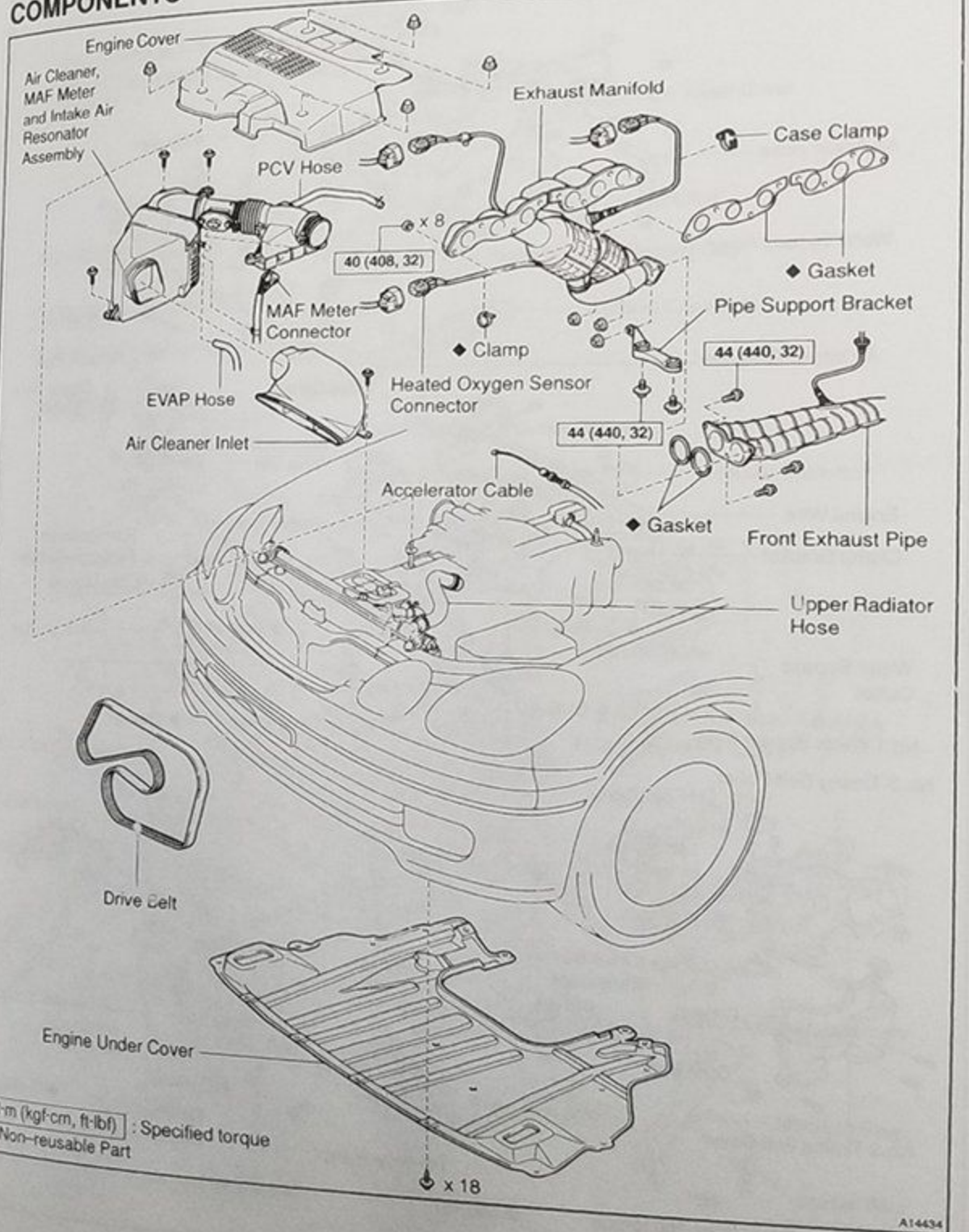
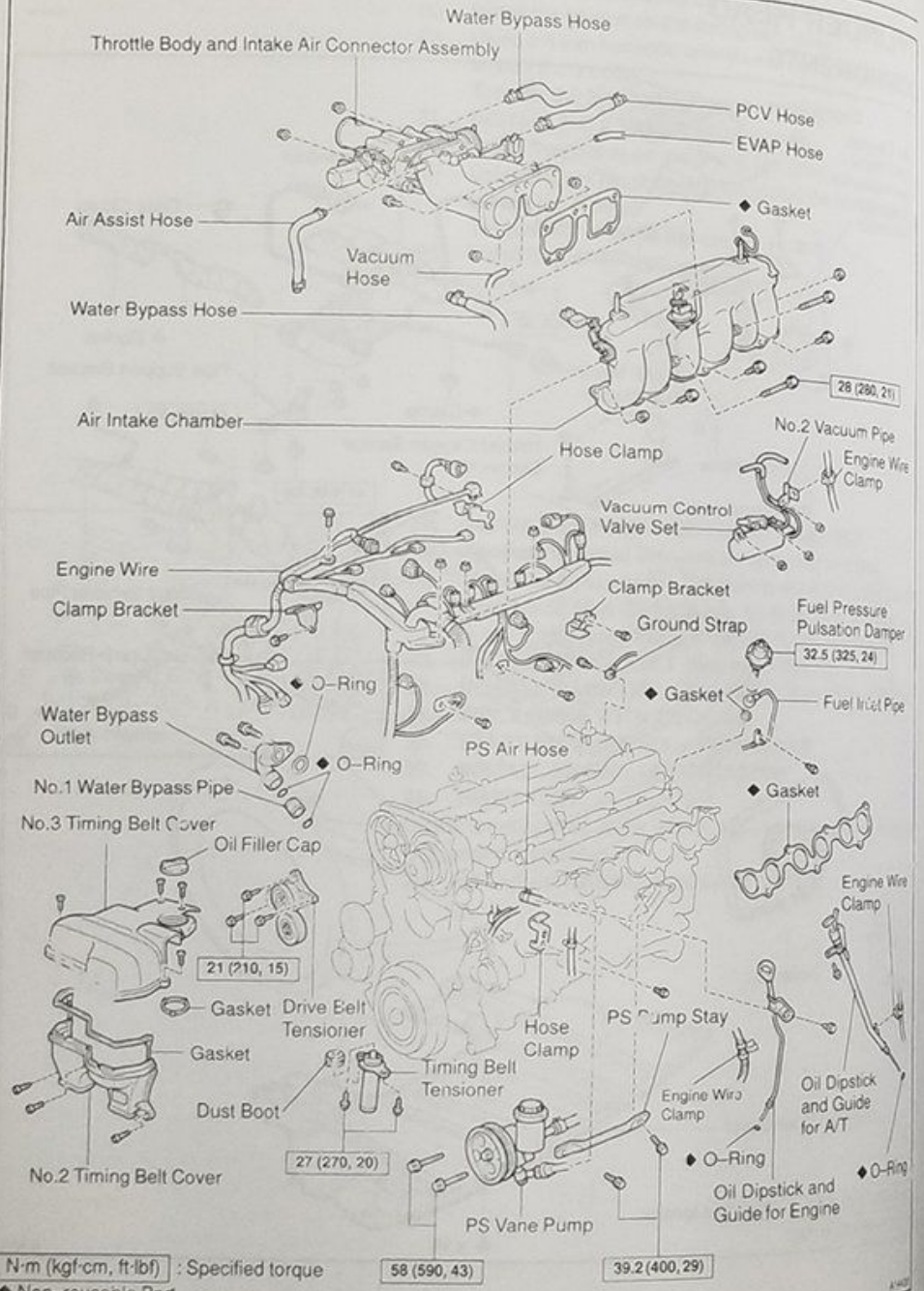
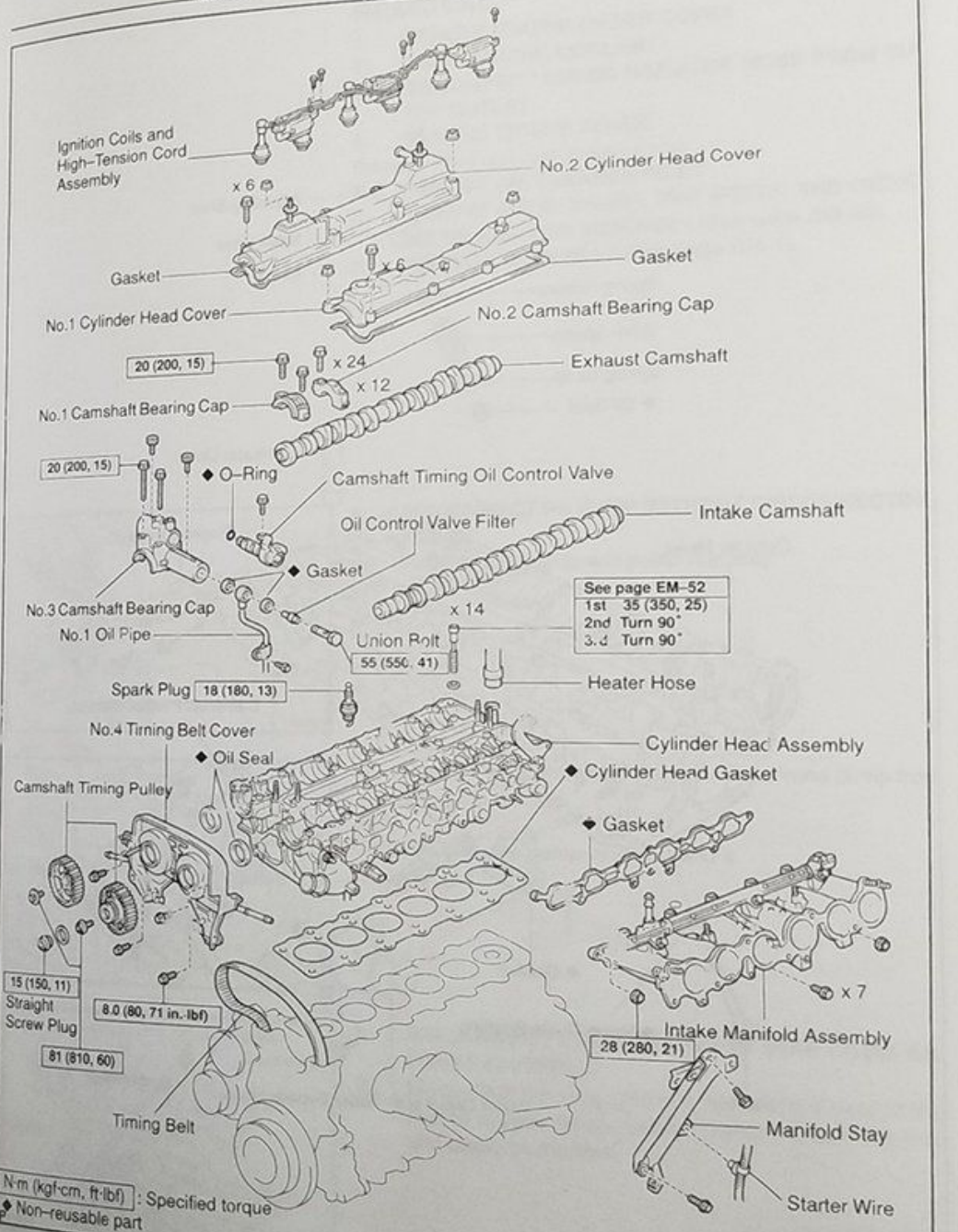
CYLINDER HEAD

