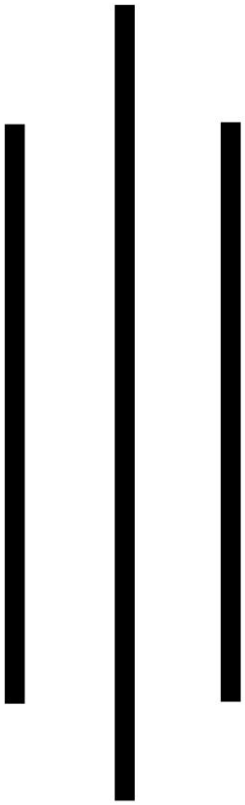
COMPUTER SYSTEM

Structure and Function of Central Processing Unit (CPU)



Compiled By:

Name : Michael R Simatupang
Class : XI TKJ 2

SMKN 1 BATAM

Jalan Prof. Dr. Hamka No. 1 (Tembesi), Batam
Tel (0778) 365904 Fax. (0778) 365903
Academic Year 2014/2015

FOREWORD

All praise and gratitude to the presence of God Almighty for the overflow of grace to we are all so we are always in his protection.

This paper is one of the tasks of TKJ productive subjects which aims to: provide additional knowledge to students. Hopefully this paper can be useful for the reader even in the writing of this paper there are still many errors. By Therefore, through this opportunity, the author humbly accepts suggestions and advice constructive criticism for the perfection of this paper.

Thus, I would like to thank all those who have helped in writing this paper.

Batam, January 26, 2015

Michael Simatupang

TABLE OF CONTENTS

CHAPTER I: INTRODUCTION

1.1 Background

A computer is a series or group of electronic machines consisting of thousands or even millions of components that can work together, and form a neat and thorough work system.

The computer consists of hardware (hardware on a computer), software (software on a computer) and brainware (human devices on a computer).
On the computer there is a CPU (Central Processing Unit). CPU is one of the hardware components that are needed on a computer. This is where all the data is processed on the CPU. Therefore the CPU is needed for the CPU.

1.2 Problem Objective

a. To find out what is meant by CPU.
b. To know CPU function
c. To know the CPU structure

2.1 UNDERSTANDING CPU

CPU stands for Central Processing Unit is computer hardware that functions to receive and execute commands and data from the software.

2.2 CPU FUNCTION

CPU works like a calculator, only CPU is much more powerful processing power. The main function of the CPU is to perform arithmetic and logical operations on data retrieved from memory or from information entered through several hardware devices, such as a keyboard, scanner, control lever, or mouse. The CPU is controlled using a set of computer software instructions. The software can be run by the CPU by reading it from storage media, such as hard disks, floppy disks, compact disks, or recording tapes. The instructions are then stored first in physical memory (RAM), where each instruction will be assigned a unique address called a memory address. Furthermore, the CPU can access the data in RAM by specifying the address of the desired data.

When a program is executed, data flows from RAM to a unit called a bus, which connects the CPU to RAM. The data is then decoded using a processing unit called an instruction decoder which can translate the instructions. The data then travels to the arithmetic and logic unit (ALU) which performs calculations and comparisons. Data may be temporarily stored by the ALU in a memory location called a register so that it can be retrieved quickly for processing. The ALU can perform certain operations, including addition, multiplication, subtraction, condition testing of the data in registers, to sending the processing results back to physical memory, storage media, or registers when processing the processing results again. During this process, a unit in the CPU called the program counter will monitor the instructions that were executed successfully so that these instructions can be executed in the correct and appropriate sequence.

2.3 HOW CPU WORK

When data and/or instructions are entered into processing-devices, they are first placed in RAM (via Input-storage); if in the form of instructions it is accommodated by the Control Unit in the Program-storage, but if it is in the form of data it is accommodated in the Working-storage). If the register is ready to receive execution, the Control Unit will take instructions from the Program-storage to be stored in the Instruction Register, while the memory address containing the instructions is stored in the Program Counter. Meanwhile, the data is taken by the Control Unit from the Working-storage to be accommodated in the General-purpose register (in this case the Operand-register). If based on the execution instructions performed are arithmetic and logic, then the ALU will take over the operations to perform based on the specified instructions. The results are stored in the Accumulator. If the processing results have been completed, the Control Unit will take the processing results in the Accumulator to be accommodated back into Working-storage. If the overall work has been completed, the Control Unit will pick up the processing results from the Working-storage to be accommodated into the Output-storage. Then next from the Output-storage, the processing results will be displayed to the output-devices.

2.4 CPU STRUCTURE

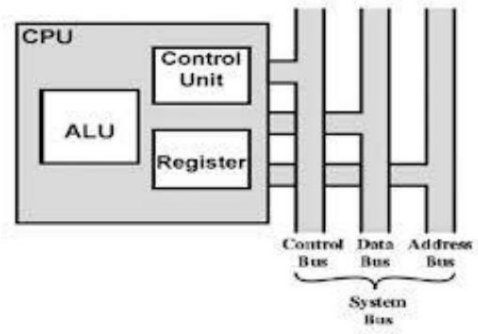


Image of Internal CPU

Here is the CPU structure:

A. Arithmetic and Logic Unit (ALU)

The ALU is in charge of forming computer data processing functions.

ALU is often called *machine language (machine language)* because this section does the machine language instructions given to it.

As the term implies, the ALU consists of two parts, namely the arithmetic unit and the boolean logic unit, each of which has its own specific task.

