RQF LEVEL 5

TRADE: ELECTRONIC SERVICES

MODULE CODE: ELSCH501

TEACHER'S GUIDE

Module name: REPAIRING COMPUTER HARDWARE

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Kigali November 2022

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Acronyms

AVI: Audio video interleave

BIOS: Basic input and output

CD: Compact disk

CD-R: Compact disk recordable

CD-ROM: Compact disk read only memory

CDRW: Compact disk rewrite

CPU: Central processing unit

DRAM: Dynamic Random Access Memory

DVD: Digital video/versatile Disc

DVDR: Digital video/versatile disk Rewrite

DVR: Digital video recorder

DVI: Digital Visual interface

EEPROM: Electrical Erasable programmable read only memory

EPROM: Erasable programmable read only memory

FDD: Floppy disk driver

HD: Hard disk

HDD: Hard disk drive

HDMI: High definition multimedia interface

I/O: Input and output

LAN: Local area network

OS: Operating System

PROM: Programmable read only memory

PC: Personal computer

PS/2: Personal system2

PSU: Power supply unit

RAM: Random Access Memory

ROM: Read only memory

SATA: Serial advanced Technology Attachment.

SRAM: Static Random Access Memory

UI: User interface

VGA: Video graphic array

USB: Universal serial bus

Introduction

This core module describes the skills, knowledge and attitude required to repair computer hardware system. The learners will be able to select, arrange different materials, equipment and tools used when doing computer hardware system repairing. in addition, she/he will be able to diagnose, troubleshoot, and replace defective part in laptop and desktop hardware.

Module Code and Title: REPAIRING COMPUTER HARDWARE-ELSCH501

Learning Units:

1. **Prepare the computer hardware repair work**
2. **Repair computer hardware**
3. **Perform hardware configuration**
4. **Document the work done**

Learning Unit 1: Prepare the computer hardware repair work

Picture/s reflecting the Learning unit 1

STRUCTURE OF LEARNING UNIT

Learning outcomes:

1.1 Select tools, Material and equipment

1.2 Setup the working environment

1.3 Identify the faults

Learning outcome 1.1 Select tools, Material and equipment

Duration: 3hrs

Learning outcome 1.1 objectives:

By the end of the learning outcome, the trainees will be able to:

1. Identify correctly Hand and safety tools and equipment used to repair computer

2. Identify Properly computer repairing materials

Resources

Equipment	**Tools**	**Materials**
Computer	Lecture notes	Electronic components
Projector	Text books	Papers
Personal safety equipment	Internet	Soldering tin
	PC Repair Tool Kit	Cleaning materials
	Whiteboard	Jumper wires and cables
	Marker	Connectors and ports
	Duster	Screwdrivers
	Pliers	Needle
	Soldering iron	
	Anti-static Mat	
	Soft cloth	
	Anti-static wrist strap	

Advance preparation:

Prepare Well the learning place Availability of electricity

Content 1: Identification of Hand and safety tools and equipment

Personal safety equipment

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

TYPES OF PERSONAL SAFETY EQUIPMENT

1. SAFETY FOR THE HEAD

Wearing a helmet offers protection and can prevent head injuries. Select a sturdy helmet that is adapted to the working conditions. These days you can find many elegant designs and you can choose extra options such as an adjustable interior harness and comfortable sweatbands

2. PROTECT YOUR EYES

The eyes are the most complex and fragile parts of our body. Each day, more than 600 people worldwide sustain eye injuries during their work. Thanks to a good pair of safety glasses, these injuries could be prevented. Do you come into contact with bright light or infrared radiation? Then welding goggles or a shield offer the ideal protection!

3. HEARING PROTECTION

Do You wok in an environnements with high sound levels? In that case it is very important to consider hearing protection. Earplugs are very comfortable, but earmuffs are convenient on the work floor as you can quickly put these on or take them off.

4. MAINTAIN A GOOD RESPIRATION

Wearing a mask at work is no luxury, definitely not when coming into contact with hazardous materials. 15% of the employees within the EU inhale vapours, smoke, powder or dusk while performing their job. Dust masks offer protection against fine dust and other dangerous particles. If the materials are truly toxic, use a full-face mask. This adheres tightly to the face, to protect the nose and mouth against harmful pollution. (energy, 2009)

5. PROTECT YOUR HANDS WITH THE RIGHT GLOVES

Hands and fingers are often injured, so it is vital to protect them properly. Depending on the sector you work in, you can choose from gloves for different applications :

- Protection against vibrations
- Protection against cuts by sharp materials
- Protection against cold or heat
- Protection against bacteriological risks
- Protection against splashes from diluted chemicals.

6. PROTECTION FOR THE FEET

Even your feet need solid protection. Safety shoes (type Sb, S1, S2 or S3) and boots (type S4 or S5) are the ideal solution to protect the feet against heavy weights. An antiskid sole is useful when working in a damp environment, definitely if you know that 16,2% of all industrial accidents are caused by tripping or sliding. On slippery surfaces, such as snow and ice, shoe claws are recommended. Special socks can provide extra comfort.

7. Wear the correct work clothing

Preventing accidents is crucial in a crowded workshop. That is why a good visibility at work is a must: an overcoat and overall made of a strong fabric can help prevent accidents. Just like the hand protection, there are versions for different applications.

SCREW DRIVERS

A **screw driver** is a tool, manual or powered, used for driving screws. A typical simple screw driver has a handle and a shaft, ending in a tip the user puts into the screw head before turning the handle.

Types of screw driver

- Flat Head (or Slotted Head) Screwdriver.

- Phillips Screwdriver.

- Pozidriv Screwdriver.

- Robertson or Square Screwdriver.

- Torx Screwdriver.

- Hex Screwdriver or Hexagon Screw driver.

Needle

P**liers**

Pliers are made in various shapes and sizes and for many uses. Some are used for **gripping** something round like a pipe or rod, some are used for twisting wires, and others are designed to be used for a combination of tasks including cutting wire.

The Common Types of Pliers

Diagonal Pliers

Hose Clamp Pliers

Combination Pliers

Needle Nose Pliers

Slip Joint Pliers

Bent Nose Pliers

Tongue and Groove Pliers

Flat Nose Pliers

The Soldering iron

A soldering iron is a hand tool used **to heat solder**, usually from an electrical supply at high temperatures above the melting point of the metal alloy. This allows for the solder to flow between the workpieces needing to be joined

ESD Tools

Short for **electrostatic discharge**, **ESD** is one of the few things you can do to damage or destroy your computer or parts in your computer. Like the shock you receive when rubbing your feet on the carpet and touching something metal, ESD can occur when working in your computer and can cause damage to components.

Preventing ESD and grounding yourself

The best method of preventing ESD is to use an ESD wrist strap, grounding mat, or grounding workbench. However, because most users don't have access to such items, we've included the following steps to reduce the chances of ESD as much as possible.

If you plan on working inside a computer more than once, we highly recommend purchasing and using an antistatic wristband. (Andrews, 2013)

- **Zero potential** - Most importantly, make sure you and the computer are at zero potential by continuously touching an unpainted metal surface of the chassis or the computer power supply case.
- **Standing** - Always be standing when working inside the computer. If you are sitting on a chair or the floor, it can generate more electrostatic.
- **Cords** - Disconnect everything from the back of the computer (e.g., power cord, monitor, and USB cables).
- **Clothes** - Make sure not to wear any clothing that conducts an electrical charge, such as a wool sweater.
- **Weather** - Electrical storms can increase the ESD risk; if it can wait, try not to work on a computer during an electrical storm.
- **Accessories** - To help reduce ESD and help prevent other problems, it is also a good idea to remove all jewelry.
- **Surface** - Standing on a hard surface, and the computer or other electrostatic sensitive devices should be on the table.

ESD tools

- **Anti-static wrist strap**

An anti-static wrist strap is a key piece of safety gear that helps to prevent the build-up of static electricity near sensitive electronics or other projects where static charge could damage electronics or cause safety issues. The wrist strap is often used with an anti-static mat or other type of work space covering. Special, highly conductive threads on the wrist strap lead to a ground conductor in order to discharge static electricity safely

- **Anti-static Mat**

Anti-static mats have a **low electrical resistance of between 0.1 and 1000 MegaOhm (MΩ)**. The use of anti-static matting prevents the build-up of electrostatic charge in the body by dissipating this charge and thus prevents a sudden discharge between electrically charged objects on contact.

Cleaning Tools

A variety of accurate and specific tools and products created and designed in various colors, materials, mechanisms, shapes, sizes and styles to clean easily, effectively and efficiently is called “Cleaning tool”

Types of cleaning tool

- Soft cloth
- Compressed air can
- Brushes

Diagnostic Tools

Computer diagnostics tools are pieces of software that give you the knowledge you need to be able to potentially repair your own computer. Some of these tools come built in to your operating system while others come from 3rd party software developers. (Bigelow, 2001)

- **Multimeter**

A **multimeter** is a measuring instrument that can measure multiple electrical properties. A typical multimeter can measure voltage, resistance, and current, in which case it is also known as a **volt-ohm-milliammeter** (**VOM**), as the unit is equipped with voltmeter, ammeter, and ohmmeter functionality.

- **Loopback Adapter**

A Loopback adapter is a network interface that can be used to route network traffic from one application to another on the same computer, but does NOT send that traffic to any other device on the network.

Summary

- ✓ Personal protective equipment
  - Overcoat, overall, safety shoes, gloves, earmuff, eye glass
- ✓ Cleaning tool and material
  - Brush, Soft cloths
- ✓ Diagnostic tool
  - Digital multimeter, Loopback adapter
- ✓ ESD tools
  - Anti-static wrist strap, Anti-static Mat

Theoretical learning Activity

Ask trainees to brainstorm about the types of personal protective equipment and their use.

Ask trainees to brainstorm about the types of different repairing tool


Practical learning Activity

Each Trainee identify tool, equipment and material used to repair computer hardware

Points to Remember

Difference between tool, material and equipment
Tool: Mechanical device intended to make task easier
Ex: Plier, screw driver, hammer.
Material: Matter which can be shaped or manipulated, particularly in making something.
Ex: Electronic component
Equipment: Set of tools used to accomplish a particular function/work
Ex: Multimeter, computer.

Content 2: Identification of computer repairing materials

Soldering tin

Soldering tin metal is easier than other metals because the steel metal materials are pre-coated with a layer of tin.

Electronic components

An electronic component is any basic discrete device in an electronic system used to affect electrons or their associated fields.

Cleaning materials

- Sponges
- Vacuum
- Spray bottle

Adhesives

Adhesive, any substance that is capable of holding materials together in a functional manner by surface attachment that resists separation.

Jumper wires and cables

A jump wire (also known as jumper wire, or jumper) is an electrical wire, or group of them in a cable, with a connector or pin at each end (or sometimes without them – simply "tinned"), which is normally used to interconnect the components of a breadboard or other prototype or test circuit, internally or with other equipment or components, without soldering.

Connectors and ports

In computer terms, a port generally refers to the part of a computing device available for connection to peripherals such as input and output devices. Computer ports have many uses, to connect a monitor, webcam, speakers, or other peripheral devices. On the physical layer, a computer port is a specialized outlet on a piece of equipment to which a plug or cable connects.

Most Connectors are Polarized

Most connectors are polarized, permitting the cable to be plugged in only in one correct direction. The keyboard and mouse use "PS2" connectors which are color-coded: The purple connector is for the keyboard while the green connector is for the mouse.

Connecting a Keyboard/Mouse to Your Computer

To plug in a keyboard or mouse cable, first match the cable to the connector. Rotate the cable until the connector keys match up with the receptors, then push the cable in. Be sure not to force the connector because you will end up bending the pins.

The parallel port, serial port, and video port all use D type connectors (DB-25M, DB-9M, and DB-15F, respectively). These are called "D connectors" because of their shape, which permits the cables to be plugged in only one way.

The audio jacks are the most confusing connectors on the back panel. Although the jacks are sometimes color-coded, the devices that plug into them rarely are. You can try using the identifying symbols stamped into the metal next to them.

The green jack (audio out) is where you plug in your left speaker. Only one speaker plugs into the computer: The right speaker plugs into a jack on the left speaker.

The red jack is where you plug in your microphone. The center jack (audio in) is where you plug in audio from another device, such a CD player. (heineman, 1996)

Connector Types

A computer cable connector is the part of a cable that plugs into a port or interface to connect a device to the motherboard or another device. Most connectors are either male (containing one or more exposed pins) or female (containing holes in which the male connector can be inserted). A number of different connector types are used to connect various external devices to the computer.

DB Connectors (Data Bus)

This connector type is most often associated with the serial, parallel, and display monitor ports. DB stands for D bucket connector and the full connector designation (e.g. DB25 male) refers to the number of pins in the connector and whether the connector is a male (plug) or female (socket) type.

Note: If a DB-type port uses a female connector, the cable associated with the port will require a male connector to 'mate' correctly and vice versa.

The standard 15-pin VGA connector was derived from an older 9-pin design; consequently, the plugs have 15 pins in a connector shell originally designed for 9. The only way to make more pins fit was to make them thinner, but this also makes them more prone to bending, so always take care when plugging in video leads because bent pins are hard to straighten without breaking them off. The monitor might work with a bent pin, but you will not get the correct colour output.

The DIN Connectors

Another type of connector is the DIN connector. DIN is an abbreviation for Deutsches Institut für Normung, or German Institute for Standardization, which is a German manufacturing industry standards group. DIN connectors are round with pins arranged in a circular pattern. This type of connector was used widely for PC keyboards, MIDI instruments, and other specialized equipment.

We have two types of DIN: Full-DIN and Mini-DIN.

Full-DIN (or five pin DIN):

This connector has five pins that are arranged in a circular pattern. This type of connector was commonly used for older AT-style computer keyboards that are obsolete nowadays.

Mini DIN:

This connector has six pins as well as a keying block. This interface was first used on the **IBM PS/2 personal computer**. For this reason, the connector is often called a PS/2 connector. This connector, which had become the industry standard for connecting keyboards and mice, has been superseded by the USB connector. (heineman B. , 1996)

Audio Connectors

Most of the audio connectors on a PC are 3.5 mm mono and stereo jack plugs, as used on most portable domestic audio equipment. Using them, you connect computer speakers or headphones to get sound out of your computer.

The USB Port

USB stands for universal serial bus. This is an industry standard **computer bus** developed in the mid- 1990s that replaced some ports we used, for instance, the PS/2 ports for mouse and keyboard.

The USB standard defines the cables, connectors, and communication protocols used in a bus for connecting devices, enabling communications and providing power between the PC and the device. After it was developed, the USB became the standard for connecting most computer peripheral devices such as modems, keyboards, mice, printers, scanners, digital cameras, disk drives, PDAs, smartphones, and a host of other devices.

Features of the USB Port:

1. It supports plug-and-play: Once connected, the device is configured automatically without any user input.

2. It supports hot swapping: Devices can be plugged and unplugged while the computer is powered on. Note that it is always recommended to eject manually using the "safely remove hardware" instruction before unplugging from the computer.

3. It supports 127 peripheral devices (you can make use of a USB hub for more additional ports).

4. It provides power to connected devices.

Difference between port and connector

Ports refer to the **connectors** that transmit and/or receive data. All ports are connectors.But, not all connectors are ports.

Connector: A connector is the unique end of a plug, jack, or the edge of a card that connects into a port

Male ports – Have pins that protrude out from the connector and require a cable with a female connector.

Female ports. Have holes in the connector to accept the male cable's pins.

Data Ports

Data ports are used to transfer data — though the transfer itself can vary depending on the devices being used Data cables can be used to connect one computer to another or to an external data storage device like an external hard drive.

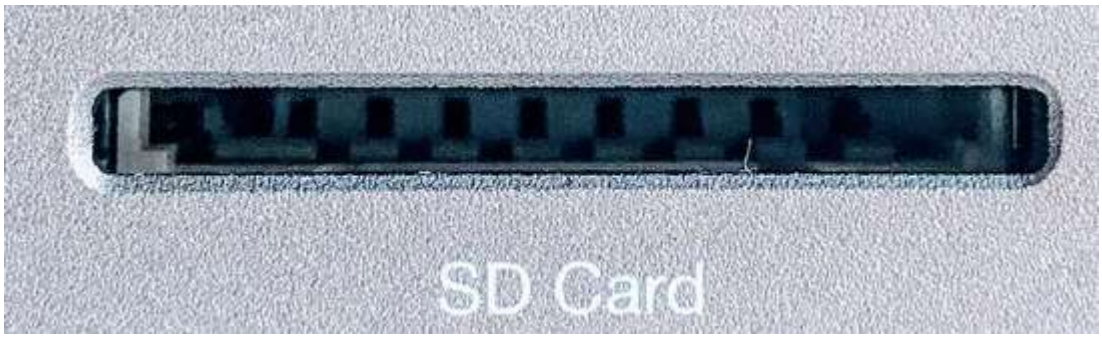
Flash drives and memory sticks preempt the need for a cable entirely by simply pairing a miniature storage device with a dongle for the appropriate data port.

As computers become more streamlined, data ports are becoming more versatile and many data cables double as charging cords for modern day laptops and other devices.

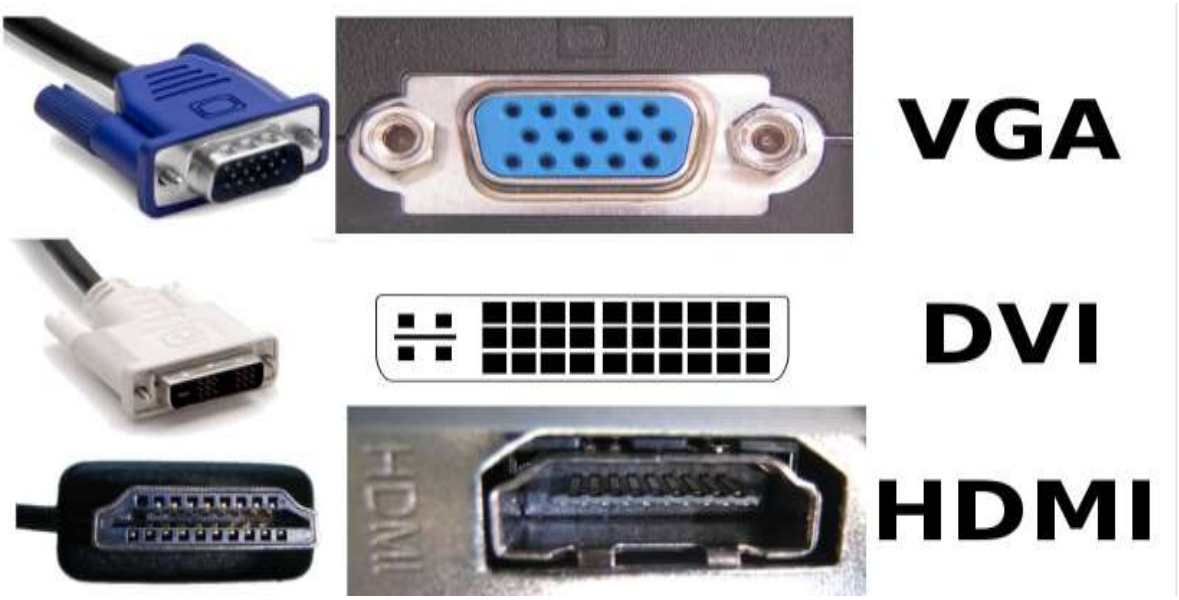
There are currently a handful of different types of data ports in wide usage, and which ones you have access to can limit the speed and efficiency of data transfer for your device.

