Computer Hardware & Networking& Server Configurations (H7E3 04)

UNIT 01
Introduction to Computer Hardware, PC Components and Functionalities

Lecturer: Thilina Rajakaruna

BEng(SEng), SCQF Level 7(EQF 5)(SEng), SCQF Level 8(EQF 5)(SEng), PgDip(Edu)

Download me here !

Central Processing Unit (CPU)

- The CPU is known as the brain of the computer.
- It is also referred to as the processor.
- The CPU executes a program, which is a sequence of stored instructions.

- Two major CPU architectures related to instruction sets:
  - **Reduced Instruction Set Computer (RISC)**
  - **Complex Instruction Set Computer (CISC)**
- The amount of data that a CPU can process at one time depends on the size of the processor data bus.

- Speed of the CPU is measured in cycles per second-megahertz (**MHz)** or gigahertz (**GHz**).

- **Overclocking** is a technique used to make a processor work at a faster speed than its original specification.

The latest processor technology has resulted in CPU manufacturers finding ways to incorporate more than one CPU core onto a single chip.

- **Single Core CPU** – One core inside a single CPU chip that handles all of the processing capability. A motherboard manufacturer may provide sockets for more than one single processor, providing the ability to build a powerful, multi-processor computer.

- **Dual Core CPU** – Two cores inside a single CPU chip in which both cores can process information at the same time.

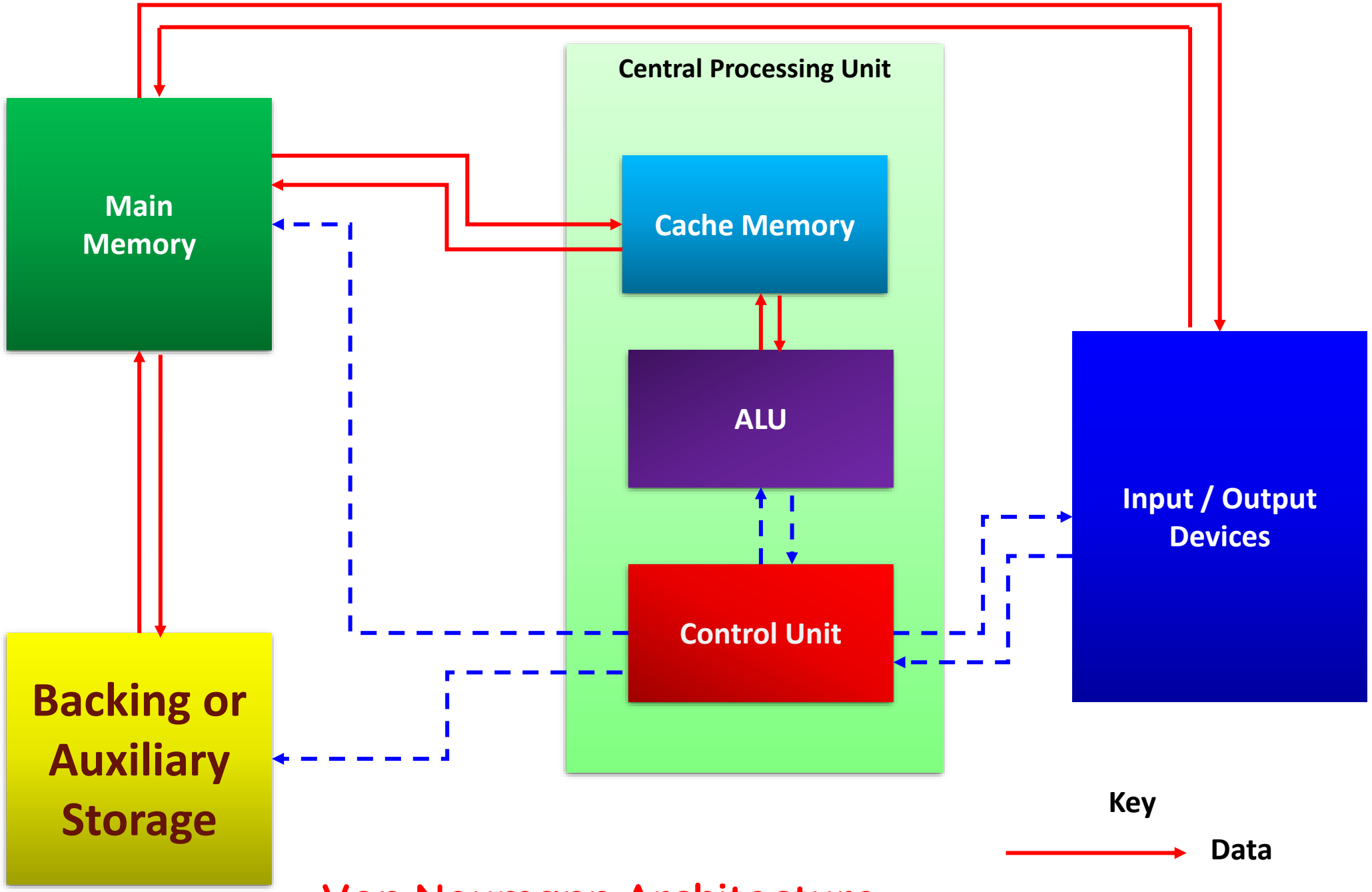
- **Triple Core CPU** – Three cores inside a single CPU that is actually a quad-core processor with one of the cores disabled.

