Practical 03

Looking inside the system unit and getting familiar with internal components

Objectives

- Getting familiar with internal components of system unit.
- Getting familiar with motherboard slots and sockets.

Tools

- System unit
- Screw drivers
- Digital multi-meter

Keywords: Socket, PSU, Slot, Connector, Pin.	**Duration:** 03 hours

3 Introduction

3.1 System Unit

System unit is the technical term that refers to the box that houses the components that make up your computer.

A system unit is sometimes called a box or main unit. The system unit includes:

- Chassis
- Motherboard
- Power Supply
- Hard Disk Drive
- Floppy Drive
- CD/DVD Drive
- RAM and ROM
- Microprocessor
- Expansion Cards
- Ports and Connectors
- Sockets and Slots
- Chipset

3.2 Chassis

Chassis also called the computer case is the metal and plastic box that contains the main components of the computer. It houses the motherboard, central processing unit (CPU), power supply, and more.

Computer cases come in different shapes and sizes. A desktop case lies flat on a desk, and the monitor usually sits on top of it. A tower case is tall and sits next to the monitor or on the floor. The front of the case usually has an on/off switch and one or more optical drives.

It is a metal frame that serves as the structural support for electronic components. Every computer system requires at least one chassis to house the circuit boards and wiring. The chassis also contains slots for expansion boards. If you want to insert more boards than there are slots, you will need an expansion chassis, which provides additional slots.

There are two basic flavors of chassis designs-desktop models and tower models -but there are many variations on these two basic types.

3.3 Power Supply Unit (PSU)

Short for Power Supply and sometimes abbreviated as PSU, which is short for Power Supply Unit. The PS is an internal hardware component used to supply the components in a computer with power by converting potentially lethal 110-115 or 220-230 volt alternating current (AC) into a steady low-voltage direct current (DC) usable by the computer. A power supply is rated by the number of watts it generates.

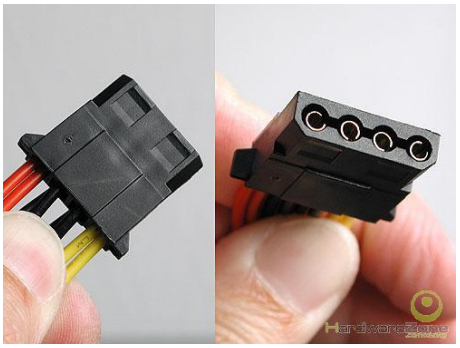
On the back end of the power supply is where you connect the power cord to the computer. In addition to the power cord connection the back also has an fan opening to draw air out of the power supply, a small red switch to change the power supply voltage, and the rocker switch to turn the power supply on and off.

On the front-end, which is not visible unless the computer is opened is several dozen other cables that connect the power supply to each of the devices and the computer motherboard. With many PC computers today the power supply connects to the motherboard using an ATX style connector, other connectors include: Auxiliary connector, Berg connector, Molex connector, and P4 connector.

3.4 Power Supply Unit Connectors

3.4.1 Molex Connector

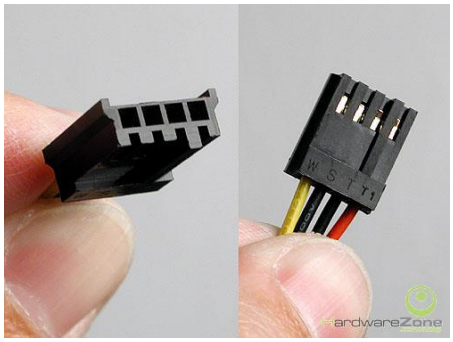
The name of the company who develops computer and other related connectors and products. This term is also known as the Molex power connector, which is the connector shown in the picture and is what connects your computer power supply to drives and devices inside the computer. Below is a diagram of this connector with its four connectors as well an explanation about each of the pins.



Pin	Name	Color	Description
1	+5V	red	+5 VDC
2	GND	black	+5 V Ground
3	GND	black	+12 V Ground (Same as +5 V Ground)
4	+12V	yellow	+12 VDC

3.4.2 Berg/Mini-Molex Connector

Sometimes labeled on the cable as P7, the Berg connector is a power connection developed by Berg It is also called as Mini-Molex connector. Electronics found with computer power supplies that connect to floppy disk drives and other parts of the computer such as the front panel lights, reset, or turbo button. The picture is an example of the 4-pin Berg connector used to power floppy disk drives in computers.



Pin	Name	Color	Description
1	+5V	red	+5 VDC
2	GND	black	+5 V Ground
3	GND	black	+12 V Ground (Same as +5 V Ground)
4	+12V	yellow	+12 VDC

3.4.3 ATX Connector

This connector is one of the largest connectors inside your computer that connects the computer power supply to an ATX style motherboard. This 20-pin cable is a multi-color cable and may be labeled as P1.

With the introduction of ATX-2, this cable is now a 24-pin cable and no longer a 20-pin cable.

The cable has a small clip on the top of the cable that should snap and hold the cable in place. This cable is also keyed, which means it only connects in one direction.

A power supply with a 24-pin connector can be used on a motherboard with a 20-pin connector by leaving the four additional pins disconnected. However, if you have a 24-pin connection on your motherboard all 24-pins need to be connected. If you are using a power supply that does not have a 24-pin connector, you need to purchase a new power supply.

3.4.4 P4 Connector

A 12V power supply cable used with motherboards that have an Intel Pentium 4 processor. The P4 cable has two black wires that serve as a ground and two yellow wires that are +12VDC.

3.4.5 PCIE/PEG Connector

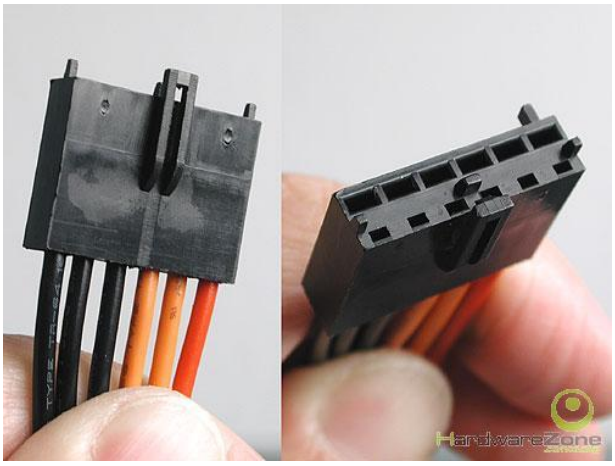
PCI Express graphics power connectors are often called PEG power connectors. There is a current limit per wire for any leads running from the power supply to the mainboard or other devices. This is the reason that some graphics cards have a single 6-pin power connection, some have dual 6 pin power connections, a few have one 6 pin and one 8 pin and extreme cards like the GTX 590 and HD6990 have dual 8 pin connectors. There are even cards that have a combination of 3 of these connectors.

The difference between the 6 pin and 8 pin power connectors is easy but also important:

- A 6 pin PEG connector can deliver 75W of 12V power to the graphics card.
- An 8 pin PEG connector can deliver 150W of 12V power to the graphics card.

