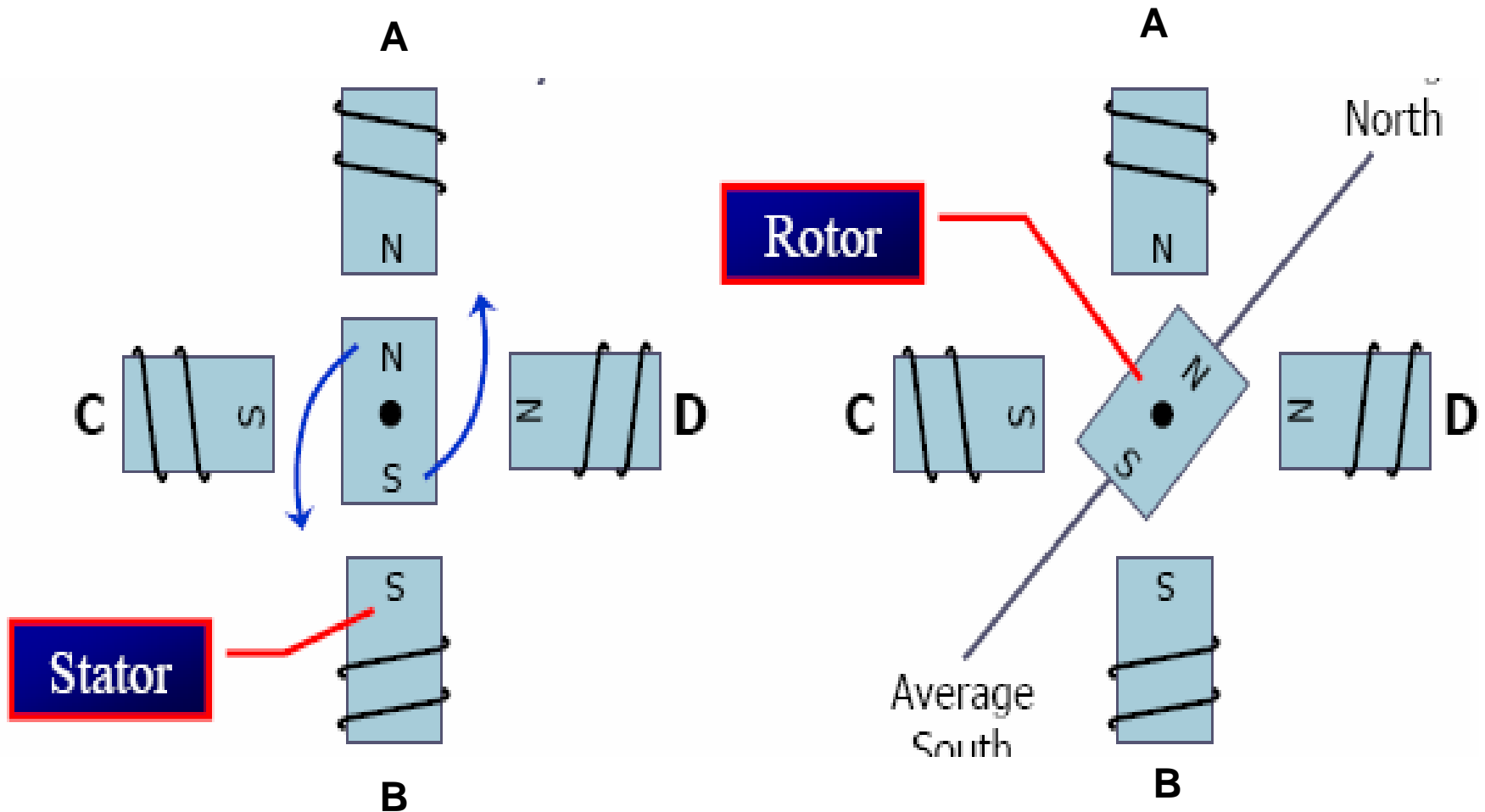


Stepper Motor Interfacing with 8051 / 8951

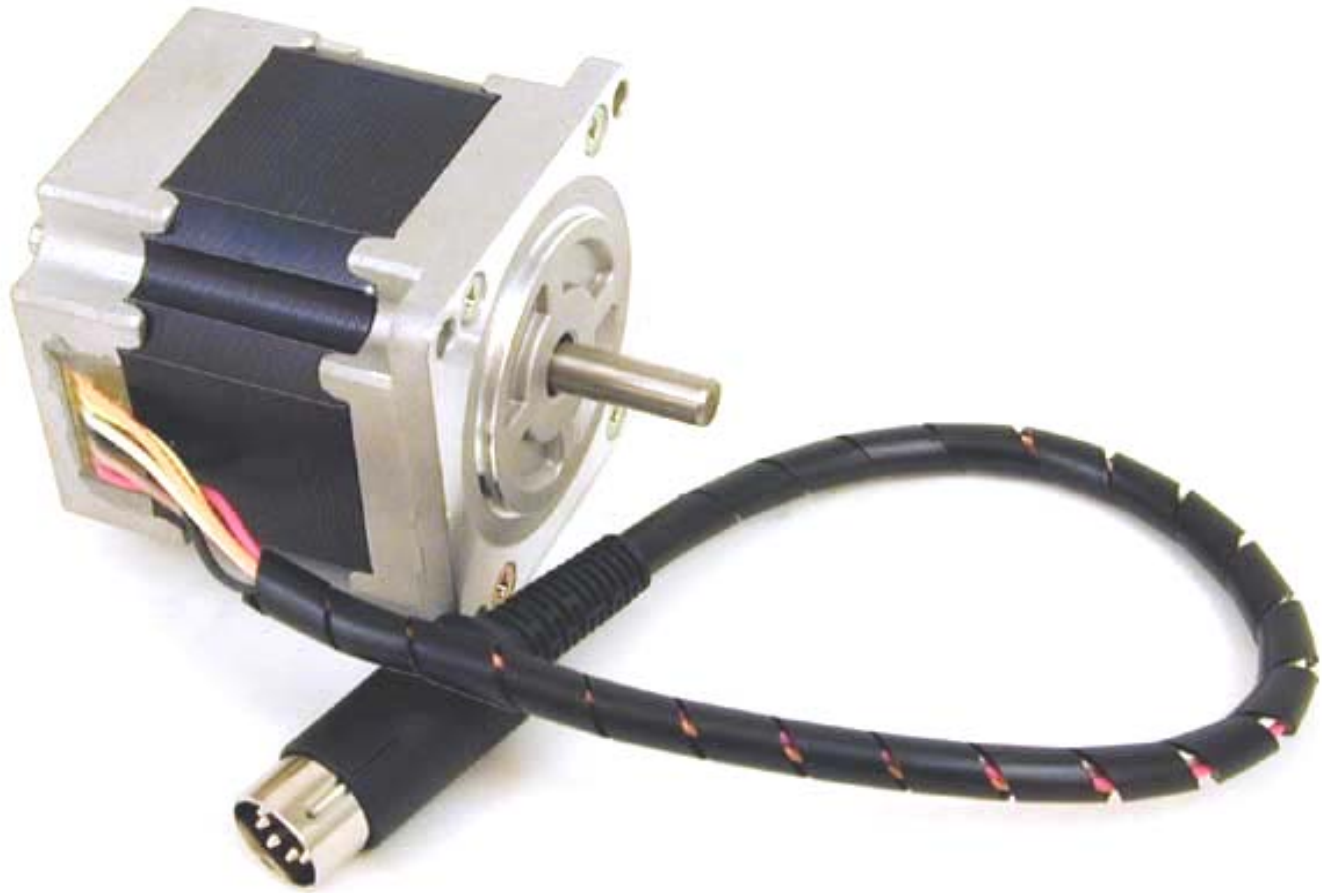
Stepper Motor

- A stepper motor is a widely used device that translates electrical pulses into mechanical movement
- The stepper motor is used for position control in applications such as disk drivers, dot matrix printers, and robotics, etc.
- Every stepper motor has a permanent magnet rotor (also called the shaft) surrounded by a stator .

