

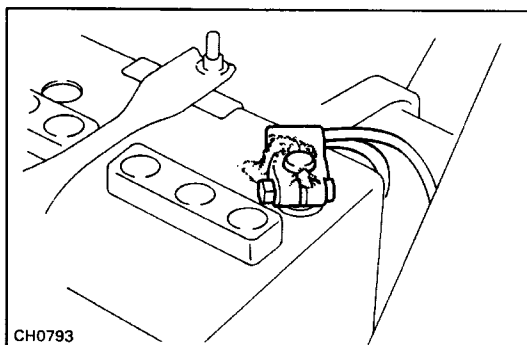
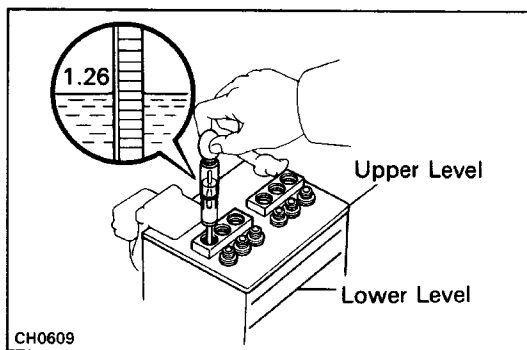
CHARGING SYSTEM

PRECAUTIONS

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 when the engine is running.

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Discharge warning light does not light with ignition ON and engine not running	Fuse blown Light burned out Wiring connections loose IC regulator faulty	Check "I G N" fuses Replace light Tighten loose connections Replace IC regulator	CH-12
Discharge warning light does not go off with engine running (battery requires frequent recharging)	Drive belt loose or worn Battery cables loose, corroded or worn Fuse blown Fusible link blown IC regulator or alternator faulty Wiring faulty	Adjust or replace drive belt Repair or replace cables Check "ECU-IG" fuse Replace fusible link Check charging system Repair wiring	CH-3 CH-4



ON-VEHICLE INSPECTION

1. INSPECT BATTERY SPECIFIC GRAVITY AND ELECTROLYTE LEVEL

- (a) Check the specific gravity of each cell.

Standard specific gravity:

1.25 – 1.27 when fully charged at 20°C(68°F)

If not within specification, charge the battery.

- (b) Check the electrolyte level of each cell.

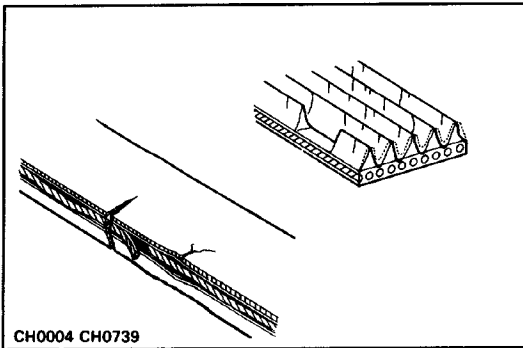
If insufficient, refill with distilled (or purified) water.

2. CHECK BATTERY TERMINALS, FUSIBLE LINK AND FUSES

- (a) Check that the battery terminals are not loose or corroded.

- (b) Check the fusible links and fuses for continuity.

Fusible link:	MAIN	2.0L
H-fuse:	ALT	100A
	AM1	40A
	AM2	30A
Fuse:	ECU-IG	15A
	IGN	7.5A



3. INSPECT DRIVE BELT

(a) Visually check the drive belt for excessive wear, frayed cords etc.

If necessary, replace the drive belt.

HINT: Cracks on rib side of a drive belt are considered acceptable. If the drive belt has chunks missing from the ribs, it should be replaced.

(b) Using a belt tension gauge, measure the drive belt tension.

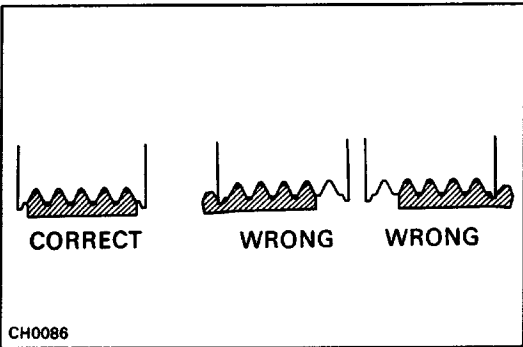
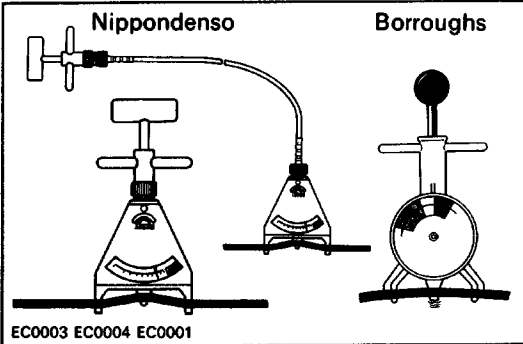
Belt tension gauge:

Nippondenso BTG-20 (95506-00020)

Borroughs No. BT-33-73F

Drive belt tension:

4A-FE	New belt	160 ± 20 lbf
	Used belt	130 ± 20 lbf
3S-GTE w/ A/C	New belt	165 ± 10 lbf
	Used belt	115 ± 20 lbf
	w/o A/C	New belt 150 ± 25 lbf
		Used belt 130 ± 25 lbf
5S-FE w/ A/C	New belt	165 ± 10 lbf
	Used belt	110 ± 10 lbf
	w/o A/C	New belt 125 ± 25 lbf
		Used belt 95 ± 20 lbf



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

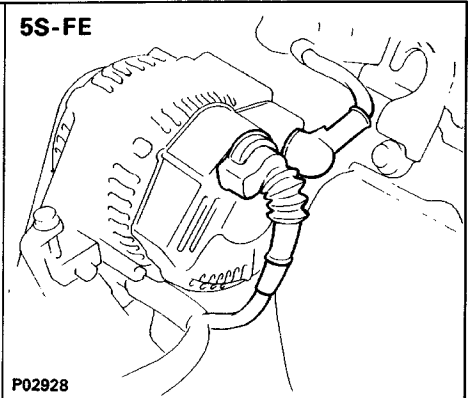
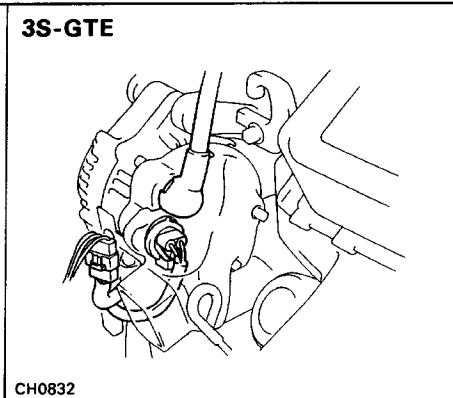
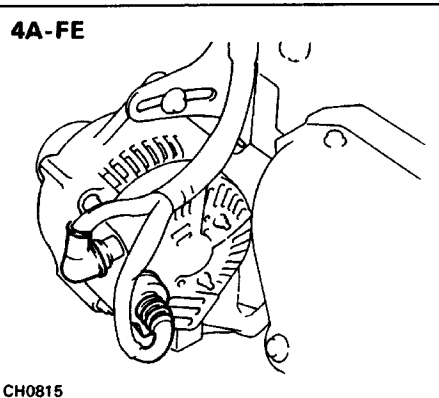
HINT:

- "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 belt, check that it fits properly in the ribbed grooves.
- Check by hand to confirm that the belt has not slipped out of the groove on the bottom of the pulley.
- After installing a new belt, run the engine for about 5 minutes and recheck the belt tension.

4. VISUALLY CHECK ALTERNATOR WIRING AND LISTEN FOR ABNORMAL NOISES

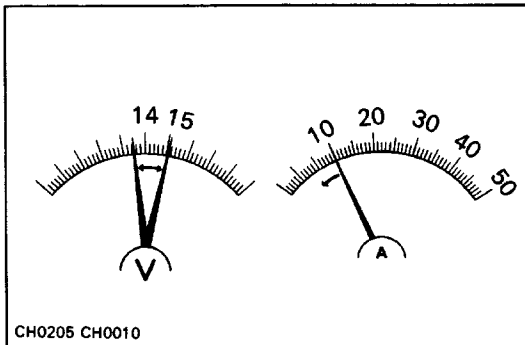
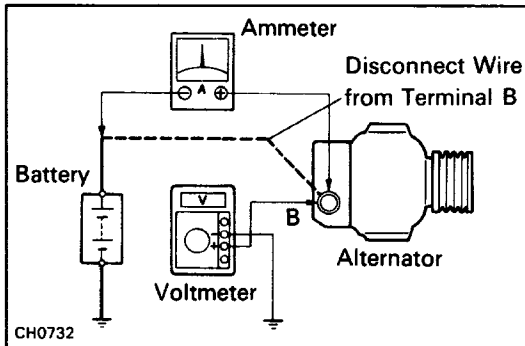
(a) Check that the wiring is in good condition.

(b) Check that there is no abnormal noise from the alternator while the engine is running.



5. INSPECT CHARGE WARNING LIGHT CIRCUIT

- Turn the ignition switch ON. Check that the charge warning light is lit.
 - Start the engine. Check that the light goes off.
- If the light does not go off as specified, troubleshoot the charge 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 manufacturer's instructions.

- 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 (-) probe of the ammeter.
 - Connect the positive (+) probe of the ammeter to terminal B of the alternator.
 - Connect the positive (+) probe of the voltmeter to terminal B of the alternator.
 - Ground the negative (-) probe of the voltmeter.
- Check the charging circuit as follows:

With the engine running from idle to 2,000 rpm, check the reading on the ammeter and voltmeter.

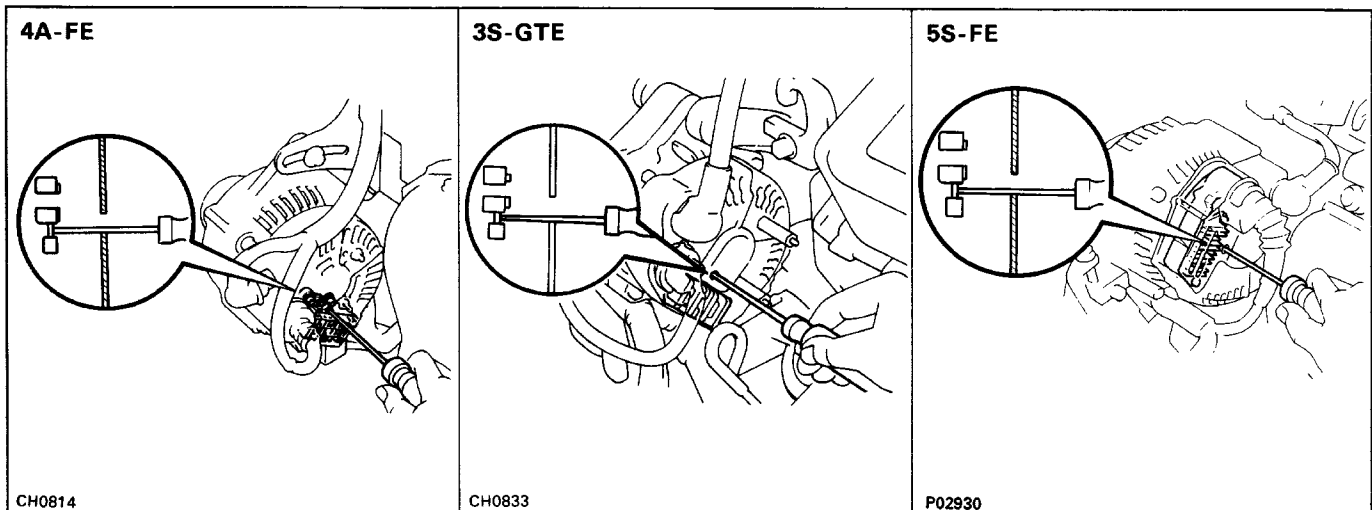
Standard amperage: 10 A or less

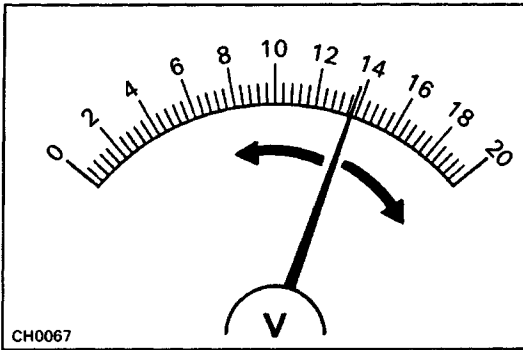
**Standard voltage: 13.9 – 15.1 V at 25°C (77°F)
13.5 – 14.3 V at 115°C (239°F)**

