

# EZTronic Installation Guide for HO Turnout Controller Kits

## *Introduction*

**Identify your Kit** Shows which HO-Kits we have available and the contents of each. Take the time to familiarize yourself with the components of your particular kit

**Wiring** Shows you how to get your components wired together and ready to use

**Operation** Shows you how the system operates and what the indicators mean

**Installation** Shows you how to install a servo motor on our custom bracket and how to use our template to properly align the bracket to your layout at the desired location

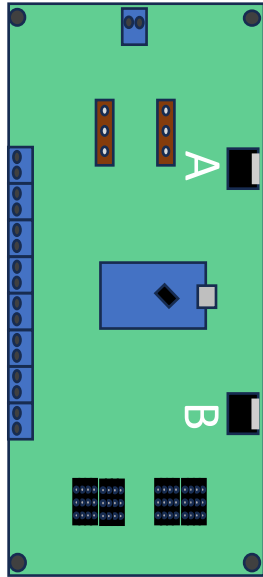
**Relay Installation** Shows the way to connect and install this custom option

**Frequently Asked Questions** At the end, we provide questions and answers for typical questions asked when installing and/or operating our system

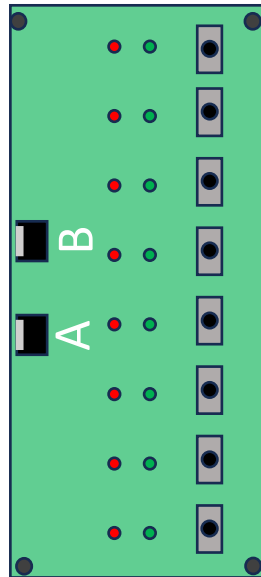
# Identify your Kit Contents

*EZ-HO-Basic*

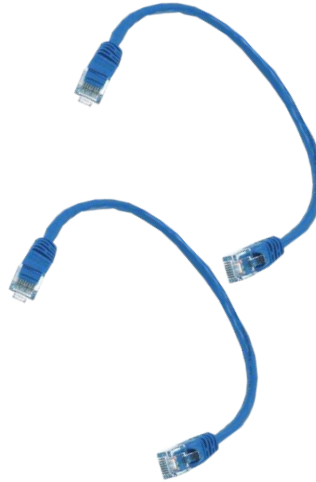
**(1) Controller Board**



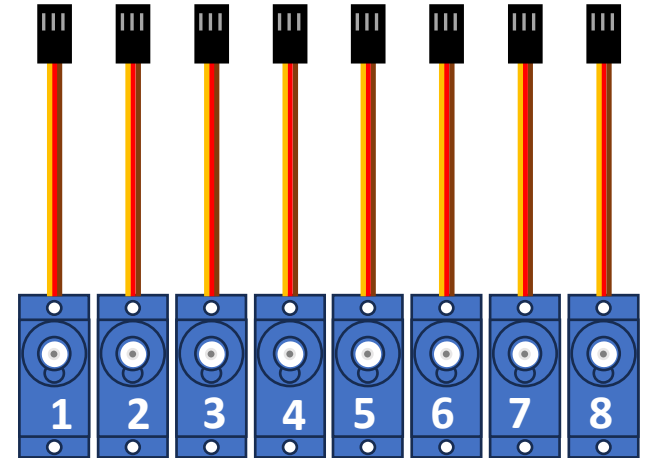
**(1) Pushbutton PCB**



**(2) Short cables**



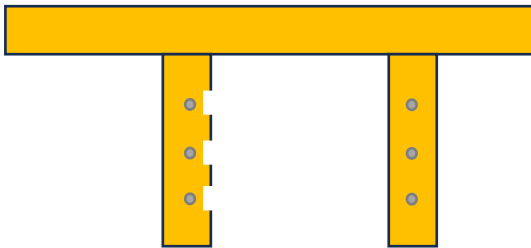
**(8) Servo motors**



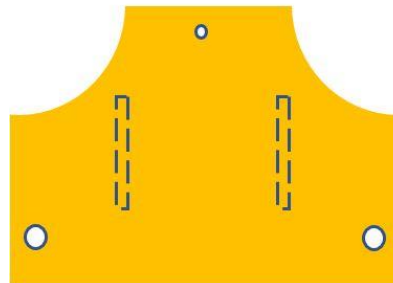
**(8) Horn kits with horn and screws**



**(8) Servo-only Brackets**



**(1) HO Template**



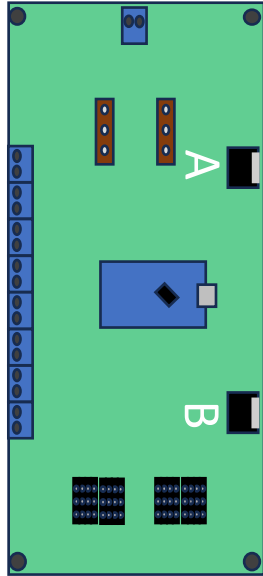
**(8) Paperclips**



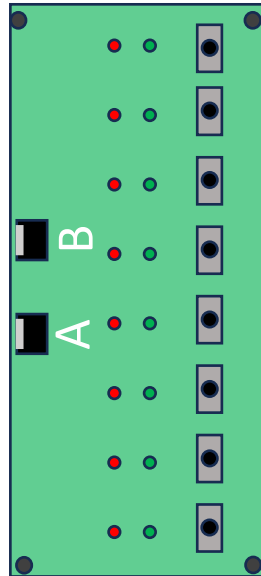
# Identify your Kit Contents

## *EZ-HO-Enhanced*

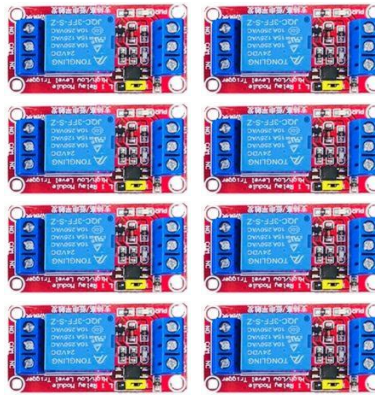
