

TO INDEX

CHARGING SYSTEM

CH

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MCH00001-00000

PRECAUTIONS

1. Prior to the inspection, be sure to turn OFF the ignition switch.
2. Never touch the terminals of the battery which is mounted on the vehicle immediately after the vehicle has been operated.
3. Since the battery electrolyte harms or damages the skin and clothes, pay utmost attention to handling of the battery.
4. The following shows how to apply first aid in the event that unexpected incidents happen in connection with the battery electrolyte.

MCH00002-00000

- (1) When you swallow the electrolyte:

Immediately rinse your mouth with clean water. Drink raw eggs, milk or a large quantity of water. Lie down and remain quiet. At the same time, call an ambulance or a doctor to receive medical treatments at a medical agency.

- (2) When the electrolyte gets into your eyes:

Flush the electrolyte gets away from your eyes with a large quantity of clean running water for at least 15 minutes. At the same time, call an ambulance or a doctor to receive medical treatments at a medical agency.

- (3) When the electrolyte splashes on your skin or clothes:

Flush the electrolyte away with a large quantity of clean running water, until there is no more electrolyte there. Then, neutralize the spot with soap water. After this treatment, call a doctor or consult with a doctor for advice.

- (4) When the electrolyte is spilled over the floor:

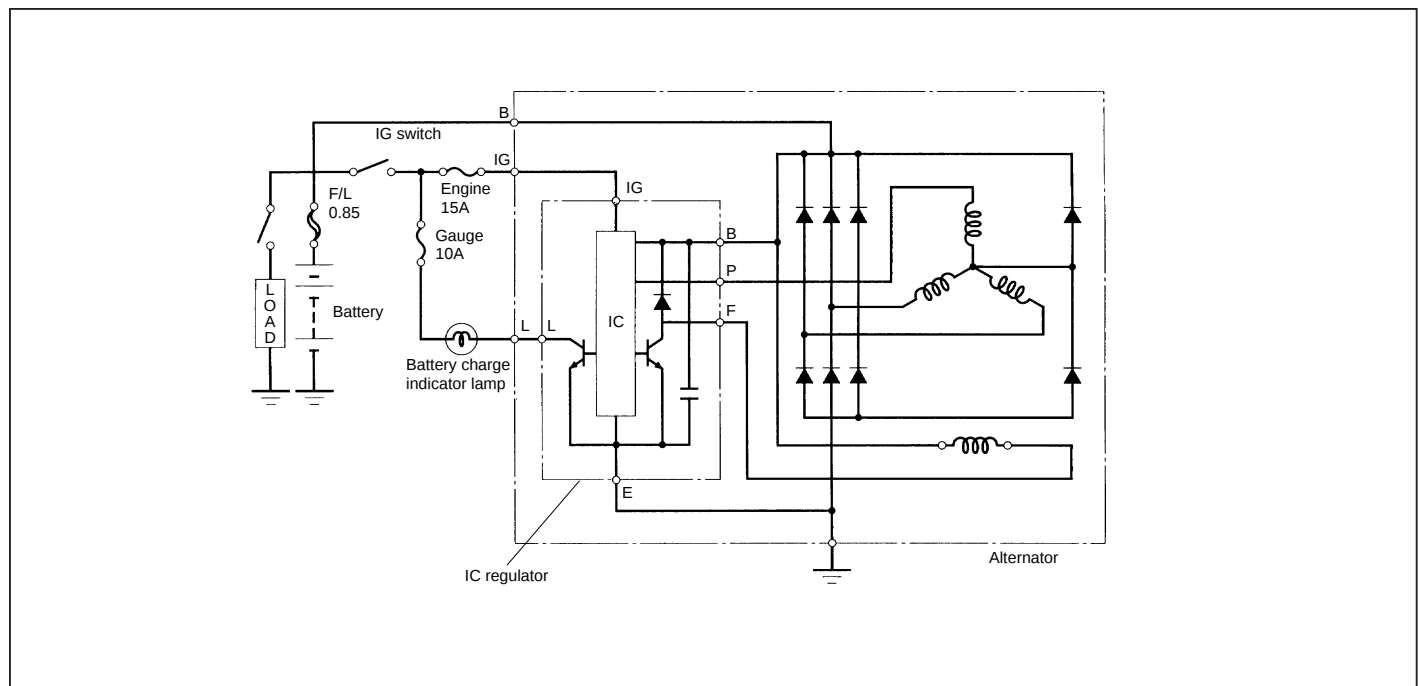
Flush the electrolyte away with a large quantity of clean running water, until there is no more electrolyte there. Then, neutralize the spot with hydrated lime.

- (5) When the electrolyte gets to a vehicle body:

Flush the electrolyte away from the affected section with a large quantity of clean running water, until there is no more electrolyte there.

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CHARGING SYSTEM CIRCUIT

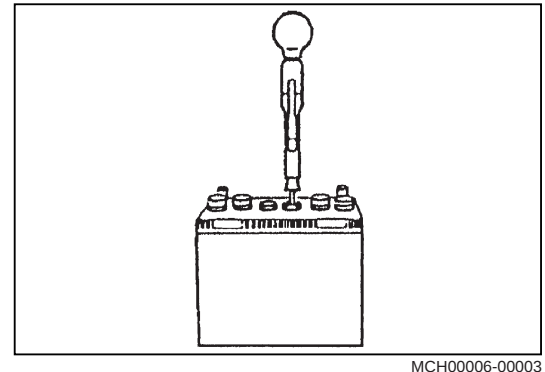
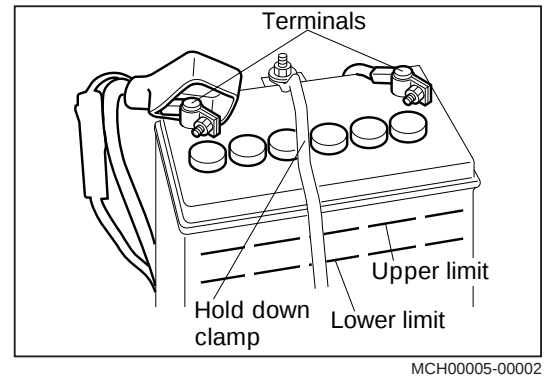


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IN-VEHICLE INSPECTION

BATTERY

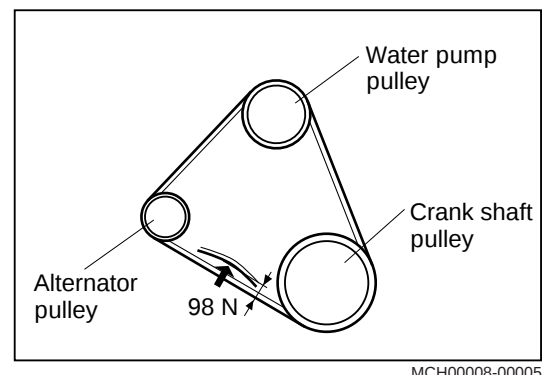
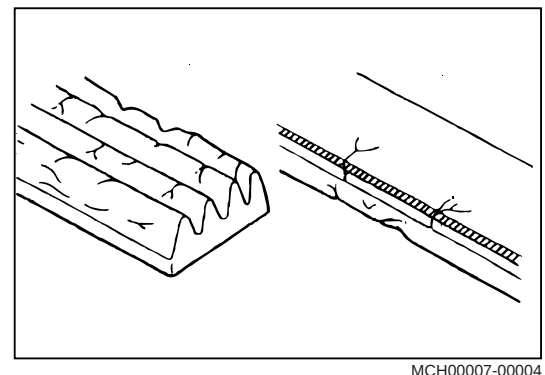
1. If the battery case exhibits cracks, replace the battery with a satisfactory one.
 2. If contamination, foreign matters or corrosion is found at the battery terminals, clean the battery.
 3. Check that the battery terminals are connected with the cable securely without any looseness.
 4. Ensure that the standard cover is mounted at the positive pole of the battery.
 5. Ensure that a thin film of lithium grease has been applied to the negative pole of the battery.
 6. Check to see if the electrolyte level of each cell of the battery has reached the specified level indicated on the battery case. If the level is below the specified level, replenish distilled water to the specified level.
 7. To check the charging condition of the battery, measure the specific gravity of each cell of the battery with a hydrometer. In the case of a maintenance-free battery, take a reading of the indicator provided at the battery. If the battery is inadequately charged, charge the battery in accordance with the instructions of the charger manufacturer.
- Specified Value:
When fully-charged: 1.28 (at 20 °C)



