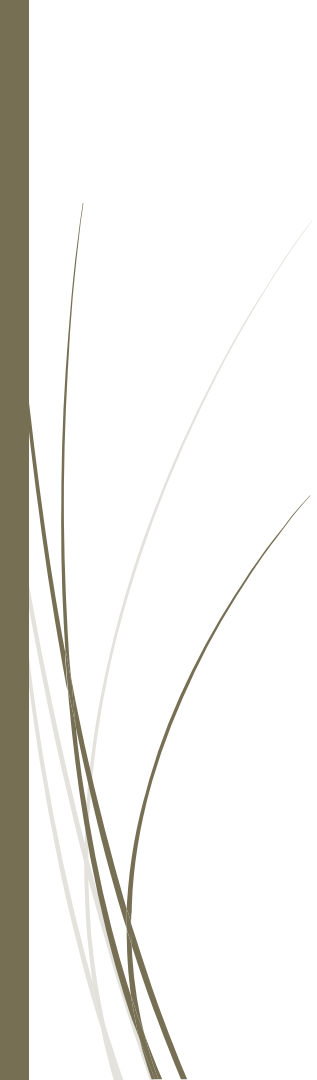




# **S1 ICT**

BY: EMMANUEL GIDUDU

# **TOPIC 2: COMPUTER HARDWARE AND SYSTEM STARTUP**

Senior One ICT | Understanding Physical Components of a Computer

# Connecting to What You Already Know (Topic 1)

**Before we begin, make sure you can answer YES to the following:**

- I know what ICT is and can name devices it covers.
- I understand that computers process data to produce information.
- I can describe the Information Processing Cycle:  
Input → Processing → Output → Storage
- I know basic safety precautions when handling ICT equipment.



**Quick Recall:** Turn to your partner and name THREE ICT devices you used this week. Which step of the processing cycle did each perform?

# What You Will Learn in This Topic

- **By the end of this topic, you should be able to:**
  - Define computer hardware and distinguish it from software.
  - Classify hardware devices into the five main categories.
  - Identify the physical parts of a desktop computer system.
  - Connect and start up a computer correctly and safely.
  - Use peripheral devices: printer, scanner, and projector.
  - Shut down a computer properly to avoid data loss.

# Lesson 1

## Learning outcomes

By the end of this lesson, you should be able to;

- Define the term computer hardware
- List the main components of computer system.
- List the five categories computer hard hardware.
- Explain each category of computer hardware in details.

# 2.1 What is Computer Hardware?

- **Computer hardware refers to all the PHYSICAL, TANGIBLE parts of a computer system that you can SEE and TOUCH.**
- Hardware includes both INTERNAL components (e.g. CPU, RAM, motherboard) and EXTERNAL devices (e.g. keyboard, printer, monitor).
- Hardware works TOGETHER WITH SOFTWARE to perform computing tasks.
- **A computer system has two main components:**
  - Computer Hardware → Input, Output, Storage, Internal Components
  - Computer Software → System Software, Application Software

 **Think:** Look around the classroom. Name FIVE hardware items you can see right now. Are they input, output, or something else?

## 2.2 The Five Categories of Hardware

- **Hardware is grouped into five categories based on what each component DOES:**
  - 1. INPUT DEVICES – Allow users to enter data into the computer.
  - 2. PROCESSING DEVICES – Perform calculations and control other components.
  - 3. OUTPUT DEVICES – Present processed information to the user.
  - 4. STORAGE DEVICES – Store data and programs permanently or temporarily.
  - 5. COMMUNICATION DEVICES – Allow computers to connect and communicate with other devices.



**Class Challenge:** Your teacher will call out a device. Shout the correct category! (keyboard / monitor / hard drive / router / CPU)

## Exercise 2.1

- What are input/output devices?
- What are some of the examples of the input/output devices?
- Explain how you have used any of these devices you have mentioned above.

# Lesson 2

- Learning outcomes

By the end of this lesson, you should be able to;

- Define input and output devices.
- List examples of input and output devices.
- Explain how each input device works.
- Analyze to carefully identify devices that are both input and output.