**(1) Controller Board**



**(1) Pushbutton PCB**



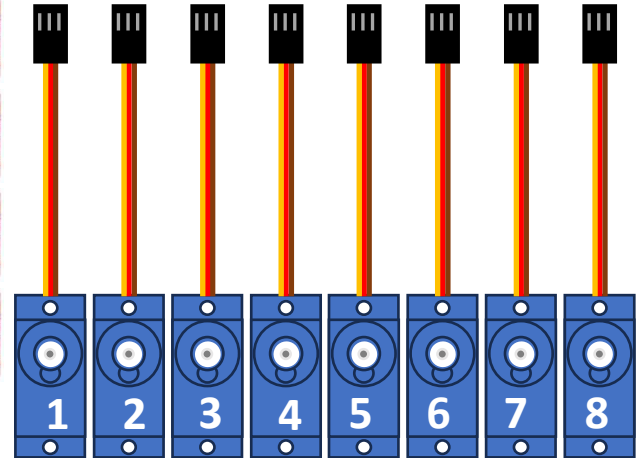
**(8) Relays**



**(2) Short cables**



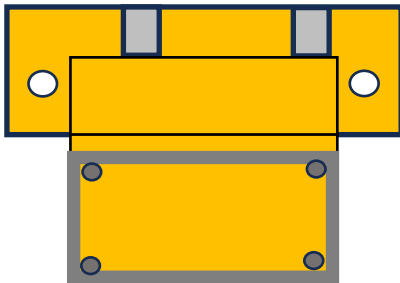
**(8) Servo motors**



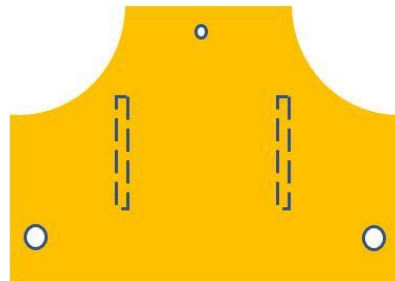
**(8) Horn kits with horn and screws**



**(8) Integrated Servo/Relay Brackets**



**(1) HO Template**



**(8) Paperclips**



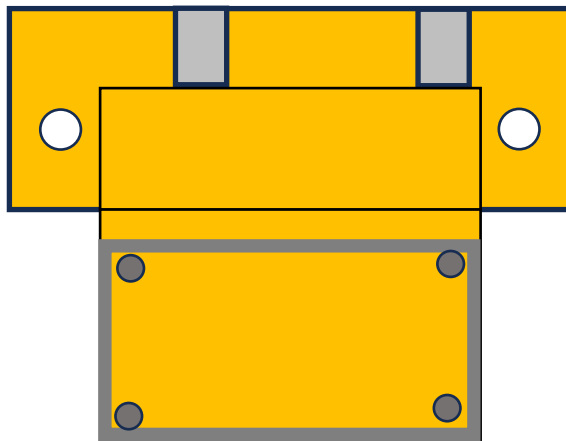
# Identify your Kit Contents

## *EZ-HO-Relay Kit*

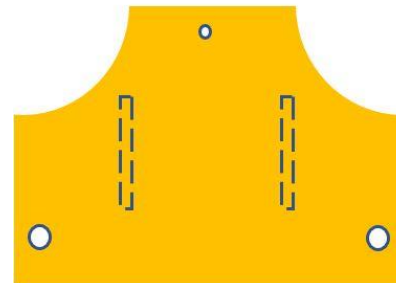
**(1) Relay with mounting screws**



**(1) Integrated Servo and Relay Bracket**



**(1) HO Template**

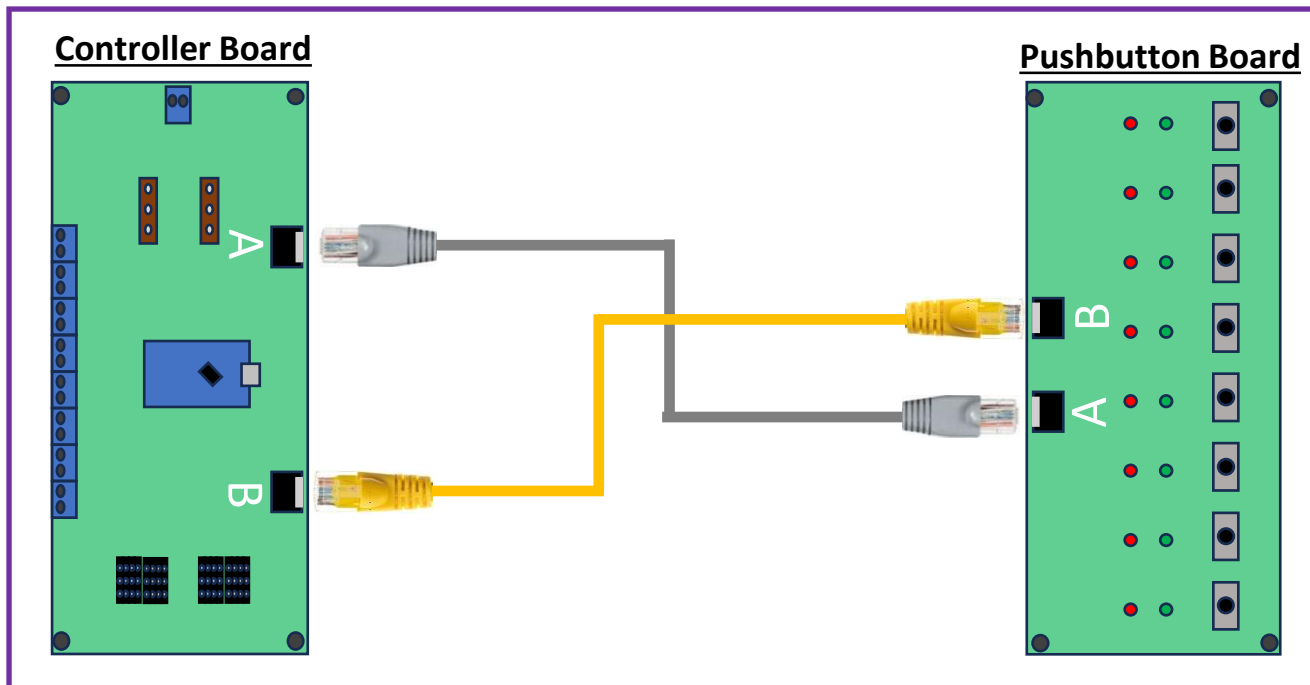


## Wiring

**STEP-1 Cable from A-A** Plug one CAT5 wire between the “A” Connector of the Controller Board to the “A” Connector of the Pushbutton Board.

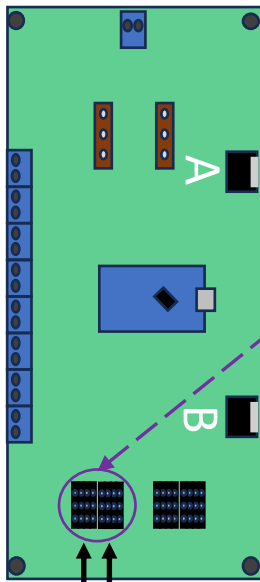
**Step-2 Cable from B-B** Plug the other CAT5 wire between the “B” Connector of the Controller Board to the “B” Connector of the Pushbutton Board

NOTE – Color of wires provided may be different than diagram below. Ensure that one cable is connected from A-A and the other cable is connected from B-B



# Wiring

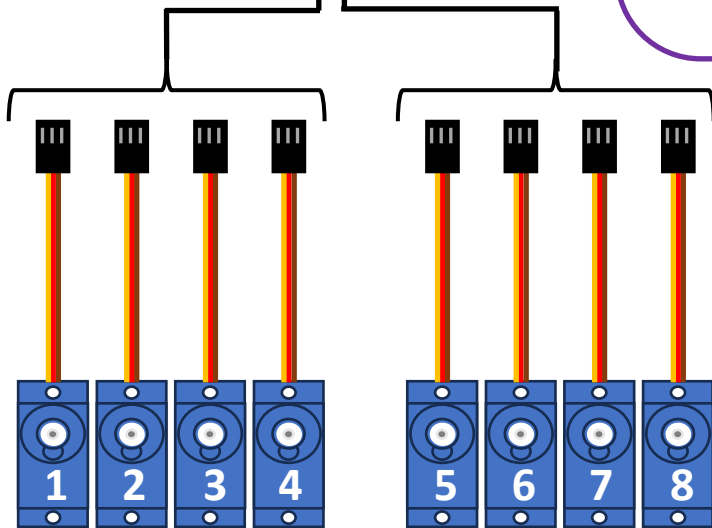
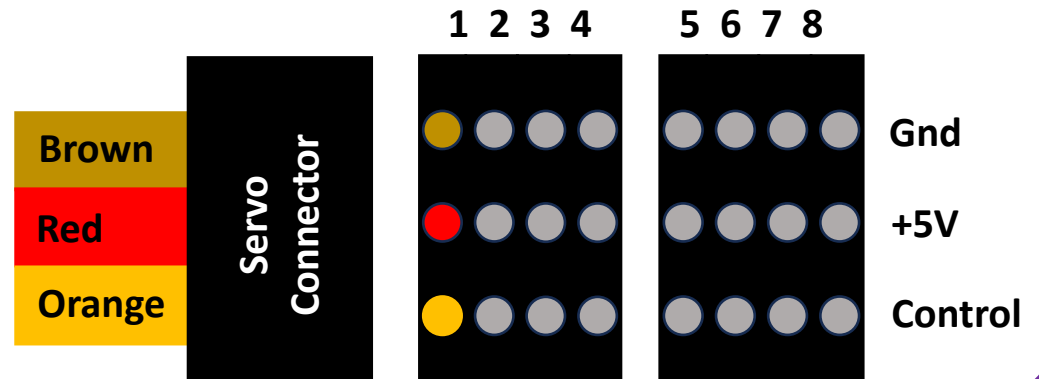
## Controller Board



**STEP-3 Plugging in Servos to Controller** Unpack *all 8 Servos*, plug them into the Controller Board.

NOTE - Do not install plastic horns on the Servos at this time – this is done in a later step

