

CHARGING SYSTEM**SPECIFICATIONS****GENERAL SPECIFICATIONS**

NOBEC-

ALTERNATOR

Items	2.6L Engine	3.0L Engine
Type	Battery voltage sensing	Battery voltage sensing
Model No.	A2T03477	A3T02198
Part No.	MD110318	MD126796
Rated output V/A	12/50	12/75
Voltage regulator	Electronic built-in type	Electronic built-in type

BATTERY

Items	2.6L Engine	3.0L Engine
Type	55B24R(S)-MF	75D26R-MF
Ampere hours (5 HR) Ah	40	57
Cranking rating [at - 17.8°C (0°F)] A	433	490
Reserve capacity min.	79	123

NOTES

1. CRANKING RATING is the current a battery can deliver for 30 seconds and maintain a terminal voltage of 7.2 or greater at a specified temperature.
2. RESERVE CAPACITY RATING is the amount of time a battery can deliver 25A and maintain a minimum terminal voltage of 10.5 at 26.7°C (80°F).

SERVICE SPECIFICATIONS

NOBEC-

Items	Specifications
Standard values	
Regulated voltage V	
Ambient temp. at voltage regulator	
-20°C (-4°F)	14.2–15.4
20°C (68°F)	13.9–14.9
60°C (140°F)	13.4–14.6
80°C (176°C)	13.1–14.5
Slip ring O.D. mm (in.)	
A2T03477	23 (.906)
A3T02198	22.7 (.894)
Field coil resistance Ω	3–5
Limit	
Output current A	
A2T03477	Min. 35
A3T02198	Min. 52.5
Slip ring O.D. mm (in.)	
A2T03477	22.2 (.874)
A3T02198	22.1 (.870)

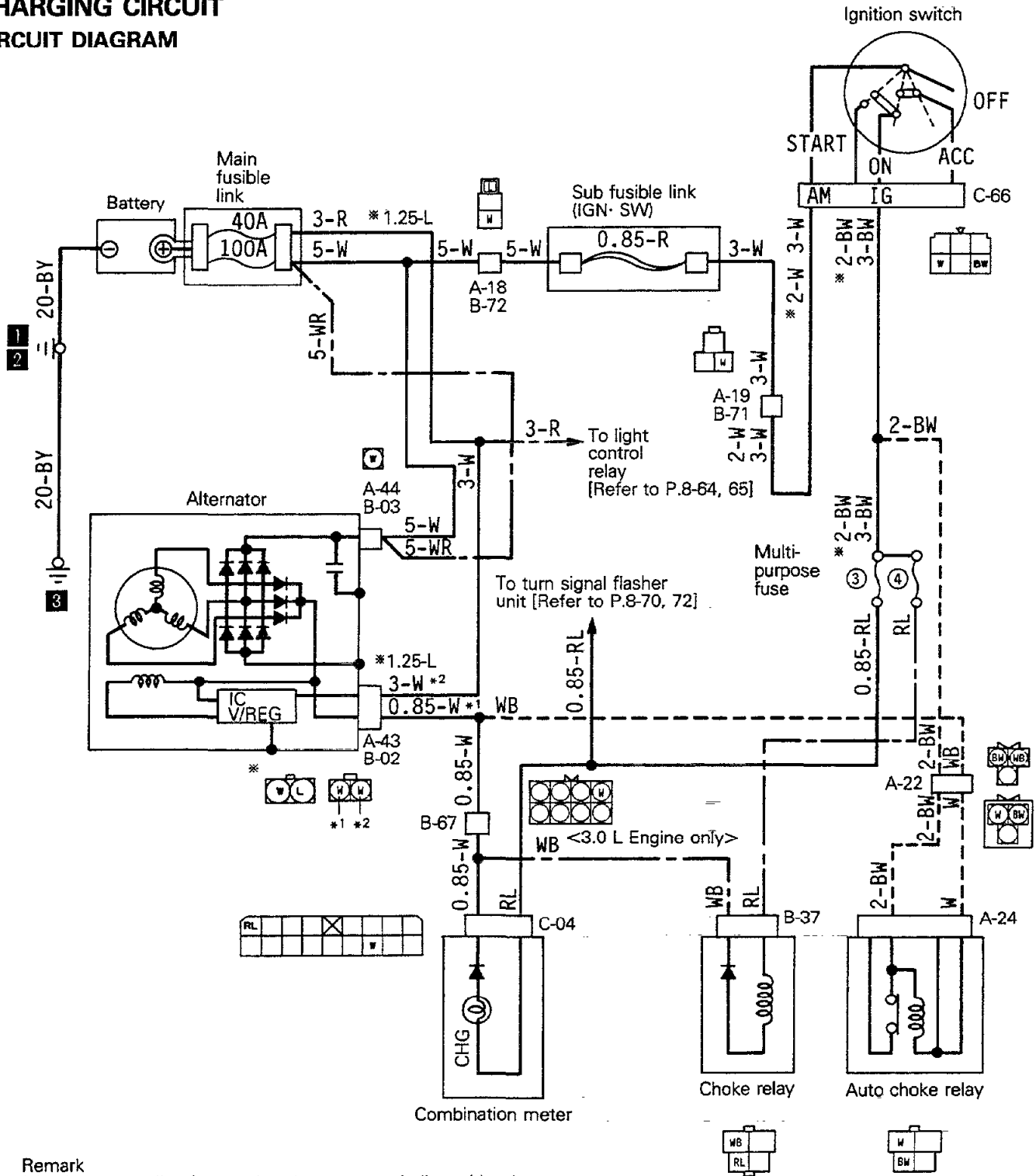
TORQUE SPECIFICATIONS

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Items	Nm	ft.lbs.
Alternator lock bolt	12–15	9–11
Alternator pivot nut	20–22	14–16
High pressure hose nut	20–25	14–18
Low pressure hose nut	30–35	22–25

TROUBLESHOOTING

CHARGING CIRCUIT
CIRCUIT DIAGRAM



Remark

- (1) The broken line (----) and connectors indicated by the * symbol are applicable to the 2.6-liter models
- (2) The chain line (- - -) is applicable to 3.0-liter models only.
- (3) For information concerning the ground points (example: ) , refer to P.8-12, 14.

Wiring color code

B: Black Br: Brown G: Green Gr: Gray L: Blue Lg: Light green
 Lt: Light blue O: Orange P: Pink R: Red Y: Yellow W: White

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OPERATION**Before engine starts**

- First, when the ignition switch is turned to "ON", and before the engine starts, current flows through fuse No.3, charging indicator light, then to alternator, and ground, causing the charging indicator light to go on.

When alternator is generating current

- Once the engine starts, battery voltage is applied to alternator S terminal. The battery voltage imposed on this terminal is monitored by the IC voltage regulator, and according to the voltage detected, the IC voltage regulator regulates the alternator field coil current, thus controlling the current the alternator generates.
- Once the alternator starts generating current, a voltage, slightly higher than battery voltage is applied to L terminal. This prevents current from flowing to the charging indicator light and the light goes off.
- At alternator B terminal, a load current proportional to the battery voltage is produced and is sent to any load.

