SEMAPHORE SIGNAL CONTROLLER DAP1A
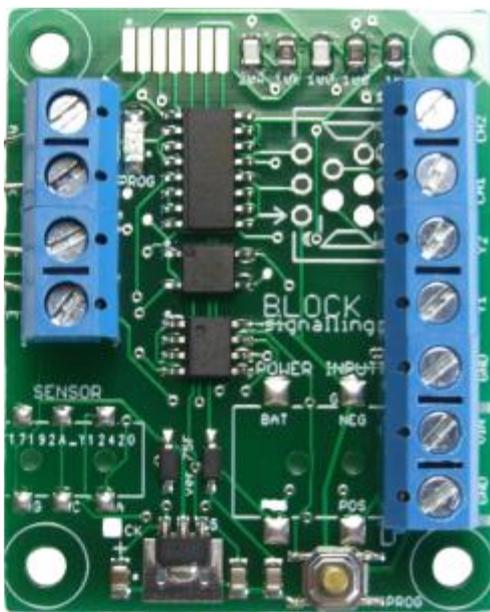
Operate Dalpol Signals Automatically

- Triggered an infra-red sensor located below the track bed
- When a train is detected passing above, the module automatically switches the signal to Clear
- When a delay (adjustable) has expired, the signal is automatically returned to Danger
- Quick and easy to set-up

This signal controller is designed to detect the presence of trains, and operate a semaphore signal in response.

The module detects the presence of trains by bouncing invisible Infra-Red (IR) light off the underside of the rolling stock, and detecting the light reflected back. When a train is detected, the module runs a built-in program which operates the attached semaphore signal.

There are two additional output channels which can be used to operate leds on a control panel to show remotely the status of the semaphore signal.

Power Supply

The module is designed for a supply voltage of **16V AC**.

There are separate output terminals on the module which are connected to the input terminals, and so provide the same voltage to the signals.

Please double check all wiring before applying power, as incorrect wiring can damage the unit.

Programming Procedure

The module is programmable, and many of the settings can be adjusted to suit. Programming is performed by inserting a link between the A and K terminals and holding down the Push Button when switching on the power. You can also program the module when the sensor is connected.
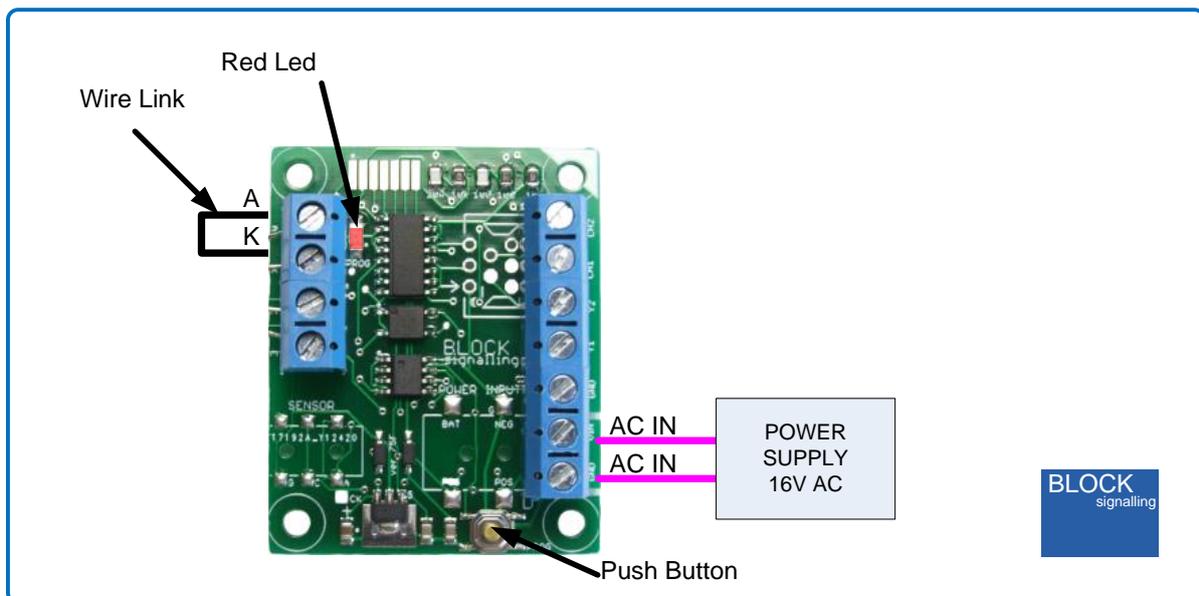
When programming, there are two values to be entered.

