DTC CHECK / CLEAR

NOTICE:

When the diagnosis system is changed from normal mode to check mode or vice versa, all DTCs and freeze frame data recorded in normal mode are cleared. Before changing modes, always check and make a note of DTCs and freeze frame data.

HINT:

- DTCs which are stored in the ECM can be displayed on the Techstream. The Techstream can display the current, pending and permanent DTCs.
- If a malfunction is detected during the current driving cycle, current and permanent DTCs are stored.
- Some DTCs are not stored if the ECM does not detect the same malfunction again during a second consecutive driving cycle. However, such malfunctions, detected on only one occasion, are stored as pending DTCs.
- Current and pending DTCs can be cleared by using the Techstream or by disconnecting the cable from the negative battery terminal. However, permanent DTCs cannot be cleared using either of these two methods.
- After clearing current DTCs using the Techstream (or by disconnecting the cable from the negative battery terminal), permanent DTCs can be cleared when the system is determined to be normal for the relevant DTCs and then the universal trip is performed. The driving pattern to obtain a normal judgment is described under the "Confirmation Driving Pattern" for the respective DTC.

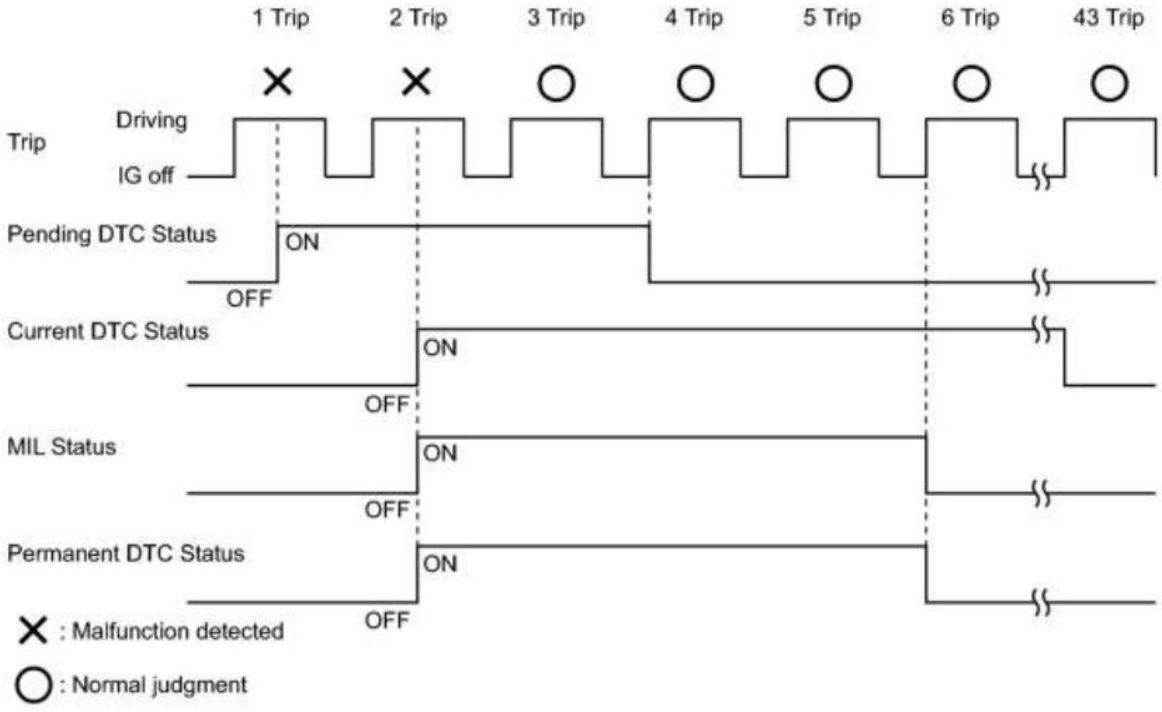
2 Trip Detection Examples

Pending DTC	Store condition	Malfunction detected
	Clear condition	System determined to be normal or DTCs cleared using Techstream or Cable disconnected from negative (-) battery terminal
Current DTC	Store condition	Malfunction detected (2nd trip)
	Clear condition	No malfunctions in 40 driving cycles or DTCs cleared using Techstream or Cable disconnected from negative (-) battery terminal
Permanent	Store	Malfunction detected (2nd trip)

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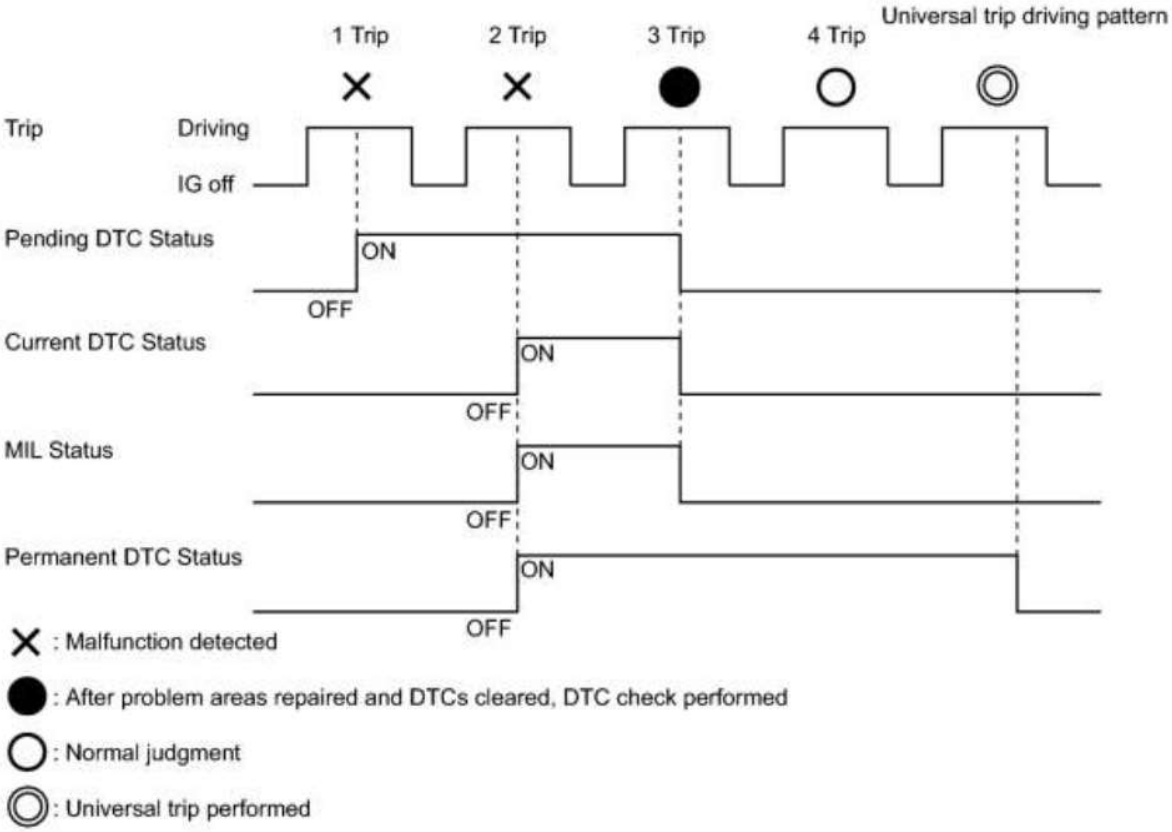
DTC	condition	
	Clear condition	Power switch turned to on (IG) after normal judgment obtained in 3 consecutive driving cycles or After DTCs cleared using Techstream or cable disconnected from negative (-) battery terminal, normal judgment obtained and universal trip performed (not for misfire and fuel system DTCs) or After DTCs cleared using Techstream or cable disconnected from negative (-) battery terminal, malfunction not detected when universal trip driving performed (misfire and fuel system DTCs)
MIL	ON	Malfunction detected (2nd trip)
	OFF	Power switch turned to on (IG) after normal judgment obtained in 3 consecutive driving cycles or DTCs cleared using Techstream or Cable disconnected from negative (-) battery terminal

2 Trip Detection Examples



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2 Trip Detection Examples (Instance when DTCs were cleared midway through by using the Techstream or by disconnecting the cable from the negative battery terminal)



HINT:

- Obtaining a normal judgment and performing a universal trip driving pattern can be done in the same driving cycle or in different driving cycles.
- It is unnecessary to obtain a normal judgment if the DTCs are misfire or fuel system DTCs.

1. CHECK DTC

(a) Connect the Techstream to the DLC3.

(b) Turn the power switch on (IG).

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.

(e) Check the DTC(s) and freeze frame data, and then write them down.

(f) Check the details of the DTC(s) INFO.

2. CLEAR DTC (Pending and Current DTC)

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(a) Connect the Techstream to the DLC3.

(b) Turn the power switch on (IG).

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.

(e) Clear the DTCs.

3. CLEAR DTC (Pending and Current DTC without using Techstream)

(a) Perform either of the following operations:

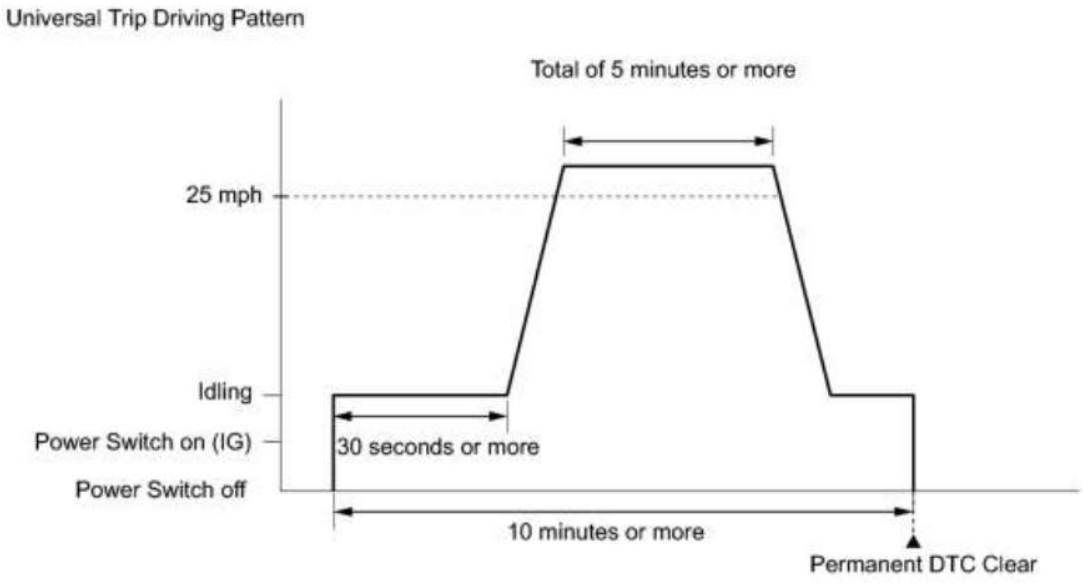
(1) Disconnect the cable from the negative (-) battery terminal for more than 1 minute.

(2) Remove the EFI MAIN and ETCS fuses from the engine room relay block located inside the engine compartment for more than 1 minute.

4. CLEAR PERMANENT DTC

HINT:

Even if the following procedure is not performed, permanent DTCs are cleared by obtaining a normal judgment during 3 consecutive driving cycles.



(a) Connect the Techstream to the DLC3.

(b) Turn the power switch on (IG).

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(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.

(e) Check if permanent DTCs are stored.

HINT:

If permanent DTCs are not output, it is not necessary to continue this procedure.

(f) Clear DTCs.

(g) Perform the respective confirmation driving patterns in order to obtain a normal judgment for the output DTCs.

HINT:

- Confirmation driving patterns do not need to be performed for misfire and fuel system DTCs.
- For the confirmation driving pattern, refer to the procedures for the relevant DTC INFO.

(h) Perform the universal trip.

HINT:

The driving pattern to obtain a normal judgment and the universal trip driving can be performed consecutively in the same driving cycle.

1. Put the engine in inspection mode INFO.
2. Idle the engine for 30 seconds or more.
3. Drive the vehicle at 25 mph (40 km/h) or more for a total of 5 minutes or more.

   HINT:

   It is possible to complete the drive pattern even if the vehicle decelerates to less than 25 mph (40 km/h) during the driving cycle provided that the vehicle is driven at 25 mph (40 km/h) or more for a total of 5 minutes.

4. Allow 10 minutes or more to elapse from the time the engine is started.

(i) Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.

(j) Check that the permanent DTCs have been cleared.

HINT:

The permanent DTCs are cleared when the universal trip is completed.

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REMOVAL

1. REMOVE ENGINE ASSEMBLY WITH TRANSAXLE

(a) Remove the engine assembly with transaxle INFO.

2. INSTALL ENGINE ON ENGINE STAND INFO

3. REMOVE ENGINE HANGERS INFO

4. REMOVE THROTTLE BODY ASSEMBLY INFO

5. REMOVE ENGINE OIL LEVEL DIPSTICK GUIDE INFO

6. REMOVE EGR PIPE ASSEMBLY INFO

7. REMOVE EGR VALVE ASSEMBLY INFO

8. REMOVE EGR WITH COOLER PIPE SUB-ASSEMBLY INFO

9. REMOVE INTAKE MANIFOLD INFO

10. REMOVE FUEL VAPOR FEED PIPE INFO

11. REMOVE FUEL DELIVERY PIPE SUB-ASSEMBLY INFO

12. REMOVE NO. 1 DELIVERY PIPE SPACER INFO

13. REMOVE FUEL INJECTOR ASSEMBLY INFO

14. REMOVE IGNITION COIL ASSEMBLY INFO

15. REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY INFO

16. REMOVE CYLINDER HEAD COVER GASKET INFO

17. REMOVE SPARK PLUG TUBE GASKET INFO

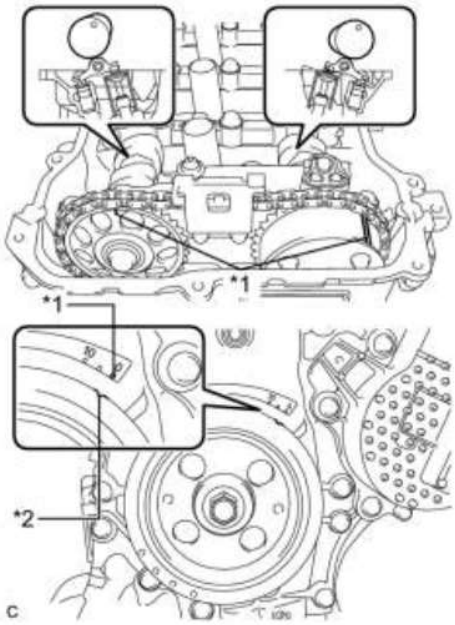
18. SET NO. 1 CYLINDER TO TDC/COMPRESSION

(a) Turn the crankshaft pulley until its notch and timing mark "0" of the timing chain cover are aligned.

Text in Illustration

*1	Timing Mark

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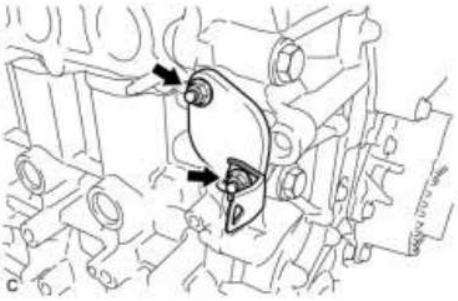
*2	Timing Notch

(b) Check that timing marks on both the camshaft timing sprocket and camshaft timing gear are facing upward as shown in the illustration.

If not, turn the crankshaft 1 complete revolution (360°) and align the marks as above.

19. REMOVE CRANKSHAFT PULLEY INFO

20. REMOVE NO. 1 CHAIN TENSIONER ASSEMBLY



(a) Remove the 2 nuts, bracket, chain tensioner and gasket.

NOTICE:

Do not turn the crankshaft without the No. 1 chain tensioner installed.

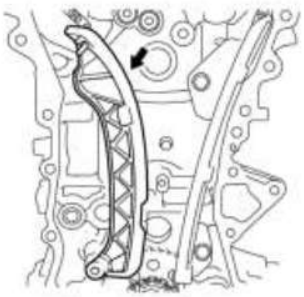
21. REMOVE TIMING CHAIN COVER SUB-ASSEMBLY INFO

22. REMOVE TIMING CHAIN COVER OIL SEAL INFO

23. REMOVE CHAIN TENSIONER SLIPPER

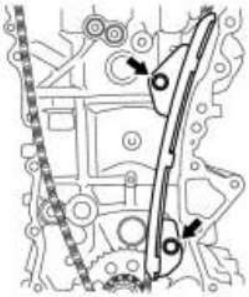
(a) Remove the chain tensioner slipper from the cylinder block.

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C

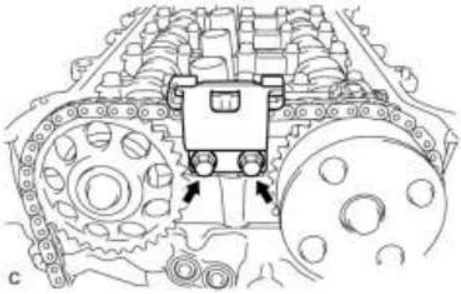
24. REMOVE NO. 1 CHAIN VIBRATION DAMPER



C

(a) Remove the 2 bolts and chain vibration damper.

25. REMOVE NO. 2 CHAIN VIBRATION DAMPER



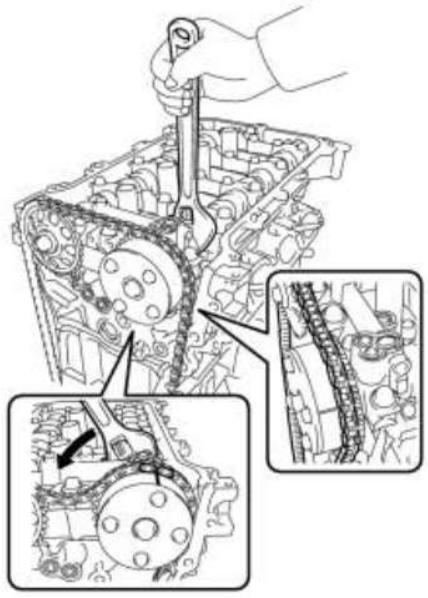
C

(a) Remove the 2 bolts and No. 2 chain vibration damper.

26. REMOVE CHAIN SUB-ASSEMBLY

(a) Hold the hexagonal portion of the camshaft with a wrench and turn the camshaft timing gear counterclockwise to loosen the chain between the camshaft timing gears.

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(b) With the chain loosened, release the chain from the camshaft timing gear and place it on the camshaft timing gear.

HINT:

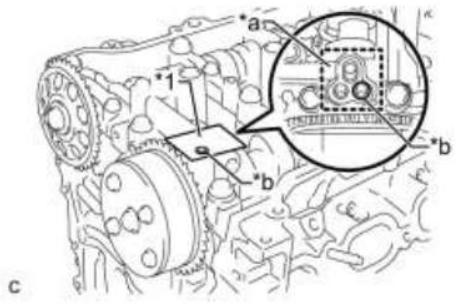
Be sure to release the chain from the sprocket completely.

(c) Turn the camshaft clockwise to return it to the original position and remove the chain.

27. INSPECT CAMSHAFT TIMING GEAR ASSEMBLY

(a) Inspect the lock of the camshaft timing gear.

(b) After cleaning and degreasing the VVT oil hole on the intake side of the No. 1 camshaft bearing cap, completely seal the oil hole with adhesive tape or equivalent as shown in the illustration to prevent air from leaking.



c

Text in Illustration

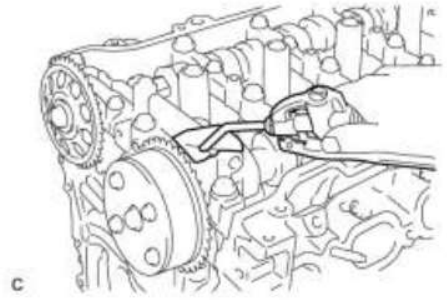
*1	Adhesive Tape
*a	Adhesive Tape Sealing Area
*b	Prick a Hole

NOTICE:

Be sure to cover the oil hole completely because air leaks due to insufficient sealing will prevent the lock pin from being released.

(c) Prick a hole in the tape covering the oil hole as shown in the illustration. (Procedure A)

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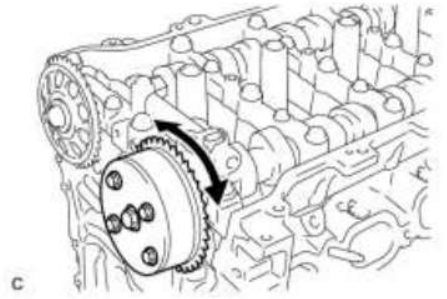
(d) Apply approximately 150 kPa (1.5 kgf/cm2, 22 psi) of air pressure to the hole pricked in procedure A to release the lock pin.

- If air leaks out, reattach the adhesive tape.
- Cover the oil hole with a piece of cloth when applying air pressure to prevent oil from spraying.

(e) Forcibly turn the camshaft timing gear in the advance direction (counterclockwise).

HINT:

Depending on the air pressure applied, the camshaft timing gear may turn in the advance direction without assistance.

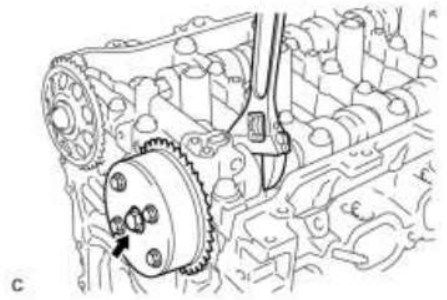


(f) Turn the camshaft timing gear within its movable range (26.5 to 28.5°) 2 or 3 times without turning it to the most retarded position. Make sure that the camshaft timing gear turns smoothly.

(g) Remove the adhesive tape from the No. 1 camshaft bearing cap.

28. REMOVE CAMSHAFT TIMING GEAR ASSEMBLY

(a) Remove the flange bolt while holding the hexagonal portion of the camshaft with a wrench, and then remove the camshaft timing gear.



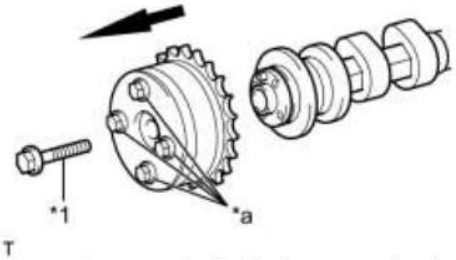
Text in Illustration

*1	Flange Bolt
*a	Do not remove

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NOTICE:

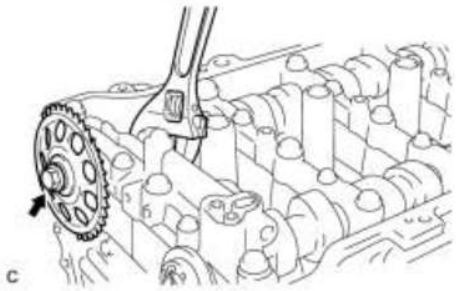
- Before removing the camshaft timing gear, make sure that the lock pin has been released.
- Be sure not to remove the other 4 bolts.



