Instructions for the SA-9S Servo controlled points

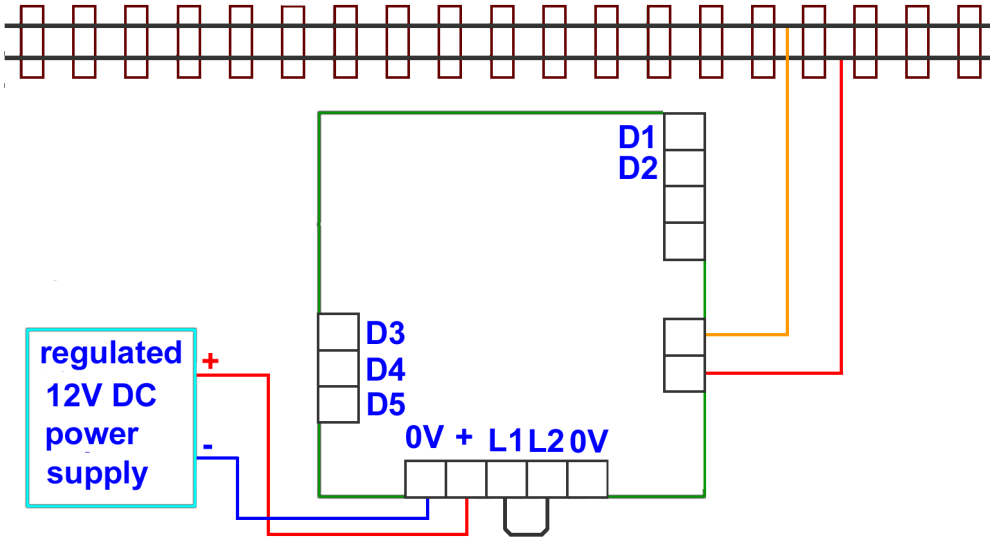
The SA9 operates a shuttle with a siding to allow two trains to alternatively shuttle backwards and forwards

The Servo point version of the SA9 requires both trains to be in the sidings when power is switched on. Ie always wait until both trains are in the sidings before switching the power off.

The points must switch to the siding with the detector connected to terminal D3 on the SA9 board when power is switched on. When installing make sure that the servo board changes the point to siding D3 when the switch is on ie S terminal connected to 0 negative terminal/

