7/8

CITY SCHOOLS DIVISION OF DASMARIÑAS

TLE

COMPUTER SYSTEMS SERVICING

SELF-LEARNING MATERIAL

TLE

Computer Systems Servicing

Development Team of the Module

Authors: DONNA ROSE M. OBCIANA / FENAMAE P. LARA

Editor: Virgilio O. Guevarra Jr., Ed.D.

Reviewer: Celedonio B. Balderas Jr.

Management Team: Gemma G. Cortez, Ed.D., CID - Chief
Leylanie V. Adao, EPS - LR
Joel D. Salazar, EPS In-charge
SDO Dasmariñas City

Guide in Using Learner's Module

For the Parents/Guardian

This module is designed to assist you as the learning facilitator at home. It provides you with activities and lesson information that the learners need to accomplish in a distance learning modality.

For the Learner

This module is designed to guide you in your independent learning activities at your own pace and time. This also aims to help you acquire the competencies required by the Department of Education at the comfort of your home.

You are expected to answer all activities on separate sheets of paper and submit the outputs to your respective teachers on the time and date agreed upon.

I What I need to know?

- **LESSON 1 – USING AND MAINTAINING HAND TOOLS (UHT)**

Learning Outcome 1. Plan and prepare for tasks to be undertaken

1.1 Identify tasks to be undertaken properly

1.2 Identify and select appropriate hand tools according to the task requirements

Learning Outcome 2. Prepare hand tools

2.1 Check appropriate hand tools for proper operation and safety

2.2 Identify and mark unsafe or faulty tools for repair according to standard company procedure

Learning Outcome 3. Use appropriate hand tools and test equipment

3.1 Use tools according to tasks undertaken.

3.2 Observe all safety procedures in using tools at all times and use appropriate PPE

3.3 Report malfunctions, unplanned or unusual events to the supervisor

Learning Outcome 4. Maintain hand tools

4.1 Do not drop tools to avoid damage; carry out routine maintenance of tools according to standard operational procedures, principles, and techniques

4.2 Store tools safely in appropriate locations in accordance with the manufacturer's specifications or standard operating procedures

After going through this lesson, you are expected to:

1. Use hand tools and equipment for computer hardware servicing;

I What is new?

Activity

Below are the tool and equipment in Computer Systems Servicing, can you categorize them based on their functions and purposes?

Flat-head screwdriver	Flashlight	Part retriever
Compressed air	Wire stripper	Soft cloth
Crimper	Digital Multimeter	Toner Probe
Hex driver	Punch-down tool	Torx screwdriver
Antistatic Wrist Strap	Parts organizer	Antistatic Mat
Wire cutters	Tweezers	Cable ties
Loopback Adapter	Phillips-head screwdriver	
Needle-nose pliers	External Hard Drive Enclosure	

Electro Static Discharge (ESD) TOOLS	HAND TOOLS	CLEANING TOOLS	DIAGNOSTIC TOOLS

D What I know?

Direction: Choose the letter of the best answer. Write the chosen letter on a separate sheet of paper.

1. Which tool is used for hardware to stand on to prevent static electricity from building up?
   a. Anti-static mat b. Hex Driver
   c. Phillips head screwdriver d. Wire cutter

2. Which tool is used to loosen or tighten cross-head screws?
   a. Anti-static mat b. Hex Driver
   c. Phillips head screwdriver d. Wire cutter

3. Which tool is sometimes called a nut driver? It is used to tighten nuts in the same way that a screwdriver tightens screw.
   a. Anti-static mat b. Hex Driver
   c. Phillips head screwdriver d. Wire cutter

4. Which tool is used to strip and cut wires?
   a. Anti-static mat b. Hex Driver
   c. Phillips head screwdriver d. Wire cutter

5. Which tool is used to retrieve parts from location that are too small for your hand to fit?
   a. Part retriever b. Lint-free cloth
   c. Cable ties d. Flat head screwdriver

6. Which tool is used to clean different computer components without scratching or leaving debris?
   a. Part retriever b. Lint-free cloth
   c. Cable ties d. Flat head screwdriver

7. Which tool is used to bundle cables neatly inside and outside of a computer?
   a. Part retriever b. Lint-free cloth
   c. Cable ties d. Flat head screwdriver

8. Which tool is used to loosen or tighten slotted screws?
   a. Part retriever b. Lint-free cloth
   c. Cable ties d. Flat head screwdriver

9. Which tool is used to loosen or tighten screws that have a star-like depression on the top?
   a. Anti-static mat b. Torx screwdriver
   c. Phillips head screwdriver d. Wire cutter

10. Which tool is used to blow away dust and debris from different computer parts without touching the components?
    a. Anti-static mat
    b. Hex driver
    c. Compressed air
    d. Wire Cutter

11. Turn the screwdriver_____ to tighten the screw.
    a. clockwise
    b. counter clockwise

12. Turn the screwdriver _____ to loosen the screw.
    a. clockwise
    b. counter clockwise

13. A _____head screwdriver is used with crosshead screws.
    a. Flat
    b. Phillips
    c. Hex
    d. Torx

14. Clean the contacts on components with _____ alcohol.
    a. Ethyl
    b. Isopropyl
    c. Methyl
    d. None of the Above

15. Which tool is use to protect computer components against ESD?
    a. Loopback adapter
    b. Anti static mat
    c. Anti static wrist strap
    d. Automatic voltage regulator

D *What is in?*

Direction: *Word Search*: Look for words that are related to Tools, Equipment and maintenance. List down all the words found.

A	**J**	**K**	**O**	**M**	**P**	**A**	**S**	**B**	**L**	**P**	**I**	**O**
M	**A**	**I**	**N**	**T**	**E**	**N**	**A**	**N**	**C**	**E**	**S**	**T**
H	**A**	**Z**	**A**	**R**	**D**	**O**	**S**	**T**	**R**	**G**	**I**	**I**
E	**Q**	**P**	**W**	**T**	**O**	**L**	**Y**	**N**	**H**	**A**	**R**	**M**
D	**U**	**R**	**M**	**Y**	**O**	**I**	**L**	**E**	**S**	**M**	**U**	**D**
M	**A**	**T**	**L**	**O**	**S**	**T**	**W**	**V**	**G**	**A**	**K**	**R**
S	**L**	**K**	**T**	**D**	**A**	**A**	**M**	**E**	**K**	**D**	**I**	**U**
R	**I**	**S**	**K**	**M**	**W**	**J**	**Y**	**R**	**V**	**N**	**C**	**S**
Y	**T**	**S**	**P**	**E**	**Q**	**U**	**I**	**P**	**M**	**E**	**N**	**T**
B	**Y**	**T**	**E**	**F**	**A**	**S**	**E**	**K**	**B**	**I**	**O**	**H**

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

D *What is it?*

Electro Static Discharge (ESD Tools)

Anti Static Wrist Strap

This tool is used to protect computer equipment against damage caused by Electro static discharged (ESD).

Anti Static Mat

This tool is used to prevent static electricity from accumulating on the hardware or on the technician.

Hand Tools

Flat-head Screw Driver

This tool is used to tighten or loosen slotted screws.

Phillips-head Screw Driver

This tool is used to tighten or loosen cross headed screws.

Torx Screwdriver

This tool is used to tighten or loosen screw with star like shape (mostly found in laptops).

Hex Driver
This tool is used to tighten or loosen nuts (sometimes called nut driver).

Needle Nose Pliers

This tool is used hold small parts.

Wire Cutters

This tool is used to strip and cut wires.

Tweezers

This tool is used to manipulate small parts.

Part Retriever

This tool is used to retrieve small parts in spaces which do not fit your hands.

Flashlight

This tool is used to light up areas that is too dark to see.

Wire Stripper

This tool is used to remove wire insulation from the wire.

Crimping Tool

This tool is used to conjoin a wire to a connector by tightly squeezing and deforming the parts to connect them together.

Punch-down Tool

This tool is used to terminate and secure cables to a jack.

Cleaning Tools

Soft cloth

This is used to clean different computer components without scratching it.

Compressed Air

This tool is used to blow away dust and debris from different computer parts without touching the components.

Cable Ties

This is used to bundle cables neatly inside and outside of a computer.

Parts Organizer

This is used as a container for small parts like screws, jumpers, fasteners.

Diagnostic Tools

Digital Multimeter

This tool is used to test the integrity and the quality of electricity in computer components.

Loopback Adapter

This tool is used to test the functionality of computer ports.

Network Cable Testers

This tool is used to check network cable connectivity and verify the correct wiring of connectors on cables.

External Hard Drive Enclosures

This tool is used to place hard drive in the external enclosure for inspection diagnostic and repair. Also use to back up files to prevent data corruption during repair.

Hand Tools Inspection Process

Before using a hand tool, whether personally owned or borrowed, it is best to check first if they are free from damages, defects, cracks, loose handles and other flaws that could cause harm.

Here are some tips when using a hand tool.

1. Ensure that the person to use it is properly trained and skilled.
2. Select the right tool for the job. Using a substitute tool may cause accidents.
3. Keep tools in good condition all the time.
4. Inspect for defects before use. Do not use if found defective.
5. Ensure that the handles are intact
6. Keep tools clean and dry
7. Keep your workspace clean. Store properly when not in use.

Forms Used in Borrowing and Requesting Tools and Equipment

Tools and Equipment Maintenance also includes keeping records on when a tool was purchased or who uses it. There are different forms that a teacher or custodian used to keep track of the tool history starting from purchased date up to its last used.

REQUISITION SLIP

Date: _____ **Request Number:** _____ **Requested by:** _____ **Approved by:** _____	**Delivered to:** **Recommended Suppliers:**

Stock Control #	Description	Quantity Requested	Quantity Received	Price	Total

BORROWERS SLIP

Name of Borrower: _____

Date and Time: _____

Grade and Section: _____

Laboratory: _____

No.	Description	Quantity	Remarks

Requested by: Signature Over Printed Name Date Returned: _____ Time Returned: _____	Approved/Checked by: Laboratory Custodian Received by: _____ Laboratory Custodian

Safety Procedures in using Hand Tools and Equipment

Proper use of hand tools helps us to finish task faster and accurately. It also prevents accident and injuries caused by improper handling of tools.

Safety Tips When Using Hand Tools and Equipment

- Buy quality tools, they are more durable and reliable.
- Perform regular maintenance and inspection of tools to make sure they are in good shape and fit for use.
- Avoid loose clothing and jewelries that can get caught in tools moving parts.
- Wear appropriate Personal Protective Equipment.
- Use the right tool for the job. An alternate tool can cause accidents.
- Never carry pointed and sharp tools in your pocket.
- Make sure tools are stored in a safe place. Do not leave it lying anywhere in your workplace.

Hand tools can be found everywhere, in your house, in schools and in all work areas. It makes task easy and faster to do, saving most of our time and energy. But sometimes we forgot how to take care of our hand tools and equipment. Tool maintenance and proper storage extend tool life span and prevent any injuries that can happen due to damage and uncheck tool condition.

Preventive Maintenance is scheduled, routine inspection to keep equipment running as well as prevent downtime and expensive repair costs. The goal is noticing small problems before it caused major injuries and downtimes.

TOOL PREVENTIVE MAINTENANCE CHECK SHEET SAMPLE											
TOOLS	**SPECIFICATION**	**METHOD OF INSPECTION**	**OBSERVATION DATE**					**STATUS (OK/ NOT OK)**	**REMARKS**
			Checked by: _____						

Common Malfunction in Hand tools, Equipment and Paraphernalia

1. In using a driving tool, screws may slip the tip of the screw driver.
2. Small objects tend to fall down.
3. In using striking tools the heads may be separated from its handle.
4. Slippage can happen while using cutting tools.
5. Inaccurate reading of Diagnostic Tools if not properly calibrated.

Procedures in Cleaning, Tightening and Simple Repair of Hand tools, Equipment and Paraphernalia

1. Inspect hand tools like screw drivers, needle nose pliers and tweezers. Check for any damage in handle and the tip. If found damaged, do not use it and report it immediately to the custodian for replacement. Meanwhile, dirt and oil can be wiped off by damp cloth.
2. Cutting tools like wire cutter, wire stripper and punch down tools must be kept sharp. Rusty, damaged and dull blades should not be used.

3. Battery operated tools like Flashlights, Digital Multimeter and Network Testers need regular checking and battery replacements.
4. Digital Multi meter should be calibrated to ensure accurate reading.
5. All tools should be stored properly and organized in a clean and dry place. Small parts should be kept in a part organizer to avoid mixing.

Damage and missing tools, equipment and paraphernalia should be reported immediately to the Custodian. Tracking and recording tools and equipment history helps employees to identify caused of damages and possible reason of losing tools.

Here is a sample Property Custodian Lost and Damaged Report:

<table>
<tr><th colspan="3">REPORT OF LOST AND DAMAGED TOOLS, EQUIPMENT AND PARAPHERNALIA</th></tr>
<tr><td>Status of Property
□ Lost
□ Damaged
□ Stolen
□ Destroyed</td><td colspan="2">NAME: _____
(Signature Over Printed Name)
Department: _____</td></tr>
<tr><th>Property Number</th><th>Description</th><th>Acquisition Cost</th></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td colspan="3">Remarks:</td></tr>
<tr><td colspan="3">Noted by:

_____
Property Custodian</td></tr>
</table>

E *What is more?*

List down and try to draw the different tools and equipment used in computer systems servicing. Identify its category/type and functions.

Tools and Equipment	Illustration/ Drawing	Type of Tools/Equipment	Function or Use

E *What I can do?*

There are situations when certain tools and equipment are not recommended to use during maintenance and repair. Can you think of any situations in which we are NOT allowed to use a certain kind of tools and equipment?

Tools and Equipment	**What are the possible reasons why we should** NOT **use it?**	**What to do in this situation?**

E What else can I do?

Additional Activities:

Look for online videos that show proper ways of maintaining tools and equipment in Computer systems servicing. Learn and apply what you have learned. Ask for your teacher or guardian's assistance.

A What I have learned?

1. Identify tasks to be undertaken properly.
2. Identify and select appropriate hand tools according to the task requirements.
3. Check appropriate hand tools for proper operation and safety.
4. Identify and mark unsafe or faulty tools for repair according to standard company procedure.
5. Use tools according to tasks undertaken.
6. Observe all safety procedures in using tools at all times. Use appropriate PPE.
7. Report malfunctions, unplanned or unusual events to the supervisor.
8. Do not drop tools to avoid damage; carry out routine maintenance of tools according to standard operational procedures, principles, and techniques.
9. Store tools safely in appropriate locations in accordance with manufacturer's specifications or standard operating procedures.

A What I can achieve?

Direction: Choose which among these following tools are needed to complete the given task. Write the letter of the correct answer.

1. _____ It is used to test the integrity of circuits and the quality of electricity in Computer Components.
2. _____ It is used to clean different computer parts without scratching or leaving debris.
3. _____ This tools is used to retrieve small parts from locations that your hands cannot fit.
4. _____ Use this to neatly bundle Computer cable and keep it organize.
5. _____ This is used to strip and cut wires.
6. _____ This tool is used to hold small parts.
7. _____ This tool is used to connect network wires into a patch panel.
8. _____ This tool is used to blow away dust and debris from different computer parts.
9. _____ This tool is used to light up areas that you cannot see well.
10. _____ This tool is used to tighten or loosen nuts.

What I know

1. A
2. C
3. B
4. D
5. A
6. B
7. C
8. D
9. B
10. C
11. A
12. B
13. B
14. B
15. C

What is In

1. Maintenance
2. Hazard
3. Equipment
4. Rust
5. Harm
6. Tools
7. Prevent
8. Lost
9. Safety
10. Quality

What I can achieve?

1. G
2. A
3. F
4. J
5. C
6. D
7. I
8. B
9. H
10. E

References

Hex Driver Image:
https://solarbotics.com/product/44224/

Hand Tools and Equipment:
http://www.ciscopress.com/articles/article.asp?p=2086239&seqNum=7

Torx Screwdriver Image:
https://www.techexpress.co.nz/products/xbox-360-and-one-t8-torx-screwdriver-tool

Loopback Adapter Image: http://rock-cafe.info/suggest/loopback-adapter-hardware-6c6f6f706261636b.html

Hex Driver Image:
https://www.amazon.com/StewMac-Hex-Truss-Rod-Wrench/dp/B01HY53R2G

Part Retriever Image:
https://www.kmscarparts.com/wilmar-performance-tool-led-magnetic-claw-retriever-91206

Safety use of tools:
https://www.ccohs.ca/oshanswers/safety_haz/hand_tools/general.html

Safety Procedures in Using Tools and Materials:

http://ndclegara.blogspot.com/2017/01/safety-procedures-in-using-hand-tools.html

https://www.ihsa.ca/resources/tool_equip_maintenance.aspx

Preventive Maintenance

https://www.micromain.com/what-is-preventive-maintenance/

I What I need to know?

LESSON 2: PERFORMING COMPUTER OPERATIONS (PCO)

LO 1. Plan and prepare for task to be undertaken

1.1 Determine requirements of task in accordance with the required output

1.2 Select appropriate hardware and software according to task assigned and required outcome

1.3 Plan a task to ensure that OSH guidelines and procedures are followed

1.4 Follow client-specific guidelines and procedures

1.5 Apply required data security guidelines in accordance with existing procedures

LO 2. Input data into computer

2.1 Enter the data into the computer using appropriate program/application in accordance with company procedures

2.2 Check the accuracy of information and save the information in accordance with standard operating procedures

2.3 Store inputted data is in storage media according to requirements

2.4 Perform work within ergonomic guidelines

LO 3. Access information using computer

3.1 Select correct program/application based on job requirements

3.2 Access program/application containing the information required according to company procedures

3.3 Select, open, and close desktop for navigation purposes

3.4 Carry out keyboard techniques in line with OSH requirements

LO 4. Produce output/ data using computer system

4.1 Process entered data using appropriate software commands

4.2 Print out data as required using computer hardware /peripheral devices in accordance with standard operating procedures

4.3 Transfer files and data between compatible systems using computer software, hardware/peripheral devices in accordance with standard operating procedures

LO 5. Use basic functions of a www browser to locate information

5.1 Establish information requirements for internet search

5.2 Launch browser

5.3 Load search engine

5.4 Enter appropriate search criteria/or URL of site

5.5 Follow relevant links to locate required information

5.6 Bookmark useful pages and print as required

LO 6. Maintain computer equipment and systems

6.1 Implement procedures for ensuring security of data, including regular backup and virus checks in accordance with standard operating procedures

6.2 Implement basic file maintenance procedures in line with the standards operating procedures

After going through this lesson, you are expected to:

1. Perform computer operations based on a given task.

I What is new?

Computer is now considered a necessity. In different fields of work like engineering, communications, medical, education, science and discoveries, technical, police work and even in our homes, computer plays a big role in accessing, processing and sharing information.

As a learner, can you give an example of how a computer can help you?

_____

_____

_____.

D What I know?

Direction: Choose the letter of the best answer. Write the chosen letter on a separate sheet of paper.

1. Under which tab in Microsoft Word would you look under to change the page orientation?
   a. Page Layout
   b. View
   c. File
   d. Insert

2. In which Microsoft Office product do you work with animations?
   a. Word
   b. Excel
   c. PowerPoint
   d. Publisher

3. _____ is the best Microsoft Office product to use to create graph.
   a. Word
   b. Excel
   c. PowerPoint
   d. Publisher

4. Your feet should be flat on the floor or supported by a footrest.
   a. True
   b. False

5. When working on a computer, adjust your chair so that you can sit with your back comfortably straight.
   a. True
   b. False

6. You should always rest your wrist on a padded wrist pad when you are keying
   a. True
   b. False

7. Everybody's chairs should be set the same way.
   a. True
   b. False

8. When entering data, your forearms, wrist, and hand should be:
   a. Bent up b. Bent Down
   c. Straight d. Raise up

9. This computer is used by touching with you finger.
   a. Laptop c. Desktop
   b. Mainframe d. Tablet

10.  What am is this type of computer?
   a. Laptop
   b. Desktop
   c. Smart Phone
   d. Mainframe computer

11. Which one of these is the most expensive?
   a. Desktop c. Super Computer
   b. Laptop d. Mainframe Computer

12. Which one of these is the least expensive?
   a. Desktop c. Super Computer
   b. Laptop d. Mainframe Computer

13. This device is categorized as _____

a. Input
b. Output
c. Storage
d. Processor

14. A software application used to view HTML like Microsoft Internet Explorer, Firefox and Google Chrome.

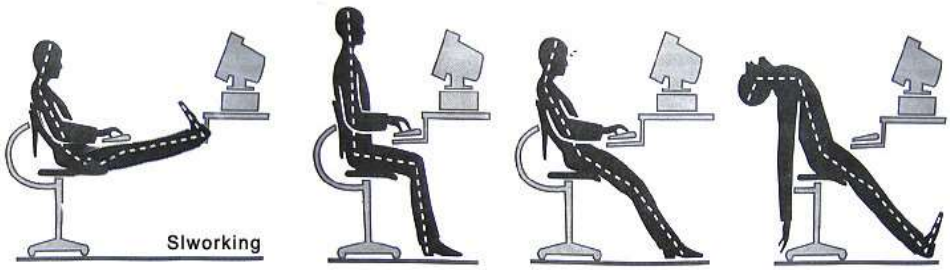
a. Router
b. Server
b. Blog
d. Browser

15. What is this sign for?

a. Coaxial Connection
b. Wired connection
c. Wi-Fi Connection
d. Bluetooth Connection

D *What is in?*

Activity: What can you say about the following images?



https://www.flickr.com/photos/akeg/4056063907

https://commons.wikimedia.org/wiki/File:Technology_stress_hunch.png

D What is it?

Performing Computer Operations

A computer is an electronic device that is used to manipulate information and data. It has the ability to store, retrieve and process data. You can use a computer to type documents, create a spreadsheet, send email, play games, create a video or presentation and browse the web.

Hardware vs. Software

Hardware refers to the tangible, physical and mechanical components of a computer.

Software refers to the intangible computer components. It is a set of instructions that tells the hardware what to do and how to do it. Examples of software include web browsers, games word processors and spreadsheets.

Different Types of Computers

Computers are classified in many types based on their size and speed.

Super Computers is an extremely fast computer, which can execute hundreds of millions of instructions per second.

Mainframe Computers is a multi-user computer system, capable of supporting hundreds of users simultaneously. Software technology is different from minicomputer.

Mini Computers is a multi-user computer system, capable of supporting hundreds of users simultaneously.

Workstations is also a single user computer system, similar to personal computer however it has a more powerful microprocessor.

A **server** is a software or hardware device that accepts and responds to requests made over a network. The device that makes the request, and receives a response from the server, is called a client.

