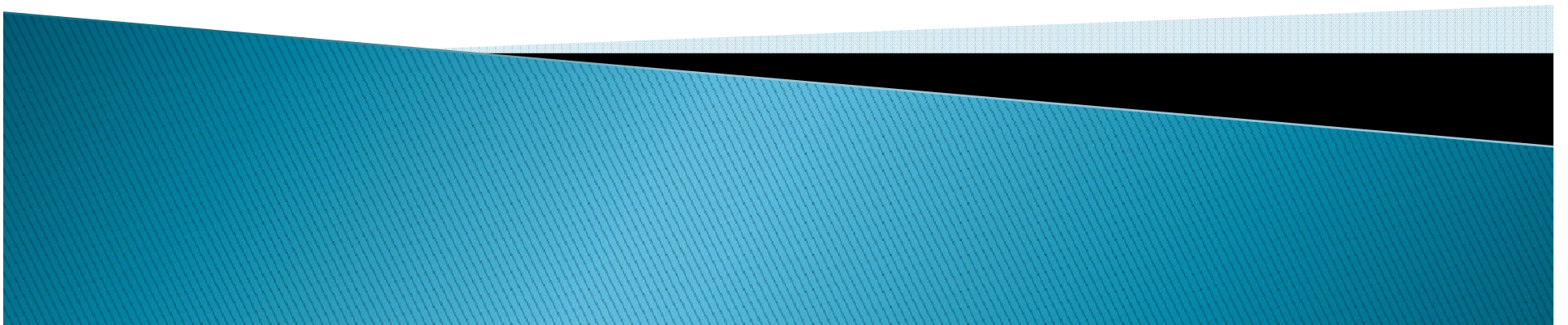



Microprocessor and Interfacing




Introduction of syllabus


The syllabus comprises four sections

- ▶ **Section-A The 8085 Microprocessor:** contains introduction of 8085 microprocessor, architecture of 8085, instruction set, interrupt structure & assembly language programming.
 - ▶ **Section-B The 8086 microprocessor architecture:** Architecture, block diagram of 8086, detail of sub block EU & BIU, memory segmentation and physical address computation, program relocation, addressing modes, pin diagram and description of various signal.
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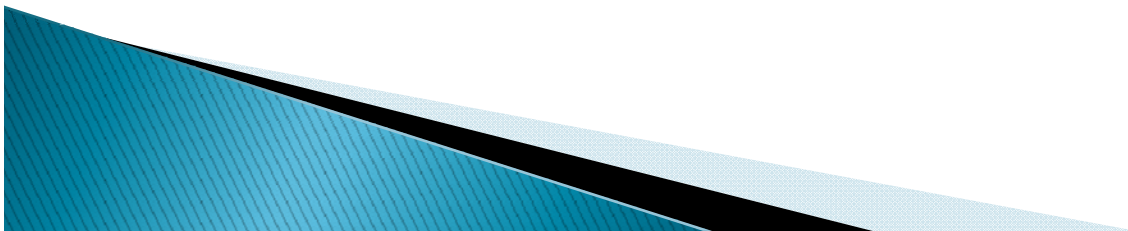
- ▶ **Section-C instruction set of 8086:** instruction execution timing, assembler instruction format, data transfer instruction, arithmetic instruction, branch instruction, loop instruction, NOP and HALT instruction, flag manipulation instruction, logical instruction, shift and rotate instruction, directives and operators, programming examples
 - ▶ **Section-D Interface devices:** 8255 programmable peripheral interface, interfacing keyboard and seven segment display, 8254(8253)programmable interval timer, 8259A interrupt controller, Direct memory access and 8237 DMA controller.
- 

