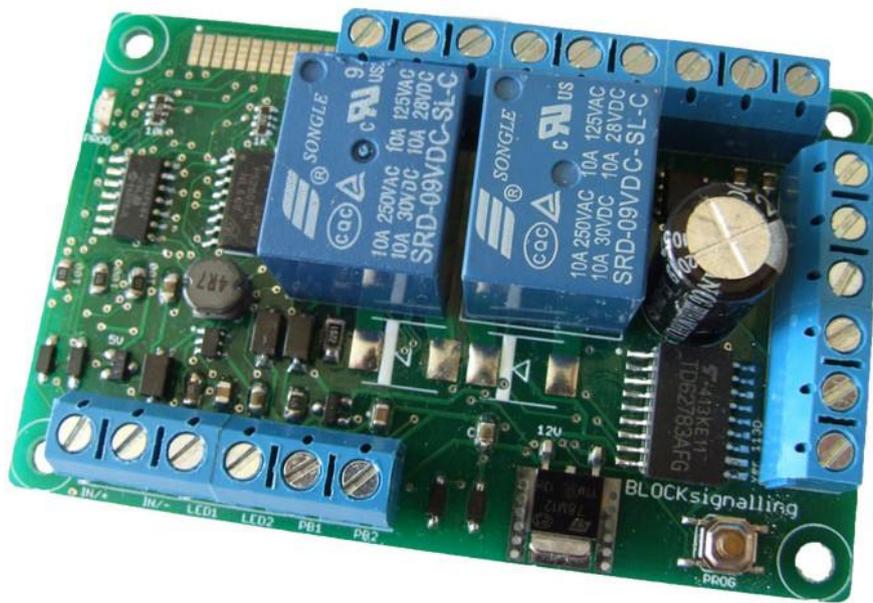


BLOCKsignalling

www.blocksignalling.co.uk

AUTOMATIC TRACK LOOP CONTROLLER L1-DC



- Manages trains entering a track loop
- Operates points to route arriving locos to vacant track
- Holds locos until another arrives, stops them for a set delay, or the user can release them
- Flexible design can easily be programmed to suit user requirements

Basic Operation

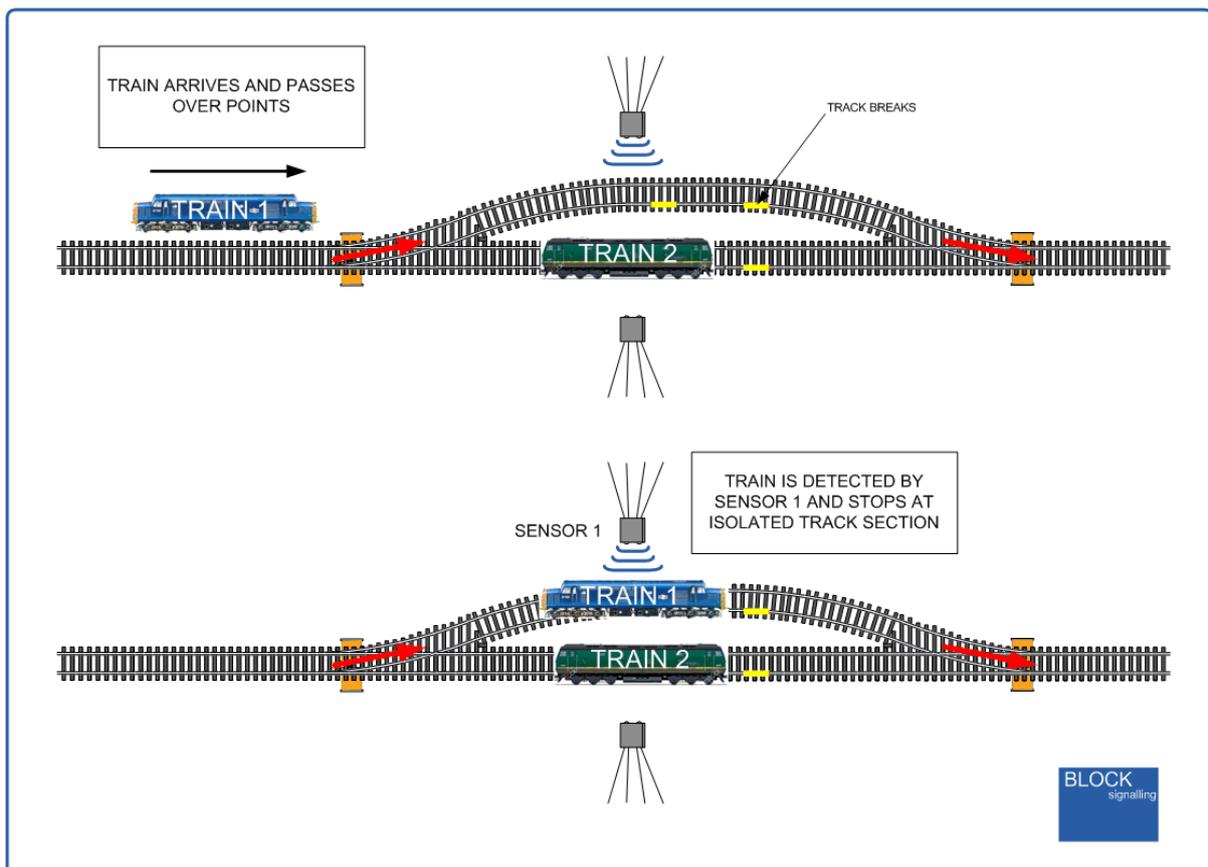
The module is connected to the points motors at both ends of a section of track with a loop.

