

SECTION 14-02B Generator, Integral Regulator — Internal Fan and Regulator Type

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VEHICLE APPLICATION

Taurus with 3.0L, 3.2L Super High Output (SHO) Engine.

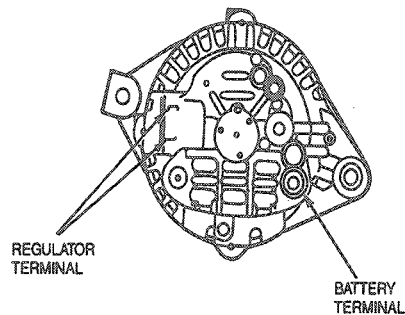
DESCRIPTION

Charging System

The electrical charging system is a negative ground system consisting of an integral generator / voltage regulator (IGR), charge indicator, storage battery and the necessary wiring and cables. Refer to the Electrical and Vacuum Troubleshooting manual for schematics and locations of components and wiring.

Generator

The integral generator / regulator (IGR) is belt-driven from the engine. Field current is supplied from the generators internally mounted voltage regulator, to the rotating field of the generator through two brushes and two slip rings.



J3437A

OPERATION

With the ignition key in the RUN position, voltage is applied through the charge indicator 'I' circuit to the voltage regulator. This turns on the regulator and the indicator. When the engine is started, the generator begins to generate alternating (AC) current which is converted to direct (DC) current by the rectifier assembly internal to the generator. This current is then supplied to the vehicles electrical system through the generator Battery Positive Voltage (B+) connection located on the rear of the generator.

Once the generator begins generating current, a voltage signal is taken from the generator stator and fed back to the regulator warning circuit, turning off the charge indicator.

With the system functioning normally, the generator output current is determined by the voltage of the 'A' circuit (battery sense voltage). The 'A' circuit voltage is compared to a set voltage internal to the regulator, and the regulator controls the generator field current to maintain proper generator output. The set voltage will vary with temperature and is typically higher in the winter than in the summer, allowing for better battery recharge in the winter and reducing the chance of overcharging the battery in the summer.

Circuit Description

Battery Positive Voltage (B+) Output

The generator output is supplied through the Battery Positive Voltage (B+) output connection to the battery and electrical system.

'I' Circuit

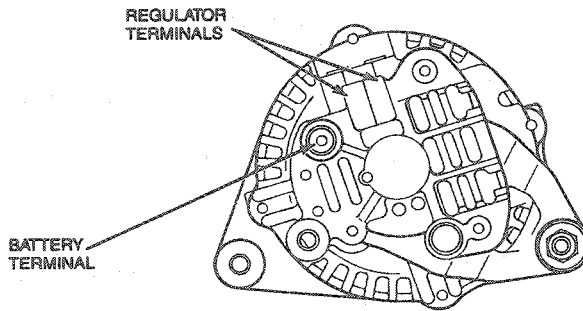
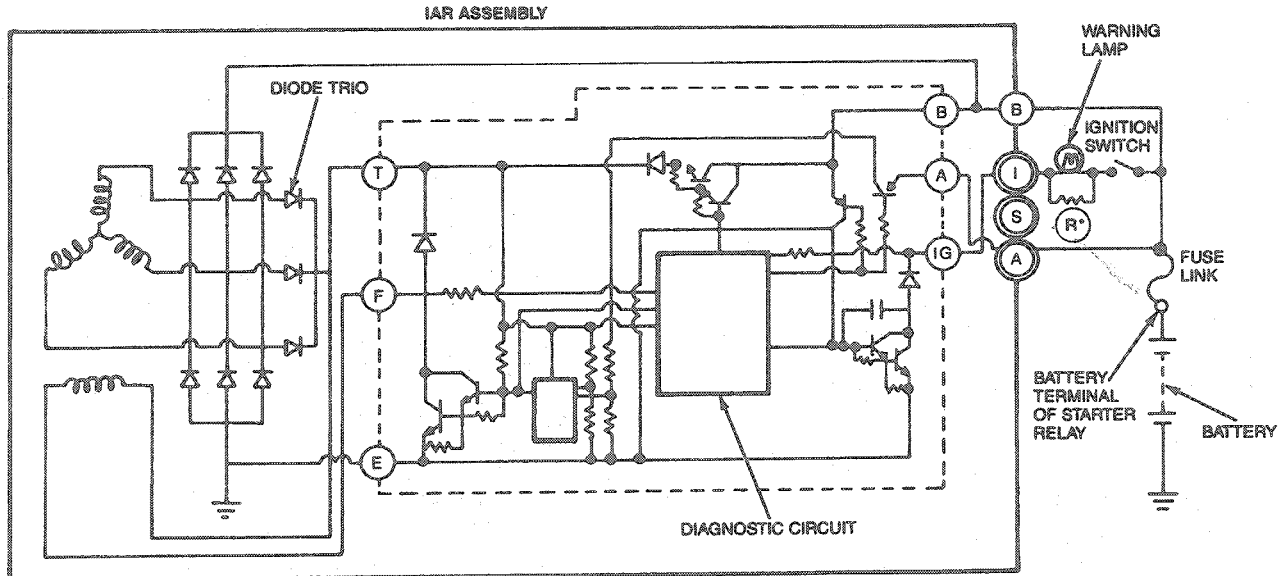
The 'I' circuit, or ignition circuit, is used to turn on the voltage regulator. This circuit is powered up with the ignition key in the RUN position. This circuit is also used to turn the indicator on if there is a fault in the charging system operation or associated wiring circuits.

OPERATION (Continued)

'A' Circuit

The 'A' circuit, or battery sense circuit, is used to sense the battery voltage. This voltage is used by the regulator to determine the generator output. This circuit is connected back to the load distribution point and is a protected circuit.

*R IS 500 OHMS FOR WARNING LAMP SYSTEM WITH STANDARD INSTRUMENT CLUSTER. 420 OHMS FOR ELECTRONIC INSTRUMENT CLUSTER



J3366-A

DIAGNOSIS AND TESTING

Certain tests outlined in this Section are illustrated in schematic and in pictorial form. A schematic drawing of the charging system is shown under Operation.

NOTE: The tests are divided into On-Vehicle and On-Bench test procedures. The On-Bench procedures follow the On-Vehicle tests in this Section.

On-Vehicle Tests

Tools Required:

- Rotunda Digital Volt-Ohmmeter 007-00001

A volt ohmmeter (0- to 20-volt scale), such as Rotunda Digital Volt-Ohmmeter 007-00001 or equivalent, jumper wire and a test lamp (12-volt) are the only tools required to perform on-vehicle tests of the complete charging system. Test meter calibration should be checked once a year and the date of calibration stamped on the meter face. It is recommended that this practice be followed by all technicians to maintain test meters at acceptable accuracy.

DIAGNOSIS AND TESTING (Continued)

Troubleshooting or diagnosis is required before actual service can be made in the electrical system. Even where an obvious condition makes replacement of a unit necessary, find out why the unit failed. When a condition is diagnosed correctly, unnecessary service is prevented, the time the vehicle is out of service will be decreased, and the condition will be properly corrected the first time.

Visual Inspection

Preliminary checks to the charging system should be made regardless of the fault condition. These checks include:

- Check battery posts and cable terminals for clean and tight connections. Clean the posts and the cables to ensure good electrical contact.
- Check for secure connections at the generator output, regulator and engine ground. Also check the connection at the load distribution point (starter relay).
- Check the generator belt to ensure proper tension and no slip between the generator pulley and the belt.
- Check the fuses / fuse links to the generator to ensure that they are not burned or damaged. This condition, resulting in an open circuit or high resistance, can cause erratic or intermittent charging system concerns.

Before performing charging system tests on the vehicle, note conditions such as: slow cranking, discharged battery, top of battery wet, generator / battery charge indicator stays on with engine running, generator / battery charge indicator does not illuminate with ignition switch in RUN and engine not running. This information will aid in isolating the part of the system causing the symptom.

