

FITTING LED BULBS TO CLASSIC BRITISH CARS.

LED bulbs are becoming more popular as they run cooler than, draw less current and are brighter than incandescent lamps. In most cases replacing an incandescent bulb is just a case of fitting the LED bulb and carrying on as usual.

But, there are several places where direct replacement only does not work. This document is based on Triumph cars but will apply to most classic vehicles.

Ignition warning lights (alternator only): As well as indicating that the alternator is not charging, this warning light also provides electrical current to the alternator to start charging. Without sufficient current, an alternator may not begin charging until the engine rpm is increased to a high value or possibly not at all. To solve this problem, an incandescent bulb must continue to be used here **OR** a 1.5 to 2 Watt resistor of 100 to 150 Ohms must be placed in parallel with the LED bulb to provide the start-up current. Once the alternator starts generating electricity it supplies the required current from its own output.

Indicators: Original equipment (mechanical) flashers, for both direction indicators and hazard lights, **will not work with LED bulbs.** Mechanical flashers rely on sufficient electric current to heat a bimetal strip which interrupts current to the indicators. LEDs do not draw sufficient current to achieve this. Electronic flasher units will need to be fitted for both turn indicators and, if present, hazard warning functions.

Indicator warning lamps: LEDs themselves are polarity conscious. If you still have a positive earth vehicle then LED bulbs are available but may not be easy to find. Some manufacturers are now producing LED bulbs which will work when supplied with power of either polarity but these may not be available from local suppliers or not at all for some bulbs. Some later cars use a single indicator warning light that is connected between the left- and right-hand indicator circuits. In this case, current is flowing through the lamp in one direction when turning left and the opposite direction when turning right. Unless a dual-polarity LED bulb is used here, the warning light will only illuminate for one direction but:

Any indicator warning light connected between left and right indicator circuits will light both left and right LED bulbs, though dimly, for the “inactive” side. (Refer next page)

The Lucas panel light dimmer: Will have **NO** noticeable dimming effect with LEDs. A dimmer specifically for use with LEDs is required but, to my knowledge, no “drop-in” replacement exists. The night dimming relay fitted to some BL vehicles also will have no noticeable effect on LEDs. (**See later comments!**)

The Lucas 6WL warning light cluster: Fitted to many Triumph cars of the late 1960s and 1970s require LED bulbs of both positive- and negative-earth polarities. Later units with a single light for indicators require a dual-polarity LED bulb. This also applies to single indicator warning lights where the 6WL cluster is not fitted.

Sets of replacement LED bulbs for the 6WL warning light cluster are available from at least two British suppliers: Classic Car LEDs and Better Car Lighting. There may be other suppliers out there.

It has been found that when installing LED bulbs, they may sometimes be very loose in lampholders. The cure is to lift (re-tension) the center connector(s) in the lampholder. The centre terminal of an incandescent 21W bulb can be 1mm higher than the centre terminal of an equivalent LED.

Note: At the time of writing, LED headlamps cannot legally be fitted to any car in New Zealand that did not have them fitted as original equipment.

This document covers most of the common configurations for the circuits described. There are almost certainly other configurations not covered here.

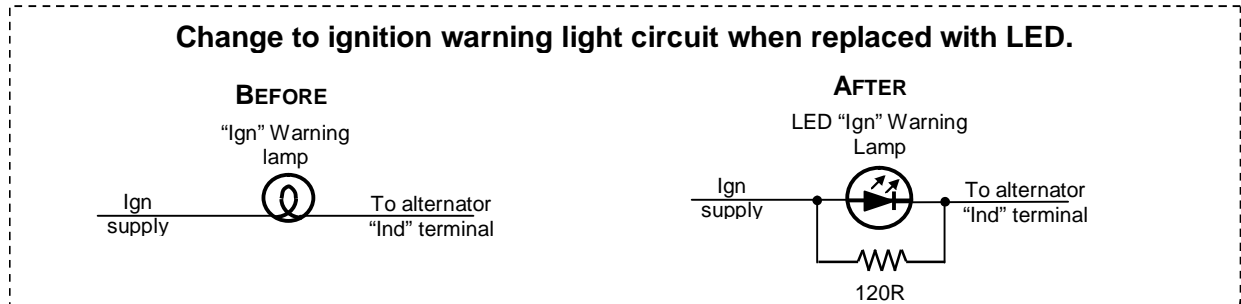


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Ignition warning light modification:

To provide startup field current to alternator, add a 1W resistor of 100 to 150 Ohms (120 Ohm shown here) in parallel with the LED bulb.