Each of the two lines has a section isolated either by insulated track joiners or breaks in the track. This section is normally not energised and so any train reaching this section will come to a stop.

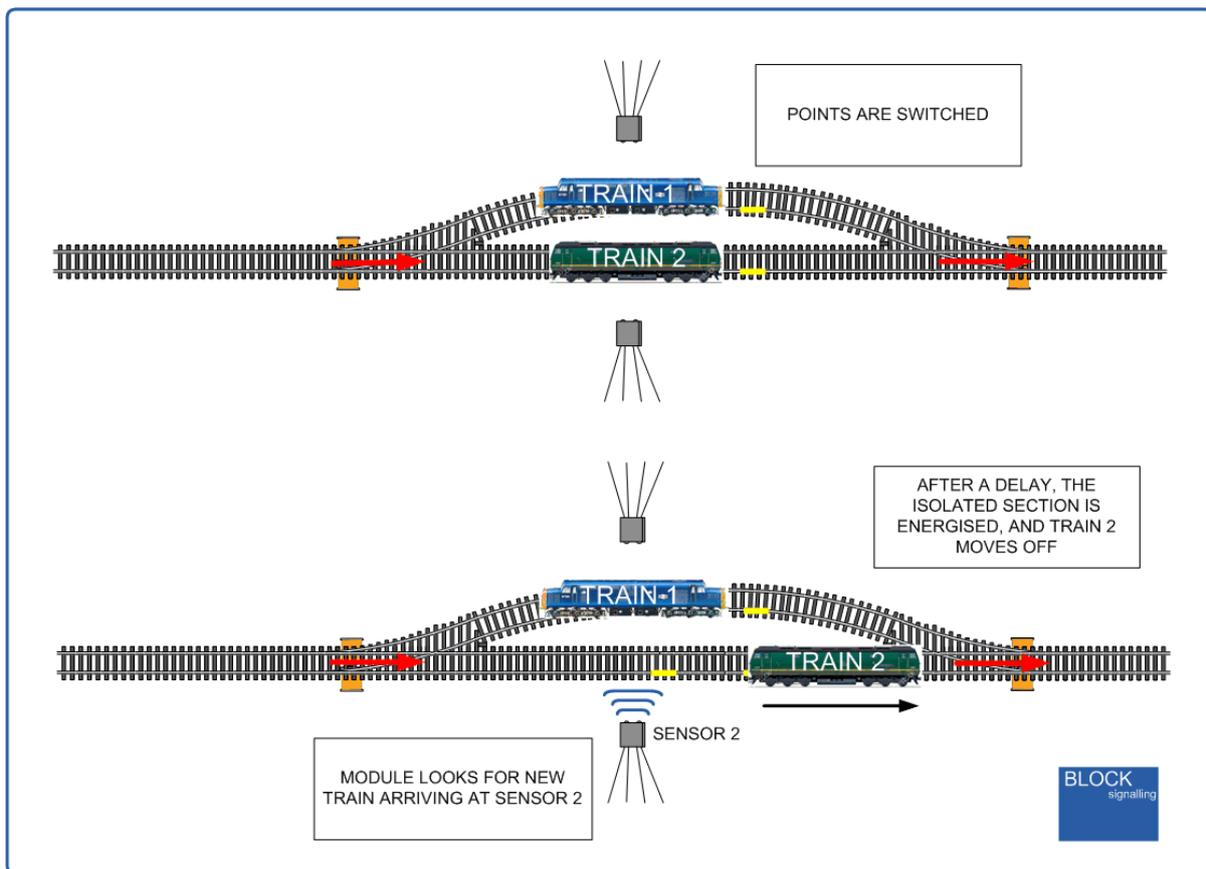
Two infra-red sensors are connected to the module that detect trains entering either the loop (L), or the main section of track (M) depending on the setting of the points. Only one sensor is active at a time.

When the module is powered, it switches the points to their last known position (from when the module was last switched off).

When a train arrives, it crosses the points and passes over one of the infra-red sensors and comes to rest at the isolated track section.



The module operates the points at both ends of the section ready to depart any waiting train on the other line and after a delay, energises the isolated section allowing any waiting train on the other line to depart.



The train which has just arrived, remains at its isolated section, until another train arrives on the opposite line, when the process is repeated.

There are many options to customise the operation which are covered in detail later.