Microcontroller are mini computers that enable the user to store data and execute simple commands and tasks. The computer in your car, for example is an embedded system

Personal Computer is a single user computer system having moderately powerful microprocessor.

- **Desktop Computers** are designed to be placed on a desk. It is commonly used at work, home and school. They are made up of different parts like mouse, monitor, keyboard and a computer system unit.

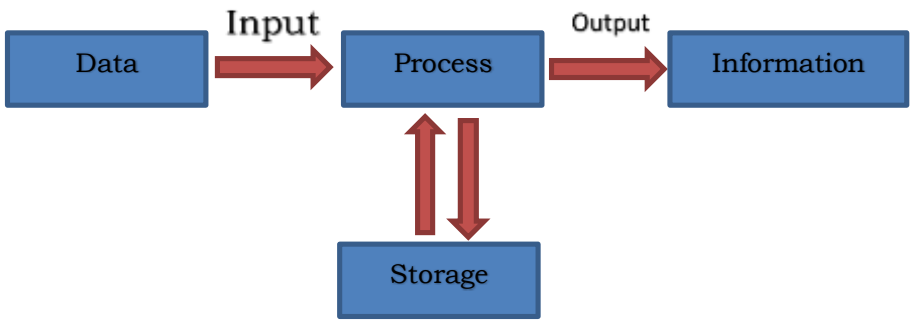
- **Laptop Computers** are battery powered computer that are more portable than desktops, allowing you to use the anywhere.

- **Tablet Computers** are handheld computers that are more portable than a laptop. It uses a touch sensitive screen for typing and navigations.

Information Processing Cycle

Four phases to process information

1. **Input:** Computer receives data and instructions.
2. **Process:** Computer applies instructions to data to produce information (organized data).
3. **Storage**: Saving the information for future use.
4. **Output:** Computer sends information to people in a usable format.

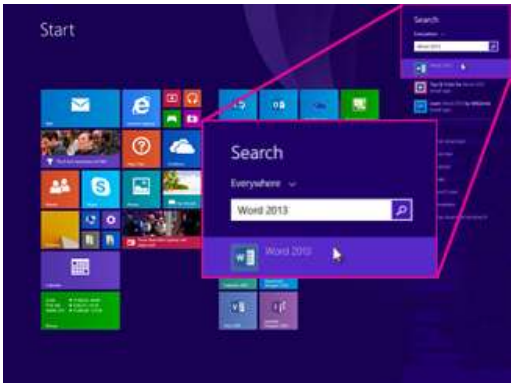


Create, Edit, Store and Print in Microsoft Office

To start using any Microsoft office application, whether Word, Excel or PowerPoint you need to:

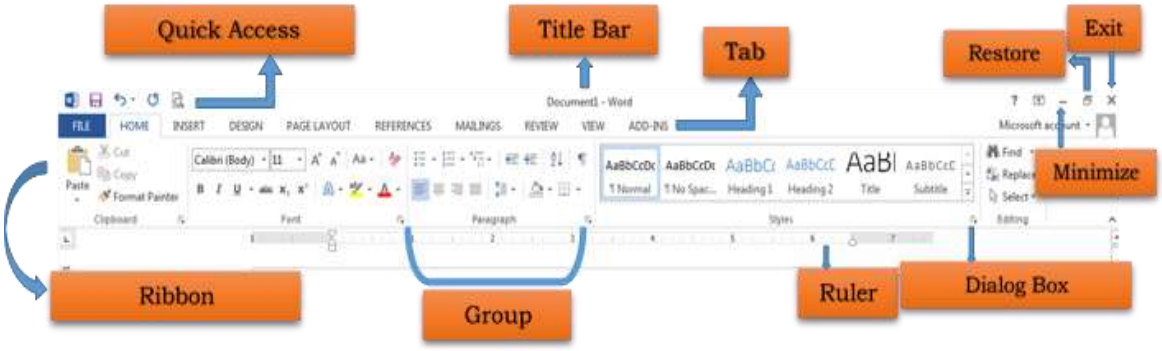
1. Click the "Start" button. Next click on all programs and look for the Microsoft Office folder. There you can select what office application you need to perform the given task.

   You can also search for it in your windows search bar by typing the office application that you need



Microsoft Office Ribbon

The **ribbon** is a set of toolbars at the top of the window in **Office** programs designed to help you quickly find the commands that you need to complete a task.



Create a New Document

- Choose File ⇨ New from the menu bar.
- This may ask you to select which document template to use for the new document.
- Click the New Blank Document button of the tool bar.
- Press CTRL + N on the keyboard.

Open an Existing Document

- Choose File ⇨ Open from the menu bar.
- Click the Open button on the toolbar.
- Press CTRL + O on the keyboard.

NOTE: Each method will show the Open dialog box. Select the drive the file was saved on, choose the file, and click the Open button.

Save a Document

- Select File ⇨ Save from the menu bar.
- Click the Save button on the toolbar.
- Press CTRL + S on the keyboard.

Navigate to the location where you would like to save the document. Make a note of the drive where the document is saved for future reference.

To save an existing open document under a different name, select 'File ⇨ Save As'.

Renaming a Document

To rename an existing, but not open Word document while using the program,

- Select File ⇨ Open (or press CTRL + O on the keyboard) and find the file you want to rename.
- Right-click on the document name with the mouse and select Rename from the shortcut menu.
- Type the new name for the file and press the ENTER key.

Closing a Document

- Choose the File ➪ Exit on the menu bar.
- Click the Close button align with the title bar.
- Press ALT + F4 on the Keyboard.

Printing a File

- Open your document
- Choose Print from the File Menu.
- Select the printer connected on your computer.
- Edit other print settings if needed

Computer Ergonomics

Many people spend hours a day in front of a computer without thinking about the impact on their bodies. Physical daily stress can lead to injuries with life-long impact on health.

Ergonomics is a field of study that attempts to reduce strain, fatigue, and injuries by improving product design and workspace arrangement. The goal is a comfortable, relaxed posture.

Elbows – above the desk at 90-110 degrees
Shoulders – relaxed as opposed to hunched
Wrist – In line with forearms
Hips, Knees, Ankles – At 90 degrees while seated
Feet – Flat on the ground or footrest

Head– Upright with ears aligned with shoulders
Eyes– Level at the top of the monitor
Seat Length– Should be long enough to provide support beneath thighs
Backrest– Angled at 90-110 degrees with adequate lumbar support in line with lower back

Keyboard and Mouse– G and H of keyboard should be aligned with your nose. Mouse gripped loosely

Connecting to the Internet

The Internet is a network of computers and other electronic devices that allows people to share information and communicate with each other.

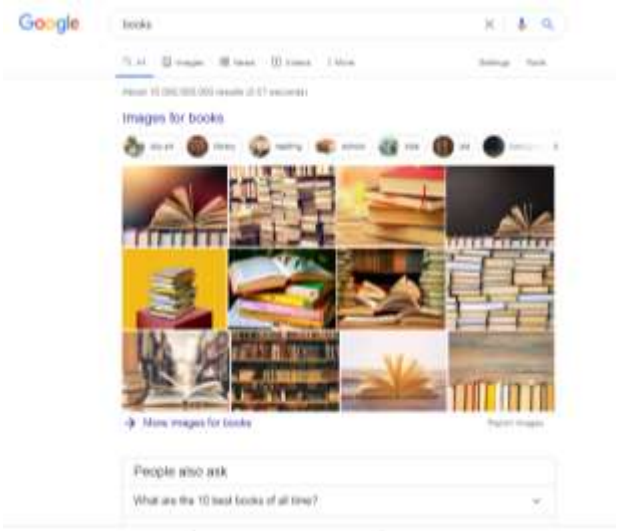
A device has to be connected to an internet service provider, usually a cable company and phone company.

Browsing the Web

- Open your computer or device web browser.
- Type in the website that you need to visit
- While navigating the website, look for hyperlinks, it is often part of a website in blue underlined text, that when clicked will load a different page. Web authors uses links to connect relevant pages.

- Click the star symbol at the end of the address bar to bookmark or save a web page address.

- When searching for a particular topic, use search engines.



- To send and receive messages, use an **Email**. Almost everyone who uses the internet has their own email account because you'll need it to do anything online like online banking and creating a Facebook account.

Maintain Computer Equipment and Systems

1. Install antivirus software
2. Update software regularly fixes for bugs and glitches as well as enhanced security features.
3. Run Computer Maintenance. Defrag your computer regularly and clean the registry. Scans and updates are also necessary.

4. Back up files. Use an external hard drive or software-based back-ups to keep your files in case something happens to your computer
5. Clean and removed dust from monitor, system unit and peripherals
6. Use an auto voltage regulator and surge protector to protect computers from power surges.

E *What is more?*

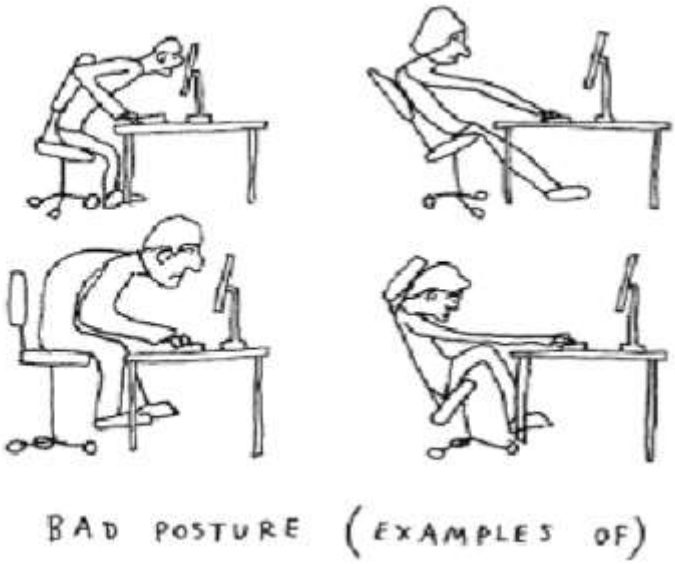
Activity: List down at least five (5) different computer peripheral devices. Identify their categories (*Input Device/ Output Device/ Storage Device*) and their functions.

Computer Peripherals	**Category**	**Function/s**
Example: Mouse	Input Device	Use move cursor to select text, images and software commands in your computer.

E *What I can do?*

Activity

What are the different uncomfortable and awkward positions did you observe in these pictures? List down ways on how to correct it.



Example:

- Elbows should be above the desk 90 to 100 degrees

1. _____
2. _____
3. _____
4. _____
5. _____

E What else can I do?

Direction:

List down steps on how to do the needed task?

1. Maria needs to do a PowerPoint presentation about her report in TLE. What are the steps she needs to perform to open and save the PowerPoint file?

2. Dave was asked to send an email to his boss. How can he do it step by step?

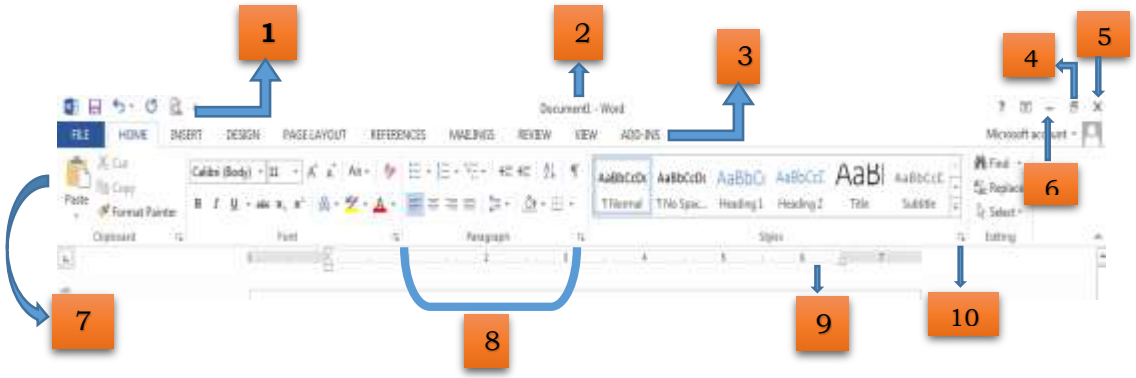
A What I have learned?

1. Determine requirements of task in accordance with the required output
2. Select appropriate hardware and software according to task assigned and required outcome
3. Plan a task to ensure that OSH guidelines and procedures are followed
4. Follow client-specific guidelines and Procedures
5. Apply required data security guidelines in accordance with existing procedures
6. Enter the data into the computer using appropriate program/application in accordance with company procedures
7. Check the accuracy of information and save the information in accordance with standard operating procedures

8. Store inputted data is in storage media according to requirements
9. Perform work within ergonomic guidelines
10. Select correct program/application based on job requirements
11. Access program/application containing the information required according to company procedures
12. Select, open, and close desktop for navigation purposes.
13. Carry out keyboard techniques in line with OSH requirements
14. Process entered data using appropriate software commands.
15. Print out data as required using computer hardware /peripheral devices in accordance with standard operating procedures
16. Transfer files and data between compatible systems using computer software, hardware/peripheral devices in accordance with standard operating procedures
17. Establish information requirements for internet search.
18. Launch browser
19. Load search engine
20. Enter appropriate search criteria/or URL of site
21. Follow relevant links to locate required information
22. Bookmark useful pages and print as required
23. Implement procedures for ensuring security of data, including regular backups and virus checks in accordance with standard operating procedures
24. Implement basic file maintenance procedures in line with the standards operating procedures.

A What I can achieve?

Direction: Using a separate paper. *Identify the parts of the Microsoft office ribbon.*



1. _____ 6. _____
2. _____ 7. _____
3. _____ 8. _____
4. _____ 9. _____
5. _____ 10. _____

What I know

1. A
2. C
3. B
4. A
5. A
6. A
7. B
8. C
9. D
10. D
11. C
12. B
13. A
14. D
15. C

What I can achieve?

1. Quick Access Toolbar
2. Title Bar
3. Tab
4. Restore
5. Exit
6. Minimize
7. Ribbon
8. Group
9. Ruler
10. Dialog Box

References

Types of Computers

https://en.wikiversity.org/wiki/Types_of_computers

Information processing cycle

https://planningtank.com/computer-applications/information-processing-cycle

Microsoft Office search bar image

https://support.office.com/en-us/article/can-t-find-office-applications-in-windows-10-windows-8-or-windows-7-907ce545-6ae8-459b-8d9d-de6764a635d6

Using MS Office

https://en.wikibooks.org/wiki/Microsoft_Office/Create_and_Edit_a_Document

Computer Ergonomics

https://www.uhs.umich.edu/computerergonomics

http://www.safety.uwa.edu.au/topics/physical/ergonomics/workstation

Connecting to the internet

https://edu.gcfglobal.org/en/computerbasics/getting-started-with-the-internet/1/

Maintain computer equipment and systems

https://www.velocitymicro.com/blog/the-10-commandements-of-computer-care/

I What I need to know?

LESSON 3: PERFORMING MENSURATION AND CALCULATION (PMC)

LO 1. Select measuring instruments

1.1 Identify object/s or component to be measured
1.2 Obtain correct specifications from relevant source
1.3 Select measuring tools in line with job requirements

LO 2. Carry out measurements and calculation

2.1 Select appropriate measuring instrument to achieve required outcome
2.2 Obtain accurate measurements for job
2.3 Perform calculation needed to complete task using the four mathematical fundamental operations addition (+), subtraction (-), multiplication (x), and division (÷)
2.4 Use calculation involving fractions, percentages and mixed numbers to complete workplace tasks
2.5 Self-check and correct numerical computation for accuracy
2.6 Read instruments to the limit of accuracy of the tool

LO 3. Maintain measuring instruments

3.1 Ensure proper handling of measuring instruments to avoid damage and clean it before and after using

3.2 Identify tasks to be undertaken for proper storage of instruments according to manufacturer's specifications and standard operating procedures

After going through this lesson, you are expected to:

1. Accurately measure and calculate based on a given tasks;

I What is new?

Motivation:

Can you name these devices?

1. 

2. 

3. 

4. 

5. 

D What I know?

Direction: Read the questions carefully and select the letter of the correct answer from the choices in the next column.

____ 1. It holds the starting instructions for the computer. Information in this Memory is permanent.	A. Floppy Disk Drive
____ 2. A portable storage device with 1GB to 1TB storage capacity. It is used to store and transfer data between devices via USB port.	B. Hard Disk Drive
____ 3. It is the brain of the computer system. It handles all instructions from mouse and keyboard and provides appropriate output.	C. CPU or Processor
____ 4. A device connected in the computer's motherboard that deals with processing images and videos.	D. Solid State Drive
____ 5. A removable disk drive 5 ¼" or 3 ½" in size that is used to save data between 1.2 MB to 1.44 MB of data capacity	E. Video Card
____ 6. A magnetic storage device installed inside the computer that is used as permanent storage of data. Storage capacity is measured in gigabytes (GB) or terabytes (TB). Speed is measured in revolution per minute or RPM	F. Optical Storage Drive
____ 7. Storage media that is often used to store photos, videos, or other data in electronic devices	G. ROM
____ 8. It holds and access data like a hard drive, but it has no moving parts. It is faster, noiseless, higher reliability and lower power consumption.	H. RAM
____ 9. A storage device that uses lasers to read data on the optical media	I. Memory Card

____ 10. The information stored in this memory is lost as the power supply to the computer is turned off, also called **Volatile Memory**	J. Flash Drive or Thumb Drive

D *What is in?*

Activity: What are the different devices or gadget that you know? What type of files can be store in that device?

Device or gadget name:	**Files that can be stored in this device?**
Example: Tablet	Music, pictures, movies, games
1.	
2.	
3.	
4.	
5.	

D What is it?

Components and Objects to be Measured

MEMORY

Memory is a component in your computer that is used to store data and instructions. Computer memory is the storage space in the computer, where data is to be processed and instructions required for processing are stored.

RAM (Random Access Memory)

RAM is a temporary memory. The information stored in this memory is lost as the power supply to the computer is turned off, also called **Volatile Memory**. It stores the data and instruction given by the user and also the results produced by the computer temporarily.

ROM (Read Only Memory)

Information stored in ROM is permanent. It holds the data even if the system is switched off. It holds the starting instructions for the computer. ROM cannot be overwritten by the computer. It is also called **Non-Volatile Memory**.

STORAGE DRIVES

These are also known as secondary memory that is used for storing data or information permanently.

Data Storage Capacity - The amount of data a storage device such as a disk or tape can hold. Storage capacity is measured in kilobytes (KB), megabytes (MB), gigabytes (GB) and terabytes (TB).

Magnetic Storage Devices

Floppy Disk Drive is a removable disk drive 5 ¼" or 3 ½" in size that is used to save data between 1.2 MB to 1.44 MB of data capacity.

Hard Disk Drive is a magnetic storage device installed inside the computer that is used as permanent storage of data. Storage capacity is measured in gigabytes (GB) or terabytes (TB). Speed is measured in revolution per minute or RPM

Optical Storage Devices

An optical drive is a storage device that uses lasers to read data on the optical media. Blue ray disc, CD-ROM disc, CR-R and CD-RW disc, DVD-R,DVD –RW are some of the examples.

Flash Memory Devices

Flash Drive is a portable storage device with 1GB to 1TB storage capacity. It is used to store and transfer data between devices via USB port.

Compact Flash is a 50 pin connection storage medium, commonly found in PDAs, digital cameras, and other portable devices.

Memory Card is a storage media that is often used to store photos, videos, or other data in electronic devices.

Solid-state Drive (SSD) is a storage device that is non volatile. It holds and access data like a hard drive, but it has no moving parts. It is faster, noiseless, higher reliability and lower power consumption.

PROCESSOR

The processor or CPU is the brain of the computer system. It handles all instructions from mouse and keyboard and provides appropriate output.

VIDEO CARD

A video card is a hardware connected in the computer's motherboard that deals with processing images and videos.

Maintain measuring instruments

Components to be measured like the Computer Memory and Storage Devices are mostly sensitive and needed extra care while using. To avoid damage follow these guidelines in maintaining your devices.

1. Always follow the manufacturer's instructions and standard operating procedure in proper usage and handling.
2. Portable storage devices, needs to be scanned using the latest virus scanner to avoid transfer of virus from one computer to another.
3. Avoid touching sensitive parts like the magnetic disk, pin and connectors.
4. Blow away dust using compressed air.
5. Use storage for small devices to avoid losing it.
6. Do not dropped to avoid damage

Using the Correct Specifications as specified in the Operating System

For a program to run, a hardware or software must be installed inside your computer. There are ***list of common set of requirements*** that is needed for a certain type of program to run. These are called **system requirement**.

Examples System Requirements for Popular PC Games

Star Wars: The Force Unleashed (2009) requires:

System requirements [hide]

	Requirements
Windows	
Operating system	Windows Windows XP SP3, Windows Vista SP2, Windows 7
CPU	Core 2 Duo or Athlon X2 at 2.4 GHz
Memory	2 GB RAM
Hard drive	8 GB of free space, 23.8 GB + 1 GB Swap File hard disk space
Graphics hardware	DirectX 9.0c compatible video card. 3D Hardware Accelerator - 256MB of memory minimum
Sound hardware	DirectX 9.0c compatible sound card

Grand Theft Auto V (2015) requires:[3]

System requirements [hide]

	Requirements
Windows	
Operating system	Windows 8.1 64 Bit, Windows 8 64 Bit, Windows 7 64 Bit Service Pack 1, Windows Vista 64 Bit Service Pack 2
CPU	Core 2 Quad Q6600 at 2.4 GHz or AMD Phenom 9850 at 2.5 GHz
Memory	4 GB RAM
Hard drive	65 GB of free space
Graphics hardware	DirectX 10-compatible GPU: GeForce 9800GT 1GB or ATI Radeon HD 4870 1GB
Sound hardware	DirectX 10 compatible sound card

(https://en.wikipedia.org/wiki/System_requirements)

CONVERSION AND CALCULATION

Computers use binary codes 1 and 0 to represent and interpret letters, numbers and special characters with bits. A decimal number can be understood by a computer if it is converted to binary first.

Convert Decimal to Binary

To convert decimal number to binary, divide the number by 2, get the quotient and remainder

Example: 45

	Quotient	Remainder
45/2	22	1
22/2	11	0
11/2	5	1
5/2	2	1
2/2	1	0
1/2	0	1
45 = 101101		

Checking:

Multiplier	1	0	1	1	0	1
Equivalents	32	16	8	4	2	1
Results	32	0	8	4	0	1
32 + 0 + 8 + 4 + 0 + 1 = 45						

When it comes to **text and characters**, there is what we called an American Standard Code for Information Interchange (ASCII).