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 first value is stored.

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

Now the two values to be stored have been entered, the led flashes 10 times rapidly, and the module starts operating.

Each value entered can range between 1 and 255. If more flashes are seen, or the programming is aborted by switching off, then the programming must be repeated.

Connecting the Unit

Each signal has four wires to be connected.

The Black and Red wires are the power input to the signal and require 16V AC. The AC terminals (marked R and BK) on the module provide 16V AC output suitable for direct connection to the signals Red and Black wires.

The two Yellow wires are connected to the module Y1 and Y2 terminals. The module shorts these two wires together to actuate the signal.
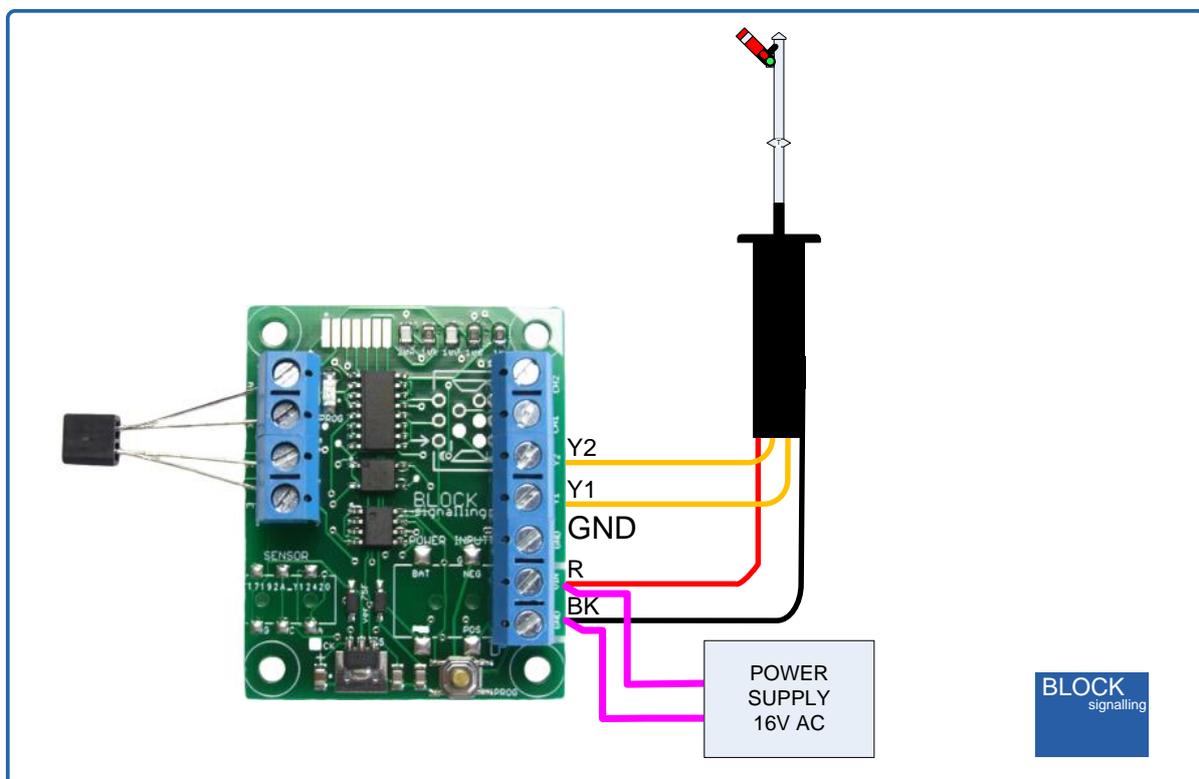
The remote outputs can be connected to leds on a control panel, and will replicate the status of the signal. The outputs provide a +12V feed to light the appropriate led, and a 1000 ohm resistor is required in series to limit the current to the led.

