Module III

EXPANSION SLOTS

Expansion slots are specific slots on a PC motherboard that facilitate the placement of expansion cards. All such expansion slots are color coded, and are built in such a way that only a specific type of card or device can interface with the system be inserted into the device.

INDUSTRY STANDARD ARCHITECTURE (ISA)

Industry Standard Architecture (ISA) is a computer bus standard for IBM PC compatible computers introduced with the IBM Personal Computer to support its Intel 8088 microprocessor's 8-bit external data bus and extended to 16 bits for the IBM Personal Computer/AT's Intel 80286 processor. The ISA bus was further extended for use with 32-bit processors as Extended Industry Standard Architecture (EISA). For general desktop computer use it has been supplanted by later buses such as IBM Micro Channel, VESA Local Bus, Peripheral Component Interconnect and other successors.

EXTENDED INDUSTRY STANDARD ARCHITECTURE (EISA)

The Extended Industry Standard Architecture in practice almost always shortened to EISA is a bus standard for IBM PC compatible computers. It was announced in September 1988 by a consortium of PC clone vendors (the "Gang of Nine") as a counter to IBM's use of its proprietary Micro Channel architecture (MCA) in its PS/2 series.

MICRO CHANNEL ARCHITECTURE (MCA)

Micro Channel Architecture (MCA) was a proprietary 16- or 32-bit parallel computer bus introduced by IBM in 1987 which was used on PS/2 and other computers until the mid-1990s. It superseded the ISA bus and was itself subsequently superseded by the PCI bus architecture.

VIDEO ELECTRONICS STANDARDS ASSOCIATION (VESA)

VESA (Video Electronics Standards Association) is an international standards body for computer graphics formed in 1988 by NEC Home Electronics, maker of the MultiSync monitor

line, and eight video display adapter manufacturers: ATI Technologies, Genoa Systems, Orchid Technology, Renaissance GRX, STB Systems, Tecmar, Video 7 and Western Digital/Paradise Systems.

VESA's initial goal was to produce a standard for 800×600 SVGA resolution video displays. Since then VESA has issued a number of standards, mostly relating to the function of video peripherals in personal computers.

In November 2010, VESA announced a cooperative agreement with the Wireless Gigabit Alliance (WiGig) for sharing technology expertise and specifications to develop multi-gigabit wireless DisplayPort capabilities. DisplayPort is a VESA technology that provides digital display connectivity.

PERIPHERAL COMPONENT INTERCONNECT (PCI)

Conventional PCI (PCI is an abbreviation formed from Peripheral Component Interconnect, part of the **PCI Local Bus standard** and often shortened to PCI) is a computer bus for attaching hardware devices in a computer. The PCI bus supports the functions found on a processor bus, but in a standardized format that is independent of any particular processor. Devices connected to the bus appear to the processor to be connected directly to the processor bus, and are assigned addresses in the processor's address space.

LOCAL BUS STANDARDS

In computer science, a local bus is a computer bus that connects directly, or almost directly, from the CPU to one or more slots on the expansion bus. The significance of direct connection to the CPU is avoiding the bottleneck created by the expansion bus, thus providing fast throughput. There are several local buses built into various types of computers to increase the speed of data transfer. Local buses for expanded memory and video boards are the most common.

VESA Local Bus is an example of a local bus design. Although VL-Bus was later succeeded by AGP, it is not correct to categorize AGP as a local bus. Whereas VL-Bus operated on the CPU's memory bus at the CPU's clock speed, an AGP peripheral runs at specified clock speeds that run independently of the CPU clock (usually using a divider of the CPU clock).

ACCELERATED GRAPHICS PORT (AGP)

The Accelerated Graphics Port (often shortened to AGP) is a high-speed point-to-point channel for attaching a video card to a computer's motherboard, primarily to assist in the acceleration of 3D computer graphics. Originally it was designed as a successor to PCI type connections. Since 2004 AGP has been progressively phased out in favor of PCI Express (PCIe). By mid-2009 PCI cards dominated the market; AGP cards and motherboards were still produced, but OEM driver support was minimal.