Isolating the Concern

Battery, starting system, and lamp system concerns can be caused by poor charging system performance. It is also reasonable to suspect the charging system if an overload condition has occurred in another area of the electrical system.

To avoid guesswork, it is necessary to isolate battery, charging system, and electrical circuits to correctly identify the area where the difficulty lies. Check the battery first before beginning any electrical system diagnosis. The battery must be in proper state of charge and operation before the other areas of the electrical system can perform normally.

Battery Check

Check battery to see if it has the capacity and ability to accept and hold a charge. Refer to Section 14-01. If battery is OK, the charging system should then be checked to see that it performs its function of keeping the battery charged.

The battery capacity, specific gravity and cell comparison test (non-maintenance free batteries only), will determine the ability of a battery to accept and hold a charge. If the battery does not meet specification, replace it with a new, fully charged battery before further diagnosis of other areas of the electrical system.

If the battery meets required specifications, it should be fully charged before proceeding with the diagnosis of other electrical system components.

Constant Current Drain Test

Tools Required:

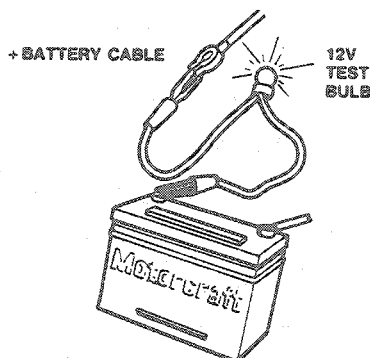
- Rotunda Dwell-Tach-Volts Ohm Tester 059-00010

NOTE: A voltmeter is sometimes used for this test but it will react to a very small normal drain caused by "always-on" electronic systems such as starter interlock, anti-theft alarm, illuminated entry, etc., which are so small they cause no concern. The test lamp shows only drains which are large enough to cause a concern.

NOTE: When the electronic instrument cluster is initially powered-up (after a battery disconnect), the "computer" may be energized for as long as one minute causing a 0.25 amp current draw before returning to the normal 0.010-0.012 amp current draw. Therefore, it is important to allow at least one minute to pass (after ammeter hookup) before observing any current measurements.

Check for current drains on the battery in excess of 50 milliamps with all the electrical accessories off and the vehicle in PARK. This test can be performed one of three ways:

- Use a clamp-on current probe to the battery positive or negative cable.
- Use an in-line ammeter between the battery positive or negative post and its respective cable.
- Use a 12-volt test lamp between the battery positive post and the positive cable. If the lamp illuminates, then there is a drain somewhere in the electrical system.



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DIAGNOSIS AND TESTING (Continued)

Typically, a drain of approximately one amp can be attributed to an underhood lamp, glove compartment lamp, or rear deck lid lamp staying on continually. Other component failures or wiring shorts may be located by selectively pulling fuses or disconnecting fuse links to pinpoint the location of the current drain. When the current drain is found, the current will drop below 50 milliamperes or the test lamp will go out. If the short is still not located, after checking all the fuses and fuse links, the drain may be due to the generator/regulator. Disconnect the generator output wire from the output stud and the regulator connector. If this eliminates the drain, check the charging system to locate the concern.

Charging System

Tools Required:

- Rotunda Starting and Charging Tester (VAT-40) 078-00005

In order to check the charging system, the use of Rotunda Starting and Charging Tester (VAT-40) 078-00005 or equivalent tester is suggested. Connect the tester to the battery positive and negative posts and also connect the current probe to the generator output lead (to measure generator output). (When measuring generator output, the tester can also be connected to the battery positive or negative cable. In this case, all electrical accessories must be turned off and 10-15 amps added to the reading on the tester due to the engine operation). With the engine running at 2000 rpm, adjust the tester load bank to determine the output of the generator. The generator output should be near to, or exceed the generator rating at 27°C (80°F). Check out the charging system as indicated and service if required.

NOTE: Refer to the Rotunda VAT-40 test procedure manual for complete directions on checking out the charging system.

Indicator System

Normal Charge Indication

With this IGR system four conditions can cause the charge indicator to come on during vehicle operation:

1. No generator output: damaged generator or regulator.
2. Over-voltage condition: shorted generator rotor or regulator.
3. No connection at generator output terminal (B+).
4. No connection at battery voltage sensing terminal ('A' terminal).

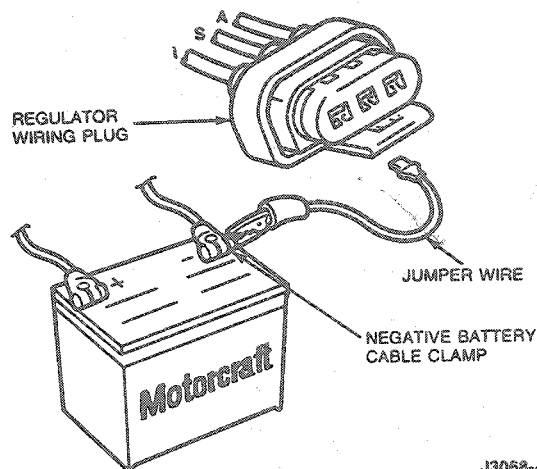
With ignition switch in the OFF position, charge indicator (generator or battery) is off.

With ignition switch in the RUN position (engine not running), charge indicator (generator or battery) is on.

With ignition switch in the RUN position (engine running), charge indicator (generator or battery) is off.

Indicator Testing

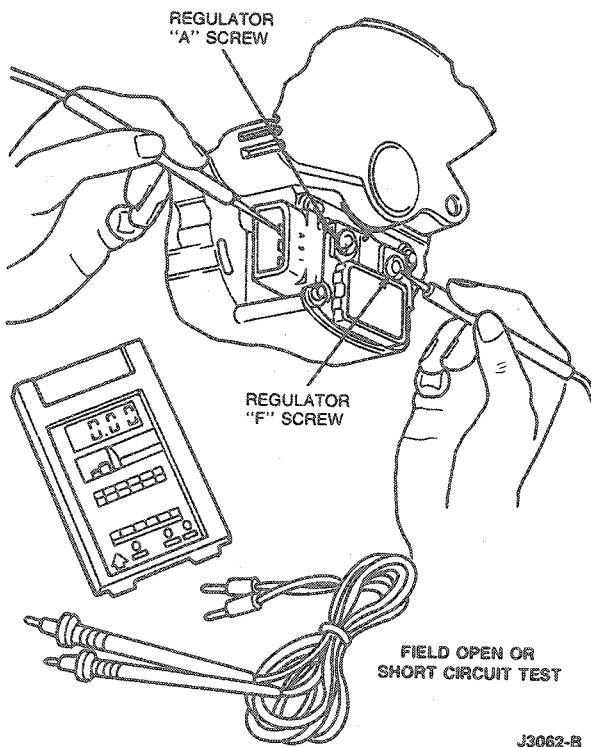
1. If charge indicator does not come on, disconnect wiring connector from regulator.
2. Connect a jumper wire from wiring connector 'I' terminal to battery negative (-) post cable clamp.



3. Turn ignition switch to RUN position with engine off. If indicator does not light, check for presence of lamp socket resistor. If resistor is present, check for contact of lamp socket leads to the flexible printed circuit. If good, check indicator for continuity and replace if burned out. If indicator checks good, perform Regulator 'I' Circuit Test.
4. If indicator does light, remove jumper wire and reconnect wiring plug to regulator. Connect voltmeter negative lead to battery negative post cable clamp and contact voltmeter position lead to regulator 'A' terminal. Battery voltage should be indicated. If battery voltage is not indicated, service 'A' circuit wiring.
5. If battery voltage is indicated, clean and tighten ground connections to engine, generator and regulator.