Connecting Control Panel Leds

The remote outputs can be connected to leds on a control panel, and will replicate the status of the signal. The outputs provide a +12V feed to light the appropriate led, and a 1000 ohm resistor is required in series to limit the current to the led.
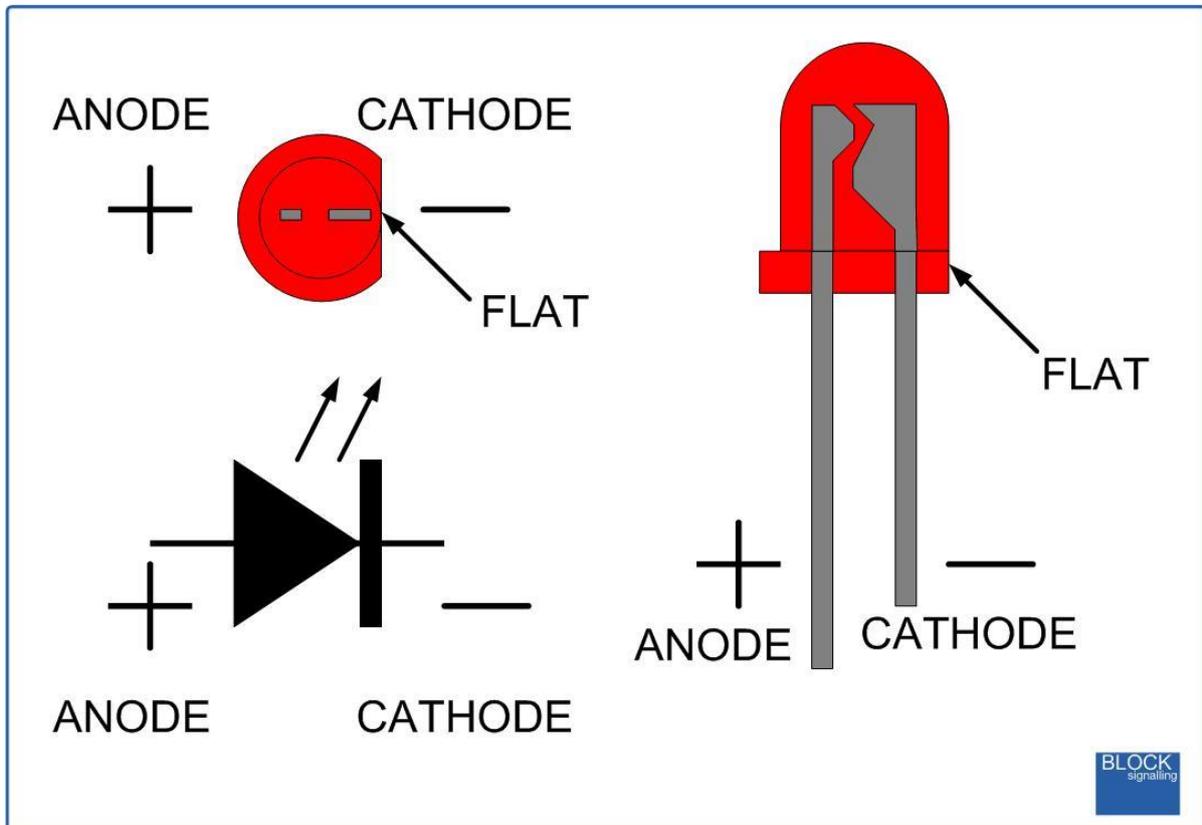
Red and green leds can be connected to the module to show the state of the signal on an operator's control panel.
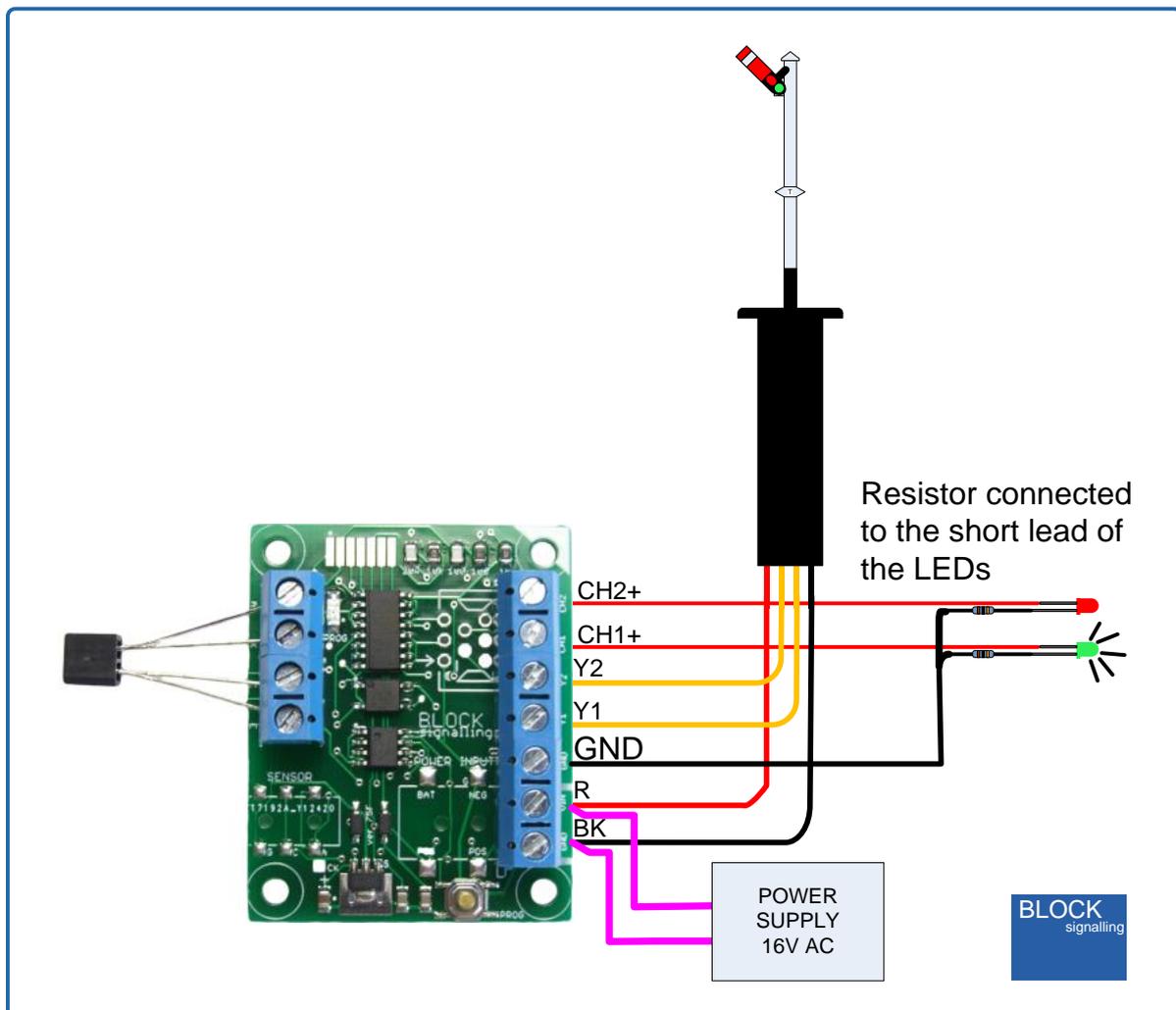
Led Connection

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.