Ports

A port is a physical docking point using which an external device can be connected to the computer. It can also be programmatic docking point through which information flows from a program to the computer or over the Internet.

Characteristics of Ports

A port has the following characteristics −

- External devices are connected to a computer using cables and ports.
- Ports are slots on the motherboard into which a cable of external device is plugged in.
- Examples of external devices attached via ports are the mouse, keyboard, monitor, microphone, speakers, etc.

Let us discuss a few important types of ports −

Serial Port

- Used for external modems and older computer mouse
- Two versions: 9 pin, 25 pin model
- Data travels at 115 kilobits per second

Parallel Port

- Used for scanners and printers
- Also called printer port
- 25 pin model
- IEEE 1284-compliant Centronics port

PS/2 Port

- Used for old computer keyboard and mouse
- Also called mouse port
- Most of the old computers provide two PS/2 port, each for the mouse and keyboard
- IEEE 1284-compliant Centronics port

Universal Serial Bus (or USB) Port

- It can connect all kinds of external USB devices such as external hard disk, printer, scanner, mouse, keyboard, etc.
- It was introduced in 1997.
- Most of the computers provide two USB ports as minimum.
- Data travels at 12 megabits per seconds.
- USB compliant devices can get power from a USB port.

VGA Port

- Connects monitor to a computer's video card.
- It has 15 holes.
- Similar to the serial port connector. However, serial port connector has pins, VGA port has holes.

Power Connector

- Three-pronged plug.
- Connects to the computer's power cable that plugs into a power bar or wall socket.

Fire wire Port

- Transfers large amount of data at very fast speed.
- Connects camcorders and video equipment to the computer.

- Data travels at 400 to 800 megabits per seconds.
- Invented by Apple.
- It has three variants: 4-Pin FireWire 400 connector, 6-Pin FireWire 400 connector, and 9-Pin FireWire 800 connector.

Modem Port

- Connects a PC's modem to the telephone network.

Ethernet Port

- Connects to a network and high speed Internet.
- Connects the network cable to a computer.
- This port resides on an Ethernet Card.
- Data travels at 10 megabits to 1000 megabits per seconds depending upon the network bandwidth.

Game Port

- Connect a joystick to a PC
- Now replaced by USB

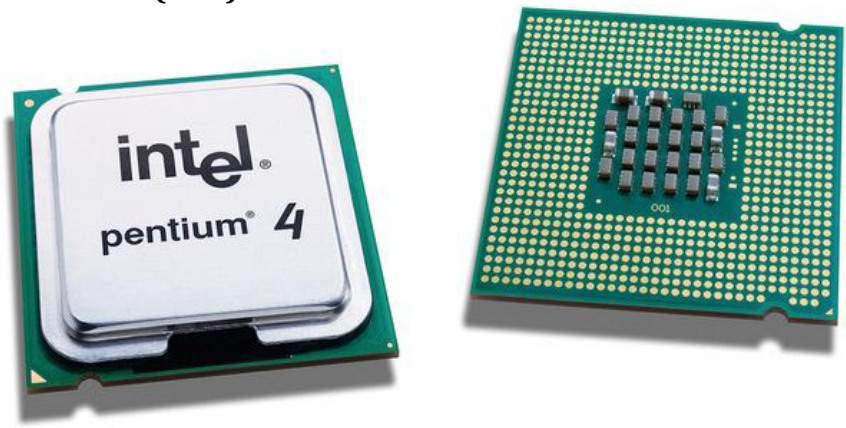
Digital Video Interface, DVI port

- Connects Flat panel LCD monitor to the computer's high-end video graphic cards.
- Very popular among video card manufacturers.

Sockets

- Sockets connect the microphone and speakers to the sound card of the computer.

Processor (CPU)



A processor is the logic circuitry that responds to and processes the basic instructions that drive a computer.