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

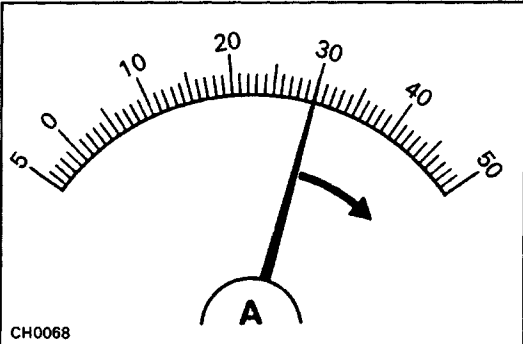
If the voltmeter reading is less than standard voltage, check the IC regulator and alternator as follows:

- With terminal F grounded, start the engine and check the voltmeter reading of terminal B.





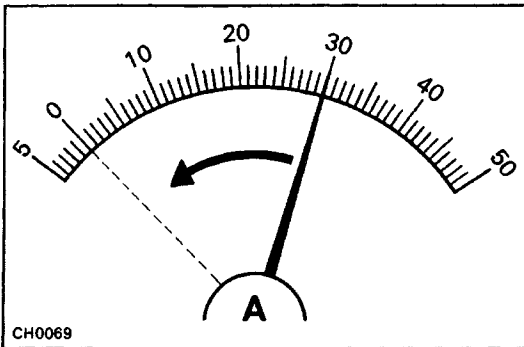
- If the voltmeter reading is greater than standard voltage, replace the IC regulator.
- If the voltmeter reading is less than standard voltage, check the alternator.



7. INSPECT CHARGING CIRCUIT WITH LOAD

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

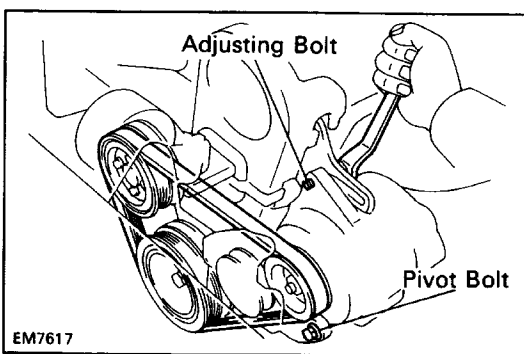
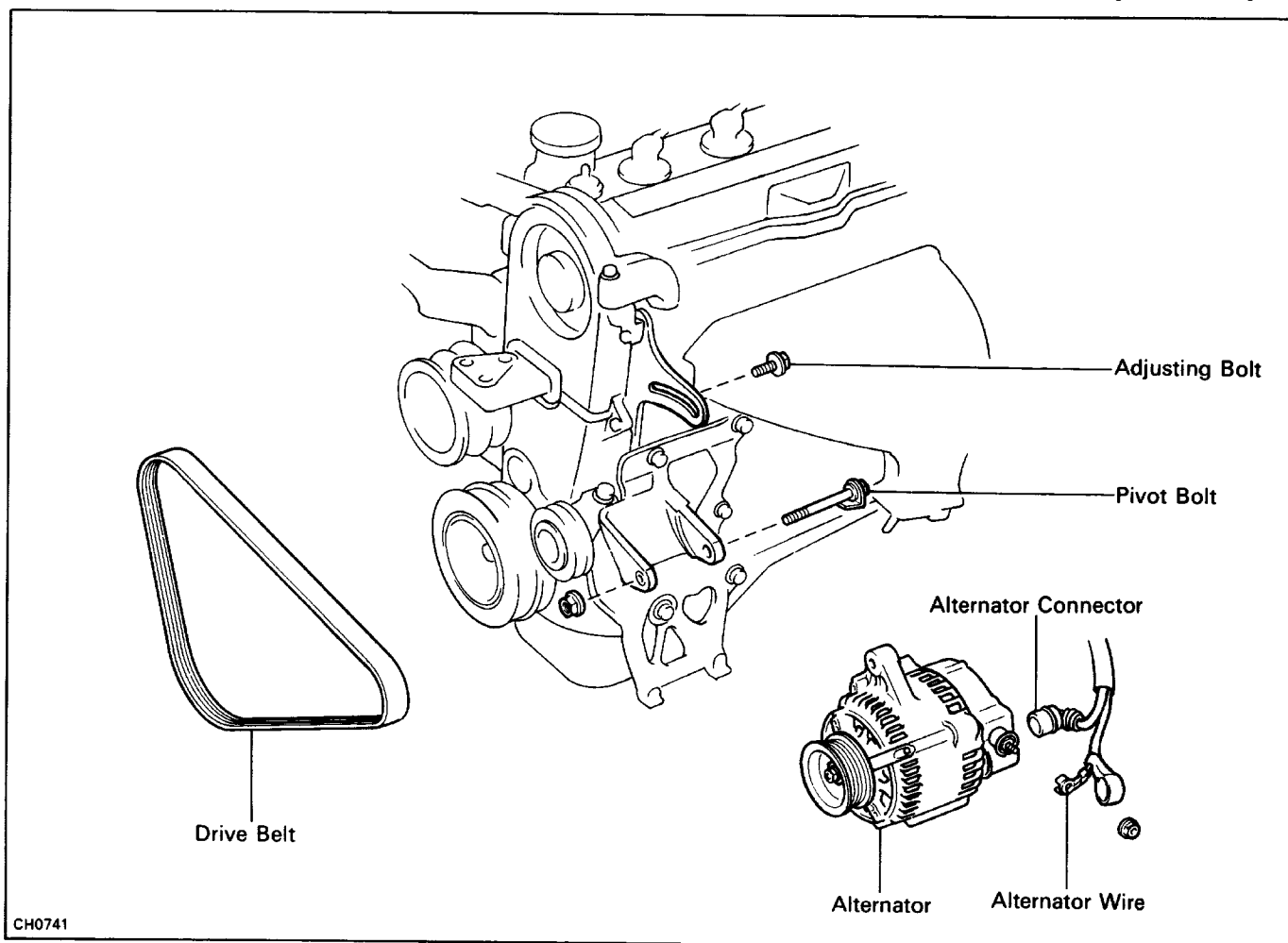
Standard amperage: 30 A or more



If the ammeter reading is less than the standard amperage, repair the alternator. (See page [CH-12](#))
 HINT: With the battery fully charged, the indication will sometimes be less than standard amperage.

ALTERNATOR

REMOVAL OF ALTERNATOR (4A-FE)

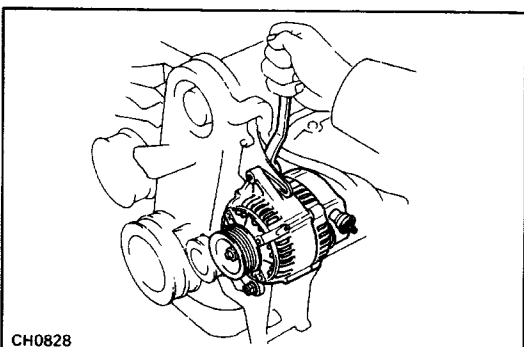


1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.

2. REMOVE DRIVE BELT

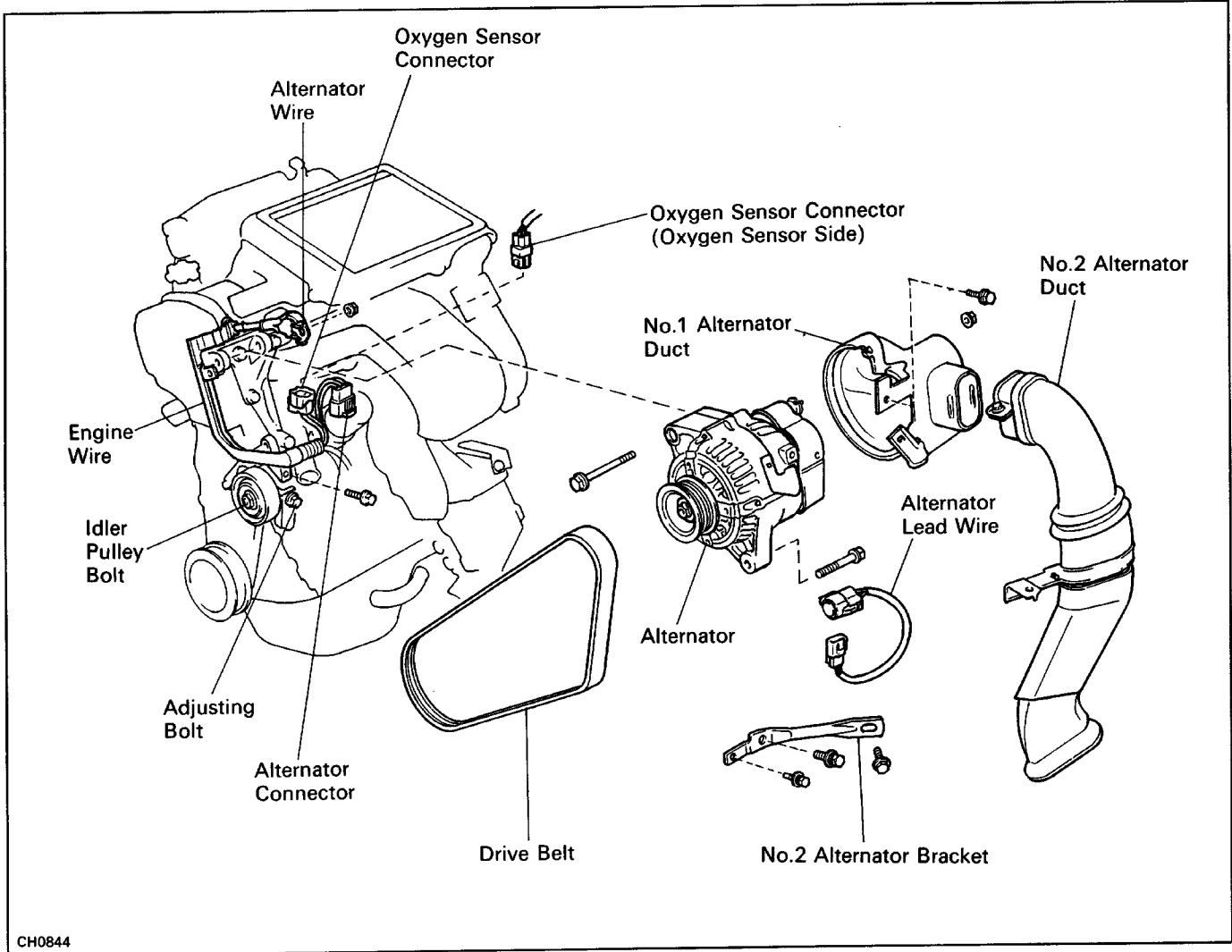
Loosen the pivot nut and adjusting bolt, and remove the drive belt.