DIAGNOSIS AND TESTING (Continued)

6. Turn ignition to RUN position with engine off. If indicator still does not light, replace regulator.



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Charging System Tests

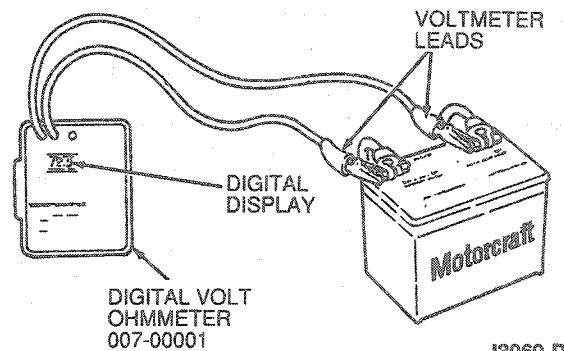
When performing charging system tests, turn OFF all lamps and electrical components. Place transmission in NEUTRAL and apply parking brake.

CAUTION: Do not make jumper wire connections except as directed. To do so may damage regulator.

NOTE: Battery posts and cable clamps must be clean and tight to ensure accurate meter indications.

Base Voltage Test

1. With ignition switch in OFF position and no electrical load, connect negative lead of voltmeter to negative battery cable clamp.
2. Connect positive lead of voltmeter to positive battery cable clamp.
3. Record battery voltage reading shown on voltmeter scale. This reading is called base voltage.



No-Load Test

1. Connect a tachometer to engine.
2. Start engine and increase speed to approximately 1500 rpm. With no other electrical load (foot off brake pedal and doors closed), voltmeter pointer should move upward (increase) but not more than 2.5 volts above base voltage.

NOTE: The reading should be taken when voltmeter pointer stops rising. It may take a few minutes to reach this point. If voltage increases to proper level, perform Load Test. If the pointer continues to rise, perform the Over Voltage Tests. If the voltage does not rise to proper level, perform Under Voltage Tests.

Load Test

1. With engine running, turn heater / air conditioner blower motor on (high speed) and headlamps on high beam.
2. Increase engine speed to approximately 2000 rpm. Voltmeter should indicate a minimum of 0.5 volt above base voltage. If not, perform Under Voltage Tests.

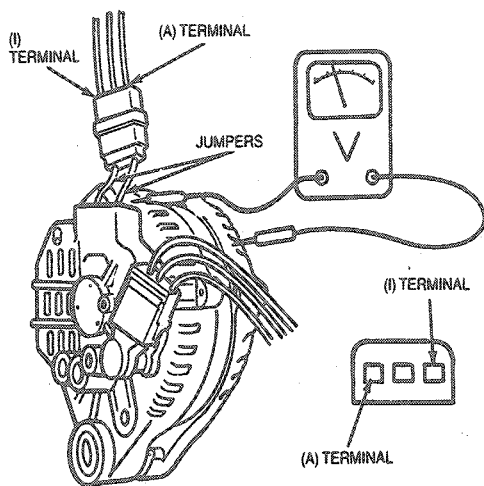
If above tests indicate proper voltage readings, charging system is operating normally. Proceed to the following tests if one or more of the readings is different than shown above and use a test lamp to check for battery drain.

Over-Voltage Tests

If voltmeter indicates more than 2 volts above base battery voltage, disconnect regulator (ASI) harness connector and insert jumper wires for 'A' and 'I' circuits. With ignition switch in ON position and engine off, connect voltmeter negative lead to generator rear housing. Contact voltmeter positive lead first to generator output connection at starter solenoid and then to regulator harness connector 'A' pin. If voltage difference between the two locations is greater than 0.5 volts, service 'A' wiring circuit to eliminate high resistance condition indicated by excessive voltage drop. Perform Regulator 'A' or 'I' Circuit Test.

DIAGNOSIS AND TESTING (Continued)

If the same voltage reading (battery voltage), is obtained at both locations, replace regulator portion of generator assembly.



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Under-Voltage Tests

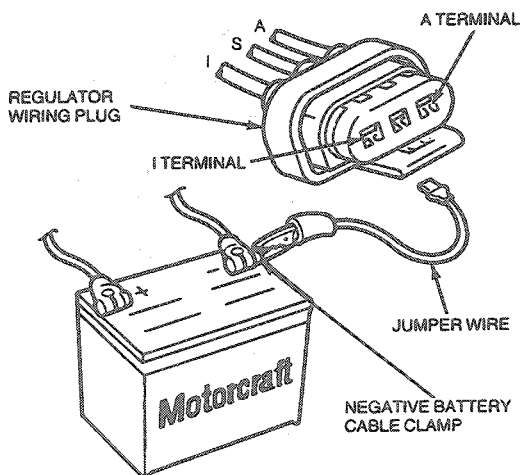
If voltmeter indicates less than 0.5 volt above base voltage, perform Regulator 'A' and/or 'I' Circuit Test.

NOTE: If under voltage condition still exists, replace integral generator assembly.

Regulator 'A' and/or 'I' Circuit Test

With ignition switch in the RUN position (engine not running), charge indicator (generator or battery) should be on.

1. Disconnect wiring connector from regulator and connect a jumper wire from wiring connector 'I' terminal to battery negative post cable clamp.



J3333-A

2. Turn ignition to RUN position with engine off. If indicator does not light, check indicator bulb for continuity and replace bulb if burned out. If bulb checks good, service open in 'I' circuit of vehicle and check for normal operation.
3. If indicator does light, remove jumper wire and connect voltmeter negative lead to battery negative post cable clamp and contact voltmeter positive lead to regulator wiring connector 'A' terminal. Battery voltage should be indicated. If battery voltage is not indicated, service 'A' circuit wiring.
4. If battery voltage is indicated, clean and tighten ground connections to engine and generator.
5. Turn ignition to RUN position with engine off. If indicator still does not light, replace complete generator assembly.

Fuse Link Continuity

1. Ensure first that battery is OK, then turn on headlamps or any accessory. If headlamps or an accessory do not operate, fuse link is probably burned out.
2. On some vehicles there are several fuse links. Use same procedure as in Step 1 to test fuse link that protects vehicle equipment.
3. To test fuse link that protects generator, ensure that battery is OK, then check with a voltmeter for voltage at Battery Positive Voltage (B+) terminal of generator and 'A' terminal of regulator. No voltage indicates that fuse link is probably burned out.

Charging System Check

The charging system test should be performed before testing any individual charging system components. The component tests will determine the type of component service required.

Test instruments used in the charging system test are a voltmeter (0-20- or 0-30-volt scale) and an ohmmeter.

WARNING: SPECIAL CARE SHOULD BE TAKEN WHEN USING THE OHMMETER NEAR "HOT" CIRCUITS. DISCONNECT THE COMPONENT TO BE CHECKED OR THE BATTERY CABLES TO PREVENT DAMAGE TO THE OHMMETER.

Continue through Diagnosis and Testing charts until service is completed. Then, test system again to see if service has corrected the condition.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST A: CHARGING SYSTEM TEST — IAR GENERATOR

