UNIT-1

8086 ARCHITECTURE

Introduction to processor:

• The processor is a logical circuit that responds to and processes basic instructions call the computer.

• The term processor has often replaced the central processing unit (CPU). I the processor on a personal computer or embedded in a small machine is often called a microprocessor.

• Processor (CPU, Central Processing Unit) is a computer brain. Allows numerical data processing, i.e. information entered in binary form, and transaction of commands stored in memory.

Microprocessor Appearance:

• Microprocessor is used as a CPU on a small computer. Now there are many different ones microprocessors are available.

• Microprocessor is a system-controlled device, which downloads instructions to it memory, decryption and execute instructions. Most Micro processors are single-chip devices.

• Microprocessor is the backbone of a computer system. called CPU

• Microprocessor speed depends on processing speed depending on the DATA CENTER BUS.

• The most common way to separate microprocessors is by number. of fragments that their ALU can

Work on time

• Address bus is not universal because address details are always provided by Micro processor to address memory input / output devices memory.

• The data bus is Bi-directional because the same bus is used to transfer data in between Micro processor and memory or input / output devices in both directions.

• Restricts on data size. Most Microprocessor do not support floating point jobs.

• Microprocessor contains a ROM chip because it contains data usage instructions.

• What is the primary and secondary storage device? - In the primary storage device the

• Storage capacity is limited. It has a flexible memory. On the last second device i the final volume is large. It is an unforgettable memory.

a) The basic devices are: RAM (read / write memory, high speed, Volatile Memory) / ROM (Read only memory, low speed, inactive memory)

b) The second devices are: Floppy disc / Hard disk

Compiler: Compiler is used to translate high-level grammar into machine code in a time. It does not require special instructions to save in memory, it saves automatically. I The time to do so is short compared to the Interpreter.

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1.4-bit Microprocessor:

• The first microprocessor (Intel 4004) was developed in 1971. It was 4-bit figures.

a device with a speed of 108 kHz. Since then, microprocessor capacity has increased

clearly. So what are these tiny pieces of silicone that use our computers ("

A General Operating Machine Especially Used for Business Education and Research ")

• It has 3200 PMOS transistors.

• It is a 4-bit device used on a calculator.

2.8-Bit microprocessor:

• In 1972, Intel came out with an 8008 8-bit.

• In 1974, Intel announced that 8080 followed by 8085 is an 8-bit processor because 8085

The processor has an 8 bit ALU (Arithmetic Logic Review). Similarly the 8086 processor has 16 bit

ALU. This has a larger command set at the time of 8080. used by NMOS transistors, so it worked

much faster than 8008.

8080 is called the "Second generation Microprocessor"

3. Limits of 8 Bit microprocessor:

• Low performance speed

• The ability to speak with low memory

• A limited number of general purpose registers

• A set of commands full of limited power

4. Examples of 4/8/16/32 Microprocessors:

a) 4-Bit Processor - 4004/4040

b) 8-bit processor - 8085 / Z80 / 6800

c) 16-bit processor - 8086/68000 / Z8000

d) 32-bit processor - 80386/80486

5. What are the processors of the first / 2nd / 3rd / 4th generation?

i. The processor made with PMOS technology is called the 1st generation processor, and it is made up to 4 bits

ii. The processor made with NMOS technology is called 2 nd generation processor, and made up to 8 bits

iii. The CMOS technology processor is called a 3rd generation processor, and it is made up to 16 bits

iv. The HCMOS technology processor is called a 4th generation processor, and it is is made of 32 bits (HCMOS: High-density n-type Complementary Metal Oxide Silicon field effect transistor)

Block microprocessor drawing:

Central Processing Unit (CPU):

This device integrates all the functions of a small computer. Downloading applications stored on it ROMs or RAMs and issue instructions depending on a set of Commands, which is a feature of each type of CPU, and which is recognized by the CPU.

Random Access (RAM) Memory: Written temporary or sequential programs.

With the exception of the ROM component, every computer has a memory cache data and programs still being developed. These memory devices are RAM or Read - write memory. Its contents are not permanent and are changed when power is off. So i RAM memory is considered a dynamic memory.

Read-Only Memory (ROM): Default programs are saved.

The device / permanent location is called ROM, because any memory the contents of the ROMs, which cannot be written over other information.

With a blank ROM, the manufacturer provides the device without any inf. In it, information can be electrified in memory. This is called burning the ROM or PROM.

Data Lines / Data Bus:

Number of data lines, such as add-ons. Lines vary by CPU .The set of data lines says Website like bus address unlike add. Bus, data bus is bidirectional because while i address information The bus is constantly flowing from the CPU; data can flow both without CPU and CPU.

Manage lines / control Bus:

Number. of control lines also depends on the specific CPU a person uses.