COMPONENTS



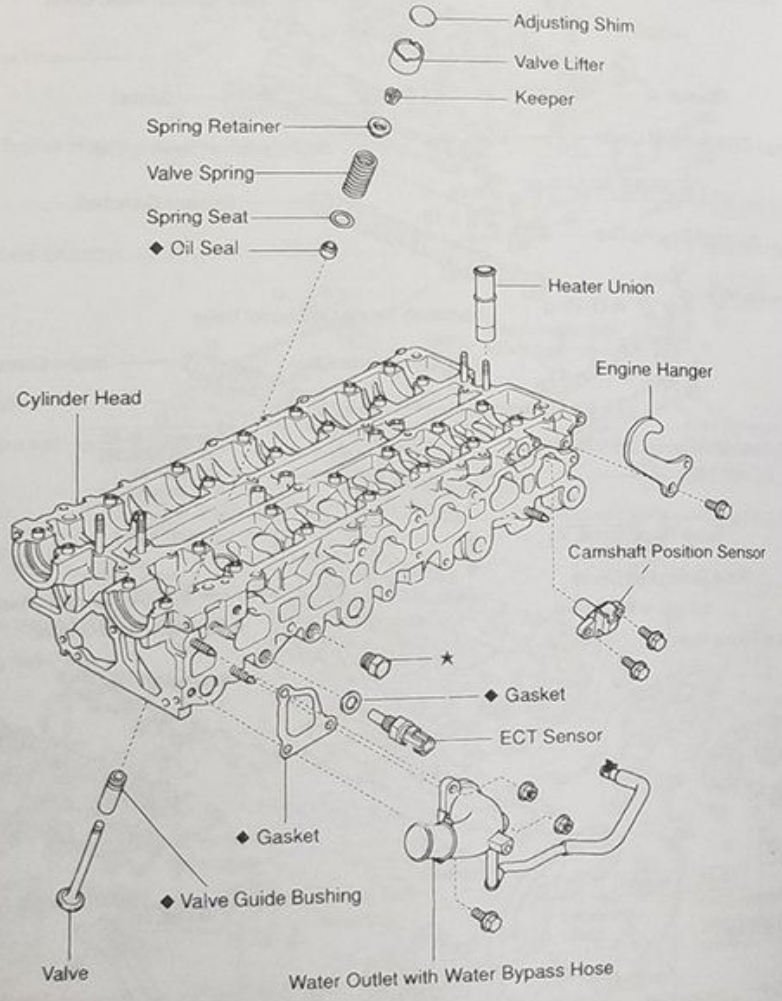


N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non–reusable Part



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

A11124



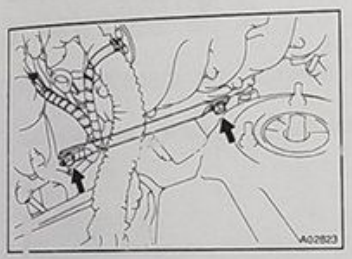
◆ Non–reusable part
★ Precoated part

REMOVAL

1. REMOVE ENGINE UNDER COVER
2. DRAIN ENGINE COOLANT
3. DISCONNECT UPPER RADIATOR HOSE FROM WATER OUTLET
4. REMOVE ENGINE COVER

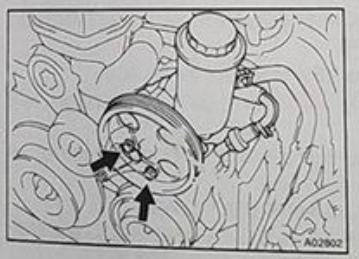
Remove the 4 nuts and engine cover.

5. REMOVE AIR CLEANER INLET
6. REMOVE AIR CLEANER, MAF METER AND INTAKE AIR RESONATOR ASSEMBLY (See page EM–62)
7. REMOVE DRIVE BELT (See page CH–1)



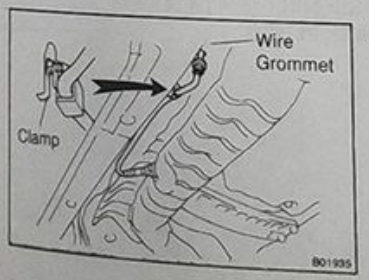
8. DISCONNECT PS PUMP WITHOUT DISCONNECTING HOSES

(a) Remove the 2 bolts and pump rear stay.



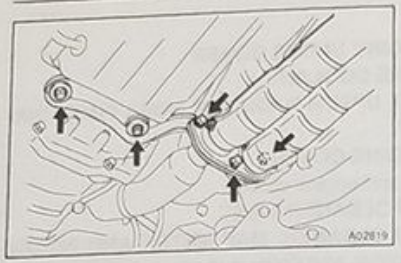
(b) Remove the 2 bolts, and disconnect the vane pump from the pump bracket.

HINT:
Put aside the vane pump, and suspend it.

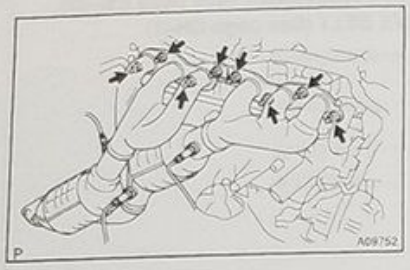


9. DISCONNECT FRONT EXHAUST PIPE FROM EXHAUST MANIFOLD

(a) Disconnect the wire grommet and sensor wire of the heated oxygen sensor (bank 2 sensor 2) from the hole and clamp on the floor.

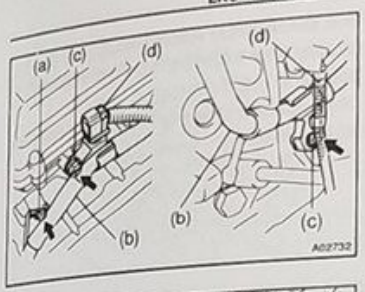


(b) Remove the 3 bolts and nuts holding the front exhaust pipe to the exhaust manifold.
(c) Remove the 2 bolts and pipe support bracket.
(d) Disconnect the front exhaust pipe from the exhaust manifold, and remove the 2 gaskets.

