

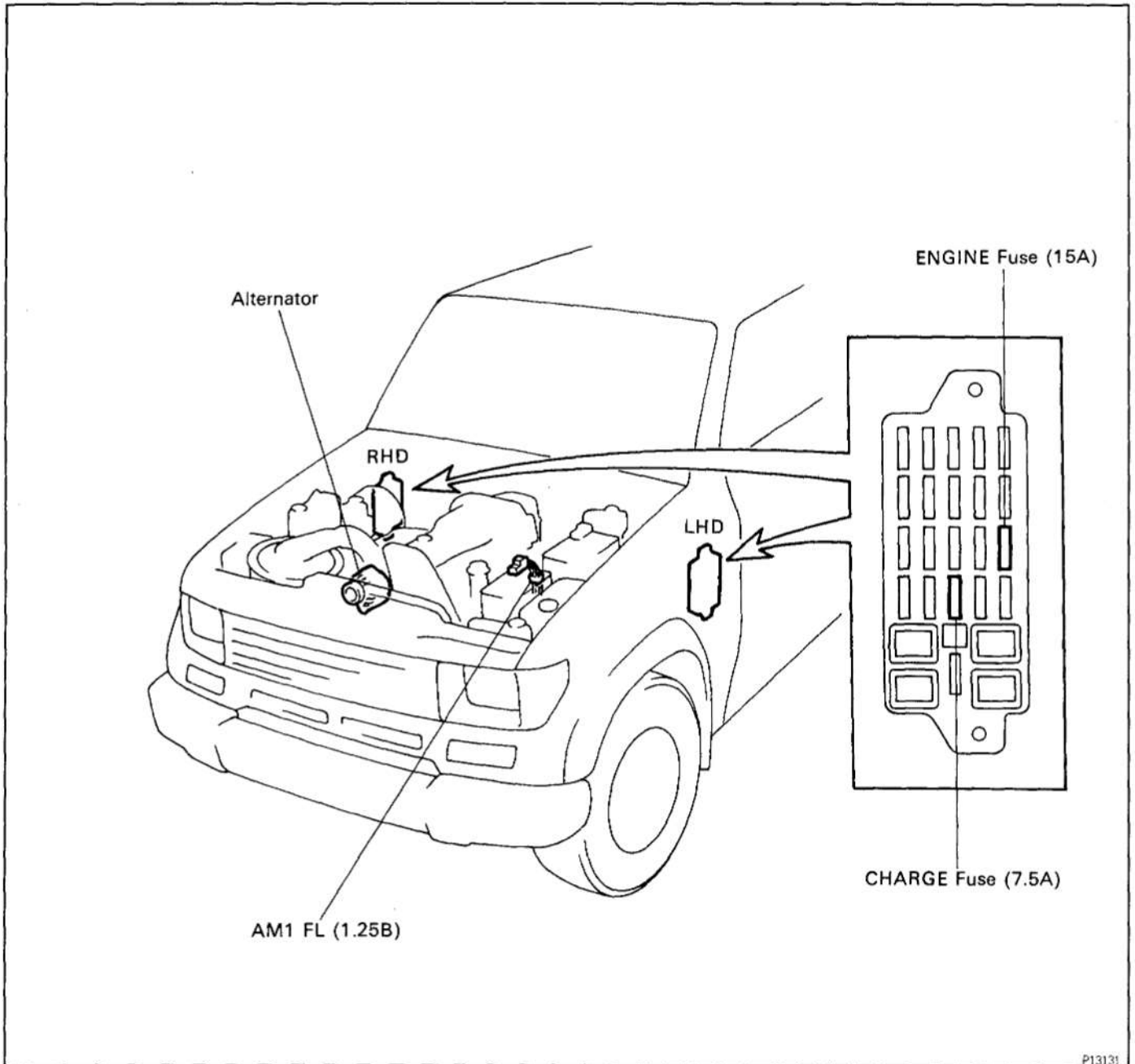
CHARGING SYSTEM

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CH

DESCRIPTION

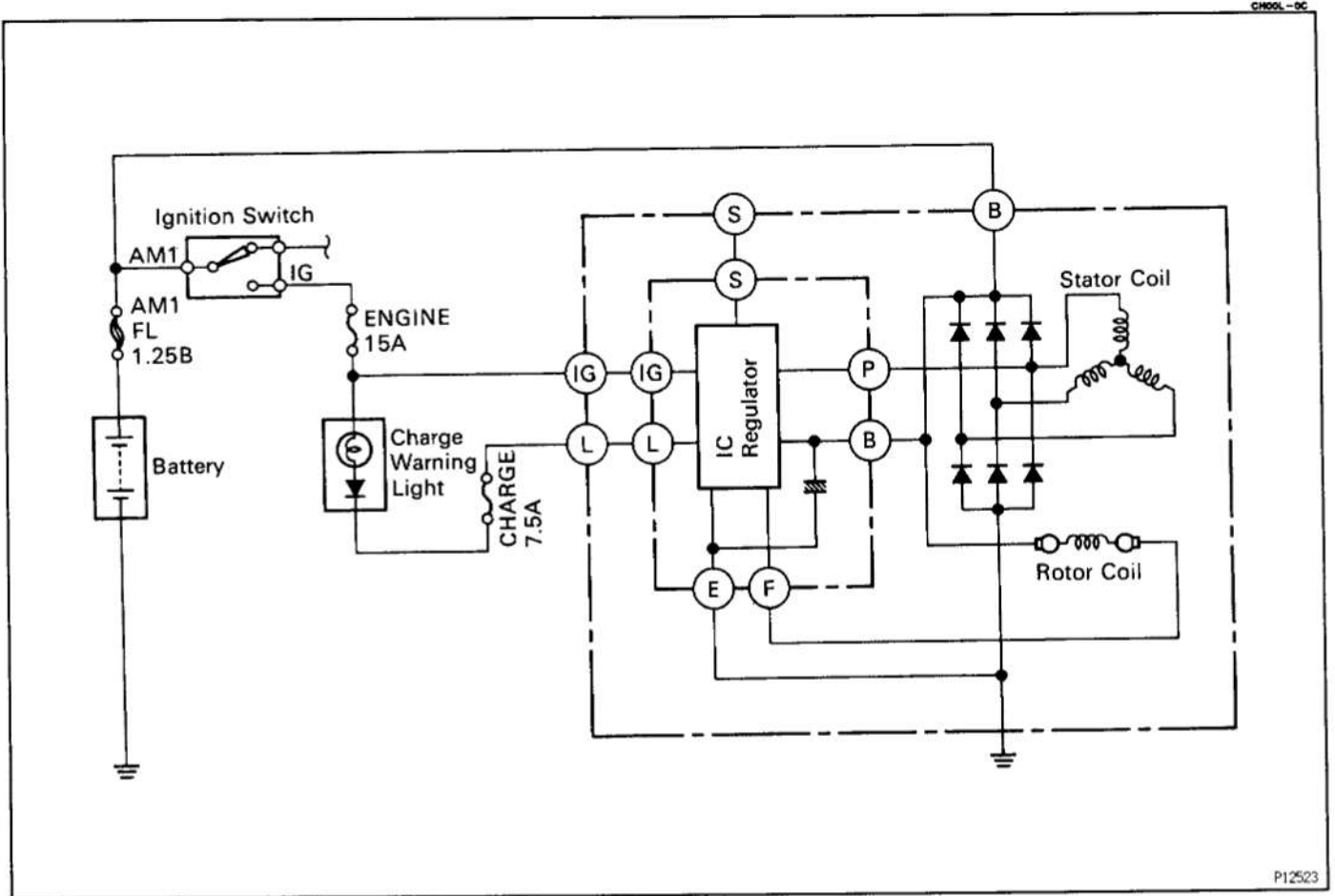
The alternator is a small, high rpm, high performance type with an IC regulator incorporated. The IC regulator uses integrated circuits and controls the voltage produced by the alternator. CH00G-08



PRECAUTION

1. Check that the battery cables are connected to the correct terminals.
2. Disconnect the battery cables when the battery is given a quick charge.
3. Do not perform tests with a high voltage insulation resistance tester.
4. Never disconnect the battery while the engine is running.

