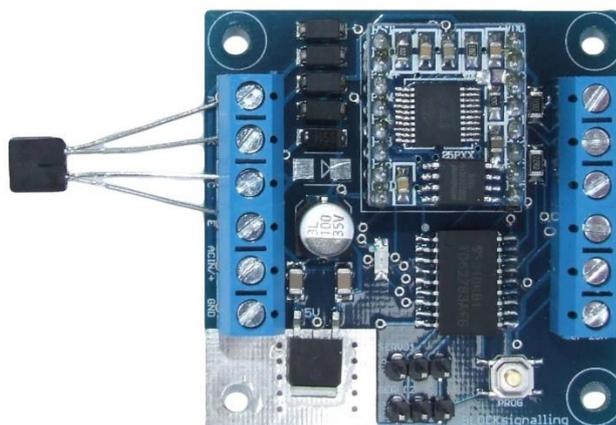


LEVEL CROSSING MODULE FOR LED SIGNALS LCS1



Fully Flexible Controller for Common-Cathode LED signals

- Automatically detects trains using an infra-red sensor mounted below the track bed
- Operates attached yellow and red leds on level crossing signs (not included)
- Once train has cleared the sensor, the leds automatically stop operating
- Built-in programs to cover most UK and continental crossing styles

Model railway layouts often incorporate a level crossing, and the LCS1 module is designed to add realism to these crossings with automatic detection of an approaching train which triggers the operation of led signals indicating to road traffic that a train is approaching.

The module is triggered by infra-red sensors mounted beneath the track and works equally on DC or DCC layouts.

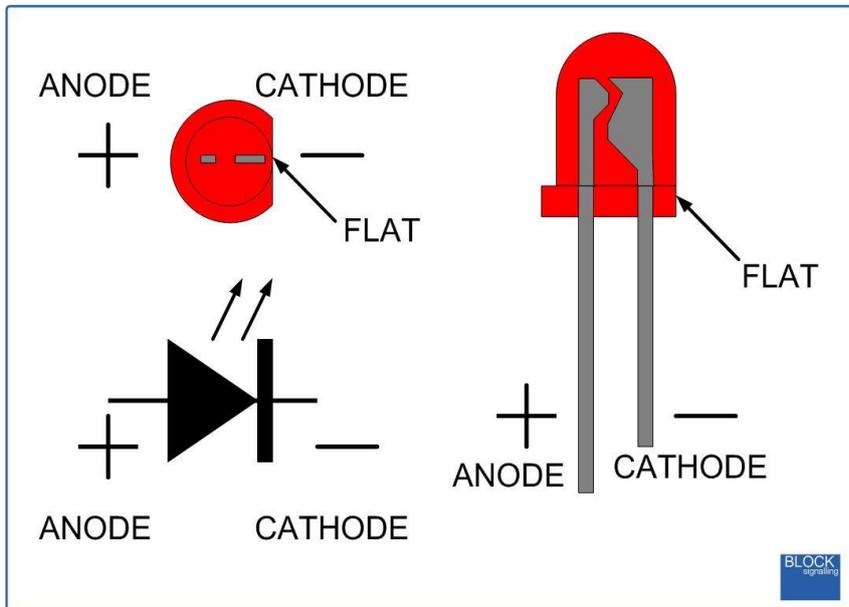
The led signals will continue flashing until the train has cleared the level crossing.

The control system is built and tested, ready for connection to the chosen warning light signals.