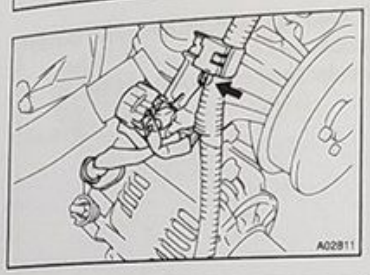


10. **REMOVE EXHAUST MANIFOLD**
(a) Disconnect the 3 heated oxygen sensor connectors and clamp.
(b) Remove the clamp and case clamp.
(c) Using a 14 mm deep socket wrench, remove the 8 nuts, exhaust manifold and 2 gaskets.
11. **REMOVE WATER BYPASS OUTLET AND NO.1 WATER BYPASS PIPE (See page CO–11)**
12. **REMOVE THROTTLE BODY AND INTAKE AIR CONNECTOR ASSEMBLY (See page EM–5)**
13. **REMOVE OIL DIPSTICK AND GUIDE FOR ENGINE (See page LU–6)**
14. **REMOVE OIL DIPSTICK AND GUIDE FOR A/T (See page EM–62)**
15. **REMOVE AIR INTAKE CHAMBER (See page SF–46)**

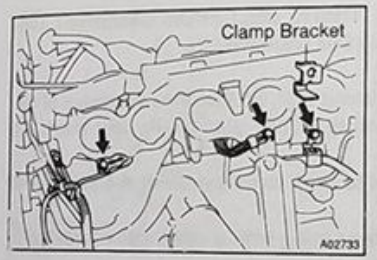
16. **REMOVE VACUUM CONTROL VALVE SET AND NO.2 VACUUM PIPE**
(a) Disconnect the VSV connector for the ACIS.
(b) Remove the 3 nuts, vacuum control valve set and No.2 vacuum pipe.
(c) Disconnect the engine wire clamp from the clamp bracket of the No.2 vacuum pipe.
17. **REMOVE NO.3 TIMING BELT COVER**
18. **REMOVE IGNITION COILS AND HIGH-TENSION CORD SET ASSEMBLY (See page IG–7)**
19. **REMOVE SPARK PLUGS**



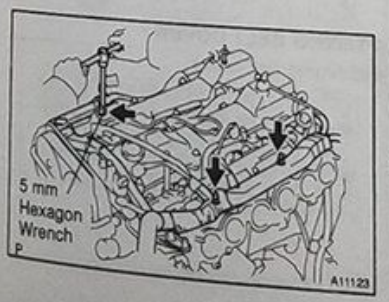
20. **DISCONNECT ENGINE WIRE FROM CYLINDER HEAD**
(a) Disconnect the ground strap from the cylinder head.
(b) Disconnect the 2 water bypass hoses from the hose clamps on the cylinder head and oil filter bracket.
(c) Remove the 2 bolts and hose clamps.
(d) Disconnect the heated oxygen sensor (bank 2 sensor 1) connector and engine wire clamp from the hose clamps.



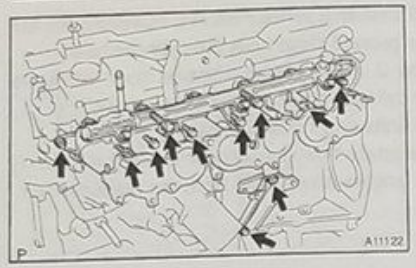
(e) Disconnect the heated oxygen sensor (bank 1 sensor 1) connector.
(f) Disconnect the crankshaft position sensor connector.
(g) Disconnect the generator connector.
(h) Remove the bolt and clamp bracket, and disconnect the engine wire from the water pump.



(i) Disconnect the 2 ground terminals from the intake manifold.
(j) Disconnect the 2 engine wire clamps from the No.1 oil pipe and clamp bracket on the intake manifold.
(k) Remove the bolt and clamp bracket.
(l) Disconnect the ECT sensor connector.
(m) Remove the 2 knock sensor connectors.
(n) Remove the oil pressure switch connector.
(o) Remove the oil level sensor connector.
(p) Remove the starter connector.
(q) Remove the 6 injector connectors.
(r) Remove the camshaft timing oil control valve connector.
(s) Remove the camshaft position sensor connector.

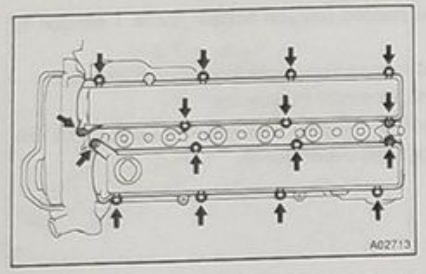


(t) Using a 5 mm hexagon wrench, remove the bolt holding the engine wire protector to the No.2 cylinder head cover.
(u) Remove the 3 nuts, and disconnect the engine wire protector from the intake manifold.
21. **REMOVE FUEL PRESSURE PULSATION DAMPER (See page SF–26)**



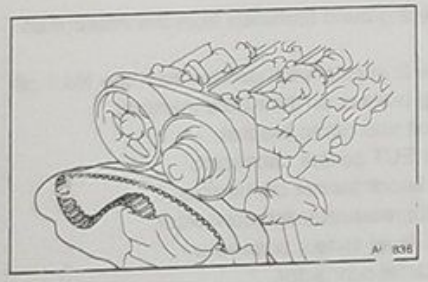
22. REMOVE INTAKE MANIFOLD ASSEMBLY

(a) Disconnect the starter wire from the manifold stay.
(b) Remove the 2 bolts and manifold stay.
(c) Remove the 7 bolts, 2 nuts, intake manifold and delivery pipe assembly and gasket.



23. REMOVE NO.1 AND NO.2 CYLINDER HEAD COVERS

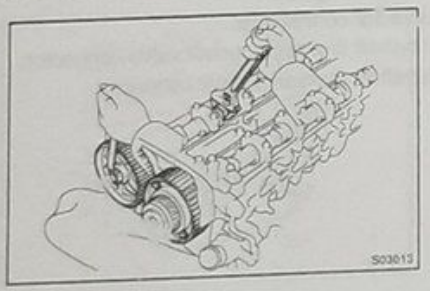
(a) Remove the 12 bolts and 4 nuts.
(b) Remove the cylinder head covers and gaskets.



24. DISCONNECT TIMING BELT FROM CAMSHAFT TIMING PULLEYS (See page EM–16)

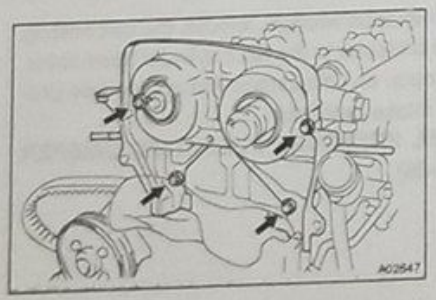
NOTICE:

- **Support the timing belt, so that the measuring of the crankshaft timing pulley and timing belt does not shift.**
- **Be careful not to drop anything inside the timing belt cover.**
- **Do not allow the timing belt to come into contact with oil, water or dust.**



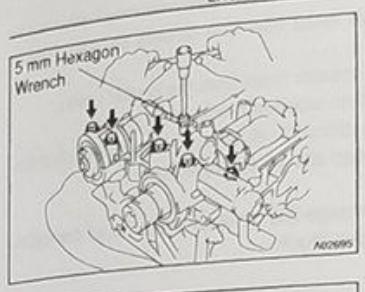
25. REMOVE CAMSHAFT TIMING PULLEYS

(a) Remove the exhaust camshaft timing pulley.
Hold the hexagon portion of the camshaft with a wrench, and remove the pulley bolt and camshaft pulley.
(b) Remove the VVT–i (intake camshaft timing) pulley (See page EM–16).



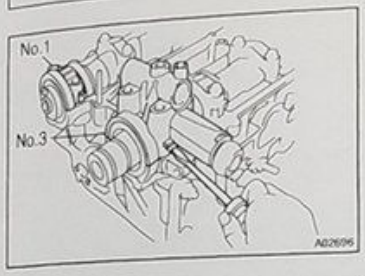
26. REMOVE NO.4 TIMING BELT COVER

Remove the 4 bolts and timing belt cover.



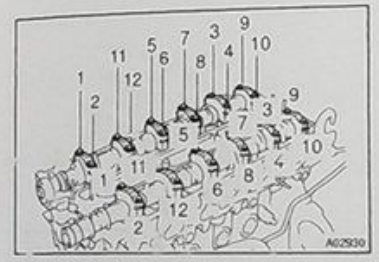
27. REMOVE CAMSHAFTS

(a) Using a 5 mm hexagon wrench, the 2 No.3 camshaft bearing cap bolts.
(b) Uniformly loosen and remove the 4 camshaft bearing cap bolts.

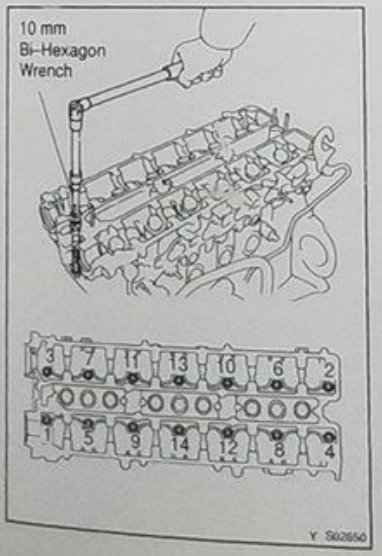


(c) Using a screwdriver, pry out the Nos.1, 3 camshaft bearing caps and oil seals.

NOTICE:
Be careful not to damage the cap. Tape the screwdriver tip.