Remarks



The alternator relay is to ensure charging the battery even when the charging indicator light bulb is burnt out.

TROUBLESHOOTING HINTS

1. Charging indicator light does not go on when the ignition switch is turned to "ON", before the engine starts
 - Check the bulb.
2. Charging indicator light fails to go off once the engine starts
 - Check drive belt tension.
 - Check the IC voltage regulator.
3. Discharged or overcharged battery
 - Check the IC voltage regulator.

BATTERY TESTING PROCEDURE

TEST STEP		RESULT	ACTION TO TAKE
A0	VISUAL INSPECTION		
	<ul style="list-style-type: none"> Remove negative cable, then positive cable. Check for dirty or corroded connections. 	OK ▶ OK ▶	CLEAN terminals and clamps.. GO to A1. GO to A1.
A1	LOOSE BATTERY POST		
	<ul style="list-style-type: none"> Check for loose battery post. 	OK ▶ OK ▶	REPLACE battery. GO to A2.
A2	CRACKED BATTERY COVER		
	<ul style="list-style-type: none"> Remove holddowns and shields. Check for broken/cracked case or cover. 	OK ▶ OK ▶	REPLACE battery. GO to A3.
A3	TEST INDICATOR/OPEN CIRCUIT VOLTAGE TEST		
	<ul style="list-style-type: none"> Turn headlamps on for 15 seconds Turn headlamps off for 2 minutes to allow battery voltage to stabilize Disconnect cables Read open circuit voltage 	BLUE DOT INVISIBLE AND OPEN CIRCUIT VOLTAGE UNDER 12.4 VOLTS OK ▶ OK ▶	CHARGE battery at 5 amps then GO to A3 GO to A4.

TEST STEP		RESULT	ACTION TO TAKE																																
A4	LOAD TEST																																		
<ul style="list-style-type: none"> Connect a load tester to the battery. Load the battery at the recommended discharge rate (See LOAD TEST RATE CHART) for 15 seconds. Read voltage after 15 seconds, then remove load. 																																			
<table border="1"> <thead> <tr> <th colspan="3">LOAD TEST CHART</th> </tr> <tr> <th rowspan="2">Minimum voltage</th> <th colspan="2">Temperature</th> </tr> <tr> <th>F°</th> <th>C°</th> </tr> </thead> <tbody> <tr> <td>9.6</td> <td>70 and above</td> <td>21 and above</td> </tr> <tr> <td>9.5</td> <td>60</td> <td>16</td> </tr> <tr> <td>9.4</td> <td>50</td> <td>10</td> </tr> <tr> <td>9.3</td> <td>40</td> <td>4</td> </tr> <tr> <td>9.1</td> <td>30</td> <td>-1</td> </tr> <tr> <td>8.9</td> <td>20</td> <td>-7</td> </tr> <tr> <td>8.7</td> <td>10</td> <td>-12</td> </tr> <tr> <td>8.5</td> <td>0</td> <td>-18</td> </tr> </tbody> </table>		LOAD TEST CHART			Minimum voltage	Temperature		F°	C°	9.6	70 and above	21 and above	9.5	60	16	9.4	50	10	9.3	40	4	9.1	30	-1	8.9	20	-7	8.7	10	-12	8.5	0	-18		
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		<p> VOLTAGE IS MORE THAN MINIMUM LISTED</p>	Battery OK.																																

SERVICE ADJUSTMENT PROCEDURES

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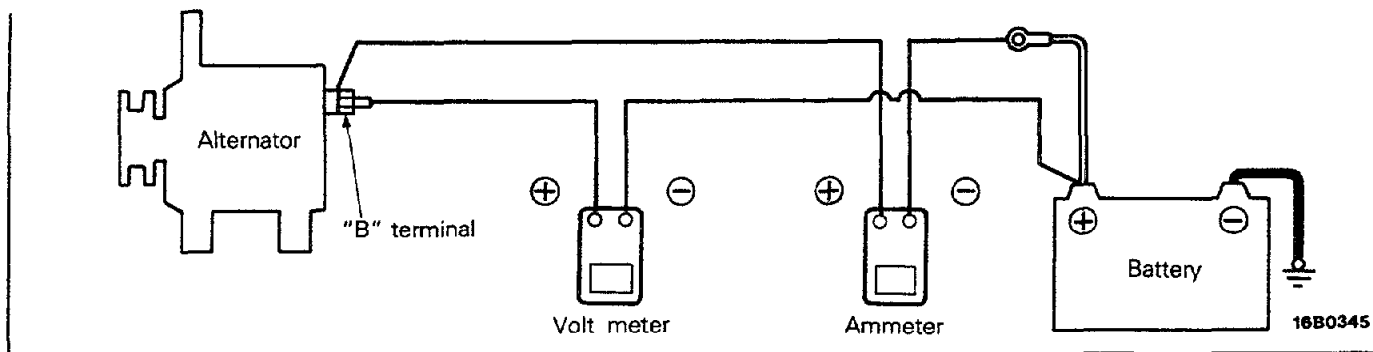
CHARGING SYSTEM INSPECTION

VOLTAGE DROP TEST OF ALTERNATOR OUTPUT WIRE

This test judges whether or not the wiring (including the fusible link) between the alternator "B" terminal and the battery (+) terminal is sound by the voltage drop method.

Preparation

- (1) Turn the ignition switch to "OFF".
- (2) Disconnect the battery ground cable.
- (3) Disconnect the alternator output lead from the alternator "B" terminal.
- (4) Connect a DC ammeter (0 to 100 A) in series to the "B" terminal and the disconnected output lead. Connect the (+) lead of the am-



Test

- (1) Start the engine.
- (2) Turn on or off the headlights and small lights and adjust the engine speed so that the ammeter reads 20A and read off the voltmeter indication under this condition.

Result

- (1) It is okay if the voltmeter indicates the standard value.

Standard value: 0.2V max.

- (2) If the voltmeter indicates a value that is larger than the standard value, poor wiring is suspected, in which case check the wiring from the alternator "B" terminal to fusible link to battery (+) terminal. Check for loose connection, color change due to overheated harness, etc. and correct them before testing again.
- (3) Upon completion of the test, set the engine speed at idle. Turn off the lights and turn off the ignition switch.
- (4) Disconnect the battery ground cable.
- (5) Disconnect the ammeter and voltmeter that have been connected for the test purpose.
- (6) Connect the alternator output wire to the alternator "B" terminal.
- (7) Connect the battery ground cable.

meter to the "B" terminal and the (-) lead to the disconnected output wire.

NOTE

Use of a clamp type ammeter that can measure current without disconnecting the harness is preferred. The reason is that when checking a vehicle that has a low output current due to poor connection of the alternator "B" terminal, such poor connection is corrected as the "B" terminal is loosened and a test ammeter is connected in its place and as a result, causes for the trouble may not be determined.

