

Understanding the Alternator



**THIS AUTOMOTIVE SERIES
ON ALTERNATORS HAS
BEEN DEVELOPED BY**

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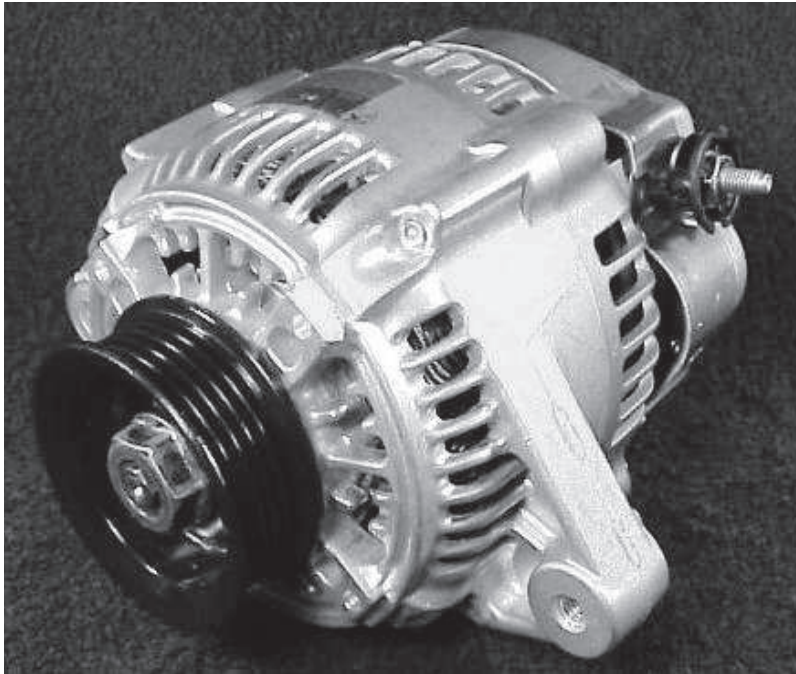
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Understanding the Alternator

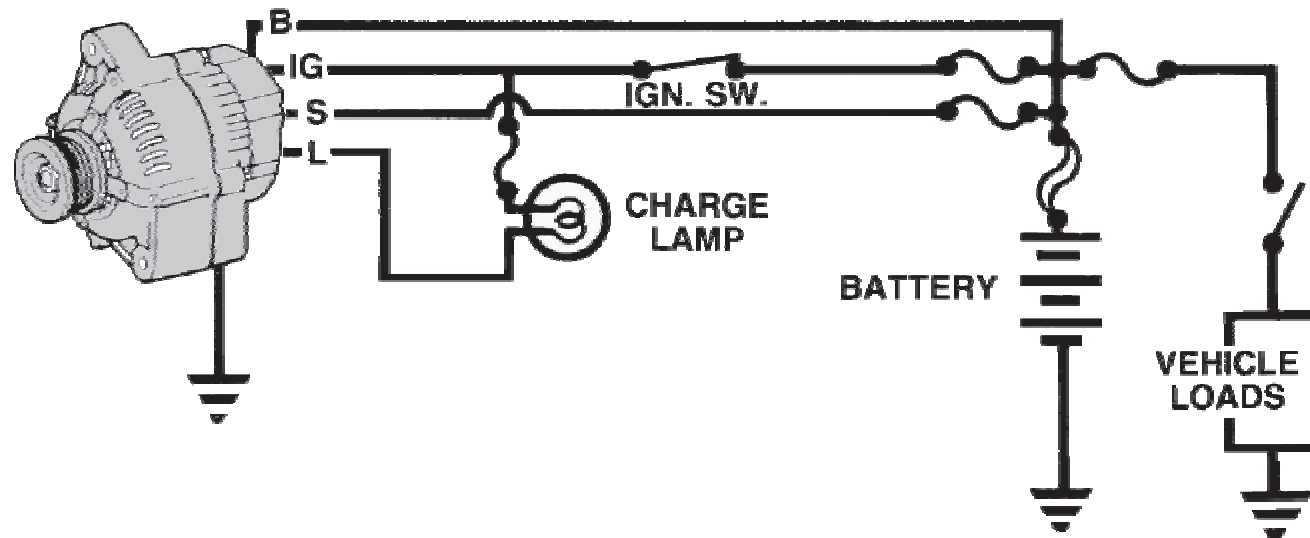
The Charging System



- The charging system has three major components. The Battery, Alternator, and the Regulator.
- This alternator works together with the battery to supply power when the vehicle is running.
- The output of an alternator is direct current, however AC voltage is actually created and then converted to DC as voltage leaves the alternator on its way to the battery and the electrical loads.

