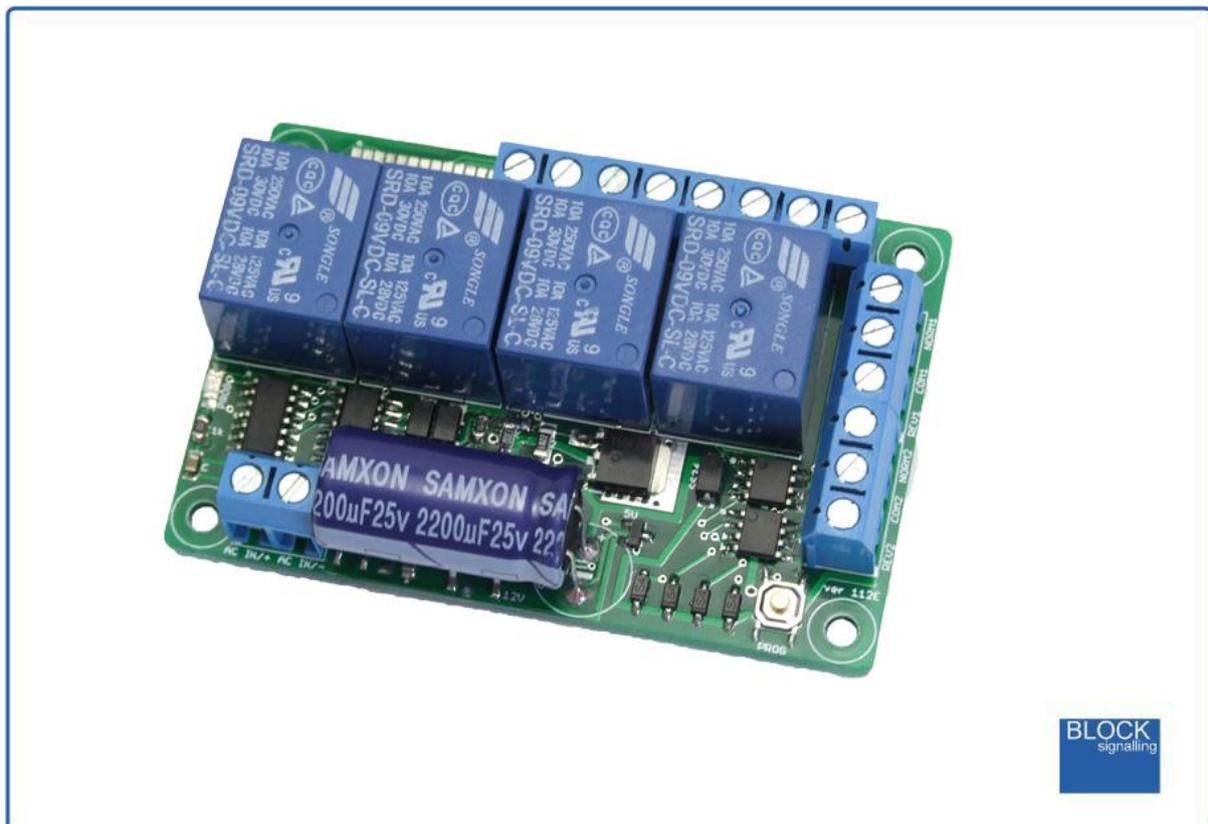


AUTOMATIC DC SHUTTLE WITH POINTS CONTROL PTS1



Shuttle that Operates Points and Routes Trains Automatically

- Operates one or more trains back and forth along a line
- Changes points automatically to route trains
- Built-in Capacitor Discharge Unit (CDU) which operates at 25V DC to minimise cable sizes
- Compatible with different route layouts
- Built-in programs for 11 route combinations
- Programmable delay timer, route switching and randomised delays

The BLOCKsignalling PTS1 is designed to automate up to three DC model trains running backwards and forwards along a length of track.

At each end of the track, a diode is fixed across an insulated rail gap to stop the train until the track current is reversed and the train can automatically start traveling back along the track.

The module is also capable of driving up to two solenoid points motors from a built-in CDU, which are automatically operated by the module to route trains. The CDU operates at 25V, meaning that thinner wire can be used to connect points motors.

The waiting time for trains when they reach the end of the line can be set to fixed or random. This also allows for delays before other train movements.

Some programs allow two or three trains to alternately run back and forth on a single line and also the module can run a variety of programs to send different trains for each departure.

Each of the relays are rated at 10A for long life (traction current is typically 0.5A to 1A).

Power Supply

The controller is designed for use with a DC power supply of 12V. The maximum current requirement of the module is 250mA.

It is important to connect the supply with the correct polarity, although no damage will occur if the supply is connected incorrectly but the module will not operate.

The built-in CDU is automatically charged to 25V when required, and so fairly small cabling can be used to connect to the points motors.

Please check the wiring carefully before turning on the power to prevent damage to the module.

Programming

When supplied, the module runs a built-in test program, to check the operation of the relays on the module and the operation of any connected solenoid points motors.

The module requires reprogramming to suit the track configuration in use.

For each program there are two values to be stored, the first is the particular setting to be changed, and the second is the value to you want to adjust that setting to.