- (5) Connect a digital voltmeter between the alternator "B" terminal and battery (+) terminal. Connect the (+) lead wire of the voltmeter to the "B" terminal and the (-) lead wire to the battery (+) terminal.
- (6) Connect the battery ground cable.
- (7) Leave the hood open.

OUTPUT CURRENT TEST

This test judges whether or not the alternator gives an output current that is equivalent to the nominal output.

Preparation

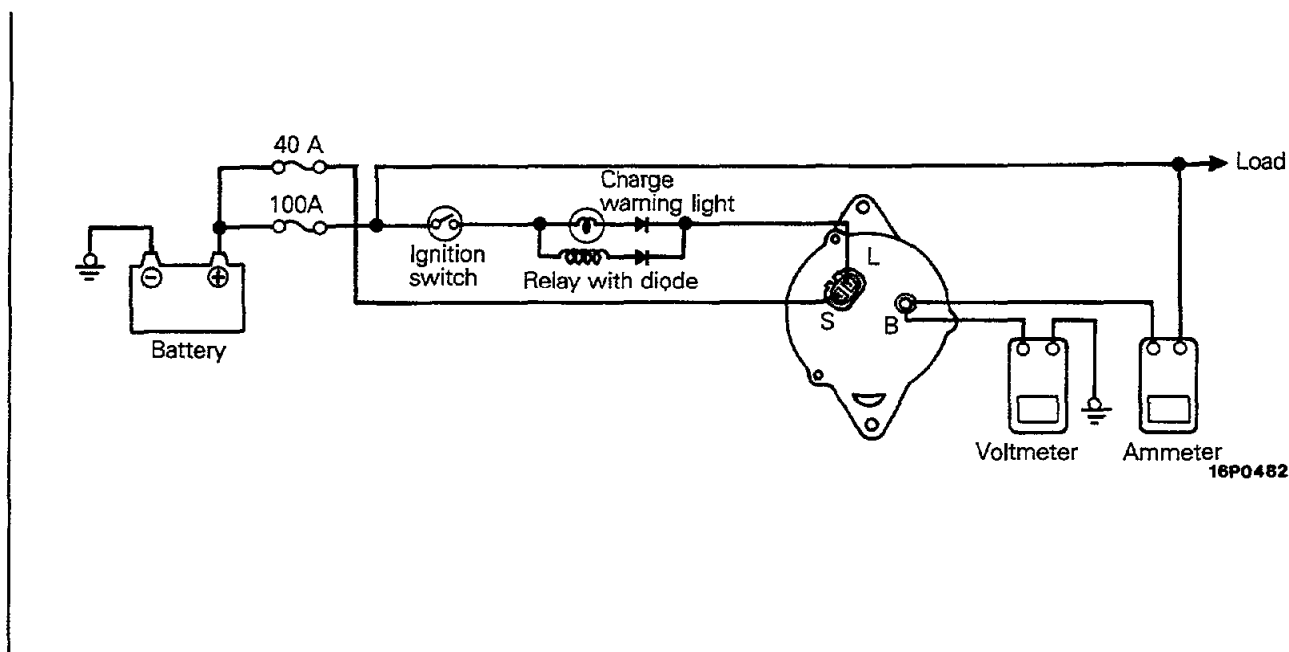
- (1) Prior to the test, check the following items and correct as necessary.

- (a) Check the battery installed in the vehicle to ensure that it is in sound state*. The battery checking method is described in "BATTERY".

NOTE

* The battery that is used to test the output current should be one that has been rather discharged. With a fully charged battery, the test may not be conducted correctly due to an insufficient load.

- (b) Check tension of the alternator drive belt. The belt tension check method is described in "GROUP 7 – Service Adjustment Procedures".
- (2) Turn off the ignition switch.
- (3) Disconnect the battery ground cable.
- (4) Disconnect the alternator output wire from the alternator "B" terminal.



- (5) Connect a DC ammeter (0 to 100A) in series between the "B" terminal and the disconnected output wire. Connect the (+) lead of the ammeter to the "B" terminal and connect the (-) lead wire to the disconnected output wire.

NOTE

Tighten each connection by bolt and nut securely as a heavy current will flow. Do not rely on clips.

- (6) Connect a voltmeter (0 to 20V) between the "B" terminal and ground. Connect the (+) lead wire to the alternator "B" terminal and (-) lead wire to a sound ground.
- (7) Set the engine tachometer and connect the battery ground cable.
- (8) Leave the engine hood open.

Test

- (1) Check to see that the voltmeter reads the same value as the battery voltage. If the voltmeter reads 0V, an open circuit in the wire between the alternator "B" terminal and battery (-) terminal, a blown fusible link or poor grounding is suspected.
- (2) Turn on the headlight switch and start the engine.
- (3) Set the headlight at high beam and the heater blower switch at HIGH, quickly increase the engine speed to 2,500 rpm and read the maximum output current value indicated by the ammeter.

NOTE

After the engine start up, the charging current quickly drops, therefore, above operation must be done quickly to read maximum current value correctly.

Result

- (1) The ammeter reading must be higher than the limit value. If it is lower but the alternator output wire is normal, remove the alternator from the vehicle and check it.

**Limit value: 35A min. 2.6L engine
52.5A min. 3.0L engine**

Caution

- The nominal output current value is shown on the nameplate affixed to the alternator body.**
 - The output current value changes with the electrical load and the temperature of the alternator itself. Therefore, the nominal output current may not be obtained if the vehicle electrical load at the time of test is small. In such a case, keep the headlights on to cause discharge of the battery or use lights of another vehicle as a load to increase the electrical load. The nominal output current may not be obtained if the temperature of the alternator itself or ambient temperature is too high. In such a case, reduce the temperature before testing again.**
- (2) Upon completion of the output current test, lower the engine speed to the idle speed and turn off the ignition switch.
- (3) Disconnect the battery ground cable.
- (4) Remove the test ammeter and voltmeter and the engine tachometer.
- (5) Connect the alternator output wire to the alternator "B" terminal.
- (6) Connect the battery ground cable.