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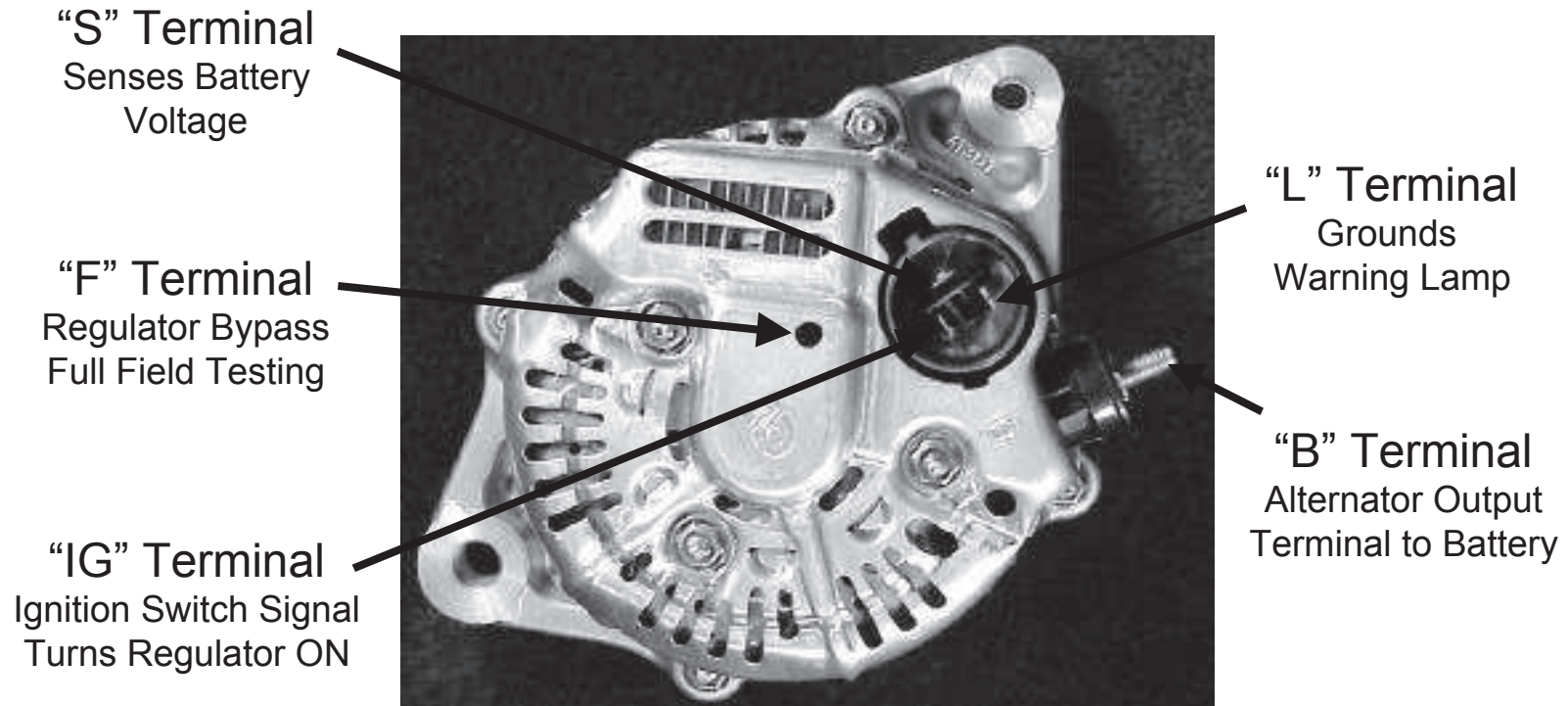
Charging System Circuit



- Four wires connect the alternator to the rest of the charging system.
- B is the alternator output wire that supplies current to the battery.
- IG is the ignition input that turns on the alternator/regulator assembly.
- S is used by the regulator to monitor charging voltage at the battery.
- L is the wire the regulator uses to ground the charge warning lamp.