(d) Uniformly loosen and remove the 12 camshaft bearing cap bolts, in several passes, in the sequence shown.
(e) Remove the 6 No.2 camshaft bearing caps and camshaft.
Remove the intake and exhaust camshafts.

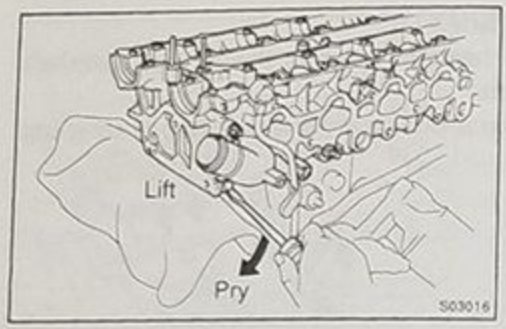


28. REMOVE CYLINDER HEAD ASSEMBLY

(a) Using a 10 mm bi–hexagon wrench, uniformly loosen and remove the 14 cylinder head bolts, in several passes, in the sequence shown.

NOTICE:
Cylinder head warpage or cranking could result from removing in incorrect order.

(b) Remove the 14 plate washers.



(c) Lift the cylinder head from the dowels on the cylinder block.
(d) Disconnect the heater hose from the heater union.
(e) Place the head on wooden blocks on a bench.

If the cylinder head is difficult to lift off, pry with a screwdriver between the cylinder head and block projection.

NOTICE:

Be careful not to damage the contact surfaces of the cylinder head and cylinder block.

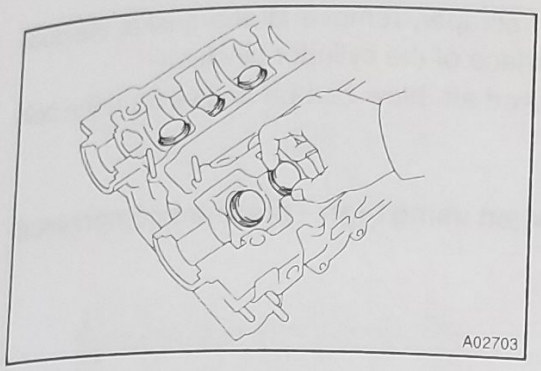
DISASSEMBLY

EM0DB-01

1. **REMOVE WATER OUTLET WITH WATER BYPASS HOSE**

Remove the 2 nuts, bolt, water outlet and gasket.

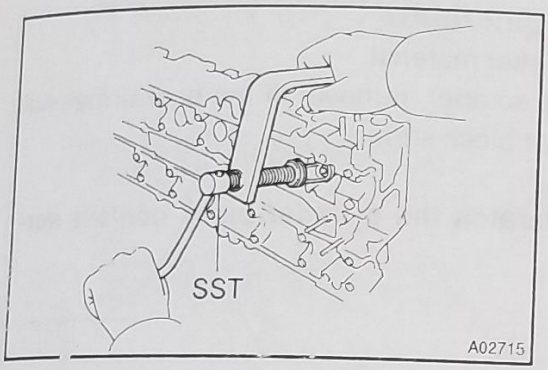
2. **REMOVE ENGINE HANGER**
3. **REMOVE CAMSHAFT POSITION SENSOR**
4. **REMOVE ECT SENSOR**



5. **REMOVE VALVE LIFTERS AND SHIMS**

HINT:

Store the valve lifters and shims in correct order.



6. **REMOVE VALVES**

(a) Using SST, compress the valve spring and remove the 2 keepers.

SST 09202–70020 (09202–00010)

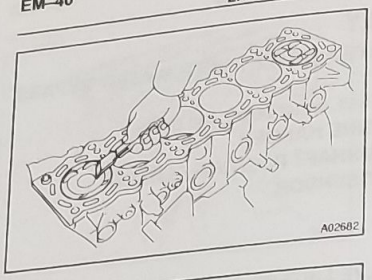
(b) Remove the spring retainer, valve spring, valve and spring seat.

HINT:

Store the valves, valve springs, spring seats and spring retainers in correct order.

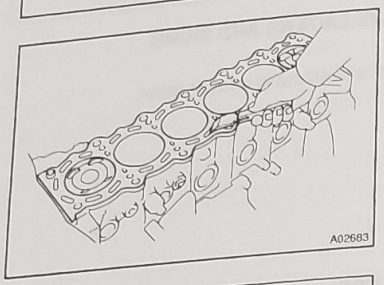
(c) Using needle–nose pliers, remove the oil seal.

INSPECTION



1. CLEAN TOP SURFACES OF PISTONS AND CYLINDER BLOCK

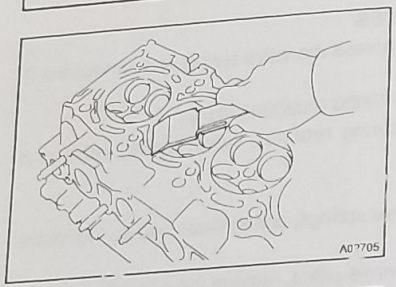
(a) Turn the crankshaft, and bring each piston to top dead center (TDC). Using a gasket scraper, remove all the carbon from the piston top surface.



(b) Using a gasket scraper, remove all the gasket material from the top surface of the cylinder block.

(c) Using compressed air, blow carbon and oil from the bolt holes.

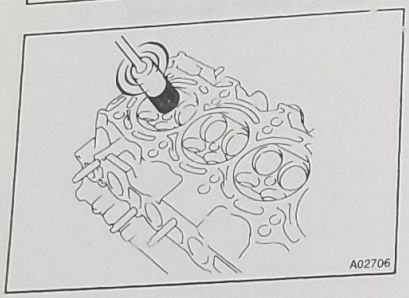
CAUTION:
Protect your eyes when using high – pressure compressed air.



2. CLEAN CYLINDER HEAD

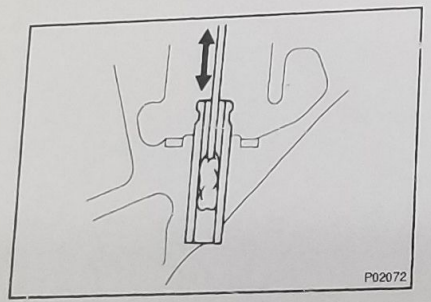
(a) Remove the gasket material.
Using a gasket scraper, remove all the gasket material from the cylinder block surface.

NOTICE:
Be careful not to scratch the cylinder block contact surface.

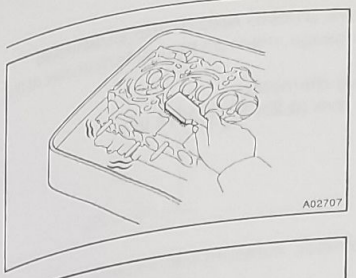


(b) Clean the combustion chambers.
Using a wire brush, remove all the carbon from the combustion chambers.

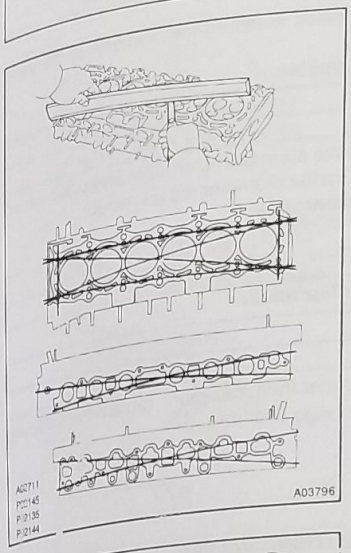
NOTICE:
Be careful not to scratch the cylinder block contact surface.



(c) Clean the valve guide bushings.
Using a valve guide bushing brush and solvent, clean all the guide bushings.

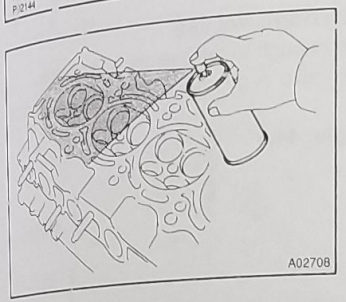


(d) Clean the cylinder head.
Using a soft brush and solvent, thoroughly clean the cylinder head.

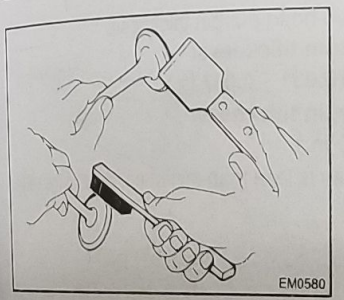


3. INSPECT CYLINDER HEAD

(a) Inspect for the flatness.
Using precision straight edge and feeler gauge, measure the surfaces contacting the cylinder block, intake and exhaust manifolds for warpage.
Maximum warpage: 0.10 mm (0.0039 in.)
If warpage is greater than maximum, replace the cylinder head.



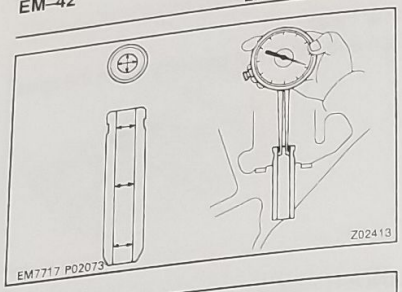
(b) Inspect for the cranks.
Using a dye penetrant, check the combustion chamber, intake ports, exhaust ports and cylinder block surface for cracks.
If cracked, replace the cylinder head.