SYSTEM CIRCUIT








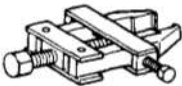

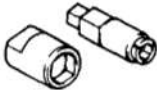
OPERATION

When the ignition switch is turned ON, current from the battery flows from terminal L of the alternator through the IC regulator to terminal E, causing the discharge warning light to light up. Then when the engine is started, the voltage output increases as the alternator rpm increases. When the voltage output becomes greater than the battery voltage, current for recharging flows from terminal B. Simultaneously, voltage at terminal L increases and the potential difference between battery and terminal L disappears, causing the discharge warning light to go off. When the voltage output exceeds the regulator adjustment voltage, the transistor inside the IC regulator regulates the voltage so that the voltage from the alternator remains constant.

PREPARATION


SST (SPECIAL SERVICE TOOLS)

CH000-06

	09285-76010	Injection Pump Camshaft Bearing Cone Replacer	Rotor rear bearing cover
	09286-46011	Injection Pump Spline Shaft Puller	Rectifier end frame
	09608-20012	Front Hub & Drive Pinion Bearing Tool Set	
	(09608-00030)	Replacer	Rotor front bearing
	(09608-00080)	Replacer	Rotor front bearing
	09820-00021	Alternator Rear Bearing Puller	
	09820-00030	Alternator Rear Bearing Replacer	Rotor rear bearing
	09820-63010	Alternator Pulley Set Nut Wrench Set	

RECOMMENDED TOOLS

CH005-01

	09082-00015	TOYOTA Electrical Tester	
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EQUIPMENT

CH000-02

Battery specific gravity gauge	
Belt tension gauge	
Torque wrench	
Vernier calipers	Rotor (Slip ring), Brush

ON – VEHICLE INSPECTION

CHOSD-01

1. CHECK BATTERY SPECIFIC GRAVITY AND ELECTROLYTE LEVEL

- (a) Check the electrolyte quantity of each cell. If insufficient, refill with distilled (or purified) water.
- (b) Check the specific gravity of each cell.

Standard specific gravity at 20°C (68°F):

1.27 – 1.29 105D31L Battery

If the gravity is less than specification, charge the battery.

2. CHECK BATTERY TERMINALS, FUSIBLE LINK AND FUSES

- (a) Check that the battery terminals are not loose or corroded.
- (b) Check the fusible link and fuses for continuity.

Fusible link:

AM1 1.25 B

Fuse:

ENGINE 15 A

CHARGE 7.5 A

3. INSPECT DRIVE BELTS

- (a) Visually check the drive belt for cracks, oiliness or wear. Check that the belt does not touch the bottom of the pulley groove.

If necessary, replace the drive belts as a set.

- (b) Check the drive belt deflection by pressing on the belt at the points indicated in the illustration with 98 N (10 kgf, 22 lbf) of pressure.

Drive belt deflection:

New belt

6 – 8 mm (0.24 – 0.31 in.)

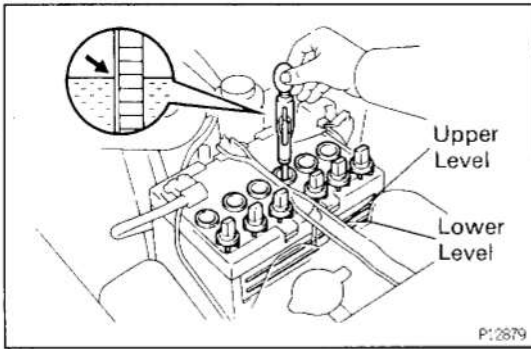
Used belt

8 – 12 mm (0.31 – 0.47 in.)

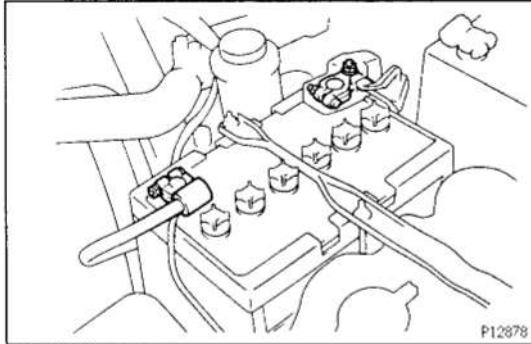
If necessary, adjust the drive belt deflection.

HINT:

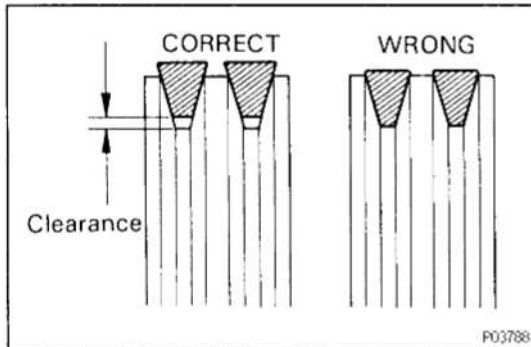
- "New belt" refers to a belt which has been used less than 5 minutes on a running engine.
- "Used belt" refers to a belt which has been used on a running engine for 5 minutes or more.
- After installing a new belt, run the engine for about 5 minutes and recheck the deflection.



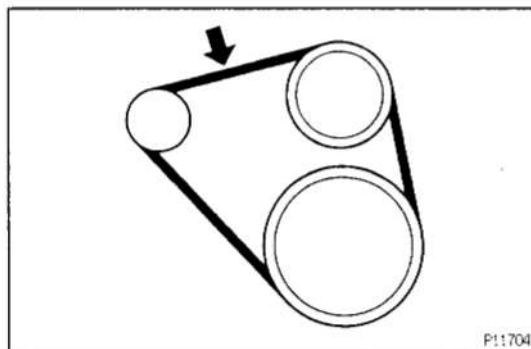
P12679



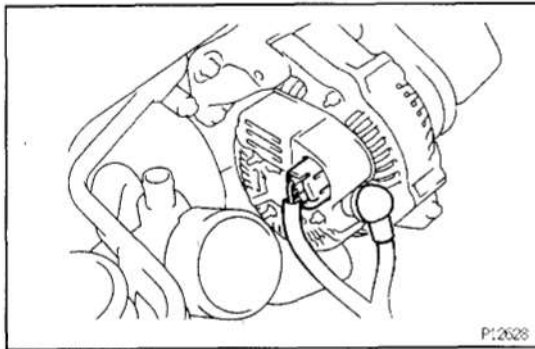
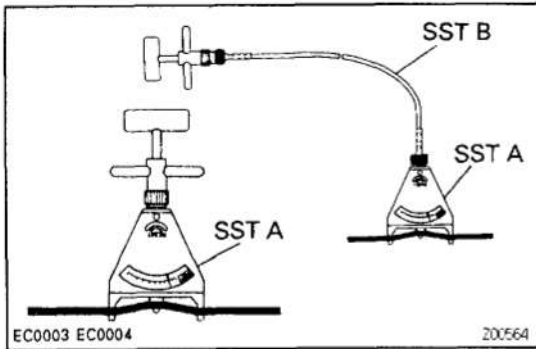
P12678



P03788



P11704

**Reference**

Using SST, check the drive belt tension.

SST A 09216-00020

SST B 09216-00030

Drive belt tension:

New belt

45 – 55 kgf

Used belt

20 – 35 kgf

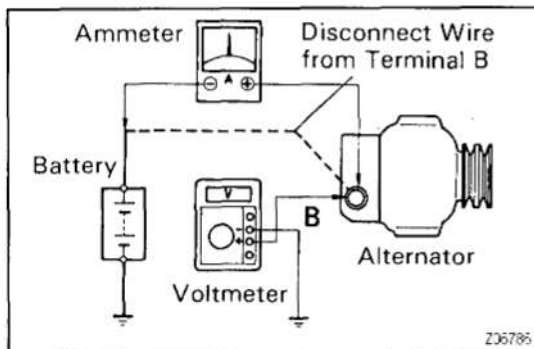
If the belt tension is not as specified, adjust it.

