ENGINE ASSEMBLY

140OC–03

INSPECTION

1. **INSPECT COOLANT (See page 16–1)**
2. **INSPECT ENGINE OIL (See page 17–1)**
3. **INSPECT BATTERY (See page 19–13)**
4. **INSPECT AIR CLEANER FILTER ELEMENT SUB–ASSY**
5. **INSPECT SPARK PLUG (See page 18–2)**
6. **INSPECT FAN AND GENERATOR V BELT**

HINT:

You don't need to check the belt deflection because auto tensioner is adopted.

7. **INSPECT IGNITION TIMING**

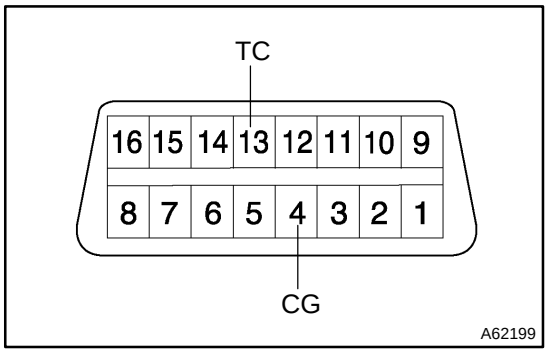
(a) Warm up engine.

(b) When using hand–held tester or OBDII scan tool.

(1) Connect the hand–held tester or OBDII scan tool to the DLC3.

HINT:

Please refer to the hand–held tester or OBDII scan tool operator's manual for further details.



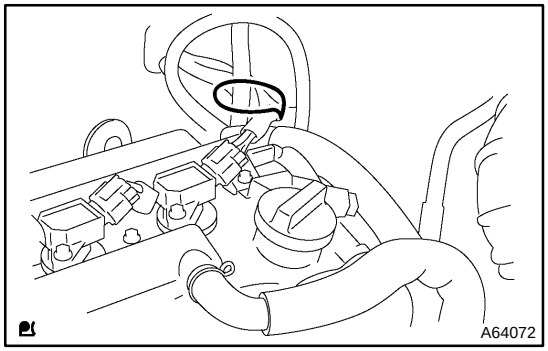
(c) When not using hand–held tester or OBDII scan tool.

(1) Using SST, connect terminal 13 (TC) and 4 (CG) of the DLC3.

SST 09843–18040

NOTICE:

- **Be sure not to connect incorrectly. It causes breakage of the engine.**
- **Turn OFF all electrical systems.**
- **Operate the inspection when the cooling fan motor is turned OFF**



(2) Remove the 2 nuts, 2 clips and cylinder head cover.

(3) Pull out the wire harness as shown in the illustration.

(4) Connect the clip of the timing light to the engine.

NOTICE:

- **Use a timing light which can detect the first signal.**
- **After checking, be sure to tape the wire harness.**

(5) Inspect ignition timing at idle.

Ignition timing: 8 – 12°BTDC

NOTICE:

When checking the ignition timing, the transmission is at neutral position.

HINT:

After engine rpm is kept at 1,000 – 1,300 rpm for 5 seconds, check that it returns idle speed.

(6) Disconnect the terminal 13 (TC) and 4 (CG) of the DLC3.
(7) Inspect ignition timing at idle.
Ignition timing: 10 – 18 °BTDC
(8) Confirm that ignition timing moves to advanced angle side when the engine rpm is increased.
(9) Remove the timing light.
(10) Install cylinder head cover No.2 with the 2 nuts and 2 clips.
Torque: 7.0 N·m (71 kgf·cm, 62 in.·lbf)

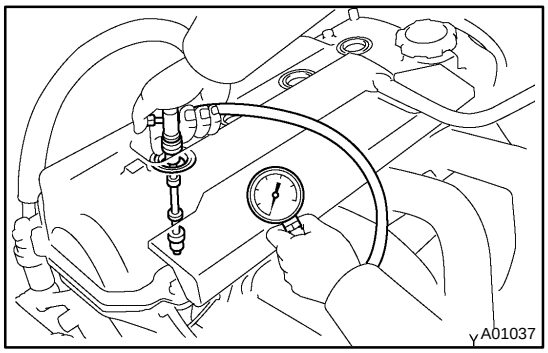
8. INSPECT ENGINE IDLE SPEED

(a) Warm up engine.
(b) When using hand–held tester or OBDII scan tool.
(1) Connect the hand–held tester or OBDII scan tool to the DLC3.

HINT:
Please refer to the hand – held tester or OBDII scan tool operator's manual for further details.

(c) Check the idle speed.
Idle speed: 650 – 750 rpm

NOTICE:
- **Check idle speed with cooling fan OFF.**
- **Switch off all accessories and air conditioning.**



9. INSPECT COMPRESSION

(a) Warm up and stop engine.
(b) Remove ignition coil.
(c) Remove spark plugs.
(d) Inspect cylinder compression pressure.
SST 09992–00500
(1) Insert a compression gauge into the spark plug hole.
(2) Fully open the throttle.
(3) While cranking the engine, measure the compression pressure.
Compression pressure
1,300 kPa (13.3 kgf·cm^2, 189 psi)
Minimum pressure: 1,000 kPa (10.2 kgf·cm^2, 145 psi)
Difference between each cylinder:
100 kPa (1.0 kgf·cm^2, 15 psi)

NOTICE:
- **Always use a fully charged battery to obtain engine speed of 250 rpm or more.**
- **Check other cylinder's compression pressure in the same way.**
- **This measurement must be done in as short a time as possible.**

(4) If the cylinder compression in one more cylinders is low, pour a small amount of engine oil into the cylinder through the spark plug hole and repeat steps (1) through (3) for cylinders with low compression.

HINT:

- If adding oil helps the compression, it is likely that the piston rings and/or cylinder bore are worn or damaged.
- If pressure stays low, a valve may be sticking or seating is improper, or there may be leakage past the gasket.

10. INSPECT CO/HC

(a) Start the engine.

(b) Race engine at 2,500 rpm for approx. 180 seconds.

(c) Insert CO/HC meter testing probe at least 40 cm (1.3 ft) into tailpipe during idling.

(d) Immediately check CO/HC concentration at idle and/or 2,500 rpm.

HINT:

- Complete the measuring within 3 minutes.
- When doing the 2 mode (idle and 2,500 rpm) test, these measuring orders are prescribed by the applicable local regulations.

(e) If the CO/HC concentration does not comply with regulations, troubleshoot in the order given below.

(1) Check heated oxygen sensor operation. (See page 12–6)

(2) See the table below for possible causes, and then inspect and correct the applicable causes if necessary.

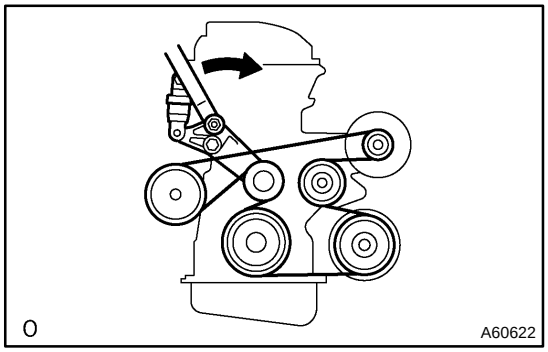
CO	HC	Problems	Causes
Normal	High	Rough idle	3. Faulty ignitions: • Incorrect timing • Fouled, shorted or improperly gapped plugs 4. Incorrect valve clearance 5. Leaky intake and exhaust valves 6. Leaky cylinders
Low	High	Rough idle (Fluctuating HC reading)	1. Vacuum leaks: • PCV hoses • Intake manifold • Throttle body • ISC valve • Brake booster line 2. Lean mixture causing misfire
High	High	Rough idle (Black smoke form exhaust)	1. Restricted air filter 2. Plugged PCV valve 3. Faulty EFI systems: • Faulty pressure regulator • Defective water temperature sensor • DEFECTIVE Air–flow meter • Faulty ECM • Faulty injectors • Faulty throttle position sensor

FAN AND GENERATOR V BELT

140OD–01

REPLACEMENT

1. REMOVE ENGINE UNDER COVER RH



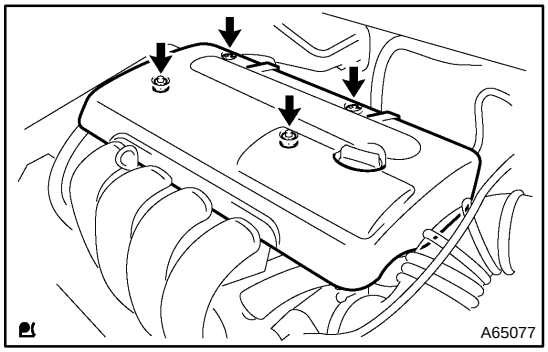
2. REMOVE FAN AND GENERATOR V BELT

(a) Turn the V–ribbed belt tensioner slowly clockwise and loosen it. Then, remove the fan and generator V belt and put back the V–ribbed belt tensioner little by little and fix it quietly.

VALVE CLEARANCE

ADJUSTMENT

140OE–01

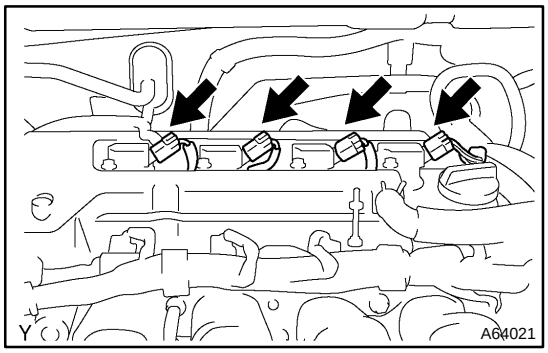


1. REMOVE CYLINDER HEAD COVER NO.2

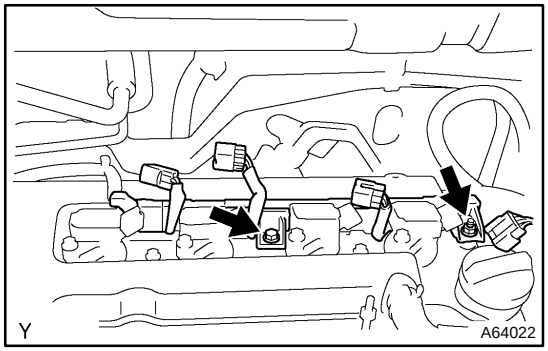
(a) Remove the 2 nuts, 2 clips and cylinder head cover.

2. DISCONNECT ENGINE WIRE

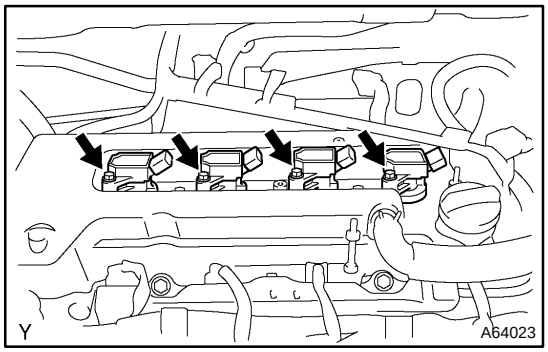
(a) Remove the 5 clamps from the 5 clamp brackets.



(b) Disconnect the 4 ignition coil connectors.

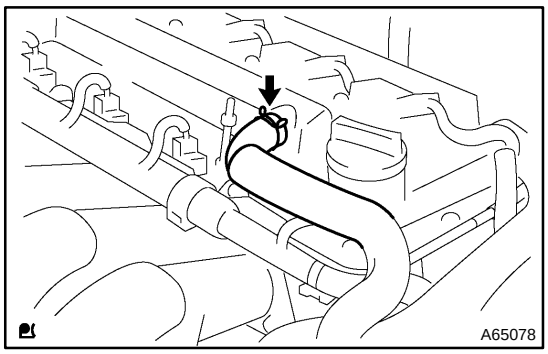


(c) Remove the bolt and nut installing the engine wire.



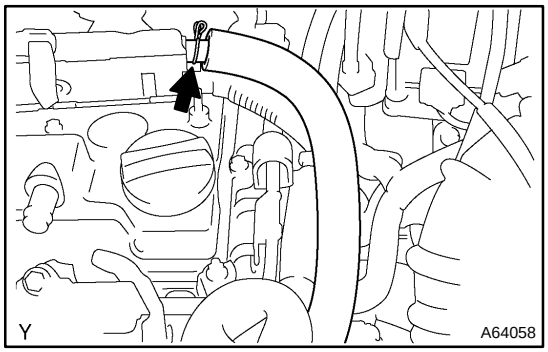
3. REMOVE IGNITION COIL ASSY

(a) Remove the 4 bolts and 4 ignition coils.



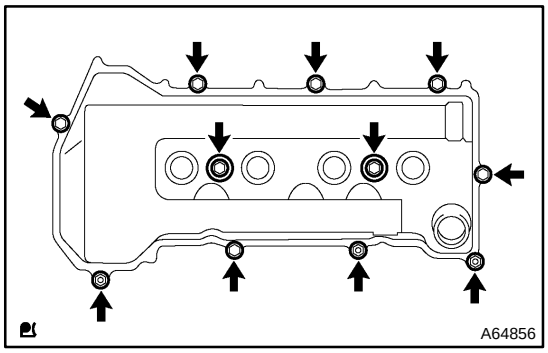
4. DISCONNECT VENTILATION HOSE

(a) Disconnect the ventilation hose from the cylinder head cover.



5. DISCONNECT VENTILATION HOSE NO.2

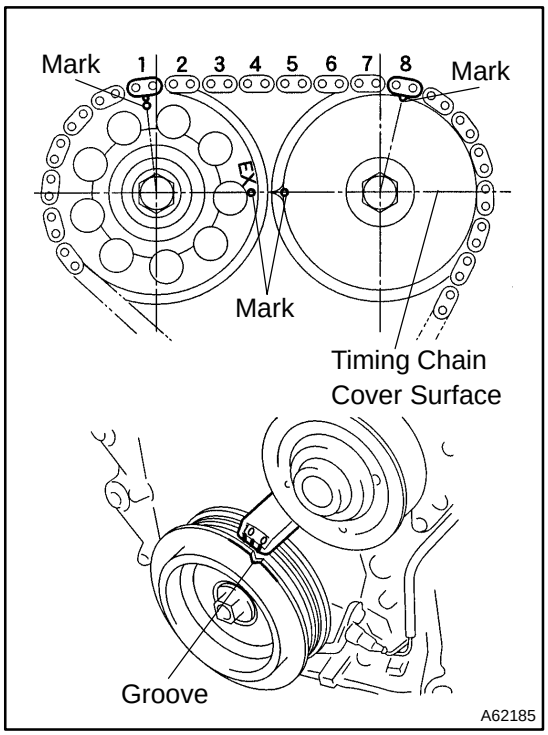
(a) Disconnect the ventilation hose from the cylinder head cover.



6. REMOVE CYLINDER HEAD COVER SUB–ASSY

(a) Remove the 9 bolts, 2 seal washers, 2 nuts, 3 clamp brackets and cylinder head cover.

7. REMOVE ENGINE UNDER COVER RH



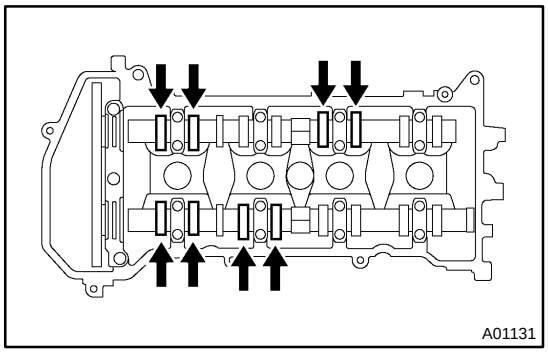
8. SET NO. 1 CYLINDER TO TDC/COMPRESSION

(a) Turn the crankshaft pulley, and align its groove with timing mark ”0” of the timing chain cover.

(b) Check that the point marks of the camshaft timing sprocket and VVT timing sprocket are in straight line on the timing chain cover surface as shown in the illustration.

HINT:

If not, turn the crankshaft 1 revolution (360°) and align the marks as above.



9. INSPECT VALVE CLEARANCE

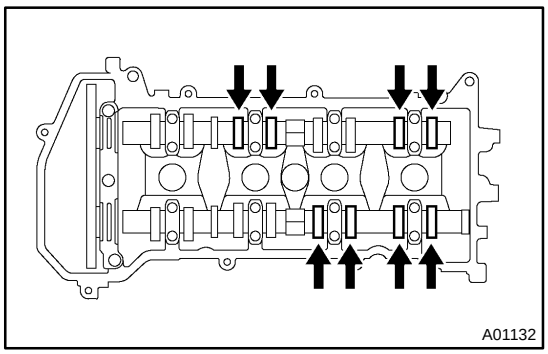
(a) Check only the valves indicated.

(1) Using a feeler gauge, measure the clearance between the valve lifter and camshaft.

(2) Record the out–of specification valve clearance measurements. They will be used later to determine the required replacement valve lifter.

Valve clearance (Cold):
Intake 0.15 – 0.25 mm (0.0059 – 0.0098 in.)
Exhaust 0.25 – 0.35 mm (0.0098 – 0.0138 in.)

(b) Turn the crankshaft 1 revolution (360 °) and set No. 4 cylinder to TDC/compression.

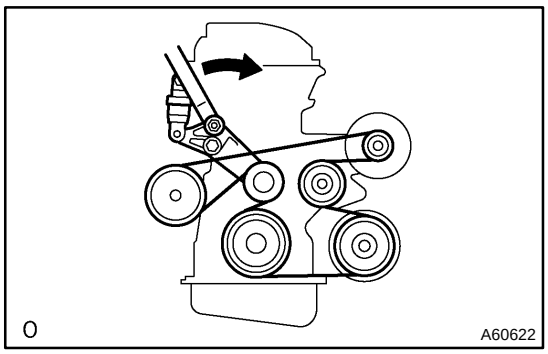


(c) Check only the valves indicated.

(1) Using a feeler gauge, measure the clearance between the valve lifter and camshaft.

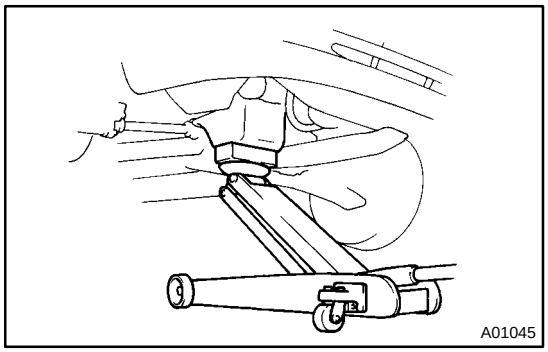
(2) Record the out–of specification valve clearance measurements. They will be used later to determine the required replacement valve lifter.

Valve clearance (Cold):
Intake 0.15 – 0.25 mm (0.0059 – 0.0098 in.)
Exhaust 0.25 – 0.35 mm (0.0098 – 0.0138 in.)



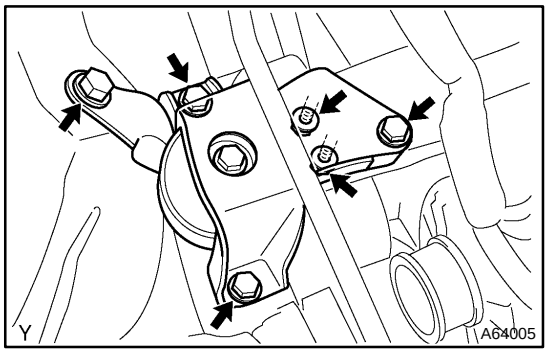
10. REMOVE FAN AND GENERATOR V BELT

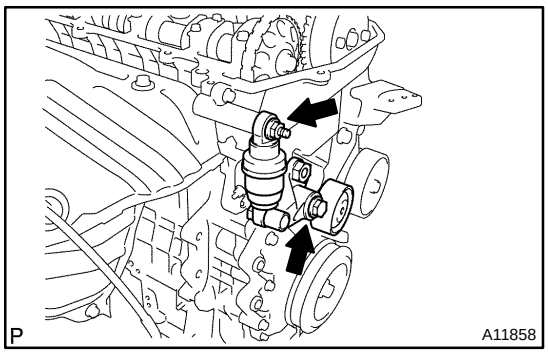
(a) Turn the V–ribbed belt tensioner slowly clockwise and loosen it. Then, remove the fan and generator V belt and put back the V–ribbed belt tensioner little by little and fix it quietly.



11. REMOVE ENGINE MOUNTING INSULATOR SUB–ASSY RH

(a) Remove the PS oil pump reservoir and put it aside.
(b) Place a wooden block between the jack and engine, and set the jack, then remove the 4 bolts, the 2 nuts and engine mounting insulator RH.



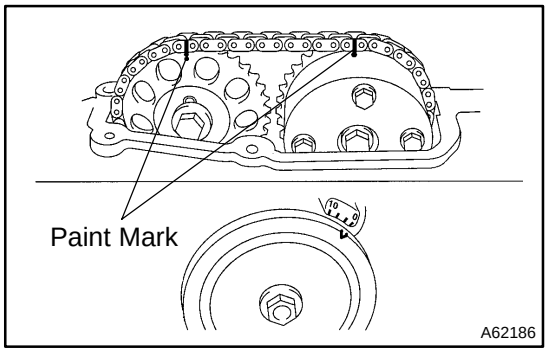


12. REMOVE V–RIBBED BELT TENSIONER ASSY

(a) Remove the bolt, nut and V–ribbed belt tensioner.

HINT:

Handle a jack up and down to remove the bolt.

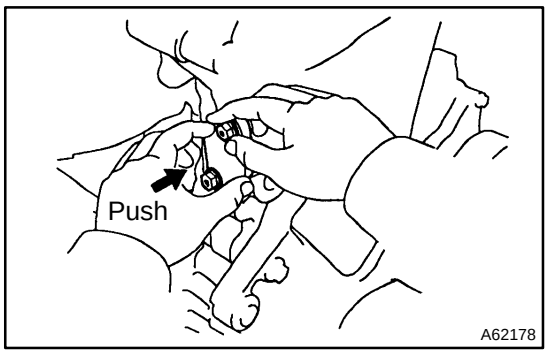


13. ADJUST VALVE CLEARANCE

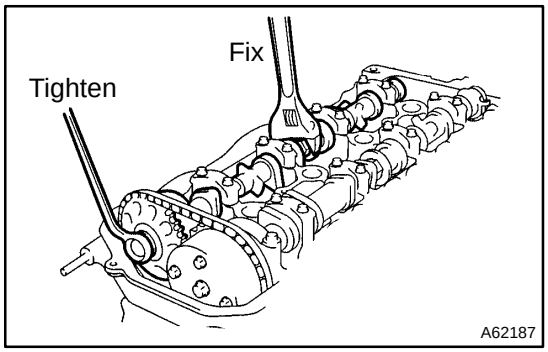
NOTICE:

Be sure not to revolve the crankshaft without the chain tensioner.

(a) Set the No. 1 cylinder to the TDC/compression.
(b) Place match marks on the timing chain and camshaft timing sprockets.

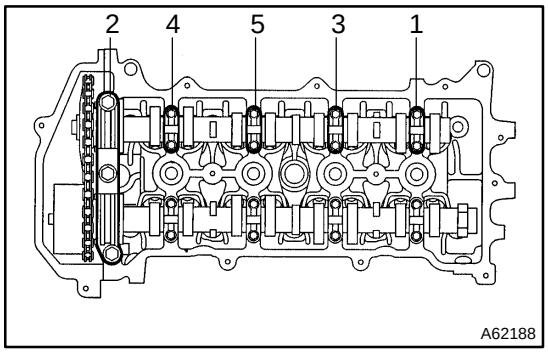


(c) Remove the 2 nuts and chain tensioner.

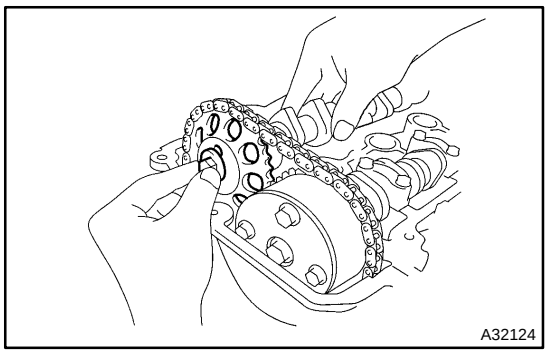


(d) Fix the camshaft with a spanner and so on, then loosen the camshaft timing gear set bolt.

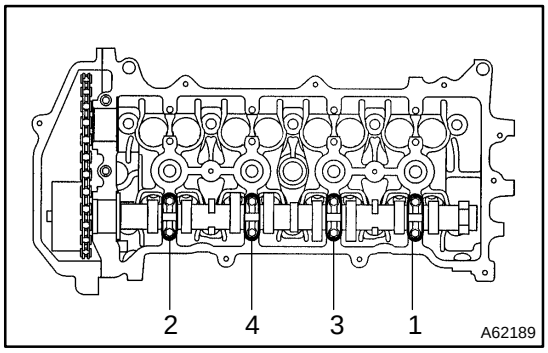
NOTICE:
Be careful not to damage the valve lifter.



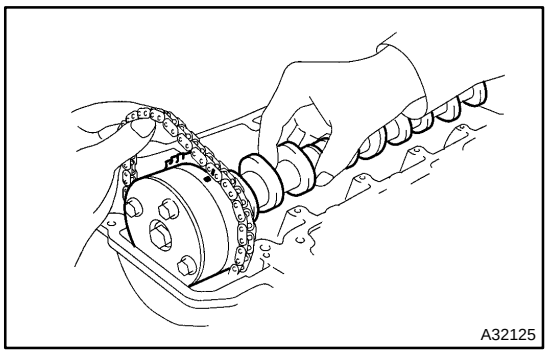
(e) Loosen the camshaft bearing cap bolts on No. 2 camshaft in the order as shown in the illustration in several passes,and remove the caps.



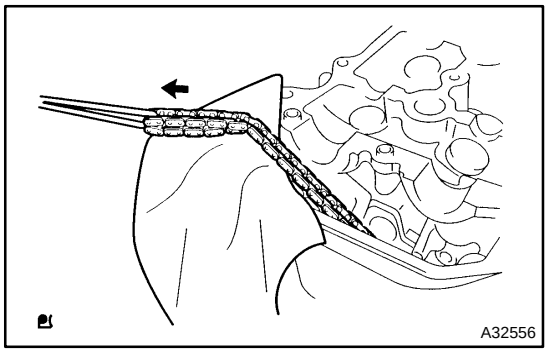
(f) Remove the camshaft timing gear as shown in the illustration.



(g) Loosen the camshaft bearing cap bolts on camshaft in the order as shown in the illustration in several passes,and remove the caps.



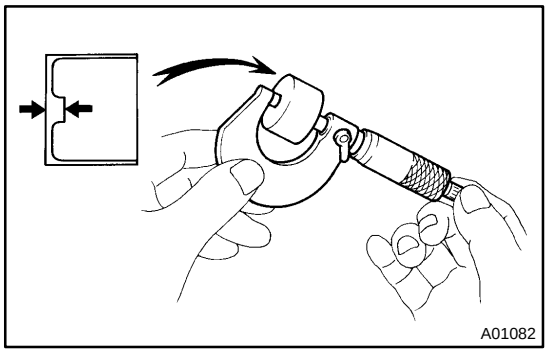
(h) Remove the camshaft with holding the timing chain.



(i) Tie the timing chain with a string as shown in the illustration.

NOTICE:

Be careful not to drop anything inside the timing chain cover.



(j) Remove the valve lifters.

(k) Using a micrometer, measure the thickness of the removed lifter.

(l) Calculate the thickness of a new lifter so that the valve clearance comes within the specified value.

A	Thickness of new lifter
B	Thickness of used lifter
C	Measured valve clearance

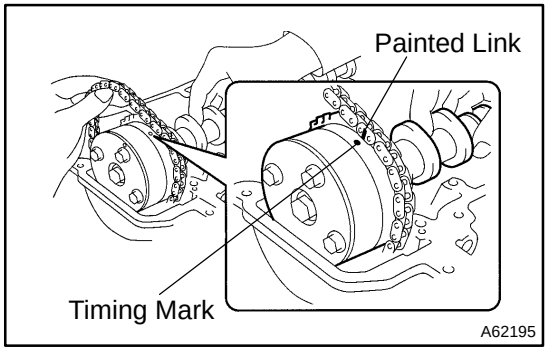
Valve clearance:

Intake A = B + (C – 0.20 mm (0.0079 in.)

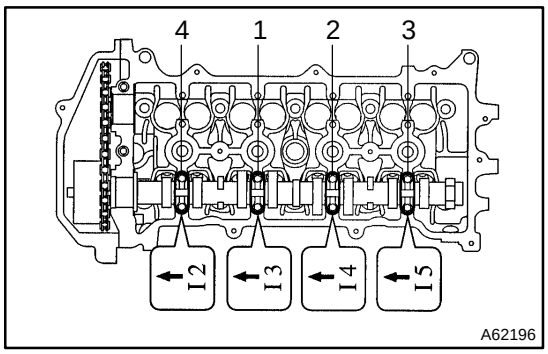
Exhaust A = B + (C – 0.30 mm (0.0118 in.)

HINT:

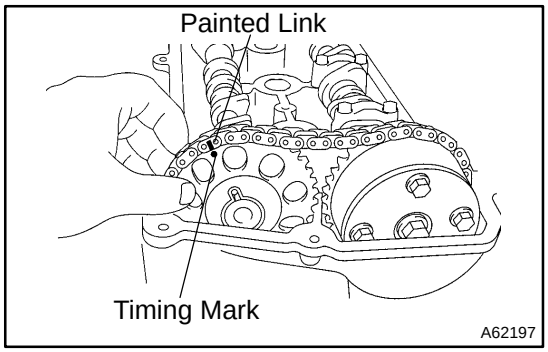
- Select a new lifter with a thickness as close as possible to the calculated values.
- Lifter are available in 35 sizes in increments of 0.020 mm (0.0008 in.), from 5.060 mm (0.1992 in.) to 5.740 mm (0.2260 in.).



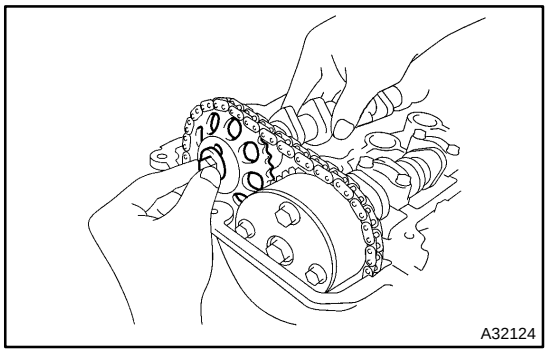
(m) As shown in the illustration, install the timing chain on the camshaft timing gear, with the painted links aligned with the timing marks on the camshaft timing sprocket.



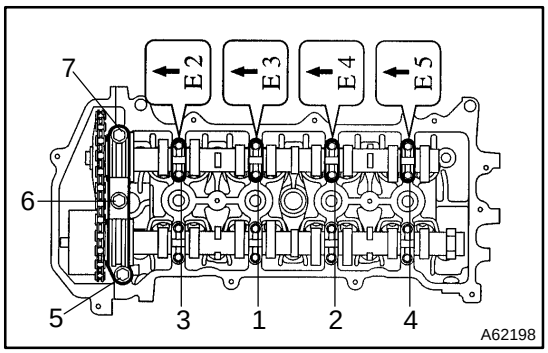
(n) Examine the front marks and numbers and tighten the bolts in the order shown in the illustration.
Torque: 13 N·m (133 kgf·cm, 10 ft·lbf)



(o) Put the camshaft No.2 on the cylinder head with the painted links of the chain aligned with the timing mark on the camshaft timing sprocket.

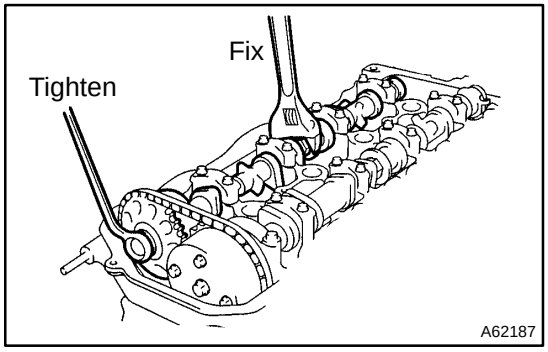


(p) Tighten the camshaft timing gear set bolt temporarily.



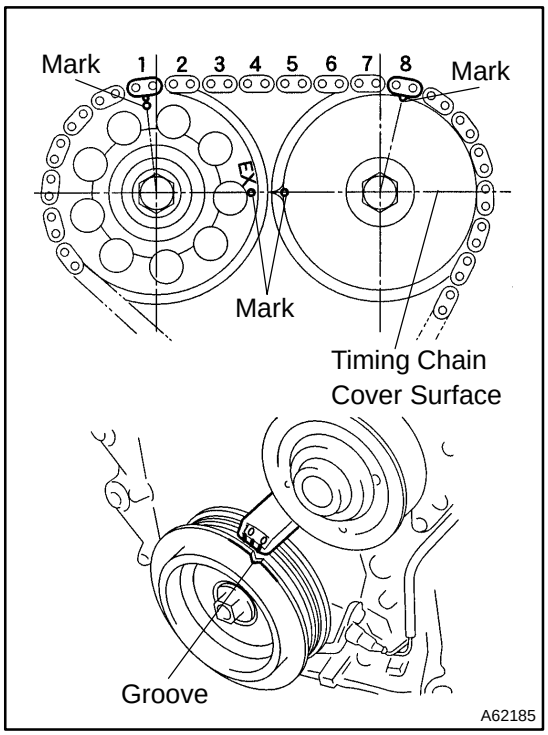
(q) Examine the front marks and numbers and tighten the bolts in the order shown in the illustration.
Torque: 13 N·m (133 kgf·cm, 10 ft·lbf)

(r) Install the bearing cap No. 1.
Torque: 23 N·m (235 kgf·cm, 17 ft·lbf)

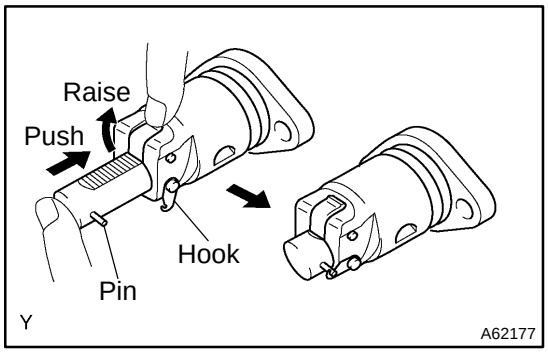


(s) Fix the camshaft with a spanner and so on, then tighten the camshaft timing gear set bolt.
Torque: 54 N·m (551 kgf·cm, 40 ft·lbf)

NOTICE:
Be careful not damage the valve lifter.

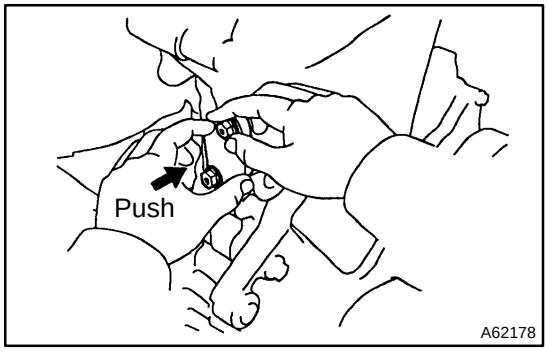


(t) Check the match marks on the timing chain and camshaft timing sprockets, and then the alignment of the pulley groove with timing mark of the chain cover as shown in the illustration.



(u) Install chain tensioner.

(1) Check the O–ring is clean, and set the hook as shown in the illustration.

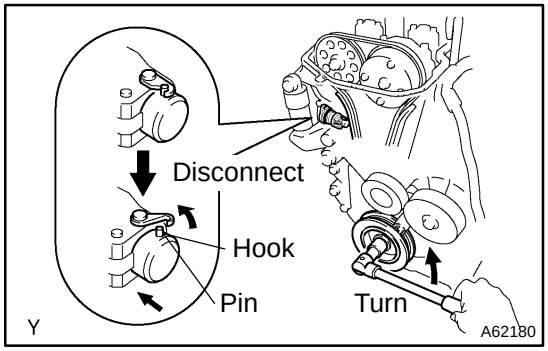


(2) Apply engine oil to the chain tensioner and install it with the 2 nuts.

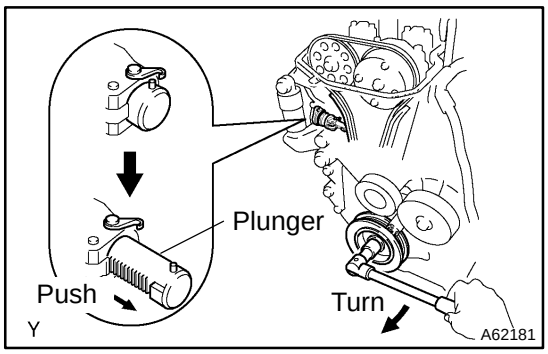
Torque: 9.0 N·m (92 kgf·cm, 80 in·lbf)

NOTICE:

When installing the tensioner, set the hook again if the hook release the plunger.



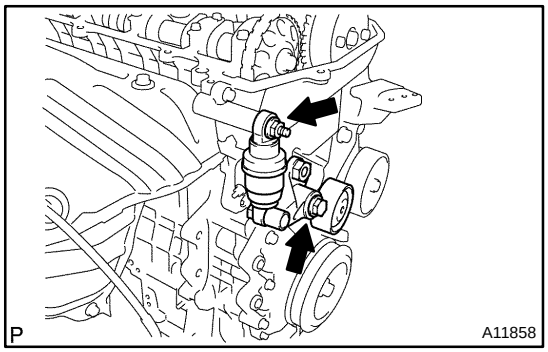
(3) Turn the crankshaft counterclockwise, and disconnect the plunger knock pin from the hook.



(4) Turn the crankshaft clockwise, and check that the slipper is pushed by the plunger.

HINT:

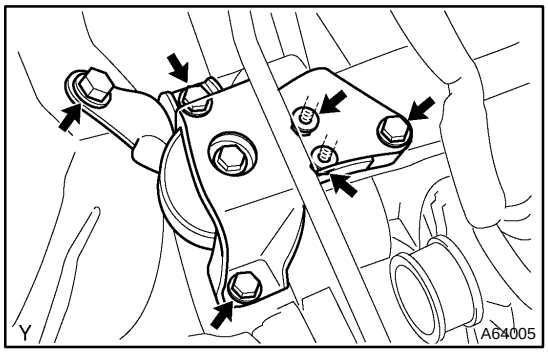
If the plunger does not spring out, press the slipper into the chain tensioner with a screwdriver so that the hook is released from the knock pin and the plunger springs out.



14. INSTALL V–RIBBED BELT TENSIONER ASSY

(a) Install the V–ribbed belt tensioner with the nut and bolt.

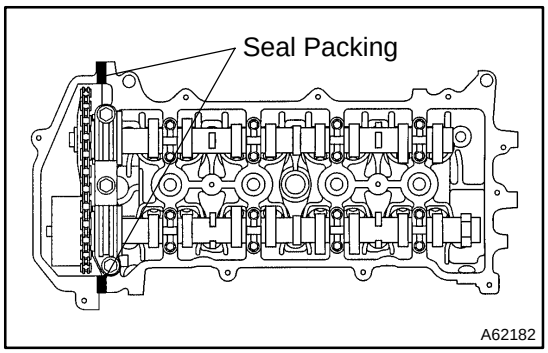
Torque:
29 N·m (296 kgf·cm, 21 ft·lbf) for Nut
69 N·m (704 kgf·cm, 51 ft·lbf) for Bolt



15. INSTALL ENGINE MOUNTING INSULATOR SUB–ASSY RH

(a) Install engine mounting insulator RH with the 4 bolts and the 2 nuts.

Torque: 52 N·m (530 kgf·cm, 38 ft·lbf)



16. INSTALL CYLINDER HEAD COVER SUB–ASSY

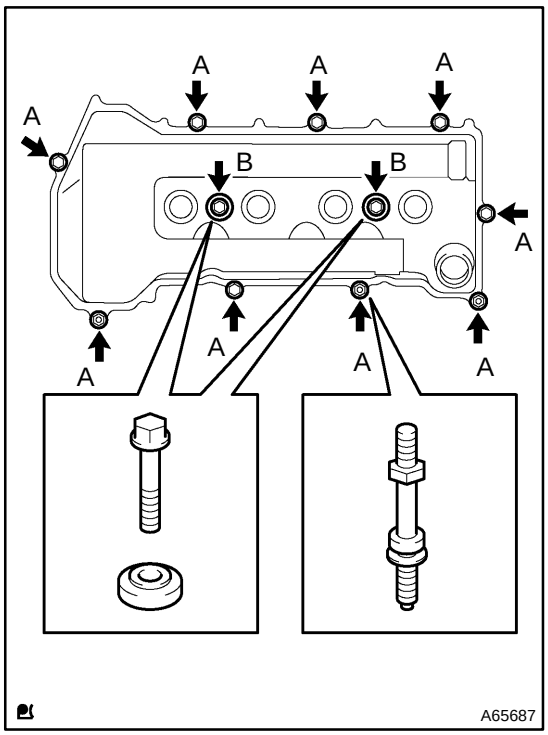
(a) Remove any old packing (FIPG) material.

(b) Apply seal packing to 2 locations as shown in the illustration.

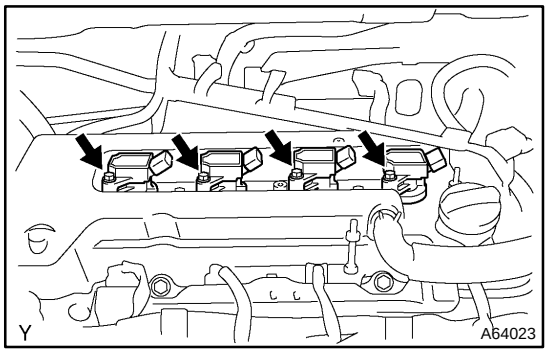
Seal packing: Part No. 08826–00080 or equivalent

NOTICE:

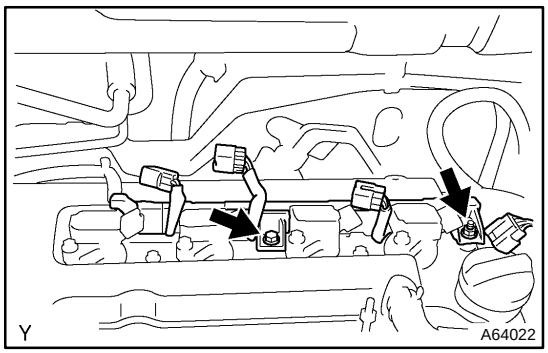
- **Remove any oil from the contact surface.**
- **Install the cylinder head cover within 3 minutes after applying seal packing.**
- **Do not put into engine oil 2 hours after installing.**



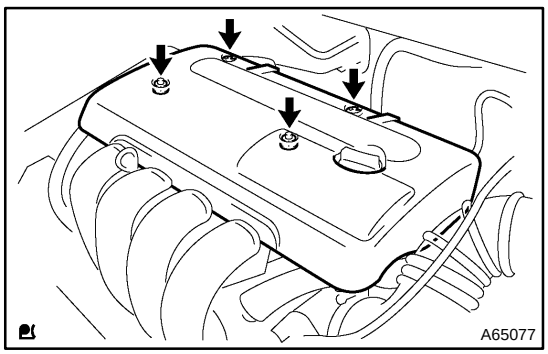
(c) Install the cylinder head cover and cable bracket with the 9 bolts, 2 seal washers and 2 nuts. Uniformly tighten the bolts and nuts, in the several passes.
Torque:
A 11 N·m (112 kgf·cm, 8 ft·lbf)
B 9.0 N·m (92 kgf·cm, 80 in·lbf)



17. INSTALL IGNITION COIL ASSY
(a) Install the 4 ignition coils with the 4 bolts.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)



18. INSTALL ENGINE WIRE
(a) Install the engine wire with the bolt and nut.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)



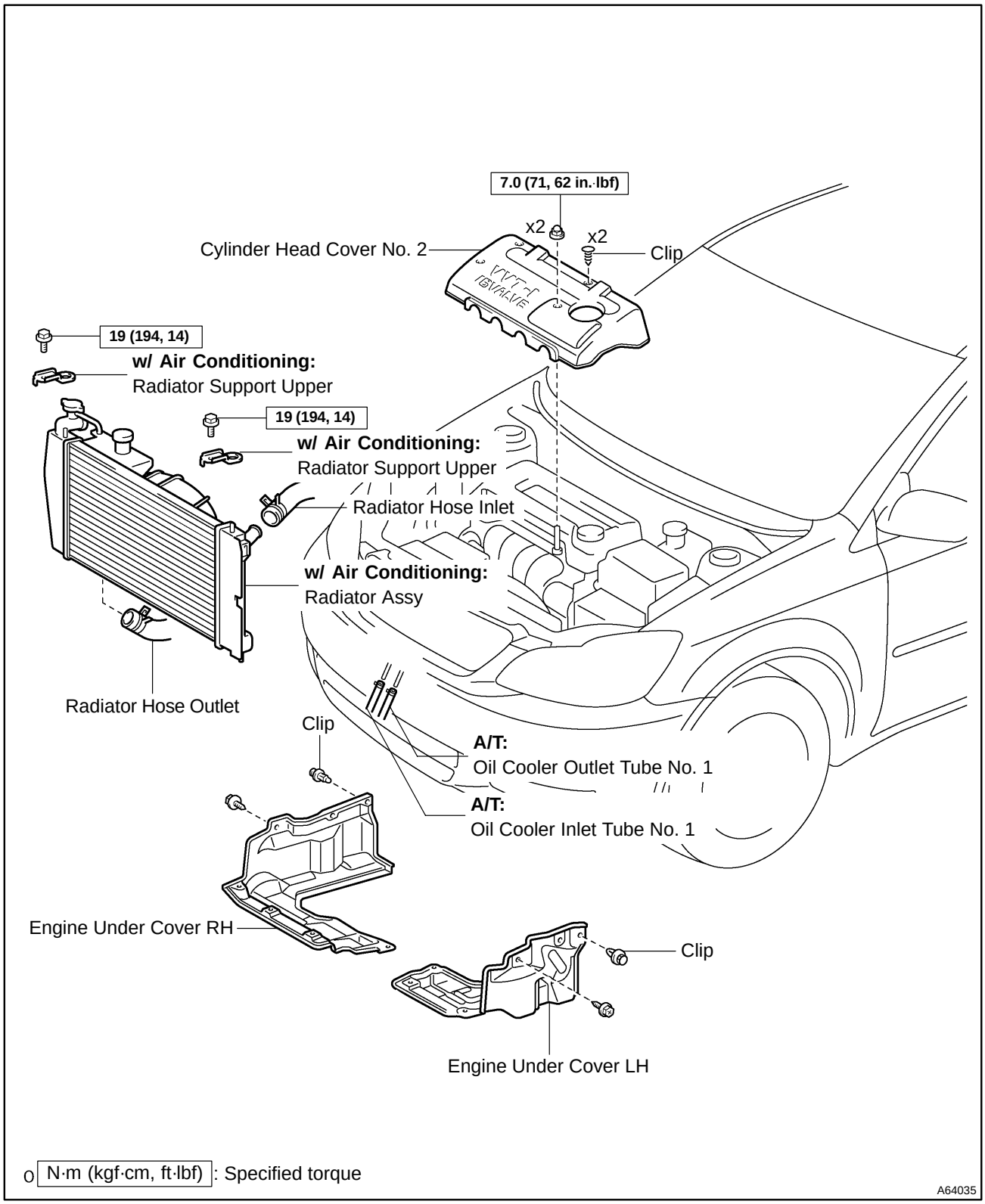
19. INSTALL CYLINDER HEAD COVER NO.2
(a) Install the cylinder head cover with the 2 nuts and 2 clips.
Torque: 7.0 N·m (71 kgf·cm, 62 in.·lbf)

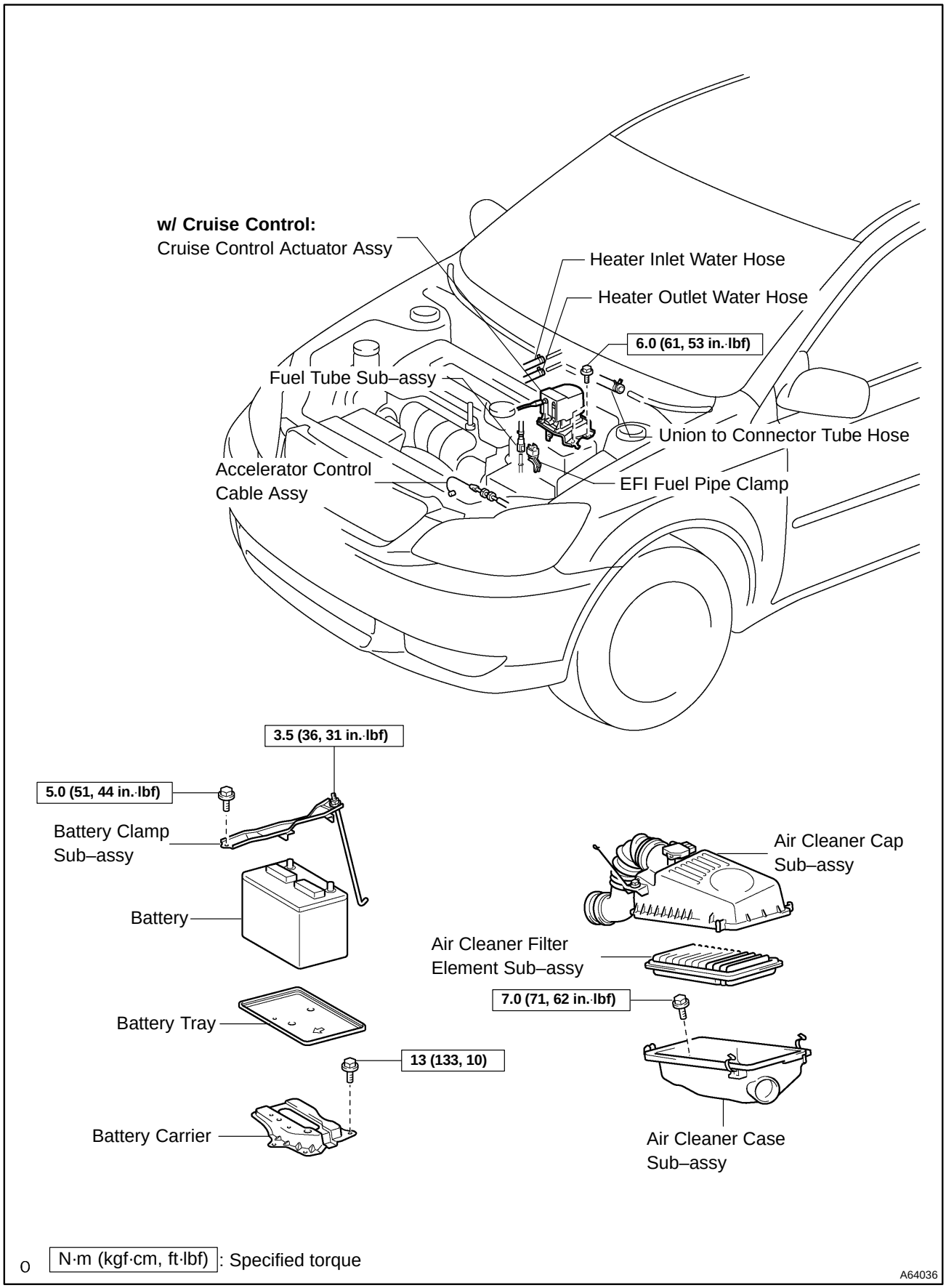
20. CHECK ENGINE OIL LEAK

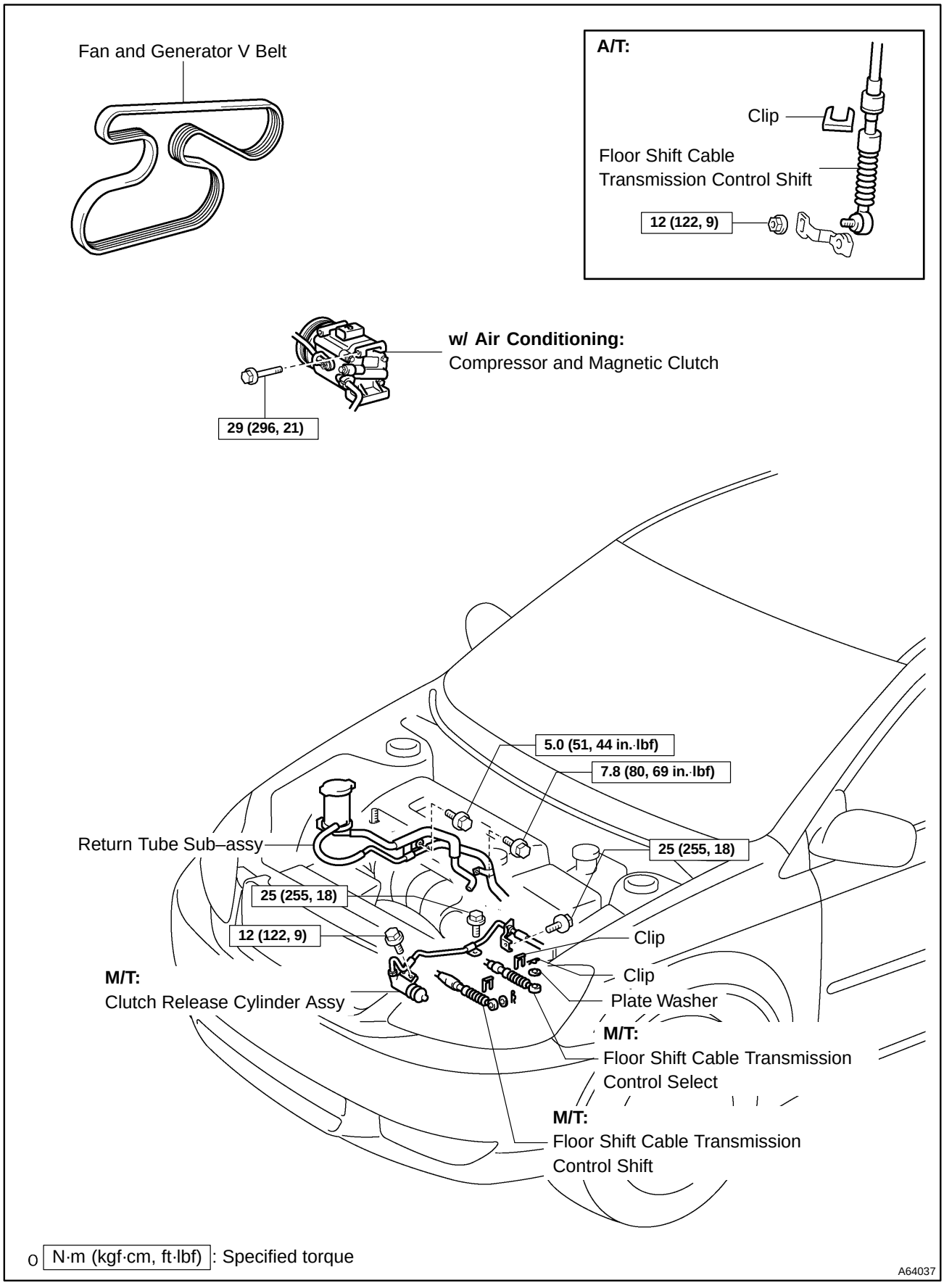
PARTIAL ENGINE ASSY (April, 2003)

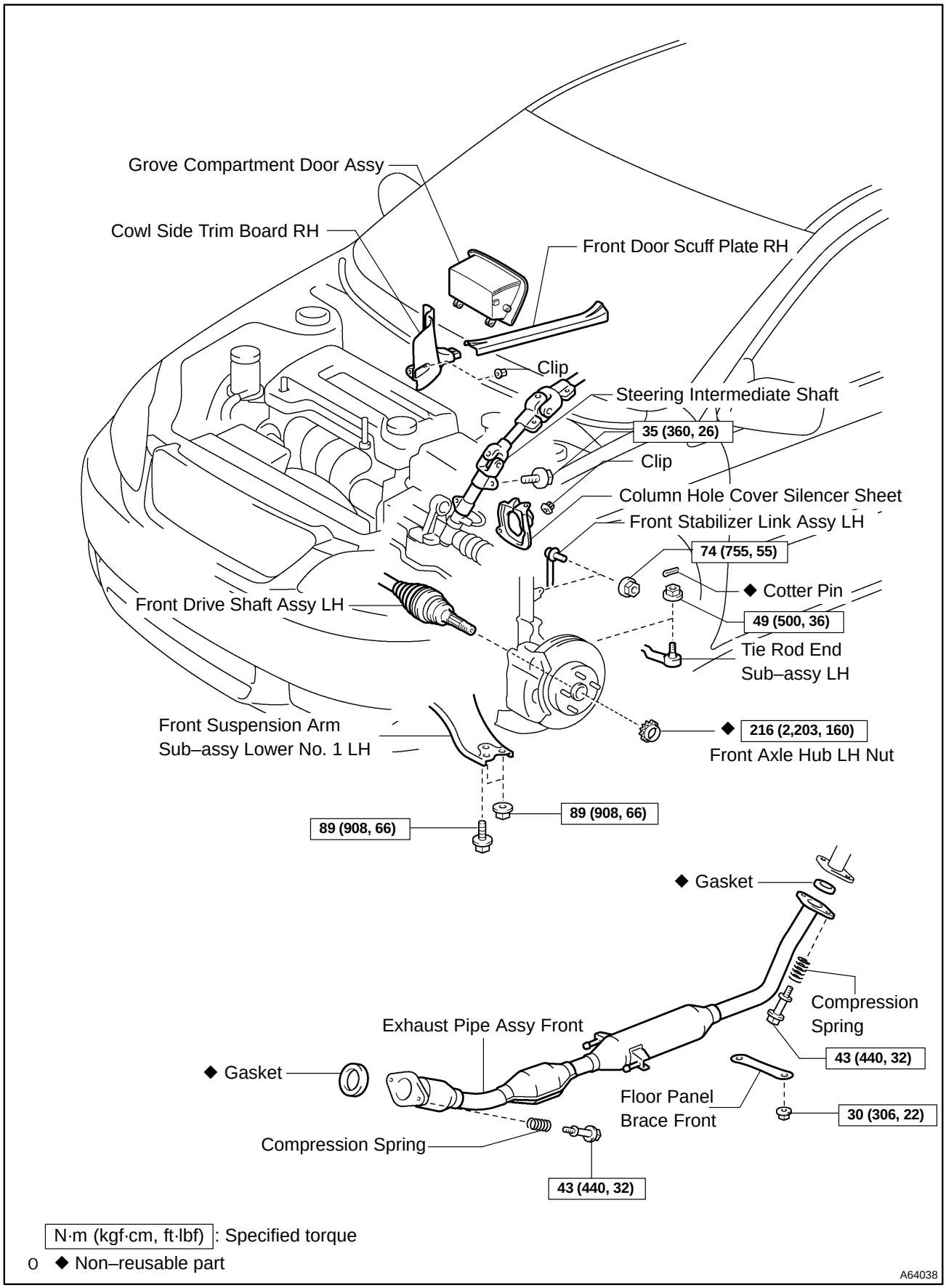
140OF–03

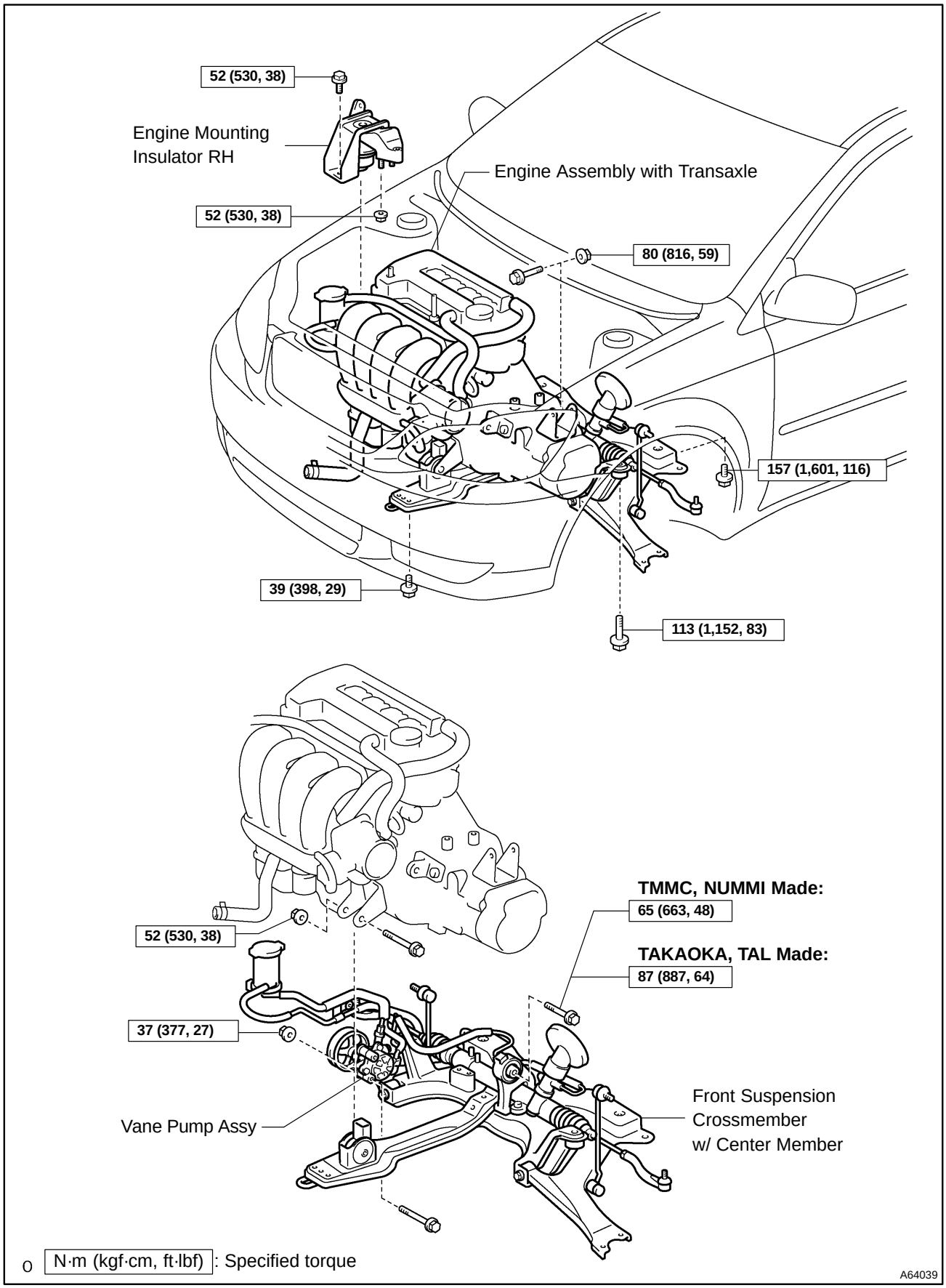
COMPONENTS

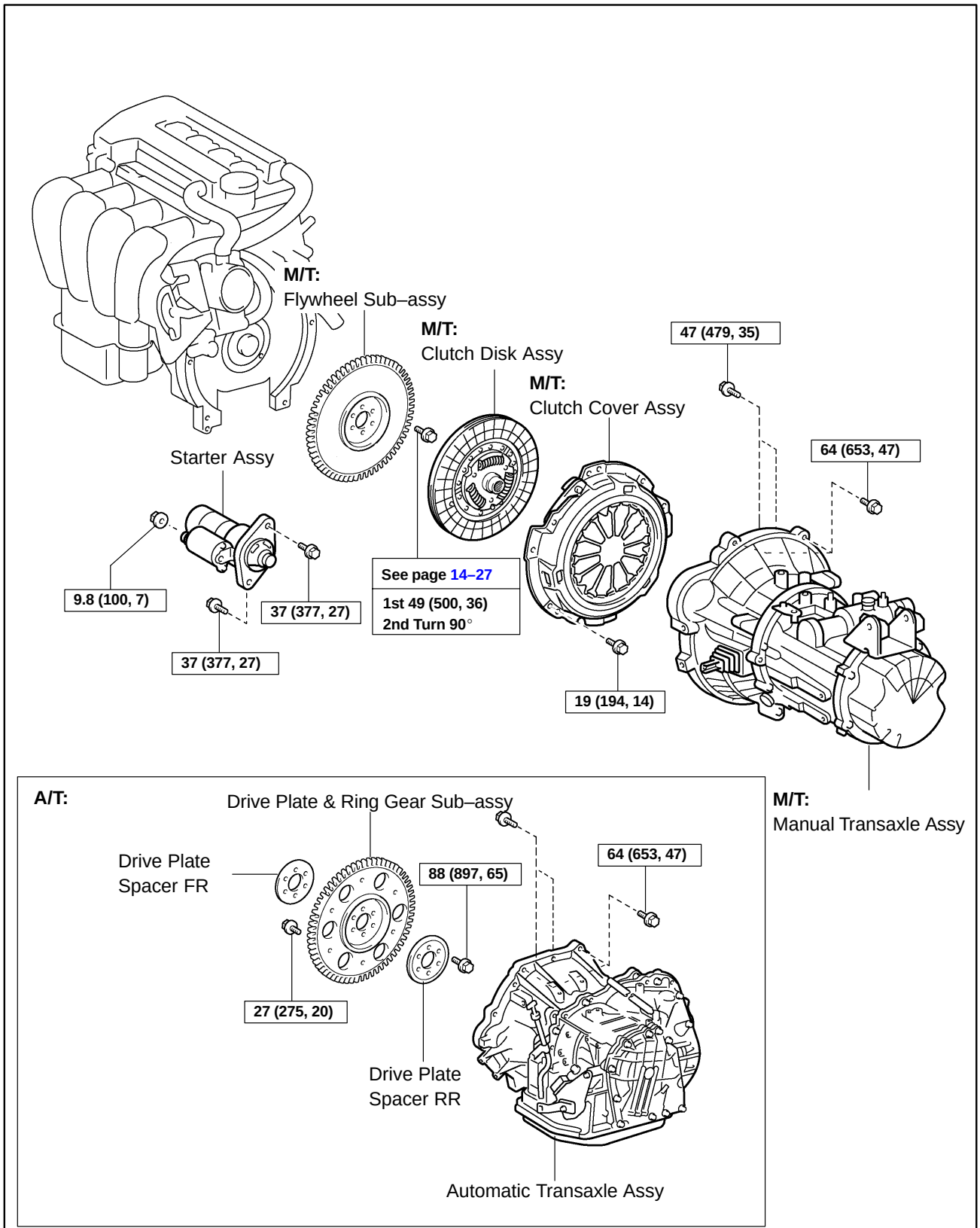



w/ Cruise Control:
Cruise Control Actuator Assy
Heater Inlet Water Hose
Heater Outlet Water Hose
6.0 (61, 53 in.·lbf)
Fuel Tube Sub–assy
Union to Connector Tube Hose
Accelerator Control Cable Assy
EFI Fuel Pipe Clamp
3.5 (36, 31 in.·lbf)
5.0 (51, 44 in.·lbf)
Battery Clamp Sub–assy
Battery
Battery Tray
13 (133, 10)
Battery Carrier
Air Cleaner Cap Sub–assy
Air Cleaner Filter Element Sub–assy
7.0 (71, 62 in.·lbf)
Air Cleaner Case Sub–assy
o N·m (kgf·cm, ft·lbf): Specified torque
A64036


Fan and Generator V Belt
A/T:
Clip
Floor Shift Cable
Transmission Control Shift
12 (122, 9)
w/ Air Conditioning:
Compressor and Magnetic Clutch
29 (296, 21)
5.0 (51, 44 in.·lbf)
7.8 (80, 69 in.·lbf)
Return Tube Sub–assy
25 (255, 18)
25 (255, 18)
12 (122, 9)
Clip
Clip
Plate Washer
M/T:
Clutch Release Cylinder Assy
M/T:
Floor Shift Cable Transmission
Control Select
M/T:
Floor Shift Cable Transmission
Control Shift
o N·m (kgf·cm, ft·lbf) : Specified torque
A64037

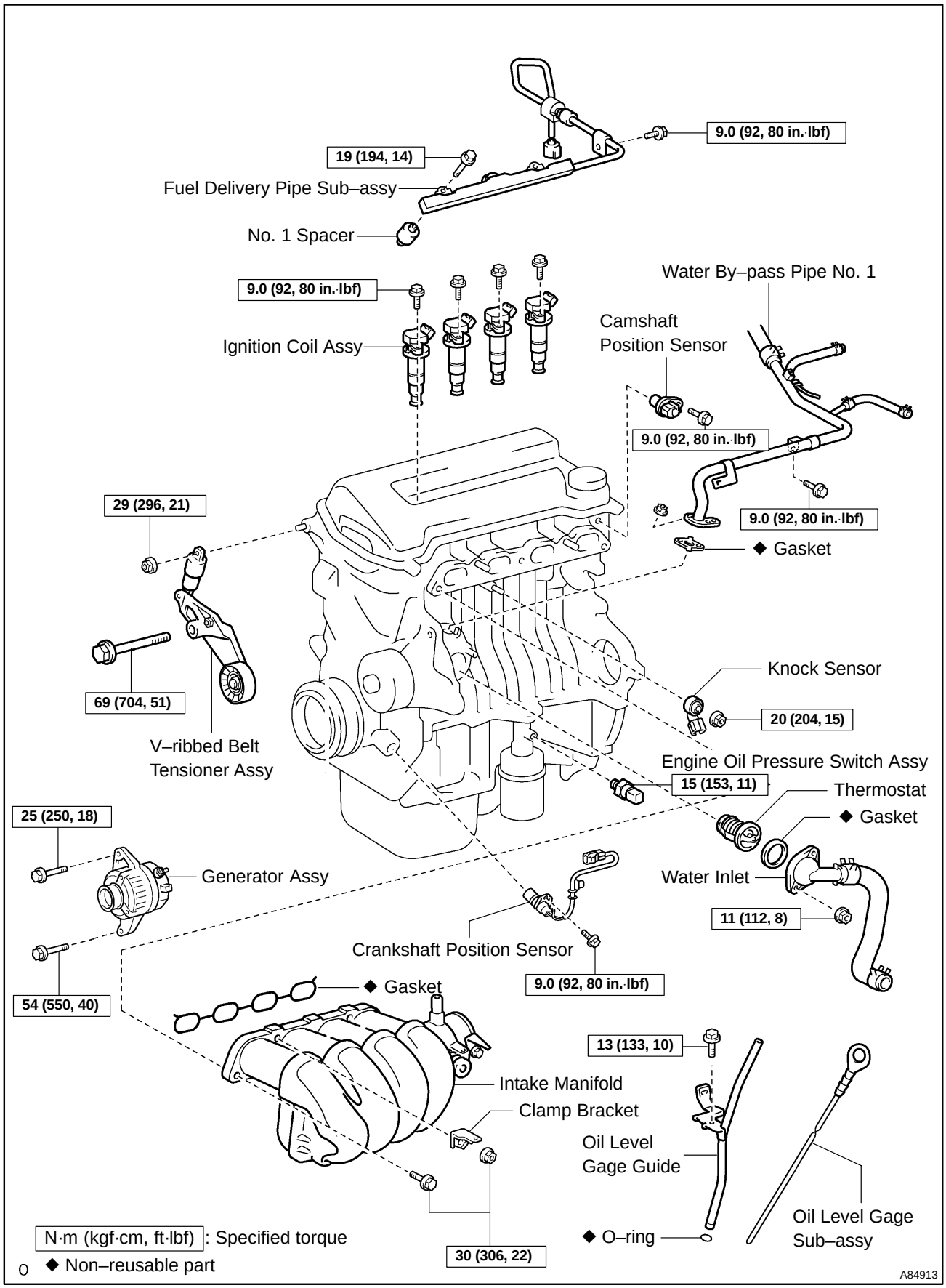

Grove Compartment Door Assy
Cowl Side Trim Board RH
Front Door Scuff Plate RH
Clip
Steering Intermediate Shaft
35 (360, 26)
Clip
Column Hole Cover Silencer Sheet
Front Stabilizer Link Assy LH
74 (755, 55)
◆ Cotter Pin
49 (500, 36)
Front Drive Shaft Assy LH
Tie Rod End
Sub–assy LH
Front Suspension Arm
Sub–assy Lower No. 1 LH
◆ 216 (2,203, 160)
Front Axle Hub LH Nut
89 (908, 66)
89 (908, 66)
◆ Gasket
Compression
Spring
Exhaust Pipe Assy Front
43 (440, 32)
◆ Gasket
Floor Panel
Brace Front
30 (306, 22)
Compression Spring
43 (440, 32)
N·m (kgf·cm, ft·lbf): Specified torque
◆ Non–reusable part
A64038

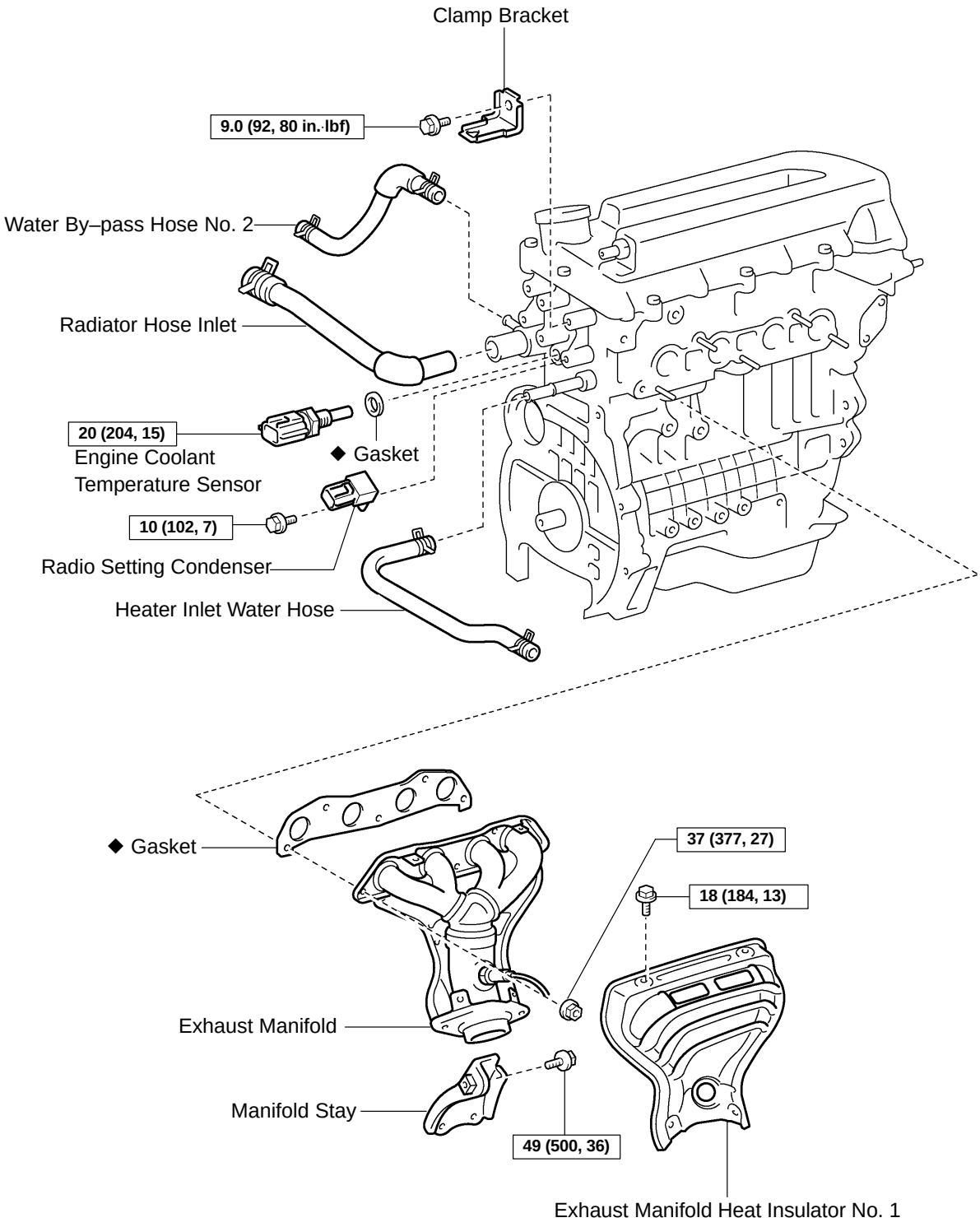

52 (530, 38)
Engine Mounting Insulator RH
Engine Assembly with Transaxle
52 (530, 38)
80 (816, 59)
157 (1,601, 116)
39 (398, 29)
113 (1,152, 83)
TMMC, NUMMI Made:
65 (663, 48)
TAKAOKA, TAL Made:
87 (887, 64)
52 (530, 38)
37 (377, 27)
Vane Pump Assy
Front Suspension Crossmember w/ Center Member
o N·m (kgf·cm, ft·lbf): Specified torque
A64039