4. CLEAN VALVES

(a) Using a gasket scraper, chip off any carbon from the valve head.

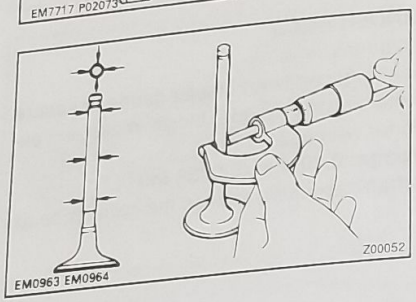
(b) Using a wire brush, thoroughly clean the valve.



5. INSPECT VALVE STEMS AND GUIDE BUSHINGS

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

Bushing inside diameter:
6.010 – 6.030 mm (0.2366 – 0.2374 in.)



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

Valve stem diameter:

Intake	5.970 – 5.985 mm (0.2350 – 0.2356 in.)
Exhaust	5.965 – 5.980 mm (0.2348 – 0.2354 in.)

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

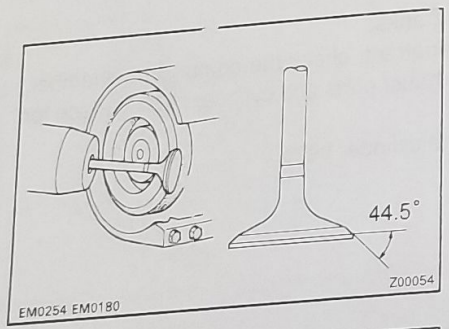
Standard oil clearance:

Intake	0.025 – 0.060 mm (0.0010 – 0.0024 in.)
Exhaust	0.030 – 0.065 mm (0.0012 – 0.0026 in.)

Maximum oil clearance:

Intake	0.08 mm (0.0031 in.)
Exhaust	0.10 mm (0.0039 in.)

If the clearance is greater than maximum, replace the valve and guide bushing. (See page EM–48)

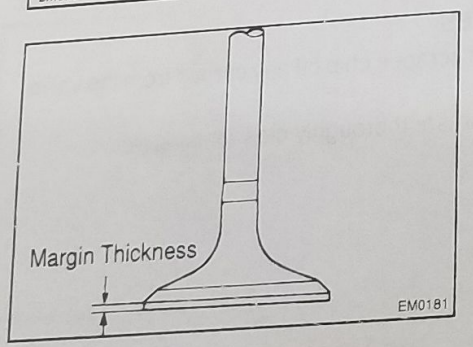


6. INSPECT AND GRIND VALVES

(a) Grind the valve enough to remove pits and carbon.

(b) Check that the valve is ground to the correct valve face angle.

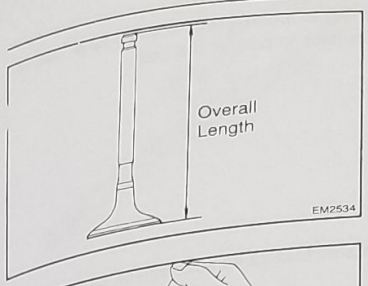
Valve face angle: 44.5°



(c) Check the valve head margin thickness.

Standard margin thickness:
0.8 – 1.2 mm (0.031 – 0.047 in.)
Minimum margin thickness:
0.5 mm (0.020 in.)

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



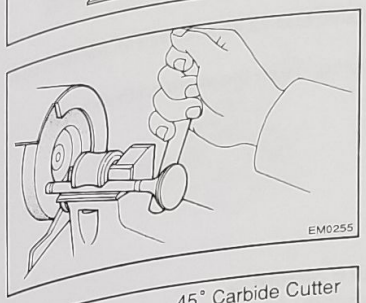
(d) Check the valve overall length.

Standard overall length:

Intake	98.29 – 98.79 mm (3.8697 – 3.8894 in.)
Exhaust	98.84 – 99.34 mm (3.8913 – 3.9110 in.)

Minimum overall length:

Intake	98.19 mm (3.8657 in.)
Exhaust	98.74 mm (3.8874 in.)

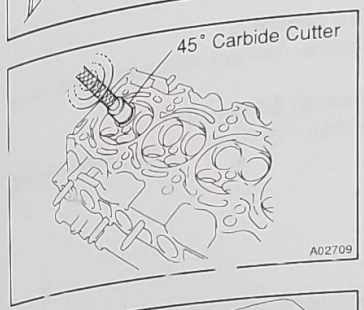


If the overall length is less than minimum, replace the valve.

(e) Check the surface of the valve stem tip for wear.

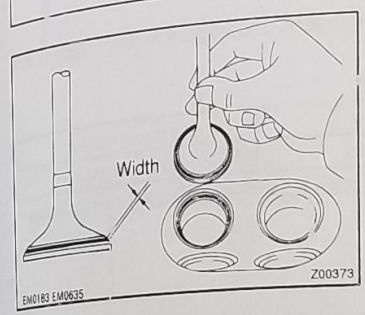
If the valve stem tip is worn, resurface the tip with a grinder or replace the valve.

NOTICE:
Do not grind off more than the minimum overall length.



7. INSPECT AND CLEAN VALVE SEATS

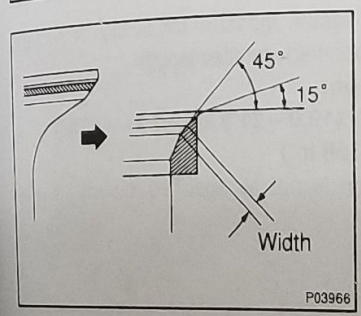
(a) Using a 45° carbide cutter, resurface the valve seats. Remove only enough metal to clean the seats.



(b) Check the valve seating position.
Apply a thin coat of Prussian blue (or white lead) to the valve face. Lightly press the valve against the seat. Do not rotate the valve.

(c) Check the valve face and seat for the following:

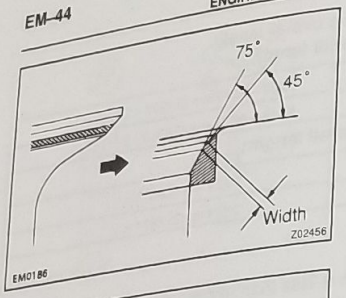
- If blue appears 360° around the face, the valve is concentric. If not, replace the valve.
- If blue appears 360° around the valve seat, the guide and face are concentric. If not, resurface the seat.
- Check that the seat contact is in the middle of the valve face with the following width:



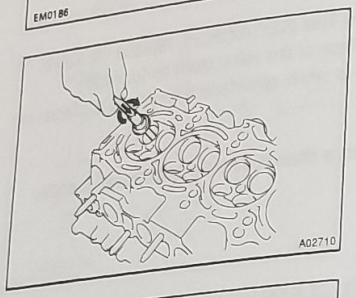
If not, correct the valve seats as follows:

Intake	1.0 – 1.4 mm (0.039 – 0.055 in.)
Exhaust	1.2 – 1.6 mm (0.047 – 0.063 in.)

(1) If the seating is too high on the valve face, use 15° and 45° cutters to correct the seat.

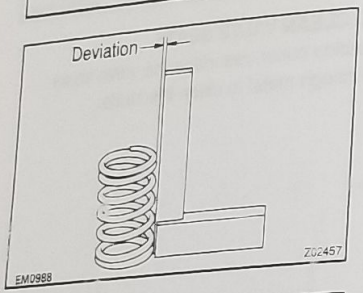


(2) If the seating is too low on the valve face, use 75° and 45° cutters to correct the seat.



(d) Hand–lap the valve and valve seat with an abrasive compound.

(e) After hand–lapping, clean the valve and valve seat.

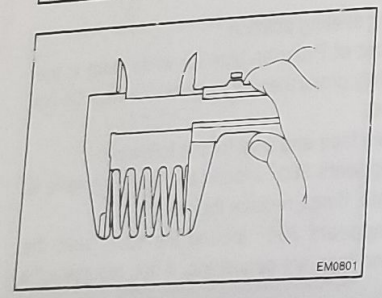


8. INSPECT VALVE SPRINGS

(a) Using a steel square, measure the deviation of the valve spring.

Maximum deviation: 2.0 mm (0.079 in.)

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

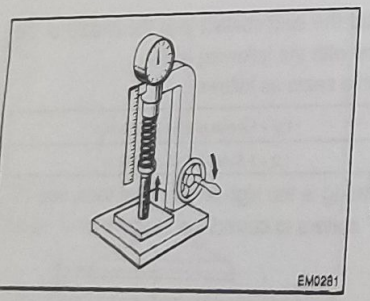


(b) Using vernier calipers, measure the free length of the valve spring.

Free length:

Pink painted mark	43.71 mm (1.7209 in.)
Yellow painted mark	44.10 mm (1.7362 in.)