ASCII TO DECIMAL TABLE

Code	Char	Code	Char	Code	Char	Code	Char	Code	Char	Code	Char
32	[space]	48	0	64	@	80	P	96	`	112	p
33	!	49	1	65	A	81	Q	97	a	113	q
34	"	50	2	66	B	82	R	98	b	114	r
35	#	51	3	67	C	83	S	99	c	115	s
36	$	52	4	68	D	84	T	100	d	116	t
37	%	53	5	69	E	85	U	101	e	117	u
38	&	54	6	70	F	86	V	102	f	118	v
39	'	55	7	71	G	87	W	103	g	119	w
40	(	56	8	72	H	88	X	104	h	120	x
41	)	57	9	73	I	89	Y	105	i	121	y
42	*	58	:	74	J	90	Z	106	j	122	z
43	+	59	;	75	K	91	[	107	k	123	{
44	,	60	<	76	L	92	\	108	l	124	|
45	-	61	=	77	M	93	]	109	m	125	}
46	.	62	>	78	N	94	^	110	n	126	~
47	/	63	?	79	O	95	_	111	o	127	[backspace]

http://everysolutionshere.blogspot.com/2014/11/ascii-to-decimal.html

If you press letter **A** in your keyboard it will be translated into ASCII code 65, then to binary which is 1000001.

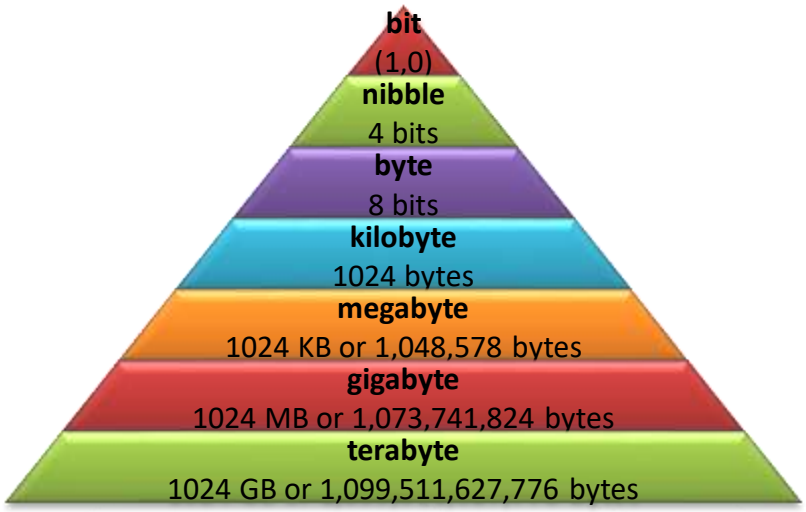
Multiplier (Binary)	**1**	**0**	**0**	**0**	**0**	**0**	**1**
Equivalents	64	32	16	8	4	2	1
Results	1x64 =64	0x32 =0	0x16 = 0	0x8 = 0	0x4 =0	0x2 =0	1x1 =1
64 + 0 + 0 + 0 + 0 + 0 + 1 = 65 **(A = ASCII Code)**							

Let us convert the word "**Hello**" into Binary

Letters	Decimal	Binary						
H	*72*	**1**	**0**	**0**	**1**	**0**	**0**	**0**
		64	32	16	8	4	2	1
e	101	**1**	**1**	**0**	**0**	**1**	**0**	**1**
		64	32	16	8	4	2	1
l	108	**1**	**1**	**0**	**1**	**1**	**0**	**0**
		64	32	16	8	4	2	1
l	108	**1**	**1**	**0**	**1**	**1**	**0**	**0**
		64	32	16	8	4	2	1
o	111	**1**	**1**	**0**	**1**	**1**	**1**	**1**
		64	32	16	8	4	2	1
Hello = 1001000 1100101 1101100 1101100 1101111								

DATA STORAGE CALCULATION

Have you ever wondered how many files can be stored in your storage drive? There is a way to know file storage capacity. When referring to storage space, we use the terms bytes (B), kilobytes (KB), megabytes (MB), gigabytes (GB), and terabytes (TB).



First step is to determine the size of your file, then identify the size of your folder or storage drive. For example:

File size is 45KB

1KB = 1024 bytes

45 * 1024 = 46,080

Folder Size = 1 MB

1MB = 1,048, 576

1,048,576 / 46,080 = 22.8 or approximately 22 files can be stored in a 1MB folder.

Another example, you are wondering how many photos can be save in your 1GB USB Flash Drive.

1 Photo = 5 MB

5 MB = 1,048,576 * 5 = 5,242,880

1 GB = 1,073,741,824

1,073,741,824 / 5,242,880

= 204.8 photos *(more or less depending on the actual image size*

E *What is more?*

List down ways on how to take care of your computer and storage devices.

1. _____
2. _____
3. _____
4. _____
5. _____

E *What I can do?*

Application: Identify the answer for each question. Show your solution in a sheet of paper.

I. Convert the following Decimal Numbers into Binary Digits. Perform checking to verify the answers.

1. 45
2. 37
3. 12
4. 56
5. 17

II. Using the ASCII code chart, what BINARY numbers correspond to the word LOVE.

III. Identify how many files can be saved in a 5MB size folder.

1. 20 KB MS Word file
2. 2 MB picture file
3. 73 KB MS Excel file

E *What else can I do?*

Using the ASCII to decimal table, create a simple name tag using your first name's Binary code.

Example:

https://images.app.goo.gl/fJPqbNxdq6LeLL6w7

A *What I have learned?*

1. Identify object/s or component to be measured
2. Obtain correct specifications from relevant source
3. Select measuring tools in line with job requirements
4. Select appropriate measuring instrument to achieve required outcome
5. Obtain accurate measurements for job
6. Perform calculation needed to complete task using the four mathematical fundamental operations addition (+), subtraction (-), multiplication (x), and division (÷)
7. Use calculation involving fractions, percentages and mixed numbers to complete workplace tasks
8. Self-check and correct numerical computation for accuracy
9. Read instruments to the limit of accuracy of the tool
10. Ensure proper handling of measuring instruments to avoid damage and clean it before and after using
11. Identify tasks to be undertaken for proper storage of instruments according to manufacturer's specifications and standard operating procedures

A What I can achieve?

Direction: Choose the letter of the correct answer.

1. A magnetic storage device that is installed inside the computer.
   a. Registers b. Hard Drive
   c. IDE d. Optical Drive

2. Temporary storage for data and programs that are being accessed by the CPU
   a. DDR b. Hard Drive
   c. Random Access Memory d. Memory Module

3. A storage device that uses lasers to read data on the optical media.
   a. Registers b. Hard Drive
   c. IDE d. Optical Drive

4. A storage device that uses removable 3.5-inch disks
   a. Optical Drive b. Hard Drive
   c. Floppy Drive d. Flash Drive

5. A removable storage device that connects to a USB port
   a. Optical Drive b. Hard Drive
   c. Floppy Drive d. Flash Drive

6. Chips that are located on the motherboard
   a. Read Only Memory b. Random Access Memory
   c. DDR d. Memory Module

7.If a 10KB file is stored in a 1MB folder , approximately how many files can be stored in that folder?
   a. 10 files b. 1000 files
   c. 102 files d. 1200 files

8. 1KB is equivalent to _____ bytes.
   a. 1024 b. 1000
   c. 1042 d. 1240

9. Convert 14 to binary.
   a. 1010 b. 1110
   c. 1011 d. 1100

10. Convert 38 to binary.
   a. 110011 b. 100000
   c. 101110 d. 100110

What I know

1. G
2. J
3. C
4. E
5. A
6. B
7. I
8. D
9. F
10. H

What I can do

I.

1. 101101
2. 100101
3. 1100
4. 111000
5. 10001

II.

1. L = 1001100
2. O =1001111
3. V = 1010110
4. E = 1000101

III.

1. 256 files
2. 2.5 or 3 files
3. 70.13 or 70 files

What I can achieve?

1. B
2. C
3. D
4. C
5. C
6. A
7. C
8. A
9. B

References

Memory

https://www.informationq.com/memory-of-the-computer/

Storage Drives

https://www.computerhope.com/jargon/s/stordevi.htm

Binary

https://www.khanacademy.org/computing/computer-science/how-computers-work2/v/khan-academy-and-codeorg-binary-data

Conversion of Decimal to Binary

https://www.wikihow.com/Convert-from-Decimal-to-Binary

I What I need to know?

LESSON 4 – PREPARING AND INTERPRETING TECHNICAL DRAWING

Learning Outcome 1. Identify different kinds of technical drawing

1.1 Select correct technical drawing in accordance with the job requirements

1.2 Segregate technical drawings in accordance with the types and kinds of drawings

Learning Outcome 2. Interpret Technical Drawing

2.1 Recognize components, assemblies or objects as required

2.2 Identify the dimension of the key features of the objects depicted in the drawing

2.3 Identify and interpret symbols used in the drawing

2.4 Check and validate drawing against job requirement or equipment in accordance with the standard operating procedure

Learning Outcome 3. Prepare/make changes to electrical/ electronic schematics and drawings

3.1 Draw and identify correctly electrical/ electronic schematic

3.2 Identify correct drawing; select and use equipment in accordance with job requirements

Learning Outcome 4. Store technical drawings and equipment/ instruments

4.1 Identify tasks to be undertaken for care and maintenance of drawings according to company procedures

4.2 Record technical drawings and prepare an inventory in accordance with company procedures

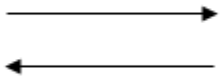
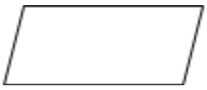
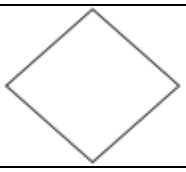
4.3 Identify tasks to be undertaken for the proper storage of instruments according to company procedure

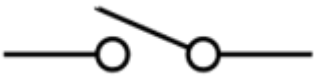
After going through this lesson, you are expected to:

1. Prepare and interpret technical drawings and work plans accurately.
2. Demonstrate and understand the concepts and underlying principles in preparing and interpreting technical drawings and work plans for computer systems servicing

I What is new?

Can you examine the given icons and write their names and functions on the space provided on the right?

FLOWCHART SYMBOLS	DESCRIPTION
	
	
	
	
	

ELECTRICAL / ELECTRONICS SYMBOLS	DESCRIPTION
	
	
	

D What I know?

Direction: Identify what is being described. Find your answer inside the box. Write the correct answer on the space provided before the number.

Oval	Diamond	Circle	Decision
Sub Process	Flowcharting	Rhomboid	
Pentagon	Rectangle	Flowchart	
Directional Arrow	Connector	Pencil	
Eraser	French Curve	T- Square	
Drawing Tape	Compass	Sharpener	

_____1. This shape represent decision

_____2. This representation symbolize data

_____3. This shape represents a process.

_____4. It is used to connect two directional lines.

_____5. It is used to connect flow of action or data from one symbol to another.

_____6. This symbol represent terminal

_____7. This symbol signify connector

_____8. This is the graphical representation of the data flow

_____9. It is the process of describing or showing the flow of operations

_____10. This symbol rectangle with double lines on each side represent _____.

_____11. It is a tool used for drawing circles and arcs.

_____12. It is a tool used to sharpen pencils.

_____13. It is a tool used in drawing horizontal lines.

_____14. It is a tool used for writing and drawing

_____15. It is a tool used for fastening the drawing paper on the drawing board

D *What is in?*

What have you noticed about the pictures below?

Can you tell me which among these two represents an image done through drawing and drafting?

If you have an idea, please write the meaning of Drafting and Drawing on the box below?

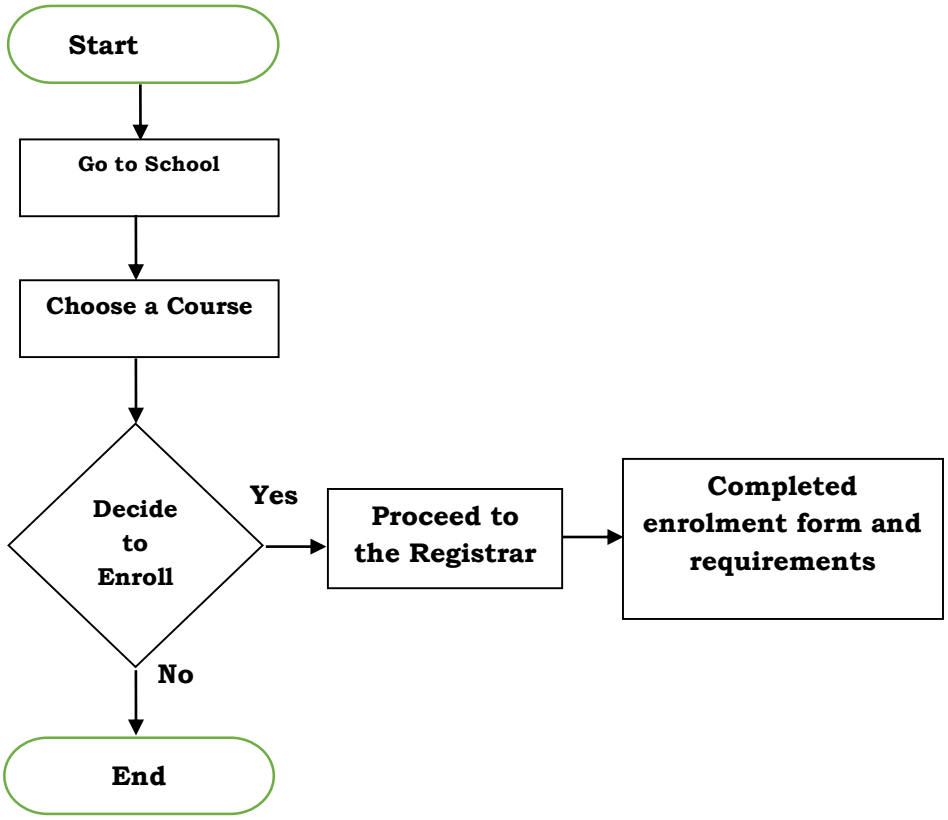
Drafting	**Drawing**

D *What is it?*

A flowchart is commonly used by systems analysts to visualize the series of processes in a business system. A flowchart is a useful tool to design an efficient business system and to troubleshoot or improve an existing system.

Flowcharting is a process of describing or showing the flow of operations that must be performed to solve a certain problem using different symbols.

Flowchart- is a visual or graphic representation of the data flow.
A flowchart represents the whole thing that you plan or do. The given flowchart below describes the simple actions.



Elements of Flowchart

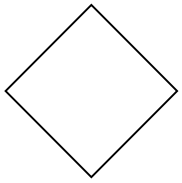
Flowcharts show the exact sequence of procedures to be made and to describe the flow of data. It uses graphics symbols that represent as terminator, process, sub process, decision, arrow lines, and connectors. The most commonly used flowchart symbols are the following:

This symbol (oval) represents a terminal usually start and end. A Flowchart is used to start or end a process or an action.

This symbol (rectangle) represents a process. This is used to represent a process, procedure, or action taken.

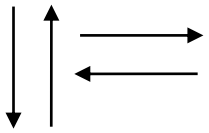
This symbol (rectangle with double lines on each side) represents a sub process. This may be a subroutine procedure that is divided into at any point in the process.

This symbol (rhomboid) symbolize data. This is used to show data or information that entering or leaving the process. This flowchart symbol is usually used as input or output.



This symbol (Diamond) signifies a decision. This is used when the decision has to be made, requiring an answer yes or no, true or false, on or off.

This symbol (small circle) design as a connector. This is used to connect two directional lines and usually labelled to show matching jump points.



The directional arrow serves as a connector line to connect the different symbols, the flow of action, and data from one symbol to another.

Procedures in Creating Flowchart

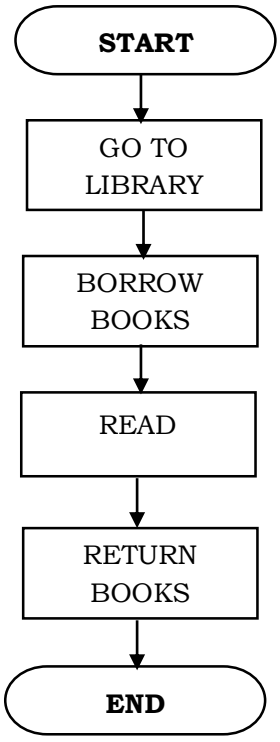
Making flowcharts is quite difficult, so when creating a flowchart, we must remember the following:

- The purpose should be described in a clear and definite process.
- Each procedure should be presented.
- Always focus on the main flow.
- Provide a useful conclusion to the entire process.
- The flow of the process should be from left to right, top to bottom.
- Write a brief and clear word or code inside the flowcharts.

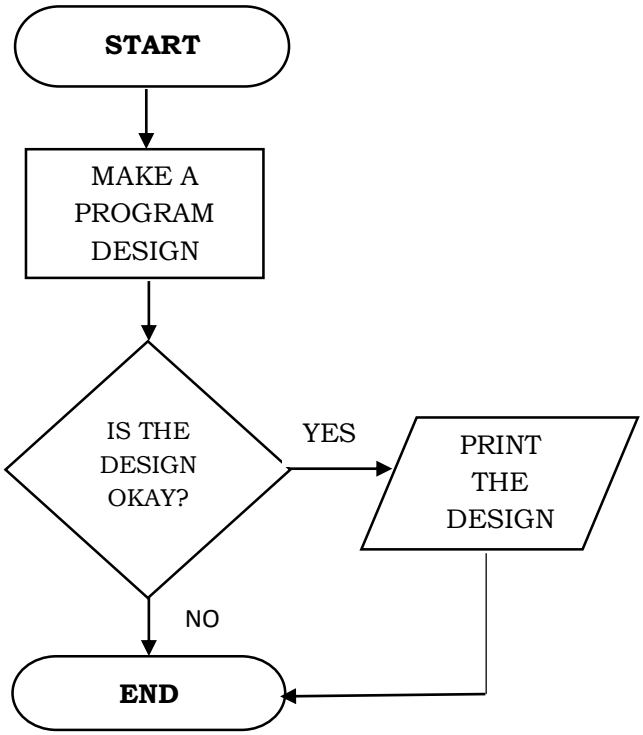
Basic Flowcharting Forms

There are only three basic flowcharting forms. These are the following:

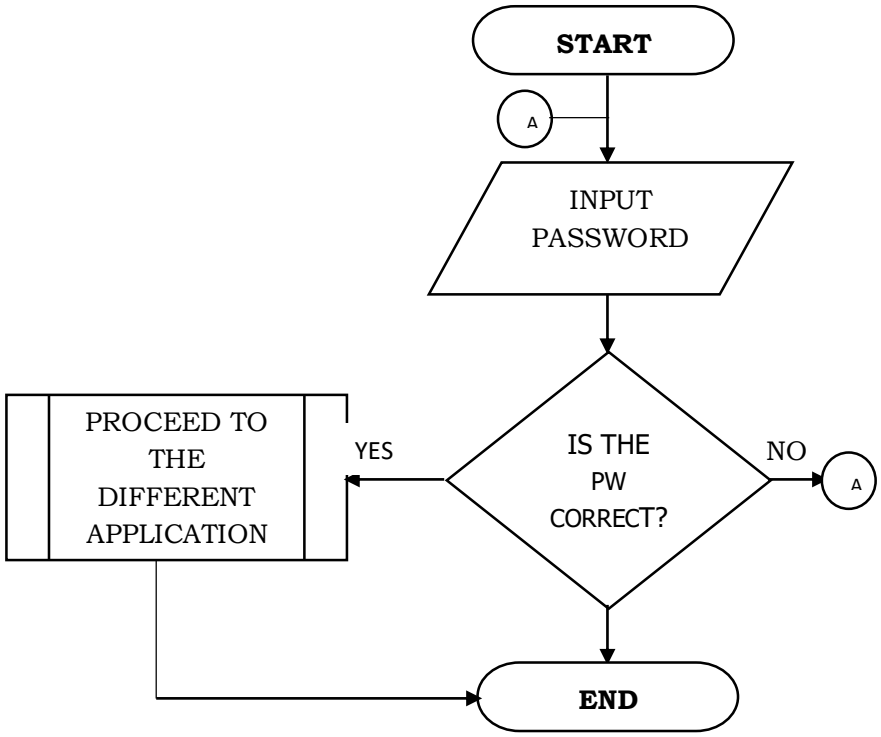
1. **SEQUENCIAL Program Flow** is a simple arrangement of actions and processes. It is composed of a series of the statement which is executed one by one from top to bottom.



2. **DECISION Program Flow** involves a decision to determine the truth or falsity of a certain statement. The direction of the flow depends on the result of the decision.



3. **LOOPING Program Flow** repeats an action several times as initially set until a certain condition is met.



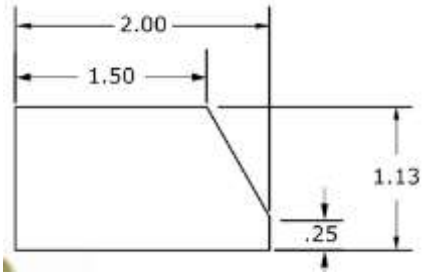
Interpret Technical Drawing

The technical drawing is essential for communicating ideas in industry and engineering. It is the act of making detailed drawings.

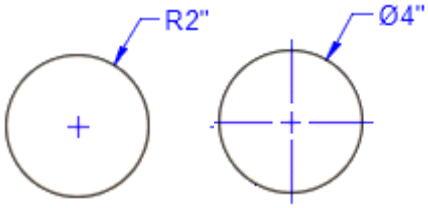
Dimensioning is the process of defining the size, form, and location of geometric features and components on an engineering drawing.
Dimensions are used to describe the sizes and relationships between features in your drawing.

The basic types of Dimensioning

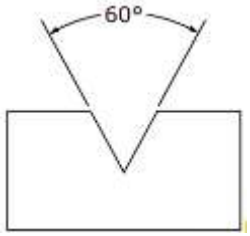
Linear dimensions can be horizontal, vertical, or aligned.



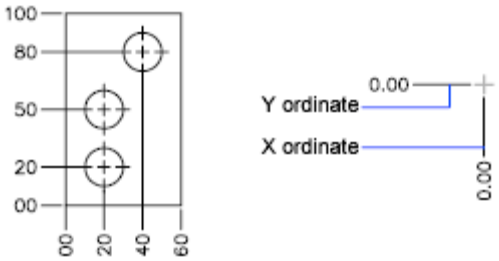
Radial dimension measures the radius or diameter of arcs and circles with an optional centerline or center mark.



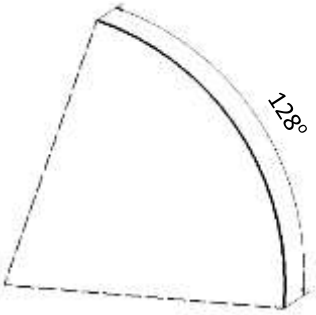
Angular dimensions measure the angle between two selected geometric objects or three points.