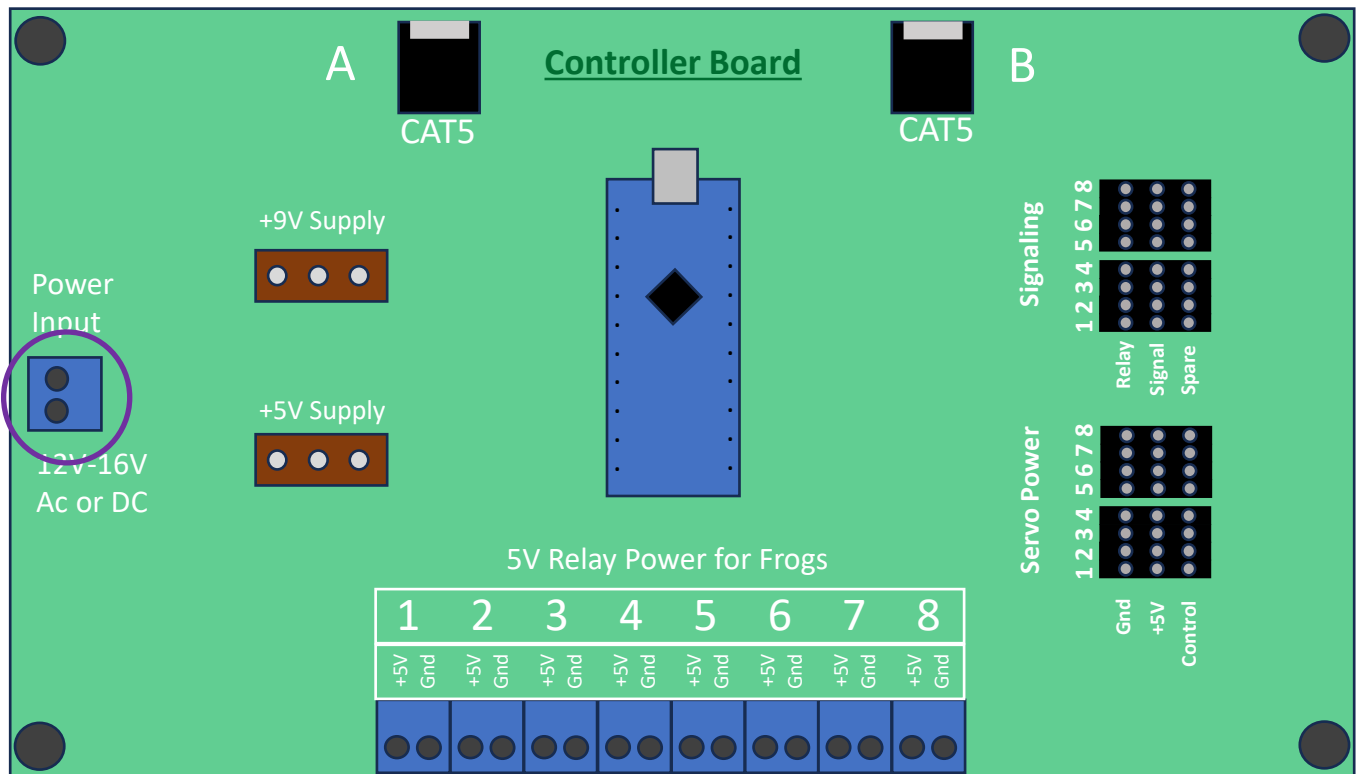
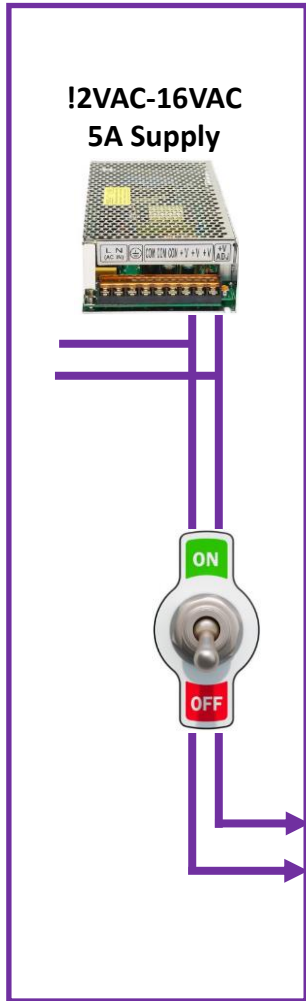
## Enlarged View of Servo Connections



# Wiring

**STEP-5 Powering the Controller** Locate the power source that you are providing (12V-16V AC or DC) and wire it to the Power Input terminals. We recommend a power supply capable of 5A. The EZTronic system is expandable up to 5 Controllers (total of 40 Turnouts) that can be run from the same single power supply.

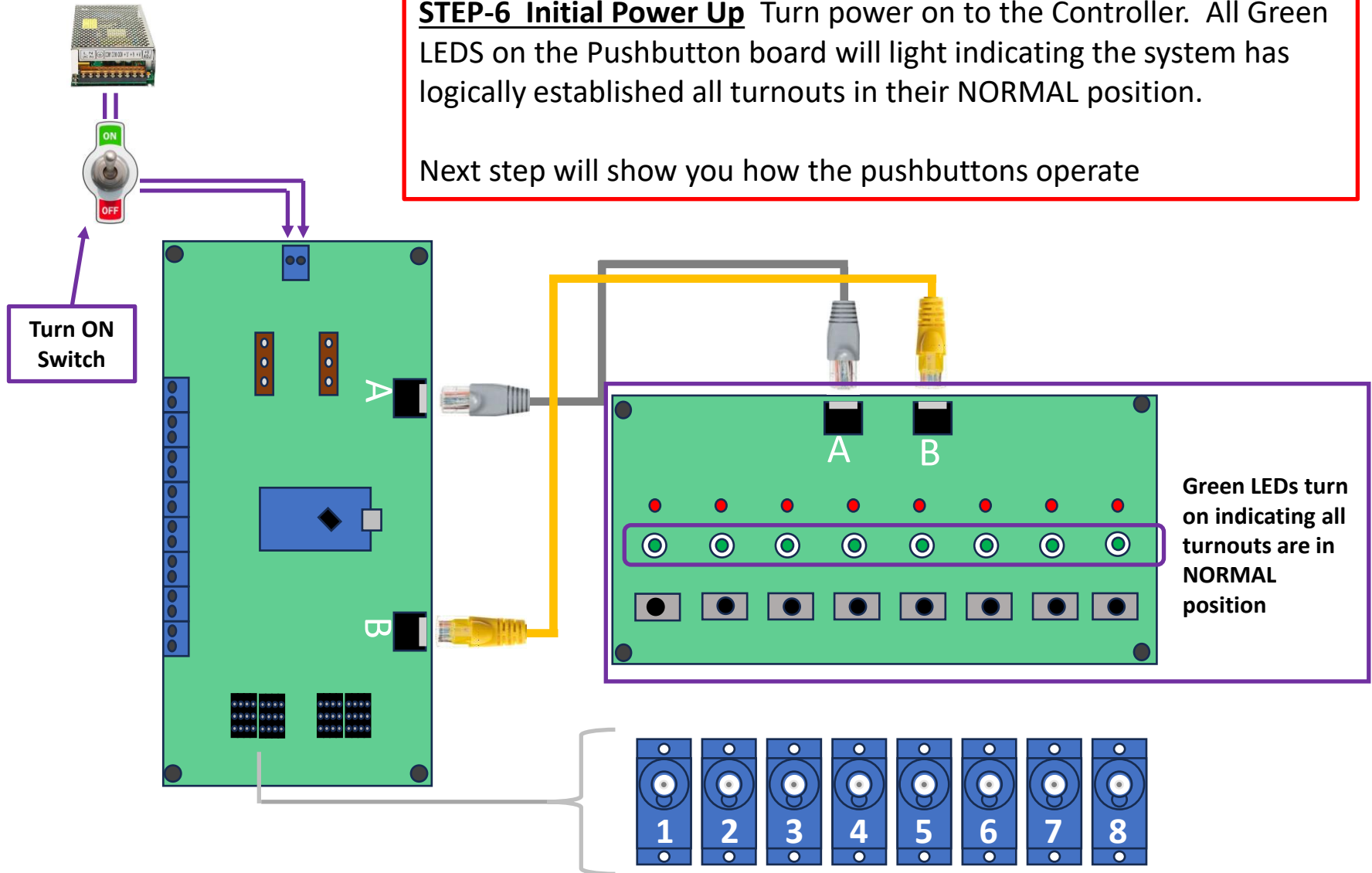
**NOTE** - We recommend that you provide a switch to turn on/off the power to each EZTronic Controller. (The system provides for centering its Servos on power-up when the first button on the Pushbutton Board is held down for a few seconds - details in STEP-7). For now, continue onto STEP-6



# Operation

**STEP-6 Initial Power Up** Turn power on to the Controller. All Green LEDs on the Pushbutton board will light indicating the system has logically established all turnouts in their NORMAL position.

Next step will show you how the pushbuttons operate





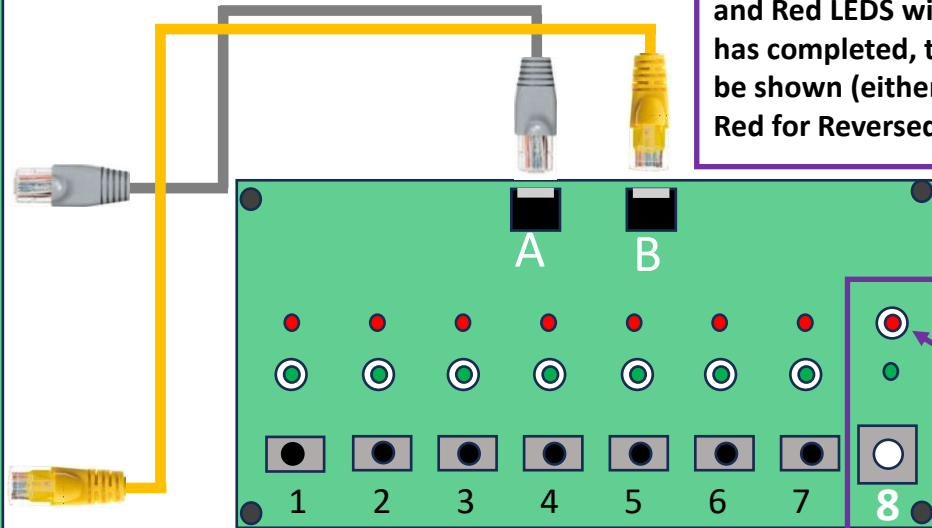
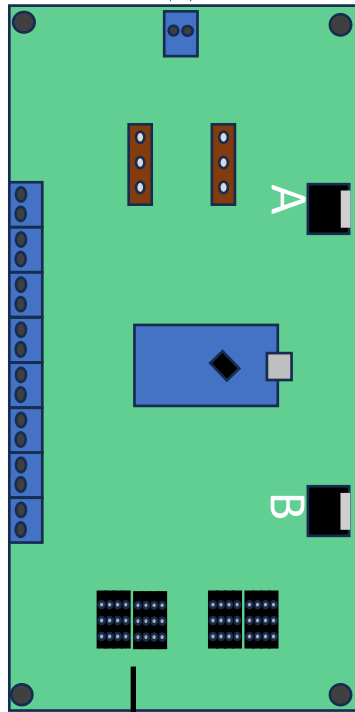
# Operation