TEST STEP		RESULT	ACTION TO TAKE
A1	PRELIMINARY CHECKS		
	<ul style="list-style-type: none"> ● Check the following: ● Fuse link. ● Battery terminals and cable clamps. ● Wiring connections at generator, integral voltage regulator (IAR) and engine-to-body grounds. ● Generator belt tension. ● Are components OK? 	Yes No	GO to A2. SERVICE and / or REPLACE as necessary. GO to A2.
A2	BASE VOLTAGE AND NO-LOAD TEST		
	<ul style="list-style-type: none"> ● Connect voltmeter to battery posts. Record battery voltage (base voltage). ● Start engine and run at 1500 rpm with no electrical load. Voltage should increase, but not more than 2 volts. 	Increases, but not more than 2 volts No increase Increases more than 2 volts	GO to A3. GO to A5. GO to A7.
A3	LOAD TEST		
	<ul style="list-style-type: none"> ● Increase engine speed to 2000 rpm. ● Turn heater / A / C blower and headlamps on HIGH. ● Voltage should read a minimum of 0.5 volt over base 'A' circuit voltage. 	Increases 0.5 volt or more Increases 0.5 volt or more, but generator indicator stays on Increases less than 0.5 volt	GO to A4. GO to A7. GO to A5.
A4	BATTERY DRAIN TEST—KEY OFF		
	<ul style="list-style-type: none"> ● Perform battery drain test. Refer to Section 14-01. ● Is there a battery drain? 	Yes No	CHECK other vehicle circuits for drain. REFER to Section 14-01.
A5	'I' CIRCUIT VOLTAGE TEST		
	<ul style="list-style-type: none"> ● Disconnect regulator. ● Turn ignition switch to RUN (engine off). ● Measure voltage at 'I' terminal of IAR. Voltage should be same as battery voltage. ● Is there battery voltage? 	Yes No	GO to A6. SERVICE 'I' circuit for open or short to ground. GO to A2.
A6	'I' CIRCUIT CURRENT TEST		
	<ul style="list-style-type: none"> ● Jumper 'I' terminal at IAR connector to battery negative post. ● Turn ignition switch to RUN (engine off). ● Does charge indicator light? 	Yes No	GO to A7. SERVICE 'I' circuit (high resistance). GO to A2.
A7	'A' CIRCUIT TEST		
	<ul style="list-style-type: none"> ● Disconnect IAR. ● Connect voltmeter negative lead to battery negative post. ● Connect voltage positive lead to 'A' terminal of IAR connector. ● Is voltage same as battery? 	Yes No	GO to A8. SERVICE 'A' circuit (open / high resistance). GO to A2.
A8	CHECK GENERATOR OUTPUT LEAD		
	<ul style="list-style-type: none"> ● Stop engine. ● Connect voltmeter positive lead to B+ terminal of generator. ● Connect voltmeter negative lead to battery negative post. ● Is voltage same as battery? 	Yes No	SERVICE or REPLACE generator. GO to A2. SERVICE or REPLACE circuit from generator to battery. GO to A2.

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DIAGNOSIS AND TESTING (Continued)

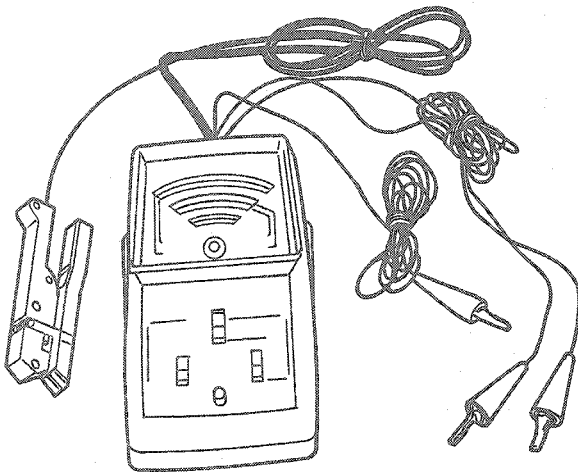
On-Bench Tests

Tools Required:

- Rotunda Dwell-Tach-Volts Ohms Tester 059-00010

If system diagnosis has isolated a concern in the integral generator/regulator assembly, remove it from vehicle for bench testing and service or replace. Refer to Removal and Installation.

The following tests are performed with an analog (needle-type) ohmmeter. Test values shown are referenced to Rotunda Dwell-Tach-Volts Ohms Tester 059-00010 or equivalent. **THESE VALUES MAY BE DIFFERENT FOR OTHER OHMMETERS.** If you do not have Rotunda Dwell-Tach-Volts Ohms Tester 059-00010 or equivalent, use known good parts to establish reference values for your own meter. These values can be written into the spaces provided in the meter reading charts for future reference.



DWELL-TACH-VOLTS
OHMS TESTER 059-00010

J2934-C

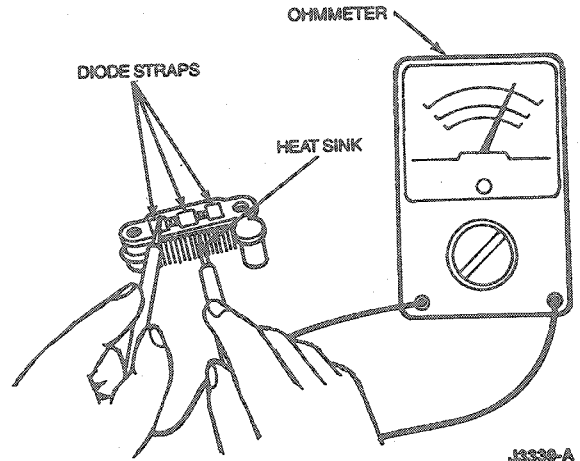
Rectifier Assembly Test

Remove the rectifier assembly from the generator. Place the ohmmeter, Rotunda Dwell-Tach-Volts Ohms Tester 059-00010 or equivalent, Multiply-By setting at 1 and calibrate the meter as directed.

CAUTION: Digital meters cannot be used to perform these tests.

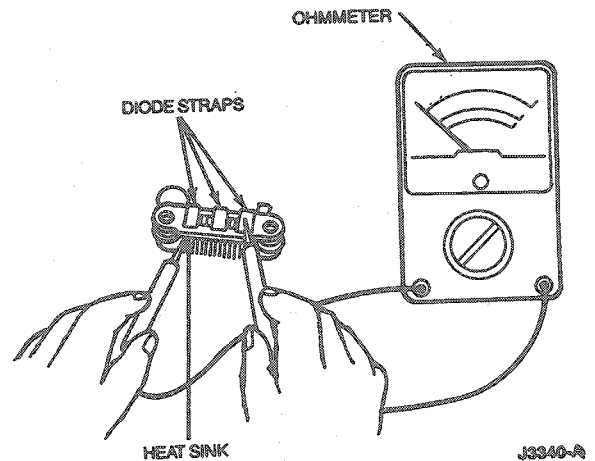
Rectifier

1. Positive Diode (non-grounded)—Check for continuity between the positive diode lead and the heat sink at the positive side, using an ohmmeter. There should be continuity only in the direction from the diode lead to the heat sink.



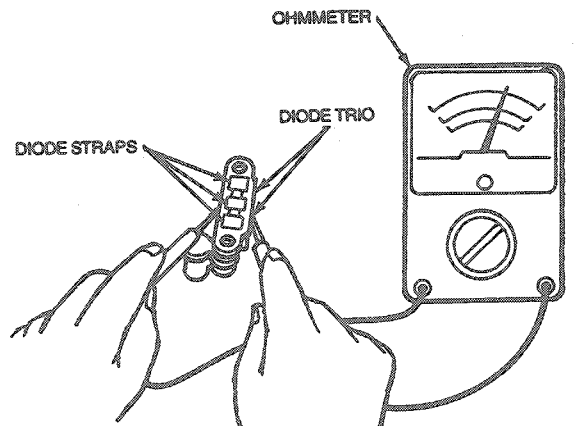
J3339-A

2. Negative Diode (grounded)—Check for continuity between the negative diode lead and the heat sink at the negative side, using an ohmmeter. There should be continuity only in the direction from the heat sink to the negative diode.



J3340-A

3. Diode Trio—Check for continuity using an ohmmeter. There should be continuity in one direction only.



J3341-A

DIAGNOSIS AND TESTING (Continued)

METER READING			
Set meter at Ohms x 1. Make readings in both probe directions to all three phase terminals.			
Resistance Measurement		Acceptable Reading	
Heat Sink	to Diode Lead	Model 059-00010	Reference For Another Meter
One probe direction to each diode		About 7.0 ohms	About ____ ohms
Other probe direction to each diode		∞	∞

CJ3342-A

- If the meter readings are not as specified, replace the generator assembly.

Radio Suppression Capacitor Open or Short Test

NOTE: This is an open or short circuit test only and does not measure capacitance value. Actual capacitance value should be measured on a capacitance bridge at 1 kHz at a maximum voltage of 350 mV rms.

The radio noise suppression capacitor is built into the rectifier assembly and cannot be serviced by itself. To test the capacitor, place the ohmmeter, Multiply-By setting at 1000 and zero the meter. Text values shown in brackets [] are referenced to Rotunda Model 059-00010 and may be different if another tester is used.

