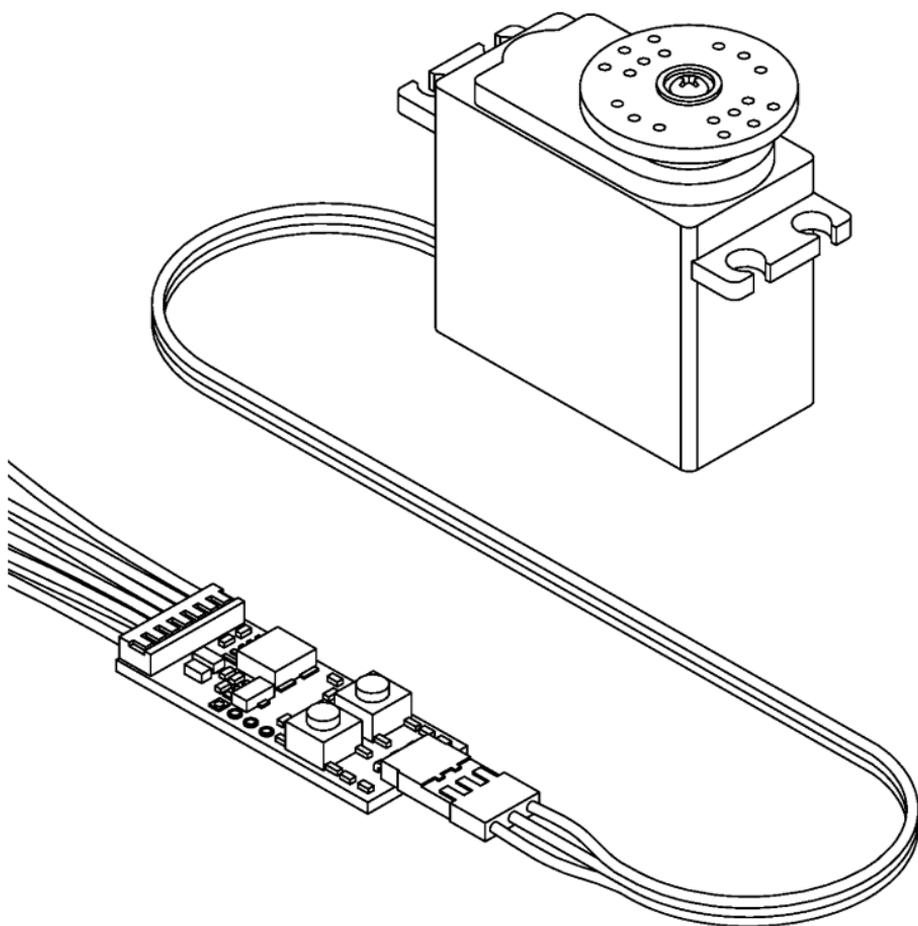


# **KADEE<sup>®</sup> RC**

## **Kadee Servo Control** **User Guide**



**Kadee<sup>®</sup>**

Quality Products Co.  
673 Avenue C,  
White City, OR 97503-1078

Thank you for purchasing the Kadee Servo Control. We at Kadee have developed the Servo Control to assist you in your motion control and actuation requirements.

The Kadee Servo Control has two modes of operation: Standard Mode & Motor Mode. For quick setup and trouble free operation, please read these instructions thoroughly.

## **Standard Mode Overview**

Standard Mode operates a standard hobby servo clockwise (CW) & counterclockwise (CCW) to a user defined position and speed. This mode is useful for actuating the Kadee® - RC Remote Couplers along with any device that requires "back & forth" actuation like turnouts, crossing gates & semaphores.

### **Standard Mode Actuation:**

Connecting the green lead with the black/white lead will rotate the servo to the set CW position. Disconnecting the green and black/white leads will rotate the servo to the set CCW position.

*(See basic wiring example on page 7)*

#### **Note:**

*The Servo control can also be actuated by connecting the green lead to the positive voltage supply. This is useful when actuation from an outside control is desired, such as from a locomotive control auxiliary output.*

***(When using an external control to actuate the Kadee Servo control. Both the servo control and the external control must use the same "common" ground.)***

### **On-board Relays in Standard Mode:**

The Servo Control contains two 250mA on-board relays that works in unison with the CW & CCW position of the servo. This is helpful when operating lighting, indicators or sending signals to other devices.

