

## POINT MOTOR FITTING AND WIRING

The topics covered in this article are the same no matter what points you use from our extensive range whether it be Peco Steamline, Peco Settrack, Hornby or Kato it's all the same in principal.

Naming conventions. There are many names used for these products, Points, Turnouts, Switches, intersections but they all mean basically the same thing. Through this document we will mainly be using the term "Point" as this is the most common expression used in the UK today.

Once you have decided on your track layout and know where to put your points you maybe wondering how to operate them. Do you go manual, rod-driven or more typically for electronic operation? For the vast majority the latter offers the best solution.

At first what can seem like a daunting prospect full of that electronics black magic and voodoo is actually quite simple to do.

You will need some basic tools and parts which include:

Soldering iron 18-25w or a temperature controlled iron and base station but we'll assume you have one of our excellent Antex 18 or 25watt irons. Some solder, for the beginner pre fluxed lead free is the best stuff to get.

Wire strippers

Wire Cutters

Screw drivers

Drill and small drill bits such as from our Expo range

A quantity of coloured wire 7/0.2 is a good starting point and ideally you want

Black - For the Commons  
Green - to Throw to Close  
Red - to Throw to Open



If using the electronic switch part of the point motor you might also consider

Orange - Common to frogs  
Brown - Live feed from track  
Yellow - Live feed from track

Small nails and other tools as needed.

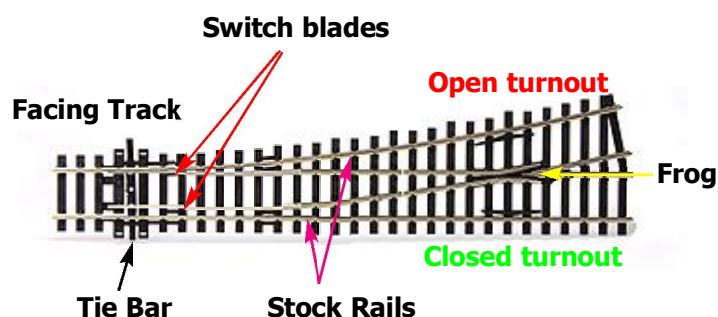
We have provided a shopping list n the last page, just print it out and mark the quantities you require and bring it along to the shop. Firstly let's take a look at the points themselves.

The point has one entry track "*facing*" and multiple outlet tracks, "*open*" and "*closed turnout*".

In the "open" position the point *blades* are set to the runoff section and "closed" the point blades are set straight ahead. It is important to remember this as reference will be made to it further down.

Wiring the track outlets is a subject all on its own and is covered elsewhere and for the purpose of this article we will not be covering specifics in wiring the track itself.

### Anatomy of a model railway turnout/point



The term Frog refers to the crossing point of the two rails. To further elaborate we also have the check rails - black pieces in between the Stock and Switch rails, The blades that set the direction, Tie bar used to keep the blades at the correct distance from each other, Stock rails that run the entire length and sleeper bed that the turnout sit on. For a full description search [wiki:railway points](https://www.wikipedia.org/wiki/railway_points) on the internet

It is worth mentioning that there are many point motor types available, all perform the same task but they fall into three main categories'.

Magnetic coil

Motor

Servo.

There are also many different brands, Tortoise, Traintronic, Gaugemaster Seep, Peco, Hornby, DCC Concepts Cobalt to name but a few. Here we will be dealing with the main types that we sell in large quantities. The Seep, Peco and Hornby electro magnetic.

At a glance the Hornby and Peco look very similar and they are, the Seeps however look quite different. So for this reason narrow our range to two product lines: Seep and the Peco/Hornby.

Both types can be mounted above or below the baseboard but the typical solution is to mount them directly below the point under the base board so they are out of the way and do not need extra detailing to hide them from view. This also has benefits in areas with large concentrations of point work due to the space required.

There is a major difference between the two types though. The Seeps have a built in switch which allows you to operate an accessory such as a signal, mimic board or change the "Frog " Polarity. in synchronisation with the point throw. The Peco and Hornby support this feature but require an additional electrical switch to be purchased,

The Seeps also have the baseboard mounting builtin for under board fitting whereas the Peco/Hornby ones require either a large hole (big enough to pass the motor through) or a mounting base, Whilst the mounting bases are not expensive by any means they are an additional cost item that needs factoring into your budget.

