Instructions

The advanced H-bridge option has a single power reversing circuit option that you can attempt; however, there are two circuits that are needed for this design to work. The first circuit is a "***control circuit***" and the other is a "***digital H-bridge***" that uses a pair of ***555 timers***. The combination of these two circuits will have its own unique advantages and disadvantages when compared to other ***H-bridge*** designs. Your task is to build both circuits, test them, and then explain how these circuits work.

As stated above, this particular ***H-bridge*** design is comprised of 2 halves. The first half of this circuit is a ***dedicated control panel*** that uses 2 ***push switches***. The second half uses 2 ***Integrated Circuits (IC)*** to create a digital ***H-bridge*** design that is compatible with a microcontroller. The ***IC*** used in this circuit design is the "***555 timer***" which is one of the most commonly used ***Integrated Circuits (IC)*** in the world. While this circuit can be used with a microcontroller *(which makes it a great design choice for advanced robotic applications)* the use of a simple control circuit allows an operator too easily control this circuit without the use of a computer.

Questions

1. What is a ***555 timer***, and what is a programable ***microcontroller***?

2. Review the design for this particular "***Digital H-bridge***" design and make some predictions as to how and why this circuit could be used with a ***microcontroller***.

3. Think about your final project. What advantages or disadvantages would this particular circuit design have compared to other ***H-bridge*** designs?

Power Reversing Circuits (Advanced Option)

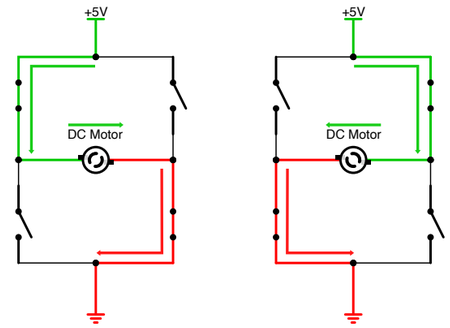
Name: _____ Date: _____

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.

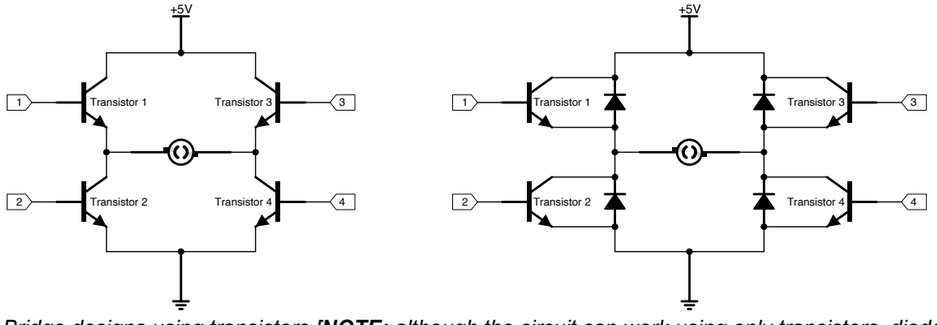
In the field of electoral engineering power reversing circuits are commonly referred to as an "***H-Bridge***". This is because the most basic ***H-Bridge*** design contains four switching element, with the load at the centre, in an H-like configuration:

H-Bridge: Noun
A simple circuit that lets you control a DC motor to go backward or forward.



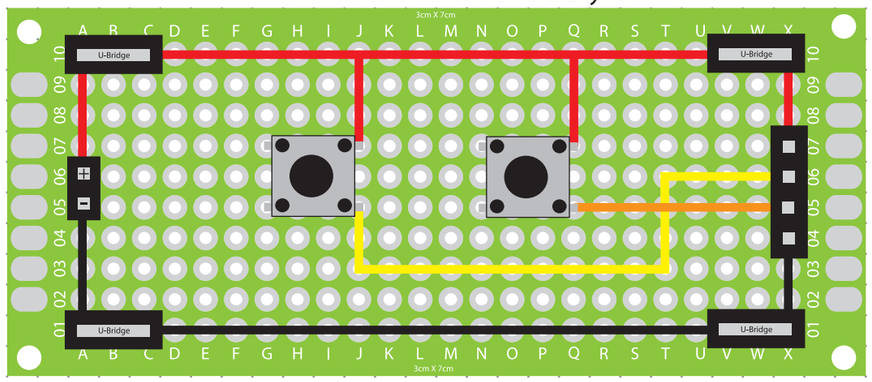
A simple H-Bridge using 4 simple switches.
The flow of electricity is marked with arrows.

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.

