SEMAPHORE SIGNAL CONTROLLER (DAP2)
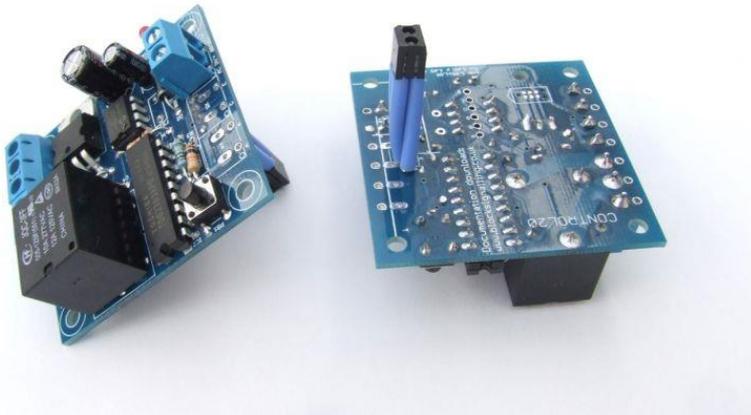
Automatically Operate Semaphore Signals by Infra-Red Triggering

This signal controller is designed to detect the presence of trains using an infra-red sensor, and operate a semaphore signal in response.

The module detects trains by bouncing invisible Infra-Red (IR) light off the underside of the rolling stock, and detecting the light reflected back. The modules are fitted to the underside of the baseboard, and the sensor sits level with the track bed.

When a train is detected, the module runs built-in programs which operate the attached semaphore signal.

The outputs are compatible with Dapol signals, and Fleischmann 9205 and 6205 signals.

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 **14-16V AC**.

There are separate AC 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 holding down the Push Button when switching on the power.
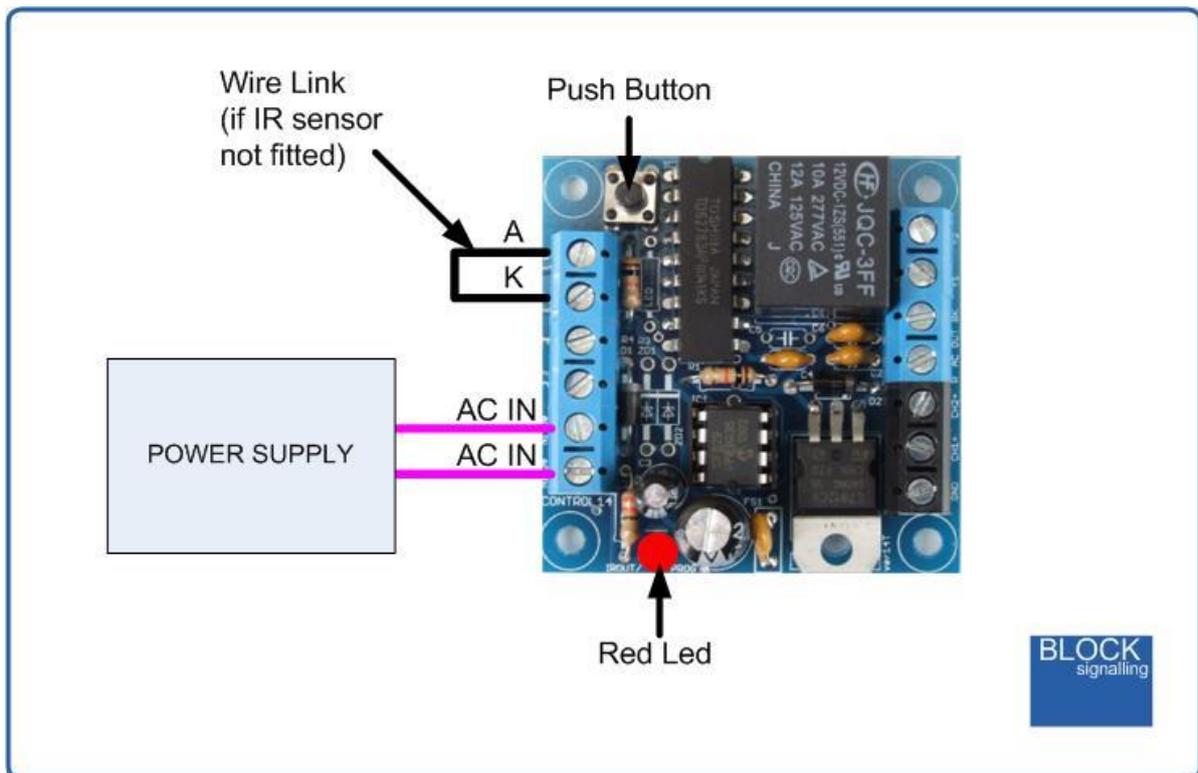
When programming, there are two values to be entered.