ALTERNATOR

Check of drive belt

1. Visually check the drive belt for wear or cracks.
 2. If there is any evidence which shows that the contact surface with the pulley has lost elasticity or slipping occurred in the surface, replace the drive belt or check the drive belt for tension.
 3. When checking the tension of the drive belt, measure the deflection amount at the mid-point between the alternator pulley and the crankshaft pulley when the aforesaid point is pushed with a force of about 98 N.
- Specified Value: 6 - 7 mm



(For the belt tension adjusting and belt replacement procedure, refer to the CH-7.)

NOTE:

- In the case of a new drive belt, perform the measurement after it was installed to the engine and has run for at least five minutes.

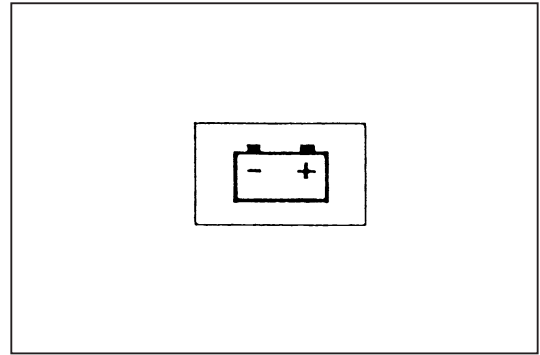
Check of battery charge warning circuit

Set the ignition switch to the ON position. Visually check to see if the charge warning lamp goes on.

Then, start the engine. At this time, visually check to see if the charge warning lamp goes out.

NOTE:

- The battery charge warning light is provided in the combination meter.

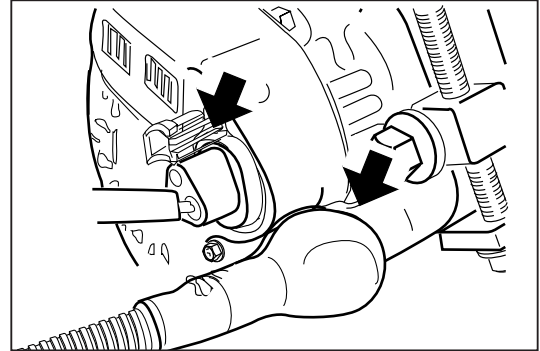


MCH00009-00006

Check of alternator

Ensure that the connector section of the wiring of the alternator is securely connected.

Check to see if abnormal noise is emitted from the alternator while the engine is operating.

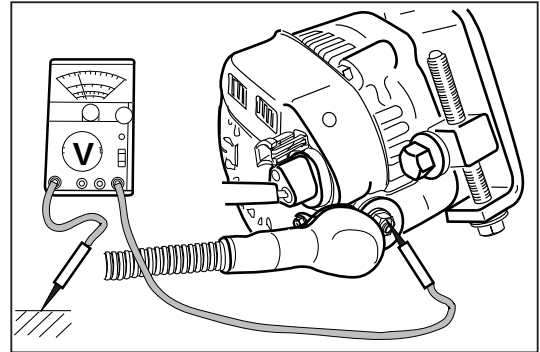


MCH00010-00007

Check of charging circuit under unloaded state

Connect the terminal B of the alternator with the negative (-) terminal of the battery by means of a voltmeter.

Turn OFF all switches of the headlamps and other devices which will become electric loads.



MCH00011-00008

Start the engine and warm it up.

Raise the engine revolution speed to 2000 rpm. At this time, measure the voltage.

Specified Value: 14.2 - 14.8 V

NOTE:

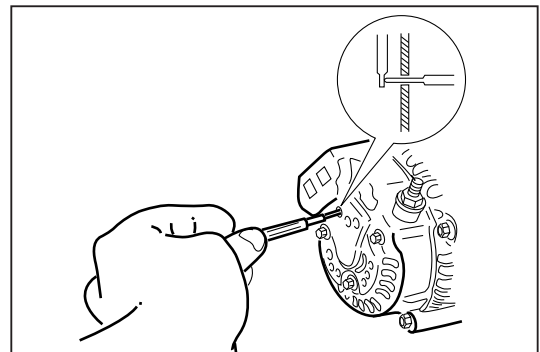
- If the measured value exceeds the specified value, replace the IC regulator.

MCH00012-00000

If the measured voltage is less than the specified value, ground the terminal F of the alternator to the alternator proper, as shown in the right figure. Raise the engine revolution speed to 2000 rpm. At this time, measure the voltage.

NOTE:

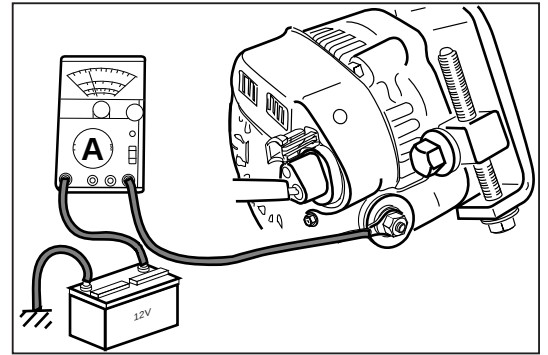
- If the measured value exceeds the specified value, replace the IC regulator.
- If the measured value is less than the specified value, disassemble the alternator.



MCH00013-00009

Check of charging circuit under loaded state

1. Disconnect the cable from the terminal B of the alternator and the battery.
2. Connect the terminal B of the alternator with the positive terminal (+) of the battery by means of an ammeter.
3. Turn ON the headlamp switch with the high beam position selected.
4. Turn ON the switch of the heater blower with the Hi position selected.



