



Introduction to 8085



Introduction to 8085

- ▶ 8085 is pronounced as "eighty-eighty-five" microprocessor.
- ▶ It is an 8-bit microprocessor designed by Intel in 1977 using NMOS technology.

Introduction to 8085

- ▶ 8 bit General purpose microprocessor (i.e. 8 bit data bus).
- ▶ It is a single chip N MOS device with 40 pins.
- ▶ It has multiplexed address and data bus.($AD_0 - AD_7$).
- ▶ It works on 5-Volt DC power supply.
- ▶ The maximum clock frequency is 3MHz while minimum frequency is 500kHz.
- ▶ It provides 16 address lines, therefore capable of addressing $2^{16} = 64K$ of memory.
- ▶ It supports external interrupt request.
- ▶ It has two 16 bit registers named program counters (PC) and stack pointer (SP).

Introduction to 8085

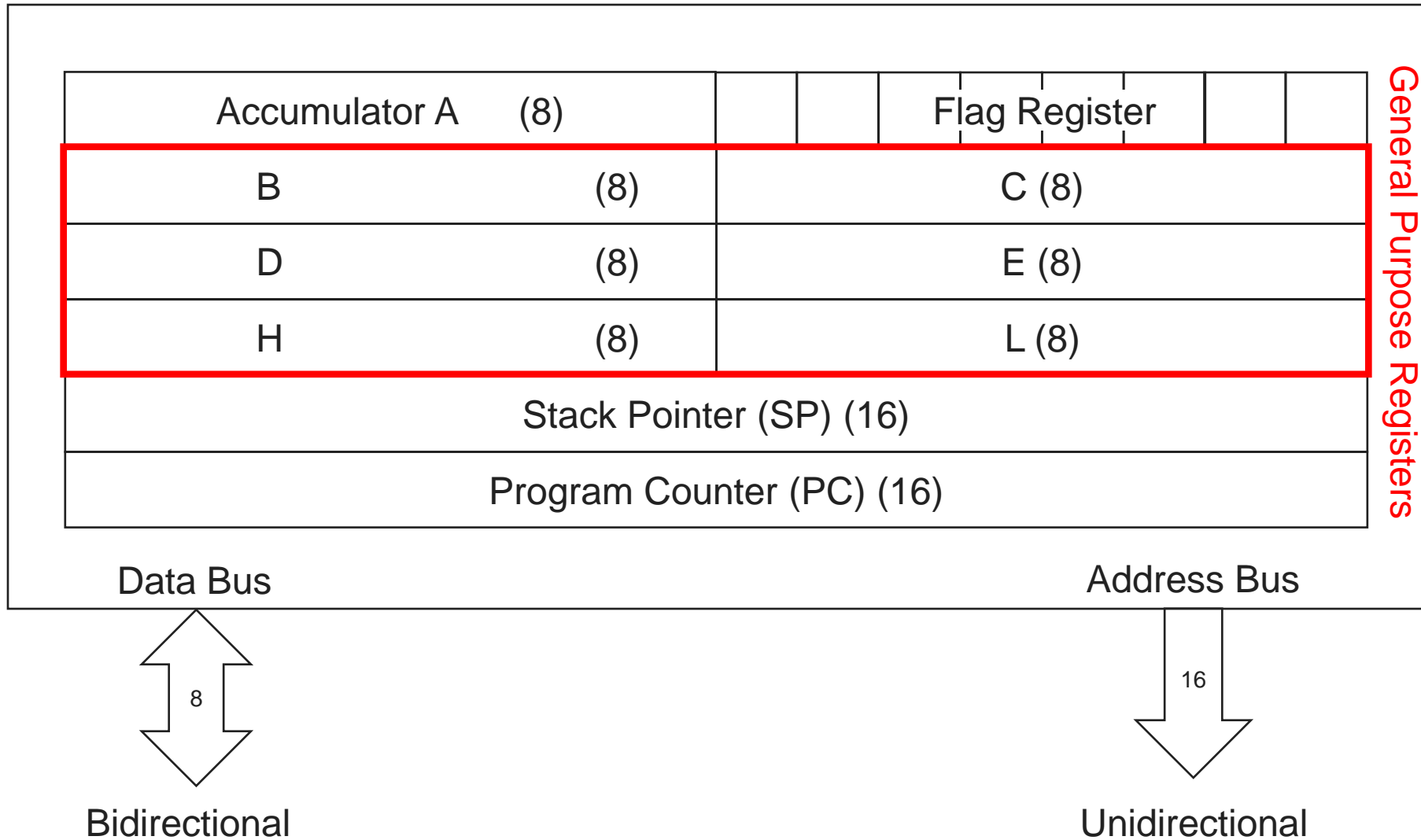
- ▶ It generates 8 bit I/O address so it can access $2^8 = 256$ input ports.
- ▶ It provides 5 hardware interrupts:
 1. TRAP
 2. RST 5.5
 3. RST 6.5
 4. RST 7.5
 5. INTR
- ▶ It provides accumulator, 5 flag register, 6 general purpose registers and 2 special purpose registers (SP,PC).



