

HOW TO USE THIS MANUAL

GENERAL INFORMATION

0108R-05

1. GENERAL DESCRIPTION

- (a) This manual is made in accordance with SAE J2008.
- (b) Generally, repair operations can be separated in the following 3 main processes:
 - 1. Diagnosis
 - 2. Removing/Installing, Replacing, Disassembling/Reassembling, Checking and Adjusting
 - 3. Final Inspection
- (c) This manual explains the 1st process of "Diagnosis" (found in the "Diagnostics" section), the 2nd process of "Removing and Installing, Replacing, Disassembling, Installing and Checking, Adjusting", but the 3rd process of "Final Inspection" is omitted.
- (d) The following essential operations are not written in this manual. However, these operations must be performed in actual situations.
 - (1) Operations with a jack or lift
 - (2) Cleaning of a removed part when necessary
 - (3) Visual check

2. INDEX

- (a) An alphabetical INDEX section is provided at the end of the book (4/4) to guide you to the item to be repaired.

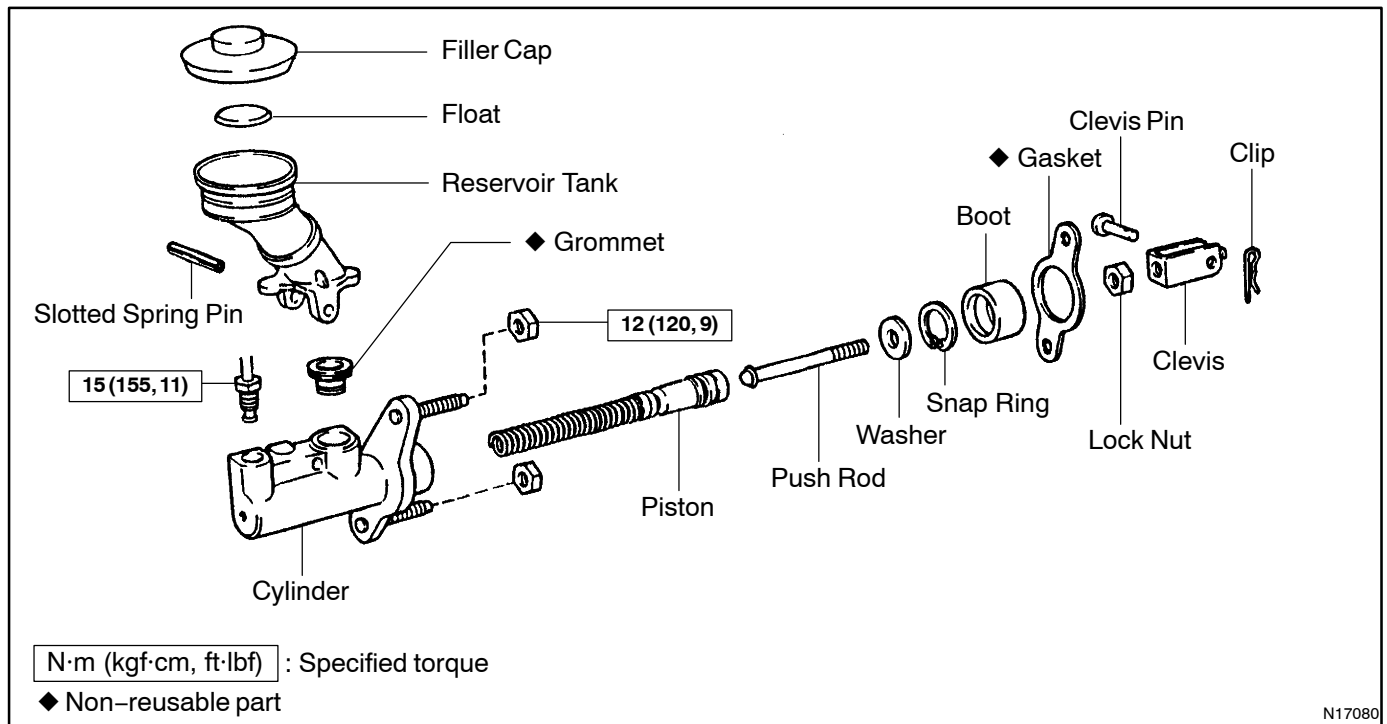
3. PREPARATION

- (a) Use of special service tools (SST) and special service materials (SSM) may be required, depending on the repair situation. Be sure to use SST and SSM when they are required and follow the working procedure properly. A list of SST and SSM is in the Preparation section of this manual.

4. REPAIR PROCEDURES

- (a) Component drawing is placed under the title where necessary.
- (b) Non-reusable parts, grease application area, precoated parts and tightening torque are specified in the components drawing.

Example:



N17080

TORQUE SPECIFICATION

14B

Part tightened	N·m	kgf·cm	ft·lbf
Fuel filter assembly x Body	18	183	13
Nozzle holder and nozzle set x Cylinder head	18	185	13
Nozzle leakage pipe Assy x Nozzle holder and nozzle set	25	255	18
Injection pipe clamp x Injection pipe set	7.5	76	66 in.·lbf
Injection pump Assy x Timing gear case sub Assy	18.5	189	14
Pump stay x Injection pump Assy	18.5	189	14
Pump stay x Cylinder block sub Assy	37.5	382	28
Fuel filter to injection pump fuel pipe x Injection pump Assy	26.55	260	19
Nozzle leakage pipe Assy No. 2 x Injection pump Assy	26.55	260	19
Injection pump Assy x Timing gear case	18.5	189	14
Injection pump stay x Injection pump Assy	18.5	189	14
Injection pump stay x Cylinder block	37.5	382	28
Injection pipe x Nozzle holder and nozzle set	25	255	18
Injection pipe x Injection pump Assy	25	255	18
Fuel inlet hollow screw x Injection pump body	36.8	375	27
Regulator valve sub-assy x Injection pump body	8.85	90	78 in.·lbf
Fuel feed pump cover x Injection pump body	2.95	30	26 in.·lbf
Timer cover x Injection pump body	8.35	85	74 in.·lbf
Timer adjusting screw x LH timer cover	14.2	145	10
Governor link x Injection pump body	13.75	140	10
Distributive head x Injection pump body	11.75	120	9
Delivery valve holder x Distributive head	58.85	600	43
Distributive head plug x Distributive head	88.3	900	65
Governor cover sub-assy x Injection pump body	8.35	85	74 in.·lbf
Bolt for control lever support pin x Governor cover sub-assy w/ HAC	6.35	70	61 in.·lbf
Bolt for lever connecting pin x Governor cover sub-assy w/ HAC	12.75	125	9
Pneumatic bellows cover x Governor cover sub-assy w/ HAC	7.35	75	65 in.·lbf
Adjusting lever x Governor cover sub-assy	8.35	85	74 in.·lbf
Engine speed sensor x Injection pump body	22.1	225	16
Fuel cut solenoid x Distributive head	20.6	210	15
Lead wire x Fuel cut solenoid	1.7	17.5	15 in.·lbf
Dash pot x Governor cover sub-assy	11	115	8
Fuel pipe clamp x Injection pump body	21.55	220	16
Spline shaft x Injection pump drive shaft	84.3	860	62
Fuel sender gauge connector x Fuel tank sub-assy	1.5	15	13 in.·lbf

