



Precision Parts

Aug. 2007

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# LIVE WIRE

Welcome to the August 2007 issue of the PPR Live Wire.

The LiveWire is now digitally published, meaning that when we find technical information to offer that takes many pages, we are not restricted in regards to printing costs. This issue illustrates the benefit of the digital publishing world.

In this issue of the LiveWire, you will find:

**Project Management**

by Gary Garberg, PPR's national sales manager.  
Pages 2, 3.

**Catalog News**

News regarding the upcoming PPR 2008 catalog.  
Page 3.

**Technical**

by Greg Stuart, PPR's engineering supervisor.  
This month's Technical column addresses DOA103  
vehicle diagnostics.  
Pages 4 through 13.

**Hot Stuff.** This month's Hot Stuff is PPR's Product  
Warranty Announcement regarding DOA786  
Page 14.



## ***Project Management, by Gary Garberg***

When I began my responsibilities with Precision Parts almost a year ago, I was asked to make occasional contributions to the LiveWire. Without hesitation, I agreed. This publication has featured a lot of great technical information in the past and it will continue to do so, but the information that I share with you will be anything but technical.

I recently saw an ad in the classified section of the newspaper. It said:

**“Wedding dress for sale. Worn once by mistake.”**

After I finished laughing until I cried, it made me think about how costly some of the mistakes are that many of us make throughout our lives and careers. I also reflected on some of the mistakes that I have made in the past and how unnecessary many of them were, had I only paid attention to what was happening around me.

Ignoring signs of common sense is real to many of us. But as they say, the definition of insanity is doing the same things over and over again and expecting different results. That just doesn't happen.

At Precision Parts, we have devised a way to learn from each one of our mistakes and we systematically record every detail of them, in a program we call **Project Manager**. Project Manager is one of the software tools that we use to maintain consistent quality in our products. It is also used to help maintain our relationships and commitments with our customers.

Imagine a system where you can record important details of your operation, and allows those involved in delivering exceptional products and service to your customers to access this information. Then, they can always review what has been done, so if possible, they can improve upon it in the future. Oh, and by the way, this information is stored indefinitely.



Well, that is what the Project Manager system does for Precision Parts. Many procedures and processes used at Precision Parts have been developed and refined through time. By accurately recording the trials and results of every attempt to improve our quality, through time, we achieve the best products possible. And, this process of continual improvement never stops, but unlike the definition of insanity, we improve with each experience.

Every piece of P.P.R. literature states that, "Precision Parts is America's highest quality source for remanufactured alternators and starters. This is a direct result of our continuous investment in the highest quality test equipment and ongoing commitment to process control and improvement."

Now you know one of the tools that we use to accomplish that.

## Catalog News

PPR anticipates the release of its 2008 Catalog in early October 2007. Since our catalog data changes are 'live' on our website ([www.pprok.com](http://www.pprok.com)), many of the changes and additions are already evident on-line. Some notable updates are:

Scion applications were originally listed in PPR as Toyota models. Scion has now been broken out as it's own brand.

PPR now also lists the popular Hummer vehicles, and the also popular, but much smaller Mini vehicles.

We look forward to releasing the new catalog as soon as we have it available.



# Technical

## Hyundai Sonata & Kia Optima Charging System Diagnosis

### Troubleshooting Information (Courtesy Hyundai Corp.):

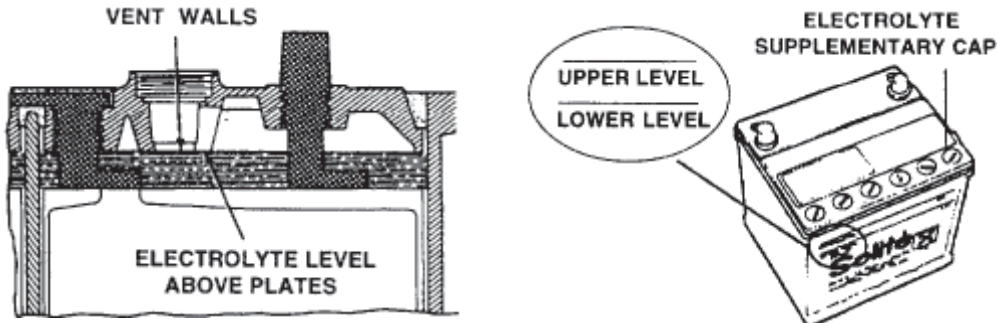
The following information applies to **DOA103** alternators.

