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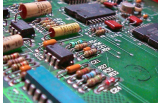


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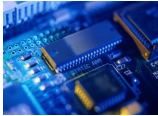
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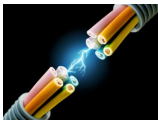
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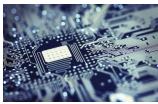
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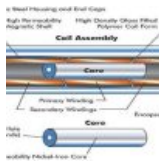
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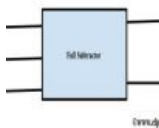
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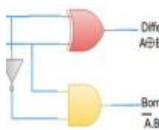
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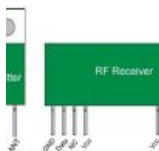
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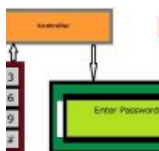
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Simple 8086 Assembly Language Programs with Explanation

by [Tarun Agarwal](#) at

- [Electronics](#)

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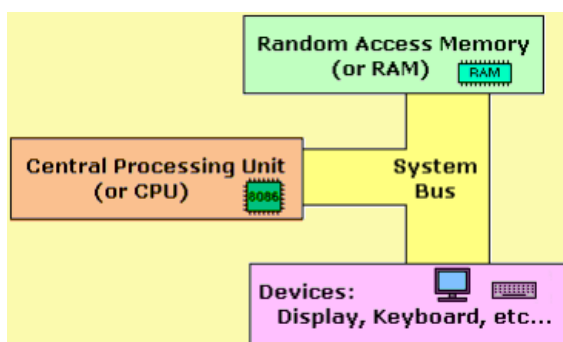
Assembly level programming is very important to low-level [embedded system](#) design is used to access the processor instructions to manipulate hardware. It is a most primitive machine level language is used to make efficient code that consumes less number of clock cycles and takes less memory as compared to the [high-level programming language](#). It is a complete hardware oriented programming language to write a program the programmer must be aware of embedded hardware. Here, we are providing basics of assembly level programming 8086.



Assembly Level Programming 8086

Assembly Level Programming 8086

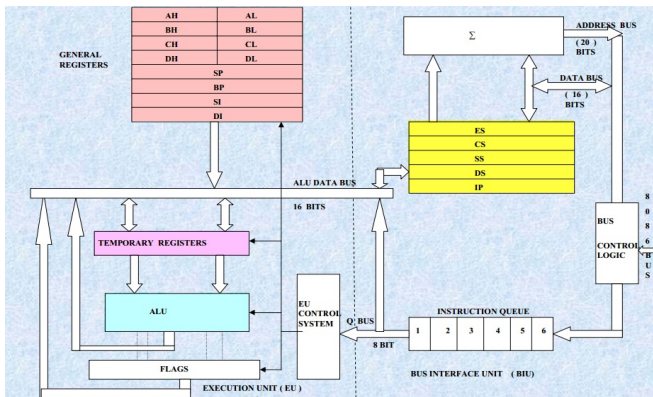
The [assembly programming language](#) is a low-level language which is developed by using mnemonics. The microcontroller or microprocessor can understand only the binary language like 0's or 1's therefore the assembler convert the assembly language to binary language and store it the memory to perform the tasks. Before writing the program the embedded designers must have sufficient knowledge on particular hardware of the controller or processor, so first we required to know hardware of 8086 processor.



Hardware of The Processor

8086 Processor Architecture

The 8086 is a processor that is represented for all peripheral devices such as serial bus, and RAM and ROM, I/O devices and so on which are all externally connected to CPU by using a system bus. The 8086 microprocessor has [CISC based architecture](#), and it has peripherals like 32 I/O, [Serial communication](#), memories and [counters/timers](#). The microprocessor requires a program to perform the operations that require a memory for read and save the functions.



8086 Processor Architecture

The assembly level programming 8086 is based on the memory registers. A Register is the main part of the [microprocessors and controllers](#) which are located in the memory that provides a faster way of collecting and storing the data. If we want to manipulate data to a processor or controller by performing multiplication, addition, etc., we cannot do that directly in the memory where need registers to process and to store the data. The 8086 microprocessor contains various kinds of registers that can be classified according to their instructions such as;

General purpose registers: The 8086 CPU has consisted 8-general purpose registers and each register has its own name as shown in the figure such as AX, BX, CX, DX, SI, DI, BP, SP. These all are 16-bit registers where four registers are divided into two parts such as AX, BX, CX, and DX which is mainly used to keep the numbers.

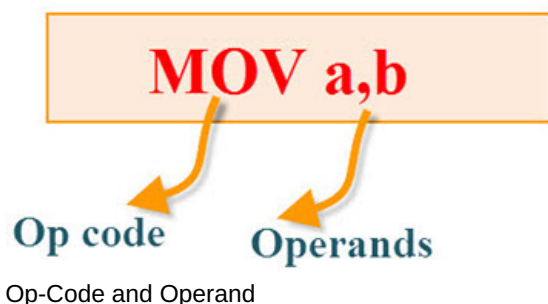
Special purpose registers: The 8086 CPU has consisted 2- special function registers such as IP and flag registers. The IP register point to the current executing instruction and always works to gather with the CS segment register. The main function of flag registers is to modify the CPU operations after mechanical functions are completed and we cannot access directly Segment registers: The 8086 CPU has consisted 4- segment registers such as CS, DS, ES, SS which is mainly used for possible to store any data in the segment registers and we can access a block of memory using segment registers.