15B-FTE

Part tightened	N·m	kgf·cm	ft·lbf
Fuel filter assembly x Body	18	183	13
Nozzle holder and nozzle set x Cylinder head	21	210	15
Nozzle leakage pipe Assy x Nozzle holder and nozzle set	12	125	9
Injection pipe clamp x Injection pipe set	7.5	76	66 in.·lbf
Injection pump Assy x Timing gear case sub Assy	18.5	189	14

DTC	12	ENGINE SPEED SENSOR CIRCUIT MALFUNCTION1 (TDC OR G1 CIRCUIT)
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CIRCUIT DESCRIPTION

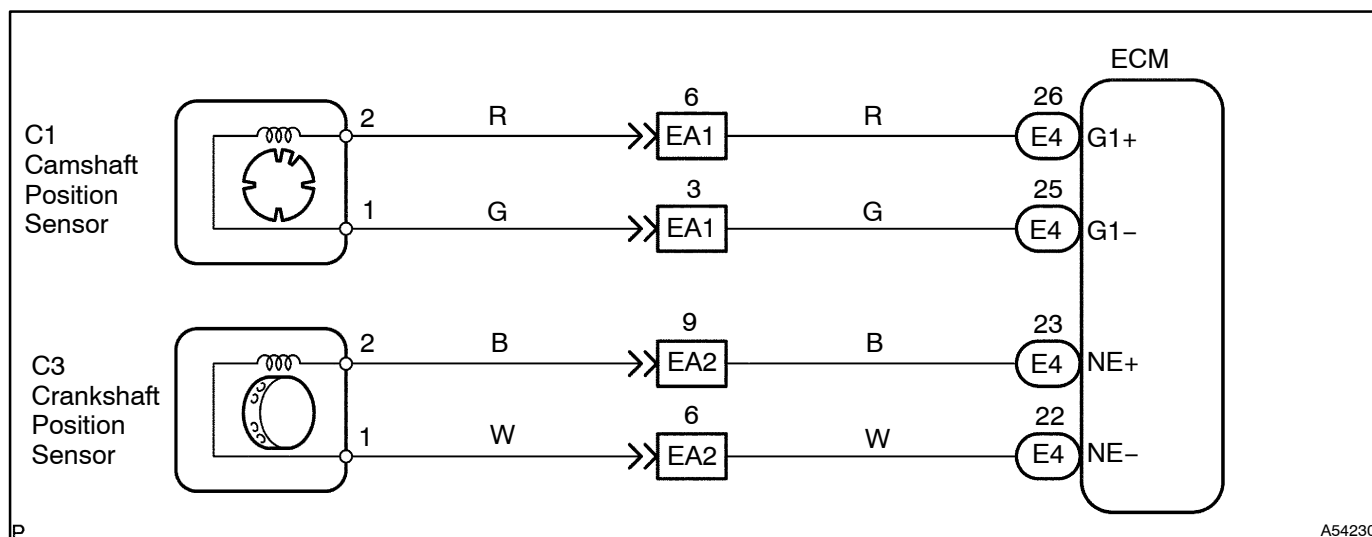
The composition of this sensor, mounted on the supply pump, is the same as that of the main engine revolution sensor, however, the coil volume is different. As the engine rotates, the protrusions and air gaps on the center of the supply pump camshaft create magnetic field by the magnet in the sensor. Then, the magnetic field generates alternative voltage in the coil.

The protrusions and air gaps exist for every 90 degrees of the camshaft (180 degrees of crankshaft angle), and therefore 5 pulses are output for 1 revolution of the camshaft (2 revolutions of the engine).

And also, there is another protrusion and air gap to output a pulse. Based on this pulse, NE standard pulse of the engine No. 1 cylinder can be recognized.

DTC No.	DTC Detection Condition	Trouble Area
12	G1 signal has not been input when NE signal detects 3,600 revolutions	<ul style="list-style-type: none"> • Open or short in crankshaft position sensor circuit • Camshaft position sensor • Camshaft timing pulley • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- Perform troubleshooting of DTC 12 first. If no trouble is found, troubleshoot the following mechanical system.
- Read freeze frame data using the hand-held tester, as freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.

DTC	C0210/33	RIGHT REAR SPEED SENSOR CIRCUIT
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DTC	C0215/34	LEFT REAR SPEED SENSOR CIRCUIT
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CIRCUIT DESCRIPTION

Refer to DTC C0200/31, C0205/32 on page 05-117.

