

COMPUTER HARDWARE AND NETWORKING LAB MANUAL

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Computer hardware & network Lab manual

C.S.E(5TH SEM)

Practical 01:- Motherboard Components Identification

Objective

To identify and understand the various **hardware components** present on a computer **motherboard**.

Materials Required

- A desktop computer motherboard (working or discarded)
- Screwdriver set
- Antistatic wrist strap or mat (for safety)
- Motherboard diagram or chart (for reference)
- Notebook and pen for recording observations

Safety Precautions

1. Disconnect all power sources before handling.
2. Use an antistatic wrist strap to prevent ESD (Electrostatic Discharge) damage.
3. Handle the motherboard by its edges.

Step-by-Step Procedure

Step 1: Opening the System Unit

1. Turn off the PC and unplug it.
2. Use a screwdriver to open the case cover.
3. Locate the **motherboard**, the large circuit board inside the case.

Step 2: Identify Major Components (with Explanation)

1. CPU Socket

- A large square socket, usually located at the center/top.
- **Holds the processor (CPU).**
- Types: LGA (Intel), PGA (AMD).
- You'll see a locking lever nearby.

2. RAM (Memory) Slots

- Long, narrow slots with clips on both sides.
- Usually 2 to 4 slots located near the CPU.
- Inserted with **DDR RAM modules**.
- Color-coded for dual-channel support.

3. Power Connectors

- **24-pin ATX power connector** – main power supply to motherboard.
- **4/8-pin CPU power connector** near CPU socket.

4. Chipset (Northbridge/Southbridge or single chip)

- Covered with a **heatsink**.
- Manages communication between CPU, RAM, GPU, and storage.
- Newer boards use **PCH (Platform Controller Hub)**.

5. BIOS/UEFI Chip

- A small black square/rectangle labeled **BIOS/UEFI**.
- Stores firmware that starts the PC.

6. CMOS Battery

- A **round silver coin-cell battery**.
- Powers the BIOS clock and settings memory.

7. Expansion Slots

- Long slots used for additional cards:
 - **PCIe x16**: for graphics cards.
 - **PCIe x1 / x4**: for network or sound cards.

8. SATA Ports

- Small **L-shaped connectors**.
- Connect to hard drives and SSDs.

9. M.2 Slot (optional)

- Thin, flat slot for **NVMe SSDs**.
- May be found near PCIe or chipset area.

10. I/O Ports (Back Panel Connectors)

- USB ports
- HDMI/VGA/DisplayPort
- Ethernet (LAN)
- Audio jacks
- PS/2 (older systems)

11. Fan Headers

- 3-pin or 4-pin connectors.
- Used for **CPU fan, chassis fan**, etc.

12. Front Panel Connectors

- Small pin headers near the bottom corner.
- Connect to **power button, reset button, LEDs**, etc.

13. VRMs (Voltage Regulator Modules)

- Near CPU socket.
- Regulate voltage to CPU.
- May be covered with heatsinks.

Diagram Example (You can draw or print a labeled motherboard chart)

USB Ports Audio Jacks LAN Port ← I/O Ports

```

| CPU Socket with Fan |
| _____ |
| | Heatsink | |
| _____ |
| RAM Slots (2-4 DIMM) |
| _____ |
| PCIe x16 (GPU) |
| PCIe x1 |

```

SATA Ports	
M.2 Slot	
24-pin ATX Power	
BIOS Chip CMOS Battery	
Front Panel Connectors	

Observation Table

Component	Location on Board	Function	Identified (Yes/No)
CPU Socket	Center top	Holds CPU	
RAM Slots	Beside CPU socket	Holds RAM	
PCIe Slot	Bottom half	Add-on cards	
SATA Ports	Right edge	Connect storage	
BIOS Chip	Bottom corner	Stores firmware	
CMOS Battery	Near BIOS	Powers RTC	
Power Connectors	Top/right edge	Power input	
VRM & heatsinks	Around CPU	Voltage regulation	

Conclusion

- Motherboard is the **central PCB** that connects all major components.
- Proper identification helps in **assembly, troubleshooting, and upgrading** PCs.
- Hands-on observation enhances understanding of theoretical concepts.

Viva Questions (For Lab Assessment)

1. What is the function of the CMOS battery?
2. Differentiate between PCIe x1 and PCIe x16 slots.
3. Why is the chipset important in a motherboard?
4. What happens if the RAM is inserted incorrectly?
5. What are front panel connectors used for?

Practical 02:- RAM identification, removal, and installation

Objective

To identify RAM modules, and to safely remove and install RAM in a desktop/laptop motherboard.

Materials Required

- Desktop PC or laptop (turned off)
- Screwdriver
- Antistatic wrist strap or mat
- RAM modules (DDR3 / DDR4 / DDR5)
- Notebook and pen

Safety Precautions

1. Turn off the power supply and unplug the system.
2. Use an antistatic wrist strap to prevent electrostatic damage.
3. Avoid touching the gold pins or circuitry on RAM.

Step-by-Step Procedure

Part 1: RAM Identification

1. Locate RAM Slots (DIMM Slots)

- On desktops: Long slots next to CPU socket (usually 2 to 4).
- On laptops: RAM is under a cover at the bottom or beneath the keyboard.

2. Check RAM Type

- Identify by label on RAM stick or slot design
 - DDR3: 240 pins (desktop), 204 pins (laptop)
 - DDR4: 288 pins (desktop), 260 pins (laptop)
 - DDR5: Newer standard, faster speeds

TIP: Notches are at different locations for each RAM type to prevent incorrect insertion.

3. Read RAM Label

Look for:

Capacity (e.g., 4GB, 8GB)

- Speed(e.g., DDR4-2666, DDR3-1600)

- Brand/model number

Part 2: RAM Removal

A. Desktop RAM Removal.

1. Open the PC cabinet.
2. Locate RAM in DIMM slots.
3. Press down the side clips on both ends of the slot.
4. RAM will pop up at an angle.
5. Gently pull the RAM stick out by holding it at the edges.

B. Laptop RAM Removal

1. Remove battery and back panel (if needed).
2. Find RAM stick (usually slanted).
3. Pull the side metal clips gently outward.
4. RAM will pop up.
5. Gently pull it out at a 30–45° angle.