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.

Led Connection

The remote outputs can be connected to leds on a control panel, and will replicate the status of the signal. The outputs provide a +5V feed to light the appropriate led, and a 300 ohm resistor is required in series to limit the current to the led (unless leds with built in resistors are used).

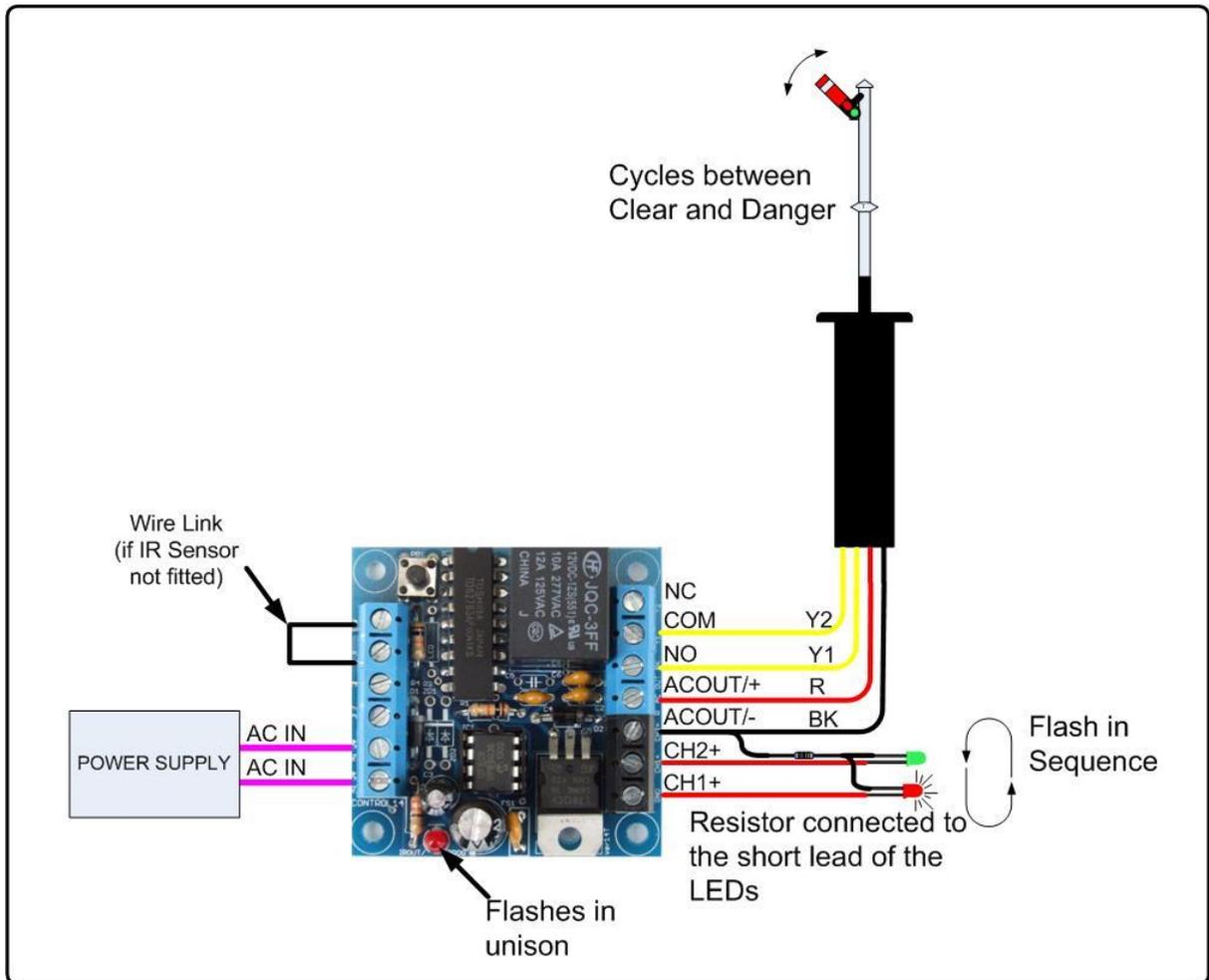When using leds it is important to connect them the right way around.

