

CHARGING SYSTEM

Major Parts

- Battery.



- Alternator



- Regulator



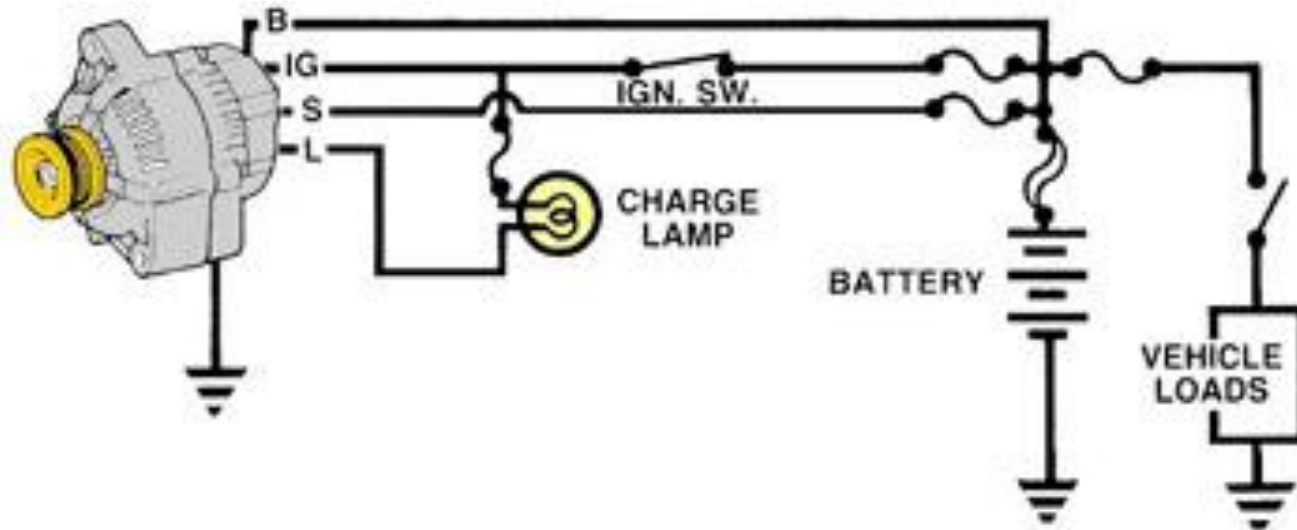
Alternator

- Provides power to the electrical components and accessories, When the vehicle is running.
- Converts mechanical energy to electrical energy
(Driven by Crankshaft, with the help of a drive-belt)
- The out put of alternator is DC, but actually AC voltage is generated and then converted to DC.



Courtesy General Motors

Charging Circuit



B is out-put and supplies current to the battery

IG is ignition input, it turns on the alternator/regulator assembly.

S is used by the regulator to monitor charging voltage at the battery.

L is the wire that regulator uses to ground the charge warning lamp.

Alternator

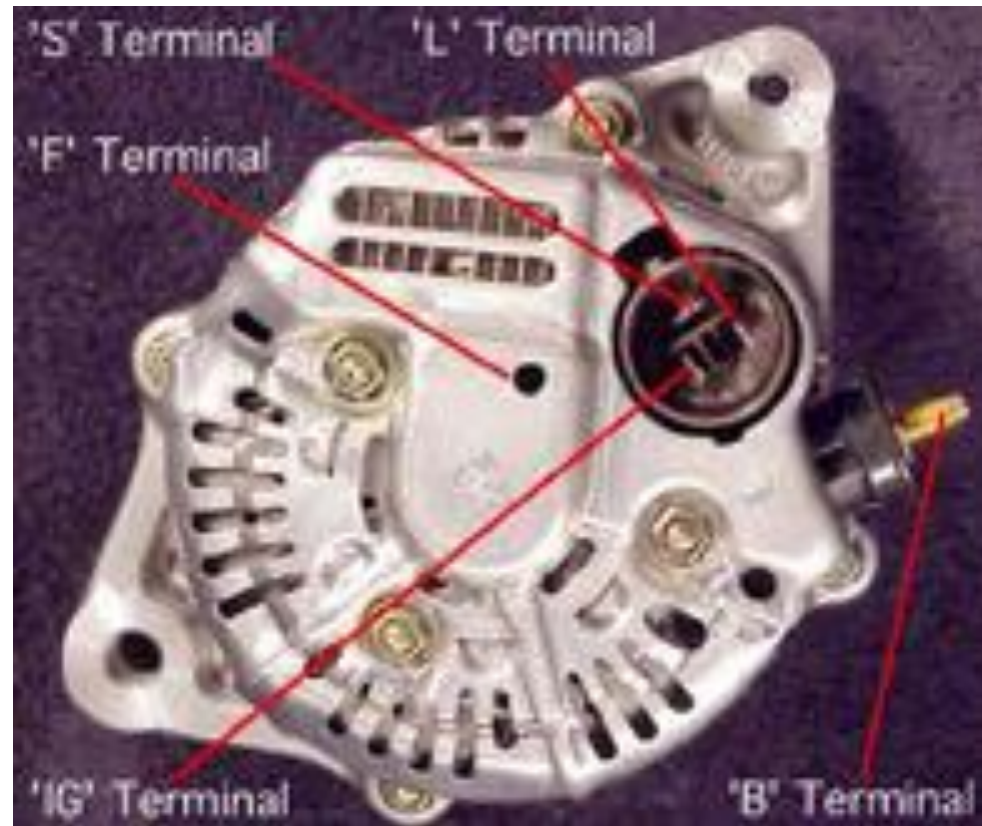
S senses battery voltage

IG ignition switch signal turns the regulator on.

