

Shift Light Unit Mk2

User Guide V2.0

Disclaimer

Although every care is taken with the design of this product, JT Innovations Ltd. can in no way be held responsible for any consequential damage resulting from the use of this product in your vehicle.

Always operate your vehicle safely and do not allow yourself to be distracted by your shift light unit while driving.

The shiftlight is intended for Off-Road use only.

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Introduction

Thank you for purchasing a shift light unit. We hope it will be easy to install and configure, and recommend that you read this guide before you start.

Shift Light Functions

The shift light provides the following functions:

- 8 high-brightness RGB LEDs
- Each LED can be set to be yellow, orange, red, green, blue, magenta, cyan or white.
- Each LED can be set to 1 of 4 different brightness levels
- Each LED has an “on” RPM setting. When the RPM is at or above this value, the LED will be ON. When below the setting, the LED will be OFF.
- Each LED has an “off” RPM setting. When the RPM is at or above this value the LED will turn off again. If the value is set very high, the LED will, effectively, not turn off when the RPM is above its RPM “on” setting
- Each LED can be set to flash or be on constantly when the RPM is above the “on” value
- A setting allows ***all*** LEDs to be turned on with a chosen colour/brightness/flash mode within a given RPM range
- When used with a Toucan, LEDs can be used to signal an alarm condition
- Configuration can be via Toucan itself, or using a PC programme that can be downloaded from the JT Innovations website. This uses a standard USB cable (supplied).
- Tacho mode, allowing connection to a 0-12V tacho pulse
- OBD-II mode, allowing RPM data to be read from vehicles equipped with CANbus OBD-II ports.

Installation

Before You Start

Please check the box contents to ensure nothing is missing. You should have:

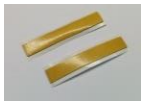
Shift Light Unit



Cable Harness (Toucan, OBD-II or Tacho)



Mounting tape



USB lead



Connectors

Toucan

The cable supplied is intended for direct connection to the expansion socket on the rear of Toucan. The cable can be connected either way round as the ends are identical.

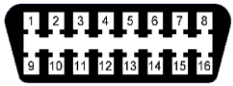
6 Way connector	Cable Colour	Function
Pin 1	Red	Battery +ve
Pin 2	Black	Ground
Pin 3		
Pin 4		
Pin 5	White	CAN HI
Pin 6	Yellow	CAN LO

OBD-II

This cable has an OBD-II connector that should be plugged directly in to the OBD-II port of the vehicle.

The Shiftlight only supports OBD-II ports with CANbus – this includes most UK/EU vehicles manufactured since 2008.

If in doubt, contact us, or check the OBD-II connector in the vehicle – for CANbus, pins 6 and 14 must be populated.



It is recommended that you unplug the shiftlight module from the OBD-II port when it's not required and the vehicle is turned off – the current draw is minimal (5mA) but there is a risk that it could drain the battery if the vehicle is not started for many weeks.

Tacho/Generic

This cable has 5 wires

6 Way connector	Cable Colour	Function
Pin 1	Red	Battery +ve
Pin 2	Black	Ground
Pin 3		
Pin 4	Green	0-12V tacho drive input
Pin 5	White	CAN HI
Pin 6	Yellow	CAN LO

The Tacho wire should be connected to a suitable source of tacho pulses – these are often available from a pin on the ECU or instrument cluster.

Do not connect directly to high voltage systems or directly to a distributor or ignition coil. These signals are at many 100's of volts and will destroy the shiftlight module.

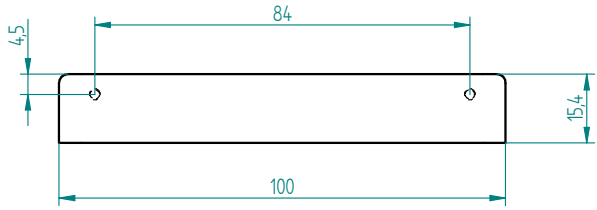
Unused wires can be cut off. It is recommended that the cut ends are taped with insulating tape to prevent short circuits.

In-vehicle Mounting

Two double sided adhesive strips are supplied allowing you to attach the shift light to anywhere you choose. The dimensions of the unit are such that it will fit neatly on top of a Toucan touchscreen unit.

Alternatively, there are a pair M2.5 tapped holes on the underside that can be used. Ensure that the screws do not penetrate too far in to the unit – no more than 5mm.

