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.

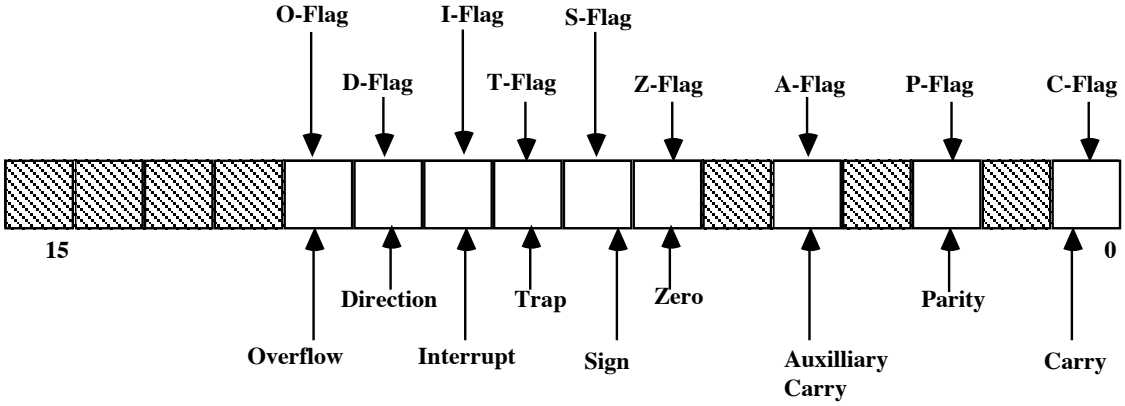
A flag can only take on the values 0 and 1. We say a flag is **set** if it has the value 1.

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.

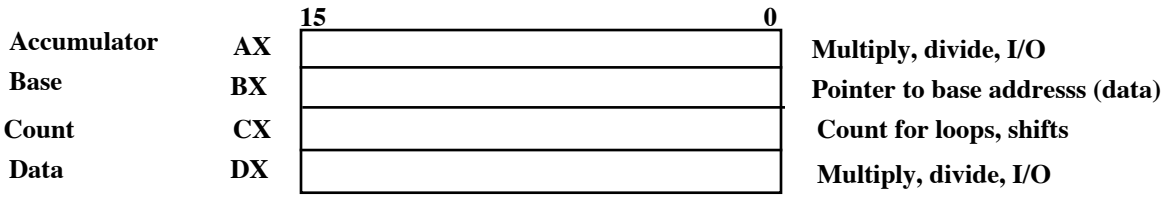


The Flags Register

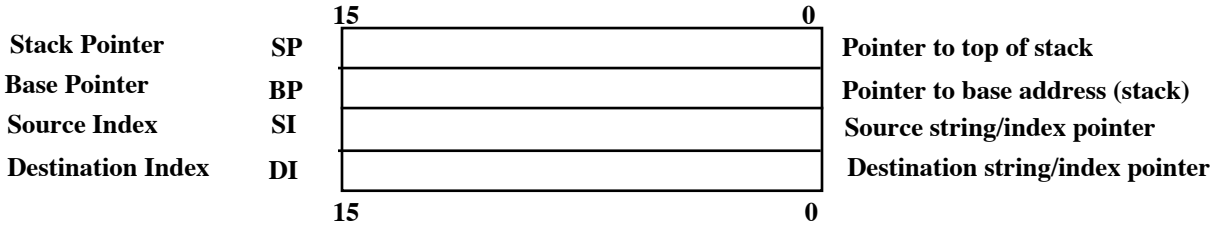
The use and manipulation of the flags register will be discussed in our treatment of 8086 assembly language.

8086 Registers

General Purpose Registers

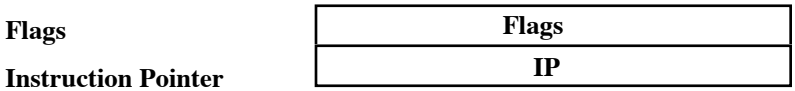


Pointer and Index Registers

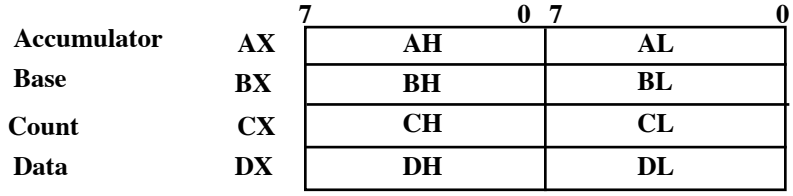


Segment Registers

Other Registers



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



H: High Order Byte

L: Low Order Byte