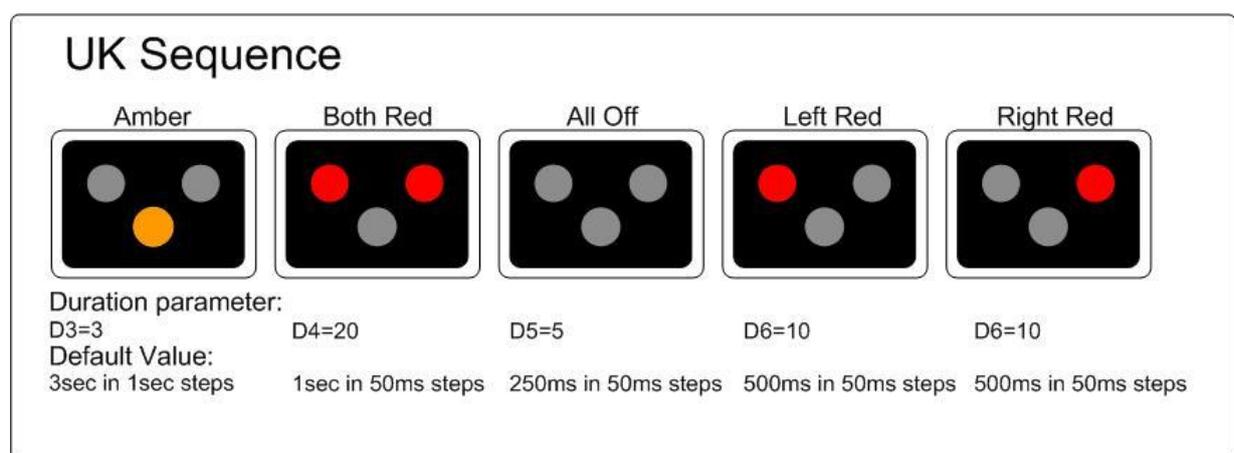# BLOCKsignalling LCS3 Continental Level Crossing Module
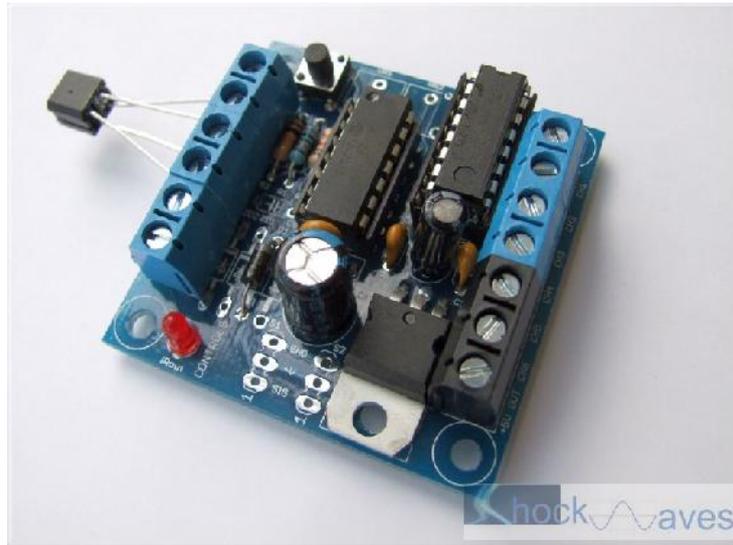
This Level Crossing Simulator detects the presence of trains by bouncing invisible Infra-Red (IR) light off the underside of the rolling stock, and detecting the light reflected back. When a train is detected, it runs a built-in program to simulate the operation of a UK level crossing.

The UK sequence is shown below. The duration of each phase can be easily adjusted during the programming to suit individual requirements.

