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**Assignment No-02**

Assignment Title : **Microprocessor**

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## **Microprocessors**

A microprocessor is a Central Processing Unit (CPU) and sometimes it is called as main processor or processor. It is a brain of a computer system. It builds with millions of transistors. It is an electronics component that use to control all the execution of the computer system. It has mainly two parts, one is Control Unit that control all the execution part and other one is Arithmetic Logic Unit which performs all the arithmetical (addition, subtraction, multiplication, division, etc.) and logical (and, or, not) operations. The main functions of the processor are fetching, decoding, executing, and write back the operations of an instruction. Main Characteristics of a processor which we have to focus when we will be going to buy a processor for our Personal Computer System. It is important to know all the features and specification to know is this processor can able to do your work with a faster. In the next page we will see the main characteristics of a processor or CPU.

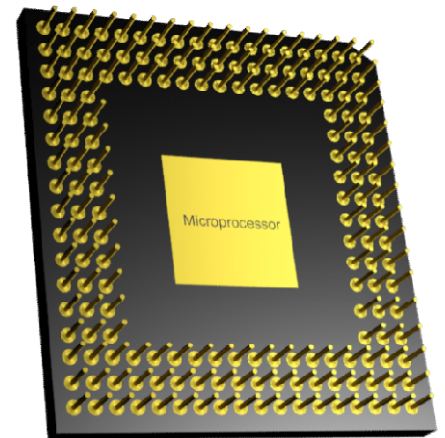


Figure 2.1 Microprocessor.

- A. Identifying CPU Characteristics**
- B. Recognizing CPU Sockets**
- C. Removing and Installing the CPU**
- D. Cooling CPU**
- E. Exploring CPU Specifications with CPU-Z**

## A. Identifying CPU Characteristics

In Windows Operating system, you will see on your keyboard a windows icon is available press on it and start typing 'System', choose System Information which will show Processor information with the name, number, and speed of the processor.

A good tech will not only learn the specifications of different CPU chips but will also master the use of reference tools such as the Internet, manufacturers' Web sites, product documentation, and reference books. A quick search of the Web or motherboard manual will generally yield.

**Table 2.1: A full list of specifications for different CPU**

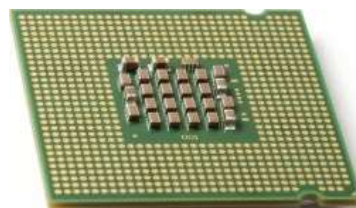
Maker	CPU Type	package	Clock speed(GHz)	FSB speed(MHz or GT/s)	L2 cache	Number of cores
Intel	Core 2 Quad Q9650	LGA775	3.00 GHz	1333MHz	2MB	4
AMD	Phenom IIX3710	microPGA	2.6 GHz	2.6 GHz	6MB	3
AMD	Phenom IIX4965	microPGA	3.4 GHz		6 MB	4
Intel	Celeron M 575	PGA 478	2.00 GHz	667MHz	1M	1
AMD	Athlon X27550 Black Edition	Socket AM2 +(940)	2.7 GHz	3.6 GT/s	3MB	Dual
Intel	Pentium 4650	PLGA775	3.40 GHz	800 MHz	2M	1
Intel	Atom 330	PBGA437	1.60 GHz	533 MHz	1M	2
Intel	Xeon X5570	FCLGA1366	2.93 GHZ	6.40 GT/s	8MB	4
Intel	Core i7 960	FCLGA 1366	3.20 GHz	4.80 GT/s	8 MB	4

### **Processor Packaging:**

Integrated circuits are put into protective packages to allow easy handling and assembly onto printed circuit boards and to protect the devices from damage. There

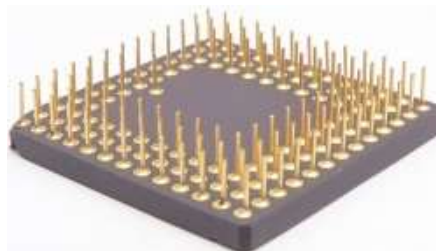
is different packaging are available, but from those for Personal Computer use three types of packaging:

1. LGA
  2. PGA
  3. BGA
- **LGA:** The LGA (Land Grid Array) has a grid of copper contacts on the underside of a package. This allows the package to be used with a socket or be soldered down using surface mount technology.