8085 Programming Model



8085 Programming Model

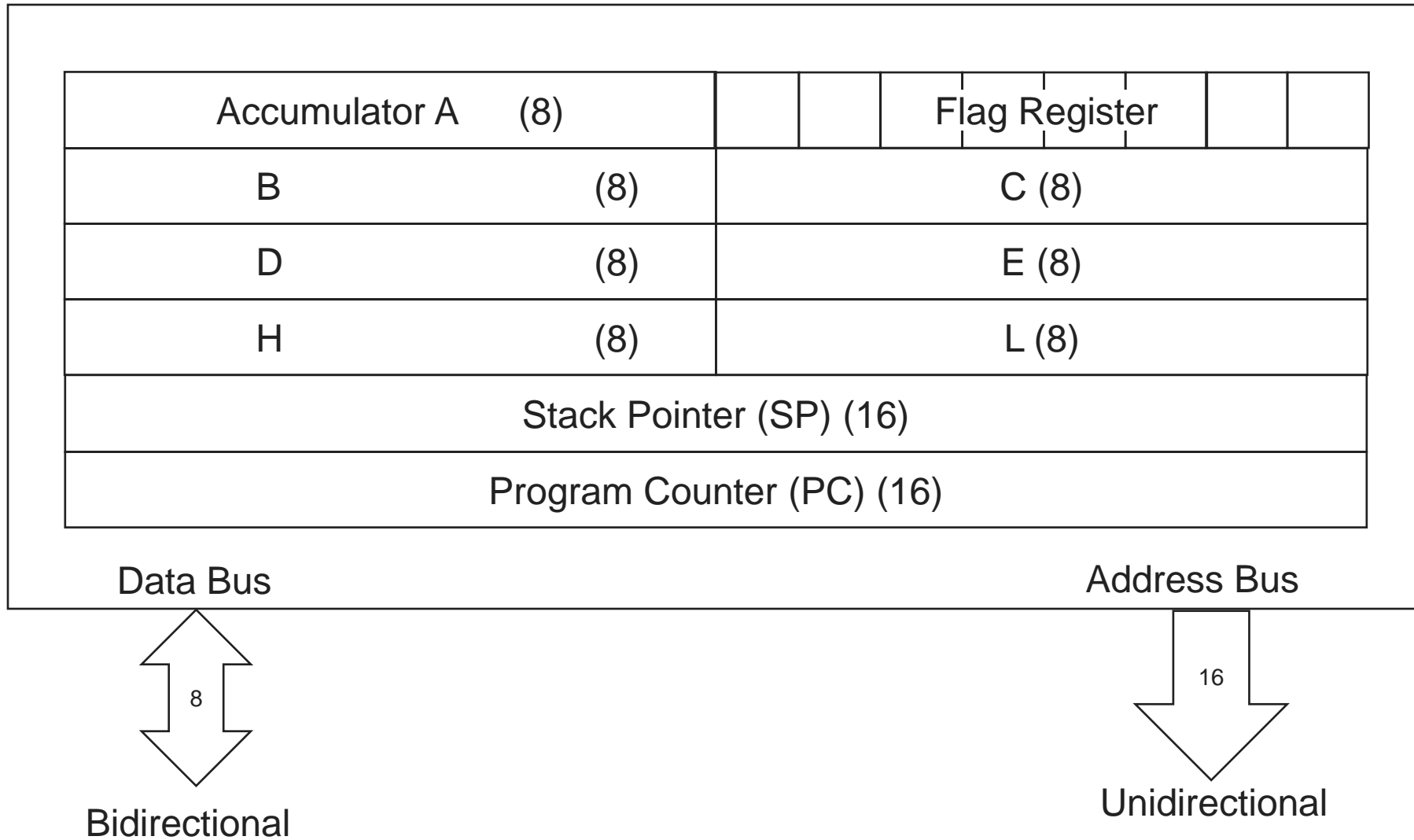


General Purpose Registers

- ▶ 6 general purpose registers to store 8-bit data B, C, D, E, H & L.
- ▶ Can be combined as fixed register pairs – BC, DE, HL to perform 16 bit operations.
- ▶ Used to store or copy data using data copy instructions.

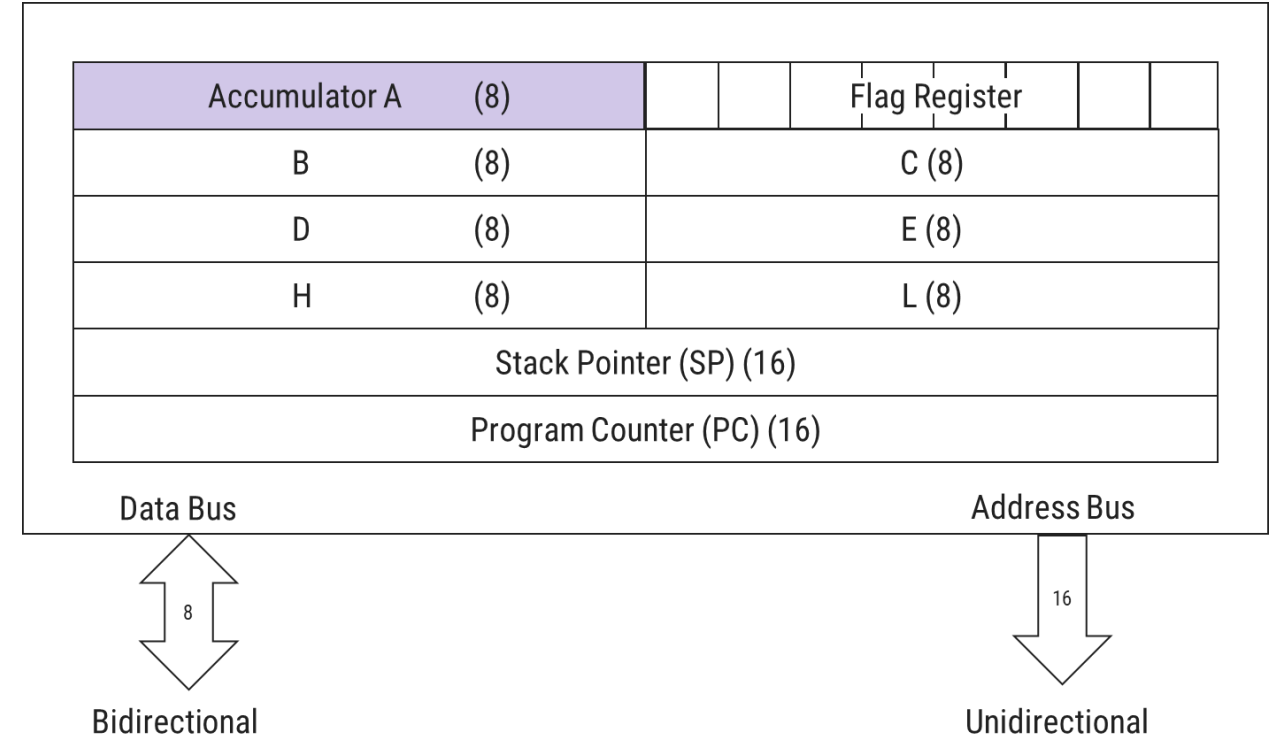
B (8)	C (8)
D (8)	E (8)
H (8)	L (8)