L grounds the warning lamp

B alternator out-put terminal

F regulator full-field bypass



Alternator

Drive Frame Cover

ID Label

End Frame Cover

Drive Pulley

Regulator,
Diode, &
Brush Cover

Circulation
Vent

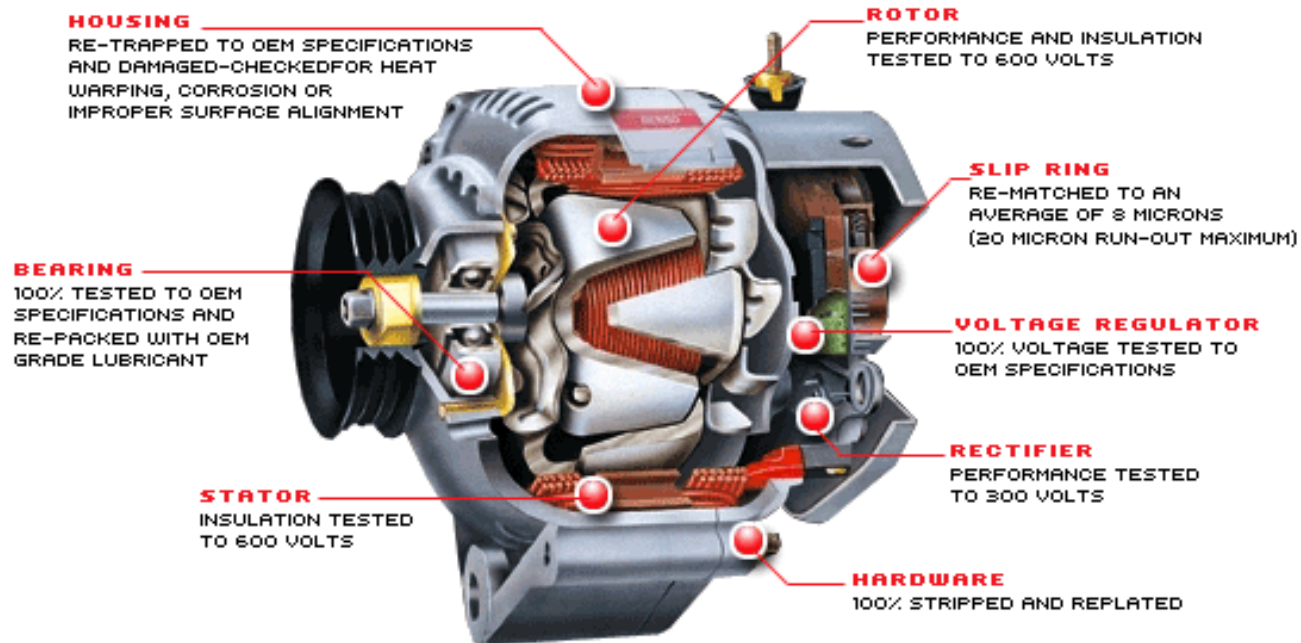
Alternator
B+ Output
Terminal

Mounting
Ear



Alternator Contains

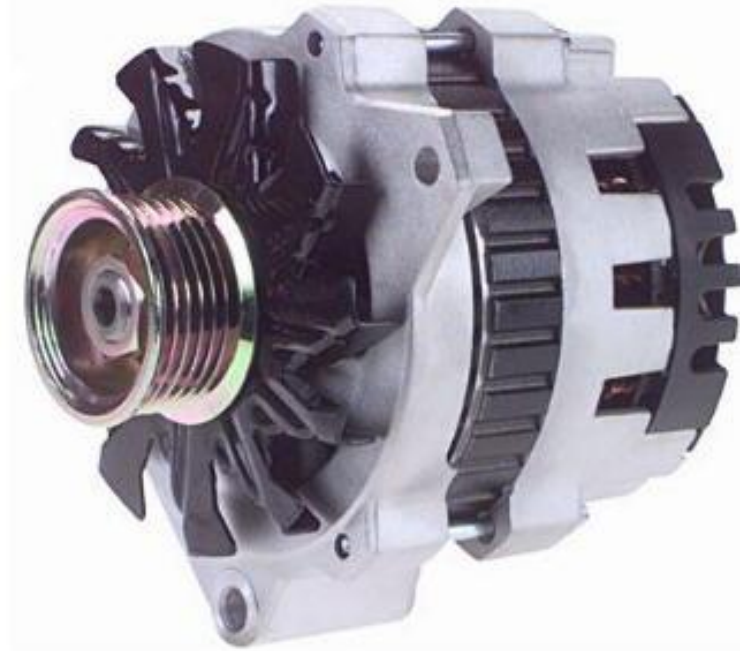
Alternator Cutaway



- 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.

Alternator 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.



Regulator

- Regulator is the brain of the alternator.
- It controls the alternator out-put (Typically 13V to 15V).
- 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.
- Electronic voltage regulator introduces more resistance between the rotor windings and battery to reduce the alternator out-put.

