The Practical Guide to Advanced Towbar Electrics 2008

Ryder Towing Relays and Monitors
How they work and when to use them

Company Profile

Founded in 1979 by David Ryder, Ryder Towing have pursued excellence and expertise for over twenty-five years and earned a just reputation as leaders in our industry. Having produced trailers, trailer lighting and towbar electrical products, from1986 we focussed primarily on towing electrical products.

First of all we became well known for flasher monitors and relays. Later we added bulb-failure bypass relays and the much imitated self-switching caravan "Smart" combination relay. Now we have the reputation of the industry's problem-solvers as well as being probably the U.K.'s largest specialist supplier of towbar electrical products. Our latest range of features the groundbreaking ***Logic*** and ***UltraSmart*** "intelligent" bypass relays.

David Ryder is a former Chairman of the National Trailer and Towing Association and was a prime mover in the establishment of the industry's National Training Programme, "Trailing Success" and of "Quality Secured" the scheme that delivers assured high standards of quality for customers throughout Britain.

CONTENTS

Different kinds of Relays

Flasher Monitors

The most common type of device fitted to cars when they are wired for towing is a flasher monitor. The function of a flasher monitor is to meet the legal requirement to provide a warning, visible or audible, that the indicator lights of a drawn trailer are working or not working.
Monitors measure current and react to it by generating some kind of signal. This is usually in the form of an electrical signal capable of lighting a lamp, causing a buzzer to sound or switching a relay. Monitors are NOT switches although they can be used to trigger relays that are switches.

Bypass relays

These devices are designed to operate trailer road lamps in unison with the towing vehicle's road lamps without drawing any significant current from the vehicle's road lamp circuits. They are used in vehicles that have bulb-failure warning devices that would be activated by the simple connection of additional lamp circuits for the trailer directly to the vehicle's own lamp circuits.
Relays are switches operated by electro-magnetic coils. They are arranged within devices so that, when a current is applied to the electromagnetic coil, the coil causes a switch to operate, switching a current on or off. Relays used in Bypass devices have low current coils that put minimal load on the car's lighting circuits. Power for the trailer lights is taken directly from the vehicle's battery.

Sophisticated Bypass Relays

These devices are more complex and are designed to handle advanced electrical systems found in many modern cars. At the simplest level they use transitors and chips to switch their relays on and off, reducing the load they impose on the vehicle's lighting circuits to very tiny amounts (less than 1mA per circuit). At the most sophisticated level they use programmed microchips to interface with the vehicle.

Caravan Relays

Caravan relays are used to switch the power supply on and off that runs from the towing vehicle to the auxiliary circuits of the caravan (battery charging and fridge). When the car is running, with its alternator charging, power is allowed to flow to all the caravan circuits but when the car stops, power to the caravan battery charging and fridge circuits is cut off. This is to protect the charge in the car battery.

Other relays

Fog cut-out: These relays are designed to switch off the fog lamp(s) of a towing vehicle when the fog lamp of a towed trailer is on. The reason for turning off the vehicle fog lamp is to avoid a distracting glare being reflected by the towed trailer, especially if the trailer is a caravan. **Fog control:** This system cuts out the fog lights of the car but requires no wires to be cut during installation.
Reversing (Parking) sensor cut out. This relay automatically silences the reversing sensor when a trailer is connected.

Flasher Monitors
Flasher monitors that fit in the boot

TF1152 Audible monitor

This is a very simple device consisting of a buzzer and two monitoring circuits, one circuit for each side of the vehicle. It is fitted in the rear part of the vehicle, close to the rear lamp clusters. When current passes through either trailer flasher circuit, it is detected and the monitor circuit causes the buzzer to buzz.

It has five wires for connection:

- left hand input wire (yellow/white);
- left hand output wire (yellow);
- earth for the buzzer (white);
- right hand input wire (green/white);
- right hand output wire (green).

It is fitted in line between the vehicle's flasher circuits and the wires that carry current via the towing socket to the trailer's indicator lamps.
It only buzzes when current passes through it to the trailer flasher lamps. Thus when no trailer is connected it remains silent.
If a trailer is connected and the audible monitor does not buzz when the flashers operate, this warns the driver that his trailer flashers are not working properly.
The reasons for the overwhelming popularity of this audible monitor amongst towbar fitters are its simplicity, its reliability, its relative cheapness and its ease of fitting.

Fitting the TF1152

Follow the general instructions for fitting 12N boot fitting relays and monitors, printed in the Appendix 3 at the back of this guide .

Chart A

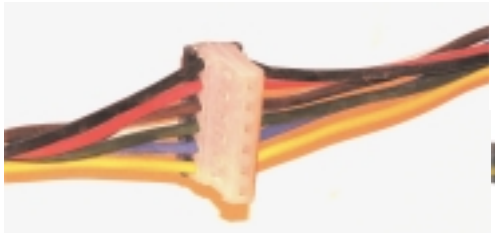
Socket pin number	7 core cable colour	to	Relay wire colour or terminal number	Relay wire colour or terminal number	to	Vehicle circuit
•						
1	Yellow		Yellow	Yellow/white		LH flasher
2	Blue		Direct	Direct*		Fog lamp
3	White		Chassis	White		Chassis earth
4	Green		Green	Green/white		RH flasher
5	Brown		Direct	Direct*		RH tail light
6	Red		Direct	Direct*		Brake lights
7	Black		Direct	Direct*		LH tail lights
-	-		-	N/A		Power (battery)

**Unless fitting a fog cut-out or bypass relay.*

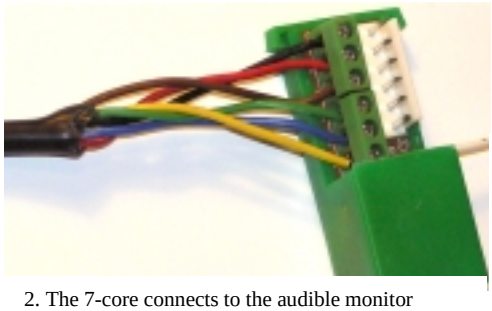
1. Follow the instructions in **Chart A** and connect together your 7-core cable, your TF1152 monitor and the appropriate wires in the vehicle loom.
2. Use a suitable test board to test the circuits. Make sure the"Tell-tale" warning buzzer is working correctly.

TF1155 Audible monitor with built-in SuperSplice plug-in connector

Combining Superbuzzer and SuperSplice, the SuperSplice Audible offers a top quality, low cost solution for the majority of wiring installations.



1.SuperSplice plug-in connector goes onto the loom



2. The 7-core connects to the audible monitor

Ultra neat assembly

3. The two plug together to make the neatest connection in the business. No Scotchloks, solder or trailing wires, just one tidy assembly

Fitting the TF1155

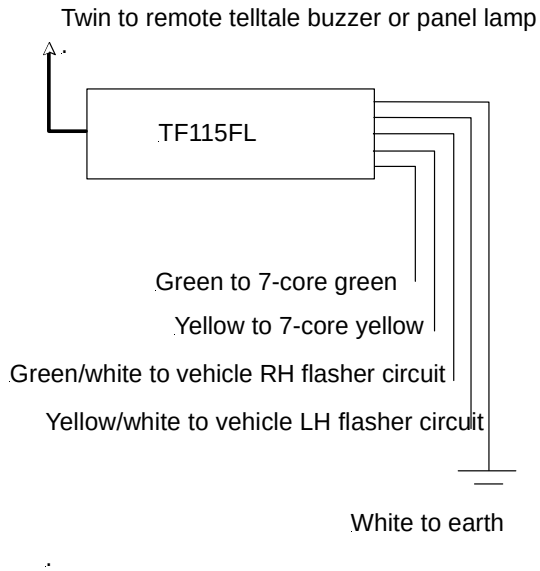
Connect the SuperSplice block to the appropriate wires in the loom.
Connect the coloured cores to the terminals on the relay as follows:

Yellow	to terminal 1
Blue core	to terminal 2
Green	to terminal 4
Brown	to terminal 5
Red	to terminal 6
Black	to terminal 7

There is no terminal 3. Connect white of the 7-core socket wire to a good earth on the chassis.

TF115FL Audible monitor with flying lead.

This is a special version of the TF1152. It is fitted with a 4 metre twin flying lead, connected where the buzzer's positive lead would normally be connected, and supplied with a separate buzzer which can be connected to the flying lead.
In all other respects its function and operation are the same as the TF1152.
It is fitted in vehicles where the buzzer has to be remote from the monitoring circuits. An example would be in a pickup. The monitor, suitably housed, would be installed close to the rear lamps of the pickup whilst the buzzer, to be audible to the driver, would be placed in the cab.
A panel lamp or similar device can be connected in place of the buzzer if required.



Fitting the TF115FL

Follow the instructions for the TF1152 but add the specific instructions relating to the telltale on the diagram above.

Trouble-Shooting: TF1152, TF1155 and TF115FL	
Buzzer does not sound.	Check all connections Check trailer (test board) flashers are working. Check your test board is drawing enough current (21watts) to make the buzzer work properly. LED testers do not draw significant current.
Buzzer is not loud enough.	Check it has not been trapped or covered. Move it to a better place Fix it to a surface that resonates In the case of a TF1152, replace it with a TF115FL and use the extension wire to put the mini-buzzer where it can be heard.

TF110RX Flasher booster/bulb-failure bypass relay with built-in "tell-tale"

This device incorporates two relays mounted with other circuits as described below.
The diagram below illustrates its appearance and application

Tell tale and damping circuits on the TF110R

- ***Tell tale***

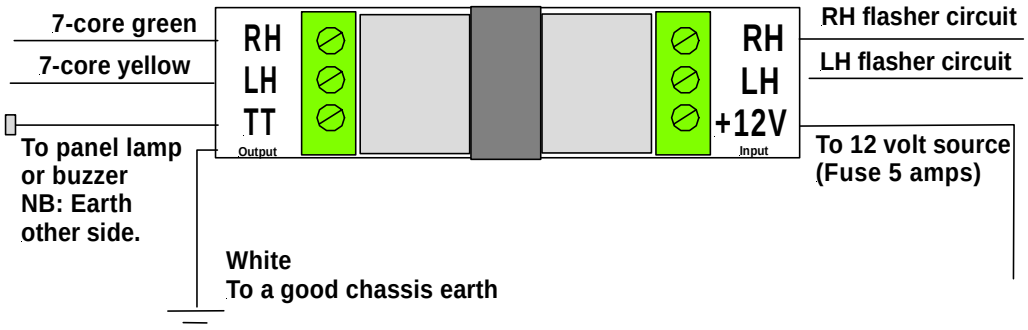
It is a legal requirement when you fit a towbar to provide some form of warning, either visible or audible, to tell you whether your trailer/caravan direction indicators (flashers) are working. For this purpose, a monitoring circuit is built into the TF110R. This detects current being drawn into the unit from the vehicle battery when the trailer flashers are working. When such current is detected, the monitoring circuit generates a signal in the tell tale output, capable of operating a buzzer or a panel lamp. (or the built-in buzzer in the TF110RX)

- ***Damping***

Although relays emit an electro-magnetic pulse when they switch, they are, for the purpose of EMC regulations, regarded as inert. But when they switch many times a minute, as these do, following the operation of a vehicle's indicators, the frequency of the pulse may contravene some regulations.
Because of this, the device has damping circuits or "snubbers" which inhibit such emissions. These damping circuits ensure that these relays will not conflict with the increasingly complex electronics in modern vehicles.

Fitting Instructions

Refer to the general instructions in Appendix 3 at the back of this manual.



Connect as follows:

Output side		
RH	to	7-core green
LH	to	7-core yellow
TT	to	Positive side of Buzzer/one side of panel light
White wire	to	Earth (chassis)
Input side		
RH	to	RH flasher circuit on car
LH	to	LH flasher circuit on car
+12V	to	Battery via 1mm^2 wire and 5 amp fuse

Trouble Shooting (TF110R/TF110RX)

1. See general details under *BYPASS RELAYS.*
2. Details specific to the TF110R:

Tell-tale light does not come on

Check all connections
Check connections to panel lamp/buzzer (NB earth.)
Check power source is adequate and constant
Check lamps on trailer or test board are flashing and that they draw enough current to activate the tell-tale. (LED testers do NOT draw enough current)

Tell-tale light comes on without a trailer or test board

Check all connections
Check there are no shorts in the trailer socket
Replace unit and test again. If the condition continues, review your circuits and connections. (This is an unlikely fault in any unit and very unlikely indeed to be found in two consecutive units.)
Contact Ryder Towing for further advice. 0161 430 1120

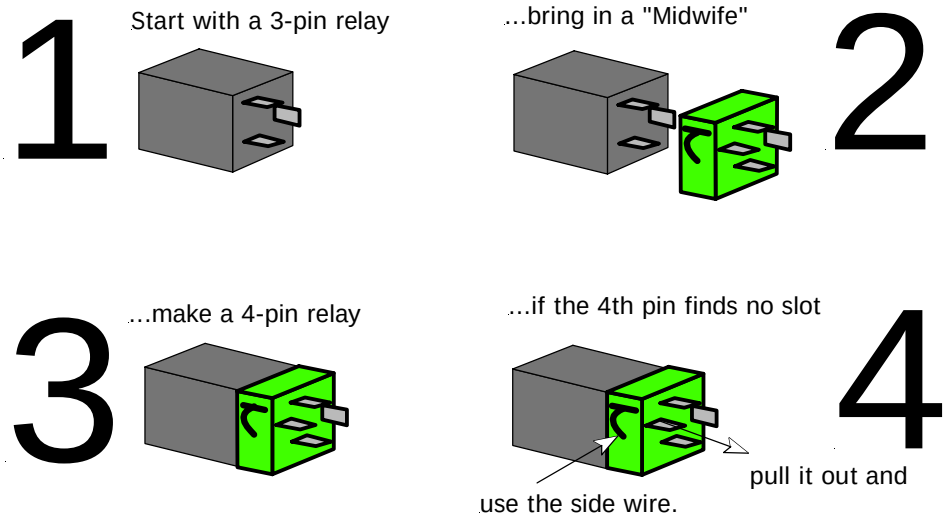
Flasher Monitors

Flasher Monitors that fit in the front

TF2001 Midwife 3 pin to 4 pin Adaptor

This Monitor is designed to mate with a traditional three-pin flasher relay to add a monitoring circuit and additional terminals, effectively converting it into a four-pin "caravan" flasher relay.

Fitting the TF2001



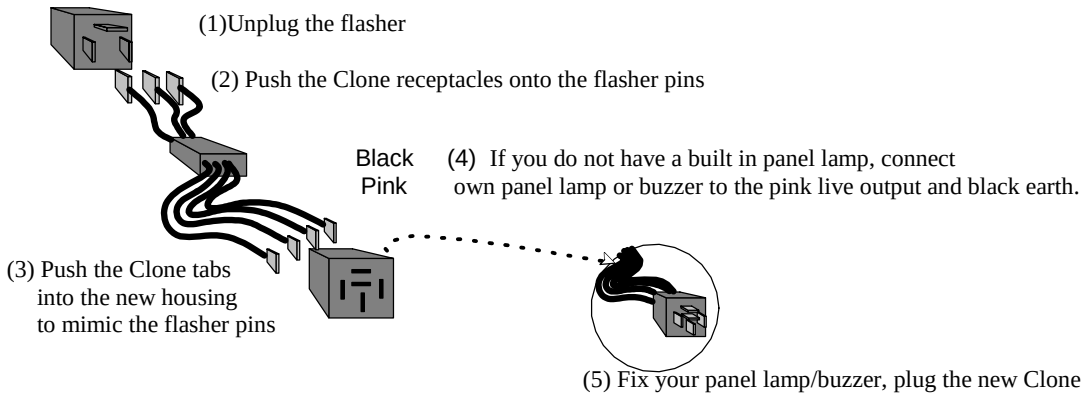
The monitor measures the current coming into the flasher relay from the battery. When a trailer flasher lamp is operating in addition to the normal vehicle flasher lamps, this monitor detects the extra current and emits a signal in its tell-tale output terminal that causes any panel lamp or buzzer connected to the tell-tale terminal to flash or sound.
The particular advantage of this device is its extreme ease of fitting. It has the disadvantage, however, that it does not fit in all vehicles. Its sister device the "Clone" Adapter (TF2100, see next page) is more universal and almost as easy to fit.

