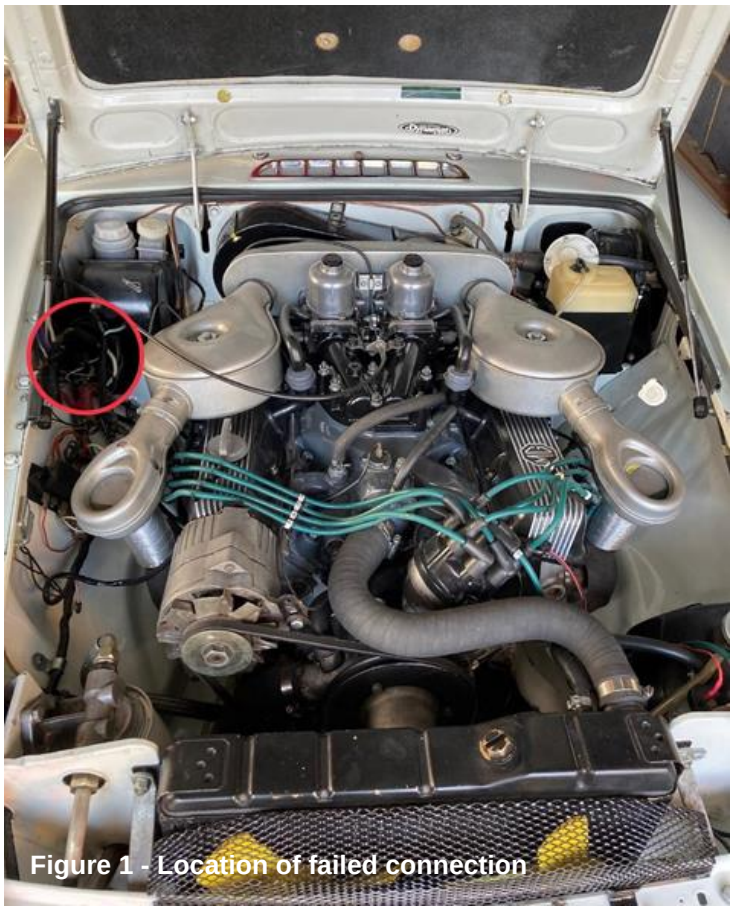

Figure 1 - Location of failed connection

Replacing a faulty bullet connector on an MGBGTV8

Jim Livingstone feels this note may seem trivial but the circumstances at the time the problem occurred (on the eve of his departure for a visit to Australia) made the failure of this simple bullet connection quite dramatic. The observed symptom was a failure to restart after a short stop. The cause was not immediately obvious and as the light was fading the breakdown service was summoned. It took all the detective skills of the RAC technician to eventually trace the source to an open circuit in the connection between the main harness and the rear harness just forward of the brake and clutch master cylinders (red ringed above). Jim reveals more.

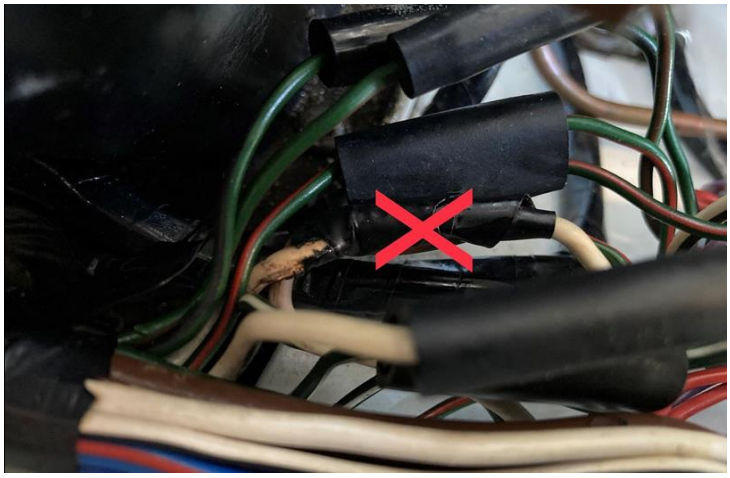

Figure 2 - Repaired connection (was formerly a 4-way bullet)

From the evidence of burning (see **figure 2**) on the connection and adjacent harness, the cause was deduced to be overheating due to high electrical resistance in the bullet connector. As modern breakdown services do not carry obsolete connectors the wires were reconnected by soldering and the journey resumed, albeit five hours behind schedule.

That this is not an isolated incident is supported by "**V8NOTE384 – Common Wiring Faults"** in which the writer, Barrie Jones, observes "there is a 4-way bullet connector on the bulkhead where the main wiring loom is connected to the rear loom. It has 3 white wires going into it. The internals often corrode and overheat."

Analysis

The MGB was designed during an era in which the 4.7mm bullet connector was the default connection between sections of wiring harness in British vehicles while connections to fixed components were made by 6.3mm blade (spade) terminals or eyelets.

Before considering a countermeasure a review of the basic requirements of a harness connection might be instructive. These are:

- Good electrical contact between the components to be joined (**electrical conduction**).
- Insulation from adjacent conducting materials (**electrical insulation**).
- Positive engagement of both components of the connection (**locking feature**).
- Ability to disengage both components without straining the wiring of the harness (**unlock feature + strain relief**).
- Protection of the wires from excessive flexing as they enter the connection (**insulation reinforcement).**
- Protection of the connection from environmental factors (**sealing + corrosion resistance**).

A study of modern automotive wiring will reveal that its connections satisfy most, if not all, of these conditions. By contrast the bullet connector only satisfied the first two of these criteria when new and the obvious solution is the replacement with a more suitable connector. However, if originality is a primary concern, it might be argued that these connections were no more unreliable than contemporary electrical products when new and given reasonable care and maintenance they might be retained in this condition. In particular, mishandling and corrosion appear to be common causes of failure so a case can be made for a regime which addresses these. **Figure 3** is attached as a reminder of the bullet and its connector.

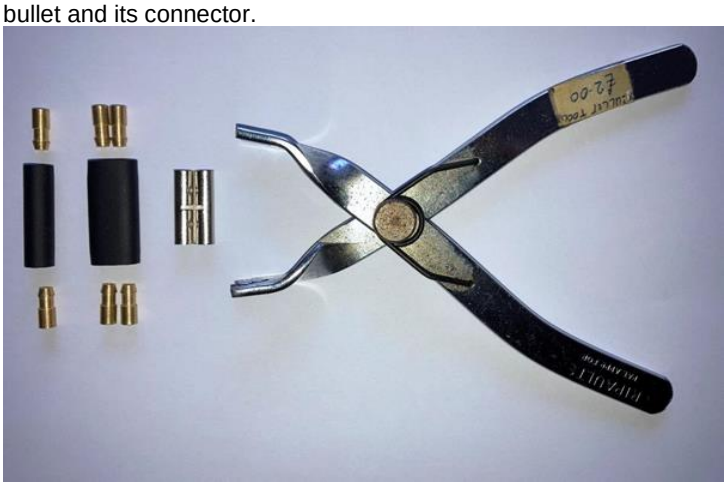

Figure 3 - Bullet Connection (L to R) Single, Double Splice + Armature & Insertion Tool

