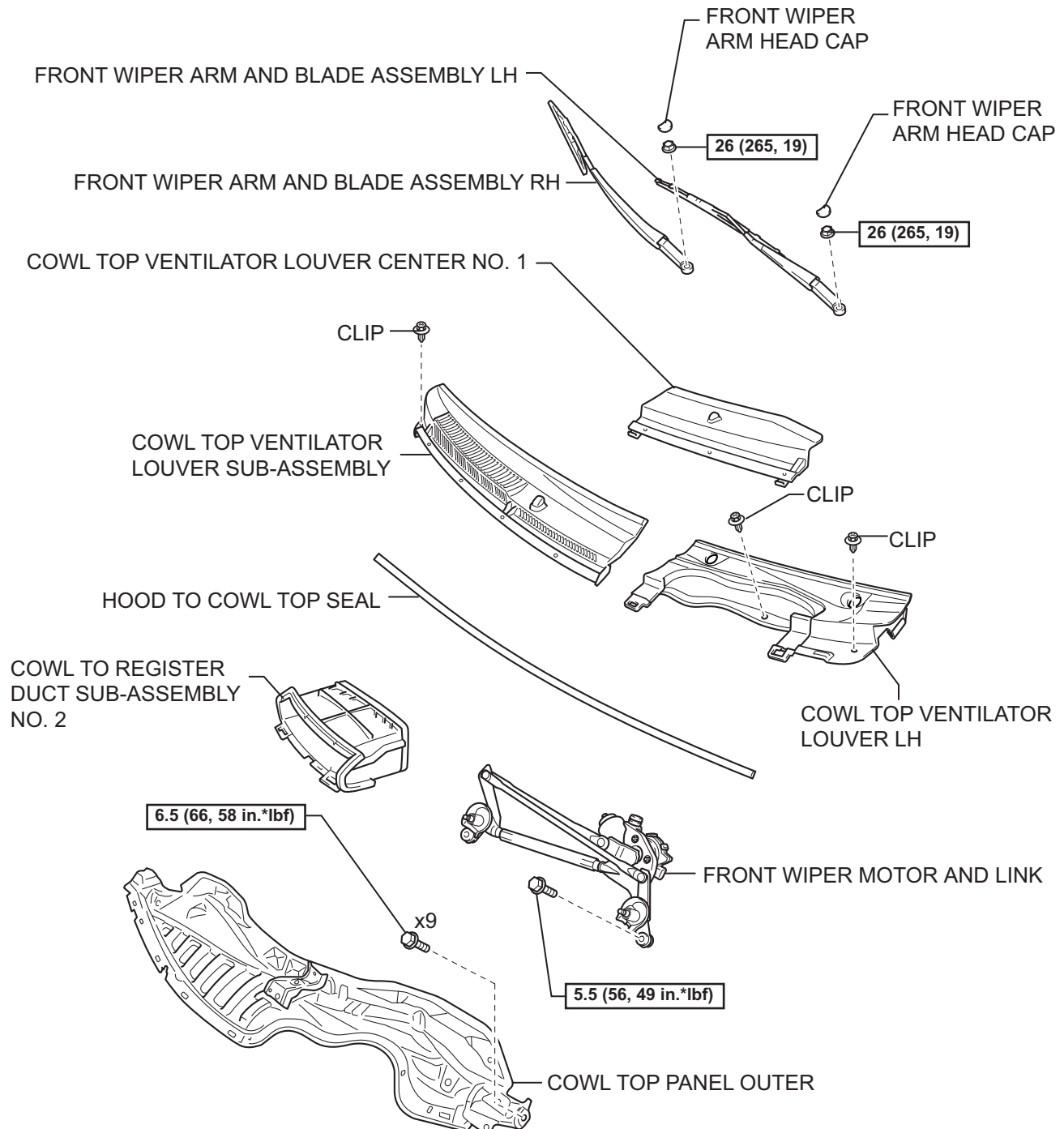


# CYLINDER HEAD

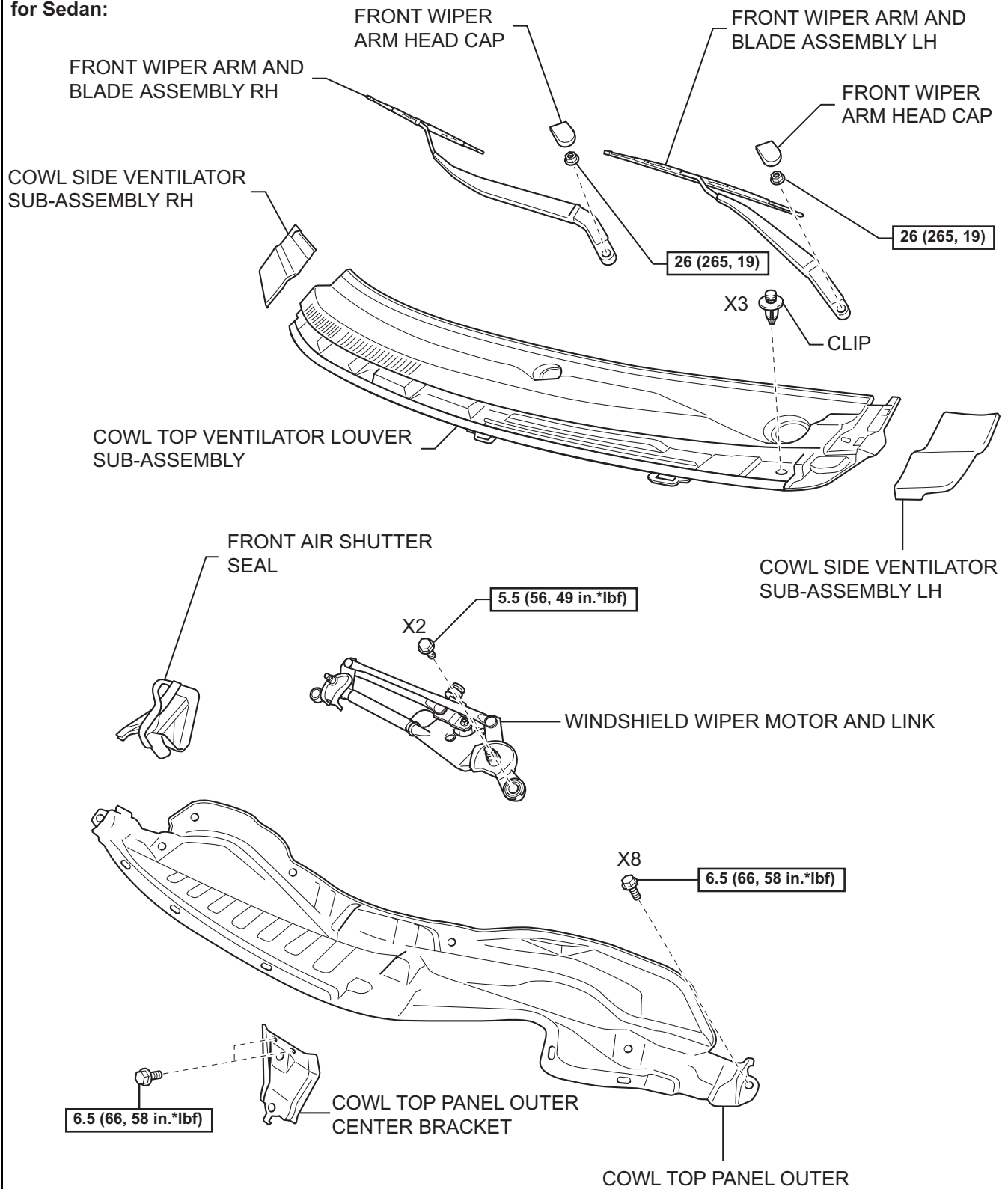
## COMPONENTS

for Hatchback:



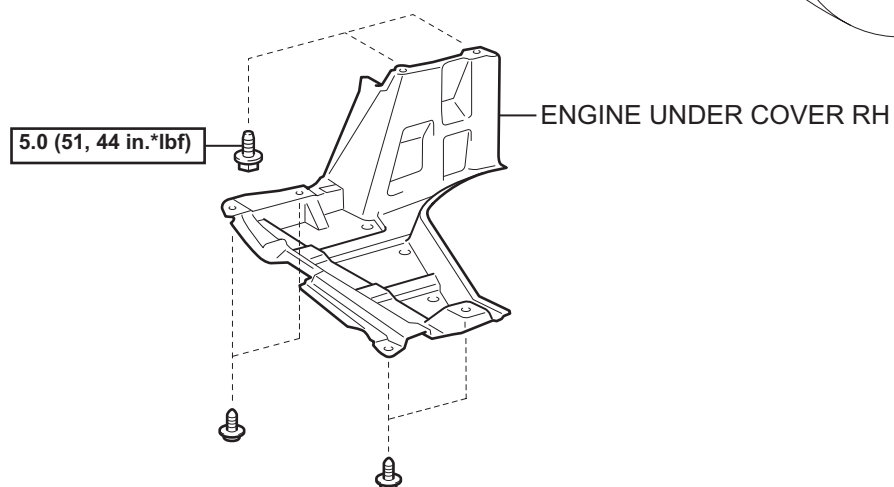
N\*m (kgf\*cm, ft\*lbf) : Specified torque

for Sedan:

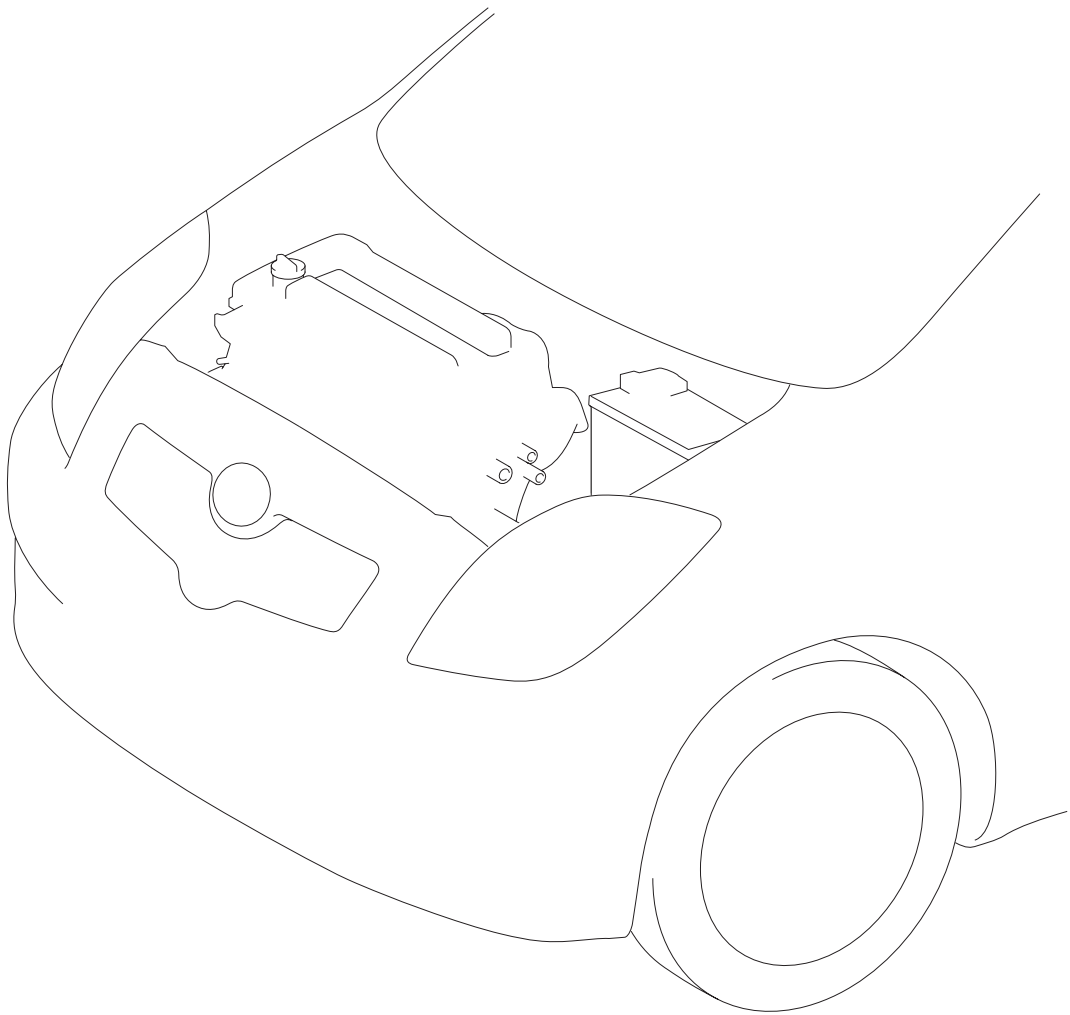
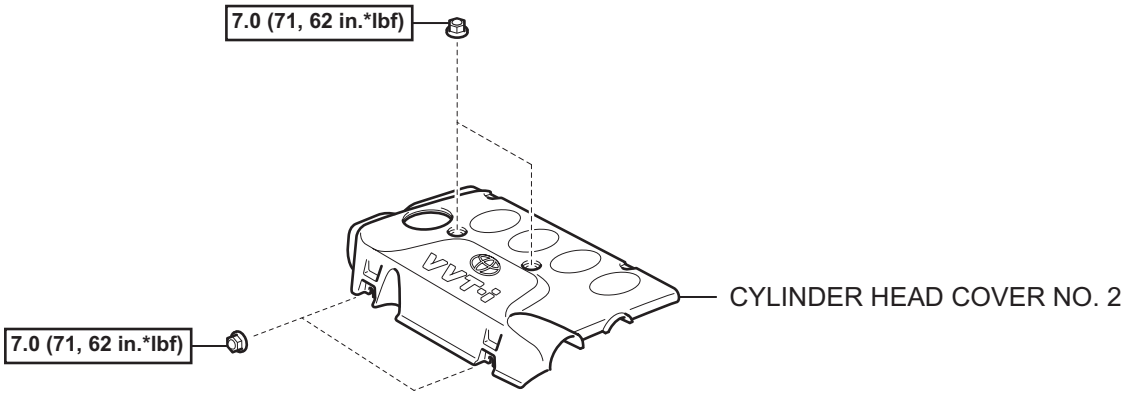


