



# FREEWheel

RACE  
system

user guide &  
fitting instructions

*"So eager to order this! Need to ditch my steering wheel umbilical as soon as possible!"*

*"Installation was really straight forward ... and the configuration software worked well"*

*"All installed and tested, works perfectly, insanely pleased :D"*



***"I cannot recommend the kit enough"***

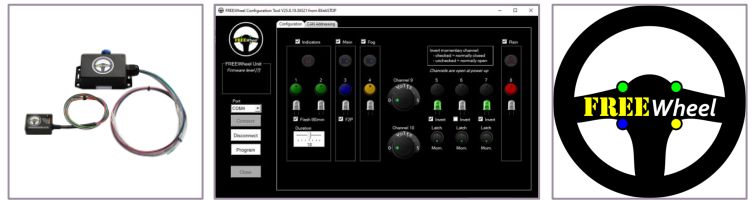
*"my favourite upgrade yet... get one."*

*"a fraction of the price of similar systems and works just as well if not even better"*

*Thank you for purchasing FREEWheel!*

**FREEWheel, the most advanced wireless steering wheel system in the world.**

Here's all the information you'll need.



### CONTENTS

Solid-state Receiver with 0.7m loom, version 7+  
Transmitter  
Battery (3V CR2 lithium) and USB cable  
Optionally: button plate bundle comprising  
IP67-rated **[OFF]** / **[ON]** momentary switches,  
nut covers, button plate, spacer disc, decals

### YOU WILL NEED

IP67-rated **[OFF]** / **[ON]** momentary switches  
USB configuration software from [www.blinkstop.co.uk](http://www.blinkstop.co.uk)  
Wire strippers, soldering iron  
Optionally: hook-and-loop or servo tape, heat shrink

### WARNINGS

Please check the contents and read the fitting instructions carefully before commencing

**FREEWheel is rated for ground-switching a maximum load of 600mA per channel and is designed to be used with additional relays or connected to a separate power distribution unit (not supplied).**

### FEATURES

- Wireless solution allows full push-button and paddle control with a detachable steering wheel
- Integrated BlinkSTOP functionality – smart indicator cancelling
- Integrated BeamSTOP functionality – smart headlight control
- Integrated IVA fog mode – inhibits and resets fog lights when headlights are turned off
- Integrated racing feature – rainlight mode with 4Hz flash or solid light selectable whilst racing
- Supports two simultaneous button presses – includes indicator channel hazard modes
- Choice of momentary and latching switch behaviour for all solid-state channels via USB configuration software
- Two analogue output (0 - 4.7V) channels for variable control
- Lightweight, compact, efficient and cost-effective design
- Uniquely, lets you use your choice of buttons, paddles and mounts. No more being tied to a manufacturer's styling choices!

### TRANSMITTER

#### SPECIFICATION

Compact case in flame-retardant ABS plastic. Requires one 3V CR2 lithium battery. Weight with battery: 61g

Robust performance even at 2.65V. Unique transmitter ID prevents cross-talk from nearby kits.

No need to disconnect the Transmitter battery if the vehicle is off the road. The sleep drain of 0.9uA and 25mA drain per ~20msec button press allows over 6 million transmissions.

Tri-colour LED indicating performance state:

- Green = Transmit OK. Transmission successfully received and acknowledged by the Receiver;
- Orange = Transmit Fail. Transmission not acknowledged by the Receiver. Possible causes are obstruction, lack of range or de-powered Receiver (e.g. vehicle ignition is off);
- Red = Low Battery <2.65V. Replace battery now.

Transmission time of 6 milliseconds for a real-time response.



### TRANSMITTER

#### INSTALLATION INSTRUCTIONS

Use of good quality, IP67 rated [OFF] / [ON] momentary switches is recommended, such as Multicomp's MCPAS6B2M1CE7, available from Farnell. Illuminated switches are not supported.

##### 1. Wiring

**DO NOT solder the switches while the Transmitter battery is fitted, as damage may occur.**

The switches are all made to a common ground, so you can connect the ground wires as you wish.