The four primary functions of a processor are **fetch**, **decode**, **execute** and **write back**.

The basic elements of a processor:
The **arithmetic logic unit (ALU),** which carries out arithmetic and logic operations on the operands in instructions.

The **floating point unit** (FPU), also known as a **math coprocessor** or **numeric coprocessor**, a specialized coprocessor that manipulates numbers more quickly than the basic microprocessor circuitry can.

Registers, which hold instructions and other data. Registers supply operands to the ALU and store the results of operations. **L1 and L2 cache memory**, their inclusion in the CPU saves time compared to having to get data from random access memory (**RAM**).

Most processors today are **multi-core**, which means that the IC contains two or more processors for enhanced performance, reduced power consumption and more efficient simultaneous processing of multiple tasks. Multi-core set-ups are similar to

having multiple, separate processors installed in the same computer, but because the processors are actually plugged into the same socket, the connection between them is faster.

The term **processor** is used interchangeably with the term **central processing unit (CPU),** although strictly speaking, the CPU is not the only processor in a computer.

The **GPU (graphics processing unit)** is the most notable example but the hard drive and other devices within a computer also perform some processing independently. Nevertheless, the term **processor** is generally understood to mean the CPU.

The processor in a personal computer or embedded in small devices is often called a **microprocessor**. That term simply means that the processor's elements are contained on a single **integrated circuitry (IC) chip**.

The two main competitors in the processor market are **Intel** and **AMD**.

CMOS Memory

CMOS (complementary metal-oxide-semiconductor) is the term usually used to describe the small amount of memory on a computer motherboard that stores the BIOS settings. Some of these BIOS settings include the system time and date as well as hardware settings.

Most talk of CMOS involves **clearing CMOS**, which means to reset the BIOS settings to their default levels. This is a really easy task that's a great troubleshooting step for many types of computer problems.

Other Names for CMOS

CMOS is sometimes referred to as **Real-Time Clock** (RTC), **CMOS RAM**, Non-Volatile RAM (**NVRAM**), **Non-Volatile BIOS memory**, or complementary-symmetry metal-oxide-semiconductor (COS-MOS).

BIOS Chip

The BIOS is a computer chip on the motherboard like CMOS except that its purpose is to communicate between the processor and other hardware components like the hard drive, USB ports, sound card, video card, and more.

A computer without a BIOS wouldn't understand how these pieces of the computer work together.

CMOS is also a computer chip on the motherboard, or more specifically a RAM chip, which means it would normally lose the settings it's storing when the computer is shut down. The CMOS battery is used to provide constant power to the BIOS chip.

When the computer first boots up, BIOS pulls information from the CMOS chip to understand the hardware settings, time, and anything else that's stored in it.

CMOS Battery

The CMOS is usually powered by a CR2032 cell battery, referred to as the CMOS battery. Most CMOS batteries will last the lifetime of a motherboard, up to 10 years in most cases, but will sometimes need to be replaced.

Incorrect or slow system date and time and loss of BIOS settings are major signs of a dead or dying CMOS battery. Replacing them is as easy as swapping out the dead one for a new one.

While most motherboards have a spot for a CMOS battery, some smaller computers, like many tablets and laptops, have a small external compartment for the CMOS battery that connects to the motherboard via two small wires.

Some devices that use CMOS include microprocessors, microcontrollers, and static RAM (SRAM).

It's important to understand that CMOS and BIOS are not interchangeable terms for the same thing. While they work

together for a specific function within the computer, they are two entirely different components.

When the computer is first starting up, there's an option to boot into BIOS or CMOS. Opening the CMOS setup is how you can change the settings it's storing, like the date and time and how the different computer components are first started up. You can also use CMOS setup to disable/enable some hardware devices.

CMOS chips are desirable for battery-powered devices like laptops because they use less power than other types of chips. Although they use both negative polarity circuits and positive polarity circuits (NMOS and PMOS), only one circuit type is powered on at a time.
The Mac equivalent to CMOS is **PRAM**, which stands for Parameter RAM.