**STEP-6A System Operation** Each press of a button will change the position of the respective Servo (Example below shows Servo-8 operation in detail)

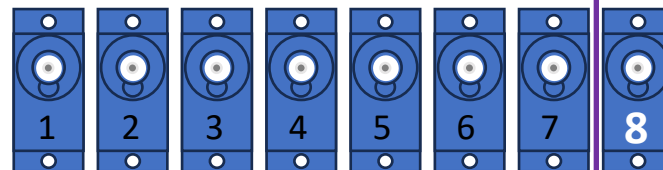
NOTE – Turn power off before moving onto the next step



NOTE – While the turnout is moving to either position, the appropriate Green and Red LEDs will blink. Once travel has completed, the correct aspect will be shown (either Green for Normal or Red for Reversed)

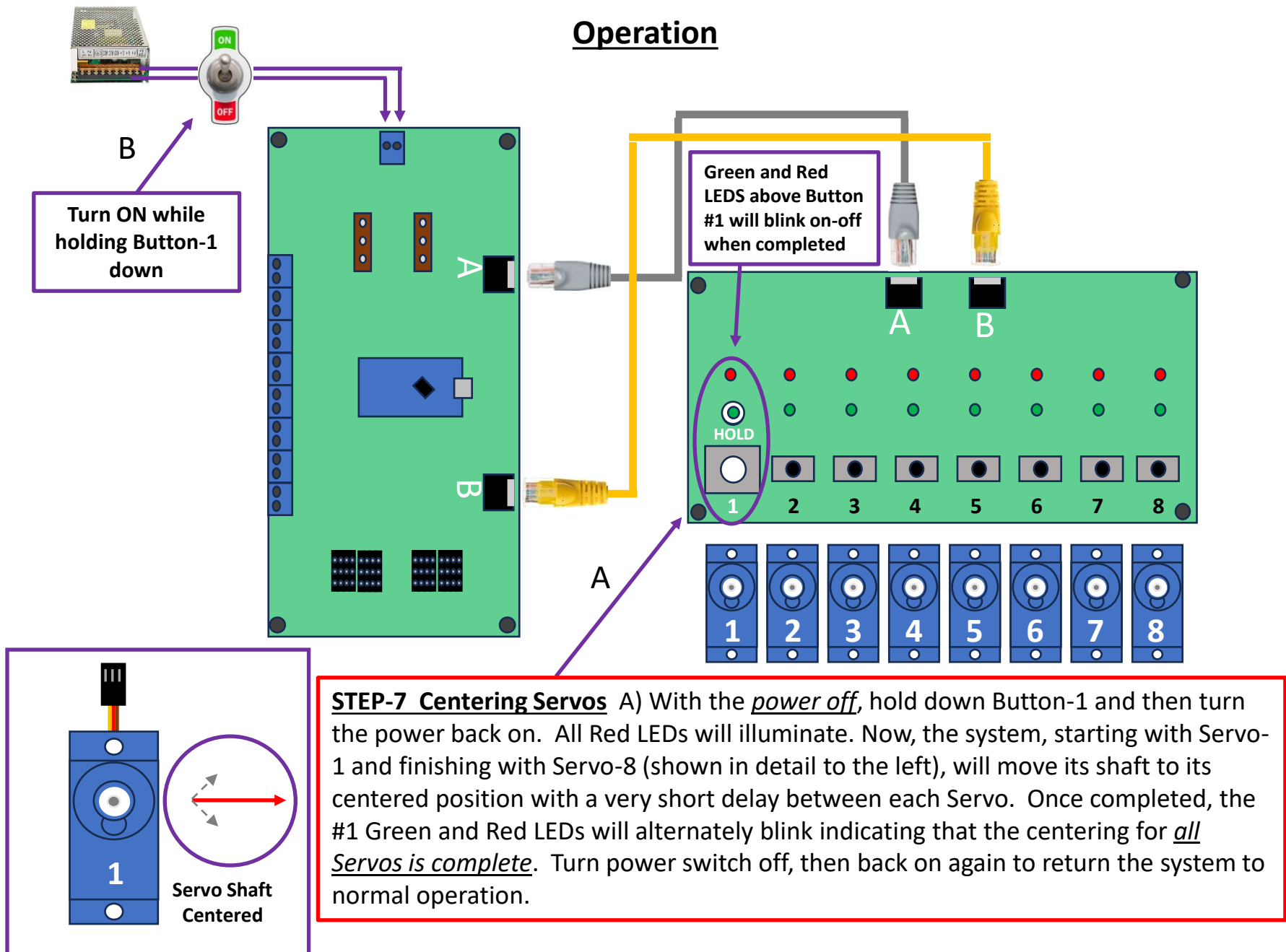


Green LED will go off and Red LED will go on



Press button-8 on Pushbutton board and Servo-8 will move.

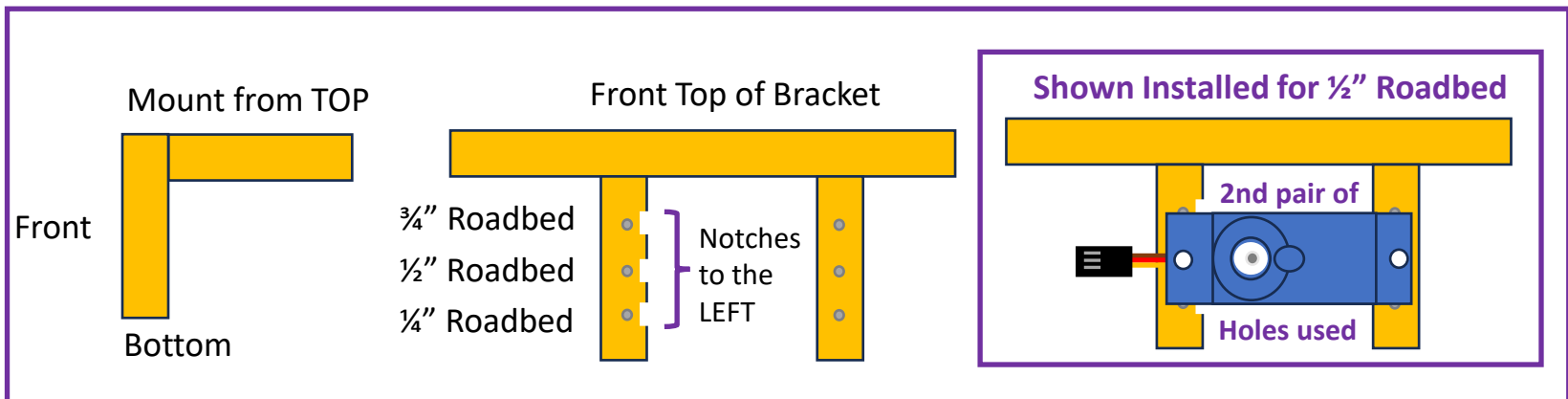
## Operation



## Installation

**STEP-8 Align and Mount Servo** With each Servo positioned as shown, align it in its bracket from the TOP. Position the Servo at the appropriate height for your roadbed using the correct alignment holes provided in the bracket. The Servo wire exits the Servo body on its left. Position the wires so they run down toward the bottom of the bracket on the inside. Notches are provided along the left edge of the bracket to allow the wires to fit in its notch comfortably. Screw the Servo to the bracket with the supplied screws. NOTE – Do NOT overtighten the servo screws as they are delicate - tighten only until snug.

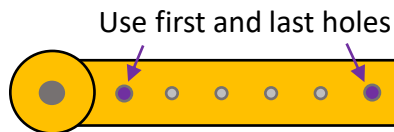
Below right shows the proper position for installing the Servo when using it for a turnout that has  $\frac{1}{2}$ " Roadbed. If the layout or location of the turnout is thicker or thinner, adjust the mounting position accordingly for best operating experience. Repeat this process for all Servos that are to be installed. When finished you should have a Servo mounted to its bracket at the correct height for its Turnout.



