PECO LECTRICS

SmartSwitch™

built by ANE model

Instruction Manual

This Manual covers the use of:

PLS-125	**SmartSwitch Servo Kit**
PLS-130	**SmartFrog**
PLS-135	**DCC Stationary Decoder**

PLEASE READ THESE INSTRUCTIONS FULLY BEFORE USE

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Introduction and Overview of the SmartSwitch

PECO is proud to bring you the SmartSwitch - an innovative way of powering turnouts, signal arms, crossing gates, and many other moving features on layouts of all scales and gauges.

One SmartSwitch control board operates up to four state-of-the-art servo motors. The servos are normal electric motors, with very low gearing to provide up to 180° of very precise and powerful movement. Despite their compact size, they are each powerful enough to throw any Peco turnout in slow motion without the need to remove the over-centre spring from the turnout.
The remote programming board (with the long ribbon cable) is used to programme the start and stop positions, as well as the operating speed, of each servo.
As standard the Servos are activated by toggle switches, although these can be substituted for push-to-make push buttons if desired. The control board also includes terminals for the optional connection of route indicator lights.
Out of the box, the SmartSwitch is a stand-alone system, and therefore compatible with all types of layout control, including 0-12Vdc analogue and DCC.

Optional Extras *(available separately)*

- If powering Electrofrog turnouts with the SmartSwitch, A **PLS-130 SmartFrog** board can be installed to each turnout to automatically and 100% reliably switch the polarity of the frog.
- With the addition of the **PLS-135 Stationary Decoder**, each servo can be activated using your DCC controller. The four DCC addresses are easily programmed.

This kit contains:

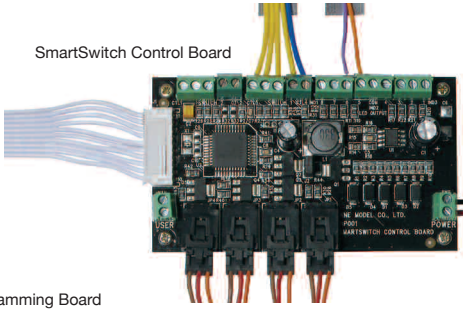
- 1x SmartSwitch Control Board
- 1x Servo Programming Board
- 4x Servo motors
- 4x Servo mounting brackets
- 4x Toggle switches
- 4x Pan head machine screw + nuts
- 4x 100mm lengths of 0.6mm diameter wire for linkages
- 8x 10mm wood screws (for mounting servos)
- 8x 15mm wood screws with spacers
  (for mounting circuit boards)

Available separately:

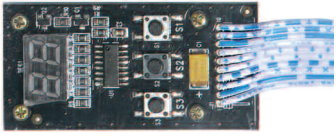
- PLS-130 SmartFrog Board
- PLS-135 DCC Stationary Decoder

Identification of Components

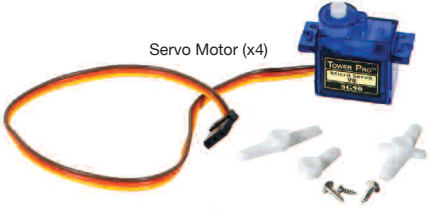
SmartSwitch Control Board



Servo Programming Board



Servo Motor (x4)



4 Toggle Switches



Screws and fixings

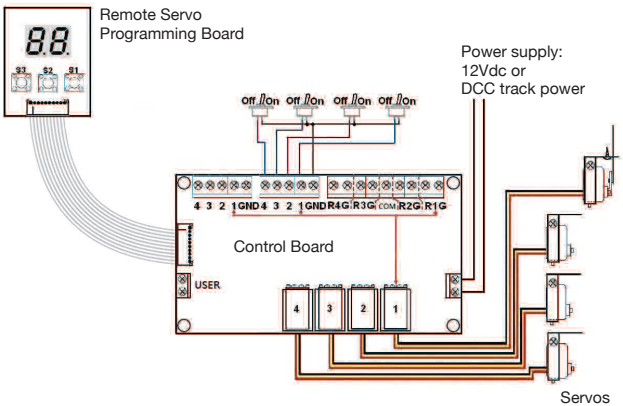
Servo Mouting Bracket (x4)



Wire for linkages (x4)

Setting up the system

The only external wiring required is to the toggle switches, which can be installed in your layout's central control panel, and to connect the 12Vdc or DCC track power feed to power the system. The connections between the Control Board, Servos and Remote Servo Programming Board simply plug together using the leads (and extension leads if required) provided, like so:



The terminals on the control board may not be labelled and spaced as they are here. Use this diagram for reference.