4. VISUALLY CHECK ALTERNATOR WIRING AND LISTEN FOR ABNORMAL NOISES

- (a) Check that the wiring is in good condition.
- (b) Check that there is no abnormal noise from the alternator while the engine is running.

5. INSPECT DISCHARGE WARNING LIGHT CIRCUIT

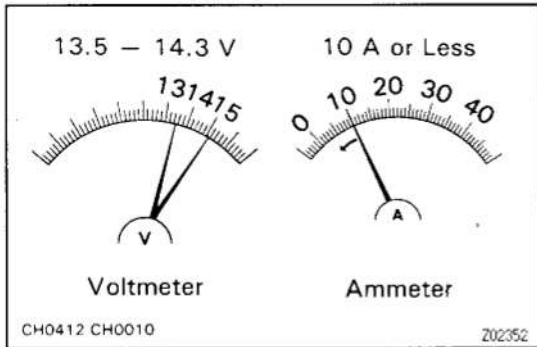
- (a) Turn the ignition switch "ON". Check that the discharge warning light comes on.
 - (b) Start the engine. Check that the light goes off.
- If the light does not operate as specified, troubleshoot the discharge warning light circuit.



6. INSPECT CHARGING CIRCUIT WITHOUT LOAD

HINT: If a battery/alternator tester is available, connect the tester to the charging circuit as per the manufacturer's instructions.

- (a) If a tester is not available, connect a voltmeter and ammeter to the charging circuit as follows:
 - Disconnect the wire from terminal B of the alternator and connect it to the negative (–) lead of the ammeter.
 - Connect the positive (+) lead of the ammeter to terminal B of the alternator.
 - Connect the positive (+) lead of the voltmeter to terminal B of the alternator.
 - Ground the negative (–) lead of the voltmeter.



- (b) Check the charging circuit as follows:
With the engine running from idle to 2,000 rpm, check the reading on the ammeter and voltmeter.

Standard amperage:

10 A or less

Standard voltage:

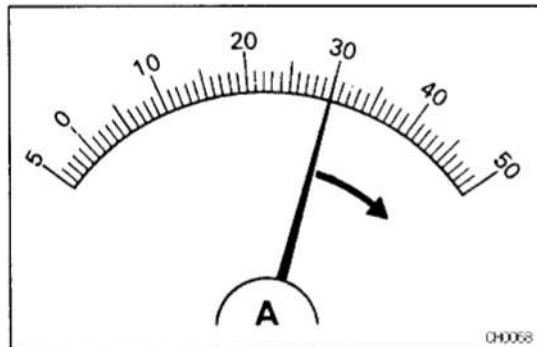
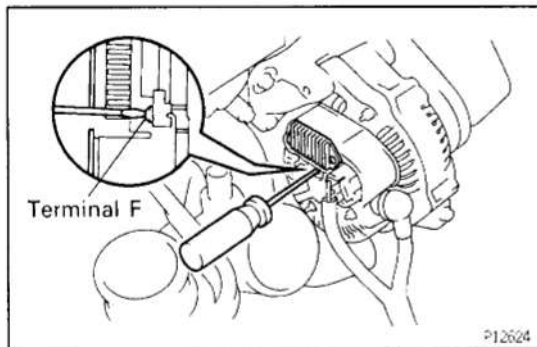
14.0 – 15.0 V at 25°C (77°F)

13.5 – 14.3 V at 115°C (239°F)

If the voltmeter reading is more than standard voltage, replace the IC regulator.

If the voltmeter reading is less than the standard voltage, check the IC regulator and alternator as follows:

- With terminal F grounded, start the engine and check the voltmeter reading of terminal B.
- If the voltmeter reading is more than standard voltage, replace the IC regulator.
- If the voltmeter reading is less than standard voltage, check the alternator.



7. INSPECT CHARGING CIRCUIT WITH LOAD

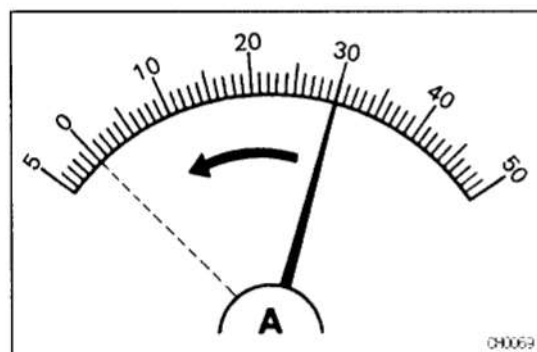
- (a) With the engine running at 2,000 rpm, turn on the high beam headlights and place the heater blower switch at "HI".
- (b) Check the reading on the ammeter.

Standard amperage:

30 A or more

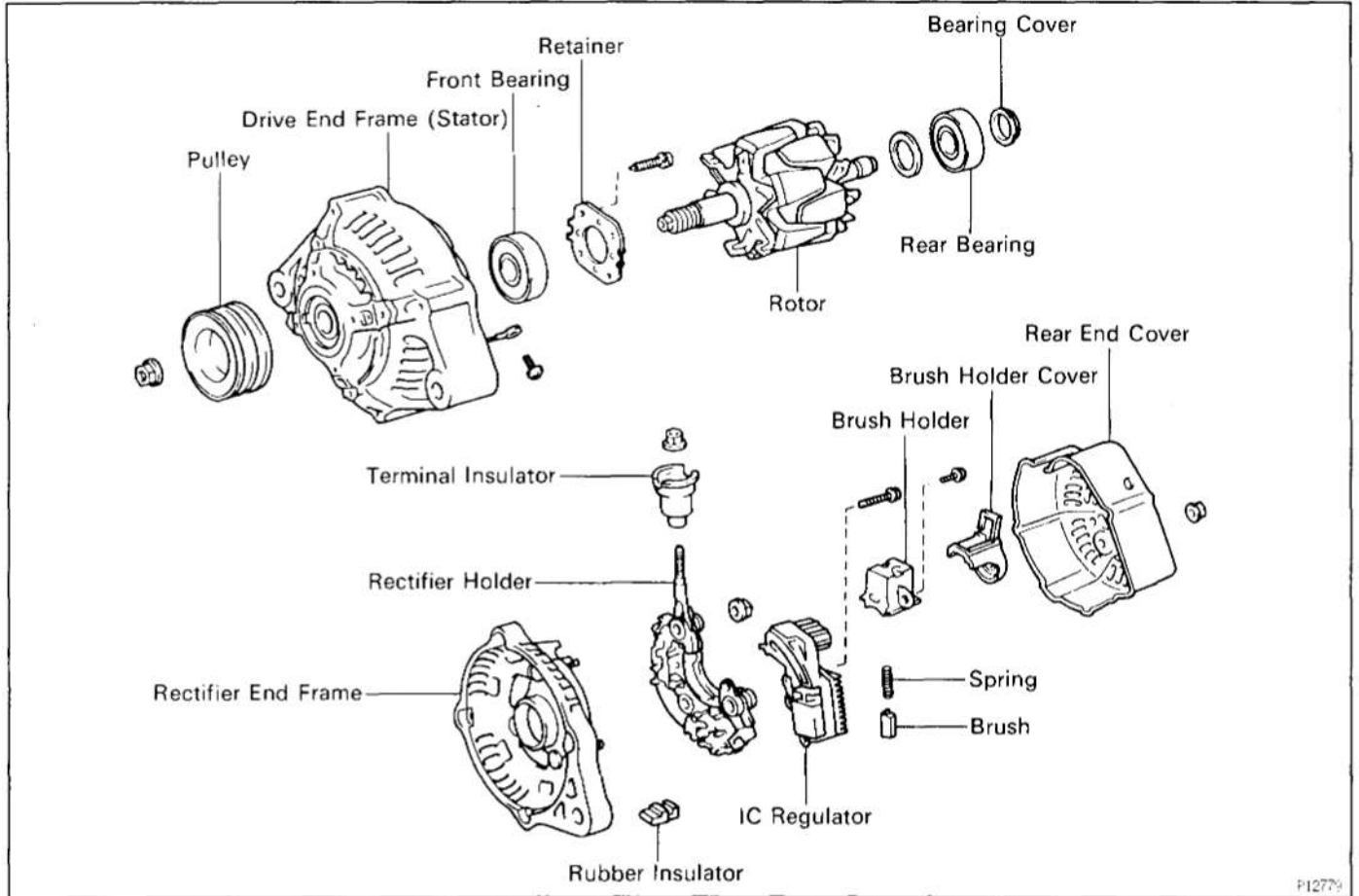
If the ammeter reading is less than standard amperage, repair the alternator.

