Fabricating and Installing Headlight Relays

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For some time I had been reading about the benefits of installing headlight relays. As I understand it, there are two principal benefits: the load of switching the headlights is taken off the original switch (the switch now only has to control the small coil in the relay); and full battery voltage is delivered to the headlights, which increases their brightness. Typical voltages without the relays are about 10.5 volts, but with the relays voltage increases to about 13.3 volts (or full battery voltage).

This article is based on excellent postings on various online forums, and I am grateful to those individuals who shared their knowledge and understanding. I borrowed many of their ideas to arrive at the system I used. The main components of the relay unit are: a 30 amp circuit breaker (about $5); two 40 amp relays with pigtail connectors (about $20 for 5 relays and connectors); a range of wire gauges and colours (10, 14, and 16); several “eye” connectors and bullet connectors; heat shrink tubing; and a piece of leftover aluminum from another project.

First task was to select a convenient location on the TR6 and sort out how to mount the relays and breaker. The overflow bottle holder provides a convenient location and is very close to the point where the headlight wiring splits from the switch to the right and left hand headlights. Using a mounting hole for the bottle also means you don’t have to add another hole to the car.

After a bit of measuring and trial and error, I cut a piece of aluminum to about 2.25 inches by 5.75 inches to give enough room from the components and sufficient clearance around the overflow bottle. I rounded the corners of the aluminum plate to save my fingers some day in the future. Figure 1 shows the breaker and relays mounted on the aluminum plate.

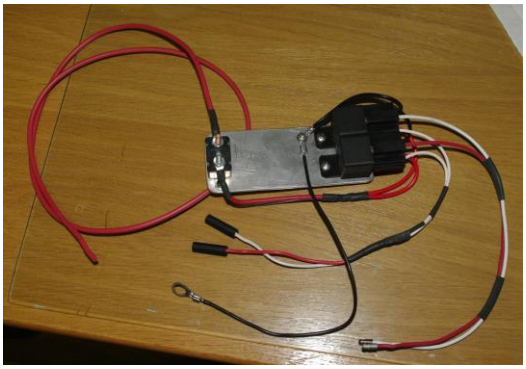

Figure 1. Breaker and relays.

The wiring is pretty straightforward. The power from the “battery” goes directly to the “Bat” side of the circuit breaker (dark colour terminal), and the power from the breaker goes to the 30 terminal of each relay (see Figure 2 for relay circuit diagram). The terminal numbers on the relay are molded onto the relay. On this relay, 87 gets power when the coil between terminals 85 and 86 is activated to close the switch. 85 is ground (black) and 86 is the trigger (where you attach the power from the original light switch). In this case, it was white.

Figure 2. Relay showing configuration of terminals.

The prewired pigtails for the relay had the red wire on terminal 87a, and the blue one on terminal 87. I removed these two wires from the pigtail because I wanted the input voltage to be on a red wire. To remove the wires, you just push in a sharp pick into the little square beside the terminal and pull the wire out of the relay (see Figure 3).

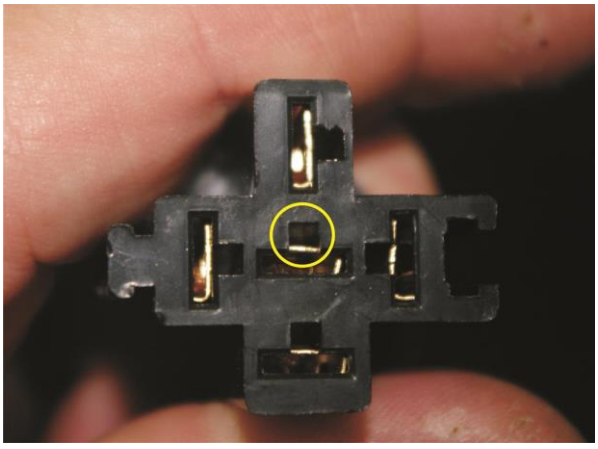

Figure 3. Spot to insert pick to slide out relay terminal.

You just push the red wire back into the pigtail (making sure that the little tab on the spade connector is out a bit so it holds the spade connector in the pigtail), and discard the blue wire as it is not needed. So now you have four wires to connect. First, connect the two red wires from terminal 30 to a heavy wire coming from the output side of the circuit breaker (silver terminal). I used 10 gauge wire to the two pigtail wires, and 10 gauge from the alternator to the “Bat” side of the breaker. I soldered all connections and insulated them with heat shrink. Next connection was to ground both of the black wires from the relays. I attached these wires with an “eye” to the aluminum plate and also added a wire from that spot to the ground on the steering column. Likely not really necessary to add that extra ground wire, but good grounds are important.

There are now two remaining wires on each relay. The white wire is thinner gauge and is attached to the trigger terminal (86). It does not carry much current as it is now only controlling the small coil inside the relay. The remaining wire was yellow (connected to the 85 terminal) and delivers the full voltage from the relay to the headlights. It was a bit heavier gauge, but because I was unsure what gauge it was I decided to swap it out for a pigtail made from 14 gauge wire. Because I did not have any appropriate spade terminals for the pigtail, I disassembled the yellow wire from the connector and soldered the new 14 gauge wire to the terminal. Rather tedious, but worked just fine.

The final preparation step is to run the wire that carries power to the “Bat” side of the circuit breaker. This wire is carrying lots of current so I opted to use some 10 gauge wire for this run. I tapped into one of the brown wires attached to the alternator (see Figure 4). I used the “outside” wire, but I don’t think it matters which heavy brown wire you use.