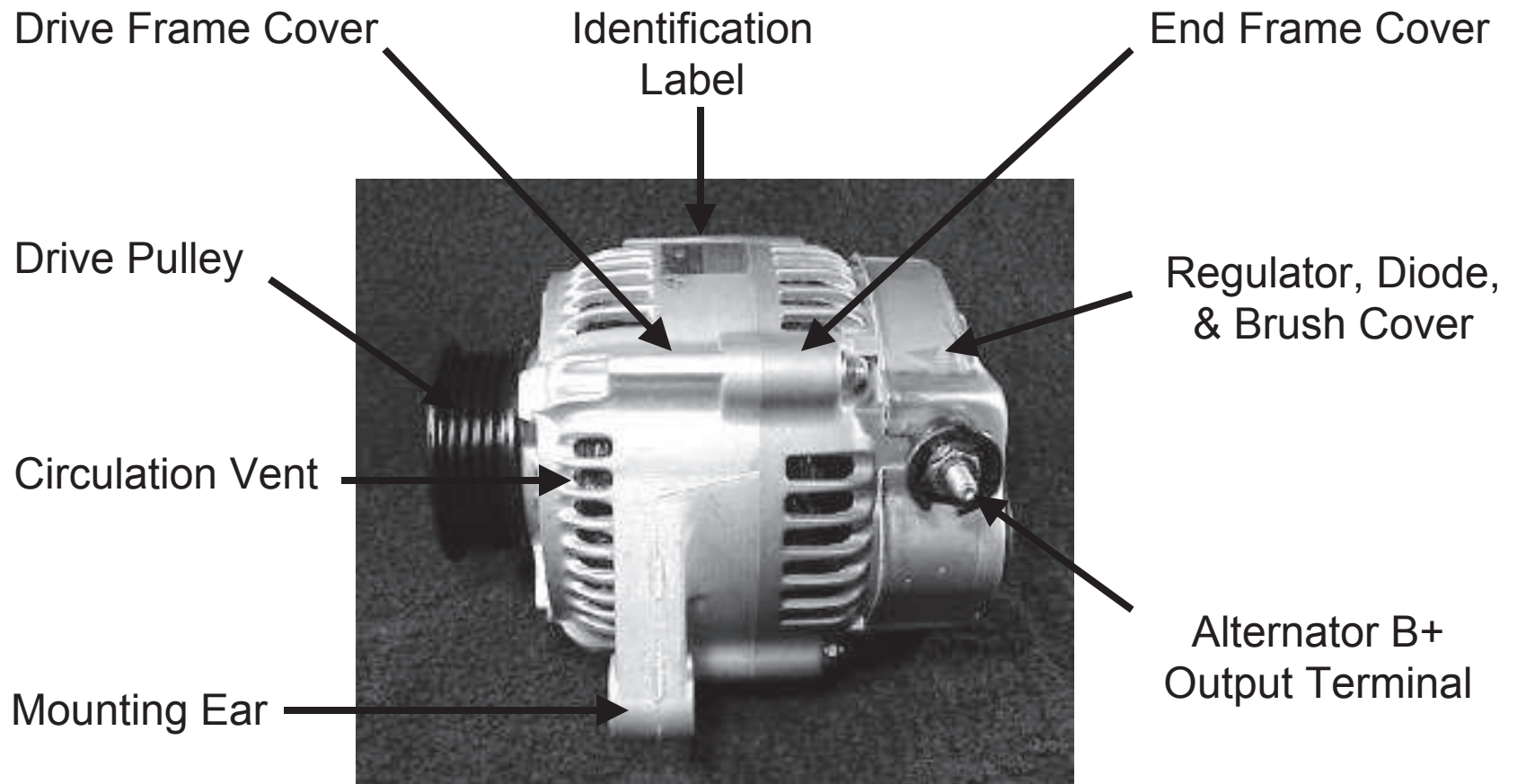
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Alternator Terminal Identification



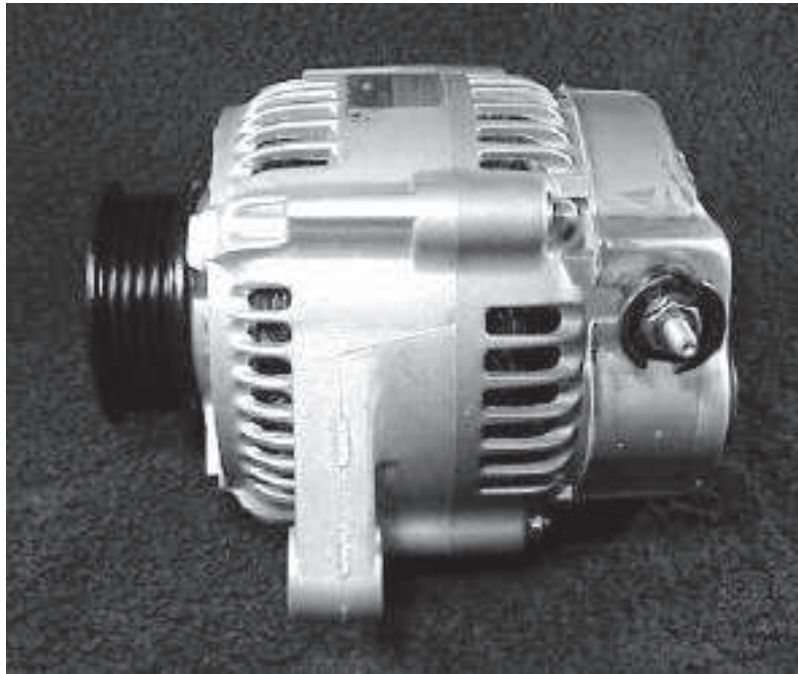
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Alternator Assembly