Part 3: RAM Installation

A. Desktop RAM Installation

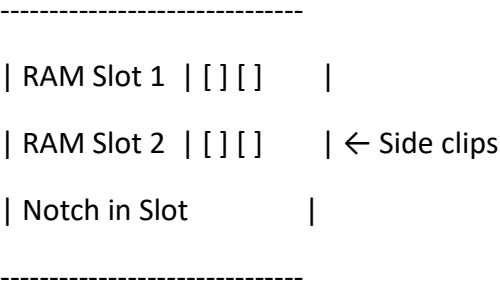
1. Align the notch on RAM with the key in the slot.
2. Firmly press the RAM straight down until both clips click into place.
3. Never force; it should fit snugly with correct orientation.

B. Laptop RAM Installation

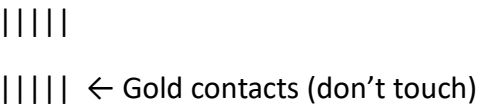
1. Insert RAM at a 30–45° angle into the slot.
2. Push down gently until it lies flat.
3. Metal clips will automatically lock it in place.

Illustrative Diagrams (Use real photos or simplified diagrams in printed version)

[Motherboard RAM Area Diagram]



[Correct RAM Insertion Direction]



Observation Table

Activity	Observation / Notes	
-----	-----	
RAM Type	e.g., DDR4	
Capacity	e.g., 8 GB	
Slot Count	e.g., 2	
Removed Properly	Yes/No	
Installed Properly	Yes/No	
System Booted?	Yes/No (post-installation test)	

Troubleshooting Tips

Issue	Possible Cause	
-----	-----	
System doesn't boot	RAM not seated properly	
Continuous beeping sound	RAM not detected or bad RAM	

| Slower performance | Incompatible or mismatched RAM |

Conclusion

- Identifying, removing, and installing RAM is a basic but crucial skill in PC maintenance.
- Always ensure proper alignment, static safety, and compatibility.
- Successful RAM installation can significantly improve system performance.

Viva Questions (For Lab/Exam)

1. What does DDR stand for?
2. Can DDR4 RAM be used in DDR3 slot? Why or why not?
3. What is the function of RAM in a computer?
4. How can you know if your system supports more RAM?
5. What precautions must be taken before removing RAM?

practical 03:- CMOS Setup (BIOS/UEFI Configuration)

Objective

To learn how to **access**, **navigate**, and **configure settings** in the **CMOS Setup Utility (BIOS/UEFI)** of a computer.

Materials Required

- Desktop or laptop computer
- Keyboard and monitor
- Power source
- Notebook and pen (for observations)
- Optional: Projector for demonstration

Safety Precautions

1. Do **not change unknown BIOS settings** unless instructed.
2. Always **save a backup** or note the original settings before modifying.
3. Only certified personnel should update BIOS firmware.

What is CMOS?

- **CMOS (Complementary Metal-Oxide-Semiconductor)** is a battery-powered chip that stores BIOS/UEFI settings.
- These settings include:
 - **Date & time**
 - **Boot order**
 - **Hardware configuration**
 - **Security settings**
 - **Power management**
 - **Step-by-Step Procedure for CMOS Setup**

Step 1: Accessing CMOS Setup

1. **Turn on the PC.**
2. As soon as the system starts, press the required key repeatedly:
 - Usually Del, F2, F10, Esc, or F12.

3. The **BIOS/UEFI Setup Utility** screen appears.

Step 2: Navigating the CMOS (BIOS/UEFI) Menu

Use:

- Arrow keys to move
- Enter to select
- Esc to go back
- F10 to Save & Exit

Modern UEFI may allow mouse control.

Main BIOS/UEFI Menus and Functions

Menu Name	Description
Main	Shows system info (BIOS version, CPU type, date & time).
Advanced	Allows enabling/disabling CPU features, USB config, etc.
Boot	Sets the boot device priority (e.g., HDD, USB, CD/DVD).
Security	Set up BIOS passwords , secure boot.
Power	Configure power-saving features like sleep, wake on LAN, ACPI.
Exit	Save or discard changes and exit the setup utility.

Menu Name	Description
Main	Shows system info (BIOS version, CPU type, date & time).
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Power	Configure power-saving features like sleep, wake on LAN, ACPI.
Exit	Save or discard changes and exit the setup utility.

Step 3: Key Tasks (Perform One or More)

A. Set System Date and Time

- Go to **Main** tab.
- Select **System Date** or **System Time**.
- Enter correct date/time using keyboard.

B. Change Boot Order

- Go to **Boot** tab.
- Highlight **Boot Priority Order**.
- Use + or – keys to move devices up/down (e.g., USB first).
- Useful for **booting from pendrive** or **installing OS**.

C. Enable/Disable Hardware

- Go to **Advanced > Integrated Peripherals**.
- Enable or disable components like USB, onboard LAN, audio, etc.

D. Set BIOS Password

- Go to **Security** tab.
- Set **User Password** or **Supervisor Password**.
- Enhances security from unauthorized access.

Step 4: Save and Exit

- Press F10 or go to **Exit > Save Changes and Exit**.
- System will reboot.

Observation Table (Sample)

Task Performed	Setting Before	Setting After	Comments
Date/Time Changed	Wrong Date	Corrected Date	System time updated
Boot Order Changed	HDD 1st	USB 1 st	Bootable USB tested
BIOS Password Set	Not Set	Password Set	Login prompt appears

Important Notes

- **CMOS Battery** powers the CMOS chip. If it's dead, settings reset after shutdown.
- **UEFI vs BIOS**: UEFI is newer, graphical, supports larger drives, and faster boot.
- **Conclusion**

CMOS setup is essential for **hardware configuration, booting, and security**. Understanding BIOS/UEFI allows users to troubleshoot and manage computer settings effectively.

Viva Questions (For Lab Evaluation)

1. What is the full form of CMOS?
2. How do you access the BIOS setup?
3. What happens if you remove the CMOS battery?
4. How do you change the boot order?
5. What is the difference between UEFI and BIOS?

6. Why would you set a BIOS password?

Practical 04:- Print a summary of your system hardware

How to Print a Summary of Your System Hardware (Windows)

Method 1: Use "System Information" Tool

Steps:

1. Press Windows + R to open the **Run** dialog box.
2. Type: msinfo32 → Press Enter.
3. The **System Information** window will open.
4. Go to **File > Export**.
5. Save the file (e.g., SystemSummary.txt).
6. Open the file and print it (Ctrl + P or File > Print).