**If used,** Left / Right Indicators, Main Beam, Fog and Rainlight **MUST** be connected to the wires shown because this is matched by the control software. See [figure 1](#) and [figure 2](#) for suggested indicator and main beam wiring diagrams.

When stripping the outer insulation, please take care not to damage the wires inside. Leave sufficient wire for future soldering of unused channels, and cover with heat-shrink.

Wire Colour	Function
BLACK	Ground
ORANGE	3V Potentiometer Live Ref
RED	Ch1 or L Indicator
GREEN	Ch2 or R Indicator
BLUE	Ch3 or Main Beam
BROWN	Ch4 or Fog
GREY	Ch5
PINK	Ch6
CYAN	Ch7
PURPLE	Ch8 or Rainlight
YELLOW	Ch9 Pot1 Signal
WHITE	Ch10 Pot2 Signal

**Transmitter wiring key**

##### 2. Nut Covers (if supplied)

Fit the nut covers to the rear of the switches. It is deliberately a tight, push fit. The covers can be secured in place with a little hot melt glue **once all testing is complete.**

##### 3. Attach the Transmitter to the Steering Wheel

The Transmitter can be easily attached to the reverse of the wheel or button plate using hook-and-loop pads or servo tape.

##### 4. Battery Fitting and Removal

Fit the CR2 battery to the transmitter. When fitting the battery, take particular care in removing the case lid and inserting the battery correctly, noting that the '+' end of the battery is nearest to the LED.

To remove the battery, carefully prise out the battery – it is deliberately a tight fit in the holder.

##### 5. IMPORTANT - Transmitter Testing

Follow the [USB configuration software installation instructions](#) to connect the Receiver to your Windows PC/laptop and to verify that your button presses for each channel are being sent by the Transmitter.

## USB CONFIGURATION SOFTWARE

### INSTALLATION AND USEAGE INSTRUCTIONS

NOTE: DO NOT disconnect the USB power during programming or the chip memory may corrupt!

#### 1. Software Installation

Connect the Receiver USB cable to the Windows PC. Windows 7, 8 and 10 are supported. Windows will auto-detect and install the FTDI Driver.

In the event the PC does not self-install the FTDI driver, download and install FTDI's VCP Virtual COM Port driver from: <http://www.ftdichip.com/Drivers/VCP.htm>

#### 2. Identify the correct COM port used by FREEWheel

Open Windows Device Manager [**Start .. Run .. or Search ..** and enter '**Device Manager**']. The port will disappear and reappear as you remove and insert the Receiver USB lead.

Download, extract to Desktop and run the FREEWheel.exe program from the FREEWheel product Downloads tab at: <http://www.blinkstop.co.uk/>

#### 3. Using the Software

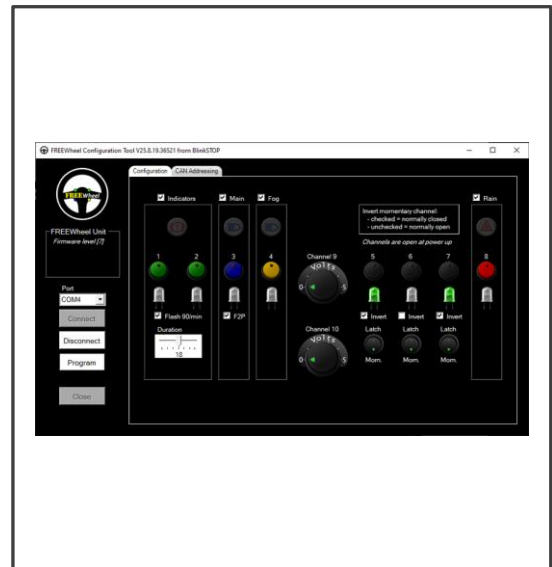
Choose the correct COM port from the available drop list and click 'Connect'. The existing channel configuration and virtual relay states will be displayed (physical relays are not powered by USB).

Pressing steering wheel buttons connected to the Transmitter will illuminate the corresponding buttons and toggle or flash the virtual relay states on the software.