B. Control Unit

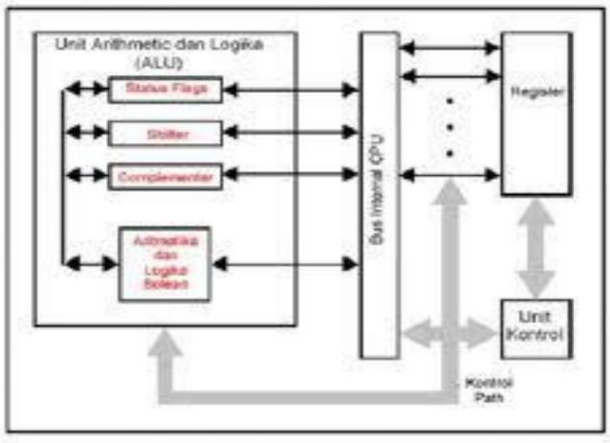
The CU is in charge of controlling the operation of the CPU and overall controlling the computer so that the synchronization of work between included in the responsibility of the control unit is to fetch instructions from main memory and determine the type of instruction.

C. Register

register is the CPU's internal storage media that is used when data processing. This memory is temporary, usually used to store data when processed or data for further processing.

D. CPU interconnection

CPU interconnection is a connection and bus system that connects the CPU's internal components, namely the ALU, control unit and registers and also with the CPU's external buses that connect with other systems, such as main memory, input/output devices.



Struktur Detail Internal CPU

2.5 REGISTER

Processor register, in computer architecture is a small amount of computer memory that works at very high speed which is used to execute computer programs by providing fast access to commonly used values.

4 Types of register groups as follows:

1. General Purpose Register

- Accumulator Register AX

Functions: As an accumulator and deals with special types of operations such as Arithmetic, In/Out, Shift, Logic, Rotate, and binary coded decimal operations.

- Base Register BX

Function: As a base register to reference memory addresses. Operations that can be performed are Rotate, Logic, Shift, and Arithmetic.

- Counter Register CX

Function: As an implicit counter with certain instructions, for example against Loop commands and string operations. The counter goes up if the direction flag is 0, and the counter goes down if the direction flag is 1.

- Data Register DX

Function: Stores the I/O port address during a specified I/O operation, either 8 bit or 16 bit port address. Also used in multiplication and division operations.

2. Pointer and Index Register

- Register SP (Stack Pointer, 16 bit)

Function: Used for stack operations such as storing the return address when calling a subroutine. SP is a register implicitly used by PUSH and POP commands to store and retrieve from the stack.

- Register BP (Base Pointer, 16 bit)

Function: As a base pointer in the stack reserved for data storage. BP is also used with programming languages such as Assembler and C.

- SI and DI registers (Source Index and Destination index, 16 bit)

Function: Stores offset values in the current memory data segment.

- Register IP (Instruction Pointer, 16 bit)

Function: Register that pairs with CS as the primary register to indicate the program command line. When the program is run, the IP will immediately point to the beginning of the program. Code Segment and Instruction Pointer function as a program counter written in CS:IP format. In general, machine code is placed in the Code Segment, all data is placed in the Data Segment, and PUSH and POP operations are performed on the Stack Segment.

3. Register Segment (16 bit)

- Register CS (Code Segment)

Function: Record segment of program code or instruction, CS register pairs with IP register (Instruction Pointer) in CS:IP format.

- Register DS (Data Segment)

Function: Stores the address of the segment where the data is located.

- Register SS (Stack Segment)

Function: Stores the address of the memory segment used as the stack.

- Register ES (Extra Segment)

Function: Stores additional segment addresses, such as display addresses, operating system addresses, and so on.

4. Register Flag

The 8086/8088 microprocessor has a 1 bit Status Flag and 4 Control Flags configured in a 16 bit register. Status Flags consist of:

• CF (Carry Flag)

Assignment: Where a carry out or borrow, if the result is the highest bit (value 1).

- PF (Parity Flag)

Assignment: Sets (value 1), if the instruction returns an even number (even parity).

• AF (Auxiliary Flag)

Assignment: Used by decimal setting instructions.

- ZF(Zero Flag)

Assignment: Sets (value 1), if the instruction result is 0.

- SF (Sign Flag)

Assignment: Sets (value 1), if the result is negative and 0 if positive.
Control Flag consists of:

• OF (Overflow Flag)

Task: Indicates an incorrect operation i.e. changing the result rather than the sign bit..

· IF (Interrupt Enable Flag)

Assignment: If set (value 1) can perform interrupt operation and vice versa if it is 0, then interrupt
can't be done.

· DF (Direction Flag)

Task: Controls the direction of string operations. If DF=1, then the SI and DI registers are decremented; if DF = 0, then the DI and SI registers are incremented. This register is used for MOVS, MOVSB, MOVSW, CMPS, CMPSB, and CMPSW instructions.

· TF (Trap Flag)

Task: Placed in single step mode for debugging purposes.

CHAPTER III: CONCLUSION

3.2 CONCLUSION

CPU, which stands for Central Processing Unit, is computer hardware that functions to receive and execute commands and data from the software.

The CPU structure consists of, namely:

1. ALU (Arithmetic Logic Unit).
2. CU (Control Unit).
3. Register.
4. CPU interconnection.

3.3 SUGGESTIONS

To understand the computer, we must also understand the devices contained in the computer, especially the CPU. It is in the CPU that all data processing is carried out and we must know more about the CPU.

BIBLIOGRAPHY

http://missnuroxfordutomo.blogspot.com/2011/04/pengertian-cpu-dan function.html

http://adi-lecture.blogspot.com/2013/02/struktur-dan-fungsi-cpu.html

https://aris83.wordpress.com/2013/06/03/jenis-jenis-register-pada-cpu/

http://vheeamalia-sukron.blogspot.com/2011/11/jenis-jenis-register-dan function.html

http://nifan10.blogspot.com/2013/03/fungsi-dan-struktur-cpu.html