

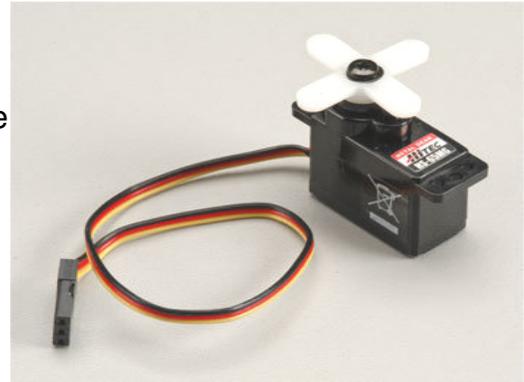
## SERVO MOTOR CONTROLLER

The Servo Motor Controller (SMC) is a low cost solution for controlling a hobby type servomotor. A servomotor is a gear driven motor with a lever arm attached to it. It rotates less than one revolution (about 180 degrees) and is controlled by a microcontroller (a small computer chip). Using some mechanical linkage, it is easy to move object(s) on your layout. The SMC has a number of control features that will allow you to adjust and program the movement of the servo so it will work in a variety of situations on your train layout.

The SMC has an Enable input. Grounding this input line will turn the servomotor ON.

When the Enable is grounded you can control the following:

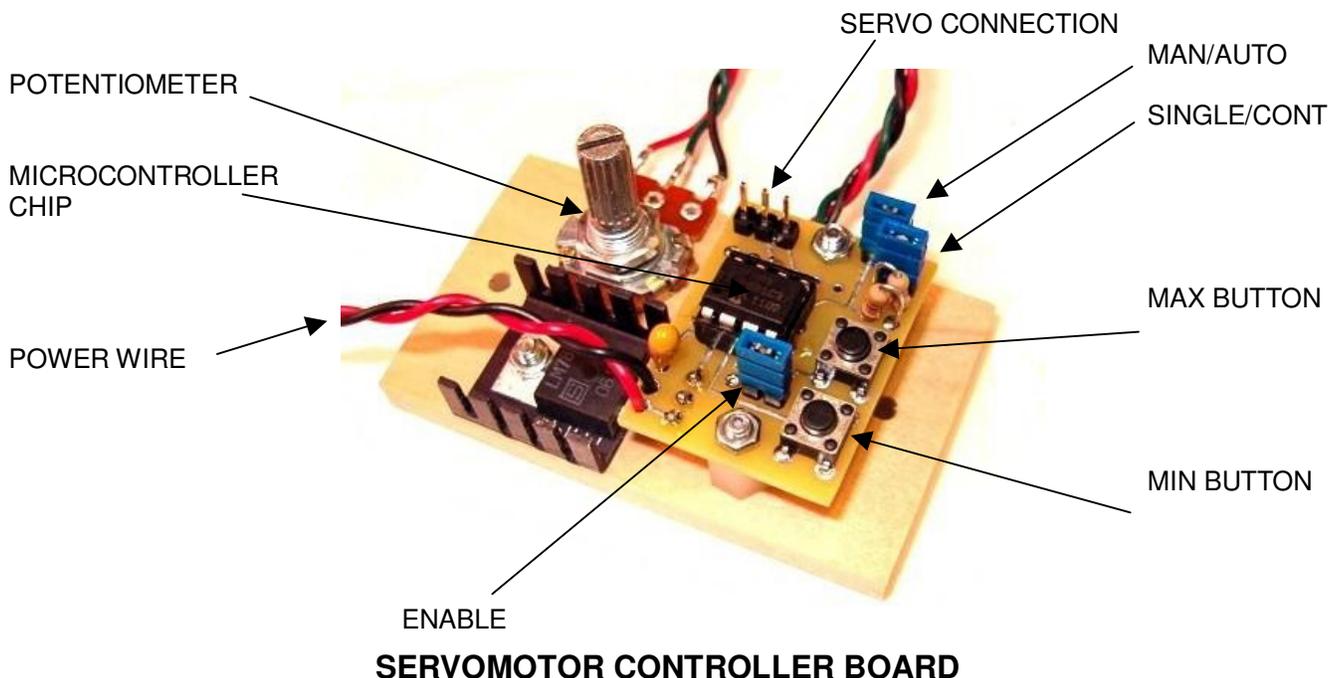
1. The rotation of the motor;
2. The cycling of back and forth motion;
3. The starting and ending positions.



