

Power Reversing Circuits (Intermediate Option)

Instructions

The intermediate H-bridge option has the choice of 2 different power reversing circuits that you can attempt. Each circuit has its own construction obstacles, advantages, and disadvantages in how it operates. Your task is to select one circuit design, built it, test it, and then explain how the circuit works.

Both circuit designs use **2 Integrated Circuits (IC)** and a **variable resistor** as a control device. The **IC** used in both of these circuit designs is the “**555 timer**” which is one of the most commonly used **Integrated Circuits (IC)** in the world. The **555IC** is often used to create a variety of digital circuits that are compatible with microcontrollers which are used to control robots. The other key component used in both of these circuit designs is a variable resistor. While one circuit uses a compact **103 variable resistor**, the other circuit uses a much larger **B10K Potentiometer**.

Questions

1. What is a **555 timer**, **variable resistor**, and **potentiometer**?

2. Conduct some internet research to determine how a **555 timer** works, then look at the circuit design and try to explain how you think this circuit might work.

3. Which circuit option did you decide to build? What advantages does having a compact variable resistor or a larger potentiometer have? Explain how will the particular circuit that you choose to build be a better option for your final project.

Power Reversing Circuits (Intermediate Option)

Name: _____

Date: _____

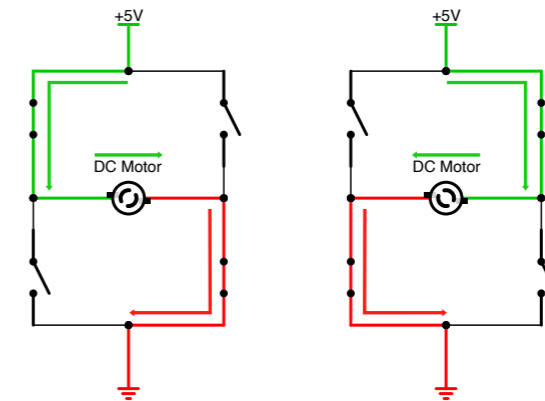
Introduction:

A power reversing circuit is used to control which direction a DC motor turns. Power reversing circuits are incredibly versatile circuits and can be used for a wide variety of applications. For instance, these simple circuits can be used to control simple devices such as a crane winch; however, if you have two or more power reversing circuits you can control advanced robotic devices such as a battle-bots.

In the field of electrical engineering power reversing circuits are commonly referred to as an “**H-Bridge**”. This is because the most basic **H-Bridge** design contains four switching element, with the load at the centre, in an H-like configuration:

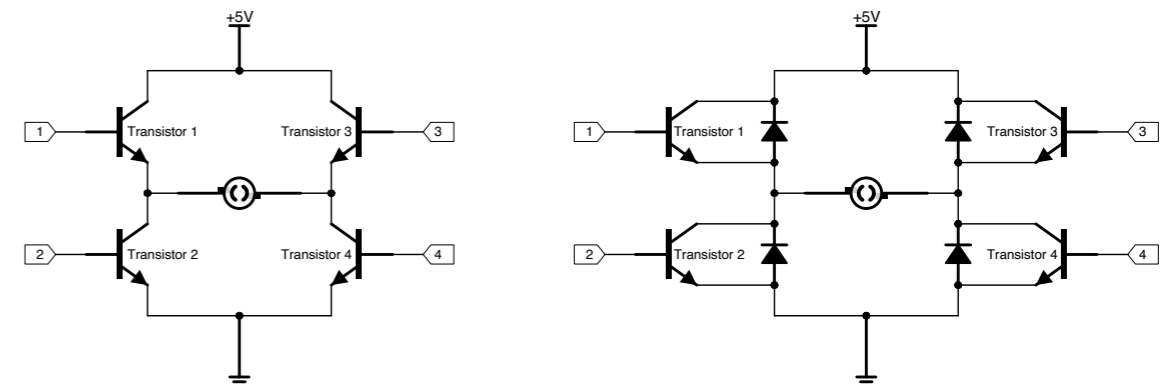
H-Bridge: Noun

A simple circuit that lets you control a DC motor to go backward or forward.