Switch off the power to the module and hold down the Push Button. The red led on the PCB flashes at 1 second intervals. When the required number of flashes is seen for the setting (see later for the list of possible choices) the button is released to store the first value. At this point the led comes on for five seconds to confirm the value is stored.

The led then starts flashing again, and this time the button needs to be pressed to store the value. Once both numbers have been entered, the led flashes 10 times rapidly, and the module starts operating. Each value entered can be up to 255 flashes. If more are seen, or the programming is aborted by switching off, then the programming must be repeated.

Connecting Up - Basic

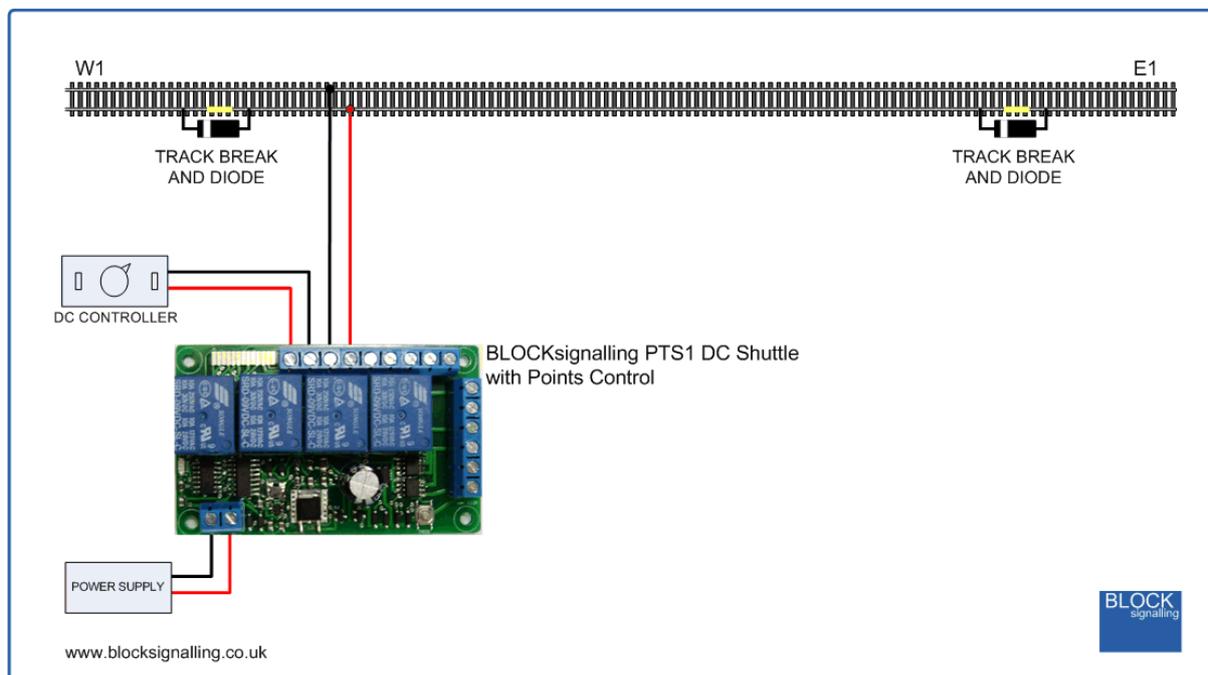
The diagram below shows the connections from the DC Controller (Throttle) wired via the shuttle module.

The controller is set to drive the train forward and then the two relays on the module control the switching of the polarity of the power feed to the track and hence the direction of the running.

Diodes are required at each end to isolate a section of track. These will hold the locomotive until the track polarity is reversed. Suitable general purpose diodes are part number 1N4004 and five are included with the module.

The points outputs are not connected on this layout.

When the power to the module is switched off (for instance, when it is not in use), the module routes the feed from the DC Controller straight to the track.



As supplied, the controller is set to program 1 (test program) and to use this program, setting 2 needs to be adjusted to the value 2.

This mode has a fixed waiting time of 5 seconds at the west end, a fixed waiting time of 10 seconds at the east end, and 20 seconds to completely traverse the track section. See later for changing these timings and how to set fixed or random waiting times.

When the throttle is opened, the train will depart the west end within 5 seconds. Providing 20 seconds is sufficient to reach the other end of the track, the train will cross the diode at the east end and the traction current will be blocked from reaching the loco. After 10 seconds of waiting time, the module will reverse the track polarity and the engine will run back towards the west end (the diode will now be able to allow the current to flow).

The time set to traverse the section must exceed the actual time required, otherwise the train will not reach the far end. Again the train is stopped by the diode, until the west end waiting time (default 10 seconds) has expired and then the traction current is reversed and the train will move off again.