## Installation

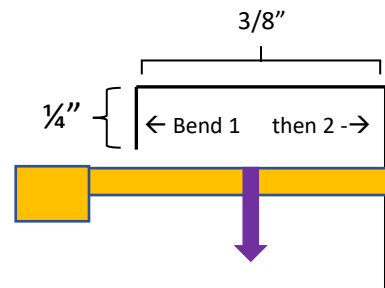
**STEP-9 Fabricate servo arm assembly** Using the straight horn and one of the provided paperclips, open the paperclip and straighten it out. Start at one end of the clip to fabricate the two bends. Then prepare the clip as shown below and prepare each Servo horn to become the fabricated arm assembly for your turnout

### A. Locate horn and identify holes



Enlarge the holes by using a #50 drill bit to accommodate paperclip. Alternatively, use the sharp tip of an Exacto blade and lightly ream out the two holes from both top and bottom of the horn

### B. Bend clip and push thru and flush with top of horn



### C. Bend clip ends up flush with bottom of the horn.

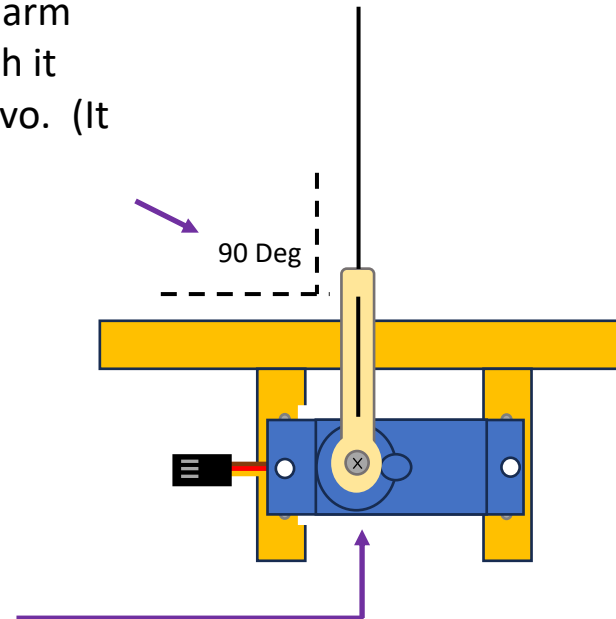


## Installation

**STEP-10 Attach arm assembly to servo** Slide the arm assembly down onto the top of the servo so that it is aiming as shown below. Sometimes the horn and gear will not be 100% centered, get it as close as possible. *Do not manually turn the servo gear during this process as the servo has already been centered for use.*

**A. Align arm at 90 degrees** - Slide arm assembly onto servo shaft and push it down onto the top shaft of the servo. (It may align a little off of perfect 90 degrees, this is ok)

**B. Attach arm assembly** - Screw arm assembly onto the Servo using the supplied screw



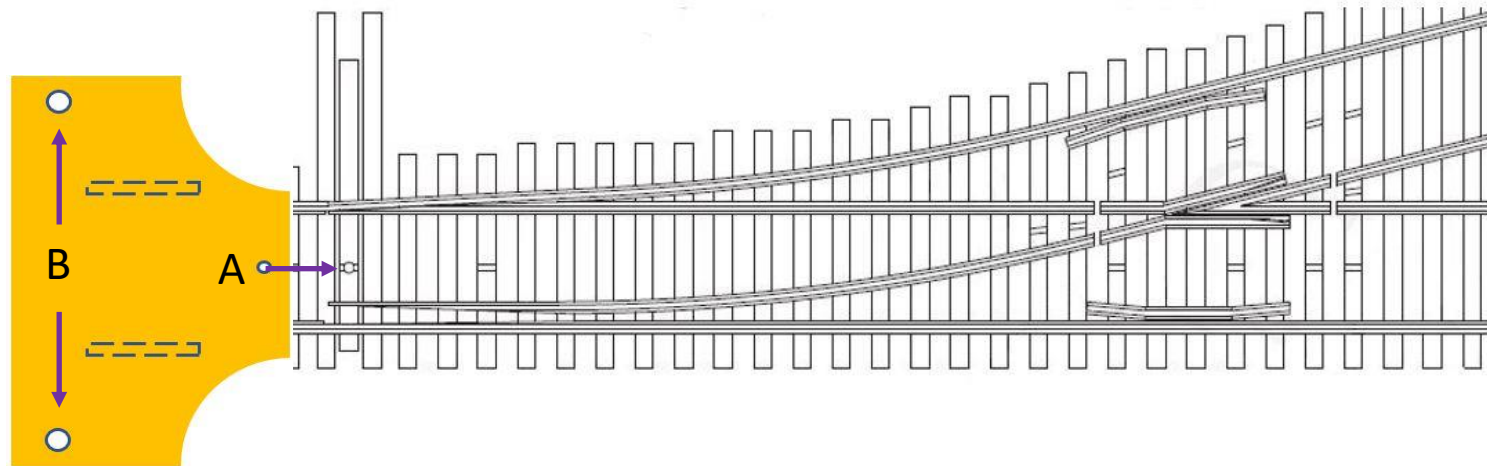
## Installation

**STEP-11 Alignment of bracket for *Left-Hand Turnout*** Shown below is the position of the template for a left-hand turnout. The template sits over the track to locate the center of the throwbar as well as the two locations for screw holes which will be used to attach the bracket to the layout location.

(For mounting options other than center of track throwbar, see Step-13)

**A. Locate template over switch, drill center hole** Lay template on track at location shown, it fits over the track and provides the location to drill all holes. Position the small front hole over the center of the throwbar. If you have not drilled a hole under the throwbar, do so now. Provide a  $\frac{1}{2}$ " hole to allow proper horizontal movement

**B. Mark and drill bracket mounting holes** With the center hole aligned over the center of the  $\frac{1}{2}$ " opening under the throwbar, mark and drill the 2 mounting holes for the bracket. Use a #27 drill bit to make these holes. NOTE – the brackets are designed to accept #6/32 screws or bolts. Purchase the length of bolt applicable for your layout.



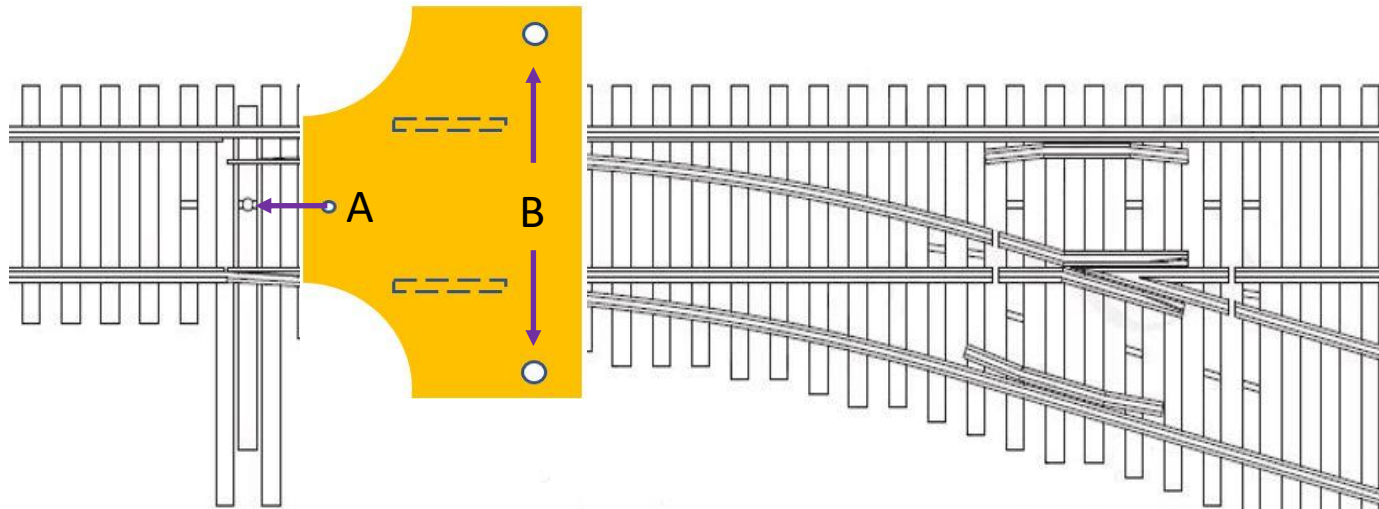
## Installation

**STEP-12 Alignment of bracket for *Right-Hand* Turnout** Shown below is the position of the template for a Right-hand turnout. The template sits over the track to locate the center of the throwbar as well as the two locations for screw holes which will be used to attach the bracket to the layout location.