# Input Devices – Entering Data into the Computer

- **An input device is used to provide DATA and CONTROL SIGNALS to the computer.**
- Input can be: Mechanical (key press, mouse click) | Audio (microphone) | Visual (scanner, webcam)
- Input can be: Discrete (a single key press) | Continuous (mouse movement)
- **KEY EXAMPLES:**
  - Keyboard – types text & commands | Mouse – controls on-screen pointer
  - Scanner – converts documents to digital images | Microphone – captures audio
  - Digital Camera – captures photos/videos | Webcam – live video
  - Touchscreen – detects finger/stylus touch | Barcode Reader – reads barcodes



**Quick Check:** Without looking at your notes – name THREE input devices and state ONE example use for each.

# Input Devices – How They Work

| Device   | How It Works                                  | Example Use                            |
|----------|-----------------------------------------------|----------------------------------------|
| Keyboard | User presses keys to enter text and commands  | Typing a letter or entering a password |
| Mouse    | User moves it to control a pointer on screen  | Clicking icons and selecting text      |
| Scanner  | Converts physical documents to digital images | Scanning a school report card          |

# Input Devices – How They Work

|                |                                            |                                    |
|----------------|--------------------------------------------|------------------------------------|
| Microphone     | Captures audio input                       | Recording voice or video calling   |
| Digital Camera | Captures photos and videos                 | Taking ID photos, recording events |
| Webcam         | Built-in or external camera for live video | Video conferencing, online lessons |
| Touchscreen    | Detects finger or stylus touch as input    | Using a tablet or ATM machine      |
| Barcode Reader | Reads barcodes to retrieve product info    | Scanning goods at a supermarket    |

# Output Devices – Presenting Results to the User

- **An output device converts electronically processed data into a HUMAN-READABLE FORM.**
- Output can be: VISUAL (soft copy) | PHYSICAL/PRINTED (hard copy) | AUDIO
- KEY EXAMPLES:
  - Monitor / Screen – Visual (soft copy) – Displaying websites, documents, videos

# Output Devices – Presenting Results to the User

- Printer – Physical (hard copy) – Printing exam papers, reports, certificates
- Speakers – Audio – Listening to music, notifications
- Projector – Visual (large screen) – Presenting lessons to the class
- Headphones – Audio – Private listening without disturbing others
- Plotter – Physical drawings – Printing architectural plans and maps

 **Spot the Difference:** What is the difference between a SOFT COPY and a HARD COPY output? Give one example of each.

# Input / Output (I/O) Devices – Doing Both!

- **Some devices can BOTH send data to and receive data from the computer.**
- These are called INPUT/OUTPUT devices (I/O devices).
- Examples of I/O Devices:
  - Touchscreen – receives your touch (input) + shows display (output)
  - Multifunction Printer – prints (output) AND scans (input)
  - Headset with Microphone – plays audio (output) + records voice (input)

# Input / Output (I/O) Devices – continuation ...

- Headset with Microphone – plays audio (output) + records voice (input)
- USB Flash Drive – saves files (output) AND reads files back (input)
- Automotive Navigation System – accepts location (input) + shows maps (output)
- Voice Output Communication Aids, Braille Embossers also serve dual roles.



**Discuss:** A smartphone – is it an input device, output device, or I/O device? Explain your reasoning to a partner.

## Lesson 3

- Learning outcomes

By the end of this lesson, you should be able to;

# Processing Devices – The Brain of the Computer

- **The CPU (Central Processing Unit) is called the BRAIN of the computer.**
- It executes ALL instructions and controls the other components.
- The CPU is located INSIDE the system unit (the metal/plastic box).
- **KEY PROCESSING COMPONENTS:**
  - CPU (Central Processing Unit) – Often called 'the processor'. Executes program instructions.
  - RAM (Random Access Memory) – TEMPORARILY stores data the CPU is currently working on. Cleared when computer is switched off.

# Processing Devices – continuation ...

- Motherboard – The MAIN CIRCUIT BOARD that connects ALL hardware components together.
- GPU (Graphics Processing Unit) – Handles graphics and visual calculations.
- Sound Card – Processes audio signals for sound output.

**? Analogy:** If the CPU is the brain, what body part would RAM be? Discuss: why does RAM clear when the computer is switched off?