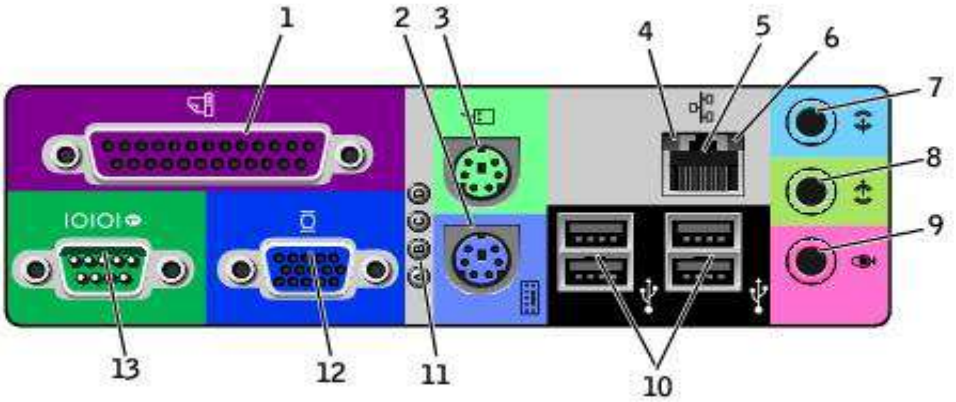
USB Type-A

SD (Secure digital) Card Reader



Video/Display Ports





No	Name of port & connector	Description
1	parallel connector	Connect a parallel device, such as a printer, to the parallel connector. If you have a USB printer, plug it into a USB connector. **NOTE:** The integrated parallel connector is automatically disabled if the computer detects an installed card containing a parallel connector configured to the same address. For more information, see "System Setup Options."
2	keyboard connector	If you have a standard keyboard, plug it into the purple keyboard connector. If you have a USB keyboard, plug it into a USB connector.

3	mouse connector	Plug a standard mouse into the green mouse connector. Turn off the computer and any attached devices before you connect a mouse to the computer. If you have a USB mouse, plug it into a USB connector. If your computer is running Windows 2000 or Windows XP, Dell installed the necessary mouse drivers on your hard drive.
4	link integrity light	• Green: A good connection exists between a 10-Mbps network and the computer. • Orange: A good connection exists between a 100-Mbps network and the computer. • Yellow : A good connection exists between a 1,000-Mbps (1-Gbps) network and the computer. • Off : The computer is not detecting a physical connection to the network.
5	network adapter	Attach the UTP cable to an RJ45 jack wall plate or to an RJ45 port on a UTP concentrator or hub and press the other end of the UTP cable into the network adapter connector until the cable snaps securely into place.
6	network activity light	The yellow light flashes when the computer is transmitting or receiving network data. A high volume of network traffic may make this light appear to be in a steady "on" state.
7	line-in connector	Use the green line-out connector (available on computers with integrated sound) to attach headphones and most speakers with integrated amplifiers. On computers with a sound card, the line-out connector is on the card.

8	line-out connector	Use the blue line-in connector (available on computers with integrated sound) to attach a record/playback device such as a cassette player, CD player, or VCR. On computers with a sound card, the line-in connector is on the card.
9	microphone connector	Use the pink microphone connector (available on computers with integrated sound) to attach a personal computer microphone for voice or musical input into a sound or telephony program. On computers with a sound card, the microphone connector is on the card.
10	USB connectors	Connect USB devices such as a mouse, keyboard, printer, joystick, and computer speakers into any of the USB connectors.
11	diagnostic lights	Use the lights to help you troubleshoot a computer problem based on the diagnostic code.
12	video connector	Plug the cable from your VGA-compatible monitor into the blue connector.
13	serial connector	Connect a serial device, such as a handheld device, to the serial port .

Computer parts

Core Components of computer are:

- CPUs / Processors
- Memory
- Motherboards
- Video Cards & Video Devices
- Computer Cases
- Power Supplies
- Fans & PC Cooling
- Barebone / Mini Computers
- Server Components
- Sound Cards

 Summary for the trainer related to the content

- ✓ Identification of computer repairing material:
- Soldering tin
- Electronic components
- Cleaning materials
- Adhesives
- Jumper wires and cables

 **Theoretical learning Activity**

- ✓ Ask trainees to brainstorm about computer repairing material within the group
- ✓ Ask trainees to brainstorm about computer cleaning material within the group
- ✓ Ask trainees to brainstorm about computer ports and connectors within the group
- ✓ Ask trainees to brainstorm about computer parts within the group

Practical learning Activity

- ✓ **Each Trainee select the appropriate computer repairing materials**
- ✓ **Each trainee identify different ports and connectors of computer**
- ✓ **Each trainee identify all computer parts**

Points to Remember

In the process of converting data to information, a computer uses hardware and software. At the simplest level, all computers consist of these two basic components; the hardware and the software.

•Hardware is any part of the computer that has a physical structure that can be seen and touched, though some may be so tiny that they are invisible to the naked eye.

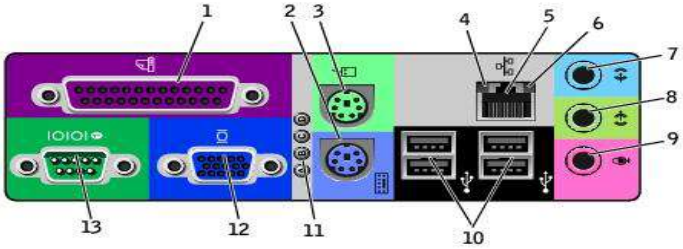
•Software is the instruction set that tells the computer how to perform tasks. Software is intangible i.e., that cannot be seen and touched, but its effect is clearly defined.

Learning outcome 1.1: formative assessment

Written assessment

Lo1.1 Assessment

1. Identify different tools used to repair computer hardware
2. State five (5) personal protective equipment and their use
3. The following figure indicates different port of computer, name them as they labelled from 1 up to 13



4. Differentiate computer port from computer connector

Practical assessment

Practical assessment

EMC Company needs to hire computer repair technician, in fact it needs to buy different materials, tools and equipment to be used in its workshop, as you are computer hardware repairer suggests different material, tools and equipment that must be baught by the company.

- ✓ Task to be performed with performance checklist/quality product checklist

Check list	Score	
Indicator: hand and safety tools and equipment are well identified (knowledge)		
✓ Personal safety equipment		
✓ Screw drivers		
✓ Soldering iron		
✓ Pliers		
✓ Needle		
Indicator: computer repairing tools are well identified (knowledge)		
✓ ESD tools		
✓ Cleaning tools		
✓ Diagnostic tools		
Indicator: computer repairing materials are well identified (skills & knowledge)		
✓ Soldering tin		
✓ Electronic components		
✓ Cleaning materials		
✓ Adhesives		
✓ Jumper, wires and cables		
Observation		

Learning outcome 1.2 Set up the working environment

Duration: 1hour

Learning outcome 1.2 objectives:

By the end of the learning outcome, the trainees will be able to:

1. Identify correctly three methods of cleaning workplace

2. Describe three methods of cleaning workplace

Resources

Equipment	**Tools**	**Materials**
Computer Projector Personal safety equipment Compressed air can Multimeter	Lecture notes Text books Internet PC Repair Tool Kit Whiteboard Marker Duster Brushes Loopback Adapter Soldering iron Anti-static Mat Soft cloth Anti-static wrist strap	Electronic components Papers Soldering tin Cleaning materials Jumper wires and cables Connectors and ports Screwdrivers Needle

Advance preparation:

Arrange well the working place

Safety and precaution must be applied during working process

Content 1: Description of Cleaning methods

Blowing: To move and make currents of air, or to be moved or make something move on a current of air using air blower. It's important to perform this dust removal procedure the correct way in order to avoid damaging the fragile and electrostatically sensitive internal parts of your PC. This is what you recommend:

1. Unplug all the cables and wires connected to your PC. If necessary, label them and/or draw a diagram to help you re-connect them after the cleaning job is finished.
2. Since there will be dust flying everywhere it is best to carry the computer outside for cleaning.
3. Place the computer on a sturdy, flat surface and remove the side panel.
4. Blow the dust out of the inside of the computer case. Move the nozzle around until you no longer see any dust flying out, being extremely careful not to touch any of the internal components with either they can, the nozzle or any part of your body.
5. Important: Make sure you don't accidentally loosen or disconnect any cables inside the machine while you're working.
6. Carefully and gently insert a long, narrow object into one of the case fans in order to keep the blades from rotating as you blow air through them.
7. Blow out the inside of the case once again in order to remove any dust from the fans that might have landed inside the case.
8. Remove any dust that might be on the side panel that you removed in step 3, then re-attach it to the computer.
9. Carry the machine back inside the house and reconnect the cables.
10. Turn the computer on and get right to work!

Brushing: Remove (dust or dirt) by sweeping or scrubbing using appropriate brush. Use a paintbrush to gently brush any more debris from under the keys, and then give the whole thing a good wipe with your damp cloth. DO NOT use bleach or any other industrial cleaner as you could damage the metal/plastic finish of your computer

Toweling: A soft, thick cloth used especially for making towels or clothing. Use a microfiber cloth to wipe away any particularly stubborn dust. Never use paper towels to wipe anything down inside a system, because they tend to leave lots of small fibers and dust on textured surfaces.

Summary for the trainer related to the content

- ✓ description of cleaning methods
  - Blowing: Removing dust from equipment using air blower
  - Brushing: Cleaning technique consists of removing dust by using brush
  - Towelling: Cleaning technique used to remove drops or liquid from computer using towel.

Theoretical learning Activity

- ✓ **Ask trainee to discuss about different methods used to clean computer within groups**

Practical learning Activity

- ✓ **Each Trainee Perform computer cleaning using different cleaning techniques.**

Points to Remember (Take home message)

Cleaning methods:
- ✓ Blowing
- ✓ Brushing
- ✓ Towelling

Cleaning tool: brush, towel, soft cloth, sponge

Content 2: Safety rules and guidelines

Safety rule can be defined as principle or regulation governing actions, procedures or devices intended to lower the occurrence or risk of injury, loss and danger to persons, property or the environment.

Individual safety precautions: Personal safety is a general recognition and avoidance of possible harmful situations or persons in your surroundings. The following are individual safety can be taken when you are repairing computer

- Dress for the Occasion.
- Vision Protection.
- Keep Your Workshop Clean.
- No Drugs, Alcohol or other Impairments Please!
- Please Read The Book.
- Keep Tools and Equipment Sharp.
- Avoid Unnecessary Distractions.
- Use Safety Tools To Assist You

Operating safety precautions: Operational safety is defined as the absence of unacceptable risks, injury or harm to the health of humans, whether direct or indirect, resulting from damage to equipment or the environment.

- Use the proper tool for the job.
- Always wear the proper PPE for the work task.
- Never work on live equipment.
- Make sure chemicals are properly labeled and stored.
- Communicate safety hazards to other personnel

Electrical safety precautions: Electrical safety is a general practice of workers who are exposed to handling and maintaining electrically powered equipment. It is a set of guidelines they follow to mitigate electrical hazards and prevent its dangerous effects in case of an incident.

- Prevent all potential contact with live electrical current.
- De-energize equipment and use lockout/tagout.

- Ensure safe use of electrical equipment.
- Install proper physical barriers around electrical hazards.
- Beware of conductive tools and cleaning materials.

 Summary for the trainer related to the content

- ✓ Safety applied in working place
  - Individual safety precautions
  - Operating safety precautions
  - Electrical safety precautions

 **Theoretical learning Activity**

- ✓ **Ask trainees to brainstorm about safety rules and guidelines used during repairing computer hardware within groups.**

 Practical learning Activity

Trainees in pair apply safety rules in the workshop

 Points to Remember (Take home message)

Safety rule can be defined as principle or regulation governing actions, procedures or devices intended to lower the occurrence or risk of injury, loss and danger to persons, property or the environment.

- Individual safety precautions
- Operating safety precautions
- Electrical safety precautions

Content 3: Methods of arranging tools, equipment and material

The arrangement of the machinery and equipment in a workshop is called 'Workshop layout', and a good workshop layout is a well-planned positioning of the company's plant, machinery, and equipment, which gives excellent ambiance for the employees to give out their best and improves the overall efficiency of the company and also better utilization of labor, machinery, and material. In the workshop materials, tools and equipment arranged by referring to their types, uses and size

Arrangement by types

Arrangement by uses

Arrangement by size/ weight

Benefits of a good workshop layout

- Improved efficiency of the workers resulting in more units per labor hour. Improved productivity in the number of units per hour.
- A good workshop layout ensures a clean and tidy working space. This improves the ambiance of working, reduces employee stress levels, and motivated employees have their willingness to do their best.
- Optimum value addition and every movement of the workers and material adds value to the product.
- Improved quality along with a reduction in rejection and waste.
- Nil or minimum idle time for machines and workers.
- Supervisor gets a good view of the workshop without much movement, which helps him/her coordinate and control to achieve better output.
- Management can forecast the production better, and this helps in realistic commitments to the customers.
- Better utilization of material and labor.
- Minimize or eliminate the work-related accidents in the workshop.
- Overall improvement of the organization improves its earning capability, and a prospering organization will lead to prosperity for the employees.
- Effective and gainful utilization of the available space and optimum work in progress and finished product leads to better financial management.
- Reduced labor cost and improved material utilization mean reduced product cost, which can be passed on to the customer in return for more orders.


Summary for the trainer related to the content

- ✓ Methods of arranging tools, equipment and material
  - Arrangement by types
  - Arrangement by uses
  - Arrangement by size/ weight


Theoretical learning Activity

- ✓ **Ask trainees to discuss about arranging techniques of tools, material and equipment in workshop within the group.**

Practical learning Activity

- ✓ **Each trainee Arrange correctly his/her material, tools and equipment after finishing work.**

Learning out come 1.2 : formative assessment

Written assessment

1. Explain three techniques used to clean the working place
2. Identify different techniques of arranging material, tools and equipment
3. Define term"SAFETY"
4. State four (4) advantages of good arrangement of material, tools and equipment in the workshop.
5. List any two (2) individual safety, operating safety and electrical safety

Practical assessment

Suppose you are electronic workshop assistant, and you are required to elaborate safety guidelines and post them in the workshop in addition select the appropriate cleaning tools and equipment to be used in the workshop.

- ✓ Task to be performed with performance checklist/quality product checklist

Checklist	Score	
	Yes	No
Indicator: safety rules and guidelines are well applied (knowledge)		
✓ Individual safety precautions		
✓ Operating safety precautions		
✓ Electrical safety precautions		
Indicator: cleaning methods are well applied (skills)		
✓ Blowing		
✓ Brushing		
✓ Towelling		
Indicator: tools, equipment and material are well arranged (skills)		
✓ Arrangement by types		
✓ Arrangement by uses		
✓ Arrangement by size/ weight		
Observation		

Learning outcome 1.3 Identify computer hardware faults

 **Duration: 1hour**

 **Learning outcome 1.3 objectives:**

By the end of the learning outcome, the trainees will be able to:

1. Identify Properly general faults symptoms that occur in computer hardware
2. Apply properly computer fault testing techniques
3. Explain correctly computer hardware faults

 **Resources**

Equipment	**Tools**	**Materials**
Computer Projector Multimeter	Lecture notes Text books Internet Whiteboard Marker Duster	Papers

 **Advance preparation:**

- Availability of electricity

- Availability of Computers that present faults

Content 1: Identification of general faults symptoms that occur in computer hardware

Memory faults

A memory read error is a malfunction that occurs when data is being accessed from memory for use by a program, or when a value read from RAM fails to match an expected value. Memory read errors can cause miscalculations, program malfunctions, unresponsiveness, the blue screen of death (BSOD) and spontaneous restarts. The following are symptoms of computer memory fault.

- Computer is slow: A slow response from a computer. It can describe any device that responds slower than expected.
- OS booting doesn't load: When a PC is booting, the BIOS tries to find a operating system on a hard drive to boot from. However, if it is unable to find one, then an "Operating system not found" error is displayed. It may be caused by an error in BIOS configuration, a faulty hard drive, or a damaged Master Boot Record

Hard Disk Drive faults: A hard drive crash can cause your computer to fail at boot up and an error message to appear if certain sectors on the hard drive have become corrupted. Sector failure can be triggered by logical failure or physical failure and can be caused by internal hard disk platter damage. The symptoms of hard disk drive faults are:

- Computer is slow
- Computer doesn't start

CPU faults: A software fault, also known as a "crash" or "abend," is when the program directs the computer to go outside of its restricted memory boundary, its signs are:

- Computer is slow
- Computer doesn't start

PSU faults: A faulty PC power supply belies many intermittent computer problems. This is why experienced PC technicians often look first at the PSU when diagnosing PC hardware issues. The system failures during the boot-up process.

- No start: The PC doesn't power on at all

Network card faults: The initial symptom of a failing Wi-Fi card is a loss of wireless connection or intermittent connection. The computer will also fail to detect any wireless connection even when such networks are available. The operating system may also fail to recognize the Wi-Fi card.

- No internet connectivity

Video card faults: Video card, also called graphics card, integrated circuit that generates the video signal sent to a computer display, when it is damaged can affect the out video and sound. The symptoms of damaged video card are:

- no video displayed
- No graphics
- no sound

Sound card faults: Most sound card problems are a result of improper, defective, or misconnected cables, incorrect drivers, or resource conflicts. Its symptoms are:

- no sound

Motherboard faults: Among the most common causes of motherboard failure are excess electrical shocks, physical damage, or excess heat. Some of these dangers are inescapable, and may vary in likelihood depending on your computer model.

- Computer keeps restarting

Cooling system faults:

- Overheating
- Computer keeps restarting

Computer port faults:

- Keyboard, mouse, printer or other peripherals aren’t working properly

Summary for the trainer related to the content

- ✓ Identification of computer hardware faults
  - Memory faults
  - Hard Disk Drive faults
  - CPU faults
  - PSU faults
  - Network card faults
  - Video card faults
  - Sound card faults

Theoretical learning Activity

- ✓ **Ask trainee to discuss about computer hardware faults within the group.**

Practical learning Activity

- ✓ **Trainees in group identify different computer hardware faults.**

Points to Remember (Take home message)

Computer hardware faults:

Memory fault, cooling fault, computer port fault

Content 2: Faults identification techniques

Interview the user: A user interview is a research method during which a technician asks the user questions about a the problem of the equipment

Visual: Some damaged devices or equipment can presents signs that our eyes can identify easily, such technique is called “Visual” technique.

PC beeps decoding:

- 1 short beep: No errors detected during self-test.
- 2 short beeps: Non-specified error.
- Continuous beep: Memory or graphics card not detected.
- Repeated short beeps: Inadequate power supplied to motherboard.
- 1 long beep: RAM error

POST (Power On Self-Test): The POST (power on self-test) is a set of procedures that a computer runs through each time it is turned on. It ensures that all of the system's hardware is working properly before trying to load the operating system. If the computer does not pass POST, it will not boot.

 Summary for the trainer related to the content

- ✓ Fault identification techniques:
  - Interview the user
  - Visual
  - PC beeps decoding
  - POST (Power On Self Test)

Theoretical learning Activity

- ✓ **Ask trainees to discuss about fault identification techniques within the group.**

Practical learning Activity

- ✓ **Trainees in pair find out different computer hardware fault using different techniques.**

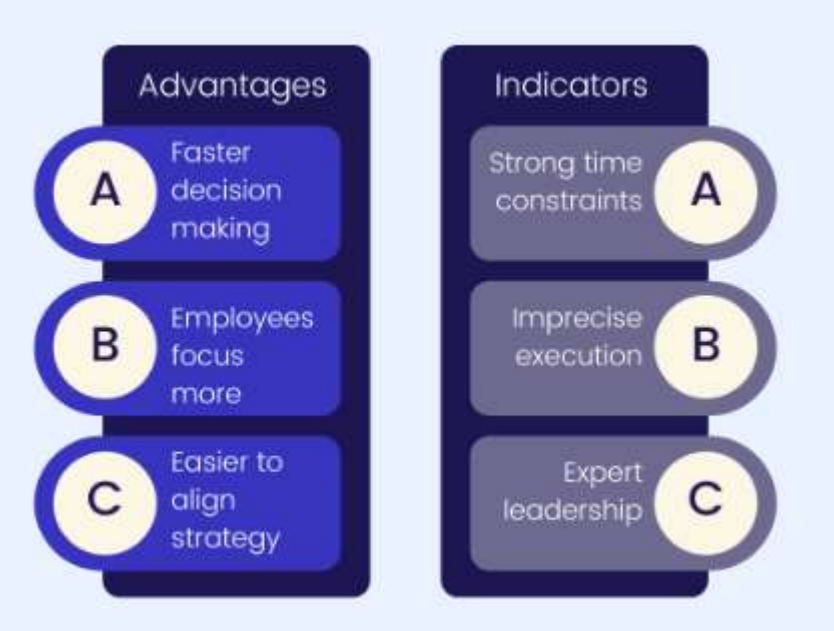
Points to Remember (Take home message)

Faults identification techniques

- Interview the user
- Visual
- PC beeps decoding
- POST (Power On Self Test)

Content 3: Fault identification approach

Top – down: Controlled, directed, or instituted from the top level a top-down corporate structure. 2 : proceeding by breaking large general aspects (as of a problem) into smaller more detailed constituents : working from the general to the specific top-down programming top-down design.