(For mounting options other than center of track throwbar, see Step-13)

**A. Locate template over switch, drill center hole** Lay template on track at location shown, it fits over the track and provides the location to drill all holes. Position the small front hole over the center of the throwbar. If you have not drilled a hole under the throwbar, do so now. Provide a  $\frac{1}{2}$ " hole to allow proper horizontal movement

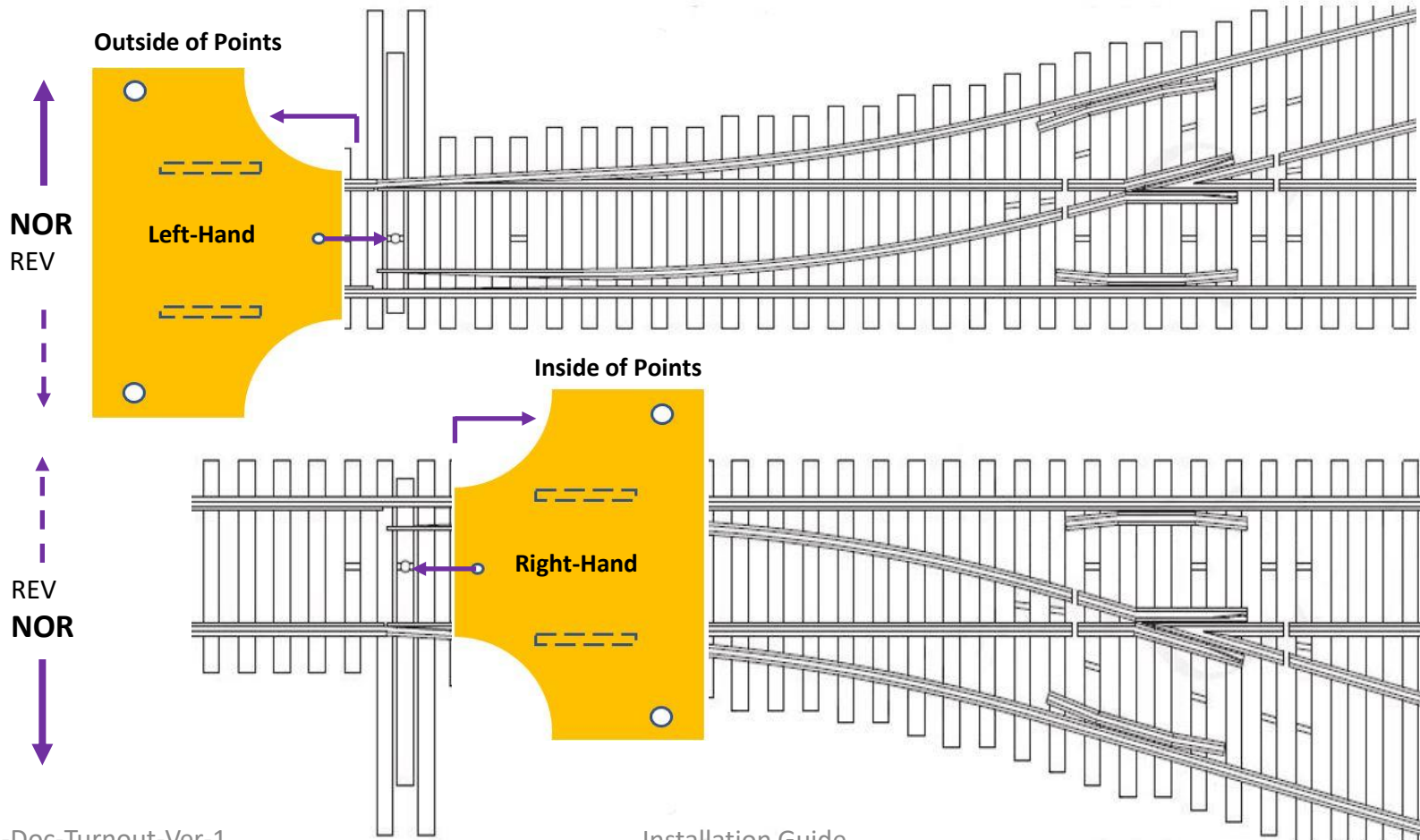
**B. Mark and drill bracket mounting holes** With the center hole aligned over the center of the  $\frac{1}{2}$ " opening under the throwbar, mark and drill the 2 mounting holes for the bracket. Use a #27 drill bit to make these holes. NOTE – the brackets are designed to accept #6/32 screws or bolts. Purchase the length of bolt applicable for your layout.



# Installation

## Why the different mounting locations for Left-Hand and Right-Hand Turnouts?

The system has been designed such that each servo will move the same direction when commanded for an operation. You therefore need to orient one of the turnouts opposite to the other such that the resultant movement will be correct for either NORMAL or REVERSED operation.



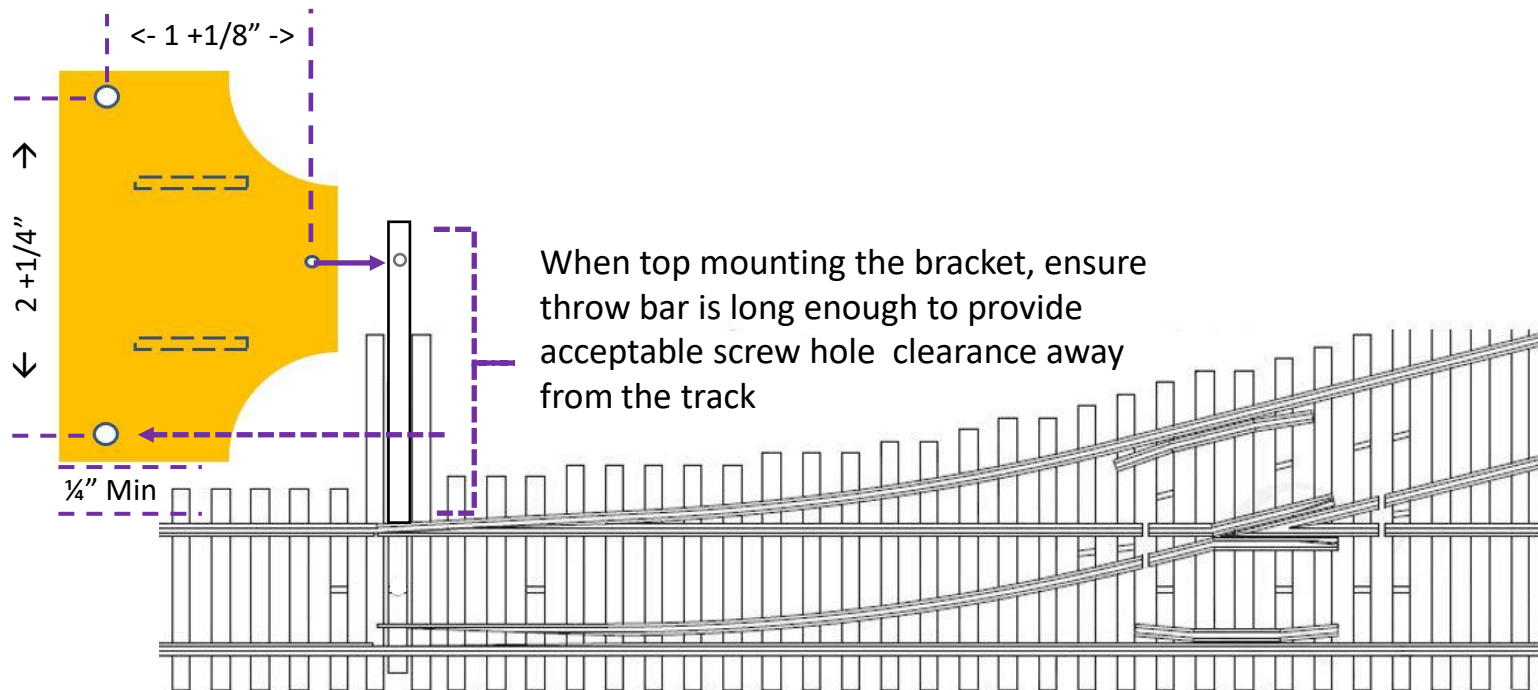


## Installation

**STEP-13 Alignment of bracket on side of turnout** Shown below is an example of mounting the switch machine such that the throwbar hole location is outside of the track center. All dimensions and clearances are the same if you choose to locate the bracket on the other side of the switch (throwbar on other side of track)

**Locate Bracket away from or outside of switch center** Below are the critical elements and dimensions for alternative mounting of the servo bracket assembly. What is important when top mounting is to leave at least  $\frac{1}{4}$ " of space from the edge of the track for the closest mounting hole.

For installations where all holes are drilled from the underside and not coming through the top, you may use the template to ensure proper spacing but not be concerned about the minimum distance from the track.



# Relay Installation

## EZTronic solution for powering frogs

For maximum consistency of operating over a switch, modelers are moving to switches with metal frogs that are powered but that are isolated from the adjacent trackwork. An ideal powering solution is one that not only powers the frog, but automatically handles polarity when the switch is changed from NORMAL to REVERSE. We provide a Relay solution which comes complete with its own Unified mounting bracket. This Integrated Bracket mounts *both the Servo and the Relay with the identical spacing for installation on your layout to our standard bracket.*

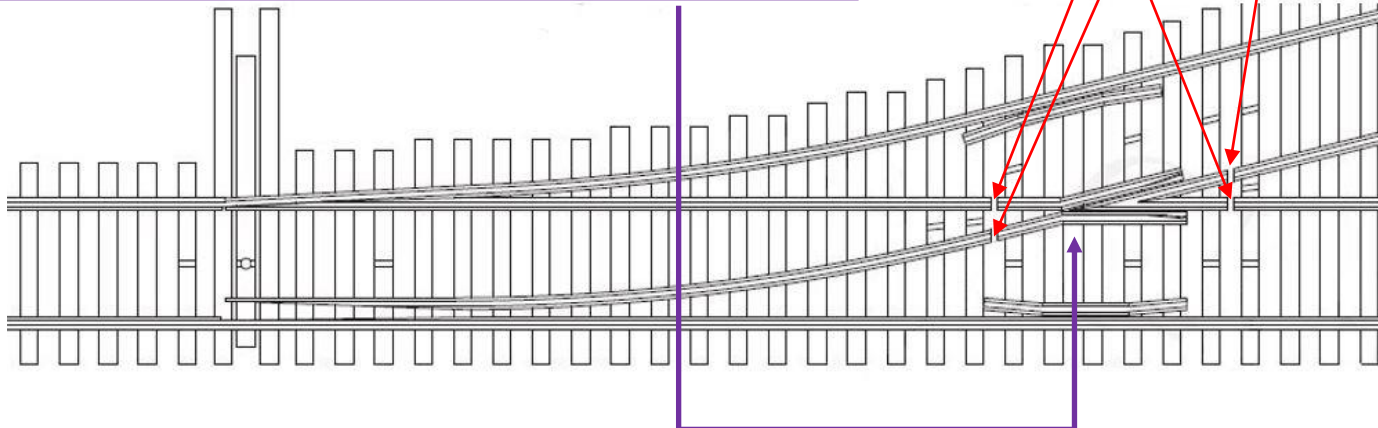
Power for the frog and associated control signals to switch the signal are already available from the base Controller board. All you need to do is wire up the Relay assembly.