T

- Keep the camshaft timing gear horizontal while removing it from the camshaft.

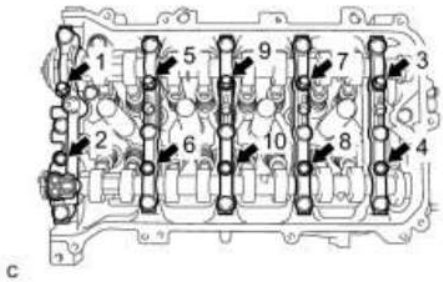
29. REMOVE CAMSHAFT TIMING SPROCKET



c

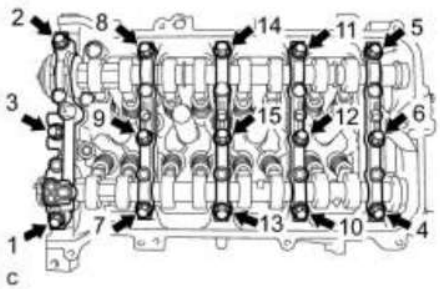
(a) Remove the flange bolt while holding the hexagonal portion of the camshaft with a wrench, and then remove the camshaft timing sprocket.

30. REMOVE CAMSHAFT BEARING CAP



c

(a) Uniformly loosen and remove the 10 bearing cap bolts in the sequence shown in the illustration.



c

(b) Uniformly loosen and remove the 15 bearing cap bolts in the sequence shown in the illustration.

NOTICE:

Uniformly loosen the bearing cap bolts while keeping the camshaft housing level.

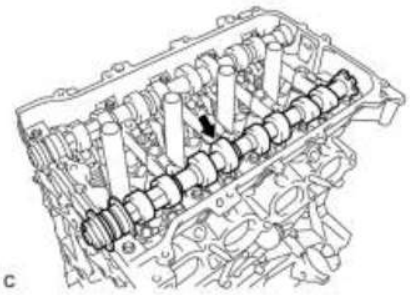
(c) Remove the 5 bearing caps.

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HINT:

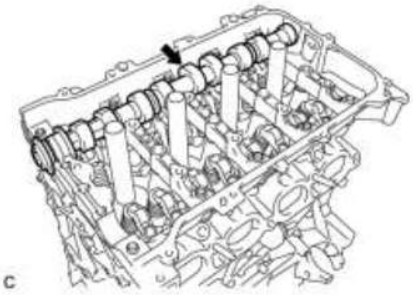
Arrange the removed parts in the correct order.

31. REMOVE CAMSHAFT



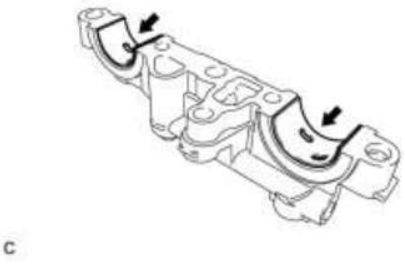
(a) Remove the camshaft.

32. REMOVE NO. 2 CAMSHAFT



(a) Remove the No. 2 camshaft.

33. REMOVE NO. 1 CAMSHAFT BEARING

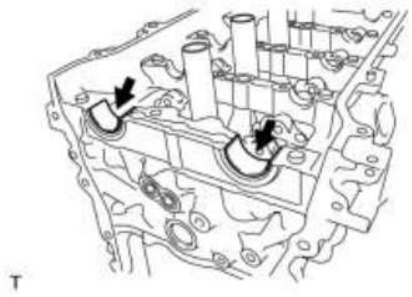


(a) Remove the 2 No. 1 camshaft bearings.

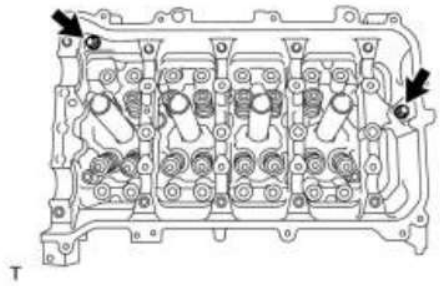
34. REMOVE NO. 2 CAMSHAFT BEARING

(a) Remove the 2 No. 2 camshaft bearings.

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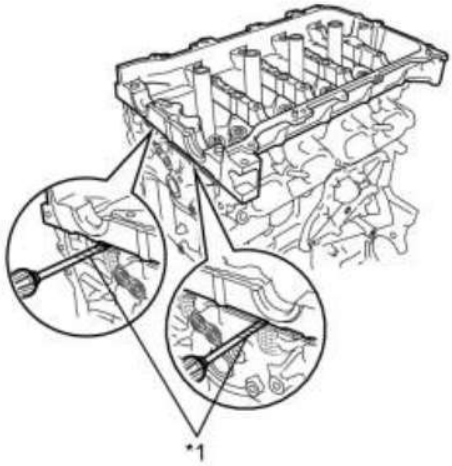


35. REMOVE CAMSHAFT HOUSING SUB-ASSEMBLY



(a) Remove the 2 bolts.

(b) Remove the camshaft housing by prying between the cylinder head and camshaft housing with a screwdriver.



Text in Illustration

*1	Protective Tape

NOTICE:

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

HINT:

Tape the screwdriver tip before use.

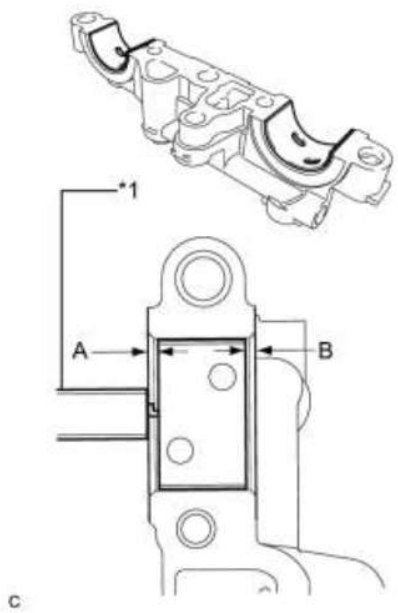
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INSTALLATION

1. INSTALL NO. 1 CAMSHAFT BEARING

(a) Clean both surfaces of the bearings.

(b) Install the 2 No. 1 camshaft bearings.



(c) Using a vernier caliper, measure the distance between the bearing cap edge and the camshaft bearing edge.

Text in Illustration

*1	Vernier Caliper

Standard dimension (A - B):

0.7 mm (0.0276 in.) or less

NOTICE:

Position the bearings to the center of the bearing cap by measuring dimensions A and B.

2. INSTALL NO. 2 CAMSHAFT BEARING

(a) Clean both surfaces of the bearings.

(b) Install the 2 No. 2 camshaft bearings.

(c) Using a vernier caliper, measure the distance between the bearing cap edge and the camshaft bearing edge.

Text in Illustration

*1	Vernier Caliper

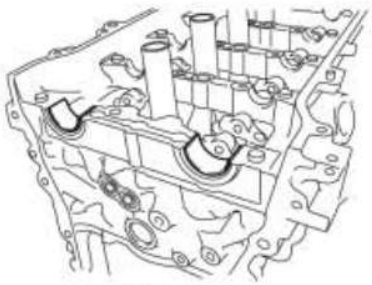
Standard dimension (A):

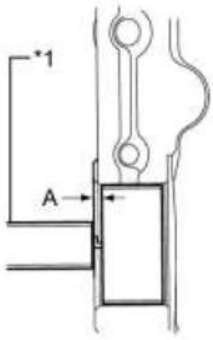
1.05 to 1.75 mm (0.0413 to 0.0689 in.)

NOTICE:

Position the bearings to the center of the bearing cap by measuring dimension A.

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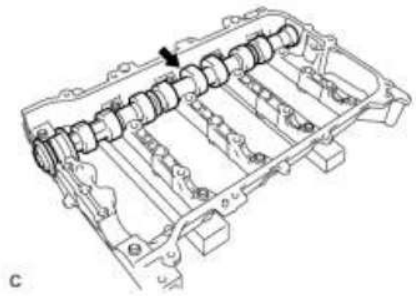




3. INSTALL NO. 2 CAMSHAFT

(a) Clean the camshaft journals.

(b) Apply a light coat of engine oil to the camshaft journals, camshaft housings and bearing caps.

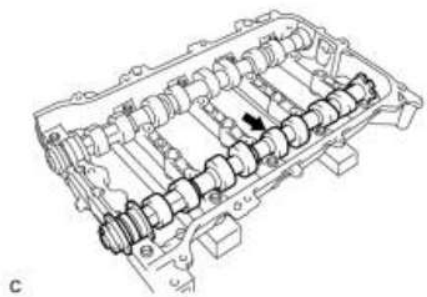


(c) Install the No. 2 camshaft to the camshaft housing.

4. INSTALL CAMSHAFT

(a) Clean the camshaft journals.

(b) Apply a light coat of engine oil to the camshaft journals, camshaft housings and bearing caps.

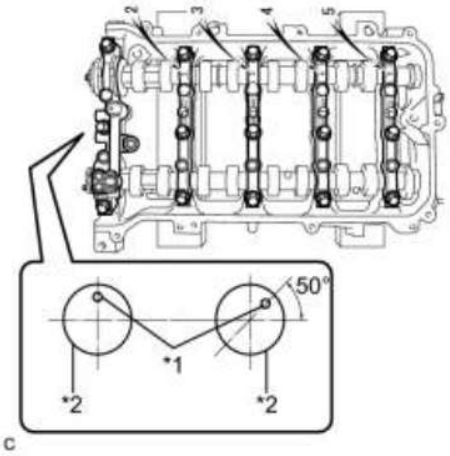


(c) Install the camshaft to the camshaft housing.

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5. INSTALL BEARING CAP

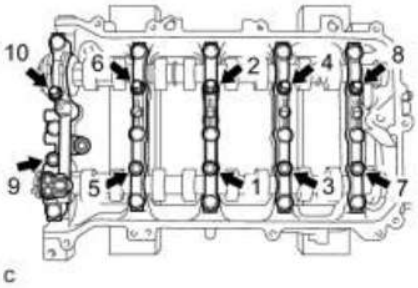
(a) Apply engine oil to the camshaft journals, camshaft housings and bearing caps.



(b) Make sure of the marks and numbers on the camshaft bearing caps and place them in each proper position and direction.

Text in Illustration

*1	Knock Pin
*2	Camshaft

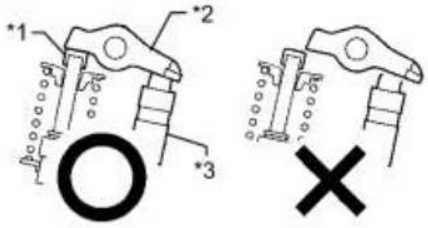


(c) Tighten the 10 bolts in the order shown in the illustration.

Torque: **16 N·m (163 kgf·cm, 12ft·lbf)**

6. INSTALL CAMSHAFT HOUSING SUB-ASSEMBLY

(a) Check that the valve rocker arms are installed as shown in the illustration.



Text in Illustration

*1	Valve Stem Cap
*2	Valve Rocker Arm
*3	Valve Lash Adjuster

(b) Apply seal packing in a continuous line as shown in the illustration.

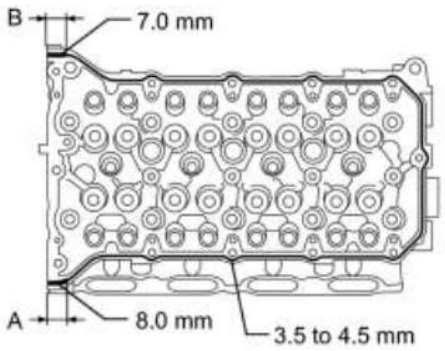
Seal packing:

Toyota Genuine Seal Packing Black, Three Bond 1207B or equivalent

Standard Seal Diameter:

Area	Specified Condition

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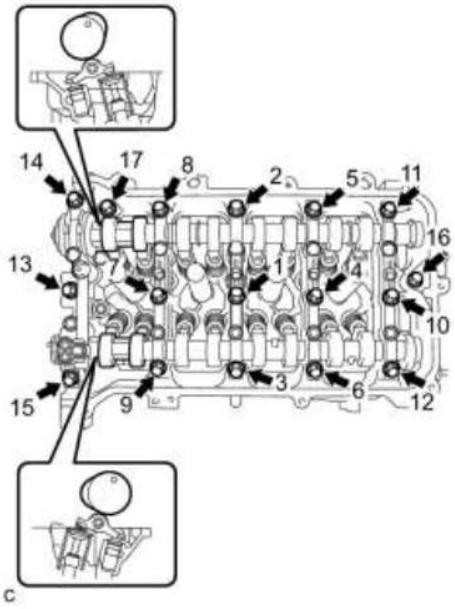


Continuous line	3.5 to 4.5 mm (0.138 to 0.177 in.)
A	8.0 mm (0.315 in.)
B	7.0 mm (0.276 in.)

Application Length A and B:

15 mm (0.591 in.)

- Remove any oil from the contact surfaces.
- Install the camshaft housing within 3 minutes and tighten the bolts within 10 minutes of applying seal packing.
- Do not start the engine for at least 2 hours after installation.



(c) Set the camshaft and No. 2 camshaft as shown in the illustration.

(d) Install the camshaft housing with the 17 bolts and tighten them in the order shown in the illustration.

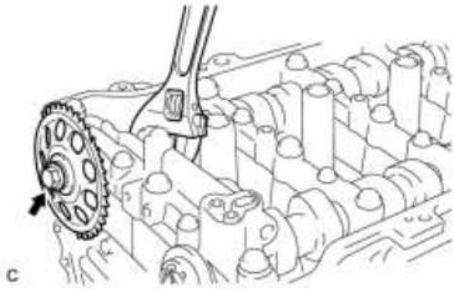
Torque: **27 N·m (275 kgf·cm, 20ft·lbf)**

NOTICE:

- After installing the camshaft housing, make sure that the cam lobes are positioned as shown in the illustration.
- If any of the bolts is loosened during installation, remove the camshaft housing, clean the installation surfaces, and reapply seal packing.
- If the camshaft housing is removed because any of the bolts is loosened during installation, make sure that the previously applied seal packing does not enter any oil passages.
- After installing the camshaft housing, wipe off any seal packing that seeped out from between the housing and cylinder head.

7. INSTALL CAMSHAFT TIMING SPROCKET

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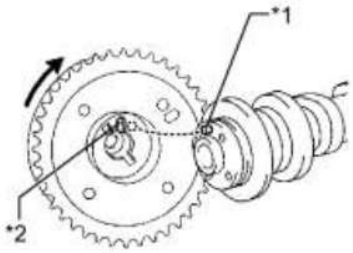


(a) Tighten the flange bolt with the camshaft timing sprocket secured in place.

Torque: **54 N·m (551 kgf·cm, 40ft·lbf)**

8. INSTALL CAMSHAFT TIMING GEAR ASSEMBLY

(a) Put the camshaft timing gear and camshaft together with the straight pin and key groove misaligned as shown in the illustration.



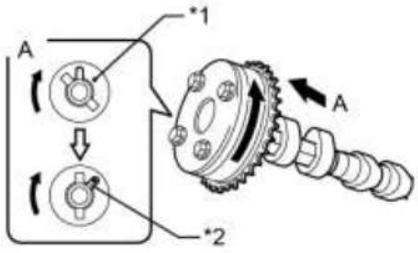
Text in Illustration

*1	Straight Pin
*2	Key Groove

NOTICE:

Do not forcefully push in the camshaft timing gear. This may cause the camshaft straight pin tip to damage the installation surface of the camshaft timing gear.

(b) Turn the camshaft timing gear as shown in the illustration while pushing it gently against the camshaft. Push further at the position where the pin fits into the groove.



Text in Illustration

*1	Straight Pin
*2	Key Groove

NOTICE:

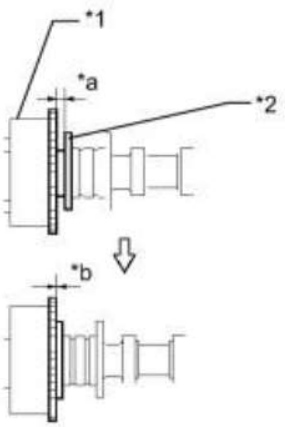
Do not turn the camshaft timing gear in the retard direction (clockwise).

(c) Check that there is no clearance between the camshaft timing gear and camshaft flange.

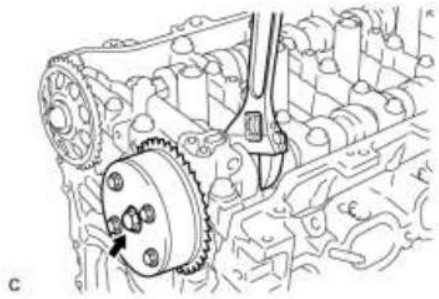
Text in Illustration

*1	Camshaft Timing Gear
*2	Flange
*a	Clearance

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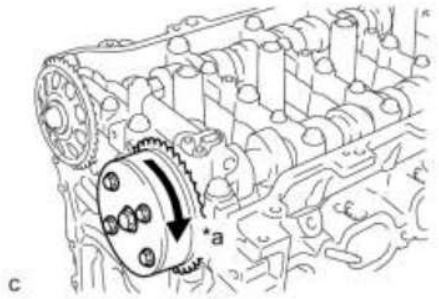


*b	No Clearance



(d) Tighten the flange bolt with the camshaft timing gear secured in place.

Torque: **54 N·m (551 kgf·cm, 40ft·lbf)**

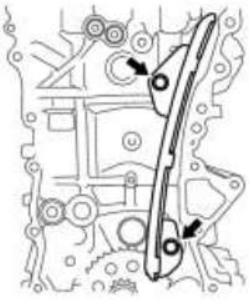


(e) Check that the camshaft timing gear can move in the retard direction (clockwise) and is locked in the most retarded position.

Text in Illustration

*a	Lock

9. INSTALL NO. 1 CHAIN VIBRATION DAMPER



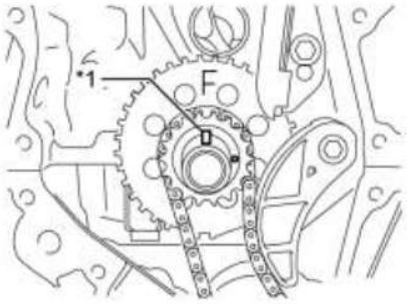
(a) Install the chain vibration damper with the 2 bolts.

Torque: **21 N·m (214 kgf·cm, 15ft·lbf)**

10. SET NO. 1 CYLINDER TO TDC/COMPRESSION

(a) Temporarily install the crankshaft pulley bolt.

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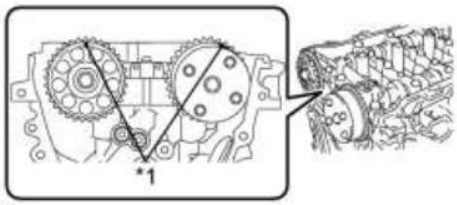


Text in Illustration

*1	Timing Gear Key

(b) Turn the crankshaft to position the timing gear key to the top.

(c) Check that the timing marks on the camshaft timing gear and camshaft timing sprocket are aligned as shown in the illustration.



c

Text in Illustration

*1	Timing Mark

(d) Remove the crankshaft pulley bolt.

11. INSTALL CHAIN SUB-ASSEMBLY

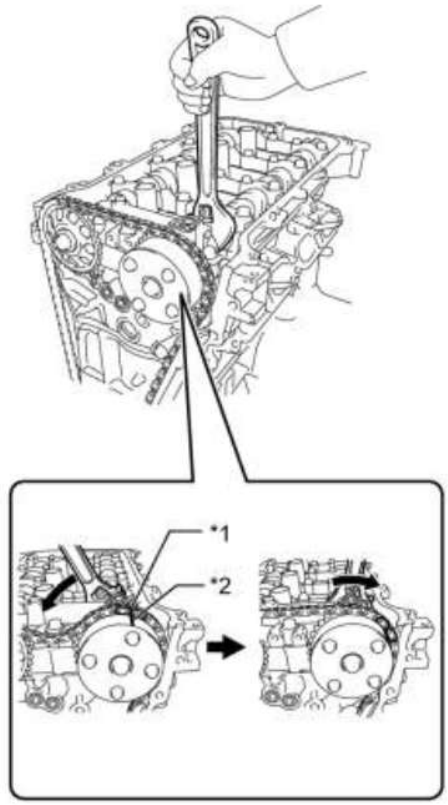
(a) Align the mark plate (orange) with the timing mark as shown in the illustration and install the chain.

Text in Illustration

*1	Mark Plate (Orange)
*2	Timing Mark

- Be sure to position the mark plate at the front of the engine.
- The mark plate on the camshaft side is colored orange.
- Do not pass the chain around the sprocket of the camshaft timing gear. Only place it on the sprocket.
- Pass the chain through the No. 1 vibration damper.

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c

(b) Hold the hexagonal portion of the camshaft with a wrench and turn the camshaft timing gear counterclockwise to align the mark plate (orange) and timing mark, and then install the chain.

(c) Hold the hexagonal portion of the camshaft with a wrench and turn the camshaft timing gear clockwise.

HINT:

To tension the chain, slowly turn the camshaft timing gear clockwise to prevent the chain from being misaligned.

(d) Align the mark plate (yellow) and timing mark and install the chain to the crankshaft timing gear.

Text in Illustration

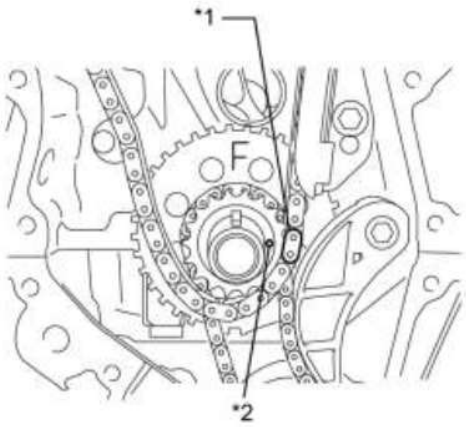
*1	Mark Plate (Yellow)
*2	Timing Mark

HINT:

The mark plate on the crankshaft side is colored pink.

