN Port,
- 19. Audio Port/Connector,
- 20. DVI Port,
- 21. Chipset,
- 22. Floppy connector,
- 23. IO Chip.

The motherboard is comprehensive in all aspects and it contains provisions to connect any kind of components to meet application requirements. The motherboard is self-sufficient to meet all requirements and it is a single board to manage all the functions, unlike the backplane which has provision to connect to multiple extension boards to hold more components. The name mother in the motherboard is attributed to its character as it takes a leadership role to manage all the components connected to it. The mouse and keypads are connected to USB ports on the motherboard. Apple computer's motherboard has minimum provisions to connect to peripheral devices. Many boards have a provision for expansion to connect to additional devices. Heat sinks and fan points are available in the modern motherboard to transfer excess heat.

❑ **Processor: -**

There are different types of processors in Different Generation

- 01. 2nd/3rd Generation (Socket-1155) => MB Model=H61, H67, Series.
- 02. 4th Generation (S-1150) => MB Model: H81,85,87 Series.
- 03. 6th/7th Generation (S=1151) => MB Model=H110, B150, B250 Series.
- 04. 8th/9th Generation (S-1151) => H310,360 Series.

- 05. 10th/11th Generation (S=1200) => MB Model=H410 etc.
- 06. 12th Generation (S=LGA 1700) =>MB Model=ASUS Prime H610M-E D4.
- 07. AM3=>MB Model=78LMT,68LMT Series.
- 08. AM4=>Ryzen.

Lesson:06

Class: 03: - The Components of a Full PC Build

❑ RAM: -

The full form of RAM is Random Access Memory. The information stored in this type of memory is lost when the power supply to the PC or laptop is switched off. The information stored in RAM can be checked with the help of BIOS. It is generally known as the main memory or temporary memory or cache memory or volatile memory of the computer system. There are Two main types of RAMS.

- 01. Static RAM,
- 02. Dynamic RAM.

➤ Static RAM: -

Static RAM is the full form of SRAM. In this type of RAM, data is stored using the state of a six-transistor memory cell. Static RAM is mostly used as a cache memory for the processor (CPU).

➤ Dynamic RAM: -

DRAM stands for Dynamic Random Access Memory. It is a type of RAM which allows you to store each bit of data in a separate capacitor within a specific integrated circuit. Dynamic RAM is a standard computer memory of many modern desktop computers. This type of RAM is a volatile memory that needs to be refreshed with voltage regularly. Else it loses the information stored on it.

Another Important RAM is shown below.

➤ FPM DRAM: -

Fast Page Mode Dynamic Random Access Memory is a type of RAM that waits through the entire process of locating a bit of data by column and row and then reading the bit before it begins on the next bit. The max transfer rate is around 176 Mbps.

➤ SDR RAM: -

SDR RAM is a full form of synchronous dynamic access memory. It has access times between 25 and 10 ns(nanosecond), and they are in DIMM (dual in-line memory module) modules of 168 contacts. They store data using capacitors using ICs (Integrated Circuits). On one of its sides, they have terminations, which can be inserted inside of the individual slots for the Motherboard's memory.



➤ **RD RAM: -**

Rambus Dynamic Random Access Memory is a full form of RDRAM. This type of RAM chip works in parallel, which allows you to achieve a data rate of 800 MHz or 1,600 Mbps. It generates much more heat as they operate at such high speeds.



➤ **V-RAM: -**

RAM optimized for video adapters is called VRAM. These chips have two ports so that video data can be written to chips at the same time the video adapter regularly reads the memory to refresh the monitor's current display.



➤ **EDO RAM: -**

EDO DRAM is an abbreviation of Extended Data Output Random Access Memory. It doesn't wait for the completion of the processing of the first bit before continuing to the next one. As soon as the address of the first bit is located, EDO DRAM begins looking for the next bit.



➤ **DDR RAM: -**

The full form of DDR SDRAM is Double Data Rate Synchronous Dynamic Random-Access Memory. It is just like SDRAM. The only difference between the two is that it has a higher bandwidth, which offers greater speed. Its maximum transfer rate to the L2 cache is approximately 1,064 Mbps.



