ALL MODELS

FREEWheel

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"

"BlinkSTOP.. have done it again!"

"my favourite upgrade yet.. get one."

"Absolutely amazing.. I'll be sure to recommend your product as it really is a fantastic piece of kit"

CONTENTS

TRANSMITTER INSTALLATION 4

Transmitter wiring keys 5

RECEIVER CONFIGURATION SOFTWARE 6

CAN configuration 7

RECEIVER INSTALLATION 11

Receiver specifications 11
Receiver output specifications 13
Receiver wiring keys 15
Example wiring diagrams 17

OUTPUT FUNCTIONS REFERENCE 20

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

Receiver and Transmitter

Battery (3V CR2 or CR123A lithium) & USB cable

Optionally: 0.7m loom(s) or connectors & pins

Optionally: Easyfit Transmitter assembly or switch plate bundle comprising IP67-rated OFF/[ON] momentary switches, nut covers, button plate, spacer disk, decals

YOU WILL NEED

IP67-rated OFF/[ON] momentary switches

USB configuration software from www.blinkstop.co.uk

Wire strippers, soldering iron (not Easyfit)

Optionally: rotary switches, hook-and-loop or servo tape, heat shrink

WARNINGS

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

FREEWheel relay channels are rated for a maximum load of 15A per channel and MUST be used with additional relays for higher current loads (additional relays not supplied).

FREEWheel solid-state channels are rated for ground-switching a maximum load of 600mA per channel, designed for use with additional relays or connected to a separate power distribution unit (not supplied).

FREEWheel CAN signalling has no internal switching capability and is designed to be used with a separate power distribution unit or ECU (not supplied).

FEATURES & OPTIONS*

- *Wireless solution allows full push-button, rotary switch, paddle control and CAN signalling with a detachable steering wheel*
- *Incredibly low battery consumption even with our backlit button option*
- *Choice of momentary and latching switch behaviour for all channels via USB configuration software*
- *Integrated body control functions – indicator cancel, headlight, IVA fog light and wiper control*
- *Integrated racing features – rain light modes, flashing and Flash-to-Pass headlight modes*
- *Supports two simultaneous button presses – includes indicator channel hazard mode*
- *Low- or high-side switching up to 15A at 12VDC using internal relays*
- *Low-side solid-state switching up to 600mA & two variable outputs (0 - 4.7V analogue, 0 – 11 CAN)*
- *Top performance from a 10ms / 100Hz broadcast rate and ultimate compatibility from seven, simultaneous CAN message formats with free selection of base address, bus speed and ID length*

**See your contract sheet for specification and included options*

TRANSMITTER INSTALLATION

SPECIFICATION

Compact case in flame-retardant ABS plastic. Requires one 3V CR2 (27mm holder) or one CR123A (34mm holder) 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 incredibly low sleep drain and 20mA drain per ~10msec button press allows over 20 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.

EASYFIT TRANSMITTER INSTALLATION INSTRUCTIONS

GTX Carbon Easyfit Transmitter shown

Easyfit Transmitter is supplied preassembled and configured to your specification.

The Easyfit Transmitter is pre-drilled to support standard 50 to 50.8mm, 70mm and 74mm PCD steering wheel bosses. The rear plate can be detached from the Transmitter and used as a guide to gently drill through the spacer disk, if required. Use a 6mm HSS drill bit with light pressure and low speed, with the parts securely clamped.

PIGTAILED 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.

Switches 1 to 8 can be assigned to Receiver outputs 1 to 8 and 11 to 16 – refer to Receiver Configuration Software.

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	4, 8 RELAY Systems Function	All SOLID-STATE, CAN, HYBRID Systems Function
BLACK	Ground	Ground
ORANGE	Ground	3V Potentiometer Live Ref
RED	Switch 1	Switch 1
GREEN	Switch 2	Switch 2
BLUE	Switch 3	Switch 3
BROWN	Switch 4	Switch 4
GREY	Switch 5	Switch 5
PINK	Switch 6	Switch 6
CYAN	Switch 7	Switch 7
PURPLE	Switch 8	Switch 8
YELLOW	Ground	Pot 9 Signal
WHITE	Ground	Pot 10 Signal

Transmitter wiring keys

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 or neutral cure silicone ***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.

TRANSMITTER BATTERY & TESTING INSTRUCTIONS

1. *Battery Fitting and Removal*

Fit the supplied battery to the transmitter battery housing, noting that the '+' end of the battery is nearest to the LED. As the battery is deliberately tightly fitted in the holder, exercise care when removing.

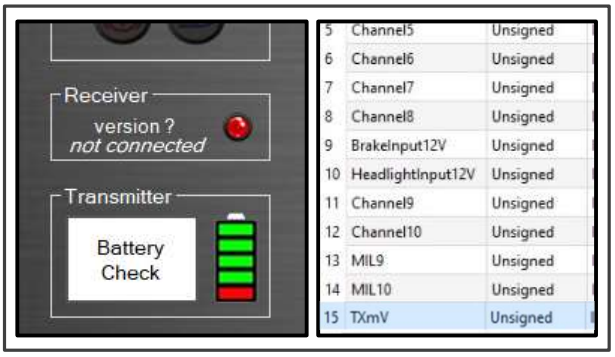
2. *IMPORTANT - Transmitter Testing*

Follow the Receiver Configuration Software instructions to connect the Receiver to your Windows PC or laptop and to verify that your button presses for each channel are being sent by the Transmitter.

3. *Battery Voltage*

With the Receiver connected to your Windows PC or laptop and communication with the Transmitter established, approximate battery strength can be checked using the Receiver Configuration Software.

For CAN-enabled Receivers, a more precise voltage can be obtained from the CAN signal in message TXmV, within the All_Compact_U8 frame in Byte 6 (scaling x10, offset 1000mV). The default is 3000mV until active communication starts. A suitable alarm value is 2700mV.



RECEIVER CONFIGURATION SOFTWARE

SOFTWARE INSTALLATION AND USAGE 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 10 and 11 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 **[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 Downloads page at: https://www.blinkstop.co.uk/shop/downloads

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.

INPUT SOURCE SELECTION

4. *Select the Input Configuration tab to activate CAN integrations* and map the channels*

Enable CAN switchboard and/or CAN keypad using the associated tick boxes. Enabling a keypad spawns an Options button which offers a choice of keypad sizes, light intensities and colours.

Assign channels to individual FREEWheel switches, switchboard inputs, keypad keys* and digital output from our Mil-spec rotary switches*.* ***Note that changes are immediately committed to the Receiver.***

RECEIVER CHANNEL OUTPUT BEHAVIOUR CONFIGURATION

5. *Use the Input Configuration tab to set the channel behaviours*

If using a PDM or similar to control your circuits, you may wish to set all channels to momentary behaviour. Alternatively, select the desired smart functions using the dropdown boxes. All channels allow a choice of momentary or latching behaviour, and those with coloured icons include a special function such as indicator cancelling and wiper mode. ***Note that changes are immediately committed to the Receiver.***

CAUTION*: use Momentary behaviour for channels activated by our Mil-spec rotary switches.*

Continue to CAN Configuration if required otherwise press 'Disconnect' and 'Close' to disconnect the Receiver from the USB software, then remove the USB cable and proceed to Receiver Installation.

**See your contract sheet for specification and included options*

CAN CONFIGURATION

6. *Select the CAN Addressing tab and configure the Receiver CAN communication*

Message ID: This is the Base Address in hexadecimal. The default is 0x500 (1280 decimal) with 11-bit (standard) Identifier. Follow the instructions on the CAN Addressing tab to set the Receiver communication to match your intended CAN-connected node (ECU / PDU / dash etc).

Once done, click 'Program'. When successful, you will see 'Success' displayed.

To achieve two-way communication, you will also need to configure your existing CAN node. If your node accepts industry standard .dbc CAN database files, you can use file KCE_WirelessCAN.dbc from the Downloads page at https://www.blinkstop.co.uk/shop/downloads , otherwise configure your node with the data below.

For best performance, the FREEWheel Receiver uses a 10ms (100Hz) broadcast rate.

For best compatibility, the FREEWheel Receiver outputs its CAN message in seven simultaneous standard formats [see the following CAN messages table and individual message illustrations). Pick the most suitable format and set your existing CAN node accordingly.

