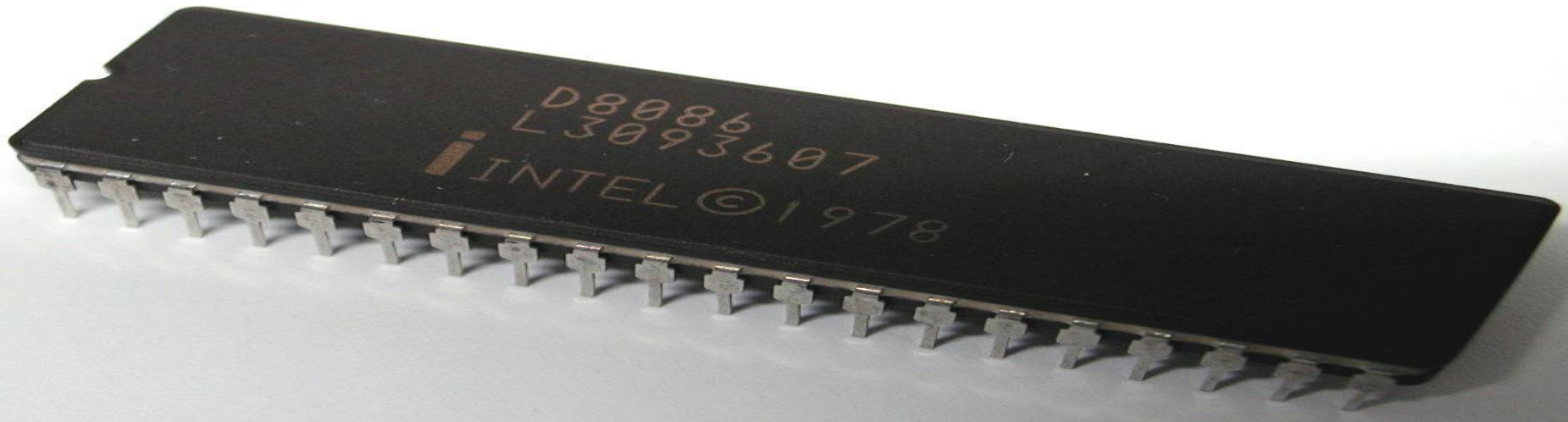


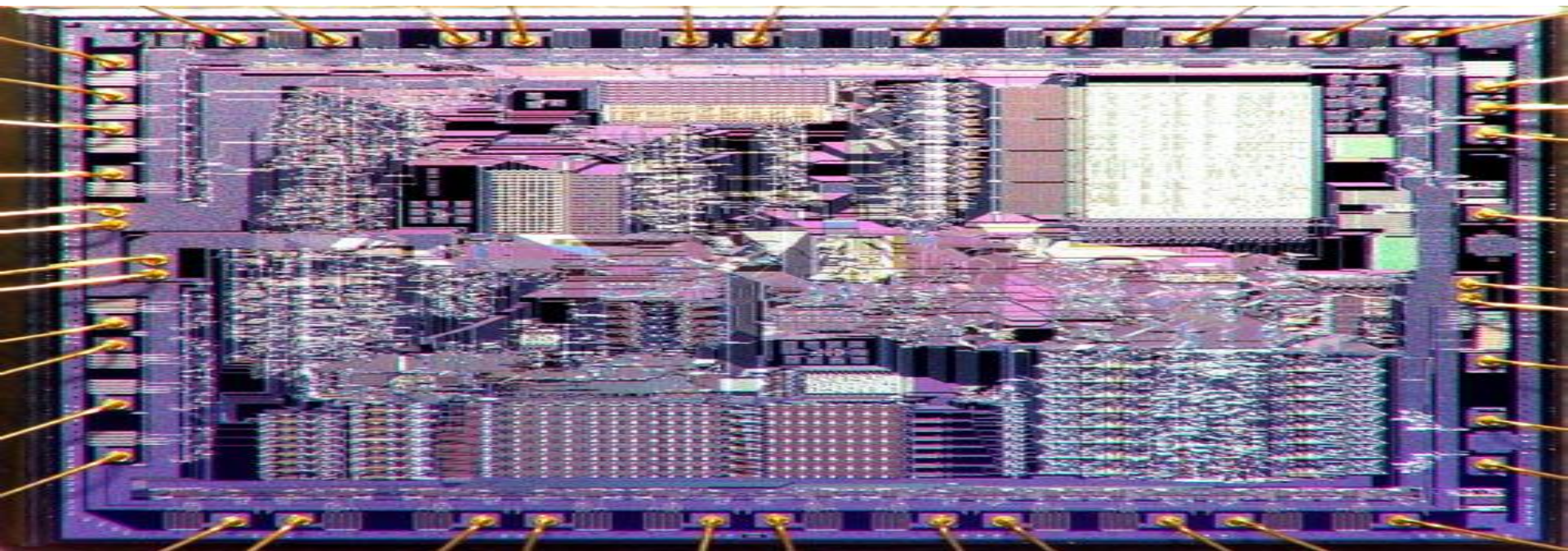
8086 Architecture

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8086 architecture



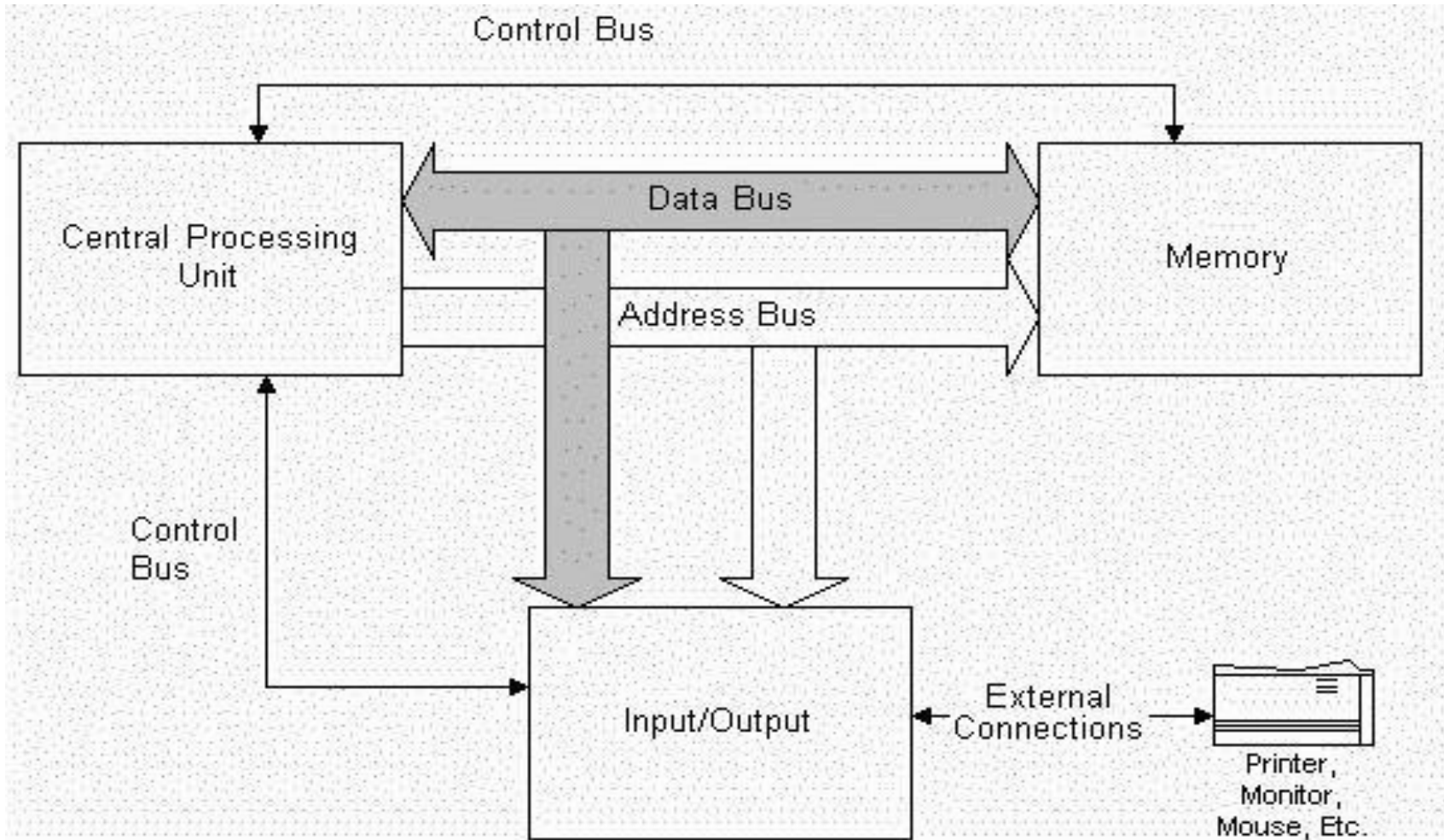
Microcomputer

- PC or a computer that depends on microprocessor
- Used by individuals as PC's or workstations or notebook computers
- Microcomputer contains a CPU on a microchip, memory, i/o ports, bus system housed on mother board
- It is a digital electronic component with miniaturized transistors on a single semiconductor IC

Microcomputer

- **MICROPROCESSOR** is a multipurpose, programmable device that accepts digital data as input, processes it according to instructions stored in its memory, and provides results as output.
- It controls the logic of almost all digital devices

Architecture of a typical Microcomputer



Some Basic Definition

- **Transistor**--A **transistor** is a semiconductor device used to amplify and switch electronic signals and electrical power. It is composed of semiconductor material with at least three terminals for connection to an external circuit.
- **Flip flops**--a **flip-flop** is a circuit that has two stable states and can be used to store state information.
- **Latches**--a circuit used to store information
- **Register**-- In computer architecture, a **processor register** is a small amount of storage available as part of a CPU or other digital processor. load data from a larger memory into registers where it is used for arithmetic, manipulated, or tested, by some machine instruction
- **Flag**-- **flag register** is a collection of flag bits for a processor. These are part of larger registers

8086 Specifications

- It is 16-bit microprocessor
- It has 20 bit address bus and can access up to 2^{20} memory locations (1 MB).
- It can support up to 64K I/O ports
- It provides 14 registers of 16-bit size
- It has multiplexed address and data bus AD_0-
 AD_{15} & $A_{16}-A_{19}$

