Modified Slanser Ground Throw Switchstand

Bill Johnson of the Sunrise Division of the NMRA has demonstrated and documented the Slanser Ground Throw mechanism on several occasions. His design requires the linkage to be mounted underneath the layout. My problem, which may be common for others, is that many areas underneath my layout are inaccessible because of the supporting benchwork or inconvenient to reach. To overcome this problem, I developed a top-mounted, drop-in version of the Slanser Ground Throw.

This unit is built on a "platform" of .125 inch think Styrene, available from Plastruct or Evergreen. The thickness of the material is not critical, but the greater the thickness, the better it will keep the pivots and stops in vertical alignment. You can adjust the thickness by cementing two or more thinner layers together. I chose to make the platform 5/8" (16 mm) wide by 1 ½ inches (38 mm) long. This width will fit between two HO tracks spaced 13 scale feet apart. This length provides sufficient overlap to provide for mounting screws on each end. You can adjust the length and width, however the smaller you make the unit, the more critical the hole positioning becomes.

Figure 1 shows the platform dimensions and the wire components required to assemble the unit. The parts are approximately actual size for HO scale. I have shown most of the dimensions in millimeters, which I find easier to measure than fractional inches.

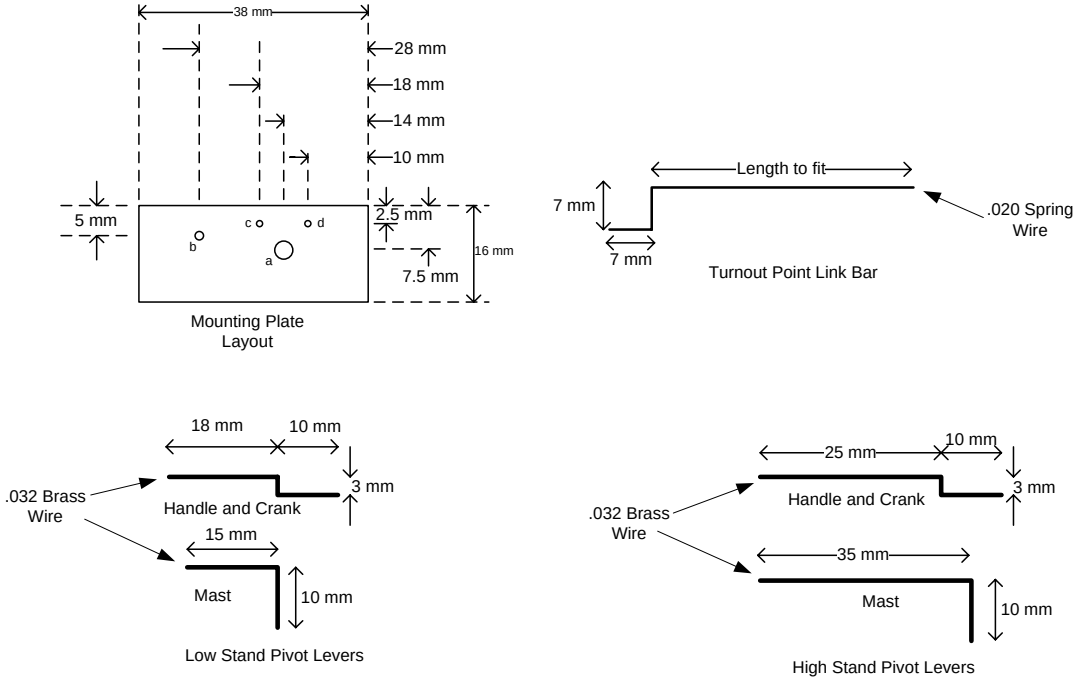


Figure 1: Ground Throw Components

Figure 1 shows the location of holes that must be drilled in the platform to accept components. I recommend using a drill press, if you have one, to ensure that the holes will be perpendicular to the platform. The throw handle and target mast pivot assembly will be inserted into hole "a". Use a 1/8" drill to drill a hole that will accept a piece of

K&S 1/8” tubing (brass or copper). Drill hole “b” with a 1/16” drill to accommodate a 1/16” brass or copper bushing for the turnout point link bar. I used #18 brass escutcheon pins for the throw stops that will keep the throw from travelling past the “normal” and “reverse” “closed” positions. These pins are approximately .050” in diameter. Before drilling holes “c” and “d” measure the diameter of the pins to select the appropriate AWG drill size. A #18 pin should require a #56 drill. If the hole is too small to accept the pin, enlarge the hole with a reamer or the next larger drill size. You can secure the pins with ACC.