- Down – top

Summary for the trainer related to the content

- ✓ Fault identification approach
  - Top – down
  - Down – top

 **Theoretical learning Activity**

- ✓ **Ask learner to brainstorm about fault identification approach within the group**

 **Practical learning Activity**

- ✓ **Trainees in pair analysis two fault identification approach.**

 **Learning outcome 1.3 : formative assessment**

Written assessment

1. **Discuss about different computer hardware faults**
2. **Explain faults identification techniques**

Practical assessment

MJD Company needs to hire computer repair technician in fact it has computers that has been damaged, as you are computer technician, you are requested to identify different faults of those computer and elaborate the list of dead company so that the company could buy the new ones to replace those which were damaged

✓ Task to be performed with performance checklist/quality product checklist

Checklist	Score	
	Yes	No
Indicator: computer hardware general faults are identified (knowledge)		
✓ Memory faults		
✓ Hard disk drive faults		
✓ CPU faults		
✓ PSU		
✓ Network card faults		
✓ Video card faults		
✓ Sound card faults		
✓ Motherboard faults		
✓ Cooling system		
✓ Computer port faults		
Indicator: Fault techniques are applied (skills and knowledge)		
✓ Visual		
✓ PC beeps		
✓ POST (power on self-test)		
Observation		

Learning Unit 2: Repair computer hardware

Picture/s reflecting the Learning unit 2

STRUCTURE OF LEARNING UNIT

Learning outcome 2.1 Disassemble the computer internal parts

Duration: 30hrs

Learning outcomes:

1. Disassemble the computer internal parts
2. Clean the computer hardware
3. Diagnose the computer hardware and status
4. Fix the computer hardware faults
5. Reassemble the computer hardware
6. Test of the computer hardware

 Learning outcome 2.1 objectives:

By the end of the learning outcome, the trainees will be able to:

1. Describe correctly computer internal and external hardware parts

2. Identify Properly computer internal and external hardware parts

 **Resources**

Equipment	**Tools**	**Materials**
Power supply Computer Projector	Whiteboard Internet PC Repair Tool Kit	Marker Duster Text books Lecture notes Papers Motherboard Processor System Buses Expansion slots Bridge controller HHD Driver

		SSD Driver Power cable Data cable
Advance preparation: • Avaibility of computer hardware is necessary • Prepare material, tools and equipment necessary to open the computer		

Content 1: Describe the computer Internal Hardware components for Laptop and Desktop

Description of system memories

A computer is an n electronic device, operating under the control of instructions stored in its own memory, that can:

– Accept data (input)

– Process the data according to specified rules (process)

– Produce results (output)

– Store the results (storage) for future use.

A computer system is an integrated set of hardware and software designed to process data and produces a meaningful result. Every computer performs the basic functions of input, processing, storage, output, and transmission of data. Instructions and data are entered, processed into results that are stored for later use, and output in a useful format.

Computers are connected to a larger network system for transmission of data and information.

Computer hardware is organized according to these basic functions. The system unit focuses on processing, whereas a variety of peripheral devices facilitate input, output, storage, and communication.

Computer hardware refers to the physical devices that make up a computer. Examples include the keyboard, monitor and disk drive. (S.J, 2001)

Hardware devices can be classified into four distinct categories:

- Input devices: For raw data input.
- Processing devices: To process raw data instructions into information.
- Output devices: To disseminate data and information.
- Storage devices (memories)*:* For data and information retention.

Memory/Storage Devices

Components that retain/store data are classified under memory/storage devices.

Storage is sub-divided under primary and secondary memory and is either volatile or nonvolatile.

Primary Memories

Primary memory is **computer memory that a processor or computer accesses first or directly**. It allows a processor to access running execution applications and services that are temporarily stored in a specific memory location. Primary memory is also known as primary storage or main memory.

Types of Primary Memory

- RAM

It stands for **Random Access Memory**. RAM is known as read /write memory, it is generally refereed as main memory of the computer system also it is a temporary memory. The information stored in this memory is lost as the power supply to the computer is switched off. That's why RAM is also called "**Volatile Memory"**

Types of RAM

a) Static RAM- Static RAM also known as SRAM, retain stored information as long as the power supply is ON. SR

AM are of higher coast and consume more power .They have higher speed than Dynamic RAM

b) Dynamic RAM– Dynamic RAM also known as DRAM, its stored information in a very short time (a few milliseconds) even though the power supply is ON. The Dynamic RAM are cheaper and moderate speed and also they consume less power.

- Cache Memory

Cache memory

In computing, a **cache** is a hardware or software component that stores data so that future requests for that data can be served faster; the data stored in a cache might be the result of an earlier computation or a copy of data stored elsewhere.

This memory is typically integrated directly into the CPU chip or placed on a separate chip that has a separate bus interconnect with the CPU. The purpose of cache memory is to store program instructions and data that are used repeatedly in the operation of programs or information that the CPU is likely to need next. The computer processor can access this information quickly from the cache rather than having to get it from computer's main memory. Fast access to these instructions increases the overall speed of the program.

- **ROM**

It stands for Read Only Memory. ROM is a Permanent Type memory. Its content are not lost when power supply is switched off. Content of ROM is decided by the computer manufacturer

and permanently stored at the time of manufacturing. ROM cannot be overwritten by the computer. It is also called **"Non-Volatile Memory".**

Type of ROM

PROM: **Programmable Read Only Memory** (PROM) chip is programmable ROM, PROM chips writes data once and read many. Once chip has been programmed, the recorded information cannot be changed. PROM is also nonvolatile memory.

EPROM**: Erasable Programmable Read Only Memory (**EPROM) chip can be programmed and again by erasing the information stored earlier in it. Information stored in EPROM exposing the chip for some time ultraviolet light.

EEPROM: **Electrically Erasable Programmable Read Only Memory** (EEPROM) is programmed and erased by special electrical waves in millisecond. A single byte of a data or the entire contents of device can be erased. (wikipedia, 2013)

Secondary Memories

Secondary Memory is external memory of the computer. It is also known as Auxiliary memory and permanent memory. It is used to store the different programs and the information permanently. Secondary Memory is nature non volatile. It means data is stored permanently even if power is switched off.

The secondary storage devices are:

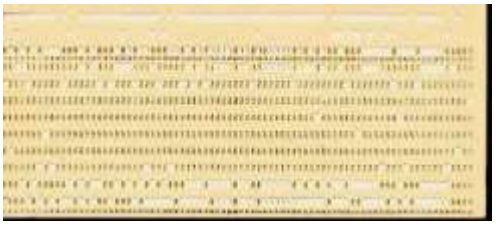
- USB flash drives: A small external flash drive that can be used with any computer that has a USB port.

- Floppy disks: A floppy disk or floppy diskette is a type of disk storage composed of a thin and flexible disk of a magnetic storage medium in a square or nearly square.

- Magnetic tape: Magnetic tape is a medium for magnetic storage, made of a thin, magnetizable coating on a long, narrow strip of plastic film

- Paper tape: Paper tape is a slow, low-capacity, sequential medium for data storage that was used on early communications and computing devices.

- **Punched cards**: **a card in which holes are punched in designated positions to represent data** called also Hollerith card, punched card.



- Standalone RAM disks: A RAM drive (also called a RAM disk) is a block of random-access memory (primary storage or volatile memory) that a computer's software is treating as if the memory were a disk drive (secondary storage).
- **Lomega**: LenovoEMC (formerly known as Iomega) was a producer of external, portable, and networked storage products. Iomega and LenovoEMC have sold more than 410 million

digital storage drives and disks. Iomega was the first producer of the removable floppy disk storage system, which was introduced in 1994 (google)

- Zip drives: A Zip drive is a medium-capacity and portable magnetic disk storage system launched by Iomega in the mid-1990s.

- Flash memory: Flash memory, also known as flash storage, is a type of nonvolatile memory that erases data in units called blocks and rewrites data at the byte level.

Summary for the trainer related to the content

✓ Types of memories

- Primary memories:

RAM Cache Memory
ROM

PROM

EPROM

EEPROM

- Secondary memories

USB flash drives Floppy disks, Magnetic tape, Paper tape, Punched cards, Standalone RAM disks, Lomega Zip drives Flash memory

 Theoretical learning Activity

✓ **Ask trainees to brainstorm about types of memories within thy group.**

 Practical learning Activity

✓ **Trainees in pair identify different types of computer memories**

 Points to Remember (Take home message)

Difference between Primary memory and secondary memory

The memory of a computer is divided into two categories first is primary memory and the second is secondary memory. The basic difference between primary and secondary memory is that the primary memory is directly accessible by the CPU while the secondary memory is not directly accessible to the CPU of the computer

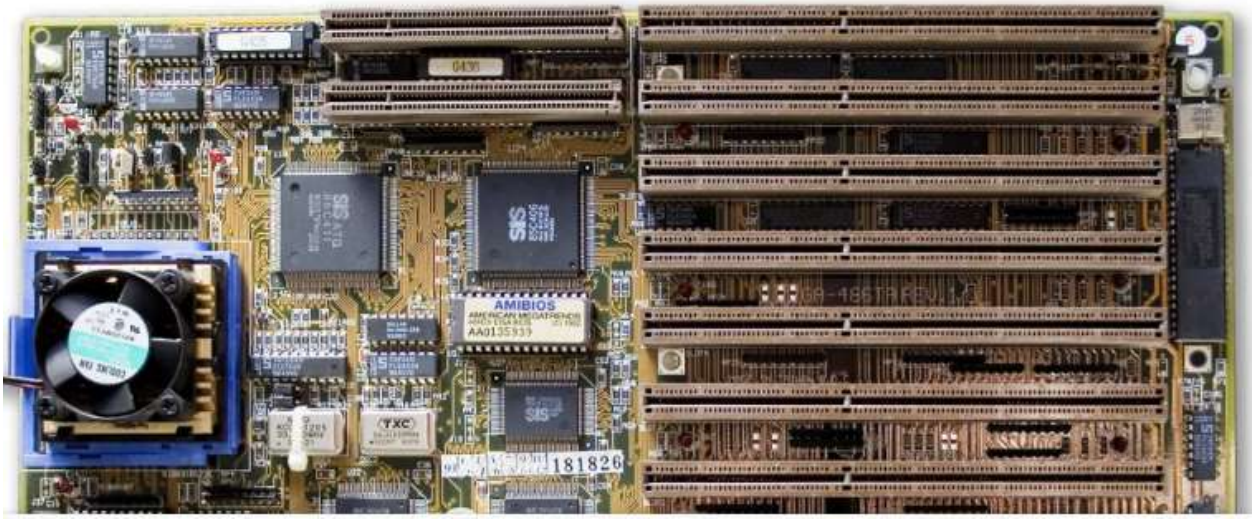
Content 2: Description of motherboard and its components

Motherboard

The motherboard is **the backbone that ties the computer's components together at one spot and allows them to talk to each other**. Without it, none of the computer pieces, such as the CPU, GPU, or hard drive, could interact. Total motherboard functionality is necessary for a computer to work well.

Types computer motherboard

- **AT Motherboard:** They are old-style LOGIC BOARDS which has an AT Form Factor. These logic boards were manufactured by IBM in 80's they dominated the PC Hardware World for a long time.

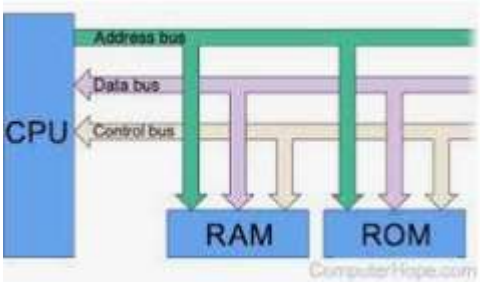


- **ATX Motherboard:** ATX (Advanced Technology eXtended) is a motherboard and power supply configuration specification developed by Intel in 1995 to improve on previous de facto standards like the AT design. It was the first major change in desktop computer enclosure, motherboard and power supply design in many years, improving standardization and interchangeability of parts. The specification defines the dimensions; the mounting points; the I/O panel; and the power and connector interfaces among a computer case, a motherboard, and a power supply.

Motherboard components

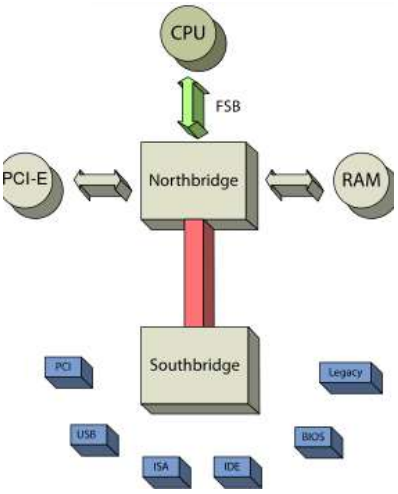
- **Processor**: A processor (CPU) is the logic circuitry that responds to and processes the basic instructions that drive a computer. The CPU is seen as the main and most crucial integrated circuitry (IC) chip in a computer, as it is responsible for interpreting most of computers commands. (en.wikipedia.org)

- **System Buses**: The computer system bus is the method by which data is communicated between all the internal pieces of a computer. It connects the processor to the RAM, to the hard drive, to the video processor, to the I/O drives, and to all the other components of the computer. They are three types of buses, Address bus, Data bus and Control bus



- **Expansion slots:** An expansion slot is a socket on the motherboard that is used to insert an expansion card (or circuit board), which provides additional features to a computer such as video, sound, advanced graphics, Ethernet or memory.

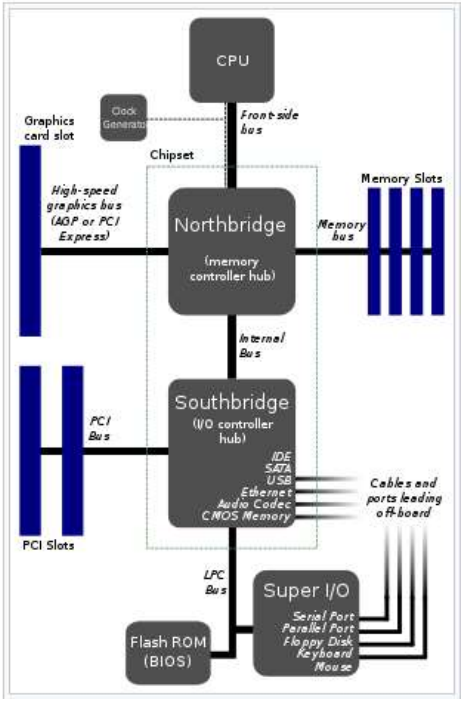
- **Bridge controller**
  - **North bridge:** Northbridge is an Intel chipset that communicates with the computer processor and controls interaction with memory, the Peripheral Component Interconnect (PCI) bus, Level 2 cache, and all Accelerated Graphics Port (AGP) activities. Northbridge communicates with the processor using the frontside bus (FSB).



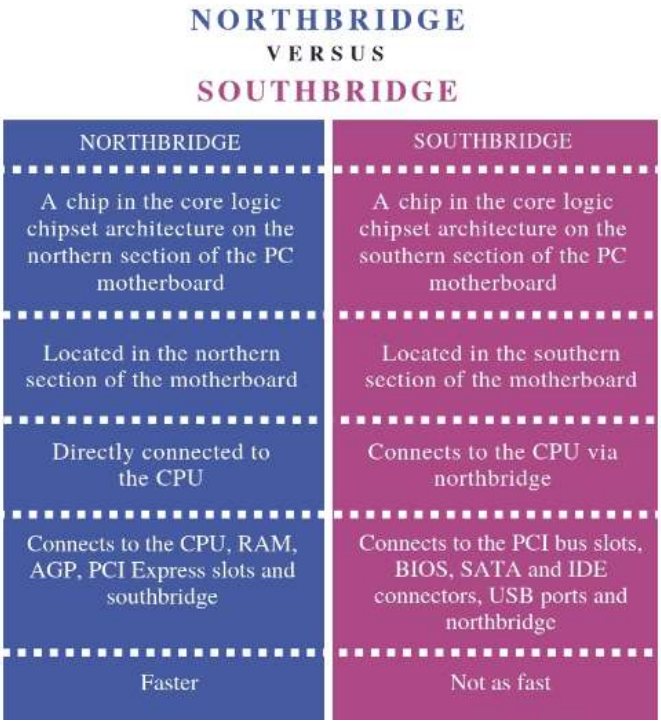
Typical north bridge

  - **South bridge**: Southbridge is a reference to a chipset on a PC motherboard. It is a group of microchips designed for a single function and manufactured

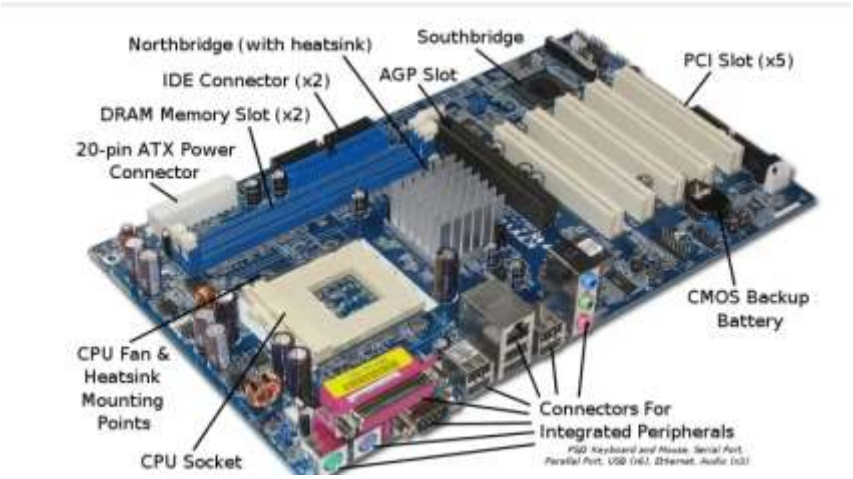
as a single unit. This chipset controls or manages input and output (I/O). Examples of I/O interface connections controlled by southbridge are USB, serial, IDE and ISA.



Typical north/south bridge layout



Major Motherboard Components



- Description of drivers

  - **HHD Driver:** A hybrid hard drive (HHD), sometimes known as a solid-state hybrid drive (SSHD), is a mass storage device that combines a conventional hard disk drive (HDD) and a NAND flash module. An HHD blends the capacity, cost and performance of physical disk storage with the accelerated performance of flash. Data that is frequently written to or retrieved from storage is served from flash memory. Seagate Technology, Toshiba Corp. and Western Digital Corp. offer variants of hybrid hard drive technology, typically branded using the SSHD moniker, for particularized consumer use in notebook computers and personal digital assistants.

  - **SSD Driver:** An SSD, or solid-state drive, is a type of storage device used in computers. This non-volatile storage media stores persistent data on solid-state flash memory. SSDs replace traditional hard disk drives (HDDs) in computers and perform the same basic functions as a hard drive. But SSDs are significantly faster in comparison. With an SSD, the device's operating system will boot up more rapidly, programs will load quicker and files can be saved faster.