8085 Programming Model

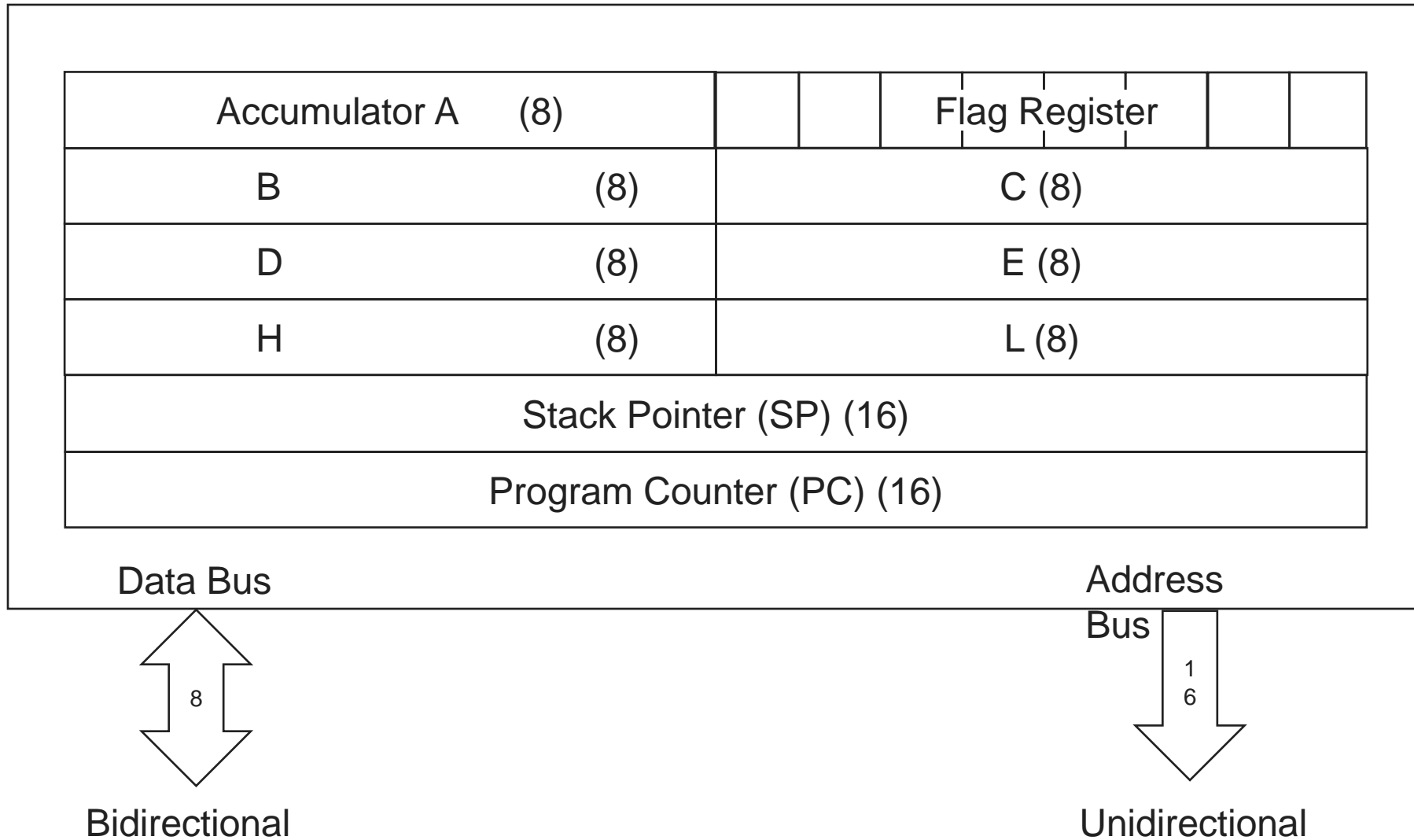


Accumulator

- ▶ 8 - bit register, identified as **A**
- ▶ Part of ALU
- ▶ Used to store 8-bit data to perform **arithmetic & logical** operations.
- ▶ Result of operation is stored in **Accumulator**.