3.4.6 AUX Connector

The auxiliary connector is a four or six wire power supply connector that connects to the motherboard. This connector provides additional power to the computer processor and other power hungry devices like a video. The cable has two black wires that provide the ground, two orange wires that provide +3.3VDC, and a red wire that provides +5VDC.



3.4.7 SATA Connector

The SATA power connector is a special 15-pin connector fed by only five wires, meaning three pins are connected directly to each wire. The overall width is about the same as the peripheral power connector, but the SATA connector is significantly thinner. All the most recent power supply form factor specifications include SATA power connectors as mandatory for systems supporting SATA drives.

In the SATA power connector, each wire is connected to three terminal pins, and the wire numbering is not in sync with the terminal numbering, which can be confusing.

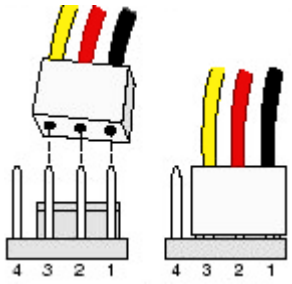
If your power supply does not feature SATA power connectors, you can use an adapter to convert a standard peripheral power connector to a SATA power connector. However, such adapters do not

include the +3.3 V power. Fortunately, though, this is not a problem for most applications because most drives do not require +3.3 V and use only +12 V and +5 V instead.

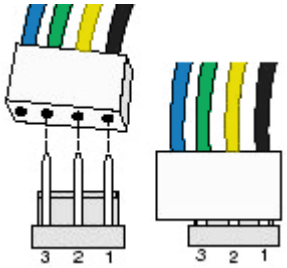
3.4.8 Fan Power Connector

Chassis and CPU fans may use either 3-pin or 4-pin power connectors. 3-pin connectors are usually used for the smaller chassis fans with lower power consumption. 4-pin connectors are usually used by CPU fans with higher power consumption. Fans and on-board fan headers are backwards compatible.

- Fan has a 3-pin power connector; desktop board has a 4-pin fan header:



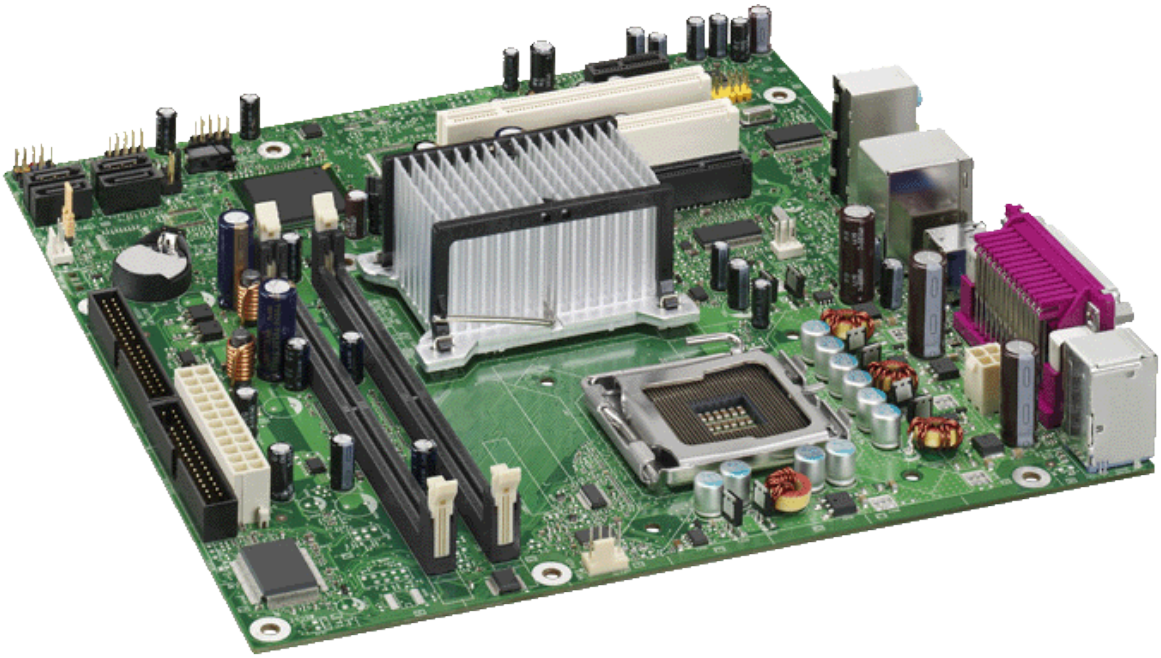
- When using a 3-pin power connector with a 4-pin fan header, the fan will always be on; there is no fan control.
- Fan has a 4-pin power connector; desktop board has a 3-pin fan header:



3.5 Motherboard

Alternatively referred to as the mb, mainboard, mobo, mobd, backplane board, base board, main circuit board, planar board, system board, or a logic board on Apple computers. The motherboard is a printed circuit board that is the foundation of a computer, located at the bottom of the computer case. It allocates power to the CPU, RAM, and all other computer hardware components and allows them to communicate with one another.

The motherboard serves to connect all of the parts of a computer together. The CPU, memory, hard drives, optical drives, video card, sound card and other ports and expansion cards all connect to the motherboard directly or via cables. The motherboard is the piece of computer hardware that can be thought of as the "back bone" of the PC.



In a desktop, the motherboard is mounted inside the case, opposite the most easily accessible side. It is securely attached via small screws through pre-drilled holes. The front of the motherboard contains ports that all of the internal components connect to. A single socket/slot houses the CPU. Multiple slots allow for one or more memory modules to be attached. Other ports reside on the motherboard which allow the hard drive and optical drive (and floppy drive if present) to connect via data cables. Small wires from the front of the computer case connect to the motherboard to allow the power, reset and LED lights to function. Power from the power supply is delivered to the motherboard by use of a specially designed port.

Also on the front of the motherboard are a number of peripheral card slots. These slots are where most video cards, sound cards and other expansion cards are connected to the motherboard. On the left side of the motherboard (the side that faces the back end of the desktop case) are a number of ports. These ports allow most of the computer's external peripherals to connect such as the monitor, keyboard, mouse, speakers, network cable and more.

All modern motherboards also include USB ports here, and increasingly other ports like HDMI and FireWire, that allow compatible devices to connect to your computer when you need them - devices like digital cameras, printers, etc.

The desktop motherboard and case are designed so that when peripheral cards are used, the sides of the cards fit just outside the back end, making their ports available for use.

3.6 Random Access Memory (RAM)

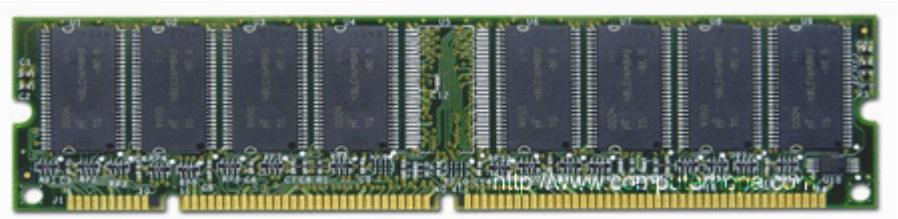
Alternatively referred to as main memory, primary memory, or system memory. Random Access Memory (RAM) is a computer storage location that allows information to be stored and accessed quickly from random locations within DRAM on a memory module. Because information is accessed randomly instead of sequentially like it is on a CD or hard drive, the computer can access the data much faster. However, unlike ROM and the hard drive RAM is a volatile memory and requires power in order to keep the data accessible, if power is lost all data contained in memory lost.