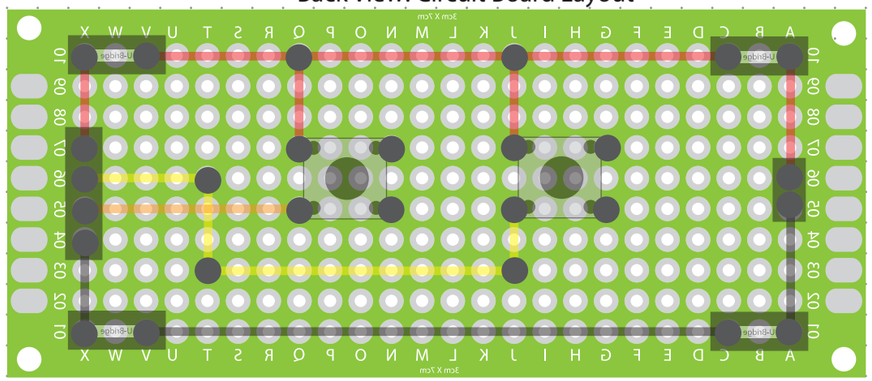


*H-Bridge designs using transistors [**NOTE:** although the circuit can work using only transistors, diodes are usually added to protect the transistors from power surges that are caused by the motor].*

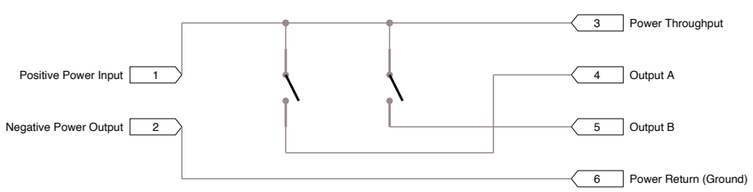
Front View: Circuit Board Layout



Back View: Circuit Board Layout



Electrical Schematics

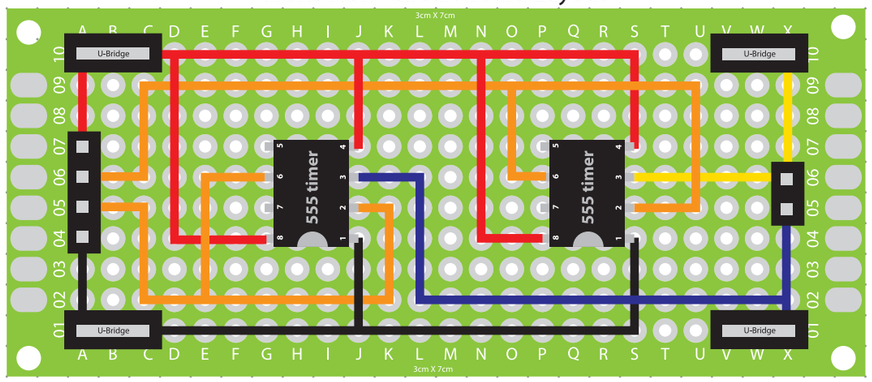


Materials:

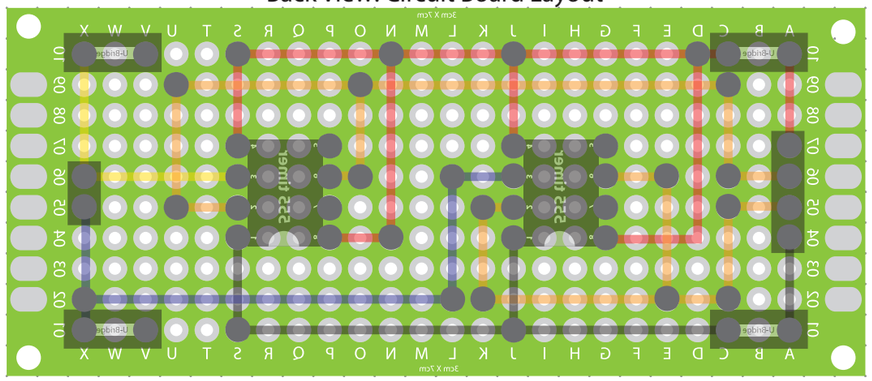
1	3x7cm circuit board
2	6x7mm push switch
6	Pin type bridge connectors
2	U-Bridge connectors
4	Colors of assorted wires

Project: Digital H-Bridge Control Circuit	Client:	5mm Dot Grid Scale: 2:1
Designer: Scott A. Campbell	Builder:	

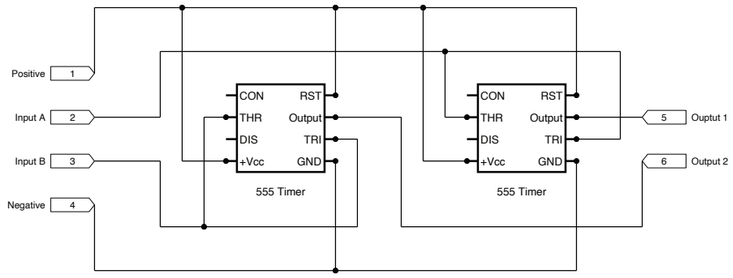
Front View: Circuit Board Layout



Back View: Circuit Board Layout



Electrical Schematics



Materials:

1	3x7cm Circuit Board
4	Bridge Pins
1	2-Pin Female Bridges
4	U-bridge connectors
2	555 Timer IC
2	DIP 8 IC Cradles (Optional)
4	Colors assorted wires

Project: Digital 555 H-Bridge	Client:	5mm Dot Grid Scale: 2:1
Designer: Scott A. Campbell	Builder:	