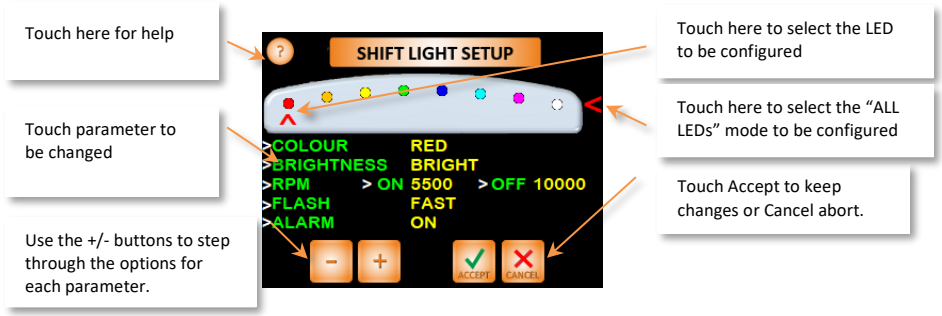
The mounting hole locations are shown here, with the dimensions in mm.



Shift Light Configuration via Toucan

When connected to a Toucan unit the shift light can be configured from Toucan menus. Toucan firmware V1.50-onwards is required for this. Latest firmware and instructions for upgrading Toucan are available via the JT Innovations website downloads page.

The configuration screen is found under “Settings” from the main screen, then “Setup”, followed by “Display Setup” and “Shift Light Setup”.



Available Functions

Colour

The colour of each LED can be chosen from: Red, Orange, Yellow, Green, Blue, Magenta, Cyan or White. In the example above LED 1 is set to RED.

Brightness

Each LED can be set to be: Bright, Medium, Low or Dim. When Toucan is in “night brightness” mode – which lowers the brightness of the LCD screen – the shift light LEDs will automatically dim. In the example above, LED1 is set to BRIGHT.

RPM – ON

This is the RPM value that the LED will turn on. In the example above, LED 1 is set to turn on at 5500 rpm.

RPM – OFF

This is the RPM value that the LED will turn off. In the example above, LED 1 is set to turn on at 10,000 rpm. For most engines, this means the LED will not actually turn off once the RPM is above the 5500 “ON” setting.

If you were to set the “off” value to 6000, for example, the LED would only remain on between 5500 and 6000 rpm. This allows the LEDs to chase each other.

Flash

When the RPM values dictate that the LED should be on, this setting determines whether the LED will be on continuously or whether it will flash.

Alarm

When set “on” the outer two LEDs will flash RED when a Toucan Alarm is triggered.

ALL

This allows a chosen brightness and flash mode to be applied to ALL LEDs for the chosen ON and OFF RPM.



Shift Light Configuration via PC

Software Installation

Visit the JT Innovations download page (www.jti.uk.com/downloads) and click the link for the configuration software. This will take you to the download page where you can click "install". Any necessary Microsoft driver or ".NET" files should also be downloaded.

- Every time the programming software is run, it will automatically check to see whether there's a new version available.

USB Connection

The shiftlight has a built-in USB interface using a standard Mini USB cable, supplied with the unit.