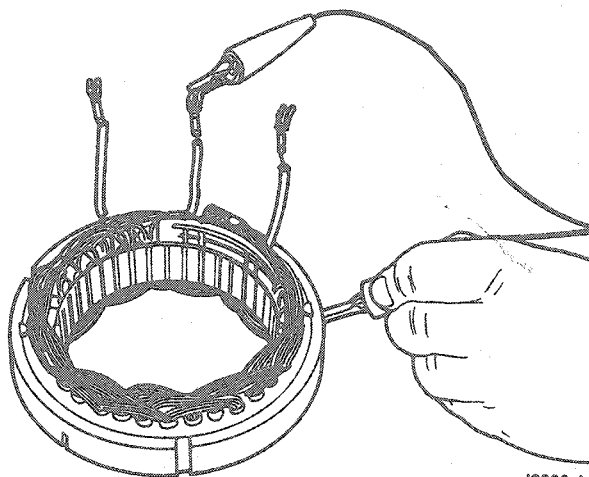
CAUTION: Digital meters cannot be used to perform this capacitor test. The rectifier assembly must be dry.

- Contact one probe to the rectifier assembly B+ terminal and contact the other probe to the rectifier assembly ground. Reverse the probes and repeat the test. One position should give an infinite reading, indicating the reverse current direction through the diodes and the other position should give a reading of about [1000] ohms, indicating the forward current direction. The same reading in both directions indicates an inoperative rectifier assembly.
- To check the capacitor, contact the probes to the rectifier assembly B+ terminal and ground in the forward current [1000] ohms reading direction. While observing the meter indicator needle, reverse the probes and again contact them to the rectifier assembly B+ terminal and ground. The indicator needle should jump slightly (indicating that the ohmmeter batteries are charging the capacitor) and then return to its original position (infinite reading). If the needle does not jump, the capacitor is open. Replace the generator assembly.

Stator Coil Grounded Test

These tests are made to determine if the stator coil is shorted to ground. Remove the stator from the generator and disconnect it from the rectifier assembly as outlined. Place the ohmmeter Multiply-By setting at 1000.

- Connect the ohmmeter probes to one of the stator lead terminals and to the stator laminated core. Ensure that the probe makes a good electrical connection with the stator core. The meter should show an infinite reading (no needle movement).
- If the meter does not indicate an infinite reading (needle moves), the stator winding is grounded to the core and the generator assembly must be replaced.



J2938-A

METER READING			
Set meter at Ohms x 1000. Make readings for all stator leads. DO NOT TOUCH LEADS WITH HANDS.			
Resistance Measurement		Acceptable Reading	
Stator Terminal	to Stator Core	Model 059-00010	Reference For Another Meter
All Stator lead combinations: Probe polarity optional		∞	∞

CJ2810-B

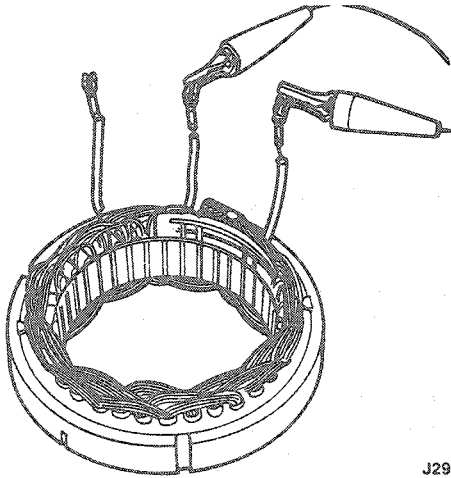
Stator Coil Open Test

This test determines if there is an open stator circuit. Disconnect the stator from the rectifier assembly. Place the ohmmeter Multiply-By setting at 1.

- Connect one ohmmeter probe to a stator phase lead terminal and touch the other probe to another stator lead terminal. Check the meter reading.

DIAGNOSIS AND TESTING (Continued)

- Repeat this test with the other two stator lead combinations. If no meter movement occurs (infinite resistance) on a lead paired with either of the other phase leads, that phase is open and the generator assembly must be replaced.



J2939-B

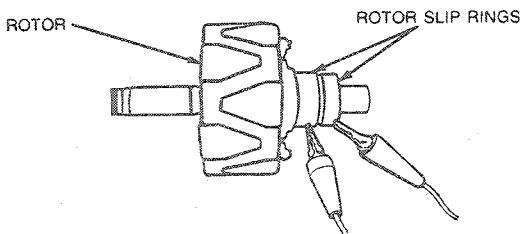
METER READING			
Set meter at Ohms x 1. Make readings for all stator lead combinations.			
Resistance Measurement		Acceptable Reading	
Stator Terminal	to Stator Terminal	Model 059-00010	Reference For Another Meter
All lead combinations; Probe polarity optional		Less than 0.5 ohms	Less than 0.5 ohms

CJ2811-B

Rotor Open or Short Test

Remove the rotor from the generator. Place the ohmmeter Multiply-By setting at 1 and calibrate the meter as directed.

- Contact each ohmmeter probe to a rotor slip ring. The meter reading should be [2.0-3.9] ohms.
- A higher reading indicates a damaged slip ring, welded connection or a broken wire. A lower reading indicates a shorted wire or slip ring. Replace the generator assembly.

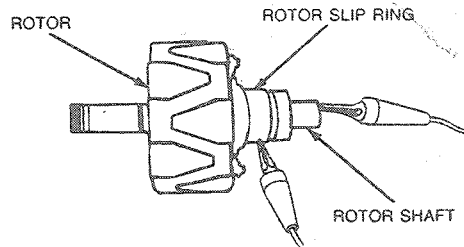


J2819-A

METER READING			
Set meter at Ohms x 1.			
Resistance Measurement		Acceptable Reading	
Slip Ring	to Slip Ring	Model 059-00010	Reference For Another Meter
Probe polarity optional		2.0 to 3.9 ohms	2.0 to 3.9 ohms

CJ2812-B

- Contact one ohmmeter probe to a slip ring and the other probe to the rotor shaft. The meter reading should be infinite (no needle movement).
- A reading other than infinite indicates the rotor coil is grounded to the shaft. Replace the generator assembly if the rotor is grounded.



J2817-A

METER READING			
Set meter at Ohms x 1.			
Resistance Measurement		Acceptable Reading	
Slip Ring	to Rotor Shaft	Model 059-00010	Reference For Another Meter
Either slip ring; Probe polarity optional		∞	∞

CJ2813-B

REMOVAL AND INSTALLATION

WARNING: BATTERIES NORMALLY PRODUCE EXPLOSIVE GASES WHICH CAN CAUSE PERSONAL INJURY. THEREFORE, DO NOT ALLOW FLAMES, SPARKS OR LIGHTED TOBACCO TO COME NEAR THE BATTERY. WHEN CHARGING OR WORKING NEAR A BATTERY, ALWAYS SHIELD YOUR FACE AND PROTECT YOUR EYES. ALWAYS PROVIDE VENTILATION.

REMOVAL AND INSTALLATION (Continued)

WHEN LIFTING A PLASTIC-CASED BATTERY, EXCESSIVE PRESSURE ON THE END WALLS COULD CAUSE ACID TO SPEW THROUGH THE VENT CAPS, RESULTING IN PERSONAL INJURY. LIFT WITH A BATTERY CARRIER OR WITH YOUR HANDS ON OPPOSITE CORNERS.

WARNING: KEEP BATTERIES OUT OF REACH OF CHILDREN. BATTERIES CONTAIN SULFURIC ACID. AVOID CONTACT WITH SKIN, EYES OR CLOTHING. ALSO, SHIELD YOUR EYES WHEN WORKING NEAR THE BATTERY TO PROTECT AGAINST POSSIBLE SPLASHING OF THE ACID SOLUTION. IN CASE OF ACID CONTACT WITH THE SKIN OR EYES, FLUSH IMMEDIATELY WITH WATER FOR A MINIMUM OF FIFTEEN MINUTES. IF ACID IS SWALLOWED, DRINK LARGE QUANTITIES OF MILK OR WATER, FOLLOWED BY MILK OF MAGNESIA, A BEATEN EGG, OR VEGETABLE OIL. CALL A PHYSICIAN IMMEDIATELY.

