TClinic

ELECTRICAL BASICS
(or TC Electrics 101)
by David Edgar, TCMG

Electrical components work on the principle that when electrons flow through it, something happens. Either a bulb will light up, an ignition spark will occur, a horn will toot or maybe the wipers will work (OK, maybe they will at least swish back and forth even if they don't wipe the water away in the case of the TC). In order for electrons to flow there are two requirements: 1) an unbalance of electrical charge so that the electrons will try to balance things out by flowing from one point to another, and, 2) a path for the electrons to travel through.

UNBALANCED ELECTRICAL CHARGE

This part is probably the least important for you to understand completely, but it is necessary to have an idea of what is going on, so we will keep it simple.

Imagine if you will, a battery with two terminals on top. One is positive and one is negative. The negative side has a surplus of electrons and the positive side has a lack of electrons. Given a choice the electrons would like to balance things out and if provided a path, will flow through that path to do so. In fact if they want to do it so bad that even if they have to do work along the way, such as light up a bulb or turn a motor, they will gladly do it. If a path is provided and electrons flow, eventually the two terminals will become more balanced (read that as low battery charge) . As the electrons flow along, each electron is doing the same amount of work along the way but because the terminals are becoming more balanced charge wise, there is not the urgency, and the number of electrons trying to force their way though have decreased. You have fewer electrons doing work now and fewer working electrons will result in a dim lamp or slow moving motor as an example.

Charging the battery (taking electrons from the positive side and moving them back to the negative side again) brings back the full potential of the unbalanced electrical charge. And not that it matters but electrons flow from the negative terminal to positive terminal no matter which way your TC is grounded.

ELECTRICAL PATHS

Let's follow a typical electrical path. From one battery terminal there is a battery cable which leads to a to a junction, to a wire, to a switch, and to a lamp. This alone is not enough to light up the lamp. We have to get the electrons back to the battery so the lamp is bolted to the metal body or frame of the TC and there is a cable from the body back to the other battery terminal which makes a complete circuit. Following the path, electrons are now able to flow from the negative side of the of the battery through the circuit (you did turn on the switch didn't you?) and try to balance things out by flowing towards the positive side of the battery.

Quickly here I want to brief you on a couple terms. Warning: These are simplified and are not intended for you engineer types out there.

Short Circuit - as the name implies the circuit is shortened. Somewhere the electrons have found a short cut (why do any more work than you have to). Lots of sparks can occur here depending on where the short is. A good safety precaution is to always disconnect the battery if you are doing repairs on the electrical system. And always disconnect the GROUND cable FIRST. Nothing happens if you short out the ground terminal to the body (it is already connected to it anyway) but short out the hot terminal and those electrons will let you know it in a FLASH.

Open Circuit - Pretty much opposite of the short. The path has been opened up and the electrons cannot get through (no matter how hard you twist the switch or cuss). Nothing happens.

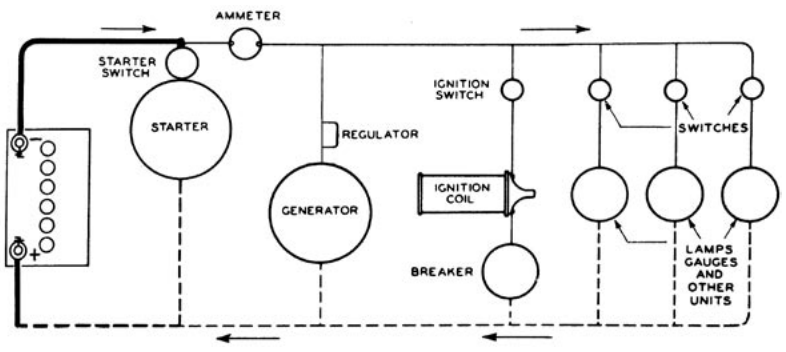
Voltage - Just a measure of how unbalanced an electrical charge is. Your TC is a 12 volt system. (but did you know a fully charged auto battery is 13.2 volts?)

Ohm - a measure of resistance to the electrons flowing. A corroded battery terminal has lots of resistance and will cut down the number of electrons flowing to do work.

Amperage - Just a measure of how many electrons are flowing through the path. Amps are determined by how much voltage you have to work with and how much resistance is in the circuit. More volts or less resistance let those electrons flow more.

OK – you now have enough basics for us to go on to the TC electrical system. Look for succeeding TClinics in this electrical series that deal with different parts of the electrical system in a simplified manner. For now look at the generic automotive circuit below. Notice that some parts of the circuit are shared by all components (ie: battery to starter switch) while some parts are used only by one component (ie: furthest unit on the right).

First printed by TCMG in April 2004



Return path through metal body and frame