Introduction

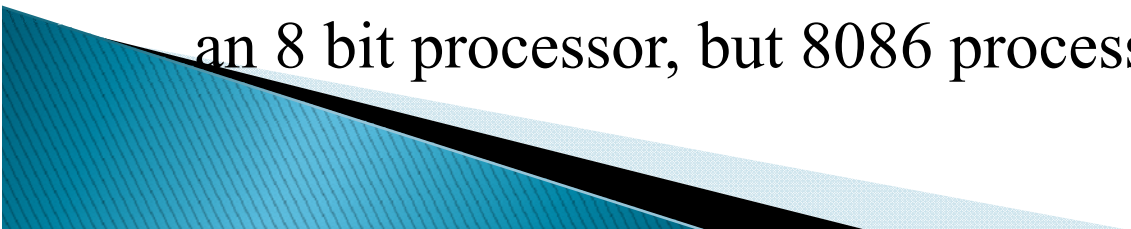
- ▶ The **MICROPROCESSOR** is the most important component of the digital computer. It acts as the brain of the computer.
 - ▶ The **Intel 8085** is an 8-bit microprocessor introduced by Intel in 1977. It was binary-compatible with the more-famous Intel 8080 but required less supporting hardware, thus allowing simpler and less expensive microcomputer systems to be built.
 - ▶ The "5" in the model number came from the fact that the 8085 requires only a +5-volt (V) power supply rather than the +5V, -5V and +12V supplies the 8080 needed.
- 

Evolution of Microprocessor

- ▶ The first microprocessor was introduced in the year 1971. It was introduced by Intel and was named Intel 4004
- ▶ Intel 4004 is a 4 bit microprocessor and it was not a powerful microprocessor. It can perform addition and subtraction operation on 4 bits at a time.



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- ▶ However **Intel's 8080** was the first microprocessor to make it to Home computers.
 - ▶ It was introduced during the year 1974 and it can perform 8 bit operations.
 - ▶ In **1976, Intel introduced 8085** processors which is nothing but an update of 8080 processors.
 - ▶ 8080 processors are updated by adding two Enable/Disable Instructions, Three added interrupt pins and serial I/O pins.
 - ▶ Intel introduced 8086 pins during the year 1976. The major difference between 8085 and 8086 processor is that 8085 is an 8 bit processor, but 8086 processor is a 16 bit processor.
- 

Manufacturer

- ▶ Apart from Intel, there are some other manufacturers who produce the CMOS version of 8085 microprocessor. Such manufacturers are called second source manufacturers.

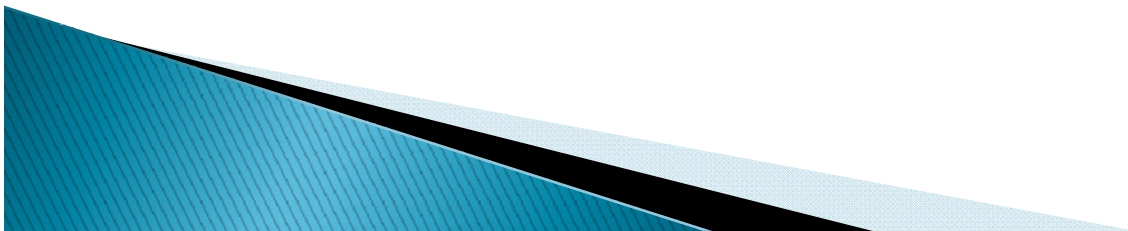
The second source manufacturers include:

- ▶ AMD
- ▶ Mitsubishi
- ▶ NEC
- ▶ OKI
- ▶ Toshiba
- ▶ Siemens

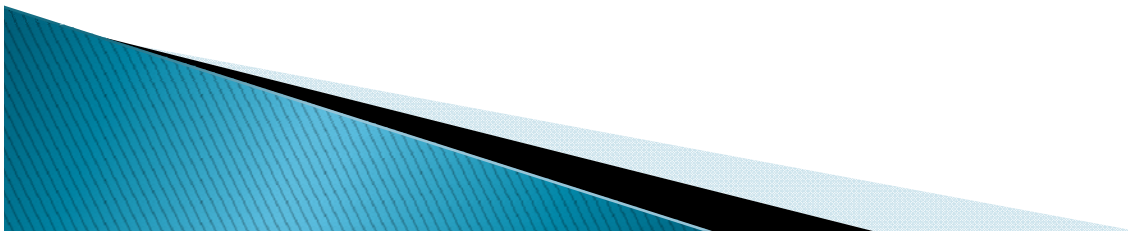


Technology

- ▶ CMOS stands for **COMPLEMENTARY METAL OXIDE SEMICONDUCTOR**. It is a technology used in Microprocessors and Microcontrollers for making Integrated circuits.
- ▶ The devices which are made of CMOS have high immunity towards noise and the static power consumption is low.