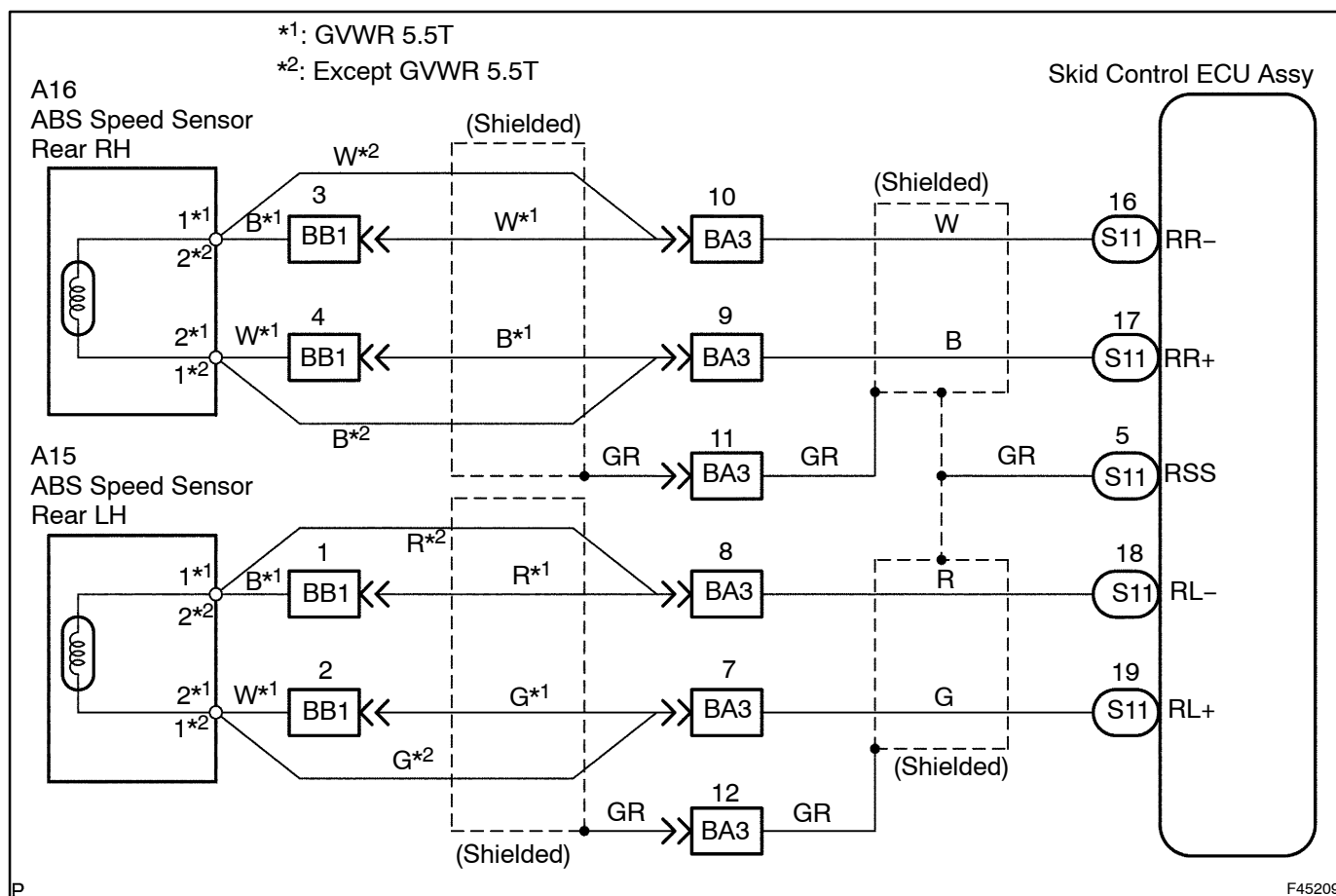
DTC No.	DTC Detection Condition	Trouble Area
C0210/33 C0215/34	Detection of any of conditions 1. through 4: 1. Vehicle speed is 10km/h (6 mph) or more and open or short circuit in the signal circuit of each vehicle speed sensor has continued for 15 sec. or more 2. Momentary interruption of each vehicle speed sensor signal has occurred more than 7 times 3. Vehicle speed is higher than 20 km/h (12 mph) and noise on the abnormal wheel sensor signal continues for 5 sec. or more 4. Open circuit condition of the vehicle speed sensor signal circuit has continued for more than 0.5 sec.	<ul style="list-style-type: none"> • Right rear and left rear speed sensors • Each speed sensor circuit • Speed sensor rotor • Sensor installation

HINT:

DTC No. C0210/33 is for the right rear speed sensor.

DTC No. C0215/34 is for the left rear speed sensor.

WIRING DIAGRAM



DTC	B0102/11	SHORT IN D SQUIB CIRCUIT (TO GROUND)
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CIRCUIT DESCRIPTION

The D squib circuit consists of the airbag ECU Assy, spiral cable sub-assy and horn button Assy.

The SRS will deploy if the SRS deployment conditions are satisfied.

DTC B0102/11 is recorded when a ground short is detected in the D squib circuit.

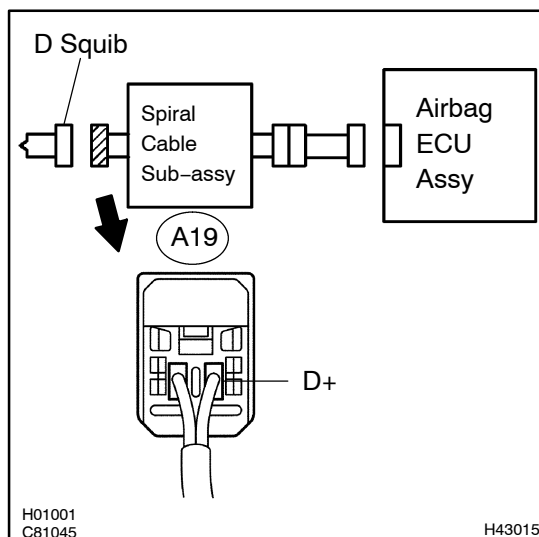
DTC No.	DTC Detection Condition	Trouble Area
B0102/11	<ul style="list-style-type: none"> • Short circuit in D squib wire harness (to ground) • D squib malfunction • Spiral cable sub-assy malfunction • Airbag ECU Assy malfunction 	<ul style="list-style-type: none"> • Horn button Assy (D squib) • Spiral cable sub-assy • Airbag ECU Assy • Wire harness

WIRING DIAGRAM

See page 05-226.

INSPECTION PROCEDURE

1	CHECK D SQUIB CIRCUIT(AIRBAG ECU ASSY-HORN BUTTON ASSY)
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- Disconnect the negative (-) terminal cable from the battery and wait at least for 90 seconds.
- Disconnect the connector between the airbag ECU Assy and the horn button Assy.
- For the connector (on the spiral cable sub-assy side) between the spiral cable sub-assy and the horn button Assy, measure the resistance between terminal D+ of the A19 connector and the body ground.

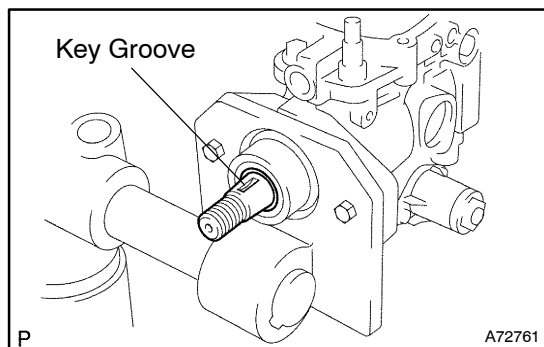
OK:

Resistance: 1 MΩ or higher

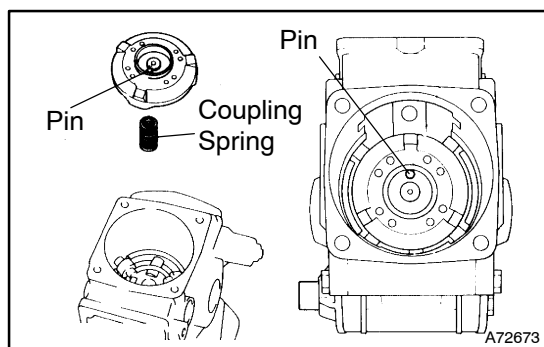
NG

Go to step 5

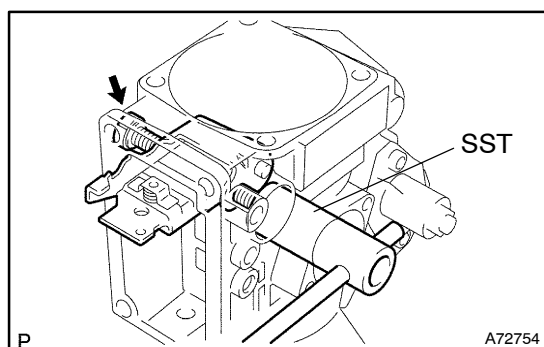
OK

**41. INSTALL FACE CAMPLATE SUB-ASSY**

- (a) Turn the drive shaft, and face the key groove upward.