Powering the SA9

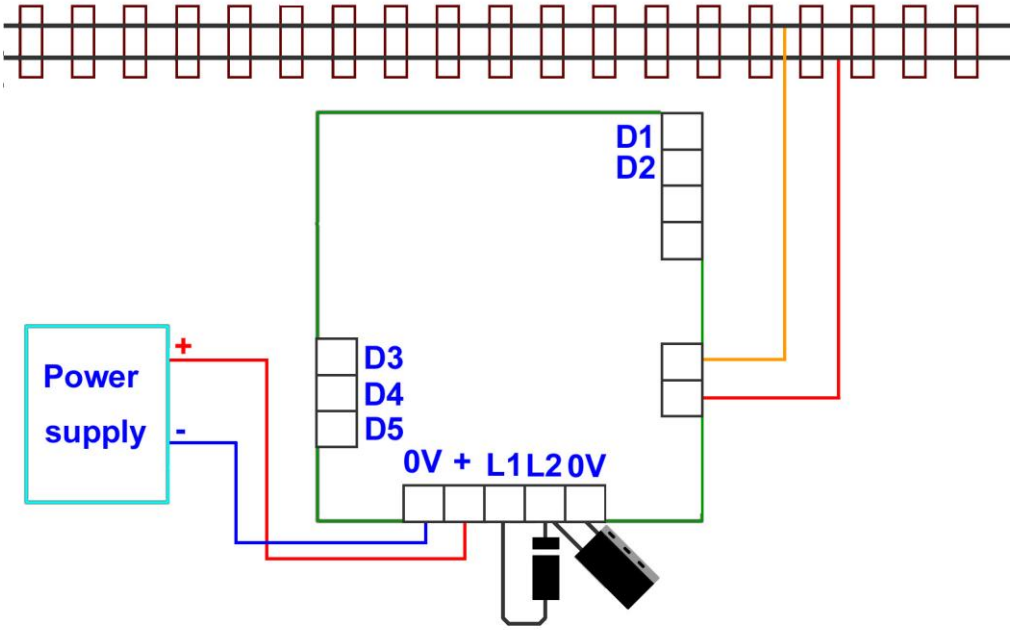
12 volt DC supply



This option powers both the control electronics and track from a 12 volt DC power source. Put a link wire between terminals L1 and L2 or leave the diode and capacitor in place. Connect a 12 volt DC supply with positive to the "+" terminal and negative to the "o" terminal.. When first powered the train must move from left to right (move towards D1 and D2). If it moves in the other direction swop over the two wires to the track.

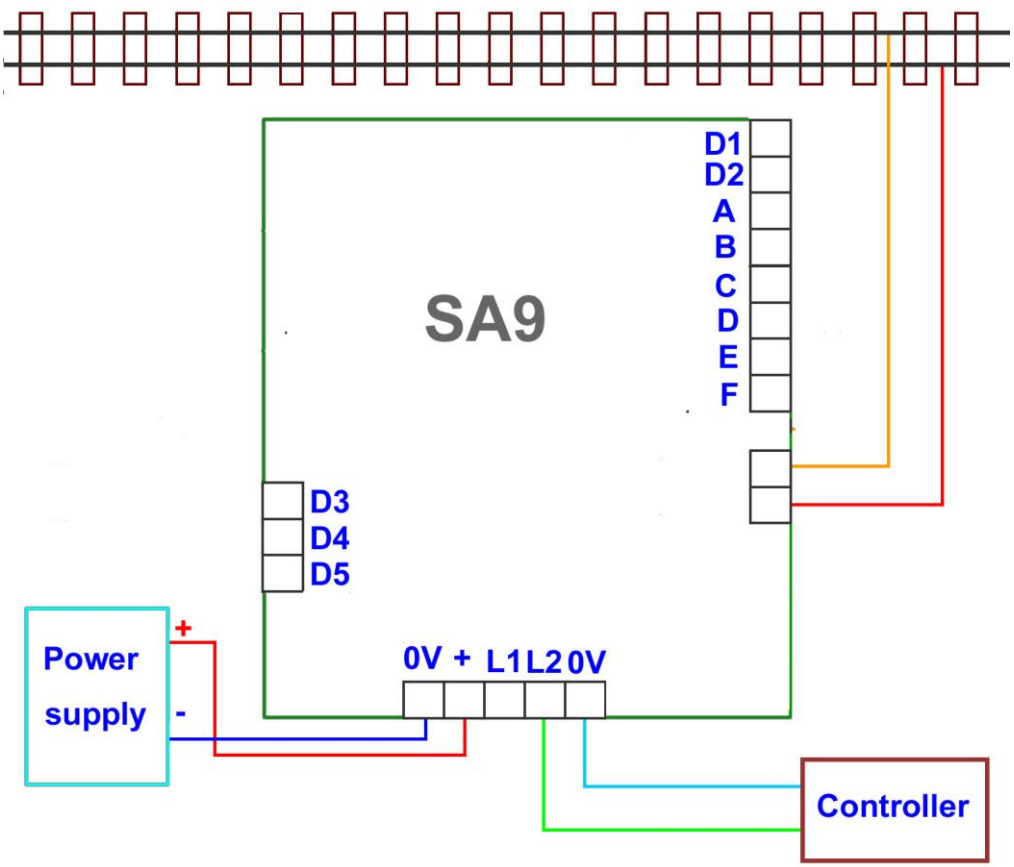
Using a smoothed regulated DC power supply will give pure DC at the track suitable for N gauge locomotives and coreless motors.

