

# TOWBAR WIRING

This leaflet is prepared as a Club service to members. Previous versions of it were titled 'Wiring a Vehicle For Trailer Towing'. The contents are believed correct at the time of publication. Please raise any queries with the Club's Information Department

October 2006

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## 1. Scope

This leaflet describes the wiring additions to a towing vehicle to make it suitable for towing. It is based on current UK practice, and on the relevant British and international standards, including the changes resulting from the introduction of European Standards for caravans from 1 September 1998. It is not intended as a set of installation instructions for tow bar wiring, and should not be used as such. Its purpose is:-

- to provide advice in the correct specification of a tow bar wiring system
- to allow an already-installed system to be checked for correctness
- to diagnose common faults and problems in service

## **2. Introduction**

Before a vehicle can be used for towing, it is necessary to fit a towing bracket, (probably) modify the direction indicator system and install the necessary socket(s) to power the caravan or trailer's road lights and any internal auxiliary equipment. In the past, this was commonly considered a straightforward task for a competent DIY person. In recent years, however, the increasing complexity of vehicle electrical systems has made it increasingly difficult to obtain and interpret the technical information necessary to ensure that the required connections are made in a correct and safe manner.

Some vehicles could be seriously damaged by the use of an 'off the shelf' tow bar wiring kit – with some others, the additional wiring would simply not work properly without extra components. Keeping up with this topic as new and revised models of vehicle are launched is a demanding task, and is certainly one which the Club does not have the resources to do. Do check with your intended manufacturer, retailer or fitter of the system, therefore, before making a final selection. If they are unfamiliar with the characteristics of your particular vehicle, it may be best to look elsewhere. For this reason, the Club recommends professional fitting, preferably by a specialist installer.

Even if you do the work yourself, some fitting centres will check it over for you, especially if you have bought the towing bracket or other components from them.

Note: Choosing a tow bar is discussed in the leaflet 'Choice of Towing Bracket'.

## **3. Which System Do You Need?**

There have been several variations in the wiring standards used for towing vehicles and caravans over the years. Which system you need depends mainly on the age of the caravan you are planning to tow, and to some extent on where the caravan was made:-

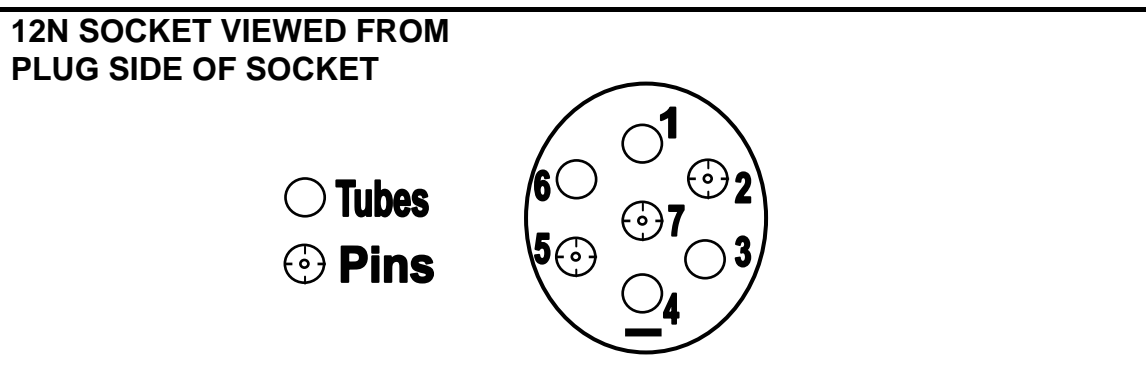
- Caravan built before 1 October 1979 – Towing vehicle needs a single 12N seven pin socket. See Section 3.1.
- Caravan built between 1 October 1979 and 31 August 1998 - Towing vehicle needs both 12N and 12S seven pin sockets. See Section 3.2. Note that some caravan manufacturers adopted changes to the 12S system prior to their formal introduction from 1 September 1998. Check carefully (via the handbook or dealer) the precise specification of 1997 and pre-September 1998 models.
- Caravan built since 1 September 1998 - Towing vehicle needs both 12N and 12S seven pin sockets, but with modified 12S wiring. See Section 3.3.
- Some Continental caravans, particularly if privately imported, or commercially imported in small numbers only - Towing vehicle needs a single 13 pin socket. See Section 3.4. An increasing number of towing vehicles are being fitted with 13 pin sockets as standard. Section 3.4 also describes this layout for these owners.

### 3.1 Pre-October 1979 Caravans

Few of these remain in their original specification now. Most caravans of this era were built with only a single black 7-pin plug ('12N' ie '12 volt, normal'), which was adequate as they tended not to have reversing lights, rear fog lights, internal auxiliary batteries that required charging, nor fridges which could run on 12V. By the end of the 70s, such features were becoming available, and in the case of rear fog lights, became compulsory for new trailers from 1 October 1979. This meant there were no longer sufficient circuits available on one 7-pin plug, and caravans made after this were therefore fitted with twin plugs (see next section). Note a pre-October 1979 caravan with twin plugs fitted will probably have been modified from its original specification. It is prudent to check that this was done correctly before attaching it to your vehicle.