Timothy Frank 2010 Toyota Prius

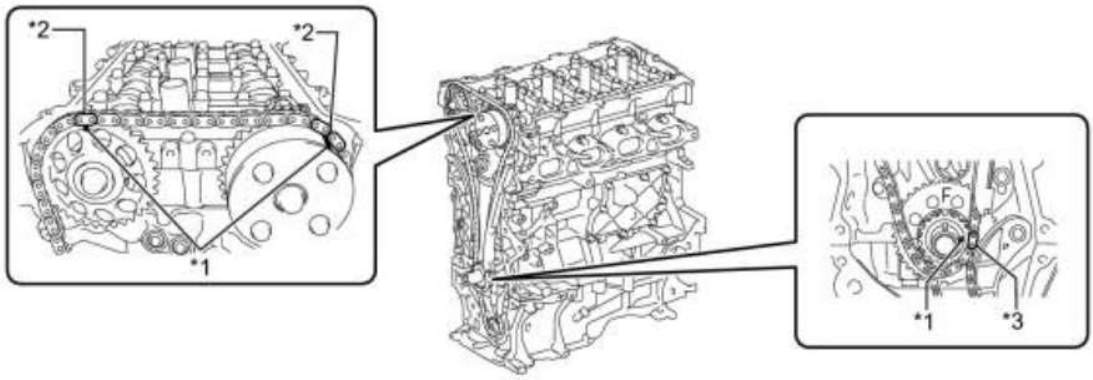
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T

12. CHECK NO. 1 CYLINDER TO TDC/COMPRESSION

(a) Check each timing mark at TDC/compression.



C

Text in Illustration

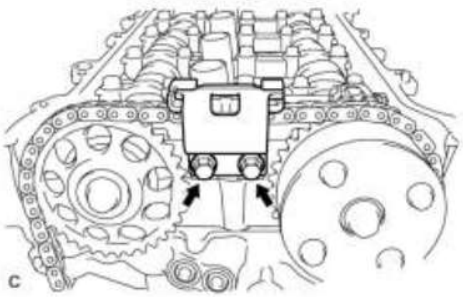
*1	Timing Mark	*2	Mark Plate (Orange)
*3	Mark Plate (Yellow)	-	-

13. INSTALL NO. 2 CHAIN VIBRATION DAMPER

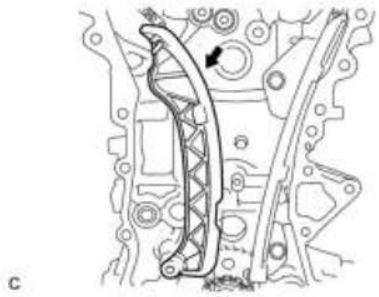
(a) Install the No. 2 chain vibration damper with the 2 bolts.

Torque: **10 N·m (102 kgf·cm, 7ft·lbf)**

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14. INSTALL CHAIN TENSIONER SLIPPER



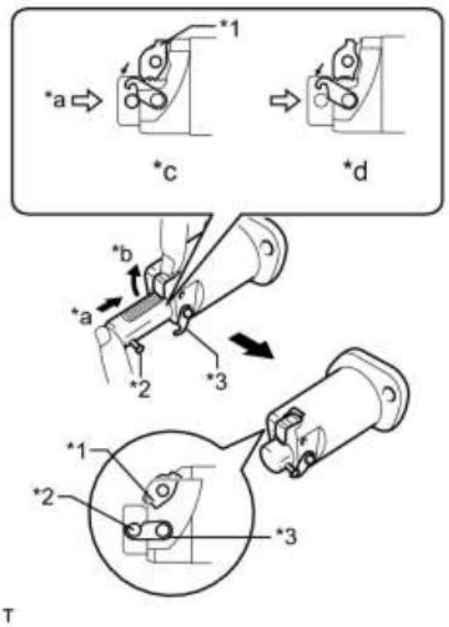
(a) Install the chain tensioner slipper to the cylinder block.

15. INSTALL TIMING CHAIN COVER OIL SEAL INFO

16. INSTALL TIMING CHAIN COVER SUB-ASSEMBLY INFO

17. INSTALL CRANKSHAFT PULLEY INFO

18. INSTALL NO. 1 CHAIN TENSIONER ASSEMBLY



(a) Release the cam, and then fully push in the plunger and engage the hook to the pin so that the plunger is in the position shown in the illustration.

Text in Illustration

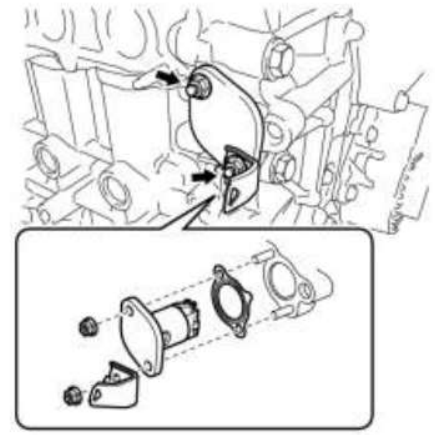
*1	Cam
*2	Pin
*3	Hook
*a	Push
*b	Raise
*c	CORRECT
*d	INCORRECT

NOTICE:

Make sure that the cam engages the first tooth of the plunger to allow the

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hook to pass over the pin.



c

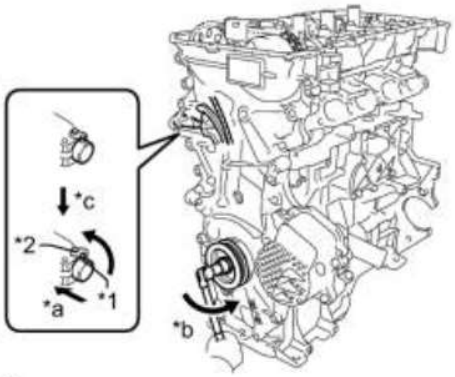
(b) Install a new gasket, the bracket and chain tensioner with the 2 nuts.

Torque: **12 N·m (122 kgf·cm, 9ft·lbf)**

NOTICE:

If the hook releases the plunger while the chain tensioner is being installed, set the hook again.

(c) Rotate the crankshaft counterclockwise slightly and check that the hook becomes released.

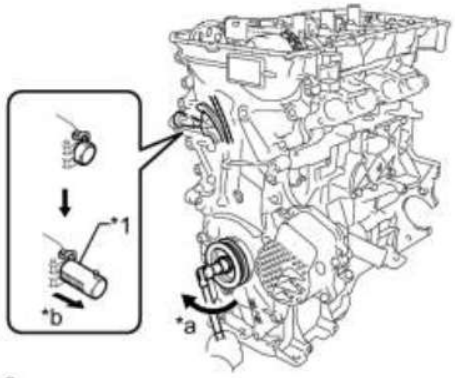


c

Text in Illustration

*1	Pin
*2	Hook
*a	Push
*b	Turn
*c	Disconnect

(d) Turn the crankshaft clockwise and check that the plunger is extended.



c

Text in Illustration

*1	Plunger
*a	Turn
*b	Plunger Extended

19. INSTALL SPARK PLUG TUBE GASKET INFO

20. INSTALL CYLINDER HEAD COVER GASKET INFO

21. INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY INFO

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22. INSTALL IGNITION COIL ASSEMBLY INFO

23. INSTALL FUEL INJECTOR ASSEMBLY INFO

24. INSTALL NO. 1 DELIVERY PIPE SPACER INFO

25. INSTALL FUEL DELIVERY PIPE SUB-ASSEMBLY INFO

26. INSTALL FUEL VAPOR FEED PIPE INFO

27. INSTALL INTAKE MANIFOLD INFO

28. INSTALL EGR WITH COOLER PIPE SUB-ASSEMBLY INFO

29. INSTALL EGR VALVE ASSEMBLY INFO

30. INSTALL EGR PIPE ASSEMBLY INFO

31. INSTALL ENGINE OIL LEVEL DIPSTICK GUIDE INFO

32. INSTALL THROTTLE BODY ASSEMBLY INFO

33. INSTALL ENGINE HANGERS INFO

34. REMOVE ENGINE ON ENGINE STAND INFO

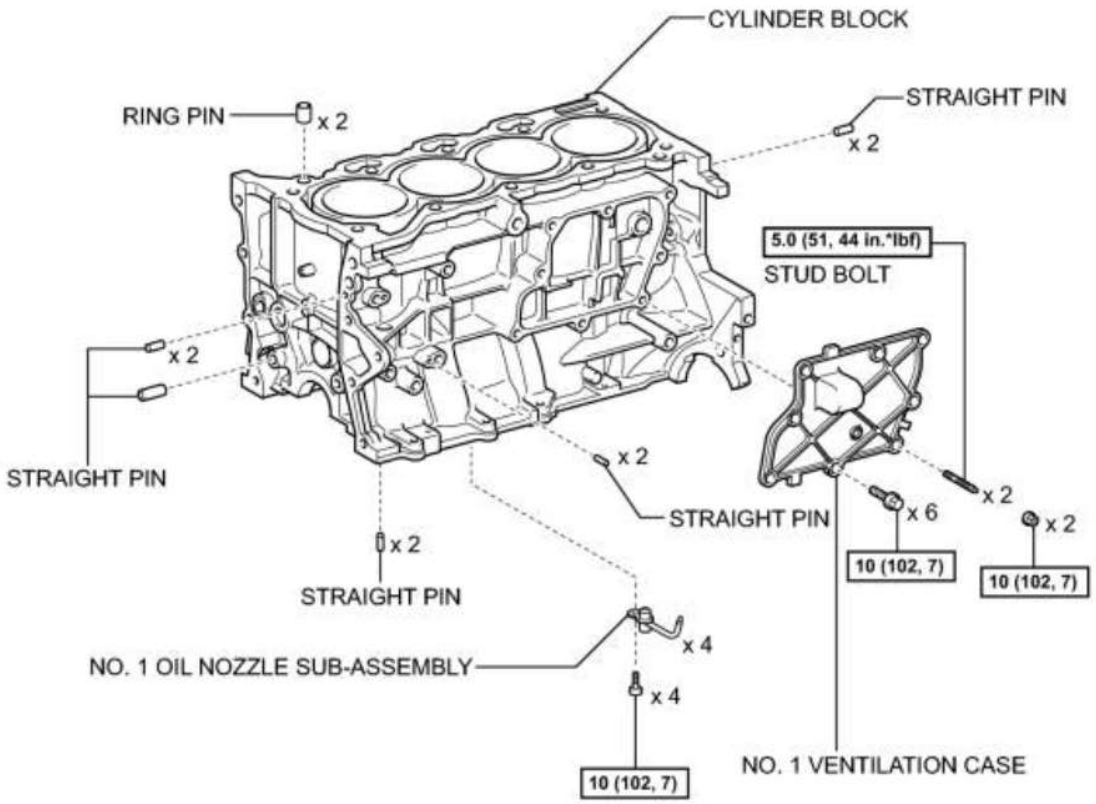
35. INSTALL ENGINE ASSEMBLY WITH TRANSAXLE

(a) Install the engine assembly with transaxle INFO.

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COMPONENTS

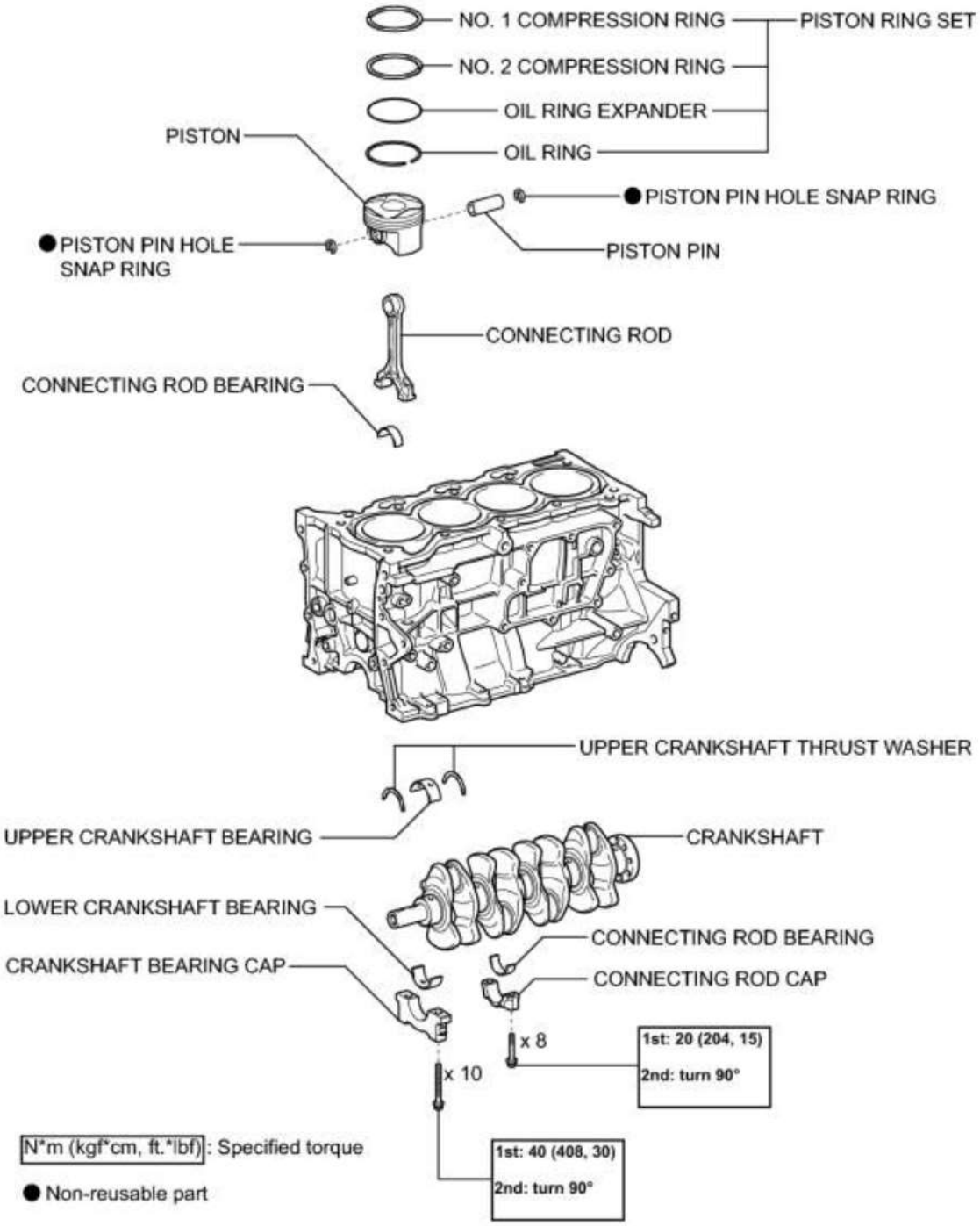
ILLUSTRATION



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

ILLUSTRATION

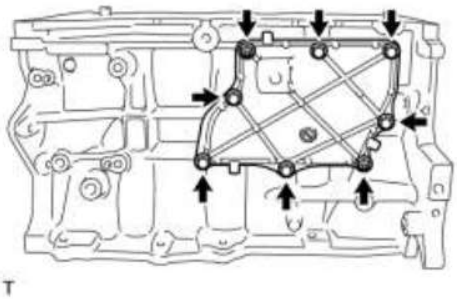
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DISASSEMBLY

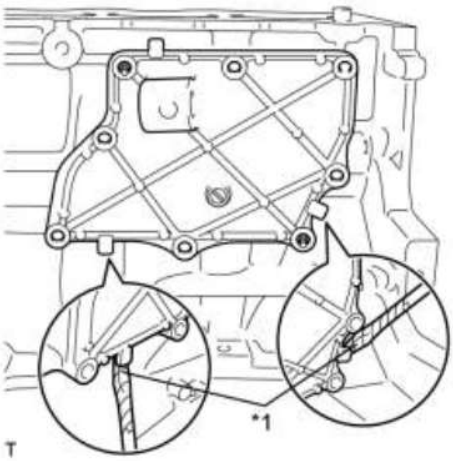
1. REMOVE NO. 1 VENTILATION CASE



T

(a) Remove the 6 bolts and 2 nuts.

(b) Remove the ventilation case by prying between the ventilation case and cylinder block with a screwdriver as shown in the illustration.



T

Text in Illustration

*1	Protective Tape

NOTICE:

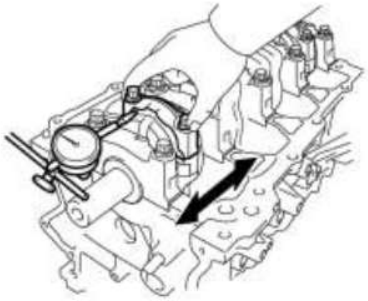
Be careful not to damage the contact surfaces of the cylinder block and No. 1 ventilation case.

HINT:

Tape the screwdriver tip before use.

2. INSPECT CONNECTING ROD THRUST CLEARANCE

(a) Using a dial indicator, measure the thrust clearance while moving the connecting rod cap back and forth.



T

Standard thrust clearance:

0.160 to 0.342 mm (0.00630 to 0.0135 in.)

Maximum thrust clearance:

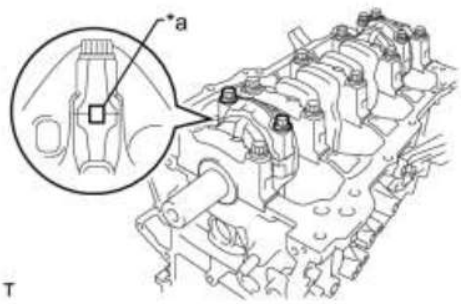
0.342 mm (0.0132 in.)

If the thrust clearance is greater than the maximum, replace the connecting rod assemblies as necessary. If necessary, replace the crankshaft.

3. INSPECT CONNECTING ROD OIL CLEARANCE

(a) Check that the matchmarks on the connecting rod and cap are aligned

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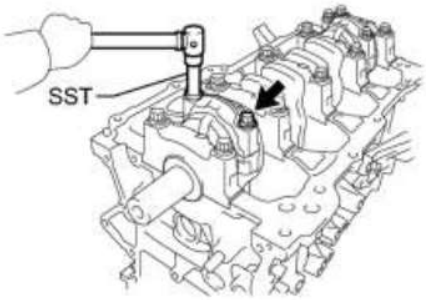
to ensure correct reassembly.

Text in Illustration

*a	Matchmark

HINT:

The matchmarks on the connecting rods and caps are provided to ensure correct reassembly.



T

(b) Using SST, uniformly loosen the 2 bolts.

SST: 09205-16011



T

(c) Using the 2 removed connecting rod cap bolts, remove the connecting rod cap and lower bearing by wiggling the connecting rod cap right and left.

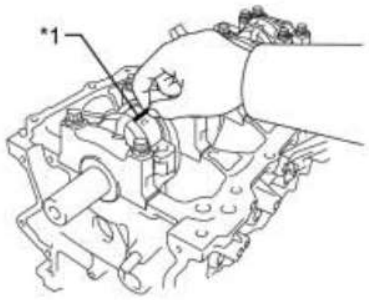
HINT:

Keep the lower bearing inserted in the connecting rod cap.

(d) Clean the crank pin and bearing.

(e) Check the crank pin and bearing for pitting and scratches.

If the crank pin or bearing is damaged, replace the bearings. If necessary, replace the crankshaft.



T

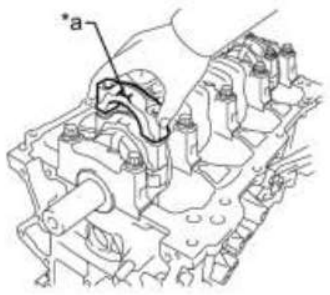
(f) Lay a strip of Plastigage on the crank pin.

Text in Illustration

*1	Plastigage

(g) Check that the front mark of the connecting rod cap is facing forward and install the connecting rod cap.

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Text in Illustration

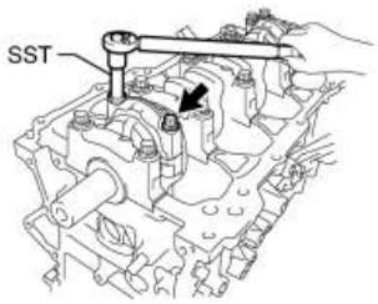
*a	Front Mark

(h) Apply a light coat of engine oil to the threads and under the heads of the connecting rod cap bolts.

(i) Install the connecting rod cap bolts.

NOTICE:

The connecting rod cap bolts should be tightened in 2 progressive steps.



T

(j) Step 1:

(1) Using SST, install and alternately tighten the bolts of the connecting rod cap in several steps.

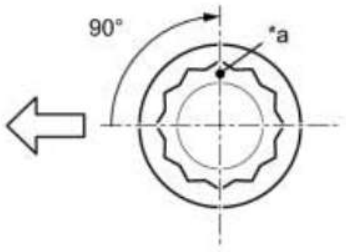
SST: 09205-16011

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

NOTICE:

Do not turn the crankshaft.

(k) Step 2:



P

Text in Illustration

*a	Paint Mark
⇨	Engine Front

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(1) Mark the front of the connecting rod cap bolts with paint.

(2) Tighten the cap bolts 90° as shown in the illustration.

NOTICE:

Do not turn the crankshaft.

(l) Remove the 2 bolts and connecting rod cap.

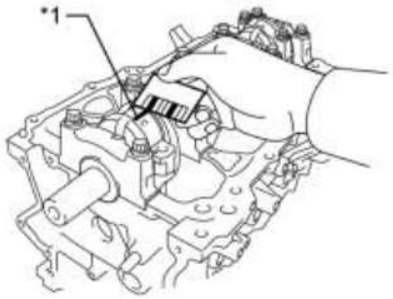
HINT:

Keep the lower bearing inserted in the connecting rod cap.

(m) Measure the Plastigage at its widest point.

Text in Illustration

*1	Plastigage
*a	Mark 1, 2 or 3





T

Standard oil clearance:

0.014 to 0.038 mm (0.000551 to 0.00150 in.)

Maximum oil clearance:

0.070 mm (0.00276 in.)

If the oil clearance is more than the maximum, replace the connecting rod bearings. If necessary, inspect the crankshaft.

NOTICE:

Remove the Plastigage completely after the measurement.

HINT:

If replacing a bearing, replace it with one that has the same number as its respective connecting rod cap. Each bearing standard thickness is indicated by a 1, 2, or 3 mark on its surface.

Standard Connecting Rod Large End Bore Diameter:

Mark	Specified Condition
Mark 1	47.000 to 47.008 mm (1.85039 to 1.85070 in.)
Mark 2	47.009 to 47.016 mm (1.85074 to 1.85102 in.)
Mark 3	47.017 to 47.024 mm (1.85106 to 1.85133 in.)

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Standard Connecting Rod Bearing Thickness:

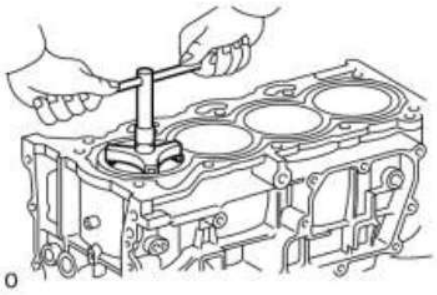
Mark	Specified Condition
Mark 1	1.489 to 1.493 mm (0.05862 to 0.05878 in.)
Mark 2	1.494 to 1.497 mm (0.05882 to 0.05894 in.)
Mark 3	1.498 to 1.501 mm (0.05898 to 0.05909 in.)