Select the desired smart features by checking or unchecking the Indicator, Main, Fog and Rainlight tickboxes. Unchecking the tickboxes will allow a free choice of momentary or latching behaviour.

To configure the channels, simply press the software switches and adjust the duration slider and click 'Program'. When successful, you will see 'Success' displayed.

To disconnect the Receiver from the USB software, press 'Disconnect' then 'Close'. Now you can safely disconnect the USB cable. Proceed to installing the Receiver.



### SOLID-STATE RECEIVER

#### SPECIFICATION

Weight with 0.7m wiring loom: 208g.

Wiring loom uses 18AWG heat resistant, high temperature, thin wall wires with tinned copper.

The Solid-State Receiver provides eight, independent, low-side drive channels of 0.6A capability, with in-built short circuit / overcurrent protection, open circuit detection and flyback voltage clamping for inductive loads.

These channels can ground switch typical automotive relay coil circuits directly, or low current loads with no further isolation required.

Channels are open circuit by default at ignition **[ON]** and are switched by the Transmitter.

Digital channels 1 - 8 are configured using the FREEWheel USB software and have behaviour options of:

- ALL: momentary **[ON]** (Transmitter button follower);
- ALL: latching **[ON]** / **[OFF]** with each separate Transmitter button press;
- Channels 1 & 2: indicator control;
- Channel 3: main beam function with Flash-to-Pass feature;
- Channel 4: IVA fog function;
- Channels 5, 6 & 7: inverted momentary function;
- Channels 8: rainlight race function.

Channels 9 & 10 are variable (0 to 4.7V) signals.



### SOLID-STATE RECEIVER

#### INSTALLATION INSTRUCTIONS

The FREEWheel Receiver contains the grounding switch circuits. Each circuit can sink up to 600mA and has an internal, self-resetting fuse. Externally, there is a white wire for each channel which is to be connected to the ground side of any load. The Receiver controls the load by connecting the white wire directly to 'ground'. Circuits below 600mA can be switched directly (e.g. certain LED lighting circuits). An external relay or other high current switching device **MUST** be added for circuits with loads above 600mA (not supplied).

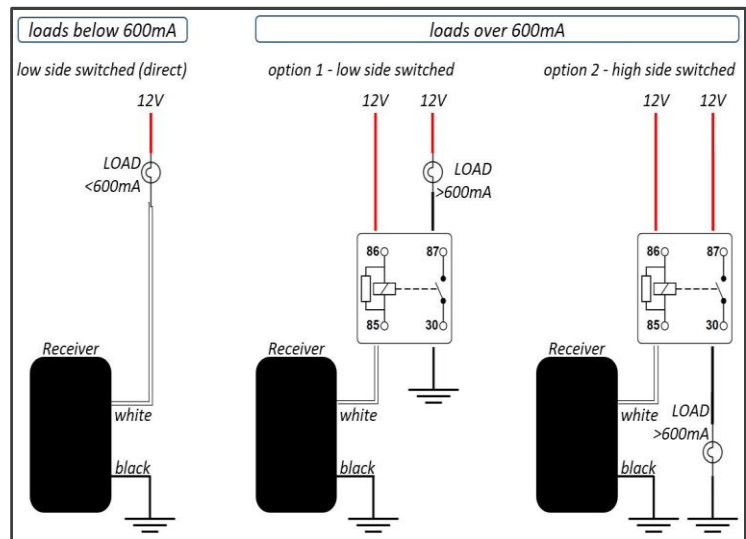
##### 1. Wiring

Identify a fused, ignition-switched circuit that can be used for the power supply to FREEWheel. The FREEWheel Receiver draws little current (<500mA typically), so will not increase the circuit load significantly.

Identify a suitable Ground connection, ideally direct to the vehicle chassis. Identify the existing circuits and schematics. These will be critical to successful installation. See [figure 1](#) and [figure 2](#) for suggested indicator and main beam wiring diagrams. Some vehicles as standard do not provide high beam flashing unless headlamps are [ON] (e.g. Westfields), so use the elements of the diagrams applicable to your vehicle.

