Adding Auto-Lamps to an MGB

Introduction

Driving in a well lit Canadian city one evening my wife an I remarked on how many vehicles appeared to have defective rear lamps and it wasn't until a few days later, when I next drove my MGB at night, that I realized why. I have wired my MGB to have daytime running lamps (DRLs) and because they come on automatically as soon as the engine has started, I drove off, with the headlamps illuminating the road ahead, without remembering to switch on the main vehicle lamps. In Canada, DRLs have been mandatory on all cars sold there since 1989, so drivers there, who don't have automatic lamps, can, like me, drive off thinking they have there lights on when, in fact, they don't. In my own defense, the other drivers should have been alerted by the lack of dash illumination, whereas in an MGB, with its pathetic dash lamps, their absence is hardly noticeable under bright street lamps.

Many modern cars have the option of auto-lamps on the lighting switch, a system in which, when light levels fall, a light sensitive device causes an electronic circuit to switch the vehicle lights on automatically. Similarly, the lights are automatically shut of when daylight is sensed. Partly because my DRLs can cause me to easily forget to switch my lights on, and partly because I like upgrading my 1970 MGB-GT, I decided to fit an auto-lamp circuit. Such a circuit would be daunting to build on one's own, but fortunately, I was able to obtain a complete circuit board with plastic a box to contain it, on eBay for $11.00 with free shipping from China to the USA. It even included the screws to install the circuit in the box, a miniature screwdriver, Scotchlok™ style connectors (which I chose not to use because I consider them unreliable) and 2 small diodes, which I didn't need in my circuit. The supplier I bought from was AIX 81, and I found the part by searching for "automatic headlight module". There are doubtless a number of other suppliers of the same or a very similar product

This document describes how I installed the system in my 1970 MGB. MGBs from 1977 use a different lighting switch that is plugged into a multi-way connector, which makes installation a little more tricky. The circuit could be used in any car, classic or modern, to which the owner wants to add auto-lamps and I hope the installation described here will help in those installations too.

The Circuit Board

The auto-lamp circuit I used had all the features I needed and so far has worked extremely well. To sense the light level, it uses a photoresistor mounted on a generous length lead which plugs into the circuit board. It has 2 adjustments. One varies the sensitivity of the sensor so that you can adjust at what light level, in your particular installation, you wish the circuit to operate the vehicle lamps. The other varies the time delay between the sensor detecting a bright light level and the circuit actually switching off the lamps. This feature, and one that also delays the time for the lamps to switch on after detection of a low light level, avoids a situation where the lights could flash on and off rapidly if the car were traveling through, for example, a dark tunnel of trees with gaps in which sunlight breaks through. The delay between detecting a low light level and the light coming on is fixed at about 4 seconds but a jumper connector on the board can be removed to make them operate immediately, which is a useful temporary measure when adjusting the circuit's light sensitivity level. Another jumper on the board allows the user to choose whether the output power from the relay is from the same source as that powering the circuit board, or whether the relay