MCH00014-00010

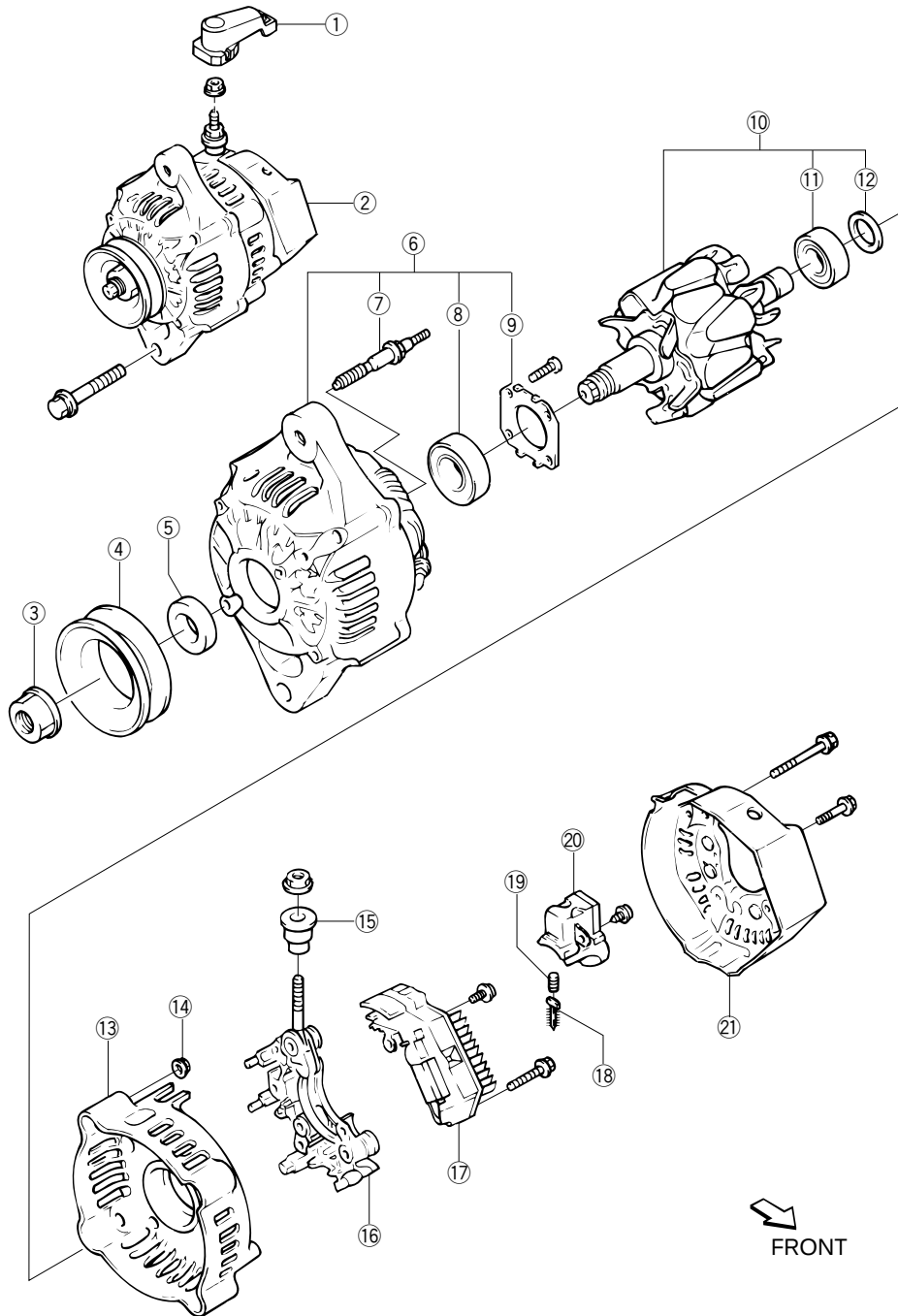
5. Start the engine and warm it up.
6. Raise the engine revolution speed to 2000 rpm. At this time, measure the current.
Specified Value: More than 30 A

NOTE:

- If the measured value less than the specified value, replace the alternator. However, there may be cases where the reading of the ammeter will not reach 30 A when the battery is fully charged.

MCH00015-00000

ALTERNATOR COMPONENTS

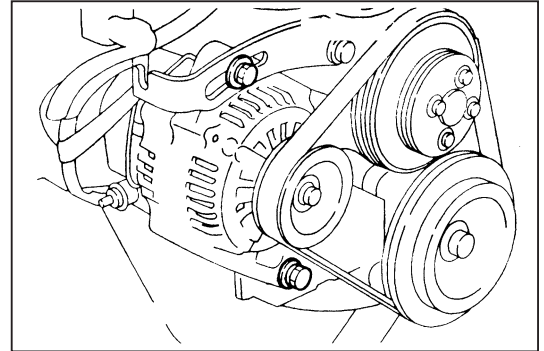


- ① Generator cap
- ② Alternator assembly
- ③ Pulley lock nut
- ④ Alternator pulley
- ⑤ Space collar
- ⑥ Drive end frame assembly
- ⑦ Stud bolt
- ⑧ Bearing
- ⑨ Retainer plate
- ⑩ Alternator rotor assembly
- ⑪ Bearing

- ⑫ Bearing cover
- ⑬ Rectifier end frame
- ⑭ Nut
- ⑮ Insulator terminal
- ⑯ Rectifier holder
- ⑰ Generator regulator assembly
- ⑱ Brush
- ⑲ Brush spring
- ⑳ Brush holder
- ㉑ Rear end cover

REMOVAL

1. Disconnect the ground cable terminal from the negative terminal of the battery.
2. Remove the generator cap.
3. Disconnect the terminal B of the alternator wire from the alternator.
4. Disconnect the alternator connector of the alternator wire from the alternator.
5. Loosen the alternator mounting bolt and adjusting bolt. Remove the V-belt.
6. Remove the alternator mounting bolt and adjusting bolt.

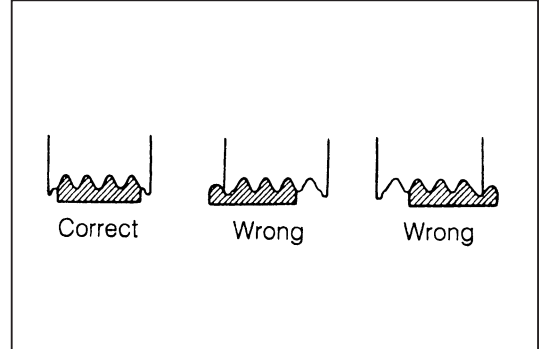


MCH00017-00012

INSTALLATION

1. Temporarily install the alternator on the engine with the alternator mounting bolt.
2. Temporarily install the adjusting bar to the engine.
3. Temporarily install the adjusting bolt.
4. With the alternator placed in the most outward position, tighten the adjusting bar securely.

Tightening Torque: $29.0 \pm 5.8 \text{ N}\cdot\text{m}$

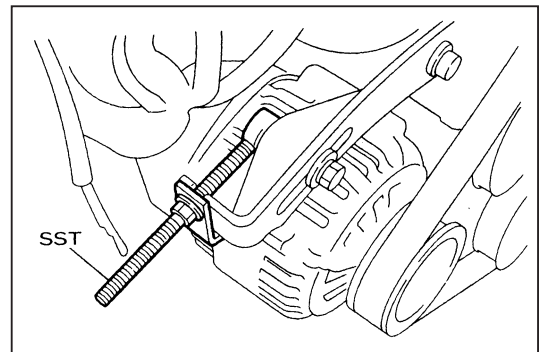


MCH00018-00013

5. Install the alternator drive belt to the engine properly.
CAUTION:
 - Make sure that the alternator drive belt is properly engaged in the groove of each pulley.
6. Install the following SST to the alternator and adjusting bar as shown in the right figure.
SST: 09286-87701-000

MCH00019-00000

7. Adjust the drive belt tension to the specified value by the adjusting nut of the SST.
Specified Belt Deflection
New belt: 4 - 5 mm
(with a force of 98 N applied at the point shown in the figure)
Used belt: 6 - 7 mm
(with a force of 98 N applied at the point shown in the right figure)



MCH00020-00014

NOTE:

- "New belt" refers to a belt which has been used on a running engine for less than five minutes.
- "Used belt" refers to a belt which has been used on a running engine for five minutes or more.
- After replacing the drive belt, check that it fits properly in the ribbed grooves, especially in the places difficult to see.
- After installing a new belt, run the engine for about five minutes and then recheck the tension.

8. Tighten the alternator mounting bolts and adjusting bolt to the specified torque.

Tightening Torque:

Mounting bolt: 52.0 ± 10.4 N·m

Adjusting bolt: 29.0 ± 5.8 N·m

9. Remove the SST from the alternator and adjusting bar.
10. Connect the alternator connector of the alternator wire to the alternator.
11. Connect the terminal B of the alternator wire to the alternator with the attaching nut.
12. Install the generator cap.

DISASSEMBLY

1. Remove the alternator pulley lock nut by means of an impact wrench, while holding the shaft by using a hexagonal box wrench.