•Mounted internally

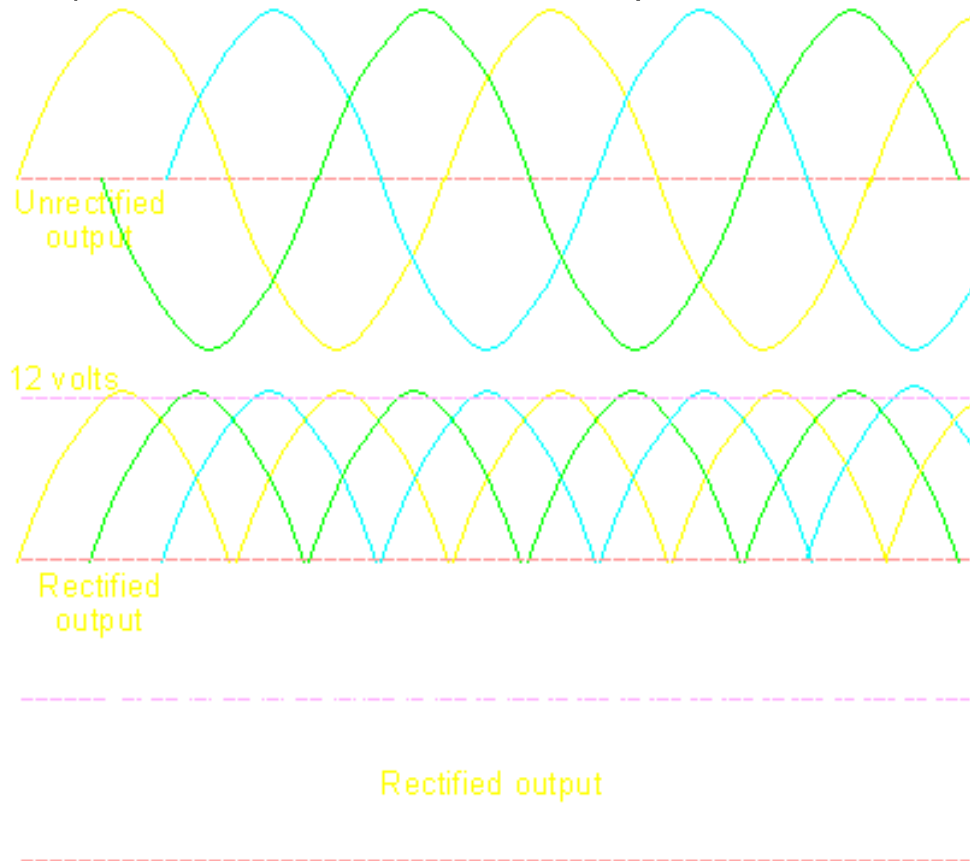


Externally



Diode Rectifier

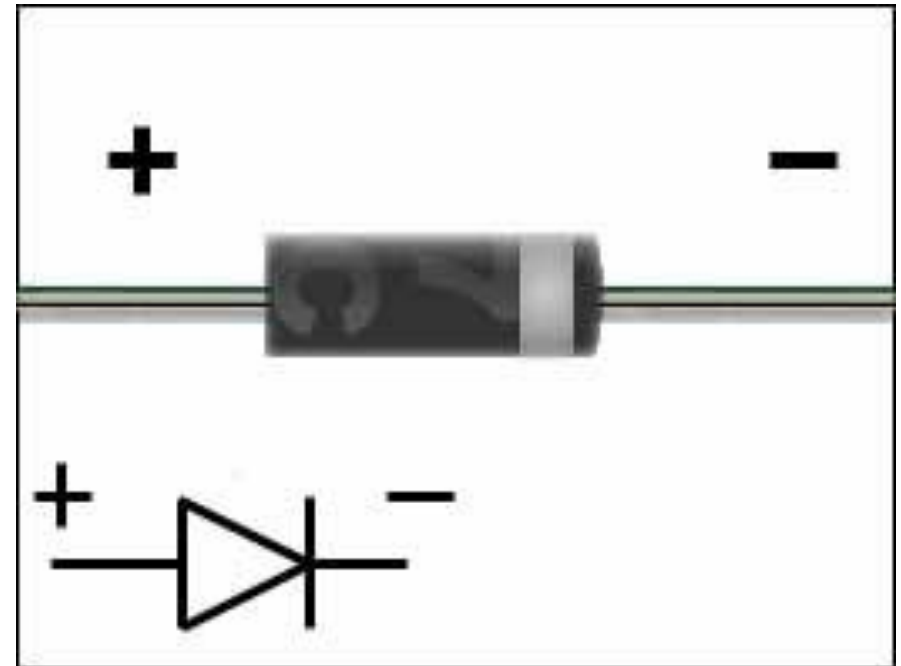
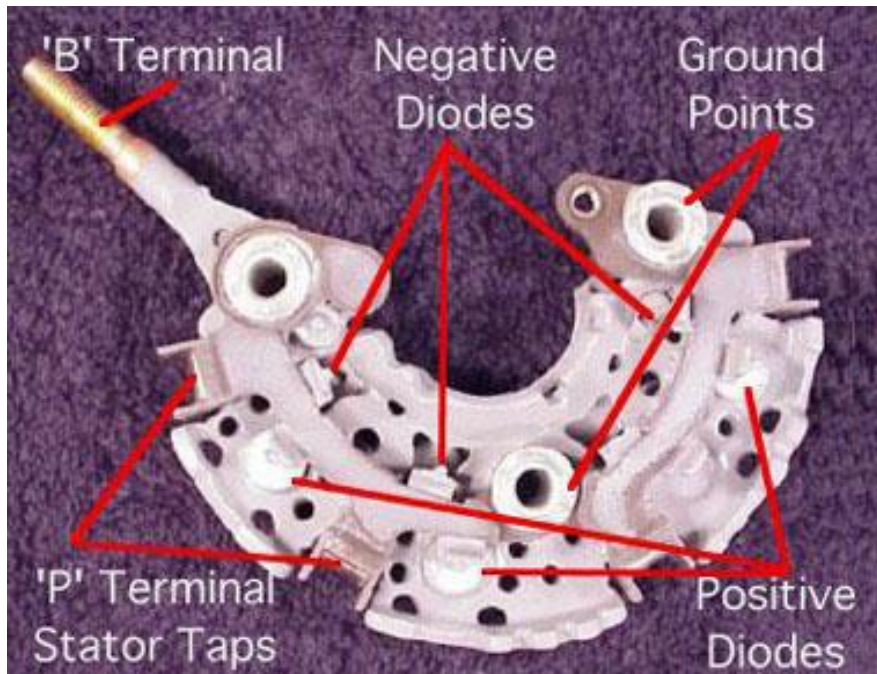
- The Diode Rectifier Bridge is responsible for the conversion or rectification of AC voltage to DC voltage.
- Six or eight diodes are used to rectify the AC stator voltage to DC voltage.
- Half of these diodes are use on the positive side and the other half are on the negative side.(*mounted on a heat-sink*)