Powering from an AC supply



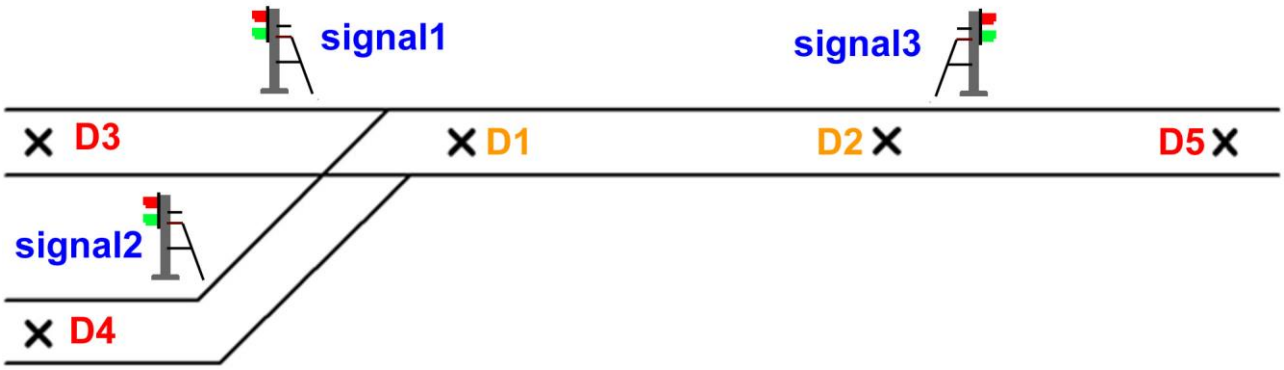
Replace the wire link with a diode. The band on the diode must face the direction shown in the diagram. The supply to the track with an AC supply will be unsmoothed DC. This may cause damage and overheating of N gauge locomotive motors but is satisfactory for OO gauge in fact older OO models may run better with unsmoothed DC. The DC on the track may be smoothed by using a (electrolytic) capacitor. The capacitor must be attached with its negative leg to the rightmost terminal. Using the capacitor will make the track power smooth and suitable for N gauge and coreless motors.

Train controller



Either a 12 volt DC supply or a 16 volt AC supply is connected as described previously to power the control electronics and the IRDOT-1s. The diode and capacitor or the wire link is removed. The controller is connected as shown, all other wiring is identical to the 12 volt DC supply diagram.