### Relay Board



- isolation of up to 10A
- Automatic control of frog
- Power provided from Controller

Gaps cut in all 4 locations to “isolate” the frog. EZTronic Controller automatically provides proper polarity to this isolated frog through the Relay



## Relay Installation

**Installing Servo and Relay in Integrated Bracket** Shown below is an example of mounting both the Servo as well as the Relay board in the provided Integrated Bracket. The Integrated Bracket is 100% compatible with the hole locations and sizes of the original Servo-only bracket.

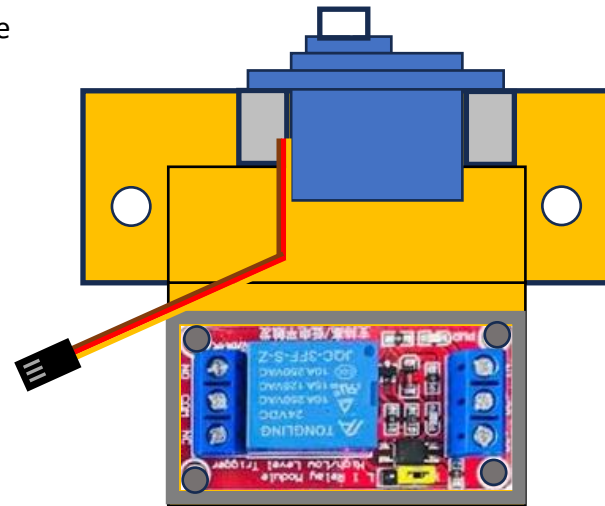
### EZTronic Integrated Mounting Bracket

For maximum flexibility and backward compatibility, we provide this integrate bracket when you order our Relay Kit. The Relay Kit comes with:

- Opto-isolated Relay board that can handle up to 10A
- Four mounting screws for mounting the relay
- New Integrated Bracket that holds both Relay and Servo
- EZTronic mounting template

This assures that whether you buy our system initially with support for metal frogs or not, you can simply add this kit later on when appropriate, The Integrated Bracket uses the same template for installation, thus assur4ing identical alignment.

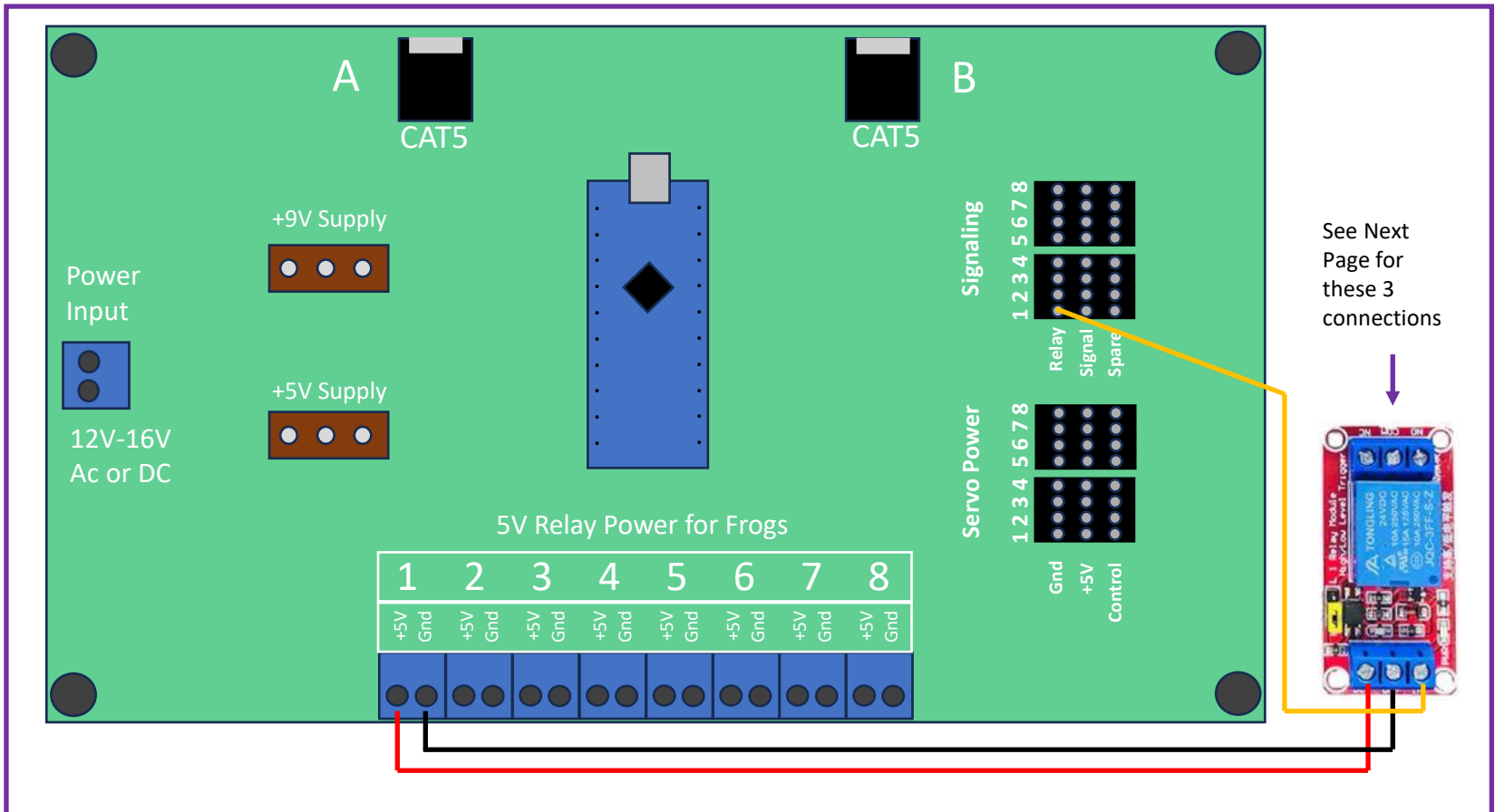
If retrofitting, simply unscrew the existing bracket from your layout, move its Servo to the new Integrated Bracket and then screw the Relay board into its integrated case. Reinstall this new Integrated Bracket in the same location using the same mounting hardware.



**Integrated Bracket shown in “Under the-table” view looking up at the underside of your surface or table**

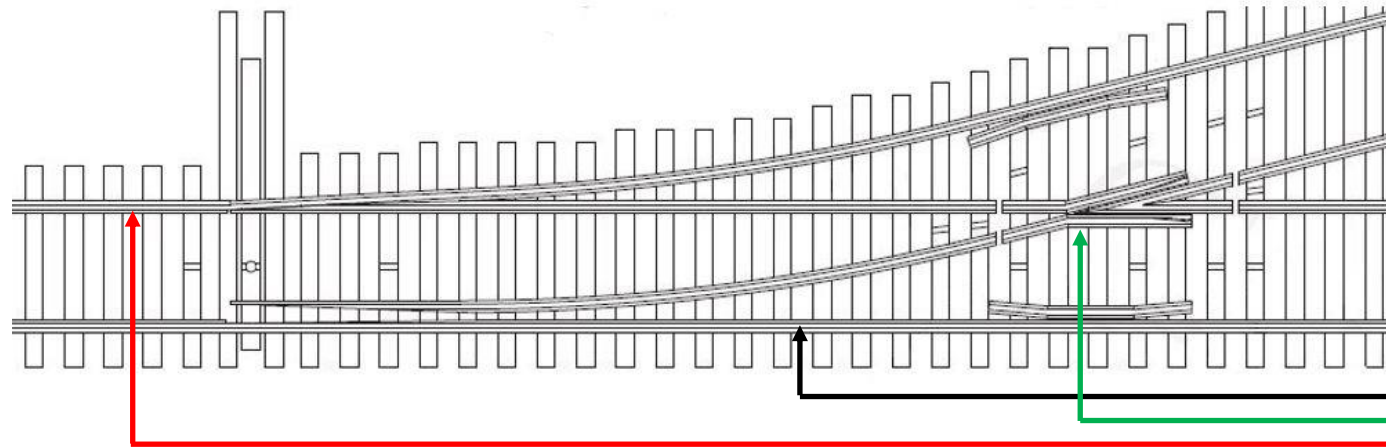
# Relay Installation

**Wiring Relay Module to Controller** Follow wiring diagram below when installing our optional Relay Kit. The Controller provides all power and proper signals to automatically control the polarity of signal going to the frog. Diagram depicts installing for Turnout-1. (See next page for details on wiring the track to the Relay)



