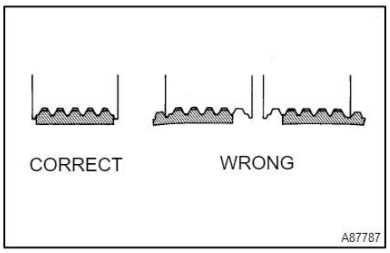
ENGINE (2AZ−FE)(From July, 2003)

14118−03

INSPECTION

1. **INSPECT ENGINE COOLANT (See page 16−1)**
2. **INSPECT ENGINE OIL (See page 17−1)**
3. **INSPECT BATTERY (See page 19−14)**
4. **INSPECT AIR CLEANER FILTER ELEMENT SUB−ASSY (See page 99−5)**
5. **INSPECT SPARK PLUG (See page 18−3)**



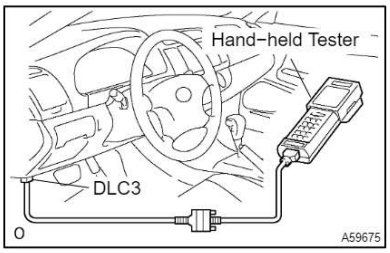
6. INSPECT V−RIBBED BELT

HINT:

- After installing the drive belt, check that it fits properly in the ribbed grooves. Check with your hand to confirm that the belt has not slipped out of the groove on the bottom of the crank pulley.
- "New belt" is a belt which has been used less than 5 minutes on a running engine.
- "Used belt" is a belt which has been used on a running engine for 5 minutes or more.
- After installing a new belt, run the engine for approximately 5 minutes and then recheck the tension.

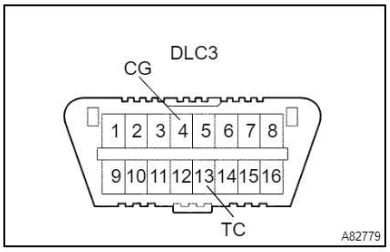
7. INSPECT IGNITION TIMING

(a) Warm up the engine.



(b) When using the hand−held tester:
Check the ignition timing.
(1) Connect the hand−held tester to the DLC3.
(2) Enter DATA LIST MODE on the hand−held tester.
Ignition timing: 8 to 12★BTDC @ idle

HINT:
Please refer to the hand−held tester operator's manual for help on selecting the DATA LIST.

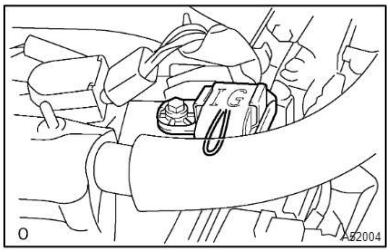


(c) When not using the hand−held tester:
Check the ignition timing.
(1) Using SST, connect terminals 13 (TC) and 4 (CG) of the DLC3.
SST 09843−18040

NOTICE:

- **Confirm the terminal numbers before connecting them. Connection with a wrong terminal can damage the engine.**
- **Turn off all electrical systems before connecting the terminals.**
- **Perform this inspection after the cooling fan motor is turned off.**

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(2) Remove the cylinder head cover No. 2.
(3) Pull out the wire harness as shown in the illustration. 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.**

(4) Check the ignition timing at idle.
Ignition timing: 8 to 12★BTDC @ idle

NOTICE:

When checking the ignition timing, the transmission should be in the neutral position.

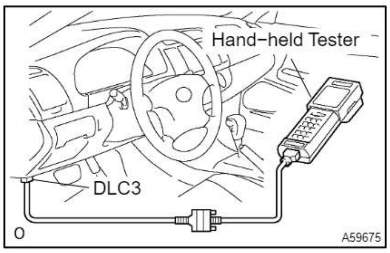
HINT:

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

(5) Disconnect terminals 13 (TC) and 4 (CG) of the DLC3.
(6) Check the ignition timing at idle.
Ignition timing: 5 to 15★BTDC @ idle
(7) Confirm that ignition timing moves to the advanced angle side when the engine rpm is increased.
(8) Remove the timing light.

8. INSPECT ENGINE IDLE SPEED

(a) Warm up the engine.



(b) When using the hand−held tester:
Check the idle speed.
(1) Connect the hand−held tester to the DLC3.

HINT:

Please refer to the hand−held tester operator's manual for further details.

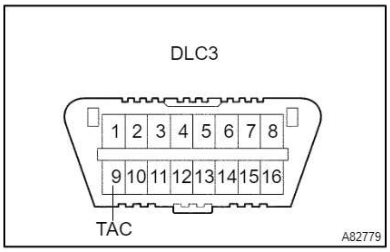
(2) Enter DATA LIST MODE on the hand−held tester.
Idle speed:

Item	Specified Condition
M/T	650 to 750 rpm
A/T	610 to 710 rpm

NOTICE:

- **When checking the idle speed, the tranmission should be in the neutral position.**
- **Check idle speed with the cooling fan off.**
- **Switch off all accessories and air conditioning before connecting the hand−held tester.**

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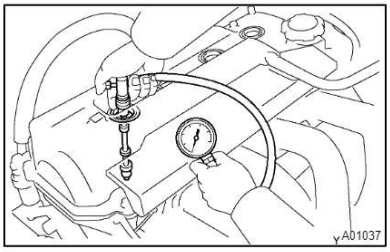


(c) When not using the hand–held tester:
Check the idle speed.
(1) Using SST, connect tachometer tester probe to terminal 9 (TAC) of the DLC3.
SST 09843–18030
(2) Check the idle speed.
Idle speed:

Item	Specified Condition
M/T	650 to 750 rpm
A/T	610 to 710 rpm

9. INSPECT COMPRESSION

(a) Warm up and stop the engine.
(b) Disconnect the injector connectors.
(c) Remove the ignition coils.
(d) Remove the spark plugs.



(e) Check the cylinder compression pressure.
(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:

Item	Specified Condition
PZEV	1,300 kPa (13.3 kg/cm^2, 189 psi)
Except PZEV	1,360 kPa (13.9 kg/cm^2, 198 psi)

Minimum pressure:

Item	Specified Condition
PZEV	1,000 kPa (10.2 kg/cm^2, 145 psi)
Except PZEV	980 kPa (10.0 kg/cm^2, 142 psi)

Difference between each cylinder:

Item	Specified Condition
PZEV	29 kPa (0.3 kg/cm^2, 4.3 psi)
Except PZEV	100 kPa (1.0 kg/cm^2, 14 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 as quickly as possible.**

(4) If the cylinder compression is low, pour a small amount of engine oil into the cylinder through the spark plug hole and inspect again.

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HINT:

- If adding oil increases the compression, the piston rings and/or cylinder bore may be worn or damaged.
- If pressure stays low, a valve may be stuck or seated improperly, or there may be leakage in the gasket.

10. INSPECT CO/HC

(a) Start the engine.
(b) Rev the engine at 2,500 rpm for approximately 180 seconds.
(c) Insert CO/HC meter testing probe at least 40 cm (1.3 ft) into the tailpipe during idling.
(d) Immediately check CO/HC concentration at idle and/or 2,500 rpm.

HINT:

- Complete the measuring within 3 minutes.
- Check regulations and restrictions in your area when performing 2 mode CO/HC concentration testing (engine check at both idle speed and at 2,500 rpm).

(e) If the CO/HC concentration does not comply with regulations, troubleshoot in the order given below.
  (1) Check A/F sensor operation (see page 05−288).
  (2) See the table below for possible causes, and then inspect and repair.

CO	HC	Problems	Causes
Normal	High	Rough idle	1. Faulty ignitions: ●Incorrect timing ●Fouled, shorted or improperly gapped plugs 2. Incorrect valve clearance 3. Leaky intake and exhaust valves 4. Leaky cylinders
Low	High	Rough idle (fluctuating HC reading)	1. Vacuum leaks: ●PCV hoses ●Intake manifold ●Throttle body ●Brake booster line 2. Lean mixture causing misfire
High	High	Rough idle (black smoke from exhaust)	1. Restricted air filter 2. Plugged PCV valve 3. Faulty SFI system: ●Faulty pressure regulator ●Defective ECT ●Defective MAF meter ●Faulty ECM ●Faulty injectors ●Faulty throttle position sensor

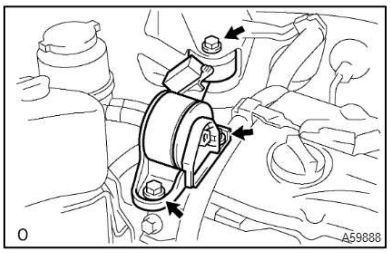
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TIMING GEAR CASE OR TIMING CHAIN CASE OIL SEAL (2AZ−FE)(From July, 2003)

141J0−01

REPLACEMENT

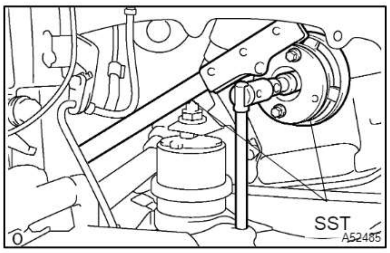
1. REMOVE FRONT WHEEL RH
2. REMOVE FRONT FENDER APRON SEAL RH
3. REMOVE ENGINE COVER SUB−ASSY NO.1



4. REMOVE ENGINE MOVING CONTROL ROD W/BRACKET

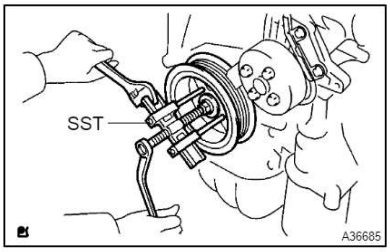
(a) Remove the 3 bolts and control rod.

5. REMOVE ENGINE MOUNTING STAY NO.2 RH
6. REMOVE ENGINE MOUNTING BRACKET NO.2 RH
7. REMOVE FAN AND GENERATOR V BELT (See page14−5)



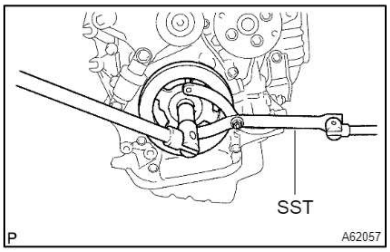
8. REMOVE CRANKSHAFT PULLEY

(a) TMC made:
Remove the crankshaft pulley.
(1) Using SST, loosen the pulley bolt.
SST 09213−54015 (91651−60855), 09330−00021

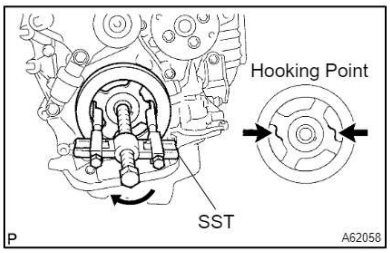


(2) Using SST, remove the pulley bolt and pulley.
SST 09950−50013 (09951−05010, 09952−05010, 09953−05020, 09954−05021)

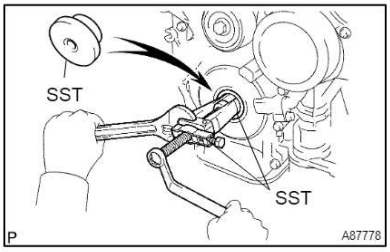
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(b) TMMK made:
Remove the crankshaft pulley.
(1) Using SST, loosen the pulley bolt.
SST 09960−10010 (09962−01000, 09963−01000)

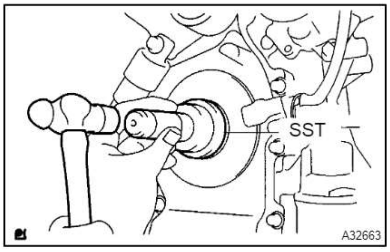


(2) Using SST, remove the crankshaft pulley.
SST 09950−40011 (09951−04010, 09952−04010, 09953−04030, 09954−04010, 09955−04041, 09957−04010, 91111−51014)



9. REMOVE TIMING GEAR CASE OR TIMING CHAIN CASE OIL SEAL

(a) Using SST, remove the oil seal.
SST 09308−10010, 09950−60010 (09951−00200)



10. INSTALL TIMING GEAR CASE OR TIMING CHAIN CASE OIL SEAL

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

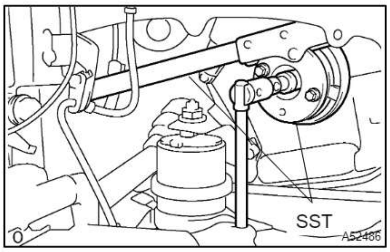
NOTICE:

Keep the lip free from foreign matter.

(b) Using SST and a hammer, tap in the oil seal until its surface is flush with the rear oil seal retainer edge.
SST 09223−22010

NOTICE:

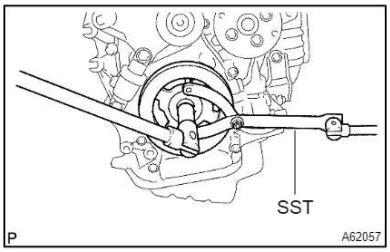
Wipe off extra grease from the crankshaft.



11. INSTALL CRANKSHAFT PULLEY

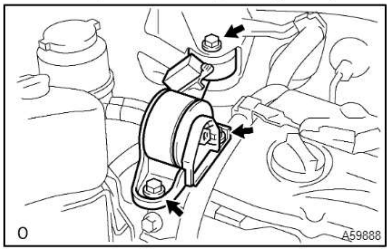
(a) TMC made:
Install the crankshaft pulley.
(1) Align the pulley set key with the key groove of the pulley.
(2) Using SST, install the pulley bolt.
SST 09213−54015 (91651−60855), 09330−00021, 09960−10010 (09962−01000, 09963−01000)
Torque: 170 N·m (1,733 kgf·cm, 125 ft·lbf)

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(b) TMMK made:
Install the crankshaft pulley.
(1) Align the pulley set key with the key groove of the pulley.
(2) Using SST, install the pulley bolt.
SST 09960–10010 (09962–01000, 09963–01000)
Torque: 170 N·m (1,733 kgf·cm, 125 ft·lbf)

12. INSTALL FAN AND GENERATOR V BELT (See page 14–5)
13. INSTALL ENGINE MOUNTING BRACKET NO.2 RH
Torque: 52 N·m (531 kgf·cm, 38 ft·lbf)
14. INSTALL ENGINE MOUNTING STAY NO.2 RH
Torque: 64 N·m (653 kgf·cm, 47 ft·lbf)



15. INSTALL ENGINE MOVING CONTROL ROD W/BRACKET
(a) Install the control rod with the 3 bolts.
Torque: 64 N·m (653 kgf·cm, 47 ft·lbf)

16. INSTALL FRONT WHEEL RH
17. CHECK FOR ENGINE OIL LEAKS

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ENGINE REAR OIL SEAL (2AZ−FE)(From July, 2003)

1411Z−02

REPLACEMENT

1. SEPARATE AUTOMATIC TRANSAXLE ASSY (A/T) (See page 40−18)

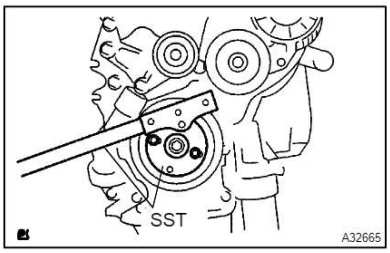
HINT:

Remove the transaxle after removing the engine assy w/ transaxle.

2. SEPARATE MANUAL TRANSAXLE ASSY (M/T) (See page 41−11)

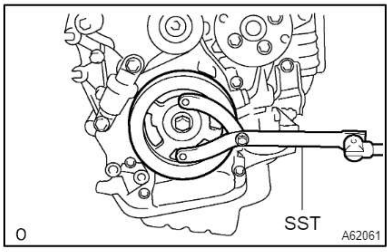
HINT:

Remove the transaxle after removing the engine assy w/ transaxle.

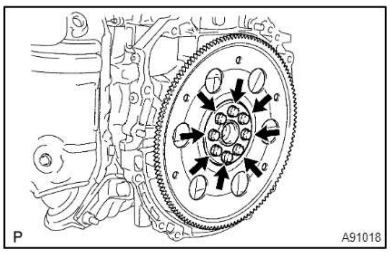


3. REMOVE DRIVE PLATE & RING GEAR SUB−ASSY

(a) TMC made:
Using SST, fix the crankshaft.
SST 09213−54015 (91651−60855), 09330−00021



(b) TMMK made:
Using SST, fix the crankshaft.
SST 09960−10010 (09962−01000, 09963−01000)

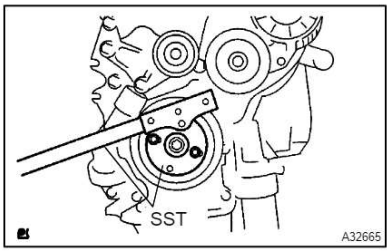


(c) Remove the 8 bolts, rear spacer, drive plate and front spacer.

4. REMOVE CLUTCH COVER ASSY (M/T) (See page 42−15)

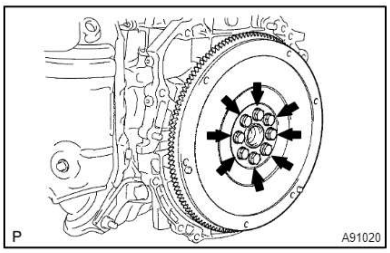
5. REMOVE CLUTCH DISC ASSY (M/T) (See page 42−15)

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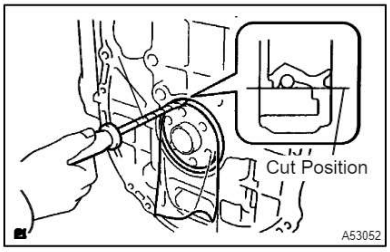


6. REMOVE FLYWHEEL SUB−ASSY (M/T)

(a) Using SST, fix the crankshaft.
SST 09213−54015 (91651−60855), 09330−00021



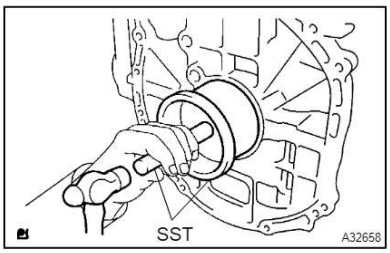
(b) Remove the 8 bolts and flywheel.



7. REMOVE ENGINE REAR OIL SEAL

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

NOTICE:
After the removal, check the crankshaft for damage. If it is damaged, smooth the surface with 400−grit sandpaper.
.



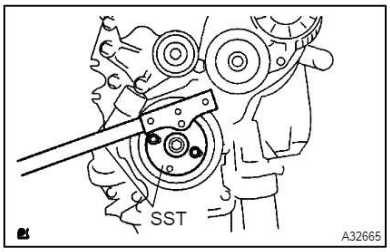
8. INSTALL ENGINE REAR OIL SEAL

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

NOTICE:
Keep the lip free from foreign matter.

(b) Using SST and a hammer, tap in the oil seal until its surface is flush with the rear oil seal retainer edge.
SST 09223−15030, 09950−70010 (09951−07100)

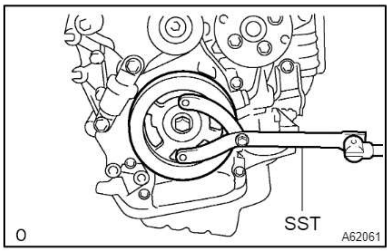
NOTICE:
Wipe off extra grease from the crankshaft.



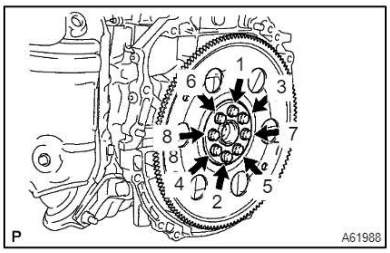
9. INSTALL DRIVE PLATE & RING GEAR SUB−ASSY (A/T)

(a) TMC made:
Using SST, fix the crankshaft.
SST 09213−54015 (91651−60855), 09330−00021

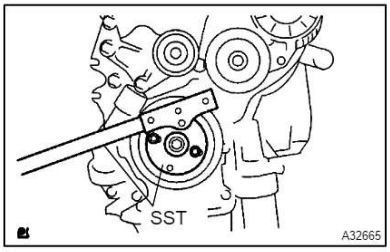
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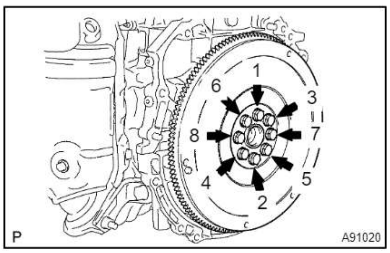
(b) TMMK made:
Using SST, fix the crankshaft.
SST 09960−10010 (09962−01000, 09963−01000)



(c) Clean the bolt and the bolt hole.
(d) Apply adhesive to 2 or 3 threads of the bolt end.
Adhesive:
Part No. 08833−00070, THREE BOND or equivalent
(e) Install the front spacer, drive plate and rear spacer with 8 bolts. Uniformly tighten the 8 bolts in the sequence shown in the illustration.
Torque: 98 N·m (1,000 kgf·cm, 72 ft·lbf)



10. INSTALL FLYWHEEL SUB−ASSY
(a) Using SST, fix the crankshaft.
SST 09213−54015 (91651−60855), 09330−00021



(b) Clean the bolt and the bolt hole.
(c) Apply adhesive to 2 or 3 threads of the bolt end.
Adhesive:
Part No. 08833−00070, THREE BOND or equivalent
(d) Install the flywheel with 8 bolts. Uniformly tighten the 8 bolts in the sequence shown in the illustration.
Torque: 130 N·m (1,330 kgf·cm, 96 ft·lbf)

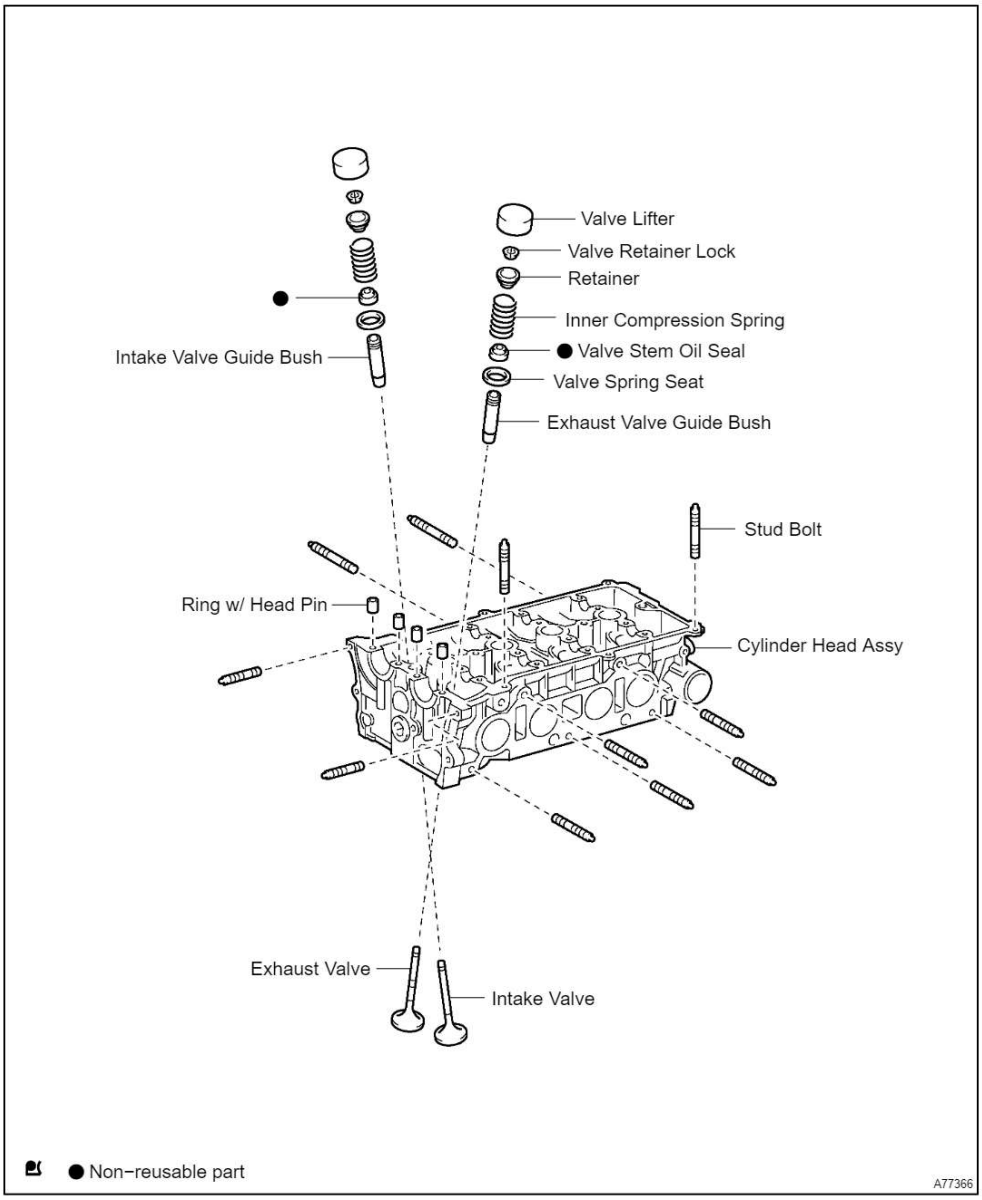
11. INSTALL CLUTCH DISC ASSY (M/T) (See page 42−15)
12. INSTALL CLUTCH COVER ASSY (M/T) (See page 42−15)
13. INSTALL AUTOMATIC TRANSAXLE ASSY (A/T) (SeePage 40−18)
14. INSTALL MANUAL TRANSAXLE ASSY (M/T) (See page 41−11)

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CYLINDER HEAD ASSY (2AZ−FE)(From July, 2003)

COMPONENTS

1411D−02



WhereEverybodyKnowsYourName

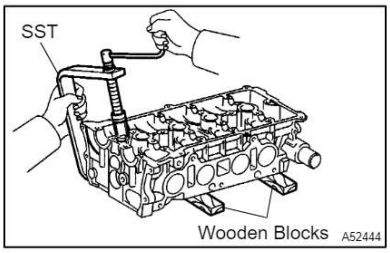
1411E−02

OVERHAUL

1. REMOVE VALVE LIFTER

HINT:

Arrange the valve lifters in the correct order.



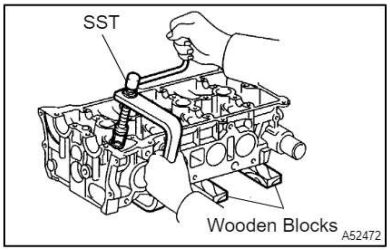
2. REMOVE INTAKE VALVE

(a) Using SST and wooden blocks, compress and remove the 8 valve spring retainer locks.
SST 09202−70020 (09202−00010)

(b) Remove the retainer, valve spring and valve.

HINT:

Arrange the removed parts in the correct order.



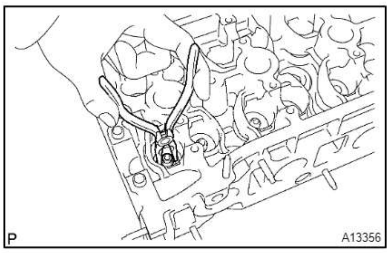
3. REMOVE EXHAUST VALVE

(a) Using SST and wooden blocks, compress and remove the 8 valve spring retainer locks.
SST 09202−70020 (09202−00010)

(b) Remove the retainer, valve spring and valve.

HINT:

Arrange the removed parts in the correct order.



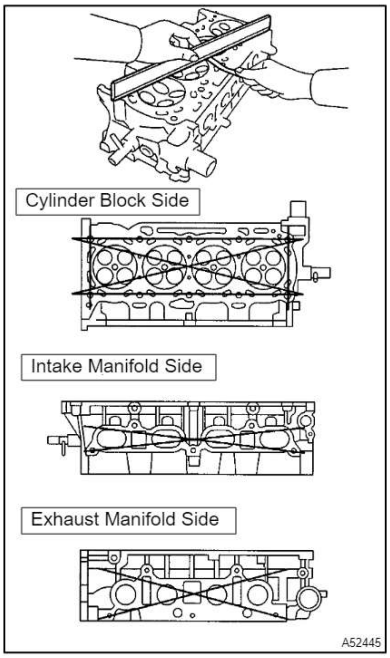
4. REMOVE VALVE STEM OIL O SEAL OR RING

(a) Using needle−nose pliers, remove the oil seals.

5. REMOVE VALVE SPRING SEAT

6. REMOVE STUD BOLT

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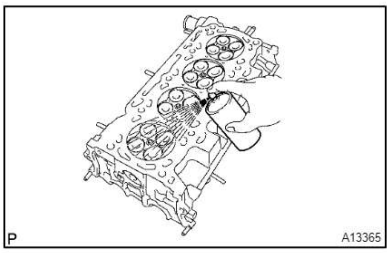
7. INSPECT CYLINDER HEAD FOR FLATNESS

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

Maximum warpage:

Item	Specified Condition
Cylinder block side	0.05 mm (0.0020 in.)
Intake manifold side	0.08 mm (0.0031 in.)
Exhaust manifold side	0.08 mm (0.0031 in.)

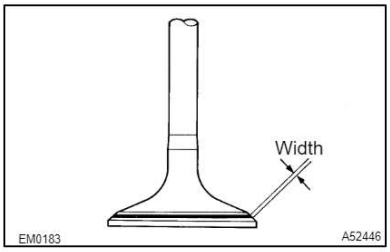
If the warpage is greater than the maximum, replace the cylinder head.



8. INSPECT CYLINDER HEAD FOR CRACKS

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

If cracked, replace the cylinder head.



9. INSPECT VALVE SEATS

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

(b) Lightly press the valve face against the valve seat.

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

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

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

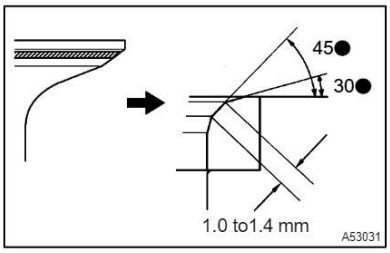
(3) Check that the valve seat contact is in the middle of the valve face with the width between 1.0 to 1.4 mm (0.039 to 0.055 in.).

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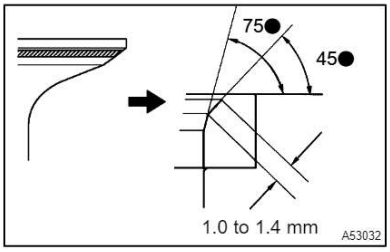
10. REPAIR VALVE SEATS

NOTICE:

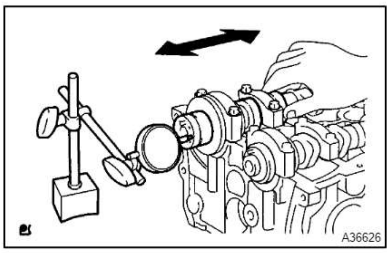
Keep the lip free from foreign matter.



(a) If the seating is too high on the valve face, use 30●and 45●cutters to correct the seat.



(b) If the seating is too low on the valve face, use 75●and 45● cutters to correct the seat.
(c) Hand−lap the valve and valve seat with an abrasive compound.
(d) Check the valve seating position.



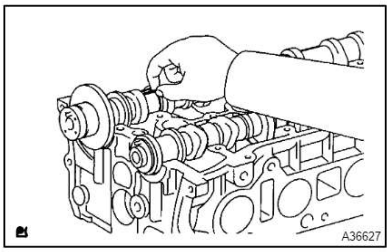
11. INSPECT CAMSHAFT THRUST CLEARANCE

(a) Install the camshafts.
(b) Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.

Specified thrust clearance:

Item	Specified Condition
Intake	0.040 to 0.110 mm (0.0016 to 0.0043 in.)
Exhaust	0.080 to 0.150 mm (0.0032 to 0.0059 in.)

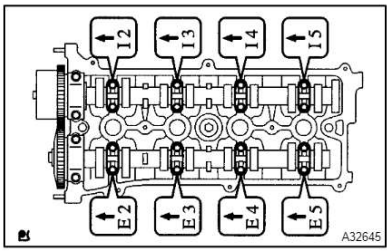
If the thrust clearance is greater than the maximum, replace the cylinder head. If the thrust surface is damaged, replace the camshaft.



12. INSPECT CAMSHAFT OIL CLEARANCE

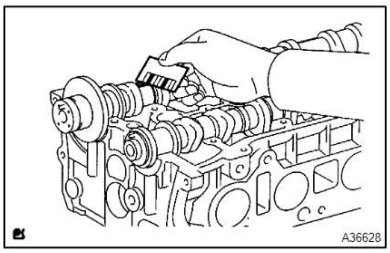
(a) Clean the bearing caps and camshaft journals.
(b) Place the camshafts on the cylinder head.
(c) Lay a strip of plastigage across each of the camshaft journal.

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(d) Install the bearing caps.
Torque:
30 N·m (301 kgf·cm, 22 ft·lbf) for No. 1 bearing cap
30 N·m (301 kgf·cm, 22 ft·lbf) for No. 2 bearing cap
9.0 N·m (92 kgf·cm, 80 in.·lbf) for No. 3 bearing cap

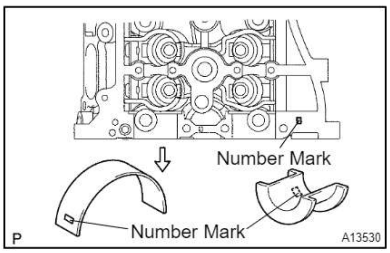
NOTICE:
Do not turn the camshaft.



(e) Remove the bearing cap, and measure the plastigage at its widest point.
Specified oil clearance:

Item	Specified Condition
Intake No. 1 journal bearing mark 1	0.007 to 0.070 mm (0.0003 to 0.0028 in.)
Intake No. 1 journal bearing mark 2	0.008 to 0.070 mm (0.0003 to 0.0028 in.)
Intake No. 1 journal bearing mark 3	0.008 to 0.070 mm (0.0003 to 0.0028 in.)
Other journals	0.025 to 0.100 mm (0.0010 to 0.0039 in.)
Exhaust No. 1 journal	0.040 to 0.100 mm (0.0016 to 0.0039 in.)
Other journals	0.025 to 0.100 mm (0.0010 to 0.0039 in.)

NOTICE:
Completely remove the plastigage after the inspection.
If the oil clearance is greater than the maximum, replace the camshaft. If necessary, replace the cylinder head.



If the oil clearance on the No.1 journal is greater than the maximum, choose a new bearing and install it.
HINT:
Cylinder head journal bore diameter

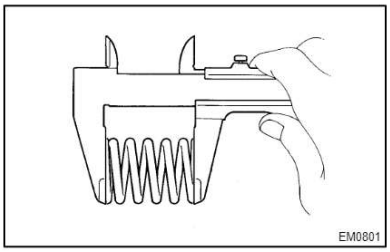
Mark 1	40.000 to 40.009 mm (1.5748 to 1.5752 in.)
Mark 2	40.009 to 40.017 mm (1.5752 to 1.5755 in.)
Mark 3	40.017 to 40.025 mm (1.5755 to 1.5758 in.)

Standard bearing center wall thickness

Mark 1	2.000 to 2.004 mm (0.0787 to 0.0789 in.)
Mark 2	2.004 to 2.008 mm (0.0789 to 0.0791 in.)
Mark 3	2.008 to 2.012 mm (0.0791 to 0.0792 in.)

Camshaft journal diameter:
35.971 to 35.985 mm (1.4162 to 1.4167 in.)

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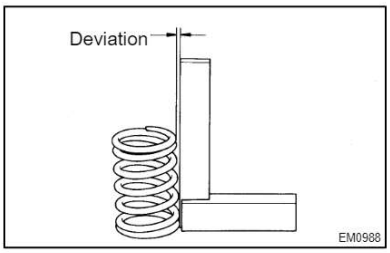


13. INSPECT INNER COMPRESSION SPRING

(a) Using a vernier caliper, measure the free length of the valve spring.

Free length: 45.7 mm (1.799 in.)

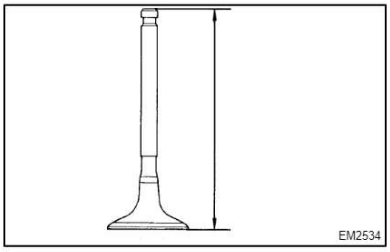
If the free length is not as specified, replace the valve spring.



(b) Using steel squares, measure the deviation of the valve spring.

Maximum deviation: 1.6 mm (0.063 in.)

If the deviation is greater than the maximum, replace the valve spring.

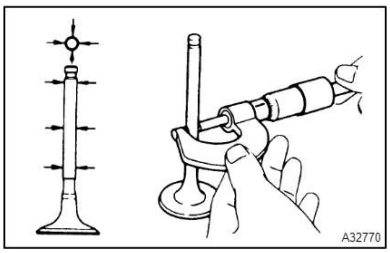


14. INSPECT INTAKE VALVE

(a) Using a vernier caliper, measure the valve overall length.

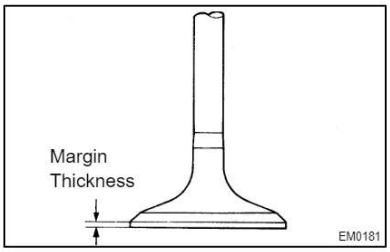
Specified overall length:
101.21 to 101.71 mm (3.9846 to 4.0043 in.)

If the overall length is less than the minimum, replace the valve.



(b) Using a micrometer, measure the diameter of the valve stem.

Valve stem diameter:
5.470 to 5.485 mm (0.2154 to 0.2159 in.)

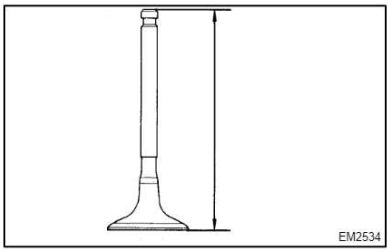


(c) Using a vernier caliper, measure the valve head margin thickness.

Specified margin thickness:
0.50 to 1.45 mm (0.0197 to 0.0571 in.)

If the margin thickness is less than the minimum, replace the valve.

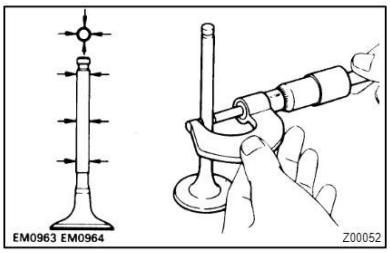
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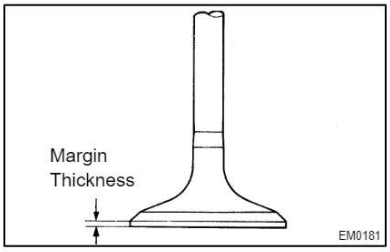
15. INSPECT EXHAUST VALVE

(a) Using a vernier caliper, measure the valve overall length.
Specified overall length:
100.70 to 101.15 mm (3.9646 to 3.9823 in.)

If the overall length is less than the minimum, replace the valve.

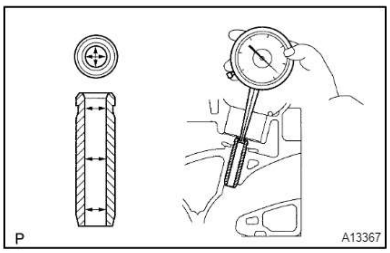


(b) Using a micrometer, measure the diameter of the valve stem.
Valve stem diameter:
5.465 to 5.480 mm (0.2152 to 0.2157 in.)



(c) Using a vernier caliper, measure the valve head margin thickness.
Specified margin thickness:
0.50 to 1.60 mm (0.0197 to 0.0630 in.)

If the margin thickness is less than the minimum, replace the valve.



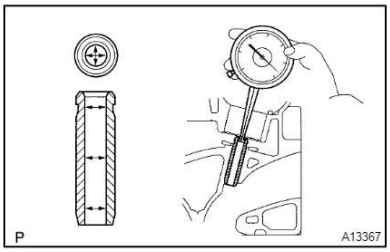
16. INSPECT INTAKE VALVE GUIDE BUSH

(a) Using a caliper gauge, measure the inside diameter of the guide bush.
Bushing inside diameter:
5.510 to 5.530 mm (0.2169 to 0.2177 in.)

(b) Subtract the valve stem diameter measurement from the guide bush inside diameter measurement.
Specified oil clearance:
0.025 to 0.080 mm (0.0010 to 0.0031 in.)

If the clearance is greater than the maximum, replace the valve and guide bush (see steps 18 and 20).

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17. INSPECT EXHAUST VALVE GUIDE BUSH

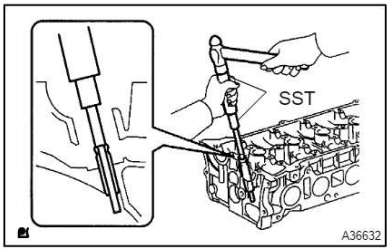
(a) Using a caliper gauge, measure the inside diameter of the guide bush.

Bushing inside diameter:
5.510 to 5.530 mm (0.2169 to 0.2177 in.)

(b) Subtract the valve stem diameter measurement from the guide bushing inside diameter measurement.

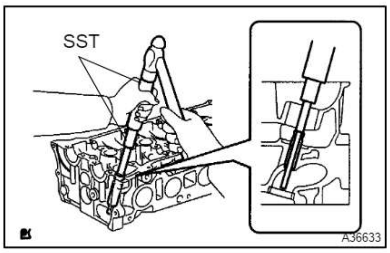
Specified oil clearance:
0.030 to 0.100 mm (0.0012 to 0.0039 in.)

If the clearance is greater than the maximum, replace the valve and guide bush (see steps 19 and 21).



18. REMOVE INTAKE VALVE GUIDE BUSH

(a) Using SST and a hammer, tap out the guide bush.
SST 09201−10000 (09201−01050), 09950−70010 (09951−07100)



19. REMOVE EXHAUST VALVE GUIDE BUSH

(a) Using SST and a hammer, tap out the guide bush.
SST 09201−10000 (09201−01050), 09950−70010 (09951−07100)

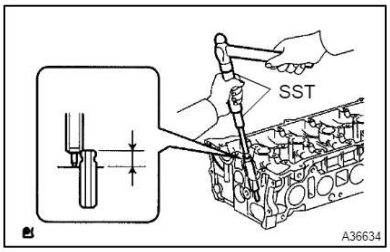
20. INSTALL INTAKE VALVE GUIDE BUSH

Using a caliper gauge, measure the bush bore diameter of the cylinder head.

Diameter: 10.285 to 10.306 mm (0.4049 to 0.4057 in.)

Install the STD bush if the diameter is within the specified diameter.

Specified diameter:
10.333 to 10.344 mm (0.4068 to 0.4072 in.)



(a) Using SST and a hammer, tap in a new guide bush to the specified protrusion height.

Protrusion height:
9.6 to 10.0 mm (0.3779 to 0.3937 in.)

SST 09201−10000 (09201−01050), 09950−70010 (09951−07100)

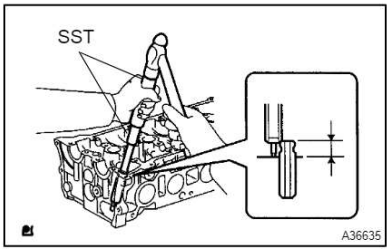
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(b) Using a sharp 5.5 mm reamer, ream the guide bush to obtain the standard specified clearance between the guide bush and valve stem.
Standard oil clearance:
0.025 to 0.060 mm (0.0010 to 0.0024 in.)

21. INSTALL EXHAUST VALVE GUIDE BUSH

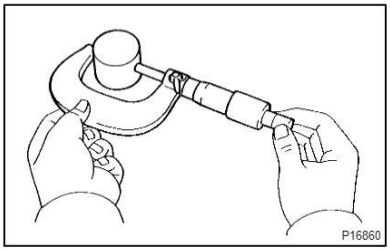
(a) Using a caliper gauge, measure the bush bore diameter of the cylinder head.
Diameter: 10.285 to 10.306 mm (0.4049 to 0.4057 in.)

(b) Install the STD bush if the diameter is within the specified diameter.
Specified diameter:
10.333 to 10.344 mm (0.4068 to 0.4072 in.)



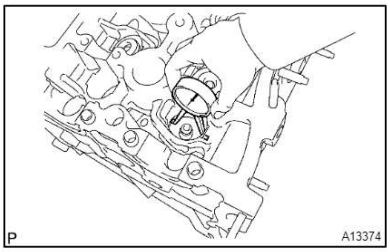
(c) Using SST and a hammer, tap in a new guide bush to the specified protrusion height.
Protrusion height:
9.6 to 10.0 mm (0.3779 to 0.3937 in.)

(d) Using a sharp 5.5 mm reamer, ream the guide bush to obtain the standard specified clearance between the guide bush and valve stem.
SST 09201−10000 (09201−01050), 09950−70010 (09951−07100)
Standard oil clearance:
0.030 to 0.065 mm (0.0012 to 0.0026 in.)



22. INSPECT VALVE LIFTER

(a) Using a micrometer, measure the lifter diameter.
Lifter diameter:
30.966 to 30.976 mm (1.2191 to 1.2195 in.)

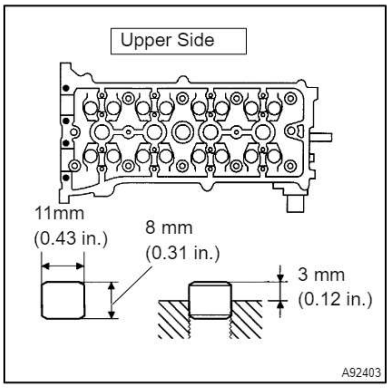


(b) Using a caliper gauge, measure the lifter bore diameter of the cylinder head.
Lifter bore diameter:
31.009 to 31.025 mm (1.2208 to 1.2215 in.)

(c) Subtract the lifter diameter measurement from the lifter bore diameter measurement.
Specified oil clearance:
0.033 to 0.070 mm (0.0013 to 0.0028 in.)

If the oil clearance is greater than the maximum, replace the lifter. If necessary, replace the cylinder head.

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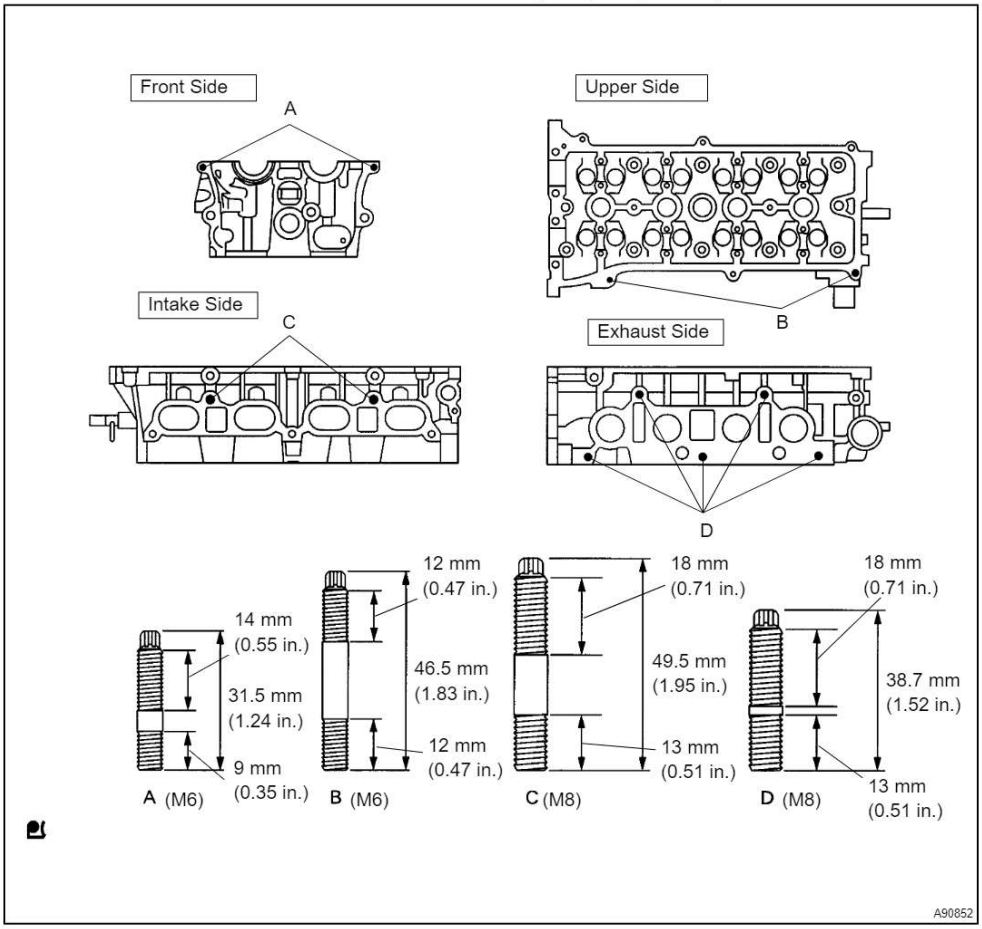


23. INSTALL RING W/HEAD PIN

(a) Using a plastic−faced hammer, tap in a new ring pin to the specified protrusion height.
Protrusion height: 3 mm (0.12 in.)

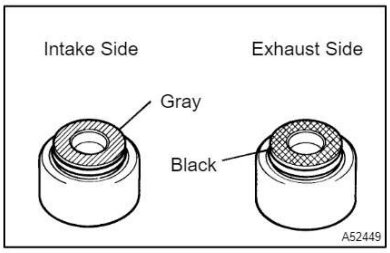
24. INSTALL STUD BOLT

Torque:
5 N·m (51 kgf·cm, 44 in.·lbf) for bolt A
5 N·m (51 kgf·cm, 44 in.·lbf) for bolt B
10 N·m (97 kgf·cm, 7 ft·lbf) for bolt C
10 N·m (97 kgf·cm, 7 ft·lbf) for bolt D



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25. INSTALL VALVE SPRING SEAT



26. INSTALL VALVE STEM OIL O SEAL OR RING

(a) Apply a light coat of engine oil on a new oil seal.

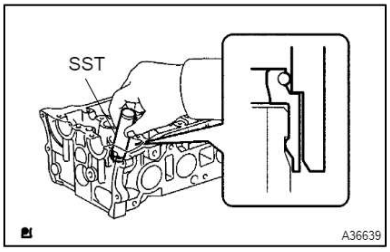
NOTICE:

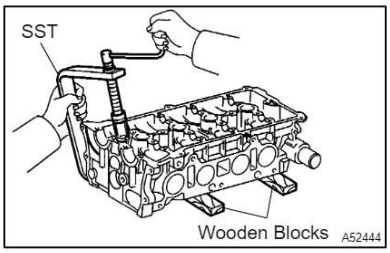
Pay close attention when installing the intake and exhaust oil seals. For example, installing the intake oil seal into the exhaust or installing the exhaust oil seal to the intake can cause installation problems later.

HINT:

The intake valve oil seal is gray and the exhaust valve oil seal is black.

(b) Using SST, push in the oil seal.
SST 09201−41020

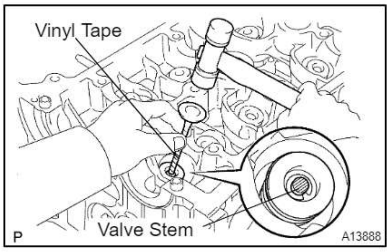




27. INSTALL INTAKE VALVE

(a) Install the valve, spring and retainer to the cylinder head.

(b) Using SST and wooden blocks, compress the spring and install the 2 retainer locks.
SST 09202−70020 (09202−00010)

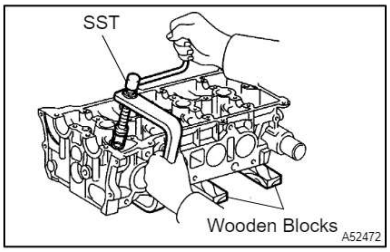


(c) Using a plastic−faced hammer and a discarded valve with its tip wrapped in tape, lightly tap the installed valve to ensure that it is securely fit.

NOTICE:

Be careful not to damage the valve stem tip.

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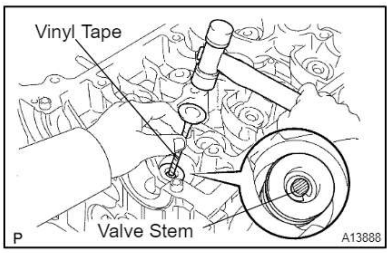


28. INSTALL EXHAUST VALVE

(a) Install the valve, spring and retainer to the cylinder head.

(b) Using SST and wooden blocks, compress the spring and install the 2 retainer locks.

SST 09202−70020 (09202−00010)



(c) Using a plastic−faced hammer and a discarded valve with its tip wrapped in tape, lightly tap the installed valve to ensure that it is securely fit.

NOTICE:

Be careful not to damage the valve stem tip.

29. INSTALL VALVE LIFTER

(a) Assemble the valve lifter and the tip of the valve stem with a light coat of engine oil applied.

NOTICE:

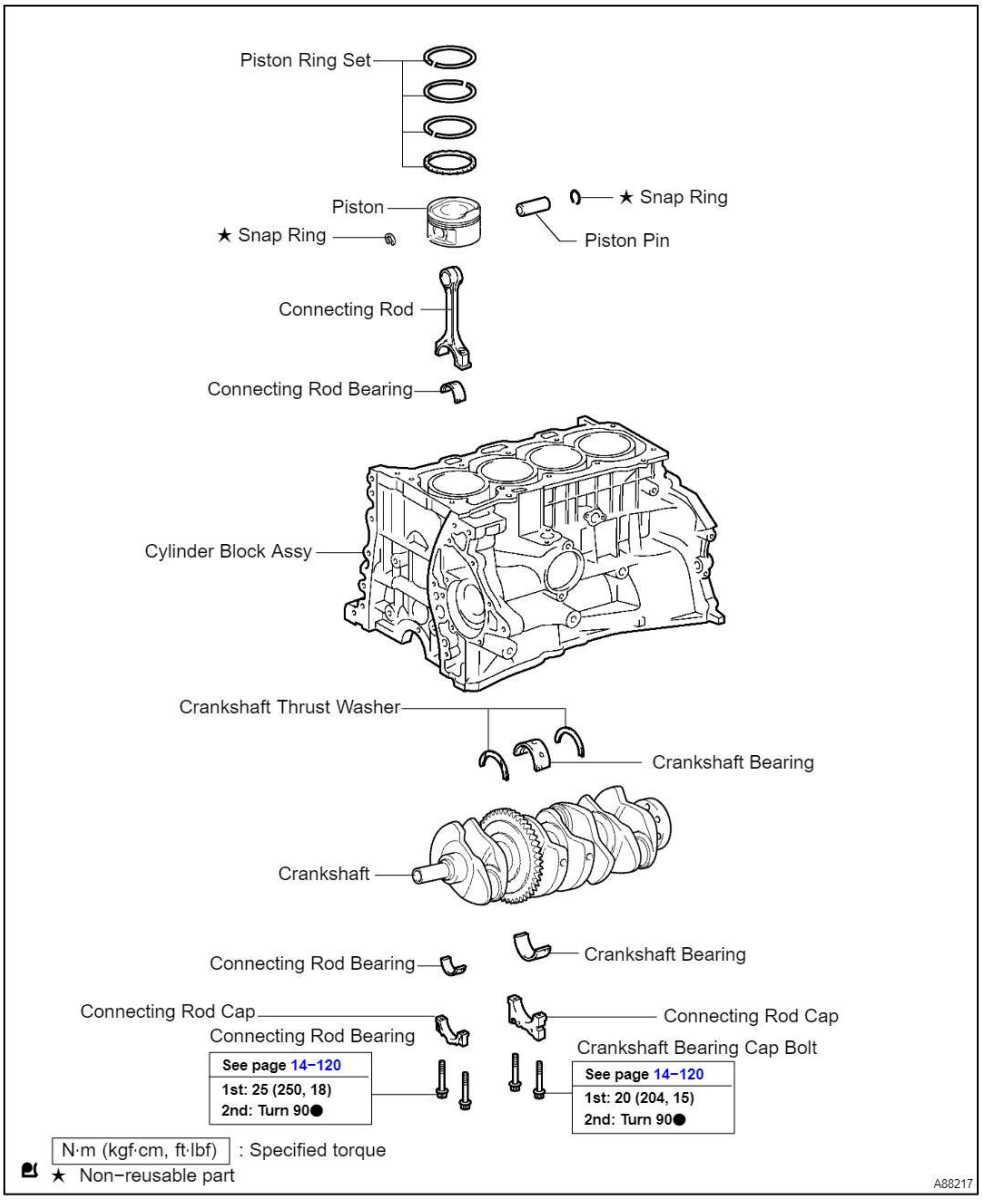
Install the valve lifters in their original places.

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CYLINDER BLOCK ASSY (2AZ−FE)(From July, 2003)

1410F−02

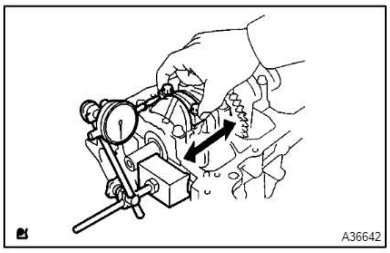
COMPONENTS



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1411G−03

OVERHAUL

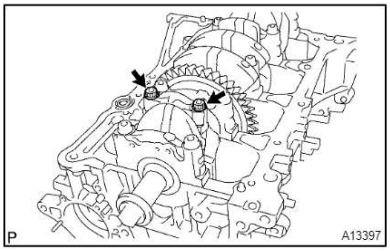


1. INSPECT CONNECTING ROD THRUST CLEARANCE

(a) Using a dial indicator, measure the thrust clearance while moving the connecting rod back and forth.

Specified thrust clearance:
0.160 to 0.362 mm (0.0063 to 0.0143 in.)

If the thrust clearance is greater than the maximum, replace the connecting rod assembly(s). If necessary, replace the crankshaft.



2. INSPECT CONNECTING ROD OIL CLEARANCE

HINT:
The connecting rod cap bolts are tightened in 2 progressive steps.

(a) Check that the matchmarks on the connecting rod and cap are aligned to ensure the correct reassembly.

HINT:
The matchmarks on the connecting rods and caps are for ensuring the correct reassembly.

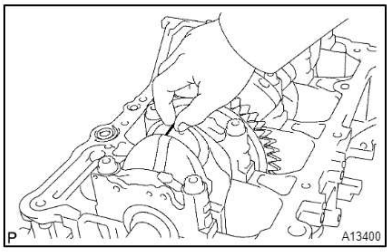
(b) Remove the 2 connecting rod cap bolts.

(c) Using the 2 removed connecting rod cap bolts, remove the connecting rod cap and lower bearing by wiggling the connecting rod cap right and left.

HINT:
Keep the lower bearing inserted to the connecting rod cap.

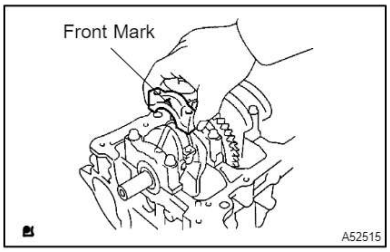
(d) Clean the crank pin and bearing.

(e) Check the crank pin and bearing for pitting and scratches.



(f) Lay a strip of Plastigage on the crank pin.

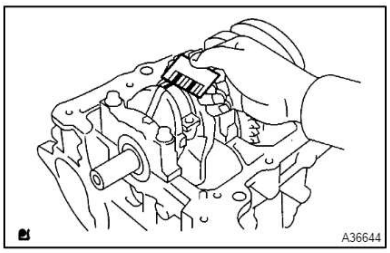
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(g) Check that the front mark of the connecting rod cap is facing in the correct direction.
(h) Apply a light coat of engine oil on the threads and under the heads of the connecting rod cap bolts.
(i) Install the connecting cap (see step 37).

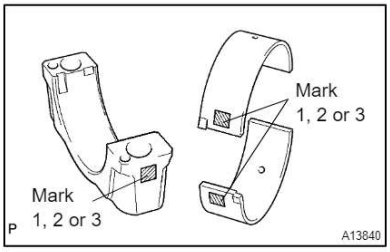
NOTICE:
Do not turn the crankshaft.

(j) Remove the 2 bolts and connecting rod cap.



(k) Measure the Plastigage at its widest point.
Specified oil clearance:
0.024 to 0.080 mm (0.0009 to 0.0031 in.)

If the crank pin or bearing is damaged, replace the bearings. If necessary, replace the crankshaft.

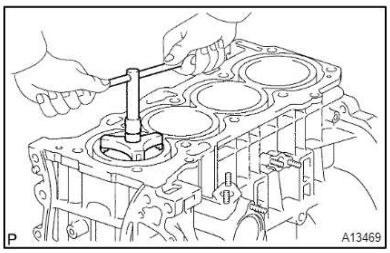


HINT:
If replacing a bearing, replace it with one that has the same number as the connecting rod. There are 3 sizes of standard bearings: 1, 2 and 3.

Standard bearing center wall thickness:

Mark 1	1.485 to 1.488 mm (0.0585 to 0.0586 in.)
Mark 2	1.488 to 1.491 mm (0.0586 to 0.0587 in.)
Mark 3	1.491 to 1.494 mm (0.0587 to 0.0588 in.)

(l) Completely remove the Plastigage.



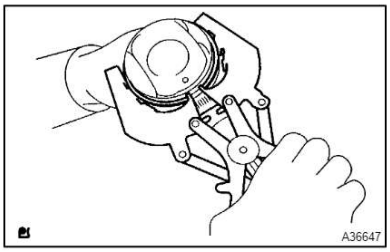
3. REMOVE PISTON SUB−ASSY W/CONNECTING ROD

(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.

4. REMOVE CONNECTING ROD BEARING

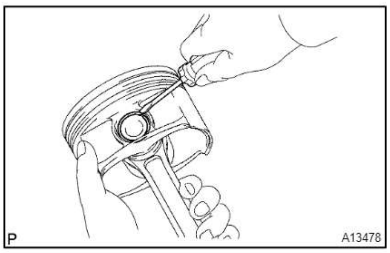
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5. REMOVE PISTON RING SET

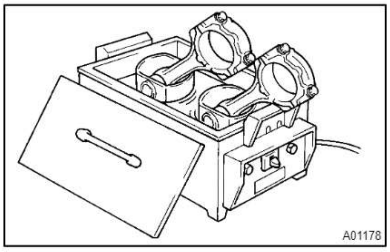
(a) Using a piston ring expander, remove the 2 compression rings.

(b) Remove the 2 side rails and oil ring by hand.



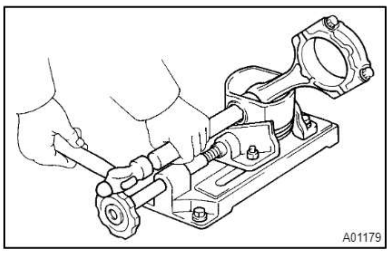
6. REMOVE PISTON PIN HOLE SNAP RING

(a) Using a small screwdriver, pry out the 2 snap rings.



7. REMOVE PISTON

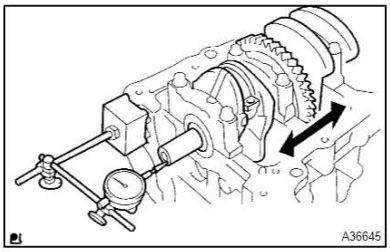
(a) Gradually heat the piston to approxinately 80 to 90°C (176 to 194°F).



(b) Using a plastic−faced hammer and brass bar, lightly tap out the piston pin and remove the connecting rod.

HINT:

- The piston and pin are a matched set.
- Arrange the pistons, pins, rings, connecting rods and bearings in the correct order.



8. INSPECT CRANKSHAFT THRUST CLEARANCE

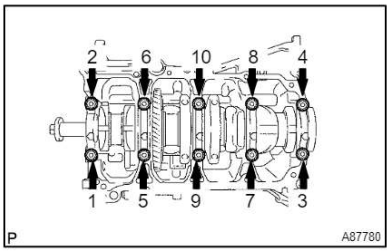
(a) Using a dial indicator, measure the thrust clearance while prying the crankshaft back and forth with a screwdriver.

Specified thrust clearance:
0.040 to 0.300 mm (0.0016 to 0.0118 in.)

If the thrust clearance is greater than the maximum, replace the thrust washers as a set.

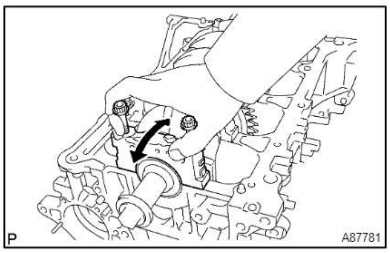
Thrust washer thickness:
1.930 to 1.980 mm (0.0760 to 0.0780 in.)

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9. INSPECT CRANKSHAFT OIL CLEARANCE

(a) Uniformly loosen and remove the 10 main bearing cap bolts, in the sequence shown in the illustration.



(b) Use 2 removed main bearing cap bolts to remove the 5 main bearing caps and 5 lower bearings.

NOTICE:

Insert the bolts into one of the caps. Ease the cap out by gently pulling up and applying force toward the front and back side of the cylinder block, as shown in the illustration. Take care not to damage the contact surfaces of the cap and cylinder block.

HINT:

- Keep the lower bearing and main bearing cap together.
- Arrange the main bearing caps in correct order.

(c) Lift out the crankshaft.

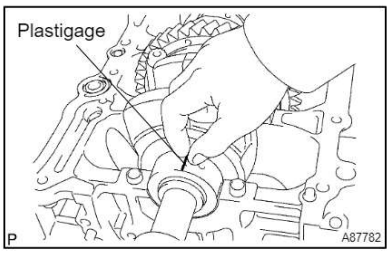
HINT:

Keep the upper bearings together with the cylinder block.

(d) Clean each main journal and bearing.

(e) Check each main journal and bearing for pitting and scratches.

If the journal or bearing is damaged, replace the bearings.
If necessary, replace the crankshaft.



(f) Place the crankshaft on the cylinder block.

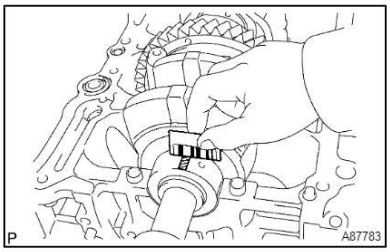
(g) Lay a strip of Plastigage across each journal.

(h) Install the main bearing caps (see step 36).

HINT:

Do not turn the crankshaft.

(i) Remove the main bearing cap (see steps (a) and (b) above).

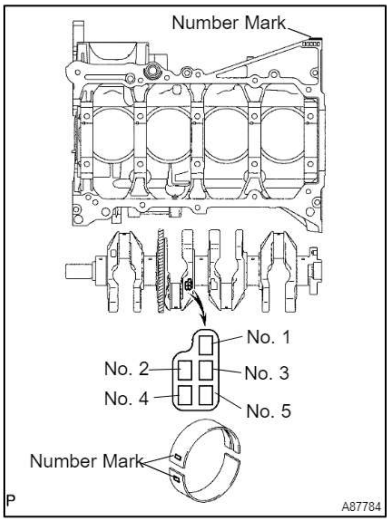


(j) Measure the Plastigage at its widest point.

Standard oil clearance:
0.008 to 0.024 mm (0.00031 to 0.00094 in.)

If the oil clearance is greater than the maximum, replace the bearings. If necessary, replace the crankshaft.

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(k) If using a standard bearing, replace it with one having the same number. If the number of the bearing cannot be determined, select the correct bearing by adding together the numbers imprinted on the cylinder block and crankshaft, and then selecting the bearing according to the chart below. There are 4 sizes of standard bearings: 1, 2, 3, and 4.

Cylinder block (A) + Crankshaft (B)	0 to 2	3 to 5	6 to 8	9 to 11
Use bearing	1	2	3	4

HINT:
EXAMPLE
Cylinder block 4 (A) + Crankshaft 3 (B) =
Total number 7 (Use bearing 3)

Reference:

Item	Mark	Specified Condition
Cylinder block main journal bore diameter (A)	0	59.000 to 59.002 mm (2.3228 to 2.3229 in.)
	1	59.002 to 59.004 mm (2.3229 to 2.3230 in.)
	2	59.004 to 59.006 mm (2.3230 to 2.3231 in.)
	3	59.006 to 59.009 mm (2.3231 to 2.3232 in.)
	4	59.009 to 59.011 mm (2.3232 to 2.3233 in.)
	5	59.011 to 59.013 mm (2.3233 to 2.3234 in.)
	6	59.013 to 59.016 mm (2.3234 to 2.3235 in.)
Crankshaft main journal diameter (B)	0	54.998 to 55.000 mm (2.1653 to 2.1654 in.)
	1	54.996 to 54.998 mm (2.1652 to 2.1653 in.)
	2	54.994 to 54.996 mm (2.1651 to 2.1652 in.)
	3	54.992 to 54.994 mm (2.1650 to 2.1651 in.)
	4	54.990 to 54.992 mm (2.1650 to 2.1650 in.)
	5	54.988 to 54.990 mm (2.1649 to 2.1650 in.)
Standard bearing center wall thickness	1	1.993 to 1.996 mm (0.0785 to 0.0786 in.)
	2	1.996 to 1.999 mm (0.0786 to 0.0787 in.)
	3	1.999 to 2.002 mm (0.0787 to 0.0788 in.)
	4	2.002 to 2.005 mm (0.0788 to 0.0789 in.)

(l) Completely remove the Plastigage.

10. REMOVE CRANKSHAFT

(a) Lift out the crankshaft.

(b) Remove the 5 upper main bearings and 2 thrust washers from the cylinder block.

HINT:
Arrange the main bearings and thrust washers in the correct order.

11. REMOVE CRANKSHAFT THRUST WASHER UPPER

12. REMOVE CRANKSHAFT BEARING

HINT:
Arrange the bearings in the correct order.

13. REMOVE CRANKSHAFT BEARING NO.2

HINT:
Arrange the bearings in the correct order.

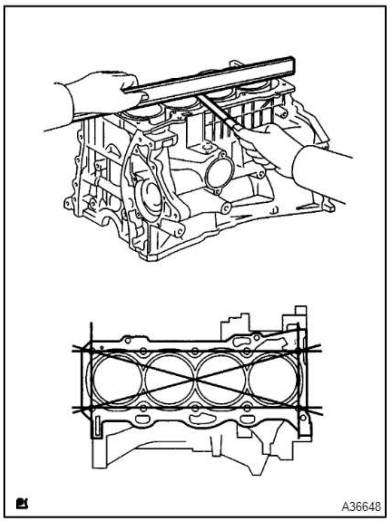
14. REMOVE STUD BOLT

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15. CLEAN CYLINDER BLOCK SUB−ASSY

NOTICE:

If the cylinder is washed at high temperatures, the cylinder liner sticks out beyond the cylinder block. Always wash the cylinder block at a temperature of 45°C (113°F) or less.

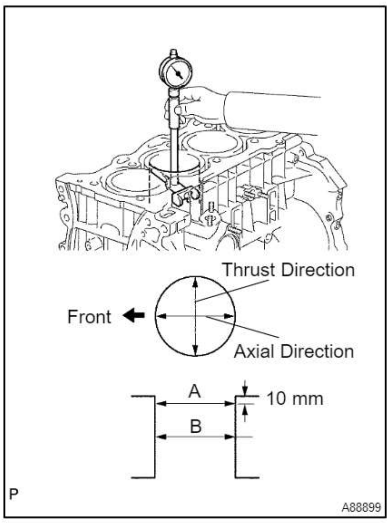


16. INSPECT CYLINDER BLOCK FOR FLATNESS

(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 the maximum, replace the cylinder block.



17. INSPECT CYLINDER BORE

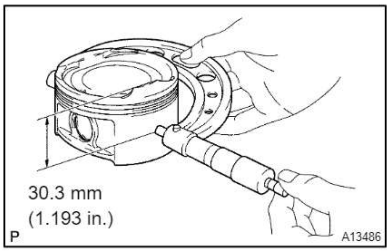
(a) Using a cylinder gauge, measure the cylinder bore diameter at positions A and B in the thrust and axial directions.

Standard diameter:

88.500 to 88.633 mm (3.4843 to 3.4894 in.)

If the average of the measured diameters is greater than the maximum, replace the cylinder block.

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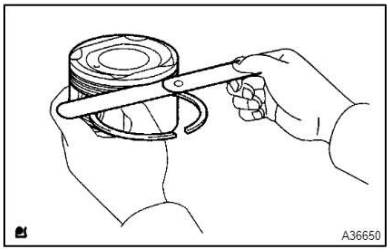
18. INSPECT PISTON DIAMETER

(a) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 30.3 mm (1.193 in.) from the piston head.
Piston diameter:
88.439 to 88.449 mm (3.4818 to 3.4822 in.)

19. INSPECT PISTON CLEARANCE

(a) Subtract the piston diameter measurement from the cylinder bore diameter measurement.
Specified oil clearance: 0.051 to 0.100 mm (0.0020 to 0.0039 in.)

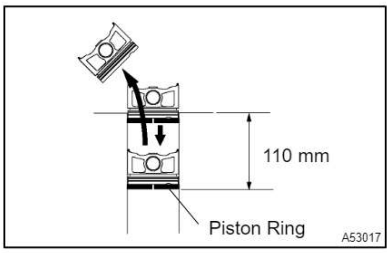
If the clearance is greater than the maximum, replace all the 4 pistons. If necessary, replace the cylinder block.



20. INSPECT RING GROOVE CLEARANCE

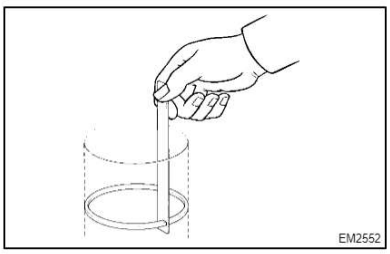
(a) Using a feeler gauge, measure the clearance between the piston ring and the wall of the ring groove.
Ring groove clearance:
0.030 to 0.070 mm (0.0012 to 0.0028 in.)

If the clearance is not as specified, replace the piston.



21. INSPECT PISTON RING END GAP

(a) Using a piston, push the piston ring a little beyond the bottom of the ring travel, 110 mm (4.33 in.) from the top of the cylinder block.

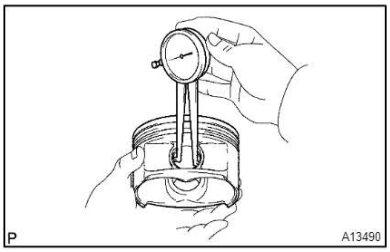


(b) Using a feeler gauge, measure the end gap.
Specified end gap:

Item	Specified Condition
No. 1	0.22 to 0.892 mm (0.0087 to 0.0350 in.)
No. 2	0.50 to 1.35 mm (0.0197 to 0.0531 in.)
Oil (side rail)	0.10 to 0.73 mm (0.0039 to 0.0287 in.)

If the end gap is greater than the maximum, replace the piston ring. If the end gap is greater than the maximum even with a new piston ring, replace the cylinder block.

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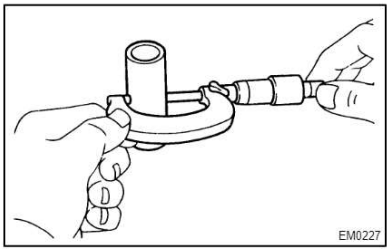


22. INSPECT PISTON PIN OIL CLEARANCE

(a) Using a caliper gauge, measure the pin hole bush diameter of the piston.

Pin hole diameter:
22.001 to 22.010 mm (0.8662 to 0.8665 in.)
Pin hole diameter (Reference):

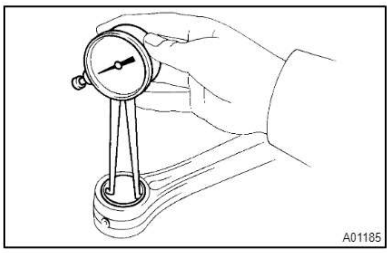
Mark	mm (in.)
A	22.001 to 22.004 (0.8662 to 0.8663)
B	22.004 to 22.007 (0.8663 to 0.8664)
C	22.007 to 22.010 (0.8664 to 0.8665)



(b) Using a micrometer, measure the piston pin diameter.

Piston pin diameter:
21.997 to 22.009 mm (0.8660 to 0.8665 in.)
Piston pin diameter (Reference):

Mark	mm (in.)
A	21.997 to 22.000 (0.8660 to 0.8661)
B	22.000 to 22.003 (0.8661 to 0.8663)
C	22.003 to 22.006 (0.8663 to 0.8664)
D	22.006 to 22.009 (0.8664 to 0.8665)



(c) Using a caliper gauge, measure the inside diameter of the connecting rod bush.

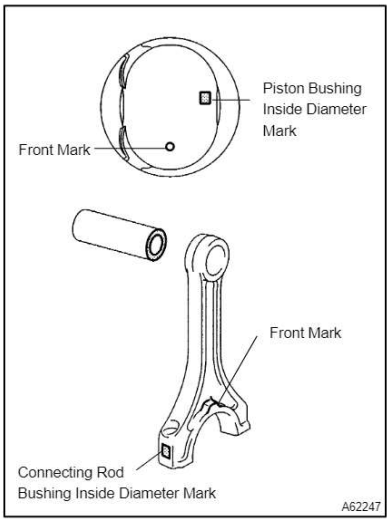
Bushing inside diameter:
22.005 to 22.014 mm (0.8663 to 0.8667 in.)
Bushing inside diameter:

Mark	mm (in.)
A	22.005 to 22.008 (0.8663 to 0.8665)
B	22.008 to 22.011 (0.8665 to 0.8666)
C	22.011 to 22.014 (0.8666 to 0.8667)

(d) Subtract the piston pin diameter measurement from the piton pin hole diameter measurement.

Specified oil clearance:
0.001 to 0.010 mm (0.00004 to 0.00039 in.)

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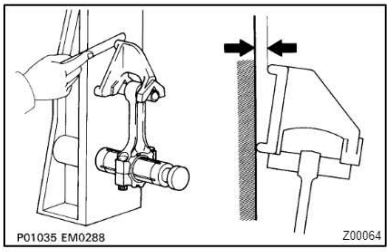


If the oil clearance is greater than the maximum, replace the connecting rod. If necessary, replace the piston and piston pin as a set.

(e) Subtract the piston pin diameter measurement from the bushing inside diameter measurement.

Specified oil clearance:
0.005 to 0.100 mm (0.0002 to 0.0020 in.)

If the oil clearance is greater than the maximum, replace the connecting rod. If necessary, replace the connecting rod and piston pin as a set.



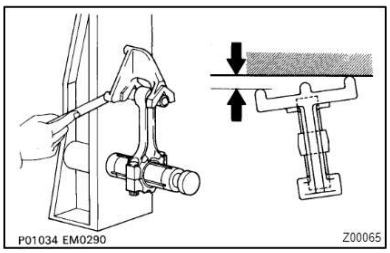
23. INSPECT CONNECTING ROD SUB−ASSY

(a) Using a 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.)

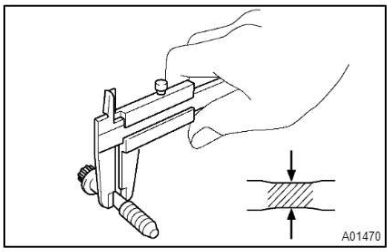
If the out−of−alignment is greater than the maximum, replace the connecting rod assembly.



(2) Check for twist.

Maximum twist:
0.15 mm (0.0059 in.) per 100 mm (3.94 in.)

If the twist is greater than the maximum, replace the connecting rod assembly.



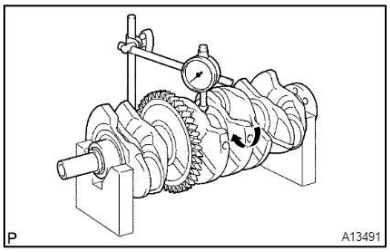
24. INSPECT CONNECTING ROD BOLT

(a) Using a vernier caliper, measure the tension portion diameter of the bolt.

Specified diameter: 7.0 to 7.3 mm (0.276 to 0.287 in.)

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

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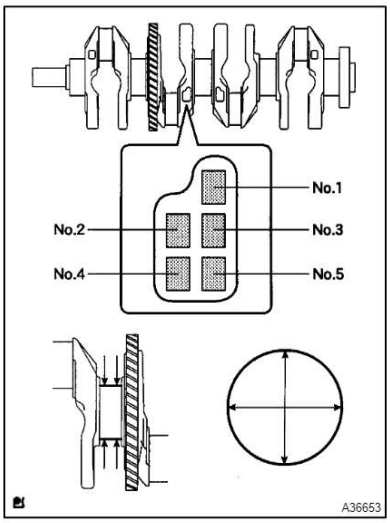


25. INSPECT CRANKSHAFT

(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 the maximum, replace the crankshaft.



(b) Using a micrometer, measure the diameter of each main journal.

Diameter: 54.988 to 55.000 (2.1648 to 2.06535 in.)

If the diameter is not as specified, check the oil clearance (see step 9). If necessary, replace the crankshaft.

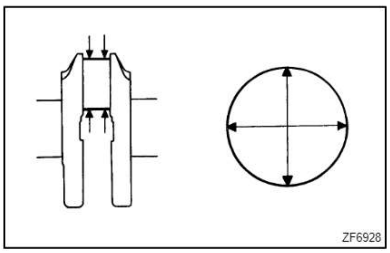
(c) Check each main journal for taper and out−of−round as shown in the illustration.

Maximum taper and out−of−round:
0.003 mm (0.0001 in.)

If the taper and out−of−round is greater than the maximum, replace the crankshaft.

Diameter (Reference):

Mark	Specified Condition
0	54.998 to 55.000 mm (2.1653 to 2.1654 in.)
1	54.996 to 54.998 mm (2.1652 to 2.1653 in.)
2	54.994 to 54.996 mm (2.1651 to 2.1652 in.)
3	54.992 to 54.994 mm (2.1650 to 2.1651 in.)
4	54.990 to 54.992 mm (2.1650 to 2.1650 in.)
5	54.988 to 54.990 mm (2.1649 to 2.1650 in.)



(d) Using a micrometer, measure the diameter of each crank pin.

Diameter: 47.990 to 48.000 mm (1.8894 to 1.8898 in.)

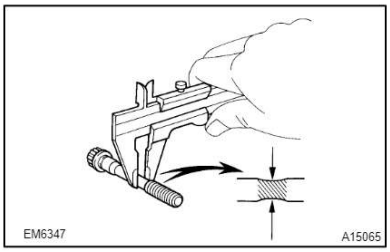
If the diameter is not as specified, check the oil clearance (see step 2). If necessary, replace the crankshaft.

(e) Check each crank pin for taper and out−of−round as shown in the illustration.

Maximum taper and out−of−round:
0.003 mm (0.0001 in.)

If the taper and out−of−round is greater than the maximum, replace the crankshaft.

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26. INSPECT CRANKSHAFT BEARING CAP SET BOLT

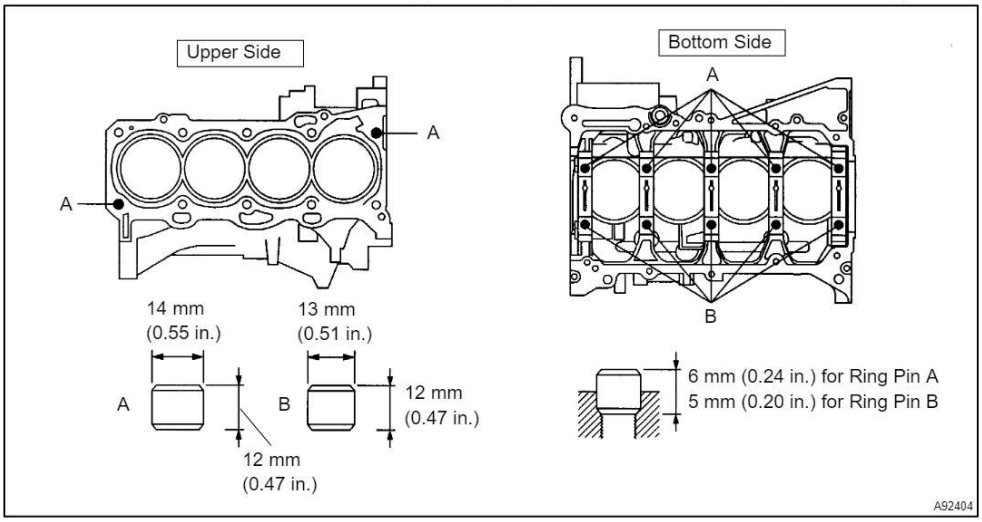
(a) Using a vernier caliper, measure the tension portion diameter of the bolt.

Specified diameter: 7.2 to 7.6 mm (0.283 to 0.299 in.)

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

27. INSTALL RING PIN

(a) Using a plastic−faced hammer, tap into the ring pin.

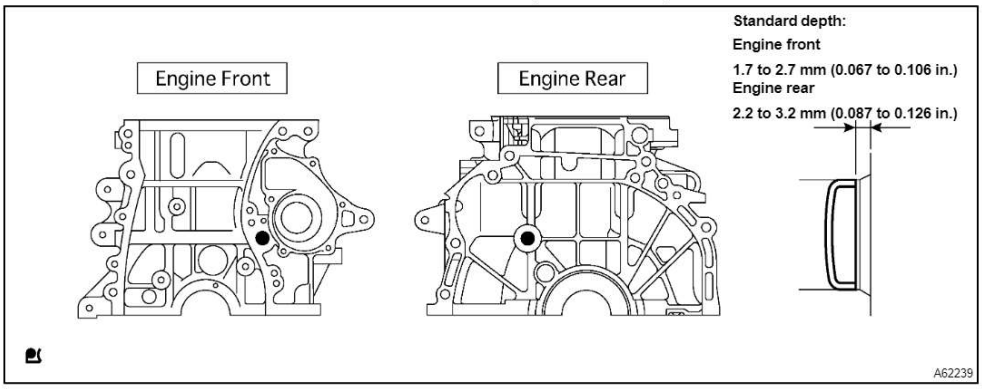


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28. INSTALL TIGHT PLUG

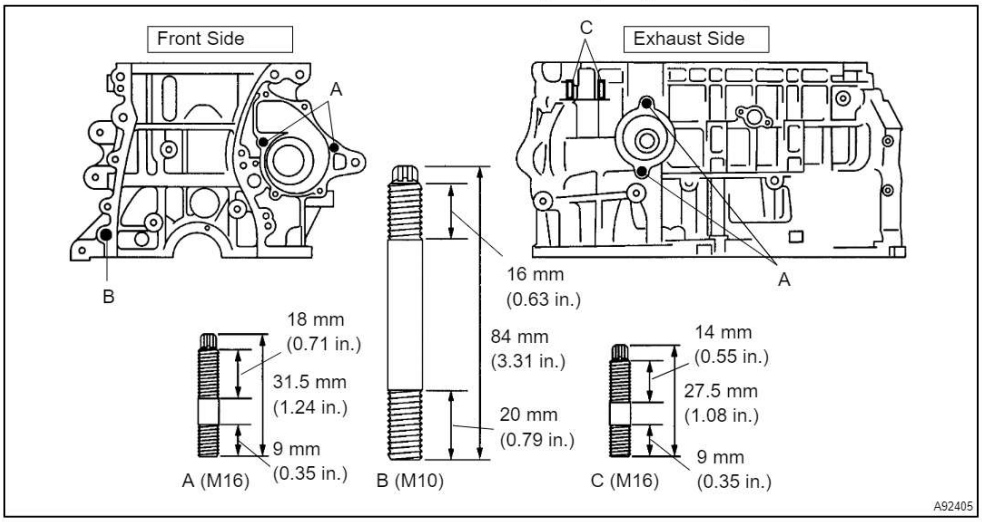
(a) Apply adhesive around the tight plugs.
Adhesive: Part No. 08833−00070, THREE BOND 1324 or equivalent.

(b) Using SST, install new tight plugs as shown in the illustration.
SST 09950−60010 (09951−00200), 09950−70010 (09951−07100)



29. INSTALL STUD BOLT

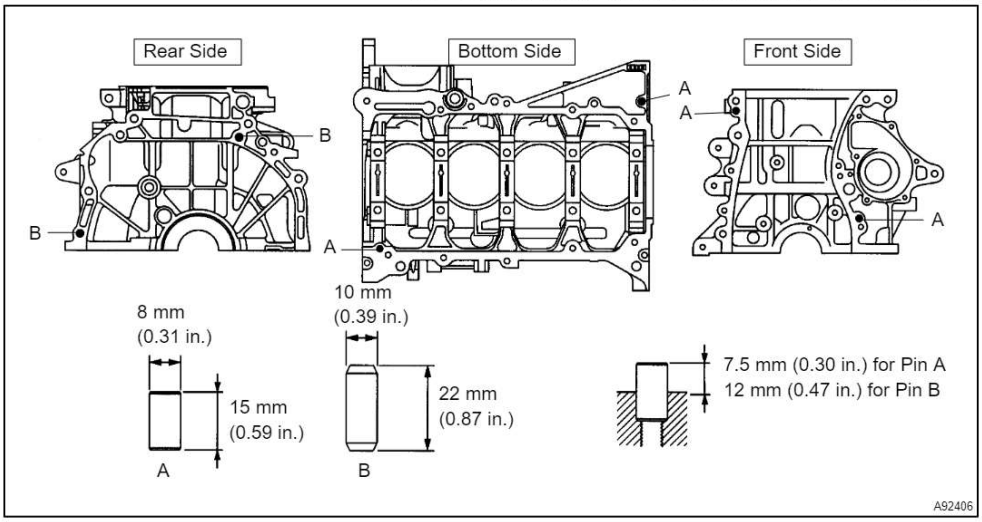
(a) Install the stud bolts as shown in the illustration.
Torque:
5.0 N·m (51 kgf·cm, 44 in.·lbf) for stud bolt A
10 N·m (97 kgf·cm, 7 ft·lbf) for stud bolt B
5.0 N·m (51 kgf·cm, 44 in.·lbf) for stud bolt C

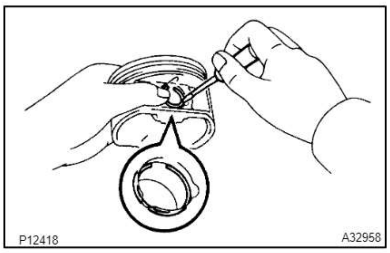


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30. INSTALL STRAIGHT PIN

(a) Using a plastic−faced hammer, tap into the straight pin.

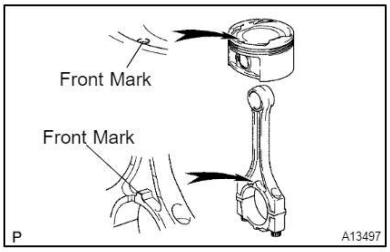




31. INSTALL PISTON

(a) Using a small screwdriver, install a new snap ring at one end of the piston pin hole.