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

A66030

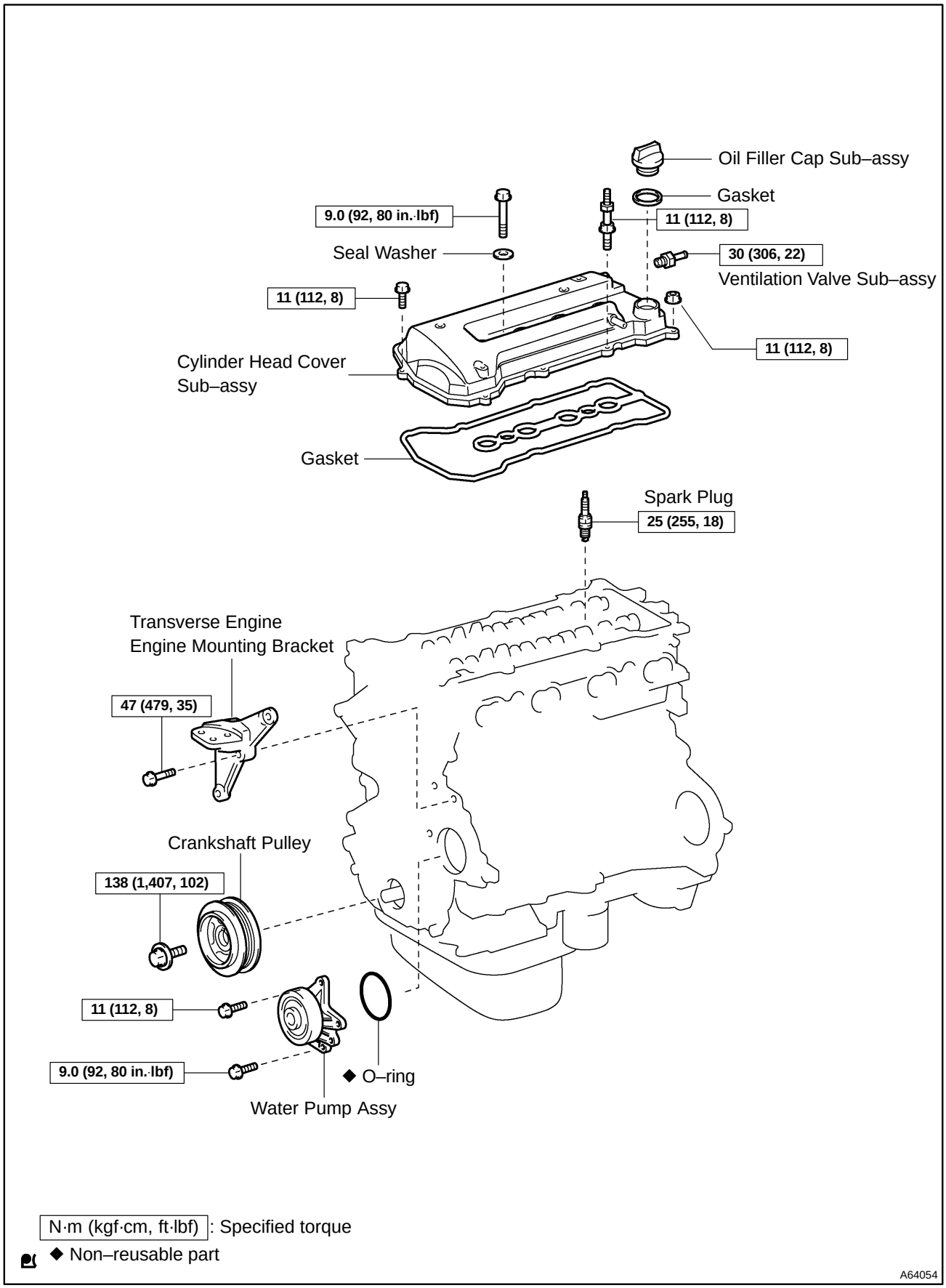

9.0 (92, 80 in.·lbf)
19 (194, 14)
Fuel Delivery Pipe Sub–assy
No. 1 Spacer
9.0 (92, 80 in.·lbf)
Ignition Coil Assy
Water By–pass Pipe No. 1
Camshaft
Position Sensor
9.0 (92, 80 in.·lbf)
9.0 (92, 80 in.·lbf)
◆ Gasket
29 (296, 21)
69 (704, 51)
V–ribbed Belt
Tensioner Assy
Knock Sensor
20 (204, 15)
Engine Oil Pressure Switch Assy
15 (153, 11)
Thermostat
◆ Gasket
25 (250, 18)
Generator Assy
Water Inlet
11 (112, 8)
Crankshaft Position Sensor
9.0 (92, 80 in.·lbf)
54 (550, 40)
◆ Gasket
13 (133, 10)
Intake Manifold
Clamp Bracket
Oil Level
Gage Guide
Oil Level Gage
Sub–assy
◆ O–ring
30 (306, 22)
N·m (kgf·cm, ft·lbf): Specified torque
◆ Non–reusable part
A84913

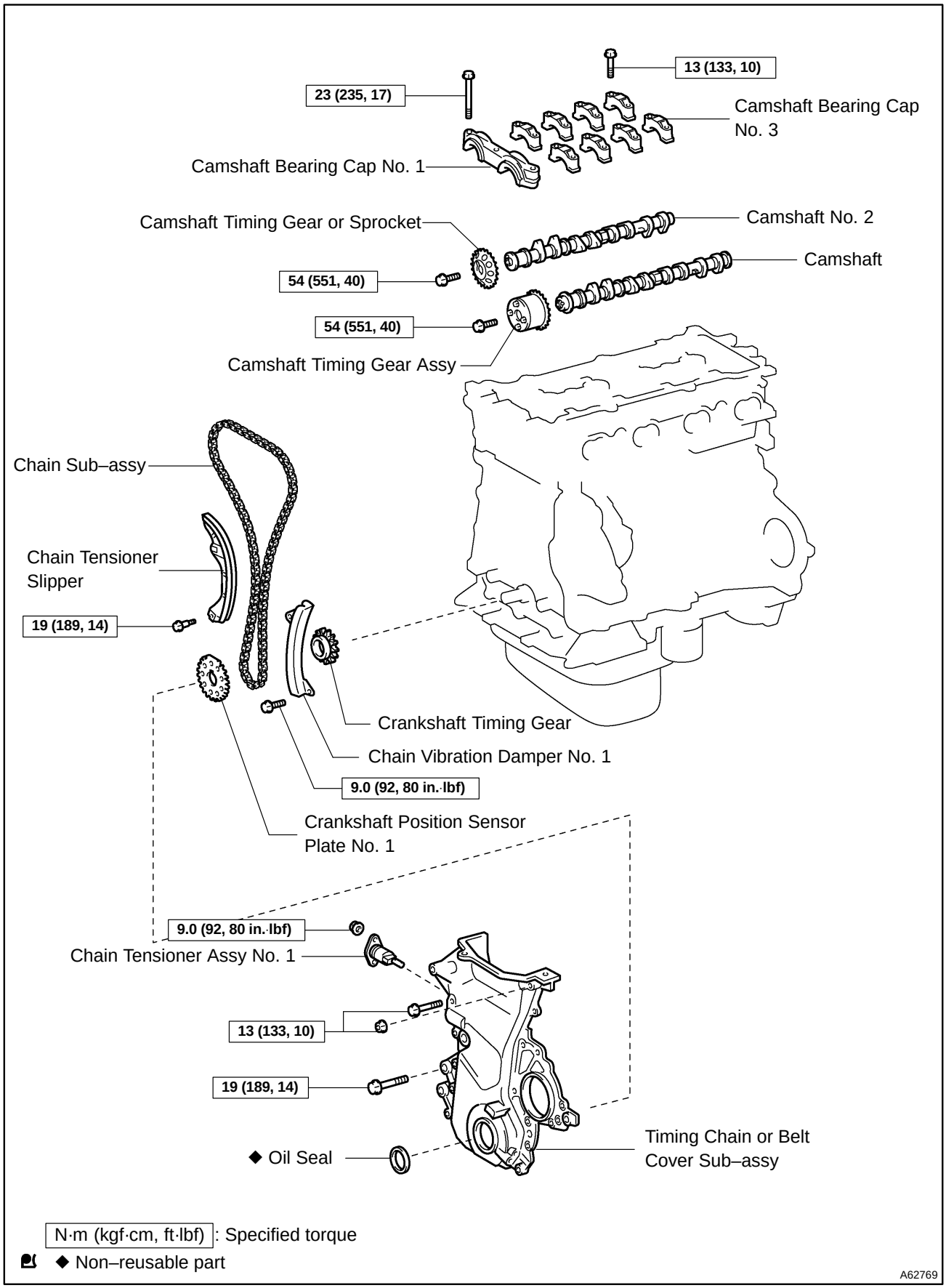


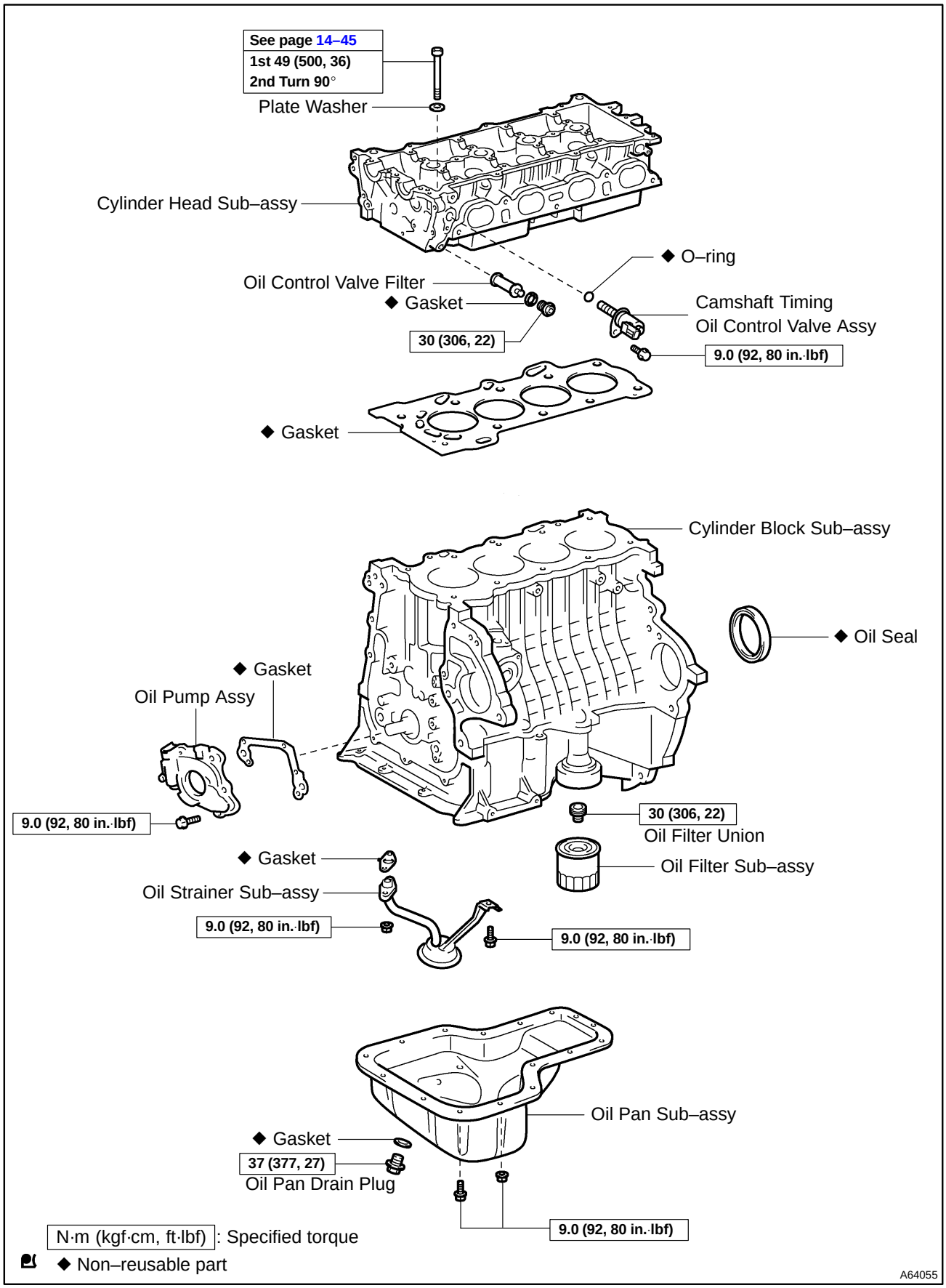
N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non–reusable part

A64041


Oil Filler Cap Sub–assy
Gasket
9.0 (92, 80 in.·lbf)
11 (112, 8)
Seal Washer
30 (306, 22)
Ventilation Valve Sub–assy
11 (112, 8)
11 (112, 8)
Cylinder Head Cover Sub–assy
Gasket
Spark Plug
25 (255, 18)
Transverse Engine Engine Mounting Bracket
47 (479, 35)
Crankshaft Pulley
138 (1,407, 102)
11 (112, 8)
9.0 (92, 80 in.·lbf)
◆ O–ring
Water Pump Assy
N·m (kgf·cm, ft·lbf): Specified torque
◆ Non–reusable part
A64054

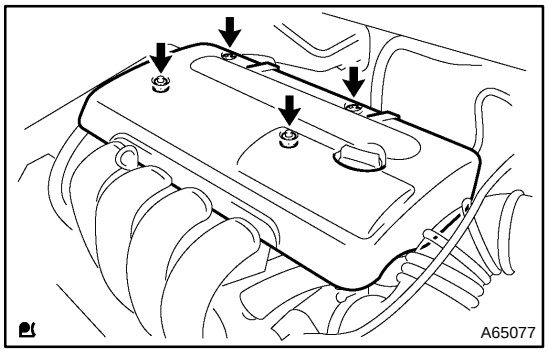

13 (133, 10)
23 (235, 17)
Camshaft Bearing Cap No. 3
Camshaft Bearing Cap No. 1
Camshaft Timing Gear or Sprocket
Camshaft No. 2
Camshaft
54 (551, 40)
54 (551, 40)
Camshaft Timing Gear Assy
Chain Sub–assy
Chain Tensioner Slipper
19 (189, 14)
Crankshaft Timing Gear
Chain Vibration Damper No. 1
9.0 (92, 80 in.·lbf)
Crankshaft Position Sensor Plate No. 1
9.0 (92, 80 in.·lbf)
Chain Tensioner Assy No. 1
13 (133, 10)
19 (189, 14)
◆ Oil Seal
Timing Chain or Belt Cover Sub–assy
N·m (kgf·cm, ft·lbf): Specified torque
◆ Non–reusable part
A62769


See page 14–45
1st 49 (500, 36)
2nd Turn 90°
Plate Washer
Cylinder Head Sub–assy
◆ O–ring
Oil Control Valve Filter
◆ Gasket
Camshaft Timing
Oil Control Valve Assy
30 (306, 22)
9.0 (92, 80 in.·lbf)
◆ Gasket
Cylinder Block Sub–assy
◆ Oil Seal
◆ Gasket
Oil Pump Assy
9.0 (92, 80 in.·lbf)
30 (306, 22)
Oil Filter Union
Oil Filter Sub–assy
◆ Gasket
Oil Strainer Sub–assy
9.0 (92, 80 in.·lbf)
9.0 (92, 80 in.·lbf)
Oil Pan Sub–assy
◆ Gasket
37 (377, 27)
Oil Pan Drain Plug
9.0 (92, 80 in.·lbf)
N·m (kgf·cm, ft·lbf): Specified torque
◆ Non–reusable part
A64055

141GS–01

REPLACEMENT

1. **WORK FOR PREVENTING GASOLINE FROM SPILLING OUT (See page 11–1)**
2. **REMOVE FRONT WHEELS**
3. **REMOVE ENGINE UNDER COVER RH**
4. **REMOVE ENGINE UNDER COVER LH**
5. **DRAIN COOLANT (See page 16–7)**



6. **REMOVE CYLINDER HEAD COVER NO.2**

(a) Remove the 2 nuts, 2 clips and cylinder head cover.

7. **DISCONNECT RADIATOR HOSE INLET**

(a) Disconnect the radiator hose inlet from the radiator.

8. **DISCONNECT RADIATOR HOSE OUTLET**

(a) Disconnect the radiator hose outlet from the radiator.

9. **DISCONNECT OIL COOLER INLET TUBE NO.1 (A/T TRANSAXLE)**

(a) Disconnect the oil cooler inlet tube from the radiator.

10. **DISCONNECT OIL COOLER OUTLET TUBE NO.1 (A/T TRANSAXLE)**

(a) Disconnect the oil cooler outlet tube from the radiator.

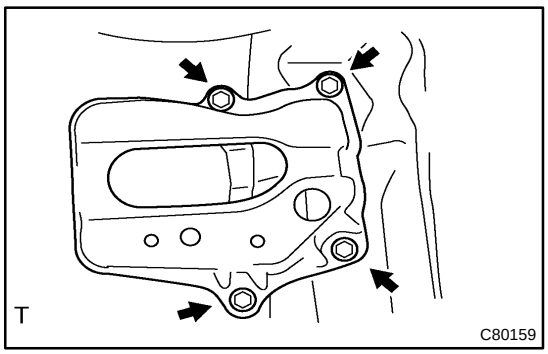
11. **REMOVE RADIATOR SUPPORT UPPER (W/ AIR CONDITIONING)**

(a) Remove the 2 bolts and 2 radiator support upper.

12. **REMOVE RADIATOR ASSY (W/ AIR CONDITIONING)**

(a) Disconnect the connector and harness clamp, and remove the radiator.

13. **REMOVE BATTERY**



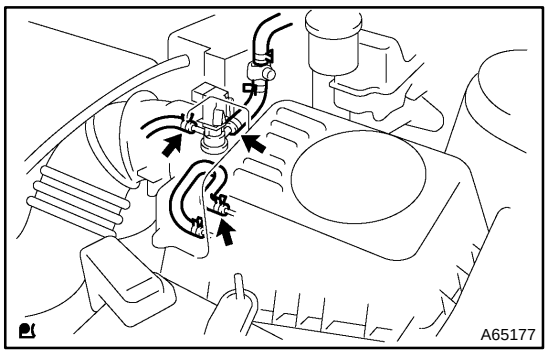
14. **REMOVE BATTERY CARRIER**

(a) Remove the 4 bolts and battery carrier.

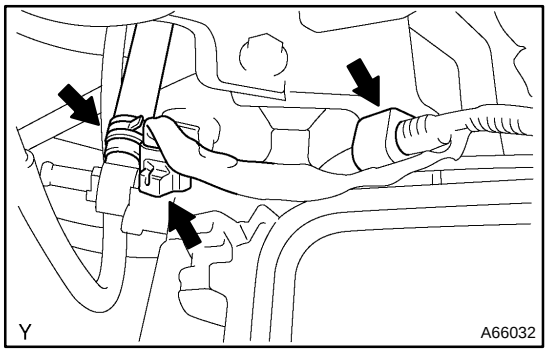
15. **REMOVE AIR CLEANER ASSEMBLY WITH HOSE**

(a) Disconnect the mass air flow sensor connector.

(b) Disconnect the VSV connector.



(c) Disconnect the 3 vacuum hoses, as shown in the illustration.
(d) Loosen the air cleaner hose clamp and disconnect the air cleaner hose.
(e) Remove the air cleaner cap.
(f) Remove the air cleaner filter element.



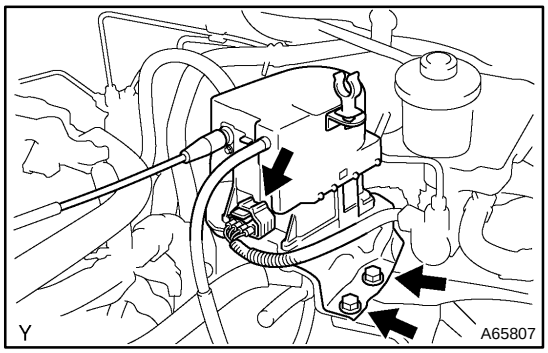
(g) Disconnect the wire harness clamp, connector and hose.
(h) Remove the 3 bolts and air cleaner case.

16. REMOVE EFI FUEL PIPE CLAMP (See page 11–10)

17. DISCONNECT FUEL TUBE SUB–ASSY (See page 11–10)

18. SEPARATE ACCELERATOR CONTROL CABLE ASSY

(a) Loosen the nut, then remove the accelerator control cable.

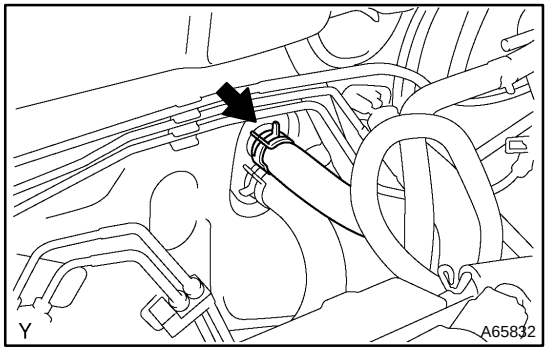


19. SEPARATE CRUISE CONTROL ACTUATOR ASSY (W/ CRUISE CONTROL)

(a) Disconnect the actuator connector.
(b) Remove the 2 bolts, then separate the actuator from the body.

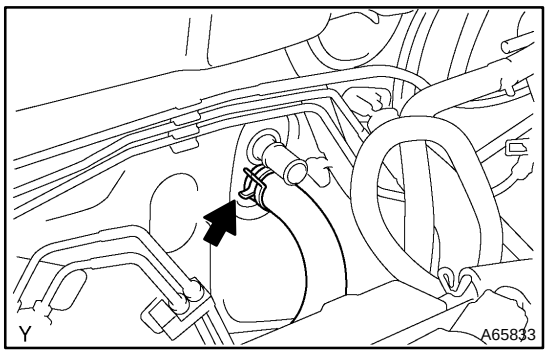
20. DISCONNECT UNION TO CONNECTOR TUBE HOSE

(a) Disconnect the union to connector tube hose from the brake booster.



21. DISCONNECT HEATER INLET WATER HOSE

(a) Disconnect the heater inlet water hose from the air conditioner tube.



22. DISCONNECT HEATER OUTLET WATER HOSE

(a) Disconnect the heater outlet water hose from the air conditioner tube.

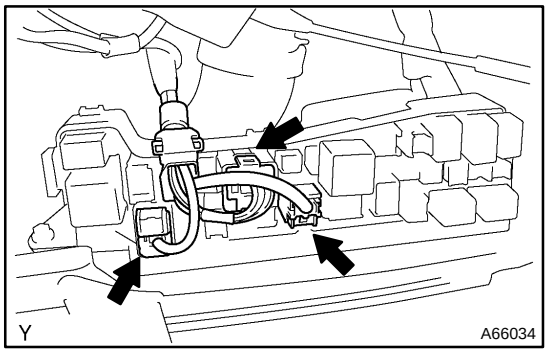
23. SEPARATE FLOOR SHIFT CABLE TRANSMISSION CONTROL SELECT (M/T TRANSAXLE) (See page 41–17)

24. SEPARATE FLOOR SHIFT CABLE TRANSMISSION CONTROL SHIFT (M/T TRANSAXLE) (See page 41–17)

25. SEPARATE FLOOR SHIFT CABLE TRANSMISSION CONTROL SHIFT (A/T TRANSAXLE) (See page 40–9)

26. SEPARATE CLUTCH RELEASE CYLINDER ASSY (M/T TRANSAXLE) (See page 41–17)

27. REMOVE GLOVE COMPARTMENT DOOR ASSY (See page 71–10)



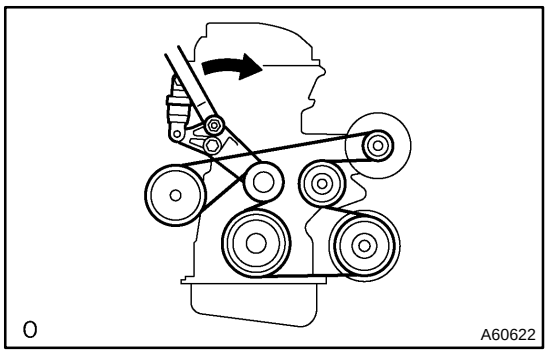
28. DISCONNECT ENGINE WIRE

(a) Disconnect the engine wire from the ECM and junction block.

(b) Pull out the engine wire.

(c) Remove the engine room relay block cover.

(d) Disconnect the engine wire from the engine room relay block.



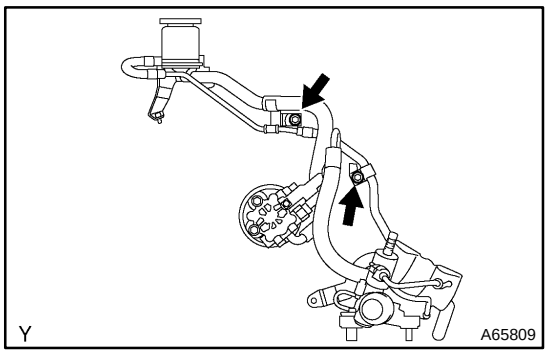
29. REMOVE FAN AND GENERATOR V BELT

(a) Slowly turn the V–ribbed belt tensioner clockwise, then remove the V belt.

30. SEPARATE COMPRESSOR AND MAGNETIC CLUTCH (W/ AIR CONDITIONING) (See page 55–34)

HINT:

Hang up the hoses instead of detaching.



31. SEPARATE RETURN TUBE SUB–ASSY

(a) Separate the vane pump oil reservoir from the oil reservoir bracket.

(b) Remove the 2 bolts installing the return tube.

32. REMOVE FRONT DOOR SCUFF PLATE RH (See page 76–21)

33. REMOVE COWL SIDE TRIM BOARD RH (See page 71–10)

34. REMOVE COLUMN HOLE COVER SILENCER SHEET

(a) Remove the 2 clips and column hole cover silencer sheet.

35. SEPARATE STEERING INTERMEDIATE SHAFT (See page 51–18)

36. REMOVE FLOOR PANEL BRACE FRONT

(a) Remove the 2 nuts and floor panel brace front.

37. REMOVE EXHAUST PIPE ASSY FRONT (See page 15–2)

38. REMOVE FRONT AXLE HUB LH NUT (See page 30–6)

SST 09930–00010

39. REMOVE FRONT AXLE HUB RH NUT (See page 30–6)

SST 09930–00010

40. SEPARATE TIE ROD END SUB–ASSY LH (See page 30–6)

SST 09628–62011

41. SEPARATE TIE ROD END SUB–ASSY RH (See page 30–6)

SST 09628–62011

42. SEPARATE FRONT STABILIZER LINK ASSY LH (See page 51–18)

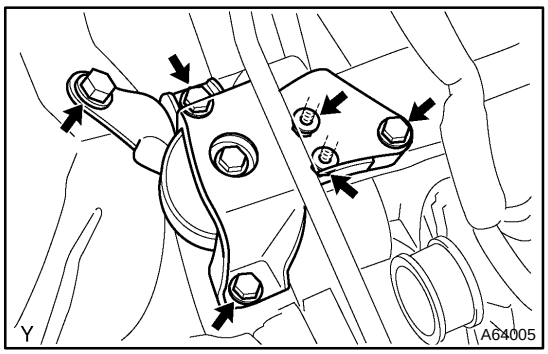
43. SEPARATE FRONT STABILIZER LINK ASSY RH (See page 51–18)

44. SEPARATE FRONT SUSPENSION ARM SUB–ASSY LOWER NO.1 LH (See page 30–6)

45. SEPARATE FRONT SUSPENSION ARM SUB–ASSY LOWER NO.1 RH (See page 30–6)

46. SEPARATE FRONT AXLE ASSY LH (See page 30–6)

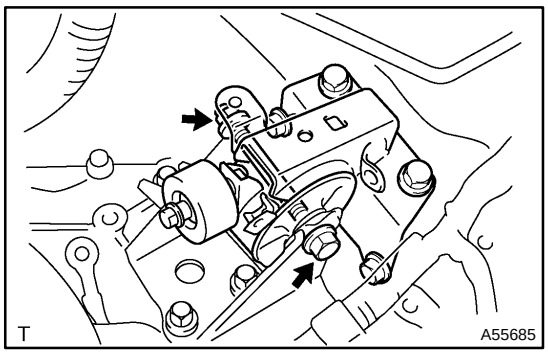
47. SEPARATE FRONT AXLE ASSY RH (See page 30–6)



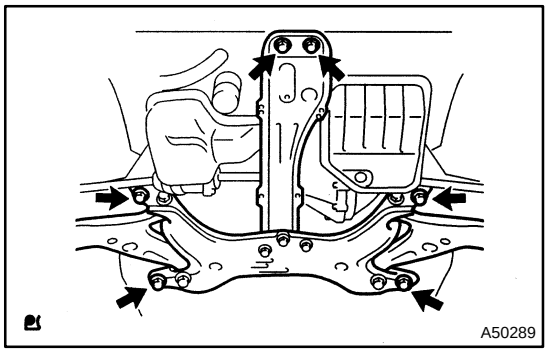
48. REMOVE ENGINE ASSEMBLY WITH TRANSAXLE

(a) Set the engine lifter.

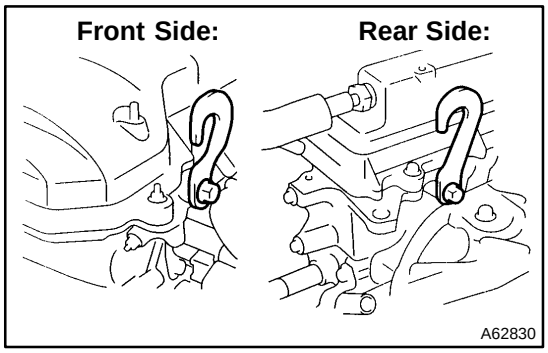
(b) Remove the 4 bolts, 2 nuts and engine mounting insulator.



(c) Remove the through bolt and nut, then detach the engine mounting insulator from the vehicle.



(d) Remove the 6 bolts, as shown in the illustration.
(e) Carefully, remove the engine with transaxle from the vehicle.



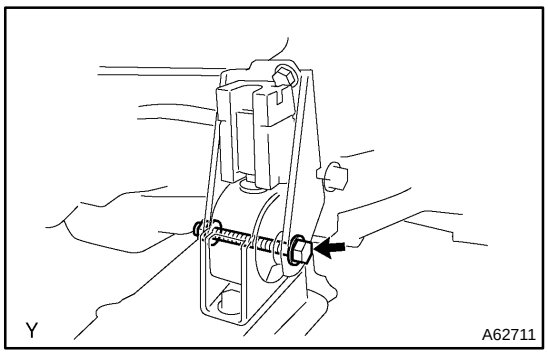
(f) Install the 2 engine hangers with the 2 bolts.
Part No.:
12281–15040 for No. 1 engine hanger
12281–22021 for No. 2 engine hanger
91512–B1016 for bolt
Torque: 38 N·m (387 kgf·cm, 28 ft·lbf)

HINT:
Be sure to install the engine hanger (12281–22021) to the front side of the engine and the engine hanger (12281–15040) to the rear side.

(g) Using the chain block and engine sling device, hang the engine assembly.

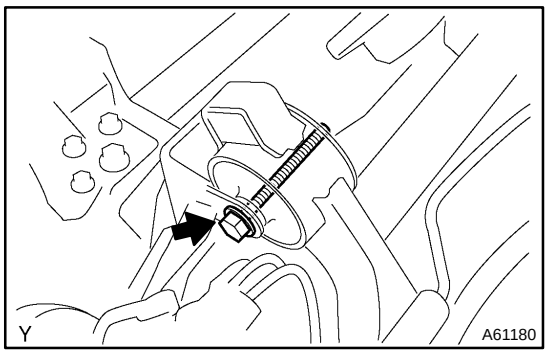
49. SEPARATE VANE PUMP ASSY (See page 51–8)

NOTICE:
Do not disconnect the hose.



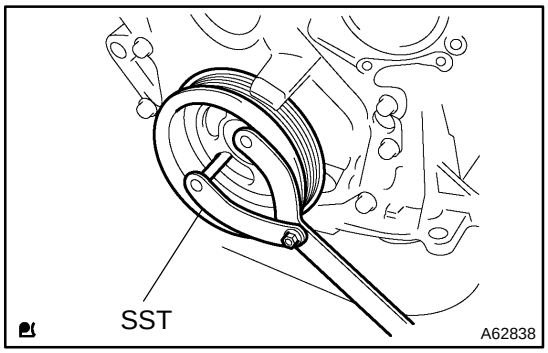
50. REMOVE FRONT SUSPENSION CROSSMEMBER W/CENTER MEMBER

(a) Remove the through bolt and nut, then detach the engine mounting insulator FR from the engine mounting bracket.

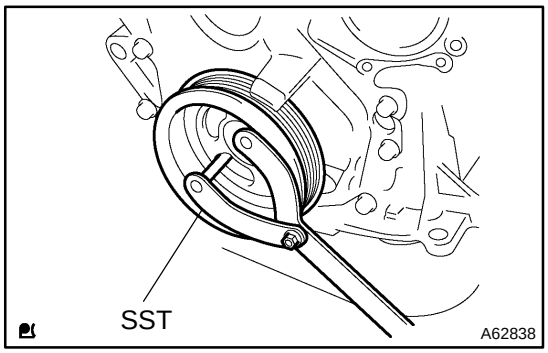


(b) Remove the through bolt, then detach the engine mounting insulator RR from the suspension crossmember.
(c) Separate the engine and transaxle assembly from the suspension crossmember and engine mounting member.

51. REMOVE STARTER ASSY (See page 19–4)
52. REMOVE MANUAL TRANSAXLE ASSY (M/T TRANSAXLE) (See page 41–17)
53. REMOVE AUTOMATIC TRANSAXLE ASSY (A/T TRANSAXLE) (See page 40–9)
54. REMOVE CLUTCH COVER ASSY (M/T TRANSAXLE) (See page 42–18)
55. REMOVE CLUTCH DISC ASSY (M/T TRANSAXLE) (See page 42–18)

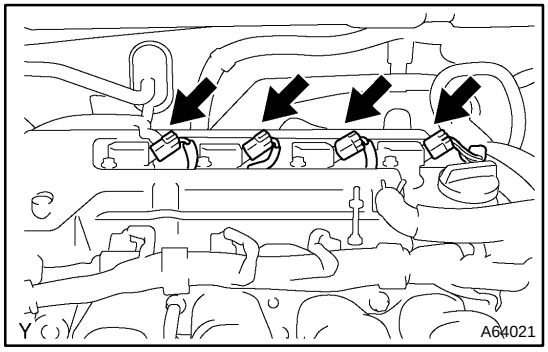


56. REMOVE FLYWHEEL SUB–ASSY (M/T TRANSAXLE)
(a) Fix the crankshaft with SST, then remove the 8 bolts and flywheel.
SST 09960–10010 (09962–01000, 09963–01000)

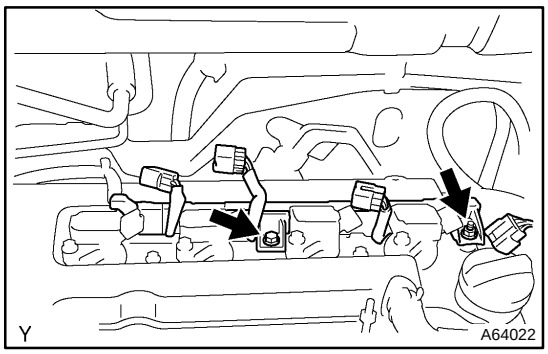


57. REMOVE DRIVE PLATE & RING GEAR SUB–ASSY (A/T TRANSAXLE)
(a) Fix the crankshaft with SST, then remove the 8 bolts and drive plate & ring gear.
SST 09960–10010 (09962–01000, 09963–01000)

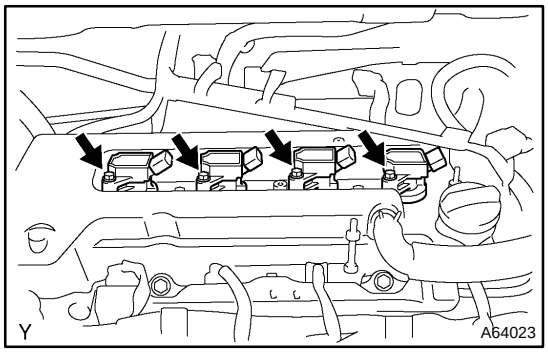
58. REMOVE GENERATOR ASSY (See page 19–16)



59. REMOVE IGNITION COIL ASSY
(a) Disconnect the 4 ignition coil connectors.

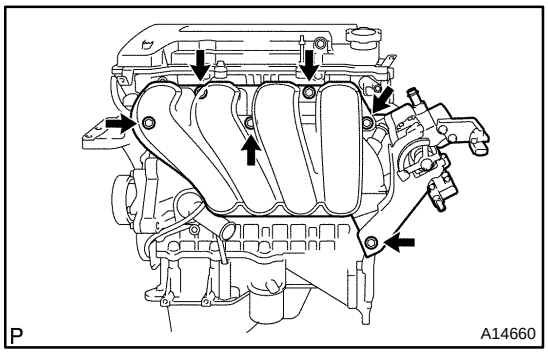


(b) Remove the bolt and nut installing the engine wire.



(c) Remove the 4 bolts and 4 ignition coils.

60. REMOVE FUEL DELIVERY PIPE SUB–ASSY (See page 11–10)

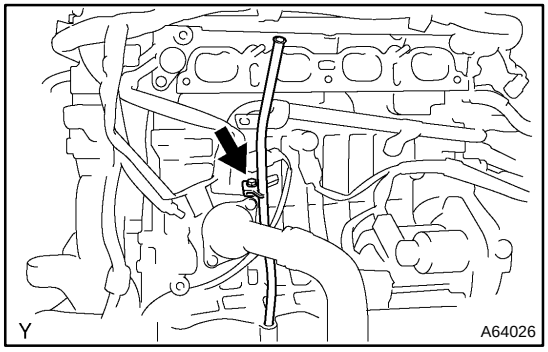


61. REMOVE INTAKE MANIFOLD

(a) Disconnect the 2 water hoses from the throttle body.
(b) Disconnect the 2 vacuum hoses from the intake manifold.
(c) Remove the 4 bolts, 2 nut, 2 wire brackets, intake manifold and throttle body assembly.
(d) Remove the gasket from the intake manifold and throttle body assembly.

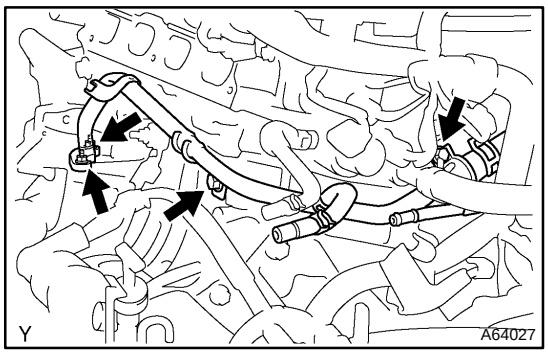
62. REMOVE OIL LEVEL GAGE SUB–ASSY

(a) Remove the oil level gage from the oil level gage guide.



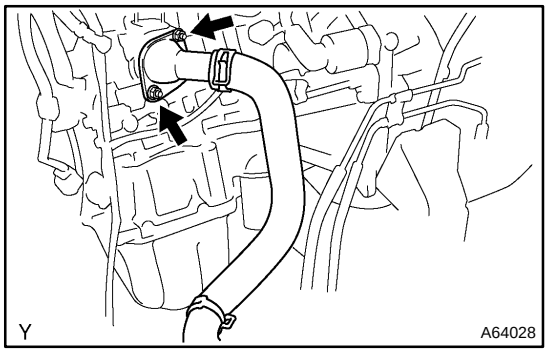
63. REMOVE OIL LEVEL GAGE GUIDE

(a) Remove the bolt and oil level gage guide.



64. REMOVE WATER BY–PASS PIPE NO.1

(a) Remove the 2 bolts, 2 nuts, water by–pass pipe and gasket.

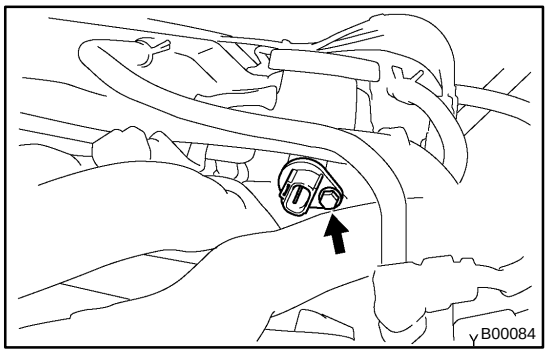


65. REMOVE WATER INLET

(a) Remove the 2 nuts and water inlet.

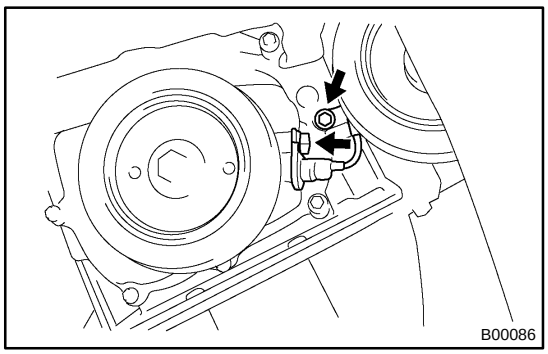
66. REMOVE THERMOSTAT

67. REMOVE ENGINE OIL PRESSURE SWITCH ASSY (See page 17–1)



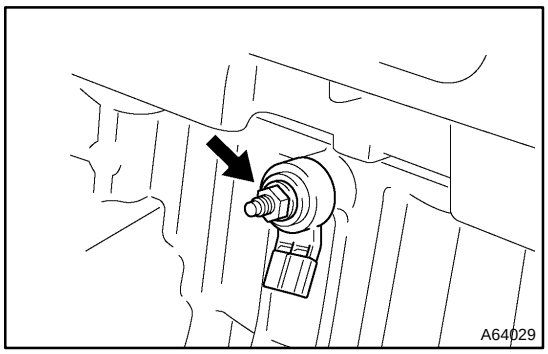
68. REMOVE CAMSHAFT POSITION SENSOR

(a) Remove the bolt and camshaft position sensor.



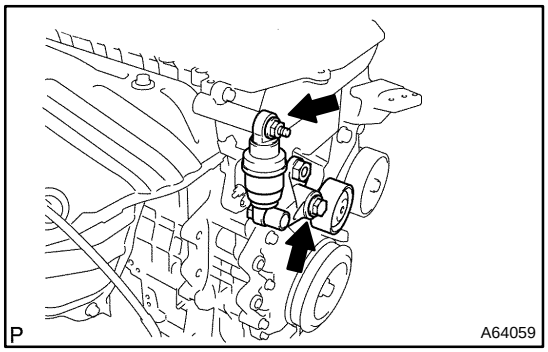
69. REMOVE CRANKSHAFT POSITION SENSOR

(a) Remove the 2 bolts and crankshaft position sensor.



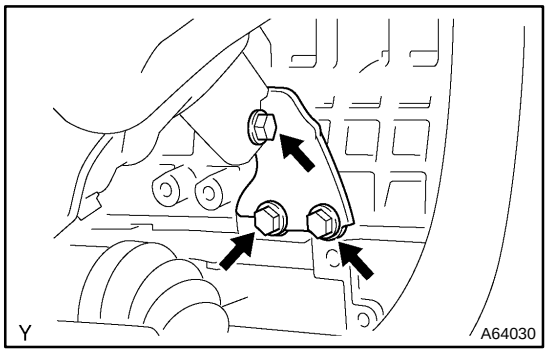
70. REMOVE KNOCK SENSOR

(a) Remove the nut and knock sensor.



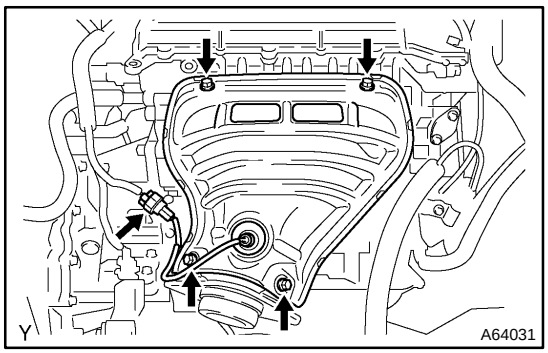
71. REMOVE V–RIBBED BELT TENSIONER ASSY

(a) Remove the bolts, nut and V–ribbed belt tensioner.



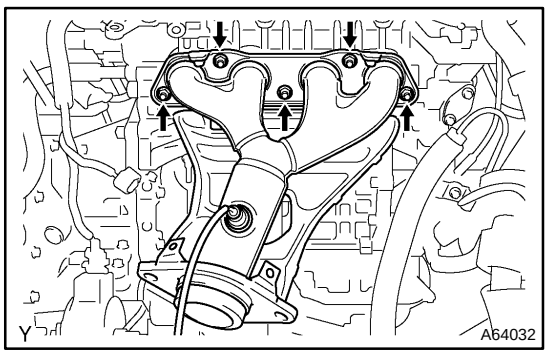
72. REMOVE MANIFOLD STAY

(a) Remove the 3 bolts and manifold stay.



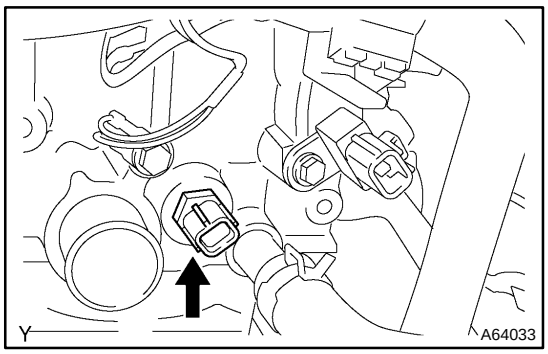
73. REMOVE EXHAUST MANIFOLD HEAT INSULATOR NO.1

(a) Remove the 4 bolts and exhaust manifold heat insulator.



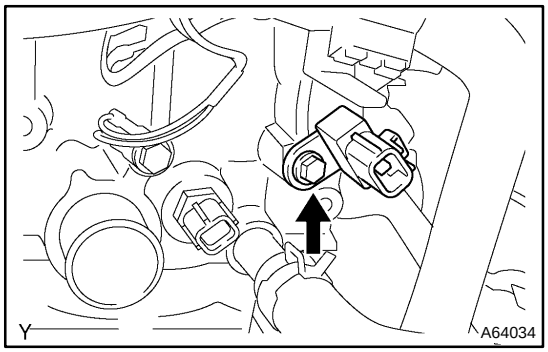
74. REMOVE EXHAUST MANIFOLD

(a) Remove the 5 nuts, exhaust manifold and gasket.



75. REMOVE ENGINE COOLANT TEMPERATURE SENSOR

(a) Using SST, remove the engine coolant temperature sensor.
SST 09817–33190



76. REMOVE RADIO SETTING CONDENSER

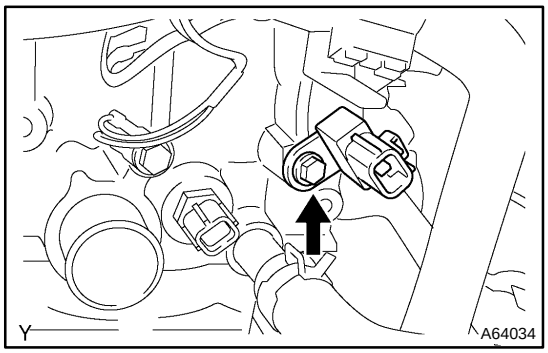
(a) Remove the bolt and condenser.

77. REMOVE WATER BY–PASS HOSE NO.2

78. REMOVE RADIATOR HOSE INLET

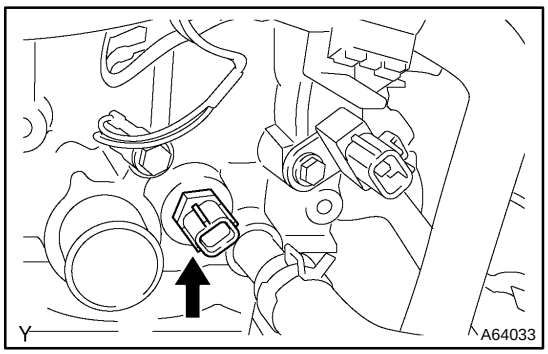
79. REMOVE HEATER INLET WATER HOSE

80. REPLACE PARTIAL ENGINE ASSY



81. INSTALL RADIO SETTING CONDENSER

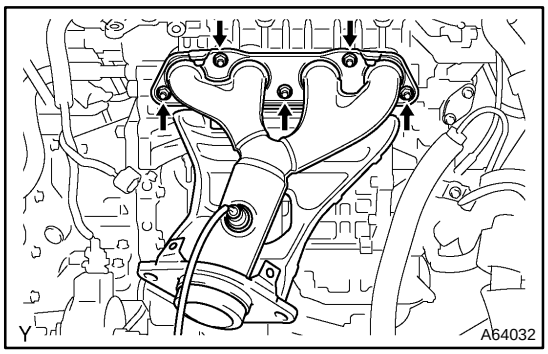
(a) Install the condenser with the bolt.
Torque: 10 N·m (102 kgf·cm, 7 ft·lbf)



82. INSTALL ENGINE COOLANT TEMPERATURE SENSOR

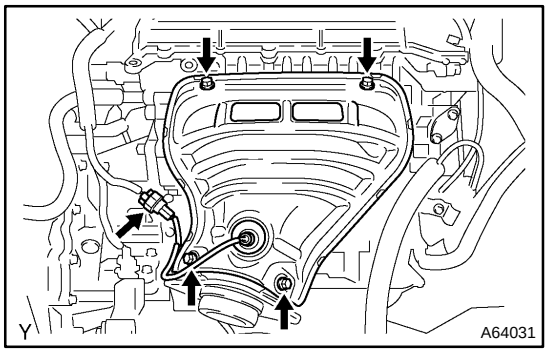
(a) Install a new gasket to the engine coolant temperature sensor.

(b) Using SST, install the engine coolant temperature sensor.
SST 09817–33190
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)



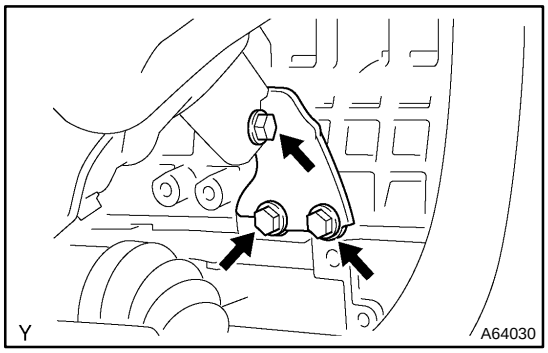
83. INSTALL EXHAUST MANIFOLD

(a) Install a new gasket and the exhaust manifold with the 5 nuts.
Torque: 37 N·m (377 kgf·cm, 27 ft·lbf)



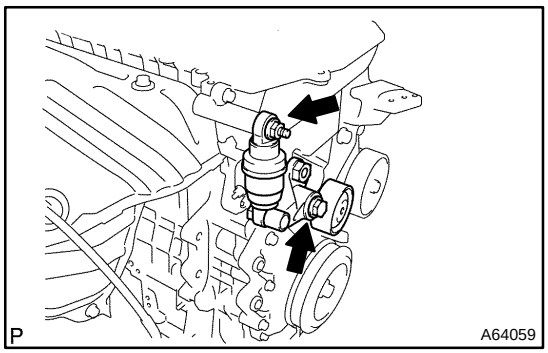
84. INSTALL EXHAUST MANIFOLD HEAT INSULATOR NO.1

(a) Install the exhaust manifold heat insulator with the 4 bolts.
Torque: 18 N·m (184 kgf·cm, 13 ft·lbf)



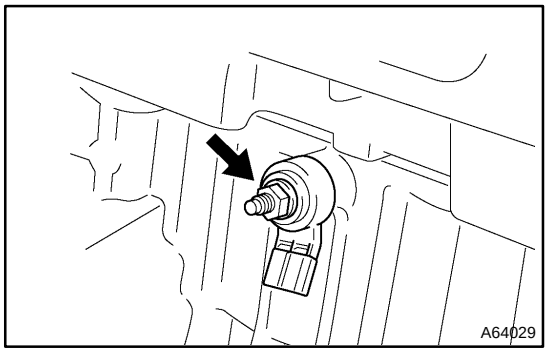
85. INSTALL MANIFOLD STAY

(a) Install the manifold stay with the 3 bolts.
Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)



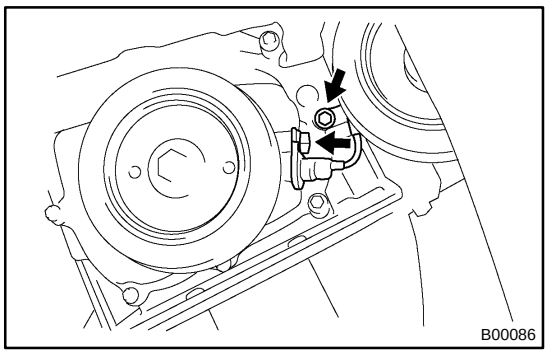
86. INSTALL V–RIBBED BELT TENSIONER ASSY

(a) Install the V–ribbed belt tensioner with the bolt and nut.
Torque:
29 N·m (296 kgf·cm, 21 ft·lbf) for nut
69 N·m (704 kgf·cm, 51 ft·lbf) for bolt



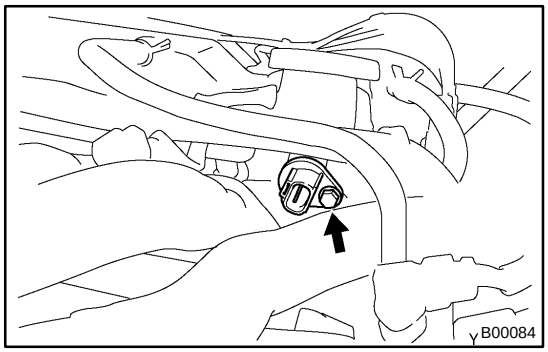
87. INSTALL KNOCK SENSOR

(a) Install the knock sensor with the nut.
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)



88. INSTALL CRANKSHAFT POSITION SENSOR

(a) Install the crankshaft position sensor with the 2 bolts.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

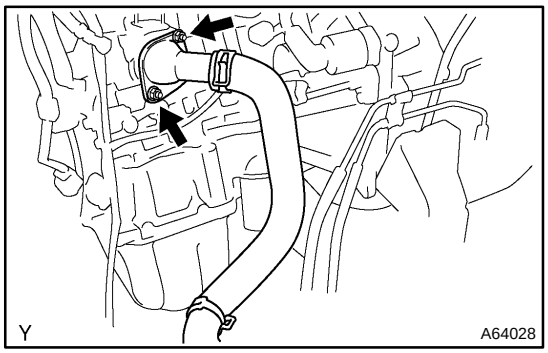


89. INSTALL CAMSHAFT POSITION SENSOR

(a) Install the camshaft position sensor with the bolt.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

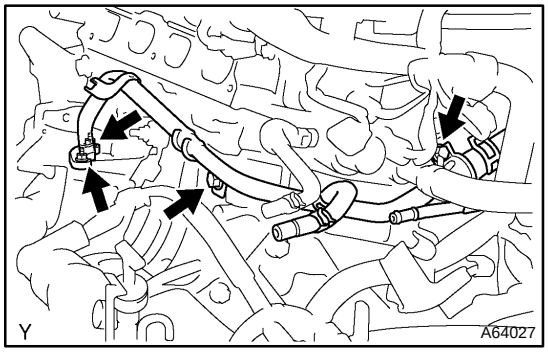
90. INSTALL ENGINE OIL PRESSURE SWITCH ASSY (See page 17–1)

91. INSTALL THERMOSTAT (See page 16–11)



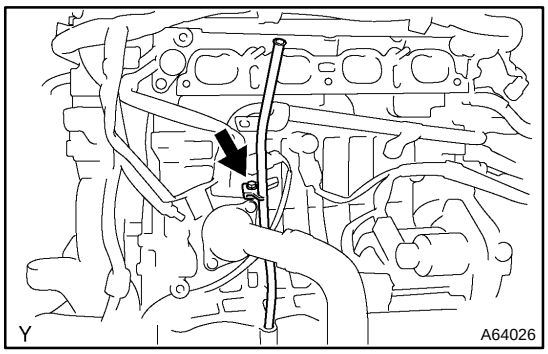
92. INSTALL WATER INLET

(a) Install the water inlet with the 2 nuts.
Torque: 11 N·m (112 kgf·cm, 8 ft·lbf)



93. INSTALL WATER BY–PASS PIPE NO.1

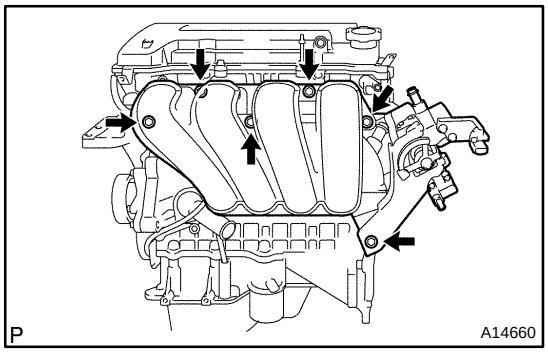
(a) Install a new gasket and water by–pass with the 2 nuts and 2 bolts.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)



94. INSTALL OIL LEVEL GAGE GUIDE

(a) Apply a light coat of a new O–ring, then install it to the oil level gage guide.

(b) Install the oil level gage guide with the bolt.
Torque: 13 N·m (133 kgf·cm, 10 ft·lbf)



95. INSTALL INTAKE MANIFOLD

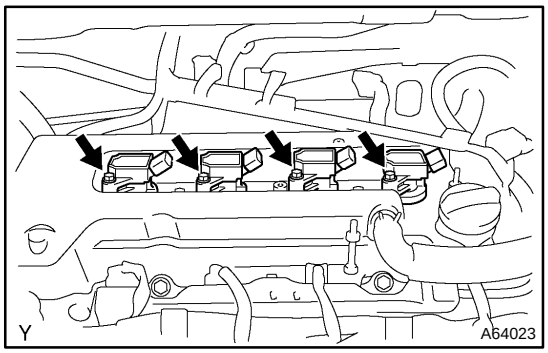
(a) Install a new gasket to the intake manifold.

(b) Install the intake manifold and throttle body assembly with the 2 brackets, 4 bolts and 2 nuts. Uniformly tighten the bolts and nuts in several passes.
Torque: 30 N·m (306 kgf·cm, 22 ft·lbf)

(c) Connect the 2 vacuum hoses to the intake manifold.

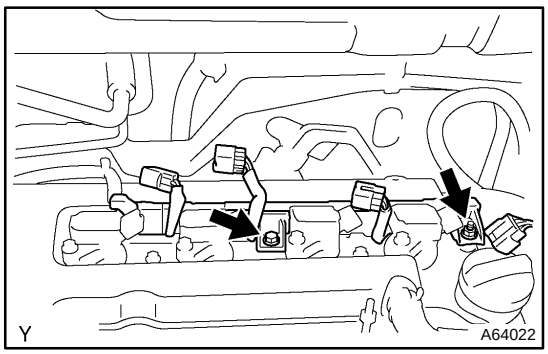
(d) Connect the 2 water hoses to the throttle body.

96. INSTALL FUEL DELIVERY PIPE SUB–ASSY(See page 11–10)



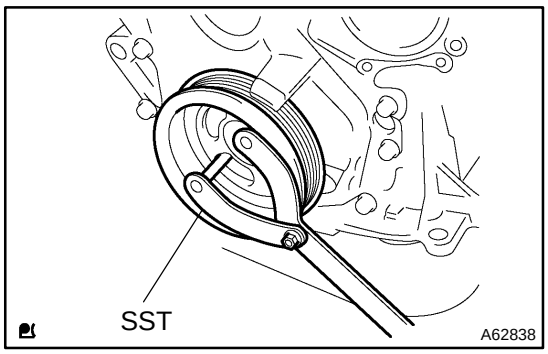
97. INSTALL IGNITION COIL ASSY

(a) Install the 4 ignition coils with the 4 bolts.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)



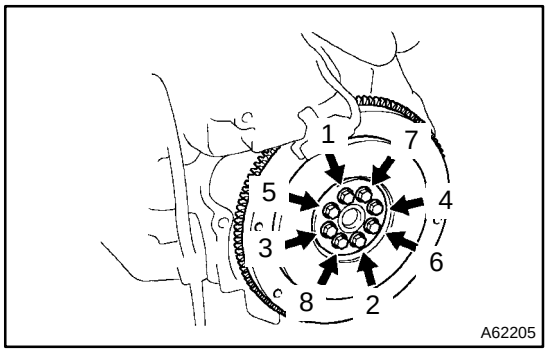
(b) Install the engine wire with the bolt and nut.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

98. INSTALL GENERATOR ASSY (See page 19–16)

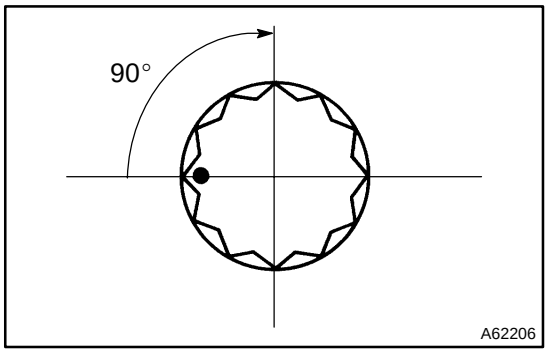


99. INSTALL FLYWHEEL SUB–ASSY (M/T TRANSAXLE)

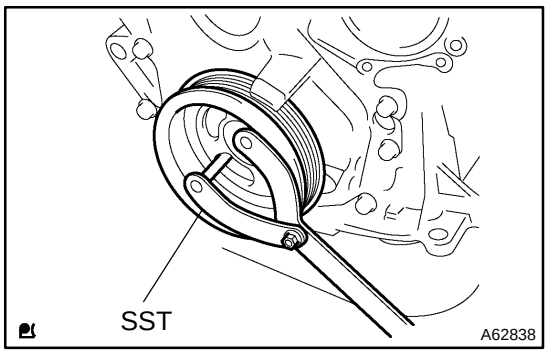
(a) Fix the crankshaft with SST.
SST 09960–10010 (09962–01000, 09963–01000)



(b) Clean the bolt and bolt hole.
(c) Apply adhesive to the bolts.
Adhesive:
Part No. 09330–00070, THREE BOND or equivalent
(d) Install and uniformly tighten the 8 bolts, in several passes, in the sequence shown.
Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)

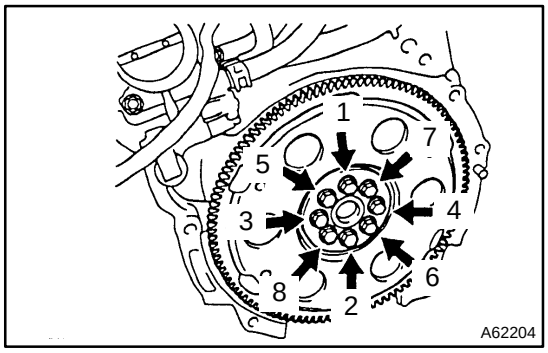


(e) Mark the bolts with paint.
(f) Retighten the bolts by an additional 90°.
(g) Check that the point marked bolts are moved by 90° angle.



100. INSTALL DRIVE PLATE & RING GEAR SUB–ASSY (A/T TRANSAXLE)

(a) Fix the crankshaft with SST.
SST 09960–10010 (09962–01000, 09963–01000)



(b) Clean the bolt and bolt hole.
(c) Apply adhesive to the bolts.
Adhesive:
Part No. 09330–00070, THREE BOND or equivalent
(d) Install and uniformly tighten the 8 bolts, in several passes, in the sequence shown.
Torque: 88 N·m (897 kgf·cm, 65 ft·lbf)

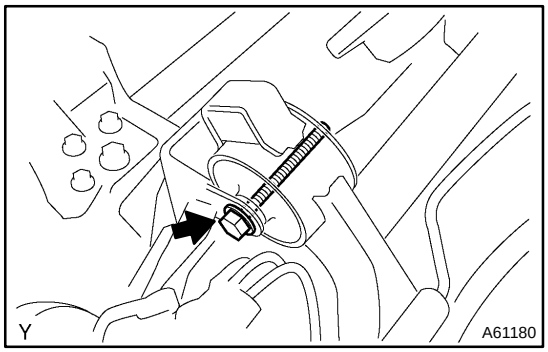
101. INSTALL CLUTCH DISC ASSY (M/T TRANSAXLE) (See page 42–18)
SST 09301–00210

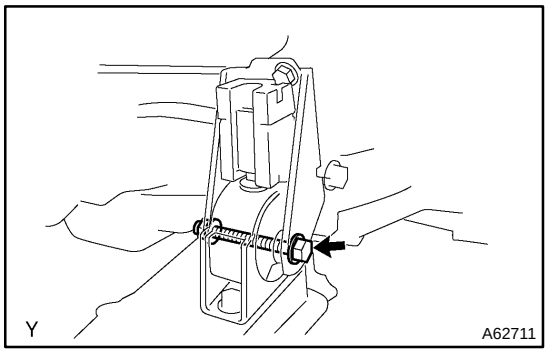
102. INSTALL CLUTCH COVER ASSY (M/T TRANSAXLE) (See page 42–18)
SST 09301–00210

103. INSTALL MANUAL TRANSAXLE ASSY (M/T TRANSAXLE) (See page 41–17)

104. INSTALL AUTOMATIC TRANSAXLE ASSY (A/T TRANSAXLE) (See page 40–9)

105. INSTALL STARTER ASSY (See page 19–4)





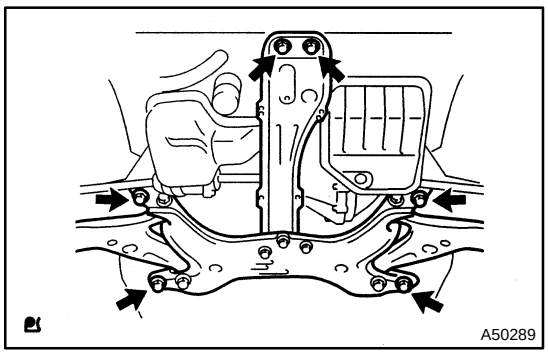
106. INSTALL FRONT SUSPENSION CROSSMEMBER W/CENTER MEMBER

(a) Attach the engine and transaxle assembly to the suspension crossmember and engine mounting member.

(b) Install the bolt holding the rear engine mounting bracket to the mounting insulator.
TMMC, NUMMI made:
Torque: 65 N·m (663 kgf·cm, 48 ft·lbf)
TAKAOKA, TAL made:
Torque: 87 N·m (887 kgf·cm, 64 ft·lbf)

(c) Install the bolt holding the front engine mounting bracket to the mounting insulator.
Torque: 52 N·m (530 kgf·cm, 38 ft·lbf)

107. INSTALL VANE PUMP ASSY (See page 51–8)



108. INSTALL ENGINE ASSEMBLY WITH TRANSAXLE

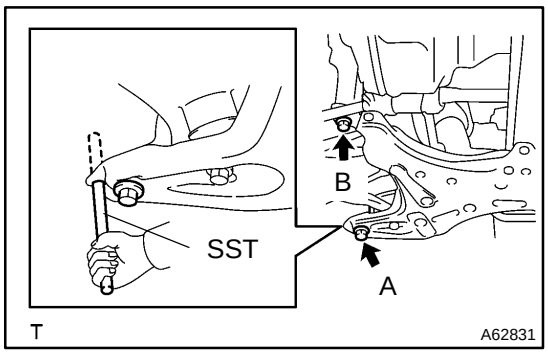
(a) Set the engine with transaxle on the engine lifter.

(b) Install the engine with transaxle to the vehicle.

(c) Temporarily, install the suspension crossmember and 6 bolts.

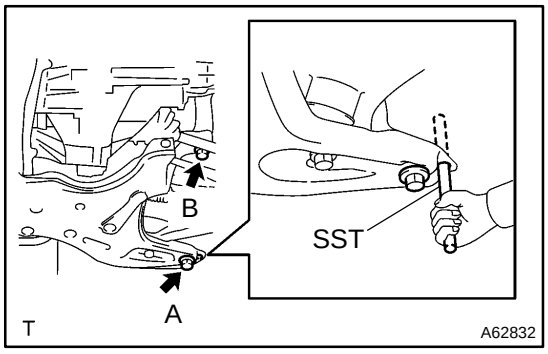
(d) Install the engine mounting insulator LH.
Torque: 80 N·m (816 kgf·cm, 59 ft·lbf)

(e) Install the engine mounting insulator RH.
Torque: 52 N·m (530 kgf·cm, 38 ft·lbf)



(f) Insert SST to the positioning holes on the right handle crossmember and on the right–handle of the vehicle.
SST 09670–00010

(g) Temporarily tighten the bolt A first, then bolt B.

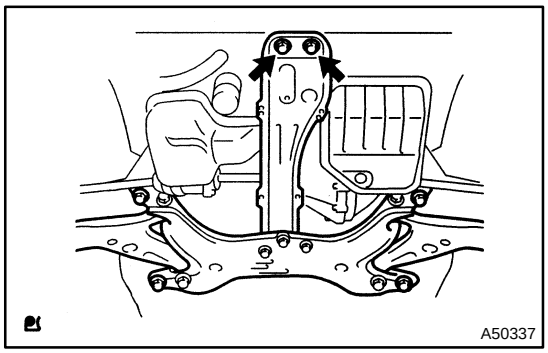


(h) Insert SST to the positioning holes on the left handle crossmember and on the left–handle of the vehicle.
SST 09670–00010

(i) Temporarily tighten the bolt A first, then bolt B.

(j) Insert SST to the positioning holes on the right–handle crossmember and right–handle of the vehicle, then tighten the bolts with the specified torque.

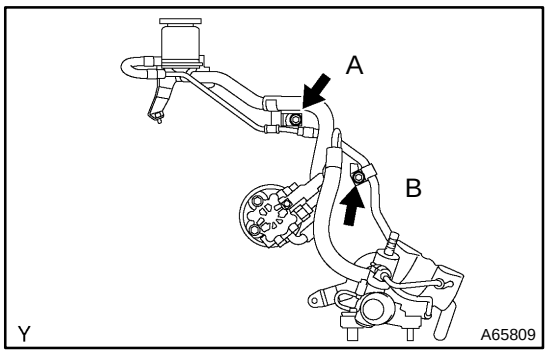
(k) Insert SST to the positioning holes on the right–handle crossmember and left–handle of the vehicle, then tighten the bolts with the specified torque.
SST 09670–00010
Torque:
157 N·m (1,601 kgf·cm, 116 ft·lbf) for bolt A
113 N·m (1,152 kgf·cm, 83 ft·lbf) for bolt B



(l) Tighten the 2 bolts, as shown in the illustration.
Torque: 39 N·m (398 kgf·cm, 29 ft·lbf)

NOTICE:
After installing the crossmember, check that the positioning holes on the crossmember and vehicle are aligned with each other.

109. INSTALL FRONT SUSPENSION ARM SUB–ASSY LOWER NO.1 LH (See page 30–6)
110. INSTALL FRONT SUSPENSION ARM SUB–ASSY LOWER NO.1 RH (See page 30–6)
111. INSTALL FRONT STABILIZER LINK ASSY LH (See page 51–18)
112. INSTALL FRONT STABILIZER LINK ASSY RH (See page 51–18)
113. INSTALL TIE ROD END SUB–ASSY LH (See page 30–6)
114. INSTALL TIE ROD END SUB–ASSY RH (See page 30–6)
115. INSTALL FRONT AXLE HUB LH NUT (See page 30–6)
116. INSTALL FRONT AXLE HUB RH NUT (See page 30–6)
117. INSTALL EXHAUST PIPE ASSY FRONT (See page 15–2)
118. INSTALL FLOOR PANEL BRACE FRONT
(a) Install the front floor panel brace with the 2 nuts.
Torque: 30 N·m (306 kgf·cm, 22 ft·lbf)
119. INSTALL STEERING INTERMEDIATE SHAFT (See page 51–18)

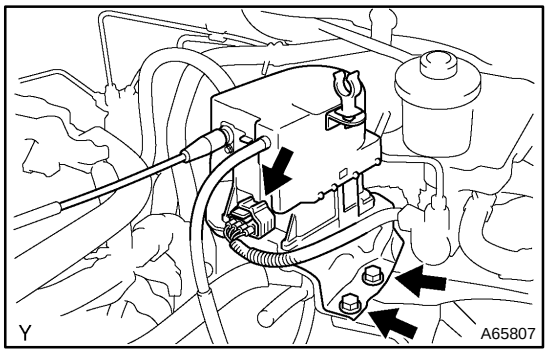


120. INSTALL RETURN TUBE SUB–ASSY

(a) Install the return tube with 2 bolts.
Torque:
5.0 N·m (51 kgf·cm, 44 in.·lbf) for bolt A
7.8 N·m (80 kgf·cm, 69 in.·lbf) for bolt B

121. INSTALL COMPRESSOR AND MAGNETIC CLUTCH (W/ AIR CONDITIONING) (See page 55–34)

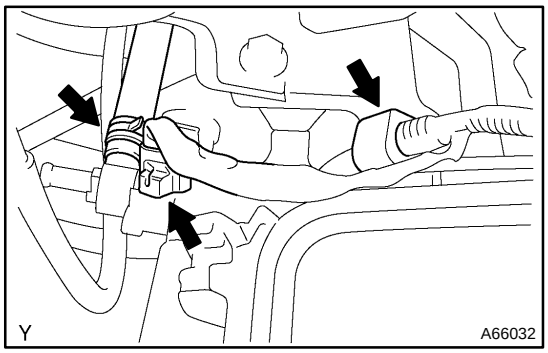
122. INSTALL CLUTCH RELEASE CYLINDER ASSY (M/T TRANSAXLE) (See page 41–17)



123. INSTALL CRUISE CONTROL ACTUATOR ASSY (W/ CRUISE CONTROL)

(a) Install the actuator with the 2 bolts.
Torque: 6.0 N·m (61 kgf·cm, 53 in.·lbf)

(b) Connect the actuator connector.



124. INSTALL AIR CLEANER ASSEMBLY WITH HOSE

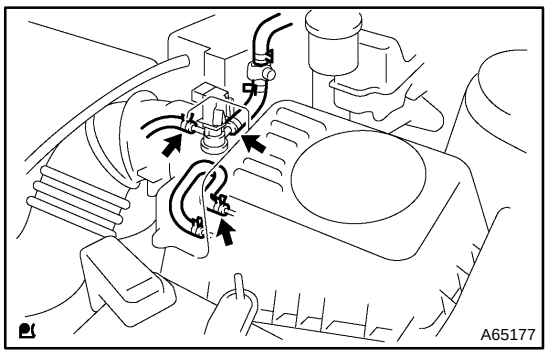
(a) Install the air cleaner case with the 3 bolts.
Torque: 7.0 N·m (71 kgf·cm, 62 in.·lbf)

(b) Connect the wire harness clamp, connector and hose.

(c) Install the air cleaner filter element.

(d) Install the air cleaner cap.

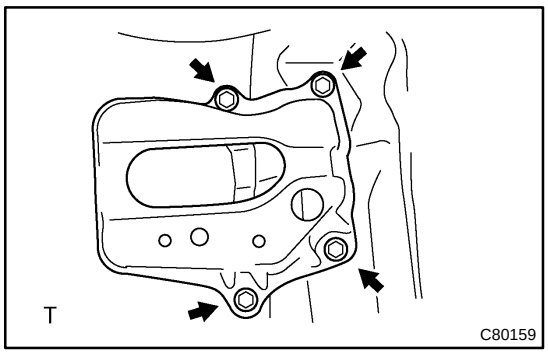
(e) Connect the air cleaner hose.



(f) Connect the 3 vacuum hoses, as shown in the illustration.

(g) Connect the VSV connector.

(h) Connect the intake air flow meter connector.



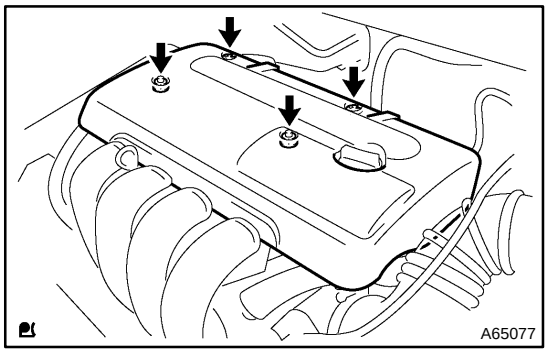
125. INSTALL BATTERY CARRIER

(a) Install the battery carrier with the 4 bolts.
Torque: 13 N·m (133 kgf·cm, 10 ft·lbf)

126. INSTALL BATTERY
Torque:
5.0 N·m (51 kgf·cm, 44 in.·lbf) for bolt
3.5 N·m (36 kgf·cm, 31 in.·lbf) for nut

127. INSTALL RADIATOR SUPPORT UPPER (W/ AIR CONDITIONING)

(a) Install the 2 radiator support uppers with the 2 bolts.
Torque: 19 N·m (194 kgf·cm, 14 ft·lbf)



128. INSTALL CYLINDER HEAD COVER NO.2

(a) Install the cylinder head cover with the 2 nuts and 2 clips.
Torque: 7.0 N·m (71 kgf·cm, 62 in.·lbf)

129. INSTALL FRONT WHEELS
Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

130. ADD AUTOMATIC TRANSAXLE FLUID (A/T TRANSAXLE)

131. ADD ENGINE OIL

132. ADD COOLANT (See page 16–7)

133. CHECK FOR ENGINE OIL LEAKS

134. CHECK FOR ENGINE COOLANT LEAKS (See page 16–7)

135. CHECK FUEL LEAK

136. CHECK FOR EXHAUST GAS LEAKS

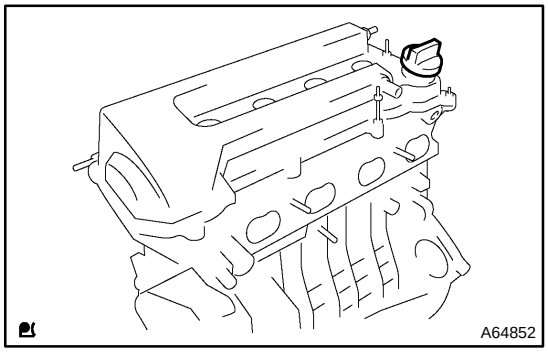
137. INSPECT CHECK IDLE SPEED AND IGNITION TIMING (See page 14–1)
SST 09843–18040

138. INSPECT CO/HC (See page 14–1)

139. INSPECT AND ADJUST FRONT WHEEL ALIGNMENT (See page 26–5)

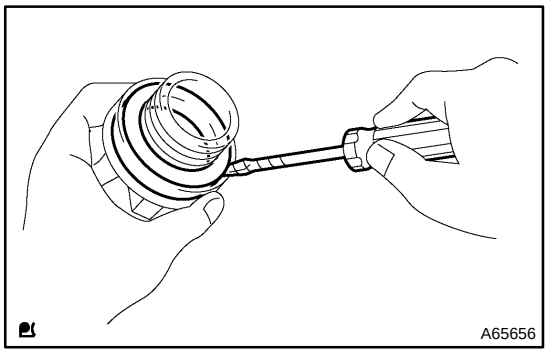
140. CHECK ABS SPEED SENSOR SIGNAL (W/ ABS)

OVERHAUL



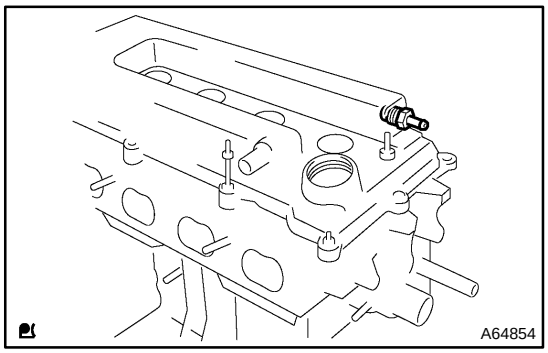
1. REMOVE OIL FILLER CAP SUB–ASSY

(a) Remove the oil filler cap from the cylinder head cover.