For an unmodified caravan, your vehicle needs a single 12N socket, wired as follows:-

#### 12N Socket To Suit Pre-October 1979 Caravans



TERMINAL	COLOUR	12N SOCKET
1	Yellow	L H Indicator
2	Blue	Interior Lights etc
3	White	Return (Earth)
4	Green	R H Indicator
5	Brown	R H Tail Light
6	Red	Stop Lights
7	Black	L H Tail Light & Number Plate

#### Notes

The power supply to the caravan via pin 2 is usually wired as permanently live, whether the vehicle engine is running or not. This enables 12V lights and water pump to be powered from the towing vehicle while on site, without requiring an auxiliary battery in the caravan. This means this system is inappropriate for running a 12V fridge, or charging a caravan battery, for the reasons given in Sections 3.5.13 and 3.5.15 below.

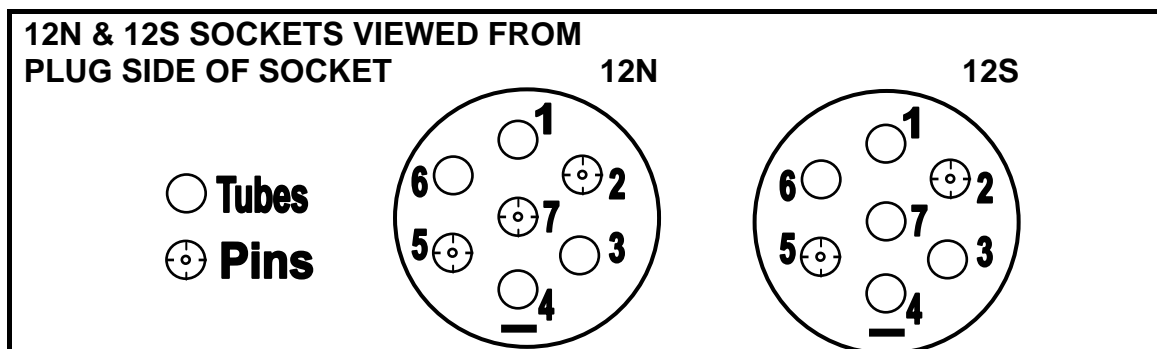
Except for the pin 2 connection, which was common practice, not a formal specification, sockets wired according to this description would comply with the now-superseded British Standard BS AU 149.

Note that currently-available wiring kits will need to be modified to give this configuration, as far as the pin 2 connection is concerned.

### **3.2 October 1979 to 31 August 1998 Caravans**

The bulk of caravans fall into this category. They are fitted with two 7-pin plugs (12N and 12S, 'supplementary'). The 12S plug is coloured grey or white to distinguish it from the 12N one, and the associated socket has a cover flap in grey or white. The arrangement of pins and tubes is also different to prevent accidental connection of the wrong plug to the wrong socket. The 12N system now contains all of the legally-required trailer road light circuits. The 12S system includes reversing lights (not currently a legal requirement on trailers), plus the various auxiliary power connections required by most modern caravans. Strictly speaking, you only need to have the 12N system functioning to tow a caravan legally. However, most owners use at least some of the 12S circuits, so the required towing vehicle wiring is as follows:-

#### **12N & 12S Sockets To Suit October 1979 to 31 August 1998 Caravans**



TERMINAL	COLOUR	12N SOCKET	12S SOCKET
1	Yellow	L H Indicator	Reversing Light(s)
2	Blue	Fog Light(s)	Caravan Battery Charging (Ignition Controlled Supply)
3	White	Return (Earth)	Return (Earth)
4	Green	R H Indicator	Interior Lights Etc (Permanent Supply)
5	Brown	R H Tail Light	Sensing Device
6	Red	Stop Lights	Fridge (Ignition Controlled Supply)
7	Black	L H Tail Light & Number Plate	Not Used

#### Notes

The supplies to 12S pins 2 and 6 must be installed such that they are live only when the vehicle engine is running (see Sections 3.5.13 and 3.5.15 below).

The supply to 12S pin 2 for caravan battery charging has been customary practice in the UK for many years. However, it has never been adopted into a British or other standard for tow bar wiring. It is, therefore, frequently ignored by vehicle manufacturers in their wiring kits.

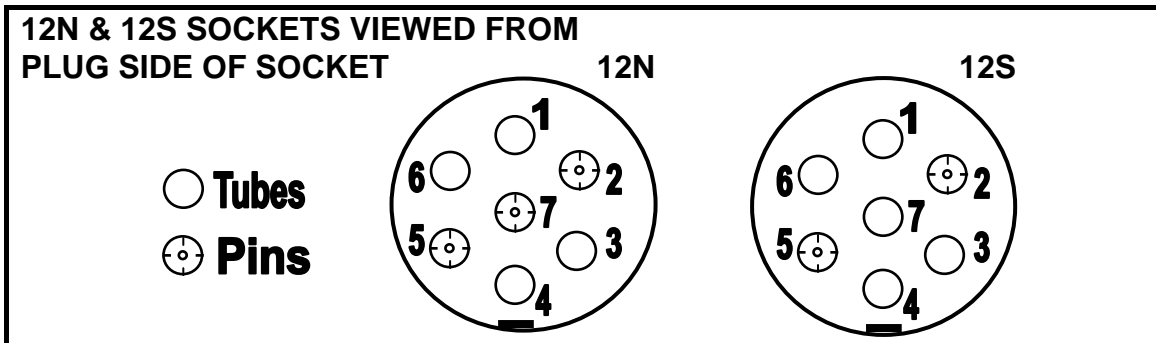
See section 3.5.16 for advice regarding 12S pin 2 if towing a continental-built caravan.

