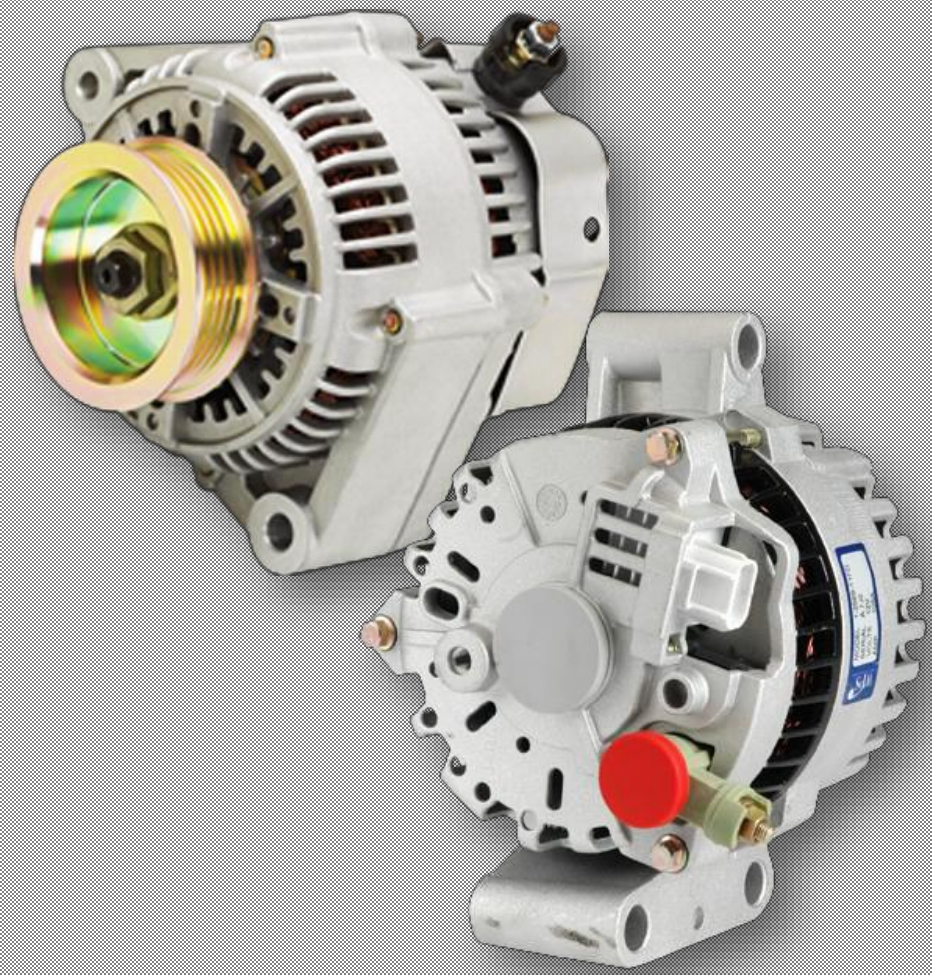
Just what is an alternator?



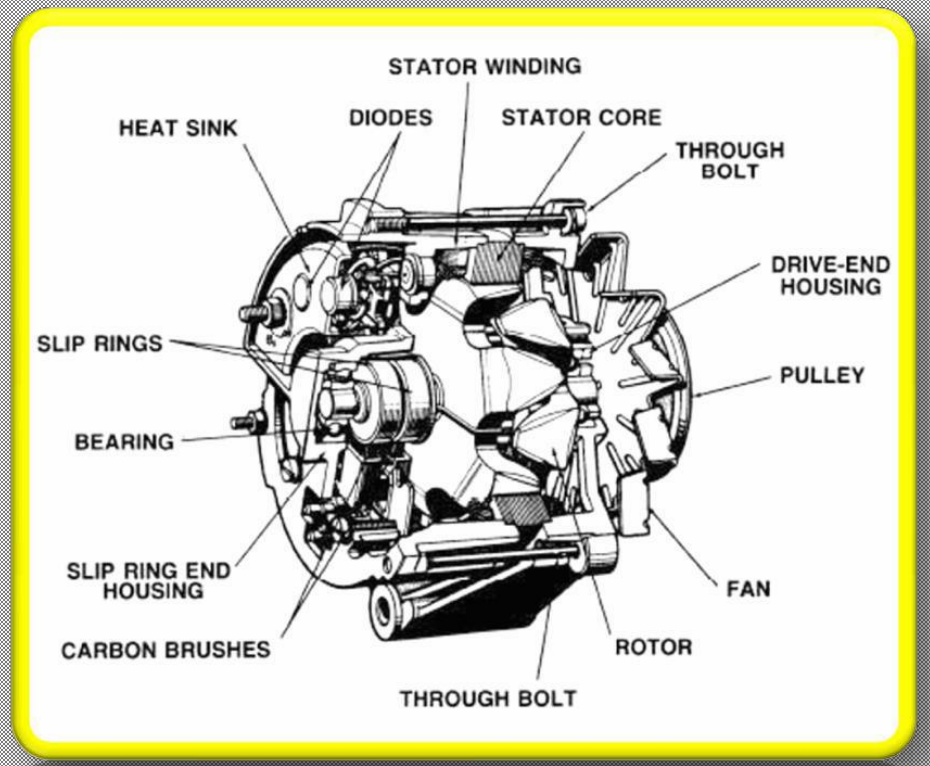
What is an alternator?

Purpose of an alternator

An alternator is a device used to produce the electricity a car needs to run and to keep the battery charged.

