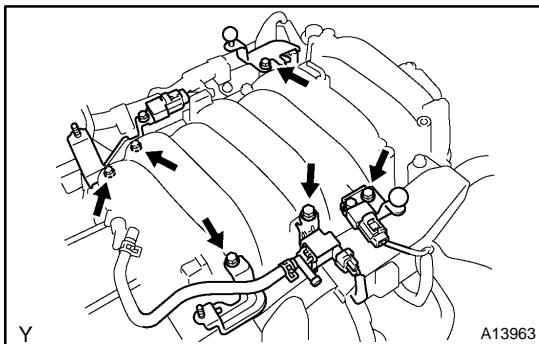
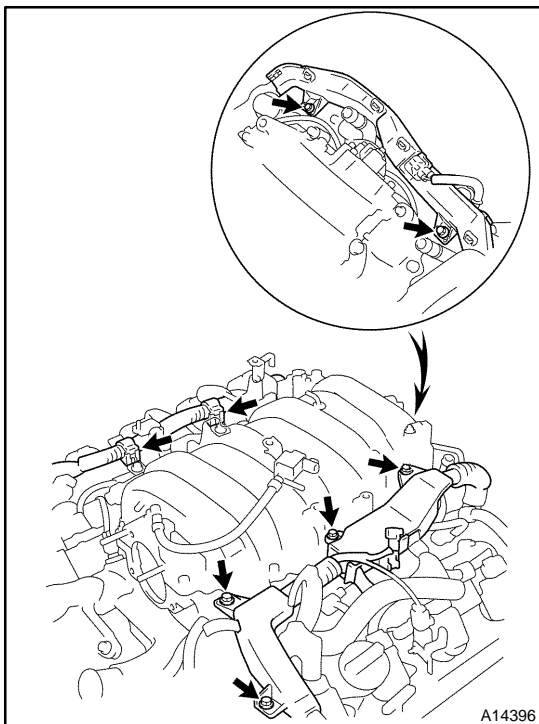


REMOVAL

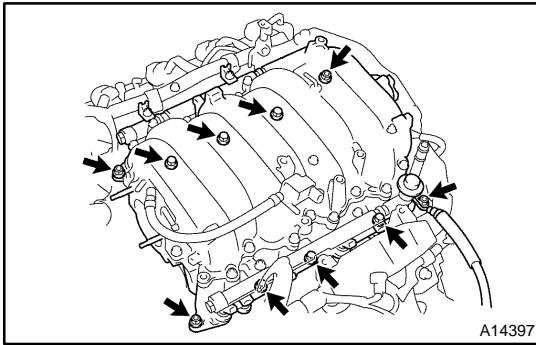
1. REMOVE ENGINE UNDER COVER
 2. DRAIN ENGINE COOLANT
 3. REMOVE V-BANK COVER
 4. REMOVE AIR CLEANER ASSEMBLY
 5. REMOVE INTAKE AIR CONNECTOR PIPE
 6. REMOVE RADIATOR ASSEMBLY (See page [CO-19](#))
 7. REMOVE THROTTLE BODY (See page [SF-37](#))
 8. REMOVE UPPER AND LOWER INTAKE MANIFOLDS ASSEMBLY
- (a) Disconnect the fuel inlet hose (rear fuel pipe) from the fuel main tube.



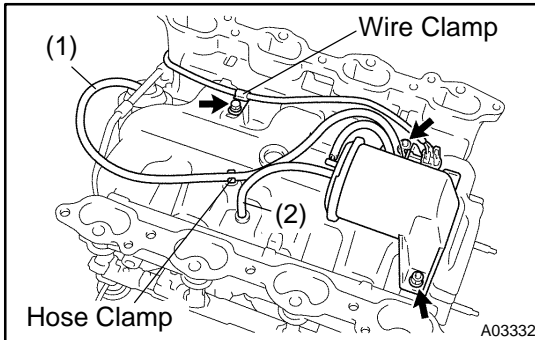
- (b) Remove and disconnect these parts:
- (1) Disconnect the VSV connector for EVAP.
 - (2) Disconnect the EVAP hose from the VSV for EVAP.
 - (3) Disconnect the VSV for EVAP from the upper intake manifold.
 - (4) Remove the No. 1 V-bank cover bracket.
 - (5) Remove the No. 2 V-bank cover bracket.
 - (6) Remove the No. 3 V-bank cover bracket.
 - (7) Remove the No. 4 V-bank cover bracket.