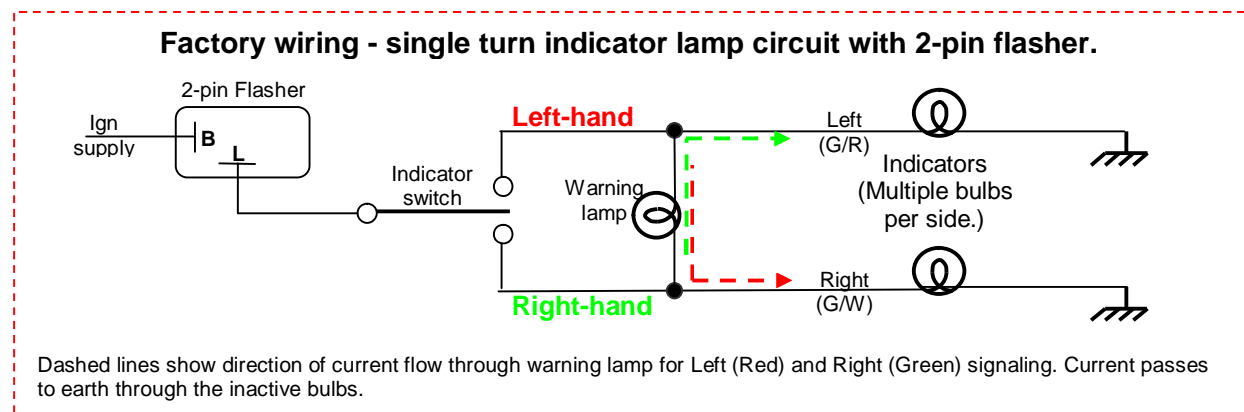


Single indicator warning light fitted to car:

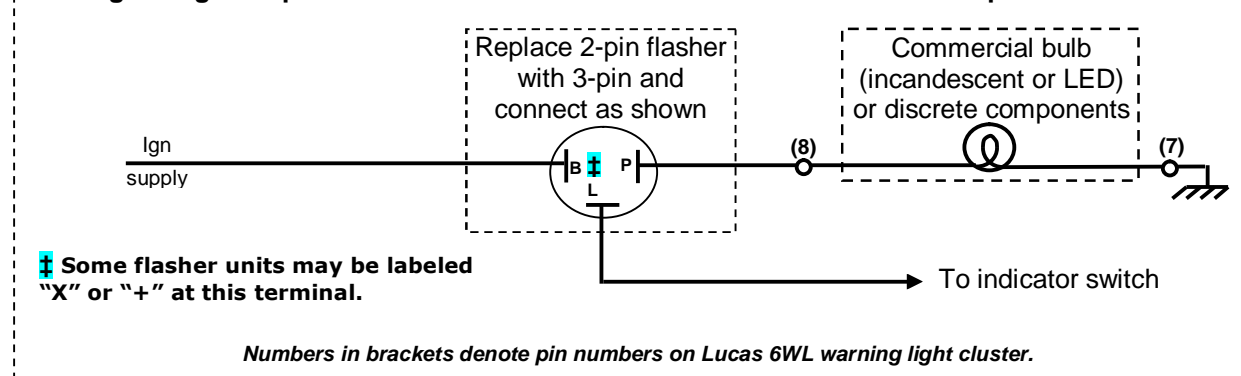
In the following drawings showing changes required for LEDs, dashboard warning bulbs are shown using the incandescent bulb symbol. It matters not whether these warning lights are incandescent bulbs OR LEDs, beyond ensuring the warning LED bulb supply polarity is correct.