- **Quad Core CPU** – Four cores inside a single CPU in which all cores can process information simultaneously for enhanced software applications.

- **Hexa-Core CPU** - Six cores inside a single CPU

- **Octa-Core CPU** - Eight cores inside a single CPU

Elements of the CPU



Von Neumann Architecture

The CPU consists of 3 Major Components

1. The Arithmetic and Logical Unit (ALU)
2. The Memory Unit
3. The Control Unit

Arithmetic & Logical Unit (ALU)

- Caries out mathematical tasks rapidly, performs calculations and logic operations in binary form 1 and 0 on data from the memory unit.

- The ALU transforms the digital data and outputs the resulting value.

Memory Unit

- Memory Unit consists of a small numbers of memory registers which will store items of data and send them to the ALU for processing.

- The result of the processing will be copied back to the memory unit for storage.

Control Unit

- Is in charge of processing.
- It interprets the software instruction and sends the right data and operation to the ALU.
- It accepts the result of the processing from the ALU and sends it back to the memory unit.
- The Control Unit will keep track of the sequence of instructions and the location of each item of data and software instruction in the memory unit.

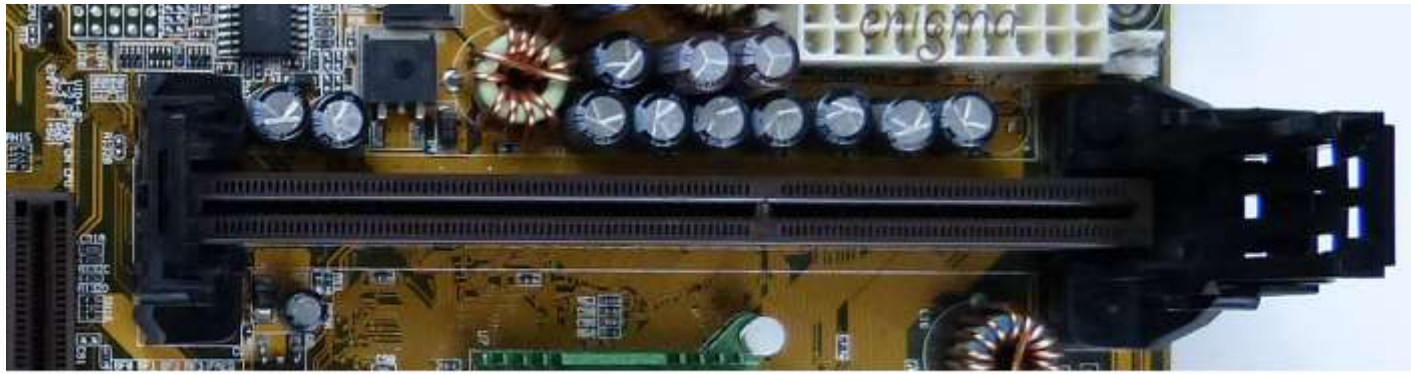
Intel Processor Generations

1. Pentium 1, 2, 3, 4
2. Celeron
3. Pentium Pro
4. Pentium M and Celeron M for mobile devices
5. Pentium Dual Core
6. Core Solo
7. Core Duo
8. Core 2 Duo
9. Core 2 Quad
10. Core i Series (i3, i5, i7,i9)

Pentium Processor Socket Types

Pentium Slot :

Slot One – Pentium 1, Pentium 2

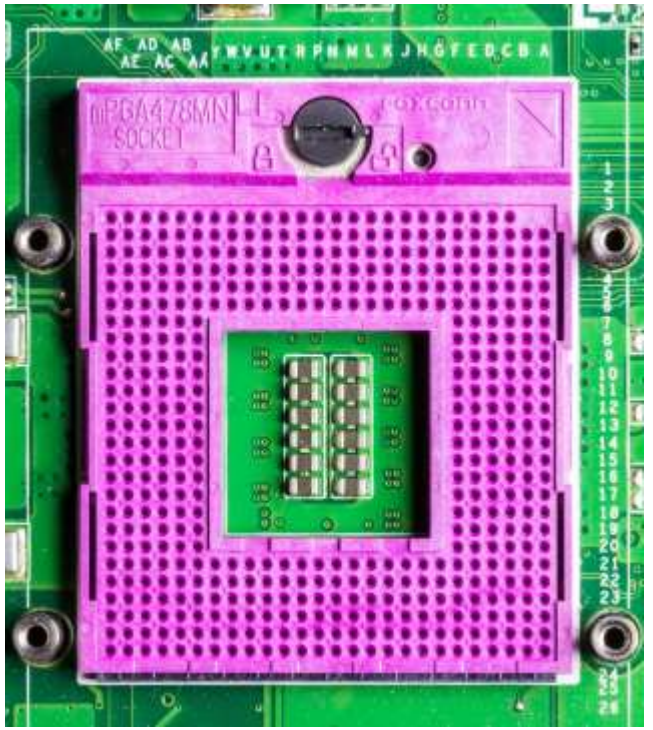


Slot One

Pentium Pin:

PGA 478 –

Pentium 2, Pentium 3, Pentium 4, Celeron



PGA 478

Pentium Pin less:

LGA 775 –

Pentium 4, Dual Core, Celeron, Core 2 Duo, Quad Core

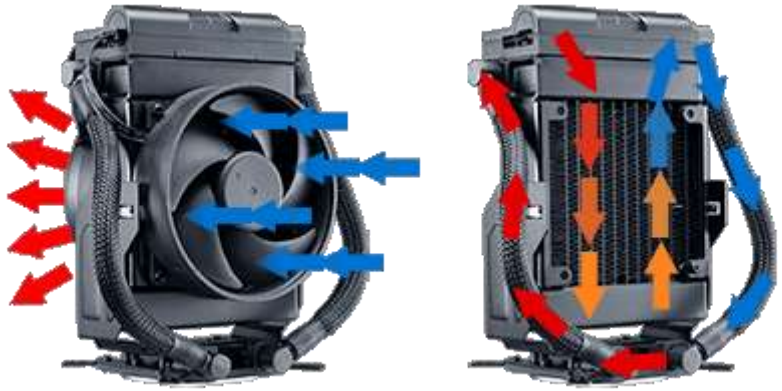
LGA 775

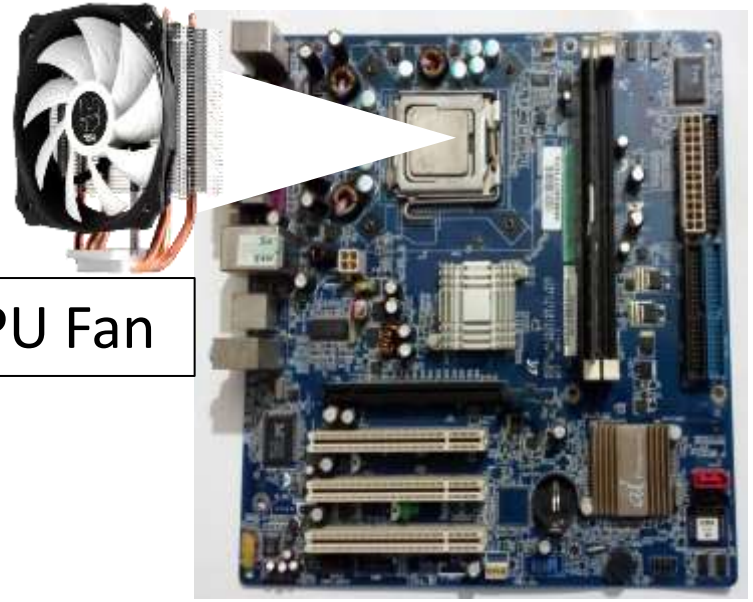
Cooling Systems

- Electronic components generate heat. Too much heat can damage components.

- A **case fan** makes the cooling process more efficient.

- A **heat sink** draws heat away from the core of the CPU. A fan on top of the heat sink moves the heat away from the CPU.
- Fans can be dedicated to cool the **Graphics-processing unit (GPU)**.





CPU Fan

ROM - Read-only memory

- Read-only memory **(ROM)**

- Basic instructions for booting the computer and loading the operating system are stored in ROM.

- ROM chips retain their contents even when the computer is powered down.


686
AMIBIOS®
©1999
UK12
2011
RN84

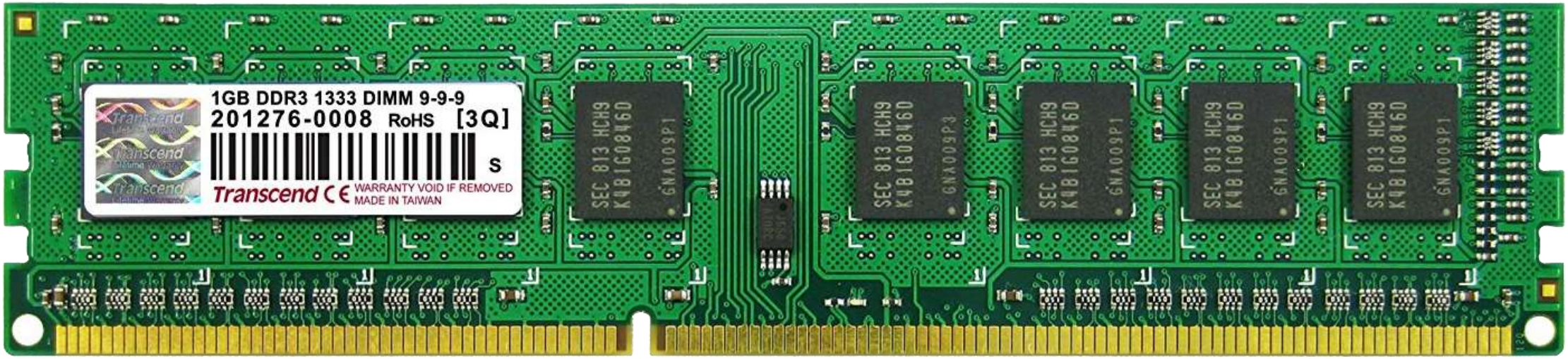
RAM - Random-access Memory

- Random-access memory **(RAM)**

- RAM is temporary storage for data and programs that are being accessed by the CPU.