Standard crankshaft pin diameter:

43.992 to 44.000 mm (1.7320 to 1.7323 in.)

(n) Perform the inspection above for each cylinder.

4. REMOVE PISTON SUB-ASSEMBLY WITH CONNECTING ROD



(a) Using a ridge reamer, remove all the carbon from the top of the cylinder.

(b) Push the piston, connecting rod and upper bearing through the top of the cylinder block.

HINT:

- Keep the bearing, connecting rod and cap together.
- Arrange the piston and connecting rod assemblies in the correct order.
- Be sure to arrange the removed piston and connecting rod assemblies in such a way that they can be reinstalled exactly as before.

5. REMOVE CONNECTING ROD BEARING

(a) Remove the connecting rod bearings.

HINT:

Arrange the removed parts in the correct order.

6. REMOVE PISTON RING SET

(a) Using a piston ring expander, remove the 2 compression rings.

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(b) Remove the oil ring and oil ring expander by hand.

HINT:

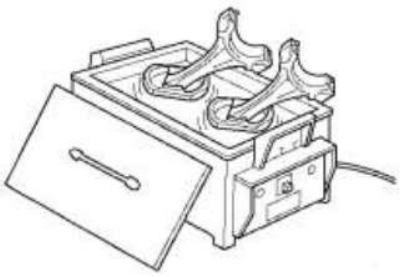
Arrange the removed parts in the correct order.

7. REMOVE PISTON



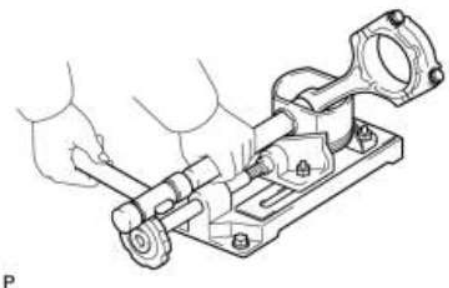
T

(a) Using a screwdriver, pry out the 2 snap rings.



Y

(b) Gradually heat each piston to approximately 80 to 90°C (176 to 194°F).



P

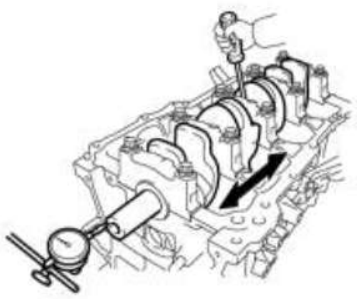
(c) Using a plastic-faced hammer and brass bar, lightly tap out the piston pin and remove the connecting rod.

- The piston and pin are a matched set.
- Arrange the pistons, pins, rings, connecting rods and bearings in the correct order.

8. INSPECT CRANKSHAFT THRUST CLEARANCE

(a) Using a dial indicator, measure the thrust clearance while prying the

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crankshaft back and forth with a screwdriver.

Standard thrust clearance:

0.04 to 0.14 mm (0.00157 to 0.00551 in.)

Maximum thrust clearance:

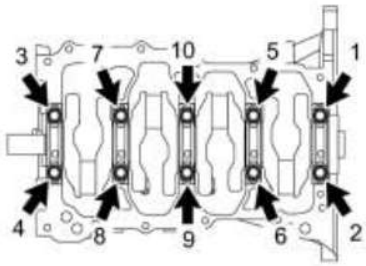
0.18 mm (0.00709 in.)

If the thrust clearance is more than the maximum, replace the thrust washers as a set. If necessary, replace the crankshaft.

HINT:

The thrust washer thickness is 2.43 to 2.48 mm (0.0957 to 0.0976 in.).

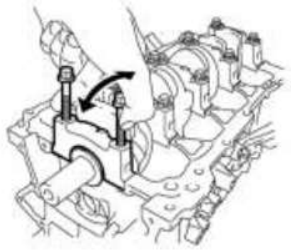
9. REMOVE CRANKSHAFT



T

(a) Uniformly loosen and remove the 10 crankshaft bearing cap bolts in the sequence shown in the illustration.

(b) Using the 2 removed crankshaft bearing cap bolts, remove the 5 crankshaft bearing caps and 5 lower bearings.



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NOTICE:

Insert the bolts into the caps in turn. Ease the cap out by gently pulling up and applying force toward the front and back sides of the cylinder block, as shown in the illustration. Take care not to damage the contact surfaces of the cap and cylinder block.

- Keep the lower bearing and crankshaft bearing cap together as a set.
- Arrange the crankshaft bearing caps in the correct order.

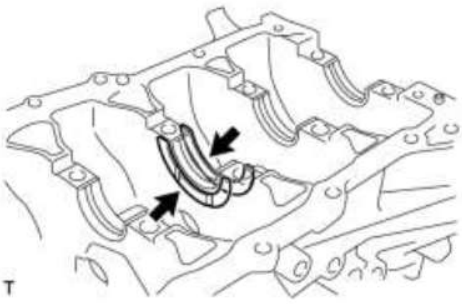
(c) Lift out the crankshaft.

(d) Check each crankshaft journal and bearing for pitting and scratches.

If the journal or bearing is damaged, replace the bearings. If necessary, replace the crankshaft.

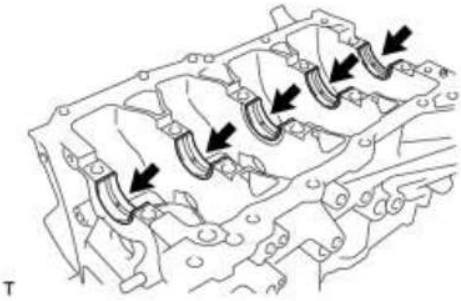
10. REMOVE UPPER CRANKSHAFT THRUST WASHER

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(a) Remove the 2 upper crankshaft thrust washers from the cylinder block.

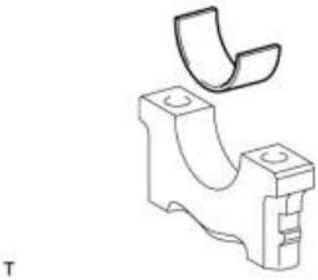
11. REMOVE CRANKSHAFT BEARING



(a) Remove the 5 upper crankshaft bearings from the cylinder block.

HINT:

Arrange the bearings in the correct order.

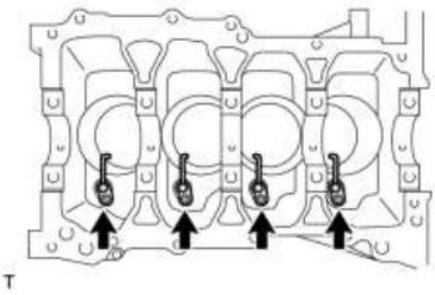


(b) Remove the 5 lower crankshaft bearings from the 5 crankshaft bearing caps.

HINT:

Arrange the bearings in the correct order.

12. REMOVE NO. 1 OIL NOZZLE SUB-ASSEMBLY



(a) Using a 5 mm socket hexagon wrench, remove the 4 bolts and 4 oil nozzles.

13. CLEAN CYLINDER BLOCK

NOTICE:

If the cylinder is washed at high temperatures, the cylinder liner will stick out beyond the cylinder block. Always wash the cylinder block at a temperature of 45°C (113°F) or less.

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14. REMOVE STUD BOLT

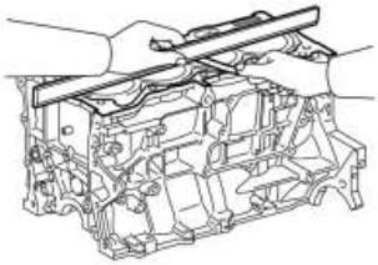
NOTICE:

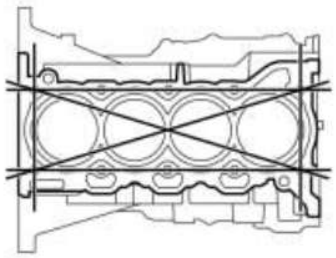
If a stud bolt is deformed or its threads are damaged, replace it.

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INSPECTION

1. INSPECT CYLINDER BLOCK FOR WARPAGE





(a) Using a straightedge and feeler gauge, measure the warpage of the surface that contacts the cylinder head gasket.

Maximum warpage:

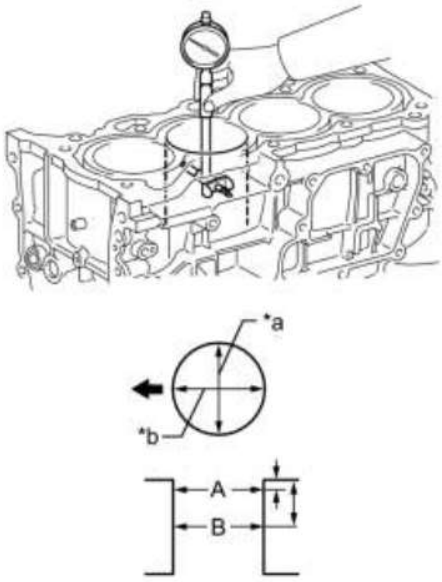
0.05 mm (0.00197 in.)

If the warpage is more than the maximum, replace the cylinder block.

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2. INSPECT CYLINDER BORE

(a) Using a cylinder gauge, measure the cylinder bore diameter at positions A and B in both the thrust and axial directions.



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Text in Illustration

*a	Thrust Direction
*b	Axial Direction
➡	Engine Front

Standard diameter:

80.500 to 80.513 mm (3.169 to 3.170 in.)

Maximum diameter:

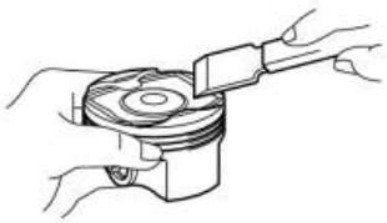
80.63 mm (3.174 in.)

Measurement Position:

Measurement Position	Cylinder Bore Position
A	10 mm (0.394 in.) from top edge
B	50 mm (1.97 in.) from top edge

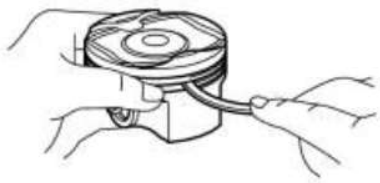
If the average diameter of the 4 positions is more than the maximum, replace the cylinder block.

3. INSPECT PISTON



o

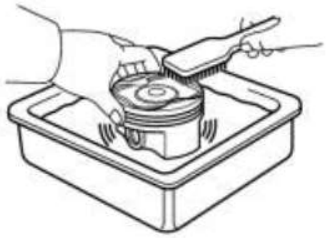
(a) Using a gasket scraper, remove the carbon from the piston top.



o

(b) Using a groove cleaning tool or broken ring, clean the piston ring grooves.

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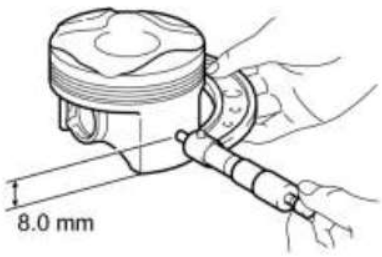


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(c) Using a brush and solvent, thoroughly clean the piston.

NOTICE:

Do not use a wire brush.



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(d) Using a micrometer, measure the piston diameter at a position that is 8.0 mm (0.315 in.) from the bottom of the piston (refer to the illustration).

Standard piston diameter:

80.461 to 80.471 mm (3.1677 to 3.1681 in.)

If the diameter is not as specified, replace the piston with pin.

4. INSPECT PISTON OIL CLEARANCE

(a) Subtract the piston diameter measurement from the cylinder bore diameter measurement.

Standard oil clearance:

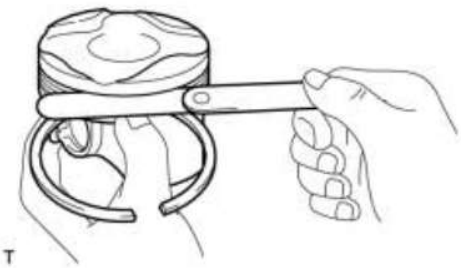
0.009 to 0.042 mm (0.000354 to 0.00165 in.)

Maximum oil clearance:

0.08 mm (0.00315 in.)

If the oil clearance is more than the maximum, replace all the pistons. If necessary, replace the cylinder block.

5. INSPECT RING GROOVE CLEARANCE



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(a) Using a feeler gauge, measure the clearance between a new piston ring and the wall of the ring groove.

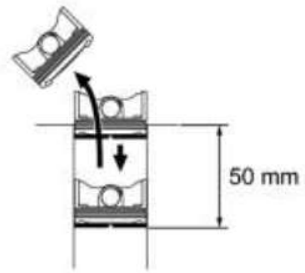
Standard Ring Groove Clearance:

Item	Specified Condition
No. 1 Compression Ring	0.02 to 0.07 mm (0.000787 to 0.00276 in.)
No. 2 Compression Ring	0.02 to 0.055 mm (0.000787 to 0.00217 in.)
Oil Ring	0.02 to 0.06 mm (0.000787 to 0.00236 in.)

If the groove clearance is not as specified, replace the piston with pin.

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6. INSPECT PISTON RING END GAP



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(a) Using a piston, push the piston ring a little beyond the bottom of the ring travel, 50 mm (1.97 in.) from the top of the cylinder block.

(b) Using a feeler gauge, measure the end gap.



Standard End Gap:

Item	Specified Condition
No. 1 Compression Ring	0.20 to 0.30 mm (0.00787 to 0.0118 in.)
No. 2 Compression Ring	0.30 to 0.45 mm (0.0118 to 0.0177 in.)
Oil Ring	0.10 to 0.35 mm (0.00394 to 0.0138 in.)

Maximum End Gap:

Item	Specified Condition
No. 1 Compression Ring	0.50 mm (0.0197 in.)
No. 2 Compression Ring	0.70 mm (0.0276 in.)
Oil Ring	0.70 mm (0.0276 in.)

If the end gap is more than the maximum, replace the piston ring. If the end gap is more than the maximum even with a new piston ring, replace the cylinder block.

7. INSPECT PISTON PIN OIL CLEARANCE



T

(a) Using a caliper gauge, measure the piston pin bore diameter.

Standard piston pin bore diameter:

20.006 to 20.015 mm (0.78764 to 0.78799 in.)

Item	Specified Condition
Mark A	20.006 to 20.009 mm (0.78764 to 0.78775 in.)
Mark B	20.010 to 20.012 mm (0.78779 to 0.78787 in.)
Mark C	20.013 to 20.015 mm (0.78791 to 0.78799 in.)

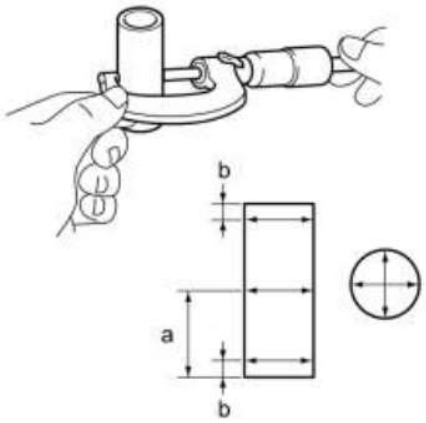
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If the diameter is not as specified, replace the piston with pin.

(b) Using a micrometer, measure the piston pin diameter.

Standard piston pin diameter:

20.004 to 20.013 mm (0.78756 to 0.78791 in.)



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Item	Specified Condition
Mark A	20.004 to 20.007 mm (0.78756 to 0.78768 in.)
Mark B	20.008 to 20.010 mm (0.78771 to 0.78779 in.)
Mark C	20.011 to 20.013 mm (0.78783 to 0.78791 in.)

If the diameter is not as specified, replace the piston with pin.

Measurement Position:

Measurement Position	Piston Pin Position
a	25 mm (0.984 in.) from side edge
b	5 mm (0.197 in.) from side edge

(c) Using a caliper gauge, measure the connecting rod small end bore diameter.



Standard connecting rod small end bore diameter:

20.012 to 20.021 mm (0.78787 to 0.78823 in.)

Item	Specified Condition
Mark A	20.012 to 20.015 mm (0.78787 to 0.78799 in.)
Mark B	20.016 to 20.018 mm (0.78803 to 0.78811 in.)
Mark C	20.019 to 20.021 mm (0.78815 to 0.78823 in.)

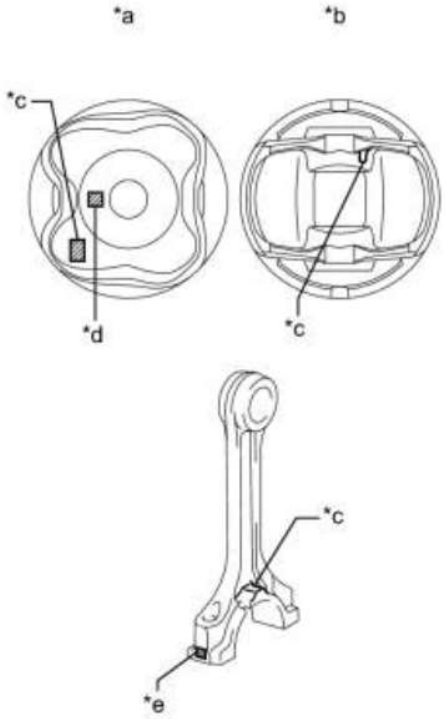
If the diameter is not as specified, replace the connecting rod.

(d) Subtract the piston pin diameter measurement from the piston pin bore diameter measurement.

Text in Illustration

*a	Upper Side:
*b	Lower Side:
*c	Front Mark
*d	Piston Pin Bore Diameter Mark
*e	Connecting Rod Small Bore Diameter Mark

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Standard oil clearance:

-0.001 to 0.005 mm (-0.0000394 to 0.000197 in.)

Maximum oil clearance:

0.010 mm (0.000394 in.)

If the oil clearance is more than the maximum, replace the connecting rod. If necessary, replace the piston and piston with pin as a set.

(e) Subtract the piston pin diameter measurement from the connecting rod small end bore diameter measurement.

Standard oil clearance:

0.005 to 0.011 mm (0.000197 to 0.000433 in.)

Maximum oil clearance:

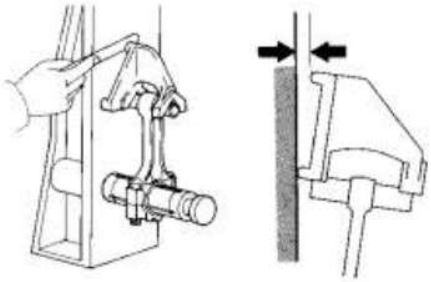
0.014 mm (0.000551 in.)

If the oil clearance is more than the maximum, replace the connecting rod small end bush. If necessary, replace the piston with pin as a set.

8. INSPECT CONNECTING ROD SUB-ASSEMBLY

(a) Using a connecting rod aligner and feeler gauge, check the connecting rod alignment.

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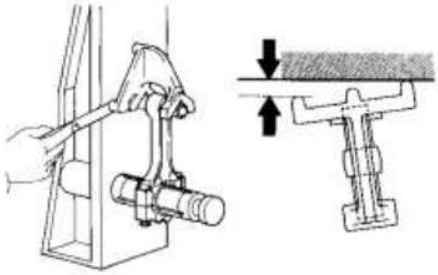


(1) Check for misalignment.

Maximum misalignment:

0.05 mm (0.00197 in.) per 100 mm (3.94 in.)

If the misalignment is more than the maximum, replace the connecting rod.



(2) Check for twist.

Maximum twist:

0.15 mm (0.00591 in.) per 100 mm (3.94 in.)

If the twist is more than the maximum, replace the connecting rod.

9. INSPECT CRANKSHAFT

(a) Inspect the circle runout.



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(1) Using a dial indicator and V-blocks, measure the circle runout as shown in the illustration.

Maximum circle runout:

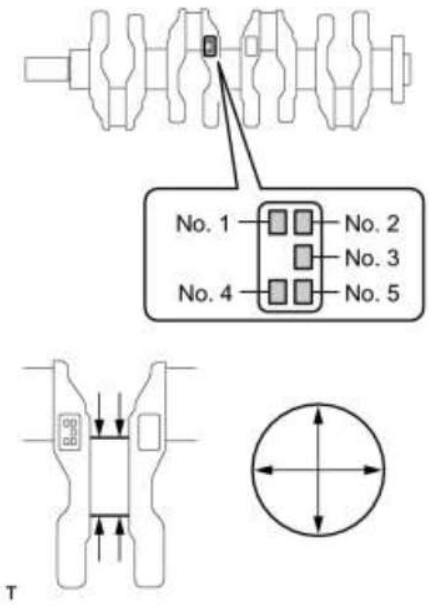
0.03 mm (0.00118 in.)

If the circle runout is more than the maximum, replace the crankshaft.

(b) Inspect the main journals.

(1) Using a micrometer, measure the diameter of each main journal.

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Standard diameter:

47.988 to 48.000 mm (1.8893 to 1.8898 in.)

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

(2) Check each main journal for taper and distortion as shown in the illustration.

Maximum taper and distortion:

0.004 mm (0.000157 in.)

If the taper and distortion are more than the maximum, replace the crankshaft.

Standard Diameter (Reference):

Mark	Specified Condition
0	47.999 to 48.000 mm (1.88972 to 1.88976 in.)
1	47.997 to 47.998 mm (1.88964 to 1.88968 in.)
2	47.995to 47.996 mm (1.88956 to 1.88960 in.)
3	47.993 to 47.994 mm (1.88948 to 1.88952 in.)
4	47.991 to 47.992 mm (1.88941 to 1.88945 in.)
5	47.988 to 47.990 mm (1.88929 to 1.88937 in.)

(c) Inspect the crank pin.

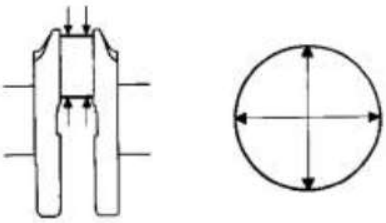
(1) Using a micrometer, measure the diameter of each crank pin.

Standard diameter:

43.992 to 44.000 mm (1.7320 to 1.7323 in.)

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

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(2) Inspect each crank pin for taper and distortion.

Maximum taper and distortion:

0.004 mm (0.000157 in.)

If the taper and distortion are more than the maximum, replace the crankshaft.

10. INSPECT CRANKSHAFT OIL CLEARANCE

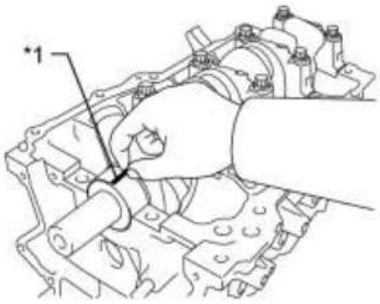
(a) Check the crankshaft journals and bearings for pitting and scratches.