UK Sequence

Amber	Both Red	All Off	Left Red	Right Red

Duration parameter:

D3=3	D4=20	D5=5	D6=10	D6=10

Default Value:

3sec in 1sec steps	1sec in 50ms steps	250ms in 50ms steps	500ms in 50ms steps	500ms in 50ms steps

The module can be used with between one and four sets of lights, depending on the complexity of the layout, and whether the crossing is visible from both sides or not.

There are six output channels, which are able to switch to ground using a transistor. Four of

these channels are used in this application.

Each channel operates in a similar way to a switch contact, with one side connected to ground. Normally, these outputs will be used to light one or more leds, with the other side of the led connected to a positive voltage. A resistor is used to limit the led current.

Power Supply

The supply can be AC or DC, and must be in the range of 10V to 16V for correct operation.

Ideally, use a 12Vdc supply, and take care to connect the positive and negative leads correctly to the AC IN/+ and AC IN/- terminals. No harm will be done if they are connected in reverse, but the unit will not function.

If powering several modules from the same AC supply, ensure that AC IN/+ terminals are connected to the same side of the supply, and the AC IN/- terminals are connected to the other side of the supply.

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

Programming Procedure

Programming is performed by inserting a link between the A and K terminals and holding down the Push Button when switching on the power.
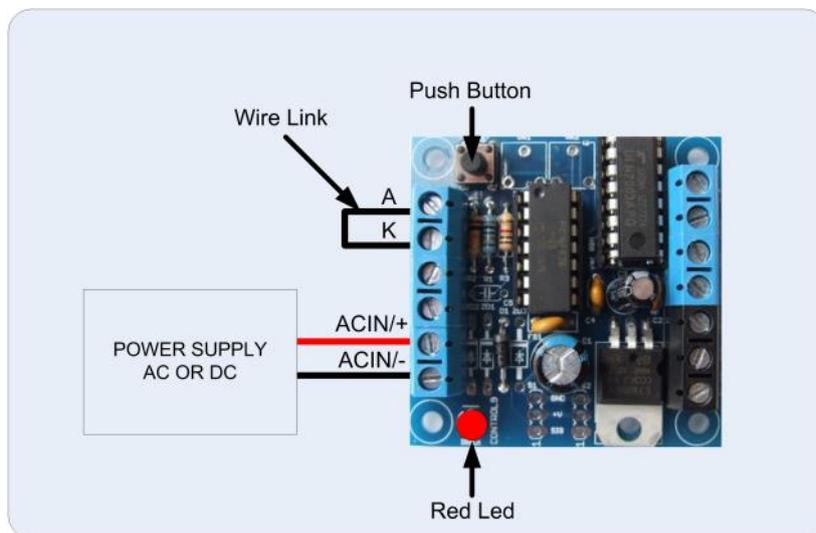
When programming, there are two values to be entered.

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.

