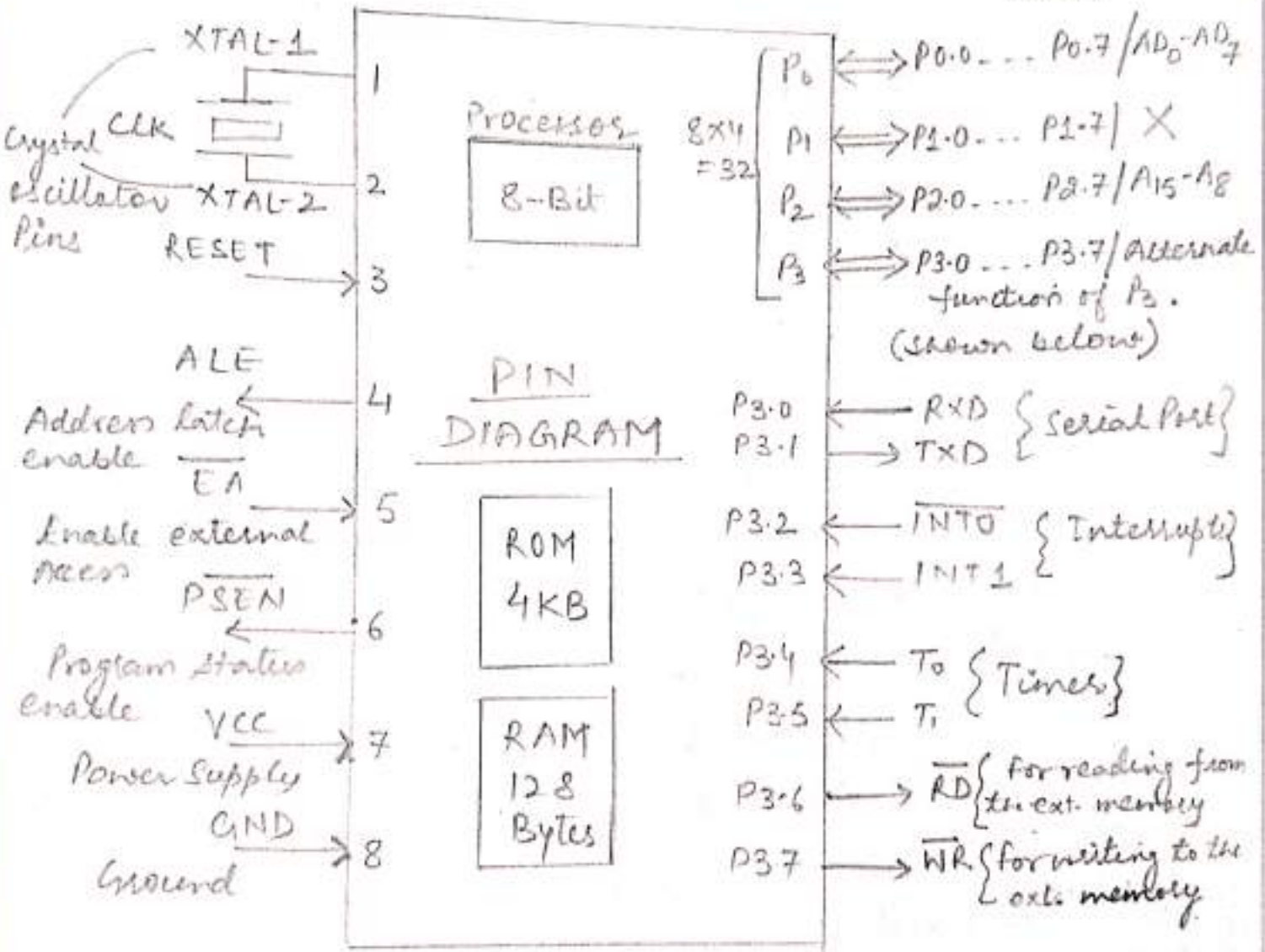
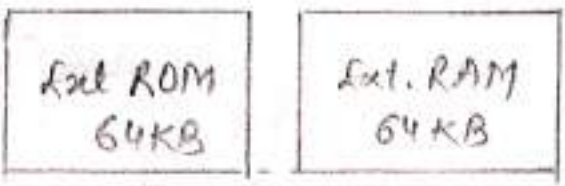
PIN - DIAGRAM 8051

In 40 PIN IC of 8051, a total of 32 pins are set aside for the four ports P0, P1, P2, P3 where each Port takes 8 Pins. The rest of 8 Pins are shown on LHS.