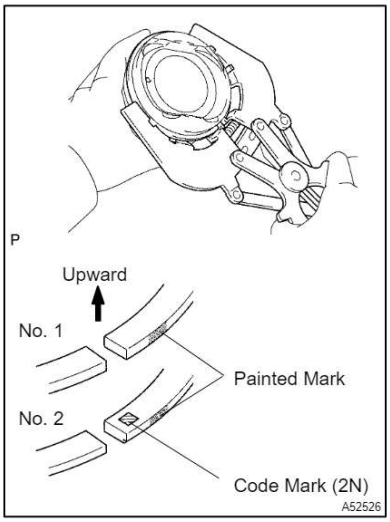
(b) Gradually heat the piston to approxinately 80 to 90°C (176 to 194°F).



(c) Align the front marks of the piston and connecting rod, and push in the piston with your thumb.

(d) Using a small screwdriver, install a new snap ring on the other end of the piston pin hole.

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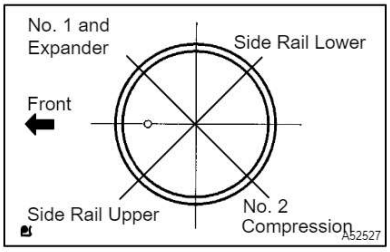
32. INSTALL PISTON RING SET

(a) Install the oil ring expander and 2 side rails by hand.

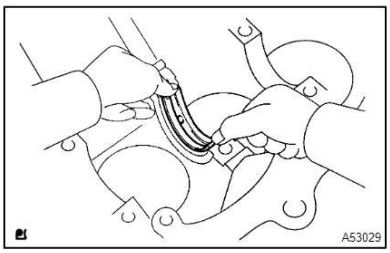
(b) Using a piston ring expander, install the 2 compression rings with the painted mark as shown in the illustration.

NOTICE:

Install the compression ring No. 2 with the code mark (2N) facing upward.



(c) Position the piston rings so that the ring ends are as shown in the illustration.

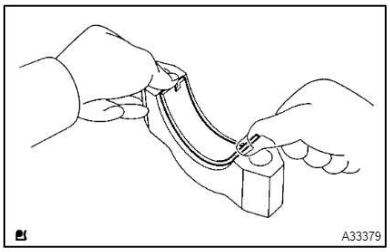


33. INSTALL CRANKSHAFT BEARING

(a) Install the upper bearing with an oil groove on the cylinder block.

NOTICE:

Clean the backside of the bearing and the bearing surface of the cylinder block and let not stick the oils and fats.



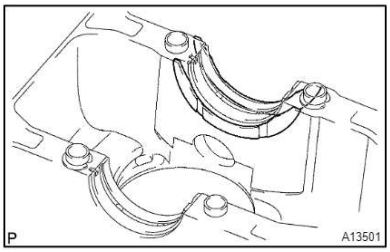
34. INSTALL CRANKSHAFT BEARING NO.2

(a) Install the lower bearing on bearing cap.

NOTICE:

Clean the backside of the bearing and the bearing surface of the connecting rod. The surface should be free of dust and oils.

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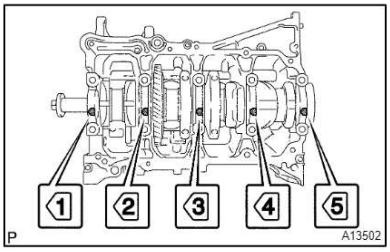
35. INSTALL CRANKSHAFT THRUST WASHER UPPER

(a) Install the 2 thrust washers under the No. 3 journal position of the cylinder block with the oil grooves facing outward.

36. INSTALL CRANKSHAFT

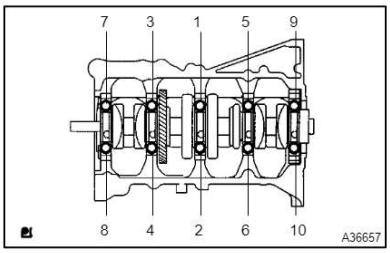
(a) Apply engine oil to upper bearing and install the crankshaft on the cylinder block.

(b) Apply engine oil to the lower bearing.

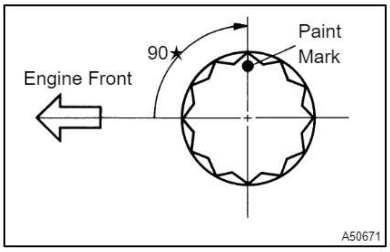


(c) Examine the front marks and install the bearing caps on the cylinder block.

(d) Apply a light coat of engine oil on the threads and under the bearing cap bolts.



(e) Uniformly install and tighten the 16 main bearing cap bolts in the sequence shown in the illustration.
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)



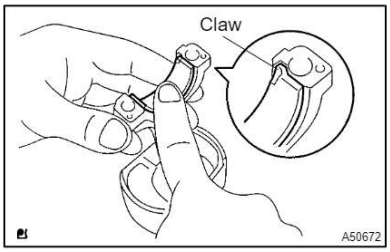
(f) Mark the front of the bearing cap bolts with paint.

(g) Retighten the bearing cap bolts by 90★in the numerical order shown in the illustration.

(h) Check that the painted mark is now at a 90★angle to the front.

(i) Check that the crankshaft turns smoothly.

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37. INSTALL CONNECTING ROD BEARING

(a) Align the bearing claw with the groove of the connecting rod or connecting cap.

NOTICE:

Clean the backside of the bearing and the bearing surface of the connecting rod. The surface should be free of dust and oil.

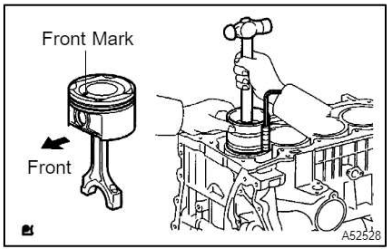
38. INSTALL PISTON

NOTICE:

The connecting rod cap bolts are tightened in 2 progressive steps.

(a) Apply engine oil to the cylinder walls, the pistons, and the surfaces of connecting rod bearings.

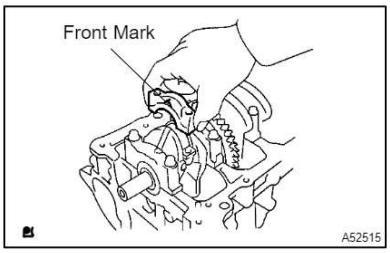
(b) Check the position of the piston ring ends.



(c) 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.

NOTICE:

Match the numbered connecting rod cap with the connecting rod.



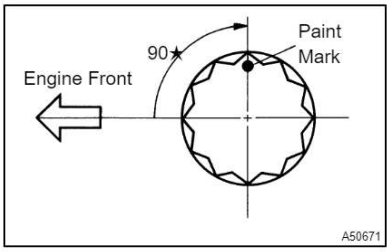
(d) Check that the protrusion of the connecting rod cap is facing in the correct direction.

(e) Apply a light coat of engine oil on the threads and under the heads of the connecting rod cap bolts.

(f) Using a 12 mm socket wrench, uniformly tighten the 2 bolts.

Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

(g) Mark the front of the connecting cap bolts with paint.



(h) Retighten the cap bolts by 90★as shown in the illustration.

(i) Check that the crankshaft turns smoothly.

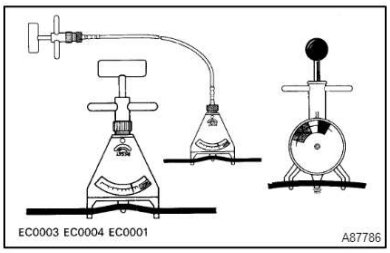
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ENGINE (1MZ−FE/3MZ−FE)

1404Q−09

INSPECTION

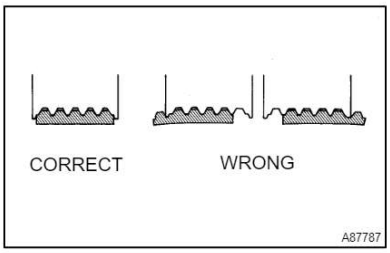
1. **INSPECT ENGINE COOLANT (See page 16−21)**
2. **INSPECT ENGINE OIL (See page 17−23)**
3. **INSPECT BATTERY (See page 19−39)**
4. **INSPECT AIR CLEANER FILTER ELEMENT SUB−ASSY (See page 99−5)**
5. **INSPECT SPARK PLUG (See page 18−9)**



6. **INSPECT V−RIBBED BELT**

(a) Using a belt tension gauge, check the belt tension.
Belt tension gauge:
DENSO BTG−20 (95506−00020)
Borroughs No. BT−33−73F
Drive belt tension:

Item	Specified Condition
Cooler compressor to crankshaft pulley New belt	139 to 192 lbf
Cooler compressor to crankshaft pulley Used belt	66 to 110 lbf
Vane pump New belt	154 to 176 lbf
Vane pump Used belt	77 to 110 lbf

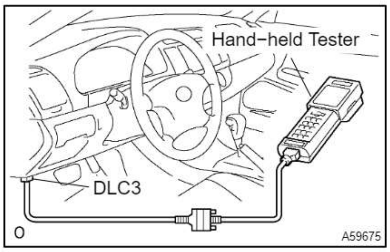


HINT:

- After installing the drive belt, check that it fits properly in the ribbed grooves. Check with your hand to confirm that the belt has not slipped out of the groove on the bottom of the crankshaft pulley.
- "New belt" is a belt which has been used less than 5 minutes on a running engine.
- "Used belt" is a belt which has been used on a running engine for 5 minutes or more.
- After installing a new belt, run the engine for approximately 5 minutes and then recheck the tension.

7. **INSPECT IGNITION TIMING**

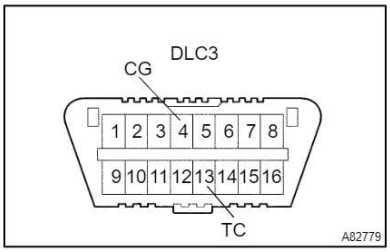
(a) Warm up the engine.



(b) When using the hand−held tester:
Check the ignition timing.
(1) Connect the hand−held tester to the DLC3.
(2) Enter DATA LIST MODE on the hand−held tester.
Ignition timing : 8 to 12★BTDC @ idle

HINT:
Please refer to the hand−held tester operator's manual for help on selecting the DATA LIST.

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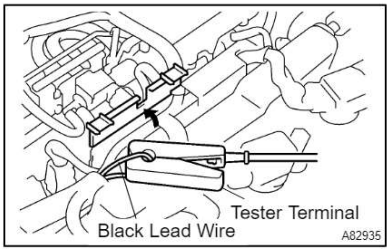


(c) When not using the hand−held tester:
Check the ignition timing.
(1) Using SST, connect terminals 13 (TC) and 4 (CG) of the DLC3.

NOTICE:

- **Confirm the terminal numbers before connecting them. Connection with a wrong terminal can damage the engine.**
- **Turn off all electrical systems before connecting the terminals.**
- **Perform this inspection after the cooling fan motor is turned off.**

(2) Remove the V−bank cover.



(3) Pull out the black lead wire harness as shown in the illustration.
(4) Connect the tester terminal of the timing light to the engine.

NOTICE:

Use a timing light which detects the first signal.

(5) Check the ignition timing at idle.
Ignition timing : 8 to 12★BTDC @ idle

NOTICE:

When checking the ignition timing, the transmission should be in the neutral position.

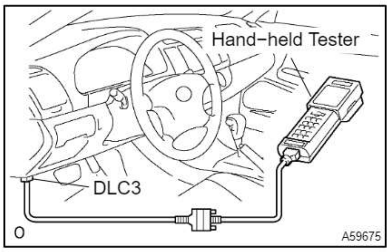
HINT:

Run the engine at 1,000 to 1,300 rpm for 5 seconds, and then check that the engine rpm returns to idle speed.

(6) Disconnect terminals 13 (TC) and 4 (CG) of the DLC3.
(7) Check the ignition timing at idle.
Ignition timing : 7 to 24★BTDC @ idle
(8) Confirm that the ignition timing moves to the advanced angle side when the engine rpm is increased.
(9) Remove the timing light.

8. INSPECT ENGINE IDLE SPEED

(a) Warm up the engine.



(b) When using the hand−held tester:
Check the idle speed.
(1) Connect the hand−held tester to the DLC3.
(2) Enter DATA LIST MODE on the hand−held tester.
Idle speed:

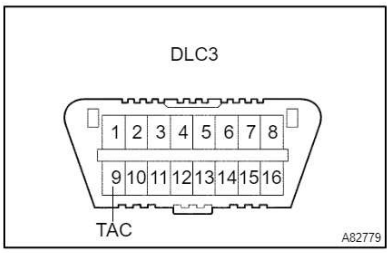
Item	Specified Condition
1MZ−FE	550 to 650 rpm
3MZ−FE	630 to 730 rpm

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NOTICE:

- **When checking the idle speed, the transmission should be in the neutral position.**
- **Check the idle speed with the cooling fan off.**
- **Switch off all accessories and air conditioning before connecting the hand−held tester.**

HINT:
Please refer to the hand−held tester operator's manual for further details.

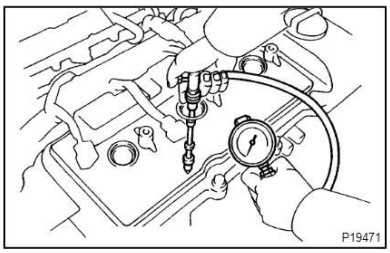


(c) When not using the hand−held tester:
Check the idle speed.
(1) Using SST, connect tachometer test probe to terminal 9 (TAC) of the DLC3.
SST 09843−18030
(2) Check the idle speed.
Idle speed:

Item	Specified Condition
1MZ−FE	550 to 650 rpm
3MZ−FE	630 to 730 rpm

9. INSPECT COMPRESSION

(a) Warm up and stop the engine.
(b) Disconnect the injector connectors.
(c) Remove the intake air surge tank (see page 14−142).
(d) Remove the 6 ignition coils.
(e) Remove the 6 spark plugs.



(f) Check the 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:1.5 MPa (15.3 kgf/cm^2, 218 psi)
Minimum pressure: 1.0 MPa (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 as quickly as possible.**

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(4) If the cylinder compression is low, pour a small amount of engine oil into the cylinder through the spark plug hole and inspect again.

HINT:

- If adding oil increases the compression, the piston rings and/or cylinder bore may be worn or damaged.
- If pressure stays low, a valve may be stuck or seated improperly, or there may be leakage in the gasket.

10. INSPECT CO/HC

(a) Start the engine.
(b) Rev the engine at 2,500 rpm for approximately 180 seconds.
(c) Insert CO/HC meter testing probe at least 40 cm (1.3 ft) into the tailpipe during idling.
(d) Check CO/HC concentration at idle and/or 2,500 rpm.

HINT:

Check regulations and restrictions in your area when performing 2 mode CO/HC concentration testing (engine check at both idle speed and at 2,500 rpm).

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

(1) Check A/F sensor operation (see page 05–791).
(2) See the table below for possible causes, and then inspect and repair.

CO	HC	Problems	Causes
Normal	High	Rough idle	1. Faulty ignitions: ●Incorrect timing ●Fouled, shorted or improperly gapped plugs 2. Incorrect valve clearance 3. Leaks in intake and exhaust valves 4. Leaks in cylinders
Low	High	Rough idle (fluctuating HC reading)	1. Vacuum leaks: ●PCV hoses ●Intake manifold ●Throttle body ●Brake booster line 2. Lean mixture causing misfire
High	High	Rough idle (black smoke from exhaust)	1. Restricted air filter 2. Plugged PCV valve 3. Faulty SFI system: ●Faulty fuel pressure regulator ●Defective ECT sensor ●Defective MAF meter ●Faulty ECM ●Faulty injectors ●Faulty throttle position sensor

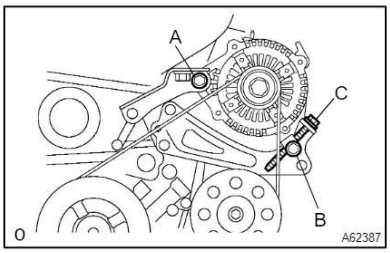
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DRIVE BELT (1MZ−FE/3MZ−FE)

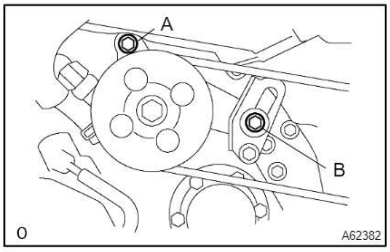
1405G−08

REPLACEMENT

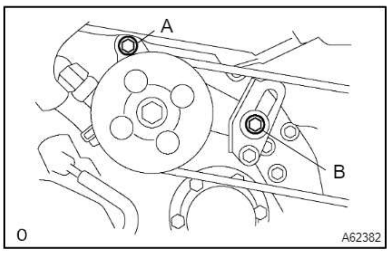
1. REMOVE FRONT WHEEL RH
2. REMOVE FRONT FENDER APRON SEAL RH



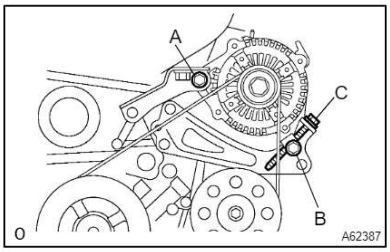
3. REMOVE V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1
(a) Loosen bolts A and B.
(b) Loosen adjusting bolt C and remove the belt.



4. REMOVE VANE PUMP V BELT
(a) Loosen bolts A and B, and remove the belt.



5. INSTALL VANE PUMP V BELT
(a) Install the belt on each pulley.
(b) Using a bar, adjust the belt tension and tighten bolt B.
Torque: 43 N·m (439 kgf·cm, 32 ft·lbf)
(c) Tighten bolt A.
Torque: 43 N·m (439 kgf·cm, 32 ft·lbf)



6. INSTALL V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1
(a) Install the belt on each pulley.
(b) Tighten adjusting bolt C, and adjust the belt tension.
(c) First tighten bolt A, then B.
Torque:
58 N·m (591 kgf·cm, 43 ft·lbf) for bolt A
18 N·m (184 kgf·cm, 13 ft·lbf) for bolt B

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7. **INSPECT DRIVE BELT TENSION (See page 14−140)**
8. **INSTALL FRONT WHEEL RH**

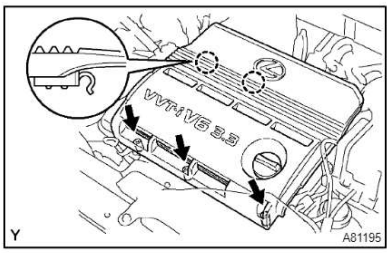
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VALVE CLEARANCE (1MZ−FE/3MZ−FE)

141IH−03

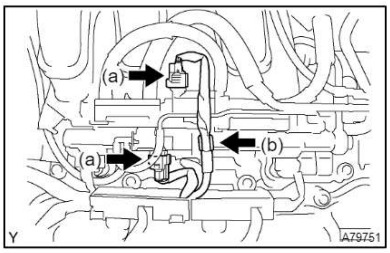
ADJUSTMENT

1. **DRAIN ENGINE COOLANT (See page 16−27)**
2. **REMOVE FRONT FENDER APRON SEAL RH**

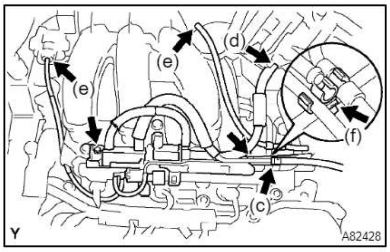


3. **REMOVE V−BANK COVER SUB−ASSY**
(a) Using a socket hexagon wrench 5, remove the 3 nuts.
(b) Remove the V−bank cover.

4. **REMOVE RADIATOR HOSE INLET**
5. **REMOVE FRONT SUSPENSION UPPER BRACE CENTER (W/ FRONT SUSPENSION BRACE UPPER CENTER)**
6. **REMOVE AIR CLEANER ASSEMBLY WITH HOSE**

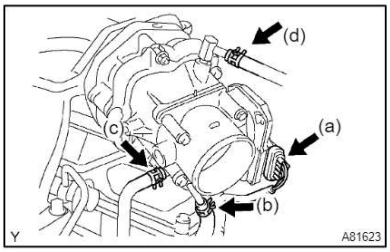


7. **REMOVE EMISSION CONTROL VALVE SET**
(a) Disconnect the 2 VSV connectors.
(b) Remove the wire harness clamp.



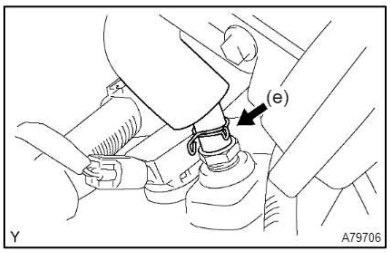
(c) Disconnect the fuel vapor feed hose No. 1.
(d) Disconnect the fuel vapor feed hose No. 2.
(e) Disconnect the 2 vacuum hoses.
(f) Remove the clamp.
(g) Remove the 2 nuts and the emission control valve set.

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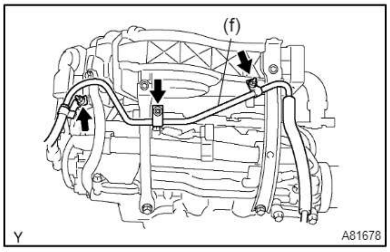


8. REMOVE INTAKE AIR SURGE TANK

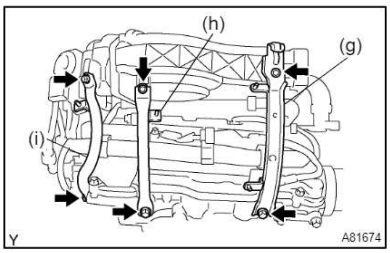
(a) Disconnect the throttle motor connector.
(b) Disconnect the water by−pass hose No. 3.
(c) Disconnect the water by−pass hose No. 2.
(d) Disconnect the union to check valve hose.



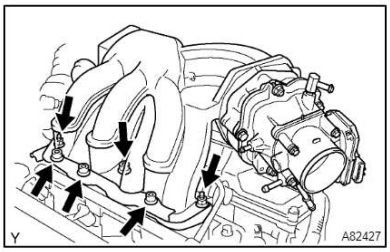
(e) Disconnect the ventilation hose.



(f) Remove the 3 nuts and disconnect the pressure feed tube.



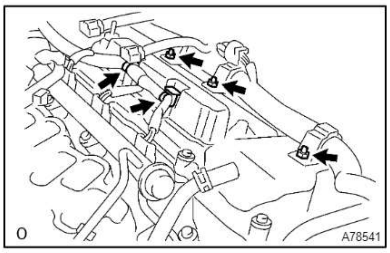
(g) Remove the 2 bolts and engine hanger No. 1.
(h) Remove the 2 bolts and surge tank stay No. 1.
(i) Remove the 2 bolts and surge tank stay No. 2.



(j) Using a socket hexagon wrench 8, remove the 4 bolts.
(k) Remove the 2 nuts, emission control valve bracket and intake air surge tank.
(l) Remove the gasket from the intake air surge tank.

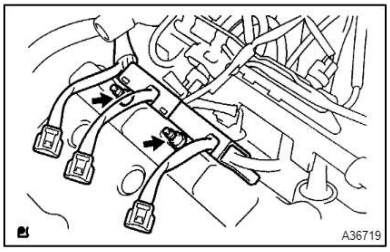
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9. REMOVE IGNITION COIL ASSY



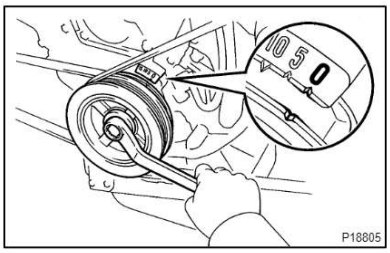
10. REMOVE CYLINDER HEAD COVER SUB−ASSY

(a) Remove the 2 engine wire harness clamps.
(b) Remove the 3 nuts and disconnect the engine wire harness.
(c) Remove the 9 bolts and cylinder head cover.



11. REMOVE CYLINDER HEAD COVER SUB−ASSY LH

(a) Using an E6 torx socket wrench, remove the 2 bolts and disconnect the engine wire harness protector.
(b) Remove the 9 bolts and cylinder head cover.

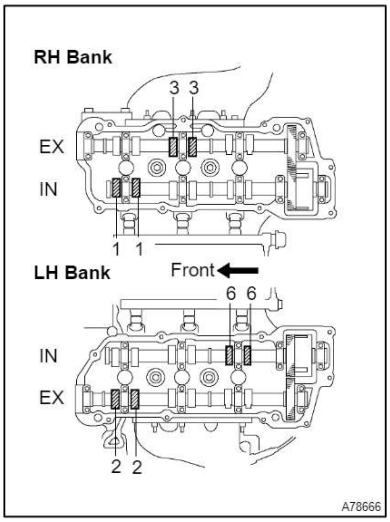


12. INSPECT VALVE CLEARANCE

(a) Turn the crankshaft pulley, and align the timing notch with timing mark 0 of the No. 1 timing belt cover.
(b) Check that the valve lifters on the No. 1 timing belt cover (IN and EX) are both loose.

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

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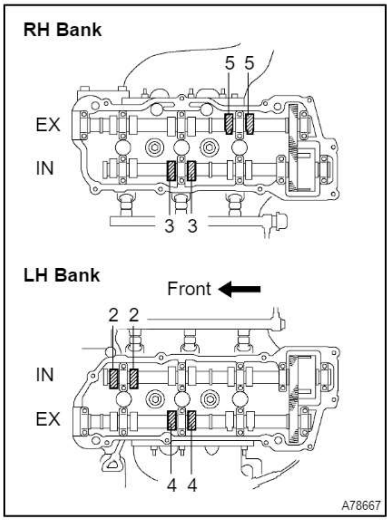
(c) Check the valves indicated in the illustration on the left.

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

Valve clearance (Cold):

Item	Specified Condition
Intake	0.15 to 0.25 mm (0.006 to 0.010 in.)
Exhaust	0.25 to 0.35 mm (0.010 to 0.014 in.)

(2) Record valve clearance measurements that are out of the specified range. These measurements will be used later to determine the size of the adjustment shim to be installed.



(d) Turn the crankshaft 2/3 of a revolution (240°), and check the valves indicated in the illustration on the left.

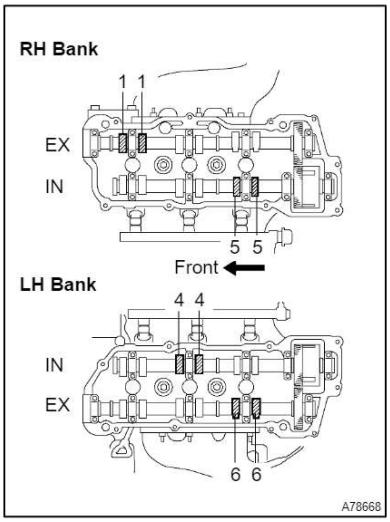
(1) Using a feeler gauge, measure the clearance between the valve lifter and camshaft.

Valve clearance (Cold):

Item	Specified Condition
Intake	0.15 to 0.25 mm (0.006 to 0.010 in.)
Exhaust	0.25 to 0.35 mm (0.010 to 0.014 in.)

(2) Record valve clearance measurements that are out of the specified range. These measurements will be used later to determine the size of the adjustment shim to be installed.

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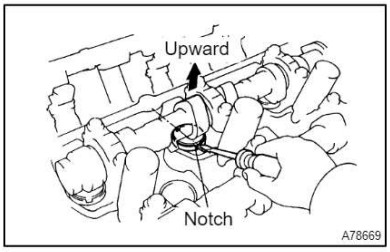
(e) Turn the crankshaft 2/3 of a revolution (240°), and check the valves indicated in the illustration on the left.

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

Valve clearance (Cold):

Item	Specified Condition
Intake	0.15 to 0.25 mm (0.006 to 0.010 in.)
Exhaust	0.25 to 0.35 mm (0.010 to 0.014 in.)

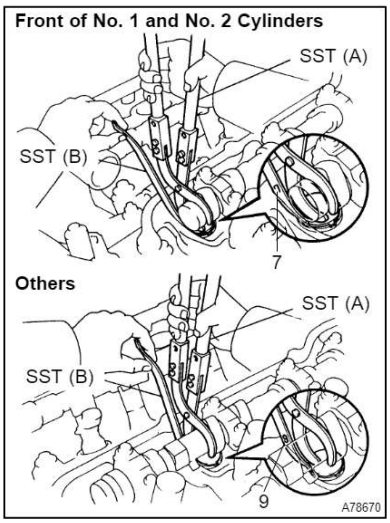
(2) Record valve clearance measurements that are out of the specified range. These measurements will be used later to determine the size of the adjustment shim to be installed.



13. ADJUST VALVE CLEARANCE

(a) Turn the camshaft so that the cam lobe faces upward.

(b) Turn the valve lifter with a screwdriver so that the notches are perpendicular to the camshaft.



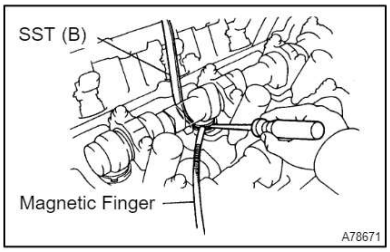
(c) Using SST (A), press down the valve lifter and place SST (B) between the camshaft and valve lifter. Remove SST (A).

SST 09248−55040 (09248−05410, 09248−05420)

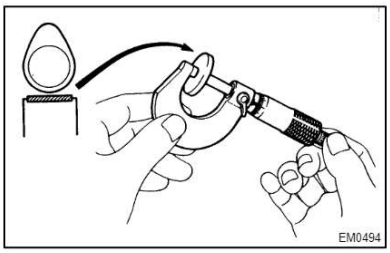
HINT:

- Apply SST (B) at a slight angle on the side marked with "9" or "7" at the position shown in the illustration.
- When SST (B) is inserted too deeply, it will get pinched by the shim. To prevent it from being stuck, insert it gently from the intake side at a slight angle.

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(d) Using a small screwdriver and magnetic finger, remove the adjusting shim.



(e) Using a micrometer, measure the thickness of the removed shim.

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

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

Specified value (Cold):
Intake A = B + (C − 0.20 mm (0.0079 in.))
Exhaust A = B + (C − 0.30 mm (0.0118 in.))

(g) Select a new shim with a thickness as close as possible to the calculated values.

EXAMPLE (Intake):
Measured valve clearance = 0.45 mm (0.0177 in.)
0.45 mm (0.0177 in.) − 0.20 mm (0.0079 in.) = 0.25 mm (0.0098 in.)
(Measured − Specification = Excess clearance)
Used shim measurement = 2.80 mm (0.1102 in.)
0.25 mm (0.0098 in.) + 2.80 mm (0.1102 in.) = 3.05 mm (0.1201 in.)
(Excess clearance + Used shim = Ideal new shim)
Closest new shim = 3.05 mm (0.1201 in.)
Select No. 12 shim

HINT:

- Shims are available in 17 sizes in increments of 0.05 mm (0.0020 in.), from 2.50 mm (0.0984 in.) to 3.30 mm (0.1299 in.).
- Refer to adjusting shim selection chart on the following 2 pages.

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Adjusting Shim Selection Chart (Intake)

Measured clearance mm (in.) \ Installed shim thickness mm (in.)	2.500 (0.0984)	2.520 (0.0992)	2.540 (0.1000)	2.550 (0.1004)	2.560 (0.1008)	2.580 (0.1016)	2.600 (0.1024)	2.620 (0.1031)	2.640 (0.1039)	2.650 (0.1043)	2.660 (0.1047)	2.670 (0.1051)	2.680 (0.1055)	2.690 (0.1059)	2.700 (0.1063)	2.710 (0.1067)	2.720 (0.1071)	2.730 (0.1075)	2.740 (0.1079)	2.750 (0.1083)	2.760 (0.1087)	2.770 (0.1091)	2.780 (0.1094)	2.790 (0.1098)	2.800 (0.1102)	2.810 (0.1106)	2.820 (0.1110)	2.830 (0.1114)	2.840 (0.1118)	2.850 (0.1122)	2.860 (0.1126)	2.870 (0.1130)	2.880 (0.1134)	2.890 (0.1138)	2.900 (0.1142)	2.910 (0.1146)	2.920 (0.1150)	2.930 (0.1154)	2.940 (0.1157)	2.950 (0.1161)	2.960 (0.1165)	2.970 (0.1169)	2.980 (0.1173)	2.990 (0.1177)	3.000 (0.1181)	3.010 (0.1185)	3.020 (0.1189)	3.030 (0.1193)	3.040 (0.1197)	3.050 (0.1201)	3.060 (0.1205)	3.080 (0.1213)	3.100 (0.1220)	3.120 (0.1228)	3.140 (0.1236)	3.150 (0.1240)	3.160 (0.1244)	3.180 (0.1252)	3.200 (0.1260)	3.220 (0.1268)	3.240 (0.1276)	3.250 (0.1280)	3.260 (0.1283)	3.280 (0.1291)	3.300 (0.1299)
0.000 – 0.020 (0.0000 – 0.0008)									1	1	1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	10	10	10	10	11	11	12	12	12	12	13	13
0.021 – 0.040 (0.0008 – 0.0016)								1	1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	10	10	10	11	11	11	12	12	12	13	13	13	14
0.041 – 0.060 (0.0016 – 0.0024)							1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	10	10	10	11	11	11	12	12	12	13	13	13	14	14
0.061 – 0.080 (0.0024 – 0.0031)						1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	11	11	11	12	12	12	13	13	13	14	14	14
0.081 – 0.100 (0.0032 – 0.0039)				1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	11	11	12	12	12	12	13	13	14	14	14	14	15
0.101 – 0.120 (0.0040 – 0.0047)			1	1	1	1	1	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	12	12	12	12	13	13	14	14	14	14	15	15
0.121 – 0.140 (0.0048 – 0.0055)		1	1	1	1	1	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	12	12	12	13	13	13	14	14	14	15	15	15	16
0.141 – 0.149 (0.0056 – 0.0059)		1	1	1	1	2	2	2	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	12	12	12	13	13	13	14	14	14	15	15	15	16	16
0.150 – 0.250 (0.0059 – 0.0098)																																																																	
0.251 – 0.260 (0.0099 – 0.0102)	2	3	3	3	3	4	4	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	15	15	15	15	16	16	17	17	17	17	17	
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0.281 – 0.300 (0.0111 – 0.0118)	3	3	4	4	4	4	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	15	15	16	16	16	16	17	17	17	17	17		
0.301 – 0.320 (0.0119 – 0.0126)	3	4	4	4	4	5	5	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	16	16	16	16	17	17	17	17				
0.321 – 0.340 (0.0126 – 0.0134)	4	4	4	5	5	5	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	16	16	16	17	17	17	17	17					
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0.361 – 0.380 (0.0142 – 0.0150)	4	5	5	5	6	6	6	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	17	17	17	17	17							
0.381 – 0.400 (0.0150 – 0.0157)	5	5	6	6	6	6	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	16	16	16	16	16	17	17	17	17	17								
0.401 – 0.420 (0.0158 – 0.0165)	5	6	6	6	6	7	7	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17										
0.421 – 0.440 (0.0166 – 0.0173)	6	6	6	7	7	7	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17											
0.441 – 0.460 (0.0174 – 0.0181)	6	6	7	7	7	8	8	8	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17												
0.461 – 0.480 (0.0181 – 0.0189)	6	7	7	7	8	8	8	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17													
0.481 – 0.500 (0.0189 – 0.0197)	7	7	8	8	8	8	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17														
0.501 – 0.520 (0.0197 – 0.0205)	7	8	8	8	8	9	9	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																
0.521 – 0.540 (0.0205 – 0.0213)	8	8	8	9	9	9	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																		
0.541 – 0.560 (0.0213 – 0.0220)	8	8	9	9	9	10	10	10	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																				
0.561 – 0.580 (0.0221 – 0.0228)	8	9	9	9	10	10	10	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																						
0.581 – 0.600 (0.0229 – 0.0236)	9	9	10	10	10	10	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																								
0.601 – 0.620 (0.0237 – 0.0244)	9	10	10	10	10	11	11	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																										
0.621 – 0.640 (0.0244 – 0.0252)	10	10	10	11	11	11	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																												
0.641 – 0.660 (0.0252 – 0.0260)	10	10	11	11	11	12	12	12	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																														
0.661 – 0.680 (0.0260 – 0.0268)	10	11	11	11	12	12	12	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																																
0.681 – 0.700 (0.0268 – 0.0276)	11	11	12	12	12	12	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																																		
0.701 – 0.720 (0.0276 – 0.0283)	11	12	12	12	12	13	13	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																																				
0.721 – 0.740 (0.0284 – 0.0291)	12	12	12	13	13	13	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																																						
0.741 – 0.760 (0.0292 – 0.0299)	12	12	13	13	13	14	14	14	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																																								
0.761 – 0.780 (0.0300 – 0.0307)	12	13	13	13	14	14	14	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																																										
0.781 – 0.800 (0.0307 – 0.0315)	13	13	14	14	14	14	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																																												
0.801 – 0.820 (0.0315 – 0.0323)	13	14	14	14	14	15	15	16	16	16	16	17	17	17	17	17	17	17	17																																														
0.821 – 0.840 (0.0323 – 0.0331)	14	14	14	15	15	15	16	16	16	17	17	17	17	17	17	17	17																																																
0.841 – 0.860 (0.0331 – 0.0339)	14	14	15	15	15	16	16	16	17	17	17	17	17	17	17																																																		
0.861 – 0.880 (0.0339 – 0.0346)	14	15	15	15	16	16	16	17	17	17	17	17	17																																																				
0.881 – 0.900 (0.0347 – 0.0354)	15	15	16	16	16	16	17	17	17	17	17																																																							
0.901 – 0.920 (0.0355 – 0.0362)	15	16	16	16	16	17	17	17	17																																																								
0.921 – 0.940 (0.0363 – 0.0370)	16	16	16	17	17	17	17	17																																																									
0.941 – 0.960 (0.0370 – 0.0378)	16	16	17	17	17	17	17																																																											
0.961 – 0.980 (0.0378 – 0.0386)	16	17	17	17	17	17																																																												
0.981 – 1.000 (0.0386 – 0.0394)	17	17	17	17	17																																																													
1.001 – 1.020 (0.0394 – 0.0402)	17	17	17																																																															
1.021 – 1.040 (0.0402 – 0.0409)	17	17																																																																
1.041 – 1.050 (0.0410 – 0.0413)	17																																																																	

V00719

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

EXAMPLE:
The 2.800 mm (0.1102 in.) shim is installed, and the measured clearance is 0.450 mm (0.0177 in.). Replace the 2.800 mm (0.1102 in.) shim with a new No. 12 shim.

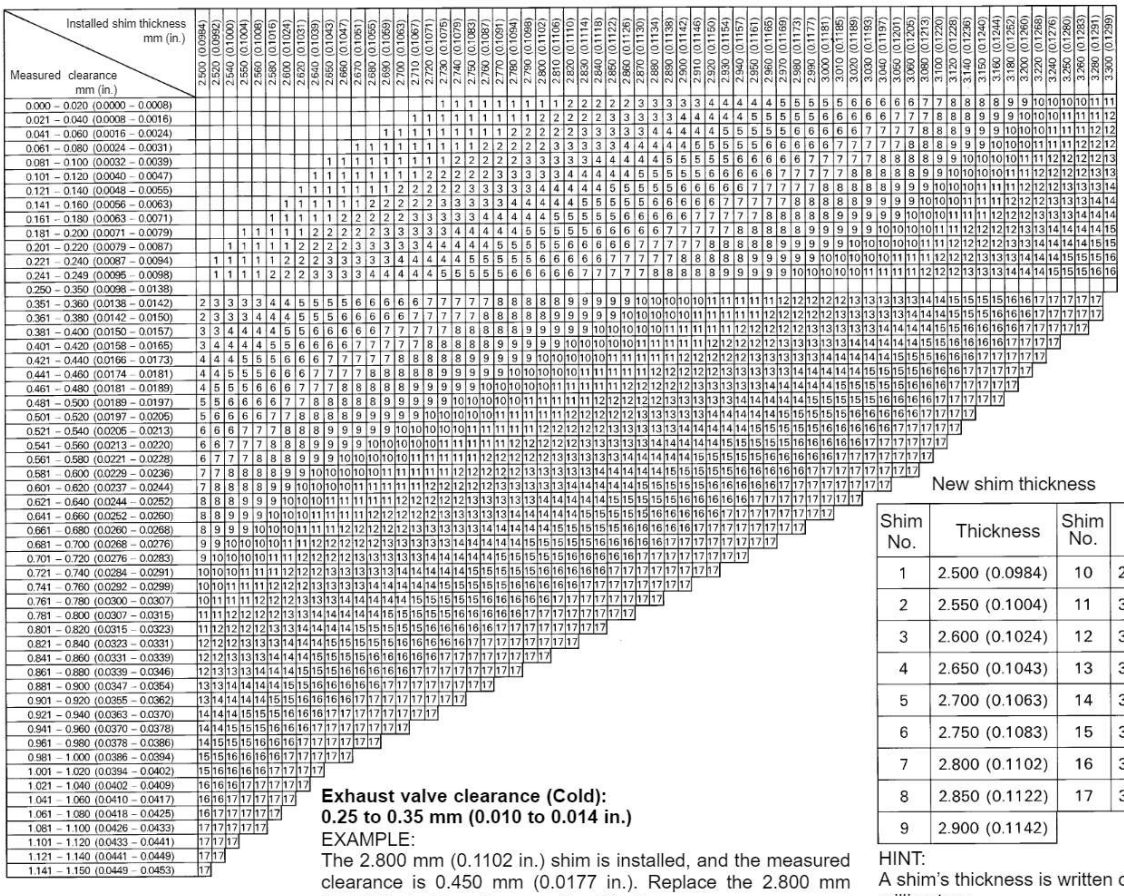
New shim thickness mm (in.)

Shim No.	Thickness	Shim No.	Thickness
1	2.500 (0.0984)	10	2.950 (0.1161)
2	2.550 (0.1004)	11	3.000 (0.1181)
3	2.600 (0.1024)	12	3.050 (0.1201)
4	2.650 (0.1043)	13	3.100 (0.1220)
5	2.700 (0.1063)	14	3.150 (0.1240)
6	2.750 (0.1083)	15	3.200 (0.1260)
7	2.800 (0.1102)	16	3.250 (0.1280)
8	2.850 (0.1122)	17	3.300 (0.1299)
9	2.900 (0.1142)		

HINT:
A shim's thickness is written on its face in millimeters.

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Adjusting Shim Selection Chart (Exhaust)



Exhaust valve clearance (Cold):
0.25 to 0.35 mm (0.010 to 0.014 in.)

EXAMPLE:
The 2.800 mm (0.1102 in.) shim is installed, and the measured clearance is 0.450 mm (0.0177 in.). Replace the 2.800 mm (0.1102 in.) shim with a new No. 10 shim.

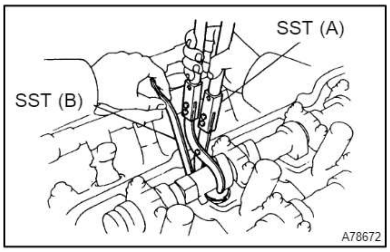
New shim thickness mm (in.)

Shim No.	Thickness	Shim No.	Thickness
1	2.500 (0.0984)	10	2.950 (0.1161)
2	2.550 (0.1004)	11	3.000 (0.1181)
3	2.600 (0.1024)	12	3.050 (0.1201)
4	2.650 (0.1043)	13	3.100 (0.1220)
5	2.700 (0.1063)	14	3.150 (0.1240)
6	2.750 (0.1083)	15	3.200 (0.1260)
7	2.800 (0.1102)	16	3.250 (0.1280)
8	2.850 (0.1122)	17	3.300 (0.1299)
9	2.900 (0.1142)		

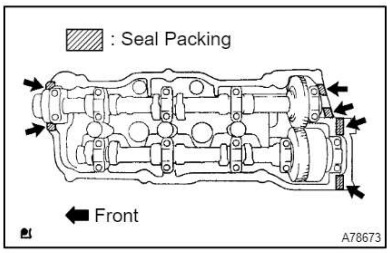
HINT:
A shim's thickness is written on its face in millimeters.

V00720

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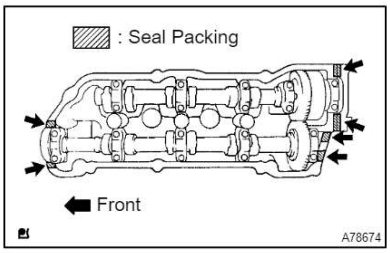


(h) Place a new adjusting shim on the valve lifter with the imprinted number facing down.
(i) Press down the valve lifter with SST (A), and remove SST (B).
SST 09248−55040 (09248−05410, 09248−05420)
(j) Recheck the valve clearance.



14. INSTALL CYLINDER HEAD COVER SUB−ASSY
(a) Apply seal packing to the cylinder head 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 start the engine for at least 2 hours after installing the cylinder head cover.**

(b) Install the cylinder head cover with the 9 bolts. Tighten the bolts uniformly in several steps.
Torque: 8.0 N·m (80 kgf·cm, 71 in.·lbf)
(c) Install the engine wire harness with the 3 nuts.
Torque: 8.4 N·m (85 kgf·cm, 74 in.·lbf)



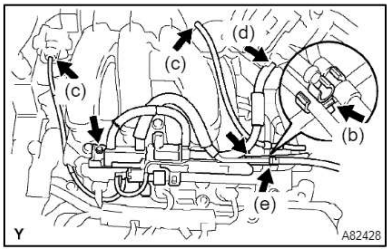
15. INSTALL CYLINDER HEAD COVER SUB−ASSY LH
(a) Apply seal packing to the cylinder head as shown in the illustration.
Seal packing: Part No. 08826−00080 or equivalent
NOTICE:
- **Remove any oil from the contact surface.**
- **Install the cylinder head cover within 3 minutes after applying seal packing.**
- **Do not start the engine for at least 2 hours after installing the cylinder head cover.**

(b) Install the cylinder head cover with the 9 bolts. Tighten the bolts uniformly in several steps.
Torque: 8.0 N·m (80 kgf·cm, 71 in.·lbf)
(c) Using an E6 torx→ socket wrench, install the engine wire harness protector with the 2 bolts.

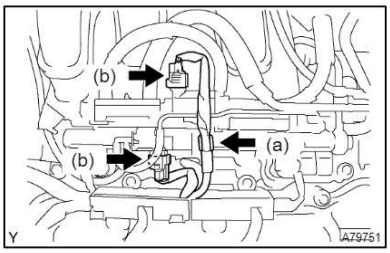
16. INSTALL IGNITION COIL ASSY
Torque: 8.0 N·m (80 kgf·cm, 71 in.·lbf)
17. INSTALL INTAKE AIR SURGE TANK
(a) Install a new gasket to the intake air surge tank.
(b) Install the intake air surge tank and emission control valve bracket with the 2 nuts.
Torque: 28 N·m (286 kgf·cm, 21 ft·lbf)
(c) Using a socket hexagon wrench 8, tighten the 4 bolts.
Torque: 28 N·m (286 kgf·cm, 21 ft·lbf)
(d) Install the surge tank stay No. 2 with the 2 bolts.
Torque: 20 N·m (199 kgf·cm, 15 ft·lbf)

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(e) Install the surge tank stay No. 1 with the 2 bolts.
Torque: 20 N·m (199 kgf·cm, 15 ft·lbf)
(f) Install the engine hanger No. 1 with the 2 bolts.
Torque: 20 N·m (199 kgf·cm, 15 ft·lbf)
(g) Install the pressure feed tube with the 3 nuts.
Torque: 7.8 N·m (80 kgf·cm, 69 in.·lbf)
(h) Connect the ventilation hose.
(i) Connect the union to check valve hose.
(j) Connect the water by−pass hose No. 2.
(k) Connect the water by−pass hose No. 3.
(l) Connect the throttle motor connector.



18. INSTALL EMISSION CONTROL VALVE SET
(a) Install the valve set with the 2 nuts.
(b) Install the clamp.
(c) Connect the 2 vacuum hoses.
(d) Connect the fuel vapor feed hose No. 2.
(e) Connect the fuel vapor feed hose No. 1.



(f) Install the wire harness clamp.
(g) Connect the 2 VSV connectors.

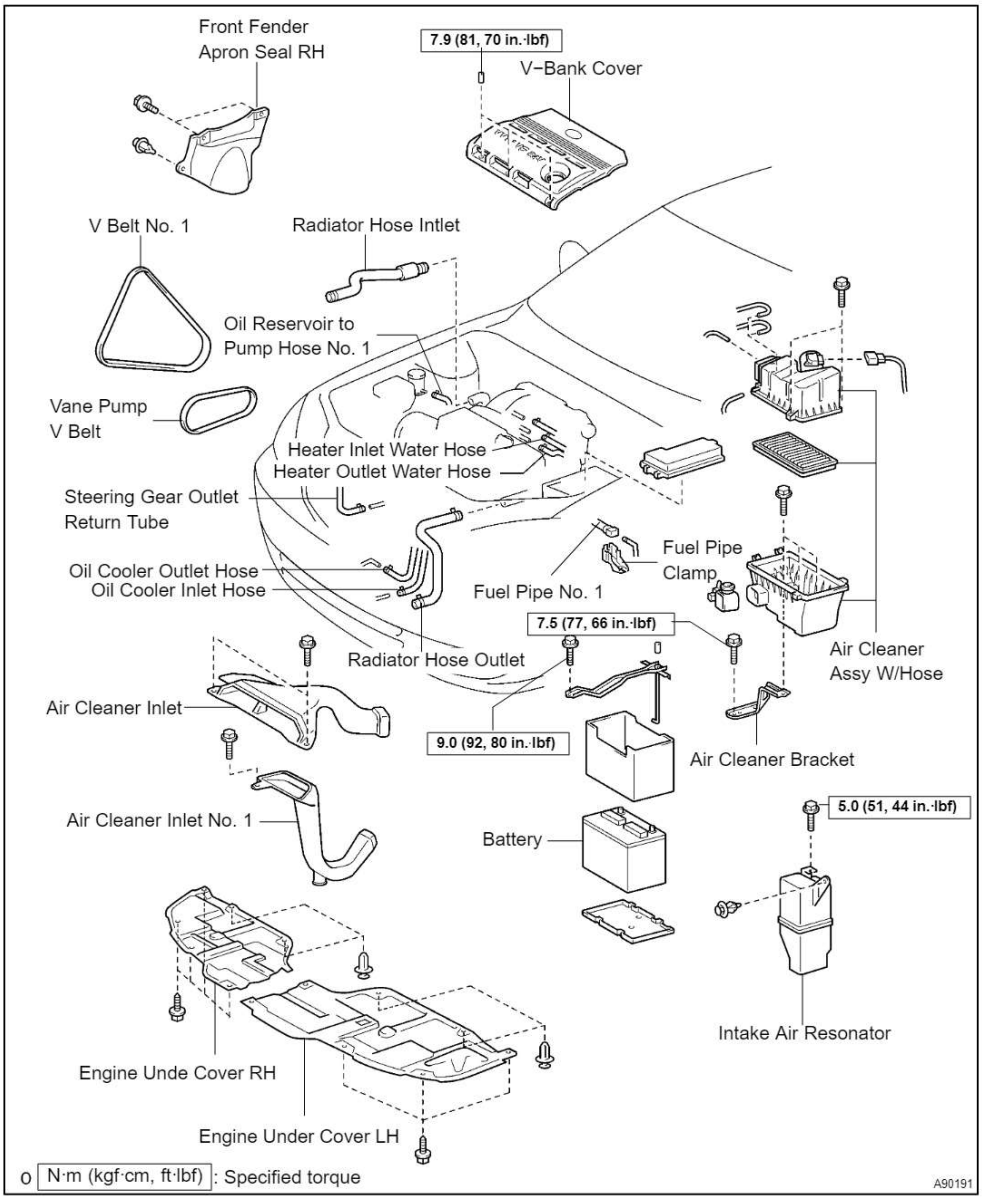
19. INSTALL AIR CLEANER ASSEMBLY WITH HOSE
20. INSTALL FRONT SUSPENSION UPPER BRACE CENTER (W/ FRONT SUSPENSION BRACE UPPER CENTER)
Torque: 80 N·m (816 kgf·cm, 59 ft.·lbf)
21. INSTALL RADIATOR HOSE INLET
22. INSTALL V−BANK COVER SUB−ASSY
(a) Fit the 2 retainers and install the V−bank cover.
(b) Using a socket hexagon wrench 5, tighten the 3 nuts.
Torque: 7.9 N·m (81 kgf·cm, 70 in.·lbf)
23. INSTALL FRONT FENDER APRON SEAL RH
24. ADD ENGINE COOLANT (See page 16−27)
25. CHECK FOR ENGINE COOLANT LEAKS (See page 16−21)

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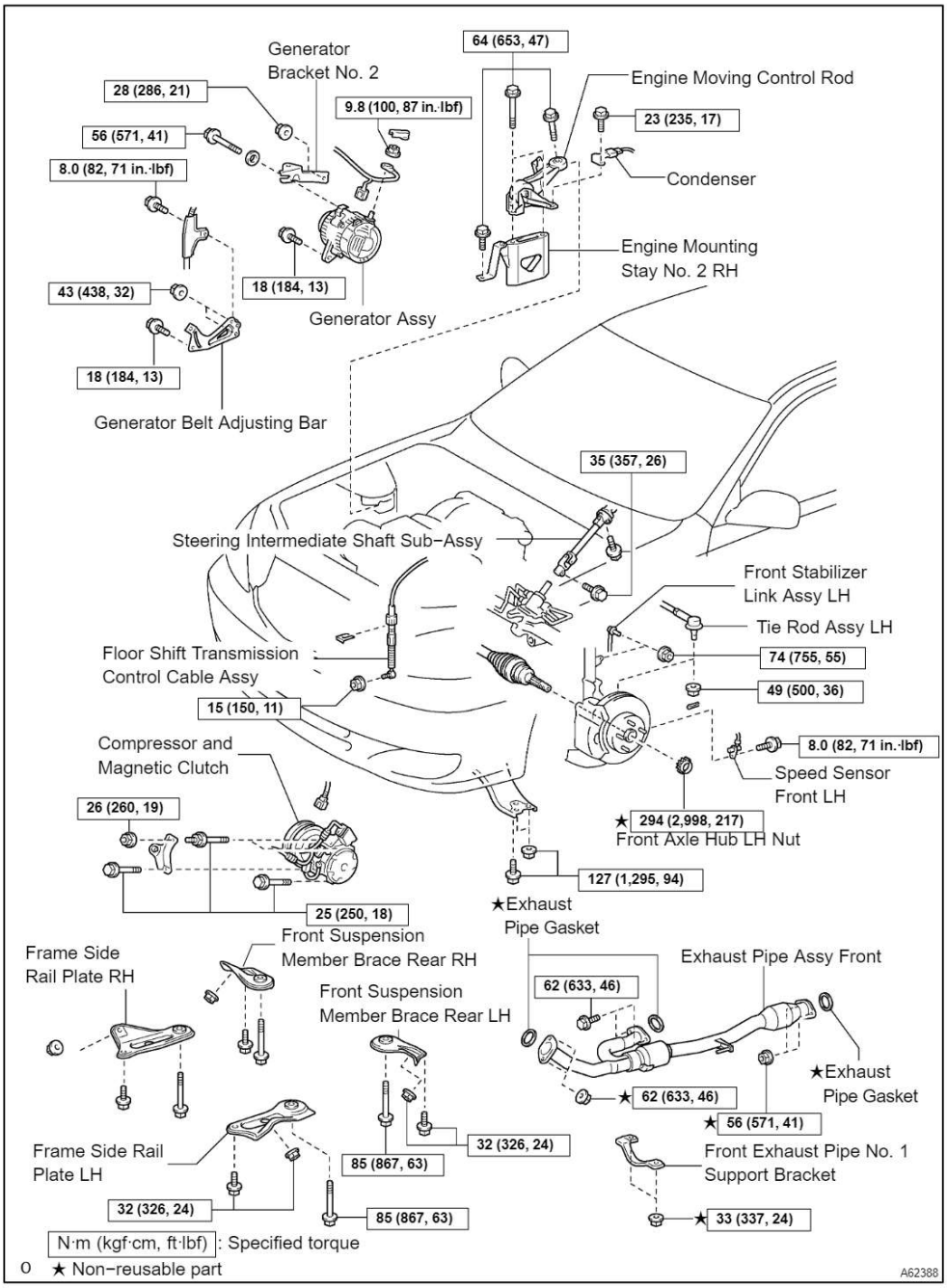
PARTIAL ENGINE ASSY (1MZ−FE/3MZ−FE)

COMPONENTS

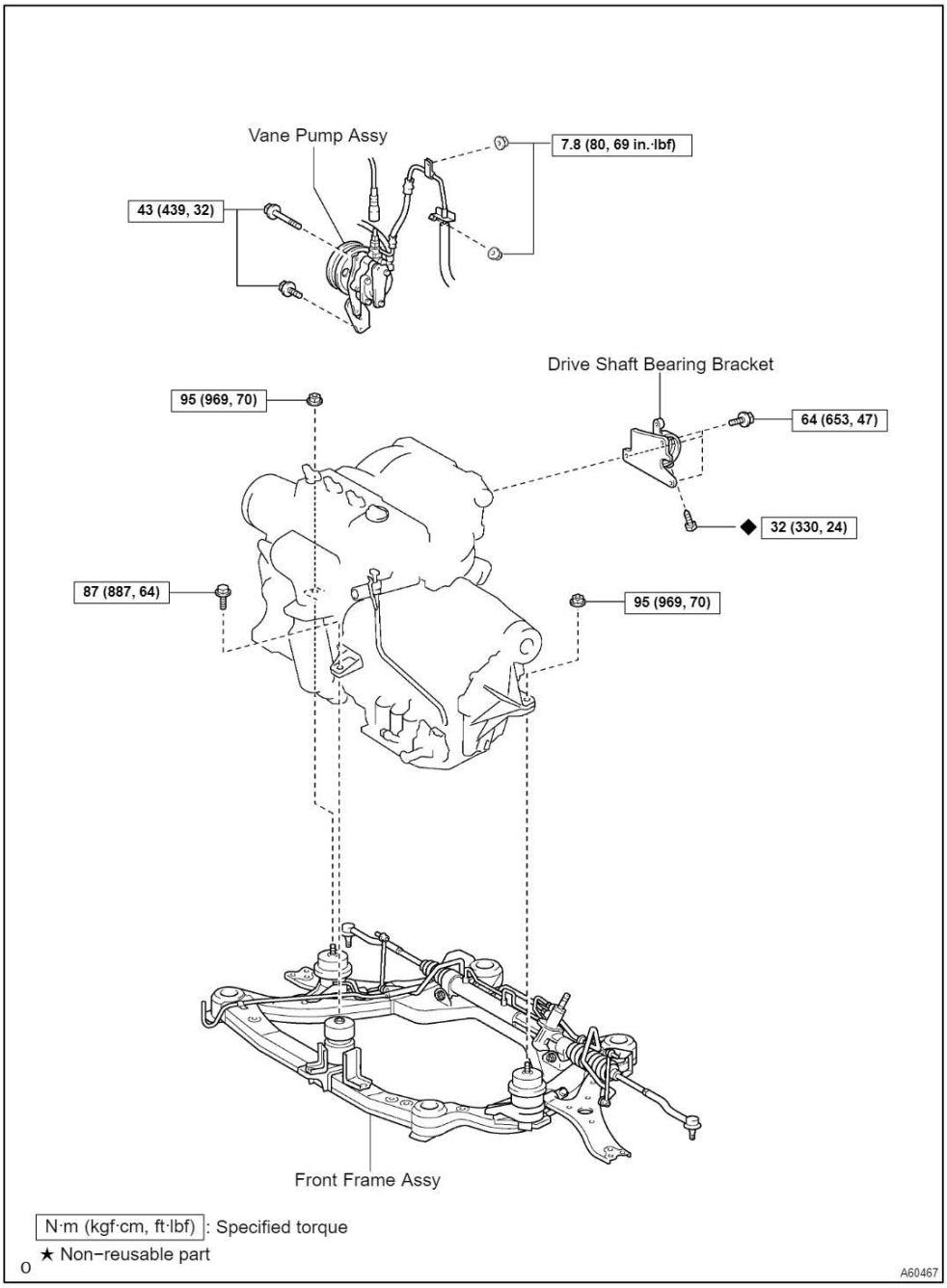
1410T−02



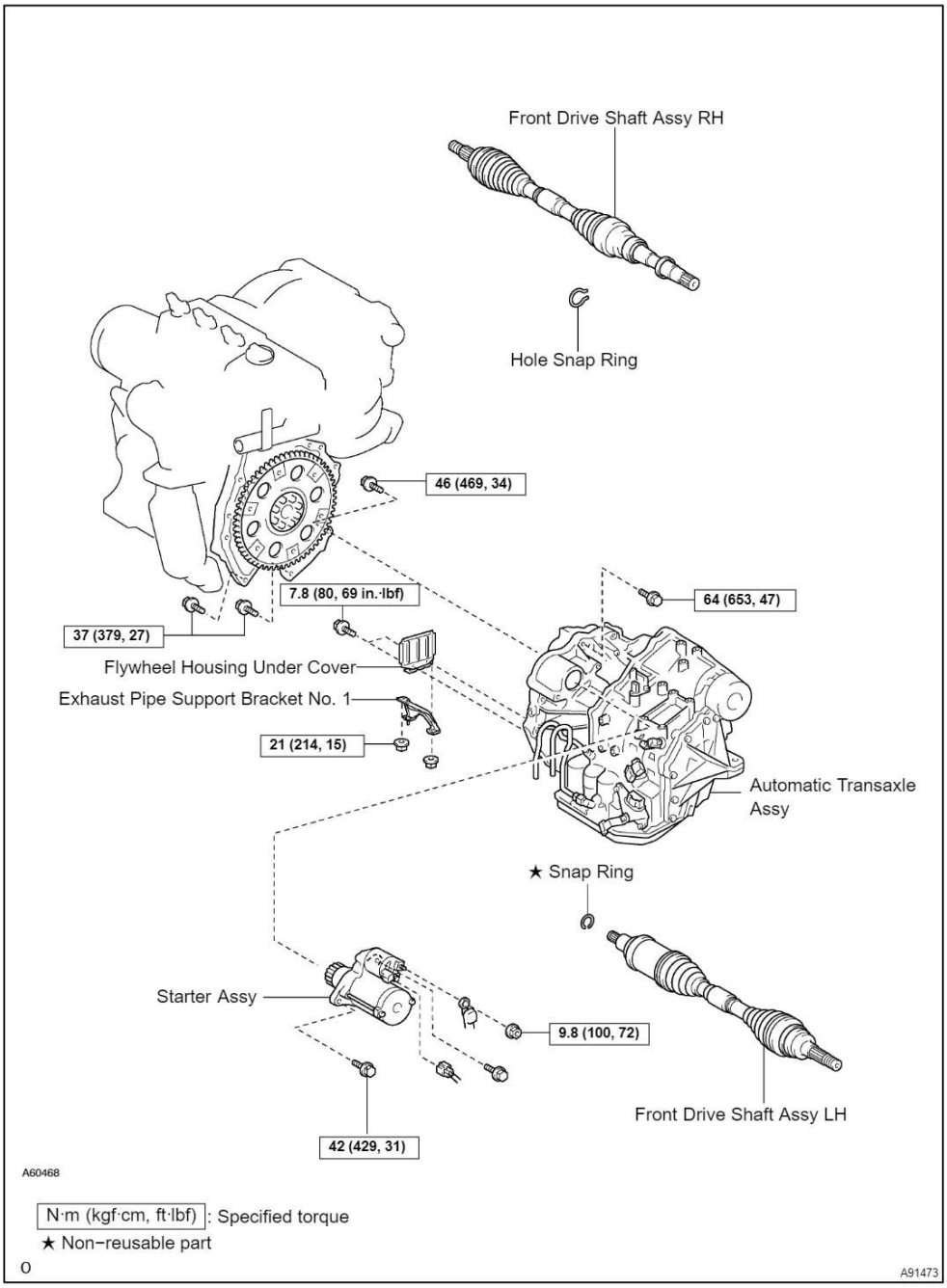
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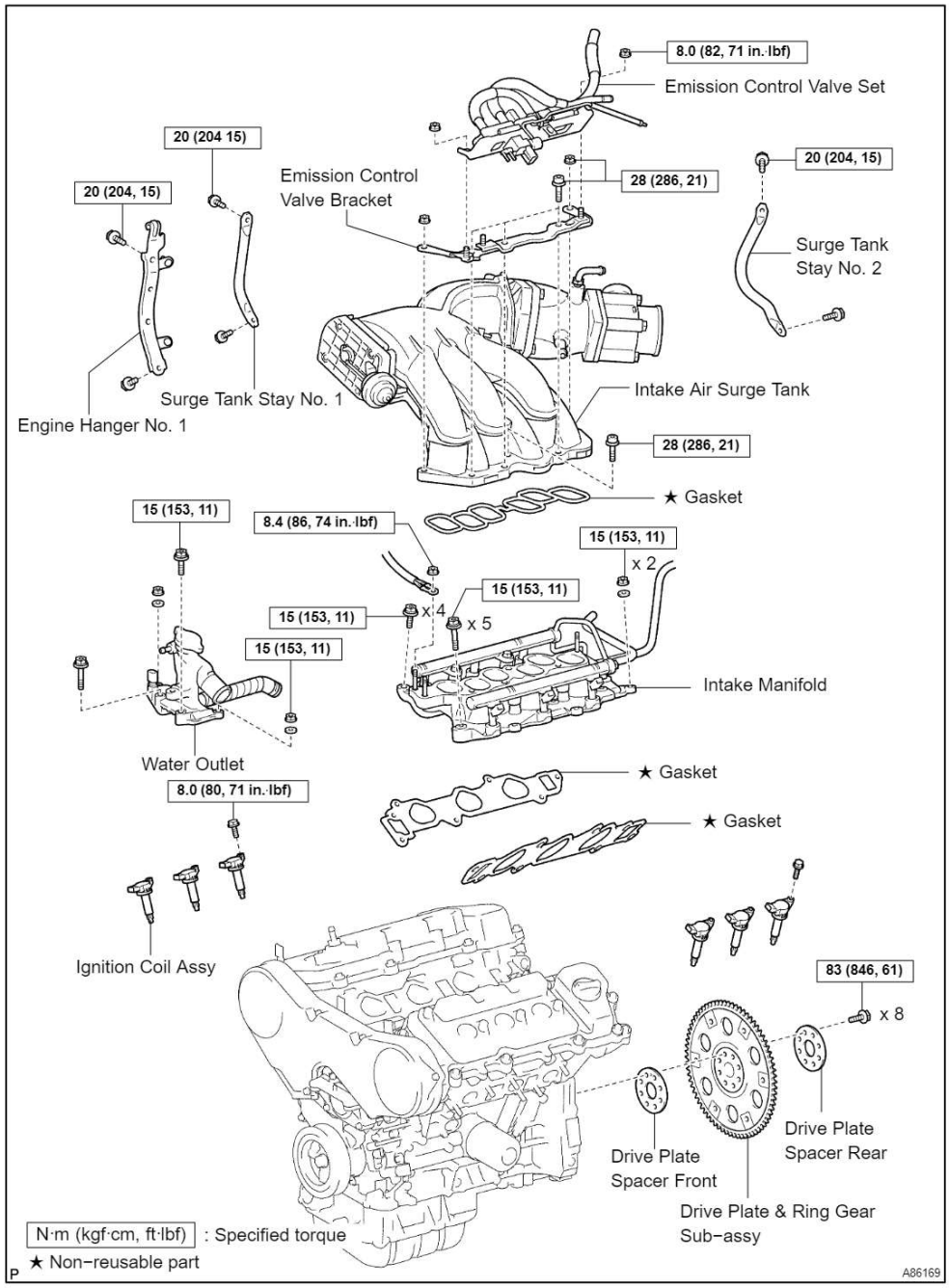
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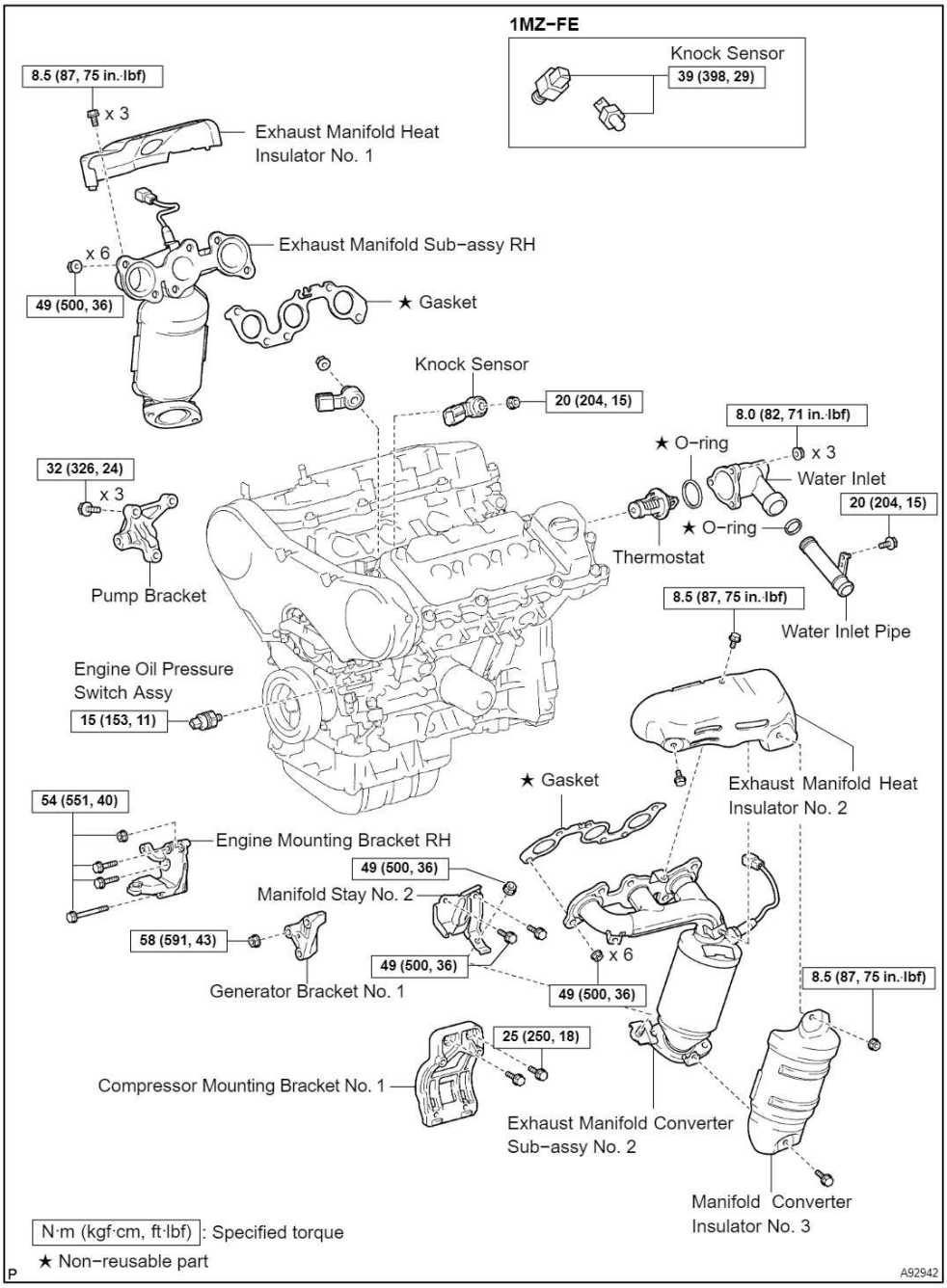
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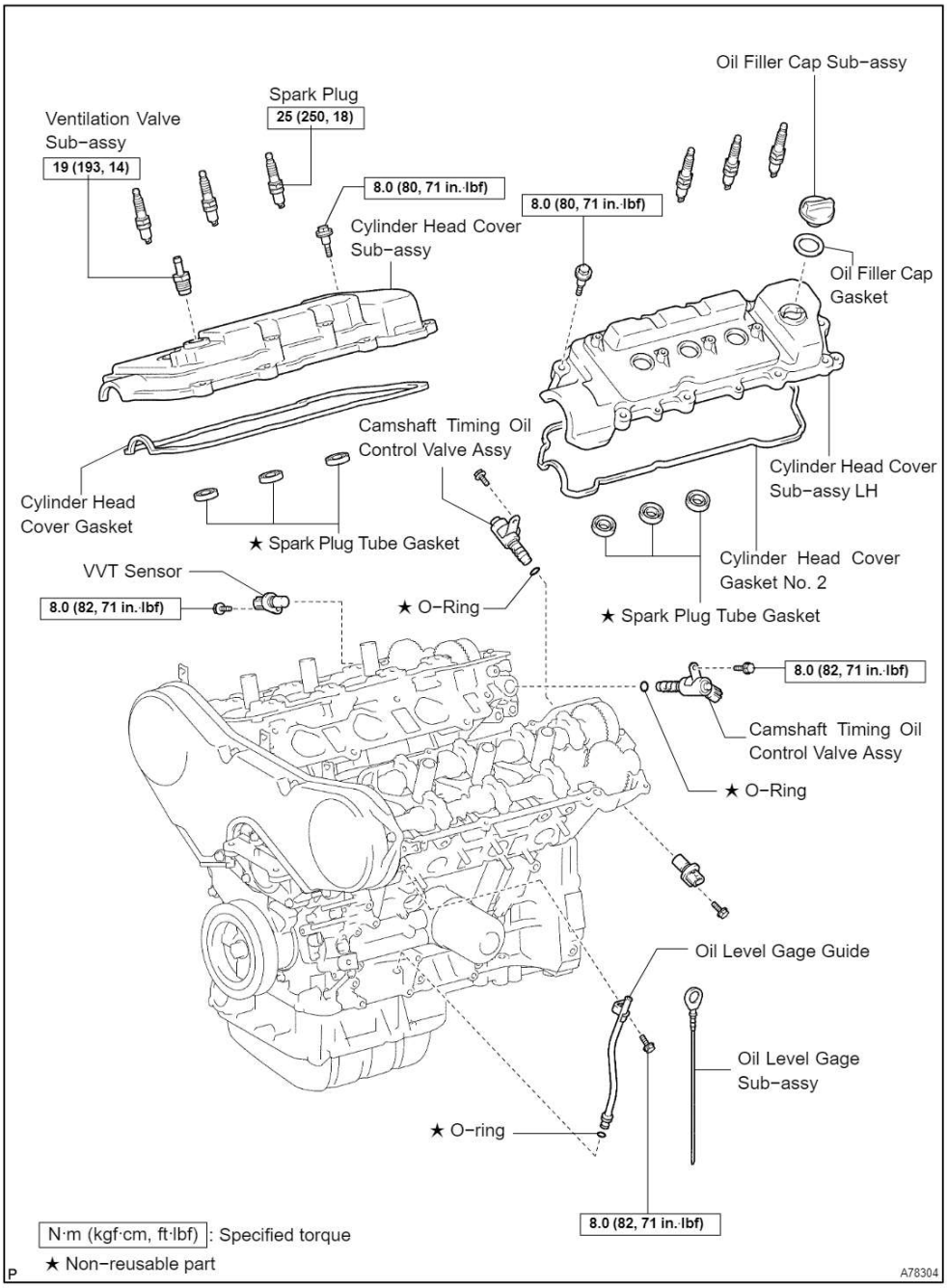
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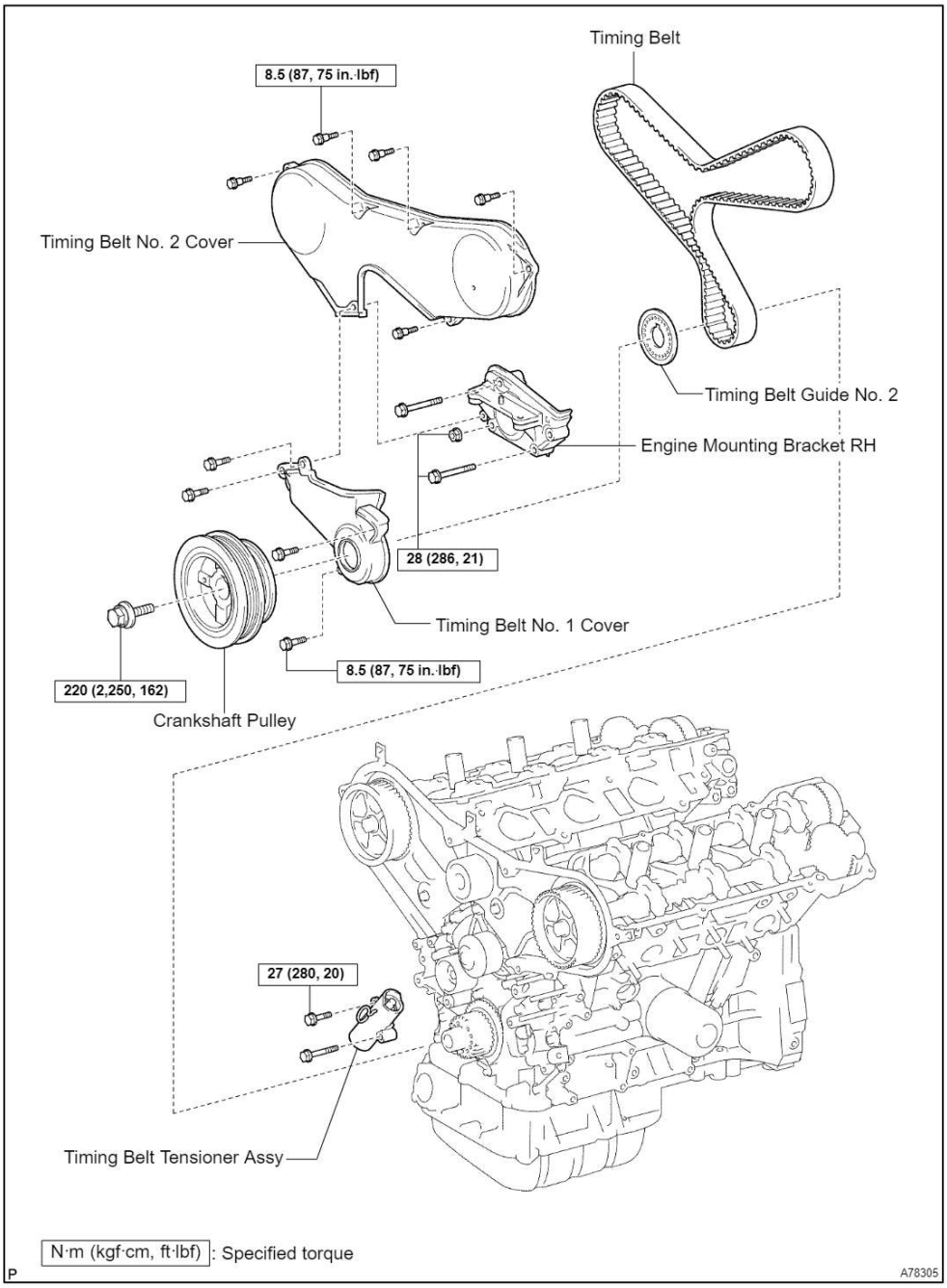
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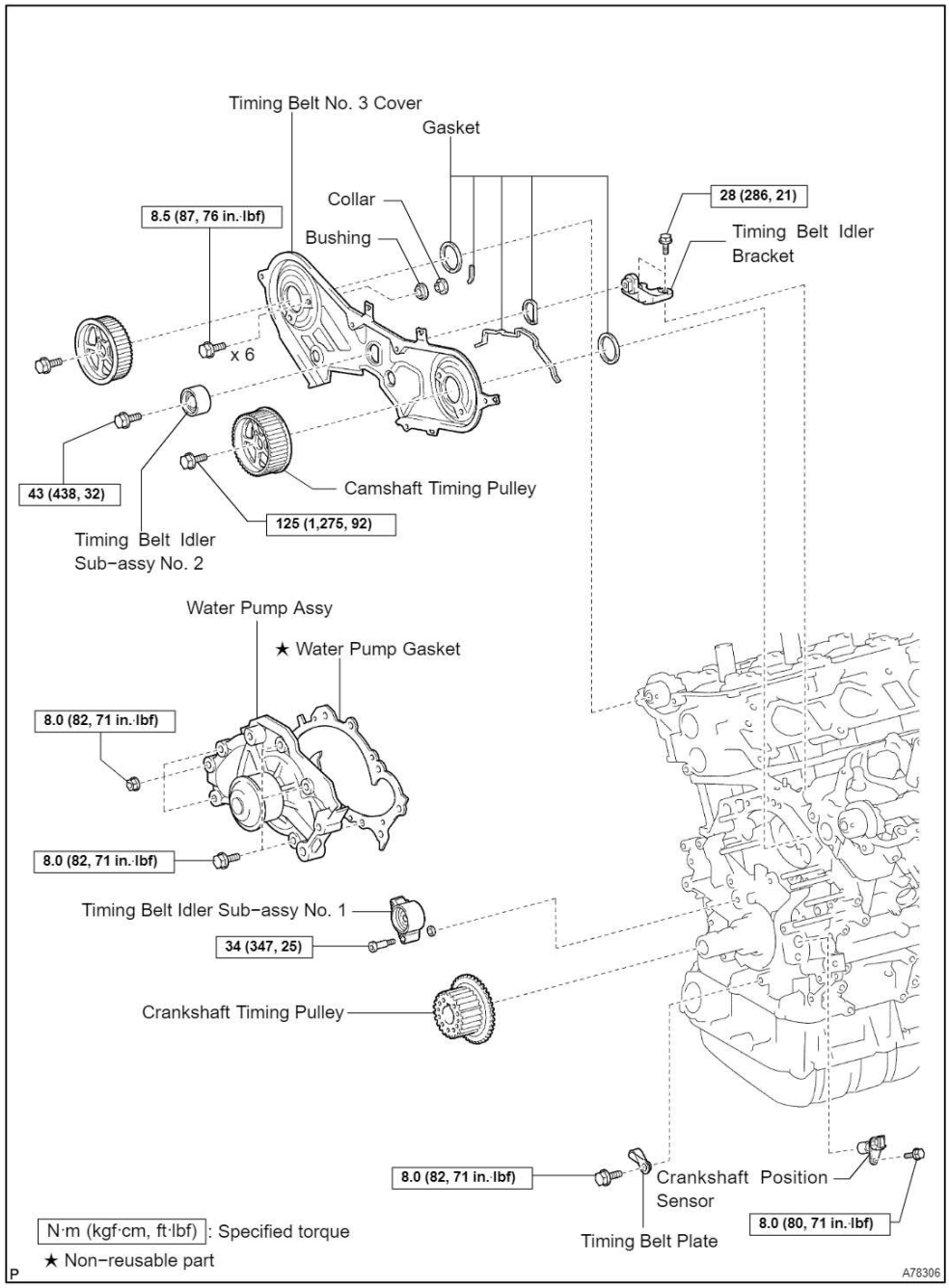
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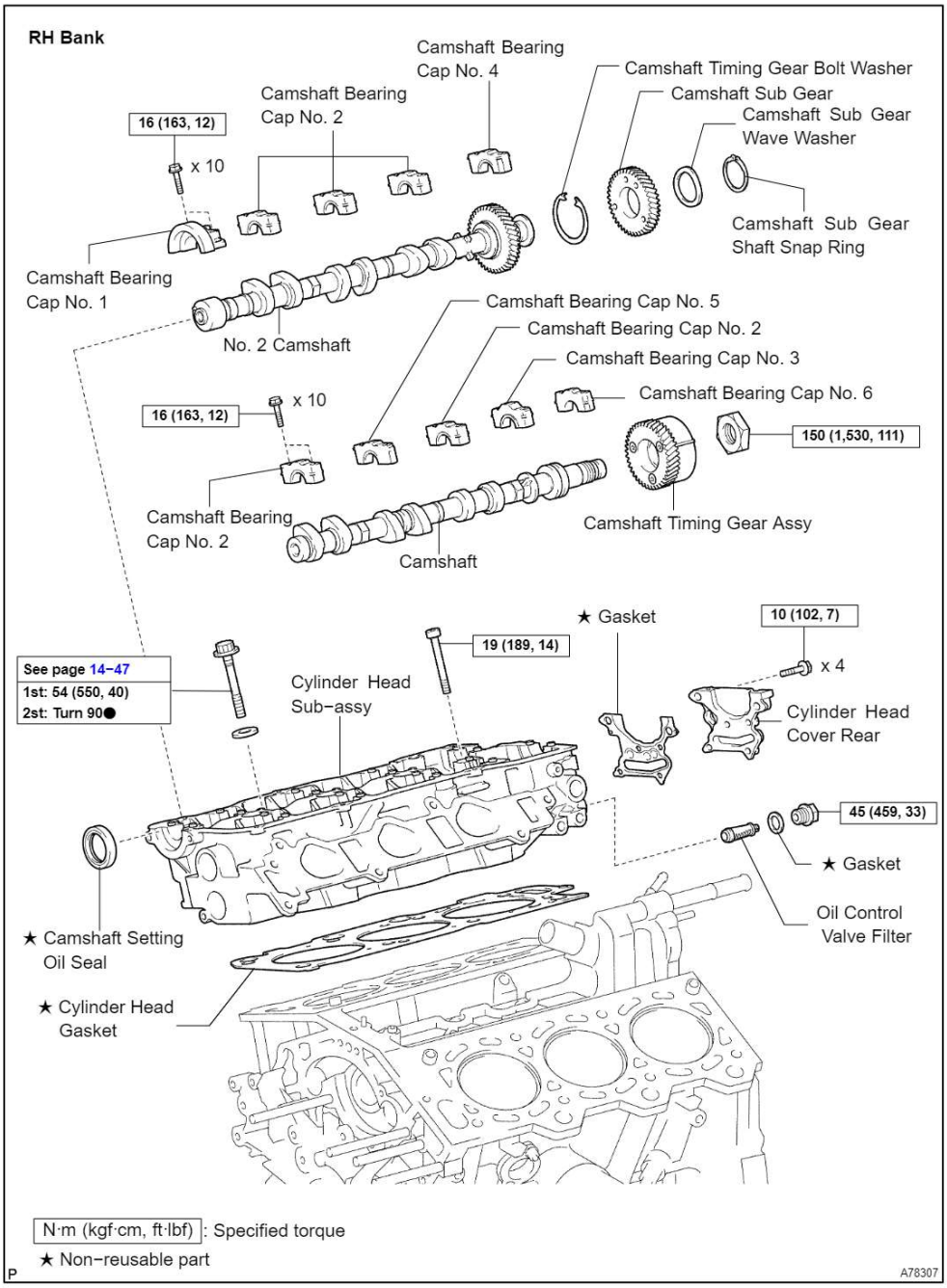
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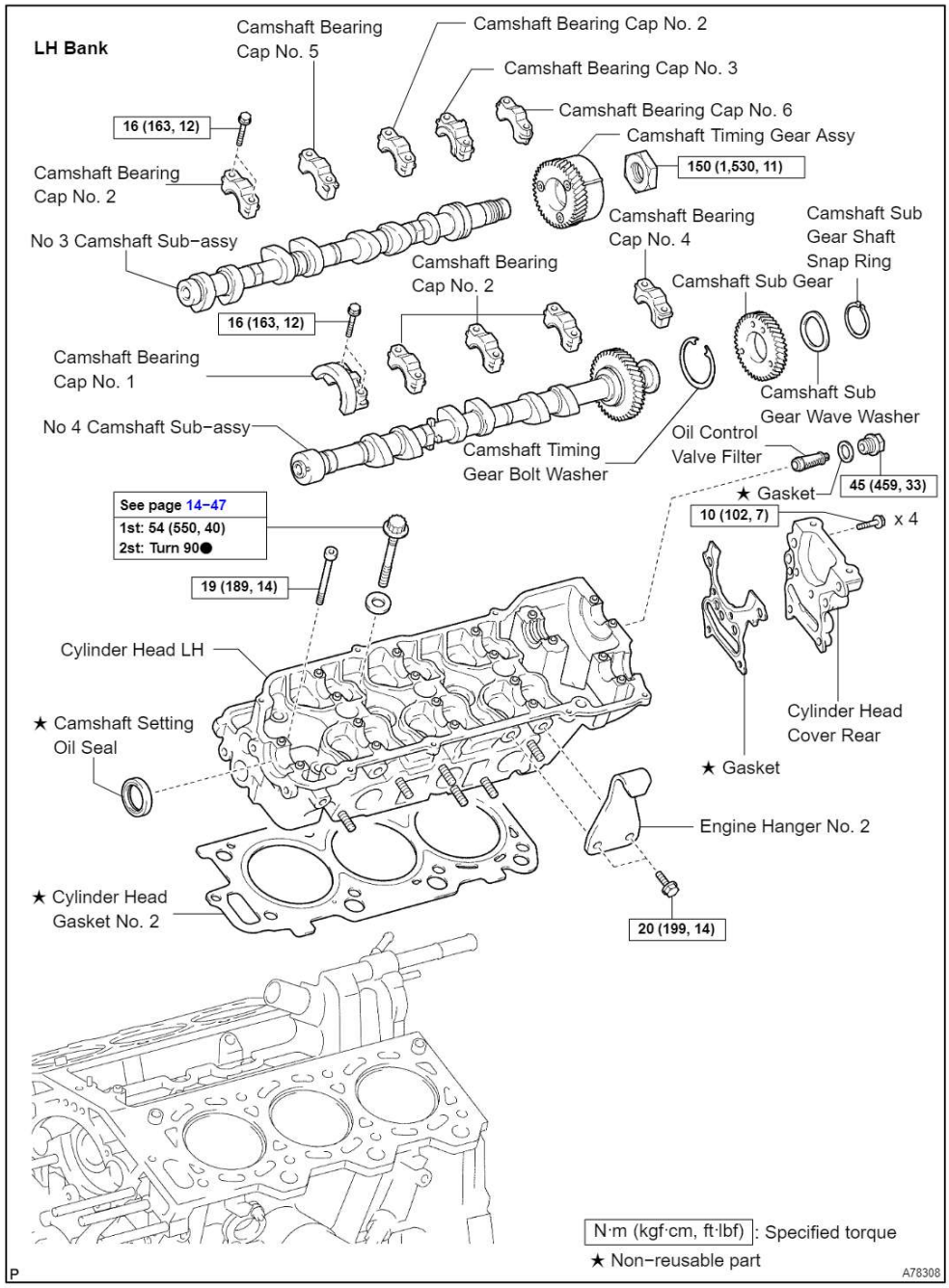
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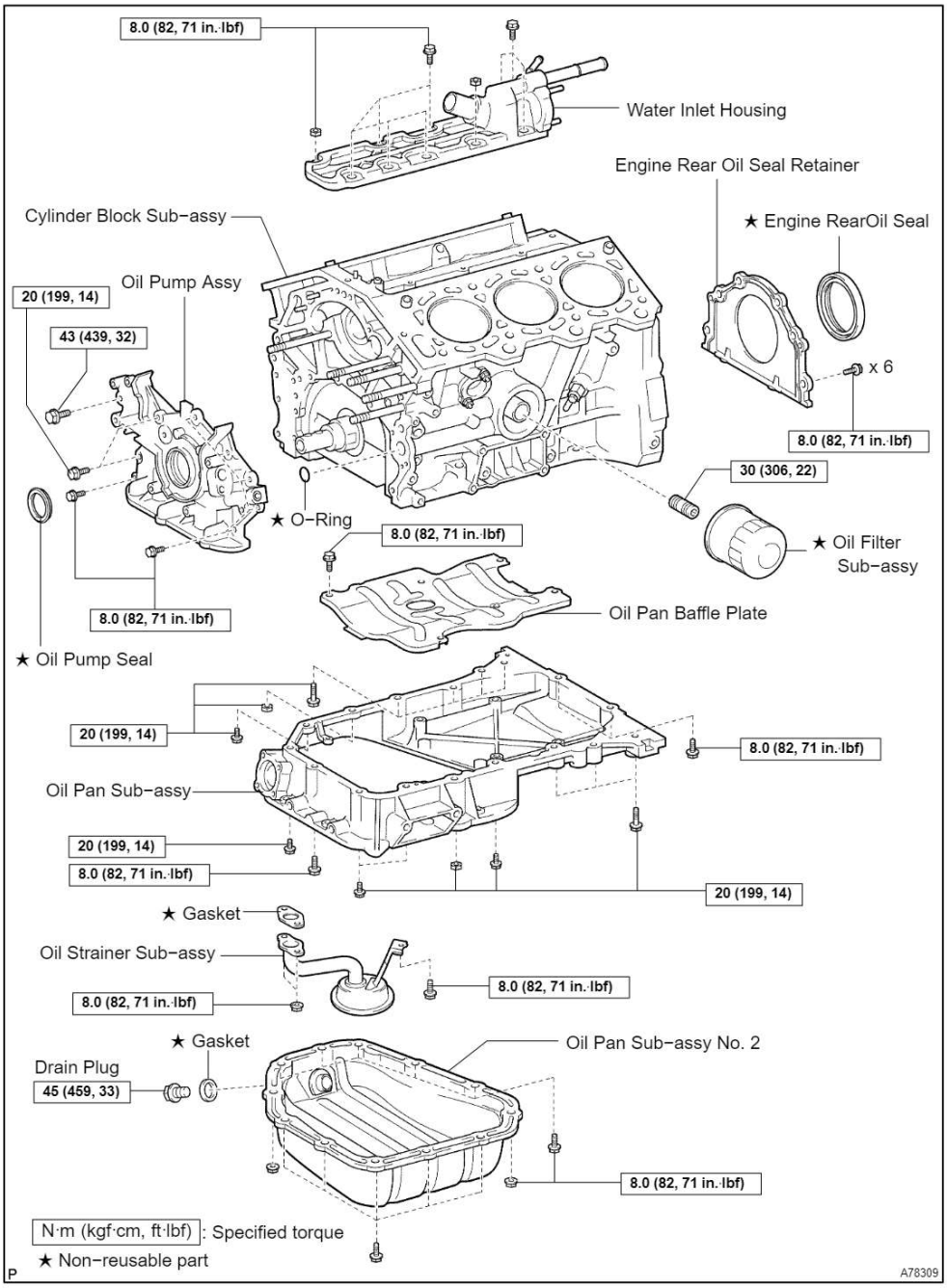
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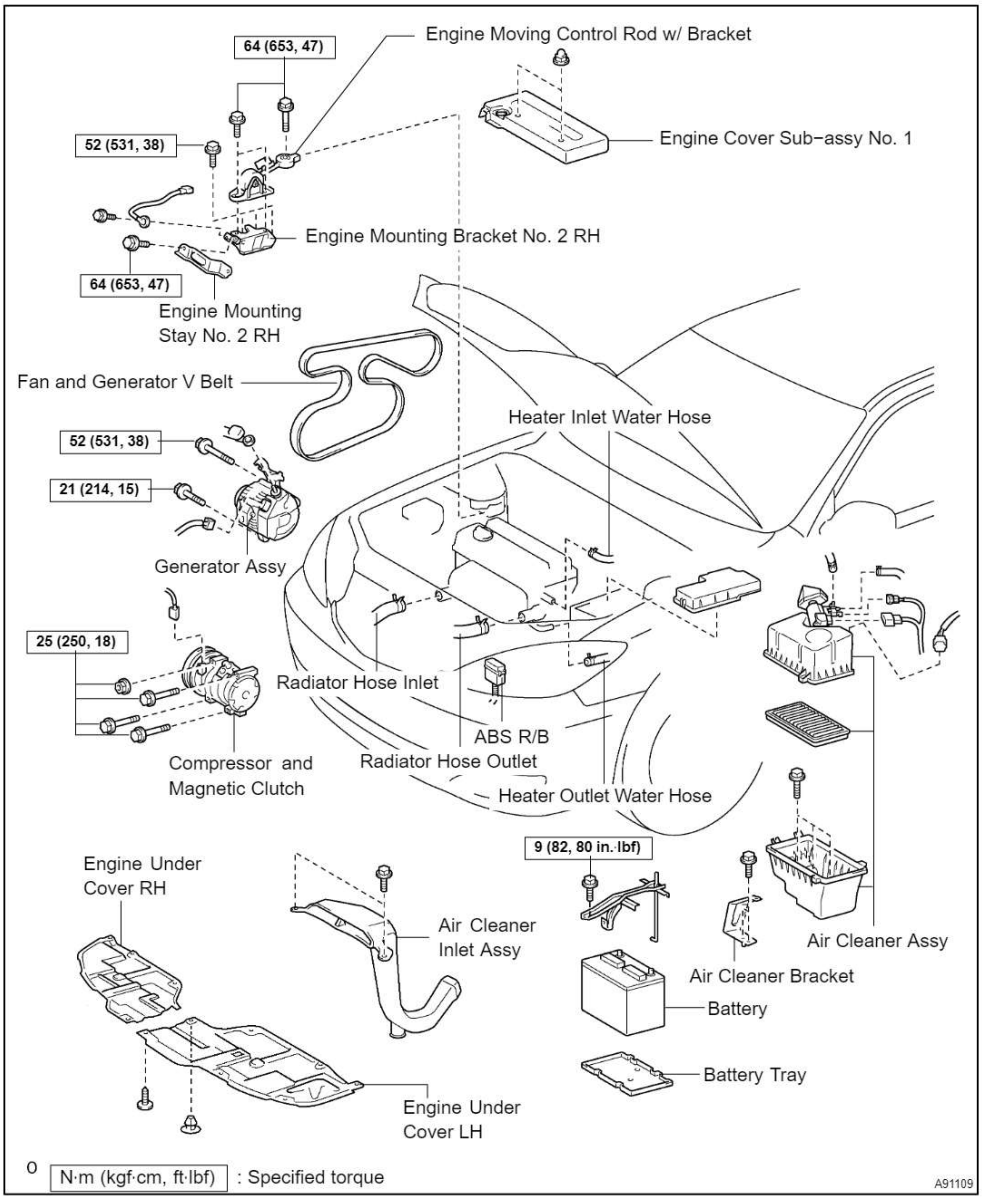