8085 Programming Model



Flag Register

D ₇	D ₆	D ₅	D ₄	D ₃	D ₂	D ₁	D ₀
S	Z	X	AC	X	P	X	CY

X:Undefined

S -Sign Flag
Set (1) if 7th bit of result is 1;
otherwise reset (0)

Z -Zero Flag
Set (1) when result is zero;
otherwise reset(0)

1 0 1 0
- 1 0 1 0

0 0 0 0
Z = 1

P -Parity Flag
Set (1) if result has even no. of 1's
& Reset(0) if result has odd no. of 1's

AC -Auxiliary Carry Flag
Set (1) when carry bit is generated by 3rd bit & passed to bit 4th bit.

1 1 1 0 1 0 1 0
+ 0 1 1 0 1 0 0 1

1 0 0 1 0 0 1 1
AC = 1

CY -Carry Flag
Set (1) if arithmetic operation results in carry;
otherwise reset(0)

1 1 1
1 0 1 0 1 0 1 0
+ 0 1 1 0 1 0 0 1

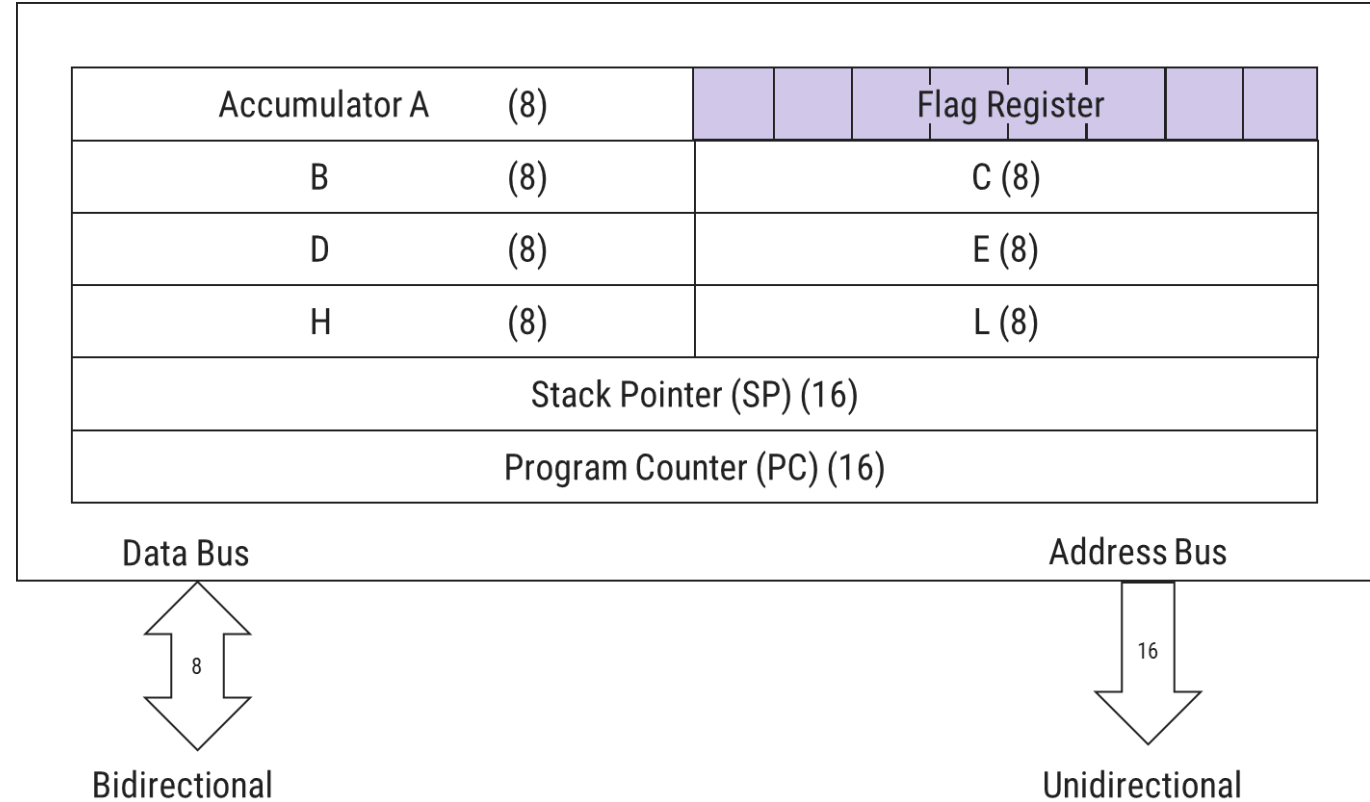
1 0 0 0 1 0 0 1
CY = 1

Flag Register

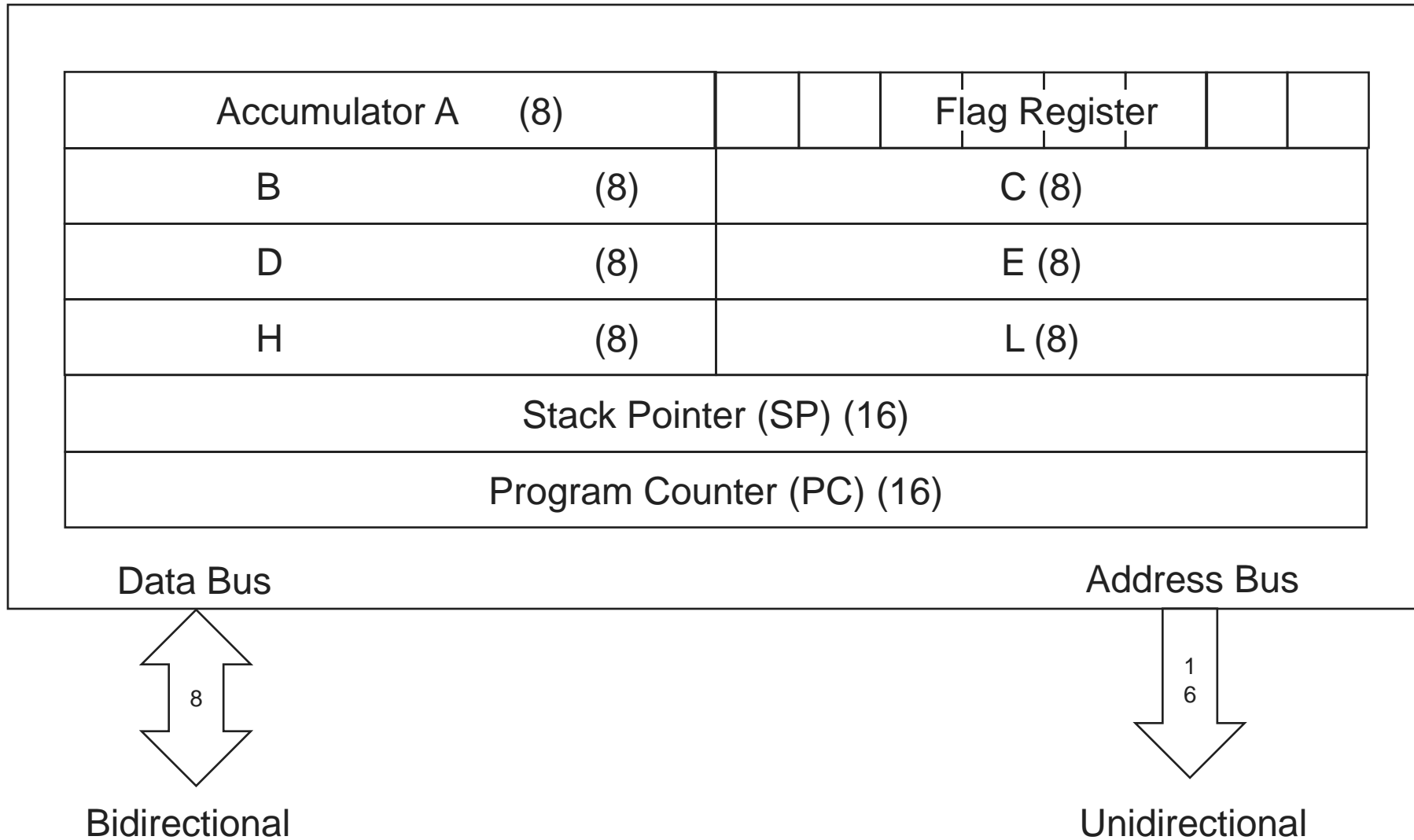
- ▶ ALU has 5 Flag Register that set/reset after an operation according to data conditions of the result in accumulator & other registers.
- ▶ Helpful in decision making process of microprocessor.
- ▶ Conditions are tested through software instructions.

For e.g.

JC (Jump On Carry) is implemented to change the sequence of program when **CY**(Carry Flag) is set(1).