N\*m (kgf\*cm, ft.\*lbf) : Specified torque

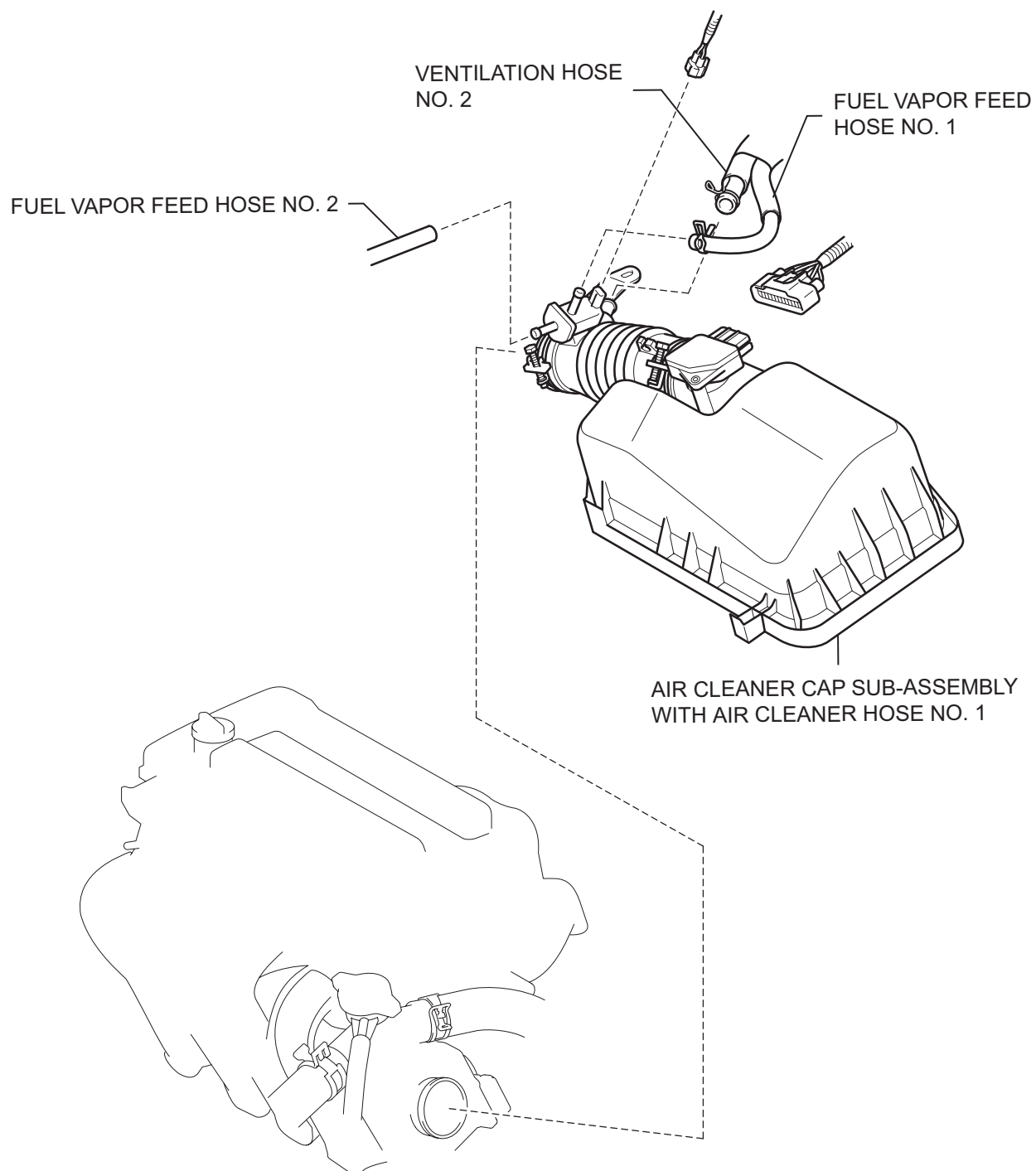
Y



[N\*m (kgf\*cm, ft.\*lbf)] : Specified torque

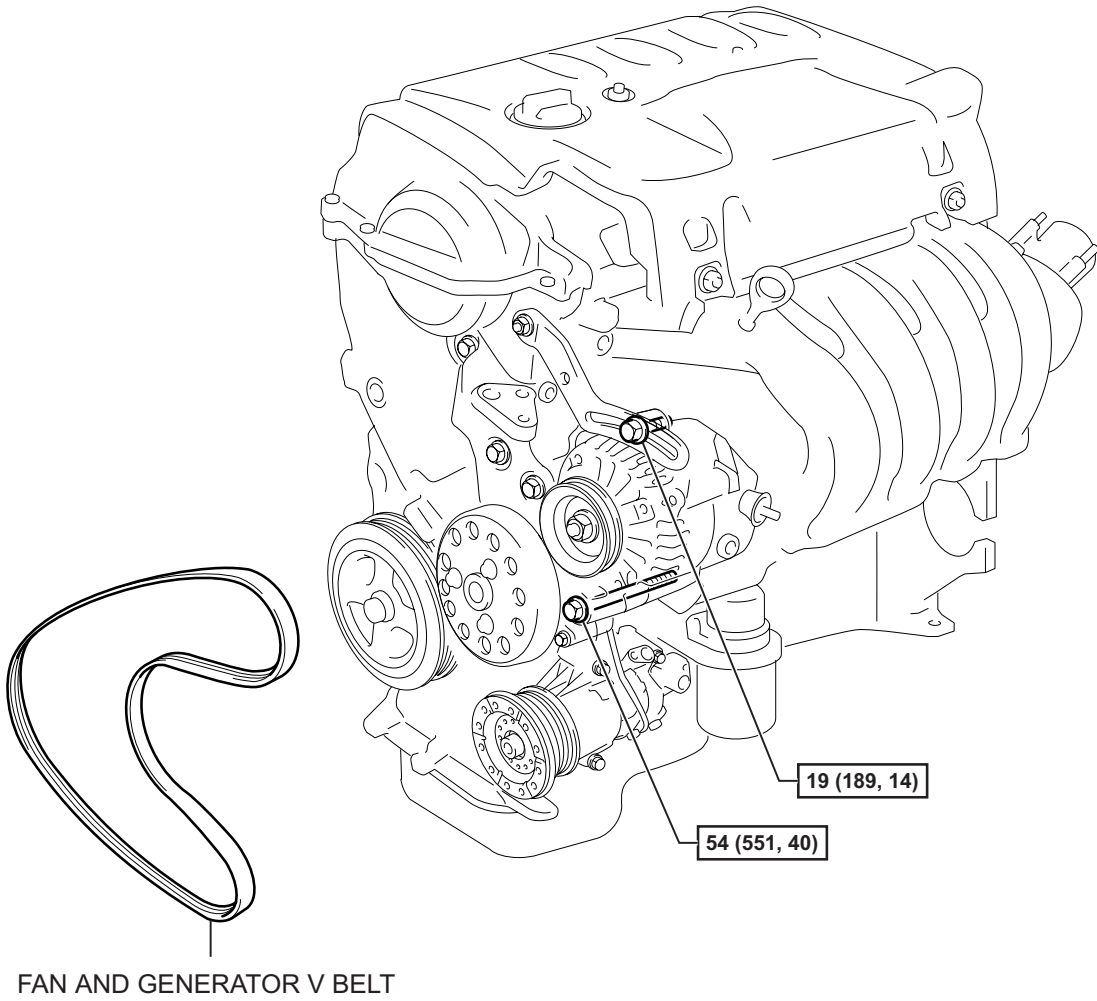


**N\*m (kgf\*cm, ft.\*lbf)** : Specified torque



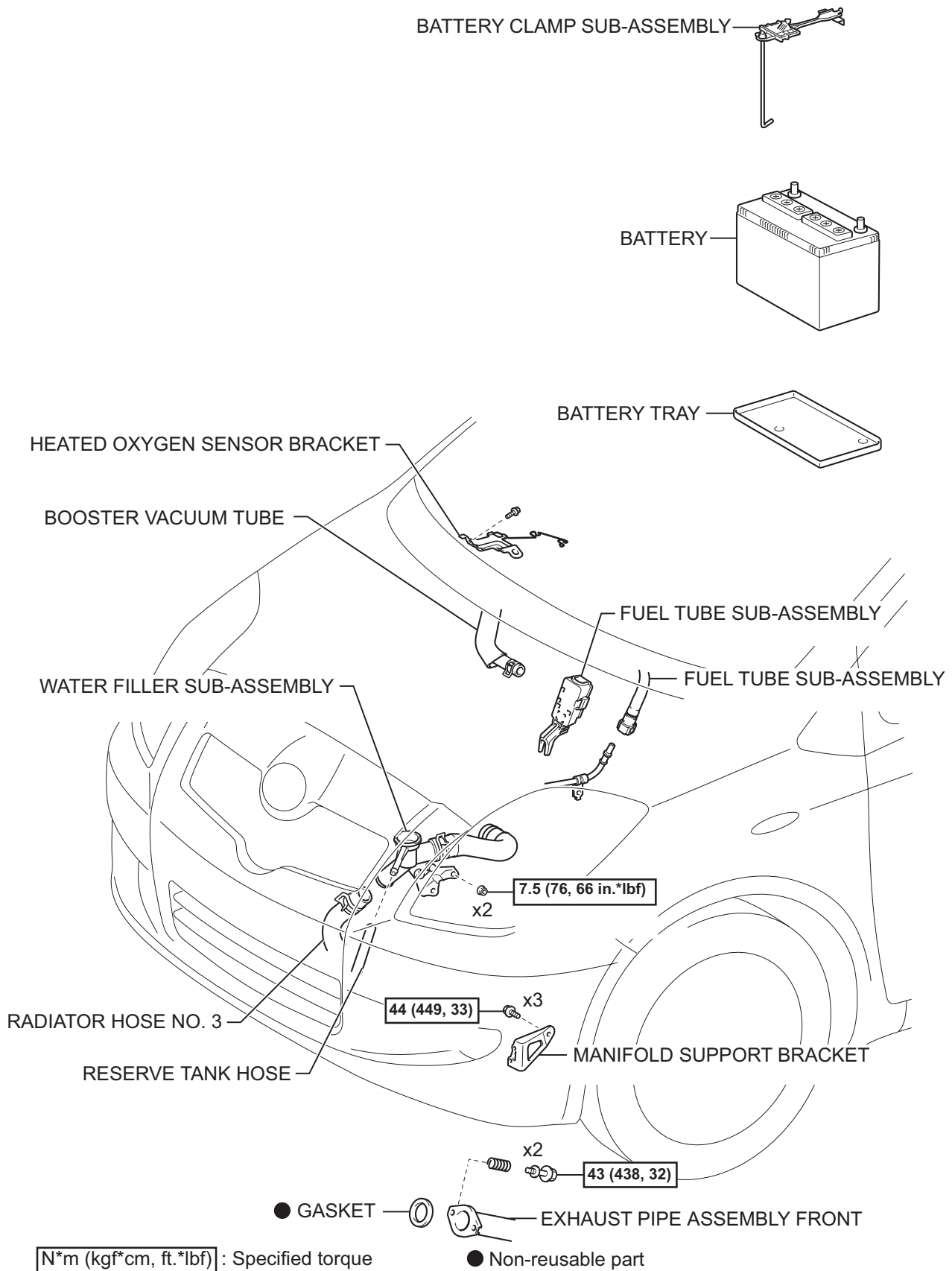
EM

EM

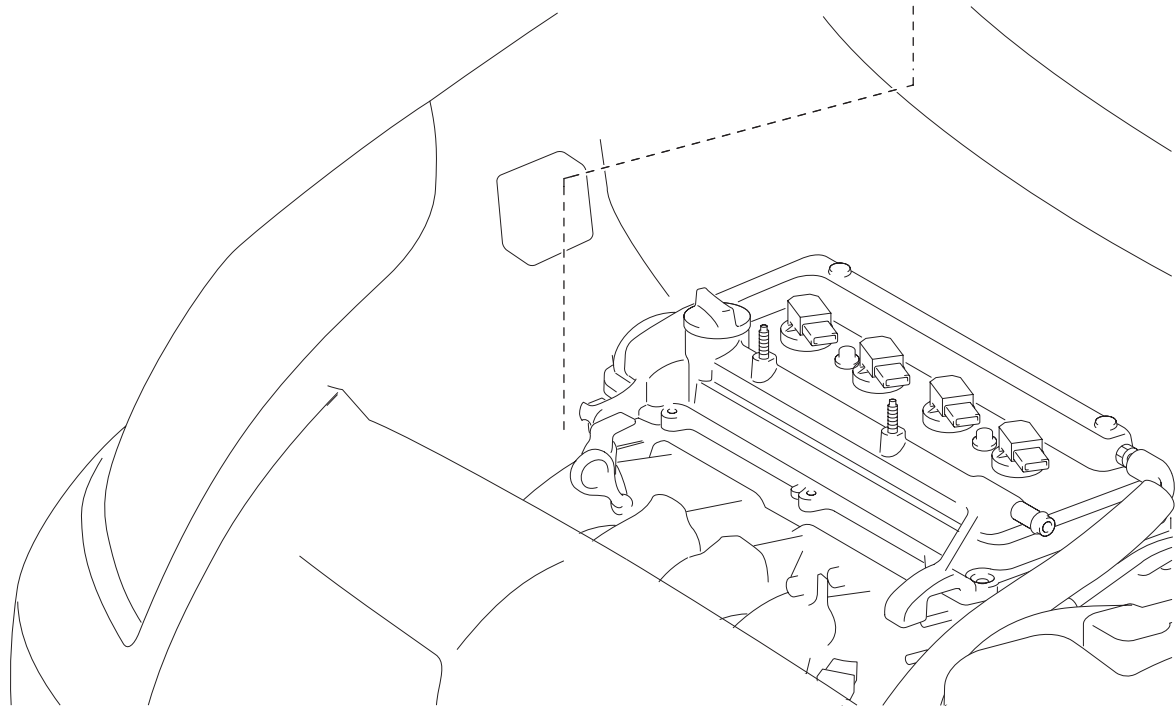
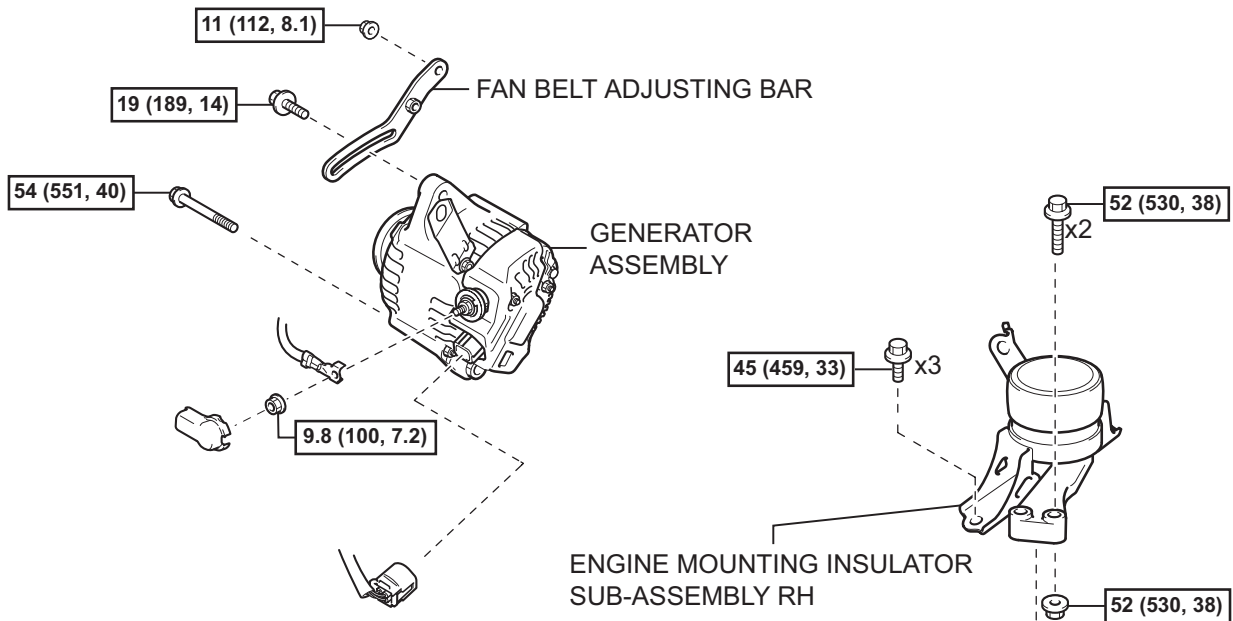


**N\*m (kgf\*cm, ft.\*lbf)** : Specified torque

T



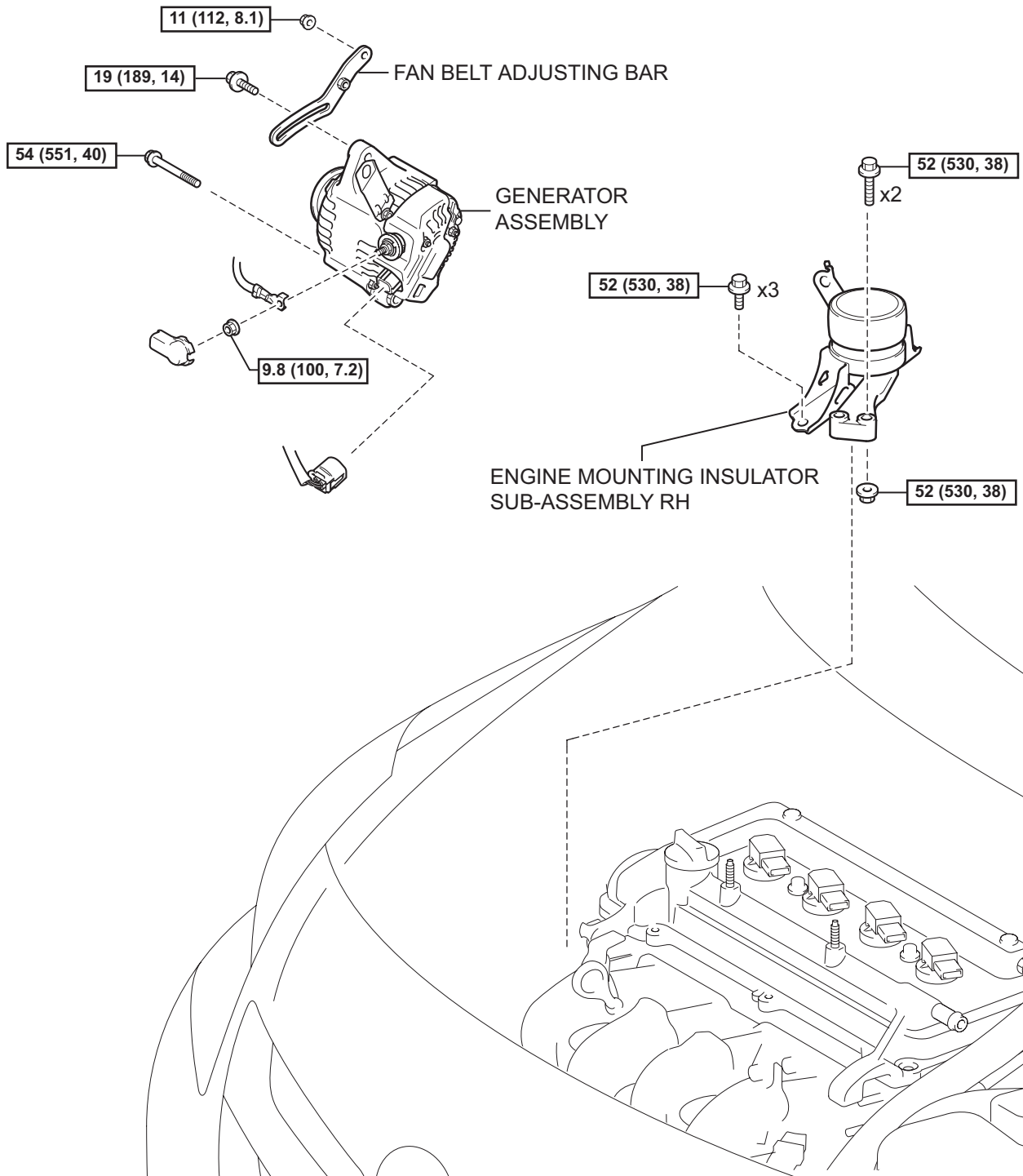
for Hatchback:



**N\*m (kgf\*cm, ft.\*lbf)** : Specified torque

T

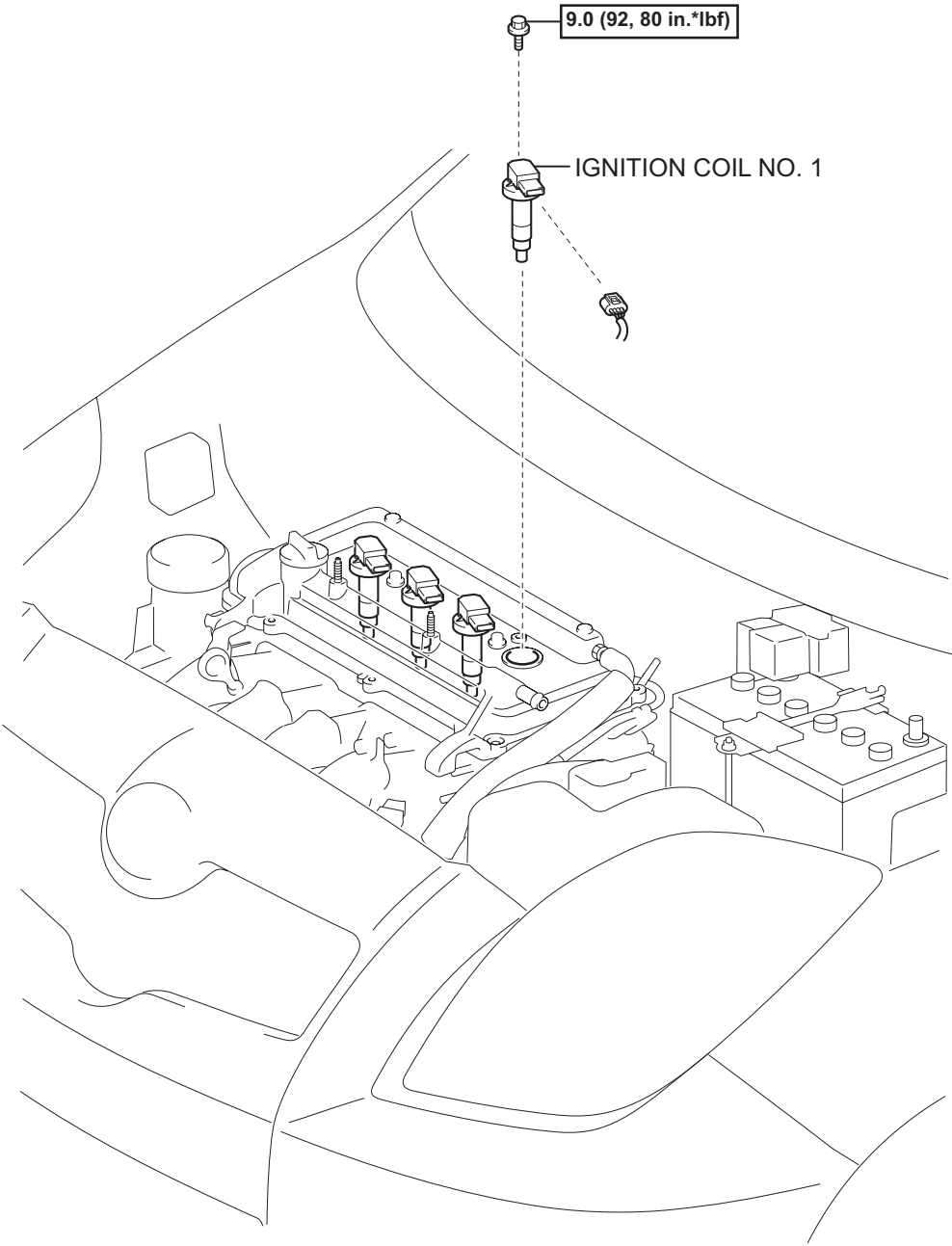
for Sedan:



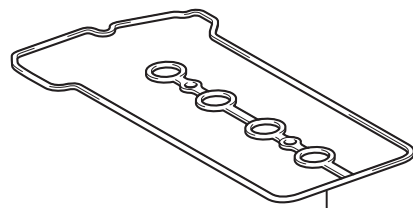
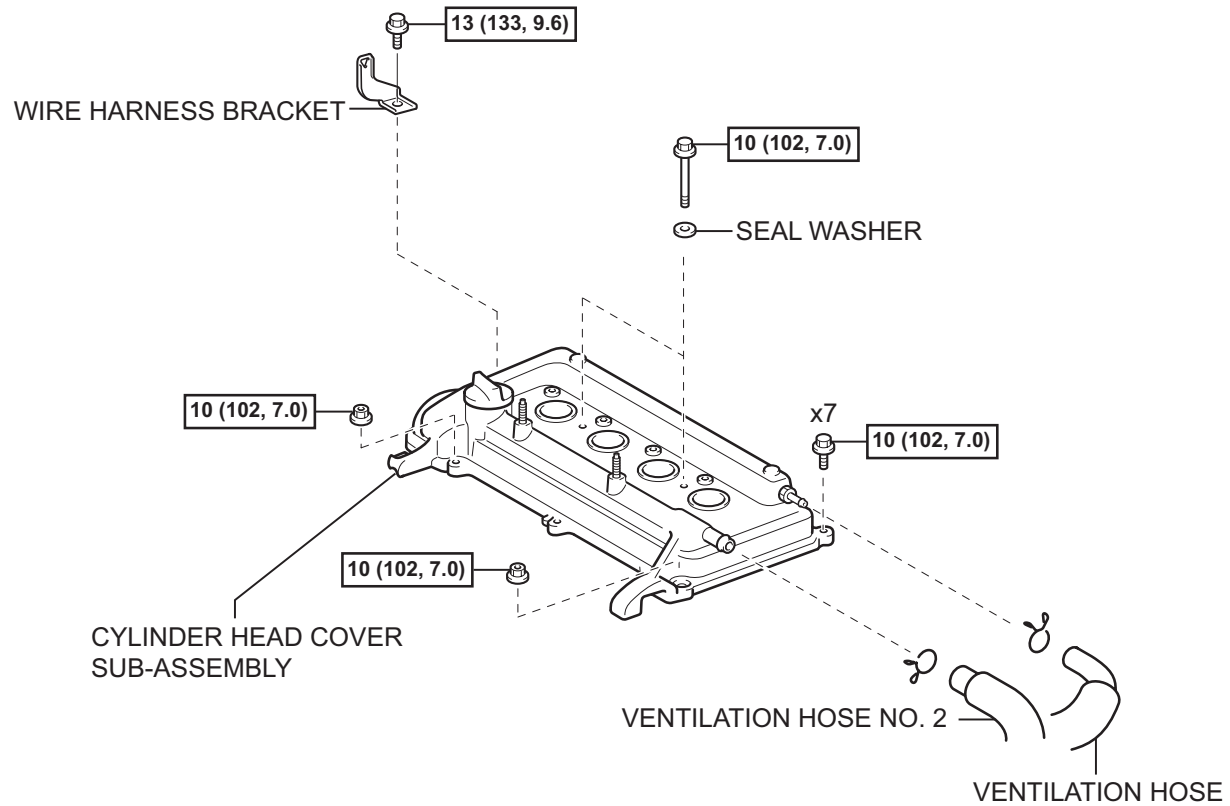
N\*m (kgf\*cm, ft\*lb) : Specified torque

EM

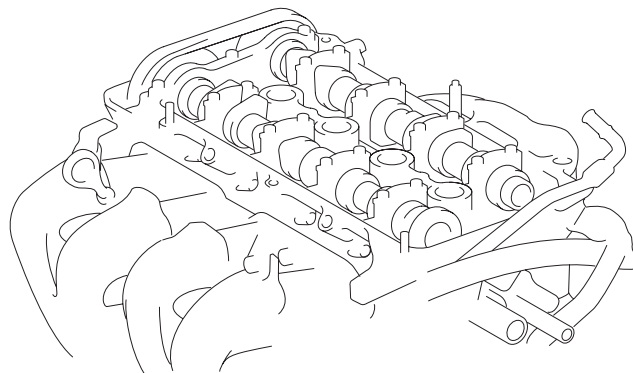
EM



$\boxed{\text{N}\cdot\text{m (kgf}\cdot\text{cm, ft.}\cdot\text{lbf)}}$  : Specified torque



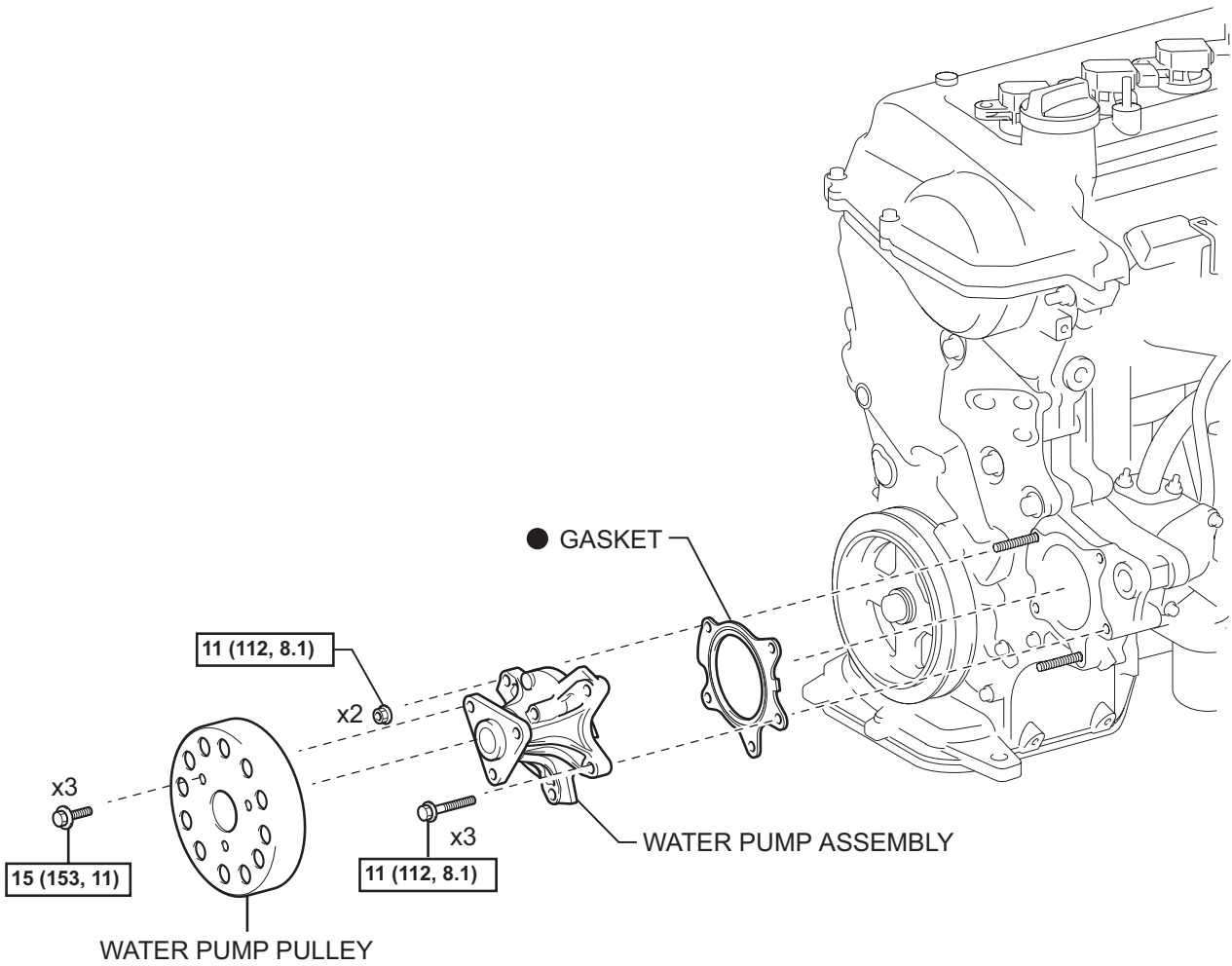
CYLINDER HEAD COVER GASKET



**N\*m (kgf\*cm, ft.\*lbf)** : Specified torque

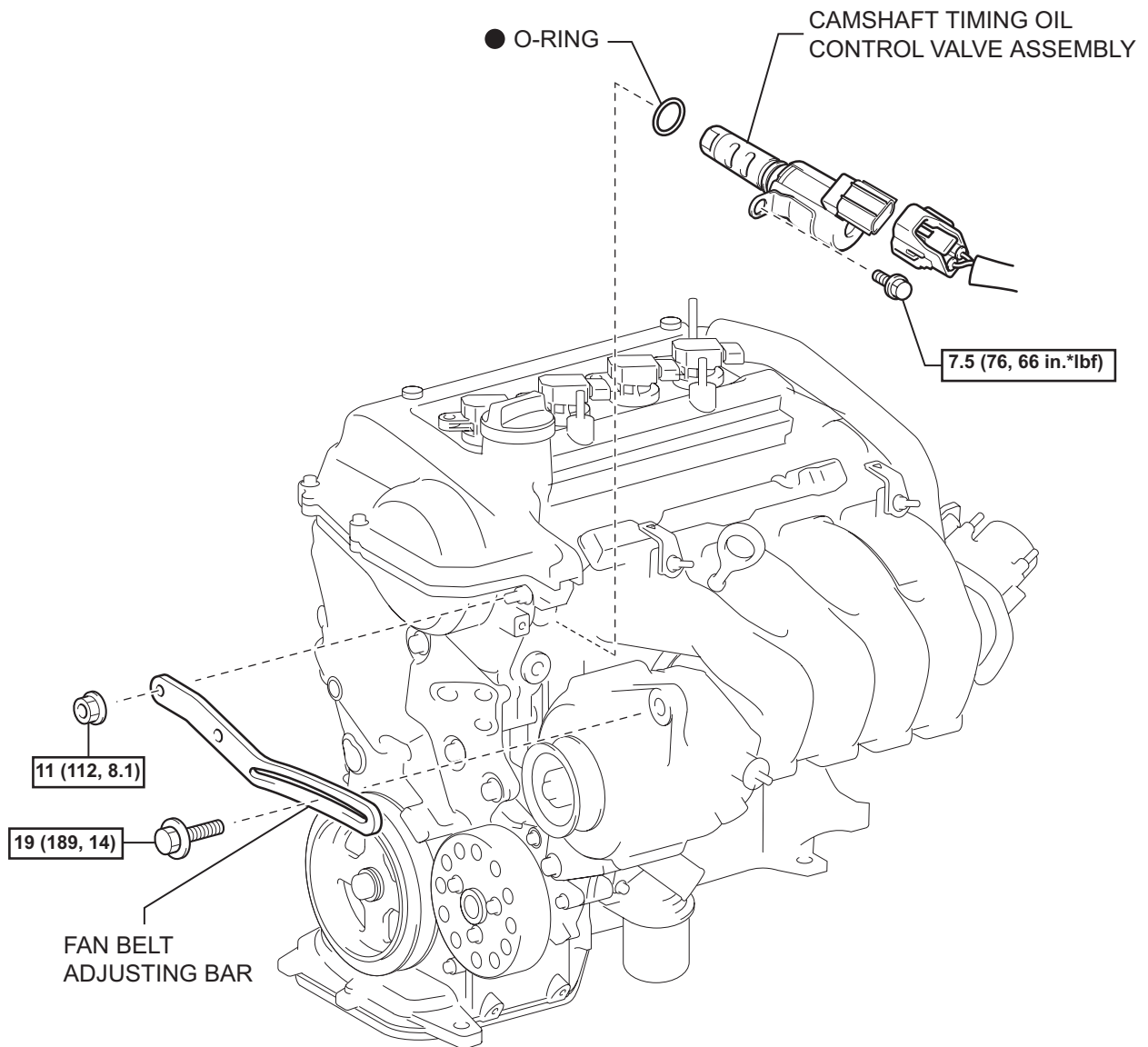
EM

EM



**[N\*m (kgf\*cm, ft.\*lbf)]** : Specified torque

● Non-reusable part

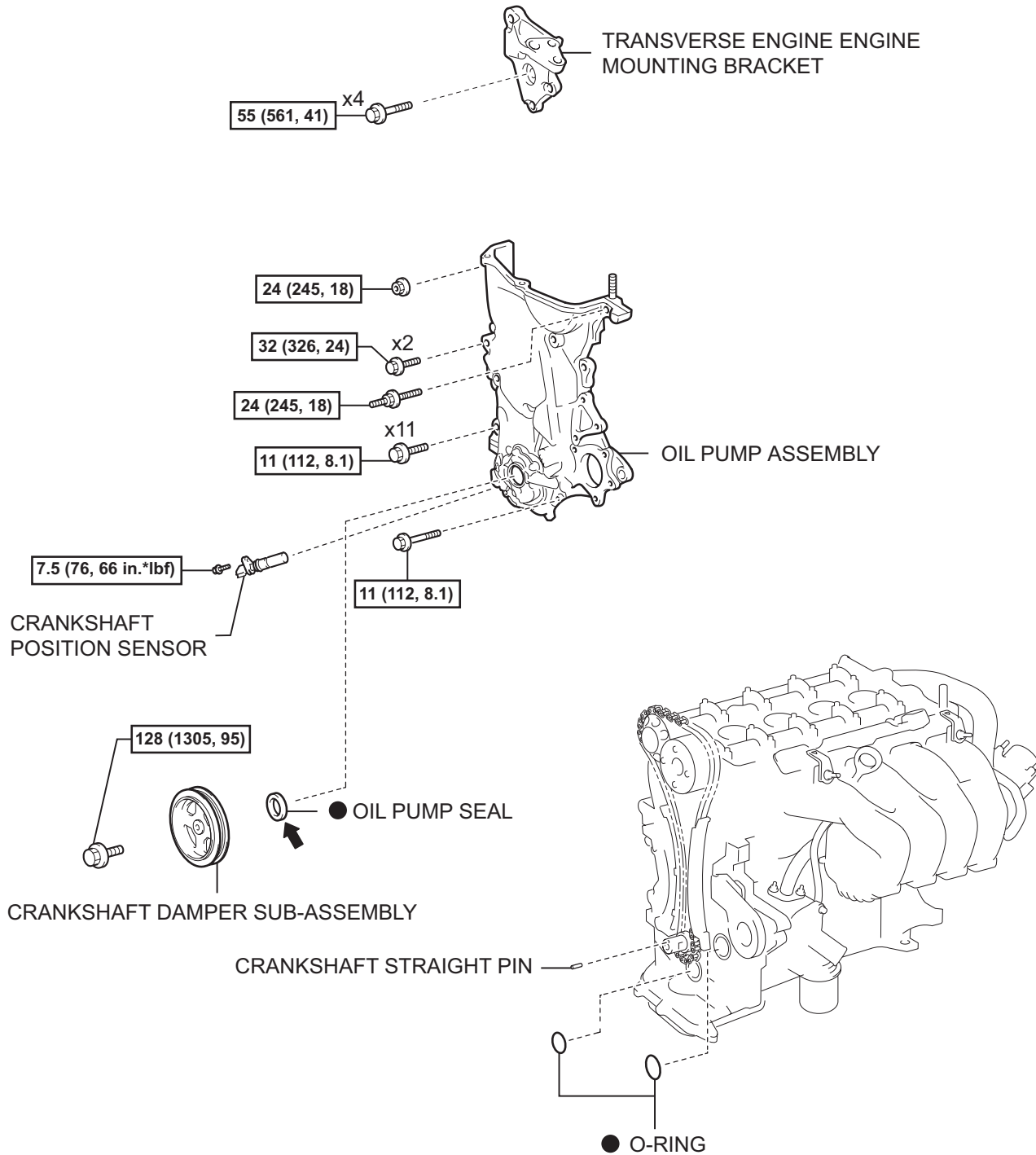


$\boxed{\text{N*m (kgf*cm, ft.*lbf)}}$  : Specified torque

● Non-reusable part

EM

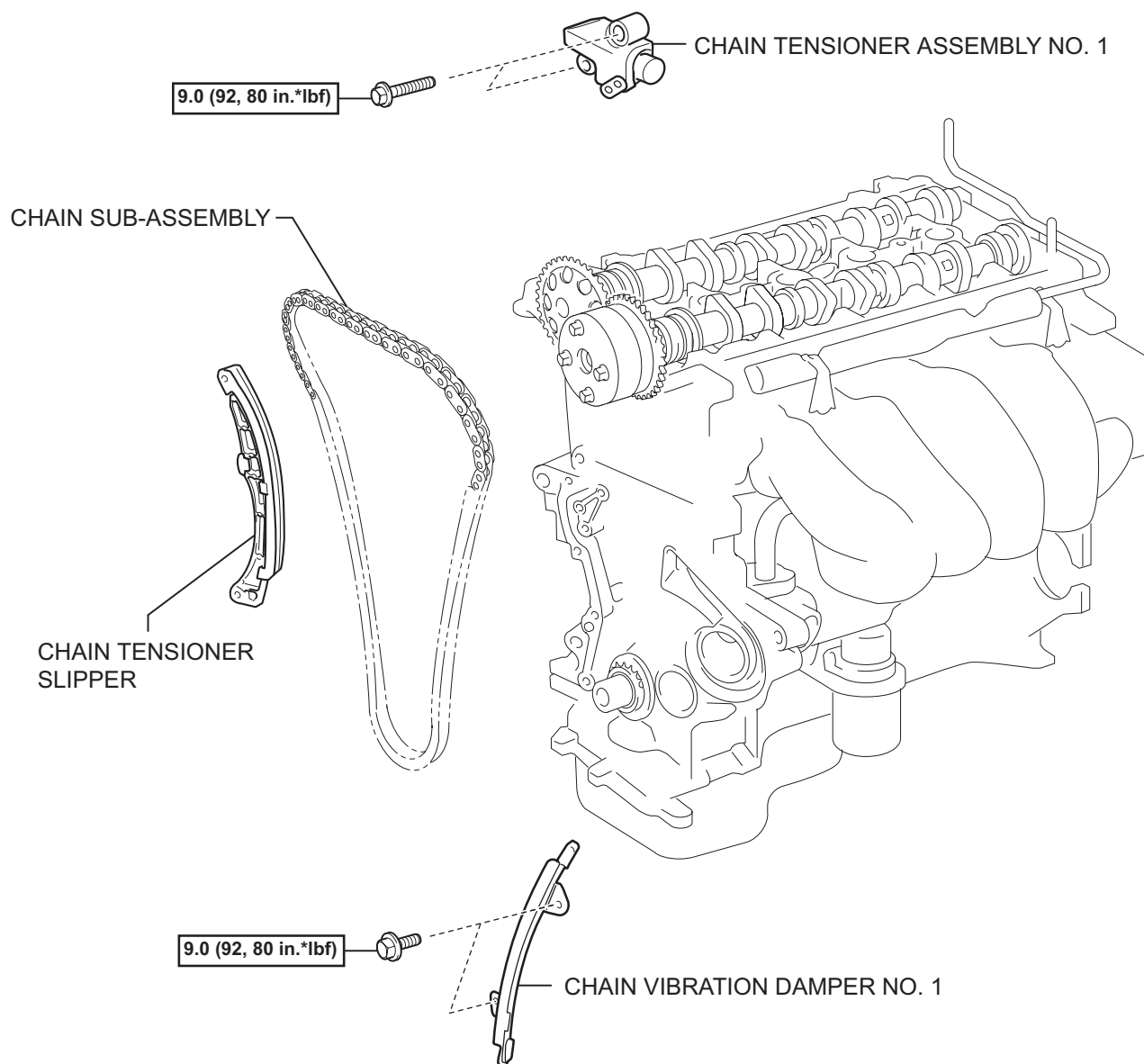
EM



[N\*m (kgf\*cm, ft.\*lbf)] : Specified torque

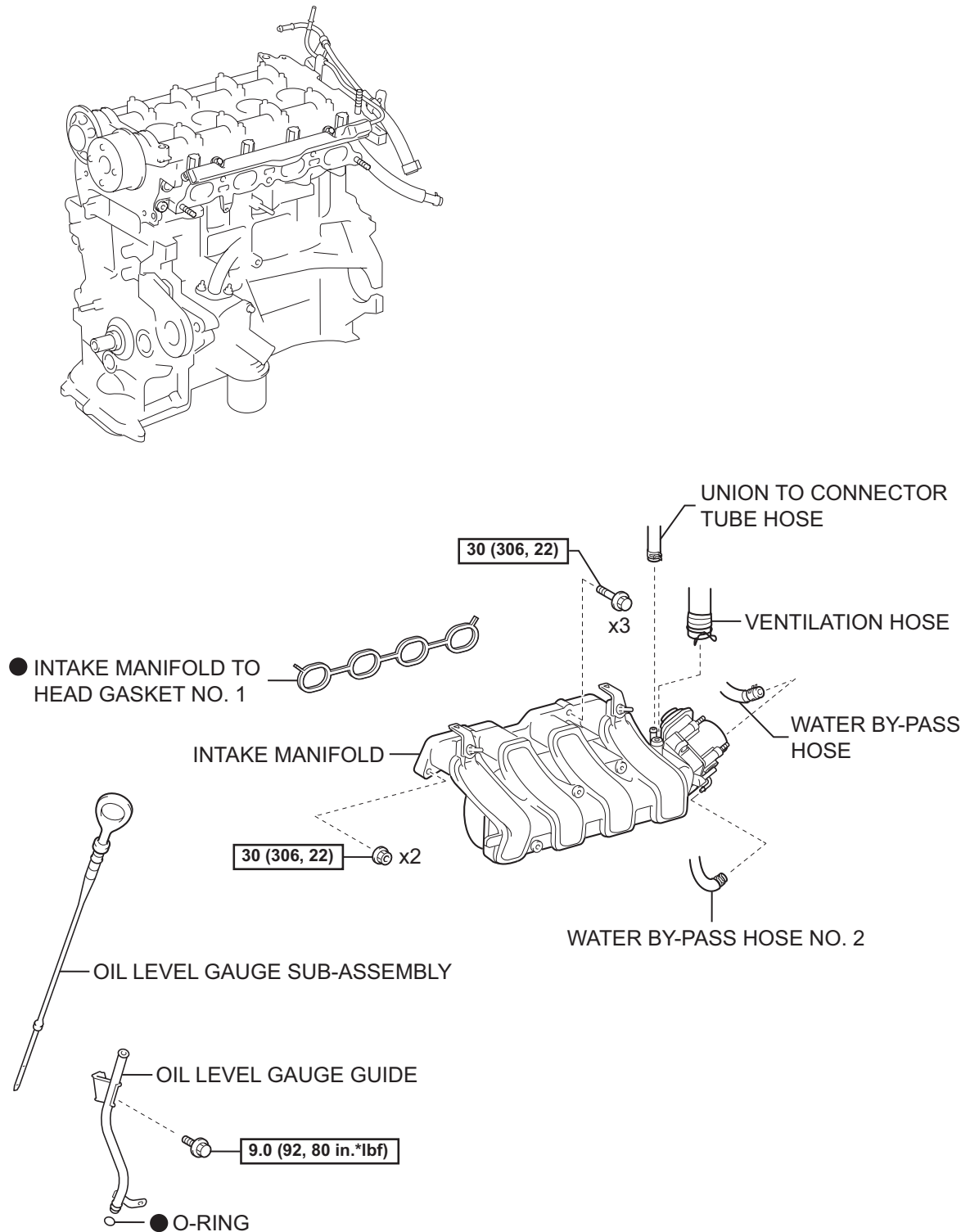
● Non-reusable part

← Apply MP grease



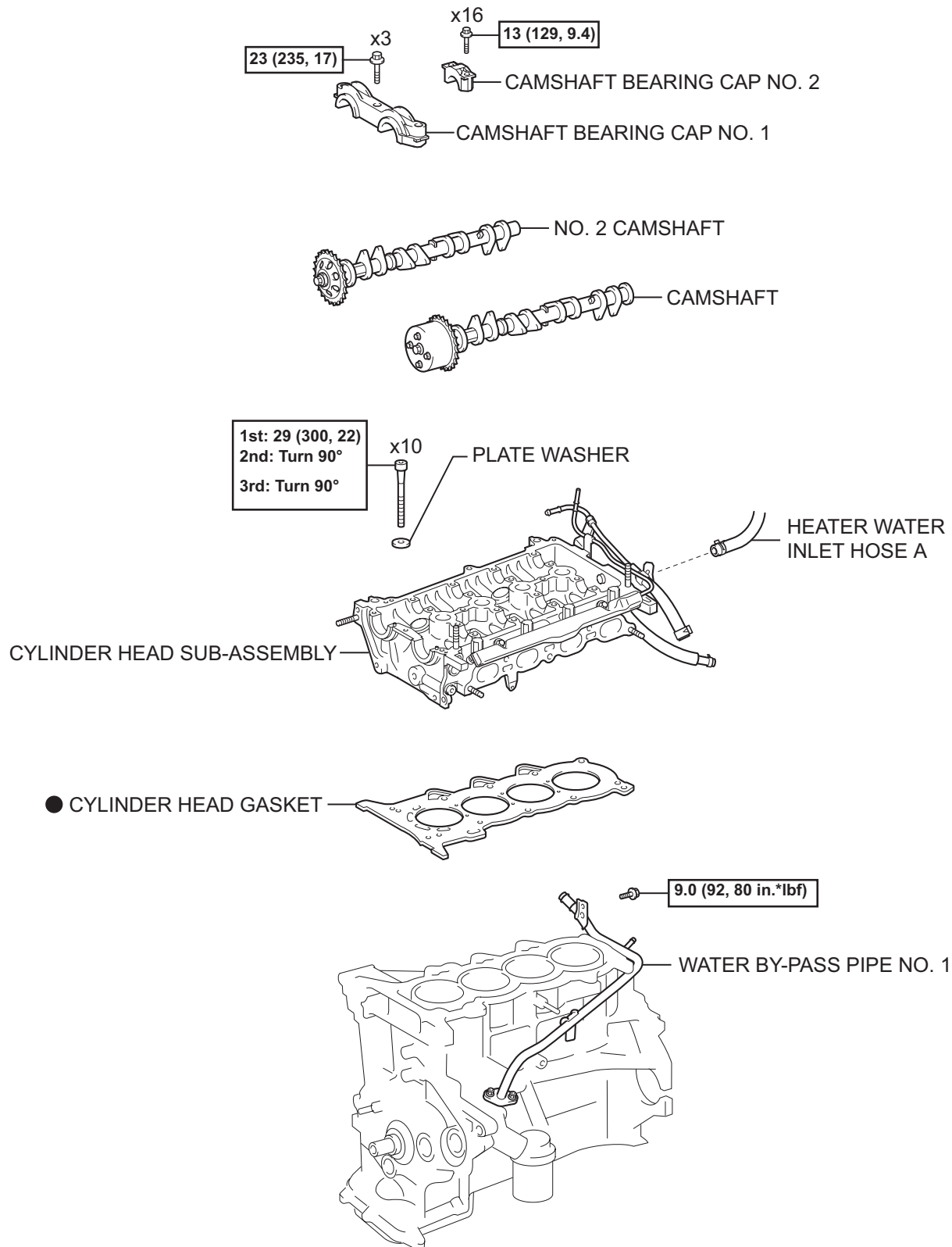
$\boxed{\text{N}^*\text{m (kgf}^*\text{cm, ft.}^*\text{lbf)}}$  : Specified torque

EM



N\*m (kgf\*cm, ft\*lbf) : Specified torque

● Non-reusable part

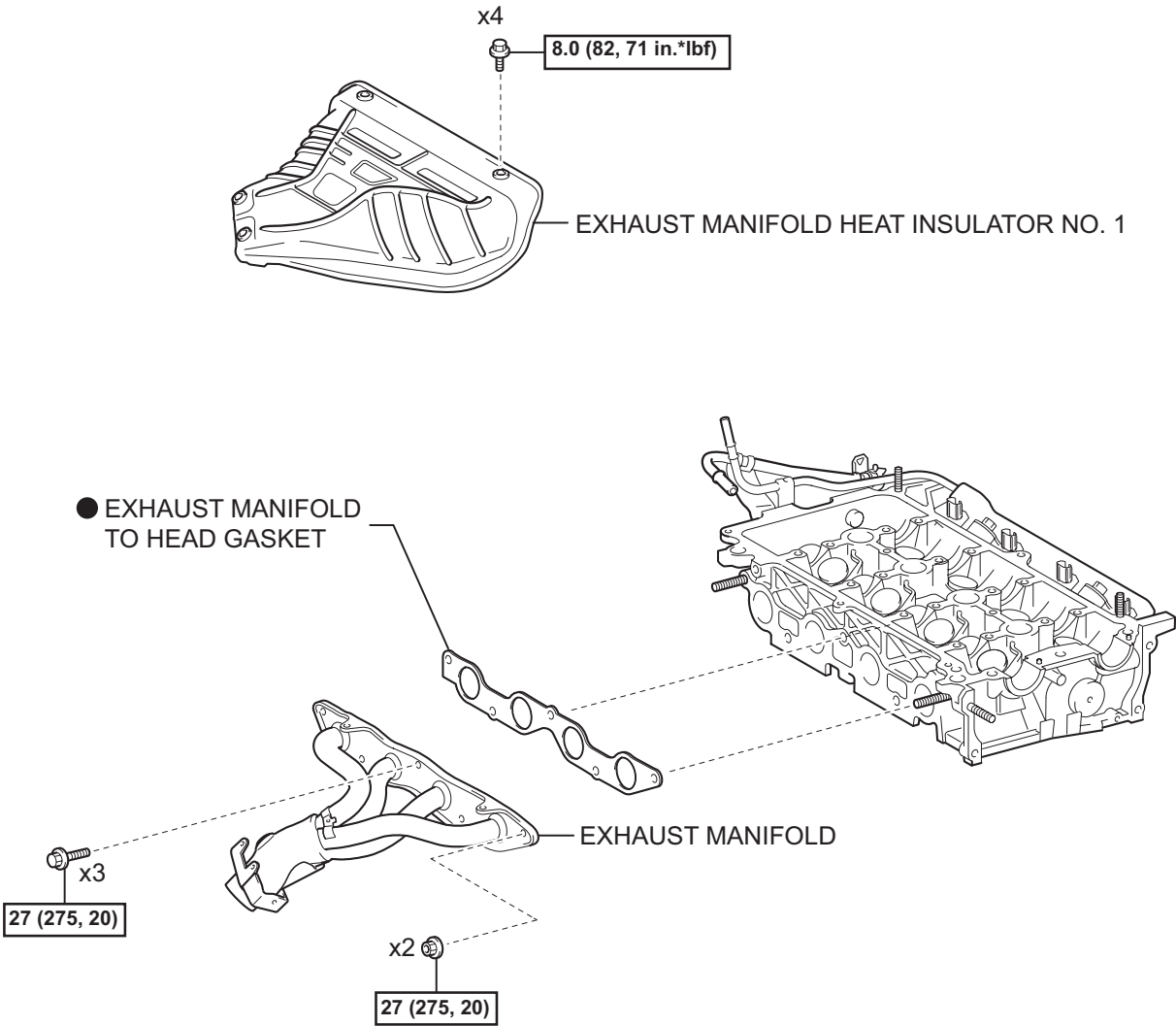


[N\*m (kgf\*cm, ft.\*lbf)] : Specified torque

● Non-reusable part

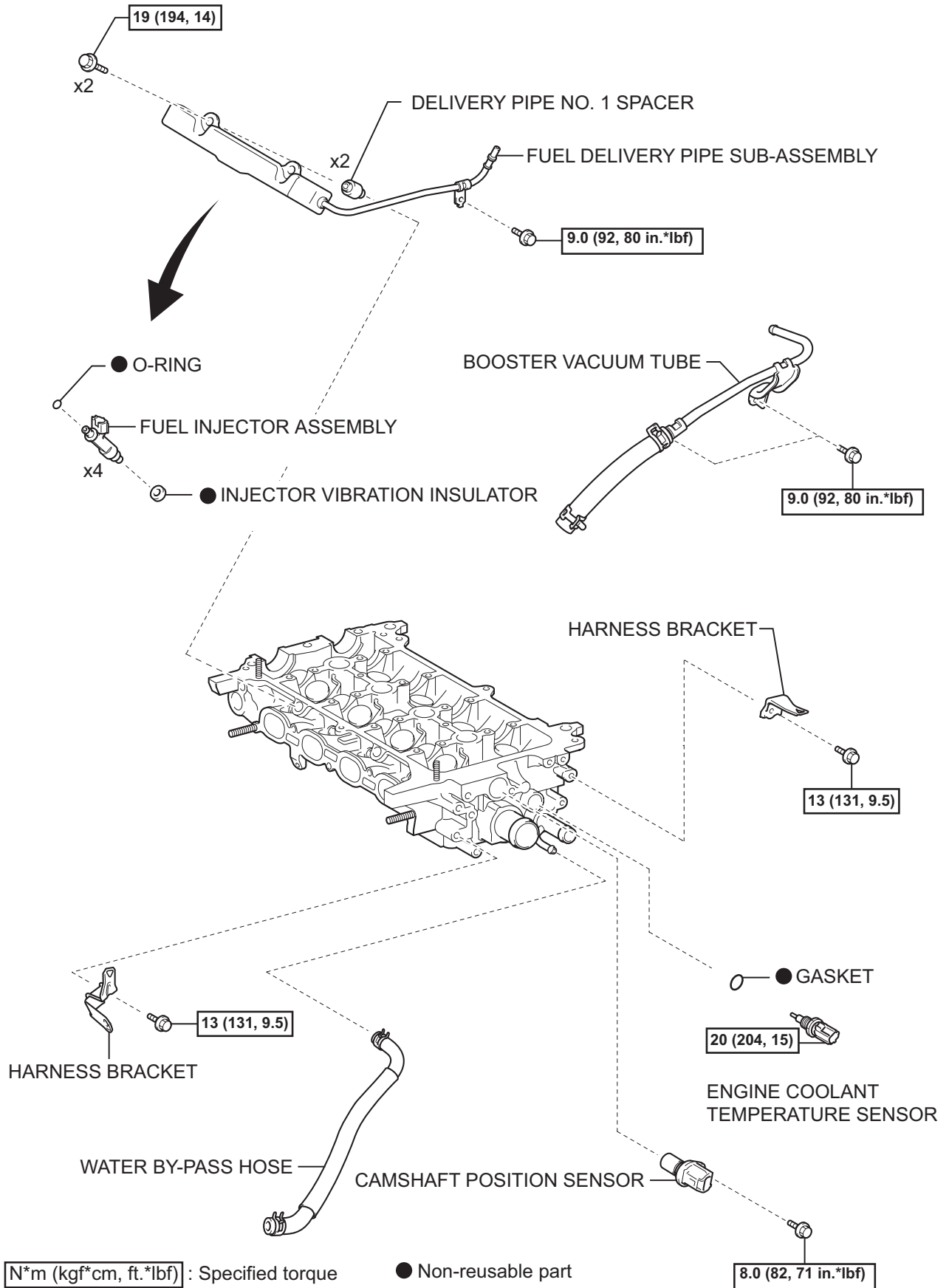
EM

EM

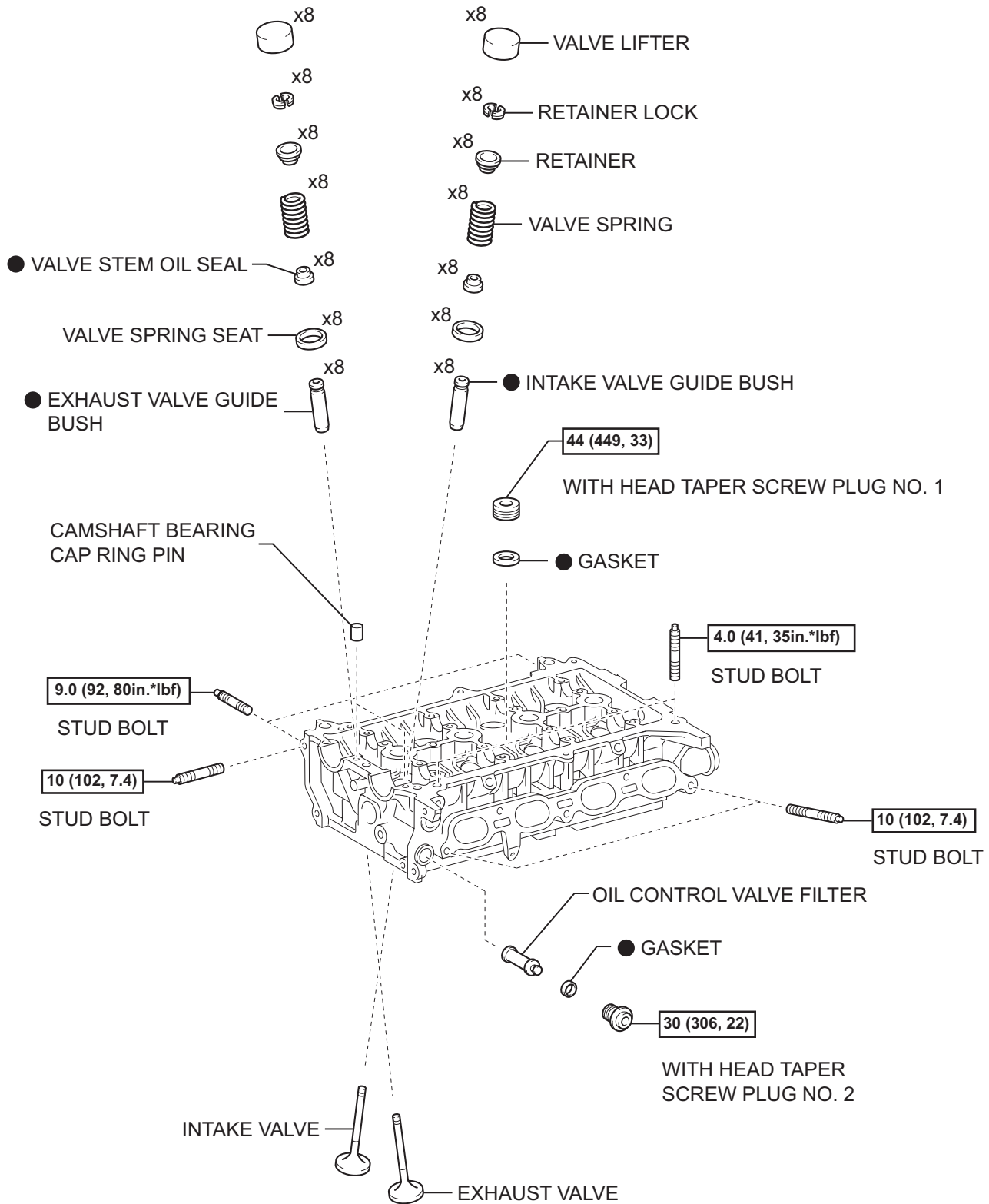


**N\*m (kgf\*cm, ft.\*lbf)** : Specified torque

● Non-reusable part



EM



**N\*m (kgf\*cm, ft.\*lbf) : Specified torque**

● Non-reusable part

## REMOVAL

1. DISCHARGE FUEL SYSTEM PRESSURE  
(See Page [FU-1](#))
2. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL
3. REMOVE FRONT WIPER ARM HEAD CAP (for Hatchback) (See page [WW-17](#))
4. REMOVE FRONT WIPER ARM HEAD CAP (for Sedan) (See page [WW-9](#))
5. REMOVE FRONT WIPER ARM AND BLADE ASSEMBLY LH (for Hatchback) (See page [WW-17](#))
6. REMOVE FRONT WIPER ARM AND BLADE ASSEMBLY LH (for Sedan) (See page [WW-9](#))
7. REMOVE FRONT WIPER ARM AND BLADE ASSEMBLY RH (for Hatchback) (See page [WW-17](#))
8. REMOVE FRONT WIPER ARM AND BLADE ASSEMBLY RH (for Sedan) (See page [WW-9](#))
9. REMOVE HOOD TO COWL TOP SEAL (for Hatchback) (See page [WW-18](#))
10. REMOVE COWL TOP VENTILATOR LOUVER SUB-ASSEMBLY (for Hatchback) (See page [WW-18](#))
11. REMOVE COWL TOP VENTILATOR LOUVER LH (for Hatchback) (See page [WW-18](#))
12. REMOVE COWL SIDE VENTILATOR SUB-ASSEMBLY LH (for Sedan) (See page [WW-10](#))
13. REMOVE COWL SIDE VENTILATOR SUB-ASSEMBLY RH (for Sedan) (See page [WW-10](#))
14. REMOVE COWL TOP VENTILATOR LOUVER SUB-ASSEMBLY (for Sedan) (See page [WW-10](#))
15. REMOVE FRONT WIPER MOTOR AND LINK (for Hatchback) (See page [WW-19](#))
16. REMOVE FRONT WIPER MOTOR AND LINK (for Sedan) (See page [WW-10](#))
17. REMOVE COWL TO REGISTER DUCT SUB-ASSEMBLY NO. 2 (for Hatchback) (See page [EM-122](#))
18. REMOVE FRONT AIR SHUTTER SEAL RH (for Sedan) (See page [ES-432](#))
19. REMOVE COWL TOP PANEL OUTER (for Hatchback) (See page [EM-123](#))
20. REMOVE COWL TOP PANEL OUTER (for Sedan) (See page [ES-432](#))
21. REMOVE BATTERY
22. REMOVE BATTERY TRAY
23. REMOVE FRONT WHEEL RH

**24. REMOVE ENGINE UNDER COVER RH**

**25. DRAIN ENGINE OIL**

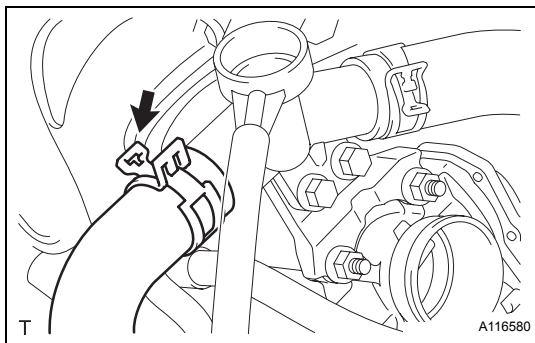
**26. DRAIN ENGINE COOLANT (See page [CO-8](#))**

**27. REMOVE CYLINDER HEAD COVER NO. 2 (See page [IG-9](#))**

**28. REMOVE AIR CLEANER CAP SUB-ASSEMBLY WITH AIR CLEANER HOSE NO. 1 (See page [ES-410](#))**

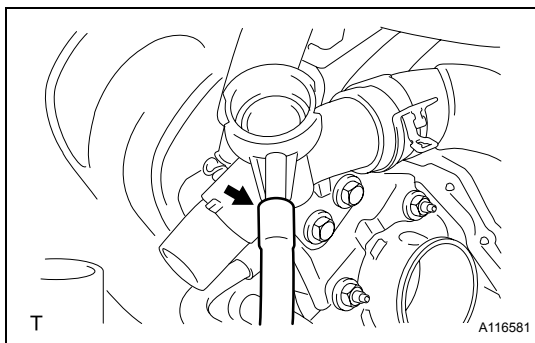
**29. DISCONNECT RADIATOR HOSE NO. 3**

(a) Disconnect radiator hose No. 3.



**30. DISCONNECT RESERVE TANK HOSE**

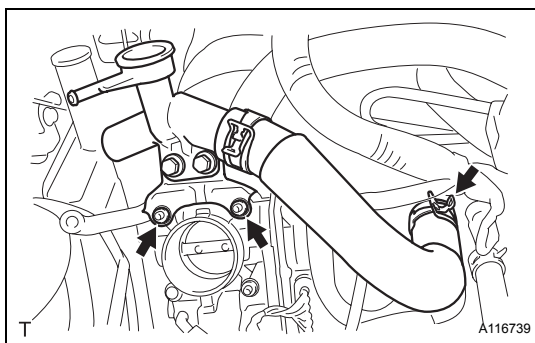
(a) Disconnect the reserve tank hose.



**31. REMOVE WATER FILLER SUB-ASSEMBLY**

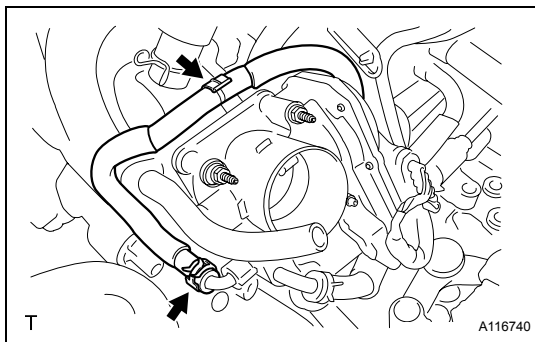
(a) Separate radiator hose No. 1 from the cylinder head.

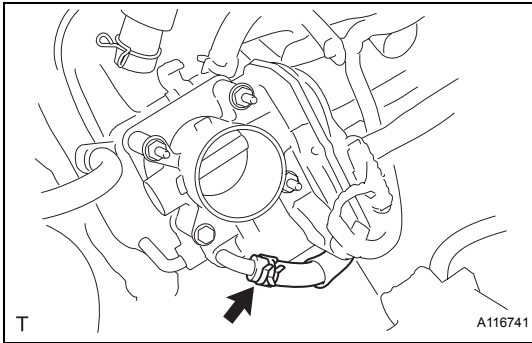
(b) Remove the 2 nuts and remove the water filler sub-assembly.



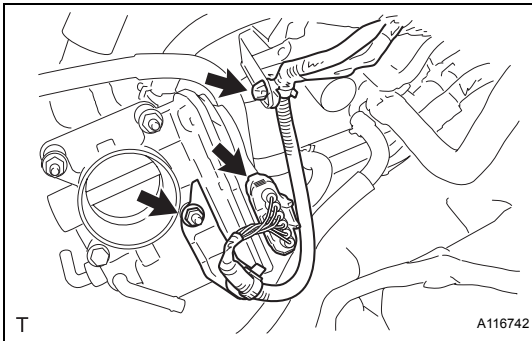
**32. DISCONNECT WATER BY-PASS HOSE NO. 2**

(a) Disconnect water by-pass hose No. 2.

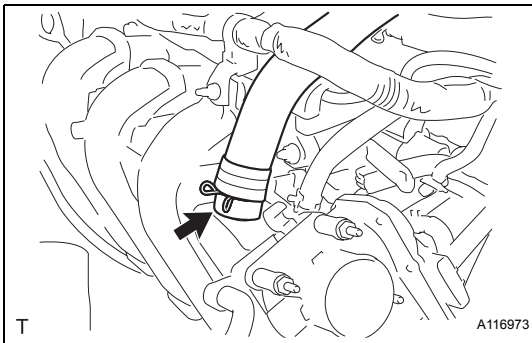


**33. DISCONNECT WATER BY-PASS HOSE**

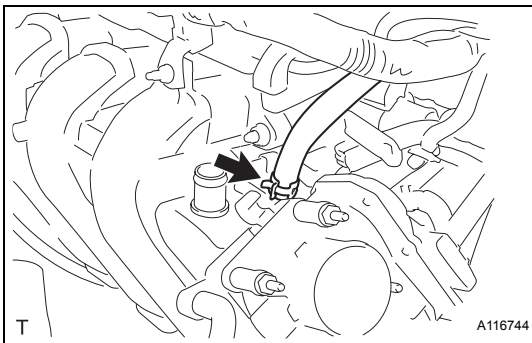
- (a) Disconnect the water by-pass hose.

**34. DISCONNECT THROTTLE WITH MOTOR BODY CONNECTOR**

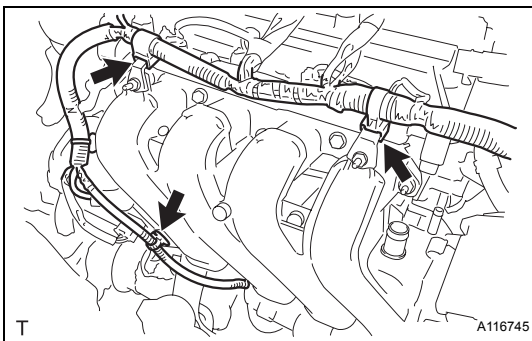
- (a) Separate the wire harness clamp.  
(b) Remove the nut and separate the throttle with motor body connector.

**35. DISCONNECT VENTILATION HOSE**

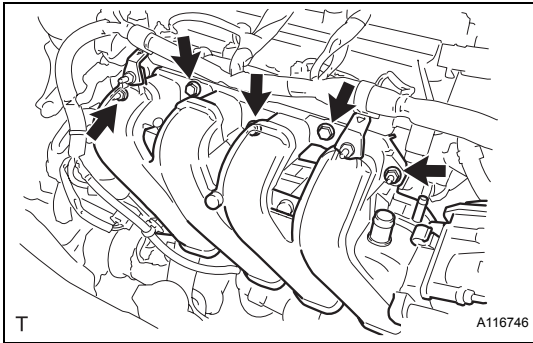
- (a) Disconnect the ventilation hose.

**36. DISCONNECT UNION TO CONNECTOR TUBE HOSE**

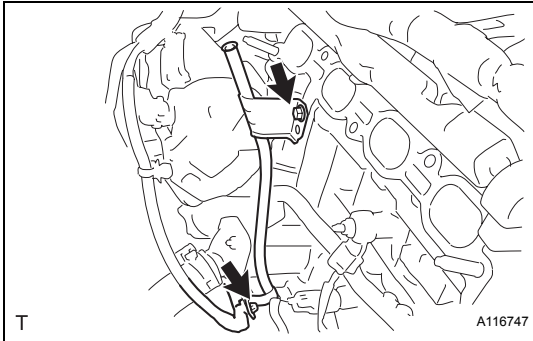
- (a) Disconnect the union to connector tube hose.

**37. REMOVE OIL LEVEL GAUGE SUB-ASSEMBLY****38. REMOVE INTAKE MANIFOLD**

- (a) Separate the 3 wire harness clamps shown in the illustration.



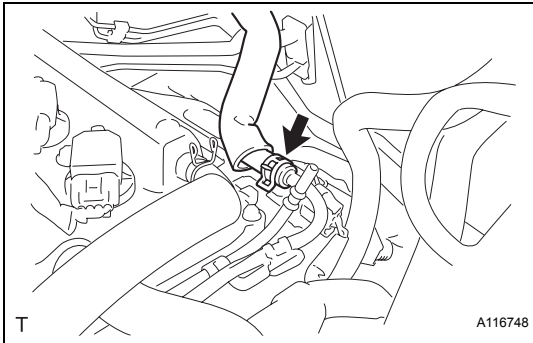
- (b) Remove the 3 bolts and 2 nuts and remove the intake manifold.



### 39. REMOVE OIL LEVEL GAUGE GUIDE

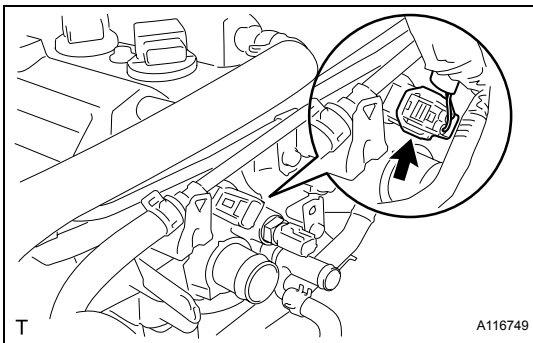
- (a) Remove the wire harness clamp and the bolt and remove the oil level gauge guide.

### 40. DISCONNECT FUEL TUBE SUB-ASSEMBLY (See page [FU-14](#))



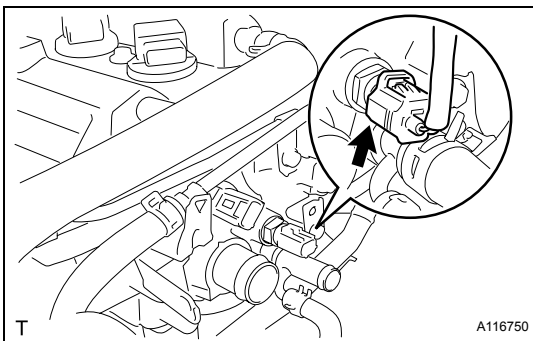
### 41. DISCONNECT BOOSTER VACUUM TUBE

- (a) Disconnect the booster vacuum tube.



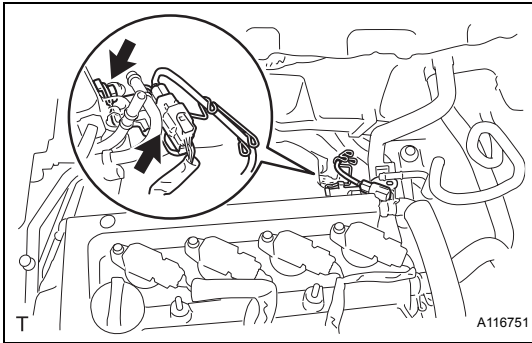
### 42. DISCONNECT CAMSHAFT POSITION SENSOR CONNECTOR

- (a) Disconnect the camshaft position sensor connector.

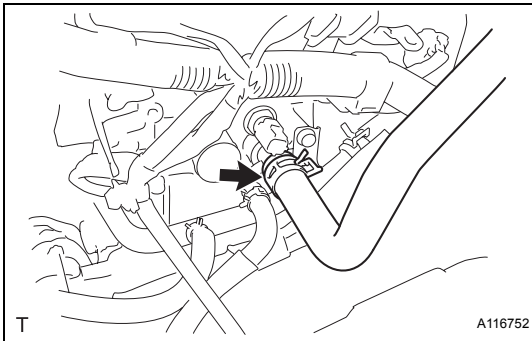


### 43. DISCONNECT ENGINE COOLANT TEMPERATURE SENSOR CONNECTOR

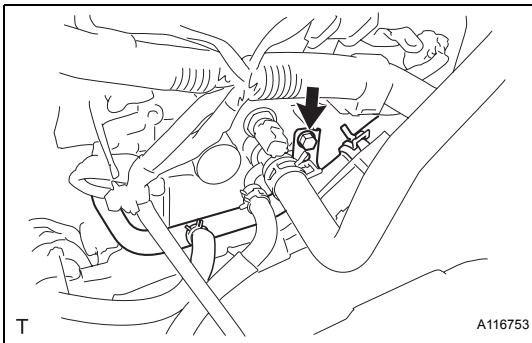
- (a) Disconnect the engine coolant temperature sensor connector.

**44. DISCONNECT HEATED OXYGEN SENSOR CONNECTOR**

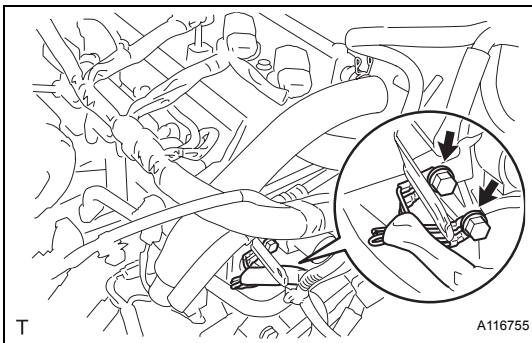
- (a) Remove the bolts and separate the sensor bracket.
- (b) Disconnect the heated oxygen sensor connector.

**45. DISCONNECT HEATER WATER INLET HOSE A**

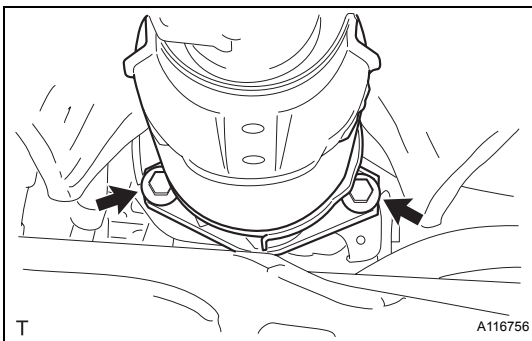
- (a) Disconnect heater water inlet hose A.

**46. SEPARATE WATER BY-PASS PIPE NO. 1**

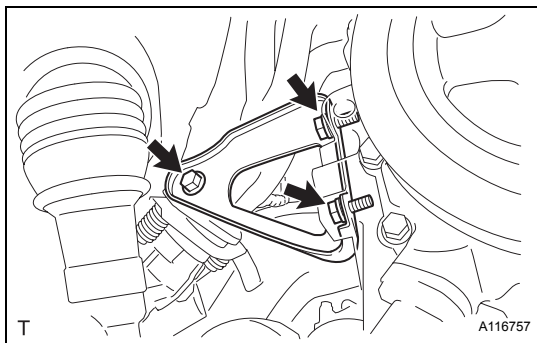
- (a) Remove the bolt and separate water by-pass pipe No. 1.

**47. DISCONNECT WIRE HARNESS**

- (a) Remove the 2 bolts and disconnect the wire harness.

**48. SEPARATE EXHAUST PIPE ASSEMBLY FRONT**

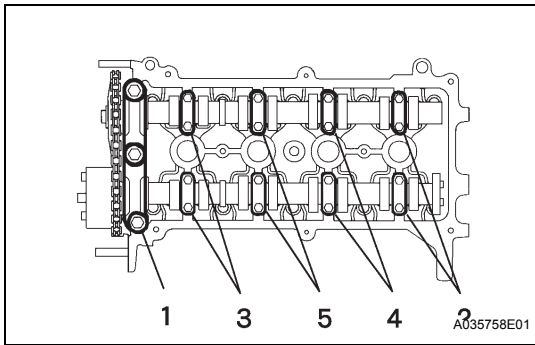
- (a) Remove the 2 bolts and 2 compression springs and separate the exhaust pipe assembly front.

**49. REMOVE MANIFOLD SUPPORT BRACKET**

- (a) Remove the 3 bolts and remove the manifold support bracket.

**50. REMOVE FAN AND GENERATOR V BELT** (See page [EM-7](#))**51. REMOVE GENERATOR ASSEMBLY** (See page [CH-10](#))**52. REMOVE IGNITION COIL NO. 1** (See page [IG-9](#))**53. REMOVE VENTILATION HOSE** (See page [FU-13](#))**54. REMOVE VENTILATION HOSE NO. 2** (See page [FU-13](#))**55. REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY** (See page [FU-13](#))**56. REMOVE ENGINE MOUNTING INSULATOR SUB-ASSEMBLY RH** (See page [LU-17](#))**57. REMOVE CRANKSHAFT DAMPER SUB-ASSEMBLY** (See page [LU-18](#))**58. REMOVE CRANKSHAFT POSITION SENSOR** (See page [ES-403](#))**59. REMOVE CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY** (See page [ES-396](#))**60. REMOVE WATER PUMP PULLEY** (See page [CO-15](#))**61. REMOVE WATER PUMP ASSEMBLY** (See page [CO-15](#))**62. REMOVE TRANSVERSE ENGINE ENGINE MOUNTING BRACKET** (See page [LU-17](#))**63. REMOVE OIL PUMP ASSEMBLY** (See page [LU-19](#))**64. REMOVE OIL PUMP SEAL** (See page [LU-21](#))**65. REMOVE CHAIN TENSIONER ASSEMBLY NO. 1** (See page [EM-33](#))**66. REMOVE CHAIN TENSIONER SLIPPER** (See page [EM-35](#))**67. REMOVE CHAIN VIBRATION DAMPER NO. 1** (See page [EM-35](#))**68. REMOVE CHAIN SUB-ASSEMBLY****69. REMOVE CAMSHAFT****NOTICE:**

When rotating the camshaft with the timing chain removed, rotate the crankshaft counterclockwise 40° from the TDC first.

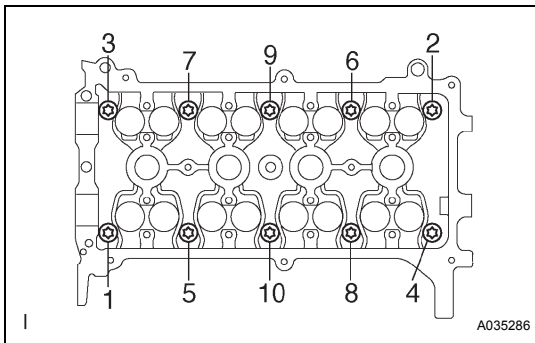


- (a) Using several steps, uniformly loosen and remove the 19 bearing cap bolts in the sequence shown in the illustration, and then remove camshaft bearing cap No. 1 and camshaft bearing cap No. 2.

**NOTICE:**

**Loosen each bolt uniformly while keeping the camshaft level.**

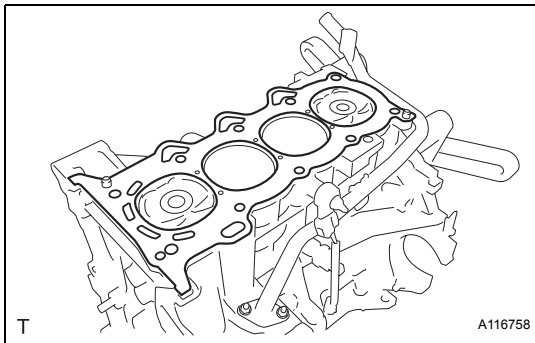
- (b) Remove the camshaft and camshaft No. 2.

**70. REMOVE CYLINDER HEAD SUB-ASSEMBLY**

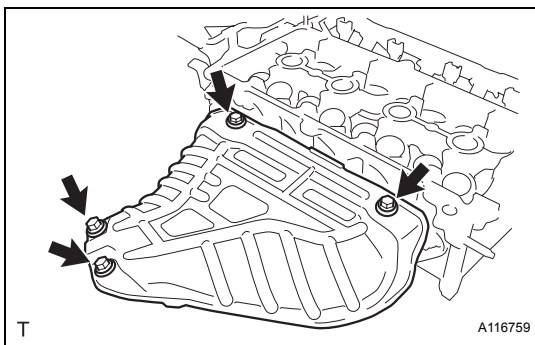
- (a) Using several steps, uniformly loosen and remove the 10 cylinder head bolts with an 8 mm bi-hexagon wrench in the sequence shown in the illustration. Remove the 10 plate washers.

**NOTICE:**

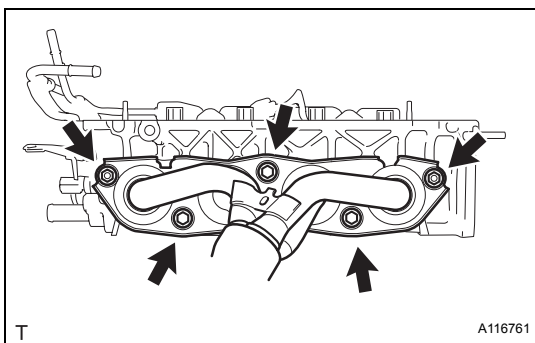
- Do not drop the washers into the cylinder head.
- Head warpage or cracking could result from removing the bolts in the wrong order.

**71. REMOVE CYLINDER HEAD GASKET**

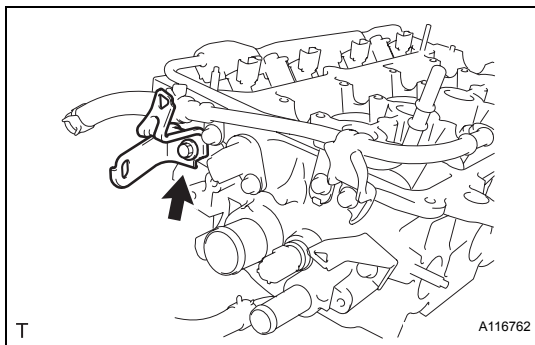
- (a) Remove the cylinder head gasket.

**72. REMOVE EXHAUST MANIFOLD HEAT INSULATOR NO. 1**

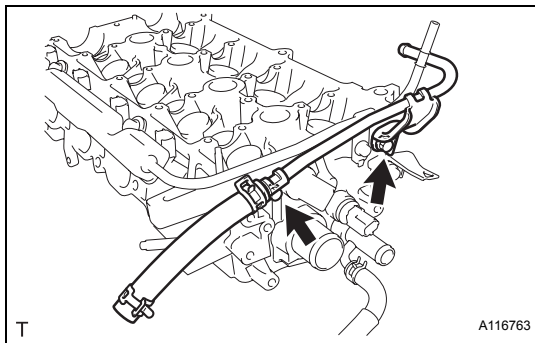
- (a) Remove the 4 bolts and remove exhaust manifold heat insulator No. 1.

**73. REMOVE EXHAUST MANIFOLD**

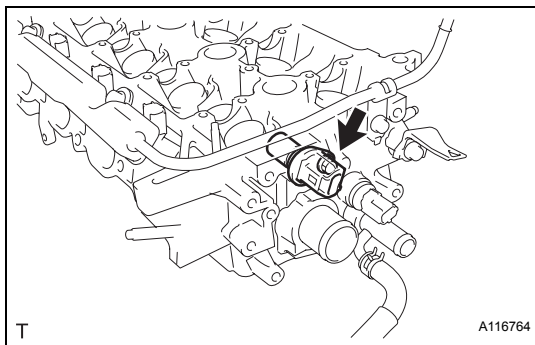
- (a) Remove the 3 bolts and 2 nuts and remove the exhaust manifold.

**74. REMOVE HARNESS BRACKET**

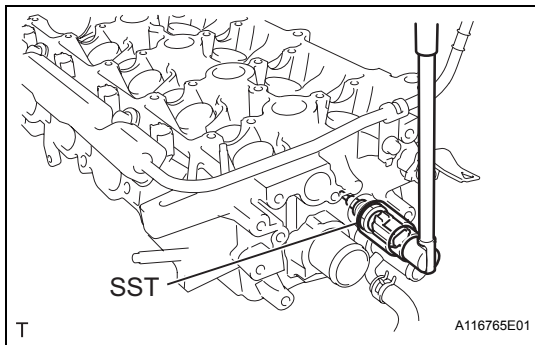
- (a) Remove the bolt and remove the harness bracket.

**75. REMOVE BOOSTER VACUUM TUBE**

- (a) Remove the 2 bolts and remove the booster vacuum tube.

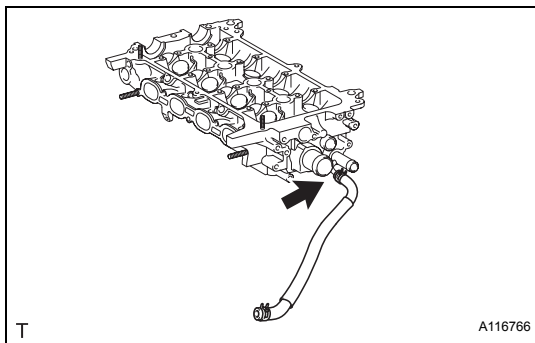
**76. REMOVE CAMSHAFT POSITION SENSOR**

- (a) Remove the bolt and remove the camshaft position sensor.

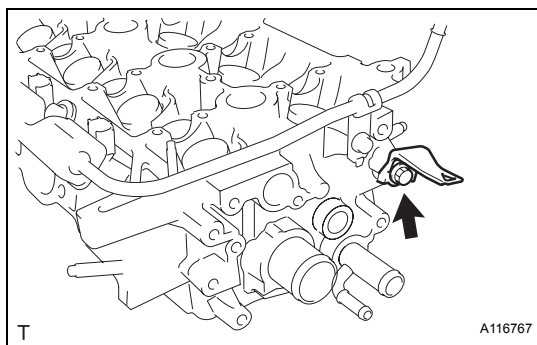
**77. REMOVE ENGINE COOLANT TEMPERATURE SENSOR**

- (a) Using SST, remove the engine coolant temperature sensor connector.

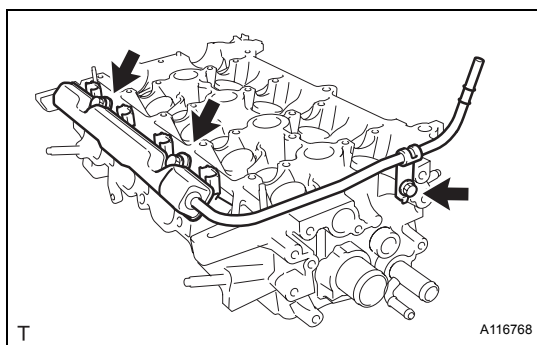
**SST 09817-33190**

**78. REMOVE WATER BY-PASS HOSE**

- (a) Remove the water by-pass hose.

**79. REMOVE HARNESS BRACKET**

- (a) Remove the bolt and remove the harness bracket.

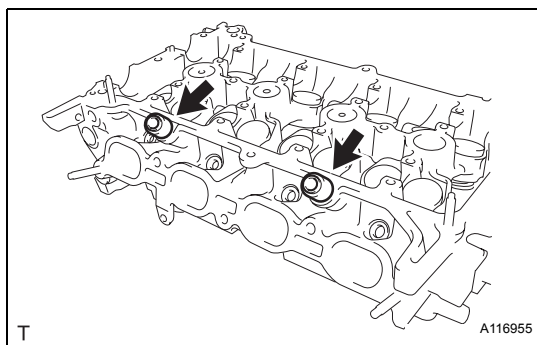
**80. REMOVE FUEL DELIVERY PIPE SUB-ASSEMBLY**

- (a) Remove the 3 bolts and remove the fuel delivery pipe sub-assembly with 4 fuel injectors.

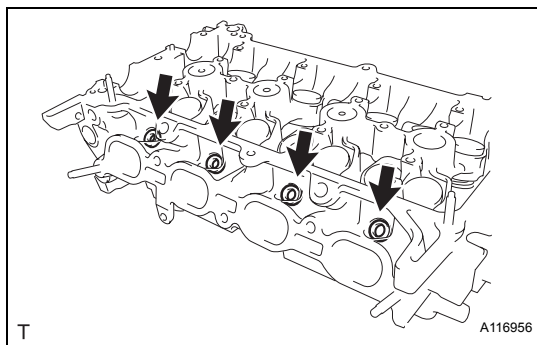
**NOTICE:**

Do not drop the fuel injectors when removing the fuel delivery pipe sub-assembly.

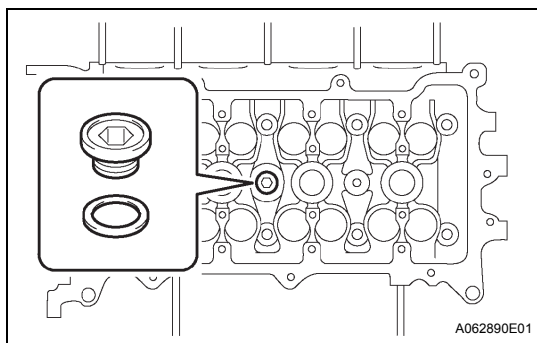
EM

**81. REMOVE FUEL INJECTOR ASSEMBLY (See page [FU-16](#))****82. REMOVE DELIVERY PIPE NO. 1 SPACER**

- (a) Remove the 2 delivery pipe No. 1 spacers.

**83. REMOVE INJECTOR VIBRATION INSULATOR**

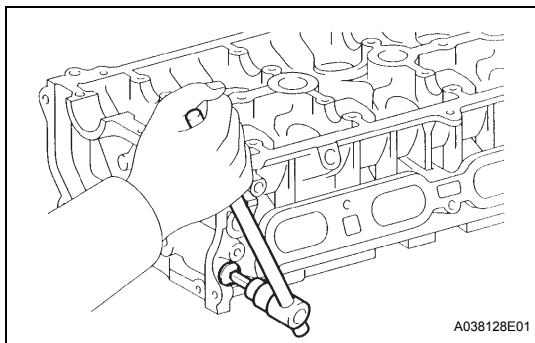
- (a) Remove the 4 injector vibration insulators.

**DISASSEMBLY****1. REMOVE WITH HEAD TAPER SCREW PLUG NO. 1**

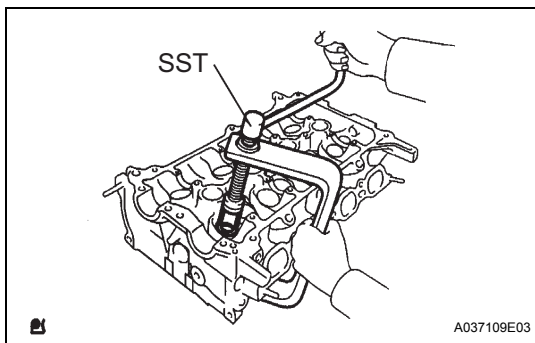
- (a) Using a 10 mm socket hexagon wrench, remove the taper screw plug and the gasket.

**2. REMOVE VALVE LIFTER****HINT:**

Keep the valve lifters in the correct order so that they can be returned to their original locations when reassembled.

**3. REMOVE WITH HEAD TAPER SCREW PLUG NO. 2**

- (a) Using an 8 mm hexagon wrench, remove the taper screw plug.

**4. REMOVE OIL CONTROL VALVE FILTER****5. REMOVE INTAKE VALVE**

- (a) Using SST, compress the valve spring and remove the 2 retainer locks, retainer and valve spring.

**SST 09202-70020 (09202-00010)**

**HINT:**

Keep the valves, valve springs, spring seats and spring retainers in the correct order so that they can be returned to their original locations when reassembled.

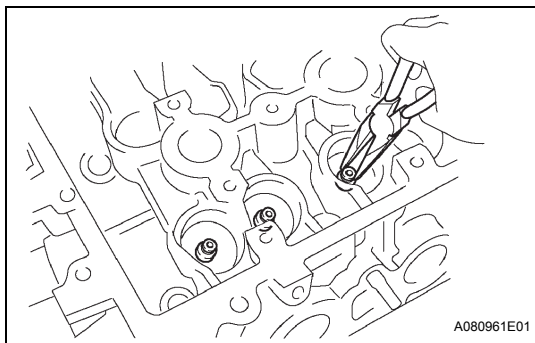
**6. REMOVE EXHAUST VALVE**

- (a) Using SST, compress the valve spring and remove the 2 retainer locks, retainer and valve spring.

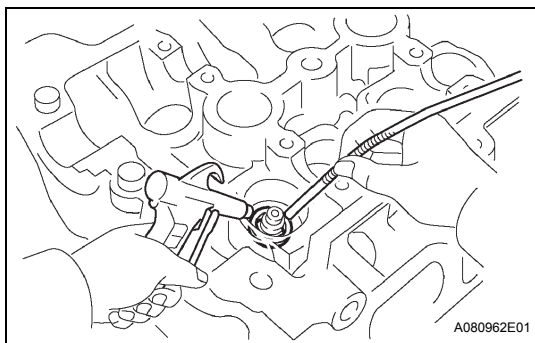
**SST 09202-70020 (09202-00010)**

**HINT:**

Keep the valves, valve springs, spring seats and spring retainers in the correct order so that they can be returned to their original locations when reassembled.

**7. REMOVE VALVE STEM OIL SEAL**

- (a) Using needle-nose pliers, remove the oil seal.

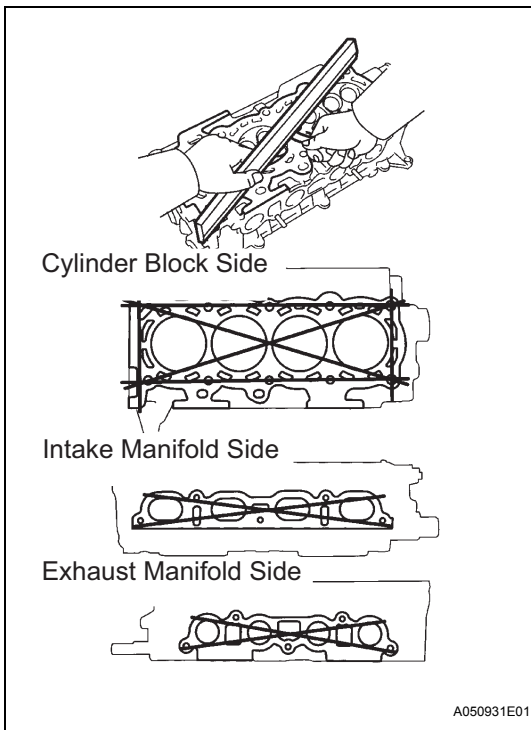
**8. REMOVE VALVE SPRING SEAT**

- (a) Using compressed air and a magnetic finger, remove the valve spring seats.

**9. REMOVE STUD BOLT**

- (a) Using "Torx" socket wrenches E5 and E7, remove the 7 stud bolts.

**10. REMOVE CAMSHAFT BEARING CAP SETTING RING PIN**



## INSPECTION

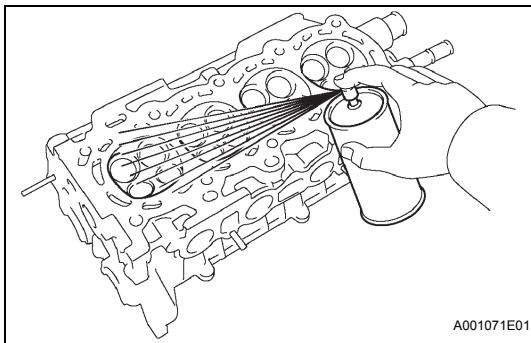
### 1. INSPECT CYLINDER HEAD FOR WARPAGE

- (a) Using a precision straightedge and feeler gauge, measure the warpage of the surface that is in contact with the cylinder block and the manifolds.

#### Maximum warpage

| Surface               | Specified Condition  |
|-----------------------|----------------------|
| Cylinder block side   | 0.05 mm (0.0020 in.) |
| Intake manifold side  | 0.10 mm (0.0039 in.) |
| Exhaust manifold side | 0.10 mm (0.0039 in.) |

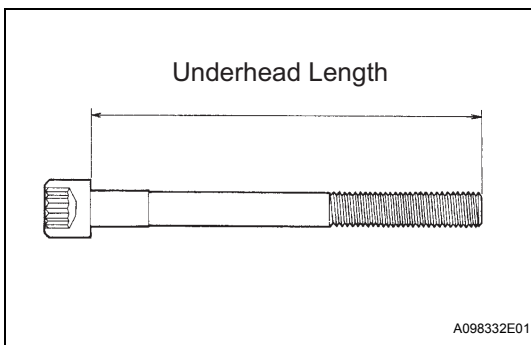
If the warpage is greater than the maximum, replace the cylinder head.



### 2. INSPECT CYLINDER HEAD FOR CRACKS

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

If cracked, replace the cylinder head.



### 3. INSPECT CYLINDER HEAD SET BOLT

- (a) Using vernier calipers, measure the length of the head bolts from the seat to the end.

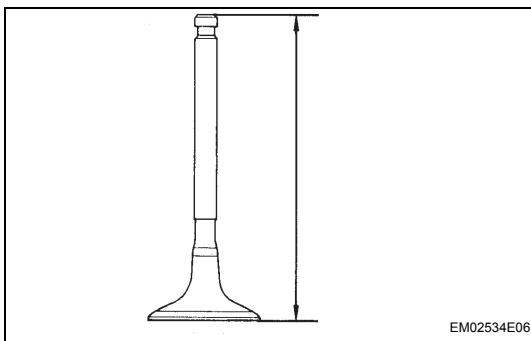
#### Standard length:

142.8 to 144.2 mm (5.622 to 5.677 in.)

#### Maximum length:

147.1 mm (5.791 in.)

If the length is greater than the maximum, replace the bolt.



### 4. INSPECT INTAKE VALVE

- (a) Check the overall valve length.

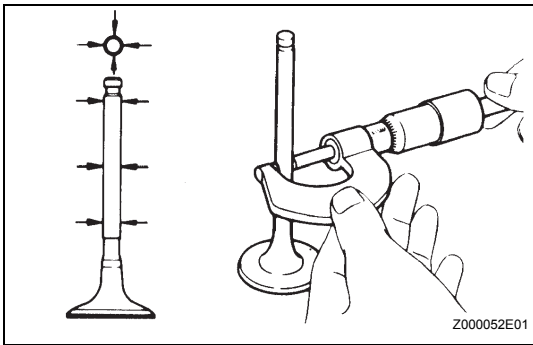
#### Standard overall length:

89.25 mm (3.5138 in.)

#### Minimum overall length:

88.75 mm (3.4941 in.)

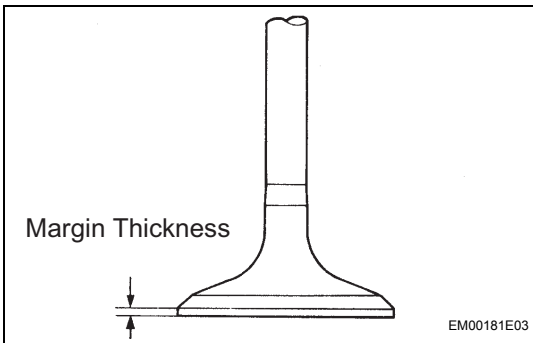
If the overall length is less than the minimum, replace the valve.



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

**Standard valve stem diameter:**

**4.970 to 4.985 mm (0.1957 to 0.1963 in.)**



- (c) Check the valve head margin thickness.

**Standard margin thickness:**

**1.0 mm (0.039 in.)**

**Minimum margin thickness:**

**0.5 mm (0.020 in.)**

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

## 5. INSPECT EXHAUST VALVE

- (a) Check the overall valve length.

**Standard overall length:**

**87.90 mm (3.4606 in.)**

**Minimum overall length:**

**87.40 mm (3.4409 in.)**

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

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

**Standard valve stem diameter:**

**4.965 to 4.980 mm (0.1955 to 0.1961 in.)**

- (c) Check the valve head margin thickness.

**Standard margin thickness:**

**1.15 mm (0.045 in.)**

**Minimum margin thickness:**

**0.5 mm (0.020 in.)**

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

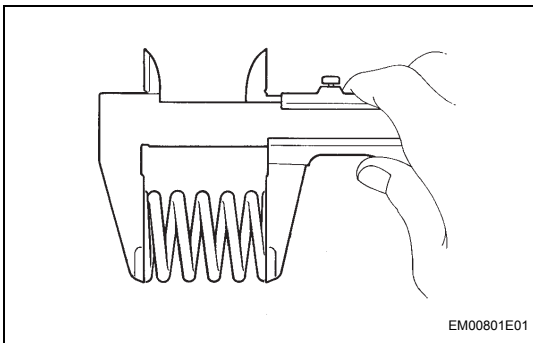
## 6. INSPECT VALVE SPRING

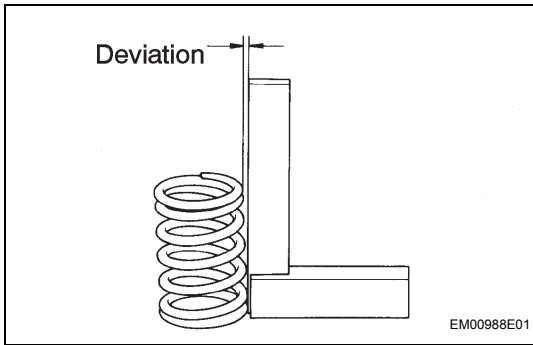
- (a) Using vernier calipers, measure the free length of the valve spring.

**Standard free length:**

**45.05 to 45.15 mm (1.774 to 1.778 in.)**

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





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

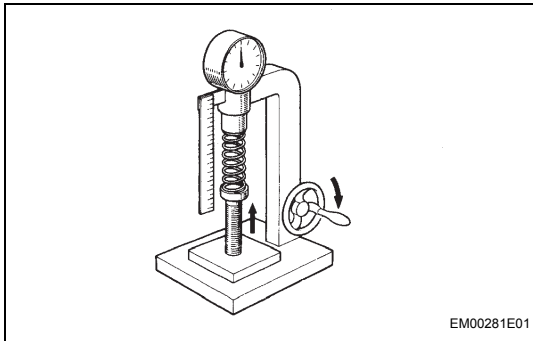
**Maximum deviation:**

**1.6 mm (0.063 in.)**

**Maximum angle (reference):**

**2°**

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



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

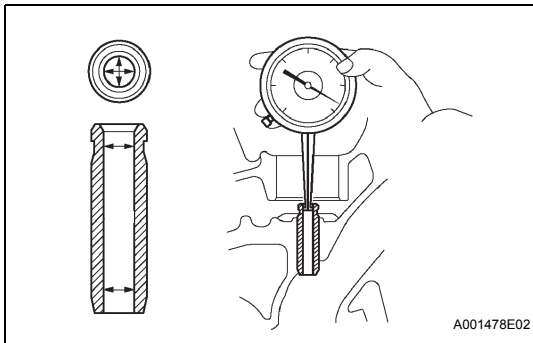
**Standard installed tension:**

**149 to 165 N (15.2 to 16.8 kgf, 33.5 to 37.1 lbf)  
at 32.5 mm (1.280 in.)**

**Maximum working tension:**

**286 to 316 N (29.1 to 32.2 kgf, 64.2 to 71.0 lbf)  
at 23.9 mm (0.941 in.)**

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



## 7. INSPECT VALVE GUIDE BUSH OIL CLEARANCE

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

**Bush inside diameter:**

**5.010 to 5.030 mm (0.1972 to 0.1980 in.)**

- (b) Subtract the valve stem diameter measurement from the guide bush inside diameter measurement to calculate the oil clearance.

**Standard oil clearance**

| Guide Bush | Specified Condition                         |
|------------|---------------------------------------------|
| Intake     | 0.025 to 0.060 mm<br>(0.0010 to 0.0024 in.) |
| Exhaust    | 0.030 to 0.065 mm<br>(0.0012 to 0.0026 in.) |

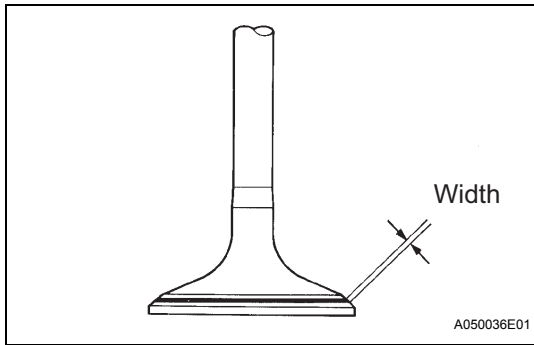
**Maximum oil clearance**

| Guide Bush | Specified Condition  |
|------------|----------------------|
| Intake     | 0.08 mm (0.0032 in.) |
| Exhaust    | 0.10 mm (0.0039 in.) |

If the clearance is greater than the maximum, replace the valve and guide bush (see page [EM-92](#)).

## 8. INSPECT INTAKE VALVE SEAT

- (a) Apply a light coat of prussian blue to the valve face.  
(b) Lightly press the valve against the seat.



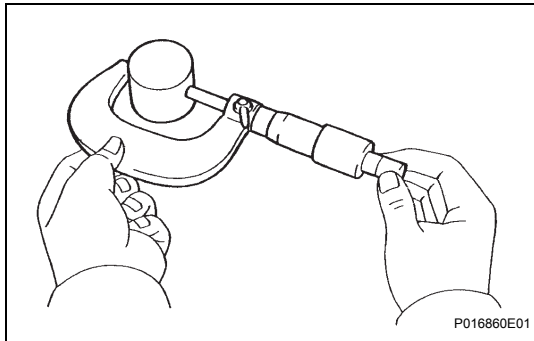
- (c) Check the valve face and seat in accordance with the following procedure.
- (1) If blue appears 360° around the face, the valve is concentric. If not, replace the valve.
  - (2) If blue appears 360° around the valve seat, the guide and face are concentric. If not, resurface the seat.
  - (3) Check that the seat contact is in the middle of the valve face with the width between 1.0 to 1.4 mm (0.039 to 0.055 in.).

## 9. INSPECT VALVE LIFTER

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

**Standard lifter diameter:**

**30.966 to 30.976 mm (1.2191 to 1.2195 in.)**



## 10. INSPECT VALVE LIFTER OIL CLEARANCE

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

**Standard lifter bore diameter:**

**31.000 to 31.025 mm (1.2205 to 1.2215 in.)**

- (b) Subtract the lifter diameter measurement from the lifter bore diameter measurement to calculate the oil clearance.

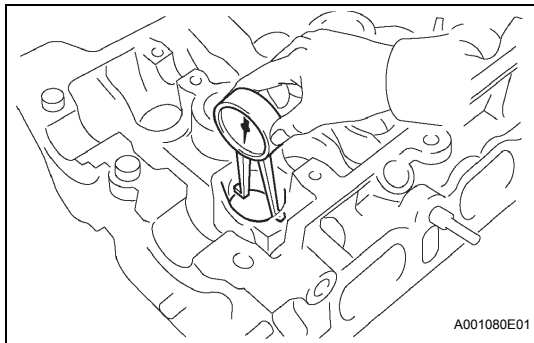
**Standard oil clearance:**

**0.024 to 0.059 mm (0.0009 to 0.0023 in.)**

**Maximum oil clearance:**

**0.1 mm (0.0039 in.)**

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



## 11. INSPECT CAMSHAFT

- (a) Inspect the camshaft for runout.

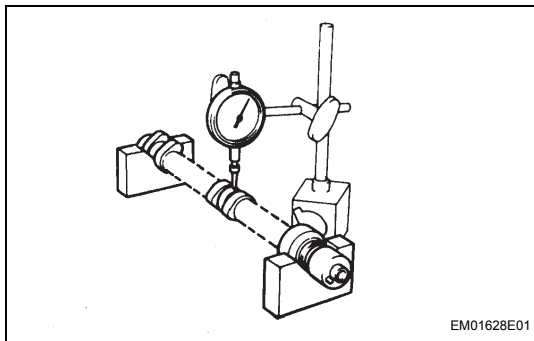
- (1) Place the camshaft on V-blocks.

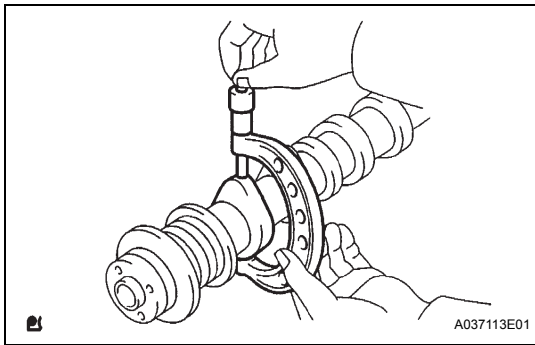
- (2) Using a dial indicator, measure the circle runout at the center journal.

**Maximum circle runout:**

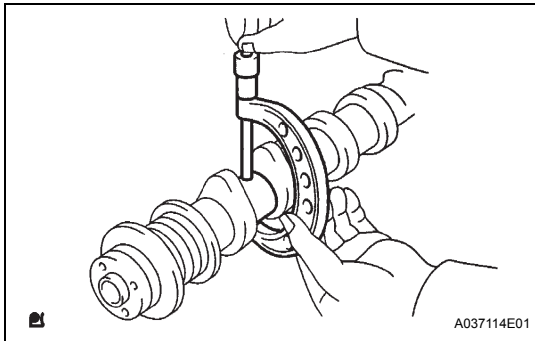
**0.03 mm (0.0012 in.)**

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





- (b) Inspect the cam lobes.
- (1) Using a micrometer, measure the cam lobe height.  
**Standard cam lobe height:**  
**44.617 to 44.717 mm (1.7566 to 1.7605 in.)**  
**Minimum cam lobe height:**  
**43.16 mm (1.6992 in.)**  
 If the cam lobe height is less than the minimum, replace the camshaft.



- (c) Inspect the camshaft journals.
- (1) Using a micrometer, measure the journal diameter.  
**Standard journal diameter**

| Journal        | Specified Condition                           |
|----------------|-----------------------------------------------|
| No. 1 journal  | 34.449 to 34.465 mm<br>(1.3563 to 1.3569 in.) |
| Other journals | 22.949 to 22.965 mm<br>(0.9035 to 0.9041 in.) |

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

## 12. INSPECT NO. 2 CAMSHAFT

- (a) Inspect the camshaft for runout.
- (1) Place the camshaft on V-blocks.
  - (2) Using a dial indicator, measure the circle runout at the center journal.  
**Maximum circle runout:**  
**0.03 mm (0.0012 in.)**  
 If the circle runout is greater than the maximum, replace the camshaft.

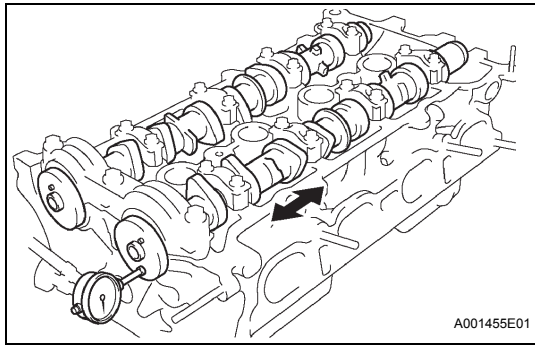
- (b) Inspect the cam lobes.
- (1) Using a micrometer, measure the cam lobe height.  
**Standard cam lobe height:**  
**44.666 to 44.766 (1.7585 to 1.7624 in.)**  
**Minimum cam lobe height:**  
**44.52 mm (1.7528 in.)**  
 If the cam lobe height is less than the minimum, replace the camshaft.

- (c) Inspect the camshaft journals.
- (1) Using a micrometer, measure the journal diameter.

### Standard journal diameter

| Journal        | Specified Condition                           |
|----------------|-----------------------------------------------|
| No. 1 journal  | 34.449 to 34.465 mm<br>(1.3563 to 1.3569 in.) |
| Other journals | 22.949 to 22.965 mm<br>(0.9035 to 0.9041 in.) |

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



### 13. INSPECT CAMSHAFT THRUST CLEARANCE

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

**Standard thrust clearance:**

**0.040 to 0.095 mm (0.0016 to 0.0037 in.)**

**Maximum thrust clearance:**

**0.11 mm (0.0043 in.)**

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

### 14. INSPECT CAMSHAFT OIL CLEARANCE

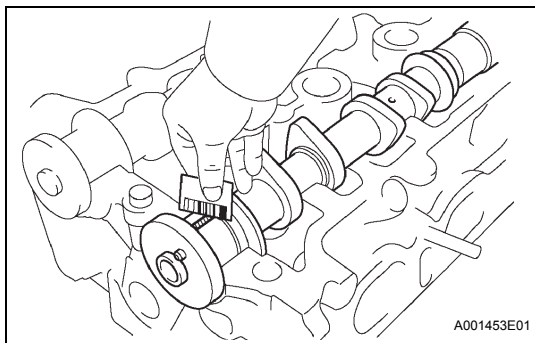
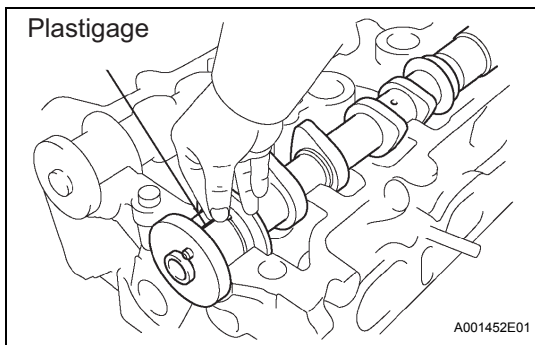
- (a) Clean the bearing caps and the camshaft journals.
- (b) Place the camshafts on the cylinder head.

- (c) Lay a strip of Plastigage across each of the camshaft journals.
- (d) Install the bearing caps (see page [EM-97](#)).

**NOTICE:**

**Do not turn the camshaft.**

- (e) Remove the bearing caps.



- (f) Measure the Plastigage at its widest point.

**Standard oil clearance:**

**0.035 to 0.072 mm (0.0014 to 0.0028 in.)**

**Maximum oil clearance:**

**0.08 mm (0.0031 in.)**

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

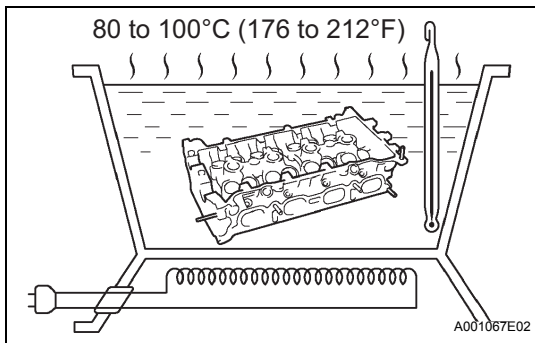
**NOTICE:**

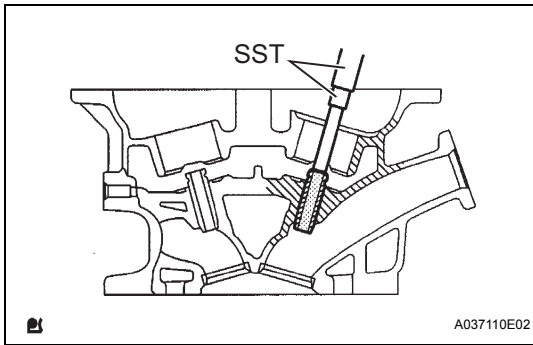
**Completely remove the Plastigage after the measurement.**

## REPLACEMENT

### 1. REMOVE INTAKE VALVE GUIDE BUSH

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





- (b) Using SST and a hammer, tap out the guide bushing.

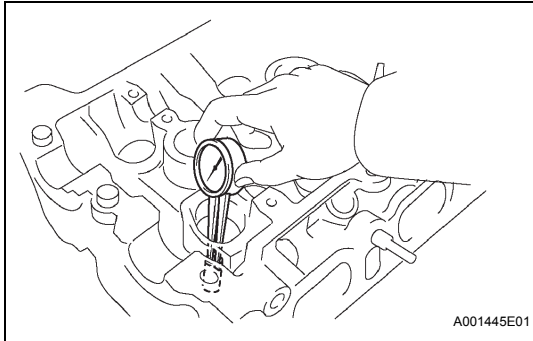
**SST 09201-10000 (09201-01050), 09950-70010 (09951-07100)**

## 2. REMOVE EXHAUST VALVE GUIDE BUSH

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

- (b) Using SST and a hammer, tap out the guide bushing.

**SST 09201-10000 (09201-01050), 09950-70010 (09951-07100)**



## 3. INSTALL INTAKE VALVE GUIDE BUSH

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

**Inside Diameter:**

**9.685 to 9.706 mm (0.3813 to 0.3821 in.)**

If the bushing bore diameter of the cylinder head is greater than 9.706 mm (0.3821 in.), machine the bushing bore to the dimension of 9.735 to 9.755 mm (0.3833 to 0.3841 in.).

| Bushing bore diameter<br>mm (in.)    | Bushing size |
|--------------------------------------|--------------|
| 9.685 to 9.706<br>(0.3813 to 0.3821) | STD          |
| 9.735 to 9.755<br>(0.3833 to 0.3841) | O/S 0.05     |

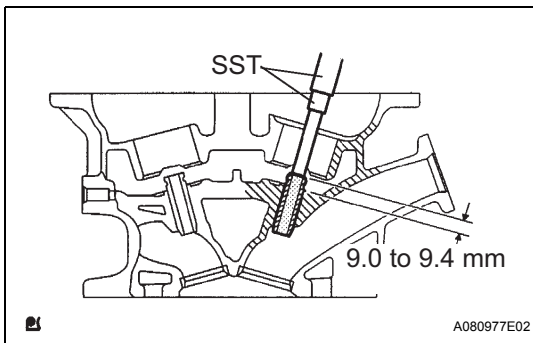
- (b) Heat the cylinder head to 80 to 100°C (176 to 212°F).

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

**SST 09201-10000 (09201-01050), 09950-70010 (09951-07100)**

**Protrusion height:**

**9.0 to 9.4 mm (0.354 to 0.370 in.)**



- (d) Using a sharp 5 mm reamer, ream the guide bushing to obtain the standard oil clearance between the guide bushing and valve stem.

**Standard oil clearance:**

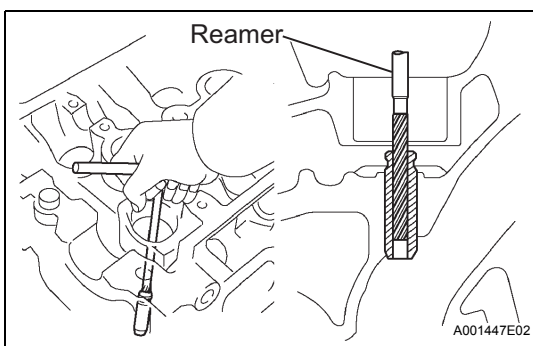
**0.025 to 0.060 mm (0.0010 to 0.0024 in.)**

## 4. INSTALL EXHAUST VALVE GUIDE BUSH

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

**Inside Diameter:**

**9.685 to 9.706 mm (0.3813 to 0.3821 in.)**



If the bushing bore diameter of the cylinder head is greater than 9.706 mm (0.3821 in.), machine the bushing bore to the dimension of 9.735 to 9.755 mm (0.3833 to 0.3841 in.).

| Bushing bore diameter<br>mm (in.)    | Bushing size |
|--------------------------------------|--------------|
| 9.685 to 9.706<br>(0.3813 to 0.3821) | STD          |
| 9.735 to 9.755<br>(0.3833 to 0.3841) | O/S 0.05     |

- (b) Heat the cylinder head to 80 to 100°C (176 to 212°F).
- (c) Using SST and a hammer, tap a new guide bushing in to the specified protrusion height.  
**SST 09201-10000 (09201-01050), 09950-70010 (09951-07100)**

**Protrusion height:**  
**9.0 to 9.4 mm (0.354 to 0.370 in.)**

- (d) Using a sharp 5 mm reamer, ream the guide bushing to obtain the standard oil clearance between the guide bushing and valve stem.  
**Standard oil clearance:**  
**0.030 to 0.065 mm (0.0012 to 0.0026 in.)**

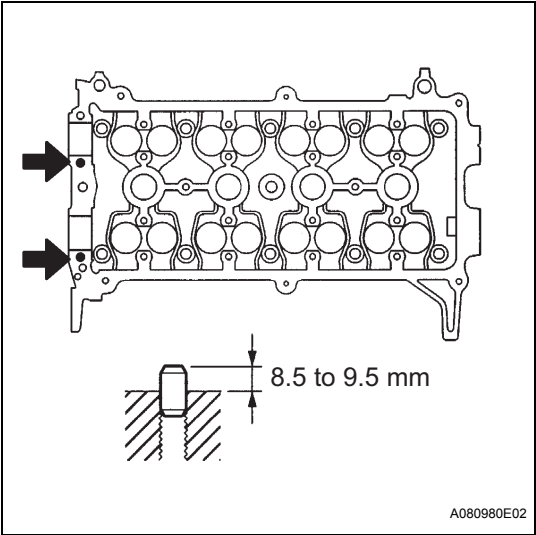
**REASSEMBLY**

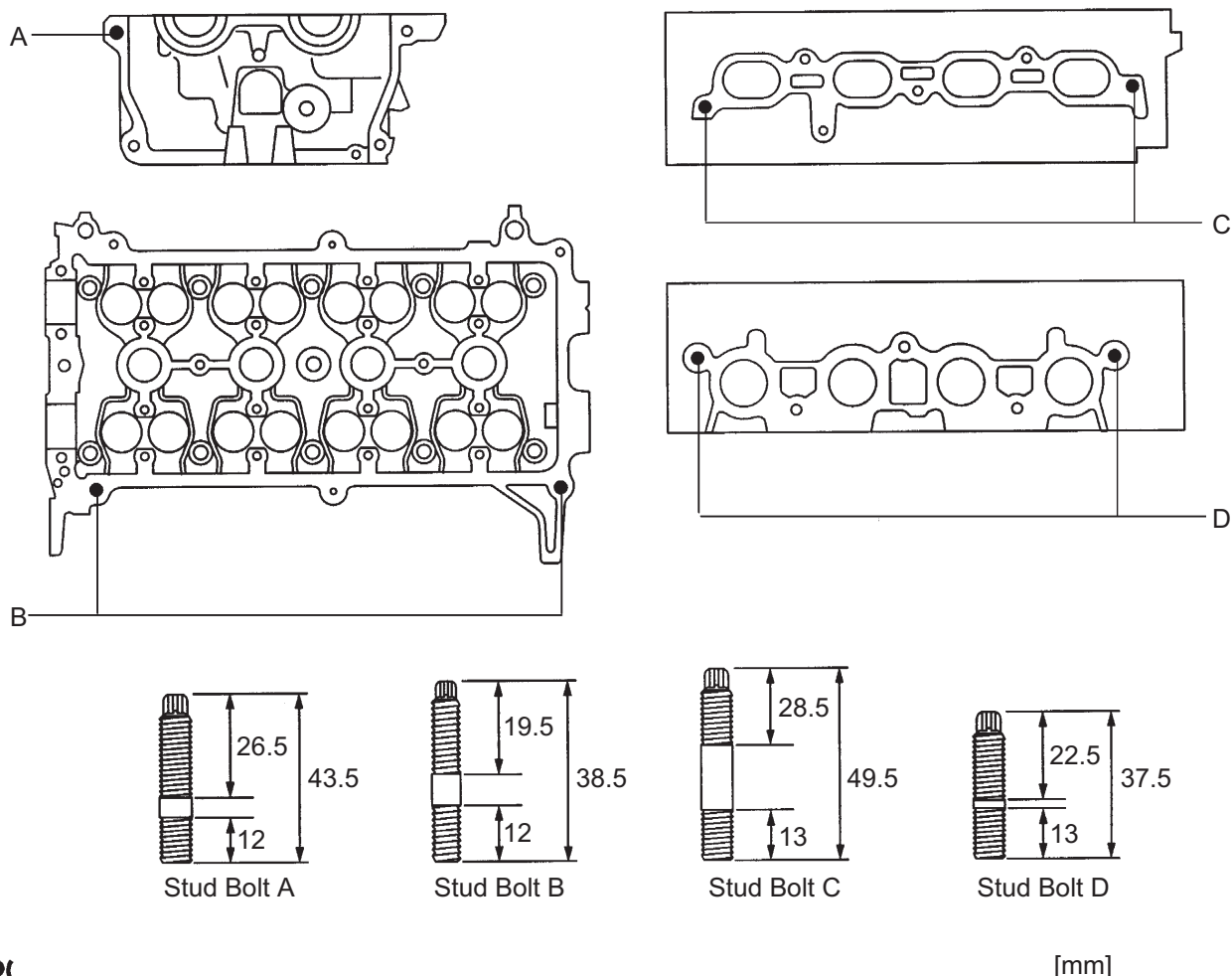
**1. INSTALL CAMSHAFT BEARING CAP SETTING RING PIN**

- (a) Using a plastic-faced hammer, tap a new ring pin in to the specified protrusion height.  
**Protrusion height:**  
**8.5 to 9.5 mm (0.335 to 0.374 in.)**

**2. INSTALL STUD BOLT**

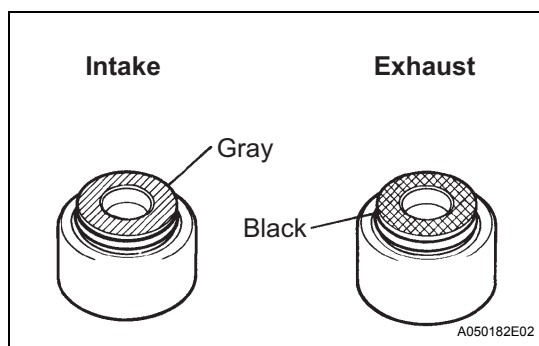
- (a) Using "Torx" socket wrenches E5 and E7, install the 7 stud bolts.  
**Torque:**  
**Stud bolt A:**  
**10 N\*m (102 kgf\*cm, 7.4 ft.\*lbf)**  
**Stud bolt B:**  
**4.0 N\*m (41 kgf\*cm, 35 in.\*lbf)**  
**Stud bolt C:**  
**10 N\*m (102 kgf\*cm, 7.4 ft.\*lbf)**  
**Stud bolt D:**  
**9.0 N\*m (92 kgf\*cm, 80 in.\*lbf)**





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EM



### 3. INSTALL VALVE STEM OIL SEAL

- (a) Apply a light coat of engine oil to new valve stem oil seals.

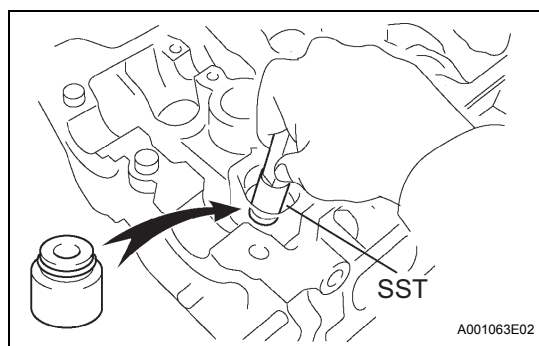
**NOTICE:**

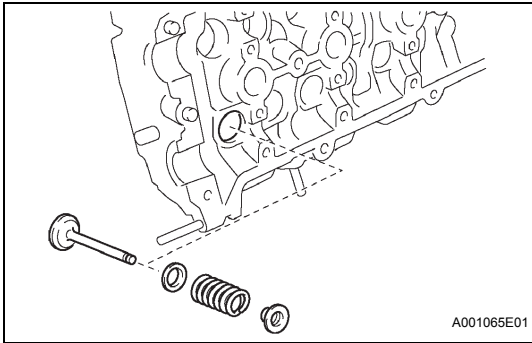
**Installing the oil seals for the intake and exhaust onto the opposite valve guide bush as may cause failures.**

**HINT:**

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

- (b) Using SST, push in the oil seals.  
**SST 09201-41020**



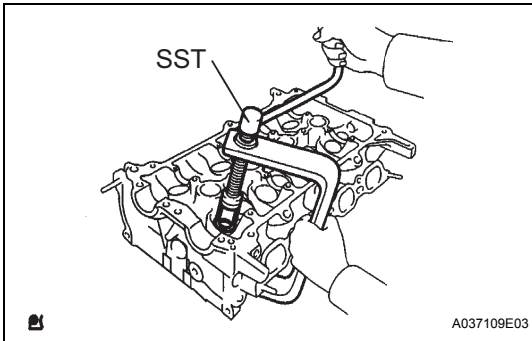


#### 4. INSTALL INTAKE VALVE

- (a) Install the valve, spring seat, valve spring, and spring retainer.

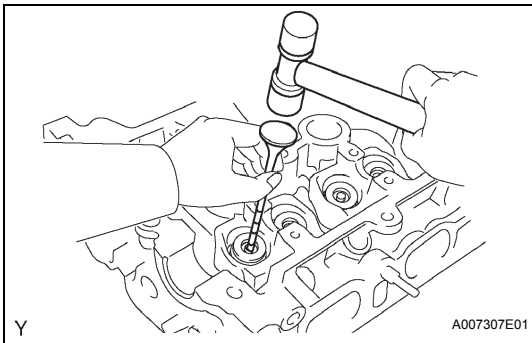
**NOTICE:**

**Install the parts in their original locations in the original order.**



- (b) Using SST, compress the valve spring and place the 2 retainer locks around the valve stem.

**SST 09202-70020 (09202-00010)**



- (c) Using a plastic-faced hammer and the valve stem (not in use) with its tip wrapped in tape, gently tap the valve stem tip to ensure a proper fit.

**NOTICE:**

**Do not damage the valve stem tip.**

#### 5. INSTALL EXHAUST VALVE

- (a) Install the valve, spring seat, valve spring, and spring retainer.

- (b) Using SST, compress the valve spring and place the 2 retainer locks around the valve stem.

**SST 09202-70020 (09202-00010)**

- (c) Using a plastic-faced hammer and the valve stem (not in use) with its tip wrapped in tape, lightly tap the valve stem tip to ensure a proper fit.

**NOTICE:**

**Do not damage the valve stem tip.**

#### 6. INSTALL OIL CONTROL VALVE FILTER

- (a) Install the oil control valve filter.

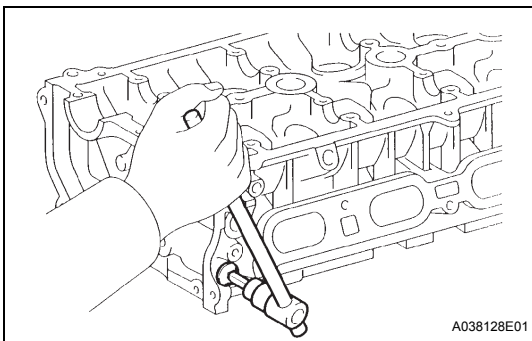
#### 7. INSTALL WITH HEAD TAPER SCREW PLUG NO. 2

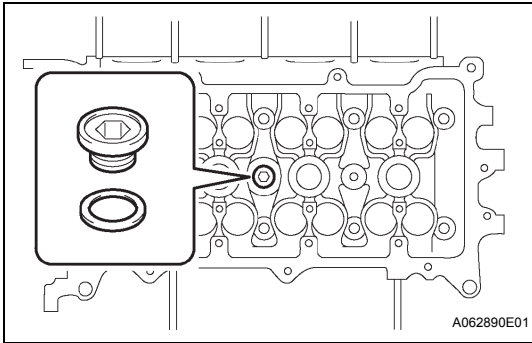
- (a) Using an 8 mm hexagon wrench, install the taper screw plug and a new gasket.

**Torque: 30 N\*m (306 kgf\*cm, 22 ft.\*lbf)**

#### 8. INSTALL VALVE LIFTER

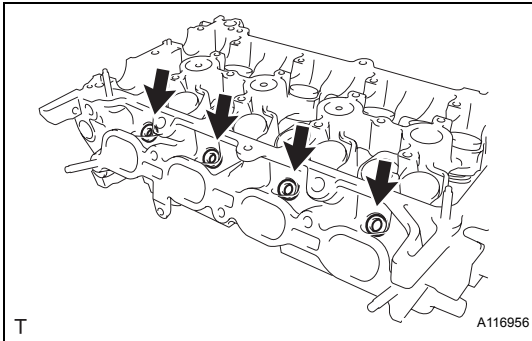
- (a) Apply a light coat of engine oil to the 16 valve lifters.
- (b) Install the 16 valve lifters.
- (c) Check that the valve lifters rotate smoothly by hand.



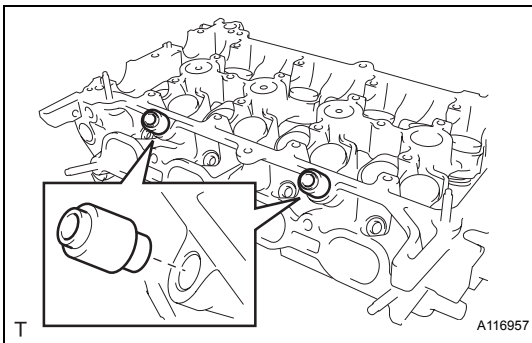


- 9. INSTALL WITH HEAD TAPER SCREW PLUG NO. 1**  
 (a) Using a 10 mm socket hexagon wrench, install the taper screw plug with a new gasket.  
**Torque: 44 N\*m (449 kgf\*cm, 33 ft.\*lbf)**

## INSTALLATION



- 1. INSTALL INJECTOR VIBRATION INSULATOR**  
 (a) Install 4 new injector vibration insulators onto the cylinder head.

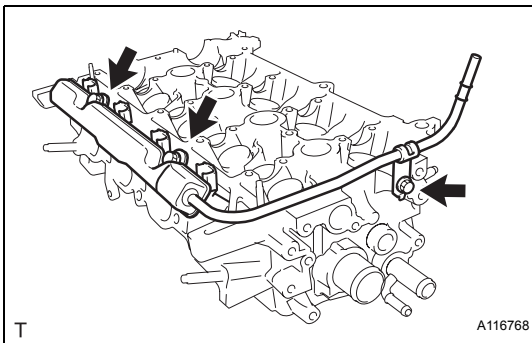


- 2. INSTALL DELIVERY PIPE NO. 1 SPACER**  
 (a) Install the 2 delivery pipe No. 1 spacers onto the cylinder head.

**NOTICE:**

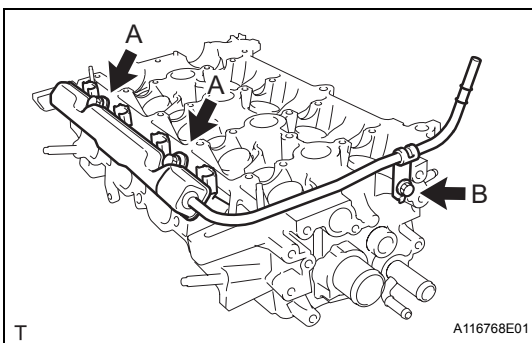
Install the delivery pipe No. 1 spacer in the correct direction.

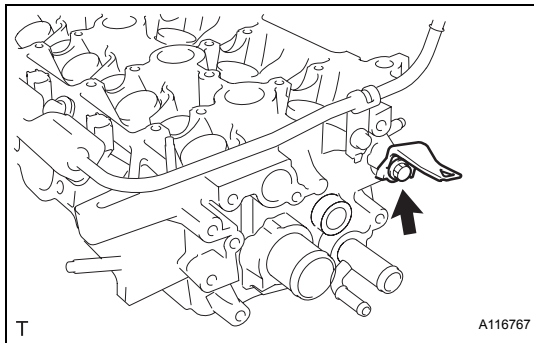
- 3. INSTALL FUEL INJECTOR ASSEMBLY (See page [FU-17](#))**



- 4. INSTALL FUEL DELIVERY PIPE SUB-ASSEMBLY**  
 (a) Provisionally install the fuel delivery pipe sub-assembly with the 4 fuel injectors using the 3 bolts.  
**NOTICE:**
- Do not drop the fuel injectors when installing the fuel delivery pipe sub-assembly.
  - Check that the fuel injectors rotate smoothly after installing the fuel delivery pipe sub-assembly.

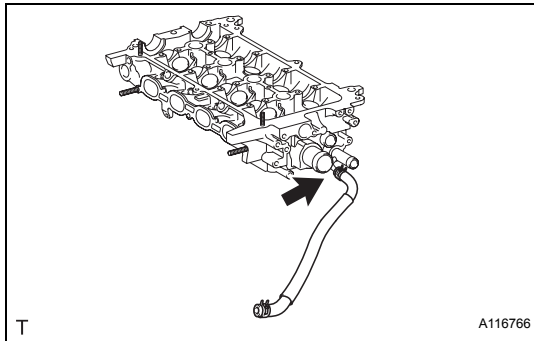
- (b) Tighten the 3 bolts to the specified torque.  
**Torque: 19 N\*m (194 kgf\*cm, 14 ft.\*lbf) for bolt A**  
**9.0 N\*m (92 kgf\*cm, 80 in.\*lbf) for bolt B**





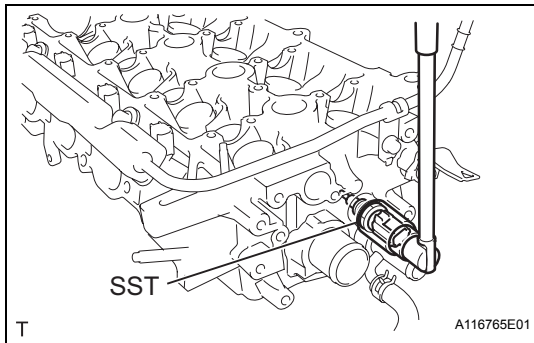
### 5. INSTALL HARNESS BRACKET

- (a) Install the harness bracket with the bolt.  
**Torque: 13 N\*m (131 kgf\*cm, 9.5 ft.\*lbf)**



### 6. INSTALL WATER BY-PASS HOSE

- (a) Install the water by-pass hose.

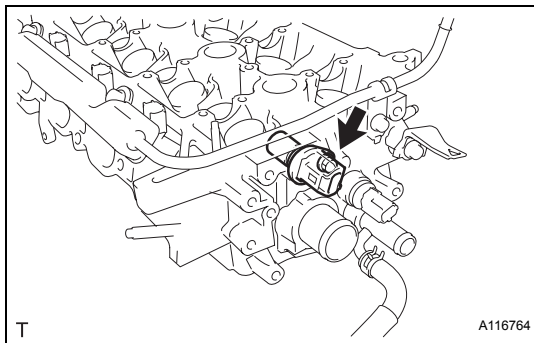


### 7. INSTALL ENGINE COOLANT TEMPERATURE SENSOR

- (a) Provisionally install the engine coolant temperature sensor through a new gasket.  
 (b) Using SST, tighten the engine coolant temperature sensor.

**SST 09817-33190**

**Torque: 20 N\*m (204 kgf\*cm, 15 ft.\*lbf)**



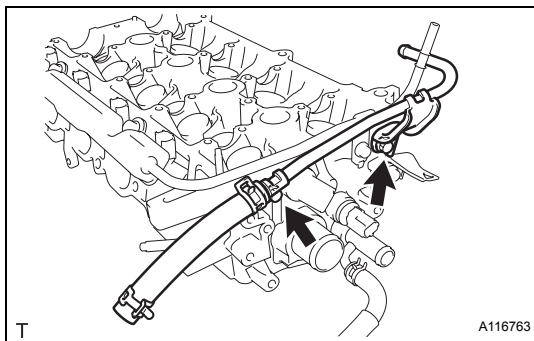
### 8. INSTALL CAMSHAFT POSITION SENSOR

- (a) Apply a light coat of engine oil to the O-ring on the camshaft position sensor.  
 (b) Install the camshaft position sensor with the bolt.

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

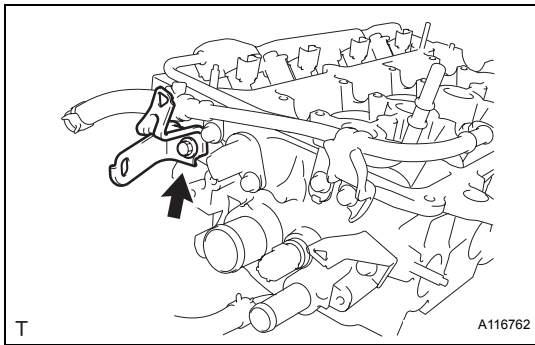
**NOTICE:**

**Do not twist the O-ring.**

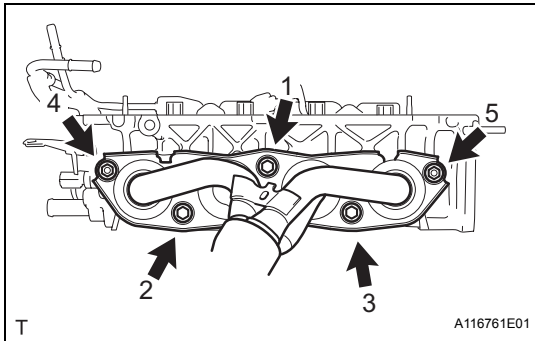


### 9. INSTALL BOOSTER VACUUM TUBE

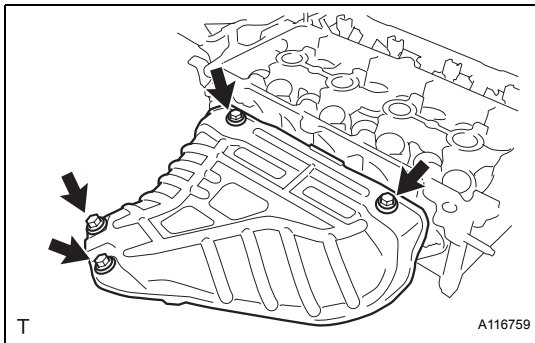
- (a) Install the booster vacuum tube with the 2 bolts.  
**Torque: 9.0 N\*m (92 kgf\*cm, 80 in.\*lbf)**

**10. INSTALL HARNESS BRACKET**

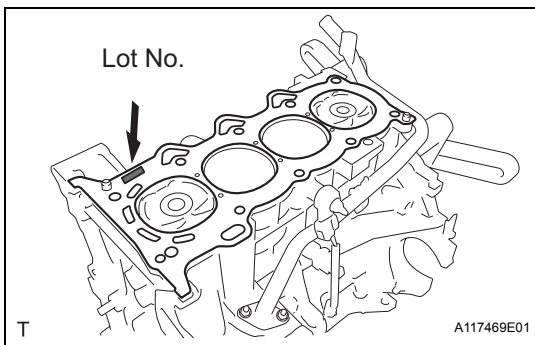
- (a) Install the harness bracket with the bolt.  
**Torque: 13 N\*m (131 kgf\*cm, 9.5 ft.\*lbf)**

**11. INSTALL EXHAUST MANIFOLD**

- (a) Using several steps, install a new exhaust manifold gasket and the exhaust manifold with the 3 bolts and 2 nuts in the sequence shown in the illustration.  
**Torque: 27 N\*m (275 kgf\*cm, 20 ft.\*lbf)**

**12. INSTALL EXHAUST MANIFOLD HEAT INSULATOR NO. 1**

- (a) Install exhaust manifold heat insulator No. 1 with the 4 bolts.  
**Torque: 8.0 N\*m (82 kgf\*cm, 71 in.\*lbf)**

**13. INSTALL CYLINDER HEAD GASKET**

- (a) Place a new cylinder head gasket on the cylinder block with the Lot No. stamp facing upward.

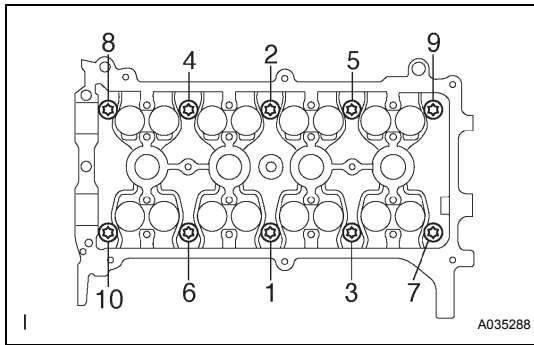
**NOTICE:**

- Remove any oil from the contact surfaces.
- Check the mounting orientation of the cylinder head gasket.
- Place the cylinder head on the cylinder head gently in order not to damage the gasket.

**14. INSTALL CYLINDER HEAD SUB-ASSEMBLY****HINT:**

The cylinder head bolts are tightened in 2 successive steps.

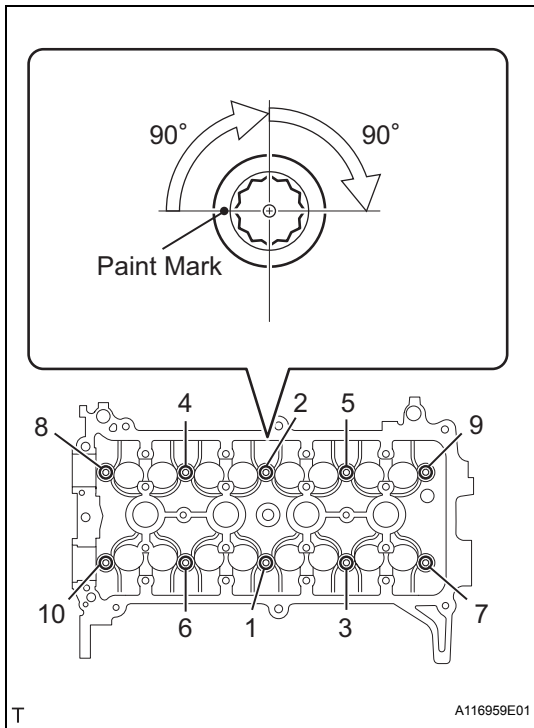
- (a) Apply a light coat of engine oil to the threads of the cylinder head bolts.



- (b) Using several steps, install and tighten the 10 cylinder head bolts and plate washers uniformly with an 8 mm bi-hexagon wrench, in the sequence shown in the illustration.

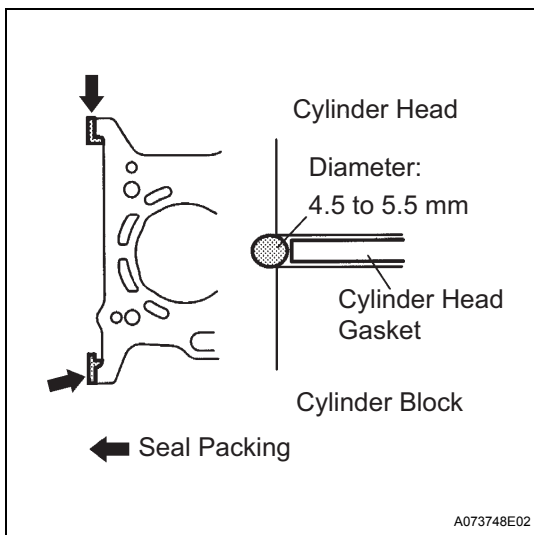
**Torque: 29 N\*m (300 kgf\*cm, 22 ft.\*lbf)**

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



- (d) Retighten the cylinder head bolts 90° and then an additional by 90° as shown in the illustration.

- (e) Check that the paint mark is now at a 180° angle from the front.



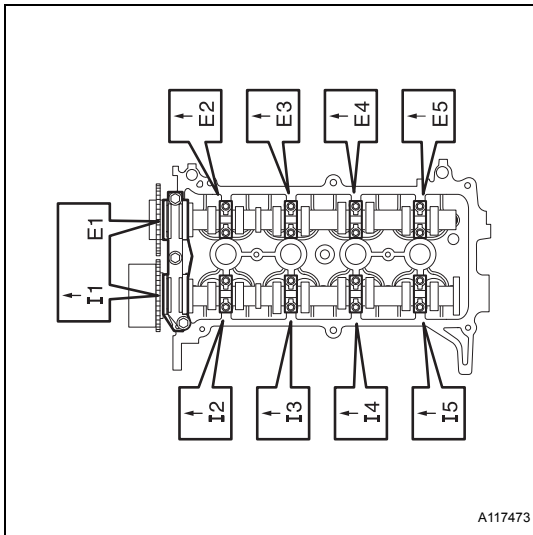
- (f) Apply a continuous bead of seal packing (Diameter 4.5 to 5.5 mm (0.177 to 0.217 in.)) as shown in the illustration.

**Seal Packing:**

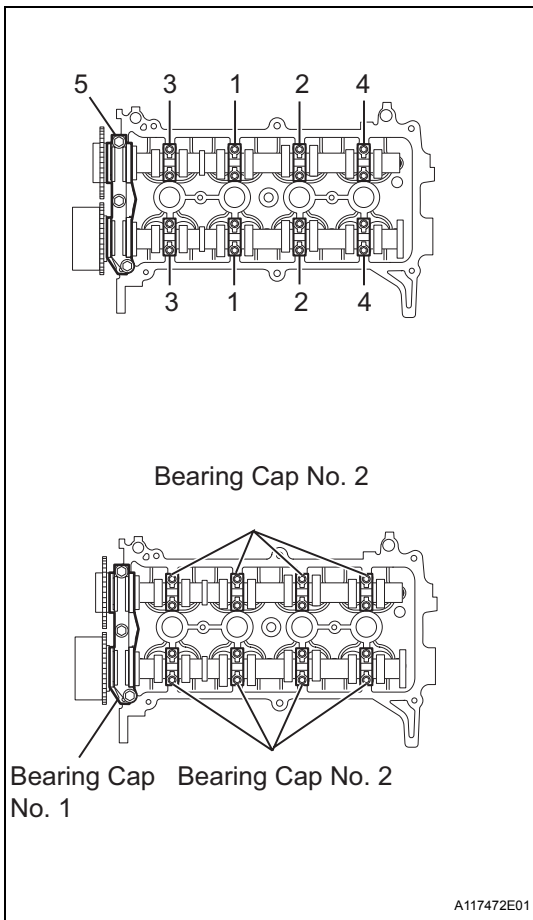
**Toyota Genuine Seal Packing Black, Three Bond 1207B or Equivalent**

**NOTICE:**

- Remove any oil from the contact surfaces.
- Install the oil pump assembly within 3 minutes and tighten the bolts within 15 minutes of applying the seal packing.

**15. INSTALL CAMSHAFT**

- (a) Examine the front marks and numbers and check that the sequence is as shown in the illustration. Then provisionally tighten the 19 bolts.



- (b) Uniformly tighten the bolts in several steps in the sequence shown in the illustration and install camshaft bearing cap No. 1 and camshaft bearing cap No. 2.