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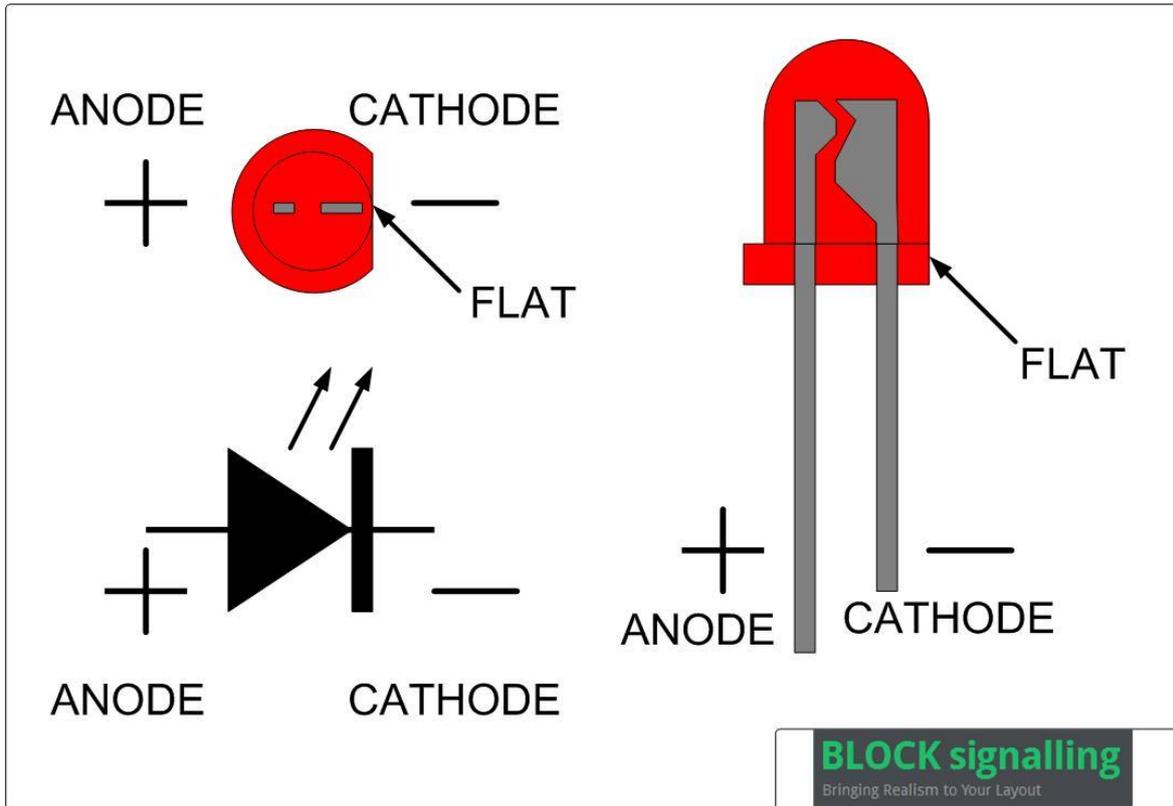
Testing Wiring

There is a test sequence which can be selected to test the installation wiring. In this sequence first all outputs are switched on (ch1 and ch2). Then ch1 is switched off and ch2 comes on. The ch1 switches off and ch2 switches on, then all channels are turned off. The cycle repeats.

At each step in the cycle, the output to the semaphore signal is operated, so the signal switches between Clear and Danger, and back to Clear every two seconds (with Dapol signals).

Cycles between Clear and Danger

Wire Link (if IR Sensor not fitted)