#### 1. Initial Checks

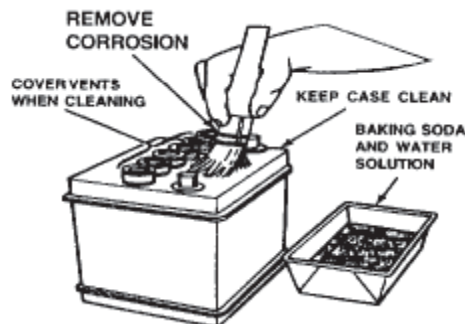
##### A. Check Battery condition

###### i) Visual Inspection

- 1) If the battery has vent caps check the electrolyte level. It should be above the top of the plates or at the indicated level within the cells. Add distilled or mineral free drinking water to raise the electrolyte level. Do not overfill.

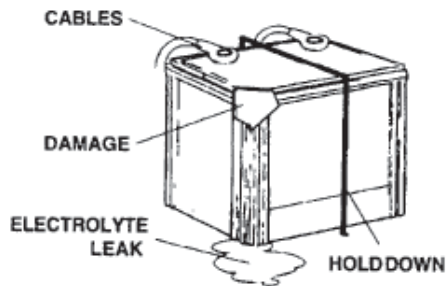


- 2) Check for loose or corroded terminals and connectors. A solution of baking soda and water will clean most of the corrosion from the battery. **DO NOT** let the solution get into the battery.



- 3) Inspect the battery case and cover for cracks and other physical damage. Inspect the battery for electrolyte leakage. Inspect for a loose or damaged hold-down.

**NOTE:** If the battery shows any type of damage that cannot be cleaned or repaired, replace it.



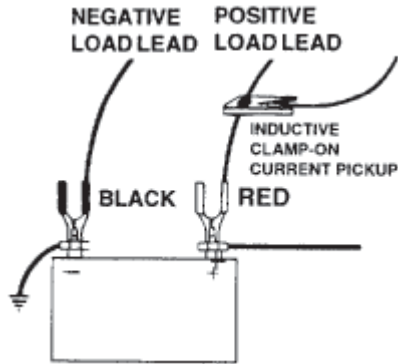
## Technical

### ii) Load Test Procedure:

The following procedure utilizes a Volt Ampere Tester, (VAT-40 or equivalent) to perform the Load Test Procedure.

1. Connect the test leads as show in the figure below.

**NOTE:** Insure the battery is fully charged prior to conducting a load test.



2. Apply a 150-170 amp load to the battery.
3. Maintain this load for 15 seconds while watching the voltmeter. Turn off the control knob immediately after 15 seconds.
4. The voltage should not fall below 9.6 volts while the load is applied.
5. After the load is removed, recovery voltage should be a minimum of 11.2V.

**NOTE:** If the voltage falls below 9.6 volts while the load is applied, conduct the 3-Minute Charge Test.

### iii) 3-Minute Charge Test:

A 3-minute charge test will determine if the discharged battery can be recharged or should be replaced. If the battery is to be tested in the vehicle, disconnect both battery cables to avoid damaging the generator & electrical system. If high voltage is recorded early in the test, stop the test and replace the battery. High internal resistance due to sulfation or poor internal connections will develop heat that can boil the electrolyte.

1. Connect the charger leads to the battery terminals, observing correct polarity (+) lead to (+) terminal and (-) lead to (-) terminal.
2. Connect a voltmeter across the battery, (+) lead to (+) terminal and (-) lead to (-) terminal.
3. Turn the charger on and adjust it for the highest charging rate but not exceeding 40 amps for a 12 volt battery. If the charger has a timer, set it for 3 minutes.
4. After 3 minutes, read the voltmeter with the charger charging. If it is 15.5 volts or less, the battery can be safely recharged. If it exceeds 15.5 volts, the battery should be replaced.