32 + 8 = 40 PIN IC



Note:
External memory of 64KB can be used, whenever required.

XTAL-1 & XTAL-2 : These pins are connected to crystal oscillator. The typical operating frequency is 12MHz. As you give power supply these plates get charged & crystal starts oscillating, as it oscillates it gives 101010.... signal (like ⎍⎍⎍⎍, a clock). It gives clock to 8051, it triggers the processor for the next instruction.

RESET : It is used to reset the 8051 mc. On reset PC becomes 0000H. This address is called the reset vector address. From here, 8051 executes the BIOS program also called the Booting program or the monitor program It is used to set up the system & make it ready, to be used by the end-user. One can use reset at any time to avoid non-desirable situations. The main purpose is that you need not to switch off power to reset the mc. The reset button will serve the function. Contents of RAM will vanish on reset. Contents of ROM will remain as such It is used to initialize everything in processor.

ALE : ADDRESS LATCH ENABLE

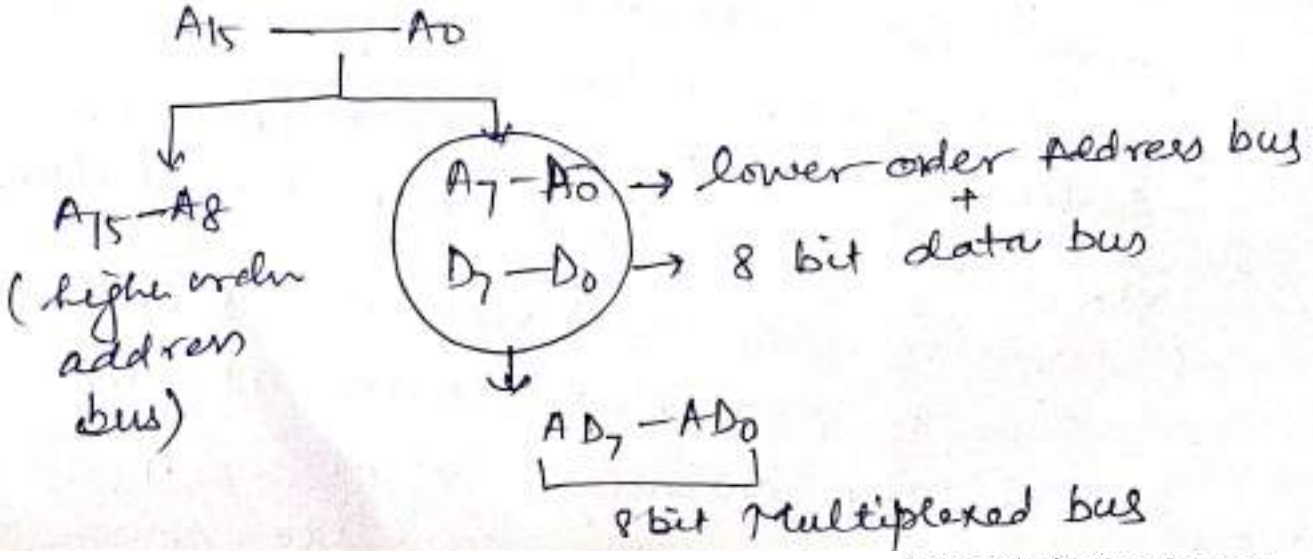
(↔)

It is used to enable the latching of address. In 8051, the addres & data buses are multiplexed, this is done to reduce the number of pins on IC. Once out of the chip, addres & data have to separated that is called as demultiplexing. This is done by a latch, with the help of ALE signal.