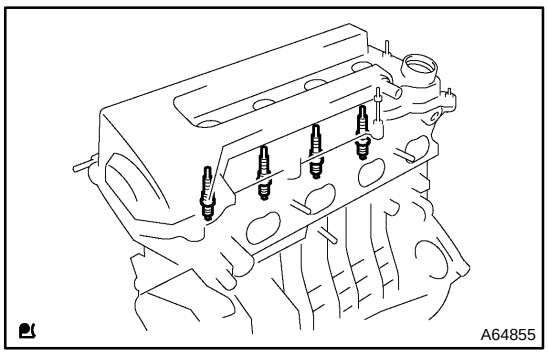
2. REMOVE OIL FILLER CAP GASKET

(a) Using a screwdriver, remove the gasket from the oil filler cap.



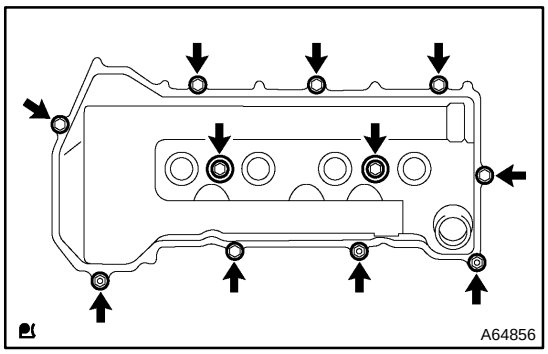
3. REMOVE VENTILATION VALVE SUB–ASSY

(a) Remove the ventilation valve from the cylinder head cover.



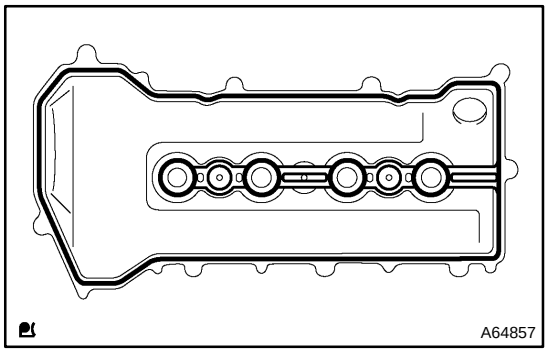
4. REMOVE SPARK PLUG

(a) Using a spark plug wrench, remove the spark plugs.



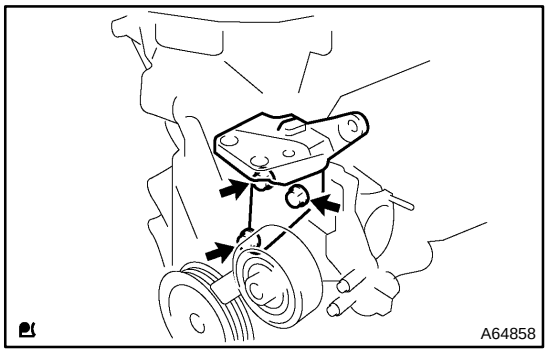
5. REMOVE CYLINDER HEAD COVER SUB–ASSY

(a) Remove the 9 bolts, 2 seal washers, 2 nuts and cylinder head cover.



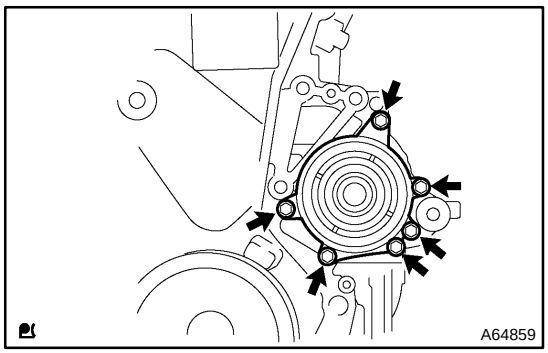
6. REMOVE CYLINDER HEAD COVER GASKET

(a) Remove the gasket from the cylinder head cover.



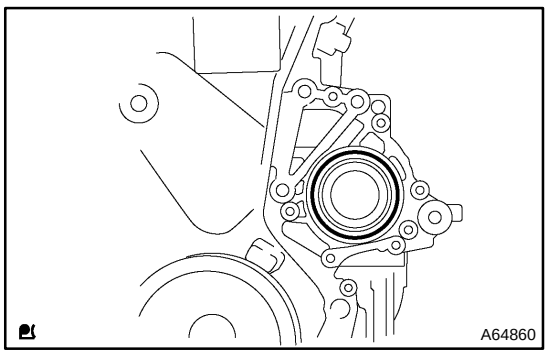
7. REMOVE TRANSVERSE ENGINE ENGINE MOUNTING BRACKET

(a) Remove the 3 bolts and transverse engine engine mounting bracket.



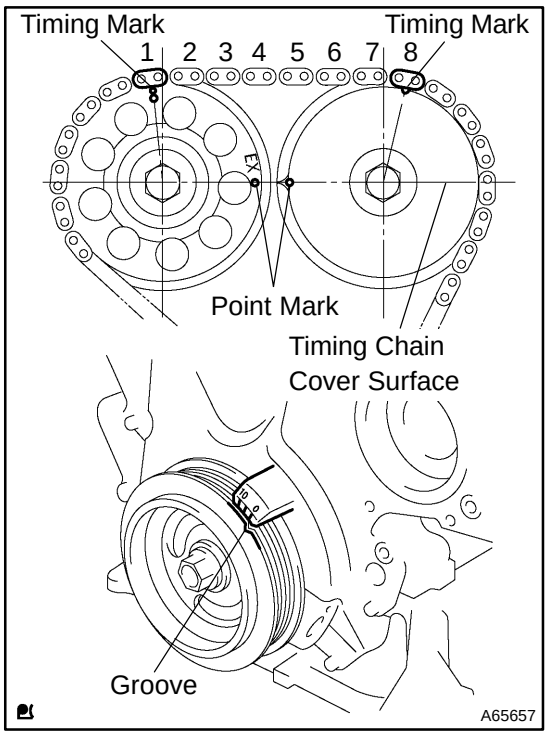
8. REMOVE WATER PUMP ASSY

(a) Remove the 6 bolts and water pump.



9. REMOVE WATER PUMP O–RING

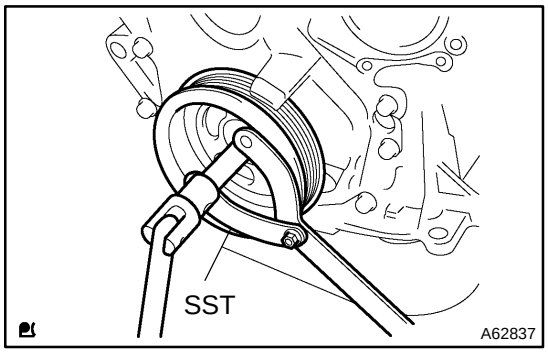
(a) Remove an O–ring from the timing chain cover.



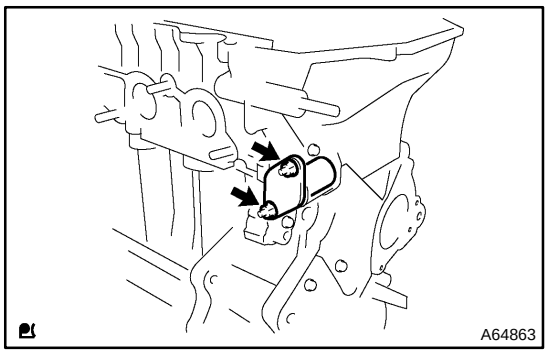
10. REMOVE CRANKSHAFT PULLEY

(a) Set the No. 1 cylinder to the TDC/compression.
  (1) Turn the crankshaft pulley, and align its groove with timing mark ”0” of the timing chain cover.
  (2) Check that the point marks of the camshaft timing gears are in straight line on the timing chain cover surface as shown in the illustration.

HINT:
If not, turn the crankshaft 1 revolution (360°) and align the marks as above.

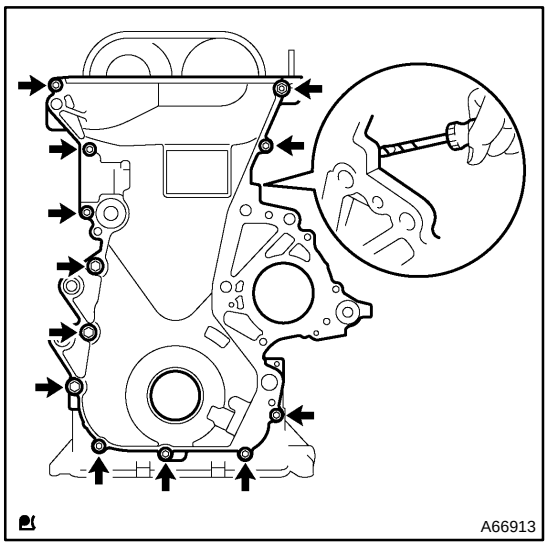


(b) Using SST, remove the crankshaft pulley bolt.
  SST 09960–10010 (09962–01000, 09963–01000)
(c) Remove the crankshaft pulley from the crankshaft.



11. REMOVE CHAIN TENSIONER ASSY NO.1

(a) Remove the 2 nuts and chain tensioner.



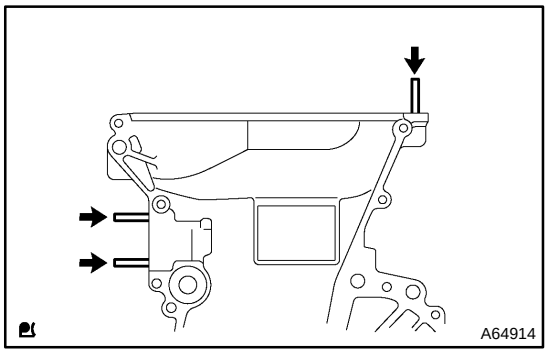
12. REMOVE TIMING CHAIN OR BELT COVER SUB–ASSY

(a) Remove the 11 bolts and nut.

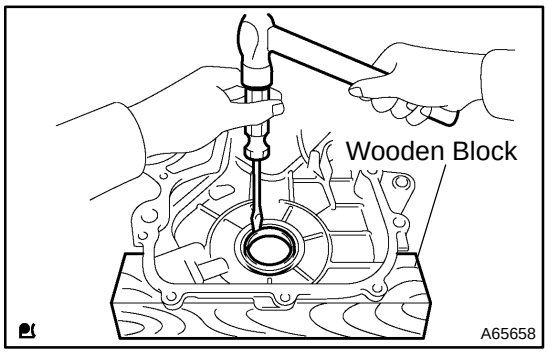
(b) Remove the timing chain cover by prying the portions between the timing chain cover and cylinder head and cylinder block with a screwdriver.

NOTICE:

Be careful not to damage the contact surfaces of the timing chain cover, cylinder head and cylinder block.



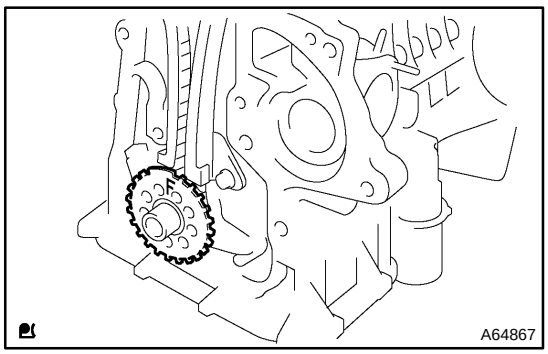
(c) Using a torx socket wrench E5, remove the 3 stud bolts.



13. REMOVE TIMING CHAIN OR BELT COVER OIL SEAL

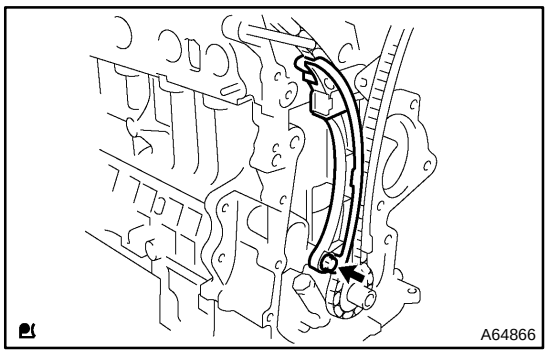
(a) Place the timing chain cover on wooden blocks.

(b) Using a screwdriver, remove the oil seal.



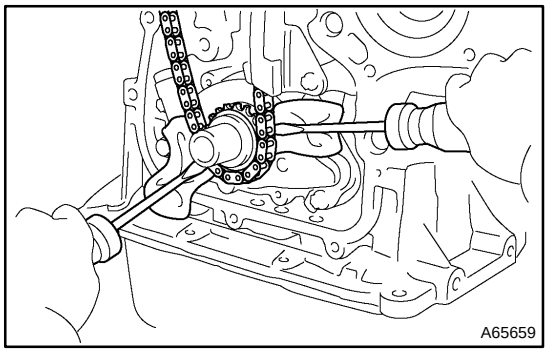
14. REMOVE CRANKSHAFT POSITION SENSOR PLATE NO.1

(a) Remove the crankshaft position sensor plate from the crankshaft.



15. REMOVE CHAIN TENSIONER SLIPPER

(a) Remove the bolt and chain tensioner slipper.

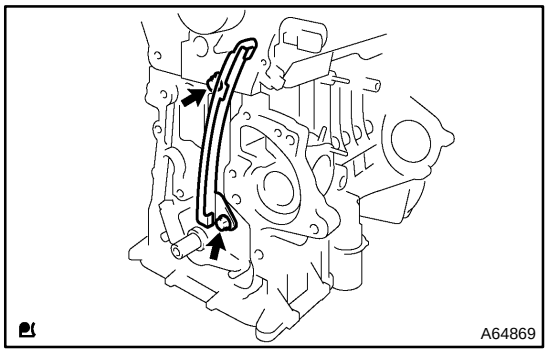


16. REMOVE CHAIN SUB–ASSY

(a) Using the 2 screwdrivers, pry out the chain with the crankshaft timing gear as shown in the illustration.

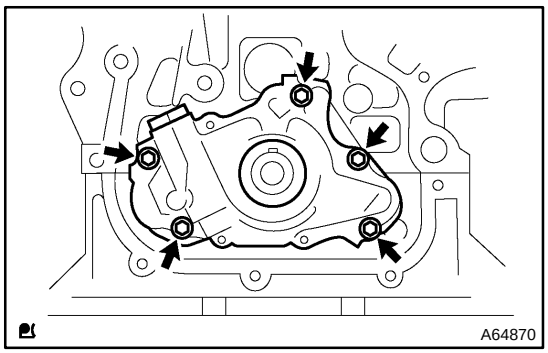
NOTICE:

- **Put shop rag to protect the engine.**
- **In case of revolving the camshafts with the chain off the gears, turn the crankshaft 1/4 revolution for valves not to touch the pistons.**



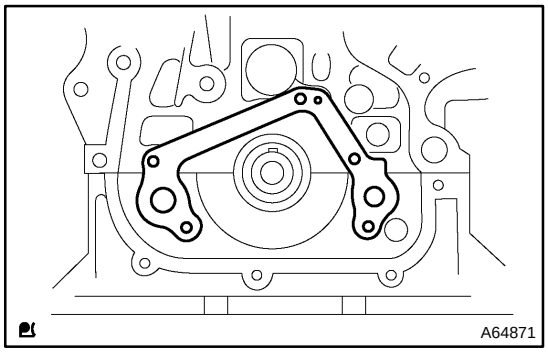
17. REMOVE CHAIN VIBRATION DAMPER NO.1

(a) Remove the 2 bolts and chain vibration damper.



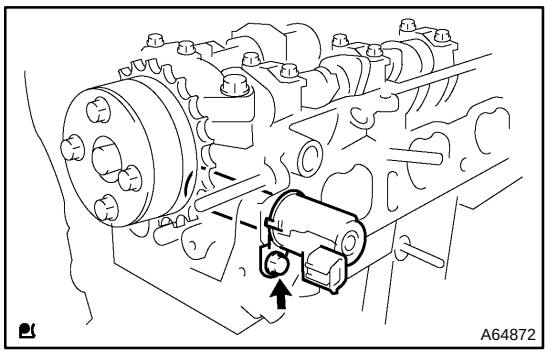
18. REMOVE OIL PUMP ASSY

(a) Remove the 5 bolts and oil pump.



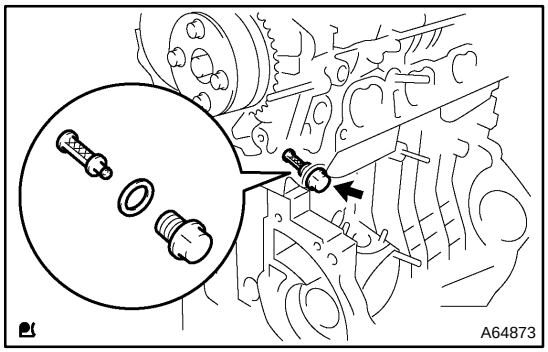
19. REMOVE OIL PUMP GASKET

(a) Remove the gasket from the cylinder block.



20. REMOVE CAMSHAFT TIMING OIL CONTROL VALVE ASSY

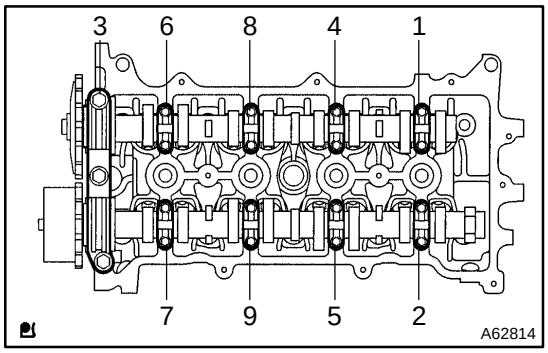
(a) Remove the bolt and camshaft timing oil control valve.



21. REMOVE OIL CONTROL VALVE FILTER

(a) Remove the bolt with gasket and oil control valve filter.

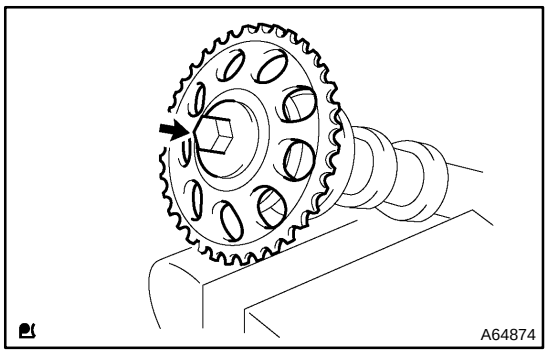
(b) Remove the gasket and oil control valve filter from the bolt.



22. REMOVE CAMSHAFT

(a) Using several steps, uniformly loosen and remove the 19 bolts in the sequence shown, then remove the 9 bearing caps.

(b) Remove the 2 camshafts from the cylinder head.

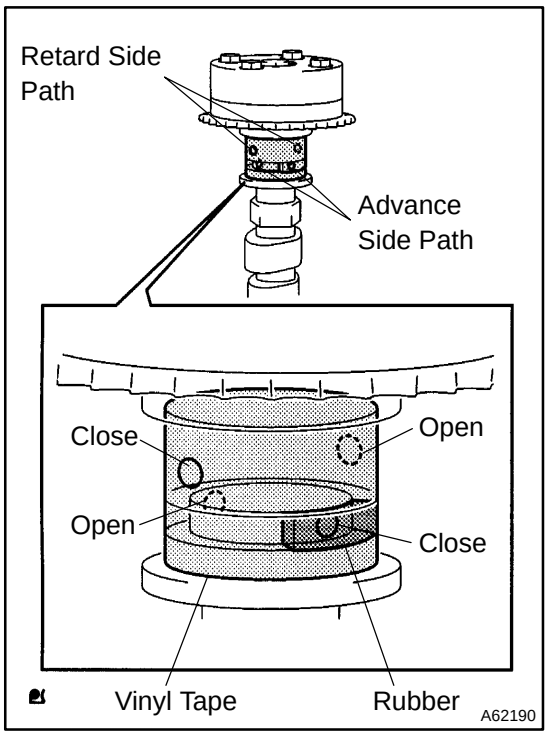


23. REMOVE CAMSHAFT TIMING GEAR OR SPROCKET

(a) Grip the camshaft with a vice, and remove the bolt and camshaft timing gear.

NOTICE:

Be careful not to damage the camshaft.



24. INSPECT CAMSHAFT TIMING GEAR ASSY

(a) Check the lock of camshaft timing gear.

(1) Clamp the camshaft in a vise, and confirm the camshaft timing gear is locked.

NOTICE:

Be careful not to damage the camshaft.

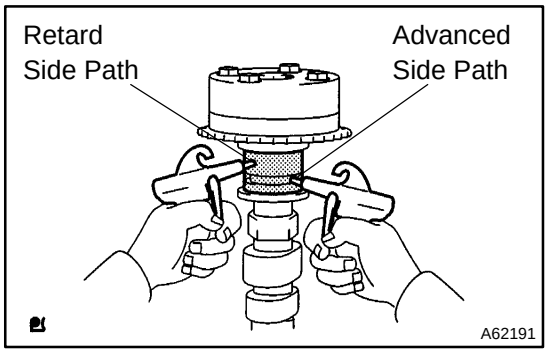
(b) Release the lock pin.

(1) Cover the 4 oil paths of the cam journal with vinyl tape as shown in the illustration.

HINT:

Two advance side paths are provided in the groove of the camshaft. Plug one of the path with a rubber piece.

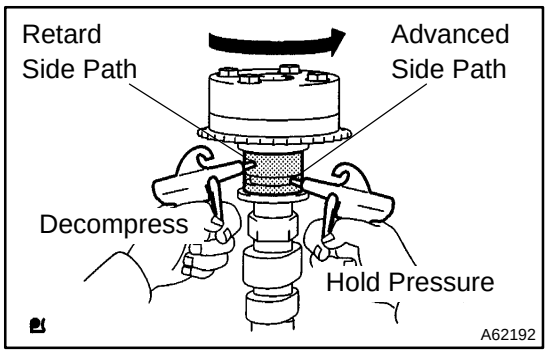
(2) Break through the tapes of the advance side path and retard side path on the opposite side of the groove.



(3) Put air pressure into two broken paths (the advance side path and retard side path) with about 150 kPa {1.5 kgf·cm^2}.

CAUTION:

Cover the paths with shop rag to avoid oil splashing.



(4) Confirm if the camshaft timing gear assembly revolves to the timing advance direction when weakening the air pressure of the timing retard path.

HINT:

The lock pin is released, and camshaft timing gear revolves to the advance direction.

(5) When the camshaft timing gear comes to the most advanced position, take out the air pressure of the timing retard side path, then take out that of the timing advance side path.

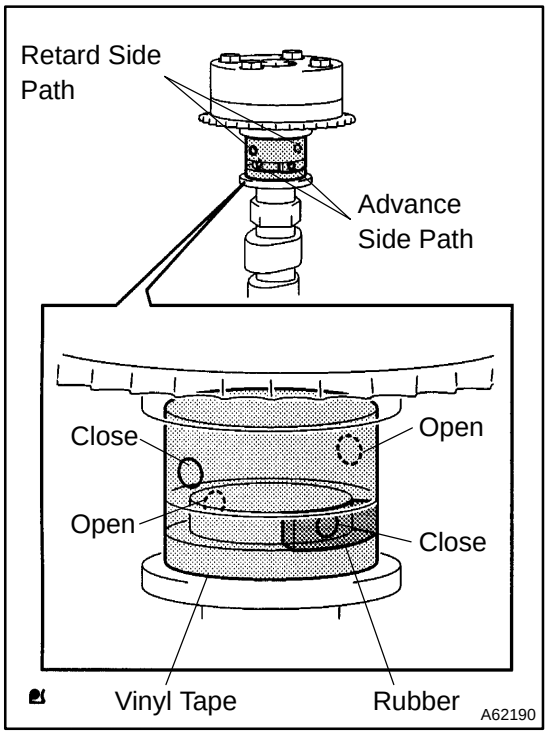
CAUTION:

The camshaft timing assembly gear occasionally shifts to the retard side abruptly, if the air compression of the advanced side path is released before the retard side path. It often causes the breakage of the lock pin.

(c) Check smooth revolution.
(1) Revolve the camshaft timing gear assembly within the movable range except for the most retarded position several times, and check that it revolves smoothly.

CAUTION:
Be sure to perform this check by hand, instead of air pressure.

(d) Check the lock in the most retarded position.
(1) Confirm that the camshaft timing gear assembly is locked at the most retarded position.



25. REMOVE CAMSHAFT TIMING GEAR ASSY

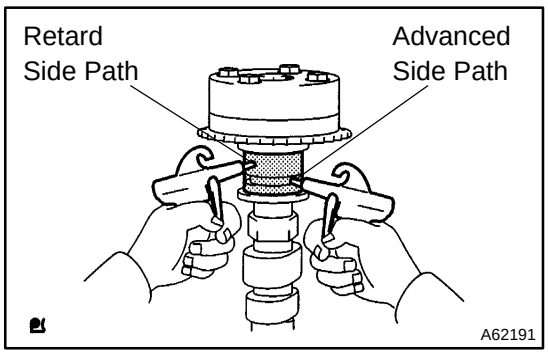
(a) Clamp the camshaft in a vise, and confirm that the gear is locked.

CAUTION:
Be careful not to damage the camshaft.

(b) Cover the 4 oil paths of the cam journal with vinyl tape as shown in the illustration.

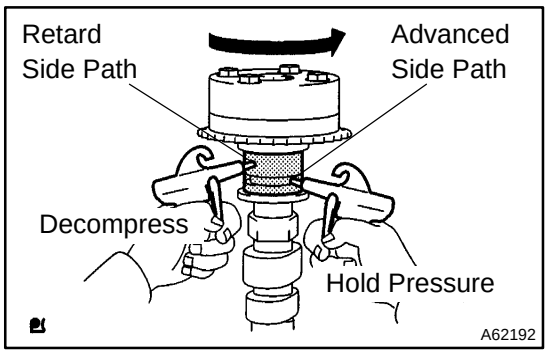
HINT:
Two advance side paths are provided in the groove of the camshaft. Plug one of the path with a rubber piece.

(c) Break through the tapes of the advance side path and retard side path on the opposite side of the groove.



(d) Put air pressure into two broken paths (the advance side path and retard side path) with about 150 kPa {1.5 kgf/cm^2}.

CAUTION:
Cover the paths with shop rag to avoid oil splashing.



(e) Confirm if the camshaft timing gear assembly revolves to the timing advance direction when weakening the air pressure of the timing retard path.

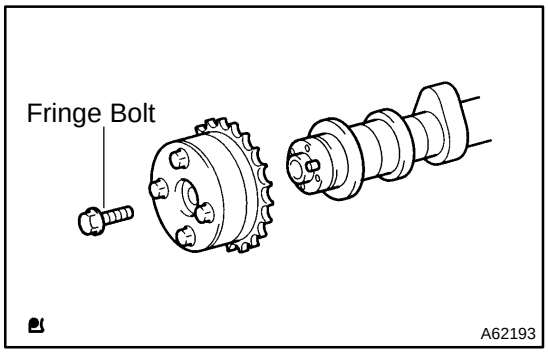
HINT:

The lock pin is released, and camshaft timing gear revolves to the advance direction.

(f) When the camshaft timing gear comes to the most advanced position, take out the air pressure of the timing retard side path, then take out that of timing advance side path.

CAUTION:

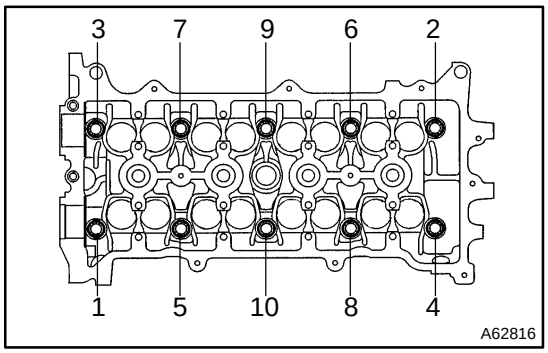
Camshaft timing gear assembly occasionally shifts to the retard side abruptly, if the air compression of the advanced side path is released before the retard side path. It often causes the breakage of the lock pin.



(g) Remove the fringe bolt and camshaft timing gear.

NOTICE:

- **Be sure not to remove the other 4 bolts.**
- **In case of reusing the camshaft timing gear, release the straight pin locking first, then install the gear.**

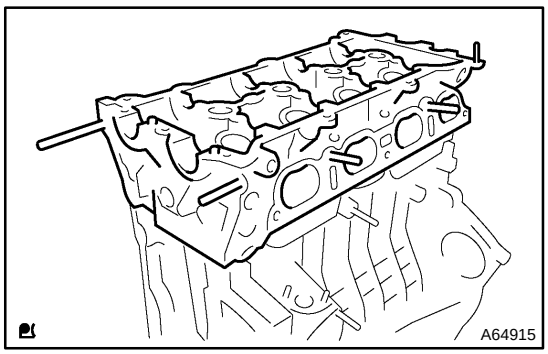


26. REMOVE CYLINDER HEAD SUB–ASSY

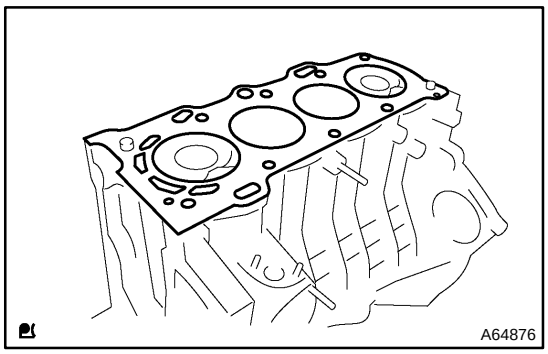
(a) Using a bi–hexagon wrench 10, uniformly loosen and remove the 10 cylinder head bolts, in several passes, in the sequence shown, then remove the 10 cylinder head bolts and 10 plate washers.

NOTICE:

- **Be careful not to drop plate washers into the cylinder head.**
- **Head warpage or cracking could result from removing bolts in an incorrect order.**

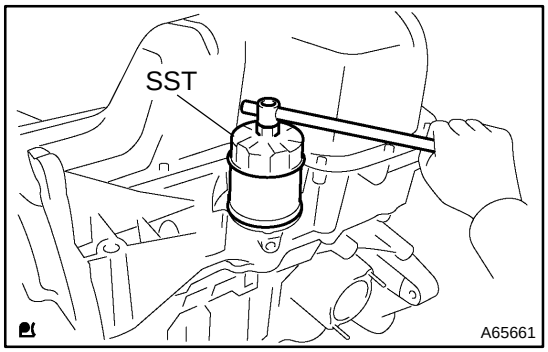


(b) Remove the cylinder head from the cylinder block.



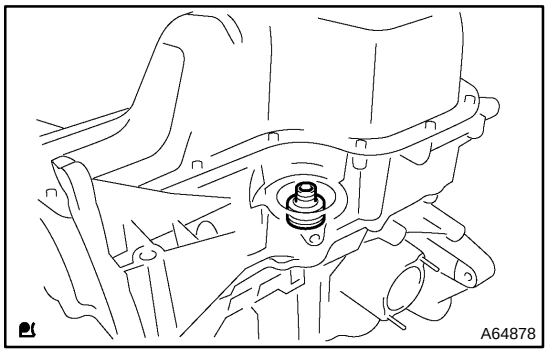
27. REMOVE CYLINDER HEAD GASKET

(a) Remove the cylinder head gasket from the cylinder block.



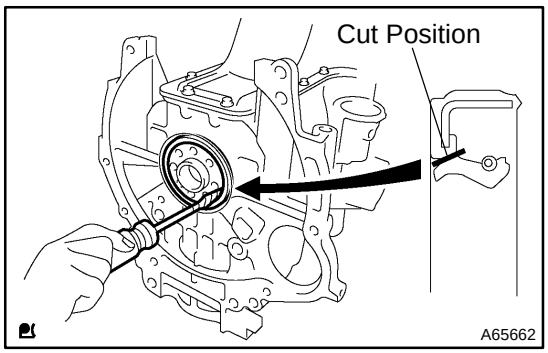
28. REMOVE OIL FILTER SUB–ASSY

(a) Using SST, remove the oil filter.
SST 09228–06501



29. REMOVE OIL FILTER UNION

(a) Using a socket hexagon wrench 12, remove the oil filter union.



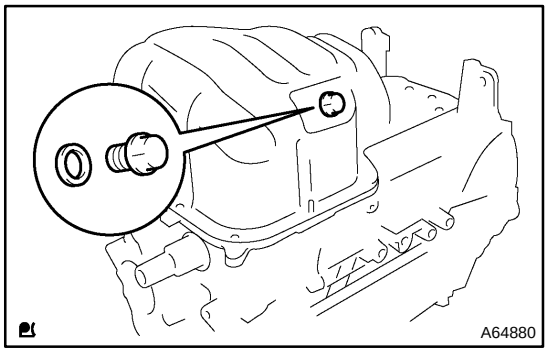
30. REMOVE ENGINE REAR OIL SEAL

(a) Using a knife, cut off the oil seal lip.

(b) Using a screwdriver with the tip wrapped in tape, pry out the oil seal.

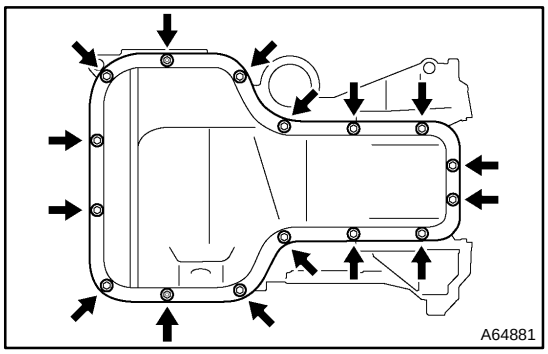
NOTICE:

After the removal, check if the crankshaft is not damaged. If damaged, smooth it with a 400–grid sandpaper.



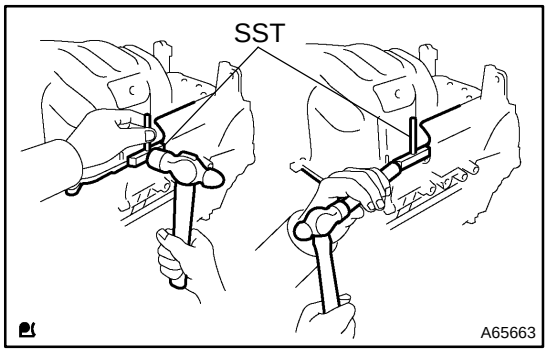
31. REMOVE OIL PAN DRAIN PLUG

(a) Remove the oil pan drain plug and gasket from the oil pan.



32. REMOVE OIL PAN SUB–ASSY

(a) Remove the 14 bolts and 2 nuts.

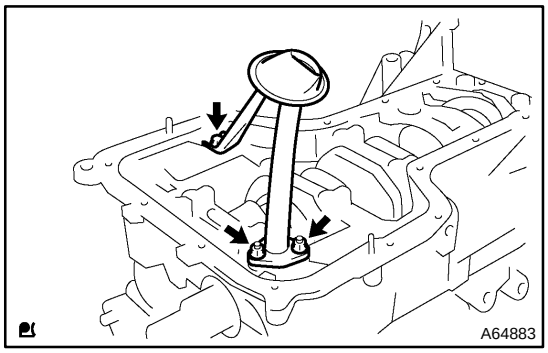


(b) Insert the blade of SST between the bearing cap and oil pan, then cut off the applied sealer and remove the oil pan.

SST 09032–00100

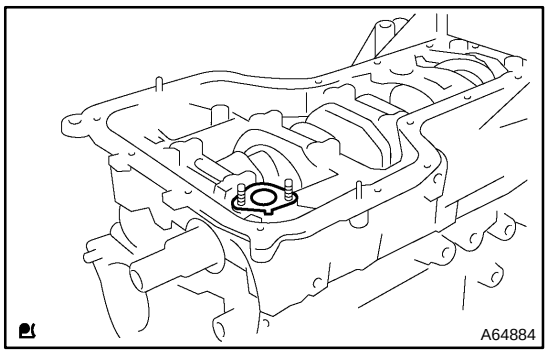
NOTICE:

Be careful not to damage the oil pan contact surface of the bearing cap and oil pan.



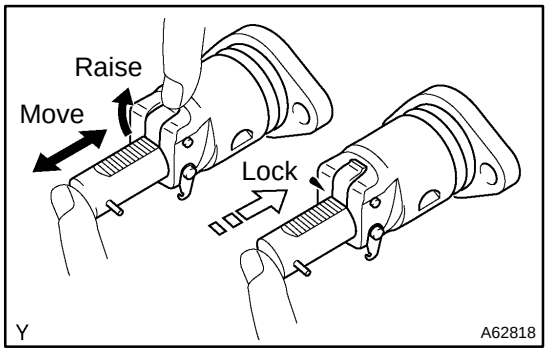
33. REMOVE OIL STRAINER SUB–ASSY

(a) Remove the bolt, 2 nuts and oil strainer.



34. REMOVE OIL STRAINER FLANGE GASKET

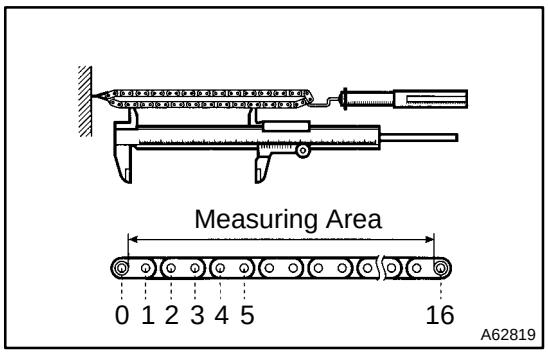
(a) Remove the gasket from the bearing cap.



35. INSPECT CHAIN TENSIONER ASSY NO.1

(a) Check that the plunger moves smoothly when the ratchet pawl is raised with your finger.

(b) Release the ratchet pawl and check that the plunger is locked in place by the ratchet pawl and does not move when pushed with your finger.



36. INSPECT CHAIN SUB–ASSY

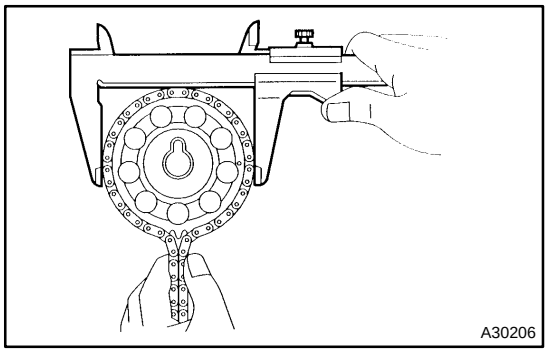
(a) Using a spring tension gauge and vernier caliper, pull the timing chain with 140 N (14.3 kgf, 31.5 lb) and measure the length of it.

Maximum chain elongation: 122.6 mm (4.827 in.)

If the chain elongation is greater than maximum, replace the chain.

HINT:

Make the same measurements pulling at 3 or more places selected at random.



37. INSPECT CAMSHAFT TIMING GEAR OR SPROCKET

(a) Wrap the chain around the camshaft timing gear.

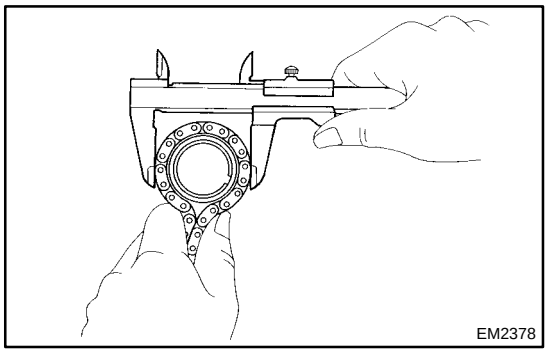
(b) Using a vernier caliper, measure the camshaft timing gear diameter with the chain.

Minimum gear diameter (w/ chain): 97.3 mm (3.831 in.)

NOTICE:

The vernier caliper must contact the chain rollers for measuring.

If the gear diameter is less than minimum, replace the chain and camshaft timing gear.



38. INSPECT CRANKSHAFT TIMING GEAR OR SPROCKET

(a) Wrap the chain around the crankshaft timing gear.

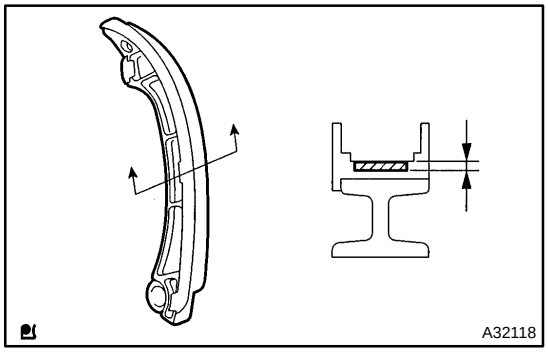
(b) Using a vernier caliper, measure the crankshaft timing gear diameter with the chain.

Minimum gear diameter (w/ chain): 51.6 mm (2.032 in.)

NOTICE:

The vernier caliper must contact the chain rollers for measuring.

If the gear diameter is less than minimum, replace the chain and crankshaft timing gear.

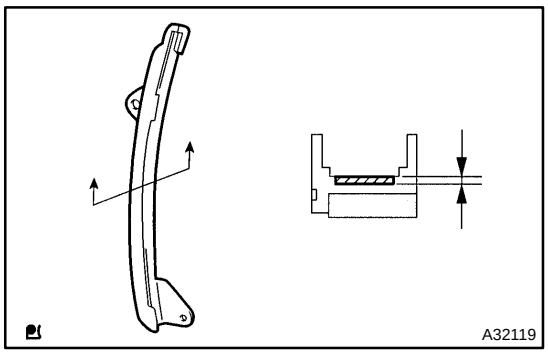


39. INSPECT CHAIN TENSIONER SLIPPER

(a) Using a vernier caliper, measure the chain tensioner slipper wears.

Maximum wear: 1.0 mm (0.039 in.)

If the wear is greater than maximum, replace the chain tensioner slipper.

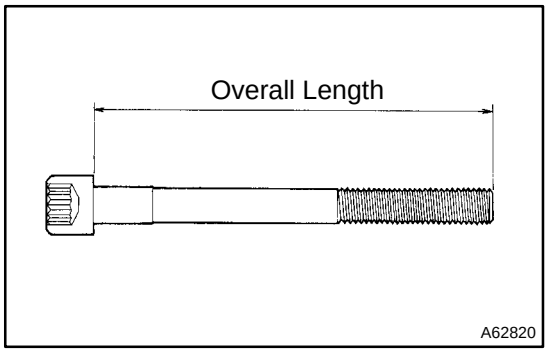


40. INSPECT CHAIN VIBRATION DAMPER NO.1

(a) Using a vernier caliper, measure the vibration damper wears.

Maximum wear: 1.0 mm (0.039 in.)

If the wear is greater than maximum, replace the chain vibration damper.

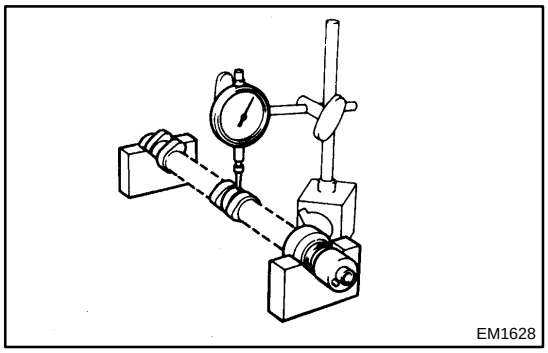


41. INSPECT CYLINDER HEAD SET BOLT

(a) Using a vernier caliper, measure the length of cylinder head bolts from the seat to the end.

Standard bolt length:
146.8 to 148.2 mm (5.780 to 5.835 in.)
Maximum bolt length: 148.5 mm (5.846 in.)

If the bolt length is greater than maximum, replace the cylinder head set bolt.



42. INSPECT CAMSHAFT

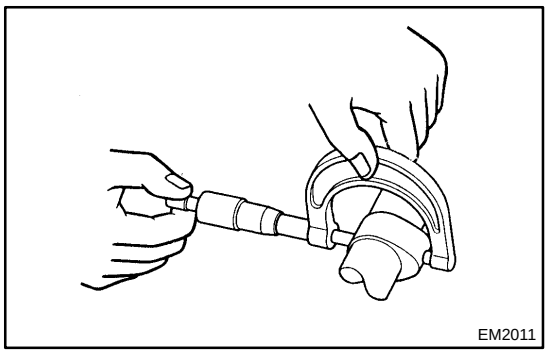
(a) Inspect the camshaft for runout.

(1) Place the camshaft on V–blocks.

(2) Using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout: 0.03 mm (0.0012 in.)

If the circle runout is greater than maximum, replace the camshaft.

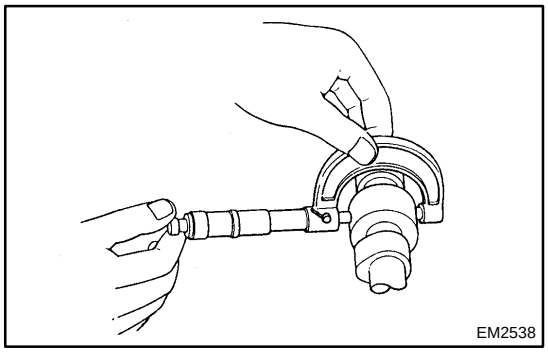


(b) Inspect the cam lobes.

(1) Using a micrometer, measure the cam lobe height.

Standard cam lobe height:
44.333 to 44.433 mm (1.7454 to 1.7493 in.) for intake
43.761 to 43.861 mm (1.7229 to 1.7268 in.) for exhaust
Minimum cam lobe height:
44.18 mm (1.7394 in.) for intake
43.61 mm (1.7169 in.) for exhaust

If the cam lobe height is less than minimum, replace the camshaft.

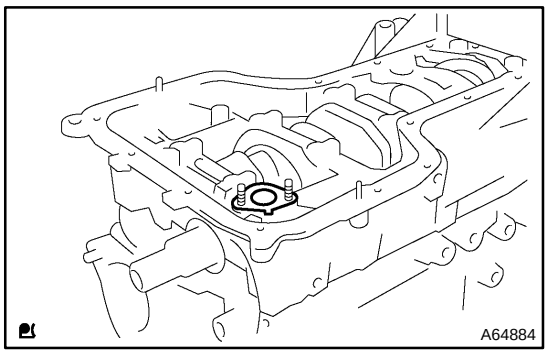


(c) Inspect the camshaft journals.

(1) Using a micrometer, measure the journal diameter.

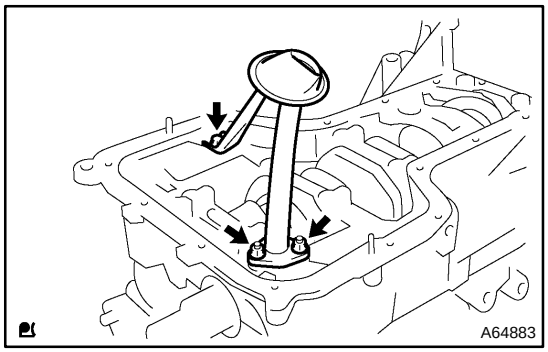
No. 1 journal diameter:
34.449 to 34.465 mm (1.3563 to 1.3569 in.)
Others journal diameter:
22.949 to 22.965 mm (0.9035 to 0.9041 in.)

If the journal diameter is not as specified, check the oil clearance.



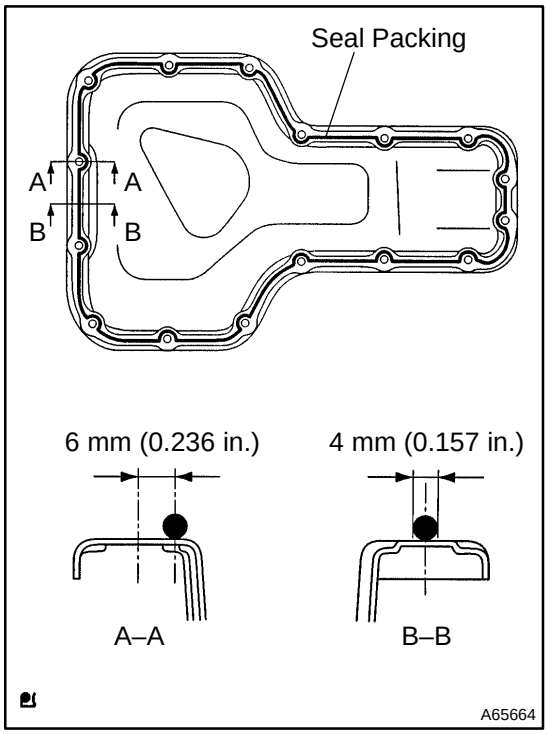
43. INSTALL OIL STRAINER FLANGE GASKET

(a) Install a new gasket to the bearing cap.



44. INSTALL OIL STRAINER SUB–ASSY

(a) Install the oil strainer with the 2 nuts and bolt.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)



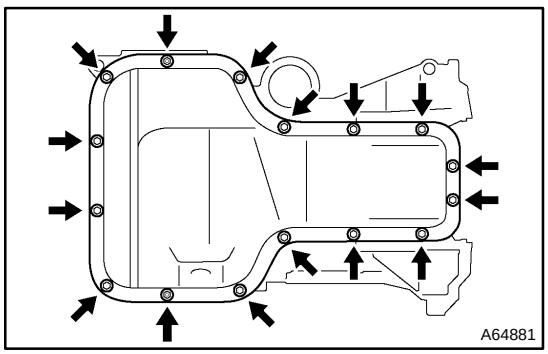
45. INSTALL OIL PAN SUB–ASSY

(a) Remove any old packing material from the contact surface and thread holes.

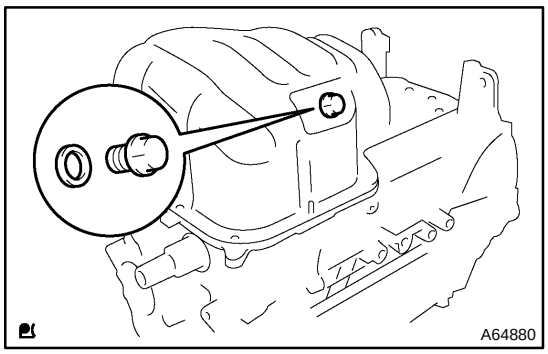
(b) Apply the seal packing in the shape of the bead (Diameter 3.5 mm to 4.5 mm (0.138 to 0.177 in.)) consequently as shown in the illustration.
Seal packing: Part No. 08826–00080 or equivalent

NOTICE:

- **Remove any oil from the contact surface.**
- **Install the oil pan within 3 minutes after applying the seal packing.**
- **Do not put into engine oil within 2 hours of installation.**



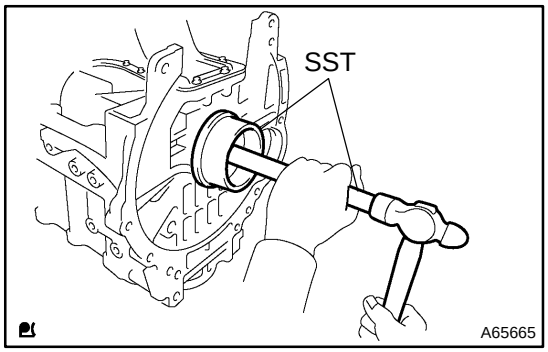
(c) Install the oil pan with the 14 bolts and 2 nuts.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)



46. INSTALL OIL PAN DRAIN PLUG

(a) Place a new gasket on the oil pan drain plug, and install it.

Torque: 37 N·m (377 kgf·cm, 27 ft·lbf)



47. INSTALL ENGINE REAR OIL SEAL

(a) Apply a light coat of multi–purpose grease to a new oil seal lip.

NOTICE:

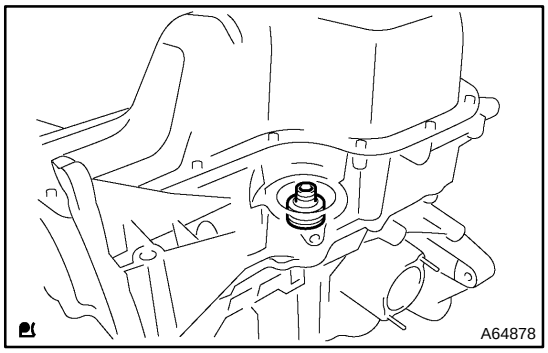
Keep the lip off foreign materials.

(b) Using SST, tap in the oil seal until its surface is flush with the oil seal retainer edge.

SST 09223–15020, 09950–70010 (09951–07100)

NOTICE:

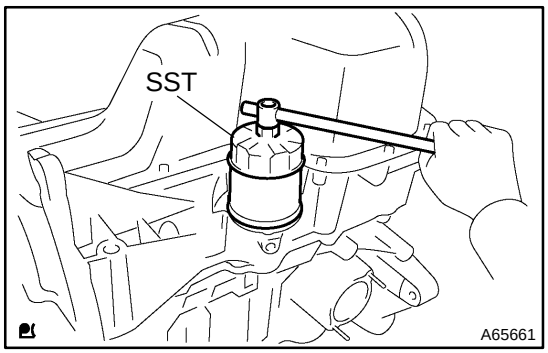
Wipe off extra grease on the crankshaft.



48. INSTALL OIL FILTER UNION

(a) Using a socket hexagon wrench 12, install the oil filter union.

Torque: 30 N·m (306 kgf·cm, 22 ft·lbf)



49. INSTALL OIL FILTER SUB–ASSY

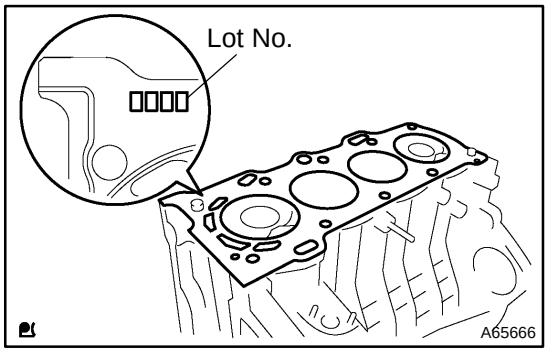
(a) Check and clean the oil filter installation surface.

(b) Apply clean engine oil to the gasket of a new oil filter.

(c) Lightly screw the oil filter into place, and tighten it until the gasket contacts the seat.

(d) Using SST, tighten it an additional 3/4 turn.

SST 09228–06501

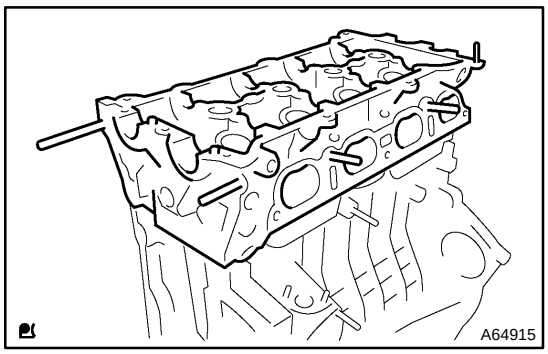


50. INSTALL CYLINDER HEAD GASKET

(a) Place a new cylinder head gasket on the cylinder block surface with the Lot No. stamp upward.

NOTICE:

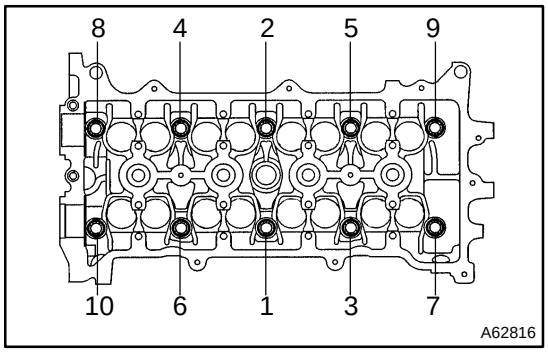
- **Pay attention to the installation direction.**
- **Place the cylinder head gently in order not to damage the gasket with the bottom part of the head.**



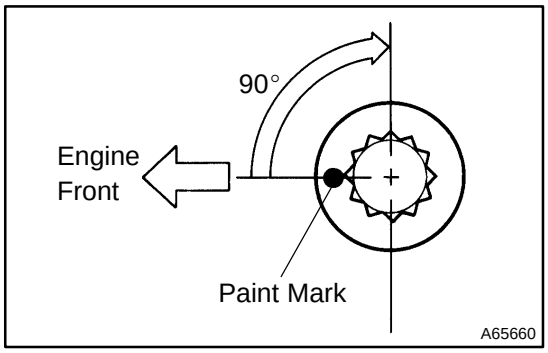
51. INSTALL CYLINDER HEAD SUB–ASSY

(a) Place the cylinder head on the cylinder block.

(b) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.



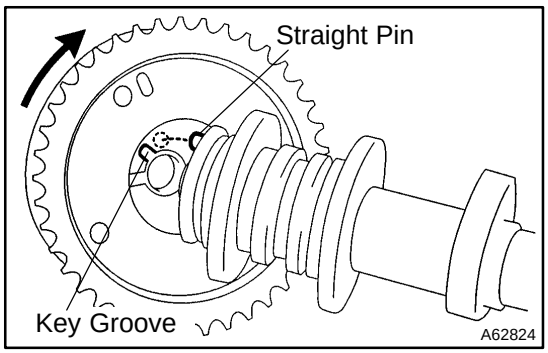
(c) Using a bi–hexagon wrench 10, install and uniformly tighten the 10 cylinder head bolts with the plate washers, in several passes, in the sequence shown.
Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)



(d) Mark the front of the cylinder head bolt with paint.

(e) Retighten the cylinder head bolts 90° in the numerical order shown.

(f) Check that the point marked bolts are moved by 90° angle.



52. INSTALL CAMSHAFT TIMING GEAR ASSY

(a) Put the camshaft timing gear assembly and camshaft together with the straight pin off the key groove.

(b) Turn the camshaft timing gear assembly to the left direction (as shown in the illustration) with pushing it lightly against the camshaft. Push further at the position where the pin gets into the groove.

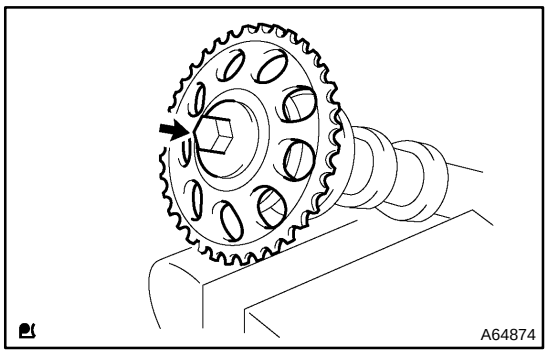
CAUTION:

Be sure not to turn the camshaft timing gear to the retard angle side (to the right angle).

(c) Check that there is no clearance between the gear's fringe and camshaft.

(d) Tighten the fringe bolt with the camshaft timing gear fixed.
Torque: 54 N·m (551 kgf·cm 40 ft·lbf)

(e) Check that the camshaft timing gear assembly can move to the retard angle side (the right angle), and is locked at the most retarded position.



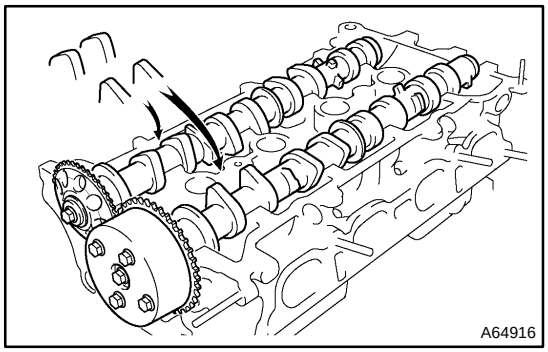
53. INSTALL CAMSHAFT TIMING GEAR OR SPROCKET

(a) Grip the camshaft with a vise, then install the camshaft timing gear with the bolt.

Torque: 54 N·m (551 kgf·cm 40 ft·lbf)

NOTICE:

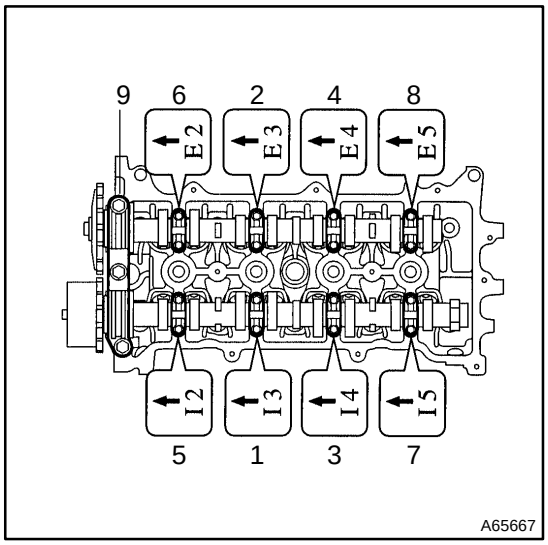
Be careful not to damage the camshaft.



54. INSTALL CAMSHAFT

(a) Apply a light coat of engine oil on the camshaft journals.

(b) Place the 2 camshafts on the cylinder head with the No. 1 cam lobes facing as shown the illustration.

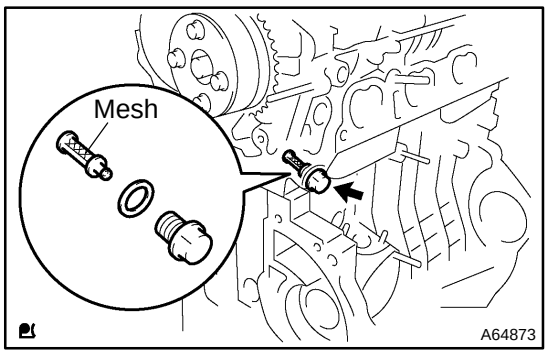


(c) Examine the front marks and numbers, then tighten the bolts in the order shown in the illustration.

Torque:

23 N·m (235 kgf·cm, 17 ft·lbf) for bearing cap No. 1

13 N·m (133 kgf·cm, 10 ft·lbf) for bearing cap No. 3

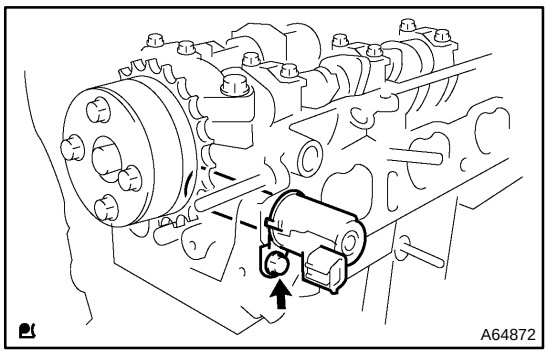


55. INSTALL OIL CONTROL VALVE FILTER

(a) Check that no foreign substance on the mesh part of the oil control valve filter.

(b) Install a new gasket and the oil control valve filter on the bolt, then install it.

Torque: 30 N·m (306 kgf·cm, 22 ft·lbf)

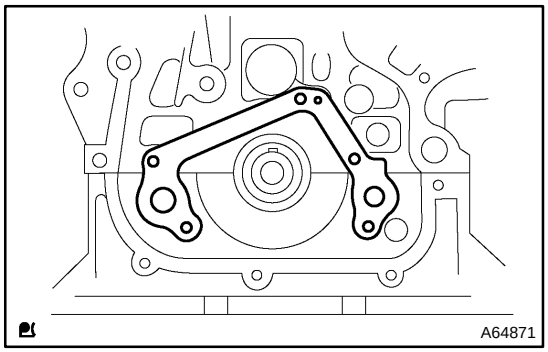


56. INSTALL CAMSHAFT TIMING OIL CONTROL VALVE ASSY

(a) Apply a light coat of engine oil to a new O–ring, then install it to the camshaft timing oil control valve.

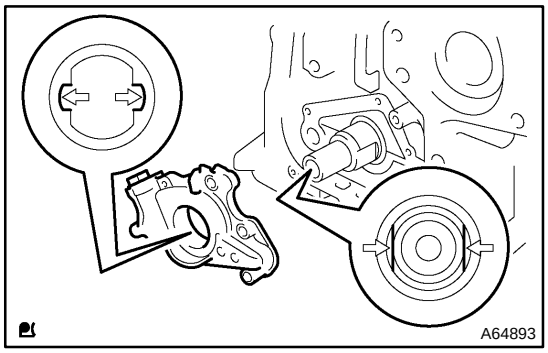
(b) Install the camshaft timing oil control valve with the bolt.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

NOTICE:
Be careful not twist the O–ring.



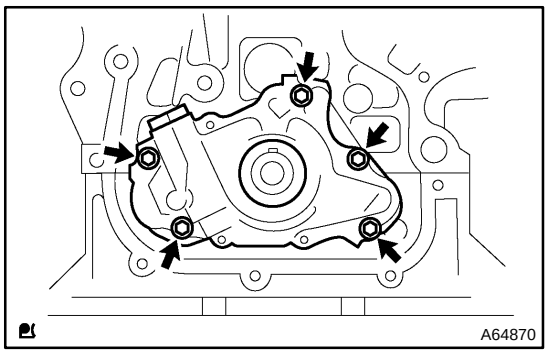
57. INSTALL OIL PUMP GASKET

(a) Install a new gasket to the cylinder block.

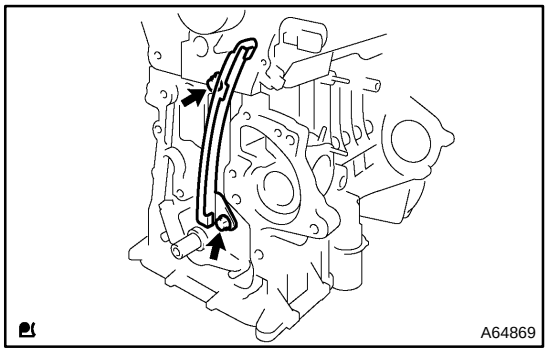


58. INSTALL OIL PUMP ASSY

(a) Engage the spline teeth of the oil pump drive rotor with the large teeth of the crankshaft, and side the oil pump into place.

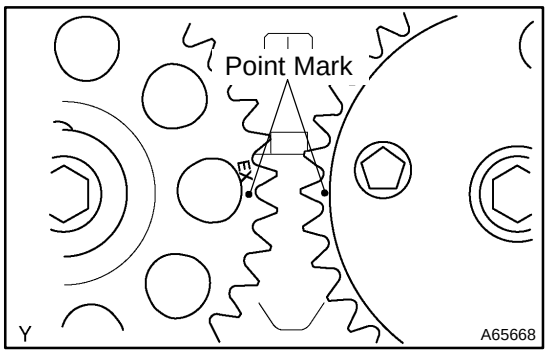


(b) Install the oil pump with the 5 bolts.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)



59. INSTALL CHAIN VIBRATION DAMPER NO.1

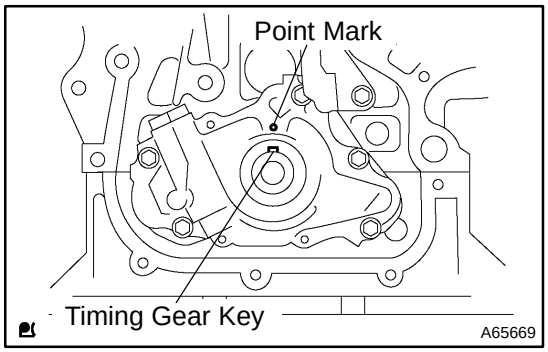
(a) Install the chain vibration damper with the 2 bolts.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)



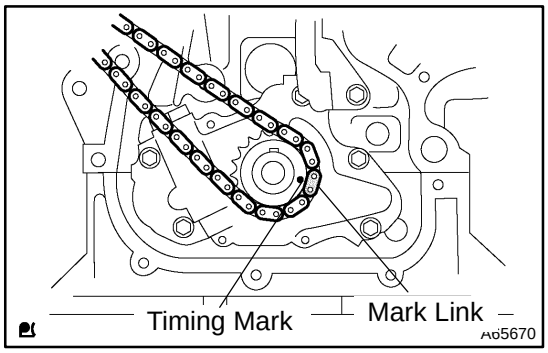
60. INSTALL CHAIN SUB–ASSY

(a) Set the No. 1 cylinder to the TDC/compression.

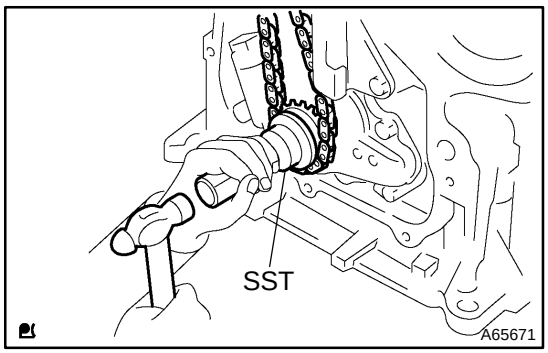
(1) Turn the hexagonal wrench head portion of the camshafts, then align the point marks of the camshaft timing gears.



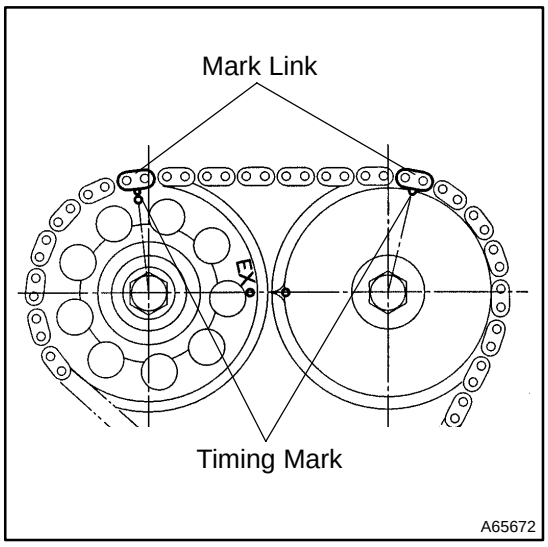
(2) Using a crankshaft pulley bolt, turn the crankshaft to align the timing gear key with the point mark located on the oil pump.



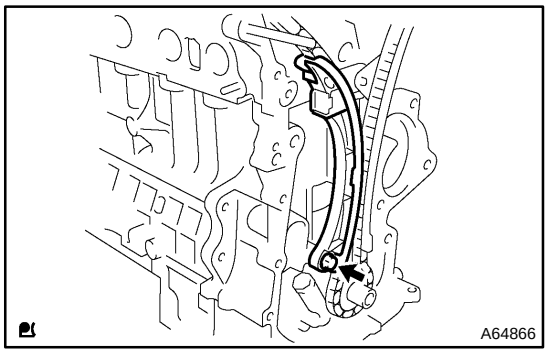
(b) Install the chain on the crankshaft timing gear with the yellow color mark link aligned with the timing mark on the crankshaft timing gear.



(c) Using SST, install the crankshaft timing gear.
SST 09223–22010

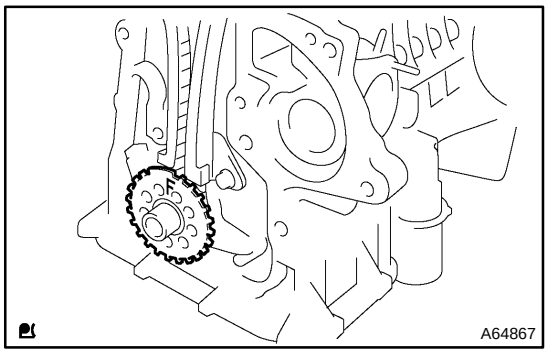


(d) Install the chain on the camshaft timing gears with the yellow color mark links aligned with the timing marks on the camshaft timing gears.



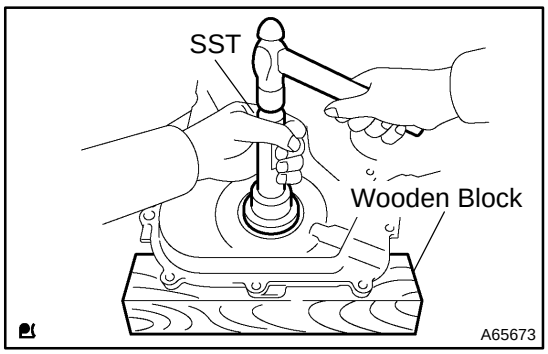
61. INSTALL CHAIN TENSIONER SLIPPER

(a) Install the chain tensioner slipper with the bolt.
Torque: 19 N·m (189 kgf·cm, 14 ft·lbf)



62. INSTALL CRANKSHAFT POSITION SENSOR PLATE NO.1

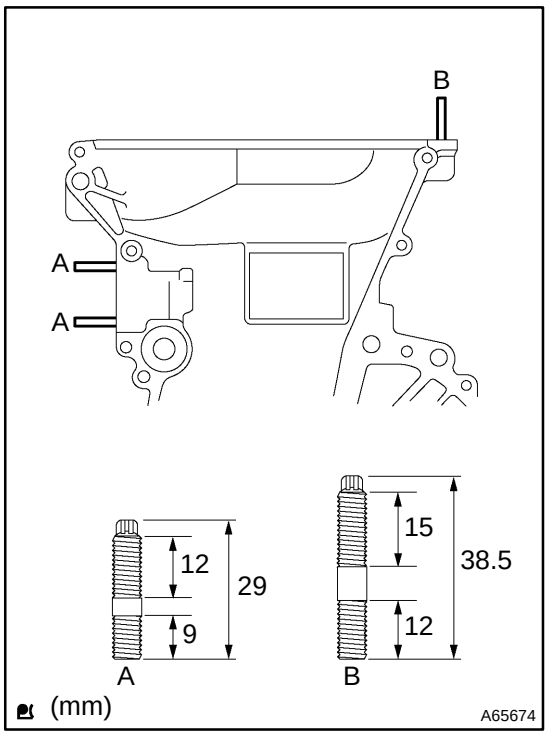
(a) Install the crankshaft position sensor plate with the ”F” mark facing forward.



63. INSTALL TIMING CHAIN OR BELT COVER OIL SEAL

(a) Apply a light coat of multi–purpose grease to a new oil seal lip.
(b) Place the timing chain cover on wooden blocks.
(c) Using SST, tap in the oil seal until its surface is flush with the timing chain cover edge.
SST 09223–22010

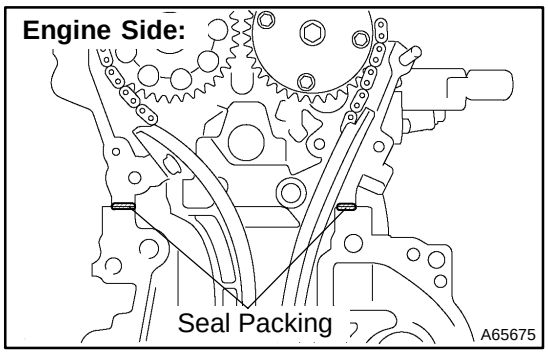
NOTICE:
Keep the lip free off foreign materials.



64. INSTALL TIMING CHAIN OR BELT COVER SUB–ASSY

(a) Remove any old packing material from the contact surface.