Construction

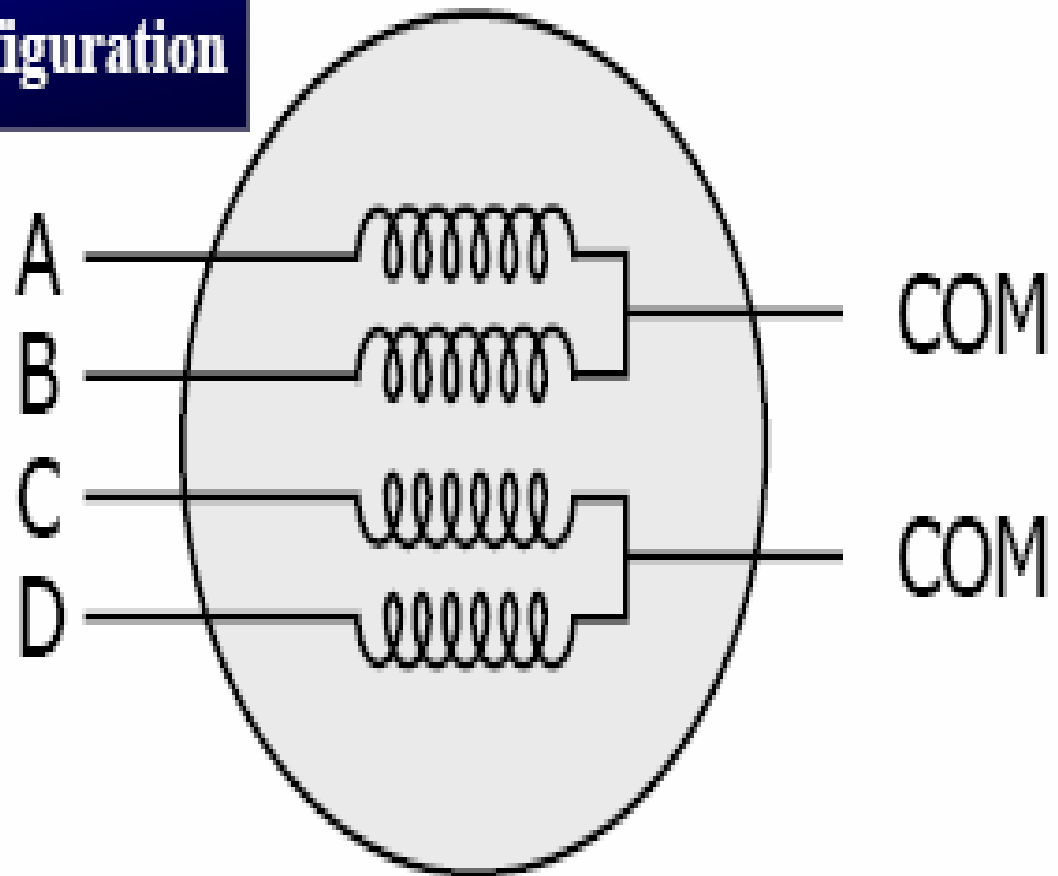






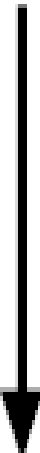
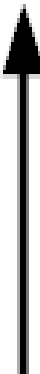
- The most common stepper motors have four stator windings that are paired with a center-tapped common.
- This type of stepper motor is commonly referred to as a four-phase stepper motor
- The center tap allows a change of current direction in each of two coils when a winding is grounded, thereby resulting in a polarity change of the stator.

