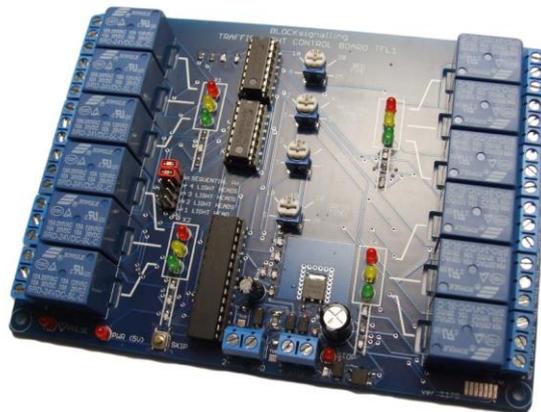


BLOCK signalling

BLOCKsignalling Traffic Lights Controller TFL1

Installation and Operation Manual



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1 REVISION RECORD

Version no.	Revision Date	Reason for Change
draft 001-999	No date required for drafts	Draft
001	2016-11-16	First issue
002		
003		
004		
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010		

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2 INTRODUCTION

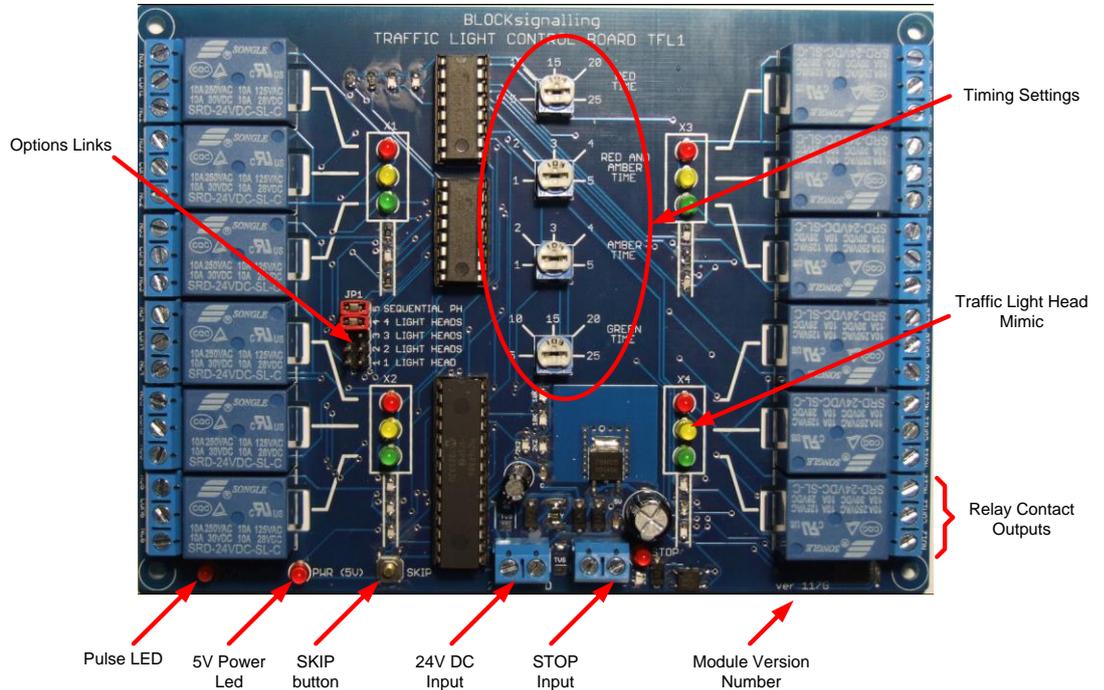
2.1 General

- 2.1.1 The BLOCKsignalling TFL1 is a basic four-channel traffic light controller designed for use on playground and model layouts. It is simple in operation as it does not incorporate the safety features as would be included on a system for use with actual road traffic.
- 2.1.2 There are up to four output channels available to drive conventional traffic light heads with red, amber, and green lights.
- 2.1.3 The module operates on 24V DC and the microcontroller on the module actuates the attached traffic lights via relay controlled outputs with volt-free contacts rated at up to 24V DC and 2A.
- 2.1.4 The timing for each phase of the traffic light operation can be varied using the four adjusters on the module. Each of the settings for red time, red and amber time, green time and amber time can be set. The program reads the setting just before operating the particular phase.
- 2.1.5 The duration when the red and amber phase are illuminated together is optional, and if the adjuster is set to a minimum, this phase will not be shown and so the lights will move from showing red to immediately showing green (applicable to certain countries).
- 2.1.6 There is a button marked SKIP on the module. When this is pressed, any remaining time for a particular phase to complete is expired, and the sequence immediately moves on to the next phase. This is ideal for quickly testing the lamp operation.