## Wiring the motors.

A quick note on wire runs would not go a miss here. The wires used can either be run directly to the control panel location or be only long enough to reach the nearest support beam of your baseboard and there connected to screw down terminal blocks. The advantage to this is there is less wastage of wire or long lengths of attached wiring to further get in your way whilst performing this stage of layout production and you don't need to have made a decision as to the location of the control system at the point wiring stage. You then only need run lengths of wire from these terminal blocks to the control panel at a later stage.

In order for the motors to throw the point we need to apply current briefly to an electromagnetic coil. The point motors have two such coils: one to "close" the point and one to "open" it. If we think in terms of closed and open we can simply envisage that applying current to the open coil will cause the operating rod to move closer to that coil and in

turn it moves the tie bar in the points in that direction - i.e. open, applying current to the other coil causes the same reaction in reverse and throws the point closed again. The power need is very brief indeed and can be as short as 5ms.

The points themselves also have a spring that holds the point blades in the direction they were thrown so we do not need to keep the motor coils energised for long. The wiring principle is almost identical for all motors. but we have split them into two sections for clarity, one covering Peco the other Seep



*Standard Peco PL10E point motor shown with optional accessories PL-9 Mounting plate shown at the top and the PL-13 Accessories Switch bottom*



*Gaugemaster Seep PM1 point motor with built-in Accessories switch and mounting plate*

### Wire stripping Tip

*When you strip the wire for connecting to your point motors and switches or any other terminal for that matter, don't just strip and remove the insulation. Using your preferred strippers cut the insulation but do not fully remove it from the wire now twist the separated piece of insulation as you slowly pull it free. This twists the copper strands really tight and prevents stray ends from being missed.*

## PECO Point Motors

With Peco motors we need to bond two of the coils together to act as a common so using a small length of wire we cut a section of insulation from the middle, this is easily achieved by rolling the wire on the cutting surface under the blade of a modelling knife at two intervals about 5mm apart then slitting it lengthwise so as to join the two original cuts, so that when viewed from above the cut insulator looks like an "I" we then remove the insulation between the cuts to produce a wire that looks like the one shown right.

Next strip the two ends back 3mm and solder them as shown to the point motor. With this done add a length of black wire to the centre stripped section by forming a loop and hook before soldering as shown. You can then add some heat shrink tubing should you wish to insulate the joint (see our expo range). Now add a red and green wire as shown on the other side and solder into place. That's it, basic wiring is done.

1

***The bonding wire is created by removing a section of insulator from the middle.***

2

***This common feed wire then has the ends stripped so that it can be soldered to the terminals on the motor coils on one face of the point motor***

3

***Solder the bonding wire that you prepared in steps 1 and 2 to the point motor this is the common connection.***

4

***A common feed wire is now added to the bonding wire. This then runs to a connection block or directly to the control panel***

5

***Now add in the two trigger wires that also need to run to the opposite location as the black common feed from step 4***

6

***The mounting plate needs the centre two tabs bent in as shown***

If mounting under the base board (for direct mounting see the instructions supplied with your point motor) you can now add the Mounting plate. If using 00 this requires (as it does for direct fitting on 00) that the centre tabs are bent flat (these are only used to mount directly to the point if using N gauge). Locate the outer tags into the corresponding slots in the base and push home, now bend the tabs in using a small screw driver. (Watch your fingers are not in the line of fire in case you slip with the screw driver.)

If using the optional switch it is a good idea to solder wires to these prior to gluing in place. Just solder one wire to each contact, the two tags closest together are the switch and the furthest one is the common. So

7

***Fit the mounting plate to the tabs provided and bend them over to secure.***

8

***Fitting the switch only requires a small dab of Cyno glue on each end making sure not to get any into the mechanism (the internal bits can be removed beforehand quite simply to avoid this issue.)***

To make trouble shooting easier at a later stage it pays to adopt a colour scheme so that the open coil is always for instance the red wire (Danger) and the closed coil (Safe) is always the green wire. This can save you potentially hours later when trying to find a fault. Oh and one other thing WE CAN NOT STRESS THIS ENOUGH... Mounting of the motor MUST be parallel to the throw of the tie bar for reliable switching of the points.