Trouble shooting the TF2001 "Midwife"
Panel lamp does not work
Check all connections
Make sure the connection to any panel lamp or buzzer is properly made.
Refer to the sketch.
Check that all vehicle and trailer flasher bulbs are working.
Check that your earth is a genuine earth.
Panel lamp works when no trailer or test board is connected.
There may be more than two twenty-one watt and one five watt bulb on each side of the
vehicle flasher circuit. If this is the case, use the TF2100T, which can be tuned to accommodate extra bulbs
*If you are not sure that this is the case, try another **Midwife**. Sometimes the tolerances of the vehicle and the monitor coincide to cause an incompatibility. A new **Midwife** may work on that vehicle.*

TF2100T Clone universal flasher adaptor.

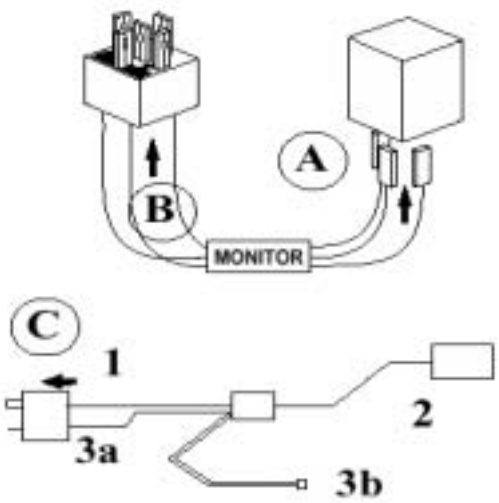
These are the most versatile plug-in flasher monitors available. They combine the excellent monitoring circuitry of the TF2000 series with an unique system that copies the pin formation of any relay using the standard 3/4/5 pin pattern. Like the TF2005, they monitor the current coming into pin 49 of the flasher relay but do so without the need to cut any of the vehicle's wires.
In most modern cars, the flasher relay can be found in the fuse box or somewhere equally accessible. The design of the Clone enables the fitter to remove the flasher relay, adapt it to monitor the presence of an active trailer flasher circuit, and plug it back in again with no "wiring" necessary.
The clone moulding has pin support slots that conform to the standard 3/4/5 pin pattern; when the device is being fitted, pins of standard dimensions, connected by wires to the pins of the vehicle flasher, are fitted into the moulding in an exact imitation of the pin-out pattern of the original relay. Between the Clone and the original relay, however, a monitor circuit is introduced, effectively converting the flasher into a "caravan" flasher relay, capable of detecting the presence of an active trailer flasher system.
The small footprint of the clone moulding means that it will fit into virtually any relay space.
Another specific advantage of the Clone is that not only will it add an extra telltale output pin to activate any built-in trailer flasher telltale panel lamp but, where there is no built-in tell-tale panel lamp, connection of a new panel lamp or buzzer is made easy by the presence of a spare earth wire on the monitor.
All connections are made "on the bench" and the only work that has to be done in the vehicle is the removal of the relay at the outset and the plugging in of the made-up clone assembly on completion (plus the fitting of the new panel lamp if applicable).

The diagram below illustrates how it is fitted. (Instructions are on the next page)



Fitting the TF2100 "CLONE" series.

The "MIDWIFE CLONE" moulding will support up to 5 pins in any combination of the positions shown (right). It can, therefore, copy the flasher relay of virtually any modern car. Its small footprint and low height make it smaller than the vehicle relay.



A. Unplug the flasher relay. Fit the monitor leads with receptacles onto its terminals. (See colour chart below)

B. Insert the monitor leads with male tabs into the clone moulding to copy the relay's terminals. If the vehicle has a built in warning lamp, insert the pink telltale lead in the appropriate slot (See C3a) and cut off black (earth). Otherwise see (C3b).

C.1 Plug the "clone" back in place of the relay.

C.2 Stow the relay in a convenient space.

C.3 If the vehicle has no built-in warning lamp cut the terminal off the pink lead and connect pink to a panel lamp or buzzer, using the thin black lead from the monitor as earth. (C3b)

Colour	Function	Pin Marking
White 3	Earth on Flasher	1, E, -
Blue	Supply	49, B, +, 15
Red	Indicator Switch	49a, L, C, Com, 54L
Grey*	Vehicle Warning Lamp	C, R, Rep, P, 8
Pink	Trailer Warning Lamp	C2 (on flasher receptacle)
Thin Black is the Panel-lamp or buzzer earth *Grey wire is separate and does not run through the electronics box. It is for vehicles with 4-pin flashers.		

Trouble-shooting the TF2100T

This relay has the same circuitry as the other 2000 series monitors and the same notes apply except:
Check carefully that the pin-out pattern on the clone really does match that of the relay. It is very easy to "mirror-image" them.
If the vehicle has extra flashers, you can tune the "Clone" to accommodate them.
Do not exceed the maximum load: 6 x 21 watts plus 2 x 10 watts in a vehicle/trailer combination.

TF2100M "SLAVE CLONE" plug-in flasher monitor.

(For Vans with "Slave" relay on flasher circuit.)

In some Mercedes and VW vans, up to about 2001, the flashers are controlled by the vehicle's cpu but powered by a slave relay. This slave relay can be found low down on the steering column. The design of the Clone enables the fitter to remove the slave relay, adapt it to monitor the presence of an active trailer flasher circuit, and plug it back in again with no "wiring" necessary.

The diagram below illustrates how it is fitted. (Instructions are on the next page)
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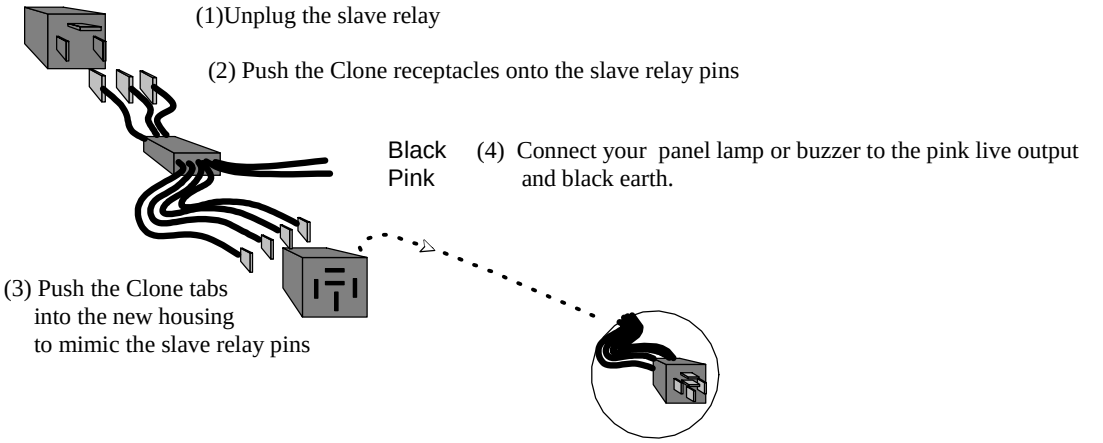


Fitting the TF2100M "Slave" Clone

A. Unplug the flasher relay. Fit the monitor leads with receptacles onto its terminals. (See "Clone receptacle lead positions" below)
B. Insert the monitor leads with male tabs into the clone moulding to copy the relay terminals.
C. Connect white wire to a good chassis earth.
D. Connect pink to a panel lamp or buzzer, using the thin black lead from the monitor as earth.
E.

(1) Plug the "clone" back in place of the relay.
(2) Stow the relay in a convenient space.

Pin Code

For vans with Slave Relay on flasher circuit
Clone receptacle lead positions

Blue	to	Pin 87
Red	to	Pin 30
Free Grey1	to	Pin 85
Free Grey2	to	Pin 86

Pink to panel lamp live
Black to panel lamp earth
White to earth on chassis

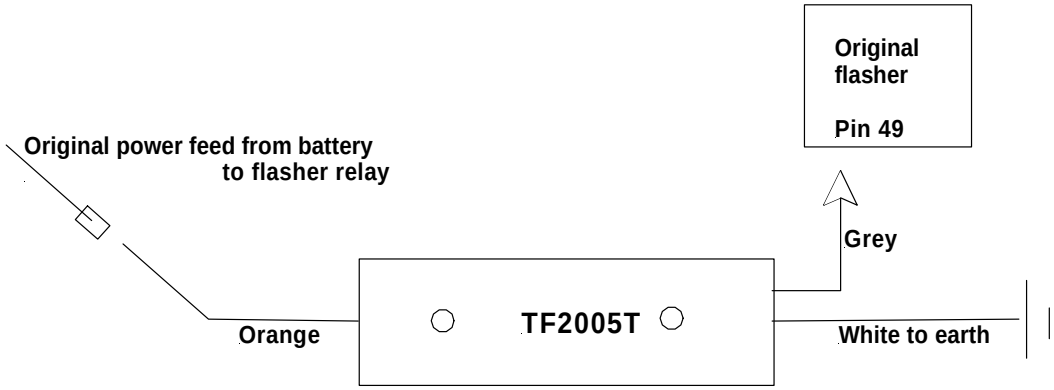
Do not exceed the maximum load: 6 x 21 watts plus 2 x 10 watts in a vehicle/trailer combination.

TF2005 Front Monitor; wire-in type with built-in buzzer
(For vehicles where flasher relay is not easy to reach)

This monitor incorporates the same monitoring circuits as all the other devices in the 2000 series. It is wired in rather than plugged in and is, therefore, suitable for vehicles where the flasher relay is not accessible. It fits in the front of the vehicle, somewhere fairly close to the flasher relay. The device should be wired in line on the input side of the flasher relay (in the line from the battery to flasher relay, pin 49, or equivalent.)

The TF2005 has three connecting wires:
Orange connects to the line from the battery
Grey connects to flasher pin 49 or to the wire to that pin (or equivalent)
White connects to a good earth on the chassis of the vehicle.

Fitting Instructions



NB, Connect/orange (power) wire LAST to reduce risk of shorting out.
Remove the power feed to relay pin 49. (If you cannot reach the relay terminal, cut the feed wire at a convenient point).
Connect the grey wire to relay pin 49 or to cut wire leading to pin 49.
Connect white to a good earth.
Connect the orange wire to the original power lead.

Trouble Shooting: All 2000 Series Monitors

Panel lamp does not work
Check all connections
Check that all vehicle and trailer flasher bulbs are working.
Check that your earth is a genuine earth.
Check that you have connected the orange and grey wires correctly: orange towards the battery, grey towards the flasher input terminal 49. (If you reverse them, you will burn out the monitor circuit.)
Check that you have connected the panel lamp leads to their correct relay leads.

Panel lamp works when no trailer or test board is connected.
There may be more than two twenty-one watt and one five watt bulb on each side of the vehicle flasher circuit. If this is the case, tune the relay.

Do not exceed the maximum load: 6 x 21 watts plus 2 x 10 watts in a vehicle/trailer combination.

Bypass relays

What they do
These devices allow trouble-free fitting on vehicles with complex electrics and electronics. They are designed to operate trailer road lamps in unison with the towing vehicle's road lamps without drawing any significant current from the vehicle's road lamp circuits. They are used in vehicles that have lighting systems that would be compromised by the simple connection of additional lamp circuits for the trailer directly to the vehicle's own lamp circuits.

Not detected
Simple bypass relays employ miniature relays to switch the trailer lamps on and off. Connection is made to the vehicle's lamp circuits but only for the purpose of energising the coils of the relays. The current drawn by each relay is less than 40 milliamps (0.04amps). This current is so small that it can be drawn from the vehicle's lamp circuits without bulb-failure warning devices in the vehicle detecting its loss. The normal tolerances found in typical vehicle lighting circuits are greater than 0.04 amps.

Sophisticated bypass relays such as the TF2217X series (Advanced7 Bypass) and TF2218 series (Ultra-Smart Bypass) are controlled by "chips" and take less than one milliamp from each of the vehicle's lighting circuits.]

Power direct from the battery
Power for the trailer lamps is taken directly from the vehicle's battery and merely switched by these relays. No significant load is put on the vehicle's own lamp circuits.

Easily handle currents
Although the coil currents are tiny, the switching capacity of each relay is sufficient to handle easily the currents found in typical trailer/caravan road light systems.

The following bypass relays are available from Ryder Towing

SOPHISTICATED

TF2217LOGIC(S&P)	**No-frills Smart7 Bypass with built in buzzer**
TF2218(S&/P)	**Ultra-Smart Bypass, microchip controlled with in buzzer**
TF2118(S&P)-FC	**Ultra-Smart Bypass with Fog Control**

***LOGIC* Bypass**

Ultra-Smart Bypass

SIMPLE

TF1011	**Single**
TF110R	**Two way with flasher monitoring (Flasher booster)**
TF1013	**Three way**
TF1014	**Four way**

Sophisticated Bypass Belays: Logic and Ultra Smart

Many cars now have complex lighting control systems that use modulated to control the rear lights. The Ryder 7-way bypass system makes fitting towbar electrics to these cars straightforward and safe.

Logic Bypass, TF2217LOGIC series

This no-frills *SMART* bypass fits virtually all cars, handles cars with standard or modulated (e.g. two lamps on one wire) circuitry, and has a quiescent current measured in MicroAmps. All this at a very low cost.

Ultra Smart Bypass, TF2218 series

The UltraSmart7 Bypass, has enhanced logic, and offers Fog Control and Trailer Lamp AutoCheck as options

How Complex are modern cars?

Traditionally, cars had rear lights fitted with standard 5, 10 and 21watt bulbs, switched on and off by conventional switches and relays. **Modern cars** have many and varied rear light systems. Car manufacturers are trying to create failsafe rear lighting.

CanBus systems have appeared, reducing the number of wires running through cars by using remote digital signals to control the lights and other functions via local control units.

New features in vehicle rear lights

In association with CanBus systems, a variety of sophisticated techniques have been developed by car makers.

- **Making one single filament bulb function at different intensities**
  - One bulb doubles as the 5W sidelight and the 21W brake light.
  - One bulb doubles as the 5W sidelight and the 21W fog light.
- **Making one wire handle two functions**
  - One wire controls both side and brake lights
  - One wire controls both side and fog lights
- **Making one bulb take over the function of another that has failed**
  - Brake or fog light takes over when a sidelight fails, and dims to sidelight intensity.
  - Sidelight takes over when a brake light fails, and brightens to brake light intensity.
- **Using special bulbs**
  - Multi-function tungsten filament bulbs
  - LED's (light emitting diodes) that need much less power to drive them
- **Constant testing and monitoring of lighting systems through:**
  - Circuit-monitoring signals
  - Low-current circuit-test pulses

Guard Against Damage To Systems

Increasingly complex

The environments in which towing electrics are being fitted are becoming less and less simple. In-car systems are increasingly complex and it is essential for after-market fitters to guard against causing damage to them.

Safe fitting

This is where our 7-way bypass system comes into its own.