NOTE:

- Be sure to use an impact wrench having a hexagonal hole.

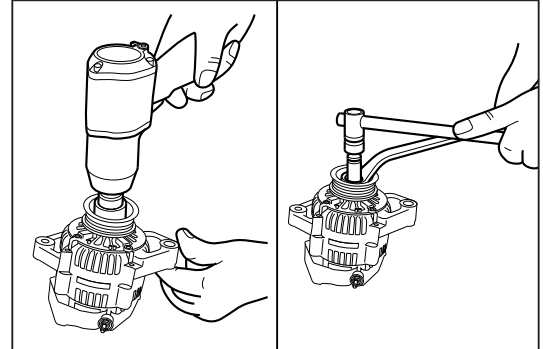
2. Remove the alternator pulley and space collar.

3. Remove the attaching nut of the washer terminal insulator.
4. Pull out the washer terminal insulator.
5. Remove the three rear end cover attaching screws.
6. Remove the rear end cover.

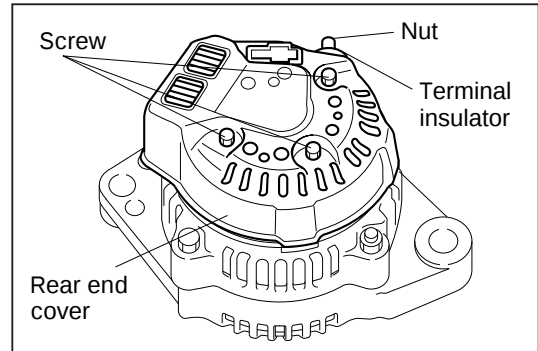
7. Remove the brush holder by removing the two attaching screws.

8. Remove the regulator generator assembly by removing the three attaching screws.
9. Remove the rectifier holder by removing the four attaching screws.

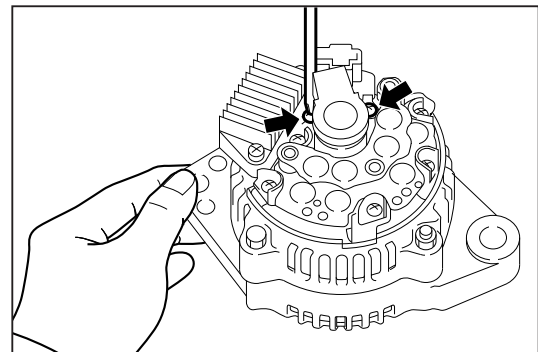
MCH00021-00000



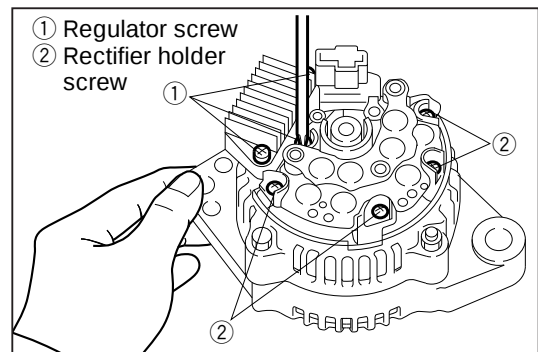
MCH00022-00015



MCH00023-00016

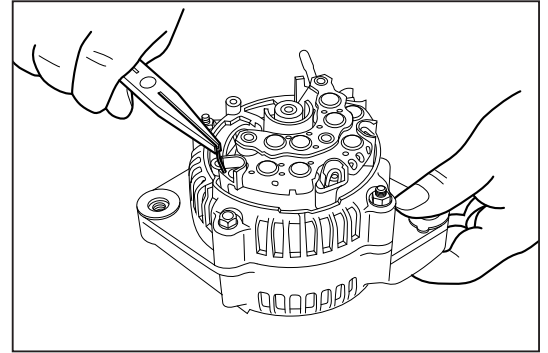


MCH00024-00017



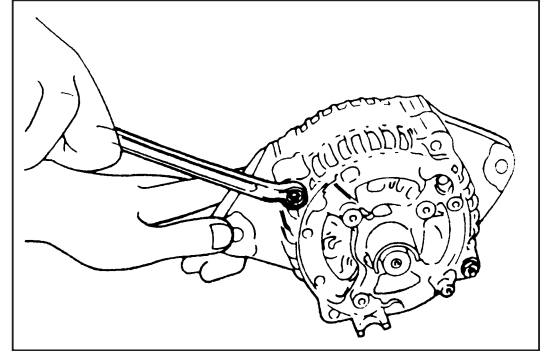
MCH00025-00018

10. Remove the rectifier holder by straightening the stator coil leads using long nosepliers.



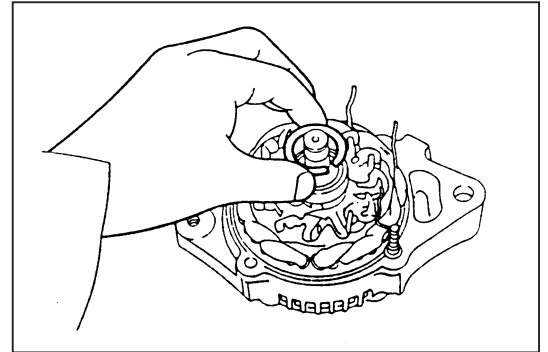
MCH00026-00019

11. Remove the rectifier end frame assembly by removing the two attaching bolts and two nuts.



MCH00027-00020

12. Remove the wave washer from the alternator rotor assembly.

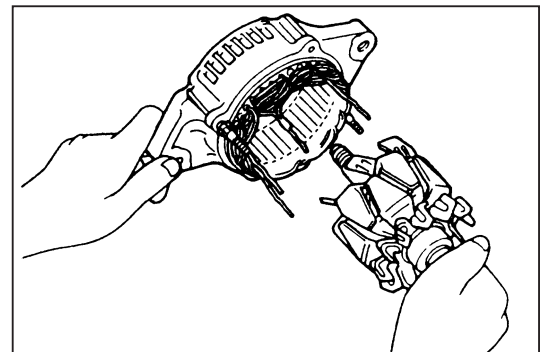


MCH00028-00021

13. Remove the alternator rotor assembly from the drive end frame assembly.

NOTE:

- If any difficulty is encountered in removing the alternator rotor assembly, lightly tap the rotor shaft with a plastic hammer or the like.



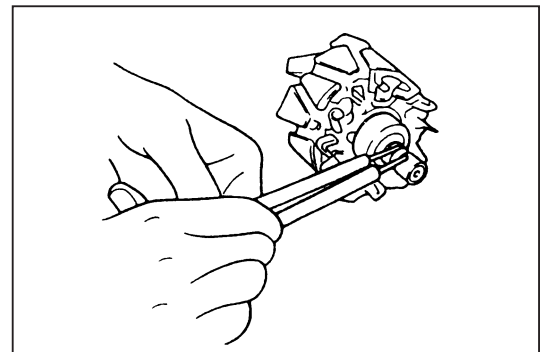
MCH00029-00022

INSPECTION

Rotor

1. Inspection of rotor for open circuit
Using an ohmmeter, check to see if the specified resistance exists between the rotor slip rings.
Standard Resistance: $2.9 \pm 0.2 \Omega$

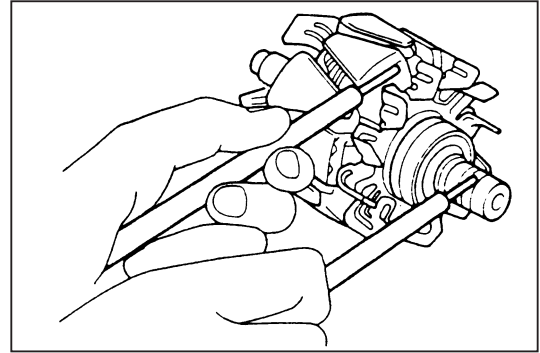
If the resistance does not conform to the specification, replace the rotor.