Connecting Up - 1 set of Points

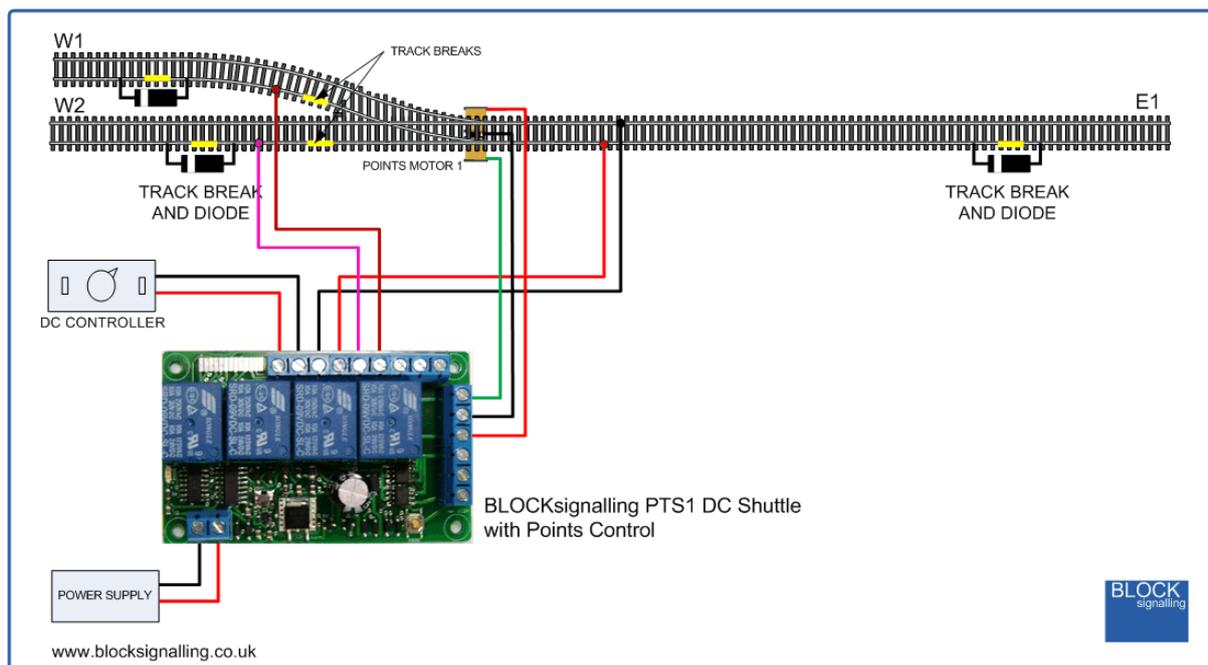
The diagram below shows a layout with a single branch line at one end (labelled W1) and one set of points connected to the NORM1 and REV1 terminals.

Diodes are fitted at each end of the track, across a track break, and there are track breaks adjacent to the points.

The module expects the train to be located on the branch line at W1 when the power is switched on (or at W1 and W2 when two trains are run).

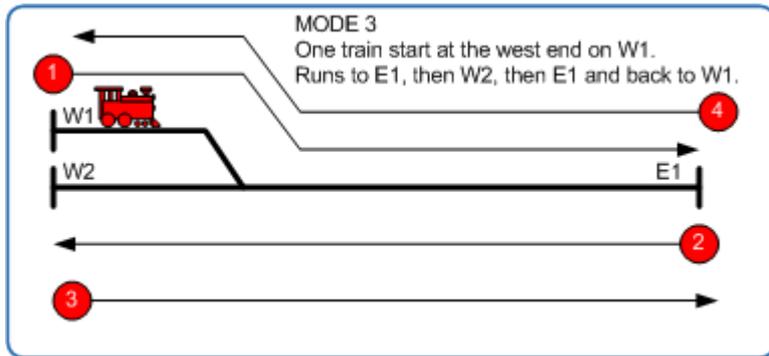
The points should be wired so that when the module operates the NORM output, the points switch to the through route (W2 to E1).

Each time the points operate, a relay switches the power feed to match the route selection. The power feed only becomes live when the module runs the train forwards or backwards.



There are two built-in programs which use this arrangement.

The first (program mode 3) is designed for a single train.

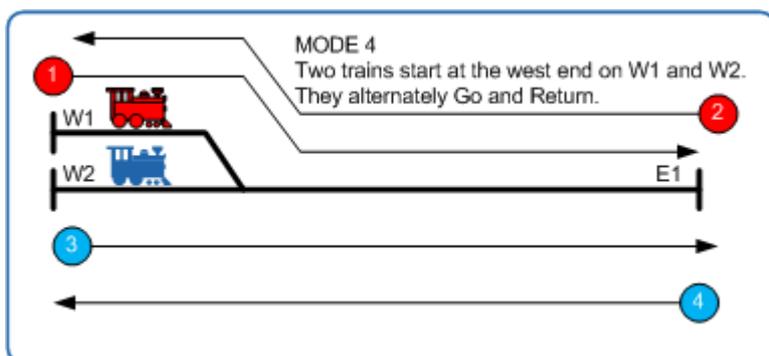


Normal operation is the power is applied to the module, after 5 seconds the points are switched to the branch line W1 and power is applied to that branch track and the main line. Providing the controller is set to drive the train forward, the train will depart the branch, over the points and on to the main track. It will continue until it reaches the diode at E1 where the traction current will be blocked and the train will stop.

After a waiting period, the module will switch the points to the through route, remove power from the branch, and apply power to the through route to W2. The polarity of the feed to the track will be automatically reversed, and the train will move in reverse towards the left, over the points and will come to a stop at W2 due to the diode blocking the current again.

This process will repeat continuously, with the train running backwards and forwards, coming to rest alternately at W1 and W2 on each run.

The second program to use this layout is designed to operate two trains (program mode 4).



This time, the module expects trains to be present at W1 and W2 when the power is switched on.