With the exception of the 12S pin 2 connection as mentioned above, sockets wired according to these specifications will comply with British Standard BS AU 149a (12N) and BS AU 177a (12S). These standards are effectively identical to International Standards ISO 1724 (12N) and ISO 3732 (12S).

### **3.3 1 September 1998 And Newer Caravans**

These are built to European standards, one of which defines the 12V wiring, and results in changes to the 12S system. (The 12N system remains the same.) An extra earth acts to separate the fridge power supply from other circuits, minimising the risk of overloading the return wire when several circuits are used together. Battery charging is officially included, but via pin 4, not pin 2, as was usual practice in the UK before, but never included in previous standards. Pin 4 also operates interior lights etc, but not at the same time as battery charging. Switching to achieve this is done in the caravan.

#### **12N & 12S Sockets To Suit 1 September 1998 And Newer Caravans**



TERMINAL	COLOUR	12N SOCKET	12S SOCKET
1	Yellow	L H Indicator	Reversing Light(s)
2	Blue	Fog Light(s)	Sensing Device
3	White	Return (Earth)	Return (Earth) For Pin 4
4	Green	R H Indicator	Interior Lights etc or Caravan Battery Charging (Permanent Supply)
5	Brown	R H Tail Light	Not Used
6	Red	Stop Lights	Fridge (Ignition Controlled Supply)
7	Black	L H Tail Light & Number Plate	Return (Earth) For Pin 6

#### Notes

The supply to 12S pin 6 must be live only when the vehicle engine is running (see Sections 3.5.15 below).

12S pins 3 and 7 should not be joined together at the socket. They should be taken separately to an earth point on the vehicle structure. Failure to do may result in overheating of the 12S plug and socket.

12S pin 4 must be permanently live for both battery charging and interior light etc functions to operate. The fridge circuit must work correctly for switching of the pin 4 supply between these functions to occur.

At the time of writing, the standards for vehicle wiring have not been updated to match the latest caravan wiring standard. The above specification complies with British Standard BS AU 149a (12N) and the effectively identical International Standard ISO 1724. BS AU 177a and ISO 3732 (12S) do not yet include the earth via pin 7, and hence this connection may be omitted by some makers and installers.

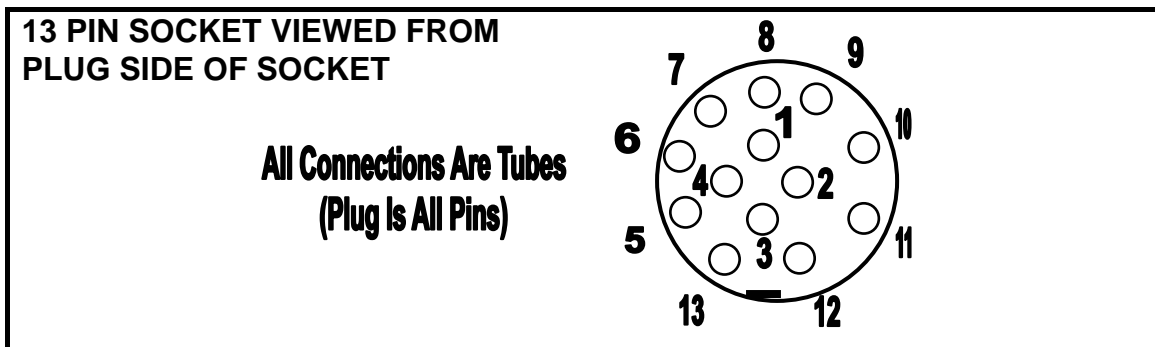
See section 3.5.16 for advice regarding 12S pin 2 if towing a continental-built caravan.

### **3.4 Some Continental-Built Caravans** **Some Towing Vehicles With Manufacturer-Supplied Tow Bars**

A single 13 pin connector is an alternative to the twin 7 pin system. This is used mainly on the continent, and hence may be seen on imported caravans, although most are either built with 7 pin plugs, or are modified to use them on arrival in this country. Models sold in very small numbers, or caravans imported privately, are most likely to have a 13 pin plug. Owners may wish to alter such caravans to the 7 pin system. For use without modification, the towing vehicle will need a single 13 pin socket as below.

