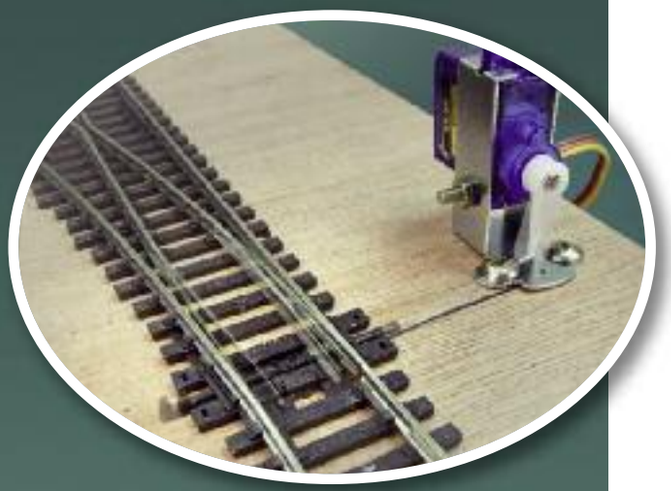
PECO

Using the Peco SmartSwitch™



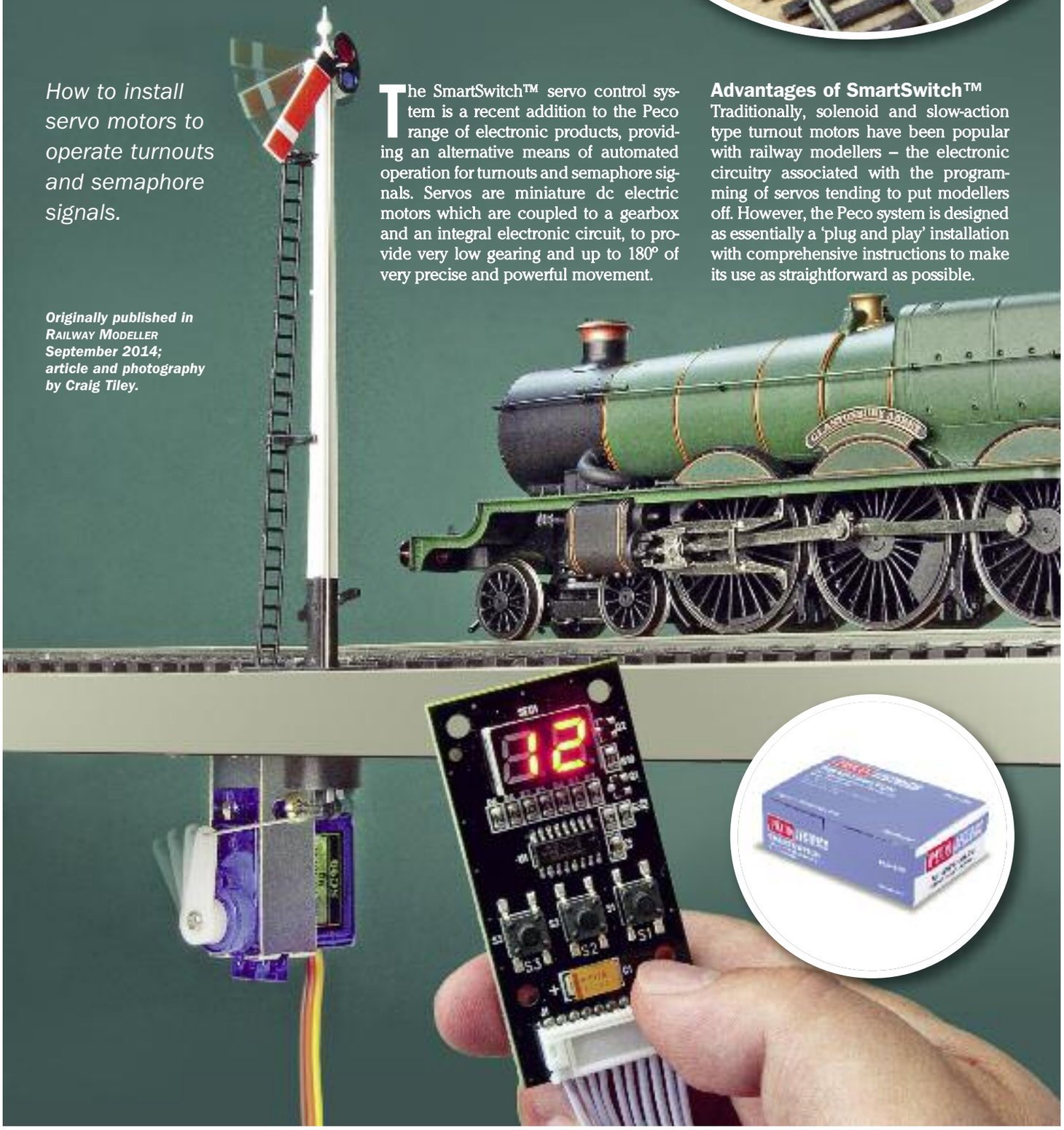
How to install servo motors to operate turnouts and semaphore signals.