***Note**: Kvaser Database Editor 3 is recommended for viewing CAN .dbc files and is freely available from https://www.kvaser.com/download/*

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

Proceed to Receiver Installation.

CAN MESSAGES

Message	Contents	Format	Address / default
All_Compact_U8	All signals	8-bit Unsigned compact industry standard (e.g. AiM)	Base Address 0x500 hex / 1280 dec
Ch1_4_U16LE	channels 1 - 4	16-bit Unsigned Little Endian / LSB First (e.g. EMtron)	Base Address +11 0x50B hex / 1291 dec
Ch5_8_U16LE	channels 5 - 8	16-bit Unsigned Little Endian / LSB First (e.g. EMtron)	Base Address +12 0x50C hex / 1292 dec
Ch9_10_U16LE	channels 9 - 10	16-bit Unsigned Little Endian / LSB First (e.g. EMtron)	Base Address +13 0x50D hex / 1293 dec
Ch1_4_S16BE	channels 1 - 4	16-bit Signed Big Endian / MSB First (e.g. Syvecs)	Base Address +1 0x501 hex / 1281 dec
Ch5_8_S16BE	channels 5 – 8	16-bit Signed Big Endian / MSB First (e.g. Syvecs)	Base Address +2 0x502 hex / 1282 dec
Ch9_10_S16BE	channels 9 - 10	16-bit Signed Big Endian / MSB First (e.g. Syvecs)	Base Address +3 0x503 hex / 1283 dec

CAN messages

CAN Messages

	Name	ID Decimal	Frame Format	DLC	TX Node	Comment
1	All_Compact_U8	1280	Standard	8	WirelessRec...	10ms U8 [Base Address from config tool]
2	Ch1_4_U16LE	1291	Standard	8	WirelessRec...	10ms Unsigned 16 bit Little Endian [Base+11]
3	Ch5_8_U16LE	1292	Standard	8	WirelessRec...	10ms Unsigned 16 bit Little Endian [Base+12]
4	Ch9_10_U16LE	1293	Standard	8	WirelessRec...	10ms Unsigned 16 bit Little Endian [Base+13]
5	Ch1_4_S16BE	1281	Standard	8	WirelessRec...	10ms Signed 16 bit Big Endian [Base+1]
6	Ch5_8_S16BE	1282	Standard	8	WirelessRec...	10ms Signed 16 bit Big Endian [Base+2]
7	Ch9_10_S16BE	1283	Standard	8	WirelessRec...	10ms Signed 16 bit Big Endian [Base+3]

Signals of Selected CAN Message

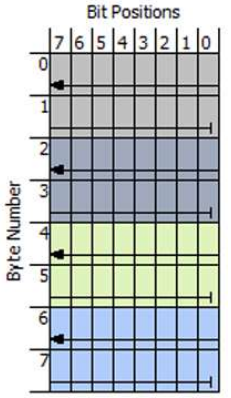
	Name	Type	Byteorder	Mode	Bitpos	Length	Factor	Offset	Minimum	Maximum	Unit	Comment	Values
1	Output1	Unsigned	Intel	Signal	7	1	1	0	0		1 Bin	0 Open Circuit	Open Circuit=0, Closed Circuit=1
2	Output2	Unsigned	Intel	Signal	6	1	1	0	0		1 Bin	0 Open Circuit	Open Circuit=0, Closed Circuit=1
3	Output3	Unsigned	Intel	Signal	5	1	1	0	0		1 Bin	0 Open Circuit	Open Circuit=0, Closed Circuit=1
4	Output4	Unsigned	Intel	Signal	4	1	1	0	0		1 Bin	0 Open Circuit	Open Circuit=0, Closed Circuit=1
5	Output5	Unsigned	Intel	Signal	3	1	1	0	0		1 Bin	0 Open Circuit	Open Circuit=0, Closed Circuit=1
6	Output6	Unsigned	Intel	Signal	2	1	1	0	0		1 Bin	0 Open Circuit	Open Circuit=0, Closed Circuit=1
7	Output7	Unsigned	Intel	Signal	1	1	1	0	0		1 Bin	0 Open Circuit	Open Circuit=0, Closed Circuit=1
8	Output8	Unsigned	Intel	Signal	0	1	1	0	0		1 Bin	0 Open Circuit	Open Circuit=0, Closed Circuit=1
9	BrakeInput12V	Unsigned	Intel	Signal	23	1	1	0	0		1 Bin	1 Input High	Low=0, High=1
10	HeadlightInput12V	Unsigned	Intel	Signal	22	1	1	0	0		1 Bin	1 Input High	Low=0, High=1
11	Output9	Unsigned	Intel	Signal	32	8	1	0	0	255	Dec	Analogue	Low=0, High=255
12	Output10	Unsigned	Intel	Signal	40	8	1	0	0	255	Dec	Analogue	Low=0, High=255
13	MIL9	Unsigned	Intel	Signal	24	8	1	0	0	11	Dec	Analogue MIL switch	
14	MIL10	Unsigned	Intel	Signal	56	8	1	0	0	11	Dec	Analogue MIL switch	
15	TXmV	Unsigned	Intel	Signal	48	8	10	1000	1000	3500	Dec	Transmitter battery voltage	
16	Output11	Unsigned	Intel	Signal	21	1	1	0	0		1 Bin	0 Open Circuit	Open Circuit=0, Closed Circuit=1
17	Output12	Unsigned	Intel	Signal	20	1	1	0	0		1 Bin	0 Open Circuit	Open Circuit=0, Closed Circuit=1
18	Output13	Unsigned	Intel	Signal	19	1	1	0	0		1 Bin	0 Open Circuit	Open Circuit=0, Closed Circuit=1
19	Output14	Unsigned	Intel	Signal	18	1	1	0	0		1 Bin	0 Open Circuit	Open Circuit=0, Closed Circuit=1
20	Output15	Unsigned	Intel	Signal	17	1	1	0	0		1 Bin	0 Open Circuit	Open Circuit=0, Closed Circuit=1
21	Output16	Unsigned	Intel	Signal	16	1	1	0	0		1 Bin	0 Open Circuit	Open Circuit=0, Closed Circuit=1

All_Compact_U8

Messages & Signals | All Signals | Node List | Communication Matrix

CAN Messages Layout

	Name	ID Decimal	Frame Format	DLC	TX Node	Comment
1	All_Compact_U8	1280	Standard	8	WirelessReceiver	10ms U8 [Base Address from config tool]
2	Ch1_4_S16BE	1281	Standard	8	WirelessReceiver	10ms Signed 16 bit Big Endian [Base+1]
3	Ch1_4_U16LE	1291	Standard	8	WirelessReceiver	10ms Unsigned 16 bit Little Endian [Base+11]
4	Ch5_8_S16BE	1282	Standard	8	WirelessReceiver	10ms Signed 16 bit Big Endian [Base+2]
5	Ch5_8_U16LE	1292	Standard	8	WirelessReceiver	10ms Unsigned 16 bit Little Endian [Base+12]
6	Ch9_10_S16BE	1283	Standard	8	WirelessReceiver	10ms Signed 16 bit Big Endian [Base+3]
7	Ch9_10_U16LE	1293	Standard	8	WirelessReceiver	10ms Unsigned 16 bit Little Endian [Base+13]



Signals of Selected CAN Message

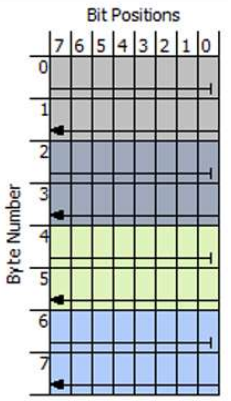
	Name	Type	Byteorder	Mode	Bitpos	Length	Factor	Offset	Minimum	Maximum	Unit
1	Channel5_S16BE	Signed	Motorola	Signal	8	16	1	0	0	1	
2	Channel6_S16BE	Signed	Motorola	Signal	24	16	1	0	0	1	
3	Channel7_S16BE	Signed	Motorola	Signal	40	16	1	0	0	1	
4	Channel8_S16BE	Signed	Motorola	Signal	56	16	1	0	0	1	