TF2217LOGIC series: No frills Smart Bypass:

Universal, for cars with modulated or standard circuitry - fits virtually all cars

This chip-controlled and buffered relay array bypasses all the vehicle's bulb-failure warning systems. On vehicles with complex lighting (modulated signals,two lamps on one wire, etc.) and all vehicles with simple voltages supplying the rear lights, switching is accurate and efficient. It is quick and easy to fit, and very cost-effective. It bypasses all the vehicle's bulb-failure warning systems.

- Monitors the trailer flashers with both a built-in audible output and terminal outputs for a remote sounder or warning lamp.
- Totally transparent: the car does not detect it.
- Fully snubbed against "spikes" and other hazards
- Type-approved for EMC compliance
- Protected: stands rough treatment, accidental current reversals, etc.
- The TF2217LOGIC-S is ready fitted with the SuperSplice plug-in connector

Part number:	***TF2217LOGIC-S***	***with SuperSplice plug-in connector***
	TF2217LOGIC-P	***with plain signal wires***

Fitted with the SuperSplice plug-in connector

The TF2217LOGIC-S Smart7 Relay is supplied ready-fitted with the SuperSplice plug-in connector. This is a safe and efficient system for connecting towbar electrics to modern cars. (See page 29)

Fitting the TF2217LOGIC-S/TF2217LOGIC-P

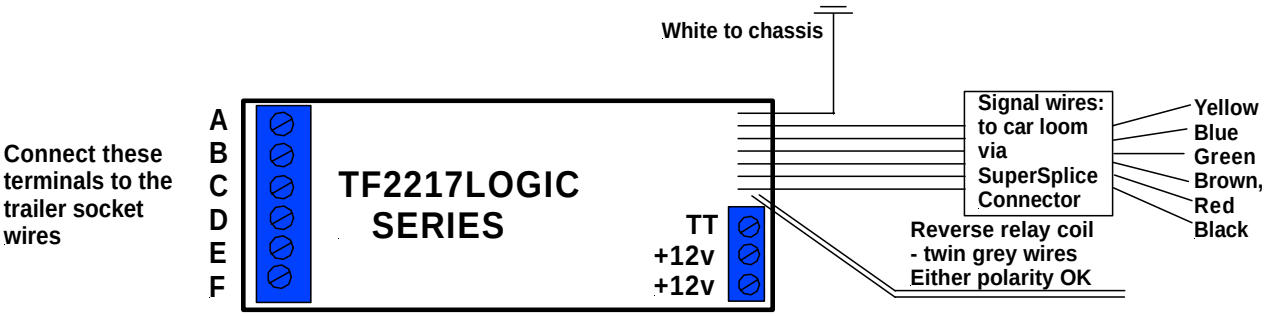
1. Route your power source cable(s) from the boot to the battery. Fit a fuseholder in line in the cable, close to the battery. (Check the fuse value on **Chart A)**.Do not insert a fuse yet
2. Follow the instructions in **Chart A** and connect together your 7-core cable, your relay and the appropriate wires in the vehicle loom. Connect your power cable to the battery and connect a test board.
3. Insert the fuse.
4. Test the installation by turning the car lights on and off and observing the lights on the test board.

Chart A: Wiring the relay(s) ***Fuse 15 amp***

Socket pin No.	7 core cable colour	to	Relay terminal number	SuperSplice number/wire colour	to	Vehicle circuit
1	Yellow		A	1 - Yellow		LH flasher
2	Blue		F	2 - Blue		Fog lamp
3	White		-	None - White		Chassis earth
4	Green		B	4 - Green		RH flasher
5	Brown		E	5 - Brown		RH tail light *
6	Red		D	6 - Red		Brake lights
7	Black		E	7 - Black		LH tail lights*
12S Pin 1	Aux Yellow		C	2 grey wires		Reverse: see notes
-	-		+12V (either)	-		Power (battery)
			+12V (either)	-		Telltale (positive)
			TT (option)**	-		Telltale switch (negative)

Special notes*

1. **Connect thin signal wires black and brown to both the car's side light circuits, black(LH) and brown (RH) and both black and brown of the 7-core to Terminal E.**
2. **Connect the trailer reverse light wire to Pin C. Connect one of the grey wires to the car's reverse circuit.**
   a. **If reverse is positive switched connect the other to earth**
   b. **If reverse is negative switched connect the other to +12v beside the power input wire.**



1. Only one 12v feed required; fuse 15 amps at battery. Second +12v terminal is spare
2. In most cases wire to standard 12N colour code but the grey wires can be swapped to different circuits when required.

-TT (*Negative Tell-Tale*) This is a switched earth that operates when the unit drives the trailer indicators. By connecting the negative side of a panel lamp or buzzer to this terminal and the positive side to the free +12 terminal, you can make a second Tell Tale system to supplement

TF2218 series: Ultra-Smart Bypass: microchip-controlled

The ***Ultra-Smart Bypass*** is a microchip-controlled, 7-lamp bypass relay that uses a software algorithm to control the switching of the trailer lighting circuits. It will work, without adjustment, on most current 12volt cars. It is quick and easy to fit and very cost-effective.
This "intelligent" unit is an array of relays controlled by a programmed microchip. The program in the microchip interrogates and accurately interprets the rear lighting systems of the cars and then switches the trailer lights on and off correctly. Exactly how it functions and the complex scenarios it handles are described in full in the chart on page 24

The key features of the Ultra-Smart Bypass

- It is intelligent -- driven by a programmed microchip.
- It switches the trailer lights correctly even when the car "swaps" lights to compensate for bulb failure.
- Its universal protocol is compatible with virtually every car rear lighting system.
- It totally protects in-car electrics by isolating the trailer wiring.
- It adds no load to the car's lighting circuits.
- It is totally transparent so that the car does not detect it. The currents drawn from the car's lighting system are less than one milliamp for each circuit. Even the current to the relay coils is taken directly from the car's battery.
- It monitors the trailer flashers with a built-in audible output
- It has extra terminal outputs for a remote sounder or warning lamp.
- It is fully snubbed against "spikes" and other hazards and type-approved for EMC compliance
- It is protected: stands rough treatment, accidental current reversals, etc.
- It is future-proof: new technical advances will be accommodated rapidly.

Added Functionality – UltraSmart Bypass with Fog Control

- It lets you turn the car fog off and leave the trailer fog on.
- It is unobtrusive: fits in exactly the same way as other relays in the Ultra-Smart range.
- Its distinctive signals, audible or visible, alert the driver when the trailer fog is on.

Future proof

The chips in the Ultra-Smart bypass have the capacity to add considerable extra functionality. New developments in cars are accommodated either within the existing programme in the relay or by its enhancement. We also add routine enhancements from time to time.

Fitted with the SuperSplice plug-in connector

The Ultra-Smart Relay, "S" version, is supplied ready-fitted with the SuperSplice plug-in connector. This is a safe and efficient system for connecting towbar electrics to modern cars. Used with the Ultra-Smart Bypass, it creates a complete and universal solution for the towbar fitter.

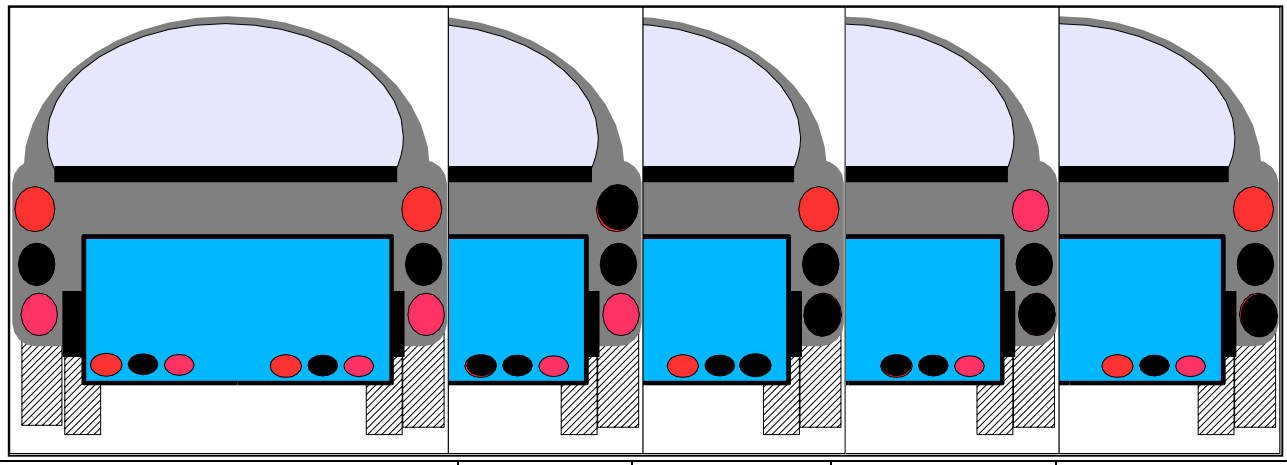
A. How the Smart Bypasses work

	Circuit (*and signal wire colour)*	**Functionality**	**Power drawn from car's system**
	Side lights *(Brown and Black)*	Will accept any signal, from a modulated low voltage up to a full 12+ volts as instruction to switch on the sidelight output to trailer.	Less than 0.001 amps to chip
	Indicators *(Yellow and Green)*	Filters out any "chatter" and accepts plain full voltage as instruction to switch on the indicator output to trailer.	Less than 0.001 amps to chip
	Brakes *(Red)*	Will accept a modulated (sidelight) voltage as instruction to switch on the sidelight output to trailer and also accept a full (brake light) 12 volts as instruction to switch on the brake light output. If it is receiving a modulated (sidelight) voltage it will maintain the sidelight output while the brake lights are being operated.	Less than 0.001 amps to chip
	Fog *(Blue)*	Will accept a modulated (sidelight) voltage as instruction to switch on the sidelight output to trailer and also accept a full (fog light) 12 volts as instruction to switch on the fog light output. If it is receiving a modulated (sidelight) voltage, it will maintain the sidelight output while the fog lights are being operated.	Less than 0.001 amps to chip
	Reverse *(Two grey wires, not polarised. Connect either way round.)*	Filters out any "chatter" and accepts plain full voltage as instruction to switch on. Works also with switched earth.	Less than 0.001 amps to chip

B. Responses to advanced car technology

	In-car scenarios	Relay response/ effect on trailer lights	Correct wiring of relay signal wires
Car Set up: Pulsed voltage on brake wires	Separate brake light and sidelight circuits and bulbs are present. Modulated (pulsed) voltage on sidelight circuit brings 21watt bulb on at 5 watts. This changes to full, unmodulated, voltage when brake pedal is pressed. Returns to 5 watts when brake pedal is released.	Relay correctly interprets both signals. Both sidelight and brake light outputs to trailer work correctly.	Signal wires all connected as normal to individual car circuits
Incidents during towing	Car loses sidelight. Separate brake light bulb takes over and comes on modulated at 5 watts. Continues to function as brake light when required.	Relay correctly interprets both signals. Both sidelight and brake light on trailer work correctly.	Signal wires all connected as normal to individual car circuits
	Car loses sidelight. Separate fog light bulb takes over and comes on modulated at 5 watts. Continues to function as fog light when required.	Relay correctly interprets both signals. Both sidelight and fog light on trailer work correctly.	
	Car loses one brake light; separate modulated sidelight bulb continues to function as sidelight but takes over at full brightness when brakes are applied.	Relay correctly interprets both signals. Both sidelight and brake light on trailer work correctly.	

Illustration 1: Car has separate stop and side lights



Normal: Stop and side lights on	**Normal: Side-lights only on**	**Normal: stop-lights only on**	**Side light fails on car. Brake-light takes over at low brightness**	**Sidelight has failed on car. Stop light, doubling as sidelight, brightens up to stop-light intensity**

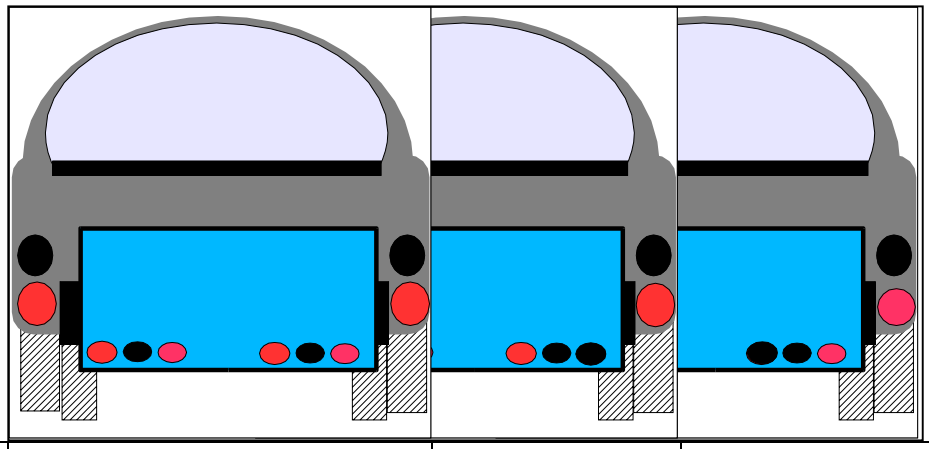
In all above cases, the Ultra-Smart Bypass makes the trailer lights work correctly

Responses to advanced car technology *(continued)*

	In-car scenarios	Relay response/ effect on trailer lights	Correct wiring of relay signal wires
Car Set up: Single side/brake wire	Single wire on each side of car supplies one single-filament 21watt bulb that acts as both sidelight and brake light. Separate brake light bulb and feed wire not present. A modulated (pulsed) voltage on this wire brings the bulb on at 5 watts. When the brake pedal is pressed, the bulb brightens to brake light intensity.	**Both sidelight and brake light outputs to trailer work correctly.** Brake light input circuit recognises modulated (sidelight) voltage and switches on the sidelight output to the trailer. Also recognises the full brake light voltage when it occurs and switches on the brake light output to trailer. If it is receiving the modulated (sidelight) voltage it will maintain the sidelight output to the trailer while the brake lights are being operated.	**Do not connect brown and black relay signal wires to car:** red signal wire alone should be connected to car's **RHS*** side/brake wire
Car Set up: Single side/fog wire	Single wire on each side of car supplies one single-filament 21watt bulb that acts as both sidelight and fog light. Separate fog light bulb and feed wire not present. A modulated (pulsed) voltage on this wire brings the bulb on at 5 watts. When the fog light is switched on, the bulb brightens to fog light intensity.	**Both sidelight and fog light outputs to trailer work correctly.** Fog light input circuit recognises modulated (sidelight) voltage and switches on the sidelight output to trailer. Also recognises the full fog light voltage when it occurs and switches on the fog light output to the trailer. If it is receiving the modulated (sidelight) voltage it will maintain the sidelight output to the trailer while the fog lights are being operated.	Connect brown and black relay signal wires to car as normal. Blue signal wire should be connected to car's **RHS*** side/fog wire

****LH in countries that drive on right***

Illustration 2. Car has one single-filament modulated bulb on each side performing as both stop and side light.

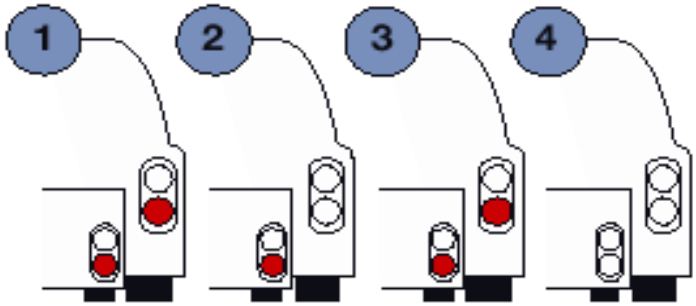


	Normal: Stop and side lights on	**Normal: stop lights only on**	**Normal: Side lights only on**

In all above cases, the Ultra-Smart Bypass makes the trailer lights work correctly. The same is true when a single bulb doubles as both fog and side light.