Originally published in RAILWAY MODELLER September 2014; article and photography by Craig Tiley.

The SmartSwitch™ servo control system is a recent addition to the Peco range of electronic products, providing an alternative means of automated operation for turnouts and semaphore signals. Servos are miniature dc electric motors which are coupled to a gearbox and an integral electronic circuit, to provide very low gearing and up to 180° of very precise and powerful movement.

Advantages of SmartSwitch™

Traditionally, solenoid and slow-action type turnout motors have been popular with railway modellers – the electronic circuitry associated with the programming of servos tending to put modellers off. However, the Peco system is designed as essentially a 'plug and play' installation with comprehensive instructions to make its use as straightforward as possible.



The main advantages of using a servo to operate a turnout or semaphore signal are that it allows precise control over the pitch of the throw, is less noisy (than the 'zap' of a solenoid) and the speed of the throwing action can be adjusted to suit. The physical size of a servo assembly is also a lot smaller than some of the popular types of slow-action turnout motor, making it much more versatile and suitable for confined spaces.

Servos can also be used to operate crossing gates and other moving features on layouts, and are powerful enough for use with all scales and gauges up to G. There is also the advantage that SmartSwitch™ servos are powerful enough to throw a Peco turnout without the need for modification, or removal of the over-centre spring.

SmartSwitch™ – what you get in the box

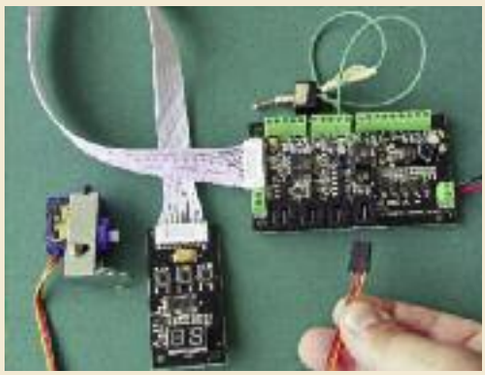
Peco offers SmartSwitch™ as a complete starter kit in a box (ref.PLS–100) with sufficient servos and components to operate four turnouts. Although, upon opening the box, the electrical circuitry looks rather complex, it is very easy to connect up; simply a matter of plugging the control board, servos and remote servo programming boards together with the leads supplied. The only external wiring required – to be fitted by the user – is the connecting wires to the toggle switches (Peco PL–31 push-on terminal connectors and shrouds can be used), and to connect a separate auxilliary 12V dc power feed to the input connections on the control board; on DCC installations the power feed can, if desired, be taken from the track.

Illustrated here are the control board, programming board (the smaller of the two), cable to connect the programming board to the control board, and comprehensive instructions. The starter kit also comes with various fixings (not pictured) for securing the control board to a layout baseboard.

The kit comes with components for four servos; the parts for one are illustrated here. Clockwise from top left: servo mounting bracket, bolt for securing servo to bracket, servo, toggle switch for operating servo, wire linkage, screws to attach servo horns, three servo horns and two wood screws to attach mounting bracket to baseboard.

Preparing the servos for installation

1



Illustrated here is the arrangement for pre-programming the servos on a workbench, prior to installation on a layout. The programming board is linked to the control board, with temporary power provided from a 12V dc controller (via the black and red wires on the right). The arrangement for connecting a toggle switch has been improvised; the masking tape protecting against an electrical short across the switch. The plug from the servo is illustrated being attached to port No.1 on the control board. The programmed settings for each servo are stored on the control board, so each servo installation needs to be assigned to one of the four ports, which it then retains for all future programming and operation. Bench testing the servos like this also affords a good opportunity to become familiar with the SmartSwitch™ system and the programming prior to installation.