- RAM is volatile memory, which means that the contents are erased when the computer is powered off.

- More RAM means more capacity to hold and process large programs and files, as well as enhance system performance.



Memory Modules

- Memory modules are memory chips that have been soldered on to a special circuit board for easy installation and removal.

- Dual Inline Package (**DIP**) is an individual memory chip.

- Single Inline Memory Module (**SIMM**) is a small circuit board that holds several memory chips.

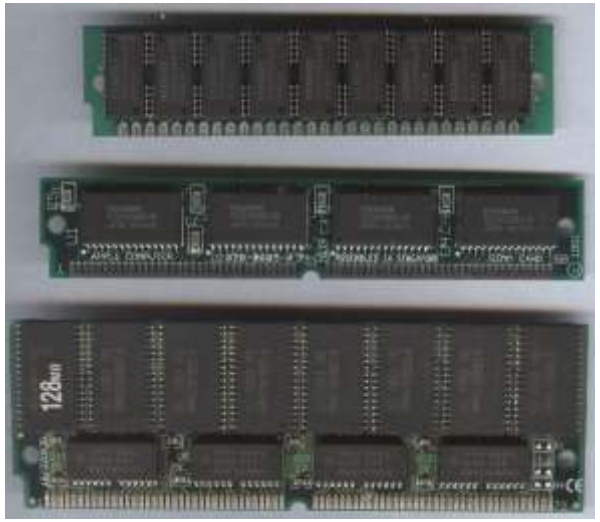
- Dual Inline Memory Module (**DIMM**) is a circuit board that holds SDRAM, DDR SDRAM, and DDR2 SDRAM chips.

- RAM Bus Inline Memory Module (**RIMM**) is a circuit board that holds RDRAM chips.

- Small Outline DIMM (**SODIMM**) is a smaller, more condensed version of DIMM which provides random access data storage that is ideal for use in laptops, printers, and other devices where conserving space is desirable.

- The speed of memory has a direct impact on how much data a processor can process because faster memory improves the performance of the processor. As processor speed increases, memory speed must also increase.

DIP Memory Modules



SIMM Memory Modules

DIMM Memory Modules

RIMM Memory Modules

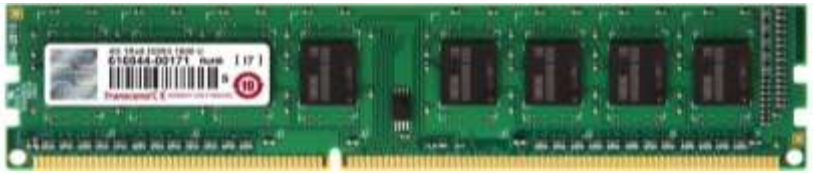
SODIMM Memory Modules

DIMM - Dual Inline Memory Module

SD RAM

DDR RAM

DDR2 RAM



DDR3 RAM

DDR4 RAM

DDR5 RAM

Adapter Cards

- Adapter cards increase the functionality of a computer by adding controllers for specific devices or by replacing malfunctioning ports.

Examples of adapter cards:

- Sound Adapter
- Video Adapter
- USB Adapter

- Network Interface Card (NIC)
- Wireless NIC
- Modem Adapter
- Serial Ports
- Parallel Adapter

Video Adapter

Parallel Adapter

USB Adapter

Serial Ports

Sound Adapter

Wireless Network Interface Card

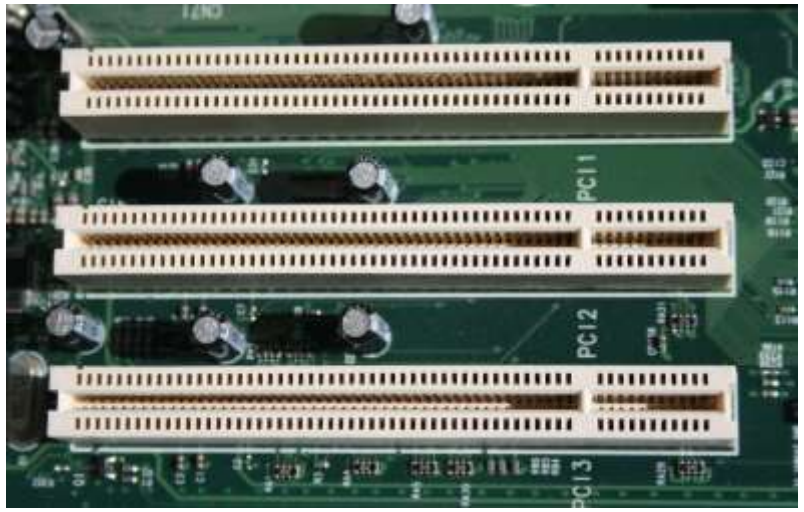
Modem Adapter

Network Interface Card (NIC)

Types of expansion slots

Types of expansion slots:

- Peripheral Component Interconnect (PCI)
- Accelerated Graphics Port(AGP)
- PCI-Express
- Mini PCI (laptops)



