Experiment 9

Aim :

Interfacing of 8051 microcontroller with DC motor.

Theory :

In many projects of embedded systems, we need to control a DC motor using controller. It is not good to connect DC motor directly to the microcontroller. Since the maximum current that can be sink from 8051 microcontroller is 15mA at 5V. But a DC motor needs much more currents. It also needs more voltages as 6v, 12v, etc. One more thing to notice is that back emf produced by the motor may affect proper functioning of the microcontroller and reversing the direction can damage the controller. Due to these reasons, we can't connect a DC motor directly to a microcontroller.

- **Motor driver for dc motor interfacing with 8051 microcontroller :**

To overcome the problems in their interfacing, a motor Driver IC is connected between microcontroller and DC motor. Motor driver is a little current amplifier. It takes a low current signal and gives out a high current signal which can drive a motor. It can also control the direction of motor. We can use any H-bridge IC like L293D or L298.
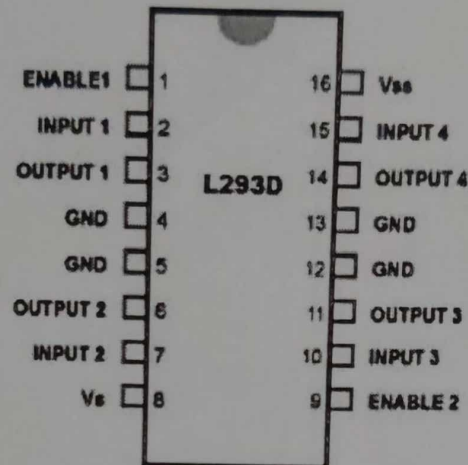
The main differences between L293D and L298 are :

CHARACTERISTICS	L298	L293D
Max. output current per channel	2A	0.6A
Peak max. output current per channel	3A	1A
Protection diodes across motors	Use externally	Internally available

L293D for dc motor interfacing with 8051 microcontroller :

It is designed to provide bidirectional drive currents of up to 600mA at voltages from 4.5V to 36V. It can drive inductive loads such as solenoid, relays, DC and bipolar stepping motors. It contains internally protection diodes across the motor.

PIN DIAGRAM:

ENABLE1	1		16	Vss
INPUT 1	2		15	INPUT 4
OUTPUT 1	3	L293D	14	OUTPUT 4
GND	4		13	GND
GND	5		12	GND
OUTPUT 2	6		11	OUTPUT 3
INPUT 2	7		10	INPUT 3
Vs	8		9	ENABLE 2

L293D contains four Half H Bridge drivers. We can drive two DC Motors by single driver.

1) VSS pin is used to provide input voltage to L293D. For 8051 interface, 5V is given to it.
2) The motor supply is given to VS pin of the L293D. It depends upon motor requirement.
3) EN1 is used to enable input pair 1 (IN1, IN2, for OUT1, OUT2) and EN2 is used to enable input pair 2 (IN3, IN4, for OUT3, OUT4). EN is connected to 5V for to enable any input.
4) Direction of motor 1 is controlled through input pins logic. IN1 and IN2 control motor connected output OUT1 and OUT2.
5) Direction of motor 2 is controlled through input pins logic. IN3 and IN4 control motor connected output OUT3 and OUT4.
6) All GND pins should be connected to ground.

Connections :

1) P2 of 8051 microcontroller is used as output port and it gives inputs to the motor driver IC. Its lower four pins are connected to drive two DC motors.
2) P0 is used as input port. 2 Buttons are connected to its lower two pins so that whenever we can manually start and stop the motors.
3) Motor 1 is connected between OUT1 and O
4) UT2 of L293D. Motor 2 is connected between OUT3 and OUT4 of L293D.
5) 12V battery is used to give input to the VS for motors.
6) 5V battery is used to give input to VSS for motor driver IC.

PROTEUS SIMULATIONS:

Button 1 and 2 both pressed, Both motors rotating in opposite directions
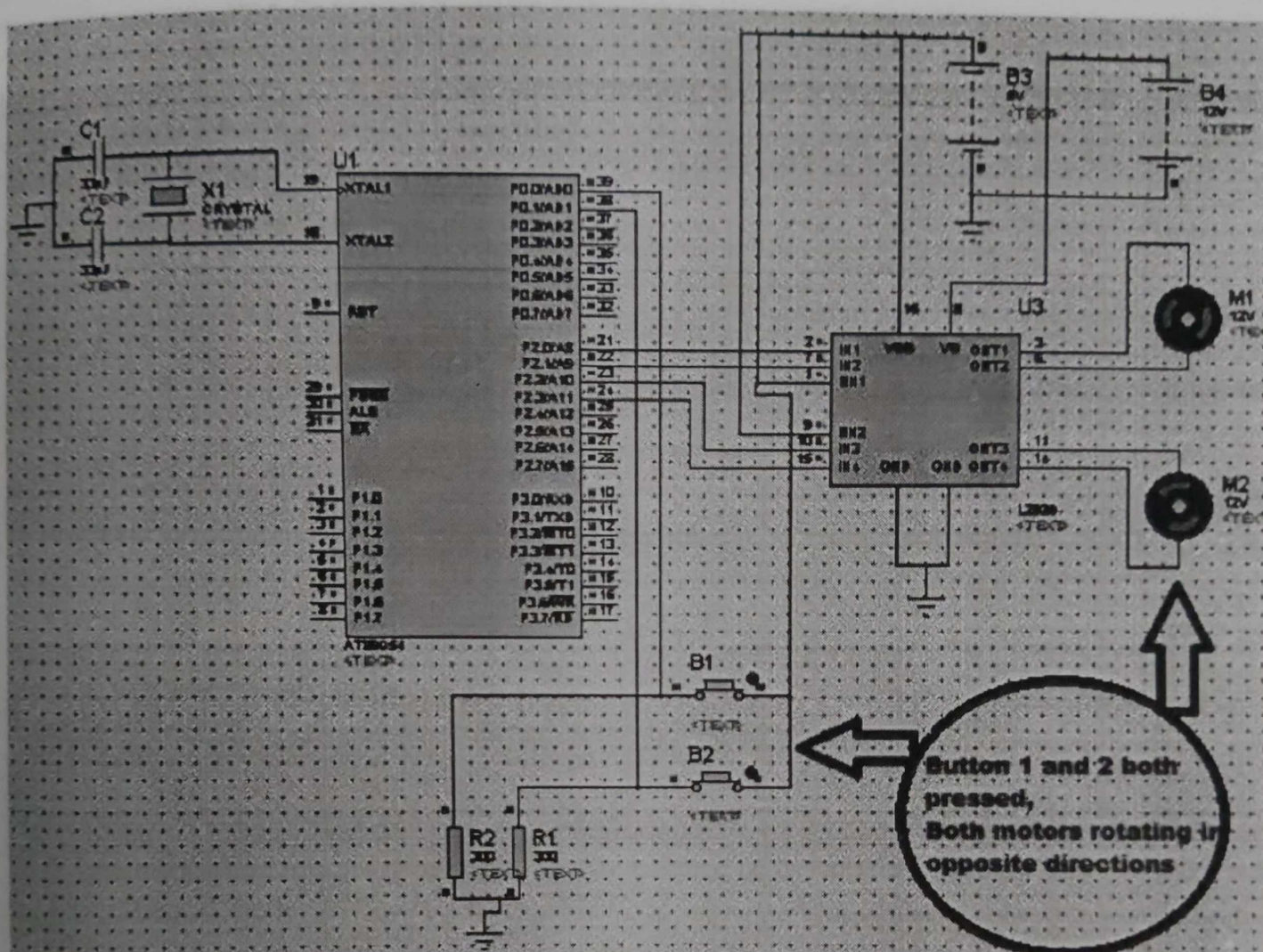
Circuit Components:

1) AT89C51 microcontroller
2) 12 MHz Oscillator
3) 12V DC battery
4) 5V DC battery
5) L293D motor driver
6) DC motor-2
7) 2 Ceramic capacitors – 33pF
8) 300 ohm resistors – 2
9) Push buttons – 2
10) Connecting wires

Working of DC motor interface with 8051 microcontroller :

After loading the program in the controller, the motors will not start turning until the buttons are not pressed. According to my coding:

When I press button 1, motor 1 starts rotating in clockwise direction.
When I leave button 1, motor 1 will stop.
When I press button 2, motor 2 will start rotating in Anti-clockwise direction.
When I leave button 2, motor 2 will stop.

PINS STATUS:

Enabling pin 1, if we give logic as:

> Pin2 = 1, pin7 = 0, motor 1 will start turning clockwise.
> Pin2 = 0, pin7 = 1, motor 1 will start turning anticlockwise
> Pin2 = 1, pin7 = 1, motor 1 will stop
> Pin2 = 0, pin7 = 0, motor 1 will stop

Enabling pin 9, if we give logic as:

> Pin10 = 1, pin15 = 0, motor 2 will start turning clockwise
> Pin10 = 0, pin15 = 1, motor 2 will start turning anticlockwise
> Pin10 = 1, pin15 = 1, motor 2 will stop
> Pin10 = 0, pin15 = 0, motor 2 will stop

Applications :

This concept is used in robots to control the robot directions.

Used to control the speed of the DC motor.

It is used in the applications where we need to drive the high voltage motors.

• **Program:**

```
# include <reg 51.h>
sbit m1 = P1 ^ 4;
sbit m2 = P1 ^ 5;


void main ()
{
    m1 = 1;
    m2 = 0;
}
```

Conclusion : In this experiment, we studied that interfacing of DC motor with 8051 microcontroller and it's programming and about motor driver.