- (b) Install the coupling spring and camplate with the camplate pin facing the governor cover side.

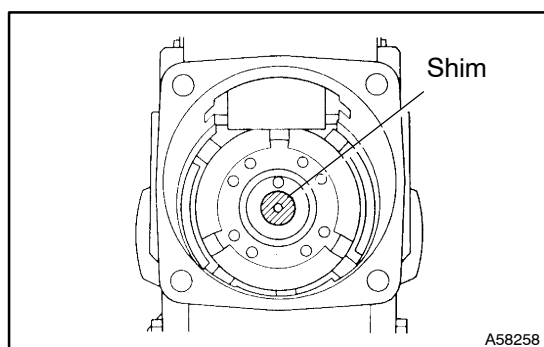
**42. INSTALL GOVERNOR LINK**

- (a) Using SST, install the governor link with 2 new gaskets and the 2 support bolts.

Torque: 13.75 N·m (140 kgf·cm, 10 ft·lbf)

SST 09260-54012 (09269-54040)

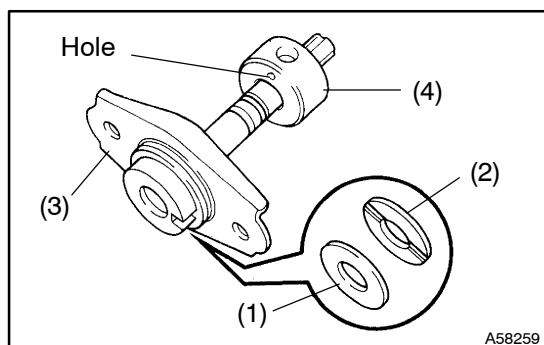
- (b) Check that the governor link smoothly moves.

**43. INSTALL PUMP PLUNGER**

- (a) Place the selected new plunger adjusting shim on the center of the camplate.

NOTICE:

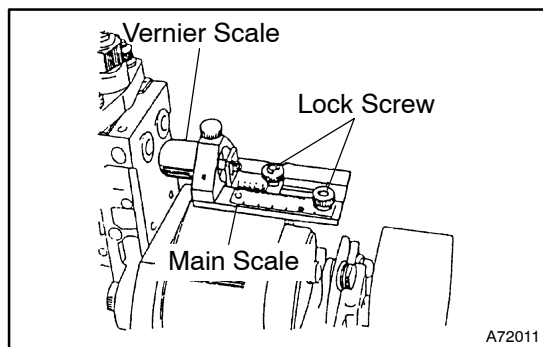
Do not apply grease to the shim.



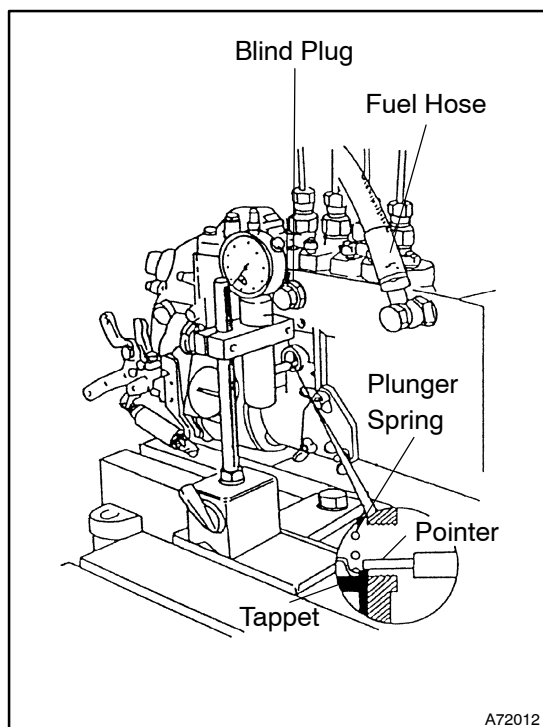
- (b) Install the lower plunger plate (1), upper plunger plate (2), lower spring seat (3) and spill ring (4) to the pump plunger.

HINT:

The hole of the spill ring should face the lower spring seat.

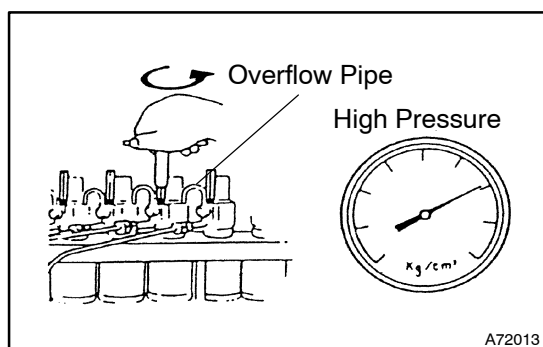


- (d) Fill the pump camshaft chamber with engine oil.

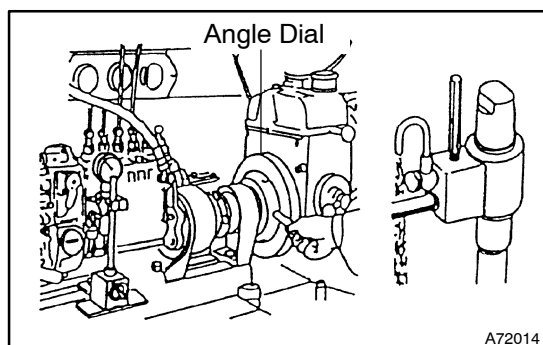


6. ADJUST INJECTION TIMING

- (a) Preparation of the pre-stroke
- (1) Remove the screw plug from the pre-stroke measuring hole of the first cylinder.
 - (2) Remove the overflow valve, attach the inlet adaptor and connect the fuel hose of the pump tester. Close the fuel port of the injection pump with a blind plug.
 - (3) Install a pre-stroke measuring instrument. Bring the tappet of the first cylinder to its bottom dead center, and set the pointer tip on the tappet.
- (b) Measure the pre-stroke (No. 1 plunger)
- (1) Set the control rack at full-load position.
 - (2) Loosen the overflow screw of each nozzle holder.



- (3) Operate the high-pressure pump of the pump tester and let fuel run out of the overflow line.



- (4) Move the angle dial to set the first cylinder of the pump to bottom dead center and adjust the pre-stroke gauge to zero.