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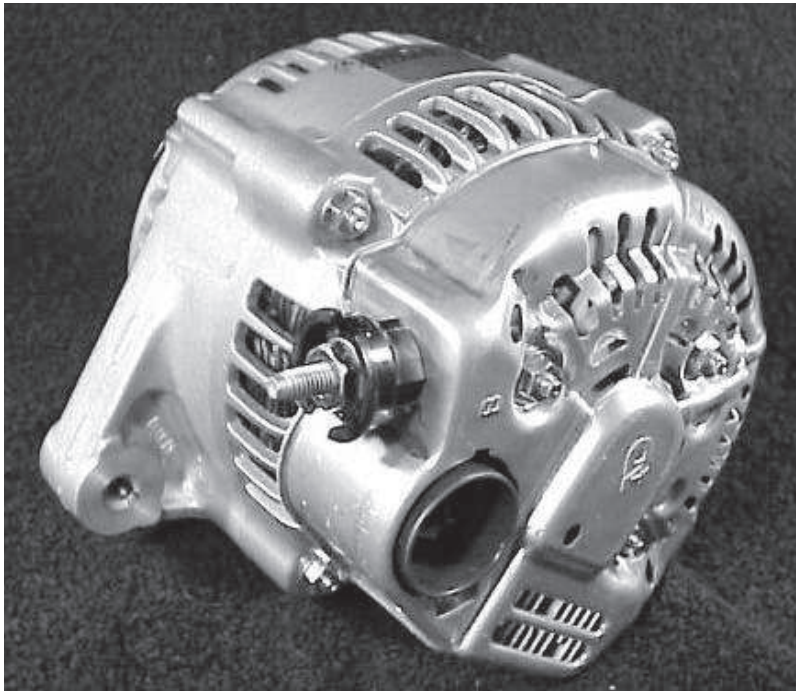
Alternator Overview



- The alternator contains:
- A rotating field winding called the rotor.
- A stationary induction winding called the stator.
- A diode assembly called the rectifier bridge.
- A control device called the voltage regulator.
- Two internal fans to promote air circulation.

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Alternator Design



- Most regulators are on the inside the alternator. Older models have externally mounted regulators.
- Unlike other manufacturers, this model can be easily serviced from the rear on the unit.
- The rear cover can be removed to expose internal parts.
- However, today's practice is to correctly diagnose the problem and replace the alternator as a unit, should one of its internal components fail.

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Drive Pulley



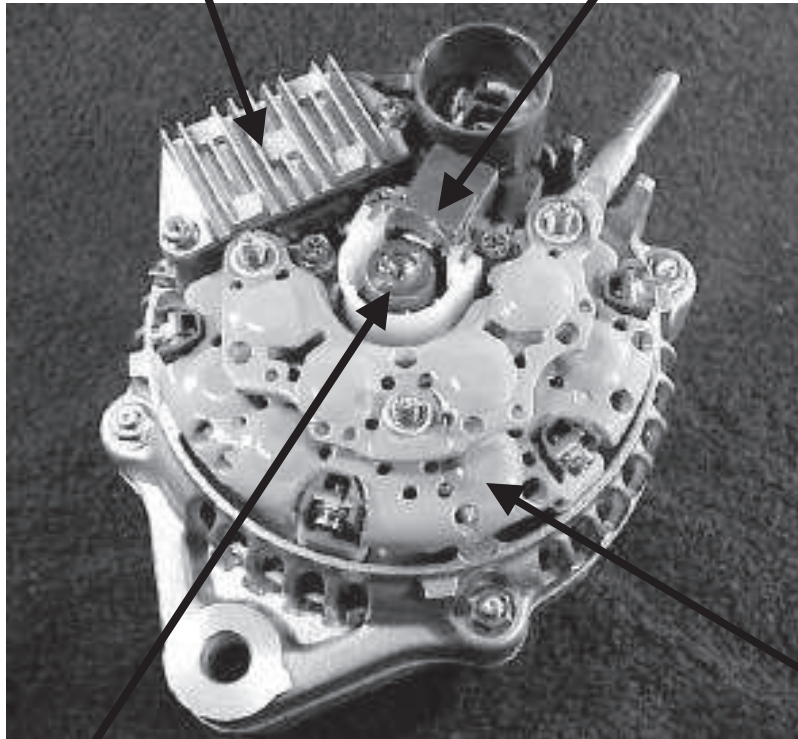
- Alternator drive pulleys either bolt on or are pressed on the rotor shaft.
- Both 'V' and Multi-groove types are used.
- Note this alternator does not have an external fan as part of the pulley assembly.
- While many manufacturers do use a external fan for cooling. This alternator has two internal fans to draw air in for cooling.

