MIZAN-TEPI UNIVERSITY

TEPI CAMPUS

SCHOOL OF COMPUTING AND INFORMATICS

DEPARTMENT OF INFORMATION SYSTEMS

ASSIGNMENT OF COMPUTER MAINTENANCE AND TROUBLESHOOTING

COURSE CODE INSY4142

NAME:AMANUEL DERESE

ID: NSR/0197/12

SUBMITTED TO MR. SAMSON

SUMMATION DATE APRIL 14 2023

TABLE OF CONTENTS

Components of Motherboard and Its Functionality in Detail

1) RAM chip and RAM Slot

RAM is an acronym for Random Access Memory. It is also referred to as the primary memory. RAM (random access memory) is a type of temporary data storage device found in computers and other electronic devices. One important thing to know about RAM is When the power is switched off, the data in RAM is deleted.

In layman's terms, RAM is analogous to short term memory. RAM forgets its content as soon as power is off, and the Information stored in short-term memory will get lost after a few days.

RAM supports **bidirectional data transfer** from the CPU to memory during a write operation and from RAM to the CPU during a read operation. It acts as a bridge between the CPU and other devices such as HDDs, CDROMs, and PEN drives.

RAM is named after the fact that any memory address in RAM can be accessed directly from any location. Data in any memory location can be accessed if the row and column numbers are known.

DRAM, SDRAM, DDR, SRAM, CMOS RAM, VRAM, and other types of RAM are available on the market. RAM in the PC market typically ranges from 2 GB to 16 GB.

2) CPU Chip and Socket

CPU is an abbreviation for Central Processing Unit. Computers and other electronic devices sometimes refer to the central processing unit (CPU) as their "brain" because it handles all of the device's decision-making functions. All of the components and peripherals are either directly or indirectly connected to the CPU. The primary role of the CPU is to perform basic arithmetic, logical, and input/output functions. CPU consists of 3 main typical components. ALU, CU and Registers

ALU: ALU is a CPU digital circuit (gates) that conducts all arithmetic and logical operations. ALU is capable of performing basic arithmetic operations such as addition, subtraction, multiplication, and division. ALU is capable of performing logical operations such as number and letter comparisons. A single CPU can have many ALUs.

CU: The Control Unit (CU) is a digital circuit within the CPU that governs all processes. It enables and instructs various logical units, I/O devices, and the computer's memory on how to respond to program instructions from various components, as well as the user.

Registers: Registers are a form of temporary memory and ALU and CU rely on them. They are sometimes referred to as "Immediate Memory". CPU can instantly access, store and transport data and instruction from registered memory and process it.

3) PCI Slots and PCI Chip

PCI stands for Peripheral Component Interconnected and is an attached hardware component of the motherboard that enables you to connect various hardware components such as modems, disk controllers, NIC cards, Sound Cards, graphics cards, SSD add-on cards, RAID cards, and additional USB and serial ports without having to add or replace the motherboard.

If your motherboard only has a limited number of ports and slots for connecting various types of hardware devices, such as graphics cards (AGP ports), you can connect these cards using PCI slots and gain the same advantage as if they were installed on the motherboard. Similarly, if your computer system only has a limited number of USB ports and you want more, you can buy a USB PCI card to add more USB ports to your system.

4) ROM Chip

ROM is nonvolatile storage whose content will not get erased even after power is cut off. Content stored in ROM is impossible or very difficult to modify.

The BIOS information is kept in ROM, which is only a few KB in size and tells how to start, what to do when it starts, which driver to load, CPU fan speed information, boot sequences information, system date time, and so on.

5) AGP Slot and Chip

AGP Slot (Accelerated Graphics Port Slot) is a type of expansion slot similar to a PCI slot, although it is mostly used for graphics cards. Intel was the first to introduce it in 1996. This expansion slot is easily identifiable because it is usually brown in color.

6) North Bridge

North Bridge is also known as Memory Controller Hub or Host Bridge. It is the motherboard's primary controller, directing traffic to and from the CPU. As a result, the northbridge chip has an impact on the computer's performance. Because it performs a lot of processing, it usually comes with a heatsink.

Characteristics of North Bridge:

- It connects southbridge to the CPU.
- It handles and communicates faster components on the motherboard like Main Memory, AGP, PCIe, ROM, and CPU.
- It acts as a controller for bus speed on the motherboard.
- Generally, it does lots of work with the CPU, so it is located near to the CPU generally with the heatsink.
- It is a core component and is directly connected to the CPU.

In some processors of Intel, all the functioning of northbridge is performed by the CPU.

7) South Bridge

The southbridge is an IC chip that manages and controls IO functionality on the motherboard. It does not have direct communication with the CPU, unlike Northbridge. It typically handles low-speed devices due to its slower communication speed. The CPU sends an instruction to the northbridge, which then sends it to the southbridge. It is linked to the PCI bus, ISA buses, IDE buses, audio, serial devices such as a mouse, keyboard, USB ports, and so on, as well as a SATA hard disk connector. In size, it is smaller than the northbridge. And in some southbridge, we can find a heatsink attached to it.