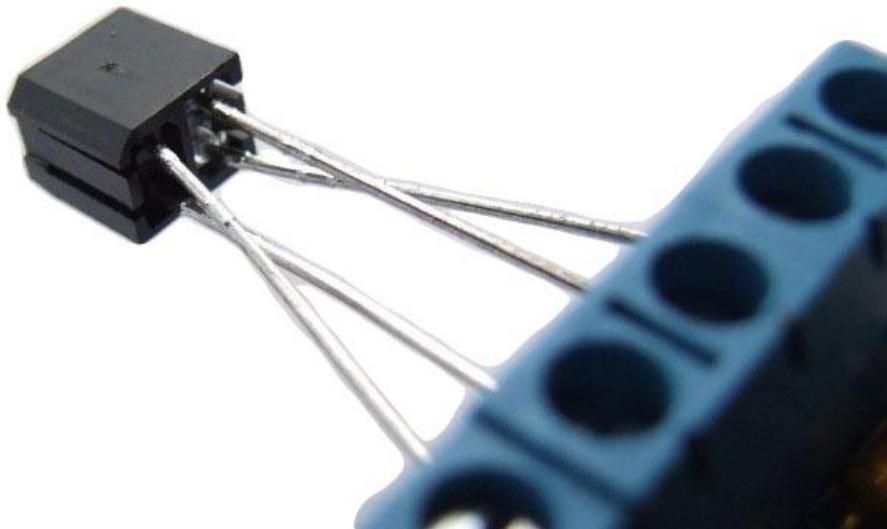**Connecting the Infra-red sensor**

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.
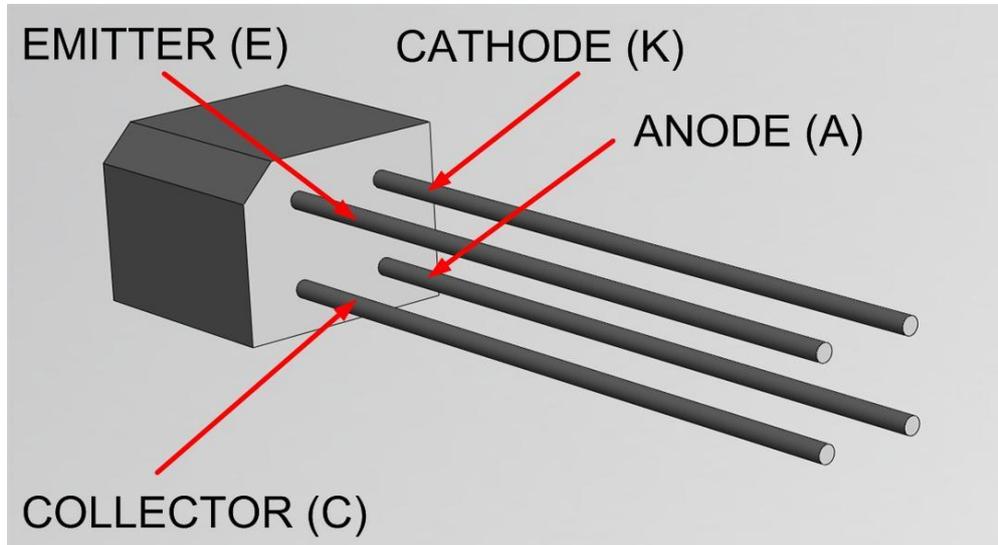
Identify the leads from the diagram and connect to the terminals marked A, K, C and E on the PCB.

