EM10Q–01

REMOVAL

1. REMOVE CYLINDER HEAD COVER LH AND RH (See page EM–14)

(a) Remove the air cleaner inlet and V–bank cover.
(b) Remove the air cleaner assembly LH and RH with the air flow meter.
(c) Remove the emission control valve set.
(d) Remove the throttle body assembly LH and RH.
(e) Remove the intake air surge tank LH and RH with the intake air connector.
(f) Remove the 2 ignition coil with the high–tension codes.
(g) Disconnect the engine wire.

2. REMOVE INTAKE MANIFOLD WITH FUEL INJECTOR

(a) Disconnect the fuel return hose and fuel tube.
(b) Remove the 4 nuts and 10 bolts.
(c) Remove the intake manifold with fuel injector and 2 gaskets.

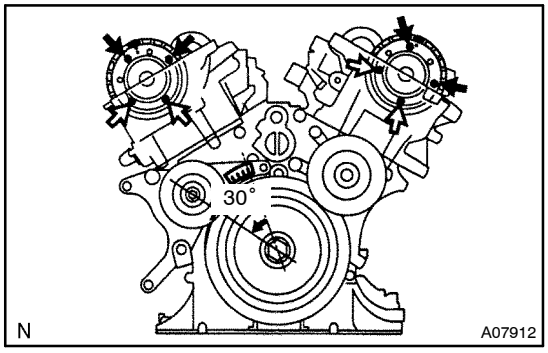
3. DISCONNECT EXHAUST MANIFOLD LH AND RH FROM EXHAUST PIPE

Remove the 4 bolts, 2 catalytic converter supports and 2 gaskets.

4. REMOVE WATER PUMP ASSEMBLY AND WATER BY–PASS JOINT FR

(a) Disconnect the 3 hoses, and remove the 3 nuts and 2 bolts.
(b) Remove the water pump assembly and 2 O–rings.
(c) Remove the 2 bolts, water by–pass joint FR and gasket.

5. REMOVE PS VANE PUMP ASSEMBLY



6. REMOVE CAMSHAFT TIMING GEAR SET BOLTS

Revolve the crank and remove the 4 set bolts indicated by the arrow.

7. SET NO.1 BTDC CYLINDER AT 30°

Revolve the crankshaft and set cylinder No.1 at 30°before the top dead center of compression.

8. REMOVE CHAIN TENSIONER NO.1

Remove 4 nuts and remove 2 tensioner No.1 and the gaskets.

9. DISCONNECT CAMSHAFT TIMING GEAR

Disconnect the timing gear from the camshaft.

NOTICE:

After disconnecting the timing gear, don't revolve the crankshaft in any case.

HINT:

This work is conducted to revolve only the camshaft when removing the camshaft bearing cap.

10. REMOVE CAMSHAFT OIL FEED PIPE

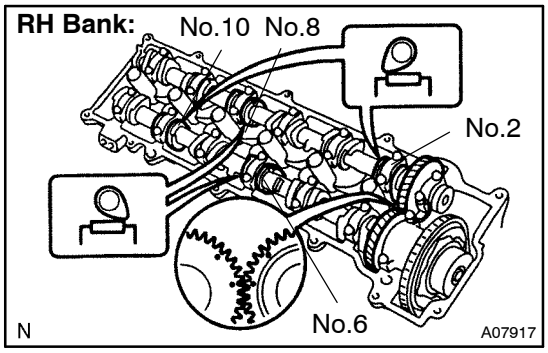
11. REMOVE CAMSHAFT BEARING CAP (RH bank intake side)

NOTICE:

The camshaft thrust clearance is small, accordingly, remove the camshaft bearing cap while keeping the camshaft level. If not, excessive force will apply to the thrust portion, thereby causing burrs to the thrust portion of the cylinder head journal. Be sure to perform the work in accordance with the following procedure.

(a) Remove bearing cap No.1.

(b) Revolve the camshaft clockwise so that the cam noses of cylinders No.6 and No.10 of camshaft No.2 may face as shown in the illustration by using the hexagon portion for service of the camshaft.