*Package Type 1 - LGA*

- **PGA:** When processor with larger width data buses were developed, the DIP package could not handle the number of connections required. The PGA (Pin Grid Array) alleviated this problem by allowing pins to be arranged in an array on the underside of the package.



*Package Type 2 - PGA*

- **BGA:** The BGA (Ball Grid Array) was designed to lower the cost of CPU and computer motherboard manufacturing, and at the same time improve reliability. With a BGA package, the pins are eliminated, replaced by tiny copper pads, each with a tiny ball of solder held to it with tacky flux. The BGA is accurately held in place while the printed circuit board is heated, forming soldered



*Package Type 3- BGA*

connections between the CPU and the circuit board. Elimination of the pins saves the cost of the pins, plus pin connections are less reliable than directly soldered connections.

## Types of Processors

There are different types of processors available nowadays in the industry. People are going to select their Processor according to their job. The major types of processors are classified as single-core, dual-core, Quad-core, Hexa core, Octa-core, and Deca core processor which is explained below.

1. **Single-Core Processor:** A single-core processor is the most basic type of processor. It consists of a single processing unit, or core, which can execute instructions one at a time. This means that it can handle only one task or thread at a time.
2. **Dual-Core Processor:** A dual-core processor contains two independent processing cores within a single physical package. Each core can handle its own tasks and execute instructions simultaneously. Dual-core processors can provide improved multitasking capabilities and better performance compared to single-core processors.
3. **Quad-Core Processor:** A quad-core processor features four independent processing cores within a single package. This type of processor can handle multiple tasks simultaneously, which makes it suitable for multitasking and resource-intensive applications. Quad-core processors offer even better performance and efficiency compared to dual-core processors.
4. **Hexa-Core Processor:** A hexa-core processor, as the name suggests, contains six independent processing cores. Hexa-core processors offer increased computational power and multitasking capabilities. They are commonly found in high-end desktop computers and servers.
5. **Octa-Core Processor:** An octa-core processor has eight independent processing cores. Octa-core processors provide even more computing power and parallel processing capabilities than quad-core or hexa-core processors. They are often used in high-performance computing systems and high-end smartphones.
6. **Deca-Core Processor:** A deca-core processor features ten independent processing cores. This type of processor provides extreme computational power and parallel processing capabilities. Deca-core processors are

typically found in high-end desktop computers, workstations, and servers that require significant processing power for demanding applications and tasks.

### **My Computer Processor and Its Specification:**

**Manufacturer:** AMD

**Model :**AMD Ryzen 5 2600G



CPU	Cores/ Threads	Clock Rate	Max Clock Rate	Max GPU Clock Speed	Power	L1 Ca che	L2 Ca che	L3 Ca che	Max Memor y Support
Ryzen 5 2600 G	4/8	3.4GH z	3.9G Hz	1250 MHz	65W	384KB	2MB	4MB	64GB

## 2. Recognizing CPU Sockets

### Types of CPU Sockets:

A processor inserts into a socket or slot, depending on the model. Most processors today insert into a socket. There are different types of sockets for Intel and AMD processors.

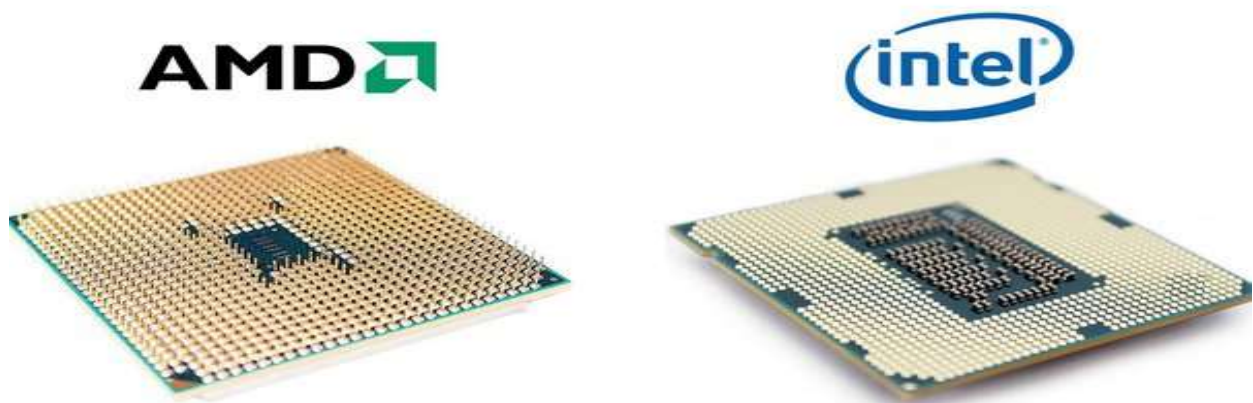
### Intel's Socket:

**LGA 1356:** It appeared in 2012 as a solution for dual-processor servers.

**LGA 1151:** Replacement LGA1150, introduced in 2015. In 2017, version 1151v2 appeared, which is currently supported.

**LGA 2066:** Replacement of LGA 2011-3 released in 2017.

**LGA 1200:** Released in Q2 2020 for Comet Lake architecture (generally new!)



### AMD's Socket:

**FM1:** Introduced in 2011 as a solution for hybrid CPUs with Fusion architecture.

**AM1:** Introduced in 2014 for budget Kabini CPUs with Jaguar microarchitecture.

**AM4:** Introduced in 2016 as a slot for Ryzen brand processors on Zen architecture.

**TR4:** Modification for Ryzen Threadripper processors, released in 2017.

**Table 2.2** Some CPU and its supported Socket Types.

CPU	Socket Type
Intel Core 2 Duo	Socket 939
AMD Phenom II	Socket AM3
AMD Athlon X2	Socket LGA-1156
Intel Pentium 4 (1.8 GHz)	Socket 478
Intel Core i7-870	Socket AM2+
AMD Athlon 64 3000+	Socket LGA-775

**My computer processor socket:**

**AMD Socket AM4**



### **3. Removing and Installing the CPU**

**To unplug/open the processor from socket as shown below:**

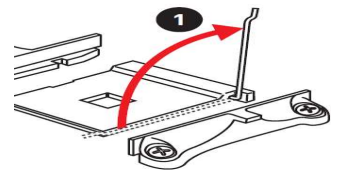
1. Remove the fan connector from the fan header.
2. Turn the push pins without flat bladed screw driver counterclockwise
3. Pull up the push pins
4. Remove the fan



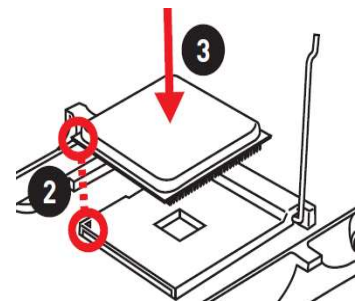
5. Turn the push pins clockwise 90 degrees to reset them.
6. Remove the fan and find the push pins
7. Press the push pins in the order shown to secure them

### **Installing Processor into the Motherboard.**

**Step-1:** First thing to do is to release the retention arm from the AM4 Socket and put it in the upright position.

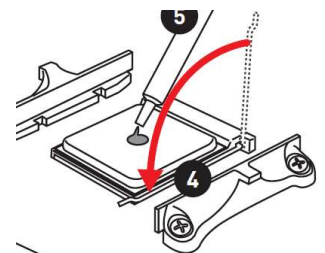


**Step-2:** Now, take the Processor Packages carefully and check the notch in AM4 Socket and in Processor Packages. (in my case, it is triangle shape. In other case, it might be coming with another shape).



**Step-3:** After matching the notch, place the Processor into the AM4 CPU Socket, make sure that retention arm is in the upright position. Do not need pressurize to the Processor to fit into the socket. Remember, if it is not fitted by itself after placing the processor into the socket, then you have to be careful (otherwise, processor can be damage) and there is something wrong.

**Step-4:** After placing the processor (make sure it is fitted) on the CPU Socket. Now, last thing to do is to pressure the retention arm from the AM4 Socket and put it in the downside position. That's All.



## My CPU info printed on Chip Package



In a CPU basically this information given: manufacturer name, manufacturing year, CPU model name, Amount of L2 cache, FSB speed and unique code are printed on CPU chip package.