Normal operation is the power is applied to the module, after 5 seconds the points are switched to the branch line W1 and power is applied to that branch track and the main line. Providing the controller is set to drive the train forward, the train will depart the branch, over the points and on to the main track. It will continue until it

reaches the diode at E1 where the traction current will be blocked and the train will stop.

After the set waiting time at the east end, the power will be reversed, and the train will return to W1.

The process then repeats for the train located at W2.

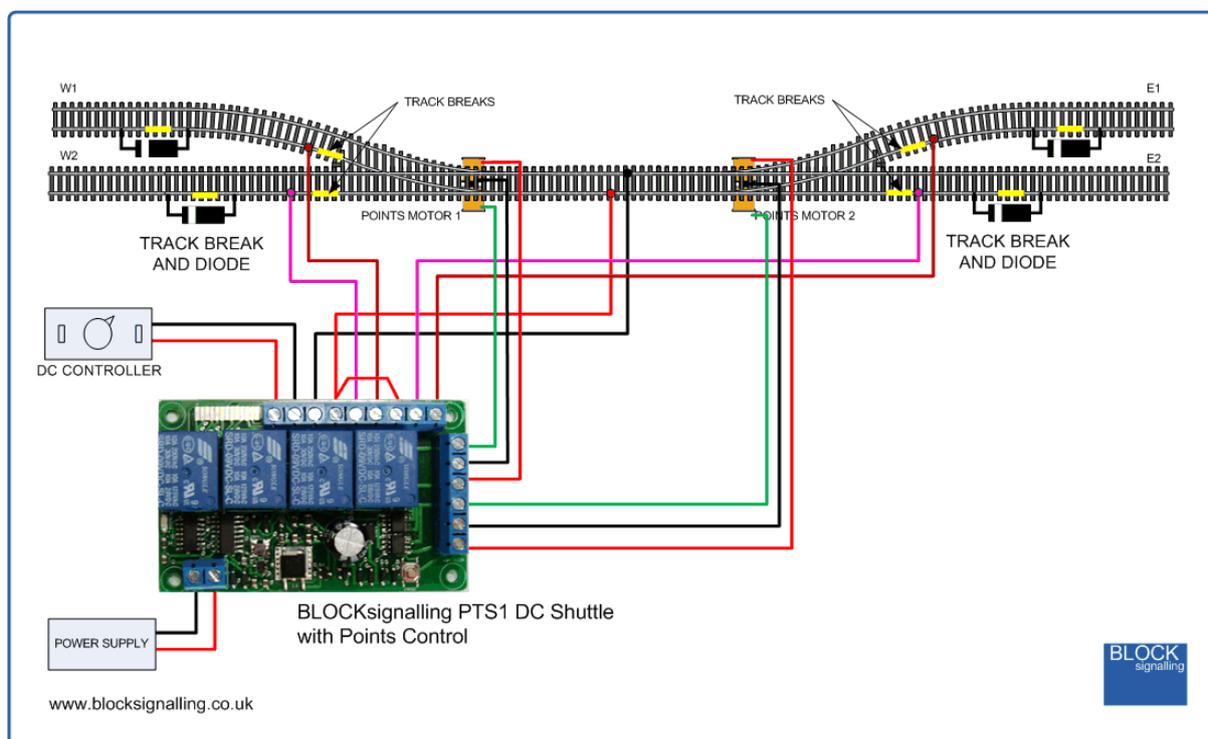
Connecting Up - Points at each end

The diagram below shows a layout with a branch line at each end of the layout (labelled W1 and E1) and two set of points connected to the NORM1, REV1, NORM2 and REV2 terminals.

Diodes are fitted at each end of the track, across a track break, and there are track breaks adjacent to the points.

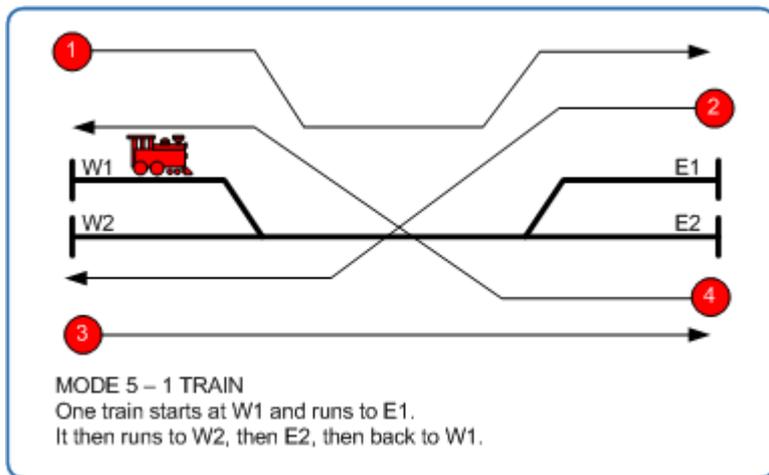
The points should be wired so that when the module operates the NORM output, the points switch to the through route (W2 to E2).

Each time the points operate, a relay switches the power feed to match the route selection. The power feed only becomes live when the module runs the train forwards or backwards.