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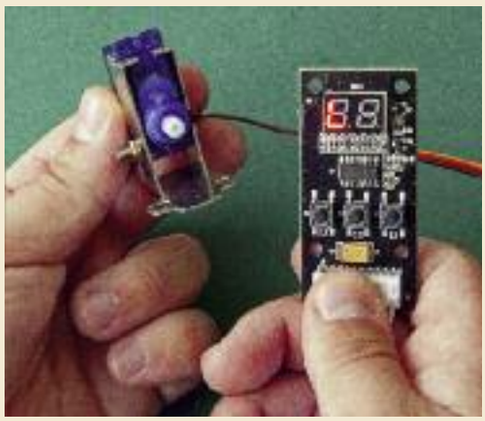
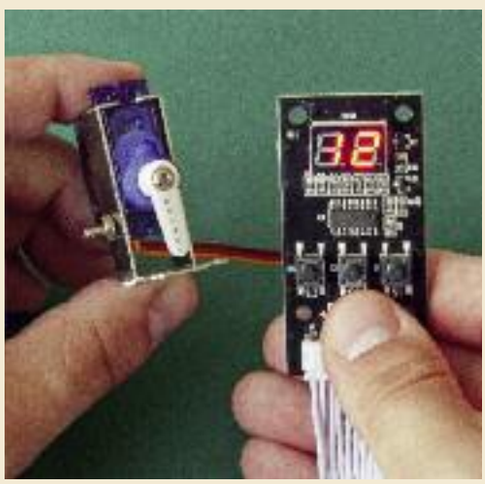


With power applied to the servo, the first task is to set the servo mechanism to its mid-position. This is achieved by pressing the S3 button on the programming board to scroll through the functions until 'L' is shown on the LED display. After three seconds the servo will automatically assume its mid position. This ensures that when the servo horn is fitted, there is an equal amount of throw available in both directions; particularly important if a 180° action is required.

3

With the servo set to its mid-position, the required horn can now be attached. Choosing which one of the three to fit is very much dependent on the specific installation of the servo – there's no hard and fast rules, and a bit of experimentation may be required. The horns are a push fit, and should be fitted to the servo in mid-position also. A screw (note that different sizes are supplied) is then fitted to retain the horn in place.

4

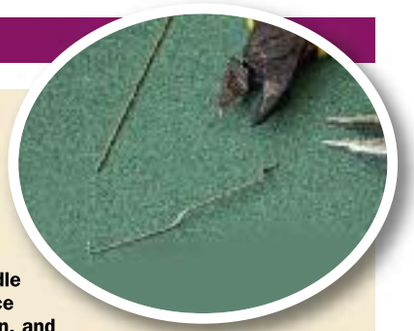


As supplied, the servo mechanism is programmed to turn well over 90°; a much greater throw than is required for most installations. To avoid any potential for damage upon linking up (particularly to signals), the throw of the horn needs to be reduced to less than what is actually required – just a millimetre or two in each direction. The servo pictured here is being programmed to achieve this; the '1' denotes the number of the servo (1 of 4), whilst the '2' refers to the direction of the servo (1 or 2, which are interchangeable). Buttons 'S1' and 'S2' are used to adjust the extremity of the throw in each direction.

Operating a turnout with a surface-mounted servo

1 With the servo pre-programmed, it can be fitted to the layout. I drew a line on the baseboard to set the horn of the servo in line with the turnout tiebar. Peco turnouts have raised spigots on the tiebar ends, which can be sliced off to reveal a hole through which the linkage wire can be attached. Here marks are being made through the mounting bracket to drill pilot holes for the two mounting screws.

2 A 100mm length of 0.6mm steel wire is supplied with each servo; strong enough to provide unsupported linkages across short distances. Pliers and snippers are used to fabricate the linkage, joggled in the middle to cater for the height difference between the tiebar and the horn, and with hooks at each end to retain the linkage in place. The length of the linkage is judged by having the turnout blades 'chocked' (with scraps of styrene) in mid-position.