- (c) Remove the 4 bolts, and disconnect the engine wire protector (LH side) from upper intake manifold and camshaft bearing cap.
- (d) Disconnect the 2 wire clamps on the engine wire (RH side) from the brackets on the RH delivery pipe.
- (e) Remove the 2 bolts, and disconnect the engine wire protector (rear side) from the rear water bypass joint and RH cylinder head.
- (f) Disconnect the VSV connector for ACIS.
- (g) Disconnect the 8 injector connectors.

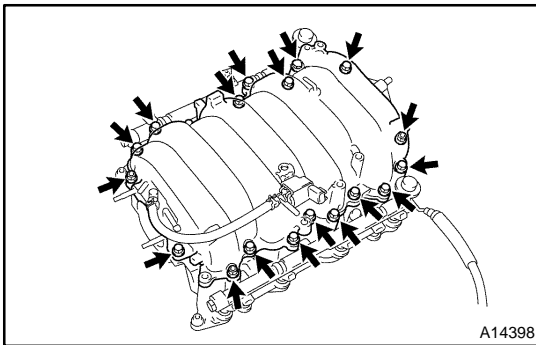


- (h) Remove the 6 bolts, 4 nuts, the upper, lower intake manifold assembly and 2 gaskets.

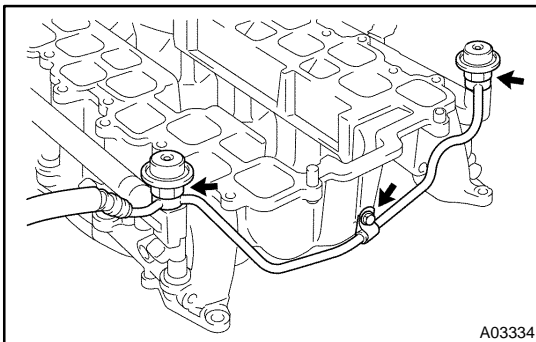


9. DISASSEMBLE UPPER AND LOWER INTAKE MANIFOLDS

- (a) Disconnect these vacuum hoses:
 - (1) Vacuum hose (from VSV for ACIS) from air control valve actuator
 - (2) Vacuum hose (from vacuum tank) from lower intake manifold
- (b) Disconnect the vacuum hose (VSV for ACIS to air control valve actuator) from the hose clamp.
- (c) Remove the bolt, and disconnect the wire clamp from the lower intake manifold.
- (d) Remove the 2 nuts, the vacuum tank and VSV assembly for the ACIS.
- (e) Remove the 3 nuts, air control valve actuator and gasket.



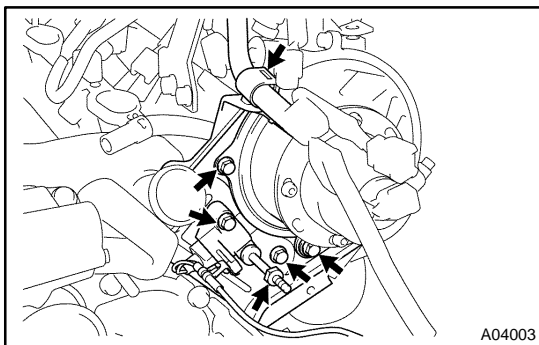
- (f) Remove the 15 bolts, 5 nuts, upper intake manifold and gasket.
- (g) Remove the 6 bolts and air control valve from the upper intake manifold.
- (h) Disconnect the EVAP hose from the upper intake manifold, and remove the VSV for EVAP.



- (i) Remove the fuel pressure pulsation damper and 2 gaskets. Remove the 2 pulsation dampers.
- (j) Remove the bolt and rear fuel pipe.
- (k) Remove the 2 delivery pipes and 8 injectors.
(See page [SF-22](#))

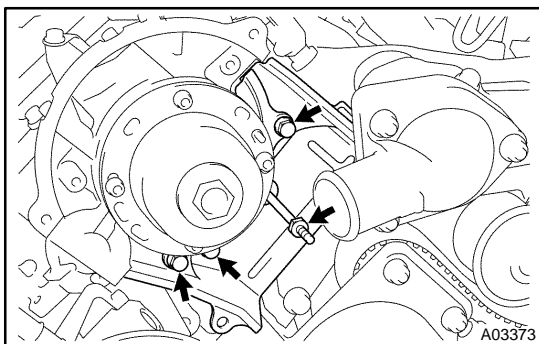
10. DISCONNECT TIMING BELT FROM CAMSHAFT TIMING PULLEYS (See page [EM-15](#))

11. REMOVE CAMSHAFT TIMING PULLEYS (See page [EM-15](#))



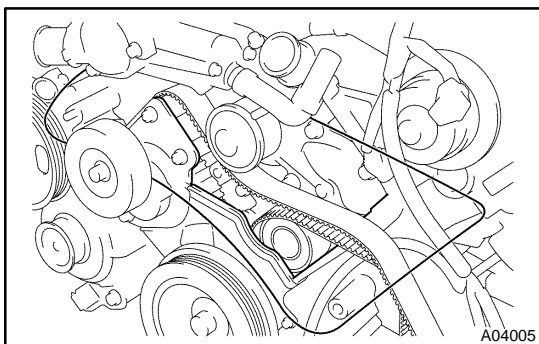
12. REMOVE CAMSHAFT POSITION SENSOR AND LH TIMING BELT REAR PLATES

- Remove the stud bolt, bolt and camshaft position sensor.
- Remove the 2 bolt, No.1 and No.2 rear plate.