8) CMOS Backup Battery

CMOS stands for "Complementary Metal Oxide Semiconductor" and is found in both laptop and desktop PCs in the form of a small circular coin. CMOS stores a variety of system data such as the current system clock, date, time, pulses, commonly used hardware settings, BIOS configuration

settings, BOOT sequences, BIOS master/admin password, GPU, and virtualization settings, power management, and so on.

They can save those sets for a longer period of time, ranging from 2 to 10 years. Because it is constantly holding all of the above-mentioned settings, CMOS works even when your system is turned off.

CMOS is also called **CMOS RAM**, **COS-MOS**, and **NVRAM** (Non-Volatile RAM) in the market.

It is also called the RTC (Real Time Clock) of the computer system because even computer is shut down it is able to store all the required information that the system required to boot the system next time.

More About CMOS

1) CMOS chips were first introduced in the IBM computer.

2) CMOS is a low-power technology chip so it lasts longer.

3) CMOS can store usually up to 256 bytes of information.

4) CMOS battery in laptop and desktop PC is 3V

5) CMOS battery life lasts 2 to 10 years (source: hp store)

6) Commonly used CMOS battery in PCs is a CR2032 lithium coin cell.

9)Power Supply Plug

The primary function of the Motherboard's Power Supply plug is to supply power to the Motherboard and its attached components and peripherals.

The power supply plug in a motherboard is typically a 24-pin ATX power connector that supplies power to the motherboard and other components in the computer. This power connector is usually located near the CPU socket and is essential for the proper functioning of the computer.

The 24-pin ATX power connector provides both 3.3V and 5V power to the motherboard, as well as +12V power to the CPU and other components. It also provides power to the PCI Express slots and other expansion slots on the motherboard.

To connect the power supply plug to the motherboard, you need to make sure that the power supply unit is turned off and unplugged from the power outlet. Then, locate the 24-pin ATX power connector on the motherboard and align the notches on the connector with the pins on the motherboard. Gently push the connector onto the motherboard until it clicks into place.

10) SATA and PATA Port and Connector

PATA is an acronym that stands for Parallel Advanced Technology Attachment. It is a ribbon cable with 40 pins that is used to connect mass storage devices such as hard disks (HDD or SSD) and optical drives to a computer. Western Digital and Compaq introduced it in 1986.

Every PATA cable has two or three connectors, one of which is connected to the adapter interfacing and the others to secondary storage devices. In modern computers, it is not used. It is outdated technology and is replaced by SATA Technology

Serial Advanced Technology Attachment is an abbreviation for Serial Advanced Technology Attachment. It is a 7-pin cable that is shorter and more powerful than the PATA connector, and it serves the same purpose. SATA's first version was released in 2000.

There are several advantages of using SATA over PATA

- **Reduce Cable Size**: The size of the SATA cable is shorter than the PATA cable. The maximum cable length of SATA cable is 18 inch and PATA's maximum cable length is ~ 39 inches.
- **Higher Bandwidth**: The bandwidth ranges of various PATA cable is between 16 MB/s - 133 MB/s. But bandwidth ranges of various SATA cable is between 150 MB/s - 600 MB/s.
- **SATA has hot-swappable features**: SATA cable from the devices can be plugged in and out even system is ON(But don't try with running hard disk or CDROM). Hot-swappable does not work with PATA. Try it(Remove SATA cable from CDROM, Restart your PC then insert SATA in CDROM, it will work.)

11) eSATA Port

Some computer also has an external SATA port. It is used to connect external secondary devices like external HDDs and CD Rom. It is much faster than the USB 3.0 port.

12) eSATAp Port

eSATAp—"**eSATA Power over eSATA**"—combines eSATA and USB so it is also known as eSATA/USB combo port. Single-connector eSATAp ports transmit data and power.

External hard drive power adapters are no longer required with eSATAp. It reduces the number of cables and accessories required to use external storage devices, making it handy for on-the-go users.

13) SCSI Port

SCSI is an abbreviation for Small Computer System Interface. It has the ability to connect up to 16 peripheral devices via a single bus, including one host adaptor. As a result, you can connect a scanner, CD ROM, Zip drive, and hard drive to a single SCSI cable chain. It is more expensive but performs better than IDE. It is now being phased out. It was available prior to the introduction of the IDE.

14) Parallel Port

A parallel port is used to transfer data through multiple communication channels in parallel. Printers, scanners, Zip drives, external HDDs, tape backup devices, external CD ROMs, and other similar devices.

15) Serial Port

With a serial port, only one bit of data gets transferred at a time. It is found in an older PC to connect older keyboards, PDAs, external modems.

16) PS/2 Port

PS/2 port was popular in older desktop PCs.But now it is obsolete.

- PS/2 (green color) is for the mouse.
- PS/2 (purple) is for the keyboard.