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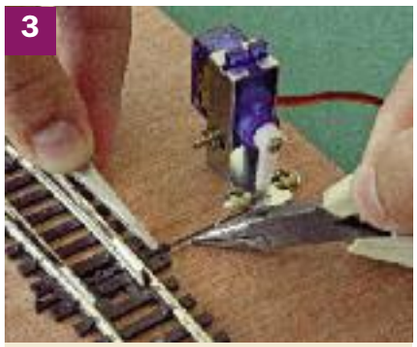
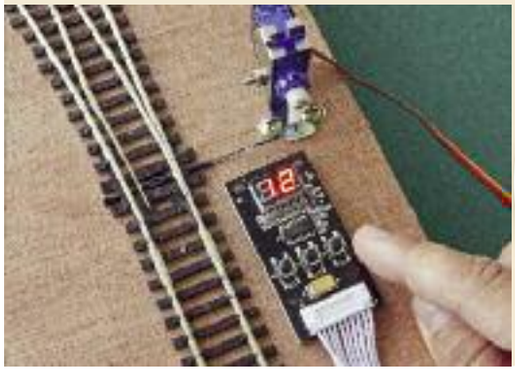
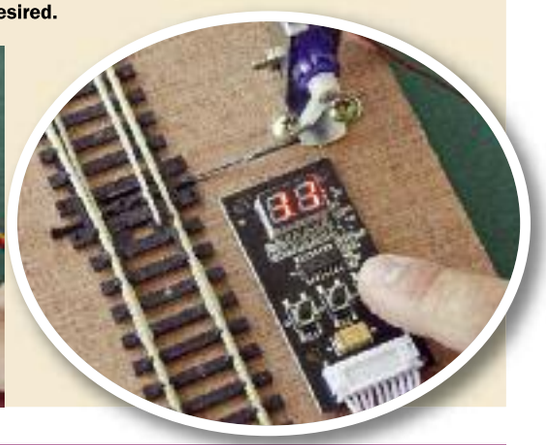


The linkage wire is then attached as illustrated with the tiebar end of the wire routed up through from underneath. Note the styrene 'chocks' referred to in the previous step. Upon removal of the chocks, don't be overly concerned if the spring of the turnout causes the blades to move across.

4 With the servo and turnout mechanically linked, power can be applied, which will cause a sudden initial movement from the servo. However, because of the pre-programming the amount of movement will be restricted. (Note that linking up the servo and applying power with it set to factory settings will cause the servo to overpower and damage the linkage wire.) Now the servo can be adjusted so that – in each direction – the relevant turnout blade makes positive contact with the corresponding stock rail. The programming board allows fractional adjustments to be made and also enables the speed of the throw to be changed if desired.





Operating a turnout with a servo mounted underneath the baseboard

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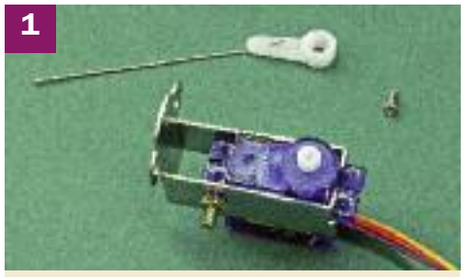


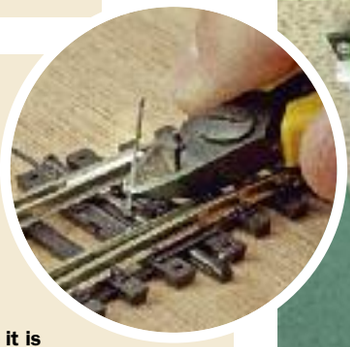
Servos can be installed underneath a layout to operate turnouts. In contrast to the previous installation, the servo motor illustrated here has been rotated through 180° within the mounting bracket, to give greater distance between the horn and the turnout tiebar. An overlength section of the linking wire is cut and hooked onto the horn as illustrated.

2

The horn is then fitted to the servo by first threading the end of the wire through the small hole in the mounting bracket.

3 To allow the wire to pass up through the tiebar, an 8mm (maximum) hole needs to be pre-drilled in the layout baseboard directly in line with the centre-point of the tiebar. (This needs to be planned in advance, prior to final fixing of the track to the baseboard.) The servo is then installed, with the mounting bracket screws located either side of the hole for the linkage.

4 The servo is then programmed to provide the required throw in both directions. The protruding end of the linkage wire can then be trimmed back with snippers to just above the the top surface of the tiebar. Note that the arcing movement of the horn causes the linkage wire to pitch upwards during the middle part of its throw; this should be considered when trimming the linkage wire to ensure it is not cut too short.