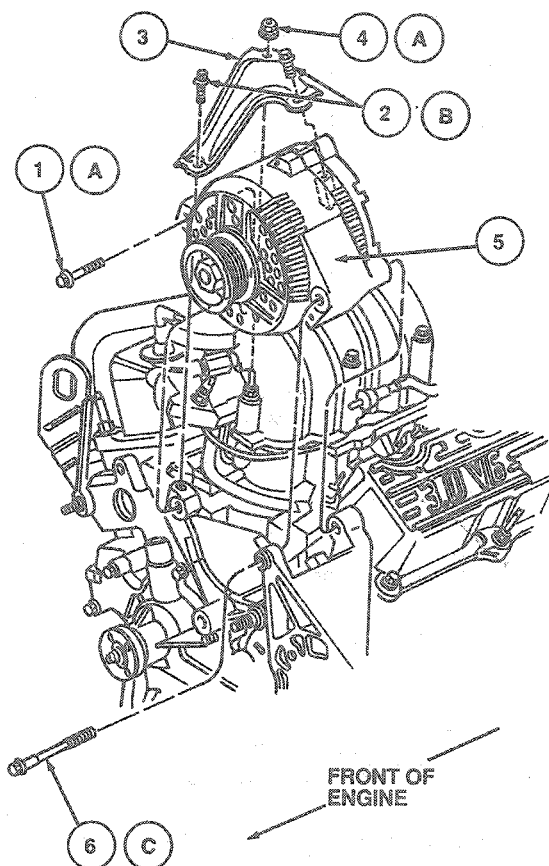
Generator

Tools Required:

- Belt Tension Gauge T63L-8620-A
- Generator Pulley Remover T65P-10300-B
- Rotunda Belt Tension Gauge 021-00019

Removal

1. Remove battery and battery tray. Refer to Section 14-01.
2. Disconnect electrical harness connector and output terminal wiring.
3. Loosen belt tensioner and remove generator belt from pulley.
4. Remove one mounting bolt at front of generator and two bolts at rear.
5. Remove generator from vehicle.



J4452-A

Item	Part Number	Description
1A	N807274-S309B	Adjusting Arm Bolt
2B	N605892-S8	Bolt (2 Req'd)
3	10B315	Alternator Brace
4A	N621939-S53B	Nut and Washer
5	10300	Alternator
6C	N807241-S36B	Pivot Bolt
A		Tighten to 20-30 N-m (15-22 Lb-Ft)
B		Tighten to 8.5-11 N-m (7-8 Lb-Ft)
C		Tighten to 40-55 N-m (30-41 Lb-Ft)

TJ4452A

Installation

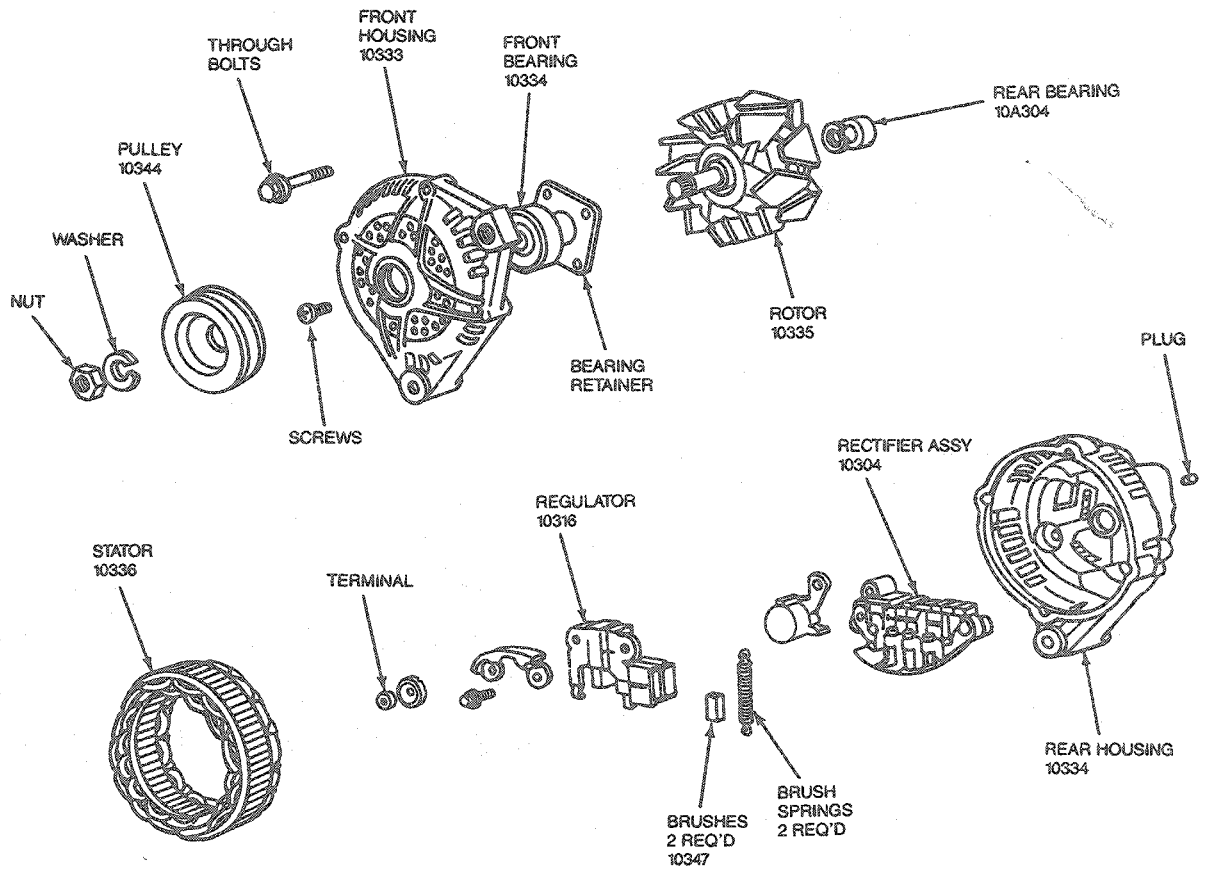
1. Position generator in vehicle and install three mounting bolts. Tighten front bolt to 48-72 N-m (36-53 lb-ft). Tighten rear bolts to 34-50 N-m (26-36 lb-ft).
2. Install generator belt and set belt tension to 658-854 N (148-191 lb) for a used belt, or to 978-1178 N (220-264 lb) for a new belt.
3. Connect output terminal wire and electrical harness connector.

REMOVAL AND INSTALLATION (Continued)

- 4. Install battery tray and battery. Refer to Section 14-01.

DISASSEMBLY AND ASSEMBLY

NOTE: All of the following Disassembly Steps may not be necessary to perform a particular test or service. Perform only those steps that apply. The following illustration is a disassembled view of the integral generator / regulator assembly.



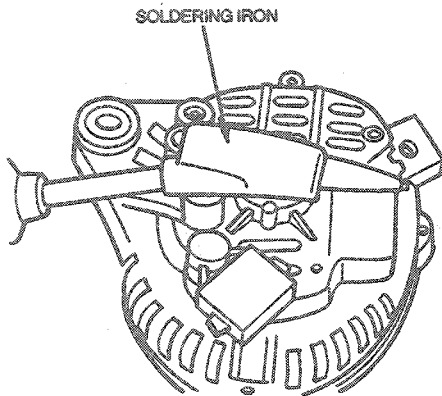
J3436-A

DISASSEMBLY AND ASSEMBLY (Continued)

Disassembly

1. Place a soldering iron (200W class) on the bearing box for three or four minutes to heat to about 50-60°C (122-144°F).