Testing Wiring

As supplied, the module is programmed to run a lamp test sequence. First all outputs are switched on, then they all go off except ch1. Then ch1 is switched off and ch2 comes on. This sequence continues until ch6 is on and then all the outputs are switched off and the sequence is repeated. Each step takes 1 second. The led on the PCB switches on and off with each step (providing A and K are linked).
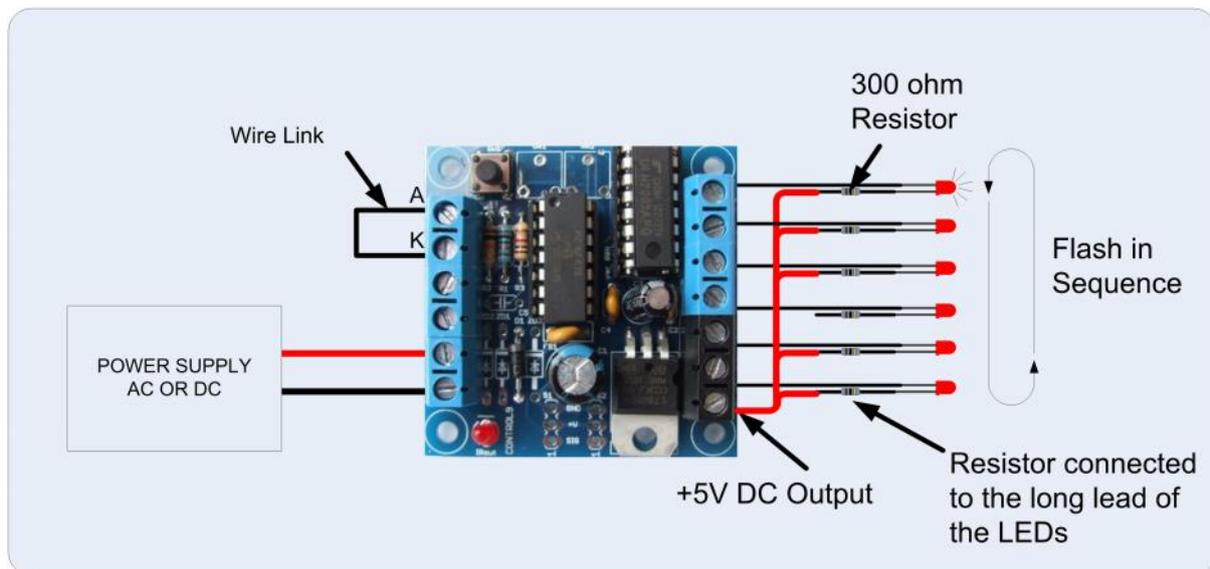
This test sequence is ideal for testing system output wiring before programming for the actual requirement.

To select this program (if not already selected), 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. 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 one 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.

PCB LED

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

1. full brightness (during programming)
2. 10% brighness, filckering (whilst searching for a train)
3. 50% brighness, 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. This mode is not used on this module.)
4. off (module is no longer searching for a train)

Testing the Infra-red Detection

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.
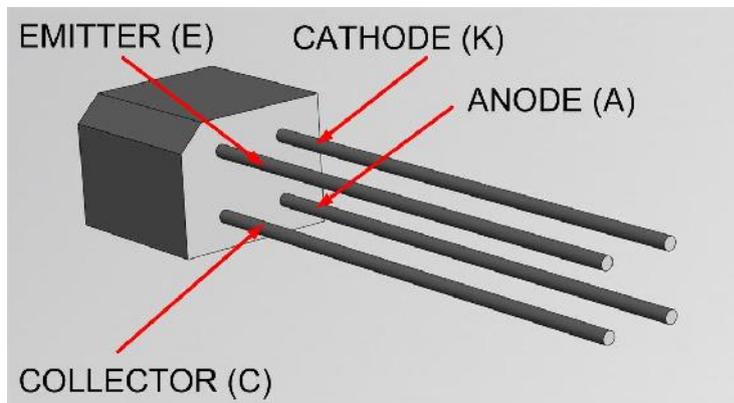
Identify the leads from the diagram and connect to the terminals marked A, K, C and E on the PCB.
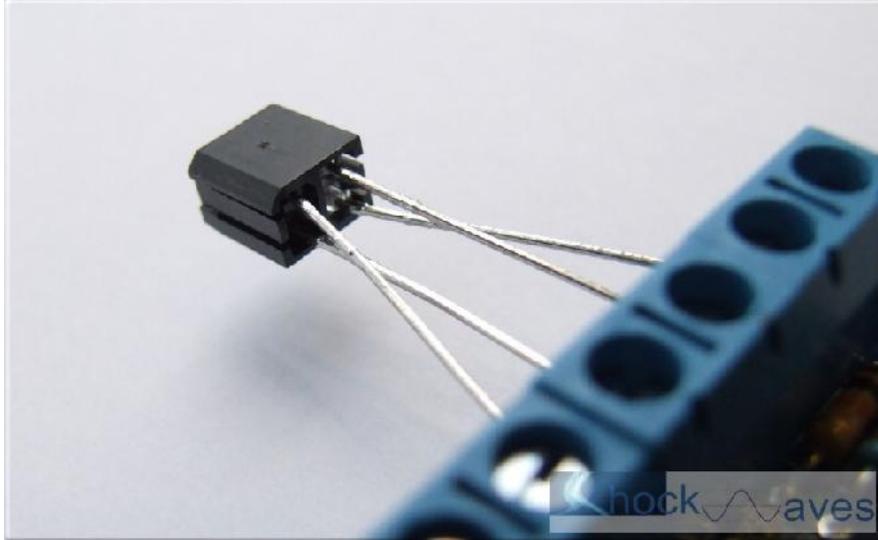
The wires can be extended using small chocolate block and extra lengths of cable if required (not supplied).