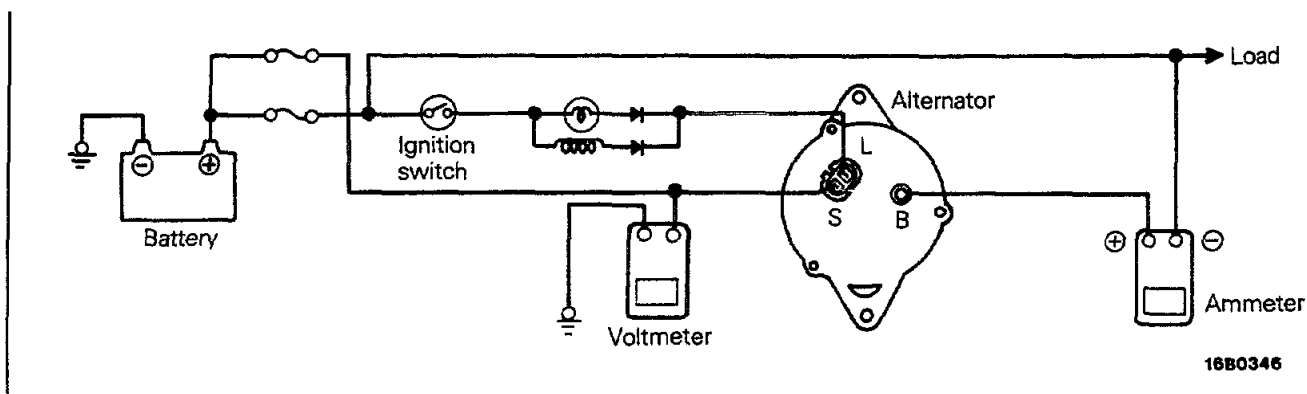
REGULATED VOLTAGE TEST

The purpose of this test is to check that the electronic voltage regulator controls the voltage correctly.

Preparation

- (1) Prior to the test, check the following items and correct if necessary.
 - (a) Check the battery installed on the vehicle to see that it is fully charged. For battery checking method, see "BATTERY".
 - (b) Check the alternator drive belt tension. For belt tension check, see "GROUP 7 – Service Adjustment Procedures".

- (2) Turn the ignition switch to "OFF".
- (3) Disconnect the battery ground cable.
- (4) Connect a digital voltmeter between the "S" terminal of the alternator and ground. Connect the (+) lead of the voltmeter to the "S" terminal of the alternator, inserting from the wire side of the two way connector and connect the (-) lead to sound ground or battery (-) terminal.



- (5) Disconnect the alternator output wire from the alternator "B" terminal.
- (6) Connect a DC ammeter (0 to 100A) in series between the "B" terminal and the disconnected output wire. Connect the (+) lead of the ammeter to the "B" terminal and connect the (-) lead wire to the disconnected output wire.
- (7) Set the engine tachometer and connect the battery ground cable.

Test

- (1) Turn on the ignition switch and check that the voltmeter indicates the following value.

Voltage: Battery voltage

If it reads 0V there is an open circuit in the wire between the alternator "S" terminal and the battery (+) or the fusible link is blown.

- (2) Start the engine. Keep all lights and accessories off.
- (3) Run the engine at a speed of about 2,500 rpm and read the voltmeter when the alternator output current drops to 10A or less.

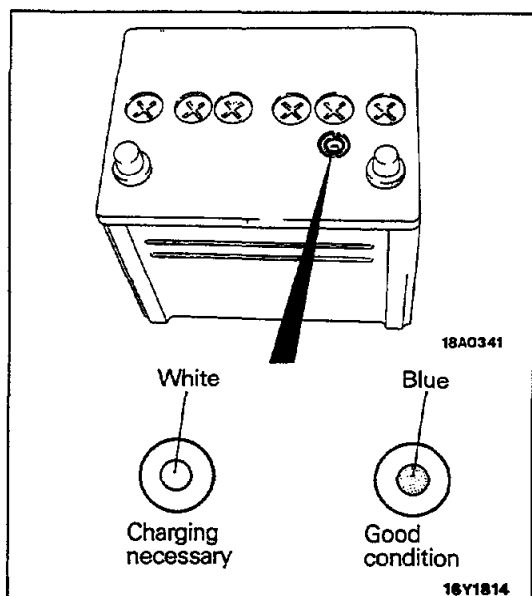
Result

- (1) If the voltmeter reading agrees with the value listed in the regulating voltage table below, the voltage regulator is functioning correctly. If the reading is other than the standard value, the voltage regulator or the alternator is faulty.

Regulating voltage table

Voltage regulator ambient temperature °C (°F)	Regulating voltage V
-20 (-4)	14.2–15.4
20 (68)	13.9–14.9
60 (140)	13.4–14.6
80 (176)	13.1–14.5

- (2) Upon completion of the test, set the engine speed at idle and turn off the ignition switch.
- (3) Disconnect the battery ground cable.
- (4) Remove the test voltmeter and ammeter and the engine tachometer.
- (5) Connect the alternator output wire to the alternator "B" terminal.
- (6) Connect the battery ground cable.



BATTERY INSPECTION

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BATTERY VISUAL INSPECTION (1)

The battery contains a visual test indicator which gives blue signal when an adequate charge level exists, and white signal when charging is required.

BATTERY VISUAL INSPECTION (2)

Make sure ignition switch is in Off position and all battery feed accessories are Off.

1. Disconnect ground cable from battery before disconnecting (+) cable.
2. Remove battery from vehicle.

Caution

Care should be taken in the event battery case is cracked or leaking to protect hands from the electrolyte. A suitable pair of rubber gloves (not the household type) should be worn when removing battery by hand.

3. Inspect battery carrier for damage caused by loss of acid from battery. If acid damage is present, it will be necessary to clean area with a solution of clean warm water and baking soda. Scrub area with a stiff bristle brush and wipe off with a cloth moistened with ammonia or baking soda in water.
4. Clean top of battery with same solutions, as described in Step (3).
5. Inspect battery case and cover for cracks. If cracks are present, battery must be replaced.
6. Clean the battery post with a suitable battery post cleaning tool.
7. Clean the inside surfaces of the terminal clamps with a suitable battery terminal cleaning tool. Replace damaged or frayed cables and broken terminals clamps.
8. Install the battery in vehicle.
9. Connect (+) and (-) cables to battery in the order of mention.
10. Tighten the clamp nut securely.

LOAD TEST RATE CHART			
Load test	Cranking rating	Reserve capacity	Application
210 A	433 A	79 minutes	55B24R(S)-MF
240 A	490 A	123 minutes	75D26R-MF

LOAD TEST CHART		
Minimum Voltage	Temperature	
	F°	C°
9.6	70 and above	21 and above
9.5	60	16
9.4	50	10
9.3	40	4
9.1	30	-1
8.9	20	-7
8.7	10	-12
8.5	0	-18

Note

The temperature is an ambient temperature of the battery that has been exposed to for the preceding few hours.

OPEN CIRCUIT VOLTAGE TEST (3)

1. Turn headlamps on for 15 seconds.
2. Turn headlamps off for 2 minutes to allow battery voltage to stabilize.
3. Disconnect cables.
4. Read open circuit voltage.
5. If the open circuit voltage is under 12.4 volts, charge the battery. (See BATTERY CHARGING)

LOAD TEST (4)

1. Connect a load tester to the battery.
2. Load the battery at 15 amp for 15 seconds to remove surface charges.
3. Load the battery at the recommended discharge rate. (See ROAD TEST RATE CHART)
4. Read voltage after 15 seconds then remove the load.
5. If the voltage is not maintained at the minimum voltage in the LOAD TEST CHART throughout the test, the battery should be replaced.