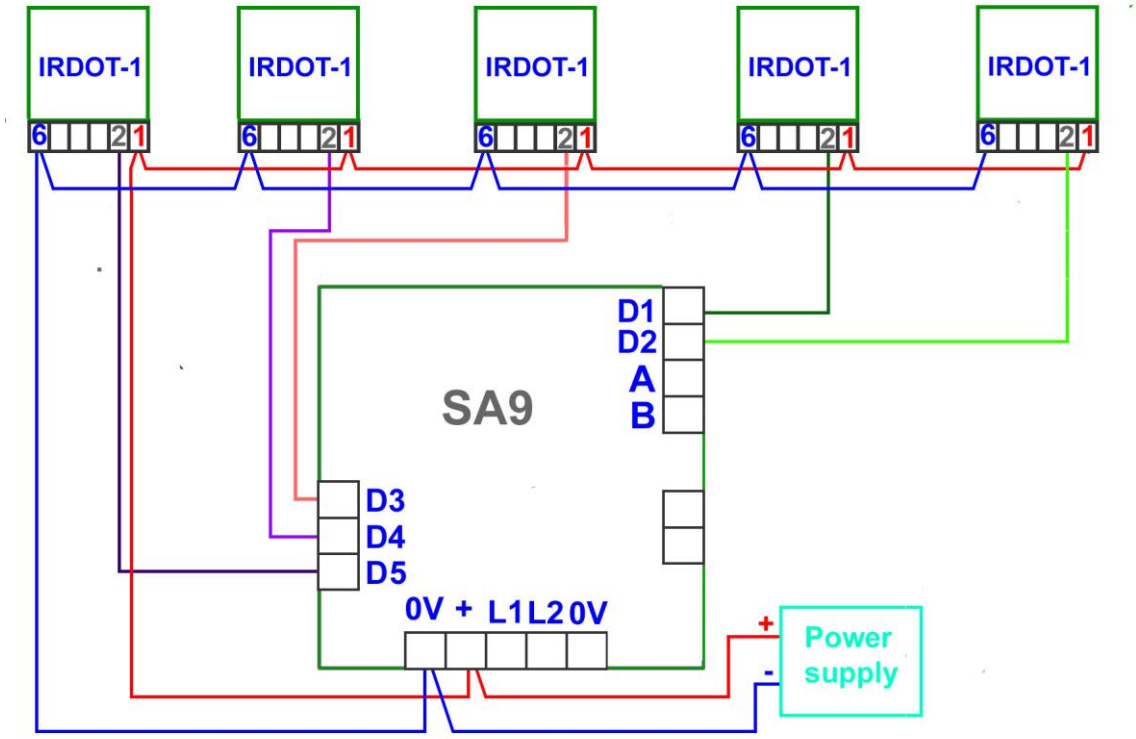
Train detectors



Either IRDOT-1 or reed switch train detectors can be used. Five train detectors are required if you wish to have gradual braking. If the trains just run slowly then you can use 4 train detectors and omit the connections to D2. The positions of the train detectors are shown above by an X with the terminals they attach to labelled alongside.

Train detectors D2 starts a train travelling to the right braking, train detector D1 starts a train travelling to the left braking. All the braking distances should be roughly equal in length.

For reed switches connect one end of every reed switch to the 0V terminal on the SA9 board and connect the other end to the appropriate terminal. If the sidings are particularly long you can have separate slowing to left detectors on wach siding, both having terminal 2 connected to terminal 1. This requires that when the train stops it is rear is not standing over the D1 detector.

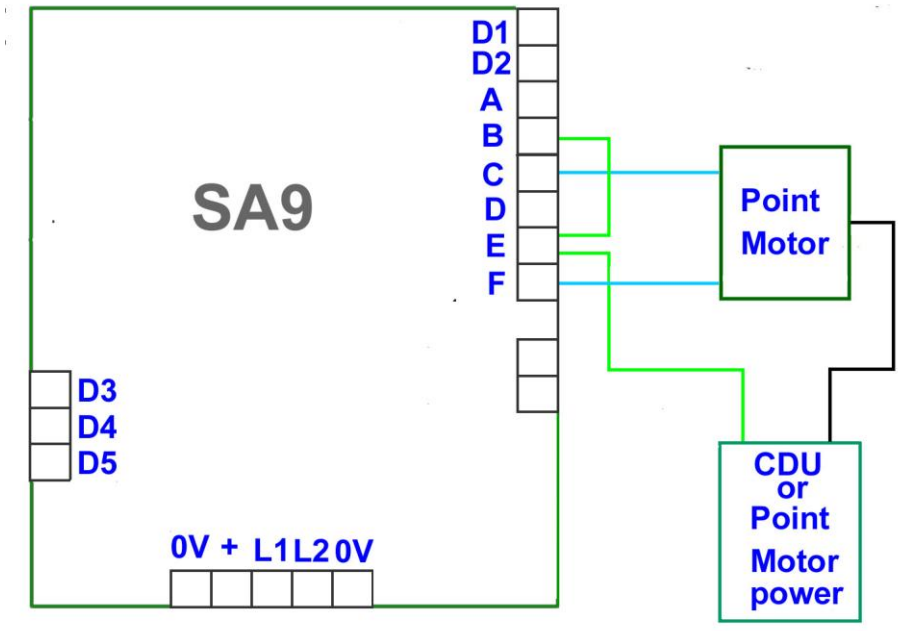


Terminal "6" of the IRDOT-1 and terminal 0V of the SA9 are connected to the negative (or 0 Volts) connection of the power supply. Terminal "1" of the IRDOT-1 and terminal "+" of the SA-9 all connect to the positive (or 12 volts) connection of the power supply.