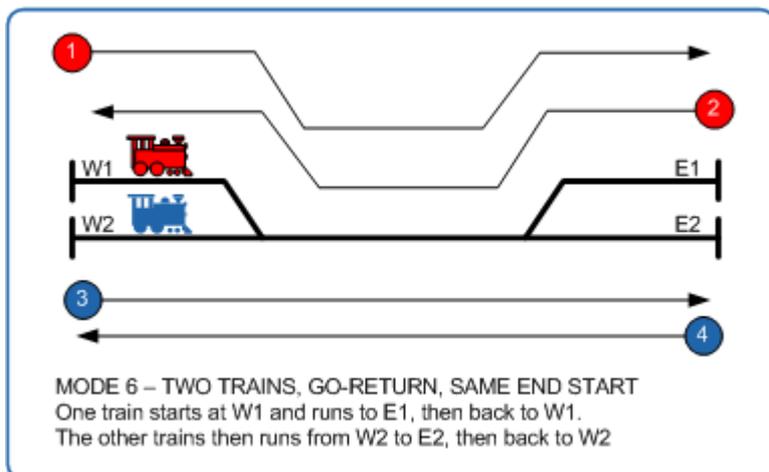


Five programs use this layout (programs 5,6,7,8 and 9).

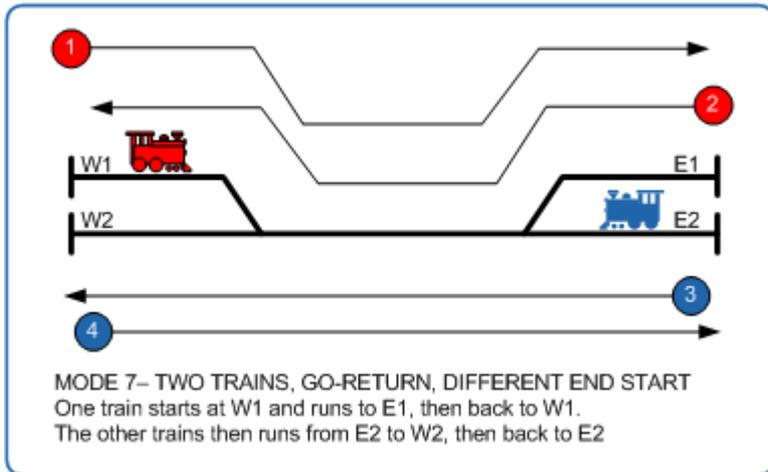
Program 5 operates a single train from W1 to E1, then to W2, to E2, and then back to W1.



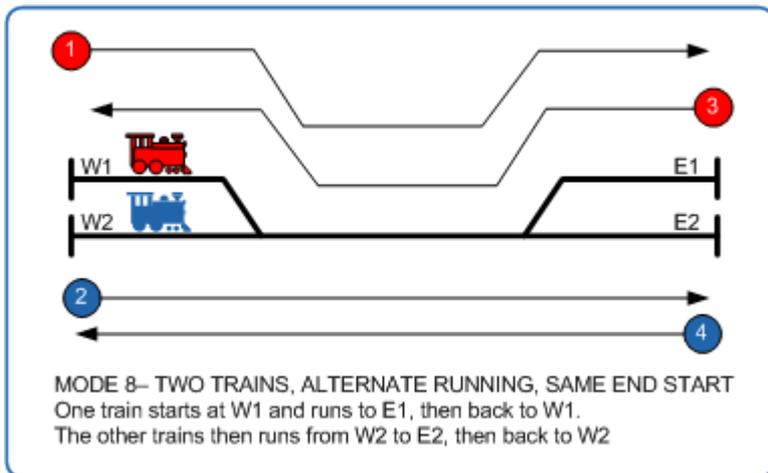
Program 6 runs one train from W1 to E1, then back to W1. Then a second train runs from W2 to E2, then back to W2.



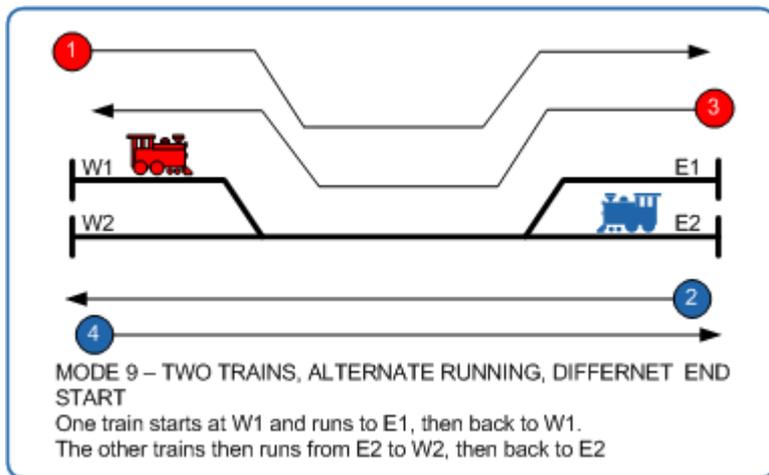
Program 7 runs one train from W1 to E1, then back to W1. Then a second train runs from E2 to W2, then back to E2.



Program 8 sends the train at W1 to E1, then the train at W2 to E2. The train at E1 then returns to W1, and the train at E2 returns to W2.



Program 9 sends the train at W1 to E1, then the train at E2 to W2. The train at E1 then returns to W1, and the train at W2 returns to E2.