MCH00030-00023

CH-10

2. Inspection of rotor for ground
Ensure that no continuity exists between the rotor slip rings and the rotor core.
If continuity exists, replace the rotor.



MCH00031-00024

3. Inspection of slip rings
 - (1) Check to see if the slip ring surface exhibits roughness, abnormal wear and/or burning.
Replace the rotor, if necessary.

NOTE:

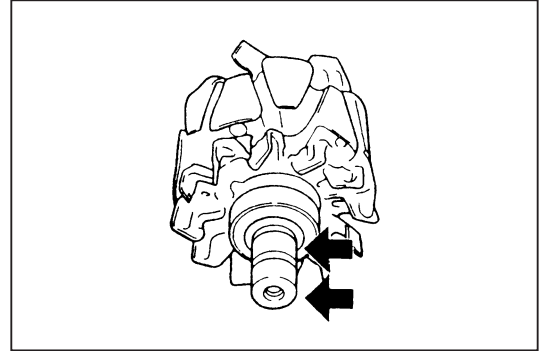
- When correcting the smear and roughness of the slip ring, polish the slip ring, using fine sand paper (#300 - 500). In this case, the slip ring can be used, until the outer diameter of the slip ring is reduced 0.4 mm from that of a new one.

- (2) Measure the outer diameter of the slip ring, using vernier calipers.

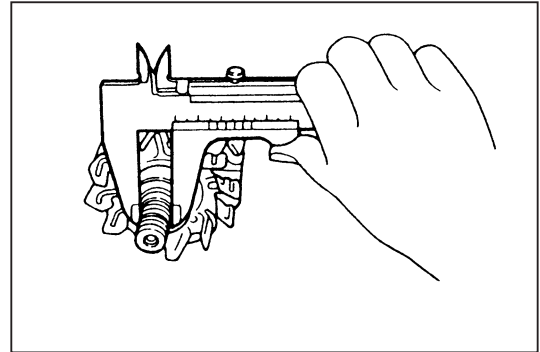
Standard Diameter: 14.4 mm

Minimum Diameter: 14.0 mm

If the slip ring diameter is less than the minimum diameter, replace the rotor assembly.



MCH00032-00025



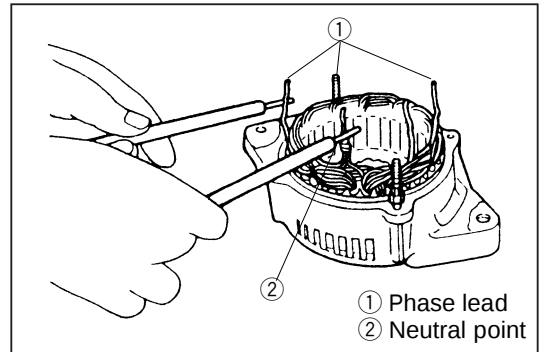
MCH00033-00026

Stator

1. Inspection of stator for open circuit
Using an ohmmeter, check to see if any open circuit of the stator coil is present between the leads.
If no continuity exists, replace the end frame assembly.
Specified Resistance: About 0.2 Ω

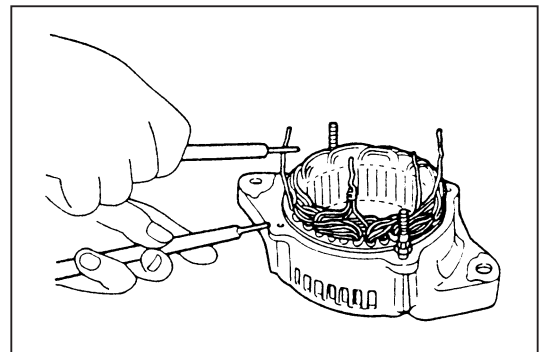
NOTE:

- If no continuity exists, there is no possibility that the stator coil itself exhibits open wire. Therefore, check the connecting section of the lead wire.



MCH00034-00027

2. Inspection of stator for short circuit
Using an ohmmeter, check to see if any short circuit of the stator coil is present between the coil lead and the drive end frame.
If continuity exists, replace the drive end frame assembly.
Specified Resistance: More than 1 k Ω



MCH00035-00028

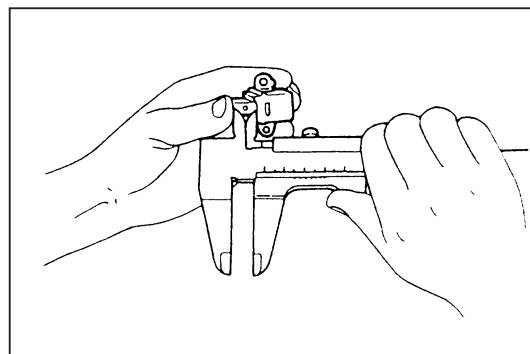
Brush and brush holder**1. Measurement of exposed brush length**

Measure the exposed brush length, using a scale.

Standard Exposed Length: 10.5 mm

Minimum Exposed Length: 8.4 mm

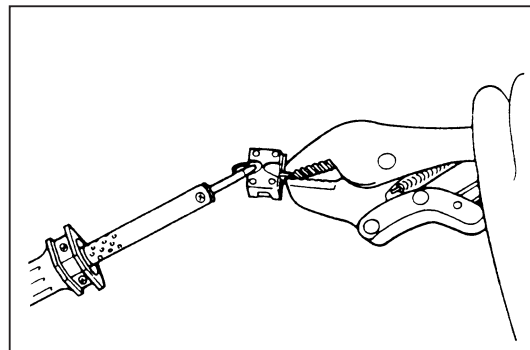
If the exposed length is less than the minimum requirement, replace the brushes.



MCH00036-00029

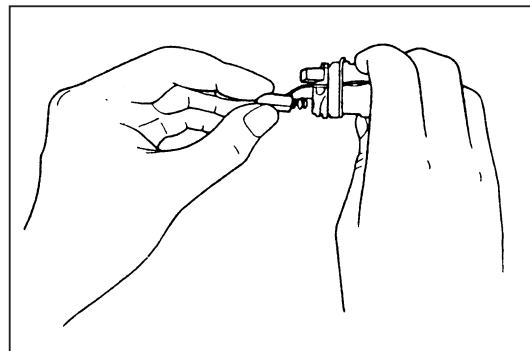
2. Replacement of brushes

(1) Remove the brush and spring from the brush holder by melting the solder by means of a soldering iron.



MCH00037-00030

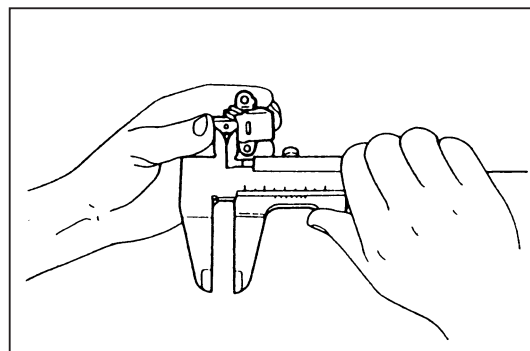
(2) Install the brush cord in the brush holder with the spring fitted in place.



MCH00038-00031

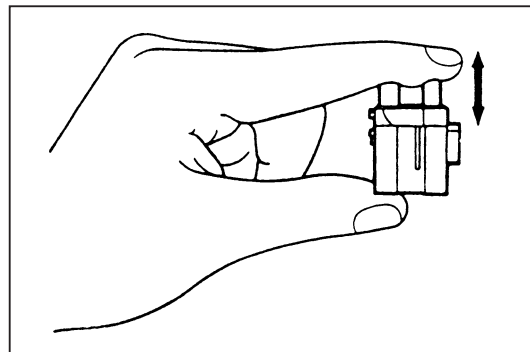
(3) Solder the brush cord in the brush holder in such a way that the exposed length of the brush meets the specification.