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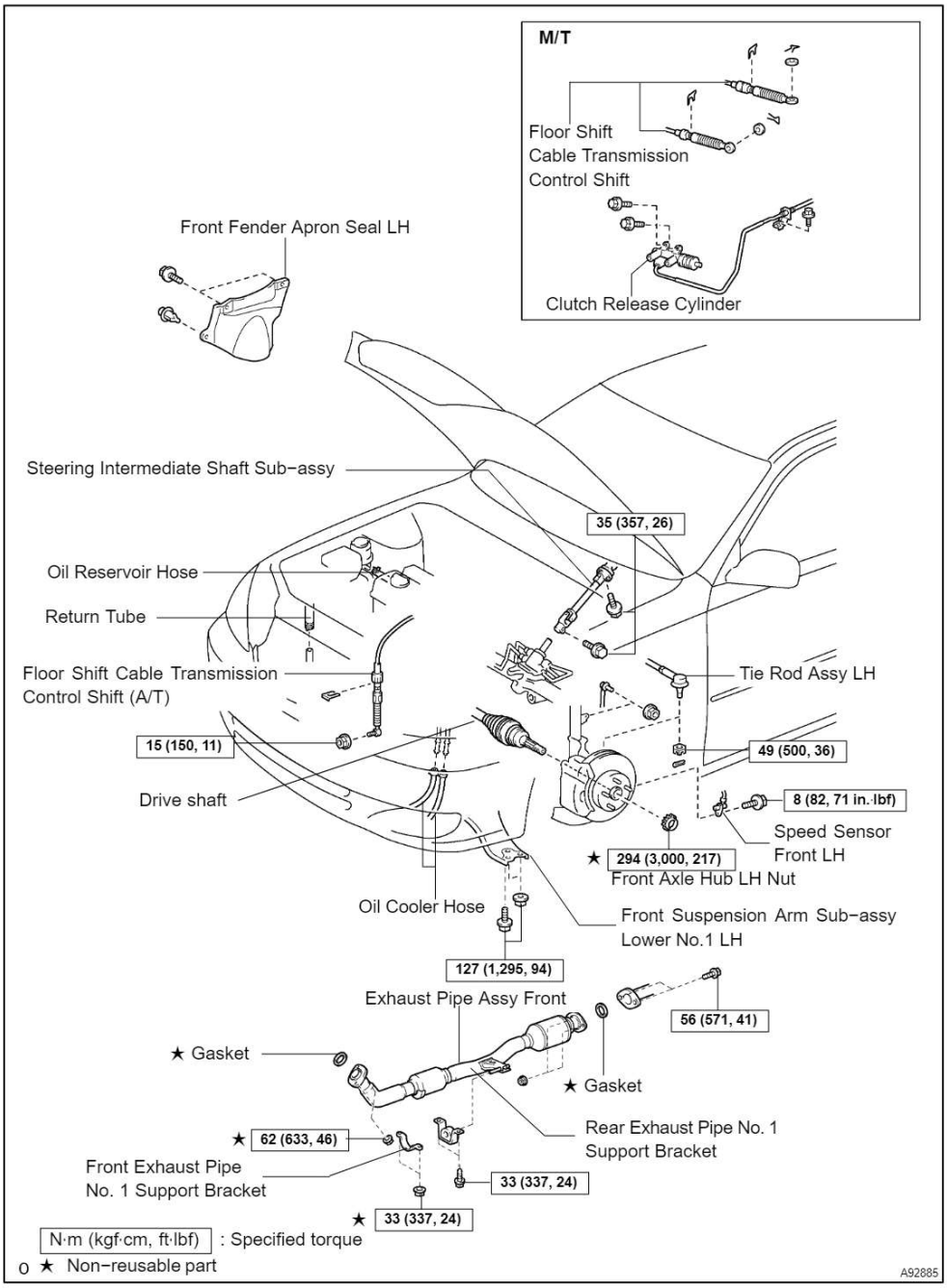
PARTIAL ENGINE ASSY (2AZ−FE)(From July, 2003)

1410B−02

COMPONENTS

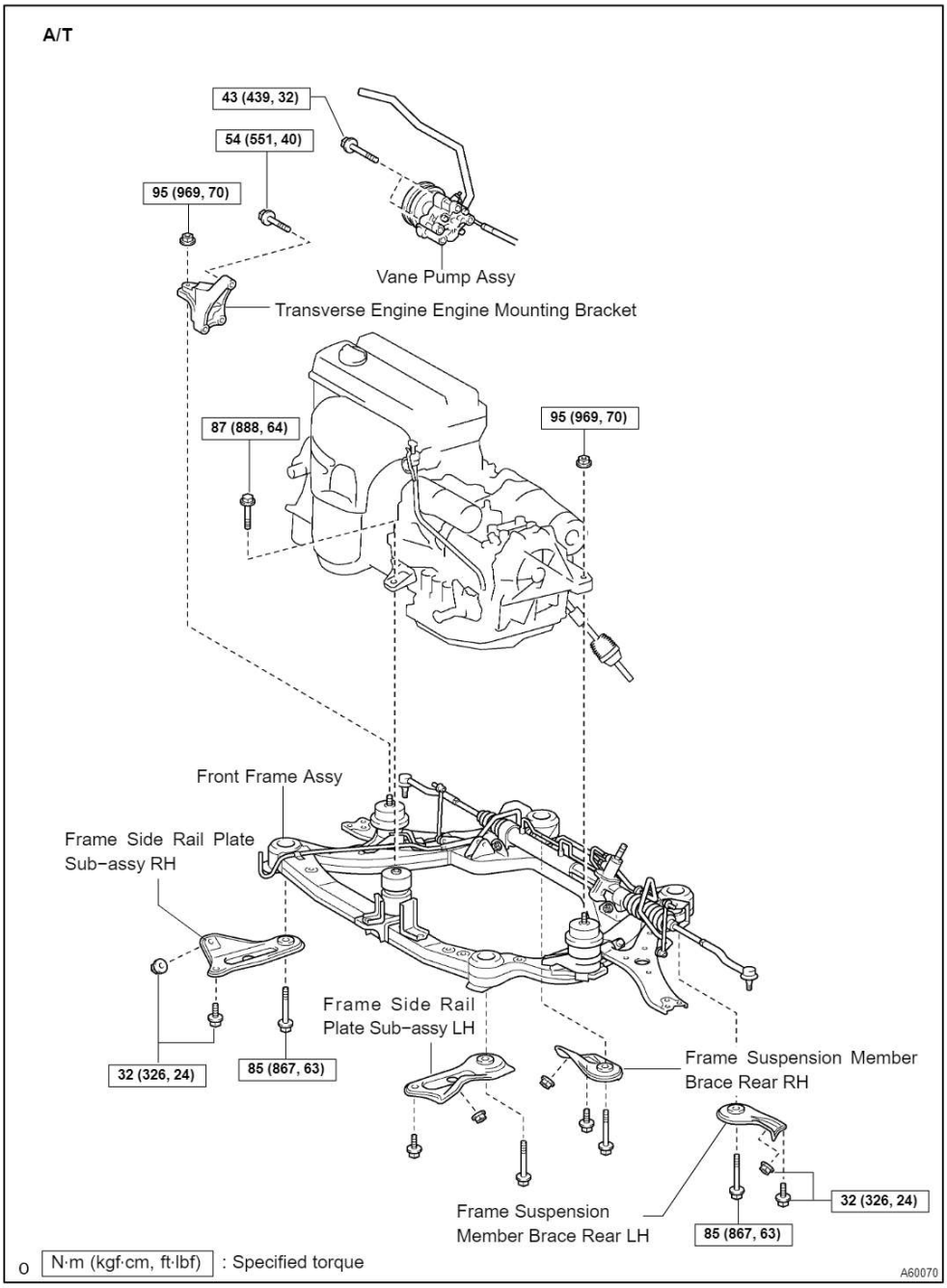


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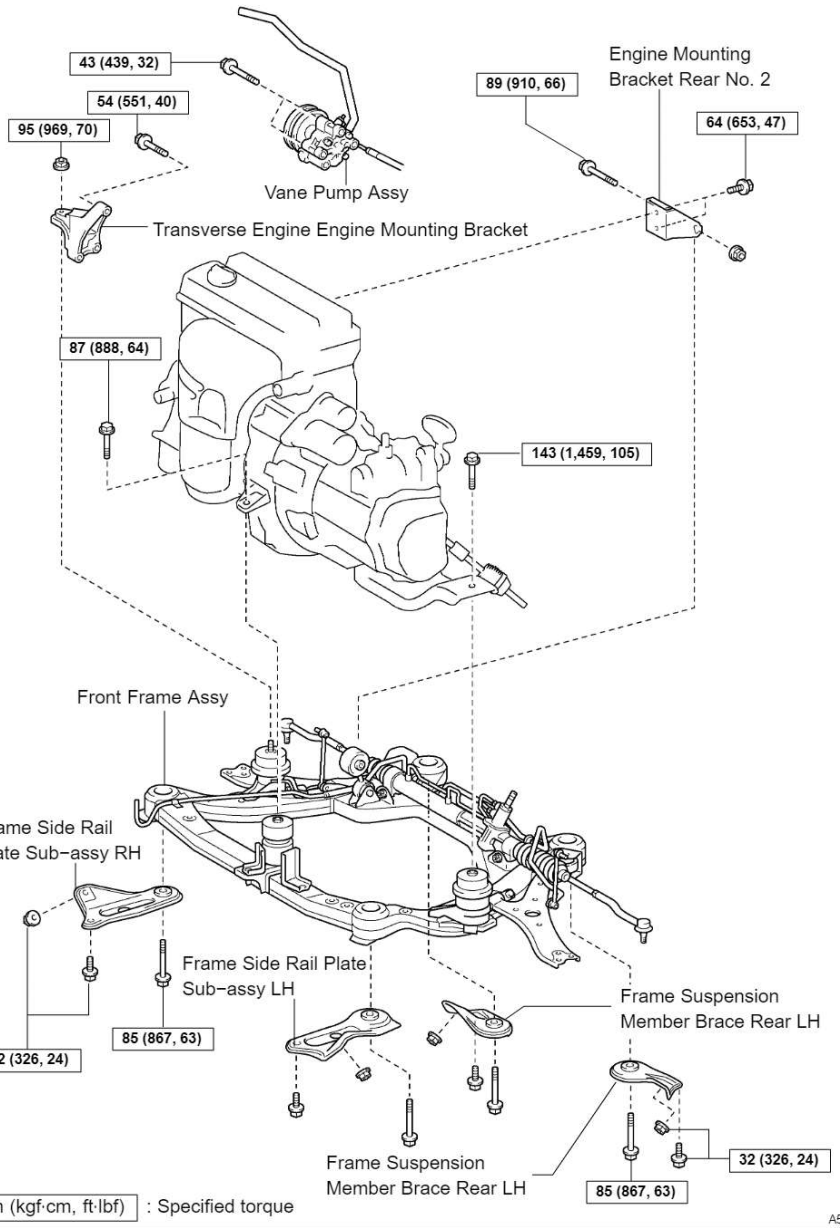
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A/T

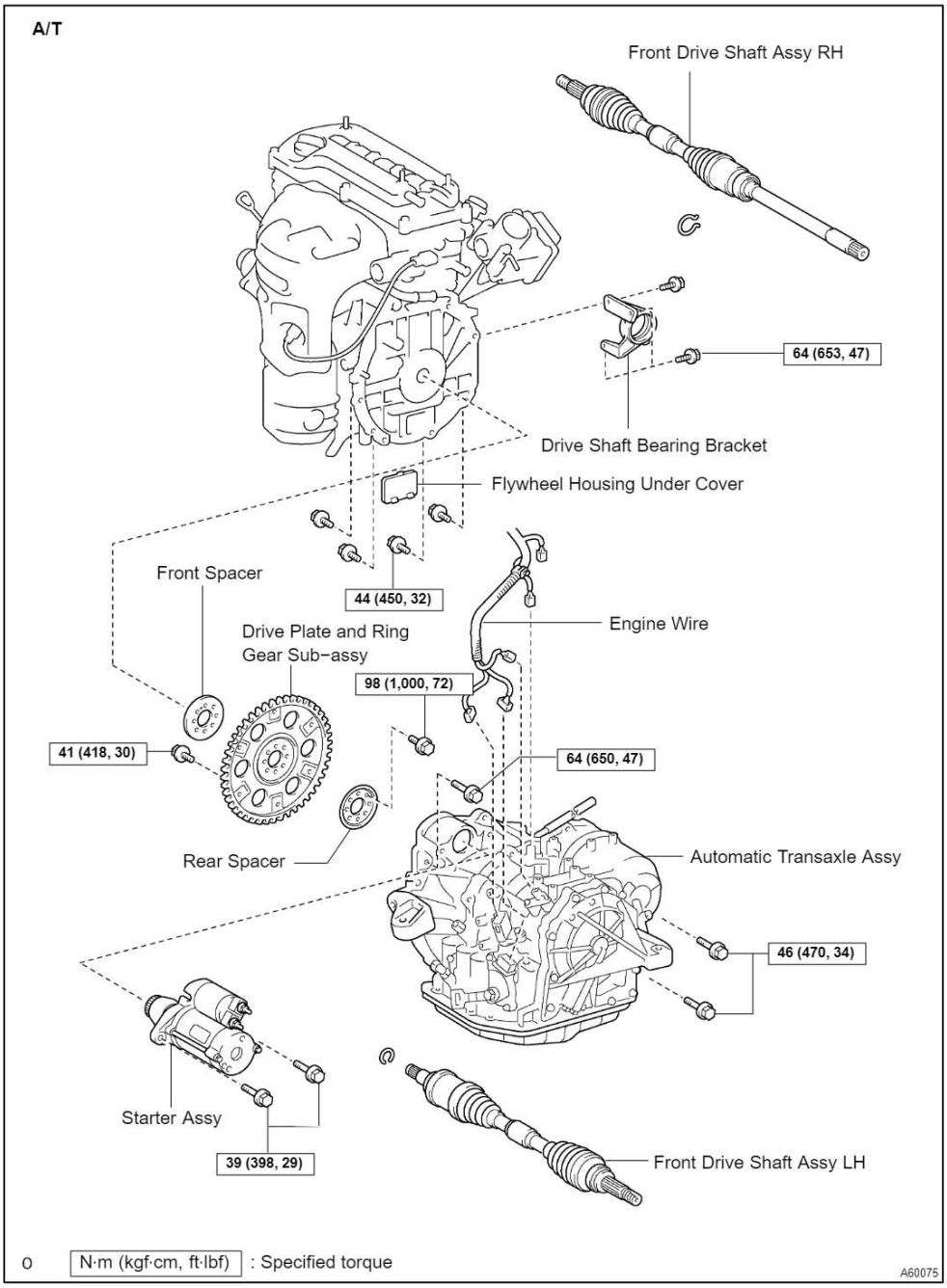


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M/T

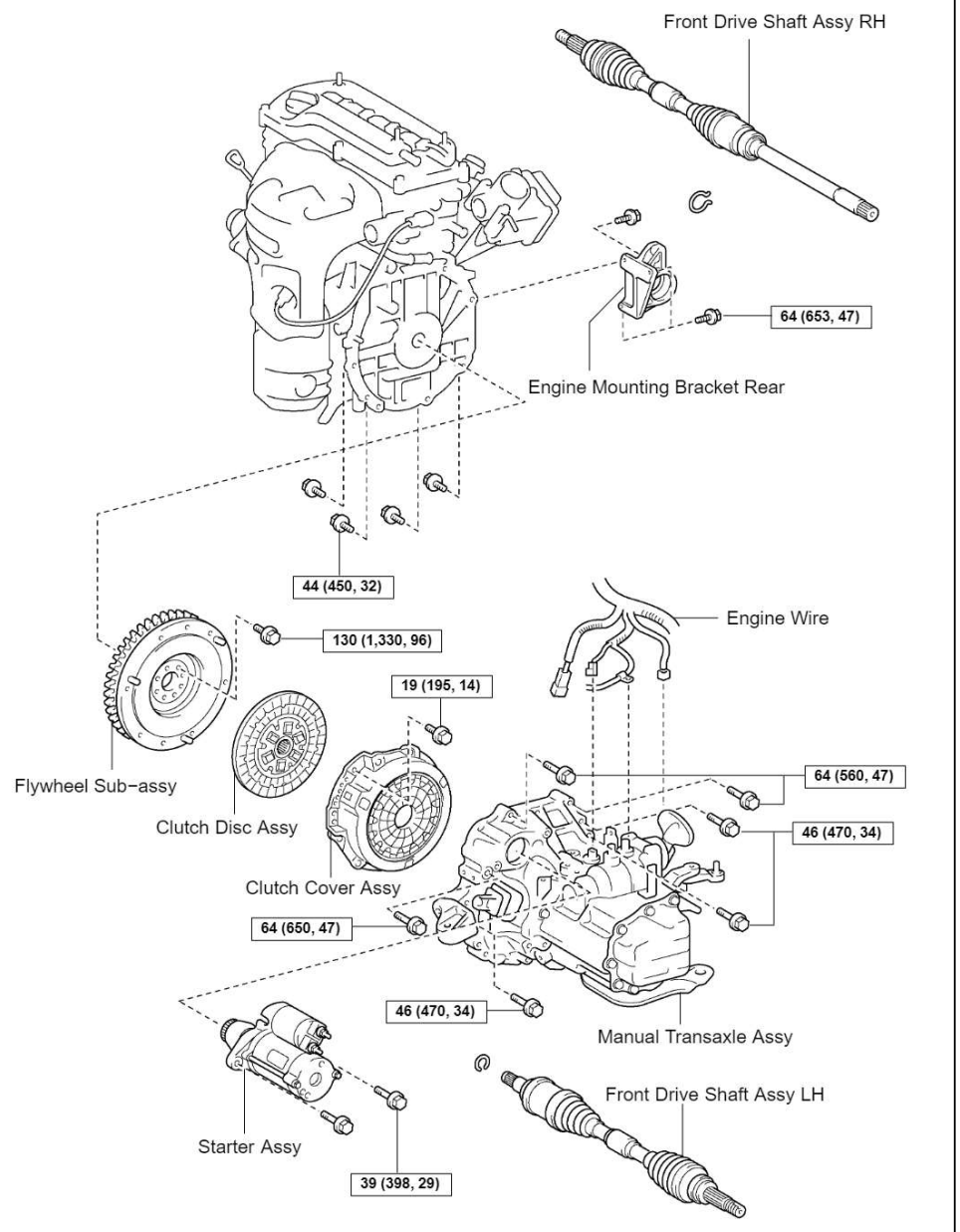


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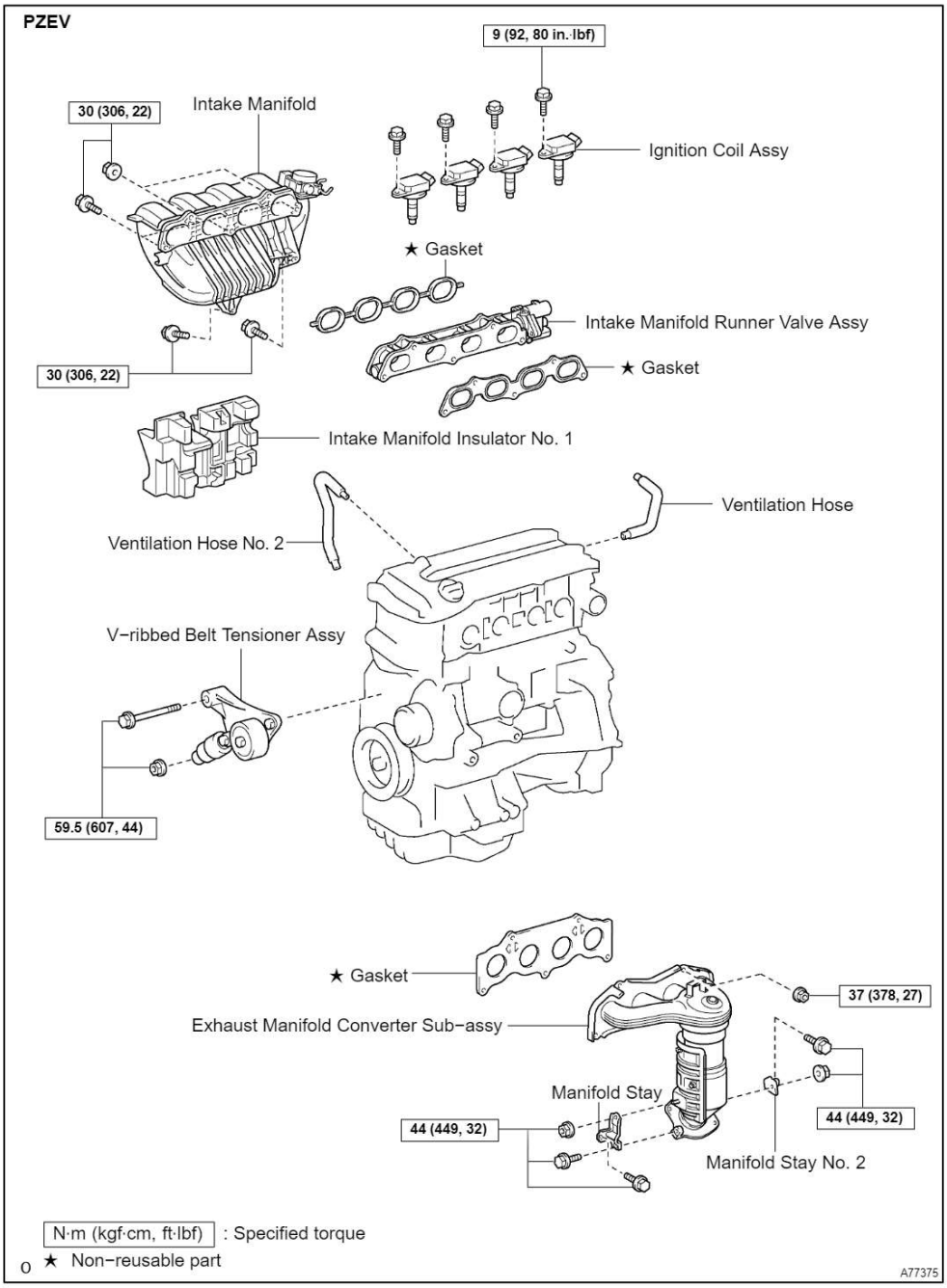


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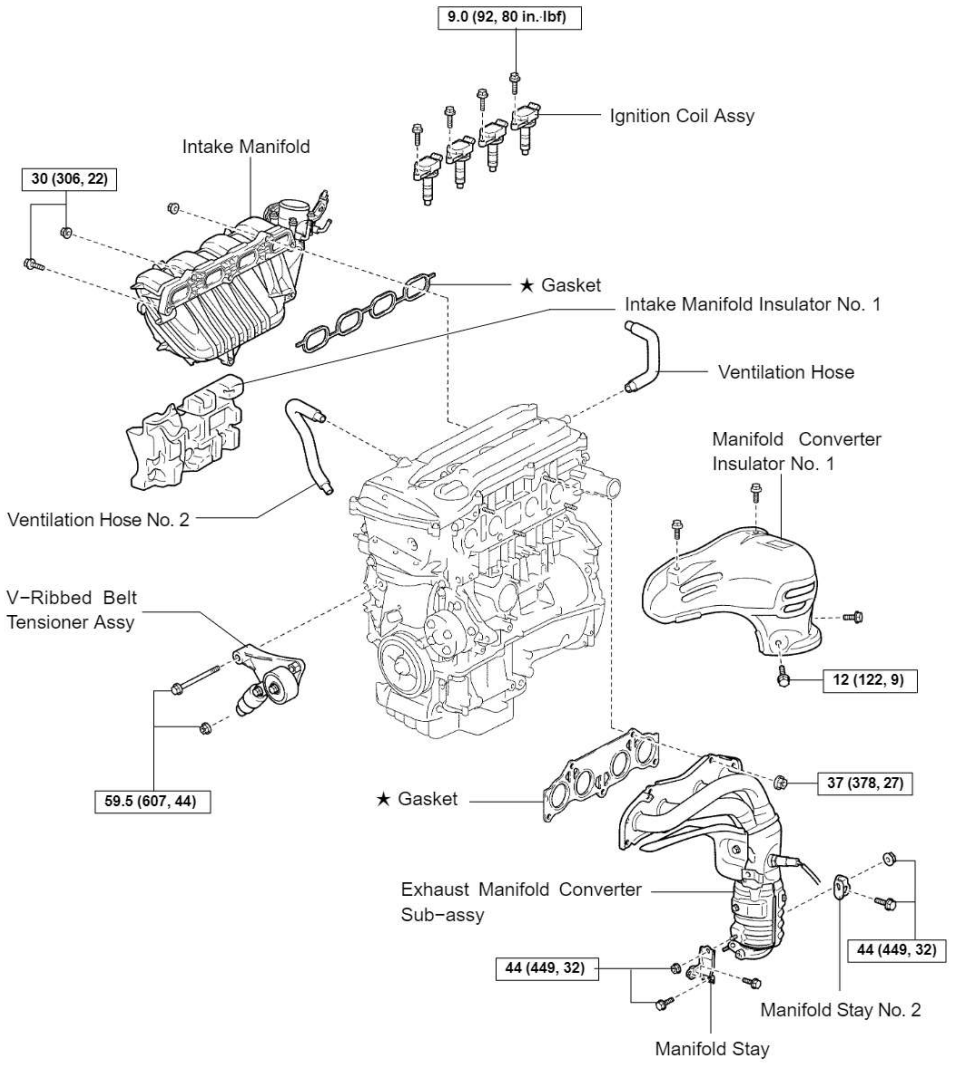


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Except PZEV

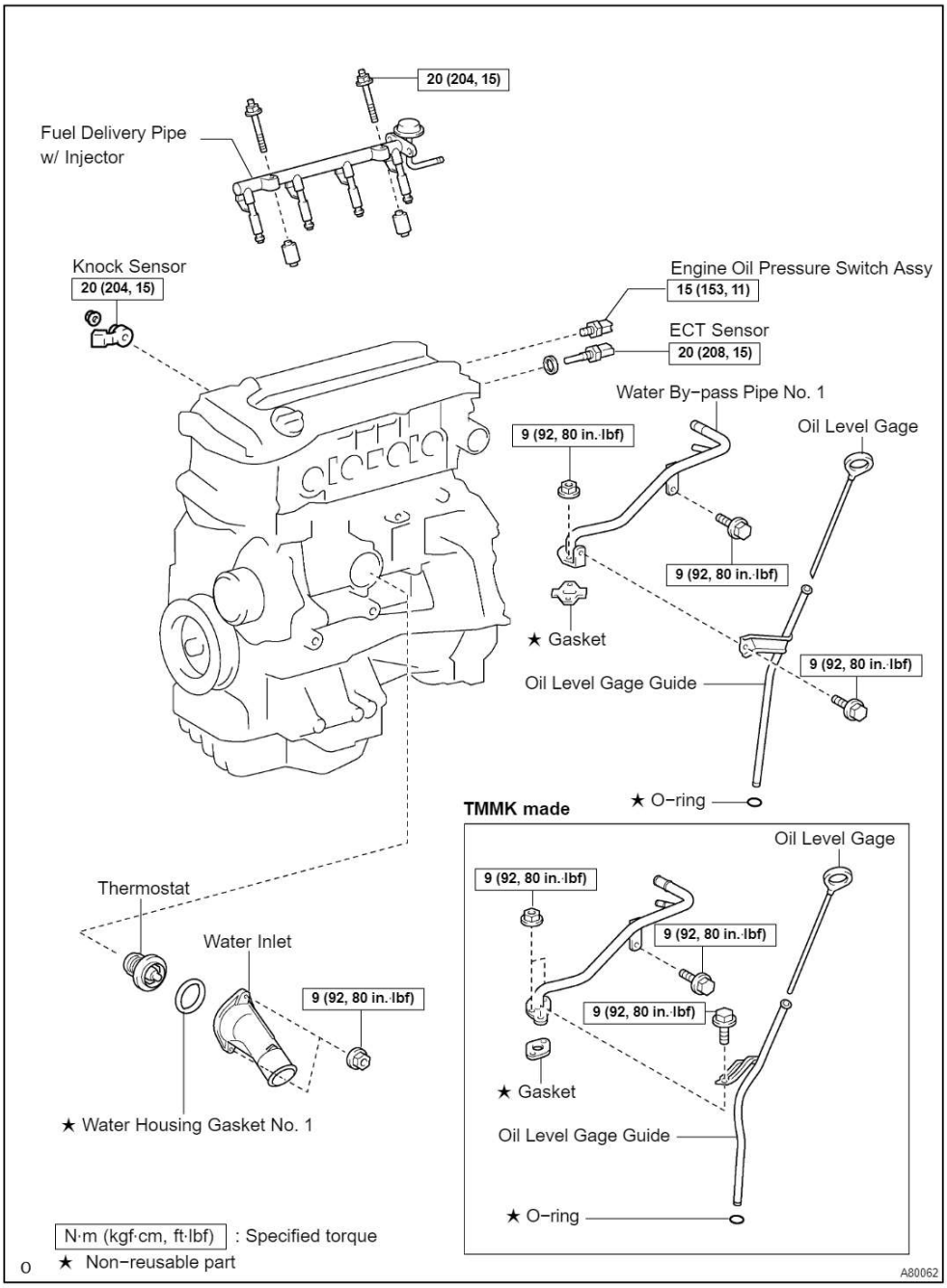


P

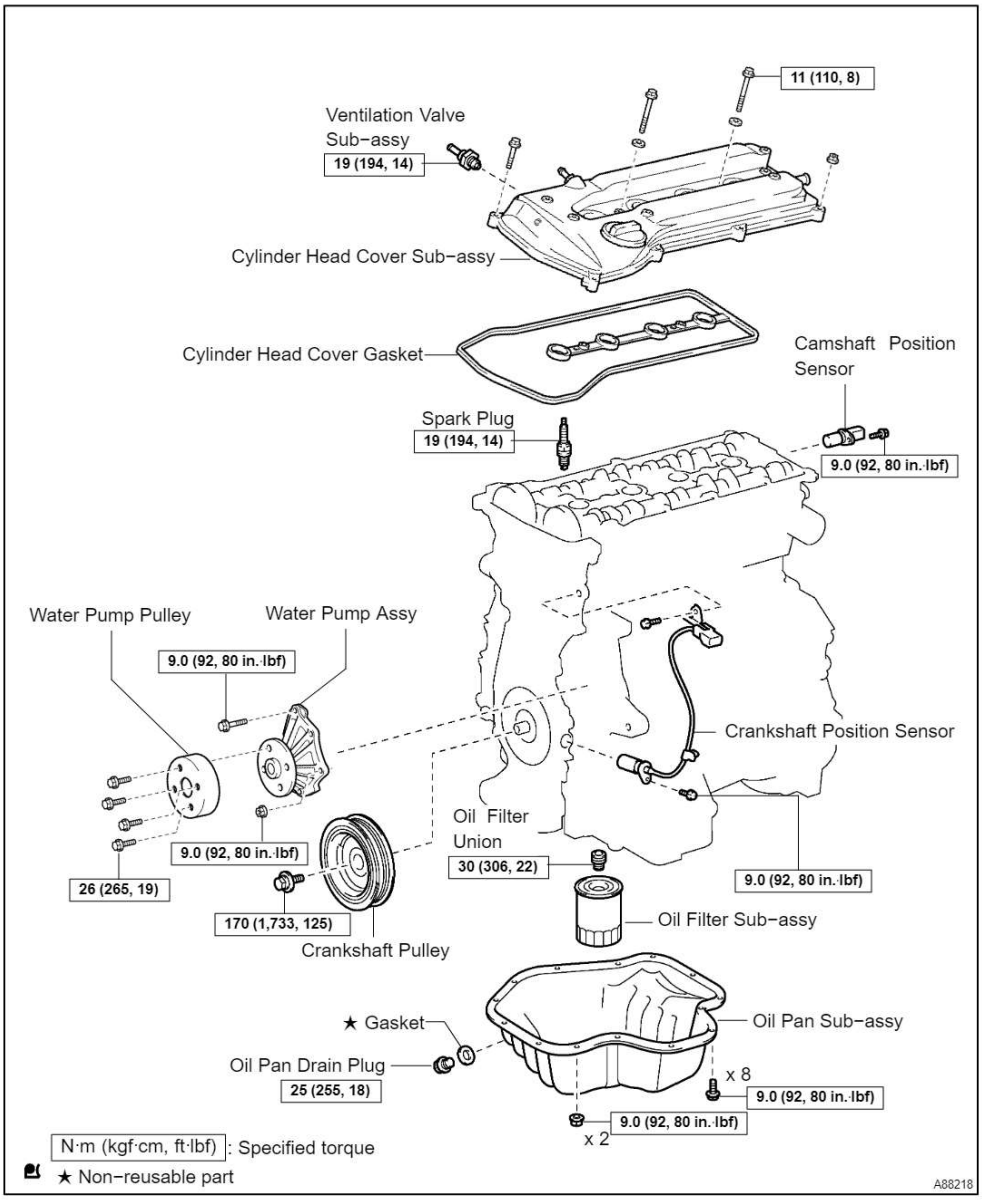
N·m (kgf·cm, ft·lbf) : Specified torque
★ Non−reusable part

A92012

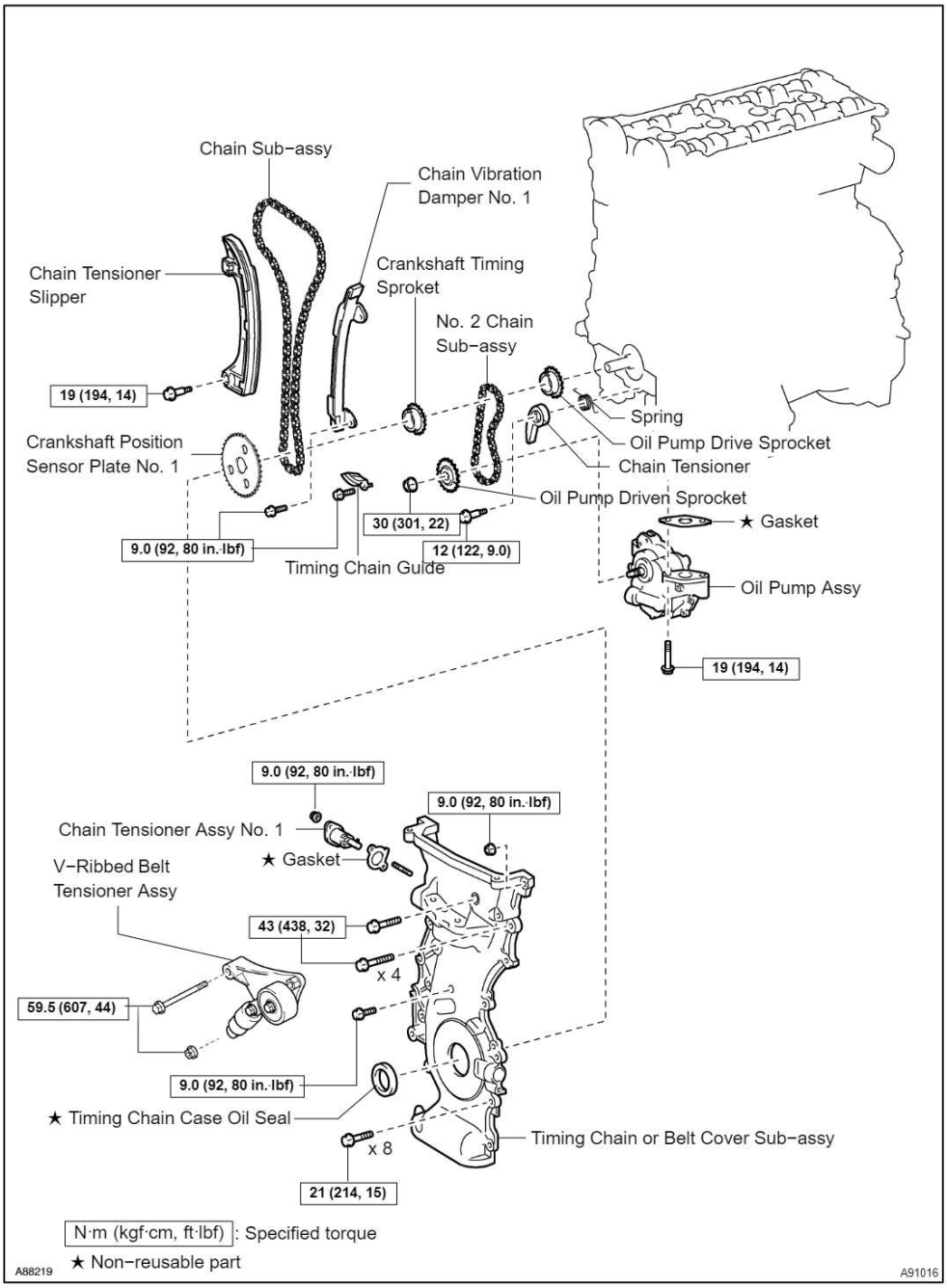
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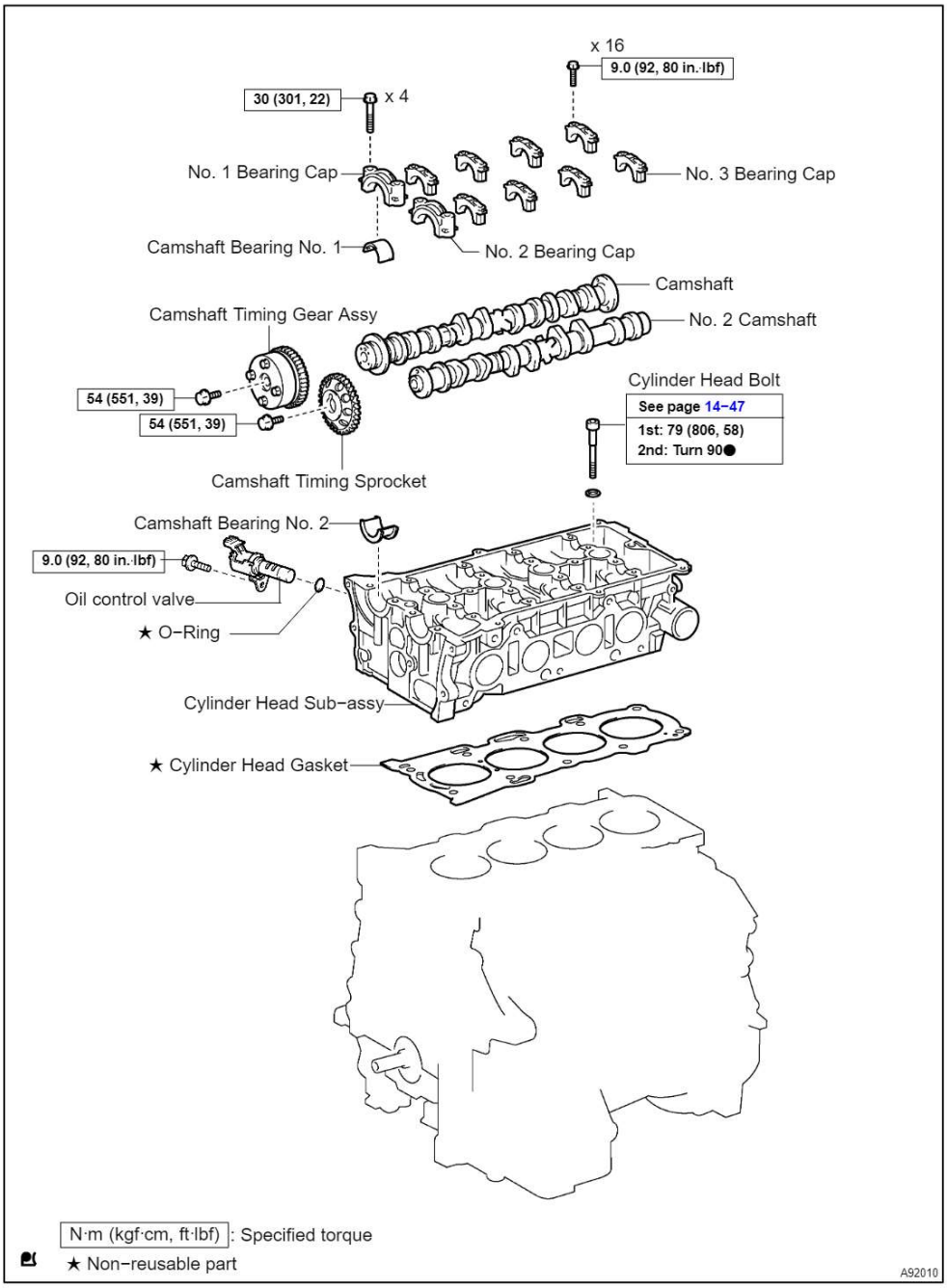
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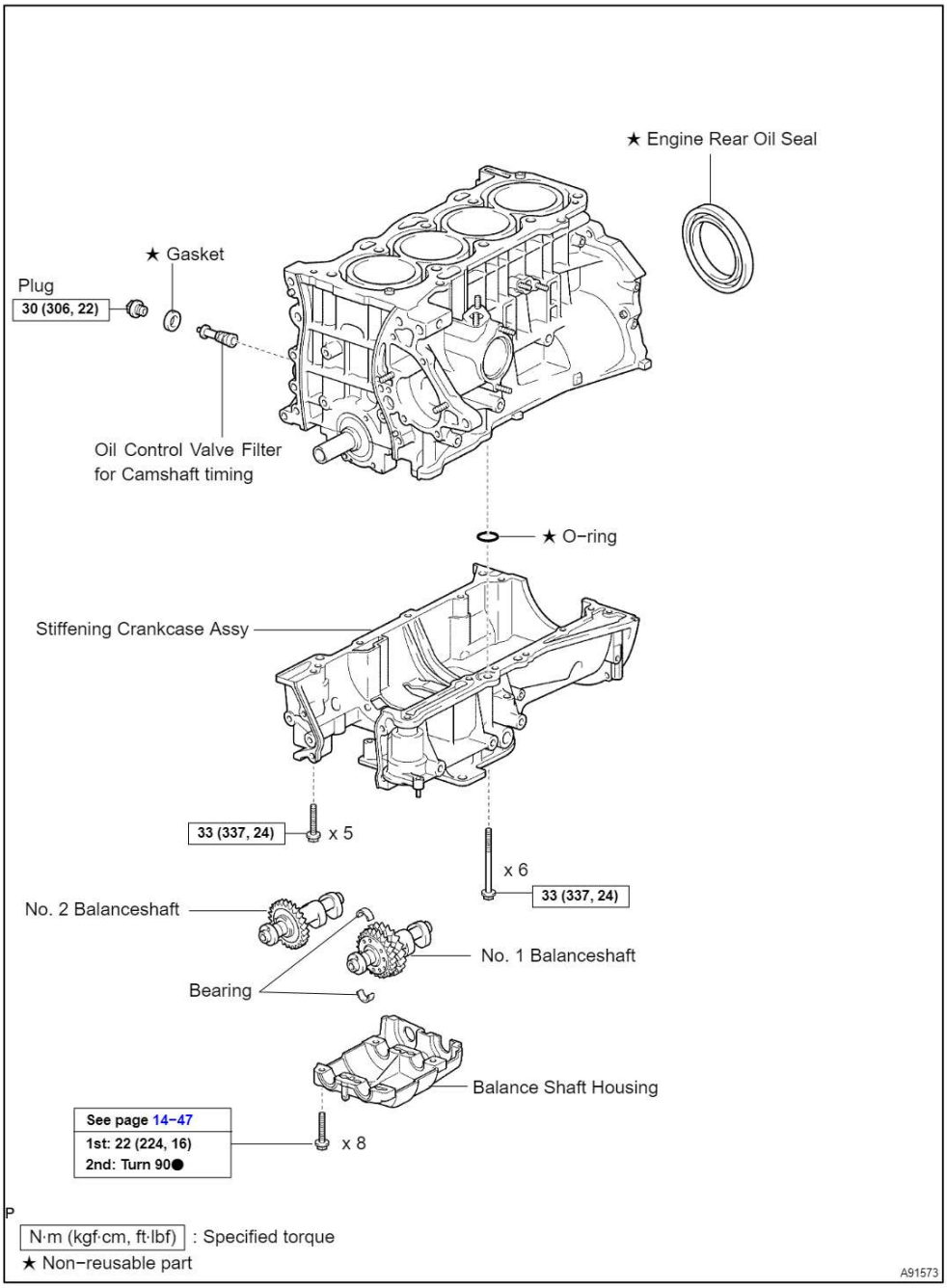
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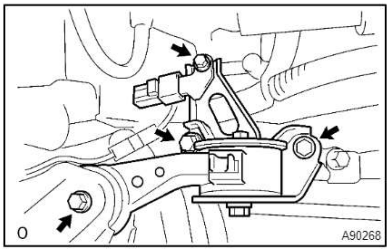


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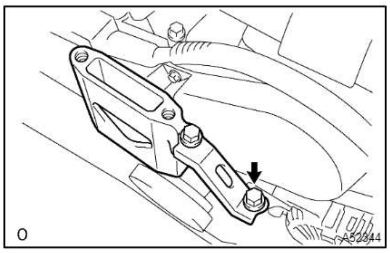
1411X−02

REPLACEMENT

1. WORK FOR PREVENTING GASOLINE FROM SPILLING OUT (See page 11−26)
2. REMOVE FRONT WHEELS
3. REMOVE ENGINE UNDER COVER RH
4. REMOVE ENGINE UNDER COVER LH
5. REMOVE FRONT FENDER APRON SEAL RH
6. DRAIN ENGINE OIL
7. DRAIN ENGINE COOLANT (See page 16−27)
8. DRAIN AUTOMATIC TRANSAXLE FLUID
9. REMOVE BATTERY
10. REMOVE V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (See page 14−140)
11. REMOVE VANE PUMP V BELT (See page 14−140)

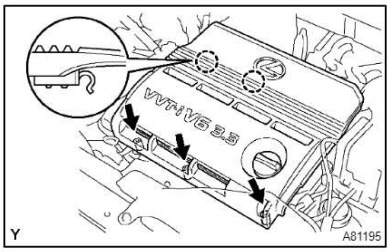


12. REMOVE ENGINE MOVING CONTROL ROD
(a) Remove the 4 bolts and control rod.



13. REMOVE ENGINE MOUNTING STAY NO.2 RH
(a) Remove the bolt, mounting stay No. 2 RH and mounting bracket No. 2 RH.

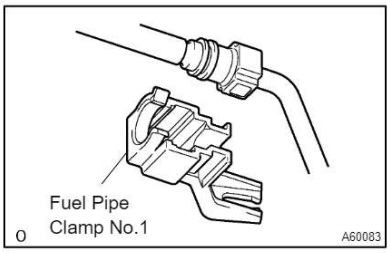
14. REMOVE UNION TO CHECK VALVE HOSE
(a) Remove the vacuum hose for the brake booster.



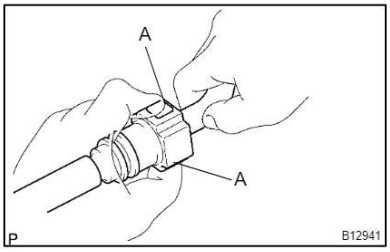
15. REMOVE V−BANK COVER SUB−ASSY
(a) Using a 5 mm hexagon wrench, remove the 3 nuts.
(b) Disconnect the 2 clips, and remove the cover.

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16. REMOVE AIR CLEANER INLET ASSY
17. REMOVE AIR CLEANER ASSEMBLY WITH HOSE
18. REMOVE AIR CLEANER BRACKET
19. REMOVE AIR CLEANER INLET NO.1
20. REMOVE INTAKE AIR RESONATOR SUB−ASSY



21. SEPARATE FUEL PIPE SUB−ASSY NO.1
(a) Remove the fuel pipe clamp.

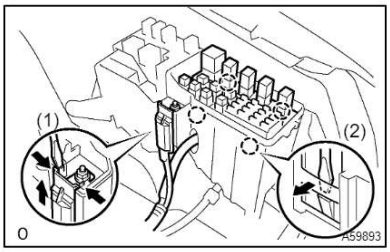


(b) Disconnect the connector from the tube while pinching part A with fingers as shown in the illustration.

NOTICE:
- **Check for contamination in the pipe and around the connector. Clean if necessary and then disconnect the connector.**
- **Disconnect the connector with your hands.**
- **Do not bend, fold or rotate the nylon tube.**
- **If the pipe and connector are stuck together, push and pull the connector until it comes free.**
- **Put the pipe and connector ends in vinyl bags to prevent damage and contamination.**

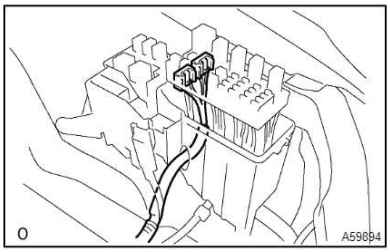
22. REMOVE RADIATOR HOSE INLET
23. REMOVE RADIATOR HOSE OUTLET
24. DISCONNECT OIL COOLER INLET HOSE
25. DISCONNECT OIL COOLER OUTLET HOSE
26. DISCONNECT HEATER INLET WATER HOSE
27. DISCONNECT HEATER OUTLET WATER HOSE
28. REMOVE GLOVE COMPARTMENT DOOR ASSY

29. DISCONNECT ENGINE WIRE
(a) Disconnect the engine wire from the ECM and J/B.



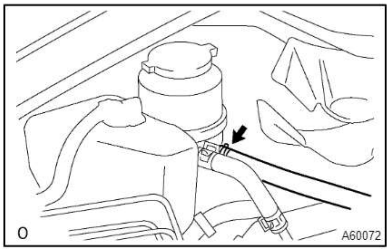
(b) Disconnect the engine wire from the engine room J/B.
(1) Remove the nut and separate the wire harness.
(2) Using a screwdriver, unlock the engine room junction block. Disconnect the engine wire by pulling it upward.

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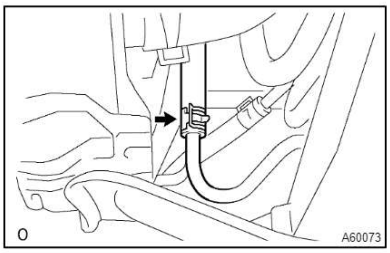


(3) Disconnect the connector.
(c) Pull out the engine wire.
(d) Remove the body ground.

30. DISCONNECT FLOOR SHIFT CABLE TRANSMISSION CONTROL SELECT **(See page 40−65)**



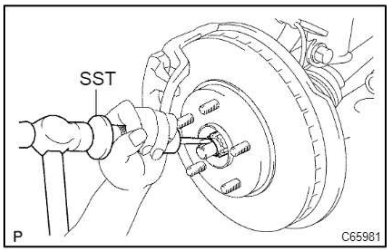
31. DISCONNECT OIL RESERVOIR TO PUMP HOSE NO.1



32. DISCONNECT STEERING GEAR OUTLET RETURN TUBE

33. REMOVE EXHAUST PIPE NO.1 SUPPORT BRACKET
34. REMOVE EXHAUST PIPE ASSY FRONT
35. DISCONNECT FRONT STABILIZER LINK ASSY LH
(a) Using a 6 mm socket hexagon wrench, hold the ball stud.
(b) Remove the nut and disconnect the stabilizer link.
36. DISCONNECT FRONT STABILIZER LINK ASSY RH
HINT:
Use the same procedures described for the LH side.

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37. REMOVE FRONT AXLE HUB LH NUT

(a) Using SST and a hammer, strike the lock nut covering to remove it.
SST 09930−00010

NOTICE:

- **Set the drive shaft's groove so that it faces up. Then use the SST and hammer.**
- **Remove the covering from the lock nut completely or the screw of the drive shaft may be damaged.**
- **Do not sharpen the tip of the SST.**

(b) Using a 30 mm socket wrench, remove the lock nut.

38. REMOVE FRONT AXLE HUB RH NUT

HINT:
Use the same procedures described for the LH side.

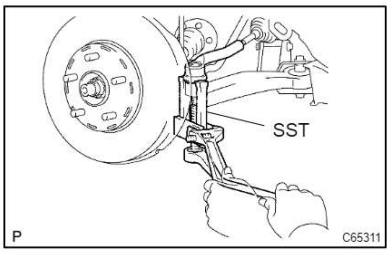
39. DISCONNECT SPEED SENSOR FRONT LH

(a) Remove the bolt and disconnect the speed sensor from the steering knuckle.

NOTICE:
Keep the speed sensor tip and connection free from foreign matter.

40. DISCONNECT SPEED SENSOR FRONT RH

HINT:
Use the same procedures described for the LH side.



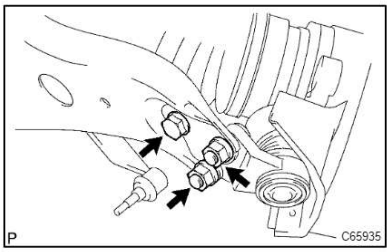
41. DISCONNECT TIE ROD ASSY LH

(a) Remove the cotter pin and nut.
(b) Using SST, disconnect the tie rod end from the steering knuckle.
SST 09628−62011

NOTICE:
Do not damage the dust cover of the ball joint.

42. DISCONNECT TIE ROD ASSY RH

HINT:
Use the same procedures described for the LH side.



43. DISCONNECT FRONT SUSPENSION ARM SUB−ASSY LOWER NO.1 LH

(a) Remove the bolt and 2 nuts, and separate the front suspension arm from the lower ball joint.
(b) Using a plastic hammer, disconnect the drive shaft from the axle hub.

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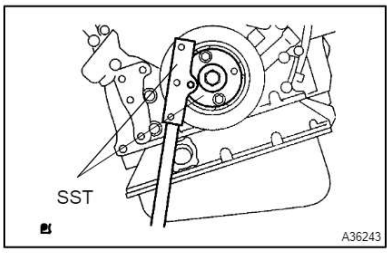
44. DISCONNECT FRONT SUSPENSION ARM SUB−ASSY LOWER NO.1 RH

HINT:

Use the same procedures described for the LH side.

45. REMOVE STARTER ASSY (See page 19−29)

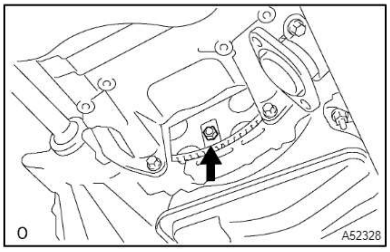
46. REMOVE EXHAUST PIPE SUPPORT BRACKET NO.1



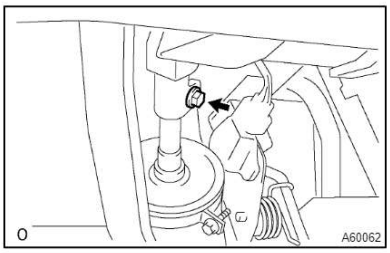
47. REMOVE DRIVE PLATE & TORQUE CONVERTER CLUTCH SETTING BOLT

(a) Using SST, hold the crankshaft.
SST 09213−54015 (91651−60855), 09330−00021

(b) Remove the 2 bolts and flywheel housing under cover.

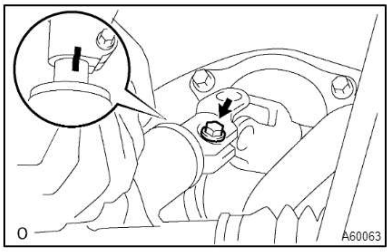


(c) Remove the 6 torque converter setting bolts.



48. DISCONNECT STEERING INTERMEDIATE SHAFT ASSY

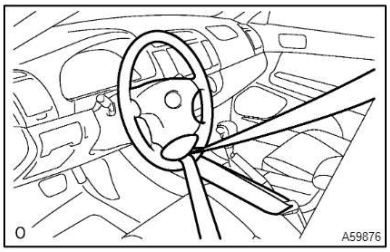
(a) Loosen the sliding yoke bolt.



(b) Place matchmarks on the steering intermediate shaft and control valve shaft.

(c) Remove the bolt and disconnect the steering intermediate shaft.

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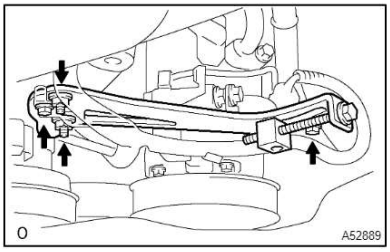
(d) To prevent the steering wheel from rotating, fix the wheel with the seat belt.

NOTICE:

If the steering wheel is not fixed, the spiral cable will be damaged.

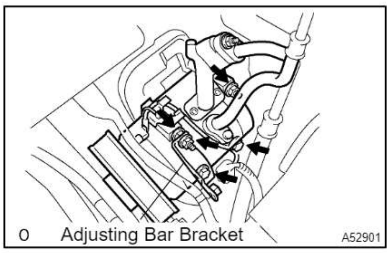
49. REMOVE GENERATOR ASSY (See page 19−42)

50. REMOVE GENERATOR BRACKET NO.2



51. REMOVE GENERATOR BELT ADJUSTING BAR

(a) Remove the 2 bolts, 2 nuts and the adjusting bar.



52. DISCONNECT COMPRESSOR AND MAGNETIC CLUTCH

(a) Remove the bolt, nut and adjusting bar bracket.

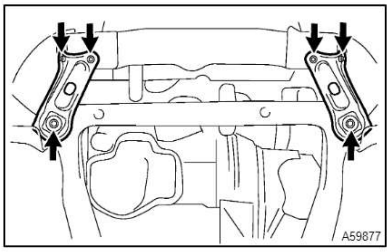
(b) Remove the 3 bolts and disconnect the compressor.

HINT:

Hang up the hoses instead of detaching them.

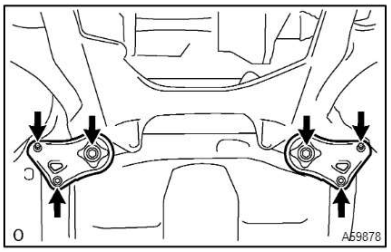
53. REMOVE ENGINE ASSEMBLY WITH TRANSAXLE

(a) Set the engine lifter.

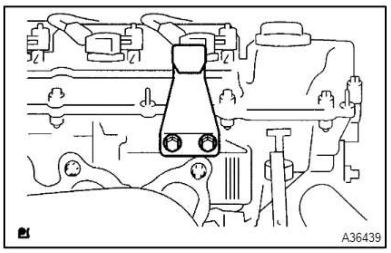


(b) Remove the 4 bolts, 2 nuts, and frame side rail plate sub−assembly RH and LH.

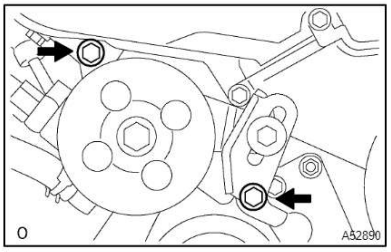
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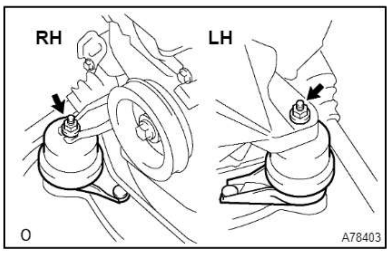
(c) Remove the 4 bolts, 2 nuts, and front suspension member brace rear RH and LH.
(d) Carefully, remove the engine assembly from the vehicle.



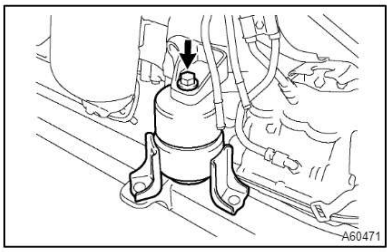
(e) Install the engine hanger as shown in the illustration.
No. 2 engine hanger: Part No. 12282−20020
Bolt: Part No. 91621−60822
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)
(f) Using a chain block and an engine sling device, hang the engine assembly.



54. REMOVE VANE PUMP ASSY
(a) Remove the power steering oil pressure sensor harness.
(b) Remove the pressure feed tube clamp.
(c) Remove the 2 bolts and vane pump.



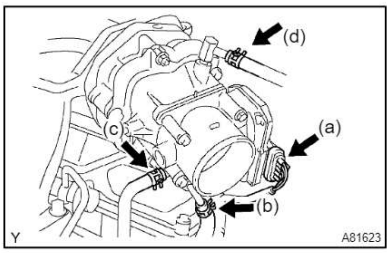
55. REMOVE FRONT FRAME ASSY
(a) Remove the 2 nuts and disconnect the engine mounting insulator RH and LH.



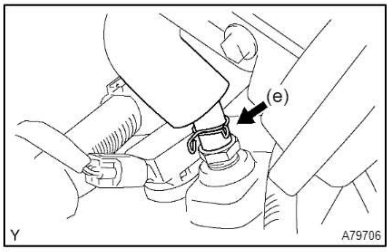
(b) Remove the bolt and disconnect the engine mounting insulator FR.

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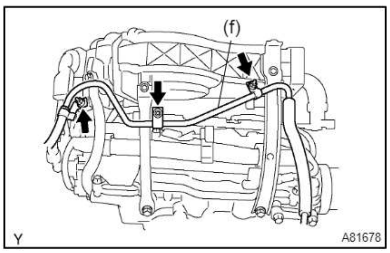
56. REMOVE FRONT DRIVE SHAFT ASSY LH (See page 30−8)
57. REMOVE FRONT DRIVE SHAFT ASSY RH (See page 30−8)
58. REMOVE ENGINE WIRE
59. REMOVE AUTOMATIC TRANSAXLE ASSY (See page 40−9)
60. REMOVE DRIVE PLATE & RING GEAR SUB−ASSY (See page 40−27)
61. INSTALL ENGINE STAND



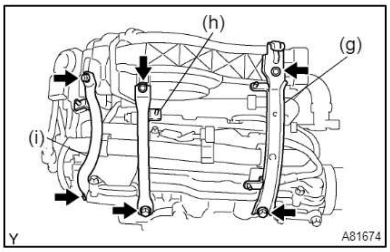
62. REMOVE INTAKE AIR SURGE TANK
(a) Disconnect the throttle motor connector.
(b) Disconnect the water bypass hose No. 3.
(c) Disconnect the water bypass hose No. 2.
(d) Disconnect the union to check valve hose.



(e) Disconnect the ventilation hose.

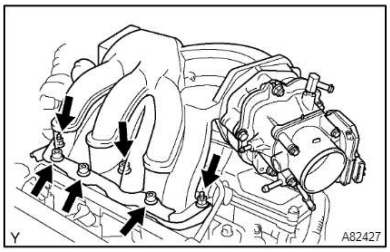


(f) Remove the 3 nuts and separate the pressure feed tube.

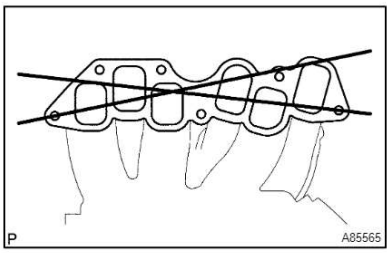


(g) Remove the 2 bolts and engine hunger No. 1.
(h) Remove the 2 bolts and surge tank stay No. 1.
(i) Remove the 2 bolts and surge tank stay No. 2.

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(j) Using a socket hexagon wrench 8, remove the 4 bolts.
(k) Remove the 2 nuts, emission control valve bracket and surge tank.
(l) Remove the gasket from the surge tank.

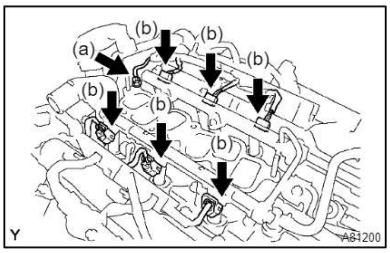


63. INSPECT INTAKE AIR SURGE TANK

(a) Using a precision straight edge and feeler gauge, measure the surface contacting the cylinder head for warpage.
Maximum warpage: 0.10 mm (0.0039 in.)

If the warpage is greater than the maximum, replace the manifold.

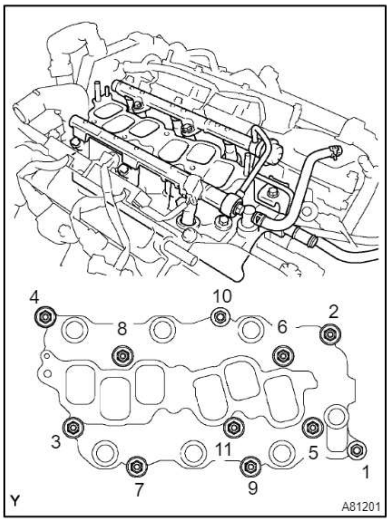
64. REMOVE IGNITION COIL ASSY



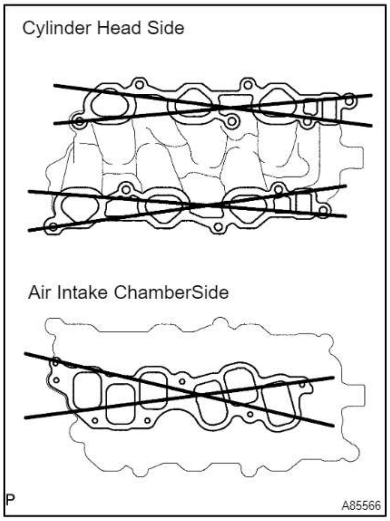
65. REMOVE INTAKE MANIFOLD

(a) Remove the nut and disconnect the ground cable.
(b) Disconnect the 6 fuel injector connectors.

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(c) Uniformly, loosen and remove the 9 bolts and 2 nuts in the sequence shown in the illustration. Remove the intake manifold.



66. INSPECT INTAKE MANIFOLD

(a) Using a precision straight edge and feeler gauge, measure the surface contacting the cylinder head and air intake surge tank for warpage.

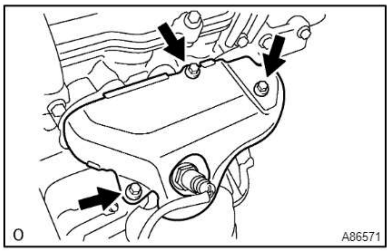
Maximum warpage:

Item	Specified Condition
Intake air surge tank side	0.15 mm (0.0059 in.)
Cylinder head side	0.08 mm (0.0031 in.)

If warpage is greater than the maximum, replace the manifold.

67. REMOVE WATER OUTLET (See page 14−239)

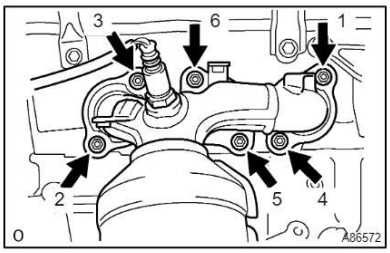
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68. REMOVE EXHAUST MANIFOLD SUB−ASSY RH

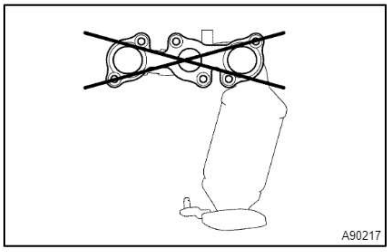
(a) Disconnect the A/F sensor connector.

(b) Remove the 3 bolts and insulator.



(c) Uniformly loosen and remove the 6 nuts in the sequence shown in the illustration.

(d) Remove the manifold and gasket.

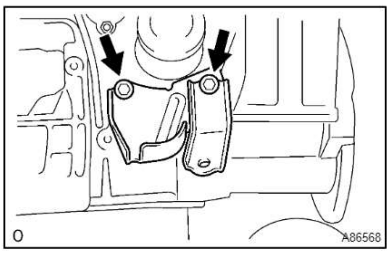


69. INSPECT EXHAUST MANIFOLD SUB−ASSY RH

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

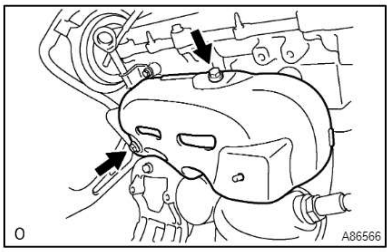
Maximum warpage: 0.50 mm (0.0196 in.)

If the warpage is greater than the maximum, replace the manifold.



70. REMOVE MANIFOLD STAY NO.2

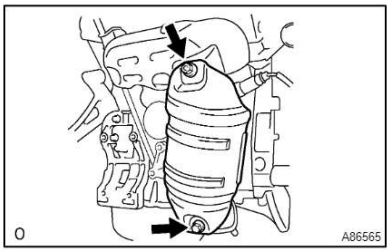
(a) Remove the 2 bolts and manifold stay.



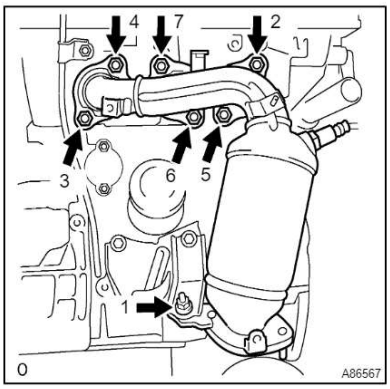
71. REMOVE EXHAUST MANIFOLD HEAT INSULATOR NO.2

(a) Remove the 2 bolts and insulator.

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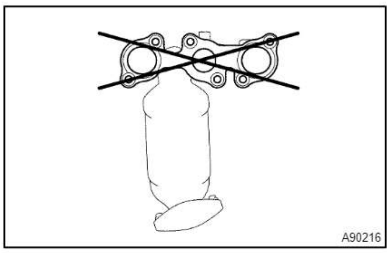
(b) Remove the bolt, nut and insulator.



72. REMOVE EXHAUST MANIFOLD CONVERTER SUB−ASSY NO.2

(a) Uniformly loosen and remove the 7 nuts in the sequence shown in the illustration.

(b) Remove the converter and gasket.



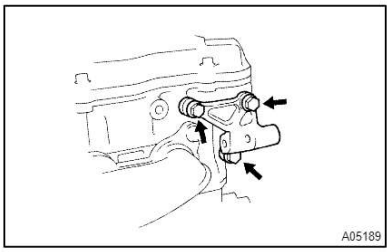
73. INSPECT EXHAUST MANIFOLD CONVERTER SUB−ASSY NO.2

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

Maximum warpage: 0.50 mm (0.0196 in.)

If the warpage is greater than the maximum, replace the manifold.

74. REMOVE DRIVE SHAFT BEARING BRACKET



75. REMOVE PUMP BRACKET

(a) Remove the 3 bolts and pump bracket.

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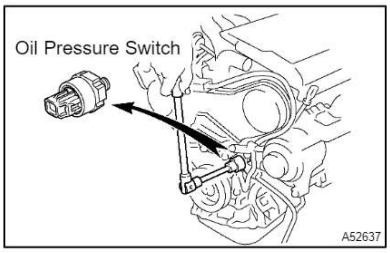
76. REMOVE GENERATOR BRACKET NO.1

77. REMOVE COMPRESSOR MOUNTING BRACKET NO.1

78. REMOVE WATER INLET PIPE

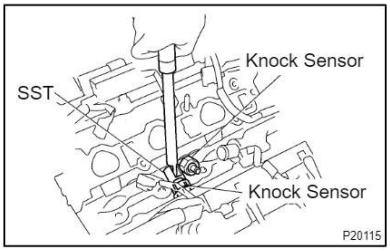
79. REMOVE WATER INLET

80. REMOVE THERMOSTAT



81. REMOVE ENGINE OIL PRESSURE SWITCH ASSY

(a) Remove the oil pressure switch.

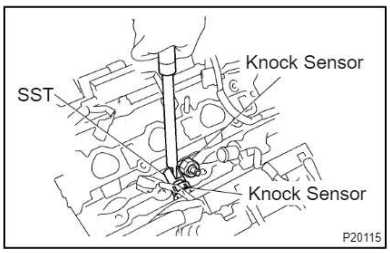


82. REMOVE KNOCK SENSOR

(a) 1MZ−FE:
Using SST, remove the 2 sensors.
SST 09816−30010

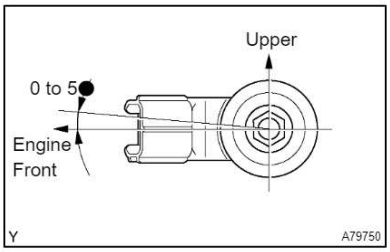
(b) 3MZ−FE:
Remove the 2 nuts and 2 sensors.

83. REPLACE PARTIAL ENGINE ASSY



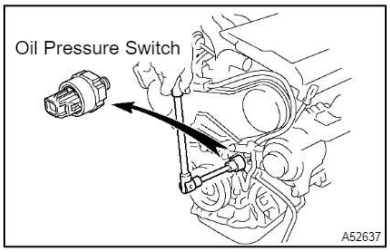
84. INSTALL KNOCK SENSOR

(a) 1MZ−FE:
Using SST, install the 2 knock control sensors.
SST 09816−30010
Torque: 39 N·m (398 kgf·cm, 29 ft·lbf)



(b) 3MZ−FE:
Install the 2 knock sensors with the 2 nuts, as shown in the illustration.
Torque: 20 N·m (199 kgf·cm, 14 ft·lbf)

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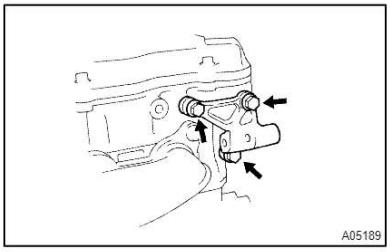


85. INSTALL ENGINE OIL PRESSURE SWITCH ASSY

(a) Clean the threads of the oil pressure switch. Apply adhesive to 2 or 3 threads of the oil pressure switch.
Adhesive:
Part No. 08833−00080 THREE BOND 1344, LOCTITE 242 or equivalent

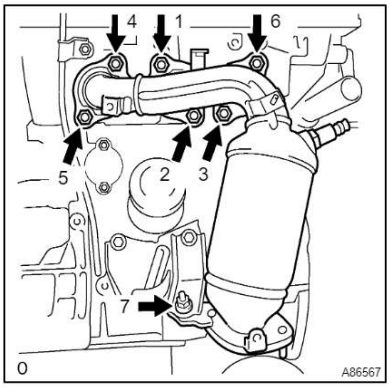
(b) Install the oil pressure switch.
Torque: 15 N·m (152 kgf·cm, 11 ft·lbf)

86. INSTALL THERMOSTAT (See page 16−32)
87. INSTALL WATER INLET (See page 16−32)
88. INSTALL WATER INLET PIPE (See page 16−32)
89. INSTALL COMPRESSOR MOUNTING BRACKET NO.1
Torque: 25 N·m (255 kgf·cm, 18 ft·lbf)
90. INSTALL GENERATOR BRACKET NO.1
Torque: 58 N·m (591 kgf·cm, 43 ft·lbf)



91. INSTALL PUMP BRACKET
Torque: 32 N·m (326 kgf·cm, 24 ft·lbf)

92. INSTALL DRIVE SHAFT BEARING BRACKET
Torque: 64 N·m (653 kgf·cm, 47 ft·lbf)



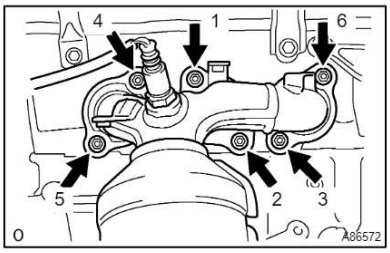
93. INSTALL EXHAUST MANIFOLD CONVERTER SUB−ASSY NO.2

(a) Install a new gasket and the converter sub−assy No. 2 with the 7 nuts. Uniformly, tighten the 7 nuts in the sequence shown in the illustration.
Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)

(b) Retighten nuts 1 and 2 as shown in the illustration.

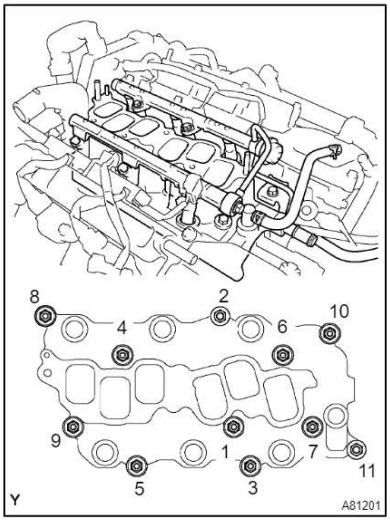
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94. INSTALL EXHAUST MANIFOLD HEAT INSULATOR NO.2
Torque: 8.5 N·m (87 kgf·cm, 55 in.·lbf)
95. INSTALL MANIFOLD STAY NO.2
Torque: 34 N·m (347 kgf·cm, 25 ft·lbf)



96. INSTALL EXHAUST MANIFOLD SUB−ASSY RH
(a) Install a new gasket and the exhaust manifold RH. Uniformly tighten the 5 nuts in the sequence shown in the illustration.
Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)
(b) Retighten nuts 1 and 2 shown in the illustration.

97. INSTALL WATER OUTLET (See page 14−239)



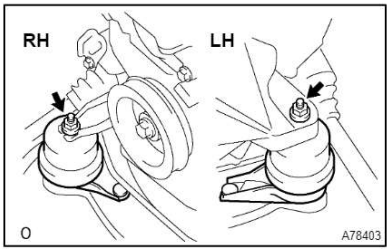
98. INSTALL INTAKE MANIFOLD
(a) Install the intake manifold with the 9 bolts, 2 nuts and 2 washers. Uniformly tighten the bolts and nuts in the sequence shown in the illustration.
Torque: 15 N·m (153 kgf·cm, 11 ft·lbf)
(b) Retighten the water outlet mounting bolts and nuts.
Torque: 15 N·m (153 kgf·cm, 11 ft·lbf)
(c) Install the ground cable with the nut.
Torque: 8.4 N·m (86 kgf·cm, 74 in.·lbf)
(d) Connect the heater inlet water hose.

99. INSTALL IGNITION COIL ASSY
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)
100. INSTALL INTAKE AIR SURGE TANK
(a) Install a new gasket to the intake air surge tank.
(b) Install the intake air surge tank and emission control valve bracket with the 2 nuts.
Torque: 28 N·m (286 kgf·cm, 21 ft·lbf)
(c) Using a socket hexagon wrench 8, tighten the 4 bolts.
Torque: 28 N·m (286 kgf·cm, 21 ft·lbf)
(d) Install the surge tank stay No. 2 with the 2 bolts.
Torque: 20 N·m (199 kgf·cm, 15 ft·lbf)

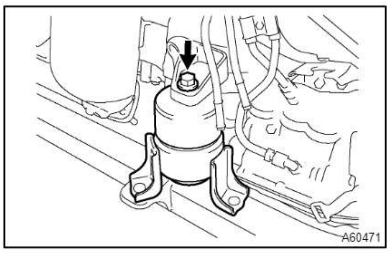
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(e) Install the surge tank stay No. 1 with the 2 bolts.
Torque: 20 N·m (199 kgf·cm, 15 ft·lbf)
(f) Install the engine hunger No. 1 with the 2 bolts.
Torque: 20 N·m (199 kgf·cm, 15 ft·lbf)
(g) Install the pressure feed tube with the 3 nuts.
Torque: 7.8 N·m (80 kgf·cm, 69 in.·lbf)
(h) Connect the ventilation hose.
(i) Connect the union to check valve hose.
(j) Connect the water bypass hose No. 2.
(k) Connect the water bypass hose No. 3.
(l) Connect the throttle motor connector.

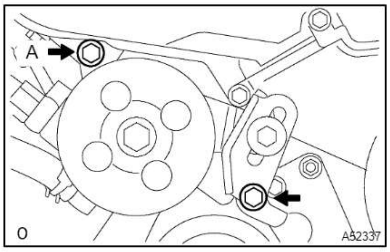
101. INSTALL DRIVE PLATE & RING GEAR SUB−ASSY (See page 40−27)
102. INSTALL AUTOMATIC TRANSAXLE ASSY (See page 40−9)
103. INSTALL FRONT DRIVE SHAFT ASSY RH (See page 30−8)
104. INSTALL FRONT DRIVE SHAFT ASSY LH (See page 30−8)



105. INSTALL FRONT FRAME ASSY
(a) Install the engine mounting insulator RH and LH with the 2 nuts.
Torque: 95 N·m (969 kgf·cm, 70 ft·lbf)

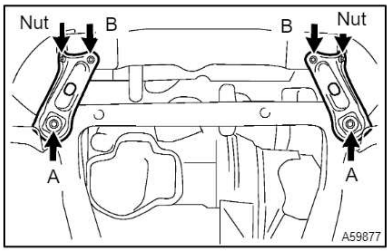


(b) Install the engine mounting insulator FR with the bolt.
Torque: 87 N·m (887 kgf·cm, 64 ft·lbf)



106. INSTALL VANE PUMP ASSY
(a) Install the vane pump with the 2 bolts.
Torque: 43 N·m (439 kgf·cm, 32 ft·lbf)
HINT:
After adjusting the V−ribbed belt, tighten bolt A.

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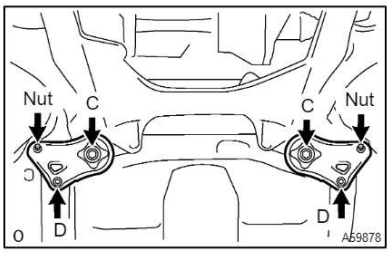
107. INSTALL ENGINE ASSEMBLY WITH TRANSAXLE

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

(b) Install the engine assembly to the vehicle.

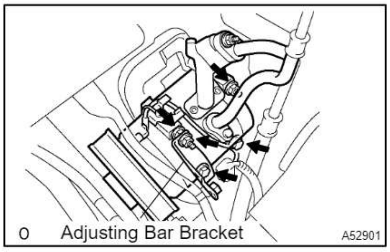
(c) Install the frame side rail plate RH and LH with the 4 bolts and 2 nuts.

Torque:
85 N·m (867 kgf·cm, 63 ft·lbf) for bolt A
32 N·m (326 kgf·cm, 24 ft·lbf) for bolt B and nut



(d) Install the front suspension member brace rear RH and LH with the 4 bolts and 2 nuts.