As the computer boots up, parts of the operating system and drivers are loaded into memory, which allows the CPU to process the instructions much faster, hence taking less time before your machine is operational. After the operating system has loaded, each program you open such as the browser you're using to view this page is loaded into memory while it is running. If too many programs are open the computer will swap the data in the memory between the RAM and the hard disk drive.

Over the evolution of computers there has been different variations of RAM used in computer. Some of the more common examples are DIMM, RIMM, SIMM, SO-DIMM, and SOO-RIMM.

3.6.1 Dual In-line Memory Module (DIMM)

Short for Dual In-line Memory Module, DIMM is a circuit board that holds memory chips. DIMMs have a 64-bit path because of the Pentium Processor requirements. Because of the new bit path, DIMMs can be installed one at a time, unlike SIMMs on a Pentium that would require two to be added. Below is an example image of a 512MB DIMM memory stick.

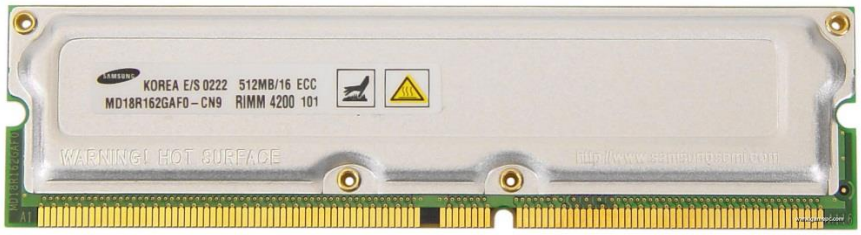


SO-DIMM is short for Small Outline DIMM and is available as a 72-pin and 144-pin configuration. SO-DIMMs are commonly utilized in laptop computers. Below is an example picture of a 4GB SODIMM memory stick from Crucial.

3.6.2 RIMM

RIMM is not an acronym and is a trademark of Rambus incorporated for the Direct Rambus or DRAM (RDRAM) modules. RIMM is computer memory that resembles DIMMs; however, it is 184-pin and is available with built-in ECC support and Non-ECC at speeds up to 800MHz. RIMM modules are commonly used on the Intel Pentium 4 motherboards.

Unlike most other computer memory, computers that support RIMM require a continuous signal. If a memory socket is left empty, the computer will not work properly. Therefore, users must utilize C-RIMM modules in any slots that do not have RIMM modules.

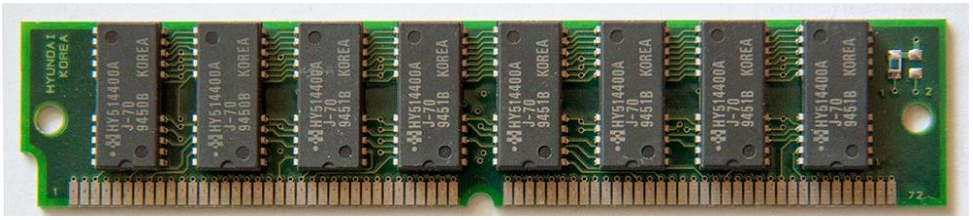


SO-RIMM is a 160-pin module and is Rambus memory used in laptop computers.

3.6.3 Single In-line Memory Module (SIMM)

Short for Single In-line Memory Module, SIMM is a memory module developed by Wang laboratories in 1983. The SIMM circuit board that holds six to nine memory chips per board, the ninth chip usually an error checking chip (parity or non parity). The SIMM was used with computers using a 486, early Intel Pentium, and compatible processors. However, because the Pentium is 64-bit and a SIMM is only 32-bits wide, they must be installed two at a time when used with any 64-bit processor.

Below is a graphic illustration of a 4MB SIMM. Today, the SIMM is rarely used and have been replaced by DIMMs.



3.7 Read Only Memory (ROM)

Short for Read-Only Memory, ROM is a type of "built-in" memory that is used with computers and other electronic devices. As the name indicates, data stored in ROM may only be read; it is either modified with extreme difficulty or not at all. ROM is mostly used for firmware updates. A simple example of ROM is the cartridge used with video game consoles; which allows one system to run multiple games. Another example of ROM is EEPROM, which is a programmable ROM used for the computer BIOS.

3.8 Complementary Metal-Oxide Semiconductor (CMOS) and Battery

Alternatively referred to as a Real-Time Clock (RTC), Non-Volatile RAM (NVRAM) or CMOS RAM, CMOS is short for Complementary Metal-Oxide Semiconductor. CMOS is an on-board, battery powered semiconductor chip inside computers that stores information. This information ranges from the system time and date to system hardware settings for your computer. The picture shows an example of the most common CMOS coin cell battery used to power the CMOS memory.

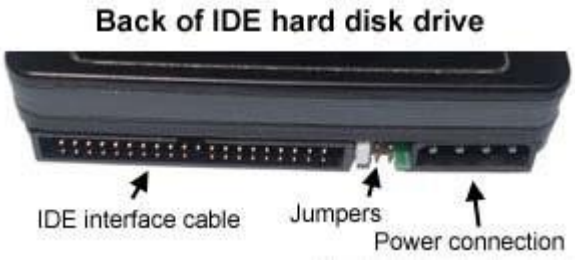
The standard lifetime of a CMOS battery is around 10 Years. However, this can vary depending on the use and environment in which the computer resides. If the battery fails, the system settings, date, and time will not be saved when the computer is turned off until it has been replaced.

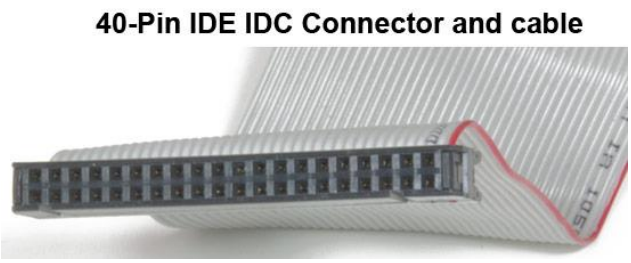
3.9 Hard Disk Drive (HDD)

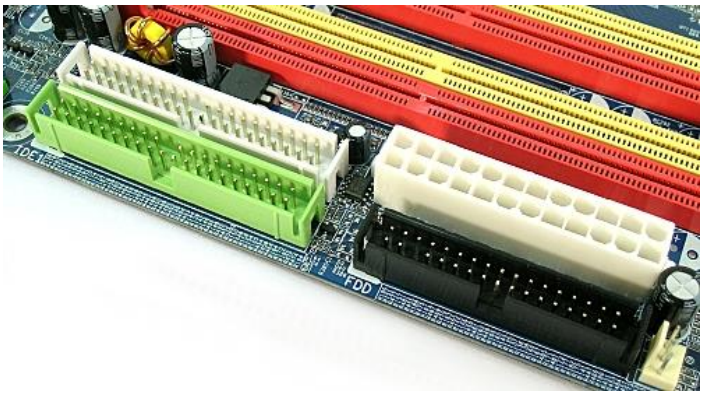
Alternatively referred to as a hard disk and abbreviated as HD or HDD, the hard drive is the computer's main storage media device that permanently stores all data on the computer. The hard drive was first introduced on September 13, 1956 and consists of one or more hard drive platters (hard disks) inside of an air sealed casing. Most computer hard drives are in an internal drive bay at the front of the computer and connect to the motherboard using both an ATA, SCSI, or SATA cable; and a power cable.