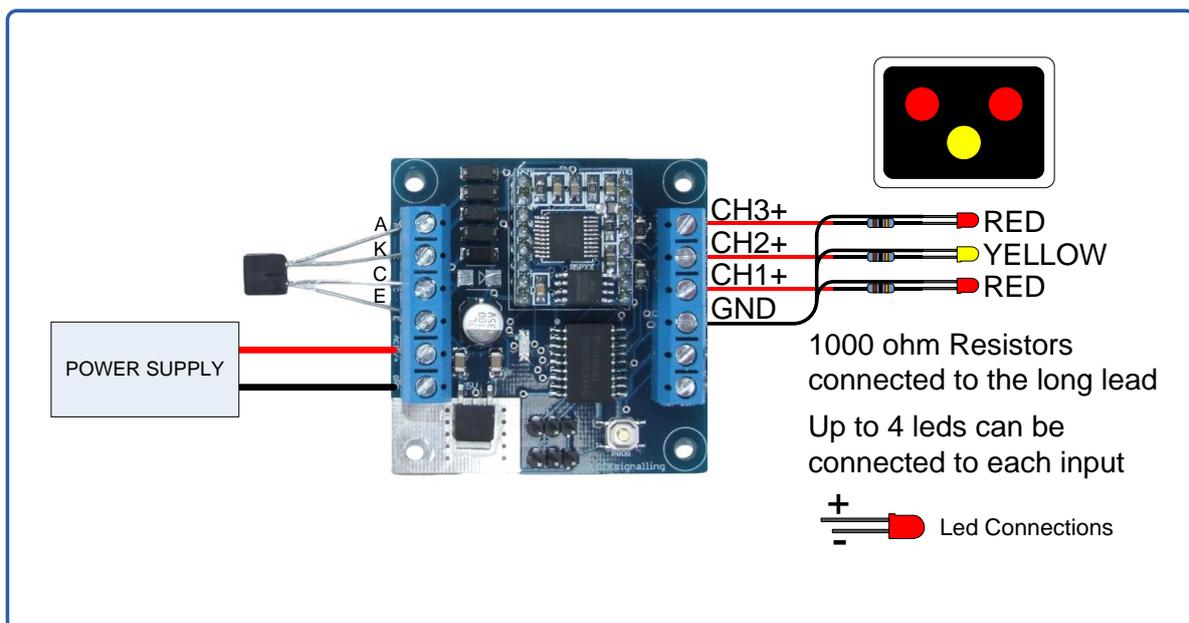
Connecting Up

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.



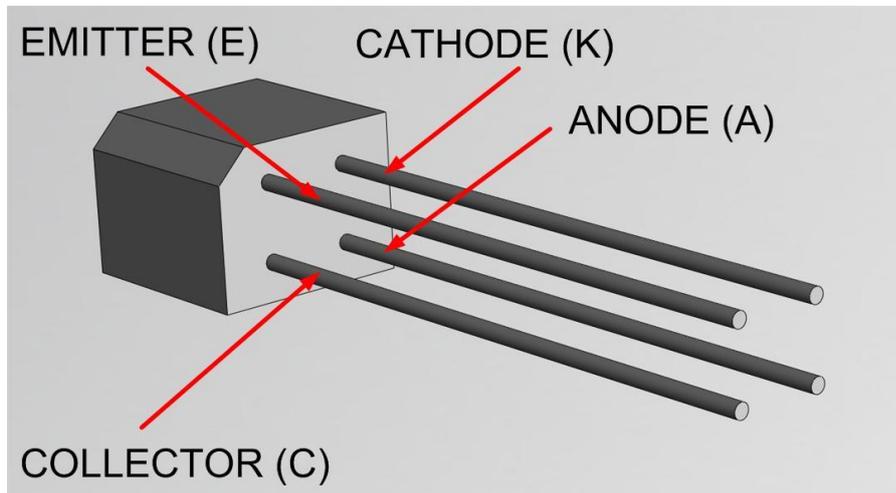
If using ready bought led signals, take care to choose signals wired with a common-cathode connection. Up to four signal heads can be connected, just be sure to use a 1k resistor in the feed to each led.



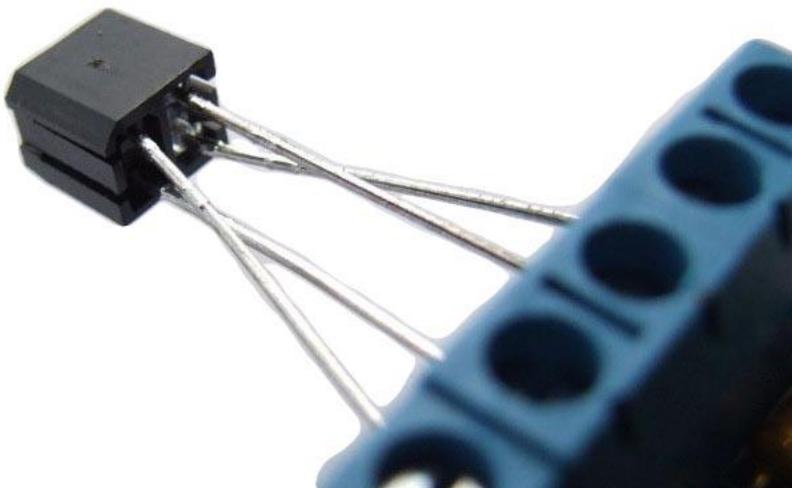
Connecting the Infra-Red Sensor

The infra-red sensor is used to detect the trains using light invisible to the human eye.

