

Electricity

The 'Force' Is With Us

Editor's Note: The following is an article written by Craig Nagle, which was originally published in Motor Age magazine. It is one of the most straight-forward explanations of the mysterious force called "electricity" I have read since high school physics. Modern automobiles are becoming so electronically sophisticated, a elementary understanding of this force by drivers is almost as important as knowing the 'rules of the road'.

Electricity may have been discovered on earth a long time ago, but today we can look to a galaxy far, far away for a better way to understand it. In 1977, when George Lucas introduced us to the universe of Star Wars he told us about a great power known as the 'force.' Although, nobody could see the force, certain people, known as the Jedi, were able to sense and use it.

Perhaps it wasn't just another Hollywood creation. There is a force in our universe as well, and it is known as electricity. In our universe, as in Star Wars, the force is all around us and when harnessed, can yield tremendous power.

Electricity is defined as a fundamental property of matter which is made up of molecules containing atoms. Since each atom contains electrons, protons and neutrons, and electricity is a result of the movement of electrons and protons, electricity or the 'force' is always with us.

In Star Wars, Obi-Wan Kenobi told Luke Skywalker that he had to learn the ways of the force, before he could become a Jedi and use it. The same applies to our force. We know that electricity is the flow of electrons, but what causes it to flow? The flow is caused via an electromotive force (EMF) which is generated either from a chemical reaction, such as the reaction inside a battery or from a magneto-mechanical device, such as a generator.

EMF, as you already know or have probably deduced by now, is what we commonly refer to as voltage. EMF or voltage does not generate electrons or power. Voltage is the pressure created by the accumulation of electrons in a confined area which exerts a force on the other electrons, and cause them to start moving via magnetism. Power is the product of the amount of voltage multiplied by the amount of current or amperage. The amperage is what is produced once the electrons are moving or flowing. This current can be one of two types: alternating current (AC) or direct current (DC). The alternating current is bi-directional and the direct current is uni-directional. Any current generated by a battery is DC and any current produced via an unrectified magnet is AC.

Once these electrons are flowing, something has to be used to keep the flow from becoming uncontrollable. The flow is controlled through restrictions known as resistance. Resistance is an important part of any electrical system because it impedes the current flow and reduces the amount of voltage. For example, we know that electricity generates heat and too much heat can damage a component. Therefore, electrical components are rated for maximum load or amperage. So, if a component such as an HVAC blower motor is rated at a maximum of 25 amps, the circuit has to incorporate enough resistance to prevent the amperage from rising above the 25-amp limit, while still allowing enough current through so that operation is not affected. Circuits and components can be protected