1.4 Programming parallel ports:

1. Pin diagram of 8051 and ports

8051 family members come in different IC packages, such as DIP (dual in-line package), QFP (quad flat package), and LLC (leadless chip carrier), they all have 40 pins that are dedicated to various functions such as I/O, RD, WR, address, data, and interrupts. some companies provide 20-pin versions of the 8051 with a reduced number of I/O ports for less demanding applications. Majority of developers uses the 40-pin chip, we will concentrate on that. Figure 8-1 shows the pin diagram of 8051.

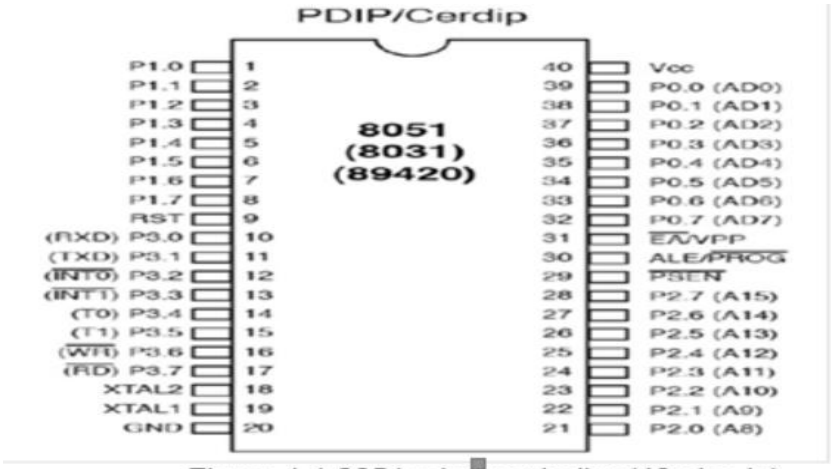

Figure 1.1 8051 microcontroller (40 pins Ic)

A set of 32 pins are set aside for the four ports P0,P1,P2 and P3 where each port takes 8 pins. Pin 40 provides supply voltage to the chip. The voltage source is +5V. Pin 20 is the ground. The rest of the pins are designated as XTAL1,XTAL2,RST,EA,PSEN and ALE. XTAL2/XTALI are for oscillator input which provides the clock pulse to microcontroller. The pins from 32 to 39 form the port0(AD0/AD7). P0.0 to P0.7 are multiplexed pins used for address and data The pins from 1 to 8 are for port 1 (P1.0 to P1.7); and the pins from 21 to 28 are for port 2. (P2.0 to P2.7) is used for sending address to memory. The 9th pin RST is used for Restarting the 8051 microcontroller. The pins from 10 to 17 are for port3 which is a special port, and it is multi-functional. The 30th pin is ALE(Address latch enable). When the pin is set to 1, then address is transferred through the pins AD0 to AD7. When the pin is set to 0 then data is transferred through the pins AD0 to AD7. The 29th pin is PSEN which is the Program Strobe Enable used for reading the program from external memory.

2.Configuring ports

When ‘0’ is written to the port, it is configured as output. To reconfigure the port as input, ‘1’ must be written to port. Port0 is configured as input by writing ‘1’ to port and then it can be used as input.

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Ex:  MOV A,#0FFH ; A=FF hex
MOV P0,A  ; write ‘1’ to port
MOV A,P0  ; A=P0
MOV P2,A   ; P2=A
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Initially Port0 is configured as input port. First, using the immediate addressing mode the hexadecimal number FFH is moved to accumulator and all the port pins in P0 is written to 1. This statement is used to declare that the port P0 is used as the input port. Port P0 is connected to some other input device. The data received by the port P0 is sent to accumulator and then finally Port 2 is the output port in which the data stored in accumulator is delivered to port2.

Another function of Port 0 is AD0-AD7. It is used for both address and data. When connecting an 8051/31 to an external memory, port 0 provides both address and data. Port 1 is used as input and output. Upon reset, port 1 is configured as an input port. Port 2 is also used as input or output. Upon reset, port 2 is configured as an input port. Port 2 along with P0 will provide the 16- bit address for the external memory. If 16 bit is needed for accessing the external memory then AD0-AD7 pins from Port 0 and A8-A15 pins from port 2 are combined in which port 2 contains the higher order byte and port 0 contains the lower order byte.

Instruction	Function
SETB bit	Set the bit (bit = 1)
CLR bit	Clear the bit (bit = 0)
CPL bit	Complement the bit (bit = NOT bit)
JB bit, target	Jump to target if bit = 1 (jump if bit)
JNB bit, target	Jump to target if bit = 0 (jump if no bit)
JBC bit, target	Jump to target if bit = 1, clear bit (jump if bit, then clear)

Table 1.2 Instructions used in single bit operations

Instructions used in single bit operation are JB and JNB. These instructions monitor a bit and make a decision depending on whether it's 0 or 1. These two instructions can be used for any bits of I/O ports 0, 1, 2, and 3. Table 1.2 lists the single bit operating instructions. Table 1.2 lists the single bit operations.