What You'll See in the Summary:

- OS Name and Version
- System Manufacturer
- System Model
- Processor (CPU)
- BIOS Version
- Total RAM (Memory)
- BaseBoard (Motherboard)
- Boot Device
- Available Virtual Memory
- Display and GPU details
- Network Adapters
- Storage devices (SATA/NVMe)

Method 2: Use Command Line (For Quick Summary)

Use Systeminfo Command:

1. Open **Command Prompt** (cmd) as Administrator.
2. Type:
3. systeminfo > "%USERPROFILE%\Desktop\SystemSummary.txt"

4. Press Enter.

5. Open the saved file from your **Desktop**, and print it.

Method 3: Use PowerShell (Detailed & Customizable)

Get-ComputerInfo | Out-File "\$env:USERPROFILE\Desktop\PC_Hardware_Summary.txt"

Practical 05:- Upgrading memory

Objective

To **upgrade the RAM (memory)** in a computer to improve system performance and multitasking capabilities.

Materials Required

- Desktop or laptop computer
- Compatible RAM module (DDR3 / DDR4 / DDR5)
- Screwdriver (for desktop/laptop case)
- Antistatic wrist strap or mat
- User manual or specifications of the system (optional but helpful)

Precautions Before Starting

1. Turn off the PC and unplug it from the power supply.
2. Press and hold the power button for 5 seconds to discharge residual electricity.
3. Use an **antistatic wrist strap** or touch metal before handling RAM.
4. Work in a clean, dry, static-free environment.

Step-by-Step ProcedureStep 1: Check Current RAM & Upgrade Options

A. Check Installed RAM

- On **Windows**:
 - Press Ctrl + Shift + Esc → Go to **Performance > Memory**
 - Or run dxdiag or systeminfo in Command Prompt

B. Identify RAM Type

- Use tools like:
 - **CPU-Z** (Free software)
 - **Crucial System Scanner**
- Note:
 - RAM Type (DDR3/DDR4/DDR5)
 - RAM Speed (MHz)
 - Number of slots used/free

- Max supported memory (Check manufacturer website)

Step 2: Choose the Right RAM Module

- Match the **type**, **speed**, and **voltage**.
- Ensure same generation (DDR3 ≠ DDR4).
- Prefer identical modules for **dual-channel performance**.
- *Example: If your motherboard supports DDR4-3200, get RAM with the same speed and DDR version.*

Step 3: Open the Case and Locate RAM Slots

A. For Desktop:

1. Unscrew and remove the side panel.
2. Locate **DIMM slots** near the CPU.

B. For Laptop:

1. Turn it over and remove the battery (if removable).
2. Unscrew RAM access panel or full back panel.
3. RAM slots are small and horizontal.

Step 4: Install New RAM Module

A. For Desktop:

1. Push the **clips outward** on the RAM slot.
2. Align the **notch** on the RAM with the slot key.
3. Firmly press down until the clips **click into place**.

B. For Laptop:

1. Insert RAM at a 30–45° angle.
2. Push down gently until it **locks flat** under the side clips.

Do **not force** RAM. If it doesn't fit, check alignment and compatibility.

Step 5: Reassemble and Test

1. Reattach panels and plug in the system.
2. Boot the computer.

Step 6: Verify Upgrade

- On **Windows**:
 - Ctrl + Shift + Esc → Performance tab → Memory
 - Or Settings > System > About
- On **BIOS/UEFI**:
 - Enter BIOS on startup (Del, F2, or Esc)
 - Check total memory detected

Observation Table

Step	Observation	Status
RAM Type Installed	DDR4 2666MHz	✓
Total Memory Before	4 GB	✓
Total Memory After	8 GB (4 GB + 4 GB)	✓
System Booted?	Yes	✓
Performance Improved Faster multitasking observed		✓

Troubleshooting

Problem	Solution
System beeps on boot	RAM not seated correctly, reinsert carefully
RAM not detected	Check compatibility, try slot swap
PC fails to boot	Use old RAM only → check if new RAM is faulty

Conclusion

- RAM upgrades can significantly improve system speed and responsiveness.
- Always match the type, speed, and capacity supported by your system.
- Proper handling avoids physical and static damage.

Viva Questions (Lab Exam)

1. What is the function of RAM in a computer?
2. Can you mix different RAM sizes or speeds?

3. How do you identify the type of RAM your system uses?
4. What is dual-channel memory?
5. What precautions should be taken when installing RAM?

Practical 06:- Hard Drive & Optical Drive Installation

Objective

To learn how to **install and connect a hard drive (HDD/SSD)** and an **optical drive (CD/DVD)** in a desktop computer system.

Materials Required

- Desktop computer (opened)
- **SATA Hard Disk Drive** or **SSD**
- **Optical Drive** (DVD-RW or CD-RW)
- **SATA data cables** (usually red)
- **Power supply cables** (SATA power)
- Screwdriver set
- Screws for mounting
- Antistatic wrist strap or mat

Safety Precautions

1. Disconnect all power sources before opening the case.
2. Use an **antistatic wrist strap**.
3. Handle drives from edges; avoid touching connector pins.
4. Use correct screws and don't overtighten.

Part 1: Hard Drive (HDD/SSD) Installation

Step-by-Step Procedure

Step 1: Prepare the System

- Shut down PC and unplug power cable.
- Open the side panel of the CPU case.

Step 2: Mount the Hard Drive

1. Locate the **3.5" bay** (for HDD) or **2.5" bay** (for SSD).
2. Slide the drive into the tray from the front or side.
3. Secure it using **screws** or **tool-free clips**.

Step 3: Connect Data and Power Cables

- Connect **SATA Data Cable** to the hard drive and to a SATA port on the **motherboard**.
- Connect **SATA Power Cable** from the **power supply** to the drive.

Note: SATA ports on motherboard are labeled as SATA0, SATA1, etc.

Step 4: Close and Boot

- Reassemble the case.
- Power on the computer and enter BIOS (Del, F2) to check drive detection.

