Stepper Motor

Overview

In this lesson, you will learn a fun and easy way to drive a stepper motor. The stepper we are using comes with its own driver board making it easy to connect to our MEGA2560.

Component Required:

1x Mega2560 R3

1 x 830 tie-points breadboard

1 x ULN2003 stepper motor driver module

1 x Stepper motor

1 x 9V1A Adapter

1x Power supply module

1 x F-M wires (Female to Male DuPont wires)

1 x M-M wire (Male to Male jumper wire)

Component Introduction
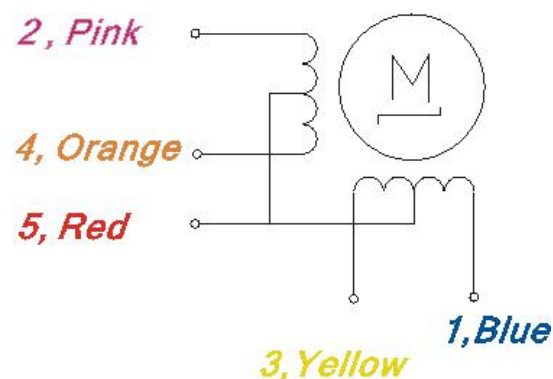
Stepper Motor

A stepper motor is an electromechanical device which converts electrical pulses into discrete mechanical movements. The shaft or spindle of a stepper motor rotates in discrete step increments when electrical command pulses are applied to it in the proper sequence. The motors rotation has several direct relationships to these applied input pulses. The sequence of the applied pulses is directly related to the direction of motor shafts

rotation. The speed of the motor shafts rotation is directly related to the frequency of the input pulses and the length of rotation is directly related to the number of input pulses applied.One of the most significant advantages of a stepper motor is its ability to be accurately controlled in an open loop system. Open loop control means no feedback information about position is needed. This type of control eliminates the need for expensive sensing and feedback devices such as optical encoders. Your position is known simply by keeping track of the input step pulses.

Stepper motor 28BYJ-48 Parameters

Rated voltage :	5VDC
Number of Phase	4
Speed Variation Ratio	1/64
Stride Angle	5.625°/64
Frequency	100Hz
DC resistance	50Ω±7%(25℃)
Idle In-traction Frequency	> 600Hz
Idle Out-traction Frequency	> 1000Hz
In-traction Torque	>34.3mN.m(120Hz)
Self-positioning Torque	>34.3mN.m
Friction torque	600-1200 gf.cm
Pull in torque	300 gf.cm
Insulated resistance	>10MΩ(500V)
Insulated electricity power	600VAC/1mA/1s
Insulation grade	A
Rise in Temperature	<40K(120Hz)
Noise	<35dB(120Hz,No load,10cm)
Model	28BYJ-48 – 5V

Interfacing circuits

The bipolar stepper motor usually has four wires coming out of it. Unlike unipolar steppers, bipolar steppers have no common center connection. They have two independent sets of coils instead. You can distinguish them from unipolar steppers by measuring the resistance between the wires. You should find two pairs of wires with equal resistance. If you've got the leads of your meter connected to two wires that are not connected (i.e. not attached to the same coil), you should see infinite resistance (or no continuity).

ULN2003 Driver Board
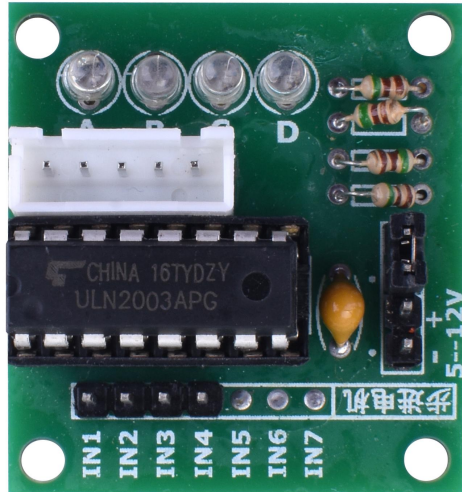
Product Description

oSize: 42mmx30mm

oUse ULN2003 driver chip, 500mA

oA. B. C. D LED indicating the four phase stepper motor working condition.

oWhite jack is the four phase stepper motor standard jack.
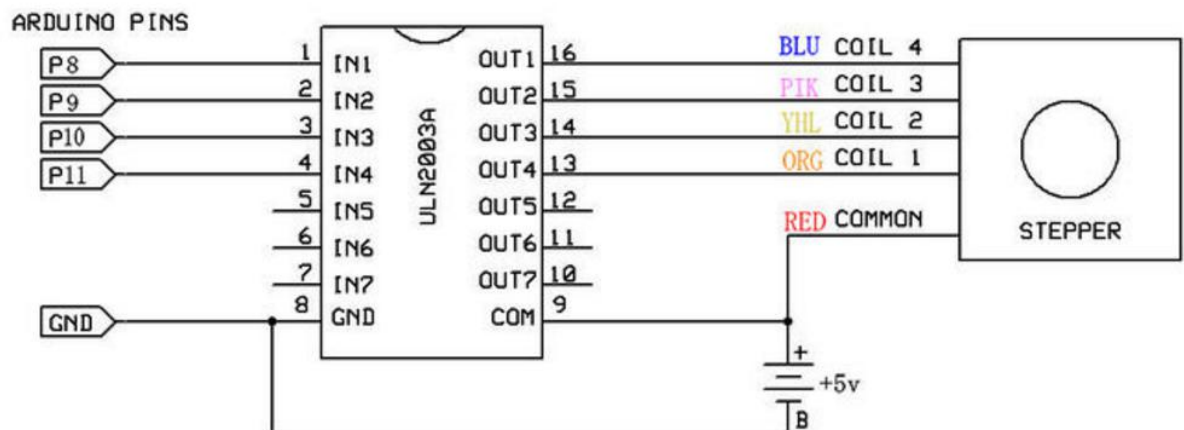
oPower pins are separated

oWe kept the rest pins of the ULN2003 chip for your further prototyping.

The simplest way of interfacing a unipolar stepper to Arduino is to use a breakout for ULN2003A transistor array chip. The ULN2003A contains seven darlington transistor drivers and is somewhat like having seven TIP120 transistors all in one package. The ULN2003A can pass up to 500 mA per channel and has an internal voltage drop of about 1V when on. It also contains internal clamp diodes to dissipate voltage spikes when driving inductive loads.To control the stepper, apply voltage to each of the coils in a specific sequence.

The sequence would go like this:

Lead Wire Color	---> CW Direction (1-2 Phase)							
	1	2	3	4	5	6	7	8
4 ORG	-	-						-
3 YEL		-	-	-				
2 PIK				-	-	-		
1 BLU						-	-	-

Here are schematics showing how to interface a unipolar stepper motor to four controller pins using a ULN2003A, and showing how to interface using ourTIP120's.

Connection   Schematic

Wiring diagram

We are using 4 pins to control the Stepper.

Pin 8-11 are controlling the Stepper motor.

We connect the Ground from to MEGA2560 to the Stepper motor.

Code

After wiring, please open the program in the folder   Stepper Motor

and click UPLOAD to upload the program. See "**example sketches Blink"**

 for details about program

uploading if there are any errors.

Before you can run this, make sure that you have installed the < Stepper > library or

re-install it, if necessary. Otherwise, your code won't work.

For details about loading the library file, see   "Arduino IDE Install & Add Libraries and Open Serial Monitor.pdf"