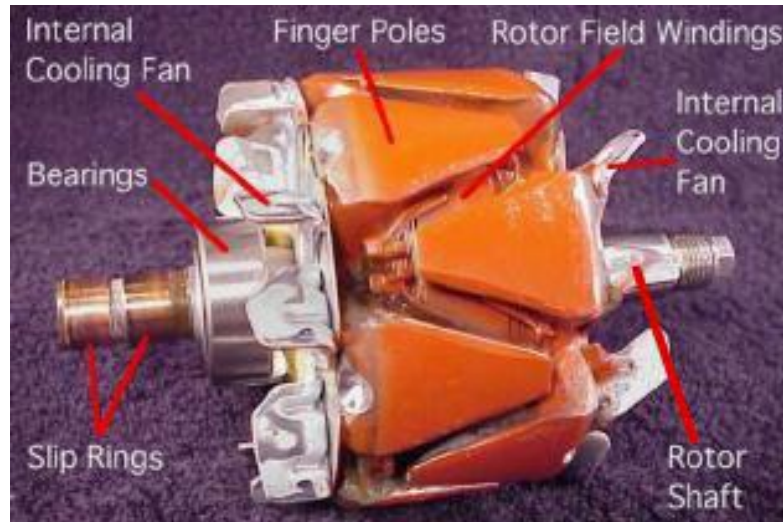
Diode Rectifier

Forward Biased acts as a conductor (*Current passes through*)

Reverse Biased acts as an insulator (*Current does not pass*)

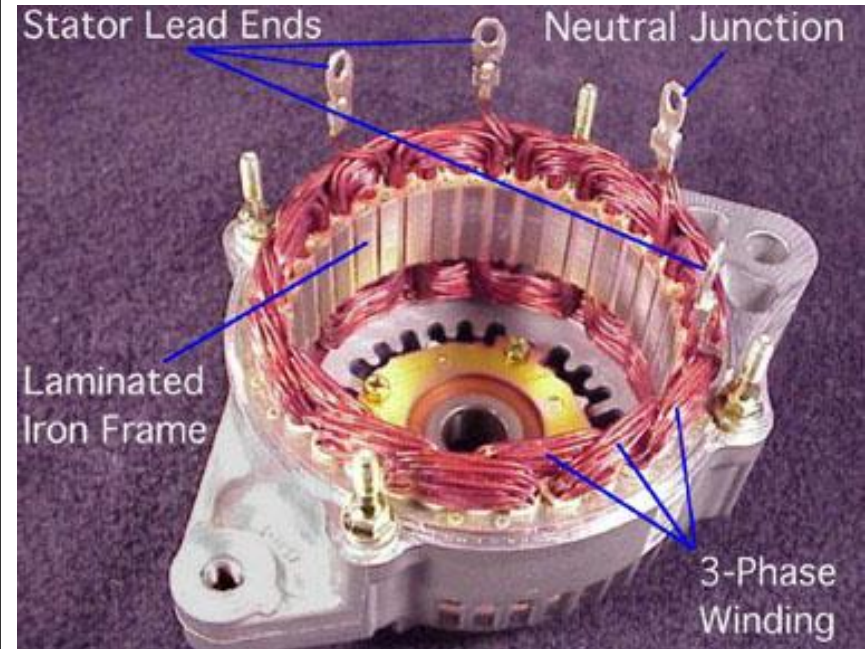
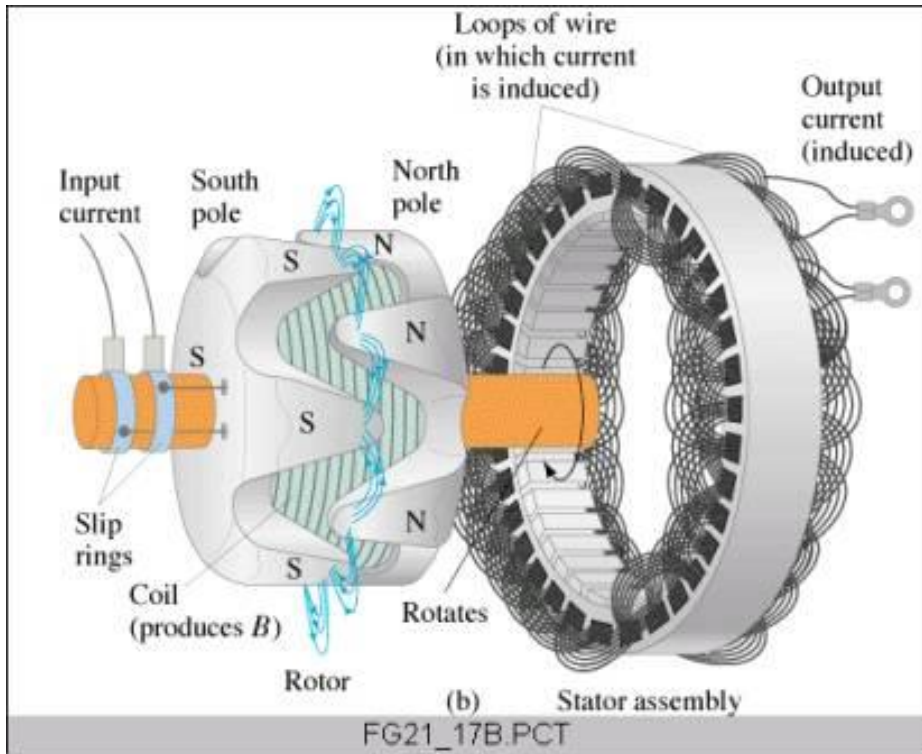