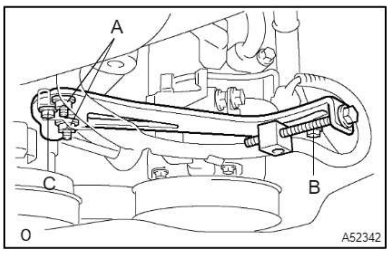
Torque:
85 N·m (867 kgf·cm, 63 ft·lbf) for bolt C
32N·m (326 kgf·cm, 24 ft·lbf) for bolt D and nut



108. INSTALL COMPRESSOR AND MAGNETIC CLUTCH

(a) Install the compressor with the 3 bolts.
Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

(b) Install the adjusting bar bracket with the bolt and nut.
Torque:
25 N·m (250 kgf·cm, 18 ft·lbf) for bolt
26 N·m (260 kgf·cm, 19 ft·lbf) for nut



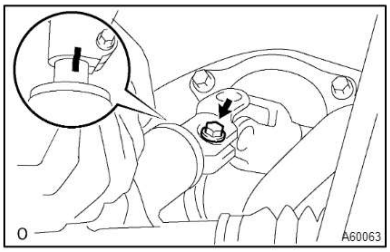
109. INSTALL GENERATOR BELT ADJUSTING BAR

(a) Install the adjusting bar with the 2 bolts and 2 nuts.
Torque:
43 N·m (438 kgf·cm, 32 ft·lbf) for nut A
18 N·m (184 kgf·cm, 13 ft·lbf) for bolt B
8.0 N·m (82 kgf·cm, 71 in.·lbf) for bolt C

110. INSTALL GENERATOR BRACKET NO.2
Torque: 28 N·m (286 kgf·cm, 21 ft·lbf)

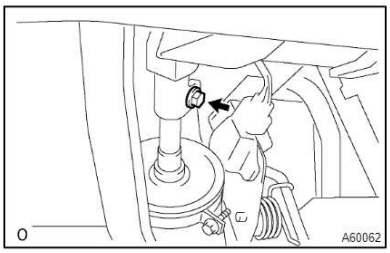
111. INSTALL GENERATOR ASSY (See page 19−42)

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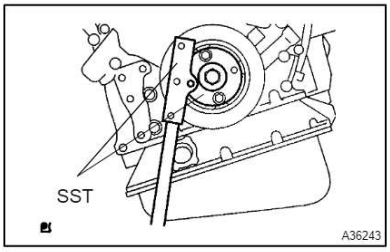


112. INSTALL STEERING INTERMEDIATE SHAFT ASSY

(a) Align the matchmarks on the intermediate shaft and control valve shaft, and install the bolt.
Torque: 35 N·m (357 kgf·cm, 26 ft·lbf)



(b) Tighten the sliding yoke bolt.
Torque: 35 N·m (357 kgf·cm, 26 ft·lbf)

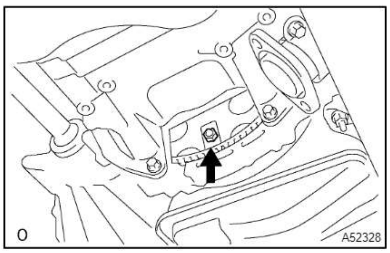


113. INSTALL DRIVE PLATE & TORQUE CONVERTER CLUTCH SETTING BOLT

(a) Using SST, hold the crankshaft.
SST 09213−54015 (91651−60855), 09330−00021

(b) Using kerosene or gasoline, clean the bolts thoroughly.

(c) Apply adhesive to 2 or 3 threads of the bolt end.
Adhesive:
Part No. 08833−00070, THREE BOND 1324 or equivalent



(d) Install the 6 torque converter set bolts.
Torque: 41 N·m (418 kgf·cm, 30 ft·lbf)

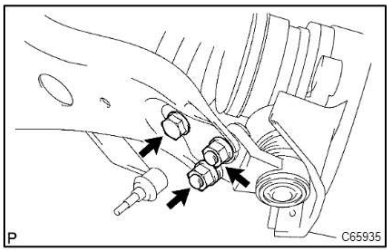
NOTICE:
First tighten the green colored bolt and then tighten the 5 bolts.

(e) Install the flywheel housing under cover with the 2 bolts.
Torque: 7.8 N·m (80 kgf·cm, 69 in.·lbf)

114. INSTALL EXHAUST PIPE SUPPORT BRACKET NO.1
Torque: 21 N·m (214 kgf·cm, 15 ft·lbf)

115. INSTALL STARTER ASSY (See page 19−29)

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116. INSTALL FRONT SUSPENSION ARM SUB−ASSY LOWER NO.1 LH

(a) Install the drive shaft to the steering knuckle.

(b) Install the suspension lower arm with the bolt and 2 nuts.
Torque: 75 N·m (764 kgf·cm, 55 ft·lbf)

117. INSTALL FRONT SUSPENSION ARM SUB−ASSY LOWER NO.1 RH

HINT:

Use the same procedures described for the LH side.

118. INSTALL TIE ROD ASSY LH

(a) Connect the tie rod end to the steering knuckle and install a new castle nut.
Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)

NOTICE:

- **Prevent any lubricant from contacting the thread and the taper portions.**
- **After tightening the castle nut, tighten it to the additional direction within 60● to put into a cotter pin.**

(b) Insert a new cotter pin.

119. INSTALL TIE ROD ASSY RH

HINT:

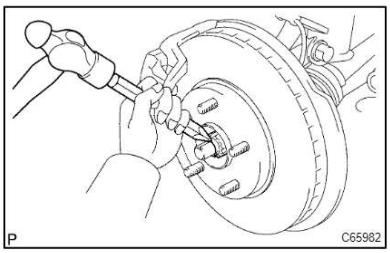
Use the same procedures described for the LH side.

120. INSTALL SPEED SENSOR FRONT LH (See page 32−66)

121. INSTALL SPEED SENSOR FRONT RH

HINT:

Use the same procedures described for the LH side.



122. INSTALL FRONT AXLE HUB LH NUT

(a) Using a 30 mm socket wrench, install a new hub nut.
Torque: 294 N·m (2,998 kgf·cm, 217 ft·lbf)

(b) Using a chisel and hammer, tapped the front axle hub LH nut.

123. INSTALL FRONT AXLE HUB RH NUT

HINT:

Use the same procedures described for the LH side.

124. INSTALL FRONT STABILIZER LINK ASSY LH

(a) Using a 6 mm socket hexagon wrench, hold the ball stud, and install the nut.
Torque: 74 N·m (755 kgf·cm, 55 ft·lbf)

125. INSTALL FRONT STABILIZER LINK ASSY RH

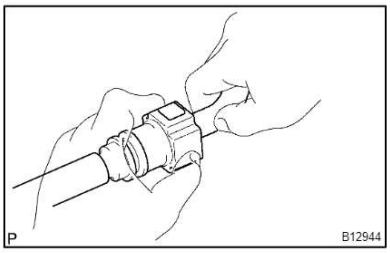
HINT:

Use the same procedures described for the LH side.

126. INSTALL EXHAUST PIPE ASSY FRONT (See page 15−7)

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127. INSTALL EXHAUST PIPE NO.1 SUPPORT BRACKET (See page 15−7)



128. CONNECT FUEL PIPE SUB−ASSY NO.1

(a) Push in the fuel tube connector to the fuel pipe until connector makes a ”click” sound.

NOTICE:

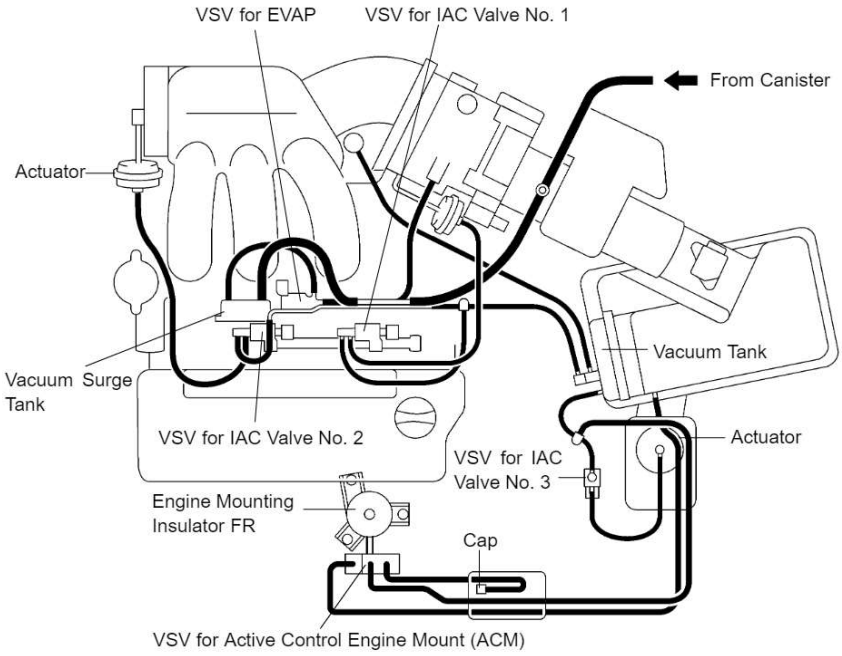
- **Check for damage or contamination on the connected part of the pipe.**
- **After having finished the connection, check if the pipe and the connector are securely connected by trying to pull them apart.**

(b) Install the fuel pipe clamp.

129. INSTALL AIR CLEANER ASSEMBLY WITH HOSE

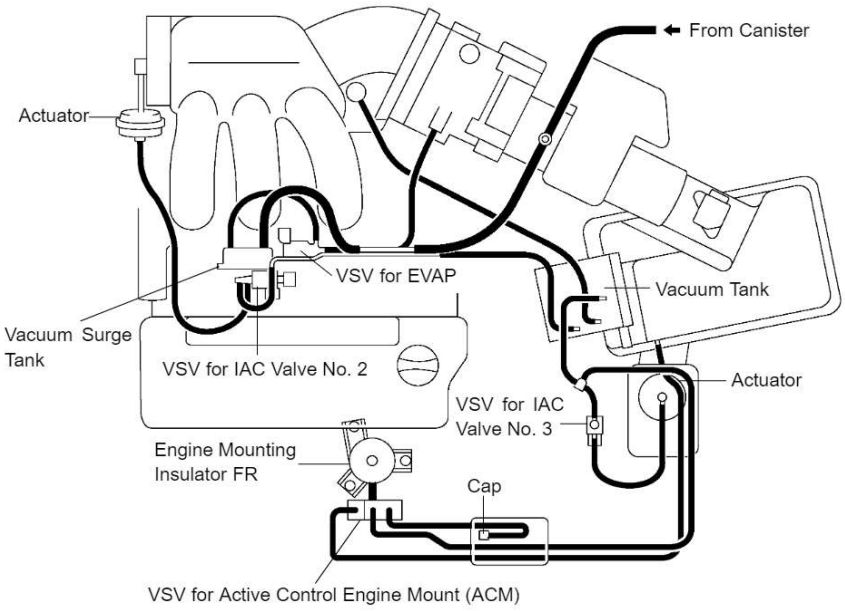
130. CONNECT VACUUM HOSES

Vacuum Hose Routing Diagram (1MZ−FE)



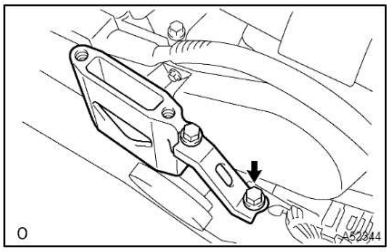
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Vacuum Hose Routing Diagram (3MZ−FE)



131. INSTALL V−BANK COVER SUB−ASSY

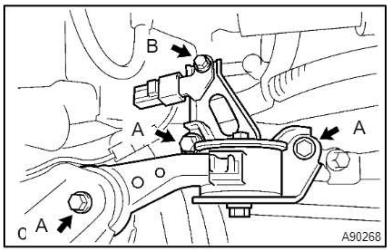
(a) Using a 5 mm socket hexagon wrench, install the V−bank cover with the 2 nuts.
Torque: 7.9 N·m (81 kgf·cm, 70 in.·lbf)



132. INSTALL ENGINE MOUNTING STAY NO.2 RH

(a) Install the mounting stay and mounting bracket with the bolt.
Torque: 64 N·m (653 kgf·cm, 47 ft·lbf)

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133. **INSTALL ENGINE MOVING CONTROL ROD**
(a) Install the control rod and bracket with the 4 bolts.
Torque:
64 N·m (653 kgf·cm, 47 ft·lbf) for bolt A
23 N·m (235 kgf·cm, 17 ft·lbf) for bolt B

134. **INSTALL VANE PUMP V BELT (See page 51−17)**
135. **INSTALL V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (See page 14−140)**
136. **INSPECT DRIVE BELT TENSION (See page 14−136)**
137. **INSTALL FRONT WHEELS**
138. **ADD AUTOMATIC TRANSAXLE FLUID (See page 40−2)**
139. **ADD ENGINE OIL**
140. **ADD ENGINE COOLANT (See page 16−27)**
141. **ADD POWER STEERING FLUID**
142. **BLEED POWER STEERING FLUID (See page 51−3)**
143. **CHECK FOR OIL LEAKS**
144. **CHECK FOR ENGINE COOLANT LEAKS (See page 16−21)**
145. **INSPECT FOR FUEL LEAKS**
146. **CHECK FOR EXHAUST GAS LEAKS**
147. **INSPECT AND ADJUST FRONT WHEEL ALIGNMENT (See page 26−5)**
148. **INSPECT IGNITION TIMING (See page 14−136)**
149. **INSPECT ENGINE IDLE SPEED (See page 14−136)**
150. **INSPECT CO/HC (See page 14−136)**
151. **CHECK ABS SPEED SENSOR SIGNAL (See page 05−990)**

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141IV−03

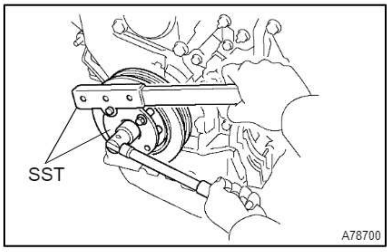
OVERHAUL

1. **REMOVE SPARK PLUG**
2. **REMOVE OIL FILLER CAP SUB−ASSY**
3. **REMOVE OIL FILLER CAP GASKET**
4. **REMOVE CYLINDER HEAD COVER SUB−ASSY LH**
5. **REMOVE CYLINDER HEAD COVER GASKET NO.2**
6. **REMOVE CYLINDER HEAD COVER SUB−ASSY**
7. **REMOVE CYLINDER HEAD COVER GASKET**
8. **REMOVE VENTILATION VALVE SUB−ASSY**
9. **REMOVE CAMSHAFT TIMING OIL CONTROL VALVE ASSY**
10. **REMOVE VVT SENSOR**

(a) Remove the sensor.

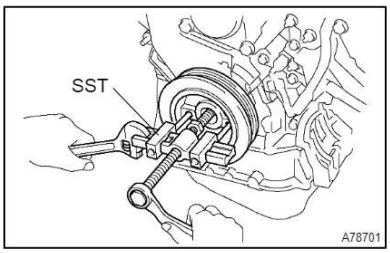
(b) Remove the O−ring from the sensor.

11. **REMOVE OIL LEVEL GAGE SUB−ASSY**
12. **REMOVE OIL LEVEL GAGE GUIDE**



13. **REMOVE CRANKSHAFT PULLEY**

(a) Using SST, loosen the pulley bolt.
SST 09213−54015 (91651−60855), 09330−00021

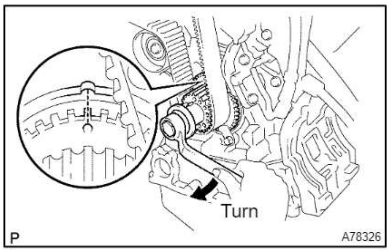


(b) Using SST and the pulley bolt, remove the pulley.
SST 09950−50013 (09951−05010, 09952−05010, 09953−05020, 09954−05031)

NOTICE:
Before using SST, apply lubricating oil on the threads and tip of the center bolt 150.

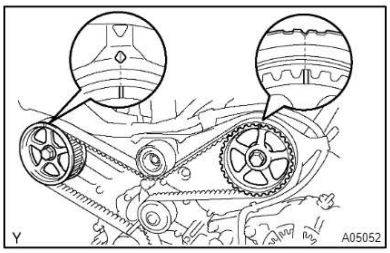
14. **REMOVE TIMING BELT NO.1 COVER**
15. **REMOVE TIMING BELT NO.2 COVER**
16. **REMOVE ENGINE MOUNTING BRACKET RH**
17. **REMOVE TIMING BELT GUIDE NO.2**

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18. REMOVE TIMING BELT

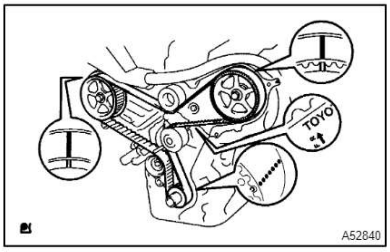
(a) Set the No. 1 cylinder to TDC/compression.
  (1) Temporarily install the crankshaft pulley bolt and washer to the crankshaft.
  (2) Turn the crankshaft clockwise, and align the timing mark of the crankshaft timing pulley with the oil pump body.



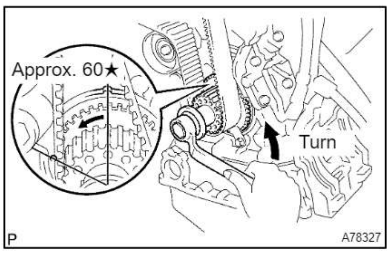
  (3) Check that timing marks of the camshaft timing pulleys and No. 3 timing belt cover are aligned.

If not, turn the crankshaft 1 revolution (360★).

  (4) Remove the crankshaft pulley bolt.



(b) If reusing the timing belt, check that there are 4 installation marks on the timing belt as shown in the illustration.
  (1) If the installation marks have disappeared, put new installation marks on the timing belt before removing.



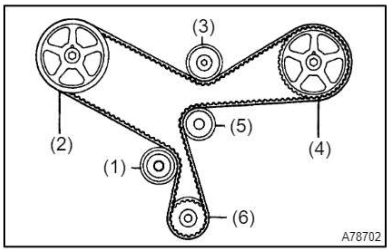
(c) Set the No. 1 cylinder to approximately 60★BTDC/ compression.
  (1) Turn the crankshaft counterclockwise by approximately 60★

NOTICE:
With timing belt removed:
The crankshaft pulley must be at the correct angle to avoid damage in later steps. If the crankshaft pulley is at the wrong angle and the camshaft timing pulley and the camshaft are removed, the piston head and valve head may come in contact and damaged.

(d) Remove the timing belt tensioner.

NOTICE:
Do not reinstall the tensioner with its plunger extended.

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(e) Remove the timing belt in this order.

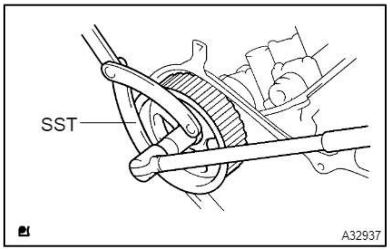
1st	No. 1 idler pulley
2nd	RH camshaft timing pulley
3rd	No. 2 idler pulley
4th	LH camshaft timing pulley
5th	Water pump pulley
6th	Crankshaft timing pulley

19. REMOVE TIMING BELT IDLER SUB−ASSY NO.1

(a) Using a socket hexagon wrench 10, remove the pivot bolt, timing belt idler No. 1 and plate washer.

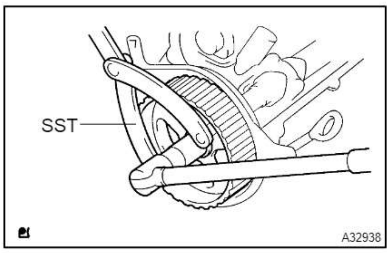
20. REMOVE TIMING BELT IDLER SUB−ASSY NO.2

21. REMOVE CRANKSHAFT POSITION SENSOR



22. REMOVE CAMSHAFT TIMING PULLEY

(a) Using SST, remove the bolt and RH timing pulley.
SST 09960−10010 (09962−01000, 09963−01000)

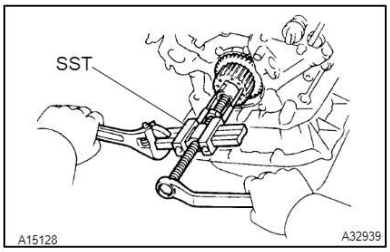


(b) Using SST, remove the bolt and LH timing pulley.
SST 09960−10010 (09962−01000, 09963−01000)

HINT:
Arrange the camshaft timing pulleys (RH and LH sides) so that they can be returned to the original locations when reassembling.

23. REMOVE TIMING BELT NO.3 COVER

24. REMOVE TIMING BELT IDLER BRACKET



25. REMOVE CRANKSHAFT TIMING PULLEY

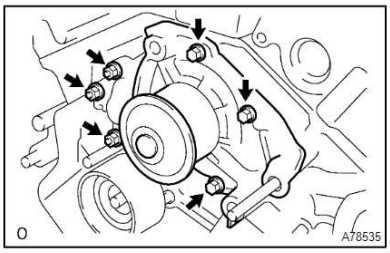
(a) Remove the bolt and the timing belt plate.
(b) Install the pulley bolt to the crankshaft.
(c) Using SST, remove the crankshaft timing pulley.
SST 09950−50013 (09951−05010, 09952−05010, 09953−05020, 09954−05011)

NOTICE:

- **Do not scratch the sensor part of the crankshaft timing pulley.**

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- **Before using SST, apply lubricating oil on the threads and tip of the center bolt 150.**



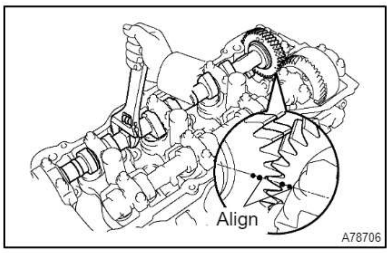
26. REMOVE WATER PUMP ASSY

(a) Remove the 3 bolts and 3 nuts, then remove the water pump and the gasket.

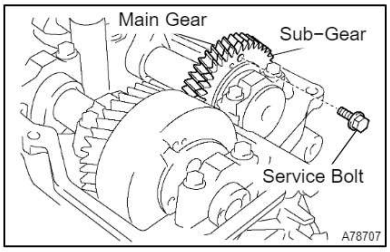
27. REMOVE CAMSHAFT

NOTICE:

Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being removed. If the camshaft is not kept level, damage to the cylinder head or to the camshaft may result. To avoid this, the following steps should be carried out.



(a) Align the camshaft drive and driven gear's timing marks (2 dot marks each) by turning the camshaft with a wrench.



(b) Secure the exhaust camshaft sub−gear to the main gear with a service bolt.
Recommended service bolt:

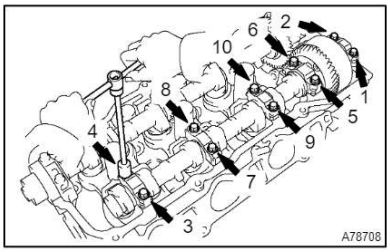
Item	Specified Condition
Thread diameter	6 mm
Thread pitch	1 mm
Bolt length	16 to 20 mm

Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

HINT:

When removing the camshaft, make certain that the torsional spring force of the sub gear has been eliminated by installation of the service bolt.

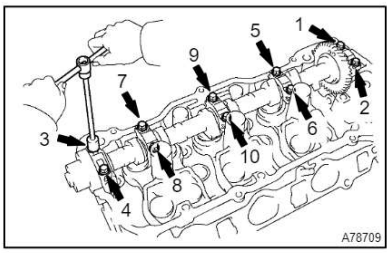
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(c) Uniformly loosen and remove the 10 bearing cap bolts in the sequence shown in the illustration. Remove the 5 bearing caps and the camshaft.

NOTICE:

- **Do not pry out the camshaft.**
- **Be careful not to damage the portion of the cylinder head receiving the shaft thrust.**



28. REMOVE NO.2 CAMSHAFT

(a) Uniformly loosen and remove the 10 bearing cap bolts in the sequence shown in the illustration. Remove the 5 bearing caps and the No. 2 camshaft.

NOTICE:

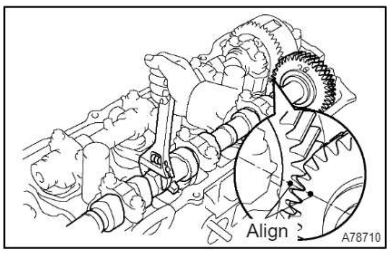
- **Do not pry out the camshaft.**
- **Be careful not to damage the portion of the cylinder head receiving the shaft thrust.**

(b) Remove the oil seal from the No. 2 camshaft.

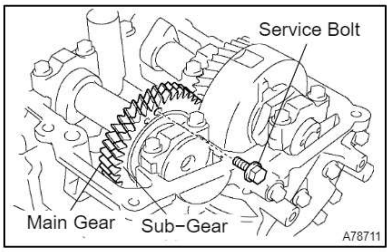
29. REMOVE NO.3 CAMSHAFT SUB−ASSY

NOTICE:

Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being removed. If the camshaft is not kept level, damage to the cylinder head or to the camshaft may result. To avoid this, the following steps should be carried out.



(a) Align the camshaft drive and driven gear's timing marks (1 dot mark each) by turning the camshaft with a wrench.



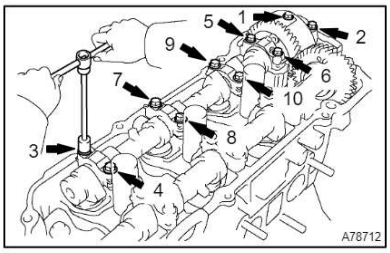
(b) Secure the exhaust camshaft sub−gear to the main gear with a service bolt.
Recommended service bolt:

Thread diameter	6 mm
Thread pitch	1 mm
Bolt length	16 to 20 mm

Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

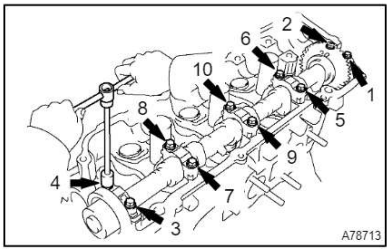
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HINT:
When removing the camshaft, make certain that the torsional spring force of the sub gear has been eliminated by installation of the service bolt.



(c) Uniformly loosen and remove the 10 bearing cap bolts in the sequence shown in the illustration. Remove the 5 bearing caps and the No. 3 camshaft.

NOTICE:
- **Do not pry out the camshaft.**
- **Be careful not to damage the portion of the cylinder head receiving the shaft thrust.**

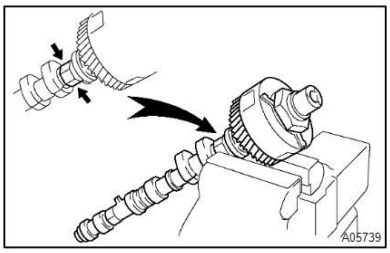


30. REMOVE NO.4 CAMSHAFT SUB−ASSY

(a) Uniformly loosen and remove the 10 bearing cap bolts in the sequence shown in the illustration. Remove the 5 bearing caps and the No. 4 camshaft.

NOTICE:
- **Do not pry out the camshaft.**
- **Be careful not to damage the portion of the cylinder head receiving the shaft thrust.**

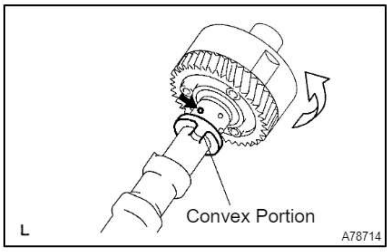
(b) Remove the oil seal from the No. 4 camshaft.



31. INSPECT CAMSHAFT TIMING GEAR ASSY

(a) Clamp the camshaft in a vise on the hexagonal lobe.

(b) Check that the VVT−i does not turn.



(c) Cover all the oil ports with vinyl tape except the port on the advanced angle side (nearest to the convex portion) shown in the illustration.

(d) Using an air gun, apply about 100 kPa (1 kgf/cm^2, 14 psi) of air pressure to the port on the advanced angle side.

NOTICE:
Some oil spraying will occur. Contain the spray with a shop rag.

HINT:
This operation releases the lock pin for the extreme retarded angle lock.

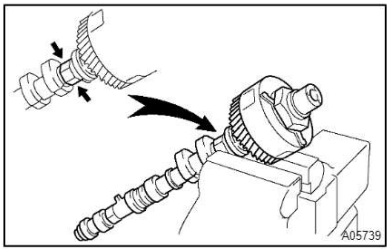
(e) Under the condition above, check that the VVT−i can be turned by hand to the advanced angle side, the direction of the white arrow in the illustration.
Standard: Must turn

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HINT:
The VVT−i will turn to the advanced angle side without applying force by hand depending on the force of the air pressure applied. Also, if applying pressure to the oil path is difficult as a result of air leakage from the port, the lock−pin may be difficult to release.

(f) Check that the VVT−i moves freely within a 30★range. Avoid moving the VVT−i unit to the extreme retarded angle position as the lock−pin will re−engage.
Standard: Smooth movable range is about 30★

(g) Turn VVT−i by hand and lock it at the extreme retarded angle position.



32. REMOVE CAMSHAFT TIMING GEAR ASSY

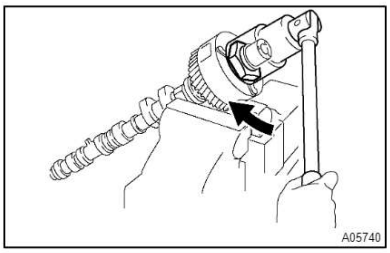
NOTICE:

Do not remove or install the timing gear (VVT−i) unless you are replacing the VVT−i or the camshaft.

(a) Clamp the camshaft in a vise on the hexagonal lobe.

NOTICE:

Do not damage the camshaft.



(b) Using a 46 mm socket wrench, remove the lock nut by turning it clockwise.

NOTICE:

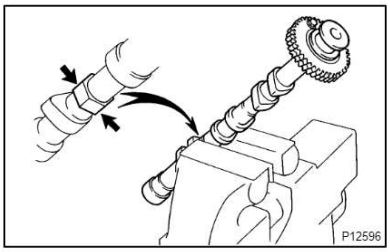
- **Remove it with the lock−pin engaged and locked at the extreme retarded angle position.**
- **The lock nut has LH threads.**
- **Only use the socket wrench. Other tools will deform the cam angle rotor.**

(c) Remove the timing gear (VVT−i).

NOTICE:

Never remove the 3 bolts on the gear.

If it is difficult to remove the VVT−i, tap it lightly using a plastic−faced hammer and then remove it.



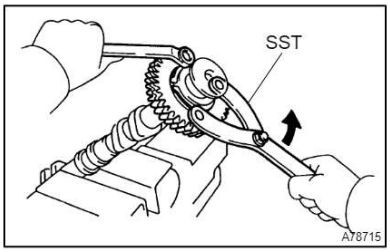
33. REMOVE CAMSHAFT SUB GEAR

(a) Clamp the camshaft in a vise on the hexagonal lobe.

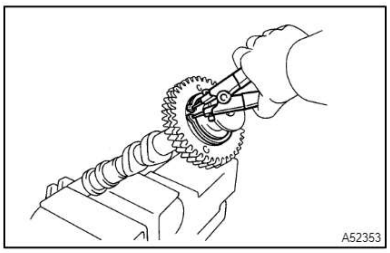
NOTICE:

Be careful not to damage the camshaft.

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(b) Using SST, turn the sub gear counterclockwise, and remove the service bolt.
SST 09960−10010 (09962−01000, 09963−00500)

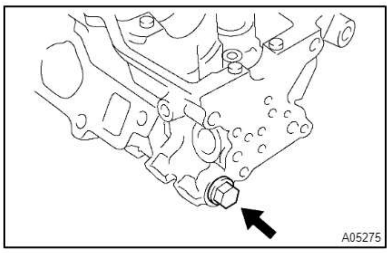


(c) Using snap ring pliers, remove the snap ring.
(d) Remove the wave washer, camshaft sub gear and camshaft gear bolt washer.

HINT:
Arrange the camshaft sub gears and gear bolt washers (RH and LH sides) so that they can be returned to the original location when reassembling.

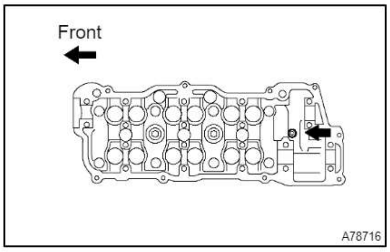
34. REMOVE ENGINE HANGER NO.2

35. REMOVE CYLINDER HEAD COVER REAR



36. REMOVE OIL CONTROL VALVE FILTER

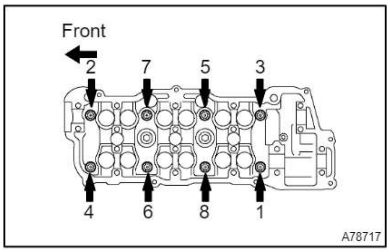
(a) Remove the plug, gasket and valve filter.



37. REMOVE CYLINDER HEAD SUB−ASSY

(a) Using a socket hexagon wrench 8, remove the hexagon bolt.

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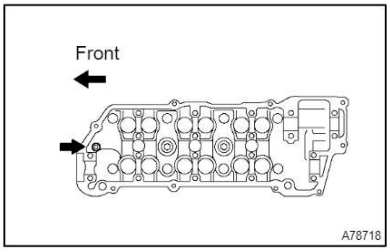


(b) Uniformly loosen the 8 cylinder head bolts in the sequence shown in the illustration. Remove the 8 cylinder head bolts and plate washers.

NOTICE:

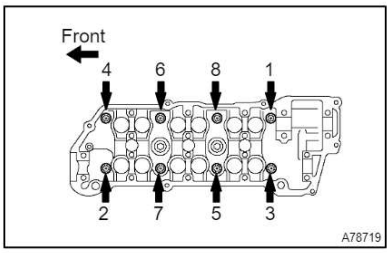
- **Be careful not to drop washers into the cylinder head.**
- **Head warpage or cracking could result from removing bolts in an incorrect order.**

38. REMOVE CYLINDER HEAD GASKET



39. REMOVE CYLINDER HEAD LH

(a) Using a socket hexagon wrench 8, remove the hexagon bolt.

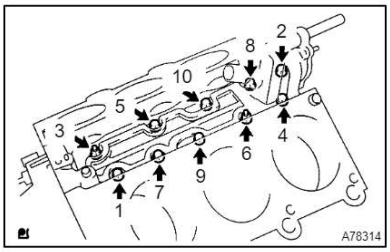


(b) Uniformly loosen the 8 cylinder head bolts in the sequence shown in the illustration. Remove the 8 cylinder head bolts and plate washers.

NOTICE:

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

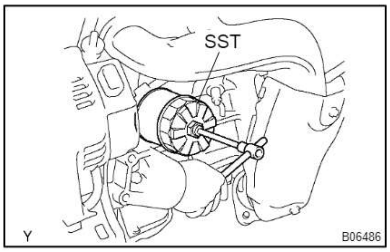
40. REMOVE CYLINDER HEAD GASKET NO.2



41. REMOVE WATER INLET HOUSING

(a) Uniformly loosen and remove the 8 bolts and 2 nuts in the sequence shown in the illustration. Remove the water inlet housing.

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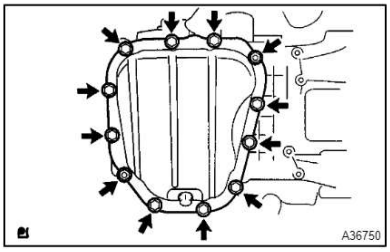


42. REMOVE OIL FILTER SUB−ASSY

(a) Using SST, remove the oil filter.
SST 09228−07501

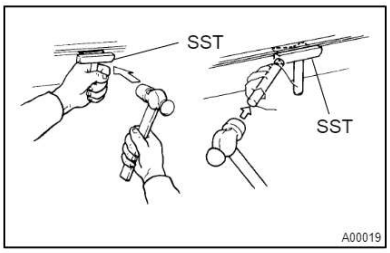
(b) Using a socket hexagon wrench 12, remove the oil filter union.

43. REMOVE OIL PAN DRAIN PLUG



44. REMOVE OIL PAN SUB−ASSY NO.2

(a) Remove the 10 bolts and 2 nuts.



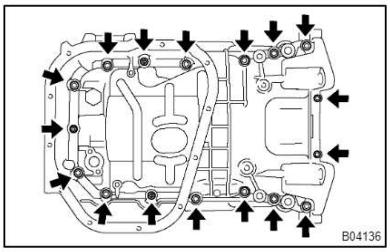
(b) Insert the blade of SST between oil pan No. 1 and oil pan No. 2, cut off the sealer and remove the oil pan No. 2.
SST 09032−00100

NOTICE:

- **Do not damage the contact surface of oil pan No. 1 and oil pan No. 2.**
- **Do not damage the flange portion of oil pan No. 2 during removal.**

45. REMOVE OIL STRAINER SUB−ASSY

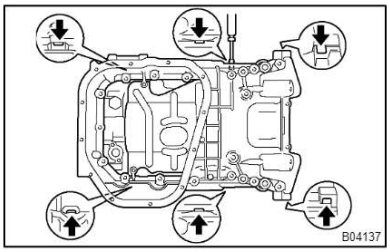
(a) Remove the bolt and 2 nuts, then remove the oil strainer and the gasket.



46. REMOVE OIL PAN SUB−ASSY

(a) Uniformly loosen and remove the 15 bolts and 2 nuts in the sequence shown in the illustration.

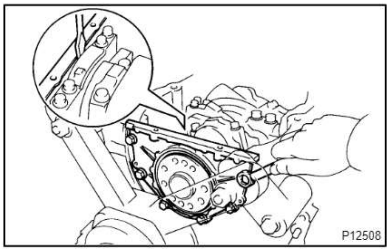
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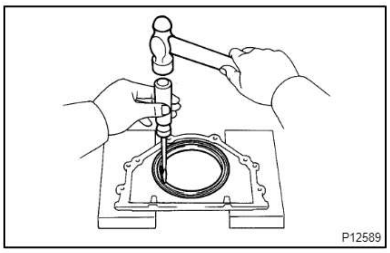
(b) Using a screwdriver, remove the oil pan by prying between the cylinder block and the oil pan.

NOTICE:
Be careful not to damage the contact surfaces of the oil pan and cylinder block.

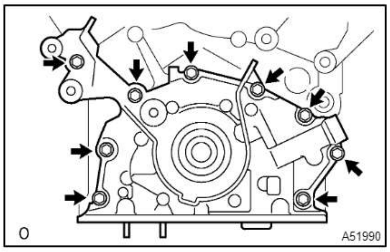
47. REMOVE OIL PAN BAFFLE PLATE



48. REMOVE ENGINE REAR OIL SEAL RETAINER
(a) Uniformly loosen and remove the 6 bolts.
(b) Using a screwdriver, remove the oil seal retainer by prying between the oil seal retainer and the main bearing cap.

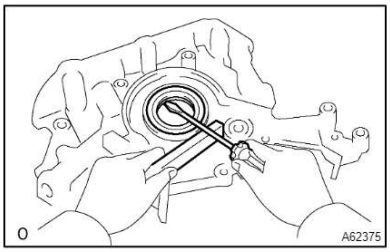


49. REMOVE ENGINE REAR OIL SEAL
(a) Using a screwdriver and a hammer, tap out the oil seal.



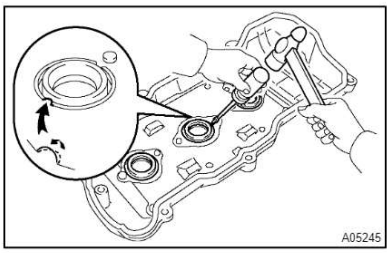
50. REMOVE OIL PUMP ASSY
(a) Remove the 9 bolts.
(b) Using a screwdriver, remove the oil pump by prying between the oil pump and the main bearing cap.
(c) Remove the O−ring.

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51. REMOVE OIL PUMP SEAL

(a) Using a screwdriver, pry out the oil seal.



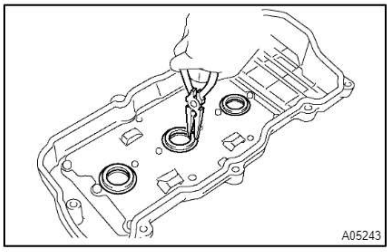
52. REMOVE SPARK PLUG TUBE GASKET

(a) Bend up the tab on the ventilation baffle plate which prevents the gasket from slipping out.

NOTICE:

Be careful not to damage the baffle plate of the cylinder head cover.

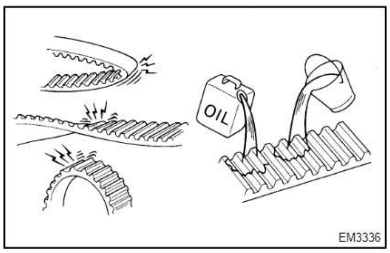
(b) Using a screwdriver and a hammer, tap out the gasket.



(c) Using needle−nose pliers, pry out the gasket.

NOTICE:

Be careful not to damage the cylinder head cover.



53. INSPECT TIMING BELT

NOTICE:

- **Do not bend, twist or turn the timing belt inside out.**
- **Do not allow the timing belt to come into contact with oil, water or steam.**
- **Do not utilize timing belt tension when installing or removing the mounting bolt of the camshaft timing pulley.**

Check the belt for any defects, as shown in the illustrations. Also, check these points below.

(a) If there is premature parting:
- Check for proper installation.
- Check the timing cover gasket for damage and proper installation.

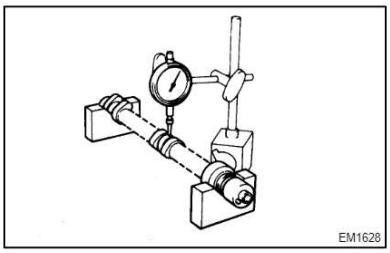
(b) If the belt teeth are cracked or damaged, check to see if either camshaft is locked.

(c) If there is noticeable wear or cracks on the belt face, check to see if there are nicks on the side of the idler pulley lock and water pump.

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(d) If there is wear or damage on only one side of the belt, check the belt guide and the alignment of each pulley.
(e) If there is noticeable wear on the belt teeth:
- Check the timing cover for damage.
- Check that the gasket has been installed correctly.
- Check for foreign object on the pulley teeth.

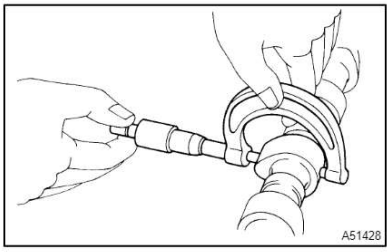
If there is any doubt about the belt condition, replace the timing belt.


EM1628

54. INSPECT CAMSHAFT

(a) Inspect the camshaft for runout.
(1) Place the camshaft on V−blocks.
(2) Using a dial indicator, measure the runout at the center journal.
Maximum circle runout: 0.06 mm (0.0024 in.)

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


A51428

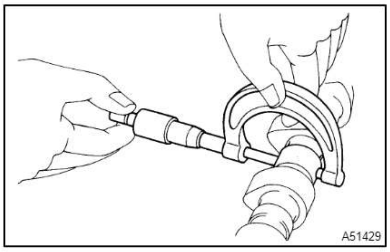
(b) Inspect the cam lobes.
(1) Using a micrometer, measure the cam lobe height.
Specified cam lobe height:
1MZ−FE

Item	Specified Condition
Intake	42.780 to 43.032 mm (1.6842 to 1.6942 in.)
Exhaust	42.610 to 42.864 mm (1.6776 to 1.6876 in.)

3MZ−FE

Item	Specified Condition
Intake	42.980 to 43.232 mm (1.6921 to 1.7020 in.)
Exhaust	42.860 to 43.110 mm (1.6874 to 1.6972 in.)

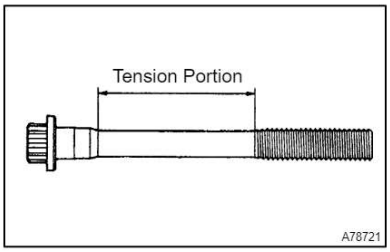
If the cam lobe height is less than the minimum, replace the camshaft.


A51429

(c) Inspect the camshaft journals.
(1) Using a micrometer, measure the journal diameter.
Journal diameter:
26.959 to 26.975 mm (1.0614 to 1.0620 in.)

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

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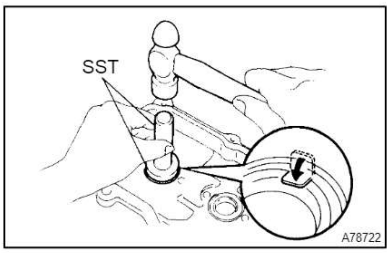


55. INSPECT CYLINDER HEAD SET BOLT

(a) Using a vernier caliper, measure the tension portion diameter of the bolt.

Specified outside diameter:
8.75 to 9.05 mm (0.3445 to 0.3563 in.)

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



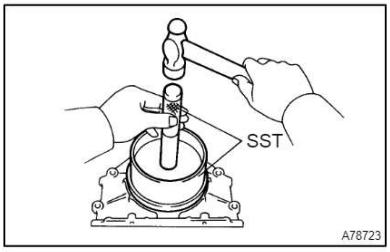
56. INSTALL SPARK PLUG TUBE GASKET

(a) Using SST and a hammer, tap in a new gasket until its surface is flush with the upper edge of the cylinder head cover.

SST 09950−60010 (09951−00430), 09950−70010 (09951−07100)

(b) Return the ventilation plate tab to its original position.

(c) Apply a light coat of MP grease to the gasket lip.



57. INSTALL ENGINE REAR OIL SEAL

(a) Using SST and a hammer, tap in a new oil seal until its surface is flush with the rear oil seal retainer edge.

SST 09223−15030, 09950−70010 (09951−07100)

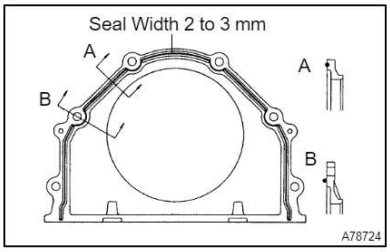
NOTICE:

- **Be careful not to tap the oil seal at an angle.**
- **Keep the gap between the rear oil seal retainer edge and the oil seal free of foreign matter.**

(b) Apply MP grease to the oil seal lip.

58. INSTALL ENGINE REAR OIL SEAL RETAINER

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



(b) Apply a continuous bead of seal packing (diameter 2 to 3 mm (0.08 to 0.12 in.)) as shown in the illustration.

Seal packing: Part No. 08826−00080 or equivalent

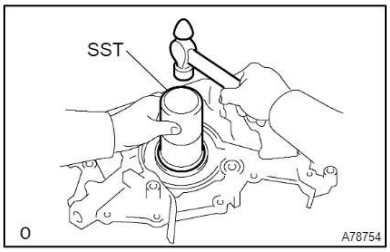
NOTICE:

- **Remove any oil from the contact surface.**
- **Install the oil seal retainer within 3 minutes after applying seal packing.**
- **Do not expose the seal to engine oil for at least 2 hours after installing.**

(c) Install the oil seal retainer. Tighten the 6 bolts uniformly.

Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

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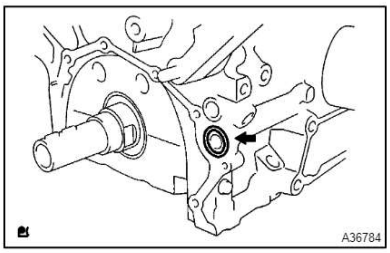
59. INSTALL OIL PUMP SEAL

(a) Using SST and a hammer, tap in a new oil seal until its surface is flush with the oil pump body edge.
SST 09223−00010

NOTICE:

- **Be careful not to tap the oil seal at an angle.**
- **Keep the gap between the oil pump body edge and the oil seal free of foreign matter.**

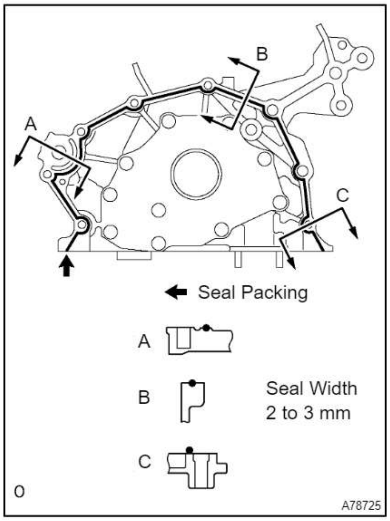
(b) Apply MP grease to the oil seal lip.



60. INSTALL OIL PUMP ASSY

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

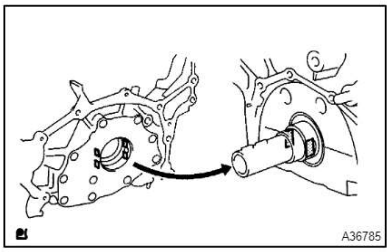
(b) Apply a light coat of engine oil to a new O−ring and place it on the cylinder block.



(c) Apply a continuous bead of seal packing (diameter 2 to 3 mm (0.08 to 0.12 in.)) as shown in the illustration.
Seal packing: Part No. 08826−00080 or equivalent

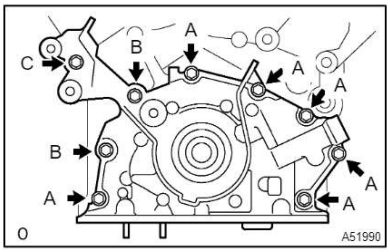
NOTICE:

- **Remove any oil from the contact surface.**
- **Apply seal packing to the inner side of the bolt holes.**
- **Install the oil pump within 3 minutes after applying seal packing.**
- **Do not expose the seal to engine oil for at least 2 hours after installing the oil pump.**



(d) Align the key of the oil pump drive gear with the keyway located on the crankshaft, and slide the oil pump into place.

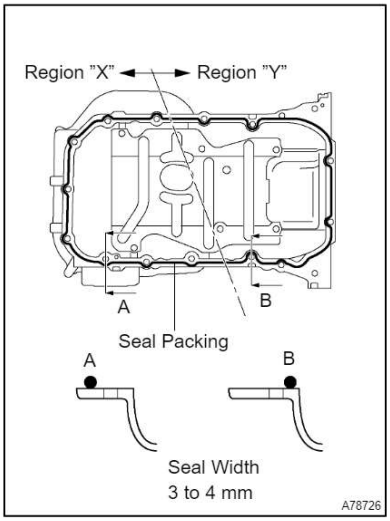
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(e) Install the oil pump with the 9 bolts. Tighten the bolts uniformly in several steps.
Torque:
8.0 N·m (82 kgf·cm, 71 in.·lbf) for bolt A
20 N·m (204 kgf·cm, 15 ft·lbf) for bolt B
43 N·m (439 kgf·cm, 32 ft·lbf) for bolt C

61. INSTALL CRANKSHAFT POSITION SENSOR
Torque: 8.0 N·m (80 kgf·cm, 71 in.·lbf)

62. INSTALL OIL PAN BAFFLE PLATE
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)



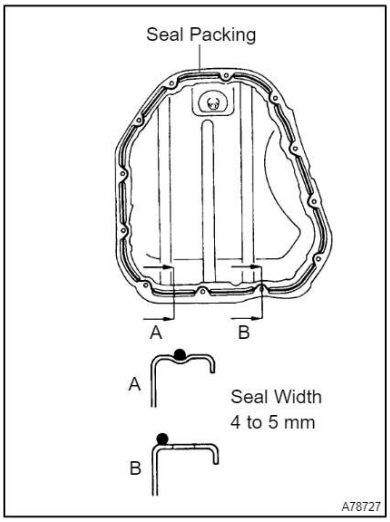
63. INSTALL OIL PAN SUB−ASSY
(a) Remove any old seal packing from the contact surface.
(b) Apply a continuous bead of seal packing (diameter 3 to 4 mm (0.12 to 0.16 in.)) as shown in the illustration.
Seal packing: Part No. 08826−00080 or equivalent

NOTICE:
- **Remove any oil from the contact surface.**
- **Apply seal packing to the outer side of the bolt holes in region "X".**
- **Apply seal packing to the inner side of the bolt holes in region "Y".**
- **Install the oil pan within 3 minutes after applying seal packing.**
- **Do not expose the seal to engine oil for at least 2 hours after installing.**

(c) Install the oil pan No. 1 with the 15 bolts and 2 nuts. Tighten the bolts uniformly in several steps.
Torque:
8.0 N·m (82 kgf·cm, 71 in.·lbf) for 10 mm head
20 N·m (199 kgf·cm, 14 ft·lbf) for 12 mm head

64. INSTALL OIL STRAINER SUB−ASSY
(a) Install a new gasket and the oil strainer with the bolt and 2 nuts.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

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65. INSTALL OIL PAN SUB−ASSY NO.2

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

(b) Apply a continuous bead of seal packing (diameter 4 to 5 mm (0.16 to 0.20 in.)) as shown in the illustration.
Seal packing: Part No. 08826−00080 or equivalent

NOTICE:

- **Remove any oil from the contact surface.**
- **Apply seal packing to the inner side of the bolt holes.**
- **Install the oil pan within 3 minutes after applying seal packing.**
- **Do not expose the seal to engine oil for at least 2 hours after installing.**

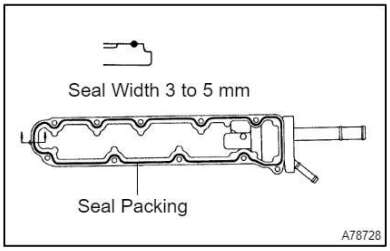
(c) Install the oil pan No. 2 with the 10 bolts and 2 nuts.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

66. INSTALL OIL PAN DRAIN PLUG

(a) Install the drain plug with a new gasket.
Torque: 45 N·m (459 kgf·cm, 33 ft·lbf)

67. INSTALL WATER INLET HOUSING

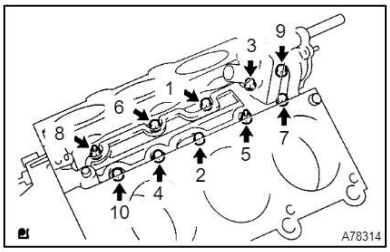
(a) Remove any old packing material from the contact surface.



(b) Apply a continuous bead of seal packing (diameter 3 to 5 mm (0.12 to 0.20 in.)) as shown in the illustration.
Seal packing: Part No. 08826−00100 or equivalent

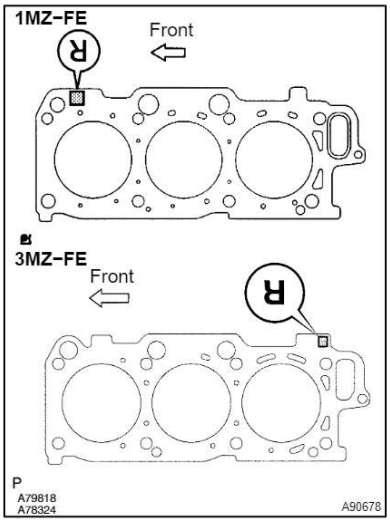
NOTICE:

- **Remove any oil from the contact surface.**
- **Install the water inlet housing within 3 minutes after applying seal packing.**
- **Do not expose the seal to coolant for at least 2 hours after installing.**



(c) Install the water inlet housing with the 8 bolts and 2 nuts. Uniformly tighten the bolts and nuts in the sequence shown in the illustration.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

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68. INSTALL CYLINDER HEAD GASKET

(a) Place a new cylinder head gasket on the cylinder block with the R mark upside down, as shown in the illustration.

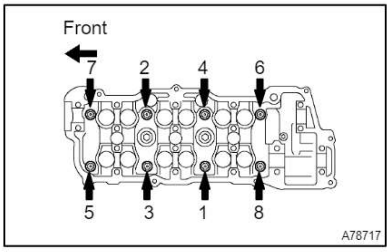
NOTICE:

- **Remove any oil from the contact surface.**
- **Make sure the cylinder head gasket is facing in the correct direction.**
- **Place the cylinder head on the gasket carefully in order not to damage the gasket at the bottom part of the head.**

69. INSTALL CYLINDER HEAD SUB−ASSY

NOTICE:

The cylinder head bolts are tightened in 2 successive steps.

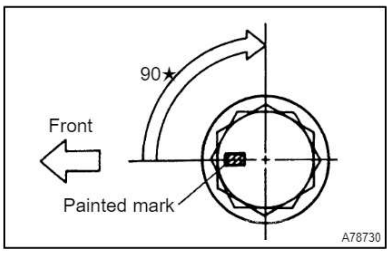


(a) Apply a light coat of engine oil on the threads of the cylinder head bolts.

(b) Install the plate washers to the cylinder head bolts.

(c) Uniformly install and tighten the 8 cylinder head bolts in the sequence shown in the illustration.

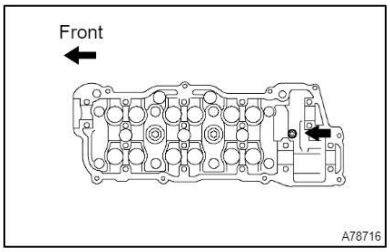
Torque: 54 N·m (550 kgf·cm, 40 ft·lbf)



(d) Mark the front side of each cylinder head bolt head with paint as shown in the illustration.

(e) Retighten the cylinder head bolts by 90★in the same sequence as step (c).

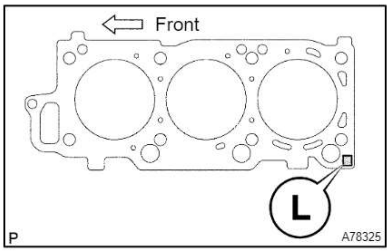
(f) Check that each painted mark is now at a 90★angle to the front.



(g) Using a socket hexagon wrench 8, install the hexagon bolt.

Torque: 19 N·m (189 kgf·cm, 14 ft·lbf)

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70. INSTALL CYLINDER HEAD GASKET NO.2

(a) Place a new cylinder head gasket on the cylinder block with the L mark as shown in the illustration.

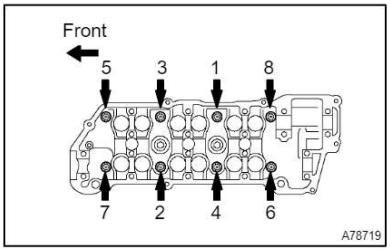
NOTICE:

- **Remove any oil from the contact surface.**
- **Make sure the cylinder head gasket is facing in the correct direction.**
- **Place the cylinder head on the gasket carefully in order not to damage the gasket at the bottom part of the head.**

71. INSTALL CYLINDER HEAD LH

NOTICE:

The cylinder head bolts are tightened in 2 successive steps.

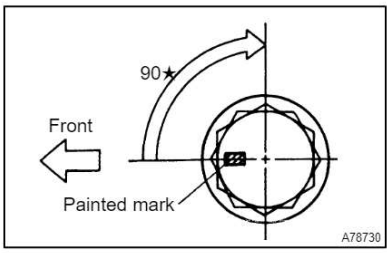


(a) Apply a light coat of engine oil on the threads of the cylinder head bolts.

(b) Install the plate washers to the cylinder head bolts.

(c) Uniformly install and tighten the 8 cylinder head bolts in the sequence shown in the illustration.

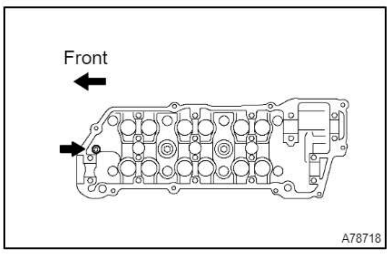
Torque: 54 N·m (550 kgf·cm, 40 ft·lbf)



(d) Mark the front side of each cylinder head bolt head with paint as shown in the illustration.

(e) Retighten the cylinder head bolts by 90★in the same sequence as step (c).

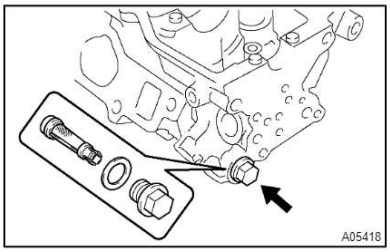
(f) Check that each painted mark is now at a 90★angle to the front.



(g) Using a socket hexagon wrench 8, install the hexagon bolt.

Torque: 19 N·m (189 kgf·cm, 14 ft·lbf)

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72. INSTALL OIL CONTROL VALVE FILTER

(a) Check that no foreign matter is on the mesh part of the filter.

(b) Assemble the valve filter and the plug.

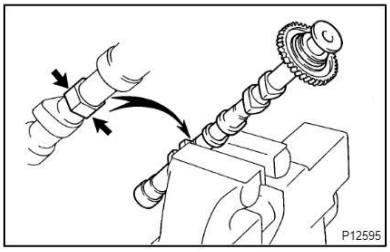
(c) Install a new gasket and the plug.

Torque: 45 N·m (459 kgf·cm, 33 ft·lbf)

73. INSTALL CYLINDER HEAD COVER REAR

(a) Install a new gasket and the rear cover with the 4 bolts.

Torque: 10 N·m (102 kgf·cm, 7 ft·lbf)

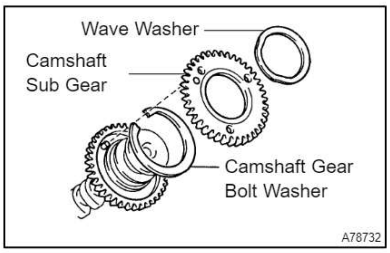


74. INSTALL CAMSHAFT SUB GEAR

(a) Clamp the camshaft in a vise on the hexagonal lobe.

NOTICE:

Be careful not to damage the camshaft.

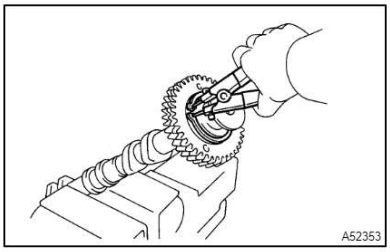


(b) Install the camshaft gear bolt washer and the camshaft sub gear.

HINT:

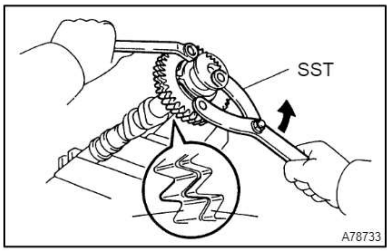
Attach the pins on the gears to the gear bolt washer ends.

(c) Install the wave washer.



(d) Using snap ring pliers, install the snap ring.

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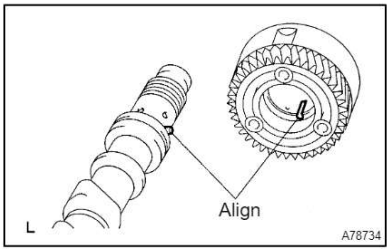


(e) Using SST, align the holes of the camshaft main gear and sub gear by turning the camshaft sub gear counterclockwise, and temporarily install a service bolt.
SST 09960−10010 (09962−01000, 09963−00500)

(f) Align the gear teeth of the main gear and sub gear, and tighten the service bolt.
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

NOTICE:
Be careful not to damage the camshaft journals.

HINT:
When installing the camshaft, make certain that the torsional spring force of the sub gear has been eliminated by installation of the service bolt.



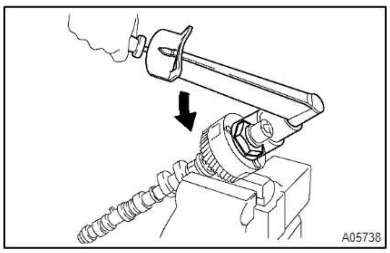
75. INSTALL CAMSHAFT TIMING GEAR ASSY

(a) Align the alignment pin with the alignment pin groove and install the VVT−i on the camshaft.

NOTICE:
Install the VVT−i with the lock−pin engaged and locked at the extreme retarded angle position.

(b) Apply engine oil on the nut, the mounting surface of the VVT−i and the screw threads.

NOTICE:
- **Be sure to apply the oil, otherwise the specified torque cannot be obtained.**
- **New nuts must be used when replacing the VVT−i unit.**



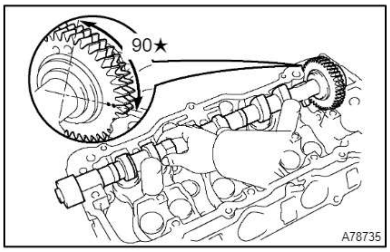
(c) Using a 46 mm socket wrench, install and tighten a lock nut by turning it counterclockwise.
Torque: 150 N·m (1,530 kgf·cm, 111 ft·lbf)

NOTICE:
- **The lock nut has LH threads.**
- **Never use any tool other than the socket wrench. Other tools will deform the cam angle rotor.**

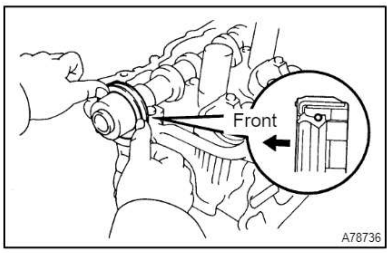
76. INSTALL NO.2 CAMSHAFT

NOTICE:
Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being installed. If the camshaft is not kept level, damage to the cylinder head or to the camshaft may result. To avoid this, the following steps must be carried out.

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(a) Apply new engine oil to the thrust portion and journal of the camshaft.
(b) Place the No. 2 camshaft at a 90★angle of the timing mark (2 dot marks) on the cylinder head.
(c) Apply MP grease to a new oil seal lip.

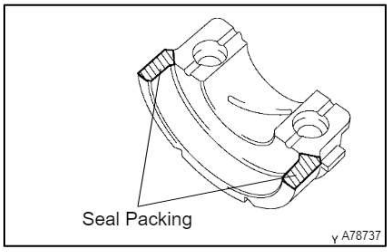


(d) Install the oil seal to the camshaft.

NOTICE:

- **Do not turn over the oil seal lip.**
- **Insert the oil seal until it stops.**

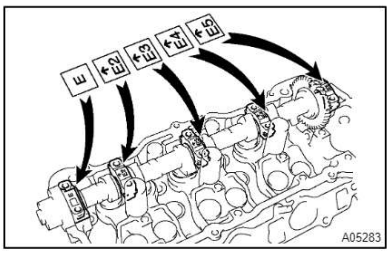
(e) Remove any old packing material from the contact surface.



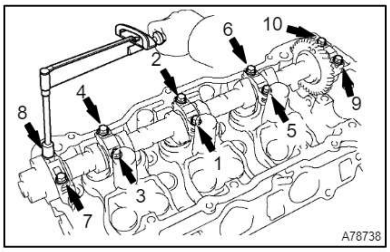
(f) Apply seal packing to the No. 1 bearing cap as shown in the illustration.
Seal packing: Part No. 08826−00080 or equivalent

NOTICE:

- **Install the No. 1 bearing cap within 5 minutes after applying seal packing.**
- **Do not expose the seal to engine oil for at least 2 hours after installing.**



(g) Install the 5 bearing caps in their proper locations.
(h) Apply a light coat of engine oil on the threads of the bearing cap bolts.



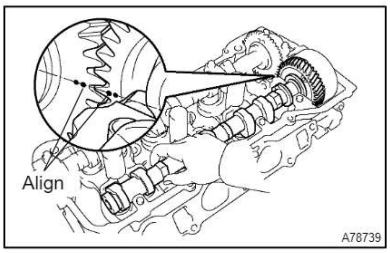
(i) Uniformly tighten the 10 bearing cap bolts in the sequence shown in the illustration.
Torque: 16 N·m (163 kgf·cm, 12 ft·lbf)

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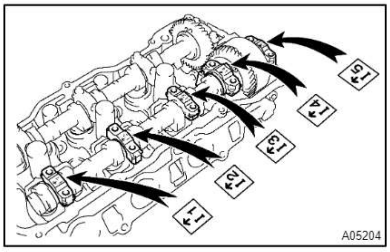
77. INSTALL CAMSHAFT

NOTICE:

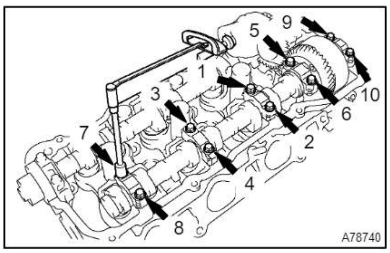
Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being installed. If the camshaft is not kept level, damage to the cylinder head or to the camshaft may result. To avoid this, the following steps must be carried out.



(a) Apply new engine oil to the thrust portion and journal of the camshaft.
(b) Align the camshaft drive and driven gear's timing marks (2 dot marks each).
(c) Place the camshaft on the cylinder head.



(d) Install the 5 bearing caps in their proper locations.
(e) Apply a light coat of engine oil on the threads of the bearing cap bolts.



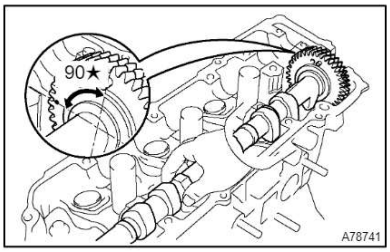
(f) Uniformly tighten the 10 bearing cap bolts uniformly in the sequence shown in the illustration.
Torque: 16 N·m (163 kgf·cm, 12 ft·lbf)
(g) Remove the service bolt.

78. INSTALL NO.4 CAMSHAFT SUB−ASSY

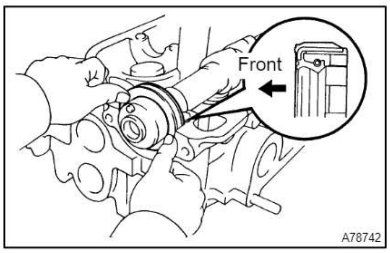
NOTICE:

Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being installed. If the camshaft is not kept level, damage to the cylinder head or to the camshaft may result. To avoid this, the following steps must be carried out.

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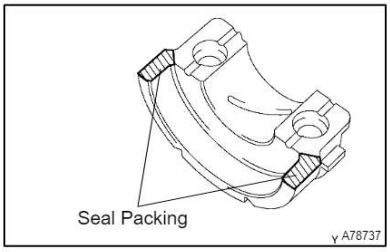
(a) Apply new engine oil to the thrust portion and journal of the camshaft.
(b) Place the No. 4 camshaft at a 90★angle of the timing mark (1 dot mark) on the cylinder head.
(c) Apply MP grease to a new oil seal lip.



(d) Install the oil seal to the camshaft.

NOTICE:

- **Do not turn over the oil seal lip.**
- **Insert the oil seal until it stops.**

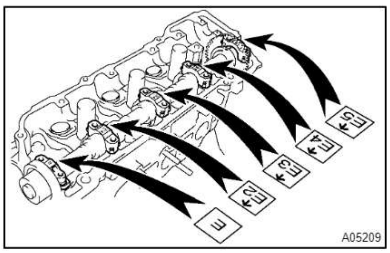


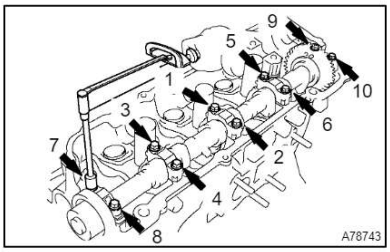
(e) Remove any old packing material from the contact surface.
(f) Apply seal packing to the No. 1 bearing cap as shown in the illustration.
Seal packing: Part No. 08826−00080 or equivalent

NOTICE:

- **Install the No. 1 bearing cap within 5 minutes after applying seal packing.**
- **Do not expose the seal to engine oil for at least 2 hours after installing.**

(g) Install the 5 bearing caps in their proper locations.
(h) Apply a light coat of engine oil on the threads of the bearing cap bolts.





(i) Uniformly tighten the 10 bearing cap bolts in the sequence shown in the illustration.
Torque: 16 N·m (163 kgf·cm, 12 ft·lbf)

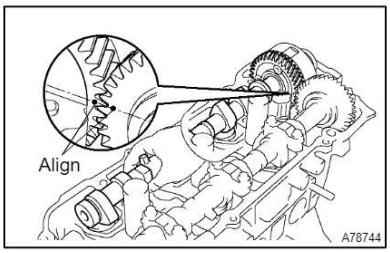
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79. INSTALL NO.3 CAMSHAFT SUB−ASSY

NOTICE:

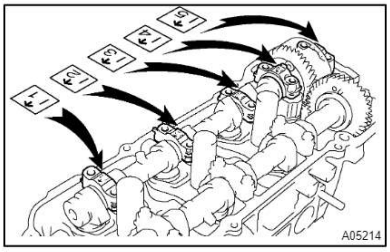
Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being installed. If the camshaft is not kept level, damage to the cylinder head or to the camshaft may result. To avoid this, the following steps must be carried out.

(a) Apply new engine oil to the thrust portion and journal of the camshaft.



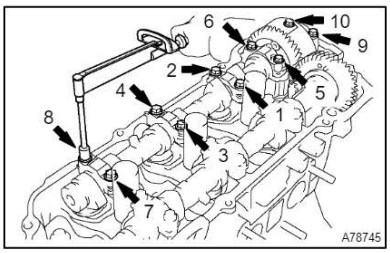
(b) Align the camshaft drive and driven gear's timing marks (1 dot mark each).

(c) Place the camshaft on the cylinder head.



(d) Install the 5 bearing caps in their proper locations.

(e) Apply a light coat of engine oil on the threads of the bearing cap bolts.



(f) Uniformly tighten the 10 bearing cap bolts in the sequence shown in the illustration.
Torque: 16 N·m (163 kgf·cm, 12 ft·lbf)

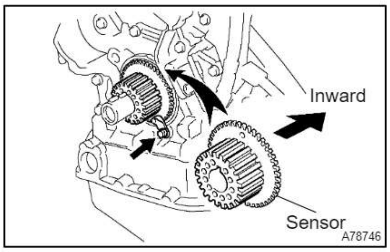
(g) Remove the service bolt.

80. INSTALL CRANKSHAFT TIMING PULLEY

(a) Align the keyway of the timing pulley with the key located on the crankshaft and slide the timing pulley into place.

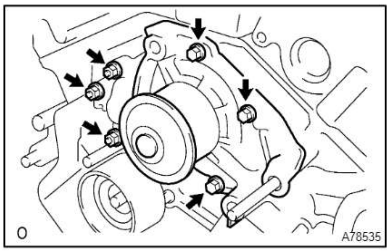
NOTICE:

Do not scratch the sensor area of the crankshaft timing pulley.



(b) Install the timing belt plate with the bolt.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

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81. INSTALL WATER PUMP ASSY

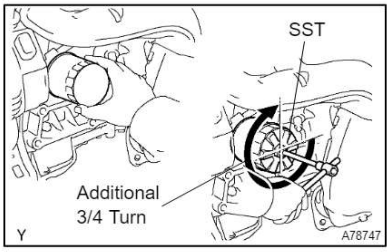
(a) Install a new gasket and the water pump with the 3 bolts and 3 nuts.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

82. INSTALL OIL LEVEL GAGE GUIDE

(a) Apply a light coat of engine oil to a new O−ring and install it to the level gage guide.
(b) Install the level gage guide.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

83. INSTALL OIL FILTER SUB−ASSY

(a) Using a socket hexagon wrench 12, install the oil filter union.
Torque: 30 N·m (306 kgf·cm, 22 ft·lbf)
(b) Check and clean the oil filter installation surface.
(c) Apply clean engine oil to the gasket of a new oil filter.
(d) Lightly screw the oil filter into place, and tighten it until the gasket contacts the seat.
(e) Using SST, tighten it an additional 3/4 turn.
SST 09228−07501



84. INSTALL TIMING BELT IDLER BRACKET
Torque: 28 N·m (286 kgf·cm, 21 ft·lbf)

85. INSTALL TIMING BELT NO.3 COVER

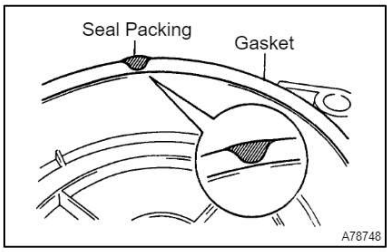
(a) Visually check for cracks and breaks on the gasket of the timing belt cover.

HINT:
If water is entering through cracks or breaks in the gasket, repair according to these guidelines: 1) if the crack length is within 2 to 3 cm (0.79 to 1.18 in.), repair with seal packing; or 2) if the crack length is over 3 cm (1.18 in.), replace the gasket.

(b) If the timing belt cover gasket needs to be repaired, follow the procedure below.
(1) Repair the cracks and breaks by applying the seal packing to the damaged area.
Seal packing: Part No. 08826−00080 or equivalent

NOTICE:
When applying the seal packing, apply it as wide and high as the gasket.

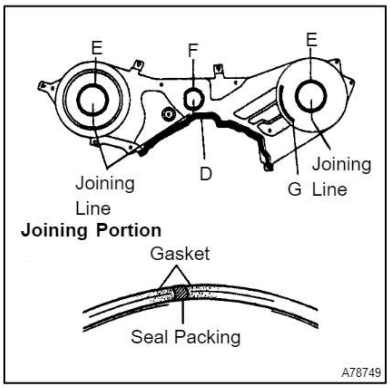
(c) If the timing belt cover gasket needs to be replaced, follow the procedure below.



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(1) Using a screwdriver and gasket scraper, remove the remaining gasket.

NOTICE:
Be careful not to damage the timing belt cover.



(2) Remove the backing paper from a new gasket, and affix the gasket along the groove of the timing belt cover as shown in the illustration.

NOTICE:
- **Affix the gasket in the center of the groove.**
- **At the corners, try to keep the gasket thickness uniform.**

Length:

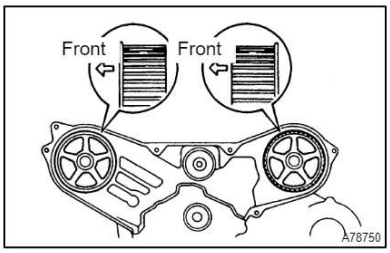
Gasket	D	E	F	G
Specified Condition	335 mm (13.19 in.)	180 mm (7.09 in.)	133 mm (5.24 in.)	72 mm (2.83 in.)

(3) If there is a gap on the joint of the gasket, apply seal packing to close the gap.

Seal packing: Part No. 08826−00080 or equivalent

NOTICE:
When applying the seal packing, apply it as wide and high as the gasket.

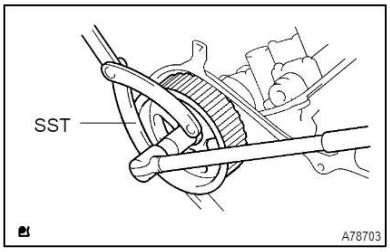
(d) Install the timing belt cover with the 6 bolts.
Torque: 8.5 N·m (87 kgf·cm, 76 in.·lbf)



86. INSTALL CAMSHAFT TIMING PULLEY

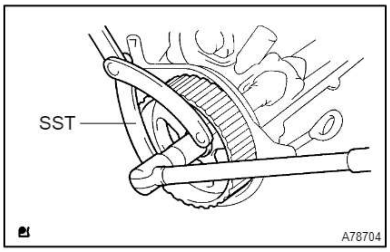
(a) Install the camshaft timing pulley with the belt guide properly oriented and tighten the bolt temporarily.

HINT:
- Face the belt guide of the RH timing pulley towards the front of the engine.
- Face the belt guide of the LH timing pulley towards the rear of the engine.



(b) Using SST, tighten the RH pulley bolt.
SST 09960−10010 (09962−01000, 09963−01000)
Torque: 125 N·m (1,275 kgf·cm, 92 ft·lbf)

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(c) Using SST, tighten the LH pulley bolt.
SST 09960−10010 (09962−01000, 09963−01000)
Torque: 125 N·m (1,275 kgf·cm, 92 ft·lbf)

87. INSTALL TIMING BELT IDLER SUB−ASSY NO.2
Torque: 43 N·m (438 kgf·cm, 32 ft·lbf)

88. INSTALL TIMING BELT IDLER SUB−ASSY NO.1

(a) Using a socket hexagon wrench 10, install the plate washer and timing belt idler No. 1 with the pivot bolt.
Torque: 34 N·m (347 kgf·cm, 25 ft·lbf)

89. INSTALL TIMING BELT

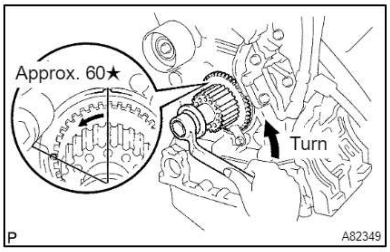
(a) Remove any oil or water on the pulleys, and keep them clean.

NOTICE:

- **If there is a trace of water and/or oil on the timing belt, repair the leakage and install a new timing belt.**
- **Only wipe the pulleys. Do not use cleaning agents on the pulleys.**

(b) Inspect the idler pulleys.
(1) Check that the idler pulley turns smoothly.
(2) Visually check the sealed portion of the idler pulley for oil leakage.

(c) Inspect the water pump.
(1) Turn the pulley, and check that the water pump bearing moves smoothly without any noise.
(2) Visually check the drain hole for coolant leakage.



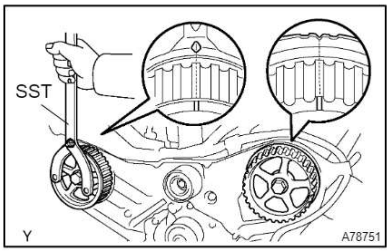
(d) Temporarily install the crankshaft pulley bolt and washer to the crankshaft.

(e) Turn the crankshaft counterclockwise by approximately 60★

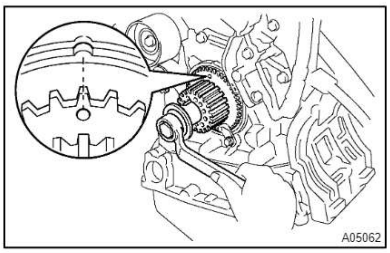
NOTICE:

To prevent contacting the piston head and the valve head from colliding, set the crankshaft pulley at approximately 60★BTDC/compression position.

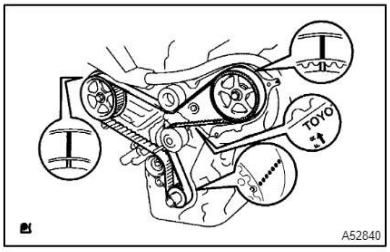
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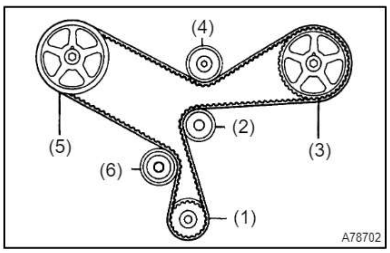
(f) Using SST, turn the crankshaft pulley, and align the timing marks of the timing pulley with the No. 3 timing belt cover.
SST 09960−10010 (09962−01000, 09963−01000)



(g) Turn the crankshaft, and align the timing mark of the crankshaft timing pulley with the oil pump body.

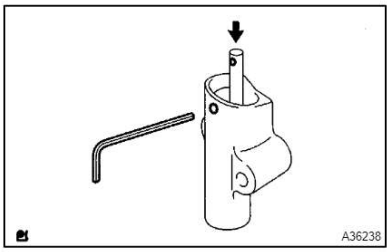


(h) Face the front mark on the timing belt forward.
(i) Align the installation mark on the timing belt with the timing mark of the crankshaft timing pulley.
(j) Align the installation marks on the timing belt with the timing marks of the camshaft timing pulleys.



(k) Install the timing belt in this order.

1st	Crankshaft timing pulley
2nd	Water pump pulley
3rd	LH camshaft timing pulley
4th	No. 2 idler pulley
5th	RH camshaft timing pulley
6th	No. 1 idler pulley



90. INSTALL TIMING BELT TENSIONER ASSY

(a) Set the timing belt tensioner uprightly on the press.
(b) Slowly press in the push rod.

NOTICE:

Do not apply pressure of more than 9.8 kN (1,000 kgf, 2,205 lbf) to the rod.

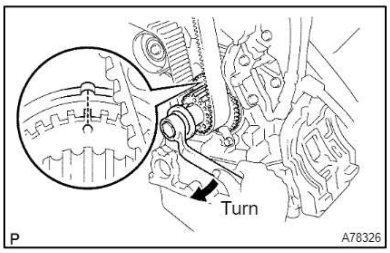
(c) Align the holes of the push rod and housing, pass a 1.5 mm hexagon wrench through the holes to keep the setting position of the push rod.
(d) Release the press.

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(e) Temporarily install the tensioner with the 2 bolts.
Torque: 27 N·m (280 kgf·cm, 20 ft·lbf)

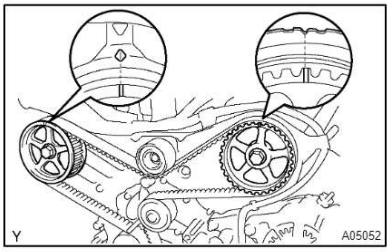
NOTICE:
Install the tensioner's bolts uniformly and evenly. Installing the tenioner at an angle may cause it to malfunction.

(f) Remove the 1.5 mm hexagon wrench from the tensioner.



(g) Turn the crankshaft 2 revolutions slowly, and align the timing mark of the crankshaft timing pulley with the oil pump body.

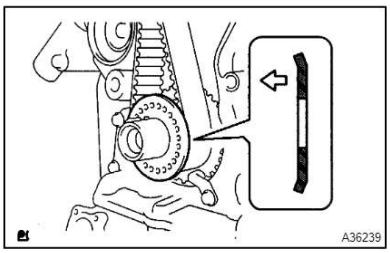
NOTICE:
Always turn the crankshaft clockwise.



(h) Check that the timing marks of the RH and LH timing pulleys are aligned with the timing marks of the No. 3 timing belt cover as shown in the illustration.

If the marks do not align, remove the timing belt and reinstall it.

(i) Remove the crankshaft pulley bolt.



91. INSTALL TIMING BELT GUIDE NO.2

(a) Install the timing belt guide, facing the cup side toward the engine front.

92. INSTALL ENGINE MOUNTING BRACKET RH
Torque: 28 N·m (286 kgf·cm, 21 ft·lbf)

93. INSTALL TIMING BELT NO.2 COVER

(a) Visually check for cracks and breaks on the gasket of the timing belt cover.

If there is a trace that water is entering at the visual check, replace the timing belt cover.

(b) Install the timing belt cover.
Torque: 8.5 N·m (87 kgf·cm, 75 in.·lbf)

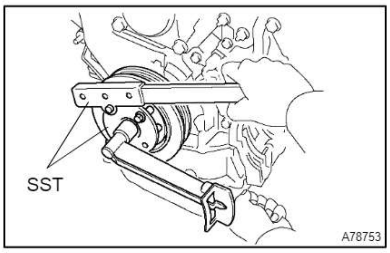
94. INSTALL TIMING BELT NO.1 COVER

(a) Visually check for cracks and breaks on the gasket of the timing belt cover.

If there is a trace that water is entering at the visual check, replace the timing belt cover.

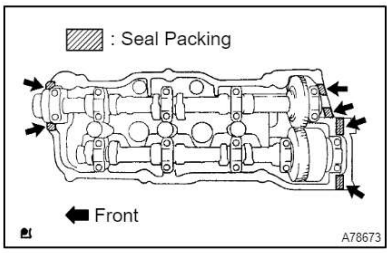
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(b) Install the timing belt cover.
Torque: 8.5 N·m (87 kgf·cm, 75 in.·lbf)



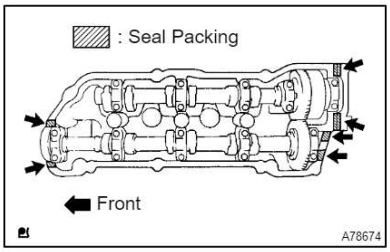
95. INSTALL CRANKSHAFT PULLEY
(a) Align the keyway of the pulley with the key located on the crankshaft and slide the pulley into place.
(b) Using SST, install the pulley bolt.
SST 09213−54015 (91651−60855), 09330−00021
Torque: 220 N·m (2,250 kgf·cm, 162 ft·lbf)

96. INSTALL VVT SENSOR
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)
97. INSTALL CAMSHAFT TIMING OIL CONTROL VALVE ASSY
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)
98. INSTALL ENGINE HANGER NO.2
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)
99. INSPECT VALVE CLEARANCE (See page 14−142)
100. ADJUST VALVE CLEARANCE (See page 14−142)



101. INSTALL CYLINDER HEAD COVER SUB−ASSY
(a) Install the gasket to the cylinder head cover.
(b) Apply seal packing to the cylinder head 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 start the engine for at least 2 hours after installing.**

(c) Install the cylinder head cover with the 9 bolts. Tighten the bolts uniformly in several steps.
Torque: 8.0 N·m (80 kgf·cm, 71 in.·lbf)



102. INSTALL CYLINDER HEAD COVER SUB−ASSY LH
(a) Install the gasket to the cylinder head cover.
(b) Apply seal packing to the cylinder head 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.**

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- **Do not start the engine for at least 2 hours after installing.**

(c) Install the cylinder head cover with the 9 bolts. Tighten the bolts uniformly in several steps.
Torque: 8.0 N·m (80 kgf·cm, 71 in.·lbf)

103. INSTALL VENTILATION VALVE SUB−ASSY

(a) Apply adhesive to 2 or 3 threads.
Adhesive:
Part No. 08833−00070, THREE BOND 1324 or eguivalent

(b) Install the ventilation valve.
Torque: 19 N·m (193 kgf·cm, 14 ft·lbf)

104. INSTALL GASKET, OIL FILLER CAP

105. INSTALL OIL FILLER CAP SUB−ASSY

106. INSTALL SPARK PLUG
Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

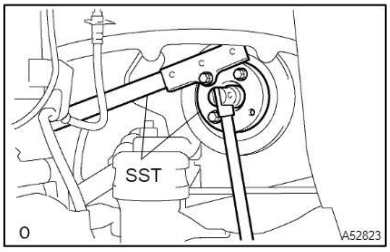
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TIMING BELT (1MZ−FE/3MZ−FE)

1419−02

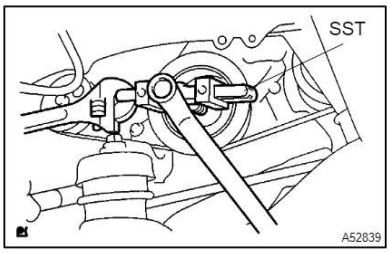
REPLACEMENT

1. REMOVE FRONT WHEEL RH
2. REMOVE FRONT FENDER APRON SEAL RH
3. REMOVE V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (See page 14−140)
4. REMOVE VANE PUMP V BELT (See page 14−140)
5. REMOVE ENGINE MOVING CONTROL ROD (See page 14−164)
6. REMOVE ENGINE MOUNTING STAY NO.2 RH (See page 14−164)
7. REMOVE GENERATOR BRACKET NO.2



8. REMOVE CRANKSHAFT PULLEY

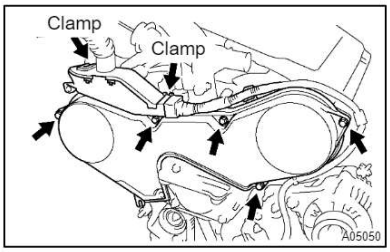
(a) Using SST, loosen the pulley bolt.
SST 09213−54015 (91651−60855), 09330−00021



(b) Using SST and the pulley bolt, remove the pulley.
SST 09950−50013 (09951−05010, 09952−05010, 09953−05010, 09954−05030)

NOTICE:
Before using SST, apply lubricating oil on the threads and tip of the center bolt 100.

9. REMOVE TIMING BELT NO.1 COVER



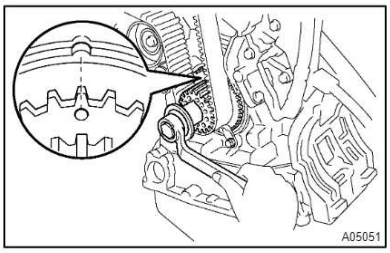
10. REMOVE TIMING BELT NO.2 COVER

(a) Disconnect the engine wire protector clamps from the timing belt No. 3 cover.
(b) Remove the 5 bolts and timing belt cover.