BATTERY CHARGING

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Caution

When batteries are being charged, an explosive gas forms beneath the cover of each cell. Do not smoke near batteries on charge or which have recently been charged. Do not break live circuits at the terminals of the batteries on charge. A spark will occur where the live circuit is broken. Keep all open flames away from the battery.

Battery electrolyte temperature may temporarily be allowed to rise to 55°C (131°F). Increase of electrolyte temperature above 55°C (131°F) is harmful to the battery, causing deformation of battery cell, decrease in life of battery, etc.

CHARGE RATE

If the test indicator is white, the battery should be charged as outlined below.

When the dot appears or when maximum charge shown below is reached, charging should be stopped.

NOTE

- When the charging is performed at 5 amperes, charging is virtually 100% three hours after the indicator's indication changes from white or blue.
Use fast charging only in an emergency.
- If the indicator does not turn to blue even after the battery is charged, the battery should be replaced; do not overcharge.

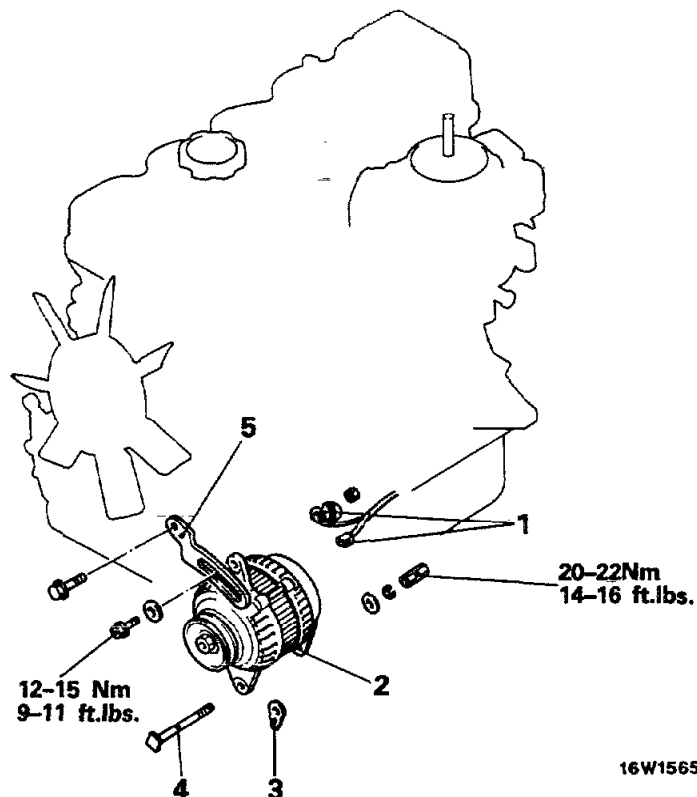
Charge Rate Chart

Battery	Slow charging	Fast charging
55B24R(S)-MF (433 A)	5 A 10 hrs.	20 A 2.5 hrs.
	10 A 5 hrs.	30 A 1.5 hrs.
75D26R-MF (490 A)	5 A 15 hrs.	20 A 3.75 hrs.
	10 A 7.5 hrs.	30 A 2.5 hrs.

ALTERNATOR**REMOVAL AND INSTALLATION <2.6L Engine>**

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<Vehicles without Air Conditioner>

**Post-installation Operation**

- Adjustment of the Drive Belt Tension (Refer to GROUP 7 – Service Adjustment Procedures)

Removal steps

1. Connection of alternator connector
2. Alternator
3. Shim
4. Support bolt
5. Brace

NOTE

Reverse the removal procedures to reinstall.

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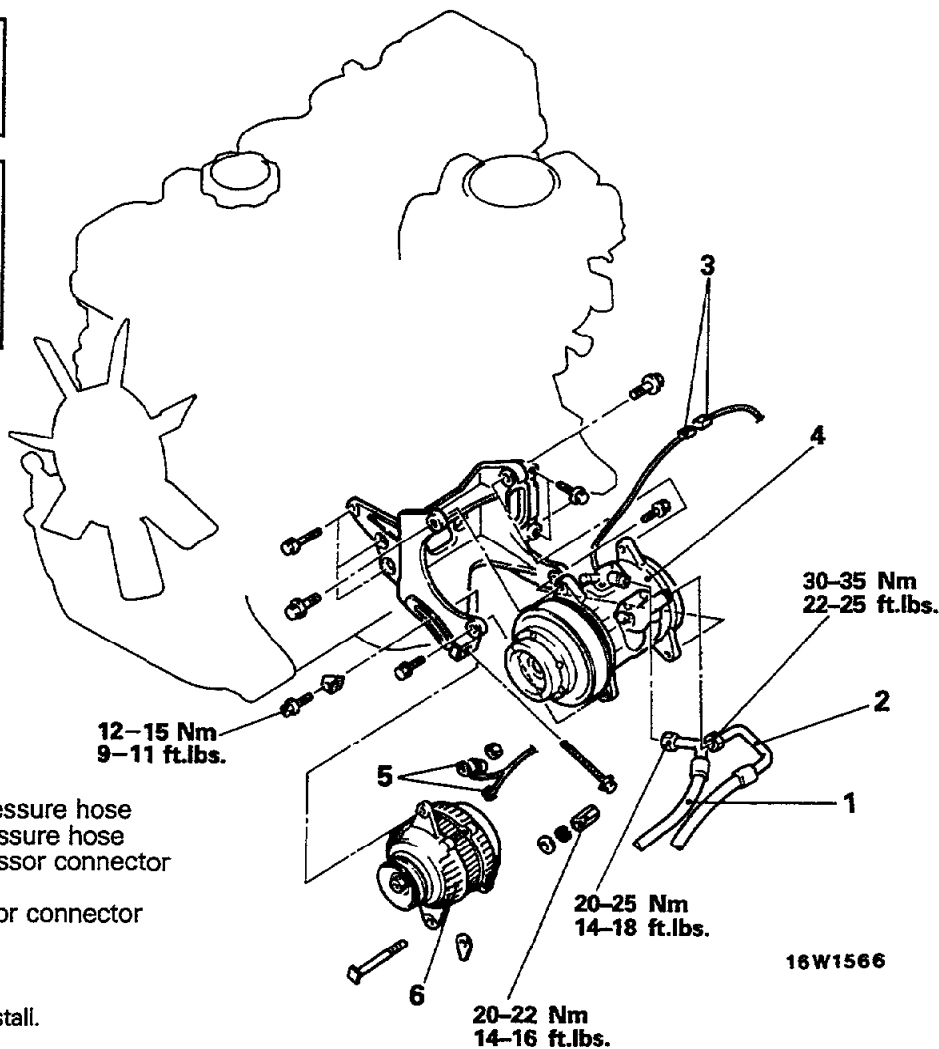
<Vehicles with Air Conditioner>

Pre-removal Operation

- Draining of Refrigerant (Refer to GROUP 24 – Service Adjustment Procedures)

