training chart manual

SECTION K

FUNDAMENTALS OF DELCOTRON® GENERATORS

Delco Remy

Delco Remy

SECTION K

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introduction

The Delcotron® generator is a lightweight, high-performance machine that supplies electrical power for charging the battery and operating accessories in gasoline and diesel engine electrical systems. Featuring an output at engine idle, a high output per pound of weight, and a very minimum of periodic maintenance requirements, it is a reliable and dependable member of the charging circuit team.

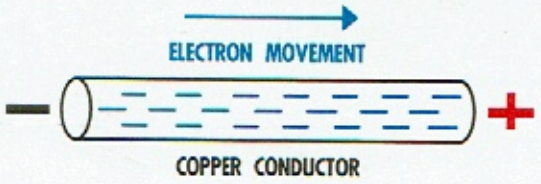
Constructed essentially of a rotor mounted on bearings in two end frames, a stator assembly, and six silicon diodes, the Delcotron generator develops A. C. voltages which are rectified by the diodes to a single D. C. voltage and D. C. current output. This manual covers the operating principles by which the Delcotron generator produces voltage and current, and also includes a section devoted to the different types and designs of Delcotron generators.

review of electricity and magnetism

In order to understand the operating principles of Delcotron® generators, it will be helpful to review briefly the fundamentals of electricity and magnetism.

current

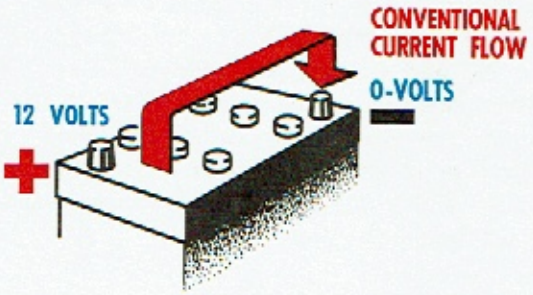
Electric current is defined as a movement of electrons through a conductor such as a copper wire. Current flow is measured in amperes, and when 6.28 billion billion electrons pass a certain point in a conductor in one second, the current flow is one ampere. Electrons, however, will not move through a conductor of their own free will. There must be some kind of force to cause the electrons to move.



voltage

The force which causes electrons to flow in a conductor is called voltage. The voltage is the difference in electrical pressure measured between two points in a circuit. Thus, using a 12-volt battery as an example, the voltage measured between the two battery posts is 12 volts.

An important concept is "voltage potential" at a certain point in the electrical circuit. This simply means the voltage or electrical pressure at a particular point with respect to another point. If the voltage potential of one post of the 12-volt battery is zero, the voltage potential at the other post is 12 volts with respect to the first post.



Another important concept is polarity. One post of a battery is said to be positive, and the other negative. By conventional theory the direction of current flow in a circuit is from the battery or generator positive terminal through the external circuit, and then back to the negative terminal of the battery or generator. This direction is opposite to the direction of electron flow.

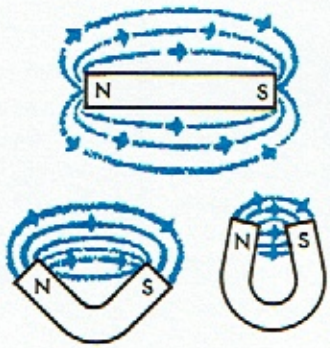
resistance

The voltage or electrical pressure needed to produce current flow in a circuit is necessary to overcome the resistance in the circuit. Resistance to the flow of current is measured in ohms. One volt will cause one ampere to flow through a resistance of one ohm. This is an expression of Ohm's Law, which can be written as illustrated.