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Inside the Alternator

Regulator

Brushes



Slip Rings (part of the Rotor Assembly)

- Removal of the rear cover reveals:

The Regulator controls the alternator output.

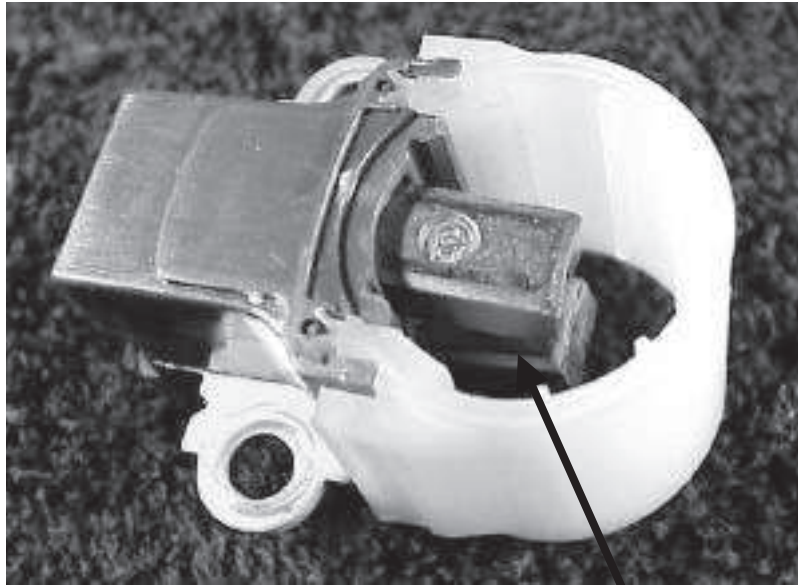
The Brushes conduct current to the rotor field winding.

The Rectifier Bridge converts AC voltage to DC voltage.

Diode Rectifier Bridge

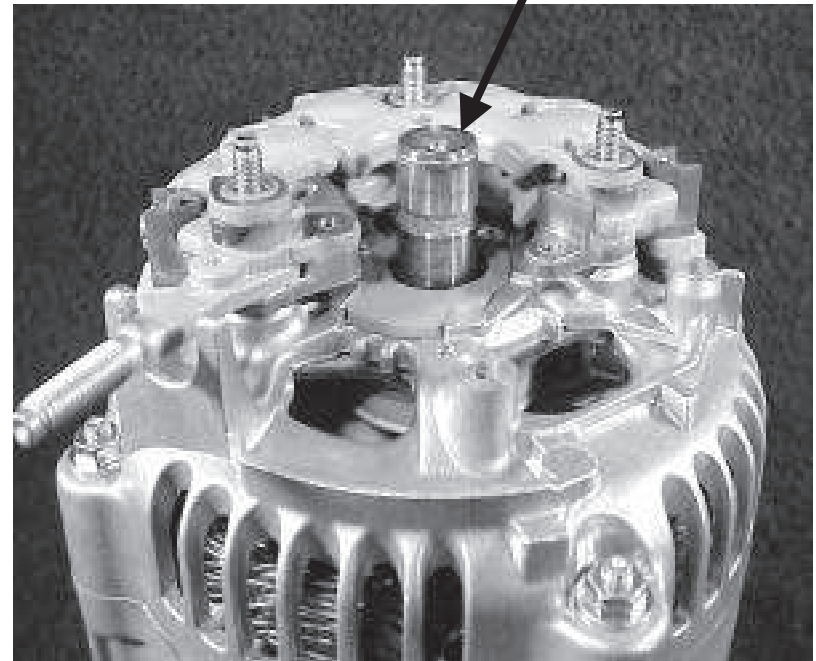
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Brushes



