

Mounting Tortoise Motors

by Stewart Jones

Several years ago I decided to replace my twin-coil switch machines with Tortoise motors. The move was primarily motivated by the decreasing reliability of the twin coil machines. Some were becoming balky and the relay contacts on others slowly became mis-aligned resulting in incorrect frog powering, signaling or worse - hard-to-find short circuits. Realigning the contacts required a tedious process of removing and reinstalling the machines.

Tortoise motors appeared to eliminate all these problems as well as providing more prototypical slow action response. However there were serious obstacles to the changeover. Drilling the slots through the roadbed to accept the throw wire was a tedious process. More serious was the inability to locate many machines directly under the turnout points because of benchwork constraints.

The original machines already had the typical “Z” linkages installed (where the throw bar passes vertically through the roadbed and makes 90-degree bends above and below.) By using the existing linkages, I found I could save a lot of time, effort and frustration.

A third consideration was that I wanted to install the Tortoise motors horizontally on the upper decks of my multi-level layout. Figures 1 and 2 show my solution, which provided a much easier method for installing the motors as a bonus.

Figure 1 shows a vertical mounting configuration. Instead of screwing the motor directly to the sub-roadbed, I mounted each motor to a mounting block at the workbench, where it's much easier to drive the screws from above than from below. The mounting blocks are several inches wider than the motor with $\frac{1}{4}$ " slots cut in from each side. These slots allow the assembly to be mounted from below with two wood screws and a washer. The assembly can be loosely mounted in an approximate position, then moved sideways to achieve optimum alignment before tightening the mounting screws. I find that Philips-head screws are much easier to install from below than slotted screws.

Figure 2 shows an alternate mounting that allows for a horizontal alignment of the machine. Here the mounting block is attached to a 1/8-inch hardboard mount at a 90 degree angle. The hardboard is several inches wider than the motor and now has the slots cut into the sides for mounting to the sub-roadbed.