NOTICE:

Bottom dead center is the point at which the pointer of the dial gauge does not move even when the angle dial is rotated while fuel is flowing from the overflow line.

ON-VEHICLE INSPECTION

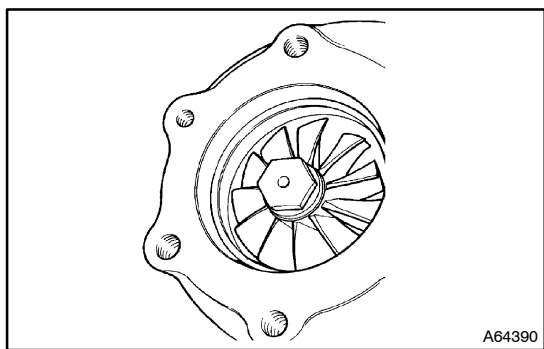
1. INSPECT TURBOCHARGER EXTERIOR AND INSTALLATION

- (a) Visually check for missing or loose nuts and bolts.
- (b) Visually check for loose or damaged intake and exhaust pipes.
- (c) Visually check for damaged oil supply and drain lines.
- (d) Visually check for cracked or deteriorating turbocharger housings.
- (e) Visually check for external oil or coolant leakage.

Correct all the problems about the installation. If the turbocharger parts are damaged, overhaul the unit after the remaining procedures of this troubleshooting about the installation.

CAUTION:

Operation of the turbocharger without the intake pipe and air cleaner connected can result in personal injury and also damage to the equipment, such as foreign objects entering the turbocharger.



2. INSPECT TURBINE WHEEL AND HOUSING

- (a) Remove the ducting from the turbine outlet. Using a flash-light, check the rub on the turbine wheel and housing, evidence of oil leakage or damage due to foreign objects. Damage to the turbine, due to foreign objects, is not usually visible through the turbine outlet unless the damage becomes severe.

- (1) Check for rub on the wheel and housing.

If wheel rub is found when the housing is securely attached to the hardware, then the turbocharger is way be damaged internally and must be overhauled.

- (2) Check for oil leakage.

If oil deposits are found, determine whether the oil has come from the engine exhaust or the turbocharger center housing.

If the oil has come from the engine, consult the chapter of ENGINE MECHANICAL and correct the problem. If oil deposits on the wheel are heavy, the turbocharger should be disassembled, cleaned, and overhauled, as necessary.

- (3) Check for damage due to foreign objects.

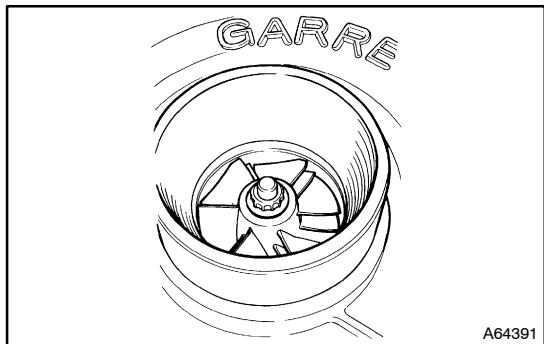
If the turbine is obviously damaged due to foreign objects, the turbocharger must be overhauled. Such damage destroys the wheel's balance and causes internal damage to the seal bores and journal bearings. Be sure to find the source of the foreign object. In many cases, the object has come from the engine, and the engine may have damage, as well.

3. INSPECT COMPRESSOR WHEEL AND HOUSING

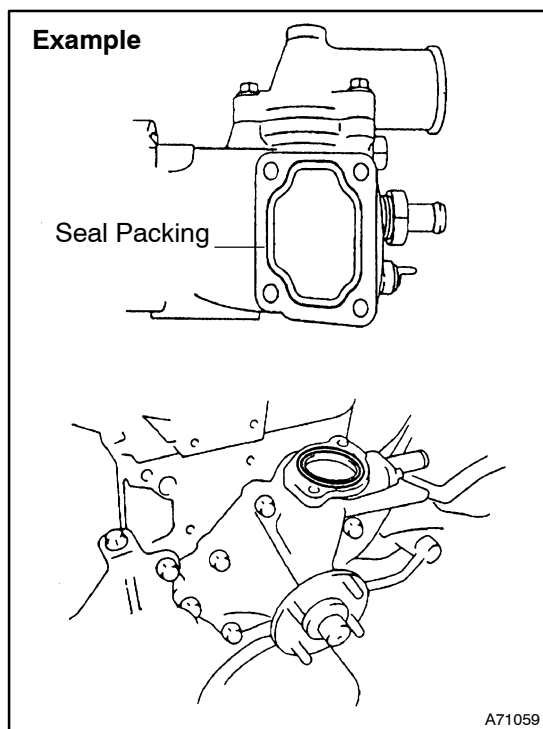
- (a) Remove the ducting from the compressor inlet. Using a flash-light, check the rub on the compressor wheel and housing, evidence of oil leakage and damage due to foreign objects.

- (1) Check for rub on the wheel and housing.

If wheel rub is found when the housing is securely attached to the hardware, then the turbocharger is way be damaged internally and must be overhauled.



- If more than 20 minutes have passed since the seal packing is applied, do not assemble the parts. After removing the seal packing completely, reapply it to assemble them.
- Do not start the engine for 2 hours after the installation.



17. INSTALL THERMOSTAT CASE

- Make sure that the O-ring is attached to the upper flange face of the water pump.
- Clean the cylinder head mounting surface of the thermostat case.
- Apply seal packing to the thermostat case and install it onto the cylinder head within 20 minutes.

Seal packing: Part No. 08826-00100 or equivalent

Coating width: 1.5 – 2.5 mm (0.059 – 0.098 in.)

HINT:

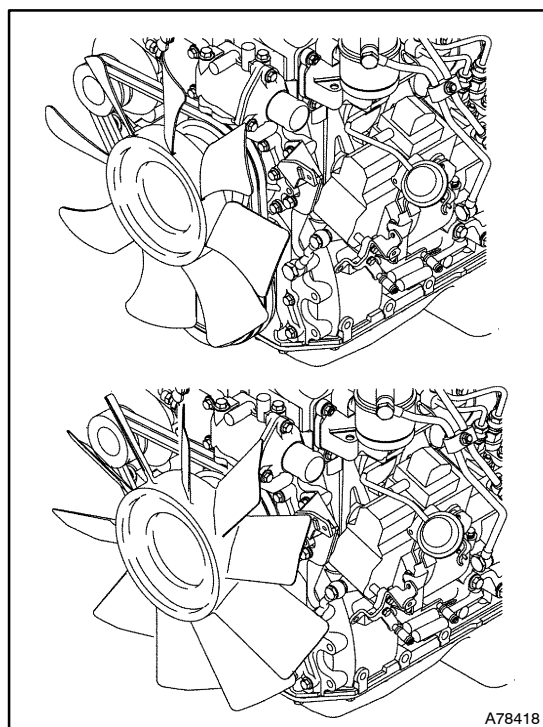
- If more than 20 minutes have passed since the seal packing is applied, do not assemble the parts. After removing the seal packing completely, reapply it to assemble them.
 - Do not start the engine for 2 hours after the installation.
- Tighten the 4 side ones of the thermostat case mounting bolts.