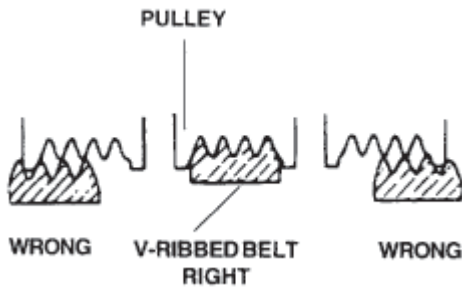
## B. Check Generator Belt

Visual Inspection:

1. Check the belt surface for damage, peeling or cracks.
2. Check the belt for worn or hardened areas.



3. Check the belt to make sure it properly fits in the pulley grooves.



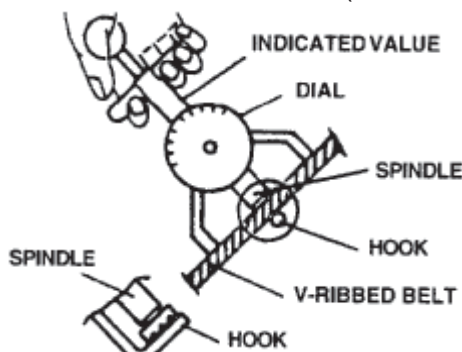
#### Belt Tension Test:

The recommended way to check belt tension is with a tension gauge.

#### “Type A” Tension Gauge

1. Place the hook between two cogs of the belt.
2. Do not let the dial section of the tension gauge contact other objects during measurement.
3. Read the tension value on the dial and compare the reading to Hyundai specifications below.

MODEL	HYUNDAI SPECIFICATION
ALL	100 +/- 20 lbs. (45.5 +/- 9.1kg)



**NOTE 1:** Always take two or more readings, moving the belt each time.

**NOTE 2:** If a tension gauge is not available, apply a pressure of 20-22 pounds (88.96-97.86N) to the belt. If the belt can be deflected more than 1/2 inch (12.7 mm), the belt will require tightening.

### C. Check Fuses & Wiring/Connection Condition

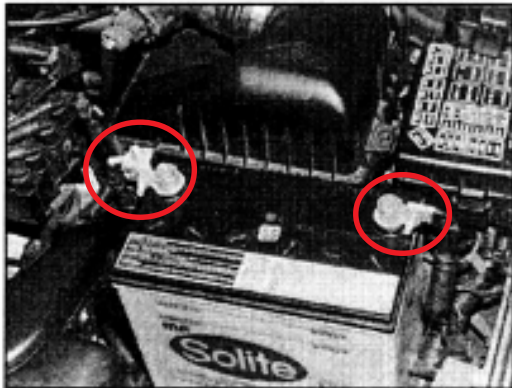
Inspect all system wiring and connections. When connectors become loose, damaged, or corroded, they may cause high resistance in a circuit. High resistance causes excessive voltage drop, which may cause improper operation of system components.

Make sure that any multiple plug connectors are latched correctly. Make sure that all connections in the charging circuit are making good electrical contact.

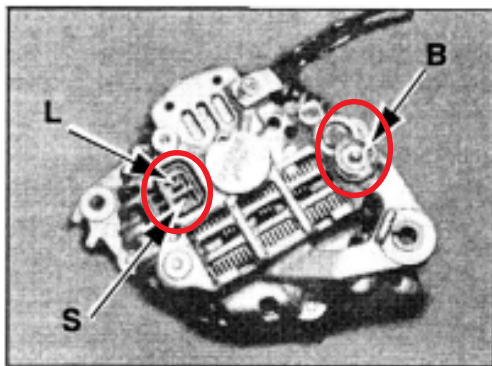


The main connections to check are:

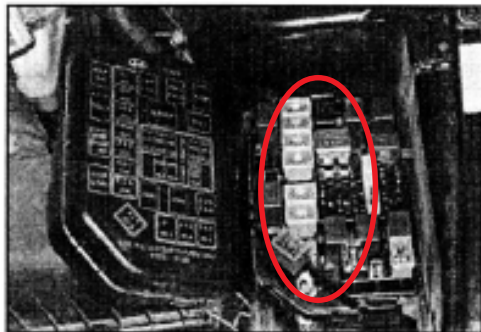
1. Both ends of the battery cables.