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.

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 mounted 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

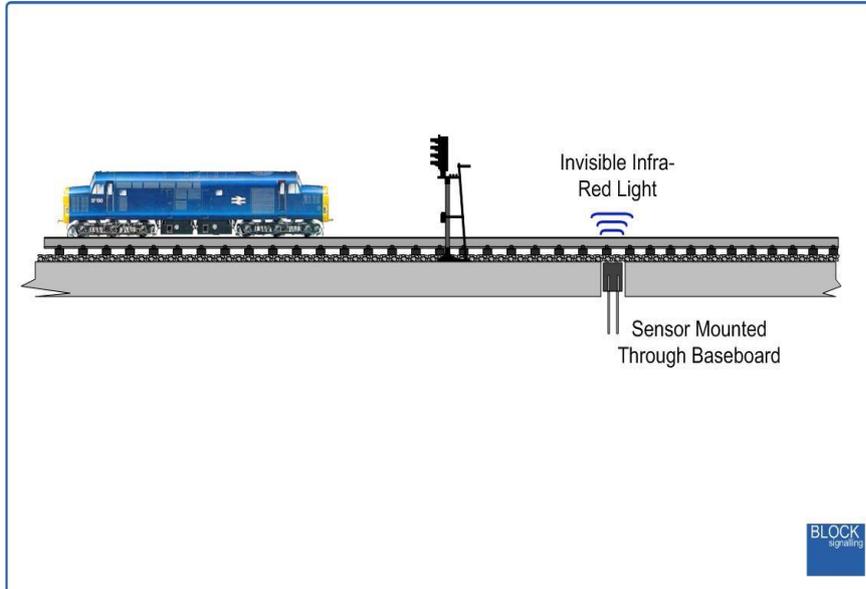
To change the sensitivity, switch off the power to the module and hold down the Push Button. Apply the power and continue holding the Push Button until **9 flashes** of the led are seen. At this point, release the button. You will see a long flash of five seconds.

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.

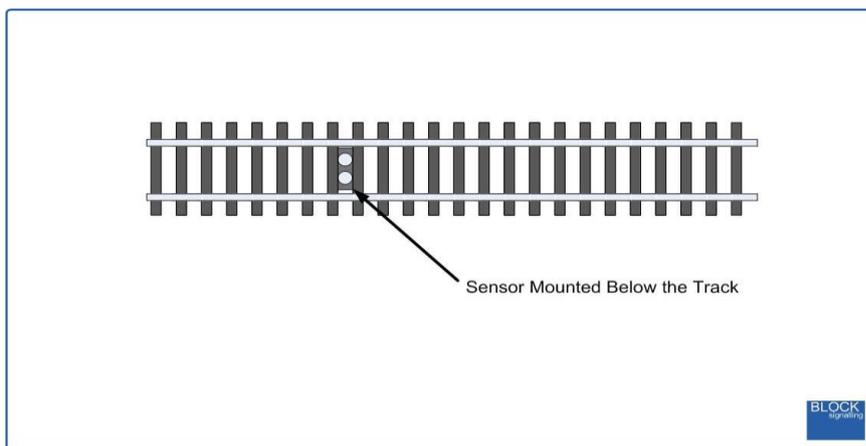
Installation

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.



Program Flow Diagram

There are many settings which can be changed to alter the operation of the module to suit your requirements.

Programming is performed by inserting a link between the A and K terminals (or by having the detector wired in place) and holding down the Push Button when switching on the power.