NC
COM   Y2
NO   Y1
ACOUT/+   R
ACOUT/-   BK
CH2+
CH1+

POWER SUPPLY
AC IN
AC IN

Flashes in unison

Flash in Sequence

Resistor connected to the short lead of the LEDs

If you are using Fleischmann signals, the signal will move between clear and danger, at 1 second intervals.
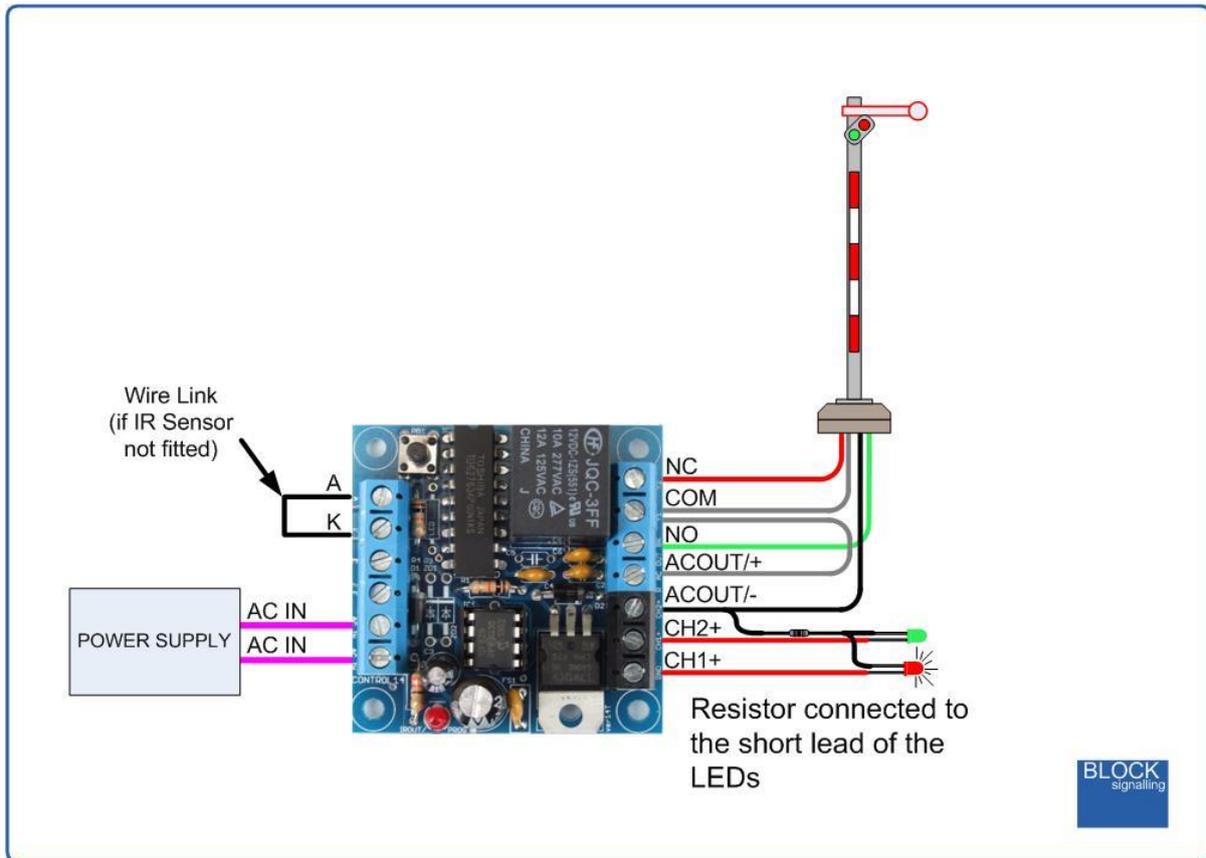
The led on the PCB also switches on and off with each step.

To select this test 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 1 flash 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 lamp test program (you should hear the relay clicking on and off at 1 second intervals). 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 (for Dapol signals). If you make a mistake programming, simply repeat the process.

If you have Fleischmann signal connected, you will need to select the Fleischmann program (see below).

PCB LED

The LED mounted on the PCB has four modes of operation:

1. full brightness (during programming)

2. 10% brightness, flickering (whilst searching for a train)

3. 50% brightness, flashing (in programs where the rear of the train is being detected, the 50% brightness flashing will continue for four seconds after the train has cleared the sensor. This is to prevent incorrect detection due to gaps between the rolling stock.

4. OFF (module is no longer searching for a train)

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).

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).

