C51 Language Extensions:

- Data Types
- Memory Types
- Memory Models
- Pointers

Data types:

Additional data types available in C51 compiler are:

- Sfr
- Sfr16
- Sbit
- Bit

sfr:

Size of sfr is 1 byte.

Syntax:

sfr sfr_name=sfr_addr;

ex:

sfr P0=0x80;

sfr DPL=0x82;

sfr16:

Size of sfr16 is 2 bytes.

Syntax:

sfr16 16 bit sfr_name=sfr_addr;

ex:

sfr16 DPTR=0x82;

sbit:

Syntax:

sbit bit_var=sfr_name^bit_pos;

ex:

sbit bit7=PSW^7;

(OR)

sbit bit_var=sfr_addr^bit_pos;

ex:

sbit bit7=0xd0^7;

bit:

syntax:

bit bit_var;

NOTE: size of sbit and bit is 1 bit.

Memory types:

Additional memory types available in C51 compiler are

- Data
- Idata
- Bdata
- Pdata
- Xdata
- Code

Syntax:

memory type data type var_name;

(or)

Data type memory type var_name;

This **data memory type** variable is located in internal RAM and they are accessed with 8bit direct addresses ranging from 0x00-0x7f.

This **idata memory type** variable is located in internal RAM and they are accessed with 8bit indirect addresses and maximum range is from 0x00-0xff.

This **bdata memory type** variable is located in bit addressable internal RAM and the range is from 0x20-0x2f.

This **pdata memory type** variable is located in a selected page of external RAM and they are accessed with 8bit indirect addresses ranging from 0x00-0xff.

This **xdata memory type** variable is located in external RAM and they are accessed with16bit indirect addresses ranging from 0x0000-0xffff.

This **code memory type** variable is located in ROM.

NOTE: first five memory types are applicable only for variables and code memory type is applicable for variables and also for functions. All the memory types can be used with local and global variables.

Memory models:

The memory model will talk about default memory type used for variables, function arguments. The C51 compiler provides three memory models and they are:

- Small
- Compact
- Large

In **Small memory model,** the default memory type used is data.

In **compact memory model,** the default memory type used is pdata.

In **Large memory model,** the default memory type used is xdata.

Pointers:

The c51 compiler provides two types of pointers and they are:

- Generic pointers
- Memory specific pointers

Generic pointers can be used for accessing any variable regardless of its location in 8051 memory space. The size of this pointer is of three bytes.

Ex:

```
Char *p;      //pointer p can point to any memory area of 8051.
```

Memory specific pointers can be used for accessing a variable located in specific 8051 memory area.

Ex:

```
char data *p;  //pointer p can point to data storage type variables

char pdata *p; //pointer p can point to pdata storage type variables

char code *p; //pointer p can point to code storage type variables
```