Post-installation Operation

- Charging of Refrigerant (Refer to GROUP 24 – Service Adjustment Procedures)
- Adjustment of Drive Belt Tension (Refer to GROUP 7 and GROUP 24 – Service Adjustment Procedures)



Removal steps

1. Connection for high pressure hose
2. Connection for low pressure hose
3. Connection for compressor connector
4. Compressor
5. Connection for alternator connector
6. Alternator

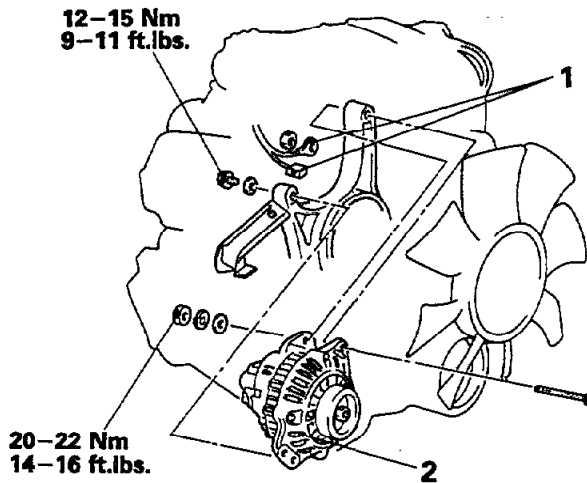
NOTE

Reverse the removal procedures to reinstall.

REMOVAL AND INSTALLATION <3.0L Engine>

Post-installation Operation

- Adjustment of the Drive Belt Tension (Refer to GROUP 7 – Service Adjustment Procedures)



Removal steps

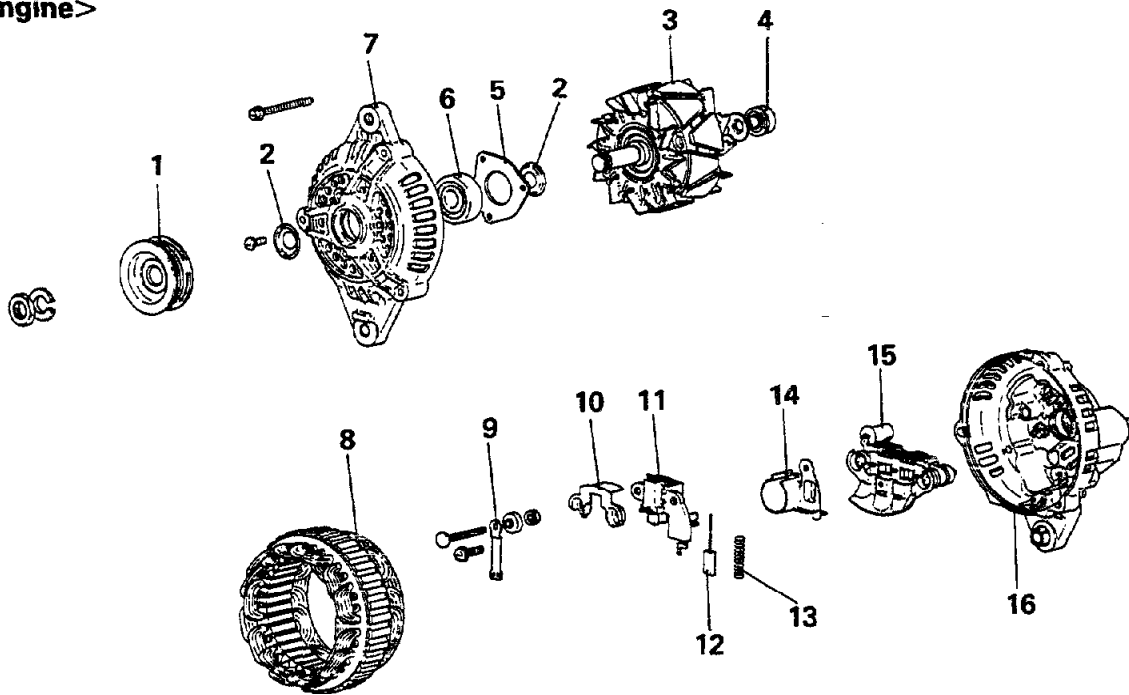
1. Connection for alternator connector
2. Alternator

NOTE

Reverse the removal procedures to reinstall.