(b) Install the crankshaft bearings INFO.

(c) Install the upper crankshaft thrust washers INFO.

(d) Clean each main journal and bearing.

(e) Place the crankshaft on the cylinder block.



(f) Lay a strip of Plastigage across each journal.

Text in Illustration

*1	Plastigage

T

(g) Examine the front marks and numbers and place the bearing caps on the cylinder block.

HINT:

A number is marked on each crankshaft bearing cap to indicate the installation position.

(h) Install the crankshaft bearing cap INFO.

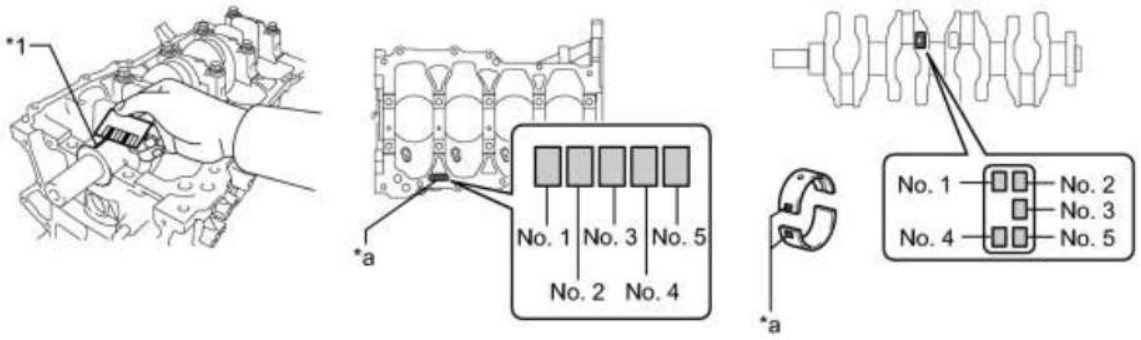
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NOTICE:

Do not turn the crankshaft.

(i) Remove the crankshaft bearing caps INFO.

(j) Measure the Plastigage at its widest point.



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Text in Illustration

*1	Plastigage	*a	Number Mark

Standard oil clearance:

0.016 to 0.039 mm (0.000630 to 0.00154 in.)

Maximum oil clearance:

0.050 mm (0.00197 in.)

If the oil clearance is more than the maximum, replace the crankshaft bearing. If necessary, replace the crankshaft.

NOTICE:

Remove the Plastigage completely after the measurement.

HINT:

If replacing a bearing, select a new one with the same number. If the number of the bearing cannot be determined, calculate the correct bearing number by adding together the numbers imprinted on the cylinder block and crankshaft. Then select a new bearing with the calculated number according to the chart below. There are 4 sizes of standard bearings, marked "1", "2", "3" and "4" accordingly.

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- Example:

Cylinder block "3" + Crankshaft "5" = Total number 8 (Use bearing "3")

Bearing Chart

Cylinder Block + Crankshaft	Bearing to be Used
0 to 2	"1"
3 to 5	"2"
6 to 8	"3"
9 to 11	"4"

Standard Cylinder Block Journal Bore Diameter:

Item	Specified Condition
Mark 0	52.000 to 52.002 mm (2.04724 to 2.04732 in.)
Mark 1	52.003 to 52.004 mm (2.04736 to 2.04740 in.)
Mark 2	52.005 to 52.006 mm (2.04744 to 2.04752 in.)
Mark 3	52.007 to 52.009 mm (2.04752 to 2.04759 in.)
Mark 4	52.010 to 52.011 mm (2.04763 to 2.04767 in.)
Mark 5	52.012 to 52.013 mm (2.04771 to 2.04775 in.)
Mark 6	52.014 to 52.016 mm (2.04779 to 2.04787 in.)

Standard Crankshaft Journal Diameter:

Item	Specified Condition
Mark 0	47.999 to 48.000 mm (1.88972 to 1.88976 in.)
Mark 1	47.997 to 47.998 mm (1.88964 to 1.88968 in.)
Mark 2	47.995 to 47.996 mm (1.88956 to 1.88961 in.)
Mark 3	47.993 to 47.994 mm (1.88948 to 1.88952 in.)
Mark 4	47.991 to 47.992 mm (1.88941 to 1.88945 in.)
Mark 5	47.988 to 47.990 mm (1.88929 to 1.88937 in.)

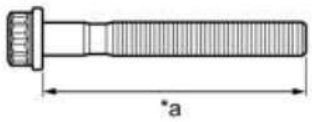
Standard Bearing Center Wall Thickness:

Item	Specified Condition
Mark 1	1.994 to 1.997 mm (0.07850 to 0.07862 in.)
Mark 2	1.998 to 2.000 mm (0.07866 to 0.07874 in.)
Mark 3	2.001 to 2.003 mm (0.07878 to 0.07886 in.)
Mark 4	2.004 to 2.006 mm (0.07890 to 0.07898 in.)

11. INSPECT CRANKSHAFT BEARING CAP SET BOLT

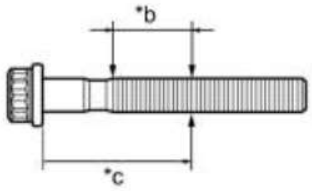
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(a) Using a vernier caliper, measure the length of the crankshaft bearing cap set bolt from the seat to end.



Text in Illustration

*a	Measurement Length
*b	Measurement Area
*c	Distance



Standard bolt length:

84.3 to 85.7 mm (3.32 to 3.37 in.)

Maximum bolt length:

86.7 mm (3.41 in.)

If the length is more than the maximum, replace the crankshaft bearing cap set bolt.

(b) Using a vernier caliper, measure the tension portion diameter of the bolts.

Measurement point:

55.0 mm (0.197 in.)

Standard diameter:

9.77 to 9.96 mm (0.385 to 0.392 in.)

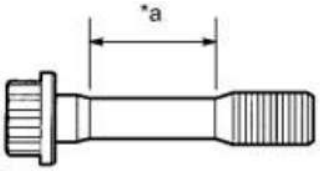
Minimum diameter:

9.1 mm (0.358 in.)

If the diameter is less than the minimum, replace the crankshaft bearing cap set bolt.

12. INSPECT CONNECTING ROD BOLT

(a) Using a vernier caliper, measure the tension portion diameter of the bolt.



Text in Illustration

*a	Measurement Area

Standard diameter:

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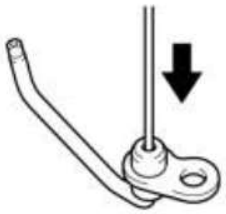
6.6 to 6.7 mm (0.260 to 0.264 in.)

Minimum diameter:

6.4 mm (0.252 in.)

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

13. INSPECT NO. 1 OIL NOZZLE SUB-ASSEMBLY



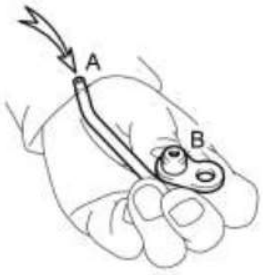
P

(a) Push the check valve with a pin to check if it is stuck.

If stuck, replace the No. 1 oil nozzle.

(b) Push the check valve with a pin to check if it moves smoothly.

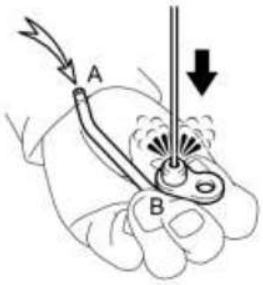
If it does not move smoothly, clean or replace the No. 1 oil nozzle.



P

(c) Apply air into A. Check that air does not leak through B.

If air leaks, clean or replace the No. 1 oil nozzle.



P

(d) Push the check valve while applying air into A. Check that air passes through B.

If air does not pass through B, clean or replace the No. 1 oil nozzle.

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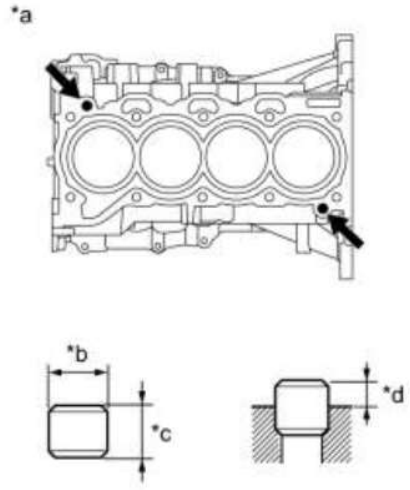
REPLACEMENT

1. REPLACE RING PIN

NOTICE:

It is not necessary to remove a ring pin unless it is being replaced.

(a) Using a plastic-faced hammer, tap in the ring pins.



T

Text in Illustration

*a	Upper Side:
*b	Width
*c	Height
*d	Protrusion Height

Standard Ring Pin:

Item	Height	Width	Protrusion
Ring Pin	14.3 to 14.7 mm (0.563 to 0.579 in.)	12.9 to 13.0 mm (0.508 to 0.512 in.)	7.5 to 8.5 mm (0.295 to 0.335 in.)

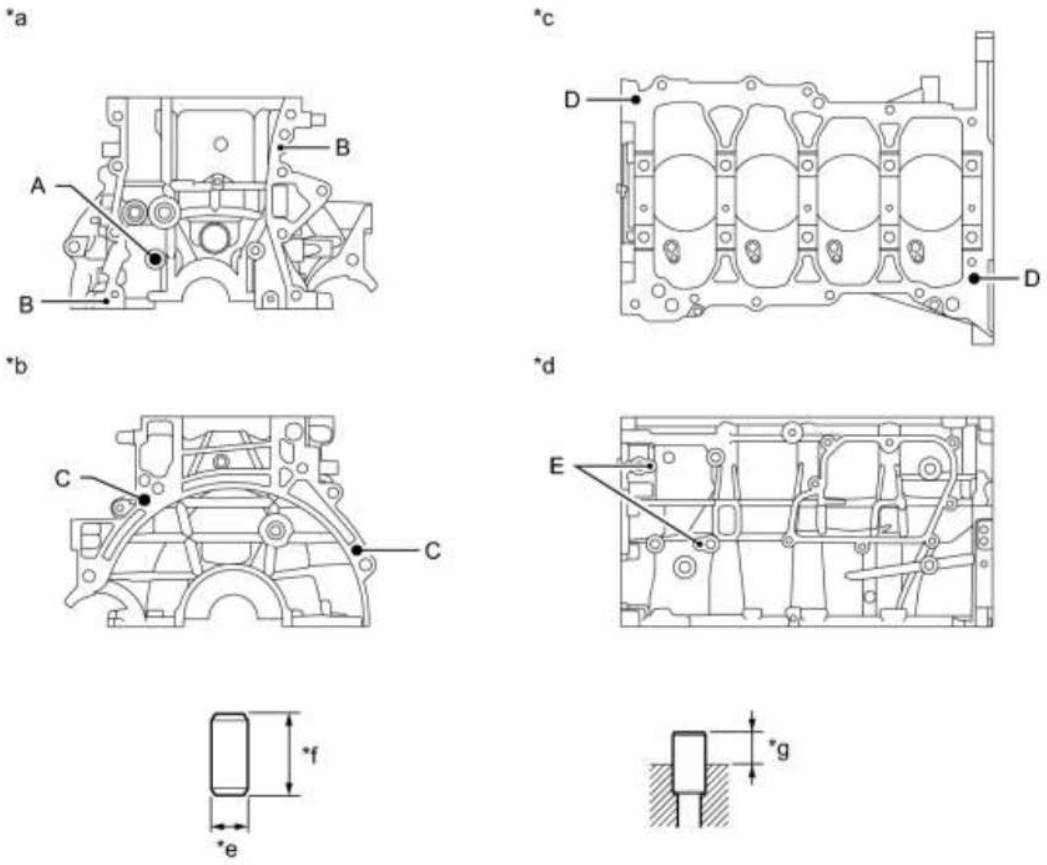
2. REPLACE STRAIGHT PIN

NOTICE:

It is not necessary to remove a straight pin unless it is being replaced.

(a) Using a plastic-faced hammer, tap in the straight pin.

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Text in Illustration

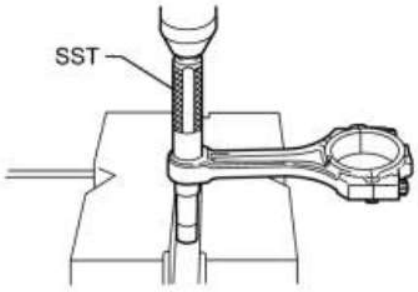
*a	Front Side:	*b	Rear Side:
*c	Lower Side:	*d	LH Side:
*e	Width	*f	Height
*g	Protrusion Height	-	-

Standard Straight Pin:

Item	Height	Width	Protrusion
Pin A	36 mm (1.42 in.)	10 mm (0.394 in.)	18.5 to 19.5 mm (0.728 to 0.768 in.)
Pin B	12 mm (0.472 in.)	4 mm (0.156 in.)	5.0 to 7.0 mm (0.197 to 0.276 in.)
Pin C	22 mm (0.866 in.)	10 mm (0.394 in.)	11 to 13 mm (0.433 to 0.512 in.)
Pin D	15 mm (0.591 in.)	8 mm (0.315 in.)	5.0 to 7.0 mm (0.197 to 0.276 in.)
Pin E	12 mm (0.472 in.)	4 mm (0.156 in.)	5.0 to 6.0 mm (0.197 to 0.236 in.)

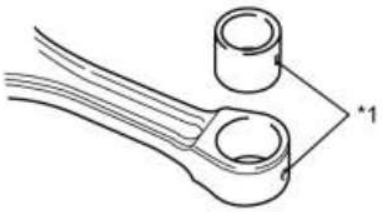
3. REPLACE CONNECTING ROD SMALL END BUSH

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(a) Using SST and a press, press out the connecting rod small end bush.

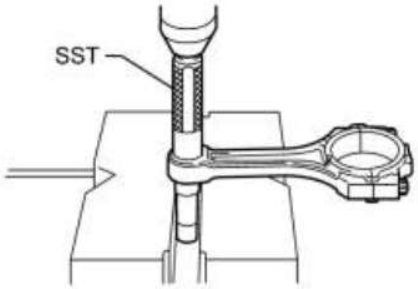
SST: 09222-30010



(b) Align the oil holes of a new connecting rod small end bush and the connecting rod.

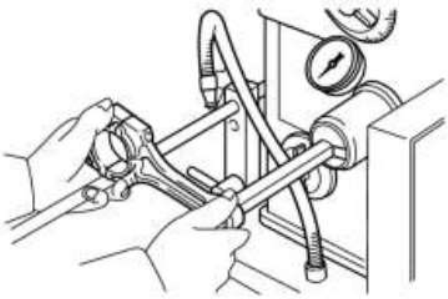
Text in Illustration

*1	Oil Hole



(c) Using SST and a press, press in the connecting rod small end bush.

SST: 09222-30010



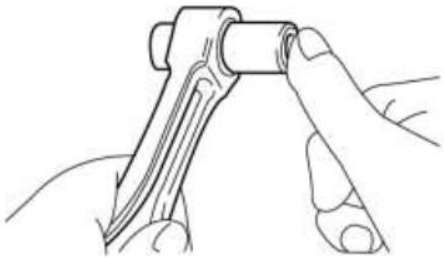
(d) Using a pin hole grinder, hone the bush to obtain the standard oil clearance between the bush and piston pin.

Standard oil clearance:

0.005 to 0.011 (0.000197 to 0.000433 in.)

(e) Coat the piston pin with engine oil. Push the piston pin into the connecting rod with your thumb to check that the piston pin fits at normal room temperature.

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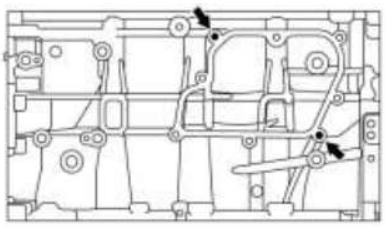
REASSEMBLY

1. INSTALL STUD BOLT

NOTICE:

If the stud bolt is deformed or the threads are damaged, replace it.

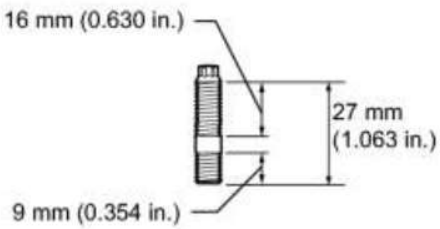
*a



(a) Using an E6 "TORX" socket, install the stud bolts as shown in the illustration.

Text in Illustration

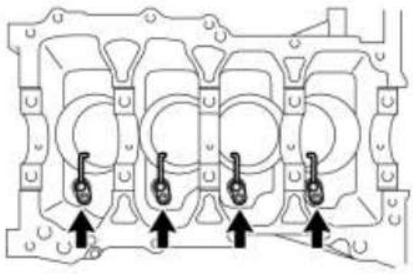
*a	LH Side:



T

Torque: **5.0 N·m (51 kgf·cm, 44in·lbf)**

2. INSTALL NO. 1 OIL NOZZLE SUB-ASSEMBLY



T

(a) Using a 5 mm socket hexagon wrench, install the 4 oil nozzles with the 4 bolts.

Torque: **10 N·m (102 kgf·cm, 7ft·lbf)**

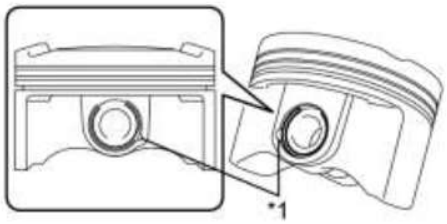
3. INSTALL PISTON

(a) Using a screwdriver, install a new snap ring at one end of the piston pin hole.

Text in Illustration

*1	Service Hole

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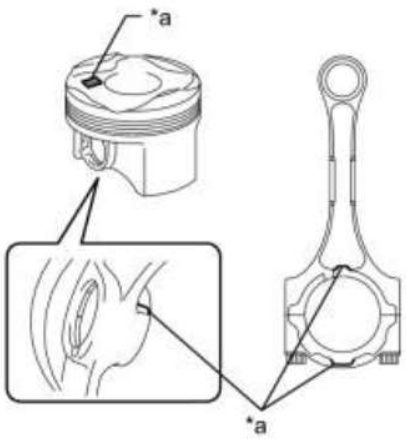


T

HINT:

Make sure that the end gap of the snap ring is not aligned with the pin hole cutout portion of the piston.

(b) Gradually heat the piston to approximately 80 to 90°C (176 to 194°F).



T

(c) Align the front marks of the piston and connecting rod, insert the connecting rod into the piston, and then push in the piston pin with your thumb until the pin comes into contact with the snap ring.

Text in Illustration

*a	Front Mark

HINT:

The piston and pin are a matched set.

(d) Using a screwdriver, install a new snap ring on the other end of the piston pin hole.

HINT:

Make sure that the end gap of the snap ring is not aligned with the pin hole cutout portion of the piston.



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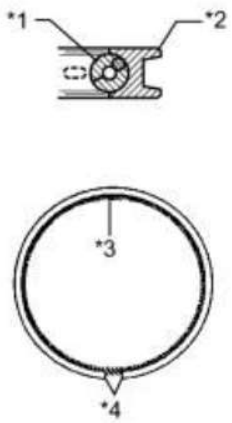
(e) Check the fitting condition between the piston and piston pin by trying to move the piston back and forth on the piston pin.

4. INSTALL PISTON RING SET

(a) Install the oil ring expander and oil ring by hand.

Text in Illustration

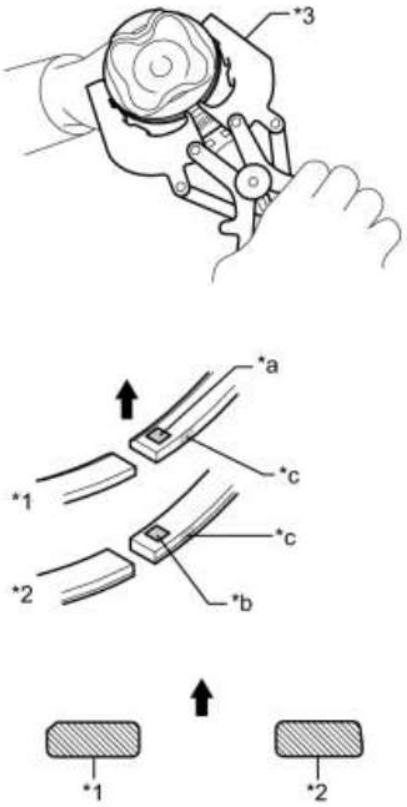
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*1	Oil Ring Expander
*2	Oil Ring
*3	Coil Joint
*4	Oil Ring End

- Install the expander and oil ring so that their ring ends are at opposite sides.
- Securely install the expander to the inner groove of the oil ring.

(b) Using a piston ring expander, install the 2 compression rings so that the paint marks are positioned as shown in the illustration.



Text in Illustration

*1	No. 1 Compression Ring

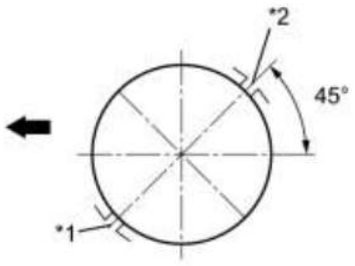
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*2	No. 2 Compression Ring
*3	Piston Ring Expander
*a	Code Mark (1R)
*b	Code Mark (2R)
*c	Paint Mark
➡	Upward

NOTICE:

- Install the No. 1 compression ring with the code mark (1R) facing upward.
- Install the No. 2 compression ring with the code mark (2R) facing upward.
- Paint marks can only be checked on new piston rings. When reusing piston rings, check each piston ring profile in order to install them into the correct positions.

(c) Position the piston rings so that the ring ends are as shown in the illustration.



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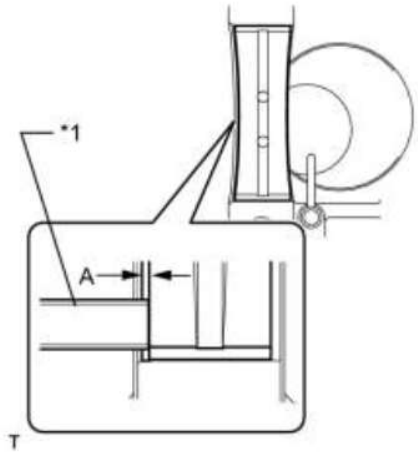
Text in Illustration

*1	No. 1 compression ring and Oil Ring
*2	No. 2 compression ring and Oil Ring Expander
➡	Engine Front

5. INSTALL CRANKSHAFT BEARING

(a) Install the upper bearing (except No. 3 journal).

Text in Illustration



*1	Vernier Caliper

(1) Install the upper bearing to the cylinder block.