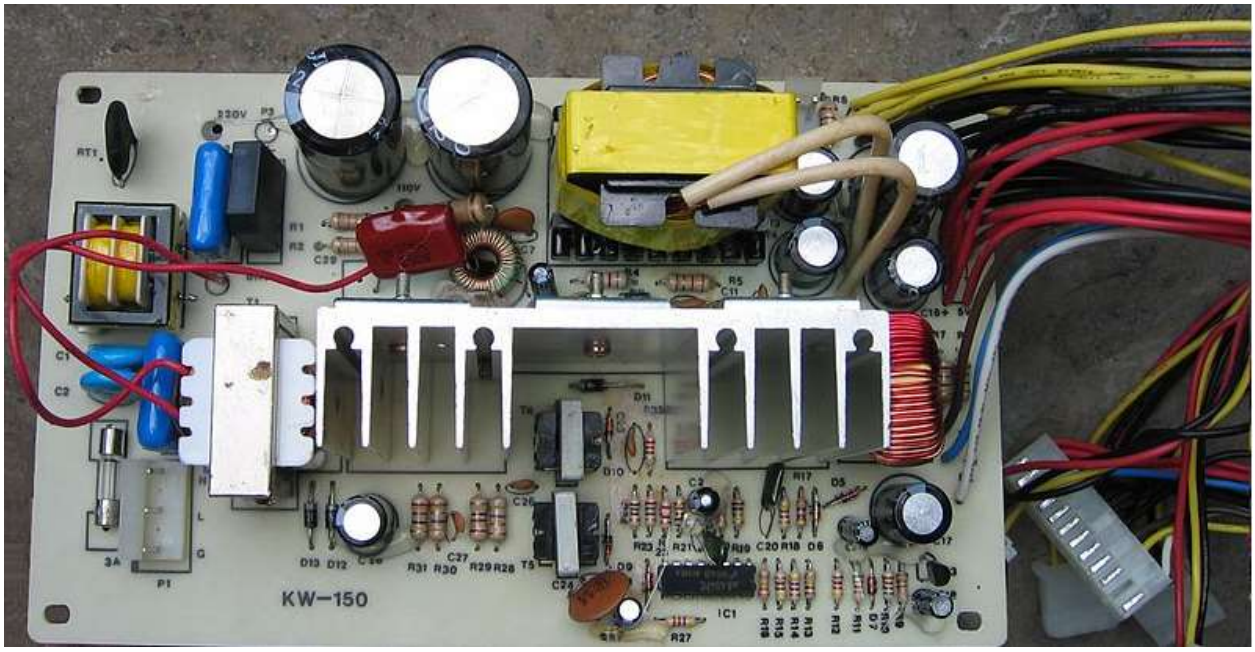
- Description of Power supply types

A **power supply unit** (**PSU**) converts mains AC to low-voltage regulated DC power for the internal components of a computer. Modern personal computers universally use switched-mode power supplies. Some power supplies have a manual switch for selecting input voltage, while others automatically adapt to the mains voltage.

Most modern desktop personal computer power supplies conform to the ATX specification, which includes form factor and voltage tolerances. While an ATX power supply is connected to the mains supply, it always provides a 5-volt standby (5VSB) power so that the standby functions on the computer and certain peripherals are powered. ATX power supplies are turned on and off by a signal from the motherboard. They also provide a signal to the motherboard to indicate when the DC voltages are in spec, so that the computer is able to safely power up and boot. The most recent ATX PSU standard is version 3.0 as of mid-2022.

Function of power supply

The desktop computer power supply converts the alternating current (AC) from a wall socket of mains electricity to a low-voltage direct current (DC) to operate the motherboard, processor and peripheral devices. Several direct-current voltages are required, and they must be regulated with some accuracy to provide stable operation of the computer. A *power supply rail* or *voltage rail* refers to a single voltage provided by a PSU. Some PSUs can also supply a standby voltage, so that most of the computer system can be powered off after preparing for hibernation or shutdown, and powered back on by an event. Standby power allows a computer to be started remotely via wake-on-LAN and Wake-on-ring or locally via Keyboard Power ON (KBPO) if the motherboard supports it. This standby voltage may be generated by a small linear power supply inside the unit or a switching power supply, sharing some components with the main unit to save cost and energy.



Summary for the trainer related to the content

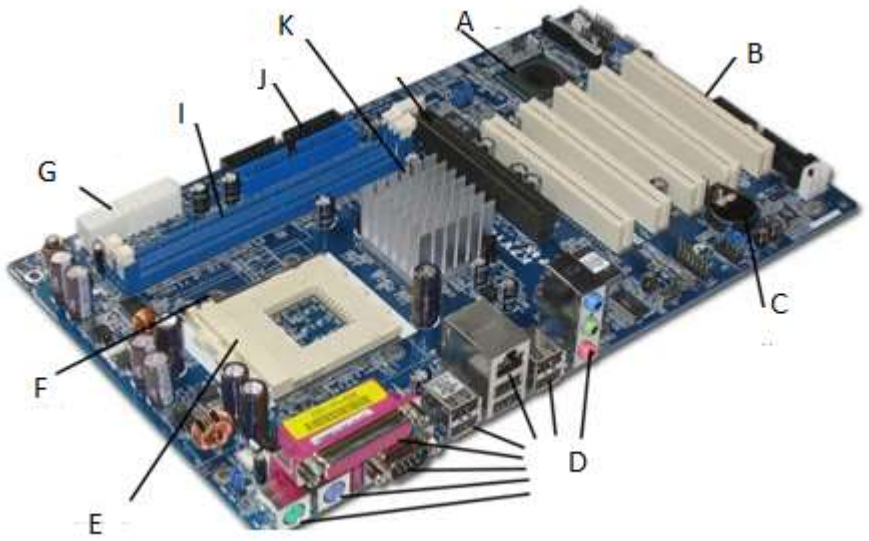
- ✓ Types of computer memory
- Primary memory: RAM, Cache Memory, ROM, PROM, EPROM, EEPROM
- Secondary memories: USB flash drives Floppy disks, Magnetic tape, Paper tape, Punched cards, Standalone RAM disks, Lomega Zip drives Flash memory
- ✓ Types of computer motherboard
  - AT motherboard
  - ATX motherboard
- ✓ Components of motherboard
  - Processor, System Buses, Expansion slots, Bridge controller

Theoretical learning Activity

- ✓ **Ask Trainees to brainstorm about types of computer memories within the group.**
- ✓ **Ask Trainees to brainstorm about computer motherboard within the group.**
- ✓ **Ask Trainees to discuss about computer power supply within the group**

Practical learning Activity

✓ **Trainees in pair identify different component of the computer motherboard as is represented from letter A up to K**



Points to Remember (Take home message)

Computer motherboard component:

- ✓ Processor
- ✓ System Buses
- ✓ Expansion slots
- ✓ Bridge controller

Types of computer motherboard:

- ✓ AT Motherboard
- ✓ ATX Motherboard

Description of Cable

- ✓ **Power cable**: A power cable is an electrical cable, an assembly of one or more electrical conductors, usually held together with an overall sheath.

- ✓ **Data cable**: A data cable is a cable that provides communication between devices.

Types of Data cable

VGA Cable : Video Graphics Array (VGA) connect one end to computer monitor, television (PC input port)

DVI Cable: Digital Visual Interface (DVI) is a video display interface developed by the Digital Display Working Group (DDWG). The digital interface is used to connect a video source, such as a video display controller, to a display device, such as a computer monitor. It was developed with the intention of creating an industry standard for the transfer of digital video content

- **HDMI Cable:** HDMI stands for High Definition Multimedia Interface and is the most frequently used HD signal for transferring both high definition audio and video over a single cable. Connect one end to computer monitor, television.

- **PS/2 Cable:** A Personal System/2 (PS/2) cable is a 6-pin connector used **to connect peripheral devices, usually a mouse or keyboard, with a computer**. Its name comes from the IBM series of personal computers, known as the Personal System/2.

- **Ethernet Cable:** Connect one end to router, network switch

- **USB Cable:** The term USB stands for "Universal Serial Bus". USB cable assemblies are some of the most popular cable types available, used mostly to connect computers to peripheral devices such as cameras, camcorders, printers, scanners, and more.

Content 3: Connect and disconnect the computer hardware

With computing, the term disconnect **when a user is either voluntarily or involuntarily cut off from a network**. While connect is the way a user can be connected to the network.

What is a network?

A network is a group of two or more devices that communicate with each other via a connection.

These devices could be desktop computers, laptops, mobile phones, tablets, or other digital appliances connected (wired or wirelessly) to other devices within a network.

Consider how your devices are connected. Connections can vary and could include:

Physical (wired) cables such as Ethernet, USB-C and HDMI.

Wireless signals such as Wi-Fi, Bluetooth, and Cellular data such as LTE/4G/5G.

Internal and external networks

An internal network has a defined set of users. Like your home or business, only certain family members, trusted friends or colleague's access inside your home with a spare key or information related to your business using a work ID. The spare key and work ID are similar to passphrases and multi-factor authentication; they act as the front door to unwanted access.

As part of your home or business network you could have many connected devices or accessories including; routers, keyboards, mice, printers, external storage devices, smart-home devices or wearable devices. Often you know and trust these devices.

An external network is open to all users and is usually managed by someone else (not you as the home user or business owner). Similar to using public transport, visiting your favourite coffee shop or the supermarket you do so at your own risk, you do not necessarily know and therefore trust everyone in that public space.

How to connect or disconnect a device

You can connect or disconnect from a network by:

- Inserting or removing the physical (wired) cables or accessories.
- Enabling or disabling connectivity through the settings on your device.

Connecting and disconnecting from a network with a physical cable

One of the easiest and most reliable ways to connect or disconnect a device from a network is to unplug the physical cables from your device. Three common connection types are Ethernet, HDMI and USB-C.

Note: For Apple products, in addition to the above, connection types may include Mini DisplayPort, Thunderbolt or Thunderbolt 3.

In the below example an Ethernet cable is used to demonstrate how to connect and disconnect a physical cable.

1. The Ethernet port, where the cable connects to, is likely to be; at the back of your desktop computer; on the side or back of your laptop; or the back of your router. If you cannot find an Ethernet port or cable check if it is connected to an accessory such as a docking station or USB Hub. If you still cannot find a cable on your desktop or laptop, your device may be using a wireless connection.
2. To disconnect, press down on the locking tab located on the bottom of cable and pull the plug towards you. Repeat this step until you have disconnected all devices. To connect,

press down on the locking tab located on the bottom of the cable and push into the Ethernet port.

Be aware, you could be connected in more than one way

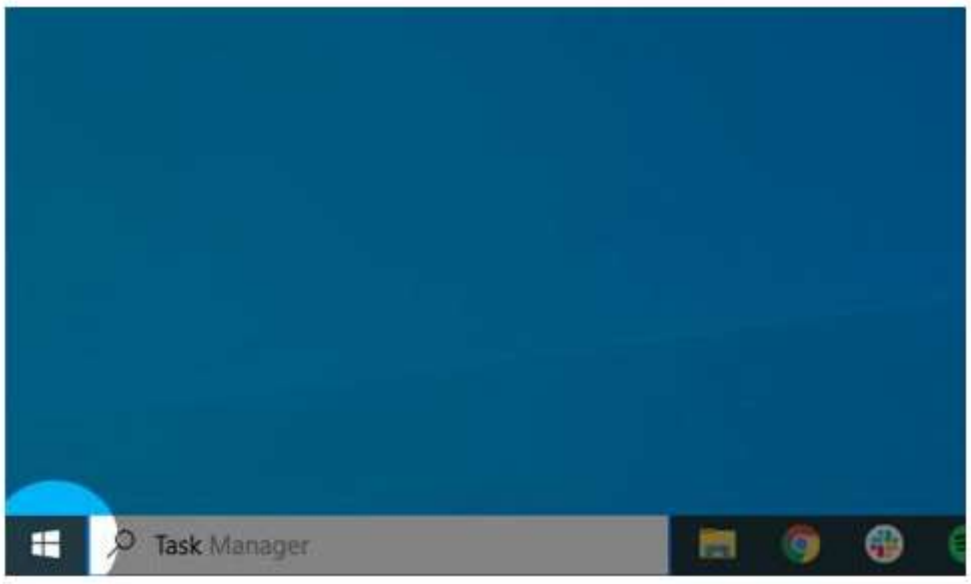
Connecting or disconnecting physical cables is a good first step in either sharing (if you are connecting to a network) or isolating (if you are disconnecting from a network) devices within an internal network. Although, it is not the only way, The next few steps of this guide, will explain how to connect and disconnect your device using settings for Wi-Fi, Bluetooth and accessories (e.g. external storage devices or printers).

If you are connected via a physical cable and have removed it, you may still need to disconnect your device from Wi-Fi, Bluetooth or other accessories.

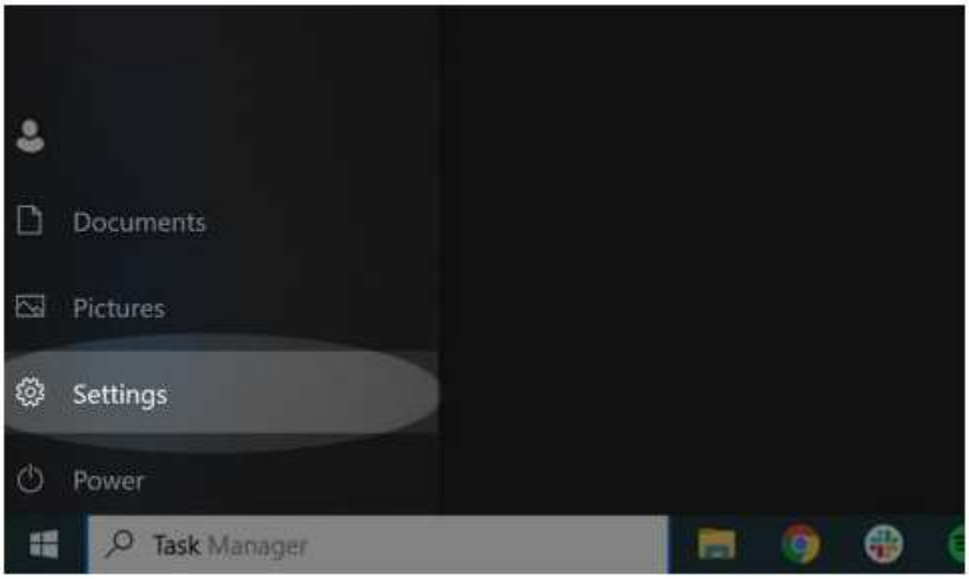
Steps of connecting and disconnecting computer hardware

If you are unable to unplug the physical cable or there is no cable, you can disconnect from the desktop. Check the bottom right corner, for the network icon to see if you are connected to a network.

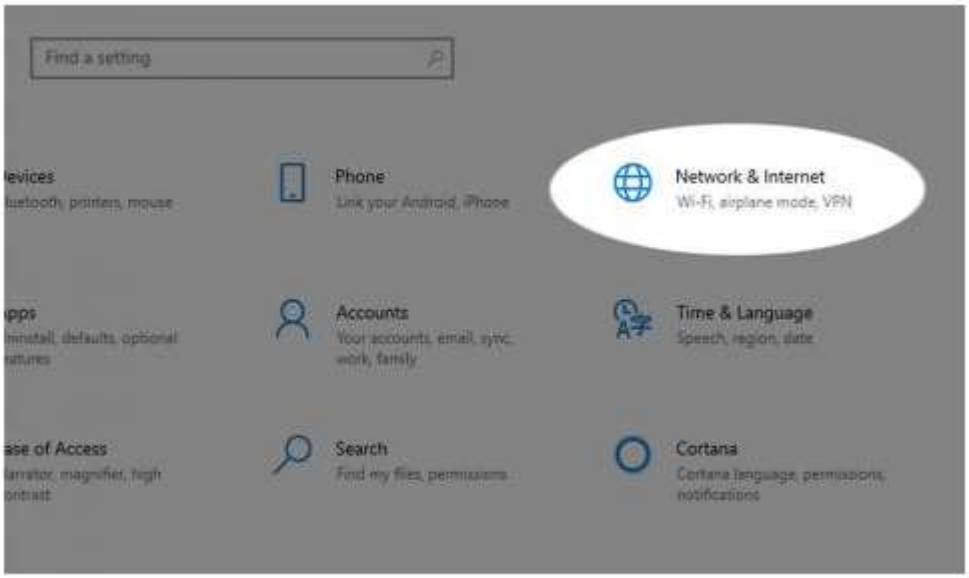
1. Click on the Start menu by clicking the Windows logo key in the bottom left corner of the desktop



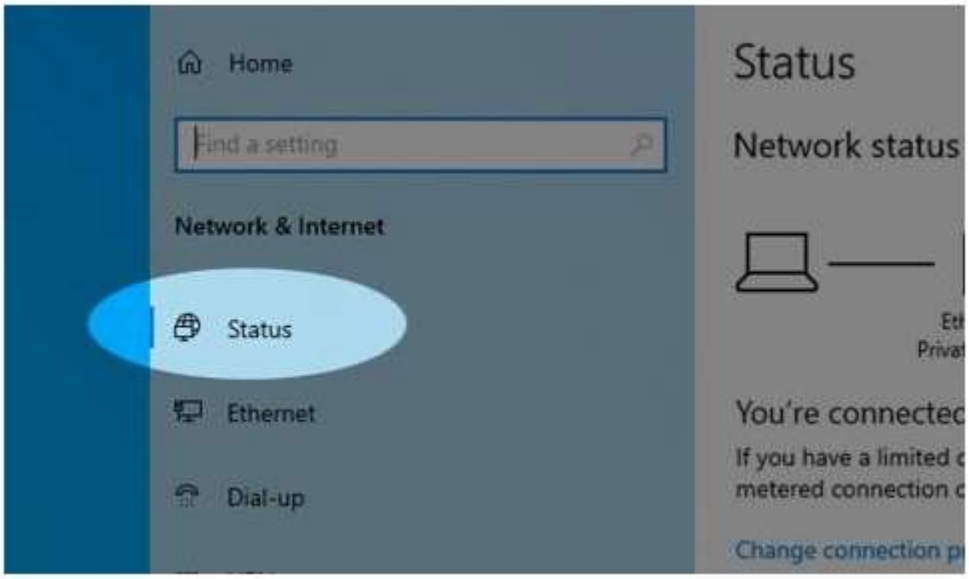
2. Click on the Settings Cog icon



3. From the Windows Settings window, click on Network & internet

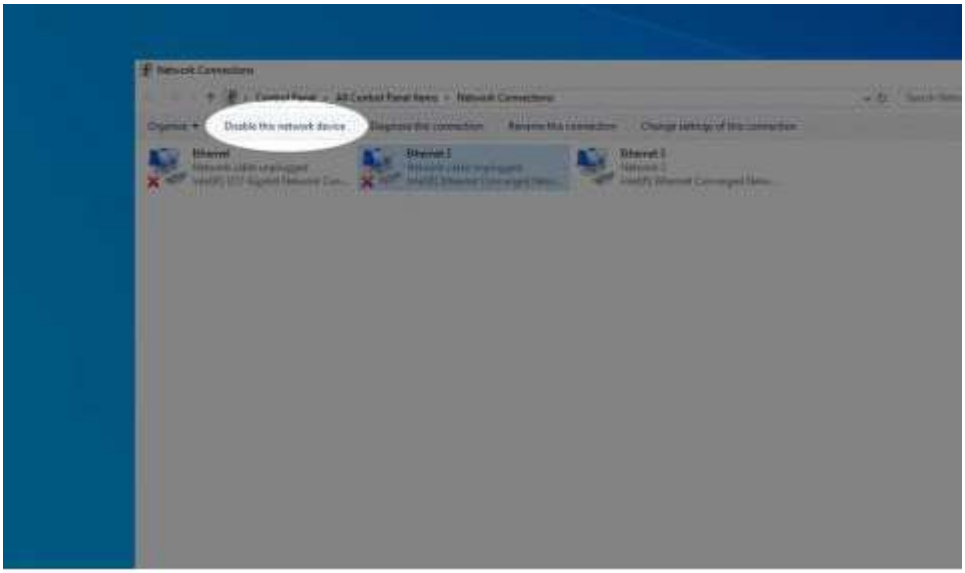


4. From the Network and internet menu on the left, click on Status.

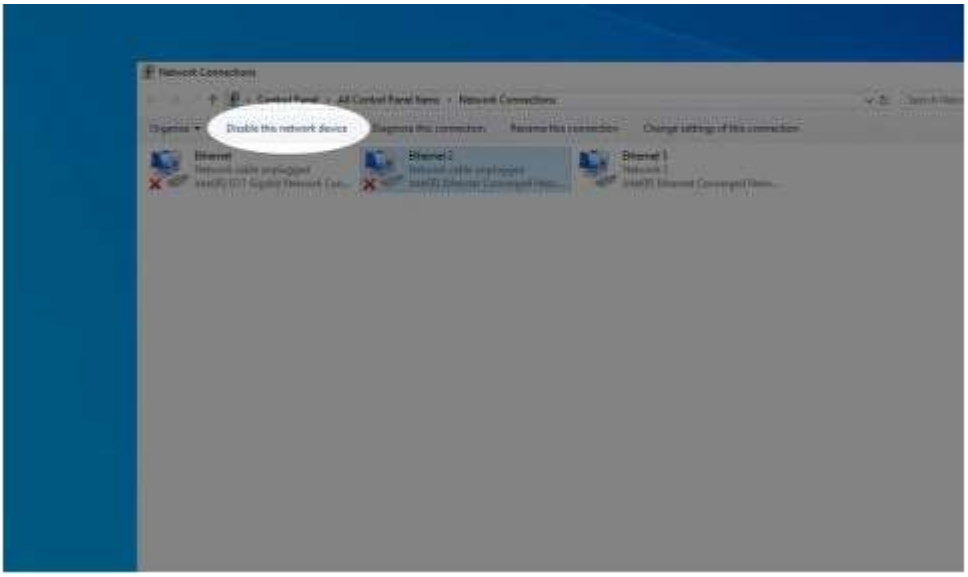


5. Under Change your network settings, click on Change adapter options.

6. Click on the network you want to disconnect from, then click on Disable this network device. Repeat this step until you have disconnected from all networks.