The terminals and servos are numbered 1-4. The toggle switch connected to terminal 1 will operate servo 1, and so on.
The five left hand terminals and the USER terminals are for use with the stationary DCC decoder. Do not plug anything else into them.

It is a good idea to connect up the system to test it out and familiarise yourself with it before installation on the layout. Any settings you change while practicing can be reset using *Factory Reset Mode*. – see the section on this on page 10 of this manual.

The control board makes a low humming noise when it is switched on. This is normal.
Push buttons can be used to control the servos instead of toggle switches if preferred. The system needs telling which type of control device is being used. See the section *Control Device Mode* on page 14.
Note: The wires from the servos may be coloured differently from the illustration. Make sure the plug is inserted into the socket so that the exposed contacts are facing downwards. The extension leads may also have different colours for each wire. If a servo won't move at all when the system is switched on, it may be that the servo plug or extension lead is connected incorrectly.

IMPORTANT

The input DC voltage is a minimum of 9V and a maximum 25V.

The SmartSwitch can use DCC track power as its input voltage, but it will not work with direct AC current.

The maximum DCC track power that the SmartSwitch can handle is 25V.

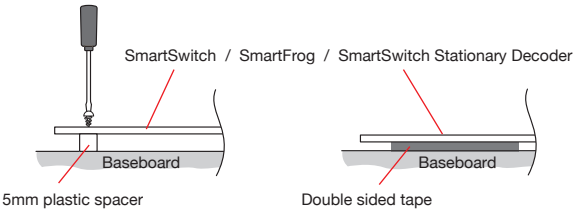
For indoor use only

Do not adjust the servo positions by hand. All the adjustments should be done through the SmartSwitch programming.

Do not attempt to connect the servo motors directly to a power supply or an accessory decoder. They are designed to work ONLY with the SmartSwitch control board.

Mounting the Circuit Boards

The circuit boards can be mounted beneath your baseboard using the 15mm wood screws and spacers provided, or onto other materials using some sticky foam pads. Always mount the boards allowing space beneath them for ventilation.



Fitting the Servo Horns

The various cranks included with each servo are known as servo horns. They are a simple push-fit onto the splined shaft of the servo, and locked on with one of the small self-tapping screws. Don't over-tighten the screw.

Use *Servo Installation Mode* (page 10) to align the servo horns centrally on the shaft in relation to the servo and its bracket.

Mounting the Servos

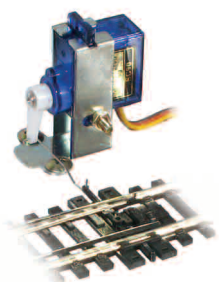
There are various methods for mounting the servos to operate turnout blades. The methods shown below illustrate just two options, and some ingenuity may be required if you are using the servo to power some other type of operational feature on the layout, or if trying to fit it into a specific space.

A mechanical linkage between the servo and the feature it is to operate will be required. The lengths of 0.6mm steel wire are ideal for this, and can be shaped with thin-nosed pliars. Again, there are various ways this can be done as well as the examples illustrated: Some imagination may be required for special purposes.

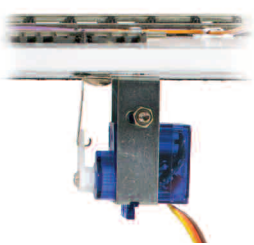
When mounting a servo, or creating the linkage between the servo and the operable device, it may be useful to use 'Installation Mode' - See the section *Servo Installation Mode*.

Insert the servo into the metal bracket as shown, and lock in place with a pan head machine screw.