Ch5_8_S16BE

Messages & Signals | All Signals | Node List | Communication Matrix

CAN Messages Layout

	Name	ID Decimal	Frame Format	DLC	TX Node	Comment
1	All_Compact_U8	1280	Standard	8	WirelessReceiver	10ms U8 [Base Address from config tool]
2	Ch1_4_S16BE	1281	Standard	8	WirelessReceiver	10ms Signed 16 bit Big Endian [Base+1]
3	Ch1_4_U16LE	1291	Standard	8	WirelessReceiver	10ms Unsigned 16 bit Little Endian [Base+11]
4	Ch5_8_S16BE	1282	Standard	8	WirelessReceiver	10ms Signed 16 bit Big Endian [Base+2]
5	Ch5_8_U16LE	1292	Standard	8	WirelessReceiver	10ms Unsigned 16 bit Little Endian [Base+12]
6	Ch9_10_S16BE	1283	Standard	8	WirelessReceiver	10ms Signed 16 bit Big Endian [Base+3]
7	Ch9_10_U16LE	1293	Standard	8	WirelessReceiver	10ms Unsigned 16 bit Little Endian [Base+13]



Signals of Selected CAN Message

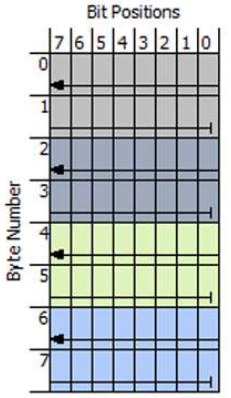
	Name	Type	Byteorder	Mode	Bitpos	Length	Factor	Offset	Minimum	Maximum	Unit
1	Channel5_U16LE	Unsigned	Intel	Signal	0	16	1	0	0	5000	
2	Channel6_U16LE	Unsigned	Intel	Signal	16	16	1	0	0	5000	
3	Channel7_U16LE	Unsigned	Intel	Signal	32	16	1	0	0	5000	
4	Channel8_U16LE	Unsigned	Intel	Signal	48	16	1	0	0	5000	

Ch5_8_U16LE

Messages & Signals | All Signals | Node List | Communication Matrix

CAN Messages Layout

	Name	ID Decimal	Frame Format	DLC	TX Node	Comment
1	All_Compact_U8	1280	Standard	8	WirelessReceiver	10ms U8 [Base Address from config tool]
2	Ch1_4_S16BE	1281	Standard	8	WirelessReceiver	10ms Signed 16 bit Big Endian [Base+1]
3	Ch1_4_U16LE	1291	Standard	8	WirelessReceiver	10ms Unsigned 16 bit Little Endian [Base+11]
4	Ch5_8_S16BE	1282	Standard	8	WirelessReceiver	10ms Signed 16 bit Big Endian [Base+2]
5	Ch5_8_U16LE	1292	Standard	8	WirelessReceiver	10ms Unsigned 16 bit Little Endian [Base+12]
6	Ch9_10_S16BE	1283	Standard	8	WirelessReceiver	10ms Signed 16 bit Big Endian [Base+3]
7	Ch9_10_U16LE	1293	Standard	8	WirelessReceiver	10ms Unsigned 16 bit Little Endian [Base+13]



Signals of Selected CAN Message

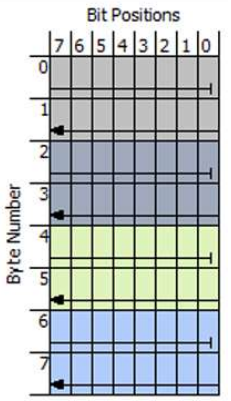
	Name	Type	Byteorder	Mode	Bitpos	Length	Factor	Offset	Minimum	Maximum	Unit
1	Channel9_S16BE	Signed	Motorola	Signal	8	16	1	0	0	255	
2	Channel10_S16BE	Signed	Motorola	Signal	24	16	1	0	0	255	
3	MIL9_S16BE	Signed	Motorola	Signal	40	16	1	0	0	11	
4	MIL10_S16BE	Signed	Motorola	Signal	56	16	1	0	0	11	

C9_10_S16BE

Messages & Signals | All Signals | Node List | Communication Matrix

CAN Messages Layout

	Name	ID Decimal	Frame Format	DLC	TX Node	Comment
1	All_Compact_U8	1280	Standard	8	WirelessReceiver	10ms U8 [Base Address from config tool]
2	Ch1_4_S16BE	1281	Standard	8	WirelessReceiver	10ms Signed 16 bit Big Endian [Base+1]
3	Ch1_4_U16LE	1291	Standard	8	WirelessReceiver	10ms Unsigned 16 bit Little Endian [Base+11]
4	Ch5_8_S16BE	1282	Standard	8	WirelessReceiver	10ms Signed 16 bit Big Endian [Base+2]
5	Ch5_8_U16LE	1292	Standard	8	WirelessReceiver	10ms Unsigned 16 bit Little Endian [Base+12]
6	Ch9_10_S16BE	1283	Standard	8	WirelessReceiver	10ms Signed 16 bit Big Endian [Base+3]
7	Ch9_10_U16LE	1293	Standard	8	WirelessReceiver	10ms Unsigned 16 bit Little Endian [Base+13]



Signals of Selected CAN Message

	Name	Type	Byteorder	Mode	Bitpos	Length	Factor	Offset	Minimum	Maximum	Unit
1	Channel9_U16LE	Unsigned	Intel	Signal	0	16	1	0	0	255	
2	Channel10_U16LE	Unsigned	Intel	Signal	16	16	1	0	0	255	
3	MIL9_U16LE	Unsigned	Intel	Signal	32	16	1	0	0	11	
4	MIL10_U16LE	Unsigned	Intel	Signal	48	16	1	0	0	11	

Ch9_10_U16LE

RECEIVER INSTALLATION

4-CHANNEL RELAY RECEIVER SPECIFICATION

Weight with/without 0.7m loom: 300g/135g.

Wiring loom uses 14-pin sealed, genuine TE connector and 18AWG heat resistant, high temperature, thin wall wires with tinned copper.

OUTPUTS: *relay digital 1 – 4*

CURRENT DRAW: *<500mA*

4-Channel Receiver

8-CHANNEL RELAY RECEIVER SPECIFICATION

Weight with/without 0.7m loom: 385g/220g.

Wiring loom uses 23-pin sealed, genuine TE connector and 18AWG heat resistant, high temperature, thin wall wires with tinned copper.

OUTPUTS: *relay digital 1 – 8*

CURRENT DRAW: *<500mA*

8-Channel Receiver

CAN RECEIVER SPECIFICATION

Weight with/without 0.7m wiring loom: 165g/112g.

Wiring loom uses 8-pin sealed, genuine TE connector and 18AWG heat resistant, high temperature, thin wall wires with tinned copper.

OUTPUTS: *CANBus*

CURRENT DRAW: *<50mA*

CAN Receiver

8, 10 & 16-CHANNEL SOLID-STATE RECEIVER SPECIFICATION

Weight with/without 0.7m loom: 285g/120g.

Wiring loom uses 23-pin sealed, genuine TE connector and 18AWG heat resistant, high temperature, thin wall wires with tinned copper.

OUTPUTS:

8 channel:	*solid-state digital 1 – 8* *optionally: CANBus*
10 channel:	*solid-state digital 1 – 8* *analogue 9 – 10* *optionally: CANBus*
16 channel:	*solid-state digital 1 – 8* *analogue 9 – 10* *solid-state digital 11 – 16* *CANBus*
CURRENT DRAW:	*<50mA*

Solid-State Receiver

16-CHANNEL HYBRID RECEIVER SPECIFICATION

Weight with/without 0.7m looms: 448g/230g.

Wiring loom 1 uses 8-pin sealed, genuine TE connector and 18AWG heat resistant, high temperature, thin wall wires with tinned copper.

Wiring loom 2 uses 23-pin sealed, genuine TE connector and 18AWG heat resistant, high temperature, thin wall wires with tinned copper.