3. REMOVE ALTERNATOR

- Disconnect the alternator connector.
- Remove the nut, and disconnect the alternator wire.
- Remove the pivot nut, bolt, adjusting bolt and alternator.

REMOVAL OF ALTERNATOR (3S-GTE)



CH0844

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.

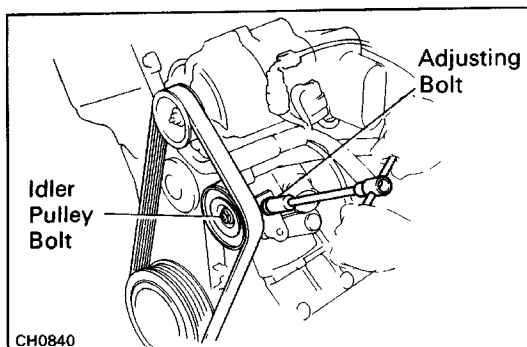
2. DISCONNECT ABS CONTROL RELAY FROM RADIATOR

3. DISCONNECT A/C RELAY BOX FROM BRACKET

4. REMOVE NO.2 ALTERNATOR DUCT

5. REMOVE DRIVE BELT

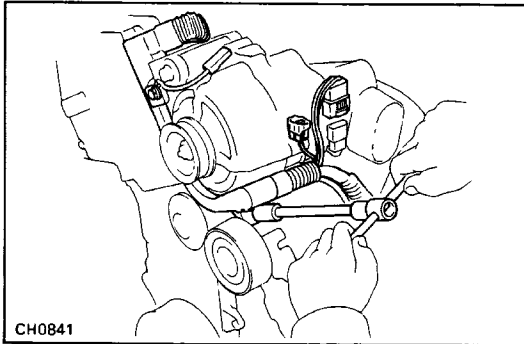
- (a) Loosen the idler pulley bolt.
- (b) Loosen the adjusting bolt, and remove the drive belt.



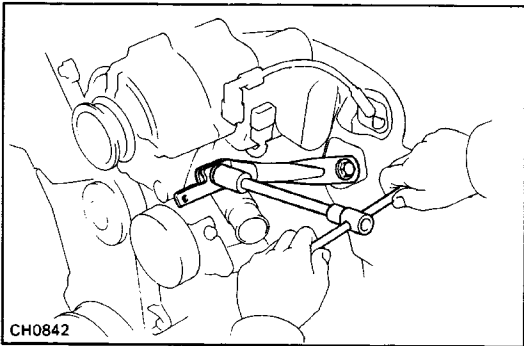
CH0840

6. DISCONNECT ENGINE WIRE

- (a) Disconnect the following connectors and wires:
- Alternator connector from lead wire
 - Alternator wire
 - A/C compressor connector
 - Water temperature switch connector
 - Oxygen sensor wire clamp from No.1 alternator duct
 - Oxygen sensor connector
 - Oxygen sensor connector (wiring harness side) from No.1 alternator duct
- (b) Remove the two bolts, and disconnect the ground strap and engine wire from the brackets.



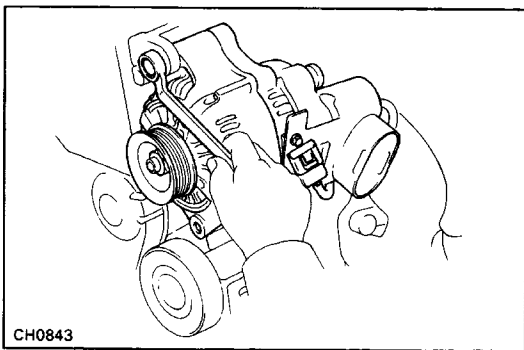
CH0841



CH0842

7. REMOVE NO.2 ALTERNATOR BRACKET

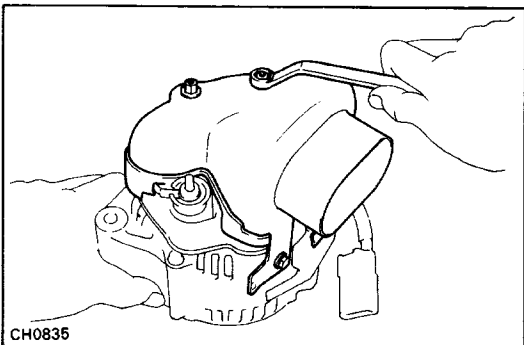
Remove the two bolts and alternator bracket.

8. REMOVE ABS ACTUATOR COVER

CH0843

9. REMOVE ALTERNATOR

Remove the two bolts and alternator.

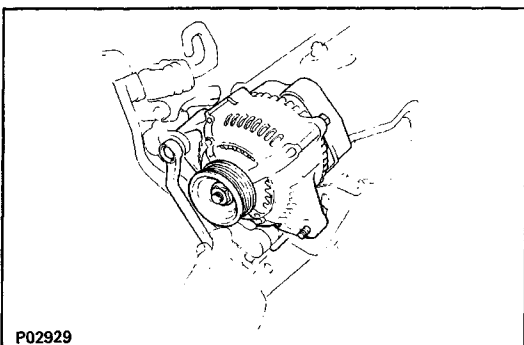
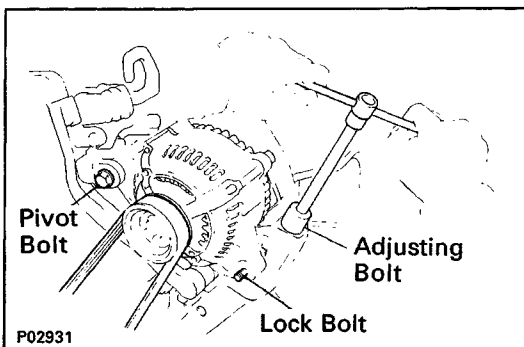
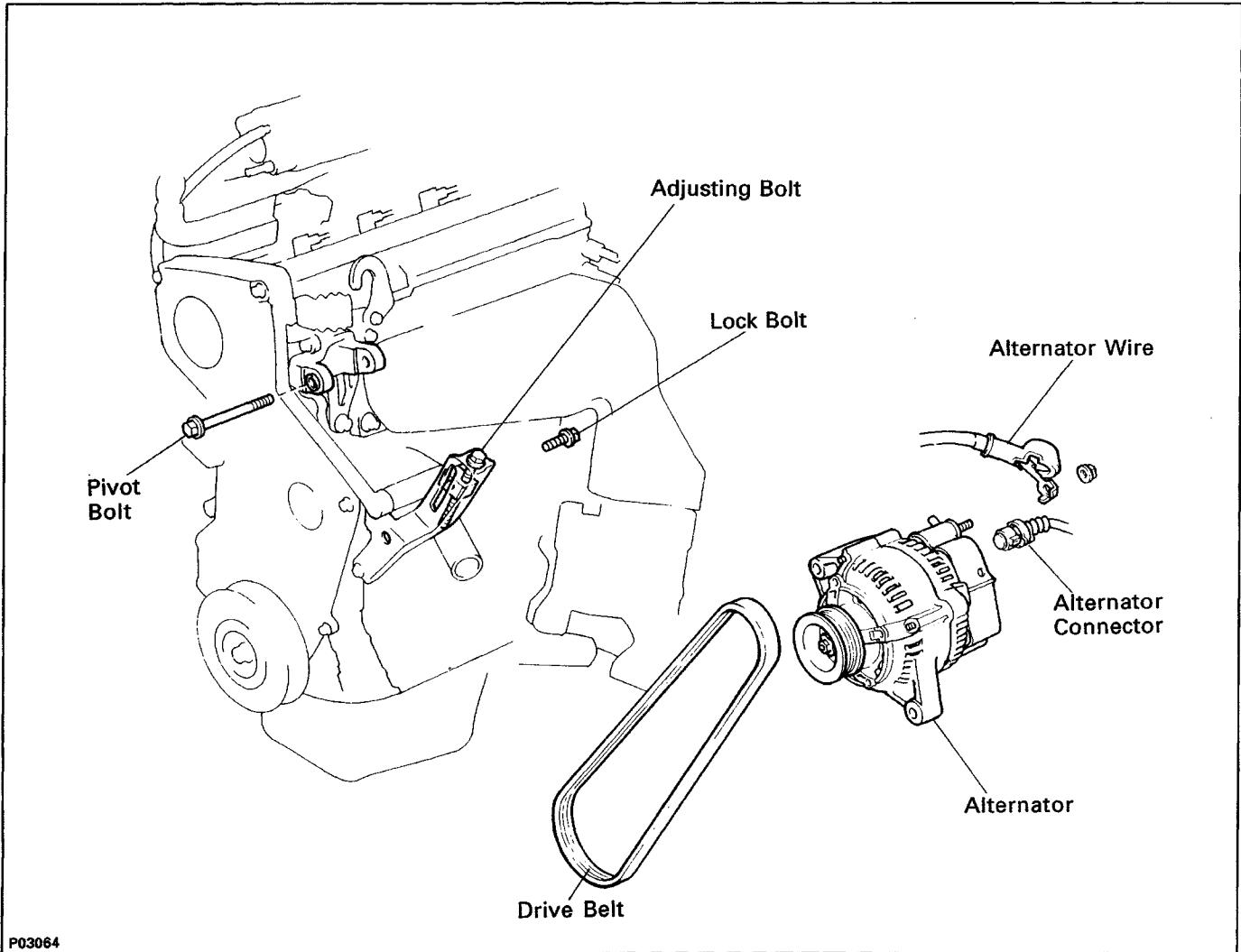


CH0835

10. REMOVE NO.1 ALTERNATOR DUCT

- (a) Remove the two nuts and alternator duct.
- (b) Remove the alternator lead wire.

REMOVAL OF ALTERNATOR (5S-FE)



1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.