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

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 module 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

To change the sensitivity, switch off the power to the module and hold down the Push Button. Apply the power and continue holding the Push Button until 9 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 reached the desired number of flashes to set the new sensitivity, press the button. You will see a long flash of five seconds and then 10 rapid flashes. The programming is then complete and the module will restart. If you make a mistake programming, simply repeat the process.

Performing a factory reset will reset the sensitivity setting back to 5.

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 normal sensitivity is set (for dark surfaces with low levels of reflectivity).
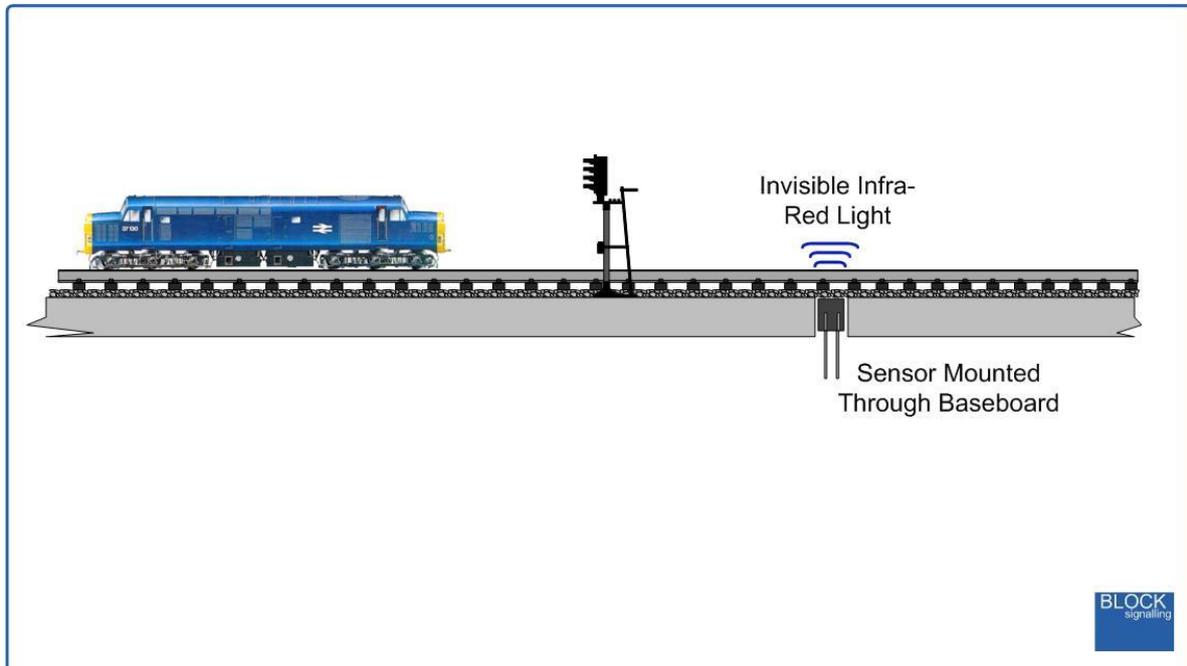
The detector can be mounted in an 8mm hole drilled through the track baseboard. If required, the detector can be held in place using a small amount of blutack, expanded polystyrene or similar.

