

Ques!- What is the address range of PC register? ⑥

Ans!- As PC is 16-bit register. This means that 8051 can access program addresses 0000H to FFFFH, a total of 64K bytes of code.

V) DPTR - Data pointer: - As the name suggests, it points to the data. It gives the address of the data, therefore it is also an 16-bit register. It holds address data in data memory (RAM).

Note: PC gets incremented automatically, therefore it is not controlled by the programmer. But DPTR can be incremented decremented & may point randomly to any address, hence it is controlled by the programmer.

DPTR is divided into two registers, DPH (higher byte) & DPL (lower byte). Here choice is given to the programmer.

DPTR can be used as whole register (16-bit) or it can be used as 2 separate registers DPH, DPL (both 8-bit). So when you are modifying

⑦ each register individually, you are modifying 8-bit register, which is faster than modifying DPTR which is 16-bit register.

See the block diagram, 8 bit data bus is connected to A, B, PSW and DPTR too. Since DPTR (as a whole) carries 16-bit addresses too, therefore it is connected to 16-bit address bus too.

DPTR is typically used by the programmer to transfer data from external RAM. It can also be used as a pointer to a look up table in ROM, using Indexed addressing mode. (this will be discussed later in detail).

Eg: `MOVX A, @DPTR` ; A gets the data from external RAM location pointed by DPTR.

`MOVC A, @A+DPTR` ; A gets the data from ROM location pointed by A+DPTR.

MEMORY SECTION



In 8051, the memory section is consist of two parts.

- | | |
|------------------------|---------------|
| 1) Internal ; RAM, ROM | } Total of 4. |
| 2) External ; RAM, ROM | |

In the architecture of 8051, we will only discuss the Internal memory section.

8051 has 128 bytes of internal RAM and 4KB of internal ROM.

i) Internal RAM :- RAM is used to store data, hence it is also called Data memory. 128 bytes of internal RAM means, there are 128 locations in the memory each containing one byte information. It contains Register banks, a bit addressable area and a general purpose area.

Ques:- What is the address range of internal memory having 128 locations.

Ans:- With 1 bit data address, we can have two locations (0,1)
" 2 " " " " " " " 4 (2²) " (00, 01, 10, 11)
" 3 " " " " " " " " 8 (2³) " (000, 001, 010, ...)
" 4 " " " " " " " " 16 (2⁴) " (0000, 0001, ...)
" 7 " " " " " " " " 128 (2⁷) " locations

9.

0000 0000
0000 0001
0000 0010

0111 1111

Add	data
00H	
01H	
02H	
⋮	⋮
7FH	

← Int. RAM (128 byte)

V. Imp

Hence, the address range of internal RAM is from 00H 7FH

Practice Ques!

What would be the range of ^{address, if} internal RAM is of 32 byte.?

Ans:- ??

ii) INTERNAL ROM: 8051 has 4KB of internal ROM. ROM is used to store programs, hence it is called program memory or code memory. There are 4K locations each containing one byte information. It mainly contains Programs. It may also contain some permanent data stored in the form of look up tables.

V. Imp

→ To access programs, the address is given by PC - Program Counter.

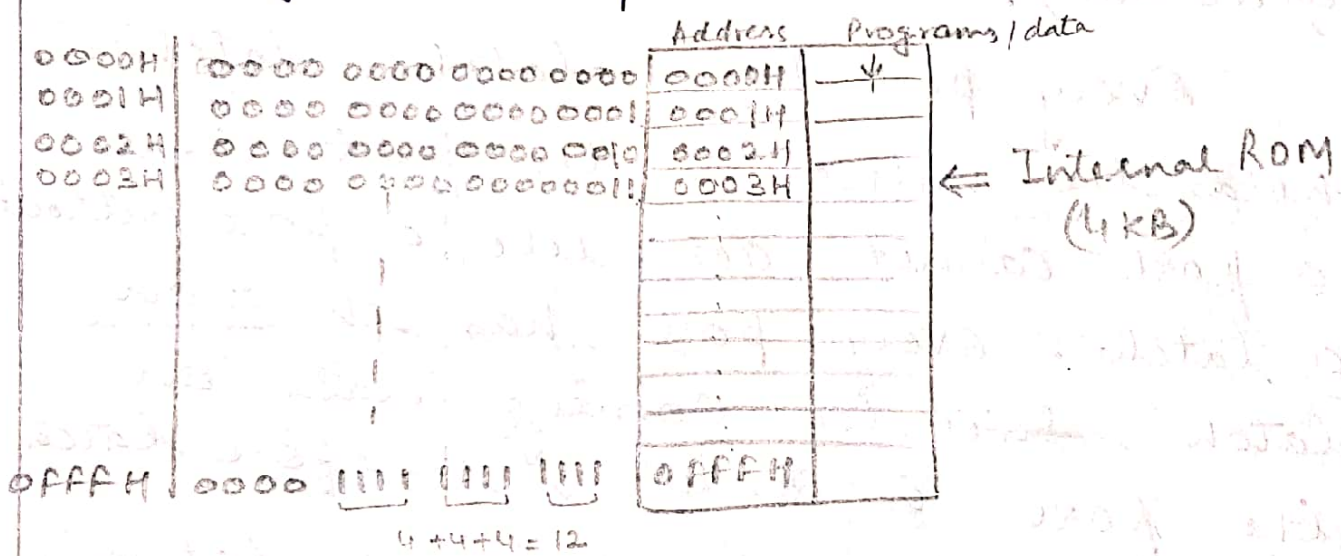
To access data, the address is given by DPTR - data pointer.

(10)

Ques! - What is the address range of internal ROM?

Ans! - Internal ROM = 4KB = 4 x 1KB
 $= 2^2 \times 2^{10}$
 $= 2^{12}$

∴ you will require 12-bit address.



∴ Address range goes from 0000H to 0FFFH & it will be carried by 16-bit address bus.

I/O COMPONENTS : 8051 has four,

8 bit I/O ports ; P0, P1, P2, P3. They support bit and byte operations. All the ports have alternate functions except port P1. Using alternate functions

②

is not compulsory, that is only why they are called alternate functions.

8 bit data bus is connected to all the ports to transfer data to all the ports. whereas 16-bit address bus is connected to only P0 & P2, ∴ they carry the address too (as alternate function).

Every port has a latch. latch holds the value on the port. hence a port cannot act like a port without a latch. every port has its own latch. Since the coming data on the port is 8-bit, therefore latch is also 8-bit. function of latch is to hold (store) the value on the port. Before the latch it was a data, & because of latch it is a port. latches are also known as port registers.

Also, there are two -16 bit timers, which operate as down counters. There is a serial port also having

⑫ pins RXD & TXD to receive & transmit data serially. There are two external interrupt pins $\overline{INT0}$ & $\overline{INT1}$.

In addition to this, there are address, data and control signals for transfers with External RAM and External ROM.

Finally, 8051 has 21, 8-bit internal SFR (special function registers). They are used to control operations of the various I/O components mentioned above. All these, is a part of

Timing & control circuit. It releases

the control signals and controls the every part of 8051. It is like brain in the human body.

_____ x _____