**Care should be taken to NOT overload the 250mA Relays. A fuse is recommended to protect the relay circuit.**

#### **On-board Relay Wiring:**

Relay #1 closes after servo rotates in CCW direction. (Orange & Gray leads).

Relay #2 closes after servo rotates in CW direction. (Orange/Black and Gray leads).

#### **Note:**

*\*The Gray leads are common to both relays.*

*\*Closed refers to the relay contacts being connected. (Closed = Lights ON / Open = Lights OFF.)*

*(See relay wiring example on page 7)*

### **Power Saving Mode:**

Power Saving Mode is helpful when the Servo Control is powered using batteries and reduces current in the following ways:

- 1) Power to the Servo is turned off after movement is complete.
- 2) When actuated, the on-board Relays close momentarily then open until the next actuation.

#### **Note:**

*Power Save Mode factory default is ON.*

## **Motor Mode Overview**

Motor Mode operates a “Continuous Rotation Servo” continually in the CW & CCW direction at a user defined speed. This type of servo will be referred to as a “Motor” in these instructions.

Motor mode enables the modeler to put motion to any component that requires rotation or motor actuation. Some examples would be: windmills, water wheels, gondolas & trams, roundabouts, cranes, drawbridges...

### **Motor Mode Actuation:**

- 1) The Red & Black Power Lead controls Motor On & Off.
- 2) Connecting the green lead with the black/white lead will toggle the motor rotation between CW & CCW.

#### **Note:**

*The green and black/white leads must be connected for the Motor to run.  
(See motor wiring example on page 8)*

### **On-board Relays in Motor Mode:**

The 250mA on-board relays work in unison with the CW & CCW direction of the Motor. This is helpful with sending signals and operating lighting and indicators associated with your device.

#### On-board Relay Wiring:

Relay #1 (Orange & Gray leads) close during Motor rotation in one direction.

Relay #2 (Orange/Black and Gray leads) close during motor rotation in the other direction.

### **IMPORTANT!**

- 1) **Before connecting any device to the servo make sure you thoroughly understand the following instructions.**
- 2) **To reduce the chances of damage to your components, make certain to set the servos to a conservative position and the speed to a safe setting for your device BEFORE you attach your device to the servo.**

## **Standard Mode Setup**

### **Set Servo Position:**

- 1) Press CW or CCW Button until LED blinks slow, then release.  
(The servo will travel to its set CW or CCW position depending on which button is pressed.)
- 2) Adjust position by momentarily holding the CW and CCW Buttons.  
(Holding button for more than 2 seconds will move the servo quickly.)
- 3) To Exit: Press both Buttons simultaneously.  
(LED will flash quickly confirming that the position is set.)

### **Set Servo Speed:**

- 1) Press Both Buttons until LED comes on, then release.  
(Servo will travel between the CW and CCW positions.)
- 2) Press the CCW Button to increase speed or the CW Button to decrease speed.  
(When pressing the button you must hold the button momentarily until the LED turns off.)

#### **Note:**

*After each speed adjustment, the servo will move slowly to the end of travel before the speed change takes effect.*

- 3) To Exit: Press both Buttons simultaneously.  
(LED will flash quickly confirming that the position is set.)

#### **Note:**

*Continual button pushing will loop through the speed setting. For example: When the fastest speed is reached the next CCW button push will loop to the slowest speed and vice versa.*

### **Toggle Power Saving Mode:**

- 1) Hold CCW Button until LED blinks slowly. (Continue holding button.)
- 2) While holding the CCW Button, press the CW Button momentarily  
(The LED flash quickly confirming that Power Save Mode is ON.)  
(When toggling out of Power Save Mode the LED confirmation will flash slowly.)

#### **Note:**

*When Power Saving is off, the LED will flash continually every three seconds.*

## Motor Mode Setup

### **To Toggle Motor Mode ON & OFF:**

- 1) Hold CW Button until LED blinks slowly. (Continue holding button.)
- 2) While holding the CW Button, press the CCW Button momentarily.  
(The LED flash quickly confirming that Motor Mode is ON.)  
(When toggling back to Standard Mode the LED confirmation will flash slowly.)

### **Set Motor Speed:**

- 1) Press Both Buttons until LED comes on, then release.  
(Motor will rotate at previously set speed.)
- 2) Press the CCW Button to increase speed or the CW Button to decrease speed.  
(When pressing the button you must hold the button momentarily until the LED turns off.)
- 3) To Exit: Press both Buttons simultaneously.  
(LED will flash quickly confirming that the Motor Speed is set.)