7. To connect, click on the network you want to connect to, then click Enable the network device.

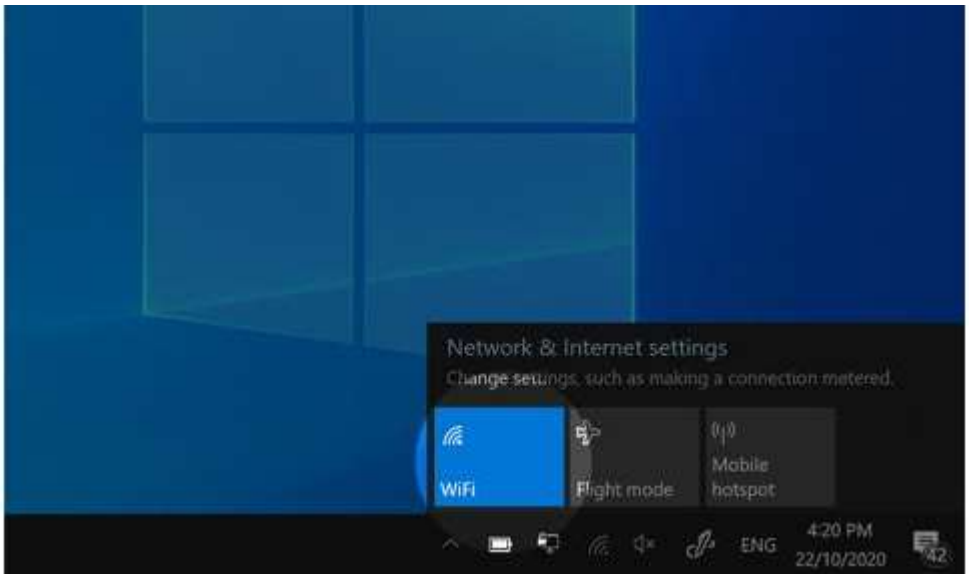


Wireless connection (Wi-Fi)

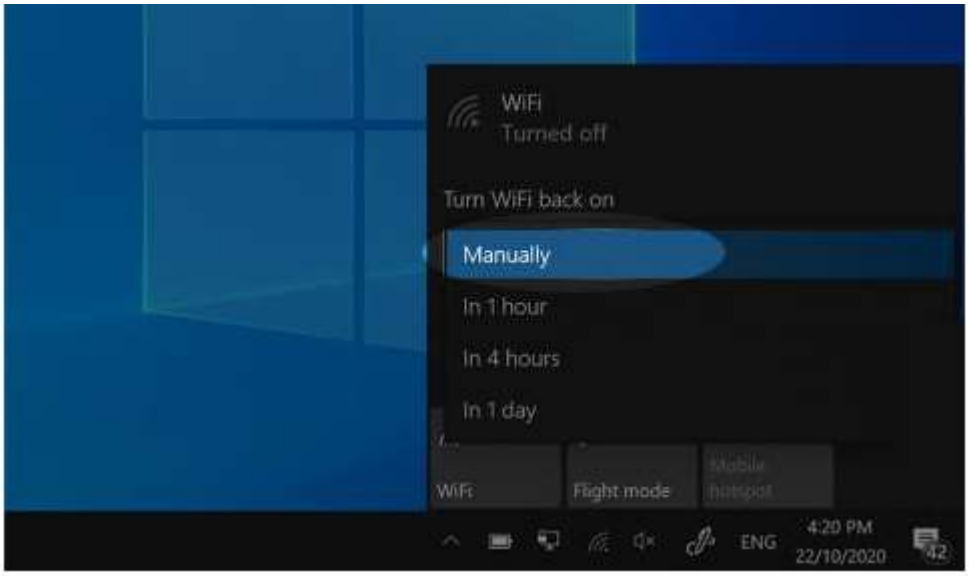
Check the bottom right corner, for the network icon to see if you are connected to a Wi-Fi network. Note: Some devices have a physical switch. If you do, turn off your Wi-Fi using the switch. If you are unsure if this includes your device, seek guidance from the manufacturer of the device.

1. Click on the Wi-Fi icon, in the bottom right corner

2. To disconnect, see if the Wi-Fi button on the bottom of the Network and Internet Settings menu is highlighted. If highlighted, you are connected to a Wi-Fi signal. To disconnect, click on this Wi-Fi button.

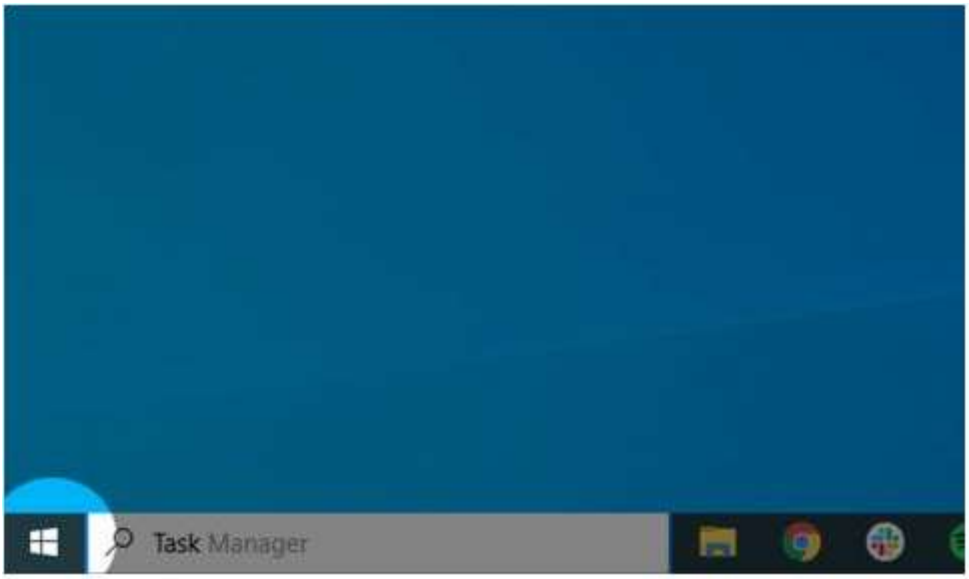


3. From the Turn Wi-Fi back on drop down menu, click on Manually. If the Wi-Fi button is greyed-out, you are disconnected. To connect, click on Wi-Fi at the bottom of the Network and Internet Settings menu. Your device will automatically attempt to connect to the most recently used Wi-Fi network. If your device is unable to connect automatically, select the Wi-Fi network you wish to connect to. If asked to “Enter the network security key”, put in the Wi-Fi password

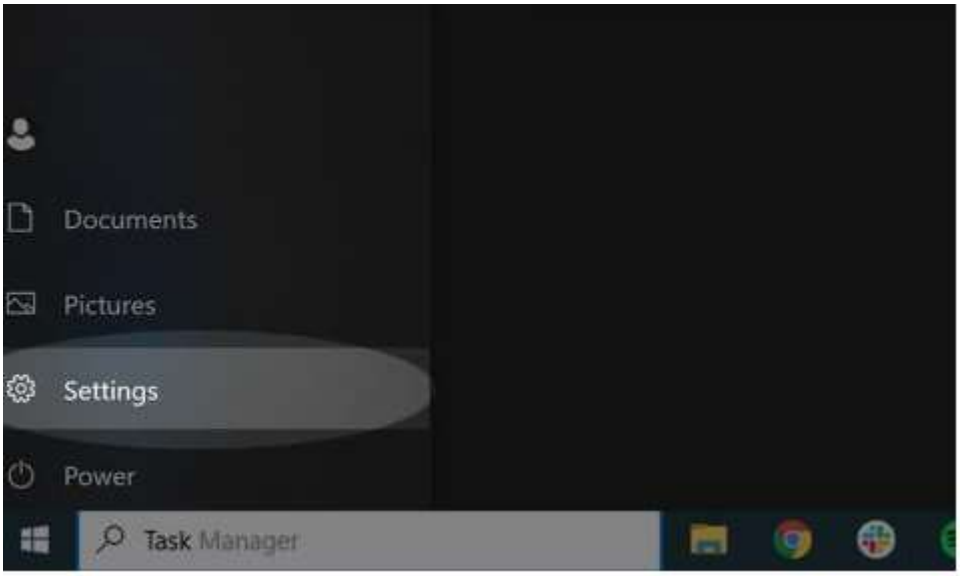


Wireless connection (Bluetooth)

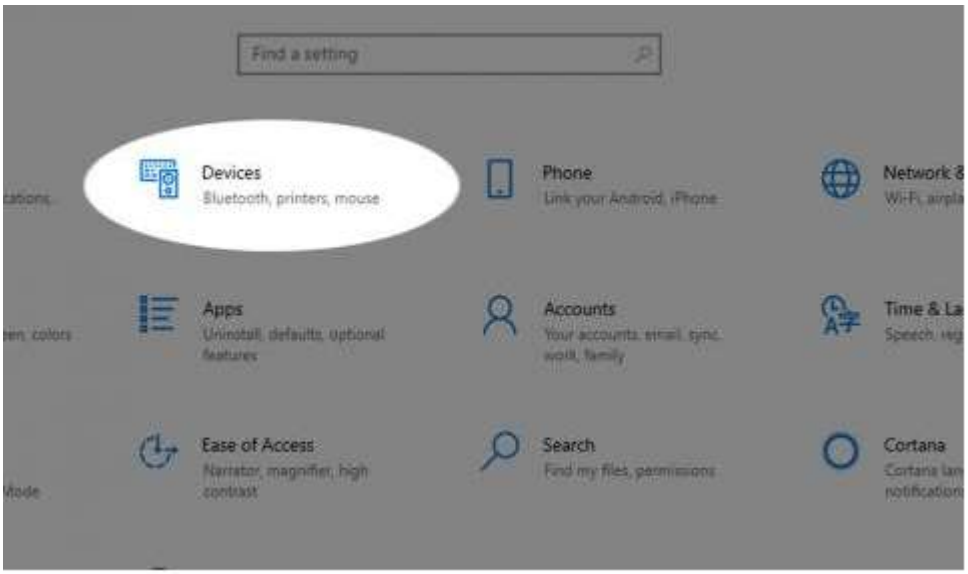
1. Navigate to the Start menu by clicking the Windows logo key in the bottom left corner of the desktop



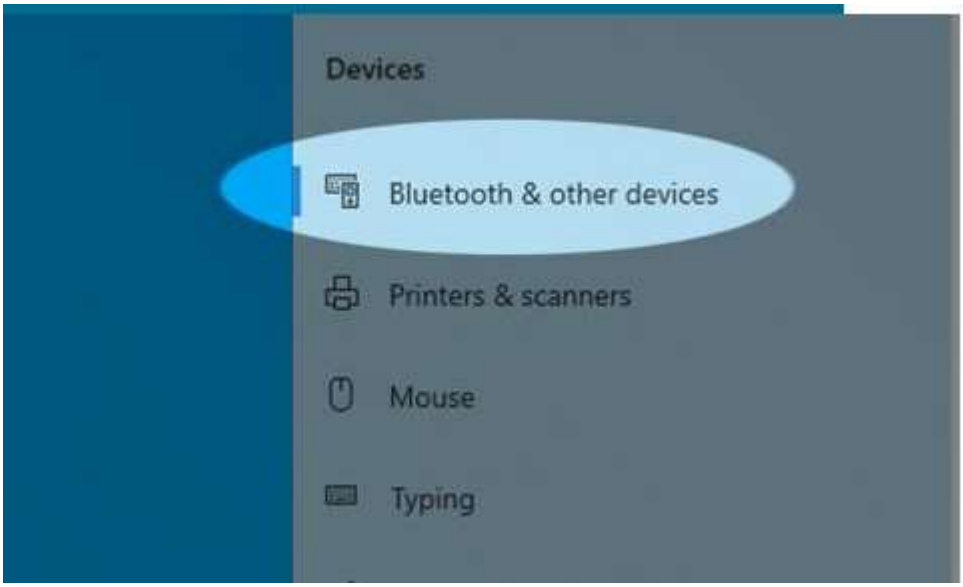
2. Click on the Settings Cog icon



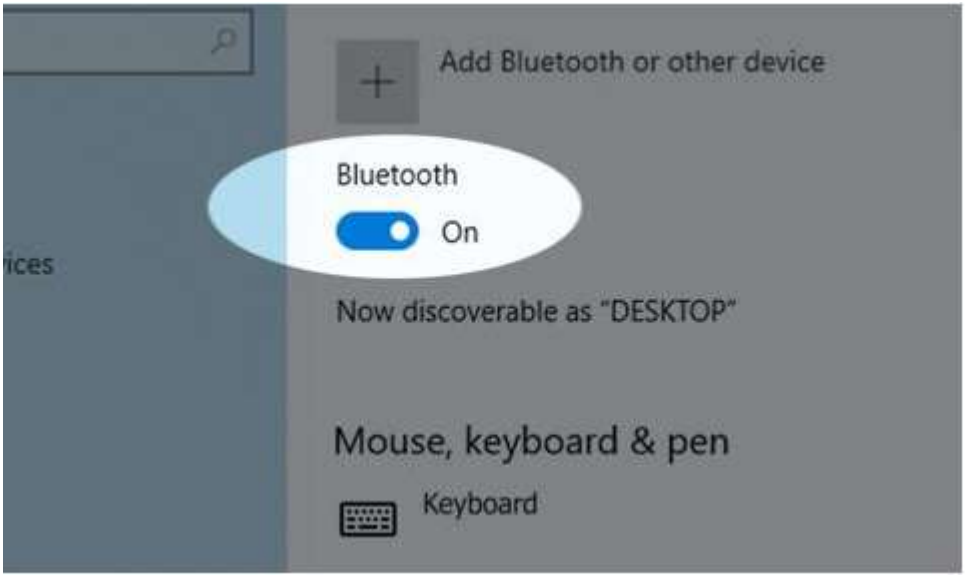
3. Click on **Devices**.



4. Click on Bluetooth & other devices in the menu on the left



5. Slide the Bluetooth toggle to Off. To connect slide the toggle to On.



External storage device

1. Click on the Start menu by clicking the Windows logo key in the bottom left corner of the desktop.
2. Click on the **Settings Cog** icon
3. From the Windows Settings window, click on Devices.
4. Click on the device you want to disconnect, e.g. printers or scanners or USB. In this instance, we will be removing a USB device.

5. Click on Remove device, then select Yes, to disconnect the external storage device

Theoretical learning Activity

✓ **Ask trainees to discuss about the steps of connecting and disconnecting computer hardware within the group.**

Practical learning Activity

✓ **Trainees in pair disconnect and connect computer hardware.**

Points to Remember (Take home message)

Connecting and disconnecting External storage device

1. Click on the Start menu by clicking the Windows logo key in the bottom left corner of the desktop.
2. Click on the **Settings Cog** icon
3. From the Windows Settings window, click on Devices.
4. Click on the device you want to disconnect, e.g. printers or scanners or USB. In this instance, we will be removing a USB device.

Content 4: Identification of external cables and connectors or ports

External cables

- VGA Cable

- DVI Cable

- Power Cable

- HDMI Cable

- USB Cable

- Serial Cable\

- Parallel Cable

Connectors or Ports

A port is the point at which a peripheral attaches to or communicates with a system unit (sometimes referred to as a jack) while a connector is any connector used within computers or to connect computers to networks, printers or other devices.

- VGA Port
- USB Port
- Serial Port
- HDMI Port
- DVI Port
- Parallel Port
- Microphone Jack
- Speaker Jack
- Ethernet Port (RJ-45 Connector)

Content 5: Computer disassembling process and verification of connected or disconnected devices

Disassembling process

- Open the case
- Disconnect and remove the power supply to the computer case
- Disconnect the components to the motherboard and remove the motherboard
- Disconnect internal drives and drives in external bays
- Uninstall adapter cards
- Uninstall and disconnect all internal cables
- Disconnect the side panels and
- Disconnect external cables to the computer

Assembling process

1. Open Case. Remove the back screws.
2. Mount Motherboard. Screw motherboard standoffs into the case.
3. Mount Processor (CPU).
4. Install CPU Cooler.
5. Install Power Supply (PSU).
6. Mount Memory (RAM).
7. Install Graphics Card.
8. Mount Storage Drives.

 Theoretical learning Activity

✓ **Ask learner to brainstorm about assembling and disassembling steps of computer hardware**

 Practical learning Activity

✓ **Trainees in pair perform the assembling and disassembling of computer hardware**

Learning out come 2.1 : formative assessment

Written assessment

1. Discuss about system memories of computer
2. Differentiate computer hardware from computer software
3. Give the difference between primary memory and seconndary memory with their examples.
4. Describe types of computer motherboard
5. Compare Northbridge and Southbridge of computer motherboard
6. Discuss about computer cables
7. State steps of disconnecting and connecting computer hardware.

Practical assessment

MJD Company needs to hire computer repair technician in fact it has computers that have been damaged, Some of them are not turning on others are running slowly and there are others which are missing operating system and drivers. As you are computer technician, you are requested to repair these computers.

✓ Task to be performed with performance checklist/quality product checklist

Checklist	Score	
	Yes	No
Indicator: Proper description of the computer internal parts		
✓ System memories		
✓ the motherboard and its components		
✓ buses and cables		
Indicator: Power supply types are well described		
✓ AT power supply		
✓ ATX power supply		
Indicator: the computer hardware are well connected /disconnect (knowledge & skills)		
✓ External cables		
✓ Connectors or ports		
✓ Devices are well verified		
Observation		

Learning outcome 2.2 Blow and clean the computer hardware

Duration: 2hrs

 Learning outcome 2.2 objectives:

By the end of the learning outcome, the trainees will be able to:

1. Clean properly the Case and Internal Components process

2. Clean perfectly keyboard and mouse

 **Resources**

Equipment	**Tools**	**Materials**
Power supply	Whiteboard	Marker Duster Text books
Computer	Internet	Lecture notes Papers
Projector	PC Repair Tool Kit	Clean solution
Blower	Soft cloth	
	Brushes	

 **Advance preparation:**

Availability of desk top computers

Safety and precaution measures are well applied

Availability of electricity

Content 1: Clean the Case and Internal Components process

- **Remove the dust from fan intakes**: Clean the fan intakes and the exhaust using short puffs of canned air. The intakes are the grid-like structures that filter the air that comes into the fan. Spray short puffs of canned air over the fan blades. To loosen clumps of dirt, hold your canned air at multiple angles rather than using long bursts of air.
- **Remove dust from power supply:** To remove dust from the inside of a computer, use a combination of compressed air, a low-air-flow ESD vacuum cleaner, and a small lint-free cloth. The air pressure from some cleaning devices can generate static and damage or loosen components and jumpers.
- **Remove dust from components inside the computer:** Blow out the inside of the drive with compressed air to remove dust. Ensure the disk spins freely. Ensure cables are firmly connected. Clean the read and write heads with a cotton swab.