The led diameter is 2.2mm, so on smaller scales the leds can still have a clear view between the sleepers.
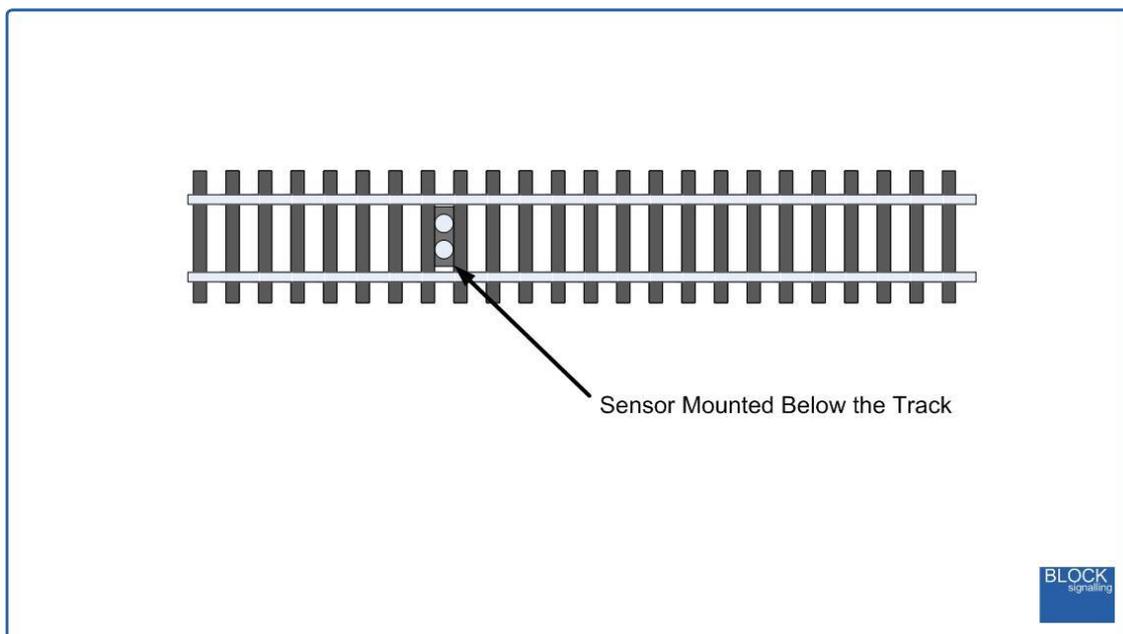
Synchronisation

The semaphore signal changes from Clear to Danger and from Danger to Clear each time the yellow wires are shorted by the module.

When first connected, the signal needs to be synchronised to the module. From that point on, the module will remember the signal position, even when the power is switched off.

If the signal is not synchronised, press the push button on the PCB, and the signal will be switched to the opposite state (note: this is only possible when the module is powered up and waiting for a train to arrive).

Selecting Clear Approach Signalling

In this mode, the signal is normally in the Danger position.

As the train approaches the signal and crosses the sensor, the signal is switched to Clear by the module. Some time later (adjustable) the signal returns to Danger.

To select this program, switch off the power to the module and hold down the Push Button. Apply the power and continue holding the push button until 2 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 2 flashes 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.

Adjusting the "Return to Danger" Time

The duration that the signal remains Clear once triggered is adjustable by setting parameter 3. So for instance if you wanted the signal to be at Clear for 6 seconds once the train has passed, then set parameter 3 to a value of 6.

The full procedure is as follows:

Switch off the power to the module and hold down the Push Button. Apply the power and continue holding the push button until 3 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 6 flashes 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.

Adjusting the Release Time

When a train with multiple carriages passes over the sensor, each gap between the carriages will be seen by the sensor. Normally, the sensor must be clear for four seconds for the module to sense the train has cleared the sensor completely.

This delay is adjustable from 1 to 255 seconds by setting parameter 6 to the number of seconds required. So, if it is required for the sensor to be uncovered for 7 seconds before it is confirmed the train has fully cleared the sensor, then set this parameter to 7.

The full procedure is as follows:

Switch off the power to the module and hold down the Push Button. Apply the power and continue holding the push button until 6 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 7 flashes 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.

Note: once the sensor has been cleared, and the release time has expired, then the red time needs to expire before the signal returns to green and can be triggered again.

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, and run the lamp test mode. If you make a mistake programming, simply repeat the process.

Program Flow Diagram

The diagram below shows all the programming options.

