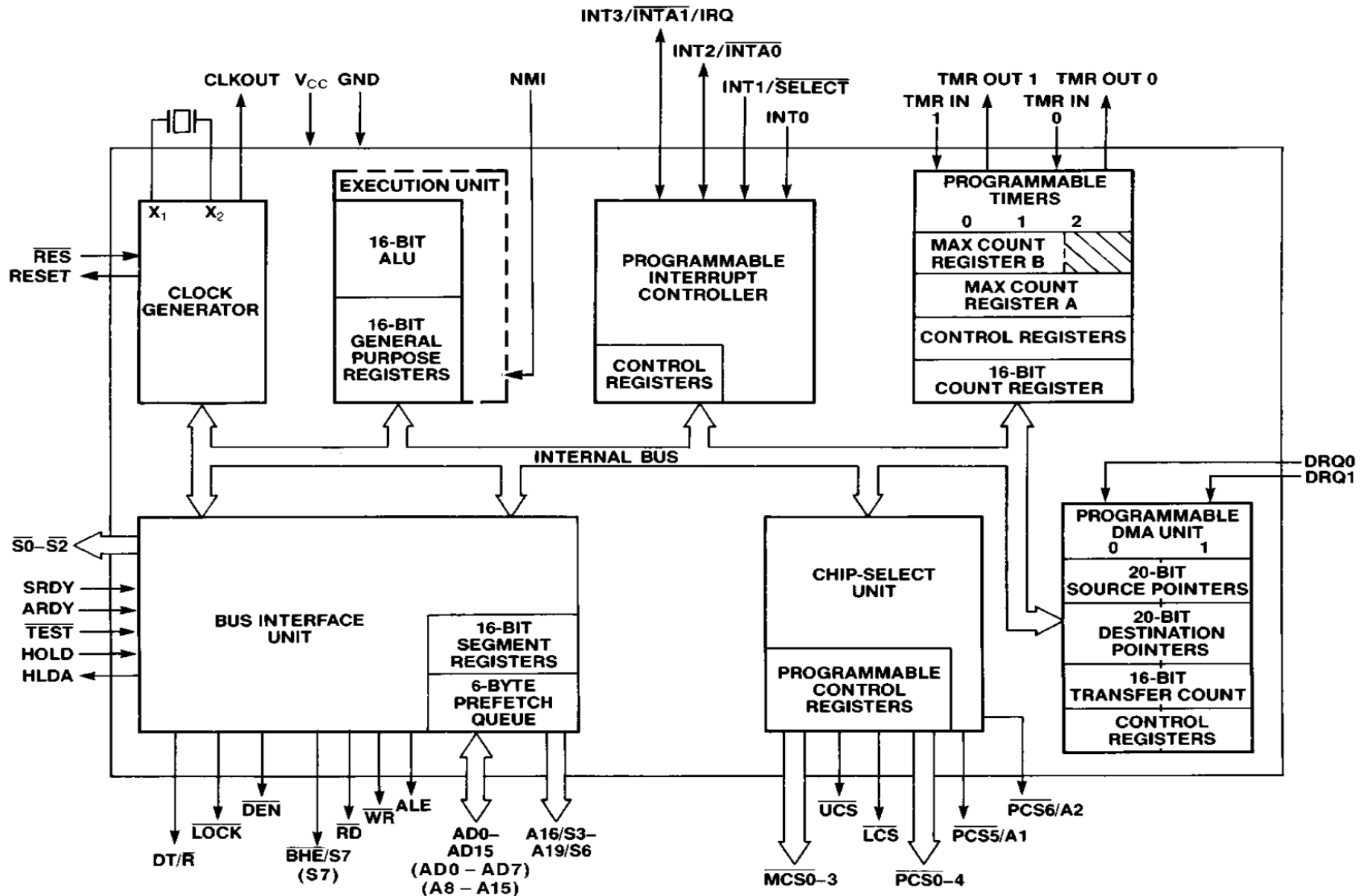# 80186

Presented by
Dr. Md. Abir Hossain
Dept. of ICT
MBSTU

General Features of 80186

- Doubles the performance of 8086 microprocessor.
- Fabricated using HMOS technology.
- Has two version: 80186 and 80188
- 80186 - 16 bit data bus and
- 80188 has 8-bit data bus
- 80186 includes 68 pins
- Able to operate in 3 different clock speed: 8MHz, 10MHz and 12.5 MHz.
- Address 1 Mbyte of memory.
- 80186 contains 8086 processor and several additional functional chips:
  - clock generator
  - 2 independent DMA channels
  - Programmable interrupt controller.
  - 3 programmable 16-bit timers
- used mostly in industrial control applications