## Relay Installation

**Wiring Relay Module to Track** Follow wiring diagram below when installing our optional Relay Kit to your track.



**Red** – Power coming to this rail is tied to NC screw of the Relay

**Black** – Power coming to this rail is tied to the NO screw of the Relay

**Green** – The Frog is wired to the COM screw

(NOTE – if you hand make your turnout, make sure that the frog is totally isolated from any and all tracks prior to powering. The frog has to be totally isolated for proper operation to occur)



## **Frequently Asked Questions-1**

**Q: Many of my switches do not have metal frogs. Some are plastic and some are metal. What is the most economical way to purchase your product without buying all 8 relays in the Enhanced Kit?**

**A: Purchase out Basic kit and order as many Relay Kits as you may require initially for the turnouts with metal frogs. You will have the same installation experience and save money for those locations that do not yet have metal frogs.**

**Q: I also have an N-scale layout. Do you have plans to offer kits for N-scale turnouts?**

**A: Although we do not yet have a release date, we do intend to provide similar kits for the N-scale modeler. We will notify our users when we intend to release them. Please join our mailing list and we will keep you updated.**

**Q: Why do you believe that your solution for powering frogs is a better alternative to products that near instantaneously simply switch to the correct polarity voltage for the frog on the fly?**

**A: These type of solutions are always looking for a short circuit, and when sensed, quickly switch voltage on the frog over to the other polarity. Sometimes, this can interfere with DCC systems that may be providing their own short circuit protection in a similar fashion, thus resulting in a temporary shut down of a section of a layout. Our solution assures that there is never a short circuit environment to deal with and therefore cannot be the source of potential problems with the design of DCC short circuit approaches by the various manufacturers**

## **Frequently Asked Questions-2**

**Q: The cables provided in your kits are short. If I wish to mount the Controller further away from the Pushbutton Board, what type of cables should I buy?**

**A: Purchase CAT5 or CAT6 cables that are data cables designed as straight through, NOT reversed. These are very common cables and are available on-line or in most electronics stores or departments. (Also see Frequently Asked Questions-5 for a diagram on how you can make your own cables if you want to)**

**Q: I am not that familiar with power supplies and specifications. Can you recommend what to buy?**

**A: Although we specify using a 12V-16V AC or DC power supply capable of providing 5A, we are not implying that power supplies of greater or less current than 5A would not work properly. If you have an existing power supply of 2A or 3A, you can use it with out kit. If you expand to multiple Turnout Kits, you should consider a larger supply if and when needed. NOTE – the voltage is important. The power supply you use cannot be less than 12V or greater than 16V for proper operation of our Controller and Pushbutton boards.**

**If you are uncomfortable or unfamiliar with selecting a power supply, consult either a licensed electrician or a knowledgeable person. EZTronic cannot be responsible for the selection of which power source you may use.**

### **Frequently Asked Questions-3**

**Q: I see that the controller and pushbutton cases are 3D printed in white plastic. Is it OK to paint the cases and if so, any recommendations you might have for doing so?**

**A: We have selected a very good, supple, yet strong PLA plastic for our brackets and cases. We intentionally chose a plastic with a relatively dull finish. The reason is that a dull finish does the best job in keeping reflections of any slight imperfections from being as noticeable to the eye.**

**We recommend that if you wish to paint our cases, take some 180 or 220 grit sandpaper and lightly sand the surfaces. Use light coats of paint and our recommendation is to stay with a dull finish. Our experiences have shown that our plastic looks very rich when done in this type of finish. You should always consider a light primer coat before applying your chosen finish color. For most colors, a light gray primer works well. Always make sure you wear protection and do all painting in a well-ventilated environment.**

**As far as brand of paint, we leave it up to you however almost any general-purpose spray paint will likely work just fine. We have tried paint for woods and metals as well as plastics and the ones we tried did adhere well to our plastic.**



## **Frequently Asked Questions-4**

**Q: What happens to your system if power goes down? Will it recall the location of each turnout and return the layout to those positions?**

**A: No, our system returns all turnouts to their normal (non-diverged) position upon power up. This is our intentional design approach. Your pushbutton indicator will go through power up and show all green LEDs lit, indicating normal position for all turnouts.**

**Background: In discussing this with various modelers, their overwhelming preference was to have the turnouts default to a known position. Whether the power-down is normal, as per the end of an operating session, or a person just finished running trains for the day and shut the layout down, the majority of people desired the system to come up in a known/defaulted state as opposed to trying to return to a previous state.**

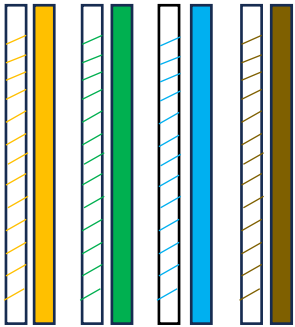
**Q: Your documentation indicates that CAT5/CAT6 cables can be used as long as they are straight pass through. Is this the most common connection methodology for CAT5/CAT6 cables and how might I go about making my own cables for use with your product on my layout?**

**A: There are a number of color schemes shown for wiring a connector for straight through connections and it is the most common type of cable. To help make it as simple as possible, we are showing one such straight through scheme that we have used for any of our cables. If you follow these connections, the cables will work for our system**

**(See next page for diagram)**

## Frequently Asked Questions-5

From Box or Roll



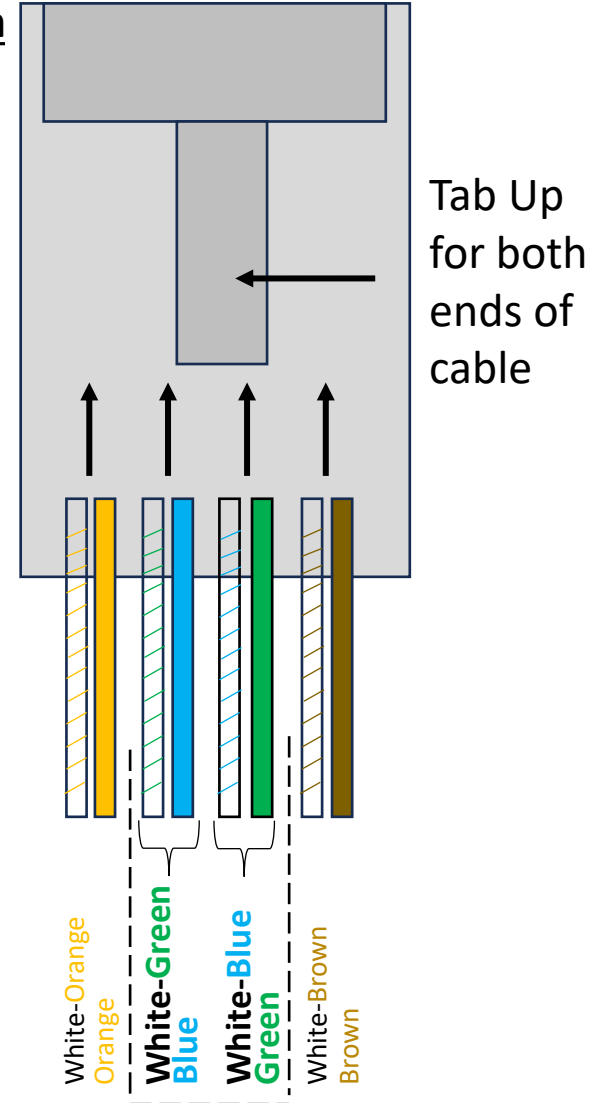
### Straight Through Wiring Diagram

CAT5 or CAT6 cable consists of 4 pairs of twisted wires:

- White Orange, Orange
- White Green, Green
- White Blue, Blue
- White Brown, Brown

1. Untwist the pairs so you have all 8 wires straightened out flat and then align them as shown on the right.
2. Insert them and crimp as shown – do the same exact thing for other end of the cable\*

\*NOTE – White-Green is paired with Blue and White-Blue is paired with Green while White-Orange stays with Orange and White-Brown stays with Brown



## Frequently Asked Questions-6

**Q:** I notice a raised area on your Pushbutton controller. It looks like it could be used for labeling of the turnouts. Is this correct?

**A:** Yes, this is correct. The raised area above the row of Red LEDs was specifically designed to allow a ¼" high label to fit. Therefore, a convenient way to mark your turnouts might be from a ¼" label maker from a suitable store.