Mount the PCB to the underside of the baseboard using 2.5mm screws and appropriate spacers, to ensure the sensor is level with the track-bed (if the module has been supplied with the sensor loose, please see below for wiring information).
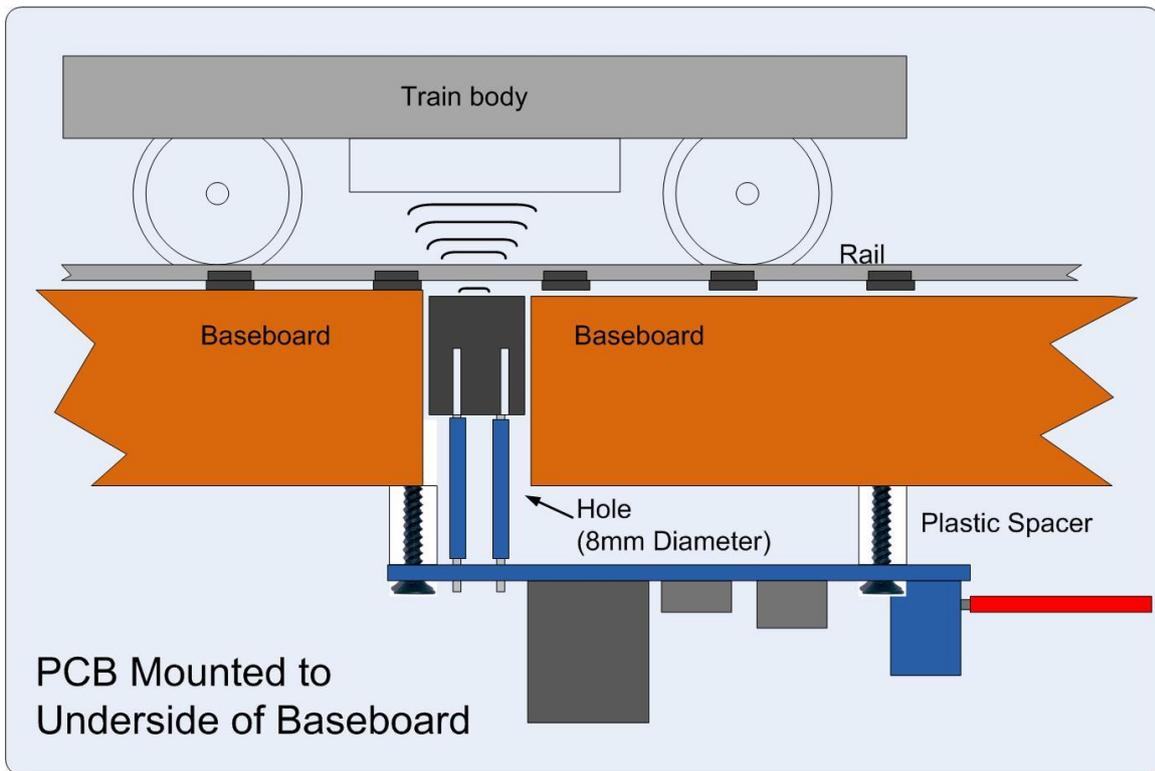
The detector can be mounted in an 8mm hole drilled through the track baseboard. If required, the detector can be held in place using a small amount of blutack, expanded polystyrene or similar.