## Mounting a Peco / Hornby point motor

Temporarily position the point in its final location making sure it's final fitment will be nice and level to insure smooth trouble free running.



The next task is to centralise the blades so they are in the middle of each throw. This can be done with spacers (shims) set between the stock rails and the blades as shown. Shims can be made from off cuts of plasticard or left-overs from a plastic kit.

We can now mark out the position of the fixing holes. This should ideally be done from above the board so that you can reference the orientation of the tie bar as the motor needs to be mounted parallel with the point.

Place the point motor upside down (i.e. mounting base down on the top surface of the rails), orientated with the red wire in opposition to the turnout rails and parallel with the track. Carefully position it in its centre of throw position so that the actuating rod is an equal distance from the two coils and drill three pilot holes using the base as a reference through the base board. Once done remove the motor and point.

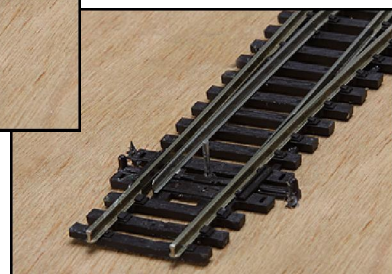
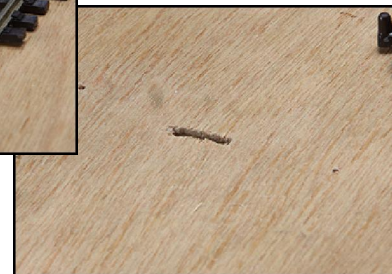
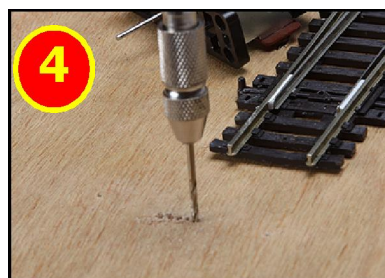
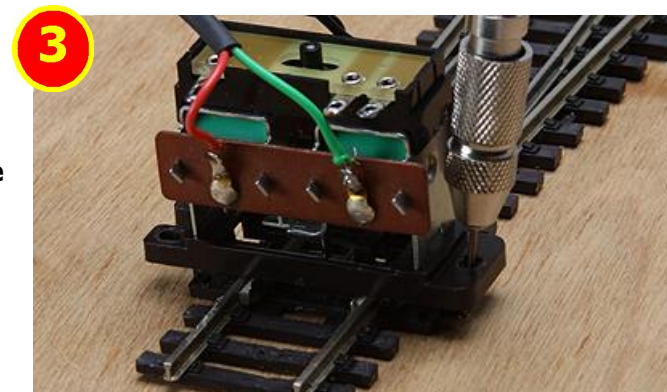
You now need to cut a slot in the board that is equal to the throw of the point blades but we generally cut one that is just larger than the total throw of the motor. This needs to run between the outer to the inner stock rails in the same direction that the tie bar moves. Start by drilling small 1 mm holes ether side of the first hole we drilled through the tie bar (2 ether side usually does the job). Join the holes together using a small saw, cutting disk or knife and file away the burs. It is also a good idea to seal the exposed baseboard with watered down PVA glue.

You can now test fit your motor and point to your layout. Connect the wires to your chosen switching method and test it throws correctly making any subtle adjustments as required.

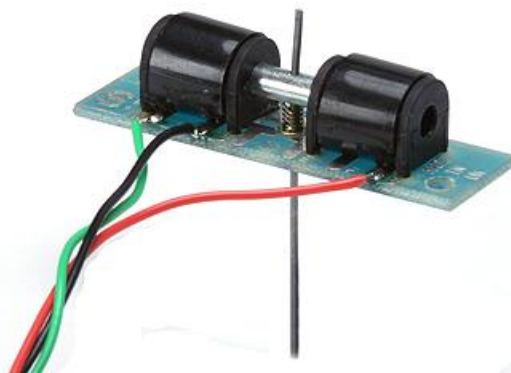
If you will be using trackbed and/or ballast You can now scroll down to see the "how to tackle trackbed around points" section on page 6.