Step 5: Initialize in Windows (if needed)

- Go to:
 - Disk Management (Right-click Start > Disk Management)
 - Initialize new drive (MBR or GPT)
 - Format and assign a drive letter

Part 2: Optical Drive Installation (CD/DVD Drive)

Step-by-Step Procedure

Step 1: Locate 5.25" Bay

- It's usually at the top front of the case.

Step 2: Insert the Optical Drive

1. Remove front panel cover (if needed).
2. Slide the optical drive from the front into the **5.25" bay**.
3. Secure with screws on both sides.

Step 3: Connect Data and Power Cables

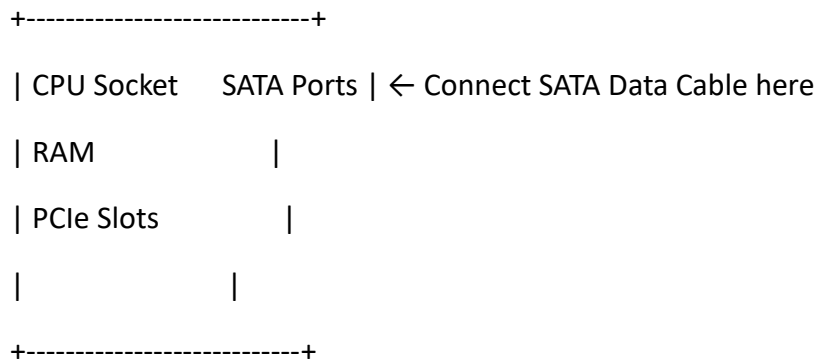
- Connect **SATA Data Cable** to drive and motherboard.
- Connect **SATA Power Cable** from power supply.

Step 4: Reassemble and Test

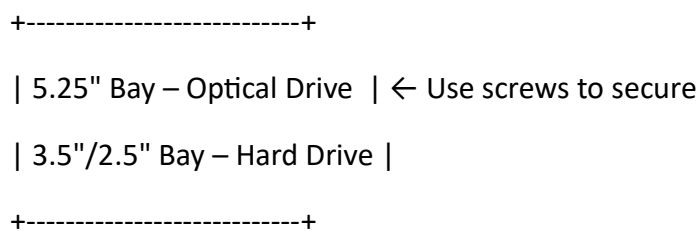
- Reattach case panel.
- Power on the PC.
- Check in **BIOS** or **This PC** (Windows Explorer) for detection.

Diagram Description (For Report/Worksheet)

[Motherboard View]



[Drive Bays View]



[Power Supply Cables]

→ SATA Power → Drives

Observation Table

Component	Type	Slot Used	Detected in BIOS	Detected in OS
Hard Drive	SATA HDD 1TB	SATA1	Yes/No	Yes/No
Optical Drive	DVD-RW	SATA2	Yes/No	Yes/No

Conclusion

You've successfully installed and connected both the **hard disk** and the **optical drive**. These components are essential for data storage, OS boot, and media access.

Viva Questions

1. What is the difference between SATA and IDE drives?
2. What is the function of an optical drive?
3. Why is it necessary to initialize a new hard drive?
4. Can you use SSD and HDD together in a system?
5. What does MBR and GPT mean in disk initialization?



Practical 07:-How to recover data on hard drive.

Experiment Title

"Recovering Data from a Hard Drive using Software Tools"

Objective

To learn and perform data recovery from a hard disk drive (HDD) or solid-state drive (SSD) using free and commercial software tools.

Materials Required

- Computer system (working)
- Faulty or formatted hard drive (internal or external)
- USB-to-SATA adapter (if external connection is needed)
- Data recovery software:
 - **Recuva** (Free)
 - **PhotoRec** or **TestDisk** (Advanced users)
 - **EaseUS Data Recovery** or **Disk Drill** (Free Trial)
- External storage drive (for recovered data)
- Pen drive with Linux (for optional method)

Safety Precautions

1. Do not install software on the same drive you're trying to recover.
2. Never write recovered data back to the source drive.
3. Avoid using CHKDSK on physically damaged drives.
4. Use antivirus to scan recovered files before use.

Theory

What is Data Recovery?

Data recovery is the process of retrieving inaccessible, lost, deleted, or formatted data from storage devices such as hard drives, SSDs, USB drives, or SD cards.

Common Data Loss Scenarios:

- Accidental file deletion

- Drive formatting
- File system corruption
- Virus/malware attack
- Physical damage (head crash, motor failure)

Procedure

Step 1: Identify the Issue

- Connect the affected hard drive to a working computer.
- Check if the drive is:
 - Detected in **File Explorer**
 - Detected in **Disk Management**
 - Detected in **BIOS/UEFI**

Step 2: Use Recovery Software (Recuva Example)

1. **Install Recuva** on a working drive (not the drive to recover).
2. Launch Recuva.
3. Select the type of files to recover (e.g., Pictures, Documents).
4. Select the drive where files were deleted/lost.
5. Click **Scan** (choose Deep Scan for formatted drives).
6. Preview and select the files to recover.
7. Save recovered files to another **external drive**.

Step 3: Use TestDisk/PhotoRec (Optional Advanced Tool)

1. Download **PhotoRec**.
2. Run the .exe (no installation needed).
3. Select the affected drive.
4. Choose file formats to recover.
5. Select destination folder on another drive.
6. Start recovery.

Note: TestDisk can also recover lost partitions.

Step 4: Linux Live OS Method (Optional)

1. Create a **bootable Ubuntu USB**.
2. Boot into Ubuntu (Try Without Installing).
3. Open **Files** and check if drive is readable.
4. Copy important files to another USB or external disk.

Observation Table

Activity	Tool Used	Outcome	Status
Drive detection	Disk Mgmt	Detected	✓ / ✗
Recuva scan	Recuva	Found 120 files	✓ / ✗
Deep scan recovery	PhotoRec	Recovered 80% files	✓ / ✗
Linux file access	Ubuntu Live	Copied manually	✓ / ✗
File integrity checked	Open files	Verified 75% successful	✓ / ✗

Result

The student was able to successfully recover lost/deleted data from a formatted hard drive using appropriate tools and methods.



Viva Questions

1. What is the difference between Recuva and PhotoRec?
2. Can you recover data from a physically damaged drive?
3. Why is it important not to write recovered files to the same drive?
4. How does deep scan differ from quick scan?
5. What precautions should be taken before performing data recovery?