The fog-control option on the Ultra-Smart Bypass

Fog Control
allows the car fog lights to be switched off, leaving the trailer fog lights on



1. Switch car fog lights on
Trailer fog lights come on

2. Switch car fog lights off
Trailer fog lights stay on

3. Switch car fog lights on
Trailer fog lights stay on

4. Switch car fog lights off
Trailer fog lights go off

The driver switches his foglights on and off once to leave the trailer foglights latched on and the car foglights off. The driver then turns them on and off again to unlatch the trailer foglights and turn them off.
At each phase,audible and visible signals alert the driver to the status of the trailer foglights

TF2217X and TF2218 series Technical specifications

Supply Voltage:	9.5-16V	
Supply Current:	15A	
Current sleep mode:	<10mA	
Input current:	<1mA per input	
Output current: (Max average current; Not short circuit protected)		
Indicators	L+R	4A
Tail	58L+58R	4A
Fog	54g	4A
Brakes	54	6A
Reverse		4A
Operating temperature	-18 to +50 degree C	
Case dimension	100 x 45 x 30	
Case material	ABS	

Fitting the TF2218S/TF2218P

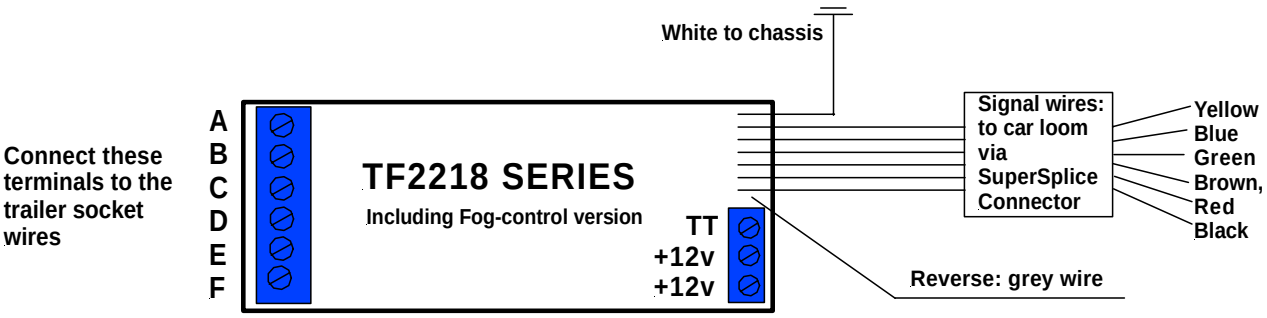
1. Route your power source cable(s) from the boot to the battery. Fit a fuseholder in line in the cable, close to the battery. (Check the fuse value on **Chart A)**.Do not insert a fuse yet
2. Follow the instructions in **Chart A** and connect together your 7-core cable, your relay and the appropriate wires in the vehicle loom. Connect your power cable to the battery and connect a test board.
3. **Turn all lights off and power the car down completely to clear any residual currents or signals.**
4. **Make sure the relay fuse is out and that the relay is at rest.**
5. Insert the fuse.
6. The unit will automatically flash the lights on the test board in sequence as soon as the fuse is inserted and buzz to indicate test complete.
7. If the self test is OK, test the installation in the usual way by switching the car lights on. Make sure any "Tell-tale" warning light or buzzer is working correctly.
8. If you have to reset and retest, make sure you power the car down again and remove the fuse from the relay feed line to clear any residual signals or currents.

Special notes*

Chart A: Wiring the relay(s) ***Fuse 15 amp***

Socket pin No.	7 core cable colour	to	Relay terminal number	SuperSplice number/wire colour	to	Vehicle circuit
1	Yellow		A	1 - Yellow		LH flasher
2	Blue		F	2 - Blue		Fog lamp
3	White		-	None - White		Chassis earth
4	Green		B	4 - Green		RH flasher
5	Brown		E	5 - Brown		RH tail light *
6	Red		D	6 - Red		Brake lights
7	Black		E	7 - Black		LH tail lights*
12S Pin 1	Aux Yellow		C	Grey wire		Reverse
-	-		+12V (either)	-		Power (battery)
			+12V (either)	-		Telltale (positive)
			TT (option)**	-		Telltale switch (negative)

1. **Connect thin signal wires black and brown to both the car's side light circuits, black(LH) and brown (RH) (but see note 3) <u>and both black and brown</u> of the 7-core to Terminal E.**
2. **Connect the trailer reverse light wire to Pin C. Connect the grey wire to the car's reverse circuit.**
3.
4. **SEE CARDATA FOR SPECIAL VARIATIONS IN CERTAIN VEHICLES**



- Only one 12v feed required; fuse 15 amps at battery. Second +12v terminal is spare
- In most cases wire to standard 12N colour code but the grey wires can be swapped to different circuits when required.
- -TT (*Minus Tell-Tale*) This is a switched earth that operates when the unit drives the trailer indicators. By connecting the negative side of a panel lamp or buzzer to this terminal and the positive side to the free +12 terminal, you can make a second Tell Tale. ……deleted

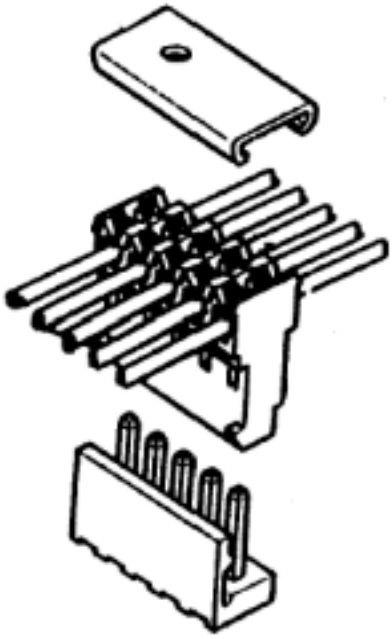
Trouble-shooting the TF2218 Ultra-smart bypass

These notes refer to TF2218 only. For troubleshooting the TF2217series, see the TF2217 page.		
Symptom	**Possible cause**	**Corrective action**
Malfunction on some or all circuits	Failure to push the car loom wires into the SuperSplice connector properly	Push all loom wires fully home into the SuperSplice receptacle
	Car loom wires connected in wrong positions on SuperSplice receptacle	Check and correct connections The numbers on the relay's SuperSplice terminal match the numbers on a 7-pin socket.
	Plug forced into SuperSplice receptacle upside down.	Insert correctly with receptacle's lugs against the plug side wall.
	Reversal of 7-core wires into relay: if D and E are reversed , the brake light will come on with the sidelights etc.	Reposition 7-core wires
Relay initially appears to fail	Any of above plus: Car battery low Car's own check systems alerted	Run the engine to charge up the battery and re test. Reset car's systems before powering the relay.
Buzzer screams continuously when unit is powered	The "-TT" terminal is wired to earth	Disconnect terminal "-TT" from earth
Rover 75	Relay appears to fail on fitting	Immediately after completing the installation and before powering and testing the relay, reset all the car's bulb-failure systems by switching every light on and off.
Vauxhall Vectra	10/15 second "tick" when vehicle off and number plate light still on	Relay reacting to car "check" signal. Does not affect lights: stops when number plate lights go off.
Vauxhall Vectra	Brand new (unregistered?) car Relay appears to malfunction	Check dealer has done a full pre-sale cpu download. Complete the download to allow the relay to work properly. Retest.

SuperSplice plug-in connector system

(Fitted to TF2218S and TF2217XS)

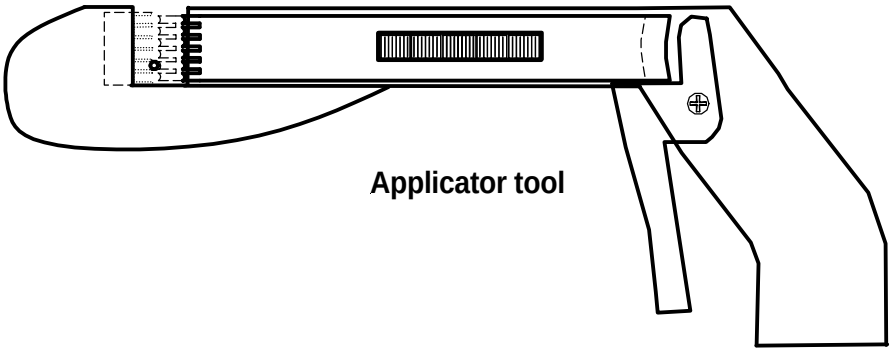
This system, using multiple insulation displacement connectors, makes an ideal alternative to Scotchlok-type connectors because of the neat and compact design of the terminals and the high quality of the connections they make. The connector block is spliced into six vehicle loom cables as they run together, making a permanent access socket. Components are then plugged into the block using matched plugs. "Slave" wires are used to bring connections from wires not found at the main connection point.
The dedicated Supersplice tool makes fitting both easy and accurate.



The cap completes a neat and secure assembly.

The applicator tool applies the connector block to the wires of the car loom with precision and accuracy to create a high-quality connection.

The header, connected to the towing relay, is plugged into the connector.



Applicator tool

Part Numbers: Tool TT7052

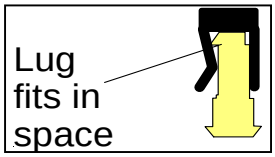
Combined Multi-splice and screw connector block (6-way) TV2086
Combined Multi-splice and screw connector block (3-way) TV2083
Multi-splice connector is built into the TF2217X and TF2218 series relays.

User Guidance

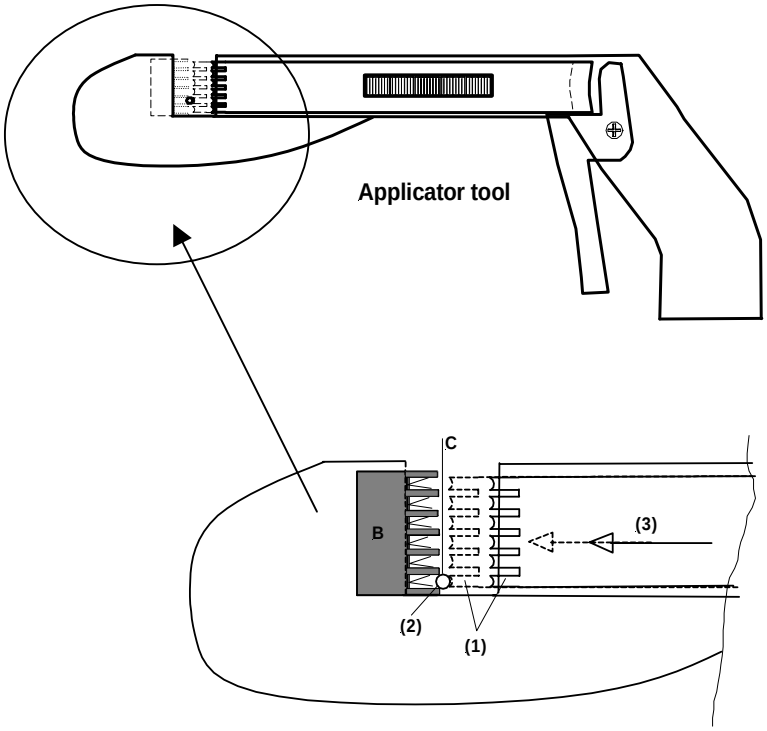
TF7052
Splice tool (and SuperSplice plug-in connector)

Putting the receptacle block into the tool

Insert the SuperSplice receptacle into the tool so that the small lugs on one side of the receptacle block are accommodated in the shaped space that you can see on the left side of the front end of the tool when you hold the tool normally.



Connecting the SuperSplice receptacle to the car loom.
Connect directly to the car's loom wires.
First of all, identify the rear light wires in the car loom, close to the light clusters if practical. If you cannot find all six of the road light wires together, you may have to bring "slave" wires across from other parts of the loom to join to the SuperSplice receptacle.
Only try to insert one wire at a time into the SuperSplice receptacle. Each wire requires a force of approximately 7kg to press it home.
Make sure the tool pushes all the wires fully home into their appropriate slots.
It is advisable not to leave the top space (1) until the last when you are inserting the wires because, with the other wires in place and the slight flexing that occurs as the tool is operated, the travel of the plunger is restricted and the top wire is unlikely to push fully home.



Connector block "B" is inserted into the special holder in the tool: this holds it firmly in place while the connections are made.

Wire "C" is presented to the appropriate slot in the connector.

When the trigger is squeezed, the applicator tips (1) on the tool's sliding bar push the wires into the connector slot (2) when the sliding applicator bar (3) is driven forqward by the action of the trigger.

Matching the wires to the receptacle.
When the receptacle is inserted into the tool with the lugs in the shaped space (see diagram above) the top slot is number 1 and the other slots correspond in order with the terminal numbers on 7-pin plugs. The tool is colour coded, from the top: yellow, blue, green, brown, red, black. This matches the normal colours of the 7-core cable.

Match the wires of the car loom to these numbers with care.

Simple Bypass Relays

TF1011: Single bulb-failure bypass relay
This device incorporates a single relay.
It is typically used to switch a single lamp, usually the fog lamp.

On most vehicles the switching function is controlled by the application of a current to the coil input wire but increasing numbers of vehicles have earth-switched fog lamps and in these vehicles this relay can also be earth-switched. (See relevant diagram below)

Diagram 1: Normal installation

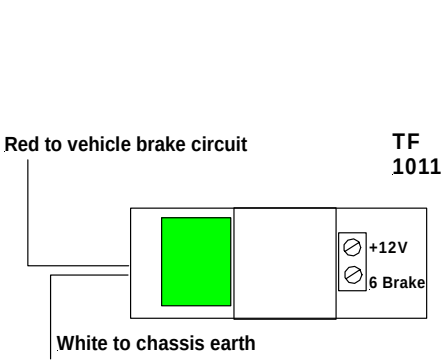
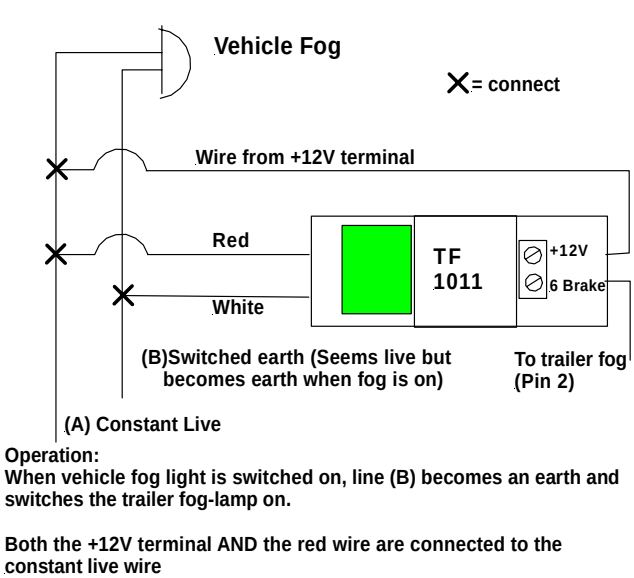


Diagram 2: Installation for a negative-switched fog light



Fuse 5 amps

Fitting the TF1011 (Standard application)

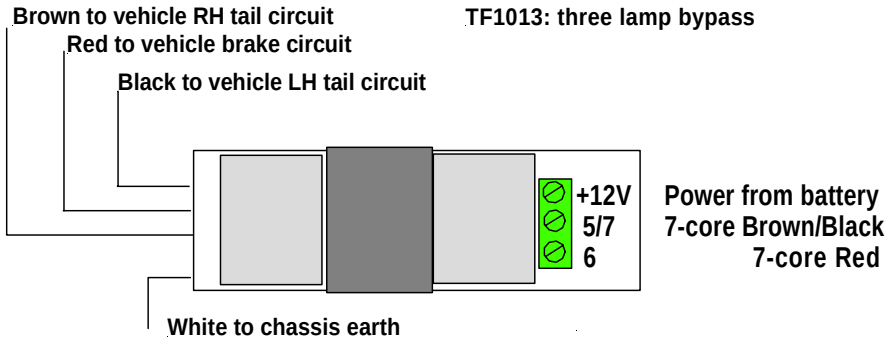
Refer to the general instructions in Appendix 3 at the back of this manual.
Connect the appropriate wire of the 7-core cable to the terminal of the relay marked "6 Brake". (You will have selected which circuit you wish the relay to control.)
Connect the thin red signal wire to the vehicle's circuit that you have selected.
Connect white to a good chassis earth.
Bring a reliable power line (1.0mm^2) from the vehicle battery to the +12V terminal. Fuse this cable close to the battery using a 5amp fuse.
Do not connect to the battery or insert the fuses until the rest of the installation is complete.
Connect the remaining 7-core wires to the loom as follows but use the TF1011 relay on the single circuit you have selected.
Connect the brown wire of the 7-core to the vehicle RH Tail light circuit*.
Connect the black wire of the 7-core to the vehicle LH Tail light circuit*.
Connect the red wire of the 7-core to the vehicle brake light circuit*.
Connect the blue wire of the 7-core to the vehicle fog lamp circuit*.
Connect the flasher circuits following the instructions with the flasher relay you are fitting*.