Now mark the baseboard by drilling through the hole in the tie bar that the point motor actuating rod will pass through (typically this would involve drilling a small 1mm hole through the board taking care not to damage the point in the process.)



## SEEP Point Motors



With Seeps, the bonding of the two coils is done internally on the circuit board so you only need to add wires to the tabs A, B and C by tinning a small amount of solder on to the tab and with heat applied feed a length of striped and tinned wire into the molten solder on the point motor tab before removing the iron. Allow the solder to flash off and repeat for the other three tabs. If utilising the switch you also need to solder wires to the remaining three terminals with "F" being the feed and "D"- "E" supplying the switching action.

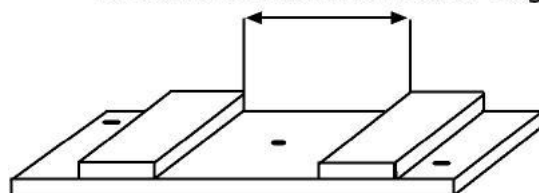
You are now ready to mount the motor to the base board and point.

To make trouble shooting easier at a later stage it pays to adopt a colour scheme so that the open coil is always for instance the red wire and the closed coil (Safe) is always the green wire. This can save you potentially hours later when trying to find a fault. Oh and incase you missed it in the Peco section - one other thing **WE CAN NOT STRESS THIS ENOUGH...** Mounting of the motor **MUST** be parallel to the throw of the tie bar for reliable switching of the points.

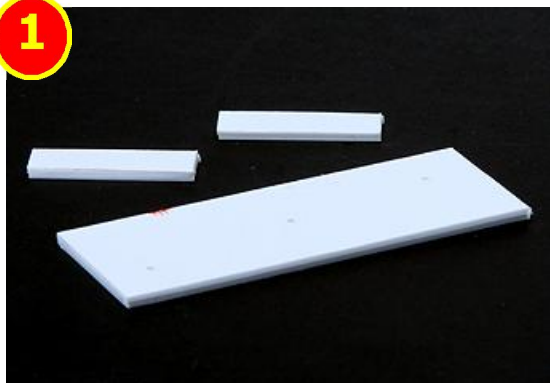
### Mounting the Seeps.

With the Seeps, especially if doing a large quantity, it is extremely beneficial to spend some time making a drilling template. Many examples exist on the internet on how to make one of these and other fixing jigs but here is a simple one any one can make.

Distance between rail outer edges



1

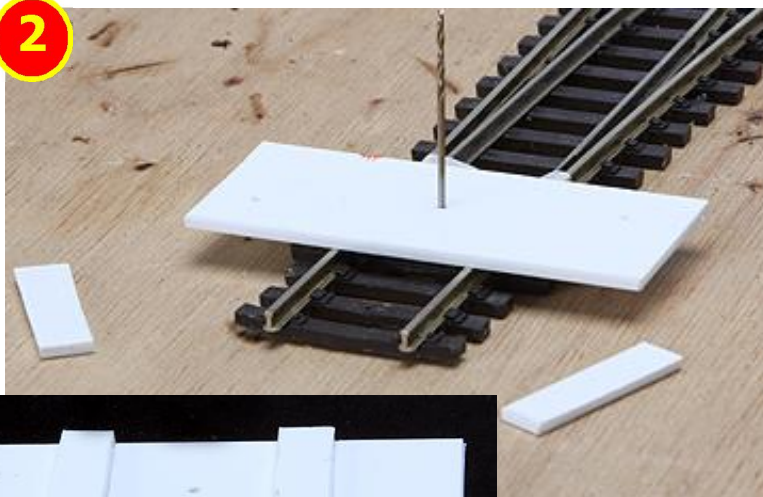


Unlike Peco mounting plates which have the fixing holes in a geometric pattern Seeps have their fixings offset so we can not directly use the motor as a template as it would need to be placed the correct way up leaving too much room for error due to the guidance holes being further away from the base-board.