HINT: If the battery is fully charged, the indication will sometimes be less than standard amperage.



ALTERNATOR COMPONENTS FOR DISASSEMBLY AND ASSEMBLY

CH010-0A



F12779

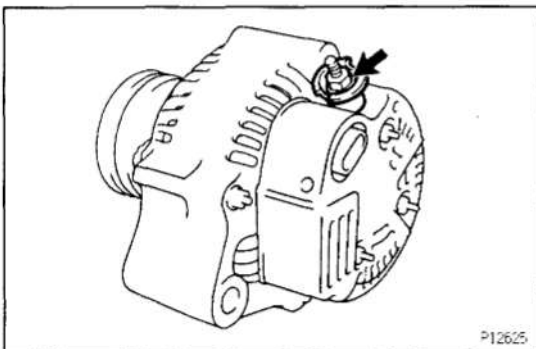
ALTERNATOR DISASSEMBLY

CH04E-02

(See Components for Disassembly and Assembly)

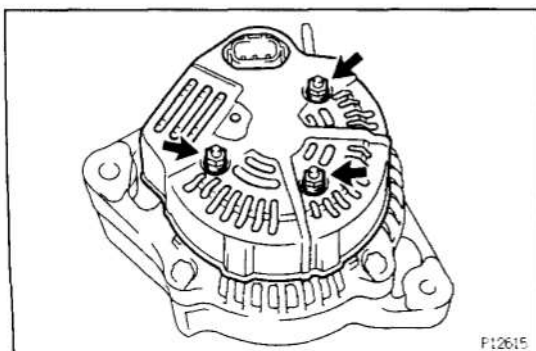
1. REMOVE REAR END COVER

(a) Remove the nut and terminal insulator.

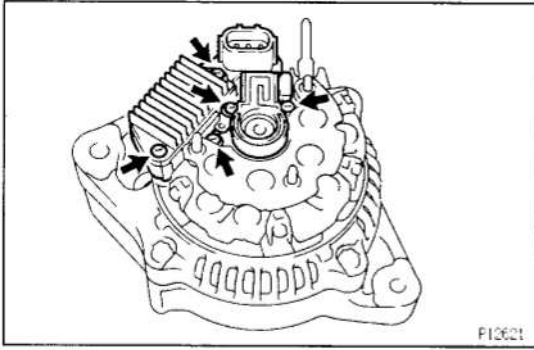


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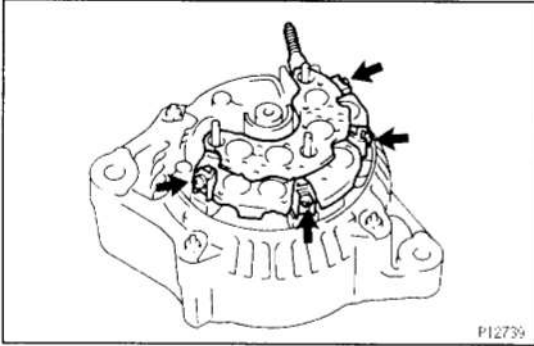
(b) Remove the 3 nuts and end cover.



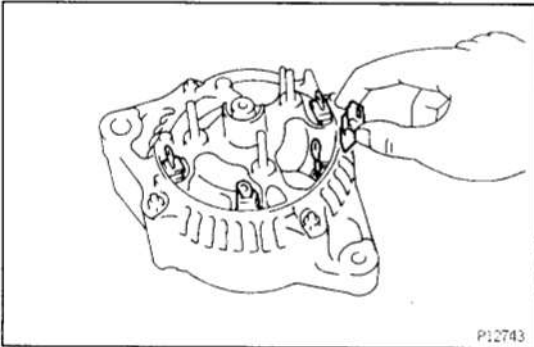
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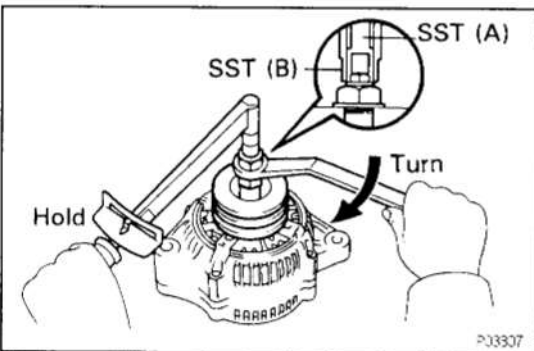
- 2. REMOVE BRUSH HOLDER AND IC REGULATOR**
- (a) Remove the 5 screws, brush holder and IC regulator.
 - (b) Remove the brush holder cover from the brush holder.



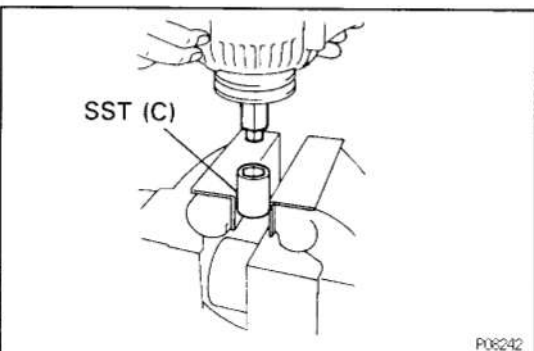
- 3. REMOVE RECTIFIER HOLDER**
- (a) Remove the 4 screws and rectifier holder.



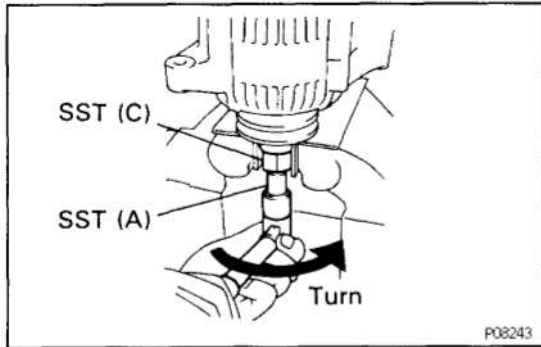
- (b) Remove the 4 rubber insulators.



- 4. REMOVE PULLEY**
- (a) Hold SST (A) with a torque wrench, and tighten SST (B) clockwise to the specified torque.
SST 09820-63010
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)
 - (b) Check that SST (A) is secured to the rotor shaft.



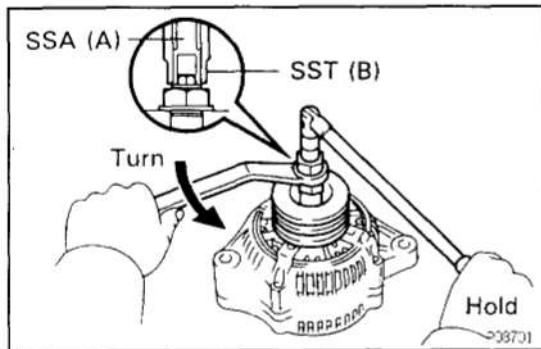
- (c) Mount SST (C) in a vise.
- (d) Install the pulley nut to SST (C).



(e) To loosen the pulley nut, turn SST (A) in the direction shown in the illustration.