## Connecting to a Locomotive Control or Other Controls

The Kadee Servo Control can be easily operated from another controller. (Care should be taken to follow the instructions and wiring diagram for connecting auxiliary components to your controller). (See diagrams page 9)

***Note:** To protect your controller from a short circuit or faulty wiring, we recommend that you use a fuse that does not exceed the maximum amperage for the outputs on your controller.*

## Wiring and Connections

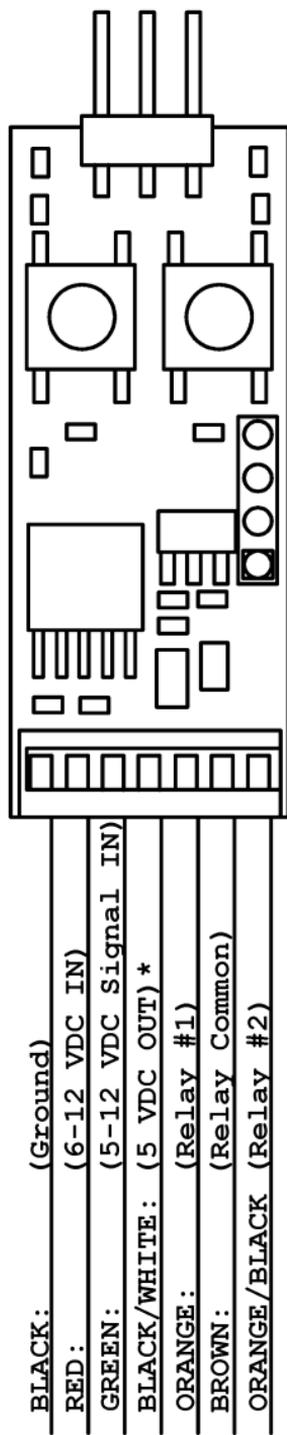
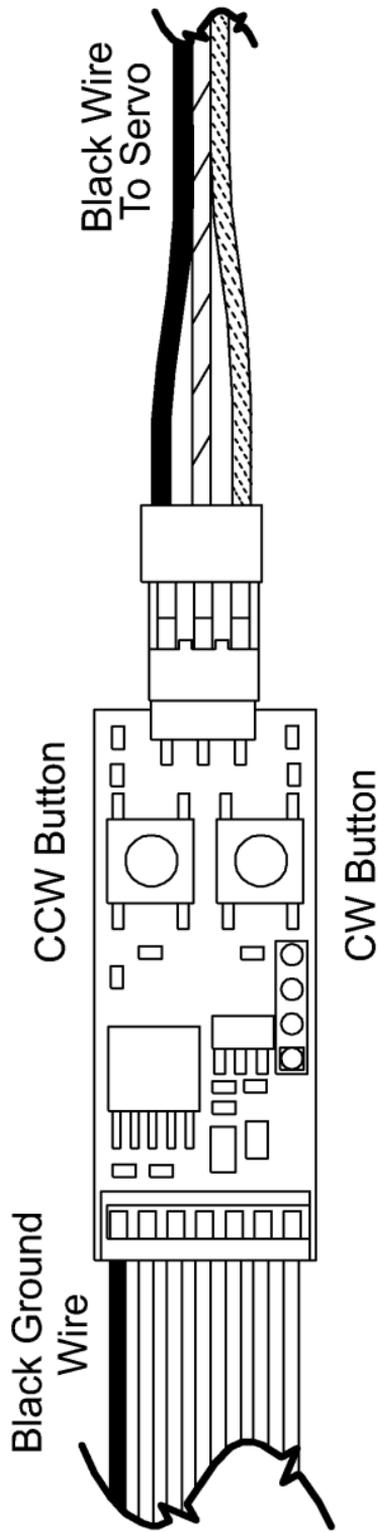
The following pages describe the proper connection methods for the Kadee Servo Control. Along with the basic hookup examples there is a diagram showing how one could use the Servo Control for back and forth motion with limit switches stopping the motion on each end. A gondola is used in the example.

### **IMPORTANT!**

**Make certain that the power connections are correct. Reverse polarity will damage the Servo Control and void the warranty.**

Be careful not to short any of the unused leads. Insulating the unused leads with electrical tape or shrink tubing is recommended.