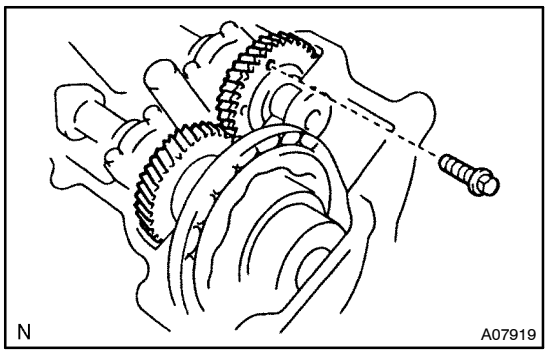
HINT:

This work is intended to keep the camshaft level by making the amount of lift displacement of the intake valves of cylinders No.6 and No.10 the same, and the push–up force from valve clearance uniform at both ends of the camshaft.

(c) Fix camshaft No.2 by using the hexagon portion for service of the camshaft and revolve the camshaft clockwise (forward crank revolution). At that time, check that the cam hoses of cylinders No.2 and No.8 of the camshaft face as shown in the illustration.

HINT:

- When camshaft No.2 is fixed, the camshaft can revolve freely in the range of about 30°.
- This work is intended to keep the camshaft level by making the amount of lift displacement of the intake valves of cylinders No.2 and No.8 the same, and the push–up force from valve clearance uniform at both ends of the camshaft.

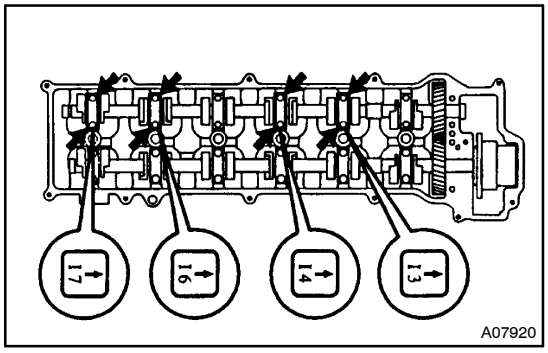


(d) Install the bolt (M6, pitch 1.0) in the bolt hole for fixing the sub–gear.

Torque: 5.5 N·m (55 kgf·cm, 48 in.·lbf)

HINT:

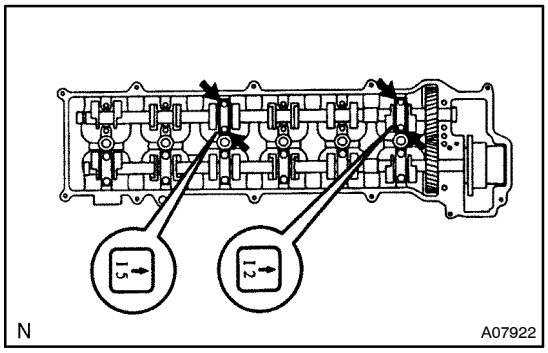
This work is intended to reduce the effect of the spring force which will act on the sub–gear.



(e) Remove camshaft bearing caps No.3, No.4, No.6 and No.7.

NOTICE:

To avoid confusing the RH bearing cap with the LH bearing cap, mark them with paint

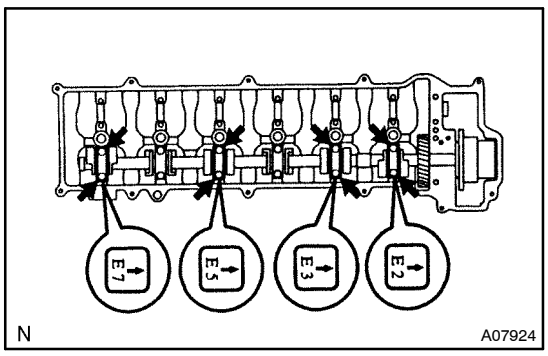


(f) Loosen camshaft bearing caps No.2 and No.5 equally and then remove them.

NOTICE:

- **Check that camshaft No.1 is lifted horizontally as the bolts of the bearing caps in journal portions No.2 and No.5 are loosened.**
- **Don't apply excessive force to the camshaft with a tool.**
- **Don't damage the thrust receiving portion on the cylinder head side.**

12. REMOVE CAMSHAFT

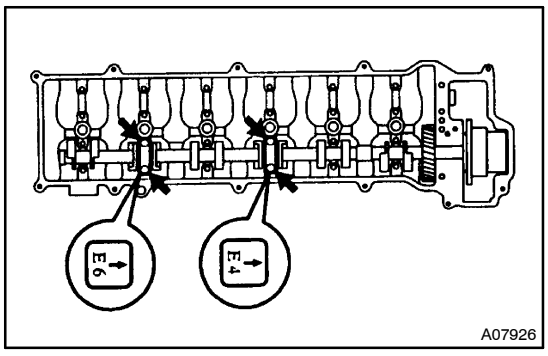


13. REMOVE CAMSHAFT BEARING CAPS (RH bank exhaust side)

(a) Remove camshaft bearing caps No.2, No.3, No.5 and No.7.