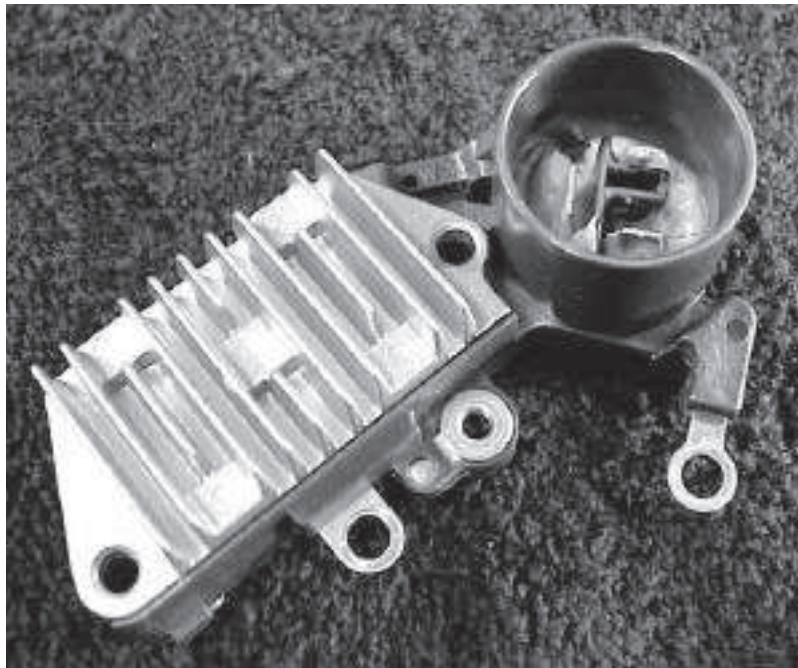
- Two stationary carbon brushes ride on two rotating slip rings. Brushes are either soldered or bolted

- Two slip rings are located on one end of the rotor assembly. Each end of the rotor field winding is attached to a slip ring. Thereby, allowing current to flow through the field winding.



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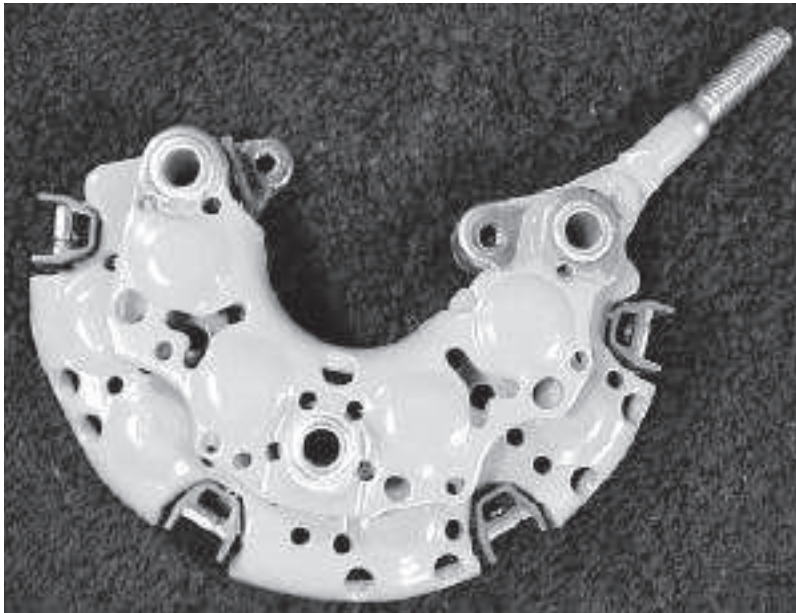
Electronic IC Regulator



- The regulator is the brain of the charging system.
- It monitors both battery and stator voltages and depending on the measured voltages, the regulator will adjust the amount of rotor field current to control alternator output.
- Regulators can be mounted both internal or external. Current technology uses an internal regulator.

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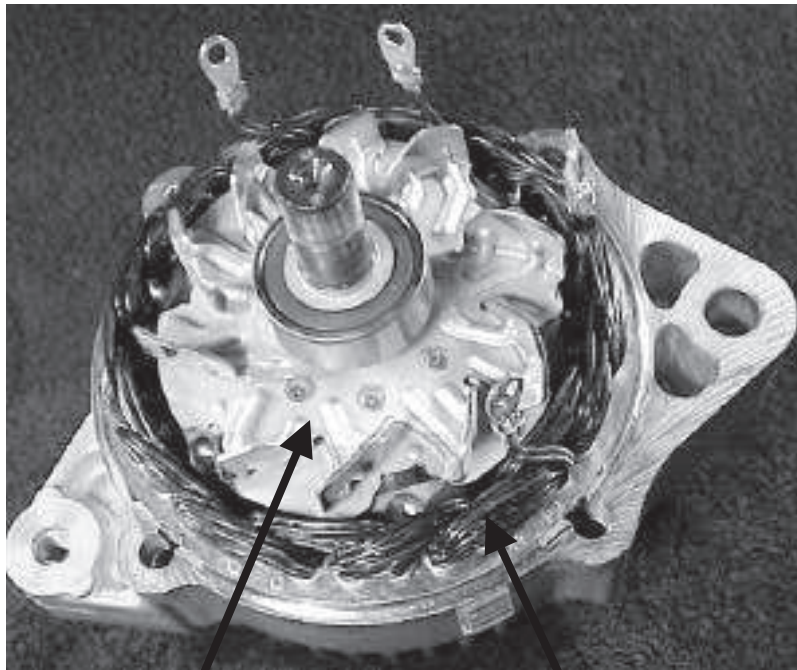
Diode Rectifier