Figure.1 The circuit board as delivered

MGB Wiring Diagram for Auto Lamps

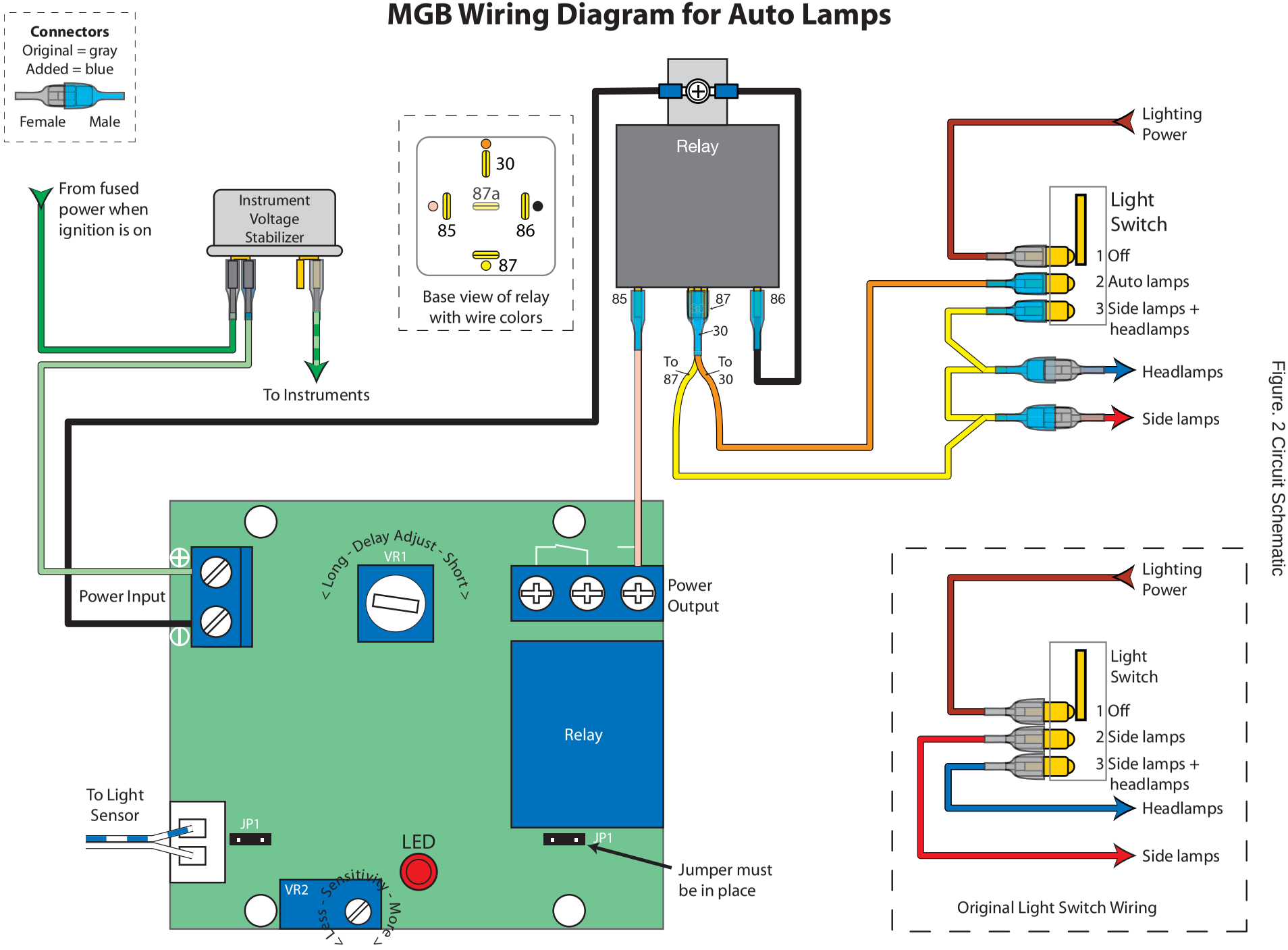

Figure. 2 Circuit Schematic

switches power from another source.

It has an on-board 10 Amp relay, which is too lightweight for an MGB having two 60W headlamps, four 6W side-lamps, two 5W license plate lamps and four 2W dash lamps, all amounting to 162 Watts, which at the bulbs' rated voltage of 13.5V equates to a draw of 12 Amps. For that reason I had the circuit board drive a standard 40 Amp automotive "ice-cube" relay and let that do the heavy-lifting. Because the on-board relay then only drives the coil of the off-board relay, a load of only about 0.25 Amps, I kept the jumper in place that makes the on-board relay's output current be sourced from that from which it is also powered.

The circuit shown in Figure 2 is designed to help make the wiring simple to understand and follow, it is, nevertheless, a schematic and the actual relative sizes and positions of the components will be different for the actual installation.

Circuit Description.
The MGB lighting switch has 3 positions, Off, Side (AKA parking) lamps and Headlamps+Side-lamps. The center side-lamp position is now redundant as in most countries, parking lamps are not needed and driving with side-lamps alone is pointless. It was decide instead to use the center side-lamp position on the lighting switch for auto-lamps. The circuit is wired so that the Off and Headlamp positions on the switch operate exactly as they did before. The driver still, therefore has full control over the cars lights, with exception that he can no longer select side-lamps alone. In the center position, with the ignition also on, the auto-lamps operate as determined by the external light levels. The switch may be permanently left in this position and the circuit will not draw current when the ignition is switch off.

The circuit board is powered from a fused and ignition switched source. When the light level falls to a predetermined level, set by VR2, its on-board relay switches power to the coil terminal (85) of the external relay, closing its contacts. If the lighting switch is in the second position, power is directed through the relay to the head and side lamps.

Wiring, Assembly and Installation
Wiring this module requires handling the car's lighting wiring, which in an MGB is unfused and unswitched. An accidental short-circuit could cause burns and a car fire, so do not start the installation without disconnecting the battery.

For the purposes of this document, I have shown all the original spade connectors in gray and the new ones in blue. In practice all the new connectors should be sized for the wire(s) onto which they are crimped. Please, to avoid dangerous short-circuits, only use the type of male and female connectors that are fully covered in insulation from end-to-end.