13. REMOVE RH TIMING BELT REAR PLATES

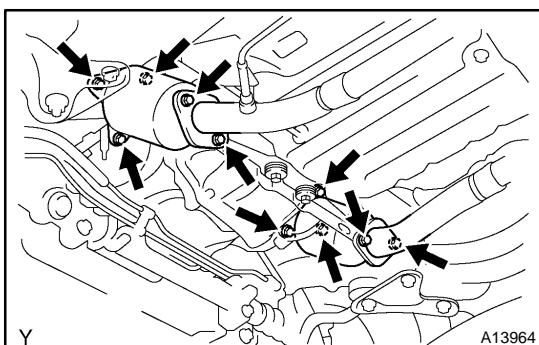
Remove the stud bolt, 3 bolts, No.1 and No.2 rear plates.



NOTICE:

- Be careful not to drop anything inside the timing belt cover.
- Do not allow the belt to come into contact with oil, water or dust.

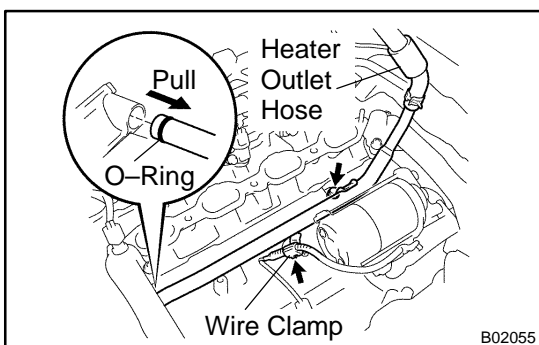
14. DISCONNECT PS PUMP FROM ENGINE (See page [EM-80](#))



15. REMOVE TWC

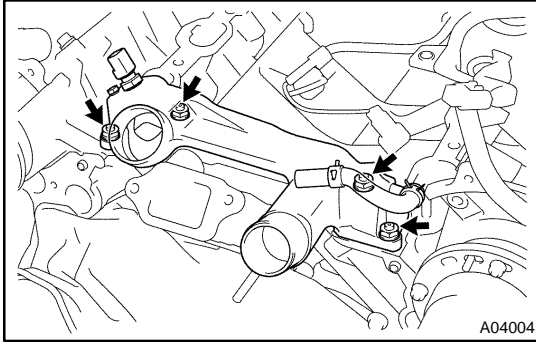
- Remove the 4 bolts and 4 nuts holding the front exhaust pipe to the TWC.
- Disconnect the front exhaust pipe from the 2 TWC, and remove the 2 gaskets.
- Remove the 3 nuts, TWC and gasket. Remove the 2 TWC.

16. DISCONNECT WATER INLET AND INLET HOUSING ASSEMBLY (See page [CO-6](#))

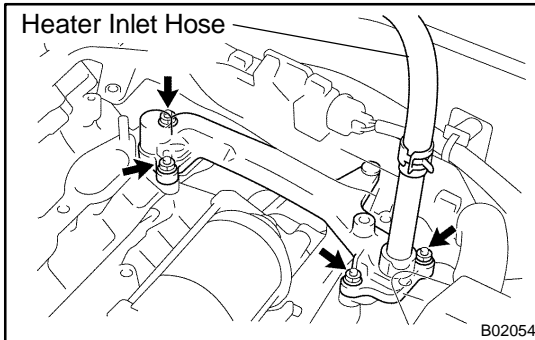


17. REMOVE WATER BYPASS PIPE

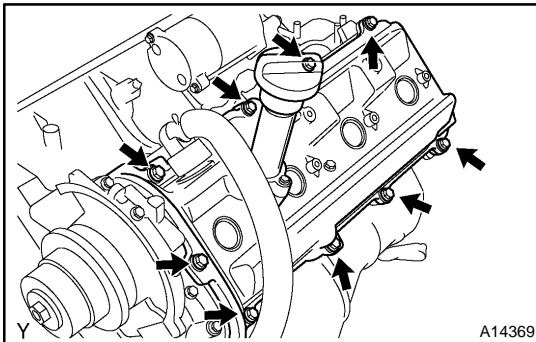
- Disconnect the heater outlet hose from the water bypass pipe.
- Disconnect the wire clamp (for knock sensor 1, 2) from bracket of the water bypass pipe.
- Remove the bolt.
- Pull out the water bypass pipe from the water pump.
- Remove the O-ring from the water bypass pipe.

