

Standard Automobile Alternator

A key component of an automobile's charging system, which provides current to recharge the battery and develops electricity to power all other electrical components when the engine is running, is the alternator. The other component of the charging system is the voltage regulator.

The basic function of the alternator is to generate the electricity required to start and run the automobile, while the regulator is designed to control the amount of voltage that circulates through the system. This discussion will focus entirely upon the alternator, specifically, the principle of operation by which it works and its main components.

An alternator (Figure 1) consists of rotor assembly, a stator assembly, and a rectifier mounted in a housing.

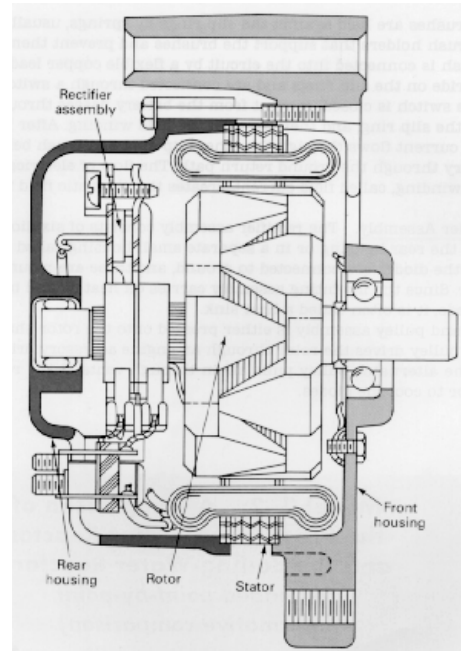


Figure 1: Parts of an Alternator

Alternator Housing

The housing is usually made up of two pieces of die-cast aluminum. Aluminum is used because it is a nonmagnetic, lightweight material that provides good heat dissipation. Bearings supporting the rotor assembly are mounted in the front and rear housing. The front bearing is usually pressed into the front housing or onto the rotor shaft. It is usually a factory-lubricated ball bearing. The rear bearing is usually installed with a light press fit in the rear housing.

Stator Assembly

The stator is clamped between the front and the rear housing. A number of steel stampings are riveted together to form its frame. Three windings around the stator frame are arranged in layers in each of the slots on the frame. At the other end, they are connected into the rectification assembly.

Rotor Assembly

The rotor assembly consists of a rotor shaft, a winding around an iron core, two pole pieces, and slip rings. The rotor is pressed into the core. Six-fingered, malleable, iron pole pieces are pressed onto the shaft against each end of the winding core. They are placed so that the fingers mesh but

do not touch. When direct current is passed through the field coil winding, the fingers become alternately north and south poles. A slip ring assembly is pressed on to the rear end of the rotor shaft and connected to the two ends of the field winding.

Two brushes are held against the slip rings by springs, usually mounted in plastic brush holders that support the brushes and prevent brush sticking. Each brush is connected into the circuit by a flexible copper lead wire. The brushes ride on the slip rings and are connected through a switch to the battery. When the switch is closed, current from the battery passes through one brush, through the slip ring, and then through the field winding. After leaving the field winding, current flows through the other slip ring and brush before returning to the battery through the ground return path. The flow of electrical energy through the field winding, called field current, creates the magnetic field for the rotor.

Rectifier Assembly

The rectifier assembly consists of six diodes mounted either in the rear housing or in a separate small housing called a rectifier bridge. Three of the diodes are connected to ground, and three are mounted in an insulator. Since the mounting assembly carries off heat caused by the operation of the diode, it is often called a heat sink.

A fan and pulley assembly is either pressed onto the rotor shaft or held with a nut. The pulley drives the rotor through an engine accessory drive belt. The fan behind the alternator pulley pulls air in through vents at the rear of the alternator to cool the diodes.