2. Generator terminals.



3. Fusible links, connections at the fuse box and fuse box link.



#### **D. Static Current Draw Test**

This test should be performed if you suspect excessive current draw from the battery.

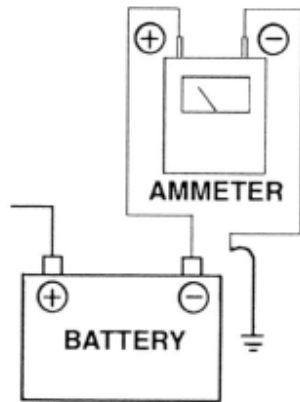
1. Make sure that all warning lamps are off, all doors are fully closed and that the ignition key is turned "OFF" and the key is removed from the ignition.



2. Disconnect the negative battery cable.

**NOTE:** When the battery is disconnected, any Diagnostic Codes (DTC) stored in the engine control and transaxle control modules (ECM & TCM) will be lost. In addition the clock and radio will have to be reset.

3. Connect the ammeter in series between the negative battery terminal and the negative battery cable.



4. The ammeter will measure the static current draw.

5. If the static current draw is above 25mA, isolate and repair the cause of the current draw.

### E. Pre-Excitation Resistor (or Relay)

The generator produces electricity by creating a magnetic field in the [stator](#) & [rotor](#). When a vehicle is first started, this magnetic field must be initiated (pre-excitation). Once the initiation has started and the generator begins producing output with sufficient voltage (more than battery voltage), the generator provides self-excitation. Thus, the pre-excitation circuit (including the pre-excitation resistor/relay) is only required during the generator output initiation phase.

If the pre-excitation resistor malfunctions, the pre-excitation circuit may not function properly and generator initiation may not occur, in which case, the generator will have no output. Thus, if a generator has no output, swap the pre-excitation resistor/relay with a known good unit and check again for output in order to confirm or eliminate the pre-excitation circuit as a possible cause.

Location of the pre-excitation resistor:

Vehicle	Location
Sonata (V6 & 14)	On the dash panel on the passenger side above the brake booster.