OUTPUTS:	*relay digital 1 – 8* *analogue 9 – 10* *solid-state digital 11 – 16* *CANBus*
CURRENT DRAW:	*<500mA*

16-Channel Hybrid Receiver

RELAY CHANNELS (DIGITAL) OUTPUTS SPECIFICATION

Internal relays are rated for maximum switching current 15A at 12VDC and support low- or high-side switching.

Circuits should be suitably protected with ≤ 20A fuses (not supplied).

SOLID-STATE CHANNELS (DIGITAL) OUTPUTS SPECIFICATION

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.

DIGITAL CHANNEL BEHAVIOURS

Digital channels are open circuit by default at ignition ON and are switched by the Transmitter.

Digital output channels are configured using the Configuration Software and have behaviour options of:

- *ALL: momentary Normally Open (ON) (Transmitter button follower)*
- *ALL: latching ON / OFF with each separate Transmitter button press*
- *ALL: inverted momentary Normally Closed (NC) (Transmitter button follower)*
- *ALL: 1Hz flashing and 2Hz flashing ON / OFF*
- *Channels 1 & 2: indicator control*
- *Channel 3: high and low beam function with Flash-to-Pass feature*
- *Channel 4: IVA fog function*
- *Channels 5 & 16: single button hazard function (triggers channels 1 and 2 simultaneously)*
- *Channel 6: intermittent wiper function*
- *Channel 8: rain light function*

ROTARY CHANNELS (ANALOGUE) OUTPUTS SPECIFICATION

Analogue channels output a 0 to 4.7V voltage proportional to the position of a connected potentiometer and can be inverted to give a 4.7 – 0V output using the Configuration Software.

CAN-enabled Receivers output CAN 0 to 255 value proportional to the position, and discrete 0 to 11 CAN signals MIL9 and MIL10 for the Kit Car Electronics' Mil-spec rotary switches.

The MIL values are also available internally to all Receivers and can be mapped to activate individual digital channels using the Configuration Software (no CAN required).

CANBUS OUTPUT SPECIFICATION

See the previous section Receiver Configuration Software for message formats.

Details of all individual features can be found towards the end of this booklet.

INSTALLATION INSTRUCTIONS

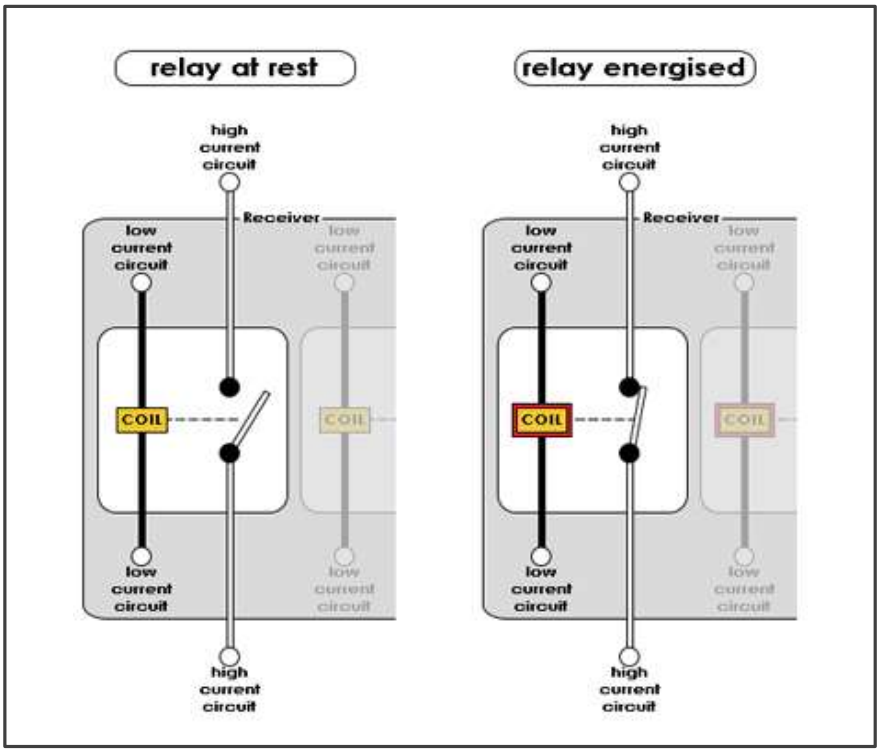
RELAY CHANNELS:

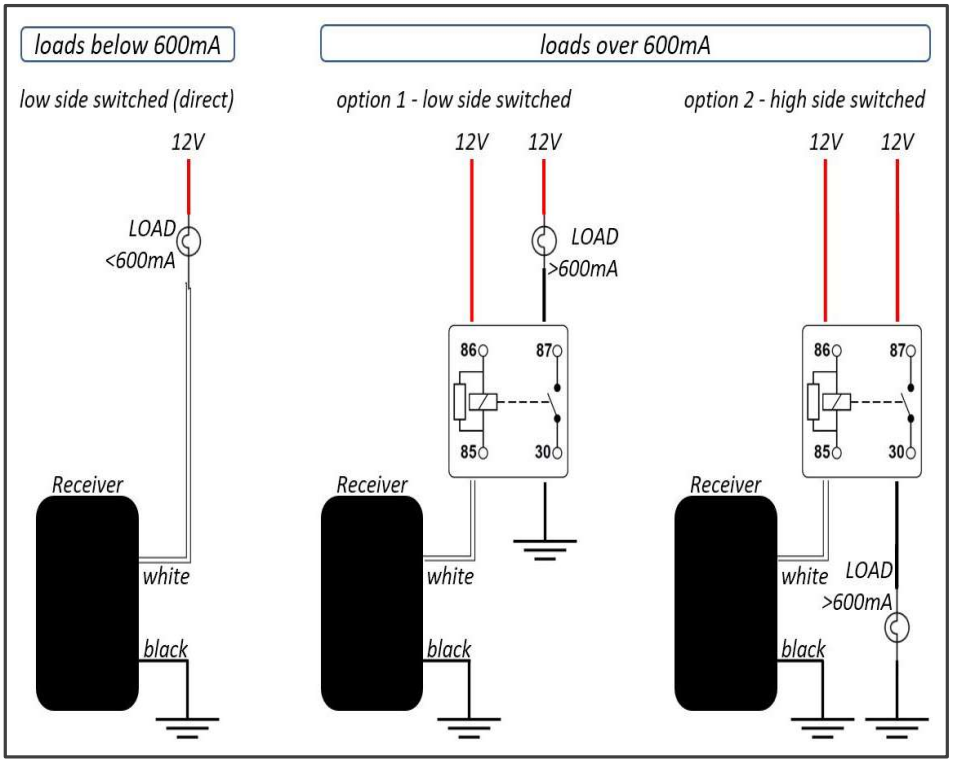
Inside the FREEWheel Receiver are the relays and 'low current circuits' that control the relay coils. The white pair from the receiver for each channel is the 'high current circuit' pair shown.

The white pair can be used to switch up to 15A and can be wired in parallel with the existing dashboard switches, or the switches can be removed, if preferred.

*In **ALL** cases, additional relays **MUST** be used for current loads above 15A (not supplied).*

All relay circuits (channels 1- 8) should be suitably protected with ≤ 20A fuses (not supplied).





SOLID-STATE CHANNELS:

The FREEWheel Receiver contains the solid-state 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).

1. *Wiring*

Identify an ignition-switched circuit that can be used for the power supply to FREEWheel. The Receiver draws little current (<500mA for relays otherwise <50mA) 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.

Refer to the pin-out diagrams on the following pages.

***For CAN-ONLY Receivers**, to use FREEWheel's smart indicator, high beam or fog IVA control logic, connect the brake light (pin 2) and/or headlamp (pin 3) 12V sense wires. Otherwise, these connections are not required.*

Connect CAN HIGH and CAN LOW wires to your vehicle CANbus. It is essential that suitable twisted pair wiring is used.

***For all other Receivers**, see the figures on the following pages 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 earlier identified wires.*

2. *Receiver Testing*

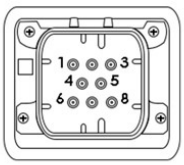
Re-connect the vehicle battery and check the relays can be heard to click when the steering wheel Transmitter buttons are pressed.