3.9.1 Integrated Drive Electronics (IDE)

Short for Integrated Drive Electronics or IBM Disc Electronics, IDE is more commonly known as ATA or Parallel ATA (PATA) and is a standard interface for IBM compatible hard drives. IDE is different from the Small Computer Systems Interface (SCSI) and Enhanced Small Device Interface (ESDI) because its controllers are on each drive, meaning the drive can connect directly to the motherboard or controller. IDE and its updated successor, Enhanced IDE (EIDE), are the most common drive interfaces found in IBM compatible computers today. Below, is a picture of the IDE connector on the back of a hard drive, a picture of what an IDE cable looks like, and the IDE channels it connects to on the motherboard.





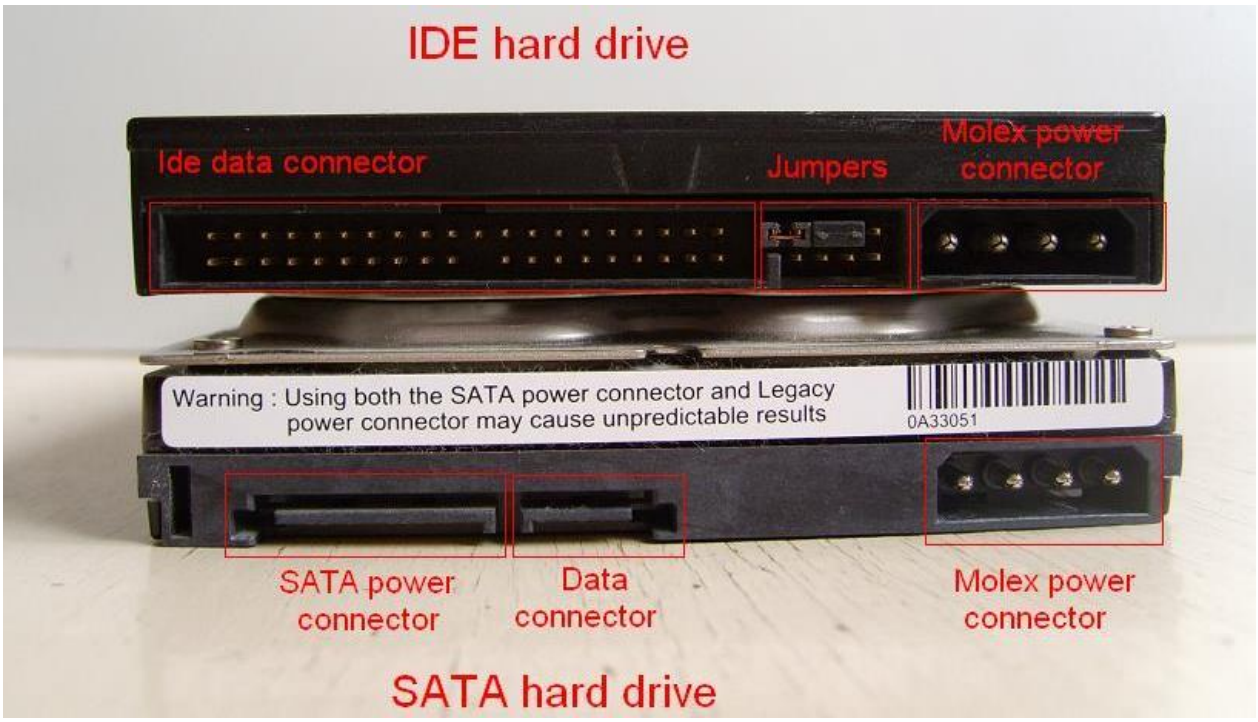


3.9.2 Serial ATA (SATA)

Short for SerialATA, SATA 1.0 was first released in August 2001 and is a replacement for the Parallel ATA interface used in IBM compatible computers. SerialATA is capable of delivering 1.5Gbps (150MBps) of performance to each drive within a disk array, offers backwards compatibility for existing ATA and ATAPI devices, and offers a thin, small cable solution as seen in the picture. This cable helps make a much easier cable routing and offers better airflow in the computer when compared to the earlier ribbon cables used with ATA drives.

In addition to being an internal solution SATA also supports external drives through External SATA more commonly known as eSATA. eSATA offers many more advantages when compared to

other solutions. For example, it is hot-swappable, supports faster transfer speeds and no bottleneck issues when compared with other popular external solutions such as USB and Firewire, and supports disk drive technologies such as S.M.A.R.T..



Unfortunately, however, eSATA does have some disadvantages such as not distributing power through the cable like USB, which means drives will require an external power source and it only supports a maximum cable lengths of up to 2m. Because of these disadvantages don't plan on eSATA becoming the only external solution for computers.

3.10 Floppy Disk Drive (FDD)

A Floppy Disk Drive, or FDD or FD for short, is a computer disk drive that enables a user to save data to removable diskettes. Although 8" disk drives were first made available in 1971, the first real disk drives used were the 5 1/4" floppy disk drives, which were later replaced with 3 1/2" floppy disk drives. Today, because of the limited capacity and reliability of floppy diskettes many computers no longer come equipped with floppy disk drives and are being replaced with CD-R, other writable discs, and flash drives.

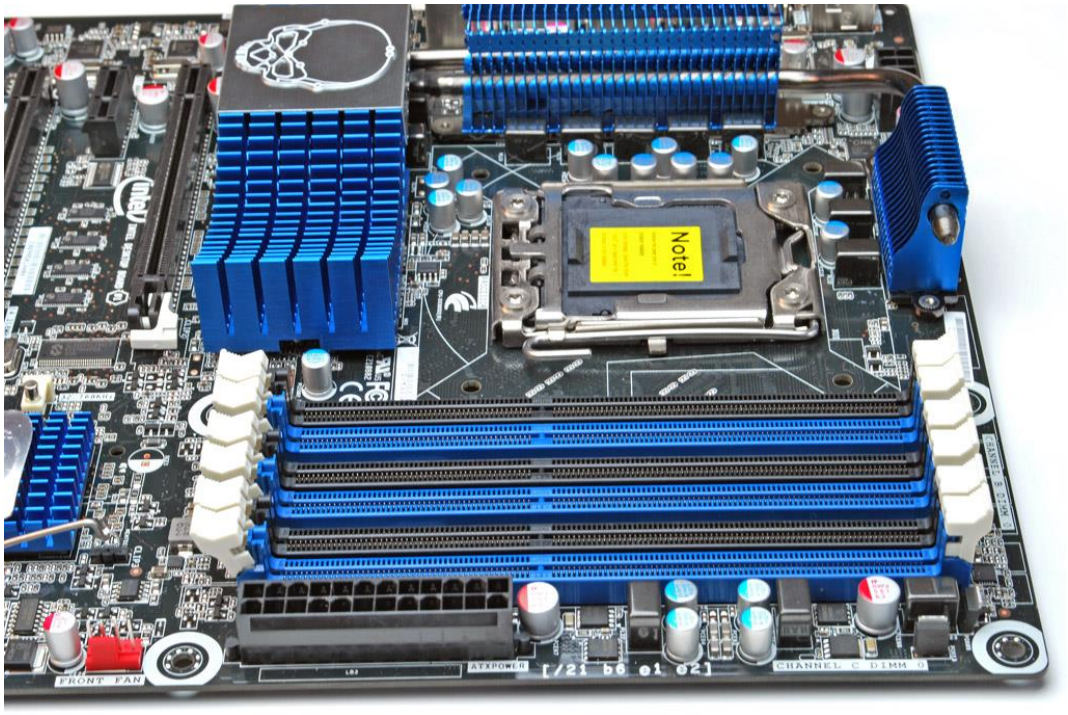
3.11 Compact Disc-Read Only Memory (CD ROM)