NOTICE:

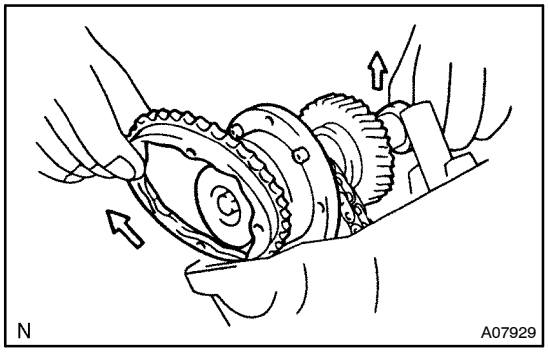
To avoid confusing the RH bearing cap with the LH bearing cap, mark them with paint.



(b) Loosen bearing caps No.4 and No.4 equally and remove them.

NOTICE:

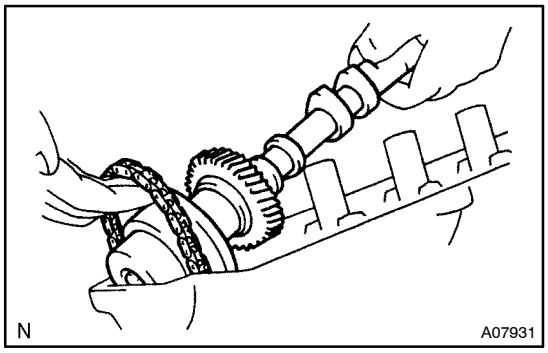
- **Check that camshaft No.1 is lifted horizontally as the bearing cap bolts of journal portions No.4 and No.6 are loosened.**
- **Don't apply excessive force to the camshaft with a tool.**
- **Don't damage the thrust receiving portion on the cylinder head side.**



14. REMOVE CAMSHAFT TIMING GEAR

Remove the timing chain from the timing gear and make the front portion of the camshaft float slightly.

Remove the timing gear.



15. REMOVE CAMSHAFT NO.2

Make the chain float slightly and remove camshaft No.2.

16. REMOVE CAMSHAFT BEARING CAPS (LH bank intake side)

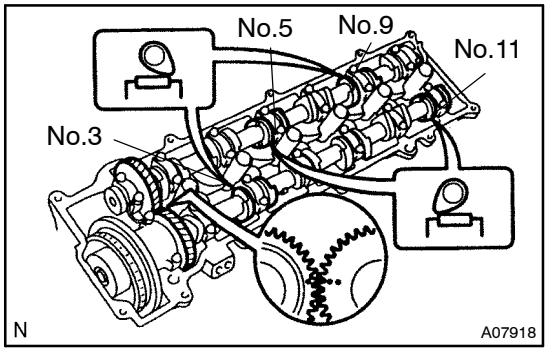
NOTICE:

The camshaft thrust clearance is small.

Accordingly, remove the camshaft bearing cap while keeping the camshaft level. If not, excessive force will be applied to the thrust portion, thereby causing burrs to the thrust portion of the cylinder head journal. Be sure to perform the work in accordance with the following procedure.

(a) Remove bearing cap No.1.

(b) Revolve the camshaft clockwise by using the hexagon portion for service of the camshaft so that the cam noses of cylinders No.3 and No.11 of camshaft No.2 may face as shown in the illustration.



HINT:

This work is intended to keep the camshaft level by making the amount of lift displacement of the intake valves of cylinders No.3 and No.11 the same, and the push–up force from valve clearance uniform at both ends of the camshaft.

(c) Fix camshaft No.2 by using the hexagon portion for service of the camshaft and revolve the camshaft clockwise (forward crank revolution). At that time, check the cam hoses of cylinders No.5 and No.9 of camshaft No.3 face as shown in the illustration.