Choose a cool location for the Receiver inside the car, with minimal (metal) obstructions between Receiver and Transmitter. Behind the dashboard is normally an ideal place.

**With the vehicle battery disconnected**, connect Receiver Power and Ground to the previously identified wires.



Label	Wire Colour	Function
-	BLUE	Headlight 12V sense
-	GREEN	Brake Light 12V sense
-	RED	12V Ignition Power
-	BLACK	Vehicle Ground
1	WHITE	Ch1 or L Indicator ground switch
2	WHITE	Ch2 or R Indicator ground switch
3	WHITE	Ch3 or Main Beam ground switch
4	WHITE	Ch4 or Fog ground switch
5	WHITE	Ch5 ground switch
6	WHITE	Ch6 ground switch
7	WHITE	Ch7 ground switch
8	WHITE	Ch8 or Rainlight ground switch
9	GREY	Ch9 (0 - 4.6V) analogue out
10	GREY	Ch10 (0 - 4.6V) analogue out

**Solid-State Receiver wiring key**

### 2. Receiver Testing

Re-connect the vehicle battery. Check that the Transmitter light is reliably GREEN on button presses and continues to flash twice a second while ignition is **[ON]**. ORANGE means that there is a probable obstruction to two-way communication. You can test the range of the system using this light for indication.

Once you have reliable communication between Transmitter and Receiver, connect the Windows PC to the USB connector and use the FREEWheel software to configure the channels, if you have not already done so (see [USB configuration software](#)). The software will show the live state of the switching and button presses.

Now **disconnect the vehicle battery** and complete the installation of the desired integrated functions.

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CHANNELS 1 AND 2 SET TO [INDICATORS]



An indicator can be toggled **[On]** and **[Off]** with each press of your steering wheel push-button.

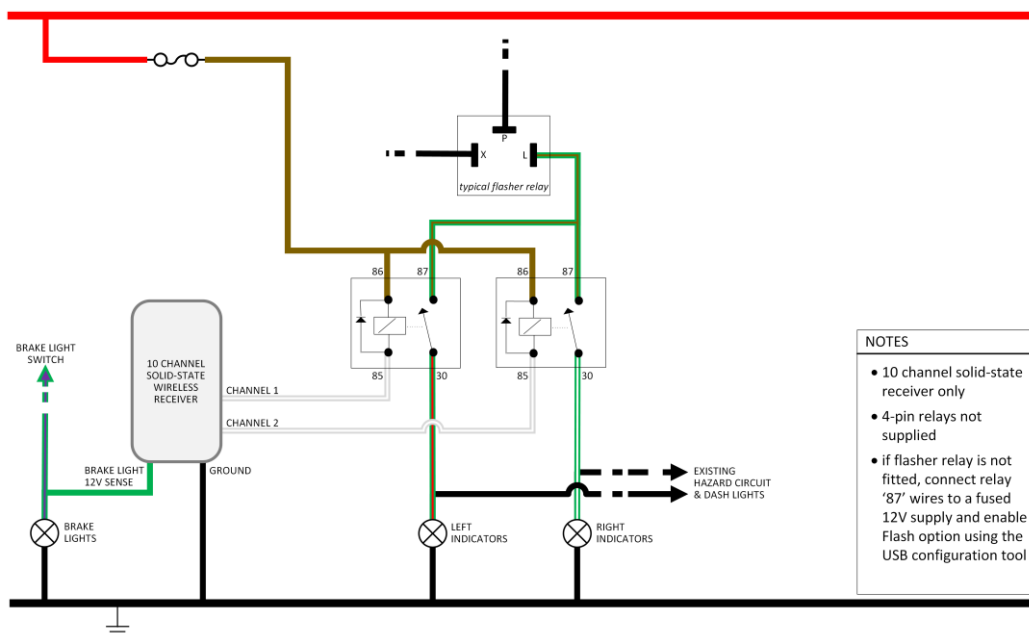
Toggleing an indicator to **[On]** begins a cancelling timer. Indicating will auto-cancel once the timer has elapsed (6 to 30 seconds, user-configurable via the [USB configuration software](#)). Indicator auto-cancelling is inhibited while the brakes are pressed, and afterwards for a short time so that the indicators can remain on in traffic or while waiting to turn.