The positions of holes a, c and d are somewhat critical. Lines drawn from the center of hole “a” to the outsides of holes “c” and “d” should form an approximate right angle. This will enable the target display to change orientation by 90 degrees as the ground throw moves from the normal to the reverse position (through a 270 degree arc.)

To begin assembling the unit, cut a length of 3/32” brass or copper tubing equal to the thickness of the platform, then insert the two pivot lever wires for either the low or high stand version as shown in Figure 2. Two pieces of .032 wire should fit snugly side-by-side into the tube. Solder the wires and the tube together at the bent end. You may want to bend the “handle” wire slightly at the straight end to prevent solder from flowing between the wires along the entire length. Don’t bend it so much that you will be unable to slide the assembly into a 1/8” tube. You will have to bend it almost 90 degrees later. Clamping the straight wires in a vice, with the tube above the vice jaws, is helpful when soldering the sub-assembly. Avoid getting any solder on the outside of the tube, since it must be inserted into the 1/8” tube and rotate freely. If you do get solder on the outside, file it flush with the surface of the tube.

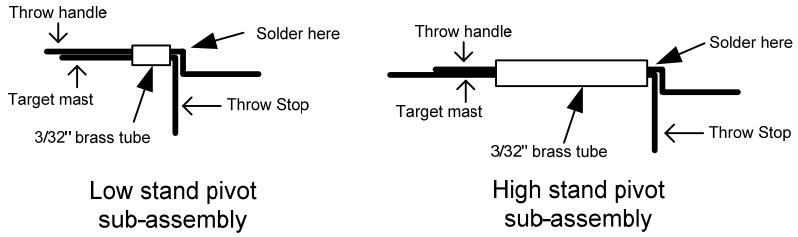


Figure 2: Throw Handle and Target Mast Sub-Assembly

Next cut a piece of 1/8” tubing approximately 1/16” or 2mm longer than the thickness of the platform. Although not necessary, you can add a pivot base. To make the base, drill or punch a piece of .010” thick sheet brass with a 1/8” hole. Trim the edges of the base approximately as shown in Figure 3 to form a square. Insert the 1/8” tube into the base and solder. I use a small block of wood with a 1/8” hole as a jig to hold this assembly while soldering. This ensures that the base will be perpendicular to the tube.

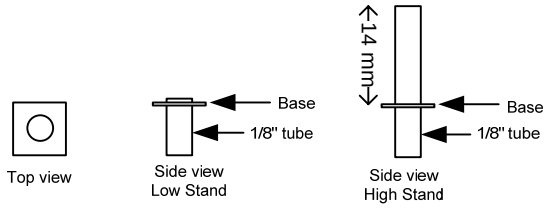


Figure 3: Throw Assembly Pivot Base and Pivot

Insert two brass escutcheon pins into holes “c” and “d”. If you want to make the ground throw electrically conductive, I recommend that you tin the pins with solder before inserting them. Likewise you may want to tin the end of the throw stop where it contacts the escutcheon pins, Figure 2. Press the Throw Assembly Pivot Base into the 1/8” hole in the platform, with the base on top. Now insert Throw Handle and Target Mast Sub-Assembly into the pivot base. Orient it so that the straight wires are on top and the bent parts of the wires are on the bottom. Make sure the horizontal stop is *not* between to two escutcheon pins. Ensure that the sub-assembly will rotate freely inside the pivot and bend the wire that forms the handle approximately 90 degrees so that the sub-assembly will not fall out.

Cut a piece of 1/16” tubing approximately the thickness of the platform and insert it into hole “b” of the platform. Insert the turnout point link bar into the 1/16” tube bushing with the bent end underneath.

Make a Link Bar from 3/32” square brass tubing or .100” square Styrene. I prefer brass for durability. Drill #60 holes at each end 14 mm apart, as in Figure 4 to match the spacing between holes “a” and “b” on the platform

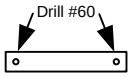


Figure 4: Link Bar

Figure 5 shows the almost completed assembly and figures 7 and 8 provide a photographic view. Slide the link bar onto the pivot assembly and the turnout point link bar as shown in Figure 5. Bend the wires that project through the link toward the center of rotation approximately 90 degrees toward the pivot points to prevent the link from falling off. Ensure that everything rotates freely without binding. You may need to make some minor adjustments. Trim the “stop” wire if it projects more than 1 millimeter beyond the escutcheon pins to eliminate possible binding against the roadbed when the ground throw is mounted in the roadbed.