Ordinate dimensions measure the perpendicular distances from an origin point called the *datum*, such as a hole in a part.



Arc length dimensions measure the distance along an arc or polyline arc segment. Typical uses of arc length dimensions include measuring the travel distance around a camp or indicating the length of a cable.



The two systems of placing dimensions

- **Aligned system** the dimension is placed perpendicular to the dimension line.
- **Unidirectional system** all dimensions are placed such that they can be read from the bottom of the drawing sheet.

A dimension consists of the following items:

Dimension lines (with arrowheads) it indicates the direction and extent of a dimension, and inscribe dimension numbers.

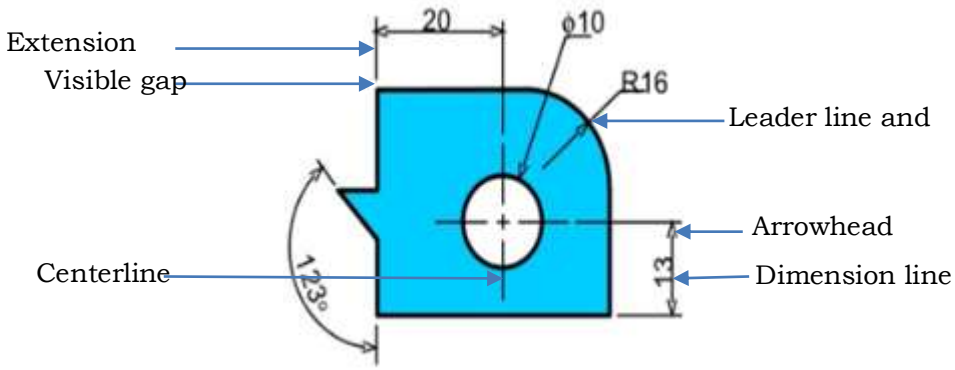
Extension lines indicate the location on the object's features that are dimensioned.

Centerline is a line dividing any symmetrical plane figure or surface of revolution into two symmetrical halves.

Leader lines indicate details of the feature with a local note. It should be at an angle of 30° to 60 °.

Arrowheads indicate the extent of dimension.

Notes it is usually necessary to supplement the direct dimensions with notes.



There are two basic types of notes used in a technical drawing

Local Note pertains to a specific area of an object. Local notes are pointed to a specific feature with a leader attached.

General Note pertains to the drawing as a whole. General notes can be located anywhere in the drawing. Some companies have standards as to where the general notes are located.

Dimension Number System

- **Dimension numbers** it is a dimension figure.

1. **U.S System** is an ASME (American Society of Mechanical Engineers.) standards for the U.S dimensioning use the decimal inch values.
2. **Metric Dimensioning System** is an ISO (International Organization for Standardization) standards for the use of metric dimensioning that require all the dimensions to be expressed in millimeters (mm).
3. **Dual Dimensioning System** is the drafting practice of using multiple units of measure in a **dimension** in the same direction of a feature.

- Length dimension is expressed in millimeters without a necessity to specify a unit symbol "mm".
- Angular dimension is expressed in degree with a symbol "o" places behind the number.

The keys to good dimensioning are:

- Choice of dimensions
- Placement of dimensions
- Technique of dimensioning
- Specifying dimension tolerances

Choice of Dimensioning

- The dimensions you specify define how the object is manufactured:
- ✓ Dimension first for function and then review seeking improvements for production/manufacturing purposes such as manufacturability, inspection, etc.
- Do not give superfluous dimensions
- ✓ Only those dimensions that are needed to manufacture and inspect the object are to be included on the drawing
- ✓ All necessary dimensions must be shown but avoid giving unnecessary dimensions.
- ✓ Each dimension should appear only once; do not repeat dimensions on the same view or a different view.

Placement of dimension

- Place dimensions between views when possible, but only attached to a single view
  The dimension should not be placed on a view unless doing promotes the clarity of the drawing
- Give dimensions where the contours of the object are defined
- Follow accepted standards so that dimensions are legible, easy to find, and easy to interpret.

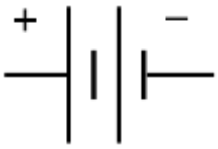
Prepare/make changes to electrical/electronic schematics and drawings

Basic Electronics and Electrical Components

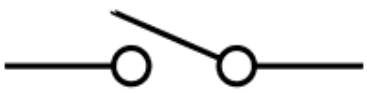
Electronic Schematic Symbols

Graphic symbols have been developed for describing the connections and functions of such circuits and systems.

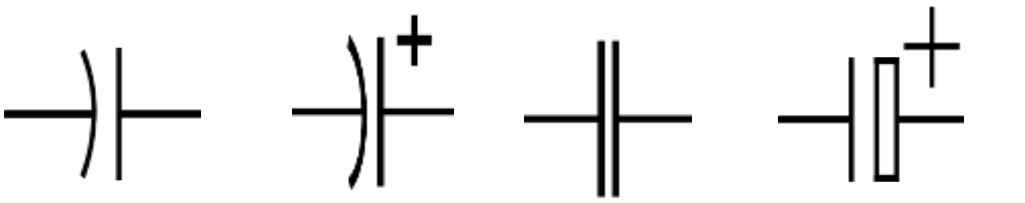
Batteries are represented on a schematic with a pair of disproportionate, parallel lines. The number of lines indicates the number of series of cells in the battery.



Switch can be represented in numerous ways in electronic schematics.

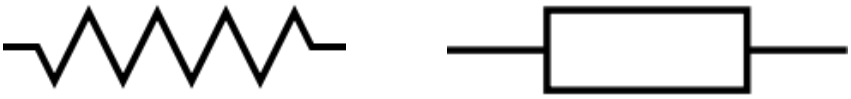


Capacitors are either polarized or not. A polarized capacitor is marked with a "+" sign.
Note: It is important to distinguish between these two because the polarized capacitor needs to be placed correctly according to the "+" sign.



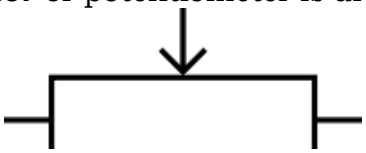
Standard Capacitor **US Style** | Polarized Capacitor **US Style** | Standard Capacitor **EU Style** | Polarized Capacitor **EU Style**

Resistor reduces the current flow. The symbol is often drawn as a resistor with an arrow across it or pointing down on it as the one below.



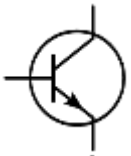
American Style Resistor | European Style Resistor

Variable resistor or potentiometer is drawn in several different ways.

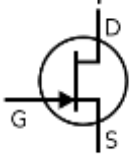


Transistor is like an electronic switch. It can turn current on and off.
The most common transistor types:

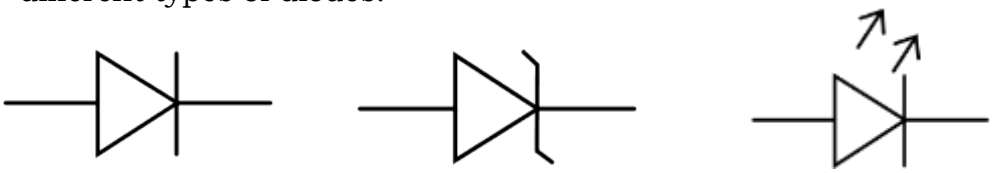
Bipolar Junction Transistor (BJT)



Field Effect Transistor (FET



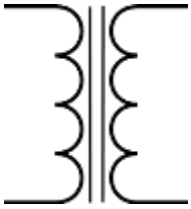
Diode family has several different symbols because there are several different types of diodes.



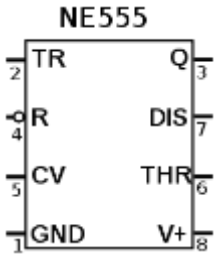
Standard Diode | Zener Diode | Light Emitting Diode

Inductor is also called a coil or reactor. The coils store energy in a magnetic field or flux. An inductor symbol looks like a coiled wire as this is what an inductor essentially is.

Transformer is two or more coils coupled by magnetic induction. It helps keep the frequency and reduce tension in an AC circuit. The symbol of the transformer looks like two inductors with something in between them.



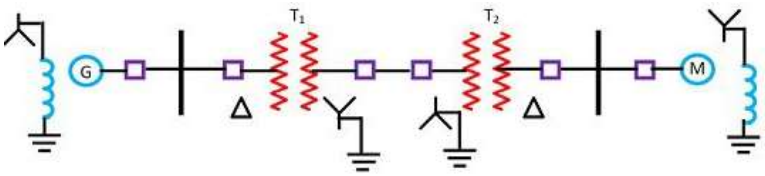
Integrated circuits (IC) are usually shown as rectangular boxes with pin names.



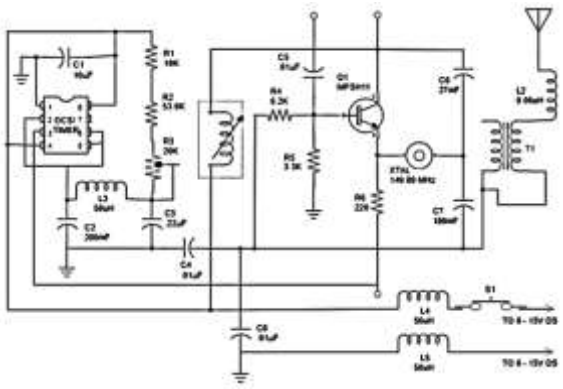
Types of Electronic/ Electrical Diagrams

There are many kinds of electrical/electronic diagrams. Each kind of diagram suits its purpose.

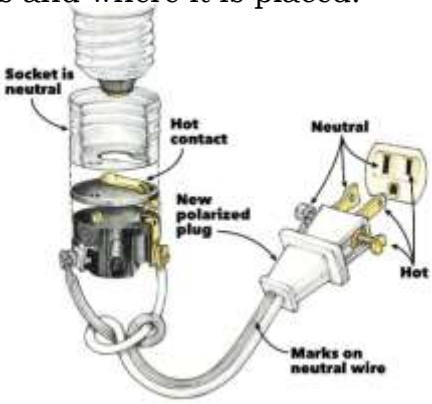
1. **Single line (One-line) diagram** is the representation of a power system using the simple symbol for each component. The single line diagram of a power system is the network that shows the main connections and arrangement of the system components along with their data (such as output rating, voltage, resistance, and reactance, etc.).



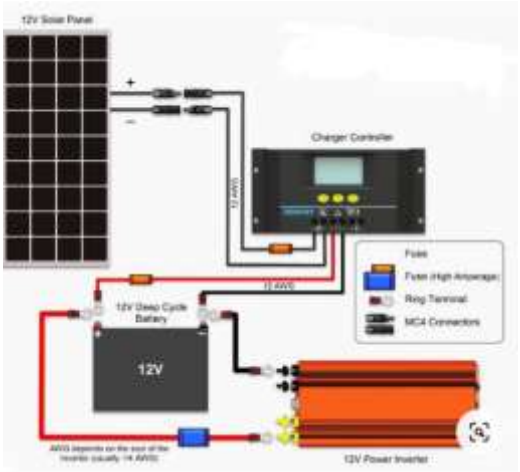
2.Schematic Diagram. This diagram shows, using graphic symbols, the ways a circuit is connected, and what the circuit does. The schematic does not have to show the size or shape of the parts of the circuit. It does not have to show where the parts of the circuit are.



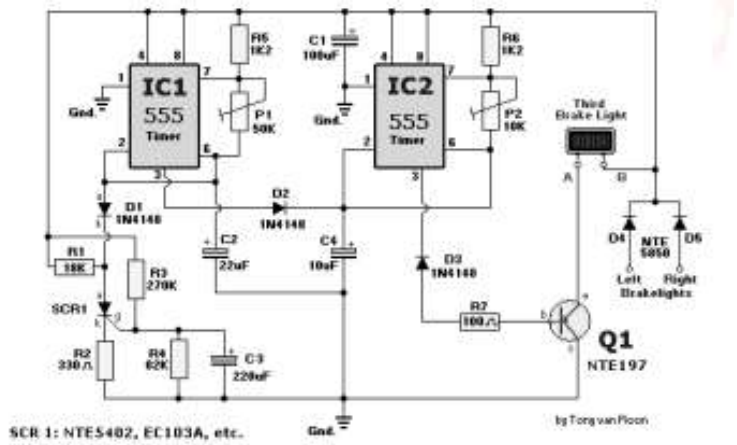
3. Connection or Wiring Diagram. This diagram shows how the components of a circuit are connected. It may cover connections inside or outside the components. It has as much detail as is needed to make or trace connections. The connection diagram usually shows how a component looks and where it is placed.

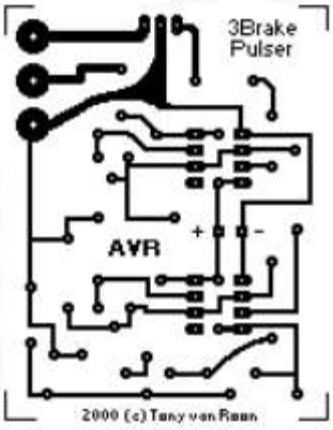


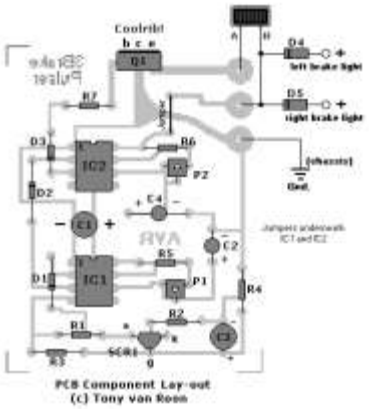
4. Interconnection diagram. This is a kind of connection or wiring diagram that shows only connections outside the component. An interconnection diagram shows the connection between components. The connections inside the component are usually left out.



5.Layout diagram – This diagram is a pictorial of how the electronic circuit looks. These drawings show the actual layout of the components on the circuit board. This provides a two-dimensional drawing, usually looking down from the top, detailing the components in their location. Normally the pictorial layout would be accompanied by a parts list.







Line Convention

- As with other types of diagrams, a schedule of line weights or line conventions is used in drawing electrical and electronics diagrams. The standard line conventions used in the preparation of these diagrams are shown below

FOR GENERAL USE	MEDIUM
MECHANICAL CONNECTION, SHIELDING AND FUTURE CIRCUIT LINE	MEDUIM
BRACKET-CONNECTING DASH LINE	MEDUIM
USE OF THIS LINE THICKNESSES OPTIONAL	
BRACKETS, LEADER LINES, ETC.	THIN
BOUNDARY OF MECHANICAL GROUPING	THIN
FOR EMPHASIS	THICK

Symbols and Layout

The symbol can be drawn to any dimensions required. For most electrical diagrams meant to be used for manufacturing, or use in a smaller form, draw symbols about 1.5 times the size of those shown in American National Standard.

Reference Designations

The symbols used to represent various components on a circuit diagram are most often accompanied by a combination of letters that identify the components but are not themselves a part of the symbol.

Components	Class Designation Letter(s)
Capacitor	C
Diode	D
Resistor	R
Switch	S or SW
Transformer	T
Transistor	Q or TR

- A well-drawn schematic makes it easy to understand how a circuit works and aids in troubleshooting; a poor schematic only creates confusion.

Store technical drawings and equipment/ instruments

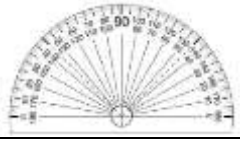
- The equipment, which has been in use is stored neatly in a clean and dry place. Dirty and damaged equipment does not help in the production of good and clean drawings.

The Technical drawing serves as a guide or plan to the construction of whatever is represented in the drawing.

Purpose of technical drawing

- The purpose of a technical drawing is to clarify an idea and to translate that idea into a common graphical language.
- Technical drawings fulfill the purpose of idea translation through the application of a variety of methods and visual conventions.

Tools used in technical drawing

Tools	Description
Drafting Table and Stand 	It is a special table with a slanted surface that can be adjusted based on the desired angle. It is higher than an ordinary writing table because some drawings, like mechanical drawing, are usually done while the draftsman is standing.
T-square 	It is a tool used in hand-drawing such things as architectural drawings. A guide in drawing parallel horizontal lines
Triangle 	It is used to draw accurate parallel lines, vertical lines, and other angled lines. It draws perfect 90, 60, 45, and 30-degree angles.
Triangular Scale 	It is a ruler that has a 3-lobed cross-section with 6 different types of scales on the edges (2 on each face) used for measuring and preparing scale drawings such as blueprints and maps. It is also called an *architect's scale.*
Compass 	It is used for drawing circles and arcs. One of the two legs of the compass ends in a needle, which the user places gently on paper to keep the compass in place.
Protractor 	It is a semicircular tool used to measure or layout angle/arc.

French Curve 	It is used to draw different types of curves. It is called a cloud template in Japanese because it resembles a cloud. The French curve enables the artist to draw curves that would be difficult to achieve with a compass.
Eraser Shield 	It is a thin sheet of stainless steel or plastic with slots and holes of different shapes. They are designed to allow erasers to be used through them to erase lines and text without removing lines close by which do not need to be (or should not be) erased.
Pencils 	It is used for writing and drawing.
Pencil Sharpener 	It is a tool used to sharpen pencils.
Eraser 	It is used to remove unwanted lines and marks in a drawing.
Drawing paper 	It is a thick paper specifically for drafting and sketching.
Drafting /Drawing Tape 	It is coated with a weak adhesive and is mainly used to fix paper to drafting boards and to hold lettering, etc. while designing and doing layouts.

Proper Care and Maintenance

It is essential to take proper care of the drafting tools, materials, and equipment. Below are some tips to properly use and take care of them.

1. Avoid dropping your tools and equipment.
2. Never use measuring tools in cutting paper.
3. Do not sharpen your pencil on top of your workplace.
4. Wipe off the surface and edges of triangles and T-squares.
5. Sharpen and store your pencils properly after use.
6. Find or create an organizer where you can hang your measuring tools.
7. Have a separate container for making tools.
8. Keep your drawing sheets in a plastic tube to protect them from dust and dirt.
9. Never lend or borrow drafting tools and materials if may.
10. Always clean the instruments and the drawing table before beginning your work

E *What is more?*

Think of a problem to solved or an objective to be accomplished. Create a flowchart to help as a solution. Use various symbols you have learned in this lesson.

Scoring Rubrics:
You will be graded according to:

FLOWCHART RUBRIC

Criteria	Points	Score
The flowchart's structure is met the objective	20	
Branching is complete and clearly illustrated	20	
Each element of the flowchart is labeled	20	
Correct symbols are used	20	
The flowchart is easy to follow	20	
TOTAL	100	

E *What I can do?*

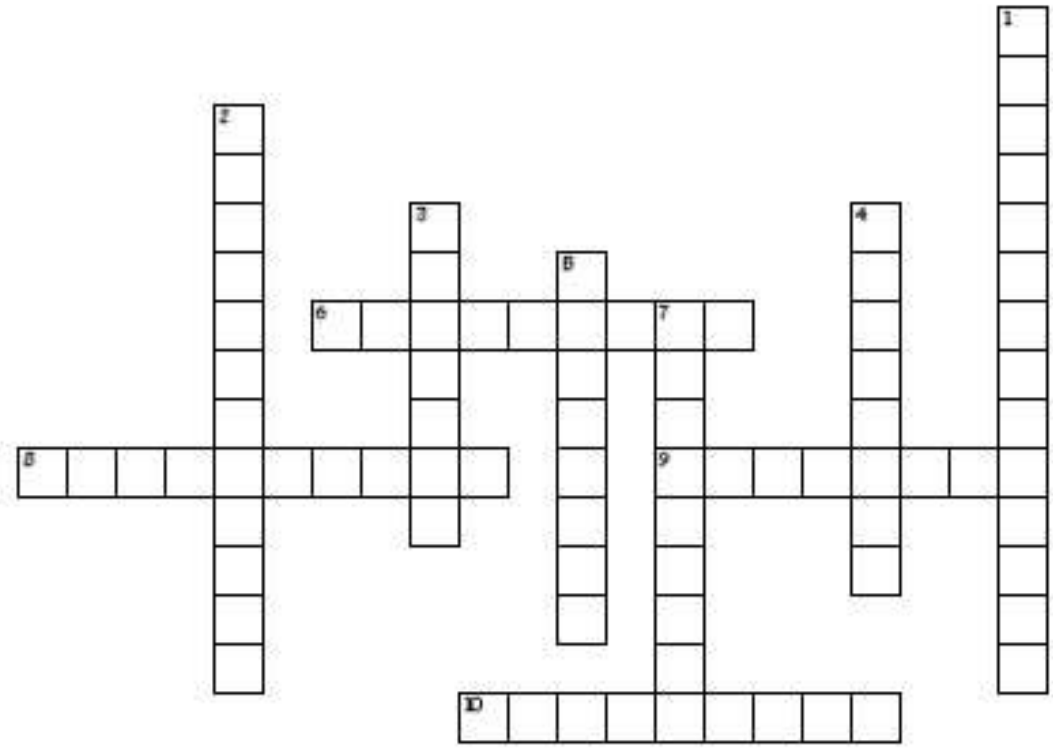
Application:

A. Create a flowchart that will read the age of the students and will display the text “Junior High” if the age is 12 and above and will end the process if the age is below 12 “. Use the space provided below.

B. On a short bond paper
Make your stand on what to do and not to do with your drafting tools and instruments:

E What else can I do?

Activity: Answer the given item to complete the puzzle.



Across

6. It shows the exact sequence of procedures and describes the flow of data.
8. It is a subroutine procedure that is divided into at any point in the process.
9. It is used to start or end a process
10. A small circle symbol design as _____.

Down

1. It is used to connect the different data and flow of action from one symbol to another.
2. It is a process of describing or showing the flow of action.
3. It is used to represent a process, procedure, or action taken.
4. It is used when the decision has to be made, requiring an answer yes or no, true or false, on or off .
5. It is a symbol used to show data or information that entering or leaving the process.
7. It is a symbol that represents a process.

A What I have learned?

1. Identify the different symbols used in flowcharting and how to use it.
2. Follow procedures creating flowcharts the right way.
3. Identify and describe the basic flowcharting forms.
4. Make a flowchart to solve a problem where the logic flow may be applied.
5. Identify graphical symbols used in technical drawing
6. Interpret technical drawing
7. Apply standard dimensions and components in technical drawing
8. Prepare/make changes to electrical/electronic schematics and drawings
9. Know the line conventions used in electronic/ electrical diagrams.
10. Prepare different electronic/ electrical diagrams correctly;
11. Apply correct line thickness and lettering in drawing electronic/ electrical diagrams; and layout the diagram with proper spacing between components for notes and reference information.
12. Identify the common drafting tools, instruments, and equipment;
13. Explain the uses, proper care of tools, instruments, and equipment in drafting; and
14. Use the basic drafting tools and instruments properly.