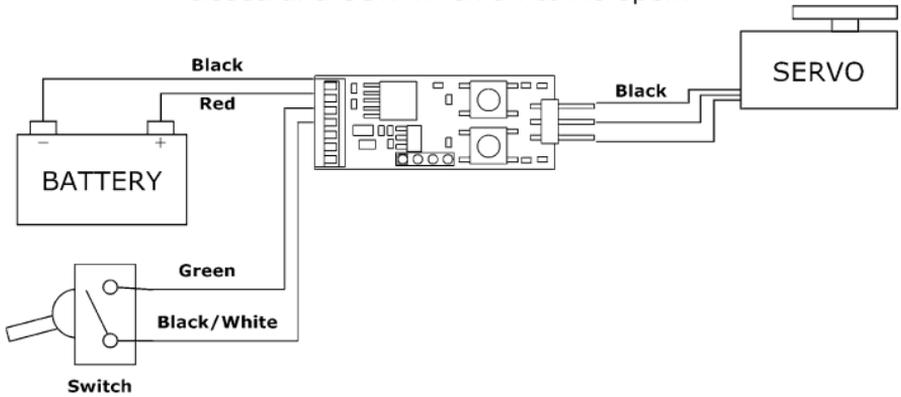
When using the onboard relays a 250 mA fuse is recommended in the relay circuit. This will protect the Servo Control from permanent damage caused by an accidental short circuit.



\*5 VDC OUT not for external devices

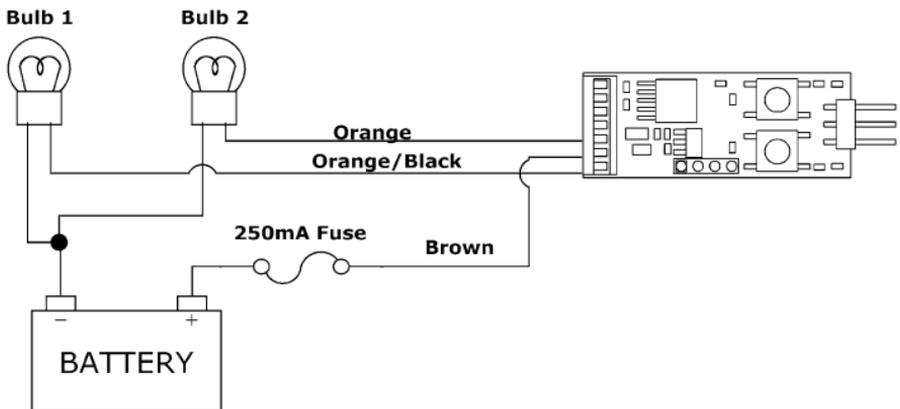
## Basic Wiring Example

Servo will rotate CW when switch is closed and CCW when switch is open.



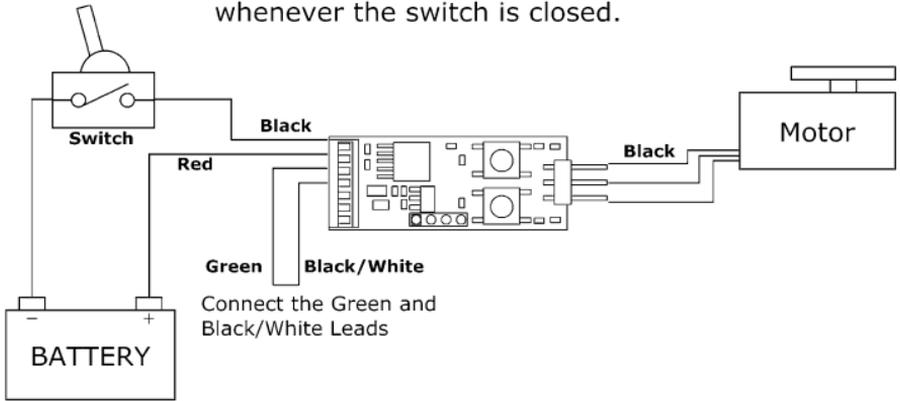
## Relay Wiring Example

Bulb 1 will light when servo rotates CW.  
Bulb 2 will light when servo rotates CCW.