Alternatively all the units can be powered from a 16 volts AC supply. If an A.C. supply is used be careful to ensure the units are connected as described (ie pretend one terminal of the AC supply is plus and one is negative) above otherwise the train detectors will not be able to operate the SA9 although they will still detect trains.

The next step is to wire the train detectors to the correct inputs (D1 to D5 as shown). If the IRDOT-1s are used wire terminal 2 to the appropriate SA9 terminal.

If reed switches are used wire one end of all the reed switches to the o (0 volts) terminal and the other end of the reed switch to the appropriate terminal of the SA9. (D1 to D5.)



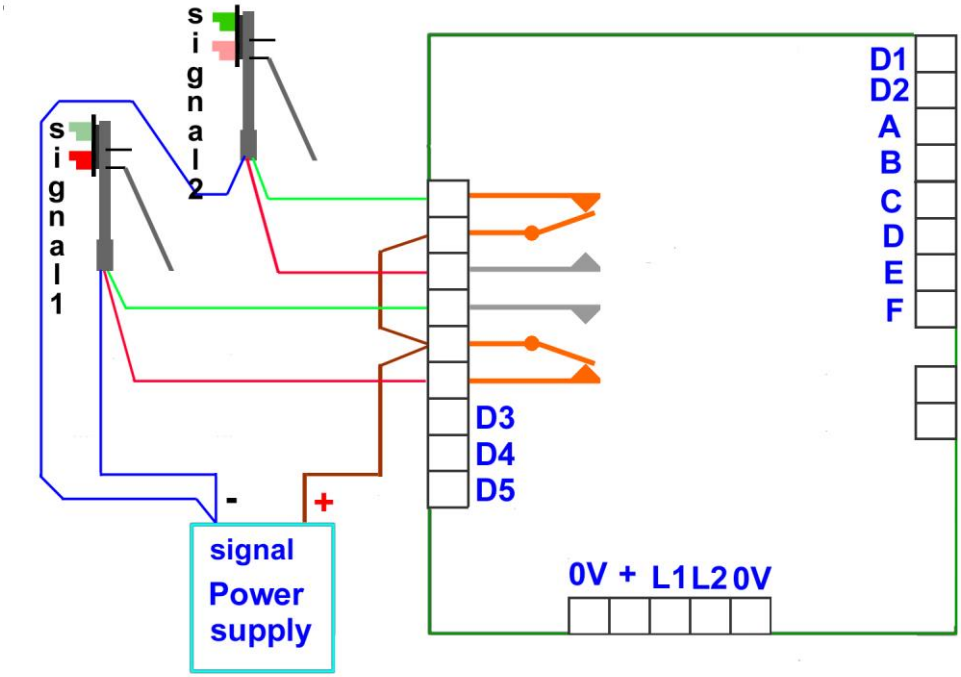
Wiring the point motor

The SA9 has two sets of contacts for switching the point motor. These contacts are accessed from terminal B and C, and from terminal E and E. The contacts connect B and C or E and F for approx 1 second to operate the point motor. PECO Hornby or SEEP point motors are suitable.

Terminals B and C should switch the point to the D3 line and terminals E and F to the D4 line.

Wiring the signals

Contact built into the SA4-S switch the signals. These contacts are not electrically connected to the rest of the SA board and can be treated identically to wiring to a SPDT (single pole double throw switch also called a change over switch). They are shown in orange and grey on the diagram.



The diagram shows the wiring for two common negative signals. The common wires connect to the negative of the power supply. Common positive signals would require the + and negative terminals at the power supply to be swopped over.

When LED signals are used a resistor is necessary to limit the current and prevent the LEDs being destroyed. The resistor is usually supplied ready wired to the signal. Each signal requires either a single resistor in the common (blue) wire or two resistors one in the green and one in the red wire.