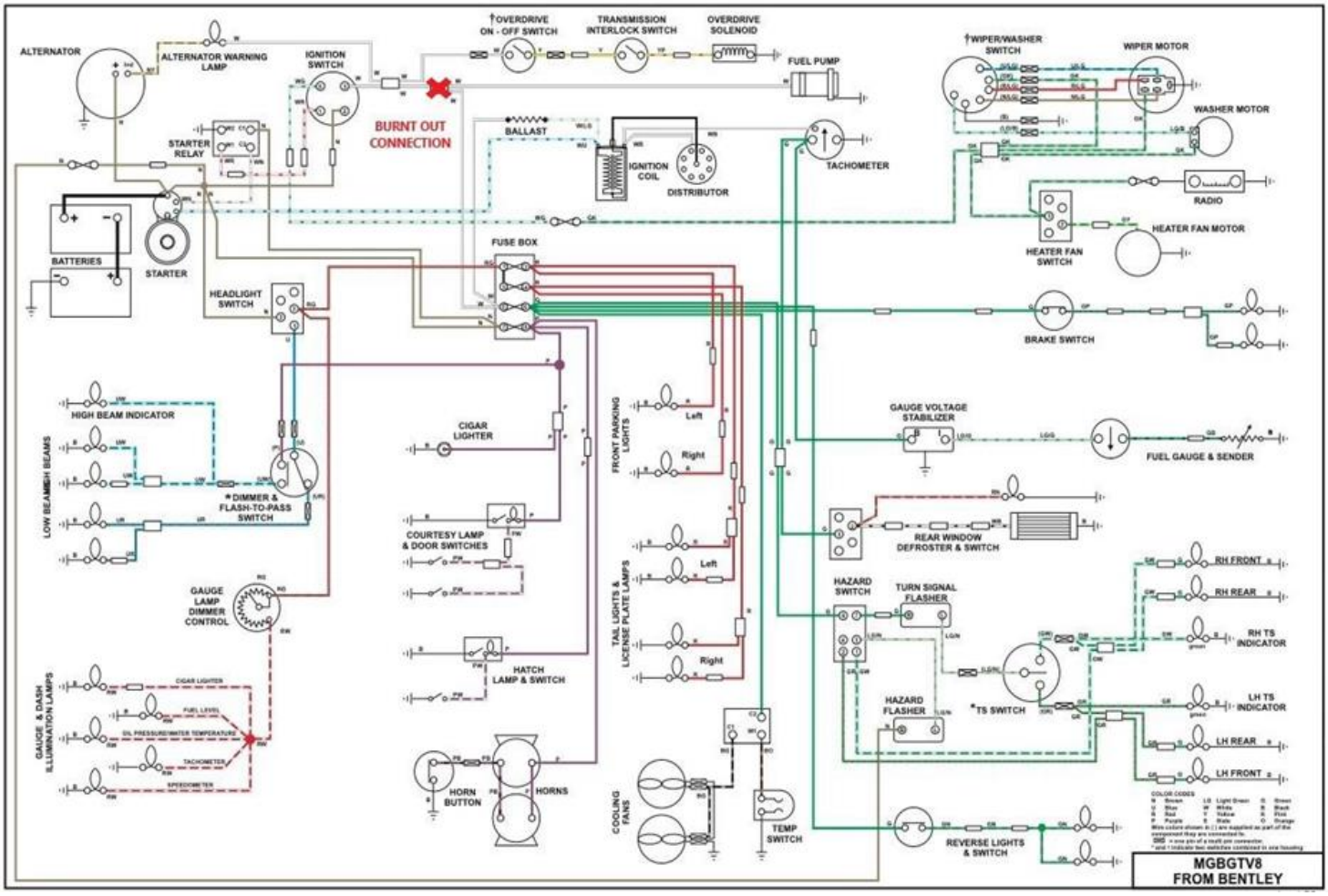

Figure 4 - MGBGT V8 wiring diagram (courtesy of Bentley Publishers)

Maintenance should include regular inspection of the connector armature for corrosion and to ensure prompt replacement if any is evident. Separation of corroded components can overstrain the cables, and this makes a strong case for incorporating strain relief in the terminals. A light coating of moisture excluding grease or wax is recommended on reassembly of the connection. An insertion tool is shown in **figure 3** for illustrative purposes but is not essential.

The Alternatives

A study of electrical catalogues reveals there are a number of alternatives to the bullet terminal and its connector. The writer would recommend the catalogue of 12 volt planet for its comprehensive range and its inclusion of a helpful **Knowledge Centre**. The following is a selection of alternatives but is far from exhaustive.

The Blade Single Connector

This is a contemporary of the bullet but in the MGB was only used as a female connector at harness terminations (e.g. fuse box) and not harness to harness connections. Unlike the three-piece bullet connection (male bullet – female/female connector – male bullet) it comprises only two pieces (male - female). Also, unlike the bullet either or both connections can be electrically insulated when disconnected which is an obvious advantage. Like the bullet, multiple connections to the same circuit (splices) are possible.

Figure 5 - Single Blade Connections, Piggybacks, Ring/Blade Terminal and Splices

The Blade Single/Multi Connector with Rigid Insulator

This is another male – female connection but features a rigid plastic insulator which bestows a level of strain relief and interlocking to the connection. Consequently, it satisfies most of the basic requirements of a harness connector with the notable exception of protection from environmental factors. An additional feature on the terminals is a latch which engages in the rigid insulator and prevents separation when the latter is pulled. If the terminals are supplied separately from the insulators the “with latches” variant should be specified. De-latching of the terminals can be awkward, and a set of

keys designed for this purpose can be useful. Environmental protection can be improved by 'potting' the cable entry at the rear of the housings with silicon sealant or hot melt glue.