# Storage Devices – Keeping Your Data Safe

- **Storage devices hold data PERMANENTLY (or semi-permanently) even when the computer is switched off.**
- Unlike RAM, data on storage devices REMAINS until deliberately deleted.

| Device                  | Type              | Capacity      | Notes                          |
|-------------------------|-------------------|---------------|--------------------------------|
| Hard Disk Drive (HDD)   | Internal/External | 500 GB – 4 TB | Common in desktops & laptops   |
| Solid State Drive (SSD) | Internal/External | 128 GB – 2 TB | Faster & more durable than HDD |

## Storage Devices – Keeping Your Data Safe

|                       |                    |                           |                                         |
|-----------------------|--------------------|---------------------------|-----------------------------------------|
| USB Flash Drive       | External/Removable | 4 GB – 256 GB             | Small, portable, easy to use            |
| Memory Card (SD Card) | External/Removable | 2 GB – 512 GB             | Used in cameras, phones, tablets        |
| CD / DVD              | Optical/Removable  | 700 MB / 4.7 GB           | Software, music, movies                 |
| Cloud Storage         | Online             | Free 5–15 GB; paid larger | Google Drive, Dropbox – internet needed |

# Communication Devices – Connecting Computers Together

- **Communication devices allow computers to EXCHANGE DATA with other computers and networks.**
- Network Interface Card (NIC) – Connects a computer to a Local Area Network (LAN).
- Router – Directs network traffic and connects a local network to the INTERNET.
- Modem – Converts digital signals into a form suitable for transmission over telephone/cable lines.

## Continuation ...

- Wi-Fi Adapter – Allows WIRELESS network connectivity.
- Bluetooth Adapter – Enables SHORT-RANGE wireless communication with other Bluetooth devices.
- Network Switch – Connects multiple devices within a LAN and manages data traffic.
- Wireless Access Point (WAP) – Extends Wi-Fi coverage in a building.



**Real Life:** What communication devices are used in YOUR school's computer lab? How do they help students access the internet?



## SCENARIO: Classifying Hardware (Class Activity)

- **The school's ICT lab has just received new equipment. The delivery includes:**
  - A keyboard, a laser printer, a 1 TB hard disk drive, a wireless router, two monitors, a webcam, a set of speakers, a wireless microphone, a USB flash drive, a scanner, and three projectors.
- **QUESTIONS – Answer in your exercise book:**
  - (a) Classify EACH device into the correct hardware category: Input, Output, Processing, Storage, or Communication.
  - (b) Which TWO devices would a teacher need to conduct an ONLINE CLASS?
  - (c) Which device would a student use to BACK UP their assignment?
  - (d) BONUS: Which device in the list could be classified as BOTH input AND output?

## 2.3 Identifying Physical Devices of a Desktop Computer

| Component              | Description                                       | Location                          |
|------------------------|---------------------------------------------------|-----------------------------------|
| System Unit<br>/ Tower | Main box containing CPU, RAM, motherboard, drives | On desk or floor beside monitor   |
| Monitor                | Screen that displays output                       | On desk, connected to system unit |
| Keyboard               | Input device with keys for typing                 | On desk in front of monitor       |
| Mouse                  | Pointing device for navigation                    | On desk beside keyboard           |

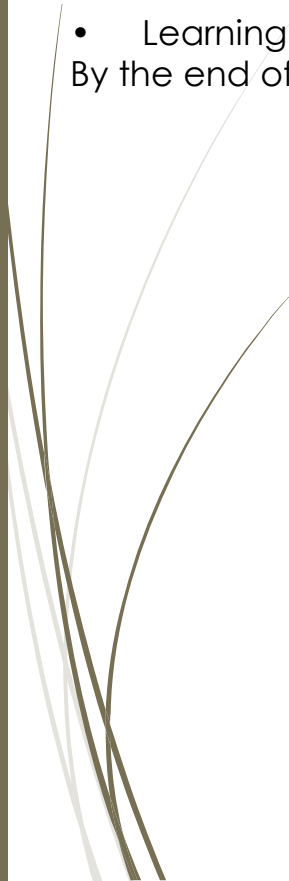
## Continuation ....