There are different categories of RAM available in our Country. This category is shown below.

Types Of RAMS	Time In Market	BUS Clock (MHZ)	Transfer Rate (GB/s)	Voltage
SDRAM	1993	100-166	0.8-1.3	3.3
DDR	2000	133-200	2.1-3.2	2.5/2.6
DDR2 SDRAM	2003	266-400	4.2-6.4	1.8
DDR3	2007	533-800	8.5-14.9	1.35/1.5
DDR 4	2014	1066-1600	17-21.3	1.2
DDR5				

❑ **Hard Disk/Hard Drives (HDDs): -**

Computers rely on hard drives (HDDs) to permanently store data. HDDs are storage devices for storing and retrieving digital information that will be referenced in the future. There are different types of Hard Drives.

01. Parallel ATA (PATA)
02. Serial ATA (SATA)
03. Small Computer System Interface (SCSI).



❑ Parallel ATA (PATA): -

Parallel ATA (PATA) drives are one of the hard drive types. They are also known as integrated drive electronics (IDE) or enhanced integrated drive electronics (EIDE) drives. It is the first hard drive connected to a computer using the PATA interface standard. The PATA drive was developed by Western Digital in 1986. It provides a driver with a common interface, which can be used on different devices commonly at the time. PATA drives can provide data transfer rates up to 133 MB/s. In the master/slave configuration, two PATA drives can be connected with one cable. Up to four PATA drives can be connected to a single motherboard because most motherboards have two channels for IDE connections. Maybe you are interested in this post - [2020 Guide] How to Choose a Motherboard for Your PC. However, the issue with PATA drives is that they are outdated. If you walk into any computer store today, it may not be possible to find any PATA drives.



❑ Serial ATA (SATA): -

As one of the HDD types, Serial ATA (SATA) hard drives are still considered to be the most common type of hard drive used today. It almost supports all computer motherboards and operating systems. SATA drives are usually one of two sizes: 3.5-inch hard drives for desktop computers and 2.7-inch small hard drives for laptop computers. The disk of the SATA drive rotates at different speeds according to the model purchased. The speed can reach 10,000 RPM to increase data transmission. Storage devices used in large servers can even reach 15,000 RPM. However, higher RPM SATA drives are also more prone to failure. Mechanical failure is one of the main disadvantages of SATA drives.



❑ Small Computer System Interface (SCSI): -

A Small Computer System Interface is also one of the types of the hard disk. It was developed in the 1970s and was first called Shugart Associates System Interface (SASI) after the company was founded. It uses a 50-pin flat ribbon connector to connect hard drives and other peripherals to the computer.



❑ Solid State Drives (SSD): -

One of the hard drive types is the solid-state drive (SSD). Today, it is at the forefront of storage technology development. It is a storage drive composed entirely of memory chips, rather than rotating magnetic disks in traditional hard disks. The SSD does not have rotating disks or any other moving parts. Instead, the data in the SSD is stored in the semiconductor chip. SSDs work using the concept of flash memory, the same concept used in the motherboard's random-access memory (RAM). SSD lacks mobile components; thus, the SSD's operating power



consumption is greatly reduced. It's one of the advantages of SSD. Another advantage of SSD is that it is not prone to failure. However, the biggest disadvantage of SSD is the price. With the same storage space, the cost of SSD is three to four times that of SATA hard drives.

❑ Types of Computer Cables:

➤ Power Cable:

A cable used for the transmission and distribution of electrical energy is called electrical power cable. Power cable consists two or more electrical conductors join with an over sheath. It is used for the transmission of extra high voltages in a place where overhead lines are impracticable to use like, the sea, airfield crossing, etc. But underground cable is more costly as compared to aerial cable for the same voltage which is one of the main draws back of electrical power cable.