8085 Programming Model



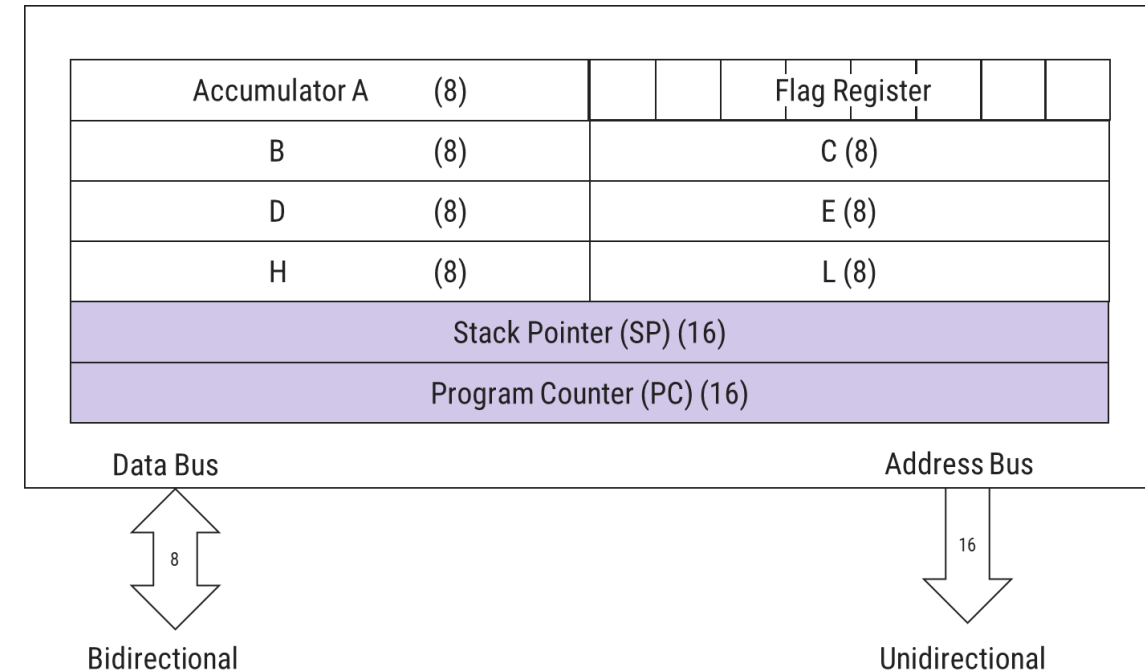
Stack Pointer & Program Counter

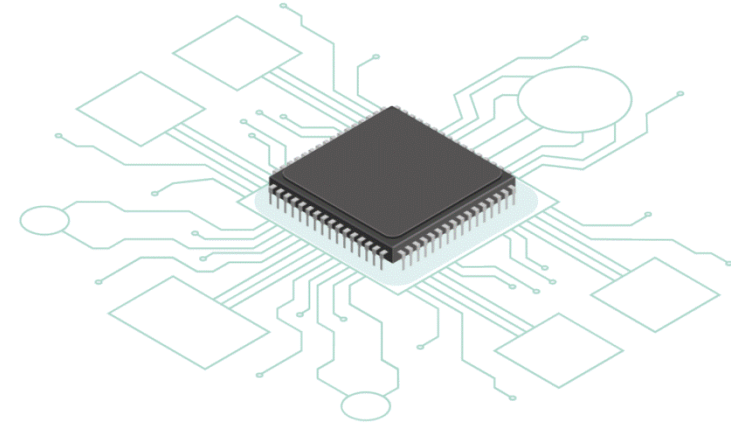
Stack Pointer(SP)

- ▶ Used as **memory pointer**.
- ▶ Points to the memory location in R/W memory, called **Stack**.
- ▶ Beginning of stack is defined by loading a 16-bit address in the stack pointer.

Program Counter(PC)

- ▶ Microprocessor uses PC register to **sequence** the execution of instructions.
- ▶ Its function is to point to memory address from which **next byte is to be fetched**.
- ▶ When a byte is being fetched, PC is **incremented** by **1** to point next memory location.