HINT:

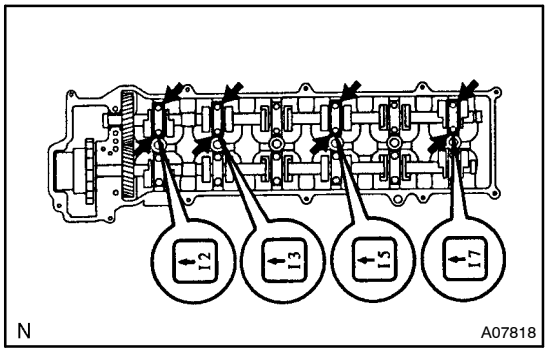
- When camshaft No.2 is fixed, camshaft No.3 can revolve freely in the range of about 30°.
- This work is intended to keep the camshaft level by making the amount of lift displacement of the intake valves of cylinders No.5 and No.9 the same, and the push–up force from valve clearance uniform at both ends of the camshaft.

(d) Install the bolt (M6, pitch 1.0) in the bolt hole for fixing the sub–gear.

Torque: 5.5 N·m (55 kgf·cm, 48 in.·lbf)

HINT:

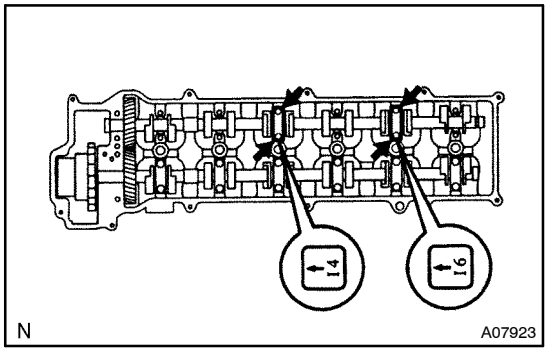
This work is intended to reduce the effect of the spring force which will act on the sub–gear.



(e) Remove camshaft bearing caps No.2, No.3, No.5 and No.7.

NOTICE:

To avoid confusing the RH bearing cap with the LH bearing cap, mark them with paint.



(f) Loosen camshaft bearing caps No.4 and No.6 equally and remove them.

NOTICE:

- **Check that camshaft No.1 is lifted horizontally as the bearing cap bolts of journal portions No.4 and No.6 are loosened.**
- **Don't apply excessive force to the camshaft with a tool.**
- **Don't damage the thrust receiving portion on the cylinder head side.**

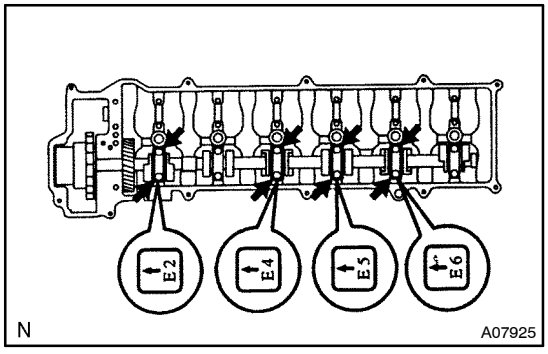
17. REMOVE CAMSHAFT NO.3

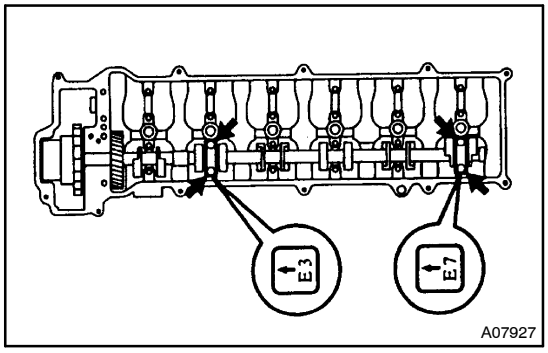
18. REMOVE CAMSHAFT BEARING CAPS (LH bank exhaust side)

(a) Remove camshaft bearing caps No.2, No.4, No.5 and No.6.

NOTICE:

To avoid confusing the RH bearing cap with the LH bearing cap, mark them with paint.





(b) Loosen bearing caps No.3 and No.7 equally and remove them.