Torque: 28.5 N·m (290 kgf·cm, 21 ft·lbf)

- Tighten the 2 upper ones of the water pump mounting bolts.

Torque: 55 N·m (560 kgf·cm, 41 ft·lbf)

- Install the cooling line.



18. INSTALL FAN PULLEY

- Install the fan pulley and fan spacer.

Torque: 28.5 N·m (290 kgf·cm, 21 ft·lbf)

19. INSTALL FAN

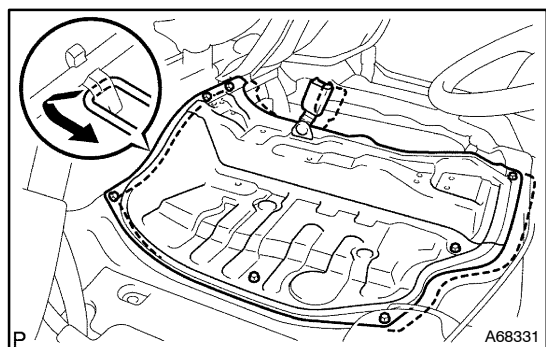
Torque: 19 N·m (194 kgf·cm, 14 ft·lbf)

WATER PUMP ASSY (15B-FTE)

160K5-01

REPLACEMENT

1. **DISCONNECT BATTERY NEGATIVE TERMINAL**
2. **DRAIN ENGINE COOLANT**
3. **REMOVE FRONT SEAT ASSEMBLY (DRIVER SEAT) (W/O TILT CAB CAB TYPE)**
(See page 72-2)
4. **REMOVE PARKING BRAKE HOLE COVER (W/O TILT CAB CAB TYPE)**
5. **REMOVE PARKING BRAKE LEVER ASSY (W/O TILT CAB CAB TYPE)** (See page 33-11)
6. **REMOVE FLOOR SHIFT SHIFT LEVER KNOB SUB-ASSY (W/O TILT CAB CAB TYPE)**
7. **REMOVE SHIFTING HOLE COVER SUB-ASSY AND SHIFT LEVER BOOT COVER (W/O TILT CAB CAB TYPE)** (See page 41-19)
 - (a) Remove the 3 clips and shift lever boot cover.
8. **REMOVE SHIFT AND SELECT TRANSMISSION CONTROL CABLE ASSY (W/O TILT CAB CAB TYPE)**
9. **REMOVE FLOOR SHIFT ASSY (W/O TILT CAB CAB TYPE)**



10. REMOVE ENGINE SERVICE HOLE SUB COVER SUB-ASSY (W/O TILT CAB CAB TYPE)

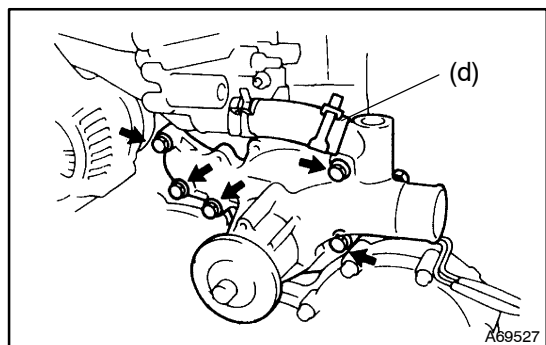
- (a) Remove the floor mat.
- (b) Remove the 7 bolts and engine service hole sub cover.

HINT:

As shown in the illustration, slide and remove the engine service hole sub cover, because there is a hook inside.

11. **DISCONNECT RADIATOR HOSE INLET**
12. **DISCONNECT RADIATOR HOSE OUTLET**
13. **REMOVE FAN SHROUD**
14. **REMOVE WATER PUMP ASSY**

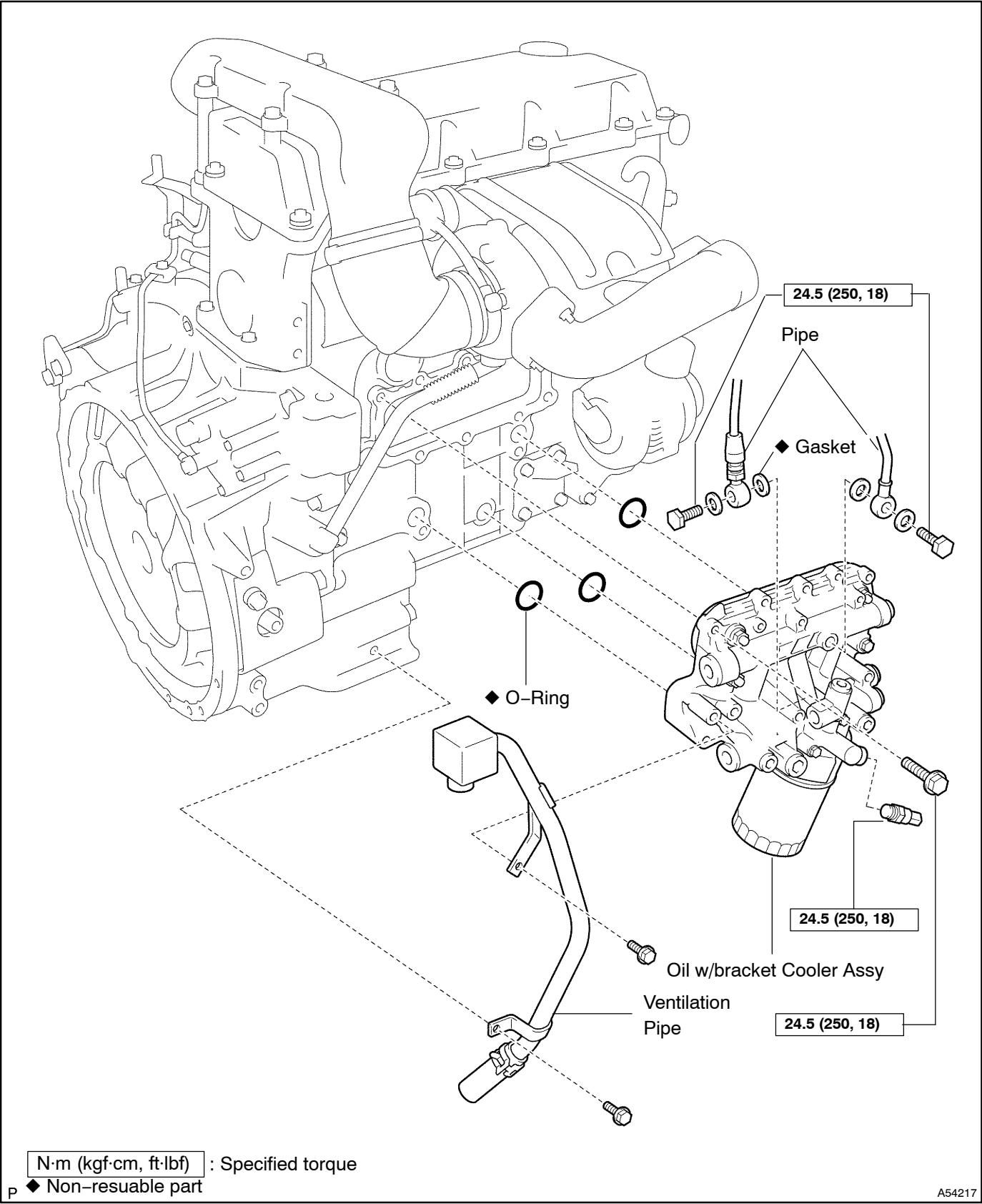
- (a) Remove the 2 bolts.
- (b) Disconnect the radiator hose from the water pump, and remove the radiator pipe.