|                 |                                     |                                         |
|-----------------|-------------------------------------|-----------------------------------------|
| Mouse Pad       | Improves mouse movement accuracy    | Under the mouse                         |
| Power Cable     | Supplies electricity to system unit | Plugged into power socket & system unit |
| VGA/HDMI Cable  | Connects monitor to system unit     | At back of monitor and system unit      |
| USB Hub / Ports | Allows connection of USB devices    | Front or back of system unit            |
| Speakers        | Produce audio output                | On desk beside monitor                  |

## Lesson 4

- Learning outcomes

By the end of this lesson, you should be able to;



## 2.4 Step-by-Step: Connecting a Desktop Computer

- **Follow these steps IN ORDER. Never skip a step!**
- Step 1 – Place system unit on a stable surface. Ensure adequate ventilation around it.
- Step 2 – Connect the monitor cable (VGA or HDMI) from monitor to the system unit. Tighten screws.
- Step 3 – Connect the keyboard USB cable to a USB port on the system unit.
- Step 4 – Connect the mouse USB cable to another USB port on the system unit.
- Step 5 – Connect external speakers to the audio output port (usually GREEN) at the back.

## Continuation ...

- Step 6 – Connect the power cable to the power socket at the back of the system unit.
- Step 7 – Connect power cable to a power outlet or surge protector. Do NOT switch on yet.
- Step 8 – If connecting to a network, plug Ethernet cable from router into network port (RJ-45).
- Step 9 – Switch ON the power outlet / surge protector first.
- Step 10 – Press the POWER BUTTON on the system unit. Computer will now boot up.

## **Safety Reminders When Connecting a Computer**

- **NEVER** connect or disconnect cables while the computer is **RUNNING**.
- ALWAYS connect all cables BEFORE switching on the power from the wall socket.
- Use a SURGE PROTECTOR to prevent damage from power surges.
- Ensure the area around the system unit has ADEQUATE VENTILATION to prevent overheating.
- Handle cables gently – do not bend, twist, or pull them forcefully.
- Keep liquids FAR AWAY from all computer equipment at all times.
- Do not eat or drink near computer equipment.

 **What would happen if...?** A student spills water on the keyboard. A power cable is disconnected while the computer is running. What should they do in each case?

# The Boot Process – What Happens When You Start a Computer?

- **When you press the power button, the computer goes through a series of automatic steps called the BOOT PROCESS:**
- **Step 1 – POWER ON:** The Power Supply Unit (PSU) sends electricity to all components.
- **Step 2 – POST (Power-On Self-Test):** The computer checks that all hardware is working properly. If a problem is detected, it BEEPS or shows an error message.

## The Boot Process – continuation ...

- Step 3 – BIOS/UEFI: A programme stored on a chip in the motherboard runs and identifies all hardware.
- Step 4 – BOOT LOADER: The computer finds the Operating System (e.g., Windows, Linux) on the hard drive and loads it into RAM.
- Step 5 – OPERATING SYSTEM LOADS: The desktop or home screen appears. The computer is READY TO USE.

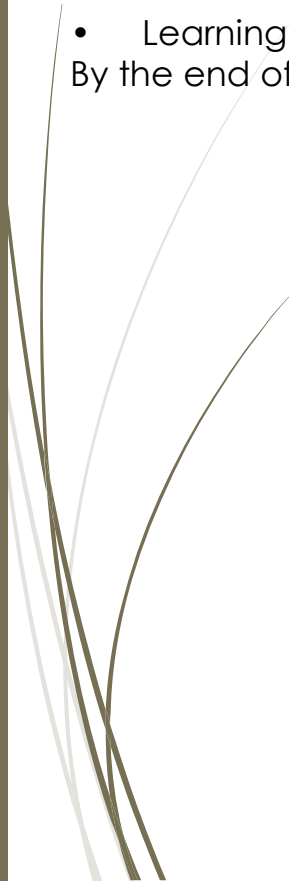


**Trace the Steps:** Which step is the computer performing if it shows a 'No Operating System Found' message? Which step if it BEEPS three times before starting?