 Theoretical learning Activity

- ✓ **Ask learner to brainstorm about cleaning computer hardware within the group**

 Practical learning Activity

- ✓ **Trainees in pair clean the computer hardware.**

Content 2: Clean mouse and keyboard

Hold the keyboard upside down and tap it gently to remove loose dirt and other debris. Use a can of compressed air (available from photo and computer stores) to blow dust and debris from

the surface and from between the keys. As an alternative, gently vacuum the top of your keyboard using a dusting brush.

Steps to clean your keyboard and mouse

✓ **Disconnect your mouse and keyboard:** First, if your keyboard is plugged into the computer, unplug it. If it's wireless, switch it off. For keyboards that are part of a laptop, shut the device down and disconnect the power chord. If the battery is accessible and easy to remove, do that as well. The same goes for your mouse. Disconnect it from your computer and take out the batteries. If it's wireless, simply flip it over, turn it off and take out the batteries. It's important to have all power sources either shut off or disconnected while you clean your components. This will prevent electrical shorts and other potentially damaging results.

✓ **Start spraying and swabbing:** Grime build-up and loose dust particles go deeper than just the top of the keys or the scroll wheel. You need something that can easily fit into those tight corners and small crevices. This is where a can of compressed air comes in. Try Blow-Off, which is a compressed air duster for keyboards. Blowing compressed air into the keyboard will help remove crumbs, dust and anything else that may have nestled itself between or under the keys.

After getting under the keys, it's time to go topside. Lightly wipe the tops of the keys and the palm rest with a microfiber cloth or a disinfectant wipe.

Similarly, your mouse can contain hidden particles of dust and grime under its scrolling wheel. You can turn the mouse upside down and continuously roll the wheel to loosen anything that may be stuck inside. Same drill wipe it down with disinfect or a microfiber cloth for the best results.

Avoid wipes that may contain high bleach content, as they can permanently damage the finish on your keyboard or mouse. If fact, you can do away with chemical-filled wipes altogether. Instead, try this cleaning gel dust cleaner for keyboards. This simple and convenient cleaning kit is great for home and office electronics such as PC keyboards, car vents, cameras, printers, phones, calculators, speakers, air conditioners, TVs and other appliances.

Make sure everything is dry

Before you plug everything back in again, be sure all components are dry. A little dampness can cause big problems and permanently ruin electronic devices once power is flowing through them.

It should only take about a minute for your mouse and keyboard to dry after cleaning, but if it seems to be taking a little longer, it's worth the wait. Never power up any device until it is completely dry.

 **Theoretical learning Activity**

✓ **Ask trainees to discuss about the cleaning of keyboard and mouse of computer.**

 **Practical learning Activity**

✓ **Trainees in pair clean computer keyboard and mouse**

✓ Task to be performed with performance checklist/quality product checklist

Checklist	Score	
	Yes	No
Indicator: case and its internal components are well cleaned		
✓ Fan intake		
✓ Power supply		
✓ Keyboard and mouse		
✓ Computer internal components		
Observation		

 Points to Remember (Take home message)

Three steps of cleaning keyboard and mouse

Disconnect your mouse and keyboard

Start spraying and swabbing

Make sure everything is dry

Learning outcome 2.3 Diagnose the computer hardware

Duration: 10hrs

Learning outcome 2.3 objectives:

By the end of the learning outcome, the trainees will be able to:

1. Identify the Diagnostic Tools of computer hardware

2. Diagnostic Process steps during repairing computer hardware

Resources

Equipment	**Tools**	**Materials**
Power supply	Bench work	Marker Duster Text books
Computer	Whiteboard	Lecture notes Papers
Projector	Internet	Clean solution
Blower	PC Repair Tool Kit	
Loopback adapter	Computer diagnostics repair kit	

Multimeter	Power supply tester Network tester	
Advance preparation: The availability of computer is necessary in order to apply and different diagnostic techniques		

CONTENT

Content 1: Identification of the Diagnostic Tools

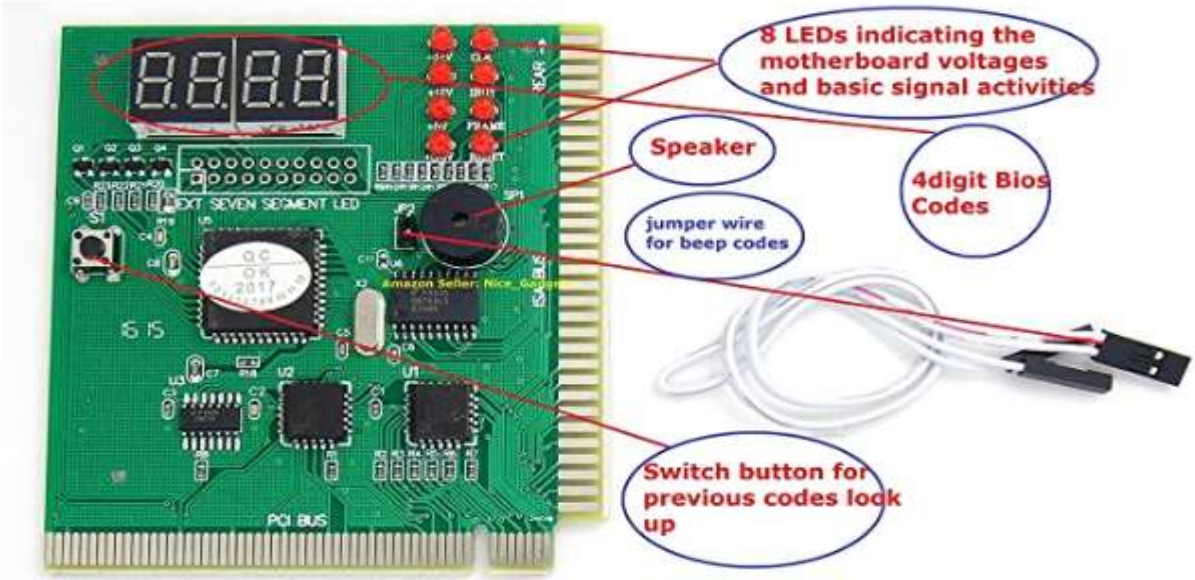
- **Multimeter:** A digital multimeter is a test tool used **to measure two or more electrical values** principally voltage (volts), current (amps) and resistance (ohms). It is a standard diagnostic tool for technicians in the electrical/electronic industries.

- **Loopback adapter:** A Loopback adapter is a network interface that can be used to route network traffic from one application to another on the same computer, but does NOT send that traffic to any other device on the network.

- **Network tester:**

- **Motherboard Power Diagnostic Analyzer**: **Pass Mark PerformanceTest** allows you to objectively benchmark a PC using different speed tests, and compare the results to other computers. Speccy gives you detailed statistics on every piece of hardware in your computer, including CPU, motherboard, RAM, graphics cards, hard disks, optical drives, and audio support.

- **Computer diagnostics repair kit**



- Power supply tester

Theoretical learning Activity

- ✓ **Ask trainees to brainstorm about diagnostic tool within the group**

Practical learning Activity

- ✓ **Trainees in pair troubleshoot different parts of computer**

CONTENT

Content 2: Diagnostic Process steps

- Gathering information from the customer
- Verifying the obvious issues
- Error/fault identification
- Error/fault analysis

- Error/fault Assessment

Theoretical learning Activity

✓ **Ask trainees to discuss about diagnostic process steps within the group.**

Practical learning Activity

✓ **Trainees in pair perform diagnostic steps**

Learning outcome 2.3: formative assessment

Written assessment

1. Discuss different steps of cleaning computer hardware
2. Elaborate materials, tools and equipment used to clean computer hardware

Practical assessment

✓ MJD Company needs to maintain its computers, as you are the technician of the company you requested to maintain them and clean well all the hardware of the machines maintained.

Task to be performed with performance checklist/quality product checklist

Checklist	Score	
	Yes	No
Indicator: diagnostic tools are well identified		
✓ Multimeter		
✓ Network tester		
✓ Motherboard power diagnostics		
✓ Computer diagnostics repair kit		
✓ Power supply tester		
Indicator: Diagnostic process are well applied		
✓ Information gathered		
✓ Obvious issues are verified		
✓ Fault identification		
✓ Errors and faults analysis		
✓ Errors and faults are assessed		
Observation		

Learning outcome 2.4 Fix the computer hardware faults

Duration: 10hrs

Learning outcome 2.4 objectives:

By the end of the learning outcome, the trainees will be able to:

1. Apply Faults rectification techniques
2. Solve perfectly the present computer hardware fault

Resources

Equipment	Tools	Materials
		Marker

Power supply Computer Projector Blower Loopback adapter Multimeter	Bench work Whiteboard Internet PC Repair Tool Kit Computer diagnostics repair kit Power supply tester Network tester	Duster Text books Lecture notes Papers Clean solution
Advance preparation: Availability of electricity Availability of repairing tools, materials and equipment Prepare the working plave		

Content 1: Faults rectification techniques

- **Desoldering and Soldering faulty components**: Desoldering is the process of removing solder from a connection to allow for component changes or repairs. Soldering is the process of creating a permanent electrical connection between two or more components by melting and flowing solder to make the joint. Desoldering methods include heat, vacuum, wick, and braid. Understanding how each tool works will help you choose the best method for specific applications. Heat is the most common desoldering method and can be effective when removing one component at a time. Although many tools exist that use heat as the primary source of desoldering, using a soldering gun with a clean tip works best because it will not leave excess solder on the circuit board.

  However, solder can quickly build up on a hot tip and transfer to sensitive components before removing the heat source. To avoid this problem, always give the iron enough time to clean off the old solder with a fresh coating of rosin before use.

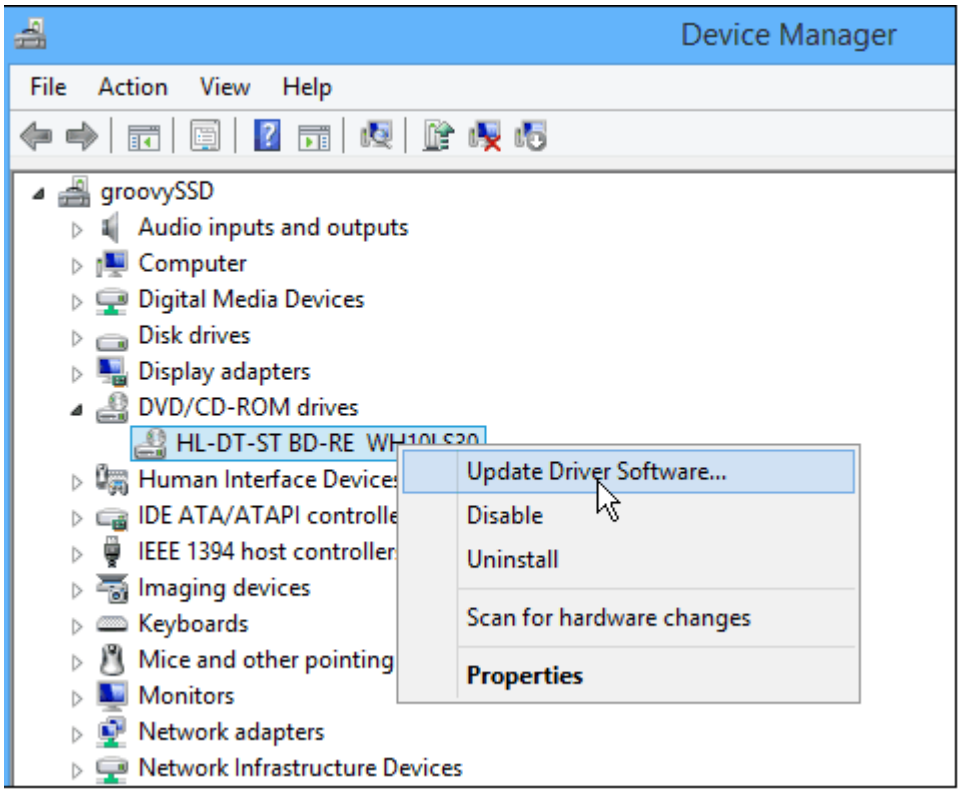
- **Replacement of defective hardware (components)**: The removal of outdated or defective hardware, software, or equipment for a more productive solution
- **Removing the short circuit**: In electrical devices, short circuits are usually caused by a breakdown in a wire's insulation or when another conductor is introduced and causes the electricity to flow in an unintended way.

- **Removing the open circuit**: An open circuit is an electric circuit that does not allow current to pass. In a circuit, current can only flow if it finds a continuous path—this is referred to as a “closed circuit.” You have an open circuit if there is a break anywhere in the circuit, and current cannot flow.
- Trying quick solutions first:
- Update the hardware driver: Hardware driver is a group of files that enable one or more hardware devices to communicate with the computer's operating system. Without drivers, the computer could not send and receive data correctly to hardware devices, such as a printer.

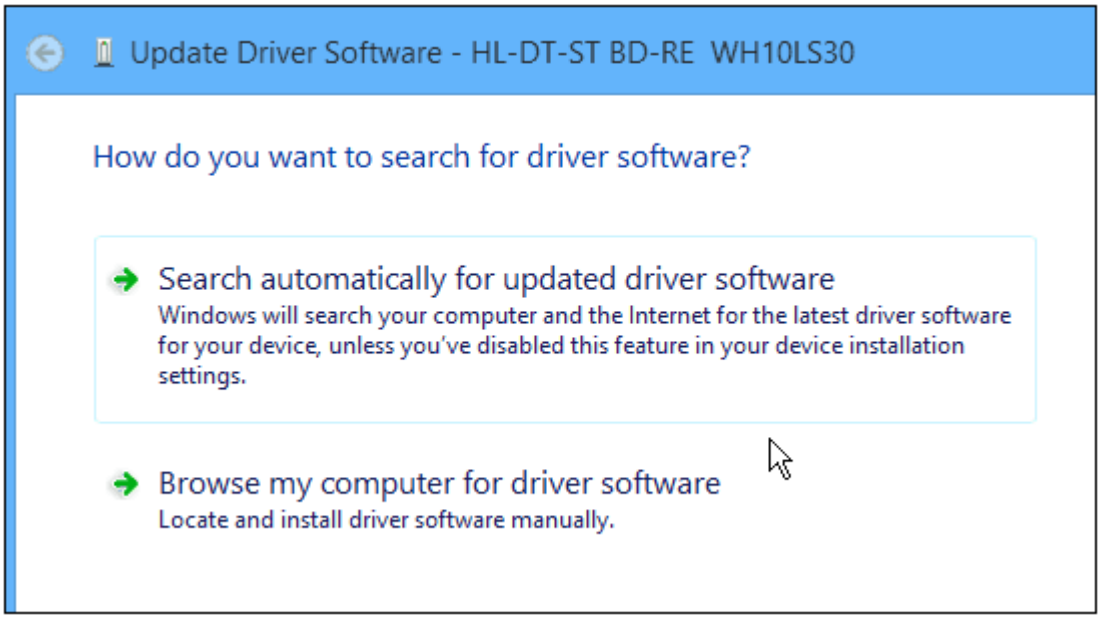
Steps of updating computer hardware driver

If a hardware device isn’t recognized by Windows in Device Manager or isn’t working properly or at all, you’ll want to get a driver or update it. Unrecognized drivers usually happens when you install a clean version of Windows.

You might first want to try the Windows way of doing it. Open Device Manager, right-click the hardware device that isn't recognized or needs an update, and select Update Driver Software.



Then follow the wizard and Windows will try to find an updated driver.



In the end, though, if everything is working fine on your computer, you can probably go without updating anything.

 Summary for the trainer related to the content

- ✓ Fault rectifying techniques
  - Desoldering and Soldering faulty components
  - Replacement of defective hardware (components).
  - Removing the short circuit
  - Removing the open circuit
  - Trying quick solutions first.
  - Update the hardware driver

 **Theoretical learning Activity**

- ✓ **Ask trainees to brainstorm about Rectifying fault techniques within the group.**

 Practical learning Activity

- ✓ **Trainees in pair applyrectifying fault techniques**

 Points to Remember (Take home message)

Steps of updating computer hardware

Step 1: Determine whether the device driver is found in Device Manager. Click Start.

Step 2: Uninstall and reinstall the device drivers.

Step 3: Use Windows Update to find a device driver


Learning out come 2.4 : formative assessment

Written assessment

Lo2.4 Assessment

1. Discuss steps of installing operating system in computer
2. Explain steps of updating computer hardware
3. Describe faults rectification techniques

Practical assessment

MJD Company needs to hire computer repair technician in fact it has computers that have been damaged, Some of them are not turning on others are running slowly and there are others which are missing operating system and drivers. As you are computer technician, you are requested to repair these computers.

- ✓ Task to be performed with performance checklist/quality product checklist

Checklist	Score	
	Yes	No
Indicator: faults rectification techniques are applied		
✓ Desoldering and Soldering faulty components		
✓ Replacement of defective hardware (components).		
✓ Removing the short circuit		
✓ Removing the open circuit		
✓ Trying quick solutions first.		
✓ Update the hardware driver		
Observation		

Learning outcome 2.5 Assemble the computer hardware

Duration: 10hrs

Learning outcome 2.5 objectives:

By the end of the learning outcome, the trainees will be able to:

1. Disassemble correctly the computer hardware for lap top and desk top
2. Assemble correctly the computer hardware for lap top and desk top

Resources

Equipment	**Tools**	**Materials**
Power supply Computer Projector Blower Loopback adapter	Bench work Whiteboard Internet PC Repair Tool Kit Computer diagnostics repair kit	Marker Duster Text books Lecture notes Papers Clean solution

Multimeter	Power supply tester Network tester	
Advance preparation: Prepare computer desktop/lap top to be assembled or disassembled		

Content 1: Assemble the computer hardware

- ✓ **Prepare the computer case:** To remove the side panels and prepare the case is fairly simple. Look at the back of the case and you will see some screws holding the case's sides on. Be careful not to unscrew the power supply on accident. When removing the cover be careful of any wires that may get caught on case itself. Not to hard is it? Note that some tool free cases may actually have clips rather than screws and some of the better cases come with locks. Forcing the case open without the key could, of course, damage it.
- ✓ **Install the power supply:** The power supply is what facilitates the flow of power from an electrical source to the other components of the computer. Keep in mind that if your computer came pre-assembled, you don't need to install the power supply, though you may eventually need to replace it.

    - Find a power supply for your computer. The power supply that you buy depends on the computer's motherboard and housing size, meaning that you'll need to research your motherboard model to see which power supplies will fit.

- Assemble your tools. You'll need at least one screwdriver (typically a Phillips head) to open the CPU housing, which is usually the right-hand side of the CPU box when looking at the back of the box.
- Ground yourself. This will help prevent you from accidentally damaging the internal components of your computer with static electricity.
- Open the computer case. You should be looking at the computer's internals at this point.
- Lay the computer case on its side, with the exposed side facing up.

- Set the power supply's voltage switch. If there's a voltage switch on the power supply, switch it to the 110v or 115v setting. This will ensure that your power supply provides ample power without damaging the components to which it's connected.

