

ME 362

Instrumentation and Measurement Sessional

Controlling Motors

Prepared by:
Partha Kumar Das
 Lecturer, Dept. of ME, BUET

Motor Control

Types of Motors:

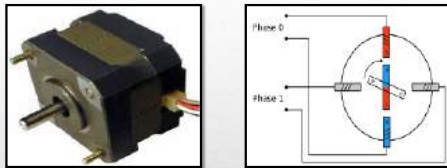
1. DC motor
2. Stepper motor
3. Servo motor
4. AC motor

1. DC motor



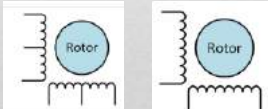
- Simple and Small size motor. Generally rotates at 15000 rpm.
- Gear is added to decrease speed and increase torque.

2. Stepper motor

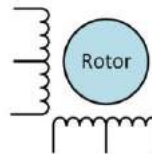


Bipolar Motor

Unipolar Motor



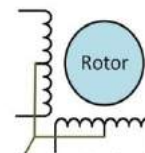
2. Stepper motor



6-Wire Motor

This motor only takes the common wires of 2 phased phases. These two wires can be joined to create a 5-wire unipolar motor.

Or you just can ignore them and treat it like a bipolar motor!

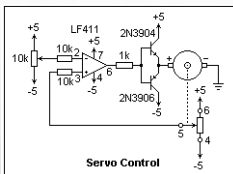


5-Wire Motor

This style is common in smaller unipolar motors. All of the common coil wires are tied together internally and brought out as a 5th wire. This motor can only be driven as a unipolar motor.

Ref.: <https://cdn-learn.adafruit.com/downloads/pdf/all-about-stepper-motors.pdf>

3. Servo motor



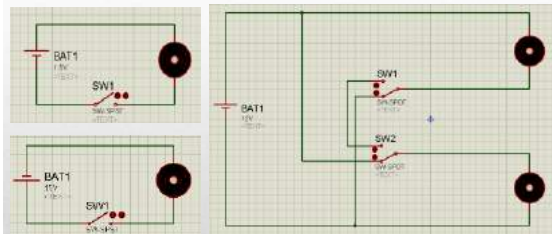
- A **servomotor** is a **rotary actuator** or **linear actuator** that allows for precise control of angular or linear position, velocity and acceleration.
- It consists of a suitable motor coupled to a sensor for position feedback.
- The motor is paired with some type of **encoder** to provide position and speed feedback.
- In the simplest case, only the position is measured.

- The measured position of the output is compared to the command position, the external input to the controller. If the output position differs from that required, an **error signal** is generated which then causes the motor to rotate in either direction, as needed to bring the output shaft to the appropriate position. As the positions approach, the error signal reduces to zero and the motor stops.
- The very simplest servomotors use position-only sensing via a **potentiometer**, and **bang-bang control** of their motor.



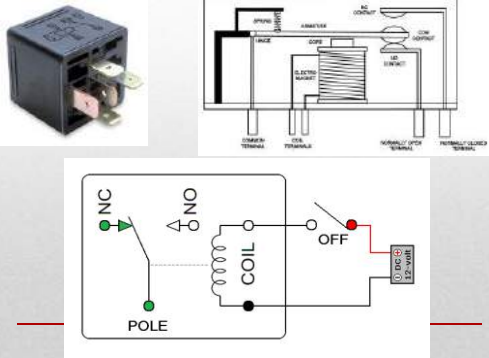
Controlling a DC motor

1. On/ Off



- Controlling manual switching involves problem of switch bouncing.

Controlling a DC motor using Relay



Controlling a DC motor using Transistor

- Low cost
- Small size
- High accuracy and sensitivity
- No failure prone mechanical parts as in relay

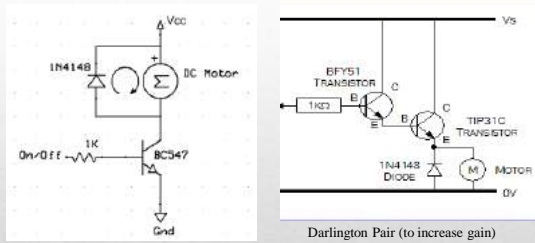
Two types of Transistor:

1. Bipolar
2. FET

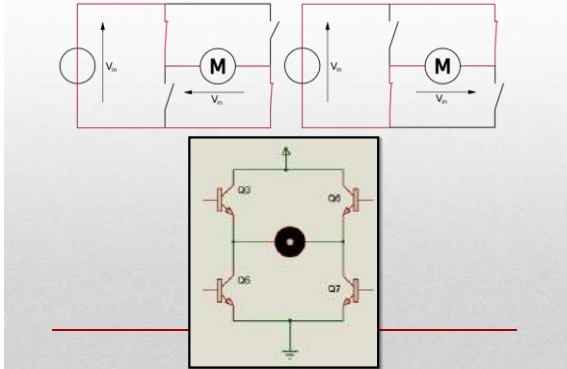
Bipolar Transistor (n-p-n)



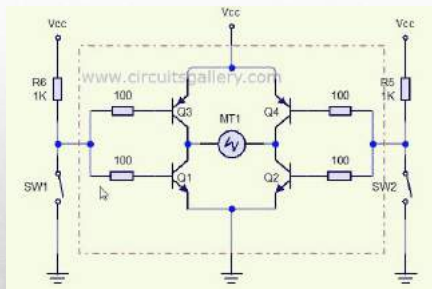
Controlling a DC motor using Transistor



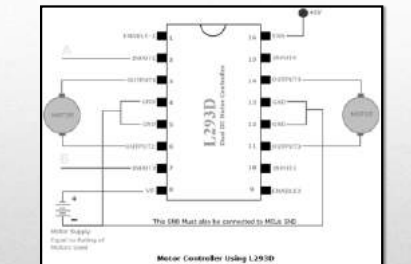
Controlling a DC motor using H-Bridge Transistor



Controlling a DC motor using H-Bridge Transistor

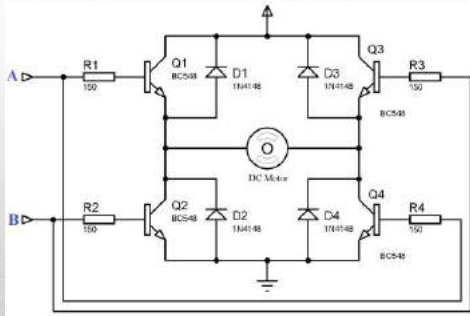


Controlling a DC motor using L293D



ABSOLUTE MAXIMUM RATINGS			
Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage	36	V
V_{CS}	Logic Supply Voltage	36	V
V_i	Input Voltage	7	V
V_{CE}	Frame Voltage	7	V
I_C	Peak Output Current (100 us rise/fall time)	1.2	A

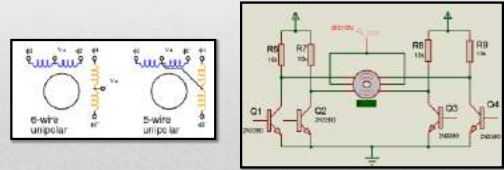
Controlling a DC motor using H-Bridge Transistor



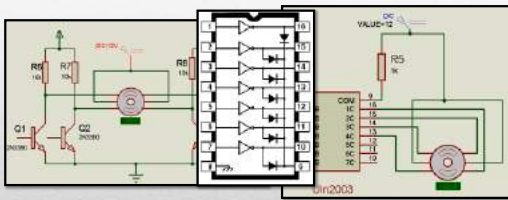
Interfacing Unipolar Stepper Motor

There are actually many ways you can interface a stepper motor to your controller, out of them the most used interfaces are:

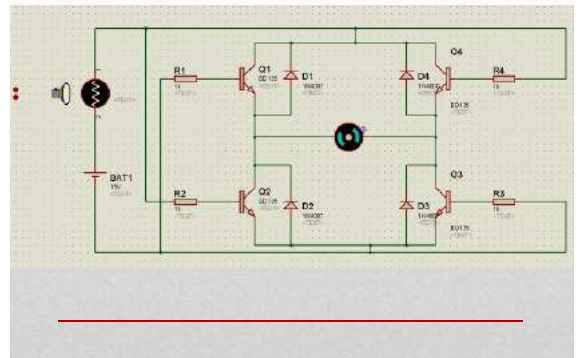
- Interface using L293D - H-Bridge Motor Driver (For both)
- Interface using ULN2003 - Darlington Arrays (For Unipolar)



Interface using ULN2003 - Darlington Arrays



!!! A Robot Afraid of Darkness !!!



!!! A Robot Afraid of Light !!!