* It is important that you check whether or not to fit bypass relays to these circuits. These instructions assume that you have made this check correctly.
When the installation is complete, make the battery connection, insert the power fuse and test the operation.

Bypass Relays

TF1013 Three-lamp bypass relay

This device incorporates two relays.
The two relays operate independently of each other when switched by the coil input but have a common earth.
Typical Application
• to switch the two side lamps (fed from both sides of the car) and the brake lamps.



It has three wires for connection to the vehicle loom: Red/white for brakes, Black/white for LH tail, Brown/white for RH tail, and an earth wire.
Connection to the trailer 7-core cable and to the wire bringing power from the battery is made by screw connectors.

Fuse: 10 amps

Fitting the TF1013

Refer to the general instructions in Appendix 3 at the back of this manual.

Connect the 7-core cable, according to the number and function codes marked on the printed circuit board.
Connect white to a good chassis earth.
Bring a reliable power line (1.0mm^2) from the vehicle battery to the power terminal +12v
Fuse this cable close to the battery using a 10amp fuse. **Do not connect to the battery or insert the fuses until the rest of the installation is complete.**

Connect the signal wires to the loom as follows

Brown	to	RH Tail lamp circuit
Black	to	LH Tail lamp circuit
Red	to	Brake lamp circuit

Connect the fog lamp circuit (7-core blue) using a fog cut out relay if appropriate.
Connect the flasher circuits following the instructions with the flasher relay you are fitting.
When the installation is complete, make the battery connection, insert the power fuses and test the operation.

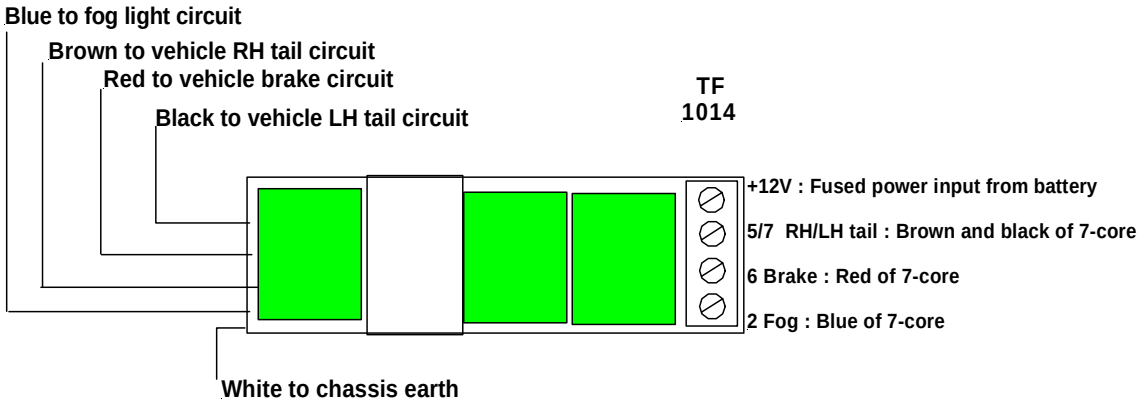
Bypass Relays

TF1014: Four lamp bypass relay

This device incorporates a set of three relays.

Typical Application
• to switch the two side lamps (fed from both sides of the car) the brake lamps and the fog lamp.

The three relays operate independently of each other when switched by the coil input but have a common earth.



It has four screw terminals: three to accept the trailer lamp wires and one for power input from the vehicle battery.
It has four signal wires for connection to the vehicle's lamp circuits and an earth wire for connection to the chassis.

Fuse: 10 amps

Fitting the TF1014

Refer to the general instructions in Appendix 3 at the back of this manual.
Connect the 7-core cable, according to the number and function codes marked on the printed circuit board.
Connect white to a good chassis earth.
Bring a reliable power lines (1.0mm^2) from the vehicle battery to the power terminals +12v
Fuse this cable close to the battery using a 10amp fuse. **Do not connect to the battery or insert the fuses until the rest of the installation is complete.**

Connect the signal wires to the loom as follows

Brown	to	RH Tail lamp circuit
Black	to	LH Tail lamp circuit
Red	to	Brake lamp circuit
Blue	to	Fog lamp circuit

Connect the flasher circuits following the instructions with the flasher relay you are fitting.
When the installation is complete, make the battery connection, insert the power fuses and test the operation.

Trouble Shooting Simple Bypass Relays

Because these are basically simple relays, there is very little about them to cause confusion or problems.

Operation

A basic test to see if they are working properly is as follows.
Connect the power-in wire or terminal to a 12-volt source. Connect the earth wire to a reliable earth. Connect a bulb to each of the designated output wires or terminals in turn and touch the appropriate signal wire to the 12-volt source. The bulb should light.

How these relays work.
Current from the vehicle's lighting circuit is picked up by the signal wires and passes through the electromagnetic coil of the relay to earth. As it does so, it energises the coil; the core of the coil becomes a magnet and pulls the electrical contacts together connecting the power-in wire or terminal directly to the designated output wires or terminals. It only takes 0.038 of an amp to energise each coil: this is why the vehicle does not detect their presence.

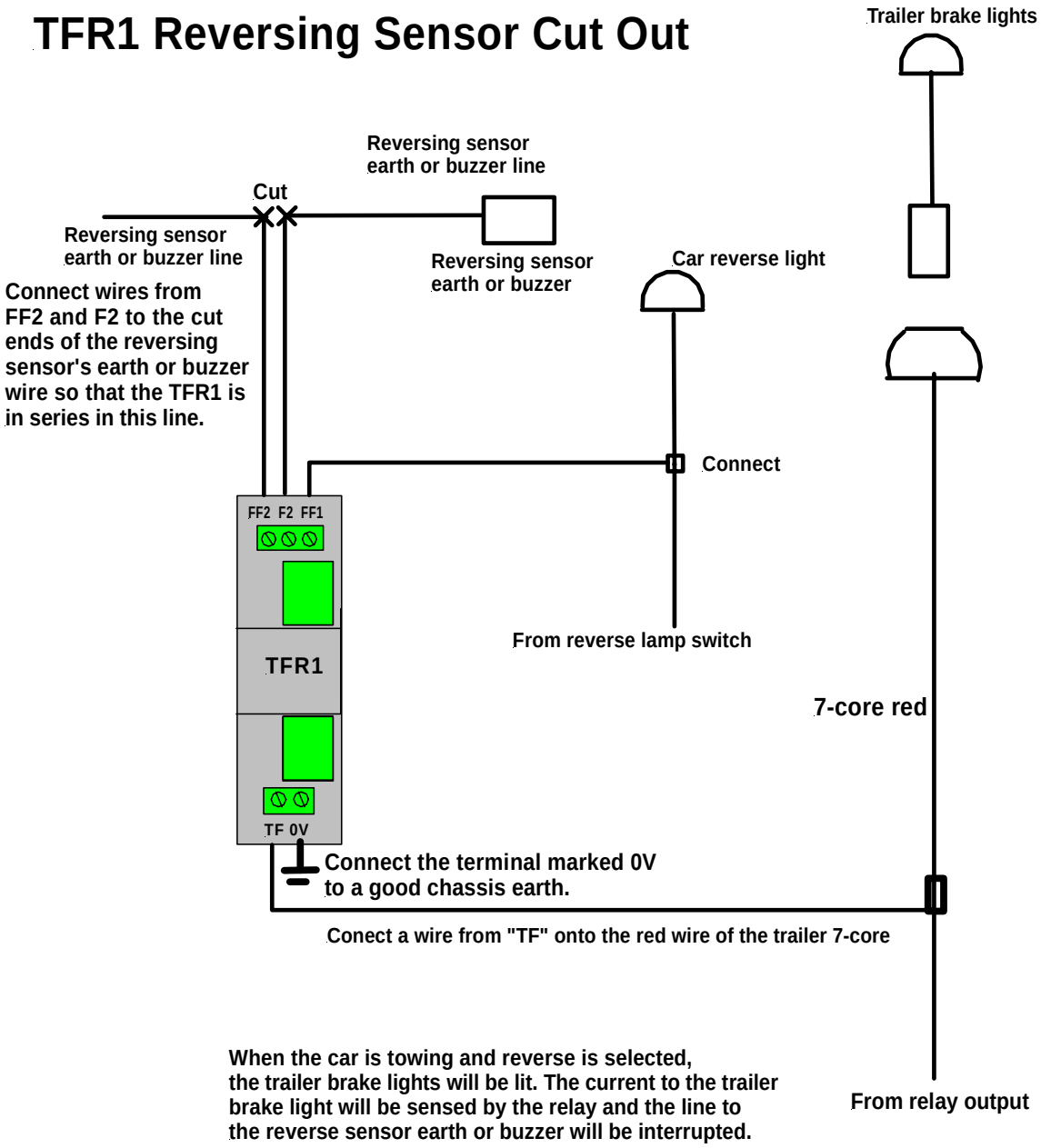
Installation checks

Basic checks are:

- that the power source is adequate and constant.
- that all connections are good
- that you have connected the correct wires and terminals together.
- that the signal source is correct

Reversing Sensor Cut Out

This device is designed to switch off the reversing (parking) sensors of a vehicle when any trailer is connected. It must be fitted in conjunction with a bypass relay on the circuit supplying the trailer brake. How it works and how it is installed is described below.



1. Connect the blue/white wire of the relay to the car's reverse light supply.
2. Connect the blue wire of the TFR1 relay to the Red trailer brakes wire of the 12N 7-core at any convenient point.
3. Cut the earth wire (or one side of the buzzer lead) of the car's reversing sensor system and wire the blue/black wire and the green/black wire of the relay in series (in line) in the line you have just cut.
4. Take the white wire of the relay to a good chassis earth

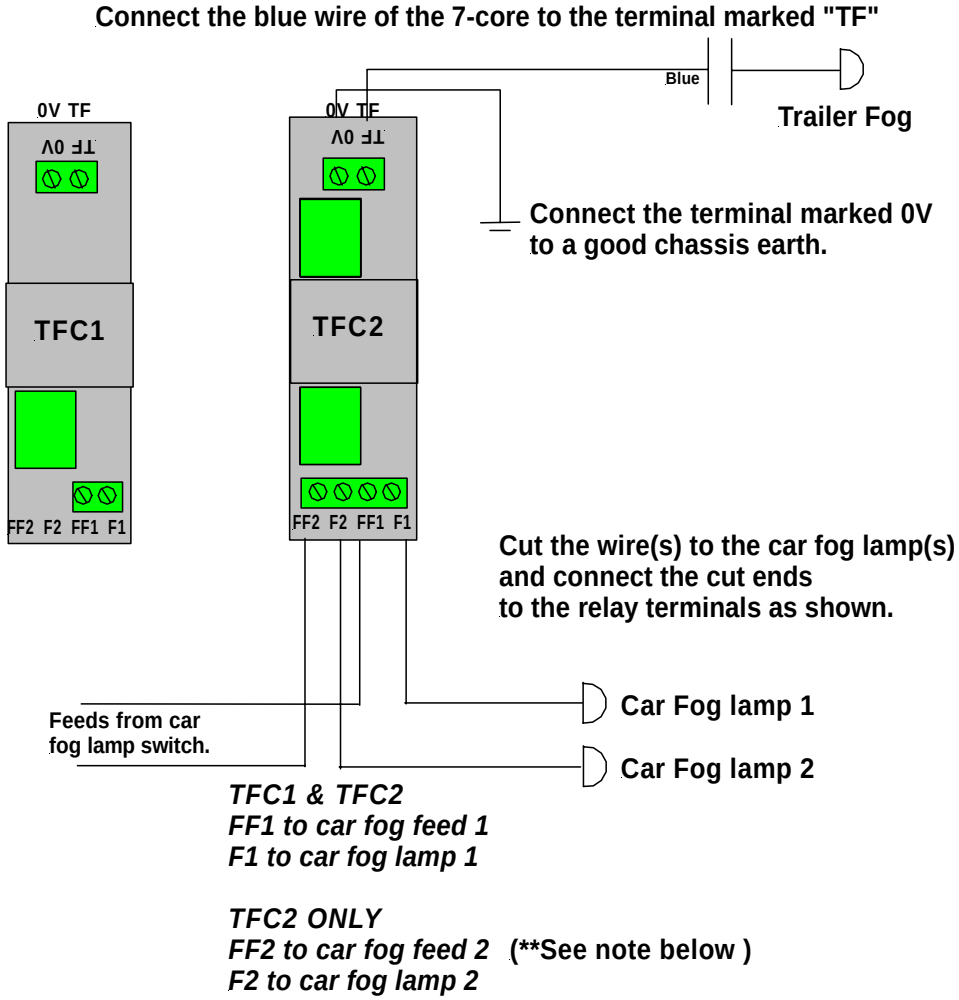
Fog Cut-out Relays

These relays are designed to switch off the fog lamp(s) of a towing vehicle when the fog lamp of a towed trailer is on. The reason for turning off the vehicle fog lamp is to avoid a distracting glare being reflected by the towed trailer, especially if the trailer is a caravan.

A fog cut-out relay is, in fact, a combined monitor and relay: the relay that switches off the towing vehicle's fog lamp is switched by a monitoring circuit that operates when it detects current flowing through it to the trailer fog lamp. The switched side is fitted in line in the vehicle fog lamp circuit and the monitoring side is fitted in the cable going to pin 2 of the vehicle's trailer socket.

TFC1 and TFC2: Fog cut out Relays

Wiring instructions



****Important Note: Terminal FF2**
If the car is likely to tow a trailer with two fog lamps but has only one fog lamp itself, it would be wise to bring an independent 12 volt supply to connect to terminal FF2 to supplement the supply to the fog lamps on the trailer.

Where the diagram shows that you have to cut the vehicle's own wiring to install the relay in line, make sure you make the best possible connections to the relay's screw terminals.