2. REMOVE DRIVE BELT

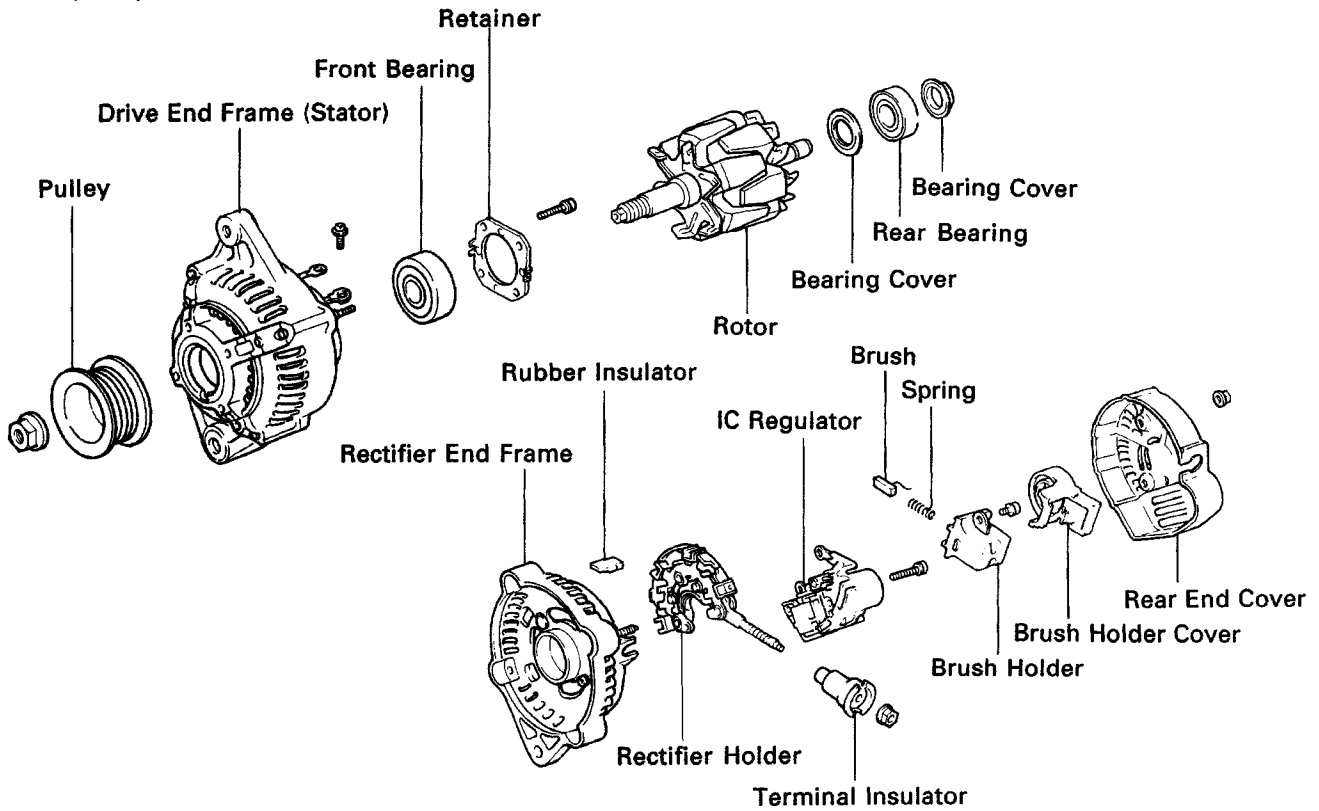
- Loosen the pivot bolt and adjusting lock bolt.
- Loosen the adjusting bolt, and remove the drive belt.

3. REMOVE ALTERNATOR

- Disconnect the alternator connector.
- Remove the nut, and disconnect the alternator wire.
- Remove the pivot bolt, adjusting lock bolt and alternator.

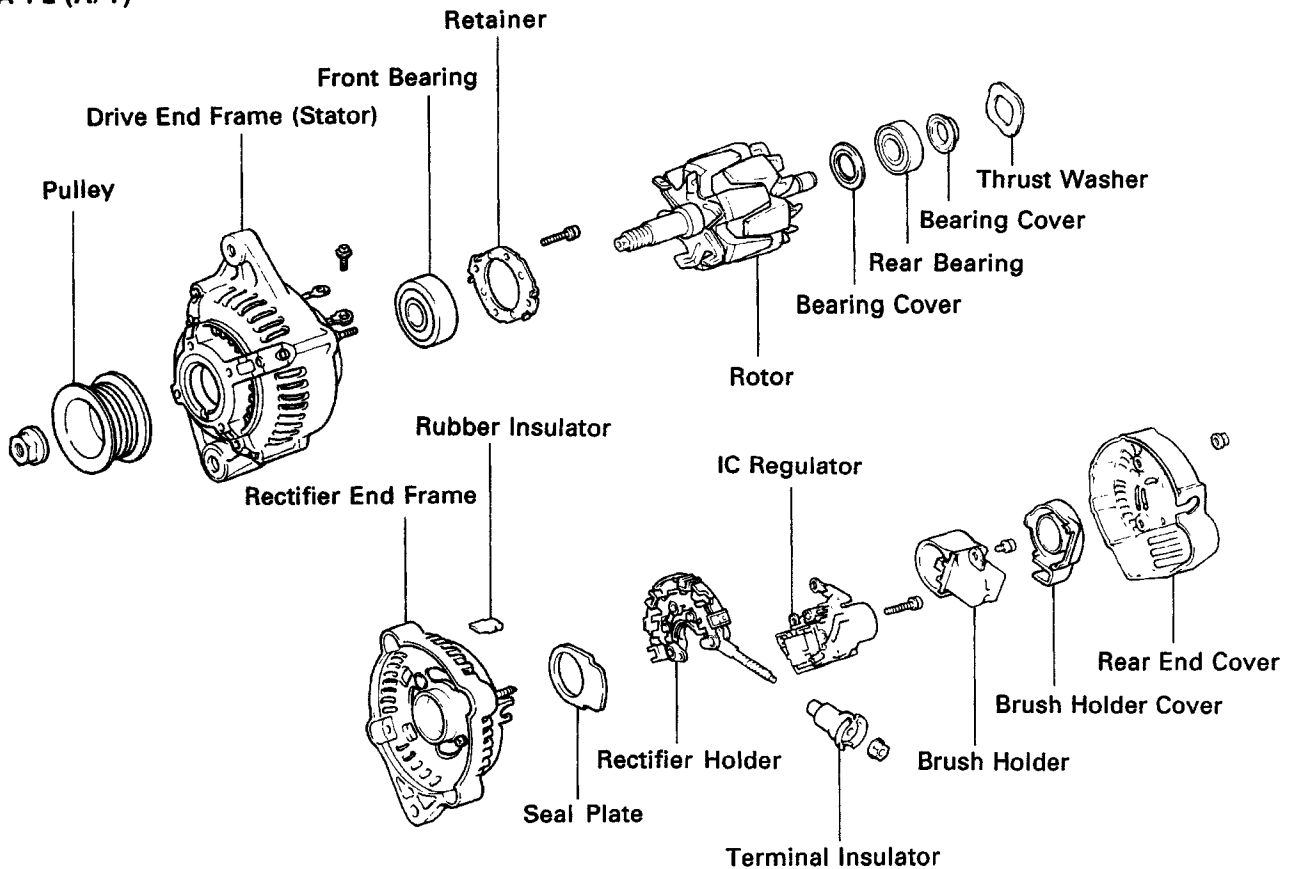
COMPONENTS

4A-FE (M/T)



P02906

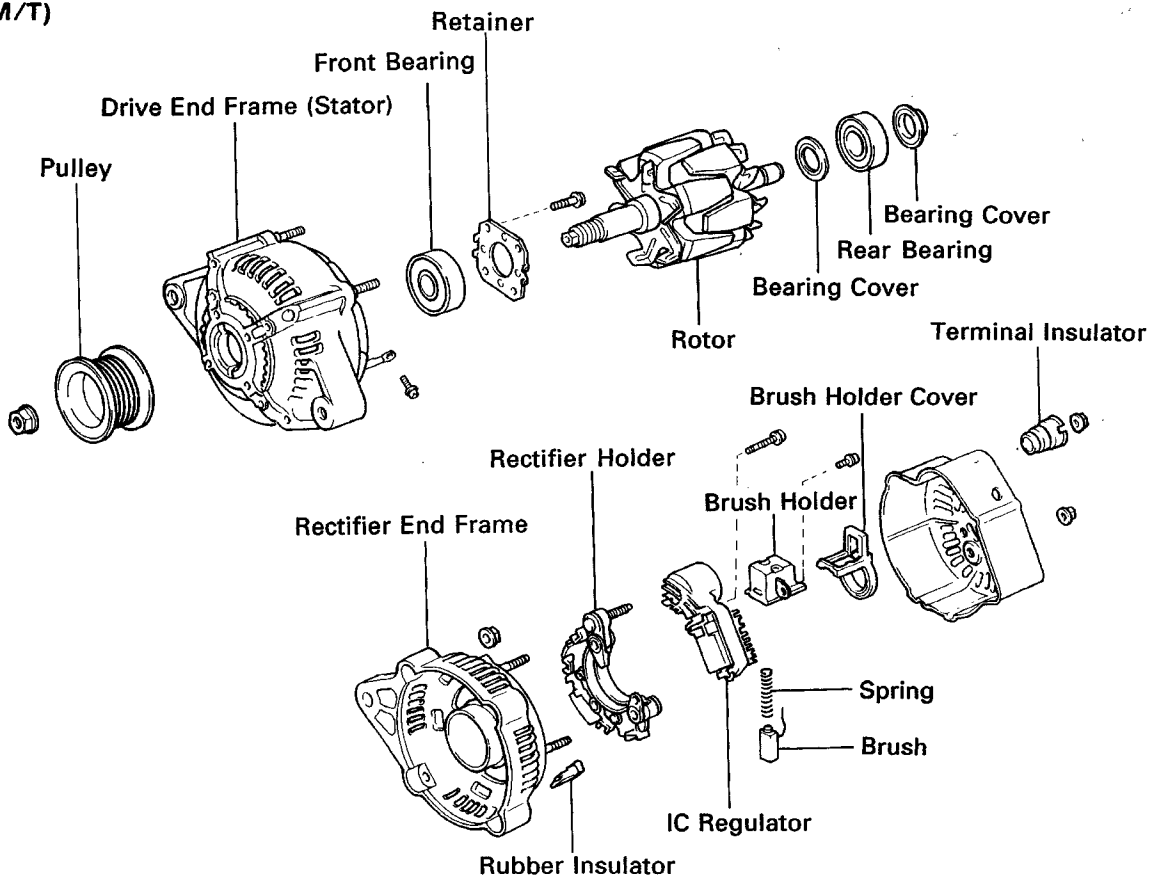
4A-FE (A/T)



P02905

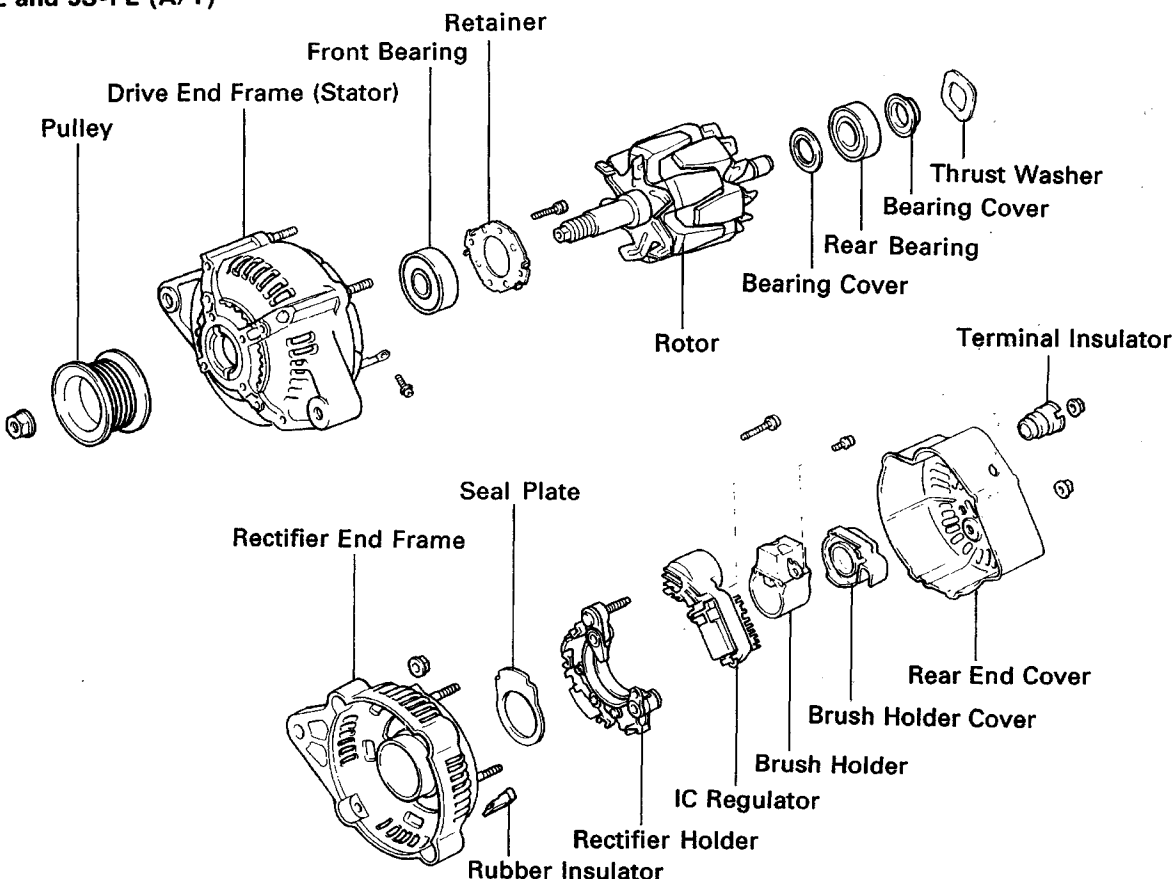
COMPONENTS (Cont'd)