A *What I can achieve?*

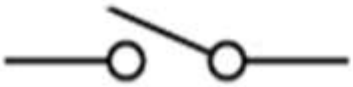
Direction: **Modified True or False**. Analyze each statement then write" **Technical "**if the statement is true. If the statement is false, underline the word that made it incorrect, and then write the correct one on the space provided before each number.

_____1. The direction of the flow depends on the result of the decision
_____2. Always focus on the sub flow.
_____3. The flow of the process should be from right to left, top to bottom.
_____4. Write a detailed and clear word or code inside the flowcharts.
_____5. Sequential program flow is composed of a series of statement which is executed one by one from top to bottom.
_____6. The terminal symbol marks the start and end of the flowchart.
_____7. Decision program flow involves a decision or test to determine the truth or falsity of a certain statement.
_____8. Use connectors to ensure that the symbols are properly connected and that the flow continues.
_____9. Only a single flow line should enter and leave a process symbol.
_____10. Write your code inside the symbols most briefly and clearest manner possible.
_____11. Find or create and organizer where you can hang your measuring tools.
_____12. Always store tools in a dry, clean, and safe place.
_____13. You can use the T-square as a guide in cutting paper.
_____14. Sharpen your pencil on top of your workplace.
_____15. Wipe the top of your drawing board before starting to work.

What I know

1. Diamond
2. Rhomboid
3. Rectangle
4. Connector
5. Directional Arrow
6. Oval
7. Circle
8. Flowchart
9. Flowcharting
10. Sub Process
11. Compass
12. Sharpener
13. T- Square
14. Pencil
15. Drawing Tape

What is new

FLOWCHART SYMBOLS	DESCRIPTION
	The directional arrow serve as connector lines to connect the different symbols, flow of action and data from one symbol to another.
	The symbol (small circle) design as connector. This is used to connect two directional lines.
	The symbol (rhomboid) symbolize data. This is used to show data or information that entering or leaving the process.
	The symbol (oval) represent a terminal usually start and end. Flowchart used to start or end a process or an action
	The symbol (Diamond) signify a decision. This is used when the decision has to be made, requiring an answer yes or no, true or false, on or off etc.
	Inductor is also called a coil or reactor. An inductor symbol looks like a coiled wire as this is what an inductor essentially is.
	The symbol is often drawn as a resistor with an arrow across it or pointing down on it as the one below.Resistor reduces current flow.
	Switch can be represented in numerous ways in electronic schematics.

What else I can do

Across

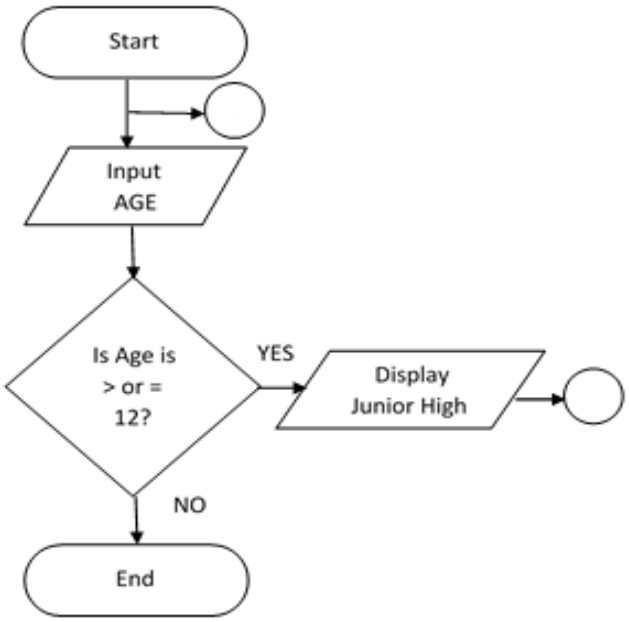
6. Flowchart
8. Sub Process
9. Terminal
10 Connector

Down

1. Connector Lines
2. Flowcharting
3. Process
4. Decision
5. Rhomboid
7. Rectangle

Answer

What I can do



What I can achieve

Modified True of False

1. Technical
2. sub- main
3. right to left- left to right
4. detailed- brief
5. Technical
6. Technical
7. Technical
8. Technical
9. Technical
10. Technical
11. Technical
12. Technical
13. Can not
14. Do not
15. Technical

Reference

K to 12 Curriculum Guide in Technology and Livelihood Education
Learning Competencies
pp. 49-53

Programming in Turbo Pascal the Easy Way
Josephine C. Sto. Domingo
Basic Flowcharting Forms
Lesson 3 pp. 17-18

Basic Symbol of Flowchart:
https://www.lucidchart.com/pages/what-is-a-flowchart-tutorial

Modified Flowchart Rubrics:
http://www.cckln.edu.hk/libweb/library_lesson/Project/multimedia/Flowchart_Rubric.htm

Puzzle Generator:http://puzzlemaker.discoveryeducation.com/

Preparing and Interpreting Technical Drawing:https://www.scribd.com/document/358649681/4-3-1-Preparing-and-Interpreting-Technical-Drawing

Types of Dimensioning:
https://www.slideshare.net/mokhtarpadeli/engineering-drawing-chapter-07-dimensioning
https://www.theengineerspost.com/dimensioning-systems/

Prepare/make changes to electrical/electronic schematics and drawings
https://www.scribd.com/document/18578272/CBLM-Prepare-Make-Changes-on-Electrical-Electronic-Schematics-and-Drawings

Transformer Image:https://en.clipdealer.com/photo/media/A:137554508

Electrical / Electronic Symbols:https://www.smartdraw.com/circuit-diagram/electrical-symbols.htm

Source: Paul Horowitz and Winfield Hill, The Art of Electronics 2nd Edition

Drafting Materials :https://steemit.com/art/@steemph.cebu/drafting-materials-and-their-proper-maintenance-or-steemph-cebu-s-5th-art-guide

Motivation Pictures:https://artprojectsforkids.org/draw-country-house/
ulrichome.com

I What I need to know?

LESSON 5 – TERMINATING AND CONNECTING ELECTRICAL WIRING AND ELECTRONICS CIRCUIT

Learning Outcome 1.Plan and prepare for termination/ connection of electrical wiring/electronics circuits

1.1 Check materials according to specifications and tasks

1.2 Select appropriate tools and equipment according to task requirements

1.3 Follow planned task to ensure OHS guidelines and procedure

1.4 Prepare electrical wiring/electronics circuits correctly for connecting/terminating in accordance with instruction and work site procedures

Learning Outcome 2. Terminate/connect electrical wiring/ electronic circuits

2.1 Observe safety procedures in using tools and use appropriate personal protective equipment at all times

2.2 Identify the tasks to be undertaken to work safely in accordance with the workplace and standard procedures

2.3 Use an appropriate range of methods in termination/connection in accordance with specifications, manufacturer's requirements, and safety

2.4 Follow the correct sequence of operation

2.5 Adjust used accessories

2.6 Confirm termination/connection in accordance with job specification

Learning Outcome 3. Test termination/connections of electrical wiring/electronics circuits

3.1 Conduct complete testing of termination/connection of electrical wiring/electronics circuits in compliance with specifications and regulations using appropriate procedures and equipment

3.2 Check wirings and circuits using specified testing procedures

3.3 Respond to unplanned events or conditions in accordance with the established procedure

After going through this lesson, you are expected to:

- Demonstrate proper termination and connection of electrical wiring and electronics circuits.
- Demonstrate an understanding of concepts and underlying principles in terminating and connecting electrical wiring and electronics circuits.

I What is new?

- Examine the given components, tools, and equipment used in electrical wiring and electronics circuits. Write their names on the space provided on the left?

Components	Symbols
	
	
	
	
	
	
	

D *What I know?*

A. State whether the following is equipment or a hand tool.

_____ 1. Desoldering Tool
_____ 2. Soldering Iron
_____ 3. Multi-Volts Power Supply
_____ 4. Long Nose Pliers
_____ 5. Portable Electric Hand Drill
_____ 6. Philips Screw Driver
_____ 7. Flat Screw Driver
_____ 8. Multi-tester
_____ 9. Side Cutter Pliers
_____ 10. Electric Hand Drill

B. Write true if the statement is correct and false if otherwise:

_____ 1. A flat screwdriver is used in driving or fastening positive slotted screw.
_____ 2. Soldering Iron is used to join two or more metal conductors with the support of soldering lead melted around it.
_____ 3. Side Cutter Pliers is used for cutting or trimming of connecting wires or terminal leads in the circuit board.
_____ 4. A multi-tester is used in boring holes in the plastics chassis.
_____ 5. A long nose pliers is used for holding, bending and sketching the lead of electronics component or connecting wire.

D What is in?

Arrange the letters to form the correct word.

Clue: Materials needed to make a simple circuit

LADO
EIWRS
TTAYBER
ITSWHC
EFUS

D What is it?

To work with electronic and electrical circuits, a beginner needs to gain special hand tools and equipment. Each of these hand tools and equipment prepares one or more specific job in joining, replacing, obtaining, and troubleshooting of electronic circuits.

Basic Electronic Hand Tools and Equipment

Tools & Equipment	Description
Long Nose Pliers 	Is used for holding, bending, and stretching the lead of electronics component or connecting wire.
Side Cutter Pliers 	It is used for cutting or trimming of connecting wires or terminal leads in the circuit board.
Flat Screw Driver 	It is used to drive or fasten negative slotted
Philips Screw Driver 	It is used to drive or fasten positive slotted screws.

Soldering Iron 	It is used to join two or more metal conductors with the support of soldering lead melted around it.
Desoldering Tool/Desoldering Pump 	It is used to unsoldered unwanted parts or components in the circuit with the support of soldering iron.
Multi-Volts Power Supply 	It is used to supply the desired *direct current voltages* in the circuit.
Multi-tester 	It is used for measuring resistance, voltage, and current.
Portable Electric Hand Drill 	It is used for boring hole/s in the plastics chassis or metal chassis.

Soldering is the process of joining two or more electronic parts together by melting solder around the connection. The Solder is a metal alloy and when it cools it creates a strong electrical bond between the parts. Even though soldering can create a permanent connection, it can also be reversed using a desoldering tool.

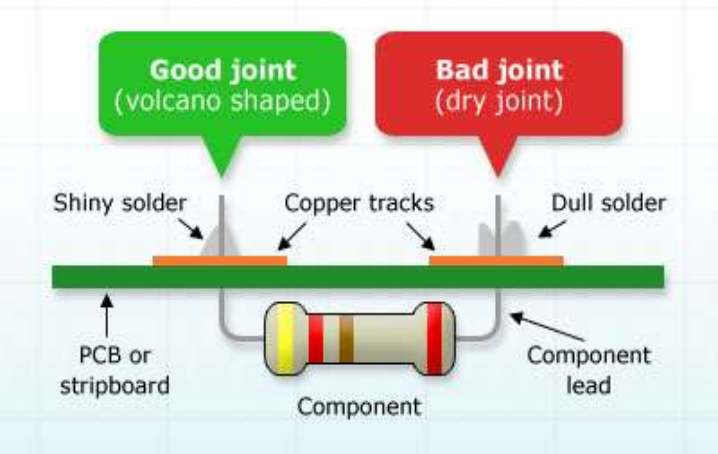
Soldering Safety

- Before you can start soldering, you need to prep your soldering iron by tinning the tip with solder. This process will help improve the heat transfer from the iron to the item you're soldering. Tinning will also help to protect the tip and reduce wear.

Step on How to Solder

Step 1: Mount The Component –Flip the board over and bend the leads outward at a 45′ angle. This will help the component make a better connection with the copper pad and prevent it from falling out while soldering.
Step 2: Heat The Joint – Turn your soldering iron on and if it has an adjustable heat control, set it to 400'C. At this point, touch the tip of the iron to the copper pad and the resistor lead at the same time. You need to hold the soldering iron in place for 3-4 seconds to heat the pad and the lead.
Step 3: Apply Solder to Joint – Continue holding the soldering iron on the copper pad and the lead and touch your solder to the joint.
Step 4: Snip The Leads – Remove the soldering iron and let the solder cool down naturally. Don't blow on the solder as this will cause a bad joint. Once cool, you can snip the extra wire from leads.

A proper solder joint is smooth, shiny, and looks like a volcano or cone shape. You want just enough solder to cover the entire joint but not too much so it becomes a ball or spills to a nearby lead or joint.



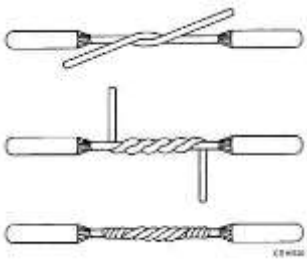
The good thing about using solder is the fact that it can be removed easily in a technique known as desoldering. This comes in handy if you need to remove a component or make a correction to your electronic circuit.

Desoldering Steps

Step 1 – Place a piece of the desoldering braid on top of the joint/solder you want to be removed.
Step 2 – Heat your soldering iron and touch the tip to the top of the braid. This will heat the solder below which will then be absorbed into the desoldering braid. You can now remove the braid to see the solder has been extracted and removed. Be careful touching the braid when you are heating it because it will get hot.

Typical electrical cable jointing methods

A. **Western Union Short tie**
   It is used when the connection must be strong enough to support long lengths of heavy, wire. In the past. this splice was used to repair telegraph wires. If the splice is to be taped, care should be taken to eliminate any sharp edges from the wire ends.

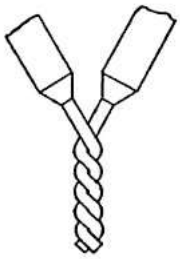


This is a straight joint used for small solid cables

1. Remove the insulation
2. Bring the two conductors to a crossed position and then make a long bend or twist in each wire.
3. Wrap the end of one of the wires around the straight portion of the other wire, and then do the same for the other wire. Repeat this for about four or five times.
4. Press ends of the wires down close to the straight portions of the wire to prevent the ends from piecing through the insulation tape.
5. Insulate the joint using the tape

B. Rat-tail Joint

It is also known as a twist splice or a pig-tail splice is a very basic electrical splice that can be done with both solid and stranded wire. It is made by taking two or more bare wires and wrapping them together symmetrically around the common axis of both wires.



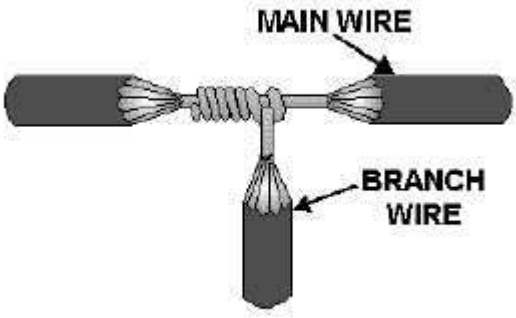
The rattail joint is usually used in the junction boxes. It allows the connection of branch or multiple circuits in buildings.

- To create the joint,

1. Strip the insulation off the ends of the cable to be joined
2. Twist the wires to create the rattail effect

C. Knotted Tap Joint

It is used for branch joints to connect a branch wire to a continuous wire. Remove about 1 inch of insulation from the main wire and about 3 inches from the branch wire.



The knotted tap joint is used for branch joints to connect a branch wire to a continuous wire.

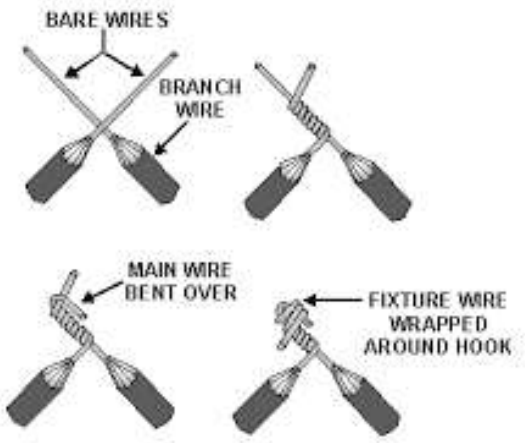
1. Remove about 1 inch of insulation from the main wire and about 3 inches from the branch wire.
2. Place the branch wire behind the main wire so that three-fourths of its bare wire extends above the main wire.
3. Bring the branch wire over the main wire, around itself, and finally over the main wire so that it forms a knot. Wrap the wire around the main conductor in short, tight turns, and trim its end.

D. Fixture Joint

It is an electric connection between two conductors, formed by crossing their bare ends, wrapping one end around the other, and then folding them over.

Remove the insulation

1. Wrap the fixture wire around the branch wire
2. Bend the branch wire over the completed turns
3. Wrap the remaining fixture wire over the bent branch wire
4. This can be followed by soldering and taping of the joint.

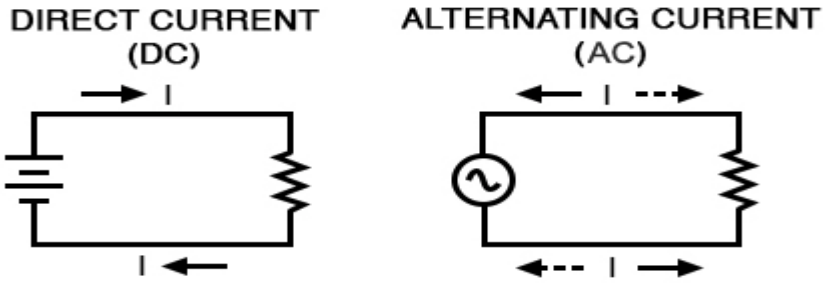


Electrical circuits are ever-present in our day-to-day lives. Our entire life would be different if we weren't surrounded by circuits everywhere you go. That's why we need to know the relationship between key concepts like electrical resistance, voltage, and electric current.

Direct Current and Alternating Current

Direct Current or DC is the first type of current because it was easy to produce. The electric charge (current) only flows in one direction. One of the disadvantages of using DC is the excessive voltage drop and power loss in the power lines in long-distance transmission.

The Alternating current electric charge changes direction periodically. The voltage in AC circuits also periodically reverses because of the current changes direction. It is the solution to the problem of DC.



An **electric circuit** provides a complete, closed path for electricity. The parts of a circuit consisting of a load or resistance; wires; and a switch.

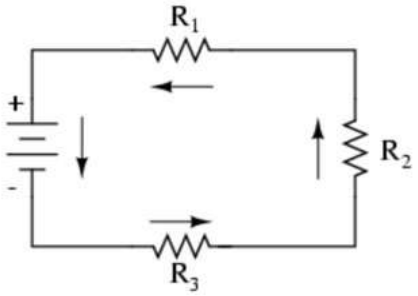
There are two types of electric circuits, the series, and parallel circuit.

Series Circuit

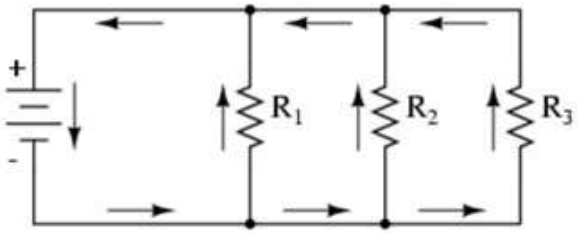
- A series circuit there is only one path for the electrons to flow. The main disadvantage of a series circuit is that if there is a break in the circuit the entire circuit is open and no current will flow.

Parallel Circuit

- A parallel circuit the different parts of the electric circuit are on several different branches. There are several different paths that electrons can flow. If there is a break in one branch of the circuit electrons can still flow in other branches.



SERIES CIRCUIT



PARALLEL CIRCUIT

OHM'S LAW states that, for a constant current, the current in a circuit is directly proportional to the total voltage acting in the circuit and inversely proportional to the total resistance of the circuit.

The law may be expressed by the following equation if the current I is in amperes, EMF E is in volts, and the resistance R is in ohms.

The relationship of the foregoing three variables was discovered by *Georg Simon Ohm,* who theorized that current is in direct proportion to resistance.

The relationship is explained algebraically, using this formula:

E – EMF in Volts
R – Resistance
I – Current in Amperes

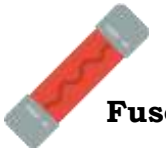
R= E/I	**E= I x R**	**I= E/R**
Resistance	Voltage	Current

Electrical Connections

A Simple circuit contains the minimum things needed to have a functioning electric circuit. A simple circuit requires the following:

AC/DC source

- Equipment that will operate on either an AC or DC power source
- Battery – A DC voltage source containing two or more cells that convert chemical energy to electrical energy.
- Cell- Single unit is used to convert chemical energy into a DC electrical voltage.



Fuse

Once you design a simple circuit on electronics, it is important to include a fuse in the primary or secondary of a transformer.

Fuse is a safety device used to protect an electrical circuit from the effect of excessive current. Its essential component is usually a strip of metal that will melt at a given temperature.

Wires and Cable

A wire is a single slender rod or filament of drawn metal. This definition restricts the term to what would ordinarily be understood as solid wire.

The word “slender” is used because the length of a wire is usually large when compared to its diameter. If a wire is covered with insulation, It is an insulated wire. Although the term “wire” properly refers to the metal, it also includes the insulation.

Switch and its function

Switch is a device used to break an electric current or transfer it to another conductor. Switches are commonly used to open or close a circuit. Closed is the ON position, while open is OFF position. Normally, switch is installed in series with the line carrying current from the power source to the load.

Load

A source drives a load. Whatever component or piece of equipment is connected to a source and draws current from a source is a load on that source. The following are examples but not limited to: – Bulb – Appliances

Classifications of Electronic Component

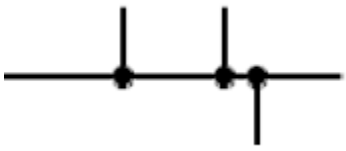
A. Passive devices

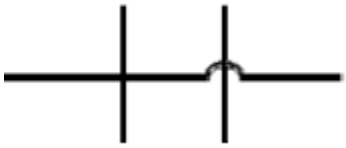
- is one that contributes no power gain (amplification) to a circuit or system. It has no control action and does not require any input other than a signal to perform its function. In other words, "A component with no brains!" Examples are Resistors, Capacitors and Inductors.

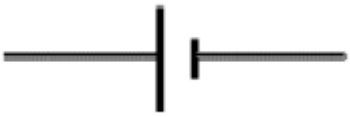
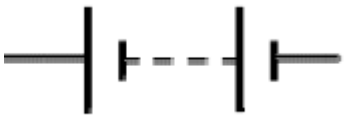
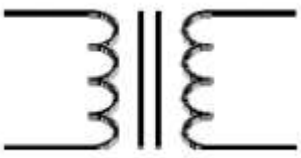
B. Active Devices

- are components that are capable of controlling voltages or currents and can create a switching action in the circuit. In other words, "Devices with smarts!" Examples are Diodes, Transistors, and Integrated circuits.