To change indicator, push the opposite button once. The current indicator will cancel, and the opposite indicator will toggle to **[On]** and begin flashing. The cancelling timer will reset.

Flash rate can be controlled by FREEWheel at 90 flashes per minute, or by your flasher relay (user-configurable).

To use the Hazard function, push both buttons together at the same time. To cancel, press either button.

### FIGURE 1 // SUGGESTED INDICATOR WIRING PLAN



### INTEGRATED BeamSTOP HEADLIGHT FUNCTION

CHANNEL 3 SET TO [MAIN]



#### INSTRUCTIONS FOR OPERATION

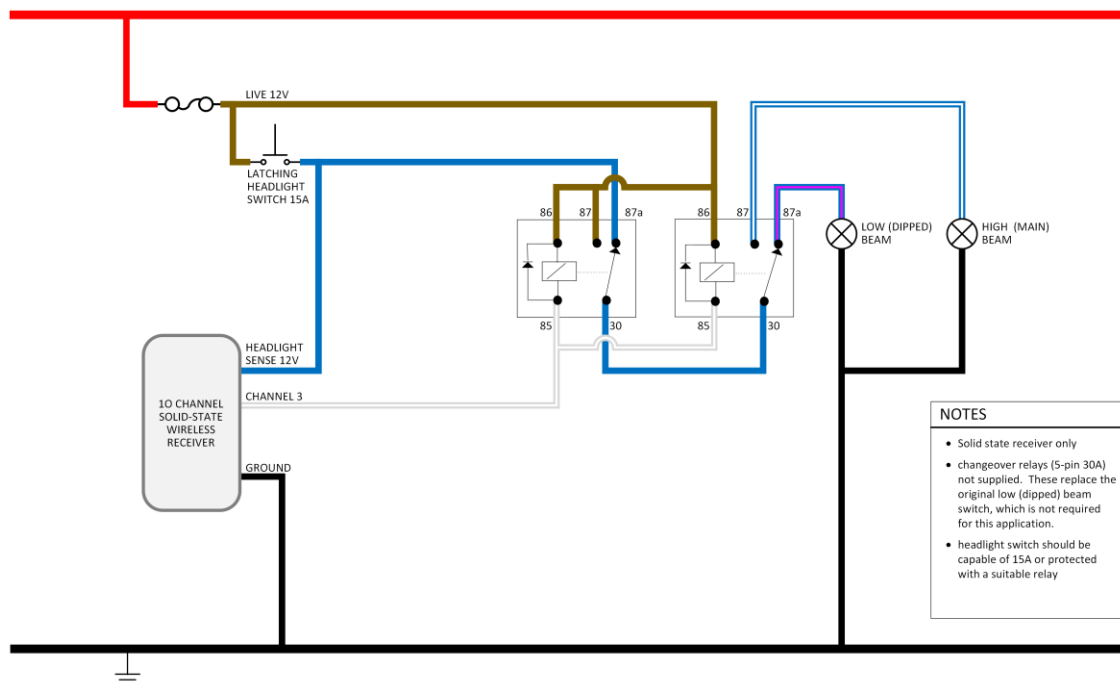
BeamSTOP allows full control of headlight main (high) beam and dipped (low) beam with a momentary **[On]** push-button, so is particularly suited to steering wheel applications.

If the headlights are **[Off]**, BeamSTOP allows the main beam to light for the duration of the button press. This makes it useful for giving a warning flash to other road users when needed.

If the headlights are **[On]**, BeamSTOP allows each button press to alternate between latched-dipped and latched-main beam.

In either case, a half-second press of the button will trigger 2 seconds of rapid flashing of the main beam if the Flash-to-Pass feature is enabled (user-configurable via USB software).