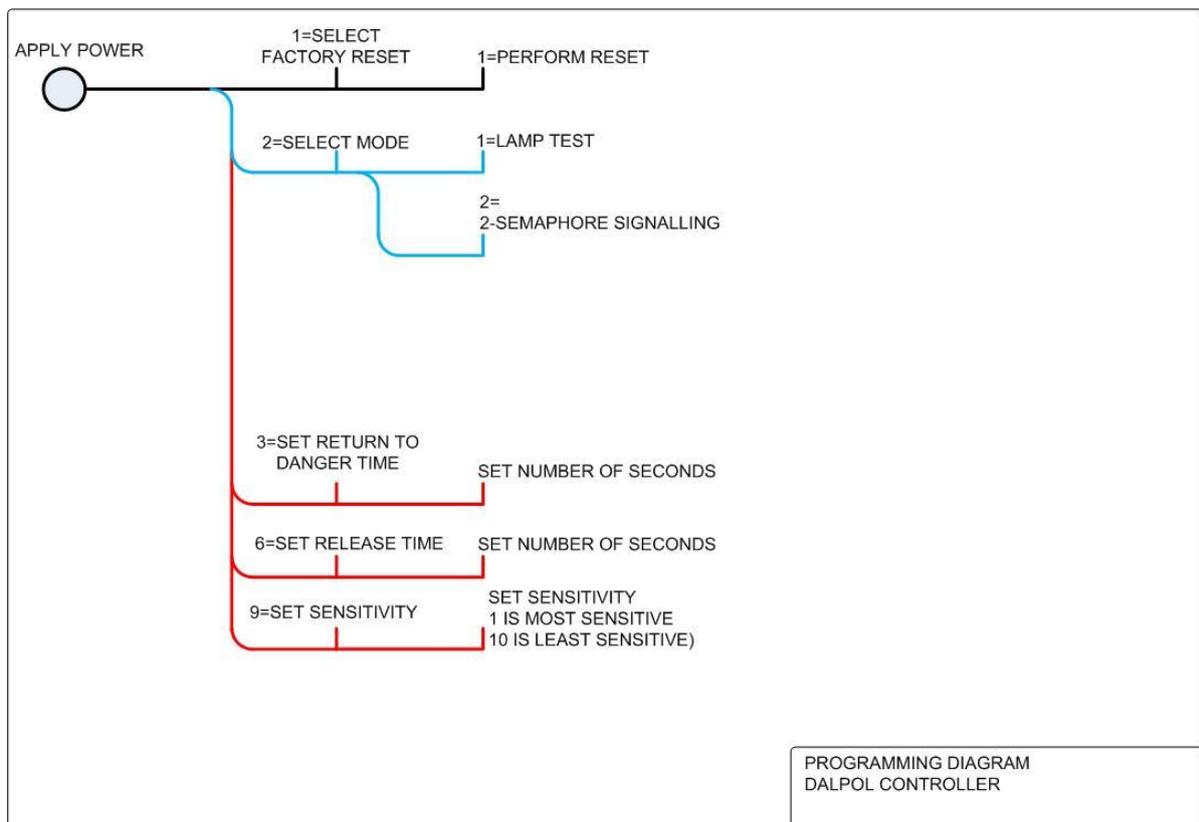Programming is performed by holding down the Push Button when switching on the power.

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 have been 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.

APPLY POWER

1=SELECT FACTORY RESET   1=PERFORM RESET

2=SELECT MODE   1=LAMP TEST

2=
2-SEMAPHORE SIGNALLING

3=SET RETURN TO DANGER TIME   SET NUMBER OF SECONDS

6=SET RELEASE TIME   SET NUMBER OF SECONDS

9=SET SENSITIVITY   SET SENSITIVITY 1 IS MOST SENSITIVE 10 IS LEAST SENSITIVE)

PROGRAMMING DIAGRAM
DALPOL CONTROLLER

Dapol signal and leds are not included, just for illustration only.