ALE is "1" when the bus carries the addres & "0" when the bus carries the data. This informs the latch, when the bus is carrying addres so that the latch captures only address & not the data

~~EA X Enable External~~

In 8051, we have 16-bit address bus & 8 bit & bit data bus



$\overline{EA}$:- Enable external access (→) ④

As 8051 can be connected to external RAM & ROM (64 KB both). This $\overline{EA}$ pin is used to enable / disable the external memory interfacing.

Whether you connect external RAM or not, internal RAM is always used. But for ROM, choice is given to user, whether to use it or not. This is done with the help of this pin.

When $\overline{EA} = 0$, internal ROM will be discarded & external ROM will be used & will begin from 0000H. 8051 now uses only external ROM.

When $\overline{EA} = 1$, Internal ROM will be used first & external ROM will begin after the internal ROM ends. (0000H – 0FFFH)

There after, the external ROM begins from 1000H :-

$\overline{PSEN}$: Program status Enable

8051 has a 16-bit address bus (A_{15}-A_0). This allows 8051 to access 64 KB of external memory as 2^{16} = 64 KB. As said earlier also, 8051 can access 64 KB of Ext ROM & 64 KB of Ext RAM making it a total of 128 KB. Both of them have the same address Ranges 0000 H to ffff H. This should not lead to any confusion therefore there are separate control signals are provided for ext RAM & ext ROM.

These are: $\overline{RD}$ & $\overline{WR}$ are control signals for external RAM.

$\overline{PSEN}$ is the READ signal for external ROM. It allows reading from ROM, which is also known as program memory (hence the name program status enable).

Imp: Having separate control signals for ext. RAM & external ROM actually allows us to double the size of external memory to a total of 128 KB from the original 64 KB.

Vcc & GND : These are power supply pins. 8051 works at +5V/0V power supply.

P0.0 – P0.7 : These are 8 pins of port 0. User can perform a byte operation (8-bit) on the whole port 0. User can also access every bit of port 0 individually by performing bit operations like set, clear, compliment etc. These bits are called P0.0 ..... P0.7.

Additionally, Port 0 also has an alternat function. It carries multiplexed address data lines. A0 – A7 (the lower bits of address) & D0 – D7 (8 bits of data) are multiplexed into $AD_0 - AD_7$. In any operation, adress & data are not issued simultaneously first, address is given, then data is transfered. Using a common bus for both, reduces the number of pins.

To identify, if the bus is carrying address or data, we check at the ALE signal

If ALE = 1, the bus carries the address.

If ALE = 0, the bus carries the data.

Note :- All ports are bidirectional & can be used as input, output ports.

P1.0 ... P1.7 :- There are 8 pins of port 1. A byte operation can be performed on the whole port. Every bit of port 1 can also be accessed individually by performing bit operations like set, clear etc. Port 1 has no alternate functions.

P2.0 --- P2.7 :- 8 pins, byte operation, accessed individually (same as above). Additionally, Port 2 also has an alternate function. It carries the higher order address lines A_8-A_{15}.

P3.0 --- P3.7 :- 8 pin, byte operation, accessed individually. The various ports of Ports have a lot of alternate functions.

P3.0 & P3.1 (RXD) (TXD) :- They are used to receive and transmit serial data. They forms the serial port of 8051.

P3.2 ($\overline{INT0}$) and P3.3 ($\overline{INT1}$) :- They are external hardware interrupts of 8051. If they occur simultaneously, INT0 is by default takes the higher priority.

P3.4 (T0) and P3.5 (T1) :- They are used as timer clock inputs. They provide external clock inputs to Timer 0 & Timer 1.

P3.6 ($\overline{WR}$) and P3.7 ($\overline{RD}$) : They are used as control signals for external RAM. 8051 can access 64 KB external RAM from 0000 H to FFFF H.