It is more likely that this system will be found on the towing vehicle, as several vehicle makers have adopted it as standard. Again, many owners may prefer to change to twin 7 pin sockets. To use the 13 pin socket, however, it should be wired as below:-

#### **13 Pin Socket To Suit Some Continental Caravans & As Fitted To Some Recent Towing Vehicles**



<b>TERMINAL</b>	<b>13 PIN SOCKET</b>	<b>TERMINAL</b>	<b>13 PIN SOCKET</b>
1	L H Indicator	8	Reversing Light(s)
2	Fog Light(s)	9	Interior Lights etc or Caravan Battery Charging (Permanent Supply)
3	Return (Earth) For Pins 1 To 8	10	Fridge (Ignition Controlled Supply)
4	R H Indicator	11	Return (Earth) For Pin 10
5	R H Tail Light	12	Sensing Device
6	Stop Lights	13	Return (Earth) For Pin 9
7	L H Tail Light & Number Plate		

#### Notes

The supply to pin 10 must be live only when the vehicle engine is running (see Section 3.5.15).

Pins 3, 11 and 13 should not be joined together at the socket. They should be taken separately to an earth point on the vehicle structure. Failure to do may result in overheating of the plug and socket.

Pin 9 must be permanently live for both battery charging and interior light etc functions to operate. The fridge circuit must work correctly for switching of the pin 9 supply between these functions to occur.

This system meets International Standard ISO 11446, and may also be referred to as 'Jaeger'. At least one other 13 pin system exists ('Multicon'), but is not a recognised standard, and is unlikely to be found.

See section 3.5.16 for advice regarding pin 12.

No colour convention for the wiring is defined in this standard.

### **3.5 General Design Points**

#### **3.5.1 Wire Specifications**

Specially-designed multi-core cables are available, and it is recommended that these are used. 12N cable has black outer insulation, and contains 7 wires (or 8 – see Fog Light section 3.5.9). 12S cable is grey or white, and also contains 7 wires. 13-core cable is available for use with 13-pin sockets. Each wire within these should be an appropriate cross-sectional area for its designated purpose, and where applicable should preferably be to the conventional colour codes indicated earlier. Note that vehicle makers do not always follow the conventional colour coding in their wiring kits.

CIRCUIT	CLUB RECOMMENDED MINIMUM WIRE SIZE <small>Note 4</small>		
	12N	12S	13-Pin
Indicators Fog Light(s) Tail Lights Stop Lights	1mm <sup>2</sup> 14 strands, 0.3mm dia. Current capacity 8.75A		1.5mm <sup>2</sup> 21 strands, 0.3mm dia. Current capacity 13.0A
Reversing Light(s) <small>Note 1</small>		1.5mm <sup>2</sup> 21 strands, 0.3mm dia. Current capacity 13.0A	1.5mm <sup>2</sup> 21 strands, 0.3mm dia. Current capacity 13.0A
Interior Lights etc		1.5mm <sup>2</sup> 21 strands, 0.3mm dia. Current capacity 13.0A	2.5mm <sup>2</sup> 36 strands, 0.3mm dia. Current capacity 21.5 A
Caravan Battery Charging <small>Note 2</small>		1.5mm <sup>2</sup> 21 strands, 0.3mm dia. Current capacity 13.0A	
Fridge <small>Note 3</small>		1.5mm <sup>2</sup> 21 strands, 0.3mm dia. Current capacity 13.0A	2.5mm <sup>2</sup> 36 strands, 0.3mm dia. Current capacity 21.5 A
Sensing Device		1.5mm <sup>2</sup> 21 strands, 0.3mm dia. Current capacity 13.0A	1.5mm <sup>2</sup> 21 strands, 0.3mm dia. Current capacity 13.0A
Return (Earth)	2.0mm <sup>2</sup> 28 strands, 0.3mm dia. Current capacity 17.5A	White wire (pin 3):- 2.5mm <sup>2</sup> 36 strands, 0.3mm dia. Current capacity 21.5 A  Black wire (pin 7):- 1.5mm <sup>2</sup> 21 strands, 0.3mm dia. Current capacity 13.0A	3 wires, each:- 2.5mm <sup>2</sup> 36 strands, 0.3mm dia. Current capacity 21.5 A

#### Notes

1. The larger gauge wire does not indicate a higher power demand than the other road lights, but merely results from the use of a larger standard size (1.5mm<sup>2</sup>) cable in the 12S cable.
2. The use of a larger section wire (eg 2.5mm<sup>2</sup>) would be advantageous to give more reliable battery charging, due to a reduced voltage drop along the charging wire.
3. The rating of the 'standard' wire is barely adequate for the fridge power supply. Better performance will be gained by up-rating this wire, with fridge manufacturers normally suggesting 2.5mm<sup>2</sup>, or even 4mm<sup>2</sup>, particularly if the supply powers a large fridge or fridge/freezer. Instead of running an additional separate wire to achieve this, it may be easier to combine the existing wire with an unused core in the 12S or 13 pin cable. Note that by doing this, however, the cable becomes non-standard, so check carefully that doing so will not interfere with other connections in your towing vehicle or caravan.
4. Not all installations follow these recommendations. While the Club believes these represent 'best practice', this does not mean that alternative specifications will not work adequately.

### **3.5.2 Connector Advice**

Road light circuits are often connected to the main wiring loom of the towing vehicle via a multiway plug and socket in the boot. Independent (ie non-vehicle manufacturer supplied) wiring kits may not use this connection, and individual connections will need to be made, as will be the case for several of the supplementary circuits.