- The fog cut out relay will turn one or both of the vehicle's fog lights off if a trailer fog lamp is connected. When the trailer fog lamp is not present, the vehicle fog lights should work as normal.
- Use a suitable test board to test the circuits. Make sure the vehicle's fog light(s) and the trailer fog lamp(s) are working correctly and that no warning lamps are showing.

Trouble-shooting TFC1 and TFC2

Before fitting:
• Check how many fog lamps on the vehicle you wish to cut out
• Check fuse-loadings to the vehicle's fog lamp circuits to make sure one side can support two fog lamps in case two are fitted to any trailer.

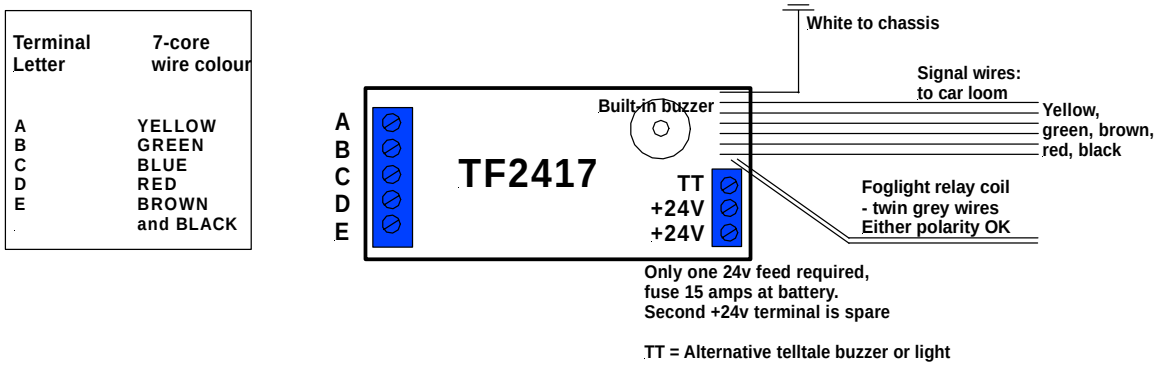
24 Volt Systems

24V to 24V

Advanced Bypass Relay TF2417P: 7-way all lamps

This is a wholly 24volt relay, designed to supply 24 volts to trailer lights from a 24 volt vehicle.
Apart from being in a 24 volt vehicle, installation is the same as for the standard 12 volt TF2217X,

Fuse each power line from the battery 10 amps.



Signal wire colours

Yellow	to	LH Flasher circuit
Grey *	to	Fog lamp circuit (**Either of 2 grey wires: second grey goes to earth*)
Green	to	RH Flasher circuit
Red	to	Stop lamp circuit
Black	to	LH Tail lamp circuit

White to a chassis earth.

Connect the 7-core wires to the relay's screw terminals as shown on the diagram. Connect both brown and black to pin E.
Feed one good 24 volt supply into one of the terminals marked +24V. Put a 15 amp fuse near the power source for this line.

24V to 12V

Use TF2217X
To supply 12 volts to a trailer from a 24V vehicle, use the standard 12 volt **TF2217X**.
The operation of this relay is entirely controlled by solid-state chips that happily tolerate a 24 volt environment. Under the control of the chip,the current to the relay coils is taken directly from the power source. As long as the power source to the +12V terminals is 12V, the relay coils will receive 12V.
With this set up, when you feed 12 volts into the power input terminals L1 and L2 and connect the signal wires (or multi-connector) directly to the vehicle's lamp circuits you get 12-volt outputs at all the terminals 1 to 7.

Fitting TF2217Xwithout a voltage dropper

A 24-volt battery is, in fact, two 12 volt batteries connected in series. A 12 volt feed is obtained by connecting a wire to the + post of the first battery (that is, the battery which is directly earthed to the chassis.) Feed the 12V so obtained into the rel;ay's +12V terminal and make all earths on the chassis. *Fitting with a voltage dropper: Next page*

Fitting with a voltage dropper

(For commercial vehicles, the fitting of a voltage dropper is usually preferred.)
Part Numbers: TF24510 (Switch-mode converter) and TF2217X (P or S) (Relay Set)

1. Find a suitable 24 volt power source capable of supplying 10 amps continuous current.
2. Connect the Switch-mode converter to the Relay Array, TF2217X as follows:
   - **Output (+) terminal (plus terminal)** from converter to relay terminal **+12v** (Put a 15 amp blade fuse in this line.)

3. Connect the wires **from the trailer socket** to the terminals of the relay set as follows:

   - **7-core Yellow** to relay terminal **A**
   - **7-core Blue** to relay terminal **C**
   - **7-core Green** to relay terminal **B**
   - **7-core Brown** to relay terminal **E**
   - **7-core Red** to relay terminal **D**
   - **7-core Black** to relay terminal **E**
   - **7-core White** to converter output minus terminal (-).
   - Connect one side of a panel lamp or buzzer to the terminal marked "TT"
   - Connect the other side to the converter output minus terminal (-).with the 7-core white wire

4. Connect the thin wires **from the TF2217X relay set** to the vehicle's light circuit as follows:
   - **Yellow** to LH Flasher
   - **Grey** to Fog lamp (1 to fog lamp, the other grey to chassis earth)
   - **Green** to RH Flasher
   - **Brown** to RH Tail lamp
   - **Red** to Brake light
   - **Black** to LH Tail lamp
   - The thin plain **white** wire from the relay to a good earth point on the vehicle chassis

5. Connect the remaining wires of the **Converter** as follows:
   - **Input + (plus terminal)** to the **24-volt source you identified at step 1.** Put a 10 amp blade fuse in this line, as close to its source as possible.
   - **Input - (minus terminal)** to a good earth point on the vehicle chassis.

TF24510 Switch mode converter 24V to 12V

Caravan (12S) Relays

Smart Combi Relays: TF1170-1, TF1170-2, TF1170-3.

- ***Introduction: Caravan fridges and auxiliary batteries. Protecting the vehicle battery.***

When a vehicle tows a caravan and the caravan is equipped with a 12-volt fridge or an auxiliary battery or both, it is necessary to provide a connection between the caravan and the towing vehicle to provide power to these.
When such a connection is provided it is advisable to protect to vehicle's own battery from being accidentally drained by the caravan fridge and auxiliary battery. In the U.K. the usual way of providing this protection is to install a suitable relay or pair of relays that will turn off the connections when the vehicle's alternator is not running.

- ***Alternator or Ignition-switched? Smart Combination Relay: switches itself***

They can be switched by a connection to the alternator or to some suitable ignition-switched source. The TF1170 series Smart Combination Relays make the installation of these relays much easier and safer. They do away with the need to find a signal/current from the alternator or ignition to switch the relays.

Function

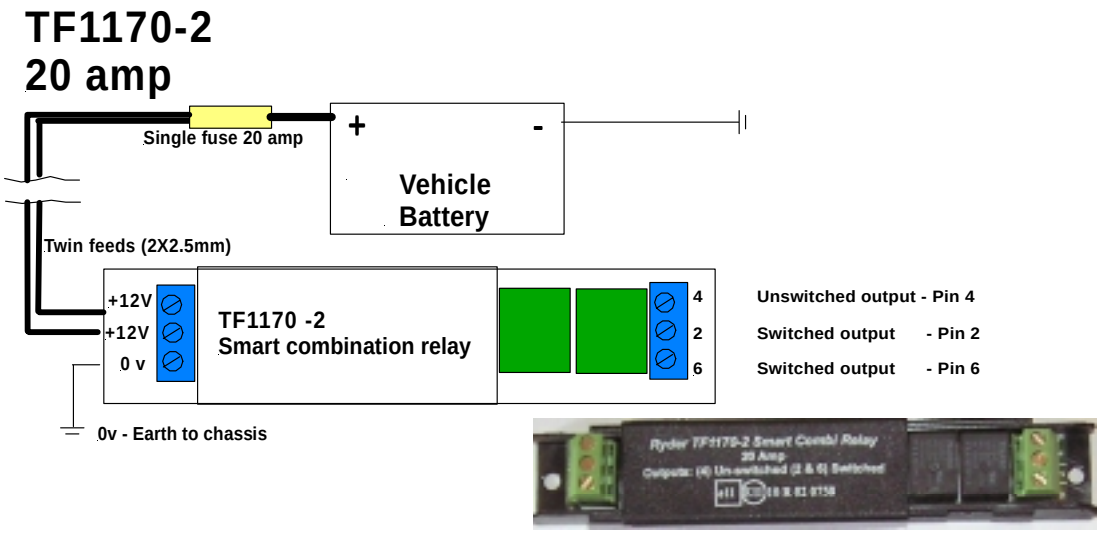
A ***TF1170 series Smart Combination Relay*** incorporates a trigger device that switches two built-in relays when certain voltages occur. The normal operating environment is a nominally 12-volt DC circuit within a motor vehicle.

Application

Typically it is used in an auxiliary towbar electrical circuit, connected to a single feed from the vehicle's battery, to switch the caravan battery charging circuit and the fridge circuit on and off. When the voltage in the line from the battery reaches the appropriate level as the alternator begins to charge the battery, the trigger system switches the relays on. When the alternator ceases to charge and the voltage drops, it switches the relays off, isolating the caravan fridge and battery from the car.

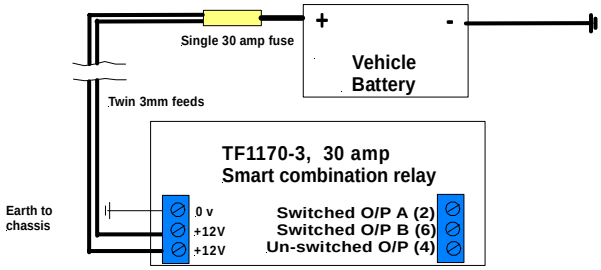
There are three versions of the Smart Combination Relay

Choose the correct relay and use wires that can handle the current



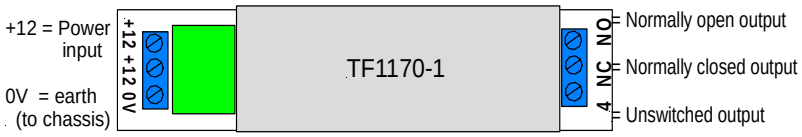
The "Standard" version, **TF1170-2**, will handle up to 20 amps. Use for most vehicles.

TF1170-3, 30 amp
Smart combination relay



The "Super" version, **TF1170-3**, will handle up to 30 amps. Use for vehicles likely to tow caravans with large fridges.

Smart Baby Relay TF1170-1



The Smart Baby Relay **TF1170-1** will handle up to 12 amps, with its single relay. It is really for in-car accessories, but it would manage a small caravan.
Has both "Switch on" (Normally Open) and "Switch off" (Normally Closed) terminals

Minimise voltage drop: Keep resistance down

Choose the right cable.

For a standard fitting to supply a fridge and charge a battery, we recommend twin 35's ($2x2.5mm^2$) or single 44's (1x3.0mm2) at least. For the largest vehicles and caravans, twin 44's ($2x3.0mm^2$) is required if the customer wants his big caravan fridge to work properly. Thinner cable is likely to produce excessive voltage drops under heavy load conditions. *(Finding other, thinner wires, such as the boot lamp wire, to feed the auxiliary circuits is potentially dangerous as these wires may overheat under load. It is unlikely that the trigger unit would operate under such circumstances, which could be just as well!)*

Fit the correct fuse

The correct fuse rating for the TF1170-2 is 20amps and for the TF1170-3, 30 amp.

[We recommend blade or ceramic fuses. Traditional glass fuses have different operating characteristics and are not recommended.]

Make sure that all connections are well made.

Amongst the most common problems encountered by fitters using these Smart units has been the problem of voltage drop caused by connections that are badly made. Of these, loose battery nuts, and crimp terminals weakly crimped are the worst culprits. In any event, poor connections can get hot or very hot under load conditions and may therefore become dangerous.

Safety

One of the greatest safety features built into the Smart combination relay is that, under load in unsafe conditions, as described above, they will switch off the current to the caravan.

How the Smart Combi does its job

Accommodating different cars and different conditions.

In order to work effectively, the unit has to accommodate a number of variables. Some variables occur between one car and another and some occur within individual cars depending on circumstances. Therefore the trigger unit has, at the outset, to be preset very precisely to operate within that narrow window of conditions that can be identified as common to all or, at least, the great majority of cars in most circumstances.

1. Variations between one car and another

The performance of battery and alternator will vary between one car and another. Factors that affect performance include good or poor battery condition, alternator condition and slipping alternator belts.

2. Variations within each particular car.

The performance of the battery and alternator of any individual car will also be affected by circumstances. For instance, not only do winter conditions make batteries and alternators work harder by virtue of the fact that heaters, wipers, lamps etc. are used more but in cold weather the voltage drop observed in a battery when even a fairly small load is applied to it is much greater than it would be in warm conditions.

Other factors that affect performance and battery condition include night driving, frequent short journeys and additional loads created by in-car accessories.

3. Voltage drop under load

One very important variable is the voltage drop that always occurs when a load is put on a battery (and the consequent rise in voltage when the load is removed). There is also some voltage drop across the length of supply cable.

4. Accommodating normal voltage drops.

To succeed in doing its job in the context of all these variables the device has to be preset very precisely as described above. The unit is also intelligent enough to deal with a number of other variables that would otherwise prevent it working efficiently. It is also equipped with a time delay that allows it to ignore transitory voltage changes.

5. Conditions that will not be accommodated

It is inevitable that some cars will fall outside the defined operating window of the Smart relay. In most cases, the poor condition of the battery or alternator or even the alternator belt will be to blame but it is possible that some cars may be "set up" differently even in prime condition. On such cars the trigger unit will not work properly.

It is also inevitable that, even in cars where the system works well, there will be times when, due to the use of other accessories that subject the battery to heavy loads, the trigger unit will turn off. This should not be regarded as a failure since the device is effectively protecting the battery from further overload but owners should be informed of the possibility and advised to monitor it

Fitting the TF1170 (-1/-2/-3)

General Instruction, 12S installations (Caravan auxiliary circuits)

1. Find a suitable entry point or drill a 13mm ($^{9}/_{16}$") hole in the floor of the boot adjacent to the socket mounting point on the towbar. (Take great care to ensure that you drill in a safe place where you will not damage wires, pipes, bodywork, etc.) Treat the edges of the hole with a rust inhibitor and line it with the grommet provided.
2. Wire the trailer socket, as shown in **Chart C** and mount it on the towbar. Lead the 7-core cable into the boot through the hole you drilled
3. Route your power source cable(s) from the boot to the battery. Fit a fuse in line in the cable, close to the battery. Do not connect yet
4. Follow the instructions in **Chart C** and connect together your 7-core cable and your relay.

Note that post 1998 caravans use pins 4 and 2 differently from the way pre 1998 caravans did. If you wire according to these instructions, all caravans will be properly accommodated.

5. Connect your power cable(s) to the battery and insert the fuse(s) provided. Check that the fuse is of the value shown in **Chart C**.
6. Use a suitable test board to test the circuits. The loads created by the test board must simulate the load created by a caravan fridge (red, Pin 6) and battery (yellow, pin 2 or green, pin 4). Make sure that the relay stays on under load.