Short for Compact Disc-Read Only Memory, a CD-ROM is an optical disc which contains audio or software data whose memory is read only. A CD-ROM Drive or optical drive is the device used to read them. CD-ROM drives have speeds ranging from 1x all the way up to 72x, meaning it reads the CD roughly 72 times faster than the 1x version.

As you would imagine, these drives are capable playing audio CDs and reading data CDs.

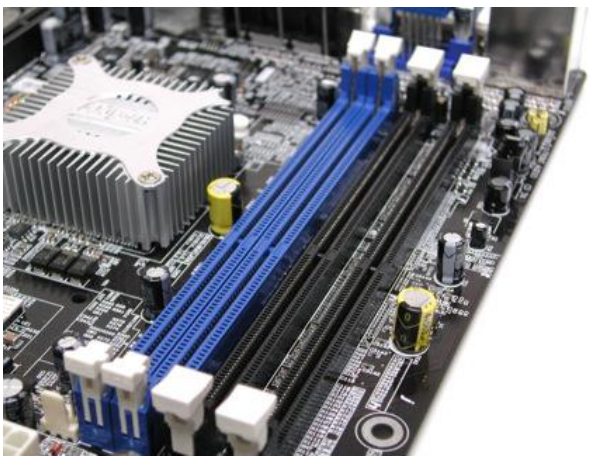
3.12 Expansion Slots

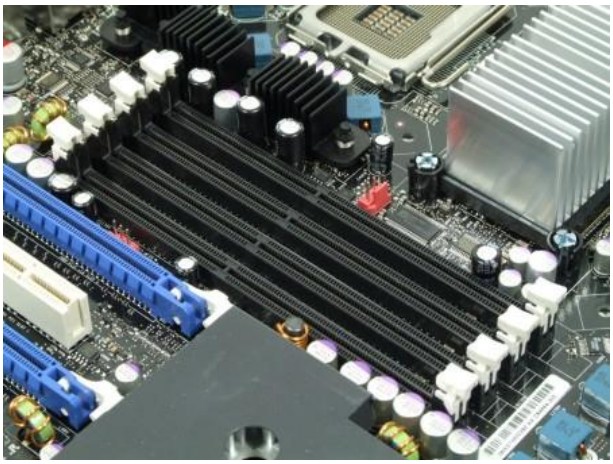
Alternatively referred to as a bus slot or expansion port, an expansion slot is an opening located inside a computer on the motherboard or riser board that allows additional boards to be connected to it. For example, if you wanted to install a new video card in the computer you'd purchase a video expansion card and install that card into the compatible expansion slot.



3.12.1 Random Access Memory (RAM) Slots

A memory slot, memory socket, or RAM slot is what allows computer memory (RAM) to be inserted into the computer. Depending on the motherboard, there may be 2 to 4 memory slots (sometimes more on high-end motherboards) and are what determine the type of RAM used with the computer.



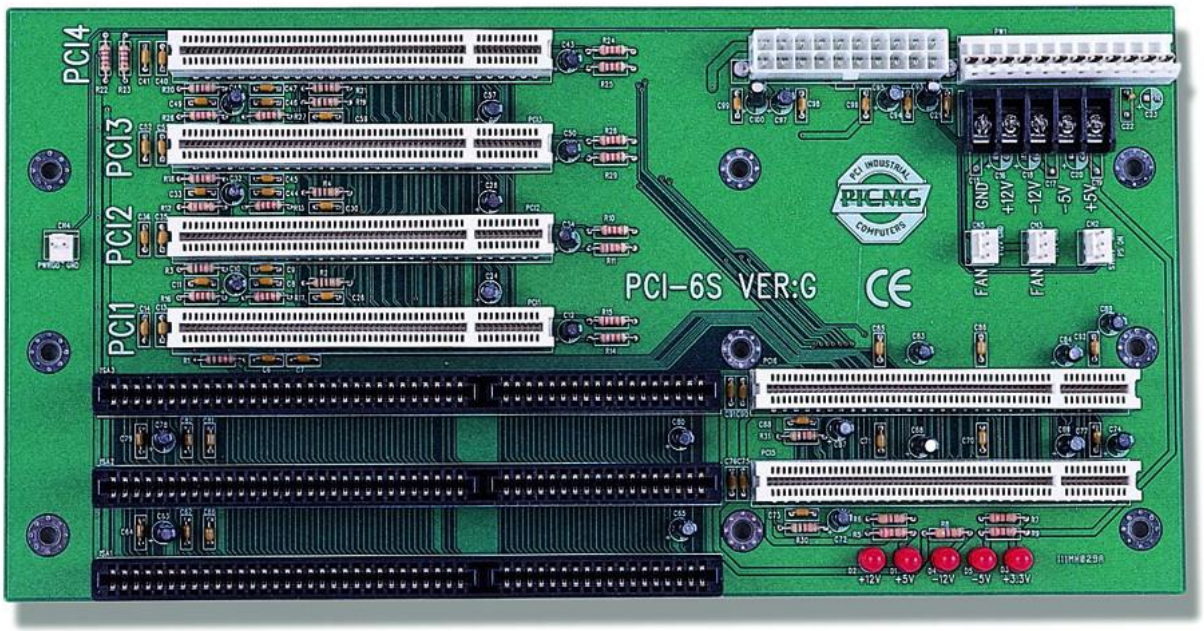


The most common types of RAM are SDRAM and DDR for desktop computers and SODIMM for laptop computers, each having various types and speeds.

3.12.2 Industry Standard Architecture (ISA) Slots

Short for Industry Standard Architecture, ISA was introduced by IBM and headed by Mark Dean. ISA was originally an 8-bit computer bus that was later expanded to a 16-bit bus in 1984. When this bus was originally released it was a proprietary bus, which allowed only IBM to create peripherals and the actual interface. However, in the early 1980's other manufacturers were creating the bus.