Standard Exposed Length: 10.5 mm



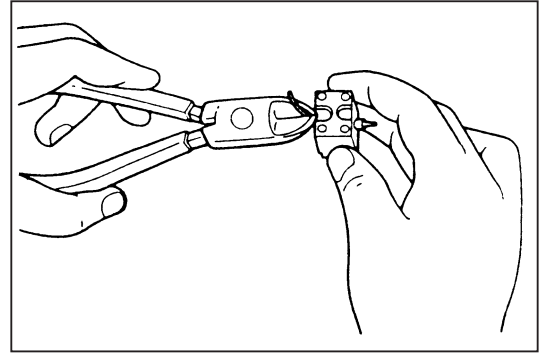
MCH00039-00032

(4) Ensure that the brush moves freely in the brush holder.



MCH00040-00033

- (5) Cut off any excess wire and apply insulation paint.



MCH00041-00.34

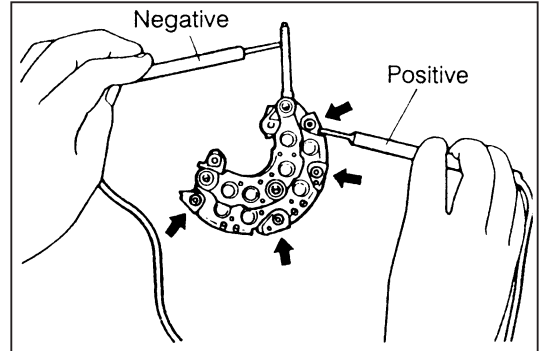
Rectifier

NOTE:

- Be sure to confirm the specification of the ohmmeter to be used for inspection before putting it into use.
- The current flow direction differs according to the design of an ohmmeter.
- This manual is described, based on a digital tester manufactured by DENSO Japan.

<Reference>

- The measured resistance should be about the same as those of other rectifiers, for the measurement results differ according to the input voltage of each tester.
- If the measured resistance of the rectifier differs more than 20 percent, replace the rectifier holder.



MCH00042-00035

1. Inspection of rectifier at positive side

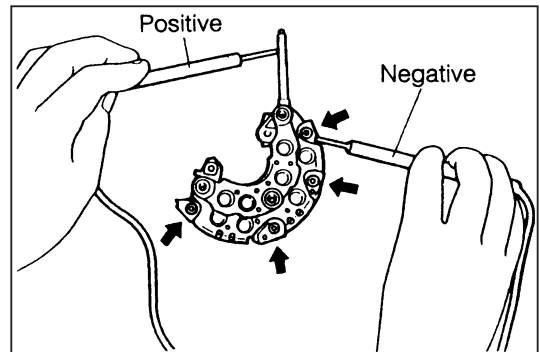
- (1) Ensure that continuity exists between the positive stud bolt of the rectifier holder and the rectifier terminal by connecting an ohmmeter as indicated in the right figure.

If no continuity exists, replace the rectifier holder.

- (2) Ensure that no continuity exists between the positive stud bolt of the rectifier holder and the rectifier terminal by connecting an ohmmeter as indicated in the right figure.

If continuity exists, replace the rectifier holder.

MCH00043-00000

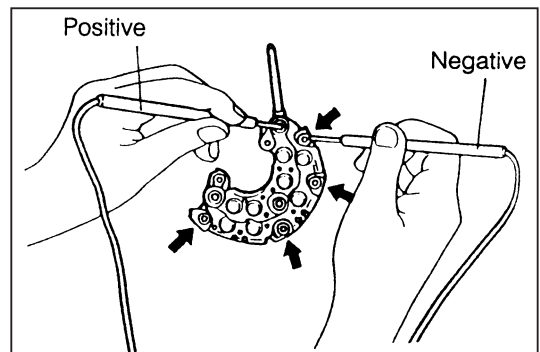


MCH00044-00036

2. Inspection of rectifier at negative side

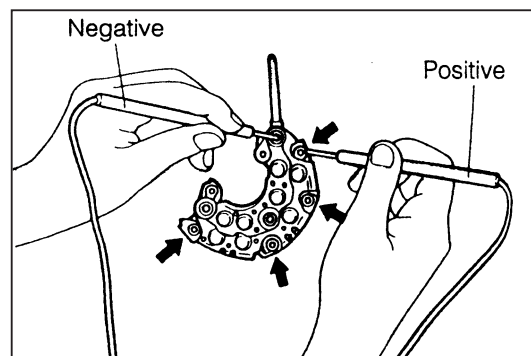
- (1) Ensure that continuity exists between each of the negative terminals of the rectifier holder and each rectifier terminal by connecting an ohmmeter as indicated in the right figure.

If no continuity exists, replace the rectifier holder.



MCH00045-00037

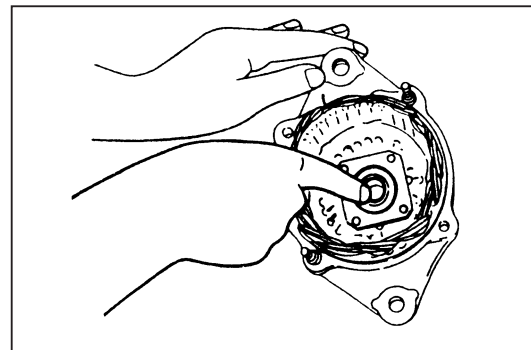
- (2) Ensure that no continuity exists between each of the negative terminals of the rectifier holder and each rectifier terminal by connecting an ohmmeter as indicated in the right figure.
If continuity exists, replace the rectifier holder.



MCH00046-00038

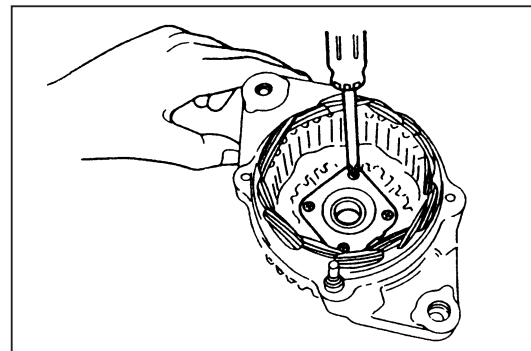
Bearing

1. Inspection of front bearing
Ensure that the bearing turns smoothly.
Replace the bearing, if necessary.



MCH00047-00039

2. Replacement of bearing
 - (1) Remove the four screws and retainer plate.

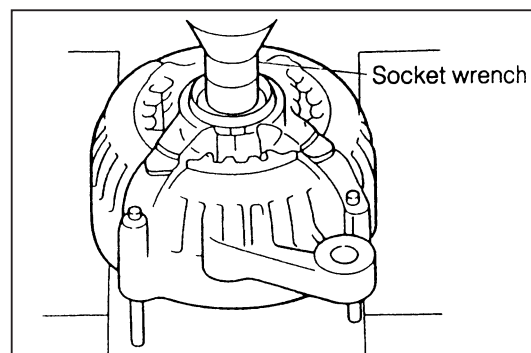


MCH00048-00040

- (2) Remove the front bearing from the drive end frame, using a suitable socket wrench in conjunction with a press.

CAUTION:

- Be very careful not to damage the coil and stud bolts during the bearing removal.