5S-FE (M/T)



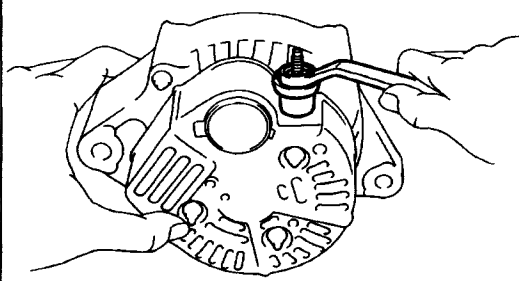
P02907

3S-GTE and 5S-FE (A/T)

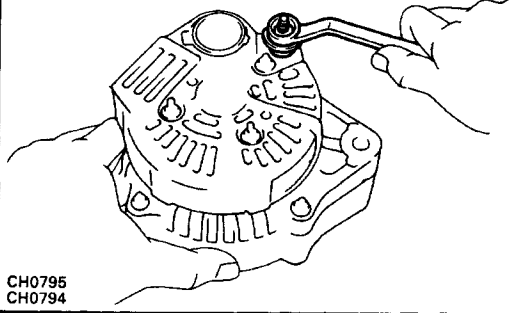
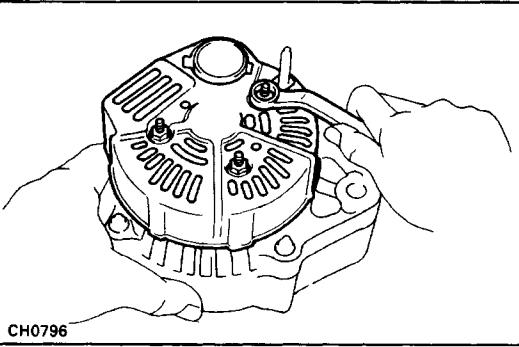


P02908

4A-FE

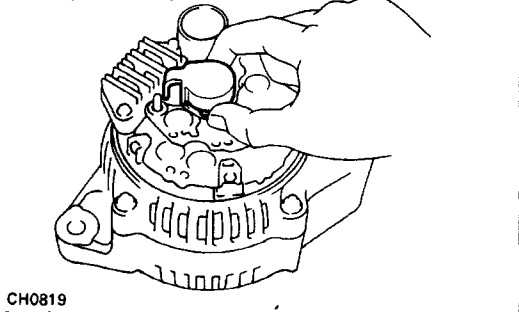


3S-GTE and 5S-FE

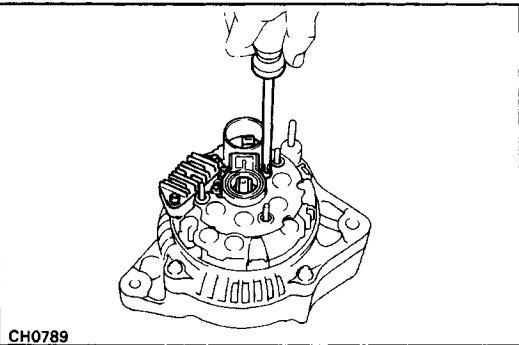
CH0795
CH0794

CH0796

M/T (3S-GTE) and A/T



CH0819



CH0789

DISASSEMBLY OF ALTERNATOR

4A-FE (See page [CH-10](#))

3S-GTE and 5S-FE (See page [CH-11](#))

1. REMOVE REAR END COVER

(a) Remove the nut and terminal insulator.

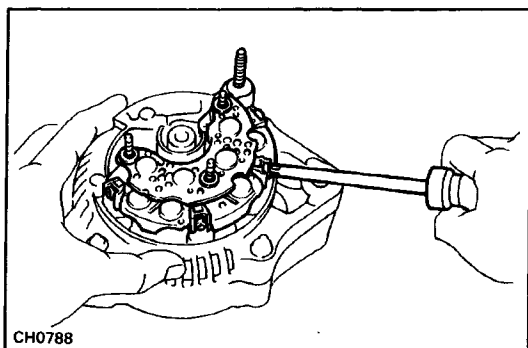
(b) Remove the three nuts and end cover.

2. REMOVE BRUSH HOLDER AND IC REGULATOR

(a) (M/T (3S-GTE) and A/T)

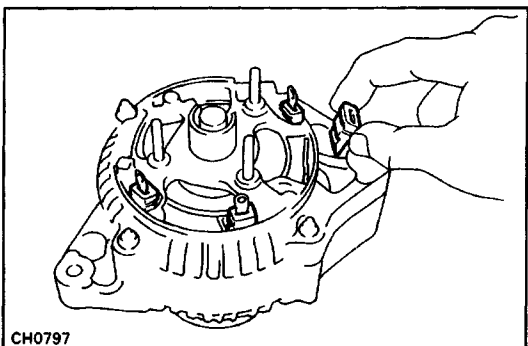
Remove the brush holder cover from the brush holder.

(b) Remove the five screws, brush holder and IC regulator.

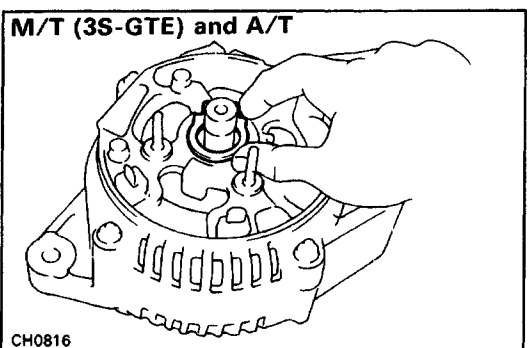


3. REMOVE RECTIFIER HOLDER

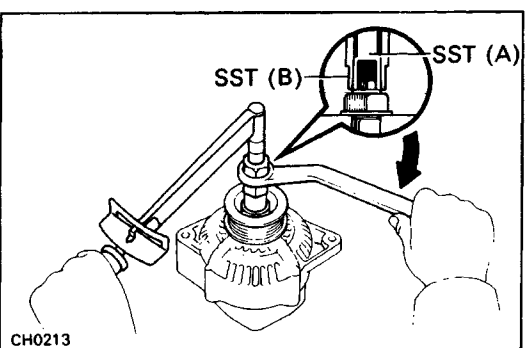
(a) Remove the four screws and rectifier holder.



(b) Remove the four rubber insulators.



(c) (M/T (3S-GTE) and A/T)
Remove the seal plate.

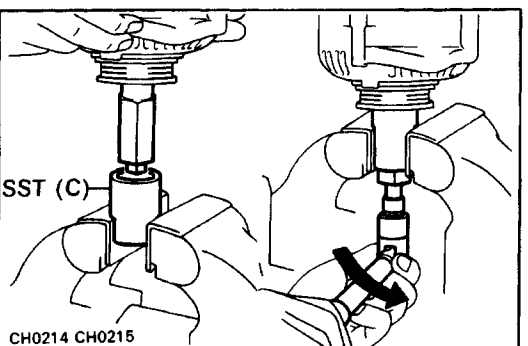


4. REMOVE PULLEY

(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) As shown in the illustration, mount SST (C) in a vise, and install the alternator to SST (C).

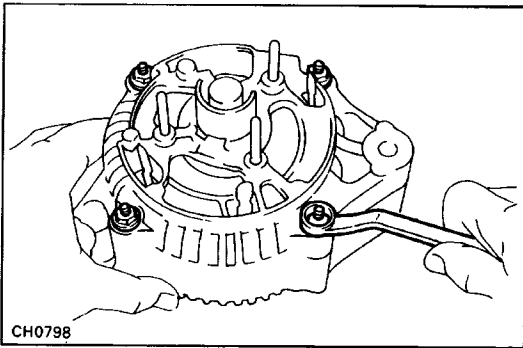
(d) To loosen the pulley nut, turn SST (A) in the direction shown in the illustration.

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

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

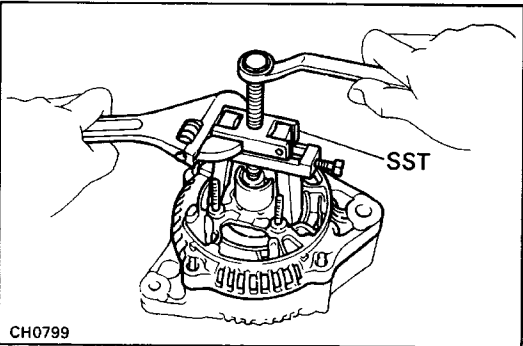
(f) Turn SST (B) and remove SST (A and B).

(g) Remove the pulley nut and pulley.

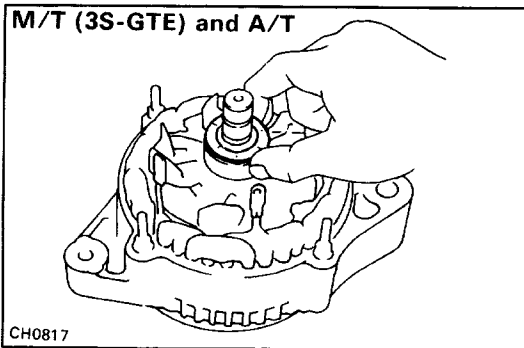


5. REMOVE RECTIFIER END FRAME

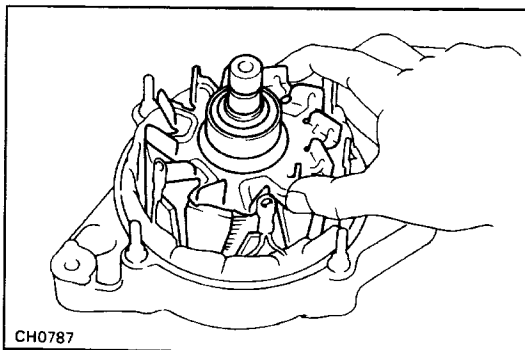
(a) Remove the four nuts.