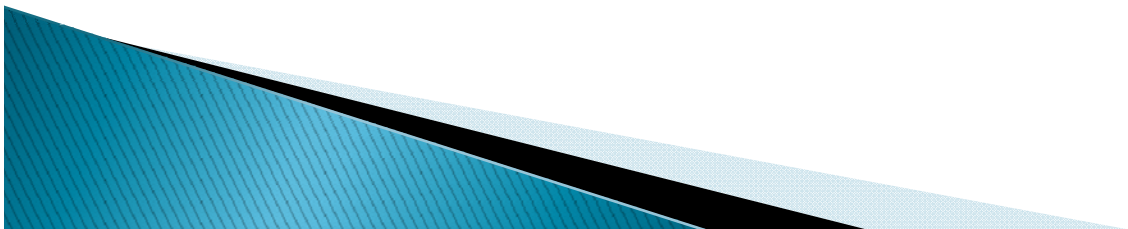


- ▶ Intel later introduced 8087 processor
- ▶ which was the first math co-processor and later the 8088 processor which was incorporated into IBM personal computers.

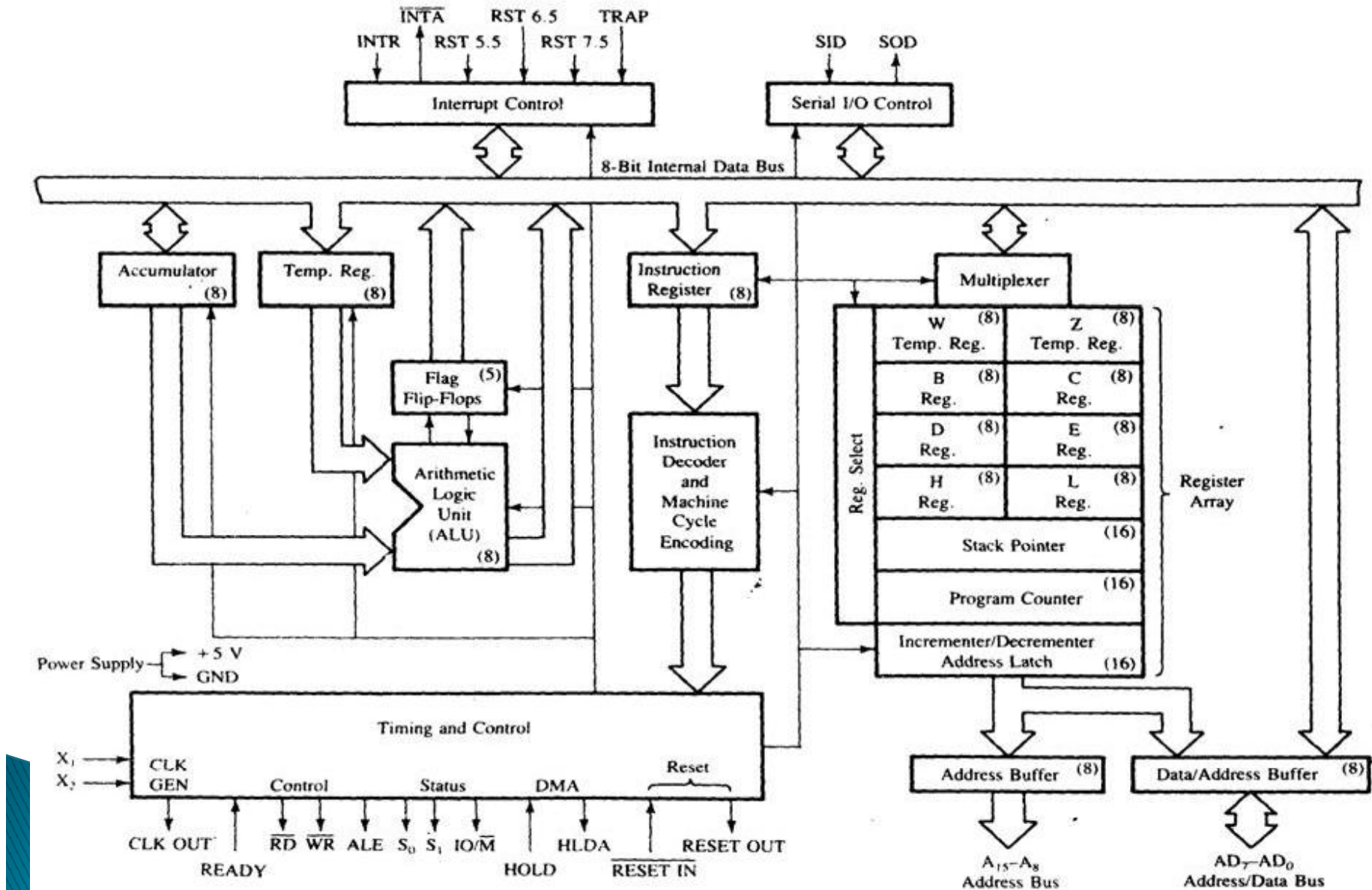


Advantages of Microprocessor:

- ▶ It is cheap and cost of manufacture is low.
- ▶ They are very small in size.
- ▶ High Reliability
- ▶ High Versatility
- ▶ Power consumption is very low.

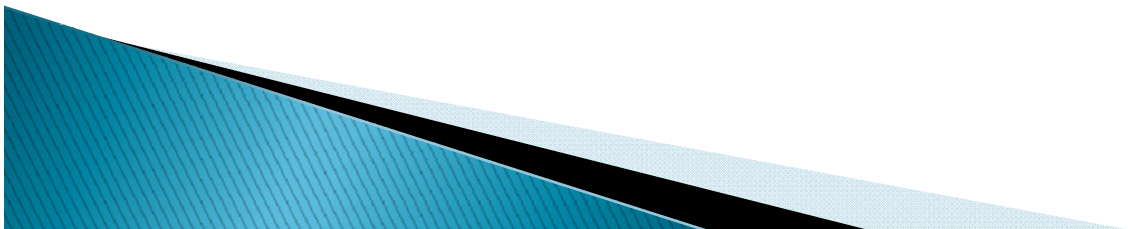


8085 Microprocessor



• Feature of 8085 Microprocessor

- ▶ The features of INTEL 8085 are :
 1. It is an 8 bit processor.
 2. It is a single chip N-MOS device with has 40 pins.
 3. It has multiplexed address and data bus.(AD0-AD7).