HINT:

Both sides of the oil groove in the cylinder block should be visible through the oil feed holes in the bearing. The amount visible on each side of the holes should be equal.

(2) Using a vernier caliper, measure the distance between the cylinder block edge and the upper bearing edge.

Standard dimension (A):

0.5 to 1.0 mm (0.0197 to 0.0394 in.)

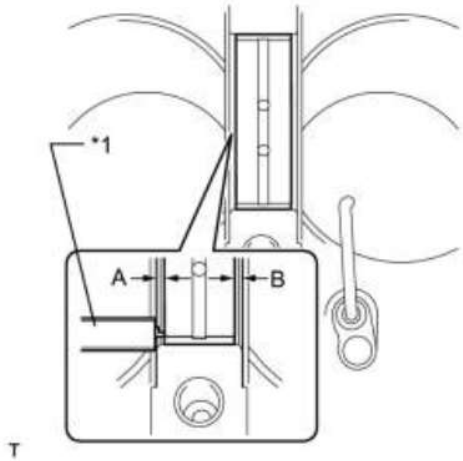
NOTICE:

Do not apply engine oil to the bearings or the contact surfaces.

(b) Install the upper bearing (for No. 3 journal).

Text in Illustration

*1	Vernier Caliper



(1) Install the upper bearing to the cylinder block.

HINT:

Both sides of the oil groove in the cylinder block should be visible through the oil feed holes in the bearing. The amount visible on each side of the holes should be equal.

(2) Using a vernier caliper, measure the distance between the cylinder block edge and the upper bearing edge.

Standard dimension (A - B):

0.7 mm (0.0276 in.) or less

NOTICE:

Do not apply engine oil to the bearing or the contact surfaces.

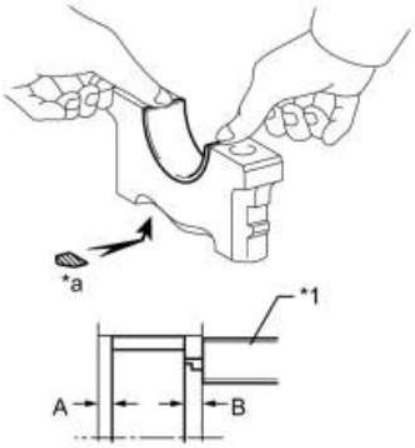
(c) Install the lower bearing.

(1) Install the upper bearing to the cylinder block.

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HINT:

Both sides of the oil groove in the cylinder block should be visible through the oil feed holes in the bearing. The amount visible on each side of the holes should be equal.



T

(2) Using a vernier caliper, measure the distance between the bearing cap edge and the lower bearing edge.

Text in Illustration

*1	Vernier Caliper
*a	Mark 1, 2, 3, 4 or 5

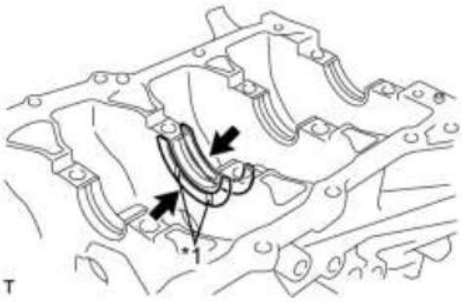
Standard dimension (A - B):

0.7 mm (0.0276 in.) or less

NOTICE:

Do not apply engine oil to the bearings or the contact surfaces.

6. INSTALL UPPER CRANKSHAFT THRUST WASHER



T

(a) Install the 2 thrust washers to the No. 3 journal position of the cylinder block with the oil grooves facing outward.

Text in Illustration

*1	Oil Groove

(b) Apply engine oil to the crankshaft thrust washer.

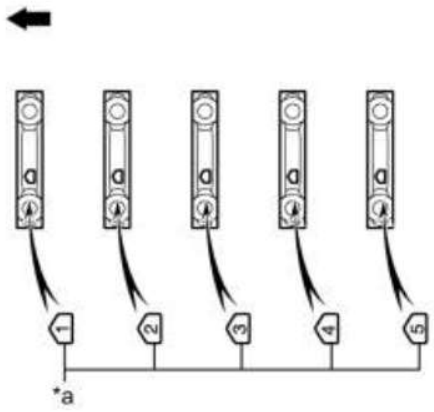
7. INSTALL CRANKSHAFT

(a) Apply engine oil to the upper bearings and install the crankshaft to the cylinder block.

(b) Apply engine oil to the lower bearings.

(c) Examine the number marks and install the bearing caps to the cylinder block.

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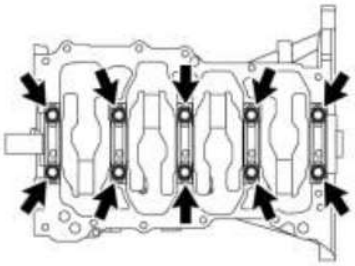


T

Text in Illustration

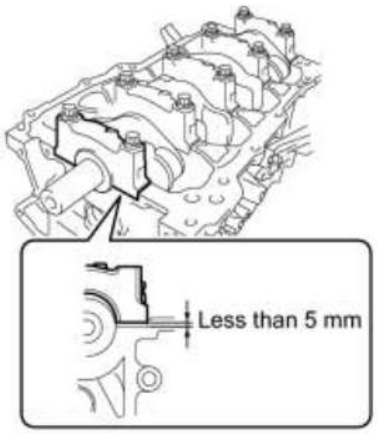
*a	Number Mark
➡	Engine Front

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



T

(e) Temporarily install the 10 crankshaft bearing cap bolts.

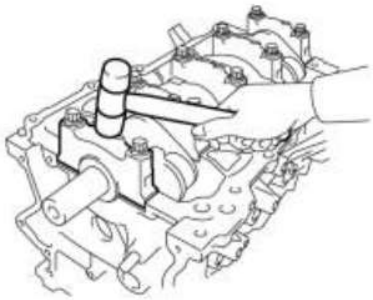


T

(f) Push on the crankshaft bearing caps with your hand until the clearance between the crankshaft bearing caps and cylinder block is less than 5 mm (0.197 in.).

(g) Using a plastic-faced hammer, lightly tap the bearing cap to ensure a proper fit.

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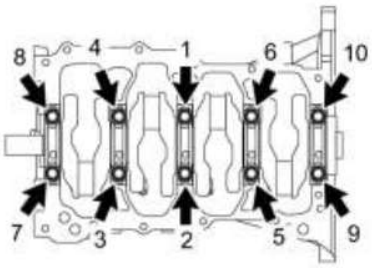
T

(h) Install the crankshaft bearing cap bolts.

NOTICE:

The crankshaft bearing cap bolts are tightened in 2 progressive steps.

(i) Step 1:



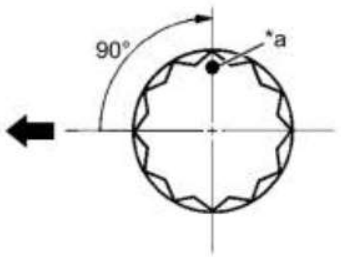
T

(1) Install and uniformly tighten the 10 crankshaft bearing cap bolts in the sequence shown in the illustration.

Torque: **40 N·m (408 kgf·cm, 30ft·lbf)**

(j) Step 2:

(1) Mark the front of the bearing cap bolts with paint.



Text in Illustration

*a	Paint Mark
➡	Engine Front

(2) Tighten the bearing cap bolts 90° in the sequence shown in step 1.

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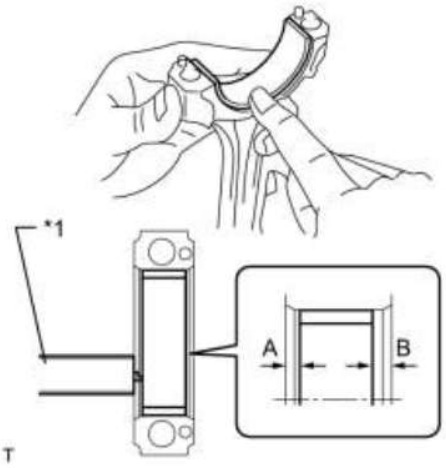
(k) Check that the paint marks are now at a 90° angle to the front.

(l) Check that the crankshaft turns smoothly.

(m) Check the crankshaft thrust clearance INFO.

8. INSTALL CONNECTING ROD BEARING

(a) Install the connecting rod bearings to the connecting rods and connecting rod caps.



(b) Using a vernier caliper, measure the distance between the edges of the connecting rods and connecting cap bearings, and the connecting rod caps and the connecting rod bearings.

Text in Illustration

*1	Vernier caliper

Standard dimension A - B or B - A:

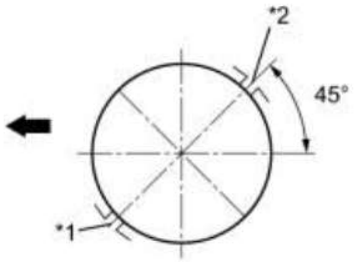
0 to 0.7 mm (0 to 0.0276 in.)

NOTICE:

Do not apply engine oil to the bearings or the contact surfaces.

9. INSTALL PISTON SUB-ASSEMBLY WITH CONNECTING ROD

(a) Apply engine oil to the cylinder walls, pistons, and the surfaces of the connecting rod bearings.



Text in Illustration

*1	No. 1 compression ring and Oil Ring

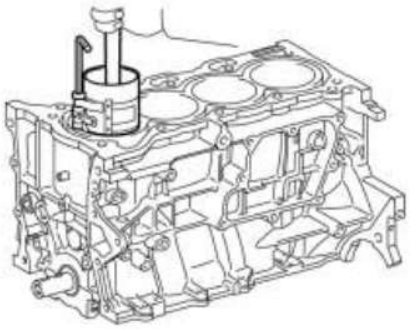
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*2	No. 2 compression ring and Oil Ring Expander
➡	Engine Front

(b) Position the piston rings so that the ring ends are as shown in the illustration.

NOTICE:

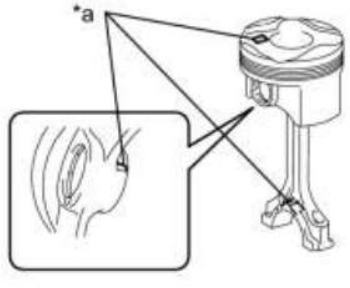
Do not align the ring ends.



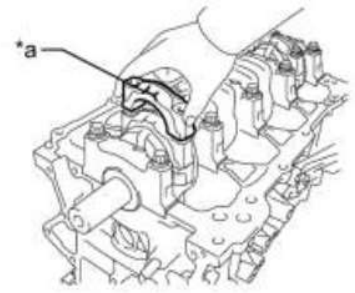
(c) Using a piston ring compressor, push the correctly numbered piston and connecting rod assembly into the cylinder with the front mark of the piston facing forward.

Text in Illustration

*a	Front Mark



- When inserting the piston with connecting rod, do not allow it to make contact with the oil nozzle.
- Match the numbered connecting rod cap with the connecting rod.



(d) Check that the front mark of the connecting rod cap is facing in the correct direction.

Text in Illustration

*a	Front Mark

(e) Apply a light coat of engine oil to the threads and under the heads of the connecting rod cap bolts.

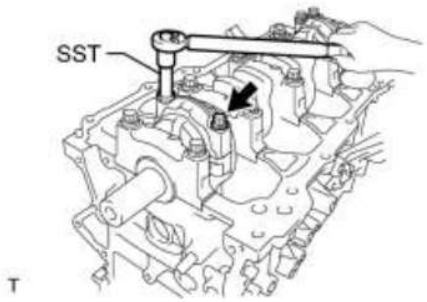
(f) Install the connecting rod cap bolts.

NOTICE:

The connecting rod cap bolts should be tightened in 2 progressive steps.

(g) Step 1:

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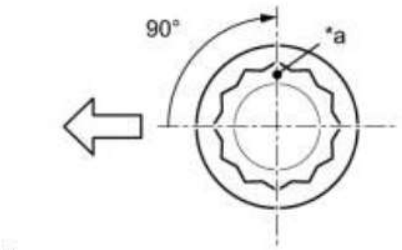
(1) Using SST, install and alternately tighten the bolts of the connecting rod cap in several steps.

SST: 09205-16011

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

(h) Step 2:

(1) Mark the front of the connecting rod cap bolts with paint.



P

Text in Illustration

*a	Paint Mark
⇨	Engine Front

(2) Tighten the cap bolts 90° as shown in the illustration.

(i) Check that the crankshaft turns smoothly.

(j) Check the connecting rod thrust clearance INFO.

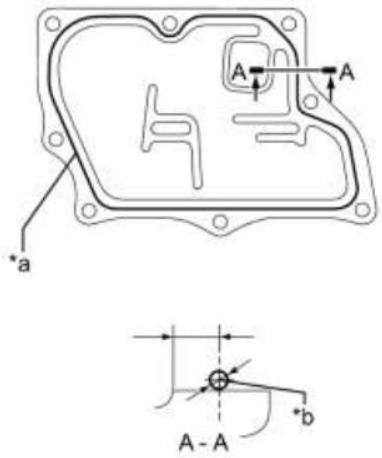
10. INSTALL NO. 1 VENTILATION CASE

(a) Apply seal packing in a continuous line as shown in the illustration.

Text in Illustration

*a	Seal Packing
*b	Seal Packing Diameter

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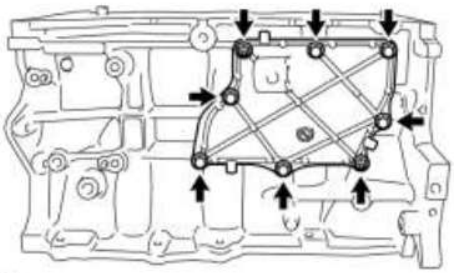
Seal packing:

Toyota Genuine Seal Packing Black, Three Bond 1207B or equivalent

Application Specification:

Seal Packing Diameter	Distance from inside edge of cover to center of seal packing
2.0 to 3.0 mm (0.0787 to 0.118 in.)	3.0 mm (0.118 in.)

- Remove any oil from the contact surface.
- Install the ventilation case within 3 minutes and tighten the bolts and nuts within 15 minutes of applying seal packing.
- Do not start the engine for at least 2 hours after installation.



T

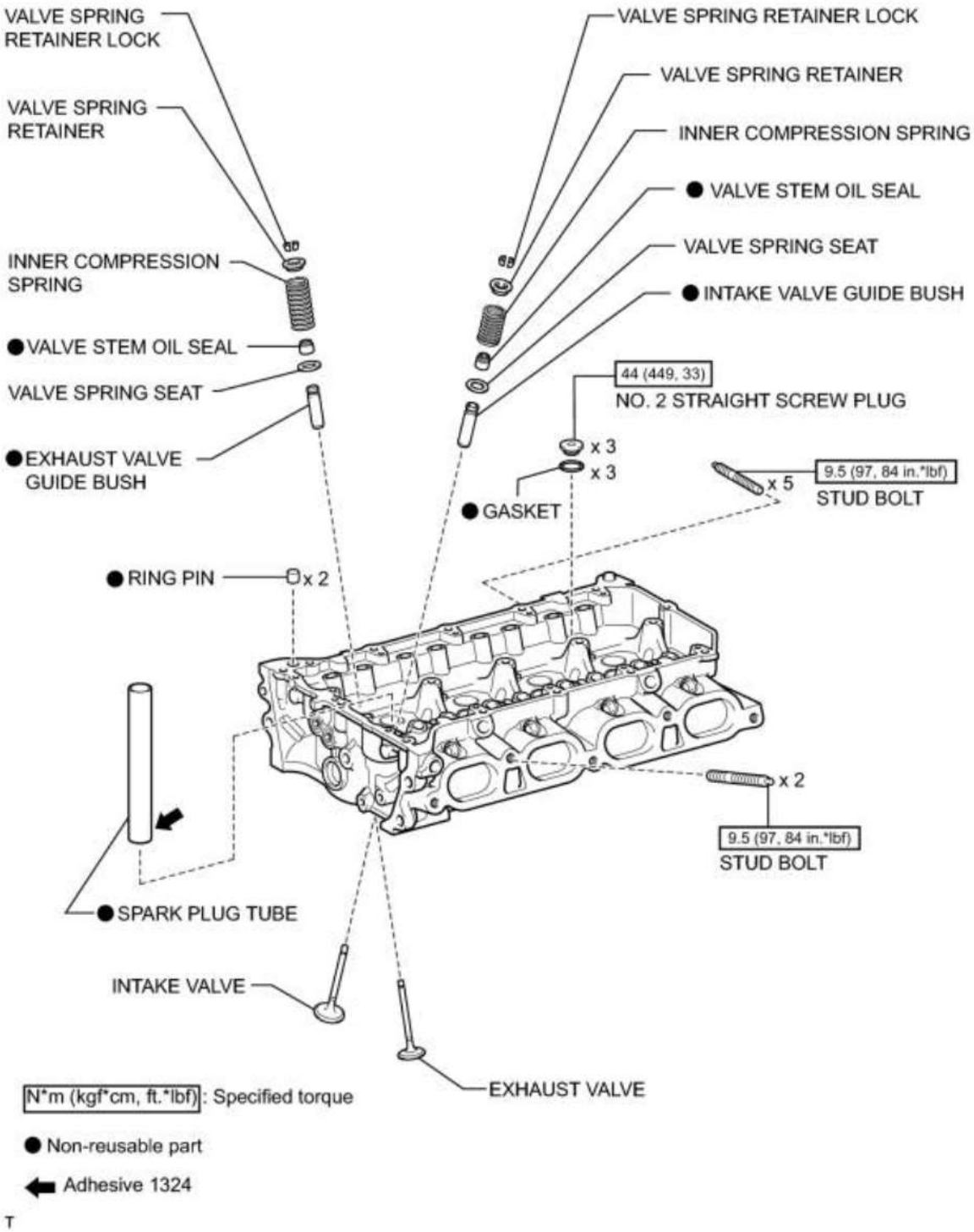
(b) Install the ventilation case with the 6 bolts and 2 nuts.

Torque: **10 N·m (102 kgf·cm, 7ft·lbf)**

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COMPONENTS

ILLUSTRATION



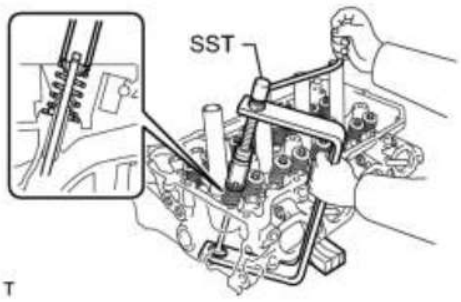
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DISASSEMBLY

1. REMOVE INTAKE VALVE

(a) Place the cylinder head on wooden blocks.



(b) Using SST and wooden blocks, compress and remove the valve retainer locks.

SST: 09202-70020

09202-00010

HINT:

Arrange the removed parts in the correct order.

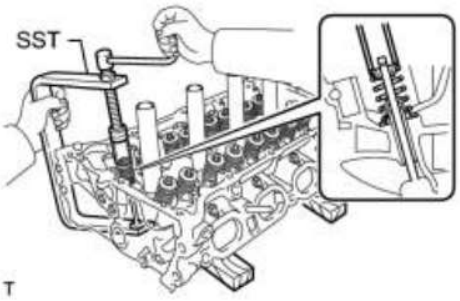
(c) Remove the retainer, valve spring and valve.

HINT:

Arrange the removed parts in the correct order.

2. REMOVE EXHAUST VALVE

(a) Place the cylinder head on wooden blocks.



(b) Using SST and wooden blocks, compress and remove the valve retainer locks.

SST: 09202-70020

09202-00010

HINT:

Arrange the removed parts in the correct order.

(c) Remove the retainer, valve spring and valve.

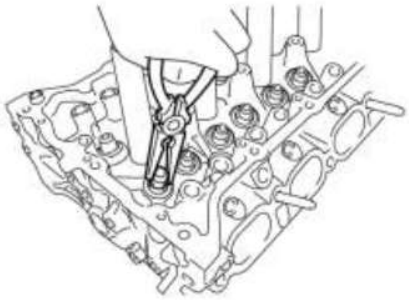
HINT:

Arrange the removed parts in the correct order.

3. REMOVE VALVE STEM OIL SEAL

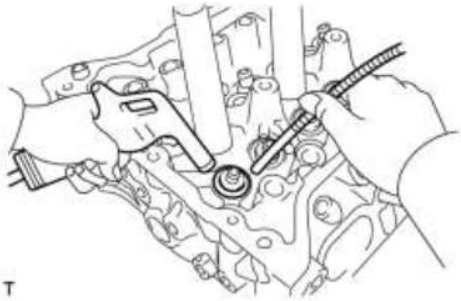
(a) Using needle-nose pliers, remove the oil seals.

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4. REMOVE VALVE SPRING SEAT



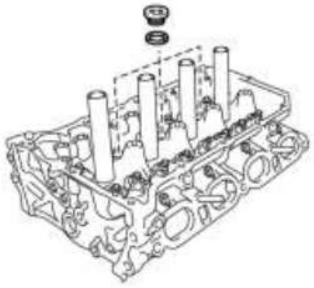
T

(a) Using compressed air and a Magnet Hand, remove the valve spring seats by blowing air onto them.

5. REMOVE NO. 2 STRAIGHT SCREW PLUG

NOTICE:

If water leaks from the straight screw plug or the plug is corroded, replace it.



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(a) Using a 10 mm straight hexagon wrench, remove the 3 screw plugs and 3 gaskets.

6. REMOVE STUD BOLT

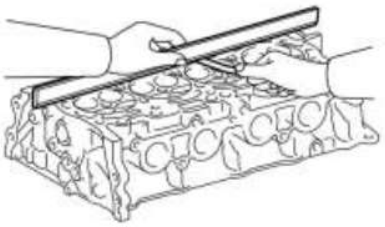
NOTICE:

If a stud bolt is deformed or its threads are damaged, replace it.

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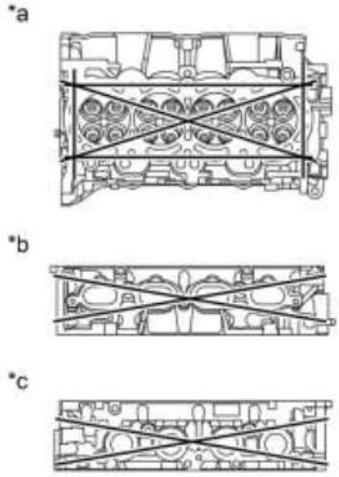
INSPECTION

1. INSPECT CYLINDER HEAD FOR FLATNESS



(a) Using a precision straightedge and feeler gauge, measure the warpage of the contact surfaces where the cylinder head contacts the cylinder block and manifold.

Text in Illustration



*a	Cylinder Head Lower Side:
*b	Intake Manifold Side:
*c	Exhaust Manifold Side:

Maximum Warpage:

Item	Specified Condition
Cylinder block side	0.05 mm (0.00197 in.)
Intake manifold side	0.10 mm (0.00394 in.)
Exhaust manifold side	0.10 mm (0.00394 in.)