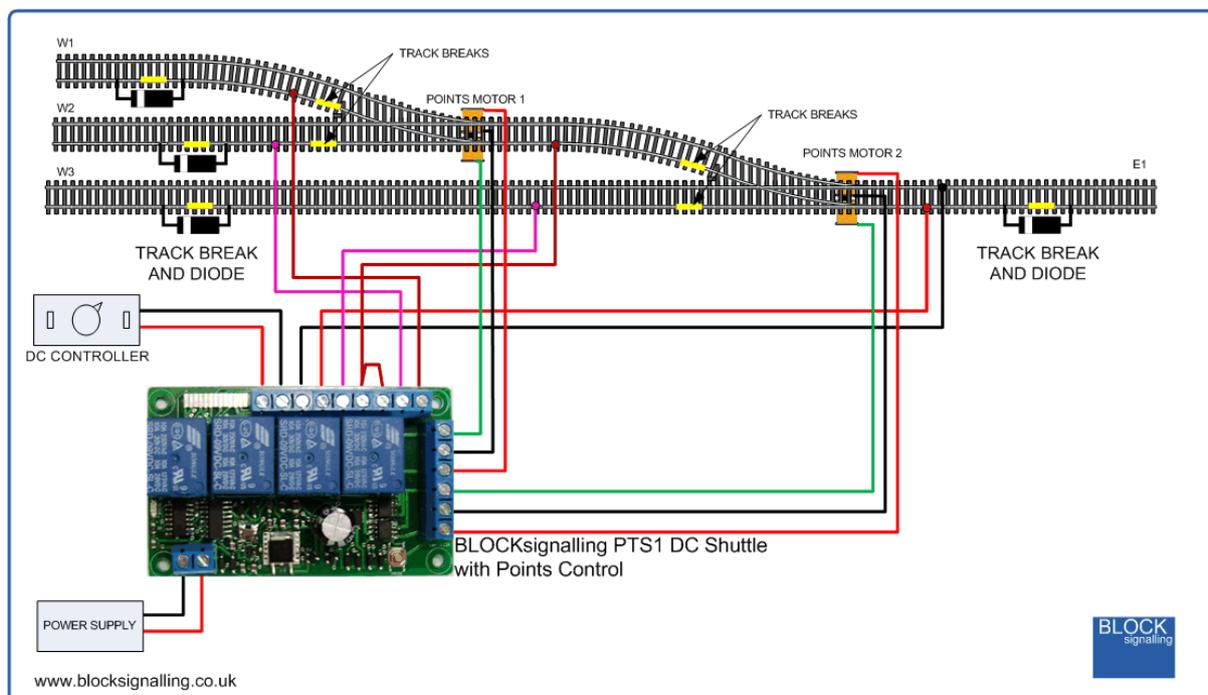
Connecting Up - Two sets of Points at one end

The diagram below shows a layout with three branch lines at one end of the layout (labelled W1, W2 and W3) and two set of points connected to the NORM1, REV1, NORM2 and REV2 terminals.

Diodes are fitted at each end of the track, across a track break, and there are track breaks adjacent to the points.

The points should be wired so that when the module operates the NORM output, the points switch to the through route (W3 to E1).

Each time the points operate, a relay switches the power feed to match the route selection. The power feed only becomes live when the module runs the train forwards or backwards.



Two programs use a layout with two points connected at one end (program 10 is for one train and program 11 is for three trains).

Program 10 sends one train from W1 to E1, then back to W2. It then sends the train from W2 to E1 and back to W3. Finally it sends it to E1 and back to W1.

Program 11 is designed for three trains, starting at W1, W2 and W3. Each one is departed in turn to E1 and then back to its starting point.

Led Indications

The red led mounted on the module is used during programming, but also operates whilst the module is running to indicate what actions the module is performing:

1. Slowly increasing from off to bright over about 5 seconds followed by a single flash shows the CDU is charging before the points output NORM1 is operated.
2. Slowly increasing from off to bright over about 5 seconds followed by a two flashes shows the CDU is charging before the points output REV1 is operated.
3. Slowly increasing from off to bright over about 5 seconds followed by a three flashes shows the CDU is charging before the points output NORM2 is operated.
4. Slowly increasing from off to bright over about 5 seconds followed by a four flashes shows the CDU is charging before the points output REV2 is operated.
5. One flash at 1 second intervals indicates that the train is moving in the forward direction.
6. Three flashes at 1 second intervals indicates that the train is moving in the reverse direction.
7. Two flashes at 1 second intervals indicates the train is stopped at the east end.
8. Four flashes at 1 second intervals indicates the train is stopped at the west end.

Setting the Transit Time and Maximum Times

Each of the times can be set from 1 second to 240 seconds.

The transit time is set using setting 3, the west end waiting time is set with setting 4 and the east end waiting time is set with setting 6.

Setting the West End waiting time sets the waiting times for W1, W2 and W3 ends simultaneously. Setting the East End waiting time sets the waiting times for E1 and E2 ends simultaneously. The delay for each branch can be adjusted later if required (see programming diagram below).

The transit time should be set to at least the time it takes for the train to travel the longest route on the layout. If the waiting times are selected to be randomised, then the waiting time only is randomised (the transit time remains fixed).