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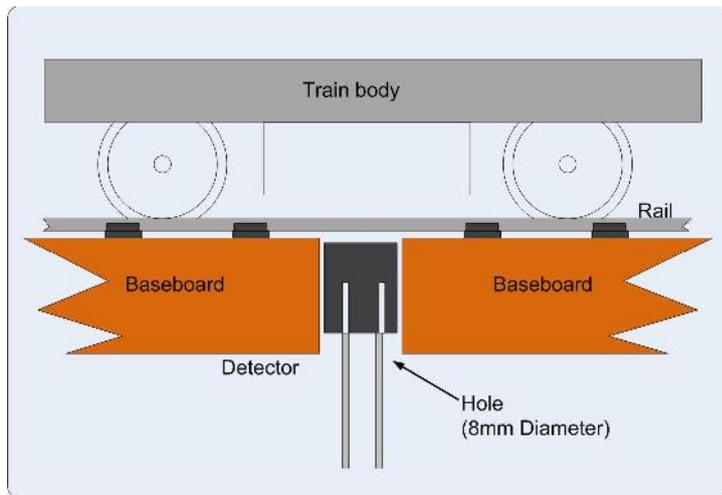
To change the sensitivity, switch off the power to the module and hold down the Push Button. Apply the power and continue holding the Push Button until 9 flashes of the led are seen. At this point, release the button. You will see a long flash of five seconds.

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).

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.

Detector Mounted in an
8mm Hole below the Track
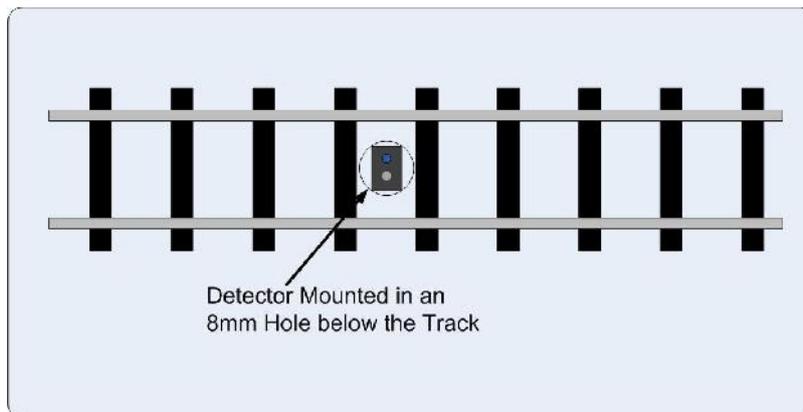
Selecting UK Level Crossing Program

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 Timing for each Phase

To change the timing of each phase from the factory settings, first refer to the diagram above to identify the individual parameter to change. For instance, to change the "both red" duration you will need to change parameter D4.

This parameter is set in 50ms steps, so to set the time to 500ms (half a second), we will set the second parameter to 10. For those values set in 1 second steps, simply set the number of seconds required.

To change D4 to 500ms, we need to let the led flash 4 times (to select parameter D4) and then 10 times (to select 500ms seconds). Other parameters are adjusted in a similar way.

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 4 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 10 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.