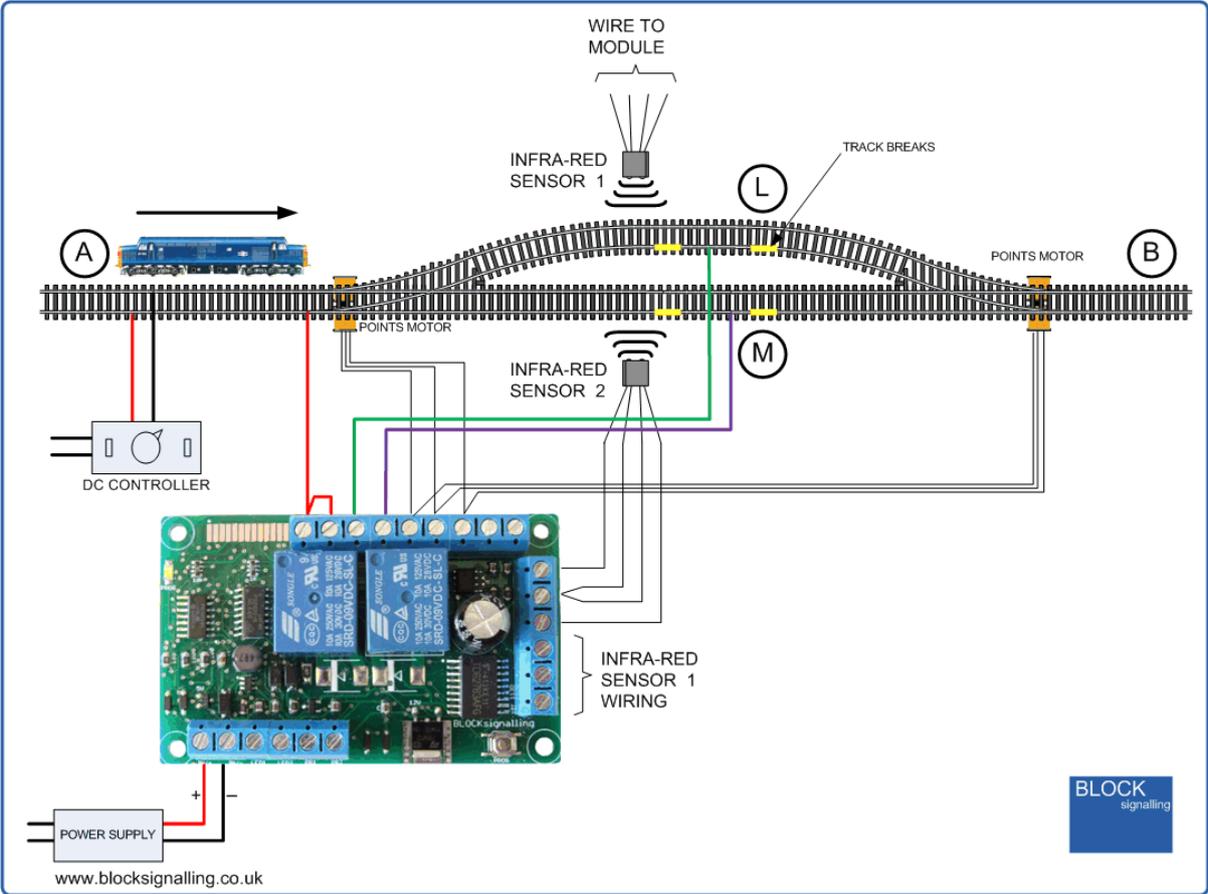
Connecting Up

To power the isolated section of track, a feed is taken from the rail on the same side (red wire). This is connected to the two relay common terminals, IN1 and IN2.