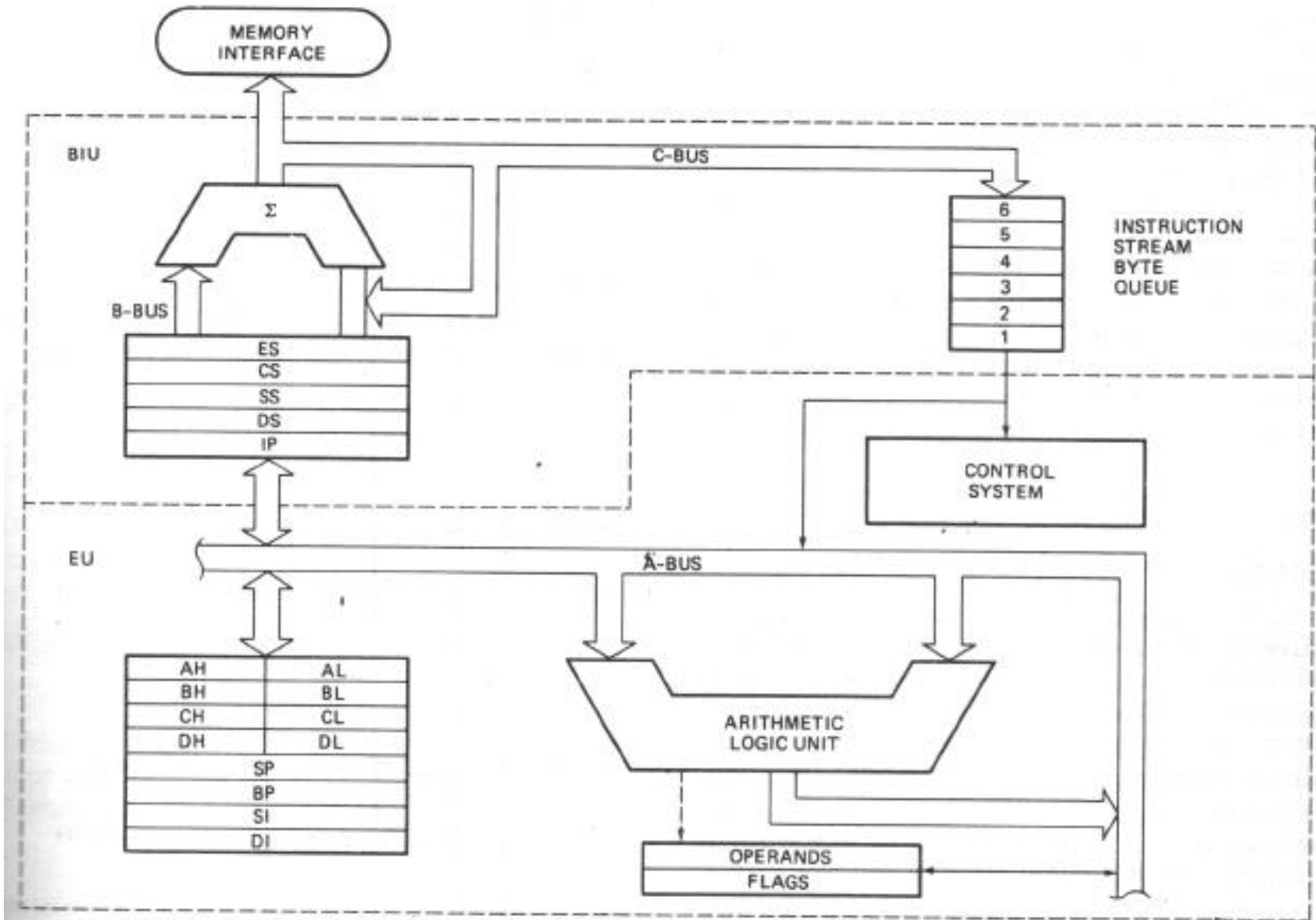
8086 Specifications

- It requires single phase clock with 33% duty cycle to provide internal timing.
- Prefetches up to 6 instruction bytes from memory and queues them in order to speed up the processing.
- It requires +5V supply
- 40 pin dual inline package
- 8086 supports 2 modes of operation
 - Minimum mode
 - Maximum mode

8086 Architecture

- The 8086 architecture has two parts:
 - Bus Interface Unit(BIU)
 - Execution Unit(EU)

8086 block diagram



8086 Architecture

- **Bus Interface Unit contains**
 - Instruction queue,
 - Segment registers,
 - Instruction pointer, and
 - Address adder.
- **Execution Unit contains**
 - Control circuitry,
 - Instruction decoder,
 - ALU,
 - Pointer and Index register,
 - Flag register

Bus interface unit functions

- Responsible for performing external bus operations
- The functions of BIU are:
 - Instruction Fetch
 - Instruction Queuing
 - Operand Fetch & storage
 - Address Relocation
 - Bus control
- Idle state
- Address adder – fetching of physical address of next instruction($CS+IP$)

Execution Unit Functions

- Decoding of Instructions
- Execution of instructions
- **Steps**
 - EU extracts instructions from top of queue in BIU
 - Decode the instructions
 - Generates operands if necessary
 - Passes operands to BIU & requests it to perform read or write bus cycles to memory or I/o
 - Perform the operation specified by the instruction on operands
 - Branch or jump instruction

Register Organization

- The types of registers are:
 1. General Data Registers (AX, BX, CX, DX)
 2. Segment Registers (CS, DS, ES, SS)
 3. Pointers and Index Registers (IP, BP, SP)
 4. Flag Registers (S, Z, P, C, T, I, D, AC, O)

General Data Registers

- AX—16 bit accumulator(AH+AL)
- BX-offset storage(BH+BL)
- CX-default counter in case of string and loop instructions(CH+CL)
- DX-General purpose register (DH+DL)

SEGMENT REGISTERS

- Code Segment Register(CS)
- Data Segment Register(DS)
- Extra Segment Register(ES)
- Stack Segment Register(SS)

POINTER and INDEX Registers

- IP—instruction pointer-store memory location of next instruction to be executed
- BP—base pointer
- SP—stack pointer
- SI—Source index
- DI—Destination index

Flag Registers(S,Z,P,C,T,I,D,Ac,O)

- Indicate results of computations in ALU
- Also contains some flag bits to control CPU operations