## 4. Cooling CPU

CPU coolers are designed to dissipate heat produced by the processor that sits at the heart of your PC. The fans, radiators, and other elements in these cooling components allow for the accumulated heat energy to flow away from vital working parts without damaging the hardware. There are different types of CPU coolers are available. The main two CPU Cooler Type is:

1. Air Cooler
2. Water or Liquid Cooler

**1. Air Cooler:** Aircoolers are ideal for general PC users. There are three more Air Cooler. These are:

- 1.1. **U-Type/Twin Tower Air Coolers:**A commonly used cooler with a vertical stack of heat fins, arranged parallel to the heat base
- 1.2. **C-Type Air Coolers:**A top-down air cooler with c-shaped heat pipes curving from the heat fin stack
- 1.3. **Low-Profile Air Coolers:** A simple cooler that doesn't take up much space. This type of unit is good for buyers looking to build a computer in a case that does not have extra space.
- 2. **Water or Liquid Cooler:** Water- or liquid-based CPU coolers are a step up from air coolers and are generally more effective at controlling the temperature of your processor.



**A.**



**B.**



### **Comparing different CPU's fan:**

Many different types of fans can be attached to CPUs in many different ways. Describe the characteristics of the types of fans shown in the figures A, B and C.

**A.** AMD Ryzen Box CPU FAN

**B.** Intel Laminar RM1 cooler

**C.** Cooling Fan

**My CPU Cooler Type:** is Air CPU Cooler.



*My Home PC's Cooler*

## Installing Air CPU Coolers

Before Installing CPU coolers, we have made sure that all power connection is turned off from the Computer System. After turning off the power supply from the computer, we can go for installing CPU Cooler.

**Step-1:** Before installing the CPU cooler, first we have to add a thin layer of heat sink paste on the surface of the CPU.



*Adding Thermal Paste*

**Step-2:** Now, put the Air Cooler Heat Sink on the surface of the CPU.

**Step-3:** Hook the CPU cooler clip to the mounting lug on one side of the retention frame. On the other side, push straight down on the CPU cooler clip to hook it to the mounting lug on the retention frame.



**Step-4:** To fix the CPU Fan now, we have to press on the CPU Cooler slightly and tighten the screw into the mounting plate.



**Step-5:** Now, connect/plug the CPU Fan wire into the CPU\_FAN header on the motherboard. That's All for installing CPU Fan.

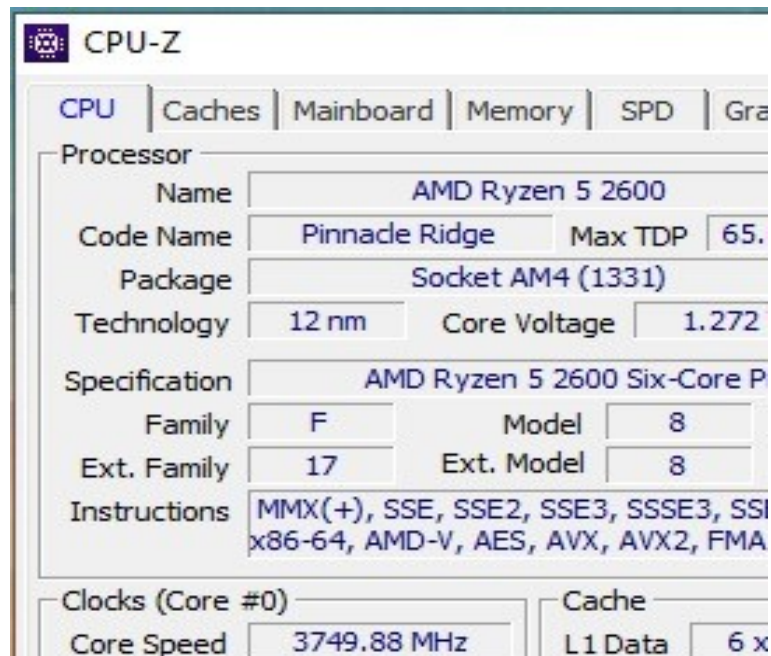
## CPU Cooling System Manufacturers for CPU:

Nowadays, there are different manufactures available to give you the best performance CPU Cooling System with the Best price in the market.