Check that the Transmitter light is reliably GREEN on button presses. 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 Receiver Configuration Software). The software will show the live state of the switching and button presses and the Transmitter battery voltage status.

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

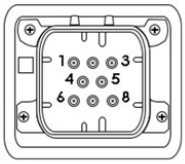
CAN RECEIVER WIRING KEY



8-PIN AMPSEAL CONNECTOR PIN-OUT DIAGRAM

PIN	COLOUR	FUNCTION/CHANNEL
1	-	-
2	GREEN	BRAKE LIGHT 12V SENSE
3	BLUE	HEADLIGHT 12V SENSE
4	RED	12V IGNITION POWER
5	BLACK	VEHICLE GROUND
6	-	-
7	WHITE	CAN LOW
8	WHITE	CAN HIGH

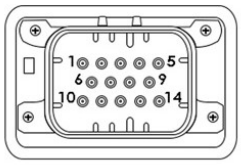
HYBRID 1 RECEIVER WIRING KEY



8-PIN AMPSEAL CONNECTOR PIN-OUT DIAGRAM

PIN	COLOUR	FUNCTION/CHANNEL
1	WHITE	CH11 GROUND SWITCH
2	WHITE	CH12 GROUND SWITCH
3	WHITE	CH13 GROUND SWITCH
4	WHITE	CH14 GROUND SWITCH
5	WHITE	CH15 GROUND SWITCH
6	WHITE	CH16 GROUND SWITCH
7	WHITE	CH9 ANLG OUT 0-5V
8	WHITE	CH10 ANLG OUT 0-5V

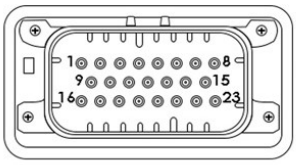
4-CHANNEL RELAY RECEIVER WIRING KEY



14-PIN AMPSEAL CONNECTOR
PIN-OUT DIAGRAM

PIN	COLOUR	FUNCTION / CHANNEL
1	WHITE	CH1 OR LEFT INDICATOR RELAY PAIR
2	WHITE	CH1 OR LEFT INDICATOR RELAY PAIR
3	WHITE	CH2 OR RIGHT INDICATOR RELAY PAIR
4	WHITE	CH2 OR RIGHT INDICATOR RELAY PAIR
5	-	-
6	WHITE	CH4 OR FOG RELAY PAIR
7	RED	12V IGNITION POWER
8	BLACK	VEHICLE GROUND
9	GREEN	BRAKE LIGHT 12V SENSE
10	WHITE	CH4 OR FOG RELAY PAIR
11	BLUE & BROWN	CH3 (NC) OR HEADLIGHT SWITCHED SUPPLY
12	WHITE & BROWN	CH3 (NO) OR HEADLIGHT FUSED SUPPLY
13	BLUE & RED	CH3 (NC) OR LOW (DIPPED) BEAM
14	WHITE & BLUE	CH3 (NO) OR HIGH(MAIN) BEAM

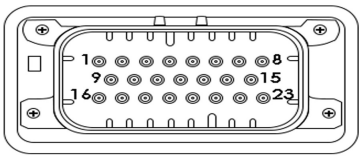
8-CHANNEL RELAY & HYBRID 2 RECEIVER WIRING KEY



23-PIN AMPSEAL CONNECTOR
PIN-OUT DIAGRAM

PIN	COLOUR	FUNCTION / CHANNEL
1	WHITE	CH1 OR LEFT INDICATOR RELAY PAIR
2	WHITE	CH1 OR LEFT INDICATOR RELAY PAIR
3	WHITE	CH2 OR RIGHT INDICATOR RELAY PAIR
4	WHITE	CH2 OR RIGHT INDICATOR RELAY PAIR
5	BLUE & BROWN	CH3 (NC) OR HEADLIGHT SWITCHED SUPPLY
6	WHITE & BROWN	CH3 (NO) OR HEADLIGHT FUSED SUPPLY
7	BLUE & RED	CH3 (NC) OR LOW (DIPPED) BEAM
8	WHITE & BLUE	CH3 (NO) OR HIGH(MAIN) BEAM
9	WHITE	CH8 OR RAINLIGHT RELAY PAIR
10	RED	12V IGNITION POWER
11	BLACK	VEHICLE GROUND
12	GREEN	BRAKE LIGHT 12V SENSE
13	WHITE	CAN LOW (OPTIONAL)
14	WHITE	CAN HIGH (OPTIONAL)
15	WHITE	CH4 OR FOG RELAY PAIR
16	WHITE	CH8 OR RAINLIGHT RELAY PAIR
17	WHITE	CH7 RELAY PAIR
18	WHITE	CH7 RELAY PAIR
19	WHITE	CH6 RELAY PAIR
20	WHITE	CH6 RELAY PAIR
21	WHITE	CH5 RELAY PAIR
22	WHITE	CH5 RELAY PAIR
23	WHITE	CH4 OR FOG RELAY PAIR

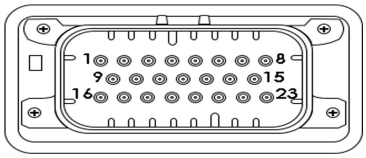
8 & 10-CHANNEL SOLID-STATE RECEIVER WIRING KEY



23-PIN AMPSEAL
CONNECTOR
PIN-OUT DIAGRAM

PIN	COLOUR	FUNCTION / CHANNEL
1	WHITE	CH1 GROUND SWITCH
2	WHITE	CH2 GROUND SWITCH
3	WHITE	CH3 GROUND SWITCH
4	WHITE	CH4 GROUND SWITCH
5	WHITE	CH5 GROUND SWITCH
6	WHITE	CH6 GROUND SWITCH
7	WHITE	CH7 GROUND SWITCH
8	WHITE	CH8 GROUND SWITCH
9	-	-
10	RED	12V IGNITION POWER
11	BLACK	VEHICLE GROUND
12	GREEN	12V SENSE
13	BLUE	12V SENSE
14	WHITE	CH9 ANALOGUE OUT 0-5V
15	WHITE	CH10 ANALOGUE OUT 0-5V
16	-	-
17	-	-
18	-	-
19	-	-
20	-	-
21	-	-
22	WHITE	CAN LOW (OPTIONAL)
23	WHITE	CAN HIGH (OPTIONAL)

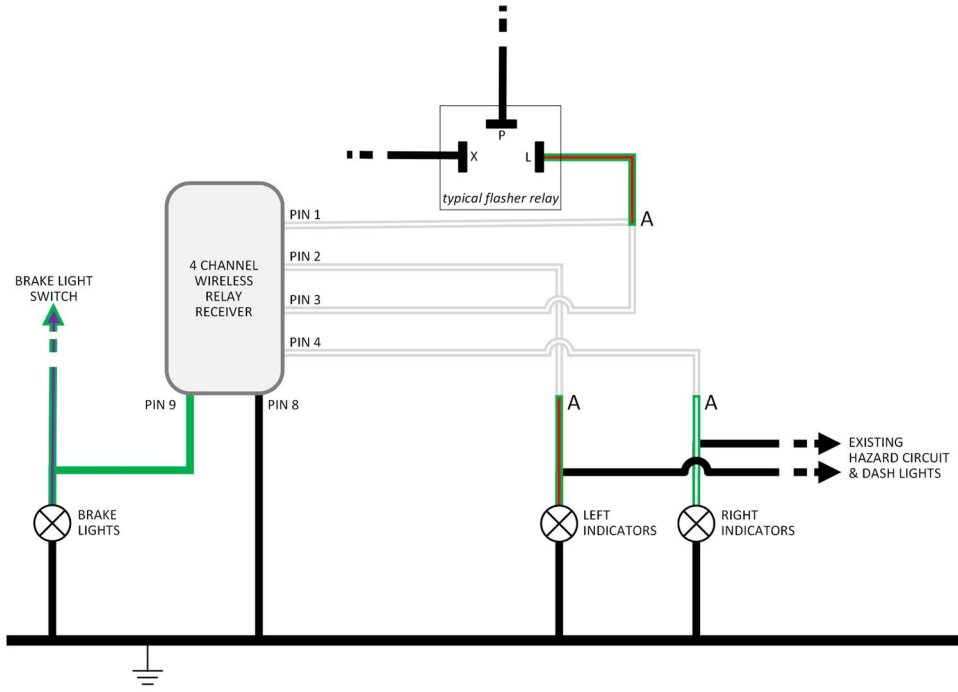
16-CHANNEL SOLID-STATE RECEIVER WIRING KEY



