

No. BPI 11-11

Subject: Electrical Circuit Repairs

Vehicles Involved: All

Condition: High Resistance, Opens, and Shorts

Repair: Anti-lock brake electronics, electronic stability control, electronic steering control, and any sensory device working in conjunction with a CAN system, require the electrical components and connections to be perfect to provide minimal resistance and required voltage.

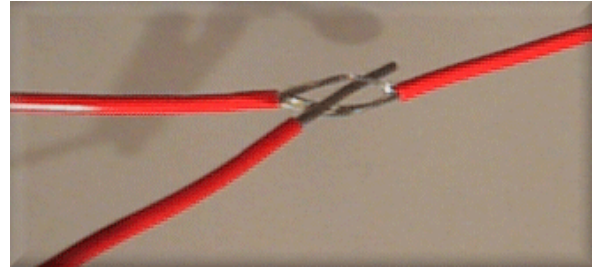
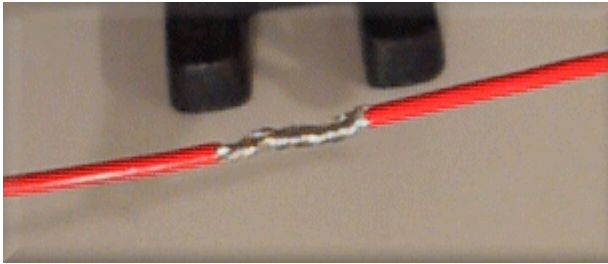
The recommended method of repairing or attaching a wire to a circuit is soldering, joining two pieces of metal by using a lower melting temperature filler metal. There are several physical processes that take place, as the base material heats up. The solder/ filler will liquefy described as wetting and polar bonding. Soldered bonds are not inherently strong but can be more durable depending on the solder alloy composition. 60% tin and 40% lead are the normal ratio, and they may use a 63/37 ratio.

Because of the hazards involving lead, the industry is moving to antimony or bismuth in place of the lead. The use of these components increases the strength of the connection, as well as the price of the solder.

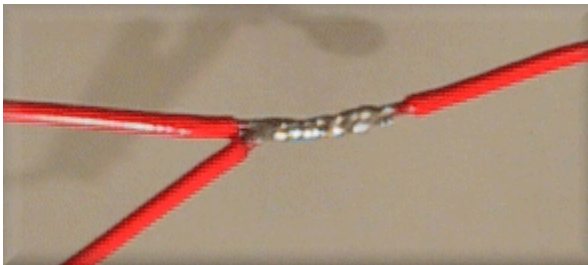
Bismuth also retards the growth of tin whiskers, which are microscopic single-crystal metal fibers that are capable of bridging distances between electrical components. These tin whiskers wear through insulation, creating short circuits and failures.

To begin the splicing procedure, the two wires are joined together. The following illustrations show different methods in accomplishing this.





Heat is applied to the connection until the solder being applied liquefies wetting and bonding the two wires. Once the solder permeates the connection, the heat is removed.



The solder must wet to the surface of the wires its trying to bond to. The greater the surface area that is wet the greater surface area the solder will bond to. In a pair of twisted wires, good surface wetting will result in the solder being pulled into and around the bonding surfaces, maximizing the contact area, providing the most minimal amount of electron interference, keeping resistance to a minimum. This will provide the best possible soldered joint.

To complete the soldered joint electrical repair, it must be protected from moisture intrusion as well as shorting to a grounded surface. Shrink tubing of the appropriate size to accommodated the joint is applied over the joint, heat is applied, shrinking the material, making the joint insulated as well as waterproof.



This completes the electrical repair.