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# 4 Phase 12-Volt 75 Ohm Unipolar Stepper Motor (#27964)

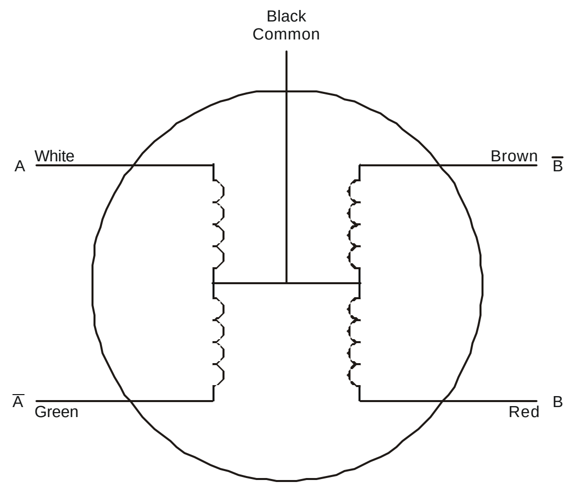
## General Information

Stepper motors are ideally suited for precision control. This motor can be operated in forward/reverse with controllable speed from a BASIC Stamp or any other microcontroller through a transistor driver circuit. Some of the applications for this motor include educational experimentation, robotics and precision mechanical control

The #27964 is a Unipolar (4 phase) 12 VDC, 150 mA motor that takes 3.6 degrees per step.

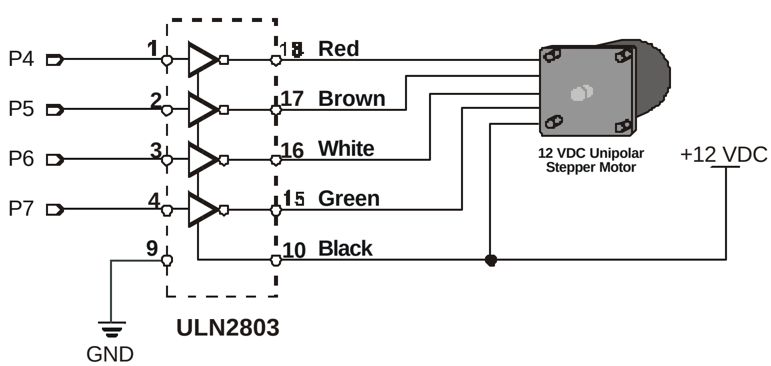
## Technical Specifications

- Phase resistance (Ohms): 75
- Current (mA): 150
- Phase Inductance (mH): 39
- Detent torque (g-cm): 80
- Holding Torque (g-cm): 600
- Mounting hole space diagonal (in.): 1.73
- Mounting hole (in.) 0.11
- Shaft diameter (in.): 0.197
- Shaft length (in.): 0.43
- Motor Diameter (in.): 1.66
- Motor height (in.): 1.35
- Weight: 0.55 lbs.




## Motor Control from a BASIC Stamp

Parallax (www.parallaxinc.com) publishes many circuits and examples to control stepper motors. Most of these examples are available for download from our web site. On www.parallaxinc.com type in “stepper motor” and you’ll find example codes below.



The Parallax examples we drive the motor through a ULN 2803 high-current transistor driver as shown above. Unlike ordinary DC motors, which spin freely when power is applied, steppers require that their power source be continuously pulsed in specific patterns. These patterns, or step sequences, determine the speed and direction of a stepper's motion.

The fixed stepping angle gives steppers their precision. As long as the motor's maximum limits of speed or torque are not exceeded, the controlling program knows a stepper's precise position at any given time.

Steppers are driven by the interaction (attraction and repulsion) of magnetic fields. The driving magnetic field "rotates" as strategically placed coils are switched on and off. This pushes and pulls at permanent magnets arranged around the edge of a rotor that drives the output shaft. When the on-off pattern of the magnetic fields is in the proper sequence, the stepper turns (when it's not, the stepper sits and quivers).

The normal stepping sequence for four-coil unipolar steppers is shown below.

| | | Step Sequence | | | | |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 1 |
| I/O pin 4 controls this coil | Coil 1 (B) | 1 | 1 | 0 | 0 | 1 |
| I/O pin 5 controls this coil | Coil 2 (B-) | 0 | 0 | 1 | 1 | 0 |
| I/O pin 6 controls this coil | Coil 3 (A) | 1 | 0 | 0 | 1 | 1 |
| I/O pin 7 controls this coil | Coil 4 (A-) | 0 | 1 | 1 | 0 | 0 |

From a microcontroller's standpoint, causing the motor to take a "step" involves taking two pins "high" at a time through the driver circuit shown above.

```
'Stamp1

pins =%11110000
symbol loop = b0
symbol delay = b1

pins = %11110000

delay = 400 'slow the step speed

start:
for loop = 1 to 10 'do this 'loop' times
pins = %01010000 'I/O pins 0 and 2 high
pause delay
pins = %10010000 'I/O pins 0 and 3 high
pause delay
pins = %10100000 'I/O pins 1 and 3 high
pause delay
pins = %01100000 'I/O pins 1 and 2 high
pause delay
pause 2500
next
```

```
'Stamp 2 ,2e,2sx,2p

loop var nib
delay var byte
dirb = %1111

delay = 400 'slow the step speed

start
for loop = 1 to 10 'do this 'loop' 10 times
outb = %0101 'I/O pins 0 and 2 high
pause delay
outb = %1001 'I/O pins 0 and 3 high
pause delay
outb = %1010 'I/O pins 1 and 3 high
pause delay
outb = %0110 'I/O pins 1 and 2 high
pause delay
pause 2500
next
stop
```