Experiment 8

Aim:- To study 8051 microcontroller.

Theory:- It is designed by Intel in 1981. It is designed of 8 bit controller. It has 40 pins, DIP like ROM & 128 bytes of data RAM, 2 16 bit timers. It consists of 4 parallel 8 bit port which are also programmable. An on chip crystal oscillator is integrated in the microcontroller having crystal frequency of 12 MHz

Architecture:

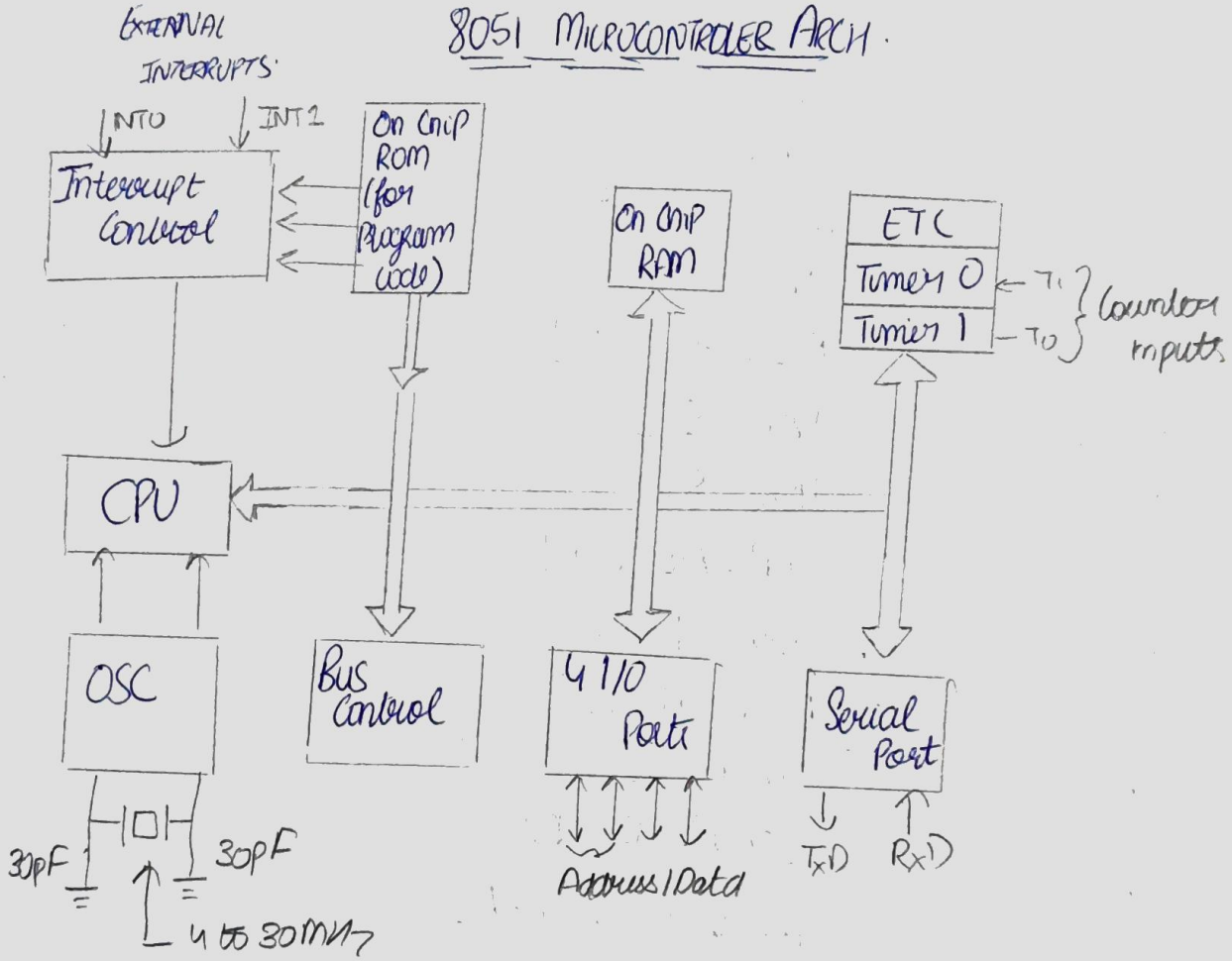
The system bus connects all the support devices to the CPU. The system bus consists of 8 bit data bus, 16 bit address bus and bus control signal. All the other devices like program memory, serial I/O, interrupts together form the system bus.

PIN DIAGRAM of 8051 Microcontroller:

Pin 1 to Pin 8:- These pins are assigned to port 1 for simple operations. They can be configured as I/P or O/P pins depending upon control control if less it act as O/P else input

Pin 9 (RST): Reset Pin is high ~~output~~ active input Pin 9 if high for 2 machine cycle, it will reset

8051 MICROCONTROLLER ARCH.



Pin 10 to Pin 17 :- These pins can also be used as universal input or O/P pins and has additional functions such as RxD, TxD, INT0', INT1', T0, T1, WR', RD'

Pin 18 & Pin 19: They are compared to a crystal oscillator.

Pin 20: It is GND Pin

Pin 21 to 28 :- They act as higher order address bytes when additional external memory is interfaced with 8051.

Pin 29 :- It is program storable pin. It is used to read external memory.

Pin 30 :- ALE Pin. It is used to Demultiplex & multiplex data & address signals.

Pin 31 :- It is EA pin & used to enable/disable external memory interface.

Pin 32 to 39: These pins are port 0. It serves as I/O Port lower address is multiplexed using these pins.

Pin 40 :- It is used to provide supply to ckt.