**18. REMOVE FRONT WATER BYPASS JOINT**

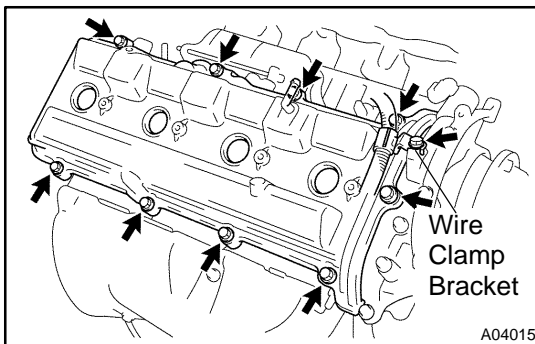
- (a) Disconnect the water temperature sensor connector.
- (b) Remove the 4 nuts, water bypass joint and 2 gaskets.

**19. REMOVE REAR WATER BYPASS JOINT**

- (a) Disconnect the heater inlet hose from the water bypass joint.
- (b) Remove the 4 nuts, water bypass joint and 2 gaskets.

20. REMOVE IGNITION COILS**21. REMOVE VVT SENSORS****22. REMOVE ENGINE HANGERS****23. REMOVE OIL DIPSTICK AND GUIDE FOR A/T****24. REMOVE OIL DIPSTICK AND GUIDE FOR ENGINE****25. REMOVE LH CYLINDER HEAD COVER**

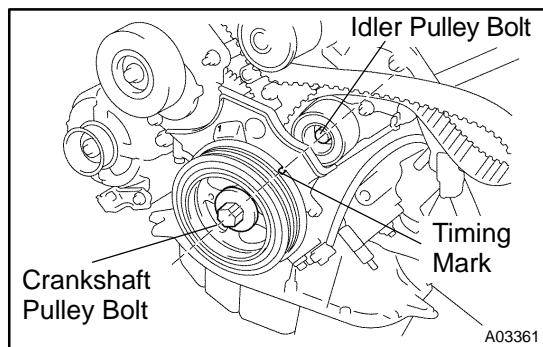
Remove the 9 bolts, 9 seal washers, cylinder head cover and gasket.

**26. REMOVE RH CYLINDER HEAD COVER**

- (a) Remove the bolt, and disconnect the wire clamp bracket on the engine wire from the camshaft bearing cap.
- (b) Remove the 9 bolts, 9 seal washers, cylinder head cover and gasket.

27. IF NECESSARY, REMOVE SEMI-CIRCULAR PLUGS AND CAMSHAFT HOUSING PLUGS**28. REMOVE CAMSHAFT TIMING OIL CONTROL VALVE****29. REMOVE CAMSHAFTS****NOTICE:**

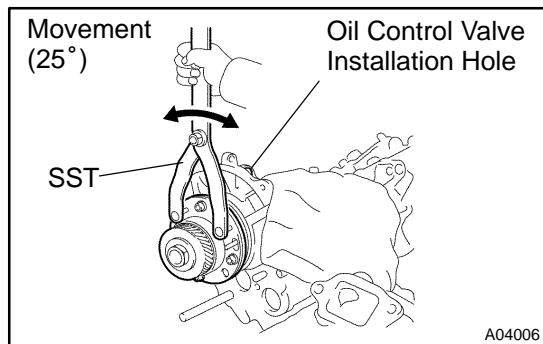
Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being removed. If the camshaft is not kept level, the portion of the cylinder head receiving the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following steps should be carried out.



- (a) Check the crankshaft pulley position.
Check that the timing mark of the crankshaft pulley is in aligned with the centers of the crankshaft pulley bolt and No.2 timing belt idler pulley bolt.

NOTICE:

Having the crankshaft pulley at the wrong angle can cause the piston head and valve head to come into contact with each other when you remove the camshaft, causing damage. So always set the crankshaft pulley at the correct angle.