- Find the power supply's intended location. Power supply units (PSUs) typically sit at the top of the case; this is why the computer's power cable usually plugs into the top-back section of the case.

- Insert the power supply. The power supply should have a distinct "back" with plugs and a fan, as well as a "bottom" with a fan on it. The "back" should face the back of the case, while the "bottom" should face the internal part of the case.

- Screw the power supply into place. With the "back" of the power supply unit pressed against the back of the case, insert the included screws to lock the power supply into place.

- Attach the power supply to the motherboard. Find the main power cable on the power supply (usually the one with the largest plug) and attach it to the long, rectangular port on the motherboard, then attach the secondary power cable to the motherboard.

- Connect the power supply to other computer components. Using the smaller cables, connect the power supply to your computer's hard drive, CD drive, and graphics card. If you have other components in your case (e.g., a lighting system), you may need to plug these in as well

- Close and plug back in your PC. Place the cover back on the PC, then stand it up and plug it back into the wall and your monitor.

- Turn on your computer. If everything is connected and powered properly, the fan on the power supply should turn on and your computer will boot like usual. If you hear a beep and nothing happens, then something inside is not connected correctly, or the power supply is not providing enough power to your components

✓ **Install the motherboard**:

- Prepare your Tools.
- Unpack the Board.
- Measure where the Motherboard goes.
- Screw in the Standoffs.
- Remove Unnecessary Bits.
- Install I/O Shield.
- Slide the Motherboard into Place.
- Screw the Motherboard

✓ **Attach the components on the motherboard**

- Install CPU.
- Installing CPU Fan.
- Install RAM.
- Install SATA devices.
- Install Expansion cards.
- Install system panel connector.
- Install ATX power connector.

- ✓ **Connecting input/output devices**: Input/output devices are usually called I/O devices. They are directly connected to an electronic module inside the systems unit called a device controller.

- ✓ **Install adapter cards:**

    - Shut down the computer.
    - Open the computer.
    - Remove the PC card slot cover.
    - Insert the new PCI card.
    - Fasten the PCI card to the case with the screw in the slot cover.
    - Carefully attach any internal or external cables between the PCI card and the hardware peripherals

- ✓ **Connect all internal cables:** Connect one end of the cable to the monitor port on the back of the computer case and the other end to the monitor. Many computer cables will only fit a specific way. If the cable doesn't fit, don't force it or you might damage the connectors. Make sure the plug aligns with the port, then connect it.
- ✓ **Boot the computer for the first time:** The first time you boot your new PC (and yes, you'll get there), you'll land on the BIOS screen. From there, navigate to your system boot options, then set your PC to boot from the USB stick. Once you boot from the USB drive, the Windows installation wizard will take care of the rest.
- ✓ **Configure BIOS:** BIOS identifies, configures, tests and connects computer hardware to the OS immediately after a computer is turned on. The combination of these steps is called the boot process.

  The BIOS Setup Utility contains both read-only information and settings that can be customized. Use this procedure to access the BIOS Setup Utility and customize settings.

    - Enter the BIOS Setup Utility by pressing the F2 key while the system is performing the power-on self-test (POST)
    - Use the following keyboard keys to navigate the BIOS Setup Utility:
      Use the left and right arrow keys to select the main menu screens.

Use the up and down arrows, on the keyboard, to select an item within a screen.

- Navigate to the item to be modified: Fields that can be configured or that provide access to a sublevel appear highlighted. All other fields are read only.
- Press Enter to select the item: A sublevel or a dialog box with the available option fields appears.
- Use the up or down arrow keys or the + or – keys to change a field.
- When you are finished customizing BIOS settings, navigate to the Exit screen
- Select one of the exit options and press Enter.

 **Theoretical learning Activity**

- ✓ **Ask trainees to brainstorm about assembling process of computer hardware within the group.**

 **Practical learning Activity**

- ✓ **Trainees in pair assemble and disassemble computer hardware**

 Points to Remember (Take home message)

Assemble the computer hardware: for Laptop and Desktop

1. Prepare the computer case
2. Install the power supply
3. Install the motherboard
4. Attach the components on the motherboard
5. Install adapter cards
6. Connect all internal cables
7. Boot the computer for the first time
8. Configure BIOS

Learning out come 2.5 : formative assessment

Written assessment

- ✓ Discuss about assembling and disassembling process of computer

Practical assessment

MJD Company needs to hire computer repair technician in fact it has computers that are not assembled, and you request to assemble them.

- ✓ Task to be performed with performance checklist/quality product checklist

Checklist	Score	
	Yes	No
Indicator: hardware assembling processes are applied		
✓ User manual instructions are respected		
✓ Prepare the computer case		
✓ Install the power supply		
✓ Install the motherboard		
✓ Attach the components on the motherboard		
✓ Install adapter cards		
✓ Connect all internal cables		
✓ Boot the computer for the first time		
✓ Configure BIOS		
Observation		

Learning outcome 2.6 Assemble the computer hardware

Duration: 10hrs

Learning outcome 2.6 objectives:

By the end of the learning outcome, the trainees will be able to:

To describe Functionality Testing of computer hardware

Test computer hardware parts

Resources

Equipment	**Tools**	**Materials**
Power supply Computer Projector Blower Loopback adapter Multimeter	Bench work Whiteboard Internet PC Repair Tool Kit Computer diagnostics repair kit Power supply tester Network tester	Marker Duster Text books Lecture notes Papers Clean solution

Advance preparation:

- Learner should remember how to connect and disconnect different computer hardware

CONTENT

Content 1: Functionality Testing

- ✓ **POST (Power on Self Testing):** The POST (power on self-test) is a set of procedures that a computer runs through each time it is turned on. It ensures that all of the system's hardware is working properly before trying to load the operating system. If the computer does not pass POST, it will not boot.
- ✓ **Power supply testing:**
  - Shut off your PSU.
  - Unplug all cables from the PSU except for the main AC cable and the 24-pin cable.
  - Locate pin 4 and pin 5 on your 24-pin cable.
  - Bend your paper clip so the ends can be inserted into pin 4 and pin 5.
  - Turn on the PSU.
  - See if the PSU fan turns
- ✓ **Keyboard / mouse testing:**
  - Click "Start." Video of the Day.
  - Click "Control Panel."
  - Click "System."
  - Click "Open Device Manager."
  - Right-click on the listing for your computer's keyboard. Select the "Scan for Hardware Changes" option from the menu. The Device Manager will now test your computer's keyboard
- ✓ **Ports testing**: A port test goes a long way to monitor the status of various ports of devices on individual computers and networks. It is used by network administrators

to check for open ports on networked computers and other devices on the network.

- ✓ **Beeps decoding:** The computer POST (power-on self-test) checks a computer's internal hardware for compatibility and connection before starting the remainder of the boot process. If the computer passes the POST, the computer may give a single beep (some computers may beep twice) as it starts and continues to boot. However, if the computer fails the POST, the computer may generate a beep code telling the user the source of the problem.

The most common causes of POST failures are problems with the following components.

- BIOS ROM
- CPU (processor)
- Motherboard
- RAM (memory)
- Video card

 **Theoretical learning Activity**

- ✓ **Ask trainees to brainstorm about functionality test of computer hardware**

 **Practical learning Activity**

- ✓ **Trainees in pair perform functionality test of computer hardware.**

 Points to Remember (Take home message)

The most common causes of POST failures are problems with the following components.

- BIOS ROM
- CPU (processor)
- Motherboard
- RAM (memory)
- Video card

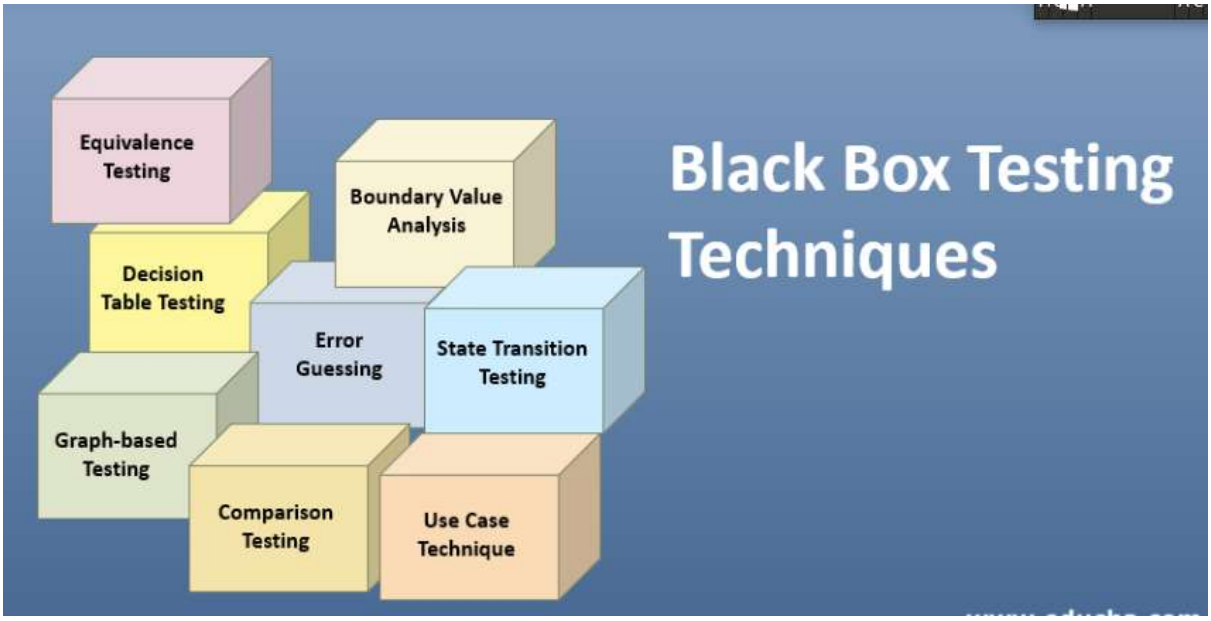
Content 2: Hardware testing Methods and techniques

Hardware testing Methods andTechniques

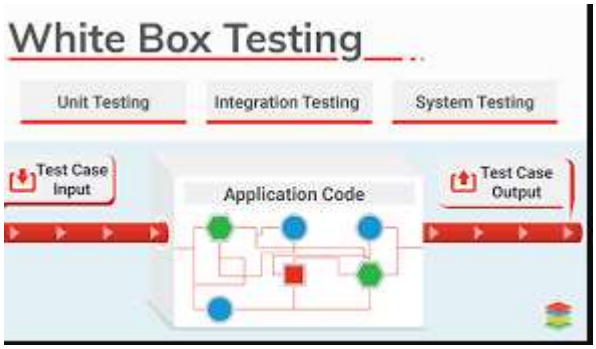
- **Comparison Testing**: When comparing models from different computer brands, the key specs to compare are the processor, memory, and storage. These should be the same, or close to the same for each model before you look at the price. When comparing storage, size isn't the only factor to consider.
- **Model-based testing:** Model-based Testing is an approach to design possible test cases in a platform- independent manner from which platform-specific test cases are derived automatically.

Testing techniques:

- **Black box testing:** Black box testing involves testing a system with no prior knowledge of its internal workings. A tester provides an input, and observes the output generated by the system under test.



- **White box testing:** White box testing is an approach that allows testers to inspect and verify the inner workings of a software system—its code, infrastructure, and integrations with external systems.



Theoretical learning Activity

- ✓ **Ask trainees to brainstorm about testing testing methods and techniques of computer hardware within the group.**

Practical learning Activity

- ✓ **Trainees in pair perform testing techniques of computer hardware.**

CONTENT

Content 3: To be familiar with basic computer copyright laws and security issues

A Copyright is a protection for any published work that helps to prevent that work from being used without prior authorization. A Copyright may be indicated by the word "Copyright," or a C surrounded by a circle (©).

Six copy right laws

- The right to distribute copies of the work to the public.
- The right to publicly perform the copyrighted work.
- The right to publicly display the copyrighted work
- (sound recording only)
- The right to digitally transmit to publicly perform the
- Copyrighted work.

 **Theoretical learning Activity**

- ✓ **Ask trainees to brainstorm about copyright laws and security within the group.** (

 Practical learning Activity

- ✓ **Trainees identify different copy right laws.**

 Learning out come 2.6: formative assessment

Written assessment

1. What are the most common causes of POST failures?
2. Discuss six (6) computer copy right law.
3. Describe computer hardware testing methods.

Practical assessment

- MJD company assign the following task to the technician,
  - To Perform computer hardware testing of the office

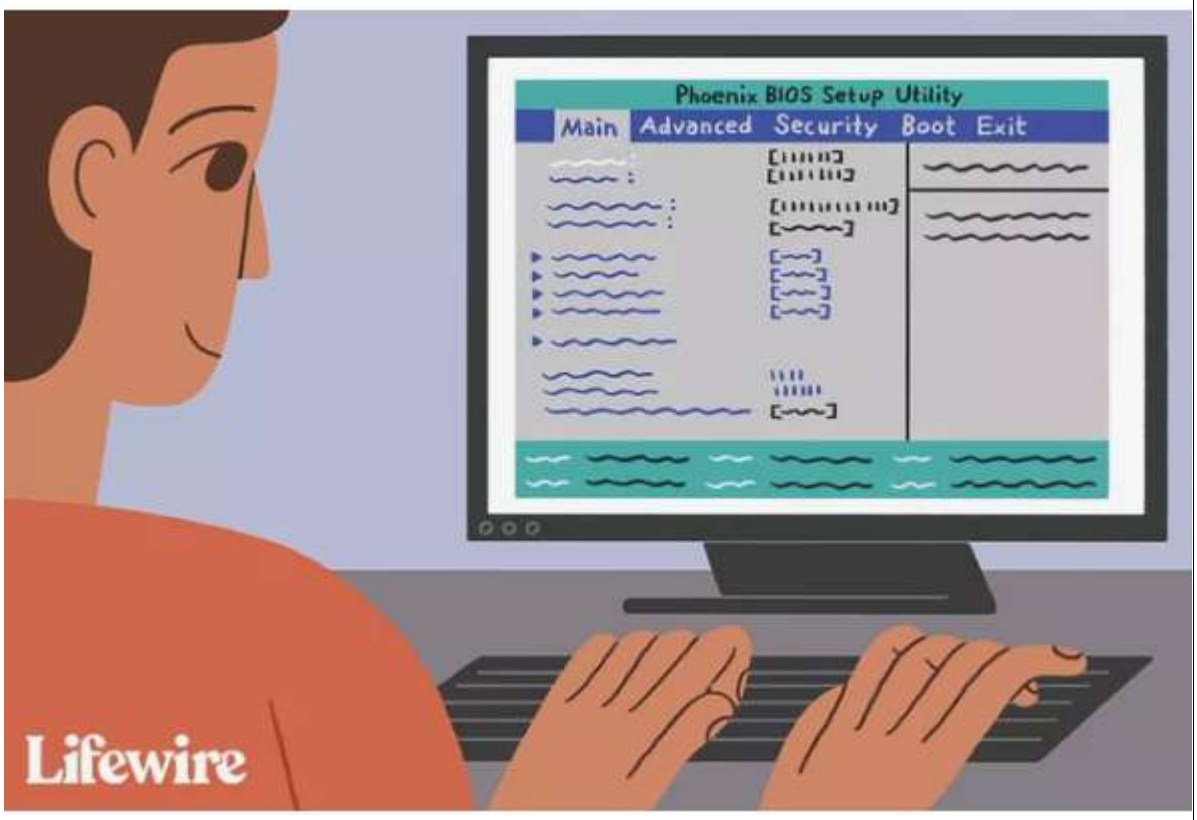
  You are assigned to perform the given task

✓ Task to be performed with performance checklist/quality product checklist

Checklist	Score	
	Yes	No
Indicator: Functionality Testing is performed		
✓ POST (Power On Self Testing)		
✓ Power supply testing		
✓ Keyboard / mouse testing		
✓ Ports testing		
✓ Beeps decoding		
Indicator: Hardware testing Methods are applied		
✓ Black box testing		
✓ White box testing		
Indicator: Hardware Testing Techniques are applied		
✓ Comparison Testing		
✓ Model-based testing		
Observation		

Learning Unit 3: INSTALL AND CONFIGURE COMPUTER SYSTEM

Picture/s reflecting the Learning unit 3



STRUCTURE OF LEARNING UNIT

Learning outcomes:

1. Identify system software
2. Install system software

3. Assure interoperability of computer hardware

Learning outcome 3.1 Identify system software

Duration: 10hrs

Learning outcome 3.1 objectives:

By the end of the learning outcome, the trainees will be able to:

1. Describe system software types
2. Differentiate software types

Resources

Equipment	**Tools**	**Materials**
Power supply Computer Projector	Whiteboard Internet	Marker Duster Text books Lecture notes Papers DVD/CD Software HHD Driver SSD Driver Power cable

Advance preparation:

Availability of internet

Availability of electricity

Content 1: Description of system software types

System software is a type of computer program that is designed to run a computer's hardware and application programs. If we think of the computer system as a layered model, the system software is the interface between the hardware and user applications.

The system software has three basic types of software:

Operating System: An operating system is the program that controls all the parts of a computer system, both the hardware and the software.

Role of operating system

Control hardware

Manage files and folders

Provide user interface

Manage applications

Example of operating systems

✓ Windows Xp, windows 7, windows 8, windows 10, Linux, Unix, windows server 2008, MacOS …etc

Device drivers: Device Driver in computing refers to a special kind of software program or a specific type of software application which controls a specific hardware device that

enables different hardware devices for communication with the computer's Operating System.

Types of Device Drivers

BIOS: BIOS (basic input/output system) is, by definition, the most basic computer driver in existence and is designed to be the first program that boots when a PC turns on.

Motherboard Drivers.

- ✓ Hardware Drivers.
- ✓ Virtual Device Drivers

Many parts of a computer need drivers and common examples are:

- Computer printers.
- Graphic cards.
- Modems.
- Network cards.
- Sound cards

- **Utility software:** Utility software is software designed to help analyze, configure, optimize or maintain a computer. It is used to support the computer infrastructure - in contrast to application software, which is aimed at directly performing tasks that benefit ordinary users. However, utilities often form part of the application systems. For example, a batch job may run user-written code to update a database and may then include a step that runs a utility to back up the database, or a job may run a utility to compress a disk before copying files.

Examples of Utility Software

- ✓ Antivirus Software.
- ✓ File Management System.
- ✓ Disk Management Tools.
- ✓ Compression Tools.
- ✓ Disk Cleanup Tool.
- ✓ Disk Defragmenter.
- ✓ Backup Utility

Application software : Application software is a type of computer program that performs a specific personal, educational, and business function. Each application is designed to assist end-users in accomplishing a variety of tasks, which may be related to productivity, creativity, or communication.

Examples of application software :

- ✓ Microsoft products such as Office, PowerPoint, Word, Excel, Outlook, etc.
- ✓ Music Application Softwares like Pandora and Spotify.
- ✓ Real-time online communication like Skype, Google Meet, and Zoom.
- ✓ Team collaboration software like Slack.
- ✓ Internet browsers like Chrome, Safari, and Firefox……


Summary for the trainer related to the content

- ✓ Types of system software

- Operating system: Windows Xp, windows 7
- Device drivers: Network driver, computer driver
- Utility software: Disk Management Tools
- Application software : Microsoft word, internet


Theoretical learning Activity

- ✓ **Ask Trainees to brainstorm about types of system software within the group.**


Practical learning Activity

- ✓ **Trainees differentiate types of system software**


Points to Remember (Take home message)

Role of operating system

- ✓ Control hardware
- ✓ Manage files and folders
- ✓ Provide user interface
- ✓ Manage applications

Content 2: Identification of computer system specifications

1. **System type** : A type system is a logical system comprising a set of rules that assigns a property called a type to the various constructs of a computer program, such as variables, expressions, functions or modules.
2. **Processor speed:** When you see a processor's speed in GHz, it refers to the speed of the processor's internal clock. Every time that the clock ticks, the processor can execute an instruction or read and write data. A 3.0 GHz processor has 3 billion opportunities per second to do something, while a 3.6 GHz processor has 3.6 billion chances -- making it roughly 20 percent faster

   Cores vs. Speeds

   Many CPUs have multiple cores, meaning that a single chip actually has more than one CPU chip inside of it. While one chip running at 5 GHz will usually be faster than two chips running at 2.5 GHz, it gets harder to compare a quad-core chip at 3.6 GHZ with a six-core chip at 3.2 GHz. Generally speaking, if your employees are running multiple programs at once or are running software that is written specifically to take advantage of multi-core processors, a processor with more cores will be slower than a faster processor with fewer cores, but not always.
3. **RAM capacity**: RAM comes shaped in physical strips. Each strip has a set amount of memory storage space ranging from **2GB to 32GB**. Most laptop's motherboards come with 2 to 3 slots for RAM. If your laptop has 8GB of RAM, it probably uses two 4GB strips of RAM in separate slots.