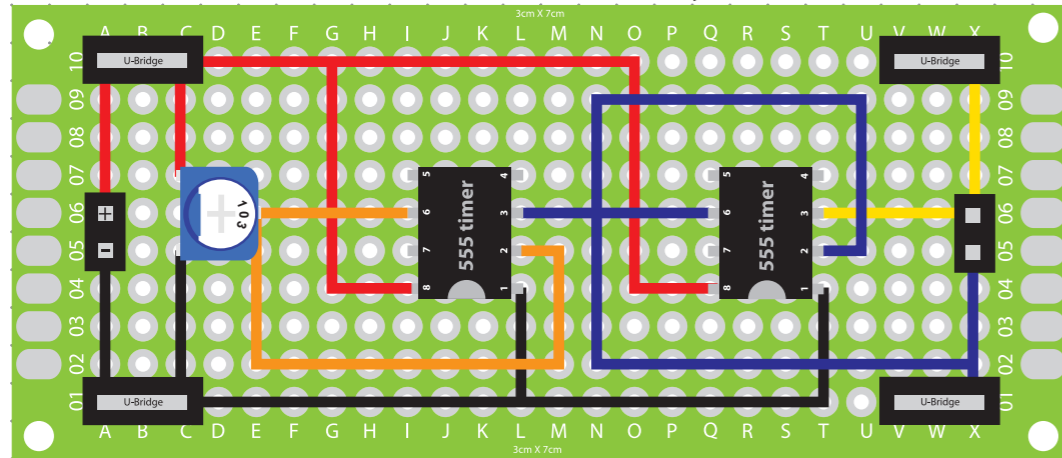
A simple H-Bridge using 4 simple switches. The flow of electricity is marked with arrows.

More advanced H-Bridge designs build on this one simple circuit design. A slightly more efficient design will replace the 4 one way switches with 2 SPDT (single pole double throw) switches, or with 1 DPDT (double through double pole) switch. However the most popular H-bridge design uses transistors and can be controlled using a simple control circuit or computerized microcontroller.

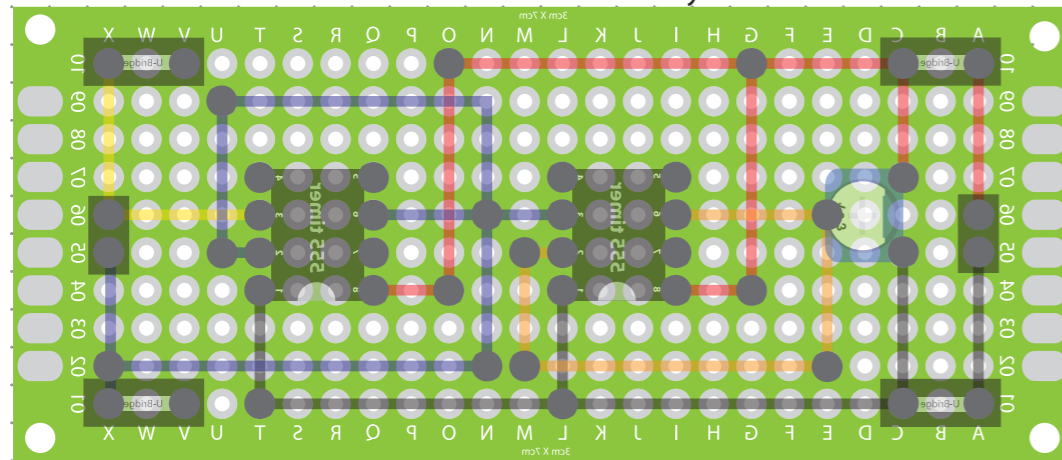


H-Bridge designs using transistors [NOTE: although the circuit can work using only transistors, diodes are usually added to protect the transistors from power surges that are caused by the motor].

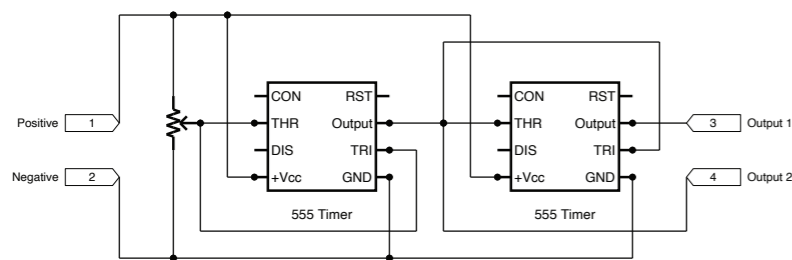
Front View: Circuit Board Layout



Back View: Circuit Board Layout



Electrical Schematics



Materials:

- 1 3x7cm Circuit Board
- 4 Bridge Pins
- 1 2-Pin Female Bridges
- 4 U-bridge connectors
- 1 #103 Variable Resistor (10k)
- 1 555 Timer IC
- 2 DIP 8 IC Cradles (Optional)
- 5 Assorted colors of wire

