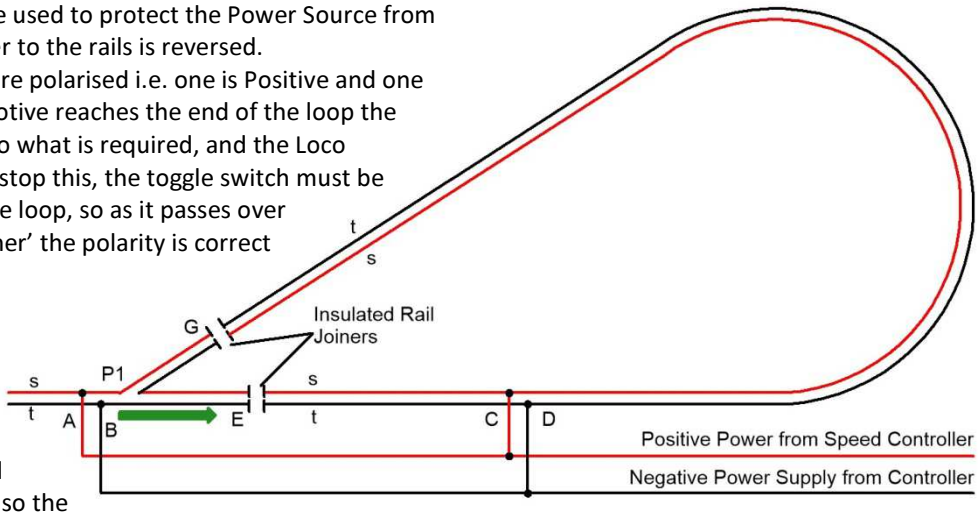
DC Reverse Loops

Manual Operation

A Reverse Loop is used to change the direction of the Locomotive without removing it from the track. This article describes how this can be done on a DC system with a DPDT (Double Pole Double Throw) switch. The train operator must flip the toggle switch in the correct sequence, a moments hesitation will result in a short circuit.

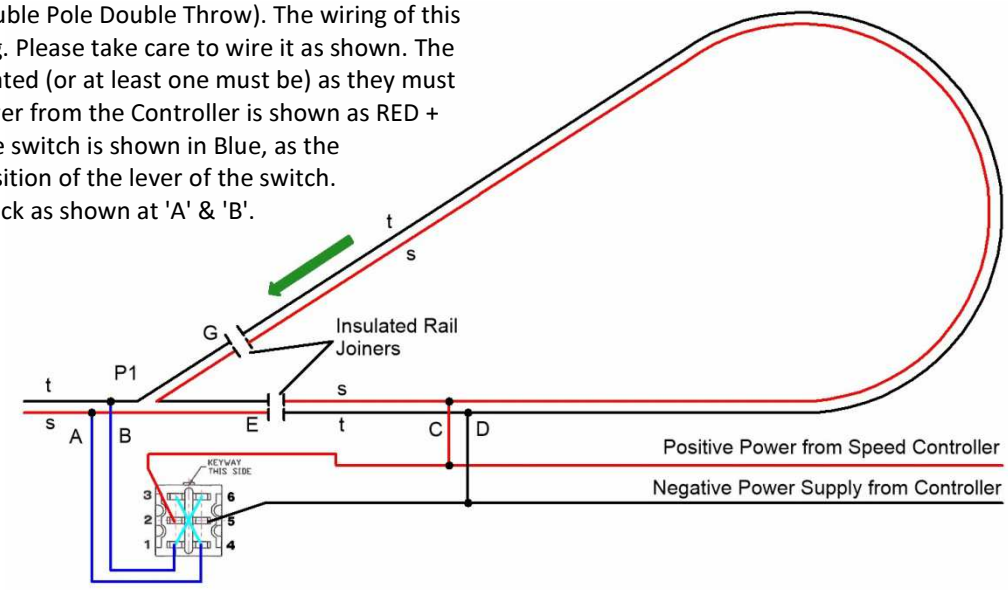
This diagram shows the direction of travel of the locomotive (green arrow) The 'Insulated Rail Joiners' are used to protect the Power Source from a short circuit when the power to the rails is reversed. With a DC system the tracks are polarised i.e. one is Positive and one is Negative. When the Locomotive reaches the end of the loop the polarity will be the opposite to what is required, and the Loco will go into reverse mode. To stop this, the toggle switch must be thrown while the train is in the loop, so as it passes over the second 'Insulated Rail Joiner' the polarity is correct for the train to continue.