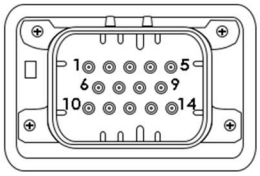
23-PIN AMPSEAL
CONNECTOR
PIN-OUT DIAGRAM

PIN	COLOUR	FUNCTION / CHANNEL
1	WHITE	CH1 GROUND SWITCH
2	WHITE	CH2 GROUND SWITCH
3	WHITE	CH3 GROUND SWITCH
4	WHITE	CH4 GROUND SWITCH
5	WHITE	CH5 GROUND SWITCH
6	WHITE	CH6 GROUND SWITCH
7	WHITE	CH7 GROUND SWITCH
8	WHITE	CH8 GROUND SWITCH
9	-	-
10	RED	12V IGNITION POWER
11	BLACK	VEHICLE GROUND
12	GREEN	12V SENSE
13	BLUE	12V SENSE
14	WHITE	CH9 ANALOGUE OUT 0-5V
15	WHITE	CH10 ANALOGUE OUT 0-5V
16	-	CH16 GROUND SWITCH
17	-	CH15 GROUND SWITCH
18	-	CH14 GROUND SWITCH
19	-	CH13 GROUND SWITCH
20	-	CH12 GROUND SWITCH
21	-	CH11 GROUND SWITCH
22	WHITE	CAN LOW
23	WHITE	CAN HIGH

FIGURE 1 // 4-CHANNEL RELAY SYSTEMS – SUGGESTED INDICATOR WIRING PLAN



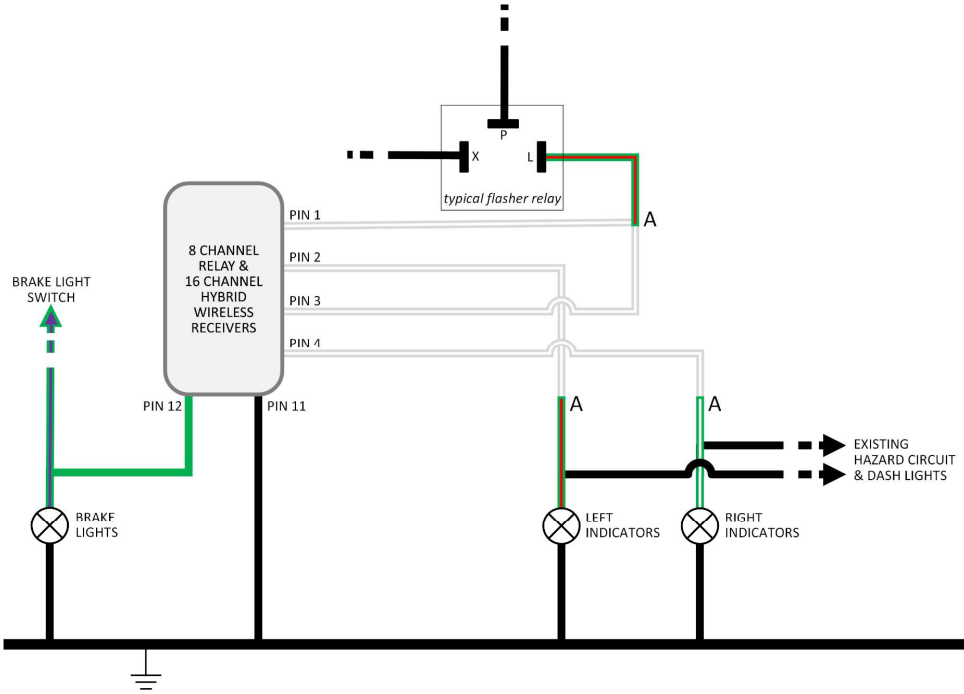
14-PIN LAYOUT (MALE)



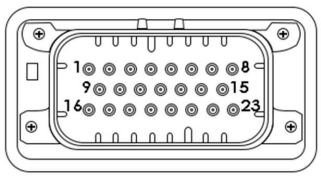
NOTES

- 4 channel relay receiver only
- numbers shown are connector pins
- wires marked A previously connected to dash switch
- if flasher relay is not fitted, connect pin 1 and pin 3 wires to a fused 12V supply and enable Flash option using the USB configuration tool

FIGURE 2 // 8-CHANNEL RELAY & HYBRID 16-CHANNEL SYSTEMS – SUGGESTED INDICATOR WIRING PLAN



23-PIN LAYOUT (MALE)



NOTES

- 8-channel relay & 16-channel hybrid receivers only
- numbers shown are connector pins
- wires marked A previously connected to dash switch
- if flasher relay is not fitted, connect pin 1 and pin 3 wires to a fused 12V supply and enable Flash option using the USB configuration tool