Peripheral Component Interconnect (PCI)

Accelerated Graphics Port (AGP)

Peripheral Component Interconnect Express (PCI-Express)

Mini PCI (laptops)

Storage Drives

- Storage drives read or write information to magnetic storage media.
- They may be fixed or removable.
- The **hard disk drive (HDD)** is a magnetic storage device.
- The storage capacity is measured in gigabytes (GB) or terabytes (TB)

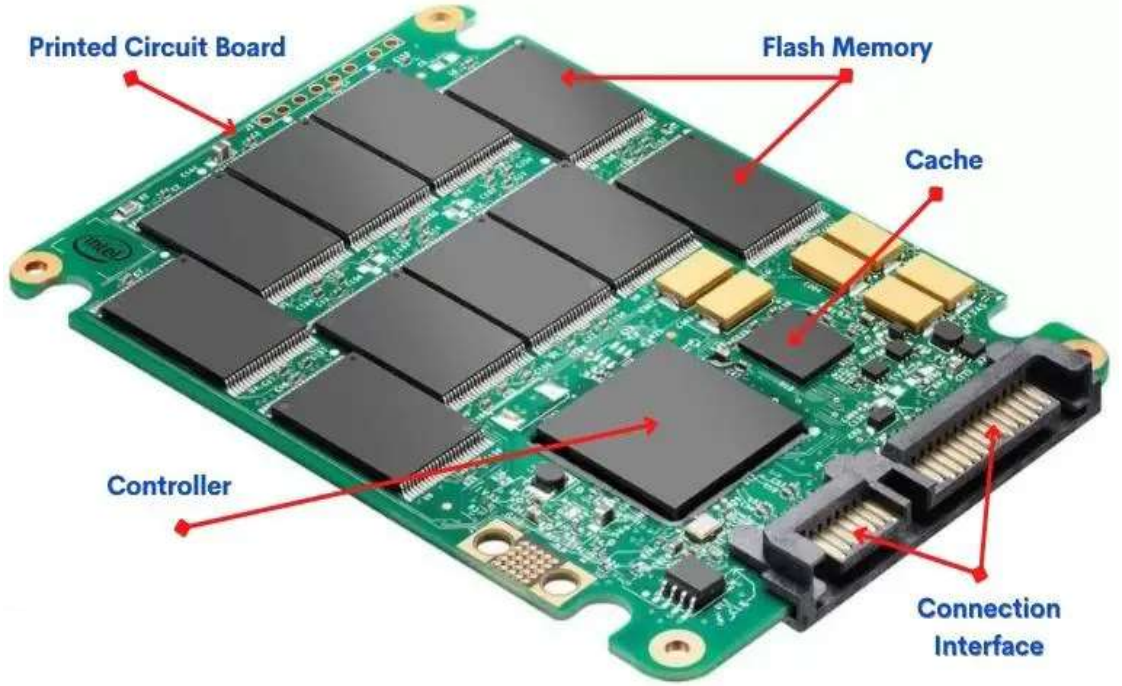
- Magnetic hard drives have drive motors designed to spin magnetic platters and move the drive heads.

- **Solid state drives (SSDs)** do not have moving parts, which results in faster access to data, higher reliability, reduced power usage.