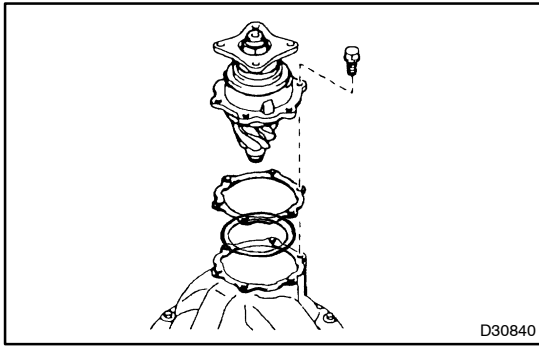


- (c) Remove the 5 bolts.
- (d) Disconnect the water bypass hose to the water pump, and remove the water pump and gasket.

OIL W/BRACKET COOLER ASSY (S05C-TA) COMPONENTS

17078-02



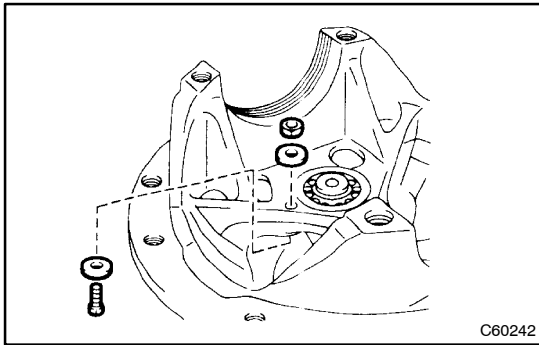


6. REMOVE DRIVE PINION SUB-ASSY

- Remove the 6 bolts.
- Remove the drive pinion assy, shims and O-ring from the differential carrier.

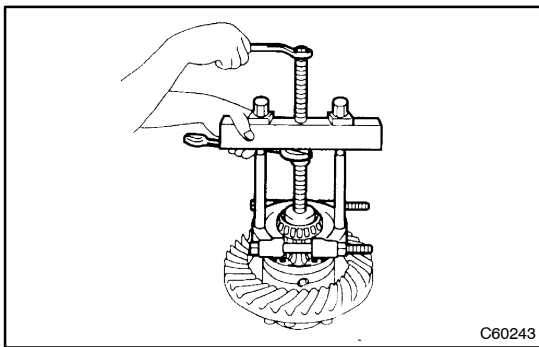
HINT:

For easy removal, Remove the outer races, using a brass bar and hammer.



7. REMOVE PILOT BEARING OUTER RACE

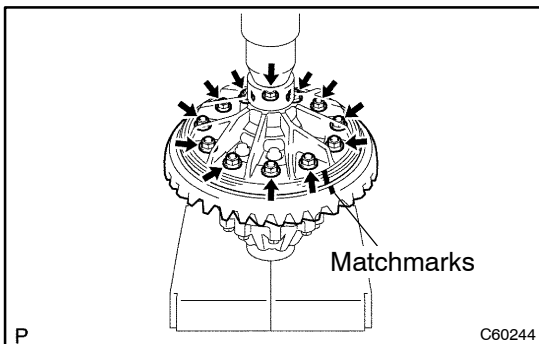
- Remove the bolt, nut and 2 bearing retainers.
- Remove the pilot bearing outer race from the differential carrier.



8. REMOVE SIDE BEARING INNER RACE

- Using SST, remove the 2 side bearing inner races from the differential case.
SST 09950-60020, (09951-00680), 09950-40011, (09957-04010), 09950-00020, 09950-00030.

If reusing the bearings, arrange them so that right bearing and left bearings can be distinguished.

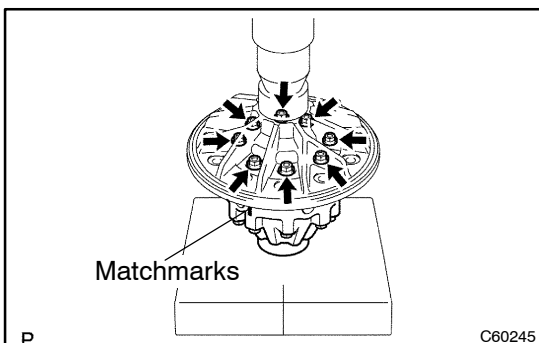


9. REMOVE RING GEAR

- Place matchmarks on the ring gear and differential case.
- Using a press, fix the differential carrier.
- Remove the 12 bolts and 12 nuts.
- Using a plastic hammer, remove the ring gear to separate it from the differential case.

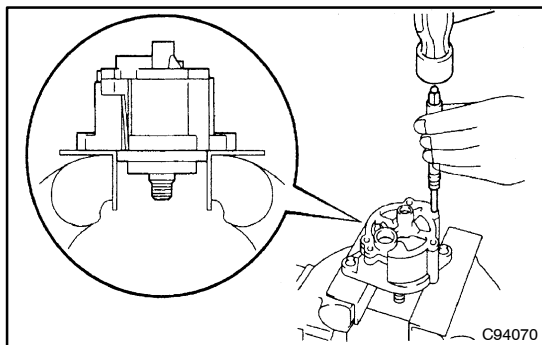
NOTICE:

Be careful not to drop the ring gear.



10. REMOVE DIFFERENTIAL CASE

- Place matchmarks on the LH and RH cases.
- Remove the 8 bolts.
- Using a plastic hammer, separate the LH and RH cases.