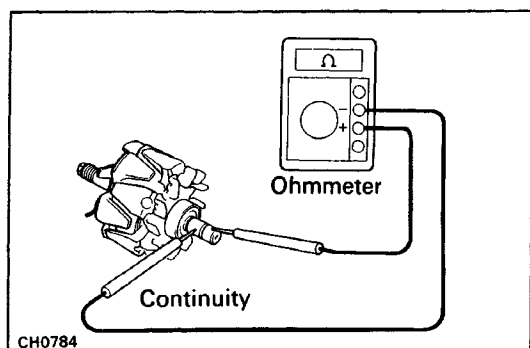
(b) Using SST, remove the rectifier end frame.
SST 09286-46011



(c) (M/T (3S-GTE) and A/T)
Remove the thrust washer.



6. REMOVE ROTOR FROM DRIVE END FRAME



INSPECTION AND REPAIR OF ALTERNATOR

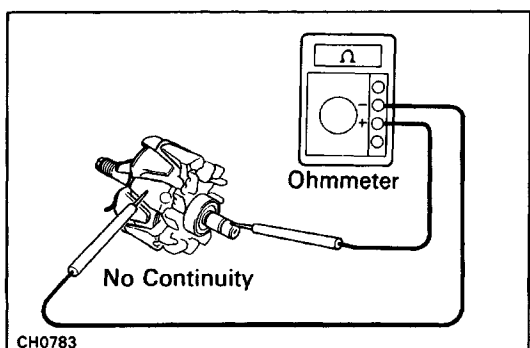
Rotor

1. INSPECT ROTOR FOR OPEN CIRCUIT

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

Standard resistance (Cold): 2.8 – 3.0Ω

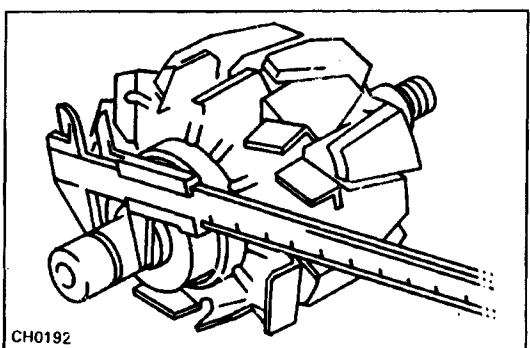
If there is no continuity, replace the rotor.



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.)

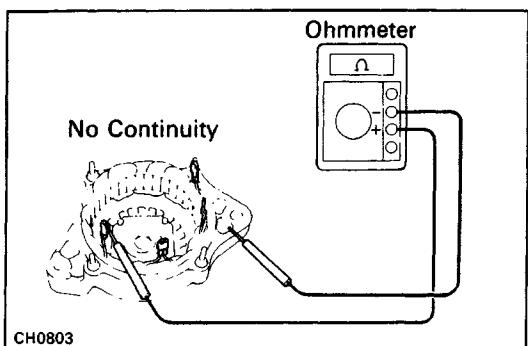
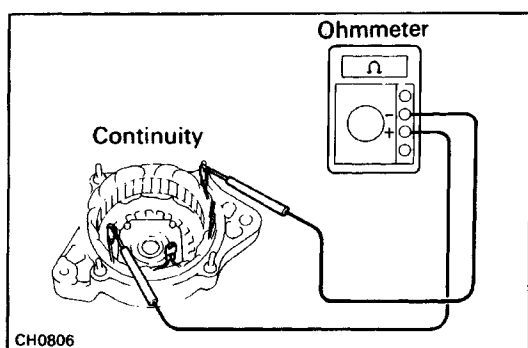
If the diameter is less than minimum, replace the rotor.

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.

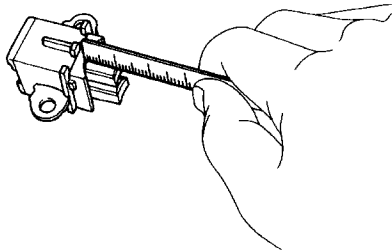


2. INSPECT STATOR FOR GROUND

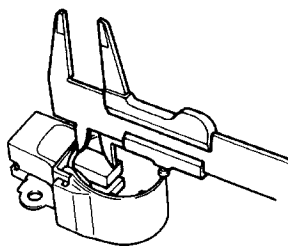
Using an ohmmeter, check that there is no continuity between the coil lead and drive end frame.

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

M/T (4A-FE and 5S-FE)



M/T (3S-GTE) and A/T

CH0247
CH0722

Brushes

1. INSPECT EXPOSED BRUSH LENGTH

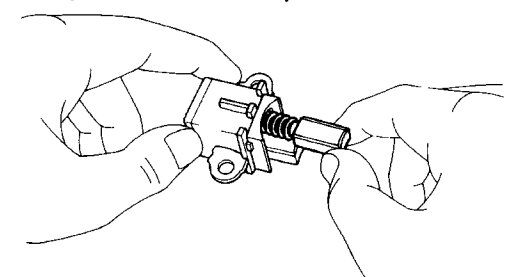
Using a vernier caliper or scale, measure the exposed brush length.

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 (M/T (4A-FE and 5S-FE)) or brushes and brush holder assembly (M/T (3S-GTE) and A/T).

M/T (4A-FE and 5S-FE)



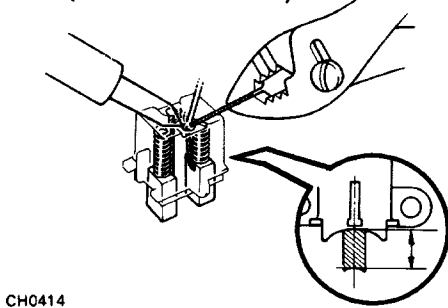
CH0248

2. (M/T (4A-FE AND 5S-FE))

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.

M/T (4A-FE and 5S-FE)



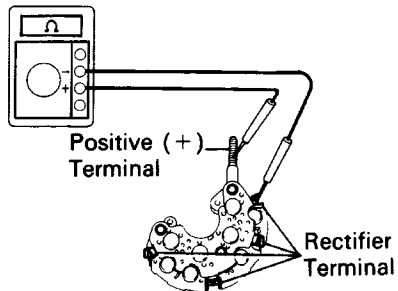
CH0414

- (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.

4A-FE Ohmmeter



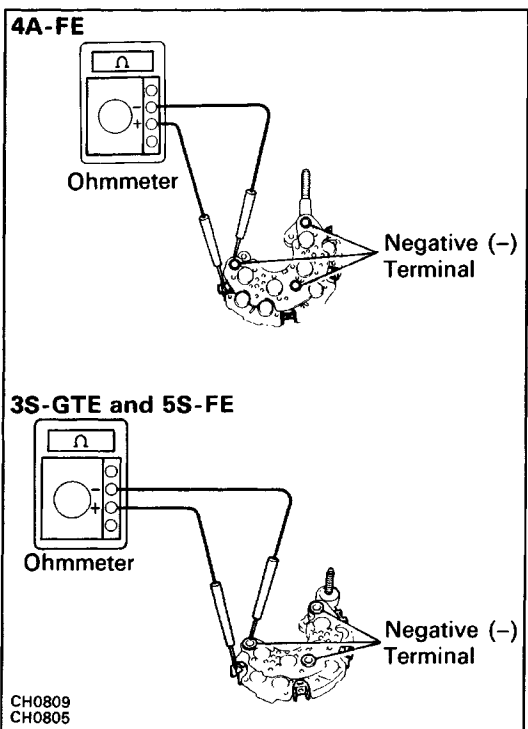
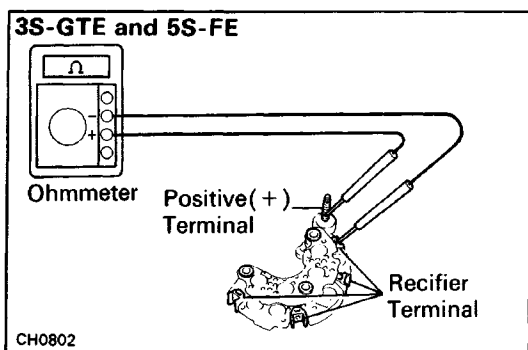
CH0808

Rectifiers (Rectifier Holder)

1. INSPECT POSITIVE RECTIFIER

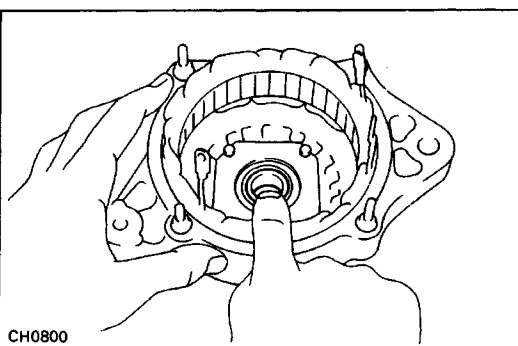
- (a) Using an ohmmeter, connect one tester probe to the positive (+) terminal and the other to each rectifier terminal.
- (b) Reverse the polarity of the tester probes and repeat step (a).
- (c) Check that one shows continuity and the other shows no continuity.

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



2. INSPECT NEGATIVE RECTIFIER

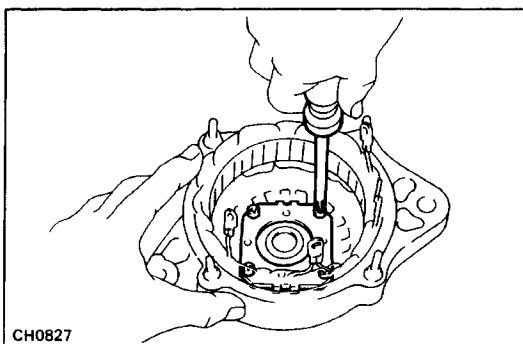
- (a) Using an ohmmeter, connect one tester probe to each negative (-) terminal and the other to each rectifier terminal.
 - (b) Reverse the polarity of the tester probes and repeat step (a)..
 - (c) Check that one shows continuity and the other shows no continuity.
- If continuity is not as specified,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



Bearings

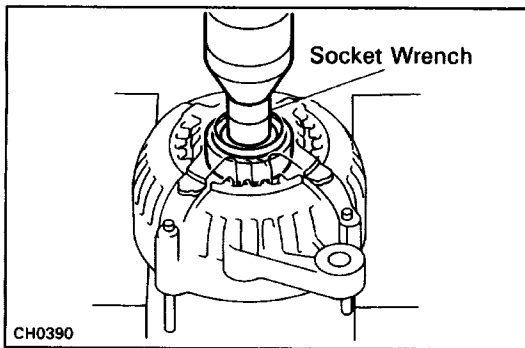
1. INSPECT FRONT BEARING

Check that the bearing is not rough or worn.

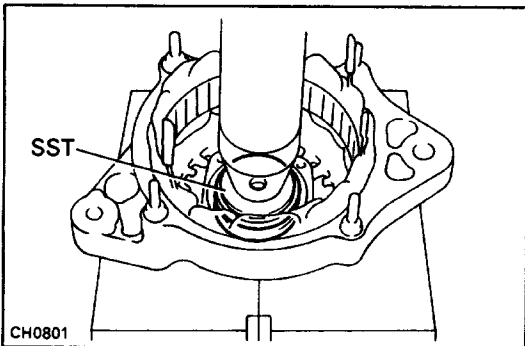


2. IF NECESSARY, REPLACE FRONT BEARING

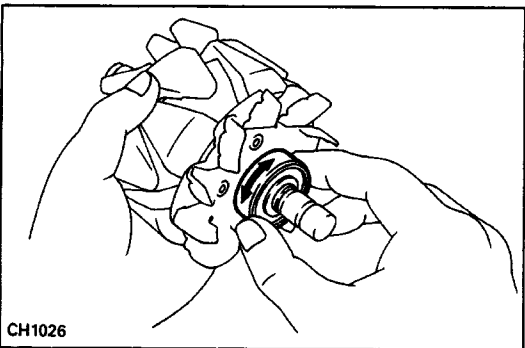
- (a) Remove the four screws, bearing retainer and bearing.