An alternator is a part of the charging system of a car that produces electricity for many devices. As a type of generator, the alternator transforms mechanical energy into electrical energy. Although your car's battery supplies some electricity, most of the electrical components within the vehicle, require the alternator's steady stream of power.

What is an alternator?



An alternator consists of:

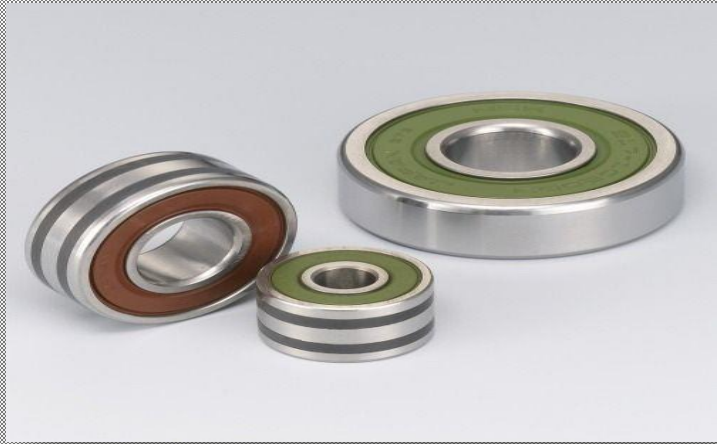
- Spinning electrical winding called a rotor
- Stationary set of windings called a stator
- Rectifier assembly
- A set of brushes to maintain electrical contact with the rotor
- Pulley

What is an alternator?

What is 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.

Alternator Housing

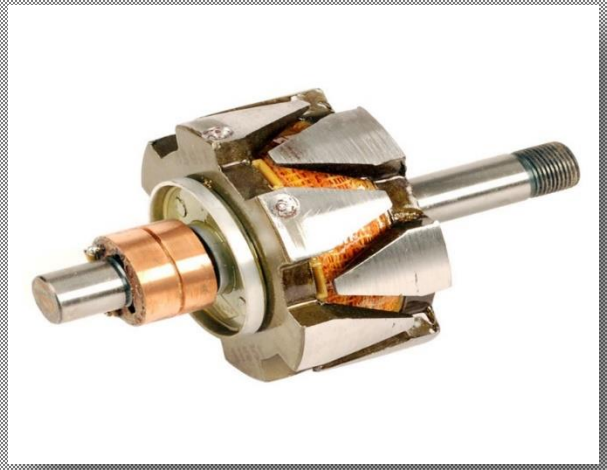


Bearings

- **Bearings** – 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.

Stator Assembly

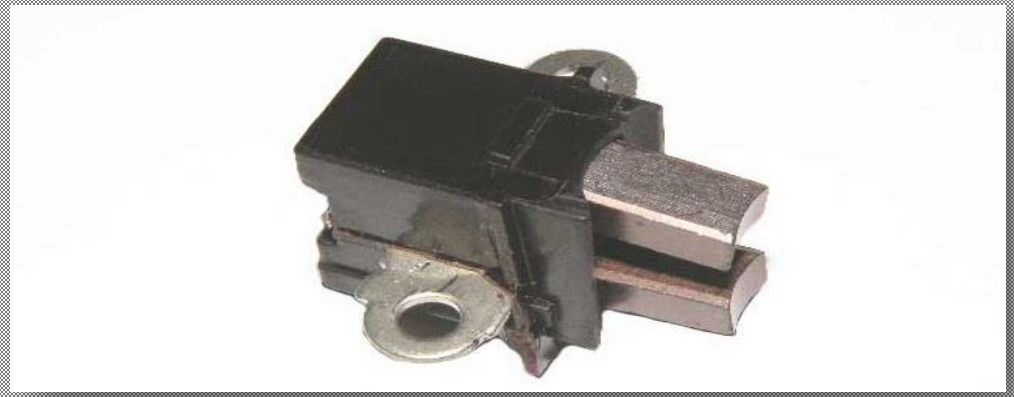


Rotor Assembly

- **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.

What is an alternator?

- **Brushes** – 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.



Brushes

What is an alternator?

Rectifier Assembly

- **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.

- **Pulleys / Fan** 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.

Pulley

What is an alternator?

How does an Alternator work?

- 1. SWITCH ON

When you switch 'on' a red lamp on the dash board lights, providing current through the lamp to the alternator rotor. This current in the rotor establishes a (small) magnetic field across the rotor.

- 2. ROTATION

As the engine spins the rotors magnetic field passes the stator windings such that the stator windings see a north pole followed by a south pole repetitively. This induces a voltage in the stator windings that similarly changes from positive to negative.

What is an alternator?

How does an Alternator work?

➢ 3. RECTIFICATION

The stator voltage is sent through the rectifier that connects the negative voltage from the stator to the battery negative, and the positive voltage from the stator to the battery positive. The rectifier only performs this connection when the alternator voltage exceeds the battery voltage. Once connected the alternator starts to supply current to the battery. The amount of this current is proportional to the current in the rotor. The regulator requires an excess of about 0.7 volts before it will pass significant current. This voltage drop times the current going through the rectifier produces power that is lost through heat. In other words it will get hot, hotter with the more work it does.

What is an alternator?

How does an Alternator work?

- 4. REGULATION

The voltage regulator limits the battery voltage by reducing the rotor current. The dash board lamp can only supply a small current, not enough to realise the full potential of the alternator. So some extra diodes in the rectifier take some of the output power of the stator to supply rotor current via the regulator. This extra diode supply also enables the red dash board lamp to turn off.

What is an alternator?

Thank you!

What is an alternator?