

Switches develop resistance as they age, causing lamps to lose their brilliance. Wear in the switch may cause an intermittent connection, which will result in flickering.

A fuse will usually burn out due to an overload, normally from a short circuit. Tail lights and stop lights may use the same fuse as some of the interior lights; so the driver will not be driving without rear lights without knowing something is wrong.

Wiring may develop loose or dirty connections which result in the same types of problems that bad switches cause. Insulation may be worn off by rubbing and cause a short circuit. Occasionally the socket may lose connection with the body of the vehicle, breaking contact with the ground.

Late model cars have many accessories on board, which are all connected to the wiring circuits. Any problem in an electrically powered unit will have to be checked for power, correct wiring, proper fuse size, and ground path back to the battery.

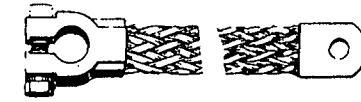
Circuits can be checked for conductivity with a test light, for resistance with an Ohmmeter, and for voltage drop with a voltmeter. When you test primary wire leads or battery cables, do not remove them from the vehicle before testing; just touch one probe of the voltmeter or volt/ohmmeter to each of the electrical components to which the cable or lead is attached. (When checking a negative battery cable, for example, one probe should touch the negative battery post and the other probe should touch the stud or bolt head used to secure the battery cable. When the engine is cranked and carrying its greatest electrical load, such as during starting, the reading should not exceed 0.1 volt.)

Wire should be clearly stripped approximately $\frac{1}{16}$ " longer than the length of the terminal's conductor clamp. Care should be taken not to nick or cut any of the strands during stripping. When attaching the wire to the terminal, insert it until it "bottoms" in the clamp or approximately $\frac{1}{16}$ " protrudes beyond the clamp. Make sure that no insulation is put into the clamp.

STARTING SYSTEM

The automobile starting system includes both the battery cables and the starter motor.

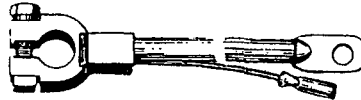
Battery Cables



6 & 12 VOLT BRAIDED
TINNED COPPER
BATTERY CABLE STRAPS



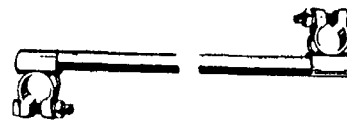
5TH WHEEL GROUND
STRAP



12 VOLT UNIVERSAL
NUT AND BOLT
TERMINAL WITH
6" TRAILING LEAD



6 & 12 VOLT INSULATED
SWITCH TO STARTER
CABLES



BATTERY JUMPER
CABLES



6 & 12 VOLT BONDING
STRAP

(Figure 14) Battery cables.

The battery cables link the battery to the electrical systems of the vehicle. Because of the relatively low voltage (pressure) and high amperage (flow) needed to supply these electrical systems, the battery cable is a large, stranded and jacketed cable. Although some manufacturers use aluminum or copper-clad aluminum, most use all copper, which is an all-around superior conductor for battery cables.

In most cables, the copper is stranded and insulated for easy handling and for protection of the electrical system. Some vehicles, however, use a braided ground strap, generally tin-coated copper for corrosion resistance. Because of the harsh environment battery cables exist in, the insulation is designed to withstand abrasion caused by vibration and to be resistant to attack by air and battery vapors.

Battery cable connections take many different forms, the most common of which is a lead casting. This casting sometimes includes a trailing lead used for grounding.