Simple Assembly Language Programs 8086

The assembly language programming 8086 has some rules such as

- The assembly level [programming 8086](#) code must be written in upper case letters
- The labels must be followed by a colon, for example: label:
- All labels and symbols must begin with a letter
- All comments are typed in lower case
- The last line of the program must be ended with the END directive

8086 processors have two other instructions to access the data, such as WORD PTR – for word (two bytes), BYTE PTR – for byte.



Op-code: A single instruction is called as an op-code that can be executed by the CPU. Here the 'MOV' instruction is called as an op-code.

Operands: A single piece data are called operands that can be operated by the op-code. Example, subtraction operation is performed by the operands that are subtracted by the operand.

Syntax: SUB b, c

8086 microprocessor assembly language programs

Write a Program For Read a Character From The Keyboard

```
MOV ah, 1h          //keyboard input subprogram
INT 21h             // character input
// character is stored in al
MOV c, al           //copy character from al to c
```

Write a Program For Reading and Displaying a Character

```
MOV ah, 1h          // keyboard input subprogram
INT 21h             //read character into al
MOV dl, al          //copy character to dl
MOV ah, 2h          //character output subprogram
INT 21h             // display character in dl
```

Write a Program Using General Purpose Registers

```
ORG 100h
MOV AL, VAR1        // check value of VAR1 by moving it to the AL.
LEA BX, VAR1         //get address of VAR1 in BX.
MOV BYTE PTR [BX], 44h // modify the contents of VAR1.
MOV AL, VAR1         //check value of VAR1 by moving it to the AL.
RET
VAR1 DB 22h
END
```

Write a Program For Displaying The String Using Library Functions

```
include emu8086.inc //Macro declaration
ORG 100h
PRINT 'Hello World!'
GOTOXY 10, 5
PUTC 65             // 65 – is an ASCII code for 'A'
PUTC 'B'
RET                 //return to the operating system.
END                 //directive to stop the compiler.
```

Arithmetic and Logic Instructions

The 8086 processes of arithmetic and logic unit has separated into three groups such as addition, division, and increment operation. Most [Arithmetic and Logic Instructions](#) affect the processor status register.

The assembly language programming 8086 mnemonics are in the form of op-code, such as MOV, MUL, JMP, and so on, which are used to perform the operations. Assembly language programming 8086 examples

Addition

```
ORG0000h
MOV DX, #07H        // move the value 7 to the register DX//
MOV AX, #09H        // move the value 9 to accumulator AX//
Add AX, 00H         // add CX value with R0 value and stores the result in AX//
END
```

Multiplication

```
ORG0000h
MOV DX, #04H        // move the value 4 to the register DX//
MOV AX, #08H        // move the value 8 to accumulator AX//
MUL AX, 06H         // Multiplied result is stored in the Accumulator AX //
END
```

Subtraction

```
ORG 0000h
MOV DX, #02H        // move the value 2 to register DX//
MOV AX, #08H        // move the value 8 to accumulator AX//
SUBB AX, 09H        // Result value is stored in the Accumulator A X//
END
```

Division

```
ORG 0000h
MOV DX, #08H        // move the value 3 to register DX//
MOV AX, #19H        // move the value 5 to accumulator AX//
DIV AX, 08H         // final value is stored in the Accumulator AX //
END
```

Therefore, this is all about Assembly Level Programming 8086, 8086 Processor Architecture simple example programs for 8086 processors, Arithmetic and Logic Instructions. Furthermore, any queries regarding this article or electronics projects, you can

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[at](#)

The explanation given above is very easy to understand.thankyou sir

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1. **Tarun Agarwal** says:

[at](#)

Hi keerthi

Thank you so much for your feedback regarding this article

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2. **Aakrist** says:

[at](#)

Comparing to other examples on the internet, I found this very beginner friendly and helpful, Thanks author for researching and

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Hi Aakrist

I sincerely appreciate your kind response regarding my article

And once again please visit our domestic website <https://www.elprocus.com>

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3. **Aakrist** says:

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Elegant and Nice,

Very useful for all the people.

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Hi

Thank you so much for your feedback

And once again please visit our domestic website <https://www.elprocus.com>

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4. **S** says:

[at](#)

Is any tool available to write microprogram ? How to write microprogram for microprocessor?

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[at](#)

Hi S

As per your query depending microprocessor we can write the micro program

And once again please visit our website once <https://www.elprocus.com>

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5. **megha** says:

[at](#)

Hi sir!!! I'M a ECE student. I'm planning to do a project based on gsm technology. I've no clear idea regarding this. The title of my project is "wireless e-notice board using gsm technology". Can you please suggest some ideas as to how to start off with the project. and also please do give more information regarding gsm technology, it's circuit diagrams if any.

[Reply](#)

1. **Tarun Agarwal** says:
[at](#)

Hi Megha,

For detailed information on [gsm based projects](#) please check out the link.

[Reply](#)

6. **Collins** says:
[at](#)

A beautiful site.

[Reply](#)

1. **Tarun Agarwal** says:
[at](#)

Hi Collins,

Thank you for your appreciation. It really helps us to work hard. Also, please check our user friendly website <https://www.elprocus.com> for all the latest projects.

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