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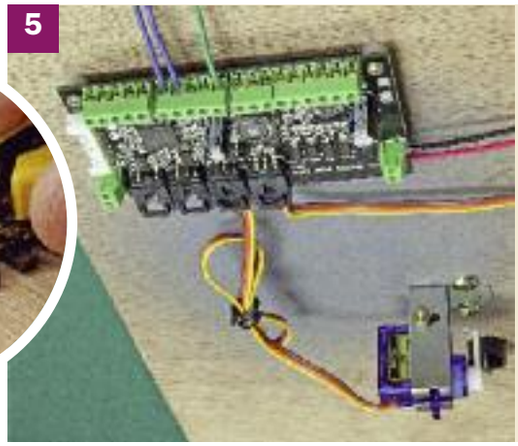
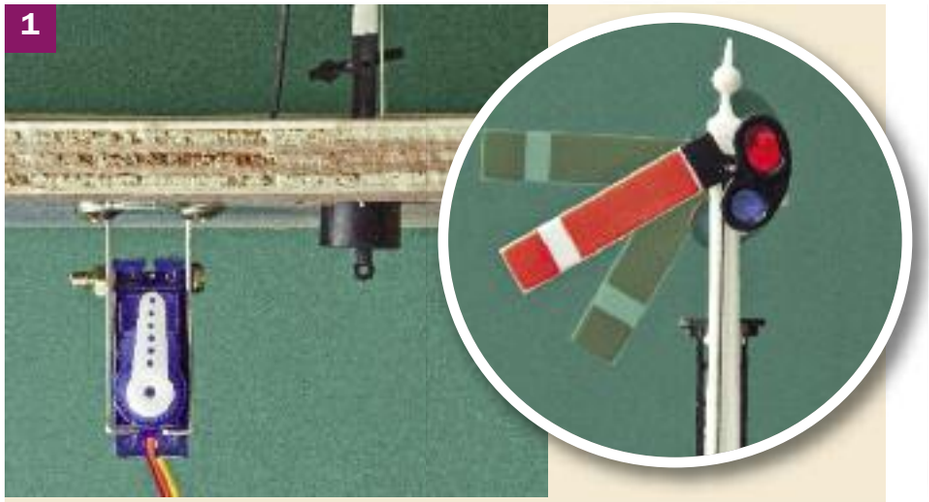
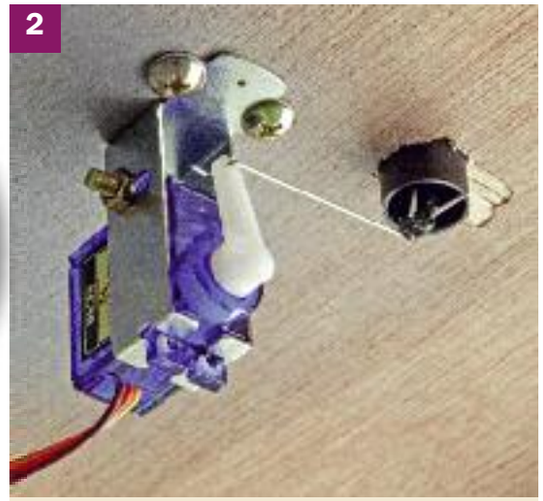


The control board is supplied complete with fixings to allow it to be attached to the underside of a baseboard, as shown. The board should be orientated such that the socket into which the cable for the programming board is plugged remains easily accessible. The arrangement pictured here represents an installation with two servos. The toggle switches that are provided with the servos are intended to be mounted on a control panel or mimic diagram.



A Ratio GWR home signal (ref.460) has been used here to demonstrate fitting a servo to a semaphore signal. The plinth at the foot of the signal post has been fixed securely to the baseboard surface. The servo has been attached so that the horn on the servo and the signal operating lever (visible protruding below the black tubular housing) are in line. The inset shows the mid-position that the semaphore arm needs to be set to prior to fabricating and fitting the linking wire.



The servo needs to have been pre-programmed with minimal movement prior to linking with the signal – failure to do this will cause damage to the signal. This view shows the shape of the linking wire used; note the excess wire at the signal end to ensure the linkage does not become detached.