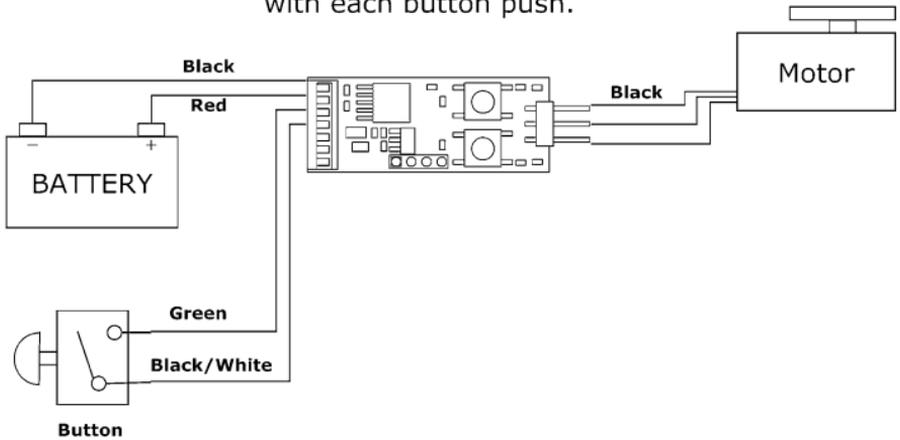
## Motor Wiring Example (Single Direction)

Motor will run in the same direction whenever the switch is closed.



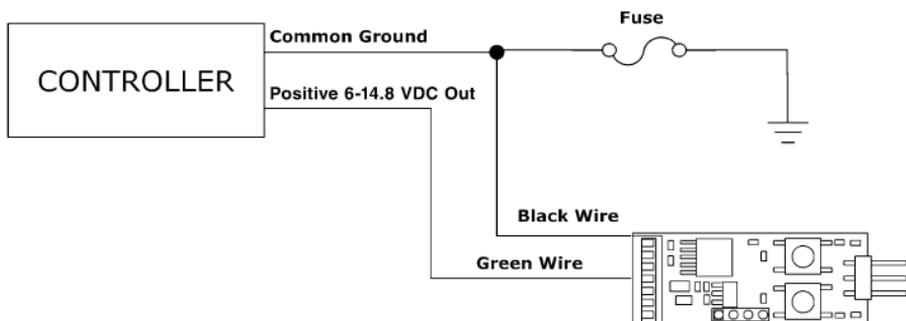
## Motor Wiring Example (Dual Direction)

Motor will change direction with each button push.



## Locomotive Control Connection Methods:

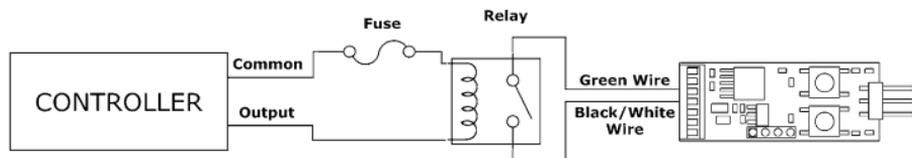
(Example DCC, AirWire, Bluetooth, or other decoders)



### Method 1

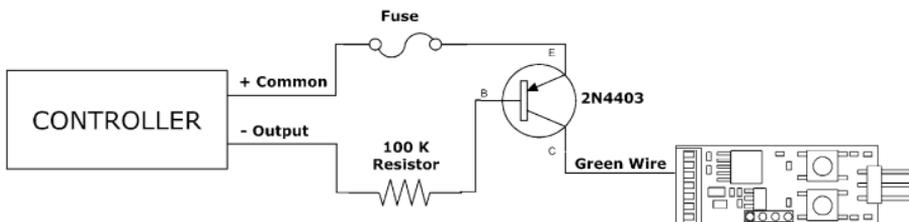
If your controller has a 6 - 14.8 VDC Digital outputs (this would be the easiest way to connect the Servo Control) Simply connect the green lead to the output on your controller.

**Note:** When connecting directly to your controller, the Servo Control and your controller must use the same (common) ground. If the outputs on your controller are greater than 14.8 VDC you must use method 2 or 3.



### Method 2

Operating a relay from the output on your controller and using the contacts on that relay to connect the green lead with the black/white lead.