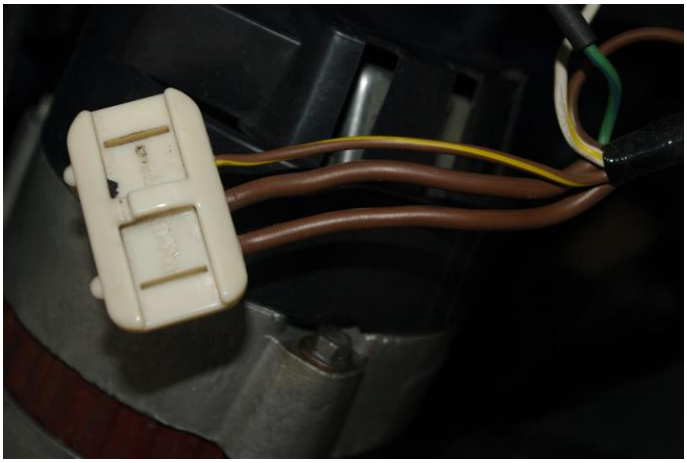

Figure 4. Alternator provides convenient location to tap for power.

For this connection I pealed the insulation off the brown wire and soldered the new red wire onto the brown one (Figure 5). I was then careful to heat shrink and tape this joint.

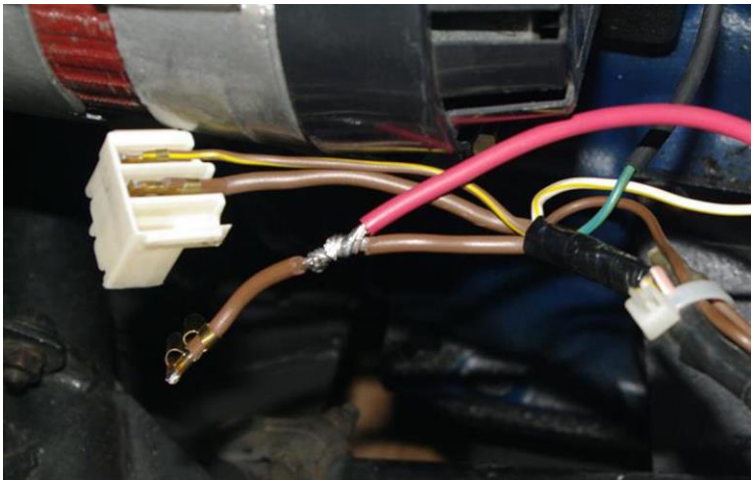

Figure 5. Wire splice providing power to circuit breaker.

After this connection was made, I secured this main power wire to the wiring harness with plastic ties and ran it to the circuit breaker. Because the terminals on the breaker are exposed and carry full battery voltage, I insulated them by adding some 3/16 inch ID rubber hose to the terminals (see Figure 6).

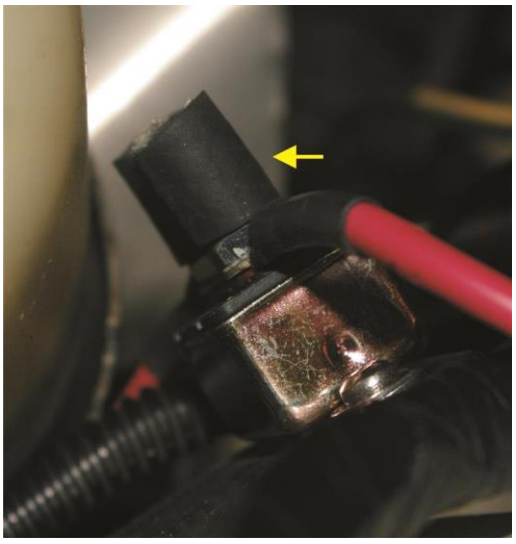

Figure 6. Terminals of circuit breaker insulated with short pieces of rubber hose.

Now comes the final hookup and testing. At the front of my 73 TR6, the wires that deliver power to the headlights are joined under the radiator shroud, and near to the overflow bottle. You must remove the shroud to access the wiring. The headlight wiring is blue with a red trace (UR), and blue with a white trace (UW). The UR wires

are for low beam, and the UW wires are the high beam wires. Because I did not have the correct Triumph wire, I used solid red from the low beam relay (on bottom), and solid white from the top relay to the high beams (I think I will remember top is high, but who knows!).

To determine which wire is coming directly from the original headlight switch, I attached a test light to each of the three same coloured wires one at a time (I started with the three UR wires). When you turn on the headlight switch and “flick” the light between high beam and low beam, the wire that is hot (lights the test light) is the low beam one to connect to the trigger wire (terminal 86). I used bullet connectors to attach the relay assembly so if for some reason I want to remove the relays or have problems with the setup the wiring can be easily restored to stock. The wire from the 85 terminal is now connected to the remaining two UR wires (one wire runs to the low beam side of each headlight). The high beam UW wires are identified and connected in the same manner to the 85 terminal of the upper (high beam) relay.

Now that everything is connected, the relay assembly fits nicely in place next to the overflow bottle (Figure 7).

Figure 7. Final installation mounted to overflow bottle bracket.

The relays work great and the headlights appear to be brighter. Best of all, I am happy to get the heavy electrical load off the old headlight switch. Total cost was less than $20. Next task is to make the same sort of assembly for the TR3.