The led diameter is 2.2mm, so on smaller scales the leds can still have a clear view between the sleepers.
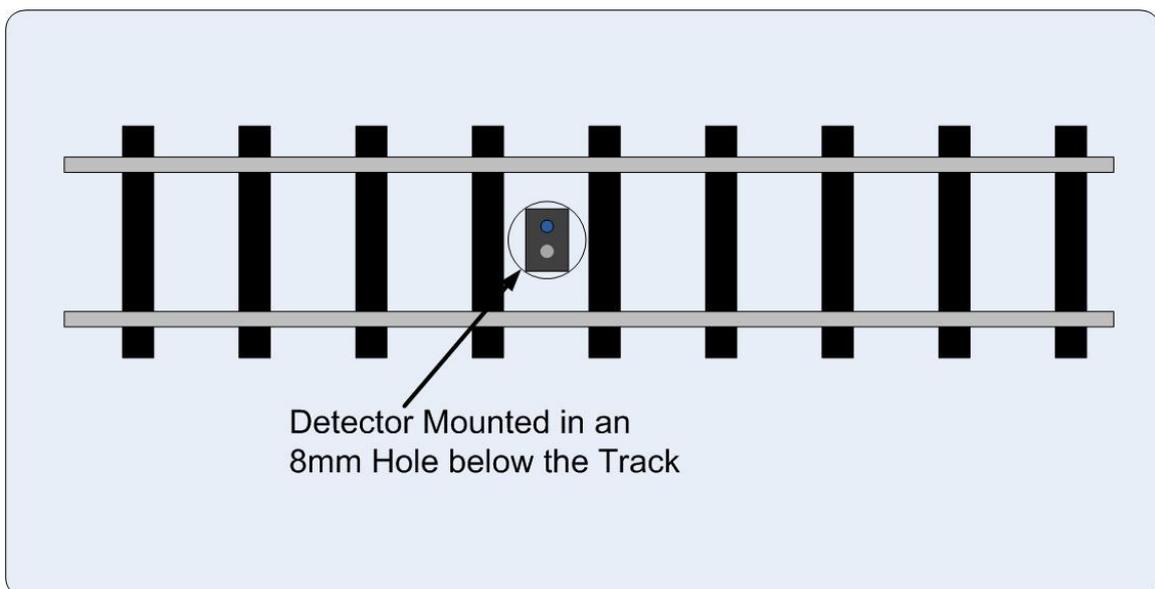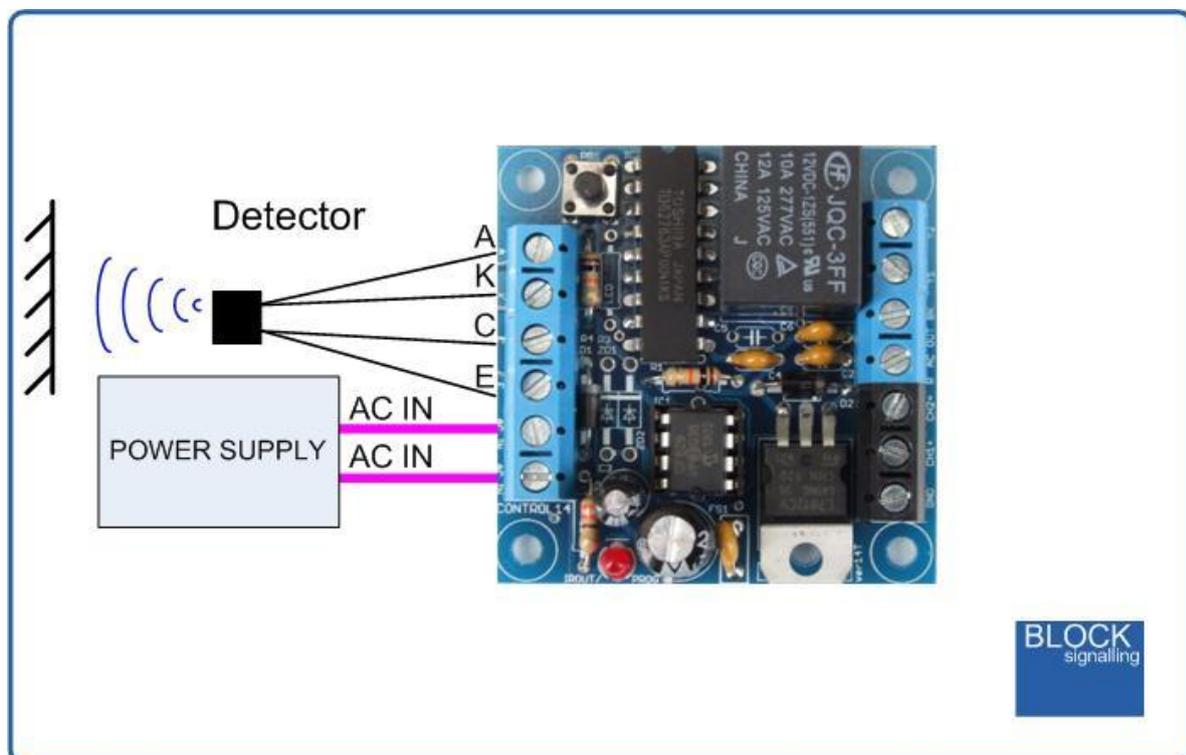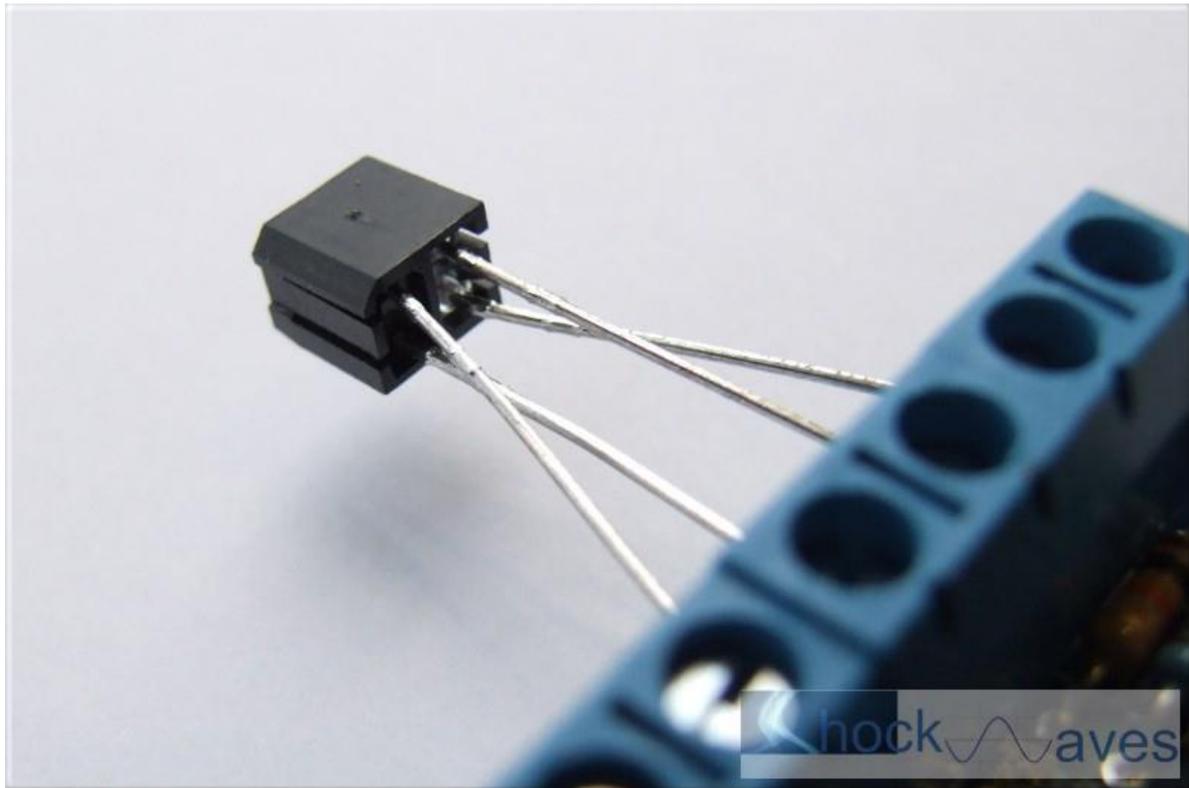
Connecting a Remotely Connected Infra-Red Sensor