Some wiring kits include snap-lock type connectors (eg 'Scotchlok'), which are quick and cheap, but do not necessarily result in a secure, effective joint. Crimp connections, soldered joints, screw connectors or professional-type plug-in connectors are a better alternative for long-term reliability.

### **3.5.3 Circuit Layout**

Wiring between the main vehicle loom and the sockets should be hidden neatly behind trim panels, load area carpeting etc, so that it is protected. Cables should be kept to the shortest practical length to minimise voltage drop problems, but with sufficient excess to allow sockets etc to be readily removed for inspection or maintenance.

### **3.5.4 Socket Positioning**

Sockets should be accessible without undue difficulty, and adjacent to the tow ball. Unusual locations (eg under the bumper, or offset too far to the side) may result in the caravan cables either not reaching, or hanging too low and hitting the road.

### **3.5.5 Bulb Failure Monitors**

Many towing vehicles use monitors to detect the failure of key road light bulbs. Tow bar wiring should be installed so as to retain the operation of these devices. Clear fitting instructions or a skilled installer may be necessary to ensure this is the case.

### **3.5.6 Fuses**

Road light circuits will already be protected by fuses, but additional circuits which are added by fitting tow bar electrics should include their own protection. Fuses may be 'in-line' (which look similar to domestic mains fuses) in cylindrical holders, or vehicle-type blade fuses. While both are acceptable, the blade type tends to give a better, more reliable contact. It is recommended that the individual supplies to the fridge, battery charging and interior light etc circuits are protected by separate fuses, typically of 15A rating. There will also be a main power supply taken from the vehicle battery from which these individual supplies are derived, and that should typically have a 25A rating fuse. Do not change any fuse to one of a different rating without confirming the acceptability of such a change with the supplier or installer of the system.



### **3.5.7 Multiplexed Wiring**

A small but growing number of vehicles are fitted with multiplexed wiring, either throughout the vehicle (eg Jaguar) or in certain sub-systems only (eg Peugeot). Such systems use individual wires for more than one purpose, and hence can be awkward to connect tow bar wiring to. Incorrect fitting may cause extensive and expensive harm. Extreme caution is advised before using an off the shelf wiring kit with such vehicles, and seeking the advice of an experienced fitter is recommended. Check with your vehicle manufacturer or dealer if unsure whether your vehicle includes such wiring.

### **3.5.8 Indicator Circuits**

It may be necessary to fit a heavy-duty indicator relay to operate the additional caravan flashers without overloading the standard unit, or affecting its flashing rate. It is also a legal requirement that the towing vehicle 'shall be equipped with an operational tell-tale for front and rear indicators (including any rear indicator on the rearmost of any trailers drawn by the vehicle)' (Road Vehicle Lighting Regulations, 1989.) This tell-tale can be an audible or visual device. Some show the correct functioning of the indicators, perhaps via an instrument panel light or boot-mounted buzzer which signals in time with the flashers. Others operate by altering the standard flasher function to an alternative 'warning' signal if a fault is detected in the circuit. Note that this tell-tale function is sometimes neglected when the tow bar wiring is fitted – this is illegal.

### **3.5.9 The Fog Light(s) Circuit**

One or two rear fog lights may be fitted – at least one is a legal requirement for caravans and other trailers built since 1 October 1979. Many owners find the reflection of the towing vehicle's rear fog light(s) off the front of the caravan a distraction, and to avoid this, it is acceptable to disconnect the towing vehicle's fog light(s) while towing, as long as the trailer ones still function. This can be done via a mechanical switch built into a suitably-equipped 12N socket, and operated by the insertion of the 12N plug. This system uses the extra wire in an 8-way 12N cable, or a separate wire can be used. An alternative is to fit a fog light cut-out relay, which senses power going to the caravan fog light, and automatically turns off the towing vehicle's one(s).

### **3.5.10 The Tail Light Circuit**

Power for the illumination of the caravan number plate is also taken from this circuit, along with power for front and side marker lights, if fitted.

### **3.5.11 The Stop Light Circuit**

High-level stop (brake) lights are not required to be fitted to caravans, but if installed will operate from this circuit along with the main stop lights.

### **3.5.12 The Reversing Light Circuit**

This circuit is not currently a legal requirement for caravans and trailers, but all modern caravans have reversing lights, and hence the use of this circuit is recommended.

### **3.5.13 The Caravan Auxiliary Battery Charging Supply**

Most modern caravans are fitted with an auxiliary battery, which will often be charged via a mains charger while on site. If touring away from mains power, however, the facility to recharge the caravan battery from the towing vehicle while travelling is very useful. It is important, however, that charge is not taken from the towing vehicle battery to top up the caravan one, or else there may be insufficient charge left to restart the engine. To avoid this situation, the battery charging circuit is an 'ignition-controlled' power supply from the towing vehicle ie charging only occurs while the towing vehicle engine is running. This may be achieved either by using a relay activated by the output of the alternator of the vehicle, or by means of a voltage sensor which detects the change in voltage in the towing vehicle circuits when the engine starts, and which then turns a relay on. A further reason to connect the circuit in this way is that it avoids the risk of the towing vehicle's engine attempting to start from the caravan battery, if its own battery were to have failed. Such a situation could otherwise result in damage to both the caravan battery and the wiring throughout the outfit. The precise connections of the circuits to achieve this function vary from vehicle to vehicle, and hence are beyond the scope of this leaflet.