- (b) Using socket wrench and press, press out the bearing.

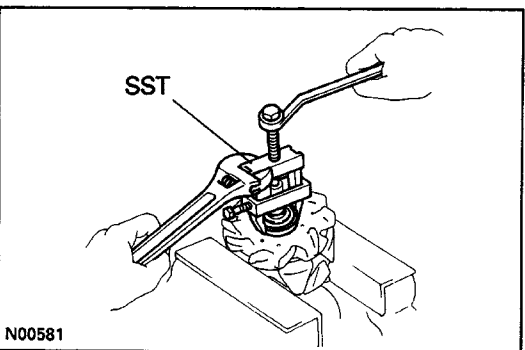


- (c) Using SST and a press, press in a new bearing.
SST 09608-20012 (09608-00030)
(d) Install the bearing retainer with the four screws.



3. INSPECT REAR BEARING

Check that the bearing is not rough or worn.

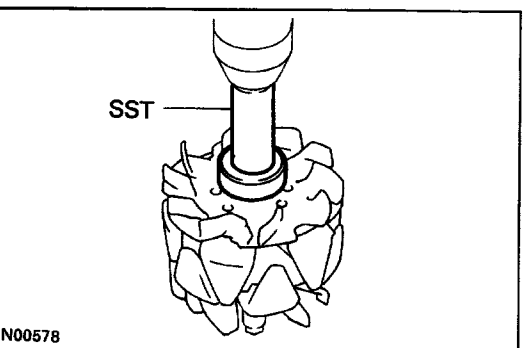


4. IF NECESSARY, REPLACE REAR BEARING

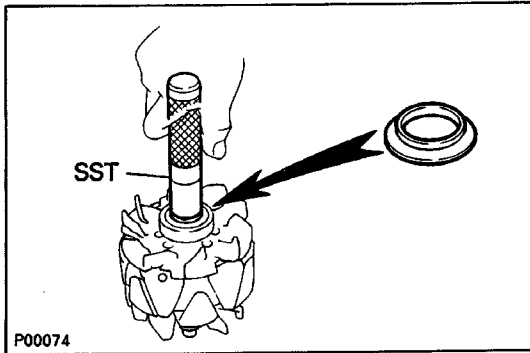
- (a) Using SST, remove the bearing covers and bearing.
SST 09820-00021

NOTICE: Be careful not to damage the fan.

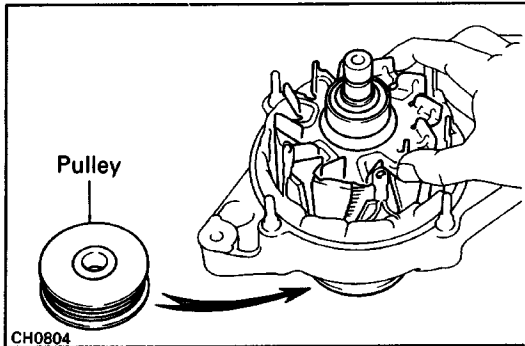
- (b) Place the bearing cover on the rotor.



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



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



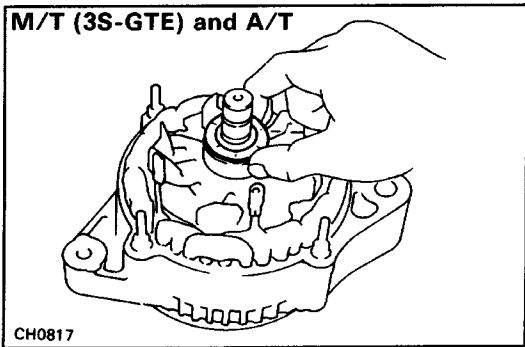
ASSEMBLY OF ALTERNATOR

4A-FE (See page EM-10)

3S-GTE and 5S-FE (See page EM-11)

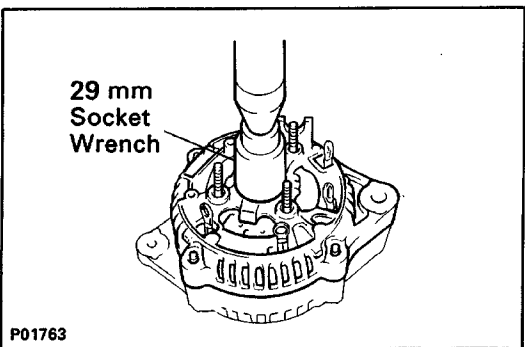
1. INSTALL ROTOR TO RECTIFIER END FRAME

- (a) Place the rectifier end frame on the pulley.
- (b) Install the rotor to the rectifier end frame.

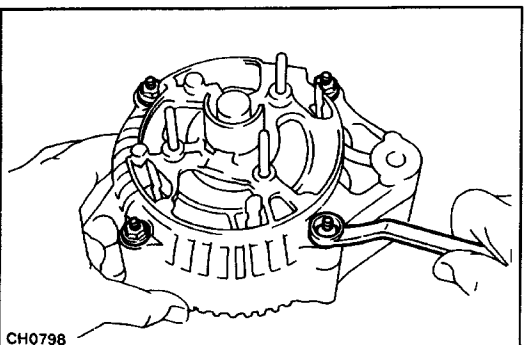


2. INSTALL RECTIFIER END FRAME

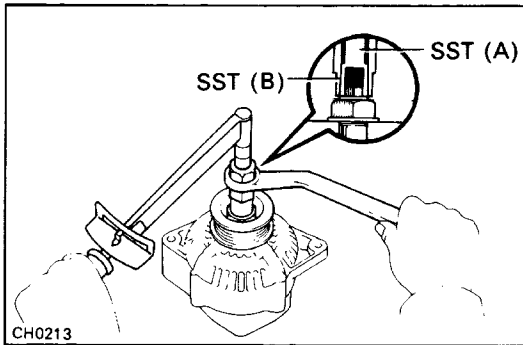
- (a) (M/T (3S-GTE) and A/T)
Place the thrust washer on the rotor.



- (b) Using a 29 mm socket wrench and press, slowly press in the rectifier end frame.



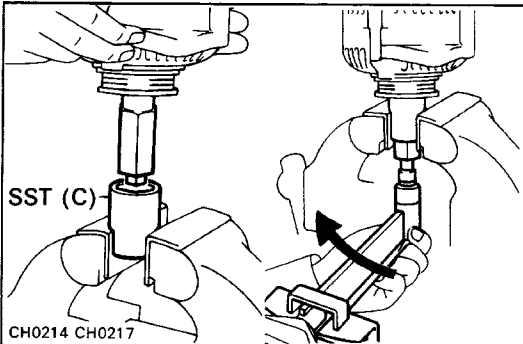
- (c) Install the four nuts.

3. 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)

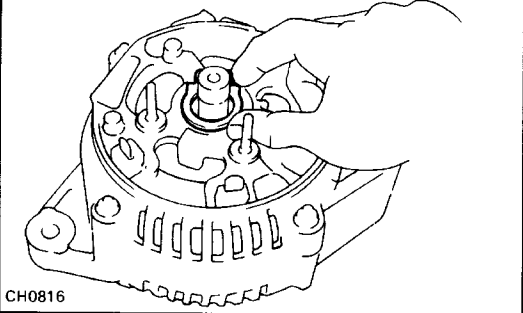
- (c) Check that SST (A) is secured to the pulley shaft.



- (d) As shown in the illustration, mount SST (C) in a vise, and install the alternator to SST (C).
- (e) To torque the pulley nut, turn SST (A) in the direction shown in the illustration.

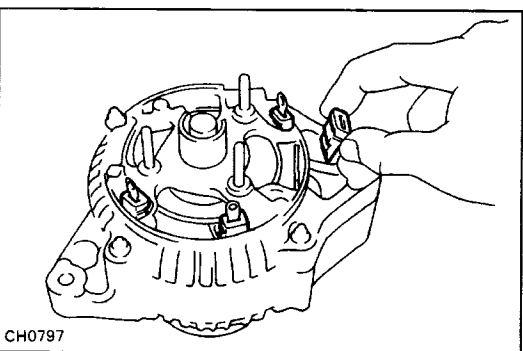
Torque: 110 N-m (7,125 kgf-cm, 81 ft-lbf)

- (f) Remove the alternator from SST (C).
- (g) Turn SST (B) and remove SST (A and B).

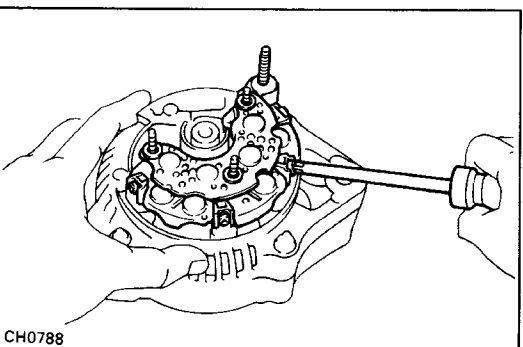
M/T (3S-GTE) and A/T**4. INSTALL RECTIFIER HOLDER**

- (a) (M/T (3S-GTE) and A/T)

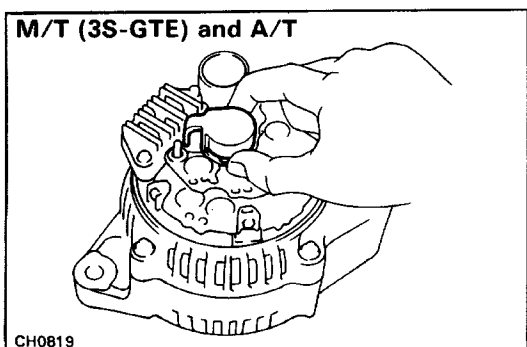
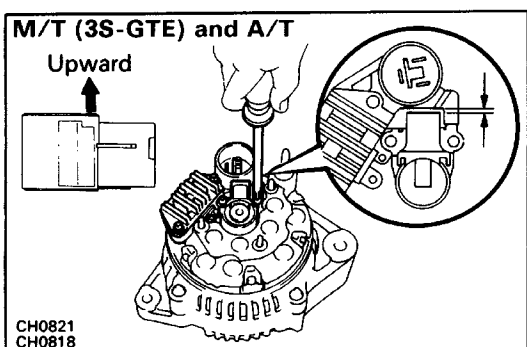
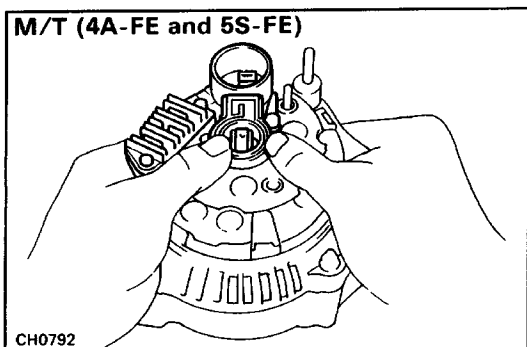
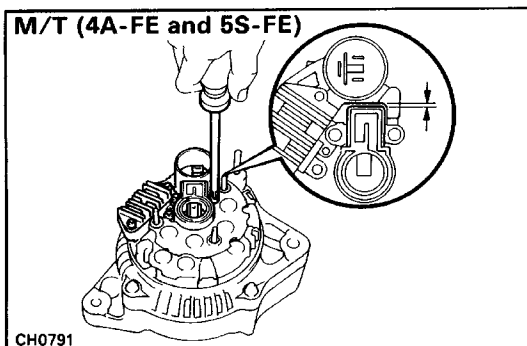
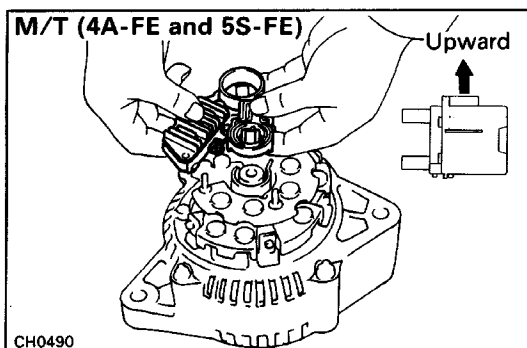
Place the seal plate on the rectifier end frame.