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

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2. INSPECT CYLINDER HEAD FOR CRACKS



(a) Using a dye penetrant, check the intake ports, exhaust ports and cylinder surface for cracks.

If cracked, replace the cylinder head.

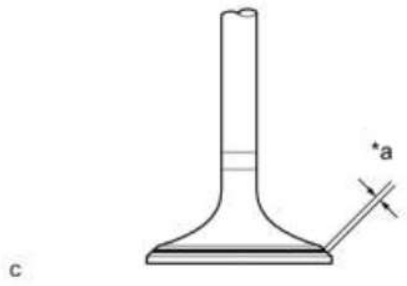
T

3. INSPECT VALVE SEATS

(a) Apply a light coat of Prussian blue to the valve face.

Text in Illustration

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C

*a	Width

(b) Lightly press the valve face against the valve seat.

HINT:

Do not rotate the valve while pressing the valve.

(c) Check the valve face and valve seat.

(1) Intake Side:

Check that the contact surfaces of the valve seat and valve face are in the middle area of their respective surfaces, with the width between 1.0 and 1.4 mm (0.0433 and 0.0551 in.).

If not, correct the valve seat.

(2) Exhaust Side:

Check that the contact surfaces of the valve seat and valve face are in the middle area of their respective surfaces, with the width between 1.0 and 1.4 mm (0.0433 and 0.0551 in.).

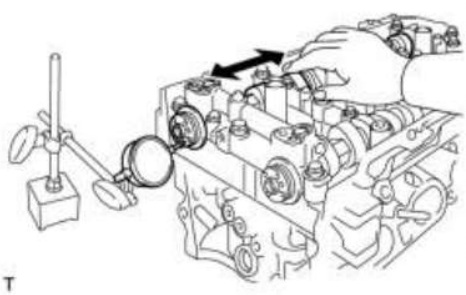
If not, correct the valve seat.

(3) Check that the contact surfaces of the valve seat and valve face are even around the entire valve seat.

If not, correct the valve seat.

4. INSPECT CAMSHAFT THRUST CLEARANCE

(a) Install the camshafts INFO.



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

Standard thrust clearance:

0.06 to 0.155 mm (0.00236 to 0.00610 in.)

Maximum thrust clearance:

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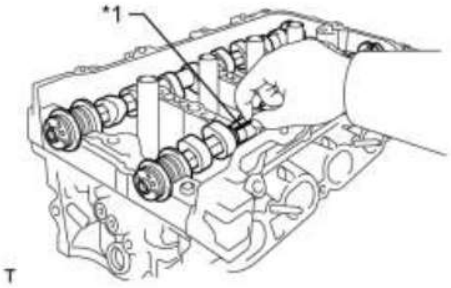
0.17 mm (0.00669 in.)

If the thrust clearance is greater than the maximum, replace the camshaft housing. If the thrust surface is damaged, replace the camshaft.

5. INSPECT CAMSHAFT OIL CLEARANCE

(a) Clean the bearing caps and camshaft journals.

(b) Place the camshafts on the camshaft housing.



(c) Lay a strip of Plastigage across each of the camshaft journals.

Text in Illustration

*1	Plastigage

(d) Install the bearing caps INFO.

NOTICE:

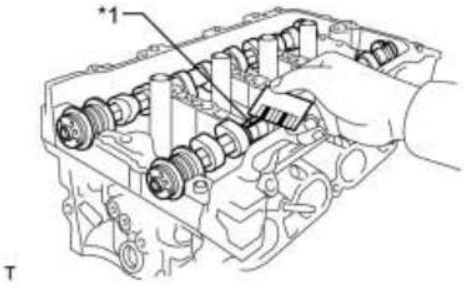
Do not turn the camshaft.

(e) Remove the bearing caps INFO.

(f) Measure the Plastigage at its widest point.

Text in Illustration

*1	Plastigage



Standard Oil Clearance:

Item	Specified Condition
Camshaft No. 1 Journal	0.030 to 0.063 mm (0.00118 to 0.00248 in.)
Camshaft Other Journals	0.035 to 0.072 mm (0.00138 to 0.00283 in.)

Maximum Oil Clearance:

Item	Specified Condition
Camshaft No. 1 Journal	0.085 mm (0.00335 in.)

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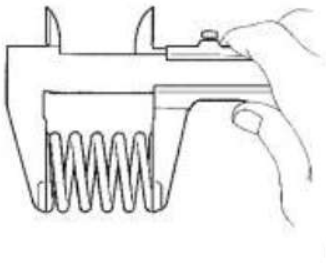
Camshaft Other Journals	0.09 mm (0.00354 in.)

NOTICE:

Completely remove the Plastigage after the inspection.

If the oil clearance is more than the maximum, replace the camshaft. If necessary, replace the camshaft housing.

6. INSPECT COMPRESSION SPRING

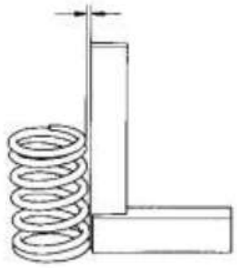


(a) Using a vernier caliper, measure the free length of the compression spring.

Standard free length:

53.36 mm (2.10 in.)

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



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

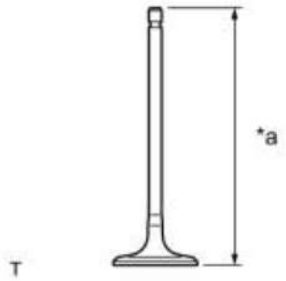
Maximum deviation:

1.0 mm (0.0394 in.)

If the deviation is more than the maximum, replace the compression spring.

7. INSPECT INTAKE VALVE

(a) Using a vernier caliper, measure the overall length of the valve.



Text in Illustration

*a	Overall Length

Standard overall length:

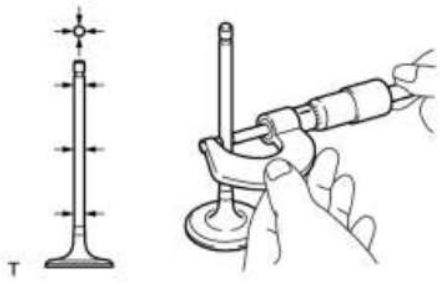
109.34 mm (4.30 in.)

Minimum overall length:

108.84 mm (4.29 in.)

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



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

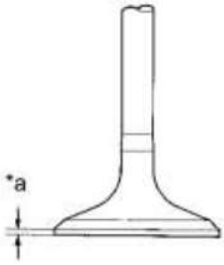
Standard valve stem diameter:

5.470 to 5.485 mm (0.215 to 0.216 in.)

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

(c) Using a vernier caliper, measure the valve head margin thickness.

Text in Illustration



*a	Margin Thickness

Standard margin thickness:

1.0 mm (0.0394 in.)

Minimum margin thickness:

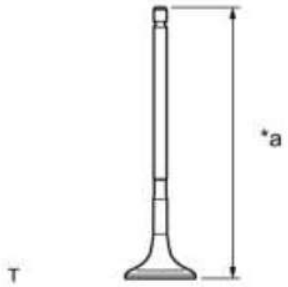
0.5 mm (0.0197 in.)

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

8. INSPECT EXHAUST VALVE

(a) Using a vernier caliper, measure the overall length of the valve.

Text in Illustration



*a	Overall Length

Standard overall length:

108.25 mm (4.26 in.)

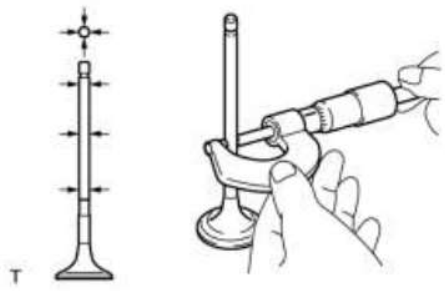
Minimum overall length:

107.75 mm (4.24 in.)

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

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

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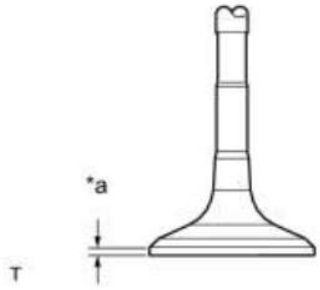


Standard valve stem diameter:

5.465 to 5.480 mm (0.215 to 0.216 in.)

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

(c) Using a vernier caliper, measure the valve head margin thickness.



Text in Illustration

*a	Margin Thickness

Standard margin thickness:

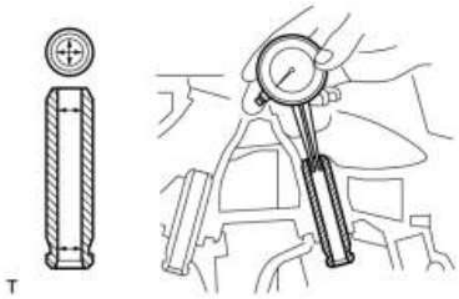
1.0 mm (0.0394 in.)

Minimum margin thickness:

0.5 mm (0.0197 in.)

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

9. INSPECT VALVE GUIDE BUSH OIL CLEARANCE



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

Standard bushing inside diameter:

5.510 to 5.530 mm (0.217 to 0.218 in.)

(b) Subtract the valve stem diameter measurement from the guide bush inside diameter measurement.

Standard Oil Clearance:

Item	Specified Condition
Intake	0.025 to 0.060 mm (0.000984 to 0.00236 in.)
Exhaust	0.030 to 0.065 mm (0.00118 to 0.00256 in.)

Maximum Oil Clearance:

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Item	Specified Condition
Intake	0.080 mm (0.00315 in.)
Exhaust	0.085 mm (0.00335 in.)

If the clearance is more than the maximum, replace the valve and guide bush.

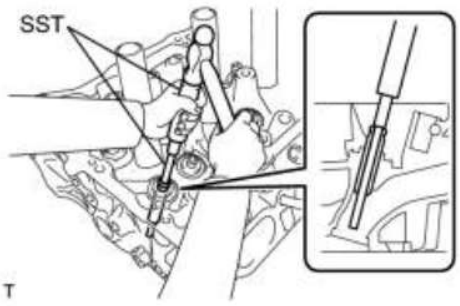
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REPLACEMENT

1. REPLACE INTAKE VALVE GUIDE BUSH

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

(b) Place the cylinder head on wooden blocks.



(c) Using SST and a hammer, tap out the guide bush.

SST: 09201-10000

09201-01050

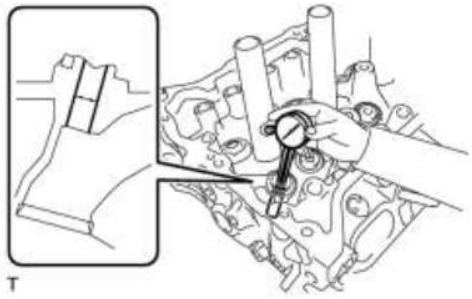
SST: 09950-70010

09951-07100

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

Standard cylinder bore diameter:

10.285 to 10.306 mm (0.405 to 0.406 in.)



Select New Guide Bush:

Bush Size	Bush Diameter
STD	10.333 to 10.344 mm (0.4068 to 0.4072 in.)
O/S 0.05	10.383 to 10.394 mm (0.4088 to 0.4092 in.)

If the bush bore diameter of the cylinder head is more than 10.306 mm (0.406 in.), machine the bush bore to a diameter of 10.335 to 10.356 mm (0.407 to 0.408 in.) in order to install an O/S 0.05 valve guide bush. If the bush bore diameter of the cylinder head is more than 10.356 mm (0.408 in.), replace the cylinder head.

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

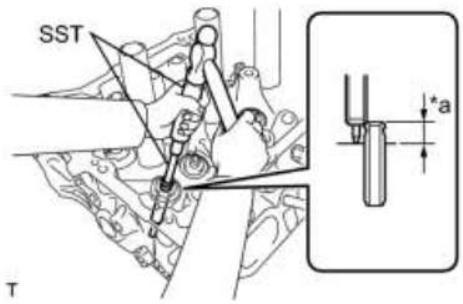
(f) Place the cylinder head on wooden blocks.

(g) Using SST and a hammer, tap in a new guide bush to the specified protrusion height.

Text in Illustration

*a	Height

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SST: 09201-10000

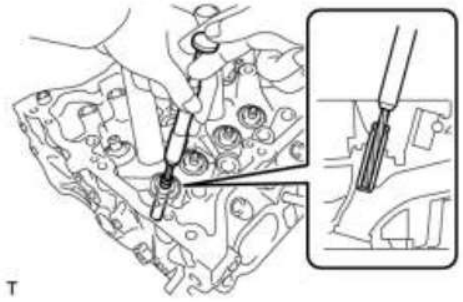
09201-01050

SST: 09950-70010

09951-07100

Standard protrusion height:

9.9 to 10.3 mm (0.390 to 0.406 in.)



(h) Using a sharp 5.5 mm reamer, ream the guide bush to obtain the standard clearance between the guide bush and valve stem.

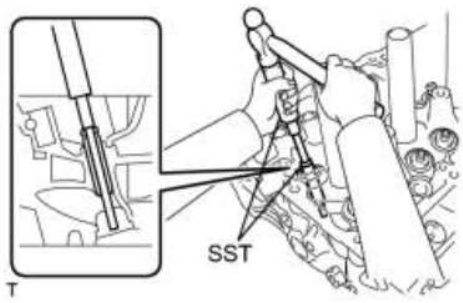
Standard oil clearance:

0.025 to 0.060 mm (0.000984 to 0.00236 in.)

2. REPLACE EXHAUST VALVE GUIDE BUSH

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

(b) Place the cylinder head on wooden blocks.



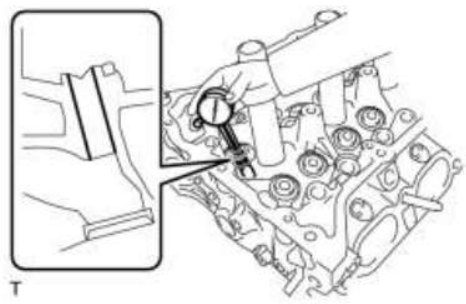
(c) Using SST and a hammer, tap out the guide bush.

SST: 09201-10000

09201-01050

SST: 09950-70010

09951-07100



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

Standard cylinder bore diameter:

10.285 to 10.306 mm (0.405 to 0.406 in.)

Select New Guide Bush:

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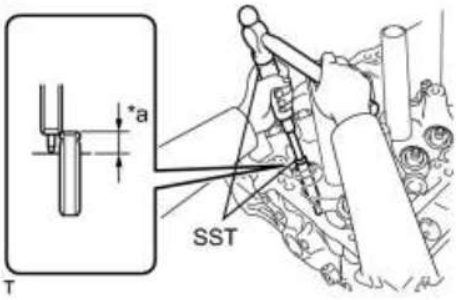
Bush Size	Bush Diameter
STD	10.333 to 10.344 mm (0.4068 to 0.4072 in.)
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If the bush bore diameter of the cylinder head is more than 10.306 mm (0.406 in.), machine the bush bore to a diameter of 10.335 to 10.356 mm (0.407 to 0.408 in.) in order to install an O/S 0.05 valve guide bush. If the bush bore diameter of the cylinder head is more than 10.356 mm (0.408 in.), replace the cylinder head.

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

(f) Place the cylinder head on wooden blocks.

(g) Using SST and a hammer, tap in a new guide bush to the specified protrusion height.



Text in Illustration

*a	Height

SST: 09201-10000

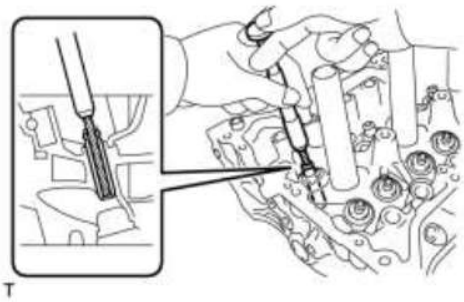
09201-01050

SST: 09950-70010

09951-07100

Standard protrusion height:

11.15 to 11.55 mm (0.439 to 0.455 in.)



(h) Using a sharp 5.5 mm reamer, ream the guide bush to obtain the standard clearance between the guide bush and valve stem.

Standard oil clearance:

0.030 to 0.065 mm (0.00118 to 0.00256 in.)

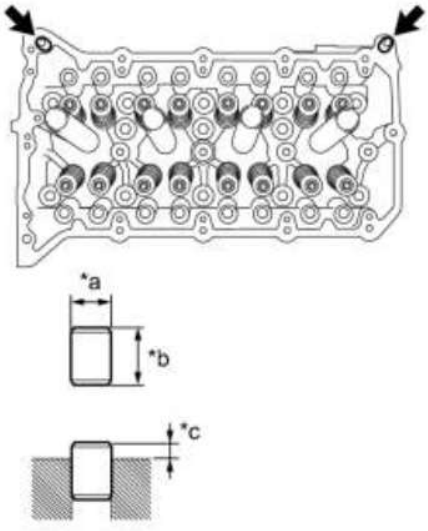
3. REPLACE RING PIN

NOTICE:

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It is not necessary to remove a ring pin unless it is being replaced.

(a) Remove the ring pins.



(b) Using a plastic-faced hammer, tap in a new ring pin to the specified protrusion height.

Text in Illustration

*a	Width
*b	Height
*c	Protrusion Height

Standard Ring Pin:

Item	Height	Width	Protrusion
Ring pin	11.7 to 12.3 mm (0.461 to 0.484 in.)	12.0 mm (0.472 in.)	6.5 to 7.5 mm (0.256 to 0.295 in.)

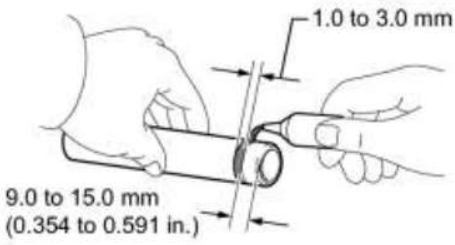
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REASSEMBLY

1. INSTALL SPARK PLUG TUBE

NOTICE:

When using a new cylinder head, the spark plug tubes must be replaced.



(a) Apply adhesive onto the shaded area of a new spark plug tube.

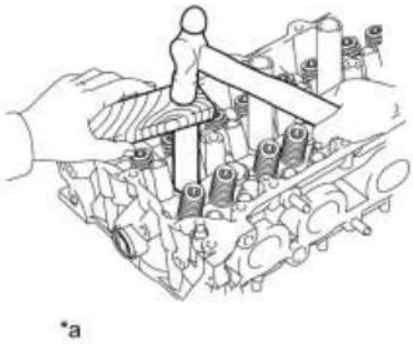
Adhesive:

Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

Standard application width:

1.0 to 3.0 mm (0.0394 to 0.118 in.)

- Install the spark plug tube within 3 minutes of applying adhesive.
- Be careful not to deform the spark plug tube.
- Be careful not to expose the seal to coolant for at least 1 hour after installing the tube.



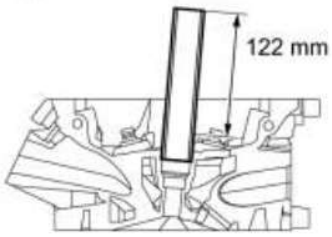
(b) Using a wooden block and hammer, tap in the spark plug tube to the specified protrusion height.

Text in Illustration

*a	Cylinder Head Casting Surface:

Standard protrusion height:

122 mm (4.80 in.)



NOTICE:

To avoid tapping in the spark plug tube too far, measure the protrusion height while tapping it.

T

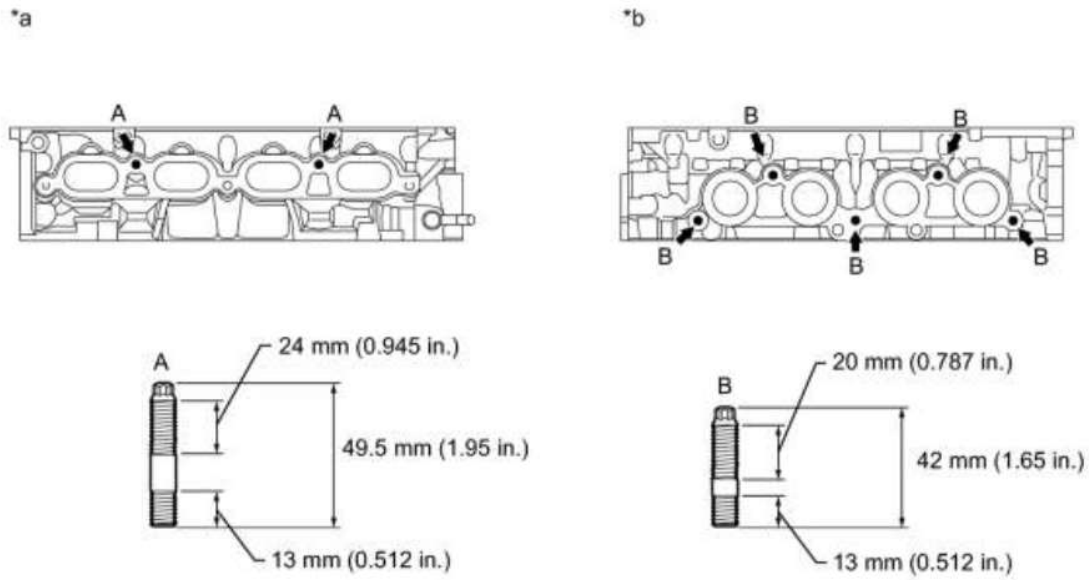
2. INSTALL STUD BOLT

NOTICE:

If a stud bolt is deformed or its threads are damaged, replace it.

(a) Using an E8 "TORX" socket, install the stud bolts.

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T

Text in Illustration

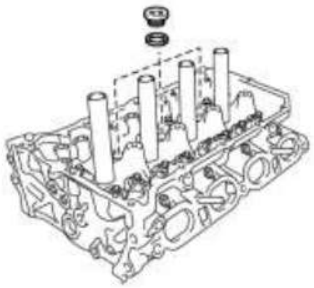
*a	Intake Side:	*b	Exhaust Side:

Torque: **9.5 N·m (97 kgf·cm, 84in·lbf)**

3. INSTALL NO. 2 STRAIGHT SCREW PLUG

NOTICE:

If water leaks from the straight screw plug or the plug is corroded, replace it.



T

(a) Using a 10 mm straight hexagon wrench, install 3 new gaskets and the 3 straight screw plugs.

Torque: **44 N·m (449 kgf·cm, 32ft·lbf)**

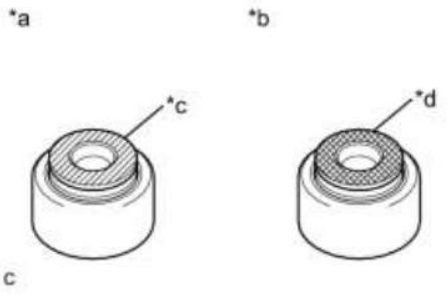
4. INSTALL VALVE SPRING SEAT

(a) Install the valve spring seats to the cylinder head.