STEPS FOR ASSEMBLING A PC
This set of instructions will help you assemble a basic computer capable of running most modern software packages encountered by a casual user. Modern computers become more affordable when users supplement their monetary investment with a few hours of effort. This computer build will be very basic and will be the minimum hardware necessary to have a functional system. After you have all of the parts and materials needed, it will take between 2 and 4 hours to assemble your computer and you will need to be able to use simple hand tools, such as a screwdriver and a pair of pliers.

Step 1: Procuring Parts
First you will need to buy the parts necessary to build the computer. The parts we will use here are labeled as follows:
1. Processor (CPU)
2. Computer Case or cabin
3. Optical Drive (DVD RW and SATA capable)
4. Memory (RAM)
5. Power Supply
6. SATA Cables

7. Motherboard (SATA Capable)
8. Processor Fan
9. Case Fan
10. Hard Drive (SATA Capable)
11. Assortment of case and drive screws

Step 2: Gather Tools and Supplies
Gather the tools you will need for assembling:

- Screwdriver
- Wire cutters and strippers
- Needle-nosed pliers
- Utility knife
- Small flashlight
- Adjustable wrench
- Small container to hold screws
- Heat sink compound
- Grounding Strap

You may not use every single one of these tools in every installation, but it is best to have all of them on hand in case you have a use for them.

Step 3: Open the Case
Open the computer case by removing the side panels. Find the screws that hold the side panels in place and remove them. The panel is removed by first sliding it back then lifting it away from the case.

Step 4: Prepare the Case for Assembly
Three things need to be done before assembly begins:

- Remove any parts or packaging materials that may have been shipped inside the case.
- Remove the cover for the optical drive.
- Make note of the cables pre-installed in the case. These should be front panel connections for features such as the power switch, audio jacks and USB ports. If they are not labeled, consult the manufacturer's documentation

and label them yourself now before other parts are installed in the case.

Step 5: Ground Yourself

Put the grounding strap on your wrist and connect the other end to the computer case. If your strap is not equipped with a clip to hook to the case, find a place to wedge against the metal. This will prevent any buildup of static electricity on your body from damaging the computer components.

Caution: Static electricity can ruin computer components. Always wear a grounding strap when handling any internal components.

Step 6: Install Motherboard

To install the motherboard we need parts that should have been included with your purchased components:

- **I/O Bezel** is a trim panel installed in the back of the case that surrounds the interface ports on the motherboard. It should be included with the motherboard.
- **Standoffs** are installed in the case screw holes to create a riser that separates the case and motherboard. The screws install into the standoffs. Screws and standoffs should be included with the case, but it is a good idea to order these items just in case they aren't included.

Follow these steps to install the motherboard in the case:

1. Install the I/O bezel plate into the opening in the back of the case. It pushes in from the inside.
2. Install standoffs in the case. The standoffs screw into the motherboard mounting holes. Check the screw hole locations on the motherboard for exact placement.
3. Lower the motherboard into the case and align with the I/O bezel.
4. Install the screws.

Step 7: Install Hard Drive

The hard drive is the device that stores all of your data. It is 3.5" wide and needs to be mounted so that you can gain access to the

cable connections on the back. If that is not possible you may need to connect cables before you install the drive. To mount the drive:

1. Find a 3.5" drive bay to install the drive in. If you have trouble finding a place to mount the drive consult your case documentation for suggestions.
2. Slide the drive into place until the screw holes on the sides are lined up with the holes in the case.
3. Install the screws.

Step 8: Install Optical Drive

The optical drive is 5.25" wide and is installed in the drive bay that we removed the cover from in a previous step. Cable access considerations apply to this drive also. To install the drive:

1. Slide the drive into the drive bay until the screw holes are lined up and the front of the drive is flush with the front of the case. Make sure that it is orientated correctly.
2. Install the screws.