### Method 3

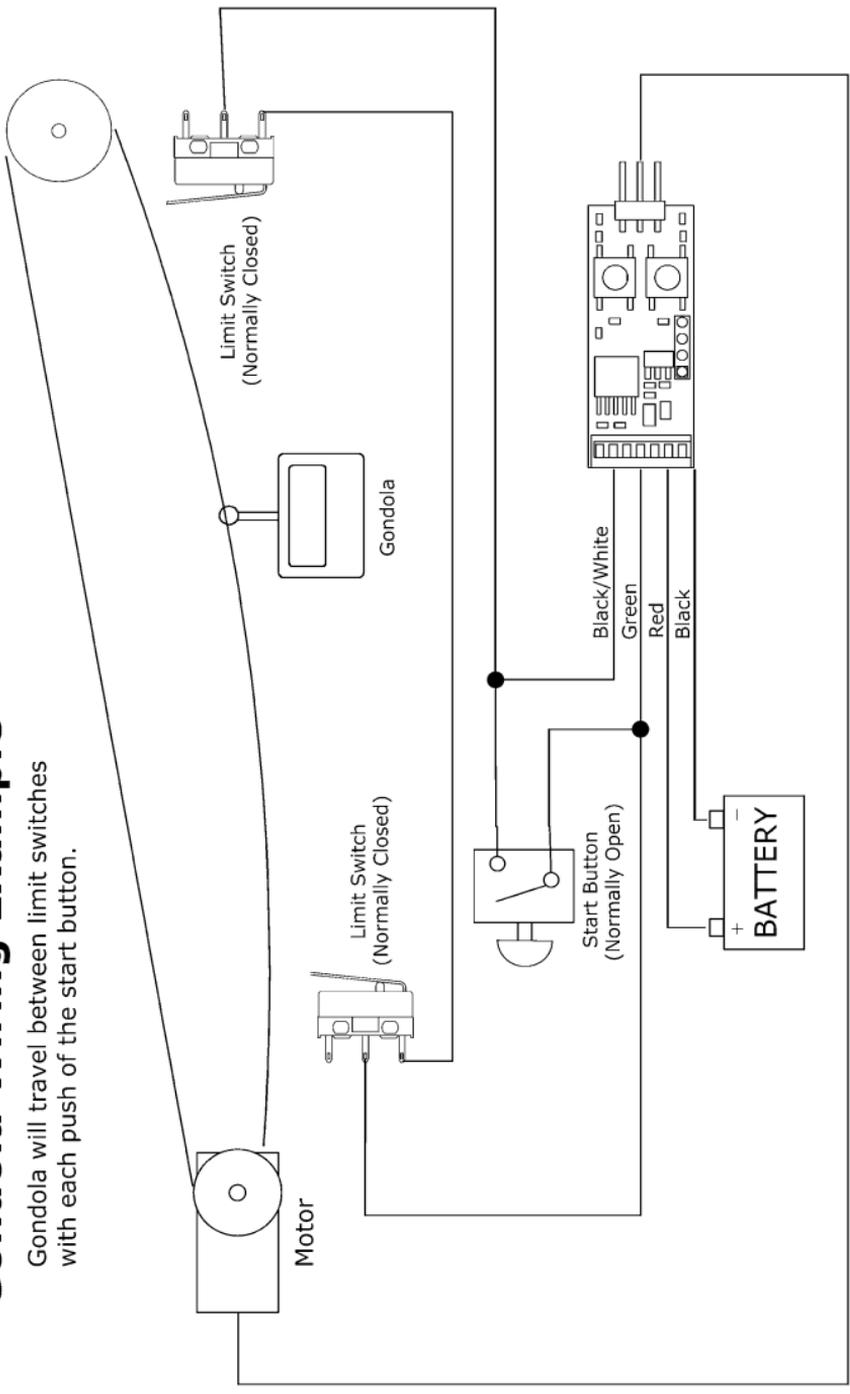
For those more advanced electronics a transistor can be used to operate the Servo Control.

The wiring example shows a PNP transistor being used with a controller that has outputs with a positive common or "Sinking Outputs".

**Note:** A transistor can also be used with outputs that have a negative common "Sourcing Outputs" with a NPN transistor.

# Gondola Wiring Example

Gondola will travel between limit switches with each push of the start button.



## **Notes on Continuous Rotation Servos:**

We tested a variety of servos, some work well and some not so well.

## **Below are some servos that work well with the Kadee Servo Control:**

Parallax Continuous Rotation Servos No. 900-00008

Sometimes a small jiggle when servo starts rotation.