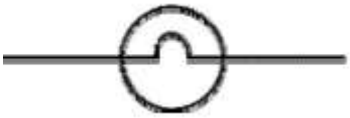
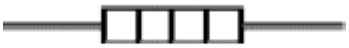
- **Electronic Schematic Symbols**

Wires Connection		
Component	**Circuit Symbol**	**Function of Component**
Wire		To pass current very easily from one part of a circuit to another.
Wires joined		A 'blob' should be drawn where wires are connected (joined), but it is sometimes omitted. Wires connected at 'crossroads should be staggered slightly to form two T- junctions, as shown on the right.

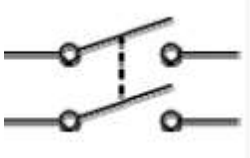
Wires not joined		In complex diagrams, it is often necessary to draw wires crossing even though they are not connected. I prefer the 'bridge' symbol shown on the right because the simple crossing on the left may be misread as a joint where you have forgotten to add a 'blob'!

Power Supplies/Source		
Component	**Circuit Symbol**	**Function of Component**
Cell		Supplies electrical energy. The larger terminal (on the left) is positive (+). A single cell is often called a battery, but strictly a battery is two or more cells joined together.
DC Supply		Supplies electrical energy. DC = Direct Current, always flowing in one direction.
AC Supply		Supplies electrical energy. AC = Alternating Current, continually changing direction.
Battery		Supplies electrical energy. A battery is more than one cell. The larger terminal (on the left) is positive (+).
Fuse		A safety device which will 'blow' (melt) if the current flowing through it exceeds a specified value.
Transformer		Transformers are used to step up (increase) and step down (decrease) AC voltages. Energy is transferred between the coils by the magnetic field in the core. There is no electrical connection between the coils.

Ground		A connection to the earth. For many electronic circuits, this is the 0V (zero volts) of the power supply, but for mains electricity and some radio circuits, it means the earth.

Output Devices/Loads: Lamps, Heater, Motor		
Component	**Circuit Symbol**	**Function of Component**
Lamp (lighting)		A transducer which converts electrical energy to light. This symbol is used for a lamp providing illumination, for example, a car headlamp or torch bulb.
Heater		A transducer which converts electrical energy to heat.
Motor		A transducer which converts electrical energy to kinetic energy (motion).
Bell		A transducer which converts electrical energy to sound.
Inductor		A coil of wire which creates a magnetic field when current passes through it. It may havean iron core inside the coil.

Switches		
Component	**Circuit Symbol**	**Function of Component**
On-Off Switch (SPST)		**Single Pole, Single Throw**. An on-off switch allows current to flow only when it is in the closed (on) position.
2-way Switch (SPDT)		**Single Pole, Double Throw.**A 2-way changeover switch directs the flow of current to one of two routes according to its position. Some SPDT switches have a central off position and are described as 'on-off-on'.

Dual On-Off Switch (DPST)		**Double Pole, Single Throw**. A dual on-off switch which is often used to switch mains electricity because it can isolate both the live and neutral connections

Parts of a Circuit

A simple circuit contains the minimum things needed to have a functioning electric circuit

- Source- a device used to supply AC or DC voltage
- Consuming (load) - any device that consumes voltage, whatever component or piece of equipment that is connected to a source and draws current from a source is a load on that source.
- Controlling (switch) -any device having two states, on (closed) or off (open). Ideally having zero impedance when closed and infinite impedance when open.
- Protecting (circuit breaker) -a component used to open the circuit when the current exceeds a predetermined maximum value.
- Connecting(wires)- a material that conducts electric current very well and is used to connect a complete path for current.

Procedure in Circuit Designing

1. Prepare all the tools and materials needed.
2. By using the schematic symbol, make a simple circuit with the following:
   a. consuming device(load)
   b. controlling device (switch)
   c. protecting device
   d. source/ battery
   e. connecting device(wires)
3. Make sure that the circuit has the following requirement that a simple circuit must have:
   a. A source of electrical potential difference or voltage.
   b. A conductive path which would allow for the movement of charges.
   c. An electrical resistance which is loosely defined as any object that uses electricity to do work.
4. Test the designed circuit

Important:

- In testing resistors, capacitors, diodes etc., do not touch both test probe lead, because our body also has a resistance that could affect the reading value of the electronic components we are testing.

A Multimeter or a Multitester, also known as a VOM (volt-ohm-millimeter), is an electronic measuring instrument that combines several measurement functions in one unit. A **typical multimeter** can measure voltage, current, and resistance.

Types of Multimeter

- **Analog multimeter** for measuring resistance is that the meter needs to be "zero'ed" before making a measurement. This is done by connecting the two probes so that there is a short circuit, and then using the "zero" control to give full-scale deflection on the meter, i.e. zero ohms. Always do the “Initial Steps in Using Analog Multi-tester”.

- **Digital multimeter** is easier and faster than making a resistance measurement with an analogue multimeter as there is no need to zero the meter. As the digital multimeter gives a direct reading of the resistance measurement, there is also no equivalent of the reverse reading found on the analog multimeters.

E *What is more?*

After the lesson, what do you think is the importance of Schematic diagram in planning a system program of a company or industry?

E *What I can do?*

On the space provided below

Draw a circuit diagram or schematic of your house.
Use appropriate symbols to the circuits
Write an explanation of your work.

_____

_____

_____

_____

_____

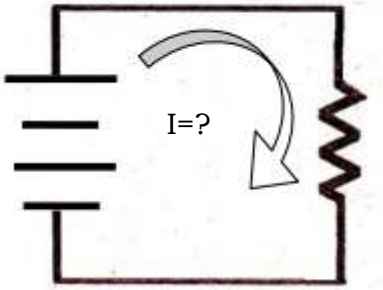
_____

_____

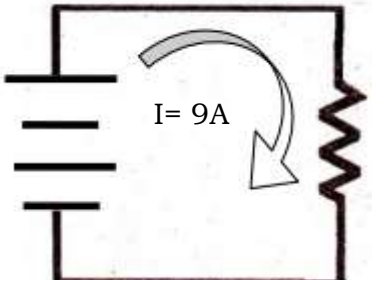
E *What else can I do?*

A. Use Ohm's Law to Solve Simple Circuits Problems.

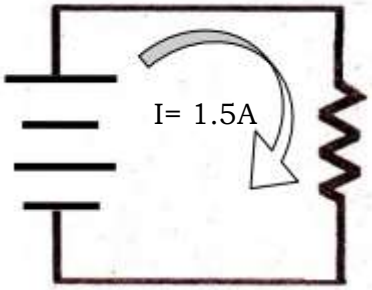
1.



2.



3.



B. Identify the following basic electronic components write their names and function on the right side of the column.

Figure	Name and Function
	
	
	
	
	
	
	

A *What I have learned?*

1. Check materials according to specifications and tasks
2. Select appropriate tools and equipment according to task requirements
3. Follow planned task to ensure OHS guidelines and procedure
4. Prepare electrical wiring/electronics circuits correctly for connecting/terminating in accordance with instruction and worksite procedures]
5. Observe safety procedures in using tools and use appropriate personal protective equipment at all times
6. Identify the tasks to be undertaken to work safely in accordance with the workplace and standard procedures
7. Use an appropriate range of methods in termination/connection in accordance with specifications, manufacturer's requirements, and safety
8. Follow the correct sequence of operation
9. Adjust used accessories
10. Confirm termination/connection in accordance with the job specification.
11. Conduct complete testing of termination/connection of electrical wiring/electronics circuits in compliance with specifications and regulations using appropriate procedures and equipment
12. Check wirings and circuits using specified testing procedures
13. Respond to unplanned events or conditions in accordance with established procedures

A What I can achieve?

A. Fill in the blanks with what is referred to by each of the following.

_____1. An interconnection of components which provides an electrical path between two or more components.
_____2. A type of circuit in which the flow of current is cut off.
_____3. A circuit in which the components are connected from end to end so that the current has only one path to follow through the circuit.
_____4. A circuit where there is more than one path for the current to flow through.
_____5. A device used to supply AC or DC voltage.
_____6. Any device having two states, ON or OFF.
_____7. A safety device used to protect an electrical circuit from the effect of excessive current.
_____8. A pathway for carrying an electric current.
_____9. Components or pieces of equipment connected to a source which draws current from a source.
_____10. A DC voltage source containing two or more cells that convert chemical energy to electrical energy.
_____11. It is also known as a twist splice or a pig-tail splice, is a very basic electrical splice that can be done with both solid and stranded wire.
_____12. It is used to for branch joints to connect a branch wire to a continuous wire.
_____13. It is an electric connection between two conductors, formed by crossing their bare ends, wrapping one end around the other, and then folding them over.
_____14. It is the process of joining two or more electronic parts together by melting solder around the connection.
_____15. It is an electronic measuring instrument that combines several measurement functions in one unit.

What is new

1. Side Cutter Pliers
2. Long Nose Pliers
3. Multimeter
4. Desoldering Pump
5. Soldering Iron
6. Switch
7. Fuse
8. Flat Screw Driver
9. Philips Screw Driver
10. Battery

What I know

1. Hand Tool
2. Hand Tool
3. Equipment
4. Hand Tool
5. Equipment
6. Hand Tool
7. Hand Tool
8. Equipment
9. Hand Tool
10. Hand Tool
11. Philip Screw Driver
12. True
13. True
14. Hand Drill
15. True

What else I can do

1. I- 1A
2. E= 648V
3. R= 8 Ω

1. Resistor reduces current flow.
2. Integrated Circuit is a set of electronic circuits on one small flat piece (or "chip") of semiconductor material that is normally silicon.
3. Switch is a component which controls the open-ness or closed-ness of an electric circuit
4. Capacitor used to store an electric charge, consisting of one or more pairs of conductors separated by an insulator.
5. Inductor is also called a coil or reactor. The coils store energy in a magnetic field or flux.
6. Transformer is two or more coils coupled by magnetic induction. It helps keep the frequency and reduce tension in an AC circuit
7. LED light-emitting diode (LED) is a semiconductor light source that emits light when current flows through it.

What can I achieve?

1. Parallel Circuits'
2. Series Circuits
3. Series Circuits
4. Series and Parallel
5. Power Supply
6. Switch
7. Fuse
8. Circuit
9. Electronic Symbols
10. Battery
11. Rat tail Splice
12. Knotted tap joint
13. Fixture Joint
14. Soldering
15. Multimeter

Reference

Terminate and Connect Wirings and Electronics Circuits

https://www.scribd.com/doc/219419403/CHS-Module-3-Terminate-and-Connect-of-Electrical-Wiring-and-Electronic-Circuits

https://kapitolyohs.files.wordpress.com/2011/06/terminating-and-connecting-of-electrical-wirings-and-electronics-circuits-2nd.pdf

How to Solder

https://www.makerspaces.com/how-to-solder/

Electronics Book Series

Enriquez, Michael, Simple Electronics (Basic) Fully Illustrated, Antonio M. Andes Sr.

I What I need to know?

LESSON 6 – TESTING ELECTRONIC COMPONENTS

Learning Outcome 1: Determine criteria for testing electronics components

1.1 Obtain and clarify work instructions based on job order or client requirements
1.2 Consult responsible person for effective and proper work coordination
1.3 Obtain and interpret data sheets/application notes based on manufacturer's specifications
1.4 Define testing criteria to ensure that components meet technical and quality requirements
1.5 Document and communicate testing criteria to relevant personnel

Learning Outcome 2. Plan an approach for components testing

2.1 Identify various testing methods based on types of electronic components
2.2 Determine characteristics and appropriateness of testing methods to be used during development and on completion
2.3 Consider/select testing methods in relation to appropriate testing strategy
2.4 Develop plan for testing components at specified points during development and on completion
2.5 Prepare and check required test and measuring instruments and tools in ccordance with established procedures
2.6 Establish records system to document testing results, including problems and faults

Learning Outcome 3. Test components

3.1 Apply appropriate testing methods to electronic components in accordance to technical specifications
3.2 Detect and record problems and faults by testing
3.3 Document remedial steps
3.4 Resolve detected problems and faults during testing in accordance with agreed project or industry practice
3.5 Evaluate final products against the determined criteria
3.6 Submit to relevant personnel the documented and summarized evaluation report of the testing process

Learning Outcome 4. Evaluate the testing process

4.1 Identify testing methods that were successful based on industry standards
4.2 Evaluate testing process and records system based on standard procedures
4.3 Document test results/findings for subsequent testing

After going through this lesson, you are expected to:

1. Test electronic components.
2. Demonstrate an understanding of concepts and underlying principles in testing electronic components

I What is new?

Directions: Write T if the statement is TRUE; write F if the statement is FALSE. Write your answers in your answer sheet.

____1. Checking transistors is not as easy as checking the two leads devices like resistors, capacitors, and diodes.

____2. The pin where the black probe is connected to showed two low reading when the red probes connected to the other two leads shows high reading is the “Base”. In the above case pin 1 is the base.

____3. If two low readings are found for one connection of the red probe (test 1 & 2), while each of the other two positions gives two high readings (test 3,4, 5 & 6), then the transistor is *NPN* type.
____4. The pin where the red probe is connected to showed two low reading when the black probes connected to the other two leads shows high reading is Base.
____5. As with the germanium diode, the reverse readings for germanium transistors will not be as good as for silicon transistors.

____6. In order to correctly test the diode, you need to use an analog multimeter and set the range to x1 ohm and x10K ohm range.

____7.. The real problem when testing a diode using the digital meter is that an open or leaky diode, the meter sometimes reads okay.

____8. Connecting the red probe of your meter to the cathode and black probe to the anode. Is called reversed biased.

____9.Connecting the red probe of your meter to the cathode and black probe to the anode. Is called forward biased.

____10. Be certain that power is removed from any circuit before performing any diode checks.
____11. In testing the resistor the first, you must know its value before you take any measurement.

____12. It doesn’t matter which probes to which two points because the resistor does not have polarity (positive and negative) like a battery.

____13. If you are a beginner It is recommended that you don't remove all the resistors' leg (I mean only one leg) and test it with your digital meter.

____14. Digital meter also needs calibration where you have to adjust the adjuster to make it zero ohm before you begin to do the measurement.

____15. By using a digital meter the LCD display in your meter will show you the exact value of the resistance under test. It is more accurate than using analog meter.

D *What I know?*

Directions: Read the questions carefully; Choose the correct answer from the choices. Write your answers in your answer sheet.

1. This is a type of capacitor that is used in many applications from audio to RF.

a. Electrolytic capacitor
b. Ceramic Capacitor
c. Silver Mica Capacitor
d. Tantalum Capacitor

2. This is a type of capacitor that is polarized.

a. Electrolytic capacitor
b. Ceramic Capacitor
c. Silver Mica Capacitor
d. Tantalum Capacitor

3. This is used where cost is a consideration as they do not offer a high tolerance.

a. Electrolytic capacitor
b. Ceramic Capacitor
c. Polyester Film Capacitor
d. Tantalum Capacitor

4. Also known as a super capacitor or ultra capacitor, as the name implies these capacitors have very large values of capacitance, of up to several thousand Farads.

a. Electrolytic capacitor
b. Ceramic Capacitor
c. Polyester Film Capacitor
d. Supercap

5. This type of capacitor is not as widely used these days, but they still offer very high levels of stability, low loss, and accuracy where space is not an issue.

a. Electrolytic capacitor
b. Silver Mica Capacitor
c. Polyester Film Capacitor
d. Supercap

6. If the transistor two-terminal reads the same resistance value in both directions.

a. Shorted
b. Open
c. Leaky
d. Good

7. If pointer deflect to a certain point at both forward and reverse bias when testing a diode it is;

a. Shorted
b. Open
c. Leaky
d. Good

8. If the reading is closed to the rated value of the resistor, and depending on its tolerance it is considered as.

a. Shorted
b. Open
c. Leaky
d. Good

9. Pointer has no deflection in any setting during testing of a resistor. It is considered as.

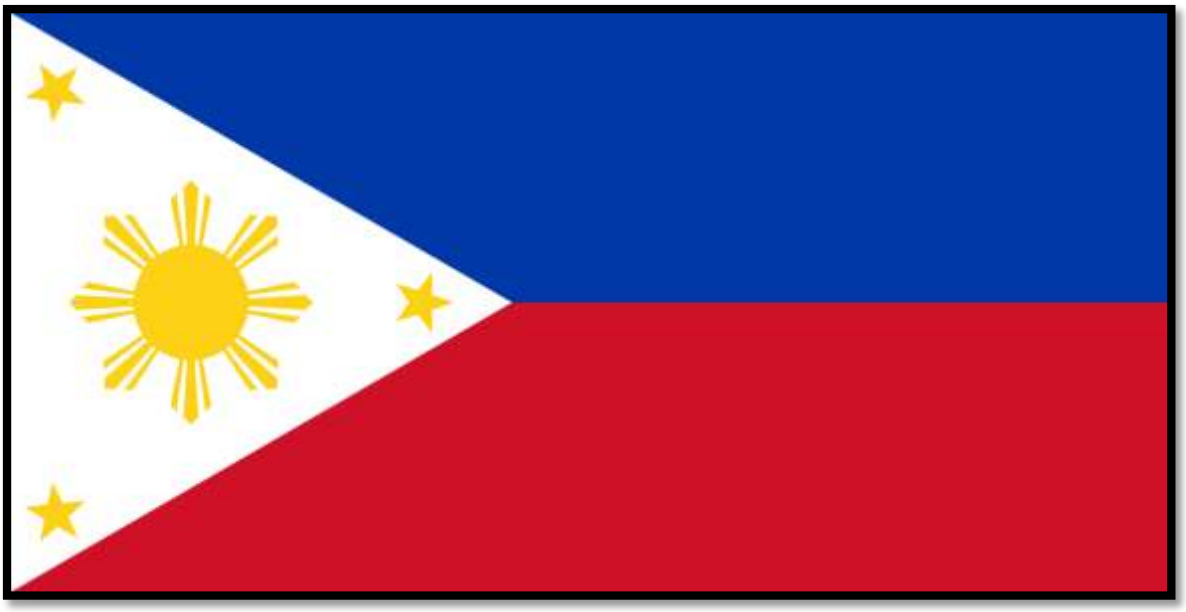
a. Shorted
b. Open
c. Leaky
d. Good

10. When testing a diode the pointer deflects at a certain when the positive test probes are connected to the cathode and the negative test probe is connected to the anode.

a. Shorted
b. Open
c. Leaky
d. Good

D *What is in?*

Tell me the Meaning

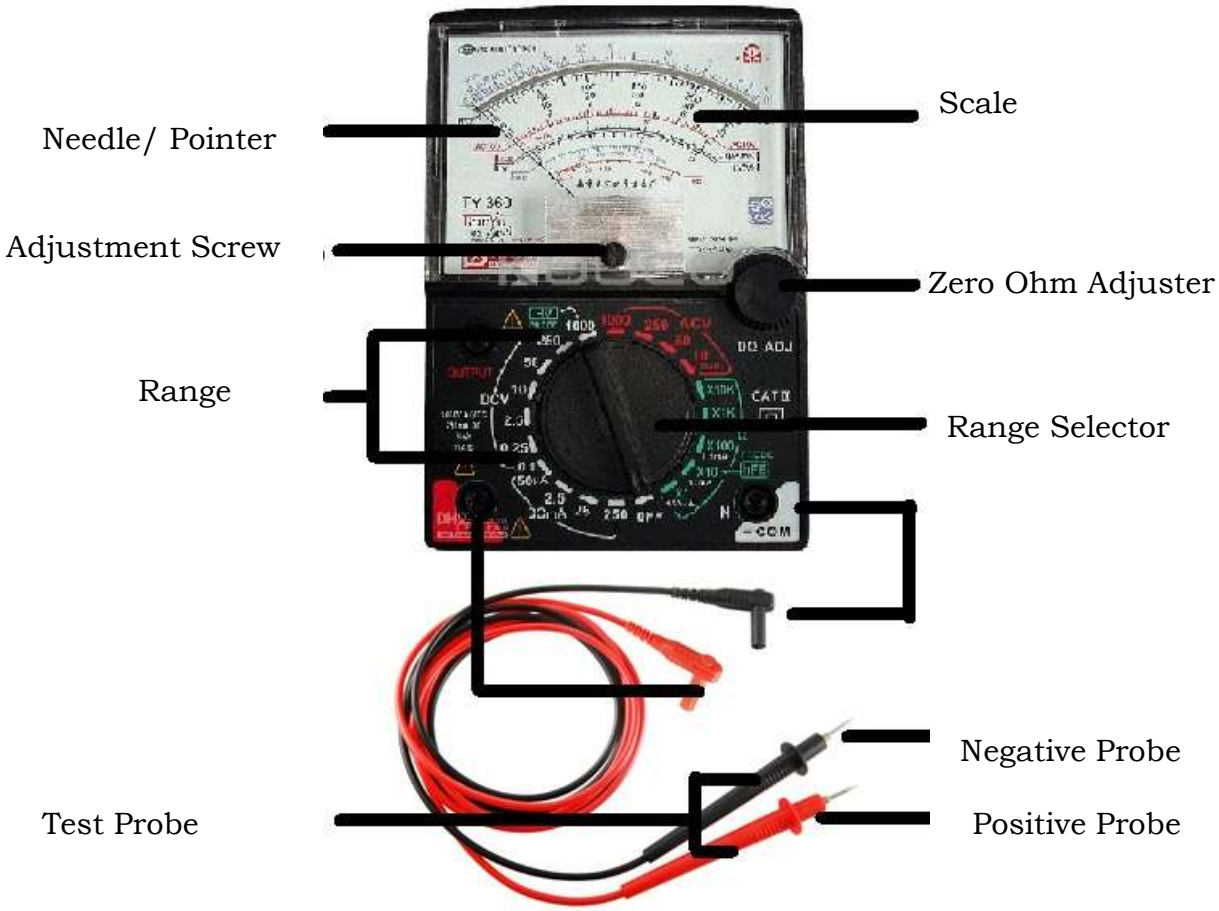


Can you tell me what the meaning of our flag is?
Do you know what the color of the Philippine Flag stands for?

Blue	**Red**
Yellow	**White**

D What is it?

A multitester, also known as a multimeter or VOM (Volt-Ohm-Milliammeter), is an electronic measuring instrument used to measure voltage, current, and resistance.