The signals may be powered from a separate power supply as shown in the diagram or they can share the power supply powering the SA4-S. If an AC supply is used a diode should be put in the signaling circuit to convert the AC to DC. LEDs can be damaged by AC.

Semaphore signals
Dapol signals require a momentary contact rather than a constant one. We have a different version of the SA9-S for these.
If you wish to control semaphore signals with a servo motor the contacts will operate either the single servo controller the dual servo controller or the bouncing semaphore controller.

Testing and set up adjustments

Ensure that with no trains present non of the red LEDs on the IRDOT boards are lit. Put a piece of rolling stock over each IRDOT, each IRDOT on the LEDs should now light.

The SA9 has been designed so that it will restart after being switched off with the trains anywhere in the sequence. Whilst testing it will probably be less confusing to start with the trains standing over D3 and D4 and the point manually set so the train can leave D3.

After the LEDs on the SA9 board have flashed red and green the red LED will light for a couple of seconds and then the green LED will light. When the green LED lights the train over D3 should move towards D5. If it moves in the wrong direction reverse the two wires to the track. If it does not move increase the speed setting by turning the minimum speed anti clockwise.

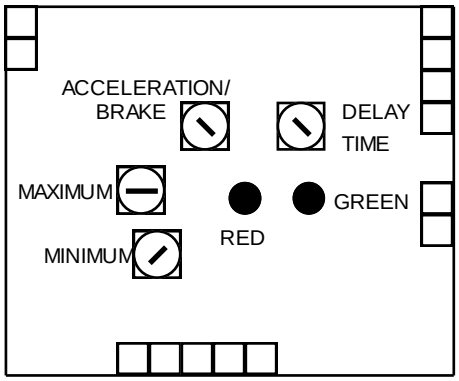
When the train reaches D2 the red LED should light on the SA9 to indicate braking, on reaching D5 the train should stop and the red and green LEDs should flash on the SA9. After a brief red the green LED should light and the train should travel back towards D3. On reaching D1 the red LED should light (train braking). On reaching D3 the red and green LEDs should flash on the SA9 board. If any of these stages fail to happen check that the red LED on the IRDOT-1 board lights when the train reaches it and that it is wired to the correct terminal on the SA9 board.

After the red and green LEDs on the SA9 board have finished flashing the points should change to the D4 line. After a brief red the SA9 should change to green and the train over the D4 board should make its journey. If the points set the wrong way swop over the wires in terminals C and F.

If the points do not move check the point wiring by momentarily touching a link wire between B and C or E and F. The power supply to the points needs to be at least 14volts. At 12 volts the points will probably not move.

Speed Adjustments.

Turn all the variable resistors fully clockwise with a fine screwdriver to give delay time=short, min speed=slow, max speed=fast, ACC/BR (rate of braking/acceleration)=abrupt.



Position the trains at the left hand end of the line over D3 and D4. After the variable delay (green and red flashing) the points will switch to the D3 sidings and there will be a short delay with the red LED lit. The green LED will light (indicating acceleration) and adjust the maximum speed until the train travels at the speed you want. When the train from reaches the detector connected to the D2 terminal it will rapidly reduce speed and halt (the red LED will light indicating braking). Adjust the min speed setting until the train just moves. It will then travel to D5 and stop. After the delay time the train return to the D3 siding. Another delay the points will change and the train over the D4 detector will depart (a further adjustment to the minimum speed setting may be required due to possibly different electrical characteristics of each locomotives motor). As the sequence continues adjust the maximum speed setting to the required speed (unless using the controller to determine the max speed in which case the maximum speed should be left at max). As successive trains brake (indicated by red LED only lit) adjust the acc/br setting so that the train slows to the minimum speed just before reaching the appropriate train detector.