Chart C: Wiring the 12S Socket & connecting to the vehicle: TF1170 type Self Switching Combi

Relay function: Switches the caravan auxiliary circuits on when the vehicle alternator provides sufficient power
Fuse rating: 15 amp (max 20 amp)

Socket pin number	7-core cable colour	to	Relay pin	Vehicle circuit
1	Yellow	to	N/A	Reversing light
2	Blue	to	2	Switched live
3	White	to	N/A	Chassis earth
4	Green	to	4	Permanent live
5	Brown	-	N/A	Spare
6	Red	to	6	Switched live
7	Black	to	N/A	Chassis earth

The feed cable from the battery must be heavy duty. We recommend TF15430D1, Double-insulated 27.5amp. This cable must be fused, as close to the battery (source) as practically possible: 15amp blade fuse (20 amp max)

(TF1170 continued)

Diagram 1(a) TF1170-2 Original Smart Combi (long shape)

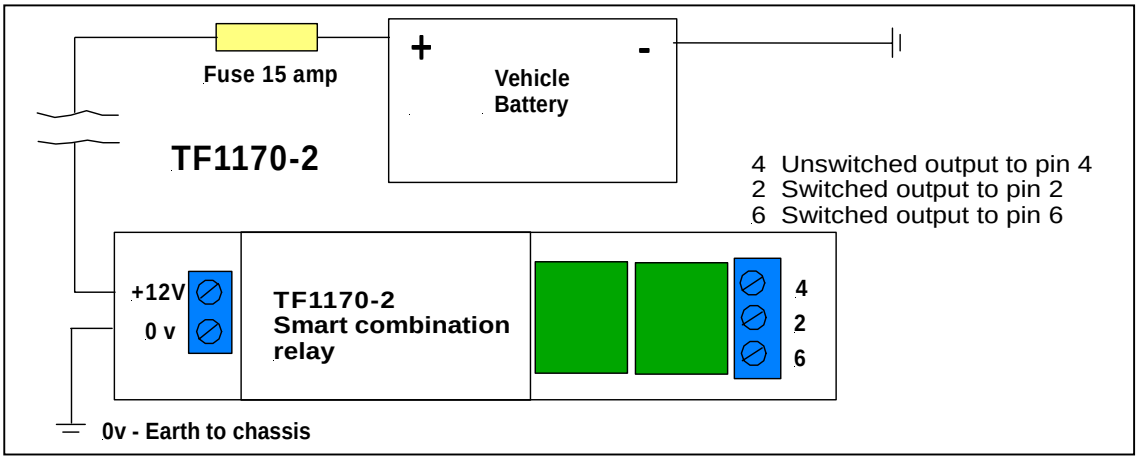
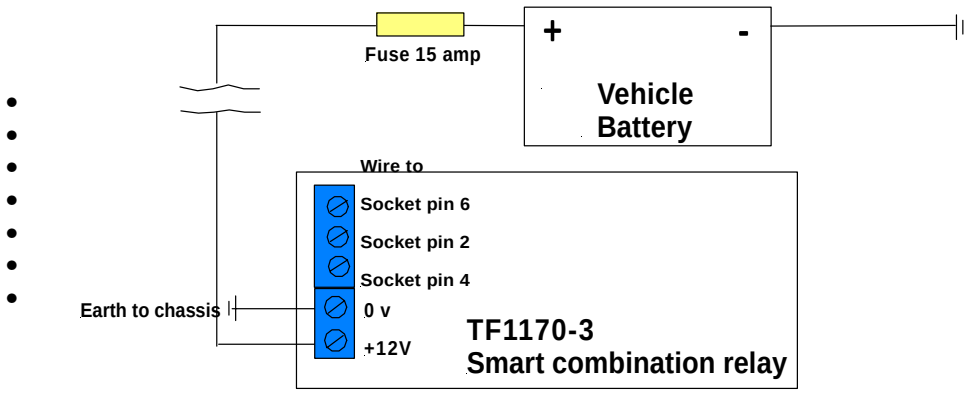


Diagram 1(b) TF1170-3 Smart Combi (squarer shape)



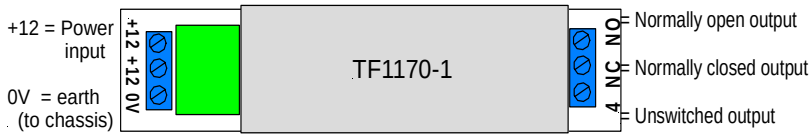
- ***Unswitched output***

The green 12S wire to socket Pin 4 supplies the interior lights of the caravan; on new caravans this is automatically switched within the caravan when towing, to charge the caravan (auxiliary) battery. The switching is controlled by a relay in the fridge circuit. The fridge circuit is controlled by the Smart combi.

- ***Switched outputs***

The blue 12S wire to Pin 2 is used to charge the caravan (auxiliary) battery except in new vans: *see above, Pin 4*
The red 12S wire to pin 6 supplies the caravan fridge
Please note that the two black relays on this device are designed to run at a temperature of around 90 degrees C. This is normal. When fitting the device, do not lodge it in a tight space or wrap it up. Allow some space around it where air can move.

Diagram 1(b) TF1170-1 Smart Baby Combi)



Trouble shooting the TF1170 Series (TF1170-2, TF1170-3)

SYMPTOMS	COMMENT/LOOK FOR
Relay feels warm:	This is normal. The relay coil warms when it is powered. Mount where there is space for some air circulation.
Relay will not switch on:	Poor battery condition Poor alternator performance
Relay switches on but switches off again when load is applied:	Poor connections. Loose battery nuts and crimp terminals not made with the appropriate ratchet crimping tool are the most common culprits
Relay cycles on and off:	Poor connections as above Feed cable too thin (Use 2.5 mm 2 or 3 mm 2 cable) Overload: Current over 16 amps may cause excessive voltage drop. Check auxiliary battery, short circuits, etc. Check fuse in relay circuit.
Relay takes time to switch off:	Poor connections as above. Faulty battery causing abnormal voltage drop under load. Lower value fuse in power line causing voltage drop as it heats up. Caused by battery maintaining high voltage. Try draining battery slightly by applying load (switching on fan, brake lights, etc.) for a few seconds. Relay should switch off within approx 30 seconds of engine being switched off although some batteries can maintain unusually high voltage (above 13.2 volts unloaded) especially in warm weather. Check if there is any load on relay. Try another unit. Phone for advice on 0161 430 1120.

All units are thoroughly tested. If you think a unit is faulty try another unit. It is extremely unlikely that you will find two in a row that are incorrectly calibrated.
IF IN DOUBT PHONE FOR ADVICE ON THE NUMBER BELOW.

Combi relays, 6 pin type (TF116) and screw terminal type (TF1171)

TF116/1171

Relay function: Switches the caravan auxiliary circuits on when the vehicle alternator charges. This relay requires a trigger signal from the alternator, a suitable ignition-switched live or a trigger device, TF1169. The trigger source must be on when the alternator is charging but off when the starter motor is cranking.

Chart C: Wiring the 12S Socket and connecting to the vehicle TF116/1171 Combination Relay

Relay function: Switches the caravan auxiliary circuits on when the vehicle alternator provides sufficient power

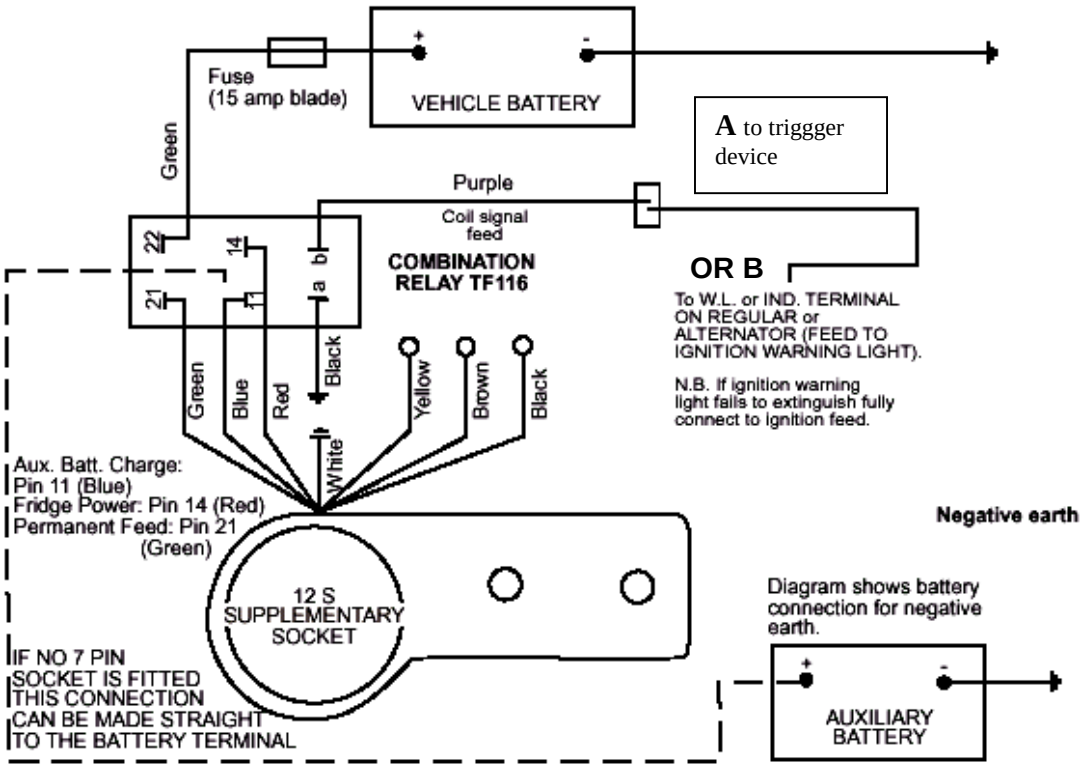
Fuse rating: **TF116** 30 amps
TF1171 15 amp

Socket pin number	7-core cable colour	to	Relay Pin	Vehicle circuit
1	Yellow	to	N/A	Reversing light
2	Blue	to	11	Switched live
3	White	to	N/A	Chassis earth
4	Green	to	21	Permanent live
5	Brown	-	N/A	Spare
6	Red	to	14	Switched live
7	Black	to	N/A	Chassis earth

General Instruction, 12S installations (Caravan auxiliary circuits)

1. Drill a 13mm ($^{9}/_{16}$") hole in the floor of the boot adjacent to the socket mounting point on the towbar. (Take great care to ensure that you drill in a safe place where you will not damage wires, pipes, bodywork, etc.) Treat the edges of the hole with a rust inhibitor and line it with the grommet provided.
2. Wire the trailer socket, as shown in **Chart C** and mount it on the towbar. Lead the 7-core cable into the boot through the hole you drilled. Make sure the seal between the grommet, the cable and the hole on the bodywork is gas tight.
3. Route your power source cable(s) from the boot to the battery. Fit a fuse in line in the cable, close to the battery. Do not connect yet
4. If you are providing a trigger wire for your relay, route this at the same time. Your trigger source must be **on** when the alternator is charging but **off** when the starter motor is cranking. Connect the trigger wire, making sure that the relay end is connected safely.
5. Follow the instructions in **Chart C** and diagram 1 (TF116) or Diagram 2 (TF1171) and connect together your 7-core cable and your relay.
6. *Note that post 1998 caravans use pins 4 and 2 differently from the way pre 1998 caravans did. If you wire according to these instructions, all caravans will be properly accommodated.*
7. Connect your power cable(s) to the battery and insert the fuse(s) provided. Check that the fuse is of the value shown in **Chart C**.
8. Use a suitable test board to test the circuits. The loads created by the test board must simulate the load created by a caravan fridge (red, Pin 6) and battery (yellow, pin 2 or green, pin 4). Make sure that the relay stays on under load.

Diagram 1: TF116



<u>TF1171 Combination relay, screw terminal type</u>

Diagram 2: TF1171

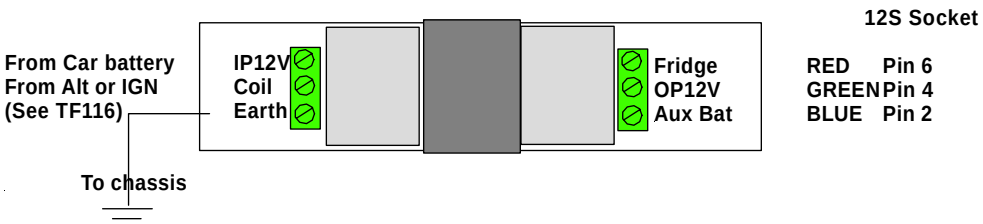


Chart C: Wiring the 12S Socket and connecting to the vehicle TF1171 Combination Relay

Relay function: Switches the caravan auxiliary circuits on when the vehicle alternator provides sufficient power

Fuse rating: 15 amp (max 20 amp)

Socket pin number	7-core cable colour	to	Relay Pin	Vehicle circuit
1	Yellow	to	N/A	Reversing light
2	Blue	to	AUX BAT	Switched live
3	White	to	N/A	Chassis earth
4	Green	to	OP12V	Permanent live
5	Brown	-	N/A	Spare
6	Red	to	FRIDGE	Switched live
7	Black	to	N/A	Chassis earth

Trouble-shooting TF116/TF1171

Relay does not switch:

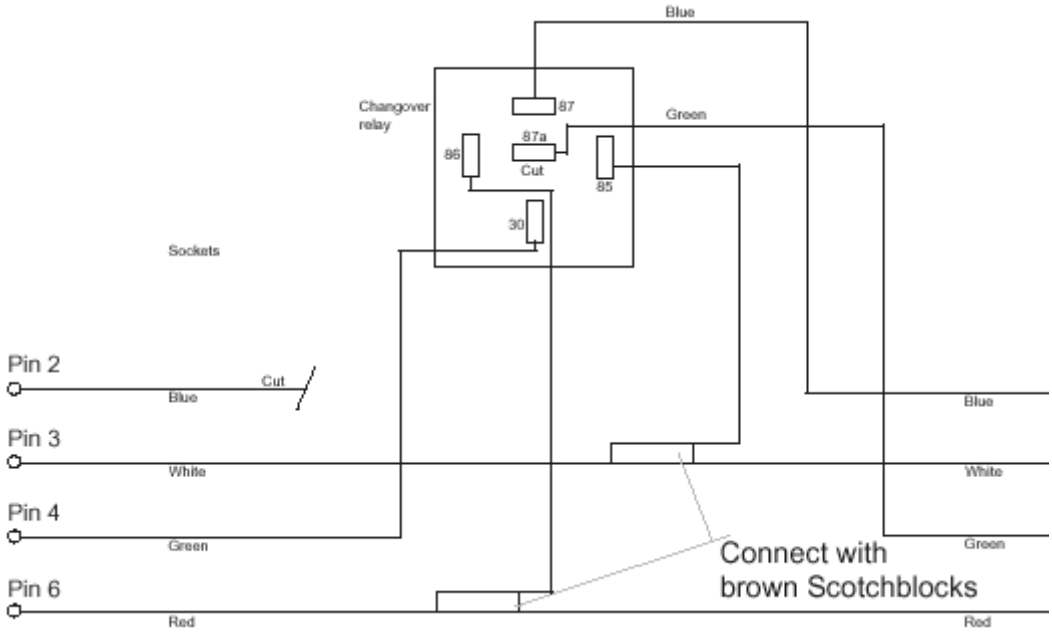
Check all connections are well made
Check any crimps make perfect contact
Check relay for signs of damage
Check earth connection
Check all signal wire connections
Check for presence of a sufficient signal current

Relay switches but no power comes to output pins/terminals

Check there is a strong power source at the power-in terminal of the relay
Check output connections
Check contact alignment of relay, if visible
Check fuse on power circuit from battery

TF2550KIT Caravan Conversion 99

If your customer's car has a factory-fitted 13-pin socket that he/she wants to retain and a caravan with pre-1999 wiring, you can't really modify the car without risking future problems. You can, however, use a simple kit to modify the caravan.
This kit installs a changeover relay (shown) in the caravan on the 12S circuit.