8051 has 4 IO ports for each of 8 bit which can be configured as I/P or O/P

8051 microcontroller have 4 I/O ports each of 8 bit which can be configured as I/P or O/P. Hence total 32 I/P & O/P pins allow. The microcontroller to be connected with the peripheral devices.

- Pin configuration:- i.e the pin can be configured as I for I/P & O/P as per logic state.

. Input & Output (I/O Pin) → All the circuits within the microcontroller must be connected to one of its pin except P0 ports because it doesn't have pull up resistors built it.

Input pins :- Logic 1 is applied to a bit of P register. The O/P FE transistor is turned off & the other pin remains connected to the power supply voltage over a pull up resistor of high resistor.

- Port 0 : The port 0 is characteristic of two function
  - When the external memory is used then the lower address byte (address A0AT) is applied on it, else All bits of this port are configured as I/P or O/P.
  - When P0 port is configured as an O/P then other port consisting of pins with built in pull up resistor connected by its end to 5V power supply, the pins of this port have this resistor left out.

Input Configuration: If any pin of this port is configured as an input, then it acts as if it "floats"; i.e the I/P has unlimited I/P resistance & in determined potential.

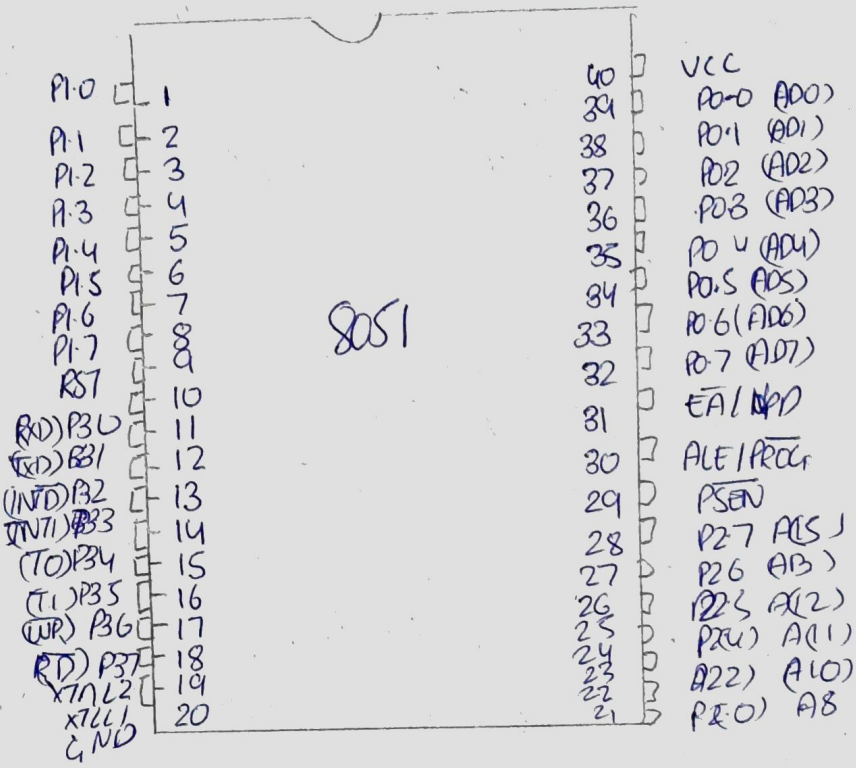
Output Configurations: When the pin is configured as an output, then it acts as if its "open drain". By applying logic 0 to port bit, the appropriate pin will be connected to ground (0V), applying logic 1, the external O/P will keep on floating.

Port 1:- P1 is a true I/O port as it doesn't have any alternate functions as in P0, but this port can be configured as general I/O only. It has a built in pull up resistor and is compatible with TTL circuits.

Port 2:- P2 is similar to P0 when the external memory is used. Pins of this port occupy address intended for the external memory chip.

Port 3:- In this port, function were similar to other ports except that the logic 1 must be applied to appropriate bit of the P3 register.

Pins Current Limitations:- • When pins are conf. as an O/P, than single port receive a current of 10mA.
• When these pins are conf. as I/P, than built in pull up resistor provide very weak current, but can activate up to 4 TTL I/P of LS series.
• If all 8 bits of a period of a port are active, then the total current must be limited to 15mA (port P0: 26 mA)


8051
P1.0 1
P1.1 2
P1.2 3
P1.3 4
P1.4 5
P1.5 6
P1.6 7
P1.7 8
RST 9
(RXD) P3.0 10
(TXD) P3.1 11
(INT0) P3.2 12
(INT1) P3.3 13
(T0) P3.4 14
(T1) P3.5 15
(WR) P3.6 16
(RD) P3.7 17
XTAL2 18
XTAL1 19
GND 20
40 VCC
39 P0.0 (AD0)
38 P0.1 (AD1)
37 P0.2 (AD2)
36 P0.3 (AD3)
35 P0.4 (AD4)
34 P0.5 (AD5)
33 P0.6 (AD6)
32 P0.7 (AD7)
31 EA/VPD
30 ALE/PROG
29 PSEN
28 P2.7 (A15)
27 P2.6 (A14)
26 P2.5 (A13)
25 P2.4 (A12)
24 P2.3 (A11)
23 P2.2 (A10)
22 P2.1 (A9)
21 P2.0 (A8)

Keil Simulator Software :-

The Keil 8051 development tools are designed to solve the complex problem facing embedded software developers. When starting a new project, simply select the microcontrolled, you use from the Device Database & the µVision IDE sets all the compiler, assembler, linker; & memory options for you.

Numerous example programs are included to help you get started with most popular embedded 8051 devices. The Keil µVision debugger accurator. Simulate on chip peripheral (I²C, CAN, UART, SPI, DA converter. etc) of your 8051 device. Simulation help you understand hardware config & avoid time wasted on setup problem.

Result: 8051 microcontroller was studied.