Also available

The SmartSwitch™ kit offers enough components to get started, and indeed may be sufficient for smaller layouts with limited turnouts and signalling. However, because most installations will require additional servos, these can be obtained individually (ref.PLS–125), whilst 1000mm extension cables (ref.PLS–140) cater for occasions where there are longer distances between a servo and the control board. Additional control boards (ref.PLS–120) are also available for situations where there is in excess of four servos used.

Also available separately is a 'Smart Frog' (ref.PLS-130), an optional circuit board that can be used in combination with a servo to change the polarity of the frog. It needs wiring to the control board, the track power and the frog itself (it also needs its own auxilliary 12V dc supply).

Regardless of the amount of servos used on an installation, only one programming board is required.

DCC operation

Digital control of the SmartSwitch™ servos is possible by connecting a Peco SmartSwitch™ stationary decoder (ref.PLS–135) to the control board. Each servo can be assigned its own unique address number, so that they can be individually controlled via a DCC controller. This also enables the servos to be operated without the toggle switches, if desired.

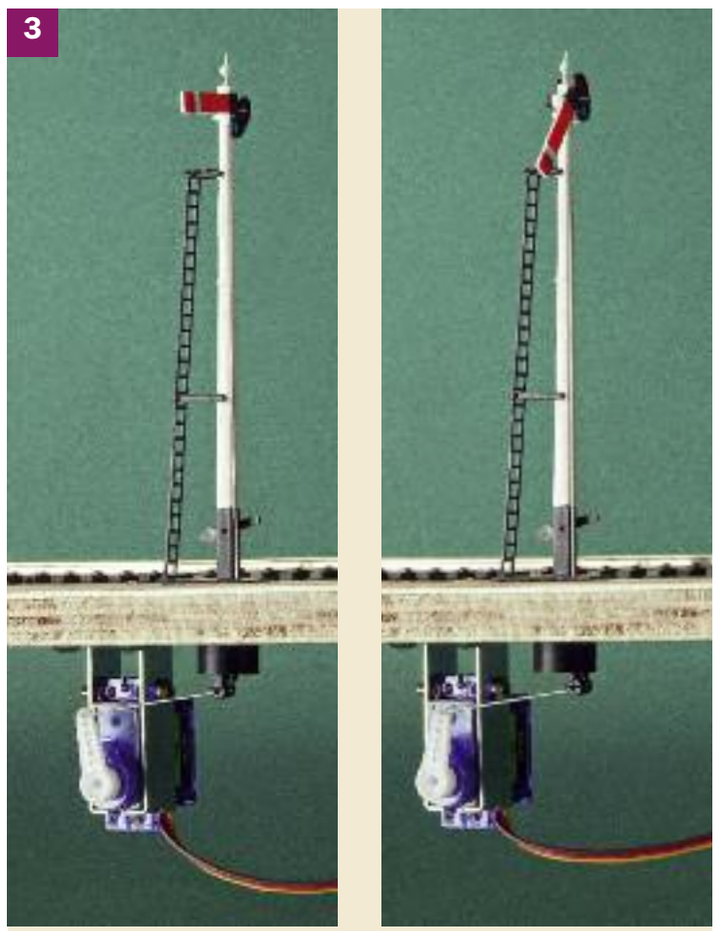
Endless possibilities

This article demonstrates the installation of servos to operate a two-way turnout (with the servo mounted both above and below the baseboard), together with a semaphore signal. The focus is centred around the mechanical aspect of installing the servos and fitting them to a layout; setting the pitch and speed of throw using the programming board is fully described in the SmartSwitch™ instruction booklet, and so only brief references to this have been included here.

Although many modellers may find adjustment of the servos to be daunting at first, it is in fact very easy to get to grips with. The applications described here are the simplest types of installation for which the SmartSwitch™ system is suited; the potential uses and animations being limited only by the imagination and ingenuity of the individual.

Supplier information

Peco SmartSwitch™ products are available from most Peco stockists. More details can be found at **www.peco-uk.com**, where there is also a link to a video which introduces and demonstrates the system.



The movement of the servo horn then needs programming to suit, much in a similar way as for the turnout installations. This pair of views illustrate the two positions of the servo horn and signal arm following programming. Any mistakes with the programming can be corrected by performing a factory reset on the servo and starting again. However, it is important to note that the mechanical linkage between the servo and the signal (or turnout) should be disconnected prior to resetting the servo, and then pre-programmed prior to restoring the linkage.