- The Diode Rectifier Bridge is responsible for the conversion or rectification of AC voltage to DC voltage.
- Six or eight diodes are used to rectify the AC stator voltage to DC voltage.
- Half of these diodes are used on the positive side and the other half are on the negative side.
- Further details about the rectifier bridge will be explained later.

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Inside the Alternator



Rotor Winding
Assembly

Stator Winding

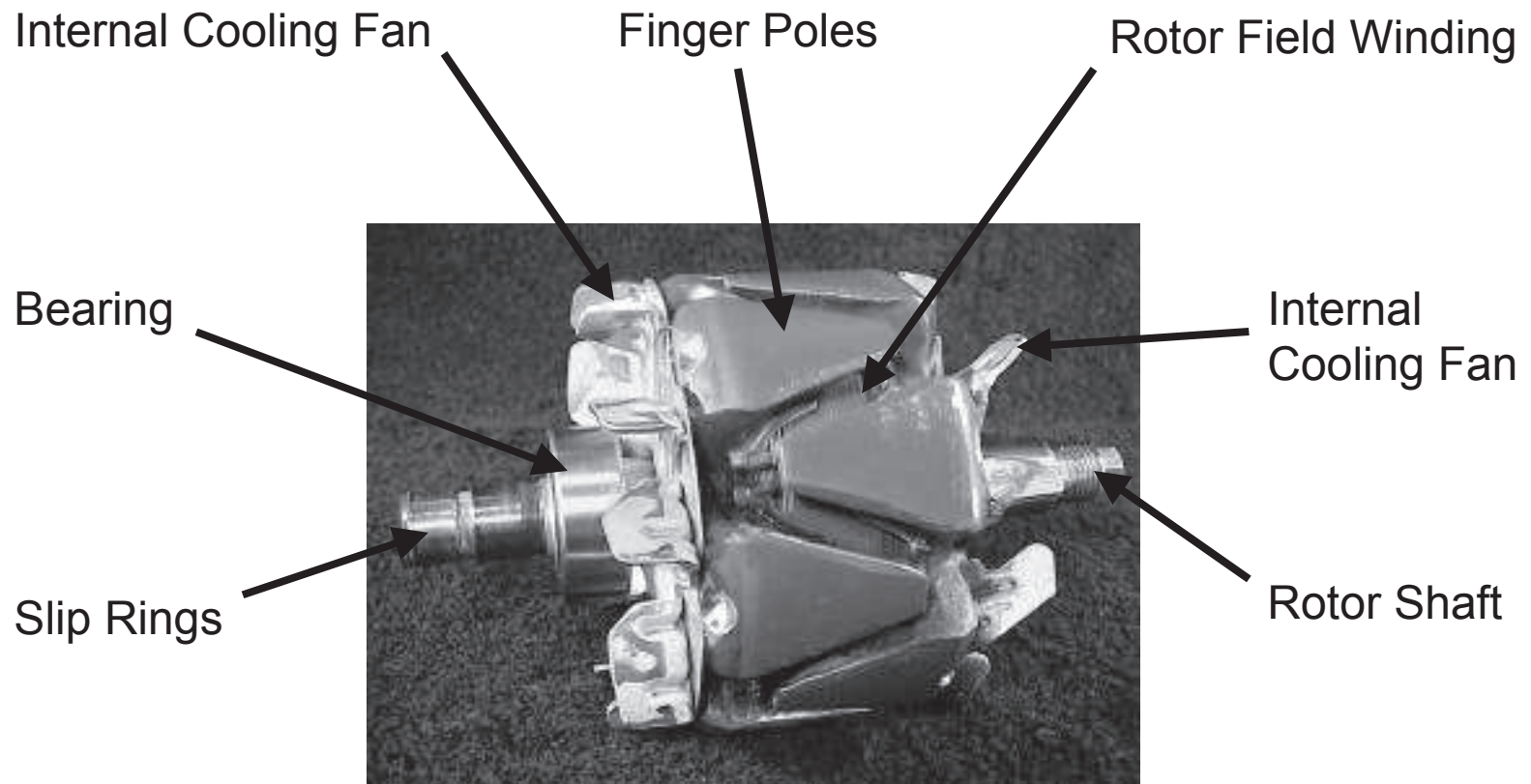
- Separating the case reveals:

The rotor winding assembly rotates inside the stator winding. The rotor generates a magnetic field.