For instance, if you want to set the west end maximum waiting time to 20 seconds, switch off the power to the module and hold down the Push Button. Apply the power and continue holding the push button until 4 flashes of the led are seen. At this point, release the button. You will see a long flash of five seconds.

The led will begin flashing again. When you have seen 20 flashes (for 20 seconds waiting time), press the button. You will see a long flash of five seconds and then 10 rapid flashes. The programming is then complete and the will start running the program. If you make a mistake programming, simply repeat the process.

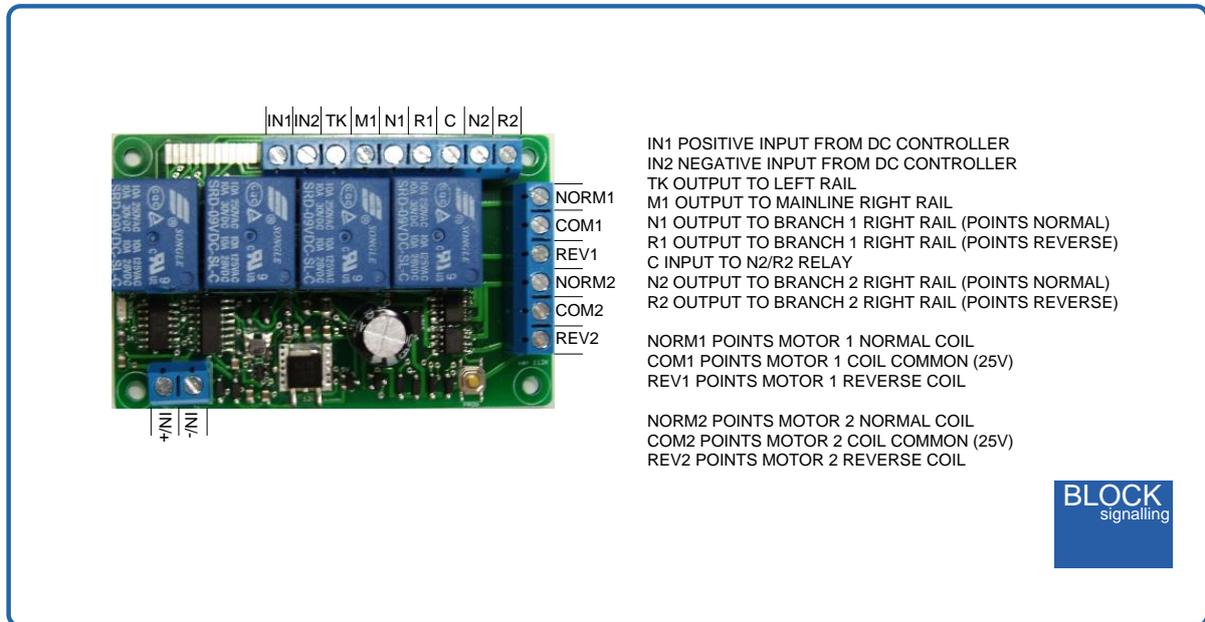
Factory Reset

To reset the module back to factory settings, switch off the power to the module and hold down the Push Button. Apply the power and continue holding the push button until 1 flash of the led is seen. At this point, release the button. You will see a long flash of five seconds.

The led will begin flashing again. When you have seen 1 flash press the button. You will see a long flash of five seconds and then 10 rapid flashes. The reset procedure is then complete and the module will restart running program 2. If you make a mistake programming, simply repeat the process.

Test Mode

Whenever the module is reset to factory settings, or mode 1 is selected, the module enters a test mode so that layout wiring can be checked. The led flashes between 1 and 7 times per second to indicate which test is being performed. Press the button briefly to move on to the next test.



1. When the module is powered on, it will switch reverse power to the main line. The led will flash one flash per second. At this point you can check the main track to confirm that the left rail is positive with respect to the right rail using a multimeter, track tester, or a locomotive. If you press the button on the board briefly, the module will move on to the next test.

2. The module switches forward power to the main line. The led will flash twice per second. At this point you can check the main track to confirm that the right rail is positive with respect to the left rail.

3. The module switches forward power to the main line and to the N1 terminal. The led will flash 3 times per second. At this point you can check the track connected to N1 to confirm that the right rail is positive compared to the left rail.

4. The module switches forward power to the main line and to the R1 terminal. The led will flash 4 times per second. At this point you can check the track connected to R1 to confirm that the right rail is positive compared to the left rail.

5. The module switches forward power to the main line and to the N2 terminal (note, a wire must link M1 to C). The led will flash 5 times per second. At this point you can check the track connected to N2 to confirm that the right rail is positive compared to the left rail.

6. The module switches forward power to the main line and to the R2 terminal (note, a wire must link M1 to C). The led will flash 6 times per second. At this point you

can check the track connected to R2 to confirm that the right rail is positive compared to the left rail.

7. The module disconnects power from the layout. The led will flash 7 times per second. At this point you can check that all the trackwork is dead.

8. The module enters a cycle of testing each of the solenoid points motors. The module led increases in brightness whilst the CDU charges. It then flashes once and operates the NORM1 points motor output. It continues testing the REV1, NORM2 and REV2 outputs in turn, flashing the led two, three and four times before each operation. This process continues until the power is removed from the module.

When you have completed your testing, you can reprogram the module to suit your layout.

Program Flow Diagram

Programming is performed by holding down the Push Button when switching on the power.