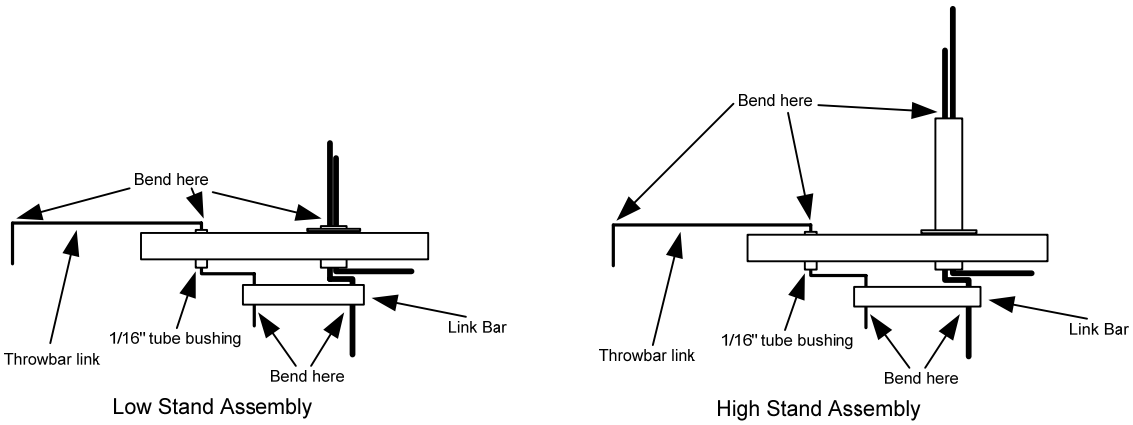


Figure 5: Final assembly, Side view (Stops are not shown)

The choice of switchstand target you install will depend on the prototype you are modeling or your personal preference. For high targets, used primarily on the mainline, I chose a circular target. I used a Micro-Mark punch to punch 3/16" holes in thin sheet brass and used the punchout disk for the target. I centered, oriented it, and soldered it to the vertical mast. I prefer to solder this target after the ground throw is installed so that the target will be perpendicular to the track in the "reverse" position. For low switchstands, used primarily in yards, I made "X"-shaped targets using strips of .005 sheet brass approximately 9 scale inches wide, or your preference. Using a small pair of pliers I made a series of folds at right angles to the length of the strip approximately one scale foot apart. Figure 6 shows a top view of a not yet tightly folded target. Tightly fold the corners using the pliers and solder the leaves of the "X" to keep it from unfolding. Use a small clamp to hold the "X", orient it so that the leaves are parallel to and perpendicular to the track, and solder it onto the vertical mast.

Figure 6: Low Target Top View

To mount the switchstand, cut a rectangular hole in your roadbed or sub-roadbed that is wide enough and long enough to clear all moving parts, but allows enough overlap to secure the platform onto the roadbed. Refer to Figure 6. Position the hole so that downward projection of the throwbar mates with the turnout point throwbar without binding. I prefer to secure the assembly with #256 wood screws at each end. Drill the holes for these screws after you have determined the optimum position for them.

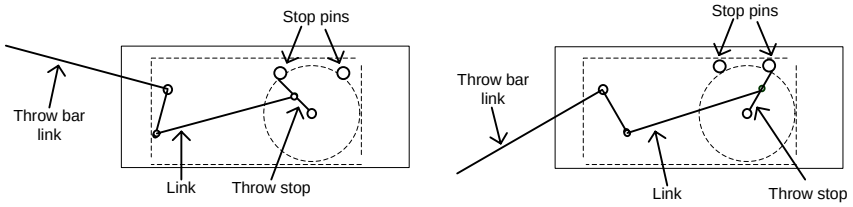


Figure 6: Ground Throw Geometry

Figure 6 shows the approximate geometry of the ground throw assembly in the “normal” and “reverse” positions. The dotted circle shows the area where the throw stop will rotate when the unit is “thrown” and it must clear the sides of the pit. The dotted rectangle shows the approximate area underneath the ground throw that must be clear to permit the unit to operate without binding. Note that there is an area of overlap at each end to secure the unit on the surface of the roadbed. If you want the unit to be flush with the roadbed, cut recesses at each end the depth of the platform. Drill a hole at each end to accept a #256 wood screw, drill pilot holes in the roadbed and screw the unit in place. Bend the end of the throw bar link downward to fit into a hole in the turnout point throw bar. Obviously this unit must be installed outside the rails and far enough away from the track so that it will not foul any passing rolling stock. Make a final check to ensure that the unit and turnout points will move freely without binding.