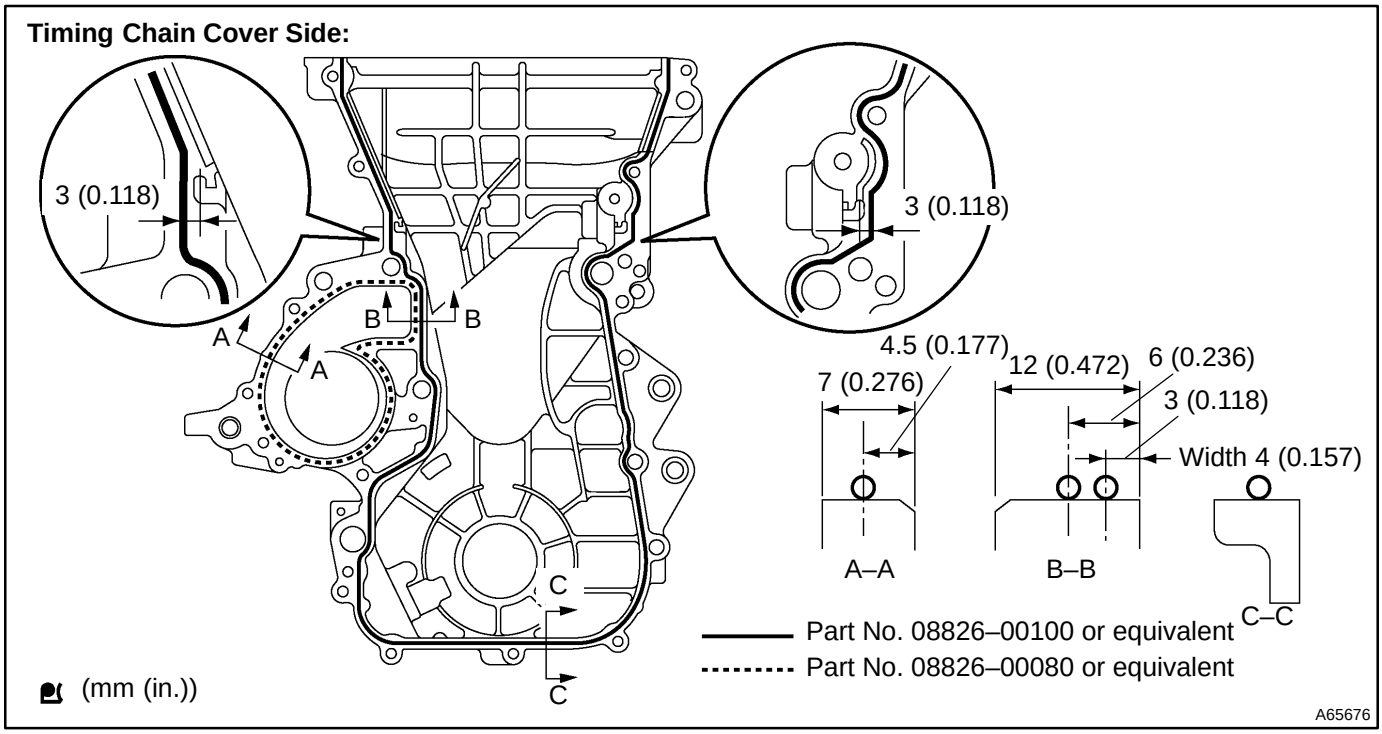
(b) Using a torx socket wrench E5, install the 3 stud bolts.
Torque: 5.0 N·m (51 kgf·cm, 44 in.·lbf)

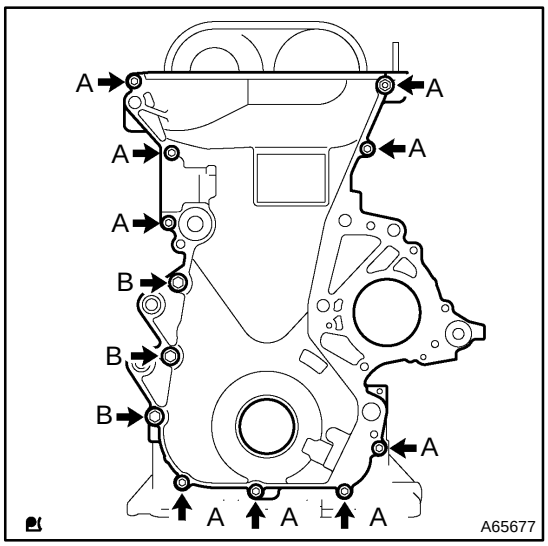


(c) Apply a continuous bead (3.5 to 4.5 mm (0.138 to 0.177 in.) diameter) of seal packing as shown in the illustration.
Seal packing:
Water pump part: Part No. 08826–00100 or equivalent
Other part: Part No. 08826–00080 or equivalent

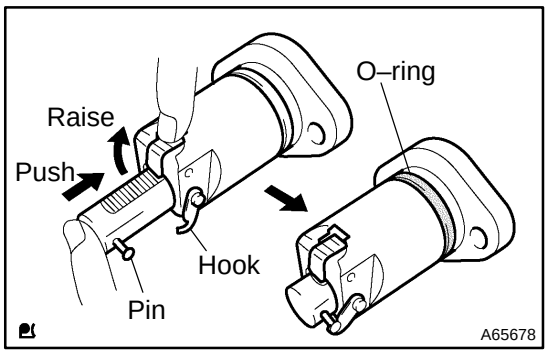
NOTICE:

- **Remove any oil from the contact surface.**
- **Install the oil pan within 3 minutes after applying the seal packing.**
- **Do not put into engine oil within 2 hours of installation.**





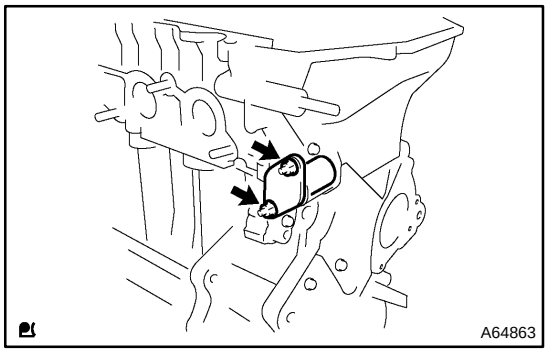
(d) Install the timing chain cover with the 12 bolts and nut.
Torque:
13 N·m (133 kgf·cm, 10 ft·lbf) for bolt A and nut A
19 N·m (189 kgf·cm, 14 ft·lbf) for bolt B



65. INSTALL CHAIN TENSIONER ASSY NO.1

(a) Check the O–ring is clean, and set the hook as shown in the illustration.

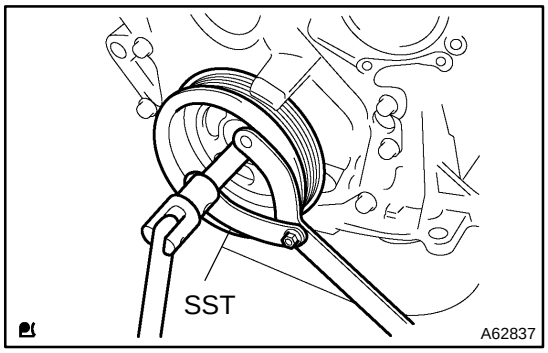
(b) Apply a light coat of engine oil to the O–ring.



(c) Install the chain tensioner with the 2 nuts.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

NOTICE:

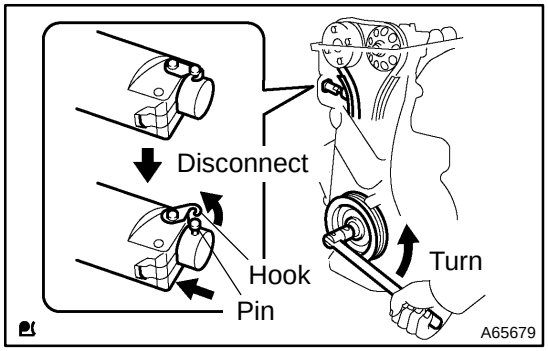
- **Be careful not twist the O–ring.**
- **When installing the chain tensioner, set the hook again if the hook releases the plunger.**



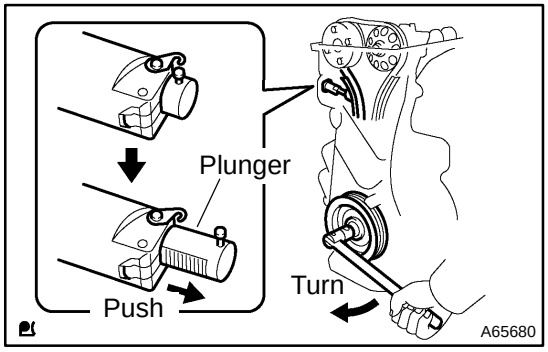
66. INSTALL CRANKSHAFT PULLEY

(a) Align the pulley set key with the key groove of the crankshaft pulley, then slide on the crankshaft pulley.

(b) Using SST, install the crankshaft pulley bolt.
SST 09960–10010 (09962–01000, 09963–01000)
Torque: 138 N·m (1,407 kgf·cm, 102 ft·lbf)



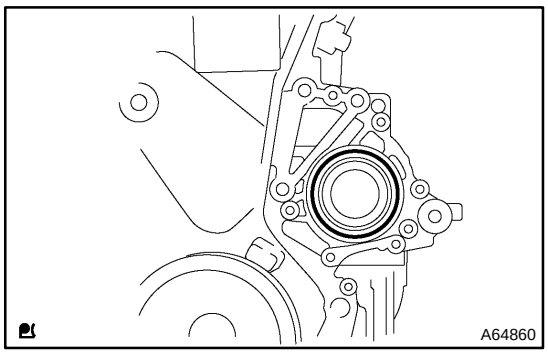
(c) Turn the crankshaft counterclockwise, then disconnect the plunger knock pin from the hook.



(d) Turn the crankshaft clockwise, then check that the slipper is pushed by the plunger.

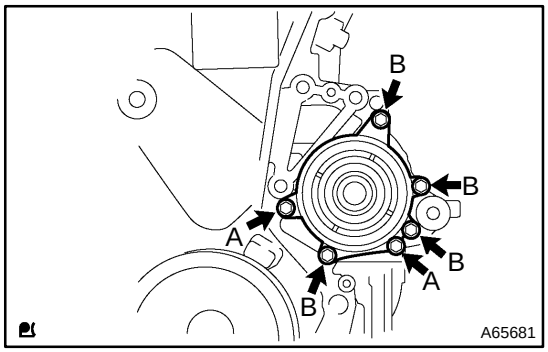
HINT:

If the plunger does not spring out, press the slipper into the chain tensioner with a screwdriver so that the hook is released from the knock pin and that the plunger springs out.



67. INSTALL WATER PUMP O–RING

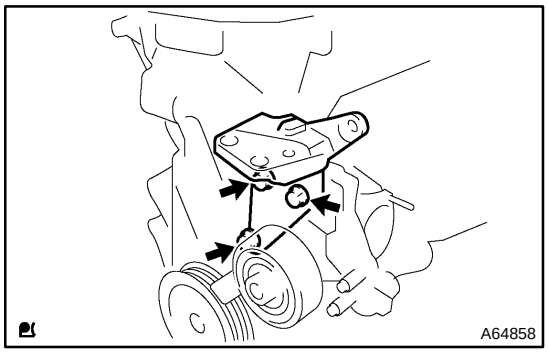
(a) Install a new O–ring to the timing chain cover.



68. INSTALL WATER PUMP ASSY

(a) Install the water pump with the 6 bolts.

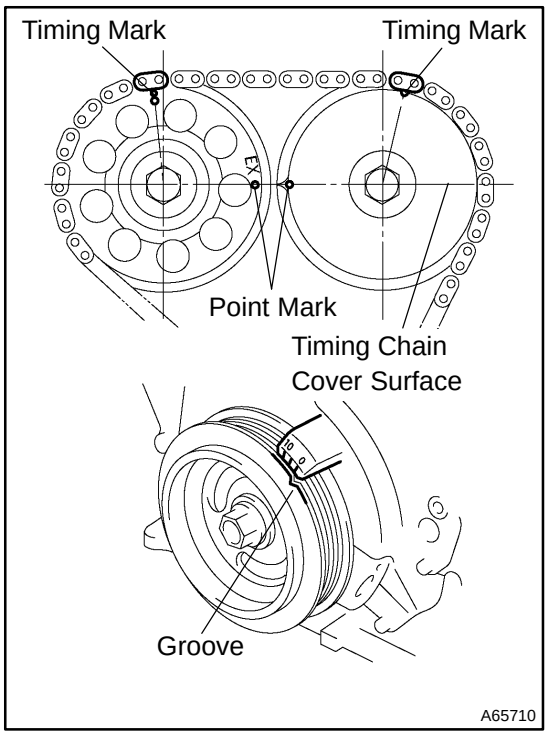
Torque:
9.0 N·m (92 kgf·cm, 80 in·lbf) for bolt A
11 N·m (112 kgf·cm, 8 ft·lbf) for bolt B



69. INSTALL TRANSVERSE ENGINE ENGINE MOUNTING BRACKET

(a) Install the transverse engine engine mounting bracket with the 3 bolts.

Torque: 47 N·m (479 kgf·cm, 35 ft·lbf)

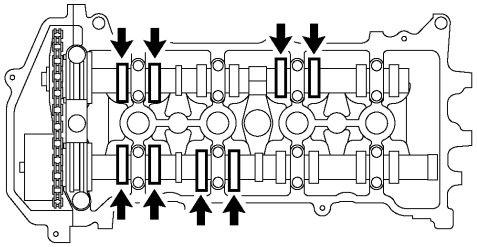


70. INSPECT VALVE CLEARANCE

(a) Set the No. 1 cylinder to the TDC/compression.
  (1) Turn the crankshaft pulley, and align its groove with timing mark ”0” of the timing chain cover.
  (2) Check that the point marks of the camshaft timing gears are in straight line on the timing chain cover surface as shown in the illustration.

HINT:
If not, turn the crankshaft 1 revolution (360°) and align the marks as above.

No. 1 Cylinder TDC/Compression:



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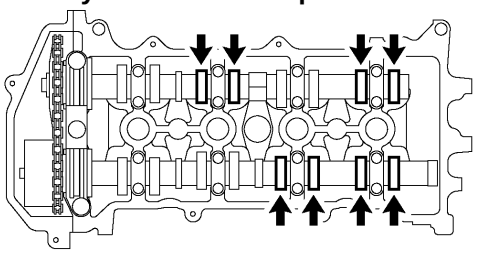
(b) Check only the valves indicated.
  (1) Using a feeler gauge, measure the clearance between the valve lifter and camshaft.
  (2) Record the out–of specification valve clearance measurements. They will be used later to determine the required replacement valve lifters.

Valve clearance (Cold):
0.15 to 0.25 mm (0.0059 to 0.0098 in.) for intake
0.25 to 0.35 mm (0.0098 to 0.0138 in.) for exhaust

No. 4 Cylinder TDC/Compression:



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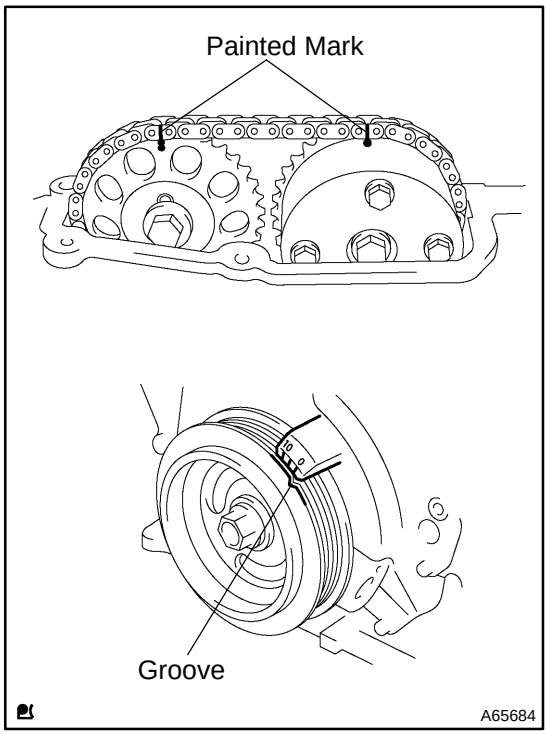
(c) Turn the crankshaft 1 revolution (360°) and set No. 4 the cylinder to the TDC/compression.
(d) Check only the valves indicated.
  (1) Using a feeler gauge, measure the clearance between the valve lifter and camshaft.
  (2) Record the out–of specification valve clearance measurements. They will be used later to determine the required replacement valve lifters.

Valve clearance (Cold):
0.15 to 0.25 mm (0.0059 to 0.0098 in.) for intake
0.25 to 0.35 mm (0.0098 to 0.0138 in.) for exhaust



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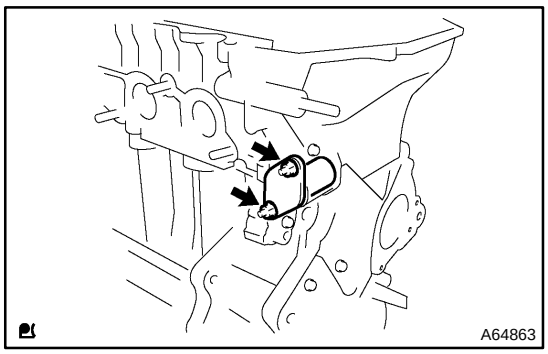
71. ADJUST VALVE CLEARANCE

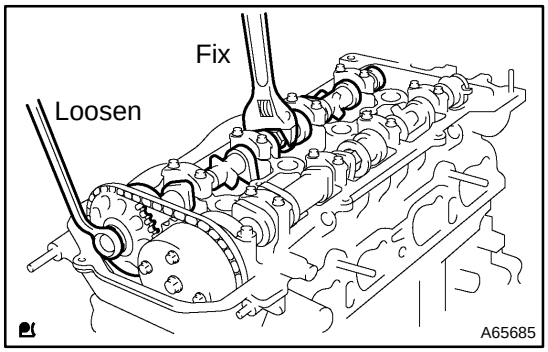
NOTICE:

Be sure not to revolve the crankshaft without the chain tensioner.

(a) Set the No. 1 cylinder to the TDC/compression.
(b) Place the painted marks on the chain and camshaft timing gears.

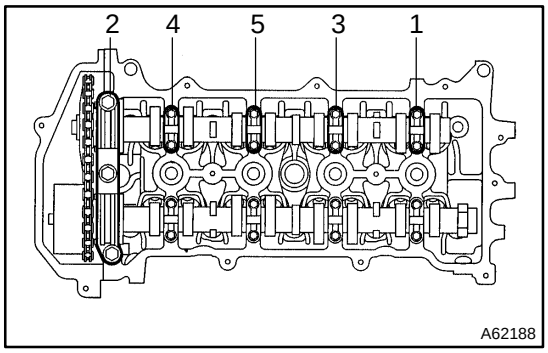


(c) Remove the 2 nuts and chain tensioner.

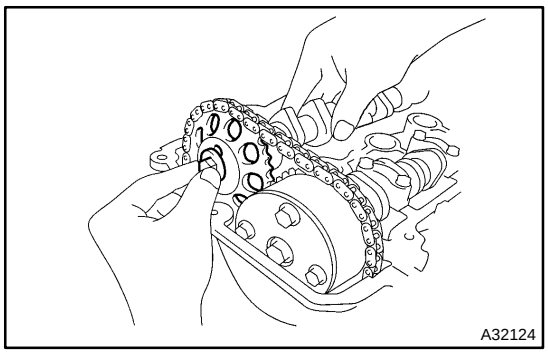


(d) Fix the camshaft with a spanner and so on, then loosen the camshaft timing gear set bolt.

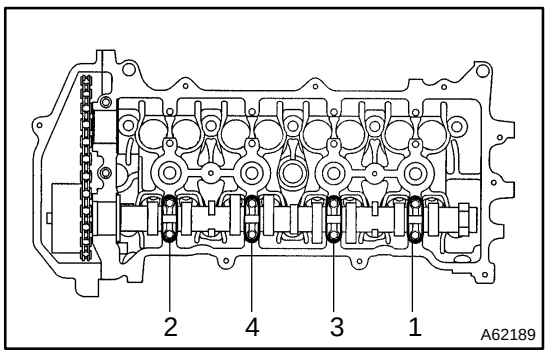
NOTICE:
Be careful not to damage the valve lifter.



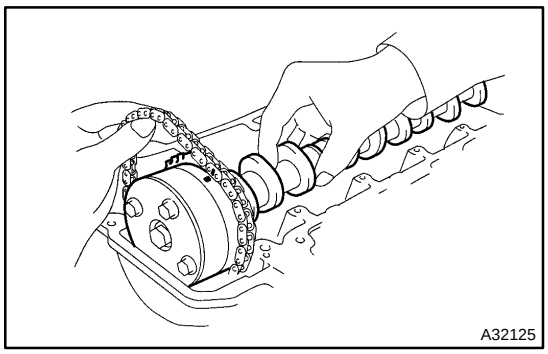
(e) Loosen the bearing cap bolts on the No. 2 camshaft in the order as shown in the illustration in several passes, then remove the bearing caps.



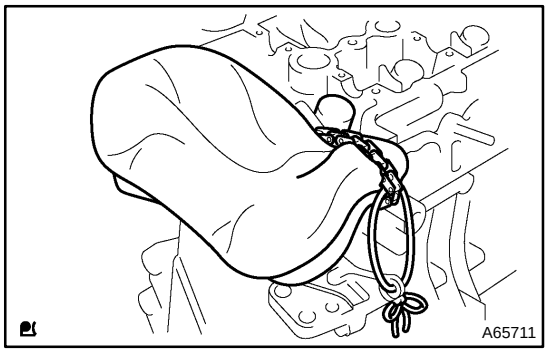
(f) Remove the camshaft timing gear as shown in the illustration.



(g) Loosen the bearing cap bolts on camshaft in the order as shown in the illustration in several passes, then remove the bearing caps.



(h) Remove the camshaft while holding the chain.

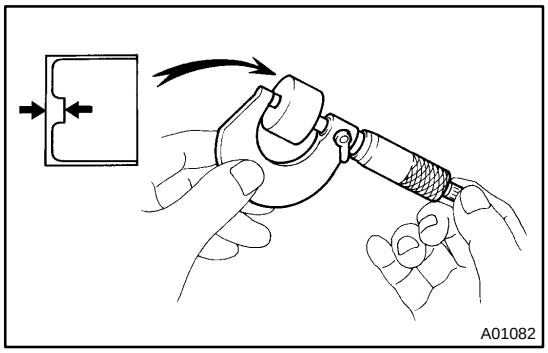


(i) Tie the chain with a string as shown in the illustration.

NOTICE:

Be careful not to drop anything inside the timing chain cover.

(j) Remove the valve lifters.



(k) Using a micrometer, measure the thickness of the removed valve lifters.

(l) Calculate the thickness of a new lifter so that the valve clearance comes within the specified value.

A	Thickness of new lifter
B	Thickness of used lifter
C	Measured valve clearance

Valve clearance:
Intake A = B + (C – 0.20 mm (0.0079 in.))
Exhaust A = B + (C – 0.30 mm (0.0118 in.))

Example (Intake):
Measure intake valve clearance = 0.40 mm (0.0158 in.)
0.40 mm (0.0158 in.) – 0.20 mm (0.0079 in.) = 0.20 mm (0.0079 in.)
(Measured – Specification = Excess clearance)
Used lifter measurement = 5.250 mm (0.2067 in.)
0.20 mm (0.0079 in.) + 5.250 mm (0.2067 in.) = 5.450 mm (0.2146 in.)
(Excess clearance + Used lifter = Ideal new lifter)
Closest new lifter = 5.460 mm (0.2150 in.)
Select No. 46 lifter

HINT:

- Select a new lifter with a thickness as close as possible to the calculated values.
- Lifter are available in 35 sizes in increments of 0.020 mm (0.0008 in.), from 5.060 mm (0.1992 in.) to 5.740 mm (0.2260 in.).
- Refer to new lifter thickness table on the next 2 pages.

Valve Lifter Selection Chart (Intake)

Measured clearance mm (in.) \ Installed lifter thickness mm (in.)	5.060 (0.1992)	5.080 (0.2000)	5.100 (0.2008)	5.120 (0.2016)	5.140 (0.2024)	5.160 (0.2031)	5.180 (0.2039)	5.200 (0.2047)	5.210 (0.2051)	5.220 (0.2055)	5.230 (0.2059)	5.240 (0.2063)	5.250 (0.2067)	5.260 (0.2071)	5.270 (0.2075)	5.280 (0.2079)	5.290 (0.2083)	5.300 (0.2087)	5.310 (0.2091)	5.320 (0.2094)	5.330 (0.2098)	5.340 (0.2102)	5.350 (0.2106)	5.360 (0.2110)	5.370 (0.2114)	5.380 (0.2118)	5.390 (0.2122)	5.400 (0.2126)	5.410 (0.2130)	5.420 (0.2134)	5.430 (0.2138)	5.440 (0.2142)	5.450 (0.2146)	5.460 (0.2150)	5.470 (0.2154)	5.480 (0.2157)	5.490 (0.2161)	5.500 (0.2165)	5.510 (0.2169)	5.520 (0.2173)	5.530 (0.2177)	5.540 (0.2181)	5.550 (0.2185)	5.560 (0.2189)	5.570 (0.2193)	5.580 (0.2197)	5.590 (0.2201)	5.600 (0.2205)	5.620 (0.2213)	5.640 (0.2220)	5.660 (0.2228)	5.680 (0.2236)	5.700 (0.2244)	5.720 (0.2252)	5.740 (0.2260)
0.000 – 0.030 (0.0000 – 0.0012)									06	06	06	06	06	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	36	36	38	38	40	40	42	42	44	46	48	50	52	54	56
0.031 – 0.050 (0.0012 – 0.0020)							06	06	06	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	48	50	52	54	56	58
0.051 – 0.070 (0.0020 – 0.0028)						06	06	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	50	52	54	56	58	60
0.071 – 0.090 (0.0028 – 0.0035)					06	06	06	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	52	54	56	58	60	62
0.091 – 0.110 (0.0036 – 0.0043)				06	06	06	08	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	54	56	58	60	62	64
0.111 – 0.130 (0.0044 – 0.0051)			06	06	06	08	10	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	56	58	60	62	64	66
0.131 – 0.149 (0.0052 – 0.0059)		06	06	06	08	10	12	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	58	60	62	64	66	68
0.150 – 0.250 (0.0059 – 0.0098)																																																								
0.251 – 0.270 (0.0099 – 0.0106)	12	14	16	18	20	22	24	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	70	72	74	74	74
0.271 – 0.290 (0.0107 – 0.0114)	14	16	18	20	22	24	26	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	72	74	74	74	
0.291 – 0.310 (0.0115 – 0.0122)	16	18	20	22	24	26	28	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	74	74	74		
0.311 – 0.330 (0.0122 – 0.0130)	18	20	22	24	26	28	30	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74			
0.331 – 0.350 (0.0130 – 0.0138)	20	22	24	26	28	30	32	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74					
0.351 – 0.370 (0.0138 – 0.0146)	22	24	26	28	30	32	34	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74						
0.371 – 0.390 (0.0146 – 0.0154)	24	26	28	30	32	34	36	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74						
0.391 – 0.410 (0.0154 – 0.0161)	26	28	30	32	34	36	38	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74	74							
0.411 – 0.430 (0.0162 – 0.0169)	28	30	32	34	36	38	40	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74	74									
0.431 – 0.450 (0.0170 – 0.0177)	30	32	34	36	38	40	42	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74	74											
0.451 – 0.470 (0.0178 – 0.0185)	32	34	36	38	40	42	44	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74														
0.471 – 0.490 (0.0185 – 0.0193)	34	36	38	40	42	44	46	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74																
0.491 – 0.510 (0.0193 – 0.0201)	36	38	40	42	44	46	48	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74																		
0.511 – 0.530 (0.0201 – 0.0209)	38	40	42	44	46	48	50	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74																			
0.531 – 0.550 (0.0209 – 0.0217)	40	42	44	46	48	50	52	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74																				
0.551 – 0.570 (0.0217 – 0.0224)	42	44	46	48	50	52	54	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74	74																					
0.571 – 0.590 (0.0225 – 0.0232)	44	46	48	50	52	54	56	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74																						
0.591 – 0.610 (0.0233 – 0.0240)	46	48	50	52	54	56	58	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74																						
0.611 – 0.630 (0.0241 – 0.0248)	48	50	52	54	56	58	60	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74																						
0.631 – 0.650 (0.0248 – 0.0256)	50	52	54	56	58	60	62	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74	74	74																						
0.651 – 0.670 (0.0256 – 0.0264)	52	54	56	58	60	62	64	66	68	68	70	70	72	72	74	74	74	74	74	74	74																									
0.671 – 0.690 (0.0264 – 0.0272)	54	56	58	60	62	64	66	68	70	70	72	72	74	74	74	74	74	74	74																									
0.691 – 0.710 (0.0272 – 0.0280)	56	58	60	62	64	66	68	70	72	72	74	74	74	74	74	74	74																											
0.711 – 0.730 (0.0280 – 0.0287)	58	60	62	64	66	68	70	72	74	74	74	74	74	74	74																											
0.731 – 0.750 (0.0288 – 0.0295)	60	62	64	66	68	70	72	74	74	74	74	74	74																											
0.751 – 0.770 (0.0296 – 0.0303)	62	64	66	68	70	72	74	74	74	74	74																													
0.771 – 0.790 (0.0304 – 0.0311)	64	66	68	70	72	74	74	74																															
0.791 – 0.810 (0.0311 – 0.0319)	66	68	70	72	74	74	74																																
0.811 – 0.830 (0.0319 – 0.0327)	68	70	72	74	74	74																																	
0.831 – 0.850 (0.0327 – 0.0335)	70	72	74	74	74																																		
0.851 – 0.870 (0.0335 – 0.0343)	72	74	74	74																																			
0.871 – 0.890 (0.0343 – 0.0350)	74	74	74																																				
0.891 – 0.910 (0.0351 – 0.0358)	74	74																																					
0.911 – 0.930 (0.0359 – 0.0366)	74																																						

Intake valve clearance (Cold):
0.15 to 0.25 mm (0.006 to 0.010 in.)

EXAMPLE: The 5.250 mm (0.2067 in.) lifter is installed, and the measured clearance is 0.400 mm (0.0157 in.).
Replace the 5.250 mm (0.2067 in.) lifter with a new No. 46 lifter.

New lifter thickness mm (in.)

Lifter No.	Thickness	Lifter No.	Thickness	Lifter No.	Thickness
06	5.060 (0.1992)	30	5.300 (0.2087)	54	5.540 (0.2181)
08	5.080 (0.2000)	32	5.320 (0.2094)	56	5.560 (0.2189)
10	5.100 (0.2008)	34	5.340 (0.2102)	58	5.580 (0.2197)
12	5.120 (0.2016)	36	5.360 (0.2110)	60	5.600 (0.2205)
14	5.140 (0.2024)	38	5.380 (0.2118)	62	5.620 (0.2213)
16	5.160 (0.2031)	40	5.400 (0.2126)	64	5.640 (0.2220)
18	5.180 (0.2039)	42	5.420 (0.2134)	66	5.660 (0.2228)
20	5.200 (0.2047)	44	5.440 (0.2142)	68	5.680 (0.2236)
22	5.220 (0.2055)	46	5.460 (0.2150)	70	5.700 (0.2244)
24	5.240 (0.2063)	48	5.480 (0.2157)	72	5.720 (0.2252)
26	5.260 (0.2071)	50	5.500 (0.2165)	74	5.740 (0.2260)
28	5.280 (0.2079)	52	5.520 (0.2173)		

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Valve Lifter Selection Chart (Exhaust)

Measured clearance mm (in.) \ Installed lifter thickness mm (in.)	5.060 (0.1992)	5.080 (0.2000)	5.100 (0.2008)	5.120 (0.2016)	5.140 (0.2024)	5.160 (0.2031)	5.180 (0.2039)	5.200 (0.2047)	5.210 (0.2051)	5.220 (0.2055)	5.230 (0.2059)	5.240 (0.2063)	5.250 (0.2067)	5.260 (0.2071)	5.270 (0.2075)	5.280 (0.2079)	5.290 (0.2083)	5.300 (0.2087)	5.310 (0.2091)	5.320 (0.2094)	5.330 (0.2098)	5.340 (0.2102)	5.350 (0.2106)	5.360 (0.2110)	5.370 (0.2114)	5.380 (0.2118)	5.390 (0.2122)	5.400 (0.2126)	5.410 (0.2130)	5.420 (0.2134)	5.430 (0.2138)	5.440 (0.2142)	5.450 (0.2146)	5.460 (0.2150)	5.470 (0.2154)	5.480 (0.2157)	5.490 (0.2161)	5.500 (0.2165)	5.510 (0.2169)	5.520 (0.2173)	5.530 (0.2177)	5.540 (0.2181)	5.550 (0.2185)	5.560 (0.2189)	5.570 (0.2193)	5.580 (0.2197)	5.590 (0.2201)	5.600 (0.2205)	5.620 (0.2213)	5.640 (0.2220)	5.660 (0.2228)	5.680 (0.2236)	5.700 (0.2244)	5.720 (0.2252)	5.740 (0.2260)
0.000 – 0.030 (0.0000 – 0.0012)																			06	06	06	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	36	38	40	42	44	46
0.031 – 0.050 (0.0012 – 0.0020)															06	06	06	06	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	38	40	42	44	46	48
0.051 – 0.070 (0.0020 – 0.0028)														06	06	06	06	06	08	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	40	42	44	46	48	50
0.071 – 0.090 (0.0028 – 0.0035)												06	06	06	06	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	42	44	46	48	50	52
0.091 – 0.110 (0.0036 – 0.0043)										06	06	06	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	44	46	48	50	52	54
0.111 – 0.130 (0.0044 – 0.0051)									06	06	06	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	46	48	50	52	54	56
0.131 – 0.150 (0.0052 – 0.0059)								06	06	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	46	48	50	52	54	56	58
0.151 – 0.170 (0.0059 – 0.0067)						06	06	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	50	52	54	56	58	60
0.171 – 0.190 (0.0067 – 0.0075)					06	06	06	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	52	54	56	58	60	62
0.191 – 0.210 (0.0075 – 0.0083)				06	06	06	08	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	52	54	56	58	60	62	64
0.211 – 0.230 (0.0083 – 0.0091)			06	06	06	08	10	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	56	58	60	62	64	66
0.231 – 0.249 (0.0091 – 0.0098)		06	06	06	08	10	12	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	58	60	62	64	66	68
0.250 – 0.350 (0.0098 – 0.0138)																																																										
0.351 – 0.370 (0.0138 – 0.0146)	12	14	16	18	20	22	24	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	70	72	74	74	74
0.371 – 0.390 (0.0146 – 0.0154)	14	16	18	20	22	24	26	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	72	74	74	74	
0.391 – 0.410 (0.0154 – 0.0161)	16	18	20	22	24	26	28	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	74	74	74		
0.411 – 0.430 (0.0162 – 0.0169)	18	20	22	24	26	28	30	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74			
0.431 – 0.450 (0.0170 – 0.0177)	20	22	24	26	28	30	32	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	68	68	70	70	72	72	74	74	74	74					
0.451 – 0.470 (0.0178 – 0.0185)	22	24	26	28	30	32	34	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74						
0.471 – 0.490 (0.0185 – 0.0193)	24	26	28	30	32	34	36	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74						
0.491 – 0.510 (0.0193 – 0.0201)	26	28	30	32	34	36	38	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74								
0.511 – 0.530 (0.0201 – 0.0209)	28	30	32	34	36	38	40	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74										
0.531 – 0.550 (0.0209 – 0.0217)	30	32	34	36	38	40	42	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74												
0.551 – 0.570 (0.0217 – 0.0224)	32	34	36	38	40	42	44	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74														
0.571 – 0.590 (0.0225 – 0.0232)	34	36	38	40	42	44	46	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74																
0.591 – 0.610 (0.0233 – 0.0240)	36	38	40	42	44	46	48	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74																		
0.611 – 0.630 (0.0241 – 0.0248)	38	40	42	44	46	48	50	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74																				
0.631 – 0.650 (0.0248 – 0.0256)	40	42	44	46	48	50	52	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74																						
0.651 – 0.670 (0.0256 – 0.0264)	42	44	46	48	50	52	54	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74																								
0.671 – 0.690 (0.0264 – 0.0272)	44	46	48	50	52	54	56	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74																										
0.691 – 0.710 (0.0272 – 0.0280)	46	48	50	52	54	56	58	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74																										
0.711 – 0.730 (0.0280 – 0.0287)	48	50	52	54	56	58	60	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74																										
0.731 – 0.750 (0.0288 – 0.0295)	50	52	54	56	58	60	62	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74																										
0.751 – 0.770 (0.0296 – 0.0303)	52	54	56	58	60	62	64	66	68	68	70	70	72	72	74	74	74	74	74	74																										
0.771 – 0.790 (0.0304 – 0.0311)	54	56	58	60	62	64	66	68	70	70	72	72	74	74	74	74	74	74																												
0.791 – 0.810 (0.0311 – 0.0319)	56	58	60	62	64	66	68	70	72	72	74	74	74	74	74	74																												
0.811 – 0.830 (0.0319 – 0.0327)	58	60	62	64	66	68	70	72	74	74	74	74	74	74																												
0.831 – 0.850 (0.0327 – 0.0335)	60	62	64	66	68	70	72	74	74	74	74	74																												
0.851 – 0.870 (0.0335 – 0.0343)	62	64	66	68	70	72	74	74	74	74																												
0.871 – 0.890 (0.0343 – 0.0350)	64	66	68	70	72	74	74	74																														
0.891 – 0.910 (0.0351 – 0.0358)	66	68	70	72	74	74	74																															
0.911 – 0.930 (0.0359 – 0.0366)	68	70	72	74	74	74																																
0.931 – 0.950 (0.0367 – 0.0374)	70	72	74	74	74																																	
0.951 – 0.970 (0.0374 – 0.0382)	72	74	74	74																																		
0.971 – 0.990 (0.0382 – 0.0390)	74	74	74																																			
0.991 – 1.010 (0.0390 – 0.0398)	74	74																																				
1.011 – 1.030 (0.0398 – 0.0406)	74																																					

A79323

Exhaust valve clearance (Cold):

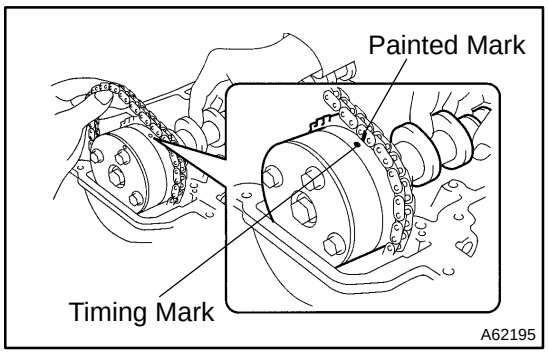
0.25 to 0.35 mm (0.010 to 0.014 in.)

EXAMPLE: The 5.340 mm (0.2102 in.) lifter is installed, and the measured clearance is 0.440 mm (0.0173 in.).

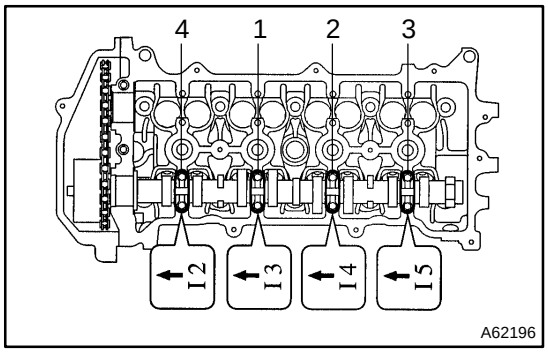
Replace the 5.340 mm (0.2102 in.) lifter with a new No. 48 lifter.

New lifter thickness mm (in.)

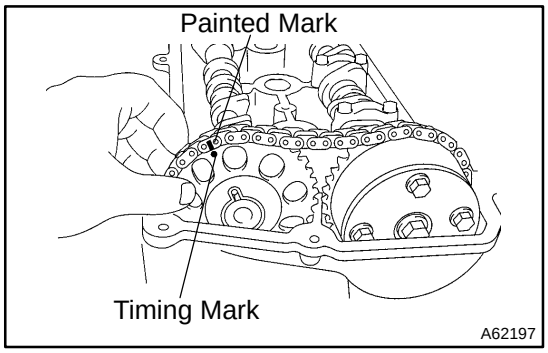
Lifter No.	Thickness	Lifter No.	Thickness	Lifter No.	Thickness
06	5.060 (0.1992)	30	5.300 (0.2087)	54	5.540 (0.2181)
08	5.080 (0.2000)	32	5.320 (0.2094)	56	5.560 (0.2189)
10	5.100 (0.2008)	34	5.340 (0.2102)	58	5.580 (0.2197)
12	5.120 (0.2016)	36	5.360 (0.2110)	60	5.600 (0.2205)
14	5.140 (0.2024)	38	5.380 (0.2118)	62	5.620 (0.2213)
16	5.160 (0.2031)	40	5.400 (0.2126)	64	5.640 (0.2220)
18	5.180 (0.2039)	42	5.420 (0.2134)	66	5.660 (0.2228)
20	5.200 (0.2047)	44	5.440 (0.2142)	68	5.680 (0.2236)
22	5.220 (0.2055)	46	5.460 (0.2150)	70	5.700 (0.2244)
24	5.240 (0.2063)	48	5.480 (0.2157)	72	5.720 (0.2252)
26	5.260 (0.2071)	50	5.500 (0.2165)	74	5.740 (0.2260)
28	5.280 (0.2079)	52	5.520 (0.2173)		



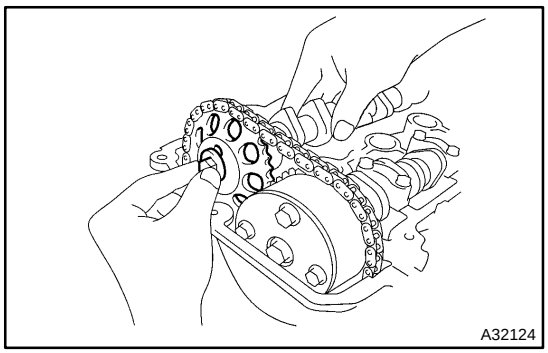
(m) As shown in the illustration, install the chain on the camshaft timing gear with the painted mark aligned with the timing mark on the camshaft timing gear.



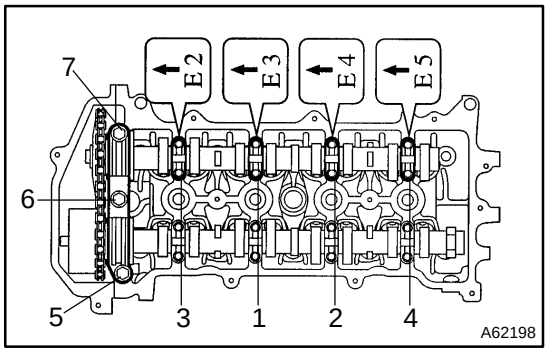
(n) Examine the front marks and numbers, then tighten the bolts in the order shown in the illustration.
Torque: 13 N·m (133 kgf·cm, 10 ft·lbf)



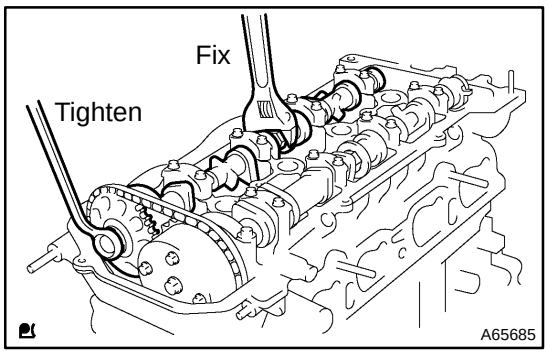
(o) Put the camshaft No. 2 on the cylinder head with the painted mark of the chain aligned with the timing mark on the camshaft timing gear.



(p) Raise the camshaft, then tighten the set bolt temporarily.



(q) Examine the front marks and numbers, then tighten the bolts in the order shown in the illustration.
Torque:
23 N·m (235 kgf·cm, 17 ft·lbf) for bearing cap No. 1
13 N·m (133 kgf·cm, 10 ft·lbf) for bearing cap No. 3

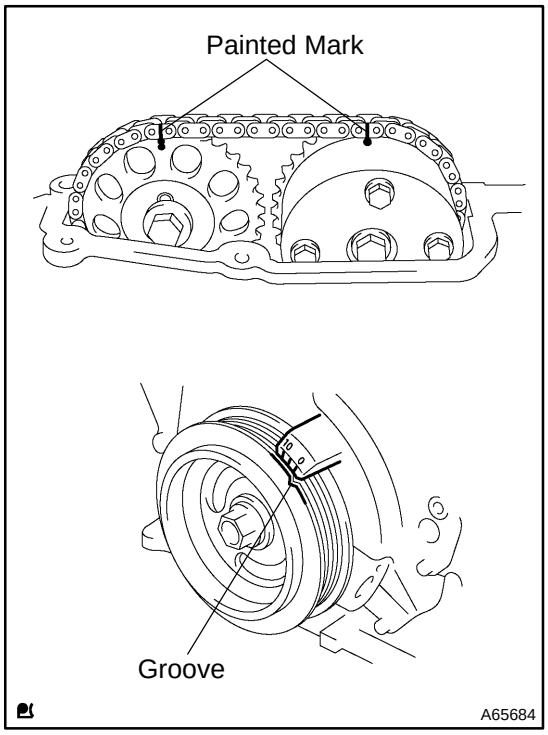


(r) Fix the camshaft with a spanner and so on, then tighten the camshaft timing gear set bolt.

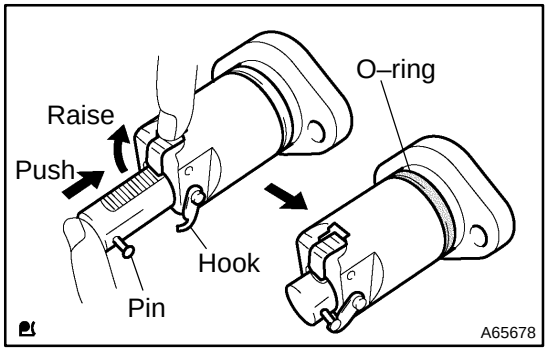
Torque: 54 N·m (551 kgf·cm, 40 ft·lbf)

NOTICE:

Be careful not to damage the valve lifter.



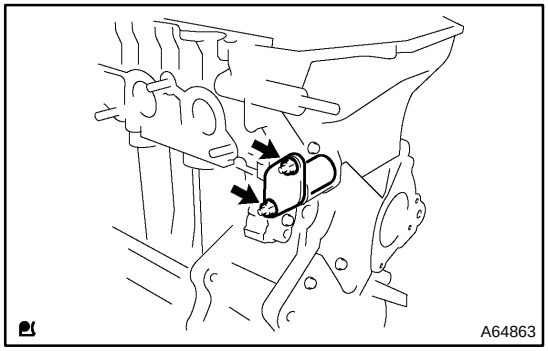
(s) Check the painted marks on the chain and camshaft timing gears. Then, check that the crankshaft pulley groove and the timing mark of the timing chain cover are aligned as shown in the illustration.



(t) Install the chain tensioner.

(1) Check the O–ring is clean, and set the hook as shown in the illustration.

(2) Apply a light coat of engine oil to the O–ring.

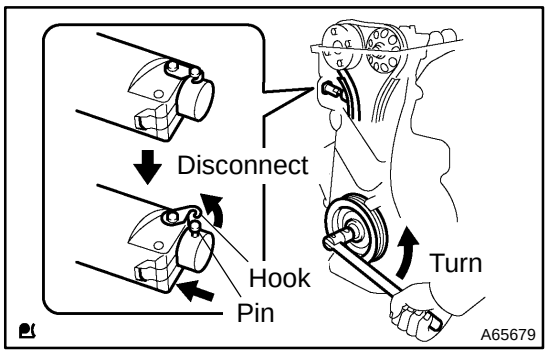


(3) Install the chain tensioner with the 2 nuts.

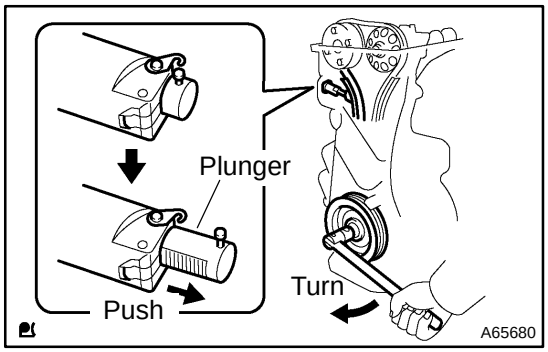
Torque: 9.0 N·m (92 kgf·cm, 80 in·lbf)

NOTICE:

- **Be careful not twist the O–ring.**
- **When installing the tensioner, set the hook again if the hook releases the plunger.**

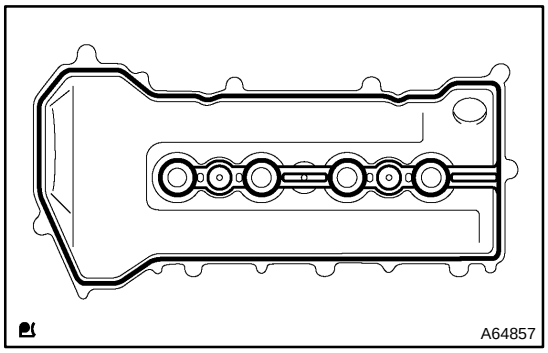


(4) Turn the crankshaft counterclockwise, then disconnect the plunger knock pin from the hook.



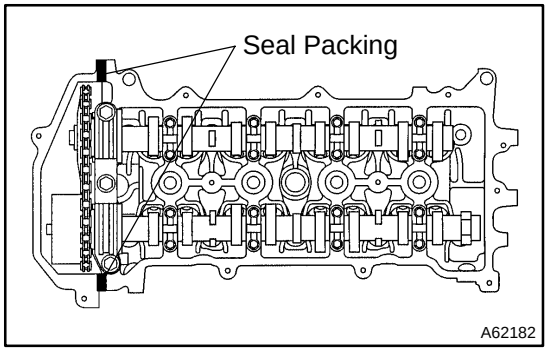
(5) Turn the crankshaft clockwise, then check that the slipper is pushed by the plunger.

HINT:
If the plunger does not spring out, press the slipper into the chain tensioner with a screwdriver so that the hook is released from the knock pin and that the plunger springs out.



72. INSTALL CYLINDER HEAD COVER GASKET

(a) Install the gasket to the cylinder head cover.



73. INSTALL CYLINDER HEAD COVER SUB–ASSY

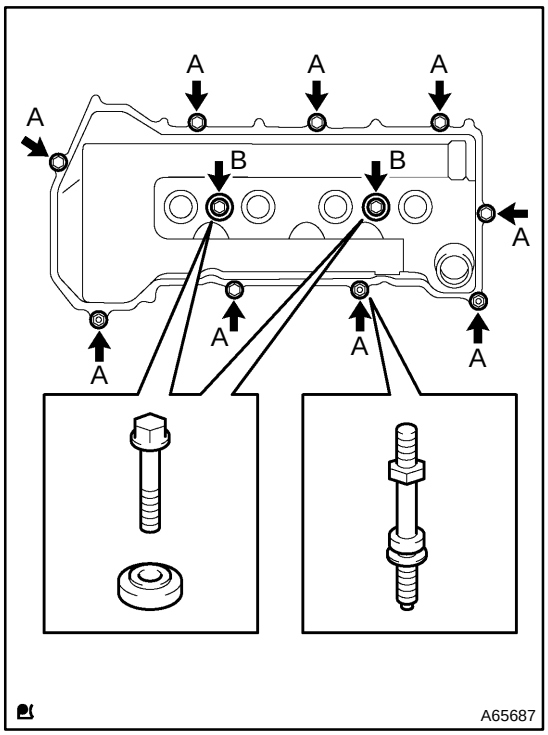
(a) Remove any old packing (FIPG) material.

(b) Apply the seal packing to the 2 locations as shown in the illustration.

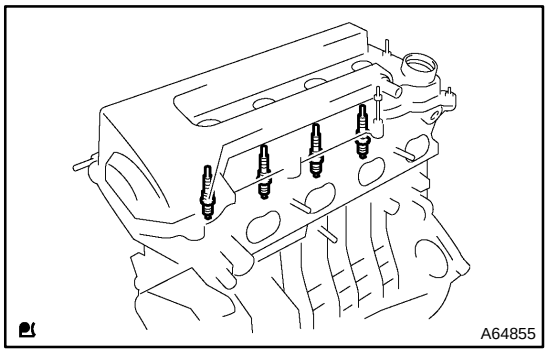
Seal packing: Part No. 08826–00080 or equivalent

NOTICE:

- **Remove any oil from the contact surface.**
- **Install the cylinder head cover within 3 minutes after applying the seal packing.**
- **Do not put into engine oil 2 hours of installation.**

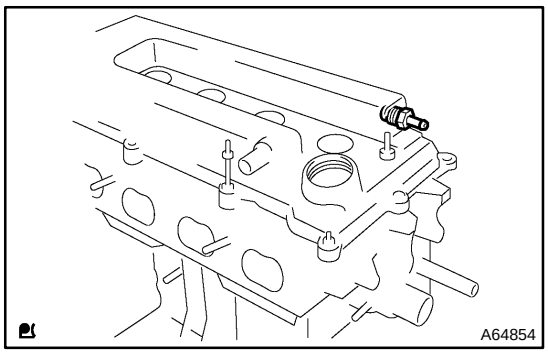


(c) Install the cylinder head cover with the 9 bolts, 2 seal washers and 2 nuts.
Torque:
11 N·m (112 kgf·cm, 8 ft·lbf) for bolt A and nut A
9.0 N·m (92 kgf·cm, 80 in·lbf) for bolt B



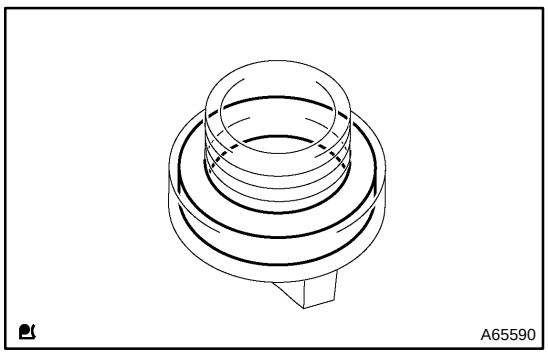
74. INSTALL SPARK PLUG

(a) Using a spark plug wrench, install the spark plugs.
Torque: 25 N·m (255 kgf·cm, 18 ft·lbf)



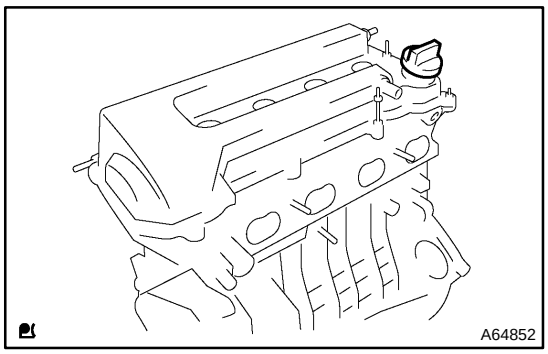
75. INSTALL VENTILATION VALVE SUB–ASSY

(a) Install the ventilation valve to the cylinder head cover.
Torque: 30 N·m (306 kgf·cm, 22 ft·lbf)



76. INSTALL OIL FILLER CAP GASKET

(a) Install the gasket to the oil filler cap.



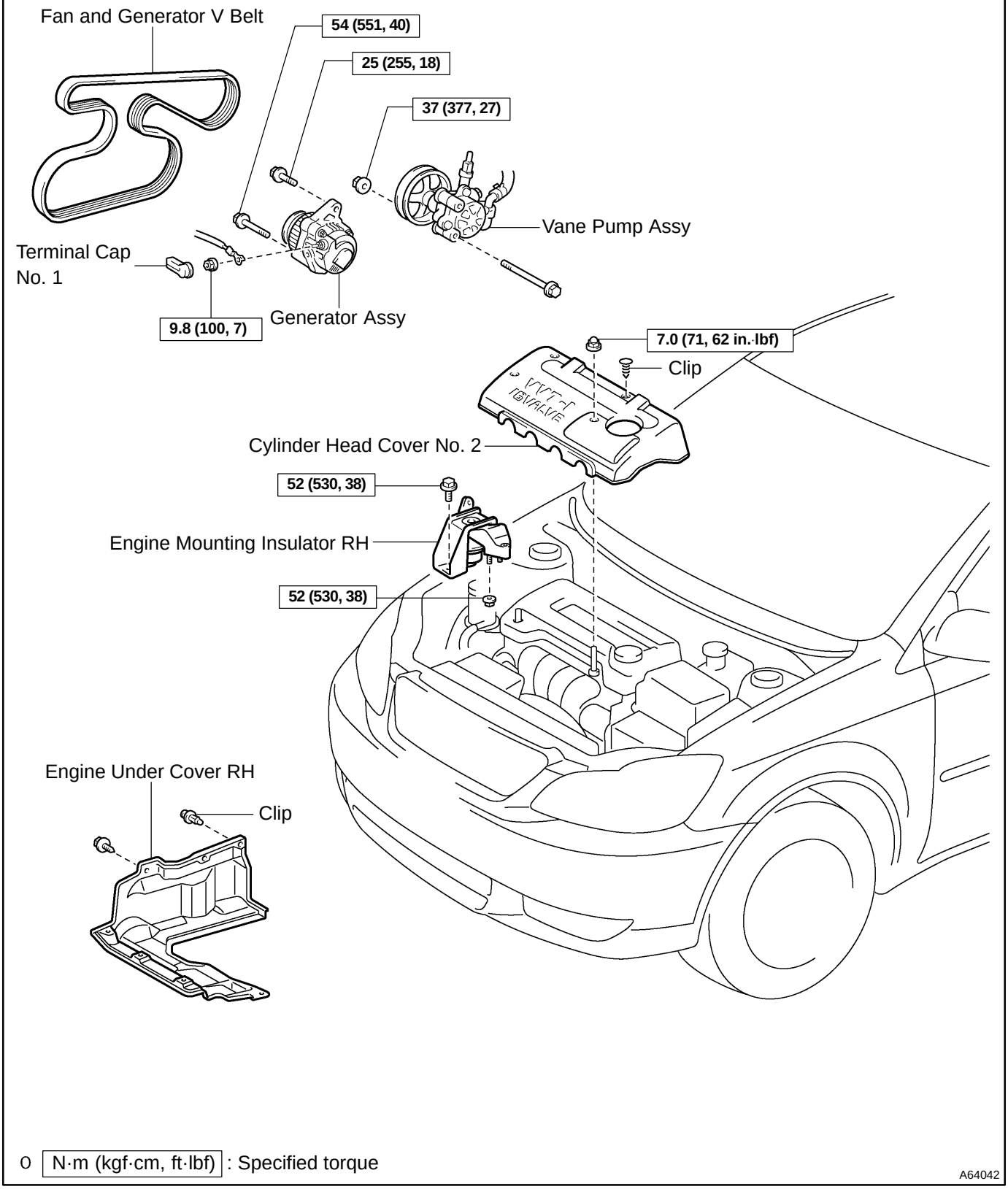
77. INSTALL OIL FILLER CAP SUB–ASSY

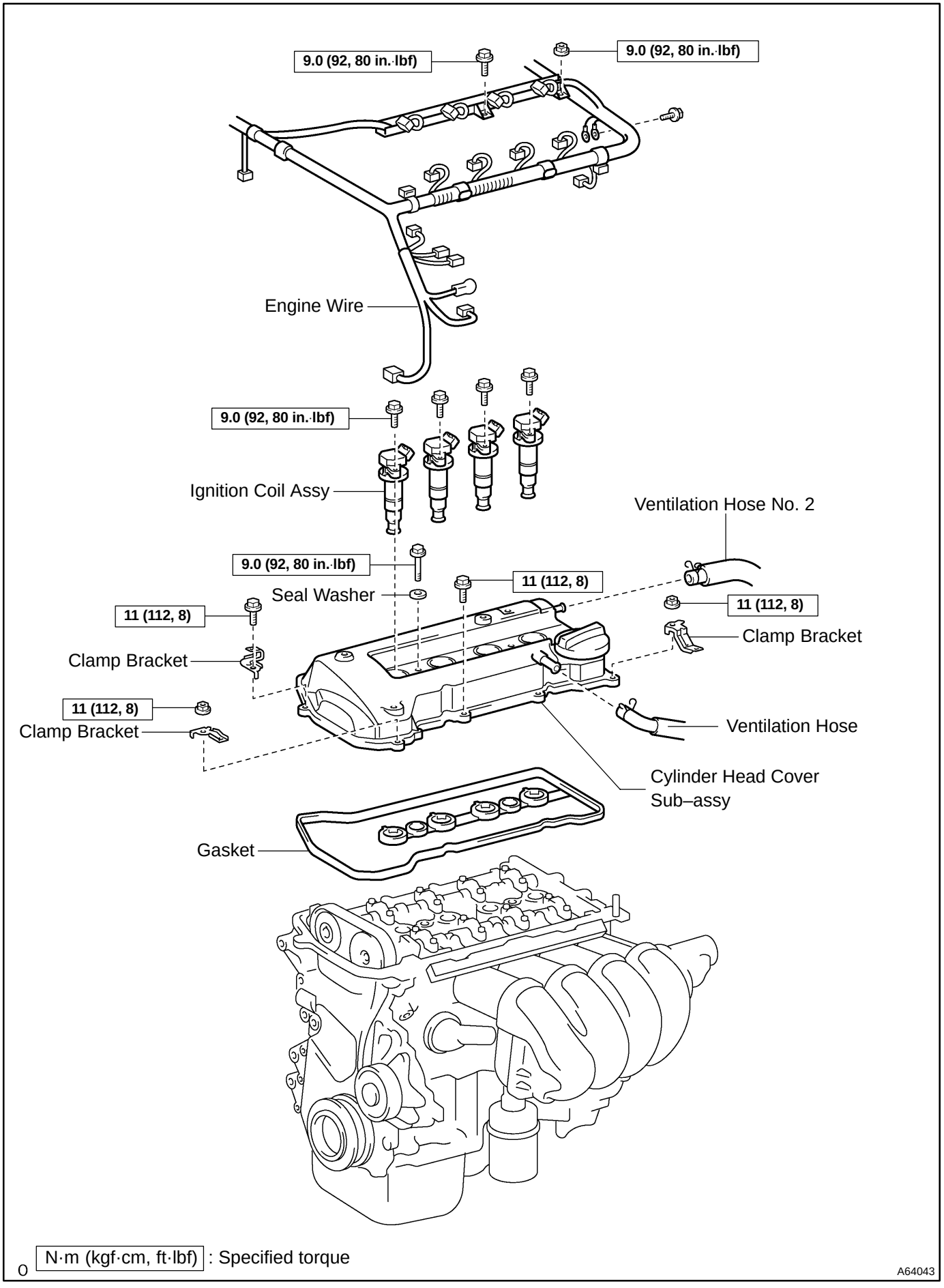
(a) Install the oil filler cap to the cylinder head cover.

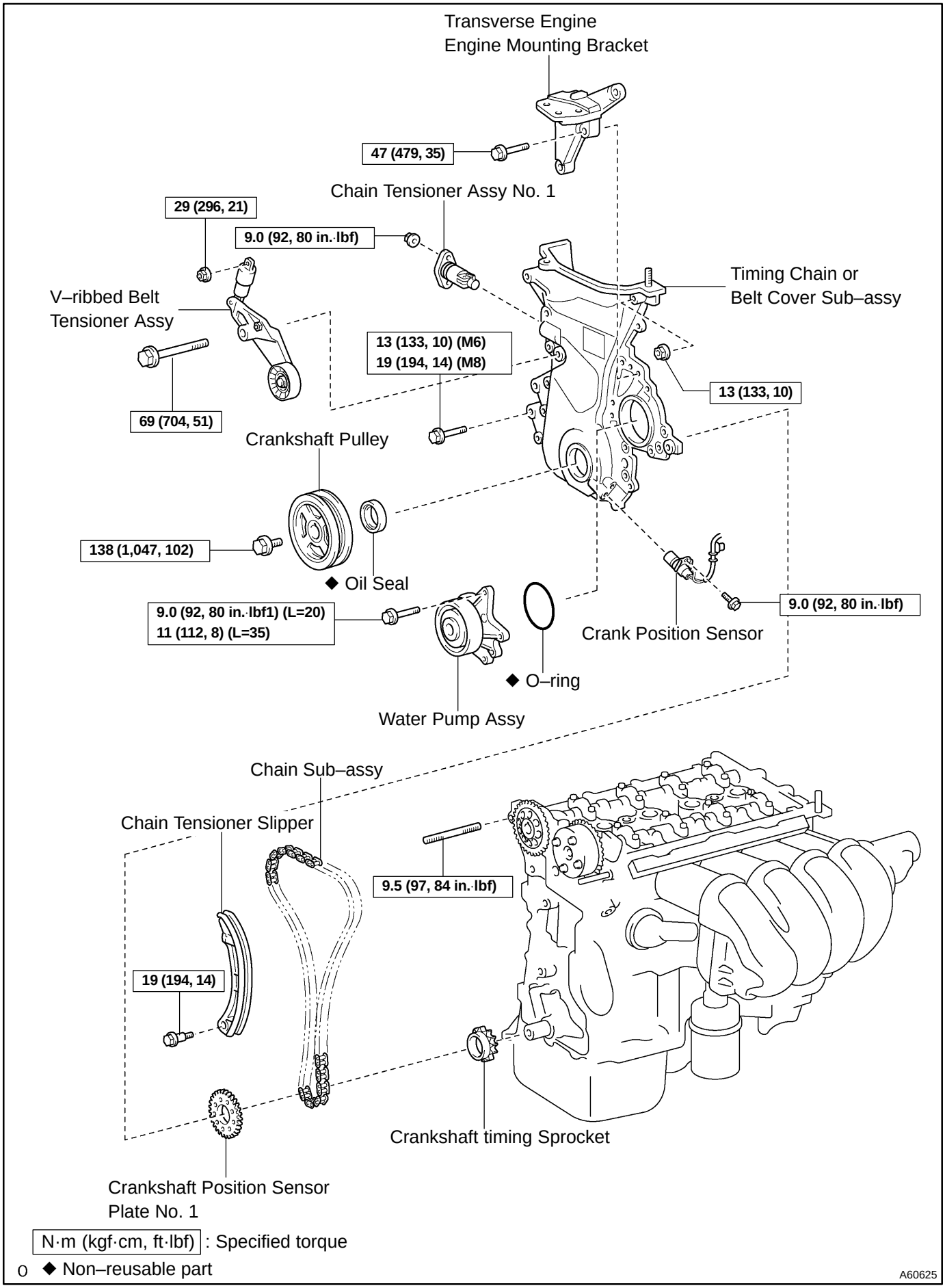
CHAIN SUB–ASSY

COMPONENTS

140OG–01



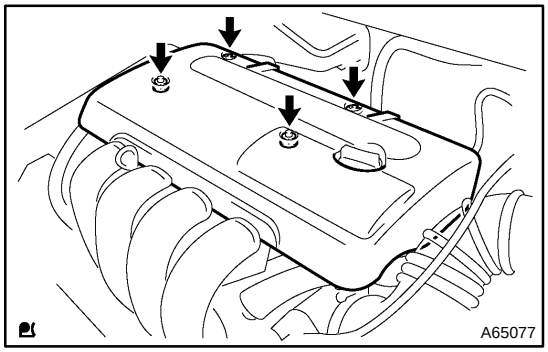

9.0 (92, 80 in.·lbf)
9.0 (92, 80 in.·lbf)
Engine Wire
9.0 (92, 80 in.·lbf)
Ignition Coil Assy
Ventilation Hose No. 2
9.0 (92, 80 in.·lbf)
11 (112, 8)
Seal Washer
11 (112, 8)
11 (112, 8)
Clamp Bracket
Clamp Bracket
11 (112, 8)
Clamp Bracket
Ventilation Hose
Cylinder Head Cover Sub–assy
Gasket
O N·m (kgf·cm, ft·lbf) : Specified torque
A64043


Transverse Engine
Engine Mounting Bracket
47 (479, 35)
Chain Tensioner Assy No. 1
29 (296, 21)
9.0 (92, 80 in.·lbf)
Timing Chain or
Belt Cover Sub–assy
V–ribbed Belt
Tensioner Assy
13 (133, 10) (M6)
19 (194, 14) (M8)
13 (133, 10)
69 (704, 51)
Crankshaft Pulley
138 (1,047, 102)
◆ Oil Seal
9.0 (92, 80 in.·lbf1) (L=20)
11 (112, 8) (L=35)
9.0 (92, 80 in.·lbf)
Crank Position Sensor
◆ O–ring
Water Pump Assy
Chain Sub–assy
Chain Tensioner Slipper
9.5 (97, 84 in.·lbf)
19 (194, 14)
Crankshaft timing Sprocket
Crankshaft Position Sensor
Plate No. 1
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non–reusable part
A60625

140OH–01

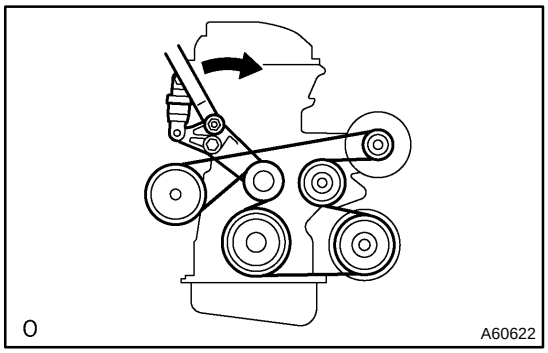
REPLACEMENT

1. REMOVE ENGINE UNDER COVER RH
2. DRAIN COOLANT (See page 16–7)
3. REMOVE FRONT WHEEL RH



4. REMOVE CYLINDER HEAD COVER NO.2

(a) Remove the 2 nuts, 2 clips and cylinder head cover.



5. REMOVE FAN AND GENERATOR V BELT

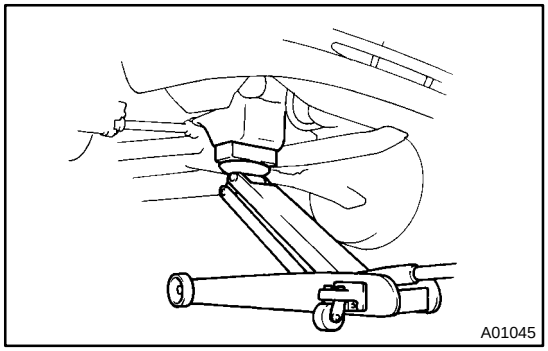
(a) Turn the V–ribbed belt tensioner slowly clockwise and loosen it. Then, remove the fan and generator V belt and put back the V–ribbed belt tensioner little by little and fix it quietly.

6. SEPARATE VANE PUMP ASSY (See page 51–8)

NOTICE:

Do not disconnect the hose.

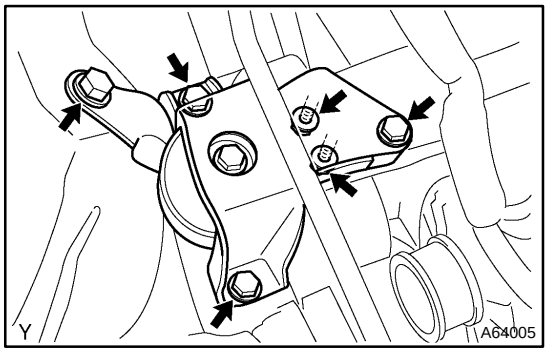
7. REMOVE GENERATOR ASSY (See page 19–16)

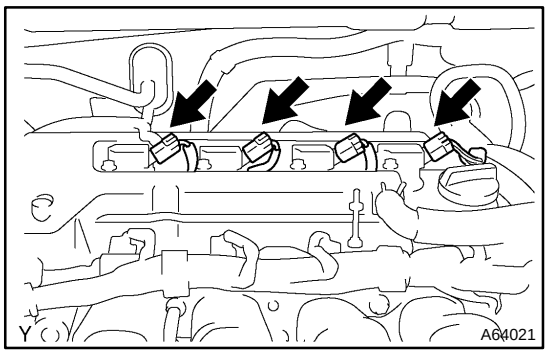


8. REMOVE ENGINE MOUNTING INSULATOR SUB–ASSY RH

(a) Remove the PS oil pump reservoir and put it aside.

(b) Place a wooden block between the jack and engine, and set the jack, then remove the 4 bolts, the 2 nuts and engine mounting insulator RH.

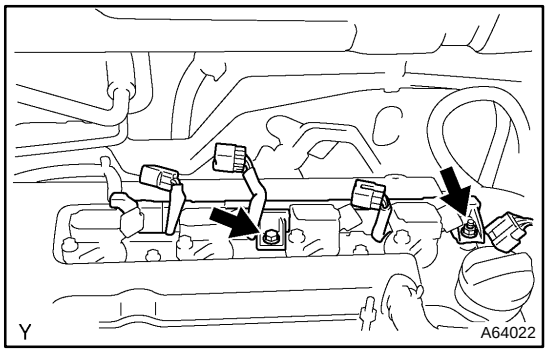




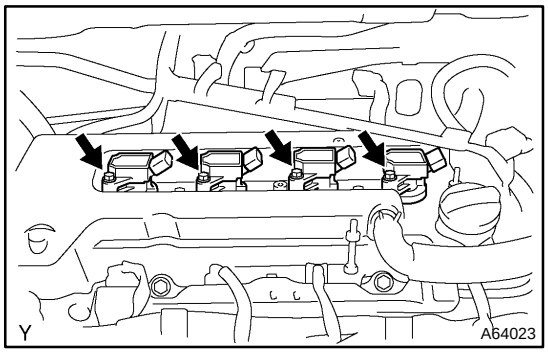
9. DISCONNECT ENGINE WIRE

(a) Remove the 5 clamps from the 5 clamp brackets.

(b) Disconnect the 4 ignition coil connectors.

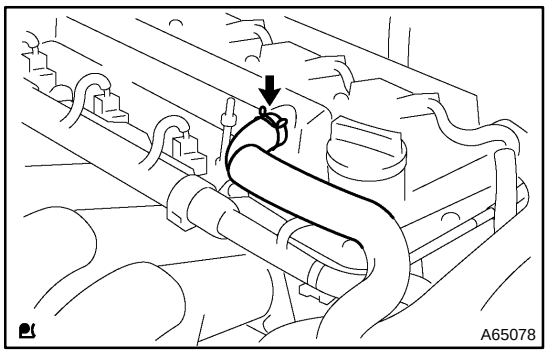


(c) Remove the bolt and nut installing the engine wire.



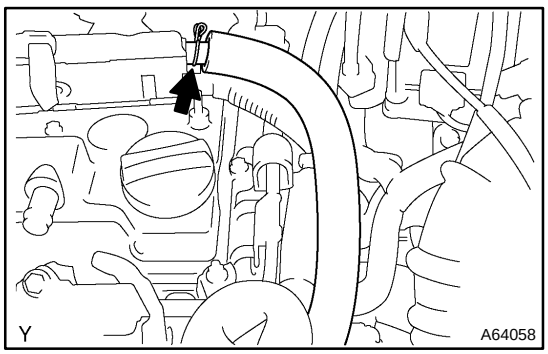
10. REMOVE IGNITION COIL ASSY

(a) Remove the 4 bolts and 4 ignition coils.



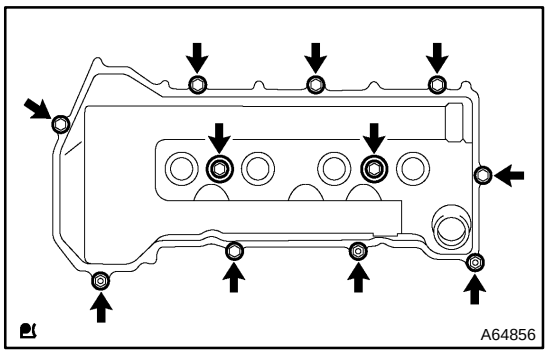
11. DISCONNECT VENTILATION HOSE

(a) Disconnect the ventilation hose from the cylinder head cover.



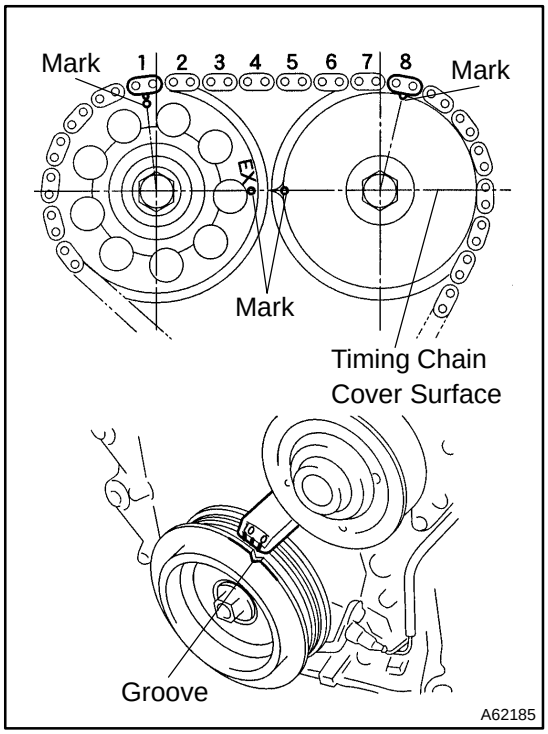
12. DISCONNECT VENTILATION HOSE NO.2

(a) Disconnect the ventilation hose from the cylinder head cover.



13. REMOVE CYLINDER HEAD COVER SUB–ASSY

(a) Remove the 9 bolts, 2 seal washers, 2 nuts, 3 clamp brackets and cylinder head cover.



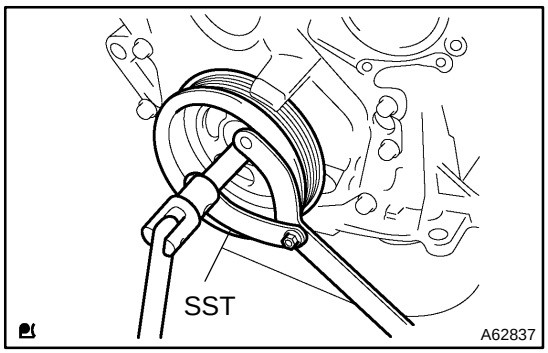
14. SET NO. 1 CYLINDER TO TDC/COMPRESSION

(a) Turn the crankshaft pulley, and align its groove with timing mark ”0” of the timing chain cover.

(b) Check that the point marks of the camshaft timing sprocket and VVT timing sprocket are in straight line on the timing chain cover surface as shown in the illustration.

HINT:

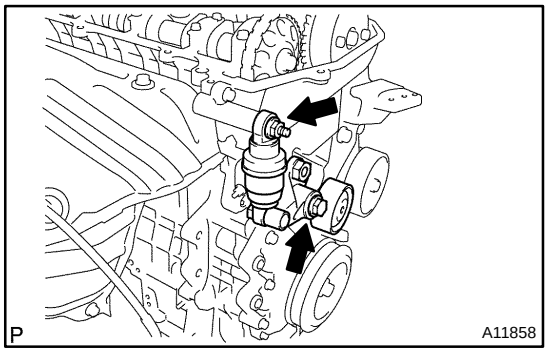
If not, turn the crankshaft 1 revolution (360°) and align the marks as above.



15. REMOVE CRANKSHAFT PULLEY

(a) Using SST, remove the pulley bolt.
SST 09960–10010 (09962–01000, 09963–01000)

(b) Remove the crankshaft pulley from the crankshaft.



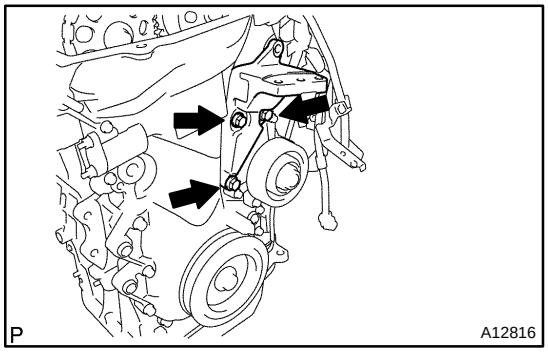
16. REMOVE V–RIBBED BELT TENSIONER ASSY

(a) Remove the bolt, nut and V–ribbed belt tensioner.