Some owners like to be able to recharge their caravan battery in the boot of the towing vehicle, perhaps while out on a day trip with the caravan left on site. To do this, an additional wire from the battery charging supply, plus an earth connection, can be run to appropriate battery terminals (not crocodile clips, which are insufficiently safe) in the boot. Do make sure that the battery is safely located, cannot fall over, and that the boot is well ventilated. Do not use this facility to recharge batteries in both the caravan and the boot of the towing vehicle simultaneously.

### **3.5.14 The Interior Lights etc Circuit**

This circuit is permanently live. Historically, this allowed the interior lights and water pump to be powered by the towing vehicle while on site, thus avoiding the need for a dedicated caravan battery. This practice is virtually unknown now, but the facility is useful while travelling, or in the event of the caravan battery running down. This circuit is also used to provide caravan battery charging on recent caravans (see above).

### **3.5.15 The Fridge Power Supply**

Most caravan owners use the facility to power their caravan fridge from the towing vehicle while travelling, thus keeping the fridge cool during the journey. Since the fridge is a relatively high-powered device the towing vehicle battery needs to be protected against being drained by the caravan fridge, if the towing vehicle engine is not running (while parked, or on a ferry, say). This is done by connecting the fridge circuit to an 'ignition-controlled' power supply from the towing vehicle. This may be achieved either by using a relay activated by the output of the alternator of the vehicle, or by means of a voltage sensor which detects the change in voltage in the towing vehicle circuits when the engine starts, and which then turns a relay on. The precise connections of the circuits to achieve this function vary from vehicle to vehicle, and hence are beyond the scope of this leaflet.

### **3.5.16 Sensing Device**

The wiring standards for 12S and 13 pin systems include provision for a ‘sensing device’. This is intended to allow the towing vehicle to detect that a trailer is present, and thus make any appropriate adjustments (eg turn off towing vehicle fog lights; adjust engine/gearbox settings etc). The Club is not currently aware of any towing vehicle which uses this facility, and hence this circuit can usually be ignored. The exception is if towing a continental-built caravan. In this case, ensure that neither 12S pin 2 nor 12S pin 5 in the caravan is connected to earth. If it is, then a dead short may occur, blowing a fuse or causing damage to the circuits. To avoid this, disconnect the relevant circuit in either the caravan or towing vehicle before hitching up. No such possible conflicts should occur with UK-built caravans, nor if using a 13 pin connector.

### **3.5.17 Earths**

Each circuit is completed via a ‘return’ or ‘earth’ connection. Unlike most towing vehicles, the chassis or body of the caravan is not used to provide the earth path – instead discrete wires are used. Since several circuits often share the same earth wire, these wires need to be able to handle quite high currents when several devices are operating simultaneously. As the number and power of devices in caravans has increased over the years, the relevant standards have added extra earth connections to ensure that these wires are not overloaded. To allow this to work effectively, it is essential that these wires are not connected together, either in the caravan, or within the towing vehicle, until they are attached to an earthing point on the body of the towing vehicle. Joining earth wires in the 12S socket, say, or elsewhere can result in local sections of the circuit (particularly the 12S plug and socket) overheating and failing.

### **3.5.18 Adapters and Extensions**

Most commonly needed is an adapter lead which connects to a towing vehicle’s single 13 pin socket, and the caravan’s two 7 pin plugs. Such leads are sometimes included when the towing vehicle is bought, or may be an ‘extra’ available through the vehicle dealer, often at a significant price. Alternative leads are obtainable from larger accessory shops, or from component specialists. Many owners may prefer to have the 13 pin socket replaced with 7 pin ones, however, assuming it is practical for this to be done. The use of an adapter lead can make the caravan connections too long, and there is a risk of them dragging on the ground while travelling. Make sure that any such adapter lead includes all of the required wires for your caravan.

With a few vehicles with unusually positioned sockets, it may be necessary to use short extension leads in order to get the caravan leads to reach. Again, these (or the components to make them up) are available from good accessory suppliers.

Finally, a longer extension (typically 3m) may be used to link the towing vehicle to the caravan while on site, so that appliances can be powered from the towing vehicle battery instead of the caravan’s one. For most caravans, this will be a 12S extension – for some of the older ones it would be a 12N extension (see Section 3.1).

#### **4. DIY vs Professional Fitting**

As stated earlier, DIY fitting of tow bars and wiring is much less common than it once was. If you choose this route, however, check the following points first:-

- Use only good quality, new parts – they shouldn't let you down while on holiday.
- Make sure you know the specification of your towing vehicle before you start – eg does it have bulb failure monitors, multiplexed wiring etc?
- Take advice from your supplier regarding unusual features of your vehicle – they should have such details, and if not, can you trust them to sell you the correct kit?
- Most vehicle dealers offer only a full 'supply and fit' service, and few know much detail about tow bar wiring anyway. By all means ask for advice, but don't expect detailed help. They should confirm if multiplexed wiring is used or not, however.
- Try to see a copy of the fitting instructions before you buy. This is not always possible, but can give a useful indication of how easy or difficult a job will be.
- Check everything as you fit it, and check it all again before you first power up and hitch to the caravan. Remember that any damage resulting from any fitting errors will be your responsibility, and your vehicle warranty etc will not cover it.