$$\text{AMPERES} = \frac{\text{VOLTS}}{\text{OHMS}}$$

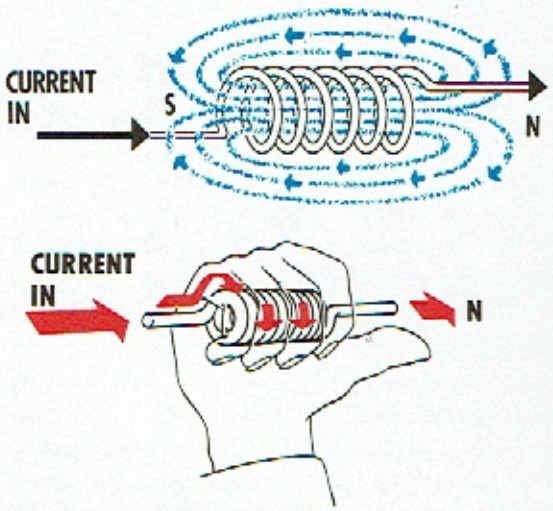
magnetism

Magnetism, like electricity, is invisible. Its effects, however, are well known. An example is the attraction of a bar magnet for iron filings. A magnet has a North pole, designated as "N," and a South pole, designated as "S." The space around the magnet in which iron filings are attracted is called the "field of force" or magnetic field, and is described as lines which come out of the North pole and enter the South pole.

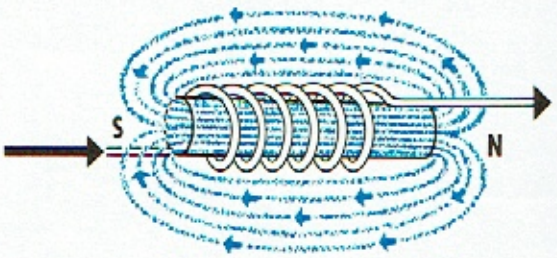


Electricity and magnetism are very closely associated, because when electric current passes through a wire a magnetic field is created around the wire.

When a wire carrying electric current is wound into a coil, a magnetic field with N and S poles is created just as in a bar magnet.



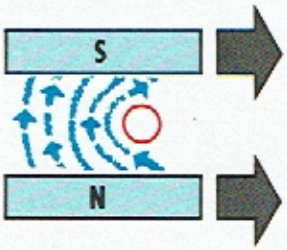
Using the "Right Hand Rule" — wrapping the fingers around the coil in the direction of current flow, the thumb will point towards the North or N pole.



If an iron core is placed inside the coil, the magnetic field becomes much stronger, because iron conducts magnetic lines much easier than air. This arrangement, called an electromagnet, is used in generators to create strong magnetic fields by winding many turns of current-carrying wire around iron cores called pole pieces.

electromagnetic induction

We have seen that a magnetic field, made up of lines of force, is created around a wire when current is passed through it. If a magnetic field is moved so that the lines of force cut across a wire conductor, a voltage will be induced in the conductor. The induced voltage will cause current to flow when an electrical load, such as a resistor, is connected across the conductor.



The direction of current flow is determined by the direction of the magnetic lines of force and the direction of motion of the magnetic field with respect to the conductor. To visualize this, note the illustration, where magnetic pole pieces are being moved so that the magnetic lines of force are cutting across a conductor.

The direction of the magnetic lines of force is upward, since magnetic lines leave the North pole and enter the South pole. The direction of motion of the magnetic field is toward the right, as indicated by the gray arrows. With this direction of motion, the magnetic lines are striking the conductor on its left side, which is called the leading side.

The direction of current flow can be determined by applying the Right Hand Rule as follows: Grasp the conductor with the right hand with the fingers on the leading side of the conductor, and pointed in the direction of the magnetic lines of force. The thumb will then point in the direction of current flow.

Voltage is generated in Delcotron generators by moving strong magnetic fields across stationary conductors.

Although our coverage of basic electrical principles has been limited and rather brief, it will serve as a useful background for the next section covering the operating principles of Delcotron generators. For a more thorough coverage of electrical fundamentals, refer to the Delco-Remy Training Chart Manual, DR-5133A, entitled, "Fundamentals of Electricity and Magnetism."