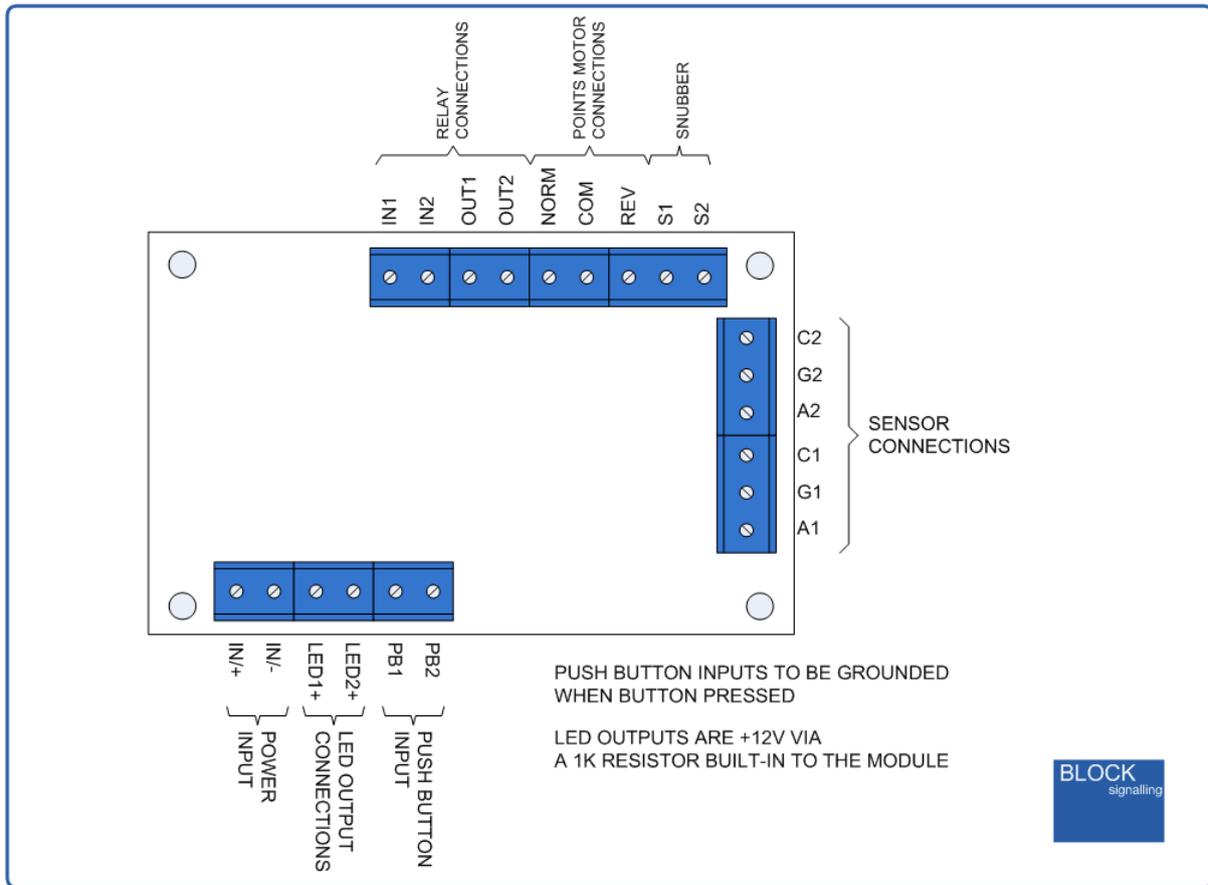
The relay output OUT1 connects to the isolated section of the loop track. The relay output OUT2 connects to the isolated section of the main track. These relay contacts are normally closed when the power is removed from the module, so with the power off, the layout can be operated manually.

The points motors are connected to the NORM (normal), COM (common) and REV (reversed) contacts.

The recommended power input is 12V DC connected to the IN/+ and IN/- terminals.



Terminal Diagram



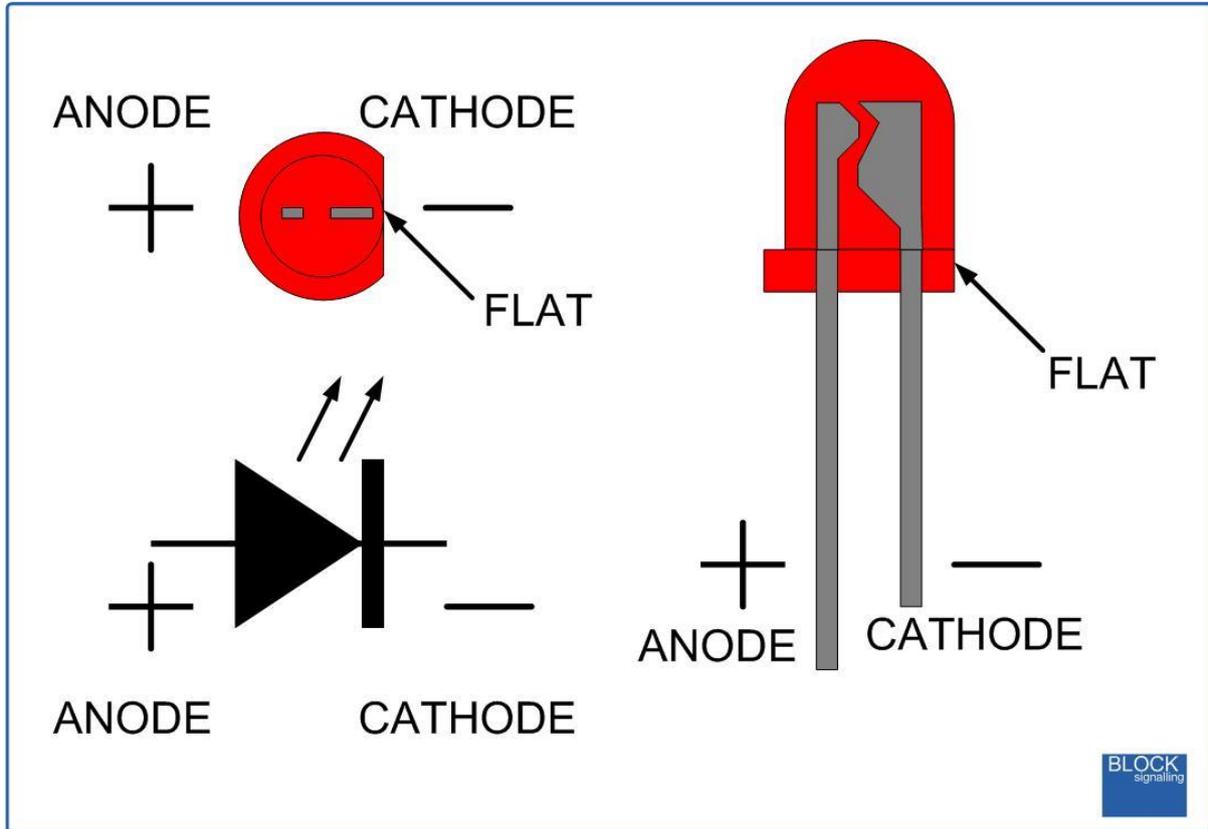
Power Supply

The module operates from a 12V DC supply. Please check the wiring carefully before turning on the power to prevent damage to the module.