 4. It works on 5 Volt dc power supply.
 5. The maximum clock frequency is 3 MHz while minimum frequency is 500kHz.
 6. It provides 74 instructions with 5 different addressing modes.



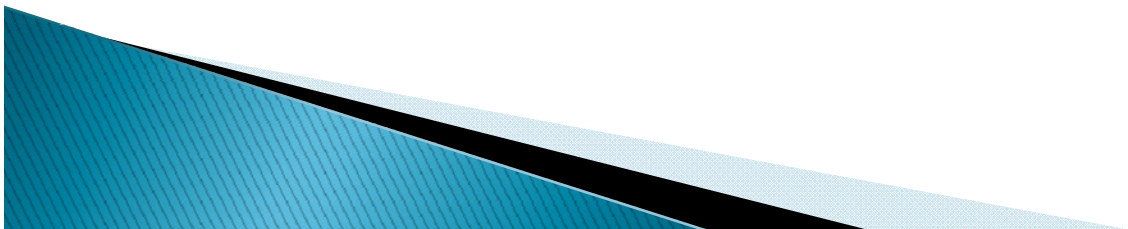
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7. It provides 16 address lines so it can access $2^{16} = 64K$ bytes of memory
8. It generates 8 bit I/O address so it can access $2^8 = 256$ input ports.
9. It provides 5 hardware interrupts: TRAP, RST 5.5, RST 6.5, RST 7.5, INTR.
10. It provides Accumulator, one flag register, 6 general purpose registers and two special purpose registers (SP, PC).
11. It provides serial lines SID, SOD. 0 serial peripherals can be interfaced with 8085 directly.