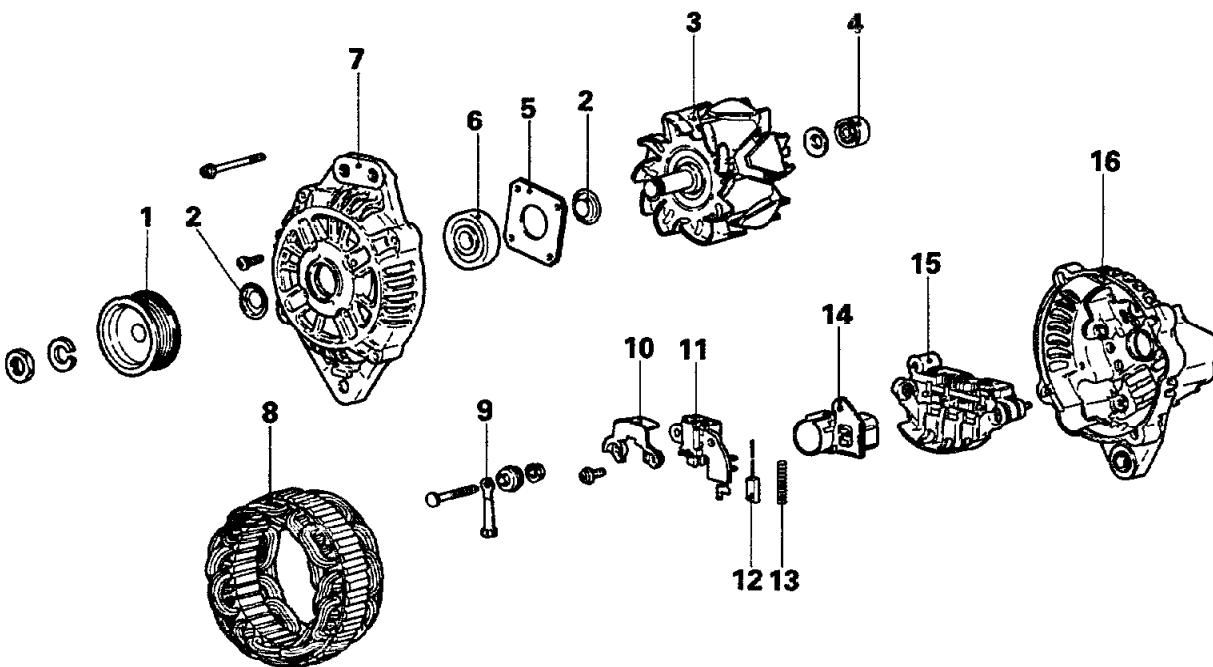
DISASSEMBLY AND REASSEMBLY

<2.6L Engine>



1EL096

<3.0L Engine>



7EL0050

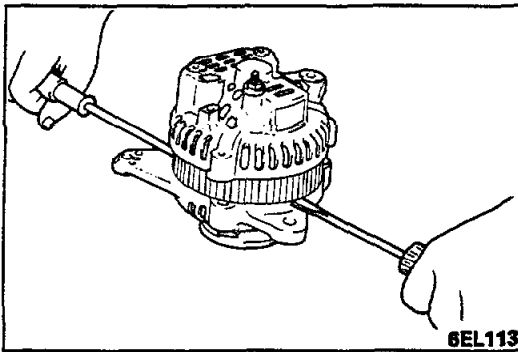
Disassembly steps

- ◄◄ 1. Pulley
- ◄◄ 2. Seal
- ◄◄ 3. Rotor assembly
- ◄◄ 4. Rear bearing
- ◄◄ 5. Bearing retainer
- ◄◄ 6. Front bearing
- ◄◄ 7. Front bracket
- ◄◄ 8. Stator
- ◄◄ 9. Terminal
- ◄◄ 10. Plate

- ◄◄ 11. Regulator and brush holder
- ◄◄ 12. Brush
- ◄◄ 13. Brush spring
- ◄◄ 14. Slinger
- ◄◄ 15. Rectifier assembly
- ◄◄ 16. Rear bracket

NOTE

- (1) Reverse the disassembly procedures to reassemble.
- (2) ◄◄ : Refer to "Service Points of Disassembly".
- (3) ◄◄ : Refer to "Service Points of Reassembly".

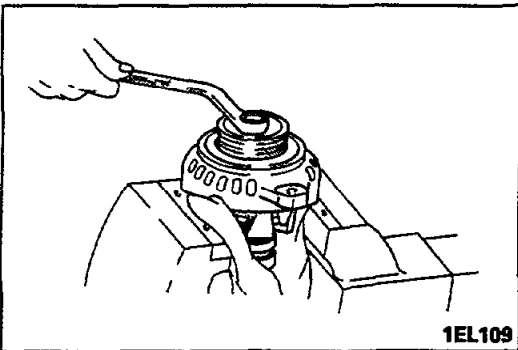


SERVICE POINTS OF DISASSEMBLY
REMOVAL OF STATOR AND REAR BRACKET

Insert plain screwdriver between front bracket and stator core and pry downward.

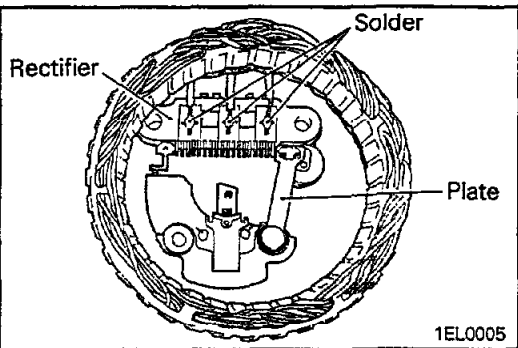
Caution

Do not insert screwdriver too deep, as there is danger of damage to stator coil.



1. REMOVAL OF PULLEY

- (1) Clamp the rotor in a vise with soft jaws.
- (2) After removing the nut, remove the pulley and front bracket from the rotor.

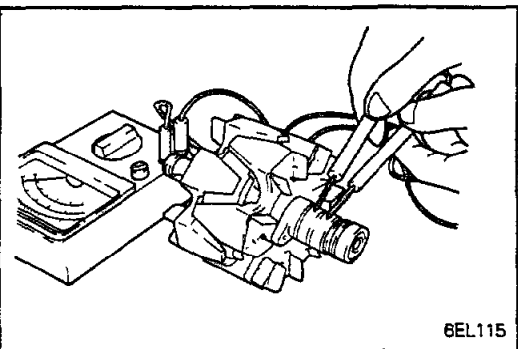


11. REMOVAL OF REGULATOR AND BRUSH HOLDER

- (1) Unsolder three stator leads soldered to main diodes on rectifier.
- (2) Unsolder two soldered points to rectifier.

Caution

1. When soldering or unsoldering, use care to make sure that heat of soldering iron is not transmitted to diodes for a long period. Finish soldering or unsoldering in as short a time as possible.
2. Use care that no undue force is exerted to leads of diodes.

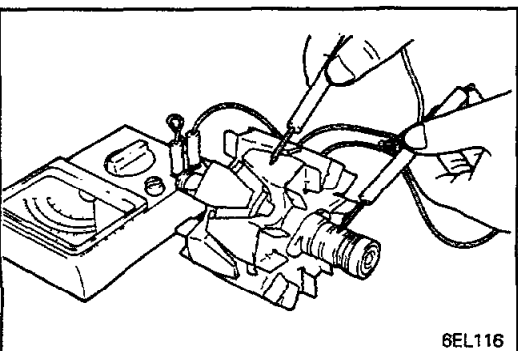


INSPECTION

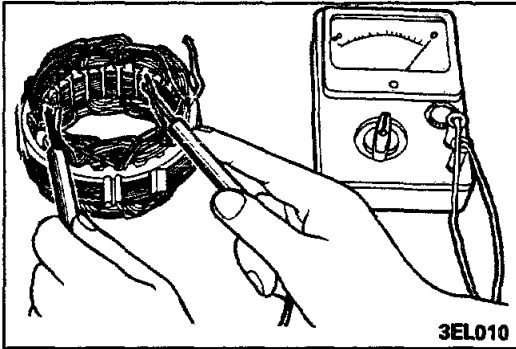
ROTOR

- Check rotor coil for continuity. Check to ensure that there is continuity between slip rings. If resistance is extremely small, it means that there is a short. If there is no continuity or if there is short circuit, replace rotor assembly.

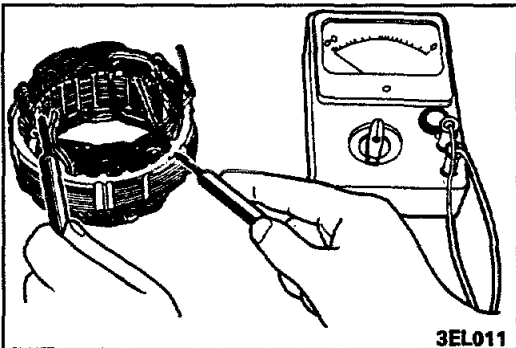
Standard value: 3–5 Ω



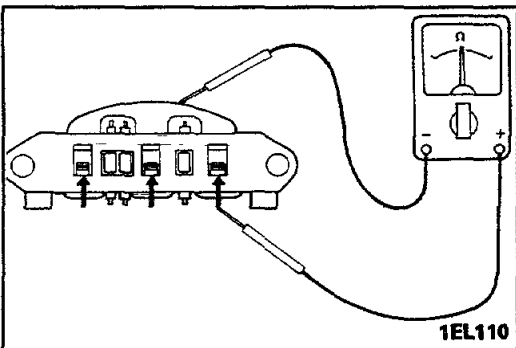
- Check rotor coil for grounding. Check to ensure that there is no continuity between slip ring and core. If there is continuity, replace rotor assembly.