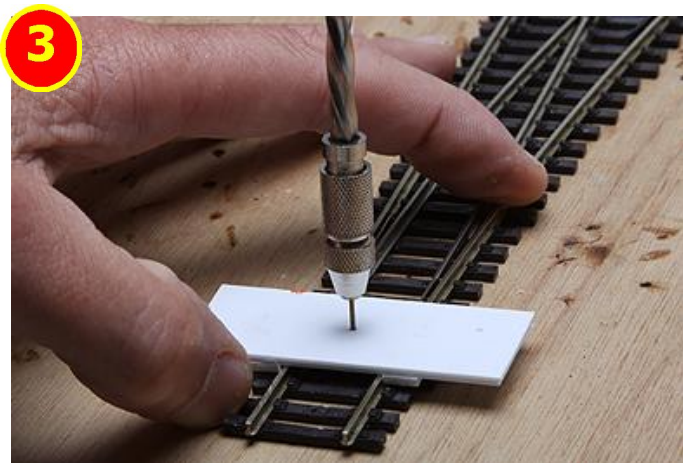
Using some 1.5mm approximately plasticard cut a rectangular piece 60mm x 23mm and two further bits 6mm x 23mm. Mark and drill a 1mm hole in the dead centre of the larger piece (30/11.5mm centre) this will form your actuating rod location. Now drill two 1mm holes at ether end, 4mm off centre line in opposite corners. (use an upturned motor inserted through the first hole for reference).

Place the large rectangle on your bench with the longest length running left to right and with the mounting holes located bottom left and top right. Grab a spare point and place a small piece of masking tape over the point at the tie bar location. Now place the large rectangle over the tie bar of the point and locate a nail or similar through the centre hole and into the tie bar actuating rod hole. Carefully move the blades to the central position, the masking tape more often than not holds them in position or shim them in place. Now glue the two smaller pieces to the underside of the larger piece making sure they are against the stock rails, be careful not to get glue on the point if you missed the bit about masking tape earlier. Allow it to set before removing.

2







You now have a template for Seep motors. To use it simply place the point in its final location and slip the template over the top using the two glued on spacers as location markers against the outer rail edges and secure using a small nail passing it through the central hole and into the tie bars corresponding hole. This will hold the point blades in their central position for the moment. Make sure the point is lined up with the rest of the trackage it serves and is in its correct place. Now using a 1mm drill make the pilot holes for the mounting screws using the holes in the outer edge of the template as a guide and fix in place with two more nails. Whilst holding the point blades in the central position carefully remove the central nail and drill the pilot for the actuating bar. Remove the template and the point.

You now need to cut a slot in the board that is equal to the throw of the point blades but we generally cut one that is just larger than the total throw of the motor. This needs to run between the outer to the inner stock rails in the same direction that the tie bar moves. Start by drilling small 1 mm holes either side of the first hole you drilled through the tie bar (2 either side usually does the job). Join the holes together using a small saw, cutting disk or knife and file away the burs. Seal the exposed cut with watered down PVA Glue



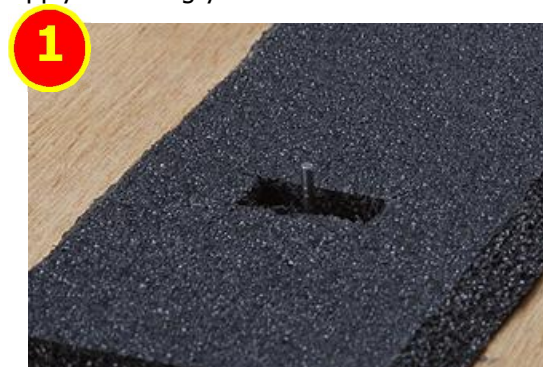
Locate the motor from underneath making sure the actuating rod passes through the slot in the base board and lightly screw the motor into place. DO NOT OVER TIGHTEN.

You can now test fit your point to your layout, connect the wires to your chosen switching method and test it throws correctly making any subtle adjustments as required..

## How to tackle trackbed around points

It is good practice to use track bed and the best stuff to get is the High density closed cell foam variety such as the Woodland Scenic's track bed ST1474 for HO/00 and ST1475 for N gauge that we supply in 24 foot rolls. Without going into the actual laying it is important to show how we tackle the point motors if you are going to apply ballasting your track.