Stator Windings Configuration

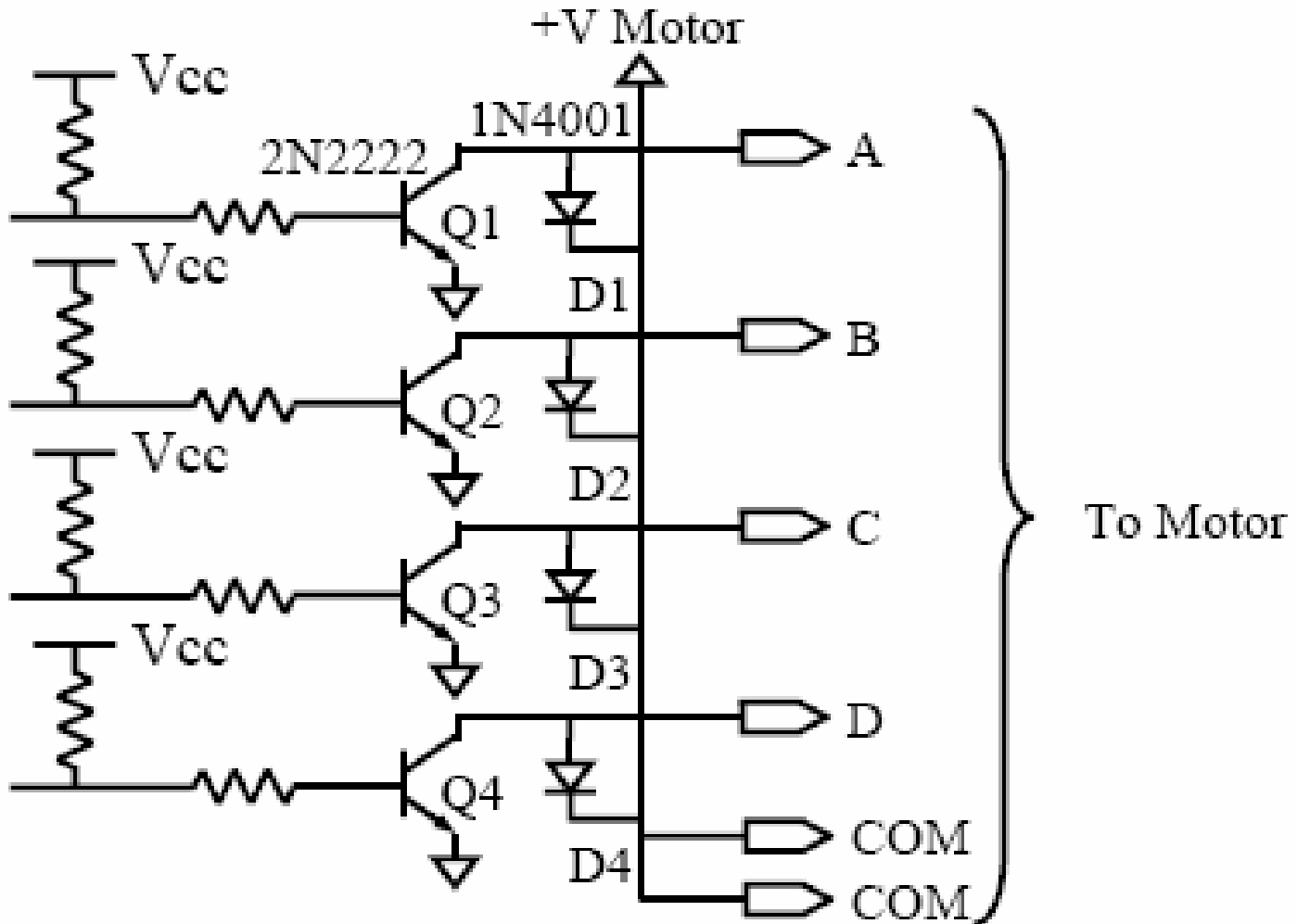


- The stepper motor discussed here has a total of 6 leads, 4 leads representing the four stator windings ,2 commons for the center tapped leads.
- As the sequence of power is applied to each stator winding, the rotor will rotate.

Normal 4-Step Sequence

Clockwise	Step #	Winding A	Winding B	Winding C	Winding D	Counter-Clockwise
	1	1	0	0	1	
	2	1	1	0	0	
	3	0	1	1	0	
	4	0	0	1	1	

Interfacing

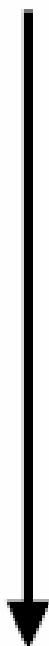



- The step angle is the minimum degree of rotation associated with a angles for various motors
- The step per revolution is the total number of steps needed to rotate one complete rotation or 360 degrees.

- The relation between RPM (revolutions per minute), steps per revolution, and steps per second is as follow
- $\text{Steps/Sec} = \text{RPM} \times \text{Steps per revolution} / 60$
- After completing every four steps, the rotor moves only one tooth pitch
- The smaller the step angle, the more teeth the motor passes
- ex. In a stepper motor with 200 steps per revolution, its rotor has 50 teeth since $4 \times 50 = 200$ steps are needed .

- To allow for finer resolutions, all stepper motors allow what is called an 8-step switching sequence.
- It's also called half-stepping, since each step is half of the normal step angle.

Half-Step 8-Step Sequence

Clockwise	Step #	Winding A	Winding B	Winding C	Winding D	Counter-Clockwise
	1	1	0	0	1	
	2	1	0	0	0	
	3	1	1	0	0	
	4	0	1	0	0	
	5	0	1	1	0	
	6	0	0	1	0	
	7	0	0	1	1	
	8	0	0	0	1	

H.W : Definition of Holding Torque

Thursday, August 28,
2008

Y.H.Dahdawe