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11. REMOVE ENGINE MOUNTING BRACKET RH

12. REMOVE TIMING BELT GUIDE NO.2

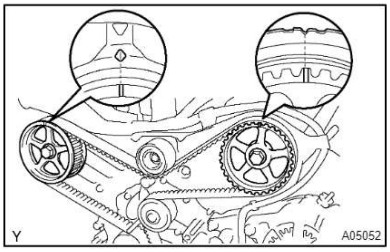


13. REMOVE TIMING BELT

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

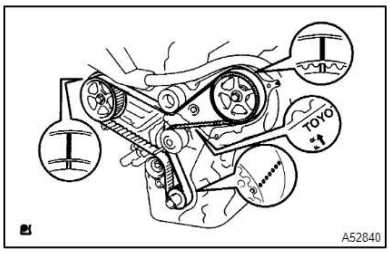
(1) Temporarily install the crankshaft pulley bolt with the washer to the crankshaft.

(2) Turn the crankshaft clockwise, and align the timing marks of the crankshaft timing pulley and oil pump body.



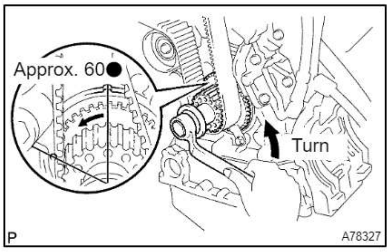
(3) Check that the timing marks of the camshaft timing pulleys and No. 3 timing belt cover are aligned. If not, turn the crankshaft 1 revolution (360●).

(4) Remove the crankshaft pulley bolt.



(b) If reusing the timing belt, check that there are 4 installation marks on the timing belt as shown in the illustration.

(1) If the installation marks have disappeared, put new installation marks on the timing belt before removing.



(c) Set the No. 1 cylinder to approximately 60●BTDC/compression.

(1) Turn the crankshaft counterclockwise by approximately 60●

NOTICE:

With timing belt removed:

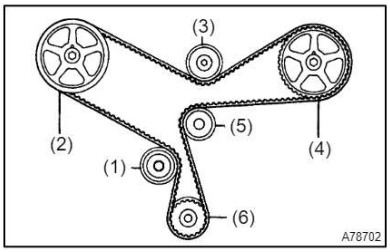
The crankshaft pulley must be at the correct angle to avoid damage in later steps. If the crankshaft pulley is at the wrong angle and then the camshaft timing pulley and the camshaft are removed, the piston head and valve head may come in contact and be damaged.

(d) Remove the timing belt tensioner.

NOTICE:

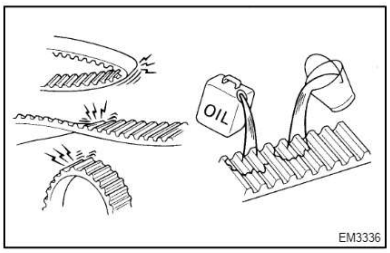
Do not reinstall the tensioner with its plunger extended.

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(e) Remove the timing belt in this order.

1st	No. 1 idler pulley
2nd	RH camshaft timing pulley
3rd	No. 2 idler pulley
4th	LH camshaft timing pulley
5th	Water pump pulley
6th	Crankshaft timing pulley



14. INSTALL TIMING BELT

NOTICE:

- **Do not bend, twist or turn the timing belt inside out.**
- **Do not allow the timing belt to come into contact with oil, water or steam.**
- **Do not utilize timing belt tension when instaling the mounting bolt of the camshaft timing pulley.**

(a) Remove any oil or water on the pulleys, and keep them clean.

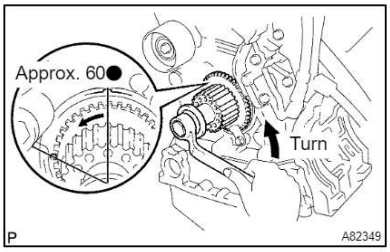
NOTICE:

- **If there is a trace of water and/or oil on the timing belt, repair the leakage and install a new timing belt.**
- **Only wipe the pulleys. Do not use cleaning agents on the pulleys.**

(b) Inspect the idler pulleys.
  (1) Check that the idler pulleys turn smoothly.
  (2) Visually check the sealed portion of the idler pulleys for oil leakage.

(c) Inspect the water pump.
  (1) Turn the pulley, and check that the water pump bearing moves smoothly without any noise.
  (2) Visually check the drain hole for coolant leakage.

(d) Temporarily install the crankshaft pulley bolt and washer to the crankshaft.

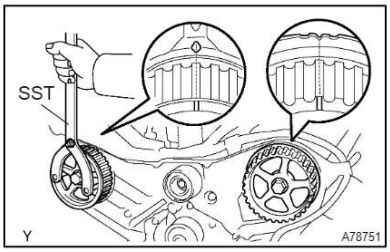


(e) Turn the crankshaft counterclockwise by approximately 60●

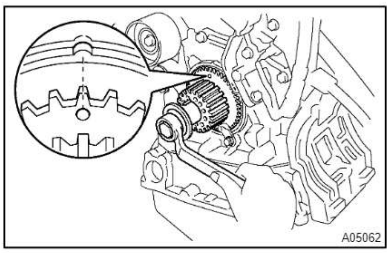
NOTICE:

To prevent the piston head and the valve head from colliding, set the crankshaft pulley at approximately 60●BTDC/ compression position.

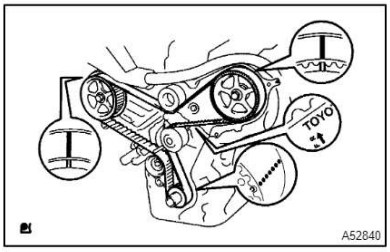
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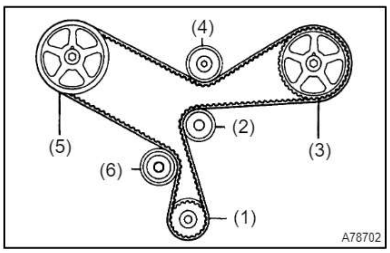
(f) Using SST, turn the timing pulleys, and align the timing marks of the timing pulleys with the No. 3 timing belt cover.
SST 09960−10010 (09962−01000, 09963−01000)



(g) Turn the crankshaft, and align the timing mark of the crankshaft timing pulley with the oil pump body.

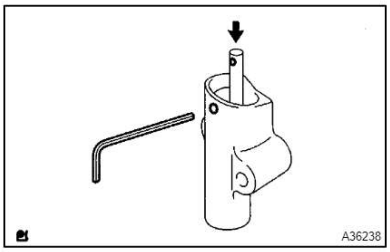


(h) Face the front mark on the timing belt forward.
(i) Align the installation mark on the timing belt with the timing mark of the crankshaft timing pulley.
(j) Align the installation marks on the timing belt with the timing marks of the camshaft timing pulleys.



(k) Install the timing belt in this order.

1st	Crankshaft timing pulley
2nd	Water pump pulley
3rd	LH camshaft timing pulley
4th	No. 2 idler pulley
5th	RH camshaft timing pulley
6th	No. 1 idler pulley



15. INSTALL TIMING BELT TENSIONER ASSY

(a) Set the timing belt tensioner uprightly on the press.
(b) Slowly press in the push rod.

NOTICE:

Do not apply pressure of more than 9.8 kN (1,000 kgf, 2,205 lbf) to the rod.

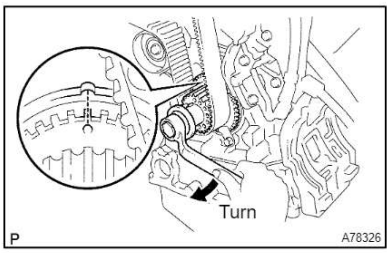
(c) Align the holes of the push rod and housing, pass a 1.5 mm hexagon wrench through the holes to keep the setting position of the push rod.
(d) Release the push rod.

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(e) Temporarily install the tensioner with the 2 bolts.
Torque: 27 N·m (280 kgf·cm, 20 ft·lbf)

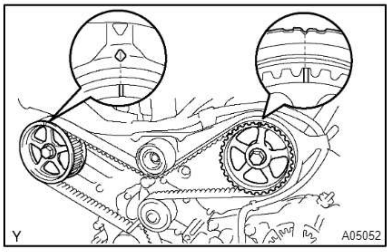
NOTICE:
Install the tensioner's bolts uniformly and evenly. Installing the tensioner at an angle may cause it to malfunction.

(f) Remove the 1.5 mm hexagon wrench from the tensioner.



(g) Turn the crankshaft 2 revolutions slowly and align the timing mark of the crankshaft timing pulley with the oil pump body.

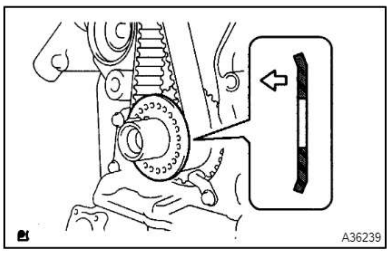
NOTICE:
Always turn the crankshaft clockwise.



(h) Check that the timing marks of the RH and LH timing pulleys are aligned with the timing marks of the No. 3 timing belt cover as shown in the illustration.

If the marks do not align, remove the timing belt and reinstall it.

(i) Remove the crankshaft pulley bolt.



16. INSTALL TIMING BELT GUIDE NO.2

(a) Install the timing belt guide, facing the cup side toward the engine front.

17. INSTALL ENGINE MOUNTING BRACKET RH
Torque: 28 N·m (286 kgf·cm, 21 ft·lbf)

18. INSTALL TIMING BELT NO.2 COVER

(a) Visually check for cracks and breaks on the gasket of the timing belt cover.

HINT:
If it is judged that water is entering at the visual check, replace the timing belt cover.

(b) Install the timing belt cover.
Torque: 8.5 N·m (87 kgf·cm, 76 in.·lbf)

19. INSTALL TIMING BELT NO.1 COVER

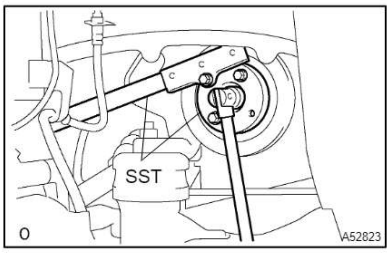
(a) Visually check for cracks and breaks on the gasket of the timing belt cover.

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HINT:
If there is a trace that water is entering at the visual check, replace the timing belt cover.

(b) Install the timing belt cover.
Torque: 8.5 N·m (87 kgf·cm, 75 in.·lbf)

(c) Install the engine wire protector cover to the timing belt No. 3 cover.



20. 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 pulley bolt.
SST 09213−54015 (91651−60855), 09330−00021
Torque: 220 N·m (2250 kgf·cm, 162 ft·lbf)

21. INSTALL GENERATOR BRACKET NO.2
Torque: 28 N·m (286 kgf·cm, 21 ft·lbf)

22. INSTALL ENGINE MOUNTING STAY NO.2 RH (See page 14−164)

23. INSTALL ENGINE MOVING CONTROL ROD (See page 14−164)

24. INSTALL VANE PUMP V BELT (See page 14−140)

25. INSTALL V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (See page 14−140)

26. INSPECT DRIVE BELT TENSION (See page 14−136)

27. INSTALL FRONT WHEEL RH

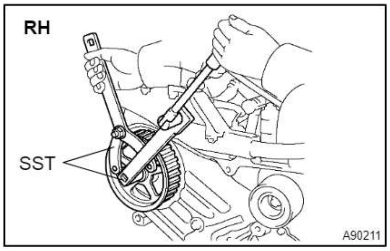
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CAMSHAFT (RH BANK) (1MZ−FE/3MZ−FE)

1411U−02

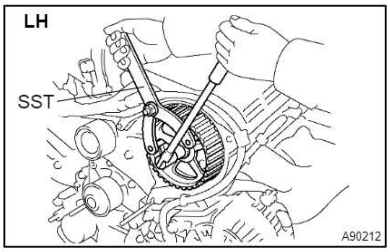
REPLACEMENT

1. DRAIN ENGINE COOLANT (See page 16−27)
2. REMOVE V−BANK COVER SUB−ASSY (See page 14−164)
3. REMOVE FRONT SUSPENSION UPPER BRACE CENTER (W/ FRONT SUSPENSION BRACE UPPER CENTER)
4. REMOVE AIR CLEANER ASSEMBLY WITH HOSE
5. REMOVE INTAKE AIR SURGE TANK (See page 14−142)
6. REMOVE SPARK PLUG
7. REMOVE CYLINDER HEAD COVER SUB−ASSY
8. REMOVE FRONT WHEEL RH
9. REMOVE FRONT FENDER APRON SEAL RH
10. REMOVE V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (See page 14−140)
11. REMOVE VANE PUMP V BELT (See page 14−140)
12. REMOVE ENGINE MOVING CONTROL ROD (See page 14−164)
13. REMOVE ENGINE MOUNTING STAY NO.2 RH (See page 14−164)
14. REMOVE GENERATOR BRACKET NO.2
15. REMOVE CRANKSHAFT PULLEY (See page 14−186)
16. REMOVE TIMING BELT NO.1 COVER (See page 14−186)
17. REMOVE TIMING BELT NO.2 COVER (See page 14−186)
18. REMOVE ENGINE MOUNTING BRACKET RH
19. REMOVE TIMING BELT GUIDE NO.2 (See page 14−186)
20. REMOVE TIMING BELT (See page 14−186)
21. REMOVE TIMING BELT IDLER SUB−ASSY NO.2



22. REMOVE CAMSHAFT TIMING PULLEY

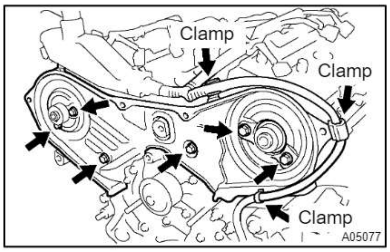
(a) Using SST, remove the bolt and RH timing pulley.
SST 09960−10010 (09962−01000, 09963−01000), 09249−63010



(b) Using SST, remove the LH timing pulley.
SST 09960−10010 (09962−01000, 09963−01000)

HINT:
Arrange the camshaft timing pulleys (RH and LH sides) so that they can be returned to the original locations when reassembling.

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23. REMOVE TIMING BELT NO.3 COVER

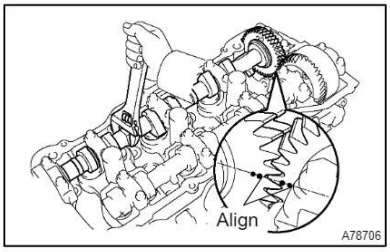
(a) Disconnect the 3 engine wire harness clamps from the timing belt No. 3 cover.

(b) Remove the 6 bolts and the timing belt cover.

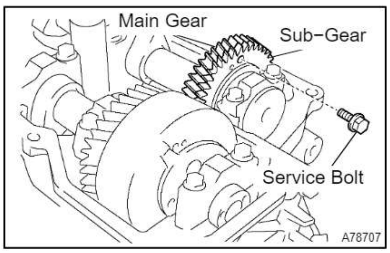
24. REMOVE CAMSHAFT

NOTICE:

Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being removed. If the camshaft is not kept level, damage to the cylinder head or to the camshaft may result. To avoid this, the following steps must be carried out.



(a) Align the camshaft drive and driven gear's timing marks (2 dot marks each) by turning the camshaft with a wrench.



(b) Secure the exhaust camshaft sub−gear to the main gear with a service bolt.

Recommended service bolt:

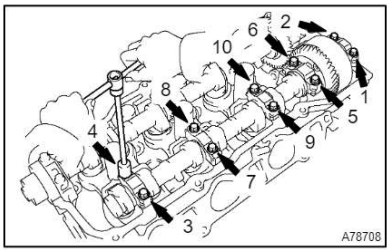
Thread diameter	6 mm
Thread pitch	1.0 mm
Bolt length	16 to 20 mm

Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

HINT:

When removing the camshaft, make certain that the torsional spring force of the sub−gear has been eliminated by installation of the service bolt.

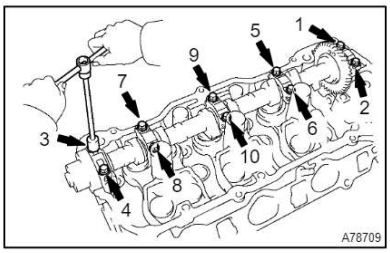
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(c) Uniformly loosen and remove the 10 bearing cap bolts in the sequence shown in the illustration. Remove the 5 bearing caps and the camshaft.

NOTICE:

- **Do not pry out the camshaft.**
- **Be careful not to damage the portion of the cylinder head receiving the shaft thrust.**



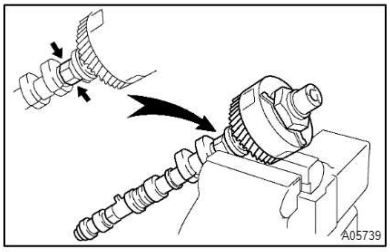
25. REMOVE NO.2 CAMSHAFT

(a) Uniformly loosen and remove the 10 bearing cap bolts in the sequence shown in the illustration. Remove the 5 bearing caps and the No. 2 camshaft.

NOTICE:

- **Do not pry out the camshaft.**
- **Be careful not to damage the portion of the cylinder head receiving the shaft thrust.**

(b) Remove the oil seal from the No. 2 camshaft.



26. REMOVE CAMSHAFT TIMING GEAR ASSY

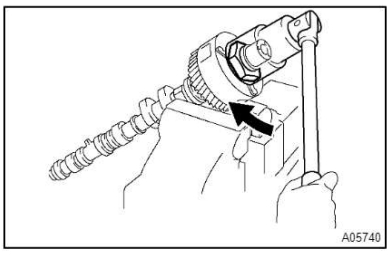
NOTICE:

Do not remove or install the camshaft timing gear (VVT−i) unless you are replacing the VVT−i or the camshaft.

(a) Clamp the camshaft in a vise on the hexagonal lobe.

NOTICE:

Do not damage the camshaft.



(b) Using a 46 mm socket wrench, remove the lock nut by turning it clockwise.

NOTICE:

- **Remove the locknut with the lock−pin engaged and locked at the extreme retarded angle position.**
- **The lock nut has LH threads.**
- **Only use the socket wrench. Other tools will deform the cam angle rotor.**

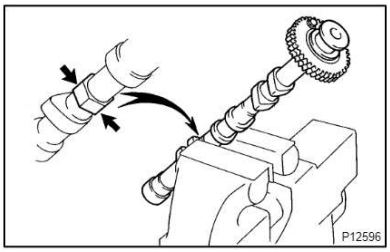
(c) Remove the timing gear (VVT−i).

NOTICE:

Never remove the 3 bolts on the gear.

If it is difficult to remove the VVT−i, tap it lightly using a plastic−faced hammer and then remove it.

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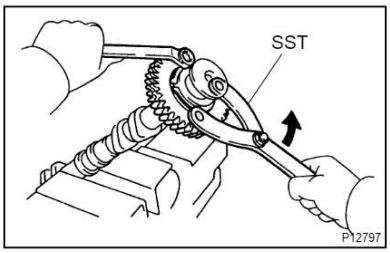


27. REMOVE CAMSHAFT SUB GEAR

(a) Clamp the camshaft in a vise on the hexagonal lobe.

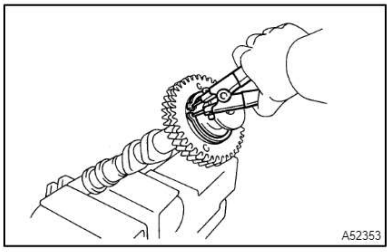
NOTICE:

Do not damage the camshaft.



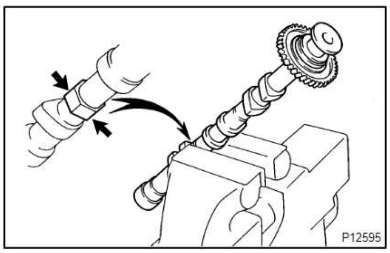
(b) Using SST, turn the sub gear counterclockwise, and remove the service bolt.

SST 09960−10010 (09962−01000, 09963−00500)



(c) Using snap ring pliers, remove the snap ring.

(d) Remove the wave washer, camshaft sub gear and camshaft gear spring.

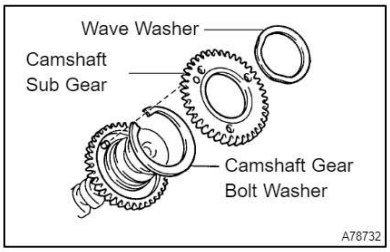


28. INSTALL CAMSHAFT SUB GEAR

(a) Clamp the camshaft in a vise on the hexagonal lobe.

NOTICE:

Do not damage the camshaft.



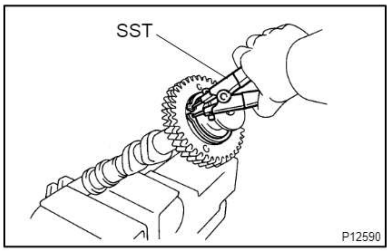
(b) Install the camshaft gear bolt washer and the camshaft sub gear.

HINT:

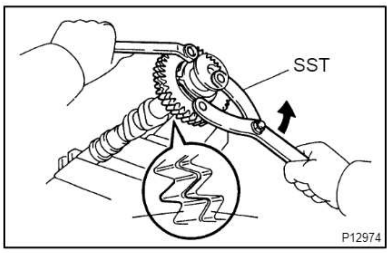
Attach the pins on the gears to the gear spring ends.

(c) Install the wave washer.

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(d) Using snap ring pliers, install the snap ring.

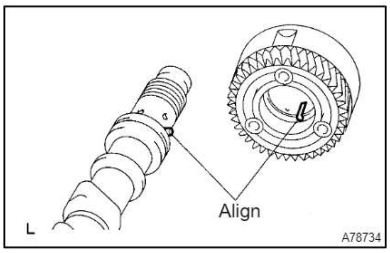


(e) Using SST, align the holes of the camshaft main gear and sub gear by turning the camshaft sub gear counterclockwise, and temporarily install a service bolt.
SST 09960−10010 (09962−01000, 09963−00500)

(f) Align the gear teeth of the main gear and sub gear, and tighten the service bolt.
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

NOTICE:
Do not damage the camshaft journals.

HINT:
When installing the camshaft, make certain that the torsional spring force of the sub gear has been eliminated by installation of the service bolt.



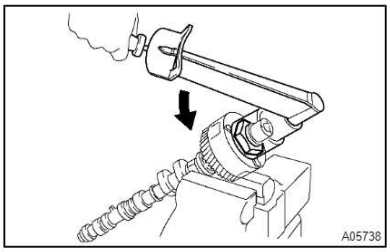
29. INSTALL CAMSHAFT TIMING GEAR ASSY

(a) Align the alignment pin with the alignment pin groove and install the VVT−i on the camshaft.

NOTICE:
Install the VVT−i with the lock−pin engaged and locked at the most retarded angle position.

(b) Apply engine oil on the nut, the mounting surface of the VVT−i and the screw threads.

NOTICE:
- **Be sure to apply the oil, otherwise the specified torque cannot be obtained.**
- **A new nut must be used when replacing the the VVT−i unit.**



(c) Using a 46 mm socket wrench, install and tighten the lock nut by turning it counterclockwise.
Torque: 150 N·m (1,530 kgf·cm, 111 ft·lbf)

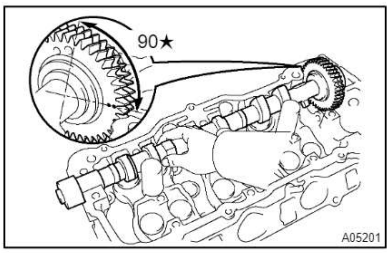
NOTICE:
- **The lock nut has LH threads.**
- **Only use the socket wrench. Other tools will deform the cam angle rotor.**

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30. INSTALL NO.2 CAMSHAFT

NOTICE:

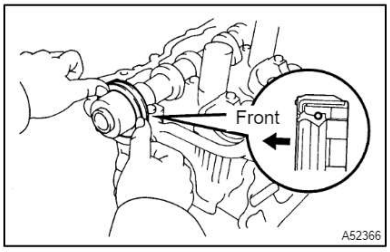
Since the thrust clearance of the camshaft is small, the camshaft must be held level while it is being installed. If the camshaft is not level, the portion of the cylinder head receiving the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following steps must be carried out.



(a) Apply new engine oil to the thrust portion and journal of the camshaft.

(b) Place the No. 2 camshaft at a 90★angle of the timing mark (2 dot marks) on the cylinder head.

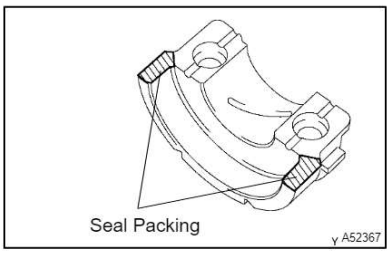
(c) Apply MP grease to a new oil seal lip.



(d) Install the oil seal to the camshaft.

NOTICE:

- **Do not turn over the oil seal lip.**
- **Insert the oil seal until it stops.**



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

(f) Apply seal packing to the No. 1 bearing cap as shown in the illustration.

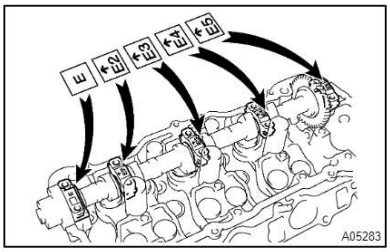
Seal packing: Part No. 08826−00080 or equivalent

NOTICE:

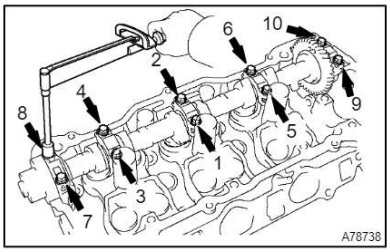
- **Install the No. 1 bearing cap within 5 minutes after applying seal packing.**
- **Do not expose the seal to engine oil for at least 2 hours after installing.**

(g) Install the 5 bearing caps in their proper locations.

(h) Apply a light coat of engine oil on the threads of the bearing cap bolts.



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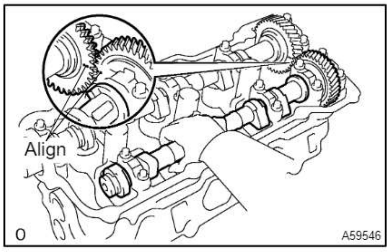


(i) Uniformly tighten the 10 bearing cap bolts in the sequence shown in the illustration.
Torque: 16 N·m (163 kgf·cm, 12 ft·lbf)

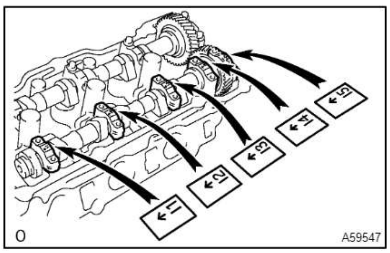
31. INSTALL CAMSHAFT

NOTICE:

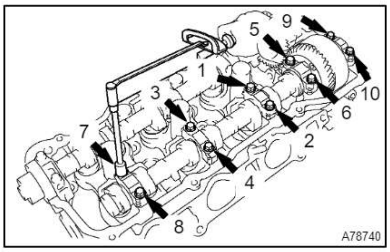
Since the thrust clearance of the camshaft is small, the camshaft must be held level while it is being installed. If the camshaft is not level, the portion of the cylinder head receiving the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following steps must be carried out.



(a) Apply new engine oil to the thrust portion and journal of the camshaft.
(b) Align the camshaft drive and driven gear's timing marks (2 dot marks each).
(c) Place the camshaft on the cylinder head.



(d) Install the 5 bearing caps in their proper locations.
(e) Apply a light coat of engine oil on the threads of the bearing cap bolts.



(f) Uniformly tighten the 10 bearing cap bolts in the sequence shown in the illustration.
Torque: 16 N·m (163 kgf·cm, 12 ft·lbf)
(g) Remove the service bolt.

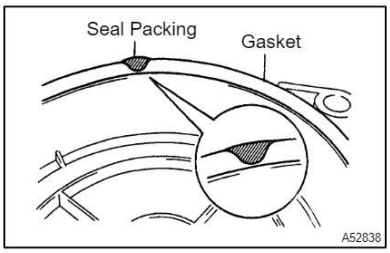
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32. INSTALL TIMING BELT NO.3 COVER

(a) Visually check for cracks and breaks in the gasket of the timing belt cover.

HINT:

If water is entering through cracks or breaks in the gasket, repair according to these guidelines: 1) if the crack length is within 2 to 3 cm (0.79 to 1.18 in.), repair with seal packing; or 2) if the crack length is over 3 cm (1.18 in.), replace the gasket.



(b) When repairing the timing belt cover gasket, follow the procedure below.

(1) Repair the cracks and breaks by applying the seal packing to the damaged area.

Seal packing: Part No. 08826−00080 or equivalent

NOTICE:

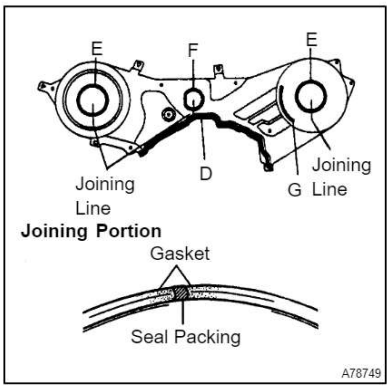
When applying the seal packing, apply it as wide and high as the gasket.

(c) If the timing belt cover gasket needs to be replaced, follow the procedure below.

(1) Using a screwdriver and gasket scraper, remove the remaining gasket.

NOTICE:

Be careful not to damage the timing belt cover.



(2) Remove the backing paper from a new gasket, and affix the gasket along the groove of the timing belt cover as shown in the illustration.

NOTICE:

- **Affix the gasket in the center of the groove.**
- **At the corners, try to keep the gasket thickness uniform.**

Length:

Gasket	D	E	F	G
Specified Condition	335 mm (13.19 in.)	180 mm (7.09 in.)	133 mm (5.24 in.)	72 mm (2.83 in.)

(3) If there is a gap on the joint of the gasket, apply seal packing to close the gap.

Seal packing: Part No. 08826−00080 or equivalent

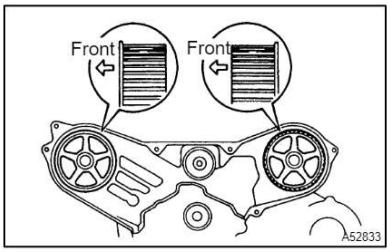
NOTICE:

When applying the seal packing, apply it as wide and high as the gasket.

(d) Install the timing belt cover with the 6 bolts.

Torque: 8.5 N·m (87 kgf·cm, 76 in.·lbf)

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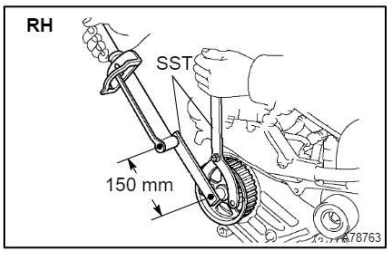


33. INSTALL CAMSHAFT TIMING PULLEY

(a) Install the camshaft timing pulley with the belt guide properly oriented and tighten the bolt temporarily.

HINT:

- Face the belt guide of the RH timing pulley towards the front of the engine.
- Face the belt guide of the LH timing pulley towards the rear of the engine.



(b) Using SST, tighten the RH pulley bolt.

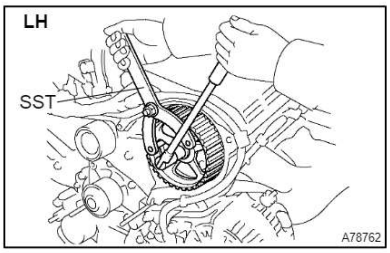
SST 09960−10010 (09962−01000, 09963−01000), 09249−63010

Torque: 125 N·m (1,275 kgf·cm, 92 ft·lbf)

NOTICE:

The torque specification above is the SST without extension tool specification. Use the special formula to calculate the SST with extension tool torque specification (see page 01−5).

Extended length of SST (09249−63010): 150 mm (5.91 in.)



(c) Using SST, tighten the LH pulley bolt.

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

Torque: 125 N·m (1275 kgf·cm, 92 ft·lbf)

34. INSTALL TIMING BELT IDLER SUB−ASSY NO.2
Torque: 43 N·m (438 kgf·cm, 32 ft·lbf)
35. INSPECT TIMING BELT (See page 14−186)
36. INSTALL TIMING BELT (See page 14−186)
37. INSTALL TIMING BELT TENSIONER ASSY (See page 14−186)
38. INSTALL TIMING BELT GUIDE NO.2 (See page 14−186)
39. INSTALL ENGINE MOUNTING BRACKET RH
Torque: 28 N·m (286 kgf·cm, 21 ft·lbf)
40. INSTALL TIMING BELT NO.2 COVER (See page 14−186)
41. INSTALL TIMING BELT NO.1 COVER (See page 14−186)
42. INSTALL CRANKSHAFT PULLEY (See page 14−186)
43. INSTALL GENERATOR BRACKET NO.2
Torque: 28 N·m (286 kgf·cm, 21 ft·lbf)
44. INSTALL ENGINE MOUNTING STAY NO.2 RH (See page 14−164)
45. INSTALL ENGINE MOVING CONTROL ROD (See page 14−164)

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46. INSPECT VALVE CLEARANCE (See page 14−142)
47. ADJUST VALVE CLEARANCE (See page 14−142)
48. INSTALL VANE PUMP V BELT (See page 14−140)
49. INSTALL V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (See page 14−140)
50. INSPECT DRIVE BELT TENSION (See page 14−136)
51. INSTALL CYLINDER HEAD COVER SUB−ASSY (See page 14−142)
52. INSTALL SPARK PLUG
    Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)
53. INSTALL INTAKE AIR SURGE TANK (See page 14−142)
54. INSTALL AIR CLEANER ASSEMBLY WITH HOSE
55. CONNECT VACUUM HOSES (See page 14−164)
56. INSTALL FRONT SUSPENSION UPPER BRACE CENTER (W/ FRONT SUSPENSION BRACE UPPER CENTER)
    Torque: 80 N·m (816 kgf·cm, 59 ft·lbf)
57. INSTALL V−BANK COVER SUB−ASSY (See page 14−164)
58. INSTALL FRONT WHEEL RH
59. ADD ENGINE COOLANT (See page 16−27)
60. CHECK FOR ENGINE COOLANT LEAKS (See page 16−21)

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CAMSHAFT (LH BANK) (1MZ−FE/3MZ−FE)

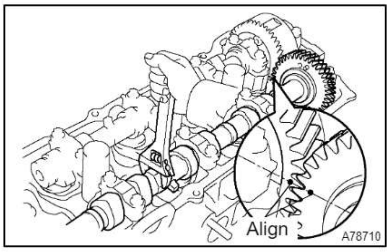
1419K−02

REPLACEMENT

1. DRAIN ENGINE COOLANT (See page 16−27)
2. REMOVE V−BANK COVER SUB−ASSY (See page 14−164)
3. REMOVE RADIATOR HOSE INLET
4. REMOVE SPARK PLUG
5. REMOVE CYLINDER HEAD COVER SUB−ASSY LH (See page 14−142)
6. REMOVE FRONT WHEEL RH
7. REMOVE FRONT FENDER APRON SEAL RH
8. REMOVE V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (See page 14−140)
9. REMOVE VANE PUMP V BELT (See page 14−140)
10. REMOVE ENGINE MOVING CONTROL ROD (See page 14−164)
11. REMOVE ENGINE MOUNTING STAY NO.2 RH (See page 14−164)
12. REMOVE GENERATOR BRACKET NO.2
13. REMOVE CRANKSHAFT PULLEY (See page 14−186)
14. REMOVE TIMING BELT NO.1 COVER (See page 14−186)
15. REMOVE TIMING BELT NO.2 COVER (See page 14−186)
16. REMOVE ENGINE MOUNTING BRACKET RH
17. REMOVE TIMING BELT GUIDE NO.2 (See page 14−186)
18. REMOVE TIMING BELT (See page 14−186)
19. REMOVE TIMING BELT IDLER SUB−ASSY NO.2
20. REMOVE CAMSHAFT TIMING PULLEY (See page 14−186)
21. REMOVE TIMING BELT NO.3 COVER (See page 14−186)
22. REMOVE NO.3 CAMSHAFT SUB−ASSY

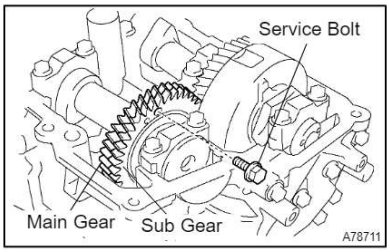
NOTICE:

Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being removed. If the camshaft is not kept level, damage to the cylinder head or to the camshaft may result. To avoid this, the following steps must be carried out.



(a) Align the camshaft drive and driven gear's timing marks (1 dot mark each) by turning the camshaft with a wrench.

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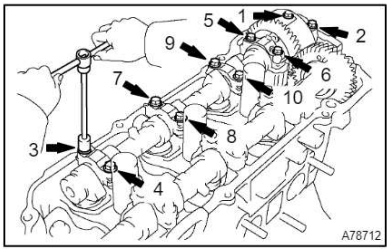


(b) Secure the exhaust camshaft sub gear to the main gear with a service bolt.
Recommended service bolt:

Thread diameter	6 mm
Thread pitch	1 mm
Bolt length	16 to 20 mm

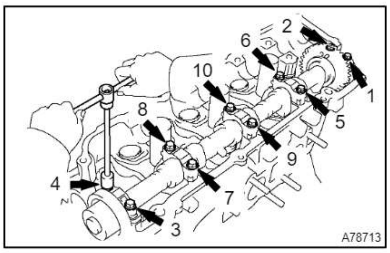
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

HINT:
When removing the camshaft, make certain that the torsional spring force of the sub gear has been eliminated by installation of the service bolt.



(c) Uniformly loosen and remove the 10 bearing cap bolts in the sequence shown in the illustration. Remove the 5 bearing caps and the No. 3 camshaft.

NOTICE:
- **Do not pry out the camshaft.**
- **Be careful not to damage the portion of the cylinder head receiving the shaft thrust.**



23. REMOVE NO.4 CAMSHAFT SUB−ASSY

(a) Uniformly loosen and remove the 10 bearing cap bolts in the sequence shown in the illustration. Remove the 5 bearing caps and the No. 4 camshaft.

NOTICE:
- **Do not pry out the camshaft.**
- **Be careful not to damage the portion of the cylinder head receiving the shaft thrust.**

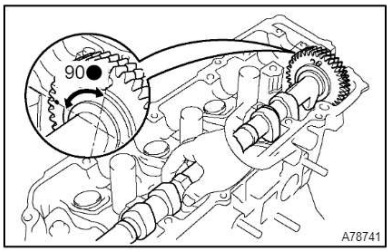
(b) Remove the oil seal from the No. 4 camshaft.

24. REMOVE CAMSHAFT TIMING GEAR ASSY (See page 14−186)
25. REMOVE CAMSHAFT SUB GEAR NO.3 (See page 14−186)
26. INSTALL CAMSHAFT SUB GEAR NO.3 (See page 14−186)
27. INSTALL CAMSHAFT TIMING GEAR ASSY (See page 14−186)

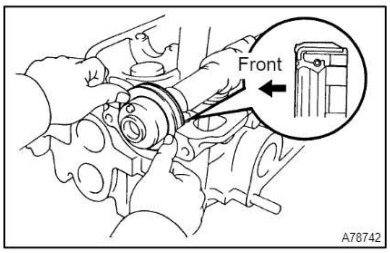
28. INSTALL NO.4 CAMSHAFT SUB−ASSY

NOTICE:
Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being installed. If the camshaft is not kept level, damage to the cylinder head or to the camshaft may result. To avoid this, the following steps must be carried out.

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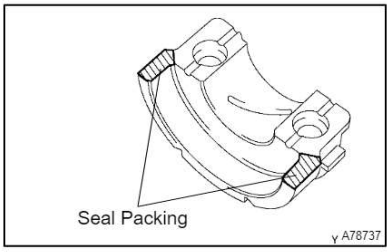


(a) Apply new engine oil to the thrust portion and journal of the camshaft.
(b) Place the No. 4 camshaft at a 90° angle of the timing mark (1 dot marks) on the cylinder head.
(c) Apply MP grease to a new oil seal lip.



(d) Install the oil seal to the camshaft.

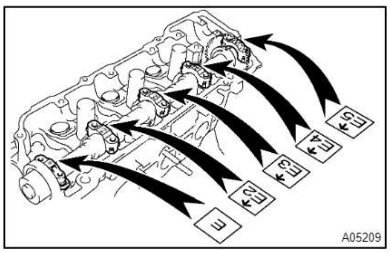
NOTICE:
- **Do not turn over the oil seal lip.**
- **Insert the oil seal until it stops.**

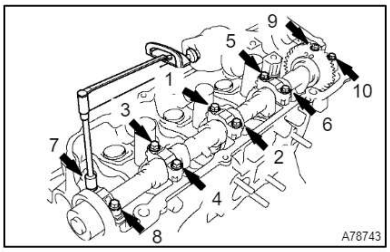


(e) Remove any old packing material from the contact surface.
(f) Apply seal packing to the No. 1 bearing cap as shown in the illustration.
Seal packing: Part No. 08826−00080 or equivalent

NOTICE:
- **Install the No. 1 bearing cap within 5 minutes after applying seal packing.**
- **Do not expose the seal to engine oil for at least 2 hours after installing.**

(g) Install the 5 bearing caps in their proper locations.
(h) Apply a light coat of engine oil on the threads of the bearing cap bolts.





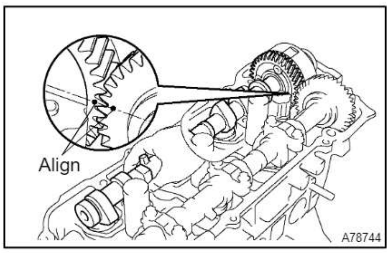
(i) Uniformly install and tighten the 10 bearing cap bolts in the sequence shown in the illustration.
Torque: 16 N·m (163 kgf·cm, 12 ft·lbf)

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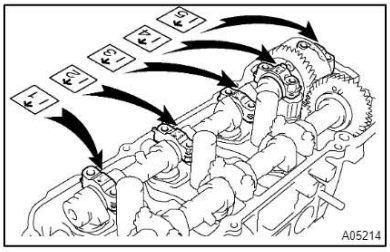
29. INSTALL NO.3 CAMSHAFT SUB−ASSY

NOTICE:

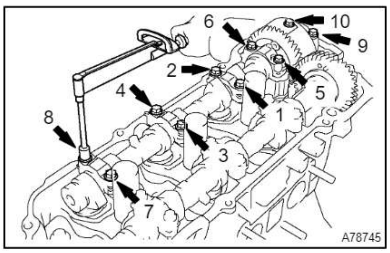
Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being installed. If the camshaft is not kept level, damage to the cylinder head or to the camshaft may result. To avoid this, the following steps must be carried out.



(a) Apply new engine oil to the thrust portion and journal of the camshaft.
(b) Align the camshaft drive and driven gear's timing mark (1 dot mark each).
(c) Place the camshaft on the cylinder head.



(d) Install the 5 bearing caps in their proper locations.
(e) Apply a light coat of engine oil on the threads of the bearing cap bolts.



(f) Uniformly install and tighten the 10 bearing cap bolts in the sequence shown in the illustration.
Torque: 16 N·m (163 kgf·cm, 12 ft·lbf)
(g) Remove the service bolt.

30. INSTALL TIMING BELT NO.3 COVER (See page 14−186)
31. INSTALL CAMSHAFT TIMING PULLEY (See page 14−186)
32. INSTALL TIMING BELT IDLER SUB−ASSY NO.2
Torque: 43 N·m (438 kgf·cm, 32 ft·lbf)
33. INSPECT TIMING BELT (See page 14−186)
34. INSTALL TIMING BELT (See page 14−186)
35. INSTALL TIMING BELT TENSIONER ASSY (See page 14−186)
36. INSTALL TIMING BELT GUIDE NO.2 (See page 14−186)
37. INSTALL ENGINE MOUNTING BRACKET RH
Torque: 28 N·m (286 kgf·cm, 21 ft·lbf)

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38. INSTALL TIMING BELT NO.2 COVER (See page 14−186)
39. INSTALL TIMING BELT NO.1 COVER (See page 14−186)
40. INSTALL CRANKSHAFT PULLEY (See page 14−186)
41. INSTALL GENERATOR BRACKET NO.2
    Torque: 28 N·m (286 kgf·cm, 21 ft·lbf)
42. INSTALL ENGINE MOUNTING STAY NO.2 RH (See page 14−164)
43. INSTALL ENGINE MOVING CONTROL ROD (See page 14−164)
44. INSPECT VALVE CLEARANCE (See page 14−142)
45. ADJUST VALVE CLEARANCE (See page 14−142)
46. INSTALL VANE PUMP V BELT (See page 14−140)
47. INSTALL V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (See page 14−140)
48. INSPECT DRIVE BELT TENSION (See page 14−136)
49. INSTALL CYLINDER HEAD COVER SUB−ASSY LH (See page 14−142)
50. INSTALL SPARK PLUG
    Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)
51. INSTALL V−BANK COVER SUB−ASSY (See page 14−164)
52. INSTALL FRONT WHEEL RH
    Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)
53. ADD ENGINE COOLANT (See page 16−27)
54. CHECK FOR ENGINE COOLANT LEAKS (See page 16−21)

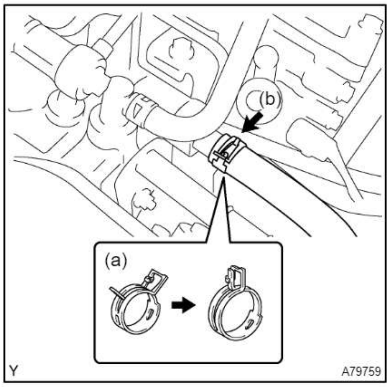
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CYLINDER HEAD GASKET (1MZ−FE/3MZ−FE)

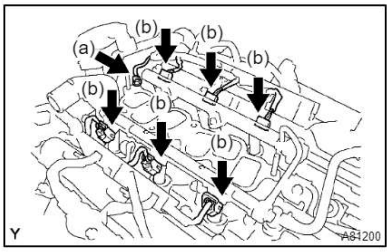
1411L−02

REPLACEMENT

1. WORK FOR PREVENTING GASOLINE FROM SPILLING OUT (See page 11−26)
2. DRAIN ENGINE COOLANT (See page 16−27)
3. DRAIN ENGINE OIL
4. REMOVE EXHAUST PIPE NO.1 SUPPORT BRACKET (See page 15−7)
5. REMOVE EXHAUST PIPE ASSY FRONT (See page 15−7)
6. REMOVE EXHAUST MANIFOLD SUB−ASSY RH (See page 14−164)
7. REMOVE V−BANK COVER SUB−ASSY (See page 14−164)
8. REMOVE FRONT SUSPENSION UPPER BRACE CENTER (W/ FRONT SUSPENSION BRACE UPPER CENTER)
9. REMOVE AIR CLEANER ASSEMBLY WITH HOSE
10. REMOVE INTAKE AIR SURGE TANK (See page 14−142)
11. DISCONNECT FUEL PIPE SUB−ASSY NO.1 (See page 11−26)

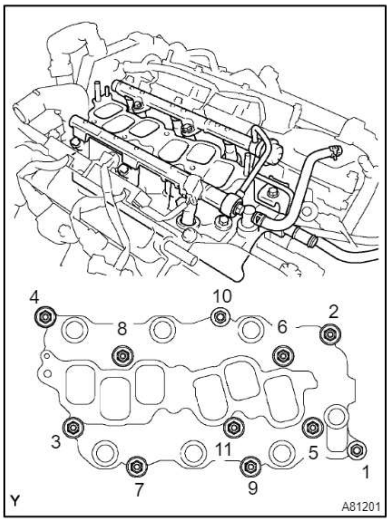


12. DISCONNECT HEATER INLET WATER HOSE
(a) Lock the hose clamp as shown in the illustration.
(b) Disconnect the heater inlet water hose.



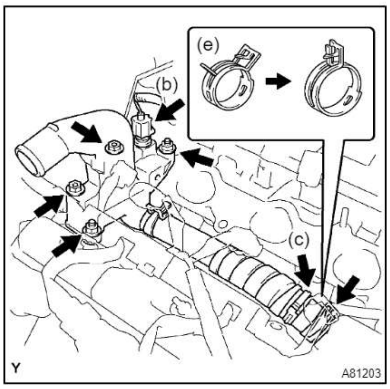
13. REMOVE INTAKE MANIFOLD
(a) Remove the nut and disconnect the ground cable.
(b) Disconnect the 6 fuel injector connectors.

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(c) Uniformly loosen and remove the intake manifold's 9 bolts and 2 nuts in the sequence shown in the illustration. Remove the intake manifold.

14. DISCONNECT RADIATOR HOSE INLET



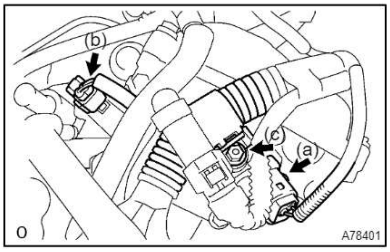
15. REMOVE WATER OUTLET

(a) Disconnect the radiator hose inlet.
(b) Disconnect the engine coolant temperature sensor connector.
(c) Remove the clamp.
(d) Remove the 2 bolts, 2 nuts and 2 washers.
(e) Lock the hose clamp as shown in the illustration and remove the water outlet together with the water by−pass hose No. 1.
(f) Remove the 2 gaskets from the 2 cylinder heads.

16. REMOVE FRONT WHEEL RH
17. REMOVE FRONT FENDER APRON SEAL RH
18. REMOVE V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (See page 14−140)
19. REMOVE VANE PUMP V BELT (See page 14−140)
20. REMOVE ENGINE MOVING CONTROL ROD (See page 14−164)
21. REMOVE ENGINE MOUNTING STAY NO.2 RH (See page 14−164)
22. REMOVE GENERATOR BRACKET NO.2
23. REMOVE CRANKSHAFT PULLEY (See page 14−186)
24. REMOVE TIMING BELT NO.1 COVER (See page 14−186)

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25. **REMOVE TIMING BELT NO.2 COVER (See page 14−186)**
26. **REMOVE ENGINE MOUNTING BRACKET RH**
27. **REMOVE TIMING BELT GUIDE NO.2**
28. **REMOVE TIMING BELT (See page 14−186)**
29. **REMOVE TIMING BELT IDLER SUB−ASSY NO.2**
30. **REMOVE CAMSHAFT TIMING PULLEY (See page 14−186)**
31. **REMOVE TIMING BELT NO.3 COVER (See page 14−186)**
32. **REMOVE VANE PUMP ASSY (See page 51−17)**
33. **REMOVE IGNITION COIL ASSY**
34. **REMOVE CYLINDER HEAD COVER SUB−ASSY (See page 14−186)**
35. **REMOVE CAMSHAFT (See page 14−186)**
36. **REMOVE NO.2 CAMSHAFT (See page 14−186)**

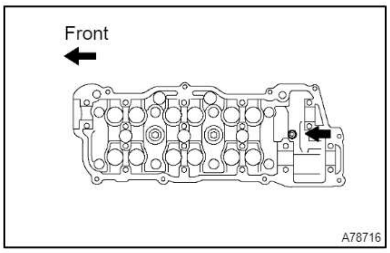


37. **REMOVE CYLINDER HEAD SUB−ASSY**

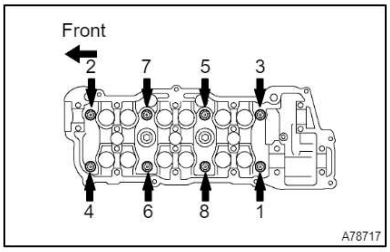
(a) Disconnect the VVT sensor connector.

(b) Disconnect the camshaft timing oil control valve connector.

(c) Remove the nut and disconnect the engine wire harness clamp.



(d) Using a socket hexagon wrench 8, remove the hexagon bolt.



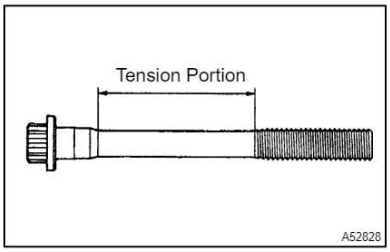
(e) Uniformly loosen the 8 cylinder head bolts in the sequence shown in the illustration. Remove the 8 cylinder head bolts and plate washers.

NOTICE:

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

38. **REMOVE CYLINDER HEAD GASKET**

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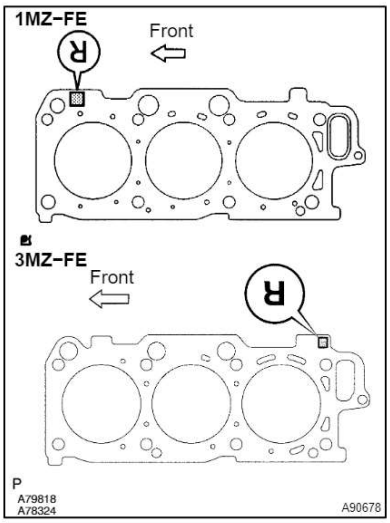


39. INSPECT CYLINDER HEAD SET BOLT

(a) Using a vernier caliper, measure the tension portion diameter of the bolt.

Specified outside diameter:
8.75 to 9.05 mm (0.3445 to 0.3563 in.)

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



40. INSTALL CYLINDER HEAD GASKET

(a) Place a new cylinder head gasket on the cylinder block with the R mark upside down, as shown in the illustration.

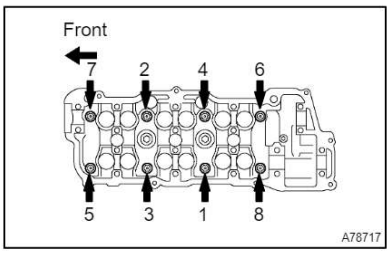
NOTICE:

- **Remove any oil from the contact surface.**
- **Be careful of the installation direction.**
- **To avoid damage to the gasket, place the cylinder head on the gasket carefully.**

41. INSTALL CYLINDER HEAD SUB−ASSY

NOTICE:

The cylinder head bolts are tightened in 2 successive steps.

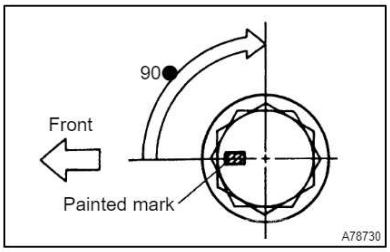


(a) Apply a light coat of engine oil on the threads of the cylinder head bolts.

(b) Install the plate washers to the cylinder head bolts.

(c) Uniformly install and tighten the 8 cylinder head bolts in the sequence shown in the illustration.

Torque: 54 N·m (550 kgf·cm, 40 ft·lbf)

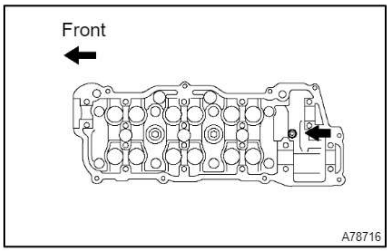


(d) Mark the front side of each cylinder head bolt head with paint as shown in the illustration.

(e) Retighten the cylinder head bolts by 90° in the same sequence as step (c).

(f) Check that each painted mark is now at a 90° angle to the front.

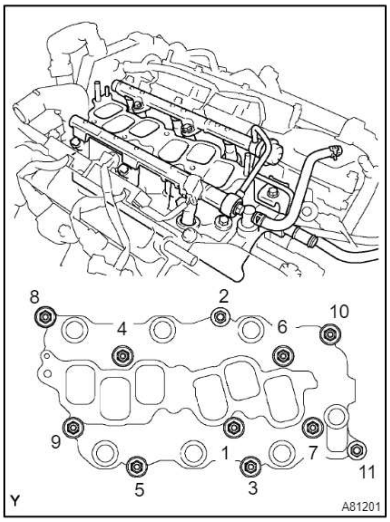
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(g) Using a socket hexagon wrench 8, install the hexagon bolt.
Torque: 19 N·m (189 kgf·cm, 14 ft·lbf)
(h) Connect the engine wire harness clamp with the nut.
Torque: 8.4 N·m (85 kgf·cm, 74 in.·lbf)

42. INSTALL NO.2 CAMSHAFT (See page 14−186)
43. INSTALL CAMSHAFT (See page 14−186)
44. INSTALL CYLINDER HEAD COVER SUB−ASSY (See page 14−186)
45. INSTALL IGNITION COIL ASSY
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)
46. INSTALL VANE PUMP ASSY (See page 51−17)
47. INSTALL TIMING BELT NO.3 COVER (See page 14−186)
48. INSTALL CAMSHAFT TIMING PULLEY (See page 14−186)
49. INSTALL TIMING BELT IDLER SUB−ASSY NO.2
Torque: 43 N·m (438 kgf·cm, 32 ft·lbf)
50. INSPECT TIMING BELT (See page 14−186)
51. INSTALL TIMING BELT (See page 14−186)
52. INSTALL TIMING BELT TENSIONER ASSY (See page 14−186)
53. INSTALL TIMING BELT GUIDE NO.2 (See page 14−186)
54. INSTALL ENGINE MOUNTING BRACKET RH
Torque: 28 N·m (286 kgf·cm, 21 ft·lbf)
55. INSTALL TIMING BELT NO.2 COVER (See page 14−186)
56. INSTALL TIMING BELT NO.1 COVER (See page 14−186)
57. INSTALL CRANKSHAFT PULLEY (See page 14−186)
58. INSTALL GENERATOR BRACKET NO.2
Torque: 28 N·m (286 kgf·cm, 21 ft·lbf)
59. INSTALL ENGINE MOUNTING STAY NO.2 RH (See page 14−164)
60. INSTALL ENGINE MOVING CONTROL ROD (See page 14−164)
61. INSTALL VANE PUMP V BELT (See page 14−140)
62. INSTALL V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (See page 14−140)
63. INSPECT DRIVE BELT TENSION (See page 14−136)
64. INSTALL WATER OUTLET
(a) Install 2 new gaskets to the 2 cylinder heads.
(b) Install the water outlet together the with water by−pass hose No. 1 and unlock the hose clamp.
(c) Tighten the 2 bolts, 2 nuts and 2 washers.
Torque: 15 N·m (153 kgf·cm, 11 ft·lbf)
(d) Install the clamp.
(e) Connect the engine coolant temperature sensor connector.
(f) Connect the radiator hose inlet.

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65. INSTALL INTAKE MANIFOLD

(a) Install the intake manifold with the 9 bolts, 2 nuts and 2 washers. Uniformly tighten the bolts and nuts in the sequence shown in the illustration.
Torque: 15 N·m (153 kgf·cm, 11 ft·lbf)

(b) Retighten the water outlet mounting bolts and nuts.
Torque: 15 N·m (153 kgf·cm, 11 ft·lbf)

(c) Install the ground cable with the nut.
Torque: 8.4 N·m (86 kgf·cm, 74 in.·lbf)

(d) Connect the heater inlet water hose.

66. CONNECT FUEL PIPE SUB−ASSY NO.1 (See page 11−26)
67. INSTALL INTAKE AIR SURGE TANK (See page 14−142)
68. INSTALL AIR CLEANER ASSEMBLY WITH HOSE
69. CONNECT VACUUM HOSES (See page 14−164)
70. INSTALL FRONT SUSPENSION UPPER BRACE CENTER (W/ FRONT SUSPENSION BRACE UPPER CENTER)
Torque: 80 N·m (816 kgf·cm, 59 ft·lbf)
71. INSTALL V−BANK COVER SUB−ASSY (See page 14−164)
72. INSTALL EXHAUST MANIFOLD SUB−ASSY RH (See page 14−164)
73. INSTALL EXHAUST PIPE ASSY FRONT (See page 15−7)
74. INSTALL EXHAUST PIPE NO.1 SUPPORT BRACKET (See page 15−7)
75. INSTALL FRONT WHEEL RH
76. ADD ENGINE OIL
77. ADD ENGINE COOLANT (See page 16−27)
78. CHECK FOR ENGINE OIL LEAKS
79. CHECK FOR ENGINE COOLANT LEAKS (See page 16−21)
80. CHECK FOR FUEL LEAKS (See page 11−29)
81. CHECK FOR EXHAUST GAS LEAKS
82. INSPECT IGNITION TIMING (See page 14−136)
83. INSPECT ENGINE IDLE SPEED (See page 14−136)
84. INSPECT COMPRESSION (See page 14−136)
85. INSPECT CO/HC (See page 14−136)

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CYLINDER HEAD GASKET NO.2 (1MZ−FE/3MZ−FE)

1418M−03

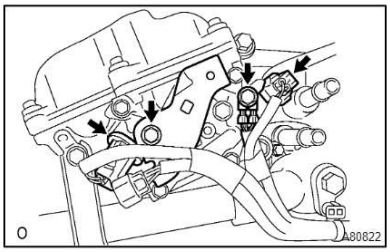
REPLACEMENT

1. WORK FOR PREVENTING GASOLINE FROM SPILLING OUT (See page 11−26)
2. DRAIN ENGINE COOLANT (See page 16−27)
3. DRAIN ENGINE OIL
4. REMOVE MANIFOLD STAY NO.2
5. DISCONNECT EXHAUST MANIFOLD CONVERTER SUB−ASSY NO.2

(a) Remove the 2 nuts, and disconnect the exhaust manifold converter from the front exhaust pipe.

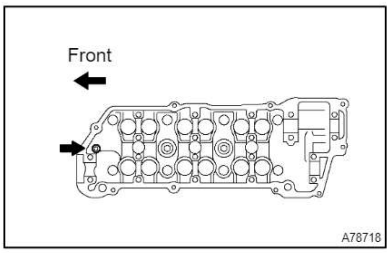
6. REMOVE V−BANK COVER SUB−ASSY (See page 14−164)
7. REMOVE FRONT SUSPENSION UPPER BRACE CENTER (W/ FRONT SUSPENSION BRACE UPPER CENTER)
8. REMOVE AIR CLEANER ASSEMBLY WITH HOSE
9. REMOVE INTAKE AIR SURGE TANK (See page 14−142)
10. DISCONNECT FUEL PIPE SUB−ASSY NO.1 (See page 11−38)
11. DISCONNECT HEATER INLET WATER HOSE
12. REMOVE INTAKE MANIFOLD (See page 14−239)
13. REMOVE RADIATOR HOSE INLET
14. REMOVE WATER OUTLET (See page 14−239)
15. DISCONNECT RADIATOR HOSE OUTLET
16. REMOVE WATER INLET PIPE
17. REMOVE OIL LEVEL GAGE SUB−ASSY
18. REMOVE OIL LEVEL GAGE GUIDE
19. REMOVE FRONT WHEEL RH
20. REMOVE FRONT FENDER APRON SEAL RH
21. REMOVE V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (See page 14−140)
22. REMOVE VANE PUMP V BELT (See page 14−140)
23. REMOVE ENGINE MOVING CONTROL ROD (See page 14−164)
24. REMOVE ENGINE MOUNTING STAY NO.2 RH (See page 14−164)
25. REMOVE GENERATOR BRACKET NO.2
26. REMOVE CRANKSHAFT PULLEY (See page 14−186)
27. REMOVE TIMING BELT NO.1 COVER (See page 14−186)
28. REMOVE TIMING BELT NO.2 COVER (See page 14−186)
29. REMOVE ENGINE MOUNTING BRACKET RH
30. REMOVE TIMING BELT GUIDE NO.2 (See page 14−186)
31. REMOVE TIMING BELT (See page 14−186)
32. REMOVE TIMING BELT IDLER SUB−ASSY NO.2
33. REMOVE CAMSHAFT TIMING PULLEY (See page 14−186)
34. REMOVE TIMING BELT NO.3 COVER (See page 14−186)
35. REMOVE IGNITION COIL ASSY
36. REMOVE CYLINDER HEAD COVER SUB−ASSY LH (See page 14−186)
37. REMOVE NO.3 CAMSHAFT SUB−ASSY (See page 14−186)
38. REMOVE NO.4 CAMSHAFT SUB−ASSY (See page 14−186)

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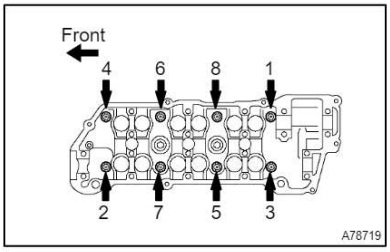


39. REMOVE CYLINDER HEAD LH

(a) Disconnect the VVT sensor connector.
(b) Disconnect the camshaft timing oil control valve connector.
(c) Remove the bolt and disconnect the ground cable.
(d) Remove the bolt and the wire harness clamp bracket.



(e) Using a socket hexagon wrench 8, remove the hexagon bolt.



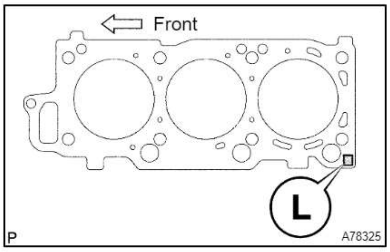
(f) Uniformly loosen the 8 cylinder head bolts in the sequence shown in the illustration. Remove the 8 cylinder head bolts and plate washers.

NOTICE:

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

40. REMOVE CYLINDER HEAD GASKET NO.2

41. INSPECT CYLINDER HEAD SET BOLT (See page 14−186)



42. INSTALL CYLINDER HEAD GASKET NO.2

(a) Place a new cylinder head gasket on the cylinder block with the L mark as shown in the illustration.

NOTICE:

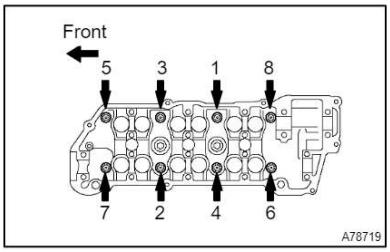
- **Remove any oil from the contact surface.**
- **Be careful of the installation direction.**
- **To avoid damage to the gasket, place the cylinder head on the gasket carefully.**

43. INSTALL CYLINDER HEAD LH

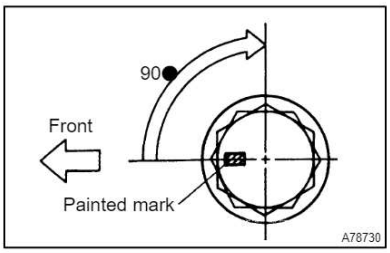
NOTICE:

The cylinder head bolts are tightened in 2 successive steps.

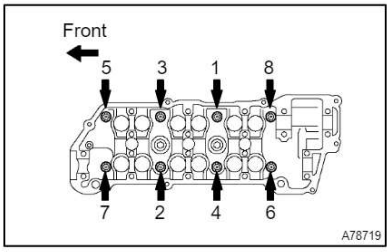
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(a) Apply a light coat of engine oil on the threads of the cylinder head bolts.
(b) Install the plate washer to the cylinder head bolt.
(c) Uniformly install and tighten the 8 cylinder head bolts in the sequence shown in the illustration.
Torque: 54 N·m (550 kgf·cm, 40 ft·lbf)



(d) Mark the front side of each cylinder head bolt head with paint as shown in the illustration.
(e) Retighten the cylinder head bolts by 90° in the same sequence as step (c).
(f) Check that each painted mark is now at a 90° angle to the front.



(g) Using a socket hexagon wrench 8, install the hexagon bolt.
Torque: 19 N·m (189 kgf·cm, 14 ft·lbf)
(h) Install the wire harness clamp bracket with the bolt.
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)
(i) Connect the ground cable with the bolt.
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

44. INSTALL NO.4 CAMSHAFT SUB−ASSY (See page 14−186)
45. INSTALL NO.3 CAMSHAFT SUB−ASSY (See page 14−186)
46. INSTALL CYLINDER HEAD COVER SUB−ASSY LH (See page 14−186)
47. INSTALL IGNITION COIL ASSY
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)
48. INSTALL TIMING BELT NO.3 COVER (See page 14−186)
49. INSTALL CAMSHAFT TIMING PULLEY (See page 14−186)
50. INSTALL TIMING BELT IDLER SUB−ASSY NO.2
Torque: 43 N·m (438 kgf·cm, 32 ft·lbf)
51. INSPECT TIMING BELT (See page 14−186)
52. INSTALL TIMING BELT (See page 14−186)
53. INSTALL TIMING BELT TENSIONER ASSY (See page 14−186)
54. INSTALL TIMING BELT GUIDE NO.2 (See page 14−186)
55. INSTALL ENGINE MOUNTING BRACKET RH
Torque: 28 N·m (286 kgf·cm, 21 ft·lbf)
56. INSTALL TIMING BELT NO.2 COVER (See page 14−186)
57. INSTALL TIMING BELT NO.1 COVER (See page 14−186)
58. INSTALL CRANKSHAFT PULLEY (See page 14−186)
59. INSTALL GENERATOR BRACKET NO.2
Torque: 28 N·m (286 kgf·cm, 21 ft·lbf)

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60. **INSTALL ENGINE MOUNTING STAY NO.2 RH (See page 14−164)**
61. **INSTALL ENGINE MOVING CONTROL ROD (See page 14−164)**
62. **INSTALL VANE PUMP V BELT (See page 14−140)**
63. **INSTALL V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (See page 14−140)**
64. **INSPECT DRIVE BELT TENSION (See page 14−136)**
65. **INSTALL OIL LEVEL GAGE GUIDE (See page 17−41)**
66. **INSTALL WATER INLET PIPE (See page 16−32)**
67. **INSTALL WATER OUTLET (See page 14−239)**
68. **INSTALL INTAKE MANIFOLD (See page 14−164)**
69. **CONNECT FUEL PIPE SUB−ASSY NO.1 (See page 11−38)**
70. **INSTALL INTAKE AIR SURGE TANK (See page 14−142)**
71. **INSTALL AIR CLEANER ASSEMBLY WITH HOSE**
72. **CONNECT VACUUM HOSES (See page 14−164)**
73. **INSTALL FRONT SUSPENSION UPPER BRACE CENTER (W/ FRONT SUSPENSION BRACE UPPER CENTER)**
    Torque: 80 N·m (816 kgf·cm, 59 ft·lbf)
74. **INSTALL V−BANK COVER SUB−ASSY (See page 14−164)**
75. **INSTALL EXHAUST MANIFOLD CONVERTER SUB−ASSY NO.2**

(a) Install a new gasket and the exhaust manifold converter to the front exhaust pipe.
Torque: 62 N·m (633 kgf·cm, 46 ft·lbf)

76. **INSTALL MANIFOLD STAY NO.2 (See page 14−164)**
77. **INSTALL FRONT WHEEL RH**
78. **ADD ENGINE OIL**
79. **ADD ENGINE COOLANT (See page 16−27)**
80. **CHECK FOR ENGINE OIL LEAKS**
81. **CHECK FOR ENGINE COOLANT LEAKS (See page 16−21)**
82. **CHECK FOR FUEL LEAKS**
83. **CHECK FOR EXHAUST GAS LEAKS**
84. **INSPECT IGNITION TIMING (See page 14−136)**
85. **INSPECT ENGINE IDLE SPEED (See page 14−136)**
86. **INSPECT COMPRESSION (See page 14−136)**
87. **INSPECT CO/HC (See page 14−136)**

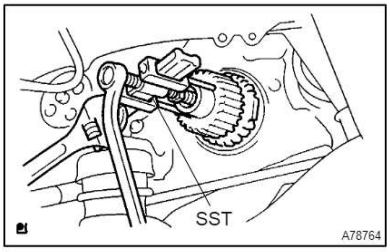
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OIL PUMP SEAL (1MZ−FE/3MZ−FE)

141IN−02

REPLACEMENT

1. REMOVE FRONT WHEEL RH
2. REMOVE FRONT FENDER APRON SEAL RH
3. REMOVE V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (See page 14−140)
4. REMOVE VANE PUMP V BELT (See page 14−140)
5. REMOVE ENGINE MOVING CONTROL ROD (See page 14−164)
6. REMOVE ENGINE MOUNTING STAY NO.2 RH (See page 14−164)
7. REMOVE GENERATOR BRACKET NO.2
8. REMOVE CRANKSHAFT PULLEY (See page 14−186)
9. REMOVE TIMING BELT NO.1 COVER (See page 14−186)
10. REMOVE TIMING BELT NO.2 COVER (See page 14−186)
11. REMOVE ENGINE MOUNTING BRACKET RH
12. REMOVE TIMING BELT GUIDE NO.2
13. REMOVE TIMING BELT (See page 14−186)



14. REMOVE CRANKSHAFT TIMING PULLEY

(a) Remove the bolt and the timing belt plate.

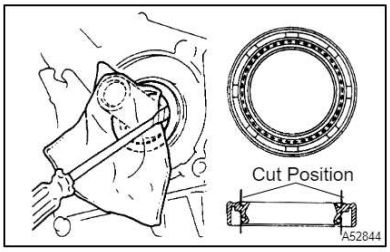
(b) Install the pulley bolt to the crankshaft.

(c) Using SST, remove the crankshaft timing pulley.

SST 09950−50013 (09951−05010, 09952−05010, 09953−05020, 09954−05010)

NOTICE:

- **Do not scratch the sensor part of the crankshaft timing pulley.**
- **Before using SST, apply lubricating oil on the threads and tip of the center bolt 150.**



15. REMOVE OIL PUMP SEAL

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

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

NOTICE:

After the removal, check the crankshaft for damage. If it is damaged, smooth the surface with 400−grit sandpaper.

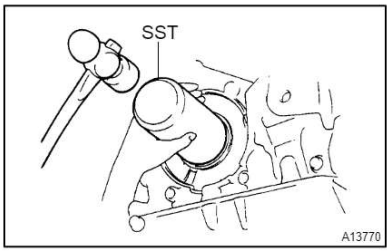
16. INSTALL OIL PUMP SEAL

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

NOTICE:

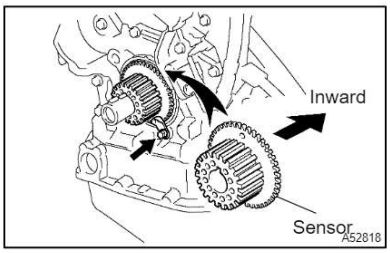
Keep the lip free of foreign matter.

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(b) Using SST and a hammer, tap in the oil seal until its surface is flush with the oil pump edge.
SST 09223−00010

NOTICE:
- **Be careful not to tap the oil seal slantingly.**
- **Wipe off extra grease on the crankshaft.**



17. INSTALL CRANKSHAFT TIMING PULLEY

(a) Align the keyway of the pulley with the key located on the crankshaft and slide the pulley into place.

NOTICE:
Do not scratch the sensor part of the crankshaft timing pulley.

(b) Install the timing belt plate with the bolt.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

18. INSPECT TIMING BELT (See page 14−186)
19. INSTALL TIMING BELT (See page 14−186)
20. INSTALL TIMING BELT GUIDE NO.2 (See page 14−186)
21. INSTALL ENGINE MOUNTING BRACKET RH
Torque: 28 N·m (286 kgf·cm, 21 ft·lbf)
22. INSTALL TIMING BELT NO.2 COVER (See page 14−186)
23. INSTALL TIMING BELT NO.1 COVER (See page 14−186)
24. INSTALL CRANKSHAFT PULLEY (See page 14−186)
25. INSTALL GENERATOR BRACKET NO.2
Torque: 28 N·m (286 kgf·cm, 21 ft·lbf)
26. INSTALL ENGINE MOUNTING STAY NO.2 RH (See page 14−164)
27. INSTALL ENGINE MOVING CONTROL ROD (See page 14−164)
28. INSTALL VANE PUMP V BELT (See page 14−140)
29. INSTALL V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (See page 14−140)
30. INSPECT DRIVE BELT TENSION (See page 14−136)
31. INSTALL FRONT WHEEL RH
32. CHECK FOR ENGINE OIL LEAKS

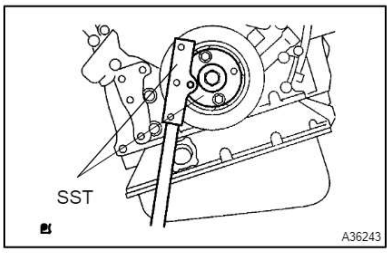
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ENGINE REAR OIL SEAL (1MZ−FE/3MZ−FE)

1405R−09

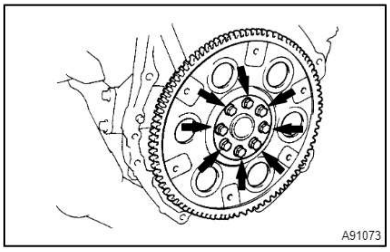
REPLACEMENT

1. REMOVE AUTOMATIC TRANSAXLE ASSY (See page 40−9)

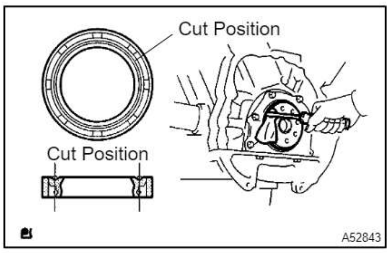


2. REMOVE DRIVE PLATE & RING GEAR SUB−ASSY

(a) Using SST, hold the crankshaft.
SST 09213−54015 (91651−60855), 09330−00021



(b) Remove the 8 bolts, the rear spacer, the drive plate and the front spacer.

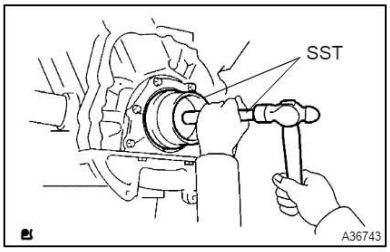


3. REMOVE ENGINE REAR OIL SEAL

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

NOTICE:

After the removal, check if the crankshaft is not damaged. If it is damaged, smooth the surface with 400−grit sandpaper.



4. INSTALL ENGINE REAR OIL SEAL

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

NOTICE:

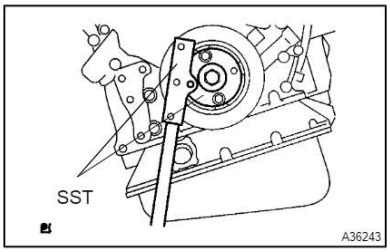
Keep the lip off foreign materials.

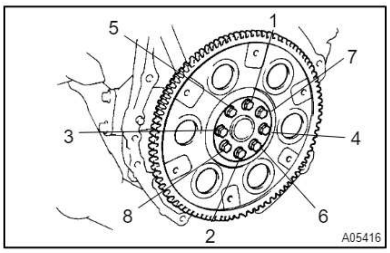
(b) Using SST and a hammer, tap in the oil seal until its surface is flush with the rear oil seal retainer edge.
SST 09223−15030, 09950−70010 (09951−07100)

NOTICE:

- **Be careful not to tap the oil seal at an angle.**
- **Wipe off extra grease from the crankshaft.**

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5. INSTALL DRIVE PLATE & RING GEAR SUB−ASSY

(a) Using SST, hold the crankshaft.
SST 09213−54015 (91651−60855), 09330−00021

(b) Clean the bolts and bolt holes.

(c) Apply adhesive to 2 or 3 threads of the bolts.
Adhesive:
Part No. 08833−00070, THREE BOND 1324 or equivalent

(d) Install the front spacer, the drive plate and the rear spacer on the crankshaft.

(e) Uniformly install and tighten the 8 bolts in the sequence shown in the illustration.
Torque: 83 N·m (846 kgf·cm, 61 ft·lbf)

NOTICE:
Do not start the engine for at least an hour after installing.

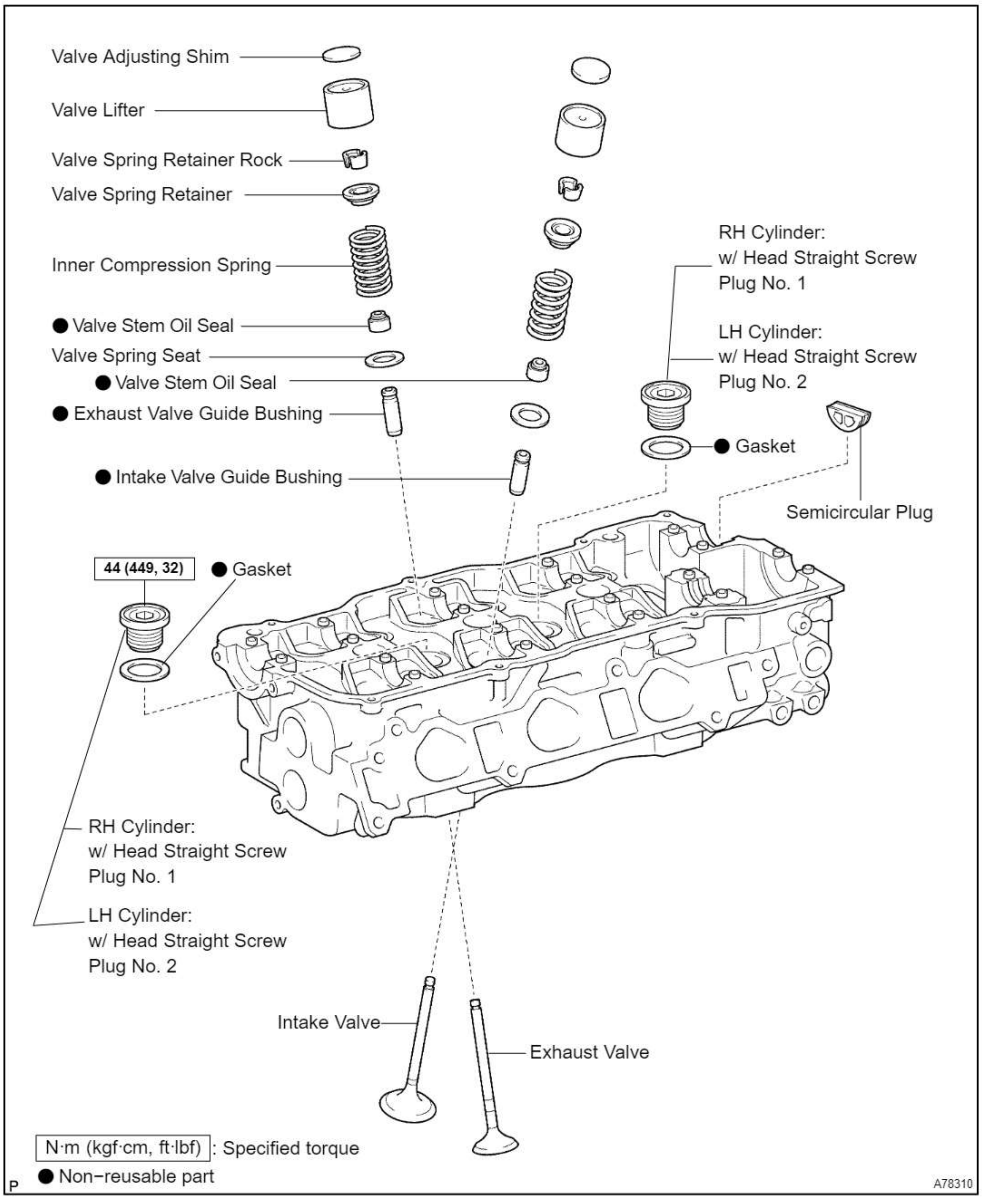
6. INSTALL AUTOMATIC TRANSAXLE ASSY (See page 40−9)

WhereEverybodyKnowsYourName

CYLINDER HEAD ASSY (1MZ−FE/3MZ−FE)

COMPONENTS

141IO−02



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141IP−02

OVERHAUL

1. REMOVE W/HEAD STRAIGHT SCREW PLUG NO.1 (RH CYLINDER)

(a) Using a straight hexagon wrench 14, remove the 2 screw plugs.

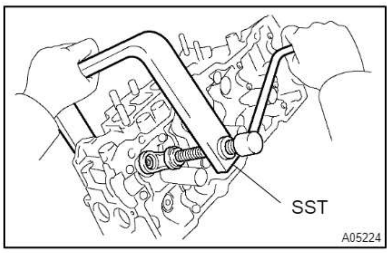
2. REMOVE W/HEAD STRAIGHT SCREW PLUG NO.2 (LH CYLINDER)

(a) Using a straight hexagon wrench 14, remove the 2 screw plugs.

3. REMOVE VALVE LIFTER

HINT:

Store the lifters in correct order so that they can be returned to the original locations when reassembling.

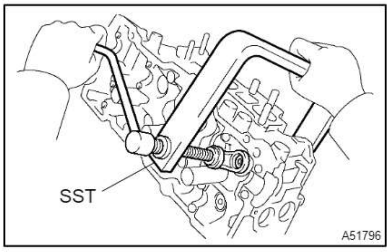


4. REMOVE INTAKE VALVE

(a) Using SST, compress the valve spring and remove the 2 keepers, retainer, spring and valve.
SST 09202−70020 (09202−00010)

HINT:

Store the valves, valve springs, spring seats and spring retainers in correct order so that they can be returned to the original locations when reassembling.



5. REMOVE EXHAUST VALVE

(a) Using SST, compress the valve spring and remove the 2 keepers, retainer, spring and valve.
SST 09202−70020 (09202−00010)

HINT:

Store the valves, valve springs, spring seats and spring retainers in correct order so that they can be returned to the original locations when reassembling.

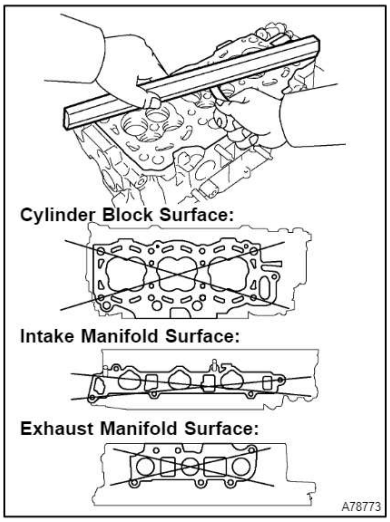
6. REMOVE VALVE STEM OIL O SEAL OR RING

(a) Using needle−nose pliers, remove the oil seal.

7. REMOVE VALVE SPRING SEAT

8. REMOVE SEMICIRCULAR PLUG

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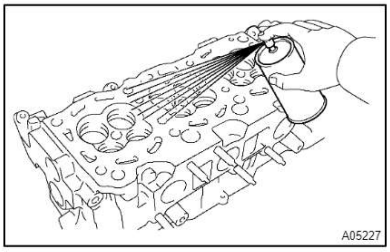
9. INSPECT CYLINDER HEAD FOR FLATNESS

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

Maximum warpage:

Item	Specified Condition
Cylinder block surface	0.05 mm (0.0020 in.)
Intake manifold surface	0.10 mm (0.0039 in.)
Exhaust manifold surface	0.10 mm (0.0039 in.)

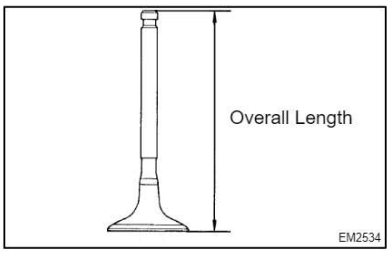
If the warpage is greater than the maximum, replace the cylinder head.



10. INSPECT CYLINDER HEAD FOR CRACKS

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

If cracked, replace the cylinder head.

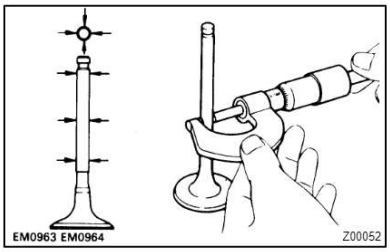


11. INSPECT INTAKE VALVE

(a) Check the valve overall length.

Specified overall length:
94.95 − 95.45 mm (3.7382 − 3.7579 in.)

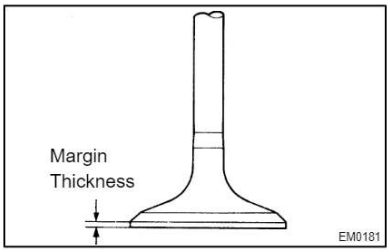
If the overall length is less than the minimum, replace the valve.



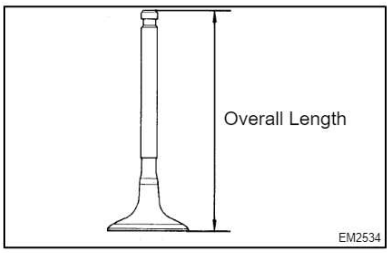
(b) Using a micrometer, measure the diameter of the valve stem.

Valve stem diameter:
5.470 to 5.485 mm (0.2154 to 0.2159 in.)

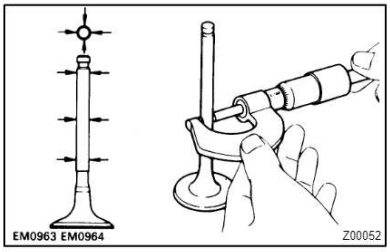
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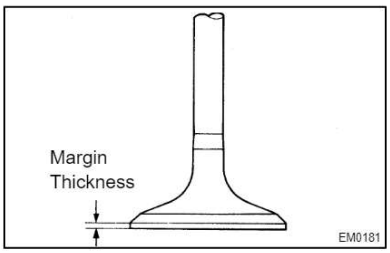
(c) Check the valve head margin thickness.
Specified margin thickness:
0.5 − 1.0 mm (0.020 − 0.039 in.)
If the margin thickness is less than the minimum, replace the valve.



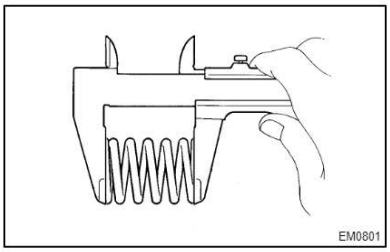
12. INSPECT EXHAUST VALVE
(a) Check the valve overall length.
Specified overall length:
94.90 − 95.40 mm (3.7362 − 3.7559 in.)
If the overall length is less than the minimum, replace the valve.



(b) Using a micrometer, measure the diameter of the valve stem.
Valve stem diameter:
5.465 to 5.480 mm (0.2152 to 0.2157 in.)

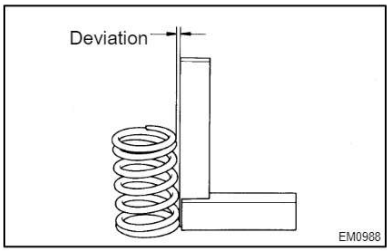


(c) Check the valve head margin thickness.
Specified margin thickness:
0.5 − 1.0 mm (0.020 − 0.039 in.)
If the margin thickness is less than the minimum, replace the valve.



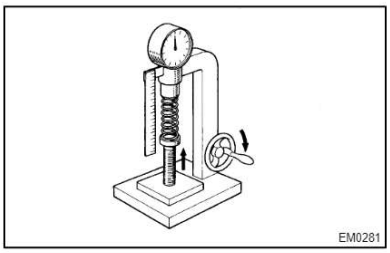
13. INSPECT INNER COMPRESSION SPRING
(a) Using a vernier caliper, measure the free length of the valve spring.
Free length: 45.50 mm (1.7913 in.)
If the free length is not as specified, replace the valve spring.