Rotor



- The rotor field winding creates the magnetic field that induces voltage into the stator.
- The rotor spins creating an alternating magnetic field, North, South, North, South, etc.
- 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.

Stator

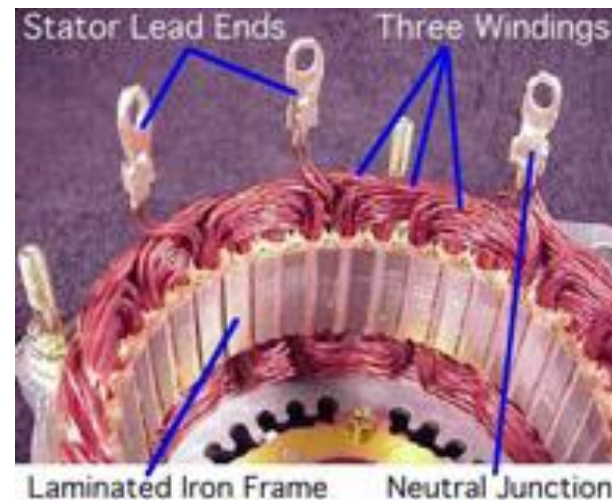
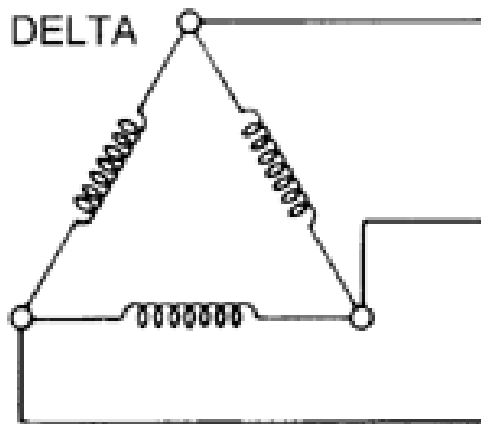


- The alternating magnetic field from the spinning rotor induces an alternating voltage into the stator winding.
- The strength of the magnetic field and the speed of the rotor affect the amount of voltage induced into the stator.

Stator Design

DELTA Delta wound stators can be identified because they have only three stator lead ends.

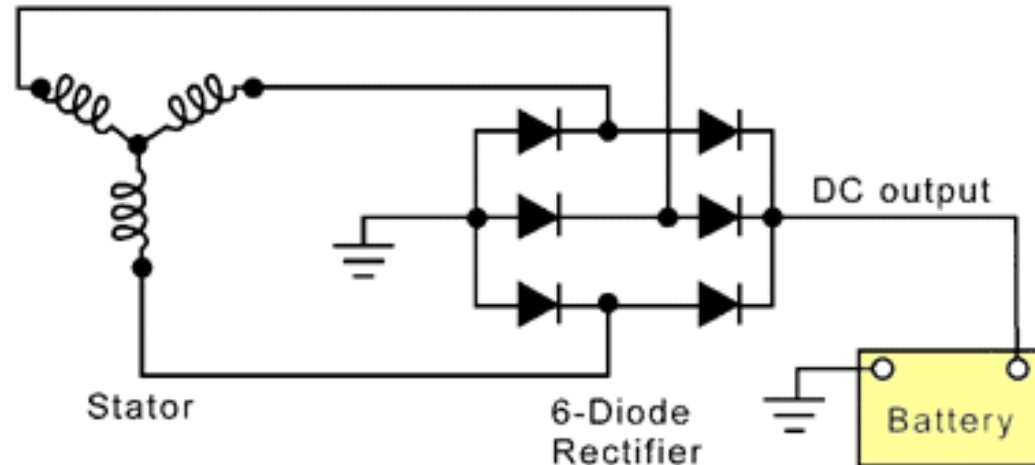
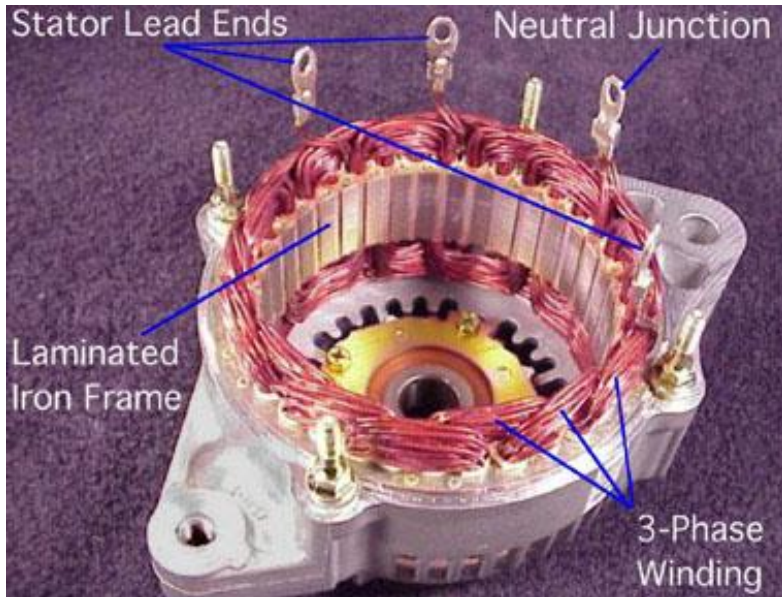
- Delta stators is used in high-output Alternators.
- The windings are in parallel