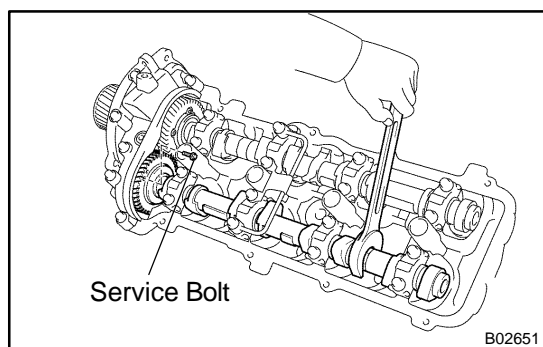


- (b) Release the oil from the front bearing caps.
Using SST, rotate the camshaft timing tube from left to right 2 to 3 times within its VVT-i range of movement (25°) and use a waste cloth to collect the oil from the camshaft timing oil control valve installation hole.

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NOTICE:

Approximately 20 cc (1.2 cu in.) of oil will be ejected, so take care not to spill it.



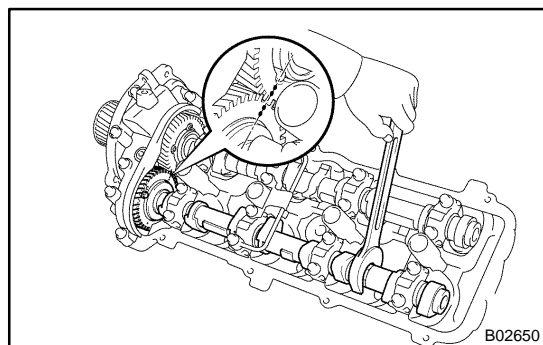
- (c) Remove the LH camshafts.
(1) Boring the service bolt hole of the sub-gear upward by turning the hexagon wrench head portion of the exhaust camshaft with a wrench.
(2) Secure the sub-gear to the main gear with a service bolt.

Recommended service bolt:

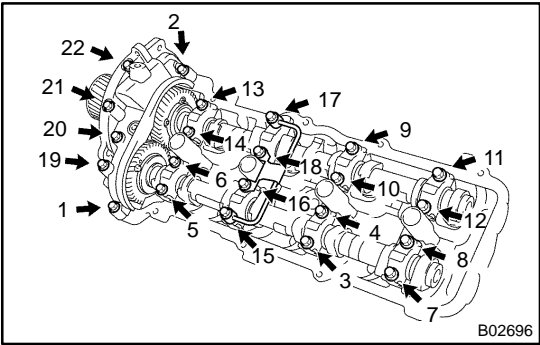
Thread diameter	6 mm
Thread pitch	1.0 mm
Bolt length	16 – 20 mm (0.63 – 0.79 in.)

HINT:

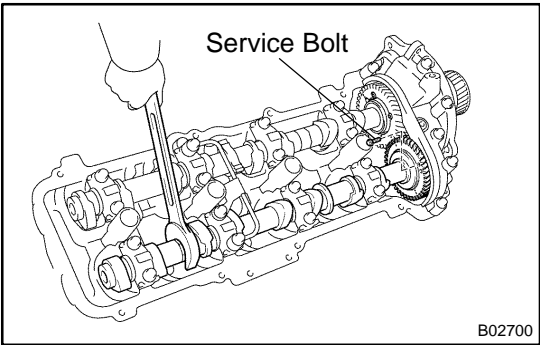
When removing the camshaft, make sure that the torsional spring force of the sub-gear has been eliminated by the above operation.



- (3) Align the timing mark (2 dot marks) of the camshaft drive gear by turning the hexagon wrench head portion of the exhaust camshaft with a wrench.



- (4) Uniformly loosen the 22 bearing cap bolts in several passes, in the sequence shown.
- (5) Remove the 22 bearing cap bolts, 4 seal washers, oil feed pipe, 9 bearing caps, camshaft housing plug, oil control valve filter and 2 camshafts.



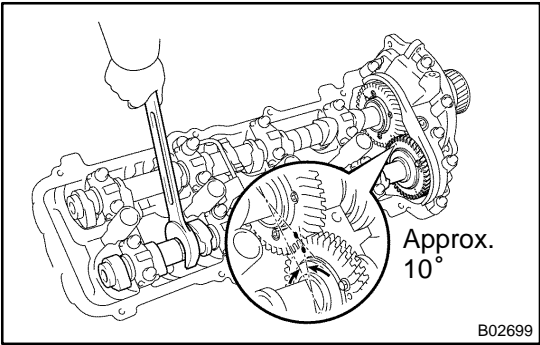
- (d) Remove the RH camshafts.
 - (1) Boring the service bolt hole of the sub-gear upward by turning the hexagon wrench head portion of the exhaust camshaft with a wrench.
 - (2) Secure the sub-gear to the main gear with a service bolt.