With your point motor fixed into place cut a section of track bed that fits the length of the point being installed. And make a rectangular cutout where the actuating pin travels - make this slightly bigger than the slot you cut in the base board so that it can not interfere with the actuating rod.



Using a piece of aluminium cooking foil, cut a small rectangular piece that is larger than the hole in the track bed. Into this make a slit slightly longer than the throw of the point motor. (we have made this oversize in our example for clarity, but you only need to cut a single blades width of the foil.

Glue your track bed into place then cut and shape a further piece to accommodate the turnout of the point and glue this into place also. Now pass the tin foil over the actuating rod and glue in place making sure first that the motor moves freely. Now once your point is installed any ballast will not fall down the gap in the board and gum things up and there is no unsightly hole showing from above the base board. You can of course paint the foil first to further hide it.



## Activating your point motors

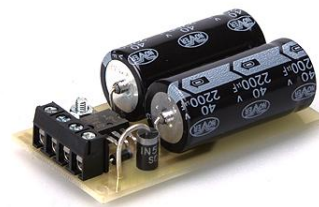
These days there are generally three ways to control points of the type discussed here.

Passing Contact Switches - Centrally biased on - off - on  
Pin and Probe on a mimic (track plan) board  
DCC Accessory Decoder

Ideally the first two should also be used with a CDU (Capacitor Discharge Unit). These greatly improve reliability in that they build up and store the current needed to operate the point motor and release all this energy in one blow. This minimises the risk of burning out a motor which can happen if they are left energised for any long (>1sec over a few months use) period of time.

The voltage required can be AC or DC (except when using DCC on some accessory decoders) and ideally needs to be around 16volts

The switches can be either our Expo SPDT biased centre off ones, Expo momentary push buttons, Peco point switches (which are available in different colours) or Hornby point switches.



**Gaugemaster  
Capacitor Discharge  
Unit CDU**



**Peco PI-26 switch**



**Hornby R044 switch**



**EXPO A280-93 sub miniature biased  
switch SPDT and EXPO A280-21 Push  
to make SPST switches**

The wiring for these is simple in that the common terminal has the power supply (or CDU) wired to it and the other two terminals have either the red or green wire to the point motor to throw it into the open or closed position depending on the direction the switch is operated.



The stud P-18 and probe PL-17 version mimics the switch in that the probe has the signal current from the Power supply or CDU and the studs (two per point) are connected to either the red or green terminals of our point motors. Briefly touching the probe on one stud or the other throws the point in that direction.

**Peco PL-18 studs and washers  
and PL-17 Probe**



With DCC you switch the point from your controller. This requires an accessory decoder (typically they each independently control 4 points) and need programming in order to work. This can quickly become not only complicated but expensive on large layouts. However the organised operator soon becomes familiar with which point requires which address to be recalled. And for some is an ideal solution.



**Hornby R2847 Accessories  
decoder for DCC operation**

Shopping List	Qty / Colour
Peco Wire PL-28 Various colours	.....
EXPO Wire 01-04*0 Various colours	.....
Expo Heat shrink tube 254-01	.....
Drill Archimedes PCB drill and 2 collets 750-22	.....
Drills Set Small sizes 116-21	.....
Soldering iron Antex CS18 18watt soldering iron	.....
Peco Point motor PL10 (standard)	.....
Peco Point motor PL-10E (extended pin),	.....
Peco Point motor PL-10W (low power)	.....
Peco Point motor PL-10WE (low power extended pin)	.....
Hornby Point Motors R8014	.....
Peco point motor Mounts PL-9 (5 PACK)	.....
Peco Point motor Accessory Switches PL-13	.....
SEEP Point Motors PM1 or PM2	.....
1.5mm Plasticard (per sheet)	.....
Woodland Scenics Track bed HO/OO ST1474	.....
Woodland Scenics Track bed N ST1475	.....
Peco Switches PL-26 Various coloured levers	.....
Hornby Switches R044	.....
Expo passing on - off - on centre biased Switches A280-93 5pack	.....
Expo Push button Switches PMRB A28021 10pack	.....
Peco Probe and stud System PL-17 and PL-18	.....
Gaugemaster Capacitor Discharge Unit CDU	.....
Hornby DCC accessory point decoder R8247/R8216	.....

Your list

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