Servos for Semaphores

By Trevor Lloyd-Lee © 2014

The miniature servos used by modellers of R/C model aircraft respond to a variable pulse-width signal. However, it is easy to operate them from an on/off switch by incorporating a readily available electronic driver device marketed by several different suppliers. These devices are designed to control a number of servos, each from its own on/off switch. The new junction on my layout needed seven new signals and was the ideal opportunity to try out these servos and the *"Octopus"* driver that can drive up to eight servos.

Photo #1

Photo #1 shows a single servo arrangement, and how the servo and switch are connected. The below-baseboard situation for this particular signal was one of uncluttered access, so rather than use my build jig, I just winged it. The servo is hot-glued to a length of half-inch-square wood which was then glued under the baseboard so that the operating wire from the signal lined up with the servo lever. A separate piece of wood was hot-glued to a baseboard frame member that was conveniently close and carries the slide switch. Because I winged it rather than carefully thinking the installation through, I created a situation where the extension to the signal operating wire passed very close to the slide switch terminals, so a length of insulating sleeve needed to be threaded on to the extension wire to prevent the possibility of any circuitry being shorted out.

Photo #2

Photo #2 shows a three-arm bracket signal mounted in a build jig and gives an overall appreciation of the compactness of the servos mounted below the track bed. I highly recommend the use of a build jig. This allows the servo and associated pieces to be assembled and tested while working comfortably at the workbench. When it has been finally tested and is working as required, it is a simple task to transfer it to the layout with the minimum of 'under-the-baseboard' contortion of the human body. The photo shows the *"Octopus"* PC board temporarily attached to the build jig.

The only critical part of the build jig is the cantilevered piece of wood that supports the signal. This needs to be the same thickness as the layout baseboard material where the signal will be installed. It needs to be elevated about 4 inches above the build jig base. May I suggest to modellers that have transportable layouts with shallower framing, that they build one mechanism copying my technique and then explore ways to make it more compact to suit their baseboard framing.

Ensure that the signal post is long enough to protrude through the baseboard material by about a quarter of an inch. Solder a 10 BA x 3/8" long screw to the signal operating wire. The head of a 10 BA screw is small enough to pass through the track bed hole drilled to suit the size of the signal post. (Any similar size screw and matching size nut will work just as well.)

A strip of wood and a small piece of hardboard make a carrier for the servos that are stuck to it. I use a blob from a hot glue gun. This carrier is screwed to the underside of the build jig now, and later transfers to the layout. The wooden strip has a notch cut into it, which fits around the protruding signal post and positions the carrier. The width of this strip of wood is adjusted so that the servo lever is in line with the signal post. Carefully study the underside of the baseboard at the signal's location for possible obstructions and then ensure that the orientation of the signal and the servo carrier when in the build jig is a copy of the required alignment when installed on the layout.

I use 1/32" dia. brass for the operating wire simply because it is a sliding fit in a 1/16" dia tube. (Both from the K&S range.) Bend the end 1/8" through 90 degrees. Thread the tube hook on this wire and then solder a nut to the end of this wire as shown in sketch Fig 1.

To help make the assembly of the nut on the operating wire to the screw attached to the signal wire, I strongly advise the addition of the extension soldered to the operating wire, shown in fig.1. Having to wind the nut onto the screw without it, is not something anyone is likely to try more than once.

Fig. 2 shows how I added a DPDT slide switch, operated by the servo, to facilitate automatic electrical interlocking of signals and turnouts, without the need for additional manual switches cluttering up my control panel. Fig 4 gives an example of one very useful task the servo operated slide switch can do. A small amount of adhesive from a hot glue gun is all that is required to fasten the switch to the side of the servo. It helps to roughen the paint on the side of the switch body first.

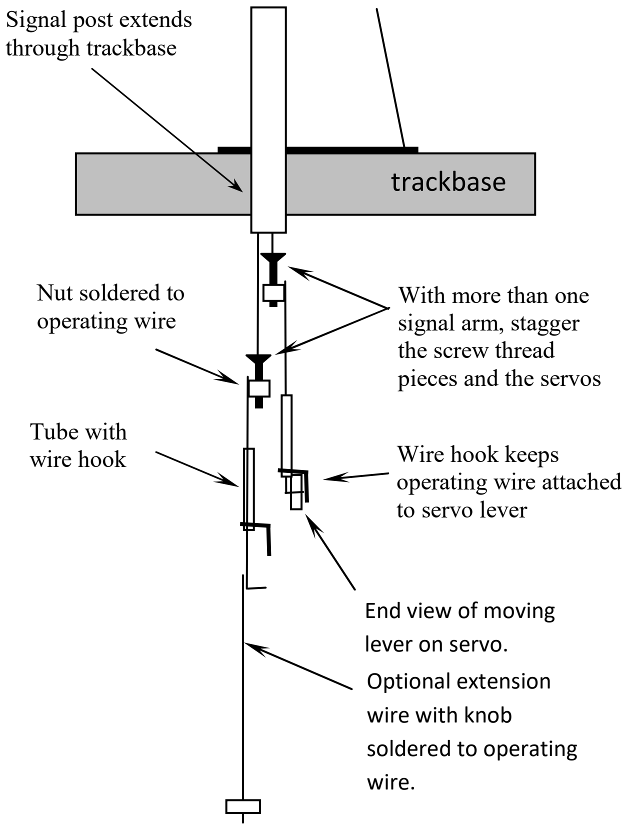


Fig. 1 Various components of adjustable linkage below track base.