Above baseboard mounting

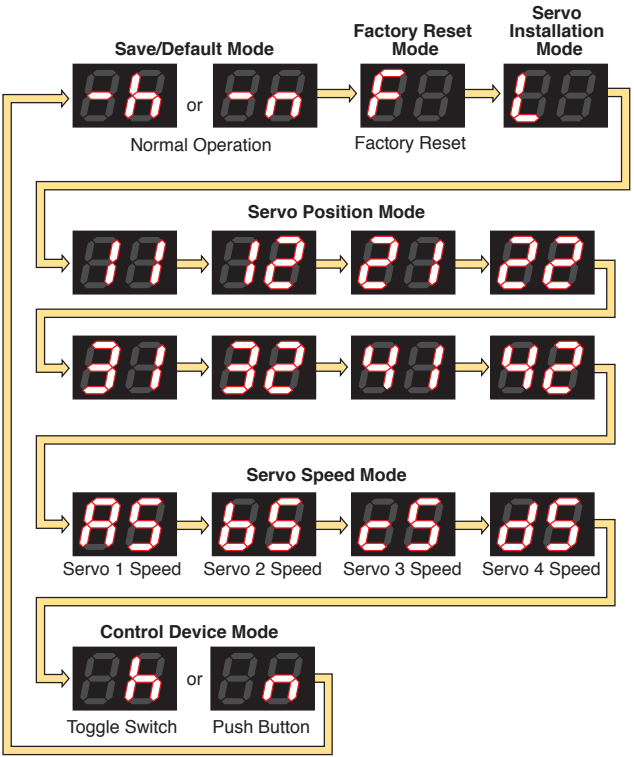


Under baseboard mounting



Order of programming modes

Each press of button **S3** on the Remote Servo Programming Board cycles through the various programming modes in the following order:



The various programming modes are covered in detail in the following sections

Default/Save mode

When the dash is displayed on the left of the LED display of the Remote Servo Programming board, such as

either  or  the system is in Default/Save mode.

This is the mode in which the system normally operates, and it means all the programming actions and settings are saved.

Press button S3 until the dash is shown on the display to enter default/save mode.

Once all the programming is complete and the system is returned to this mode, the Remote Servo Programming board can be unplugged and stored safely until it is needed again.

Factory Reset

The system can be reset to its factory defaults if need be.

Press button S3 until you see 

Press and hold buttons S1, S2 and S3 simultaneously

until  is displayed.

The system will restore its factory settings.

Press S3 to cycle through the modes to return to Default/Save mode.

Servo Installation Mode

This mode sets each servo to its mid-position. This assists with the installation of the servos on the layout prior to programming their start and stop positions and with proper alignment of the servo horns.

To activate Installation Mode, connect up the SmartSwitch as shown in the diagram on page 5 and apply power.

On the Remote Servo Programming Board, press button S3 until  is shown on the LED display.

After three seconds, all servos plugged into the SmartSwitch control board will assume and maintain their mid-position. Any mechanical linkages can now be attached.
By holding the turnout (or whatever the servo is to operate) in mid-position also, linking the two mid-points will ensure that the servo will have equal and enough travel in each direction to have the desired effect.

To exit installation mode, press button S3 until

 or  are displayed to enter default/save mode.

The servos will return to their previous start/stop positions.

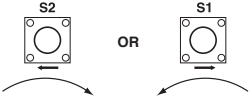
You may now find that some or all servos make a 'jittering' noise. This means they cannot reach their previously programmed or factory default start/stop positions due to being physically stopped by the limit of travel of the device they are now operating. This is normal. However, don't allow a servo to jitter constantly, as it is stalling the motor and will eventually overheat.
Go to the section *Servo Position Mode* to program new start/stop positions for the affected servo(s) and stop the jittering noise.

Servo Position Mode

This mode allows you to set the start and stop positions of each servo. i.e. the limits of travel (the terms ‘start’ and ‘stop’ are interchangeable). It allows the very fine-tuning of the start and stop positions for every point or accessory.

The servos are numbered 1-4. (as per the number of the plug on the Control Board to which the servo is connected) Press button S3 on the Remote Servo Programming Board until the number of the servo you wish to program is shown on the left of the display, and either 1(start position) or 2(stop position) is shown on the right. The servo should move to the position being programmed, unless it is already there.

Use buttons S1 or S2 to adjust the servo’s start/stop position.



Each button press moves the servo horn only a fraction. Press and hold the button to move the servo horn quickly.
When operating turnouts, the start/stop position needs to be set so that the turnout blades are in full contact with the stock rails, but just prior to the point where the servo starts to make a ‘jittering’ sound.

Don’t allow the servo to jitter constantly, as it is stalling the motor and will eventually overheat.