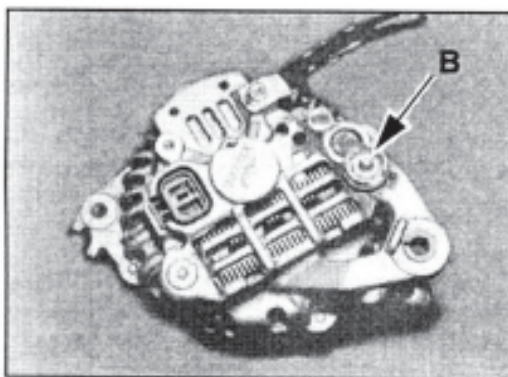
## 1. Charging Systems Test

### A. Circuit Resistance Test

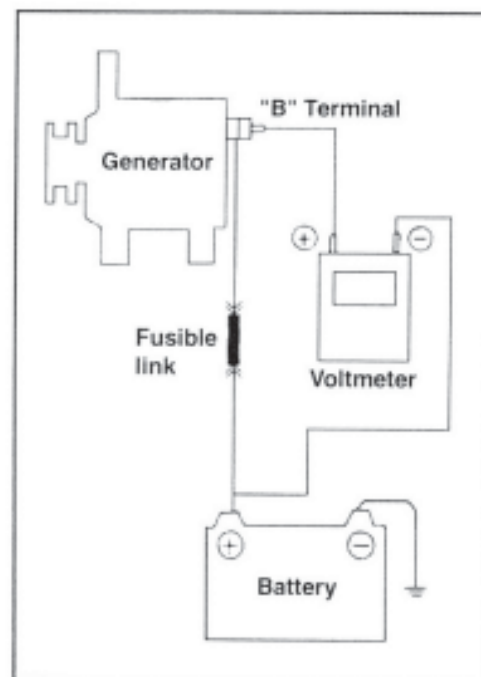
#### i) Test Procedure Using DVOM

<b>Condition</b>	Battery discharging
<b>Check:</b>	Wiring condition between the generator and the battery
<b>Preparation:</b>	<ul style="list-style-type: none"><li>• Connect the positive lead of the voltmeter to the "B" terminal of the generator*</li><li>• Start the engine</li><li>• Turn on the headlamps, blower motor to max., rear defroster, radio, etc. This is to maximize the electrical load on the system.</li><li>• Connect the negative lead of the voltmeter to the "+" terminal of the battery.*</li></ul>
<b>Analysis:</b>	The voltage drop should be less than 0.5 volts. (i.e. The voltmeter should read 0.5 volts or less)
<b>Repair:</b>	If the voltmeter reads higher than 0.5 volts, check the wiring between the generator and battery for: <ul style="list-style-type: none"><li>• loose connections</li><li>• discolored wiring due to an overheated harness</li><li>• cut or damaged wiring, etc.</li></ul>

\* Refer to the photograph and drawing below



Generator Connection



Voltmeter connections

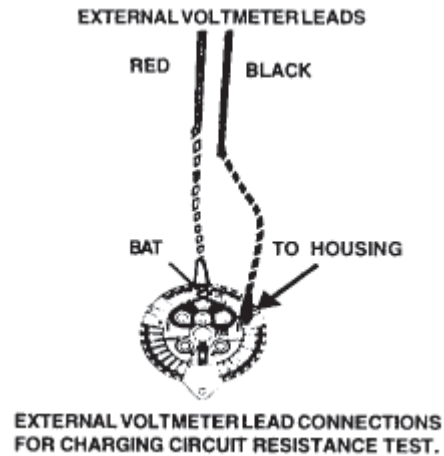
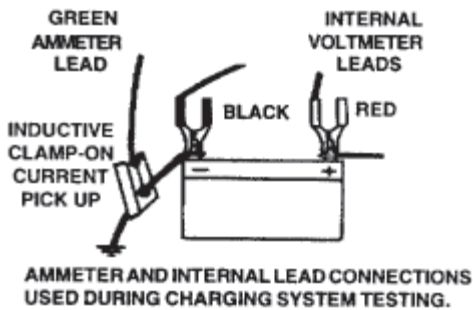


ii) Test Procedure Using Sun Volt Amp Tester

(VAT-40 or equivalent):

Circuit Resistance Test:

1. Set TEST SELECTOR knob to # 2 CHARGING position.
2. Set LOAD INCREASE knob to the OFF position.
3. Set VOLT SELECTOR knob to the EXT 18 V position.
4. Connect tester leads as shown in the figures.



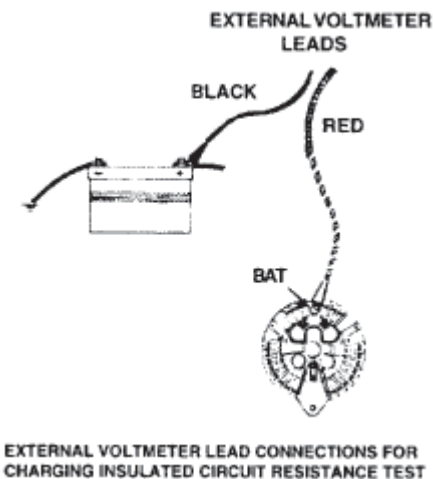
5. Start the engine and increase to 2000 RPM.
6. Adjust LOAD INCREASE knob until the reading of the Red Ammeter Scale indicates 175 A.
7. Observe the reading on the Green Voltmeter Scale. Note this reading.
8. Set VOLT SELECTOR knob to INT 18 V position. Observe the reading on the Green Voltmeter Scale. Subtract this reading from the reading obtained in step 7. The difference is the voltage drop caused by circuit resistance and must be less than 0.5 volts.