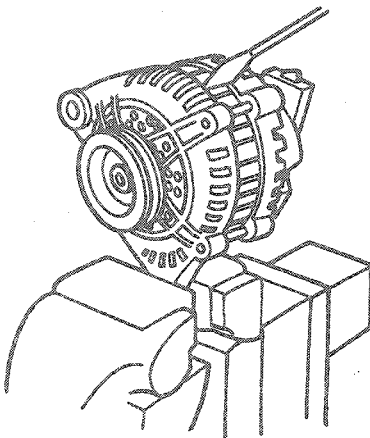
NOTE: If the bearing box is not heated, the bearing may not be pulled out, because the rear bearing and rear bracket fit together very tightly.



J3343-A

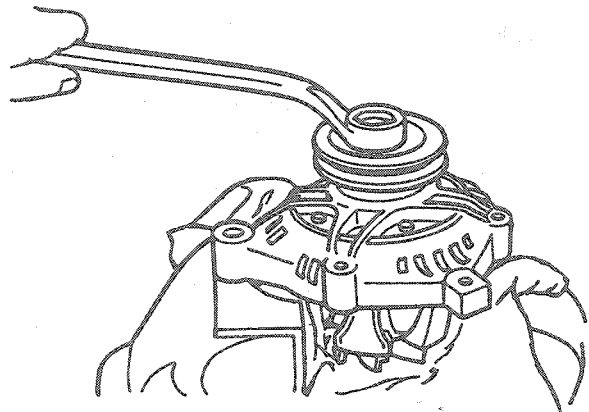
2. Remove the four bolts, and insert a flat-tip screwdriver between the stator core and front bracket and separate them.

NOTE: Be careful not to force the screwdriver in too far, because the stator may be scratched.



J3344-A

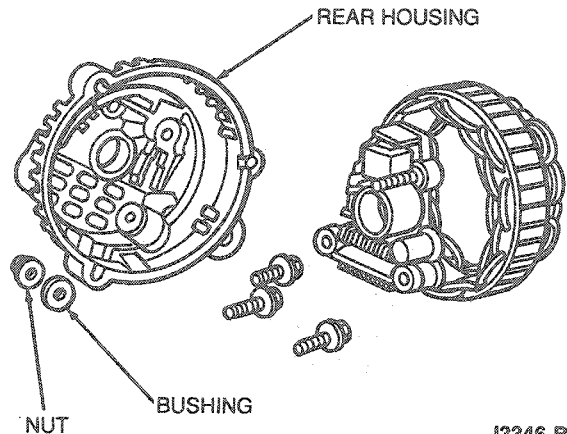
3. Remove the locknut, pulley, rotor and front bracket.



J3345-A

4. Remove the following rear bracket and stator parts:

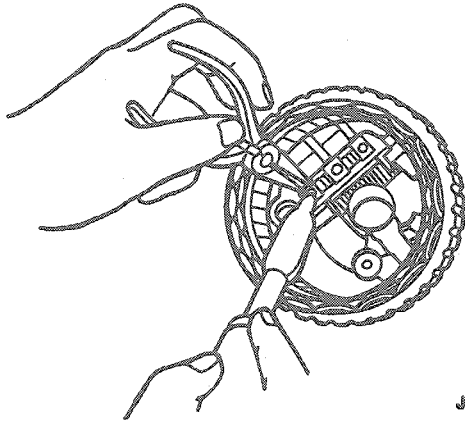
- The nut of the 'B+' terminal
- Insulation bushing
- Rectifier retaining screws
- Brush holder retaining screw



J3346-B

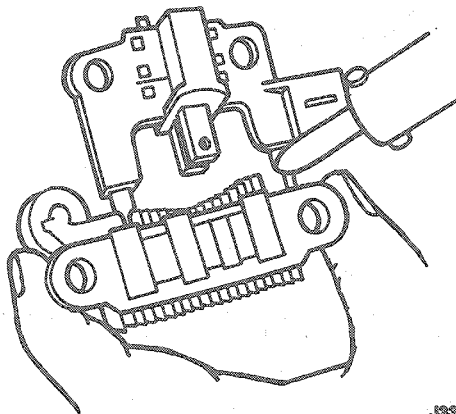
DISASSEMBLY AND ASSEMBLY (Continued)

- Use a soldering iron to remove the solder from the rectifier and the stator lead.
CAUTION: Disconnect quickly, use the soldering iron no more than about five seconds, because the rectifier may become damaged if it is overheated.



J3347-A

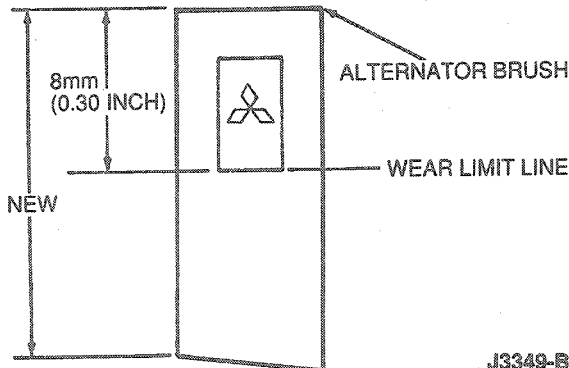
- Use a soldering iron to remove the IC regulator from the rectifier.



J3348-A

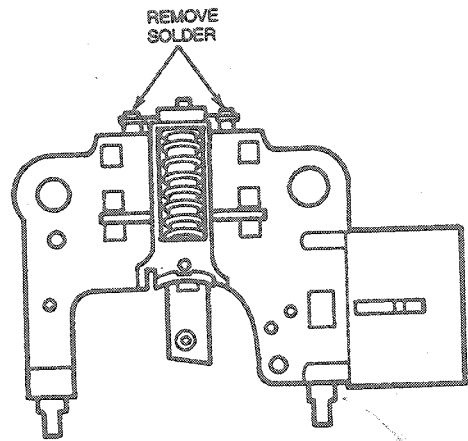
Brush Replacement

- Replace the brushes if they are worn at or near the wear line as shown.



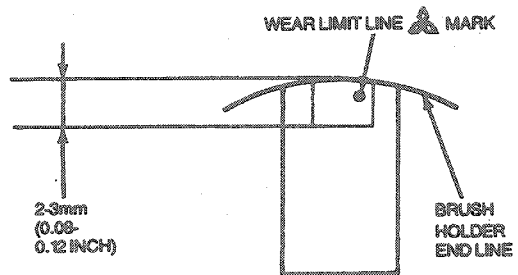
J3349-B

- If it is necessary to replace the brushes, remove the solder from the brush pigtails at the points shown. Remove the brushes.



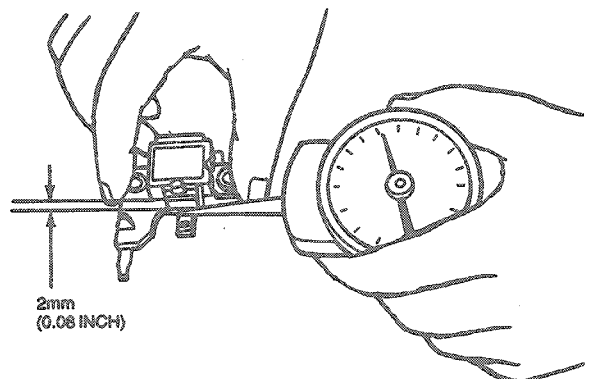
J3350-A

- When soldering the brush, solder the pigtail so that the wear limit line of the brush projects 2 or 3mm (0.08-0.12 inch) out from the end of the brush holder.



J3351-A

- Brush springs may be checked by using a spring pressure gauge to push the brush into the brush holder until the tip of the brush projects 2mm (0.080 inch). Read the force at this time. Replace the spring if the force is less than 2.0N (200g or 7.1 oz). For a new brush the force should be 3 to 4.4N (310-450g or 10.9-15.9 oz).