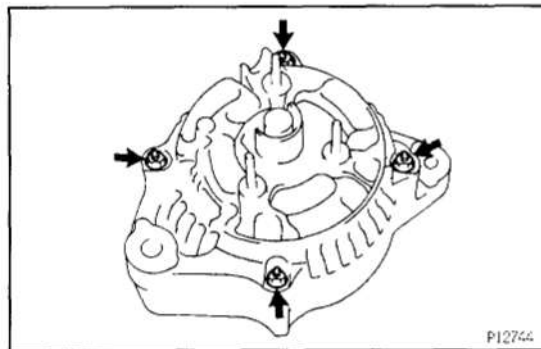
NOTICE: To prevent damage to the rotor shaft, do not loosen the pulley nut more than one-half of a turn.

(f) Remove the alternator from SST (C).



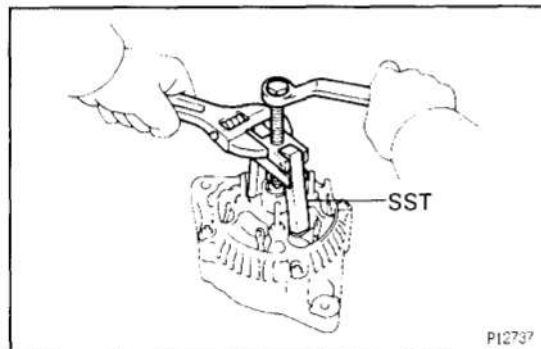
(g) Turn SST (B), and remove SST (A and B).

(h) Remove the pulley nut and pulley.

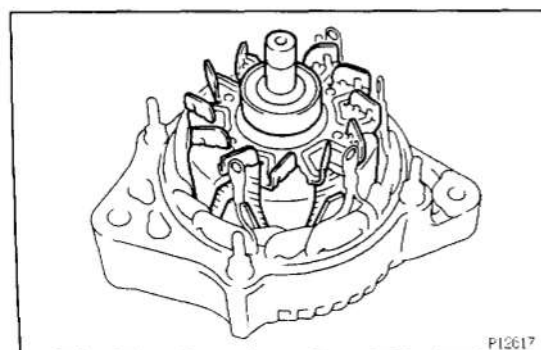


5. REMOVE RECTIFIER END FRAME

(a) Remove the 4 nuts.



(b) Using SST, remove the rectifier end frame.
SST 09286-46011



6. REMOVE ROTOR FROM DRIVE END FRAME

ALTERNATOR INSPECTION AND REPAIR**Rotor****1. INSPECT ROTOR FOR OPEN CIRCUIT**

Using an ohmmeter, check that there is continuity between the slip rings.

Standard resistance (Cold):

2.7 – 3.1 Ω

If there is no continuity, replace the rotor.

2. INSPECT ROTOR FOR GROUND

Using an ohmmeter, check that there is no continuity between the slip ring and rotor.

If there is continuity, replace the rotor.

3. INSPECT SLIP RINGS

(a) Check that the slip rings are not rough or scored. If rough or scored, replace the rotor.

(b) Using a vernier caliper, measure the slip ring diameter.

Standard diameter:

14.2 – 14.4 mm (0.559 – 0.567 in.)

Minimum diameter:

12.8 mm (0.504 in.)

If the diameter is less than minimum, replace the rotor.

Stator (Drive End Frame)**1. INSPECT STATOR FOR OPEN CIRCUIT**

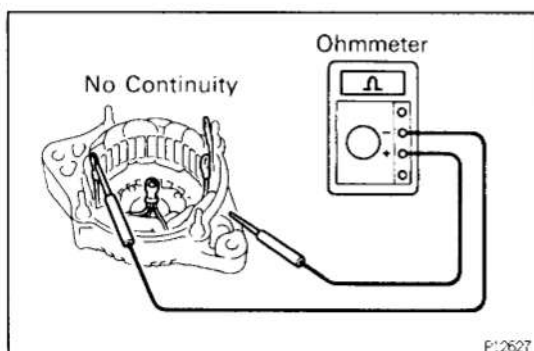
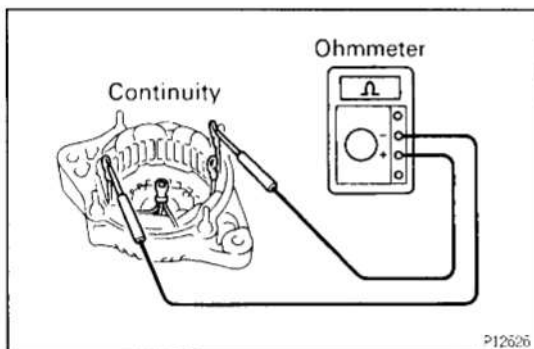
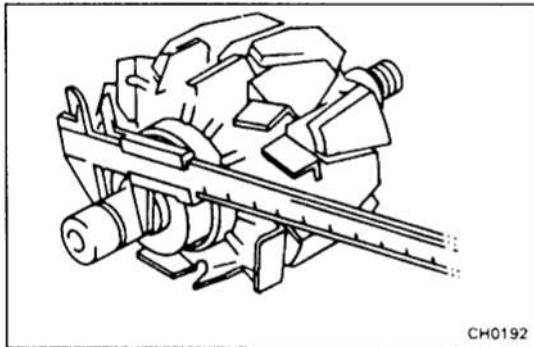
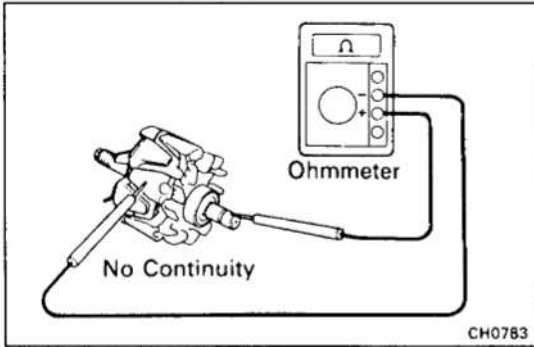
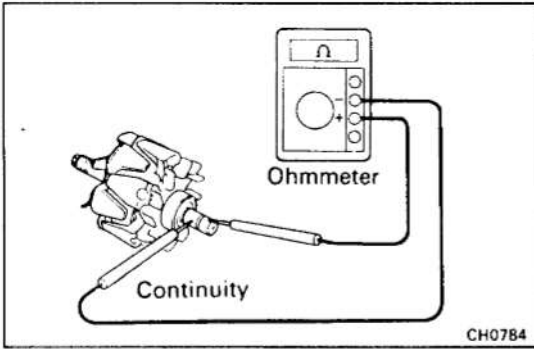
Using an ohmmeter, check that there is continuity between the coil leads.

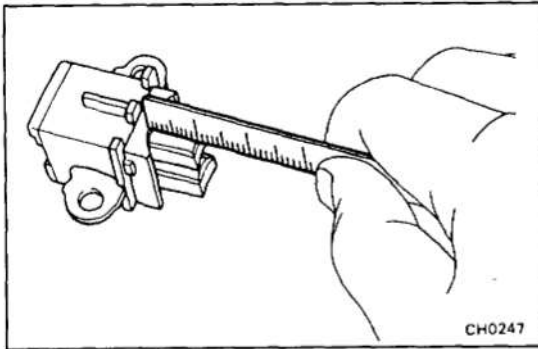
If there is no continuity, replace the drive end frame assembly.

2. INSPECT STATOR FOR GROUND

Using an ohmmeter, check that there is no continuity between the coil lead and drive end frame.

If there is continuity, replace the drive end frame assembly.





Brushes

1. INSPECT EXPOSED BRUSH LENGTH

Using a scale, measure the exposed brush length.

Standard exposed length:

10.5 mm (0.413 in.)

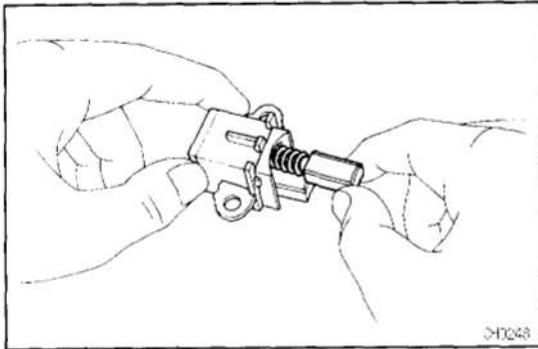
Minimum exposed length:

1.5 mm (0.059 in.)