Some versions of this module are supplied with a separate infra-red sensor.
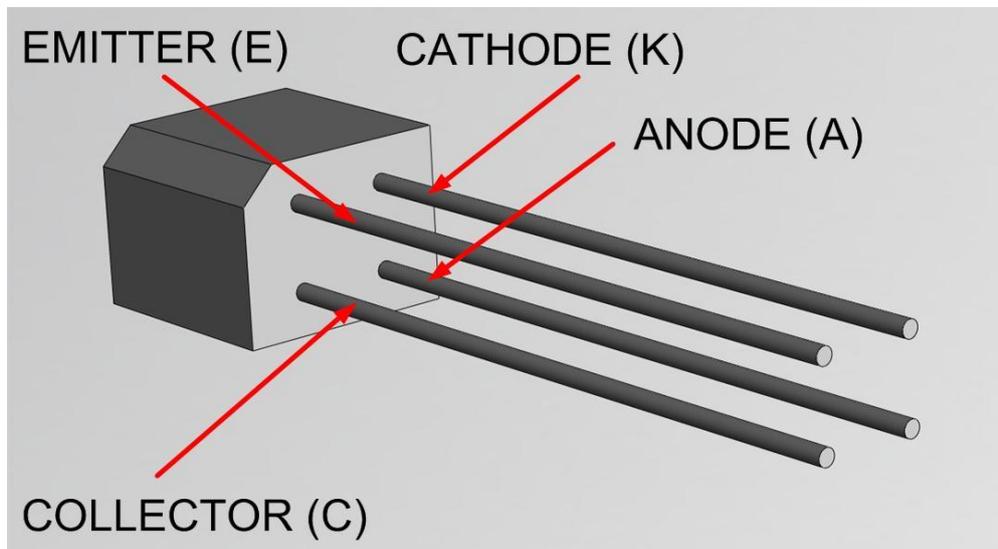
Identify the leads from the diagram and connect to the terminals marked A, K, C and E on the PCB.

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 (for Dapol Signals) or 3 flashes (for Fleischmann Signals) 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 start running the program. If you make a mistake programming, simply repeat the process.

The red led will blink rapidly, whilst the module searches for a train.

You can test the operation by placing your finger close (around 10mm form the signal) and you should hear the relay click and the signal should operate.

If you keep your finger inplace, the led will continue to flicker (at half the rate compared to before). It is now looking for the train to have passed.

If you remove your finger briefly, and the replace it, the flickering will continue and the module will think that the gaps between carriages are passing the sensor.

After you remove your finger fully, the led will flash briefly at 1 second intervals. This is the counting out of the delay now the train has cleared the detector and is the interval before the signal returns to danger.

Each of these timings is configurable (see below).