## Additional Instruction of Continental Level Crossing Module

There are three addition settings, to allow simulation of continental level crossing lights.

Setting 10 allows the yellow phase to be skipped. By default, this setting has a value of 1 and the yellow phase is shown, as per UK level crossing lights. If this setting is changed to the value 2, then when the level crossing module is triggered, the sequence will progress straight to the part where both red leds are on together.

Setting 11 allows the phase where both reds are lit simultaneously, then both are off, to be skipped. By default, this setting has a value of 1 and both red leds will be shown on together and then both reds will be switched off, as per UK level crossing lights.
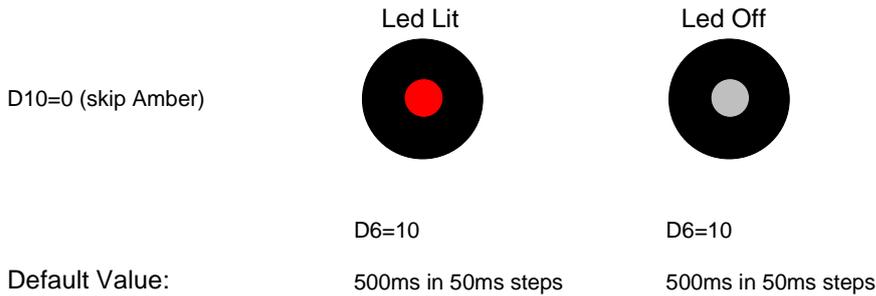
If this setting is changed to the value 2, then when the level crossing module is triggered, the sequence will progress from a single yellow led (unless skipped using setting 10) straight to the part where both red leds flash alternately.

For example, to simulate the Dutch crossing below, change setting 10 to value 2 and setting 11 to value 2. The when the level crossing module is triggered, it will alternately flash the red leds connected to channels CH1 and CH3. The number of flash cycles is set by D7 and D8, as described earlier.

Dutch Sequence Example
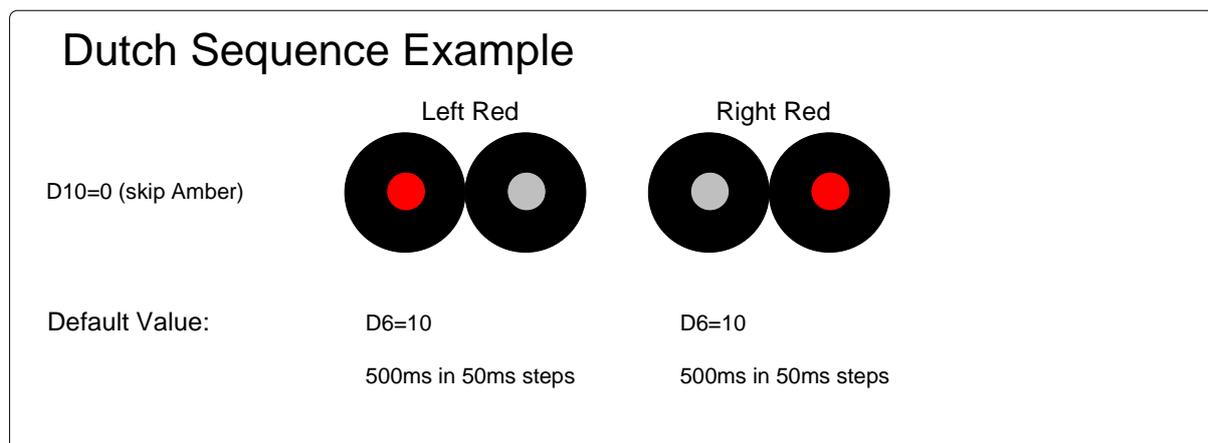
If you are just using a single flashing red led, like the German crossing example below, then change setting 10 to value 2 and setting 11 to value 2, and connect the led(s) to CH1. This is identical to the arrangement for the Dutch crossing above, but there is no led connected to CH3.