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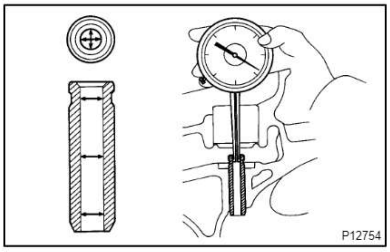
(b) Using steel squares, measure the deviation of the valve spring.
Maximum deviation: 2.0 mm (0.079 in.)

If the deviation is greater than the maximum, replace the valve spring.



(c) Using a spring tester, measure the tension of the valve spring at the specified installed length.
Installed tension:
86 to 206 N (19.0 to 21.0 kgf, 41.9 to 46.3 lbf)
at 33.8 mm (1.331 in.)

If the installed tension is not as specified, replace the valve spring.



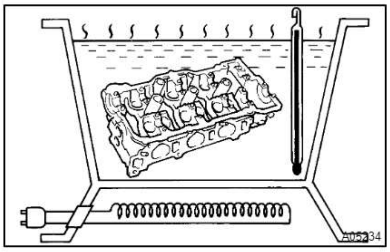
14. INSPECT VALVE GUIDE BUSHING OIL CLEARANCE

(a) Using a caliper gauge, measure the inside diameter of the guide bushing.
Bushing inside diameter:
5.510 to 5.530 mm (0.2169 to 0.2177 in.)

(b) Subtract the valve stem diameter measurement from the guide bushing inside diameter measurement.
Specified oil clearance:

Item	Specified Condition
Intake	0.025 to 0.080 mm (0.0010 to 0.0031 in.)
Exhaust	0.030 to 0.100 mm (0.0012 to 0.0039 in.)

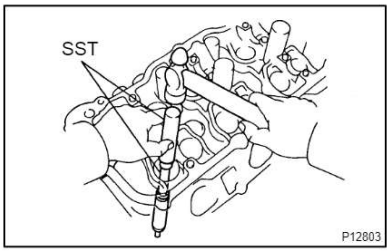
If the clearance is greater than the maximum, replace the valve and guide bushing.



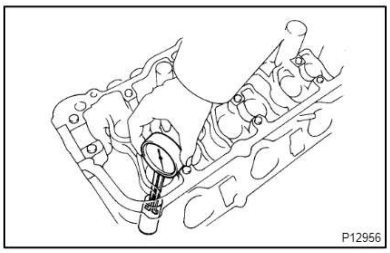
15. REMOVE VALVE GUIDE BUSHING

(a) Heat the cylinder head to approximately 80 to 100 ℃ (176 to 212 ℉).

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(b) Using SST and a hammer, tap out the guide bushing.
SST 09201−10000, 09201−01055, 09950−70010 (09951−07100)



16. INSTALL VALVE GUIDE BUSHING

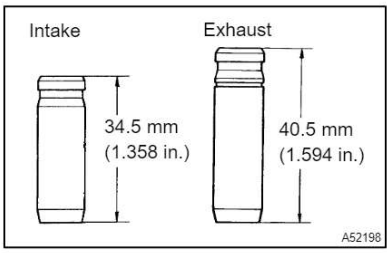
(a) Using a caliper gauge, measure the bushing bore diameter of the cylinder head.

Diameter: 10.295 to 10.313 mm (0.4053 to 0.4060 in.)

If the bushing bore diameter of the cylinder head is greater than 10.313 mm (0.4060 in.), machine the bushing bore to the dimension of 10.345 to 10.363 mm (0.4073 to 0.4080 in.).

Bushing diameter:

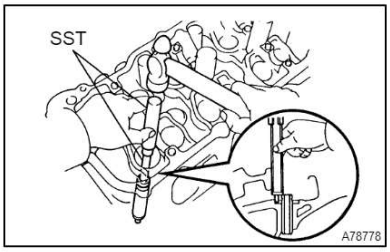
STD	10.333 to 10.344 mm (0.4068 to 0.4072 in.)
O/S	10.383 to 10.394 mm (0.4088 to 0.4092 in.)



HINT:
Different the bushes are used for the intake and exhaust.

Bushing length:

Intake	34.5 mm (1.358 in.)
Exhaust	40.5 mm (1.594 in.)



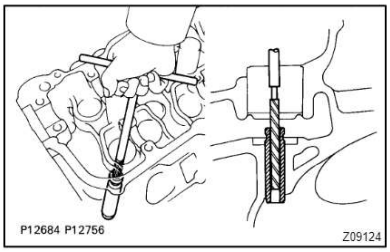
(b) Heat the cylinder head to approximately 80 to 100 ℃ (176 to 212 ℉)

(c) Using SST and a hammer, tap in a new guide bushing to the specified protrusion height.
SST 09201−10000, 09201−01055, 09950−70010 (09951−07100)

Protrusion height:

Item	Specified Condition
Intake	11.1 to 11.5 mm (0.437 to 0.453 in.)
Exhaust	8.9 to 9.3 mm (0.350 to 0.336 in.)

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(d) Using a sharp 5.5 mm reamer, ream the guide bushing to obtain the standard specified clearance between the guide bushing and the valve stem.

Standard oil clearance:

Item	Specified Condition
Intake	0.025 to 0.060 mm (0.0010 to 0.0024 in.)
Exhaust	0.030 to 0.065 mm (0.0012 to 0.0026 in.)

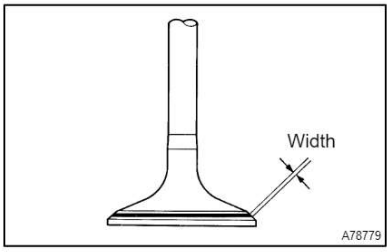
17. INSPECT VALVE SEATS

(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 the valve.

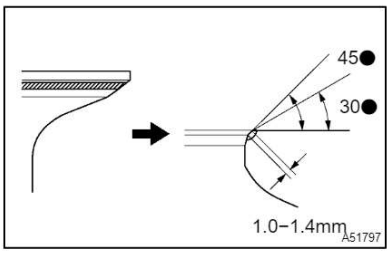


(c) Check the valve face and valve seat according to the following procedure.

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

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

(3) Check that the valve seat contact is in the middle of the valve face with the width between 1.0 to 1.4 mm (0.039 to 0.055 in.).

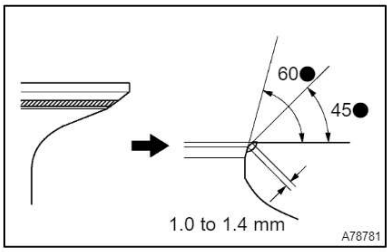


18. REPAIR VALVE SEATS

NOTICE:

Releasing the seat−cutter pressure gradually helps to make smoother valve seat faces.

(a) If the seating is too high on the valve face, use 30● and 45● cutters to correct the seat.

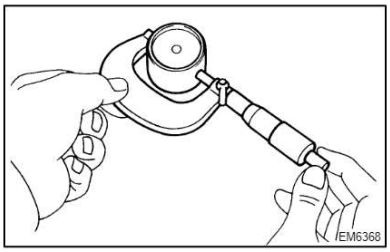


(b) If the seating is too low on the valve face, use 60● and 45● cutters to correct the seat.

(c) Handrub the valve and valve seat with an abrasive compound.

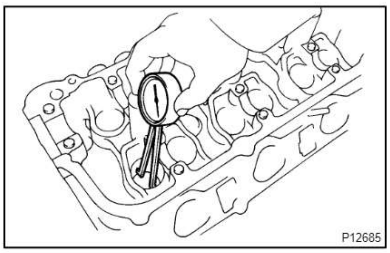
(d) Recheck the valve seating position.

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19. INSPECT VALVE LIFTER

(a) Using a micrometer, measure the lifter diameter.
Lifter diameter:
30.966 to 30.976 mm (1.2191 to 1.2195 in.)



20. INSPECT VALVE LIFTER OIL CLEARANCE

(a) Using a caliper gauge, measure the lifter bore diameter of the cylinder head.
Lifter bore diameter:
31.009 to 31.025 mm (1.2208 to 1.2215 in.)

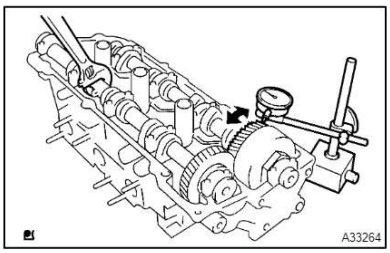
(b) Subtract the lifter diameter measurement from the lifter bore diameter measurement.
Specified oil clearance:
0.033 to 0.070 mm (0.0013 to 0.0028 in.)

If the oil clearance is greater than the maximum, replace the lifter. If necessary, replace the cylinder head.

21. INSPECT CAMSHAFT GEAR BACKLASH

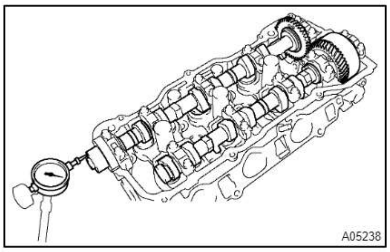
(a) Install the camshaft timing gear assembly.
(b) Install the camshafts to the cylinder head.

NOTICE:
- **Install without valves and sub−gear.**
- **Install with its timing mark matched.**



(c) Set the dial indicator to the teeth of the intake camshaft at a right angle (90●).
(d) Measure the backlash of the camshaft timing gear at least 4 positions.
Specified backlash:
0.020 to 0.300 mm (0.0008 to 0.0118 in.)

If the backlash is greater than the maximum, replace the camshafts.



22. INSPECT CAMSHAFT THRUST CLEARANCE

(a) Install the camshafts.
(b) Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.
Specified thrust clearance:
0.040 to 0.120 mm (0.0016 to 0.0047 in.)

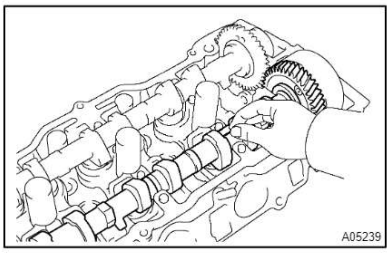
If the thrust clearance is greater than the maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head together.

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23. 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.

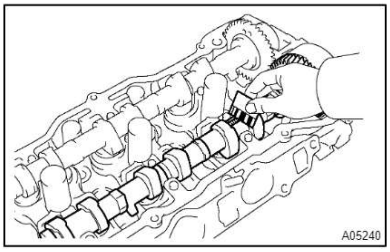
(d) Install the bearing caps.

Torque: 16 N·m (163 kgf·cm, 12 ft·lbf)

NOTICE:

Do not turn the camshaft.

(e) Remove the bearing caps.



(f) Measure the plastigage at its widest point.

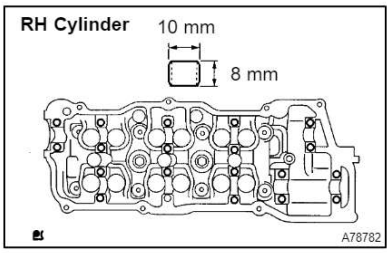
Specified oil clearance:

0.025 to 0.100 mm (0.0010 to 0.0039 in.)

If the oil clearance is greater than the maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head together.

NOTICE:

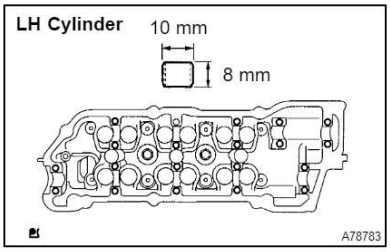
Completely remove the plastigage.



24. INSTALL RING W/HEAD PIN (RH CYLINDER)

(a) Using a plastic−faced hammer, tap in a new ring pin to the specified protrusion height.

Protrusion height: 3 mm (0.12 in.)

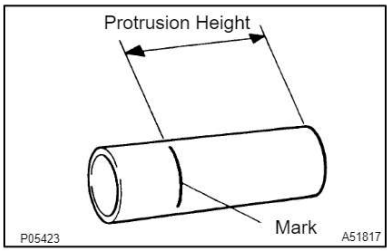


25. INSTALL RING PIN (LH CYLINDER)

(a) Using a plastic−faced hammer, tap in a new ring pin to the specified protrusion height.

Protrusion height: 3 mm (0.12 in.)

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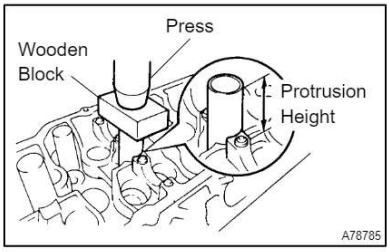
26. INSTALL SPARK PLUG TUBE

(a) Using paint, mark the standard position from the edge.
Standard protrusion height:
42.4 to 43.4 mm (1.669 to 1.709 in.)

HINT:
Use either end of the spark plug tube.

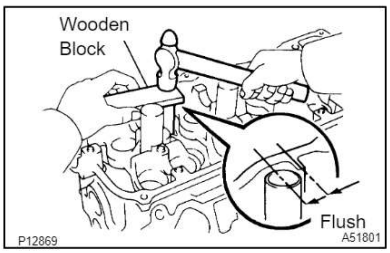
(b) Apply adhesive to the spark plug tube where it will be pressed into the cylinder head.
Adhesive: Part No. 08833−00070 THREE BOND 1324 or equivalent

NOTICE:
- **Install the spark plug tube within 3 minutes after applying adhesive.**
- **Do not deform the spark plug tube.**
- **Do not expose the seal to coolant for at least 1 hour after installing.**



(c) Using a press and wooden block, install the spark plug tube to the required protrusion height.

NOTICE:
Be careful not to drip the adhesive.

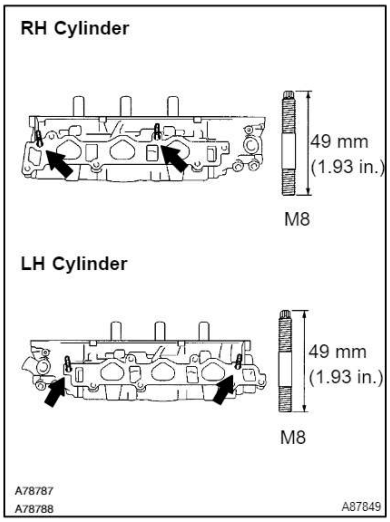


27. INSTALL PCV PIPE

(a) Using a wooden block and hammer, tap in 2 new PCV pipes until its top edge is flush with the cylinder head edge.

NOTICE:
Be careful not to damage the cylinder head edge.

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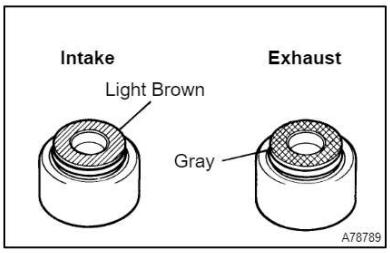


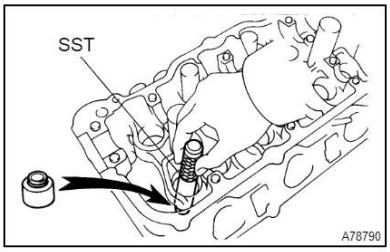
28. INSTALL STUD BOLT

(a) Install the stud bolts on the intake side.
Torque: 7.5 N·m (76 kgf·cm, 66 in.·lbf)

29. INSTALL STUD BOLT

(a) Install the stud bolts on the exhaust side.
Torque: 20 N·m (199 kgf·cm, 14 ft·lbf)





30. INSTALL VALVE STEM OIL O SEAL OR RING

(a) Apply a light coat of engine oil on the valve stem.

NOTICE:

Pay close attention when installing the intake and exhaust oil seals. For example, installing the intake oil seal into the exhaust or installing the exhaust oil seal to the intake can cause installation problems later.

HINT:

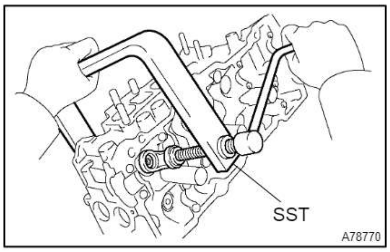
The intake valve oil seal is light brown and the exhaust valve oil seal is gray.

(b) Using SST, push in a new oil seal.
SST 09201−41020

NOTICE:

Failure to use SST will cause the seal to be damaged or improperly seated.

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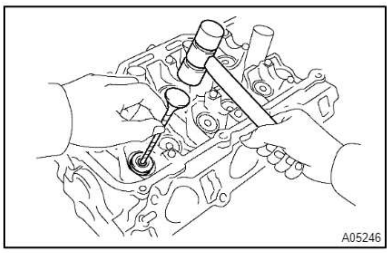
31. INSTALL INTAKE VALVE

(a) Install the valve, spring seat, valve spring and spring retainer.

NOTICE:

Install the same part in the same combination to the original locations.

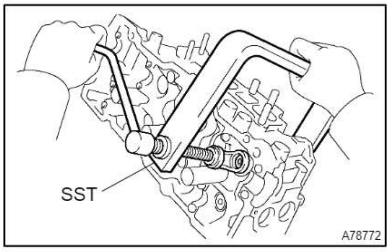
(b) Using SST, compress the valve spring and place the 2 keepers around the valve stem.
SST 09202−70020 (09202−00010)



(c) Using a plastic−faced hammer and a discarded valve with its tip wrapped in tape, lightly tap the installed valve to ensure that it is securely fit.

NOTICE:

Be careful not to damage the installed valve stem tip.



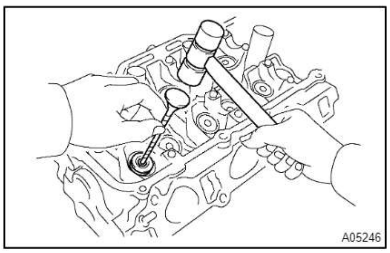
32. INSTALL EXHAUST VALVE

(a) Install the valve, spring seat, valve spring and spring retainer.

NOTICE:

Install the same parts in the same combination to the original locations.

(b) Using SST, compress the valve spring and place the 2 keepers around the valve stem.
SST 09202−70020 (09202−00010)



(c) Using a plastic−faced hammer and a discarded valve with its tip wrapped in tape, lightly tap the installed valve to ensure that it is securely fit.

NOTICE:

Be careful not to damage the installed valve stem tip.

33. INSTALL VALVE LIFTER

(a) Apply a light coat of engine oil on the valve lifter.

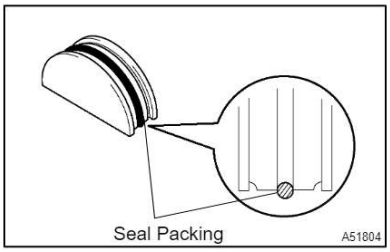
NOTICE:

Install the same part in the same combination to the original locations.

(b) Install the valve lifter.

(c) Check that the valve lifter rotates smoothly by hand.

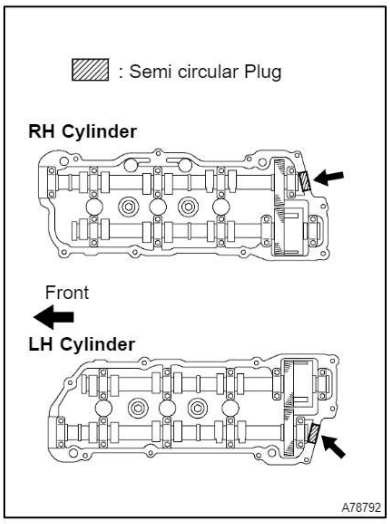
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34. INSTALL SEMICIRCULAR PLUG

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

(b) Apply seal packing to the semi circular plug grooves.
Seal packing: Part No. 08826−00080 or equivalent



(c) Install the 2 semi circular plugs to the cylinder heads.

NOTICE:

- **Install the plugs so that it is flush with the top of the cylinder head.**
- **Install the semi circular plugs within 3 minutes after applying seal packing.**
- **Do not expose the seal to engine oil for at least 2 hours after installing.**

35. INSTALL W/HEAD STRAIGHT SCREW PLUG NO.2

(a) Using a straight hexagon wrench 14, install 2 new gaskets and the 2 screw plugs.
Torque: 44 N·m (449 kgf·cm, 32 ft·lbf)

36. INSTALL W/HEAD STRAIGHT SCREW PLUG NO.1

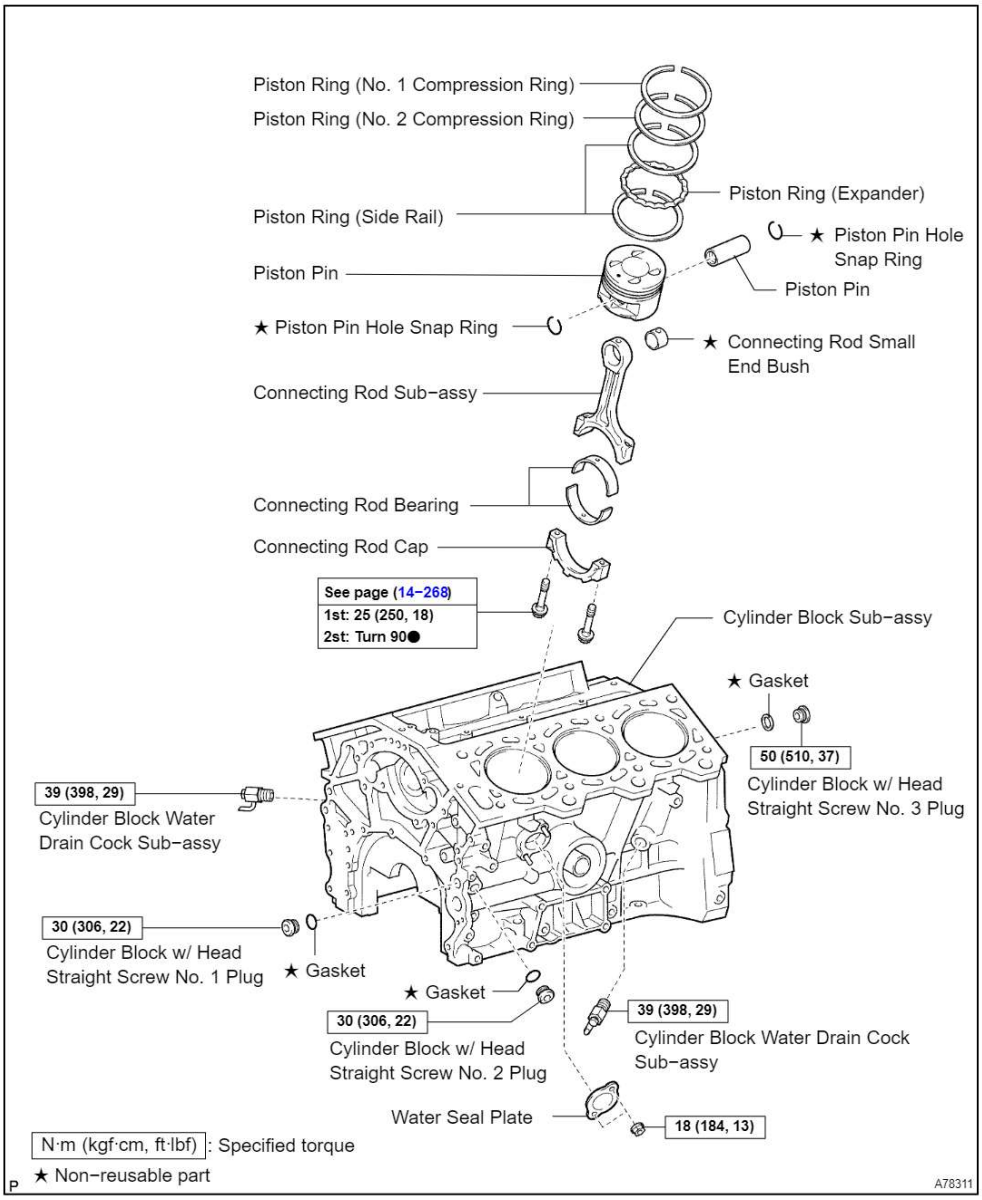
(a) Using a straight hexagon wrench 14, install 2 new gaskets and the 2 screw plugs.
Torque: 44 N·m (449 kgf·cm, 32 ft·lbf)

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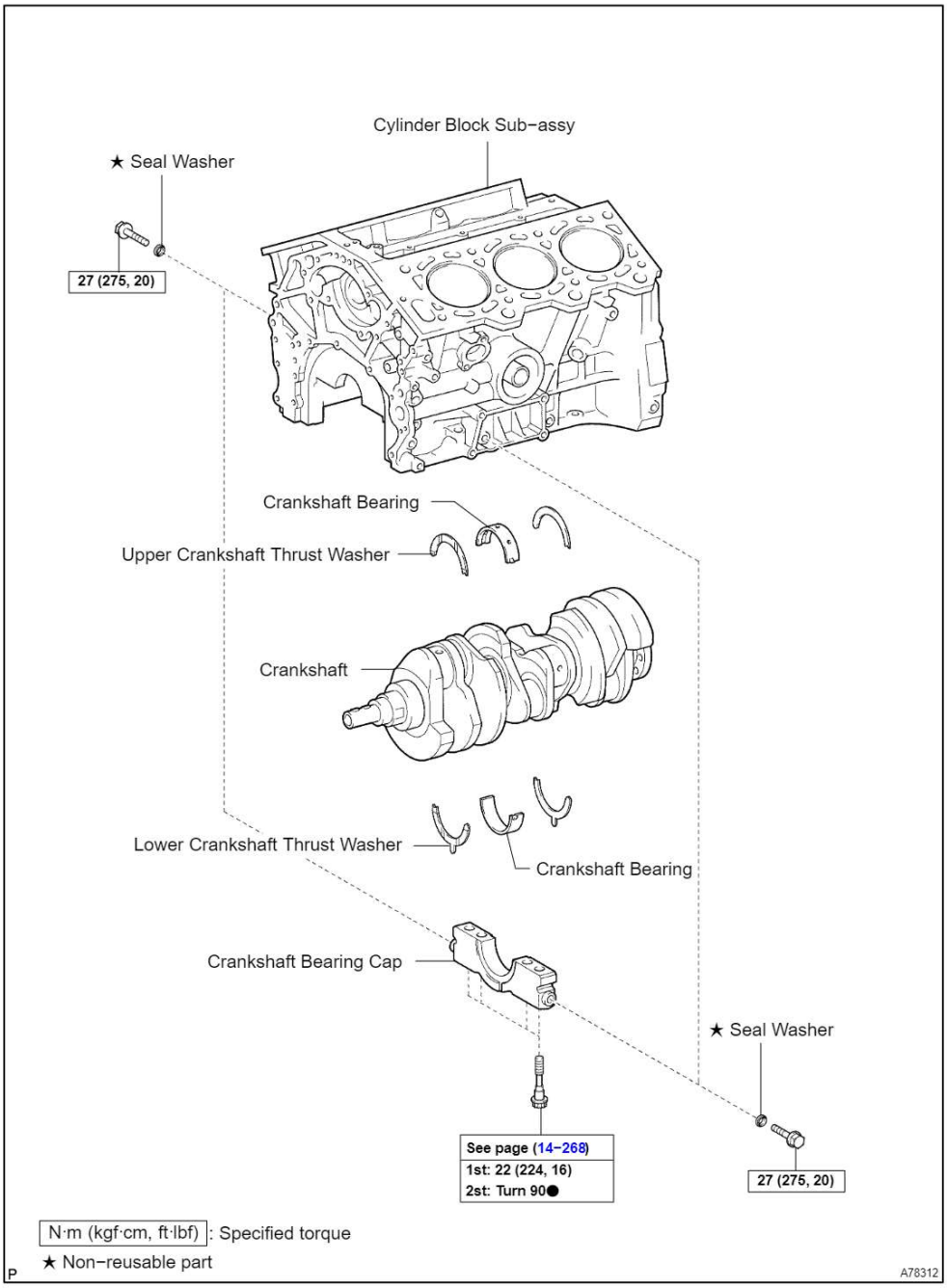
CYLINDER BLOCK ASSY (1MZ−FE/3MZ−FE)

COMPONENTS

141IQ−02



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1411Y−02

OVERHAUL

1. REMOVE CYLINDER BLOCK WATER DRAIN COCK SUB−ASSY

2. REMOVE WATER SEAL PLATE

3. REMOVE CYLINDER BLOCK W/HEAD STRAIGHT SCREW NO.1 PLUG

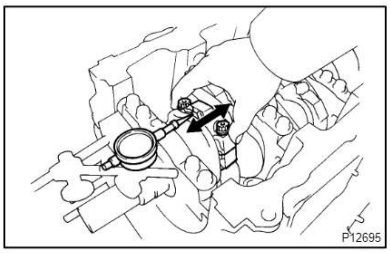
(a) Using a socket hexagon wrench 10, remove the screw plug.

4. REMOVE CYLINDER BLOCK W/HEAD STRAIGHT SCREW NO.2 PLUG

(a) Using a socket hexagon wrench 10, remove the screw plug.

5. REMOVE CYLINDER BLOCK W/HEAD STRAIGHT SCREW NO.3 PLUG

(a) Using a socket hexagon wrench 10, remove the screw plug.



6. INSPECT CONNECTING ROD THRUST CLEARANCE

(a) Using a dial indicator, measure the thrust clearance while moving the connecting rod back and forth.

Specified thrust clearance:
0.15 to 0.35 mm (0.0059 to 0.0138 in.)

If the thrust clearance is greater than the maximum, replace the connecting rod assembly(s). If necessary, replace the crankshaft.

Connecting rod thickness:
20.80 to 20.85 mm (0.8189 to 0.8209 in.)

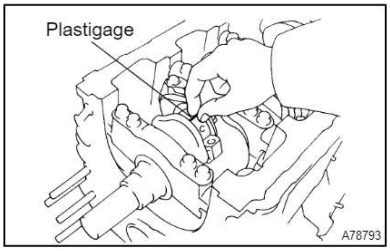
7. INSPECT CONNECTING ROD OIL CLEARANCE

(a) Check that the matchmarks on the connecting rod and cap are aligned to ensure correct reassembly.

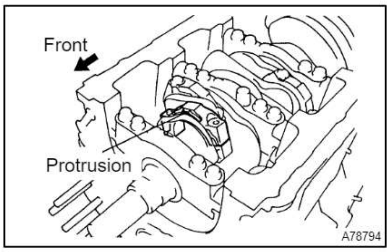
(b) Remove the 2 connecting rod cap bolts.

(c) Clean the crank pin, the bearing and the connecting rod.

(d) Check the crank pin and bearing for pitting and scratches.



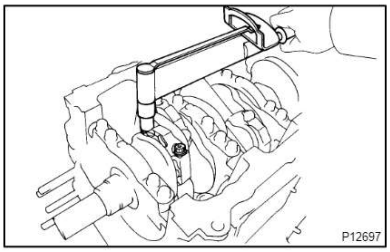
(e) Lay a strip of plastigage across the crank pin.



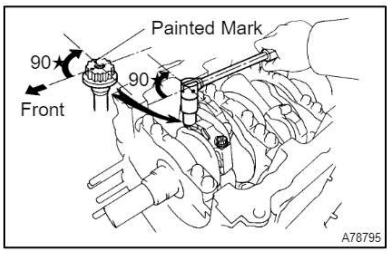
(f) Check that the protrusion of the connecting rod cap is facing the correct direction.

(g) Apply a light coat of engine oil on the threads of the connecting rod cap bolts.

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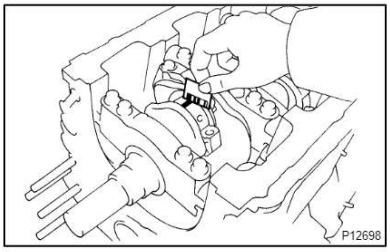
(h) Tighten the bolts in several steps by the specified torque.
Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)



(i) Mark the front side of each connecting cap bolt with paint.
(j) Retighten the cap bolts by 90★as shown in the illustration.

NOTICE:
Do not turn the crankshaft.

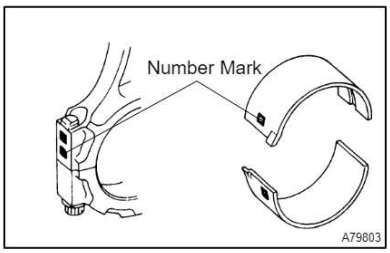
(k) Remove the 2 bolts, the connecting rod cap and the lower bearing.



(l) Measure the plastigage at its widest point.
Specified oil clearance:
0.038 to 0.080 mm (0.0015 to 0.0031 in.)

If the oil clearance is greater than the maximum, replace the bearings. If necessary, grind or replace the crankshaft.

(m) Completely remove the plastigage.

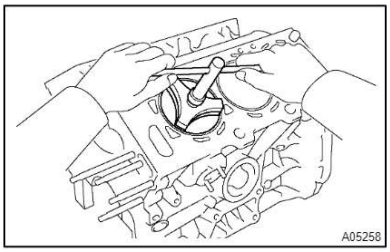


HINT:
If replacing the bearing, replace it with one that has the same number as the connecting rod. There are 4 sizes of standard bearings: 1, 2, 3 and 4.

Standard bearing center wall thickness:

Mark	Specified Condition
1	1.484 to 1.487 mm (0.0584 to 0.0585 in.)
2	1.487 to 1.490 mm (0.0585 to 0.0587 in.)
3	1.490 to 1.493 mm (0.0587 to 0.0588 in.)
4	1.493 to 1.496 mm (0.0588 to 0.0589 in.)

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8. REMOVE PISTON SUB−ASSY W/CONNECTING ROD

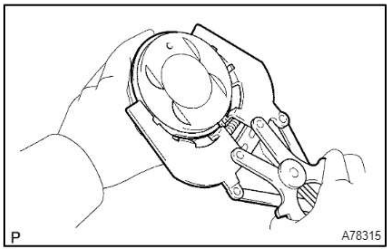
(a) Using a ridge reamer, remove all the carbon from the top of the cylinder.

(b) Push out the piston and the connecting rod assembly from the top of the cylinder block.

HINT:

- Keep the bearings, the connecting rod and the cap together.
- Arrange the piston and the connecting rod assemblies in correct order so they can be returned to the original locations when reassembling.

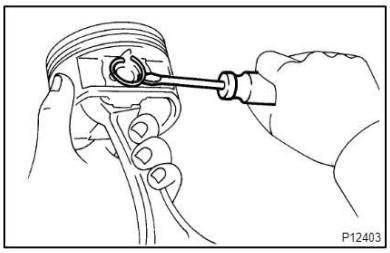
9. REMOVE CONNECTING ROD BEARING



10. REMOVE PISTON RING SET

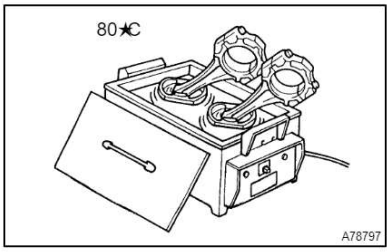
(a) Using a piston ring expander, remove the 2 compression rings.

(b) Remove the 2 side rails and oil ring by hand.



11. REMOVE PISTON PIN HOLE SNAP RING

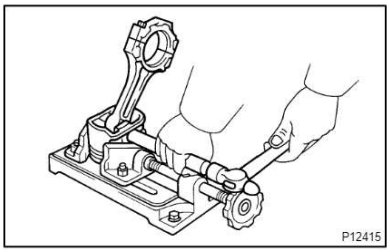
(a) Using a small screwdriver, pry out the 2 snap rings.



12. REMOVE W/PIN PISTON SUB−ASSY

(a) Gradually heat the piston to approximately 80°C (176°F).

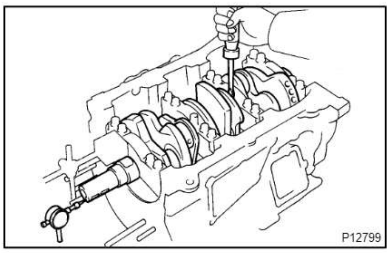
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(b) Using a plastic−faced hammer and a brass bar, lightly tap out the piston pin and remove the connecting rod.

HINT:

- The piston and pin are a matched set.
- Store the pistons, the pins, the rings, the connecting rods and the bearings in correct order so that they can be returned to the original locations when re assembling.



13. INSPECT CRANKSHAFT THRUST CLEARANCE

(a) Using a dial indicator, measure the thrust clearance while prying the crankshaft back and forth with a screwdriver.

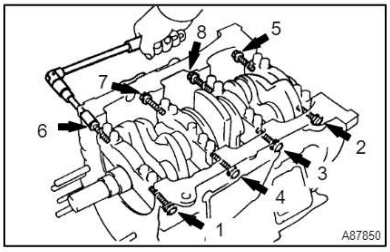
Specified thrust clearance:
0.04 to 0.30 mm (0.0016 to 0.0118 in.)

If the thrust clearance is greater than the maximum, replace the thrust washers as a set. Check the crankshaft for wear, repair or replace if necessary.

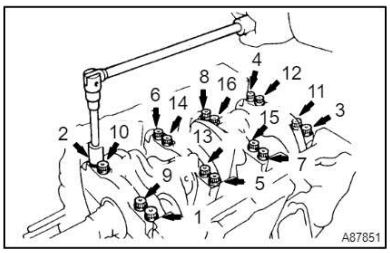
Thrust washer thickness:
1.93 to 1.98 mm (0.0760 to 0.0780 in.).

14. CHECK OIL CLEARANCE

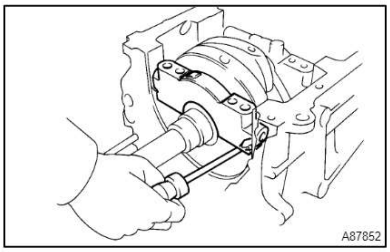
(a) Uniformly loosen and remove the 8 main bearing cap bolts and seal washers in the sequence shown in the illustration.



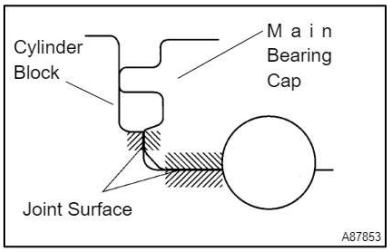
(b) Uniformly loosen and remove the 16 main bearing cap bolts the sequence shown in the illustration.



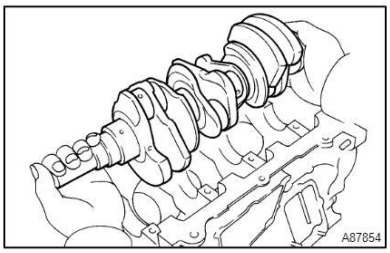
(c) Remove the 4 main bearing caps and 4 lower bearings. Also remove the 2 lower thrust washers, located under the No. 2 main bearing cap.



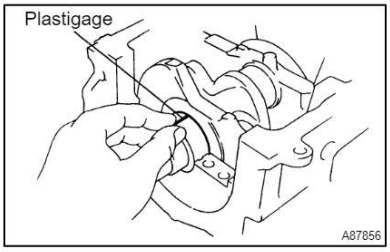
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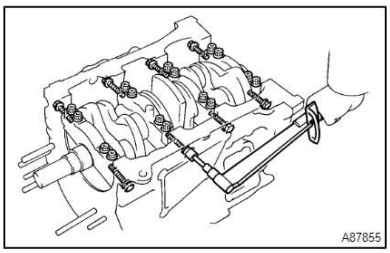
NOTICE:
Using a screwdriver, push up on the cap little by little, alternating from the right and left side until the cap is free. Take care not to damage the contact surfaces of the cap and cylinder block.
HINT:
- Keep the lower bearing and main bearing cap together.
- Arrange the main bearing caps and lower thrust washers in correct order.



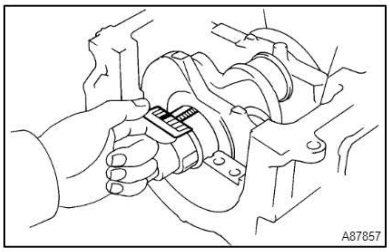
(d) Lift out the crankshaft.
HINT:
Keep the upper bearings together with the cylinder block.
(e) Clean each main journal and bearing.
(f) Check each main journal and bearing for pitting and scratches.
If the journal or bearing is damaged, replace the bearings. If necessary, replace the crankshaft.



(g) Place the crankshaft on the cylinder block.
(h) Lay a strip of Plastigage across each journal.



(i) Install the 4 main bearing caps (see step 42).
NOTICE:
Do not turn the crankshaft.
(j) Remove the main bearing caps (see steps (a) to (c)).

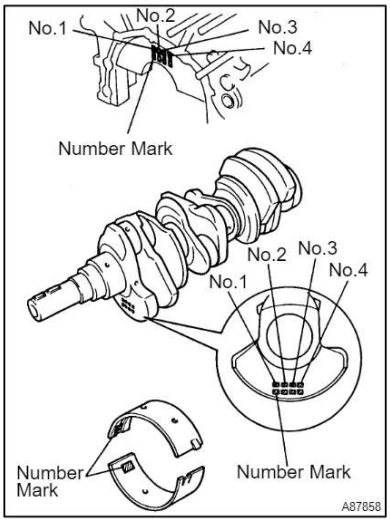


(k) Measure the Plastigage at its widest point.
Specified oil clearance:

No. 1 and No. 4 journals	0.014 to 0.050 mm (0.0006 to 0.0020 in.)
No. 2 and No. 3 journals	0.026 to 0.060 mm (0.0010 to 0.0024 in.)

If the oil clearance is greater than the maximum, replace the bearings. If necessary, replace the crankshaft.

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HINT:
If using a bearing, replace it with one that has the same number. If the number of the bearing cannot be determined, select the correct bearing by adding together the numbers imprinted on the cylinder block and crankshaft, then refer to the table on the next page for the appropriate bearing number. The No. 1 and No. 4 journal bearings have 5 standard bearing sizes, marked 3, 4, 5, 6 and 7 accordingly. The No. 2 and No. 3 journal bearings have 5 standard bearing sizes, marked 1, 2, 3, 4 and 5 accordingly.

No. 1 and No. 4 journal bearings

Cylinder block + Crankshaft =	0 to 5	6 to 11	12 to 17	18 to 23	24 to 28
Replacement Bearing	3	4	5	6	7

HINT:
EXAMPLE:
Cylinder block imprinted number mark is 06
Crankshaft imprinted number mark is 08
6 + 8 = 14
Select the bearing marked ”5”

No. 1 and No. 4 journal standard bearings selection chart

Crankshaft number mark	Cylinder block number mark																
	00	01	02	03	04	05	**06**	07	08	09	10	11	12	13	14	15	16
00	3	3	3	3	3	3	4	4	4	4	4	4	5	5	5	5	5
01	3	3	3	3	3	4	4	4	4	4	4	5	5	5	5	5	5
02	3	3	3	3	4	4	4	4	4	4	5	5	5	5	5	5	6
03	3	3	3	4	4	4	4	4	4	5	5	5	5	5	5	6	6
04	3	3	4	4	4	4	4	4	5	5	5	5	5	5	6	6	6
05	3	4	4	4	4	4	4	5	5	5	5	5	5	6	6	6	6
06	4	4	4	4	4	4	5	5	5	5	5	5	6	6	6	6	6
07	4	4	4	4	4	5	5	5	5	5	5	6	6	6	6	6	6
08	4	4	4	4	5	5	**5**	5	5	5	6	6	6	6	6	6	7
09	4	4	4	5	5	5	5	5	5	6	6	6	6	6	6	7	7
10	4	4	5	5	5	5	5	5	6	6	6	6	6	6	7	7	7
11	4	5	5	5	5	5	5	6	6	6	6	6	6	7	7	7	7
12	5	5	5	5	5	5	6	6	6	6	6	6	7	7	7	7	7

EXAMPLE:
Cylinder block ”**06**”, Crankshaft ”**08**” = Use bearing ”**5**”

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No. 2 and No. 3 journal bearings

Cylinder block + Crankshaft =	0 to 5	6 to 11	12 to 17	18 to 23	24 to 28
Replace-ment Bearing	3	4	5	6	7

HINT:
EXAMPLE
Cylinder block imprinted number mark is 06
Crankshaft imprinted number mark is 08
6 + 8 = 14
Select the bearing marked "3"

No.2 and No.3 journal standard bearings selection chart

Crankshaft number mark	Cylinder block number mark																
	00	01	02	03	04	05	**06**	07	08	09	10	11	12	13	14	15	16
00	1	1	1	1	1	1	2	2	2	2	2	2	3	3	3	3	3
01	1	1	1	1	1	2	2	2	2	2	2	3	3	3	3	3	3
02	1	1	1	1	2	2	2	2	2	2	3	3	3	3	3	3	4
03	1	1	1	2	2	2	2	2	2	3	3	3	3	3	3	4	4
04	1	1	2	2	2	2	2	2	3	3	3	3	3	3	4	4	4
05	1	2	2	2	2	2	2	3	3	3	3	3	3	4	4	4	4
06	2	2	2	2	2	2	3	3	3	3	3	3	4	4	4	4	4
07	2	2	2	2	2	3	3	3	3	3	3	4	4	4	4	4	4
08	2	2	2	2	3	3	**3**	3	3	3	4	4	4	4	4	4	5
09	2	2	2	3	3	3	3	3	3	4	4	4	4	4	4	5	5
10	2	2	3	3	3	3	3	3	4	4	4	4	4	4	5	5	5
11	2	3	3	3	3	3	3	4	4	4	4	4	4	5	5	5	5
12	3	3	3	3	3	3	4	4	4	4	4	4	5	5	5	5	5

EXAMPLE:
Cylinder block "**06**", Crankshaft "**08**" = Use bearing "**3**"

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Reference

Item	Mark	Specified Condition
Cylinder block main journal bore diameter (A)	00	66.000 mm (2.5984 in.)
	01	66.001 mm (2.5985 in.)
	02	66.002 mm (2.5985 in.)
	03	66.003 mm (2.5985 in.)
	04	66.004 mm (2.5986 in.)
	05	66.005 mm(2.5986 in.)
	06	66.006 mm (2.5987 in.)
	07	66.007 mm (2.5987 in.)
	08	66.008 mm (2.5987 in.)
	09	66.009 mm (2.5988 in.)
	10	66.010 mm (2.5988 in.)
	11	66.011 mm (2.5989 in.)
	12	66.012 mm (2.5989 in.)
	13	66.013 mm (2.5989 in.)
	14	66.014 mm (2.5990 in.)
	15	66.015 mm (2.5990 in.)
	16	66.016 mm (2.5990 in.)
Crankshaft main journal diameter (B)	00	61.000 mm (2.4016 in.)
	01	60.999 mm (2.4015 in.)
	02	60.998 mm (2.4015 in.)
	03	60.997 mm (2.4015 in.)
	04	60.996 mm (2.4014 in.)
	05	60.995 mm (2.4014 in.)
	06	60.994 mm (2.4013 in.)
	07	60.993 mm (2.4012 in.)
	08	60.992 mm (2.4012 in.)
	09	60.991 mm (2.4012 in.)
	10	60.990 mm (2.4012 in.)
	11	60.989 mm (2.4011 in.)
	12	60.988 mm (2.4011 in.)
Standard bearing center wall thickness	1	2.486 to 2.489 mm (0.0979 to 0.0980 in.)
	2	2.489 to 2.492 mm (0.0980 to 0.0981 in.)
	3	2.492 to 2.495 mm (0.0981 to 0.0982 in.)
	4	2.495 to 2.498 mm (0.0982 to 0.0983 in.)
	5	2.498 to 2.501 mm (0.0983 to 0.0985 in.)
	6	2.501 to 2.504 mm (0.0985 to 0.0986 in.)
	7	2.504 to 2.507 mm (0.0986 to 0.0987 in.)

(l) Completely remove the Plastigage.

15. REMOVE CRANKSHAFT

(a) Lift the crankshaft.

(b) Remove the 4 upper main bearings and 2 upper thrust washers from the cylinder block.

HINT:

Arrange the main bearing caps, bearings and thrust washers in the correct order.

16. REMOVE CRANKSHAFT THRUST WASHER SET

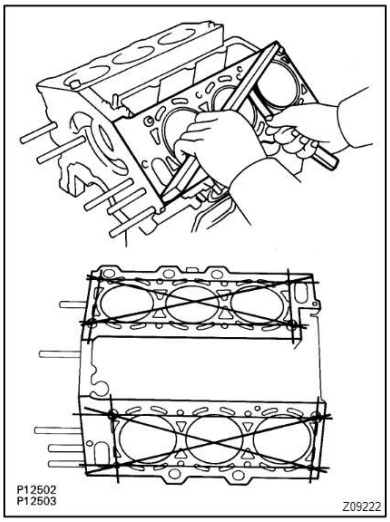
17. REMOVE CRANKSHAFT BEARING

18. CLEAN CYLINDER BLOCK

NOTICE:

If the cylinder is washed at high temperatures, the cylinder liner sticks out beyond the cylinder block. Always wash the cylinder block at a temperature of 45°C (113°F) or less.

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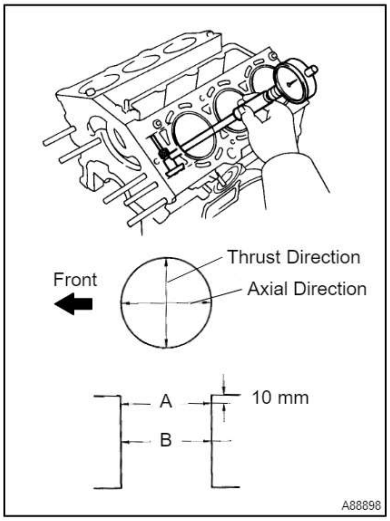


19. INSPECT CYLINDER BLOCK FOR FLATNESS

(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 the maximum, replace the cylinder block.



20. INSPECT CYLINDER BORE

(a) Using a cylinder gauge, measure the cylinder bore diameter at positions A and B in the thrust and axial directions.

Specified diameter:

Item	Specified Condition
1MZ−FE	87.500 to 87.632 mm (3.4449 to 3.4501 in.)
3MZ−FE	92.000 to 92.132 mm (3.6220 to 3.6272 in.)

If the average of the measured diameters is greater than the maximum, replace the cylinder block.

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21. INSPECT W/PIN PISTON SUB−ASSY

(a) 1MZ−FE:

Using a micrometer, measure the diameter at right angles to the piston pin center line and the distance from the piston head.

Distance:

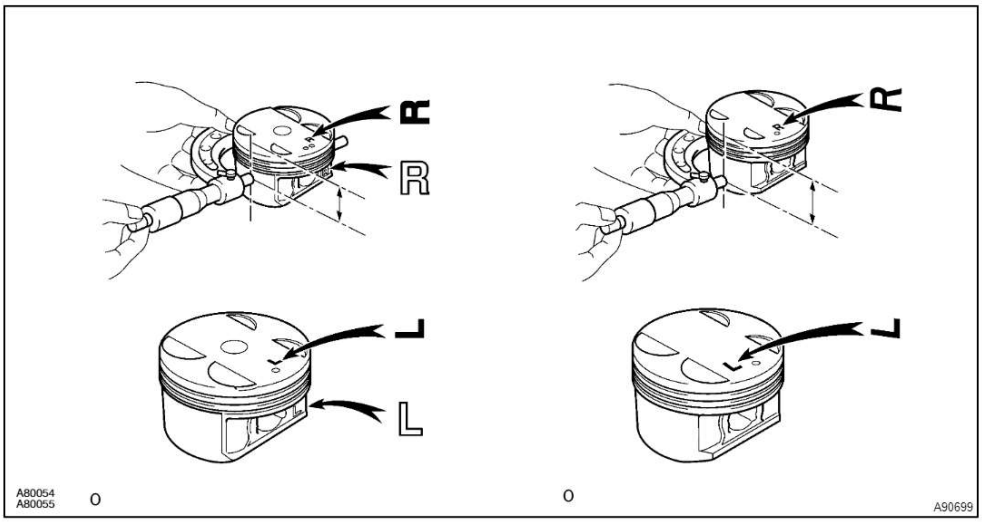
Item	Specified Condition
1MZ−FE for AISIN made	23.2 mm (0.913 in.)
1MZ−FE for MAHLE made	41.2 mm (1.922 in.)

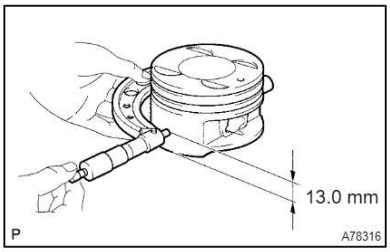
Piston diameter:

Item	Specified Condition
1MZ−FE for AISIN made	87.406 to 87.416 mm (3.4412 to 3.4416 in.)
1MZ−FE for MAHLE made	87.453 to 87.467 mm (3.4430 to 3.4436 in.)

HINT:

The shape of the piston varies for the RH and LH banks. The RH piston is marked with "R", the LH piston with "L".





(b) 3MZ−FE:

Using a micrometer, measure a diameter at right angles to the piston pin center line and the distance from the piston bottom.

Distance: 13.0 mm (0.512 in.)

Piston diameter:

91.953 to 91.967 mm (3.6202 to 3.6207 in.)

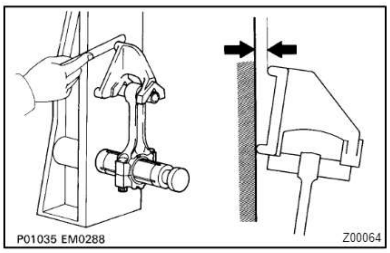
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22. INSPECT PISTON OIL CLEARANCE

(a) Subtract the piston diameter measurement from the cylinder bore diameter measurement.
Specified oil clearance: 0.033 to 0.130 mm (0.0013 to 0.0051 in.)

Item	Specified Condition:
1MZ−FE for AISIN made	0.084 to 0.130 mm (0.0033 to 0.0051 in.)
1MZ−FE for MAHLE made	0.033 to 0.130 mm (0.0013 to 0.0051 in.)
3MZ−FE	0.033 to 0.130 mm (0.0013 to 0.0051 in.)

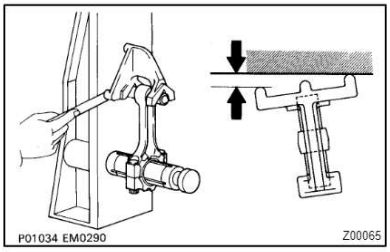
If the oil clearance is greater than the maximum, replace all the 6 pistons. If necessary, replace the cylinder block.



23. INSPECT CONNECTING ROD SUB−ASSY

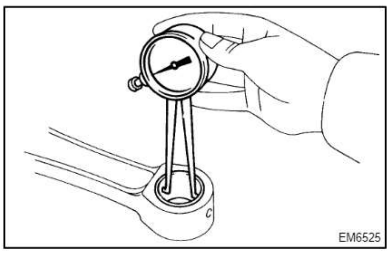
(a) Using a rod aligner and feeler gauge, check the connecting rod alignment.
(1) Check for misalignment.
Maximum misalignment:
0.05 mm (0.0020 in.) per 100 mm (3.94 in.)

If misalignment is greater than the maximum, replace the connecting rod assembly.



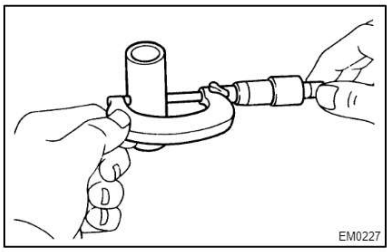
(2) Check for twist.
Maximum twist:
0.15 mm (0.0059 in.) per 100 mm (3.94 in.)

If the twist is greater than the maximum, replace the connecting rod assembly.



24. INSPECT PISTON PIN OIL CLEARANCE

(a) Using a caliper gauge, measure the inside diameter of the connecting rod bushing.
Bushing inside diameter:
22.005 to 22.014 mm (0.8663 to 0.8667 in.)

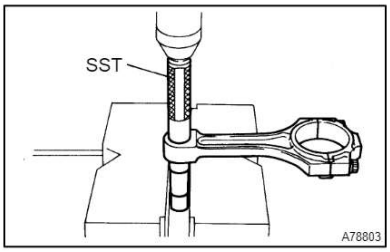


(b) Using a micrometer, measure the piston pin diameter.
Piston pin diameter:
21.997 to 22.006 mm (0.8660 to 0.8664 in.)

(c) Subtract the piston pin diameter measurement from the bushing inside diameter measurement.
Specified oil clearance:
0.005 to 0.050 mm (0.0002 to 0.0020 in.)

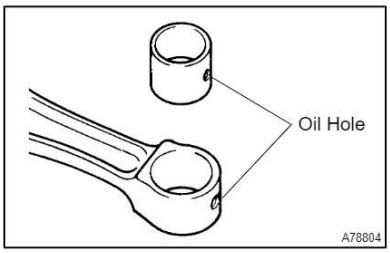
If the oil clearance is greater than the maximum, replace the bushing. If necessary, replace the piston and the piston pin together.

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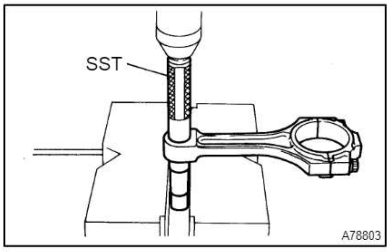
25. REMOVE CONNECTING ROD SMALL END BUSH

(a) Using SST and a press, press out the bushing.
SST 09222−30010

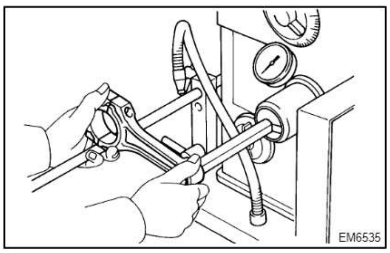


26. INSTALL CONNECTING ROD SMALL END BUSH

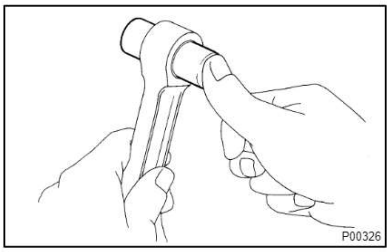
(a) Align the oil holes of a new bushing and the connecting rod.



(b) Using SST and a press, press in the bushing.
SST 09222−30010

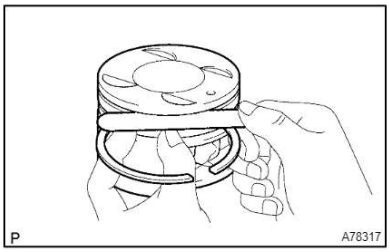


(c) Using a pin hole grinder, hone the bushing to obtain the standard specified clearance between the bushing and piston pin.
Standard oil clearance:
0.005 to 0.011 mm (0.0002 to 0.0004 in.)



(d) Check that the piston pin fits at normal room temperature. Coat the piston pin with engine oil, and push it into the connecting rod with your thumb.

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27. INSPECT RING GROOVE CLEARANCE

(a) Using a feeler gauge, measure the clearance between new piston ring and the wall of the ring groove.

Ring groove clearance:

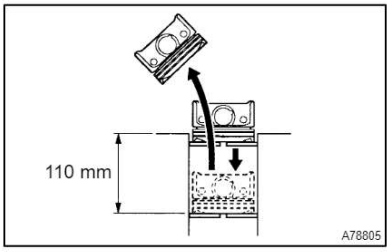
1MZ−FE

Item	Specified Condition
No. 1	0.02 to 0.07 mm (0.0008 to 0.0028 in.)
No. 2	0.02 to 0.06 mm (0.0008 to 0.0024 in.)
Oil	0.04 to 0.12 mm (0.0016 to 0.0047 in.)

3MZ−FE:

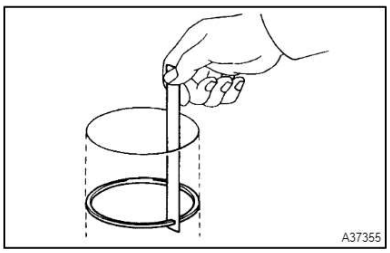
Item	Specified Condition
No. 1	0.03 to 0.08 mm (0.0012 to 0.0031 in.)
No. 2	0.02 to 0.06 mm (0.0008 to 0.0024 in.)
Oil	0.03 to 0.11 mm (0.0012 to 0.0043 in.)

If the clearance is not as specified, replace the piston.



28. INSPECT PISTON RING END GAP

(a) Using a piston, push the piston ring a little beyond the bottom of the ring travel, 110 mm (4.33 in.) from the top of the cylinder block.



(b) Using a feeler gauge, measure the end gap.

Specified end gap:

1MZ−FE

Item	Specified Condition
No. 1	0.25 to 0.95 mm (0.0098 to 0.0374 in.)
No. 2	0.35 to 1.05 mm (0.0138 to 0.0413 in.)
Oil (Side rail)	0.15 to 1.00 mm (0.0059 to 0.0394 in.)

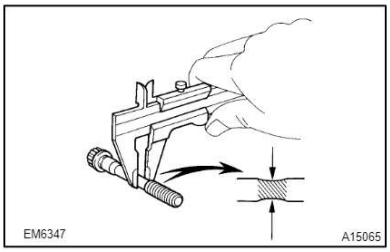
3MZ−FE:

Item	Specified Condition
No. 1	0.30 to 0.95 mm (0.0118 to 0.0374 in.)
No. 2	0.50 to 1.05 mm (0.0197 to 0.0413 in.)
Oil (Side rail)	0.15 to 1.00 mm (0.0059 to 0.0394 in.)

If the end gap is greater than the maximum, replace the piston ring.

If the end gap is greater than the maximum even with a new piston ring, replace the cylinder block.

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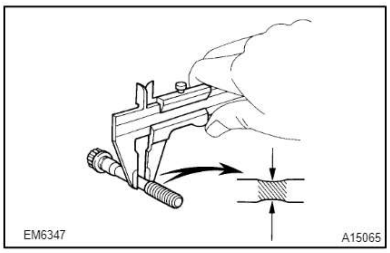


29. INSPECT CONNECTING ROD BOLT

(a) Using a vernier caliper, measure the tension portion diameter of the bolt.

Specified diameter:
7.2 to 7.6 mm (0.283 to 0.299 in.)

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

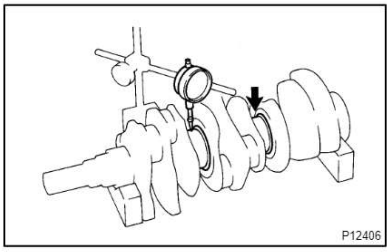


30. INSPECT CRANKSHAFT BEARING CAP SET BOLT

(a) Using a dial indicator and V−blocks, measure the runout as shown in the illustration.

Maximum circle runout: 0.06 mm (0.0024 in.)

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

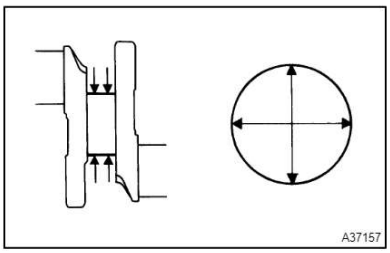


31. INSPECT CRANKSHAFT

(a) Using a dial indicator and V−blocks, measure the runout as shown in the illustration.

Maximum circle runout: 0.06 mm (0.0024 in.)

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



(b) Using a micrometer, measure the diameter of each main journal.

Diameter: 60.988 to 61.000 mm (2.4011 to 2.4016 in.)

If the diameter is not as specified, check the oil clearance (see step 7).

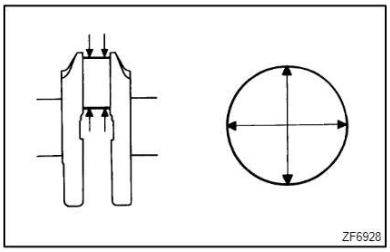
If necessary, replace the crankshaft.

(c) Check each main journal for taper and out−of−round as shown in the illustration.

Maximum taper and out−of−round:
0.02 mm (0.0008 in.)

If the taper and out−of−round is greater than the maximum, replace the crankshaft.

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(d) Using a micrometer, measure the diameter of each crank pin.

Diameter: 52.992 to 53.000 mm (2.0863 to 2.0866 in.)

If the diameter is not as specified, check the oil clearance (see step 7).

(e) Check each crank pin for taper and out−of−round as shown in the illustration.

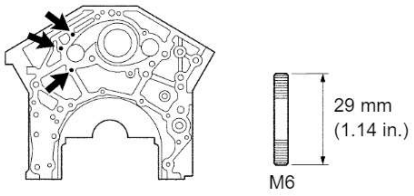
Maximum taper and out−of−round:
0.02 mm (0.0008 in.)

If the taper and out−of−round is greater than the maximum, replace the crankshaft.

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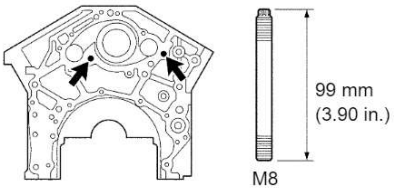
32. INSTALL STUD BOLT

Front Side



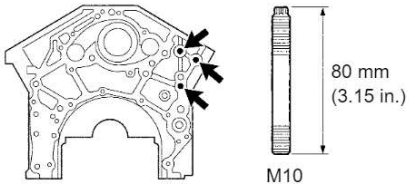
Torque: 6.0 N·m (60 kgf·cm, 53 in.·lbf)

Front Side



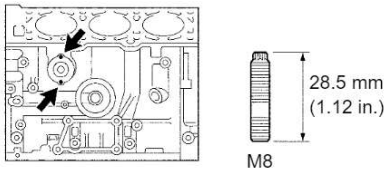
Torque: 15 N·m (145 kgf·cm, 11 ft·lbf)

Front Side



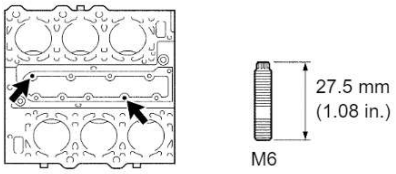
Torque: 21 N·m (220 kgf·cm, 15 ft·lbf)

Left Side



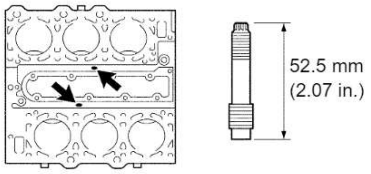
Torque: 7.0 N·m (70 kgf·cm, 62 in.·lbf)

Top Side



Torque: 4.0 N·m (40 kgf·cm, 35 in.·lbf)

Top Side



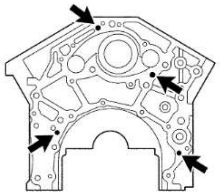
Torque: 12 N·m (122 kgf·cm, 9 ft·lbf)

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33. INSTALL STRAIGHT PIN

Front Side

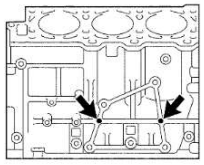


4 mm (0.16 in.)

12 mm (0.47 in.)

Protrusion Height:
6 mm (0.24 in.)

Right Side (FF)

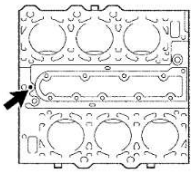


4 mm (0.16 in.)

12 mm (0.47 in.)

Protrusion Height:
6 mm (0.24 in.)

Top Side

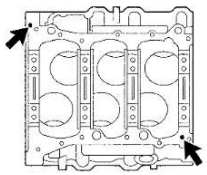


4 mm (0.16 in.)

12 mm (0.47 in.)

Protrusion Height:
6 mm (0.24 in.)

Bottom Side

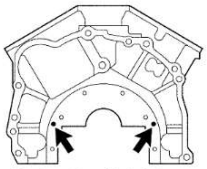


4 mm (0.16 in.)

12 mm (0.47 in.)

Protrusion Height:
6 mm (0.24 in.)

Backside

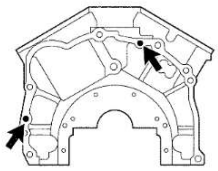


4 mm (0.16 in.)

12 mm (0.47 in.)

Protrusion Height:
6 mm (0.24 in.)

Backside



10 mm

22 mm (0.87 in.)

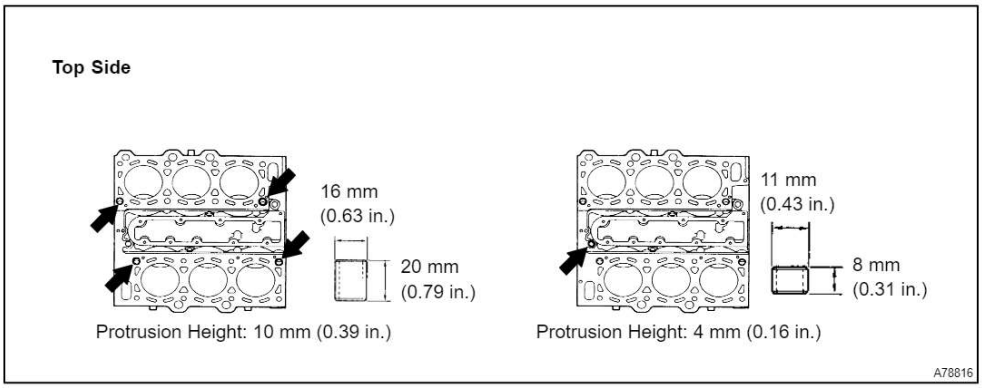
Protrusion Height:
11 mm (0.43 in.)

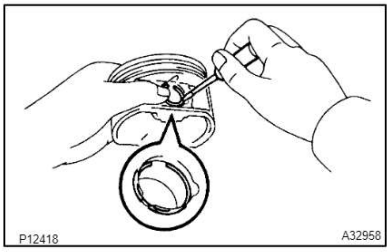
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34. INSTALL RING PIN



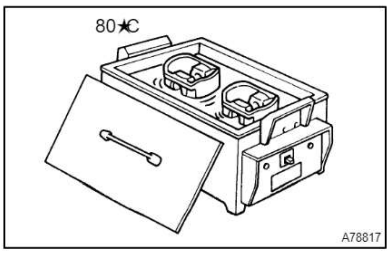


35. INSTALL PISTON PIN HOLE SNAP RING

(a) 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 not aligned with the pin hole cutout portion of the piston.

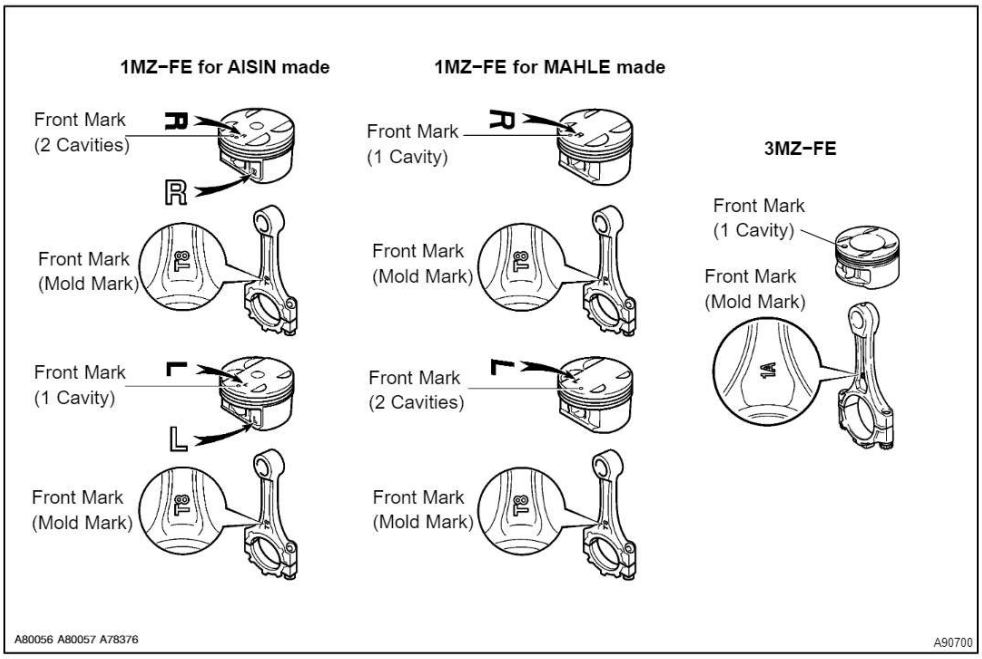


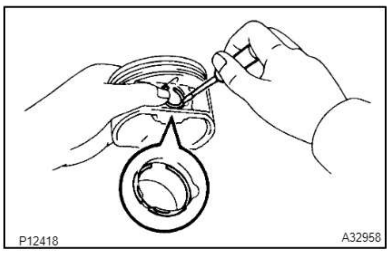
36. INSTALL W/PIN PISTON SUB−ASSY

(a) Gradually heat the piston to about 80★C (176★F).

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(b) Coat the piston pin with engine oil.
(c) Align the front marks of the piston and connecting rod, and push in the piston pin with your thumb until the pin contacts the snap ring.





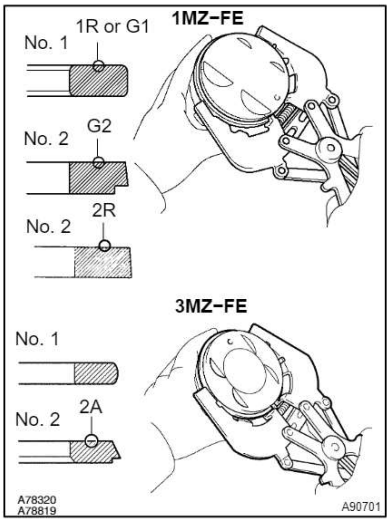
37. INSTALL PISTON PIN HOLE SNAP RING

(a) Using a small screwdriver, install a new snap ring on the other end of the piston pin hole.

HINT:

Be sure that the end of gap of the snap ring is not aligned with the pin hole cutout portion of the piston.

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38. INSTALL PISTON RING SET

(a) Install the oil ring expander and the 2 side rails by hand.

(b) Using a piston ring expander, install the 2 compression rings.

HINT:

The No. 1 and No. 2 compression rings are installed with code mark faced upward as shown in the illustration.

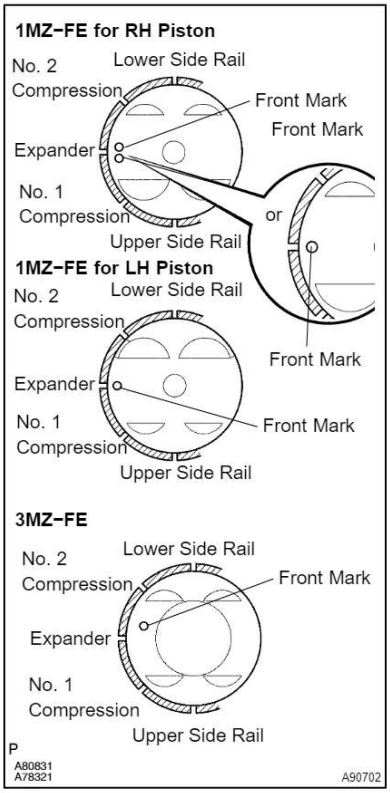
Code mark:

1MZ−FE:

Item	Code Mark
No. 1	1R or G1
No. 2	2R or G1

3MZ−FE

Item	Code Mark
No. 2	2A

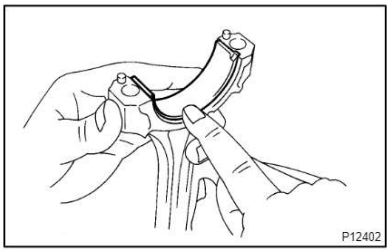


(c) Position the piston rings so that the ring ends are arranged as shown in the illustration.

NOTICE:

Do not align the ring ends.

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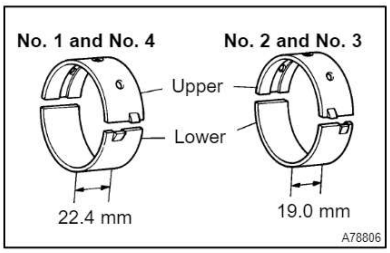


39. INSTALL CONNECTING ROD BEARING

(a) Align the key of the bearing with the keyway of the connecting rod or connecting cap.

NOTICE:

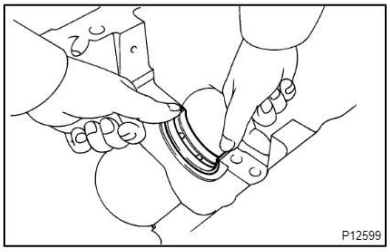
Clean the backside of the bearing and the bearing surface of the connecting rod. The surface should be free of dust and oils.



40. INSTALL CRANKSHAFT BEARING

HINT:

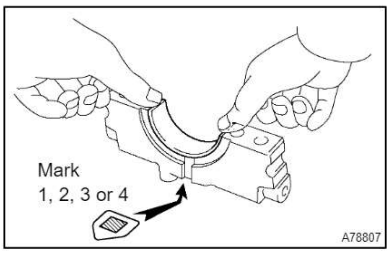
Main bearings come in width of 22.4 mm (0.882 in.) and 19.0 mm (0.748 in.). Install the 22.4mm (0.882 in.) bearings in the No. 1 and No. 4 cylinder block journal positions with the main bearing cap. Install the 19.0 mm (0.748 in.) bearings in the No. 2 and No. 3 positions.



(a) Align the key of the bearing with the keyway of the cylinder block, and push in the 4 upper bearings.

NOTICE:

Do not apply engine oil to the bearing and its contact surface.



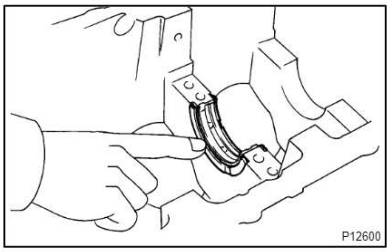
(b) Align the key of the bearing with the keyway of the main bearing cap, and push in the 4 lower bearings.

NOTICE:

Do not apply engine oil to the bearing and its contact surface.

HINT:

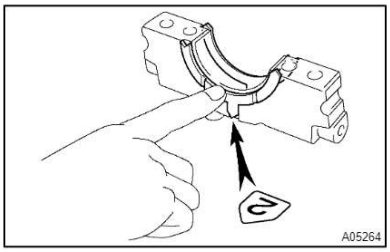
A number is marked on each main bearing cap to indicate the installation position.



41. INSTALL CRANKSHAFT THRUST WASHER SET

(a) Install the 2 thrust washers under the No. 2 journal position of the cylinder block with the oil grooves facing outward.

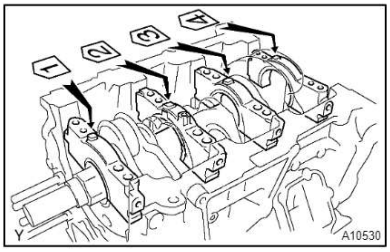
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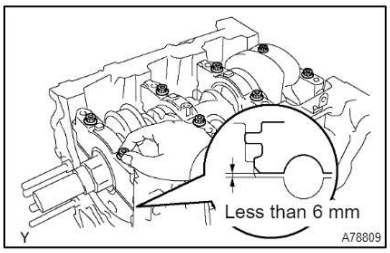
(b) Install the 2 thrust washers on the No. 2 bearing cap with the grooves facing outward.

42. INSTALL CRANKSHAFT

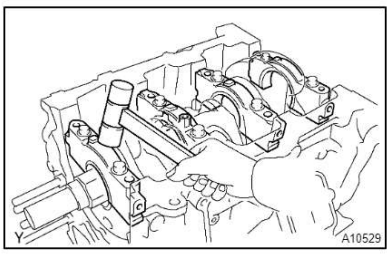
(a) Apply engine oil to the upper bearing and install the crankshaft on the cylinder block.



(b) Examine the front marks and numbers and install the bearing caps on the cylinder block.
(c) Apply a light coat of engine oil on the threads of the bearing cap bolts.
(d) Temporarily install the 8 main bearing cap bolts to the inside positions.

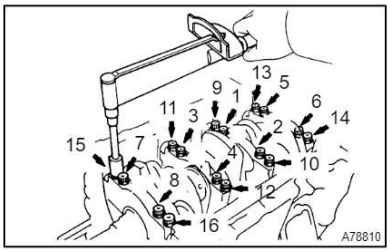


(e) Install the main bearing cap by hand using the inner bolt as a guide. Stop the main bearing cap is about 6 mm (0.23 in.) away from contacting with the block.

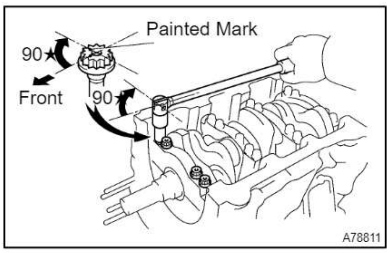


(f) Using a plastic−faced hammer, lightly tap the bearing cap to ensure a proper fit.
(g) Apply a light coat of engine oil on the threads of the main bearing cap bolts.

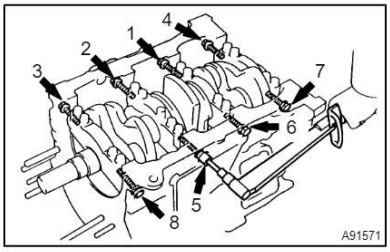
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(h) Uniformly install and tighten the 16 main bearing cap bolts in the sequence shown in the illustration.
Torque: 22 N·m (224 kgf·cm, 16 ft·lbf)

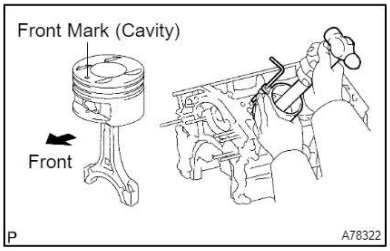


(i) Mark the front side of the bearing cap bolts with paint.
(j) Retighten the bearing cap bolts by 90★in the same sequence as step (h).
(k) Check that each painted mark is now at a 90★angle to the front.
(l) Check that the crankshaft turns smoothly.
(m) Install a new seal washer to the main bearing cap bolt



(n) Uniformly install and tighten the 8 main bearing cap bolts in the sequence shown in the illustration.
Torque: 27 N·m (275 kgf·cm, 20 ft·lbf)

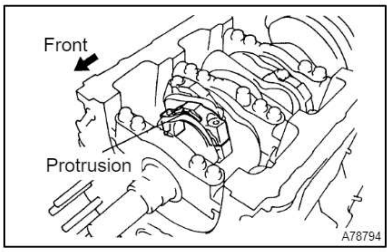
HINT:
Use the short bolt for the marked position (arrow).



43. INSTALL PISTON SUB−ASSY W/CONNECTING ROD

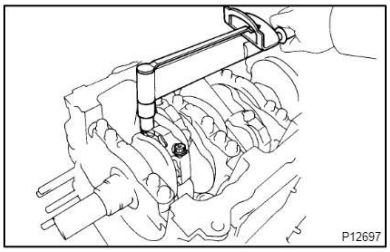
(a) Apply engine oil to the cylinder walls, the pistons, and the surfaces of connecting rod bearings.
(b) Check the position of the piston ring ends.
(c) Using a piston ring compressor, push the correctly numbered piston and connecting rod assemblies into each cylinder with the front mark of the piston facing forward.

NOTICE:
Match the numbered connecting rod cap with the connecting rod.

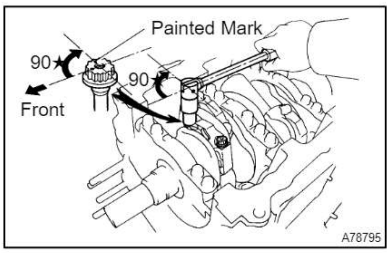


(d) Check that the protrusion of the connecting rod cap is facing the correct direction.
(e) Apply a light coat of engine oil on the threads of the connecting rod cap bolts.

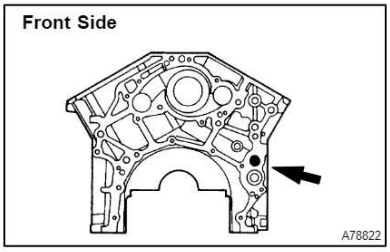
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(f) Tighten the bolts in several steps by the specified torque.
Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

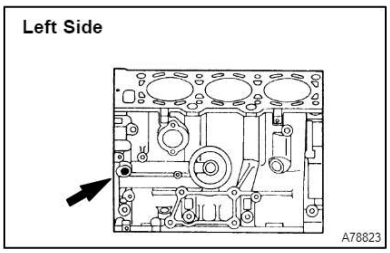


(g) Mark the front side of each connecting cap bolt with paint.
(h) Retighten the cap bolts by 90★as shown in the illustration.
(i) Check that the crankshaft turns smoothly.



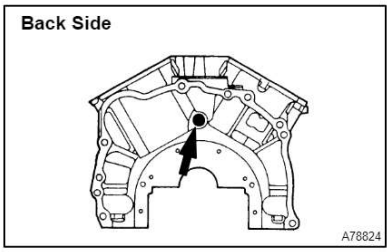
44. INSTALL CYLINDER BLOCK W/HEAD STRAIGHT SCREW NO.1 PLUG

(a) Using a socket hexagon wrench 10, install a new gasket and the screw plug.
Torque: 30 N·m (306 kgf·cm, 22 ft·lbf)



45. INSTALL CYLINDER BLOCK W/HEAD STRAIGHT SCREW NO.2 PLUG

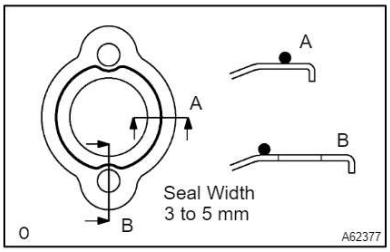
(a) Using a socket hexagon wrench 10, install a new gasket and the screw plug.
Torque: 30 N·m (306 kgf·cm, 22 ft·lbf)



46. INSTALL CYLINDER BLOCK W/HEAD STRAIGHT SCREW NO.3 PLUG

(a) Using a socket hexagon wrench 10, install a new gasket and the screw plug.
Torque: 50 N·m (510 kgf·cm, 37 ft·lbf)

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47. INSTALL WATER SEAL PLATE

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

(b) Apply a continuous bead of seal packing (diameter 3 to 5 mm (0.12 to 0.20 in.)) as shown in the illustration.
Seal packing: Part No. 08826−00100 or equivalent

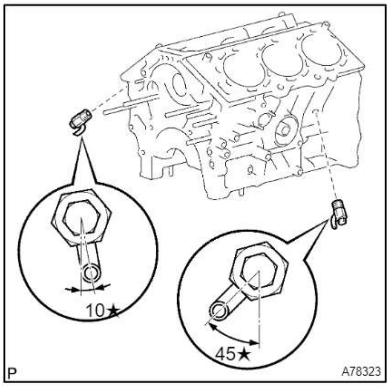
NOTICE:

- **Remove any oil from the contact surface.**
- **Install the seal plate within 3 minutes after applying seal packing.**
- **Do not expose the seal to engine oil for at least 2 hours after installing.**

(c) Install the seal plate with the 2 nuts.
Torque: 18 N·m (184 kgf·cm, 13 ft·lbf)

48. INSTALL CYLINDER BLOCK WATER DRAIN COCK SUB−ASSY

(a) Apply adhesive to 2 or 3 threads of the drain cock end.
Adhesive:
Part No. 08833−00070, THREE BOND 1324 or equivalent



(b) After applying the specified torque, rotate the drain cock clockwise as shown in the illustration.
Torque: 39 N·m (398 kgf·cm, 29 ft·lbf)

NOTICE:

- **Install the drain cock within 3 minutes after applying adhesive.**
- **Do not expose the seal to coolant for at least 1 hour after installing.**
- **Do not rotate the drain cock more than 1 revolution (360★) after tightening the drain cock with the specified torque.**
- **Do not loosen the drain cock after setting it correctly.**

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REPLACEMENT

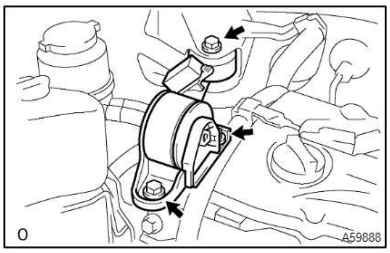
1. **WORK FOR PREVENTING GASOLINE FROM SPILLING OUT (See page 11−1)**
2. **REMOVE FRONT WHEELS**
3. **REMOVE ENGINE UNDER COVER LH**
4. **REMOVE ENGINE UNDER COVER RH**
5. **REMOVE FRONT FENDER APRON SEAL RH**
6. **DRAIN ENGINE OIL**
7. **DRAIN ENGINE COOLANT (See page 16−6)**
8. **DRAIN AUTOMATIC TRANSAXLE FLUID (A/T)**

(a) Using a 10 mm hexagon wrench, remove the drain plug and gasket. Drain automatic transaxle fluid.
(b) Install a new gasket and the drain plug.
Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)

9. **DRAIN MANUAL TRANSAXLE OIL (M/T)**

(a) Install a new gasket and the drain plug after draining transaxle oil.
Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)

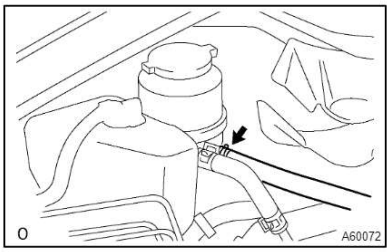
10. **REMOVE BATTERY**
11. **REMOVE AIR CLEANER ASSY**
12. **REMOVE ENGINE COVER SUB−ASSY NO.1**
13. **DISCONNECT RADIATOR HOSE INLET**
14. **DISCONNECT RADIATOR HOSE OUTLET**
15. **DISCONNECT OIL COOLER OUTLET HOSE NO.2 (A/T)**
16. **DISCONNECT OIL COOLER OUTLET HOSE NO.3 (A/T)**



17. **REMOVE ENGINE MOVING CONTROL ROD W/BRACKET**

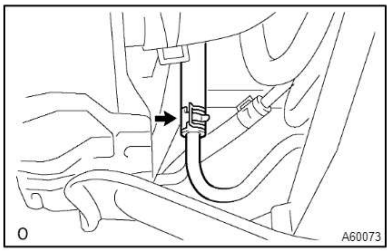
(a) Remove the 3 bolts and the engine moving control rod w/ bracket.