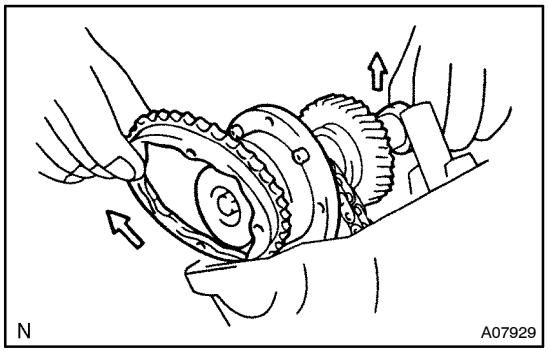
NOTICE:

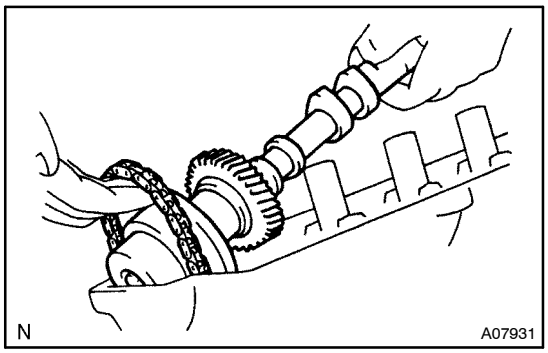
- **Check that camshaft No.1 is lifted equally as the bearing cap bolts of journal portions No.3 and No.7 are loosened.**
- **Don't apply excessive force to the camshaft with a tool.**
- **Don't damage the thrust receiving side on the cylinder head side.**

19. REMOVE CAMSHAFT TIMING GEAR

Remove the timing chain from the timing gear and make the front portion of the camshaft float slightly.

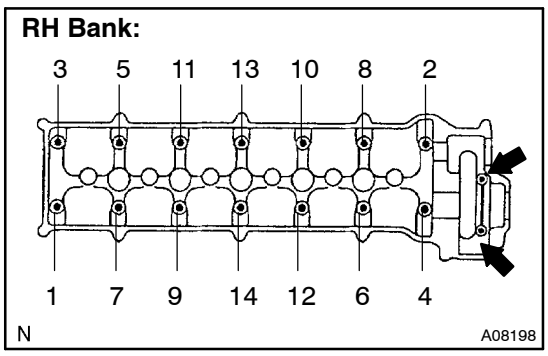
Remove the timing gear.





20. REMOVE CAMSHAFT NO.2

Make the chain float slightly and remove the camshaft No.2.



21. REMOVE CYLINDER HEAD LH AND RH

(a) Remove the 4 bolts indicated by the arrow.

(b) Loosen the bolts in the order shown in the illustration 2 or 3 times with a socket wrench (12 mm, 12 square) and remove the bolts and washers.

NOTICE:

When pulling out the bolts, be careful not to drop them into the cylinder head.

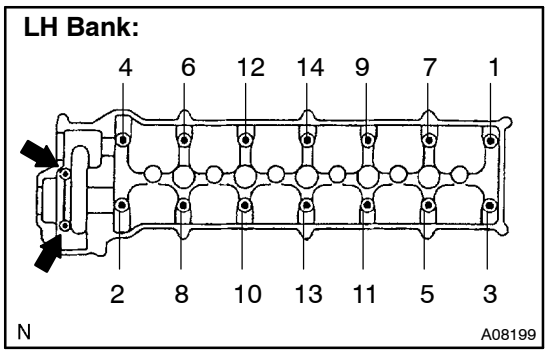
(c) Remove the cylinder head RH with manifold.

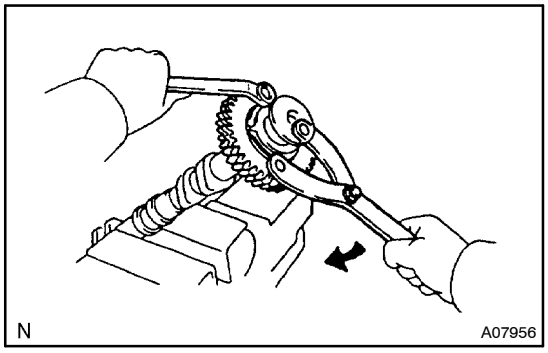
22. REMOVE 2 CYLINDER HEAD GASKETS

23. REMOVE 2 EXHAUST MANIFOLDS

(a) Remove the 8 bolts and 2 heat insulators.