Fig. 3 shows the slide switch drive more clearly. The "Z" shape switch operating wire passes through a hole drilled in the switch knob and has two metal collars, one each side of the switch knob. Drive the servo to the end of its travel that puts the operating wire in its lowest position. Move the switch knob to its lowest position; move the top collar down to touch the switch knob and solder it to the wire. Drive the servo to the other end of its stroke. Move the switch knob to the other end of its travel and move the lower collar to touch the switch knob and then solder the lower collar to the wire. Operate the servo electrically several times to ensure that both the servo and switch travel the required distance.

Now comes the tricky bit for me, telling you about servos and their driver electronics when the little I know about these topics is just what I learned putting this one project together.

The "Octopus" servo driver is marketed by www.tamvalleydepot.com. The Octopus 3 user's manual can be downloaded from this website. Their UK stockists are http://www.digitrains.co.uk/ and http://www.coastaldcc.co.uk/. Cost around £23.

I have the "Octopus 2" driver. This model has recently been superseded by "Octopus 3" that has a few extra 'bells & whistles'. The basic features are the same. I chose the most basic feature which is to have all servo levers moving through the same angle, which drastically reduces set-up time. The choices available are approximately 17, 33 or 55 degrees. I chose the 33 degree setting.

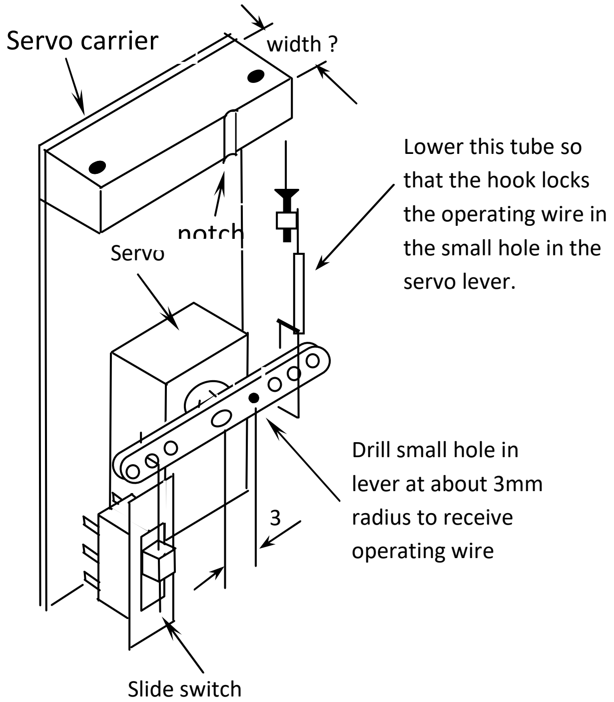


Fig. 2 How the servo, switch and operating wire come

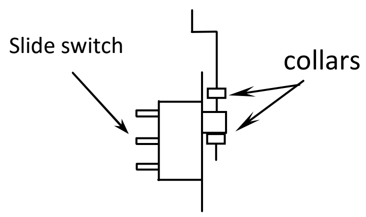


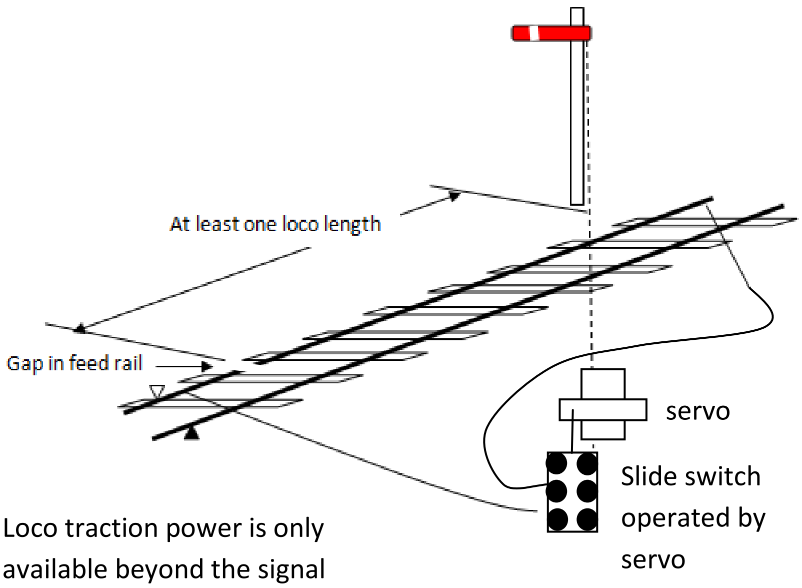
Fig. 3 "Z" shape wire with collars to move slide switch knob

One useful feature allows each servo to be set up individually. If you wish to do this then you will require an alignment tool at about £8. (Only one is required, irrespective of how many servos need to be programmed). Another available feature is to have the DCC add-on, which will allow servos to be operated directly from a DCC controller. These two features are explained in the user's manual, but I have no experience using either of them.

It is recommended that the Octopus is powered by a separate 12v DC 1 amp power supply because it, like many electronic circuits, can be affected by electronic noise from other shared circuits.

I used SR90 miniature servos. This is a generic code for a common type that is readily available at about £3 each. (All prices quoted are correct for Jan 2014).

I have no connection with Tam valley Depot except as a very satisfied customer.



Loco traction power is only available beyond the signal when the signal is in the “Go” position.

Fig 4