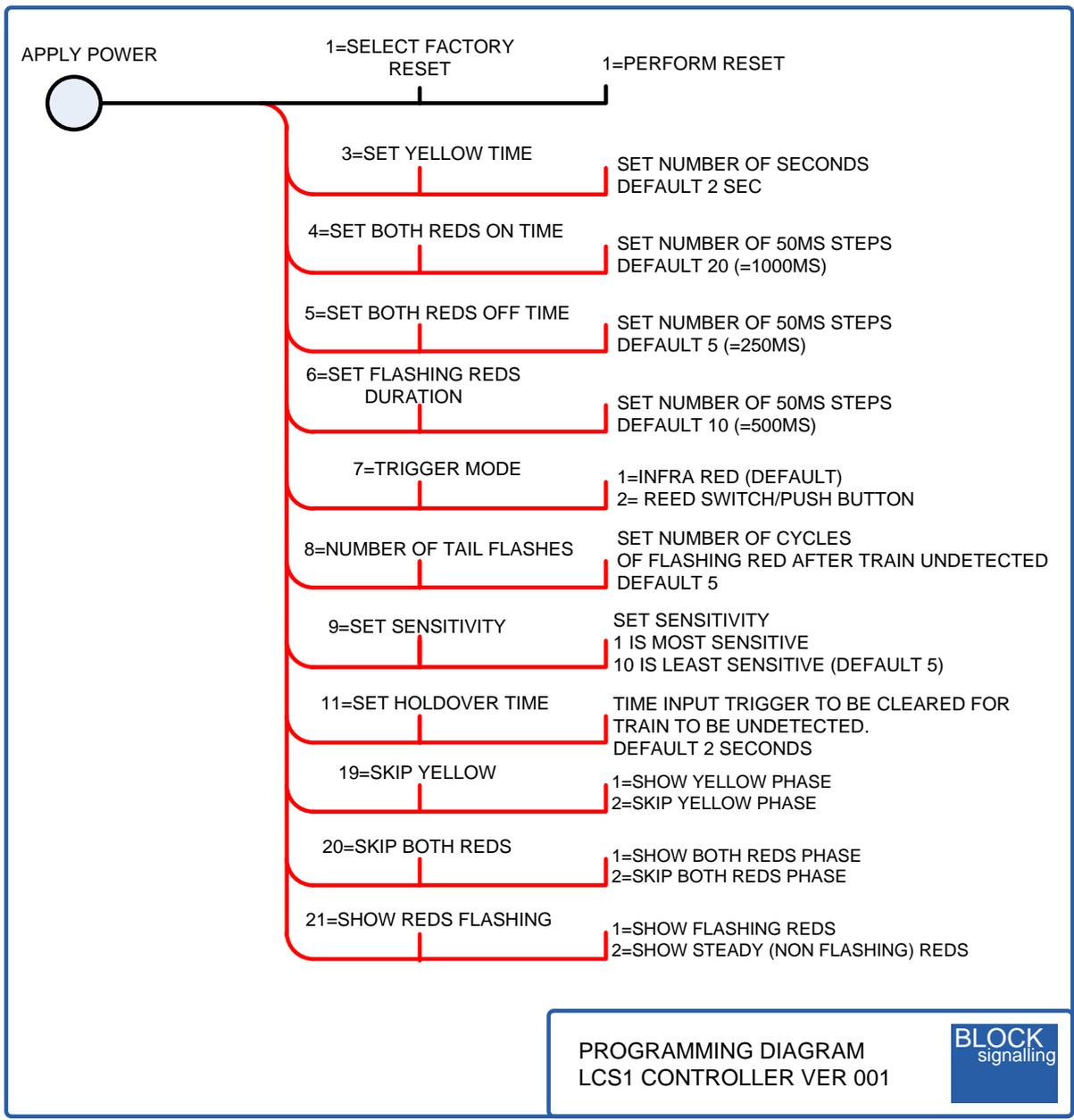
The red led on the PCB flashes at 1 second intervals. When the required number of flashes is seen (see later for the list of possible choices) the button is released to store the first value. At this point the led comes on for five seconds to confirm the value is stored.

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.

Following the diagram are detailed explanations of all the settings.



Factory Reset

By performing a factory reset, any changes which have been made to any settings will be returned to the standard factory defaults, those being for a gated crossing with yellow and red lights.