### Air Cooling Manufacturers:

Manufacturer	Model Number	Offer For	Price	Benefits
Noctua	Noctua NH-D15	Ryzen 9 5950X	\$110 USD	<ul style="list-style-type: none"> <li>• Great cooling performance</li> <li>• Two fans</li> <li>• Huge cooling surface</li> </ul>
Thermalright	Peerless Assassin 120 SE	Core i9-12900K	\$35.99 USD	<ul style="list-style-type: none"> <li>• Capable of cooling 200W</li> <li>• +With Alder Lake CPUs</li> </ul>
Deepcool	Deepcool Assassin III	AMD AM4 Socket	\$59 USD	<ul style="list-style-type: none"> <li>• Four direct contact heat pipes</li> <li>• Upgradable to dual fans</li> </ul>
Corsair	Corsair H100i Elite	AMD AM4 / AM5	\$140 USD	<ul style="list-style-type: none"> <li>• Noise Level very low 20 ~39.9 dBA</li> <li>• RGB Elite</li> </ul>
Zalman	Zalman CNPS10x	Intel 115x, 1200, 2011, 2066	\$90	<ul style="list-style-type: none"> <li>• Max Noise Level 27 dBA</li> <li>• Materials: Pure Copper, Pure Aluminum, ABS</li> </ul>

## My Processors CPU-Z Information



CPU-Z			
CPU		Caches	Mainboard   Memory   SPD   Gra
Processor			
Name	AMD Ryzen 5 2600		
Code Name	Pinnacle Ridge	Max TDP	65.
Package	Socket AM4 (1331)		
Technology	12 nm	Core Voltage	1.272
Specification	AMD Ryzen 5 2600 Six-Core P		
Family	F	Model	8
Ext. Family	17	Ext. Model	8
Instructions	MMX(+), SSE, SSE2, SSE3, SSSE3, SSI x86-64, AMD-V, AES, AVX, AVX2, FMA		
Clocks (Core #0)		Cache	
Core Speed	3749.88 MHz	L1 Data	6 x

*CPU-Z information of my processor*

- **Processor Name:** AMD Ryzen 5 2600G
- **Code Name:** The code name of the processor chip running on the machine. For this one, the name is Raven Ridge.
- **Package:** The socket type of the CPU. For each different socket type, the number of pins varies. This parameter is very important when upgrading the CPU. The socket type for this processor is AM4 (1331).
- **Technology :** Technology of transistors. The Ryzen 5 2600G uses 14nm technology. A smaller number is better, as it allows the chip to contain more transistors, run faster, and operate more efficiently.
- **Specification:** Full CPU name of the computer: AMD Ryzen 5 2600G with Radeon Vega Graphics.
- **Model :** The type of CPU in the family that the computer has. This one is 8.
- **Stepping:** This number determines the kind of improvements made to the core. Like software patches, a larger number indicates more fixes and improvements from previous versions. The stepping for this processor is 2.
- **Revision:** A combination of Family, Model, and Stepping tells the Revision. This CPU's revision is B2.



- **Instructions** : This is the list of scripts that the chip processes. For this processor, they include: MMX(+), SSE, SSE2, SSE3, SSSE3, SSE4.1, SSE4.2, SSE4A, x86-64, AES, AVX, AVX2, FMA3, SHA.
- **Core Speed**: CPU clock. This parameter changes with core voltage to save power. For the Ryzen 5 2600G, it is 3200 MHz (base) and 3600 MHz (boost).
- **Multiplier**: The coefficient of impulse (bus ratio), which sets the ratio of the internal clock rate to the external pulse provided. For this processor, it is x32.0.
- **Bus Speed** : How quickly the system bus moves data between components. For this processor, it is approximately 100 MHz.
- **Core/Thread**: Cores are physical processing units; threads are virtual sequences of instructions. Multithreading divides tasks into separate threads to run in parallel. This CPU has 4 cores and 8 threads.
- **L1 Cache**: Level 1 cache is built into the microprocessor for storing recently accessed information. For this processor, it is 4 x 32KB (per core).
- **L2 Cache**: Level 2 cache is located outside and separate from the microprocessor core but on the same processor chip package. For this processor, it is 4 x 64KB (per core).
- **L3 Cache**: Level 3 cache improves performance of L1 and L2. With multicore processors, it is often shared. For this processor, it is 4MB (shared).
- **Max TDP**: Maximum CPU power consumption. For the Ryzen 5 2600G, it is 65W.