HINT:

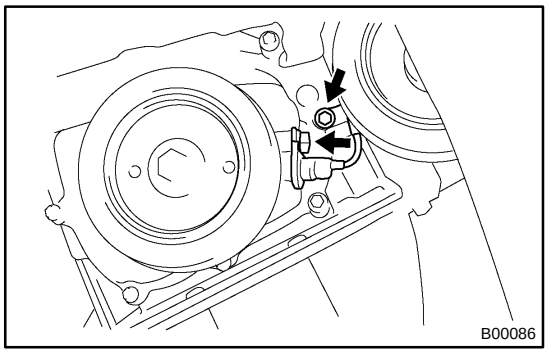
Handle a jack up and down to remove the bolt.

17. REMOVE WATER PUMP ASSY (See page 16–8)



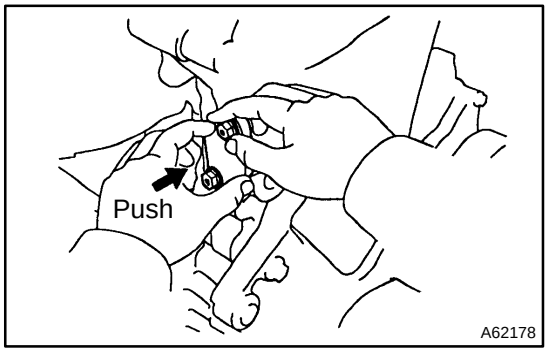
18. REMOVE TRANSVERSE ENGINE ENGINE MOUNTING BRACKET

(a) Remove the 3 bolts and transverse engine engine mounting bracket.



19. REMOVE CRANK POSITION SENSOR

(a) Remove the 2 bolts installing the crank position sensor.

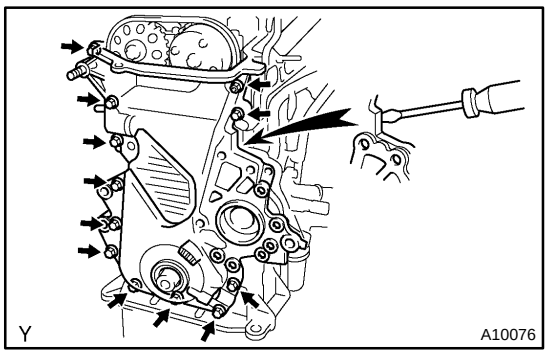


20. REMOVE CHAIN TENSIONER ASSY NO.1

(a) Remove the 2 nuts and chain tensioner.

NOTICE:

Be sure not to revolve the crankshaft without the chain tensioner.



21. REMOVE TIMING CHAIN OR BELT COVER SUB–ASSY

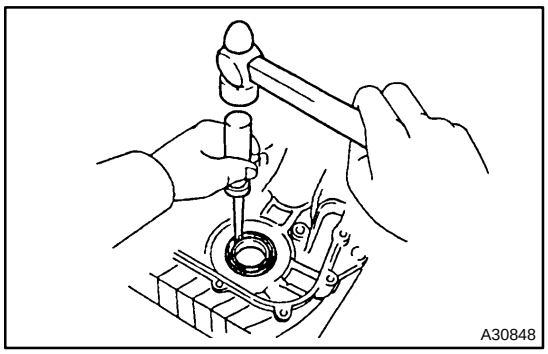
(a) Remove the 11 bolts and nuts.

(b) Using a torx wrench socket (E8), remove the stud bolt.

(c) Remove the timing chain cover by prying the portions between the cylinder head and cylinder block with a screwdriver.

NOTICE:

Be careful no tot damage the contact surfaces of the timing chain cover, cylinder head and cylinder block.



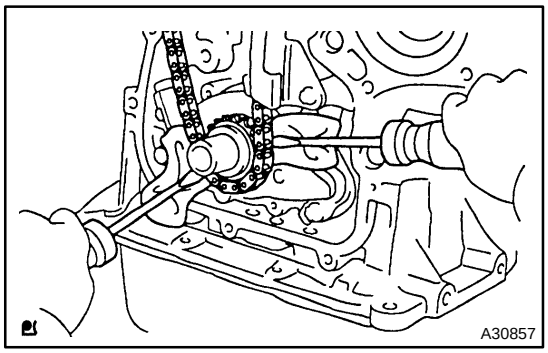
22. REMOVE TIMING GEAR COVER OIL SEAL

(a) Using a screwdriver, remove the oil seal.

23. REMOVE CRANKSHAFT POSITION SENSOR PLATE NO.1

24. REMOVE CHAIN TENSIONER SLIPPER

(a) Remove the bolt and chain tensioner slipper.

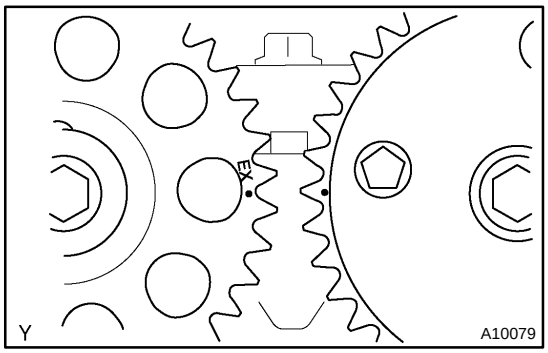


25. REMOVE CHAIN SUB–ASSY

(a) Remove the timing chain with the crankshaft timing gear plying screwdrivers as shown in the illustration.

NOTICE:

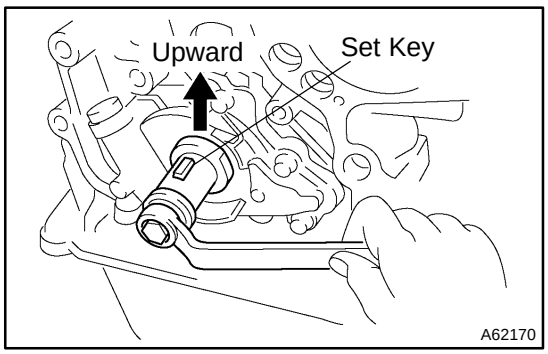
- **Put shop rag to protect the engine.**
- **In case of revolving the camshafts with the chain off the sprockets, turn the crankshaft 1/4 revolution for valves not to touch the pistons.**



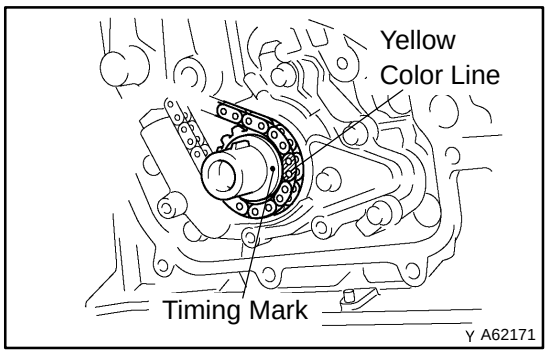
26. INSTALL CHAIN SUB–ASSY

(a) Set No. 1 cylinder to TDC/compression.

(1) Turn the hexagonal wrench head portion of the camshafts, and align the point marks of the camshaft timing sprockets.



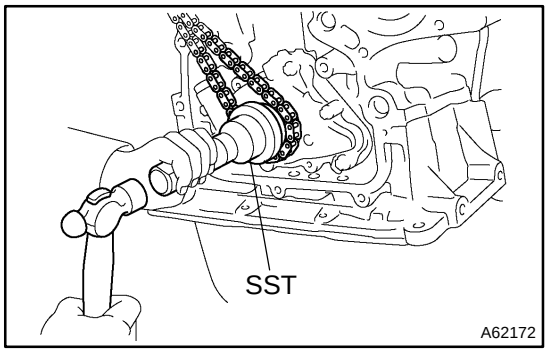
(2) Using a crankshaft pulley bolt, turn the crankshaft and set the set key on the crankshaft upward.



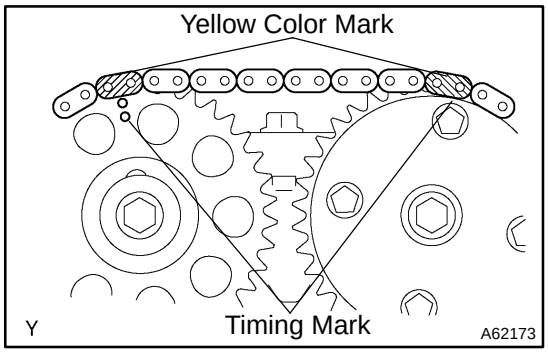
(b) Install the timing chain on the crankshaft timing sprocket with the yellow color link aligned with the timing mark on the crankshaft timing sprocket.

HINT:

Three yellow color links are on the chain.



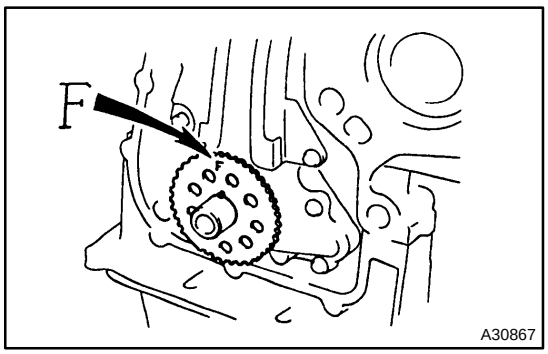
(c) Using SST, install the crankshaft timing sprocket.
SST 09223–22010



(d) Install the timing chain on the camshaft timing sprockets with the yellow color links aligned with the timing marks on the camshaft timing sprockets.

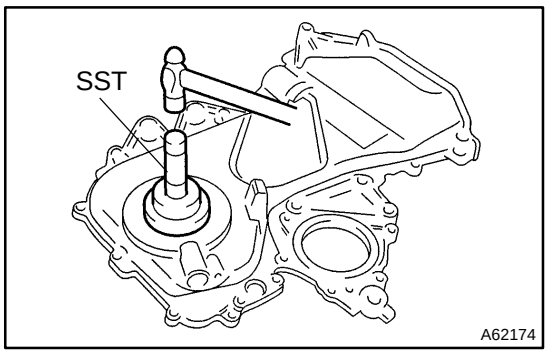
27. INSTALL CHAIN TENSIONER SLIPPER

(a) Install the chain tensioner slipper with the bolt.
Torque: 19 N·m (194 kgf·cm, 14 ft·lbf)



28. INSTALL CRANKSHAFT POSITION SENSOR PLATE NO.1

(a) Install the plate with the ”F” mark facing forward.



29. INSTALL TIMING GEAR COVER OIL SEAL

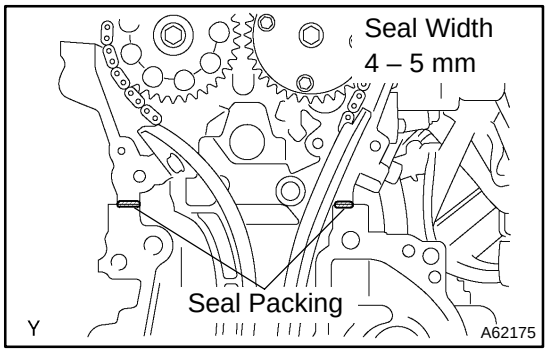
(a) Apply MP grease to a new oil seal lip.

(b) Using SST, tap in the oil seal until its surface is flush with the timing chain cover edge.

SST 09223–22010

NOTICE:

Keep the lip off foreign materials.



30. INSTALL TIMING CHAIN OR BELT COVER SUB–ASSY

(a) Remove any old packing material from the contact surface.

(b) Apply seal packing in the shape of bead (Diameter 3.5 mm – 4.5 mm (0.1379 – 0.177 in.)) consequently as shown in the illustration.

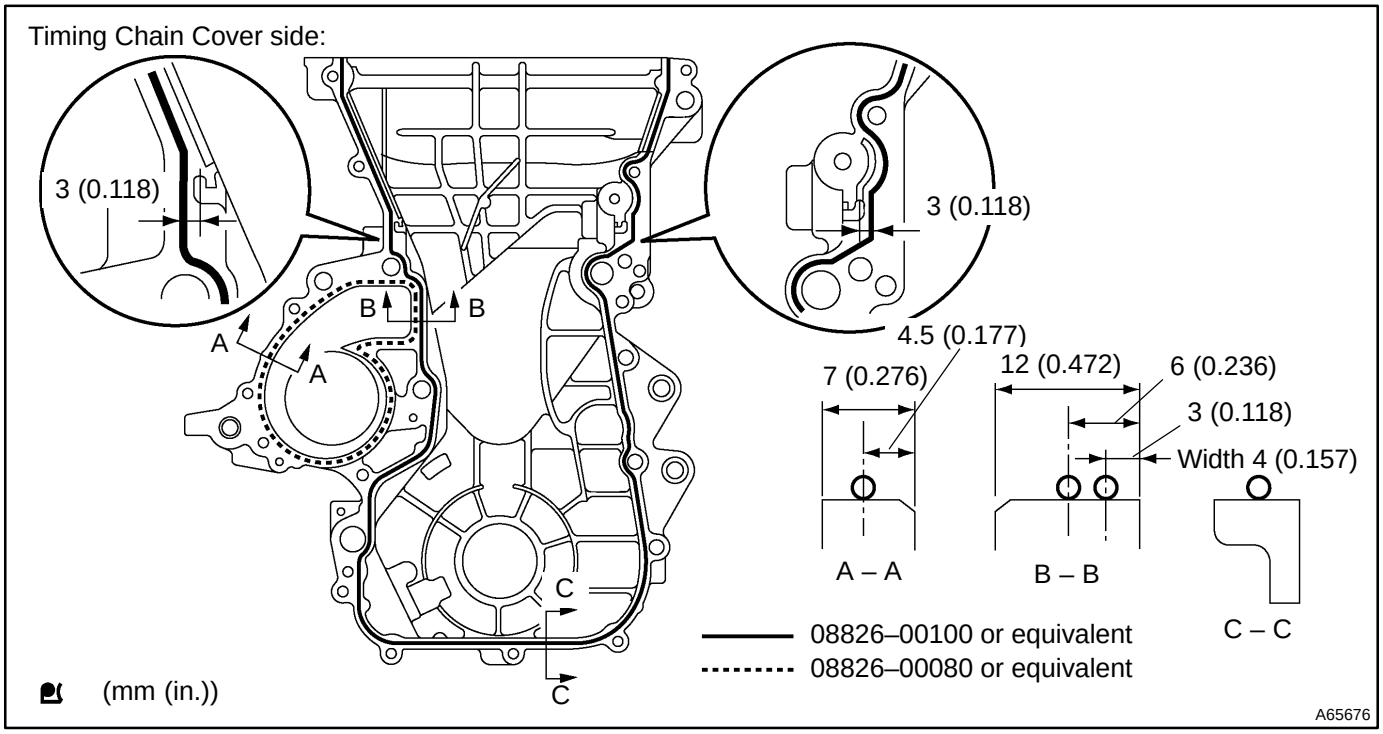
Seal packing:

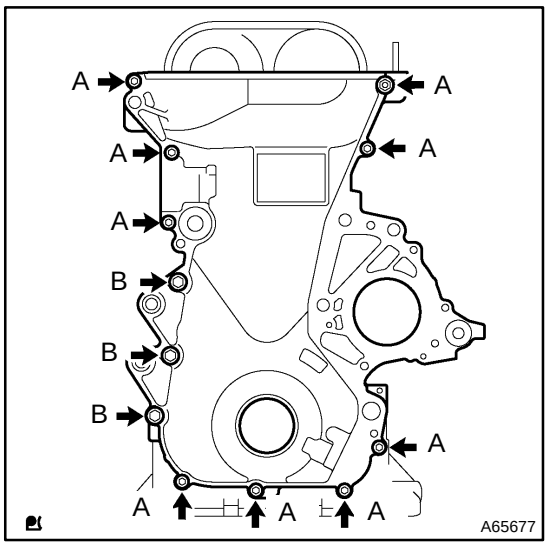
Water pump part part No. 08826–00100 or equivalent

Other part part No. 08826–00080 or equivalent.

NOTICE:

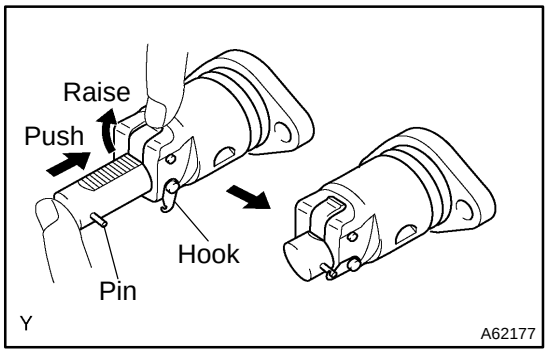
- **Remove any oil from the contact surface.**
- **Install the oil pan within 3 minutes after applying seal packing.**
- **Do not put into engine oil within 2 hours after installing.**





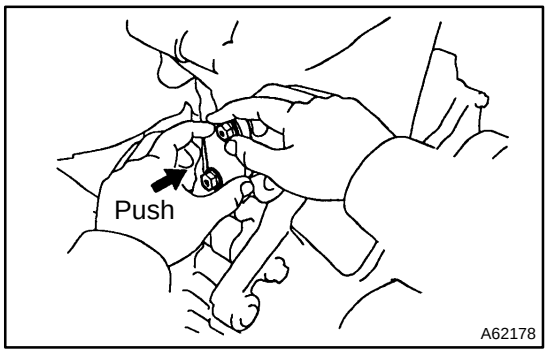
(c) Install the timing chain cover with the 11 bolts and nut.
Torque:
A: 13 N·m (133 kgf·cm, 10 ft·lbf)
B: 19 N·m (194 kgf·cm, 14 ft·lbf)

(d) Using a torx wrench socket (E8), install the stud bolt.
Torque: 9.5 N·m (97 kgf·cm, 84 in.·lbf)



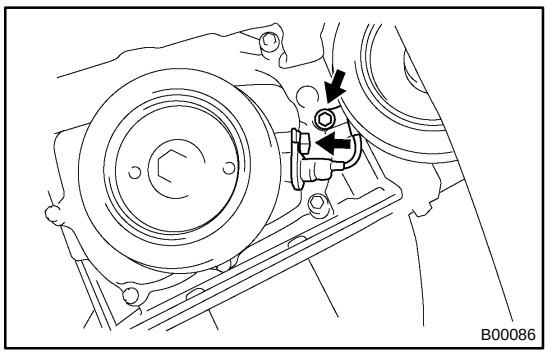
31. INSTALL CHAIN TENSIONER ASSY NO.1

(a) Check the O–ring is clean, and set the hook as shown in the illustration.



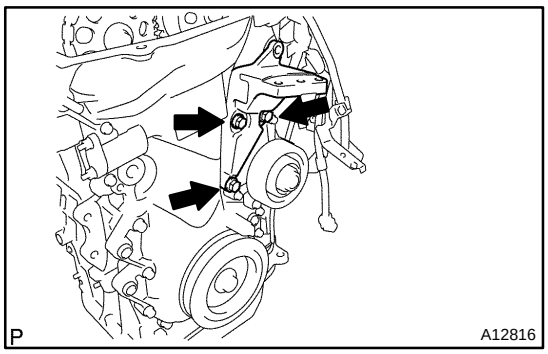
(b) Apply engine oil to the chain tensioner and install it withe 2 nuts.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

NOTICE:
When installing the tensioner, set the hook again if the hook release the plunger.



32. INSTALL CRANK POSITION SENSOR

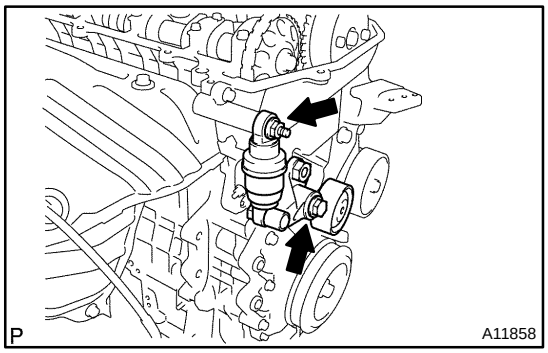
(a) Install the crank position sensor with the 2 bolts.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)



33. INSTALL TRANSVERSE ENGINE ENGINE MOUNTING BRACKET

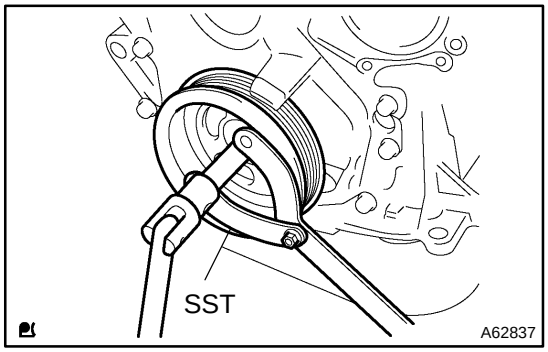
(a) Install the transverse engine engine mounting bracket with the 3 bolts.
Torque: 47 N·m (479 kgf·cm, 35 ft·lbf)

34. INSTALL WATER PUMP ASSY (See page 16–8)



35. INSTALL V–RIBBED BELT TENSIONER ASSY

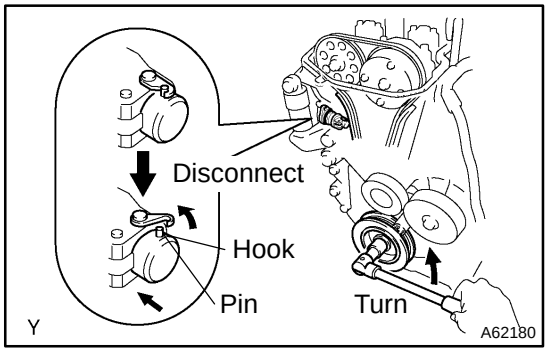
(a) Install the V–ribbed belt tensioner with the nut and bolt.
Torque:
Nut 29 N·m (296 kgf·cm, 21 ft·lbf)
Bolt 69 N·m (704 kgf·cm, 51 ft·lbf)



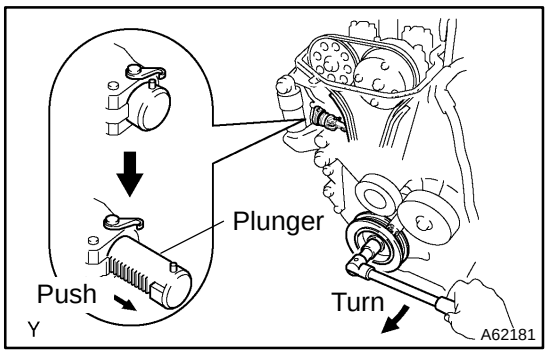
36. INSTALL CRANKSHAFT PULLEY

(a) Align the pulley set key with the key groove of the pulley, and slide on the pulley.

(b) Using SST, install the crankshaft pulley bolt.
SST 09960–10010 (09962–01000, 09963–01000)
Torque: 138 N·m (1,407 kgf·cm, 102 ft·lbf)



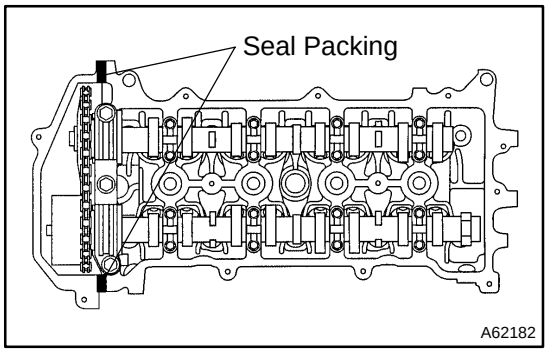
(c) Turn the crankshaft counter clockwise, and disconnect the plunger knock pin form the hook.



(d) Turn the crankshaft clockwise, and check that the slipper is pushed by the plunger.

HINT:

If the plunger does not spring out, press the slipper into the chain tensioner with a screwdriver so that the hook is released from the knock pin and the plunger springs out.



37. INSTALL CYLINDER HEAD COVER SUB–ASSY

(a) Remove any old pacing (FIPG) material.

(b) Apply seal packing to 2 locations as shown in the illustration.

Seal packing: Part No. 08826–00080 or equivalent

NOTICE:

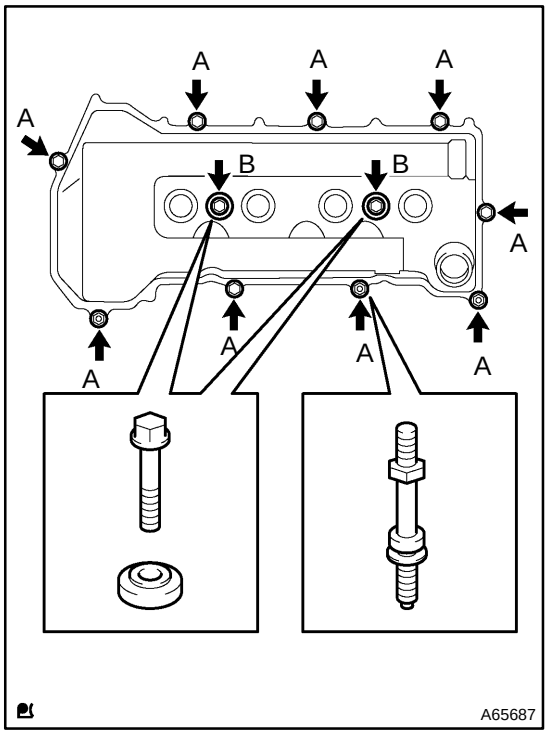
- **Remove any oil from the contact surface.**
- **Install the cylinder head cover within 3 minutes after applying seal packing.**
- **Do not put into engine oil 2 hours after installing.**

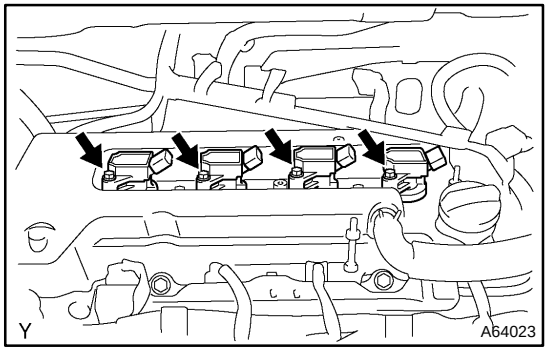
(c) Install the cylinder head cover and 3 cable brackets with the 9 bolts, 2 seal washers and 2 nuts. Uniformly tighten the bolts and nuts, in the several passes.

Torque:

A 11 N·m (112 kgf·cm, 8 ft·lbf)

B 9.0 N·m (92 kgf·cm, 80 in.·lbf)

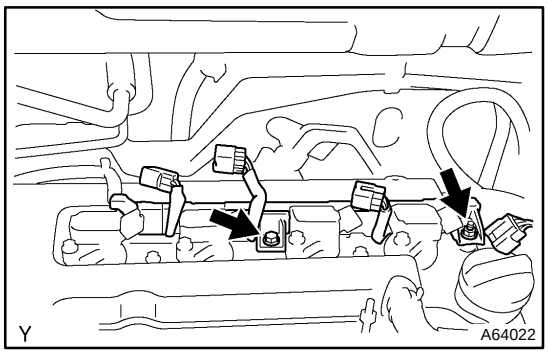




38. INSTALL IGNITION COIL ASSY

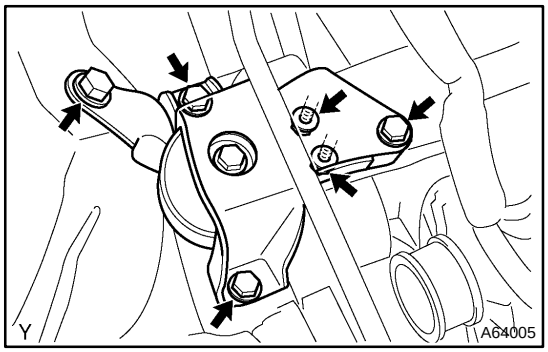
(a) Install the 4 ignition coils with the 4 bolts.

Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)



39. INSTALL ENGINE WIRE

(a) Install the engine wire with the bolt and nut.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

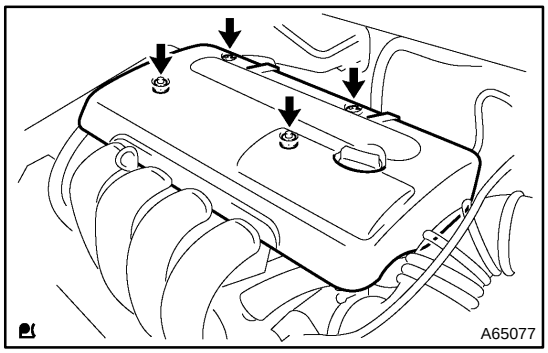


40. INSTALL ENGINE MOUNTING INSULATOR SUB–ASSY RH

(a) Install the engine mounting insulator with the 4 bolts and 2 nuts.
Torque: 52 N·m (530 kgf·cm, 38 ft·lbf)

41. INSTALL GENERATOR ASSY (See page 51–8)

42. INSTALL VANE PUMP ASSY (See page 51–8)



43. INSTALL CYLINDER HEAD COVER NO.2

(a) Install the cylinder head cover with the 2 nuts and 2 clips.
Torque: 7.0 N·m (71 kgf·cm, 62 in.·lbf)

44. INSTALL FRONT WHEEL RH
Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

45. ADD COOLANT (See page 16–7)

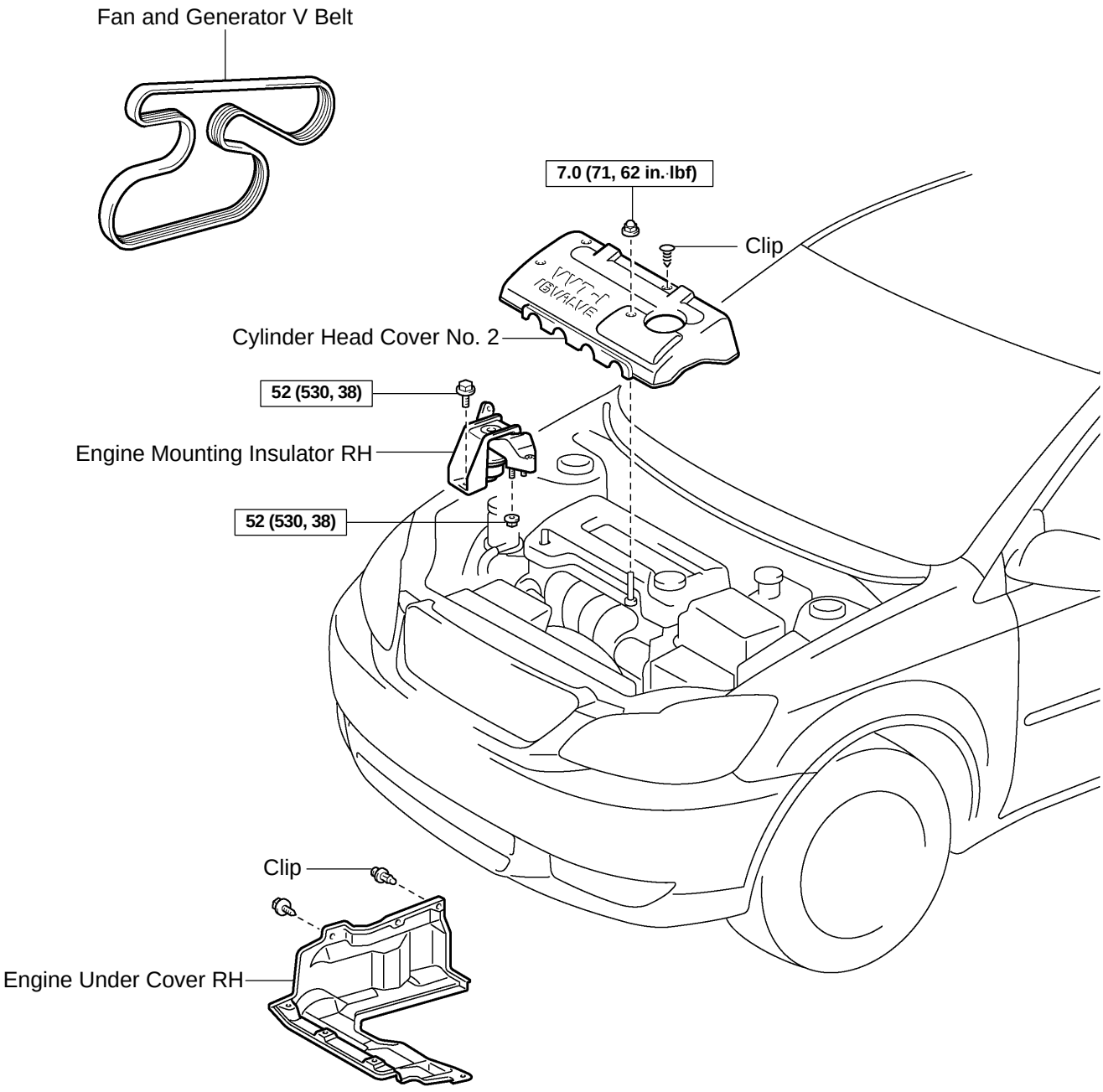
46. CHECK ENGINE COOLANT LEAK (See page 16–7)

47. CHECK ENGINE OIL LEAK

CAMSHAFT

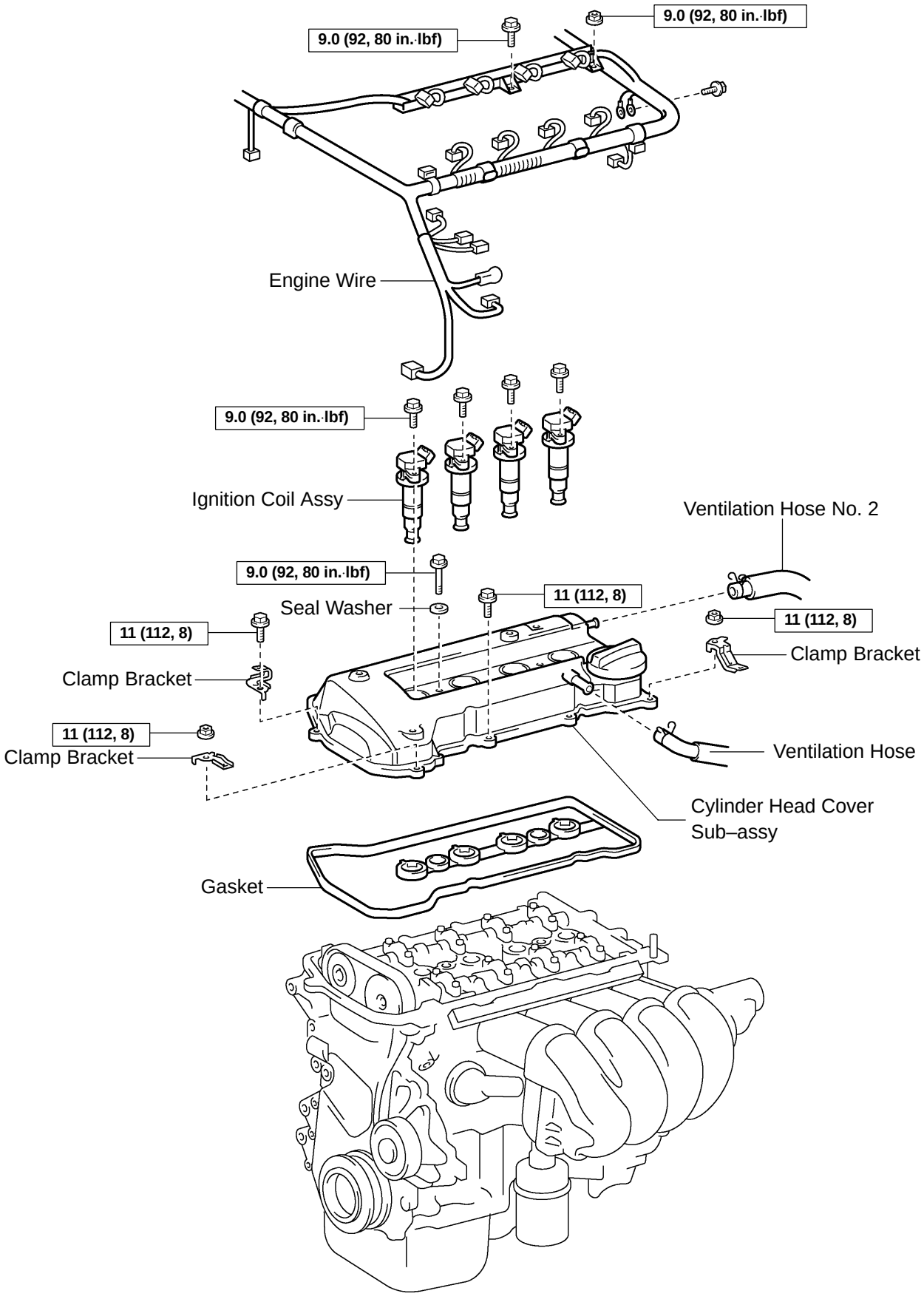
COMPONENTS

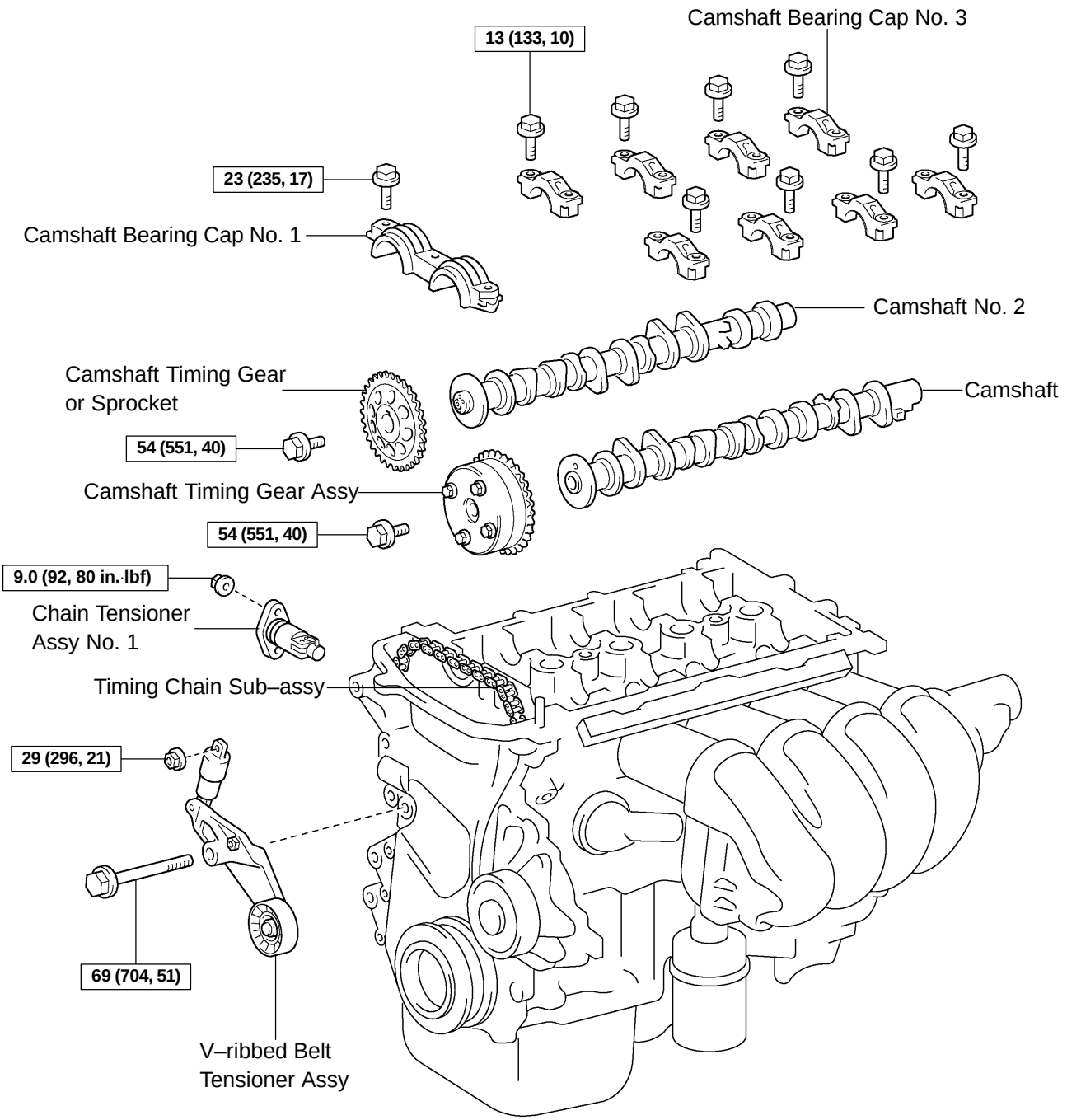
140OI–01



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

A64044


9.0 (92, 80 in.·lbf)
9.0 (92, 80 in.·lbf)
Engine Wire
9.0 (92, 80 in.·lbf)
Ignition Coil Assy
Ventilation Hose No. 2
9.0 (92, 80 in.·lbf)
Seal Washer
11 (112, 8)
11 (112, 8)
11 (112, 8)
Clamp Bracket
Clamp Bracket
11 (112, 8)
Clamp Bracket
Ventilation Hose
Cylinder Head Cover Sub–assy
Gasket
O
N·m (kgf·cm, ft·lbf) : Specified torque
A64043



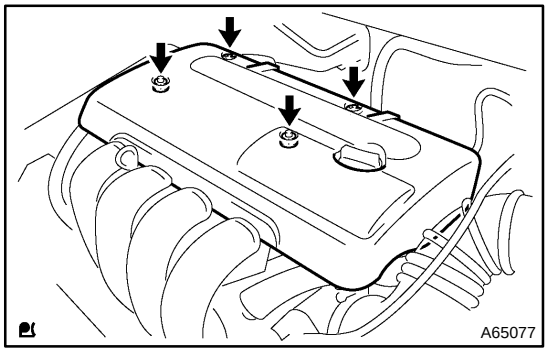
N·m (kgf·cm, ft·lbf) : Specified torque

A64006

140OJ–01

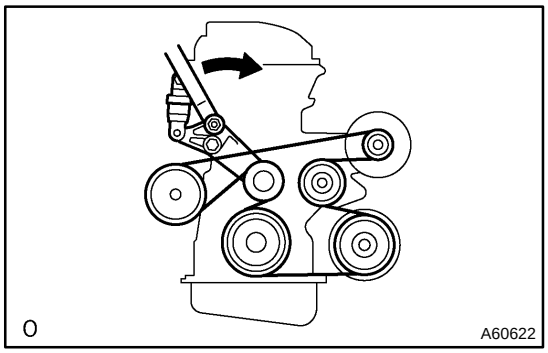
REPLACEMENT

1. REMOVE ENGINE UNDER COVER RH



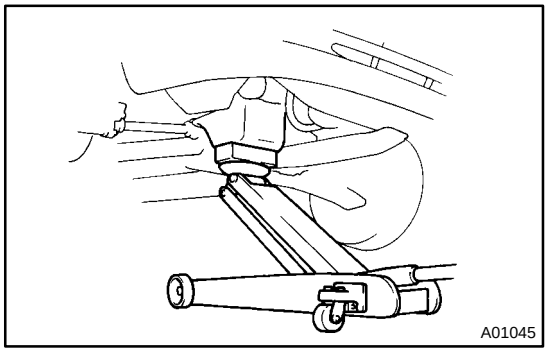
2. REMOVE CYLINDER HEAD COVER NO.2

(a) Remove the 2 screw, 3 clips and engine under cover.



3. REMOVE FAN AND GENERATOR V BELT

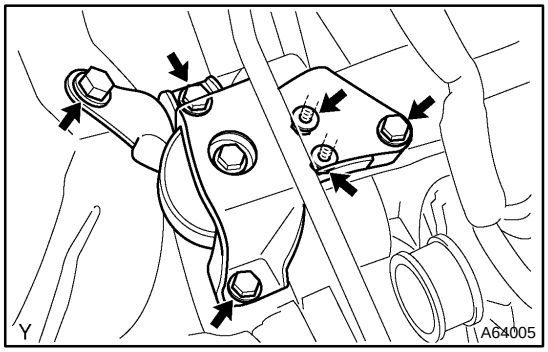
(a) Turn the V–ribbed belt tensioner slowly clockwise and loosen it. Then, remove the fan and generator V belt and put back the V–ribbed belt tensioner little by little and fix it quietly.

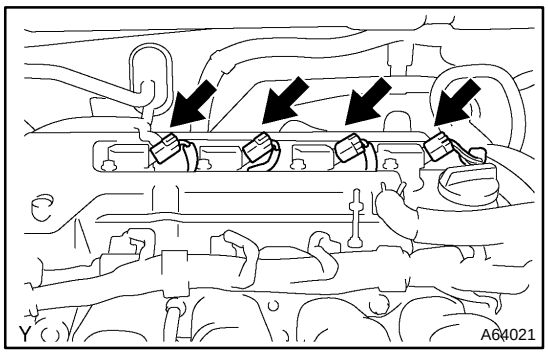


4. REMOVE ENGINE MOUNTING INSULATOR SUB–ASSY RH

(a) Remove the PS oil pump reservoir and put it aside.

(b) Place a wooden block between the jack and engine, and set the jack, then remove the 4 bolts, the 2 nuts and engine mounting insulator RH.

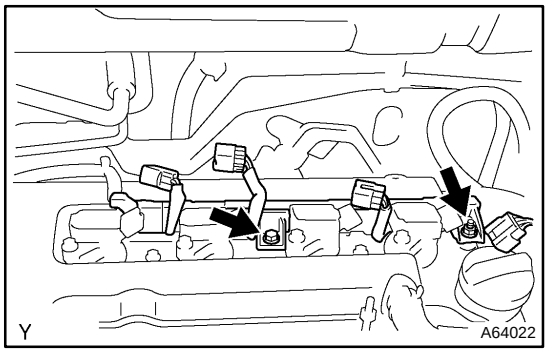




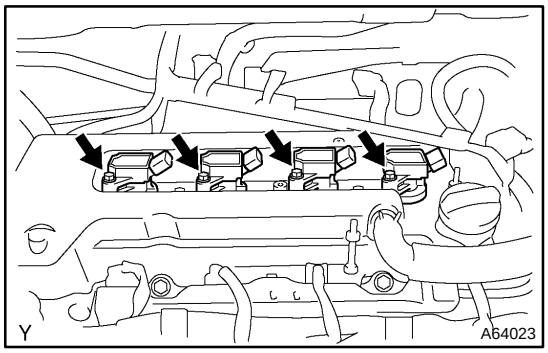
5. DISCONNECT ENGINE WIRE

(a) Remove the 5 clamps from the 5 clamp brackets.

(b) Disconnect the 4 ignition coil connectors.

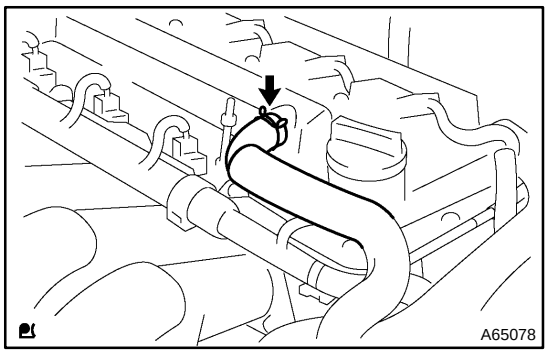


(c) Remove the bolt and nut installing the engine wire.



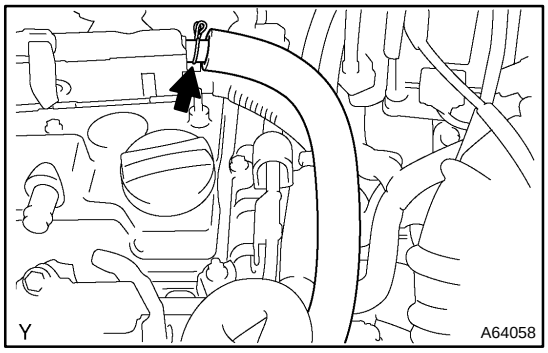
6. REMOVE IGNITION COIL ASSY

(a) Remove the 4 bolts and 4 ignition coils.



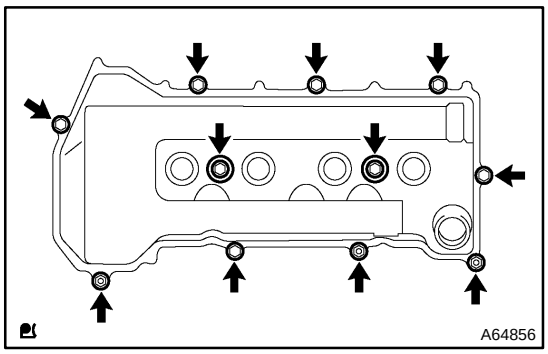
7. DISCONNECT VENTILATION HOSE

(a) Disconnect the ventilation hose from the cylinder head cover.



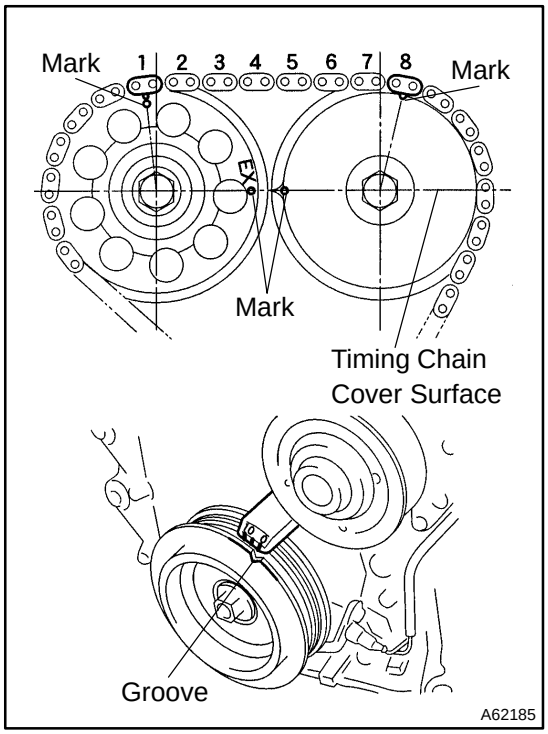
8. DISCONNECT VENTILATION HOSE NO.2

(a) Disconnect the ventilation hose from the cylinder head cover.



9. REMOVE CYLINDER HEAD COVER SUB–ASSY

(a) Remove the 9 bolts, 2 seal washers, 2 nuts, 3 clamp brackets and cylinder head cover.



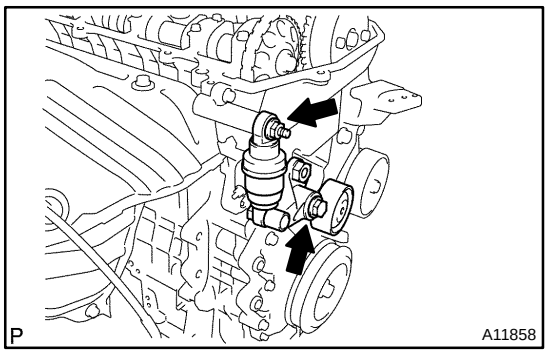
10. SET NO. 1 CYLINDER TO TDC/COMPRESSION

(a) Turn the crankshaft pulley, and align its groove with timing mark ”0” of the timing chain cover.

(b) Check that the point marks of the camshaft timing sprocket and VVT timing sprocket are in straight line on the timing chain cover surface as shown in the illustration.

HINT:

If not, turn the crankshaft 1 revolution (360°) and align the marks as above.

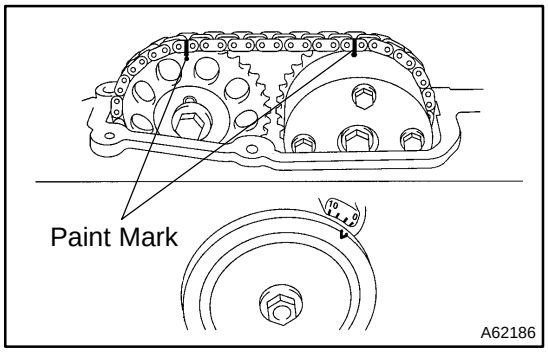


11. REMOVE V–RIBBED BELT TENSIONER ASSY

(a) Remove the bolt, nut and V–ribbed belt tensioner.

HINT:

Handle a jack up and down to remove the bolt.



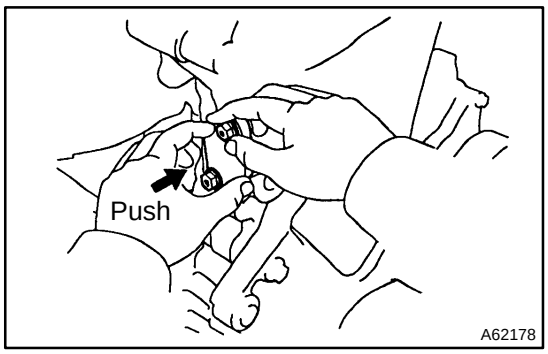
12. REMOVE CAMSHAFT

NOTICE:

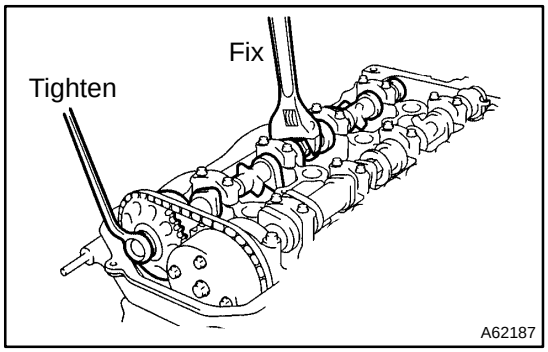
Be sure not to revolve the crankshaft without the chain tensioner.

(a) Set the No. 1 cylinder to the TDC/compression.

(b) Place match marks on the timing chain and camshaft timing sprockets.

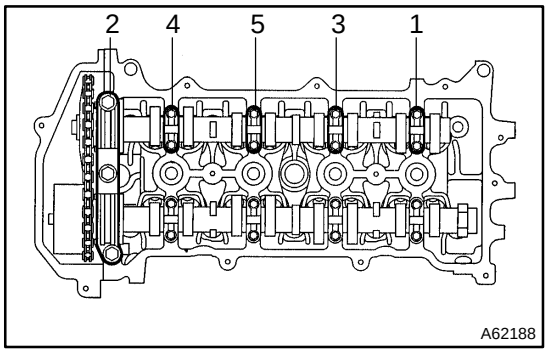


(c) Remove the 2 nuts and chain tensioner.

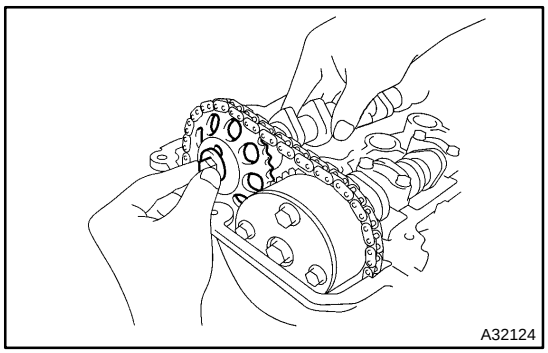


(d) Fix the camshaft with a wrench and so on, then loosen the camshaft timing gear set bolt.

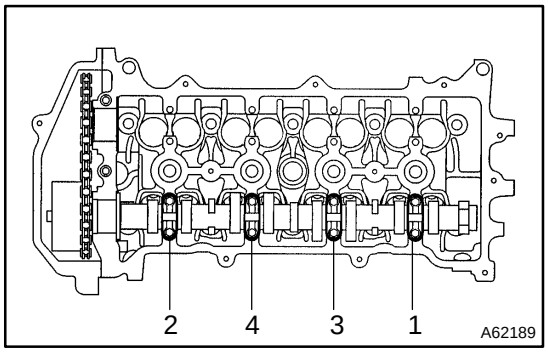
NOTICE:
Be careful not to damage the valve lifter.



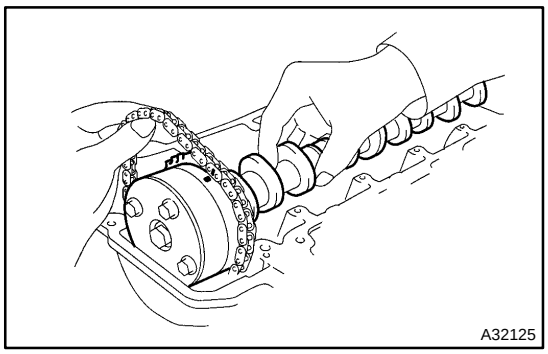
(e) Loosen the camshaft bearing cap bolts on No. 2 camshaft in the order as shown in the illustration in several passes,and remove the caps.



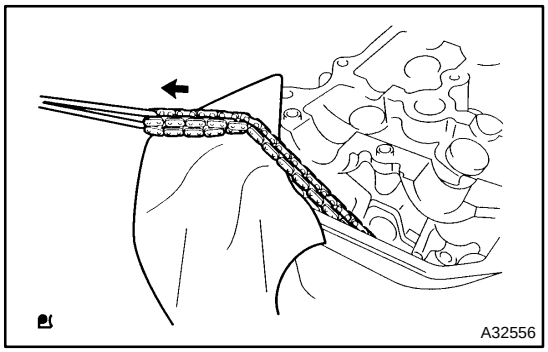
(f) Remove the camshaft timing gear as shown in the illustration.



(g) Loosen the camshaft bearing cap bolts on camshaft in the order as shown in the illustration in several passes,and remove the caps.



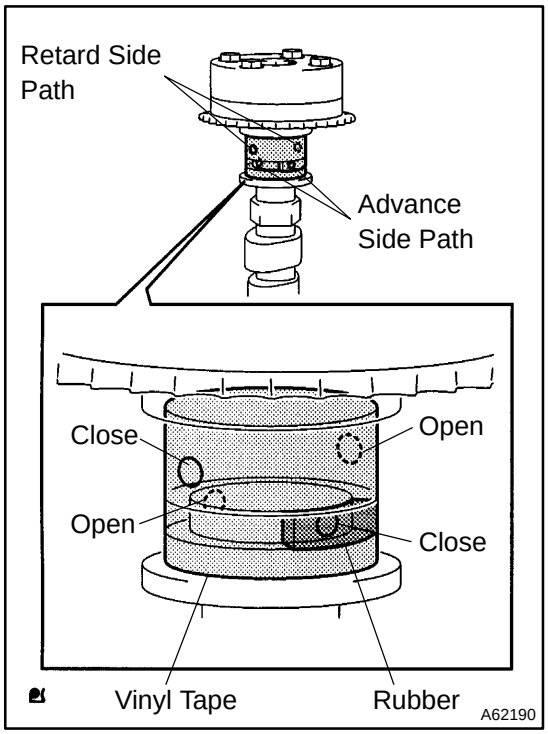
(h) Remove the camshaft with holding the timing chain.



(i) Tie the timing chain with a string as shown in the illustration.

NOTICE:

Be careful not to drop anything inside the timing chain cover.



13. INSPECT CAMSHAFT TIMING GEAR ASSY

(a) Check the lock of camshaft timing gear.

(1) Grip the camshaft with a vice, and confirm the camshaft timing gear is locked.

NOTICE:

Be careful not to damage the camshaft.

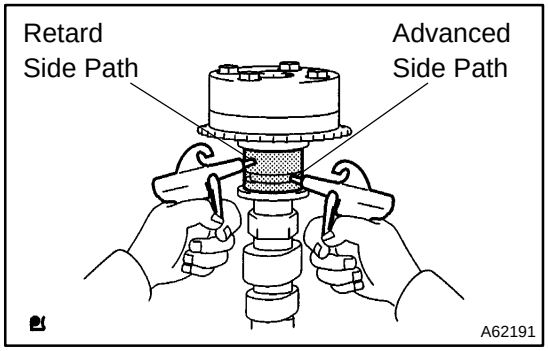
(b) Release lock pin.

(1) Cover 4 oil paths of cam journal with vinyl tape as shown in the illustration.

HINT:

Two advance side paths are provided in the groove of the camshaft. Plug one of the path with a rubber piece.

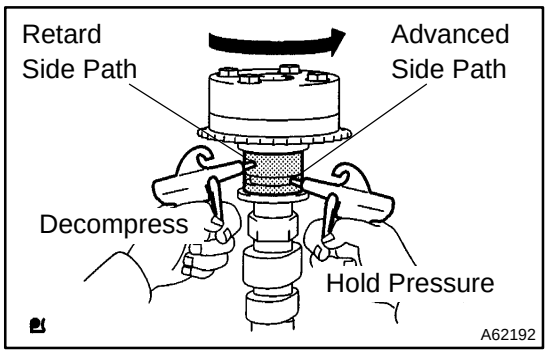
(2) Break through the tapes of the advance side path and the retard side path on the opposite side of the groove.



(3) Put air pressure into two broken paths (the advance side path and the retard side path) with about 150 kPa {1.5 kgf·cm}.

CAUTION:

Cover the pathes with shop rag to avoid oil splashing.



(4) Confirm if the camshaft timing gear assembly revolves in the timing advance direction when weakening the air pressure of the timing retard path.

HINT:

The lock pin is released, and camshaft timing gear, revolves in the advance direction.

(5) When the camshaft timing gear comes to the most advanced position, take out the air pressure of the timing retard side path, and then, take out that of timing advance side path.

CAUTION:

Camshaft timing assembly gear occasionally shifts to the retard side abruptly, if the air compression of the advanced side path is released before retard side path. It often causes the breakage of the lock pin.

(c) Check smooth revolution

(1) Revolve the camshaft timing gear assembly within the movable range except for the most retarded position several times, and check the smooth revolution.

CAUTION:

Be sure to perform this check by hand, instead of air pressure.

(d) Check the lock in the most retarded position.

(1) Confirm that the camshaft timing gear assembly is locked at the most retarded position.

14. REMOVE CAMSHAFT TIMING GEAR ASSY

(a) Grip the camshaft with a vice, and confirm that it the gear locked.

CAUTION:

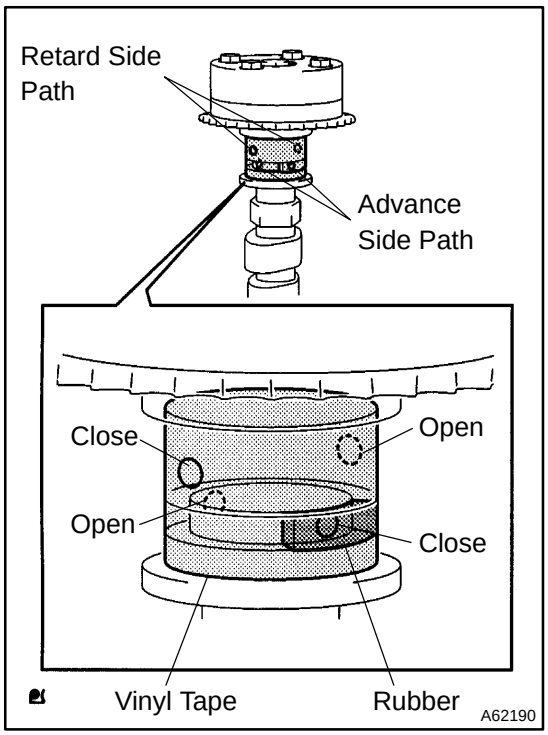
Be careful not to damage the camshaft.

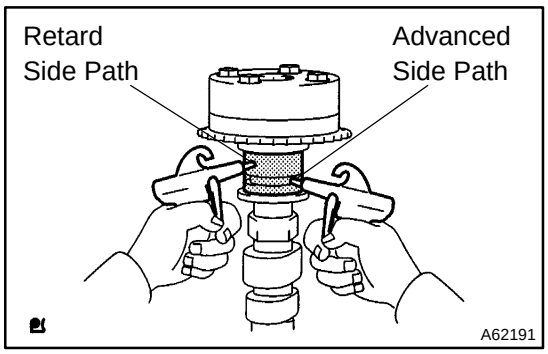
(b) Cover 4 oil paths of cam journal with vinyl tape as shown in the illustration.

HINT:

Two advance side paths are provided in the groove of the camshaft. Plug one of the path with a rubber piece.

(c) Break through the tapes of the advance side path and the retard side path on the opposite side of the groove.

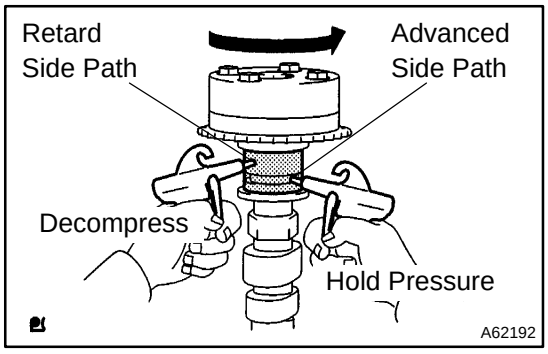




(d) Put air pressure into two broken paths (the advance side path and the retard side path) with about 150 kPa {1.5 kgf·cm}.

CAUTION:

Cover the pathes with shop rag to avoid oil splashing.



(e) Confirm if the camshaft timing gear assembly revolves in the timing advance direction when weakening the air pressure of the timing retard path.

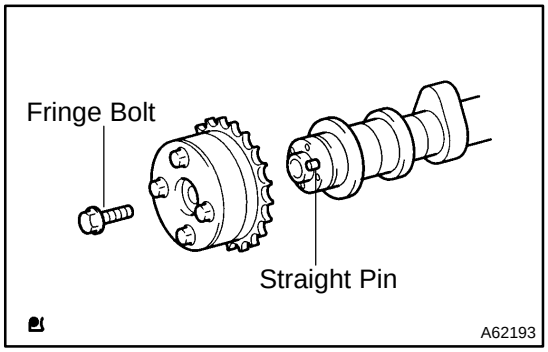
HINT:

The lock pin is released, and camshaft timing gear revolves in the advance direction.

(f) When the camshaft timing gear comes to the most advanced position, take out the air pressure of the timing retard side path, and then, takeout that of timing advance side path.

CAUTION:

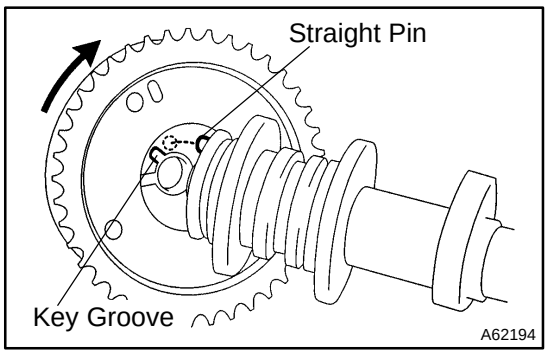
Camshaft timing gear assembly occasionally shifts to the retard side abruptly, if the air compression of the advanced side path is released before retard side paths. It often causes the breakage of the lock pin.



(g) Remove the fringe bolt of camshaft timing gear assembly.

NOTICE:

- **Be sure not to remove the other 4 bolts.**
- **In case of reusing the camshaft timing gear, release the strait pin locking first, and then install the gear.**



15. INSTALL CAMSHAFT TIMING GEAR ASSY

(a) Put the camshaft timing gear assembly and the camshaft together with the straight pin off the key groove.

(b) Turn the camshaft timing gear assembly to the left direction (as shown in the illustration) with pushing it lightly against the camshaft. Push further at the position where the pin gets into the groove.

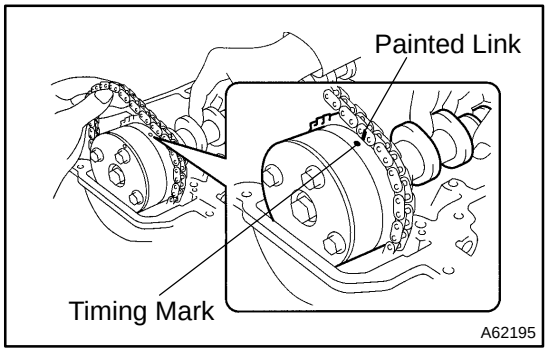
CAUTION:

Be sure not to turn the camshaft timing gear to the retard angle side (to the right angle).

(c) Check that there is no clearance between the gear's fringe and the camshaft.

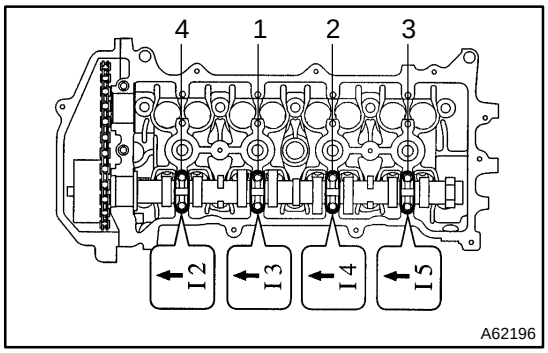
(d) Tighten the fringe bolt with the camshaft timing gear fixed.
Torque: 54 N·m (551 kgf·cm 40 ft·lbf)

(e) Check that the camshaft timing gear assembly can move to the retard angle side (the right angle), and is locked at the most retarded position.

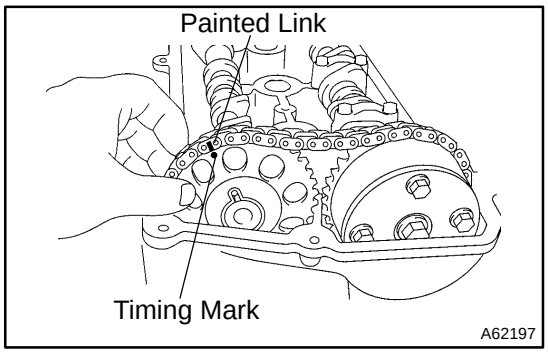


16. INSTALL CAMSHAFT

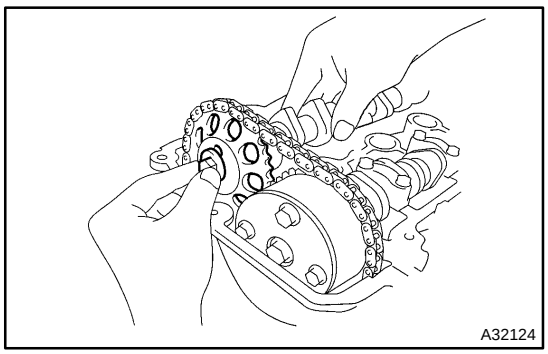
(a) As shown in the illustration, install the timing chain on the camshaft timing gear, with the painted links aligned with the timing marks on the camshaft timing gear.



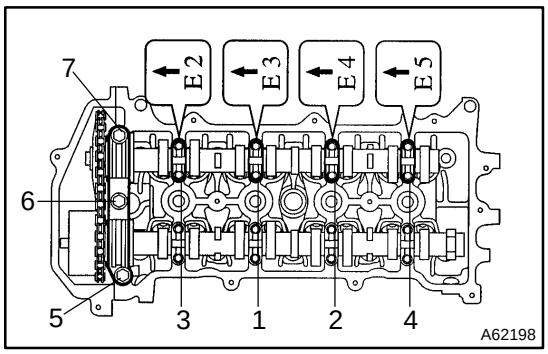
(b) Examine the front marks and numbers and tighten the bolts in the order shown in the illustration.
Torque: 13 N·m (133 kgf·cm, 10 ft·lbf)



(c) Put the camshaft No.2 on the cylinder head with the painted links of the chain aligned with the timing mark on the camshaft timing gear.

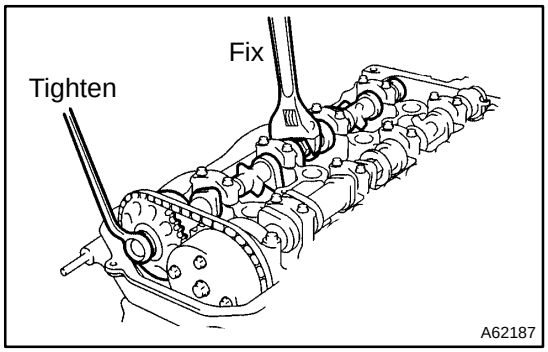


(d) Tighten the camshaft timing gear set bolt temporarily.



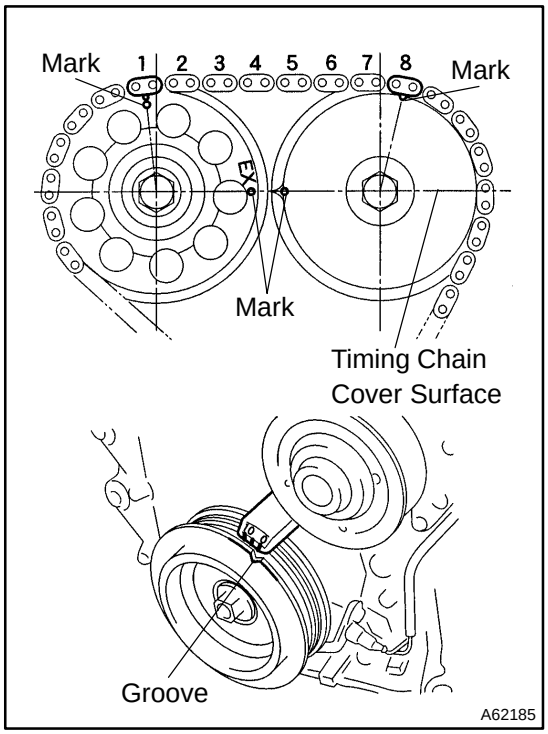
(e) Examine the front marks and numbers and tighten the bolts in the order shown in the illustration.
Torque: 13 N·m (133 kgf·cm, 10 ft·lbf)

(f) Install the bearing cap No. 1.
Torque: 23 N·m (235 kgf·cm, 17 ft·lbf)

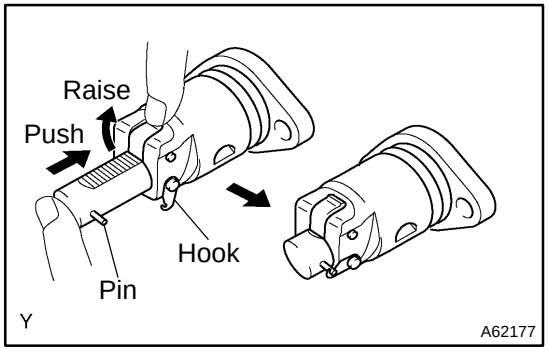


(g) Fix the camshaft with a wrench and so on, then tighten the camshaft timing gear set bolt.
Torque: 54 N·m (551 kgf·cm, 40 ft·lbf)

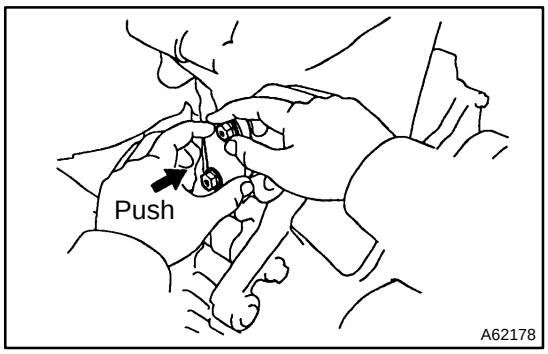
NOTICE:
Be careful not damage the valve lifter.



(h) Check the match marks on the timing chain and camshaft timing sprockets, and then the alignment of the pulley groove with timing mark of the chain cover as shown in the illustration.



(i) Install chain tensioner.
(1) Check the O–ring is clean, and set the hook as shown in the illustration.

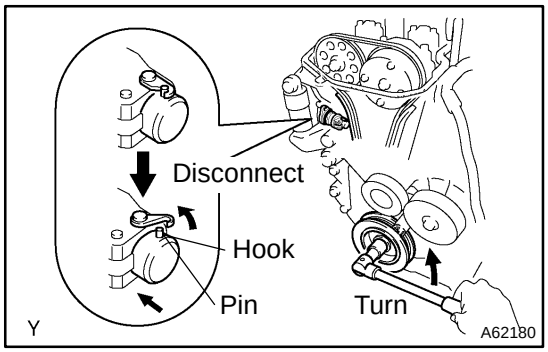


(2) Apply engine oil to the chain tensioner and install it with the 2 nuts.

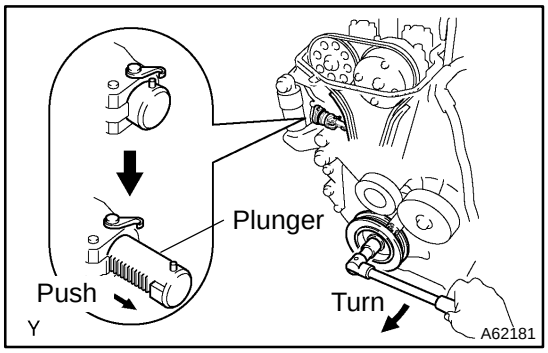
Torque: 9.0 N·m (92 kgf·cm, 80 in·lbf)

NOTICE:

When installing the tensioner, set the hook again if the hook release the plunger.



(3) Turn the crankshaft counter clockwise, and disconnect the plunger knock pin from the hook.

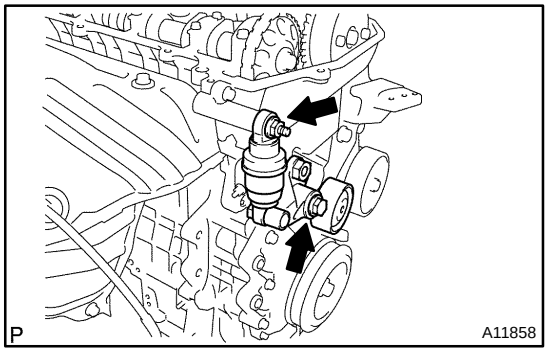


(4) Turn the crankshaft clockwise, and check that the slipper is pushed by the plunger.

HINT:

If the plunger does not spring out, press the slipper into the chain tensioner with a screwdriver so that the hook is released from the knock pin and the plunger springs out.