8086 Microprocessor

1. It is a 16-bit μ p.
2. 8086 has a 20 bit address bus, so it can access up to $2^{20} = 1$ MB Memory Location.
3. It can support up to 64K I/O ports
4. It provides 14, 16-bit registers.
5. Word size is 16 bits and double word size is 4 bytes.
6. It has multiplexed address and data bus AD0- AD15 and A16 – A19.
7. It requires single phase clock with 33% duty cycle to provide internal timing.



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8. 8086 is designed to operate in two modes, Minimum and Maximum.
 9. It can prefetches up to 6 instruction bytes from memory and queues them in order to speed up instruction execution.
 - 10 It requires +5V power supply.
 - 11.**A 40 pin dual in line package.
 - 12.Address ranges from 00000H to FFFFFFFH
 - 13.Memory is byte addressable - Every byte has a separate address.
- 

8086 Block diagram

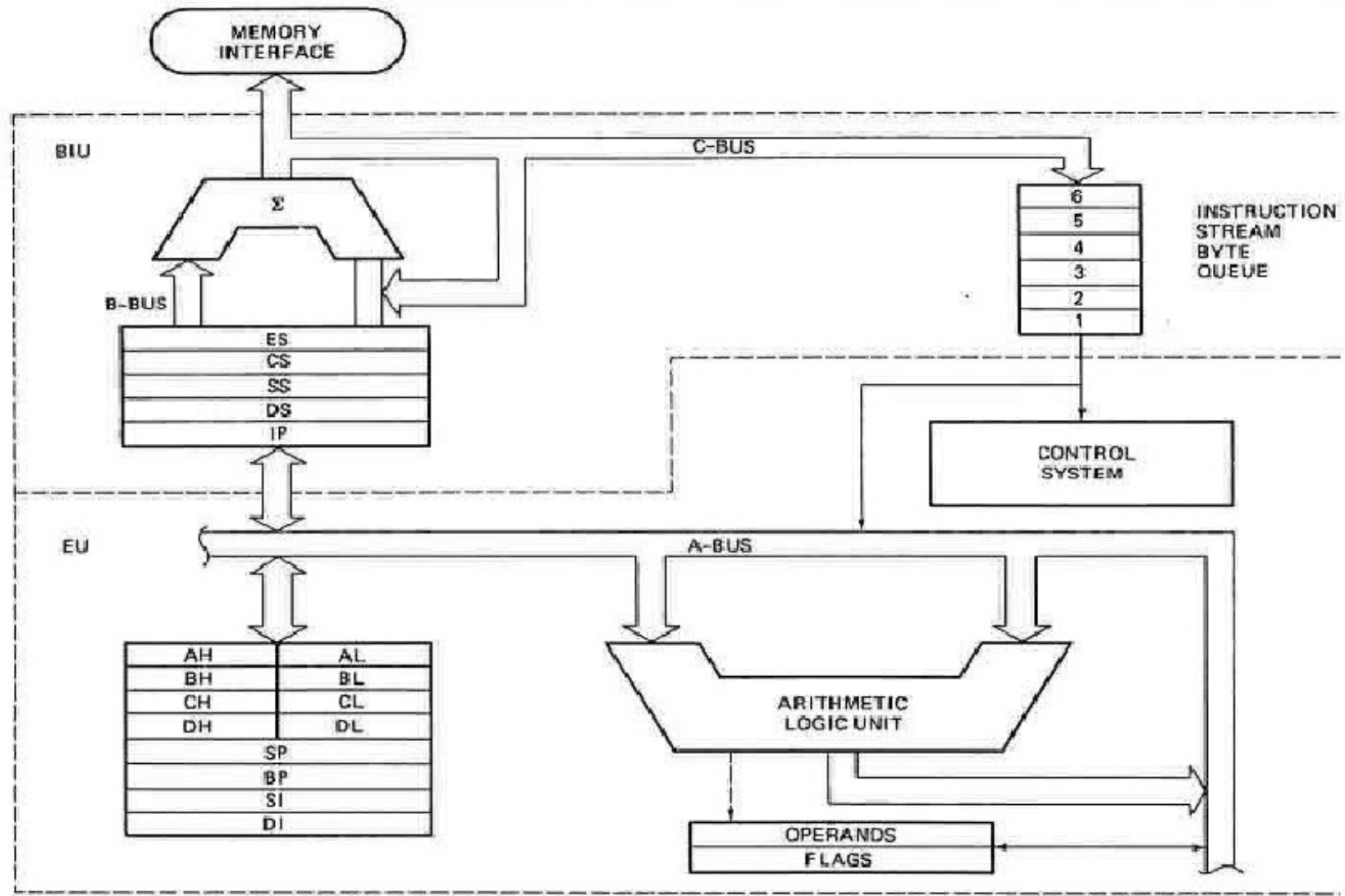
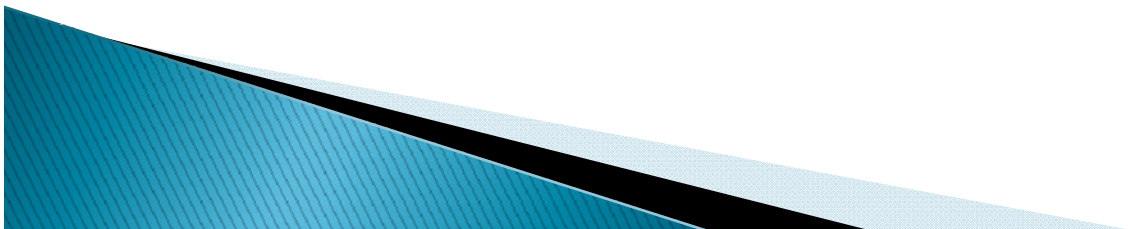


FIGURE 8086 internal block diagram.

Architecture of 8086

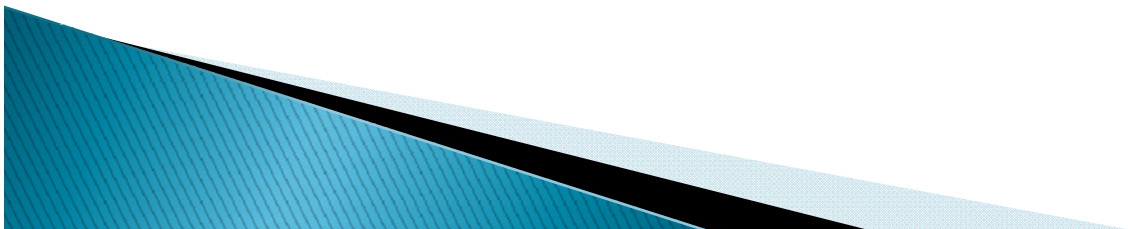
Internal architecture of 8086

- ▶ 8086 has two blocks BIU and EU.
- ▶ The BIU handles all transactions of data and addresses on the buses for EU.
- ▶ The BIU performs all bus operations such as instruction fetching, reading and writing operands for memory and calculating the addresses of the memory operands. The instruction bytes are transferred to the instruction queue.
- ▶ EU executes instructions from the instruction system byte queue.