Flag register

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
X	X	X	X	O	D	I	T	S	Z	X	Ac	X	P	X	Cy

O – Overflow flag

D – Direction flag

I – Interrupt flag

T – Trap flag

S – Sign flag

Z – Zero flag

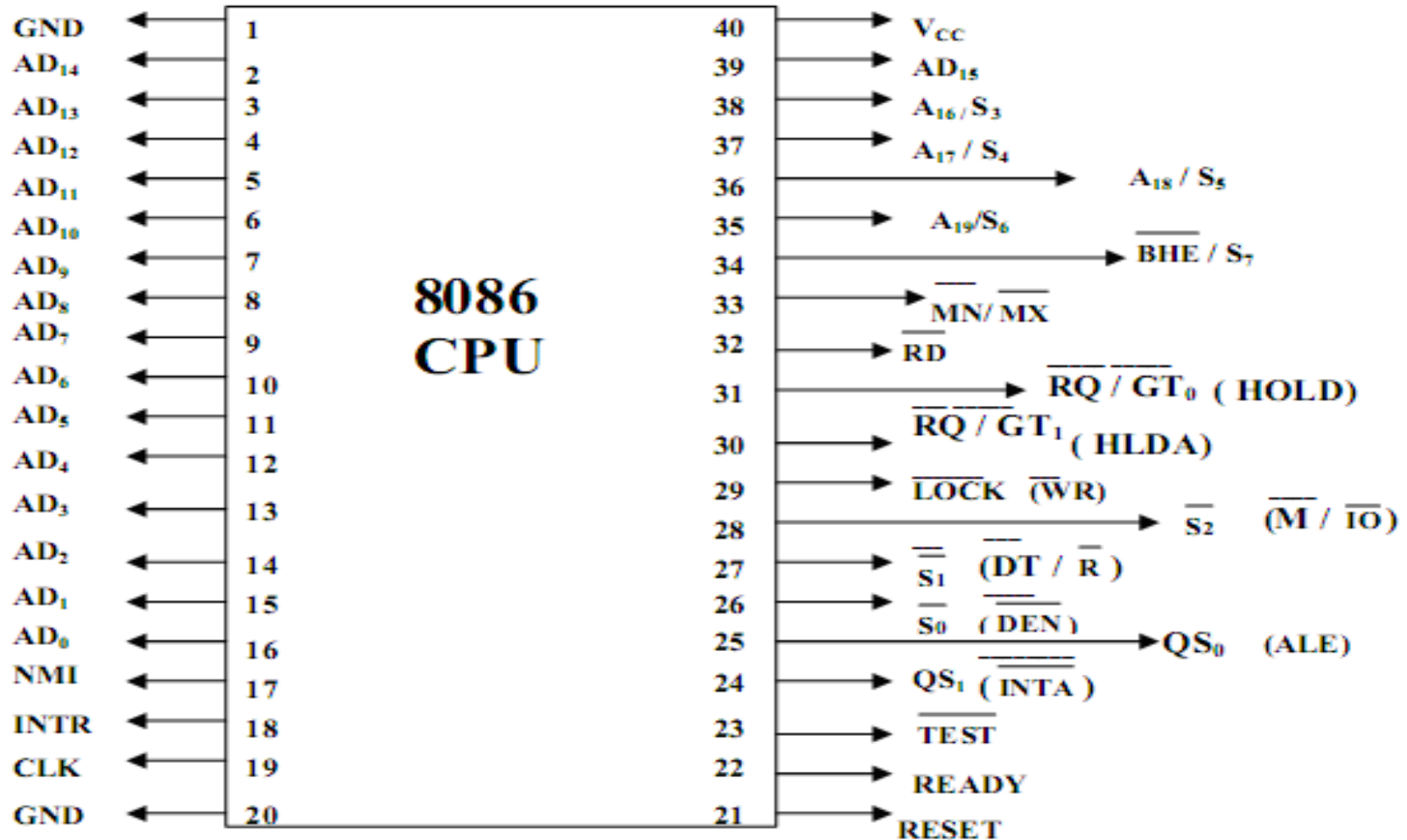
Ac – Auxiliary carry flag

P – Parity flag

Cy – Carry flag

X – Not used

Pin diagram



Pin Diagram of 8086