- (b) Install the four rubber insulators on the lead wires.



- (c) Install the rectifier holder with the four screws.



5. INSTALL IC REGULATOR AND BRUSH HOLDER (M/T (4A-FE and 5S-FE))

- Install the brush holder cover to the brush holder.
NOTICE: Be careful of the holder installation direction.
- Place the IC regulator together with the brush holder horizontally on the rectifier end frame.

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

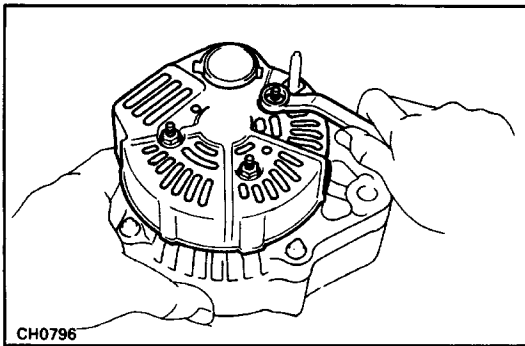
- Fit the brush holder cover.

(M/T (3S-GTE) and A/T)

- Place the IC regulator and brush holder on the rectifier end frame.

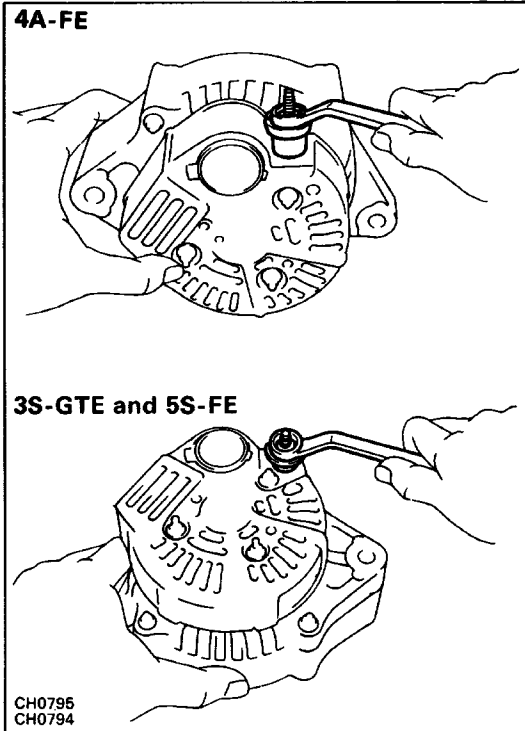
- NOTICE: Be careful of the holder installation direction.**
- Install the five screws until there is a clearance of approx. 1 mm (0.04 in.) between the brush holder and connector.

- Place the brush holder cover on the brush holder.

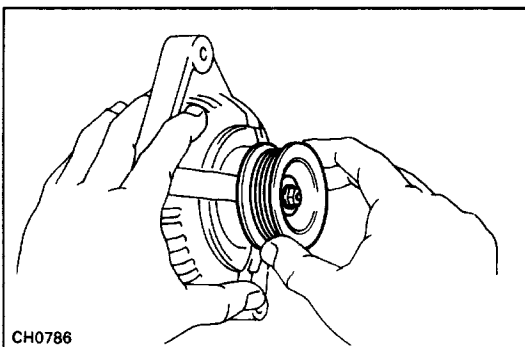


6. INSTALL REAR END COVER

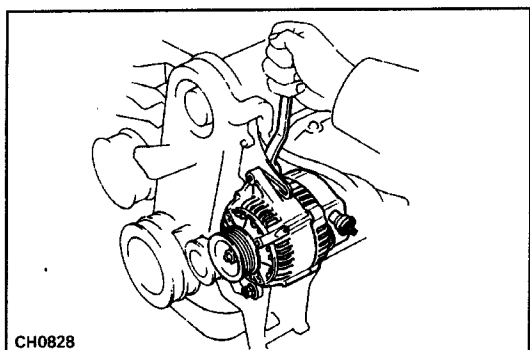
(a) Install the end cover with the three nuts.



(b) Install the terminal insulator with the nut.



7. CHECK THAT ROTOR ROTATES SMOOTHLY



INSTALLATION OF ALTERNATOR (4A-FE)

(See page [CH-6](#)).

1. INSTALL ALTERNATOR

- (a) Mount the alternator on the alternator brackets with the pivot bolt, nut and adjusting bolt. Do not tighten the bolt and nut yet.
- (b) Connect the alternator connector.
- (c) Connect the alternator wire with the nut.

2. INSTALL DRIVE BELT

Adjust the drive belt tension.

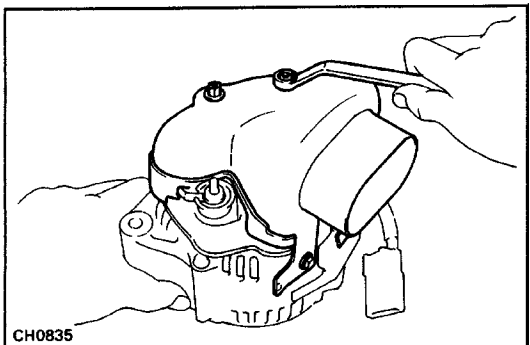
(See step 3 on page [CH-3](#))

Drive belt tension: **New belt** 160 ± 20 lbf
Used belt 130 ± 20 lbf

3. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

4. PERFORM ON-VEHICLE INSPECTION

(See steps 5 to 7 on pages [CH-4](#) to 5)

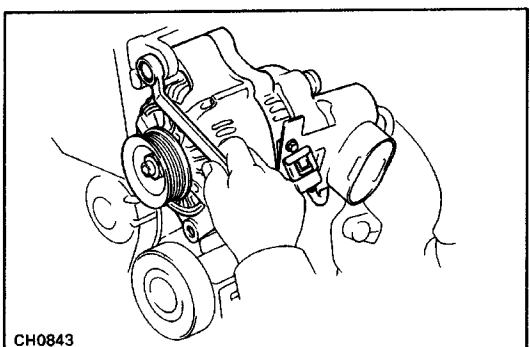


INSTALLATION OF ALTERNATOR (3S-GTE)

(See page [CH-7](#))

1. INSTALL NO.1 ALTERNATOR DUCT

- (a) Install the alternator lead wire.
- (b) Remove the alternator duct with the two nuts.



2. INSTALL ALTERNATOR

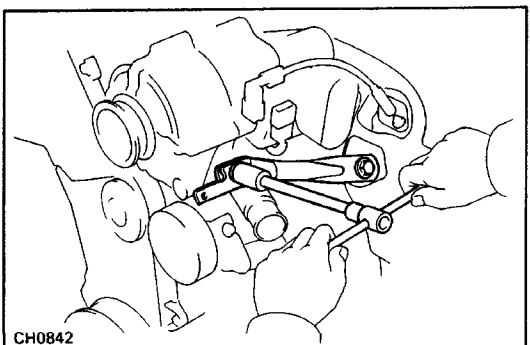
Install the alternator with the two bolts.

Torque:

12 mm head bolt 19 N-m (195 kgf-cm, 14 ft-lbf)

14 mm head bolt 52 N-m (530 kgf-cm, 38 ft-lbf)

3. INSTALL ABS ACTUATOR COVER



4. INSTALL NO.2 ALTERNATOR BRACKET

Install the alternator bracket with the two bolts.

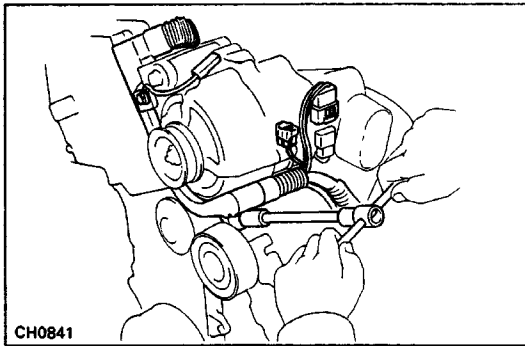
Torque:

To turbine outlet elbow

43 N-m (440 kgf-cm, 32 ft-lbf)

To No.1 alternator bracket

39 N-m (400 kgf-cm, 29 ft-lbf)



5. INSTALL ENGINE WIRE

- (a) Install the engine wire and ground strap with the two bolts.
- (b) Connect the following connectors and wires:
 - Alternator connector from lead wire
 - Alternator wire
 - A/C compressor connector
 - Water temperature switch connector
 - Oxygen sensor wire clamp from No.1 alternator duct
 - Oxygen sensor connector
 - Oxygen sensor connector (wiring harness side) from No.1 alternator duct

6. INSTALL DRIVE BELT

Adjust the drive belt tension.

(See step 3 on page [CH-2](#))

Drive belt tension:

w/ A/C	New belt	165 ± 10 lbf
	Used belt	115 ± 20 lbf
w/o A/C	New belt	150 ± 25 lbf
	Used belt	130 ± 25 lbf

7. INSTALL A/C RELAY BOX TO BRACKET

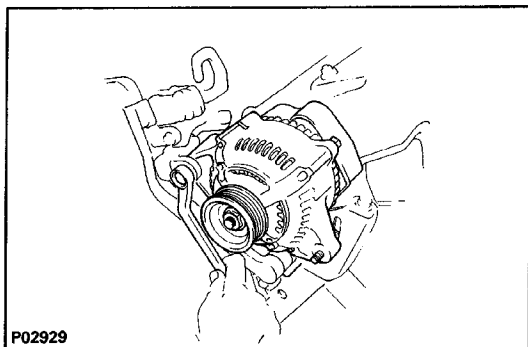
8. INSTALL ABS CONTROL RELAY TO RADIATOR

9. INSTALL NO.2 ALTERNATOR DUCT

10. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

11. PERFORM ON-VEHICLE INSPECTION

(See steps 5 to 7 on pages [CH-4](#) and 5)



INSTALLATION OF ALTERNATOR (5S-FE)

(See page [CH-9](#))

1. INSTALL ALTERNATOR

- (a) Mount the alternator on the alternator brackets with the pivot bolt and adjusting lock bolt. Do not tighten the bolts yet.
- (b) Connect the alternator connector.
- (c) Connect the alternator wire with the nut.

2. INSTALL DRIVE BELT

Adjust the drive belt tension.

(See step 3 on page [CH-3](#))

Drive belt tension:

w/ A/C	New belt	165 ± 10 lbf
	Used belt	110 ± 10 lbf
w/o A/C	New belt	125 ± 25 lbf
	Used belt	95 ± 20 lbf

3. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

4. PERFORM ON-VEHICLE INSPECTION

(See steps 5 to 7 on pages [CH-4](#) to 5)