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 1 second 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.
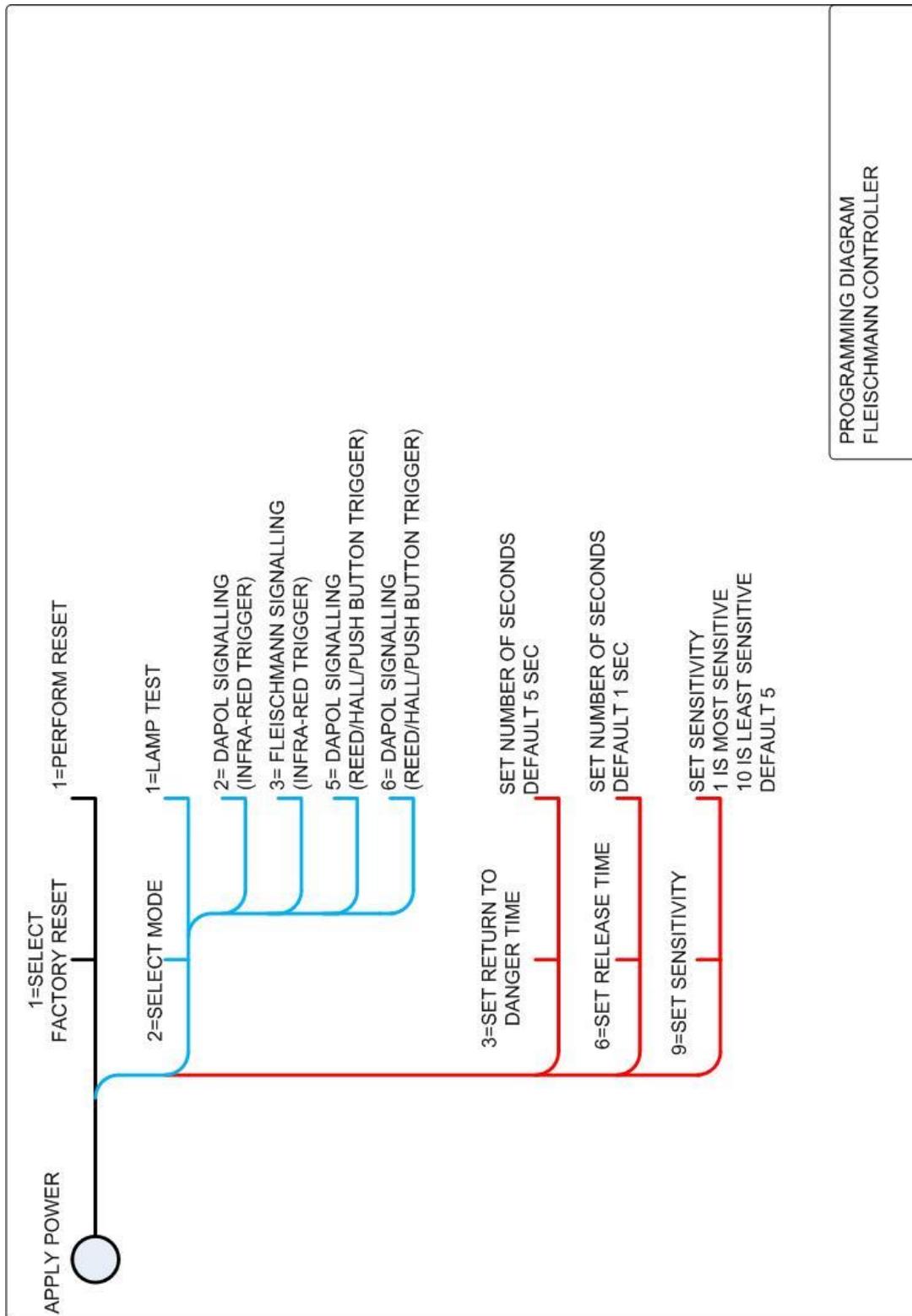
The full procedure is as follows:

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 "Return To Danger" time needs to expire before the signal returns to danger and can be triggered again.

Programming Diagram

The following diagram shows all the programming options.

APPLY POWER

1=SELECT FACTORY RESET
1=PERFORM RESET

2=SELECT MODE
1=LAMP TEST
2= DAPOL SIGNALLING (INFRA-RED TRIGGER)
3= FLEISCHMANN SIGNALLING (INFRA-RED TRIGGER)
5= DAPOL SIGNALLING (REED/HALL/PUSH BUTTON TRIGGER)
6= DAPOL SIGNALLING (REED/HALL/PUSH BUTTON TRIGGER)

3=SET RETURN TO DANGER TIME
SET NUMBER OF SECONDS DEFAULT 5 SEC

6=SET RELEASE TIME
SET NUMBER OF SECONDS DEFAULT 1 SEC

9=SET SENSITIVITY
SET SENSITIVITY
1 IS MOST SENSITIVE
10 IS LEAST SENSITIVE
DEFAULT 5

PROGRAMMING DIAGRAM
FLEISCHMANN CONTROLLER

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