The throw bar link moves through a wider angle than the turnout points require. This provides a positive springing action that will keep the points securely against the stock rails and will maintain the ground throw securely in position.

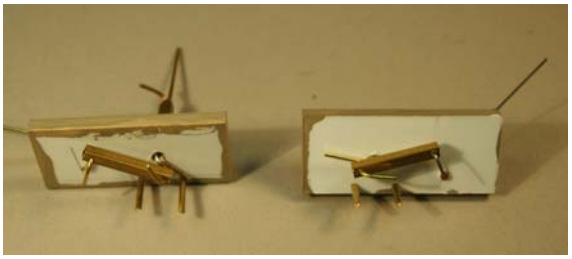
To throw the turnout points, you must rotate the ground throw through a 270 degree arc. I prefer to mount the unit so that the handle points away from the track in the “locked” positions to prevent the handle from fouling any passing rolling stock. Refer to Figures 9 and 10 for examples. To throw the unit, always rotate the handle toward the track.

I also like to solder a short length (12 to 20 scale inches) of 1/16” tubing to the end of the handle, primarily for appearance, but also to prevent the handle wire from piercing your finger when you throw the turnout.

This unit can be wired to provide a “hot frog.” To do this, solder one end of feeder wires to the stop pins and the other end to the stock rails, or other source of track power supply. Solder a wire from the pivot assembly, taking care that you do not solder the throw assembly to the pivot at the same time. (You might want to do this early in the assembly.) Solder the other end of the wire to the frog. You will probably need to experiment to determine which feeder wire to connect to each rail to observe correct frog polarity.

When your assembly is complete, paint the base to match the roadbed and cover it with ballast or other ground cover as you prefer. Paint the base, handle, mast and target appropriate colors. Be careful not to let paint run down between the pivot and throw unit. Again you might want to do this painting earlier in the assembly. Figures 7 and 8 show almost completely assembled units. Figures 9 show a low unit installed on a yard turnout and Figure 10 shows a high unit installed on a mainline turnout.

The manufacturing process sounds complicated, but with practice you can build a unit in about 30 minutes. You can speed up assembly even more by using mass-production methods to build multiple units at a time.



Figures 7: Assembled Units – Bottom View

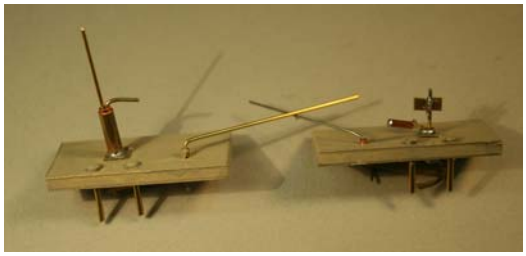


Figure 8: Assembled Units – Top View

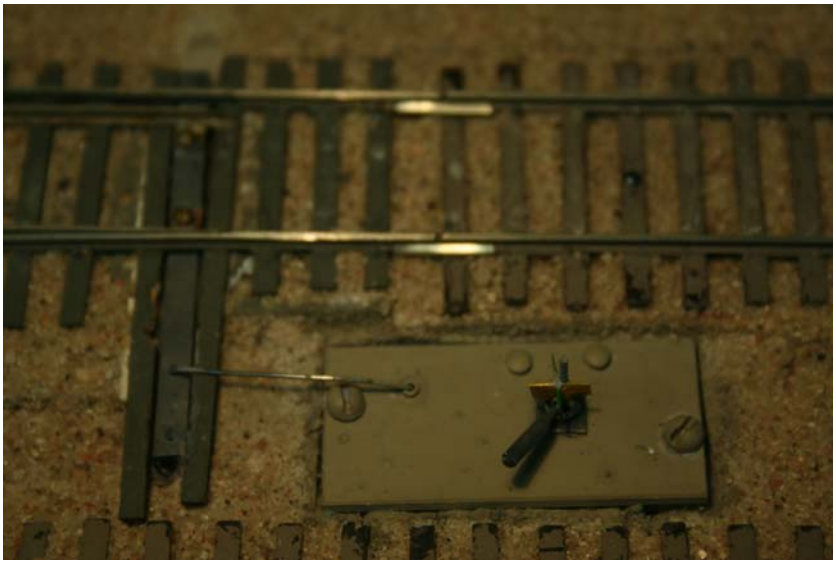


Figure 9: Installed Low Ground Throw

Figure 10: Installed High Ground Throw