J3352-A

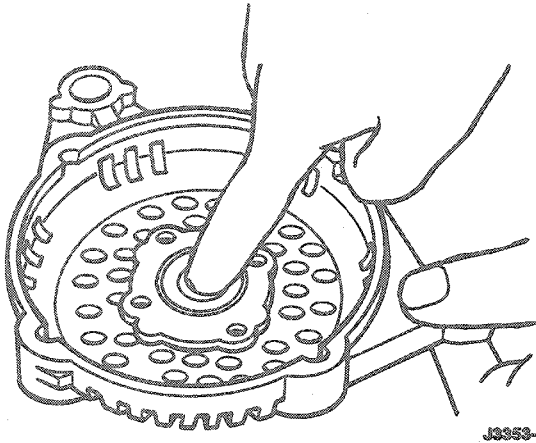
DISASSEMBLY AND ASSEMBLY (Continued)

Bearing Replacement

Tools Required:

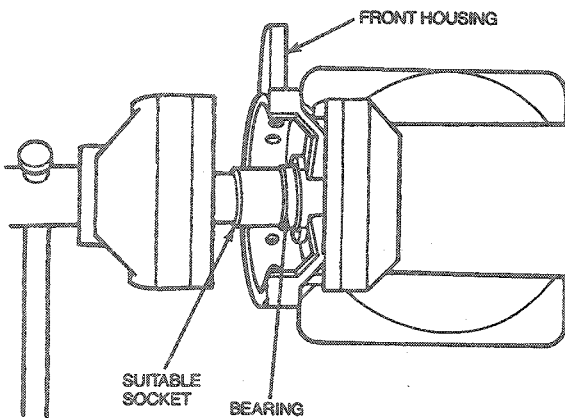
- Bearing Puller D80L-1002-L

1. Check front bearing for abnormal noise, looseness, binding or insufficient lubrication. Replace the bearing if there is any concern.



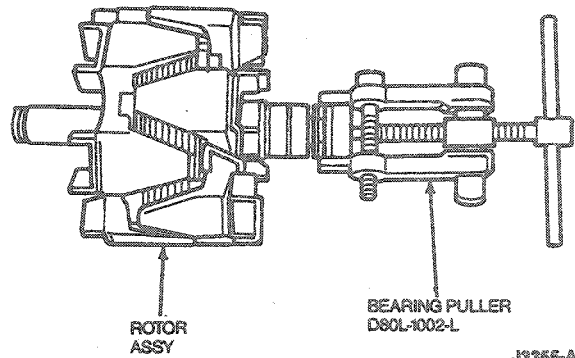
J3353-A

2. To replace the generator front bearing, use a socket or driver which fits the outer race of the generator front bearing, and carefully press a new bearing into the generator front housing using a press or vise.



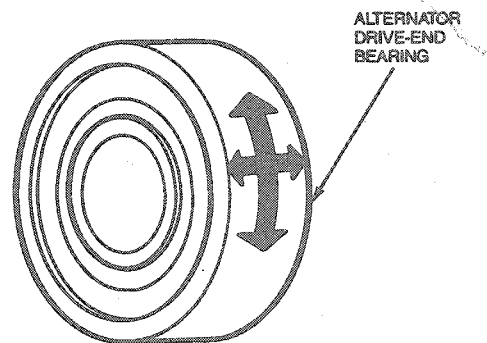
J3354-A

3. Check for rear bearing abnormal noise, looseness, binding, or insufficient lubrication. Replace the bearing if there is any concern.
4. To replace the generator rear bearing, first remove the old bearing from the rotor using two-jaw Bearing Puller D80L-1002-L or equivalent as shown.



J3355-A

5. Check the bearings for abnormal noise, looseness or insufficient lubrication. Replace as necessary.



J3356-A

Cleaning and Inspection

CAUTION: When rebuilding an integral generator, use only high-temperature bearings. Use of standard parts will result in generator failure.

1. Wipe the stator, rotor and front bearing with a clean cloth. Do not clean these parts with solvent.
2. Rotate the front bearing on the drive end of the rotor shaft. Check for any scraping noise, looseness or roughness. Look for excessive lubricant leakage. If any of these conditions exist, replace the bearing.
3. Inspect the rotor shaft rear bearing surface for roughness or severe chatter marks. Replace the rotor assembly if the shaft is not smooth.
4. Place the rear bearing on the end of the rotor shaft and rotate the bearing. Make the same check for noise, looseness and roughness as was made for the front bearing. Inspect the rollers and cage for damage. Replace the rear bearing if these conditions exist or if the lubricant is lost or contaminated.
5. Check all wire leads on both the rotor and stator assemblies for loose or broken connections. Check the windings for burned insulation. Replace parts that show signs of burned insulation.

DISASSEMBLY AND ASSEMBLY (Continued)

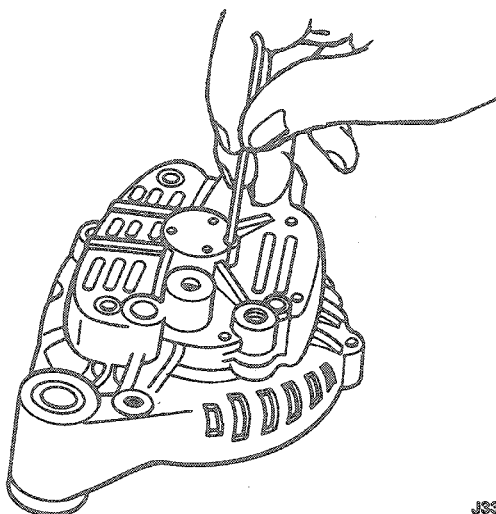
6. Check the pulley and fan for excessive looseness on the rotor shaft and for cracks or other damage. Replace any pulley or fan that is loose, cracked or bent out of shape.
7. Check both the front and rear housings for cracks, particularly in the webbed areas at the mounting ear. Replace a damaged or cracked housing.
8. Replace the brushes if they are at or are worn shorter than the wear limit line, 8mm (0.30 inch).

Assembly

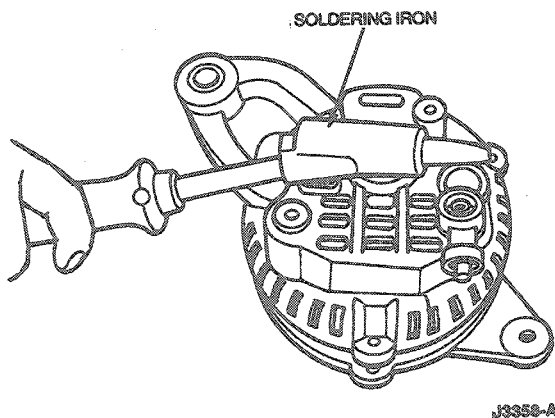
Assembly is in the reverse order of disassembly. There is no lubrication required. Tighten generator assembly through bolts to 4.0-6.7 N·m (35-59 lb-in). Tighten generator pulley locknut to 82-135 N·m (60-100 lb-ft).

1. Before assembly, push the brush into the brush holder and pass a wire (2 mm, 40-50mm (0.08 inch, 1.6-2 inch)) through the hole shown to secure the brush in position.

NOTE: Be sure to pull the wire out after the assembly is completed.



2. When the rear bearing is pressed into the rear bracket, heat the bracket before pressing it in.



3. After assembly is completed, rotate the pulley manually and check that the rotor turns easily.

ADJUSTMENTS

Refer to Section 03-05 for drive belt adjustments.

SPECIFICATIONS

TORQUE SPECIFICATIONS

Description	N·m	Lb·Ft
Generator Front Mounting Bolts	48-72	36-53
Generator Rear Mounting Bolts	34-50	26-36

SPECIAL SERVICE TOOLS

Tool Number / Description	Illustration
T63L-8620-A Belt Tension Gauge	 T63L-8620-A
T65P-10300-B Generator Pulley Remover	 T65P-10300-B

Tool Number	Description
D80L-1002-L	Bearing Puller

ROTUNDA EQUIPMENT

Model	Description
007-00001	Digital Volt Ohmmeter
021-00019	Belt Tension Gauge
059-00010	Dwell-Tach-Volts Ohms Tester
078-00005	Starting and Charging Tester (VAT-40)