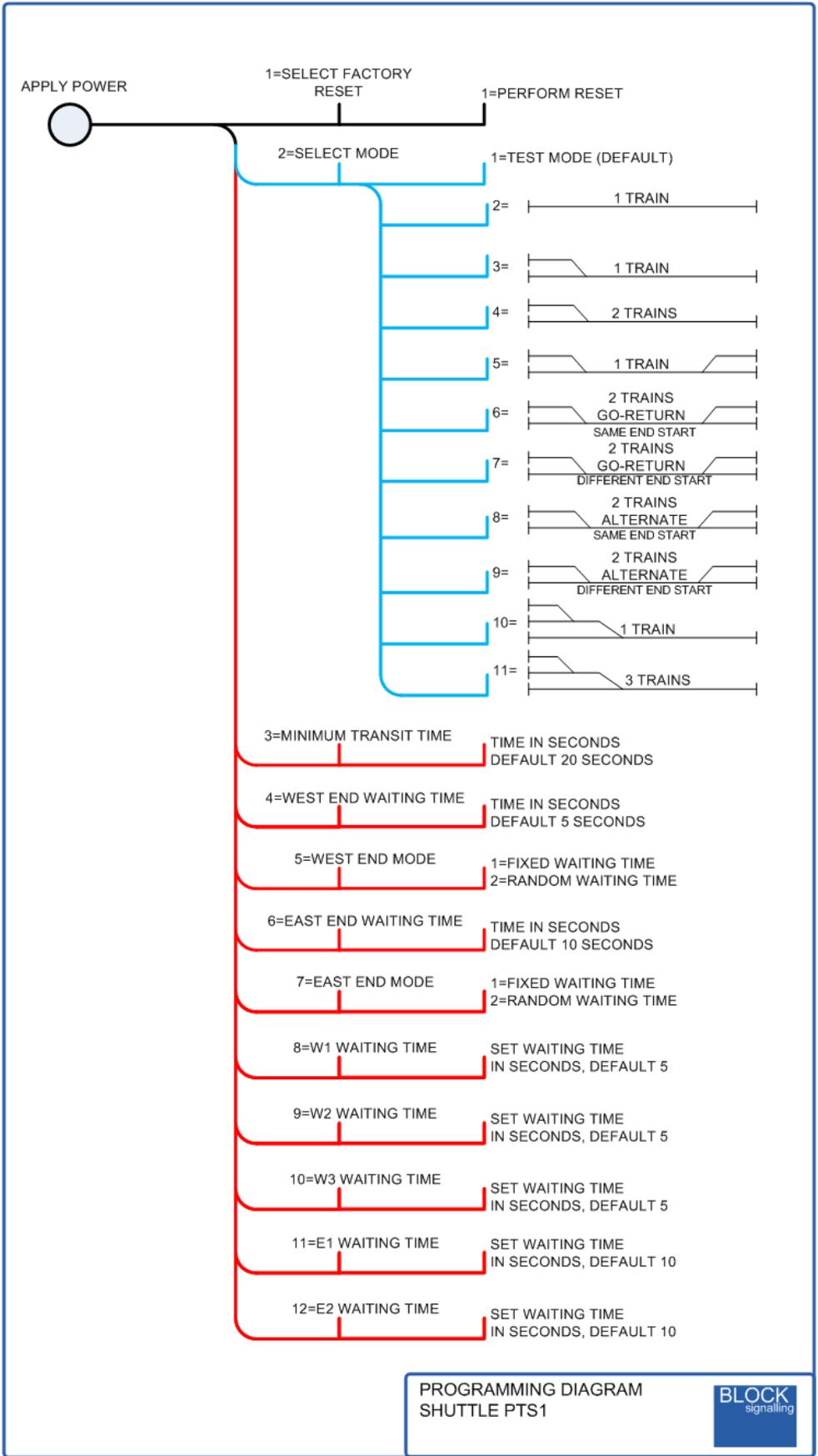
The red led on the PCB flashes at 1 second intervals. When the required number of flashes is seen (see diagram below for the list of possible choices) the button is released to store the first value. At this point the led comes on for five seconds to confirm the value is stored.

The led then starts flashing again, and this time the button needs to be pressed to store the second value.

Once the two values to be stored are entered, the led flashes 10 times rapidly, and the module starts operating.

Most values entered can range between 1 and 255 (see below for limits). If more are seen, or the programming is aborted by switching off, then the programming must be repeated.

Following the diagram is a detailed explanation of all the settings.



PROGRAMMING DIAGRAM
SHUTTLE PTS1



Notes & Troubleshooting

1. When first connecting up the module connect only the power supply and switch on. You should hear the module running through a relay test sequence.
2. The default program is a test sequence and you will need to reprogram the module for the type of layout that you have.
3. An appropriate transit time will need to be programmed, otherwise the train will not complete its run all the way to the blocking diode at the end of the track.
4. Setting up a section of test track, before installing on a layout is a good idea.
5. With the module power off, the controller power is directed straight to the track, and the feeds to the straight-through paths of the points are energised. This way you can test run a train.
6. The straight-through and thrown routes of the points can be swapped, by switching the NORM and REV connections at the module. You will also need to swap the N and R connections to the track.
7. Five diodes are included with the module. Points motors are not included.