**STATOR**

- Make continuity test on stator coil. Check to ensure that there is continuity between coil leads. If there is no continuity, replace stator assembly.

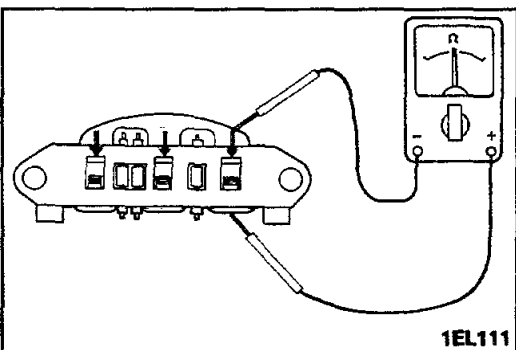


- Check coil for grounding. Check to ensure that there is no continuity between coil and core. If there is continuity, replace stator assembly.

**RECTIFIERS**

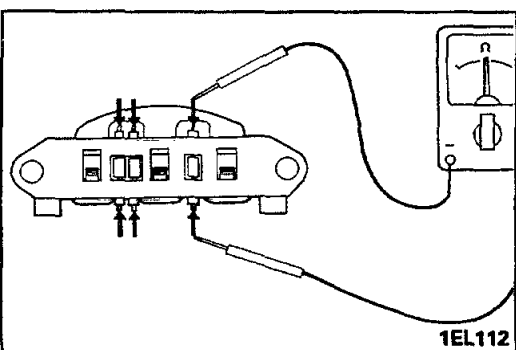
- **Positive rectifier test**

Check for continuity between positive rectifier and stator coil lead connection terminal with a circuit tester. If there is continuity in both directions, diode is shorted. Replace rectifier assembly.



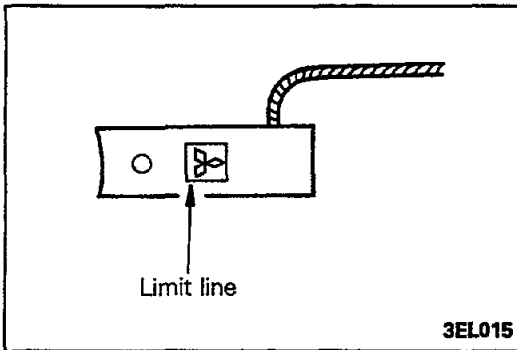
- **Negative rectifier test**

Check for continuity between negative rectifier and stator coil lead connection terminal. If there is continuity in both direction, diode is shorted, and rectifier assembly must be replaced.



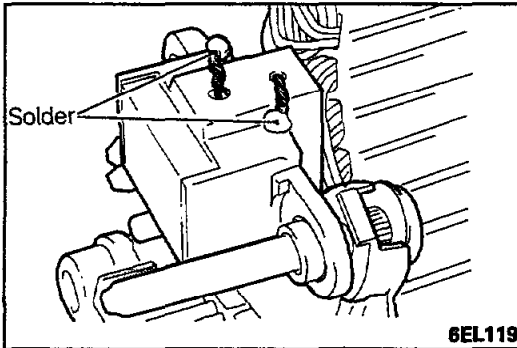
- **Diode trio test**

Check three diodes for continuity by connecting a circuit tester to both ends or each diode. If there is no continuity or no continuity in both directions, diode is defective and heatsink assembly must be replaced.

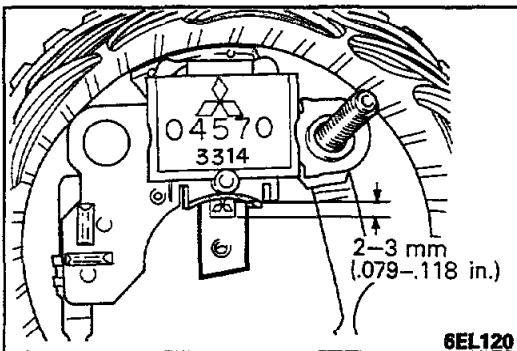


REPLACEMENT OF BRUSH

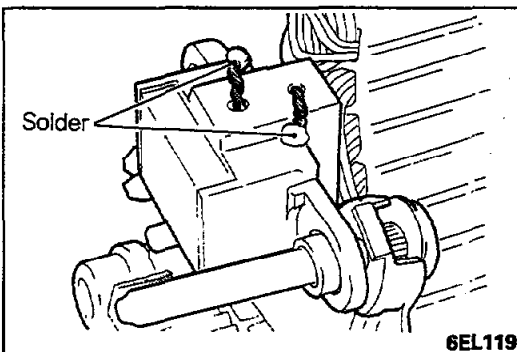
A brush worn away to the limit is replaced using the procedure below.



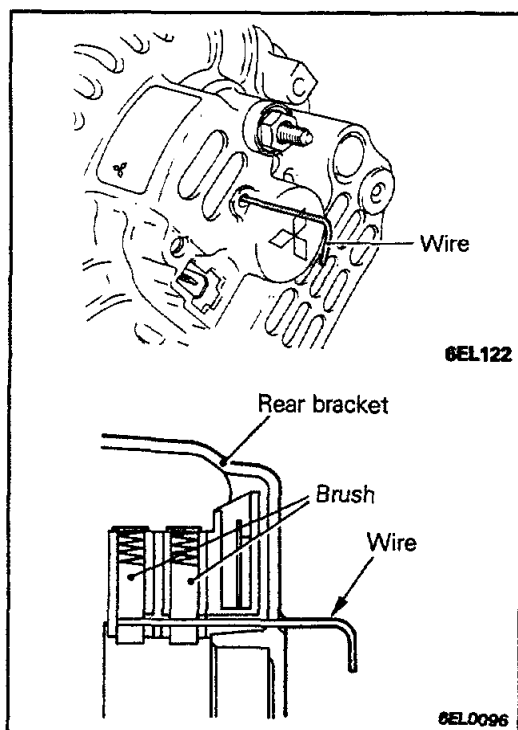
- (1) Remove the pigtail solder and take out the old brush and spring.



- (2) Install brush spring and new brush in brush holder.
- (3) Insert the brush to where there is a space 2-3 mm (.079-.118 in.) between the limit line and the end of the brush holder.



- (4) While maintaining the position of the step, solder the pigtails to the end of the brush holder.



SERVICE POINTS OF REASSEMBLY

3. INSTALLATION OF ROTOR ASSEMBLY

- (1) Push the brushes into the holder; then pass the wire through the small hole in the rear bracket and the small hole in the brushes.
- (2) Install the front bracket and the rotor to the rear bracket.
- (3) Remove the wire.