Led Connection

When using leds it is important to connect them the right way around.

The negative lead (cathode) is identified by a flat on the side of the led body, and by having a shorter lead. led anode and cathode connections

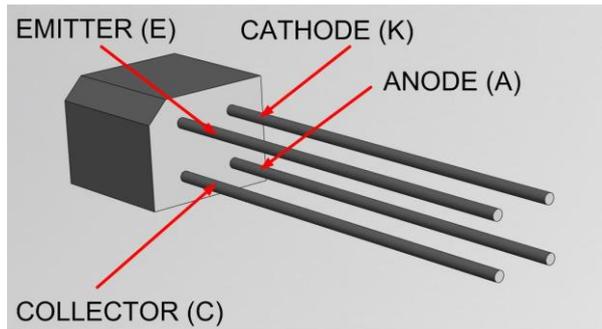


Connecting the Infra-Red Sensors

An Infra-Red source and Infra-Red detector are moulded into a single 5mm x 6.5mm package that can be located below the track bed to reflect light off rolling stock.

Identify the Sensor 1 leads from the diagram and connect to the terminals marked A1 and C1 on the module. Leads E and K both connect to terminal G1.

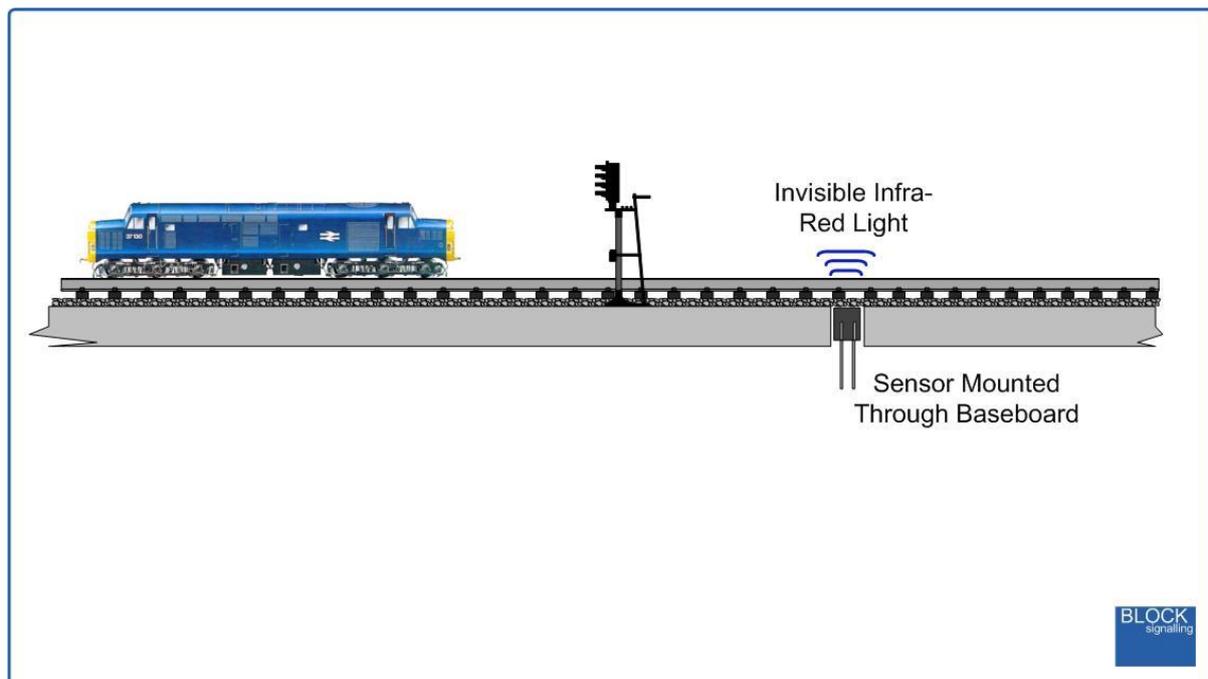
Repeat for Sensor 2, connecting to C2, G2 and A2.