Project: Variable Resistor 555 H-Bridge

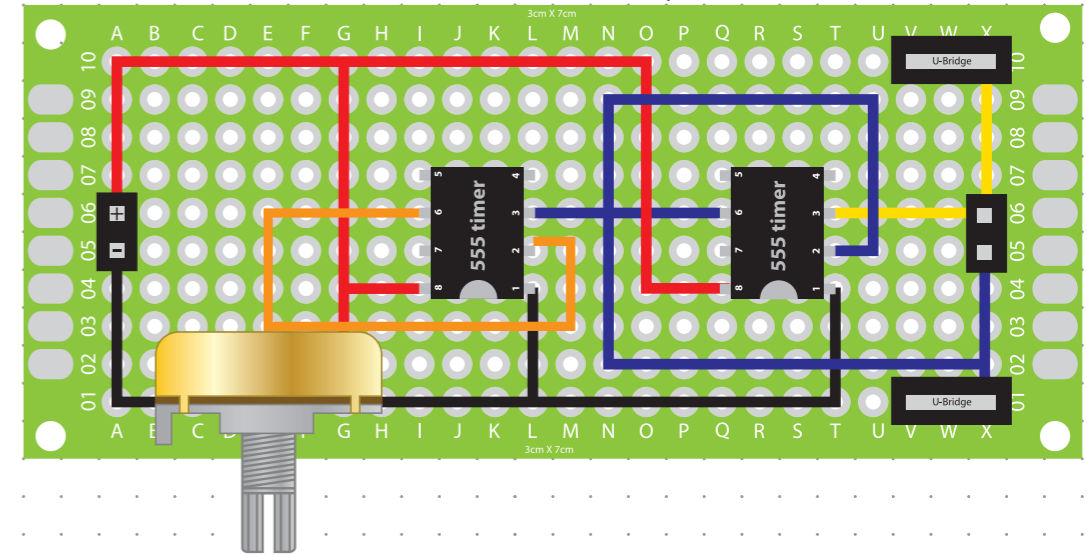
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Scale:
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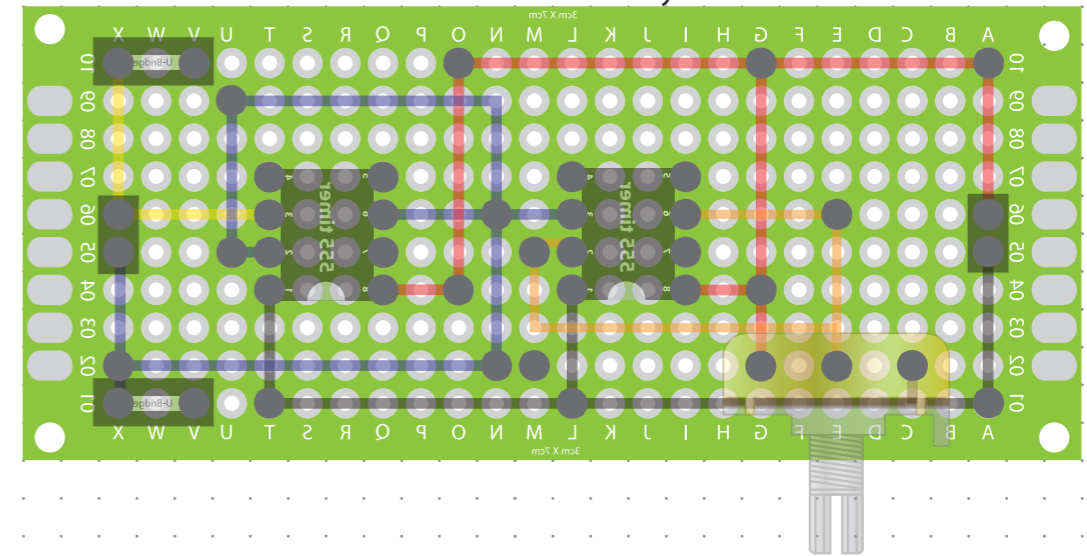
Designer: Scott A. Campbell

Builder:

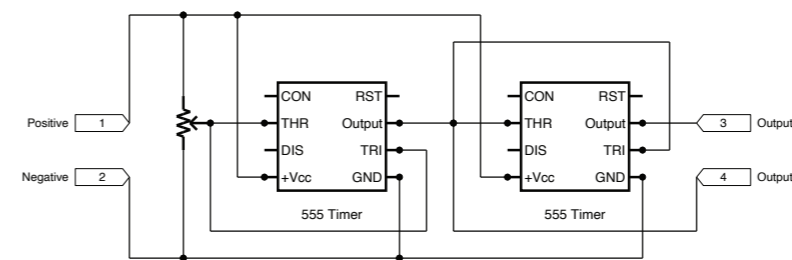
Front View: Circuit Board Layout



Back View: Circuit Board Layout



Electrical Schematics



Materials:

- 1 3x7cm Circuit Board
- 4 Bridge Pins
- 1 2-Pin Female Bridges
- 4 U-bridge connectors
- 1 B10K Potentiometer (10k)
- 1 555 Timer IC
- 2 DIP 8 IC Cradles (Optional)
- 5 Assorted colors of wire

Project: Potentiometer 555 H-Bridge

Client:

5mm Dot Grid
Scale:
2:1

Designer: Scott A. Campbell

Builder: