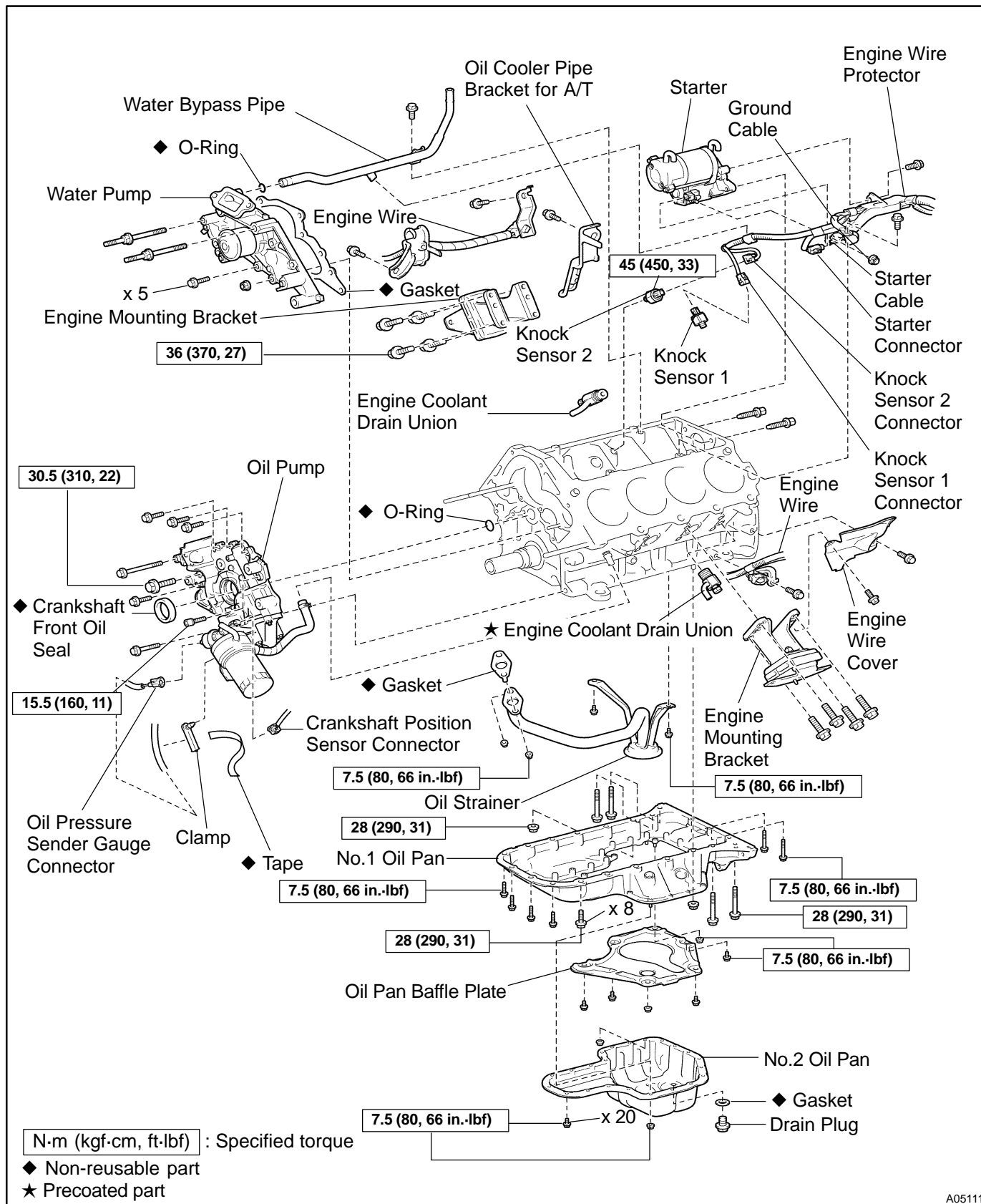
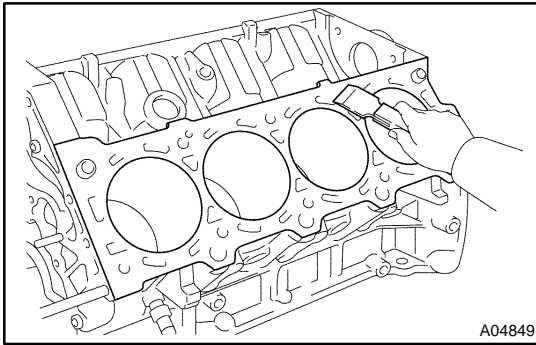


CYLINDER BLOCK COMPONENTS

EM0E9-15



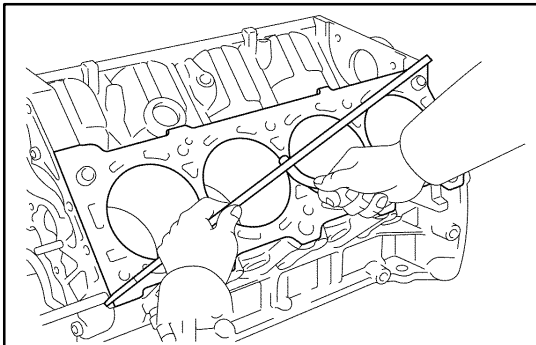
A05111



INSPECTION

1. CLEAN CYLINDER BLOCK

- (a) Using a gasket scraper, remove all the gasket material from the top surface of the cylinder block.
- (b) Using a soft brush and solvent, thoroughly clean the cylinder block.



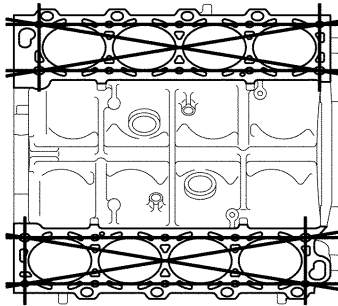
2. INSPECT CYLINDER BLOCK

- (a) Inspect for flatness.
Using a precision straight edge and a feeler gauge, measure the surfaces contacting the cylinder head and main bearing cap for a warp.

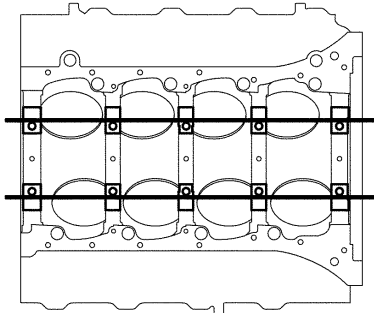
Maximum warp: 0.07 mm (0.0028 in.)

If the warp is greater than the maximum, replace the cylinder block.

Cylinder Block Side

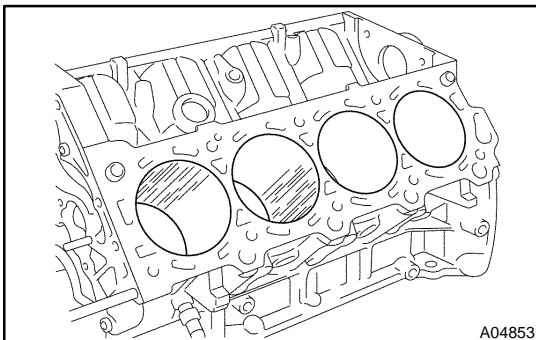


Main Bearing Cap Side

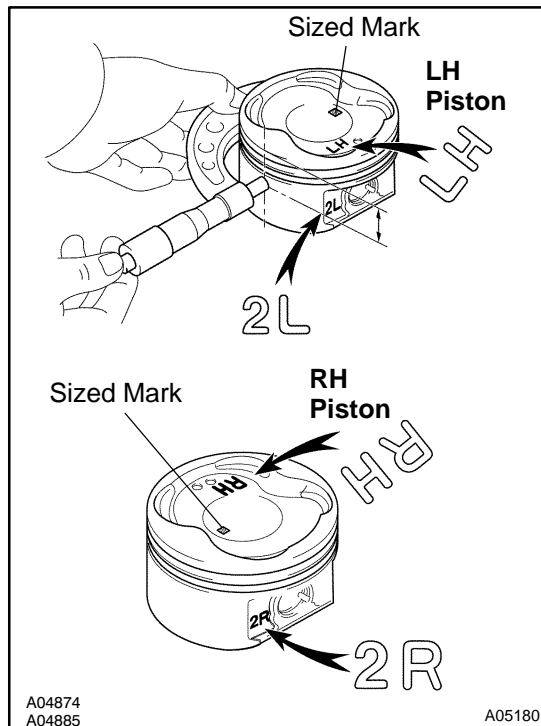


A04850
A04210
A04212

A05178



- (b) Visually check the cylinder for vertical scratches.
If deep scratches are found, rebore all the 8 cylinders and replace all the 8 pistons (See page [EM-104](#)). If necessary, replace the cylinder block.



REPLACEMENT

1. REPLACE OVERSIZED (O/S) PISTONS FOR CYLINDER BORING

HINT:

- ★ Bore all the 8 cylinders to the oversized piston outside diameter.
- ★ Replace all the piston rings with the ones to match the oversized pistons.

- (a) Keep 8 new O/S pistons.

O/S 0.50 piston diameter:

94.402 - 94.430 mm (3.7166 - 3.7177 in.)

HINT:

The shape of the piston varies for the LH and RH banks. The LH piston is marked with "LH" and "2L", the RH piston with "RH" and "2R".

- (b) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 30.75 mm (1.2106 in.) from the piston head.
- (c) Calculate the amount for each cylinder to be rebored as follows:

Size to be rebored = P + C - H

P = Piston diameter

C = Piston clearance:

0.090 - 0.111 mm (0.0035 - 0.0044 in.)

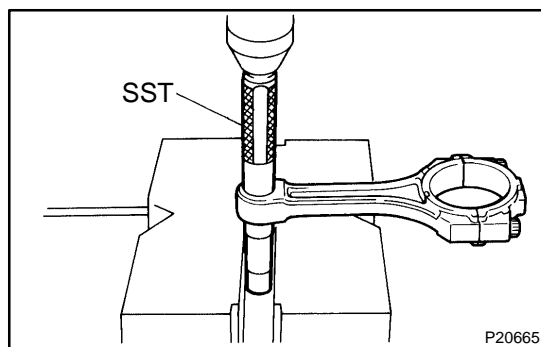
H = Allowance for honing: 0.02 mm (0.0008 in.) or less

- (d) Bore and hone the cylinders to calculated dimensions.

Maximum honing: 0.02 mm (0.0008 in.)

NOTICE:

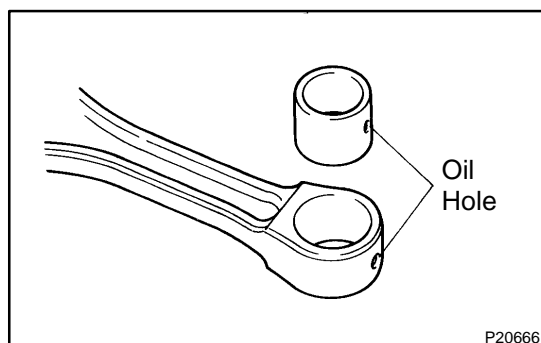
Excess honing will destroy the finished roundness.



2. REPLACE CONNECTING ROD BUSHINGS

- (a) Using SST and a press, press out the bushing.

SST 09222-30010



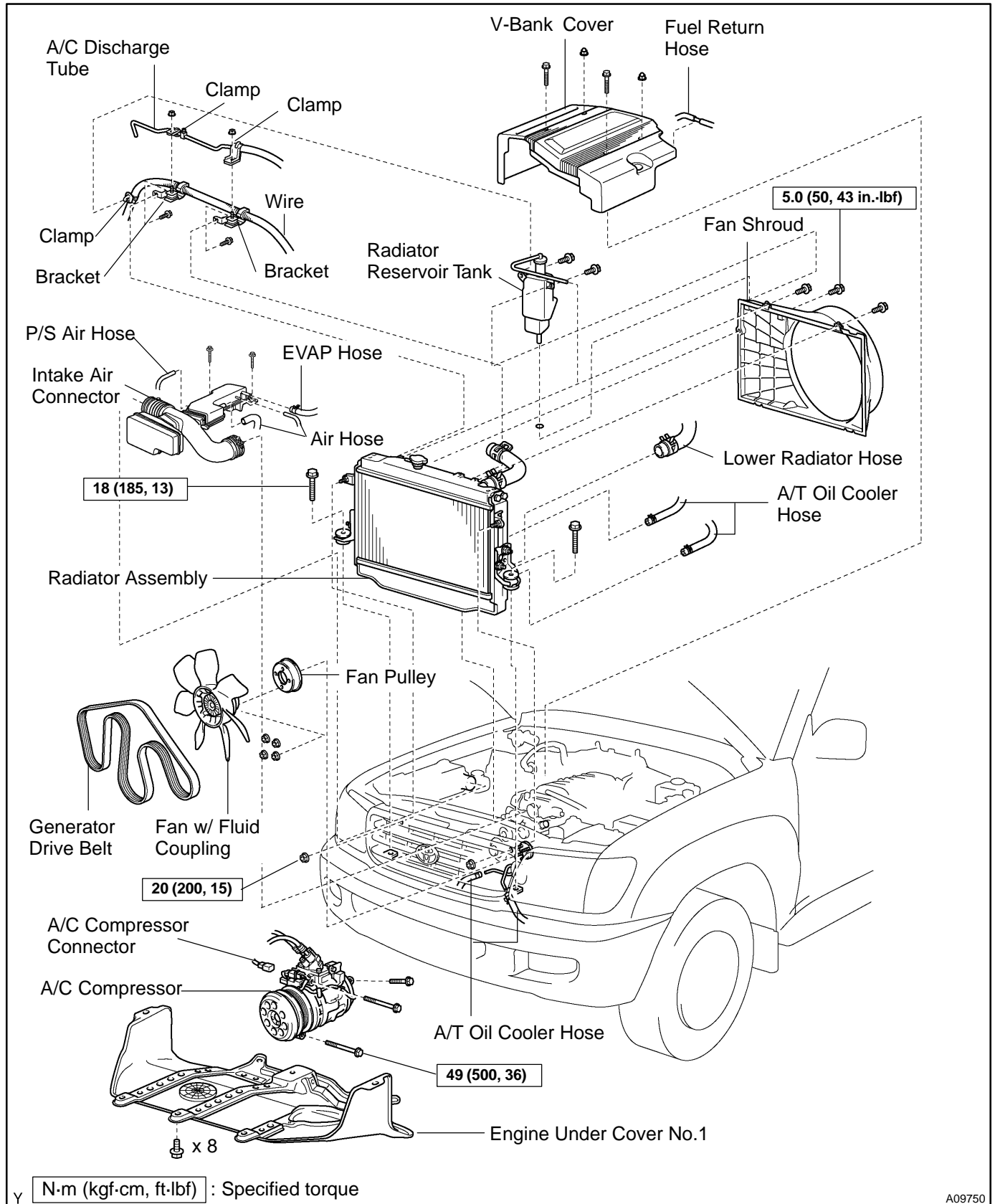
- (b) Align the oil holes of a new bushing and the connecting rod.

- (c) Using SST and a press, press in the bushing.

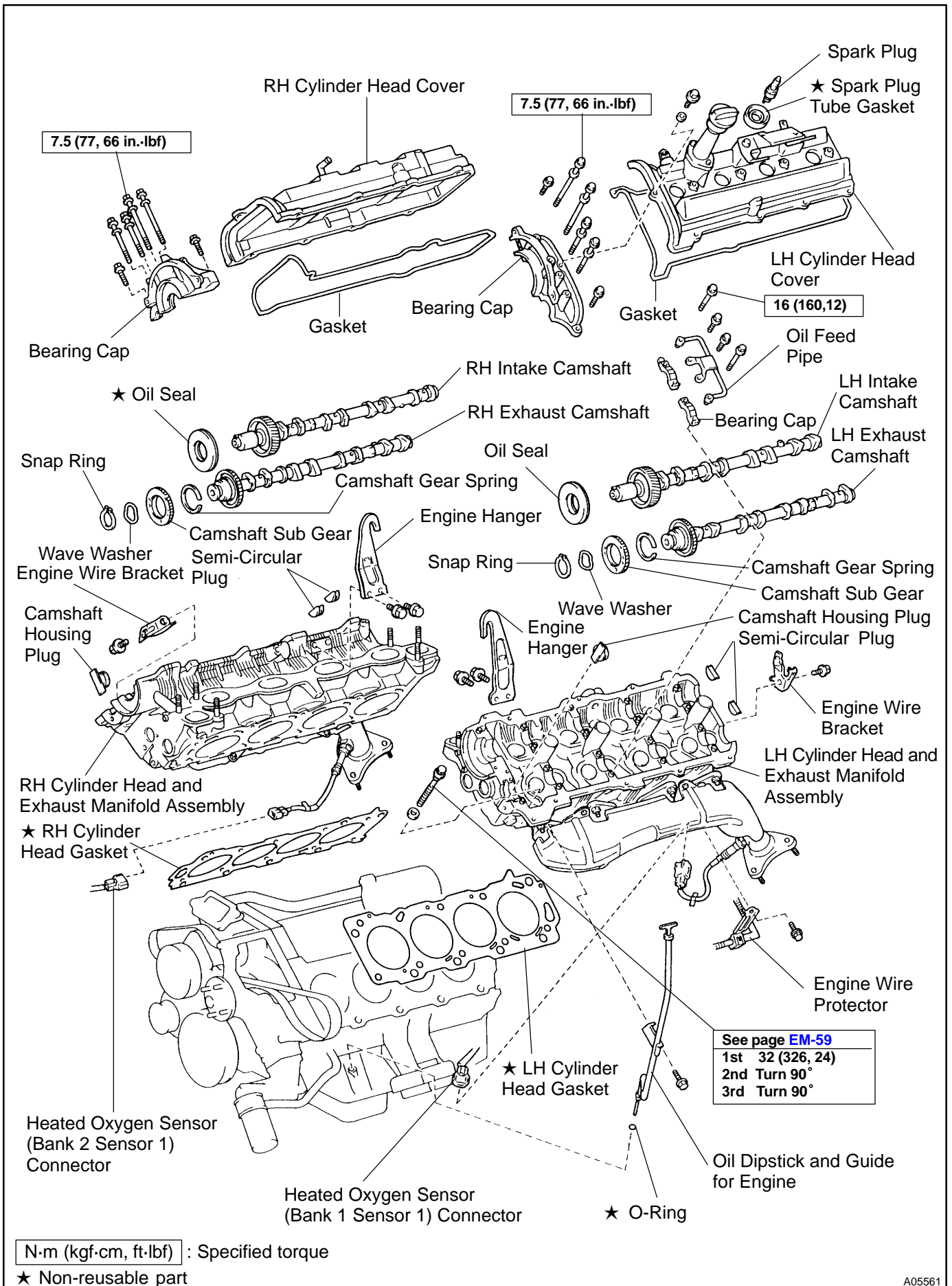
SST 09222-30010

CYLINDER HEAD COMPONENTS

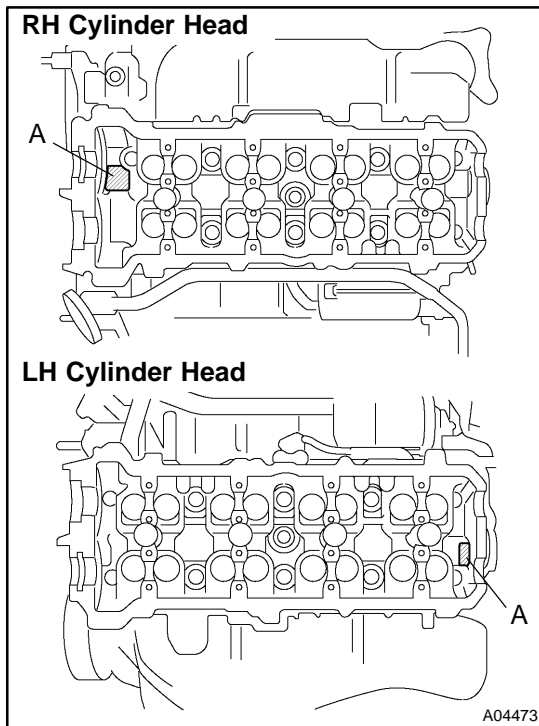
EM1V7-01



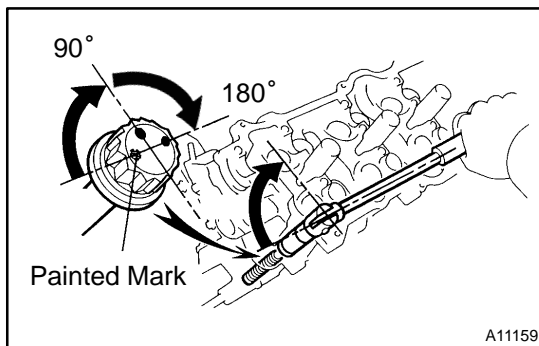
A09750



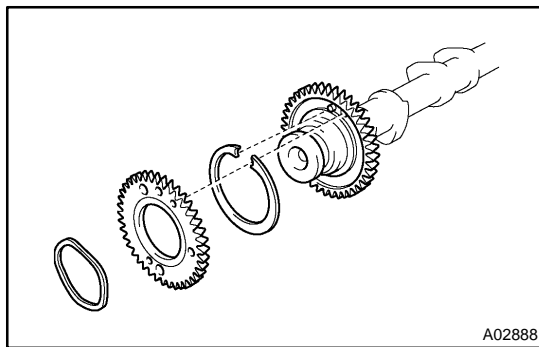
A05561

**NOTICE:**

Do not drop the plate washer of the cylinder head bolt into A area in the illustration. It will fall down to the oil pan through the cylinder head and the cylinder block.



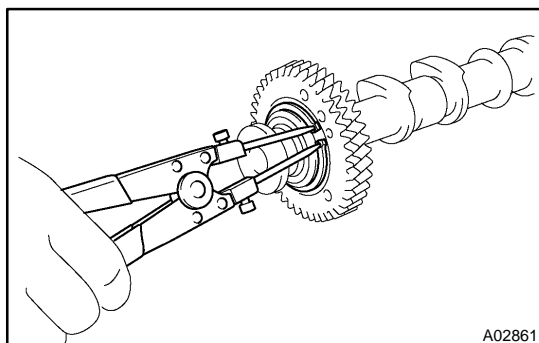
- (d) Mark the front of the cylinder head bolt head with paint.
- (e) Retighten the cylinder head bolts by 90° only for the first time.
- (f) Then retighten them by 90° further for the second time.
- (g) Check that the painted mark is now at a 180° angle to the front.

5. INSTALL SPARK PLUGS**6. ASSEMBLE EXHAUST CAMSHAFT**

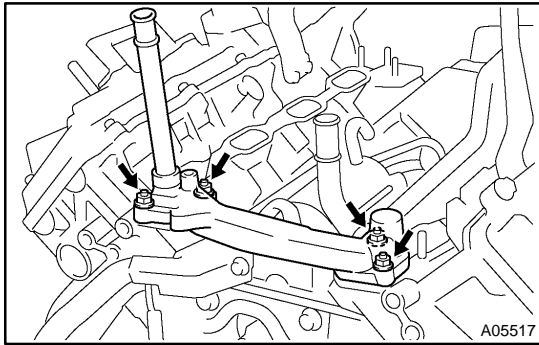
- (a) Install the camshaft gear spring, the camshaft sub-gear and the wave washer.

HINT:

Attach the pins on the gears to the gear spring ends.

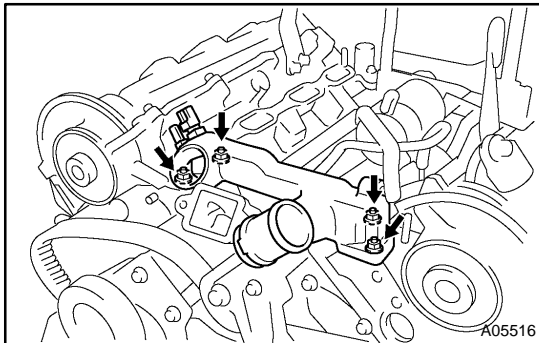


- (b) Using snap ring pliers, install the snap ring.

**14. INSTALL REAR WATER BYPASS JOINT**

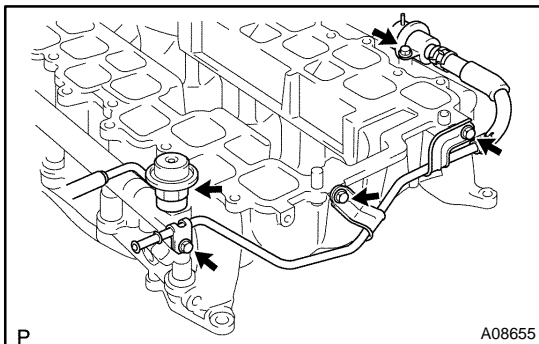
- (a) Install 2 new gaskets to the cylinder head.
- (b) Install the 4 nuts holding the water bypass joint to the cylinder heads. Alternately tighten the nuts.

Torque: 18 N·m (185 kgf-cm, 13 ft-lbf)

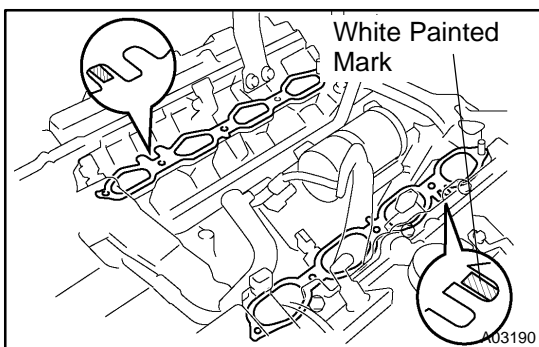
**15. INSTALL FRONT WATER BYPASS JOINT**

Install 2 new gaskets and the water bypass joint with the 4 nuts. Alternately tighten the nuts.

Torque: 18 N·m (185 kgf-cm, 13 ft-lbf)

16. INSTALL WATER INLET AND INLET HOUSING ASSEMBLY (See page CO-8)**17. ASSEMBLE UPPER AND LOWER INTAKE MANIFOLDS**

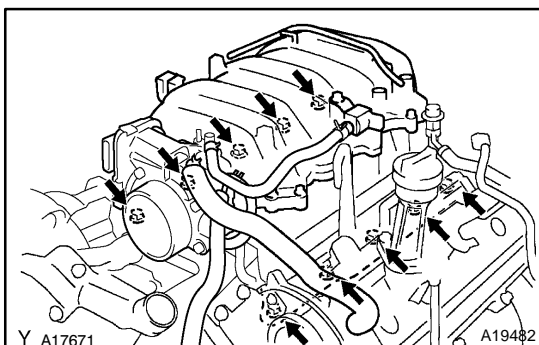
- (a) Install the 2 delivery pipes and the 8 injectors (See page SF-27).
- (b) Install new 2 gaskets, the fuel pressure regulator and the fuel pulsation damper.
- (c) Install the fuel return hose to the lower intake manifold with the 3 bolts.
- (d) Connect the fuel return hose to the fuel pressure regulator.

**18. INSTALL INTAKE MANIFOLD ASSEMBLY**

- (a) Place 2 new gaskets on the cylinder heads with white painted mark facing upward.

NOTICE:

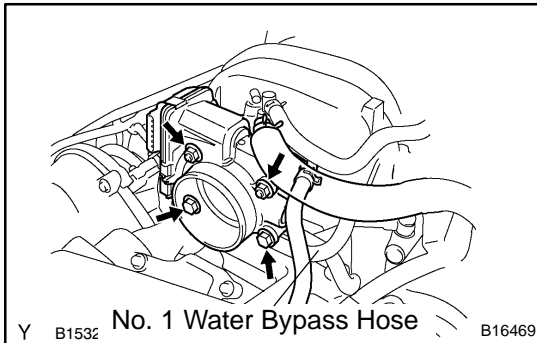
- ★ **Align the port holes of the gasket and cylinder head.**
- ★ **Be careful of the installation direction.**



- (b) Place the intake manifold assembly on the cylinder heads.
- (c) Install and uniformly tighten the 6 bolts and the 4 nuts in several passes.

Torque: 18 N·m (185 kgf-cm, 13 ft-lbf)

- (r) Connect the PS air hose to intake manifold.



- (s) Connect the No.1 water bypass hose (from water inlet housing) to throttle body.
- (t) Connect the throttle control connector.
- (u) Connect the VSV connector for EVAP.
- (v) Connect the 8 injector connectors.
- (w) Connect the ECT sensor.
- (x) Connect the water sender gauge.
- (y) Connect the 8 ignition coil connectors.
- (z) Connect the 2 oxygen sensor connectors.

19. CONNECT FUEL INLET HOSE (See page [SF-24](#))

20. INSTALL TIMING BELT REAR PLATES

- (a) Install the RH timing belt rear plates.
Install the No.1 timing belt rear plate to the cylinder head with the 3 bolts and the stud bolt.
- Torque: 7.5 N·m (80 kgf·cm, 66 in.-lbf)**
- (b) Install the LH timing belt rear plates.
- (1) Connect the wire clamp to the No.1 timing belt rear plate.
- (2) Install the No.1 timing belt rear plate to the cylinder head with the 3 bolts.

Torque: 7.5 N·m (80 kgf·cm, 66 in.-lbf)

21. INSTALL V-BANK COVER

Install the 3 V-bank covers.

Torque: 7.5 N·m (80 kgf·cm, 66 in.-lbf)

22. INSTALL IGNITION COILS (See page [IG-6](#))

23. INSTALL OIL DIPSTICK AND GUIDE FOR A/T

24. INSTALL FRONT EXHAUST PIPE (See page [EM-1 15](#))

25. INSTALL PS PUMP (See page [EM-81](#))

26. INSTALL CAMSHAFT POSITION SENSOR (See page [IG-10](#))

27. INSTALL CAMSHAFT TIMING PULLEYS

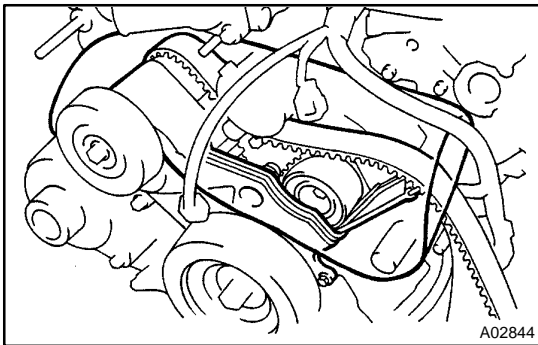
(See page [EM-22](#))

28. CONNECT TIMING BELT TO CAMSHAFT TIMING PULLEYS (See page [EM-22](#))

29. CHECK ENGINE OIL LEVEL

REMOVAL

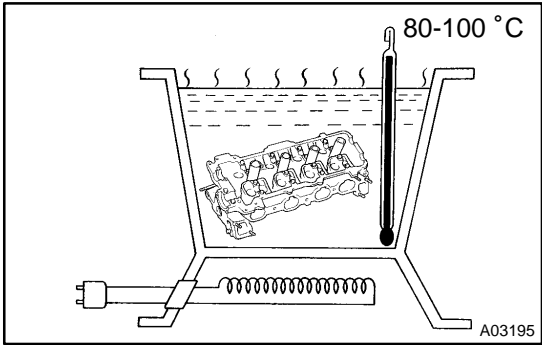
1. **DRAIN ENGINE COOLANT**
2. **REMOVE V-BANK COVER**
Remove the V-bank covers.
3. **DISCONNECT TIMING BELT FROM CAMSHAFT TIMING PULLEYS (See page EM-15)**
4. **REMOVE CAMSHAFT TIMING PULLEYS (See page EM-15)**
5. **REMOVE CAMSHAFT POSITION SENSOR (See page IG-9)**
6. **DISCONNECT PS PUMP FROM ENGINE (See page EM-77)**
7. **REMOVE FRONT EXHAUST PIPE (See page EM-1 15)**
8. **REMOVE OIL DIPSTICK AND GUIDE FOR A/T**
9. **REMOVE IGNITION COILS (See page IG-6)**
10. **REMOVE TIMING BELT REAR PLATES**
 - (1) Remove the 3 bolts, the stud bolt, and the RH No.1 timing belt rear plates.
 - (2) Disconnect the wire clamp from the LH timing belt rear plate.
 - (3) Remove the 3 bolts, the stud bolt, the LH No.1 and the timing belt rear plates.



NOTICE:

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

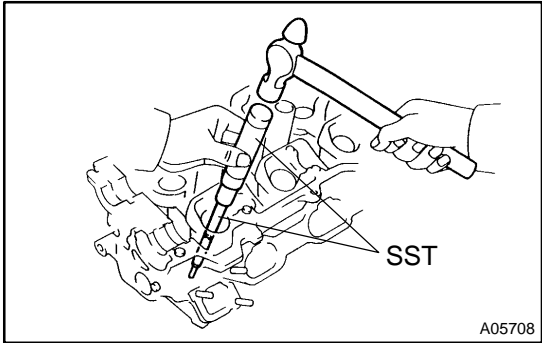
11. **DISCONNECT FUEL INLET HOSE (See page SF-24)**
12. **REMOVE INTAKE MANIFOLD ASSEMBLY**
 - (a) Disconnect the throttle control connector.
 - (b) Disconnect the VSV connector for EVAP.
 - (c) Disconnect the 8 injector connectors.
 - (d) Disconnect the ECT sensor connector.
 - (e) Disconnect the water sender gauge connector.
 - (f) Disconnect the 8 ignition coil connectors.
 - (g) Disconnect the 2 oxygen sensor connectors.



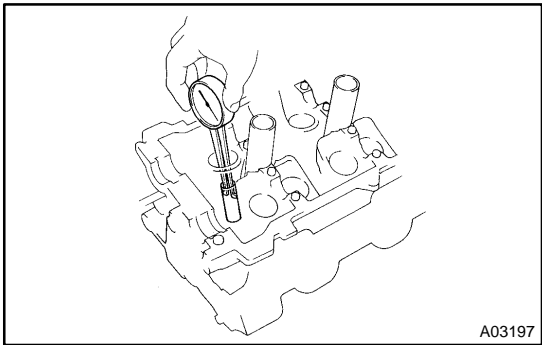
REPLACEMENT

1. REPLACE VALVE GUIDE BUSHINGS

- (a) Gradually heat the cylinder head to 80 - 100°C (176 - 212°F).



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



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

Both intake and exhaust

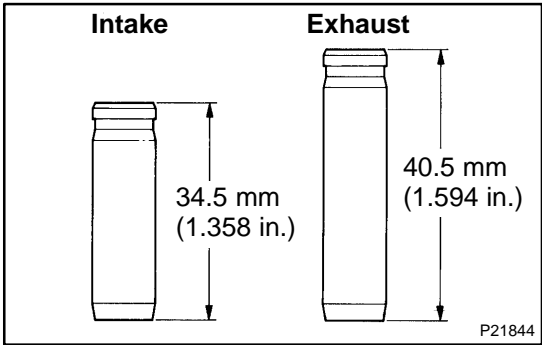
Bushing bore diameter mm (in.)	Bushing size
10.285 - 10.306 (0.4049 - 0.4057)	Use STD
10.335 - 10.356 (0.4069 - 0.4077)	Use O/S STD

- (d) Select a new guide bushing (STD or O/S 0.05).

If the bushing bore diameter of the cylinder head is greater than 10.306 mm (0.4057 in.), machine the bushing bore to the following dimension:

10.335 - 10.356 mm (0.4069 - 0.4077 in.)

If the bushing bore diameter of the cylinder head is greater than 10.356 mm (0.4077 in.), replace the cylinder head.

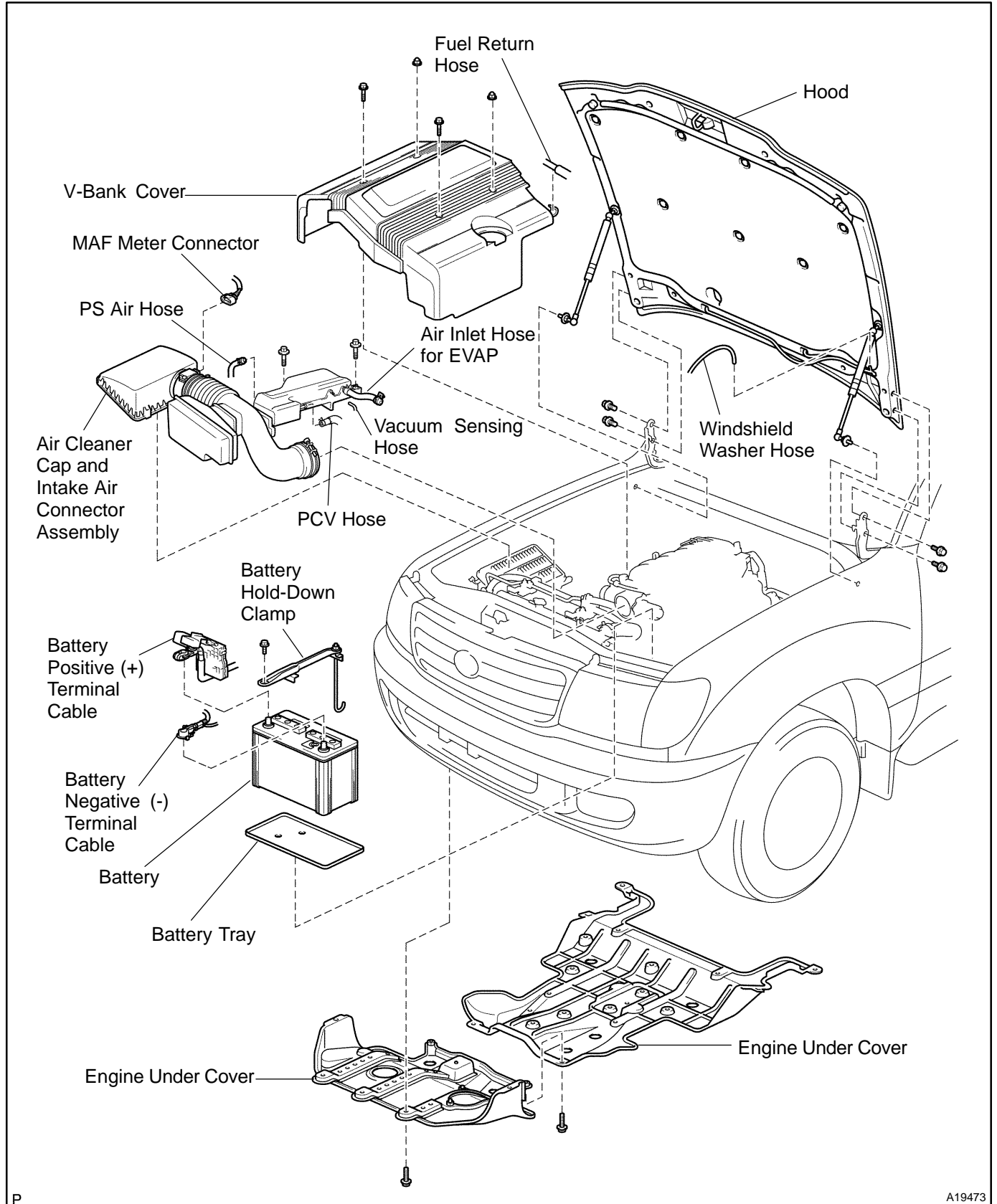


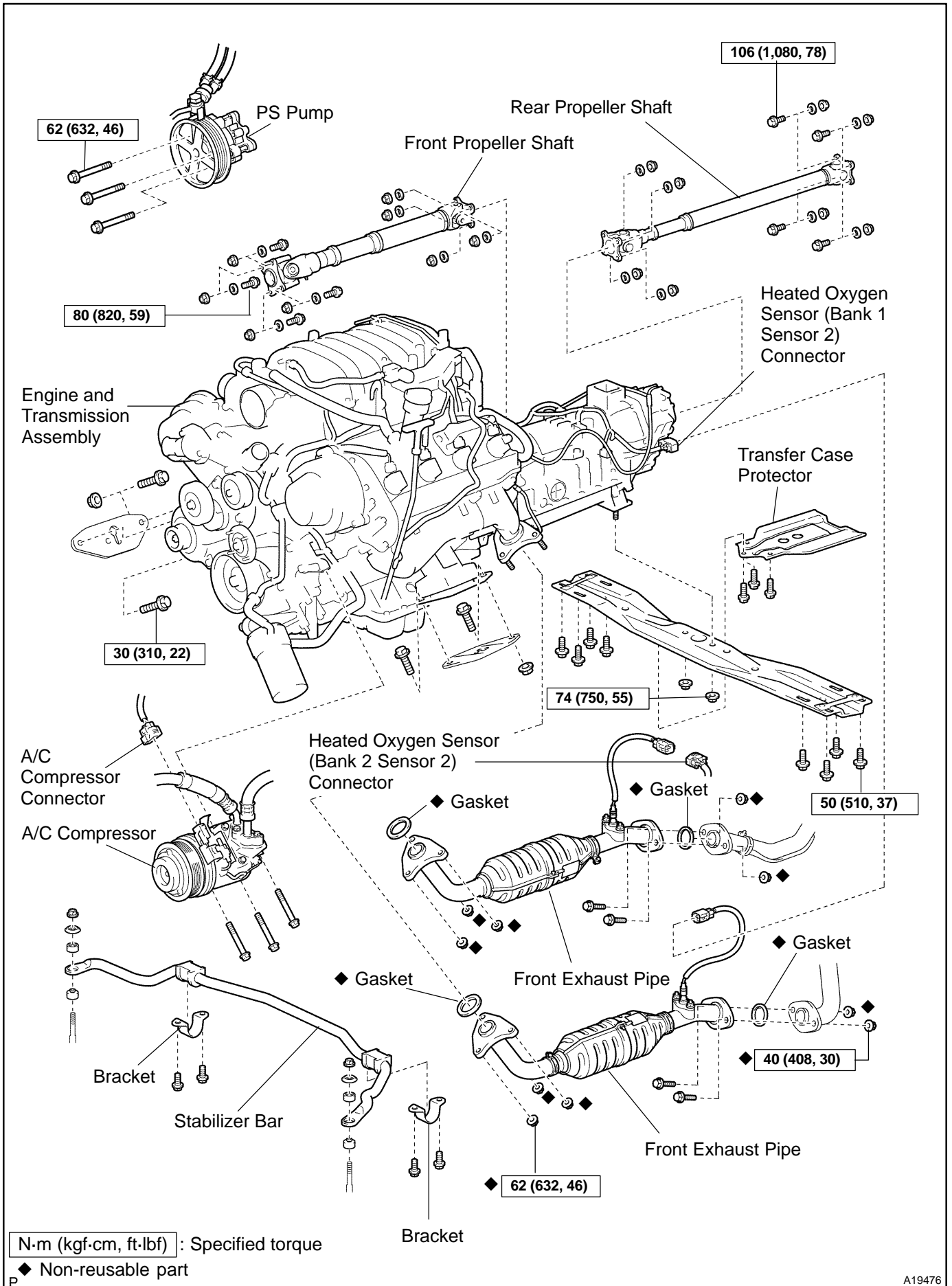
HINT:

The intake bushing and the exhaust bushing differ in their sizes.

ENGINE UNIT COMPONENTS

EM0LB-09



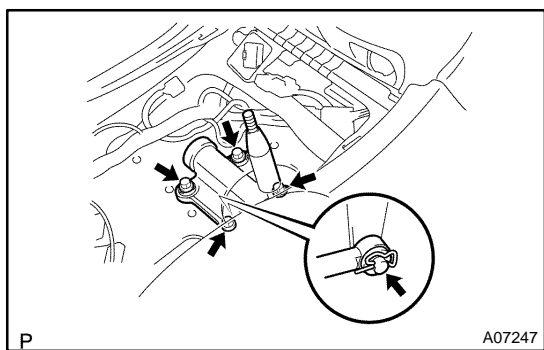
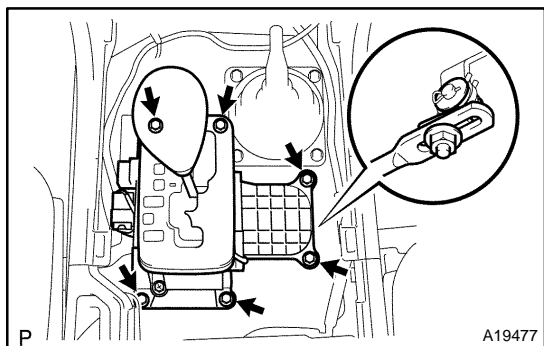


A19476

- (f) Disconnect the 2 heater hoses.
- (g) Disconnect the engine wire clamp from the bracket on the cowl panel.
- (h) Disconnect the engine wire grommet from cowl panel.
- (i) Disconnect the ground strap connector.
- (j) Disconnect the fuel main hose and the clamps.
- (k) Disconnect the fuel return hose and the clamp.
- (l) Disconnect the air inlet hose from the charcoal canister.
- (m) Disconnect the EVAP hose from the charcoal canister.
- (n) Disconnect the engine wire from the clamp on the right fender apron.
- (o) Disconnect the clamp on battery negative (-) cable from the relay box.
- (p) Disconnect the battery negative (-) cable from the right fender apron.
- (q) Disconnect the battery positive (+) terminal cable.

13. REMOVE SHIFT LEVER ASSEMBLY AND TRANSFER SHIFT LEVER ASSEMBLY

- (a) Remove the transfer shift lever knob.
- (b) Remove the upper console panel.
- (c) Remove the shift lever assembly.
 - (1) Disconnect the connector.
 - (2) Remove the 6 bolts.
 - (3) Remove the nut and disconnect the transmission control rod from the shift lever assembly.
 - (4) Remove the shift lever assembly.
- (d) Remove the 4 bolts and the transfer shift lever boot.



- (e) Remove the transfer shift lever assembly.
 - (1) Remove the clip, the plate washer and the wave washer, and disconnect the transfer rod from the shift lever.
 - (2) Remove the bushing.
 - (3) Remove the 4 bolts, the shift lever and the gasket.

14. REMOVE FRONT EXHAUST PIPES

15. REMOVE PROPELLER SHAFT (See page [PR-4](#))

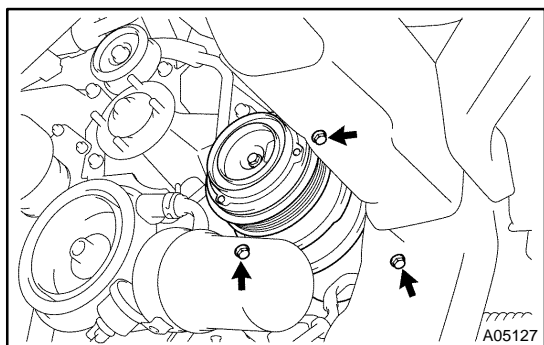
16. REMOVE STABILIZER BAR (See page [SA-81](#))

17. DISCONNECT A/C COMPRESSOR FROM ENGINE

- (a) Disconnect the A/C compressor connector.
- (b) Remove the 3 bolts, and disconnect the A/C compressor from the engine.

HINT:

Suspend the A/C compressor securely.



EM0EE-18

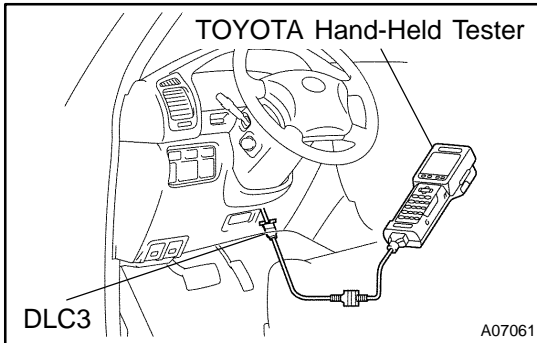


IGNITION TIMING INSPECTION

EMOKT-10

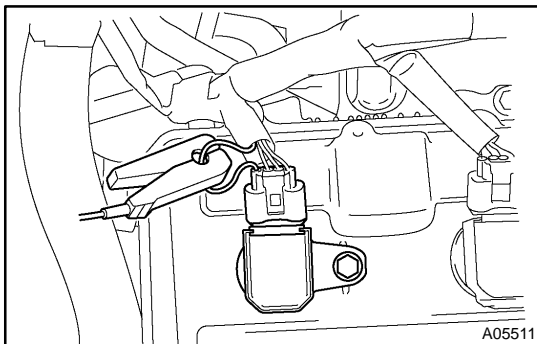
1. REMOVE BATTERY CLAMP COVER
2. REMOVE INTAKE AIR CONNECTOR
3. REMOVE V-BANK COVER
4. WARM UP ENGINE

Allow the engine to warm up to the normal operating temperature.



5. **CONNECT TOYOTA HAND-HELD TESTER OR OBD II SCAN TOOL**

- (a) Connect the TOYOTA hand-held tester or OBD II scan tool to the DLC3.
- (b) Please refer to the TOYOTA hand-held tester or OBD II scan tool operator's manual for further details.



6. **CONNECT TIMING LIGHT TO ENGINE**

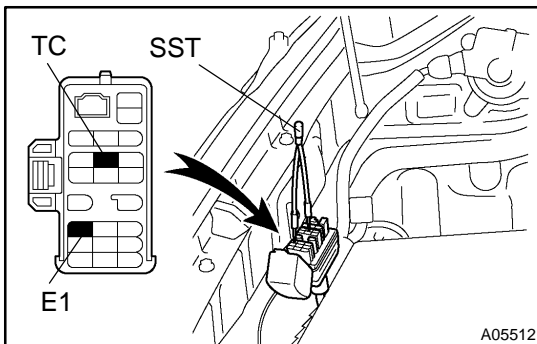
Connect the tester probe of a timing light to the wire of the ignition coil connector for No.1 cylinder.

7. **CHECK IDLE SPEED**

- (a) Race the engine speed at 2,500 rpm for approx. 90 seconds.
- (b) Check the idle speed.

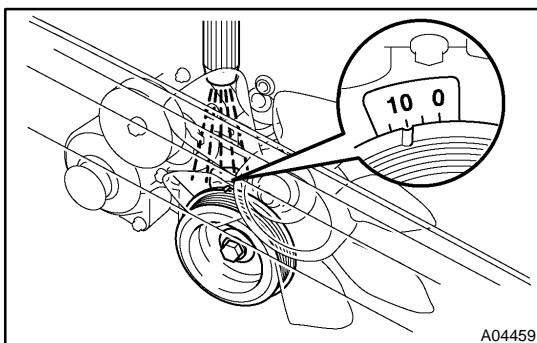
Idle speed:

700 ± 50 rpm



8. **INSPECT IGNITION TIMING**

- (a) Using SST, connect terminal TC and E1 of the DLC1.
SST 09843-18020



- (b) Using a timing light, check the ignition timing.

Ignition timing:

5 - 15° BTDC @ idle

(Transmission in neutral position)

- (c) Remove SST from the DLC1.
SST 09843-18020

9. **DISCONNECT TIMING LIGHT FROM ENGINE**
10. **DISCONNECT TOYOTA HAND-HELD TESTER OR OBD II SCAN TOOL**