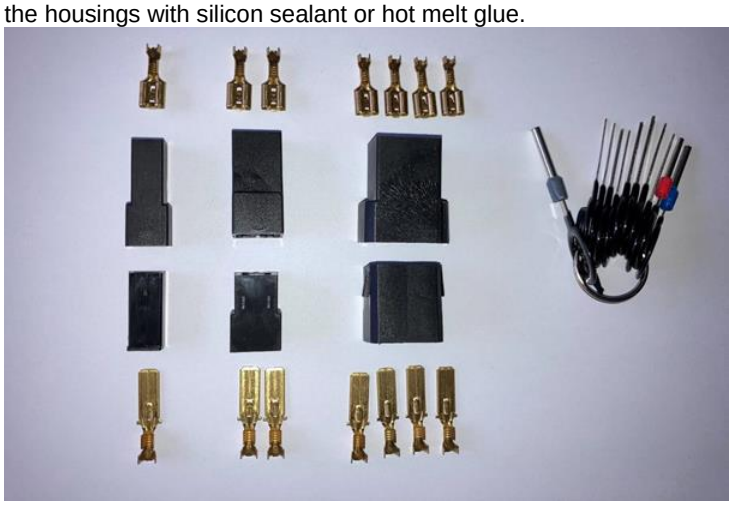

Figure 6 - Blade Multi Connector with terminal de-latching keys

The Unsealed Multi Connector

A contemporary example of the pin multi connector in the MGB harness is located under the instrument cluster adjacent to the steering column. A current version is available in the **Mate N Lok series** which features round pin conductors and accommodates 0.5 to 2.0 mm^2 cable.

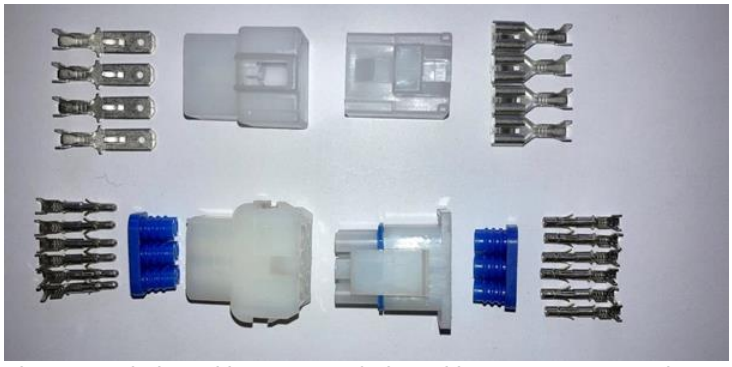

Figure 7 - Blade Multi Connector / Pin Multi Connector comparison (note the locking features on the insulated housings)

The Sealed Multi Connector

Figure 8 - Superseal Series 1.5 Connectors, Terminals and Insulators

This development post-dates the MGB and incorporates all the desirable features cited in the analysis. Commercially available examples include **Econoseal and Superseal**. It should be noted that Superseal is available in two series, 1.5 to accommodate 0.5 to 1.5 mm^2 cable and 2.8 to accommodate 1.5 to 2.5 mm^2 cable. The appearance is not exactly 1970s automotive electrics but, thankfully, neither is the performance. Their incorporation might be better restricted to less obvious but vulnerable areas of the car like the electrical connections behind the radiator grille.

Procedure

The procedure varies with the terminal selected and is covered comprehensively elsewhere - e.g. see **Knowledge Centre** at https://www.12voltplanet.co.uk/ . Most modern cable joining is performed by mechanical crimping as this removes some of the skill requirement and variability from the operation. Crimping has the added advantage of incorporating the cable insulation into the connection and even the insulator in the case of Superseal Connectors. The range of crimping tools is extensive and a couple are shown in **figure 9**. It may be noted that insulated terminals have not been included in the list of alternatives. This is intentional on the part of the writer as he finds the quality of the crimp to be difficult to inspect and any insulation may be separately applied.

Figure 9 - Crimping Tools for Uninsulated Terminals

Conclusions

Electrical connections rarely fail without prior warning and in this case that had been a flickering tachometer and occasional engine misfire. A superficial investigation revealed no obvious faults but in a fifty year old car a more rigorous inspection is called for. From this experience the writer would recommend that it includes the bullet connectors.