17. ADJUST VALVE CLEARANCE (See page 14–5)



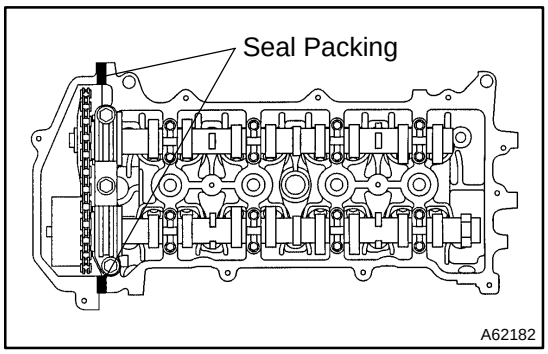
18. INSTALL V–RIBBED BELT TENSIONER ASSY

(a) Install the V–ribbed belt tensioner with the nut and bolt.

Torque:

Nut 29 N·m (296 kgf·cm, 21 ft·lbf)

Bolt 69 N·m (704 kgf·cm, 51 ft·lbf)



19. INSTALL CYLINDER HEAD COVER SUB–ASSY

(a) Remove any old packing (FIPG) material.

(b) Apply seal packing to 2 locations as shown in the illustration.

Seal packing: Part No. 08826–00080 or equivalent

NOTICE:

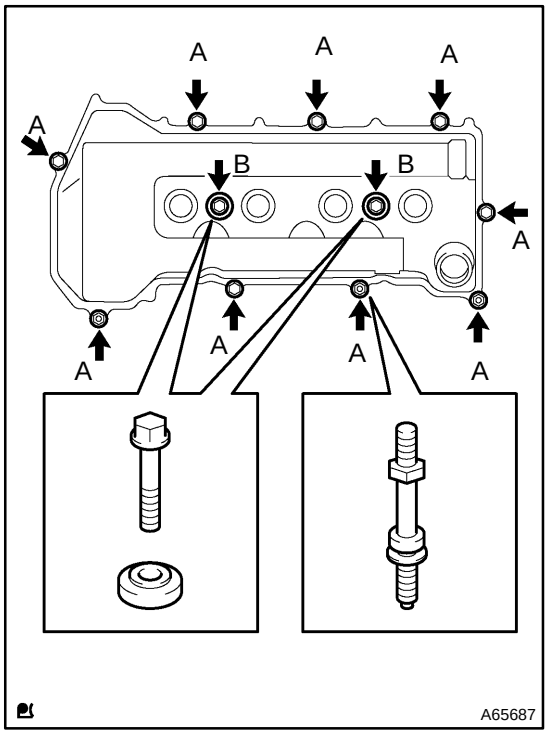
- **Remove any oil from the contact surface.**
- **Install the cylinder head cover within 3 minutes after applying seal packing.**
- **Do not put into engine oil 2 hours after installing.**

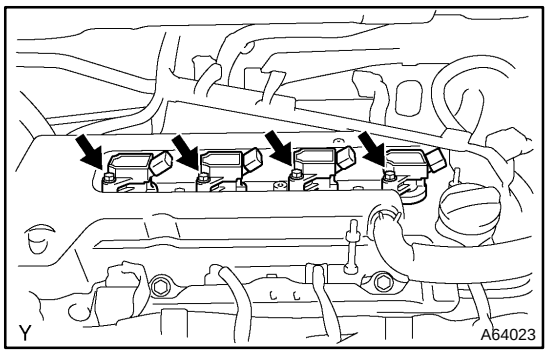
(c) Install the cylinder head cover and 3 cable brackets with the 9 bolts, 2 seal washers and 2 nuts. Uniformly tighten the bolts and nuts, in the several passes.

Torque:

A 11 N·m (112 kgf·cm, 8 ft·lbf)

B 9.0 N·m (92 kgf·cm, 80 in·lbf)

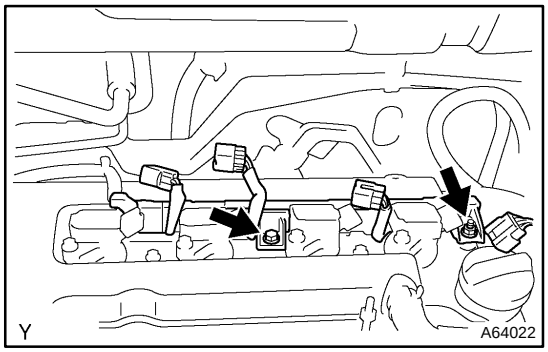




20. INSTALL IGNITION COIL ASSY

(a) Install the 4 ignition coils with the 4 bolts.

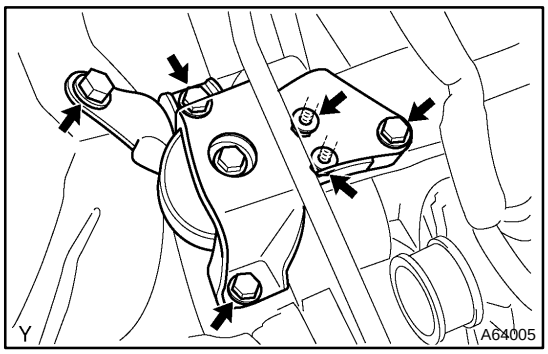
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)



21. INSTALL ENGINE WIRE

(a) Install the engine wire with the bolt and nut.

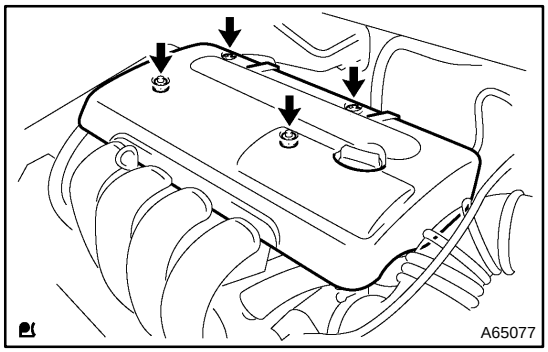
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)



22. INSTALL ENGINE MOUNTING INSULATOR SUB–ASSY RH

(a) Install engine mounting insulator with the 4 bolts and 2 nuts.

Torque: 52 N·m (530 kgf·cm, 38 ft·lbf)



23. INSTALL CYLINDER HEAD COVER NO.2

(a) Install the cylinder head cover with the 2 nuts and 2 clips.

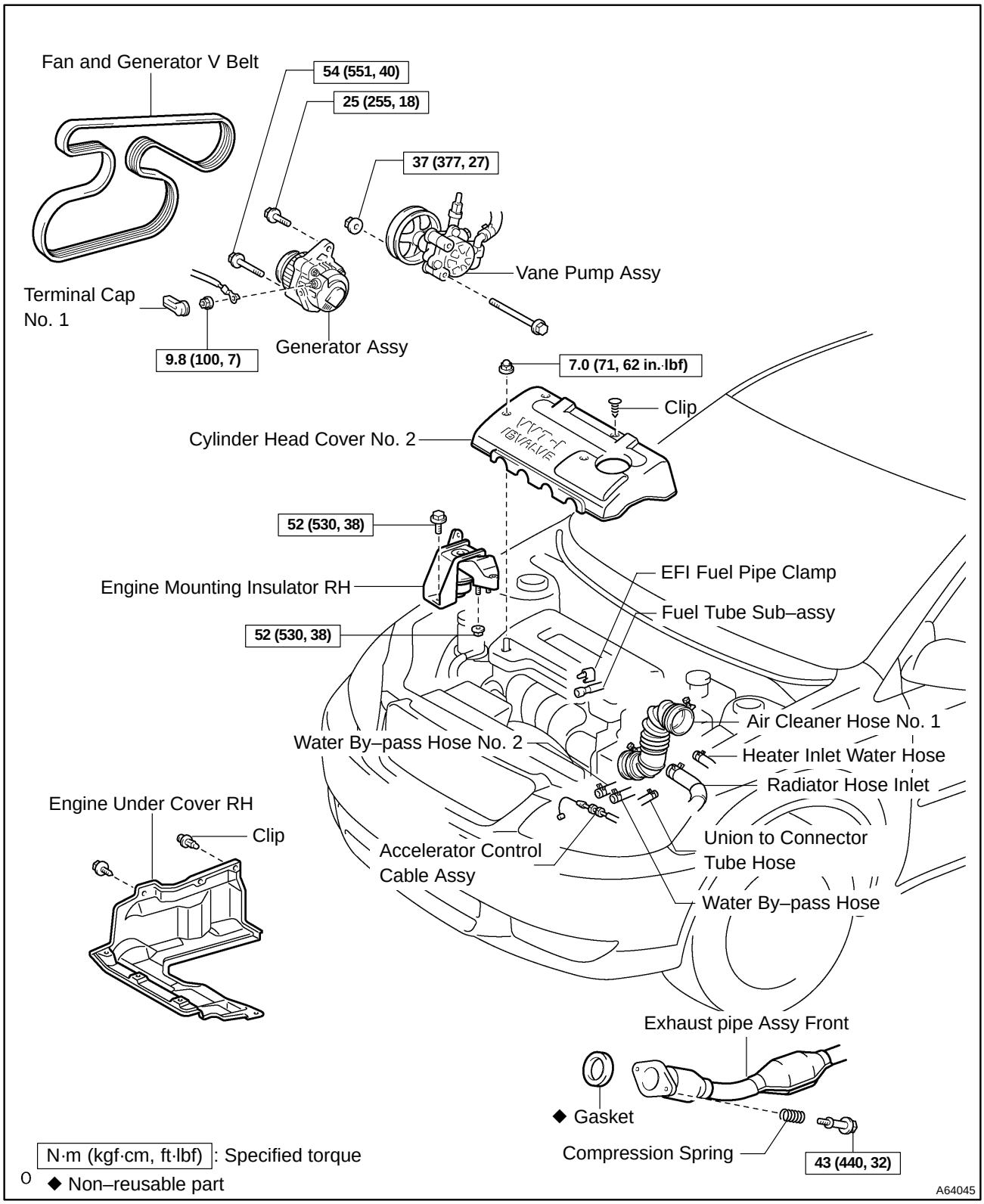
Torque: 7.0 N·m (71 kgf·cm, 62 in.·lbf)

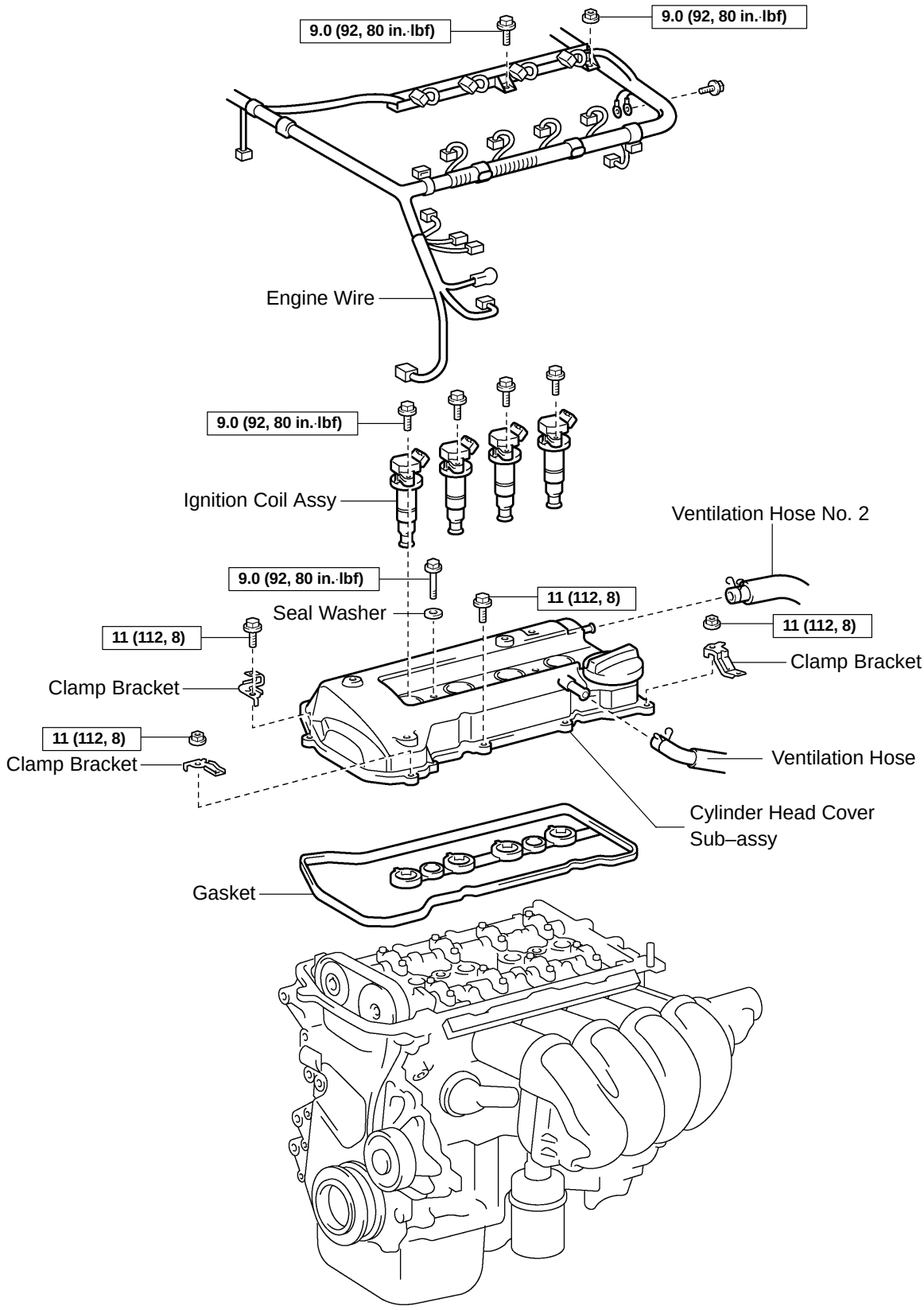
24. CHECK ENGINE OIL LEAK

CYLINDER HEAD GASKET

COMPONENTS

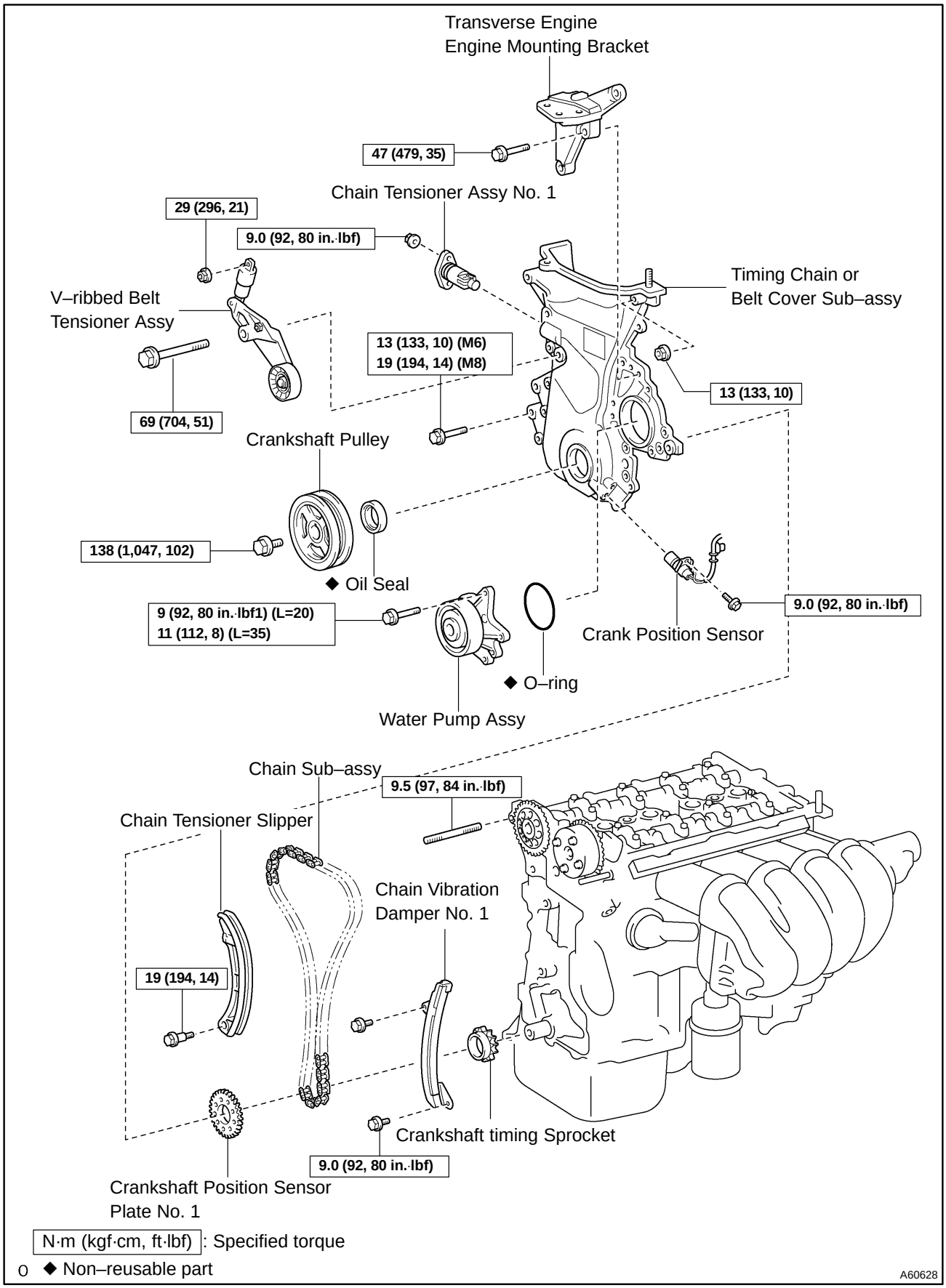
140OK–05

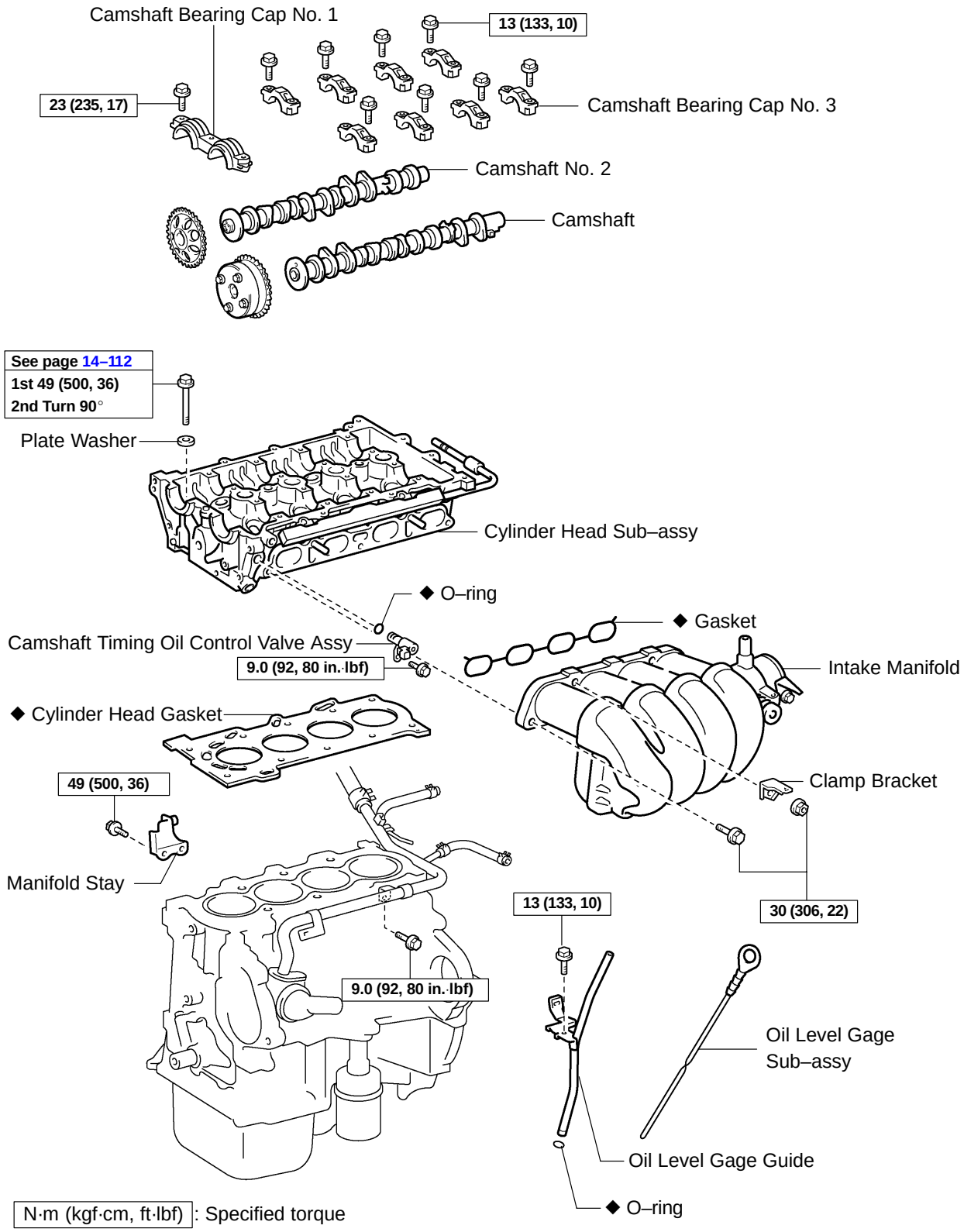




O N·m (kgf·cm, ft·lbf): Specified torque

A64043

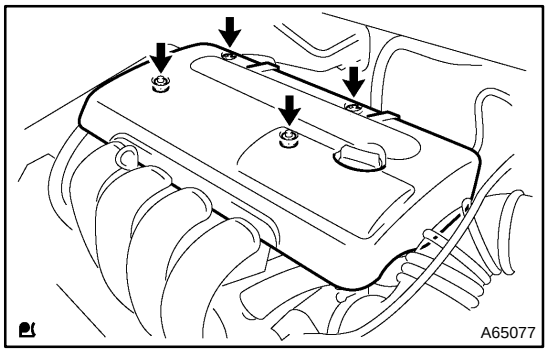

Transverse Engine
Engine Mounting Bracket
47 (479, 35)
Chain Tensioner Assy No. 1
29 (296, 21)
9.0 (92, 80 in.·lbf)
V–ribbed Belt
Tensioner Assy
Timing Chain or
Belt Cover Sub–assy
13 (133, 10) (M6)
19 (194, 14) (M8)
13 (133, 10)
69 (704, 51)
Crankshaft Pulley
138 (1,047, 102)
◆ Oil Seal
9 (92, 80 in.·lbf1) (L=20)
11 (112, 8) (L=35)
9.0 (92, 80 in.·lbf)
Crank Position Sensor
◆ O–ring
Water Pump Assy
Chain Sub–assy
9.5 (97, 84 in.·lbf)
Chain Tensioner Slipper
Chain Vibration
Damper No. 1
19 (194, 14)
Crankshaft timing Sprocket
9.0 (92, 80 in.·lbf)
Crankshaft Position Sensor
Plate No. 1
N·m (kgf·cm, ft·lbf): Specified torque
◆ Non–reusable part
A60628


Camshaft Bearing Cap No. 1
13 (133, 10)
23 (235, 17)
Camshaft Bearing Cap No. 3
Camshaft No. 2
Camshaft
See page 14–112
1st 49 (500, 36)
2nd Turn 90°
Plate Washer
Cylinder Head Sub–assy
◆ O–ring
◆ Gasket
Camshaft Timing Oil Control Valve Assy
9.0 (92, 80 in.·lbf)
Intake Manifold
◆ Cylinder Head Gasket
49 (500, 36)
Clamp Bracket
Manifold Stay
13 (133, 10)
30 (306, 22)
9.0 (92, 80 in.·lbf)
Oil Level Gage Sub–assy
Oil Level Gage Guide
◆ O–ring
N·m (kgf·cm, ft·lbf): Specified torque
◆ Non–reusable part
A64046

140OL–01

REPLACEMENT

1. **WORK FOR PREVENTING GASOLINE FROM SPILLING OUT (See page 11–1)**
2. **REMOVE ENGINE UNDER COVER RH**
3. **DRAIN COOLANT (See page 16–7)**
4. **REMOVE FRONT WHEEL RH**



5. **REMOVE CYLINDER HEAD COVER NO.2**

(a) Remove the 2 nuts, 2 clips and cylinder head cover.

6. **REMOVE AIR CLEANER HOSE NO.1**

(a) Loosen the 2 air cleaner hose clamp bolts, and remove the air cleaner hose.

7. **SEPARATE ACCELERATOR CONTROL CABLE ASSY**

(a) Loosen the nut, and remove the accelerator control cable from the accelerator control cable bracket.

8. **DISCONNECT WATER BY–PASS HOSE**

(a) Disconnect the water by–pass hose from the throttle body.

9. **DISCONNECT WATER BY–PASS HOSE NO.2**

(a) Disconnect the water by–pass hose from the throttle body.

10. **REMOVE EFI FUEL PIPE CLAMP (See page 11–10)**
11. **DISCONNECT FUEL TUBE SUB–ASSY (See page 11–10)**

SST 09268–21010

12. **DISCONNECT UNION TO CONNECTOR TUBE HOSE**

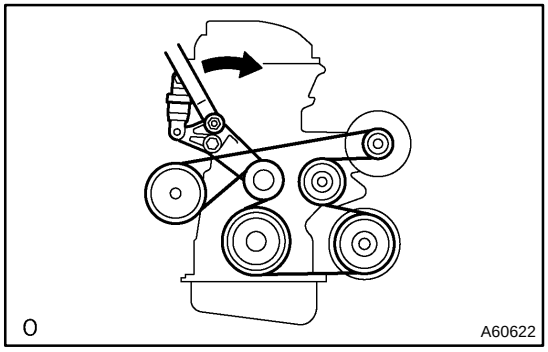
(a) Disconnect the union to connector tube hose from the hose to hose tube.

13. **DISCONNECT RADIATOR HOSE INLET**

(a) Disconnect radiator hose inlet from the cylinder head.

14. **DISCONNECT HEATER INLET WATER HOSE**

(a) Disconnect the heater inlet water hose from the cylinder head.



15. **REMOVE FAN AND GENERATOR V BELT**

(a) Turn the V–ribbed belt tensioner slowly clockwise and loosen it. Then, remove the fan and generator V belt and put back the V–ribbed belt tensioner little by little and fix it quietly.

16. SEPARATE VANE PUMP ASSY (See page 51–8)

NOTICE:

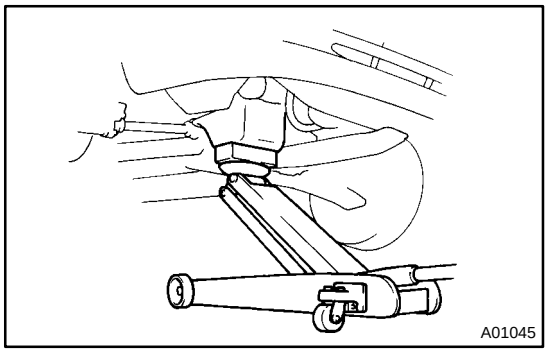
Do not disconnect the hose.

17. REMOVE GENERATOR ASSY (See page 19–16)

18. SEPARATE EXHAUST PIPE ASSY FRONT

(a) Remove the 2 bolts, 2 compression spring installing the front side of exhaust pipe.

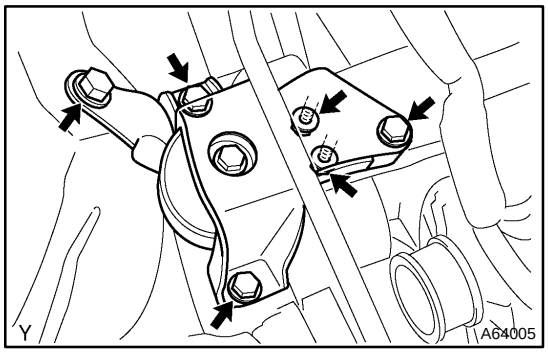
(b) Remove the gasket.

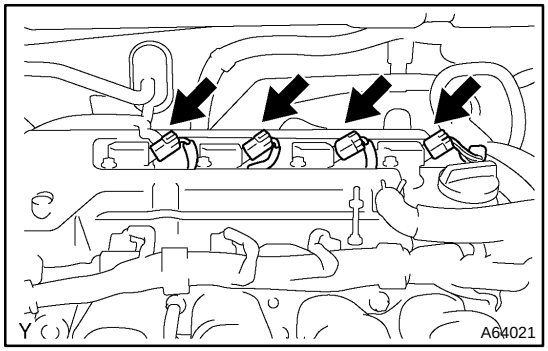


19. REMOVE ENGINE MOUNTING INSULATOR SUB–ASSY RH

(a) Remove the PS oil pump reservoir and put it aside.

(b) Place a wooden block between the jack and engine, and set the jack, then remove the 4 bolts, the 2 nuts and engine mounting insulator RH.

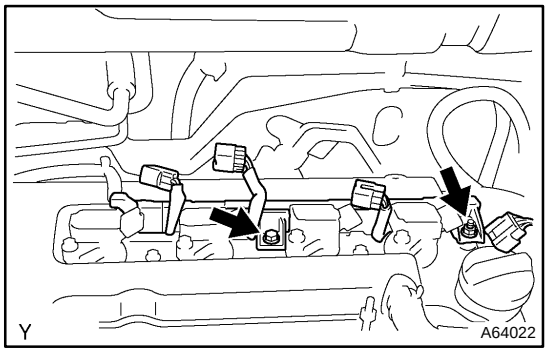




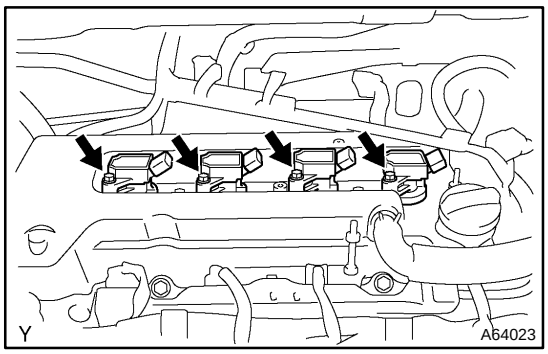
20. DISCONNECT ENGINE WIRE

(a) Remove the 5 clamps from the 5 clamp brackets.

(b) Disconnect the 4 ignition coil connectors.

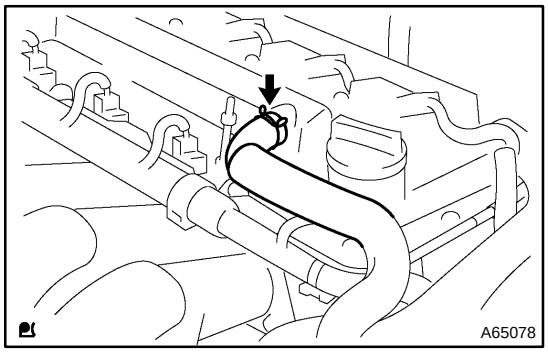


(c) Remove the bolt and nut installing the engine wire.



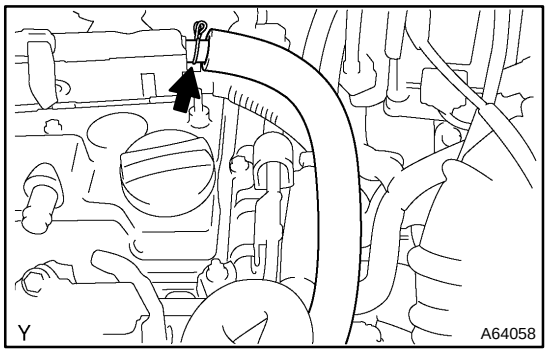
21. REMOVE IGNITION COIL ASSY

(a) Remove the 4 bolts and 4 ignition coils.



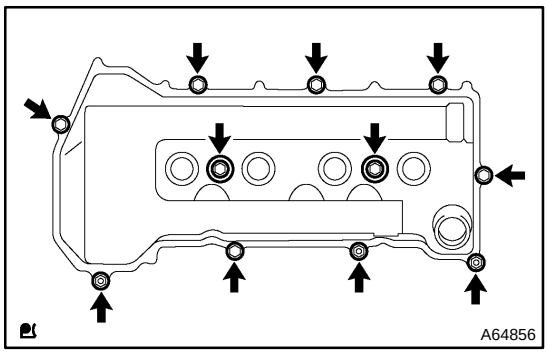
22. DISCONNECT VENTILATION HOSE

(a) Disconnect the ventilation hose from the cylinder head cover.



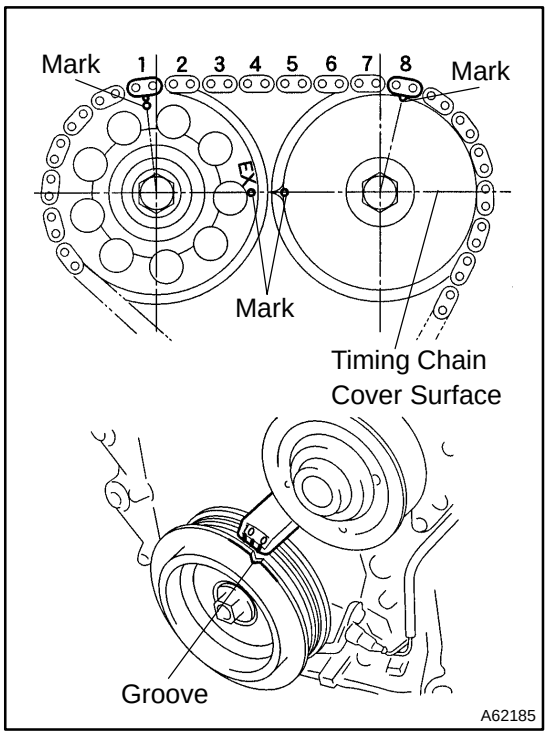
23. DISCONNECT VENTILATION HOSE NO.2

(a) Disconnect the ventilation hose from the cylinder head cover.



24. REMOVE CYLINDER HEAD COVER SUB–ASSY

(a) Remove the 9 bolts, 2 seal washers, 2 nuts, 3 clamp brackets and cylinder head cover.



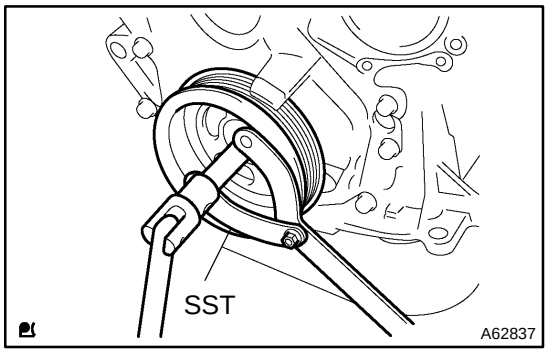
25. SET NO. 1 CYLINDER TO TDC/COMPRESSION

(a) Turn the crankshaft pulley, and align its groove with timing mark ”0” of the timing chain cover.

(b) Check that the point marks of the camshaft timing sprocket and VVT timing sprocket are in straight line on the timing chain cover surface as shown in the illustration.

HINT:

If not, turn the crankshaft 1 revolution (360°) and align the marks as above.

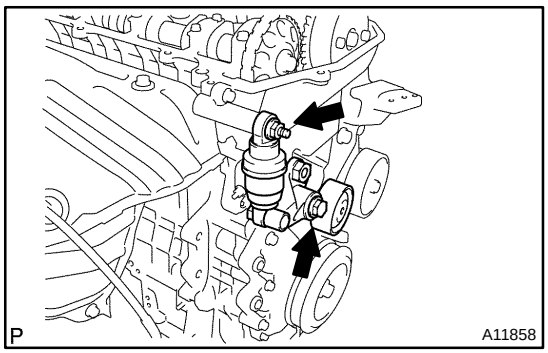


26. REMOVE CRANKSHAFT PULLEY

(a) Using SST, remove the pulley bolt.

SST 09960–10010 (09962–01000, 09963–01000)

(b) Remove the crankshaft pulley from the crankshaft.



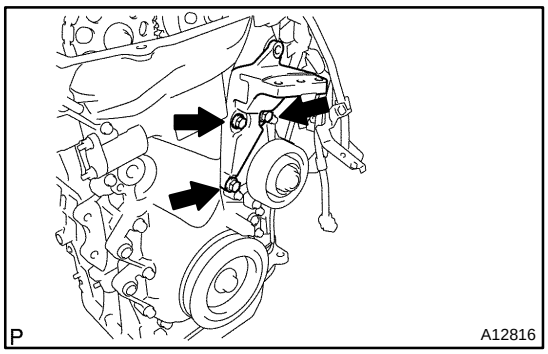
27. REMOVE V–RIBBED BELT TENSIONER ASSY

(a) Remove the bolt, nut and V–ribbed belt tensioner.

HINT:

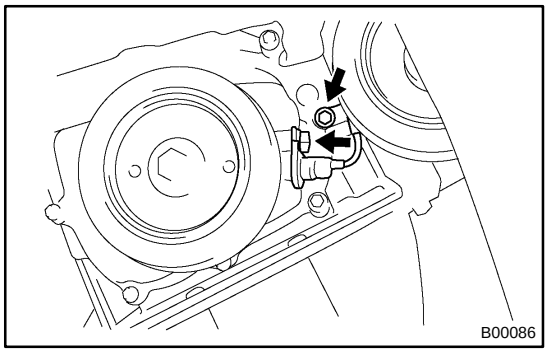
Handle a jack up and down to remove the bolt.

28. REMOVE WATER PUMP ASSY (See page 16–8)



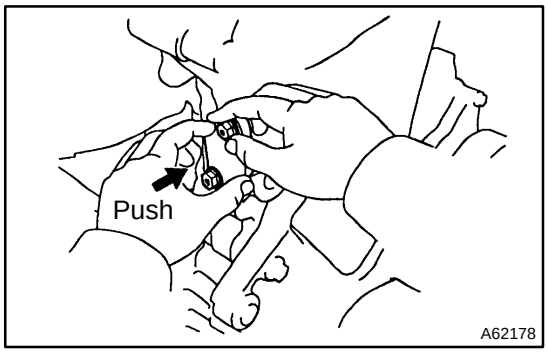
29. REMOVE TRANSVERSE ENGINE ENGINE MOUNTING BRACKET

(a) Remove the 3 bolts and transverse engine engine mounting bracket.



30. REMOVE CRANK POSITION SENSOR

(a) Remove the 2 bolts installing the crank position sensor.

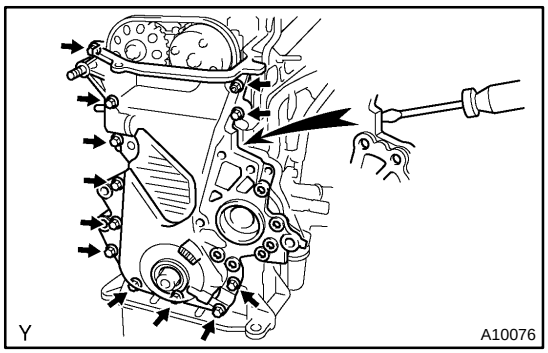


31. REMOVE CHAIN TENSIONER ASSY NO.1

(a) Remove the 2 nuts and chain tensioner.

NOTICE:

Be sure not to revolve the crankshaft without the chain tensioner.



32. REMOVE TIMING CHAIN OR BELT COVER SUB–ASSY

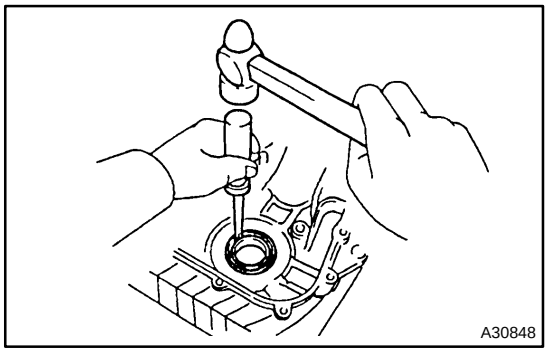
(a) Remove the 11 bolts and nuts.

(b) Using a torx wrench socket (E8), remove the stud bolt.

(c) Remove the timing chain cover by prying the portions between the cylinder head and cylinder block with a screwdriver.

NOTICE:

Be careful no tot damage the contact surfaces of the timing chain cover, cylinder head and cylinder block.



33. REMOVE TIMING GEAR COVER OIL SEAL

(a) Using a screwdriver, remove the oil seal.

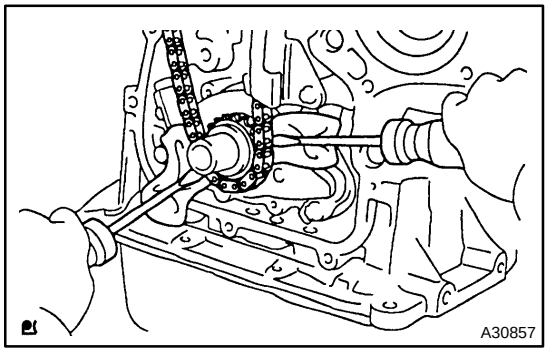
34. REMOVE CRANKSHAFT POSITION SENSOR PLATE NO.1

35. REMOVE CHAIN TENSIONER SLIPPER

(a) Remove the bolt and chain tensioner slipper.

36. REMOVE CHAIN VIBRATION DAMPER NO.1

(a) Remove the 2 bolt and chain vibration damper.

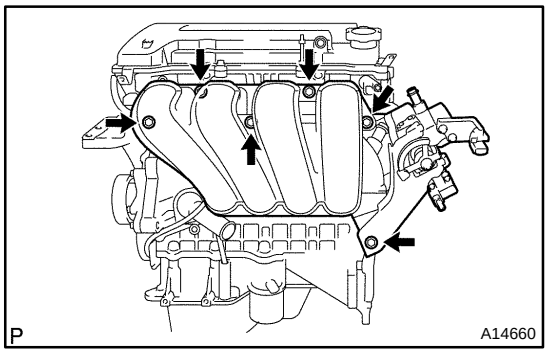


37. REMOVE CHAIN SUB–ASSY

(a) Remove the timing chain with the crankshaft timing gear plying screwdrivers as shown in the illustration.

NOTICE:

- **Put shop rag to protect the engine.**
- **In case of revolving the camshafts with the chain off the sprockets, turn the crankshaft 1/4 revolution for valves not to touch the pistons.**



38. REMOVE INTAKE MANIFOLD

(a) Disconnect the 2 water hoses from the throttle body.

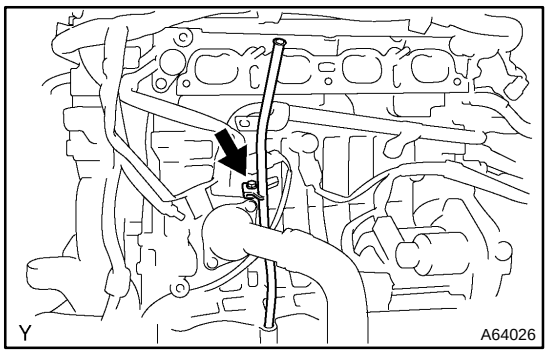
(b) Disconnect the 2 vacuum hoses from the intake manihold.

(c) Remove the 4 bolts, 2 nuts, 2 wire brackets, the intake manihold and throttle body assembly.

(d) Remove the gasket from the intake manihold and throttle body assembly.

39. REMOVE OIL LEVEL GAGE SUB–ASSY

(a) Remove the oil level gage from the oil level gage guide.

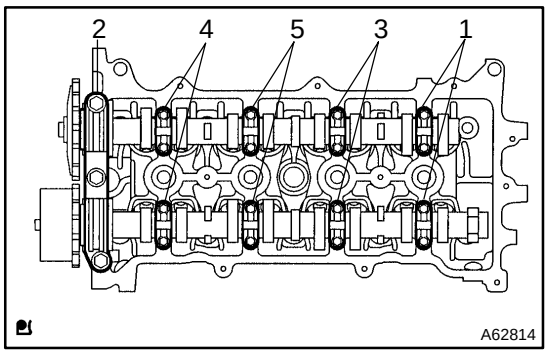


40. REMOVE OIL LEVEL GAGE GUIDE

(a) Remove the bolt and oil level gage guide.

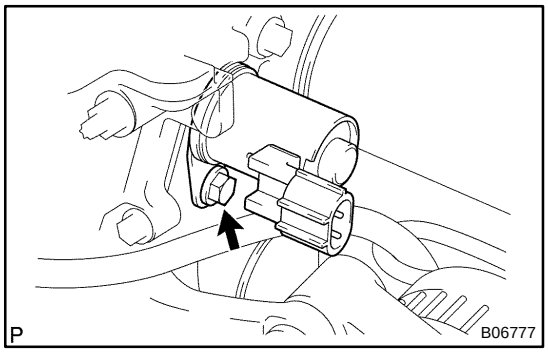
41. SEPARATE WATER BY–PASS PIPE NO.1

(a) Remove the 2 bolts installing the water by–pass pipe.



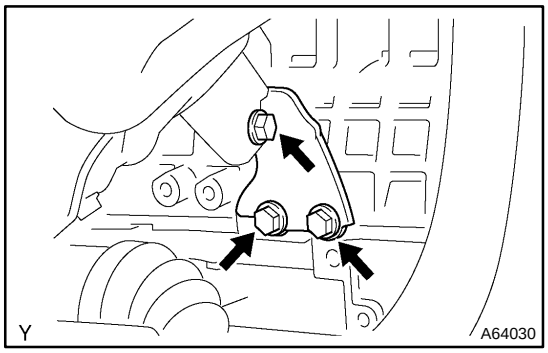
42. REMOVE CAMSHAFT

(a) Uniformly loosen and remove the 19 bearing cap bolts, in several passes, in the sequence shown, and remove the 9 bearing caps, intake and exhaust camshafts.



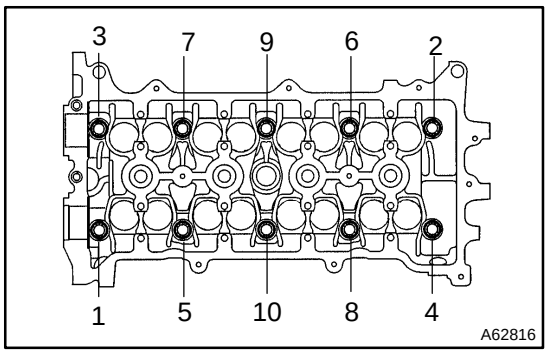
43. REMOVE CAMSHAFT TIMING OIL CONTROL VALVE ASSY

(a) Remove the bolt and camshaft timing oil control valve.



44. REMOVE MANIFOLD STAY

(a) Remove the 3 bolts and manifold stay.

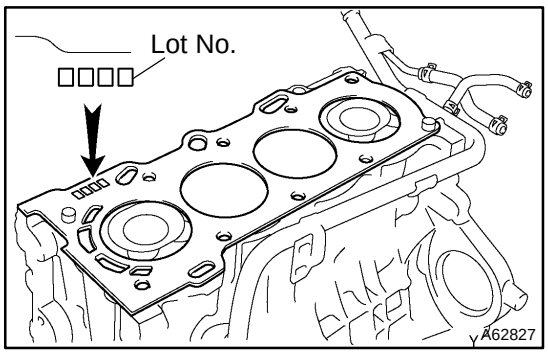


45. REMOVE CYLINDER HEAD SUB–ASSY

(a) Using a 10 mm bi–hexagon wrench, uniformly loosen and remove the 10 cylinder head bolts, in several passes, in the sequence shown, and remove the 10 cylinder head bolts and 10 plate washers.

(b) Remove the cylinder head.

46. REMOVE CYLINDER HEAD GASKET

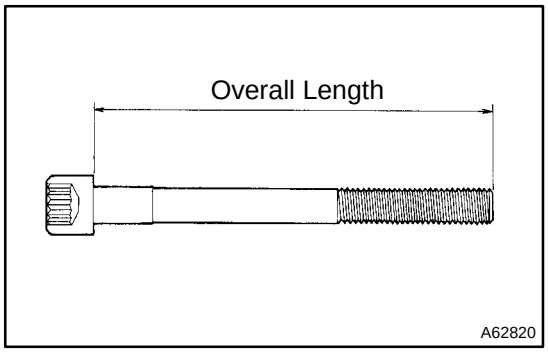


47. INSTALL CYLINDER HEAD GASKET

(a) Place a new cylinder head gasket on the cylinder block surface with the Lot No. stamp upward.

NOTICE:

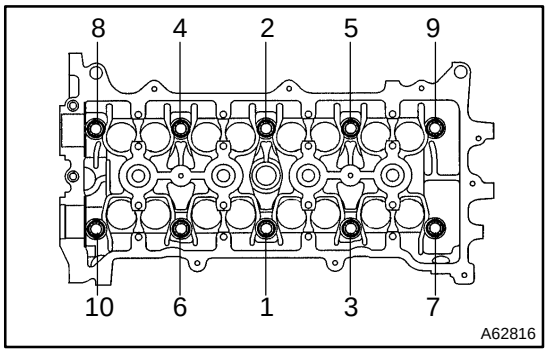
- **Pay attention to the installation direction.**
- **Place the cylinder head quietly in order not to damage the gasket with the bottom part of the head.**



48. INSPECT CYLINDER HEAD SET BOLT

(a) Using a vernier calipers, measure the length of cylinder head bolt from the seat to the end.
Standard length: 146.8 – 148.2 mm (5.780 – 5.835 in.)
Maximum length: 148.5 mm (5.846 in.)

If the length surpasses the maximum, replace the bolt.



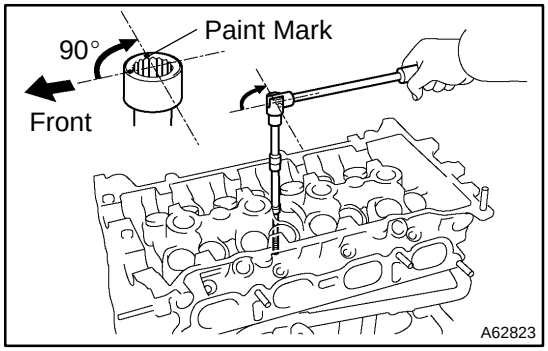
49. INSTALL CYLINDER HEAD SUB–ASSY

HINT:

The cylinder head bolts are tightened in 2 progressive steps.

(a) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.

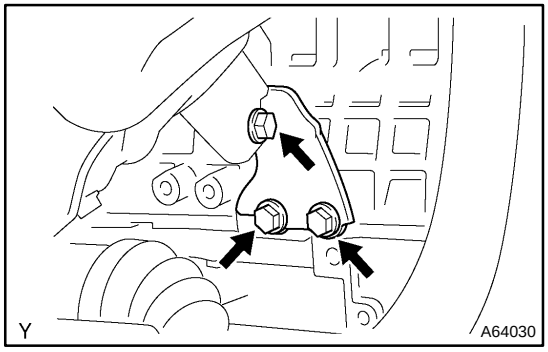
(b) Using a 10 mm bi–hexagon wrench, install and uniformly tighten the 10 cylinder head bolts and plate washers, in several passes, in the sequence shown.
Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)



(c) Make the front of the cylinder head bolt with paint.

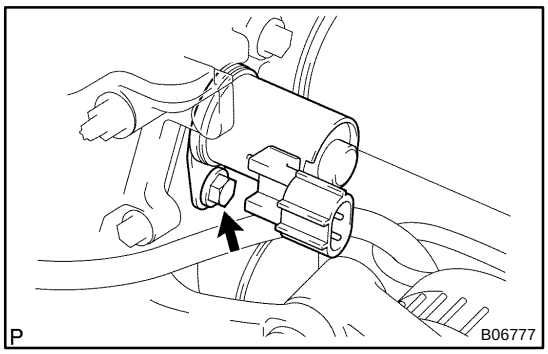
(d) Retighten the cylinder head bolts 90° in the numerical order shown.

(e) Check that the point marked bolts are moved at 90° angle.



50. INSTALL MANIFOLD STAY

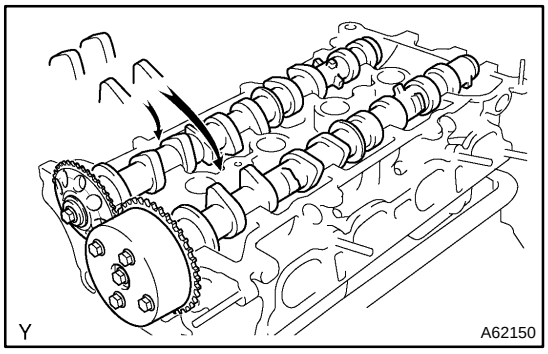
(a) Install the manifold stay with 3 bolts.
Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)



51. INSTALL CAMSHAFT TIMING OIL CONTROL VALVE ASSY

(a) Apply a light coat of engine oil on a new O–ring, and install it to the camshaft timing oil control valve.

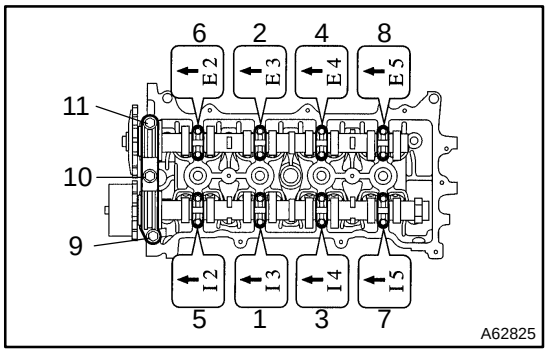
(b) Install the camshaft timing oil control valve with the bolt.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)



52. INSTALL CAMSHAFT

(a) Apply a light coat of engine oil on the camshaft journals.

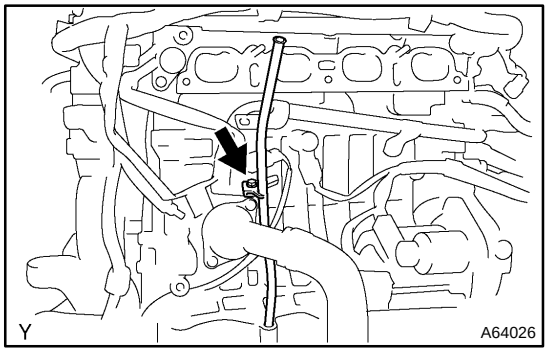
(b) Place the 2 camshafts on the cylinder head with the No. 1 cam lobes facing as shown the illustration.



(c) Examine the front marks and numbers and tighten the bolts in the order shown in the illustration.
Torque:
Bearing cap No. 1 23 N·m (235 kgf·cm, 17 ft·lbf)
Bearing cap No. 3 13 N·m (133 kgf·cm, 10 ft·lbf)

53. INSTALL WATER BY–PASS PIPE NO.1

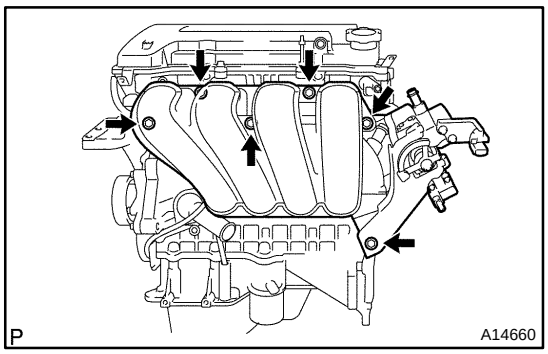
(a) Install the water by–pass pipe with the 2 bolts.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)



54. INSTALL OIL LEVEL GAGE GUIDE

(a) Apply a light coat of engine oil on a new O–ring, and install it to the oil level gage guide.

(b) Install the oil level gage guide with the bolt.
Torque: 13 N·m (133 kgf·cm, 10 ft·lbf)



55. INSTALL INTAKE MANIFOLD

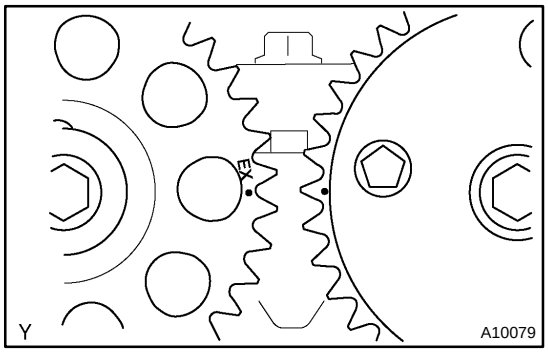
(a) Install a new gasket to the intake manifold.

(b) Install the intake manifold and throttle body assembly with the 2 brackets, 4 bolts and 2 nuts. Uniformly tighten the bolts and nuts in several passes.

Torque: 30 N·m (306 kgf·cm, 22 ft·lbf)

(c) Connect the 2 vacuum hoses to the intake manifold.

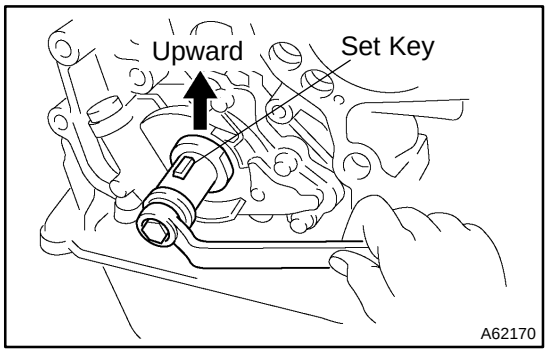
(d) Connect the 2 water hoses to the throttle body.



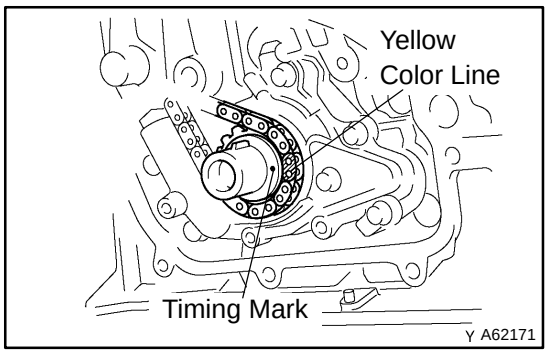
56. INSTALL CHAIN SUB–ASSY

(a) Set No. 1 cylinder to TDC/compression.

(1) Turn the hexagonal wrench head portion of the camshafts, and align the point marks of the camshaft timing sprockets.



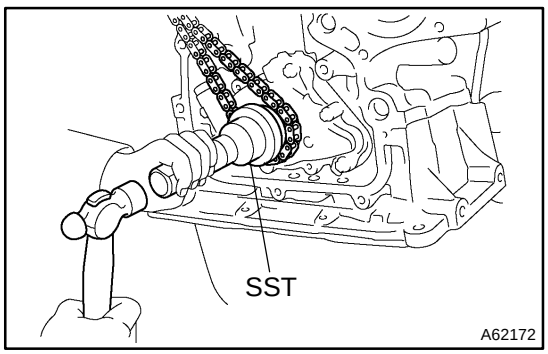
(2) Using a crankshaft pulley bolt, turn the crankshaft and set the set key on the crankshaft upward.



(b) Install the timing chain on the crankshaft timing sprocket with the yellow color link aligned with the timing mark on the crankshaft timing sprocket.

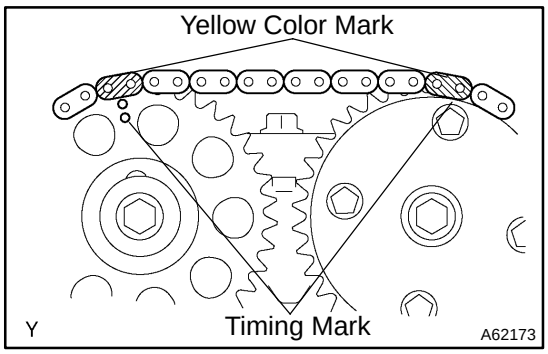
HINT:

Three yellow color links are on the chain.



(c) Using SST, install the crankshaft timing sprocket.

SST 09223–22010



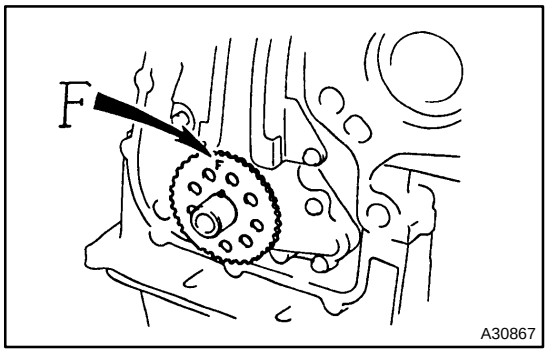
(d) Install the timing chain on the camshaft timing sprockets with the yellow color links aligned with the timing marks on the camshaft timing sprockets.

57. INSTALL CHAIN VIBRATION DAMPER NO.1

(a) Install the chain vibration damper with the 2 bolts.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

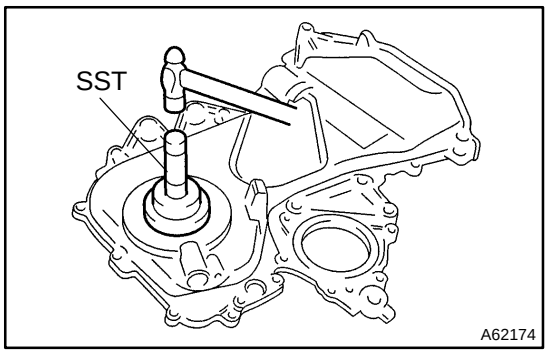
58. INSTALL CHAIN TENSIONER SLIPPER

(a) Install the chain tensioner slipper with the bolt.
Torque: 19 N·m (194 kgf·cm, 14 ft·lbf)



59. INSTALL CRANKSHAFT POSITION SENSOR PLATE NO.1

(a) Install the plate with the ”F” mark facing forward.

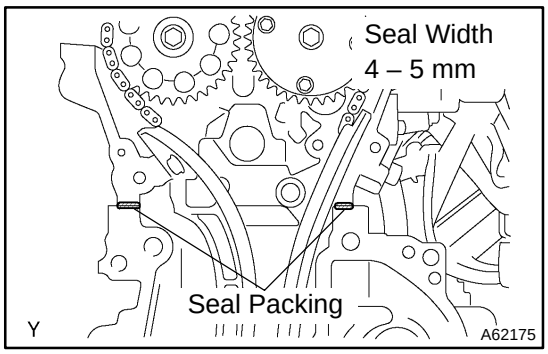


60. INSTALL TIMING GEAR COVER OIL SEAL

(a) Apply MP grease to a new oil seal lip.

(b) Using SST, tap in the oil seal until its surface is flush with the timing chain cover edge.
SST 09223–22010

NOTICE:
Keep the lip off foreign materials.



61. INSTALL TIMING CHAIN OR BELT COVER SUB–ASSY

(a) Remove any old packing material from the contact surface.

(b) Apply seal packing in the shape of bead (Diameter 3.5 mm – 4.5 mm (0.1379 – 0.177 in.)) consequently as shown in the illustration.

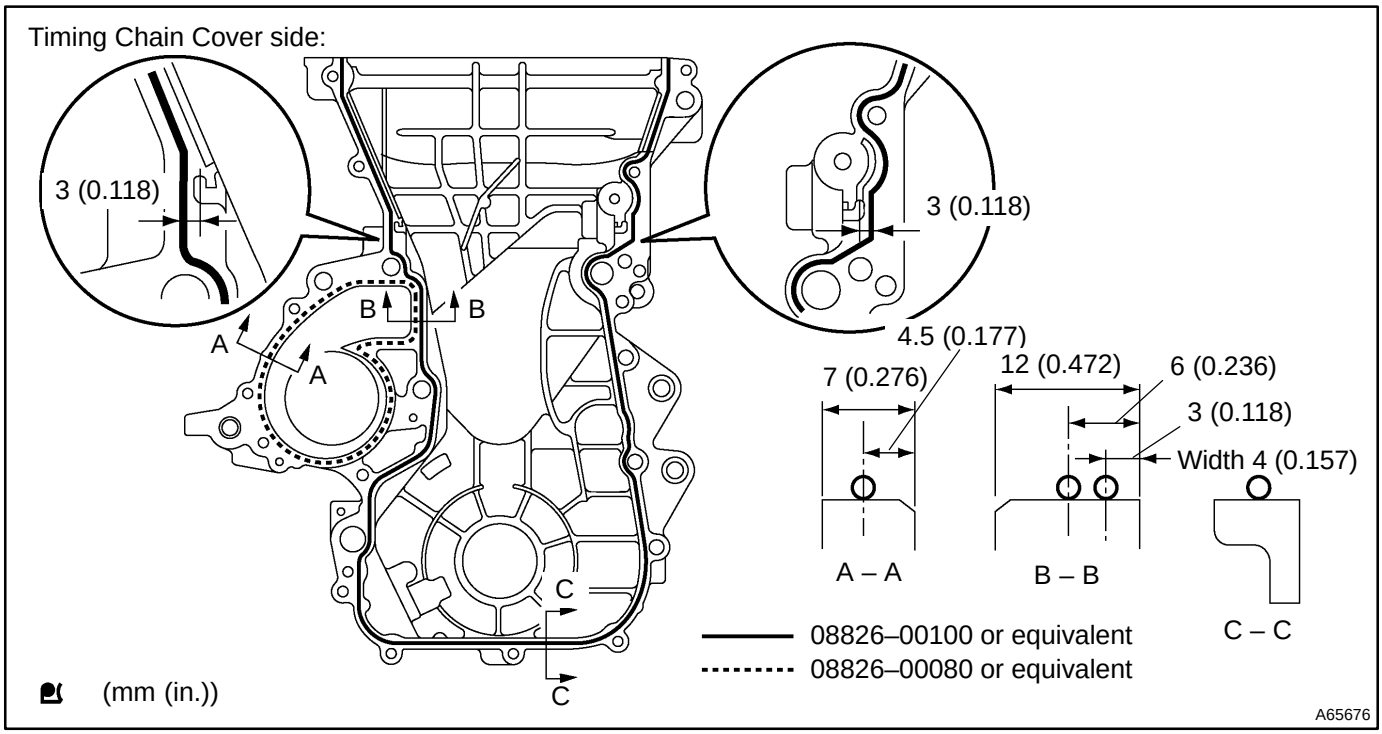
Seal packing:

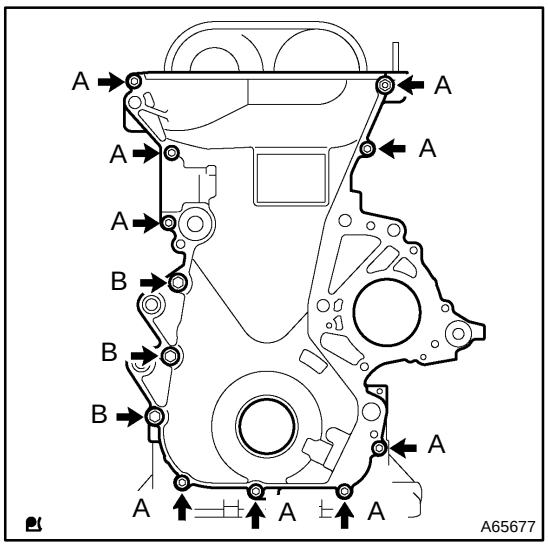
Water pump part part No. 08826–00100 or equivalent

Other part part No. 08826–00080 or equivalent.

NOTICE:

- **Remove any oil from the contact surface.**
- **Install the oil pan within 3 minutes after applying seal packing.**
- **Do not put into engine oil within 2 hours after installing.**





(c) Install the timing chain cover with the 11 bolts and nut.

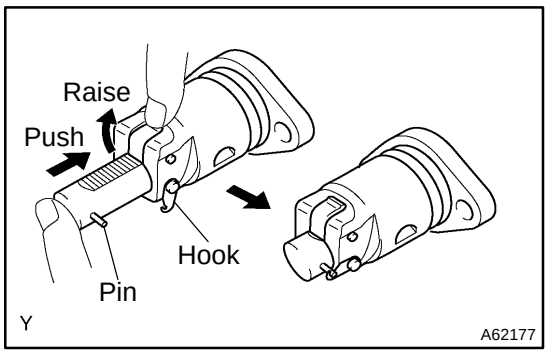
Torque:

A 13 N·m (133 kgf·cm, 10 ft·lbf)

B 19 N·m (194 kgf·cm, 14 ft·lbf)

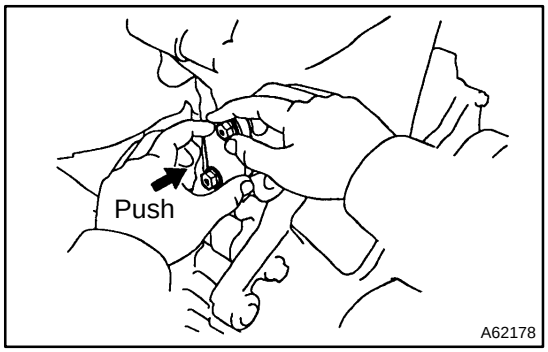
(d) Using a torx wrench socket (E8), install the stud bolt.

Torque: 9.5 N·m (97 kgf·cm, 84 in.·lbf)



62. INSTALL CHAIN TENSIONER ASSY NO.1

(a) Check the O–ring is clean, and set the hook as shown in the illustration.

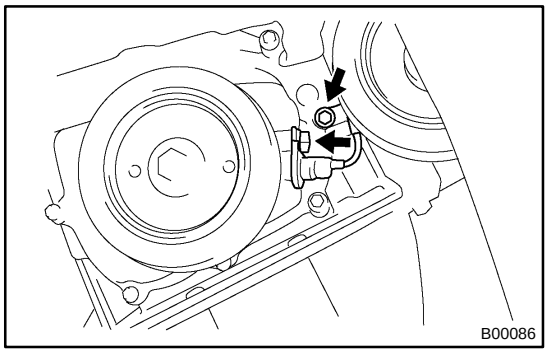


(b) Apply engine oil to the chain tensioner and install it withe 2 nuts.

Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

NOTICE:

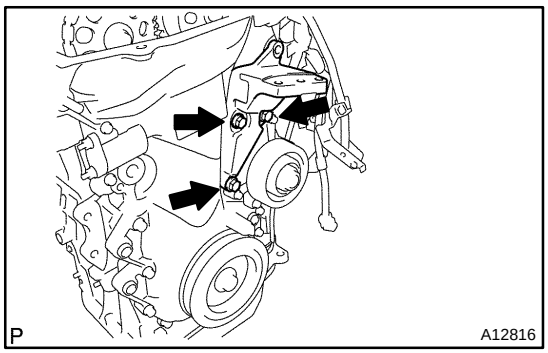
When installing the tensioner, set the hook again if the hook release the plunger.



63. INSTALL CRANK POSITION SENSOR

(a) Install the crank position sensor with the 2 bolts.

Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

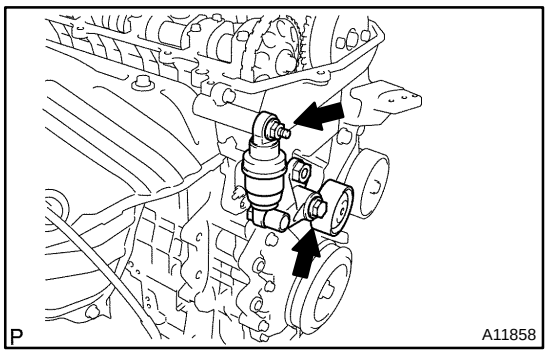


64. INSTALL TRANSVERSE ENGINE ENGINE MOUNTING BRACKET

(a) Install the transverse engine engine mounting bracket with the 3 bolts.

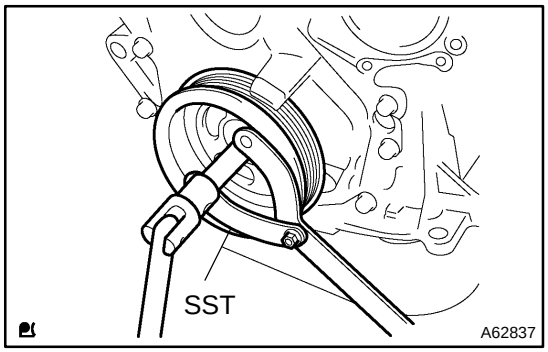
Torque: 47 N·m (479 kgf·cm, 35 ft·lbf)

65. INSTALL WATER PUMP ASSY (See page 16–8)



66. INSTALL V–RIBBED BELT TENSIONER ASSY

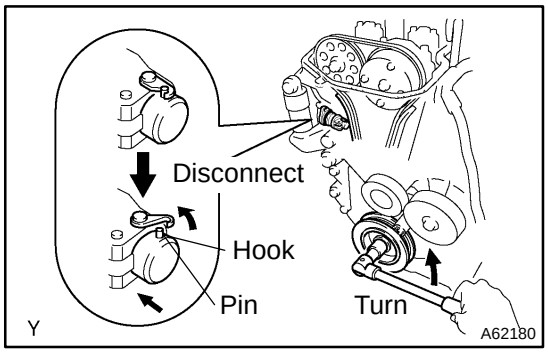
(a) Install the V–ribbed belt tensioner with the nut and bolt.
Torque:
Nut 29 N·m (296 kgf·cm, 21 ft·lbf)
Bolt 69 N·m (704 kgf·cm, 51 ft·lbf)



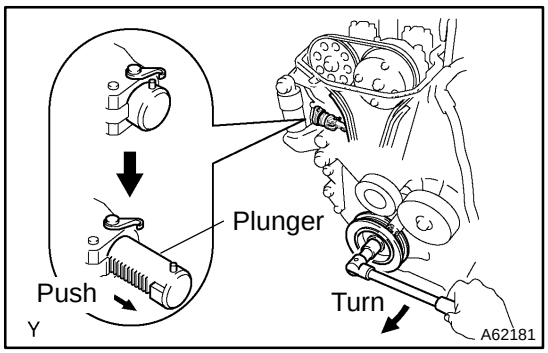
67. INSTALL CRANKSHAFT PULLEY

(a) Align the pulley set key with the key groove of the pulley, and slide on the pulley.

(b) Using SST, install the crankshaft pulley bolt.
SST 09960–10010 (09962–01000, 09963–01000)
Torque: 138 N·m (1,407 kgf·cm, 102 ft·lbf)

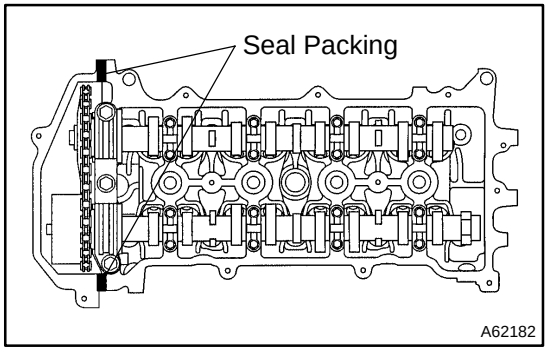


(c) Turn the crankshaft counter clockwise, and disconnect the plunger knock pin form the hook.



(d) Turn the crankshaft clockwise, and check that the slipper is pushed by the plunger.

HINT:
If the plunger does not spring out, press the slipper into the chain tensioner with a screwdriver so that the hook is released from the knock pin and the plunger springs out.

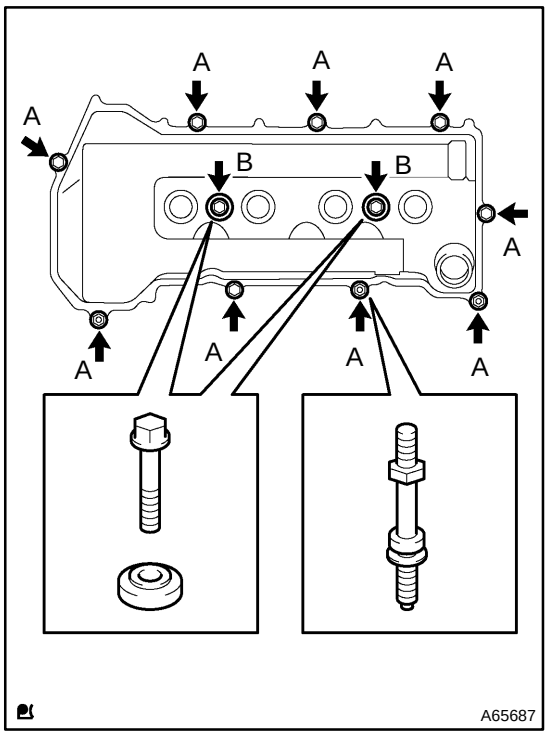


68. INSTALL CYLINDER HEAD COVER SUB–ASSY

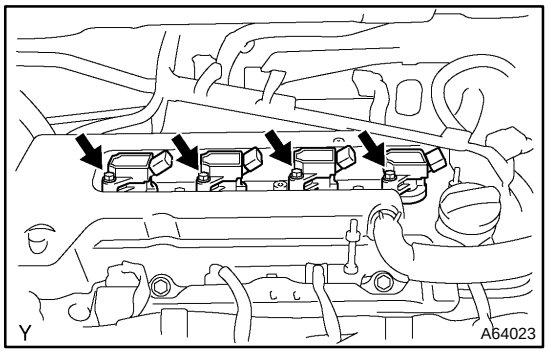
(a) Remove any old pacing (FIPG) material.