- 2.1.7 The module can connect to between one and four lamp heads. A link can be fitted on the module to identify the number of lamp heads connected so that the software can operate the appropriate number of lamp heads. The link position is read when the module is powered up and also immediately before the red light for the traffic light head X1 is illuminated.
- 2.1.8 A link can also be inserted to tell the software to operate the signals in sequence, so that only one of the lamp head at a junction shows green at any one time. If this link is omitted, the software operates facing traffic routes simultaneously (see later).

3 MODULE LAYOUT

3.1 Module Connections and Settings

3.1.1 The module is constructed on one printed circuit board (pcb) which contains a regulated and smoothed 5V power supply for the microprocessor. A red led is connected across this power supply, and this should normally be lit to confirm the 5V power supply is present (**5V POWER LED**).



3.1.2 When the program is normally running, the **PULSE LED** flashes at 1 second intervals. This confirms that the microprocessor is operating correctly.

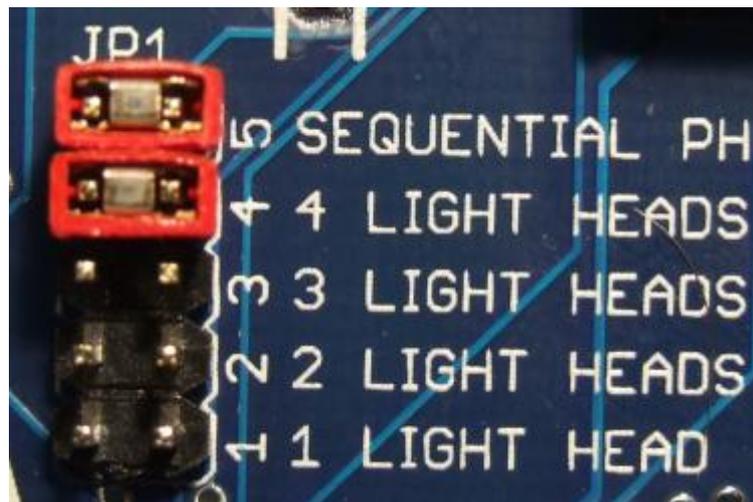
3.1.3 A **SKIP BUTTON** is provided, which when pressed will force the expiry of any reaming delay before the lights change, and so the lights will immediately progress to the next phase of operation.

3.1.4 The **24V DC INPUT** is protected against reverse polarity connection, overcurrent, and transients which may occur on the power supply. This input provides power to the relay coils and is also used (after voltage reduction) to power the microprocessor.

3.1.5 The **STOP** (option) is an input which permits the microprocessor to be remotely stopped. When this input has 24V DC connected, the microprocessor is held at reset and so stops all operations. All traffic light heads show red. The STOP led lights, and the pulse led stops pulsing.