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

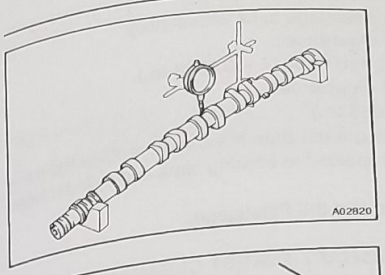


(c) Using a spring tester, measure the tension of the valve spring at the specified installed length.

Installed tension:

186.2 – 205.8 N (19.0 – 21.0 kgf, 41.9 – 46.3 lbf) at 34.5 mm (1.358 in.)

If the installed tension is not as specified, replace the valve spring.



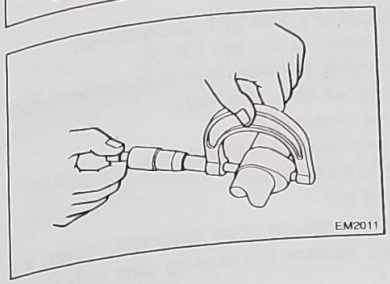
9. INSPECT CAMSHAFTS FOR RUNOUT

(a) Place the camshaft on V–blocks.

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

Maximum circle runout: 0.08 mm (0.0031 in.)

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



10. INSPECT CAM LOBES

Using a micrometer, measure the cam lobe height.

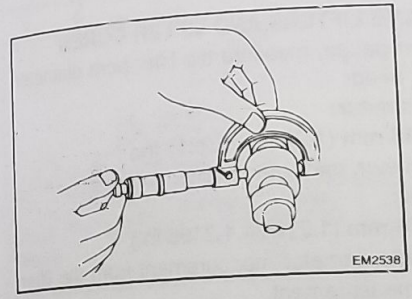
Standard cam lobe height:

Intake	44.310 – 44.360 mm (1.7445 – 1.7465 in.)
Exhaust	44.250 – 44.350 mm (1.7421 – 1.7461 in.)

Minimum cam lobe height:

Intake	44.16 mm (1.7386 in.)
Exhaust	44.10 mm (1.7362 in.)

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



11. INSPECT CAMSHAFT JOURNALS

Using a micrometer, measure the journal diameter.

Journal diameter:

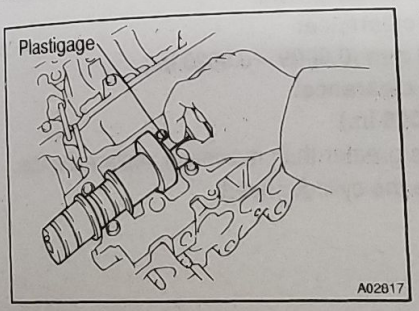
28.949 – 28.965 mm (1.1397 – 1.1404 in.)

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

12. INSPECT CAMSHAFT BEARING

Check the bearings for flaking and scoring.

If the bearings are damaged, replace the bearing caps and cylinder head as a set.



13. INSPECT CAMSHAFT JOURNAL 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 journals.

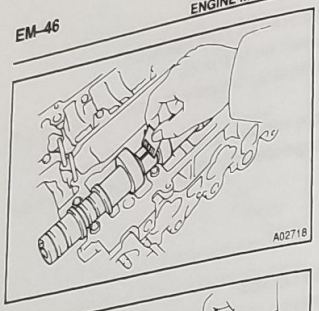
(d) Install the bearing caps. (See page EM–52)

Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

NOTICE:

Do not turn the camshaft.

(e) Remove the bearing caps.

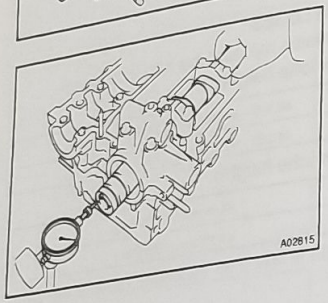


(f) Measure the Plastigage at its widest point.

Standard oil clearance:
0.035 – 0.072 mm (0.0014 – 0.0028 in.)
Maximum oil clearance:
0.10 mm (0.0039 in.)

If the oil clearance is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.

(g) Completely remove the Plastigage.



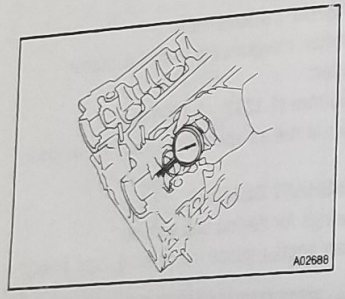
14. INSPECT CAMSHAFT THRUST CLEARANCE

(a) Install the camshafts. (See page EM–52)

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

Standard thrust clearance:
0.080 – 0.190 mm (0.0031 – 0.0075 in.)
Maximum thrust clearance:
0.30 mm (0.0118 in.)

If the thrust clearance is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.



15. INSPECT VALVE LIFTERS AND LIFTER BORES

(a) Using a caliper gauge, measure the lifter bore diameter of the cylinder head.

Lifter bore diameter:
31.000 – 31.016 mm (1.2205 – 1.2211 in.)

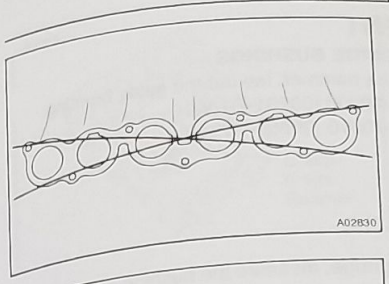
(b) Using a micrometer, measure the lifter diameter.

Lifter diameter:
30.966 – 30.976 mm (1.2191 – 1.2195 in.)

(c) Subtract the lifter diameter measurement from the lifter bore diameter measurement.

Standard oil clearance:
0.024 – 0.050 mm (0.0009 – 0.0020 in.)
Maximum oil clearance:
0.07 mm (0.0028 in.)

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

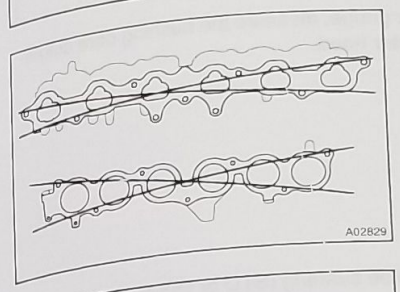


16. INSPECT AIR INTAKE CHAMBER

Using a precision straight edge and feeler gauge, measure the surfaces contacting the intake manifold for warpage.

Maximum warpage: 0.15 mm (0.0059 in.)

If warpage is greater than maximum, replace the chamber.

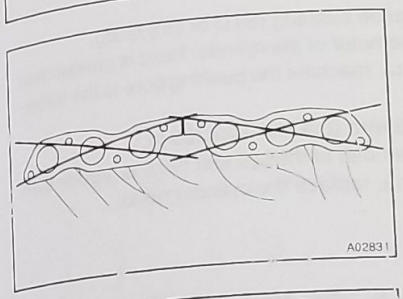


17. INSPECT INTAKE MANIFOLD

Using a precision straight edge and feeler gauge, measure the surfaces contacting the cylinder head and air intake chamber for warpage.

Maximum warpage: 0.15 mm (0.0059 in.)

If warpage is greater than maximum, replace the manifold.

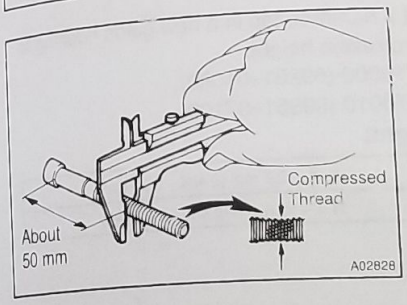


18. INSPECT EXHAUST MANIFOLD

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

Maximum warpage: 0.50 mm (0.0196 in.)

If warpage is greater than maximum, replace the manifold.



19. INSPECT CYLINDER HEAD BOLTS

Using a vernier caliper, measure the thread outside diameter of the bolt.

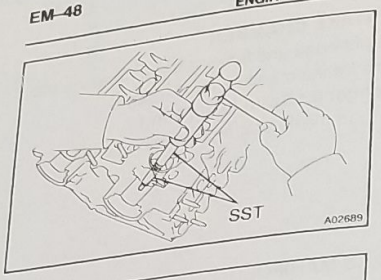
Standard outside diameter:
10.8 – 11.0 mm (0.425 – 0.433 in.)
Minimum outside diameter:
10.7 mm (0.421 in.)

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

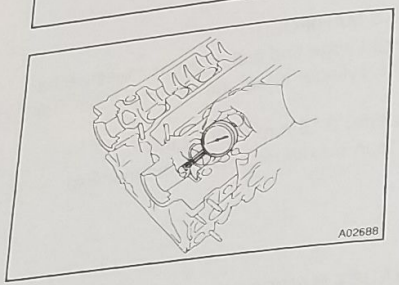
REPLACEMENT

REPLACE VALVE GUIDE BUSHINGS

(a) Using SST and a hammer, tap out the guide bushing.
SST 09201–10000 (09201–01060),
09950–70010 (09951–07100)



(b) Using a caliper gauge, measure the bushing bore diameter of the cylinder head.