Recommended service bolt:

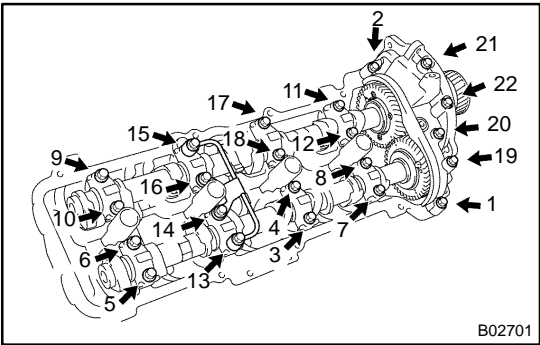
Thread diameter	6 mm
Thread pitch	1.0 mm
Bolt length	16 – 20 mm (0.63 – 0.79 in.)

HINT:

When removing the camshafts, make sure that the torsional spring force of the sub-gear has been eliminated by the above operation.



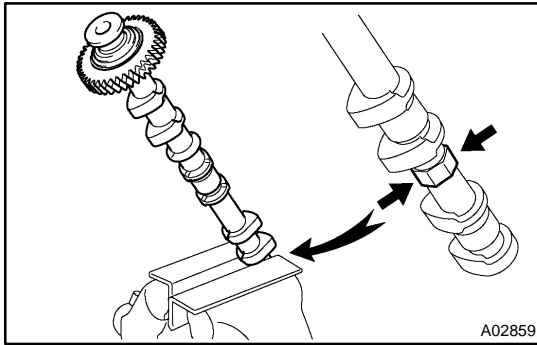
- (3) Set the timing mark (1 dot mark) of the camshaft main gear at approx. 10° angle by turning the hexagon wrench head portion of the exhaust camshaft with a wrench.



- (4) Uniformly loosen the 22 bearing cap bolts in several passes, in the sequence shown.
- (5) Remove the 22 bearing cap bolts, 4 seal washers, oil feed pipe, 9 bearing caps, camshaft housing plug, oil control valve filter and 2 camshafts.

HINT:

Arrange the bearing caps (RH and LH sides).

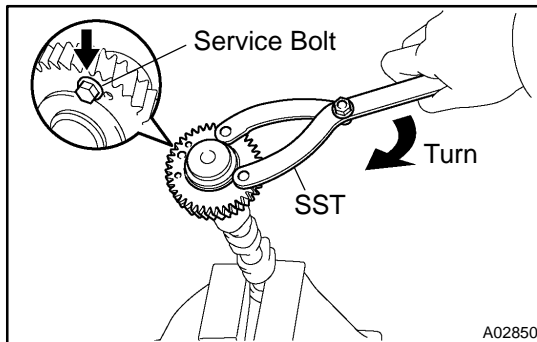


30. DISASSEMBLE EXHAUST CAMSHAFT

- (a) Mount the hexagon wrench head portion of the camshaft in a vise.

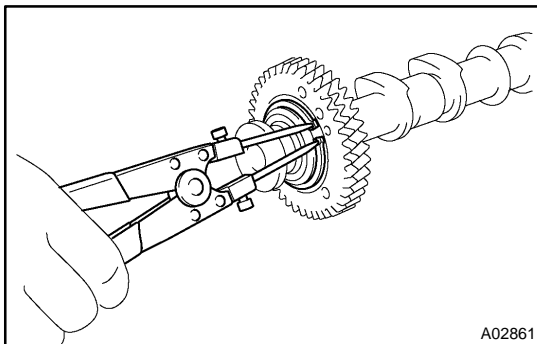
NOTICE:

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)



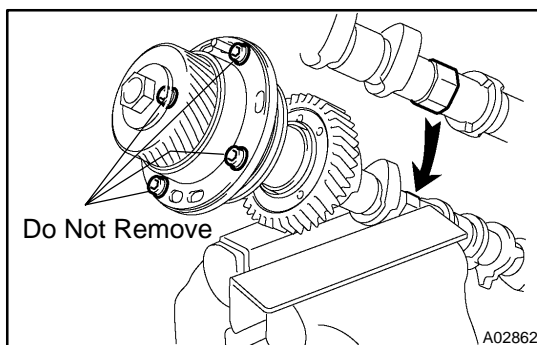
- (c) Using snap ring pliers, remove the snap ring.

- (d) Remove these parts:

- (1) Remove the wave washer.
- (2) Remove the camshaft driven sub-gear.
- (3) Remove the camshaft gear spring.

HINT:

Arrange the driven sub-gears and gear spring (RH and LH sides).