Speed: Slow = 7 rpm / Fast = 65 rpm

### **HiTec;**

HS-311 (modified for continuous rotation)

Works well.

Speed: Slow = 6 rpm / Fast = 60 rpm

HS-422 & 425BB (modified for continuous rotation)

These servos work excellent in all test with best smoothness & speed control.

Ball Bearing model 425BB is very smooth at slow speeds.

Speed: Slow = 3 rpm / Fast = 75 rpm

## **Trouble Shooting** 05/05/2014

### **If the Servo acts erratically, check the following:**

\*Batteries or Power Supply

Minimum 4 volts required in most situations.

Servo Control will fail if power input exceeds 15 volts DC.

\*Check for loose contacts

\*Make certain correct mode is selected (Standard or Motor).

\*Switching Servo direction too quickly

\*Replace Servo

### **In Motor Mode the Motor rotates in the opposite direction as expected:**

The rotation direction varies between brands of continuous rotation servos.

## **Specifications** 06/23/2014

Operating voltage: 6 VDC - 14.8 VDC.

Drive standard hobby servos.

Drive continuous rotation servos.

Adjustable speed.

Adjustable Servo position CW & CCW.

Two 200ma on-board relays.

## LIMITED WARRANTY

Kadee Quality Products will repair or replace, at our sole option without charge, any Kadee Remote Control Product or Kadee Remote Control system products affiliated with Kadee Remote Control system (#11110, #11130, #11215, #11225, #11230) determined by Kadee to be defective, where such product fails due to a defect in material or workmanship within (1) Year following the initial consumer purchase. Kadee's responsibility and liability pursuant to this warranty is expressly and solely limited to the replacement and repair of the Kadee Product in accordance with this warranty.

This warranty is limited to the original "Purchaser" and is not transferable or assignable. This warranty covers only those Kadee Products purchased from an authorized dealer. Third party transactions (such as EBAY) are not covered by this warranty.

Proof of purchase or product registration reflecting a purchase within the warranty period is required for warranty claims. Further, Kadee reserves the right to change or modify this warranty without notice and disclaims all other warranties, express or implied.

This warranty does not cover: normal wear and tear, cosmetic or physical damage to the surface of the product, including cracks or scratches. Any damage due to improper installation, operation, maintenance, handling, accident, fire, water or liquids, power changes, abuse, alteration, modification, negligence, battery leak, damage caused by third parties, damage due to attempted repair by anyone other than Kadee, acts of God, devices purchased from anyone other than an authorized retailer or distributor or devices that have been previously registered.

This warranty is considered void if the product case has been opened or the protective wrap has been removed by anyone other than Kadee.

Any device needing to be returned to Kadee must have a return merchandise authorization (RMA) number. Any device received at Kadee without a valid RMA number will be returned to the sender at sender's expense. RMA numbers are valid for (10) business days.

Kadee reserves the right to inspect any and all equipment involved in a warranty claim. Repair or replacement decisions are at the sole discretion of Kadee.

A technical representative will be able to determine if the device is defective and still under the limited warranty period. It also may be necessary for the device to be sent for evaluation to determine the validity of the warranty claim.

If the device is not deemed defective or is out of the limited warranty period, you may be given the option to repair the device for a fee or have the device returned as is, at your expense.

## DISCLAIMER:

REPAIR OR REPLACEMENT AS PROVIDED UNDER THIS WARRANTY IS YOUR EXCLUSIVE REMEDY. THIS WARRANTY IS IN LIEU OF ALL OTHER EXPRESS OR IMPLIED WARRANTIES. KADEE SHALL NOT BE RESPONSIBLE OR LIABLE FOR ANY SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES FOR BREACH OF ANY EXPRESS OR IMPLIED WARRANTY ON THIS PRODUCT. EXCEPT TO THE EXTENT PROHIBITED BY LAW, ANY IMPLIED WARRANTY, INCLUDING THE WARRANTY OF MERCHANTABILITY OR THE WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE ON THIS PRODUCT IS LIMITED IN DURATION TO THE TERM OF THIS WARRANTY. Some states/countries do not allow limitations of how long an implied warranty lasts or the exclusion or limitation of such damages, so these limitations and exclusions may not apply to you. This warranty gives the consumer specific legal rights and you may also have other rights which vary from location to location. If any portion of this warranty is held to be invalid or unenforceable for any reason, such finding will not invalidate any other provision.