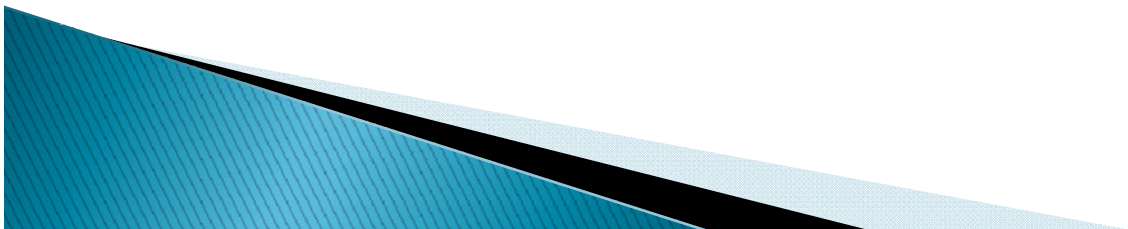
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- ▶ Both units operate asynchronously to give the 8086 an overlapping instruction fetch and execution mechanism which is called as Pipelining. This results in efficient use of the system bus and system performance.
- ▶ BIU contains Instruction queue, Segment registers, Instruction pointer, Address adder.
- ▶ EU contains Control circuitry, Instruction decoder, ALU, Pointer and Index register, Flag register.



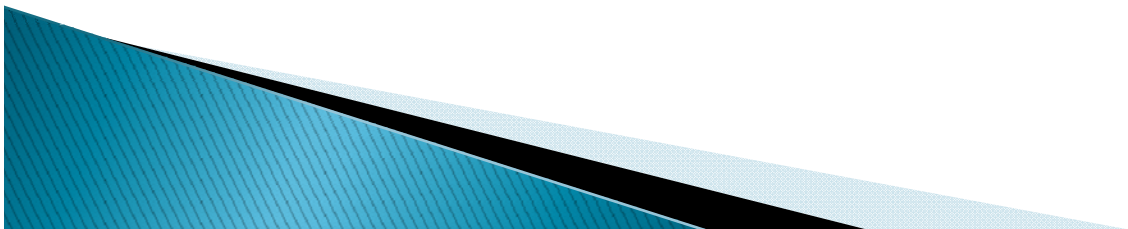
Execution Unit

- ▶ EXECUTION UNIT
- ▶ Decodes instructions fetched by the BIU
- ▶ Generate control signals,
- ▶ Executes instructions. The main parts are:
- ▶ Control Circuitry
- ▶ Instruction decoder
- ▶ ALU



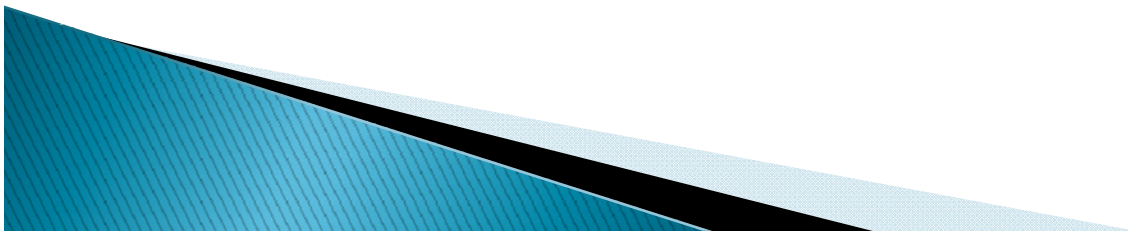
Interface Devices

- 1.8255 programmable peripheral interface.
- 2.8259 Programmable interrupt controller.
- 3.8237 (DMA) direct memory access.
- 4.8254/8253 programmable interval timer.



Application Of Microprocessor

To day word can not imagine without microprocessor, microprocessors are using all most every field where computer is using such as education, business, entertainment, research, Science etc.



Scope of research

- ▶ There are lot of scope in microprocessor research
- ▶ Here we can develop new application of microprocessor.
- ▶ Develop microcontroller.
- ▶ Enhance the feature of microprocessor.