German Sequence Example 1

Led Lit

Led Off

D10=0 (skip Amber)

D6=10

D6=10

Default Value:

500ms in 50ms steps

500ms in 50ms steps

Setting 12 allows the red phase to be either flashing or steady. By default, this setting has a value of 1 and the red leds connected to CH1 and CH2 will flash.

If this setting is changed to the value 2, when the sequence reaches the part where the red leds would normally flash, they will instead be shown steady.

For example, to simulate the German crossing below, change setting 12 to a value of 2. When the when the level crossing module is triggered, it will show a steady yellow led (connected to CH2) and then a steady red led (connected to CH1) . It is also necessary that setting 11 is 2 to skip the phase where both reds are lit simultaneously, then both are off.

The time for lowering barrier 1 is given by 2 x D7 x D6 x 50ms. The same value is applied to barrier 2.

The total duration for the red phase is given by 2 x 2 x D7 x D6 x 50ms + D8 x D6 x 50ms.

Using the default values:

Barrier 1 lowering time= 2 x D7 x D6 x 50ms = 2 x 5 x 10 x 50ms= 5sec

Barrier 2 lowering time= 2 x D7 x D6 x 50ms = 2 x 5 x 10 x 50ms= 5sec

Total duration of the red phase= 10sec + 10 x 10 x 50ms= 15sec

German Sequence Example 2

Yellow Led
Lit (lower)

Red Led
Lit (upper)

D3=3
Default Value:
3sec in 1sec steps

D6=10

500ms in 50ms steps
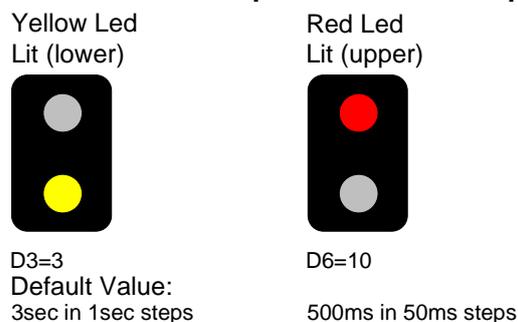
Programming Diagram

The following diagram shows all the programming options.

APPLY POWER	1=SELECT FACTORY RESET	1=PERFORM RESET
	2=SELECT MODE	1=TEST MODE/LAMP TEST
		2=UK LEVEL CROSSING (NO TRIGGER)
		3=UK LEVEL CROSSING (IR TRIGGER)
		4=UK LEVEL CROSSING (BUTTON/REED SWITCH TRIGGER)
	3=SET AMBER TIME	SET NUMBER OF SECONDS DEFAULT 5 SEC
	4=SET BOTH REDS TIME	SET NUMBER OF 50MS STEPS DEFAULT 20 (=1000MS)
	5=SET REDS OFF TIME	SET NUMBER OF 50MS STEPS DEFAULT 5 (=250MS)
	6=SET REDS ON TIME TIME	SET NUMBER OF 50MS STEPS DEFAULT 10 (=500MS)
	7=SET NUM OF FLASH CYCLES FOR BARRIER	SET NUMBER OF CYCLES DURING BARRIER FALL DEFAULT 5
	8=NUMBER OF TAIL FLASHES	SET NUMBER OF CYCLES AFTER BOTH BARRIERS HAVE FALLEN DEFAULT 10
	9=SET SENSITIVITY	SET SENSITIVITY 1 IS MOST SENSITIVE 10 IS LEAST SENSITIVE DEFAULT 5
	10=SKIP AMBER PHASE	1=INCLUDE AMBER PHASE 2=SKIP AMBER PHASE DEFAULT=1
	11=SKIP BOTH REDS PHASE	1=INCLUDE BOTH REDS PHASE 2=SKIP BOTH REDS PHASE DEFAULT=1
	12=RED PHASE FLASHING	1=FLASHING 2=STEADY DEFAULT=1