4. **Hard Disk Drive free space**: Free space is a term used to describe the available storage capacity of a drive or disk. For example, the picture below shows that there is 25.9 GB of free space on the C: drive. Knowing how much free space a storage medium has is useful when you want to install a new program
5. **System model:** System modeling is the process of developing abstract models of a system, with each model presenting a different view or perspective of that system. It is about representing a system using some kind of graphical notation, which is now almost always based on notations in the Unified Modeling Language (UML).

 Theoretical learning Activity

- ✓ **Ask trainees to brainstorm about computer system specification within the group.**

 **Practical learning Activity**

- ✓ **Trainees select the best computer among the given different computer system.**

 **Learning out come 3.1 : formative assessment**

Written assessment

1. Describe system software of computer
2. Discuss the role of operating system
3. Identify different computer specification

Practical assessment

MJD Company needs to buy new computers and to replace different software in the existing computers, and you are selected as expert. You are requested to

supply these new computers to the company by respecting the following specification

- **RAM capacity: 16GB**
- **Hard Disk: 500GB**
- **Processor speed:3.0Ghz**
  - ✓ Task to be performed with performance checklist/quality product checklist

Checklist	Score	
	Yes	No
Indicator: Computer system specifications are identified		
✓ Operating System		
✓ Device drivers		
✓ Utility software		
Indicator: System software types are described		
✓ System type		
✓ System model		
✓ Hard Disk Drive free space		
✓ Performance index		
✓ RAM capacity		
✓ Processor speed		
Observation		

Learning outcome 3.2: install operating system software on PC

Duration: 4hrs

Learning outcome 3.2 objectives:

By the end of the learning outcome, the trainees will be able to:

1. Identify operating system types as it is in computer system
2. Check hardware and software compatibility

Resources

Equipment	Tools	Materials
Power supply Computer Projector	Whiteboard Internet	Marker Duster Text books Lecture notes Papers DVD/CD Software HHD Driver SSD Driver Power cable

Advance preparation:

.Availability of internet

.Prepare different software and drivers to be installed in the computer

.Prepare the computer desktop/lap

CONTENT

Content 1: Checking software and hardware compatibility

Compatibility of Hardware and Software means the components those can be replaced because they have the same properties and mostly the same or similar design.

Hardware compatibility can refer to the compatibility of computer hardware components with a particular CPU architecture, bus, motherboard or operating system. Hardware that is compatible may not always run at its highest stated performance, but it can nevertheless work with legacy components.

- **Disk space:** Disk space is the total amount of data that a hard disk or hard drive can store. Your operating system and apps like Google Chrome take up disk space, which can also be called disk storage or storage capacity. Disk space is measured in gigabytes (GB).
- **Memory capacity**: Memory capacity is the amount of memory that can be used for an electronic device such as a computer, laptop, smartphone or other smart device. Every hardware device or computer has a minimum and maximum amount of memory.
- **Processor capacity:** Processing capacity refers to the ability and speed of a processor, and how many operations it can carry out in a given amount of time. These kinds of measurements are critical for those who analyze hardware systems and measure their overall capacity and capabilities.
- **System type:** In programming languages, a type system is a logical system comprising a set of rules that assigns a property called a type to the various constructs of a computer program, such as variables, expressions, functions or modules.

 **Theoretical learning Activity**

- ✓ **Ask learners to discuss about software and hardware compatibility within the group**

 Practical learning Activity

- ✓ **Trainees select compatible software of hardware**

 Points to Remember (Take home message)

Hardware compatibility can refer to the compatibility of computer hardware components with a particular CPU architecture, bus, motherboard or operating system. Hardware that is compatible may not always run at its highest stated performance, but it can nevertheless work with legacy components.

Content 2: Identification of operating system

An operating system (OS) is system software that manages computer hardware, software resources, and provides common services for computer programs.

Types of Operating system :

- **Single-tasking and multi-tasking**

A single-tasking system can only run one program at a time, while a multi-tasking operating system allows more than one program to be running concurrently. This is achieved by time-sharing, where the available processor time is divided between multiple processes. These processes are each interrupted repeatedly in time slices by a task-scheduling subsystem of the operating system. Multi-tasking may be characterized in preemptive and cooperative types. In preemptive multitasking, the operating system slices the CPU time and dedicates a slot to each of the programs. Unix-like operating systems, such as Linux—as well as non-Unix-like, such as AmigaOS—support preemptive multitasking. Cooperative multitasking is achieved by relying on each process to provide time to the other processes in a defined manner. 16-bit versions of Microsoft Windows used cooperative multi-tasking; 32-bit versions of both Windows NT and Win9x used preemptive multi-tasking.

- **Single- and multi-user**

Single-user operating systems have no facilities to distinguish users but may allow multiple programs to run in tandem.[8] A multi-user operating system extends the basic concept of multi-tasking with facilities that identify processes and resources, such as disk space, belonging to multiple users, and the system permits multiple users to interact with the system at the same time. Time-sharing operating systems schedule tasks for efficient use of the system and may also include accounting software for cost allocation of processor time, mass storage, printing, and other resources to multiple users.

- **Distributed**

A distributed operating system manages a group of distinct, networked computers and makes them appear to be a single computer, as all computations are distributed (divided amongst the constituent computers).[9]

- **Templated**

In the distributed and cloud computing context of an OS, templating refers to creating a single virtual machine image as a guest operating system, then saving it as a tool for multiple running virtual machines. The technique is used both in virtualization and cloud computing management, and is common in large server warehouses.

- **+Embedded**

Embedded operating systems are designed to be used in embedded computer systems. They are designed to operate on small machines with less autonomy (e.g. PDAs). They are very compact and extremely efficient by design and are able to operate with a limited amount of resources. Windows CE and Minix 3 are some examples of embedded operating systems.

- Open source OS : Which is open source OS?
- Linux is a free, open source operating system (OS), released under the GNU General Public License (GPL). It's also become the largest open source software project in the world.
- Proprietary OS: A proprietary operating system is one which a particular company conceptualizes, designs, develops and sells. Examples of proprietary operating systems are Windows and Mac OS X. These operating systems are designed and sold by these companies and are not meant to be tampered with or tweaked by users.
- **Real-time operating system (RTOS):** A real-time operating system is an operating system that guarantees to process events or data by a specific moment in time. A real-time operating system may be single- or multi-tasking, but when multitasking, it uses specialized scheduling algorithms so that a deterministic nature of behavior is achieved. Such an event-driven system switches between tasks based on their priorities or external events, whereas time-sharing operating systems switch tasks based on clock interrupts.

- **Multi-user (Server OS**): A multi-user operating system (OS) is a computer system that allows multiple users that are on different computers to access a single system's OS resources simultaneously, as shown in this figure appearing on your screen right now. Users on the system are connected through a network.

 **Theoretical learning Activity**

- ✓ **Ask trainees to discuss about operating system installation process within the group.**

 **Practical learning Activity**

- ✓ **Trainees identify types of operating system**

Content 3: Identification of media storage

The device that actually holds the data is known as the storage medium ('media' is the plural). The device that saves data onto the storage medium, or reads data from it, is known as the storage device.

- DVD/CD
- Floppy disk
- Flash disk
- External hard disk

Content 4: OS Installation Process and testing the OS

OS installation process

- ✓ Media selection : **Archival-quality CDs and DVDs (and perhaps Blu-Ray)** are probably worth the money if you're thinking of storing for many,

many years. There are experts that even as recently as a few years ago will tell you this is the way to go. I suspect it's a very safe bet for the most important data.

- ✓ Boot process: Booting is basically the process of starting the computer. When the CPU is first switched on it has nothing inside the Memory.

- ✓ **Start setup**: Startup Settings is a menu of the various ways by which you can start Windows, including the well-known diagnostic startup option called Safe Mode
- ✓ Follow the instructions
- ✓ Customization
- ✓ Finalise the installation

OS test

- Running the installed OS
- Testing of the performance
- Checking features

Learning out come 3.2: formative assessment

Written assessment

1. Discuss on the types of operating system.
2. Describe storage media.
3. Enumerate steps of installing operating system in computer machine.

Practical assessment

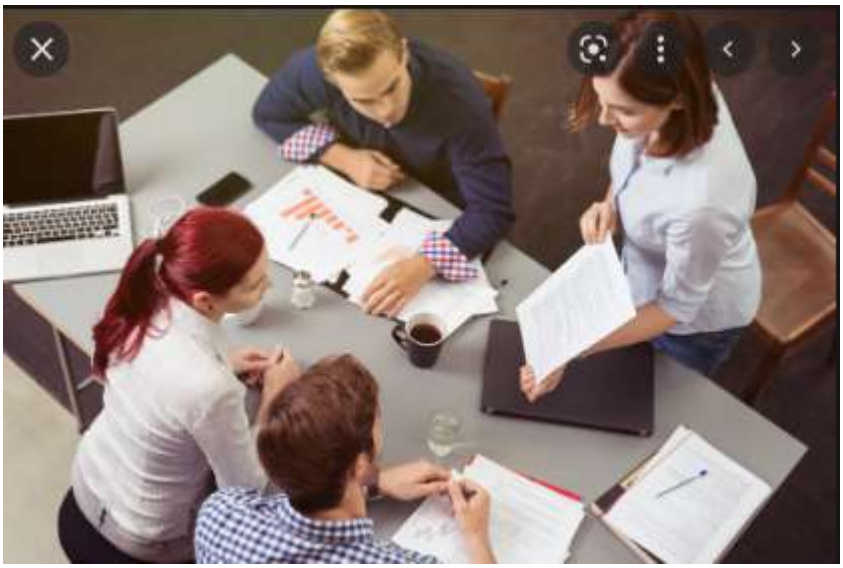
You are requested to install new operating system and drivers to the machine desktop of MJD Company located to Mc city.

✓ Task to be performed with performance checklist/quality product checklist

Checklist	Score	
	Yes	No
Indicator: Device drivers are identified		
✓ Chipset drivers		
✓ (Basic) device drivers		
✓ NIC drivers		
✓ Graphic card drivers		
Indicator: device drivers are installed		
✓ Media selection		
✓ Start setup		
✓ Follow the instructions		
✓ Customization		
✓ Finalise the installation		
Indicator: device functionality is tested		
✓ Testing of the device performance		
✓ Checking installed device status		
Observation		

Learning Unit 4: Document the work done

Picture/s reflecting the Learning unit 3



STRUCTURE OF LEARNING UNIT

Learning outcomes:

1. Review the previous work
2. Record the work process
3. Write technical recommendation

Learning outcome 4.1 : Review the previous work document

Duration: 4hrs

Learning outcome 4.1 objectives:

By the end of the learning outcome, the trainees will be able to:

Describe elements of work related documents

Analyse The previous work document

Prepare perfectly work related document

Resources

Equipment	Tools	Materials
Computer Projector	Whiteboard Internet	Board Pen Flipchart Books and handouts Markers Chalks

Advance preparation:

.Prepare different work document repair report and invoice

Content 1: Description of work document elements

Repairing date: Repair Date means the date on which the repair of a Product is completed

Addresses of technician: A Technician is someone who installs, inspects, repairs or modifies complex systems or who undertakes diagnostic or mechanical tests, after completing his/her job he/she must prepare the report that includes the address.

Status of computer peripheral parts: A peripheral is any computing device or equipment that is part of the computer but doesn't perform any core computing process. It is an externally or internally connected device that adds up or complements the host computer's capabilities or functionality in some form.

Name of the repaired parts

Work carried out: Carry out a task" synonyms: accomplish, action, carry through, execute, fulfil, fulfill follow out, follow through, follow up, go through, implement, put through. pursue to a conclusion or bring to a successful issue.

Recommendation: A thing or course of action suggested as suitable or appropriate

 Theoretical learning Activity

Ask trainees to brainstorm about workdone document within the group.

 Practical learning Activity

Trainees prepare work related document.

Content 2: Analysis of the previous work document

- ✓ Previous faults
- ✓ Previous used Techniques

- ✓ Previous status of the computer peripheral
- ✓ Previous recommendation


Learning out come 4.1 : formative assessment

Written assessment

1. Outline element of repair
2. State three (3) importance of providing recommendation to the customer

Practical assessment

Elaborate sample of repair report

- ✓ Task to be performed with performance checklist/quality product checklist

Checklist	Score	
	Yes	No
Indicator: work document elements are well described		
✓ Repairing date		
✓ Addresses of technician		
✓ Status of computer peripheral parts		
✓ Name of the repaired parts		
✓ Work carried out		
✓ Recommendation		
Indicator: previous work document is well interpreted		
✓ Previous faults		
✓ Previous used Techniques		
✓ Previous status of the computer peripheral parts		
✓ Previous recommendation		
Observation		

Learning outcome 4.2: Record the work process

 **Duration: 4hrs**

 **Learning outcome 4.2 objectives:**

By the end of the learning outcome, the trainees will be able to:

Describe the work carried out

Analyse The previous work document

Prepare perfectly work related document

 **Resources**

Equipment	Tools	Materials
Computer Projector	Whiteboard Internet	Board Pen Flipchart Books and handouts Markers Chalks

Advance preparation: .Prepare report and interpretation of repair report elements		

Content 1: Description of the work carried out

Faulty parts: Proper demonstration of the defective computer hardware part

Type of fault: Explain properly the type of fault repaired

tools, materials and Equipment used

steps and Techniques used to fix the fault

Status of the computer peripheral after work

Theoretical learning Activity

Ask trainees to brainstorm about work carried document within the group

Practical learning Activity

- ✓ **Trainees demonstrate and explain correctly the status of computer hardware after repairing.**

Content 2: Analysis of the previous work document

- Previous faults
- Previous used Techniques
- Previous status of the computer peripheral
- Previous recommendation

Theoretical learning Activity

- ✓ **Ask trainees to brainstorm about the information of the previous work document within the group.**

Practical learning Activity

- ✓ **Trainees analyse the information of the previous work document.**

Learning out come 4.2: formative assessment

Written assessment

- Assessment instruments/tools

Write short note on how to present the work carried out to your supervisor

Practical assessment

- Prepare a document that explain the work done by the technician after repairing

  ✓ Task to be performed with performance checklist/quality product checklist

Checklist	Score	
	Yes	No
Indicator: Work Document elements are well described		
✓ Repairing date		
✓ Addresses of technician		
✓ Status of computer peripheral		
✓ Name of the repaired part		
✓ Steps work carried out		
✓ Recommendation		
Indicator: The work carried out is well described		
✓ Fixed fault		
✓ tools, materials and Equipment used		
✓ steps and techniques used to fix the fault		
Observation		

Learning outcome 4.3: Record the work process

Duration: 4hrs

Learning outcome 4.3 objectives:

By the end of the learning outcome, the trainees will be able to:

Describe elements of technical recommendation

Resources

Equipment	Tools	Materials
Computer Projector	Whiteboard Internet	Board Pen Flipchart Books and handouts Markers Chalks

Advance preparation:

.Proper preparation of recommendation and good communication to the client

Content 1: Description of element of technical recommendation

Propose preventive strategies

Suggest solutions to faced challenges

Propose the periodic check up

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REPAIR ESTIMATE INFORMATION FORM

How did you hear about our service?

☐ Friend ☐ Insurance Company ☐ Repeat Customer ☐ Yellow Pages ☐ Radio Ad

☐ Drive By ☐ Dealer Referral ☐ Website ☐ Other

Customer Information

First Name _____ Day Phone _____

Last Name _____ Evening Phone _____

Address _____ Email Address 1 _____

City _____

State _____ Contact Me By

Zip _____ ☐ Phone ☐ Email

SOURCE OF REPAIR PAYMENT ☐ My Insurance ☐ Their Insurance ☐ Owner Payment

Insurance Company _____ Claim Number _____

Date of Accident _____ Amount of Deductible _____

Adjusters Name _____ Adjusters Phone Number _____

Print Form **Send Form**

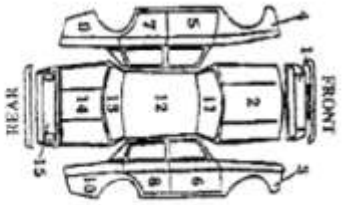
OFFICE USE ONLY VIN # _____

Estimator _____ Date _____

Make _____ Model _____ Year _____ Prod Date _____ Trim Code _____ Tire Size _____

Mileage _____ Lic.# _____ Paint Code _____ Stripe Code _____ Engine Size _____

NOTES



Prior Damage

Learning out come 4.3 : formative assessment

Written assessment

- Assessment instruments/tools
  - ✓ Describe elements of technical recommendation

Practical assessment

Elaborate a document that contains technical recommendation provided to the client.

✓ Task to be performed with performance checklist/quality product checklist

Checklist	Score	
	Yes	No
Indicator: element of technical recommendation are well described		
✓ Propose preventive strategies		
✓ Suggest solutions to faced challenges		
✓ Propose the periodic check up		
Observation		

Learning outcome 4.3: Record the work process

Duration: 4hrs

Learning outcome 4.3 objectives:

By the end of the learning outcome, the trainees will be able to:

Describe elements of technical recommendation		
Resources		
Equipment	**Tools**	**Materials**
Computer Projector	Whiteboard Internet	Board Pen Flipchart Books and handouts Markers Chalks
Advance preparation: . Proper preparation of recommendation and good communication to the client		

CONTENT

Content 1: Description of element of technical recommendation

- ✓ Propose preventive strategies
- ✓ Suggest solutions to faced challenges
- ✓ Propose the periodic check up

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REPAIR ESTIMATE INFORMATION FORM

How did you hear about our service?

☐ Friend ☐ Insurance Company ☐ Repeat Customer ☐ Yellow Pages ☐ Radio Ad

☐ Drive By ☐ Dealer Referral ☐ Website ☐ Other

Customer Information

First Name

Last Name

Address

Day Phone

Evening Phone

Email Address 1

City

State

Zip

Contact Me By

☐ Phone ☐ Email

SOURCE OF REPAIR PAYMENT

☐ My Insurance ☐ Their Insurance ☐ Owner Payment

Insurance Company

Date of Accident

Adjusters Name

Claim Number

Amount of Deductible

Adjusters Phone Number

Print Form **Send Form**

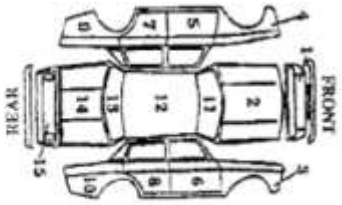
OFFICE USE ONLY VIN #

Estimator Date

Make Model Year Prod Date Trim Code Tire Size

Mileage Lic.# Paint Code Stripe Code Engine Size

NOTES



Prior Damage

INTEGRATED ASSESSMENT

BEERA Company, is brewer, located in GASABO district. It has many computers used to monitor their beer plants. One of the computers, used to monitor the soft drinks, got faulty. For the first time, it starts slowing down. Thereafter, unwillingly, it restarts, its self, several times. Finally, it cannot boot at all. This brewer section cannot stop for three hours, otherwise, they will lose a big market. The machine operator cannot get the user interface to perform his daily activities, because of the above issues. In this regard, BEERA would like to hire a qualified technician to resurrect its computer. Being employed as computer Hardware technician, you are requested to check and rectify the above mentioned faults so that the computer can be reused as usual.

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