Conclusion

- Data recovery is possible in most **logical failure cases** using software.
- Always back up data regularly to avoid permanent loss.
- Physical drive issues require **professional recovery labs**.

Homework / Extension Activity

- Try recovering data from a USB drive using Recuva.
- Explore and write a report comparing **Recuva vs. EaseUS** features.

Practical 08:- Trouble shooting keyboard, monitor, printer.

- (a) few keys do not work.
- (b) keyboard does not work at all.
- (c) key continuous to repeat after being released.
- (d) key produces wrong character.
- (e) power light(led) does not go on, no picture.
- (f) power LED light is on no picture power up.
- (g) power on but monitor display wrong character.

Aim:

To identify and troubleshoot common hardware issues related to the keyboard, monitor, and printer.

Apparatus/Tools Required:

- Computer system (CPU, monitor, keyboard, printer)
- Spare keyboard and monitor for testing
- Power cables, VGA/HDMI cables
- Compressed air or cleaning brush
- Driver installation software or internet connection

A. Keyboard Troubleshooting

Problem	Cause	Troubleshooting Steps
(a) Few keys do not work	- Dust or debris under keys- Physical damage- Circuit failure	- Clean keyboard with compressed air- Try another keyboard to test- Replace if still not working
(b) Keyboard does not work at all	- Loose or disconnected cable- Faulty USB port- Driver issue	- Check USB/PS2 connection- Try another port- Restart system- Update/reinstall drivers from Device Manager
(c) Key continues to repeat after being released	- Sticky keys setting enabled- Physical key stuck	- Check for stuck key- Disable Sticky Keys (Control Panel → Ease of Access)

Problem	Cause	Troubleshooting Steps
(d) Key produces wrong character	- Wrong keyboard layout selected- Input language mismatch	- Go to Settings → Time & Language → Language → Set correct input method (e.g., English - US)

B. Monitor Troubleshooting

Problem	Cause	Troubleshooting Steps
(e) Power light (LED) does not go on, no picture	- Power cable unplugged- Faulty monitor or power source	- Ensure power cable is connected properly- Try another power outlet- Replace power cord or test another monitor
(f) Power LED is on, but no picture during power-up	- Loose video cable- No signal from CPU- Incorrect input source	- Check VGA/HDMI/DisplayPort cable- Restart system- Use monitor menu to select correct input- Test monitor on another system
(g) Power on but monitor displays wrong characters	- Graphics driver issue- RAM/GPU problem- Display resolution set incorrectly	- Boot into Safe Mode and update display driver- Adjust screen resolution- Check with another monitor

C. Printer Troubleshooting (Add-on for completeness)

Common Problem	Cause	Troubleshooting Steps
Printer not printing	- Not set as default- Connection issue	- Set as default printer- Check USB/Wi-Fi connection- Restart print spooler service
Paper jam	- Misfed paper	- Open all covers- Gently remove jammed paper- Reload paper correctly
Low print quality	- Low ink/toner- Dirty heads	- Replace cartridge- Clean print heads using utility software

Conclusion:

Through systematic checking of connections, settings, and drivers, most hardware problems related to the keyboard, monitor, and printer can be identified and resolved efficiently.

Practical 09:- printer problem

1.Laser printer

(a) printer never leaves warm -up mode

(b) paper jam message is display.

(c) printed message is distorted.

2.DMP (Dot Matrix Printers)

(a) print head moves back and forth but nothing prints

(b) print self-test work but from a computer application does not work etc.

Aim:

To identify and troubleshoot common hardware and printing issues in **Laser Printers** and **Dot Matrix Printers (DMP)**.

Tools Required:

- Laser printer / Dot Matrix Printer
- System with installed drivers
- Power and data cables
- Test print page (for self-test)
- Cleaning kit (if needed)

1. Laser Printer Problems

Problem	Possible Causes	Troubleshooting Steps
(a) Printer never leaves warm-up mode	- Faulty fuser unit- Power supply issue- Temperature sensor malfunction	- Power cycle the printer- Replace fuser unit if needed- Contact service if internal sensor failure
(b) Paper jam message is displayed (but no jam found)	- Jam sensor stuck or dirty- Partial jam not visible- Incorrect paper path	- Open all compartments and check thoroughly- Clean paper path and sensors- Reload paper properly

Problem	Possible Causes	Troubleshooting Steps
(c) Printed message is distorted	- Bad toner cartridge- Defective drum or laser scanner- Dirty corona wire	- Replace toner cartridge- Clean internal components carefully- Try printing from another application to confirm

2. DMP (Dot Matrix Printer) Problems

Problem	Possible Causes	Troubleshooting Steps
(a) Print head moves back and forth but nothing prints	- Empty ribbon- Ribbon not properly installed- Head or cable fault	- Check and replace ribbon- Reinstall ribbon properly- Inspect print head connector
(b) Print self-test works but not printing from application	- Driver issue- Wrong port selected- Application misconfiguration	- Reinstall/update printer driver- Check printer port settings (LPT1/USB/COM)- Try printing from another application
(c) Printer prints garbage characters	- Wrong printer driver- Communication error- Corrupted data	- Install correct driver- Use correct emulation (e.g., Epson FX/LQ)- Check data cable and software settings
(d) Paper feeding problems	- Misaligned tractor feed- Wrong paper type- Worn-out rollers	- Align paper guides properly- Use correct paper size/type- Clean or replace rollers

Conclusion:

Laser and DMP printers require regular checks on **hardware components, ribbon/toner**, and **driver/software configurations**. Most issues can be fixed by methodical troubleshooting and ensuring all settings and parts are correctly aligned and clean.

Practical 10:- Installation of Operating System

Aim:

To learn and perform the step-by-step installation of an Operating System (e.g., **Windows 10/11, Linux Ubuntu**, etc.) on a computer.

Apparatus/Tools Required:

- Computer or laptop
- Operating System bootable device (DVD or USB)
- Product key (if required)
- Stable power supply
- Backup device (optional, for data)

Pre-Installation Checklist:

1. **Backup** existing data from the hard drive (if reinstalling).
2. **Create a bootable USB/DVD** with the OS ISO image.
3. **Check system requirements** (RAM, HDD, processor).
4. Connect to **power source** and plug in the **bootable device**.

