

# 8086 CPU Registers

The 8086 microprocessor has a total of **fourteen** registers that are accessible to the programmer.

Eight of the registers are known as **general purpose** registers i.e. they can be used by the programmer for data manipulation.

Each of the registers is **16 bits long** i.e. can contain a 16-bit binary number.

The first four registers are sometimes referred to as **data** registers. They are the **ax**, **bx**, **cx** and **dx** registers.

The second four are referred to as **index/pointer** registers. They are the **sp**, **bp**, **si** and **di** registers.

The data registers can be treated as 16-bit registers or they can each be treated as two **8-bit** registers.

Each 8-bit register can be used independently.

The **ax** register may be accessed as **ah** and **al** (H and L refer to high-order and low-order bytes).

Similarly

**bx** may be accessed as **bh**, **bl**

**cx** may be accessed as **ch**, **cl**

**dx** may be accessed as **dh**, **dl**

If you use a data register as an 8 bit register, you cannot use its 16 bit parent **at the same time**.

The four **index** registers can be used for arithmetic operations but their use is usually concerned with the memory addressing modes of the 8086 microprocessor which we look at later.

The two remaining registers are the **instruction pointer (ip)** and the **status word**, or **flags** register.

Neither of these is referenced **directly** by your program.

## Instruction Pointer Register

This is a crucially important register which is used to control which instruction the CPU executes. The **ip**, or *program counter*, is used to store the memory location of the next instruction to be executed.

The CPU checks the program counter to ascertain which instruction to carry out next. It then updates the program counter to point to the next instruction. Thus the program counter will always point to the next instruction to be executed.

## Status (Flags) Register

Nine individual **bits** of the **status** register are used as **control** flags (3 of them) and **status** flags (6 of them). The remaining 7 are not used.

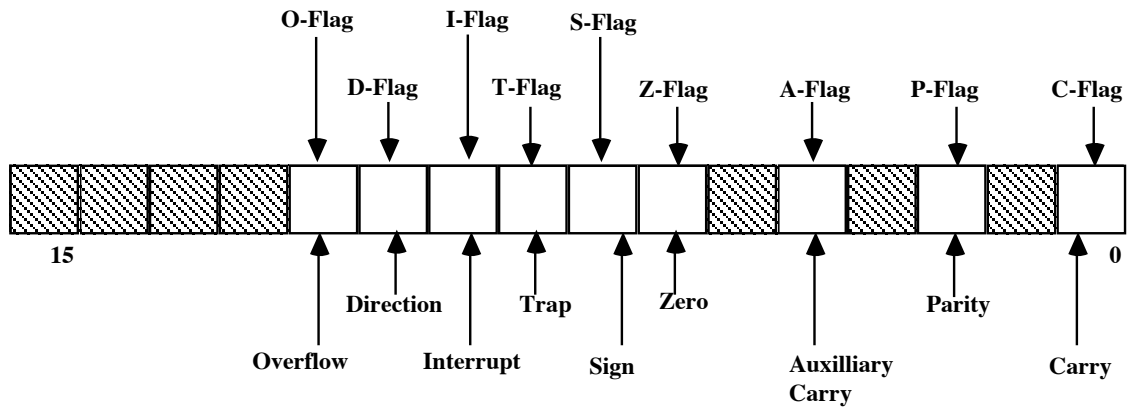
A flag can only take on the values 0 and 1. We say a flag is **set** if it has the value 1.

The status flags are used to record specific characteristics of arithmetic and of logical instructions.

**Example:**

The **zero flag (Z-Flag)** is set to 1 if the result of an arithmetic operation is zero.

The control flags are used to control certain modes of the CPU.



## The Flags Register

The use and manipulation of the flags register will be discussed in our treatment of 8086 assembly language.

# 8086 Registers

## General Purpose Registers

		15	0	
Accumulator	AX			Multiply, divide, I/O
Base	BX			Pointer to base addresss (data)
Count	CX			Count for loops, shifts
Data	DX			Multiply, divide, I/O

## Pointer and Index Registers

		15	0	
Stack Pointer	SP			Pointer to top of stack
Base Pointer	BP			Pointer to base address (stack)
Source Index	SI			Source string/index pointer
Destination Index	DI			Destination string/index pointer
		15	0	

## Segment Registers

Code Segment	CS	
Data Segment	DS	
Stack Segment	SS	
Extra Segment	ES	

## Other Registers

Flags	Flags
Instruction Pointer	IP

**Note: Four of the 16-bit registers may also be treated as eight 8-bit (one byte) registers.**

		7	0	7	0
Accumulator	AX	AH		AL	
Base	BX	BH		BL	
Count	CX	CH		CL	
Data	DX	DH		DL	

**H: High Order  
Byte**

**L: Low Order  
Byte**