The drawing opposite shows how the Positive rail 'S' is opposite the 'S' at point 'G'. So at this point the train will try to go into reverse, and possible cause a short circuit, so the polarity needs to change before the train reaches 'G'

Note: The polarity of the loop never changes, it's the main line that is changing polarity. In the drawing below the Locomotive is now in the position of the Green Arrow. The DPDT switch must be thrown before it reaches the 'Insulated Rail Joiners' G. This will change the polarity of the main track after the 'Rail Joiners' G. As you have an Insulated track joiner at 'E' this change will have no effect on the Loop Polarity.

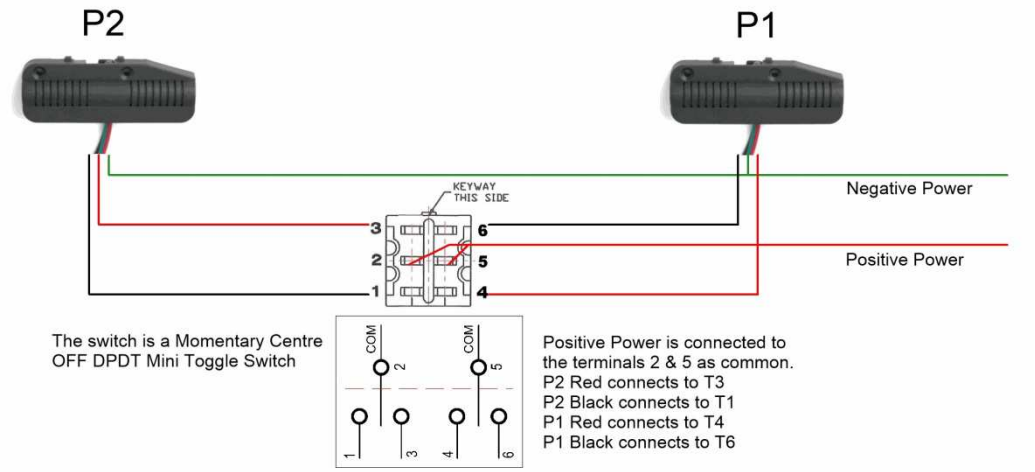
The switch used is a DPDT (Double Pole Double Throw). The wiring of this switch is shown in this drawing. Please take care to wire it as shown. The 'Light Blue' wire must be insulated (or at least one must be) as they must not touch each other. The Power from the Controller is shown as RED + & Negative -, The output of the switch is shown in Blue, as the polarity will depend on the position of the lever of the switch. These are connected to the track as shown at 'A' & 'B'.



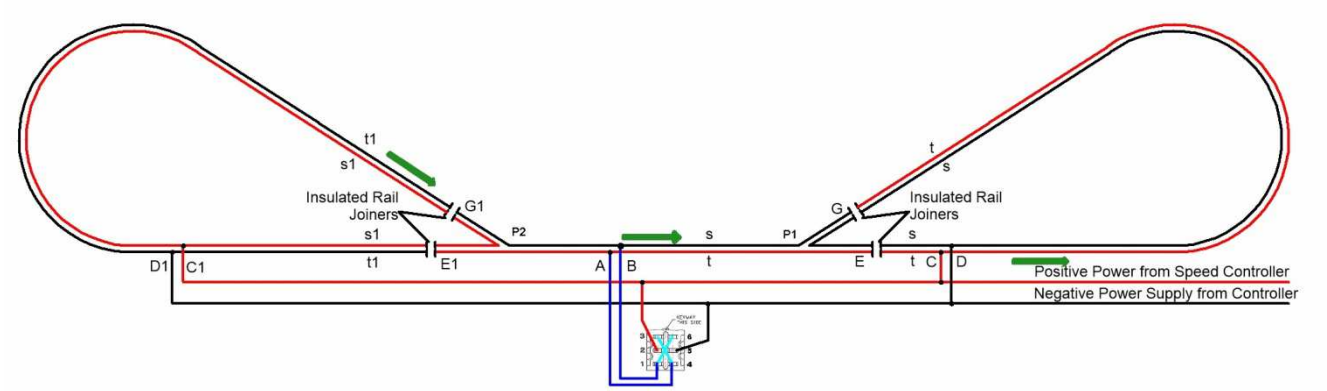
Don't forget your P1 is a set of points so will need changing when the train is in the position of the GREEN arrow.