**NOTE:** If the voltage drop exceeds 0.5 volts, then conduct the test on the following page (Insulated Circuit Resistance Test).

Insulated Circuit Resistance Test:

**NOTE:** Leave main clamps on VAT-40.

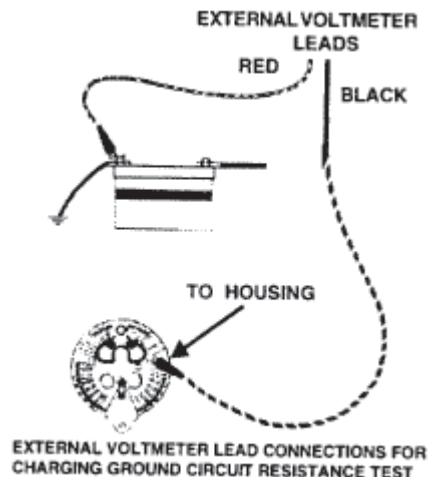
1. Connect test leads as shown.



2. Set VOLT SELECTOR knob to EXT 3 V position.
3. Start the engine and adjust speed to approximately 2000 RPM.
4. Adjust LOAD INCREASE knob until Red Ammeter Scale indicates 175 A.
5. Observe voltage reading on Black (3 Volt) Voltmeter:
  - \*If below 0.5 volts, proceed to the "Ground Circuit Resistance Test".
  - \*If above 0.5 volts, repeat this test with voltmeter connected across each connection and each wire of the insulated circuit to isolate the point of high resistance.

#### Ground Circuit Resistance Test:

1. Connect test leads as shown.



2. Start the engine and adjust speed to 2000 RPM.
3. Adjust LOAD INCREASE knob until Red Ammeter Scale indicates 175 A.
4. Observe Black (3 volt) Voltmeter Scale. Test with voltmeter leads connected across each connection and each wire of the ground circuit to isolate the point of high resistance.



## B. Generator Output Test

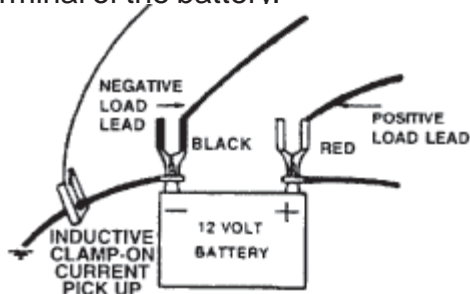
### i) Test Procedure Using DVOM & Ammeter

<b>Condition:</b>	Insufficient output from the Generator.												
<b>Check:</b>	The current output of the Generator.												
<b>Preparation:</b>	<ul style="list-style-type: none"> <li>• Disconnect the battery ground (-) cable.</li> <li>• Disconnect the generator output wire from the generator "B" terminal.</li> <li>• Connect a DC Ammeter (100A) in series between the "B" terminal and the disconnected output wire. <i>(Tighten each connection securely. Do not rely on alligator clips.)</i></li> <li>• Connect the positive lead of the voltmeter to the "B" terminal of the generator.</li> <li>• Connect the negative lead of the voltmeter to a good ground.</li> <li>• Reconnect the battery ground (-) cable.</li> </ul>												
<b>Test:</b>	<ul style="list-style-type: none"> <li>• Check to see that the voltmeter reads battery voltage. If the voltage reads 0V, check for: <ul style="list-style-type: none"> <li>- An open circuit in the wire between the generator "B" terminal and the battery ground (-) terminal.</li> <li>- Blown fusible link.</li> <li>- Poor voltmeter ground connection.</li> </ul> </li> <li>• Start the engine.</li> <li>• Turn on the headlamps (high beam), blower motor to the max., rear defroster, radio, etc. This is to maximize the electrical load on the system.</li> <li>• Quickly increase the engine speed to 2500 RPM and read the maximum output current on the ammeter. <i>(NOTE: This test must be conducted while the engine and generator are as cold as possible. Thus, conduct this test as soon as the vehicle is started.)</i></li> </ul>												
<b>Analysis:</b>	<ul style="list-style-type: none"> <li>• The ammeter reading must be higher than the limit value</li> </ul> <table border="1" style="margin-left: 40px;"> <thead> <tr> <th>Model</th> <th>Limit Value</th> <th>Normal Rating</th> </tr> </thead> <tbody> <tr> <td>Tiburon / Elantra</td> <td>63A minimum</td> <td>90A</td> </tr> <tr> <td>Accent</td> <td>53A minimum</td> <td>75A</td> </tr> <tr> <td>Sonata</td> <td>70A minimum</td> <td>100A</td> </tr> </tbody> </table>	Model	Limit Value	Normal Rating	Tiburon / Elantra	63A minimum	90A	Accent	53A minimum	75A	Sonata	70A minimum	100A
Model	Limit Value	Normal Rating											
Tiburon / Elantra	63A minimum	90A											
Accent	53A minimum	75A											
Sonata	70A minimum	100A											
<b>Repair:</b>	<ul style="list-style-type: none"> <li>• If the ammeter reads lower than the limit value, replace the generator.</li> </ul>												