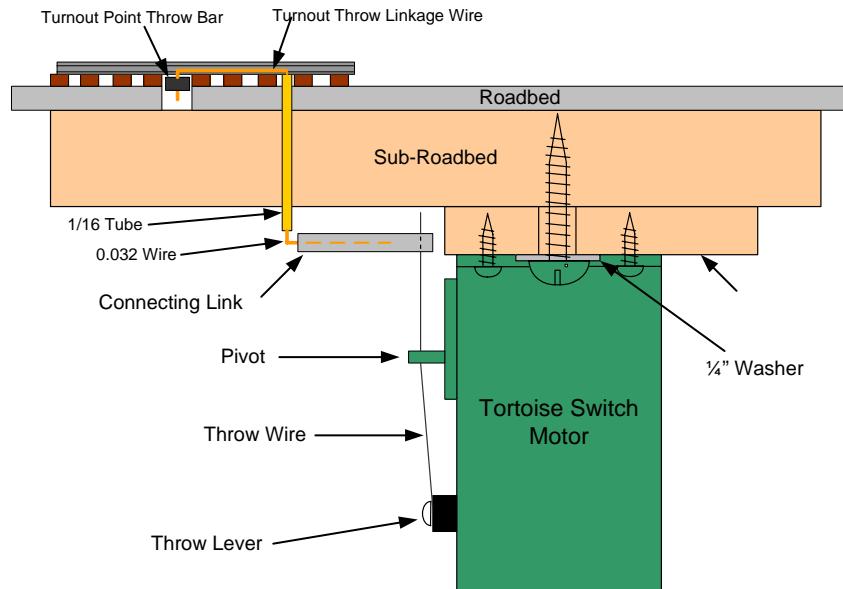


Figure 1: Vertical Mount

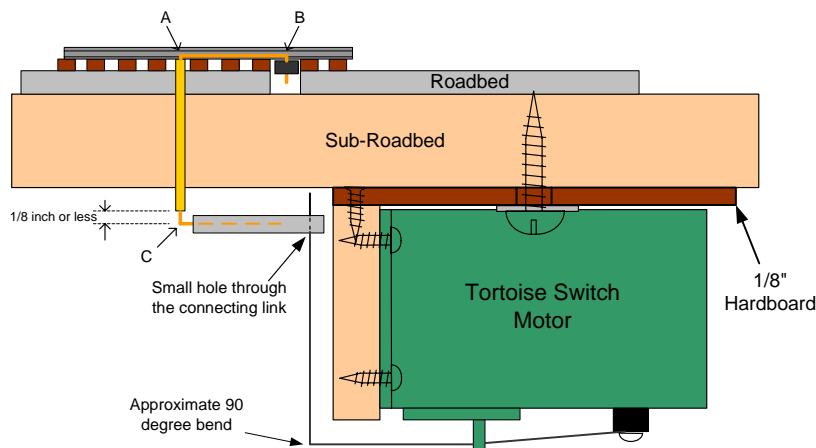


Figure 2: Horizontal Mount

Making the turnout throw linkage (“Z” link) requires some care. Begin by drilling a 1/16-inch hole about $\frac{1}{2}$ to 1 inch from the turnout point throw bar, either between the tracks or to the side.. Cut a length of 1/16 tubing so that it is long enough to extend from the top of the ties, through the roadbed, and at least $\frac{1}{4}$ inch below the bottom of the roadbed. Make the throw linkage from 0.032” wire long enough to reach from the 1/16 tube to the turnout throw bar plus about $\frac{1}{4}$ inch through the tubing and about 2 to 4 inches beyond (or longer, if necessary.) Make two 90-degree bends at points A and B (Figure 2) so that the bend at B fits comfortably into a hole drilled in the turnout throw bar when inserted into the 1/16 tube. The turnout points should move freely without binding. You may need to trim the rod beyond B if it binds against the roadbed. Make the 90-degree bend at C only after the previous steps have been completed and orient the bend toward

the location of the switch motor location. Make this bend as close to the end of the 1/16" tube as possible.

Figures 3 and 4 show a bottom view of the assembly mounting. Figure 5 shows a typical horizontal mounting. To locate the optimum position for the Tortoise assembly, I move the Tortoise throw mechanism to its center position, move the turnout points midway between the stock rails and position the entire assembly so that the "Z" link "points" directly at the throw wire with about $\frac{1}{4}$ inch separation. Locate the position for the mounting screws on each side. Drill pilot holes and insert one of the two screws. Insert the motor loosely under one screw, then insert the second screw. Slide the assembly side to side until the throw wire and the "Z" link line up correctly, then tighten both screws so that the entire assembly is immobile. I generally install the connecting link before tightening the assembly into position. Make certain that the link is positioned far enough down on the throw wire that it cannot slip off and that the 1/16" tube is long enough so that the link to prevent slippage above and below.

The final modification is to connect the Tortoise throw wire to the "Z" link using a tubular link. This arrangement provides the ultimate flexibility since the motor can be mounted almost anywhere in the vicinity of the turnout. The underside leg of the "Z" linkage can be oriented at almost any convenient angle.

I have used a variety of materials for the connecting linkage, including brass tubing and plastic tubing. The only requirement is that inside diameter of the tube must be close to the diameter of the linkage wire so that there isn't much sideways play and the connecting link can still slide and rotate freely. This provides three degrees of freedom between the Tortoise throw wire and the "Z" link (back and forth, up and down and rotational.) The Tortoise motor can be mounted up to six inches from the point where the "Z" link passes through the roadbed. If you opt for a greater distance, increase the length of the throwbar proportionally above the roadbed.

Drill a hole (#55 to #60) through the connecting link to slide over the Tortoise throw wire. You may need to use several sizes of nesting tubing to achieve a dimension large enough to drill through. I prefer to use square tubing over round because it is easier to drill. At first I soldered several sizes of brass tubing together, but found that if the tube segments are long enough, soldering wasn't necessary. Eventually I opted for plastic tubing.

As a final adjustment, move the throw arm to each side and check that the turnout points firmly press against each stock rail with good springing action. You can still make minor adjustments to the motor assembly placement, if necessary.

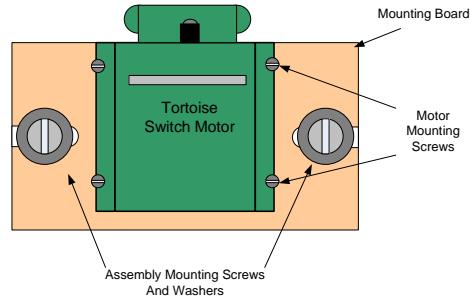


Figure 3: Tortoise Motor Vertical
Assembly Bottom View

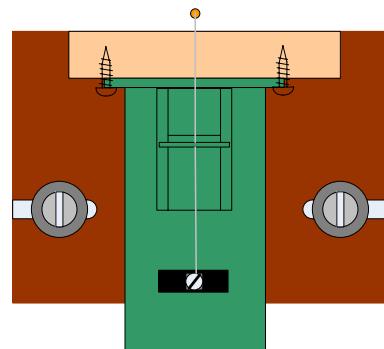


Figure 4: Tortoise Motor Horizontal
Assembly Bottom View



Figure 5: A Typical Horizontal Mounting