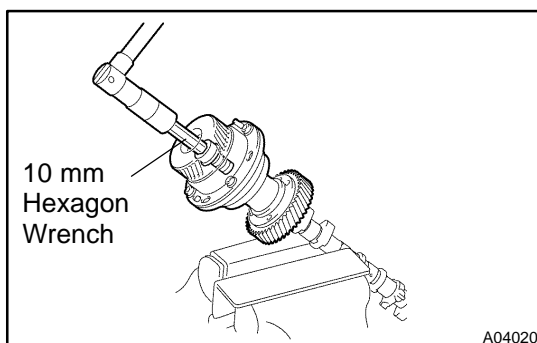


31. REMOVE CAMSHAFT TIMING TUBE FROM INTAKE CAMSHAFT

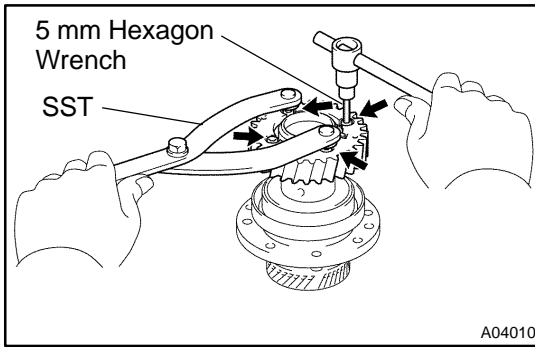
- (a) Mount the hexagon wrench head portion of the intake camshaft in a vise.

NOTICE:

- **Be careful not to damage the camshaft.**
- **The 4 bolts shown in the illustration determine the backlash of the gear in the timing tube, so do not remove them. If any of the 4 bolts are removed, install a new timing tube assembly.**



- (b) Remove the screw plug and seal washer.
- (c) Using a 10 mm hexagon wrench, and remove the bolt.
- (d) Pull out the timing tube and drive gear assembly from the camshaft.



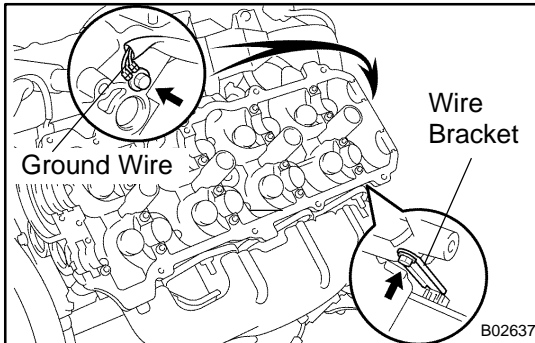
- (e) Using SST and a 5 mm hexagon wrench, and remove the 4 bolts, drive gear and oil seal.

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

NOTICE:

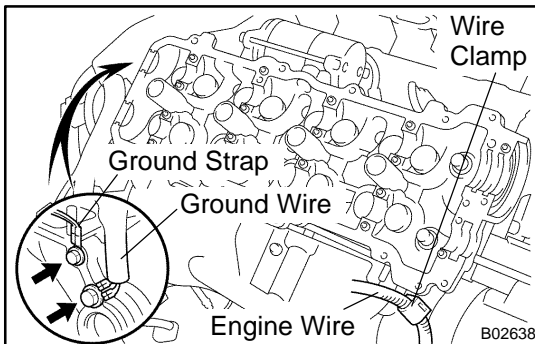
Be careful not to damage the timing tube.

32. REMOVE SPARK PLUGS

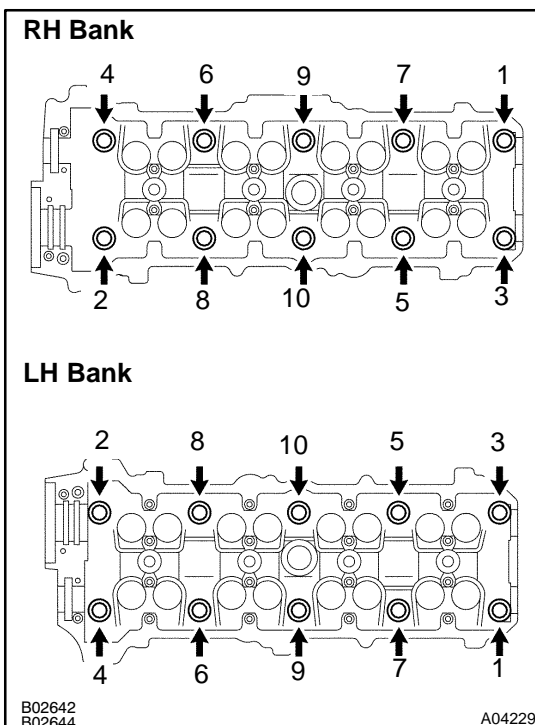


33. REMOVE CYLINDER HEAD AND EXHAUST MANIFOLD ASSEMBLIES

- (a) Disconnect the 2 heated oxygen sensor connectors.
(b) Remove the bolt, and disconnect the ground wire from the LH cylinder head.
(c) Remove the bolt, and disconnect the engine wire bracket for the heated oxygen sensor from the LH cylinder head.