FIGURE 3 // 8, 10 & 16-CHANNEL SOLID-STATE SYSTEMS – SUGGESTED INDICATOR WIRING PLAN

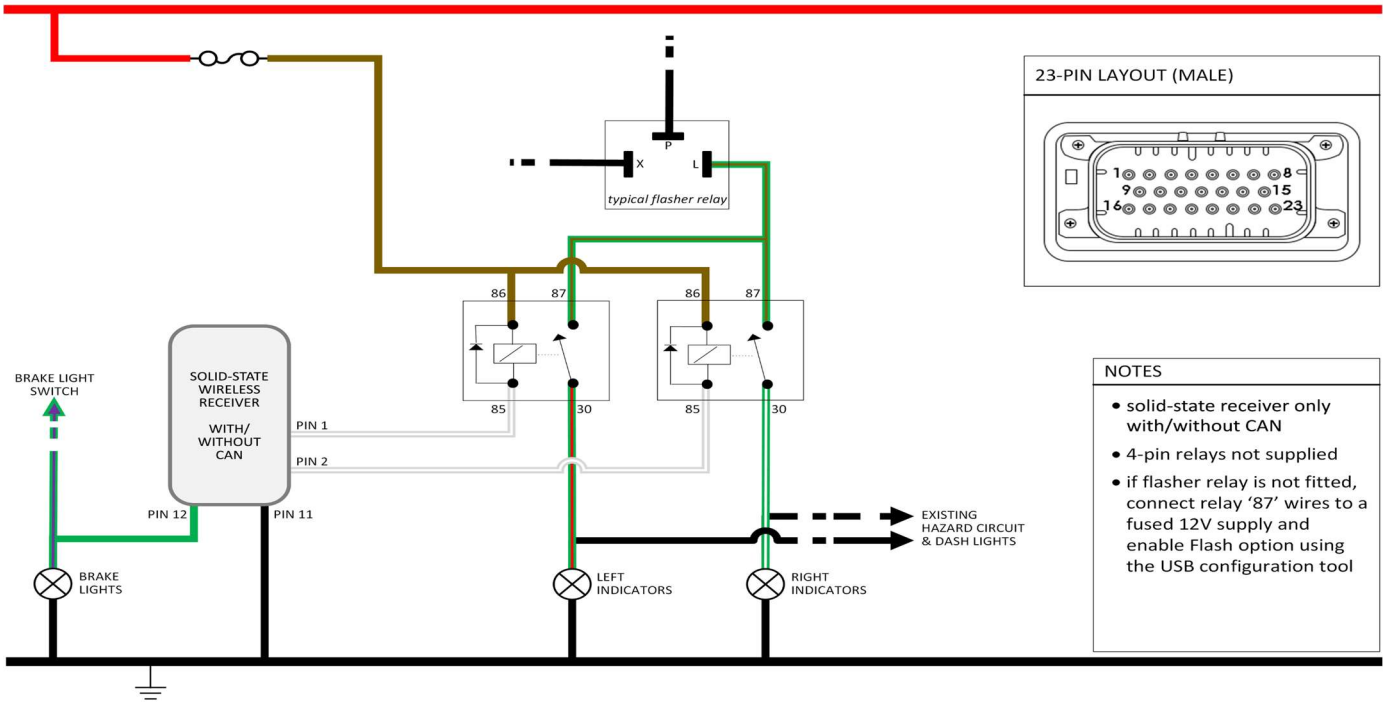


FIGURE 4 // 4-CHANNEL RELAY SYSTEMS – SUGGESTED MAIN BEAM WIRING PLAN

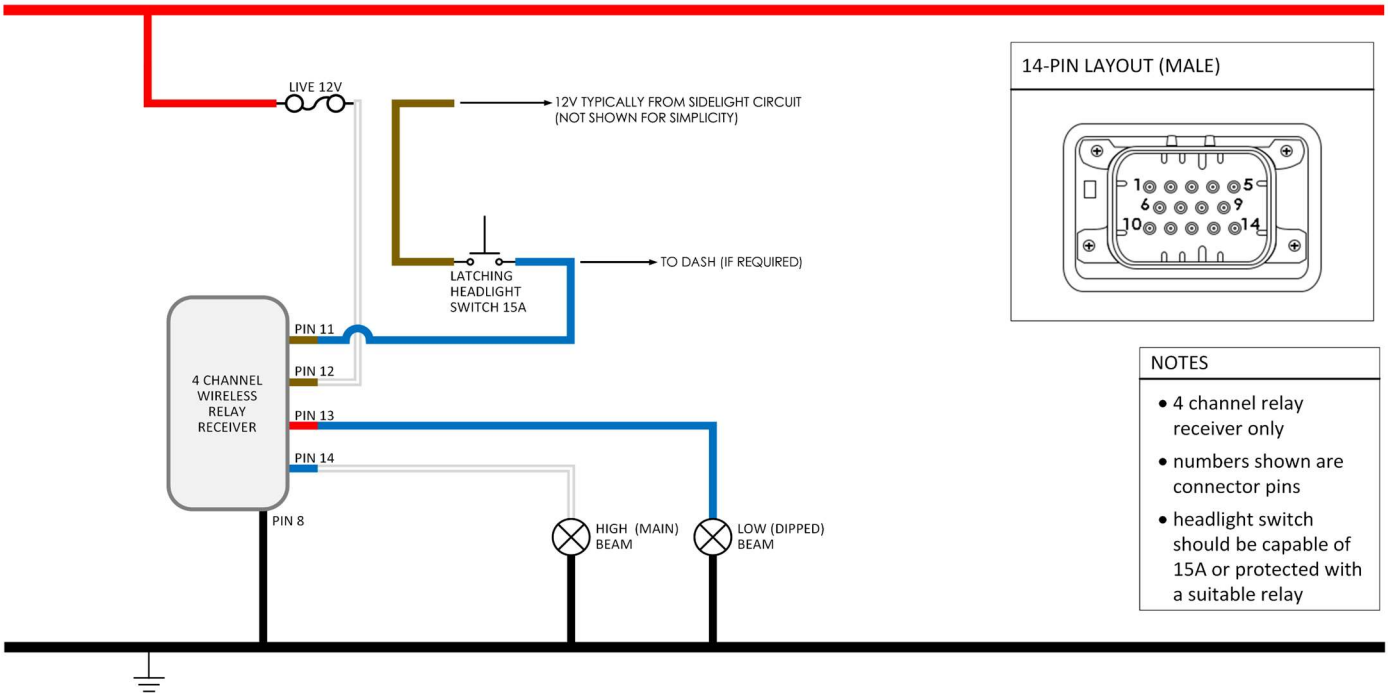


FIGURE 5 // 8-CHANNEL RELAY & HYBRID 16-CHANNEL SYSTEMS – SUGGESTED MAIN BEAM WIRING PLAN

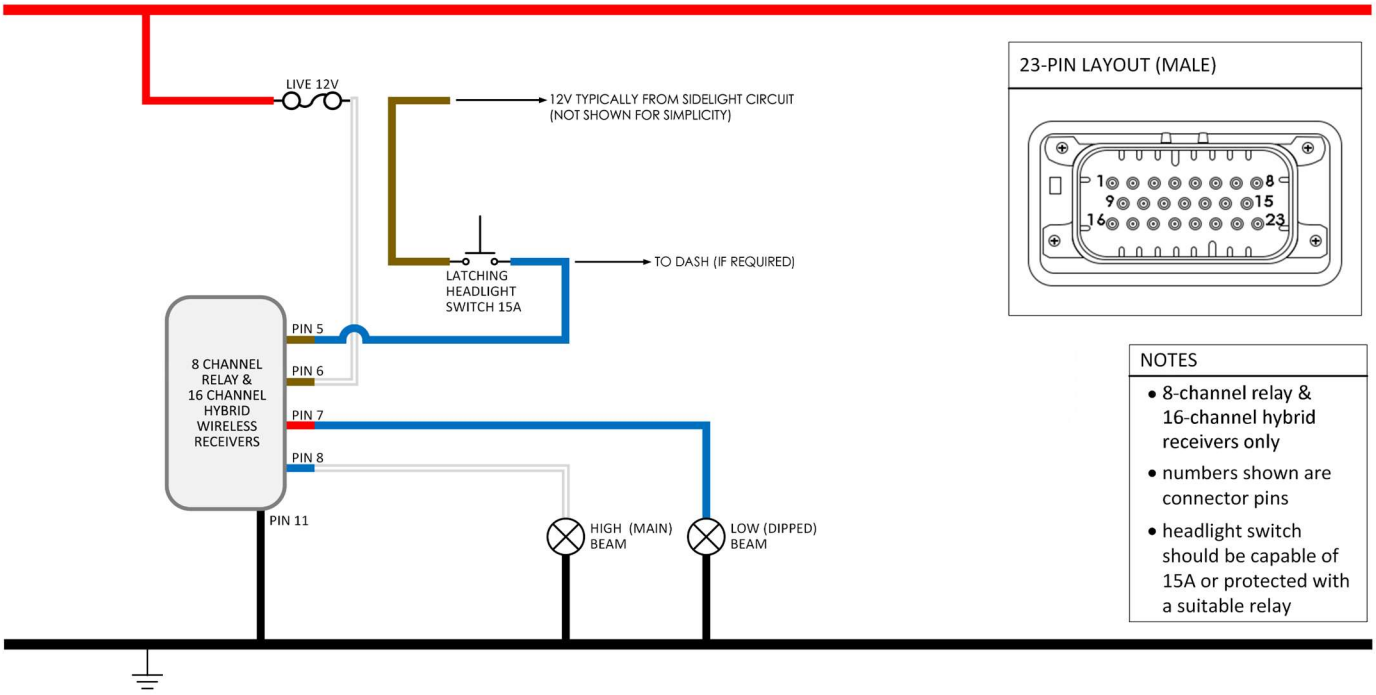
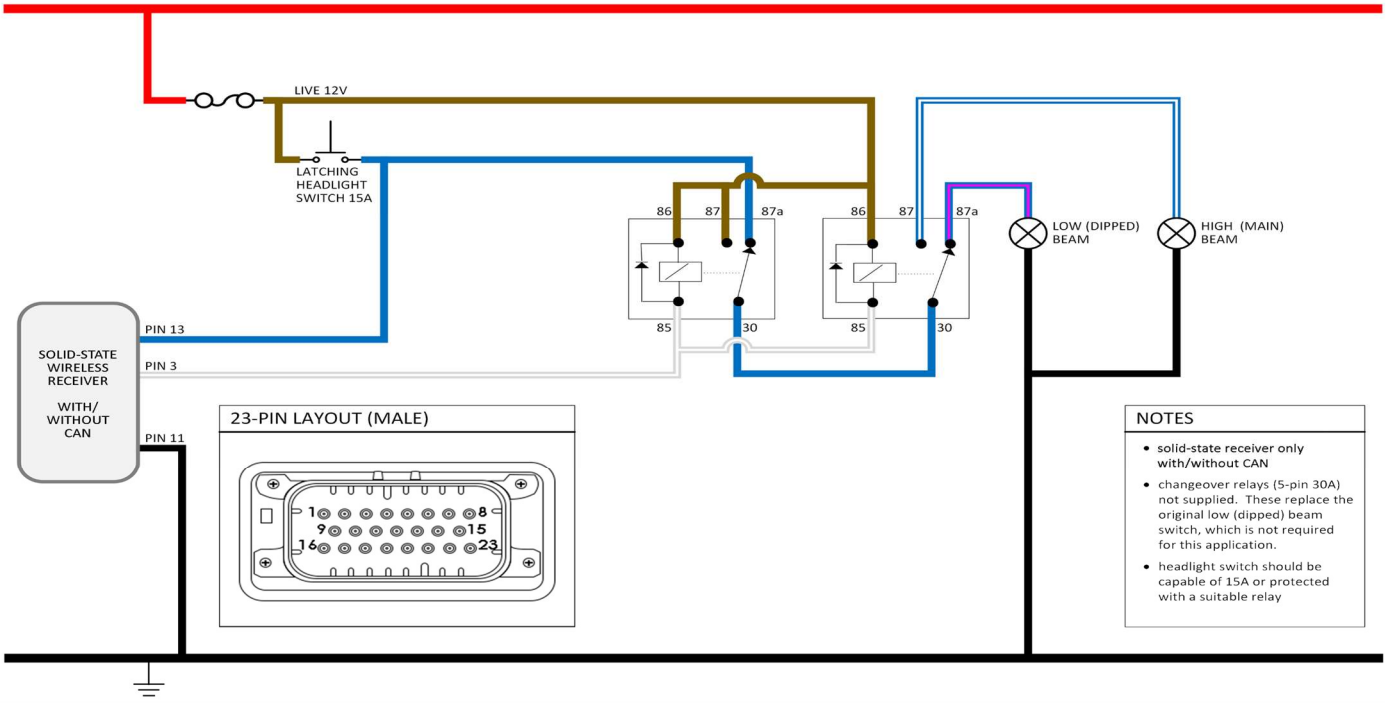