When finished, press button S3 to cycle through the modes to return to Default/Save mode  or 

If the servo doesn’t move, first check its connection to the control board. Secondly, flick the toggle switch or push the button that operates it, and try again.

Servo Speed Mode

This mode allows you to set the speed of each servo to suit your preferences.

There are 9 speed steps. 1 is the slowest, 9 is the fastest. The factory default speed setting is 5.

In speed setting mode, each Servo is assigned a letter:

Servo 1=A
Servo 2=B
Servo 3=C
Servo 4=D

Press button S3 on the Remote Servo Programming board until you see the letter corresponding to the servo you want to program on the left of the LED display.

Use buttons S1 and S2 to adjust the number on the right to your preferred speed setting.

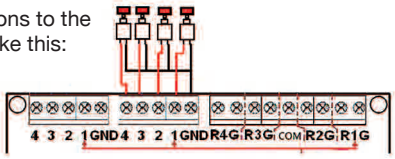
When finished, press button S3 to cycle through the modes to return to Default/Save mode  or 

Control Device Mode

(Changing between toggle switch and optional push button operation)

The servos can be controlled manually using either the toggle switches included, or replacing them with optional push buttons. The system needs instructing which type of switches are being used.

Wire push buttons to the control board like this:



Note: Make sure the push buttons are the 'Push-to-make' type, with the contacts normally open.

To change between toggle switch and push button operation, press button S3 on the Remote Servo Programming board until you reach control device mode,

whereupon either  or  is displayed.

Use either button S1 or S2 to change between the toggle switch or push button symbols, then S3 to return to Default/Save mode.

 = Toggle switch operation

 = Push button operation

Note: If you plan to control the SmartSwitch system using your DCC controller with the PLS-135 Stationary Decoder, toggle switch operation needs to be selected, regardless of whether the switches are actually fitted.

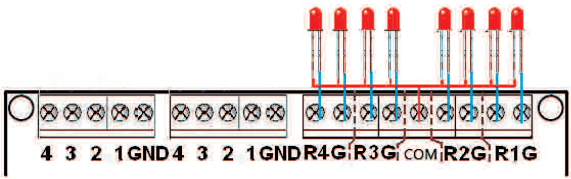
Adding Route Indication Lights *(Optional)*

Route indication lights that show the status of each servo can be added using the bank of terminals on the right of the SmartSwitch Control Board.
These could be used to operate two-aspect colour light signals on the layout, for example, or to simply show which way turnouts are set on a control panel.

LEDs can be used, and there is no need for resistors as these are built into the board.

Terminals R1G correspond to Servo 1, R2G corresponds to Servo 2, and so on.

COM is the common return.

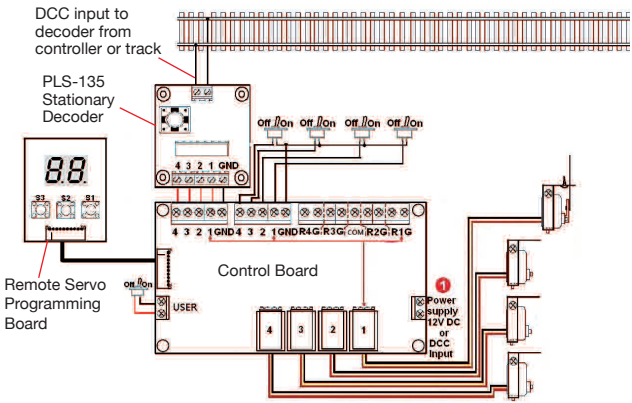


The terminals may not be labelled or spaced on the board exactly as they are here. Use this diagram for reference.

DCC Operation of the SmartSwitch *(Optional)*

To activate the servos using your DCC controller, connect a PLS-135 Stationary Decoder to the control board using five lengths of wire between the terminals, as shown:

Note: PLS-135 is the only decoder compatible with the SmartSwitch



When using DCC to control the SmartSwitch, fitting the toggle switches is not essential. However with them in place, command of the servos can be changed between the DCC controller and 'manual', using the toggle switches, by changing another toggle switch fitted in the 'USER' terminals. This may be useful for testing purposes.

For the system to be activated by your DCC controller, Control Device Mode needs to be set to Toggle Switch operation (regardless of whether the switches are actually fitted), see page 14. Following which, the system needs to be set into default/save mode, as it does for normal operation.