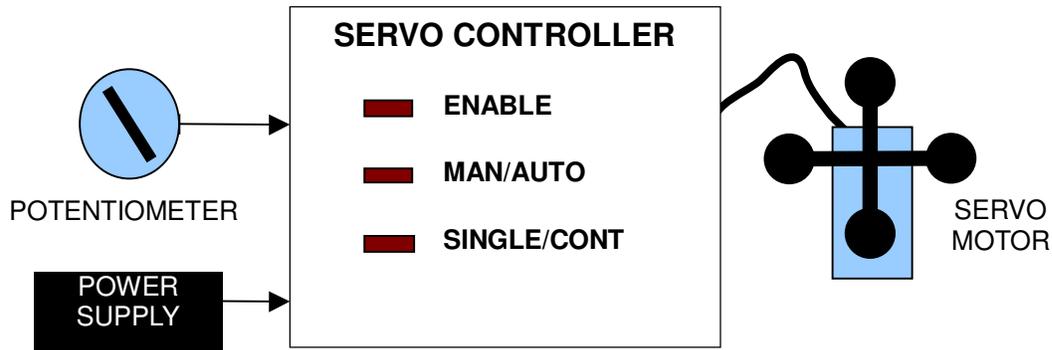
This is a very useful board if you want any sort of movement on your layout. Servomotors are available for less than \$15 on eBay. The HiTec HS-311 is pictured.

## HARDWARE

A servomotor connects to the controller board with a 3-conductor cable. In the picture above the cable is 9 inches in length. Cable extensions are available on eBay.



A potentiometer (or volume control type adjustment) is used to set the servomotor's position. It is also used to set the rotational speed when the servomotor is moving. A block diagram is shown below:



**SERVO BOARD CONTROLLER DIAGRAM**

**POWER SUPPLY**

The Power Supply can be either a battery or a plug-in wall-wart type supply. If you are using the TLSB then you can get power from the TLSB. You need at least 8 volts DC and 100MA of current. A 9-volt battery will also work. Please observe the polarity of the supply. Red is positive and Black is negative.

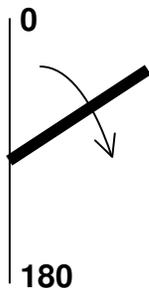
**OPERATION**

There are two modes of operation: Manual and Automatic. The mode is selected by inserting or removing a shorting jumper (MAN / AUTO). Manual mode has the jumper installed. In Manual mode, turning the potentiometer (pot) would cause a corresponding rotational movement of the servo. The position of the servo would reflect the position of the pot.

A sample application would be to mount an HO crane on the shaft of the servomotor. You could rotate the crane back and forth. The crane will move slightly more than 180 degrees (1/2 turn).

The Enable above would connect to either a push-button switch or to a control relay output on the TLSB. The Enable works essentially as the ON/OFF switch for the controller.

In **Automatic** mode the servo would move between a preset minimum and a preset maximum position.



To the left, the black arm represents the movement of the servo's lever arm. It can rotate from 0 degrees to 180 degrees (or about 1/2 turn).

If you put the controller in Manual mode, then using the pot, you can rotate the arm to where you would like to set the min and max rotational positions.

When the desired min position is reached, press the Min button for 3 seconds. Likewise when the desired max position is reached press the Max button for 3 seconds. When either button is pressed, the lever position is stored in EEPROM memory in the controller. When you put the controller in Automatic mode the servomotor will rotate between the min and max positions.

Also when in Automatic mode the pot will control the speed of the rotational movement. If the pot is turned counterclockwise, the motor will rotate faster. The servomotor cycles between the minimum and maximum positions.

When the **Single / Continuous** jumper is removed, CONT is selected and the motor will continuously move back and forth (when Enabled). In SIN (jumper installed) the motor moves to the max position when enabled. When disabled the motor moves to the min position.

