

Topic - Addressing Modes of 8051 MC.

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There are five addressing modes.

- (a) Register Addressing Mode.
- (b) Direct Addressing Mode
- (c) Register Indirect Ad. Mode.
- (d) Immediate Ad. Mode.
- (e) Base-register plus Index-register Indirect Ad. mode.

Table : 1. SHOWING Addressing Mode & Associated Memory space.

Addressing Mode	Memory Space
(a) Register Ad. Mode	R0-R7, ACC, B, DPTR, CY
(b) Direct Ad. Mode	Lower 128 byte of internal RAM, SFR
(c) Register Indirect Ad. Mode	Internal RAM (@R1, @R0, SP) External RAM (@R1, @R0, @DPTR)
(d) Immediate Ad. Mode	Program Memory.
(e) Base Register plus Index Register Indirect Ad. Mode.	Program Memory (@DPTR + A, @PC + A)

(a) Register Addressing :- 8 Working registers of selected register bank are used. ACC, B, DPTR, CY - also used.
NOTE:- Boolean Processor - 8051 - 'CY' used as accumulator

(b) Direct Addressing :- The ^{only} method to use or to access the SFRs and lower 128 bytes of internal RAM is direct Addressing Mode.

(c) Register Indirect Addressing :- content of R0 or R1 is used as pointer to memory location of 256 byte size. The memory space that used as is Internal RAM (by using @R0, @R1, SP) or External RAM (by using @R1, @R0, @DPTR). SFR cannot be accessed.

(d) Immediate Addressing :- It is used for program memory.

(e) Base-Register plus Index-Register Indirect Addressing :- It is used to access a byte from the program memory indirectly from the location whose address is sum of Base Register (DPTR, PC) and Index Register (Accumulator).
Ex: $\left. \begin{matrix} @DPTR + A \\ @PC + A \end{matrix} \right\}$ used in Look up table cases.

Instructions Format of 8051 :-

- **ADD A, R_n.** (Where $n = 0, 1, 2, \dots, 7$).
Add content of accumulator & specific working register & result stores at accumulator.
- **ADD A, direct**
Add content of accumulator & specified address's content & places result into accumulator.
- **ADD A, @R_i** ($i = 0, 1$).
Add content of memory pointed by R_i with content of accumulator & result stores at accumulator.
- **ADD A, #Data.**
Add content of accumulator with immediate data & places the result into accumulator.

Example :

① Add 57H & 6AH. & store result into 52H memory location.

MOV A, #57H

~~MOV~~ ADD A, #6AH.

MOV 52H, A.

Ans: Result.
52H → C1H.

② Add 35H & 63H using pointer. Use R₀ as pointer.
[By default Bank 0 is selected on reset].

MOV R₀, #51H.

MOV A, @R₀

ADD A, 52H

MOV 53H, A.

Memory Location	Data
51H	35H
52H	63H
53H	<div style="border: 1px solid black; width: 40px; height: 20px; display: flex; align-items: center; justify-content: center;">Result.</div>