Several Triumph vehicles use the circuit shown below to provide a single warning light for both left- and right-hand indicators. For example the TR5 and TR6 cars. Other cars such as Mk II Stags and late model Dolomites use the same method and are fitted with the Lucas 6WL warning light cluster with the single indicator warning light. Earlier cars used 3-pin flasher relays, with a dedicated pilot light output, so are not affected.

The reason that the original circuit works with incandescent bulbs is that a warning light will be rated at 2 Watts



Wiring changes required in these cars when external indicator bulbs are replaced with LEDs.



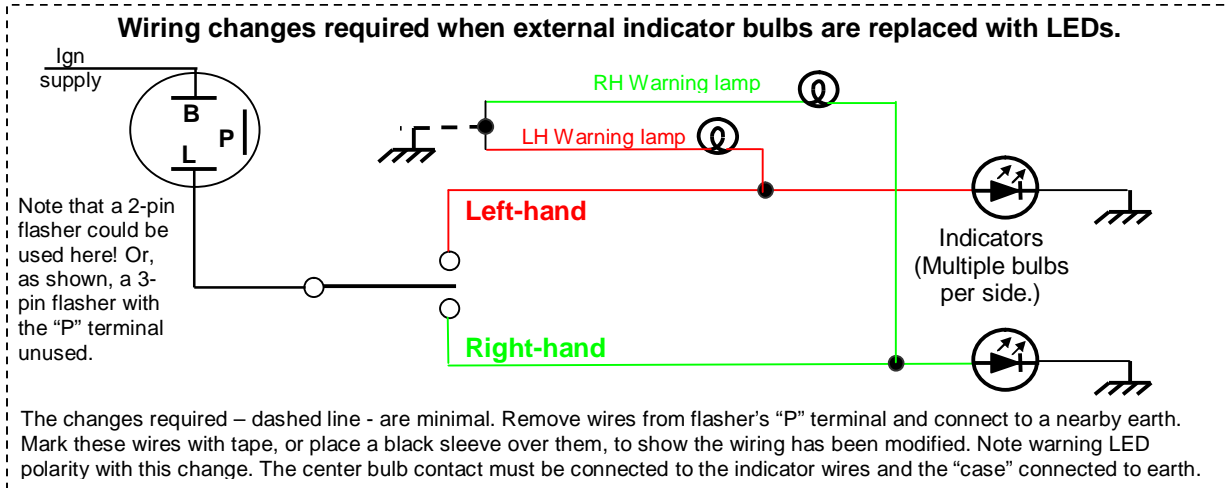
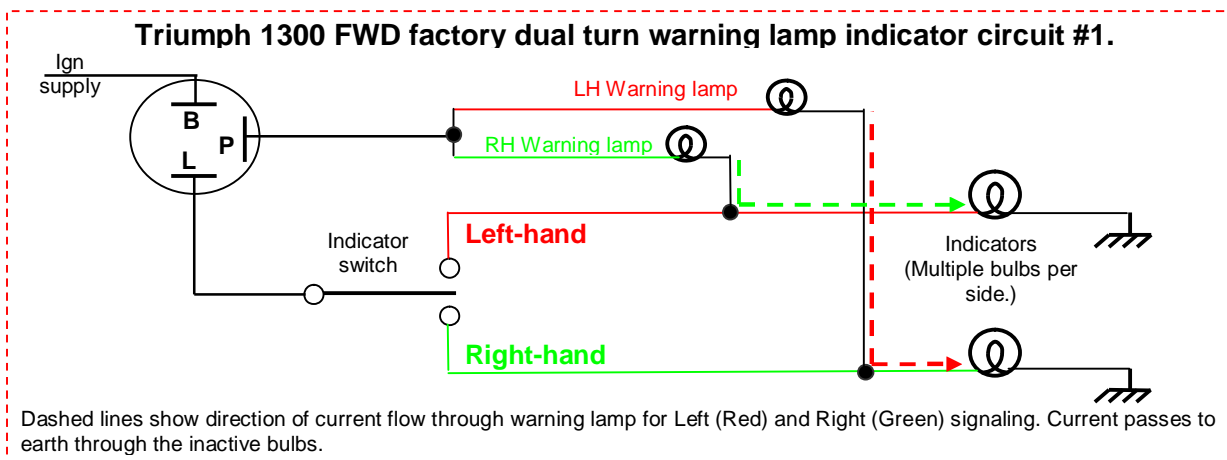
or less which will draw a current of about 160mA whereas the indicator bulbs will draw 3000ma (for two bulbs). This gives a calculated resistance for the indicators of about 4 Ohms which, when a current of 160mA, from a warning light bulb is passed through them, will generate a voltage of less than 0.64V across the inactive indicator circuit which will barely warm the bulb filaments and produce no visible light from them. This method also works if a warning light is replaced with an LED but the external indicator bulbs are incandescent.