#### FIGURE 2 // SUGGESTED MAIN BEAM WIRING PLAN



## INTEGRATED FOG LIGHT 'IVA' FUNCTION

CHANNEL 4 SET TO [FOG]



### INSTRUCTIONS FOR OPERATION

Channel 4 can be used as an auto-cancelling fog light channel. When the headlights are **[Off]**, the fog light will automatically cancel and is inhibited from operation.

### WIRING

When the steering wheel button is pressed, to ensure the fog light will only activate if the headlights are **[On]**, connect the blue headlight sense wire, as shown in [figure 2](#).

## INVERTED MOMENTARY FUNCTION

CHANNELS 5, 6 AND / OR 7 SET TO MOMENTARY [INVERTED]

### INSTRUCTIONS FOR OPERATION

Channels 5, 6 and 7 can be used as inverted momentary switched channels, i.e. normally closed. Each channel can be configured independently and will always be open at power up, with normally closed behaviour starting once power-on checks are completed (<50ms).

### WIRING

No additional wiring is necessary.

## INTEGRATED RAINLIGHT RACE FUNCTION

CHANNEL 8 SET TO [RAINLIGHT]



### INSTRUCTIONS FOR OPERATION

Channel 8 can be used as a racing mode rainlight. A short press of the steering wheel button will latch the rainlight **[ON]** and a longer, one-second press will trigger the 'Rain Hazard' 4Hz flashing mode.

A subsequent one-second press will cancel the Rain Hazard mode and return to the previous state.

### WIRING

Connect the Receiver channel wire to the rainlight's relay coil circuit Ground, or directly to the rainlight Ground if 600mA or less.



## POTENTIOMETER CHANNELS

### CHANNELS 9 AND 10

#### INSTRUCTIONS FOR OPERATION

The Transmitter supports 2Hz sampling of two independent 10k $\Omega$  potentiometers.

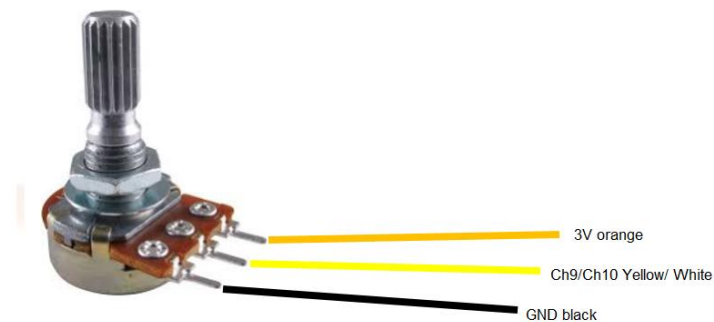
Initial voltage output is 0V at power-up, until two-way communication is established. Ensure that this is considered in the final intended switching design.

With ignition **[ON]**, pressing any of the channels 1 to 8 momentary switches initiates communication, and the green Transmitter LED will flash at 2Hz to show successful two-way messaging. The eight, grounding, momentary channels will each trigger a transmission immediately on button press, independently of the 2Hz potentiometer transmission frequency.

The Transmitter LED will automatically power down when the vehicle ignition is powered **[Off]**.

#### WIRING

Fit a 10k $\Omega$  potentiometer to each Transmitter potentiometer channel (Channels 9 and 10) as illustrated. The Receiver unit will output an analogue (0 to 4.7V) voltage proportional to the position of the potentiometer.



Connect each analogue output to a high impedance input sampling circuit (typically > 50k $\Omega$  impedance) to ensure the voltage is not reduced.

**GUARANTEE**

All our products come with a two-year guarantee, except our batteries which have a five-year guarantee.

**RETURNS & EXCHANGES**

You can return many of our products within 14 days from delivery, however customised goods and bespoke hardware, firmware and software cannot be returned or exchanged.

**GOT A PROBLEM OR CHANGED YOUR MIND?**

In all cases, we will be reasonable and responsive and will endeavour to give an excellent service. Please see [blinkstop.co.uk/shop](http://blinkstop.co.uk/shop) for further details.

# **BlinkSTOP.co.uk**

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*Kit Car Electronics Limited*