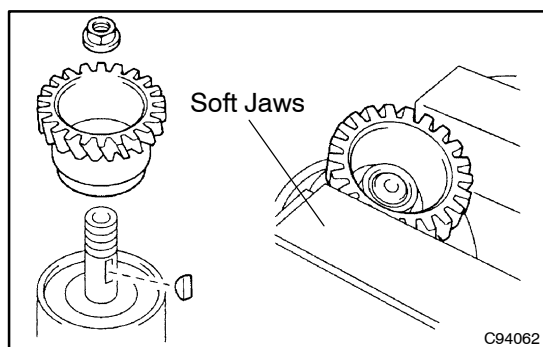
**14. INSTALL END COVER**

- Place the vacuum pump on a vise.
- Install a new O-ring.
- Install the end cover in place, and temporarily install the 3 bolts.
- Using a pin punch and hammer, tap in the 2 straight pins.
- Tighten the 3 bolts.

Torque: 7.8 N·m (80 kgf·cm, 69 in·lbf)

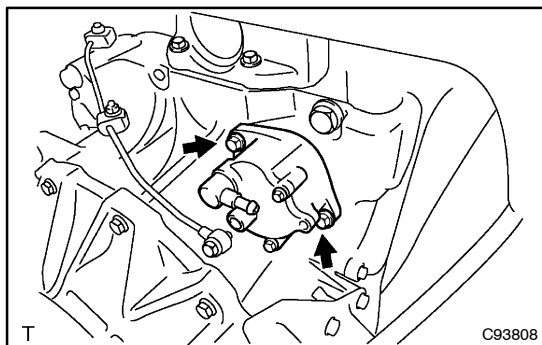
NOTICE:

Do not tighten the vise.

**15. INSTALL VACUUM PUMP GEAR**

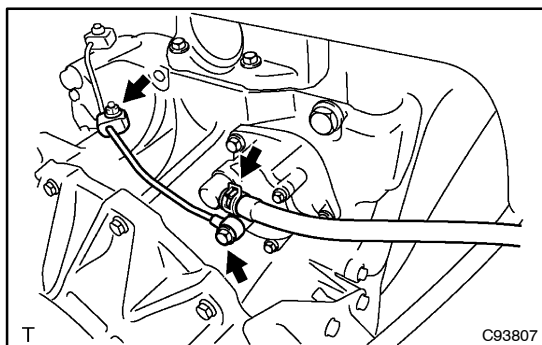
- Temporarily install the key, gear and lock nut to the pump.
- Using soft jaws on a vise, clamp the gear in the vise.
- Tighten the gear lock nut.

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

**16. INSTALL VACUUM PUMP ASSY**

- Install a new O-ring to the pump.
- Install the pump to the engine with the 2 bolts.

Torque: 55 N·m (560 kgf·cm, 41 ft·lbf)

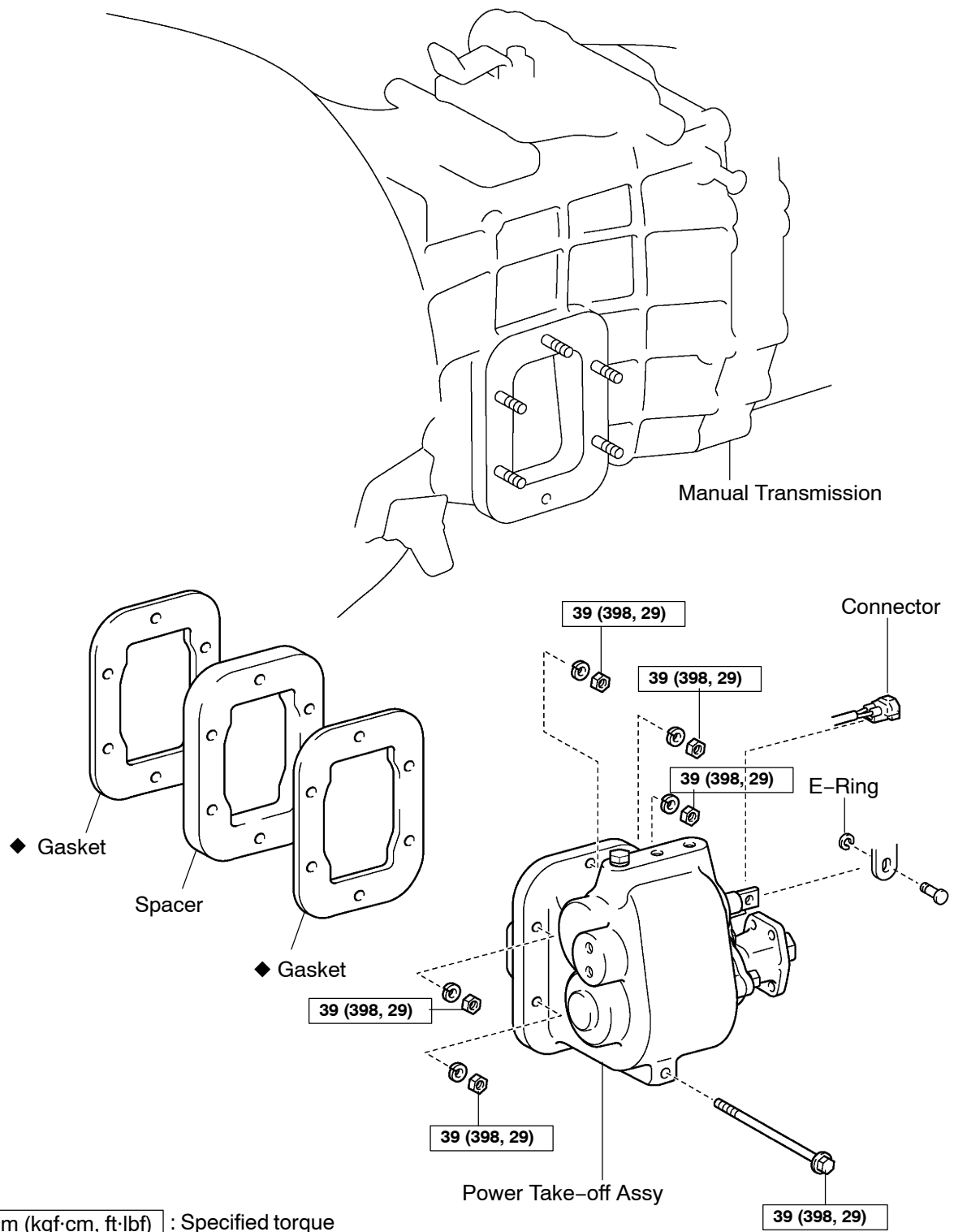


- Install the union bolt and a new gasket, and then connect the union tube.

Torque: 13.7 N·m (140 kgf·cm, 10 ft·lbf)

- Install the bolt and clip to the tube.
- Install the clip and connect the vacuum hose.

H351



N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part