Step 9: Install the CPU

The CPU is the brain of the computer. It is installed on the motherboard in the socket. To install the CPU:

1. Find the corner marking that designates pin 1 of the CPU. On a brand processor, the corner is marked with an arrow. Consult the manufacturer's documentation for specific information about your processor.
2. Lift the small metal rod next to the socket.
3. Find the corresponding marking on the CPU socket and insert the CPU so that the markings are lined up.
4. Push the rod down to lock the processor in place.

Step 10: Install RAM

The RAM is the temporary memory location that the processor works from. Permanently stored data is pulled from disks and stored in RAM while the processor works with it. The memory is easy to install:

1. Set the RAM board in the socket. Check to see that the **notch** in the board is in the correct location. If it is not, turn it around 180^0.
2. Press firmly on both ends of the board to set it into the socket. Make sure the tabs lock into place.

Caution: Pressing the boards in when the tab is not aligned could cause damage to the RAM boards as well as the motherboard.

Step 11: Install the CPU Fan

The CPU fan is really a combination of a heat sink and fan together. The unit draws heat away from the CPU. To install the fan:

1. Place thermal compound to the CPU following the instructions provided with the compound.
2. Set the fan assembly on the CPU with mounting tabs aligned.
3. Pull the locking rod down on the fan assembly to lock into place.
4. Connect the fan assembly's power connector to the motherboard. Consult the manual to determine proper placement.

Caution: Failure to apply thermal compound will result in insufficient cooling and will cause damage to the CPU and/or motherboard.

Step 12: Install Case Fan

The case fan is usually installed on the back panel of the case. If the fan mount is not obvious consult the case documentation. To mount the fan:

1. Align the mounting holes by holding the fan to the mounting pad on the inside of the case. The fan needs to be mounted so that it blows air out of the case.
2. Insert the screws from the outside of the case and tighten.

Step 13: Install Power Supply

Follow these directions to install the power supply:

1. Align the mounting holes in the case and power supply.
2. Insert screws and tighten.

Step 14: Connect Cables

With all of the components installed in the case, the jungle of wires can be daunting. It is important to consult the motherboard manual in order to make sure proper connections are made. There are two kinds of connections, **power** and **data**.

- Every device that has been installed needs power. The power supply connectors are to be connected and fixed. The motherboard has **two power connections**, and there are two connectors specifically for SATA devices (drives). The other connectors will run fans and other non-SATA devices.
- Data cables connect drives and front panel devices to the motherboard. Please consult the motherboard documentation for the exact placement of connectors.

Warning: Incorrect connections can damage components and cause bodily injury.

Step 15: Wrap-up

Now that the components are completely installed, the last thing to do is to reinstall the side panels on the case. The computer is now ready to be turned on and to have software loaded on it. If the computer has problems starting up, check all component connections and mounting to make sure that you have hooked everything up correctly. Consult individual component manuals for specific troubleshooting information if problems persist.

Model Questions

Part A: Answer in One or Two Sentences

1. What is MCA?
2. What is AGP?
3. What is USB?
4. What is a DVI port?
5. Which are the primary functions of a processor?
6. Expand GPU?
7. What is I/O Bezel?
8. What is ISA?
9. Write note on local bus standards?
10. Compare serial and parallel ports.
11. Why USB ports are used?
12. Compare USB and PS/2 port.
13. What is a BIOS chip?
14. Why ground straps are used?
15. What is the use of CPU fan?

Part B: Short Essay Type Questions

1. What is EISA?
2. Write note on VESA.
3. What are the characteristics of ports?
4. Compare modem and Ethernet port.
5. What is CMOS memory?
6. What are the tools required for assembling a PC?

Part C: Long Essay Type Questions

1. Explain different types of expansion slots in a computer system.
2. Explain which are well known ports in a computer system.
3. Write notes on computer processors.
4. Write note on CMOS.
5. Explain the steps for assembling a PC.