Stator Design

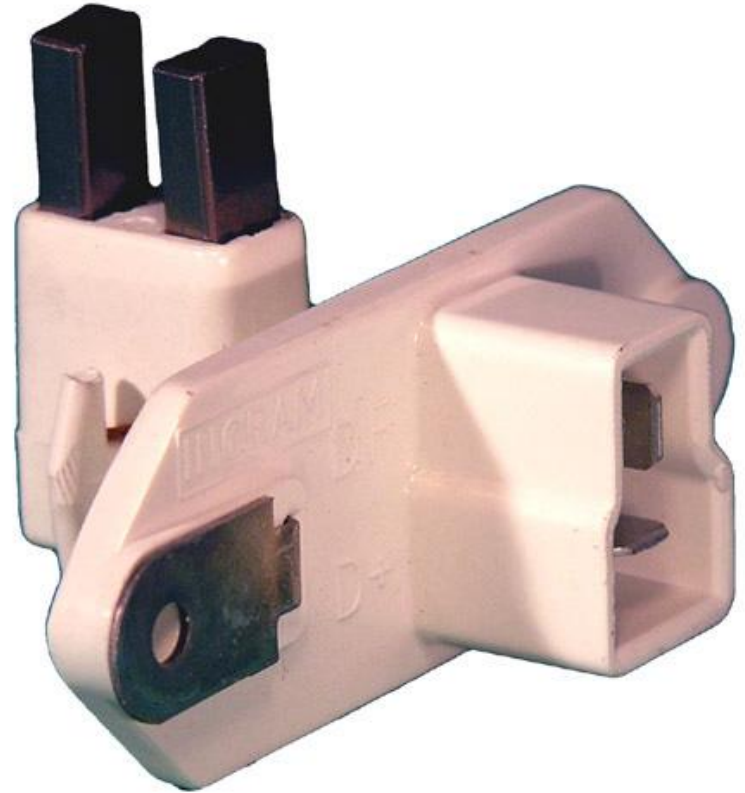
Wye (Y) wound stator have three windings with a common neutral junction.

- Can be identified by 4 stator leads.
- Used in alternators that require high voltage output at low alternator speeds.
- Two windings are in series at any one time during charge output.



Brushes

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



Diagnosing

Common Symptoms

- Dead Battery
- Overcharging battery
- Abnormal noise
- Indicator shows problem

Diagnosing

Preliminary Check

- Belt – too loose will slip and too tight will kill the bearings (*Should deflect 1/2” with thumb pressure*)
- Battery/Charging Fuse or fusible link.
- Dirty terminal/post.
- Loose connections or broken wires.

Diagnosing

•PERCAUTIONS

- Disconnect Battery.
- Do not reverse polarity.
- Do not operate alternator with battery disconnected.

Diagnosing

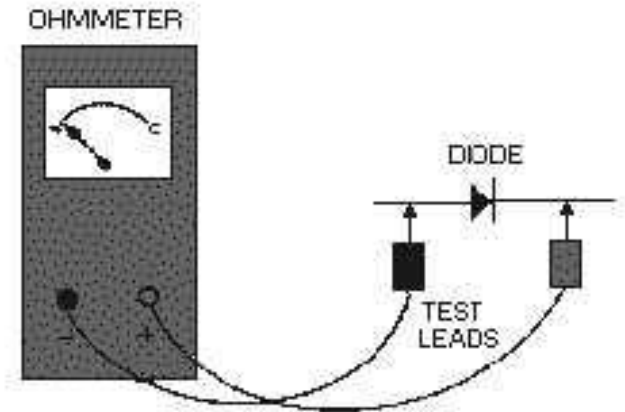
Charging System Test

- Charging System out put test: measures current and voltage output of charging system under a load (*Most Accurate test*).
- Regulator Voltage Test: measure charging system voltage under low output, low load condition.
- Regulator Voltage Test: connect full battery voltage to alternator field, leaving regulator out of circuit (*By-pass Regulator*).
- Circuit Resistance Test: measure resistance in insulated and ground circuits of system (*locate wiring problem*).

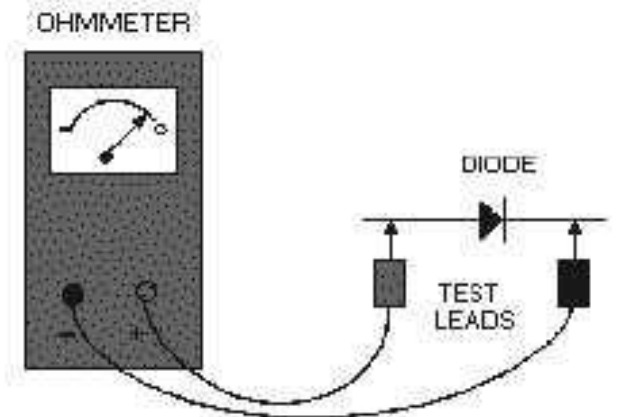
Diagnosing

Checking Diodes:

- The meter should read high resistance ($.010\Omega$) one way and low resistance ($.999\Omega$) the other.