The wires to and from the circuit board are all very low current, so 22 AWG wire could be used. From the electrical point of view, still smaller wires could be employed but those smaller than 22 AWG are not recommended because they would not have sufficient mechanical strength for automotive applications. For these wires you would use 20 AWG connectors, which are red. Where power connections are required from the lighting switch, I used 18 or 16 AWG wires along with the correct sized connectors, which are blue, but had I used 16 AWG where 2 had to go into a single connector, I would have to have used 12 AWG connectors, which are yellow. Wire colors are not really important, but, to avoid confusion, I try to use wires in a variety of colors, where possible, selecting those that won't be found in the same area of the car. Obviously, the ultimate choice will be based on what is available.

Just 3-connections had to be made to the circuit board, power in, power out and ground. The photosensor was already plugged into the board at the lower left corner. To provide power to the on-board relay, make sure the jumper marked JP1 is in place over its 2 pins.

Figure 3. The wired and Boxed Module

I chose to mount the board and relay under the dash above the driver's left knee. That gave easy access to the lighting switch on my 1970 car and a power source for the circuit board, where I used the car's fused green accessory circuit, (which is switched on and off with the ignition), where it connects to the instrument voltage stabilizer, also mounted above the driver's left knee. I was fortunate that nothing else was connected to the other half of the double male connector on the stabilizer on to which the green power wire is plugged, so I could use it as my circuit board power source. That won't be the case on all cars, in which case a Y joiner made of 2-female connectors going to a single male, could be used to make the connection, constructing it in a similar way to the headlamp harness described later.

To install the box containing the module, I actually mounted the snap-on lid to the bulkhead and snapped the box onto it. I made sure that the pry slots in the lid, that permit the box to be more easily opened, were on the right side where I had the easiest screwdriver access to them. Because I had to mount the lid on a seam and its associated sealing compound, I spaced it off from the bulkhead on a piece of ¾" wood, so as to stop it distorting when tightened down and possibly causing it not to snap onto the box as well as it should. Mounting the lid, rather than the box, also gave me better access to the module for the sensitivity adjustment.

Once I had determined the required length of the wires and cut them, I secured them to the terminal blocks of the module. I then put knots in them so that they could not be snagged free. I used a small tie around the photoresistor wire for the same reason. I drilled a $^{3}/_{16}$" hole, in the box side and once the photoresistor had been passed through it, the other wires could pass through too.

I connected the ground wire to a ring terminal and secured it using the self tapping screw I had also initially used to secure the relay and its ground terminal, as shown in Figure 2, but see the later note regarding turning the lamps off during starting. Note that relays should always be mounted with their terminals mounted downward, so that moisture cannot gather around them and short-circuit across the contacts or enter the relay enclosure. Figure 2 shows a relay with the bracket closest to contact 87 of the relay. However, there is no standard convention and you may well have a relay with the bracket mounted closest to terminal 30. In practice the connections to terminals 30 & 87 may be swapped as can those to terminals 85 & 86. If you have a relay with a 5th contact 87a, it will work fine; just leave it unterminated.

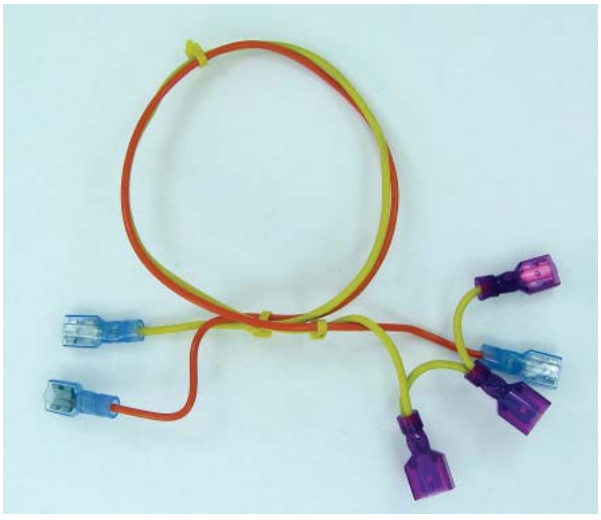

Figure 4. The Switch Harness

The earlier MGB lighting switches are connected using 3 spade terminals. I made a small harness, shown as yellow and orange wires in Figure 2 and it practice in Figure 4, which would allow me to easily go back to the original configuration should I ever wish to remove the auto-lamp function. Unfortunately, installation to later cars having a single multi-way connector requires the switch wires to be cut. I would recommend cutting the wires and crimping

male and female connectors to them so that they may be easily rejoined if necessary. A similar small harness can then be used to connect the switch to the relay and lamps.