The following diagram shows how you can wire one toggle switch to operate both sets of points in opposite directions. The switch is a DPDT (Double Pole Double Throw) Momentary Centre OFF Switch SW310. The use of this switch is important so that you do not burn out the Point Motors, as they only require a pulse of electricity to operate them.

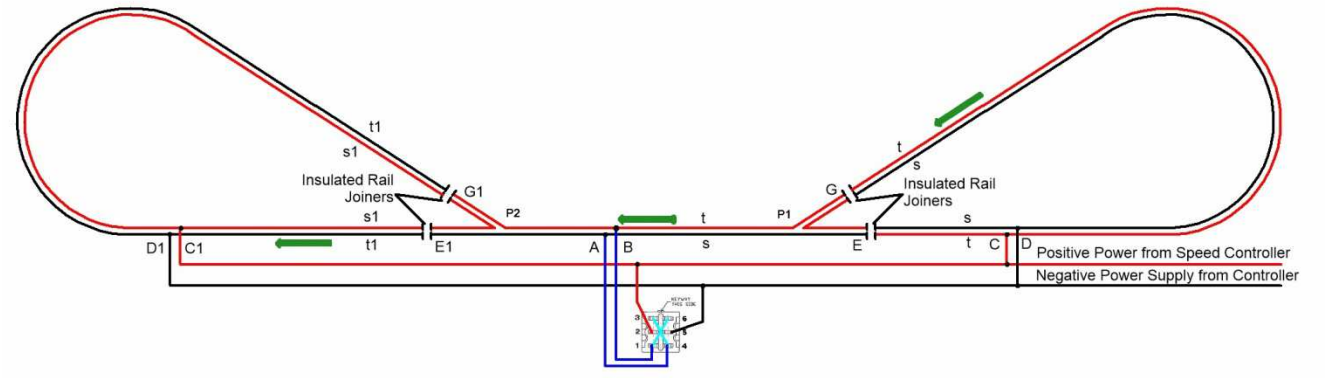
Depending on the type of motor you use will determine the colour of the wires. In this case the motor used is the Hornby R8243. This motor is wired with the Green as Negative 0v, and the Black & Red as the direction wires for the motor. Other motors may have different colours for the wires.



The next drawings show the full loop layout.
In the first drawing the train is travelling from left to right, and the power is correct to point 'G'. This is when you change the Polarity and the Points P1 & P2. Why both Points: Points P2 will be in the turn out position to allow the train to come down the loop onto the straight. The train is now in position G so points P1 need to change to allow the train onto the straight, however P2 needs to change at the same time to allow the train to proceed onto the lower part of the second loop.



The next drawing shows the polarity has changed to allow the train to pass through points P1, run along the straight to points P2. The points P2 have also changed to allow the train to pass onto the lower part of the left loop.
The process starts again
As the train reaches the Insulated Rail Joiner G1. The points P1 need to change and the polarity needs to change to allow the train to proceed from left to right.