18. **REMOVE ENGINE MOUNTING STAY NO.2 RH**
19. **REMOVE ENGINE MOUNTING BRACKET NO.2 RH**
20. **REMOVE FAN AND GENERATOR V BELT (See page 14−5)**



21. **DISCONNECT OIL RESERVOIR TO PUMP HOSE NO.1**

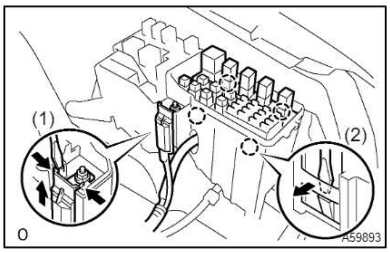
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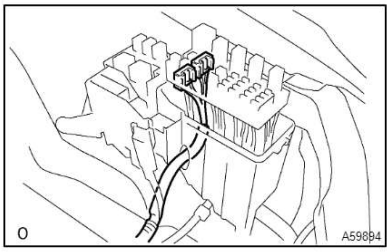
22. DISCONNECT RETURN TUBE SUB−ASSY

23. DISCONNECT UNION TO CONNECTOR TUBE HOSE
24. DISCONNECT FLOOR SHIFT CABLE TRANSMISSION CONTROL SHIFT (A/T)
(See page 40−65)
25. DISCONNECT FLOOR SHIFT CABLE TRANSMISSION CONTROL SHIFT (M/T)
26. DISCONNECT FLOOR SHIFT CABLE TRANSMISSION CONTROL SELECT (M/T)
27. REMOVE CLUTCH RELEASE CYLINDER ASSY (M/T)
(a) Remove the bolt and flexible hose.
(b) Remove the 2 bolts and clutch release cylinder.
28. DISCONNECT HEATER INLET WATER HOSE
29. DISCONNECT HEATER OUTLET WATER HOSE
30. DISCONNECT FUEL TUBE SUB−ASSY (See page 11−1)

31. DISCONNECT ENGINE WIRE
(a) Disconnect the engine wire from the ECM and J/B.

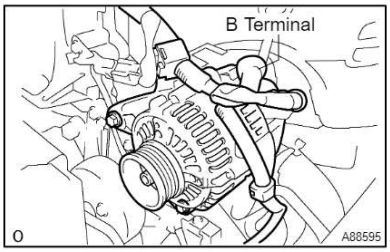


(b) Disconnect the engine wire from the engine room J/B.
(1) Remove the nut fixing the wire harness.
(2) Using a screwdriver, unlock the engine room J/B. Disconnect the engine wire by pulling it upward.

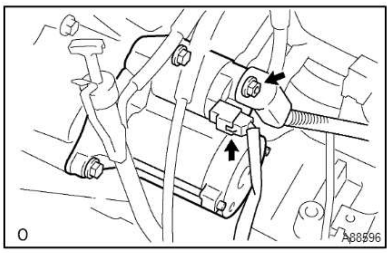


(3) Disconnect the connectors.
(c) Pull out the engine wire.

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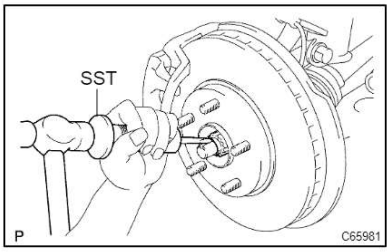


(d) Disconnect the B terminal of the generator.
(e) Remove the body ground.
(f) Remove the starter connector.



32. DISCONNECT ENGINE WIRE NO.2
(a) Remove the nut and disconnect terminal 30 of the starter.

33. REMOVE GENERATOR ASSY
34. REMOVE COMPRESSOR AND MAGNETIC CLUTCH
HINT:
Hang up the hoses instead of detaching.
35. REMOVE EXHAUST PIPE ASSY FRONT
36. REMOVE FRONT STABILIZER LINK ASSY LH
(a) Using a 6 mm socket hexagon wrench, fix the stud bolt.
(b) Remove the nut and disconnect the stabilizer link.
37. REMOVE FRONT STABILIZER LINK ASSY RH
HINT:
Use the same procedures described for the LH side.



38. REMOVE FRONT AXLE HUB LH NUT
(a) Using SST and a hammer, strike the lock nut covering to remove it.
SST 09930–00010
NOTICE:
- **Set the drive shaft's groove so that it faces up. Then use the SST and hammer.**
- **Remove the covering from the lock nut completely or the screw of the drive shaft may be damaged.**
- **Do not sharpen the tip of the SST.**

(b) Using a 30 mm socket wrench, remove the lock nut.

39. REMOVE FRONT AXLE HUB RH NUT
HINT:
Use the same procedures described for the LH side.

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40. REMOVE SPEED SENSOR FRONT LH (W/ ABS)

(a) Remove the bolt and disconnect the speed sensor from the steering knuckle.

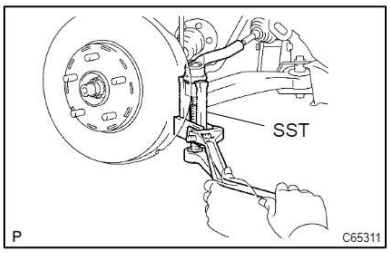
NOTICE:

Keep the speed sensor tip and connection free from foreign matter.

41. REMOVE SPEED SENSOR FRONT RH (W/ ABS)

HINT:

Use the same procedures described for the LH side.



42. DISCONNECT TIE ROD ASSY LH

(a) Remove the cotter pin and castle nut.

(b) Using SST, disconnect the tie rod end from the steering knuckle.

SST 09628−62011

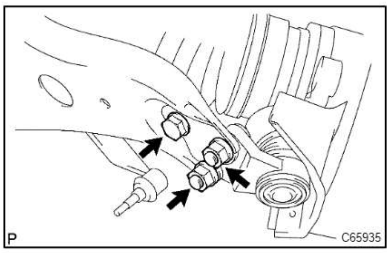
NOTICE:

Be careful not to damage the cover of the ball joint.

43. DISCONNECT TIE ROD ASSY RH

HINT:

Use the same procedures described for the LH side.



44. DISCONNECT FRONT SUSPENSION ARM SUB−ASSY LOWER NO.1 LH

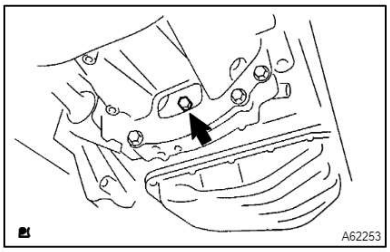
(a) Remove the bolt and 2 nuts, as shown in the illustration.

(b) Using a plastic hammer, disconnect the drive shaft from the axle hub.

45. DISCONNECT FRONT SUSPENSION ARM SUB−ASSY LOWER NO.1 RH

HINT:

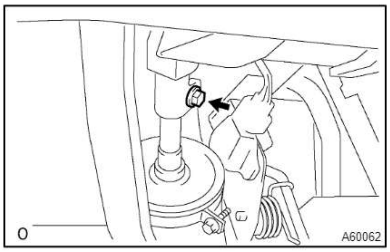
Use the same procedures described for the LH side.



46. REMOVE DRIVE PLATE & TORQUE CONVERTER CLUTCH SETTING BOLT

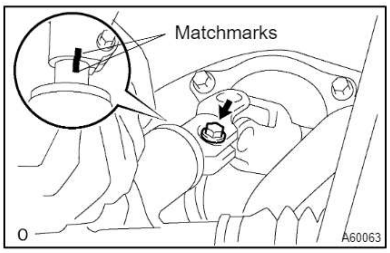
(a) Fix the crankshaft and remove the 6 setting bolts.

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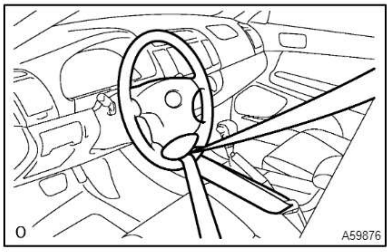
47. REMOVE STEERING INTERMEDIATE SHAFT ASSY

(a) Loosen the sliding yoke bolt.



(b) Place matchmarks on the intermediate shaft and control valve shaft.

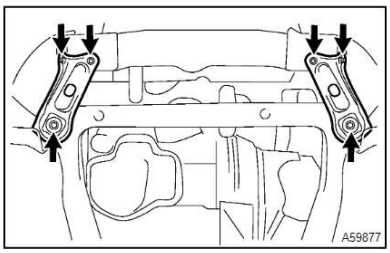
(c) Remove the bolt and the steering intermediate shaft.



(d) To prevent the steering wheel from rotating, fix the wheel with the seat belt.

NOTICE:

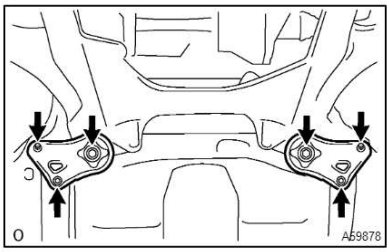
If the steering wheel is not fixed, the spiral cable will be damaged.



48. REMOVE ENGINE ASSEMBLY WITH TRANSAXLE

(a) Set the engine lifter.

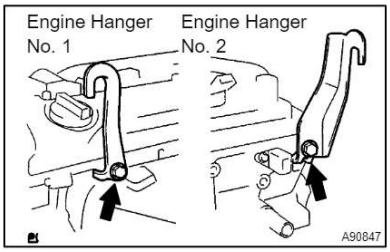
(b) Remove the 4 bolts, 2 nuts and frame side rail plate RH and LH.



(c) Remove the 4 bolts, 2 nuts and front suspension member brace rear RH and LH.

(d) Carefully remove the engine assembly from the vehicle.

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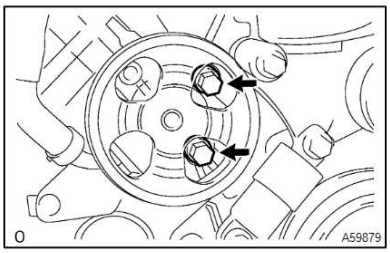


(e) Install the 2 engine hangers as shown in the illustration.
Parts No.:

Engine hanger No. 1	12281−28010
Engine hanger No. 2	12282−28010
Bolt	91512−61020

Torque: 38 N·m (387 kgf·cm, 28 ft lbf)

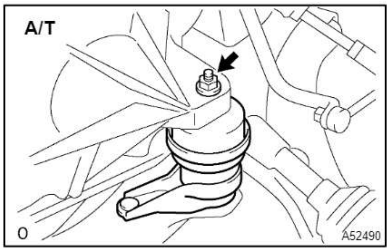
(f) Using a chain block and an engine sling device, hang the engine assembly.



49. REMOVE VANE PUMP ASSY

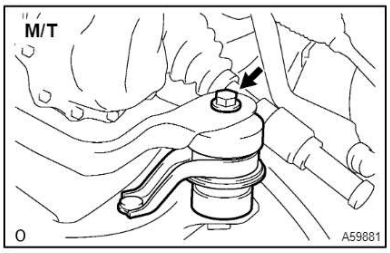
(a) Disconnect the PS oil pressure switch connector.

(b) Remove the 2 bolts and vane pump from the engine.

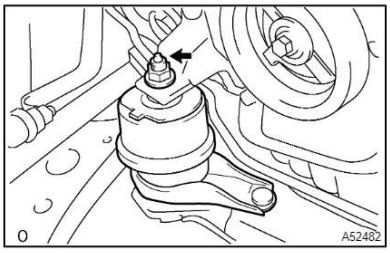


50. REMOVE FRONT FRAME ASSY

(a) A/T:
Remove the nut installing the engine mounting insulator LH.

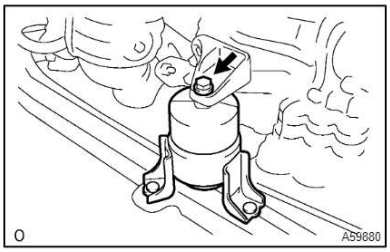


(b) M/T:
Remove the bolt installing the engine mounting insulator LH.

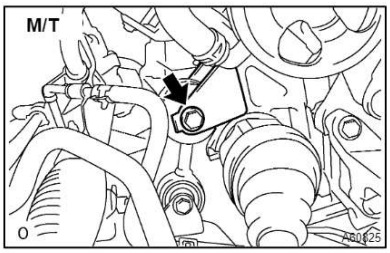


(c) Remove the nut installing the engine mounting insulator RH.

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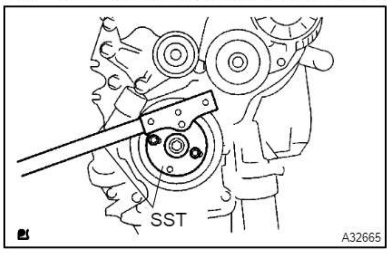


(d) Remove the bolt installing the engine mounting insulator FR.

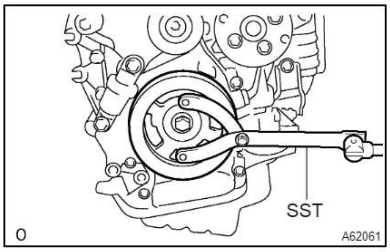


(e) M/T:
Remove the bolt installing the engine lateral control rod.
(f) Raise the engine assembly and separate the front frame.

51. REMOVE FRONT DRIVE SHAFT ASSY LH (See page 30−8)
52. REMOVE FRONT DRIVE SHAFT ASSY RH (See page 30−8)
53. REMOVE STARTER ASSY (See page 19−5)
54. SEPARATE AUTOMATIC TRANSAXLE ASSY (A/T) (See page 40−18)
55. SEPARATE MANUAL TRANSAXLE ASSY (M/T) (See page 41−11)

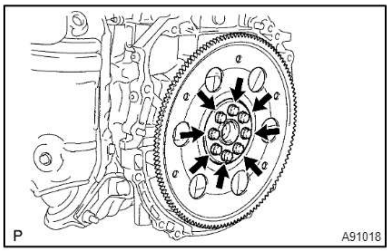


56. REMOVE DRIVE PLATE & RING GEAR SUB−ASSY (A/T)
(a) TMC made:
Using SST, fix the crankshaft.
SST 09213−54015 (91651−60855), 09330−00021



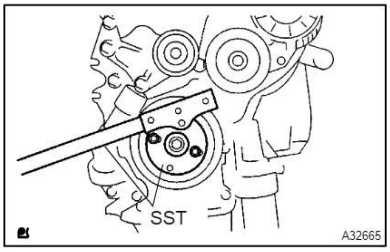
(b) TMMK made:
Using SST, fix the crankshaft.
SST 09960−10010 (09962−01000, 09963−01000)

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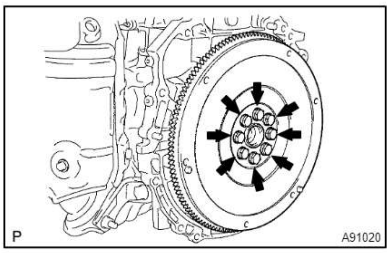


(c) Remove the 8 bolts, rear spacer, drive plate and front spacer.

57. REMOVE CLUTCH COVER ASSY (M/T) (See page 42−15)
58. REMOVE CLUTCH DISC ASSY (M/T) (See page 42−15)

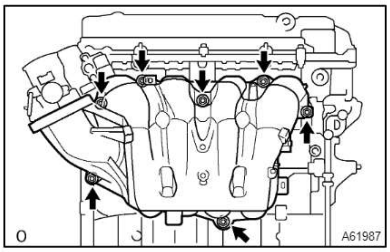


59. REMOVE FLYWHEEL SUB−ASSY (M/T)
(a) Using SST, fix the crankshaft.
SST 09213−54015 (91651−60855), 09330−00021



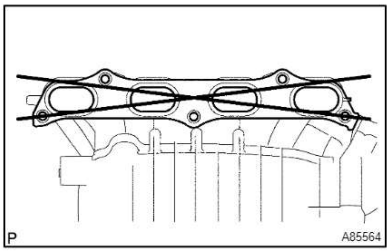
(b) Remove the 8 bolts, rear spacer and flywheel.

60. INSTALL ENGINE STAND



61. REMOVE INTAKE MANIFOLD
(a) Remove the 5 bolts, 2 nuts, intake manifold and gasket.

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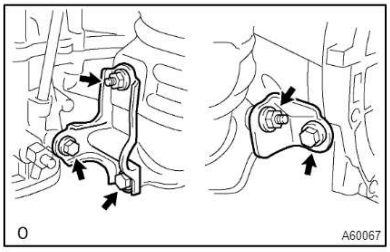
62. INSPECT INTAKE MANIFOLD

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

Maximum warpage: 0.20 mm (0.0079 in.)

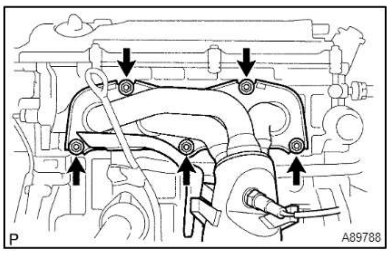
If the warpage is greater than maximum, replace the manifold.

63. REMOVE INTAKE MANIFOLD RUNNER VALVE ASSY (PZEV only) (See page 13–5)
64. REMOVE VENTILATION HOSE
65. REMOVE VENTILATION HOSE NO.2
66. REMOVE ENGINE WIRE
67. REMOVE INTAKE MANIFOLD INSULATOR NO.1
68. REMOVE OIL LEVEL GAGE SUB–ASSY
69. REMOVE OIL LEVEL GAGE GUIDE
70. REMOVE MANIFOLD CONVERTER INSULATOR NO.1

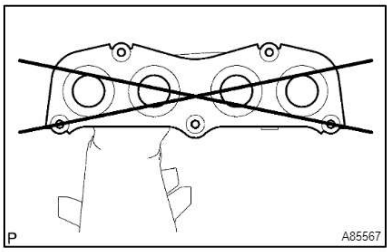


71. REMOVE EXHAUST MANIFOLD CONVERTER SUB–ASSY

(a) Remove the 3 bolts, 2 nuts, and the No. 1 and No. 2 exhaust manifold stays.



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



72. INSPECT CONVERTER SUB–ASSY, EXHAUST MANIFOLD

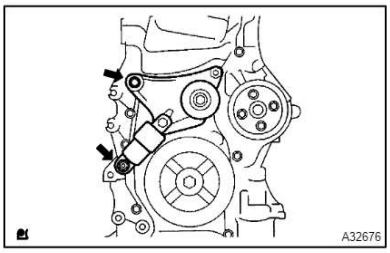
(a) Using a precision straight edge and feeler gauge, measure the surface contacting the cylinder head for warpage.

Maximum warpage: 0.70 mm (0.0276 in.)

If the warpage is greater than the maximum, replace the manifold.

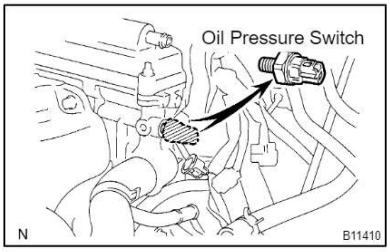
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73. REMOVE WATER INLET
74. REMOVE THERMOSTAT
75. REMOVE IGNITION COIL ASSY



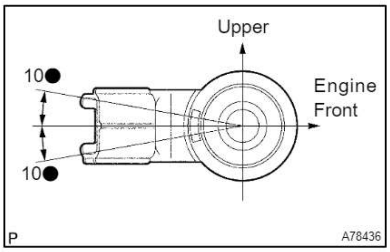
76. REMOVE V−RIBBED BELT TENSIONER ASSY
(a) Remove the bolt, nut and belt tensioner.

77. REMOVE DRIVE SHAFT BEARING BRACKET
78. REMOVE ENGINE MOUNTING BRACKET RH
79. REMOVE FUEL DELIVERY PIPE W/INJECTOR (See page 11−10)
80. REMOVE WATER BY−PASS PIPE NO.1



81. REMOVE ENGINE OIL PRESSURE SWITCH ASSY
(a) Remove the oil pressure switch.

82. REMOVE KNOCK SENSOR
(a) Disconnect the sensor connector.
(b) Remove the nut and sensor.
83. REMOVE ENGINE COOLANT TEMPERATURE SENSOR
84. REPLACE PARTIAL ENGINE ASSY
85. INSTALL ENGINE COOLANT TEMPERATURE SENSOR
(a) Install a new gasket to the sensor.
(b) Install the sensor.
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)



86. INSTALL KNOCK SENSOR
(a) Install the sensor with the nut, as shown in the illustration.
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)

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87. INSTALL ENGINE OIL PRESSURE SWITCH ASSY

(a) Clean the threads of the oil pressure switch. Apply adhesive to 2 or 3 threads of the oil.
Adhesive: Part No. 08833−00080 THREE BOND 1344 or equivalent

(b) Install the oil pressure switch.
Torque: 15 N·m (153 kgf·cm, 11 ft·lbf)

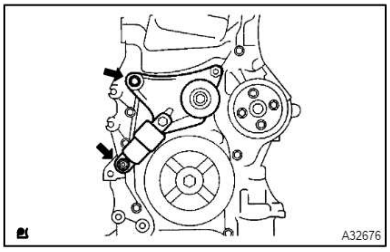
88. INSTALL WATER BY−PASS PIPE NO.1

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

89. INSTALL FUEL DELIVERY PIPE W/INJECTOR (See page 11−10)

90. INSTALL ENGINE MOUNTING BRACKET RH
Torque: 54 N·m (551 kgf·cm, 40 ft·lbf)

91. INSTALL DRIVE SHAFT BEARING BRACKET
Torque: 64 N·m (653 kgf·cm, 47 ft·lbf)



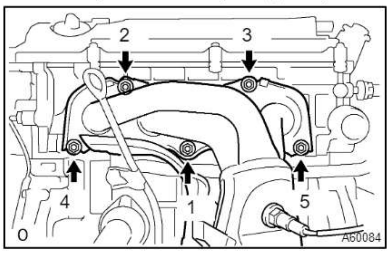
92. INSTALL V−RIBBED BELT TENSIONER ASSY

(a) Install the belt tensioner with the bolt and the nut.
Torque: 59.5 N·m (607 kgf·cm, 44 ft·lbf)

93. INSTALL IGNITION COIL ASSY
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

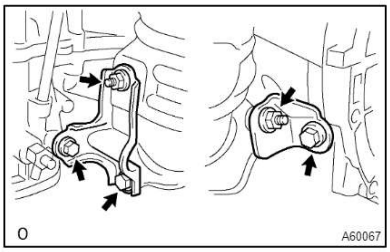
94. INSTALL THERMOSTAT (See page 16−11)

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



96. INSTALL EXHAUST MANIFOLD CONVERTER SUB−ASSY

(a) Install a new gasket and the exhaust manifold converter. Uniformly tighten the 5 nuts in the sequence shown in the illustration.
Torque: 37 N·m (378 kgf·cm, 27 ft·lbf)



(b) Install the No. 1 and No. 2 exhaust manifold stays with the 3 bolts and 2 nuts.
Torque: 44 N·m (449 kgf·cm, 32 ft·lbf)

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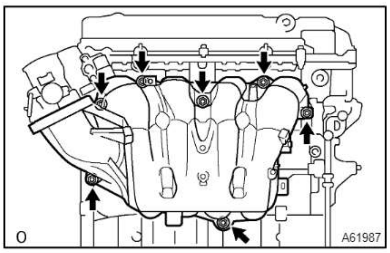
97. INSTALL MANIFOLD CONVERTER INSULATOR NO.1
Torque: 12 N·m (122 kgf·cm, 9 ft·lbf)

98. INSTALL OIL LEVEL GAGE GUIDE

(a) Apply a light coat of engine oil to the O−ring and install it to the guide.

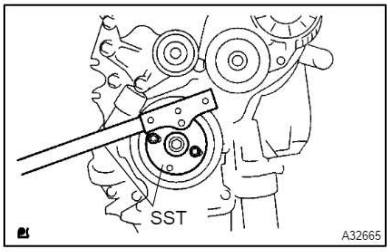
(b) Install the oil level gage and guide with the bolt.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

99. INSTALL INTAKE MANIFOLD RUNNER VALVE ASSY (PZEV only) (See page 13−5)



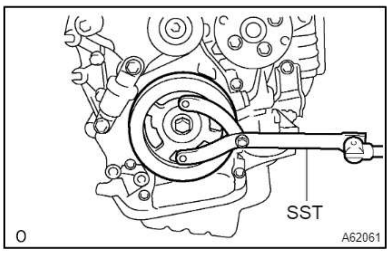
100. INSTALL INTAKE MANIFOLD

(a) Install a new gasket and the intake manifold with the 5 bolts and 2 nuts.
Torque: 30 N·m (306 kgf·cm, 22 ft·lbf)

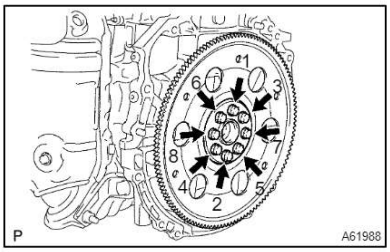


101. INSTALL DRIVE PLATE & RING GEAR SUB−ASSY (A/T)

(a) TMC made:
Using SST, fix the crankshaft.
SST 09213−54015 (91651−60855), 09330−00021



(b) TMMK made:
Using SST, fix the crankshaft.
SST 09960−10010 (09962−01000, 09963−01000)

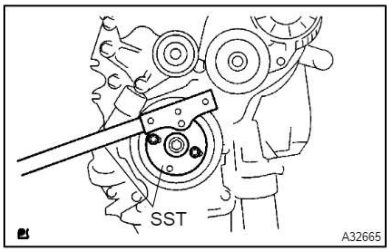


(c) Clean the bolt and the bolt hole.

(d) Apply adhesive to 2 or 3 threads of the bolt end.
Adhesive:
Part No. 08833−00070, THREE BOND or equivalent.

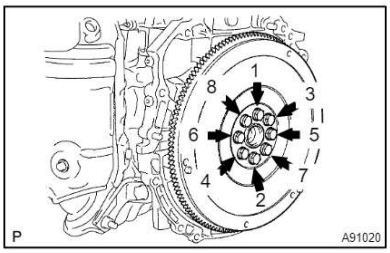
(e) Install the front spacer, drive plate and rear spacer with 8 bolts. Uniformly tighten the 8 bolts in the sequence shown in the illustration.
Torque: 98 N·m (1,000 kgf·cm, 72 ft·lbf)

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102. INSTALL FLYWHEEL SUB−ASSY

(a) Using SST, fix the crankshaft.
SST 09213−54015 (91651−60855), 09330−00021

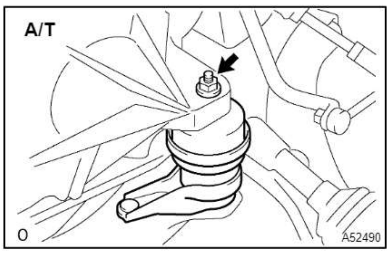


(b) Clean the bolt and the bolt hole.

(c) Apply adhesive to 2 or 3 threads of the bolt end.
Adhesive:
Part No. 08833−00070, THREE BOND or equivalent.

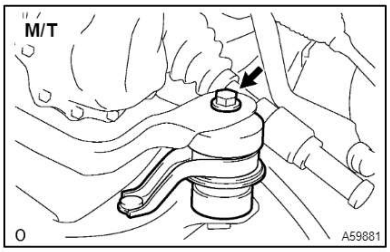
(d) Install the flywheel. Uniformly tighten the 8 bolts in the sequence shown in the illustration.
Torque: 130 N·m (1,330 kgf·cm, 96 ft·lbf)

103. INSTALL CLUTCH DISC ASSY (M/T) (See page 42−15)
104. INSTALL CLUTCH COVER ASSY (M/T) (See page 42−15)
105. INSTALL AUTOMATIC TRANSAXLE ASSY (A/T) (See page 40−18)
106. INSTALL MANUAL TRANSAXLE ASSY (M/T) (See page 41−11)
107. INSTALL STARTER ASSY (See page 19−5)
Torque: 39 N·m (398 kgf·cm, 29 ft·lbf)
108. INSTALL FRONT DRIVE SHAFT ASSY RH (See page 30−8)
109. INSTALL FRONT DRIVE SHAFT ASSY LH (See page 30−8)



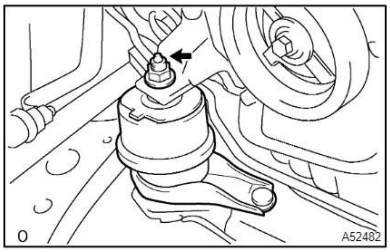
110. INSTALL FRONT FRAME ASSY

(a) A/T:
Install the engine mounting insulator LH with the nut.
Torque: 95 N·m (969 kgf·cm, 70 ft·lbf)

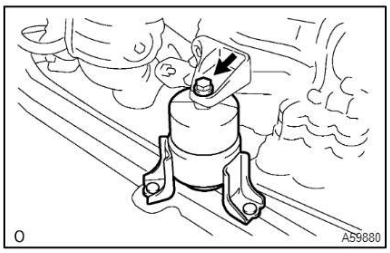


(b) M/T:
Install the engine mounting insulator LH with the bolt.
Torque: 143 N·m (1,459 kgf·cm, 105 ft·lbf)

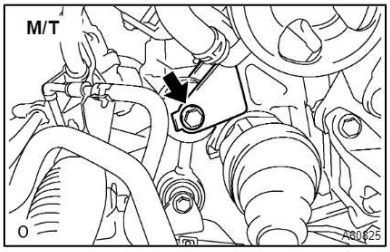
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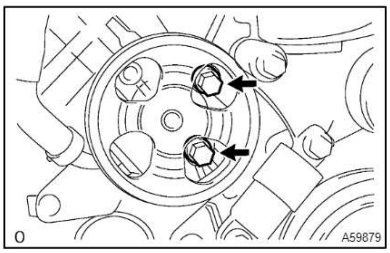
(c) Install the engine mounting insulator RH with the nut.
Torque: 95 N·m (969 kgf·cm, 70 ft·lbf)



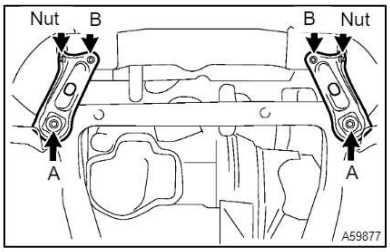
(d) Install the engine mounting insulator FR with the bolt.
Torque: 87 N·m (888 kgf·cm, 64 ft·lbf)



(e) M/T:
Install the engine lateral control rod with the bolt.
Torque: 89 N·m (910 kgf·cm, 66 ft·lbf)

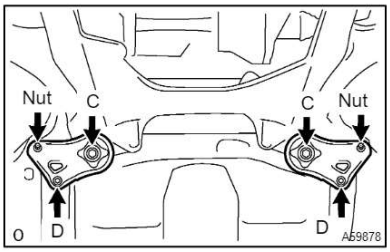


111. INSTALL VANE PUMP ASSY
(a) Install the vane pump to the engine with the 2 bolts.
(b) Connect the PS oil pressure switch connector.
Torque: 43 N·m (439 kgf·cm, 32 ft·lbf)

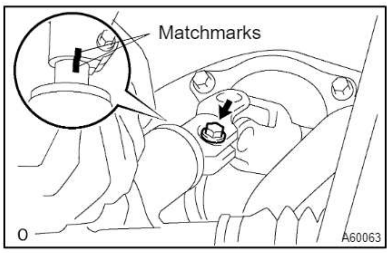


112. INSTALL ENGINE ASSEMBLY WITH TRANSAXLE
(a) Set the engine assembly with transaxle on the engine lifter.
(b) Install the engine assembly to the vehicle.
(c) Install the frame side plate LH and RH with the 4 bolts and 2 nuts.
Torque:
85 N·m (867 kgf·cm, 63 ft·lbf) for bolt A
32 N·m (326 kgf·cm, 24 ft·lbf) for bolt B and nut

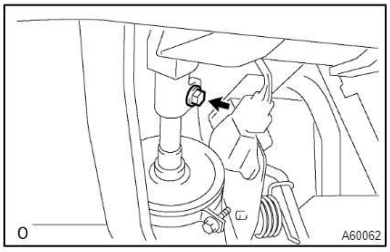
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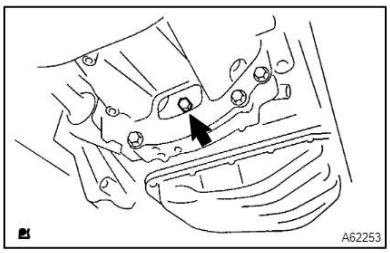
(d) Install the front suspension member brace rear RH and LH with the 4 bolts and 2 nuts.
Torque:
85 N·m (867 kgf·cm, 63 ft·lbf) for bolt C
32 N·m (326 kgf·cm, 24 ft·lbf) for bolt D and nut



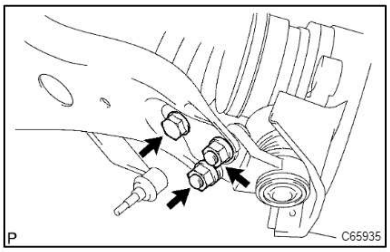
113. INSTALL STEERING INTERMEDIATE SHAFT ASSY
(a) Align the matchmarks on the intermediate shaft and control valve shaft.
Torque: 35 N·m (357 kgf·cm, 26 ft·lbf)



(b) Tighten the bolt.
Torque: 35 N·m (357 kgf·cm, 26 ft·lbf)



114. INSTALL DRIVE PLATE & TORQUE CONVERTER CLUTCH SETTING BOLT (A/T)
(a) Fix the crankshaft, and install the 6 setting bolts.
Torque: 41 N·m (418 kgf·cm, 30 ft·lbf)



115. INSTALL FRONT SUSPENSION ARM SUB–ASSY LOWER NO.1 LH
(a) Install the drive shaft to the steering knuckle.
(b) Install the suspension lower arm with the bolt and the 2 nuts.
Torque: 75 N·m (765 kgf·cm, 55 ft·lbf)

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116. INSTALL FRONT SUSPENSION ARM SUB−ASSY LOWER NO.1 RH

HINT:

Use the same procedures described for the LH side.

117. INSTALL TIE ROD ASSY LH

(a) Connect the tie rod end to the steering knuckle and install a new castle nut.
Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)

NOTICE:

- **Prevent any lubricant from contacting the thread and the taper portions.**
- **After tightening the castle nut, tighten it to the additional direction within 60● to put into a cotter pin.**

(b) Insert a new cotter pin.

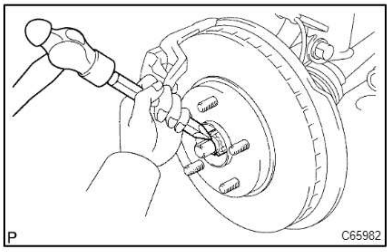
118. INSTALL TIE ROD ASSY RH

HINT:

Use the same procedures described for the LH side.

119. INSTALL SPEED SENSOR FRONT LH (W/ABS)
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

120. INSTALL SPEED SENSOR FRONT RH (W/ABS)
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)



121. INSTALL FRONT AXLE HUB LH NUT

(a) Using a 30 mm socket wrench, install a new hub nut.
Torque: 294 N·m (3,000 kgf·cm, 217 ft·lbf)

(b) Using a chisel and hammer, tapped the front axle hub LH nut.

122. INSTALL FRONT AXLE HUB RH NUT

HINT:

Use the same procedures described for the LH side.

123. INSTALL FRONT STABILIZER LINK ASSY LH

(a) Using a 5 mm socket hexagon wrench, fix the stud bolt and install the nut.
Torque: 74 N·m (755 kgf·cm, 55 ft·lbf)

124. INSTALL FRONT STABILIZER LINK ASSY RH

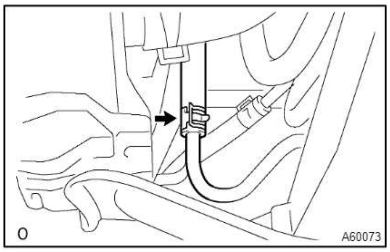
HINT:

Use the same procedures described for the LH side.

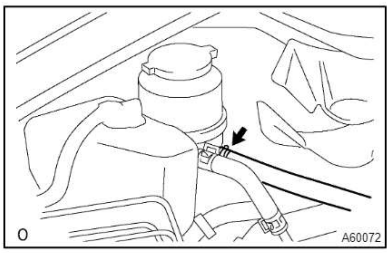
125. INSTALL EXHAUST PIPE ASSY FRONT (See page 15−3)

126. CONNECT FUEL TUBE SUB−ASSY (See page 11−1)

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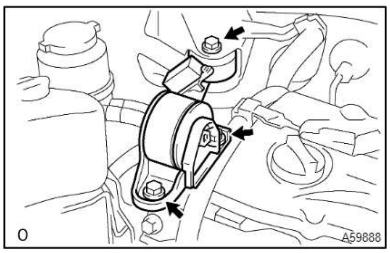


127. INSTALL RETURN TUBE SUB−ASSY



128. INSTALL OIL RESERVOIR TO PUMP HOSE NO.1

129. INSTALL COMPRESSOR AND MAGNETIC CLUTCH (See page 55−68)
130. INSTALL GENERATOR ASSY (See page 19−17)
131. INSTALL FAN AND GENERATOR V BELT (See page 14−5)
132. CONNECT ENGINE WIRE NO.2
133. CONNECT ENGINE WIRE
134. INSTALL ENGINE MOUNTING BRACKET NO.2 RH
Torque: 52 N·m (531 kgf·cm, 38 ft·lbf)
135. INSTALL ENGINE MOUNTING STAY NO.2 RH
Torque: 64 N·m (653 kgf·cm, 47 ft·lbf)



136. INSTALL ENGINE MOVING CONTROL ROD W/BRACKET
(a) Install the engine mounting control rod with the 3 bolts.
Torque: 64 N·m (653 kgf·cm, 47 ft·lbf)

137. INSTALL AIR CLEANER ASSY
Torque: 5.0 N·m (51 kgf·cm, 44 in.·lbf)
138. ADD AUTOMATIC TRANSAXLE FLUID (A/T)
139. ADD MANUAL TRANSAXLE OIL (M/T)
140. ADD ENGINE OIL
141. ADD ENGINE COOLANT (See page 16−6)
142. ADD POWER STEERING FLUID
143. BLEED POWER STEERING FLUID
144. CHECK FOR OIL LEAKS
145. CHECK FOR ENGINE COOLANT LEAKS (See page 16−1)

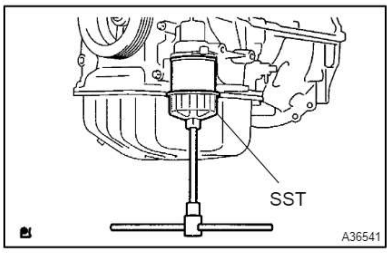
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146. CHECK FOR FUEL LEAKS (See page 11−4)
147. INSTALL FRONT WHEEL
148. ADJUST FRONT WHEEL ALIGNMENT (See page 26−5)
149. INSPECT CHECK IDLE SPEED AND IGNITION TIMING (See page 14−1)
150. INSPECT CO/HC
151. CHECK ABS SPEED SENSOR SIGNAL (W/ ABS) (See page 05−873, 05−933 or 05−990)

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14134−01

OVERHAUL



1. REMOVE OIL FILTER SUB−ASSY

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

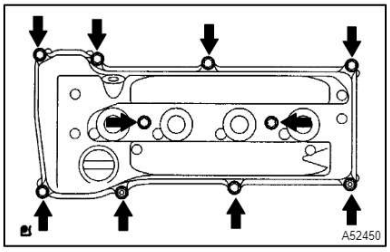
2. REMOVE OIL FILTER UNION

(a) Using a 12 mm hexagon wrench, remove the union.

3. REMOVE OIL FILLER CAP SUB−ASSY

4. REMOVE VENTILATION VALVE SUB−ASSY

5. REMOVE SPARK PLUG

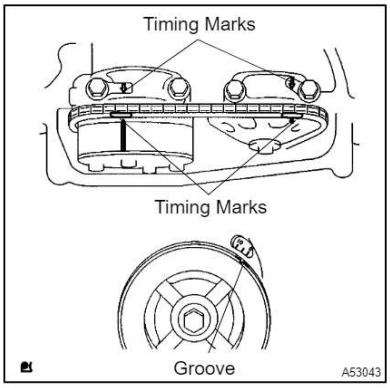


6. REMOVE CYLINDER HEAD COVER SUB−ASSY

(a) Remove the 8 bolts, 2 nuts, and cylinder head cover.

7. REMOVE CYLINDER HEAD COVER GASKET

8. REMOVE CRANKSHAFT POSITION SENSOR

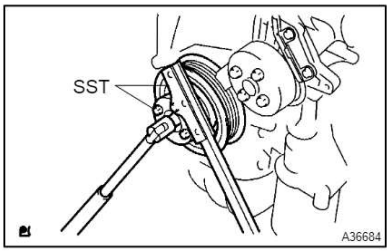


9. REMOVE CRANKSHAFT PULLEY

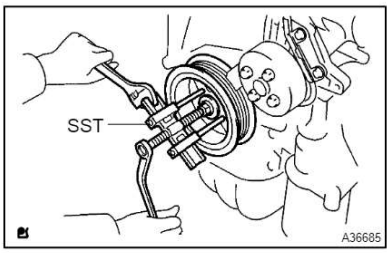
(a) Turn the crankshaft pulley and align its groove with timing mark 0 of the timing chain cover.

(b) Check that the timing marks of the camshaft timing sprockets are aligned with the timing marks of the No. 1 bearing cap, as shown in the illustration.

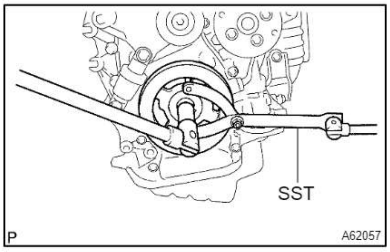
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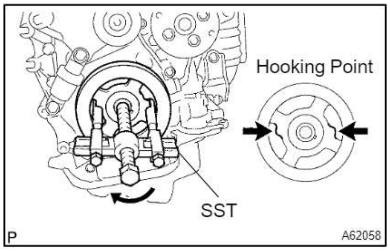
(c) TMC made:
Remove the crankshaft pulley.
(1) Using SST, fix the pulley and loosen the bolt.
SST 09213−54015 (91651−60855), 09330−00021



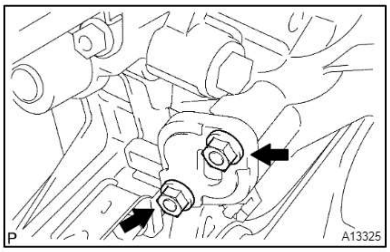
(2) Using SST, remove the bolt and pulley.
SST 09950−50013 (09951−05010, 09952−05010, 09953−05020, 09954−05021)



(d) TMMK made:
Remove the crankshaft pulley.
(1) Using SST, fix the crankshaft pulley and loosen a pulley set bolt.
SST 09960−10010 (09962−01000, 09963−01000)

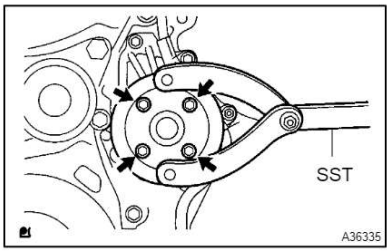


(2) Using SST, remove the crankshaft pulley.
SST 09950−40011 (09951−04010, 09952−04010, 09953−04030, 09954−04010, 09955−04041, 09957−04010, 91111−51014)



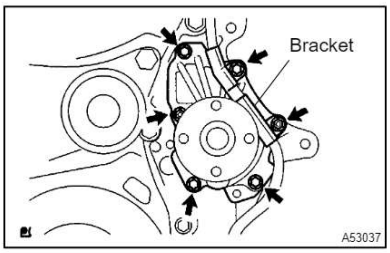
10. REMOVE CHAIN TENSIONER ASSY NO.1
(a) Remove the 2 nuts, chain tensioner and gasket.
NOTICE:
Do not to turn the crankshaft without the chain tensioner.

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11. REMOVE WATER PUMP PULLEY

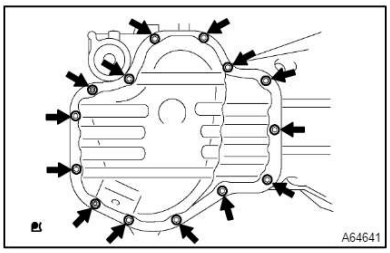
(a) Using SST, remove the water pump pulley.
SST 09960−10010 (09962−01000, 09963−00700)



12. REMOVE WATER PUMP ASSY

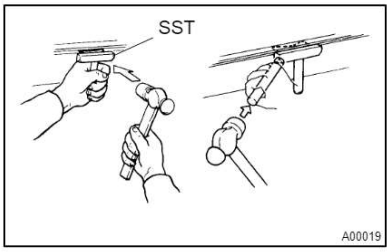
(a) Remove the 4 bolts, 2 nuts, bracket and water pump.

13. REMOVE OIL PAN DRAIN PLUG



14. REMOVE OIL PAN SUB−ASSY

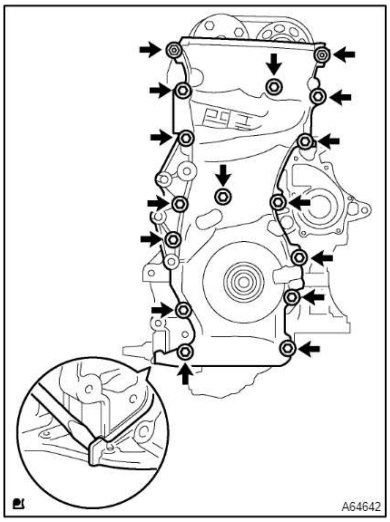
(a) Remove the 12 bolts and 2 nuts.



(b) Insert the blade of SST between the crankcase and oil pan. Cut off applied sealer and remove the oil pan.
SST 09032−00100

NOTICE:
Be careful not to damage the contact surface of the cylinder block and oil pan.

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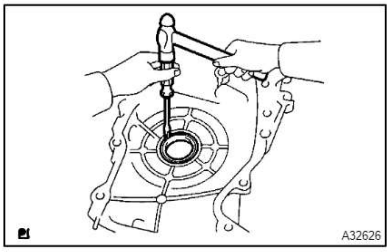
15. REMOVE TIMING CHAIN OR BELT COVER SUB−ASSY

(a) Remove the 14 bolts and 2 nuts.

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

NOTICE:

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



16. REMOVE TIMING GEAR CASE OR TIMING CHAIN CASE OIL SEAL

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

17. REMOVE CRANKSHAFT POSITION SENSOR PLATE NO.1

18. REMOVE TIMING CHAIN GUIDE

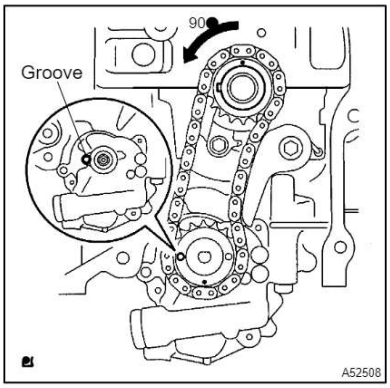
19. REMOVE CHAIN TENSIONER SLIPPER

20. REMOVE CHAIN VIBRATION DAMPER NO.1

21. REMOVE CHAIN SUB−ASSY

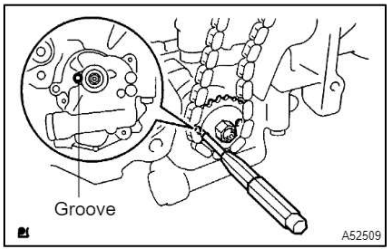
22. REMOVE CRANKSHAFT TIMING GEAR OR SPROCKET

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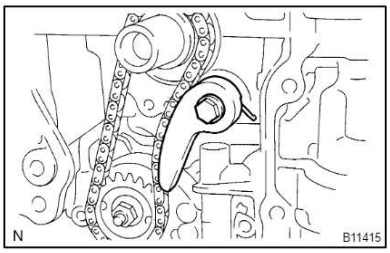


23. REMOVE NO.2 CHAIN SUB–ASSY

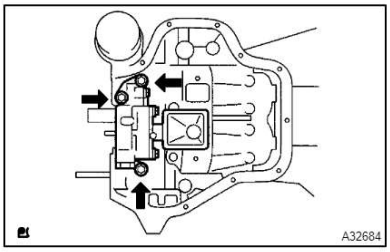
(a) Turn the crankshaft counterclockwise by 90● and align the adjusting hole of the oil pump driven sprocket with the groove of the oil pump.



(b) Put a bar (φ 4 mm) in the adjusting hole of the oil pump driven sprocket to temporarily lock the sprocket in position. Remove the nut.



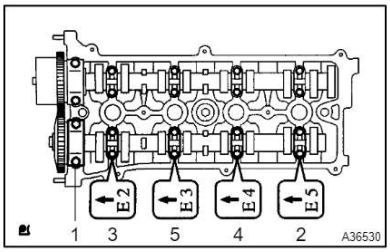
(c) Remove the bolt, chain tensioner plate and spring.
(d) Remove the oil pump drive sprocket, oil pump driven sprocket and chain.



24. REMOVE OIL PUMP ASSY

(a) Remove the 3 bolts, oil pump and gasket.

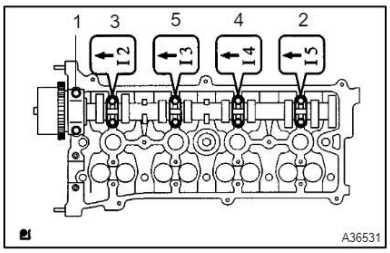
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25. REMOVE NO.2 CAMSHAFT

(a) Uniformly loosen and remove the No. 2 camshaft's 10 bearing cap bolts in the sequence shown in the illustration. Then remove the 5 bearings.

(b) Remove the camshaft.

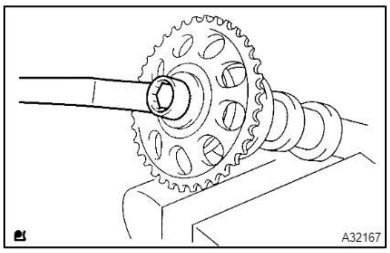


26. REMOVE CAMSHAFT

(a) Uniformly loosen and remove the No. 2 camshaft's 10 bearing cap bolts in the sequence shown in the illustration. Then remove the 5 bearings.

(b) Remove the camshaft.

27. REMOVE CAMSHAFT BEARING NO.1

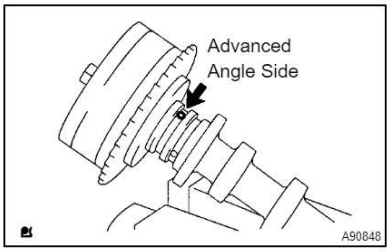


28. REMOVE CAMSHAFT TIMING GEAR OR SPROCKET

(a) Fix the camshaft with a vise and remove the camshaft timing sprocket.

NOTICE:

Be careful not to damage the camshaft.

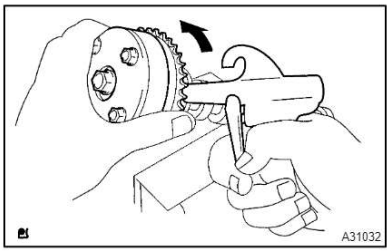


29. REMOVE CAMSHAFT TIMING GEAR ASSY

(a) Fix the camshaft with a vise, and make sure that the camshaft timing gear does not move.

(b) Cover all the oil ports with vinyl tape except the advanced angle side, as shown in the illustration.

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(c) Using an air gun, apply about 150 kPA (1.5 kgf/cm, 21 psi) of air pressure to the port on the advanced angle side.

CAUTION:

Some oil spraying will occur. Contain the spray with a shop rag.

HINT:

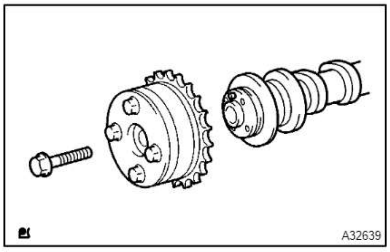
This operation releases the lock pin for the extreme retarded angle lock.

(d) Under the condition above, check that the camshaft timing gear can be turned by hand to the advanced angle side (counterclockwise), the direction of the arrow in the illustration.

Standard: Must turn

HINT:

The camshaft timing gear will turn to the advanced angle side without applying force by hand depending on the force of the air pressure applied. Also, if applying pressure to the oil path is difficult as a result of air leakage from the port, the lock−pin may be difficult to release.



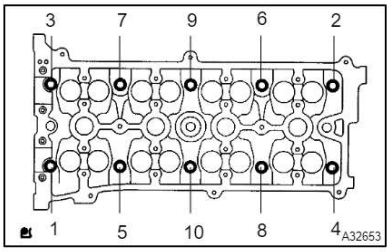
(e) Remove the fringe bolt from the camshaft timing gear.

NOTICE:

- **Be sure not to remove the other 4 bolts.**
- **If planning to reuse the camshaft timing gear, release the straight pin lock first, and then install the gear.**

30. REMOVE CAMSHAFT BEARING NO.2

31. REMOVE CAMSHAFT TIMING OIL CONTROL VALVE ASSY



32. REMOVE CYLINDER HEAD SUB−ASSY

(a) Using a 10 mm bi−hexagon wrench, uniformly loosen the 10 bolts in the sequence shown in the illustration. Remove the 10 cylinder head bolts and plate washers.

NOTICE:

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

33. REMOVE CYLINDER HEAD GASKET

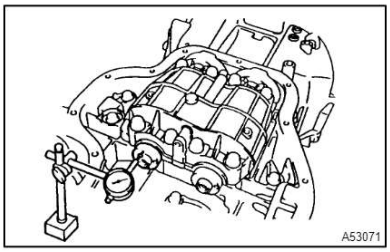
34. REMOVE CYLINDER BLOCK WATER DRAIN COCK SUB−ASSY

35. REMOVE OIL CONTROL VALVE FILTER

(a) Using a 6 mm socket hexagon wrench, remove the plug and filter.

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

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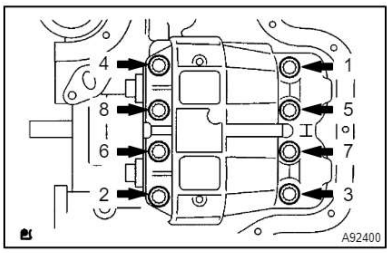


37. INSPECT BALANCESHAFT THRUST CLEARANCE

(a) Using a dial indicator, measure the thrust clearance while moving the balance shaft back and forth.

Specified thrust clearance:
0.050 to 0.090 mm (0.0020 to 0.0035 in.)

If the thrust clearance is greater than the maximum, replace the balance shaft housing and bearings. If necessary, replace the balance shaft.



38. INSPECT BALANCESHAFT OIL CLEARANCE

(a) Uniformly loosen and remove the 8 bolts in the sequence shown in the illustration.

NOTICE:

Be careful not to damage the contact surfaces of the balance shaft housing and crankcase.

HINT:

Keep the lower bearing and balance shaft housing together.

(b) Lift out the No. 1 and No. 2 balance shafts.

HINT:

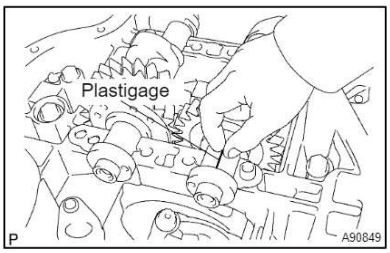
Keep the upper bearing with the crankcase.

(c) Clean each bearing and journal.

(d) Check each bearing and journal for pitting and scratches.

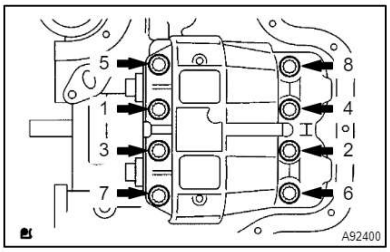
If a bearing or journal is damaged, replace the bearings. If necessary, replace the balance shaft.

(e) Place the No. 1 and No. 2 balance shafts on the crankcase.



(f) Lay a strip of Plastigage across each journal, and install the balance shaft housing.

(g) Apply light coat of engine oil on the threads and under the heads of the balance shaft housing bolts.



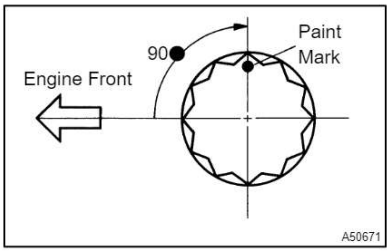
(h) Uniformly tighten the 8 bolts in the sequence shown in the illustration.

Torque: 22 N·m (220 kgf·cm, 16 ft·lbf)

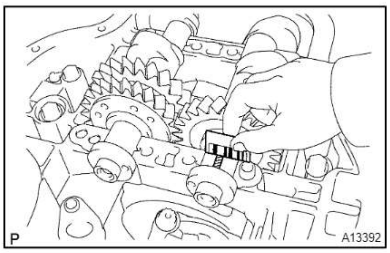
HINT:

The balance shaft housing bolts are tightened in 2 progressive steps.

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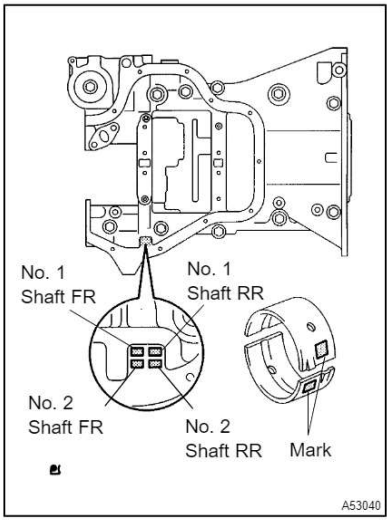


(i) Mark the front side of each balance shaft housing bolt head with paint.
(j) Retighten the bolts by 90° as shown in the illustration.
(k) Check that the paint marks are now at a 90° angle to the front.



(l) Remove the balance shaft housing, and measure the Plastigage at its widest point.
Specified oil clearance:
0.004 to 0.031 mm (0.0002 to 0.0012 in.)
(m) Completely remove the plastigage after the inspection.

If the clearance is greater than the maximum, replace the bearing. If necessary, replace the balance shaft.



HINT:
If replacing a bearing, replace it with one that has the same number as the stiffening crankcase. There are 3 sizes of standard bearings: 1, 2 and 3.

Balance shaft housing journal bore diameter:

Mark 1	26.000 to 26.006 mm (1.0236 to 1.0239 in.)
Mark 2	26.006 to 26.012 mm (1.0239 to 1.0241 in.)
Mark 3	26.012 to 26.018 mm (1.0241 to 1.0243 in.)

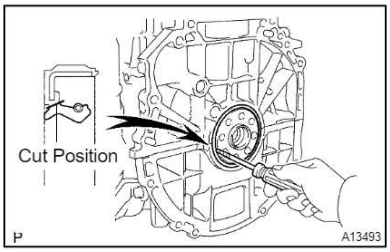
Balance shaft journal diameter:
22.985 to 23.000 mm (0.9049 to 0.9055 in.)
Standard bearing center wall thickness:

Mark 1	1.486 to 1.489 mm (0.0585 to 0.0586 in.)
Mark 2	1.489 to 1.492 mm (0.0586 to 0.0587 in.)
Mark 3	1.492 to 1.495 mm (0.0587 to 0.0589 in.)

(n) Completely remove the Plastigage after the inspection.

39. REMOVE BALANCESHAFT
40. REMOVE BALANCESHAFT BEARING NO. 1

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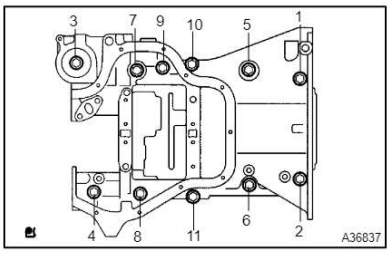
41. REMOVE ENGINE REAR OIL SEAL

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

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

NOTICE:

After the removal, check the crankshaft for damage. If it is damaged, smooth the surface with 400−grit sandpaper.



42. REMOVE STIFFENING CRANKCASE ASSY

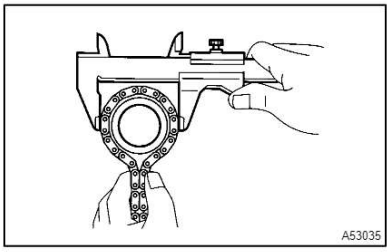
(a) Uniformly loosen and remove the 11 bolts in the sequence shown in the illustration.

(b) Using a screwdriver, remove the crankcase by prying the portions between the crankcase and cylinder block.

NOTICE:

Be careful not to damage the contact surfaces of the crankcase and cylinder block.

(c) Remove the O−ring from the cylinder block.



43. INSPECT OIL PUMP DRIVE SPROCKET

(a) Wrap the chain around the drive sprocket.

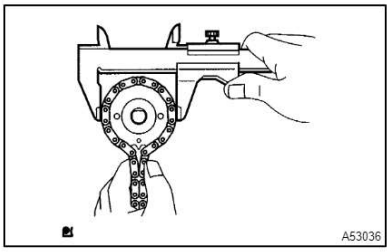
(b) Using a vernier caliper, measure the drive sprocket diameter with the chain.

NOTICE:

The vernier caliper must contact the chain rollers for the measurement.

Minimum sprocket diameter (w/ chain):
48.2 mm (1.898 in.)

If the diameter is less than the minimum, replace the chain and sprocket.



44. INSPECT OIL PUMP DRIVEN SPROCKET

(a) Wrap the chain around the driven sprocket.

(b) Using a vernier caliper, measure the driven sprocket diameter with the chain.

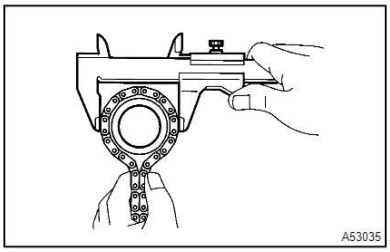
NOTICE:

The vernier caliper must contact the chain rollers for the measurement.

Minimum sprocket diameter (w/ chain):
48.2 mm (1.898 in.)

If the diameter is less than the minimum, replace the chain and drive shaft gear.

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45. INSPECT CRANKSHAFT TIMING GEAR OR SPROCKET

(a) Wrap the chain around the timing sprocket.

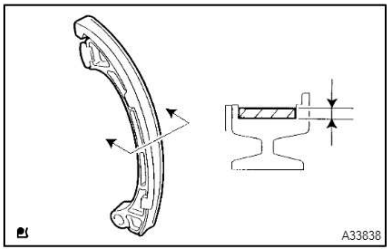
(b) Using a vernier caliper, measure the timing sprocket diameter with the chain.

NOTICE:

The vernier caliper must contact the chain rollers for the measurement.

Minimum sprocket diameter (w/ chain):
51.6 mm (2.031 in.)

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

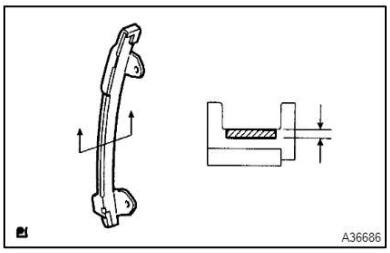


46. INSPECT CHAIN TENSIONER SLIPPER

(a) Measure the tensioner slipper wear.

Maximum wear: 1.0 mm (0.039 in.)

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

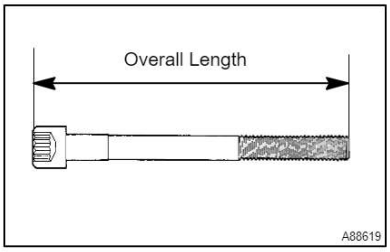


47. INSPECT CHAIN VIBRATION DAMPER NO.1

(a) Measure the vibration damper wear.

Maximum wear: 1.0 mm (0.039 in.)

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



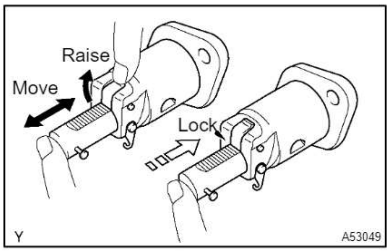
48. INSPECT CYLINDER HEAD SET BOLT

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

Specified bolt length:
161.3 to 164.2 mm (6.350 to 6.465 in.)

If the length is greater than the maximum, replace the bolt.

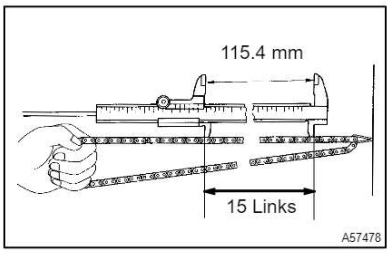
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49. INSPECT CHAIN TENSIONER ASSY NO.1

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

(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 finger.



50. INSPECT CHAIN SUB−ASSY

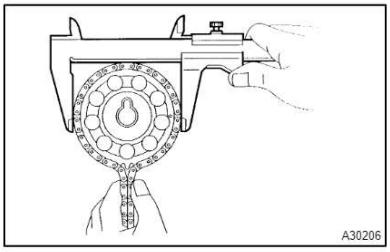
(a) Using a vernier caliper, measure the length of 15 links with the chain fully stretched.

Maximum chain elongation: 115.4 mm (4.543 in.)

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

NOTICE:

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



51. INSPECT CAMSHAFT TIMING GEAR OR SPROCKET

(a) Wrap the chain around the timing sprocket.

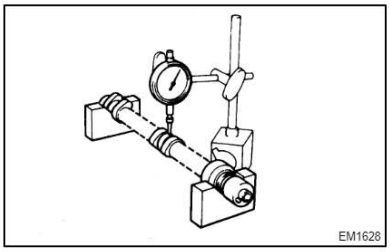
(b) Using a vernier caliper, measure the timing sprocket diameter with the chain.

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

NOTICE:

The vernier caliper must contact the chain rollers for the measurement.

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



52. INSPECT CAMSHAFT

(a) Check the camshaft for runout.

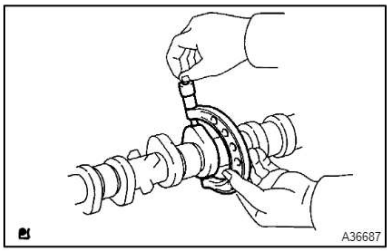
(1) Place the camshaft on V−blocks.

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

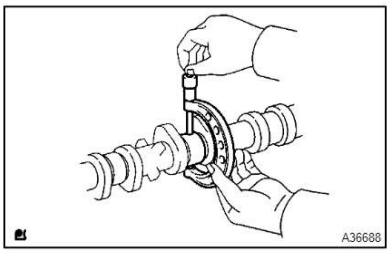
Maximum circle runout: 0.03 mm (0.0012 in.)

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

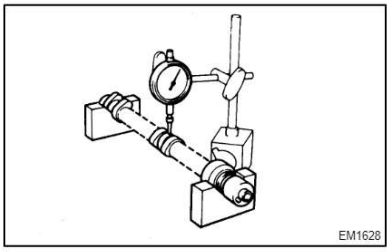
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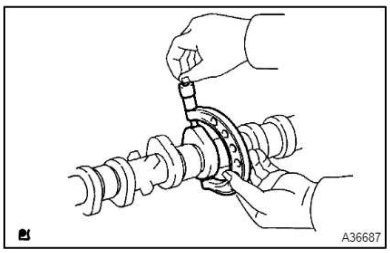
(b) Using a micrometer, measure the cam lobe height.
Specified cam lobe height:
46.599 to 46.809 mm (1.8346 to 1.8429 in.)
If the cam lobe height is less than the minimum, replace the camshaft.



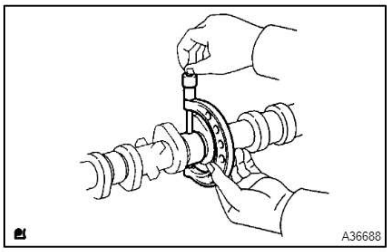
(c) Using a micrometer, measure the journal diameter.
No. 1 journal diameter:
35.971 to 35.985 mm (1.4162 to 1.4167 in.)
Other journal diameter:
22.959 to 22.975 mm (0.9039 to 0.9045 in.)
If the journal diameter is not as specified, check the oil clearance.



53. INSPECT NO.2 CAMSHAFT
(a) Check 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 the maximum, replace the camshaft.



(b) Using a micrometer, measure the cam lobe height.
Specified cam lobe height:
45.599 to 46.809 mm (1.8346 to 1.8429 in.)
If the cam lobe height is less than the minimum, replace the camshaft.

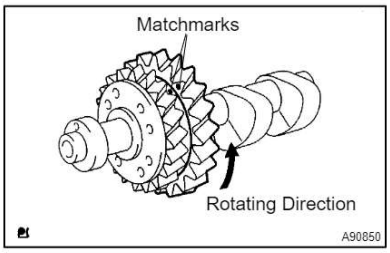


(c) Using a micrometer, measure the journal diameter.
No. 1 journal diameter:
35.971 to 35.985 mm (1.4162 to 1.4167 in.)
Other journal diameter:
22.959 to 22.975 mm (0.9039 to 0.9045 in.)
If the journal diameter is not as specified, check the oil clearance.

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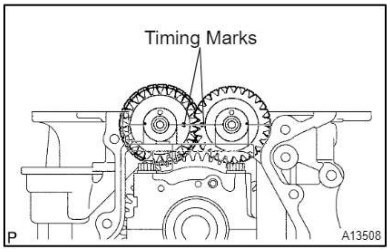
54. INSTALL BALANCESHAFT BEARING NO.1

(a) Install the bearings in the crankcase and balance shaft housing.
(b) Apply a light coat of engine oil on the bearings.

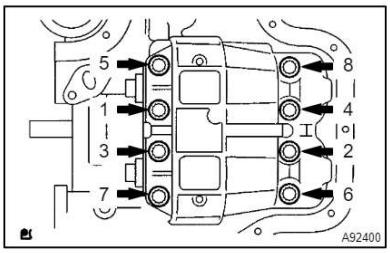


55. INSTALL BALANCESHAFT NO. 1 AND NO. 2

(a) Rotate the driven gear No. 1 of balance shaft No. 1 for the rotating direction until it hits the stopper.
(b) Confirm that the matchmarks on driven gear No. 1 and No. 2 are matched.

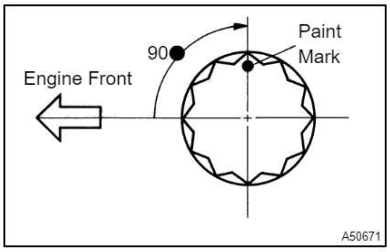


(c) Align the timing marks of the No. 1 and No. 2 balance shafts as shown in the illustration.
(d) Place the No. 1 and No. 2 balance shafts on the crank case.
(e) Apply a light coat of engine oil under the heads of the balance shaft housing bolts.



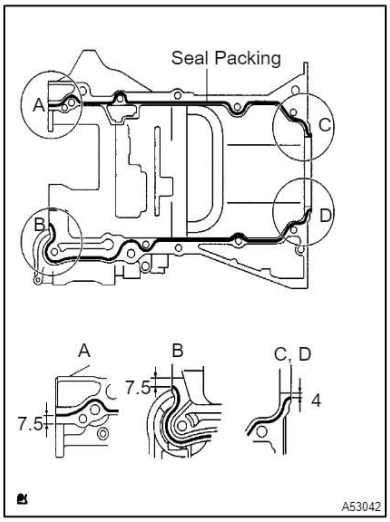
(f) Uniformly tighten the 8 bolts in the sequence shown in the illustration.
Torque: 22 N·m (220 kgf·cm, 16 ft·lbf)

HINT:
The balance shaft housing bolts are tightened in 2 progressive steps.



(g) Mark the front side of each balance shaft housing bolt head with paint.
(h) Retighten the bolts by 90° as shown in the illustration.
(i) Check that the painted marks are now at a 90° angle to the front.

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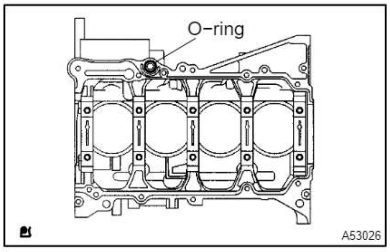
56. INSTALL STIFFENING CRANKCASE ASSY

(a) Apply seal packing in a continuous bead (diameter: 2.5 to 3 mm (0.098 to 0.118 in.)) to the places shown in the illustration.

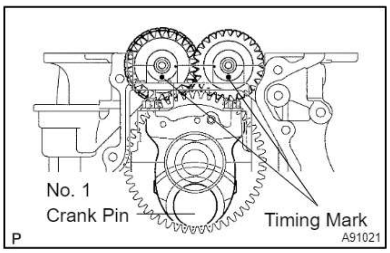
Seal packing: Part No. 08826−00080 or equivalent

NOTICE:

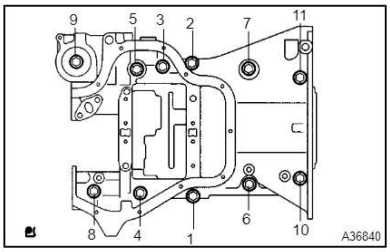
- **Remove any oil from the contact surface.**
- **Install the crankcase within 3 minutes after applying seal packing.**
- **Do not start the engine for at least 2 hours after installing.**



(b) Place a new O−ring on the cylinder block, as shown in the illustration.



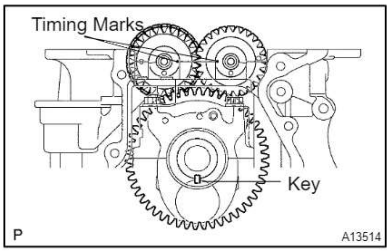
(c) With the No. 1 crank pin of the crankshaft placed at 6 o'clock, install the No. 1 and No. 2 balanceshaft and the adjusting hole as shown in the illustration.



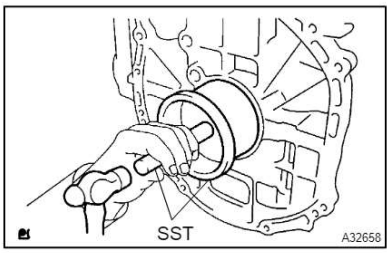
(d) Uniformly tighten the 11 bolts in the sequence shown in the illustration.

Torque: 33 N·m (332 kgf·cm, 24 ft·lbf)

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(e) Confirm that the timing marks of the balanceshafts are matched when the key groove is placed at 6 o'clock, as shown in the illustration.



57. INSTALL ENGINE REAR OIL SEAL

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

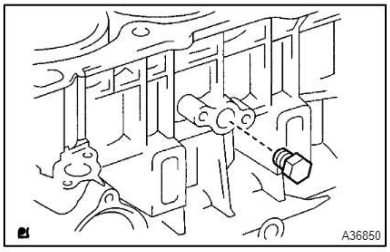
NOTICE:

Keep the lip off the foreign materials.

(b) Using SST and a hammer, evenly tap the oil seal until its surface is flush with the rear oil seal retainer edge.
SST 09223−15030, 09950−70010 (09951−07100)

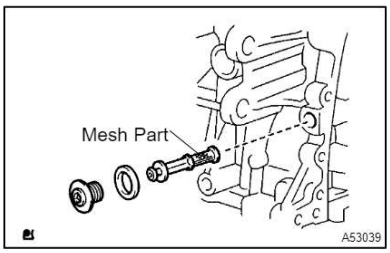
NOTICE:

Wipe off extra grease on the crankshaft.



58. INSTALL W/HEAD TAPER SCREW PLUG NO.1

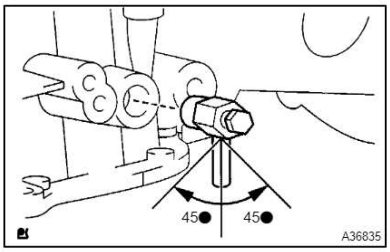
(a) Apply adhesive to the threads of the plug and install it.
Adhesive:
Part No. 08833−00070, THREE BOND 1324 or equivalent
Torque: 26 N·m (265 kgf·cm, 19 ft·lbf)



59. INSTALL OIL CONTROL VALVE FILTER

(a) Check that no foreign substance is on the mesh part of the filter.

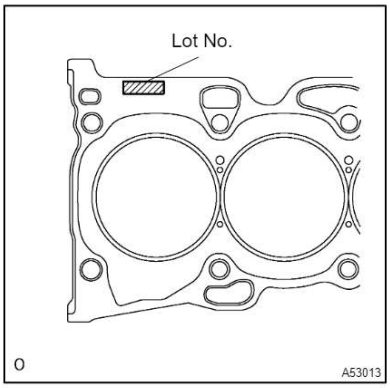
(b) Using a 6 mm socket hexagon wrench, install a new gasket and the oil control valve filter with the screw plug.
Torque: 30 N·m (306 kgf·cm, 22 ft·lbf)



60. INSTALL CYLINDER BLOCK WATER DRAIN COCK SUB−ASSY

(a) Install the water drain cock within the range shown in the illustration.
Torque: 25 N·m (255 kgf·cm, 18 ft·lbf)

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61. INSTALL CYLINDER HEAD GASKET

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

NOTICE:

- **Remove any oil from contact surface.**
- **Be careful of the installation direction.**
- **To avoid damage to the gasket, place the cylinder head on the gasket carefully.**

62. INSTALL CYLINDER HEAD SUB−ASSY

HINT:

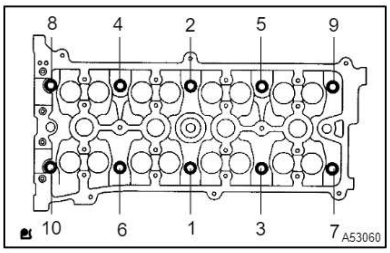
The cylinder head bolts are tightened in 2 progressive steps.

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

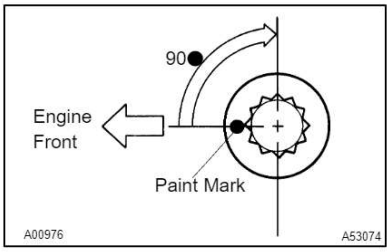
(b) Install the 10 bolts and plate washers to the cylinder head.

NOTICE:

Do not drop the washers into the cylinder head.



(c) Using a 10 mm bi−hexagon wrench, uniformly tighten the 10 bolts in the sequence shown in the illustration.
Torque: 79 N·m (806 kgf·cm, 58 ft·lbf)



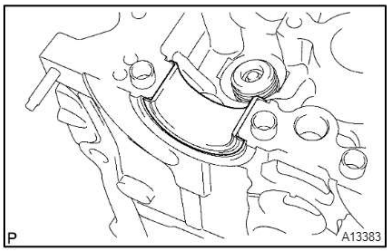
(d) Mark the front side of each cylinder head bolt with paint.

(e) Retighten the cylinder head bolts by 90● in the sequence shown in the illustration.

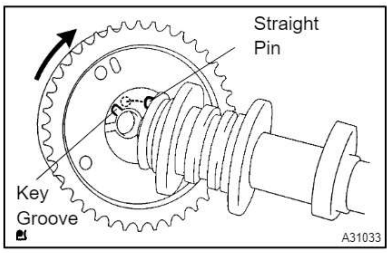
(f) Check that the painted marks are now at a 90● angle to the front.

63. INSTALL CAMSHAFT TIMING OIL CONTROL VALVE ASSY
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

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64. INSTALL CAMSHAFT BEARING NO.2



65. INSTALL CAMSHAFT TIMING GEAR ASSY

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

(b) Turn the camshaft timing gear (as shown in the illustration) while pushing it lightly against the camshaft. Push further at the position where the pin enters the groove.

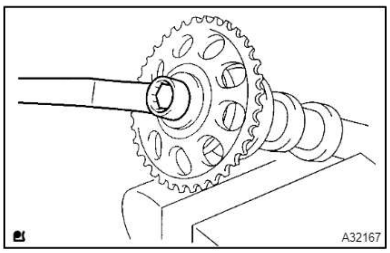
CAUTION:

Be sure not to turn the camshaft timing gear to the retarded 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 can move to the retarded angle side (the right direction) and is locked at the extreme retarded angle position.

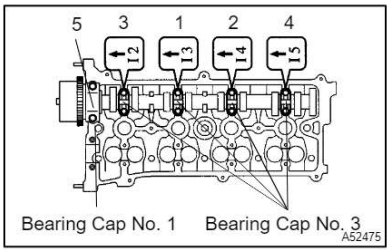


66. INSTALL CAMSHAFT TIMING GEAR OR SPROCKET

(a) Fix the camshaft with a vise, and install the camshaft No. 2 timing gear.
Torque: 54 N·m (551 kgf·cm, 40 ft·lbf)

67. INSTALL CAMSHAFT BEARING NO.1

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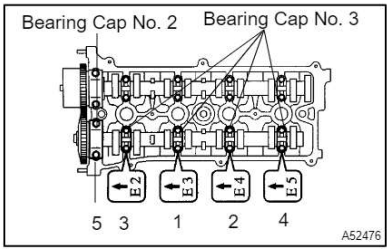
68. INSTALL CAMSHAFT

(a) Examine the front marks and numbers of the 5 bearing caps and install them. Then install the 10 bearing cap bolts. Uniformly tighten the bolts in the sequence shown in the illustration.

Torque:
30 N·m (301 kgf·cm, 22 ft·lbf) for bearing cap No. 1
9.0 N·m (92 kgf·cm, 80 in.·lbf) for bearing cap No. 3

NOTICE:

- **Tighten the bolts after deciding the position for the thrust direction of the camshaft by the bearing cap No. 1.**
- **Install the camshaft with its timing mark of the camshaft timing gear on top.**



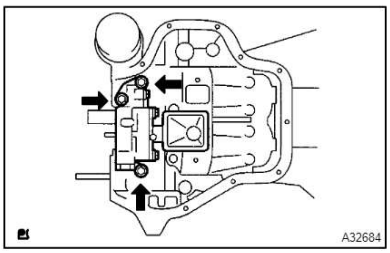
69. INSTALL NO.2 CAMSHAFT

(a) Examine the front marks and numbers of the 5 bearing caps and install them. Then install the 10 bearing cap bolts. Uniformly tighten the bolts in the sequence shown in the illustration.

Torque:
30 N·m (301 kgf·cm, 22 ft·lbf) for bearing cap No. 2
9.0 N·m (92 kgf·cm, 80 in.·lbf) for bearing cap No. 3

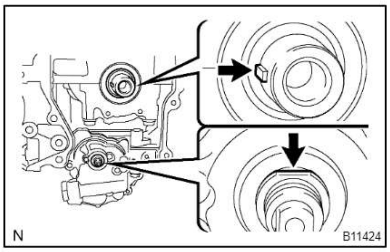
NOTICE:

- **Tighten the bolts after deciding the position for the thrust direction of the camshaft by the bearing cap No. 2.**
- **Install the camshaft with its timing mark of the camshaft timing gear on top.**



70. INSTALL OIL PUMP ASSY

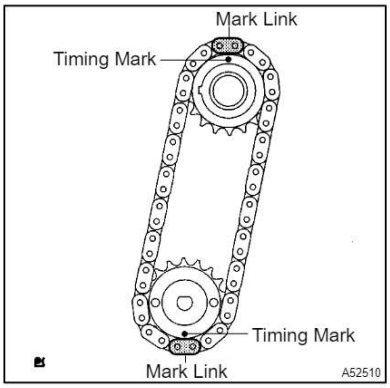
(a) Install a new gasket and oil pump with the 3 bolts.
Torque: 19 N·m (194 kgf·cm, 14 ft·lbf)



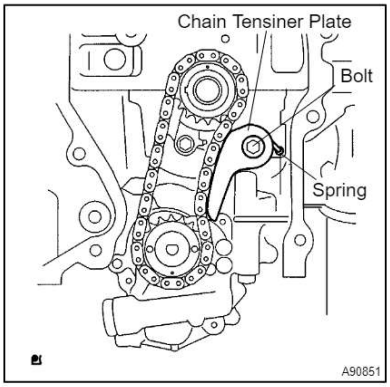
71. INSTALL NO.2 CHAIN SUB–ASSY

(a) Set the crankshaft key into the left horizontal position.
(b) Turn the cutout of the drive shaft to the top.

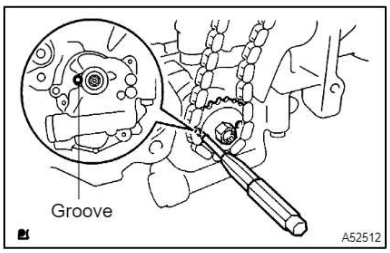
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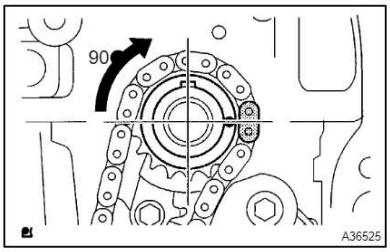
(c) Align the mark links (yellow colored links) with the timing marks of the sprocket as shown in the illustration.
(d) Insert the sprocket with chain to the crankshaft and oil pump shaft.
(e) Temporarily tighten the oil pump driven sprocket with the nut.



(f) Insert the damper spring into the adjusting hole, and install the chain tensioner plate by the bolt.
Torque: 12 N·m (122 kgf·cm, 9 ft·lbf)



(g) Align the adjusting hole of the sprocket with the groove of the oil pump.
(h) Put a bar (φ 4 mm) into the adjusting hole of the sprocket to temporarily lock the sprocket in position. Install the nut.
Torque: 30 N·m (301 kgf·cm, 22 ft·lbf)



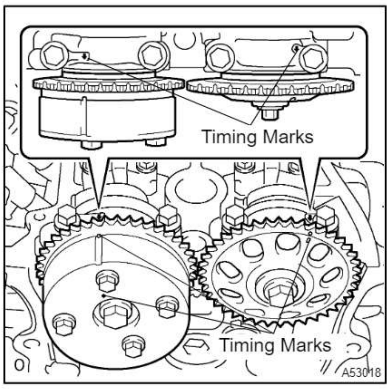
(i) Rotate the crankshaft clockwise by 90● and align the crankshaft key with the top.

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72. INSTALL CRANKSHAFT TIMING GEAR OR SPROCKET

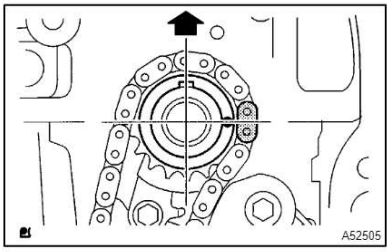
73. INSTALL CHAIN VIBRATION DAMPER NO.1

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

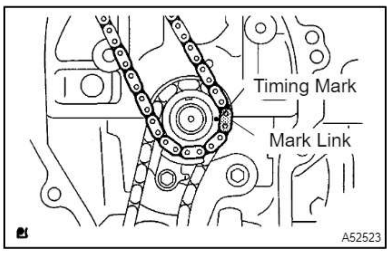


74. INSTALL CHAIN SUB−ASSY

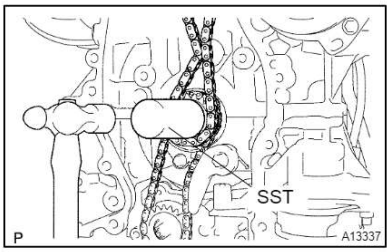
(a) Set the No. 1 cylinder to TDC/compression.
(1) Align the timing marks of the camshaft timing gear/sprocket and bearing caps (No. 1 and No. 2).



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

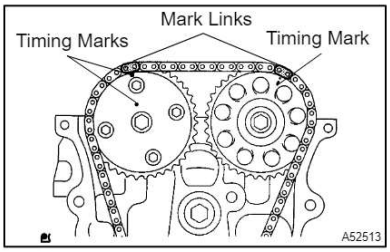


(b) Align the mark link (blue or orange colored link) with the timing mark of the crankshaft timing sprocket.



(c) Using SST, tap in the sprocket.
SST 09309−37010

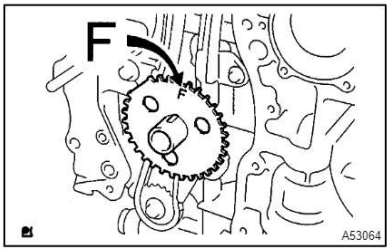
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(d) Align the mark links (gold or yellow colored links) with the timing marks of the camshaft timing gear and camshaft timing sprocket, and install the chain.

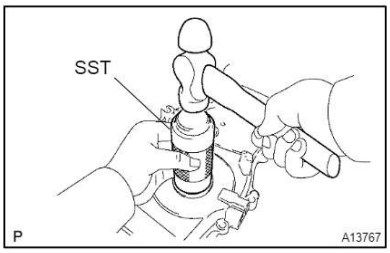
75. INSTALL CHAIN TENSIONER SLIPPER
Torque: 19 N·m (194 kgf·cm, 14 ft·lbf)

76. INSTALL TIMING CHAIN GUIDE
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)



77. INSTALL CRANKSHAFT POSITION SENSOR PLATE NO.1

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

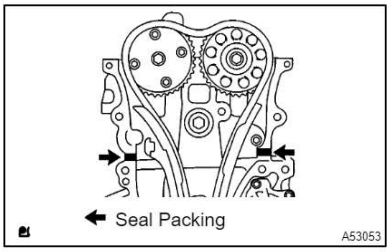


78. INSTALL TIMING GEAR CASE OR TIMING CHAIN CASE OIL SEAL

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

(b) Apply a light coat of MP grease to the lip of the oil seal.

NOTICE:
Keep the gap between the timing chain cover edge and the oil seal free of foreign matter.



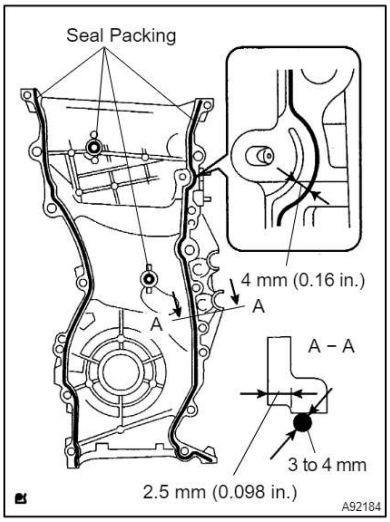
79. INSTALL TIMING CHAIN OR BELT COVER SUB−ASSY

NOTICE:
- **Remove any oil from the contact surface.**
- **Install the chain cover within 3 minutes after applying seal packing.**
- **Do not start the engine for at least 2 hours after installing.**

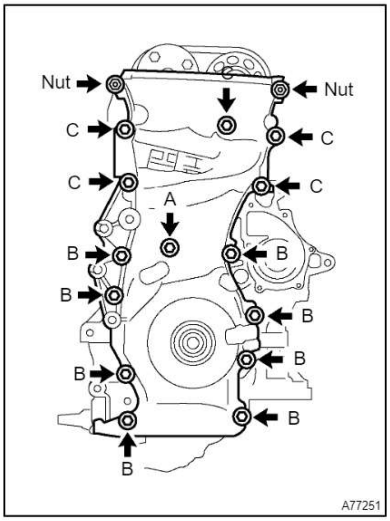
(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the timing chain cover, cylinder head and cylinder block.