(b) Apply seal packing to 2 locations as shown in the illustration.
Seal packing: Part No. 08826–00080 or equivalent

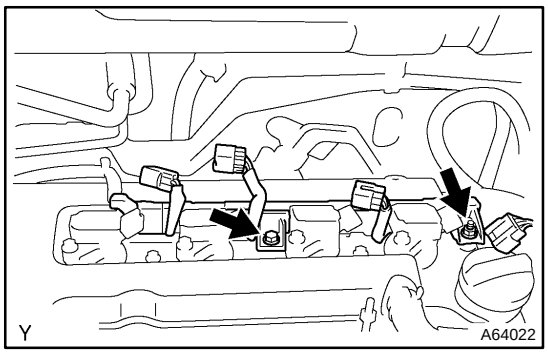
NOTICE:
- **Remove any oil from the contact surface.**
- **Install the cylinder head cover within 3 minutes after applying seal packing.**
- **Do not put into engine oil 2 hours after installing.**



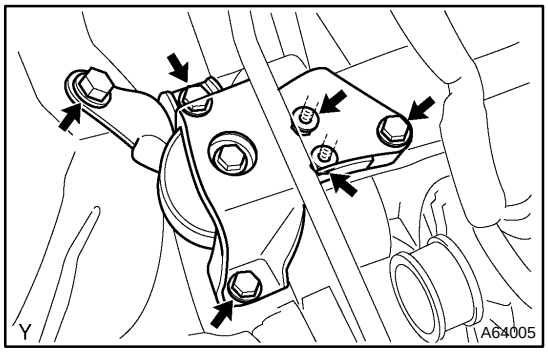
(c) Install the cylinder head cover and 3 cable brackets with the 9 bolts, 2 seal washers and 2 nuts. Uniformly tighten the bolts and nuts, in the several passes.
Torque:
A 11 N·m (112 kgf·cm, 8 ft·lbf)
B 9.0 N·m (92 kgf·cm, 80 in.·lbf)



69. INSTALL IGNITION COIL ASSY
(a) Install the 4 ignition coils with the 4 bolts.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

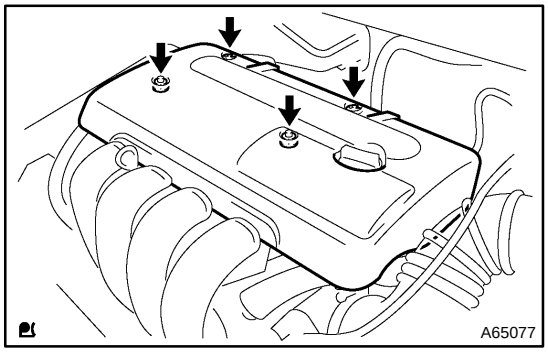


70. INSTALL ENGINE WIRE
(a) Install the engine wire with the bolt and nut.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)



71. INSTALL ENGINE MOUNTING INSULATOR SUB–ASSY RH
(a) Install the engine mounting insulator with the 4 bolts and 2 nuts.
Torque: 52 N·m (530 kgf·cm, 38 ft·lbf)

72. INSTALL EXHAUST PIPE ASSY FRONT (See page 15–2)
73. INSTALL VANE PUMP ASSY (See page 51–8)
74. INSTALL GENERATOR ASSY (See page 19–16)



75. INSTALL CYLINDER HEAD COVER NO.2
(a) Install the cylinder head cover with the 2 nuts and 2 clips.
Torque: 7.0 N·m (71 kgf·cm, 62 in.·lbf)

76. INSTALL FRONT WHEEL RH
Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)
77. ADD COOLANT (See page 16–7)
78. INSPECT COMPRESSION (See page 14–1)
SST 09992–00500
79. INSPECT CO/HC (See page 14–1)
80. INSPECT IGNITION TIMING (See page 14–1)
SST 09843–18040
81. CHECK ENGINE COOLANT LEAK (See page 16–7)
82. CHECK ENGINE OIL LEAK

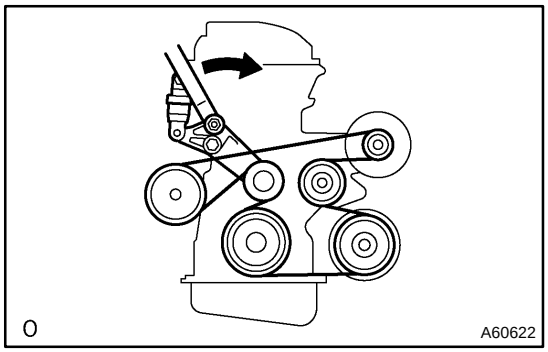
TIMING GEAR COVER OIL SEAL

140OM–01

REPLACEMENT

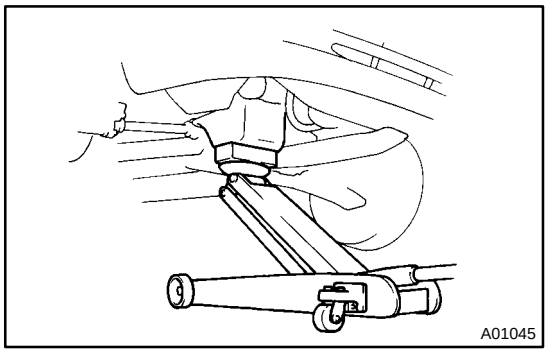
1. REMOVE ENGINE UNDER COVER RH

2. REMOVE FRONT WHEEL RH



3. REMOVE FAN AND GENERATOR V BELT

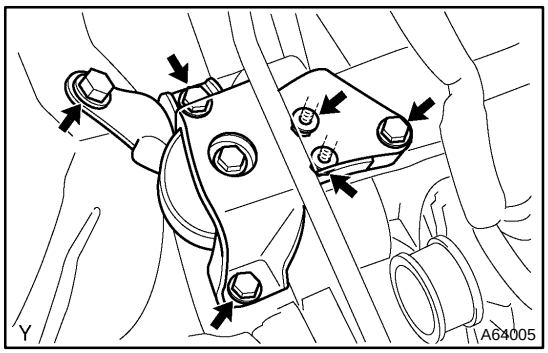
(a) Turn the V–ribbed belt tensioner slowly clockwise and loosen it. Then, remove the fan and generator belt V and put back the V–ribbed belt tensioner little by little and fix it quietly.

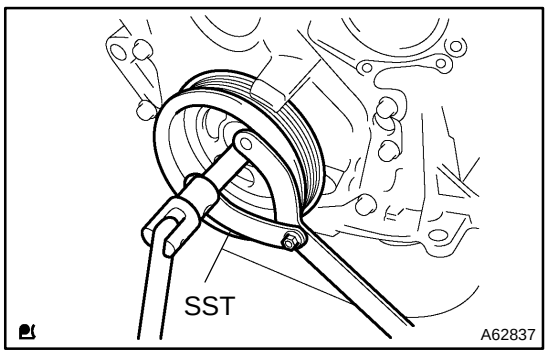


4. REMOVE ENGINE MOUNTING INSULATOR SUB–ASSY RH

(a) Remove the the PS oil pump reservoir and put it aside.

(b) Place a wooden block between the jack and engine, and set the jack. Then, remove the 4 bolts, the 2 nuts and engine mounting insulator RH.

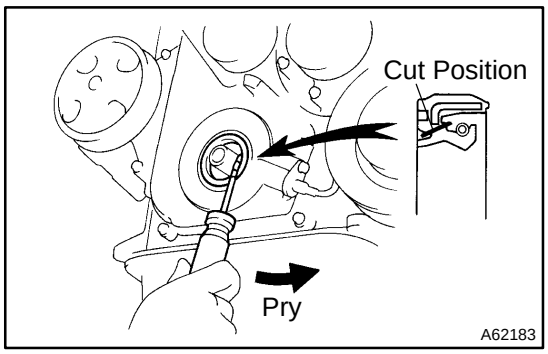




5. REMOVE CRANKSHAFT PULLEY

(a) Using SST, remove the crankshaft pulley bolt.
SST 09960–10010 (09962–01000, 09963–01000)

(b) Remove the crankshaft pulley from the crankshaft.



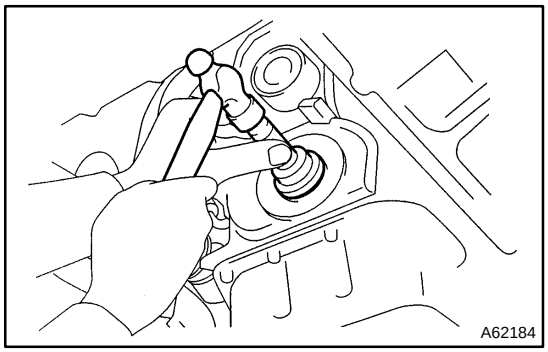
6. REMOVE TIMING GEAR COVER OIL SEAL

(a) Using a knife, cut off the oil seal lip.

(b) Using a screwdriver with taping its tip, pry out the oil seal.

NOTICE:

After the removal, check if the crankshaft is not damaged. If there is, mend it with a sandpaper (#400).



7. INSTALL TIMING GEAR COVER OIL SEAL

(a) Apply MP grease to a new oil seal lip.

NOTICE:

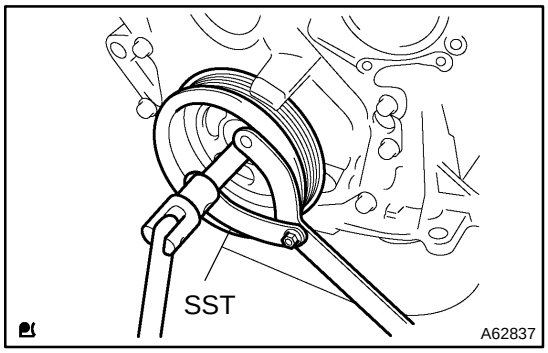
Keep the lip off foreign materials.

(b) Using SST, tap in the oil seal until its surface is flush with the timing chain cover edge.

SST 09223–22010

NOTICE:

Wipe off extra grease on the crankshaft.



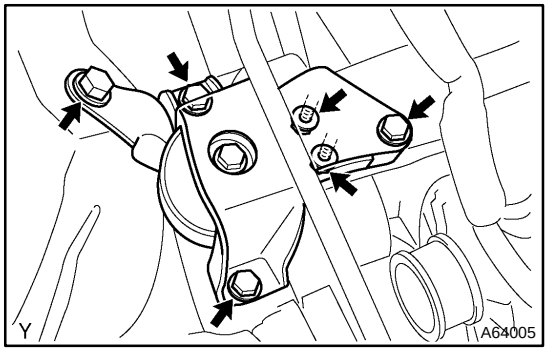
8. INSTALL CRANKSHAFT PULLEY

(a) Align the pulley set key with the key groove of the pulley, and slide on the pulley.

(b) Using SST, install the crankshaft pulley bolt.

SST 09960–10010 (09962–01000, 09963–01000)

Torque: 138 N·m (1,407 kgf·cm, 102 ft·lbf)



9. INSTALL ENGINE MOUNTING INSULATOR SUB–ASSY RH

(a) Install the engine mounting insulator RH with the 4 bolts and 2 nuts.

Torque: 52 N·m (530 kgf·cm, 38 ft·lbf)

10. INSTALL FRONT WHEEL RH

Torque: 103 N·m (1050 kgf·cm, 76 ft·lbf)

11. CHECK ENGINE OIL LEAK

ENGINE REAR OIL SEAL

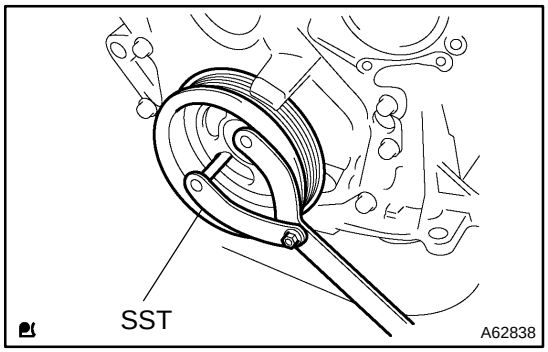
140ON–01

REPLACEMENT

1. **REMOVE MANUAL TRANSAXLE ASSY (M/T TRANSAXLE) (See page 41–17)**
2. **REMOVE AUTOMATIC TRANSAXLE ASSY (A/T TRANSAXLE) (See page 40–9)**
3. **REMOVE CLUTCH COVER ASSY (M/T TRANSAXLE) (See page 42–18)**

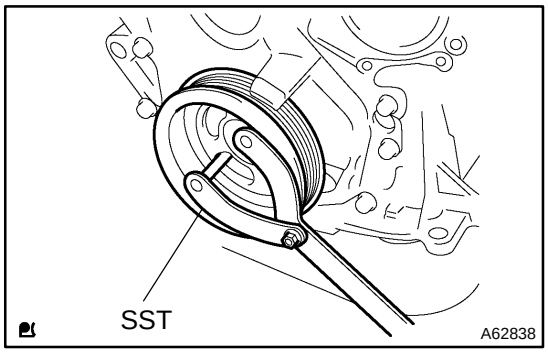
(a) Remove the 6 bolts and clutch cover.

4. **REMOVE CLUTCH DISC ASSY (M/T TRANSAXLE) (See page 42–18)**



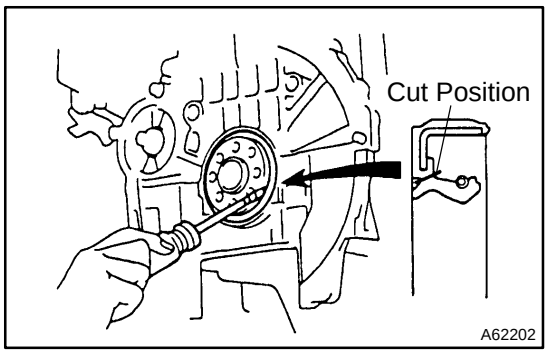
5. **REMOVE FLYWHEEL SUB–ASSY (M/T TRANSAXLE)**

(a) Fix the crankshaft with SST, then remove the 8 bolts and flywheel.
SST 09960–10010 (09962–01000, 09963–01000)



6. **REMOVE DRIVE PLATE & RING GEAR SUB–ASSY (A/T TRANSAXLE)**

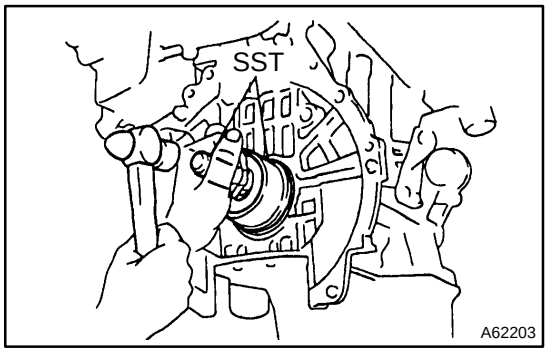
(a) Fix the crankshaft with SST, then remove the 8 bolts and drive plate & ring gear.
SST 09960–10010 (09962–01000, 09963–01000)



7. **REMOVE ENGINE REAR OIL SEAL**

(a) Using a knife, cut off the oil seal lip.
(b) Using a screwdriver with taping its tip, pry out the oil seal.

NOTICE:
After the removal, check if the crankshaft is not damaged. If there is, mend it with a sandpaper (#400).



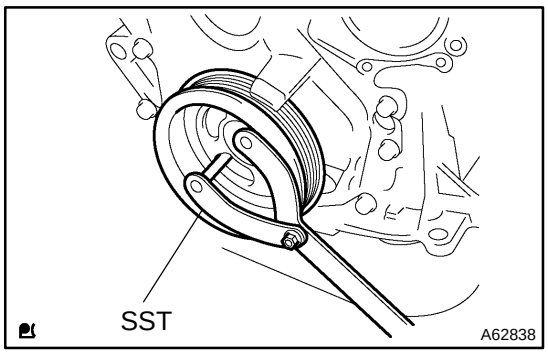
8. **INSTALL ENGINE REAR OIL SEAL**

(a) Apply MP grease to a new oil seal lip.

NOTICE:
Keep the lip off foreign materials.

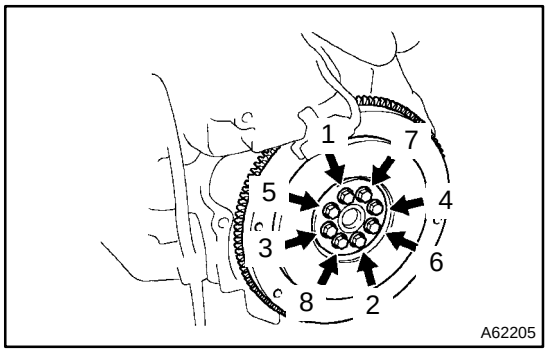
(b) Using SST, tap in the oil seal until its surface is flush with the rear oil seal retainer edge.
SST 09223–15020, 09950–70010 (09951–07100)

NOTICE:
Wipe off extra grease on the crankshaft.

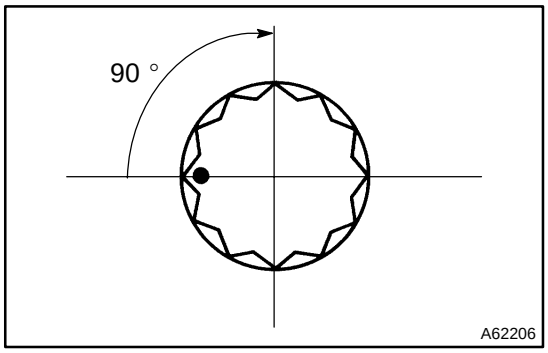


9. INSTALL FLYWHEEL SUB–ASSY (M/T TRANSAXLE)

(a) Fix the crankshaft with SST.
SST 09960–10010 (09962–01000, 09963–01000)



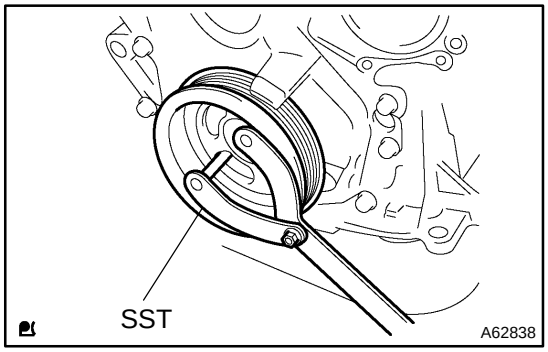
(b) Clean the bolt and bolt hole.
(c) Apply adhesive to the bolts.
Adhesive:
Part No. 09330–00070, THREE BOND or equivalent.
(d) Install and uniformly tighten the 8 bolts, in several passes, in the sequence shown.
Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)



(e) Mark the bolts with paint.
(f) Retighten the bolts by an additional 90°.
(g) Check that the point marked bolts are moved at 90° angle.

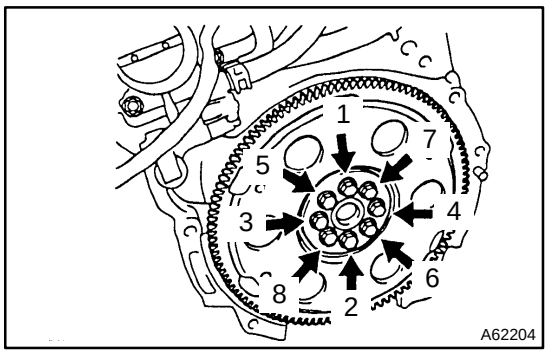
10. INSTALL CLUTCH DISC ASSY (M/T TRANSAXLE) (See page 42–18)
SST 09301–00210

11. INSTALL CLUTCH COVER ASSY (M/T TRANSAXLE) (See page 42–18)



12. INSTALL DRIVE PLATE & RING GEAR SUB–ASSY (A/T TRANSAXLE)

(a) Fix the crankshaft with SST.
SST 09960–10010 (09962–01000, 09963–01000)



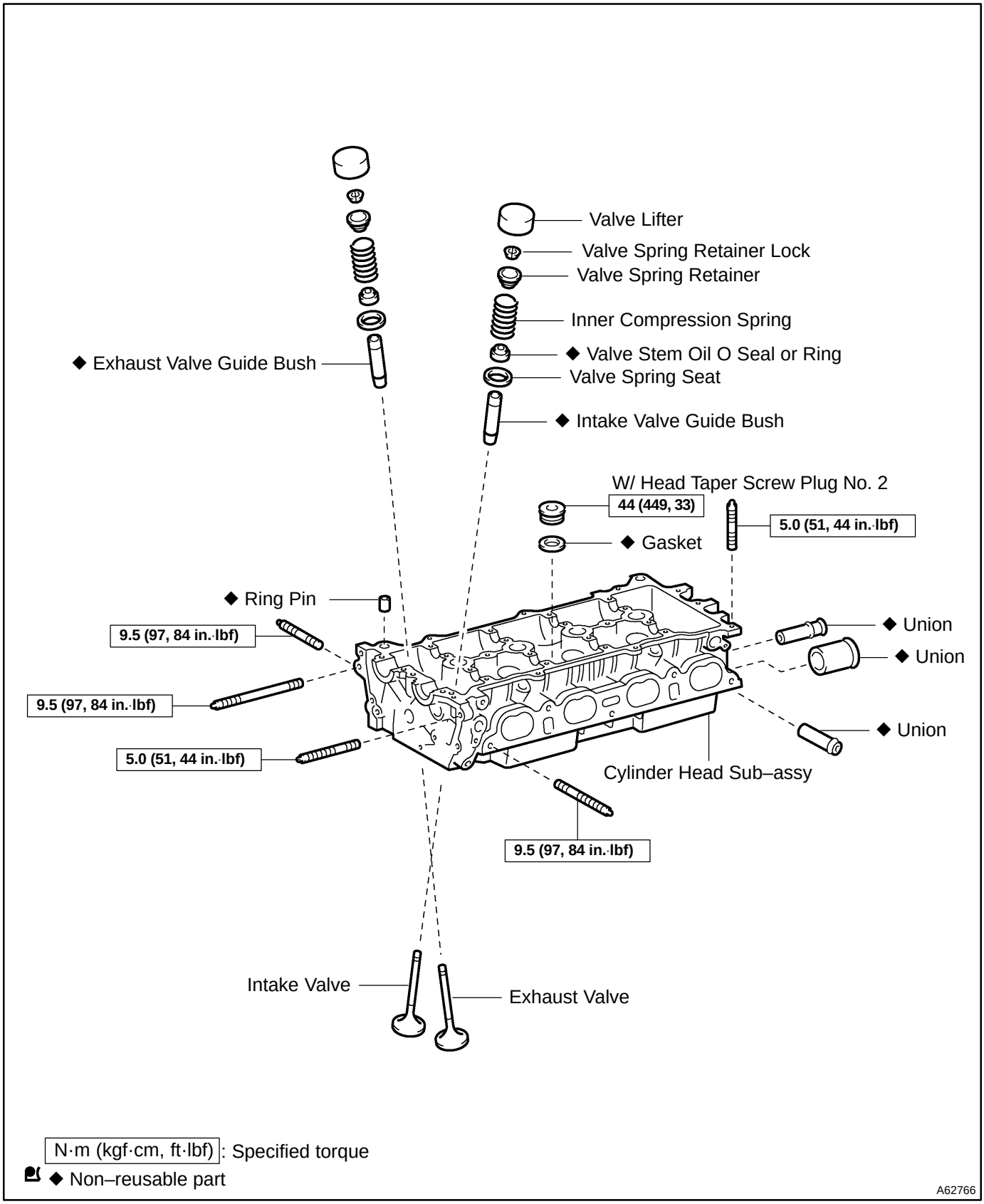
(b) Clean the bolt and bolt hole.
(c) Apply adhesive to the bolts.
Adhesive:
Part No. 09330–00070, THREE BOND or equivalent.
(d) Install and uniformly tighten the 8 bolts, in several passes, in the sequence shown.
(e) Fix the crankshaft with SST.
Torque: 88 N·m (897 kgf·cm, 65 ft·lbf)

13. INSTALL MANUAL TRANSAXLE ASSY (M/T TRANSAXLE) (See page 41–17)
14. INSTALL AUTOMATIC TRANSAXLE ASSY (A/T TRANSAXLE) (See page 40–9)

CYLINDER HEAD ASSY

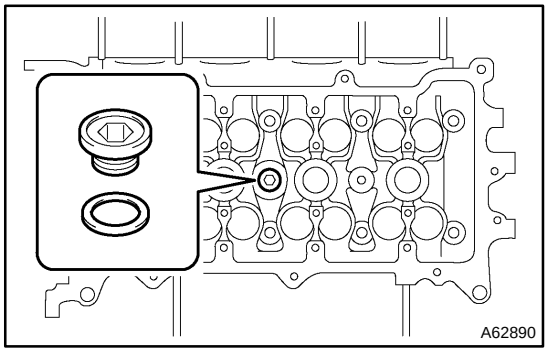
140Q6–02

COMPONENTS



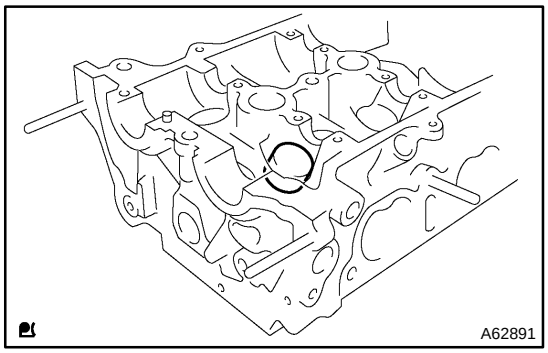
140Q7–04

OVERHAUL



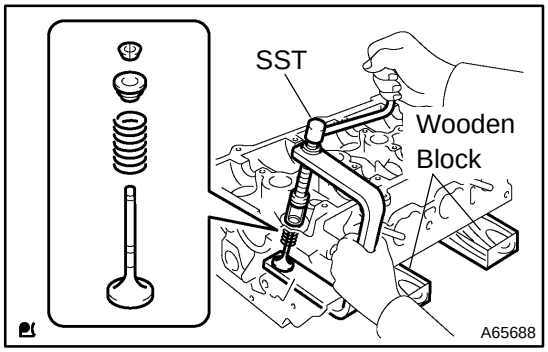
1. REMOVE W/HEAD TAPER SCREW PLUG NO.2

(a) Using a socket hexagon wench 10, remove the taper screw plug and gasket.



2. REMOVE VALVE LIFTER

(a) Remove the valve lifters from the cylinder head.



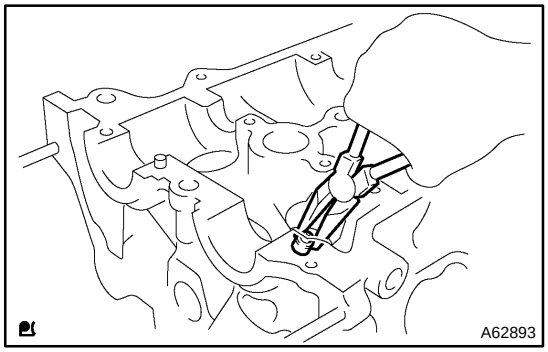
3. REMOVE VALVE

(a) Place the cylinder head on wooden blocks.

(b) Using SST, compress the inner compression spring and remove the 2 valve spring retainer locks.

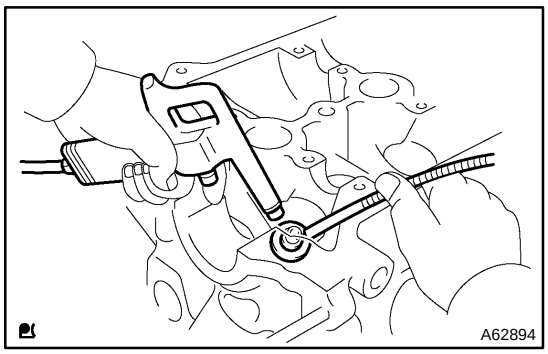
SST 09202–70020 (09202–00010, 09202–01010, 09202–01020)

(c) Remove the valve spring retainers, inner compression springs and valves from the cylinder head.



4. VALVE STEM OIL O SEAL OR RING

(a) Using a needle–nose pliers, remove the valve stem oil seals.

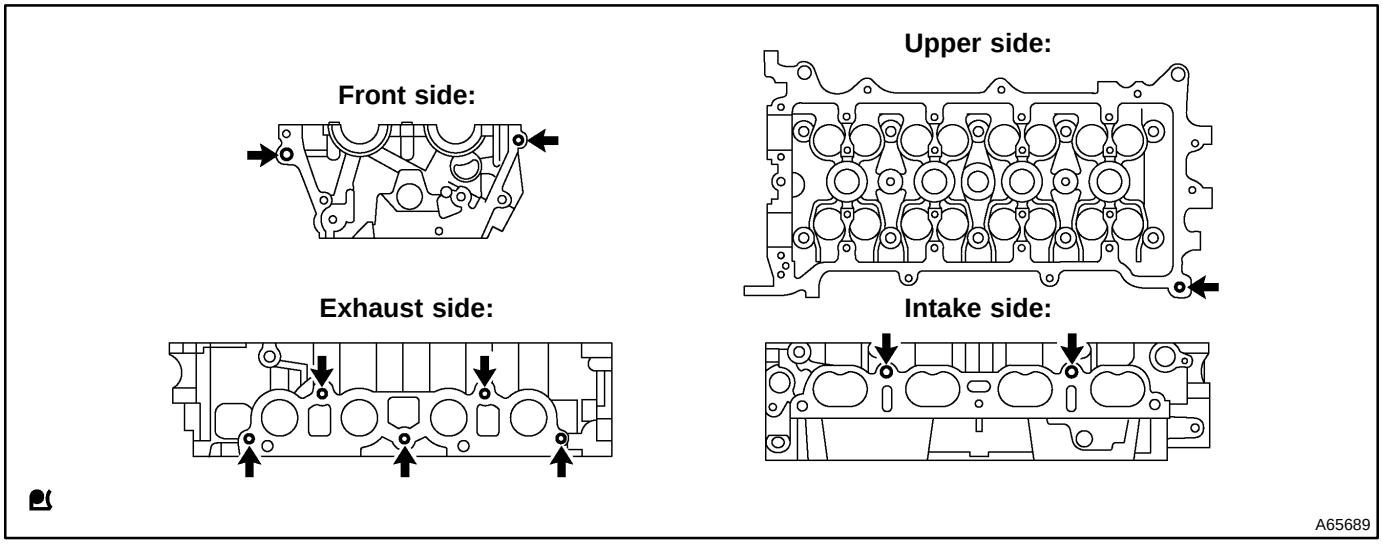


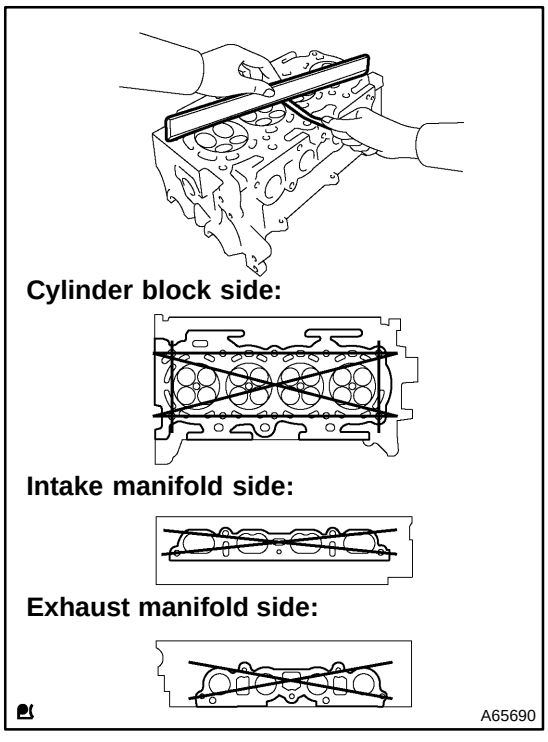
5. REMOVE VALVE SPRING SEAT

(a) Using a compressed air and a magnetic finger, remove the valve spring seats.

6. REMOVE STUD BOLT

(a) Using torx socket wrench E5 and E7, remove the 11 stud bolts.



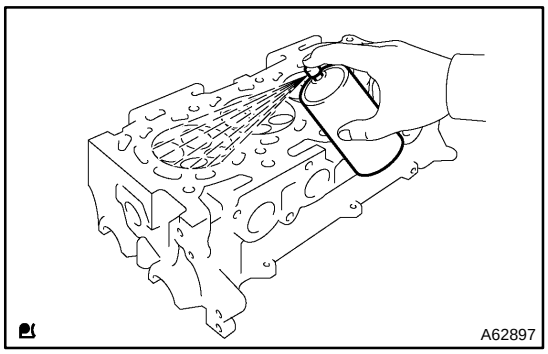


7. INSPECT CYLINDER HEAD FOR FLATNESS

(a) Using a precision straight edge and a feeler gauge, measure the surface contacting the cylinder block and the manifolds for warpage.

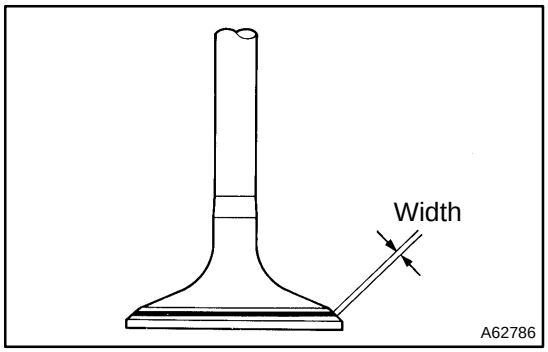
Maximum warpage:
Cylinder block side 0.05 mm (0.0020 in.)
Intake manifold side 0.10 mm (0.0039 in.)
Exhaust manifold side 0.10 mm (0.0039 in.)

If the warpage is greater than maximum, replace the cylinder head.



8. INSPECT CYLINDER HEAD FOR CRACKS

(a) Using a dye penetrate, check the combustion chamber, intake ports, exhaust ports and cylinder block surface for cracks.



9. INSPECT VALVE SEATS

(a) Apply a light coat of prussian blue (or white lead) to the valve face.

(b) Lightly press the valve against the seat.

NOTICE:

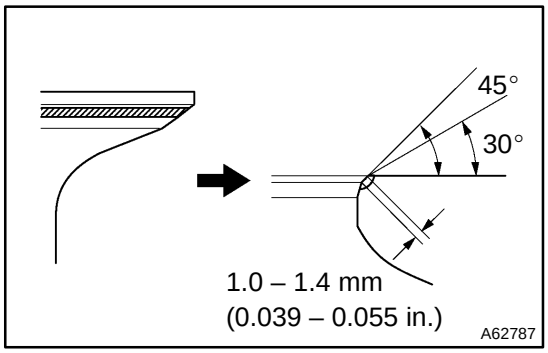
Do not rotate valve.

(c) Check the valve face and seat according to the following procedure.

(1) If blue appears 360° around the face, the valve is concentric. If not, replace the valve.

(2) If blue appears 360° around the valve seat, the guide and face are concentric. If not, resurface the seat.

(3) Check that the seat contact is in the middle of the valve face with the width between 1.0 – 1.4 mm (0.039 – 0.055 in.).

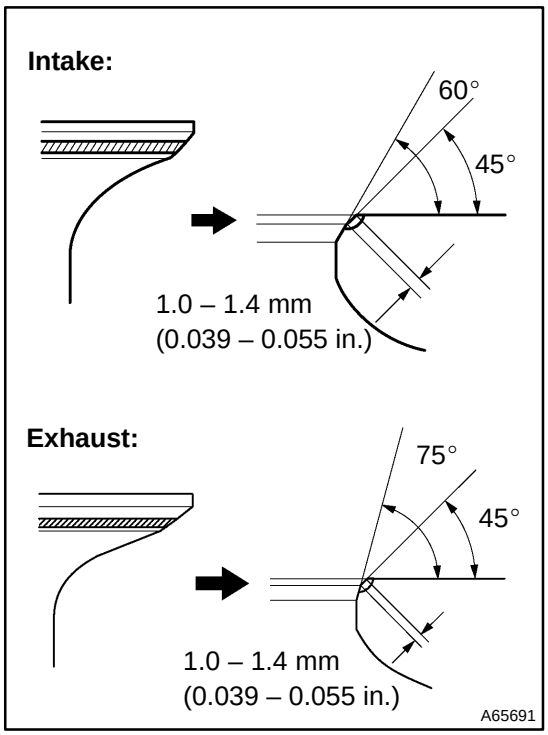


10. REPAIR VALVE SEATS

NOTICE:

Take off a cutter gradually to make smooth valve seats.

(a) If the seating is too high on the valve face, use 30° and 45° cutters to correct the seat.

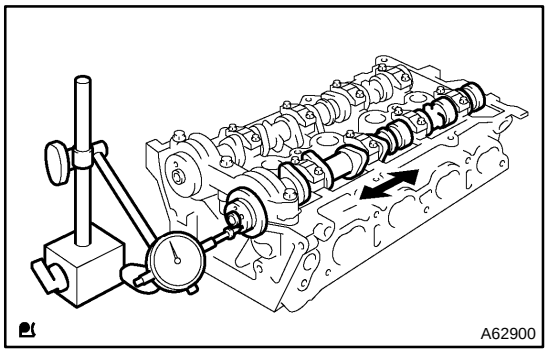


(b) Intake:
  (1) If the seating is too low on the valve face, use 60° and 45° cutters to correct the seat.

(c) Exhaust:
  (1) If the seating is too low on the valve face, use 75° and 45° cutters to correct the seat.

(d) Hand–lap the valve and valve seat with an abrasive compound.

(e) Check the valve seating position.



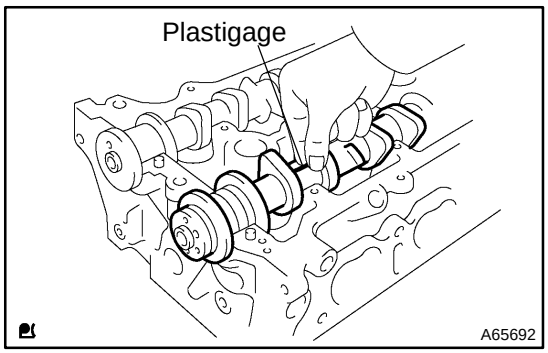
11. INSPECT CAMSHAFT THRUST CLEARANCE

(a) Install the 2 camshafts.

(b) Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.

Standard thrust clearance:
0.040 – 0.095 mm (0.0016 – 0.0037 in.)
Maximum thrust clearance: 0.110 mm (0.0043 in.)

If the thrust clearance is greater than maximum, replace the cylinder head. If damages are found on the camshaft thrust surfaces, the camshaft also has to be replaced.



12. INSPECT CAMSHAFT OIL CLEARANCE

(a) Clean the bearing caps and camshaft journals.

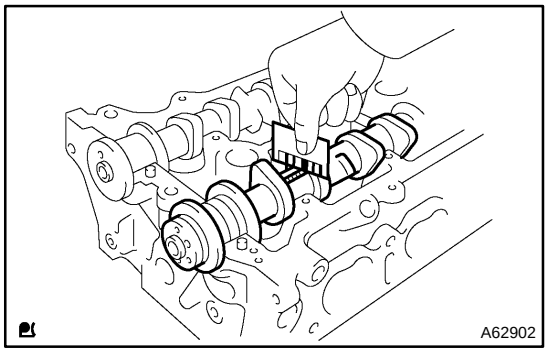
(b) Place the camshafts on the cylinder head.

(c) Lay a strip of plastigage across each of the camshaft journal.

(d) Install the bearing caps. (See page 14–45)

NOTICE:
Do not turn the camshaft.

(e) Remove the bearing caps. (See page 14–45)

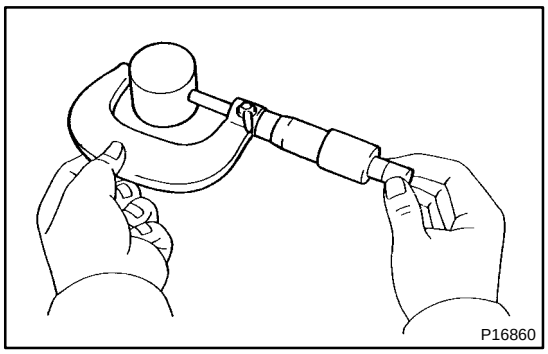


(f) Measure the plastigage at its widest point.

Standard oil clearance:
0.035 – 0.072 mm (0.0014 – 0.0028 in.)
Maximum oil clearance: 0.10 mm (0.0039 in.)

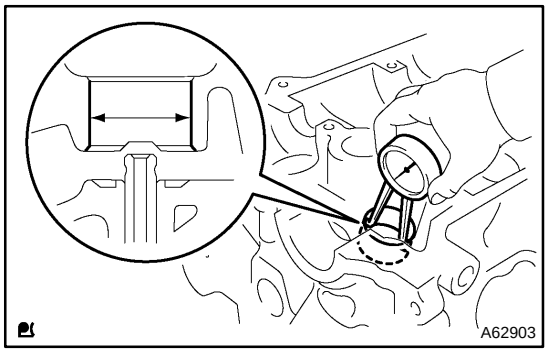
NOTICE:
Completely remove the plastigage after the measuring.

If the oil clearance is greater than maximum, replace the cylinder head.



13. INSPECT VALVE LIFTER

(a) Using a micrometer, measure the valve lifter diameter.
Lifter diameter:
30.966 – 30.976 mm (1.2191 – 1.2195 in.)



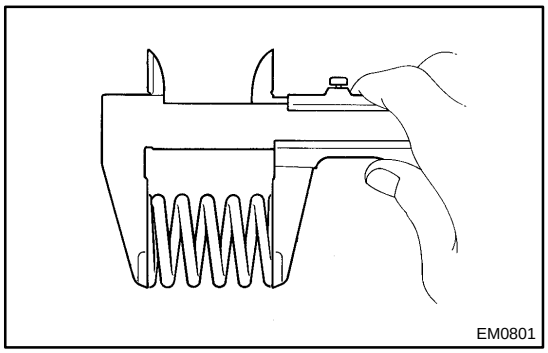
14. INSPECT VALVE LIFTER OIL CLEARANCE

(a) Using a caliper gauge, measure the valve lifter bore diameter of the cylinder head.
Lifter bore diameter:
31.000 – 31.025 mm (1.2205 – 1.2215 in.)

(b) Subtract the valve lifter diameter measurement from the valve lifter bore diameter measurement.
Standard oil clearance:
0.024 – 0.059 mm (0.0009 – 0.0023 in.)
Maximum oil clearance: 0.079 mm (0.0031 in.)

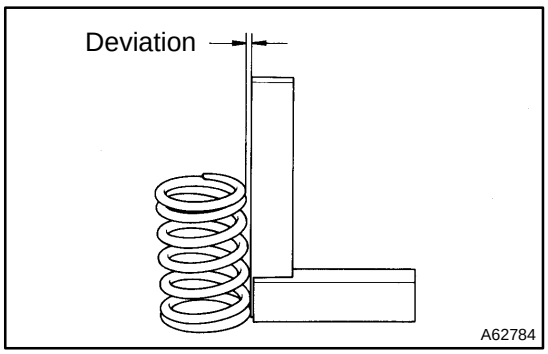
If the oil clearance is greater than maximum, replace the valve lifter.

If necessary, replace the cylinder head.



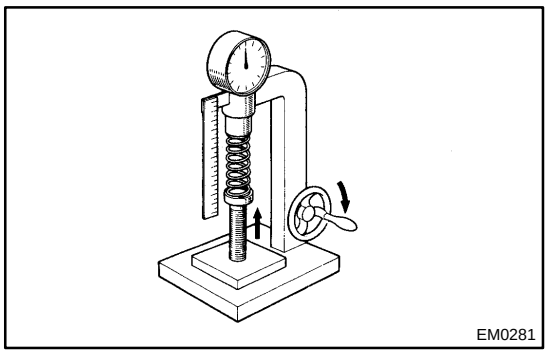
15. INSPECT INNER COMPRESSION SPRING

(a) Using a vernier caliper, measure the free length of the inner compression spring.
Free length: 43.40 mm (1.7087 in.)



(b) Using a steel square, measure the deviation of the inner compression spring.
Maximum deviation: 1.6 mm (0.063 in.)
Maximum angle (reference): 2°

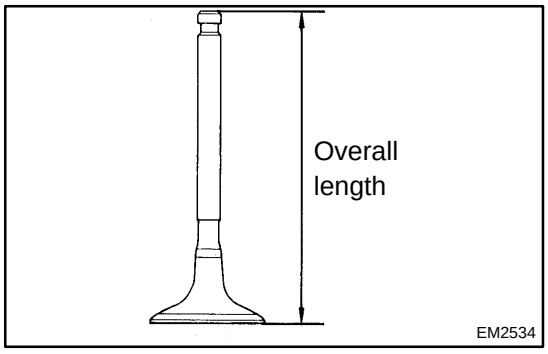
If the deviation is greater than maximum, replace the inner compression spring.


EM0281

(c) Using a spring tester, measure the tension of the inner compression spring at the specified installed length.
Installed tension:
158.6 – 175.4 N (16.2 – 17.9 kgf, 35.7 – 39.5 lbf)
at 33.6 mm (1.323 in.)
Maximum working tension:
335.3 – 370.7 N (34.2 – 37.8 kgf, 75.4 – 83.3 lbf)
at 24.1 mm (0.949 in.)

If the installed tension is not as specified, replace the inner compression spring.

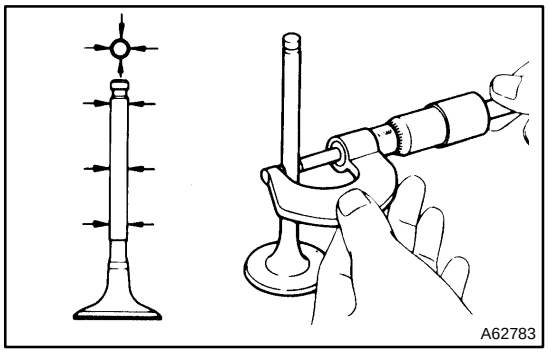
16. INSPECT VALVE



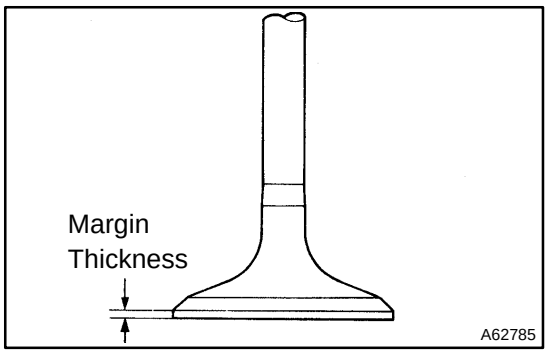
EM2534

(a) Using a vernier calipers, check the valve overall length.
Standard overall length:
Intake 88.65 mm (3.4902 in.)
Exhaust 88.69 mm (3.4917 in.)
Minimum overall length:
Intake 88.35 mm (3.4784 in.)
Exhaust 88.39 mm (3.4799 in.)

If the overall length is less than minimum, replace the valve.


A62783

(b) Using a micrometer, measure the diameter of the valve stem.
Valve stem diameter:
Intake 5.470 – 5.485 mm (0.2154 – 0.2159 in.)
Exhaust 5.465 – 5.480 mm (0.2152 – 0.2158 in.)

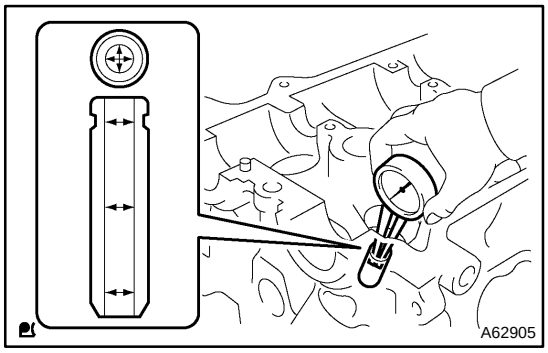


A62785

(c) Using a vernier calipers, check the valve head margin thickness.
Standard margin thickness: 1.0 mm (0.039 in.)
Minimum margin thickness: 0.7 mm (0.028 in.)

If the overall length is less than minimum, replace the valve.

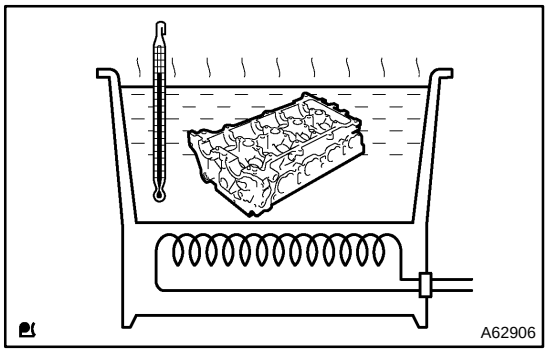
17. INSPECT VALVE GUIDE BUSHING OIL CLEARANCE


A62905

(a) Using a caliper gauge, measure the inside diameter of the valve guide bush.
Busing inside diameter:
5.510 – 5.530 mm (0.2169 – 0.2177 in.)

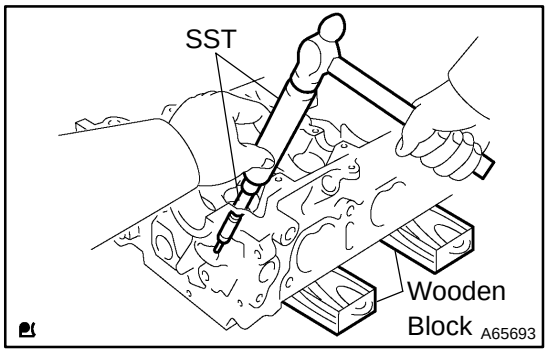
(b) Subtract the valve stem diameter measurement from the guide bushing inside diameter measurement.
Standard oil clearance:
Intake 0.025 – 0.060 mm (0.0010 – 0.0024 in.)
Exhaust 0.030 – 0.065 mm (0.0012 – 0.0026 in.)
Maximum oil clearance:
Intake 0.08 mm (0.0032 in.)
Exhaust 0.10 mm (0.0039 in.)

If the oil clearance is greater than maximum, replace the valve and valve guide bushing.



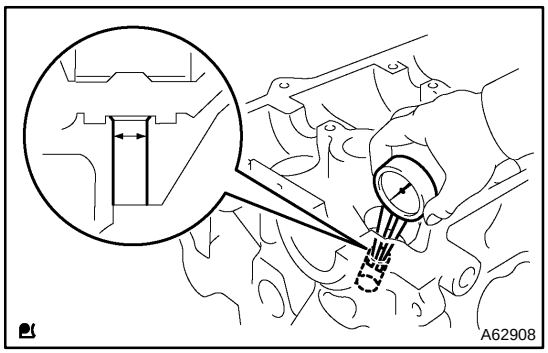
18. REPLACE VALVE GUIDE BUSHING

(a) Heat the cylinder head to 80 – 100°C (176 – 212°F).



(b) Place the cylinder head on the wooden blocks.

(c) Using SST, tap out the valve guide bushing.
SST 09201–10000, 09201–01055, 09950–70010 (09951–07100)

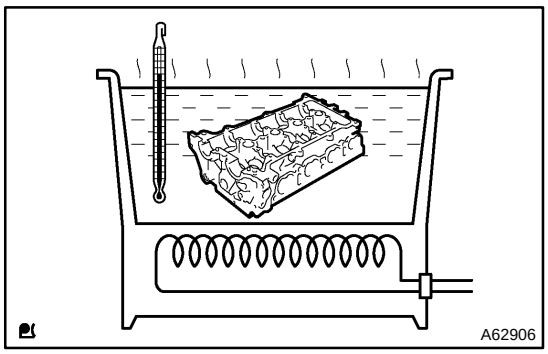


(d) Using a caliper gauge, measure the bushing bore diameter of the cylinder head.
Diameter: 10.285 – 10.306 mm (0.4049 – 0.4058 in.)

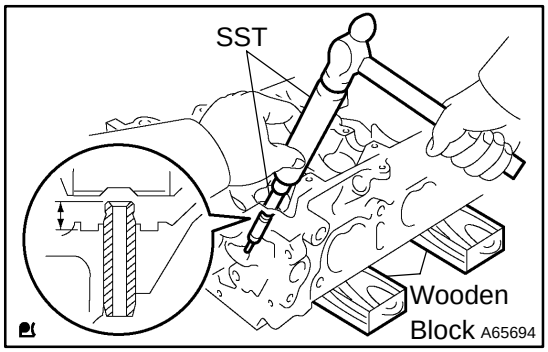
If the bushing bore diameter of the cylinder head is greater than 10.306 mm (0.4058 in.), machine the bushing bore to the dimension of 10.335 – 10.356 mm (0.4069 – 0.4077 in.) to install a over size valve guide bushing.

HINT:

Valve guide bushing size	Bushing bore diameter mm (in.)
STD	10.285 – 10.306 (0.4049 – 0.4058)
O/S 0.05	10.335 – 10.356 (0.4069 – 0.4077)



(e) Heat the cylinder head to 80 – 100°C (176 – 212°F).

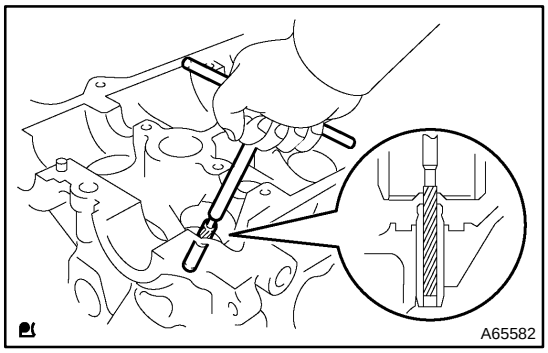


(f) Place the cylinder head on wooden blocks.

(g) Using SST, tap in a new valve guide bushing to the specified protrusion height.

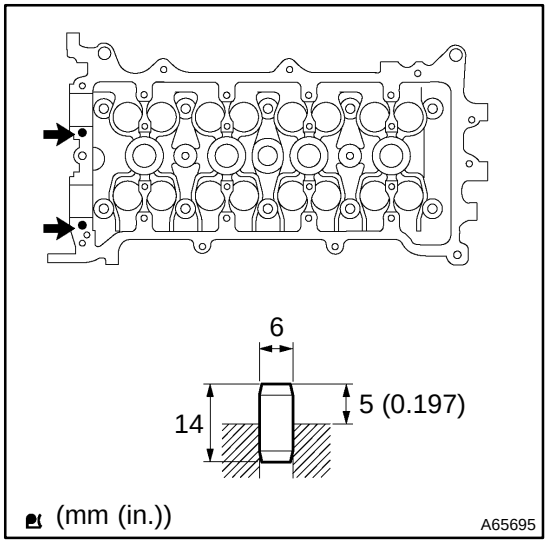
SST 09201–10000, 09201–01055, 09950–70010 (09951–07100)

Protrusion height: 8.7 – 9.1 mm (0.343 – 0.358 in.)



(h) Using a sharp 5.5 mm reamer, ream the valve guide bushing to obtain the standard specified clearance.

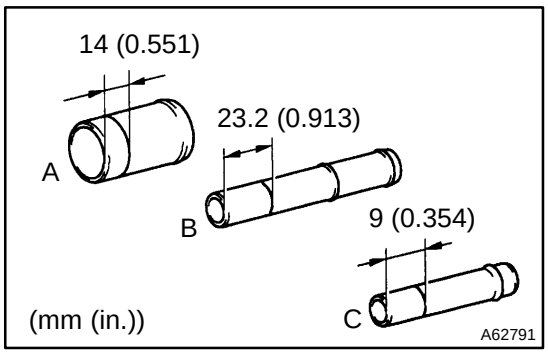
Standard oil clearance:
Intake 0.025 – 0.060 mm (0.0010 – 0.0024 in.)
Exhaust 0.030 – 0.065 mm (0.0012 – 0.0026 in.)



19. INSTALL STRAIGHT PIN

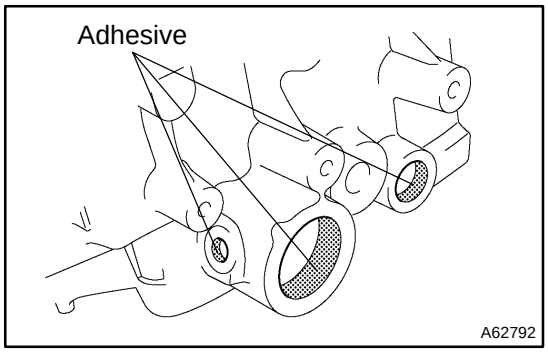
(a) Using a plastic hammer, install the new 2 straight pins.

Standard protrusion: 5 mm (0.197 in.)



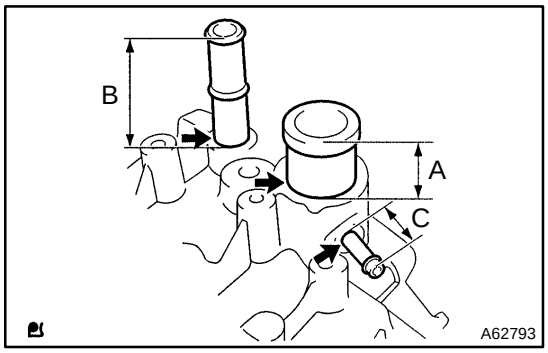
20. INSTALL UNION

(a) Mark the standard position away from the edge, onto the water hose union as shown in the illustration.



(b) Apply adhesive to the water hose union hole of the cylinder head.

Adhesive:
Part No. 08833–00070, THREE BOND 1324 or equivalent.



(c) Using a press, press in a new water hose union until the standard marks come to the level of the cylinder head surface.

Standard protrusion:
A 29 mm (1.142 in.)
B 66.5 mm (2.618 in.)
C 24 mm (0.945 in.)

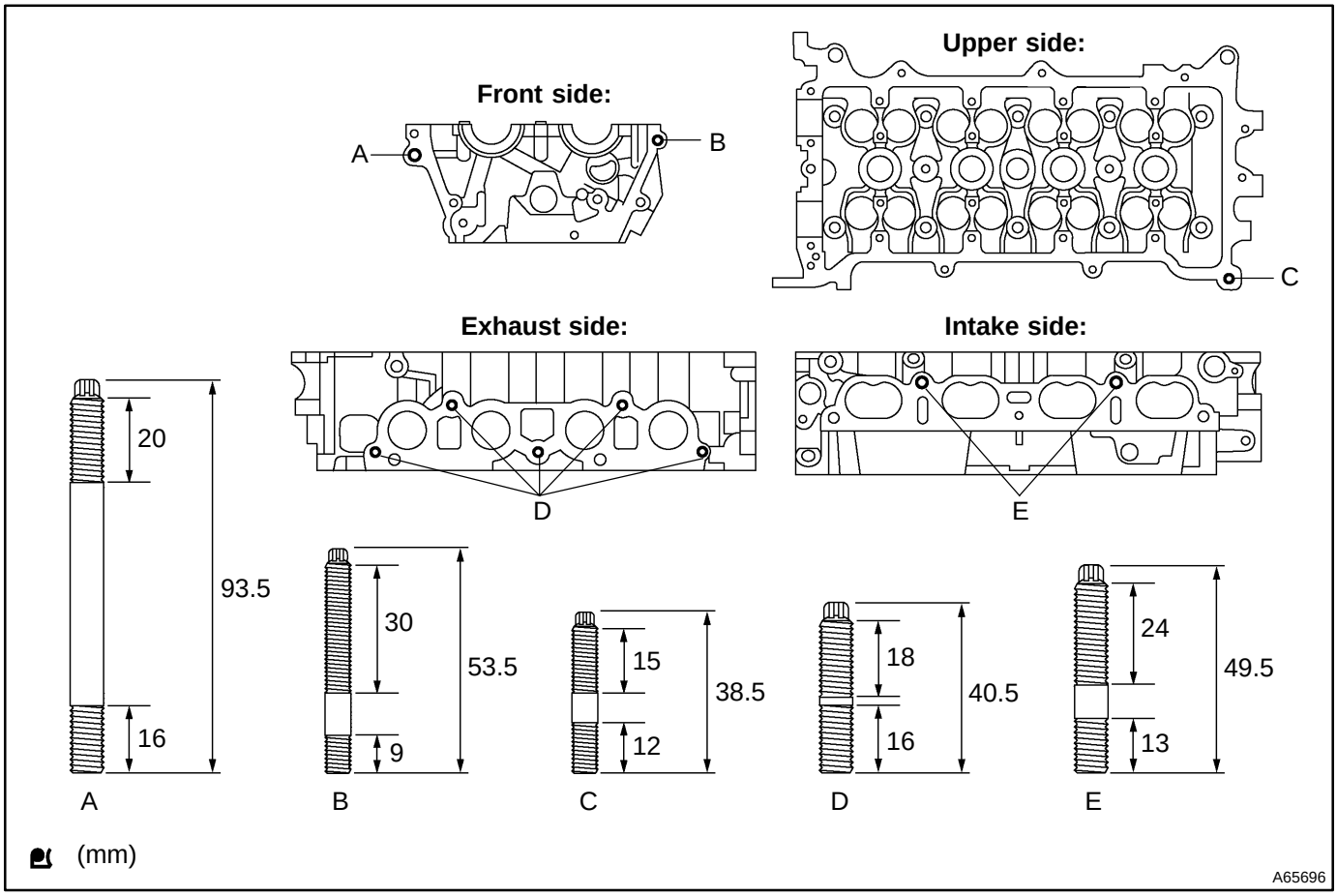
NOTICE:

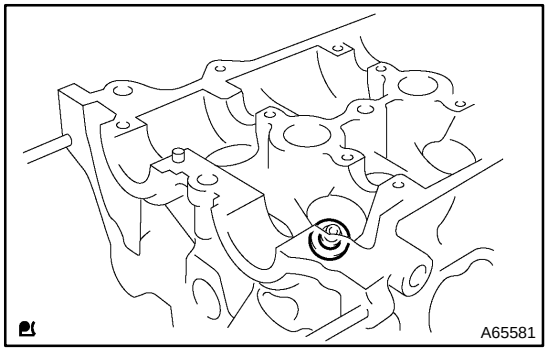
- **Install the water hose union within 3 minutes after applying adhesive.**
- **Do not put into coolant within an hour after installing.**

21. INSTALL STUD BOLT

(a) Using torx socket wrench E5 and E7, install the 11 stud bolts,

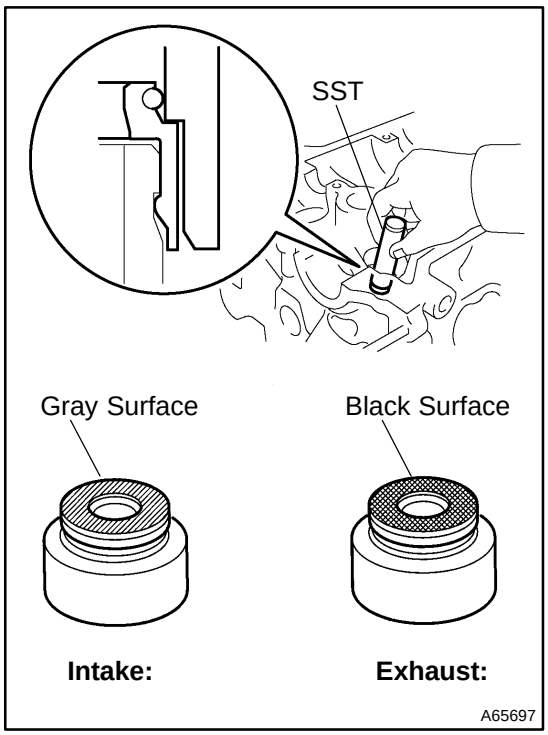
Torque:
Stud bolt A, D and E 9.5 N·m (97 kgf·cm, 84 in.·lbf)
Stud bolt B and C 5.0 N·m (51 kgf·cm, 44 in.·lbf)





22. INSTALL VALVE SPRING SEAT

(a) Install the valve spring seats to the cylinder head.



23. INSTALL VALVE STEM OIL O SEAL OR RING

(a) Apply a light coat of engine oil to a new valve stem oil seals.

NOTICE:

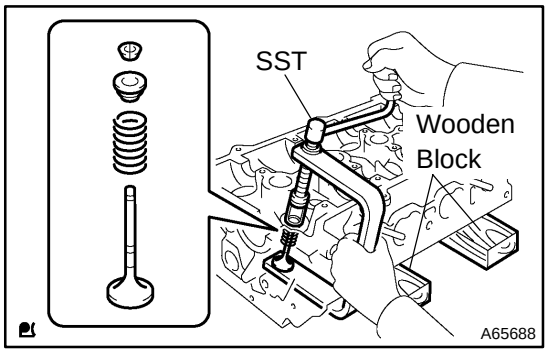
Be very careful to assemble the oil seal for intake and exhaust. Assembling the wrong one may cause a failure.

HINT:

The intake valve stem oil seal is gray and exhaust valve stem oil seal is black.

(b) Using SST, push in the valve stem oil seals.

SST 09201–41020



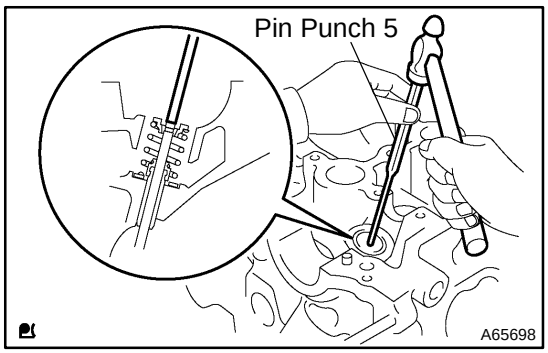
24. INSTALL VALVE

(a) Place the cylinder head on wooden blocks.

(b) Install the valves, inner compression springs and valve spring retainers to the cylinder head.

(c) Using SST, compress the inner compression spring, and place the 2 valve spring retainer locks around the valve stem.

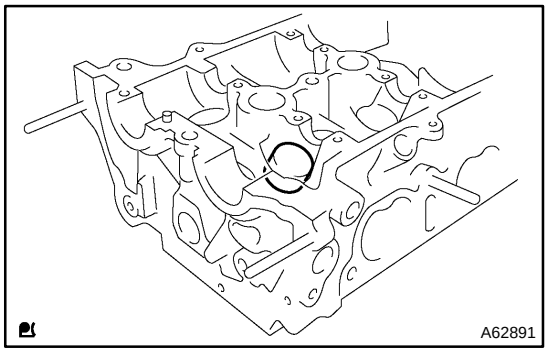
SST 09202–70020 (09202–00010, 09202–01010, 09202–01020)



(d) Using a pin punch 5, lightly tap the valve stem tip to ensure a proper fit.

NOTICE:

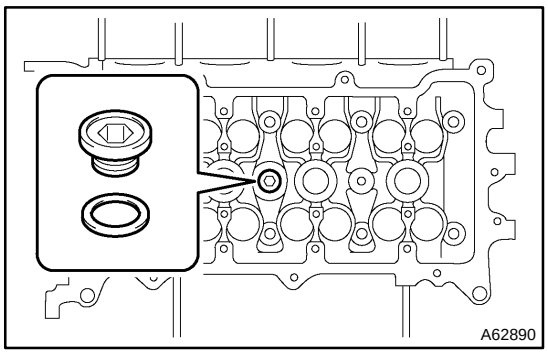
Be careful not to damage the valve stem tip.



25. INSTALL VALVE LIFTER

(a) Apply a light coat of engine oil to the valve lifters.

(b) Install the valve lifters to the cylinder head.



26. INSTALL W/HEAD TAPER SCREW PLUG NO.2

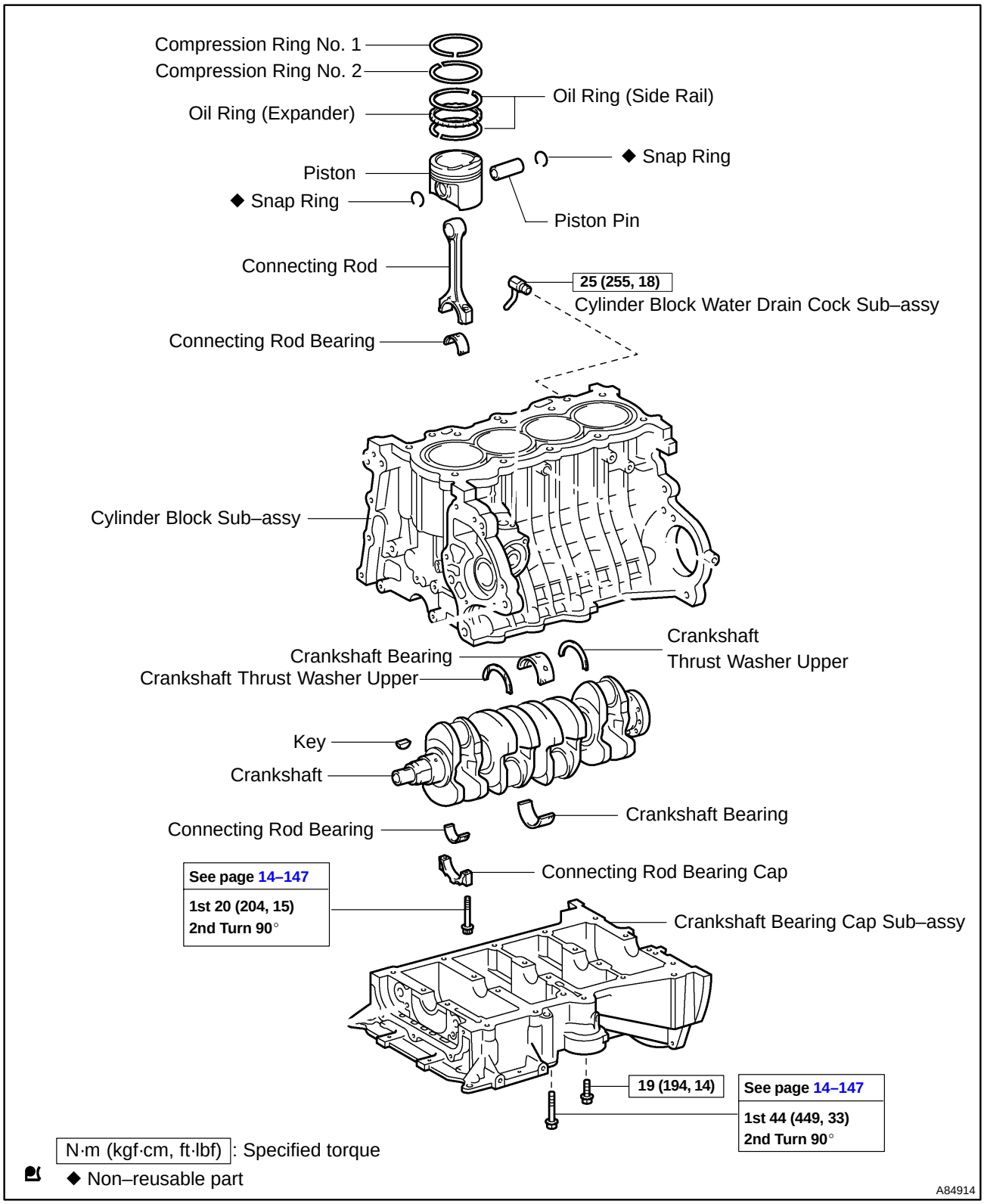
(a) Using a socket hexagon wrench 10, install the taper screw plug with a new gasket.

Torque: 44 N·m (449 kgf·cm, 33 ft·lbf)

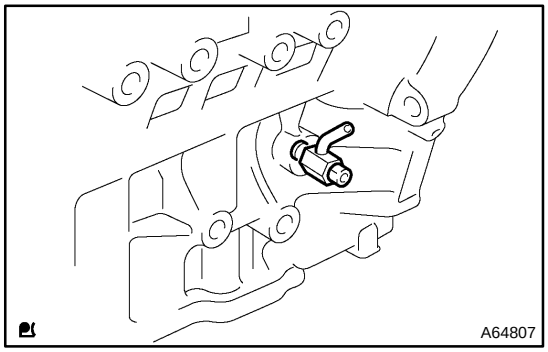
CYLINDER BLOCK ASSY (April, 2003)

COMPONENTS

140Q8–05

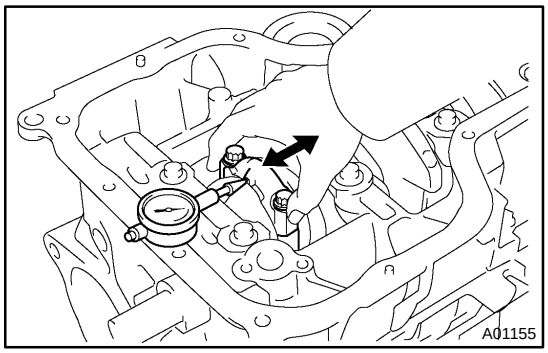


OVERHAUL



1. REMOVE CYLINDER BLOCK WATER DRAIN COCK SUB–ASSY

(a) Remove the cylinder block water drain cock from the cylinder block.

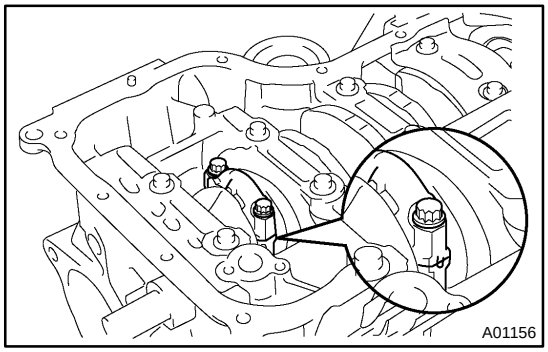


2. INSPECT CONNECTING ROD THRUST CLEARANCE

(a) Using a dial indicator, measure the thrust clearance while moving the connecting rod back and forth.

Standard thrust clearance:
0.160 to 0.342 mm (0.0063 to 0.0135 in.)
Maximum thrust clearance:
0.342 mm (0.0135 in.)

- If the thrust clearance is greater than maximum, replace the connecting rod.
- If necessary, replace the crankshaft.



3. INSPECT CONNECTING ROD OIL CLEARANCE

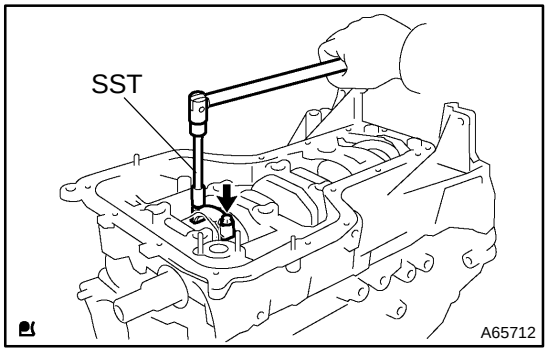
NOTICE:

Do not turn the crankshaft.

(a) Using marking paint, write the matched cylinder number on each connecting rod and cap.

HINT:

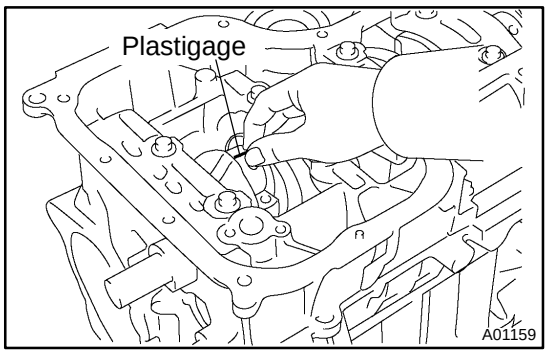
The match marks on the connecting rods and caps are for ensuring correct reassembly.



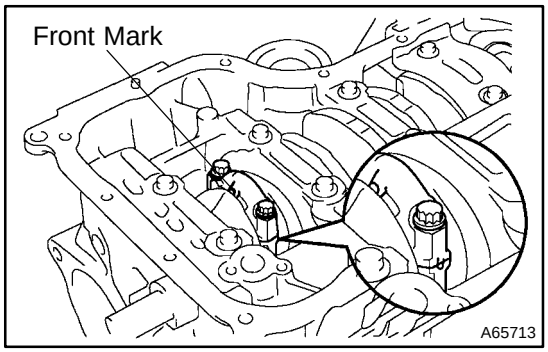
(b) Using SST, remove the 2 bolts and connecting rod cap.
SST 09205–16010

(c) Clean the crank pin and bearing.

(d) Check the crank pin and bearing for pitting and scratches.

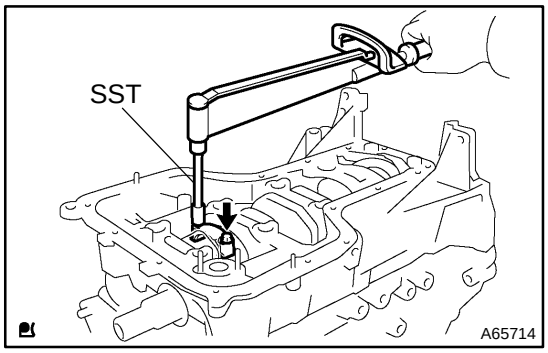


(e) Lay a strip of the Plastigage across the crank pin.

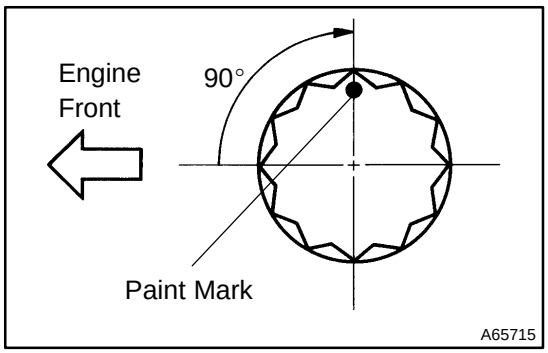


(f) Check that the front mark of the connecting rod cap is facing the correct direction.

(g) Apply a light coat of engine oil on the threads and under the heads of the connecting rod cap bolts.



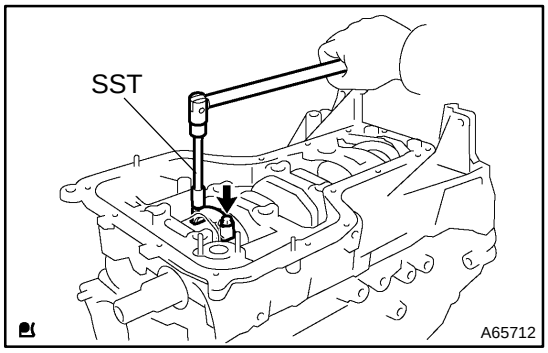
(h) Using SST, tighten the bolts in several passes by the specified torque.
SST 09205–16010
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)



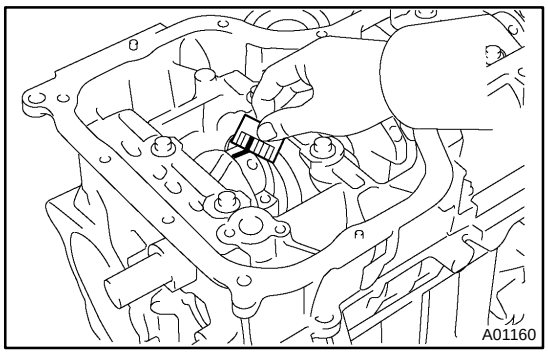
(i) Mark the front of the connecting cap bolts with paint.

(j) Retighten the cap bolts by 90° as shown in the illustration.

(k) Check that the crankshaft turns smoothly.



(l) Remove the 2 bolts and connecting rod cap.



(m) Measure the Plastigage at its widest point.

Standard oil clearance:
0.028 to 0.060 mm (0.0011 to 0.0024 in.)
Maximum oil clearance: 0.080 mm (0.0031 in.)