Eg: Read; Write lines for examples of control lines

CLOCK:

A clock is a square wave signal that drives a CPU

Instructions: A command is a basic function that can be performed by a processor.

The instructions say sto3. Auxiliary Carry Flag (AC):

If D3 generates any carry when doing any arithmetic and logical operation, this flag is set.

Otherwise it is reset.

4. Parity Flag (P):

If the result of arithmetic and logical operation contains even number of 1's then this flag will be set and if it is odd number of 1's it will be reset.

5. Carry Flag (CY):

If any arithmetic and logical operation result any carry then carry flag is set otherwise it is reset.

Arithmetic and Logic Unit (ALU):

- It is used to perform the arithmetic operations like addition, subtraction, multiplication, division, increment and decrement and logical operations like AND, OR and EX-OR.
- It receives the data from accumulator and registers.

- According to the result it set or reset the flags.

Program Counter (PC):

- This 16-bit register sequencing the execution of instructions.
- It is a memory pointer. Memory locations have 16-bit addresses, and that is why this is a 16-bit register.
- The function of the program counter is to point to the memory address of the next instruction to be executed.
- When an opcode is being fetched, the program counter is incremented by one to point to the next memory location.

Stack Pointer (SP):

- The stack pointer is also a 16-bit register used as a memory pointer.
- It points to a memory location in R/W memory, called the stack.
- The beginning of the stack is defined by loading a 16-bit address in the stack pointer (register).

Temporary Register: It is used to hold the data during the arithmetic and logical operations.

Instruction Register: When an instruction is fetched from the memory, it is loaded in the

instruction register.

Instruction Decoder: It gets the instruction from the instruction register and decodes the

instruction. It identifies the instruction to be performed.

Serial I/O Control: It has two control signals named SID and SOD for serial data transmission.

Timing and Control unit:

- It has three control signals ALE, RD (Active low) and WR (Active low) and three status signals IO/M(Active low), S0 and S1.
- ALE is used for provide control signal to synchronize the components of microprocessor and timing for instruction to perform the operation.5
- RD (Active low) and WR (Active low) are used to indicate whether the operation is reading the data from memory or writing the data into memory respectively.
- IO/M(Active low) is used to indicate whether the operation is belongs to the memory or peripherals.
- If,

Interrupt Control Unit:

- It receives hardware interrupt signals and sends an acknowledgement for receiving the interrupt signal.

Pin Diagram and Pin Description Of 8085

8085 is a 40 pin IC, DIP package. The signals from the pins can be grouped as follows

1. Power supply and clock signals

2. Address bus

3. Data bus

4. Control and status signals

5. Interrupts and externally initiated signals

6. Serial I/O ports

1. Power supply and clock frequency signals

- Vcc + 5 volt power supply
- Vss Ground

- X1, X2: Crystal or R/C network or LC network connections to set the frequency of internal clock generator.
- The frequency is internally divided by two. Since the basic operating timing frequency is 3 MHz, a 6 MHz crystal is connected externally.
- CLK (output)-Clock Output is used as the system clock for peripheral and devices interfaced with the microprocessor.

2. Address Bus:

- A8 - A15 (output; 3-state)
- It carries the most significant 8 bits of the memory address or the 8 bits of the I/O address;

3. Multiplexed Address / Data Bus:

- AD0 - AD7 (input/output; 3-state)
- These multiplexed set of lines used to carry the lower order 8 bit address as well as data bus.
- During the opcode fetch operation, in the first clock cycle, the lines deliver the lower order address A0 - A7.
- In the subsequent IO / memory, read / write clock cycle the lines are used as data bus.
- The CPU may read or write out data through these lines.

4. Control and Status signals:

- ALE (output) - Address Latch Enable.
- This signal helps to capture the lower order address presented on the multiplexed address / data bus.
- RD (output 3-state, active low) - Read memory or IO device.
- This indicates that the selected memory location or I/O device is to be read and that the data bus is ready for accepting data from the memory or I/O device.
- WR (output 3-state, active low) - Write memory or IO device.
- This indicates that the data on the data bus is to be written into the selected memory location or I/O device.
- IO/M (output) - Select memory or an IO device.
- This status signal indicates that the read / write operation relates to whether the memory or I/O device.
- It goes high to indicate an I/O operation.
- It goes low for memory operations.

5. Status Signals:

- It is used to know the type of current operation of the microprocessor.

6. Interrupts and externally initiated operations:

- They are the signals initiated by an external device to request the microprocessor to do a particular task or work.
  There are five hardware interrupts called,

- On receipt of an interrupt, the microprocessor acknowledges the interrupt by the act programming o

low INTA signal (Consent Disruption).

Reset (included, active down)

• This signal is used to reset the microprocessor.

• The system counter inside the microprocessor is set to zero.

• Three-phase buses.

Reset (Output)

• Indicates that the CPU is reset.

• Used to reset all connected devices when the microprocessor is reset

7. Direct Memory Access (DMA):

Tri state devices:

• The 3 output regions are the highest and lowest and in addition the highest.

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• If you enable E at the top the gate opens and the Q output is either 1 or 0 (if A is 0, Q is 1, otherwise Q is 0). However, when the E is low the gate is turned off and the output Q enters in a state of high impedance.

• In both high and low cases, the output Q pulls the current of the gate input OR.

• When E is low, Q goes into high impedance; high impedance means gas separated from the OR gate input, although physically connected. Therefore, it does not draw any current for gate input OR.

• If 2 or more devices are connected to a standard bus, to prevent devices from entering interfering with each other, tristate gates are used to disconnect all external devices one that connects instantly.

• CPU controls the data transfer function between the memory and the I / O device. Exactly The memory log function is used to transfer large volume data between memory and I / O device directly.

• The CPU is turned off three times its buses and the transfer is done directly external control regions.

• The BAMBA signal is generated by the DMA control circuit. Upon receiving this sign, i microprocessor approves the request by sending an HLDA signal and leaving it out bus control. After the HLDA signal the DMA controller begins direct transmission of data.

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OK (included)

• Memory and I / O devices will have a slower reaction compared to microprocessors.

• Before completing the current task such a slow peripheral may not be able to perform additional data or control signal from the CPU.

• The processor sets the READY signal after completing the current task to access the data.

• The microprocessor enters the standby mode while the READY PIN is turned off.

8. Single Bit Serial I / O holes:

• SID (input) - Serial input data line

• SOD (output) - Outgoing serial data line

• These symbols are used for serial communication.

Overview or Features 8086

• 16-bit Microprocessor (µp). ALU, internal registers working with 16bit binary voice.

• 8086 has a 20 bit bus address which can be up to 2

20

= 1 MB memory locations.

• 8086 has a 16bit data bus. It can read or write data to memory / memory either 16bits or 8 bit on time.

• Can support up to 64K I / O holes.

• Provides 14, 16 -bit registers.

• The 8086 frequency range is 6-10 MHz

• Contains dual address and data bus AD0- AD15 and A16 - A19.

• Requires a single phase clock with a 33% work cycle to provide internal time.

• It can preload up to 6 command bytes and line them up to speed up the execution of instructions.

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• Requires + 5V power supply.

• 40 pin line package.

• 8086 is designed to work in two modes, Mini Mode and Advanced Mode.

o Minimum mode is selected using logic 1 on the MN / MX # input code.

This is a single microprocessor configuration.

o High mode is selected using logic 0 in MN / MX # input code.

This is a configuration of multi micro processors.

Register Organization 8086

General purpose registers

The 8086 microprocessor has a total of fourteen registers accessible at

editor. Divided into four groups. Of course:

• Four registers for general purposes

• Four Index / Pointer Registers

• Four-phase registers

• Two more registers

General purpose registers:

The Accumulator register contains two 8-bit registers AL and AH, which can be integrated

together and used as an AX for 16-bit register. AL in this case contains a low order byte for

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voice, and AH contains high quality byte. Accumulator can be used for I / O tasks as well

cord manipulation.

The base register contains two 8-bit BL and BH registers, which can be integrated

and used as a 16-bit BX register. BL in this case contains a low order byte of the word, as well as BH

contains high order byte. The BX register usually contains a used, based data index

reference or registered address.

The calculation register contains two 8-bit CL and CH registers, which can be integrated

together and used as a 16-bit CX register. When combined, the CL register contains a low order

Name byte, and CH contains high order byte. The calculation register can be used in Loop,

shift / rotate instructions as a counter to convert wires

The data register contains two registers of 8-bit DL and DH, which can be integrated

and used as a 16-bit DX register. When combined, the DL register contains a low order byte for

voice, and DH contains a high order byte. The data register can be used as a hole number in the I / O

jobs. For a total of 32-bit duplicates and separate commands DX register contains high order

the name of the first number or result.

Index or Pointer Registers

These registers can also be called Special Purpose registers.

Stack Pointer (SP) 16-bit register identifying system stack, i.e. used for capture

top stack address. The stack is kept as LIFO under it at the beginning of stack section (referred to as SS segment register). Unlike the SP register, BP can be used to specify offset for other parts of the system.

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Base Pointer (BP) is a 16-bit register that identifies data in the stack section. It is often used with subroutines to find the variables transferred to the stack by the beat system. BP register is usually used for a supported address, index-based or indirect address.

Source (SI) index is a 16-bit register. SI is used for indexed, based indexed and register indirect address, and address data source in character .