The stator winding develops voltage and current begins to flow from the induced magnetic field of the rotor.

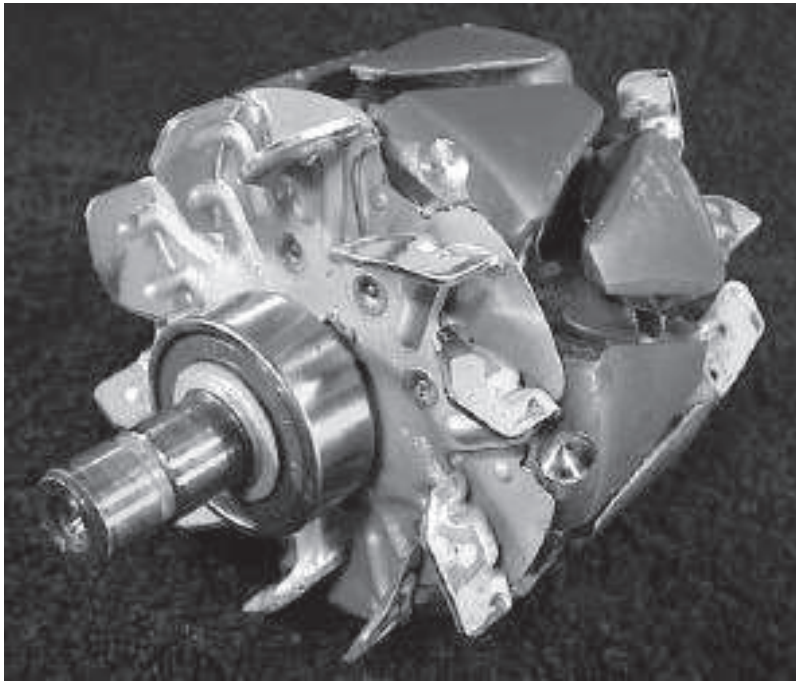
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Rotor Assembly



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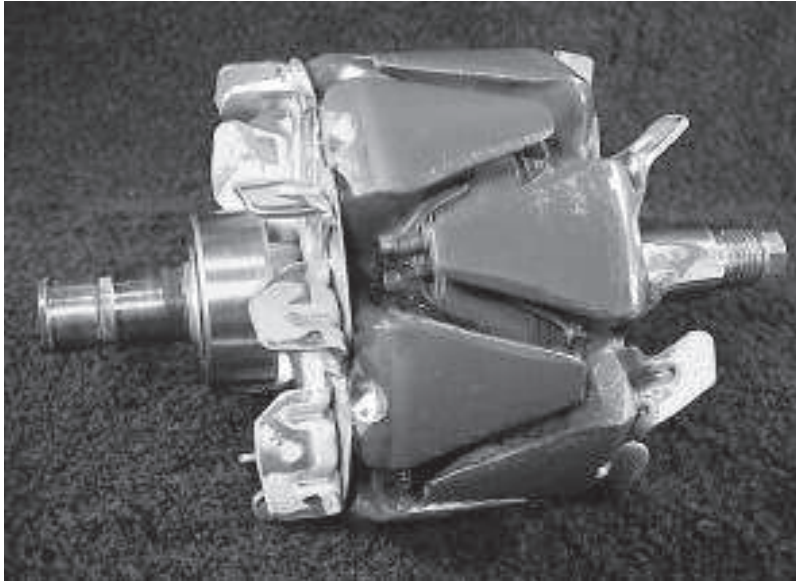
Rotor Assembly



- A basic rotor consists of a iron core, coil winding, two slip rings, and two claw-shaped finger pole pieces.
- Some models include support bearings and one or two internal cooling fans.
- The rotor is driven or rotated inside the alternator by an engine (alternator) drive belt.

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Rotor Assembly



- The rotor contains the field winding wound over an iron core which is part of the shaft.
- Surrounding the field coil are two claw-type finger poles.
- Each end of the rotor field winding is attached to a slip ring. Stationary brushes connect the alternator to the rotor.
- The rotor assembly is supported by bearings. One on the shaft the other in the drive frame.