**NOTE:** A partially discharged battery works best for this test. A partially discharged battery allows most of the electrical load to be put on the Generator (thus taking the battery out of the equation).

### ii) Test Procedure Using Sun Vat-40 or Equivalent Tester

1. Connect the Green Clamp-on Amps Pickup around the battery ground cable. Connect the NEGATIVE LOAD LEAD to the ground (-) terminal of the battery. Connect the POSITIVE LOAD LEAD to the positive (+) terminal of the battery.



2. Set the TEST SELECTOR to the # 2 CHARGING position.
3. Turn the ignition switch to the ON position and read the rate of discharge on the Blue Ammeter Scale.
4. Start the engine and adjust the speed to 2500 RPM.

5. Adjust the LOAD INCREASE control slowly as required to obtain the highest reading on the Blue Ammeter scale. Do not allow the voltage to drop below 12 volts.

**NOTE:** For charging Systems rated above 100A, use the # 1 STARTING position and read the Red 0-500A scale.

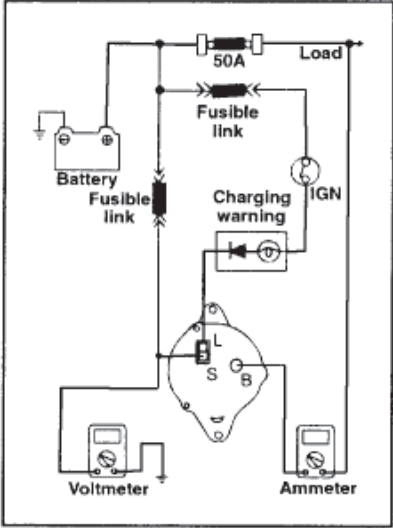
6. Rotate LOAD INCREASE control to OFF and shut off the engine.

7. Add the ammeter readings from step 3 and 5 for the total generator output. Compare this number to the normal generator output rating found on the housing of the generator.

**NOTE:** If the output from the generator is within 10% of the specifications (amperage), the generator passes this test. If not, replace the generator.