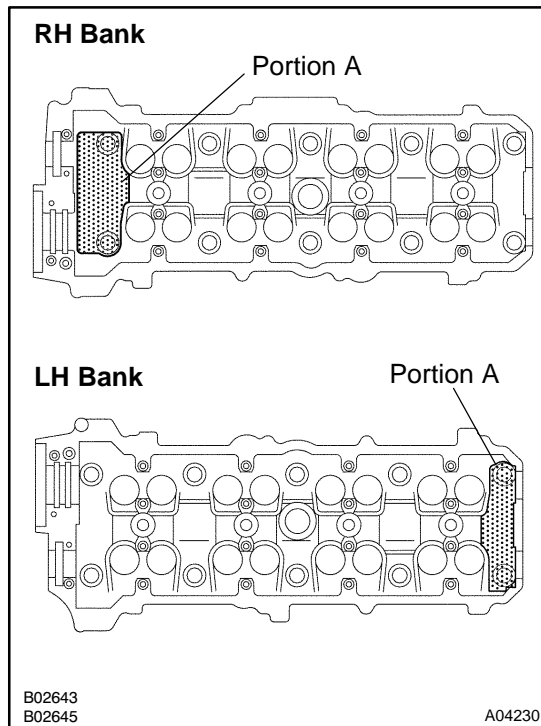
- (d) Remove the bolt, and disconnect the ground wire from the RH cylinder head.
(e) Remove the bolt, and disconnect the ground strap from the RH cylinder head.
(f) Disconnect the engine wire from the wire clamp on the RH cylinder head.



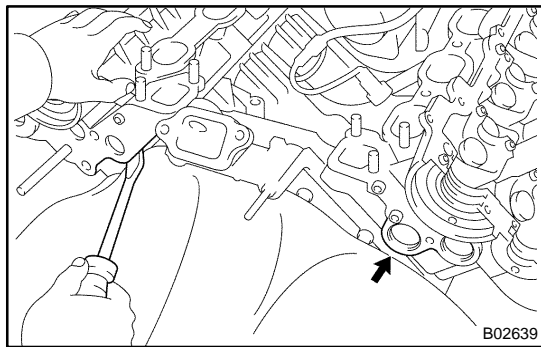
- (g) Uniformly loosen the 10 cylinder head bolts on one side of each cylinder head in several passes, in the sequence shown, then do the other side as shown. Remove the 20 cylinder head bolts and plate washers.

NOTICE:

- Cylinder head warpage or cracking could result from removing bolts in incorrect order.**



- Do not drop the plate washer for cylinder head bolt into portion A of the cylinder head. If dropped into portion A, the plate washer will pass through the cylinder head and cylinder block into the oil pan.



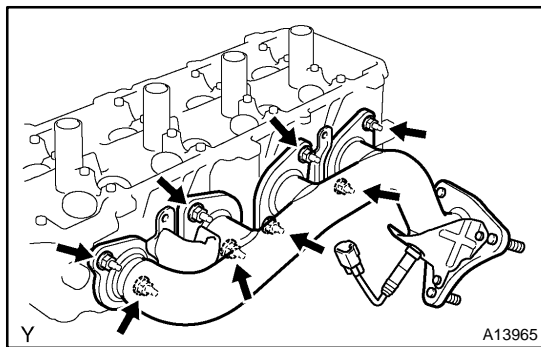
- (h) Lift the cylinder head from the dowels on the cylinder block, and place the 2 cylinder heads on wooden blocks on a bench.

HINT:

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

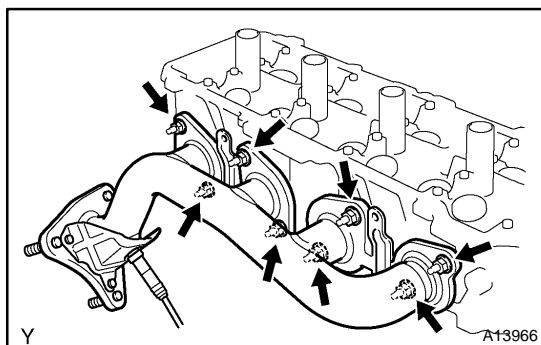
NOTICE:

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



34. REMOVE LH EXHAUST MANIFOLD FROM CYLINDER HEAD

- Remove the 4 bolts and heat insulator.
- Remove the 8 nuts, exhaust manifold and gasket.



35. REMOVE RH EXHAUST MANIFOLD FROM CYLINDER HEAD

- Remove the 4 bolts and heat insulator.
- Remove the 8 nuts, exhaust manifold and gasket.