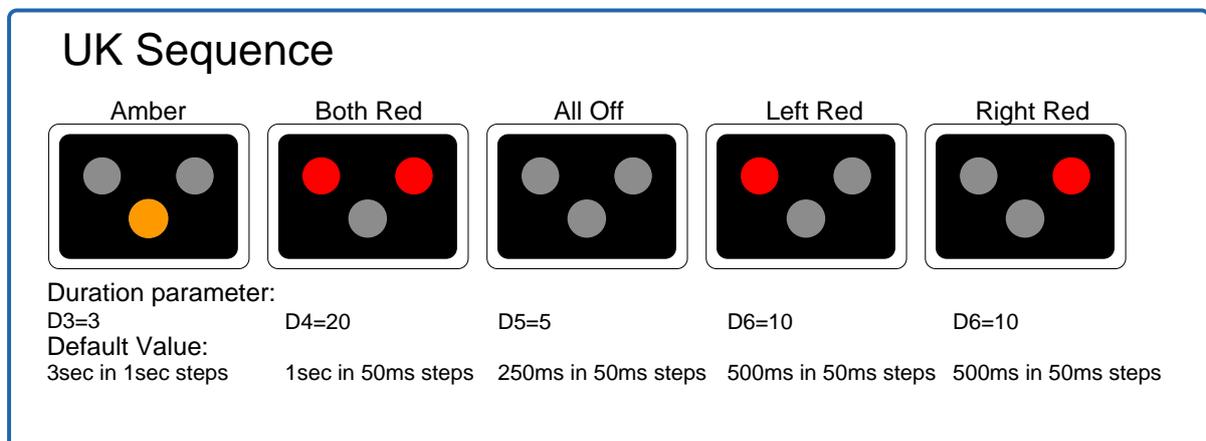
To reset the module back to factory settings, switch off the power to the module and hold down the Push Button. Apply the power and continue holding the push button until 1 flash of the led is seen. At this point, release the button. You will see a long flash of five seconds.

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

Led signal Sequences

The diagram below shows the default UK sequence.

By reprogramming the module, it is possible to change the timings of the flashing of the leds. This is not normally required unless you wish to model specific continental level crossings where the flashing rate is different, or the yellow aspect is not shown.



Setting 3 - Set Yellow Time

Following a reset, the time that the yellow led is lit is set to 3 seconds. The duration can be changed here to between 1 and 255 seconds. See below for how to set this duration to zero so the yellow led is not shown (setting 19).

Setting 4 - Set Both Reds On Time

On UK crossings, after the yellow aspect is extinguished, both reds are shown together for approximately 1 second.

The duration can be changed here to between 50ms and 12.5 seconds, in 50ms steps.

The default value is a setting of 20 which gives a duration of $20 \times 50\text{ms} = 1000\text{ms} = 1$ second. See below for how to set this duration to zero so that both reds are not shown (setting 20).

Setting 5 - Set Both Reds Off Time

On UK crossings, after the yellow aspect is extinguished, both reds are shown together for approximately 1 second. Then they both are extinguished.

The duration of them being extinguished can be changed here to between 50ms and 12.5 seconds, in 50ms steps.

The default value is a setting of 5 which gives a duration of $5 \times 50\text{ms} = 250\text{ms} = 1/4$ second.

Setting 6 - Set Flashing Duration for Reds

The duration that the red leds are lit during the flashing part of the sequence can be set in 50ms steps, the default being 10 so each red led is alternately lit for 500ms (1/2 second).

See below for how to set this duration so both reds are shown steady instead of flashing (setting 21).

Setting 7 - Set Trigger Mode

The default trigger mode is infra-red. It can be changed here to triggering by a switch or reed relay. Note, keeping the switch closed will keep the leds operating.

For triggering by reed switch, increase setting 8 to allow the whole train to pass before the leds stop operating.

Setting 8 - Set the Number of Tail Flashes

Once the train has cleared the sensor, the lights continue to flash for a number of cycles determined by this value (default 5 cycles).

Setting 9 -Sensitivity

The module is supplied with the infra-red detector 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).

Setting 11 - Holdover Time

This setting determines how long a train needs to be undetected before the module considers it has passed. The default is 2 seconds and allows for the gaps between carriages.

If the module detects that a slow train has passed, when in fact it is still crossing the sensor, increase this value.

Setting 19 - Skip Yellow

If this setting is set to 1, the yellow led will be operational.

If it is set to 2, the yellow led will not be shown.

This setting is used to adjust the light sequence for continental level crossings.

Setting 20 - Skip Double Reds

If this setting is set to 1, the phase of the sequence when both reds are shown will be operational.

If it is set to 2, the phase of the sequence with both reds lit will not be shown.

This setting is used to adjust the light sequence for continental level crossings.

Setting 21 - Show Reds Flashing

If this setting is set to 1, the red leds will flash.

If it is set to 2, the red leds will be shown steady.

This setting is used to adjust the light sequence for continental level crossings.