➤ HDMI Cable: -

HDMI (High-definition Media Interface) is a type of computer cable used to transmit high-definition video and audio signals. Using the HDMI cables, the audio and video signal can be easily transmitted without compromising the quality of images and can send crystal clear images using this cable. HDMI cables are used to connect cable boxes, TVs, DVD players, media streamers, and other electronic devices. All types of Av devices can be connected to one standard cable, which is an HDMI cable. Also, one HDMI cable is capable of transmitting both audio and video signals at the same time.



➤ VGA cable: -

VGA (Video Graphics Ray) cable is another type of computer cable which is used for sending video signals and is used to link the monitor and the CPU of a computer. The VGA cable can also be used in HD televisions. All the information displayed on the monitor is coming from the VGA cable. There is a total of 15 pins in the plugin cable, which has three rows containing 5 pins each. And the cable is easily fitted in the monitor and the other end is fixed in the CPU of a computer system.



➤ DVI Cable: -

DVI cables are used to connect the LCD monitor and the video card. Using this cable, the user can see high image quality without any disturbance. The DVI cable is mostly used in CRT monitors, which have a VGA connection. This cable transmits digital and analog signals to the computer system. The DVI cable is capable enough for digital connections and analog connections. The DVI cable can be easily distinguished, whether it is analog or digital, by looking if there is any flat pin present on the cable. If the flat pin has four pins around, then it is a DVI analog, and if there is only a flat pin, then it is DVI digital.



➤ **Ethernet Cable: -**

The Ethernet cable is a type of computer network cable which is used for a wired network. The Ethernet cable is used to connect the switches, monitors, and PCs to the LAN (Local Area Network). The length and durability of the Ethernet cable describe the quality of the connection. If the cable is too long and is not durable, it will contain a poor-quality signal. And due to this factor, there are different types of Ethernet cables present in the market. The Ethernet cables are plugged into the Ethernet port present on the motherboard. The Ethernet cable looks like a phone cable but contains more wires than phone cables. There are eight wires in the Ethernet cable, and they can be available in different colors in one market.



➤ **PS-2 Cable: -**

The PS/2 cable is a standard cable to connect the mouse and keyboard to the computer system. The length of the PS/2 cable is long enough so that the user can easily connect the mouse and keyboard to the system and use the system. There are a total of 6 pins in PS/2 cables and a round connector. There are majorly two sizes of PS/2 cable. The smaller size is the most common cable, but some adaptors can be used to convert it into a larger size. This cable is now replaced with USB cables as they are universal cables and can be easily plugged into any system.



➤ **USB Cables: -**

The USB (Universal Serial Bus) cable is a standard cable used to connect universal devices or personal computers. It is mainly used for short-distance digital communication. The digital data can be transferred using a USB cable. Nowadays, the USB cable is used to charge devices like smartphones, Bluetooth speakers, trimmers, and many more. The USB cables can be used to connect two devices directly. The USB cable is connected to the USB port present in the computer system. The mouse and keyboard are also connected to a USB port as they have USB cables. As the device is connected through the USB cable, the unplugging of the USB cable when a device is running can cause damage to a device, so whenever there is a need of removing the USB cable, first it should be ejected safely, and then it should be removed from the system.



➤ **5mm Audio Cable: -**

The 3.5mm audio cables are a type of computer cable are using in computer audio applications. This cable can be used for connecting a mini-stereo audio device, PC sound card, or any portable CD player to any multimedia speaker. This cable can also be used to connect earphones and headphones to the system. The green port is for headphones and computer speakers. The Blue port is the for DVD and player, MP3 player and the pink port is used for connecting microphones.



❑ **Scope and Benifits:-**

01. Management and maintenance of a large number of Desktop and Laptop computers.
02. Scope to Job any Reputation and Branded Computer Servicing Company.
03. Scope to Job any IT Company.
04. Scope to Start own Business on Desktop and Laptop Servicing.

❑ **Course Summary: -**

01. OHS.
02. About Tools.
03. About Components.
04. Abou ICs.
05. About Circuit.
06. About PC Components.
07. Benefits.
08. Scops.

Thanks To All