3.1.6 The **MODULE VERSION NUMBER** is marked on the PCB in the bottom right-hand corner.

- 3.1.7 Each of the traffic light heads has **MIMIC IMAGE** of the traffic light head on the PCB. The mimic head has red, amber and green leds incorporated and these operate synchronised to the three output relays which connect to the actual lights (the leds are connected across the relay coils). The light heads are marked X1, X2, X3 and X4.
- 3.1.8 The **RELAY CONTACT OUTPUTS** are volt-free. Normally-closed, common and normally-open contacts are wired to adjacent terminals.
- 3.1.9 The **TIMING SETTINGS** are made on the four adjusters. The adjusters are read by the software immediately before the traffic light phase changes, for example, the red light timing is read from the adjuster immediately before the red light is illuminated.
- 3.1.10 The **OPTIONS LINKS** are five possible link positions, where one or two plastic links can be inserted to select an option.



When the link is inserted in position 1, then the software only operates the X1 traffic light head. The remaining heads show red.

When the link is inserted in position 2, then the software only operates the X1 and X3 traffic light heads. The remaining heads show red.

When the link is inserted in position 3, then the software only operates the X1, X2 and X3 traffic light heads. The remaining heads show red.

When the link is inserted in position 4, then the software operates all the traffic light heads.

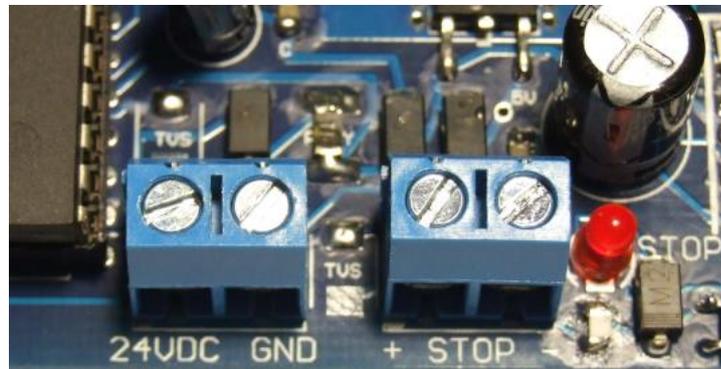
If a link is inserted in position 5, then the traffic lights are operated so that only one light head shows green at any one time.

Without a link in position 5, then traffic light heads X1 and X3 will operate together, and traffic light heads X2 and X4 will operate together (see later for diagrams).

4 CONNECTING THE MODULE TO POWER AND SIGNAL HEADS

4.1 Power Supply Wiring

- 4.1.1 The module operates from a 24V DC power supply.
- 4.1.2 Make the power connection to the terminals at the bottom of the board.
- 4.1.3 Observe the correct polarity otherwise the board will not power up.



- 4.1.4 The power input is protected against reverse polarity connection, overcurrent, and transients which may occur on the power supply.
- 4.1.5 If the red 5V POWER led does not light when the power supply is switched on, check the polarity of the connection to the terminals.

4.2 Lamp Head Wiring

- 4.2.1 Each of the lamps (leds or filament bulbs) in the lamp head has an associated relay.



- 4.2.2 The switched feed to the lamp-head is connected to the normally-open and common terminals.
- 4.2.3 It is recommended to keep the wiring long enough so that the lamp heads can be connected to different outputs from the control module in case the sequence of the operation of the lamp heads is desired to be changed.

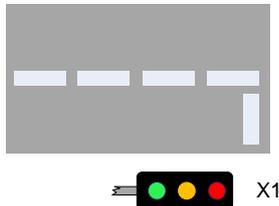
5 PROGRAMMING

5.1 Timing Setting using Adjusters

- 5.1.1 It is recommended to start with the timing settings for all the adjusters to be set to the mid position.
- 5.1.2 This will provide approximately 15 seconds of red time and 15 seconds of green time.
- 5.1.3 The red+amber time will be approximately 3 seconds (this can be reduced to zero by turning the adjuster to the minimum position if it is not required to show red and amber together in the particular country).
- 5.1.4 The amber time will also be 3 seconds.