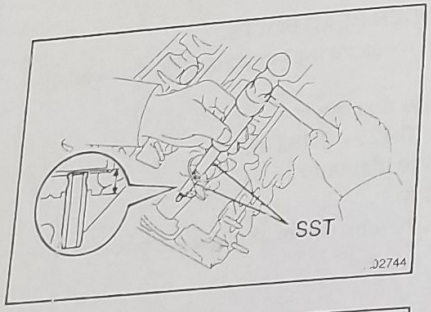
Both intake and exhaust

Bushing bore diameter mm (in.)	Bushing size
10.985 – 11.006 mm (0.4325 – 0.4333 in.)	Use STD
11.035 – 11.056 mm (0.4344 – 0.4353 in.)	Use O/S 0.05

(c) Select a new guide bushing (STD or O/S 0.05).
If the bushing bore diameter of the cylinder head is greater than 11.006 mm (0.4333 in.), machine the bushing bore to the following dimension:

11.035 – 11.056 mm (0.4344 – 0.4353 in.)

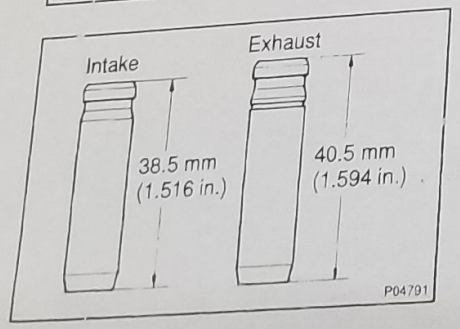
If the bushing bore diameter of the cylinder head is greater than 11.056 mm (0.4353 in.), replace the cylinder head.



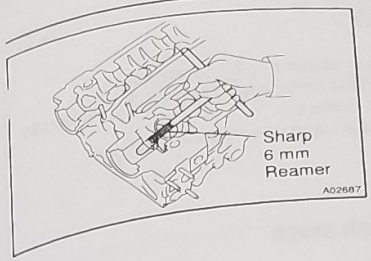
(d) Using SST and a hammer, tap in a new guide bushing to the specified protrusion height.
SST 09201–10000 (09201–01060),
09950–70010 (09951–07100)

Protrusion height:

Intake	12.3 – 12.7 mm (0.484 – 0.500 in.)
Exhaust	11.4 – 11.8 mm (0.449 – 0.465 in.)



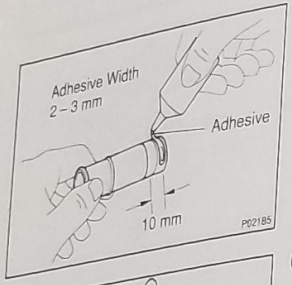
HINT:
Different bushings are used for the intake and exhaust.



(e) Using a sharp 6 mm reamer, ream the guide bushing to obtain the standard specified clearance (See page EM–40) between the guide bushing and valve stem.

REASSEMBLY

HINT:
- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply fresh engine oil to all sliding and rotating surfaces.
- Replace all gaskets and oil seals with new ones.

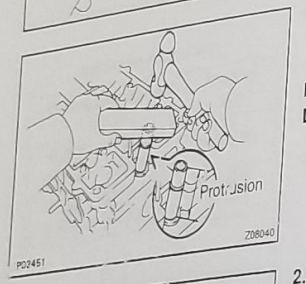


1. INSTALL HEATER UNION

HINT:
When using a new cylinder head, a new heater union must be installed.

(a) Apply adhesive to the end of the heater union as shown in the illustration.

Adhesive: Part No.08833–00070, THREE BOND 1324 or equivalent

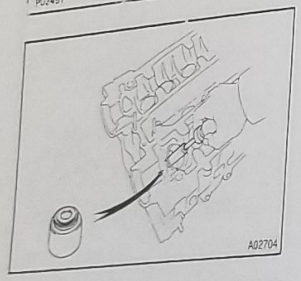


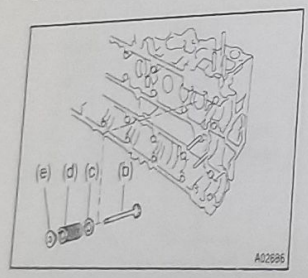
(b) Using a wooden block and hammer, tap in a new heater union, leaving 48 mm (1.89 in.) protruding from the cylinder head.

NOTICE:
Do not tap it in too far.

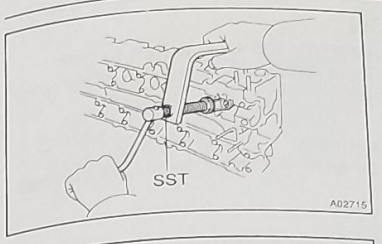
2. INSTALL VALVES

(a) Install a new oil seal on the valve guide bushing.

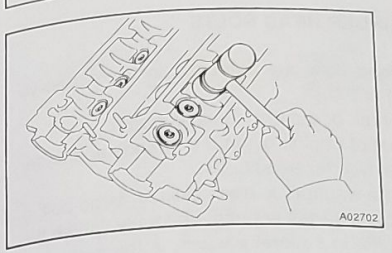




(b) Install the valve.
(c) Install the spring seat.
(d) Install the valve spring.
(e) Install the spring retainer.



(f) Using SST, compress the valve spring and place the 2 keepers around the valve stem.
SST 09202–70020 (09202–00010)



(g) Using a plastic–faced hammer, lightly tap the valve stem tip to assure proper fit.

3. INSTALL VALVE LIFTERS AND SHIMS

(a) Install the valve lifter and shim.
(b) Check that the valve lifter rotates smoothly by hand.

4. INSTALL ECT SENSOR

Torque: 19.6 N·m (200 kgf·cm, 14 ft·lbf)

5. INSTALL CAMSHAFT POSITION SENSOR

6. INSTALL ENGINE HANGER

Torque: 40 N·m (400 kgf·cm, 30 ft·lbf)

7. INSTALL WATER OUTLET WITH WATER BYPASS HOSE

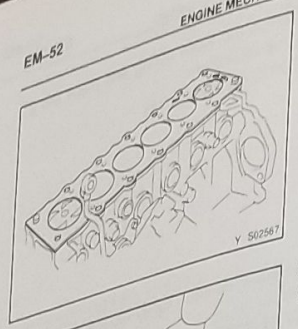
Install a new gasket and the water outlet with the bolt and 2 nuts.

Torque: 28 N·m (280 kgf·cm, 21 ft·lbf)

INSTALLATION

1. PLACE CYLINDER HEAD ON CYLINDER BLOCK

(a) Place a new cylinder head gasket in position on the cylinder block.



NOTICE:
Be sure to install it correctly.

(b) Place the cylinder head in position on the cylinder head gasket.

2. INSTALL CYLINDER HEAD BOLTS

HINT:

- The cylinder head bolts are tightened in 2 progressive steps (steps (c) and (f)).
- If any of bolts break or deform, replace them.

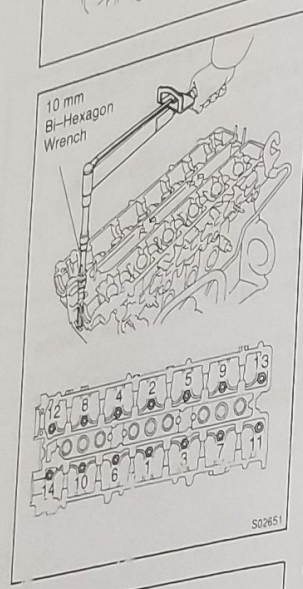
(a) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.

(b) Install the 14 plate washers to each cylinder head bolt.

(c) Using a 10 mm bi–hexagon wrench, uniformly tighten the cylinder head bolts, in several passes, in the sequence shown.

Torque: 35 N·m (350 kgf·cm, 26 ft·lbf)

If any of the bolts do not meet the torque specification, replace the bolt.

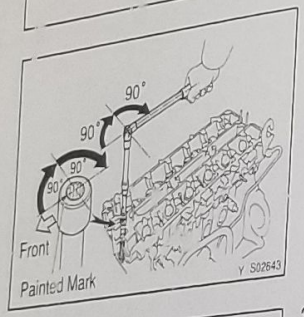


(d) Mark the front of the cylinder head bolt head with paint.

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

(f) Retighten cylinder head bolts by an additional 90° shown.

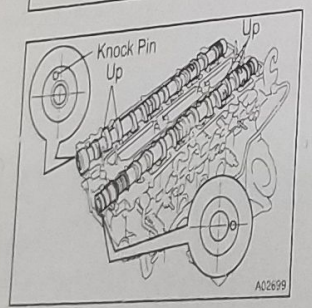
(g) Check that the painted mark is now turned to the rear.

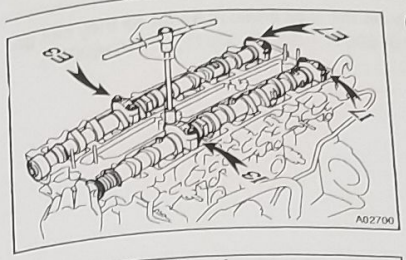


3. INSTALL CAMSHAFTS

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

(b) Place the camshaft on the cylinder head with the cam lobe facing up as shown.

