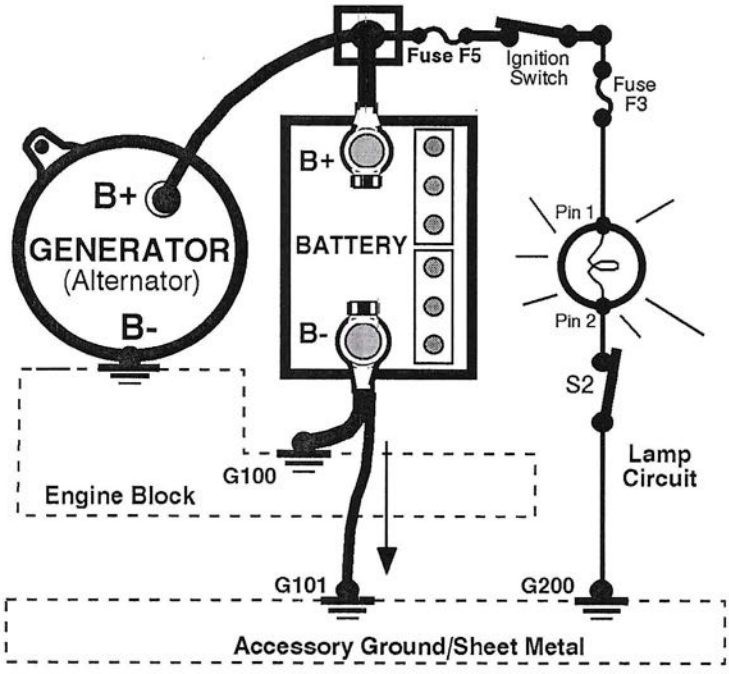
Electron Current in Vehicle Electrical Systems

Engine OFF - Battery Power



The two **"schemations"** at the left show a vehicle's electrical power system consisting of a battery and a generator (alternator). *(A "schemation" is a Veejer creation combining a **schematic** with an **illustration.)***

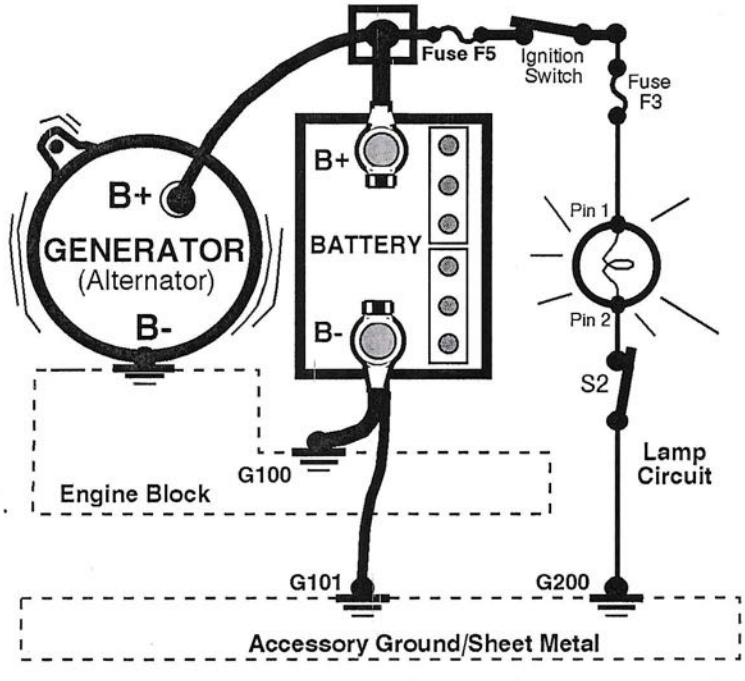
Both battery and generator (+) terminals are labeled **B+** and connected together through a large cable. Both negative terminals, labeled, **B-,** are connected together through the Engine Block. This places the battery and generator connections in parallel and the laws of parallel circuits apply. The battery's negative terminal is connected to both the Engine Block, at G100, by the heavy Engine Ground Cable, and to the sheet metal, at G101 by the lighter wire of the Accessory Ground Cable.

The engine is not running but the Ignition Switch at the top/right is CLOSED. The Lamp in the circuit is "ON" because Switch S2 is CLOSED and the battery is supplying electron current up through the Lamp circuit to operate the Lamp which works creating light.

Trace battery current as it flows down the Accessory ground with an arrow as shown. Now draw an arrow connecting G101 with G200. Draw an arrow flowing up from G200 through Switch S2 to Lamp Pin 2 indicating the flow of electron current through the Lamp circuit.

Next draw an arrow up from Lamp Pin 1 through the Fuse F3. Next draw an arrow facing to the left illustrating electron current flowing through the fuse to the battery's positive post. Next draw an arrow tracing down to Battery B+. These arrows trace battery electron current through the Lamp, also known as the **Load** in the circuit. As long as S2 remains CLOSED and the battery has sufficent charge, electrons flow. As battery charge decreases, the flow of electrons decreases and the Lamp becomes dim. The solution to this problem, low voltage producing low electron current causing poor load performance is solved by a Generator, also called an Alternator.

Engine Run - Generator Power



It is very important to understand how the Generator, now running in the schemation at the left, supplies electron current to all vehicle circuits during engine RUN. The generator produces higher voltage than battery voltage so it takes over operating the electrcal system during engine RUN. Generator electron current leaves the Generator B- terminal bolted to the engine block and flows through the engine block to G100.

VERY IMPORTANT:
Generator electron current recharges the battery and supplies current to all vehicle circuits **at the same time.**

Draw an arrow from GEN B- over to G100 indicating current going to G100. Draw an arrow going up the battery cable from G100 to indicate total current flow going into the battery post. **The electron current splits in two directions at the battery B- terminal post.**
(1) Current flows through battery to recharge battery.
(2) Trace remaining current down the Accessory ground which connects to sheet metal at G101. This current supplies all the electrical system circuits connected to sheet metal, which reveals the **extreme importance** the Accessory Ground cable and G101 connection is to the vehicle's entire electrical system performing properly.

This topic is fully explained in my book entitled: **"Vehicle Electrical Troubleshooting *SHORTCUTS."***
Learn the correct ways to test this circuit's current and voltage during discharge and recharge.

Figure 01-2025 "Electron Flow in a vehicle circuit"