5.2 Single Light Head

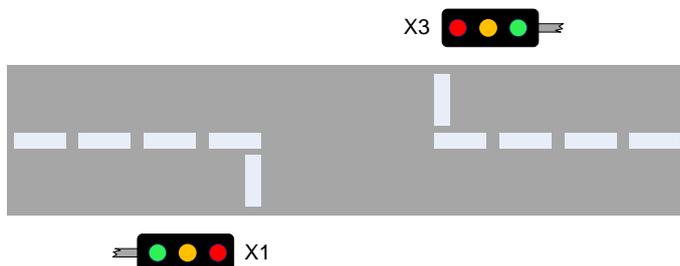
- 5.2.1 With the link only in position 1, only a single lamp head will operate.
- 5.2.2 Only connect the operational lamp head to the X1 relays.
- 5.2.3 Any lamp heads connected to other relays will remain at red.



- 5.2.4 This sequence is most likely to be used for operating a single light heads in a window display, water flume or other similar arrangement.

5.3 Two Light Heads

- 5.3.1 With the link only in position 2, only two lamp heads will operate.
- 5.3.2 Normally a link will also be placed in position 5, so that the lamp heads operate sequentially (they show green alternately).
- 5.3.3 Only connect the operational lamp heads to the X1 and X3 relays.
- 5.3.4 Any lamp heads connected to other relays will remain at red.
- 5.3.5 When powering the module, lamp head X1 will be the first to operate.



5.3.6 This sequence is most likely to be used for operating an alternate flow system, such as at roadworks.

5.3.7 If the link in position 5 is omitted, the lamp heads will operate concurrently.

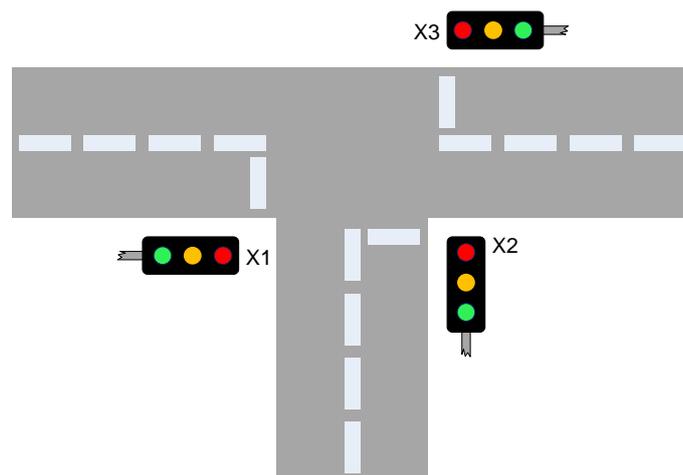
5.4 Three Light Heads

5.4.1 With the link only in position 3, only three lamp heads will operate.

5.4.2 Only connect the operational lamp heads to the X1, X2 and X3 relays.

5.4.3 Any lamp heads connected to the x4 relays will remain at red.

5.4.4 When powering the module, lamp head X1 will be the first to operate.



5.4.5 If the link in position 5 is omitted, lamp heads X1 and X3 will operate concurrently, followed by X2 on its own.

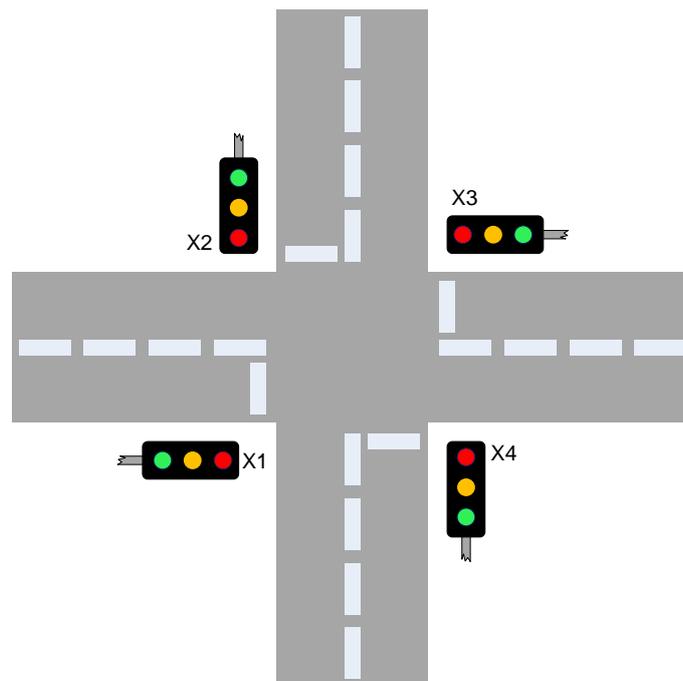
5.4.6 If the link is omitted, the lamp heads will operate sequentially in the sequence X1, X3, X2.

