

## **GROUND POINT AND (OTHER ELECTRICAL CONNECTION) PREPARATION**

**by Dave DuBois**

One of the most often asked question on the various Bulletin Boards and Forums is in regard to electrical problems – why do my turn signals flash slow or not at all on one side and not the other, why are my lights dim all the time, why do my windshield wipers run so slow, etc., etc., etc. The quick, cynical answer, of course is the Price of Darkness has struck or other such jokes about Lucas electrics. For the real answer, we have to take a look at the cars we are working on, or better yet, their age. The newest MG for those of us here in the U.S. is at least 28 years old, while the T series cars are over 50 years old and most of these cars have had less than good (or even mediocre) care and maintenance. I don't care what kind of a vehicle you are trying to restore or even just trying to keep running, if it is between 30 and 50 years old, there are going to be problems with the electrical system. State of the art alone, that many years ago was not what it is today and the intervening years have further degraded even the best assembled electrical systems. The biggest problems that we face when dealing with these aging electrical systems is loose connections, corrosion and contamination. By contamination, I am talking about oil and grease that have collected over the years and paint sprayed indiscriminately on or around electrical connections that has run between the two mating surfaces of these connections. What I am going to talk about in this article is how repair these bad connections and make them reliable conductors of electricity so that the electrical system in your car will perform it's job correctly.

I am going to start with grounds, which is where most of the problems exist. On the surface, grounds look like simple minded connections – it's just a hole in the metal part of the car with a ground wire attached to it. There is, however, more to it than that. For an example, I recently received a turn signal relay used on the T series cars, MGAs and Magnettes. The owner reported flaky operation of the relay and thought he needed either a new one or to have the existing one rebuilt with modern relays instead of the old relays that were originally used. Pictured here is



one of the mounting surfaces of the relay assembly. If you look closely at the cleaned area around the mounting bolt hole, you can see that the paint is quite thick and it originally extended right up to the hole. The first thing I did to insure a good ground connection was to clean both the front and rear surface around the bolt holes down to bright shiny metal. This operation took me about 5 seconds per side on each mounting hole using a piloted end brush in a battery operated drill (see below at the end of the article for information on these brushes). You can see at the edges of the brushed area around the hole that I originally started working with a sanding disk in a Dremel tool, which will also

work, just not as quickly. The preparation of the mating surface of this ground connection rests with the owner of the relay assembly. He will have to insure that the area around the mounting holes on his car are also cleaned right down to shiny metal. All of the surfaces will have to be coated with a good conductive grease made to enhance conductance of electrical joints. One of the best products for this application is Kopr-Shield, a grease with copper particles in it (see below at the end of the article for information on Kopr-Shield). The grease keeps the cleaned surfaces from corroding and the copper particles insures good current flow. There are other products available that will retard corrosion, but not with the copper particles to enhance conductance.

The next area of concern is connections to the terminals of electrical devices like the relay assembly above. These terminals (and the fork or ring terminals on the end of the wires) have to



be clean and free of any dirt, hardened grease corrosion and paint. Remember, dirt, hardened grease, corrosion and paint, while not the best insulators, are definitely not good conductors of electric current and all of these foreign materials must be cleaned off of the terminals in order to have a good connection. In the case of the terminals on the relay assembly, I first started trying to clean the with a small wire brush. While this got the big stuff off, it didn't get some hardened grease and the paint overspray off of the terminals as you can see in this picture to the right (note: this picture is of the back side of the terminals because I didn't get a picture of the front prior to cleaning them). You can see where I wire brushed the terminals and portions of them are somewhat clean, but the center terminal still has hardened grease and dirt on it while the one on the left has paint on it. Contrast this to the lower picture of the front of



the terminals that were cleaned with a sanding disk in a Dremel tool. The front of the terminals, where the connecting wires will be attached, are again cleaned right down to bright, shiny metal

and are ready for an application of the conductive grease and the terminal ends (also cleaned of all foreign material and corrosion) on the wires.

Finally, let's talk about the wire to wire connectors used in our cars. The wires in all but the very late MGBs connect wire to wire through bullet connectors. These connectors consist of pins that are approximately 1/8" in diameter that are crimped or soldered onto the end of the wire and is inserted into a sleeve (also known as Luclar connectors) that is covered with a thick insulating material. The sleeves come in various configurations that take 2, 4, or 6 wires. Since neither end of these are sealed to the environment, the pins (bullets) and/or the inside of the sleeve can become contaminated with dirt, oil, paint overspray or even moisture and the moisture or contaminants in the air can cause corrosion of the pins, the sleeve or even in some extreme cases, the bare wire that is crimped inside the pin. Whenever assembling these bullet connectors after having taken them apart for any reason, the pins should be cleaned with a wire brush (and some solvent if the contamination on them is particularly stubborn). Some people even go so far as to heat the bullet up and run solder inside, bonding the wire and the bullet together. While this is not necessary, it is a belt and suspenders approach to insuring that a good connection is made – more on this in a bit. The sleeves also need to be cleaned of any contamination or replaced. You can get a set of brushes for cleaning the inside of the sleeves from Gerry Masterman at GEM Enterprises (see below at the end of this article for information on GEM Enterprises). Since I have found that these sleeves tend to get brittle with age, I generally replace them with new ones when correcting problems in the electrical system. When the bullets and the sleeves are all cleaned, the bullets should be smeared with a dielectric grease that is readily available at auto parts stores, Radio Shack, Home Depot, or Lowe's under various brand names and then inserted into the sleeve. When inserting the bullets, make sure that they are pushed all the way into the sleeve so that the back of the bullet is flush with the outer end of the sleeve and the sleeve is centered in the insulating cover. Once the bullets are securely inserted into the sleeve and everything is centered in the insulating cover, put a glob of the dielectric grease around the wire, pushing it down into the sleeve to seal the open ends so contaminated air and moisture are excluded from the connections. If one or more of the ends of a multiple wire sleeve are unused, fill it with some dielectric grease to keep out any contamination and moisture. If all of your bullet connectors are connected and finished in this manner, it will go a long way to insure trouble free motoring for many happy miles.

Regarding soldering the bullet connectors that are crimped on to the ends of the wires in the earlier MGBs. I stated above that this is not usually necessary or desirable, but for every statement like that, there is an exception. I had a situation where one of these wires crimped into a bullet had developed corrosion inside the crimp. This may have been a crimp that was not done up properly, because a correctly crimped wire in any kind of a pin or terminal is supposed to form a gas tight connection, which the one in question had not done. The result was sufficient resistance developed in this wire crimped into the bullet, that it was dropping all the voltage that was supposed to be going to the bulb for the left front turn signal. I finally determined where the problem was after spending considerable time troubleshooting grounds and even the socket of the turn signal bulb holder. I wound up cutting the offending bullet off and crimping a new one in place. It would have done no good trying to soldering the original bullet, because solder will not stick to corroded wires or metal.

Speaking of chasing bad grounds and lamp sockets, it is not uncommon to find that the socket can have hidden corrosion inside the crimp that holds the socket into the lamp assembly. If that is the case, a new lamp assembly is in order or sometimes a wire can be soldered to the metal on either side of the crimp.

Later MGBs that use multi-pin plugs instead of the bullet connectors are more immune to contamination and moisture getting to the pins in the connectors because they are more air and moisture tight. Note that I said more air and moisture tight, not completely so. It is always a good idea any time these plugs are disconnected, that some dielectric grease is smeared on the female socket before reconnecting the plug so that the air and moisture tight seal is enhanced and corrosion is kept at bay.

Below is a listing of where to get the items I talk about in the above article.

Pilot bonding end brushes are available from MSC Industrial Supply Co. (800-645-7270)

(Web site <http://www.mscdirect.com/>)

1/2" End Brush with 3/16" pilot - P/N 00126722

1/2" End Brush with 1/4" pilot - P/N 00126730

Kopr-Shield – Thomas & Betts P/N 201-31879 is available from The Eastwood Co (web site <http://www.eastwoodco.com>). It is also available at electrical supply outlets such as CED and is may be available at Lowe's and Home Depot.

The brushes for cleaning the sleeves for the bullet connectors are available from GEM Enterprise <http://gem-enterprises.net> under part number MG-105.

6/26/08