1/19/2017

LOCATING A FAILURE IN YOUR CHARGING SYSTEM

Most electrical problems stem from a bad battery with low voltage. A battery voltage reading of 12.4v or lower means you need to charge or replace your battery in order to avoid serious electrical problems in the future. In the event that your battery was discharged, we recommend that you have your battery "load tested" for free at your local autoparts store.

The alternator does NOT charge a battery, it only maintains the battery voltage!

When you are having charging problems then you need to determine the root cause of the failure. The charging system has four key components and one of the following components, in order of most sensitive to least sensitive may have failed:

- The Diode Board
- The Voltage Regulator
- The Rotor
- The Stator

In the event that all four components are healthy then all wiring and connections need to be checked for correct location, loose connections, chafed or broken wires. Check the rotor brushes for good contact – replace these if they are less than half the original length (less than 7.5mm long).

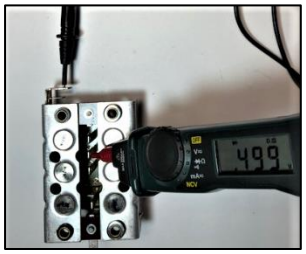
The following four tests will assist you in identifying a faulty charging system component:

1. TESTING THE DIODE BOARD

The diode board is sensitive to heat (from the engine heat and electrical) and is often shorted out when removing the front cover with the battery connected. – a key reason why you should disconnect the battery when working on the electrical system.

The diode board may show visual symptoms of being damaged – solder splats or bubbles on soldered connections. In many cases the diode board may appear undamaged but the following test will confirm if you need to replace the diode board.

1. Set your multimeter to the diode mode setting 
2. Apply a probe to the large B+ terminal and the other probe on each of the four AC input terminals (U,V,W and Y), note whether a reading is indicated. The precise values are not important, nor do they all have to be the same. Reverse the multimeter probes and retest all terminals.



You should only have readings in one direction. The diode board is faulty if there is CONTINUITY IN BOTH DIRECTIONS on any terminal or NO CONTINUITY in either direction. Photos show healthy diode board.

2. TESTING THE VOLTAGE REGULATOR

The voltage regulator may be faulty if the charge indicator light burns brightly or erratically at high engine rpm's or the battery voltage exceeds 15v.

The test for the voltage regulator is to bypass the regulator and if the charging light goes out immediately and the voltage output is high (+15v at 200rpm) then the voltage regulator is faulty.

To by-pass the regulator simply disconnect the three wire connector at the voltage regulator and insert a short wire between the two outer wire connectors DF and D+ as indicated in the photos.

The short circuit wire cannot cause any damage if connected incorrectly – the brown wire at the top of the connector is a ground wire.

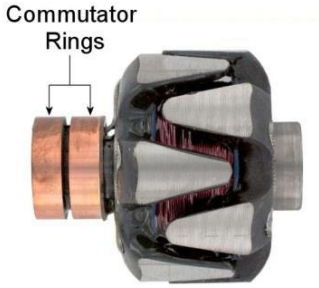
3. TESTING THE ROTOR

The rotor is simply an electromagnet consisting of a coil of one wire with each end connected to each of the two commutator rings. The wire can break and this will not always be visible.

Test the charge indicator light by removing the DF wire and touch it to ground on the alternator frame. The charge indicator light should burn brightly. Failure of this test will mean that there is a problem between the alternator and the charge indicator bulb or the bulb itself. If the bulb burns brightly, proceed with testing the rotor.

If the charge indicator light does not shine or flashes erratically it indicates a faulty rotor. If the charge indicator light works, short out the commutator rings and if the light burns brightly the rotor is suspect.

Perform the following test to determine if your rotor is healthy.



1. Clean both commutator slip rings
2. Set your digital OHM meter to 0-20 Ω
3. Ensure that the brushes are isolated from the commutator rings
4. Apply a probe to each of the two sections on the commutator rings

When you receive an open reading or that of 1Ω or less your rotor has failed. A healthy rotor will deliver rotor will have a reading between 2.8 (1990 and later) and 6.9 Ω (1970).

Now apply one probe on one of the commutator rings and one probe on the steel case. Your rotor should have no continuity to ground. If your rotor failed either test you should replace your rotor.

Check the rotor for scuff marks where it may be making contact with the stator, which means the rotor could be grounding out and thereby reduce the output of the charging system. The rotor "run out" may be excessive and may also need to be replaced. In extreme cases, the crankshaft may be bent.

4. TESTING THE STATOR

The stator wire coils vary between different models and you must ensure that the stator wires are not touching the aluminum stator frame housing. The stator wire will ground out the stator on the stator frame (if it is touching) and will not allow the system to charge properly.

Another indicator that the stator may be grounded is that the charge indicator light will NOT turn on.

If necessary, remove some aluminum from the stator frame that is touching the stator coil wire(s). This may be easily performed with a file or Dremel-type grinding tool. Simply remove the aluminum stator frame off the stator and relieve portion of the aluminum frame that is touching the stator coil wire.

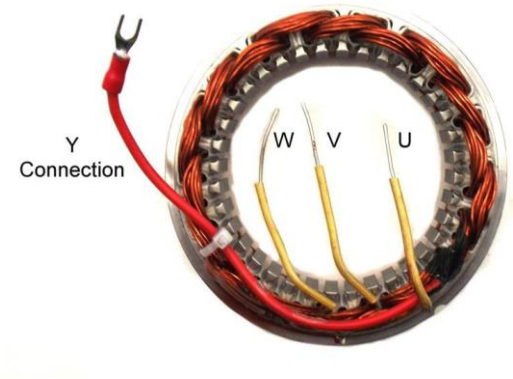
Perform the following test to determine if your stator is healthy.

1. Locate the 3 or 4 stator wires that connect to the WVU and Y connections on the alternator brush holder.

2. Set your multimeter to the Ω mode

3. Check two wires at a time testing all combinations for continuity around 0.5Ω to 1Ω.

4. When testing from each wire to ground (the outer steel) you should perceive no continuity.



The stator will need to be replaced if there is no continuity between the WVU and Y wires or if there is any continuity to ground.