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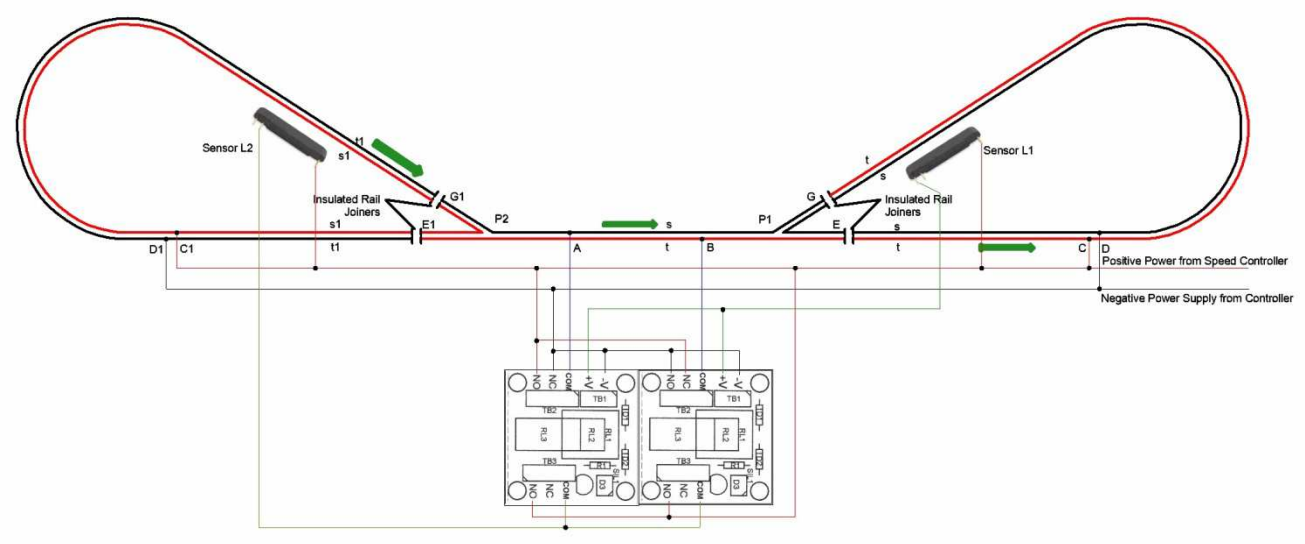
Automatic Reverse Loop.

The first drawing shows how to automate the polarity change. A sensor is required in each loop just before the Insulated Rail Joiner G & G1. The sensor on the right needs to be a Normally Open Contact, and the sensor on the left needs to be a Normally Closed contact. In the example below we have used the same sensor in both positions, as it is a Changeover contact, SW929. See the list of Sensors available.

Each train needs a magnet fitted to the underside of the Locomotive, preferably at the front. See the range of Magnets.

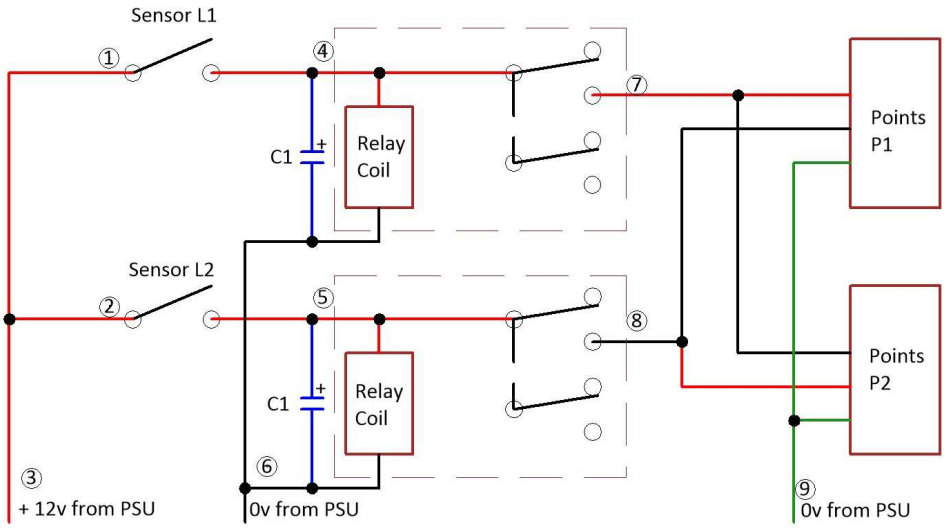
As the sensors are only activated for a fraction of a second as the train passes over them the Relay that changes the polarity needs to latch ON until the left had sensor is activated. This is achieved by wiring the EM135 circuit as shown below. The left hand sensor resets the latched circuits allowing the polarity to change again.



Now the Points.

The points need to change at the same time as the polarity is changed. Using the same sensors L1 & L2 and another EM135 this can be done automatically. The first problem here is that the point motors only require a short pulse of 12volts for no longer than 0.5 sec. The second problem is that each set of points has two direction and therefore 2 wires plus the negative.

In this circuit the sensors are wired to the relay coils as shown, & the common feed to the points. As you will see the points are wired together but opposite functions. Example when points P1 switch to straight through, points P2 must switch to turn out, and visa versa. Each coil has an electrolytic capacitor across the coil, this is to hold the coil ON for a little longer than the sensor will.