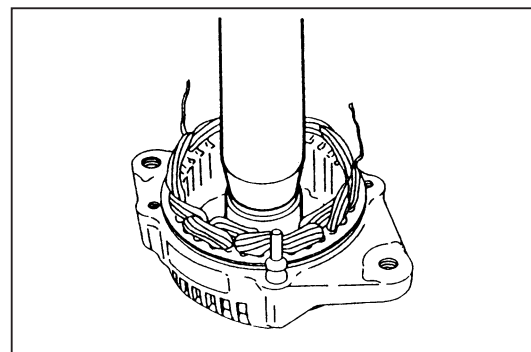


MCH00049-00041

- (3) Press a new front bearing into the drive end frame, using a suitable socket wrench in conjunction with a press.

CAUTION:

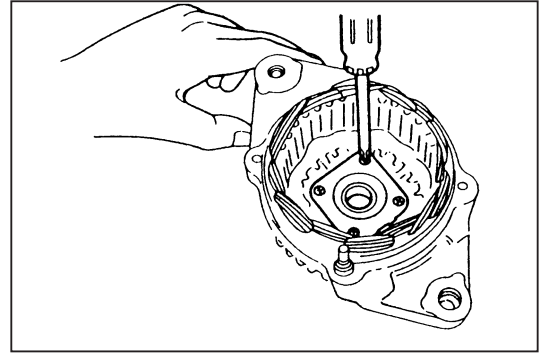
- Be sure to hold the outer race of the new bearing during the installation. Holding of the inner race or side cover will cause the bearing to be damaged.



MCH00050-00042

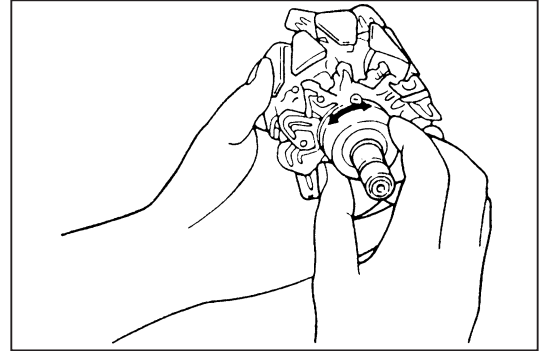
CH-14

- (4) Attach the retainer plate to the drive end frame with the four screws.



MCH00051-00043

3. Inspection of rear bearing
Ensure that the bearing turns smoothly.
Replace the bearing, if necessary.



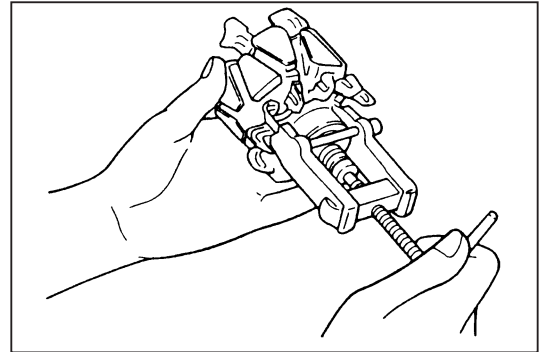
MCH00052-00044

4. Replacement of rear bearing
(1) Remove the rear bearing cover from the rotor, using an armature bearing puller.

CAUTION:

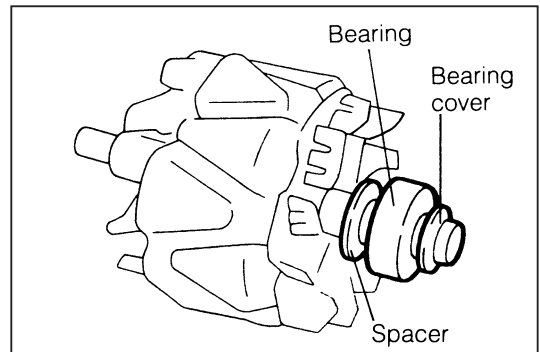
- Be very careful not to damage the fan during the removal.

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MCH00053-00045

- (2) Place the parts on the rotor in the following order.
Spacer
New rear bearing
New bearing cover

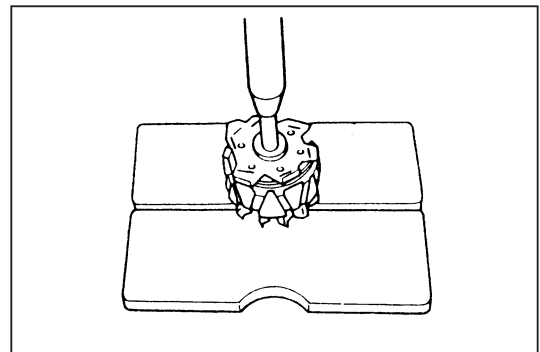


MCH00054-00046

- (3) Press the assembled parts into the rotor, using a hydraulic press in combination with a suitable attachment.

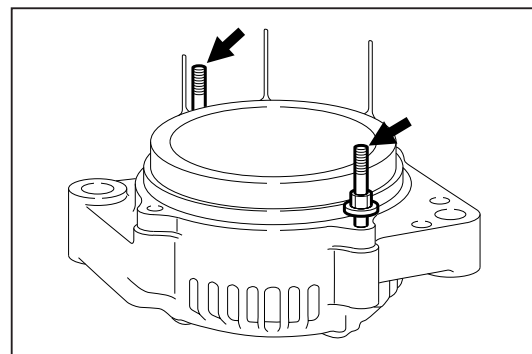
NOTE:

- Care must be exercised so that the point where the bearing is assembled to the rotor shaft may not deform an bearing cover.
Therefore, be sure to select a suitable attachment to assemble the bearing cover.



MCH00055-00047

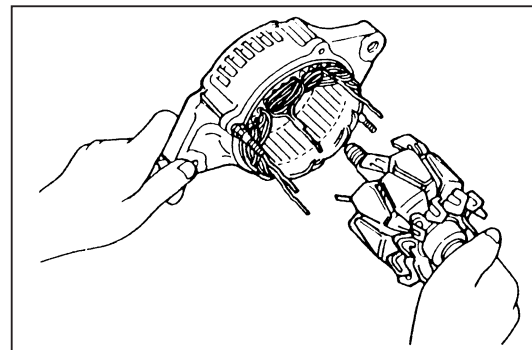
5. Inspection/replacement of stud bolt
Visually inspect the thread portion of the stud bolt.
If any damage exists, replace the stud bolt.



MCH00056-00048

ASSEMBLY

1. Install the rotor in the drive end frame assembly.

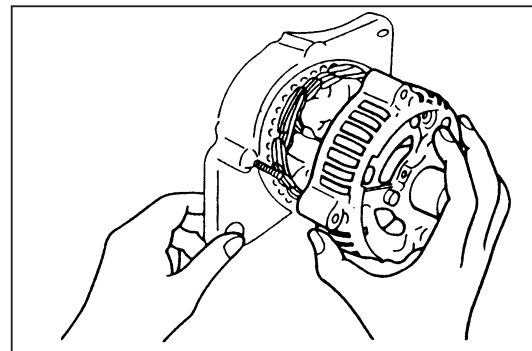


MCH00057-00049

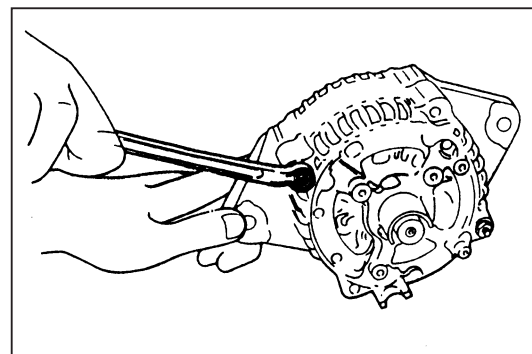
2. Installation of rectifier end frame on drive end frame
 - (1) Place the wave washer on the rear bearing.
 - (2) Install the rectifier end frame on the drive end frame with the two bolts and two nuts or four attaching nuts.