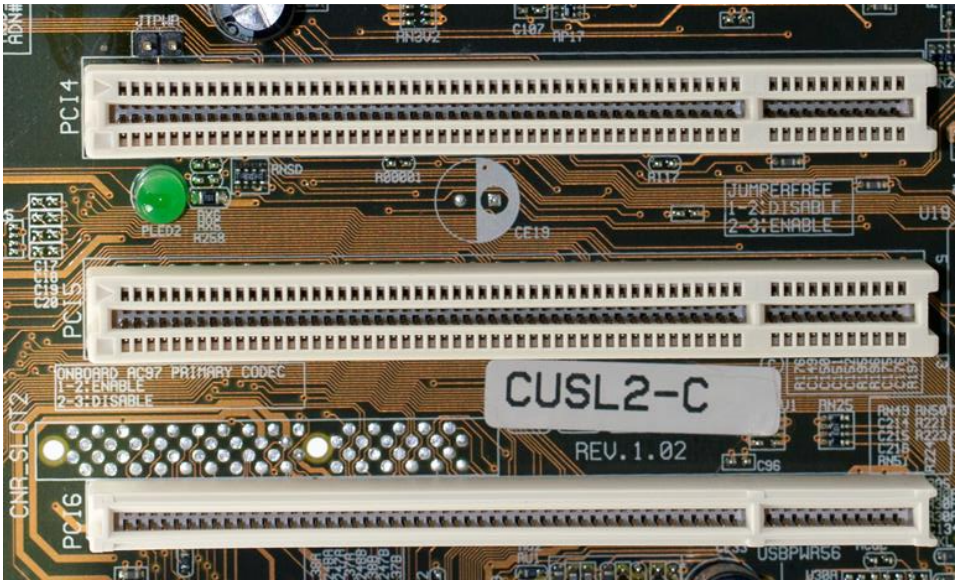
In 1993, Intel and Microsoft introduced a PnP ISA bus that allowed the computer to automatically detect and setup computer ISA peripherals, such as a modem or sound card. Using the PnP technology, an end-user would have the capability of connecting a device and not having to configure the device using jumpers or dip switches.



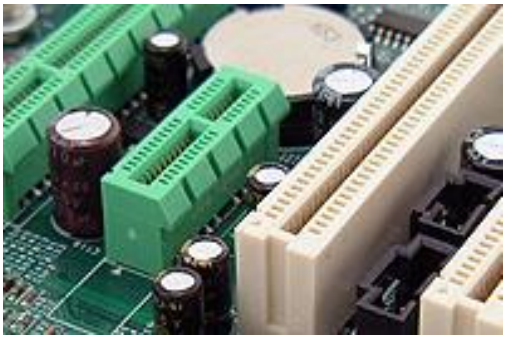
All recent computers today no longer included the ISA slots and instead are using more PCI, AGP, and other slots. Below is a graphic of what an ISA expansion card may look like as well as the slot it connects into on the motherboard.

3.12.3 Peripheral Component Interconnect (PCI) Slots

Short for Peripheral Component Interconnect, PCI was introduced by Intel in1992, revised in 1993 to version 2.0, and later revised in 1995 to PCI 2.1 and is as an expansion to the ISA bus. The PCI bus is a 32-bit (133MBps) computer bus that is also available as a 64-bit bus and was the most commonly found and used computer bus in computers during the late 1990's and early 2000's. Unlike, ISA and earlier expansion cards, PCI follows the PnP specification and therefore does not require any type of jumpers or dip switches. Below is an example of what the PCI slots looks like on a motherboard. In the picture, there are three PCI slots, PCI4, PCI5, and PCI6.



3.12.4 Peripheral Component Interconnect Express (PCI-E) Slots



Originally known as 3rd Generation I/O (3GIO), PCI Express, or PCIe, was approved as a standard on July 2002 and is a computer bus found in computers. PCI Express is a serial bus designed to replace PCI and AGP and is available in different formats: x1, x2, x4, x8, x12, x16, and x32. The data transmitted over PCI-Express is sent over wires called lanes in full duplex mode (both directions at the same time). Each lane is capable of around 250MBps and the specification can be scaled from 1 to 32 lanes. This means 16 lanes could support a bandwidth of up to 4,000MBps in both directions.

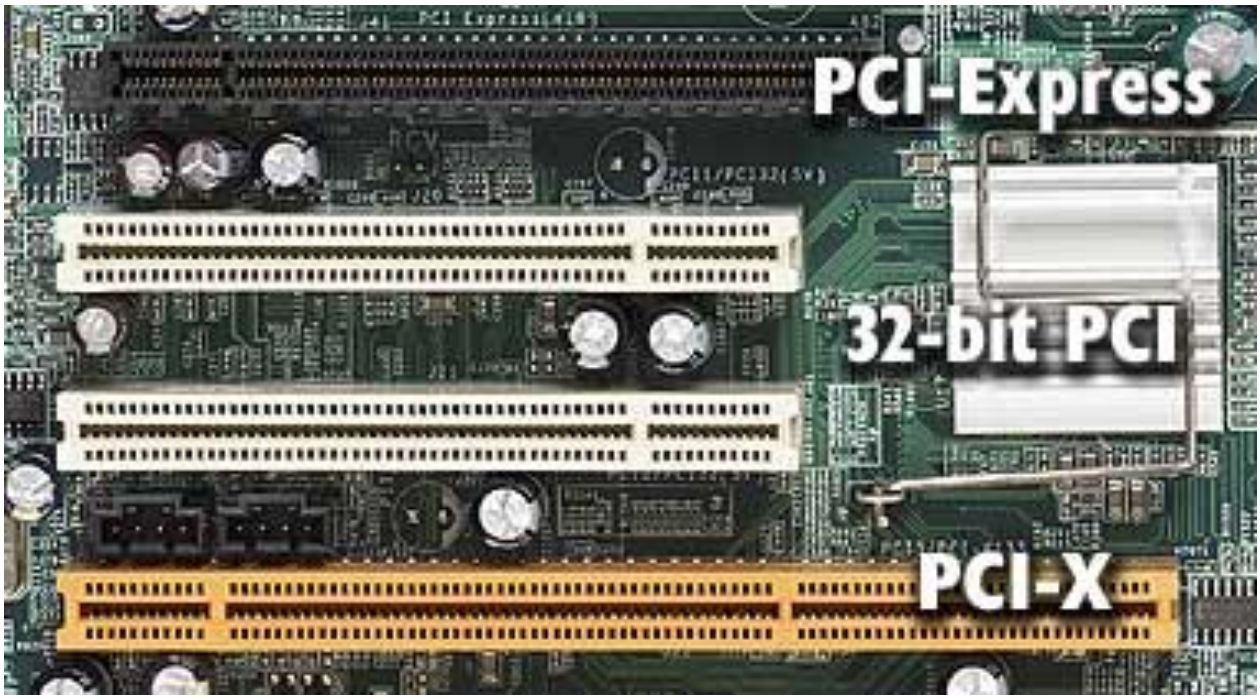
3.12.5 Peripheral Component Interconnect eXtended (PCI-X) Slots

PCI-X, short for Peripheral Component Interconnect eXtended, is a computer bus and expansion card standard that enhances the 32-bit PCI Local Bus for higher bandwidth demanded by servers. It is a double-wide version of PCI, running at up to four times the clock speed, but is otherwise similar in electrical implementation and uses the same protocol.