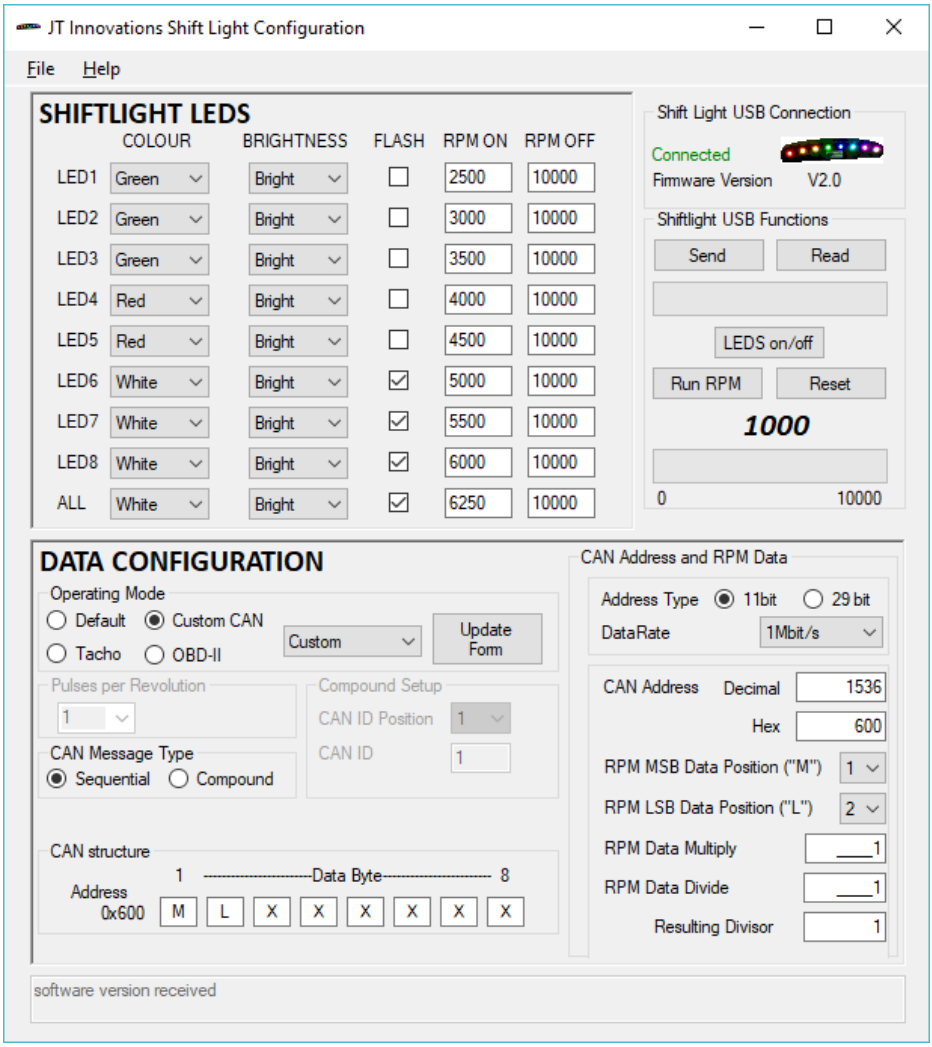
When you plug the shiftlight into a PC or laptop, Windows should auto-detect the connection and install appropriate drivers.

When you now run the Configuration Software it should automatically detect the shift light and connect to it. If the main screen shows that the USB connection is disconnected, try unplugging the USB lead from the computer and then plugging it in again.

- *If the program still doesn't connect, it is possible that there is another device connected using the same USB device drivers. Try unplugging other USB devices and, if it still does not connect, contact JT Innovations for technical assistance.*

Configuration – Basics

A status area on the right of the screen shows the USB connection status and reports the firmware version of the shift light.





USB Functions

Below the USB Connection status area are various buttons related to the shift light that can be actioned over the USB connection.

- **Read**. This reads the current configuration of the shift light and shows this in the application window.
- **Send**. This sends the configuration displayed in the application window to the shift light, and instructs the shift light to store the settings in non-volatile memory.
- **LEDs on/off**. This will instruct the shift light to turn all 8 LEDs on using the values shown in the application window. Any LEDs set to flash will, however, be on rather than flashing.
- **Run RPM**. This simulates the real operation of the shift light by continuously sending RPM values over the USB connection. This can be started and stopped as required, and allows you to see how the configured LED settings will appear once the shift light is back in the vehicle.
- **Reset**. This resets the RPM run back to the start.

Shiftlight LED Configuration

This area of the application window allows the colour and brightness of each LED to be configured, as well as whether the LED will flash or not when the RPM settings determine the LED should be on.

Each LED has an RPM on and RPM off setting – the LED will only be on when the RPM is above the "on" value and below the "off" value. By setting the "off" value beyond the rpm range of your engine, the LED will remain on when the RPM is above the "rpm on" value.



"Send" must be clicked before any changes are applied to the shift light.

File Functions

The LED setup as displayed in the application window can be saved to file or loaded from file. This might be useful if you want different setups for different tracks or weather conditions, for example.



CANbus Configuration

Basic Modes

Default

This mode is used when the shift light is to be controlled via Toucan. The CAN protocol used is documented in a later section so this mode can also be used for custom installations where you have control over specific CAN shiftlight messages from the ECU (e.g. MoTeC installations).

Custom

This mode offers a number of preset modes that set the unit up to work directly with popular after-market ECUs such as Syvecs or AlcaTek. Choose the ECU type from the drop down box and click “apply”. This applies the CAN bus settings to the application window but does not send them to the shiftlight.