## Lesson 5

- Learning outcomes

By the end of this lesson, you should be able to;



# Step-by-Step: Shutting Down a Computer Correctly

- **IMPORTANT: ALWAYS shut down using the correct procedure. Never pull the plug!**
- Step 1 – SAVE all open documents and CLOSE all running programmes.
- Step 2 – Click the START button (Windows) or Apple menu (Mac).
- Step 3 – Select 'Shut Down' from the menu.

# Step-by-Step: Shutting Down a Computer Correctly

- Step 4 – WAIT for the computer to close all programmes and switch itself off. Do NOT press the power button forcefully during this process.
- Step 5 – Once the screen goes dark and all indicator lights turn off, switch off the power outlet.
- Step 6 – Cover the computer or keyboard if necessary to protect from dust.

 **Warning:** NEVER switch off a computer by pulling the power plug while it is running. This can cause DATA LOSS and DAMAGE THE HARD DRIVE.



## **SCENARIO: Computer Startup Problem (Problem Solving Activity)**

- **Read the scenario carefully and answer the questions below:**
  - Ochieng switches on the computer but NOTHING appears on the monitor. The system unit IS running (the fan is spinning and the power light is on).
- **QUESTIONS:**
  - (a) What are TWO possible reasons the monitor is not displaying anything?
  - (b) What steps should Ochieng follow to TROUBLESHOOT the problem?
  - (c) After fixing the issue, the computer shows an error screen during startup. What BOOT PROCESS STEP was the computer performing when this error appeared?
  - (d) **EXTENSION:** Ochieng accidentally presses the power button to force shut down. What DATA RISKS does he face?

## 2.5 Using Peripheral Devices

- **Peripheral devices are EXTERNAL hardware devices connected to the computer to EXPAND its functionality.**
- **In this section we will learn to use THREE key peripheral devices:**
  - 1. PRINTER – produces hard copy (printed) output of documents.
  - 2. SCANNER – captures a physical document and converts it to a digital file.
  - 3. PROJECTOR – displays the computer screen on a large surface for an audience.

## 2.5 Using Peripheral Devices

- Each device must be correctly CONNECTED, CONFIGURED, and OPERATED.
- Peripheral devices usually require DRIVERS – software that lets the computer communicate with the device.



**Name More:** Can you name TWO other peripheral devices not listed above? State what each one does.

## Using a Printer – Step-by-Step

- Step 1 – Connect the printer to the computer via USB cable OR join the same Wi-Fi network.
- Step 2 – Ensure the printer is SWITCHED ON and has PAPER loaded in the paper tray.
- Step 3 – Download and install PRINTER DRIVERS from the manufacturer's website. Run the executable file while the printer is connected.

## Using a Printer – Step-by-Step

- Step 4 – Open the document you want to print.
- Step 5 – Press Ctrl + P (or go to File > Print).
- Step 6 – In the Print dialogue box, SELECT THE CORRECT PRINTER from the dropdown list.
- Step 7 – Set number of copies, page range, and other options as needed.
- Step 8 – Click 'Print'. The printer will begin printing.

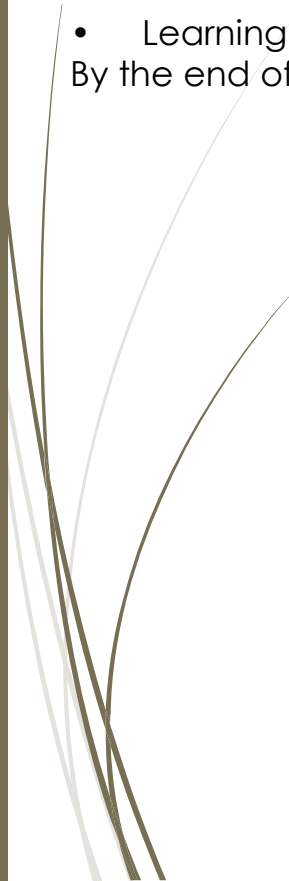


**Practical Tip:** If a document does not print, check: Is the correct printer selected? Is the printer online? Is there paper in the tray? Is the driver installed?

## Lesson 6

- Learning outcomes

By the end of this lesson, you should be able to;



## Using a Scanner – Step-by-Step

- **A scanner is an INPUT DEVICE that converts physical documents to digital files.**
- Many modern printers also have a scanning function (multifunction printers).
- Step 1 – Connect the scanner via USB and ensure it is switched on.
- Step 2 – Lift the scanner lid and place the document FACE-DOWN on the glass surface, aligned with the guide marks.

## Using a Scanner – continuation ....

- Step 3 – Close the lid GENTLY.
- Step 4 – Open the scanning software on the computer (e.g., Windows Scan).
- Step 5 – Choose scan type (photo/document) and select RESOLUTION (DPI). Higher DPI = better quality BUT larger file size.
- Step 6 – Click 'Preview' to check the result, then 'Scan' to proceed.
- Step 7 – SAVE the scanned file in your chosen location with an appropriate file name.

## Using a Projector – Step-by-Step

- **A projector displays the computer's screen onto a large wall or screen for an audience to view.**
- Step 1 – Place the projector on a STABLE surface facing a white wall or projector screen.
- Step 2 – Connect the projector to the computer using an HDMI or VGA cable.
- Step 3 – Switch ON the projector using its power button.
- Step 4 – On the computer, press Windows key + P, then choose 'Duplicate' to show the screen on both monitor and projector.

## Using a Projector – continuation

- Step 5 – Adjust the projector's FOCUS RING to make the image sharp.
- Step 6 – Adjust projector POSITION or ZOOM to fill the screen appropriately.
- Step 7 – When done, switch off the projector. ALLOW IT TO COOL DOWN before covering or moving it.



**Teacher Scenario:** A teacher is presenting to S.1 but the projector image is blurry. Which step should they revisit? What key shortcut extends the display to the projector?



# Think-Pair Activity: Classify 10 Hardware Devices

- **INSTRUCTIONS:**

- Work in PAIRS. Classify each device below into the correct category.
- Categories: INPUT | OUTPUT | PROCESSING | STORAGE  
| COMMUNICATION

- **DEVICES TO CLASSIFY:**

- 1. Projector   2. USB Flash Drive   3. Webcam   4. Router  
5. RAM
- 6. Keyboard   7. Speakers   8. Hard Disk Drive   9. CPU  
10. Barcode Reader

- **DISCUSSION QUESTIONS (share with the class):**

- Which device was hardest to classify? Why?
- Were any devices able to fit into MORE THAN ONE category?



## Revision Questions – Topic 2

- **Answer the following questions in your exercise book:**
- 1. Define 'computer hardware' and give THREE examples.
- 2. State the FIVE categories of hardware and give TWO examples from each.
- 3. Explain the difference between RAM and a Hard Disk Drive.
- 4. List FIVE steps to correctly connect a desktop computer.
- 5. Explain what happens during POST (Power-On Self-Test).
- 6. Why should you NEVER force-shutdown a computer by pulling the power plug?
- 7. You want to print 3 copies of a 5-page document. Describe the steps you would follow.
- 8. A scanned image is very large in file size. What scanning setting could you change to reduce it?



## Key Terms – Topic 2 Glossary

| Term          | Definition                                                                    |
|---------------|-------------------------------------------------------------------------------|
| Hardware      | Physical, tangible parts of a computer system you can see and touch.          |
| Input Device  | Hardware that allows the user to enter data into the computer.                |
| Output Device | Hardware that presents processed results to the user.                         |
| CPU           | Central Processing Unit – the 'brain' of the computer; executes instructions. |
| RAM           | Random Access Memory – temporary storage used by the CPU while working.       |

## Key Terms – continuation ....

|              |                                                                         |
|--------------|-------------------------------------------------------------------------|
| Motherboard  | Main circuit board connecting all hardware components.                  |
| Boot Process | The series of steps a computer follows when it is switched on.          |
| POST         | Power-On Self-Test – hardware check performed at startup.               |
| BIOS/UEFI    | Firmware that identifies hardware and starts the boot loader.           |
| Peripheral   | External hardware device connected to expand computer functionality.    |
| Driver       | Software that allows the operating system to communicate with a device. |



# **End of Topic 2**

Computer Hardware and System Startup