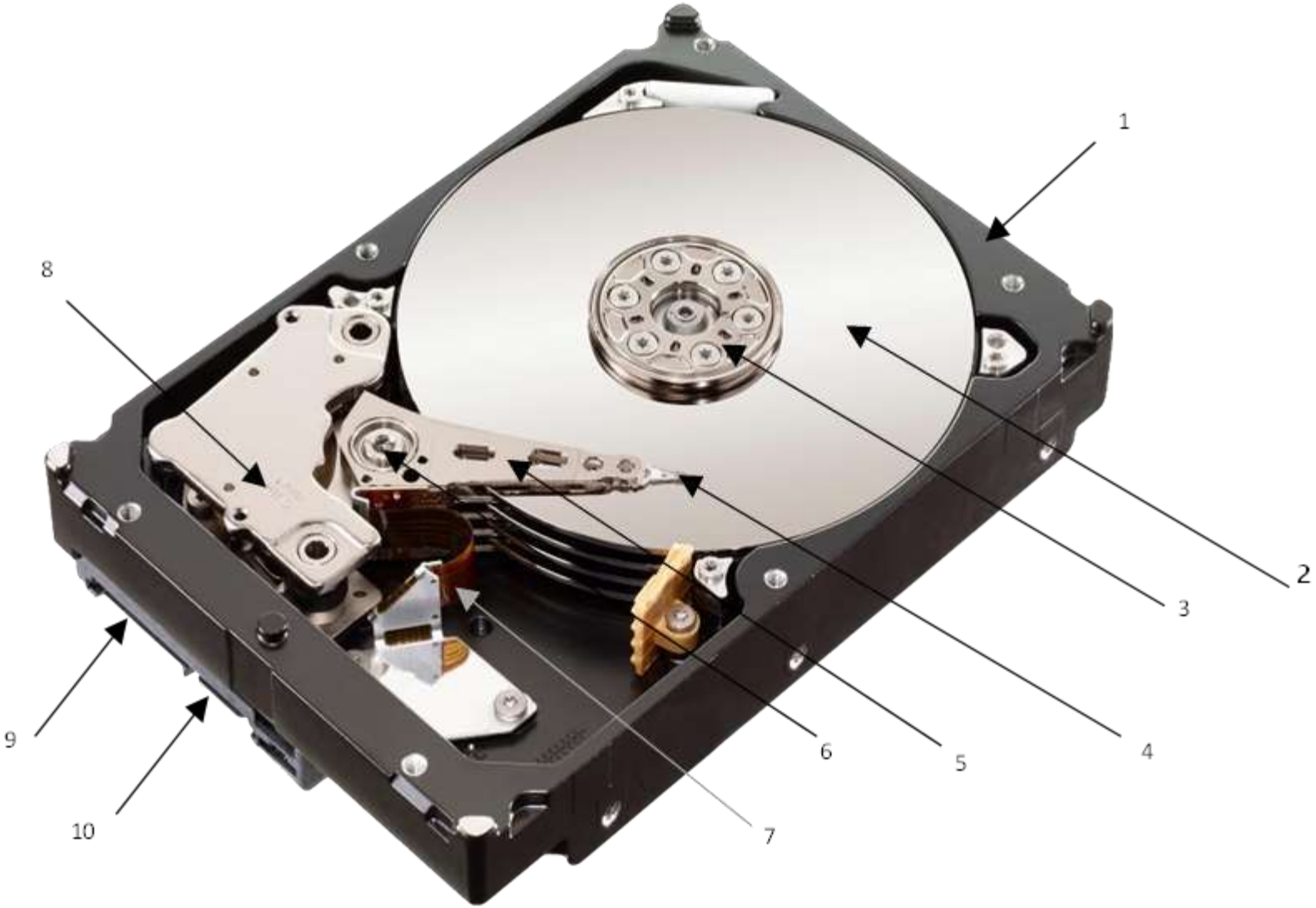
Hard Disk Drive (HDD)

Solid State Drives (SSDS)

Solid State Drives (SSD)
Hard Disk Parts

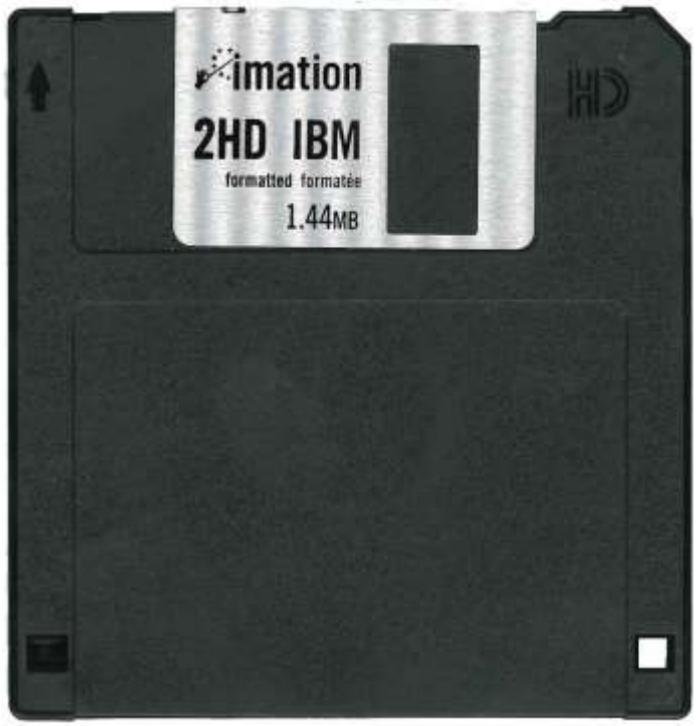


Naming Hard Disk Drive Parts.



1. Base Casing
2. Platters
3. Spindle (Disk Driver Motor)
4. Read/Write Head
5. Actuator Arm
6. Actuator Axis
7. Ribbon Cable
8. Actuator
9. SATA Power Connector
10. SATA Data Cable Connector

Floppy Disk Drive (FDD)



Floppy Disk

- A **Floppy Disk Drive (FDD)** is Storage Device That Uses Removable 3.5 Inch Floppy Disks That Can Store Up To 1.44 MB Of Data.

Optical Drives, Flash Drives and Drive Interfaces

- An **optical drive** is a storage device that uses lasers to read data on the optical media. The three types are CD, DVD, and BD (Blu-ray).

Optical Drive

- A **flash drive** is a removable storage device that connects to a USB port. A flash drive uses a type of memory that requires no power to maintain the data.

Flash Drive

Internal Cables

- Power Supply Connectors- SATA, Molex, And Berg.