This method does not work when external indicator bulbs are replaced with LEDs. When tested on the bench, 2 x 21W equivalent LED bulbs in series with an LED warning light, all LEDs lit at part brightness. Although the total current through the LEDs was only 6mA, it was sufficient to provide noticeable illumination from all bulbs. An incandescent warning light would barely light - if it lit at all!

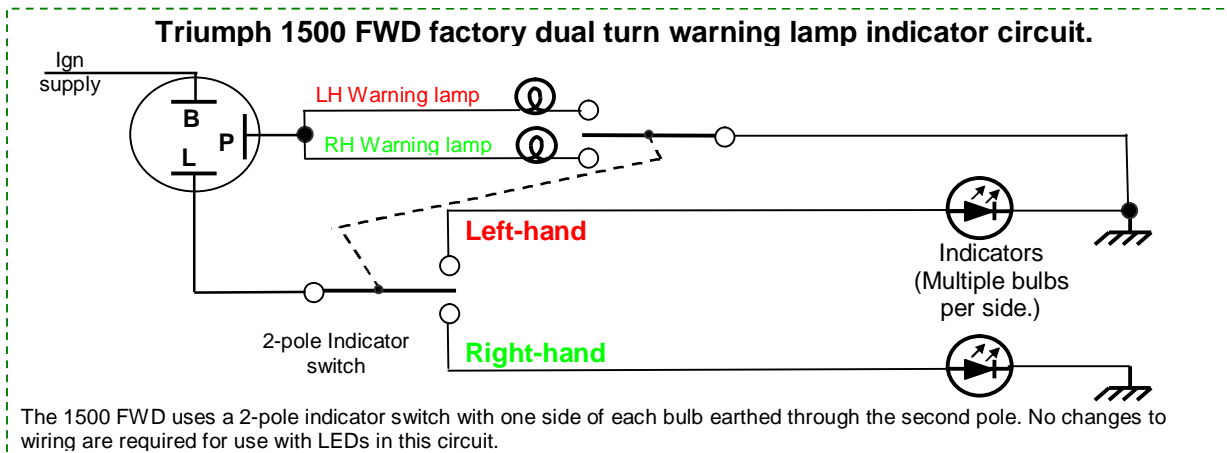
Another problematic indicator warning light circuit:

To prove that there is more than one way to do a job, consider the indicator circuits, for the Triumph 1300 FWD cars. This factory configuration cannot be used when LED indicator bulbs are fitted.

The warning light bulbs themselves could be replaced with LEDs and provided the supply to these bulbs is correct, will work as intended for as long as incandescent bulbs are used elsewhere in the indicator circuits.



A wiring diagram to hand for the 1500 FWD cars (below) shows a 2-pole indicator switch but may not require wiring changes when LED bulbs are fitted. Any required changes would be to ensure that the LED bulbs are wired with the correct polarity (bulb case to earth). Similar turn indicator wiring can be found in some Jaguar cars and possibly other marques.