REVERSE CONDITION -
HIGH RESISTANCE MEASUREMENT

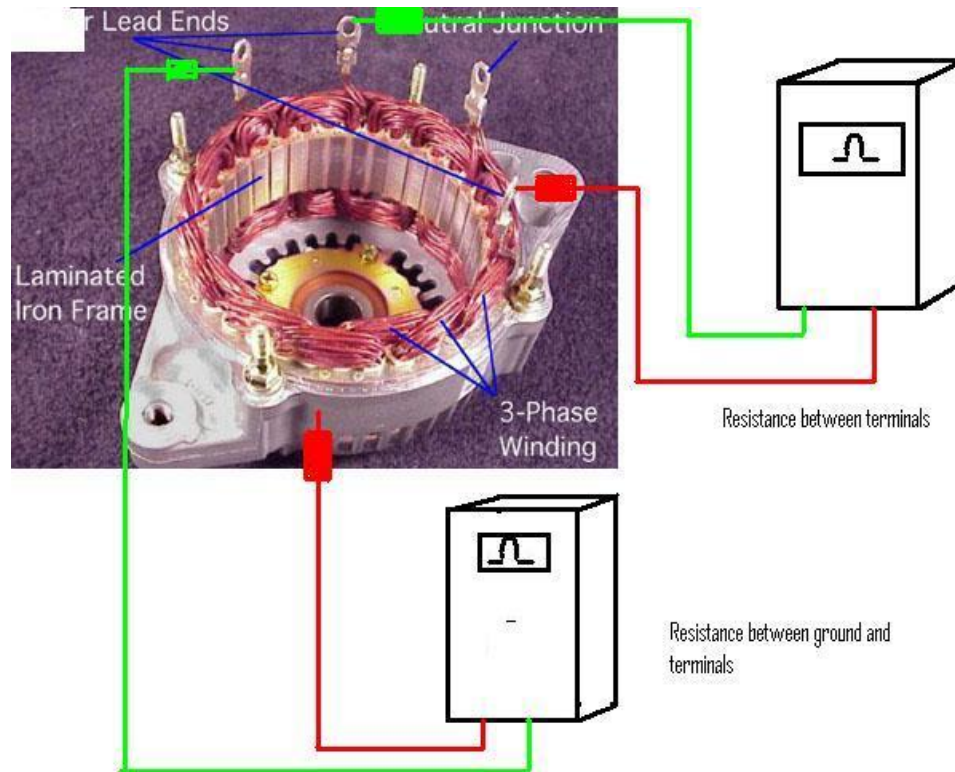


FORWARD CONDITION -
LOW RESISTANCE MEASUREMENT

Diagnosing

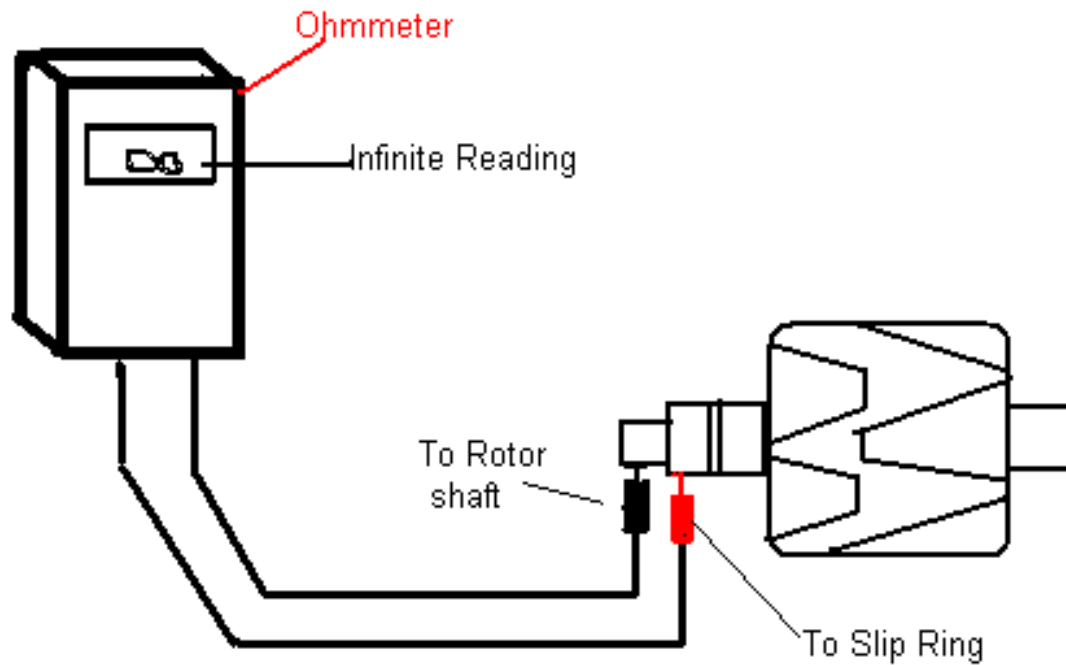
Stator check

- Check resistance between terminals (A,B,C) and ground to Terminals.
- If resistance is high (infinite) the stator is shorted.