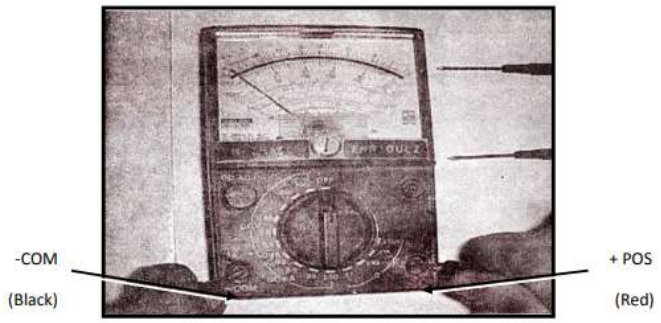
Parts of Analog Multitester

Needle or Pointer it indicates the values read from the scale
Scale – it shows the value of what is being measured
Adjustment Screw is also known as the **dial** or **infinity knob**. This allows you to adjust the pointer to the zero position of the scale – usually with the help of a flat head screwdriver
Zero Ohm Adjuster is used to calibrate the multitester when you want to measure the resistance of an object.
Range Selector Knob is also known as a **selector switch**. This allows you to adjust the settings of the multitester
Range – it allows more accurate measurement for small values
Test Probes – Positive probe (red) and Negative Probe (black) are used to connect to the circuit or device under test.

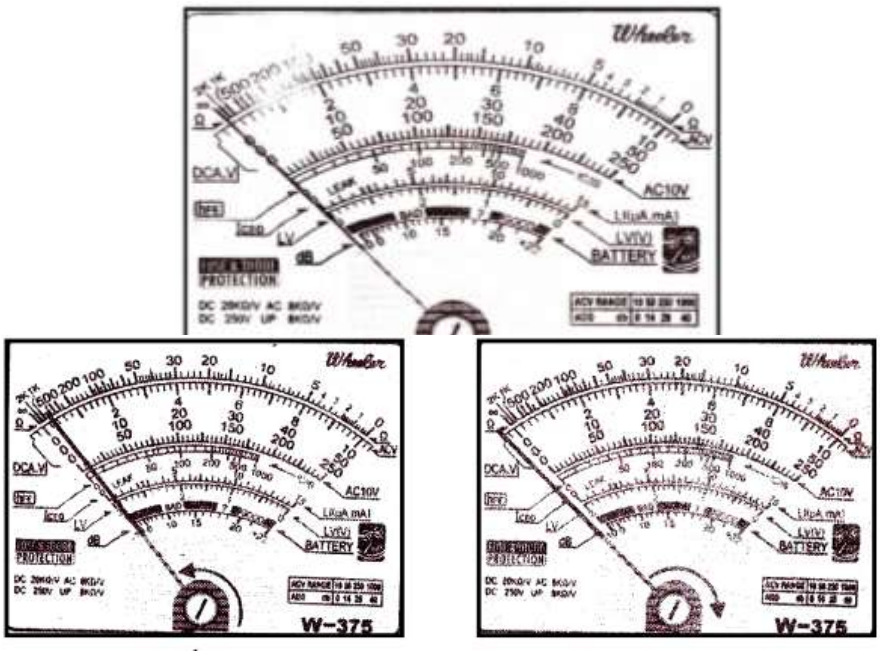
USING ANALOG AND DIGITAL MULTIMETER

A. Initial Steps in Using Analog Multi-tester

1. Connect the test probe to the appropriate jack. The red test probe to the positive (+) jack and the black to the common (-) jack.

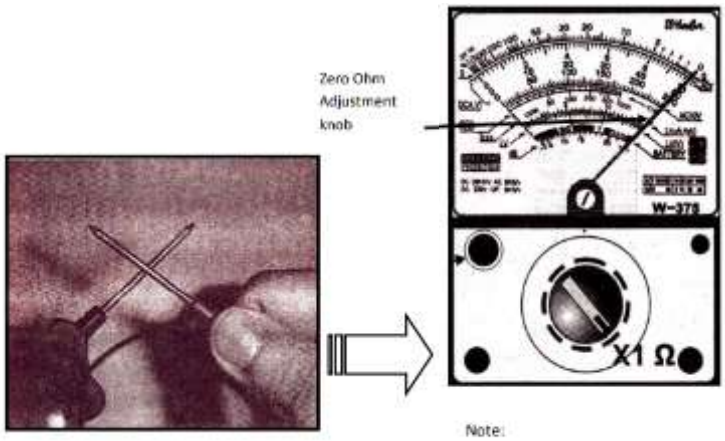


2. Check if the pointer rests exactly at the infinite zero position in ohmmeter range.



3. Check the probes if they are in condition. (Ohmmeter calibration)

a. Set the Multi-tester to the corresponding selector resistance range.
b. Short the two test probes lead together.

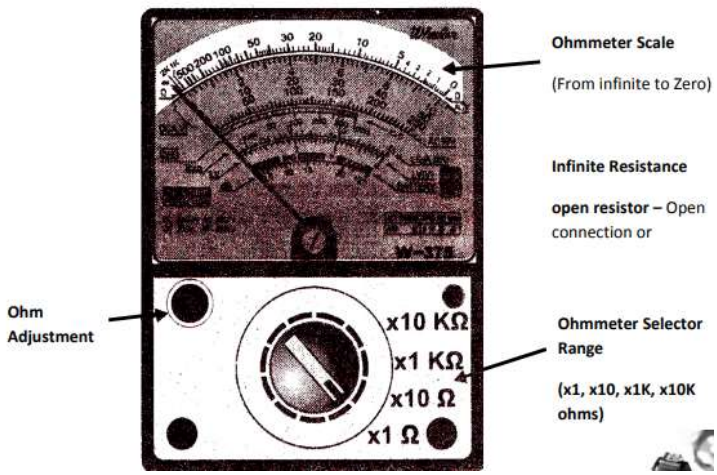


Adjust the ohm adjustment if the pointer could not rest exactly at "O" ohm reading.

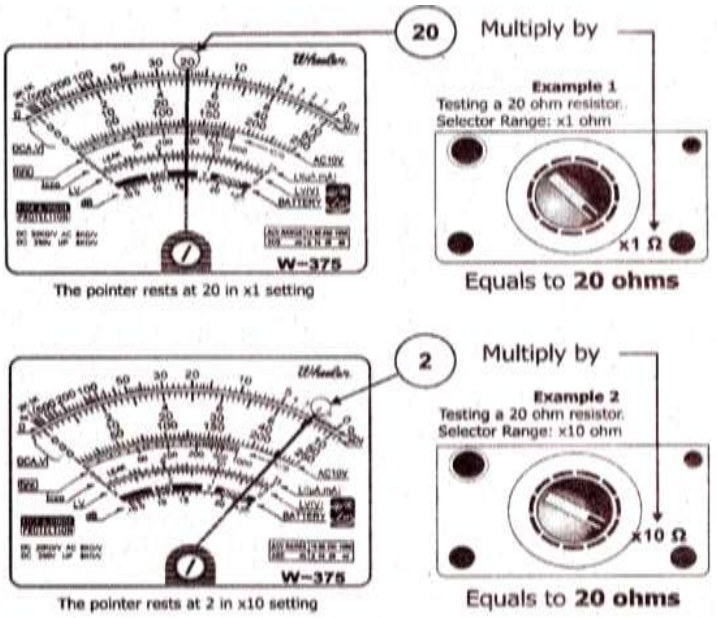
As indicated, the pointer rests out of the range of ohmmeter scale. Adjust the ohm adjustment counter clockwise until the pointer rests "O" ohm reading.

Resistance Measurements

1. Always do the "Initial Steps in Using Analog Multi-tester".
2. In testing resistors, capacitors, diodes, etc. do not touch both test probe lead, because our body also has a resistance that could affect the reading value of the electronic components we are testing.
3. If you do not know the value of the resistor to be measured, find the ohmmeter selector setting until you have a clear reading on the ohmmeter scale.

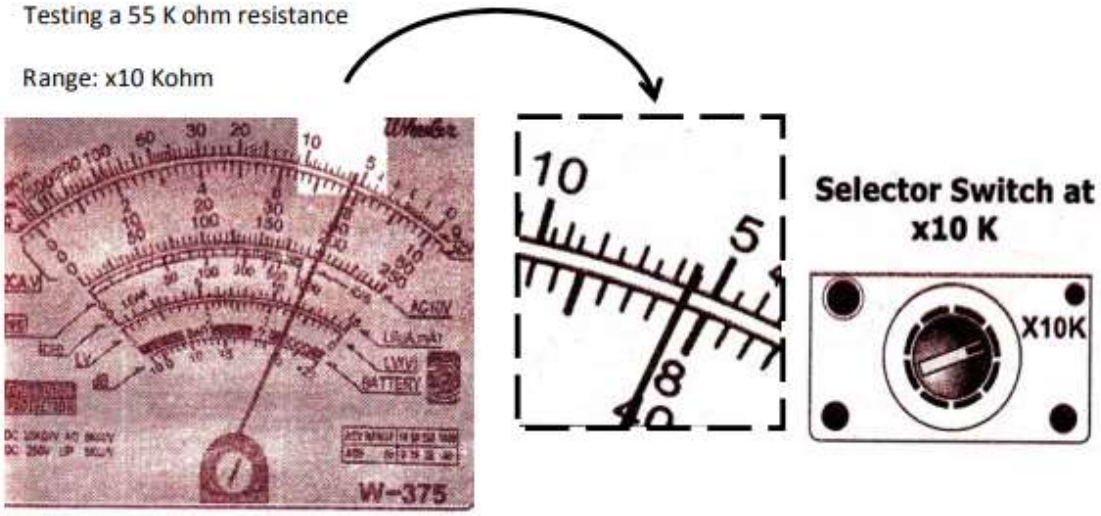


4. Select the desired resistance range scale with the selector switch.



Testing a 55 K ohm resistance

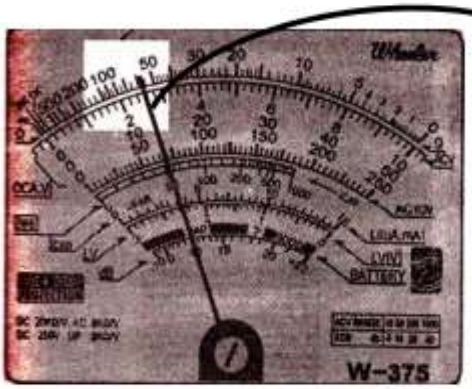
Range: x10 Kohm



The pointer stops at 5.5 in x10K range on selector switch

Testing a 55 K ohm resistance

Range: x1 K ohm



The setting (x1K in 56K Ohm resistor) is not an advisable setting in testing 55 K ohms resistance. Because, the pointer stops somewhere in 50. You cannot clearly read the resistance value, unlike in x10K ohm setting.

An **electronic circuit** is a structure that directs and controls electric current to perform various functions including signal amplification, computation, and data transfer. It comprises several different components such as resistors, transistors, capacitors, inductors, and diodes. Conductive wires or traces are used to connect the components.

Component testing is defined as a software testing type, in which the testing is performed on each component separately without integrating with other components.

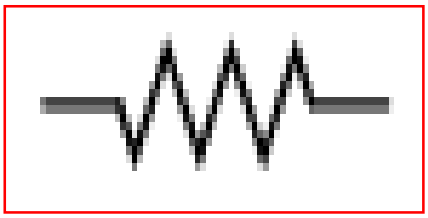
Common Electronic Components

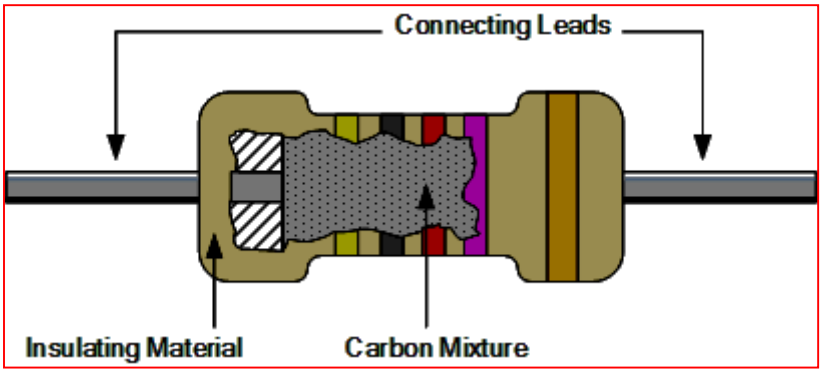
- **Passive** are components or device which doesn't generate voltage but controls the current in an electronic circuit.
  Resistor, Capacitor, Inductor, etc.

- **Active** are the components that generate, amplify, and also control the voltage and current in an electronic circuit.
  Diode, Transistor, Integrated Circuit, etc.

Resistance and Resistors

- **Resistance** means opposition to some action. In electricity resistance means the opposition to the flow of current.
  - ✓ Measured in ohms(Ω)
  - ✓ Expressed in kilo-ohms, milli-ohms etc. With 1000Ω= 1 kilo ohms,1000000Ω= 1 mega ohms.
  - ✓ The symbol of resistance is shown as:





Types of Resistor

1. Carbon-Composition Resistors
2. Carbon-Film Resistor
3. Metal-Film Resistors
4. Wire Wounds
5. Fusible Resistor
6. Variable Resistor

- ➢ A Resistor can be used to adjust circuit elements (such as volume control or a lamp dimmer), or as sensing devices for heat, light, humidity, force, or chemical activity.

- ➢ physical means of adjustment, either a rotating shaft or lever that can be moved to vary the amount of electrical resistance.

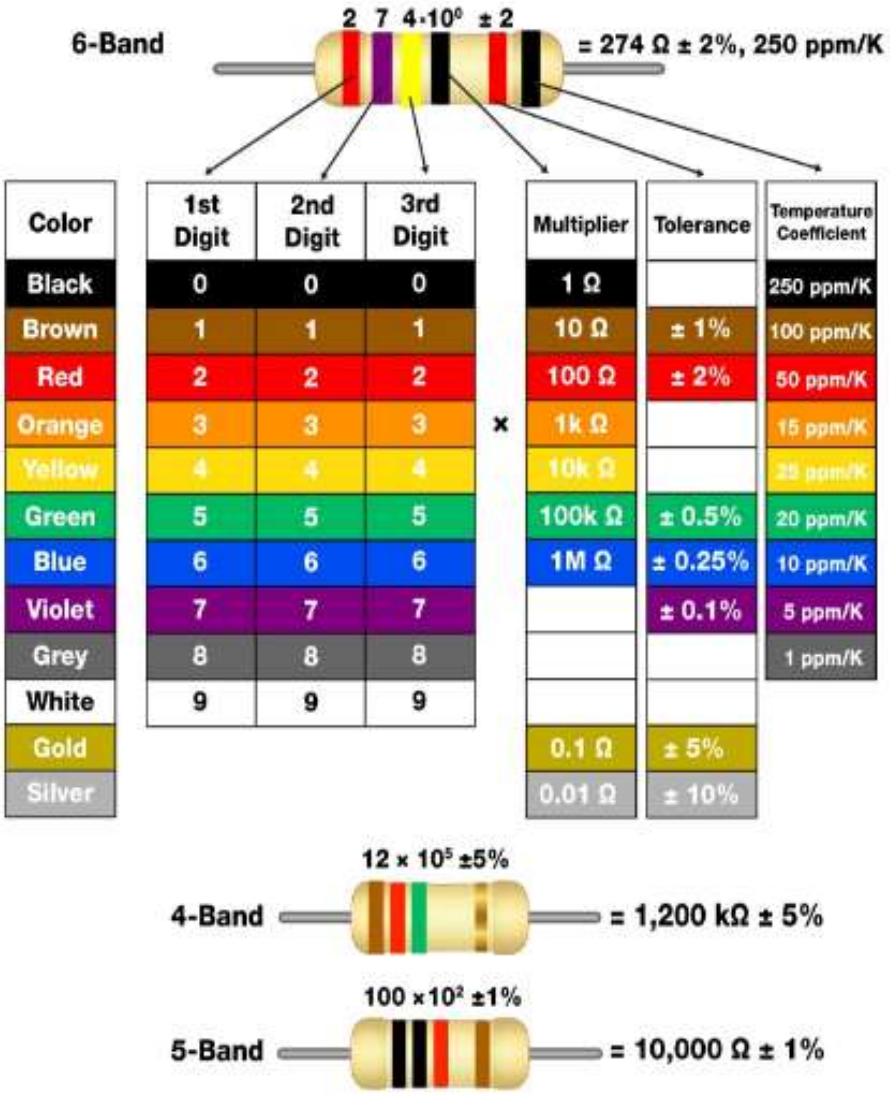
Functions of Resistor

A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element. In electronic circuits, resistors are used to reduce current flow, adjust signal levels, to divide voltages, bias active elements, and terminate transmission lines, among other uses

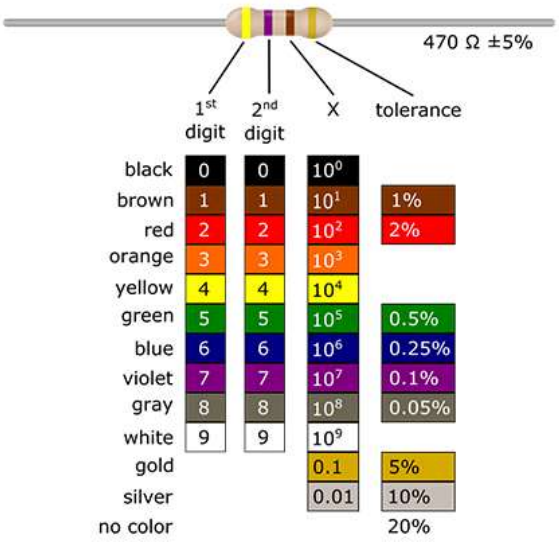
- ✓ ***Electrical resistors are very similar***—affected by the same three factors. If you make a wire thinner or longer, it's harder for electrons to wiggle through it

RESISTOR COLOR CODING

- ➢ uses colored bands to quickly identify a resistor resistive value and its percentage of tolerance.



How to Read Resistor Values



a. Decide which band is the first band.
   Compare the ends of the resistor.
   Note: Always read resistors from left to right. A gold or silver band (the tolerance) is always the last band.
b. Look up the color of the first band in the column labeled "1st digit" and find the number associated with that color.
c. Look up the color of the second band in the column labeled "2nd digit" and find the number associated with that color.
d. Look up the color of the third band in the column labeled "X" and find the number associated with that color.
e. Put the first two digits side-by-side to form a two-digit number.
f. Multiply the two-digit number by the multiplier.

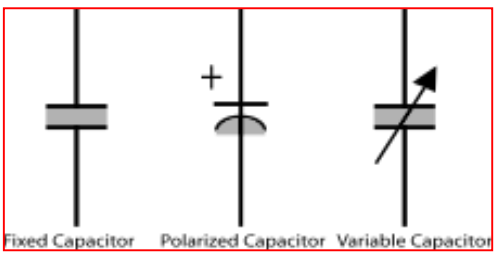
Band	1st	2nd	3rd	4th
Color	Yellow	Violet	Brown	Gold
Value	4	7	Multiplier -10	5

Combine the 1st & 2nd digit, then multiply it by the multiplier which is 10

47 x 10 = 470 Ω with the tolerance of 5%

Capacitor

- A capacitor (formerly known as a condenser, and before that known as a permittor) is a passive two-terminal electrical component that stores electric energy in an electric field.
- Capacitors (sometimes known as condensers) are energy-storing devices that are widely used in televisions, radios, and other kinds.



CAPACITANCE

- The amount of electrical energy a capacitor can store.
- The capacitance of a capacitor is a bit like the size of a bucket: the bigger the bucket, the more water it can store; the bigger the capacitance, the more electricity a capacitor can store.

Three ways to increase the capacitance of a capacitor.

1. One is to increase the size of the plates.
2. Another is to move the plates closer together.
3. The third way is to make the dielectric as good an insulator as possible

How Does It Work?

When you apply a voltage over the two plates or connect them to a source, an electric field develops across the insulator, causing one plate to accumulate positive charge while negative charge gets collected on the other. The capacitor continues to hold its charge even if you disconnect it from the source. The moment you connect it to a load, the stored energy will flow from the capacitor to the load.

Capacitance is the amount of energy stored in a capacitor. The higher the capacitance, the more energy it can store. You can increase the capacitance by moving the plates closer to each other or increasing their size. Alternatively, you can also enhance the insulation qualities to increase the capacitance.

Types of Capacitor

1. Ceramic capacitor: The ceramic capacitor is a type of capacitor that is used in many applications from audio to RF. It is most commonly used type of capacitor being cheap and reliable and their loss factor is particularly low although this is dependent on the exact dielectric in use.

2. Electrolytic capacitor: Electrolytic capacitors are a type of capacitor that is polarized. They can offer high capacitance values - typically above 1µF and are most widely used for low-frequency applications - power supplies, decoupling, and audio coupling applications as they have a frequency limit if around 100 kHz.

3.Tantalum capacitor: Like electrolytic capacitors, tantalum capacitors are also polarized and offer a very high capacitance level for their volume. However, this type of capacitor is very intolerant of being reversely biased, often exploding when placed under stress.

4. Silver Mica Capacitor: Silver mica capacitors are not as widely used these days, but they still offer very high levels of stability, low loss, and accuracy where space is not an issue.

5.Polystyrene Film Capacitor: Polystyrene capacitors are a relatively cheap form of capacitor but offer a close tolerance capacitor where needed.

6.Polyester Film Capacitor: Polyester film capacitors are used where cost is a consideration as they do not offer a high tolerance.

7.Metallised Polyester Film Capacitor: This type of capacitor is essentially a form of polyester film capacitor where the polyester films themselves are metalized.

8.Polycarbonate capacitor: The polycarbonate capacitors have been used in applications where reliability and performance are critical.

9.Polypropylene Capacitor: The polypropylene capacitor is sometimes used when a higher tolerance type of capacitor is necessary than polyester capacitors offer.

10.Glass capacitors: As the name implies, this capacitor type uses glass as the dielectric.

11.Supercap: Also known as a super capacitor or ultra capacitor, as the name implies these capacitors have very large values of capacitance, of up to several thousand Farads.

Functions of Capacitor

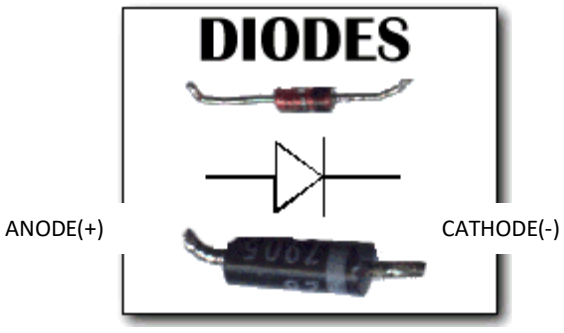
Its function is to store the electrical energy and give this energy again to the circuit when necessary. In other words, it charges and discharges the electric charge stored in it. Besides this, the functions of a capacitor are as follows: It blocks the flow of DC and permits the flow of AC.