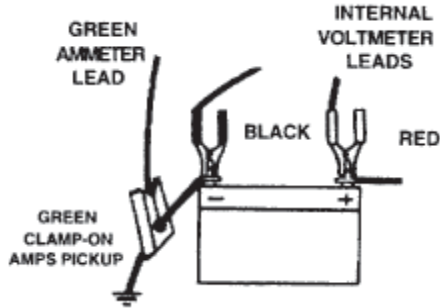
### C. Voltage Regulator Test

#### i) Test Procedure Using DVOM & Ammeter

<b>Condition:</b>	Abnormal Voltage.										
<b>Check:</b>	Voltage Regulator.										
<b>Preparation:</b>	<ul style="list-style-type: none"> <li>Disconnect the battery ground (-) cable.</li> <li>Connect the positive lead of the voltmeter to the "S" terminal of the generator.</li> <li>Connect the negative lead of the voltmeter to a ground.</li> <li>Disconnect the generator output wire from the "B" terminal and the disconnected output wire.</li> </ul> <p><b>(Tighten each connection securely. Do not rely on alligator clips.)</b></p> <ul style="list-style-type: none"> <li>Reconnect the battery ground (-) cable.</li> </ul>										
<b>Test:</b>	<ul style="list-style-type: none"> <li>Turn the ignition ON. The voltmeter should read BATTERY VOLTAGE (about 13 volts). If it reads 0V, there is an open circuit in the wiring between the generator "S" terminal and the battery positive (+) terminal or the fusible link is blown.</li> <li>Start the engine.</li> <li>Turn off all lights and accessories.</li> <li>Raise the engine speed to about 2500 RPM and record the voltmeter reading when the generator output current drops to 10A or less.</li> </ul> 										
<b>Analysis:</b>	<ul style="list-style-type: none"> <li>If the voltmeter reading was within the specs below, the voltage regulator is functioning properly.</li> </ul> <table border="1" data-bbox="651 1623 1287 1850"> <thead> <tr> <th>Voltage Regulator Ambient Temp. °F(°C)</th> <th>Regulator Voltage (V)</th> </tr> </thead> <tbody> <tr> <td>-4 (-20)</td> <td>14.2 - 15.4</td> </tr> <tr> <td>68 (20)</td> <td>13.9 - 14.9</td> </tr> <tr> <td>140 (60)</td> <td>13.4 - 14.6</td> </tr> <tr> <td>176 (80)</td> <td>13.1 - 14.5</td> </tr> </tbody> </table>	Voltage Regulator Ambient Temp. °F(°C)	Regulator Voltage (V)	-4 (-20)	14.2 - 15.4	68 (20)	13.9 - 14.9	140 (60)	13.4 - 14.6	176 (80)	13.1 - 14.5
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140 (60)	13.4 - 14.6										
176 (80)	13.1 - 14.5										
<b>Repair:</b>	<ul style="list-style-type: none"> <li>If voltmeter reads lower than limit values shown replace the generator.</li> </ul>										

## ii) Test Procedure Using Sun Vat-40 or Equivalent Tester

1. Connect the tester leads as shown in the figure.



2. Set TEST SELECTOR knob to # 3 REGULATOR position.
3. Set VOLT SELECTOR knob to INT 18 V position.
4. Operate the engine at a speed of 2000 RPM.
5. **Note** the reading on the voltmeter after it ceases to rise; generally the charging rate is between 5 and 10 amperes. The length of time required depends upon the battery state of charge.

GOOD Regulator:

Voltage reading is within 14 volts.

BAD Regulator:

Voltage is above or below specified voltage range (refer to the A. Using a DVOM & Ammeter table of this TSB). Replace the generator per Hyundai's instructions and then retest system.

Diode Stator Test:

**NOTE:** Continue to operate the engine at a speed of 2000 RPM.

1. With TEST SELECTOR set in the # 3 REGULATOR position, adjust the LOAD INCREASE control if necessary to obtain a charge rate of at least 15 amperes.
2. Set the TEST SELECTOR to the # 4 DIODE STATOR position; observe the Red and Blue DIODE STATOR scale.

GOOD Regulator:

Meter reads in Blue area of DIODE STATOR scale.

BAD Regulator:

Meter reads in Red area of DIODE STATOR scale. Replace the generator per Hyundai's instructions and then retest system.

3. Return the LOAD INCREASE control to OFF and the engine speed to idle.



# HOT STUFF

## PRODUCT WARRANTY ANNOUNCEMENT

Aug - 2007

### DOA786

Due to vehicle conditions beyond our control, warranty credit will NOT be issued if the warranty unit is oil soaked. We see major contamination of the slipping brushholder area resulting in units which will no longer operate due to this contamination.

This is a vehicle problem and must be repaired before replacing the alternator. If you see an incoming core that is oil soaked please warn your customer that the warranty will be void on this unit unless the vehicle is repaired.