PCI-X is a highly upgraded version of the parallel Peripheral Components Interconnect (PCI) bus. It is a classic bus topology, and requires a large number of pins for connections. As mentioned before, the available bandwidth is shared between all attached devices.

Unlike the conventional PCI in your computer system, which is 32 bits wide, PCI-X is 64 bits wide. As a result, the bandwidth is automatically twice as high as what 32-bit PCI can deliver, and the slot connector obviously is much larger as well. Yet everything else, including the transfer protocols, signals and basic connector types, are compatible. This allows 3.3 V 32 Bit PCI cards to run in PCI-X

slot. It is also possible to run many 64 Bit PCI-X cards in 32 Bit PCI slots, but at dramatically reduced bandwidth.



3.12.6 Accelerated Graphics Port (AGP) Slots

Short for Accelerated Graphics Port, AGP is an advanced port designed for Video cards and 3D accelerators. Designed by Intel and introduced in August of 1997, AGP introduces a dedicated point-to-point channel that allows the graphics controller direct access the system memory. Below is an illustration of what the AGP slot may look like on your motherboard.

3.13 CPU/Microprocessor

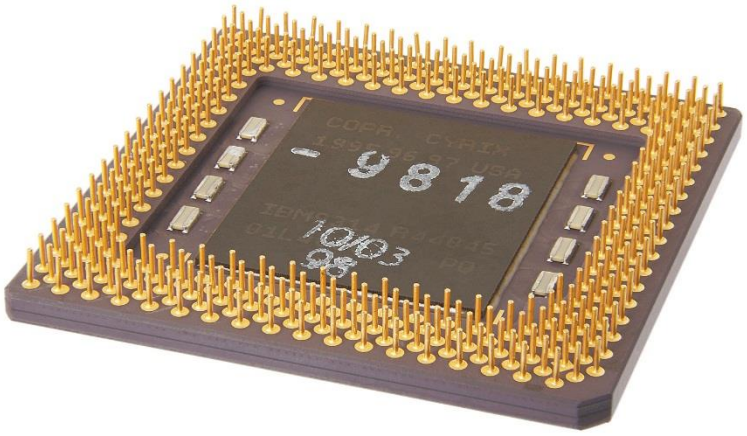
Alternatively referred to as the brain of the computer, processor, central processor, or microprocessor, the CPU was first developed at Intel with the help of Ted Hoff in the early 1970's and is short for Central Processing Unit. The computer CPU is responsible for handling all instructions it receives from hardware and software running on the computer.

In the picture below, is an example of what the top and bottom of an Intel Pentium processor looks like. The processor is placed and secured into a compatible CPU socket found on the motherboard, and because of the heat it produces it is covered with a heat sink to help keep it cool and running smoothly.

There are two main types of CPUs found in computers today: 32-bit and 64-bit. In addition to this, CPUs can be broken down into types based on the manufacturer and version as well.

3.13.1 Pin Grid Array (PGA)

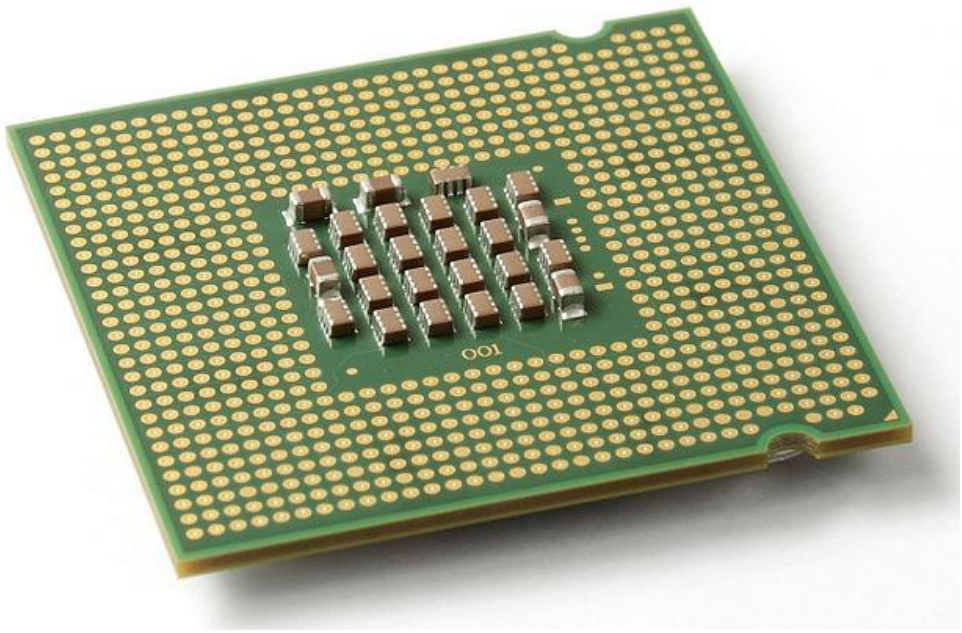
A pin grid array, often abbreviated PGA, is a type of integrated circuit packaging. In a PGA, the package is square or rectangular, and the pins are arranged in a regular array on the underside of the package. The pins are commonly spaced 2.54 mm (0.1") apart, and may or may not cover the entire underside of the package.



PGAs are often mounted on printed circuit boards using the through hole method or inserted into a socket. PGAs allow for more pins per integrated circuit than older packages such as dual in-line package (DIP).

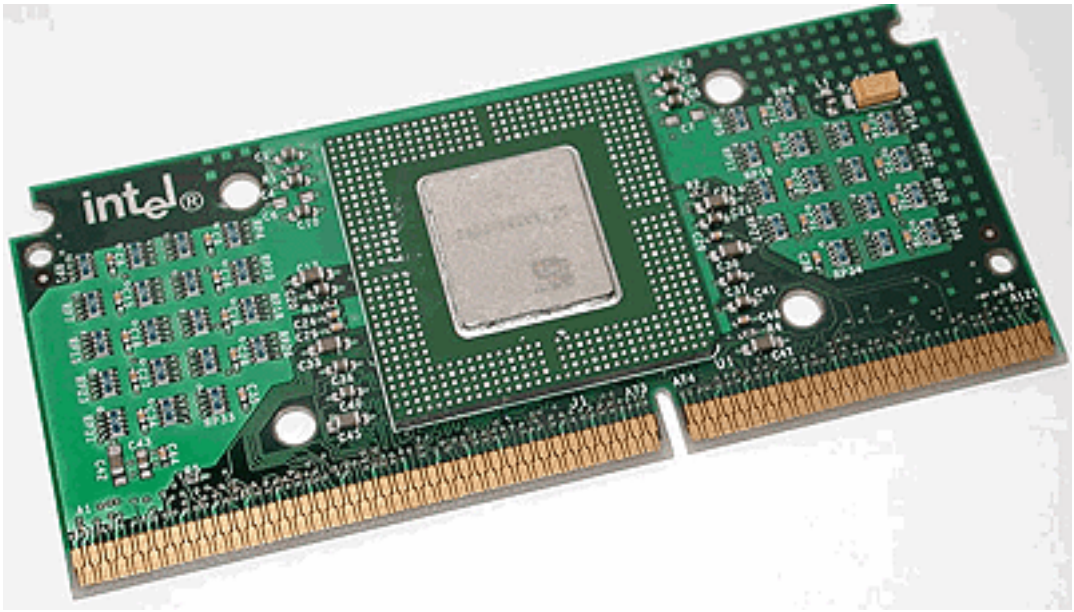
3.13.2 Land Grid Array (LGA)

The land grid array (LGA) is a type of surface-mount packaging for integrated circuits (ICs) that is notable for having the pins on the socket rather than the integrated circuit. An LGA can be electrically connected to a printed circuit board (PCB) either by the use of a socket or by soldering directly to the board.