1 x 20+4 PIN
(20 Pin or 24 Pin)
Included

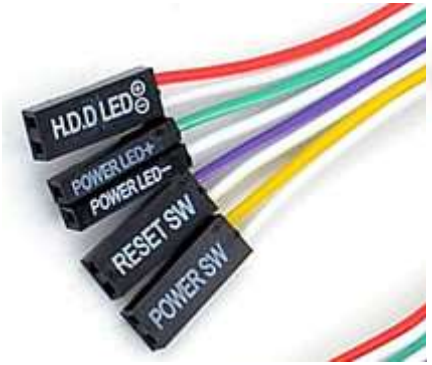
1 x P4 12v
Included

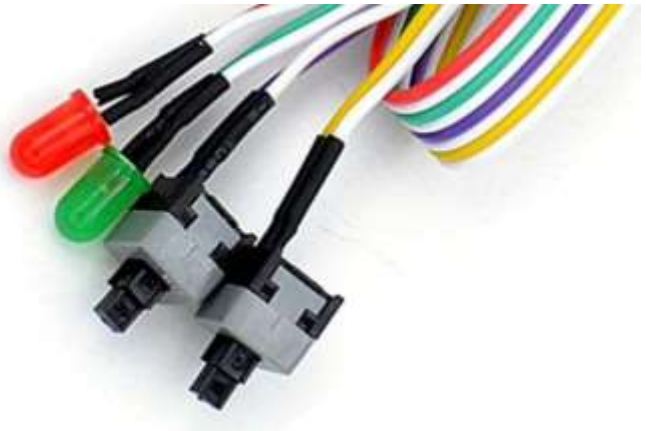
1 x Floppy
Included

3 x SATA
Included

3 x Molex
Included

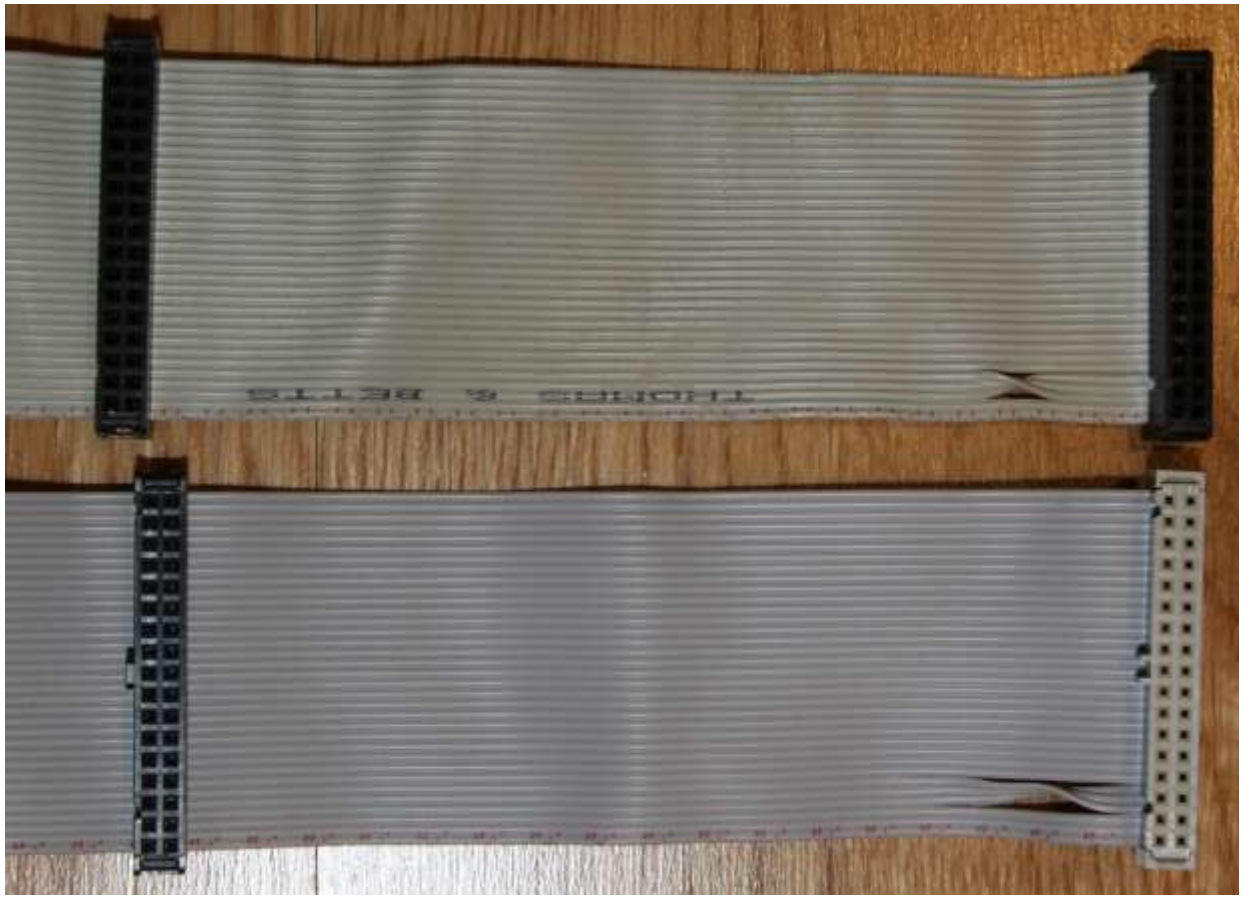
- Front Panel Cables Connect The Case Buttons And Lights To The Motherboard.





Data Cables Connect Drives To The Drive Controller.

- Floppy Disk Drive (FDD) Data Cable (34 Conductor)



Data Cables Connect Drives To The Drive Controller.