5.5 Four Light Heads

5.5.1 With the link only in position 4, all four lamp heads will operate.

5.5.2 Connect lamp heads to the X1, X2, X3 and X4 terminals.

- 5.5.3 When powering the module, lamp head X1 will be the first to operate.



- 5.5.4 If the link in position 5 is omitted, lamp heads X1 and X3 will operate concurrently followed X1 and X4.
- 5.5.5 If the link is omitted, the lamp heads will operate sequentially in the sequence X1, X3, X2, X4. In the arrangement above, the traffic will take it turns to flow, each time the traffic to the left of the currently flowing traffic will be the next to be released.
- 5.5.6 By rewiring the connections of the lamp heads to the relays, the order of the traffic flow can be altered to suit.

6 FAULT FINDING

6.1 Power Led Does Not Light

6.1.1 The power led is fed from the 5V regulator which is used to power the microprocessor.

6.1.2 The led will not light if the 5V is absent, and this could be due to:

The 24V DC supply being absent.

The 24V DC supply having the reverse polarity.

The 24V DC supply exceeding 24V (absolute maximum 26.4V).

Regulator failure.

Short-circuit on the regulator output.

Led itself faulty.

6.2 Pulse Led Does Not Flash

6.2.1 The pulse led is connected to a single dedicated output from the microprocessor.

6.2.2 If the pulse led is not flashing at 1 second intervals, then providing the 5V led is lit, then either the microprocessor is faulty or the led itself is faulty.

6.2.3 The led is only an indication, so providing the remainder of the module appears to be operating correctly, the module can continue to be used.

6.2.4 If the microprocessor appears to be faulty, then this item can be replaced independently of the whole module as the microprocessor is designed as a plug-in replacement part.

6.3 Relay Does Not Operate

6.3.1 If the pulse led is operating correctly, then it is indicative of the microprocessor functioning correctly.

6.3.2 If despite this, the relays fail to operate as expected, then check their associated mimic leds. The mimic leds are across the relay coils, and so if the mimic led operates, but not the relay itself, then it suggests a relay failure.

6.3.3 If neither the mimic led or the relay operates, then as long as the links are correctly in place, it may be necessary to exchange the relay drivers. These items can be replaced independently of the whole module as they are designed as a plug-in replacement parts (ULN2003APG).

7 SPECIFICATION

7.1 Dimensions

- 7.1.1 The PCB is nominally 5.9" x 4.35" (150mm x 110.5mm).
- 7.1.2 There are four 3mm fixing holes at 5.75" x 4.2" (146mm x 107mm) centres.

7.2 Power Supply

- 7.2.1 The power supply requirement is 24V DC nominal (26.4V DC absolute maximum).
- 7.2.2 The current consumption of the module with five relays energised is 100mA.

7.3 STOP Input

- 7.3.1 Minimum voltage to stop processor: 11V typical
- 7.3.2 Recommended input voltage: 24V
- 7.3.3 Absolute maximum voltage: 26.4V
- 7.3.4 Current at 24V input: 20mA

7.4 Usage

- 7.4.1 This product is not designed for use in devices or systems where malfunction of the product could in any instance be expected to result in injury. BLOCKsignalling customers using or selling this product for use in such applications do so at their own risk and indemnify BLOCKsignalling for any damages resulting from such improper use or sale.

8 WIRING DIAGRAM

8.1 Example Connections