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

2. IF NECESSARY, REPLACE BRUSHES

- (a) Unsolder and remove the brush and spring.
- (b) Run the wire of a new brush through the spring and the hole in the brush holder, and insert the spring and brush into the brush holder.

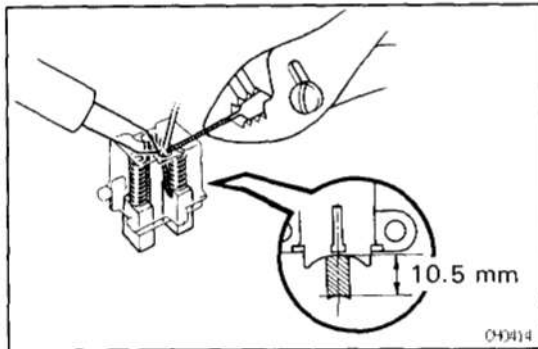


- (c) Solder the brush wire to the brush holder at specified exposed length.

Exposed length:

10.5 mm (0.413 in.)

- (d) Check that the brush moves smoothly in the brush holder.
- (e) Cut off the excess wire.
- (f) Apply insulation paint to the soldered area.

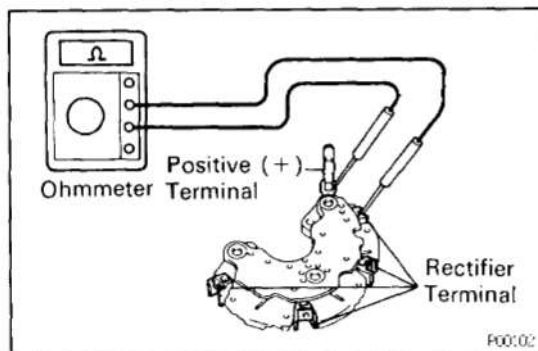


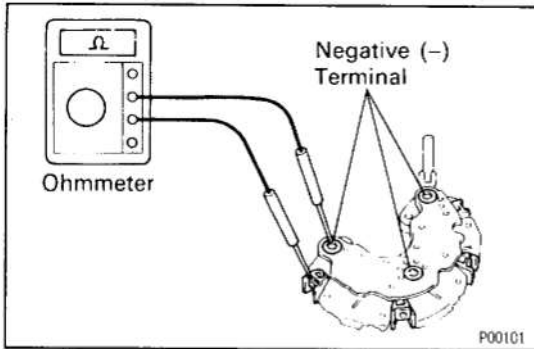
Rectifiers (Rectifier Holder)

1. INSPECT POSITIVE RECTIFIER

- (a) Using an ohmmeter, connect one tester probe to positive (+) terminal and the other to each rectifier terminal.
- (b) Reverse the polarity of the tester probes and repeat step (a).
- (c) Check that one shows continuity and the other shows no continuity.

If continuity is not as specified, replace the rectifier holder.





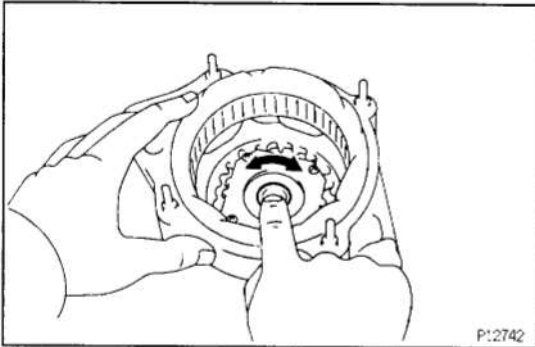
2. INSPECT NEGATIVE RECTIFIER

- (a) Using an ohmmeter, connect one tester probe to each negative (-) terminal and the other to each rectifier terminal.
- (b) Reverse the polarity of the tester probes and repeat step (a).
- (c) Check that one shows continuity and the other shows no continuity.
If continuity is not as specified, replace the rectifier holder.

Bearings

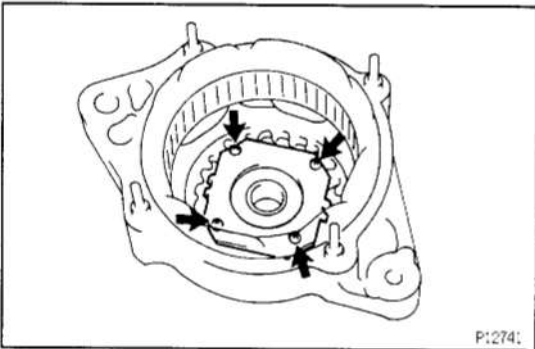
1. INSPECT FRONT BEARING

Check that the bearing is not rough or worn.

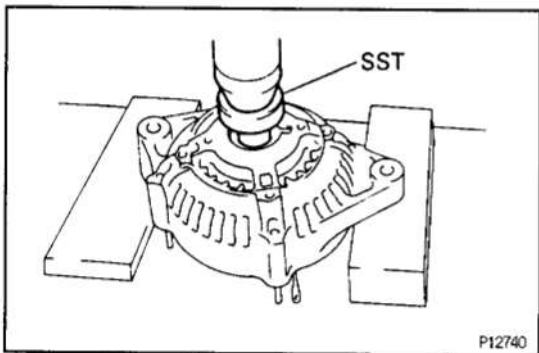


2. IF NECESSARY, REPLACE FRONT BEARING

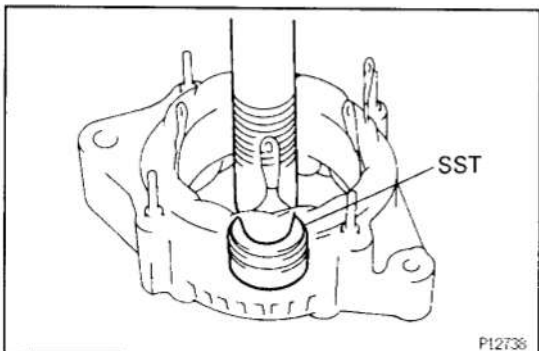
- (a) Remove the 4 screws, bearing retainer and bearing.

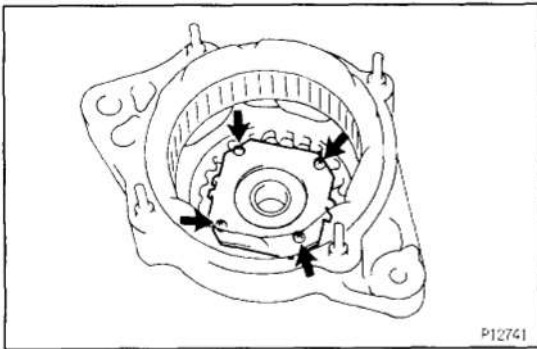


- (b) Using SST and a press, press out the bearing.
SST 09608-20012 (09608-00080)

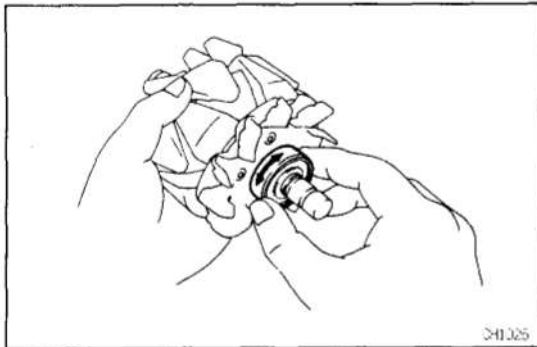


- (c) Using SST and a press, press in a new bearing.
SST 09608-20012 (09608-00030)



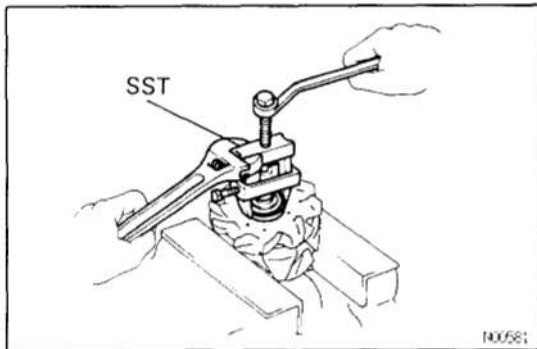


(d) Install the bearing retainer with the 4 screws.