Tacho

This mode is used when the RPM data from the shiftlight is from a tachi signal (rev counter).

Most tacho signals are actually “ignition pulses per revolution”. This means the setting would be:

- 2 pulses per revolution for a 4 cylinder engine
- 3 pulses per revolution for a 6 cylinder engine
- 4 pulses per revolution for an 8 cylinder engine

OBD-II

This mode is used when the RPM data is to be read via CANbus from an OBD-II port. When set to this mode, and the shiftlight is plugged in to an OBD-II port, it will automatically detect the correct communication method for the vehicle:

- the left hand LED will flash 4 times green every time the unit is powered, and OBD-II communications are established.
- the left hand LED will flash 4 times red, every 60 seconds, if the unit is powered but no OBD-II communications are detected – usually when the engine is switched off.



Advanced Modes

The CANbus parameters are totally configurable, allowing the unit to be work in virtually any installation. This requires detailed knowledge of the CAN system you are connecting to, so reference to ECU documentation will be necessary. We will do our best to assist for custom installs, so please contact us if needed.

- **Data Rate**. This can be chosen from 250kbit/s, 500kbit/s or 1Mbit/s.
- **CAN Address**. This is the address that the RPM data is to be received on.
- **RPM MSB Data position**. RPM will be received as a 16 bit value, split into two bytes. This parameter dictates where the shift light will look for the most significant byte (MSB) of the rpm data.
- **RPM LSB Data position**. This parameter dictates where the shift light will look for the least significant byte (LSB) of the rpm data.
- **RPM Multiplier and Divider**. These two determine how the raw data is manipulated to derive actual RPM, with the overall divisor shown in the "Resulting Divisor" field. These are usually left as equal to "1" but may need altering depending on the vehicle.
- **Sequential Message type**. This type of CAN bus messaging is where every set of parameters sent by the ECU has its own unique address. For example RPM data might be sent on packets with a CAN address of 0x600 whereas vehicle speed might be sent on a message with a CAN address of 0x610.
- **Compound Message type.** With this type of message, all data is sent using the same CAN address (e.g. 0x620) with one of the 8 bytes of data sent having an "ID" that indicates what the data represents. For this to work two parameters must be configured:
    - **CAN ID Position.** The byte position where the CAN ID will be found
    - **CAN ID.** The actual ID of the packet containing RPM data.

The configured settings will be displayed in the "CAN structure" diagram at the bottom of the application window.

Technical

Data Interface	CAN 2.0A/2.0B at 1Mbit/s, 500kbit/s or 250kbit/s. OBD-II compliant
Power	8-20V <20mA typ.
Memory	Non-volatile storage of all parameters
Tacho signal	Grounding pulse or 0-12V pulse stream. ***Do not connect directly to high voltage systems.*** ***Do not connect directly to a distributor or ignition coil***
Warranty	1 year
Dimensions	100x20x16mm
Weight	30g
LEDs	High Brightness RGB
Package contents	Shift Light unit, power/data cable harness, sticky tape for mounting, installation guide, USB cable.



Default CANbus Protocol

As shipped, and when set to "default" mode using the PC software, the following protocol is used on the CANbus to control the shiftlights:

- Data Rate – 1Mbit/s
- 11 bit ID
- CAN ID 29 decimal (0x1D hex) for main shift light messages
- Data byte 1 sets LED 1, byte 2 is for LED 2, etc.
- Data values are as follows, in hex:
    - 0x00 Off
    - 0x01 Red
    - 0x20 Orange
    - 0x40 Yellow
    - 0x60 Green
    - 0x80 Blue
    - 0xA0 Cyan
    - 0xC0 Magenta
    - 0xE0 White
- A brightness modifier needs to be added to each of the above values to set the brightness:
    - 0x1F Full brightness
    - 0x17 Medium brightness
    - 0x0F Low brightness
    - 0x07 Dim brightness

  For example:

  A full bright red led needs the Hex value 0x01 + 0x1F = 0x20 to be sent.
  A medium brightness yellow needs the Hex value 0x40+0x17 = 0x57 to be sent.

- There is also a second message on CAN ID 30 decimal. This is an overall brightness command that could be used, for example, as a day/night brightness switch. Range is 0-4095 where 4095 is the brightest. The unit will default to full brightness at power up and it is not necessary to send messages on this ID if not required.
- The unit will time out if it receives no messages after 2 seconds, and turn all LEDs off.

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