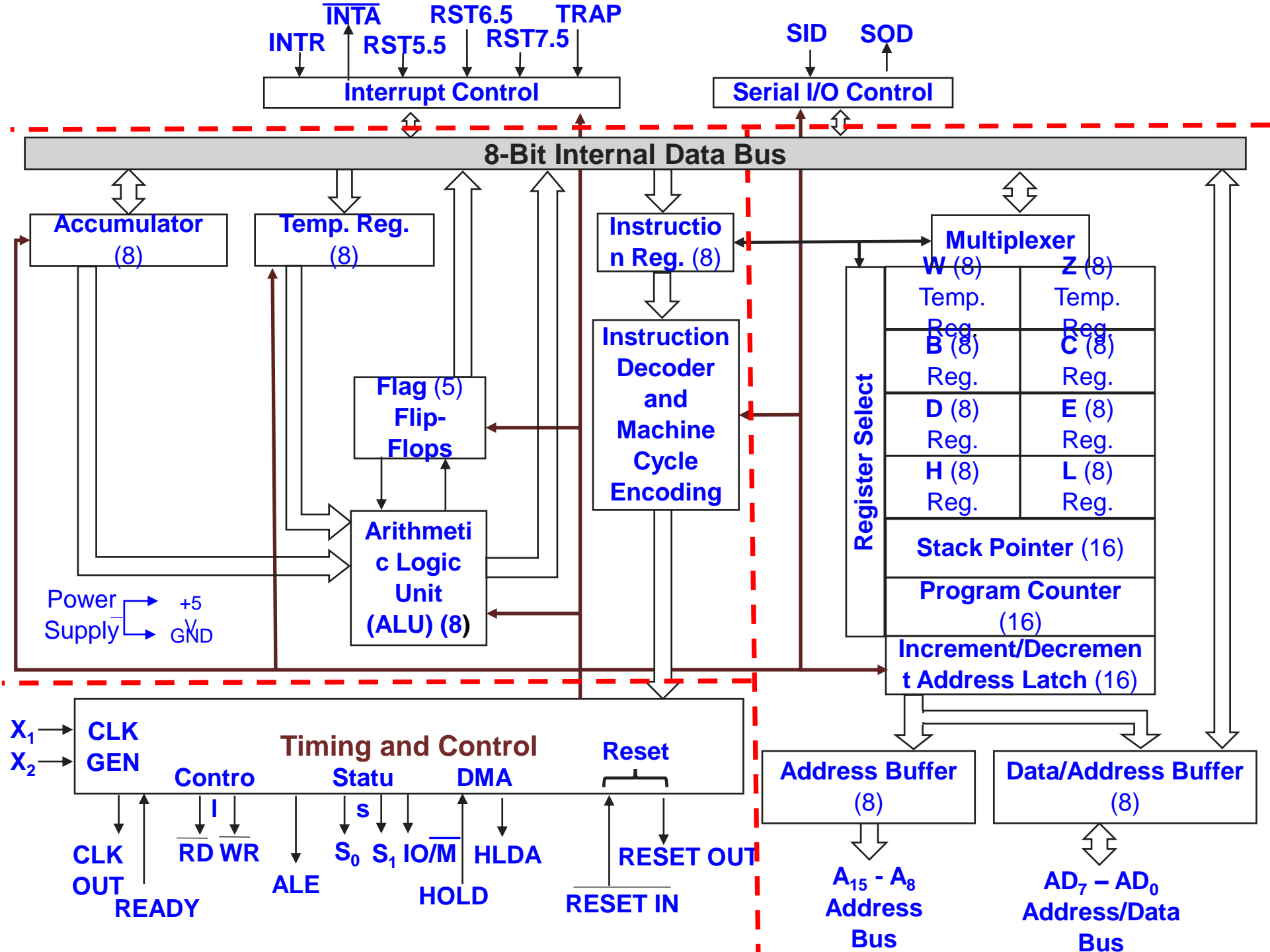




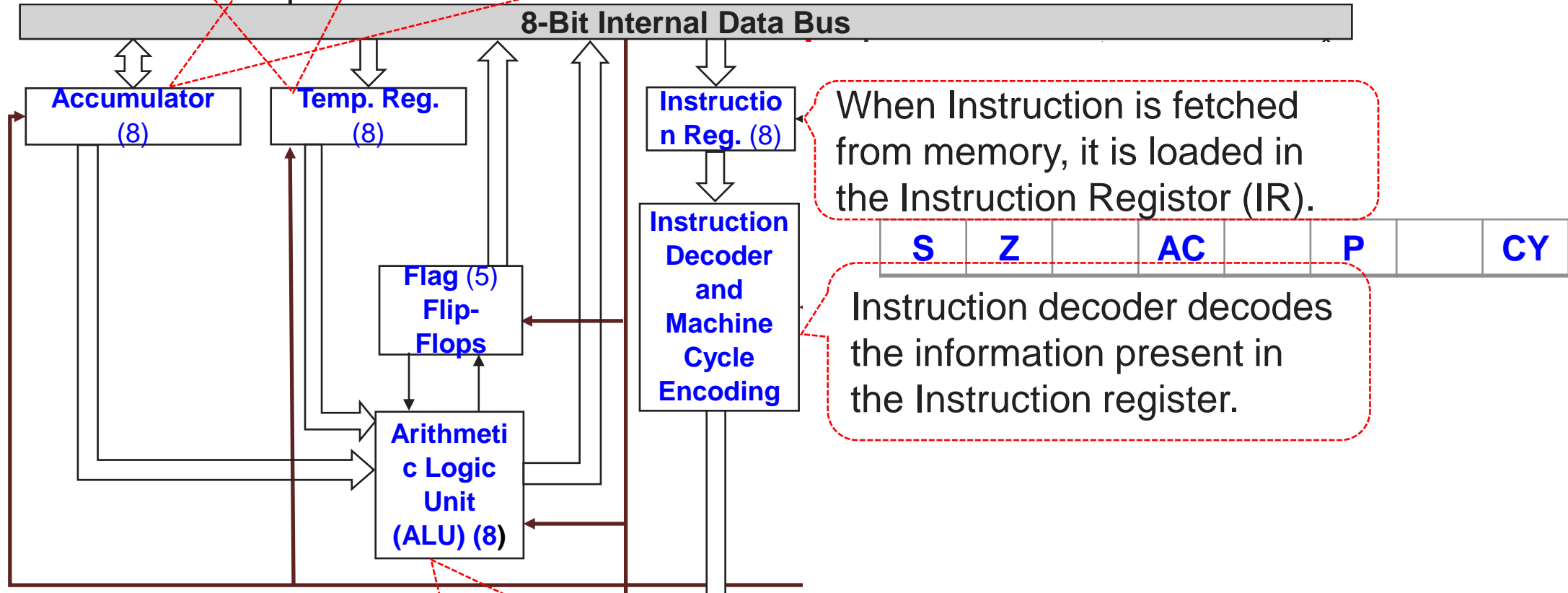
8085 Architecture/Block Diagram



8085 Block Diagram



- Used to store 8-bit data (i.e. temporary data) during ALU operation.
- Result of operation is stored in Accumulator.