3. INSPECT REAR BEARING

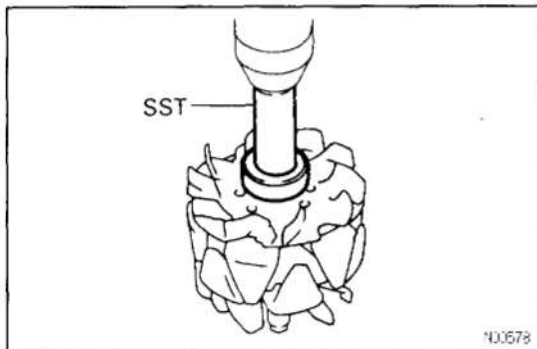
Check that the bearing is not rough or worn.



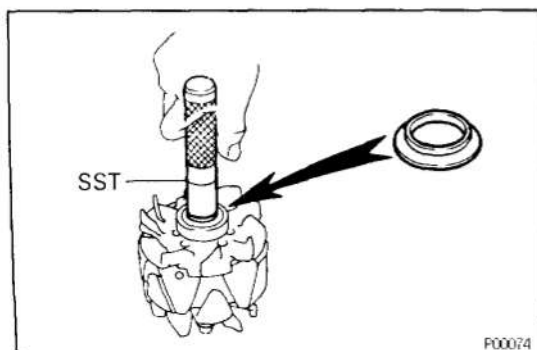
4. IF NECESSARY, REPLACE REAR BEARING

(a) Using SST, remove the bearing cover and bearing.
SST 09820-00021

NOTICE: Be careful not to damage the fan.



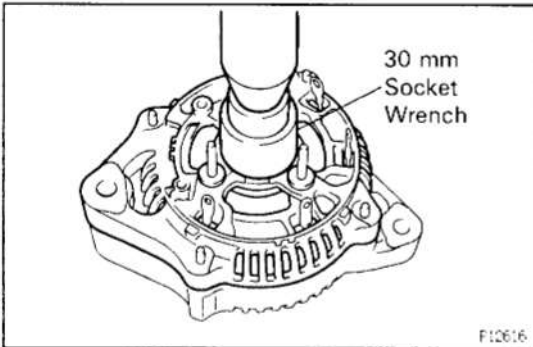
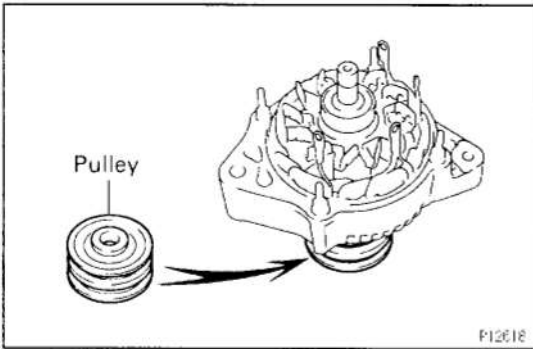
(b) Using SST and a press, press in a new bearing.
SST 09820-00030



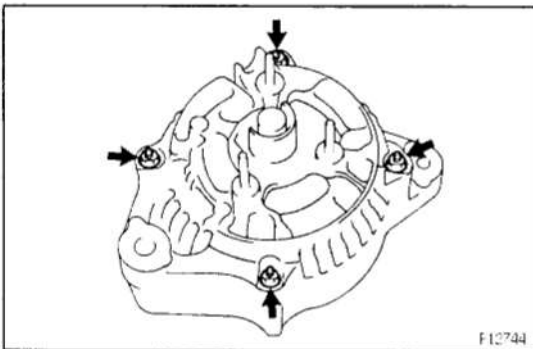
(c) Using SST, push in the bearing cover.
SST 09285-76010

ALTERNATOR ASSEMBLY**(See Components for Disassembly and Assembly)**

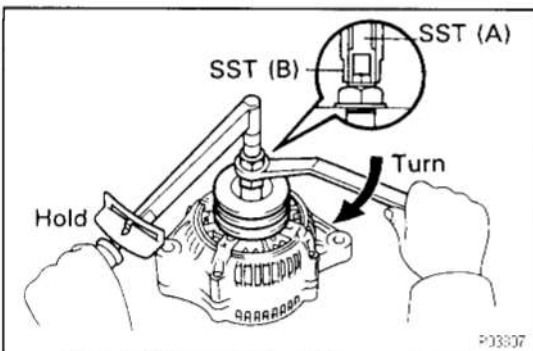
1. PLACE RECTIFIER END FRAME ON PULLEY
2. INSTALL ROTOR TO DRIVE END FRAME

**3. INSTALL RECTIFIER END FRAME**

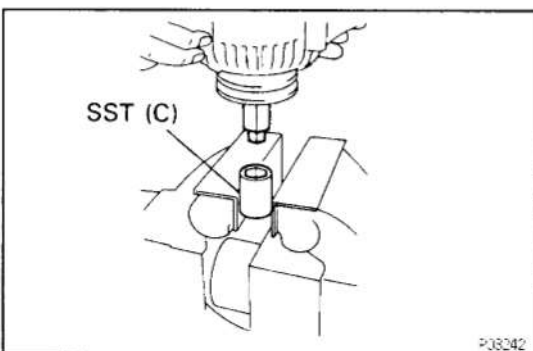
- (a) Using a 30 mm socket wrench and press, slowly press in the rectifier end frame.



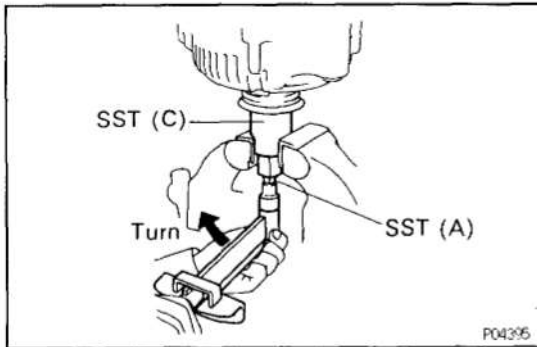
- (b) Install the 4 nuts.

**4. INSTALL PULLEY**

- (a) Install the pulley to the rotor shaft by tightening the pulley nut by hand.
- (b) Hold SST (A) with a torque wrench, and tighten SST (B) clockwise to the specified torque.
SST 09820-63010
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)
- (c) Check that SST (A) is secured to the pulley shaft.



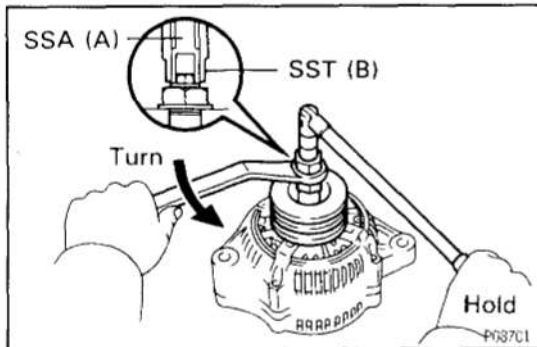
- (d) Mount SST (C) in a vise.
- (e) Install the pulley nut to SST (C).



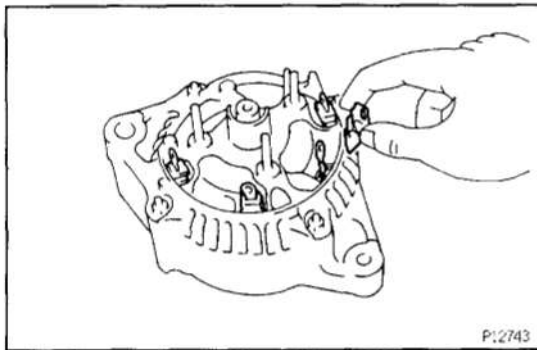
(f) To torque the pulley nut turn SST (A) in the direction shown in the illustration.