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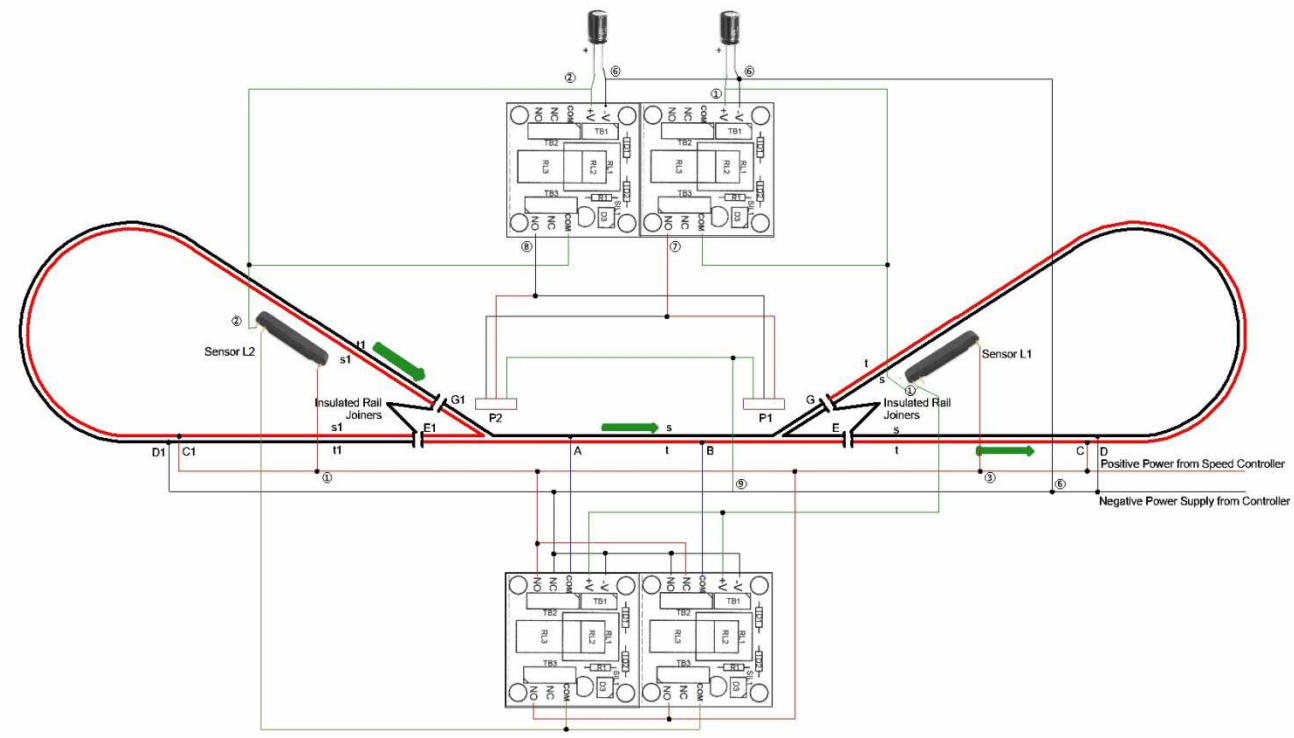
The drawing below shows the complete layout for the fully automatic Reverse Loop. The numbers in circles on the circuit above have been transposed to the layout below.
For protection of the system it would be an idea to put an ON/OFF switch in the 'Positive Power from Speed Controller' line.
This layout will run continuously for as long as there is power to the rails so could be used as an exhibition layout.
Note:
Ensure the Locomotive with the Magnet do not stop over the Sensors, as this will activate the Points continuously which will damage them.



Parts List:

Manual		**Automatic**		
Insulated Rail Joiners	4 sets	Insulated Rail Joiners		4 sets
Power Connectors	2 No	Power Connectors		2 No
Reverse Polarity Switch DPDT	SW315	7/0.2 or 16/0.2 Equipment Wire Various Colours		
Points Control Switch DPDT Momentary	SW310	EM135 Dual Relay Cards		2 No
7/0.2 or 16/0.2 Equipment Wire Various Colours		Magnetic Reed Sensors (See all alternative Sensors)	2 No	SW929
		Miniature Magnets	2 No	SW923
		Capacitor Electrolytic 22mF 16v		CA610