**Torque: Camshaft bearing cap No. 1**  
 23 N\*m (235 kgf\*cm, 17 ft.\*lbf)  
**Camshaft bearing cap No. 2**  
 13 N\*m (129 kgf\*cm, 9.4 ft.\*lbf)

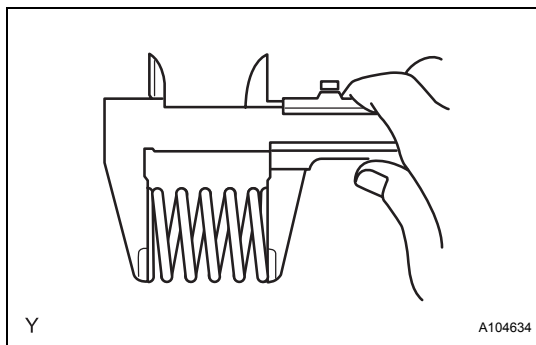
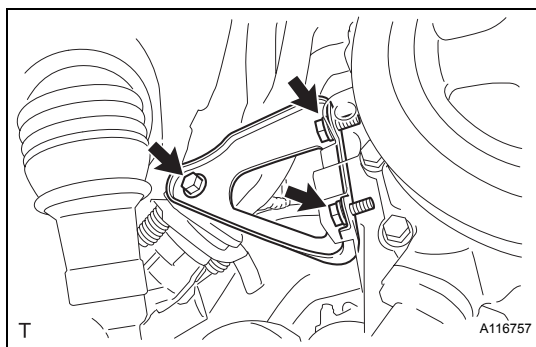
**NOTICE:**

Tighten each bolt uniformly while keeping the camshaft level.

16. INSTALL CHAIN SUB-ASSEMBLY (See page [EM-36](#))
17. INSTALL CHAIN TENSIONER SLIPPER (See page [EM-38](#))
18. INSTALL CHAIN TENSIONER ASSEMBLY NO. 1 (See page [EM-38](#))
19. INSTALL OIL PUMP SEAL (See page [LU-21](#))
20. INSTALL OIL PUMP ASSEMBLY (See page [LU-22](#))
21. INSTALL TRANSVERSE ENGINE ENGINE MOUNTING BRACKET (See page [LU-26](#))
22. INSTALL WATER PUMP ASSEMBLY (See page [CO-16](#))
23. INSTALL WATER PUMP PULLEY (See page [CO-16](#))
24. INSTALL CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY (See page [ES-397](#))
25. INSTALL CRANKSHAFT POSITION SENSOR (See page [ES-403](#))
26. INSTALL CRANKSHAFT DAMPER SUB-ASSEMBLY (See page [LU-26](#))
27. INSTALL ENGINE MOUNTING INSULATOR SUB-ASSEMBLY RH (See page [LU-26](#))

EM

28. INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY (See page [FU-19](#))
29. INSTALL VENTILATION HOSE NO. 2 (See page [FU-20](#))
30. INSTALL VENTILATION HOSE (See page [FU-20](#))
31. INSTALL IGNITION COIL NO. 1 (See page [IG-9](#))
32. INSTALL GENERATOR ASSEMBLY (See page [CH-17](#))
33. INSTALL FAN AND GENERATOR V BELT (See page [EM-7](#))
34. ADJUST FAN AND GENERATOR V BELT (See page [EM-7](#))
35. INSPECT FAN AND GENERATOR V BELT (See page [EM-8](#))
36. INSTALL MANIFOLD SUPPORT BRACKET
  - (a) Install the manifold support bracket with the 3 bolts.  
Torque: 44 N\*m (449 kgf\*cm, 33 ft.\*lbf)



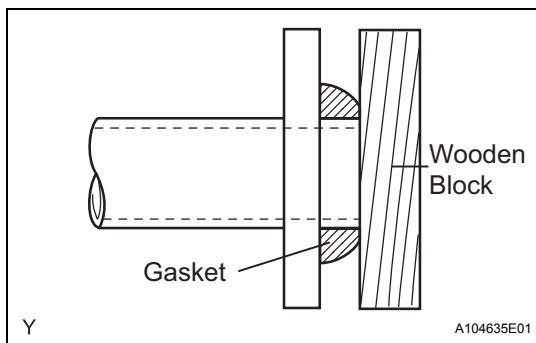
### 37. INSTALL EXHAUST PIPE ASSEMBLY FRONT

- (a) Using vernier calipers, measure the free length of the compression spring.

**Minimum length:**

**40.5 mm (1.594 in.)**

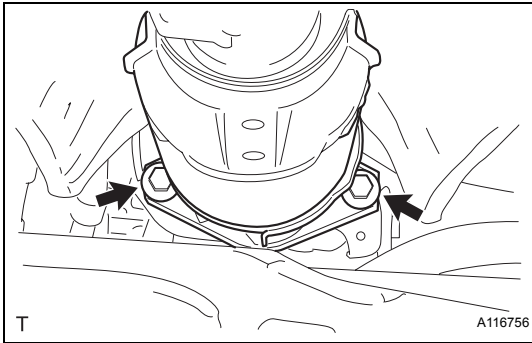
If the length is not as specified, replace the compression spring.



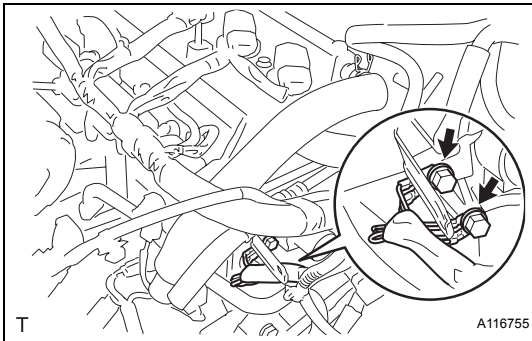
- (b) Using a plastic hammer and a wooden block, tap in a new exhaust pipe gasket until its surface is flush with the exhaust manifold.

**NOTICE:**

- Install the exhaust pipe gasket in the correct direction.
- Do not damage the outer surface of the exhaust pipe gasket.
- Do not reuse the exhaust pipe gasket.
- Do not push in the gasket with the exhaust pipe when installing.

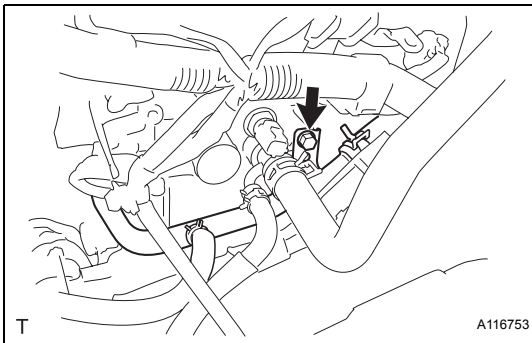


- (c) Install the exhaust front pipe assembly with the 2 compression springs and 2 bolts.  
**Torque: 43 N\*m (439 kgf\*cm, 32 ft.\*lbf)**



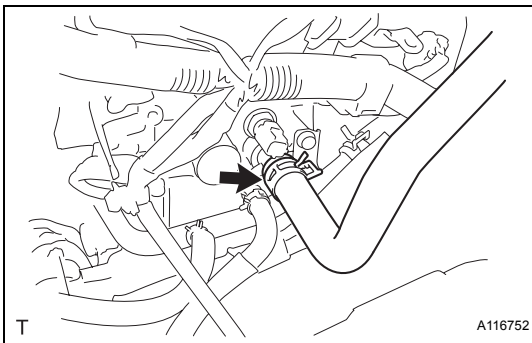
### 38. CONNECT WIRE HARNESS

- (a) Connect the wire harness with the 2 bolts.  
**Torque: 13 N\*m (133 kgf\*cm, 10 ft.\*lbf)**



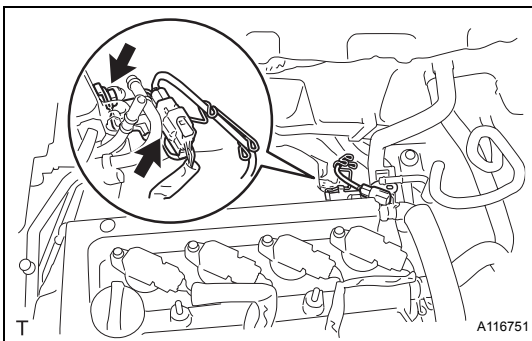
### 39. INSTALL WATER BY-PASS HOSE NO. 1

- (a) Install water by-pass pipe No. 1 with the bolt.  
**Torque: 9.0 N\*m (92 kgf\*cm, 80 in.\*lbf)**



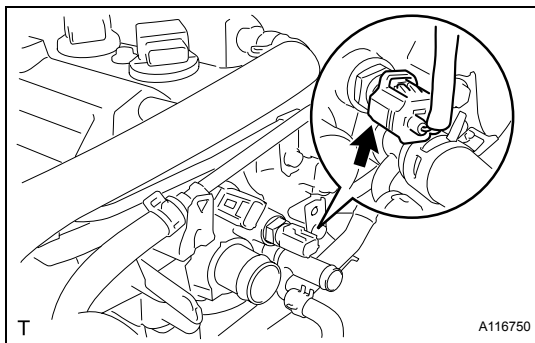
### 40. CONNECT HEATER WATER INLET HOSE A

- (a) Connect heater water inlet hose A.



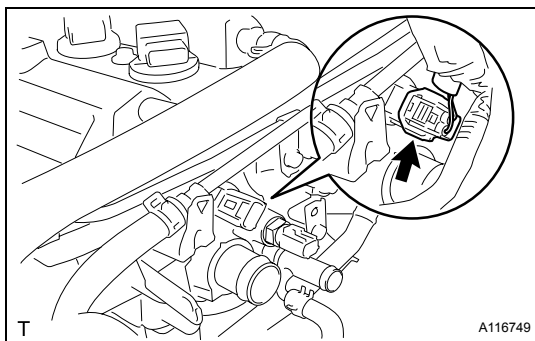
### 41. CONNECT HEATED OXYGEN SENSOR CONNECTOR

- (a) Connect the heated oxygen sensor connector.  
(b) Install the sensor bracket with the bolt.



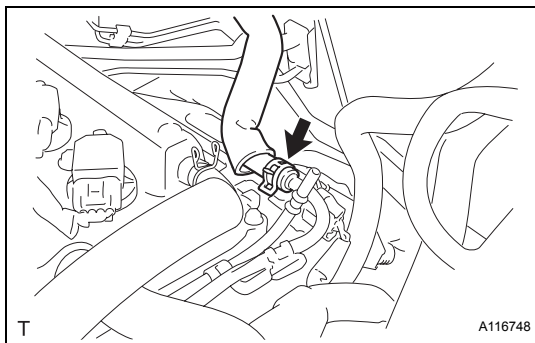
#### 42. CONNECT ENGINE COOLANT TEMPERATURE SENSOR CONNECTOR

- (a) Connect the engine coolant temperature sensor connector.



#### 43. CONNECT CAMSHAFT POSITION SENSOR CONNECTOR

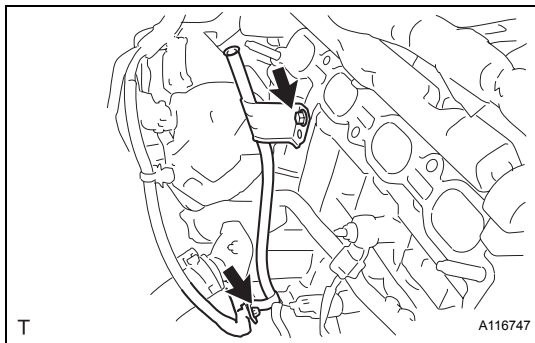
- (a) Connect the camshaft position sensor connector.



#### 44. CONNECT BOOSTER VACUUM TUBE

- (a) Connect the booster vacuum tube.

#### 45. CONNECT FUEL TUBE SUB-ASSEMBLY (See page [FU-18](#))

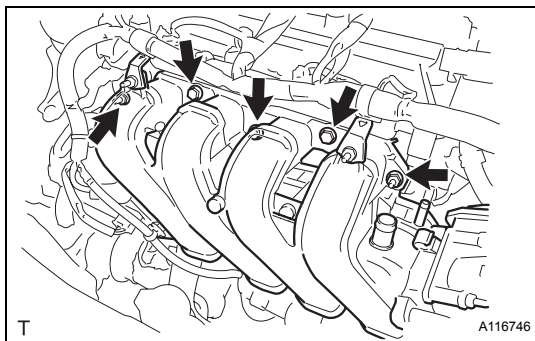


#### 46. INSTALL OIL LEVEL GAUGE GUIDE

- (a) Apply engine oil to a new O-ring.  
 (b) Install the oil level gauge guide with the bolt through a new O-ring.  
**Torque: 9.0 N\*m (92 kgf\*cm, 80 in.\*lbf)**  
 (c) Install the wire harness.

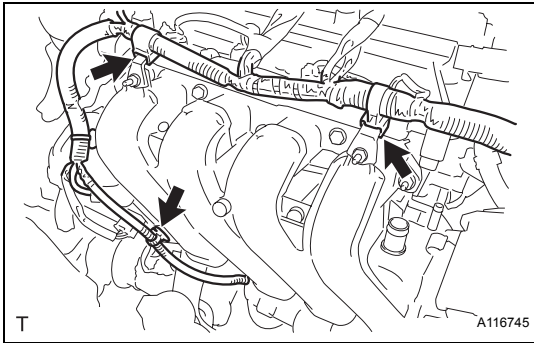
#### 47. INSTALL INTAKE MANIFOLD

- (a) Install a new gasket onto the intake manifold.



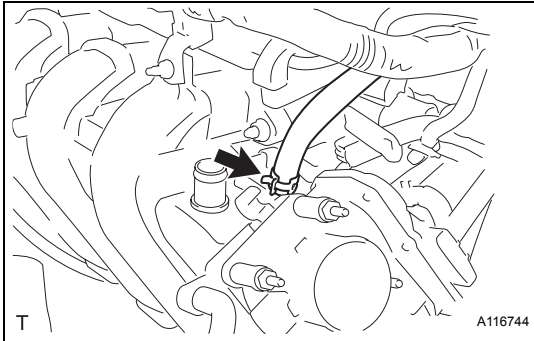
- (b) Install the intake manifold with the 3 bolts and 2 nuts.

**Torque: 30 N\*m (306 kgf\*cm, 22 ft.\*lbf)**



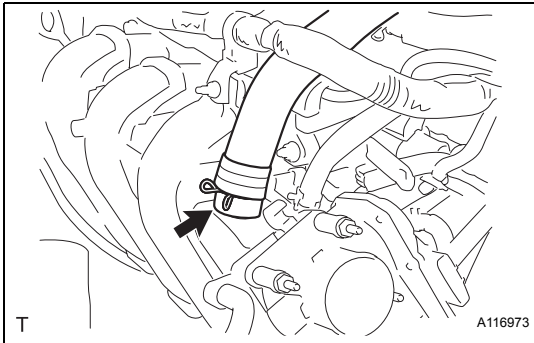
- (c) Connect the 3 wire harness clamps shown in the illustration.

#### 48. INSTALL OIL LEVEL GAUGE SUB-ASSEMBLY



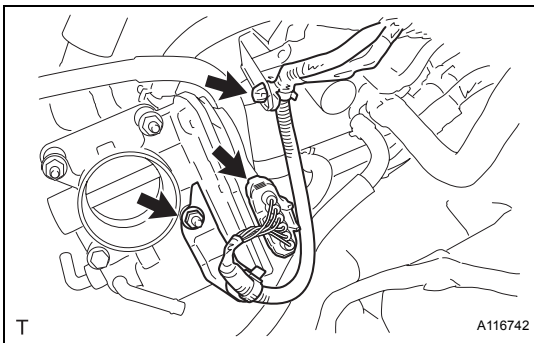
#### 49. CONNECT UNION TO CONNECTOR TUBE HOSE

- (a) Connect the union to connector tube hose.



#### 50. CONNECT VENTILATION HOSE

- (a) Connect the ventilation hose.

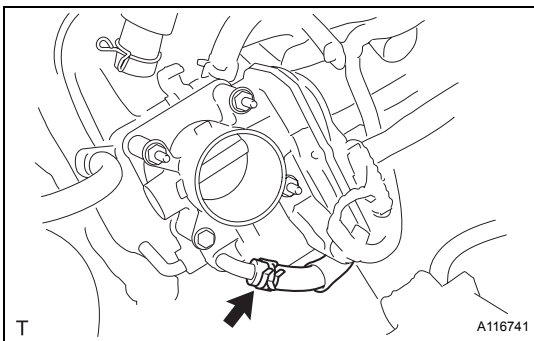


#### 51. CONNECT THROTTLE WITH MOTOR BODY CONNECTOR

- (a) Install the throttle with motor body connector bracket with the nut.

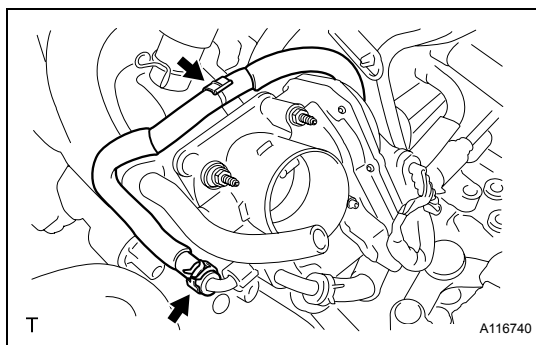
**Torque: 9.0 N\*m (92 kgf\*cm, 80 in.\*lbf)**

- (b) Connect the throttle with motor body connector.  
(c) Connect the wire harness clamp.

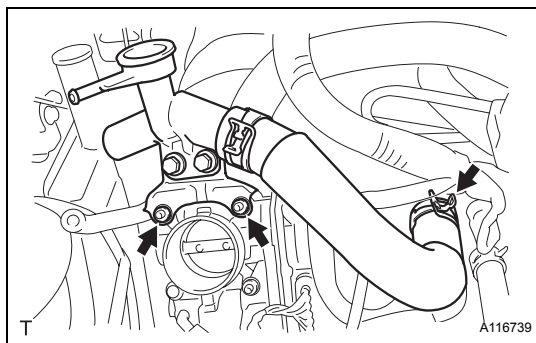


#### 52. CONNECT WATER BY-PASS HOSE

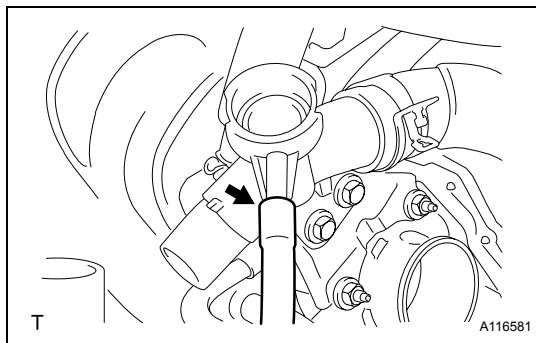
- (a) Connect the water by-pass hose.

**53. CONNECT WATER BY-PASS HOSE NO. 2**

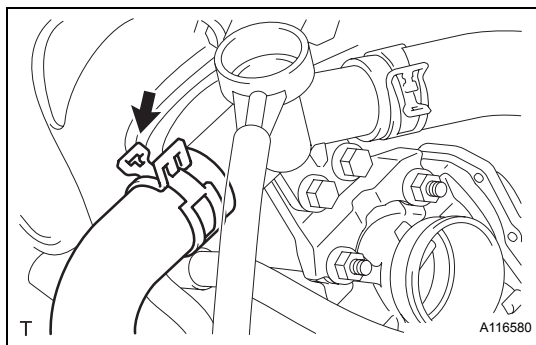
- (a) Connect water by-pass hose No. 2.

**54. INSTALL WATER FILLER SUB-ASSEMBLY**

- (a) Install the water filler sub-assembly with the 2 nuts.  
**Torque: 7.5 N\*m (76 kgf\*cm, 66 in.\*lbf)**  
 (b) Connect radiator hose No. 1 to the cylinder head.

**55. CONNECT RESERVE TANK HOSE**

- (a) Connect the reserve tank hose.

**56. CONNECT RADIATOR HOSE NO. 3**

- (a) Connect radiator hose No. 3.

**57. INSTALL AIR CLEANER CAP SUB-ASSEMBLY WITH AIR CLEANER HOSE NO. 1 (See page [ES-414](#))****58. INSTALL BATTERY TRAY****59. INSTALL BATTERY****60. ADD ENGINE OIL****61. ADD ENGINE COOLANT (See page [CO-8](#))****62. CHECK ENGINE OIL LEVEL (See page [LU-1](#))****63. CHECK FOR ENGINE OIL LEAKAGE****64. CHECK FOR ENGINE COOLANT LEAKAGE (See page [CO-1](#))****65. CHECK FOR EXHAUST GAS LEAKAGE****66. CHECK FOR FUEL LEAKAGE (See page [FU-7](#))****67. INSTALL CYLINDER HEAD COVER NO. 2 (See page [IG-10](#))**

68. INSTALL ENGINE UNDER COVER RH
69. INSTALL FRONT WHEEL RH
70. INSTALL COWL TOP PANEL OUTER (for Hatchback)  
(See page [EM-146](#))
71. INSTALL COWL TOP PANEL OUTER (for Sedan) (See  
page [ES-434](#))
72. INSTALL COWL TO REGISTER DUCT SUB-  
ASSEMBLY NO. 2 (for Hatchback) (See page [EM-147](#))
73. INSTALL FRONT AIR SHUTTER SEAL RH (for Sedan)  
(See page [ES-435](#))
74. INSTALL FRONT WIPER MOTOR AND LINK (for  
Hatchback) (See page [WW-21](#))
75. INSTALL FRONT WIPER MOTOR AND LINK (for  
Sedan) (See page [WW-12](#))
76. INSTALL COWL TOP VENTILATOR LOUVER LH (for  
Hatchback) (See page [WW-21](#))
77. INSTALL COWL TOP VENTILATOR LOUVER SUB-  
ASSEMBLY (for Hatchback) (See page [WW-21](#))
78. INSTALL COWL TOP VENTILATOR LOUVER SUB-  
ASSEMBLY (for Sedan) (See page [WW-12](#))
79. INSTALL COWL SIDE VENTILATOR SUB-ASSEMBLY  
LH (for Sedan) (See page [WW-13](#))
80. INSTALL COWL SIDE VENTILATOR SUB-ASSEMBLY  
RH (for Sedan) (See page [WW-13](#))
81. INSTALL HOOD TO COWL TOP SEAL (for  
Hatchback) (See page [WW-22](#))
82. INSTALL FRONT WIPER ARM AND BLADE  
ASSEMBLY LH (for Hatchback) (See page [WW-22](#))
83. INSTALL FRONT WIPER ARM AND BLADE  
ASSEMBLY LH (for Sedan) (See page [WW-13](#))
84. INSTALL FRONT WIPER ARM AND BLADE  
ASSEMBLY RH (for Hatchback) (See page [WW-23](#))
85. INSTALL FRONT WIPER ARM AND BLADE  
ASSEMBLY RH (for Sedan) (See page [WW-14](#))
86. INSTALL FRONT WIPER ARM HEAD CAP (for  
Hatchback) (See page [WW-23](#))
87. INSTALL FRONT WIPER ARM HEAD CAP (for Sedan)  
(See page [WW-15](#))

## REPAIR

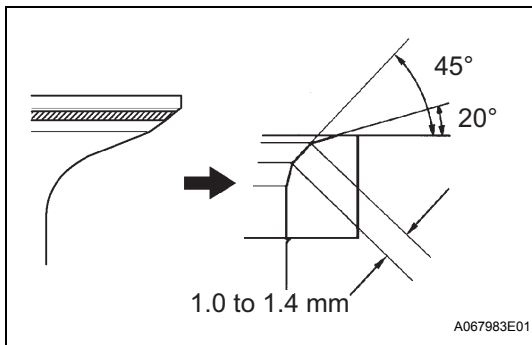
### 1. REPAIR INTAKE VALVE

- (a) Repair the intake valve seat.

**NOTICE:**

**Releasing the seat-cutter pressure gradually helps to make the valve seat face smoother.**

- (b) If the seating is too high on the valve face, use 20° and 45° cutters to correct the seat.



- (c) 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) Recheck the valve seating position.

### 2. REPAIR EXHAUST VALVE

**NOTICE:**

**Releasing the seat-cutter pressure gradually helps to make the valve seat face smoother.**

- (a) If the seating is too high on the valve face, use 20° and 45° cutters to correct the seat.
- (b) If the seating is too low on the valve face, use 75° and 45° cutters to correct the seat.
- (c) Hand-lap the valve and valve seat with an abrasive compound.
- (d) Recheck the valve seating position.