Night-dimming relay - another problematic circuit:

The Lucas 11RA, Triumph part # 212878, night dimming relay (NDR) was fitted to cars from the mid-1960s into the 1970s. Frequently in a yellow housing but sometimes in blue. Lucas part #s were 33245 (yellow case) and 33248 (blue case). 33245 reduced light intensity of connected bulbs to one quarter, 33248 to one half.

In many cases these relays may have been disabled (remove wire from W2 to earth) or even removed completely. If still present and active, these will cause problems when LED bulbs are fitted to the rear indicators.

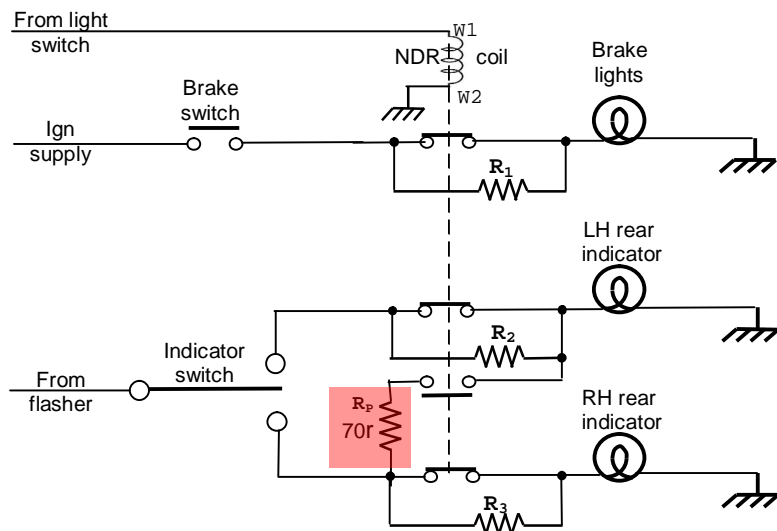
The solution is to either disable the night dimming relay or remove the internal resistor R_P from circuit. This latter may be possible if a strip of thin (1/64") gasket "paper" is placed under the contact assemblies and held in place with glue so that the contact beneath the center arm is insulated.

Schematic diagram shows the Lucas Night-dimming relay circuit.

The purpose of " R_P " (70 Ohms, highlighted,) is to compensate for the lower load on the flasher when the night-dimming relay is energized. Without this resistor the flash rate of the indicators will change when thermal flashers are used but not with an "electronic" flasher that is independent of load.

The night dimming relay, with R_P present, will cause left- and right-hand indicators to light when LED bulbs are fitted and the relay energised.

Night-dimming relay (NDR) circuit.



For those who may wish to know, the table below shows resistance values for the 12V night-dimming relays.

There is a 24V version, 33267 also in a blue case, which has a coil resistance of 143 Ohms and different values for the resistors. Photograph below from a Lucas publication shows the internal construction of this relay.

Resistor ID	Resistance (Ohms)	
	33245 (Yellow)	33248 (Blue)
Coil	36	36
R_1	1.6	0.42
R_2	2.75	1.35
R_3	2.75	1.35
R_P	70	70

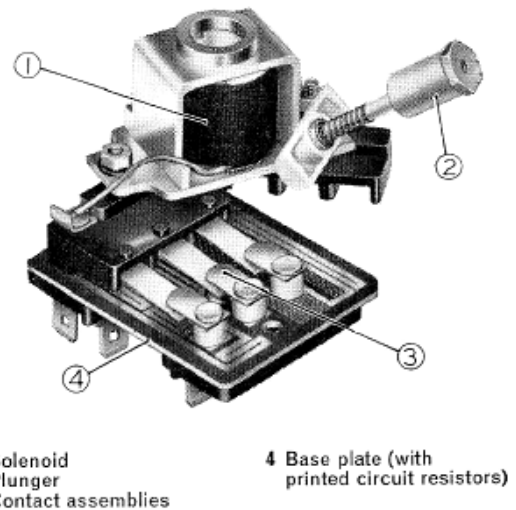


Fig. 1 Relay dismantled to show construction