If you have the wiring fitted for you, there is a choice between using a vehicle dealer or an independent specialist.

Vehicle dealers do not fit tow bars and wiring everyday, so they may be relatively inexperienced at it. Make sure they understand what you expect from the wiring system (use the specifications from Sections 3.1 to 3.4, if need be). Generally, few problems result from the 12N system (or the 12N 'half' of a 13 pin system). Frequent problems arise with the 12S circuits, however, with circuits either missing entirely, or not being correct (eg permanently live when it should be ignition-controlled). You may not get much choice of system at a dealer either – 13 pin electrics and a swan-neck style tow bar do not suit all caravanners! The advantage of a dealer-fitted system is the work should be properly guaranteed, and your vehicle warranty will not be affected.

In contrast, for most independent tow bar fitters this is a major part of their business. They should, therefore, be both experienced and knowledgeable. This is generally the case, but there have been enough reports of 'cowboy' fitters to advise a degree of caution. Look for well-established companies, and question them on their knowledge of your particular vehicle. Bear in mind that damage to the vehicle through the fitting of non-manufacturer approved tow bar wiring may not be covered by the vehicle warranty, so make sure the fitter's work is fully guaranteed.

For peace of mind, a nationwide scheme has recently been set up by the National Trailer and Towing Association, the trade body for tow bar fitters and trailer manufacturers and retailers. To join the 'Quality Assured' Scheme, a fitting outlet must pass assessment for competence, and will provide a thorough guarantee of work carried out. The NTTA provide the only specialist tow bar fitting and tow bar electrics training recognised as satisfying an NVQ level, and additionally have excellent technical back-up advice available to their members for 'awkward' vehicles. Hence, their accredited fitters should provide some of the best installation services available. The scheme is new, but the number of accredited outlets should increase steadily over time. Contact the NTTA on 01926 335445 for details of the nearest outlet in your area.

## **5. Checking A New Installation**

If you have installed the wiring yourself, you will hopefully have carried out checks as you go, but a final functional check will still be needed, of course. If the system has been installed for you, then an installation check may also be prudent:-

### **5.1 Installation Check**

- Are all the components (sockets etc) securely fitted, and located in a sensible place, such that you can readily insert and remove the caravan plugs?
- Is the wiring neat, and not vulnerable to damage, especially in the luggage compartment?
- Can you identify where all the key components (eg fuses, relays) are fitted, in case of future problems?
- Have sufficient fuses of appropriate ratings been fitted?
- Do the connections between the tow bar wiring and the main vehicle wiring loom look adequate and secure?
- Has the point where the tow bar wiring from the sockets enters the towing vehicle been protected with a rubber grommet or seal to protect the cables from abrasion, and prevent water penetration into the towing vehicle?
- Is the point where the cable enters the back of the socket fitted with a rubber seal, to help keep water out of the socket wiring?
- Have any trim panels which were removed during the installation been correctly and securely refitted, using all of their fixings?
- Have you been given documentation (eg fitting instructions, specification sheet etc) which gives details of the components which have been fitted? These may be very useful during fault checking or if components need to be replaced in the future. Keep such details with the towing vehicle's handbook.

### **5.2 Functional Check**

#### **5.2.1 Road Lights**

- Do all of the towing vehicle's lights still work without the caravan attached?
- Attach a test device, multimeter, trailer lighting board or the caravan. Note that in some situations, attaching anything other than a caravan may not result in the correct load being applied to the electrical system, and hence may not show up all faults. In the vast majority of cases, however, a test device or trailer board is adequate and often more convenient.
- Check each road light circuit in turn. Make sure that the towing vehicle's lights remain operational in addition to the caravan's.
- Check road lights in combination – eg head/tail lights, fog light and indicators together, and make sure that the circuits are not interfering with each other.

#### **5.2.2 Supplementary Functions**

- These are best checked either by connection to the caravan, or with a multimeter.
- With a multimeter, check that there is voltage at the battery charging, fridge and interior lights pins on the socket while the engine is running, but that battery charging and fridge supplies turn off when the engine is stopped.

- If using the caravan, disconnect power from the caravan battery, then attach the caravan plug to the towing vehicle. Check for operation of the interior lights with the engine not running. Switch the fridge to 12V operation, and check it works only when the engine is running. Check for power at the positive connector for the caravan battery is present only when the engine is running.