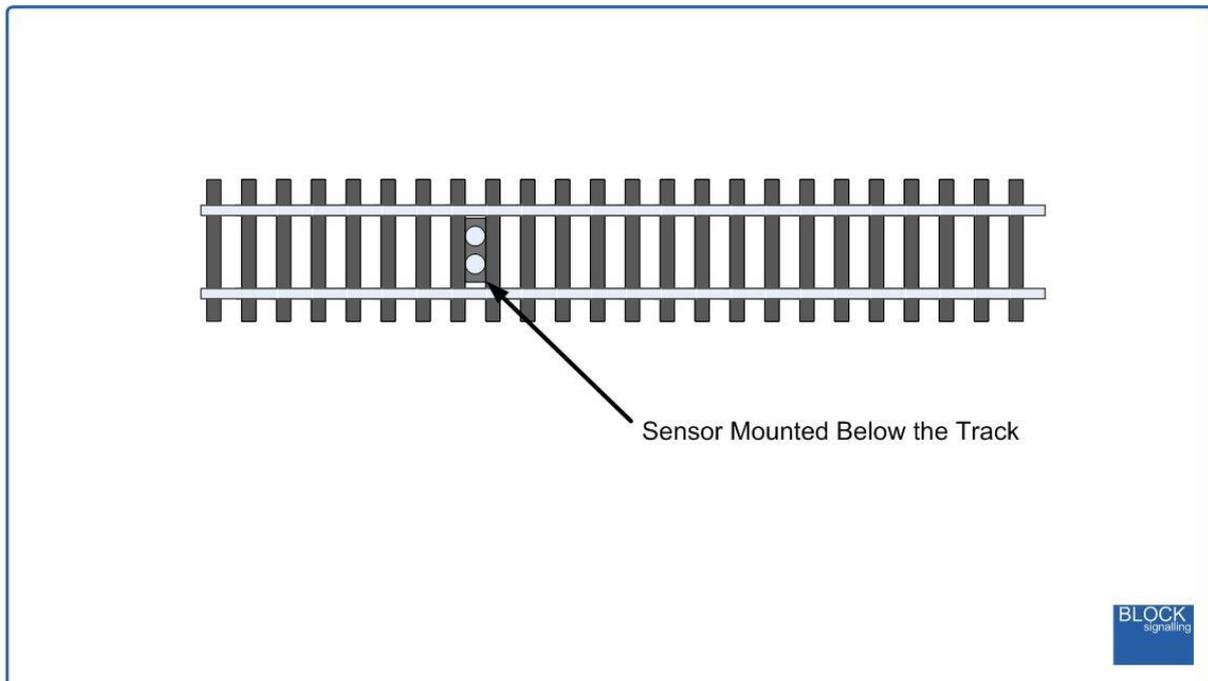
The wires can be extended using small chocolate block and extra lengths of cable if required (not supplied).

Sensor Installation

The Infra-Red sensor is normally installed below the track-bed.



The detection range of the unit is up to approximately 25mm from the face of the package when the default sensitivity is set (for dark surfaces with low levels of reflectivity).



Infra Red Train Detection The detector can be mounted in an 8mm hole drilled through the track baseboard. If required, the detector can be held in place using a small amount of blutack, expanded polystyrene or similar. The led diameter is 2.2mm, so on smaller scales the leds can still have a clear view between the sleepers. Infra Red Sensor Under Track

Sequence of Operation

When first powered on, the following sequence occurs:

1. The led on the module lights for 1 second, then the points are switched to NORM.
2. Both sensors alternately search for the presence of a train (in case a train is already present on either line from the last time the layout was used).
3. If a train is found, one of the leds is lit to signify the train is present. A delay occurs (normally 10 seconds), then the points change to the opposite line to that train is on (if necessary).
4. Power is applied to the isolated section in front of the waiting train on the other line for a minimum of 5 seconds.
5. The power remains applied, until the end of the train has been detected (the sensor is clear for more than 5 seconds).
6. If there was an led lit, signifying there was a train present on that section of line, it is now extinguished.
7. The sensors then alternately search for the arrival of a train again. If there is already one over the sensor, they will be dispatched after the delay time.

Program Settings

A number of the settings which control the operation of the module can be adjusted by the user to tailor the operation of the module to suit their own requirements.

The settings are changed by powering the module with the push button on the module held down. A sequence of led flashes and push button presses are used to select the options. See later for the detailed procedure.

The following section details the settings which can be changed.

Program Mode

There are two modes that the module operate in, normal running mode and test mode. Test mode is used to check the operation of the module and is detailed later.

Sensor Type

At present, only infra-red sensors are supported.

Sensitivity

Sensitivity Setting The module is supplied with the sensitivity pre-set to suit most installations and should not need adjustment.

In locations such as tunnels, or when the sensor is not being used under the track bed, then it may be desirable to adjust the detection threshold.

The sensitivity is factory set to 5, and can be adjusted from 1 to 10 (with 1 being the most sensitive and 10 being the least sensitive).

	Trigger Threshold					
	2	3	4	5	6	7
Aluminium Foil (shiny side)	170mm	125mm	100mm	95mm	90mm	85mm
A4 White Paper	100mm	65mm	50mm	45mm	40mm	35mm
Matt Black Card	55mm	35mm	30mm	25mm	20mm	15mm
Shiny Black Plastic	45mm	30mm	25mm	20mm	18mm	15mm

Overrun

This is the time the sensor must be clear for, to confirm the train has passed. It is normally set to 5 seconds, which allows for the gaps between the carriages.