PROGRAMMING DIAGRAM
LCS2 CONTROLLER VER 001

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.
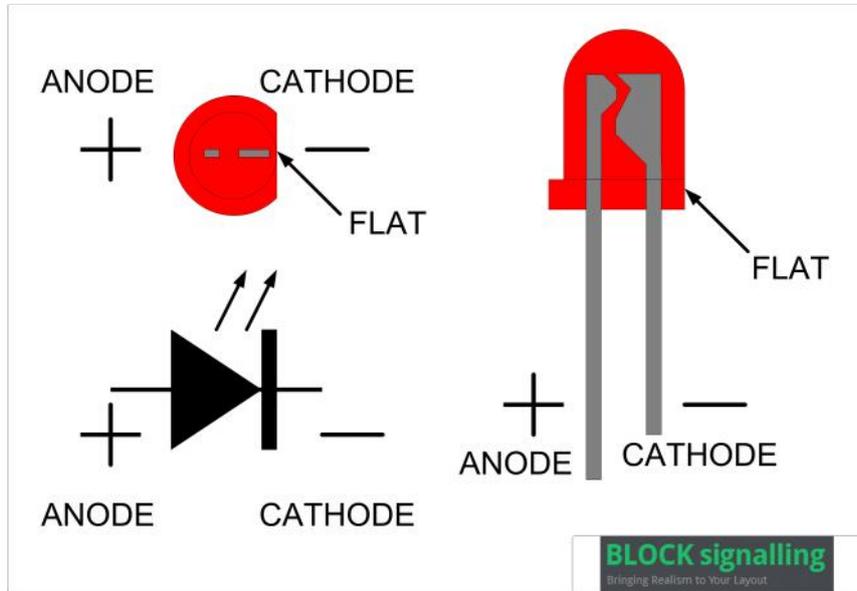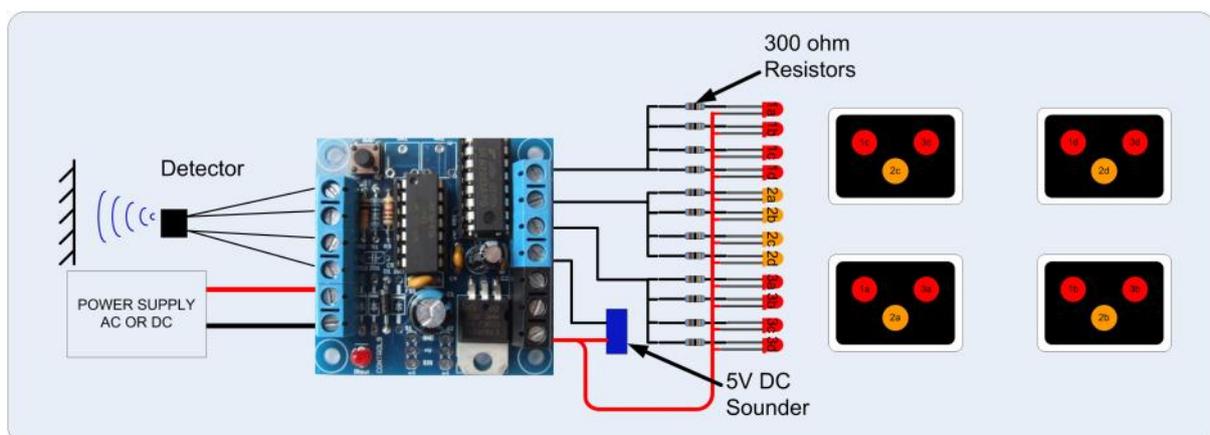

Connecting the Unit

The diagram below shows the connection to the individual leds, with each light head containing three leds.

For each led, a 300 ohm resistor is necessary to limit the current from the +5V supply, which is available from an output on the module.

Alternatively, you can use leds with built in resistors, suitable for direct connection to 5V dc.

If you are using fewer light heads, then simply omit those wires and leds.