## **6. Fault Finding**

### **6.1 Road Light Circuits**

	Battery Connected & Functional?	12N Or 13 Pin Plug Inserted Correctly?	12S Plug Inserted Correctly?	Check Connections On Plug & Socket	Check Wiring Connections To Caravan Lights	Check Connections Between Socket Cable & Main Wiring Loom	Check Bulbs	Check Vehicle Fuses	Check Indicator Relay	Check For Moisture Or Corrosion In Plug, Socket Or Caravan Lights	Check Exposed Cables For Damage
No Road Lights Work	✓	✓		✓	✓	✓		✓			✓
Caravan Indicators Do Not Flash		✓		✓	✓	✓		✓	✓		✓
Only One Indicator Flashes		✓		✓	✓	✓	✓	✓		✓	✓
Indicators Flash Dimly, Or At Wrong Rate		✓		✓	✓	✓	✓			✓	✓
Wrong Indicator Flashes				✓	✓	✓			✓		✓
Other Lights Do Not Work		✓		✓	✓	✓	✓	✓		✓	✓
Indicator Tell-Tale Does Not Work				✓		✓	✓		✓		✓
Indicator Tell-Tale Works w/o C.van				✓		✓			✓		✓
Fuses Blow				✓	✓	✓				✓	✓





## **7. Miscellaneous Matters**

### **7.1 42V Electrical Systems**

The motor industry has decided that the days of 12V systems in vehicles are numbered. Over the next few years, they plan to treble the nominal voltage at which vehicle systems operate. Currently, vehicle alternators produce around 14V, and vehicle batteries are around 12V. In due course, the battery voltage will be increased to 36V, while the alternator output rises to 42V. The reasons for this are twofold. Firstly, the power requirements within a typical vehicle have increased by 50% over the last 20 years, and the existing system cannot be stretched much further. Secondly, by raising the voltage, it is easier to introduce higher powered sub-systems, such as electric power steering and electric air conditioning. By taking direct loads off the engine, it is believed that such sub-systems will enable fuel economy to be increased significantly.

Completely 42V systems are predicted as appearing by 2007, but hybrid 42/14V systems may appear around 2004. Clearly, this will impact on the tow bar electrics, and the Club is monitoring this situation closely to ensure that caravanners' interests are protected. At the time of writing, however, it is unclear how the industry will modify many of the more fundamental vehicle electrical sub-systems, and hence there is no indication yet what will be adopted for tow bar wiring. In the short to medium term, though, it is likely that caravans will remain as they are at present, with higher voltage vehicles needing the addition of a step down unit to deliver 12V to the caravan.

### **7.2 Glossary of Terms**

Some of the terminology used in this leaflet may benefit from further explanation:-

Cable	The term cable has been used to describe a conductor which is made up of a number of separately insulated wires (eg the lead to the 12S socket).
Circuit	A path for electricity from a power supply (eg a battery) via a wire to a load, and back to the power supply via an return wire.
Load	A device powered by electricity.
Loom	The network of wires and cables throughout the body of the towing vehicle.
Monitor	A device which measures an effect and generates a signal as a result of this – eg it might indicate whether a light is on or not.
Pin	The male half of the circuit connection in the car to caravan plug and socket. Note that sockets are usually described as being '7 pin' or '13 pin' even if the socket half of the connector actually contains a mixture of pins and tubes, or even just tubes!
Relay	A switch which is triggered by a signal (perhaps from a monitor) which results in a circuit being turned on or off (eg the fridge power supply).
Return	The wire which completes the electrical circuit from the load back to the power supply. Also commonly know as an 'earth'. Within most towing vehicles, return connections are made via the metal of the vehicle body or chassis, thus reducing the number of separate wires needed to run the entire length of the vehicle.

Sensor	See Monitor.
Short	A direct (and usually inadvertent) linkage between a power supply and a return (earth) connection, without there being a load in between. The absence of a load means there is negligible resistance to the flow of electricity, usually resulting in a very high current flow, and an associated risk of overheating, if the circuit is not protected by a suitable fuse.
Tube	The female half of the circuit connection in the car to caravan plug and socket.
Wire	In this leaflet, the term wire has been used to describe a single insulated conductor (eg the cable to the 12S socket is made up of 7 separate wires).

## **8. Useful Contacts**

Hella Ltd. Wildmere Industrial Estate Banbury Oxon OX16 3JU	Tel 01295 272233 Fax 01295 225480 hella.uk@hella.com www.hella.co.uk	Wiring Kits, Relays, Adapter Leads etc
Maypole Limited 54 Kettleswood Drive Woodgate Business Park Birmingham B32 3DB	Tel 0121 4233011 Fax 0121 4233020 maypole@maypole.ltd.uk www.maypole.ltd.uk	Wiring Kits, Relays, Adapter Leads etc
Towsure 151 - 183 Holme Lane Hillsborough Sheffield South Yorks S6 4JR	Tel 0114 250 3000 Fax 0800 444434 www.towsure.com	Components by Mail Order – Wiring Kits, Cable, Relays, Plugs, Sockets etc
Ryder Towing Equipment Ltd Alvanley House Alvanley Industrial Estate Stockport Road East Bredbury Stockport Cheshire SK6 2DJ	Tel 0161 4301120 Fax 0161 4308140 www.rydertowing.co.uk	Relays, Monitors etc
National Trailer & Towing Association: 1 Alveston Place Leamington Spa Warwickshire CV32 4SN	Tel 01926 335445 Fax 01926 335445 www.ntta.co.uk	'Quality Assured' Tow Bar Fitters