Therefore  should be shown on the LED display.

Programming the DCC Decoder Address

Each Servo needs assigning its own unique address number, so it can be individually controlled via your DCC controller.

The addresses of the 4 servos will be automatically grouped together, so all you need to do is programme in the address you would like Servo 4 to be, and Servos 1, 2 and 3 automatically take the next three sequential addresses below it.

For example: If you programme the system to address 28, Servo 4 will be programmed to this number, Servo 3 will be on address 27, Servo 2 will be on address 26 and Servo 1 will be on address 25.

Therefore, to avoid ending up with two servos on the same address number if you are using more than one SmartSwitch system on DCC, only use numbers that are a multiple of 4 for the addresses of Servo 4.
The range of numbers available for the address is any multiple of 4 between 4 and 2048.

How to do it:

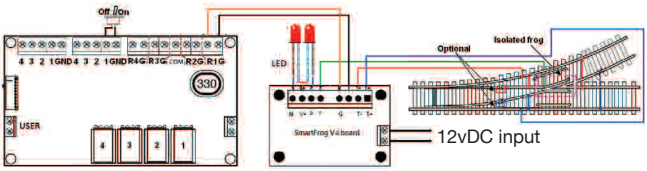
- Turn on your DCC controller and the SmartSwitch.
- Enter accessory address mode on your DCC controller, and key in the number you like for the address of Servo 4 (see above).
- Press the only button on the PLS-135 Stationary Decoder for 1 second, the green LED on the board will start to flash.
- Press the button on your DCC controller to activate the accessory/throw the turnout. The green LED will stop flashing, the other three addresses are automatically allocated and the address numbers are saved.

The SmartSwitch is then ready for use under DCC control. See the instructions for your DCC controller for how to call up and activate turnouts/accessories.

SmartFrog *(Optional)*

Peco Electrofrog and Unifrog turnouts have the **OPTION** of having the frog area switched independently, thereby eliminating the dependence on the electrical contact between the blades and the stock rails for good running. – See the instructions for the turnout.
If this option is preferred and the SmartSwitch is being used for turnout operation, SmartFrog boards can be added to change the polarity of the frog area automatically, electronically and 100% reliably.

One SmartFrog is required per turnout, and should be wired like so:



Note that the SmartFrog uses the terminals on the control board previously allocated for the operation of route indicator lights. These can now be connected to the SmartFrog board itself, as shown, again without the need to wire in a resistor for LEDs.

Each SmartFrog needs a 12Vdc power supply, attached to the terminals on the right hand side of the board (polarity doesn't matter.)
The SmartFrog doesn't use or provide the power passing through the rails of the turnout, it simply re-routes it. Therefore **it works with both Analogue and DCC track power** and doesn't need any setting or modification to use one or the other.

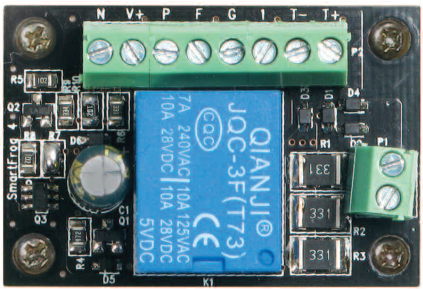
Note: when the SmartSwitch is turned on, the SmartFrog(s) will buzz for a few seconds. This is normal.

Guarantee

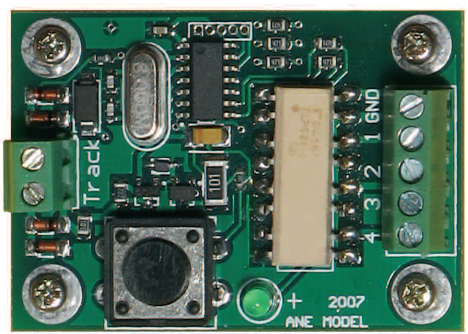
This product is guaranteed in accordance with the high quality for which Peco is world renowned. Should you require further information you are invited to contact Peco Technical Advice Bureau, see back cover for contact details.

Also available

PLS-130 SmartFrog Board



PLS-135 DCC Stationary Decoder



We hope you have enjoyed using the SmartSwitch

If you require any further information, have any comments, or if you have come up with an innovative application for the system that you would like to share, please contact the Peco Technical Advice Bureau at the address below.

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