Functional Block diagram of 80186

80186 Functional Block

- ### *Clock Generator:*

- Built-in clock generator instead of the external 8284A clock generator used in 8086 microprocessors. This reduces the component count in a system.

- Connected at 80186 X1 and X2 pins.

- ### *Execution unit:*

- 80186 has execution unit like 8086 microprocessor.

- Execution unit includes 16-bit ALU and 16-bit general purpose registers.

- ### *Programmable Interrupt Controller(PIC):*

- Allows 80186 to receive interrupts from external or internal sources.

- Has 5 pins as **NMI, INT3/$\overline{INTA1}$, INT2/ $\overline{INTA0}$, INT1, INT0**

- The priority sequence of pins as **INT0, INT1, INT2/ $\overline{INTA0}$, INT3/$\overline{INTA1}$**

4

80186 Functional Block

- **_Programmable Interrupt Controller(PIC)(con..):_**

- The PIC arbitrates all internal and external interrupts and controls up to two external 8259A PICs. When an external 8259 is attached, the 80186 microprocessors function acts as the **master** and the 8259 functions as the **slave.**

- **_Programmable Timers:_**

- contains three programmable 16-bit timers/counters as counters 0, 1, and 2.

- timers 0 and 1 generate wave-forms for external use and driven by either the master clock of the 80186 or by an external clock

- The third timer, timer 2 is internal and clocked by the master 80186 clock.

80186 Functional Block

- **_Programmable DMA unit:_**
- The programmable DMA unit contains two DMA channels, or four DMA channels in some models

- Each channel can transfer data between memory locations, between memory and IO, or between IO devices

- For two DMA channels, has two DMA request input pins DRQ_0, DRQ_1

- One input signal used for external device as disk controller to request a data transfer between the memory and disk via DMA techniques.

- Each 80186 DMA channel contains
  - Two 20 bit registers- one is hold the destination address
  - One 16 bit counter- count the number of words or bytes to be transferred

- ST/STOP bit stops the transfer of bits when control bit set to one

80186 Functional Block

- ***Programmable Chip Selection unit:***

- Built-in chip selection unit act as address decoder

- Programmed to generate 6 memory chip selects among them **LCS(**Lower chip select**), UCS(**Upper chip select**),** and **MCS0 -**3 pins and several I/O or peripheral chip selection 3 pins are **PCS0-4, PCS5/A1, PCS6/A2.**

- The lower chip select activates when 80186 wants to access a memory in between 00000H to higher address in the range of 1K to 256K range.

- The higher chip select activates when 80186 wants to access a higher memory location in which higher address in the range of FFFFFH.

- The middle chip select activates when 80186 wants to access a midrange memory location.

- The peripheral chip select helps to access a port address located in a block of address up to 128 bytes

80186 additional Features

- ***Power save/Power Down Feature***:
- The power save feature allows the system clock to be divided by <mark>4, 8, or 16</mark> to reduce power consumption
- The power saving feature is started by software and exited by a hardware event such as an interrupt

- ***Refresh Control Unit:***
- The refresh control unit <mark>generates the refresh row address</mark> at the interval programmed. The refresh address is provided to the memory system at the end of the programmed refresh <mark>interval, along with the RFSH control signal.</mark>

80186 Functional Block

- 80186 has 8 addressing modes.
- [Assignments 1.]-list out the all addressing modes of 80186
- 80186 has 10 additional instruction beyond 8086
- [Assignments 2.]-list out the 10 new addition instruction of 80186 beyond 8086