17) USB Port

Universal Serial Bus is the abbreviation for Universal Serial Bus. Its transfer rates are faster than the PS/2 connector, hence we don't see a PS/2 port on recent computers. USB ports come in a variety of shapes and sizes, including:

- Type A
- Type B
- Type C
- Type A Mini
- Type B Mini
- Type A Micro
- Type B Micro
- Type B Micro USB3

18) RJ-45 Port

Register Jack is abbreviated as RJ. It resembles a telephone jack, but it is slightly larger. RJ45 is also known as an Ethernet port because it is used to connect a computer to the internet. The RJ 45 port is used to connect to the Local Area Network via a twisted pair ethernet cable. The Ethernet cable has a connector that is connected to the RJ45 port.

19) HDMI port

HDMI is an abbreviation for High-Definition Multimedia Interface. It was created in the year 2002 AD. It appears to be a USB port, but it is much larger in size. HDMI is a digital interface that allows audio and video data to be transmitted in a single cable to digital devices such as a digital TV, projector, gaming console, computer, mobile devices, digital camera, cable box, blu ray player, and so on.

20) Audio Port

Most desktop computer nowadays comes with 3 to 6 port.

- Green Color Port is a Line Out which is for headphones and stereo speakers.

- Pink /Light Pink Port for Microphones input.
- Light Blue Port is line In which is for mp3 players, DVD players, CD players, stereo receivers, turntables, electric guitar, and VCR audio outputs.
- Dolby Audio Black Port for rear speaker.
- The orange/yellow port is the Center/Bass Channel which is for the subwoofer

21) Heatsink

A heatsink is a component that is used to dissipate heat generated by electronic components on a motherboard, such as the CPU, GPU, and VRM.

When electronic components are in use, they generate heat, and if that heat is not removed, it can cause the components to malfunction or even fail. The heatsink is designed to absorb and dissipate this heat away from the electronic components and into the surrounding air.

Heatsinks are typically made of materials such as aluminum or copper, which have good thermal conductivity. They are usually designed with fins or other features that increase their surface area, allowing more heat to be dissipated into the air. Some heatsinks also use fans or other cooling mechanisms to enhance their cooling performance.

In summary, heatsinks are an important component in a motherboard that help to prevent overheating and ensure the stability and longevity of the electronic components.

22) Switches and Jumper

Switches and jumpers are used to reconfigure the circuit onto an existing circuit board in a reversible way.

Jumper also called Jumper Shunt is a small circuit board used to close, open or bypass part of an electronic circuit.

Closed Stage Jumper: If the plug is pushed down over two pins, the jumper is referred to as jumpered.

Opened Stage Jumper: If there is no plug into the pin then it is an open stage.

🔥 Caution: Before adjusting jumper configuration make sure that the system is turned off otherwise system may get damaged.

23) Capacitor

A capacitor is an electronic device used for filtering, decoupling, and timing the circuit in the motherboard. There are more capacitors in the motherboard which mostly does decoupling functionality, so those capacitors are called decoupling capacitors. A decoupling capacitor is used for stabilizing power in each IC used in the system.

It comes with various voltage levels like 3.3 V, 5 V, and 12 V.

Suppose a circuit needs 5 V input than before that circuit there will be capacitors in parallel which allow up to 5 V to pass to that circuit.

24) Transistor and MOSFET

Transistor is used in most of the components of motherboard for various purposes like

- controlling the amount of current or voltage in the component
- amplification/modulation electronic signal
- switching of an electronic signal and electrical power.

Today's motherboard has SMD(Surface Mount Device) transistor which uses Surface Mount Technology(SMT). They are found mounted in the motherboard.

MOSFET(Metal Oxide Semiconductor Field Effect Transistor) is the most widely used transistor in motherboards.

Denoting letter for Mosfet and Transistor is same: ie. Q, PQ

25) Diode

The motherboard in your laptop and the mobile phone both have SMD Diodes that are mounted on the motherboard.

The diode's primary function is to allow current to flow in only one direction, much like a one-way street. It aids in the conversion of voltage spikes in the motherboard by converting alternating current (AC) voltage spikes to direct current.

Denoting letter for Diode: D

26) VRMs

VRMs stands for Voltage Regulator module. VRMs are electronic circuits located near the CPU and their main work is to provide steady and consistent voltage to the processor. As the Power supply unit converts external voltage eg. 240 volts to 12V or 5 V, this voltage is again taken by VRMs first and then again step down and regulates these voltages and provides the continuous required power to the processor.

It is especially important for overclocking a CPU or GPU.

27) Mounting Screw Hole

Mounting holes let us mount our motherboard to a surface.

You simply have to pick a screw size that matches the size of mounting holes in your motherboard, find a surface to which it will be mounted and drill accordingly.

Conclusion

Each component or parts of motherboard mention above was design for specific purpose in the motherboard and computer system. Understanding a motherboard's parts is essential for resolving hardware issues, and upgrading the hardware components.

Reference

https://ourtechroom.com/tech/parts-of-motherboard/

https://www.techtarget.com/whatis/definition/motherboard

https://www.partitionwizard.com/partitionmanager/motherboard-components.html