Torque: 110 N·m (1,125 kgf·cm, 81 ft·lbf)

(g) Remove the alternator from SST (C).

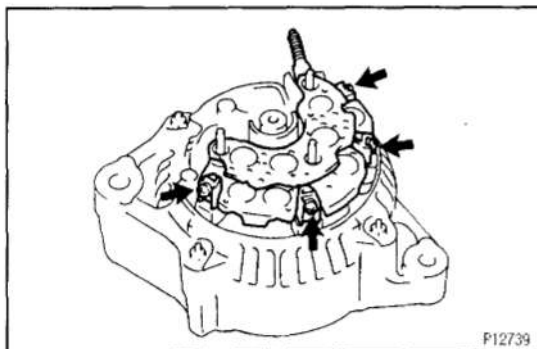


(h) Turn SST (B) and remove SST (A and B).



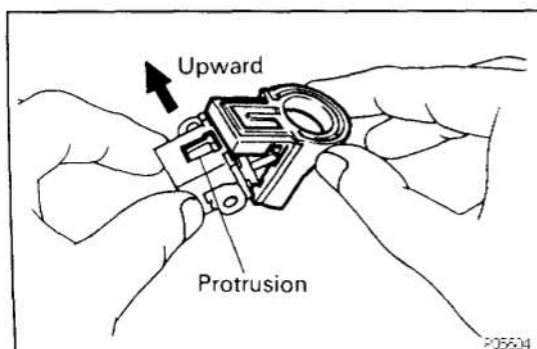
5. INSTALL RECTIFIER HOLDER

(a) Install the 4 rubber insulators on the lead wires.



(b) Install the rectifier holder while pushing it with the 4 screws.

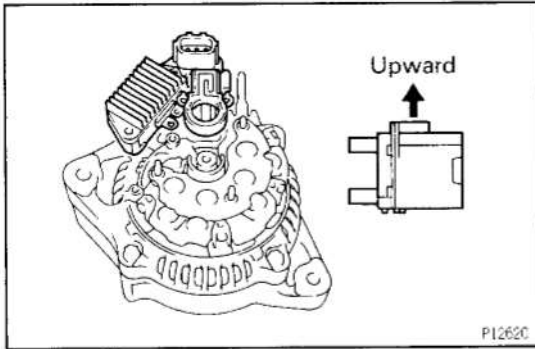
Torque: 1.96 N·m (20 kgf·cm, 17 in·lbf)



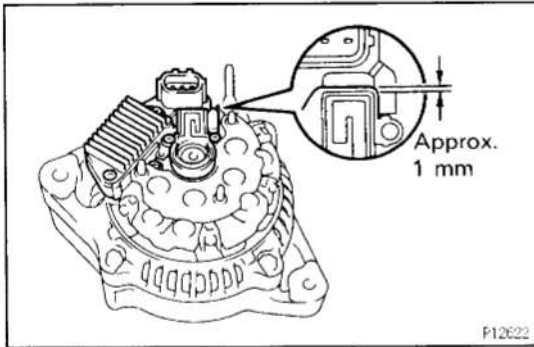
6. INSTALL IC REGULATOR AND BRUSH HOLDER

(a) Install the brush holder cover to the brush holder.

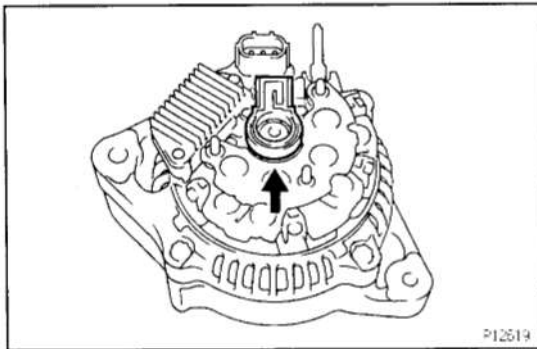
NOTICE: Be careful of the holder installation direction.



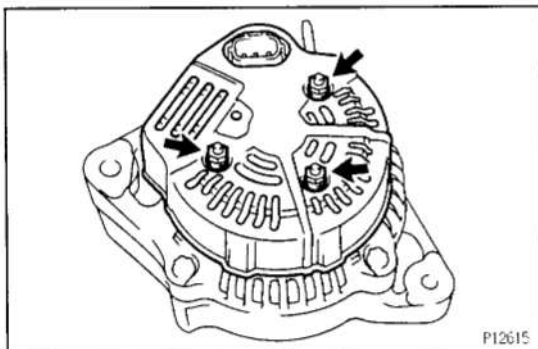
- (b) Place the IC regulator together with the brush holder horizontally on the rectifier end frame.



- (c) Install the 5 screws until there is a clearance of approx. 1 mm (0.04 in.) between the brush holder and connector.

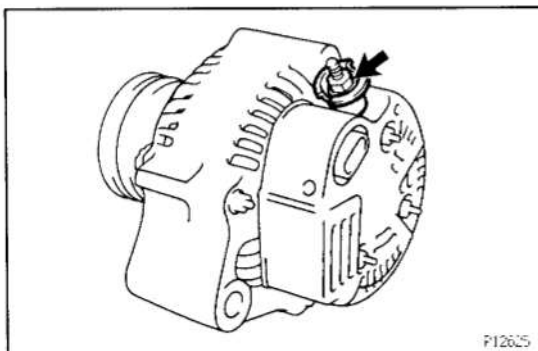


- (d) Fit the brush holder cover.

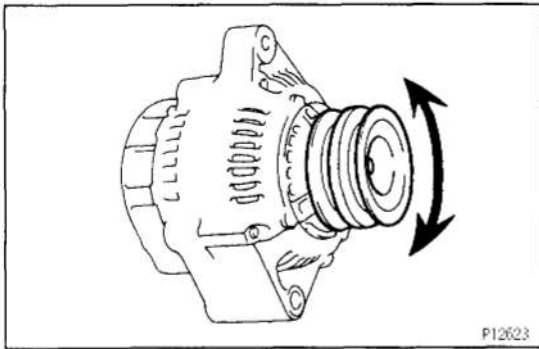


7. INSTALL REAR END COVER

- (a) Install the end cover with the 3 nuts.
Torque: 4.5 N·m (46 kgf·cm, 40 in·lbf)



- (b) Install the terminal insulator with the nut.
Torque: 4.1 N·m (42 kgf·cm, 36 in·lbf)



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8. CHECK THAT ROTOR ROTATES SMOOTHLY

SERVICE SPECIFICATIONS**SERVICE DATA**

CH01A-08

Battery	Specific gravity (When fully charge at 20°C (68°F))	1.27 – 1.29
Drive belt	Deflection – New belt	6 – 8 mm (0.24 – 0.31 in.)
	Deflection – Used belt	8 – 12 mm (0.31 – 0.47 in.)
	Tension – New belt	45 – 55 kgf
	Tension – Used belt	20 – 35 kgf
Alternator	Rated output	12 V – 55 A
	Rotor coil resistance	2.7 – 3.1 Ω
	Slip ring diameter (STD)	14.2 mm – 14.4 mm (0.559 – 0.567 in.)
	Slip ring diameter (Minimum)	12.8 mm (0.504 in.)
	Brush exposed length (STD)	10.5 mm (0.413 in.)
	Brush exposed length (Minimum)	1.5 mm (0.059 in.)
Alternator regulator (IC)	Regulating voltage at 25°C (77°F)	14.0 – 15.0 V
	Regulating voltage at 115°C (239°F)	13.5 – 14.3 V

TORQUE SPECIFICATIONS

CH01C-07

Part tightened	N·m	kgf·cm	ft·lbf
Alternator pulley x Rotor	110	1,125	81
Rectifier end frame x Drive end frame	1.96	20	17 in·lbf
Rear end cover x Alternator	4.5	46	40 in·lbf
Nut for terminal B	4.1	42	36 in·lbf