3.13.3 SECC

Short for Single Edge Contact Cartridge, SECC is also known as a Slot 1 processor cartridge or Single Edge Processor Package (SEPP). This cartridge is used by Intel Pentium II and III processors.



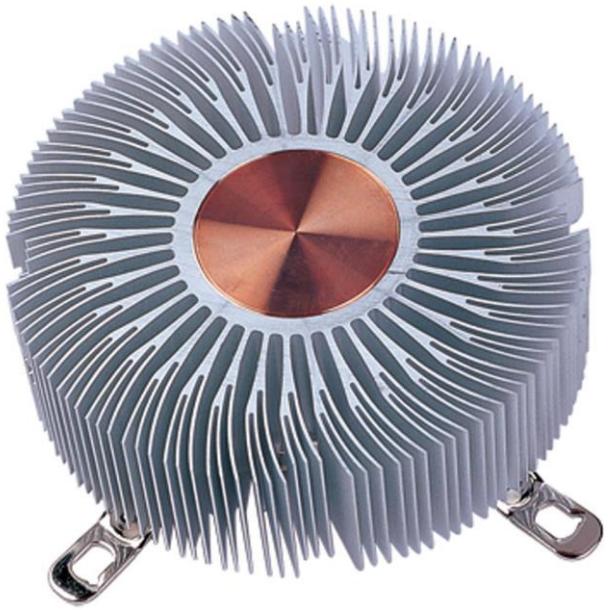
3.14 Heat Sink

A heat sink is an electronic device that incorporates either a fan or a peltier device to keep a hot component such as a processor cool. There are two heat sink types: active and passive.

Active heat sinks utilize power and are usually a fan type or some other peltier cooling device. If you are looking to purchase an active heat sink, it is recommended that you purchase fans with ball-bearing motors that often last much longer than sleeve bearings. Sometimes these types of heat sinks are referred to as a HSF, which is short for heat sink and fan.

Passive heat sinks are 100% reliable, as they have no mechanical components. Passive heat sinks are made of an aluminum-finned radiator that dissipates heat through convection. For Passive heat sinks to work to their full capacity, it is recommended that there is a steady air flow moving across the fins. The above picture is an example of a heat sink that is both active and passive.

Heat spreaders are another name for heat sinks and commonly used to describe the covers on computer memory that helps dissipate the heat produced by the memory.



3.15 Chipsets

A number of integrated circuits designed to perform one or more related functions. For example, one chipset may provide the basic functions of a modem while another provides the CPU functions for a computer. Newer chipsets generally include functions provided by two or more older chipsets. In some cases, older chipsets that required two or more physical chips can be replaced with a chipset on one chip.

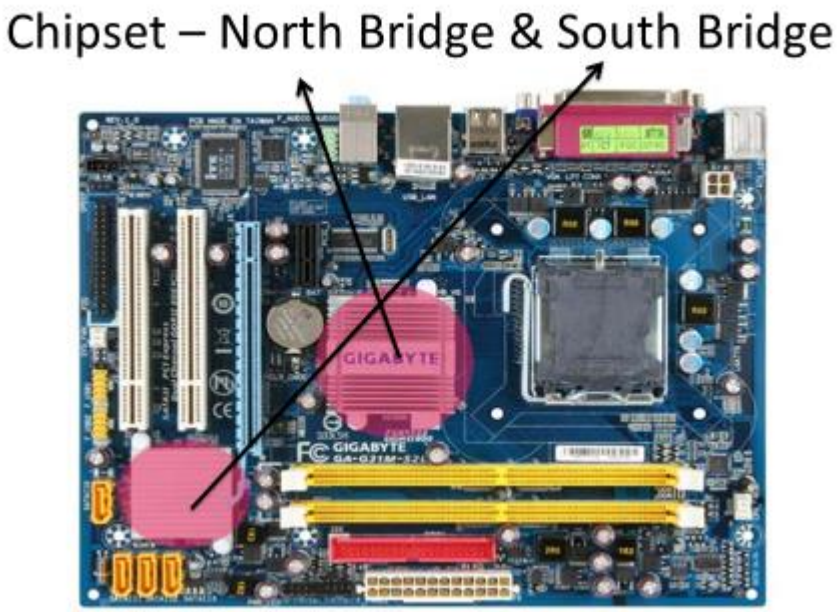
The term is often used to refer to the core functionality of a motherboard.

3.15.1 Southbridge Chipset

The Southbridge is an integrated circuit on the motherboard that is responsible for the hard drive controller, I/O controller and integrated hardware such as sound card, video card if present on the motherboard, USB, PCI, ISA, IDE, BIOS, and Ethernet. The southbridge gets its name for commonly being South of the PCI bus. Below is a graphic illustration of the ASUS P5AD2-E motherboard and some basic explanations of each of the major portions of the motherboard including the southbridge. It is common for the northbridge and southbridge to have a heat sink; in addition, the northbridge is usually slightly larger than the southbridge.

3.15.2 Northbridge Chipset

Alternatively referred to as the PAC (PCI/AGP Controller) and sometimes abbreviated as nb, the northbridge is an integrated circuit that is responsible for communications between the CPU interface, AGP, and the memory. Unlike the Southbridge the Northbridge is directly connected to these components and acts like a "bridge" for the Southbridge chip to communicate with the CPU, RAM, and graphics controller. Today, the northbridge is a single-chip that is North of the PCI bus, however, early computers may have had up to three separate chips that made up the northbridge.



EXERCISE

1. **What is the orientation of your PC's System Unit? What other orientations are available?**
2. **Check in your PC, and specify the number of following PSU connectors:**
    a. **Molex**
    b. **Mini-Molex**
    c. **SATA**
    d. **P4**
    e. **PCIE**
    f. **ATX**
3. **Check in your PC, and specify the followings:**
    a. **Number of RAM slots**
    b. **Type of RAM modules (SIMM, DIMM or RIMM)**
    c. **Size of Each of the RAM module**
    d. **Number of PCI Slots**
    e. **Number of PCIE Slots**
    f. **Number of PCI-X Slots**
    g. **Number of ISA Slots**
    h. **Number of AGP Slots**
    i. **Type of CPU Chip (LGA, PGA, SECC)**
    j. **Number of Heat Sinks and associated components**
    k. **BIOS Manufacturer**
    l. **Number of HDDs attached**
    m. **Number of FDDs attached**
    n. **Types of HDD (IDE, SATA)**
    o. **Types of CD/DVD ROM (IDE/SATA)**
    p. **Number of IDE Connectors on motherboard**
    q. **Maximum number of IDE devices supported by motherboard**