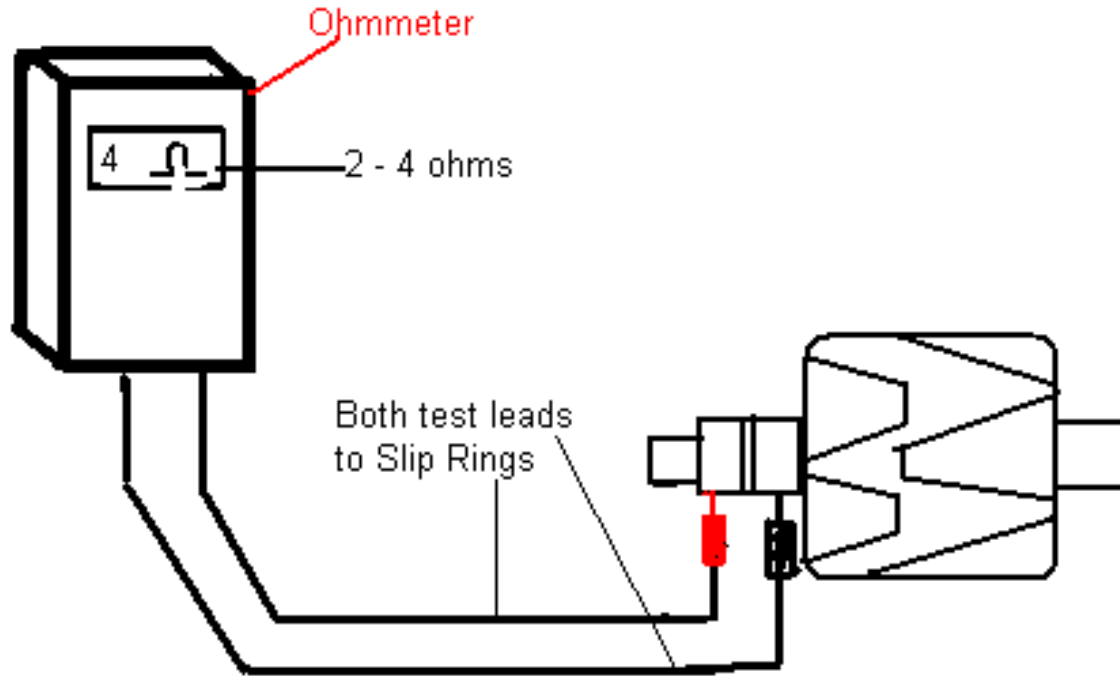
Rotor Test

Short-to-Ground Test



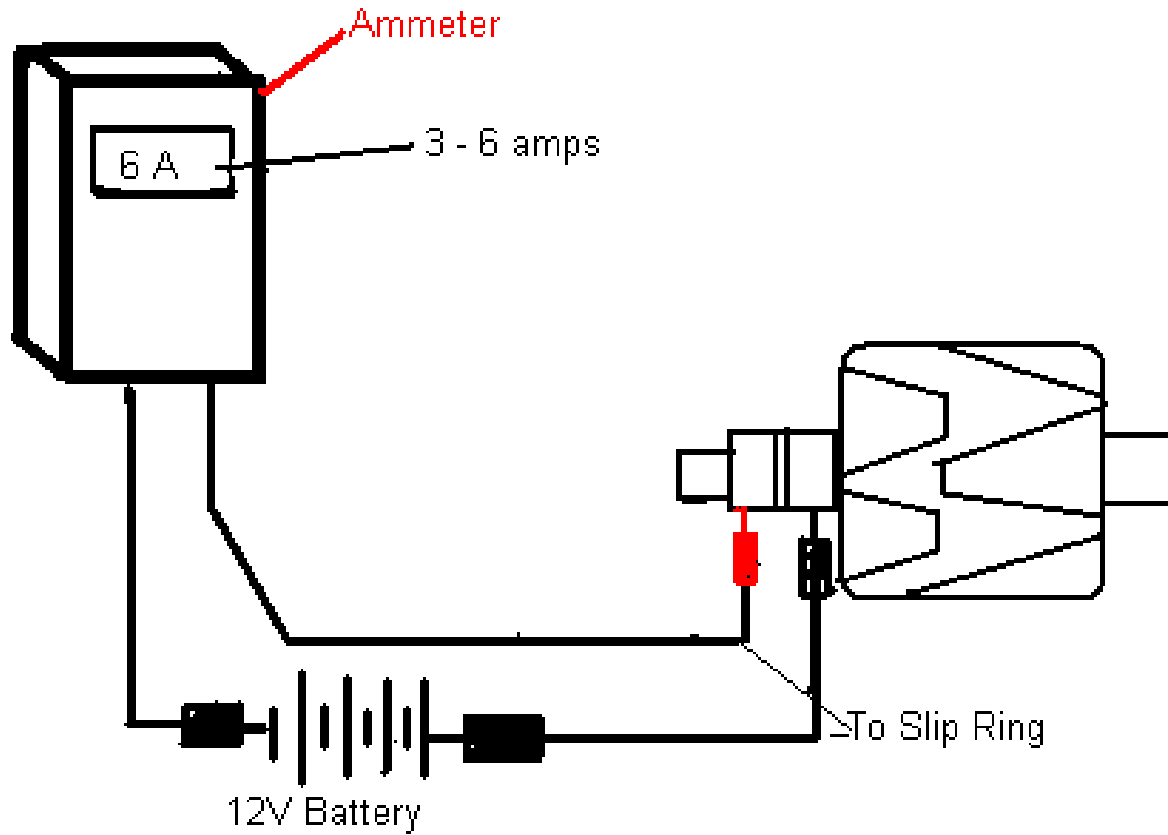
Rotor Test

Open Circuit Test



Rotor Test

Current Test



Diagnosing