(b) Apply seal packing in a continuous bead (diameter: 2 mm (0.09 in.)) as shown in the illustration.
Seal packing: Part No. 08826−00080 or equivalent

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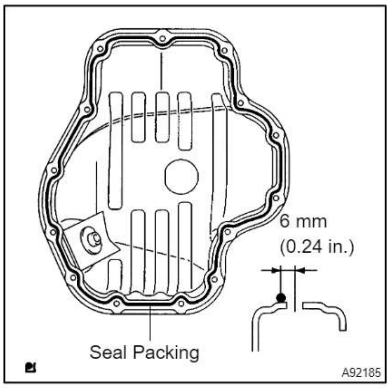


(c) Apply seal packing in a continuous bead (diameter: 3 to 4 mm (0.12 to 0.16 in.)) as shown in the illustration.
Seal packing: Part No. 08826−00080 or equivalent



(d) Install the timing chain cover with the 14 bolts and 2 nuts.
Torque:
9.0 N·m (92 kgf·cm, 80 in.·lbf) for bolt A
21 N·m (214 kgf·cm, 15 ft·lbf) for bolt B
43 N·m (438 kgf·cm, 32 ft·lbf) for bolt C
9.0 N·m (92 kgf·cm, 80 in.·lbf) for nut

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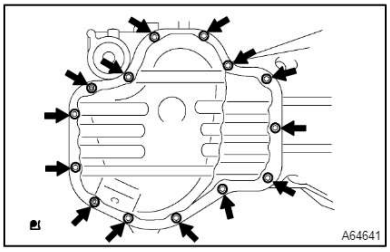
80. INSTALL OIL PAN SUB−ASSY

NOTICE:

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

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the cylinder block and oil pan.

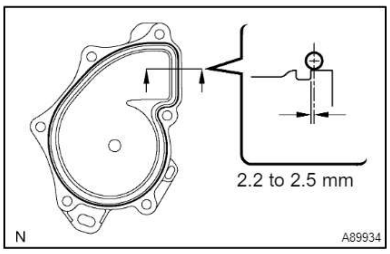
(b) Apply seal packing in a continuous bead (diameter: 3 mm to 4 mm (0.157 in.)) as shown in the illustration, and install the oil pan.
Seal packing: Part No. 08826−00080 or equivalent



(c) Install the oil pan with the 12 bolts and 2 nuts.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

81. INSTALL OIL PAN DRAIN PLUG

(a) Install a new gasket and oil pan drain plug with a new gasket.
Torque: 25 N·m (255 kgf·cm, 18 ft·lbf)



82. INSTALL WATER PUMP ASSY

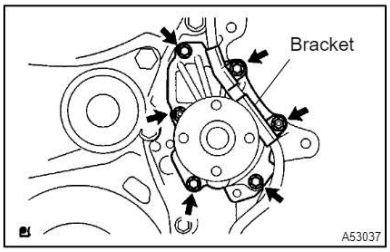
(a) Clean the contact surface of the cylinder block.

(b) Apply seal packing in a continuous bead (diameter: 2.2 to 2.5 mm (0.09 to 0.10 in.)) to the outside edge of the water pump.
Seal packing: Part No. 08826−00100 or equivalent

NOTICE:

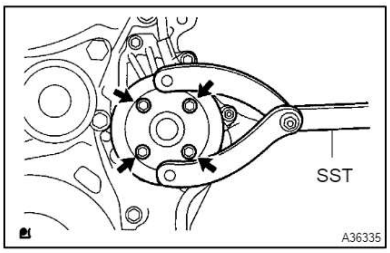
- **Remove any oil from the contact surface.**
- **Install the water pump within 5 minutes after applying seal packing.**
- **Do not start the engine for at least 2 hours after installing.**

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(c) Install the water pump and bracket with the 4 bolts and 2 nuts.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

NOTICE:
Tighten the outside bolts and nuts with the clamp.

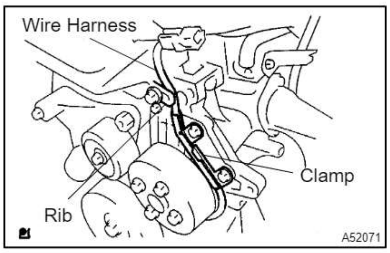


83. INSTALL WATER PUMP PULLEY

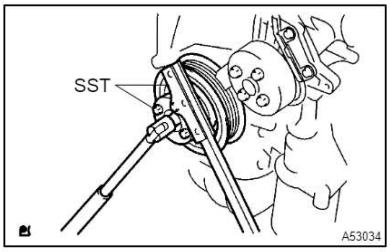
(a) Using SST, install the water pump pulley.
SST 09960−10010 (09962−01000, 09963−00700)
Torque: 26 N·m (265 kgf·cm, 19 ft·lbf)

84. INSTALL CRANKSHAFT POSITION SENSOR

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



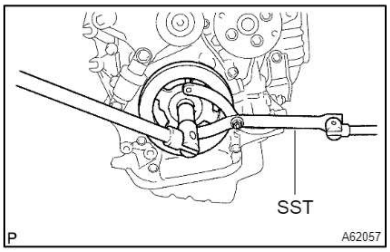
(b) Confirm that the wire harness of the sensor is placed as shown in the illustration.



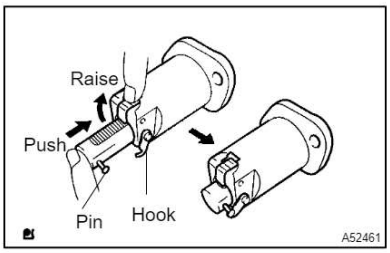
85. INSTALL CRANKSHAFT PULLEY

(a) Install the pulley.
(b) TMC made:
Using SST, tighten the bolt.
SST 09213−54015 (91651−60855), 09330−00021
Torque: 170 N·m (1,733 kgf·cm, 125 ft·lbf)

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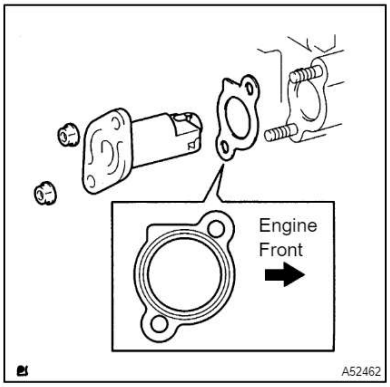


(c) TMMK made:
Using SST, tighten the set bolt.
SST 09960−10010 (09962−01000, 09963−01000)
Torque: 170 N·m (1,733 kgf·cm, 125 ft·lbf)



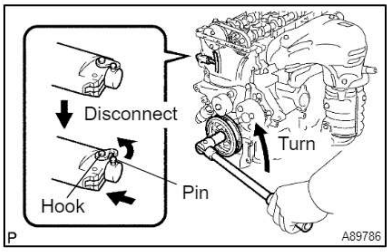
86. INSTALL CHAIN TENSIONER ASSY NO.1

(a) Release the ratchet pawl, fully push in the plunger and apply the hook to the pin so that the plunger cannot spring out.



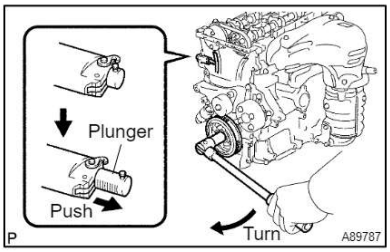
(b) Install a new gasket and the chain tensioner with the 2 nuts.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

NOTICE:
If the hook is released while inserting, apply the hook again, and insert the chain tensioner.



(c) Turn the crankshaft counterclockwise and check that the plunger knock pin is disconnected from the hook.

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

87. INSPECT VALVE CLEARANCE (See page 14–7)

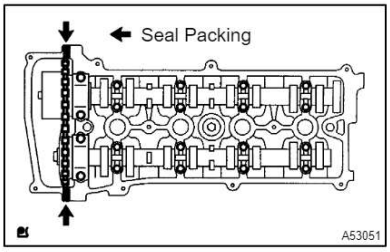
88. ADJUST VALVE CLEARANCE (See page 14–7)

89. INSTALL CYLINDER HEAD COVER GASKET

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

90. INSTALL CYLINDER HEAD COVER SUB–ASSY

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

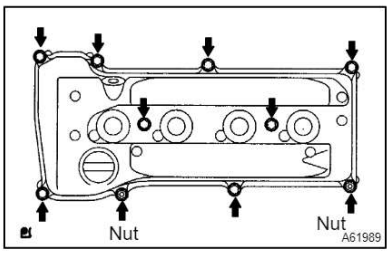


(b) Apply seal packing to the 2 locations shown in the illustration.

Seal packing: Part No. 08826–00080 or equivalent

NOTICE:

- **Remove any oil from the contact surface.**
- **Install the cylinder head cover within 5 minutes after applying seal packing.**
- **Do not apply engine oil for at least 2 hours after installing.**



(c) Install the cylinder head cover with the 8 bolts and 2 nuts.

Torque: 11 N·m (112 kgf·cm, 8 ft·lbf)

91. INSTALL SPARK PLUG

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

92. INSTALL VENTILATION VALVE SUB–ASSY

(a) Apply adhesive on the threads of the ventilation valve.

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

Adhesive: Part No. 08833–00070 THREE BOND 1324 or equivalent

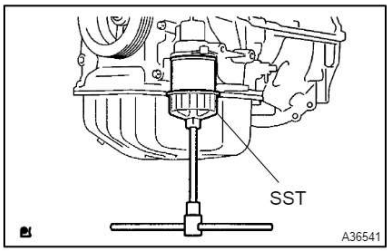
93. INSTALL OIL FILLER CAP SUB–ASSY

94. INSTALL OIL FILTER UNION

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

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

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95. 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

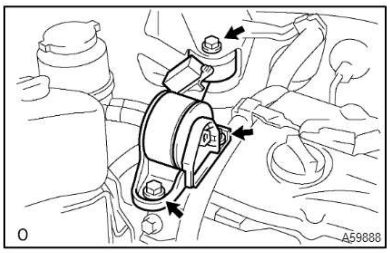
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DRIVE BELT (2AZ−FE)(From July, 2003)

1405U−06

REPLACEMENT

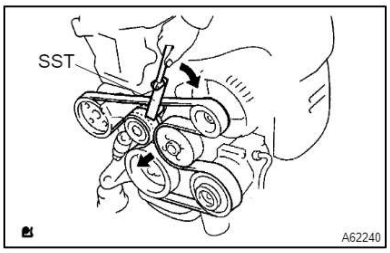
1. REMOVE FRONT WHEEL RH
2. REMOVE FRONT FENDER APRON SEAL RH
3. REMOVE ENGINE COVER SUB−ASSY NO.1



4. REMOVE ENGINE MOVING CONTROL ROD W/BRACKET

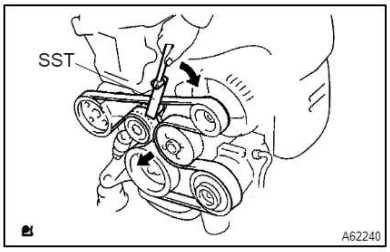
(a) Remove the 3 bolts and control rod.

5. REMOVE ENGINE MOUNTING STAY NO.2 RH
6. REMOVE ENGINE MOUNTING BRACKET NO.2 RH



7. REMOVE DRIVE BELT

(a) Slowly turn the belt tensioner clockwise for more than 3 seconds, and remove the drive belt by using SST.
SST 09249−63010

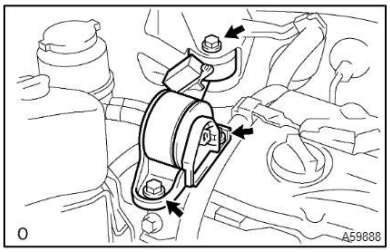


8. INSTALL DRIVE BELT

(a) Slowly turn the belt tensioner clockwise for more than 3 seconds, and install the drive belt by using SST.
SST 09249−63010

9. INSTALL ENGINE MOUNTING BRACKET NO.2 RH
Torque: 52 N·m (531 kgf·cm, 38 ft·lbf)
10. INSTALL ENGINE MOUNTING STAY NO.2 RH
Torque: 64 N·m (653 kgf·cm, 47 ft·lbf)

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11. INSTALL ENGINE MOVING CONTROL ROD W/BRACKET

(a) Install the engine control rod with the 3 bolts.
Torque: 64 N·m (653 kgf·cm, 47 ft·lbf)

12. INSTALL FRONT WHEEL RH

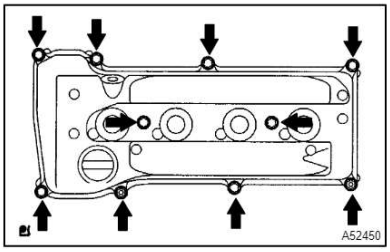
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VALVE CLEARANCE (2AZ−FE)

14107−01

ADJUSTMENT

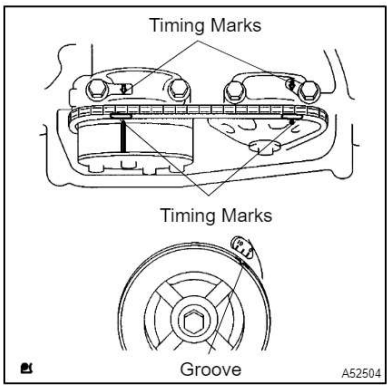
1. REMOVE FRONT WHEEL RH
2. REMOVE FRONT FENDER APRON SEAL RH
3. REMOVE ENGINE COVER SUB−ASSY NO.1
4. REMOVE SPARK PLUG
5. DISCONNECT VENTILATION HOSE
6. DISCONNECT VENTILATION HOSE NO.2
7. DISCONNECT ENGINE WIRE



8. REMOVE CYLINDER HEAD COVER SUB−ASSY

(a) Remove the bolt and disconnect the engine wire harness clamp.

(b) Remove the 8 bolts, 2 nuts, cylinder head cover and gasket.



9. SET NO. 1 CYLINDER TO TDC/COMPRESSION

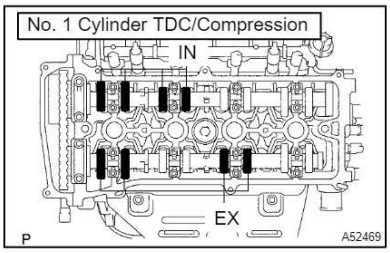
(a) Turn the crankshaft pulley, and align its groove with timing mark 0 of the timing chain cover.

(b) Check that the timing marks of the camshaft timing gear and sprocket are aligned with the timing marks of bearing caps No. 1 and No. 2, as shown in the illustration.

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10. INSPECT VALVE CLEARANCE

HINT:
Inspect and adjust the valve clearance when the engine is cold.

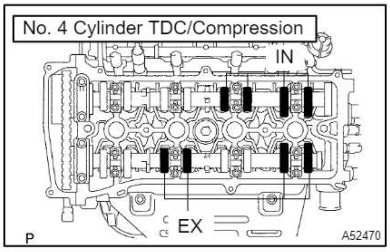


(a) Check only the valves indicated on the left.
  (1) Using a feeler gauge, measure the clearance between each valve lifter and camshaft.
  (2) Record valve clearance measurements that are out of the specified range. These measurements will be used later to determine the size of the adjustment shim to be installed.

Valve clearance (Cold):

Item	Specified Condition
Intake	0.19 to 0.29 mm (0.008 to 0.011 in.)
Exhaust	0.30 to 0.40 mm (0.012 to 0.016 in.)

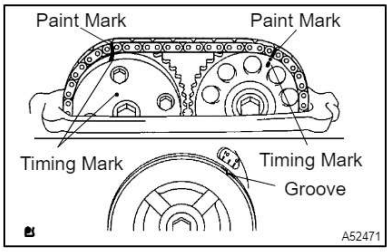
(b) Turn the crankshaft clockwise 1 revolution (360°) and set the No. 4 cylinder to TDC/compression.



(c) Check only the valves indicated on the left.
  (1) Using a feeler gauge, measure the clearance between each valve lifter and camshaft.
  (2) Record valve clearance measurements that are out of the specified range. These measurements will be used later to determine the size of the adjustment shim to be installed.

Valve clearance (Cold):

Item	Specified Condition
Intake	0.19 to 0.29 mm (0.008 to 0.011 in.)
Exhaust	0.30 to 0.40 mm (0.012 to 0.016 in.)

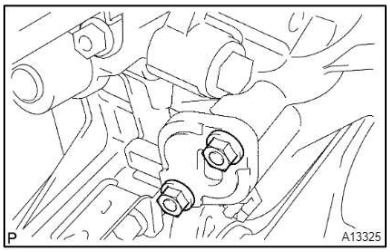


11. ADJUST VALVE CLEARANCE

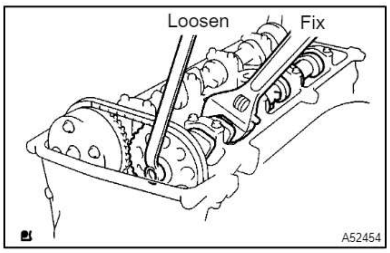
NOTICE:
Be sure not to turn the crankshaft without the chain tensioner.

(a) Turn the crankshaft clockwise 1 revolution (360°) and set the No. 1 cylinder to the TDC/compression.
(b) Place paint marks on the timing chain and camshaft timing gear/sprocket.

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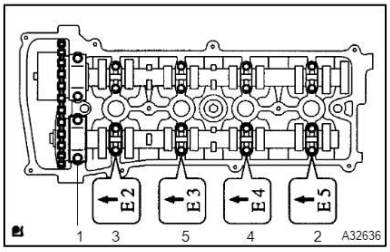


(c) Remove the 2 bolts and chain tensioner.

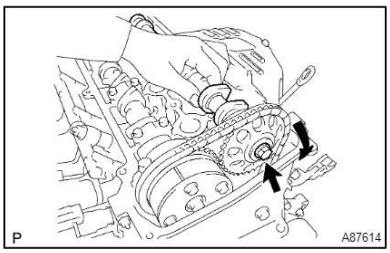


(d) Remove the No. 2 camshaft.
(1) Fix the camshaft with a wrench and then loosen the sproket bolt.

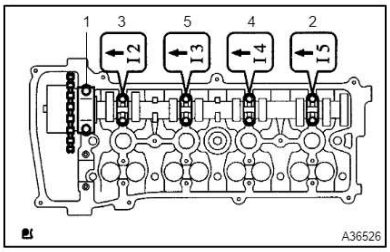
NOTICE:
Be careful not to damage the valve lifter.



(2) Uniformly loosen and remove the No. 2 camshaft's 10 bearing cap bolts in the sequence shown in the illustration. Then remove the 5 bearing caps.

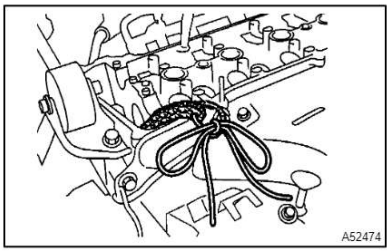


(3) Raise the No. 2 camshaft and remove it. Then remove the sprocket bolt.
(4) Remove the camshaft timing sprocket and the timing chain from the No. 2 camshaft.
(5) Remove the camshaft timing sprocket from the timing chain.



(e) Remove the camshaft.
(1) Uniformly loosen and remove the camshaft's 10 bearing cap bolts in the sequence shown in the illustration. Then remove the 5 bearing caps.
(2) Remove the camshaft.

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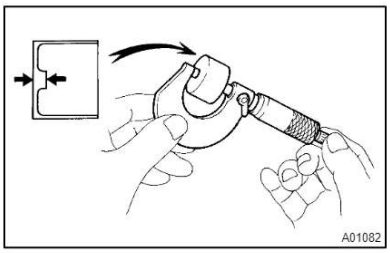


(f) Tie the timing chain with a string.

NOTICE:

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

(g) Remove the valve lifters.



(h) Adjust the valve clearance.

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

(2) 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:

Item	Specified Condition
Intake	A = B + (C − 0.24 mm (0.0094 in.))
Exhaust	A = B + (C − 0.35 mm (0.0138 in.))

EXAMPLE: (Intake)
Measured valve clearance = 0.44 mm (0.0173 in.)
0.44 mm (0.0173 in.) − 0.24 mm (0.0094 in.) = 0.20 mm (0.0079 in.)
(Measured − Specification = Excess clearance)
Used shim measurement = 5.30 mm (0.2087 in.)
0.20 mm (0.0079 in.) + 5.30 mm (0.2087 in.) = 5.50 mm (0.2165 in.)
(Excess clearance + Used shim = Ideal new shim)
Closest new shim = 5.50 mm (0.2165 in.) = Shim No. ”50”

(3) Select a new lifter with a thickness as close as possible to the calculated values.

HINT:

- Lifters 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 valve lifter selection chart on the following 2 pages.

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Valve Lifter Selection Chart (Intake)

Measure 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	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
0.031–0.050 (0.0012–0.0020)									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
0.051–0.070 (0.0020–0.0028)								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	38	40	40	42	42	44	44	46	48	50	52	54	56	58	60
0.071–0.090 (0.0028–0.0035)							06	08	10	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	62
0.091–0.110 (0.0036–0.0043)						06	08	10	12	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
0.111–0.130 (0.0044–0.0051)					06	08	10	12	14	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	66
0.131–0.150 (0.0052–0.0059)				06	08	10	12	14	16	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	68
0.151–0.170 (0.0059–0.0067)			06	08	10	12	14	16	18	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	70
0.171–0.189 (0.0067–0.0074)		06	08	10	12	14	16	18	20	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	56	58	60	62	64	66	68	70	72
0.190–0.290 (0.0075–0.0114)																																																								
0.291–0.310 (0.0115–0.0122)	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
0.311–0.330 (0.0122–0.0130)	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	
0.331–0.350 (0.0130–0.0138)	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		
0.351–0.370 (0.0138–0.0146)	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	72	72	74	74	74				
0.371–0.390 (0.0146–0.0154)	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	74				
0.391–0.410 (0.0154–0.0161)	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						
0.411–0.430 (0.0162–0.0169)	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							
0.431–0.450 (0.0170–0.0177)	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										
0.451–0.470 (0.0178–0.0185)	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												
0.471–0.490 (0.0185–0.0193)	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														
0.491–0.510 (0.0193–0.0201)	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																
0.511–0.530 (0.0201–0.0209)	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																		
0.531–0.550 (0.0209–0.0217)	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																				
0.551–0.570 (0.0217–0.0224)	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																				
0.571–0.590 (0.0225–0.0232)	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																								
0.591–0.610 (0.0233–0.0240)	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																								
0.611–0.630 (0.0241–0.0248)	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																										
0.631–0.650 (0.0248–0.0256)	46	48	50	52	54	56	58	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74																										
0.651–0.670 (0.0256–0.0264)	48	50	52	54	56	58	60	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74																										
0.671–0.690 (0.0264–0.0272)	50	52	54	56	58	60	62	64	66	66	68	68	70	70	72	72	74	74	74	74	74																										
0.691–0.710 (0.0272–0.0280)	52	54	56	58	60	62	64	66	68	68	70	70	72	72	74	74	74	74																												
0.711–0.730 (0.0280–0.0287)	54	56	58	60	62	64	66	68	70	70	72	72	74	74	74	74																												
0.731–0.750 (0.0288–0.0295)	56	58	60	62	64	66	68	70	72	72	74	74	74	74																												
0.751–0.770 (0.0296–0.0303)	58	60	62	64	66	68	70	72	74	74	74	74																												
0.771–0.790 (0.0304–0.0311)	60	62	64	66	68	70	72	74	74	74																												
0.791–0.810 (0.0311–0.0319)	62	64	66	68	70	72	74																															
0.811–0.830 (0.0319–0.0327)	64	66	68	70	72	74																																
0.831–0.850 (0.0327–0.0335)	66	68	70	72	74																																	
0.851–0.870 (0.0335–0.0343)	68	70	72	74																																		
0.871–0.890 (0.0343–0.0350)	70	72	74																																			
0.891–0.910 (0.0351–0.0358)	72	74																																				
0.911–0.930 (0.0359–0.0366)	74																																					

AT7296

Intake valve clearance (Cold):
0.19 to 0.29 mm (0.008 to 0.011 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. 42 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)

Measure 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	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	34	36	38	40	42	44
0.031 – 0.050 (0.0012 – 0.0020)																						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	32	34	36	38	40	42	44	46
0.051 – 0.070 (0.0020 – 0.0028)																			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
0.071 – 0.090 (0.0028 – 0.0035)																	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	40	42	44	46	48	50
0.091 – 0.110 (0.0036 – 0.0043)															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
0.111 – 0.130 (0.0044 – 0.0051)												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
0.131 – 0.150 (0.0052 – 0.0059)											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
0.151 – 0.170 (0.0059 – 0.0067)									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
0.171 – 0.190 (0.0067 – 0.0075)								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
0.191 – 0.210 (0.0075 – 0.0083)							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
0.211 – 0.230 (0.0083 – 0.0091)						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
0.231 – 0.250 (0.0091 – 0.0098)				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
0.251 – 0.270 (0.0099 – 0.0106)				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
0.271 – 0.290 (0.0107 – 0.0114)			06	08	10	12	14	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	56	58	60	62	64	66	68	70
0.291 – 0.299 (0.0115 – 0.0118)		06	08	10	12	14	16	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	56	58	58	60	62	64	66	68	70	72
0.300 – 0.400 (0.0118 – 0.0157)																																																											
0.401 – 0.420 (0.0158 – 0.0165)	12	14	16	18	20	22	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	56	58	58	60	60	62	62	64	64	66	68	70	72	74	74	74
0.421 – 0.440 (0.0166 – 0.0173)	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	
0.441 – 0.460 (0.0174 – 0.0181)	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		
0.461 – 0.480 (0.0181 – 0.0189)	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			
0.481 – 0.500 (0.0189 – 0.0197)	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					
0.501 – 0.520 (0.0197 – 0.0205)	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	74	74	74							
0.521 – 0.540 (0.0205 – 0.0213)	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	74	74	76	74								
0.541 – 0.560 (0.0213 – 0.0220)	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	74	74	74	74	74	74								
0.561 – 0.580 (0.0221 – 0.0228)	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	74	74	74	74	74	74										
0.581 – 0.600 (0.0229 – 0.0236)	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	74	74	74	74	74	74												
0.601 – 0.620 (0.0237 – 0.0244)	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													
0.621 – 0.640 (0.0244 – 0.0252)	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	74														
0.641 – 0.660 (0.0252 – 0.0260)	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	74																
0.661 – 0.680 (0.0260 – 0.0268)	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	74																		
0.681 – 0.700 (0.0268 – 0.0276)	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	74																				
0.701 – 0.720 (0.0276 – 0.0283)	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	74																						
0.721 – 0.740 (0.0284 – 0.0291)	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																								
0.741 – 0.760 (0.0292 – 0.0299)	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	74																										
0.761 – 0.780 (0.0300 – 0.0307)	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	74	74																										
0.781 – 0.800 (0.0307 – 0.0315)	50	52	54	56	58	60	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74	74	74																										
0.801 – 0.820 (0.0315 – 0.0323)	52	54	56	58	60	62	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74	74	74																										
0.821 – 0.840 (0.0323 – 0.0331)	54	56	58	60	62	64	66	68	68	70	70	72	72	74	74	74	74	74	74	74	74																										
0.841 – 0.860 (0.0331 – 0.0339)	56	58	60	62	64	66	68	70	70	72	72	74	74	74	74	74	74	74																													
0.861 – 0.880 (0.0339 – 0.0346)	58	60	62	64	66	68	70	72	72	74	74	74	74	74	74	74																													
0.881 – 0.900 (0.0347 – 0.0354)	60	62	64	66	68	70	72	74	74	74	74	74	74	74																													
0.901 – 0.920 (0.0355 – 0.0362)	62	64	66	68	70	72	74	74	74	74	74																																		
0.921 – 0.940 (0.0363 – 0.0370)	64	66	68	70	72	74	74	74	74																																				
0.941 – 0.960 (0.0370 – 0.0378)	66	68	70	72	74	74	74																																						
0.961 – 0.980 (0.0378 – 0.0386)	68	70	72	74	74	74																																							
0.981 – 1.000 (0.0386 – 0.0394)	70	72	74	74	74																																								
1.001 – 1.020 (0.0394 – 0.0402)	72	74	74	74																																									
1.021 – 1.040 (0.0402 – 0.0409)	74	74	74																																										
1.041 – 1.060 (0.0410 – 0.0417)	74	74																																											
1.061 – 1.080 (0.0418 – 0.0425)	74																																												

Exhaust valve clearance (Cold):
0.30 to 0.40 mm (0.012 to 0.016 in.)

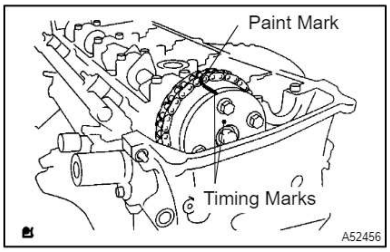
EXAMPLE:

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. 44 lifter.

New lifter thickness mm (in.)

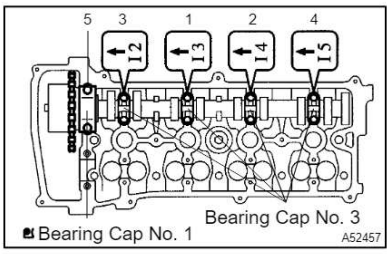
Lifter No.	Thickness	Lifter No.	Thickness	Lifter No.	Thickness
06	5.060 (0.1992)	30	5.300 (0.2087)	54	5.540 (0.2181)
08	5.080 (0.2000)	32	5.320 (0.2094)	56	5.560 (0.2189)
10	5.100 (0.2008)	34	5.340 (0.2102)	58	5.580 (0.2197)
12	5.120 (0.2016)	36	5.360 (0.2110)	60	5.600 (0.2205)
14	5.140 (0.2024)	38	5.380 (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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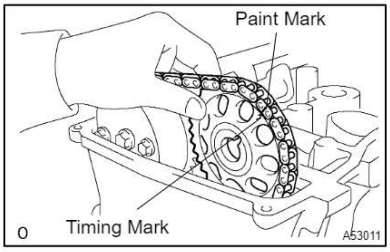
(i) Install the camshaft.

(1) Install the timing chain on the camshaft timing gear, with the paint mark aligned with the timing marks on the camshaft timing gear.



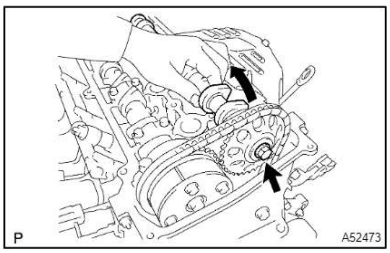
(2) Examine the front marks and numbers of the 5 bearing caps and install them. Then install the 10 bearing cap bolts. Uniformly tighten the bolts in the sequence shown in the illustration.

Torque:
30 N·m (301 kgf·cm, 22 ft·lbf) for bearing cap No. 1
9.0 N·m (92 kgf·cm, 80 in.·lbf) for bearing cap No. 3

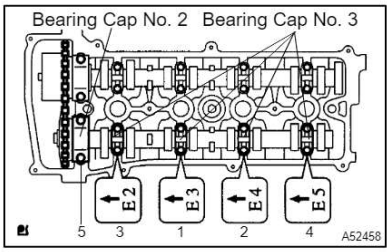


(j) Install the No. 2 camshaft.

(1) Put the No. 2 camshaft on the cylinder head with the paint mark of the chain aligned with the timing mark on the camshaft timing sprocket.



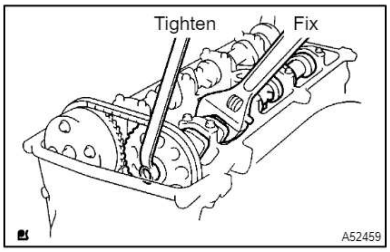
(2) Raise the No. 2 camshaft and temporarily tighten the sprocket bolt.



(3) Examine the front marks and numbers of the 5 bearing caps and install them. Then install the 10 bearing cap bolts. Uniformly tighten the bolts in the sequence shown in the illustration.

Torque:
30 N·m (301 kgf·cm, 22 ft·lbf) for bearing cap No. 2
9.0 N·m (92 kgf·cm, 80 in.·lbf) for bearing cap No. 3

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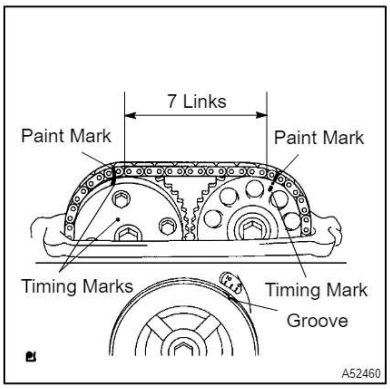


(4) Fix the camshaft with a wrench, then tighten the sprocket bolt.

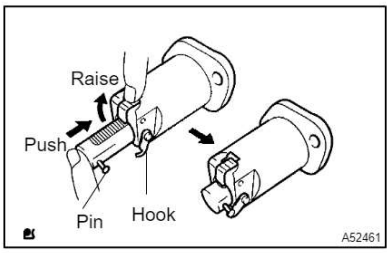
Torque: 54 N·m (551 kgf·cm, 40 ft·lbf)

NOTICE:

Be careful not to damage the valve lifter.

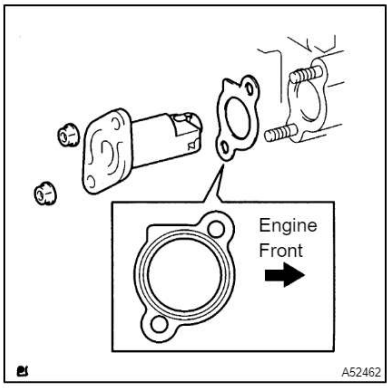


(k) Check that the timing chain paint marks are aligned with the camshaft timing sprocket timing mark and the camshaft timing gear timing mark. Also check the alignment of the pulley groove and chain cover timing mark 0.



(l) Install the chain tensioner.

(1) Raise the ratchet pawl, fully push in the plunger and apply the hook to the pin so that the plunger cannot spring out.



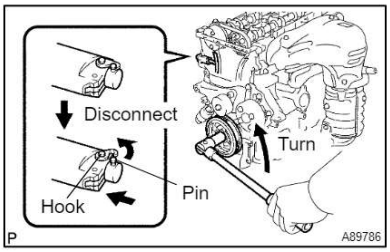
(2) Install a new gasket and the chain tensioner with the 2 nuts.

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

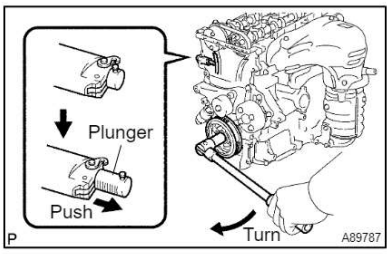
NOTICE:

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

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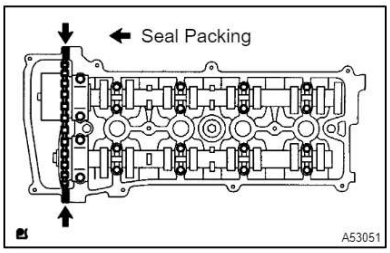
(3) Turn the crankshaft counterclockwise, and disconnect the plunger knock pin from the hook.



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

12. INSTALL CYLINDER HEAD COVER SUB–ASSY

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

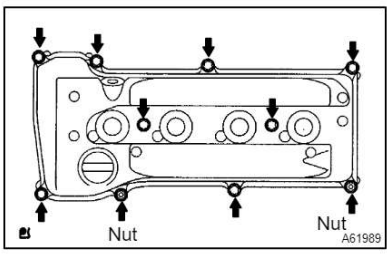


(b) Apply seal packing to the 2 locations shown in the illustration.

Seal packing: Part No. 08826–00080 or equivalent

NOTICE:

- **Remove any oil from the contact surface.**
- **Install the cylinder head cover within 5 minutes after applying seal packing.**
- **Do not start the engine for at least 2 hours after installing the cylinder head cover.**



(c) Install the cylinder head cover with the 8 bolts and 2 nuts.

Torque: 11 N·m (110 kgf·cm, 8 ft·lbf)

13. INSTALL SPARK PLUG
Torque: 19 N·m (194 kgf·cm, 14 in.·lbf)

14. INSTALL FRONT WHEEL RH

15. INSPECT OIL LEAK

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CHAIN (2AZ−FE)(From July, 2003)

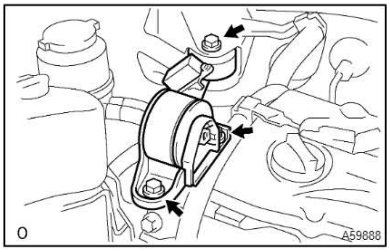
141J1−01

REPLACEMENT

1. REMOVE HOOD SUB−ASSY
2. REMOVE FRONT WHEEL RH
3. REMOVE ENGINE UNDER COVER LH
4. REMOVE ENGINE UNDER COVER RH
5. REMOVE FRONT FENDER APRON SEAL RH
6. DRAIN ENGINE OIL

(a) Install a new gasket and the drain plug after draining engine oil.
Torque: 25 N·m (255 kgf·cm, 18 ft·lbf)

7. REMOVE EXHAUST PIPE ASSY FRONT



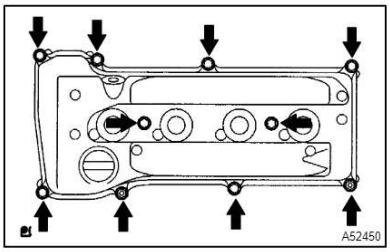
8. REMOVE ENGINE MOVING CONTROL ROD W/BRACKET

(a) Remove the 3 bolts and control rod.

9. REMOVE ENGINE MOUNTING STAY NO.2 RH
10. REMOVE ENGINE MOUNTING BRACKET NO.2 RH
11. REMOVE FAN AND GENERATOR V BELT (See page 14−29)
12. REMOVE ENGINE COVER SUB−ASSY NO.1
13. DISCONNECT ENGINE WIRE
14. REMOVE GENERATOR ASSY
15. REMOVE VANE PUMP ASSY (See page 51−8)

NOTICE:
Do not disconnect the hose.

16. REMOVE IGNITION COIL ASSY
17. DISCONNECT VENTILATION HOSE
18. DISCONNECT VENTILATION HOSE NO.2

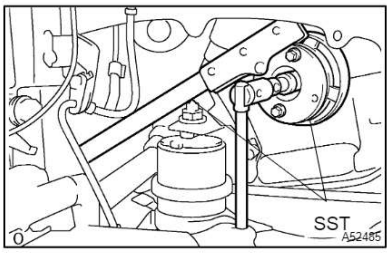


19. REMOVE CYLINDER HEAD COVER SUB−ASSY

(a) Remove the bolt and disconnect the engine wire harness clamp.
(b) Remove the 8 bolts and 2 nuts, and disconnect the cylinder head cover.

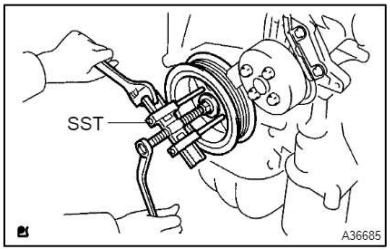
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20. SET NO. 1 CYLINDER TO TDC/COMPRESSION (See page 14−7)

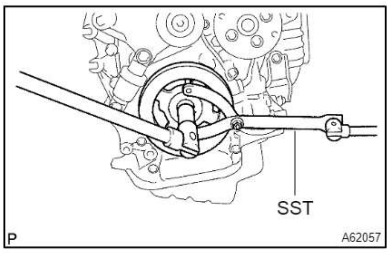


21. REMOVE CRANKSHAFT PULLEY

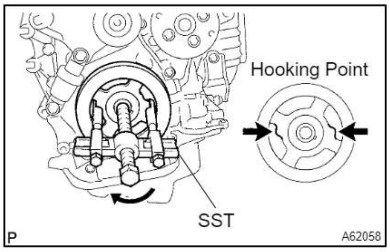
(a) TMC made:
Remove the crankshaft pulley.
(1) Using SST, fix the pulley and loosen the bolt.
SST 09213−54015 (91651−60855), 09330−00021



(2) Using SST, remove the bolt and pulley.
SST 09950−50013 (09951−05010, 09952−05010, 09953−05020, 09954−05021)



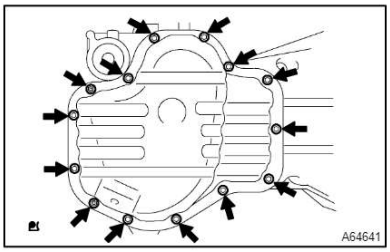
(b) TMMK made:
Remove the crankshaft pulley.
(1) Using SST, fix the pulley and remove the bolt.
SST 09960−10010 (09962−01000, 09963−01000)



(2) Using SST, remove the crankshaft pulley.
SST 09950−40011 (09951−04010, 09952−04010, 09953−04030, 09954−04010, 09955−04041, 09957−04010, 91111−51014)

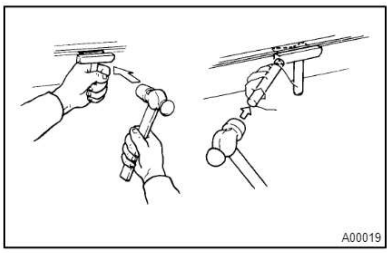
22. REMOVE CRANKSHAFT POSITION SENSOR

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23. REMOVE OIL PAN SUB–ASSY

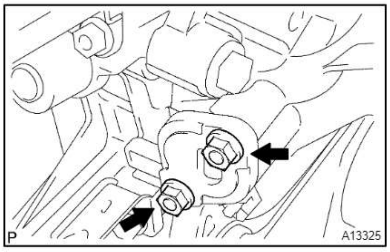
(a) Remove the 12 bolts and 2 nuts.



(b) Insert the blade of SST between the crankcase and oil pan. Cut through the sealer and remove the oil pan.
SST 09032–00100

NOTICE:

Be careful not to damage the contact surface of the cylinder block and oil pan.

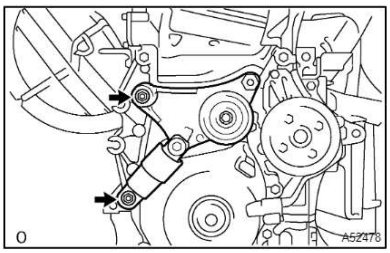


24. REMOVE CHAIN TENSIONER ASSY NO.1

(a) Remove the 2 nuts, tensioner and gasket.

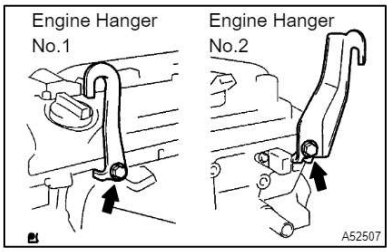
NOTICE:

Do not revolve the crankshaft without the tensioner.



25. REMOVE V–RIBBED BELT TENSIONER ASSY

(a) Remove the bolt, nut and tensioner.



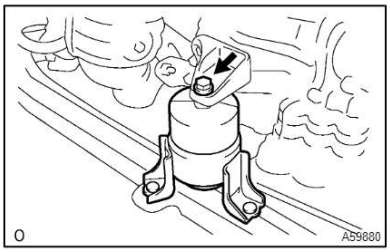
26. INSTALL ENGINE HANGER NO.1

(a) Install the engine hanger No. 1 and No. 2 with the bolts as shown in the illustration.
Parts No.:

Engine hanger No. 1	12281–28010
Engine hanger No. 2	12282–28010
Bolt	91512–61020

Torque: 38 N·m (387 kgf·cm, 28 ft·lbf)

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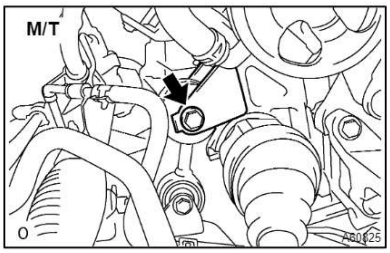
27. REMOVE ENGINE MOUNTING INSULATOR

(a) Attach the engine chain hoist to the engine hangers.

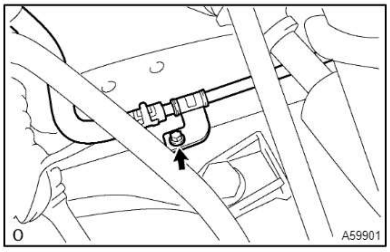
CAUTION:

Do not attempt to hang the engine by hooking the chain to any other part.

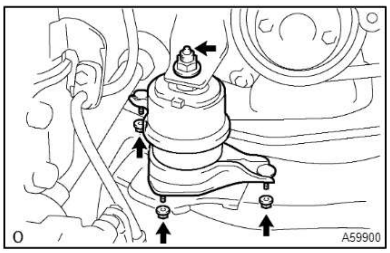
(b) Remove the bolt and disconnect the engine mounting insulator FR.



(c) M/T:
Remove the bolt and disconnect the engine lateral control rod.

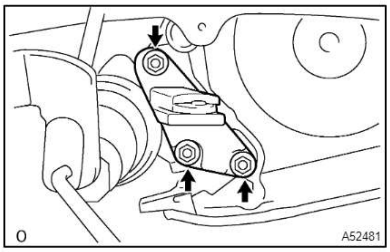


(d) Remove the bolt and disconnect the steering gear return hose clamp from the frame.



(e) Remove the 4 nuts from the engine mounting insulator RH.

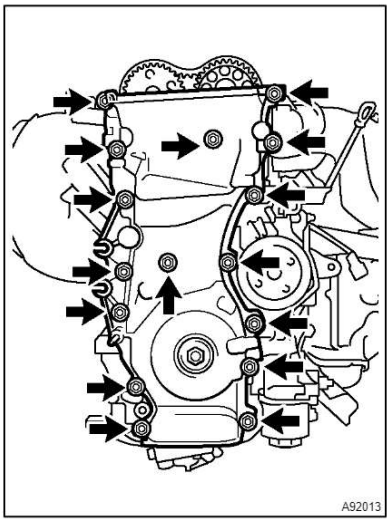
(f) Raise the engine and remove the engine mounting insulator RH.



28. REMOVE ENGINE MOUNTING BRACKET RH

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

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29. REMOVE TIMING CHAIN OR BELT COVER SUB–ASSY

(a) Remove the stud bolt for the drive belt tensioner from the cylinder block.
(b) Remove the 14 bolts and 2 nuts.
(c) Pry out the timing chain cover with a screwdriver.

NOTICE:

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

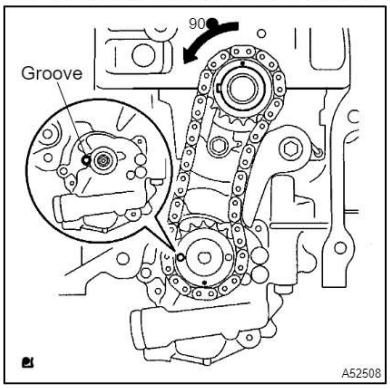
30. REMOVE CRANKSHAFT POSITION SENSOR PLATE NO.1

31. REMOVE CHAIN TENSIONER SLIPPER

32. REMOVE CHAIN VIBRATION DAMPER NO.1

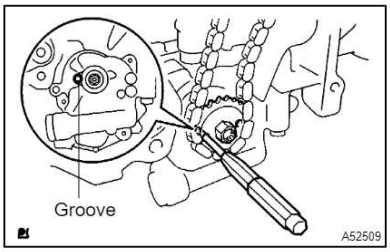
33. REMOVE CHAIN SUB–ASSY

34. REMOVE CRANKSHAFT TIMING GEAR OR SPROCKET



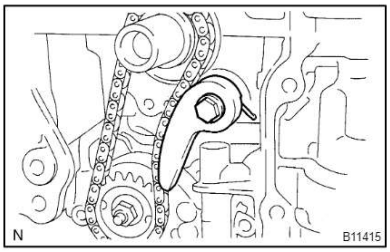
35. REMOVE NO.2 CHAIN SUB–ASSY

(a) Turn the crankshaft counterclockwise by 90● and align an adjusting hole of the oil pump driven sprocket with the groove of the oil pump.

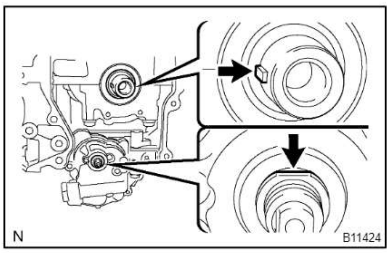


(b) Put a bar (φ 4 mm) in the adjusting hole of the oil pump driven sprocket to temporarily lock the sprocket in position. Remove the nut.

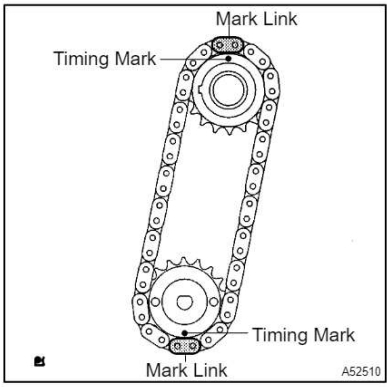
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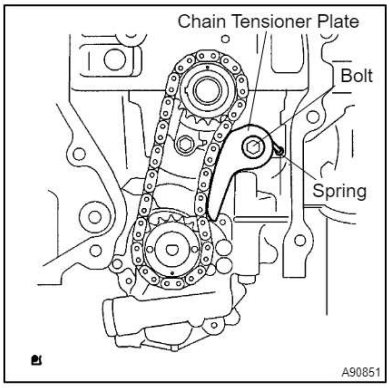
(c) Remove the bolt, chain tensioner plate and spring.
(d) Remove the chain tensioner, oil pump driven sprocket and chain.



36. INSTALL NO.2 CHAIN SUB−ASSY
(a) Set the crankshaft key into the left horizontal position.
(b) Turn the cutout of the drive shaft to the top.

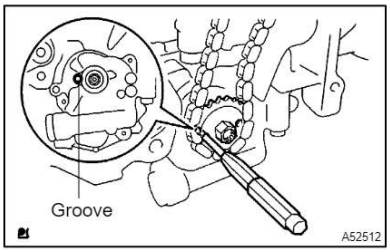


(c) Align the mark links (yellow colored links) with the timing marks of the sprocket as shown in the illustration.
(d) Insert the sprockets with chain to the crankshaft and oil pump shaft.
(e) Temporarily tighten the oil pump driven sprocket with the nut.

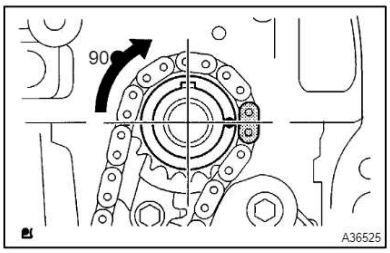


(f) Insert the damper spring into the adjusting hole, and install the chain tensioner plate with the nut.
Torque: 12 N·m (122 kgf·cm, 9 ft·lbf)

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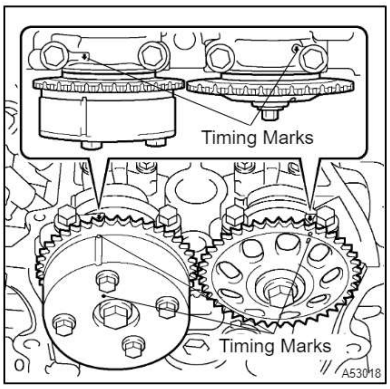


(g) Align the adjusting hole of the oil pump driven sprocket with the groove of the oil pump.
(h) Put a bar (φ 4 mm) in the adjusting hole of the oil pump driven sprocket to temporarily lock the sprocket in position. Install the nut.
Torque: 30 N·m (301 kgf·cm, 22 ft·lbf)

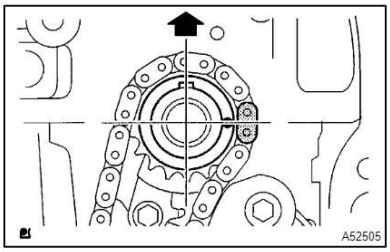


(i) Rotate the crankshaft counterclockwise by 90° and align the crankshaft key to the top.

37. INSTALL CHAIN VIBRATION DAMPER NO.1
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

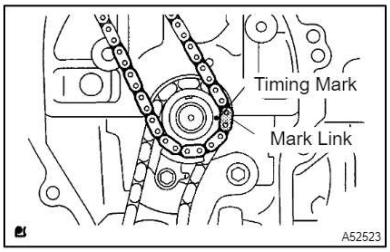


38. INSTALL CHAIN SUB–ASSY
(a) Set the No.1 cylinder to TDC/compression.
(1) Align the timing marks of the camshaft timing sprockets and bearing caps (No. 1 and No. 2).

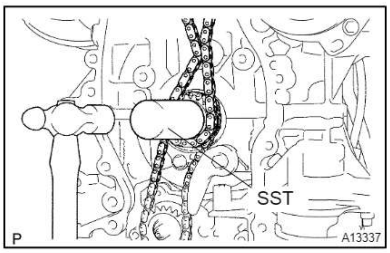


(2) Using the crankshaft pulley bolt, turn the crankshaft and set the set key on the crankshaft upward.

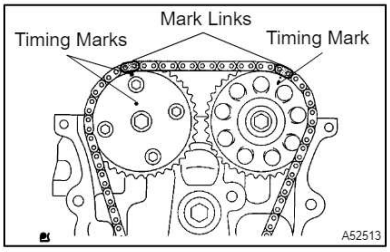
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(b) Align the mark link (gold or orange colored link) with the timing mark of the crankshaft timing sprocket.

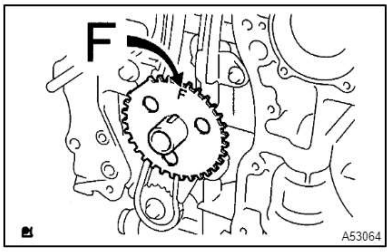


(c) Using SST, tap in the sprocket.
SST 09309−37010



(d) Align the mark links (gold or yellow colored links) with the timing marks of the camshaft timing gear and camshaft timing sprocket. Install the chain.

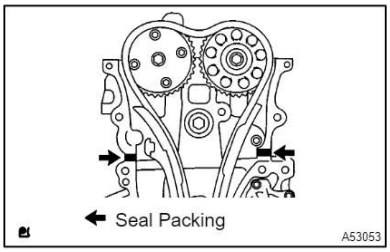
39. INSTALL CHAIN TENSIONER SLIPPER
Torque: 19 N·m (194 kgf·cm, 14 ft·lbf)



40. INSTALL CRANKSHAFT POSITION SENSOR PLATE NO.1

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

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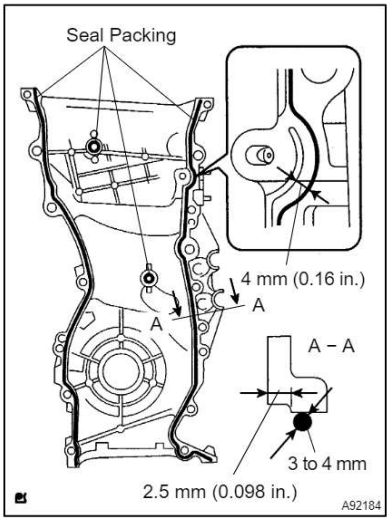
41. INSTALL TIMING CHAIN OR BELT COVER SUB−ASSY

NOTICE:

- **Remove any oil from the contact surface.**
- **Install the chain cover within 3 minutes after applying seal packing.**
- **Do not start the engine for at least 2 hours after installing.**

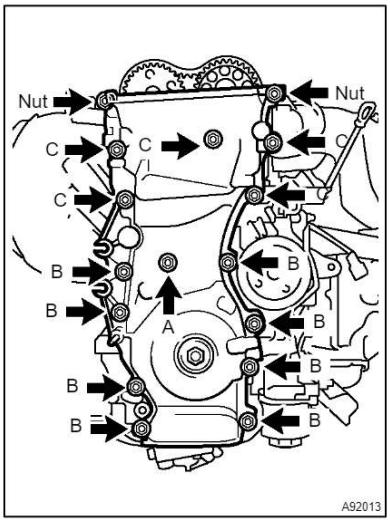
(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the timing chain cover, cylinder head and cylinder block.

(b) Apply seal packing in a continuous bead (diameter: 2 mm (0.099 in.)) as shown in the illustration.
Seal packing: Part No. 08826−00080 or equivalent



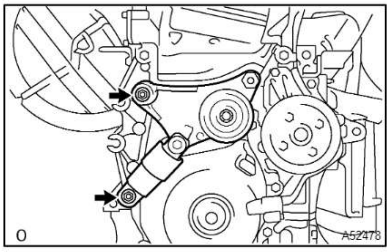
(c) Apply seal packing in a continuous bead (diameter: 3 to 4 mm (0.12 to 0.16 in.)) as shown in the illustration.
Seal packing: Part No. 08826−00080 or equivalent

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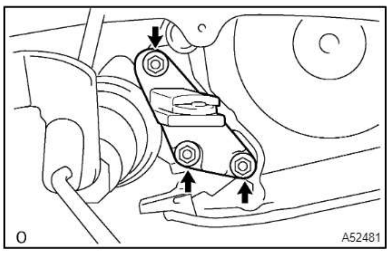
(d) Install the timing chain cover with the 14 bolts and 2 nuts.
Torque:
9.0 N·m (92 kgf·cm, 80 in.·lbf) for bolt A
21 N·m (214 kgf·cm, 15 ft·lbf) for bolt B
43 N·m (438 kgf·cm, 32 ft·lbf) for bolt C
9.0 N·m (92 kgf·cm, 80 in.·lbf) for nut

(e) Install the stud bolt to the drive belt tensioner.
Torque: 10 N·m (102 kgf·cm, 7 ft·lbf)



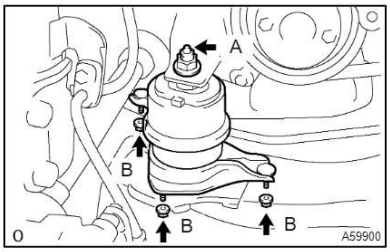
42. INSTALL V−RIBBED BELT TENSIONER ASSY

(a) Install the tensioner with the bolt and nut.
Torque: 59.5 N·m (607 kgf·cm, 44 ft·lbf)



43. INSTALL ENGINE MOUNTING BRACKET RH

(a) Install the engine mounting bracket with the 3 bolts.
Torque: 54 N·m (551 kgf·cm, 40 ft·lbf)

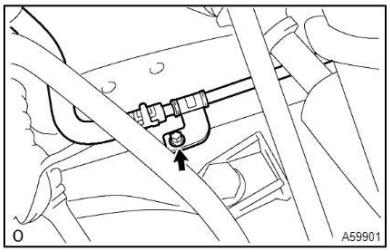


44. INSTALL ENGINE MOUNTING INSULATOR

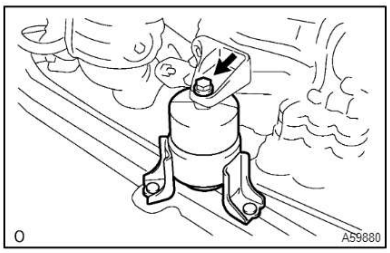
(a) Raise the engine and install the engine mounting insulator RH.

(b) Install the engine mounting insulator RH with the 4 nuts.
Torque:
95 N·m (969 kgf·cm, 70 ft·lbf) for bolt A
87 N·m (888 kgf·cm, 64 ft·lbf) for bolt B

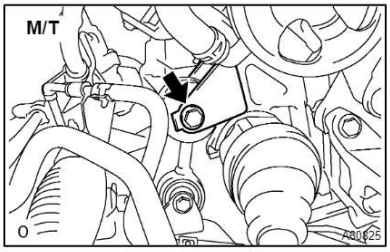
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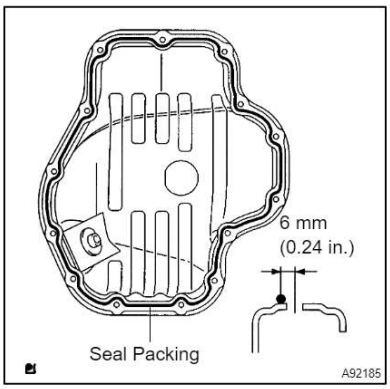
(c) Install the steering gear return hose clamp to the frame with the bolt.
Torque: 8.0 N·m (80 kgf·cm, 69 in.·lbf)



(d) Install the engine mounting insulator FR with the bolt.
Torque: 87 N·m (888 kgf·cm, 64 ft·lbf)



(e) M/T:
Install the engine lateral control rod with the bolt.
Torque: 89 N·m (910 kgf·cm, 66 ft·lbf)



45. INSTALL OIL PAN SUB–ASSY

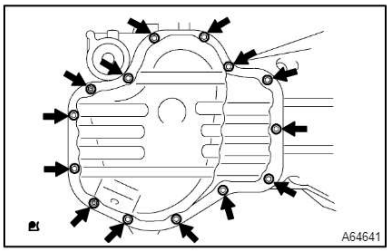
NOTICE:

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

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surface of the cylinder block and oil pan.

(b) Apply seal packing in a continuous bead (diameter: 3 to 4 mm (0.12 to 0.16 in.)) as shown in the illustration, and install the oil pan.
Seal packing: Part No. 08826–00080 or equivalent

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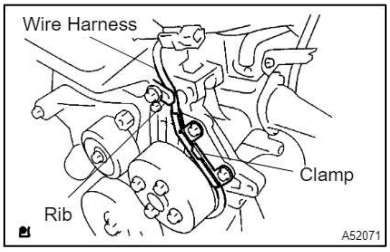


(c) Install the oil pan with the 12 bolts and 2 nuts.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

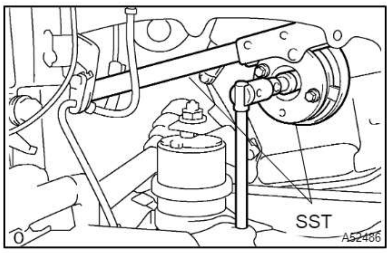
46. INSTALL CHAIN TENSIONER ASSY NO.1 (See page 14−47)

47. INSTALL CRANKSHAFT POSITION SENSOR

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

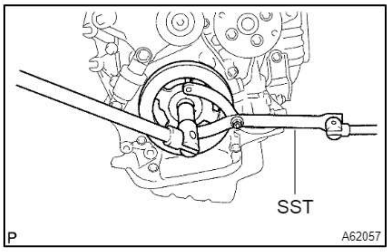


(b) Confirm that the wire harness of the sensor is placed as shown in the illustration.



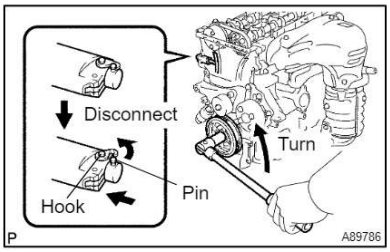
48. INSTALL CRANKSHAFT PULLEY

(a) TMC made:
Install the crankshaft pulley.
(1) Align the pulley set key with the key groove of the pulley, and side on the pulley.
(2) Using SST, install the pulley bolt.
SST 09213−54015 (91651−60855), 09330−00021
Torque: 170 N·m (1,733 kgf·cm, 125 ft lbf)

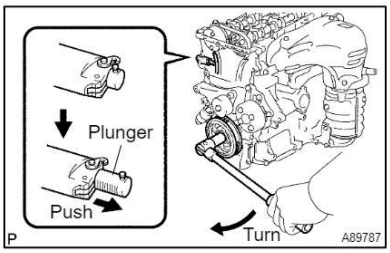


(b) TMMK made:
Install the crankshaft pulley.
(1) Align the pulley set key with the key groove of the pulley, and side on the pulley.
SST 09960−10010 (09962−01000, 09963−01000)
(2) Using SST, install the pulley bolt.
Torque: 170 N·m (1,733 kgf·cm, 125 ft lbf)

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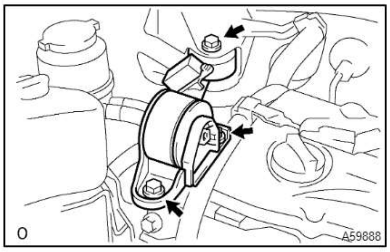


(c) Turn the crankshaft counterclockwise and disconnect the plunger knock pin from the hook.



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

49. INSTALL CYLINDER HEAD COVER SUB–ASSY (See page 14–47)
50. INSTALL IGNITION COIL ASSY
Torque: 19 N·m (194 kgf·cm, 14 ft·lbf)
51. INSTALL VANE PUMP ASSY (See page 51–8)
52. INSTALL GENERATOR ASSY (See page 19–17)
53. INSTALL ENGINE WIRE
54. INSTALL FAN AND GENERATOR V BELT (See page 14–5)
55. INSTALL ENGINE MOUNTING BRACKET NO.2 RH
Torque: 52 N·m (531 kgf·cm, 38 ft·lbf)
56. INSTALL ENGINE MOUNTING STAY NO.2 RH
Torque: 64 N·m (653 kgf·cm, 47 ft·lbf)



57. INSTALL ENGINE MOVING CONTROL ROD W/BRACKET
(a) Install the engine mounting control rod with the 3 bolts.
Torque: 64 N·m (653 kgf·cm, 47 ft·lbf)

58. INSTALL EXHAUST PIPE ASSY FRONT (See page 15–3)
59. INSTALL FRONT WHEEL RH
60. INSTALL HOOD SUB–ASSY
Torque: 13 N·m (133 kgf·cm, 10 ft·lbf)
61. ADD ENGINE OIL

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62. INSPECT CHECK FOR ENGINE OIL LEAKS

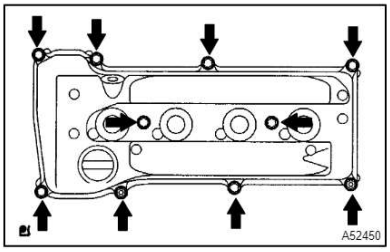
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CAMSHAFT (2AZ−FE)(From July, 2003)

1405Y−06

REPLACEMENT

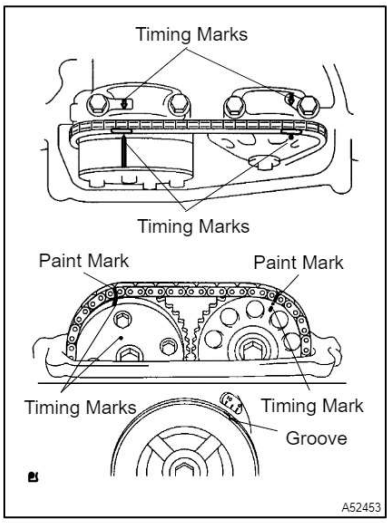
1. REMOVE FRONT WHEEL RH
2. REMOVE FRONT FENDER APRON SEAL RH
3. REMOVE ENGINE COVER SUB−ASSY NO.1
4. REMOVE SPARK PLUG
5. DISCONNECT VENTILATION HOSE
6. DISCONNECT VENTILATION HOSE NO.2
7. DISCONNECT ENGINE WIRE



8. REMOVE CYLINDER HEAD COVER SUB−ASSY

(a) Remove the bolt and disconnect the engine wire harness clamp.

(b) Remove the bolts, 2 nuts, cylinder head cover and gasket.



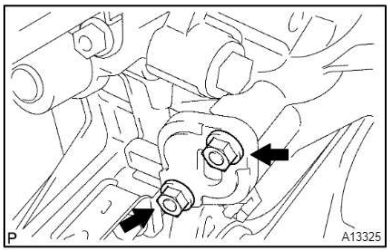
9. SET NO. 1 CYLINDER TO TDC/COMPRESSION

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

(b) Check that the timing marks of the camshaft timing gear and camshaft timing sprocket are aligned with the timing marks of the bearing cap as shown in the illustration.

(c) Place a paint mark on the timing chain.

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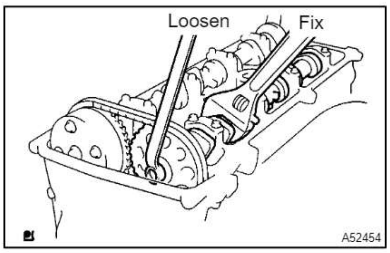


10. REMOVE CHAIN TENSIONER ASSY NO.1

(a) Remove the 2 nuts, tensioner and gasket.

NOTICE:

Be sure not to revolve the crankshaft without the tensioner.

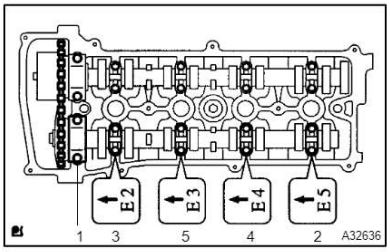


11. REMOVE CAMSHAFT SUB−ASSY, NO.2

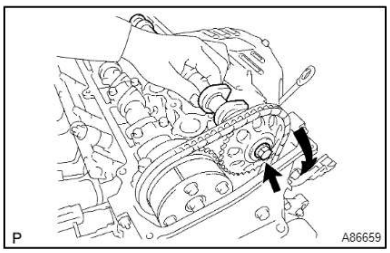
(a) Fix the camshaft with a wrench and then loosen the sprocket bolt.

NOTICE:

Be careful not to damage the valve lifter.



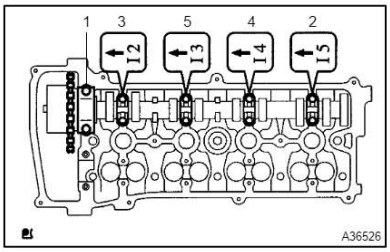
(b) Uniformly loosen and remove the No. 2 camshaft's 10 bearing cap bolts in the sequence shown in the illustration. Then remove the 5 bearing caps.



(c) Raise the No. 2 camahaft and remove it. Then remove the sprocket bolt.

(d) Remove the timing chain sprocket and the timing chain from the No. 2 camshaft.

(e) Remove the camshaft timing sprocket from the timing chain.

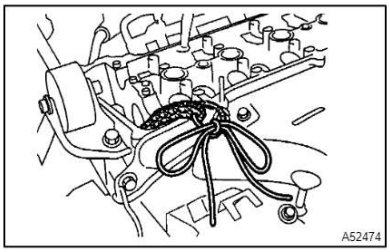


12. REMOVE CAMSHAFT

(a) Uniformly loosen and remove the camshaft's 10 bearing cap bolts in the sequence shown in the illustration. Then remove the 5 bearing caps.

(b) Remove the camshaft.

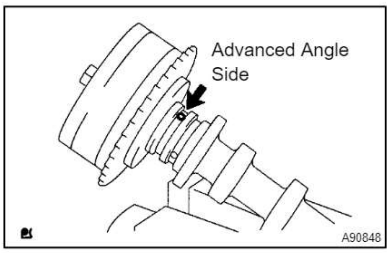
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(c) Tie the timing chain with a string.

NOTICE:

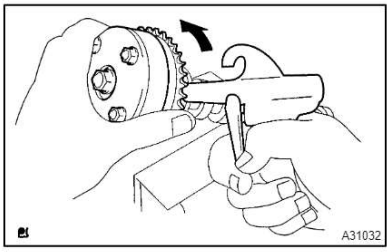
Do not drop anything inside the timing chain cover.



13. REMOVE CAMSHAFT TIMING GEAR ASSY

(a) Fix the No. 1 camshaft with a vise, and make sure that the camshaft timing gear does not rotate.

(b) Cover all the paths with vinyl tape except the advanced side path shown in the illustration.



(c) Using an air gun, apply about 150 kPA (1.5kgf/cm), 21 psi) of air pressure to the port on the advanced angle side.

CAUTION:

Some oil spraying will occur. Contain the spray with a shop rag.

HINT:

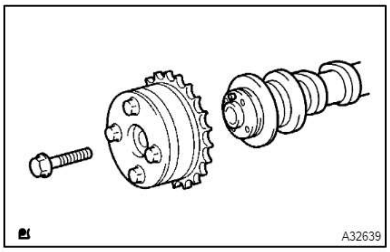
This operation releases the lock pin for the extreme retarded angle lock.

(d) Under the condition above, check that the camshaft timing gear can be turned by hand to the advanced angle side (counterclokwise), the direction of the arrow in the illustration.

Standard: Must turn

HINT:

The camshaft timing gear will turn to the advanced angle side without applying foce by hand depending on the force of the air pressure applied. Also, if applying pressure to the oil path is difficult as a result of air leakage from the port, the lock−pin may be difficult to release.

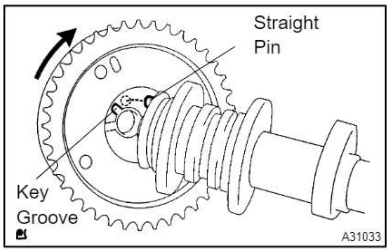


(e) Remove the fringe bolt from the camshaft timing gear.

NOTICE:

- **Be sure not to remove the other 4 bolts.**
- **If planning to reuse the camshaft timing gear assembly, release the straight pin lock first, and then install the gear.**

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14. INSTALL CAMSHAFT TIMING GEAR ASSY

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

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

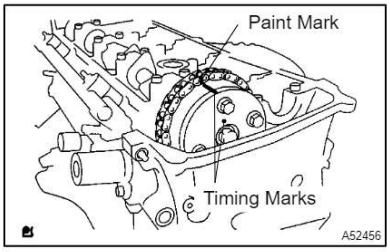
NOTICE:

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

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

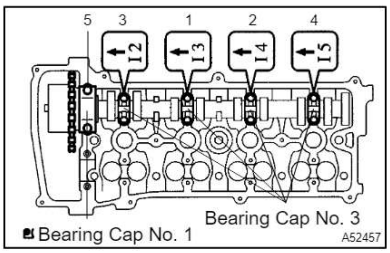
(d) Tighten the fringe bolt with the camshaft timing gear fixed.
Torque: 54 N·m (551 kgf·cm, 40 ft·lbf)

(e) Check that the camshaft timing gear can move to the retarded angle side (to the right direction) and is locked at the extrene retard angleed position.

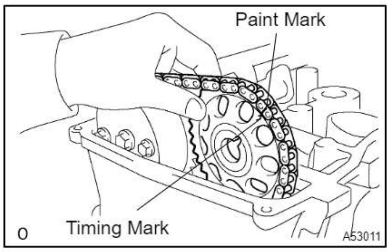


15. INSTALL CAMSHAFT

(a) Install the timing chain on the camshaft timing gear, with the painted mark of the link aligned with the timing marks of the camshaft timing sprocket.



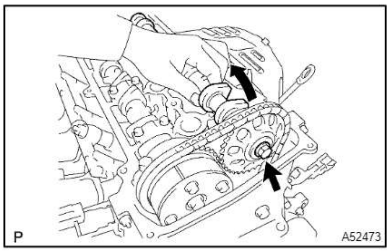
(b) Examine the front marks and unmbers of the 5 bearing caps and install them. Then install the 10 bearing cap bolts. Uniformly tighten the bolts in the sequence shown in the illustration.
Torque:
30 N·m (301 kgf·cm, 22 ft·lbf) for bearing cap No. 1
9.0 N·m (92 kgf·cm, 80 in.·lbf) for bearing cap No. 3



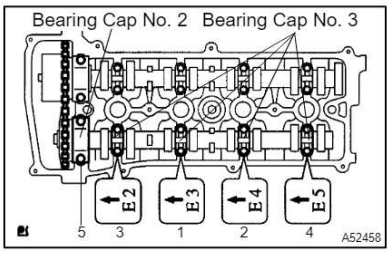
16. INSTALL NO.2 CAMSHAFT

(a) Put the camshaft on the cylinder head with the painted mark of the link of chain aligned with the timing mark of the camshaft timing sprocket.

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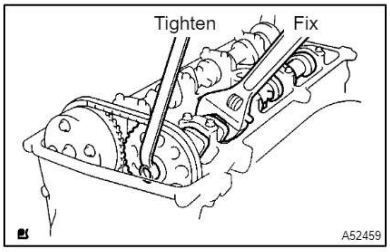


(b) Raising the camshaft, temporarily tighten the sprocket bolt.



(c) Examine the front marks and unmbers of the 5 bearing caps and install them. Then install the 10 bearing cap bolts. Uniformly tighten the bolts in the sequence shown in the illustration.

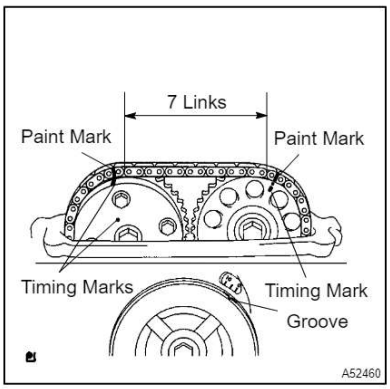
Torque:
30 N·m (301 kgf·cm, 22 ft·lbf) for bearing cap No. 2
9.0 N·m (92 kgf·cm, 80 in.·lbf) for bearing cap No. 3



(d) Fix the camshaft with a wrench, and then tighten the sprocket bolt.

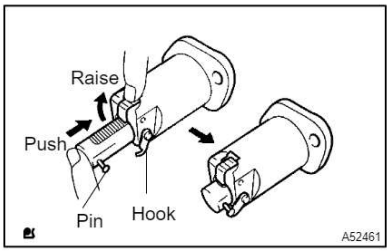
Torque: 54 N·m (551 kgf·cm, 40 ft·lbf)

NOTICE:
Be careful not to damage the valve lifter.



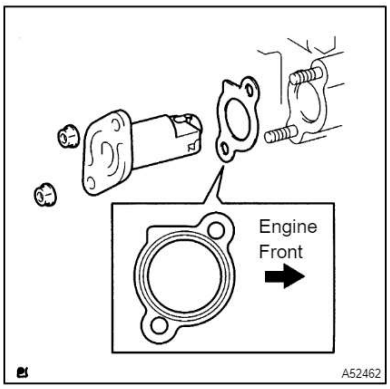
(e) As shown in the illustration, check the paint marks of the timing chain, camshaft timing gear and camshaft timing sprocket and the alignment of the pulley groove with timing mark of the chain cover.

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17. INSTALL CHAIN TENSIONER ASSY NO.1

(a) Release the ratchet pawl, fully push in the plunger and apply the hook to the pin so that the plunger cannot spring out.

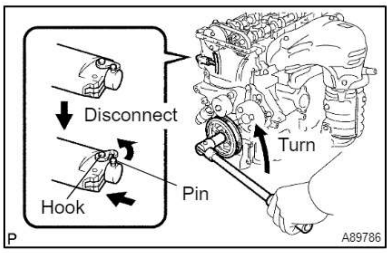


(b) Install a new gasket and the chain tensioner with the 2 nuts.

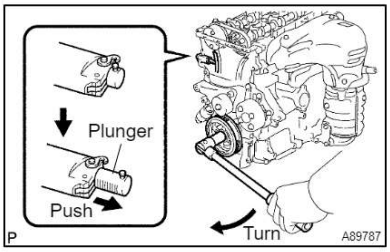
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

NOTICE:

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

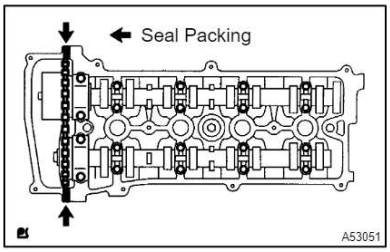


(c) Turn the crankshaft counterclockwise and check that the plunger knock pin is disconnected from the hook.



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

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18. INSTALL CYLINDER HEAD COVER SUB–ASSY

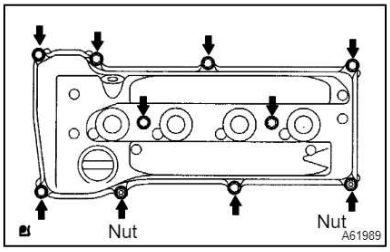
(a) Remove any old packing (FIPG) material.

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

Seal packing: Part No. 08826–00080 or equivalent

NOTICE:

- **Remove any oil the contact surface.**
- **Install the cylinder head cover within 5 minutes after applying seal packing.**
- **Do not apply engine oil for at least 2 hours after installing.**



(c) Install the cylinder head cover with the 8 bolts and 2 nuts.
Torque: 11 N·m (110 kgf·cm, 8 ft·lbf)

19. CONNECT ENGINE WIRE

20. INSTALL SPARK PLUG
Torque: 19 N·m (194 kgf·cm, 14 ft·lbf)

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

22. INSPECT OIL LEAK

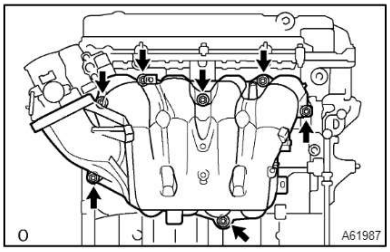
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CYLINDER HEAD GASKET (2AZ−FE)(From July, 2003)

141J3−02

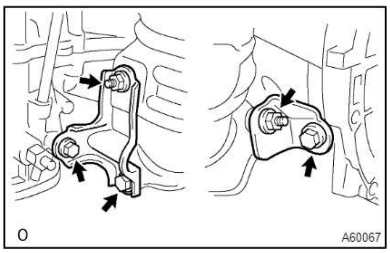
REPLACEMENT

1. WORK FOR PREVENTING GASOLINE FROM SPILLING OUT (See page 11−1)
2. REMOVE FRONT SUSPENSION UPPER BRACE CENTER (W/ FRONT SUSPENSION BRACE UPPER CENTER)
3. DRAIN COOLANT (See page 16−6)
4. DISCONNECT RADIATOR HOSE OUTLET
5. DISCONNECT UNION TO CONNECTOR TUBE HOSE
6. DISCONNECT HEATER INLET WATER HOSE
7. DISCONNECT FUEL TUBE SUB−ASSY (See page 11−1)

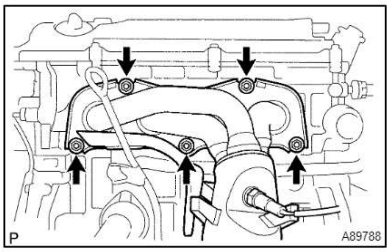


8. REMOVE INTAKE MANIFOLD
   (a) Disconnect the 2 water by−pass hoses of the throttle body.
   (b) Remove the 5 bolts, 2 nuts, intake manifold and gasket.

9. REMOVE INTAKE MANIFOLD RUNNER VALVE ASSY (See page 13−5)
10. DISCONNECT ENGINE WIRE
11. REMOVE INTAKE MANIFOLD INSULATOR NO.1
12. REMOVE EXHAUST MANIFOLD HEAT INSULATOR NO.1



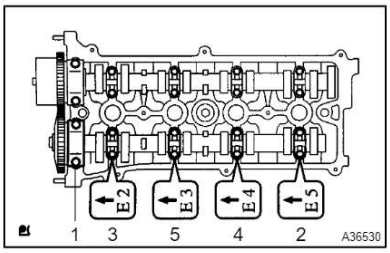
13. REMOVE EXHAUST MANIFOLD CONVERTER SUB−ASSY
   (a) Remove the 3 bolts, 2 nuts, No. 1 and No. 2 exhaust manifold stays.



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

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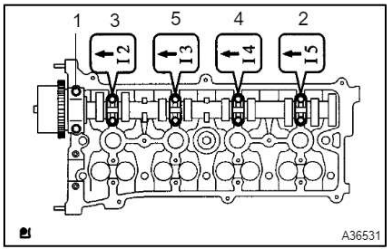
14. REMOVE CHAIN SUB–ASSY (See page 14–75)



15. REMOVE NO.2 CAMSHAFT

(a) Uniformly loosen and remove the No. 2 camshaft's 10 bearing cap bolts in the sequence shown in the illustration. Then remove the 5 bearings.

(b) Remove the camshaft.



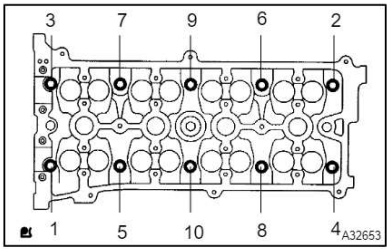
16. REMOVE CAMSHAFT

(a) Uniformly loosen and remove the No. 2 camshaft's 10 bearing cap bolts in the sequence shown in the illustration. Then remove the 5 bearings.

(b) Remove the camshaft.

17. REMOVE CAMSHAFT BEARING NO.2

18. REMOVE CAMSHAFT TIMING OIL CONTROL VALVE ASSY



19. REMOVE CYLINDER HEAD SUB–ASSY

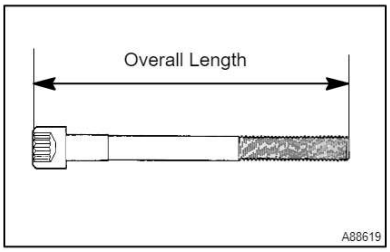
(a) Using a 10 mm bi–hexagon wrench, uniformly loosen the 10 bolts in the sequence shown in the illustration. Remove the 10 cylinder head bolts and plate washers.

NOTICE:

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

20. REMOVE CYLINDER HEAD GASKET

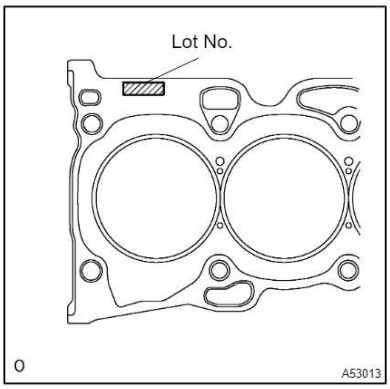
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21. INSPECT CYLINDER HEAD SET BOLT

(a) Using a vernier caliper, measure the length of the head bolts from the seat to the end.
Specified bolt length:
161.3 to 164.2 mm (6.350 to 6.465 in.)

If the length is greater than the maximum, replace the bolt.



22. INSTALL CYLINDER HEAD GASKET

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

NOTICE:

- **Remove any oil from contact surface.**
- **Be careful of the installation direction.**
- **To avoid damage to the gasket, place the cylinder head on the gasket carefully.**

23. INSTALL CYLINDER HEAD SUB−ASSY

HINT:

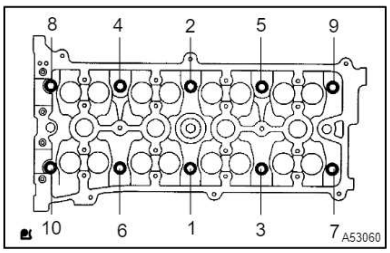
The cylinder head bolts are tightened in 2 progressive steps.

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

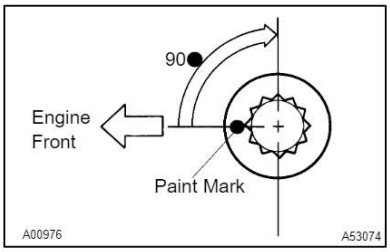
(b) Install the bolts and plate washers to the cylinder head.

NOTICE:

Do not drop the washers into the cylinder head.



(c) Using a 10 mm bi−hexagon wrench, uniformly tighten the 10 bolts in the sequence shown in the illustration.
Torque: 79 N·m (806 kgf·cm, 58 ft·lbf)



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

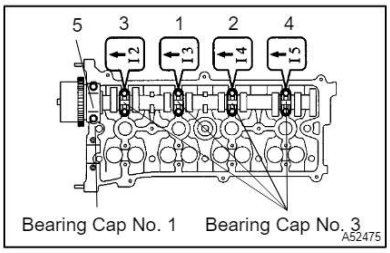
(e) Retighten the cylinder head bolts by 90° in the sequence shown in the illustration.

(f) Check that the painted mark is now at a 90° angle to the front.

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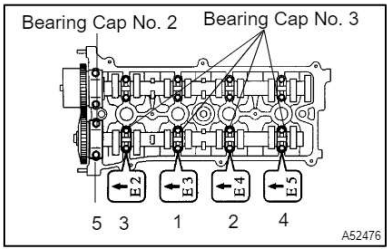
24. INSTALL CAMSHAFT TIMING OIL CONTROL VALVE ASSY
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

25. INSTALL CAMSHAFT BEARING NO.2



26. INSTALL CAMSHAFT

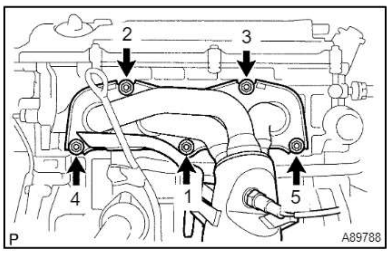
(a) Examine the front marks and numbers of the 5 bearing caps and install them. Then install the 10 bearing cap bolts. Uniformly tighten the bolts in the sequence shown in the illustration.
Torque:
30 N·m (301 kgf·cm, 22 ft·lbf) for bearing cap No. 1
9.0 N·m (92 kgf·cm, 80 in.·lbf) for bearing cap No. 3



27. INSTALL NO.2 CAMSHAFT

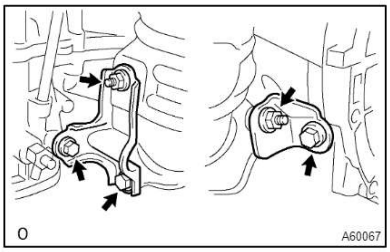
(a) Examine the front marks and numbers of the 5 bearing caps and install them. Then install the 10 bearing cap bolts. Uniformly tighten the bolts in the sequence shown in the illustration.
Torque:
30 N·m (301 kgf·cm, 22 ft·lbf) for bearing cap No.2
9.0 N·m (92 kgf·cm, 80 in.·lbf) for bearing cap No.3

28. INSTALL CHAIN SUB–ASSY (See page 14–75)



29. INSTALL EXHAUST MANIFOLD CONVERTER SUB–ASSY

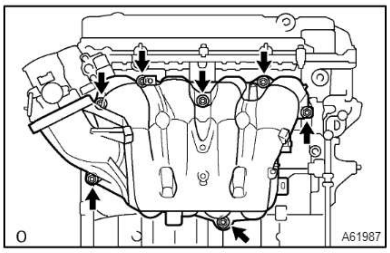
(a) Install a new gasket and the exhaust manifold with the 5 nuts.
Torque: 37 N·m (378 kgf·cm, 27 ft·lbf)



(b) Install the No. 1 and No. 2 exhaust manifold stays with the 3 bolts and 2 nuts.
Torque: 44 N·m (449 kgf·cm, 32 ft·lbf)

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30. **INSTALL EXHAUST MANIFOLD HEAT INSULATOR NO.1**
Torque: 12 N·m (122 kgf·cm, 9 ft·lbf)
31. **INSTALL INTAKE MANIFOLD RUNNER VALVE ASSY (See page 13−5)**



32. **INSTALL INTAKE MANIFOLD**
(a) Install a new gasket and the intake manifold with the 5 bolts and 2 nuts.
Torque: 30 N·m (306 kgf·cm, 22 ft·lbf)

33. **CONNECT FUEL TUBE SUB−ASSY (See page 11−1)**
34. **ADD ENGINE OIL**
35. **ADD ENGINE COOLANT (See page 16−6)**
36. **CHECK FOR ENGINE OIL LEAKS**
37. **CHECK FOR ENGINE COOLANT LEAKS (See page 16−1)**
38. **INSPECT FOR FUEL LEAKS (See page 11−4)**
39. **INSPECT CHECK IDLE SPEED AND IGNITION TIMING (See page 14−1)**
40. **INSPECT CO/HC (See page 14−1)**

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