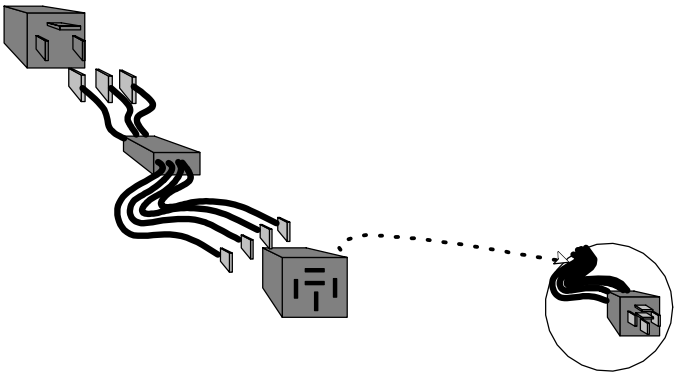


Green and blue are cut. The blue lead from the plug is discarded but the remaining blue lead to the caravan battery is fitted with a receptacle and connected to pin 87

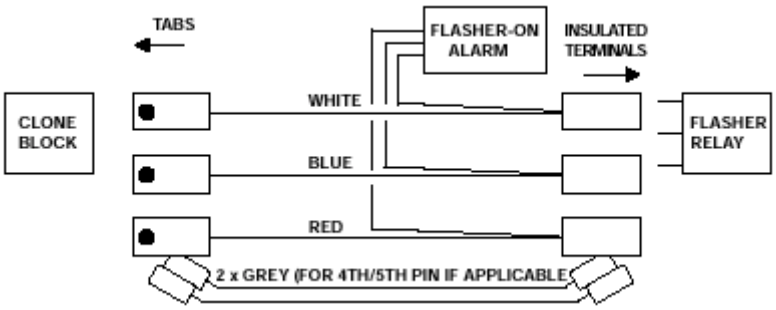
Driver's Audible Relay

TF2560 "Flasher-On" Alarm with Clone Universal Adaptor
Warns driver when flasher has been left on by mistake.

Fitting Instructions
For vehicles with conventional three, four or five pin flasher relays
12 volt, negative earth.



Locate the flasher relay.
Switch off the ignition.
Remove the vehicle flasher relay from its carrier (in fuse box etc.)
Insert the tabs on the wires into the clone block so that the protruding blades exactly match the tabs of the vehicle flasher relay. (Be careful not to "mirror-image" them.)



Push the insulated terminals of the blue, red and white wires onto the tabs (flat pins) of the flasher relay following the order shown in the chart below. If the flasher relay has more than three tabs use the grey wire(s) to link these tabs to the clone block to reproduce exactly the pin-out pattern of the relay.

Wire colour	Function	Pin Marking
White	Earth on Flasher	31, E, -
Blue	Supply	49, B, +, 15
Red	Indicator switch	49a, L, C. Com, 54L

Push the completed Clone into the place vacated by the flasher relay, stow the relay in a suitable adjacent space and fix the flasher-on sounder in a suitable place so that it will be audible.
Switch on the ignition and the flashers (left or right). After approximately 30 seconds the flasher-on alarm will begin to sound.

Appendix 1: Complex wiring

Basic Principles of Multiplex Wiring Systems

The multiplex system used on vehicles has a large supply cable running around the vehicle. Connected to this are electrical system units i.e. relays, lamps, actuators, motors and other electrical equipment. By use of a coded digital signal, either electrical or optical transmitted around a second cable known as a data line or "bus", the electrical system units can be made to operate.

Fitted to each consumer unit is a decoder, which recognises when a given signal is being transmitted along the data bus. On receipt of the message by the decoder following the recognition of its call-up code, a relay is operated by the decoder as instructed and thus the consumer unit is actuated. One data bus can carry a number of messages: this is done by allocating a time slot for each instruction. The process for dividing the time is known as time division multiplexing (MUX).

Since each burst of data is sent many times a second, the response of the system appears to be instantaneous as far as the driver is concerned, just as if the switches were wired directly to the electrical system units.

A practical multiplex system would incorporate many sending and receiving units, located at strategic points around the vehicle, all connected to the same data bus.

Because the signal current needed to operate a multiplex system is very low (10 mA) good connections are important. Furthermore, precautions must be taken to reduce electrical noise (interference) in the line, since this can interfere with the digital signals in a manner that would affect the operation of the system. Fibre optic cables are unaffected by electrical fields especially those radiated from HT ignition systems.

The additional cost of multiplex systems, along with design conservatism, has meant that relatively few systems have reached the market and multiplexing has tended to be confined to just part of electrical system such as door sub harnesses. This situation appears to be changing, with many manufacturers introducing multiplexing elements into an increasing range of models.

Advantages of multiplexing

- Wiring harnesses are small and simpler providing a saving on cost and weight.
- Faster harness installation time.
- Reliability through the reduction in the number of wires being used.
- Self-diagnosis can be built into the system.

Detecting multiplex systems

Tell-tale signs are not obvious but multiplex junction boxes typically have few (e.g. three) wires going in, including at least one thick one, and many coming out to feed the various devices. Experience tell that identifying multiplexing is not at all simple. Some vehicles have junction boxes with large numbers of wires coming out in all directions. One Honda Accord model had partial multiplexing which is virtually undetectable, despite being quite critical to towbar fitters.

Can you tap into the multiplex feed wire?

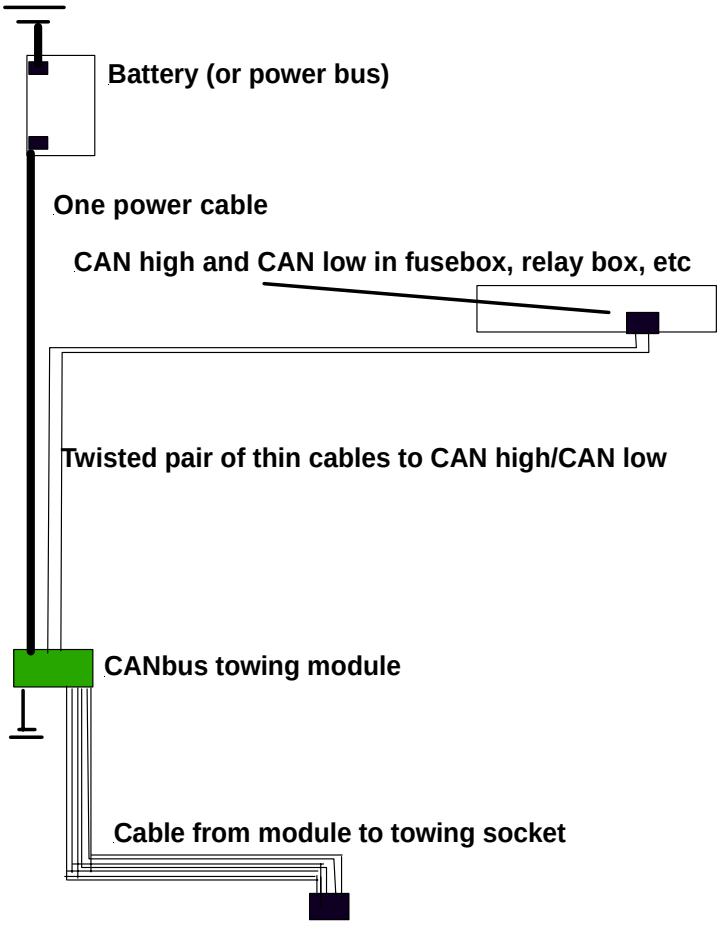
There will be a thick power feed wire associated with any multiplex system. It is unwise to tap into this feed wire as a source of power for bypass relays, because of the likelihood of interfering with the multiplex signalling and this fact should be taken into account by any fitter looking for a suitable power source other than the battery.

CANbus systems

CANbus is becoming increasingly common on today's vehicles, and will become more common as the technology matures and reduces in cost.
Although "Smart" bypass relays will still be applicable to most vehicles with CANbus controlled rear lights, CANbus-dedicated towing kits may be required in certain cases. For example, vehicles with a trailer stability program (an extension of electronic stability control) may need to recognise the attachment of a trailer. This would require a towing module that communicates with the CANbus network

Because connection to the CANbus network usually requires only two wires, installing properly designed CANbus relays is not particularly difficult, once the fitter has gained some practice. The schematic below illustrates this.

Fitting a CANbus module is relatively simple



Appendix 2: General Information

Ryder Standard Colour and Terminal Codes

The following colour, letter and number code governs all wires and terminals on our 12N relays. The colours and numbers are based on the familiar 12N colours and numbers. (* Except TF2100, Clones)

Relay terminal number	**Relay terminal letter** (TT2217 series etc)	**Relay input wire**	**Relay output wire**	**Relay application**
1	A	Yellow	Yellow	Lh indicator
2	F	Blue	Blue	Fog
0V	-	White	White	Earth
4	B	Green	Green	RH Indicator
5	E	Brown	Brown	RH Side light
6	D	Red	Red	Brake light
7	E	Black	Black	LH Side light
+12V	-	Orange	Orange	Power feed in
TT	-TT	Pink	Pink	Telltale (Buzzer, etc.)

Thirteen Pin Wiring Codes

Note: Pins 1 to 7 as 12N.		
Pin 8	Reversing light	Yellow
Pin 9	Constant live	Green
Pin 10	Ignition-controlled power supply	Red
Pin 11	Earth (for pin 10)	Black
Pin 12	Coding for coupled Trailer	None
Pin 13	Earth (for pin 9)	White
	Cut off Blue and Brown	

Appendix 3: General Fitting Instruction, 12N relays and monitors

Before you start

- **Examine the car carefully** to see that all electrical circuits are working correctly and that no warning lights are showing.
- **Decide whether to disconnect the battery**. Take into account:
  - Would disconnection disrupt memory circuits, etc? (You may need a device to keep memory circuits safe.)
  - Can you make your electrical connections safely with the battery connected?

Installation

1. Find a suitable entry point or drill a 12mm hole in a suitable place reasonably close to the socket mounting point on the towbar. (Take great care to ensure that you drill in a safe place where you will not damage wires, pipes, bodywork, etc.) Treat the edges of the hole with a rust inhibitor and line it with the grommet provided.
2. Wire the trailer socket, as shown in **Chart A** and mount it on the towbar. Lead the 7-core cable into the boot through the entry point. Make sure the cable is a snug fit in its grommet to prevent fumes coming into the car.
3. Use a suitable probe tester to identify which wire feeds each rear lamp.

If you need to take a power source for a bypass relay, etc.

4. Route your power source cable(s) from the boot to the battery. Fit a fuse in line in the cable, close to the battery. Do not connect yet.
5. When routing the cable, take care to route it where it will not be cut or crushed. Pay particular attention to points where the cable passes through bulkheads, etc.

In all cases

6. Follow the instructions in **Chart A** and connect together your 7-core cable, your relay(s) and/or monitor and the appropriate wires in the vehicle loom.
9. If applicable, connect your power cable to the battery and insert the fuse provided. Check that the fuse is of the correct value.
10. Use a suitable test board to test the circuits. Make sure any "Tell-tale" warning light or buzzer is working correctly.

Chart A

Socket pin number	7 core cable colour	to	Relay wire colour or terminal number	Relay wire colour or terminal number	to	Vehicle circuit
•						
1	Yellow	to	Yellow	See relay instr.	to	LH flasher
2	Blue		Direct	Direct*		Fog lamp
3	White	to	Chassis	White	to	Chassis earth
4	Green	to	Green	See relay instr.	to	RH flasher
5	Brown		Direct	Direct*		RH tail light
6	Red		Direct	Direct*		Brake lights
7	Black		Direct	Direct*		LH tail lights
-	-		-	N/A		Power (battery)

Unless you are connecting a bypass or fog cut out relay.

Essential Towbar Checklist
Booking in

Name: **Date:**
Address: **Advert:**
Contact Number:

Customer Signature: **Quoted price:**
Our Signature:

Insurance note: Cover against loss or collision remains the responsibility of the owner at all times.

Details of the vehicle	Make			Model			
Tax Date: Disc Number:	Reg No			Plate No			
Alarm	Key No:			Immobiliser:			
Electrical requirements:	Single		Double		Towball		Tow jaw	

Arrival and departure checks

Conditions of vehicle	**On arrival**	**On departure**

Item	On arrival	On completion	Comment
Reverse lights			
Tail lamps			
Number pl. lamps			
Brake lamps			
Fog lamp(s)			
Indicators/repeaters			
Hazard-warning			
Wipers. Front Rear			
Interior light			
Fuel Gauge			
Radio			
Clock			
Flasher unit			
Bulb warnings			
Spare wheel			
Jack			

Appendix 5: Quality Assurance

Name:	**Date:**
Vehicle make/model:	**Reg number:**

QUALITY ASSURANCE STATEMENT – TOWBAR ELECTRICAL INSTALLATION

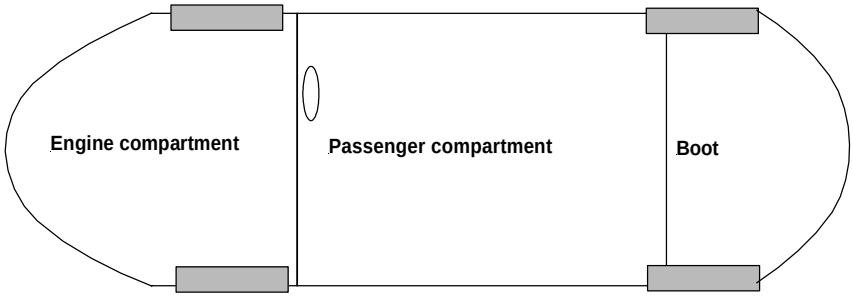
As part of your Towbar electrical installation, we have fitted certain Ryder guaranteed relays and monitors. This document gives you details. Please store it with your vehicle handbook.

Type of flasher or monitor fitted		**Function**	**Location**	**Fuse Value**	**Maintenance required**
Part No.	Description				
		Tells you if your trailer's direction indicators (flashers) are working		None	None
Bypass relays		Switch power from the battery direct to trailer road light circuits below			Check in-line fuse if trailer lights fail
Part No.	Description				
		Side Lights			None
		Brake lights			None
		Flashers			None
		Fog lights			None
		Reverse light			None
Caravan Relay					
Part No.	Description	Controls caravan fridge and charging of caravan battery		**Maintenance required**	
				Check in-line fuse routinely or if the caravan auxiliary supply fails. (Check for constant live at 12S socket pin 4.)	

Relays and monitors made and supplied by *Ryder Towing Equipment Ltd*

Installed by:

Where the fuses and relays are located



Contacting Ryder Towing

Contact us for sales or technical advice:
Phone: 0161 430 1120
Fax: 0161 430 8140
Email: sales@rydertowing.co.uk,
info@rydertowing.co.uk
tech@rydertowing.co.uk

Terms Of Trade

Accounts should be settled within 30 days of invoice date.
All goods supplied by Ryder Towing Equipment Ltd shall remain the property of Ryder Towing Equipment Ltd until the customer has paid the agreed price together with all other monies owed by the customer to Ryder Towing Equipment Ltd.

All prices are exclusive of V.A.T.

CARRIAGE INLAND EXCEPT SCOTTISH HIGHLANDS AND ISLANDS.

Our minimum carriage paid trade order is £300.00 plus V.A.T.
Orders below this value will be subject to a carriage charge at the lowest appropriate rate being charged to us.
Otherwise by arrangement

An insurance charge of £2.00 will be applied to each consignment.

GUARANTEE
Our guarantee extends only to the replacement of faulty goods. It does not include charges for labour supplied by others.

We reserve the right to alter our prices without notice.

The Practical Guide to Advanced Towbar Electrics 2006

Ryder Towing Relays and Monitors and when to use them