(b) Remove the 24 nuts and 2 manifolds.





24. REMOVE CAMSHAFT SUB–GEAR

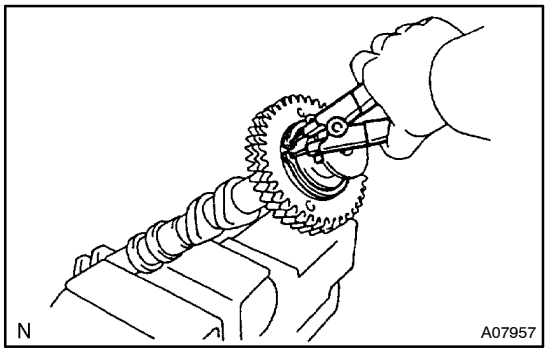
(a) Mount the hexagon point of the camshaft in a vise.

NOTICE:

Be careful not to damage the camshaft.

(b) Using SST, turn the sub–gear clockwise, and remove the service bolt.

SST 09960–10010 (09962–01000, 09963–00500)



(c) Using snap ring pliers, remove snap ring.

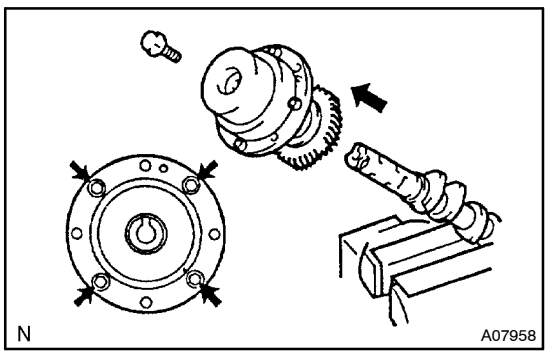
(d) Remove the wave washer, sub–gear and camshaft gear spring.

25. REMOVE CAMSHAFT GEAR ASSEMBLY

(a) Mount the hexagon point of the camshaft in a vise.

NOTICE:

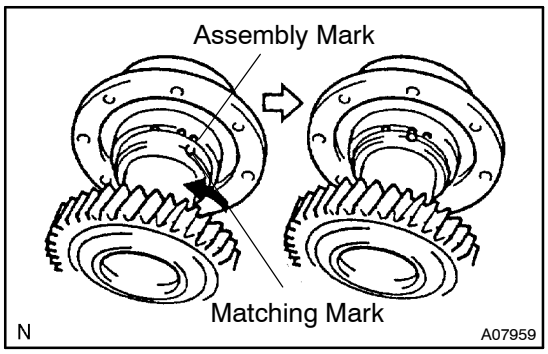
Be careful not to damage the camshaft.



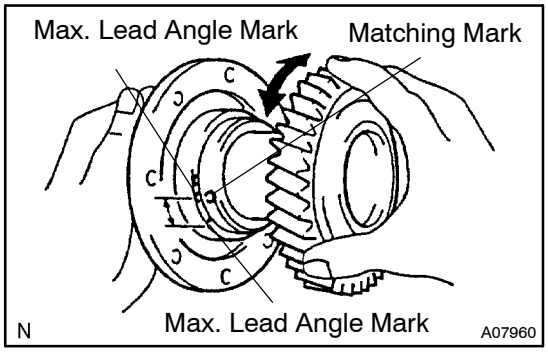
(b) Remove the bolt and remove the camshaft gear assembly.

NOTICE:

- **When removing the timing gear assembly, take care not to cause the camshaft drive tube to slip off.**
- **Don't loosen the bolts indicated by the arrow in the illustration in any case.**



(c) If the camshaft drive tube slips out, align the matching mark of the drive mark with the assembly mark of the cam shaft timing gear cover and thrust it in by turning the drive tube counterclockwise.



(d) Fix the timing gear cover and turn the drive tube clockwise completely by hand. At that time, check that the matching mark of the drive tube aligns with the maximum lag angle mark.

(e) Fix the timing gear cover and turn the drive tube counter-clockwise completely by hand. At that time, check that the matching mark of the drive tube exceeds the maximum lead angle mark.

(f) Fix the timing gear cover and turn the drive gear by hand. At that time, check that the drive gear can move smoothly.

26. REMOVE 2 OIL CONTROL VALVE FILTERS