- PATA (IDE) Data Cable (40 Conductor)

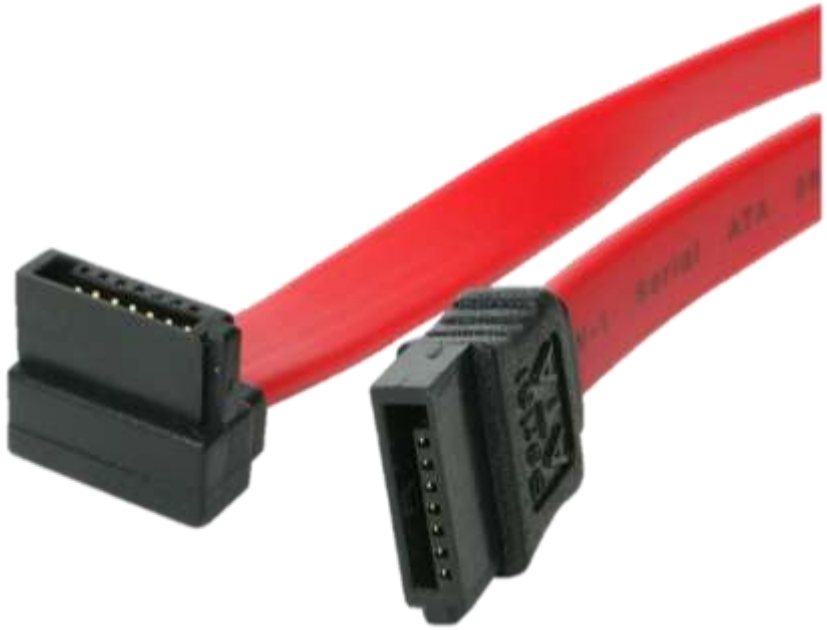
PATA - Parallel Advanced Technology Attachment

Data Cables Connect Drives To The Drive Controller.

- PATA (EIDE) Data Cable (80 Conductor)

Data Cables Connect Drives To The Drive Controller.

- SATA Data Cable



- SCSI Data Cable

Video Ports and Cables

- A Video Port Connects A Monitor Cable To A Computer.

- Display Cables Transfer Video Signals From The Computer To Display Devices.

Connector Types:

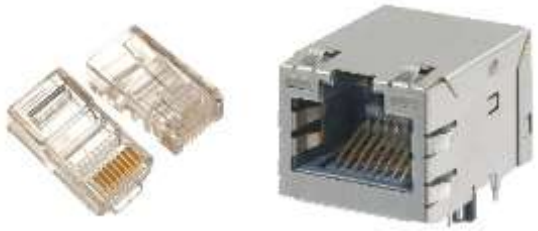
- DVI
- RCA
- DB-15
- BNC
- RJ-45
- HDMI
- Din-6

DVI Male and Female Connector

BNC Male and Female Connector

RCA Male and Female Connector

DB-15 Male and Female Connector



RJ 45 Male and Female Connector

DIN Male and Female Connector

HDMI Male and Female Connector

Display cable types:

- High-Definition Multimedia Interface (HDMI)
- DVI
- Video Graphics Array (VGA)
- Component / RGB
- S-Video
- Coaxial.

HDMI Cable

DVI Cable

VGA Cable

Component Cable

S-Video Cable

Coaxial Cable

Ports and Cables

- **Serial Ports** Transmit One Bit Of Data At A Time.
- **Telephone Cable** (RJ11) Is Used To Connect A Modem To A Telephone Outlet.
- **USB** Is A Standard Interface For Connecting Hot-swappable Peripheral Devices To A Computer.
- Some Devices Can Also Be Powered Through The USB Port.

- A **Parallel Cable** Is Used To Connect Parallel Devices, Such As A Printer Or Scanner, And Can Transmit 8 Bits Of Data At One Time.

- A **SCSI Port** Can Transmit Data At Rates In Excess Of 320 Mbps And Can Support Up To 15 Devices. SCSI Devices Must Be Terminated At The Endpoints Of The SCSI Chain.

- A **Network Port**, Also Known As An RJ-45 Port, Connects A Computer To A Network. The Maximum Length Of Network Cable Is 328 Feet (100 M).

- A **PS/2 Port** Connects A Keyboard Or A Mouse To A Computer. The PS/2 Port Is A 6-pin Mini-din Female Connector.

- An **Audio Port** Connects Audio Devices To The Computer.

- A **Video Port** Connects A Monitor Cable To A Computer.










Question

Student will be conduct to discover about the history of computer hardware components. This assignment enables to make a solid background about computer hardware components at the end.

Guideline for Candidates

Students are expected to conduct an analysis in Computer Hardware Components order to produce a brief documentation as specified below:

Brief description of the evolution of the existing computer generations and future technologies.
Describe briefly the main functionalities of the following hardware components:
Processor
Motherboard
RAM
Hard disk
Optical drives

- Critically evaluate the evolution of existing computer generations, including the role of hardware components within each generation.

- The document should consist 1500 to 2000 words and relevant diagrams.

Contact Me ...

Email : thilina.jiat@gmail.com

THANK YOU