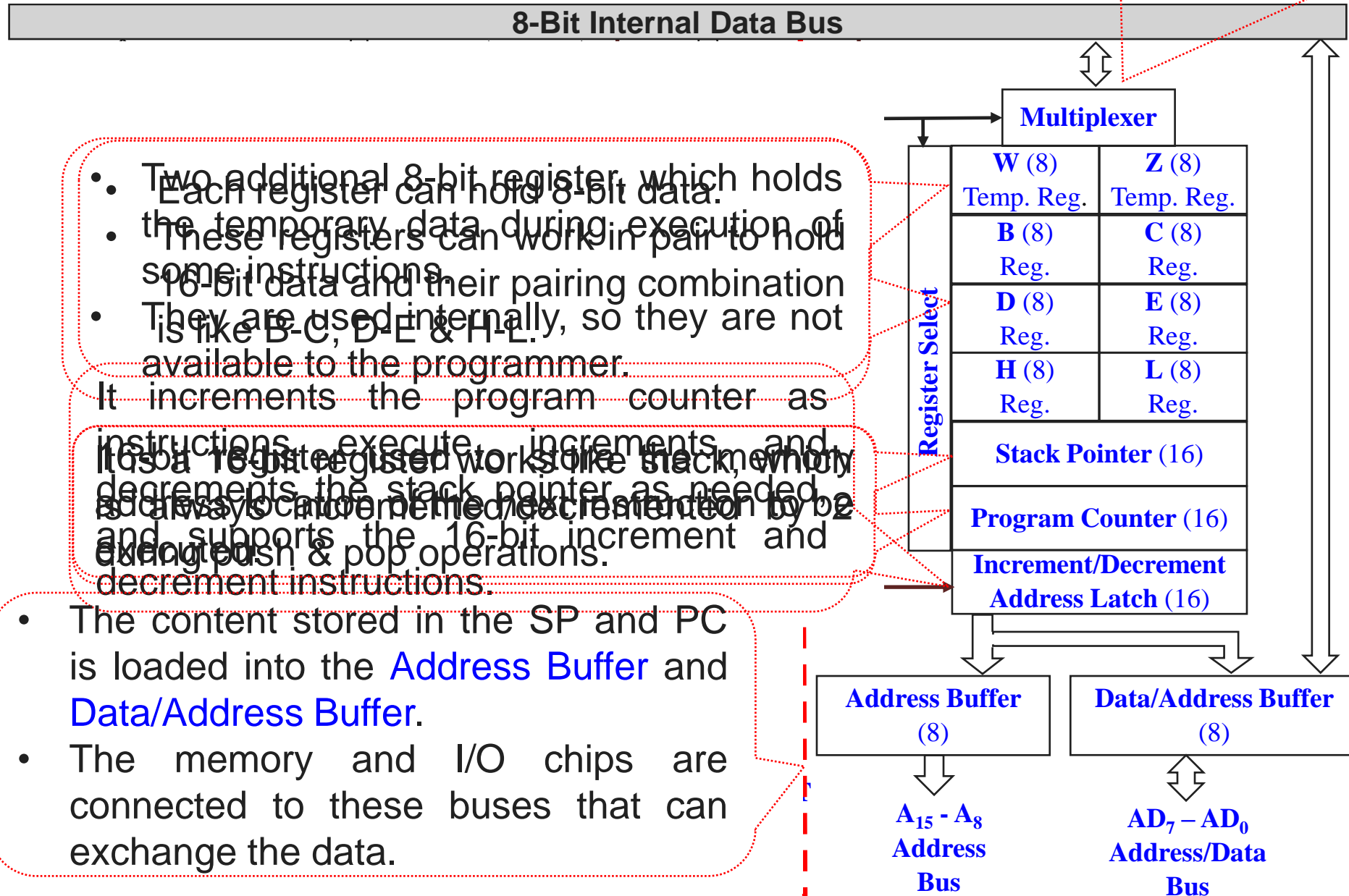


When Instruction is fetched from memory, it is loaded in the Instruction Register (IR).

Instruction decoder decodes the information present in the Instruction register.

- Performs Computing Functions.
- Accumulator, Temporal Register and Flag Registers are part of ALU.

A multiplexer pulls out the right group of bits, depending on the instruction.



- Two additional 8-bit register, which holds the temporary data during execution of some instructions.
- These registers can work in pair to hold 16-bit data and their pairing combination is like B-C, D-E & H-L.
- They are used internally, so they are not available to the programmer.

It increments the program counter as instructions execute, increments, and decrements the stack pointer as needed, and always increments the next instruction by 2 during push & pop operations.

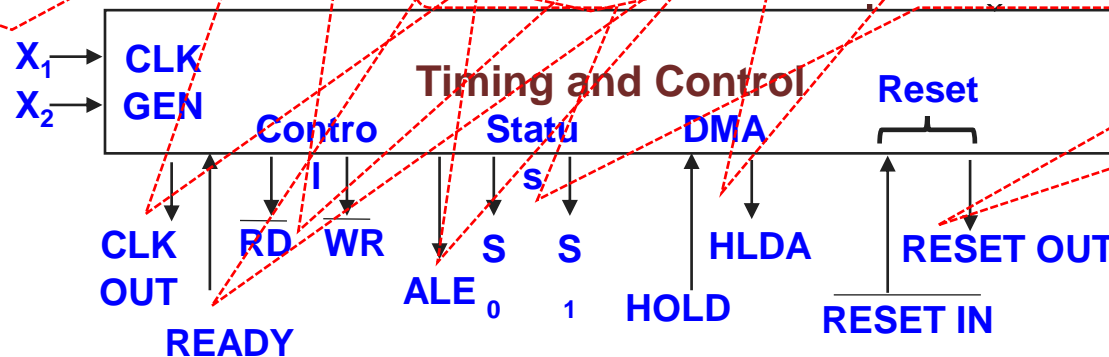
- The content stored in the SP and PC is loaded into the **Address Buffer** and **Data/Address Buffer**.
- The memory and I/O chips are connected to these buses that can exchange the data.

8-Bit Internal Data Bus

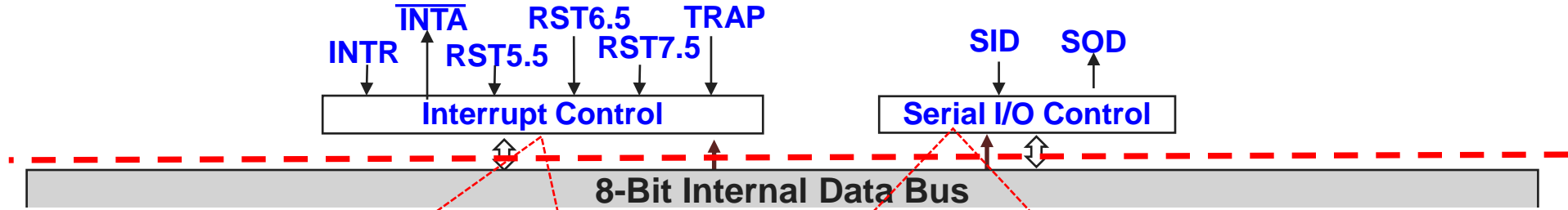
This unit **synchronizes** all the microprocessor operations with the **clock** and generates **control signal** Read/Write either to/from memory or peripheral. **Address signal** Enable control peripheral.

Frequency Control Signal for microprocessor with peripheral device. Shows read/write status to/from memory or I/O.

Signal to **RESET** microprocessor and other devices connected to it.



8-Bit Internal Data Bus



- It controls the serial data communication by using two instructions:
- i. **SID** (Serial input data)
 - ii. **SOD** (Serial output data)
- It controls the interrupts during a process.
- There are 5 interrupt signals in 8085 microprocessor:
TRAP, RST 7.5, RST 6.5, RST 5.5, INTR.