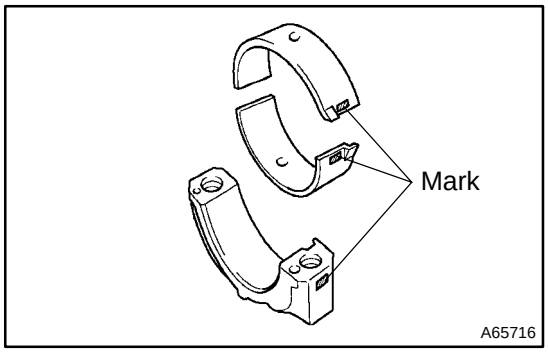
NOTICE:

Remove the Plastigage completely after the measurement.

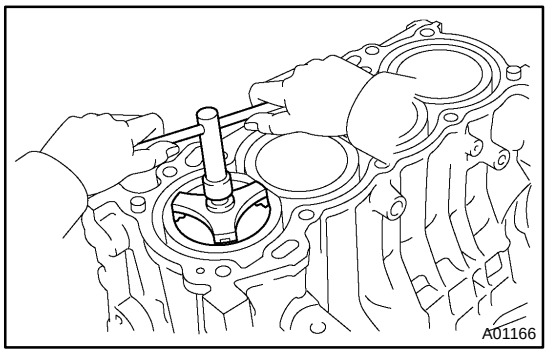
- If the oil clearance is greater than maximum, replace the connecting rod bearing.
- If necessary, grind or replace the crankshaft.

HINT:

If replacing a bearing, select a new one having the same number as marked on the connecting rod. There are 3 sizes of standard bearings, marked ”1”, ”2” and ”3” accordingly.

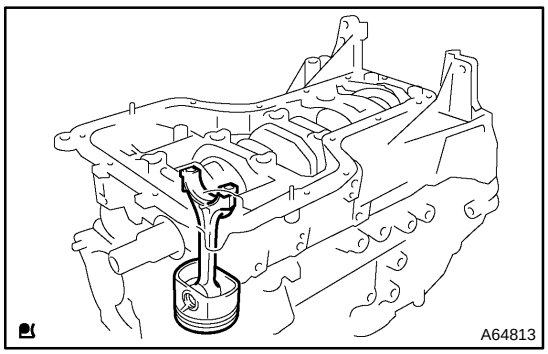


Item	Mark	mm (in.)
Connecting rod large end bore diameter	1 2 3	47.000 to 47.008 (1.8504 to 1.8507) 47.009 to 47.016 (1.8507 to 1.8510) 47.017 to 47.024 (1.8511 to 1.8513)
Connecting rod bearing thickness	1 2 3	1.486 to 1.490 (0.0585 to 0.0587) 1.491 to 1.494 (0.0587 to 0.0588) 1.495 to 1.498 (0.0589 to 0.0590)
Crankshaft pin outer diameter	–	43.992 to 44.000 (1.7320 to 1.7323)



4. REMOVE CONNECTING ROD SUB–ASSY

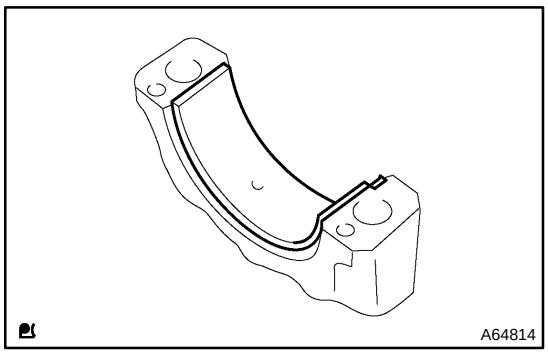
(a) Using a ridge reamer, remove all the carbon from the top of the cylinder.



(b) Push the piston, connecting rod assembly and upper bearing through the top of the cylinder block.

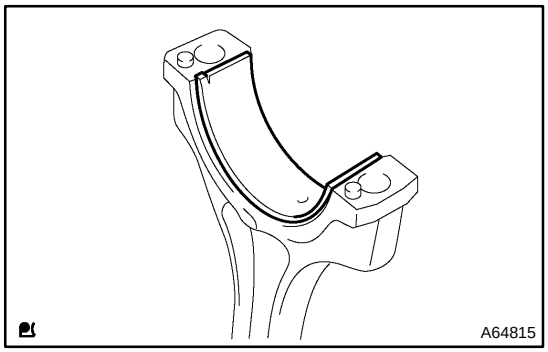
HINT:

- Keep the bearing, connecting rod and cap together.
- Arrange the piston and connecting rod assemblies in the correct order.

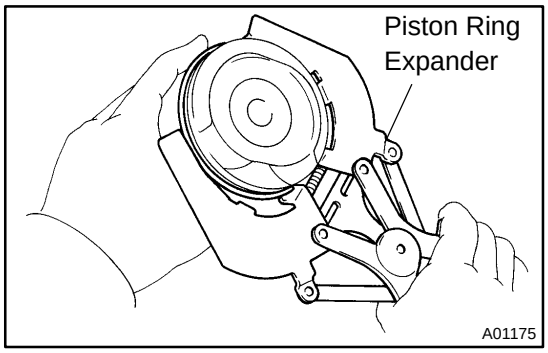


5. REMOVE CONNECTING ROD BEARING

(a) Remove the connecting rod bearing from the connecting rod cap.



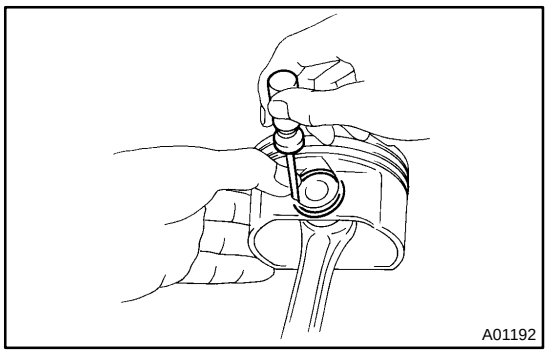
(b) Remove the connecting rod bearing from the connecting rod.



6. REMOVE PISTON RING SET

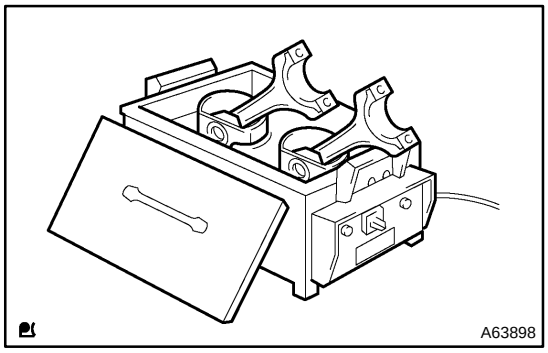
(a) Using a piston ring expander, remove the 2 compression rings.

(b) Remove the 2 side rails and oil ring by hand.

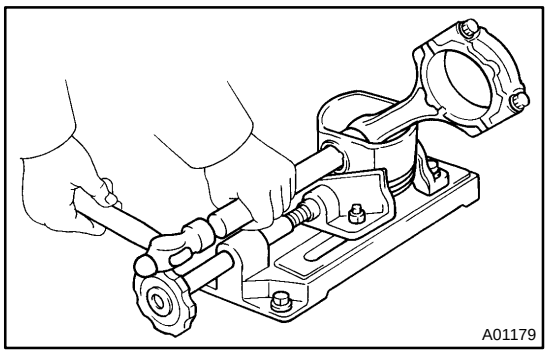


7. REMOVE W/PIN PISTON SUB–ASSY

(a) Using a small screwdriver, pry out the 2 snap rings.



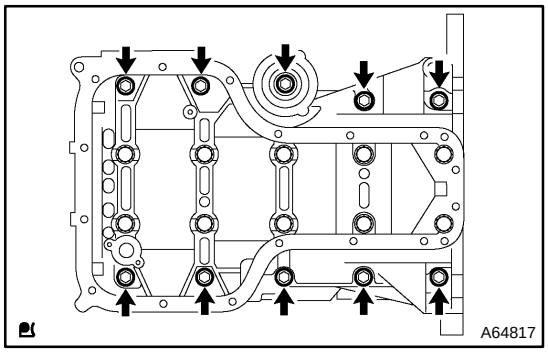
(b) Heat the piston to 80 to 90°C (176 to 194°F).



(c) Using a plastic hammer and brass bar, lightly tap out the piston pin, then remove the connecting rod.

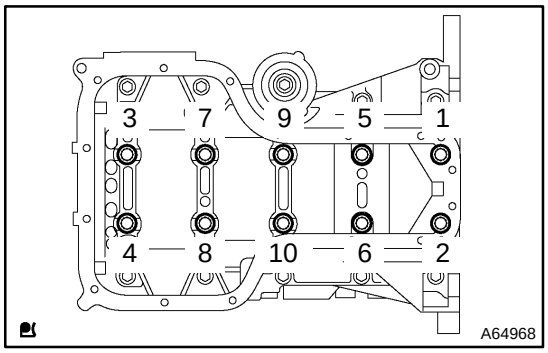
HINT:

- The piston and pin are a matched set.
- Arrange the piston, pin, ring, connecting rod and bearings in the correct order.

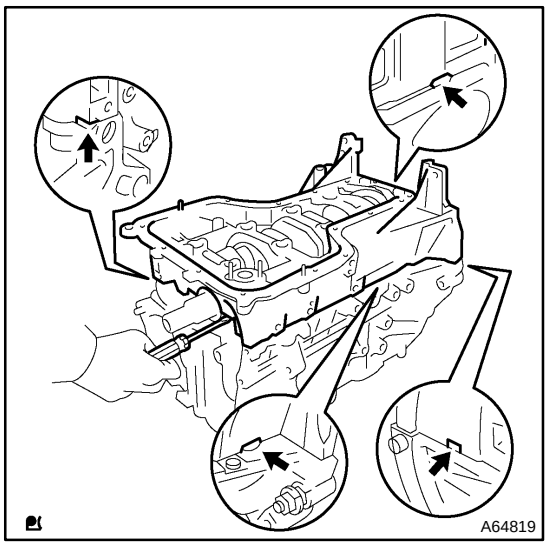


8. REMOVE CRANKSHAFT

(a) Remove the 10 bolts.



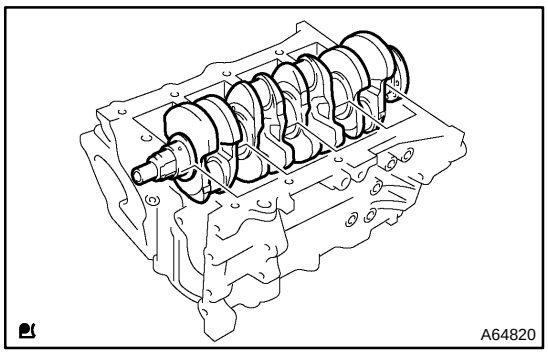
(b) Uniformly loosen the 10 bearing cap bolts, in several passes, in the sequence shown in the illustration.
SST 09011–38121



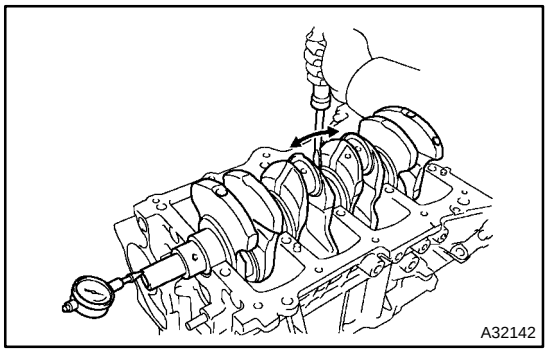
(c) Using a screwdriver, remove the bearing cap by prying the indicated portions between the cylinder block and bearing cap.

NOTICE:

Be careful not to damage the contact surfaces of the cylinder block and bearing cap.



(d) Remove the crankshaft from the cylinder block.



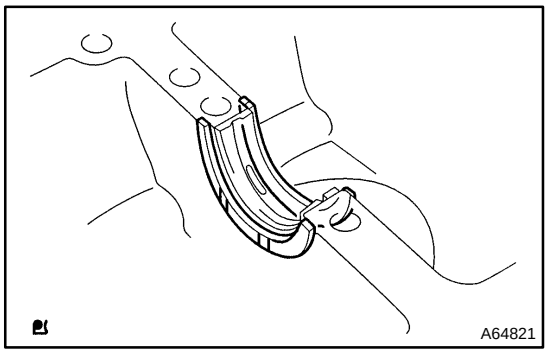
9. INSPECT CRANKSHAFT THRUST CLEARANCE

(a) Using a dial indicator, measure the thrust clearance while prying the crankshaft back and forth with a screwdriver.

Standard thrust clearance:
0.04 to 0.24 mm (0.0016 to 0.0094 in.)
Maximum thrust clearance: 0.30 mm (0.0118 in.)

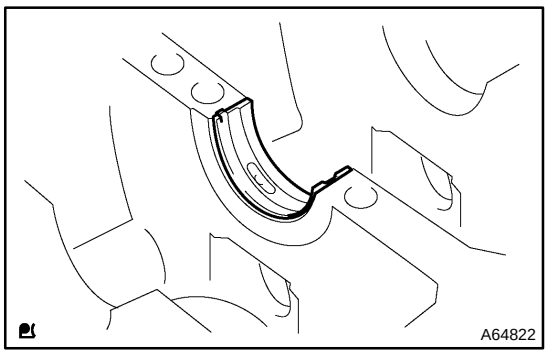
- If the thrust clearance is greater than maximum, measure the thrust washer thickness.
- If the thickness is not specified, replace the thrust washer.

HINT:
Thrust washer thickness: 2.430 to 2.480 mm (0.0957 to 0.0976 in.).



10. REMOVE CRANKSHAFT THRUST WASHER UPPER

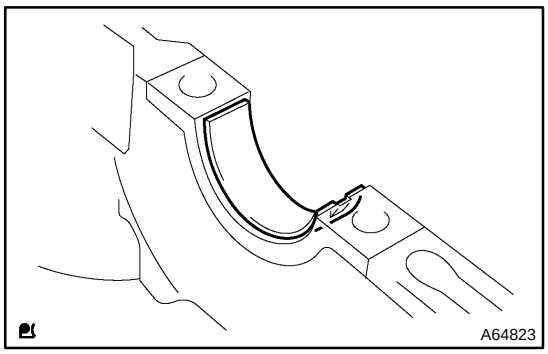
(a) Remove the 2 crankshaft thrust washers from the cylinder block.



11. REMOVE CRANKSHAFT BEARING

(a) Remove the 5 crankshaft bearings from the cylinder block.

NOTICE:
Arrange the main bearings and thrust washers in the correct order.



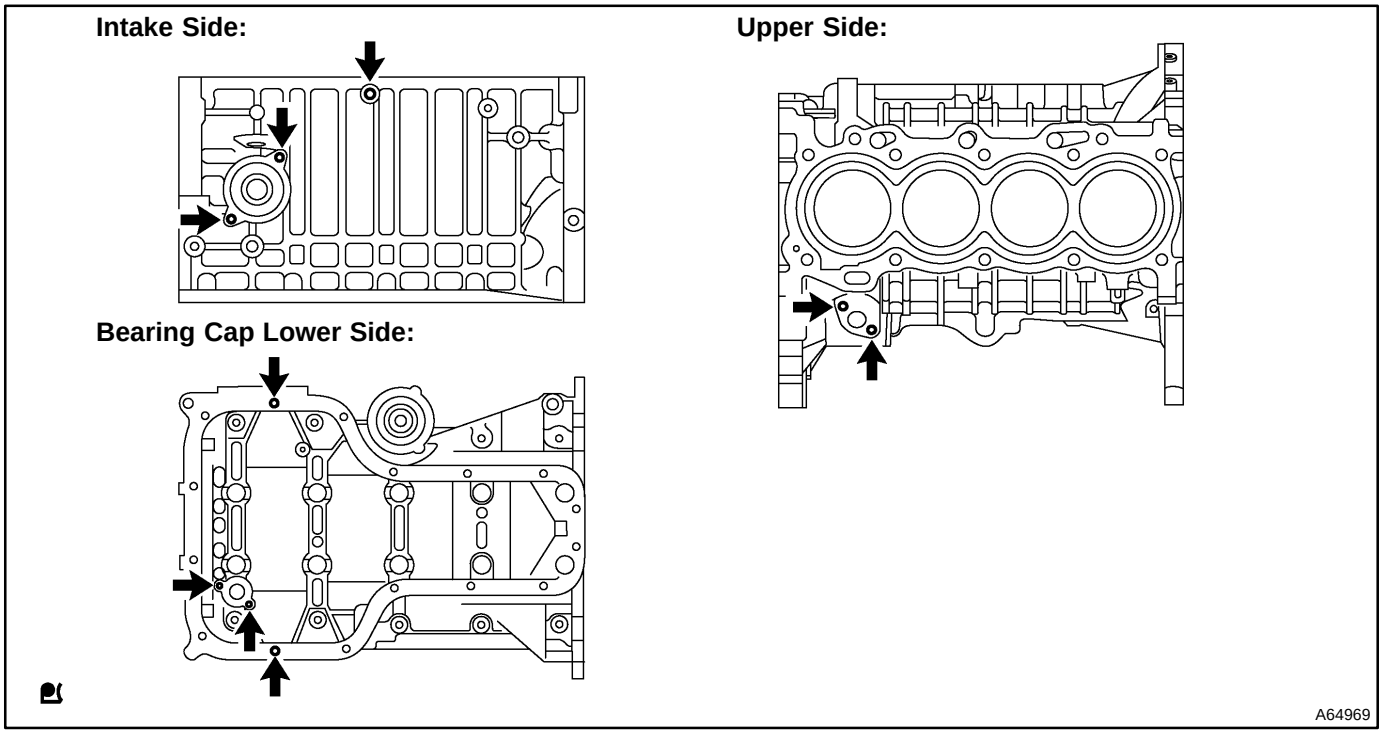
(b) Remove the 5 crankshaft bearings from the bearing cap.

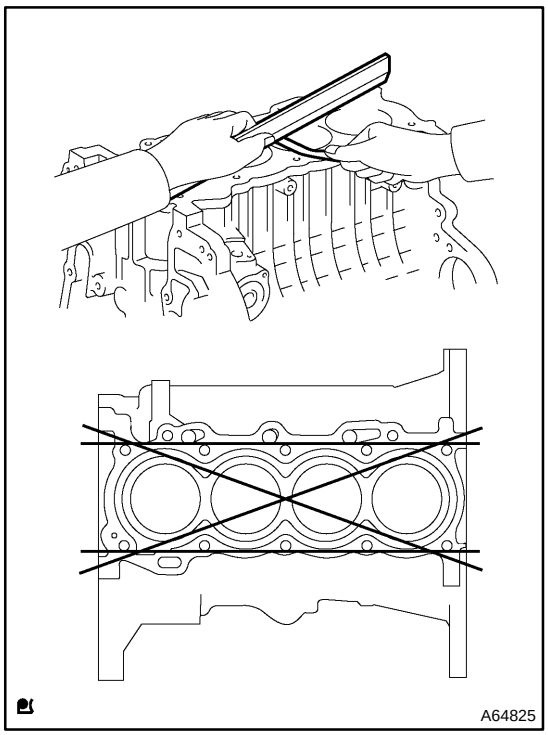
NOTICE:

Arrange the main bearings and thrust washers in the correct order.

12. REMOVE STUD BOLT

(a) Using torx socket wrench E5 and E7, remove the 9 stud bolts.



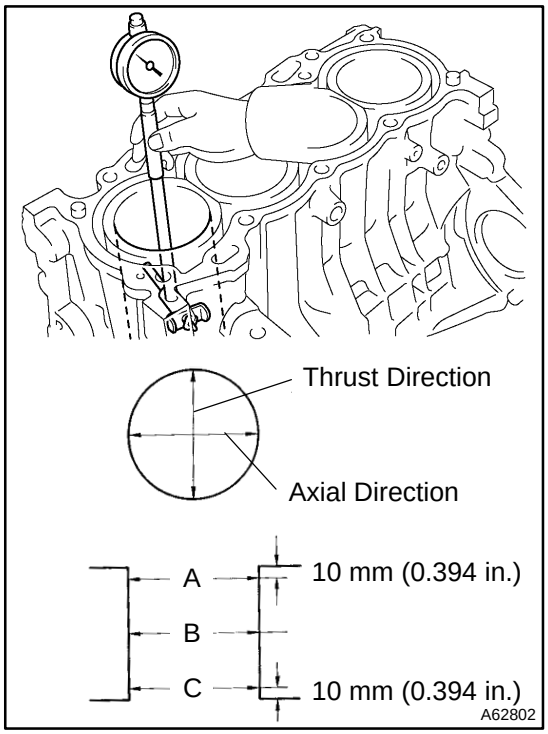


13. INSPECT CYLINDER BLOCK FOR FLATNESS

(a) Using a precision straight edge and feeler gauge, measure the surface contacting the cylinder head gasket for warpage.

Maximum warpage: 0.05 mm (0.0020 in.)

If the warpage is greater than maximum, replace the cylinder block.



14. INSPECT CYLINDER BORE

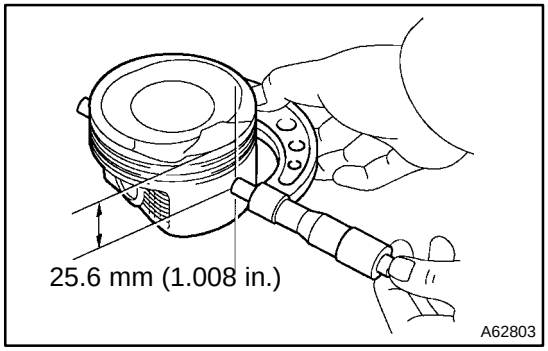
(a) Using a cylinder gauge, measure the cylinder bore diameter at positions A, B and C in the thrust and axial directions.

Standard diameter:
79.000 to 79.013 mm (3.1102 to 3.1107 in.)

(b) Calculate the difference between the maximum diameter and minimum diameter of the 6 measured values.

Difference limit: 0.10 mm (0.0039 in.)

If the difference is greater than limit, replace the cylinder block.



15. INSPECT W/PIN PISTON SUB–ASSY

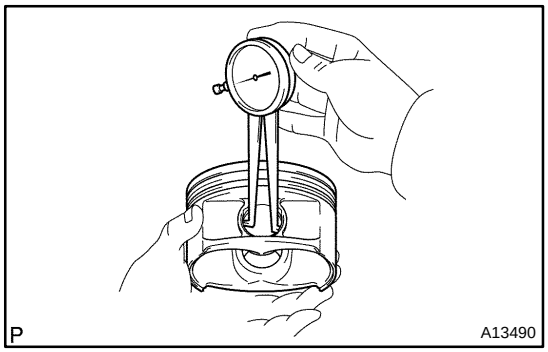
(a) Using a micrometer, measure the piston diameter at a right angle to the piston pin hole, and at the piston of 25.6 mm (1.008 in.) from the piston head.

Piston diameter:
78.872 to 78.972 mm (3.1052 to 3.1091 in.)

16. INSPECT PISTON OIL CLEARANCE

(a) Subtract the piston diameter measurement from the cylinder bore diameter measurement.
Standard oil clearance: 0.065 to 0.088 mm (0.0026 to 0.0035 in.)
Maximum oil clearance: 0.088 mm (0.0035 in.)

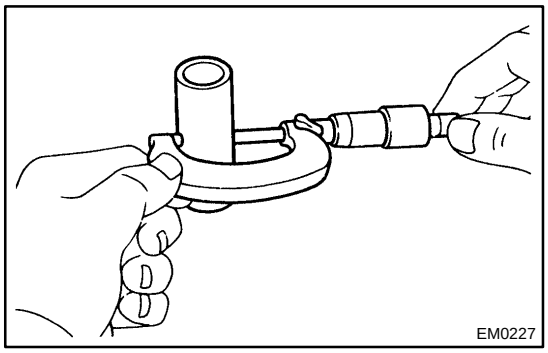
- If the oil clearance is greater than maximum, replace all the pistons.
- If necessary, replace the cylinder block.



17. INSPECT PISTON PIN OIL CLEARANCE

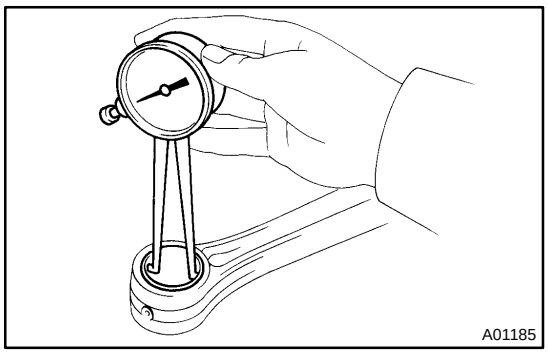
(a) Using a caliper gauge, measure the piston pin bore diameter.
Piston pin bore diameter:
20.006 to 20.015 mm (0.7876 to 0.7880 in.)

Mark	mm (in.)
A	20.006 to 20.009 (0.7876 to 0.7878)
B	20.010 to 20.012 (0.7878 to 0.7879)
C	20.013 to 20.015 (0.7879 to 0.7880)



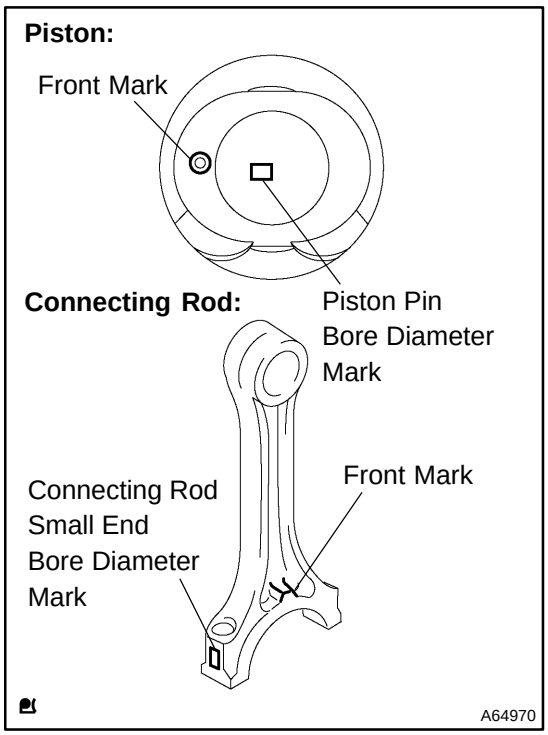
(b) Using a micrometer, measure the piston pin outer diameter.
Piston pin outer diameter:
20.004 to 20.013 mm (0.7876 to 0.7879 in.)

Mark	mm (in.)
A	20.004 to 20.007 (0.7876 to 0.7877)
B	20.008 to 20.010 (0.7877 to 0.7878)
C	20.011 to 20.013 (0.7878 to 0.7879)



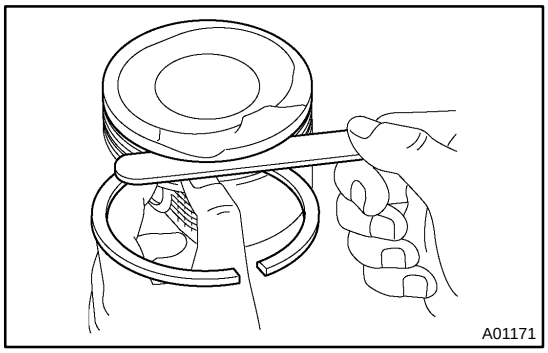
(c) Using a caliper gauge, measure the connecting rod small end bore diameter.
Connecting rod small end bore diameter:
20.012 to 20.021 mm (0.7879 to 0.7882 in.)

Mark	mm (in.)
A	20.012 to 20.015 (0.7879 to 0.7880)
B	20.016 to 20.018 (0.7880 to 0.7881)
C	20.019 to 20.021 (0.7881 to 0.7882)



(d) Subtract the piston pin outer diameter measurement from the piston pin bore diameter measurement.
Standard oil clearance:
0.002 to 0.011 mm (0.0001 to 0.0004 in.)
Maximum oil clearance: 0.011 mm (0.0004 in.)
- If the oil clearance is greater than maximum, replace the connecting rod.
- If necessary, replace the w/ pin piston.

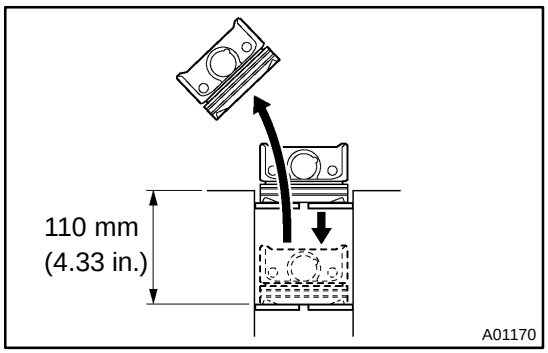
(e) Subtract the piston pin outer diameter measurement from the connecting rod small end bore diameter measurement.
Standard oil clearance:
–0.001 to 0.017 mm (–0.00004 to 0.0007 in.)
Maximum oil clearance: 0.017 mm (0.0007 in.)
- If the oil clearance is greater than maximum, replace the connecting rod.
- If necessary, replace the connecting rod and w/ pin piston.



18. INSPECT RING GROOVE CLEARANCE

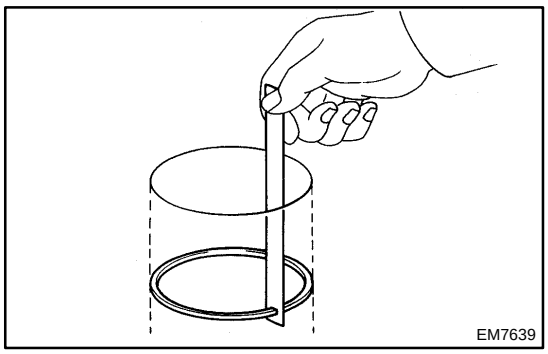
(a) Using a feeler gauge, measure the clearance between the new piston ring and the wall of the ring groove.
Ring groove clearance:
0.02 to 0.07 mm (0.0008 to 0.0028 in.) for No. 1 ring
0.03 to 0.07 mm (0.0012 to 0.0028 in.) for No. 2 ring
0.03 to 0.11 mm (0.0012 to 0.0043 in.) for oil ring

If the groove clearance is not as specified, replace the piston ring.



19. INSPECT PISTON RING END GAP

(a) Using a piston, push the piston ring a little beyond the bottom of the ring travel, that means 110 mm (4.33 in.) from the top of the cylinder block.



(b) Using a feeler gauge, measure the end gap.

Standard end gap:

0.25 to 0.35 mm (0.0098 to 0.0138 in.) for No. 1 ring

0.35 to 0.50 mm (0.0138 to 0.0197 in.) for No. 2 ring

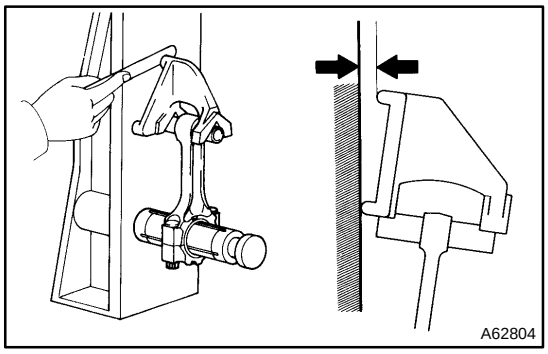
0.15 to 0.40 mm (0.0059 to 0.0157 in.) for oil ring

Maximum end gap:

1.05 mm (0.0413 in.) for No. 1 ring

1.20 mm (0.0472 in.) for No. 2 ring

- If the end gap is greater than maximum, replace the piston ring.
- If the end gap is greater than maximum, even with a new piston ring, replace the cylinder block.



20. INSPECT CONNECTING ROD SUB–ASSY

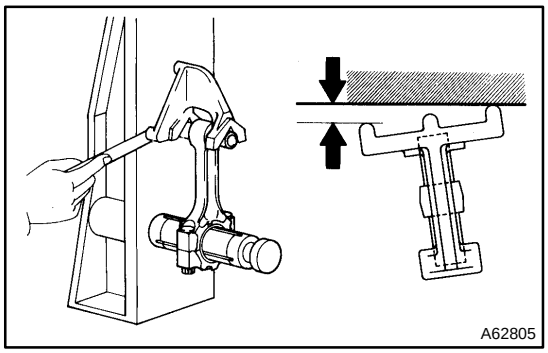
(a) Using a connecting rod aligner and feeler gauge, check the connecting rod alignment.

(1) Check for out–of–alignment.

Maximum out–of–alignment:

0.05 mm (0.0020 in.) per 100 mm (3.94 in.)

If out–of–alignment is greater than maximum, replace the connecting rod assembly.

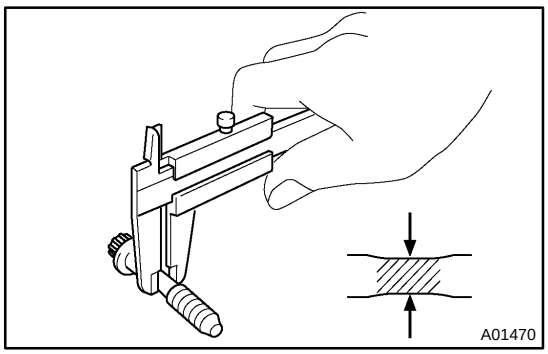


(2) Check for twist.

Maximum twist:

0.05mm (0.0020 in.) per 100 mm (3.94 in.)

If twist is greater than maximum, replace the connecting rod assembly.



21. INSPECT CONNECTING ROD BOLT

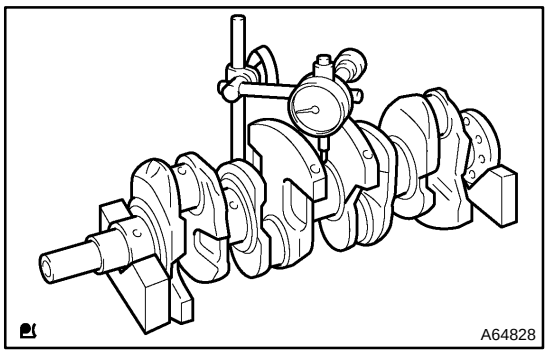
(a) Using a vernier caliper, measure the tension portion diameter of the bolts.

Standard diameter:

6.6 to 6.7 mm (0.260 to 0.264 in.)

Maximum diameter: 6.4 mm (0.252 in.)

If the diameter is less than maximum, replace the connecting rod bolt.

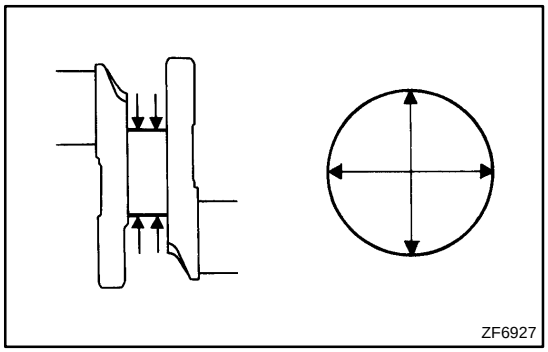


22. INSPECT CRANKSHAFT

(a) Using a dial indicator and V–blocks, measure the circle runout, as shown in the illustration.

Maximum circle runout: 0.03 mm (0.0012 in.)

If the circle runout is greater than maximum, replace the crankshaft.



(b) Using a micrometer, measure the diameter of each main journal at the points shown in the illustration.

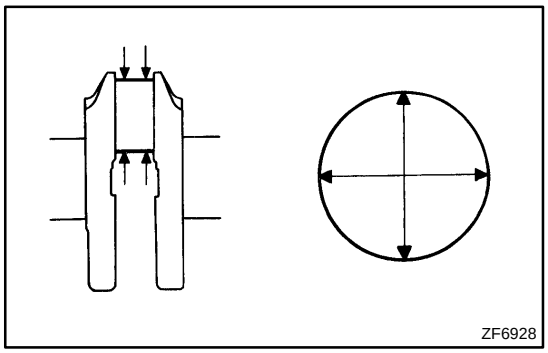
Diameter: 47.988 to 48.000 mm (1.8893 to 1.8898 in.)

If the diameter is not as specified, check the crankshaft oil clearance.

(c) Check each main journal for taper and out–of–round as shown.

Maximum taper and out–of–round:
0.02 mm (0.0008 in.)

If the taper and out–of–round is greater than maximum, replace the crankshaft.



(d) Using a micrometer, measure the diameter of each crank pin at the points shown in the illustration.

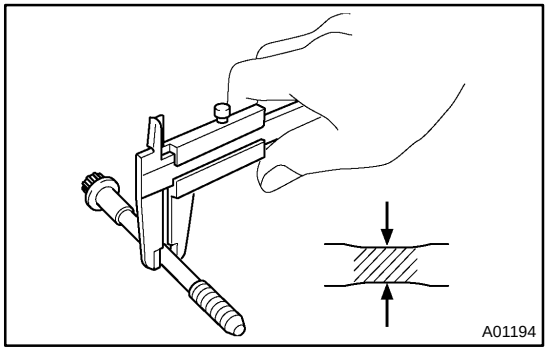
Diameter: 43.992 to 44.000 mm (1.7320 to 1.7323 in.)

If the diameter is not as specified, check the connecting rod oil clearance.

(e) Check each crank pin for taper and out–of–round as shown.

Maximum taper and out–of–round:
0.02 mm (0.0008 in.)

If the taper and out–of–round is greater than maximum, replace the crankshaft.

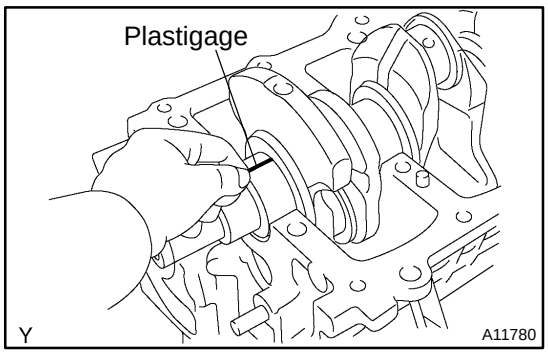


23. INSPECT CRANKSHAFT BEARING CAP SET BOLT

(a) Using a vernier caliper, measure the tension portion diameter of the bolts.

Standard diameter: 7.3 to 7.5 mm (0.287 to 0.295 in.)
Minimum diameter: 7.3 mm (0.287 in.)

If the diameter is greater than minimum, replace the crankshaft bearing cap set bolt.



24. INSPECT CRANKSHAFT OIL CLEARANCE

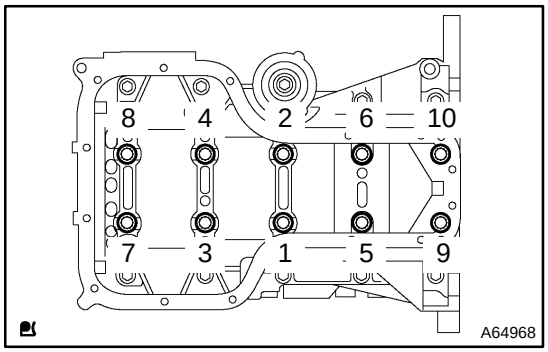
NOTICE:

Do not turn the crankshaft.

(a) Clean each main journal and bearing.

(b) Place the crankshaft on the cylinder block.

(c) Lay a strip of the Plastigage across each journal.



(d) Using SST, tighten the bolts in several passes, in the sequence shown, by the specified torque.
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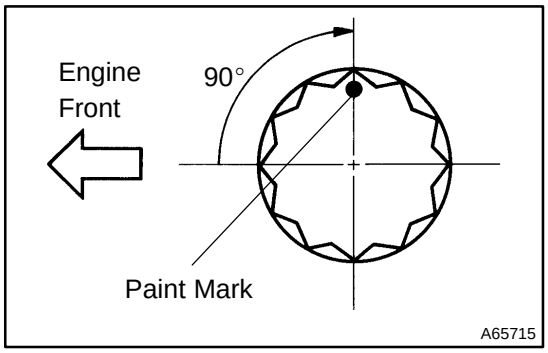
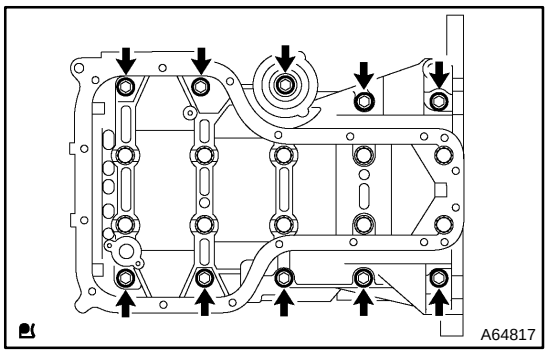
Torque: 44 N·m (449 kgf·cm, 33 ft·lbf)



(e) Mark the front of the bearing cap bolts with paint.

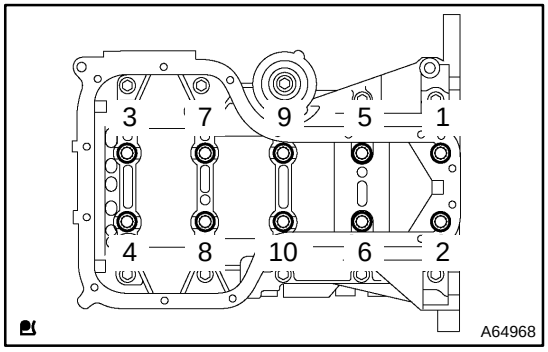
(f) Retighten the bearing cap bolts by 90° as shown in the illustration.

(g) Check that the painted mark is now at a 90° angle to the front.



(h) Tighten the other 10 bolts for the bearing cap.
Torque: 19 N·m (194 kgf·cm, 14 ft·lbf)

(i) Remove the 10 bolts.



(j) Uniformly loosen the 10 bearing cap bolts, in several passes, in the sequence shown in the illustration.
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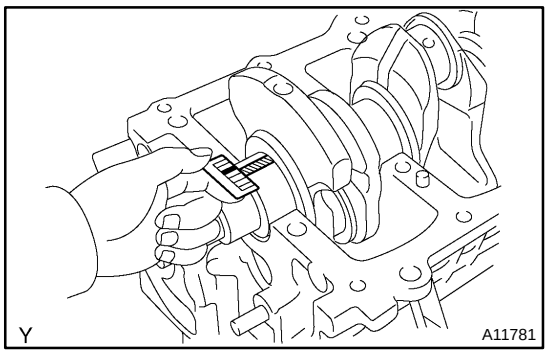
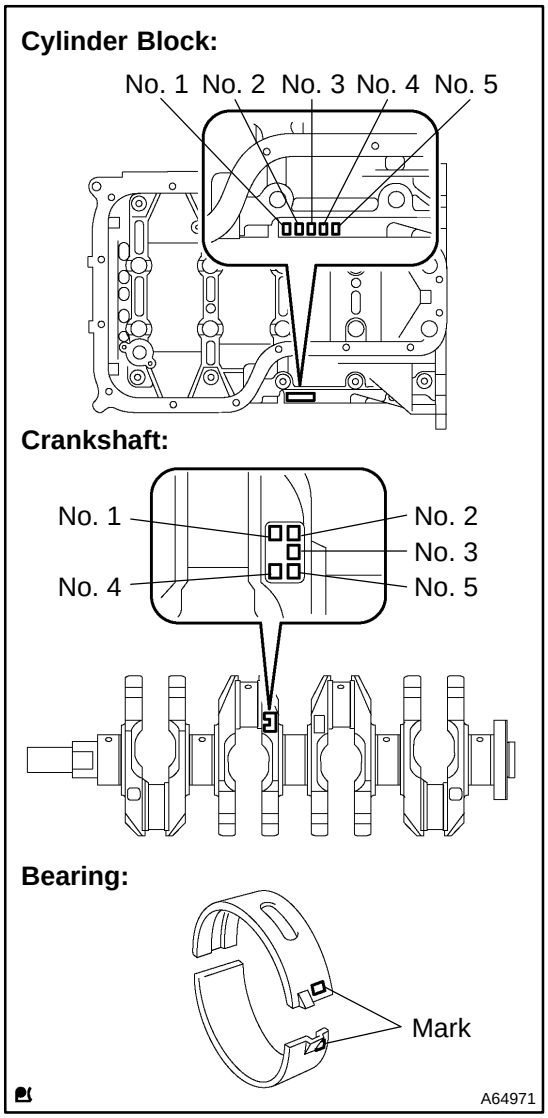




(k) Measure the Plastigage at its widest point.

Standard oil clearance:
0.015 to 0.032 mm (0.0006 to 0.0013 in.)
Minimum oil clearance: 0.05 mm (0.0020 in.)

NOTICE:

Completely remove the Plastigage.

- If the oil clearance is greater than minimum, replace the crankshaft bearing.
- If necessary, replace the crankshaft.

HINT:

If replacing a bearing, select a new one having the same number. If the number of the bearing cannot be determined, calculate the correct bearing number by adding together the numbers imprinted on the cylinder block and crankshaft, then select a new bearing having the calculated number. There are 4 sizes of standard bearings, marked ”1”, ”2”, ”3” and ”4” accordingly.

Cylinder block (A) + Crankshaft (B)	0 to 2	3 to 5	6 to 8	9 to 11
Use bearing	”1”	”2”	”3”	”4”

EXAMPLE:

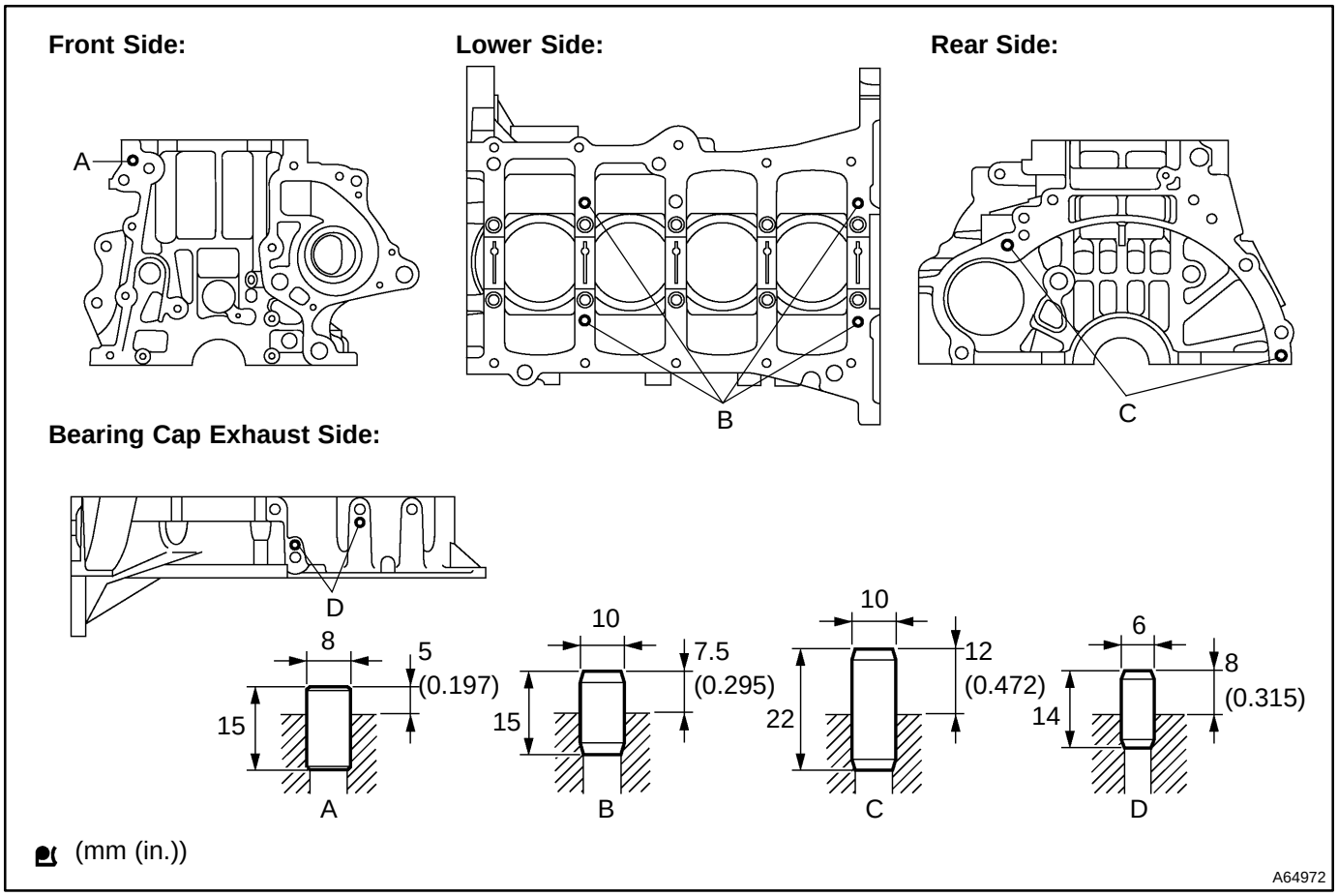
Cylinder block ”3” (A) + Crankshaft ”4” (B) = Total number 7 (Use bearing ”3”)

Item	Mark	mm (in.)
Cylinder block journal bore diameter (A)	”0”	52.000 to 52.002 (2.0472 to 2.0473)
	”1”	52.003 to 52.004 (2.0474 to 2.0474)
	”2”	52.005 to 52.006 (2.0474 to 2.0475)
	”3”	52.007 to 52.009 (2.0475 to 2.0476)
	”4”	52.010 to 52.011 (2.0476 to 2.0477)
	”5”	52.012 to 52.013 (2.0477 to 2.0478)
	”6”	52.014 to 52.015 (2.0478 to 2.0478)
Crankshaft journal diameter (B)	”0”	47.999 to 48.000 (1.8897 to 1.8898)
	”1”	47.997 to 47.998 (1.8896 to 1.8897)
	”2”	47.995 to 47.996 (1.8896 to 1.8896)
	”3”	47.993 to 47.994 (1.8895 to 1.8895)
	”4”	47.991 to 47.992 (1.8894 to 1.8894)
	”5”	47.988 to 47.990 (1.8893 to 1.8894)
Standard bearing center wall thickness	”1”	1.994 to 1.997 (0.0785 to 0.0786)
	”2”	1.998 to 2.000 (0.0787 to 0.0787)
	”3”	2.001 to 2.003 (0.0788 to 0.0789)
	”4”	2.004 to 2.006 (0.0789 to 0.0790)

25. INSTALL STRAIGHT PIN

(a) Using a plastic hammer, install the 9 straight pins to the cylinder block.

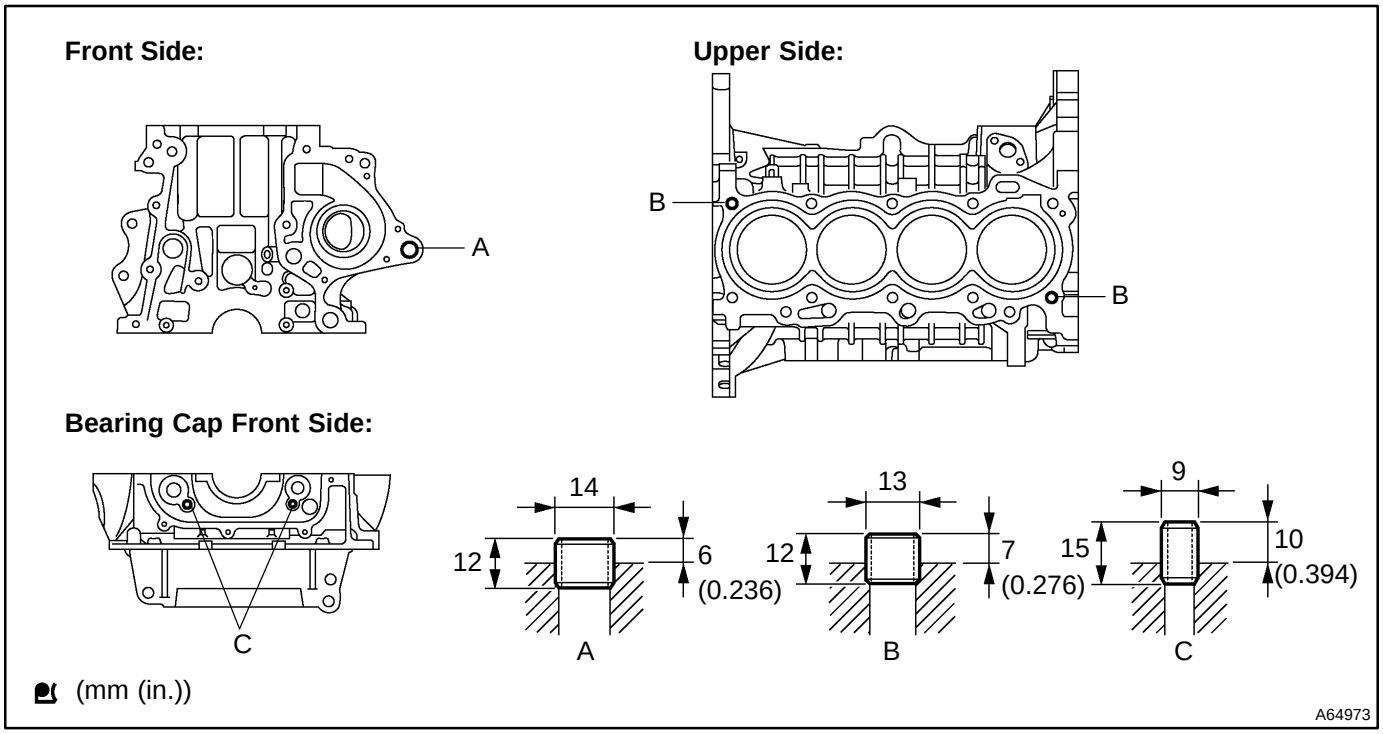
Standard protrusion:
5 mm (0.197 in.) for straight pin A
7.5 mm (0.295 in.) for straight pin B
12 mm (0.472 in.) for straight pin C
8 mm (0.315 in.) for straight pin D



26. INSTALL RING PIN

(a) Using a plastic hammer, install the 5 ring pins to the cylinder block.

Standard protrusion:
6 mm (0.236 in.) for ring pin A
7 mm (0.276 in.) for rIng pin B
10 mm (0.394 in.) for ring pin C



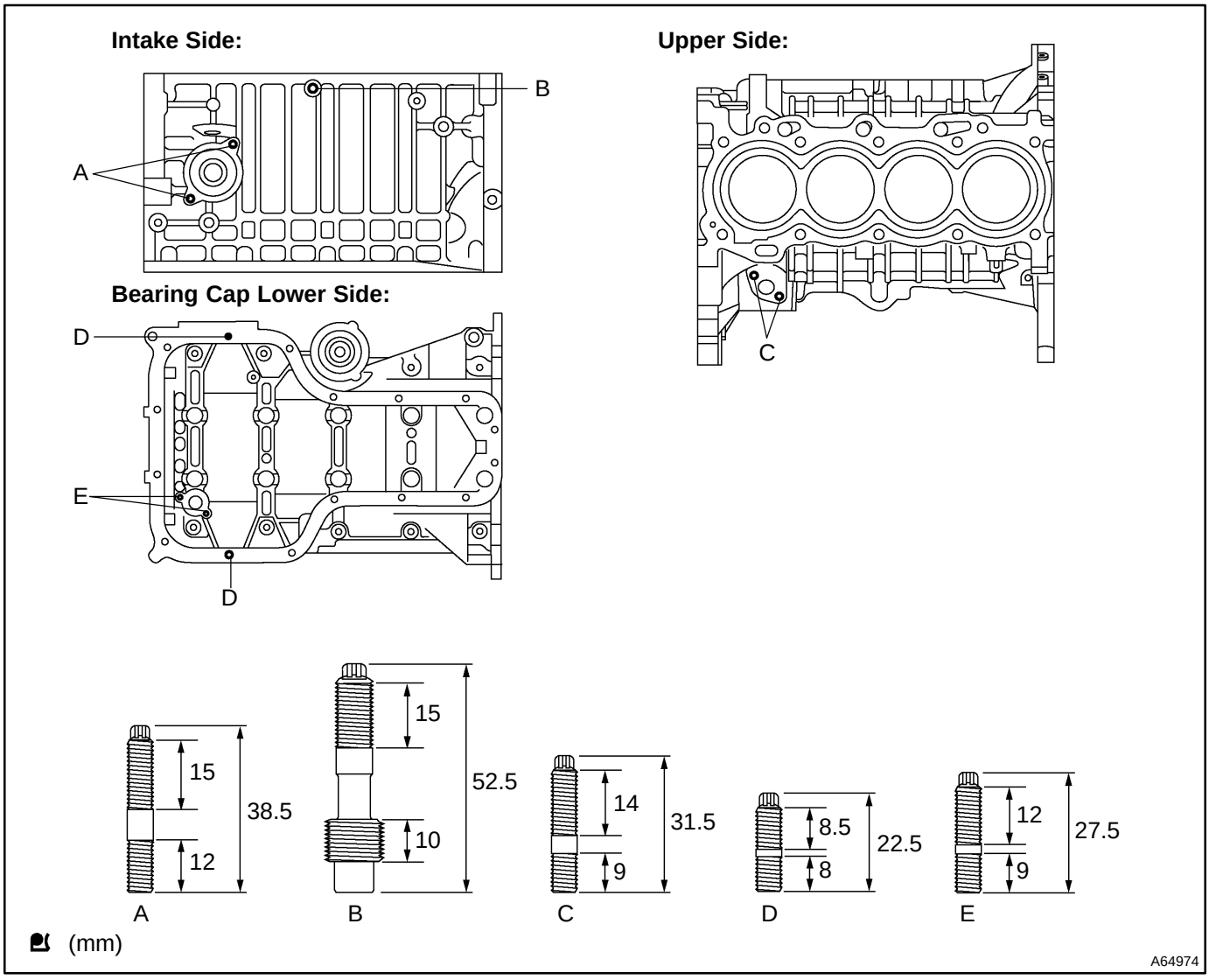
27. INSTALL STUD BOLT

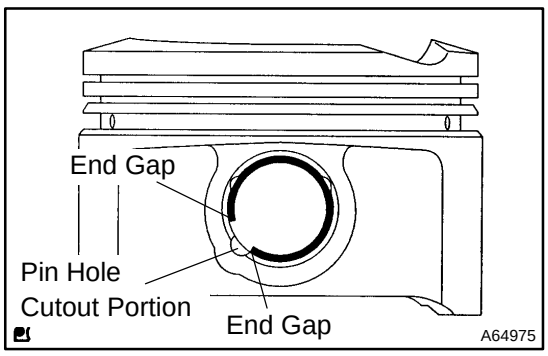
(a) Using torx socket wrench E5 and E7, install the 9 stud bolt to the cylinder block.

Torque:

5.0 N·m (51 kgf·cm, 44 in.·lbf) for stud bolt A, C, D and E

11 N·m (112 kgf·cm, 8 ft·lbf) for stud bolt B



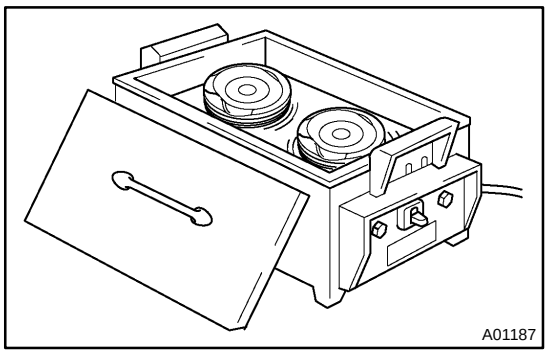


28. INSTALL W/PIN PISTON SUB–ASSY

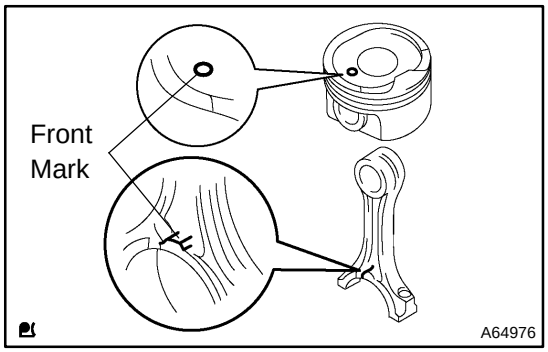
(a) Using a small screwdriver, install a new snap ring at one end of the piston pin hole.

HINT:

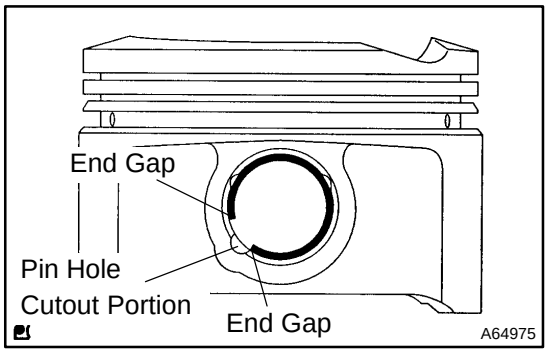
Be sure that end the gap of the snap ring is aligned with the pin hole cutout portion of the piston.



(b) Heat the piston to 80 to 90°C (176 to 194°F).



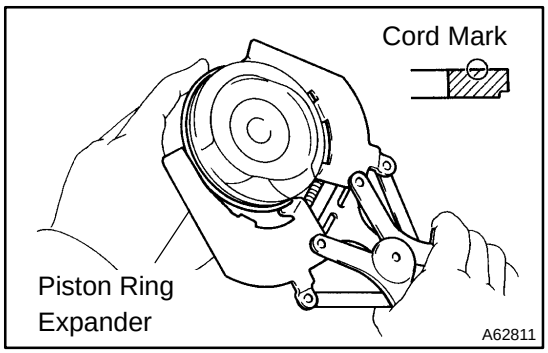
(c) Align the front marks on the piston with connecting rod, then push in the piston with your thumb.



(d) Using a small screwdriver, install a new snap ring at one end of the piston pin hole.

HINT:

Be sure that the end gap of the snap ring is aligned with the pin hole cutout portion of the piston.



29. INSTALL PISTON RING SET

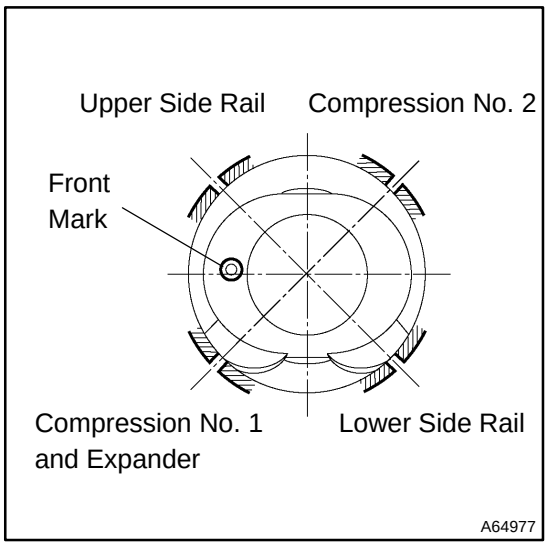
HINT:

In case of reusing the piston rings, install them to the matched pistons with the surfaces facing correctly.

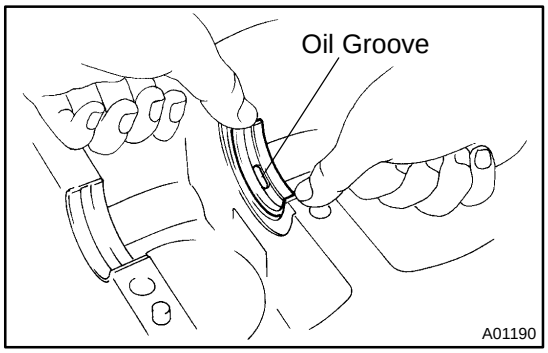
(a) Install the oil ring expander and 2 side rails by hand.

(b) Using a piston ring expander, install the 2 compression rings with the code mark facing upward.

Code mark (No. 2 only): 2R



(c) Position the piston rings so that the ring ends are as shown.

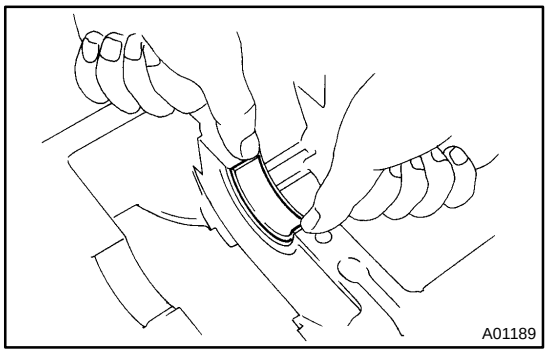


30. INSTALL CRANKSHAFT BEARING

(a) Install the upper bearing with the oil groove on the cylinder block.

NOTICE:

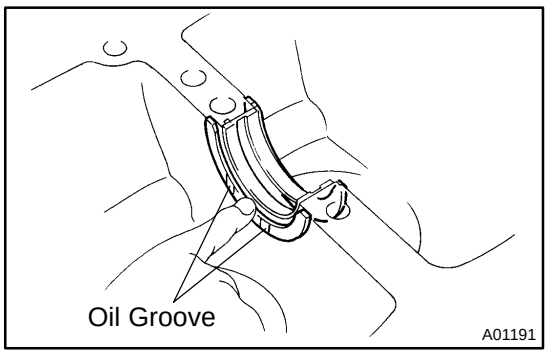
Do not apply engine oil to the bearing and its contact surface.



(b) Install the lower bearing on the bearing cap.

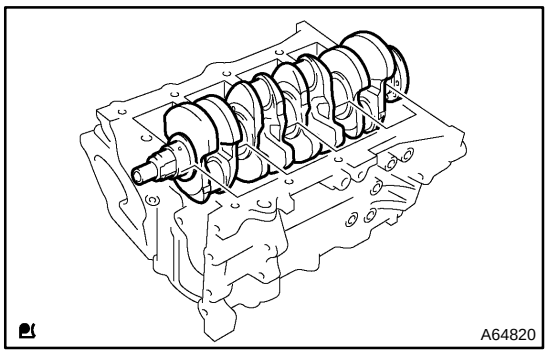
NOTICE:

Do not apply engine oil to the bearing and its contact surface.



31. INSTALL CRANKSHAFT THRUST WASHER UPPER

(a) Install the 2 thrust washers under the No. 3 journal position of the cylinder block with the oil grooves facing outward.

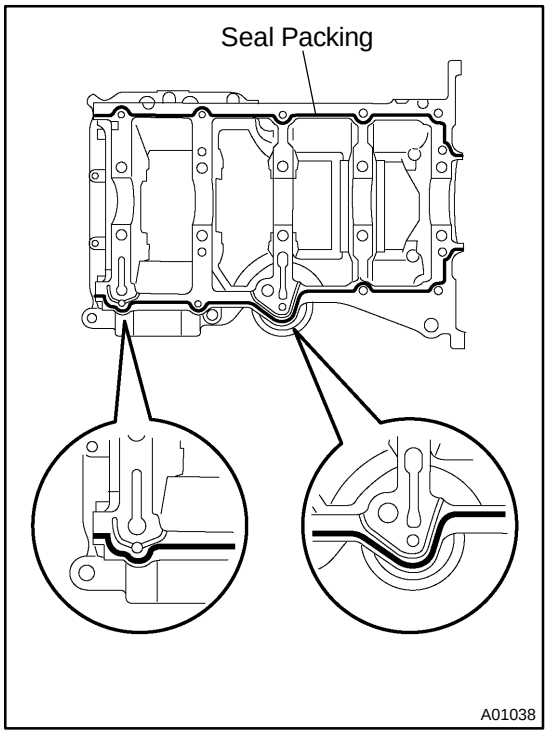


32. INSTALL CRANKSHAFT

(a) Apply engine oil to the upper bearing, then install the crankshaft on the cylinder block.

(b) Apply a light coat of engine oil on the bolt threads, bolt seats, and bearings of the bearing cap.

(c) Install the crankshaft to the cylinder block.

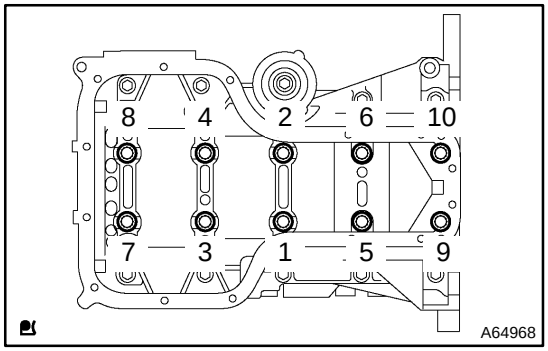


(d) Apply the seal packing in the shape of the bead (Diameter 2.5 to 3.5 mm (0.098 to 0.138 in.) consequently as shown in the illustration.

Seal packing: Part No. 08826–00080 or equivalent

NOTICE:

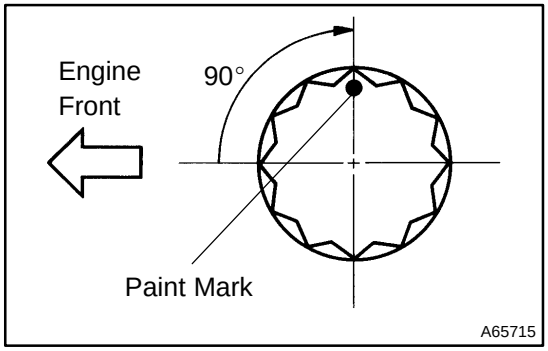
- **Remove any oil from the contact surface.**
- **Install the bearing cap sub–assembly within 3 minutes after applying the seal packing.**
- **Do not put into engine oil within 2 hours of installation.**



(e) Using SST, tighten the bolts in several passes, in the sequence shown, by the specified torque.

SST 09011–38121

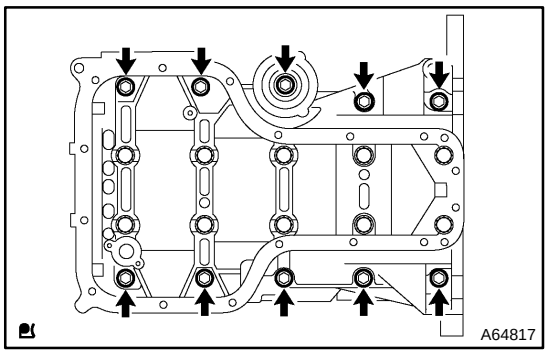
Torque: 44 N·m (449 kgf·cm, 33 ft·lbf)



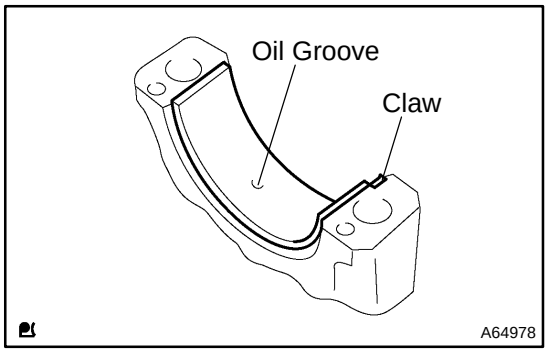
(f) Mark the front of the bearing cap bolts with paint.

(g) Retighten the bearing cap bolts by 90° as shown in the illustration.

(h) Check that the painted mark is now at a 90° angle to the front.



(i) Tighten the other 10 bolts for the bearing cap.
Torque: 19 N·m (194 kgf·cm, 14 ft·lbf)



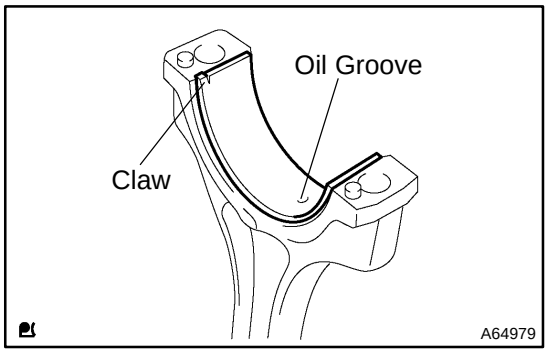
33. INSTALL CONNECTING ROD BEARING

(a) Align the connecting rod bearing claw with the oil groove of the connecting rod cap.

(b) Install the connecting rod bearing in the connecting rod cap.

NOTICE:

Do not apply engine oil to the bearing and its contact surface.

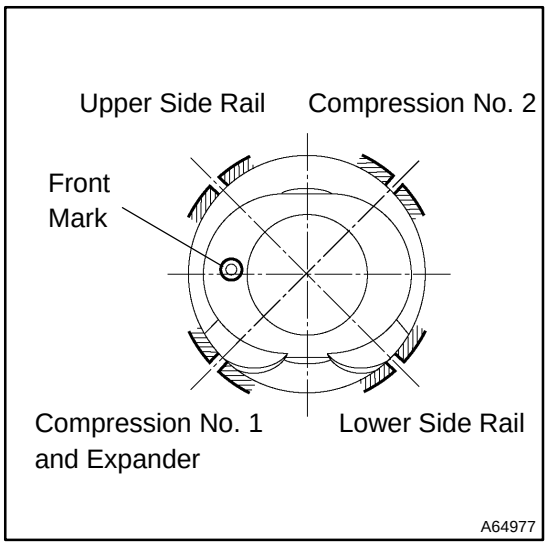


(c) Align the connecting rod bearing claw with the oil groove of the connecting rod.

(d) Install the connecting rod bearing in the connecting rod.

NOTICE:

Do not apply engine oil to the bearing and its contact surface.

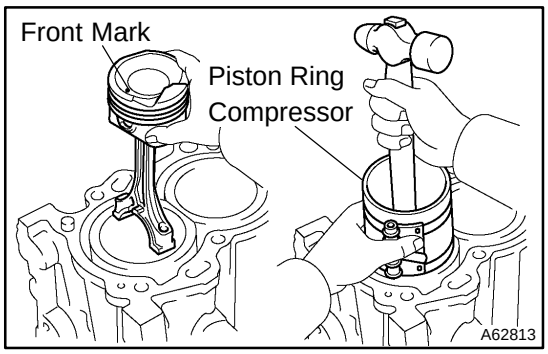


34. INSTALL CONNECTING ROD SUB–ASSY

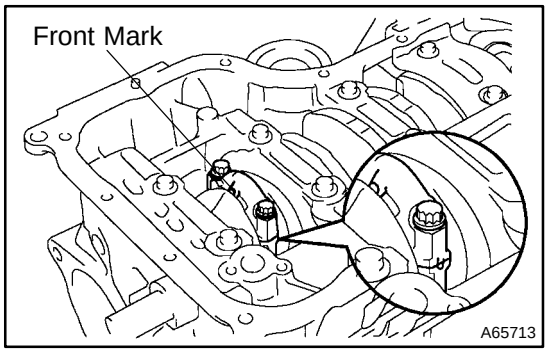
(a) Position the piston rings so that the ring ends are as shown.

(b) Apply engine oil to the cylinder walls, pistons, and surfaces of the connecting rod bearings.

(c) Check the position of the piston ring ends.



(d) Using a piston ring compressor, push the correctly numbered piston and connecting rod assemblies into each cylinder with the front mark of the piston facing forward.



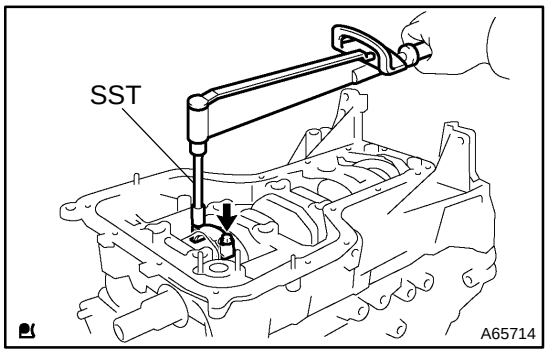
(e) Align the pin dowels of the connecting rod cap with the pins of the connecting rod, then install the connecting rod.

NOTICE:

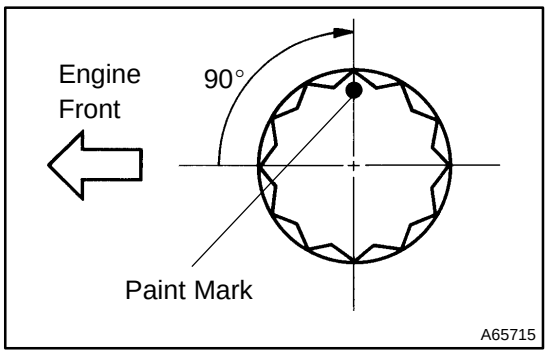
- **Clean the backside and surface of the connecting rod cap bearing and let not stick the oils and fats.**
- **Match the numbered connecting rod cap with the same numbered connecting rod.**

(f) Check that the protrusion of the connecting rod cap is facing the correct direction.

(g) Apply a light coat of engine oil on the threads and under the heads of the connecting rod cap bolts.



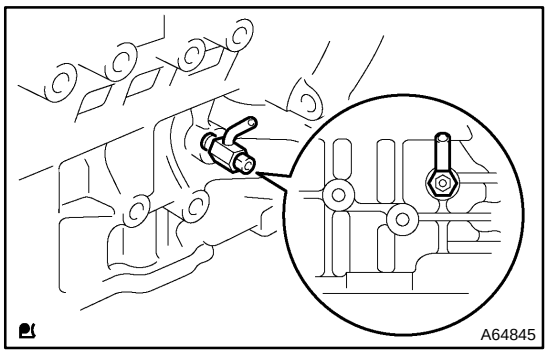
(h) Using SST, tighten the bolts in several passes by the specified torque.
SST 09205–16010
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)



(i) Mark the front of the connecting cap bolts with paint.

(j) Retighten the cap bolts by 90° as shown in the illustration.

(k) Check that the crankshaft turns smoothly.



35. INSTALL CYLINDER BLOCK WATER DRAIN COCK SUB–ASSY

(a) Apply 2 or 3 threads of adhesive to the cylinder block water drain cock, then install it within 3 minutes.
Torque: 25 N·m (255 kgf·cm, 18 ft·lbf)
Adhesive:
Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(b) After applying the specified torque, rotate the cylinder block water drain cock clockwise until its drain port faces downward.

NOTICE:

- **Do not put into coolant in an hour of installation.**
- **Do not rotate the drain union more than 360° in (b), and never loosen it after setting the union correctly.**