FIGURE 6 // 8, 10 & 16-CHANNEL SOLID-STATE SYSTEMS – SUGGESTED MAIN BEAM WIRING PLAN



BlinkSTOP FUNCTION

CHANNELS 1 AND 2 SET TO [INDICATORS]

INSTRUCTIONS FOR OPERATION

An indicator can be toggled ON (CAN signal alternating TRUE and FALSE) and OFF (CAN signal FALSE) with each press of a button. Flash rate can be controlled by FREEWheel to 60, 75, 90, 105 or 120 flashes per minute or by your flasher relay (user-configurable).

Toggling to ON begins a cancel timer. Indicating will auto-cancel once the timer has elapsed (6 to 30 seconds, user-configurable). If suitably connected, auto-cancelling is inhibited during brake press and briefly afterwards so that the indicators 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 (CAN signal will begin alternating TRUE and FALSE). The cancelling timer will reset.

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

WIRING: For a suggested wiring plan see previous figures; for CAN-only if cancel-inhibit is required, connect the 12V brake sense wire to the brake light circuit.

BeamSTOP HEADLIGHT FUNCTION

CHANNEL 3 SET TO [MAIN BEAM]

INSTRUCTIONS FOR OPERATION

BeamSTOP allows full control of headlight main (high) beam and dipped (low) beam.

IF the headlights are OFF, the main beam will light for the duration of the button press (CAN message TRUE). If the headlights are ON, BeamSTOP allows each button press to alternate between latched-dipped and latched-main beam (each button press toggles the CAN message between TRUE and FALSE).

If Flash-to-Pass is enabled, a half-second press will trigger 4 seconds of rapid flashing of the main beam (toggling of the CAN message).

WIRING: For a suggested wiring plan see previous figures; for CAN-only connect the 12V headlight switch sense wire to the headlight switch circuit.

FOG LIGHT 'IVA' FUNCTION

CHANNEL 4 SET TO [IVA FOG]

INSTRUCTIONS FOR OPERATION

Channel 4 can be used as an auto-cancelling fog light channel. When suitably connected and the headlights are OFF, the fog light will automatically cancel and is inhibited from operation by button press (CAN message will be set to FALSE regardless of button press state).

WIRING:

***Relay & Hybrid Receivers**: connect the blue/brown wire to the headlight switch, as shown in the previous figures (4-channel pin 11, 8-channel pin 5, Hybrid pin 5).*

***Solid-state Receivers**: connect the blue wire from pin 13 to the headlight switch, as shown in the figure.*

***CAN-only Receivers**: connect the 12V headlight switch sense wire to the headlight switch circuit.*

HAZARD FUNCTION

CHANNELS 5 or 16 SET TO [HAZARDS]

INSTRUCTIONS FOR OPERATION

Channel 5 or 16 can be used as a single button hazard channel and require channels 1 and 2 to be set to the BlinkSTOP indicator function. A single button press will cause the indicator outputs to be active (indicator CAN signals will be toggled together); flash rate can be controlled by the FREEWheel BlinkSTOP flash setting or by your flasher relay.

NOTE: some markets require that hazard lights can be operated by a single lit button when the ignition is off, therefore this feature should be used with suitable consideration.

WIPER FUNCTION

CHANNEL 6 SET TO [WIPER]

INSTRUCTIONS FOR OPERATION

A short press will toggle between [OFF] and latched [ON] (CAN message FALSE and latched TRUE). A one-second press will trigger an intermittent [ON]/[OFF] (CAN FALSE and TRUE) with the durations configurable to 250ms, 500ms, 1s, 2s, 4s, 7s and 10s. A subsequent one-second press will cancel the intermittent mode and return to the previous state.

WIRING: Connect the Receiver channel wire to the wiper's low speed and park circuit.

INVERTED MOMENTARY FUNCTION

CHANNEL SET TO [INVERTED MOMENTARY]

INSTRUCTIONS FOR OPERATION

Any digital channel can be an inverted momentary channel, i.e., normally closed (CAN normally TRUE). The channel will be open (FALSE) at power up with normally closed behaviour starting once power-on checks are completed (<50ms).

FLASH FUNCTIONS

CHANNEL SET TO [FLASHING 1Hz or FLASHING 2Hz]

INSTRUCTIONS FOR OPERATION

A short press will trigger a flashing mode (toggles the CAN message TRUE and FALSE) at the selected frequency. A subsequent press cancels and returns to the previous state.

RAIN LIGHT FUNCTION

CHANNEL 8 SET TO [RAIN LIGHT]

INSTRUCTIONS FOR OPERATION

Channel 8 can be used as a racing mode rain light. A short press of the steering wheel button will latch the rain light ON (CAN message TRUE) 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:

***Relay channels**: connect the Receiver channel wire to the rain light's power circuit.*

***Solid-state channels**: connect the Receiver channel wire to the rain light's relay coil circuit Ground, or directly to the rain light Ground if 600mA or less.*

POTENTIOMETER CHANNELS

CHANNELS 9 AND 10 & OPTIONALLY MIL9 AND MIL10

INSTRUCTIONS FOR OPERATION

The Transmitter supports 2Hz sampling of two independent 10kΩ 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 momentary switches assigned to channels 1 to 8 or 11 to 16 initiates communication, and the green Transmitter LED will flash at 2Hz to show successful two-way messaging. The 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.

***Analogue channels** output a 0 to 4.7V voltage proportional to the potentiometer's position and can be inverted to give a 4.7 – 0V output using the Configuration Software.*

***CAN-enabled Receivers** output a digital (0 to 255) CAN message with value proportional to the position, and a discrete 0 to 11 signal MIL9 and MIL10 CAN for the Kit Car Electronics' Mil-spec rotary switches.*

The MIL values are also available internally to all Receivers and can be mapped to activate individual digital channels using the Configuration Software (no CAN required).

WIRING: Fit a 10kΩ potentiometer or a Kit Car Electronics' Mil-spec rotary switch to each Transmitter potentiometer channel as illustrated.

Connect each analogue channel output to a high impedance input sampling circuit (typically > 50kΩ impedance) to ensure the voltage is not reduced. Connect the Receiver ground to signal ground.

3V – orange (REF)
channel 9 or 10 – yellow or white (SIG)
ground – black (GND)

ALL MODELS

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 for further details.

BlinkSTOP.co.uk

Contact:

info@blinkstop.co.uk

Another quality product from

Kit Car Electronics Limited

BlinkSTOP.co.uk