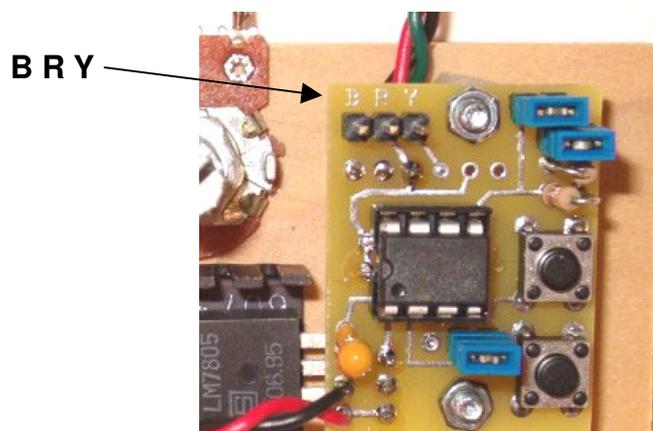
In all modes the Enable jumper will turn the motor on/off. In the Automatic mode the Enable would move the servomotor arm CW when low (to the max position) and CCW when high (to the min position). CW means clockwise and CCW means counterclockwise.

The controller can be operated in any mode. You may find that you will always want to turn the pot to rotate the servomotor.

## SERVOMOTOR

The servomotor connects to the control board with a three-wire cable and plug. The wires are colored Black-Red-Yellow. You may also find the colors Black-Red-White used too. The Yellow and White are used for the same purpose.

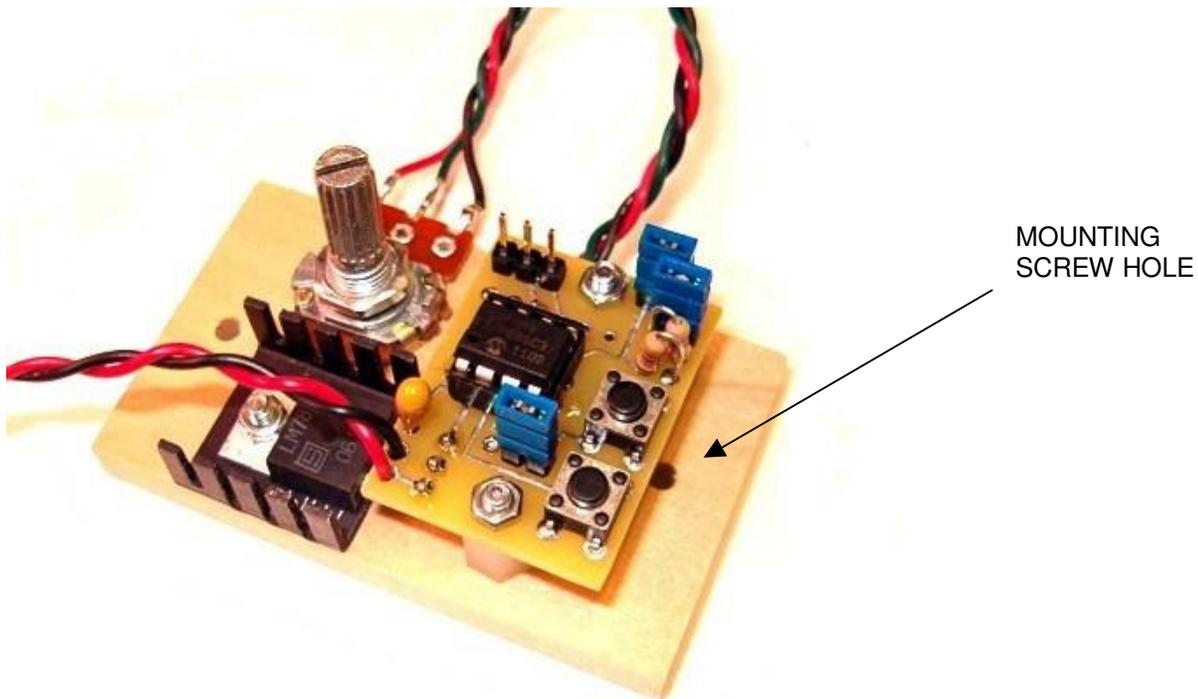
Be sure to connect the cable to the board observing the **B R Y** letters on the board. The Black wire connects to the B, the Red wire connects to the R and the Yellow wire connects to the Y.



## NOTE - DON'T PLUG THE CABLE IN THE WRONG WAY!

Whenever you connect the servomotor cable, make sure the power is OFF to the controller board. Failure to do this may cause the servomotor to not work. You will need to turn the power OFF and then ON.

**SOME PICTURES:**



**PARTS INCLUDED**

Everything in the above picture is included. The servomotor is not included.