Steps to Install Windows OS (e.g., Windows 10)

Step	Description
1. Boot from USB/DVD	Insert USB/DVD → Restart PC → Press BIOS key (F2/F12/ESC/DEL) → Set USB/DVD as 1st Boot Device
2. Start Installation	After booting, "Windows Setup" will load. Click Next → Click Install Now
3. Enter Product Key	Enter product key (if required) → Or click "I don't have a product key" to activate later
4. Accept License Terms	Check the box to accept license agreement → Click Next
5. Choose Installation Type	Choose " Custom: Install Windows only (Advanced) "
6. Partition Hard Disk	Select the drive → Click on Delete / Format / New to create partitions → Select drive for OS installation

Step	Description
7. Installing Windows	Installation starts and system may reboot several times automatically
8. Setup Personalization	Set region, language, keyboard layout → Create username and password
9. Final Settings	Choose privacy settings → Finish setup

Windows is now installed!

Basic Steps to Install Linux (e.g., Ubuntu)

Step	Description
1. Boot from USB	Insert Ubuntu bootable USB → Restart PC → Enter BIOS → Boot from USB
2. Start Installer	Select " Install Ubuntu " from menu
3. Keyboard and Updates	Choose keyboard layout → Select whether to install updates during install
4. Installation Type	Choose: Erase disk (for clean install) or Install alongside (dual-boot)
5. Partitioning	If manual, create root (/), swap, and home partitions
6. Set User Info	Enter name, computer name, password
7. Begin Installation	Wait till completion → Reboot and remove USB when prompted

Ubuntu/Linux is now installed!

Conclusion:

Operating System installation involves preparing the system, selecting appropriate options during setup, and configuring user settings. Careful step-by-step execution ensures a successful installation.

Practical 11:- Installation of Network Card

Aim:

To understand and perform the installation of a **Network Interface Card (NIC)** in a computer system.

Apparatus/Tools Required:

- Desktop PC (or laptop with expansion slot)
- Internal or external Network Interface Card (Ethernet/Wi-Fi)
- Screwdriver set (for internal NIC)
- Driver software (CD or downloaded installer)
- Operating System (Windows/Linux)
- Internet access (optional, for driver updates)

Types of Network Cards:

Type	Interface	Use Case
Internal NIC	PCI/PCIe slot	Desktop PCs
External NIC	USB port	Laptops or temporary use
Onboard NIC	Built into motherboard	Modern PCs, no installation needed

Steps to Install an Internal Network Card (PCI/PCIe)

Step	Description
1. Power Off and Unplug	Turn off the computer and unplug the power cable.
2. Open the Cabinet	Use a screwdriver to open the CPU case (side panel).
3. Locate PCI/PCIe Slot	Identify a free PCI/PCIe slot on the motherboard.
4. Insert the Network Card	Align the card with the slot and press firmly until it is seated. Screw it to fix in place.
5. Close the Cabinet	Replace the side panel and tighten screws.
6. Boot the System	Power on the computer.

Step	Description
7. Install Driver Software	If not auto-detected, install driver from CD or official website.
8. Verify Installation	Go to Device Manager (Windows) or lspci (Linux) to confirm the NIC is detected and working.

Steps to Install an External Network Card (USB Wi-Fi Dongle or Adapter)

Step	Description
1. Plug into USB Port	Insert the external NIC into an available USB port.
2. Driver Installation	Most USB NICs are plug-and-play; else, install driver manually.
3. Check Network Icon	Confirm the network icon appears in the system tray.
4. Connect to Network	Go to network settings and connect to Wi-Fi or LAN.

Post-Installation Check:

Check	How to Verify
Device status	Go to Device Manager → Network Adapters
Internet access	Ping a website: ping google.com
IP Address assigned	ipconfig (Windows) or ifconfig/ip a (Linux)
Driver working	No yellow exclamation mark in Device Manager

Conclusion:

Installing a network card is a simple hardware and software task that enables a computer to connect to a network. Understanding proper slot selection, safe handling, and driver installation is essential.

Practical 12:- Preparing the UTP cable for cross and direct connections using crimping tool

Experiment Title:

Preparing the UTP cable for Straight-through (Direct) and Crossover connections using a Crimping Tool

Objective:

To create and test:

- **Straight-through UTP cable** (for connecting dissimilar devices like PC to Switch)
- **Crossover UTP cable** (for connecting similar devices like PC to PC)

Apparatus / Materials Required:

Item	Quantity
UTP Cable (Cat5e/Cat6)	As needed
RJ-45 Connectors	4
Crimping Tool	1
Cable Tester (optional)	1
Wire Stripper/Cutter	1
Marker and Labels	Optional

Theory:

UTP (Unshielded Twisted Pair) cables are used for Ethernet networking. There are **two types of terminations**:

1. Straight-through Cable

- Used to connect **different devices**.
- **Same wiring standard** at both ends.
- **Common standard**: T568B – T568B

2. Crossover Cable

- Used to connect **similar devices**.

- **Different wiring standards** at both ends.
- **Standard:** T568A – T568B

Wiring Standards:

Pin T568A (Crossover End) T568B (Straight End)

1	White/Green	White/Orange
2	Green	Orange
3	White/Orange	White/Green
4	Blue	Blue
5	White/Blue	White/Blue
6	Orange	Green
7	White/Brown	White/Brown
8	Brown	Brown

Procedure:

Step 1: Strip the Cable

- Cut the UTP cable to the required length.
- Strip about **1 inch (2.5 cm)** of the outer jacket using the wire stripper.

Step 2: Untwist & Arrange Wires

- Carefully untwist the 4 pairs (8 wires).
- Arrange them in the **correct order** based on the wiring type (T568A or T568B).

Step 3: Trim Wires

- Align the wires flat and trim them evenly so they are **about 1.5 cm** in length.

Step 4: Insert into RJ-45 Connector

- Insert the wires into the RJ-45 connector carefully.
- Ensure each wire goes into its correct slot and touches the end of the connector.

Step 5: Crimp the Connector

- Insert the RJ-45 plug into the crimping tool.

- Press down firmly to secure the connector onto the cable.

Step 6: Repeat for Other End

- For **straight-through**: Use same standard (T568B or T568A) on both ends.
- For **crossover**: Use T568A on one end and T568B on the other.

Step 7: Test the Cable (Optional but Recommended)

- Use a cable tester to check for continuity and correct pinout.

Observations:

Cable Type	End A Wiring	End B Wiring	Test Result
Straight-through	T568B	T568B	Pass/Fail
Crossover	T568A	T568B	Pass/Fail

Diagrams:

Straight-through (T568B - T568B):

End A	End B
-----	-----
1 W-O	1 W-O
2 O	2 O
3 W-G	3 W-G
4 B	4 B
5 W-B	5 W-B
6 G	6 G
7 W-Br	7 W-Br
8 Br	8 Br

Crossover (T568A - T568B):

End A (T568A)	End B (T568B)
-----	-----

1 W-G 1 W-O

2 G 2 O

3 W-O 3 W-G

4 B 4 B

5 W-B 5 W-B

6 O 6 G

7 W-Br 7 W-Br

8 Br 8 Br

Result:

- Successfully prepared and tested both Straight-through and Crossover UTP cables using a crimping tool.

Precautions:

- Do not untwist the pairs more than necessary (to avoid interference).
- Ensure wires are fully inserted before crimping.
- Use a cable tester to verify functionality.

Practical 13:- Installation of a switch and connecting systems to a network switch.

Objective:

- To install a **network switch** in a LAN environment.
- To connect **multiple systems (computers)** to the switch using **UTP cables**.
- To verify network connectivity between connected systems.

Apparatus / Materials Required:

Item	Quantity
Network Switch (8/16/24 port)	1
UTP Cables (Cat5e/Cat6)	As required
RJ-45 Connectors	As required
Crimping Tool	1
Computers/Systems	2 or more
Power Source	1
Cable Tester (Optional)	1

Theory:

A **network switch** is a central device that connects multiple devices (like computers, printers, etc.) in a Local Area Network (LAN). Unlike hubs, switches are intelligent and send data only to the intended recipient device.

Switches use **MAC addresses** to forward data frames, making the network faster and more secure.

Procedure:

Step 1: Preparing the Setup

1. Place the **network switch** in a central location (rack/table).
2. Ensure all **computers** are arranged properly and turned **off** during cable connection.

Step 2: Powering the Switch

1. Plug the **switch's power adapter** into an electrical outlet.

2. Turn **on** the switch and confirm that **power LED** is lit.

Step 3: Connect UTP Cables

1. Create **straight-through UTP cables** using crimping tool if not available.
2. Connect one end of each UTP cable to the **Ethernet port** on each computer.
3. Connect the other end of each cable to the **available ports on the switch**.

Step 4: Configure IP Addresses (Manual Setup)

1. Go to each system:
 - **Control Panel > Network and Sharing Center > Change Adapter Settings**
 - Right-click on **Ethernet > Properties**
 - Click on **Internet Protocol Version 4 (TCP/IPv4)** and set:
 - IP Address: 192.168.1.X (X = 2,3,4... for each computer)
 - Subnet Mask: 255.255.255.0
 - Default Gateway: 192.168.1.1 (if router present)

Step 5: Verify Network Connection

1. Open **Command Prompt** in each system.
2. Use the command:
3. ping 192.168.1.X

(Ping the IP address of another computer to test connectivity.)

Observations:

System Name	IP Address	Connected to Switch Port	Ping Result (Success/Fail)
-------------	------------	--------------------------	----------------------------

PC1	192.168.1.2	Port 1	Success
PC2	192.168.1.3	Port 2	Success
PC3	192.168.1.4	Port 3	Success

Result:

- Switch was successfully installed.
- All systems connected via UTP cables.

- Network communication was verified using the **ping** command.

Precautions:

- Always power off systems when connecting hardware.
- Ensure IP addresses are in the **same subnet**.
- Use **straight-through cables** to connect PC to switch.
- Avoid using damaged cables or loose connectors.

Conclusion:

By completing this experiment, we learned how to:

- Install and power a network switch,
- Connect multiple systems using UTP cables,
- Manually assign IP addresses,
- Test connectivity using the ping command.

Practical 14:- Installation of a modem (internal, external or USB) and connecting to internet.

Objective:

- To install a **modem** (internal, external, or USB type) on a computer system.
- To configure the modem settings.
- To establish an **internet connection** using the modem.

Apparatus / Materials Required:

Item	Quantity
Computer System	1
Modem (Internal / External / USB)	1
Telephone Line / DSL / Fiber cable	1
Power Adapter (for external modem)	1
USB cable / Serial cable (as required)	1
ISP (Internet Service Provider) account details	1
Modem Driver CD or file	1

Theory:

A **modem (Modulator-Demodulator)** is a device that converts digital signals from a computer into analog signals for transmission over telephone lines and vice versa.

There are **three main types** of modems:

1. **Internal Modem** – Installed inside the CPU cabinet on a PCI slot.
2. **External Modem** – Separate device connected via serial or USB port.
3. **USB Modem** – Plug-and-play device connected via USB port, often used for mobile broadband.

Procedure:

Part A: Internal Modem Installation

1. Power off the computer and unplug it.
2. Open the CPU cabinet and locate an empty **PCI slot**.

3. Insert the internal modem card carefully and screw it in place.
4. Close the cabinet and reconnect power.
5. Start the system. The OS will detect the new hardware.
6. Insert the **driver CD** (if required) and install the modem driver.
7. Connect a **telephone line** to the modem's **Line In** port.

Part B: External or USB Modem Installation

1. Connect the **modem to power** using its adapter (external only).
2. Connect the modem to the computer via **USB or serial port**.
3. Plug in the **telephone line** or **network cable** into the modem.
4. Power on the modem and the computer.
5. The system may auto-detect the modem. If not, install the modem driver manually.
6. Follow the wizard to install the driver and complete setup.

Part C: Configuring Internet Connection (Windows Example)

1. Open **Control Panel > Network and Internet > Network Connections**.
2. Click on "**Set up a new connection or network**".
3. Choose "**Connect to the Internet**".
4. Select the appropriate connection type:
 - **Dial-up** for telephone line.
 - **Broadband (PPPoE)** for DSL.
 - **Mobile broadband** for USB dongle.
5. Enter **ISP username and password** if required.
6. Click **Connect**.

Testing the Connection

1. Open a web browser.
2. Visit a website like: www.google.com.
3. Alternatively, use the **ping command**:
4. `ping www.google.com`

If replies are received, the connection is successful.

Observations Table:

Type of Modem	Connection Interface	Driver Installed	ISP Details Entered	Internet Status
---------------	----------------------	------------------	---------------------	-----------------

USB Modem	USB Port	Yes	Yes	Connected
External Modem	Serial Port	Yes	Yes	Connected

Result:

- Modem was successfully installed (internal/external/USB).
- Internet connection was established and verified.

Precautions:

- Always turn off the power supply before installing internal hardware.
- Ensure modem drivers are compatible with the operating system.
- Use correct ISP settings (username/password, access number).
- Avoid static discharge by grounding yourself before handling internal modems.

Conclusion:

This experiment demonstrates how to:

- Physically install different types of modems,
- Install appropriate drivers,
- Configure system settings to establish internet access.

Practical 15:- Using FTP for uploading and downloading files.

Objective:

- To use the **FTP (File Transfer Protocol)** to upload and download files between a **client** and a **server**.
- To understand basic FTP **commands** and **GUI tools**.

Apparatus / Materials Required:

Item	Quantity
Computer with Internet/LAN access	1 or more
FTP Server (local or online)	1
FTP Client Software (FileZilla/Command Prompt)	1
Valid FTP Username and Password	1
Files for Upload/Download	As required

Theory:

FTP (File Transfer Protocol) is a standard network protocol used to **transfer files** between a client and a server over a TCP/IP network.

FTP works in:

- **Active Mode** or **Passive Mode**
- **Command-Line Interface (CLI)** or **Graphical User Interface (GUI)**

Default FTP port: **21**

Procedure:

Method 1: Using FTP via Command Prompt

Step 1: Open Command Prompt

- Press Win + R, type cmd, and hit Enter.

Step 2: Connect to FTP Server

ftp ftp.example.com

- Replace ftp.example.com with the **actual FTP server address**.

Step 3: Login

- Enter **username** and **password** when prompted.

Step 4: View Files on Server

ls

Step 5: Download File from Server to Client

get filename.txt

Step 6: Upload File from Client to Server

put filename.txt

Step 7: Exit FTP Session

bye

Method 2: Using GUI Client (FileZilla)

Step 1: Open FileZilla

Step 2: Enter FTP Server Details

- **Host:** ftp.example.com
- **Username:** your_username
- **Password:** your_password
- **Port:** 21 (default)

Click **Quickconnect**.

Step 3: Interface Overview

- **Left Pane:** Local computer files
- **Right Pane:** Remote server files

Step 4: Upload a File

- Drag file from **left pane** to **right pane** (local to server).

Step 5: Download a File

- Drag file from **right pane** to **left pane** (server to local).

Step 6: Disconnect

- Click **Server > Disconnect** after file transfer.

Observations:

Operation File Name Method Used Success (Yes/No)

Upload report.txt FileZilla Yes

Download data.csv FTP (CMD) Yes

Result:

- FTP was successfully used to upload and download files using both **command line** and **GUI-based tools**.

Precautions:

- Always ensure correct **server address** and **login credentials**.
- Check **file permissions** on the server before uploading.
- Avoid uploading sensitive files to public FTP servers.
- Use **SFTP** for secure file transfers.

Conclusion:

This experiment demonstrates the practical use of **FTP** for file transfers using:

- **Command-line interface**
- **Graphical FTP client**

Practical 16:- Installation and configuring the proxy server for internet access..

Objective:

- To install and configure a **proxy server** to manage and monitor **internet access**.
- To understand how a proxy server works and how clients use it to access the internet.

Apparatus / Materials Required:

Item	Quantity
Computer System (Server)	1
Computer Systems (Clients)	1 or more
Internet Connection	1
Operating System (Linux/Windows)	1
Proxy Server Software (e.g., Squid for Linux or CCProxy/WinGate for Windows)	1
LAN Switch and Cables	As needed
Web Browser	Installed on clients

Theory:

A **proxy server** acts as an intermediary between a client and the internet. It receives client requests, forwards them to the destination server, and returns the response to the client.

Functions of a Proxy Server:

- Content caching
- Access control
- Logging and monitoring
- Web filtering

Procedure:

Method 1: Installing & Configuring a Proxy Server in Linux using Squid

Step 1: Install Squid Proxy Server

For Debian/Ubuntu:

```
sudo apt update
```

```
sudo apt install squid -y
```

For RHEL/CentOS:

```
sudo yum install squid -y
```

Step 2: Configure Squid

1. Open the configuration file:

```
sudo nano /etc/squid/squid.conf
```

2. Edit or add the following:

```
http_port 3128
```

```
acl localnet src 192.168.1.0/24
```

```
http_access allow localnet
```

3. Save and exit.

Step 3: Start & Enable Squid Service

```
sudo systemctl start squid
```

```
sudo systemctl enable squid
```

Step 4: Configure Client System

1. Go to browser settings on client PC.
2. Set **Manual Proxy**:
 - Address: IP of proxy server (e.g., 192.168.1.1)
 - Port: 3128
3. Try browsing a website to confirm connectivity.

Method 2: Installing Proxy Server in Windows using CCProxy

Step 1: Download & Install CCProxy

- Download from: <https://www.youngzsoft.net/ccproxy/>
- Install and launch the application.

Step 2: Configure CCProxy

- Click on **Options**:

- Enable **HTTP, HTTPS, FTP**, etc.
 - Set the **port** (default: 808)
 - Optionally, create **user accounts** for access control.
- Click **OK** and **Start** the proxy server.

Step 3: Configure Client System

1. Open browser > Settings > Network/Proxy.
2. Set:
 - Proxy IP: IP of Windows system running CCProxy (e.g., 192.168.1.100)
 - Port: 808
3. Save and test internet access.

Observations:

Client System	Proxy IP	Port	Access	Success	Comments
PC1	192.168.1.1	3128	Yes		Squid Proxy
PC2	192.168.1.100	808	Yes		CCProxy Windows

Result:

- Proxy server was successfully installed and configured.
- Clients accessed the internet via the proxy server.

Precautions:

- Ensure the proxy server and client are on the same **network/subnet**.
- Configure firewall to allow proxy port (3128 or 808).
- Regularly monitor logs to avoid misuse.
- Use **authentication** for secure access.

Conclusion:

This lab demonstrates how to:

- Install a proxy server (Linux/Windows)
- Configure settings to control internet access
- Redirect client web traffic through the proxy