Departure Trigger

Normally, the departure of the second train is a fixed time after the arrival of the first train. By setting this memory to Random, the departure delay will be between 25% and 75% of the set delay. If it is set to Push Button, a button connected to the PB1 terminal must be pressed to dispatch the train.

Departure Delay

This is the delay before the second train is dispatched, after the first train arrives. The default value is 10 seconds.

Rail Energise Time

This set the minimum duration the isolated rail is energised to dispatch the train. It should be set to allow sufficient time for the whole loco to cross the isolated section, although the power will continue to be supplied until the train has cleared the sensor for at least the Overrun time. The default value is 5 seconds.

Points Position at Power On

When power is applied to the module, the points are switched according to this setting. You can select Normal, Reverse, or the same position as when the power was last switched off.

Led Function

As a default, the leds connected to LED1 and LED2 terminals will light when a train is detected by Sensor 1 and Sensor 2 respectively. The leds are extinguished after the train have moved off and the isolated rail section is de-energised. As an alternative, the leds can be set to light only when a train is departing. A resistor is built into the module, so any attached leds will not need their own resistor.

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 with factory settings.

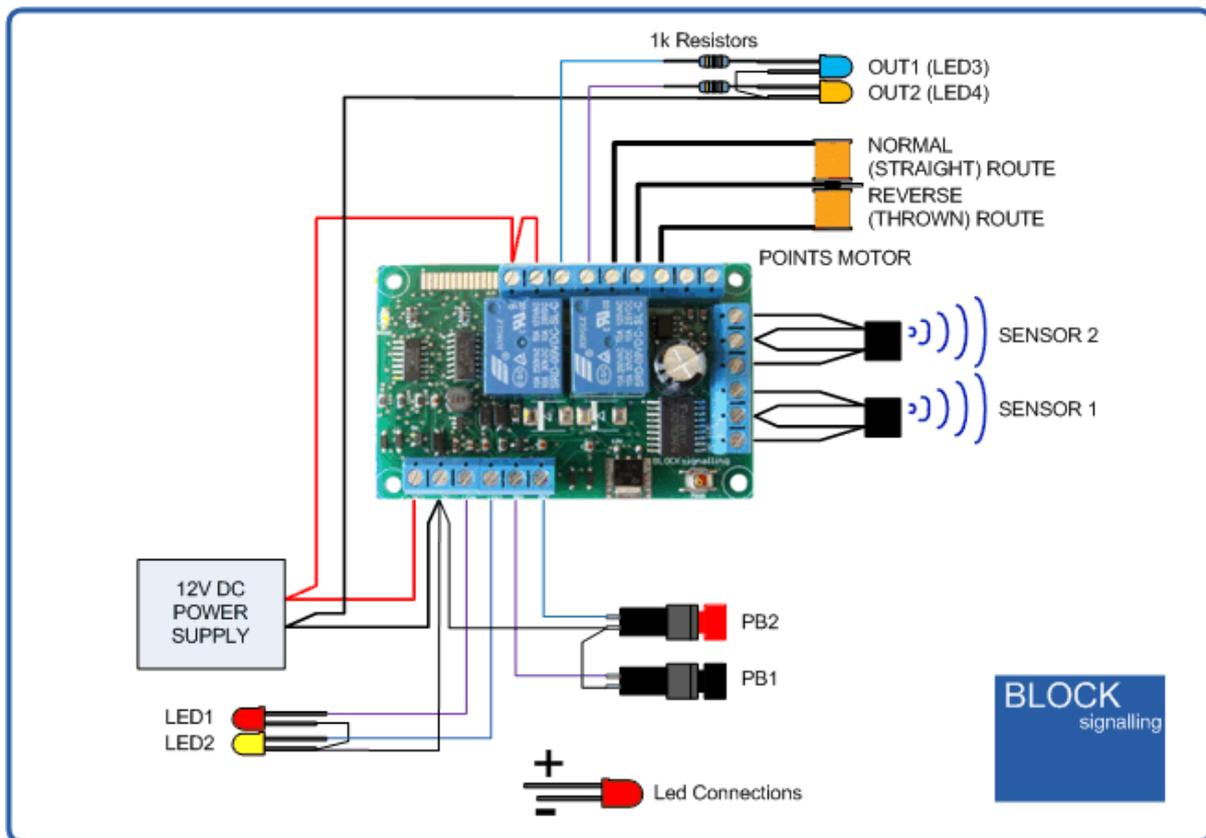
If you make a mistake programming, simply repeat the process.

Test Mode

There is a built-in test mode which can be used to check the operation of each of the inputs and outputs of the module. This can also be used to check the function of the module, and if the sensors are operating correctly.

Connect up the module with push buttons and leds as per the image below. It is recommended to use 1k resistors in the feed to each led. Take care with the polarity of the leds.

To select the test mode, program memory 2 to the value of 1.