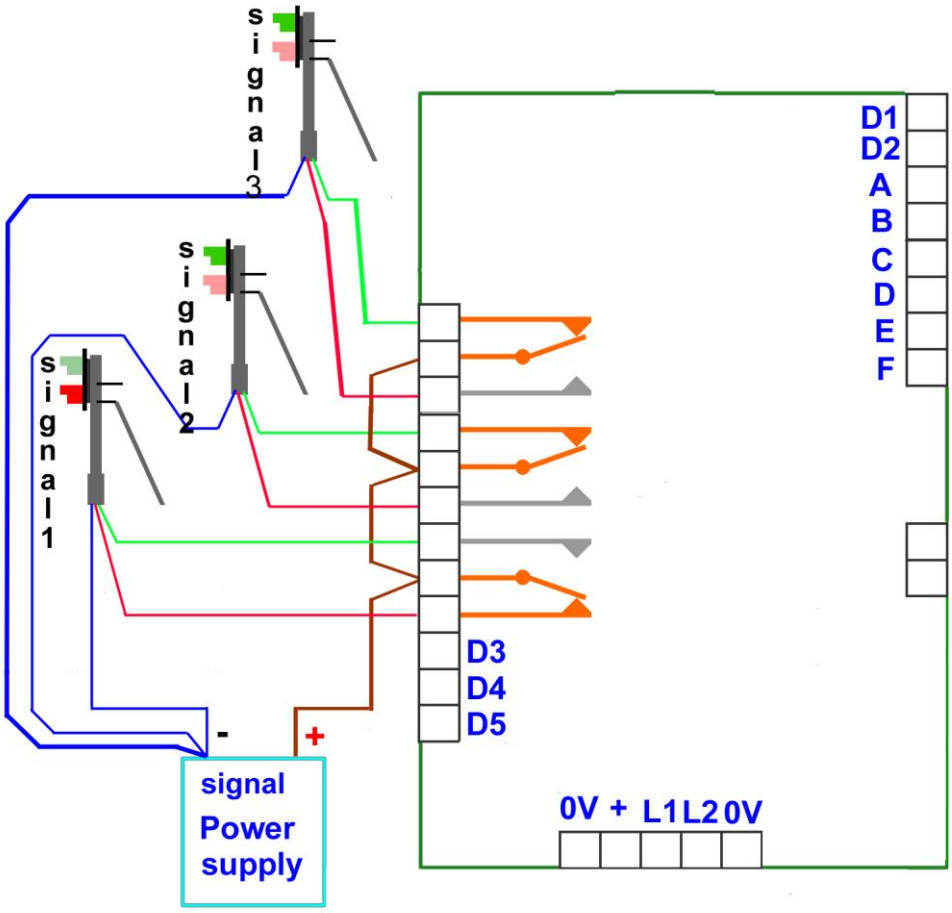
Note: min and max speed adjustments are confusing to set unless acc/brake is set to abrupt because of the effect of electronic inertia. Also maximum speed can only take effect whilst the green LED is lit and Minimum speed only whilst the red LED is lit. Finally adjust the delay time setting to the desired time. Note that the length of the flashes is proportional to the delay time.

Overload protection

Overload protection is built into the SA9. If an excessive current is drawn from the unit then the overload circuit will prevent the unit from being damaged by switching off power to the track. This fault condition is indicated by the red and green LED's both lighting. As soon as the fault is rectified the unit will resume normal working.

Signals

There are 3 sets of single pole changeover contacts for switching the signals.



Installation tips

Check none of the LEDs are lit on the IRDOTs until rolling stock is over them.
When starting up for the first time ensure trains are placed over both the D3 and D4 detectors and they are lit.
Ensure the point changes to the D3 siding and when the train returns to D3 the points change to the D4 siding.
The first train should depart towards D5 if it does not reverse the connections to the track.
Once set up the the SA9 is designed so that power can be switched off at any point in the sequence and the trains will resume the sequence from this position. This meansthat if the trains are not over D3 and D4 they will initially travel towards them.

As the train leaves D3 the green LED will be lit on the SA9 board. When it reaches D2 the red LED only will light on the SA9 board. On the reverse journey the green LED will be lit until the train reaches D1 when the red LED will light. This is a good check that the IRDOT sae detecting the train correctly and are wired to the correct terminal.