My actual installation is shown in Figure 5. The voltage stabilizer can be seen to the left, the relay in the center and the box containing the auto-lamp module is on the right.

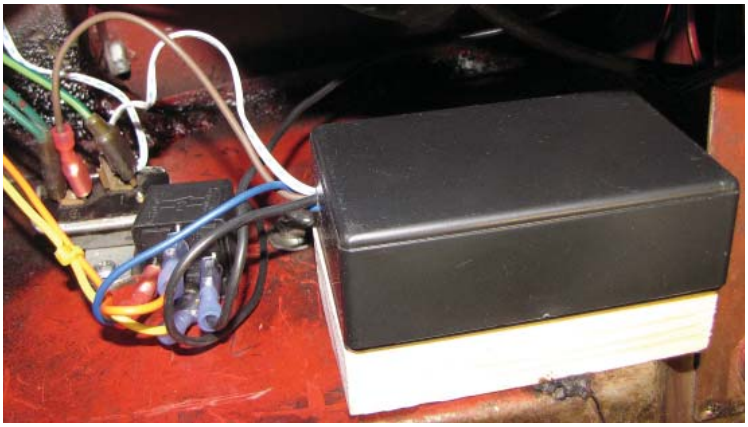

Figure 5. The Installed Components

Close examination of the black (ground) wire coming from the relay in Figure 5, shows that it does not terminate at the relay fixing screw as shown in Figure 2. That's because I did not want the lights using valuable battery power during starting. Although it's a long trek, I took the ground wire from the relay to the white brown wire of the starter solenoid by terminating it at the starter relay. The starter solenoid has a very low resistance and draws quite a lot of current. Under normal running, it is not energized and the 0.25 Amps or so that the relay draws through it has a negligible affect on it. However, during cranking, the solenoid is switched by the starter relay to battery voltage, denying a ground return path to my auto-lamp relay and switching the vehicle lamps off during the time the engine is cranking.

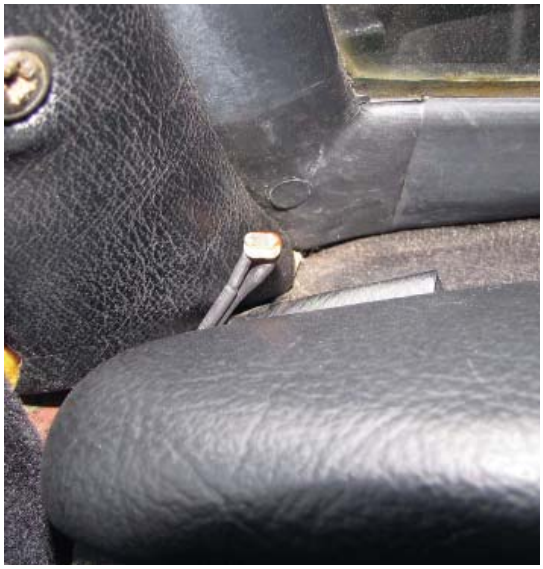

Figure 6. The Photoresistor Installation

As for the location of the photoresistor, I know my installation is not the best. Ideally it should be in the center of the dash close to the windshield, where it is least likely to be affected by shadow from the side pillars of the car. However, removing the dash is such a chore that I simply slipped mine into the gap between the A pillar and the padded dash. If I ever do remove the dash, I'll probably see if I can mount the photo resistor inside a clear panel lens lamp holder, like those available from RadioShack, and mount the assembly between the windshield defrost vents.

Adjustment

Adjustment of VR1 clockwise shortens the time for the auto-lamps to switch off after detecting bright light, and vice-versa. If the delay is too short there is a danger the lamps may go on and off as the car travels through patches of heavy shadow and out again. A delay of around 10 seconds is reasonable. There is some hysteresis or back-lash in the sensing system too, which also prevents constant on-off-on cycling.

I initially adjusted the light sensitivity via VR2 in daytime in my garage with the door open. As it happens, when I took the car out around dusk, I had accidently adjusted it so that the lamps came on automatically about 10 minutes before sunset, which is ideal. Because my sensor installation is close to the A pillar, rather than being in a more open position, I am sure that if I had pointed the car in a different direction, the lights would have come on a few minutes sooner or later.

An LED on the board is a useful aid to telling when the lights are on or off. Temporarily removing JP1 cancels the 4-5 second delay between the photoresistor sensing darkness and switching the lamps on, which is helpful during adjustment.