After programming the module to run the test program, it will follow the sequence below (each step at 1 second intervals):

1. Illuminates the led on the module for 1 second.
2. Energises Relay 1 and LED1 at the same time for 1 second. The OUT1 led will extinguish at the same time.
3. Energises Relay 2 and LED2 at the same time for 1 second. The OUT2 led will extinguish at the same time.
4. Illuminates the LED1 for 1 second.
5. Illuminates the LED2 for 1 second.
6. The points are switched to the Normal direction. At the same time LED1 illuminates for a second.
7. The points are switched to the Reverse direction. At the same time LED2 illuminates for a second.
8. The points are switched to the Normal direction. At the same time LED1 illuminates for a second.
9. The points are switched to the Reverse direction. At the same time LED2 illuminates for a second.

10. Sensors 1 and 2 are switched on. If an object is brought close to Sensor 1, LED1 will flash slowly. If an object is brought close to Sensor 2, LED2 will flash slowly.

The test can be repeated by removing and reapplying power to the module.

To leave the test mode, reprogram the module to the mode you wish to use.

Program Flow Diagram

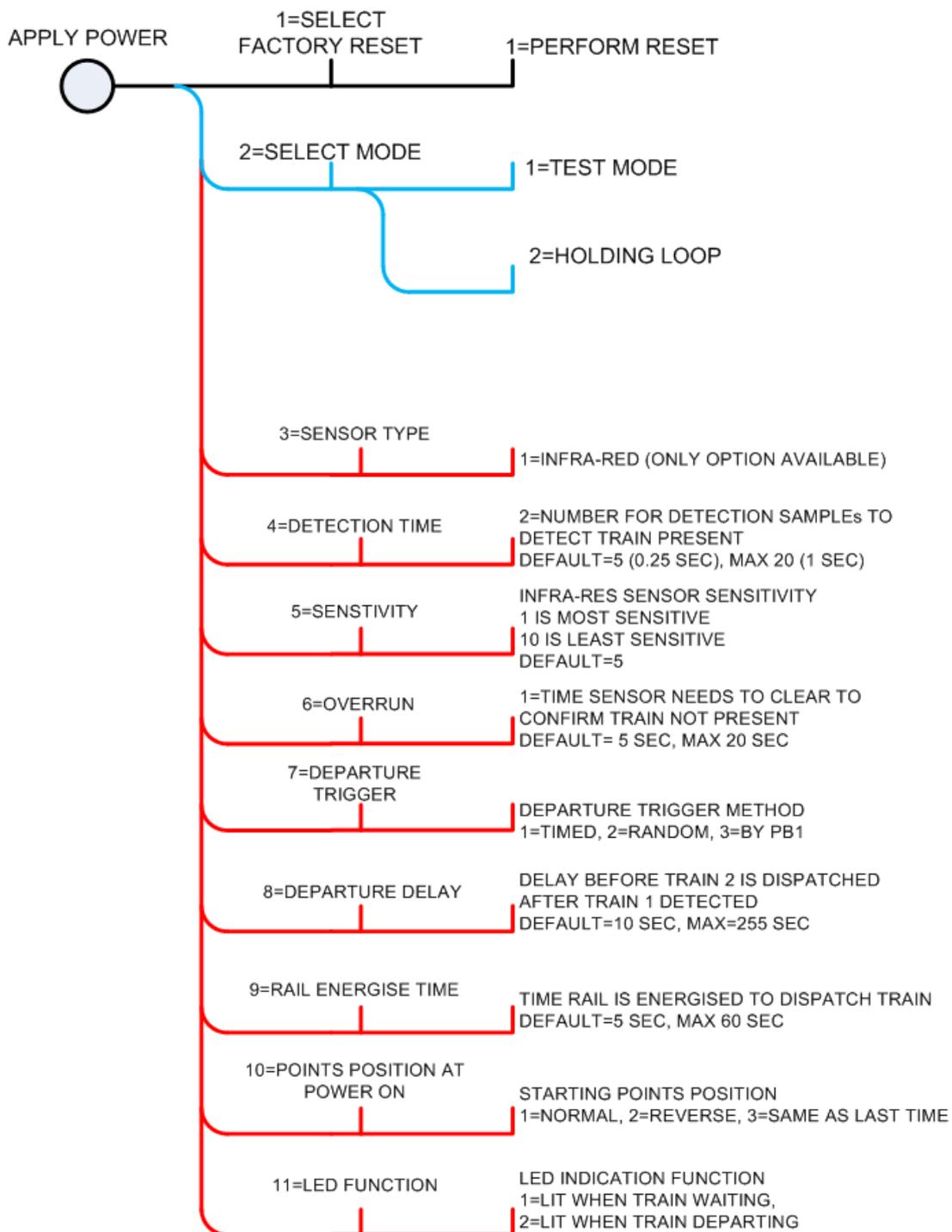
Programming is performed by holding down the Push Button when switching on the power. The red led on the PCB flashes at 1 second intervals.

When the required number of flashes is seen (see 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 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.



PROGRAMMING DIAGRAM
SECTION CONTROLLERS