CAUTION:

- Be very careful not to damage the coil cord during the installation.

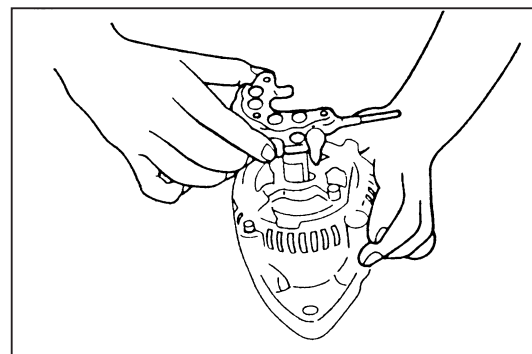


MCH00058-00050



MCH00000-00051

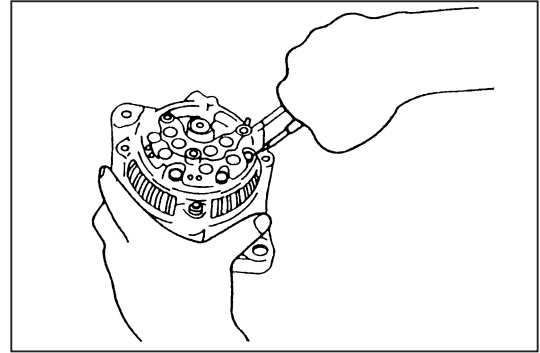
3. Installation of rectifier holder, regulator assembly and brush holder
 - (1) Attach the rectifier holder to the end frame with the coil wires passed through the aperture of the rectifier holder.



MCH00059-00052

CH-16

- (2) Wind the coil wires around the installing section of the rectifier attaching bolt hole.

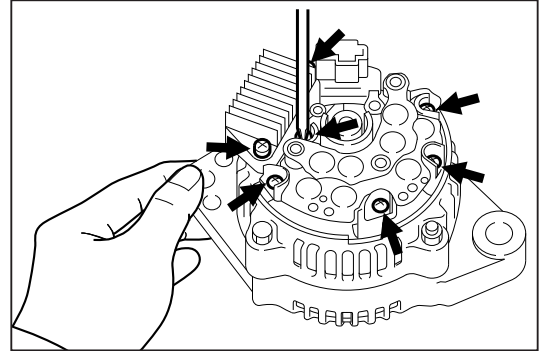


MCH00060-00053

- (3) Connect the coil wires to the rectifier holder with the attaching screws.
- (4) Install the rectifier holder and regulator assembly with the attaching screws.

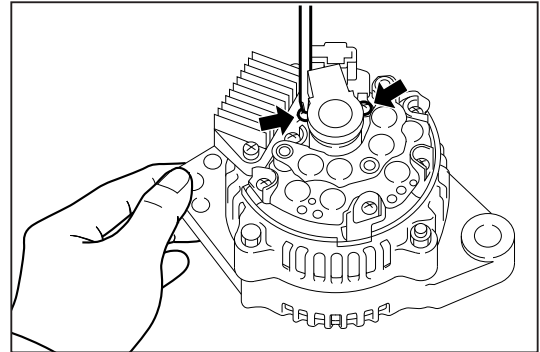
NOTE:

- Make sure that the regulator assembly has been installed properly with the attaching screws.



MCH00061-00054

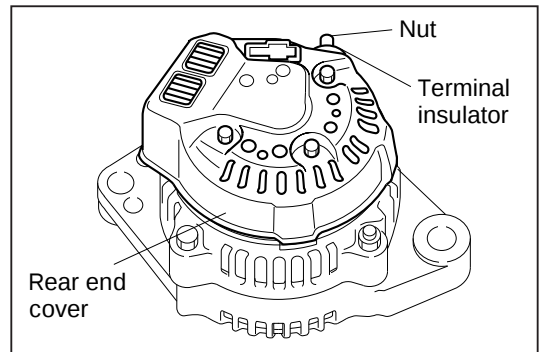
- (5) Install the brush holder in such a way that a gap of at least 1 mm is provided between the brush holder and the regulator assembly.
Secure the brush holder with the two screws.



MCH00062-00055

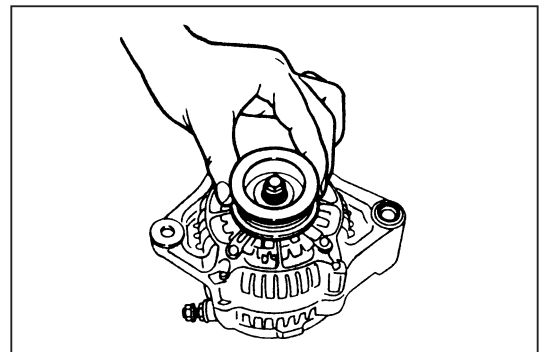
4. Installation of rear end cover.

- (1) Install the rear end cover on the alternator.
- (2) Secure the rear end cover with the three attaching nuts or screws.
- (3) Install the terminal insulator.
- (4) Secure the terminal insulator attaching nut.



MCH00063-00056

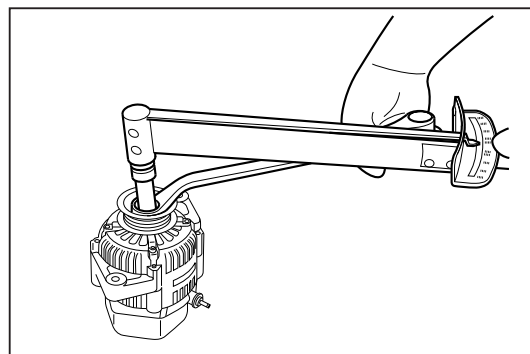
5. Attach the pulley and space collar to the rotor shaft.



MCH00064-00057

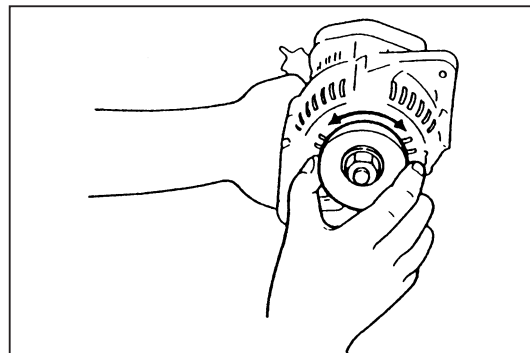
6. Tighten the pulley lock nut to the specified tightening torque.

Tightening Torque: 93.1 - 127.4 N·m



MCH00065-00058

7. Ensure that the rotor turns smoothly.



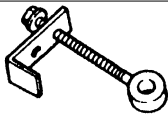
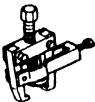
MCH00066-00059

SERVICE SPECIFICATIONS

Battery specific gravity			1.25 - 1.28
Alternator: 60A	Rated output	Amperage	60A
	Rotor coil resistance	Resistance	2.9 Ω at 20℃ (68ℱ)
	Slip ring diameter	Standard	14.4 mm
		Minimum	14.0 mm
	Brush exposed length	Standard	10.5 mm
		Minimum	8.4 mm
	IC regulating voltage	High level	14.2 - 14.8 volts

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SSTs

Shape	Part No.	Part name
	09286-87701-000	Alternator adjusting bar
	09820-00021-000	Alternator bearing puller

MCH00068-00000

TIGHTENING TORQUE

Tightening components	Tightening torque	
	N·m	kgf-m
Alternator adjusting bar × engine	29.0 ± 5.8	3.0 ± 0.6
Alternator attaching bolt (Mounting bolt) (Adjusting bolt)	52.0 ± 10.4	5.3 ± 1.1
	29.0 ± 5.8	3.0 ± 0.6
Pulley lock nut	93.1 - 127.4	9.5 - 13.0

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