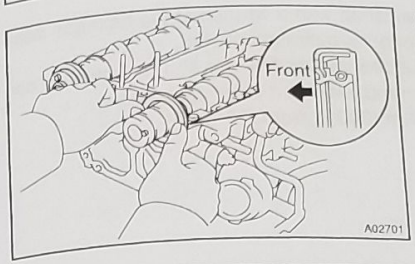




(c) Place the (Nos. 3, 7 journal) camshaft bearing caps in their proper location.

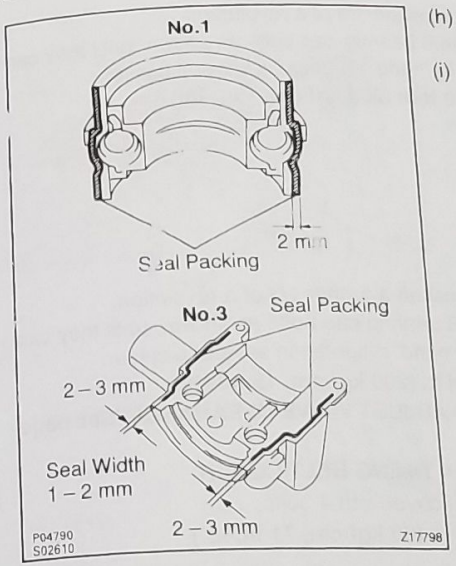
(d) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.

(e) Temporarily tighten these bearing cap bolts uniformly and alternately, in several passes, until the bearing caps are snug with the cylinder head.



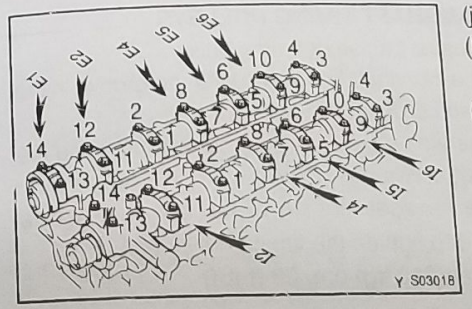
(f) Apply MP grease to a new camshaft oil seal lip.

(g) Install the 2 oil seals to the camshafts.



(h) Clean the installed surfaces of the Nos.1, 3 camshaft bearing cap and cylinder head with cleaner.

(i) Apply seal packing to the bearing caps as shown.
Seal packing: Part No. 08826–00080 or equivalent

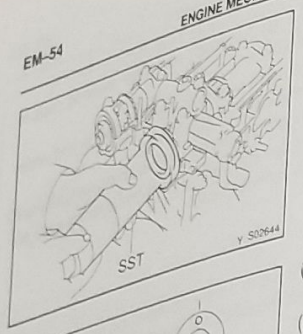


(j) Install the other bearing caps in their proper locations.

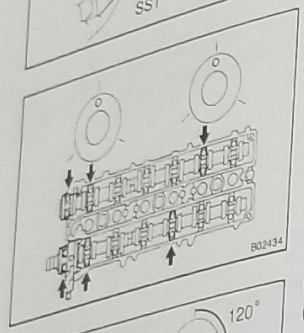
(k) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.

(l) Install and uniformly tighten the 14 bearing cap bolts on one side, in several passes, in the sequence shown.
Torque: 20 N·m (200 kgf·cm, 15 ft·lbf)

(m) Using a 5 mm hexagon wrench, the 2 No.3 camshaft bearing cap bolts.
Torque: 5.0 N·m (50 kgf·cm, 44 in.·lbf)

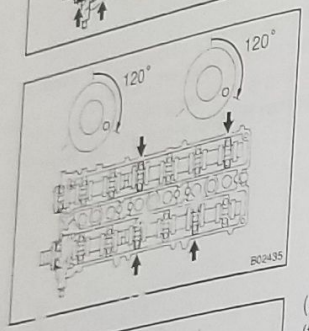


(n) Using SST, push the 2 oil seals in as far as they can go.
SST 09316–60011 (09316–00011, 09316–00051)



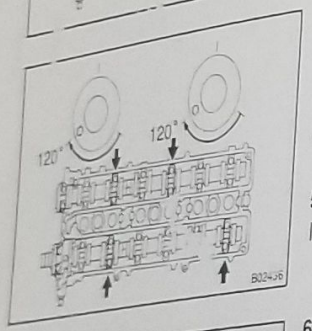
(o) Rotate the camshaft with a wrench at the hexagon position, bring the forward straight pin up.

(p) Loosen the 12 bearing cap bolts as shown, until they can be turned by hand; retighten in several passes.
Torque: 20 N·m (200 kgf·cm, 15 ft·lbf)



(q) Turn the camshaft 1/3 of a revolution.

(r) Loosen the 8 bearing cap bolts as shown, until they can be turned by hand; retighten in several passes.
Torque: 20 N·m (200 kgf·cm, 15 ft·lbf)



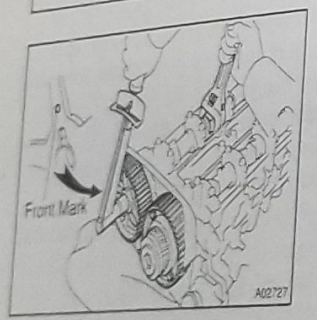
(s) Turn the camshaft a further 1/3 of a revolution.

(t) Loosen the 8 bearing cap bolts as shown, until they can be turned by hand; retighten in several passes.
Torque: 20 N·m (200 kgf·cm, 15 ft·lbf)

4. **CHECK AND ADJUST VALVE CLEARANCE (See page EM–5)**

5. **INSTALL NO.4 TIMING BELT COVER**

Install the timing belt cover with 4 bolts.
Torque: 3.0 N·m (80 kgf·cm, 71 in.·lbf)



6. **INSTALL CAMSHAFT TIMING PULLEYS**

(a) Install the exhaust camshaft timing pulley.

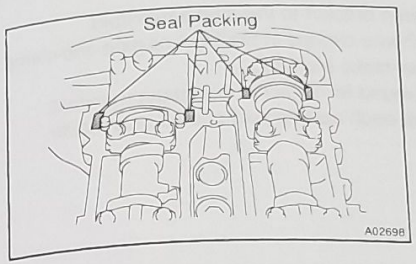
(1) Align the camshaft knock pin with the groove in the pulley, and slide on the pulley.

(2) Slide the timing pulley on the camshaft, facing the front mark forward.

(3) Hold the hexagon portion of the camshaft with a wrench, and tighten the timing pulley bolt.
Torque: 81 N·m (810 kgf·cm, 60 ft·lbf)

(b) Install the VV–i (intake camshaft timing) pulley (See page EM–23).

7. **CONNECT TIMING BELT TO CAMSHAFT TIMING PULLEYS (See page EM–23)**



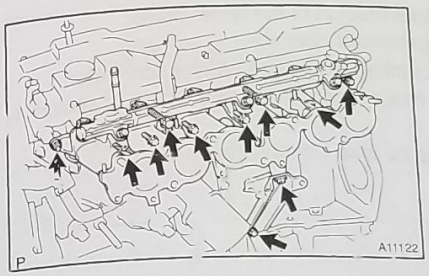
8. **INSTALL NO.1 AND NO.2 CYLINDER HEAD COVERS**

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

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

(c) Install the gaskets to the cylinder head covers.

(d) Install the cylinder head covers with the 12 bolts and 4 nuts.
Torque: 8.5 N·m (85 kgf·cm, 75 in.·lbf)



9. **INSTALL INTAKE MANIFOLD ASSEMBLY**

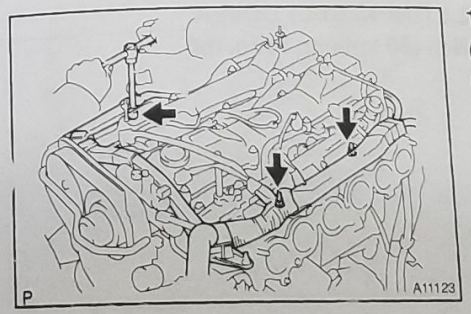
(a) Install a new gasket and the intake manifold and delivery pipe assembly with the 7 bolts and 2 nuts.
Torque: 28 N·m (280 kgf·cm, 21 ft·lbf)

(b) Pass the water bypass hose between the No.2, No.3 intake ports of the manifold and delivery pipe.

(c) Install the manifold stay with the 2 bolts.
Torque: 40 N·m (400 kgf·cm, 30 ft·lbf)

(d) Install the starter wire to the manifold stay.

10. **INSTALL FUEL PRESSURE PULSATION DAMPER (See page SF–27)**



11. **CONNECT ENGINE WIRE TO CYLINDER HEAD**

(a) Install the engine wire protector with the 3 nuts.

(b) Using a 5 mm hexagon wrench, install the bolt holding the engine wire protector to the No.2 cylinder head cover.

(c) Connect the 6 injector connectors.

HINT:

The Nos.1, 3, 5 injector connectors and dark gray, and the Nos.2, 4, 6 injector connectors are brown.

(d) Connect the camshaft timing oil control valve connector.

(e) Connect the camshaft position sensor connector.