Diode

Diodes are known as rectifiers. It is used to convert the **ac** voltage to **dc** voltage. It is an electronic equivalent of one-way streets. Diodes allow an electric current to flow through them in only one direction.

Diode Composed of two terminals:

- **Anode** is the positive electrode, the point of exit of electrons from a device to the external circuit.
- **Cathode** is the negative electrode, the point of entry of electrons into a device from an external circuit. It is also the terminal connected to the positive point of the circuit.



- Diodes are a one-way valve for electrical current. They let it flow in one direction (from positive to negative) and not in the other direction.

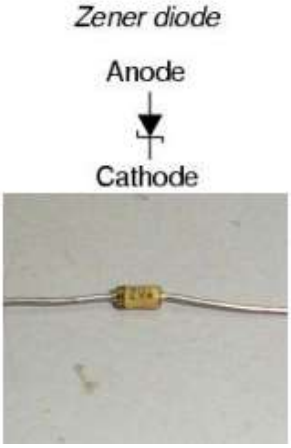
LEDs: Light Emitting *Diodes*:

- LEDs are simply *diodes* that emit light of one form or another. They are used as indicator devices. Example: LED- lit equals machine on. They come in several sizes and colors. Some even emit Infrared Light which cannot be seen by the human eye.
- LED emits light when the current flows through it when it is forward bias.
    - ✓ **Forward Biased** permits the flow of current when DC voltage is applied to the cathode (negative terminal). The diode is its active stage. LED does not emit light when it is reversed-biased.
    - ✓ **Reversed Biased** does not permit the flow of current when DC voltage is applied to the anode(positive terminal). The diode becomes an insulator.

- LED is used as a low current indicator lamp in many types of consumer and industrial equipment, such as monitors, TV, printers, hi-f- systems, and machinery control panels.
- LED only needs 2v across its anode and cathode terminals to make it emit light.

ZENER DIODE

- Used as a regulator.
- Before you start to test any zener diode, you must first understand the marking or part number and then look for the voltage ratings.
- Zener diode markings.
- 2.4=2.4 volt zener diode
- 2V4=2.4 volt



Main Function of Diode

The most common function of a diode is to allow an electric current to pass in one direction (called the diode's forward direction), while blocking it in the opposite direction (the reverse direction). As such, the diode can be viewed as an electronic version of a check valve.
Bridge type Rectifier

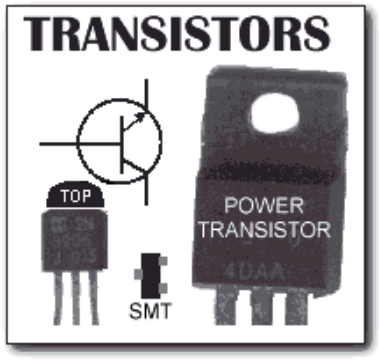
- The function of the bridge rectifier in the power supply is to convert the AC supply voltage into DC voltagr.
- Full wave rectification, it is not necessary to use four individual diodes since all four diodes can be obtained in one package as shown in fig.1
- Each package has two AC input terminals and two DC output terminal marked (+) and (-).

How Does It Work?

Vacuum Diode

- When the cathode is heated by a filament, an invisible cloud of electrons, called space charge, forms in the vacuum. Though electrons are emitted from the cathode, the negative space charge repels them. As electrons can't reach the anode, no current flows through the circuit. However, when the anode is made positive, the space charge vanishes. As a result, current starts flowing from the cathode to the anode. Thus, electric current within the diode flows only from the cathode to the anode and never from the anode to the cathode.

Transistor



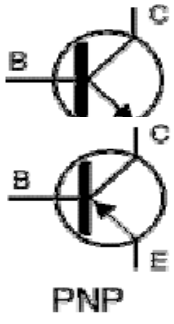
The transistor is possibly the most important invention of this decade.

- It performs two basic functions.
- It acts as a switch turning current on and off.
- It acts as an amplifier. This makes an output signal that is a magnified version of the input signal. More on transistors in later sections.

Transistors are more complex and can be used in many more ways.
The name transistor is derived from "transresistor", meaning that it changes resistance. Unlike a diode, a transistor has three leads.
The three transistor leads are designated as Base(B), Collector(C), an Emitter(E).

- **NPN TRANSISTOR**
  - The **base** is formed by connecting two anodes.
  - The **emitter** is one of the cathodes, and the collector is the other cathode.

  PNP TRANSISTOR
  - The **base** is formed by connecting two Cathodes.
  - The **emitter** is one of the anode, and the collector is the other anode.



- The main difference between an NPN and a PNP transistor in a circuit is the direction in which electrons flow between emitter and collector.

Transistors Function

- The main operational characteristic of a transistor is that a small voltage placed on one of the three leads can control a large amount of current flow through the two leads. This enables a transistor to perform two basic functions:

1. A transistor can acts as an electronic switch, turning current flow ON and OFF.
2. A transistor can amplify a signal, making it larger in amplitude.

- Either type transistor, NPN or PNP, can perform, essentially the same function in an electronic circuit.

Before we perform different testing components, it is necessary to know the standard procedure on how we can prevent an accident.

OHS or Occupational Health and Safety refers to the legislation, policies, procedures, and activities that aim to protect the health, safety, and welfare of all people at the workplace.

1. Do not work alone so that there's someone who can take care of you in case of an emergency.
2. Always power off the computer and unplug the computer before working on it.
3. Take away any liquid near your working area to avoid getting electrocuted or accidentally damaging computer parts.
4. Be careful with tools that may cause short circuits.
5. Always ground or discharge yourself before touching any part of the computer.
6. Do not use excessive force if things don't quite slip into place.
7. Clean the area before and after using it to maintain sanitation and prevent accidents.
8. Hold the components on the edges and do not touch the Integrated Circuit (IC) parts.
9. Always wear personal protective equipment (PPE) in accordance with the organization's OHS procedures and practices.
10. Make sure that the pins are properly aligned when connecting a cable connector.
11. Contingency measures during workplace accidents, fire, and other emergencies are recognized

TESTING COMPONENTS USING ANALOG MULTIMETER

Testing Resistor

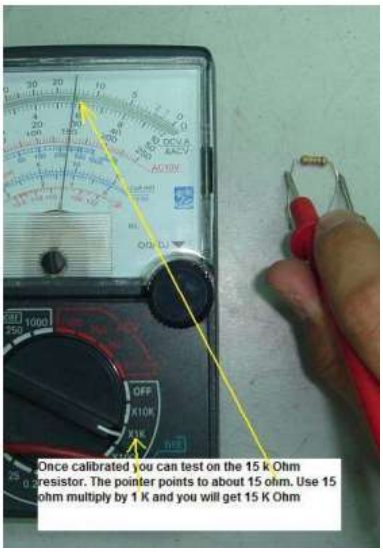
- Check the resistor resistance by selecting the ohmmeter range in the analog and digital multimeter.

1. First, you must know the resistor value before you take any measurement.
2. With the resistor color band calculation you have read from the previous section, I'm sure you have no problem in identifying resistor value by looking at the color bands.
3. Assuming you are measuring a resistor with colors of; yellow, purple, black, and gold. From the calculation, it is a 47 ohms resistor with 5% tolerance.
4. Set your analog meter to x1 ohm, shorting the probes, and calibrate the pointer so that it will stay at zero ohm.
5. Place your meter probes to the two points of the resistors as shown in the photo. It doesn't matter which probes to which two points because the resistor does not have polarity (positive and negative) like a battery.
6. You should have got somewhere near 47ohm by observing the pointer.

7. If you get more than 47 ohm say 150 ohm, this means that the resistor has gone up in resistance and needs permanent replacement.
8. Remember to press a little bit hard on the leads of the resistor while measuring it otherwise, you may not get a precise reading or intermittent reading could occur.
9. Similarly, if you want to check a 15K ohm resistor, short the two probes together and calibrate by adjusting the adjuster knob.
10. You must set your meter to x1 K ohm range so that the measurement is within the range.

11. Check the result to see if the pointer point to near or exactly15K ohm. If the resistor has 5% tolerance the pointer should point between the values of 14.25K to 15.75 K ohm.

12. Any value you get that is not between the tolerance ranges, you should replace the resistor.



13. To check a 100K ohm resistor, you have to select the X10K ohm range. Follow the procedure explained above and you should be able to get the measurement.

Testing Capacitor

1. First, method, before you test the capacitor, make sure you use an analog multimeter set to X1 ohm range and connect a capacitor to the test probe.

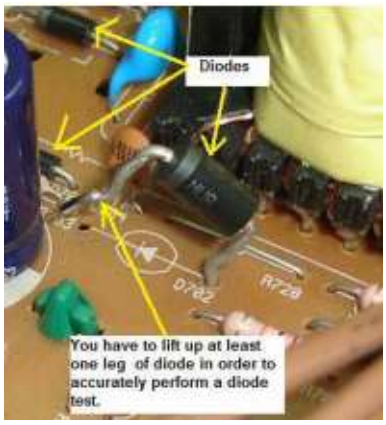
An Analog Multimeter

2. See the panel if the pointer flicks up and comes down or not, this represents charging. If it still cannot flick or no response then set your meter to X10 ohm and then to 1K ohm and lastly to 10 K ohm range.

3. If it still doesn't flick then the capacitor under test has developed an open circuit.
4. This is a rather old method to test capacitors because even though a capacitor can charge and discharge, this does not mean the capacitor value is good. Due to this problem, the digital capacitance meter was developed.

Testing Diode

1. The first step on how to test a diode accurately is to remove one of the diode lead. You can't always be certain if a diode is good or bad if you perform in a circuit test, because of back circuits(parallel connection) through other components.



If you reverse the probes the pointer will not move at all

2. Set your analog meter to x1 ohm range to check for current diode leakage reverse and forward testing.
3. Connecting the red probe of your meter to the cathode and black probe to the anode. The diode is **forward biased** and the meter should read some value of resistance.
4. Touch the black probe of your meter to the cathode and red probe to the anode, the diode is **reverse biased** and should look like an open reading the meter pointer not moving.
5. If you get two readings then most probably the diode is shorted or leaky and you should replace it.

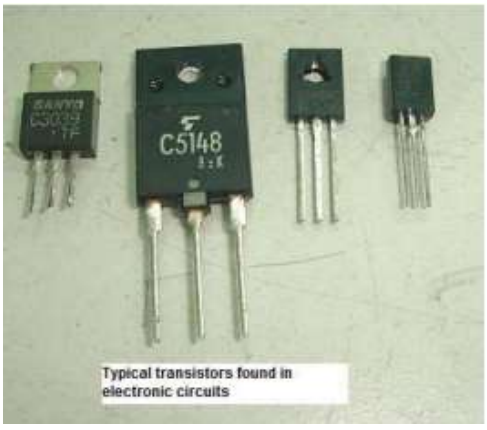
6. If you don't get any reading either forward or reverse bias, the diode is considered open circuit.
7. The real problem when testing a diode using the digital meter is that an open or leaky diode, the meter sometimes reads okay.
8. This is due to the digital meter diode test output voltage (which you can measure the output test probe using another meter) is around 500mv to 2v.

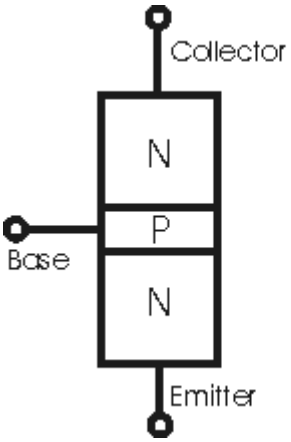
9. You have to select your meter to X10K ohm range to test the diode again. The output voltage of X10K ohms is about 12V.
10. Again the diode under test should show only one reading.
11. Always replace a diode with the same or higher rating than the original specification.

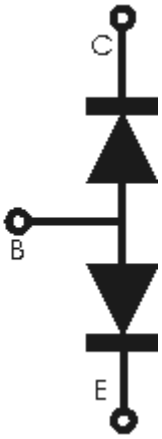
Assessment: To correctly test the diode you need to use an analog multimeter and set the range to x1 ohm and x10K ohm range.

Testing Transistor

The test relies on the fact that a transistor can be considered to comprise of two back to back diodes, and by performing the diode test between the base and collector and the base and emitter of the transistor using an analog multimeter, the basic integrity of the transistor can be ascertained.







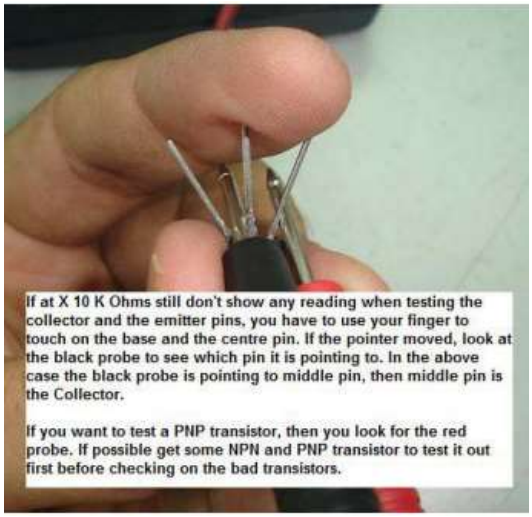
It should be noted that a transistor cannot be functionally replicated using two separate diodes because the operation of the transistor depends upon the base which is the junction of the two diodes, being one physical layer, and also very thin.

NPN Type

1. Connect the black probe of the multimeter to one of the transistor leads, and connect the red probe to any of the other leads.
2. If two low readings are found for one connection of the black probe (test no 1& 2) while each of the other two positions gives two high readings (test no. 3,4,5 & 6) then the transistor is NPN type.
3. The pin where the black probe is connected to showed two low reading when the red probes connected to the other two leads shows high reading is the "Base". In the above case pin 1 is the base.

PNP Type

1. Connect the red probe of the multimeter to one of the transistor leads and connect the black probe to any of the other leads.
2. If two low readings are found for one connection of the red probe (test 1 & 2), while each of the other two positions gives two high readings (test 3,4, 5 & 6), then the transistor is PNP type.
3. The pin where the red probe is connected to showed two low reading when the black probes connected to the other two leads shows high reading is Base. In the above case pin 1 is the Base.



- Checking transistors is not as easy as checking the two leads devices like resistors, capacitors, and diodes

Test Indicator of a Resistors

- Open Resistor- pointer has no deflection in any setting.
- Shorted Resistor-pointer turn to zero in any setting.
- High Resistance- resistance value is higher than the allowed resistor.
- Low Resistance- resistance value lower than the allowed resistance.
- Good Resistor- if the reading is closed to the rated value of the resistor depending on the tolerance.
- Defective Resistor- if the pointer does not deflect at all of the resistors is open. The reading has a big difference to the resistor rated value. The resistor's resistance value has change

Test Indicator of a Capacitors

- Open Capacitor- pointer has no deflection on either side.
- Shorted Capacitor- pointer deflects on right and doesn't turn back to infinity.
- Leaky Capacitor- pointer turns right at a specific point but do not turn back to infinity.
- Good Capacitor- pointer turns to the right at a value and deflects back to infinity.

Test Indicator of a Diode

- Open Diode- pointer remains at infinity or does not deflect to the right at any setting of the test probes.
- Shorted Diode- pointer deflects to zero ohms at any setting of the test probes.
- Leaky Diode- pointer deflect to a certain point at both forward and reverse bias.
- Good Diode pointer deflects at a certain when positive test probes is connected the cathode and the negative test probe is connected to the anode. It will deflect when the connection of the test probe is reversed.

Test Indicator of a Transistor

- Open Trasistor- if the tester pointer has no deflection in the base to emitter or base to collector.
- Shorted Transistor- if the transistor two terminal read has same resistance value in both directions.

E *What is more?*

1. On a space provided below. Draw and label an Analog Multitester
2. Answer the following question
    a. What do think will happen to multimeter if you try to measure resistance without disconnecting the component from the circuit?
    b. Why you should have a multimeter when doing any electrical work?

1._____
_____
_____
_____
_____
_____
2._____
_____
_____
_____
_____
_____
_____

E *What I can do?*

A. Calculate the following resistor color code. Write your answer on the space provided below.

1. Violet, Yellow, Red, Gold
2. Green, Blue, Grey, Orange, Silver
3. Blue, Red, Orange, Green, Gold
4. Brown, Black, Red, Blue, Gold
5. Yellow, Red, Orange, Yellow, Gold

B. On a short bond paper
Make an essay about the Importance of Electronic Components

E What else can I do?

A. Draw and explain a simple circuit to make a light turn on.
B. Arrange the following steps in order. Use number 1 for the first step, 2 for the second, and so on. Write the answer on the space provided.

How to Test Capacitor

_____ If it still doesn't flick then the capacitor under test have developed an open circuit.
_____ First method, before you test the capacitor, make sure you use an analog multimeter set to X1 ohm range and connect a capacitor to the test probe.
_____ See the panel if the pointer flicks up and comes down or not, this represents charging. If it still cannot flick or no response then set your meter to X10 ohm and then to 1K ohm and lastly to 10 K ohm range.
_____ This is a rather old method to test capacitors because even though a capacitor can charge and discharge, this does not mean the capacitor value is good. Due to this problem, the digital capacitance meter was developed.

How to Test Resistor using Analog Multimeter

_____ First, you must know the resistor value before you take any measurement.

_____ Check the result to see if the pointer point to near or exact 15K ohm. If the resistor has 5% tolerance the pointer should point between the values of 14.25K to 15.75 K ohm

_____ With the resistor color band calculation you have read from the previous section, I'm sure you have no problem in identifying resistor value by looking at the color bands.

_____You must set your meter to x1 K ohm range so that the measurement is within the range.

_____ Assuming you are measuring a resistor with colors of; yellow, purple, black, and gold. From the calculation, it is a 47 ohms resistor with 5% tolerance.

_____If you get more than 47 ohm say 150 ohm, this means that the resistor has gone up in resistance and needs permanent replacement.

_____ Set your analog meter to x1 ohm, shorting the probes and calibrate the pointer so that it will stay at zero ohm.

_____ Place your meter probes to the two points of the resistors as shown in the photo. It doesn't matter which probes to which two points because the resistor does not have polarity (positive and negative) like a battery.

_____ You should have got somewhere near 47ohm by observing the pointer.

_____ Similarly if you want to check a 15K ohm resistor, short the two probes together and calibrate by adjusting the adjuster knob.

_____ Remember to press a little bit hard on the leads of the resistor while measuring it otherwise, you may not get a precise reading or intermittent reading could occur.

A What I have learned?

1. Obtain and clarify work instructions based on job order or client requirements
2. Consult responsible person for effective and proper work coordination
3. Identify various testing methods based on types of electronic components
4. Determine the characteristics and appropriateness of testing methods to be used during development and on completion
5. Consider/select testing methods concerning an appropriate testing strategy
6. Develop a plan for testing components at specified points during development and on completion
7. Prepare and check the required test and measuring instruments and tools in accordance with established procedures
8. Establish records system to document testing results, including problems and faults
9. Apply appropriate testing methods to electronic components in accordance with technical specifications
10. Detect and record problems and faults by testing
11. Document remedial steps
12. Resolve detected problems and faults during testing in accordance with the agreed project or industry practice
13. Evaluate final products against the determined criteria
14. Submit to relevant personnel the documented and summarized evaluation report of the testing process
15. Identify testing methods that were successful based on industry standards
16. Evaluate testing process and records system based on standard procedures
17. Document test results/findings for subsequent testing

A What I can achieve?

Direction: Identify the following statement.

_____1. is a structure that directs and controls electric current to perform various functions including signal amplification, computation, and data transfer.

_____2. It does not permit the flow of current when DC voltage is applied to the anode (positive terminal). The diode becomes an insulator.

_____3. It used to convert the **ac** voltage to **dc** voltage.

_____4. It permits the flow of current when DC voltage is applied to the cathode (negative terminal). The diode is its active stage. LED does not emit light when it is reversed-biased.

_____5. It is types are by far the most commonly used type of capacitor being cheap and reliable and their loss factor is particularly low although this is dependent on the exact dielectric in use.

_____6. It means opposition to some action.

_____7. It can be used to adjust circuit elements (such as volume control or a lamp dimmer), or as sensing devices for heat, light, humidity, force, or chemical activity.

_____8. It is formerly known as a condenser, and before that known as a permittor) is a passive two-terminal electrical component that stores electric energy in an electric field.

_____9. are components or device which doesn't generate voltage but controls the current in an electronic circuit.

_____10. are the components which generate, amplify, and also control the voltage and current in an electronic circuit.

_____11. It is the positive electrode, the point of exit of electrons from a device to the external circuit.

_____12. It is the negative electrode, the point of entry of electrons into a device from an external circuit. It is also the terminal connected to the positive point of the circuit.

_____13.It is derived from "transresistor", meaning that it changes resistance.

_____ 14. It is used to reduce current flow, adjust signal levels, to divide voltages, bias active elements, and terminate transmission lines, among other uses.

_____ 15. It is a semiconductor device that essentially acts as a one-way switch for current.

What is new?

1. T
2. T
3. F
4. T
5. T
6. T
7 T
8.T
9.F
10.T
11. T
12. T
13. F
14. F
15. T

What I know?

1. B
2. A
3. C
4. D
5. B
6. A
7. C
8. D
9. B
10. D

What I can do?

1. 7.4KΩ ±5%

2. 568K Ω ±10%

3. 62.3MΩ ±5%

4. 102MΩ ±5%

5. 4.23MΩ ±5%

What else I can do

How to test Capacitor
3,1,2,4

What can I achieved?

1. Electronic Components
2. Reversed Biased
3. Diode
4. Forward Biased
5 Ceramic Capacitor
6. RESISTANCE
7. VARIABLE RESISTOR
8. CAPACITOR
9. PASSIVE
10. ACTIVE
11. ANODE
12. CATHODE
13. TRANSISTOR
14. RESISTOR
15. DIODE

Reference

How to use Multimeter
https://www.electricalknowledge.com/electricians-tools/multimeter-how-to-use/

Learning Module in Electronics
https://www.scribd.com/doc/98056266/k-to-12-Electronics-Learning-Module

Electronic Component
https://blog.mide.com/how-electronic-components-work

Procedure in Testing Electronics Component
https://www.scribd.com/document/340080493/12-OHS-Procedures-for-Computer-Hardware-Servicing-NC-II

How to read resistor color codes
https://www.dummies.com/programming/electronics/how-to-read-resistor-values/

Picture of Resistor Color Code
https://www.arrow.com/en/research-and-events/articles/resistor-color