5. INSTALL VALVE STEM OIL SEAL

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(a) Apply a light coat of engine oil to a new oil seal.



Text in Illustration

*a	Intake Side:
*b	Exhaust Side:
*c	Gray
*d	Black

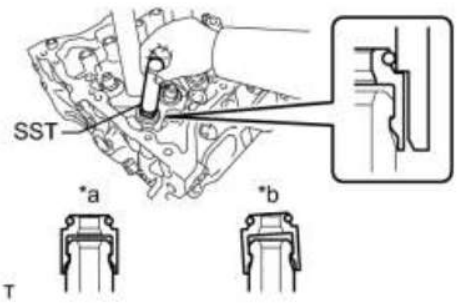
NOTICE:

Pay close attention when installing the intake and exhaust oil seals. For example, installing the intake oil seal to the exhaust side or installing the exhaust oil seal to the intake side can cause installation problems later.

HINT:

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

(b) Using SST, push on the oil seal.



Text in Illustration

*a	CORRECT
*b	INCORRECT

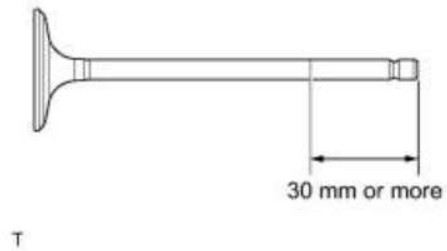
SST: 09201-41020

NOTICE:

Failure to use SST will cause the seal to be damaged or improperly seated.

6. INSTALL INTAKE VALVE

(a) Place the cylinder head on wooden blocks.



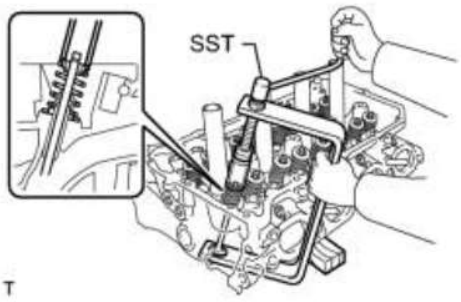
(b) Apply engine oil to each valve over an area 30 mm (1.18 in.) or more from its tip, as shown in the illustration.

(c) Install the valve, compression spring and spring retainer to the cylinder head.

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NOTICE:

Install the same parts in the same combination to the original locations.

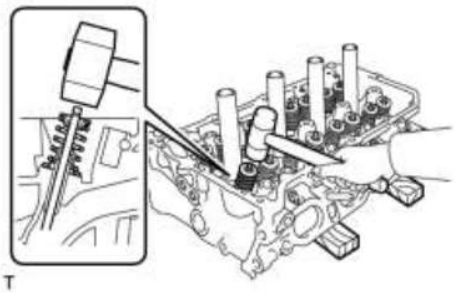


T

(d) Using SST, compression spring and install the valve retainer locks.

SST: 09202-70020

09202-00010



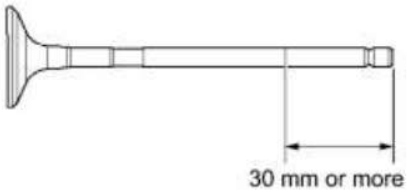
T

(e) Using a plastic-faced hammer, lightly tap the valve stem tip to ensure a proper fit.

- Be careful not to damage the valve stem tip.
- Be careful not to damage the retainer.

7. INSTALL EXHAUST VALVE

(a) Place the cylinder head on wooden blocks.



T

(b) Apply engine oil to each valve over an area 30 mm (1.18 in.) or more from its tip, as shown in the illustration.

(c) Install the valve, compression spring and spring retainer to the cylinder head.

NOTICE:

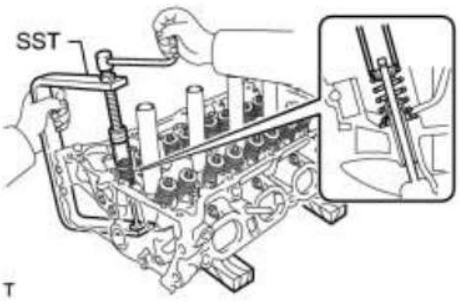
Install the same parts in the same combination to the original locations.

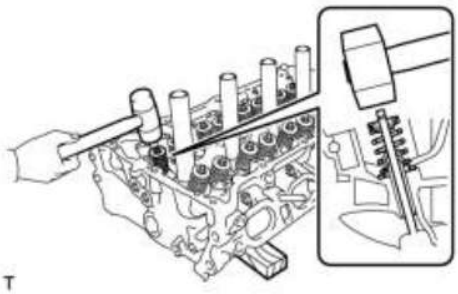
(d) Using SST, compression spring and install the valve retainer locks.

SST: 09202-70020

09202-00010

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(e) Using a plastic-faced hammer, lightly tap the valve stem tip to ensure a proper fit.

- Be careful not to damage the valve stem tip.
- Be careful not to damage the retainer.

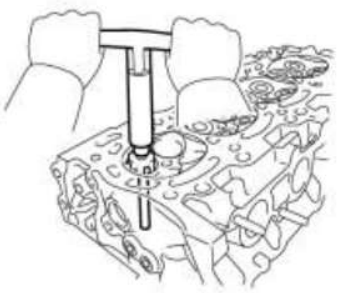
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REPAIR

1. REPAIR VALVE SEAT

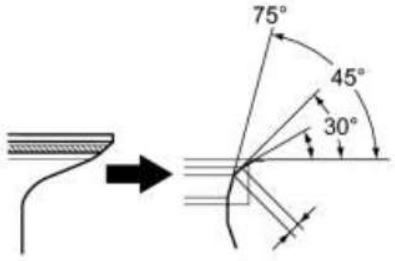
NOTICE:

- Repair the seat while checking the seating position.
- Keep the lip free from foreign matter.
- Take off the cutter gradually to make the valve seat smooth.



T

(a) Using a 45° cutter, resurface the valve seat so that the valve seat width is more than the specification.



(b) Using 30° and 75° cutters, correct the valve seat so that the valve contacts the entire circumference of the seat. The contact should be in the center of the valve seat, and the valve seat width should be maintained within the specified range around the entire circumference of the seat.

Standard valve seat width:

1.0 to 1.4 mm (0.0394 to 0.0551 in.)

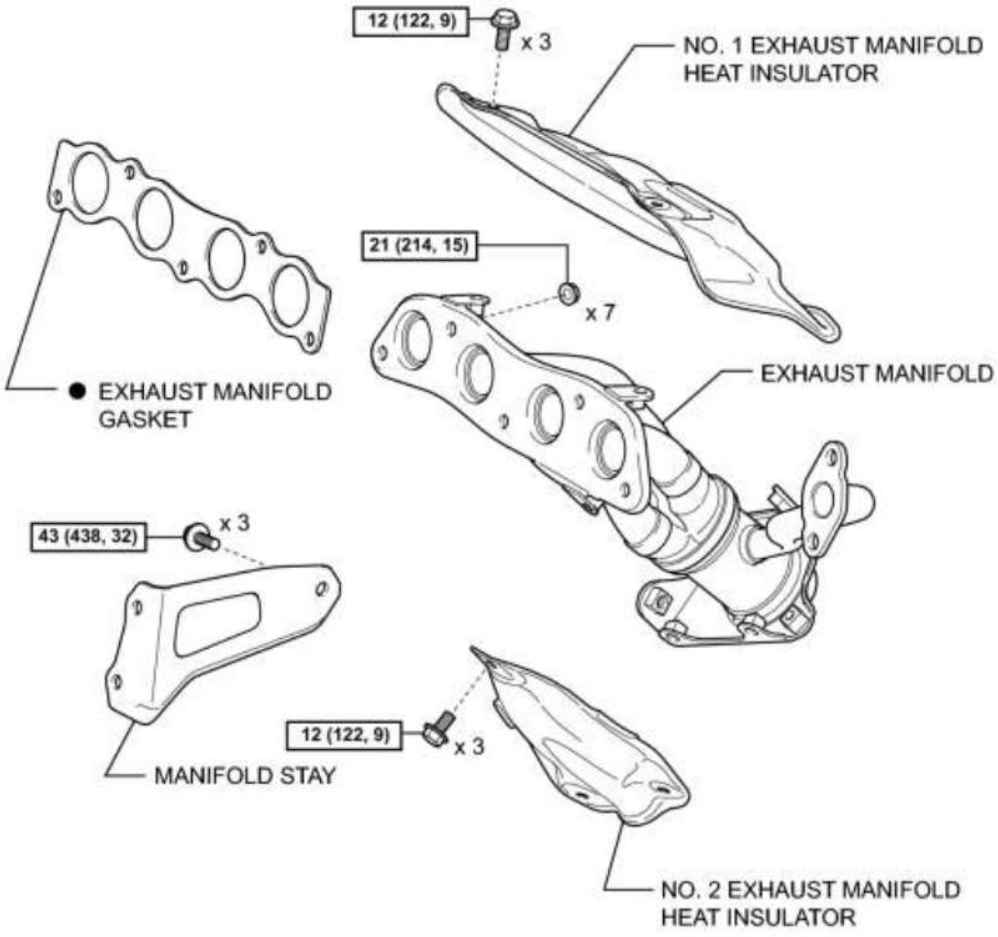
(c) Hand-lap the valve and valve seat with an abrasive compound.

(d) Check the valve seating position.

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COMPONENTS

ILLUSTRATION



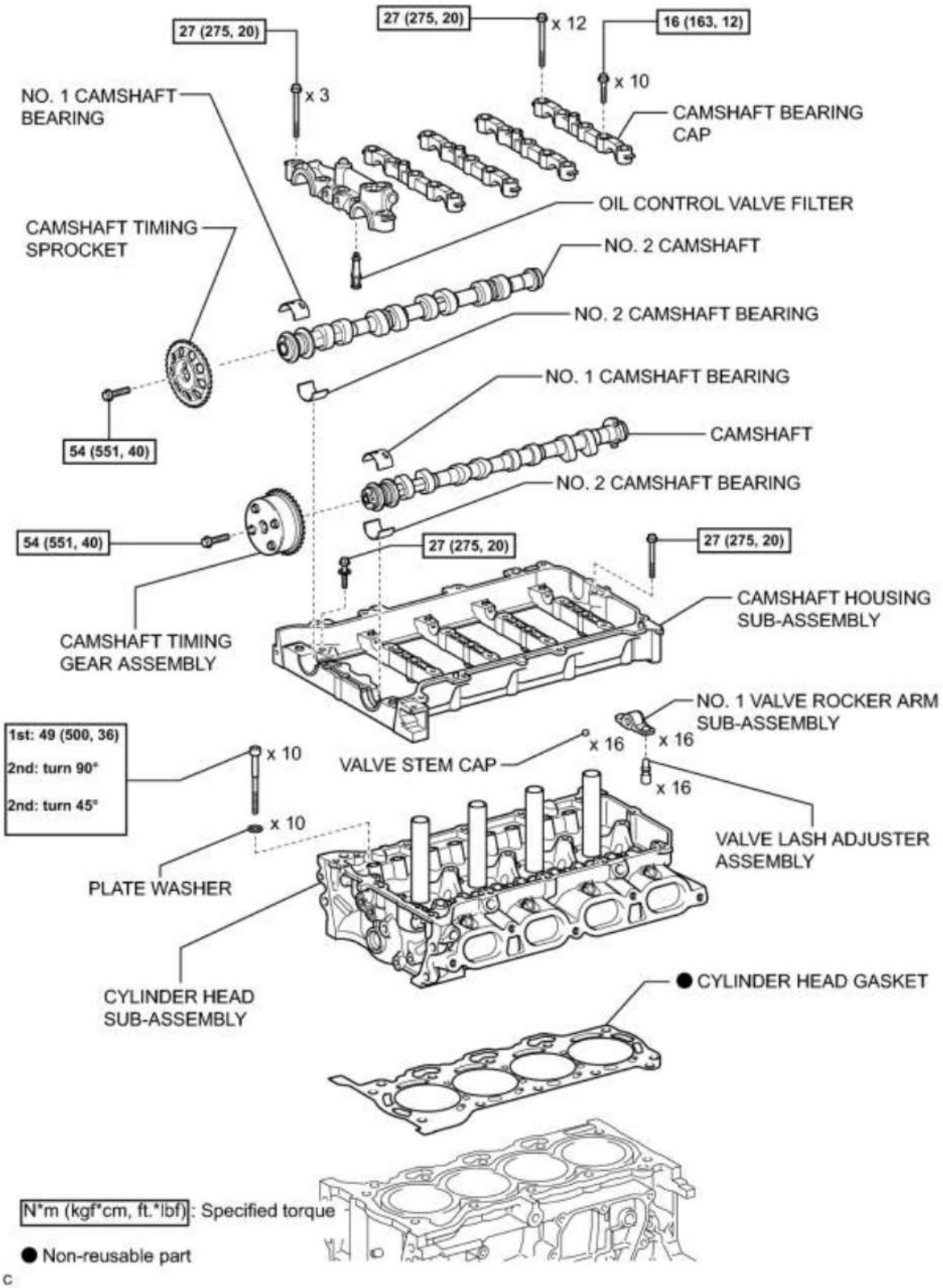
N*m (kgf*cm, ft.*lbf) : Specified torque

● Non-reusable part

c

ILLUSTRATION

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REMOVAL

1. REMOVE CAMSHAFT HOUSING SUB-ASSEMBLY

(a) Remove the camshaft housing sub-assembly INFO.

2. REMOVE NO. 1 EXHAUST MANIFOLD HEAT INSULATOR INFO

3. REMOVE MANIFOLD STAY INFO

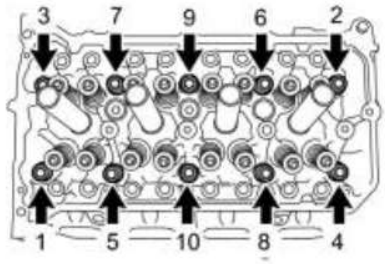
4. REMOVE EXHAUST MANIFOLD INFO

5. REMOVE NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY INFO

6. REMOVE VALVE LASH ADJUSTER ASSEMBLY INFO

7. REMOVE VALVE STEM CAP INFO

8. REMOVE CYLINDER HEAD SUB-ASSEMBLY



T

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

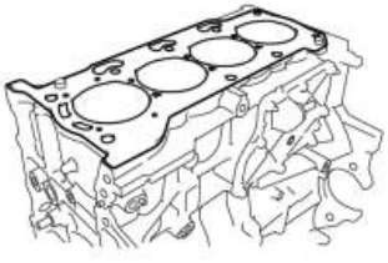
- Be careful not to drop washers into the cylinder head.
- Head warpage or cracking could result from removing the bolts in the wrong order.

(b) Using a screwdriver with its tip wrapped with tape, pry between the cylinder head and cylinder block, and remove the cylinder head.

NOTICE:

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

9. REMOVE CYLINDER HEAD GASKET



T

(a) Remove the cylinder head gasket.

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INSTALLATION

1. INSPECT NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY INFO

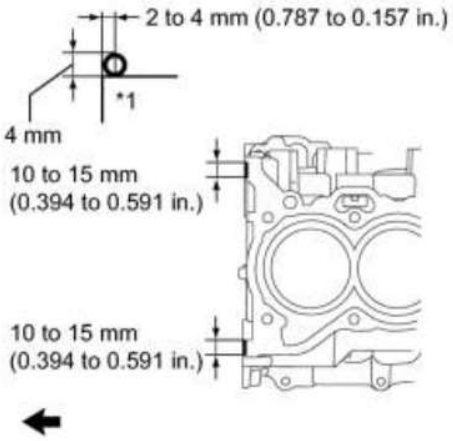
2. INSPECT VALVE LASH ADJUSTER ASSEMBLY INFO

3. INSPECT CYLINDER HEAD SET BOLT INFO

4. INSPECT CYLINDER HEAD INFO

5. INSTALL CYLINDER HEAD GASKET

(a) Apply seal packing (Diameter 4.0 mm (0.157 in.)) to the cylinder block as shown in the illustration.



Text in Illustration

*1	Cylinder Block
➡	Engine Front

Seal packing:

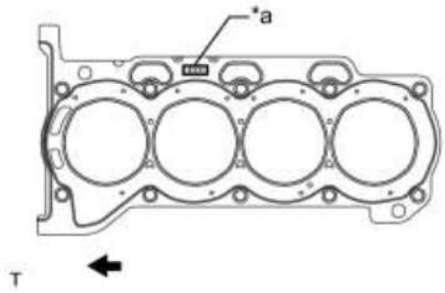
Toyota Genuine Seal Packing Black, Three Bond 1207B or equivalent

NOTICE:

Remove any oil from the cylinder block.

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

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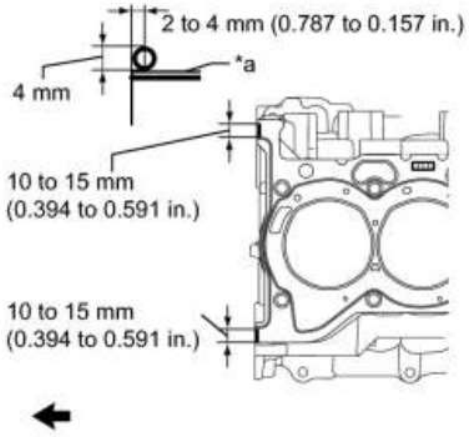
Text in Illustration

*a	Lot No.
➡	Engine Front

NOTICE:

Install the cylinder head gasket within 3 minutes after applying seal packing.

(c) Apply seal packing (Diameter 4.0 mm (0.157 in.)) to the new cylinder head gasket as shown in the illustration.



Text in Illustration

*1	Cylinder Head Gasket
➡	Engine Front

Seal packing:

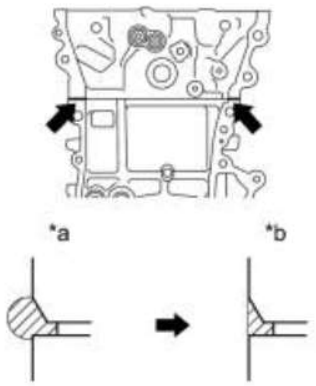
Toyota Genuine Seal Packing Black, Three Bond 1207B or equivalent

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NOTICE:

- Remove any oil from the cylinder head gasket and cylinder head.
- Install the cylinder head gasket within 3 minutes and tighten the bolts within 15 minutes of applying seal packing.



(d) After tightening the cylinder head bolts, wipe off the seal packing material seeped out from the contact surfaces between the cylinder head and cylinder block.

Text in Illustration

*a	Before wiping off:
*b	After wiping off:

6. INSTALL CYLINDER HEAD SUB-ASSEMBLY

HINT:

The cylinder head bolts are tightened in 3 progressive steps.

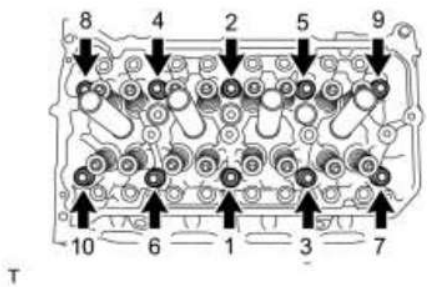
(a) Place the cylinder head on the cylinder block.

NOTICE:

- Make sure that no oil is on the mounting surface of the cylinder head.
- Place the cylinder head on the cylinder block gently in order not to damage the gasket with the bottom part of the head.

(b) Install the plate washers to the cylinder head bolts.

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



(d) Step 1:

(1) Using a 10 mm bi-hexagon wrench, install and uniformly tighten the 10 cylinder head bolts in several steps, in the sequence shown in the illustration.

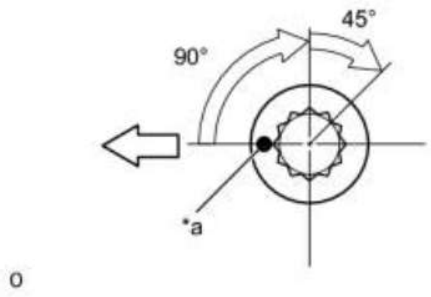
Torque: **49 N·m (500 kgf·cm, 36ft·lbf)**

NOTICE:

Do not drop the plate washers into the cylinder head.

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(e) Step 2:



Text in Illustration

*a	Paint Mark
⇨	Engine Front

(1) Mark each cylinder head bolt head with paint as shown in the illustration.

(2) Tighten the cylinder head bolts 90° in the sequence shown in step 1.

(f) Step 3:

(1) Tighten the cylinder head bolts another 45° in the sequence shown in step 1.

(g) Check that the paint mark is now at a 135° angle to the front.

7. INSTALL VALVE STEM CAP INFO

8. INSTALL VALVE LASH ADJUSTER ASSEMBLY INFO

9. INSTALL NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY INFO

10. INSTALL EXHAUST MANIFOLD INFO

11. INSTALL MANIFOLD STAY INFO

12. INSTALL NO. 1 EXHAUST MANIFOLD HEAT INSULATOR INFO

13. INSTALL CAMSHAFT HOUSING SUB-ASSEMBLY

(a) Install the camshaft housing sub-assembly INFO.

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ON-VEHICLE INSPECTION

1. INSPECT COOLANT (for Engine)

HINT: INFO.

2. INSPECT ENGINE OIL

HINT: INFO.

3. INSPECT AUXILIARY BATTERY

HINT: INFO.

4. INSPECT AIR CLEANER FILTER ELEMENT SUB-ASSEMBLY

(a) Remove the air cleaner cap.

(b) Remove the air cleaner filter element.

(c) Visually check that the air cleaner filter element is not excessively damaged or oily.

If necessary, replace the air cleaner filter element.

(d) Install the air cleaner filter element.

(e) Install the air cleaner cap.

5. INSPECT VALVE AND ADJUSTER NOISE

(a) Put the engine in inspection mode INFO.

(b) Rev up the engine several times. Check that the engine does not emit unusual noises. If unusual noises occur, warm up the engine and idle it for over 30 minutes. Then, perform the inspection above again. If any defects or problems are found during the inspection above, perform a lash adjuster inspection INFO.

6. INSPECT IGNITION TIMING

(a) Put the engine in inspection mode INFO.

(b) Warm up and stop the engine.

(c) When using the Techstream:

Check the ignition timing.

(1) Connect the Techstream to the DLC3.

(2) Put the engine in inspection mode INFO.

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(3) Turn the Techstream on.

(4) Enter the following menus: Powertrain / Engine and ECT / Data List / IGN Advance.

Standard ignition timing:

0 to 16 degrees BTDC

NOTICE:

- Check the ignition timing with the cooling fans off.
- Turn off all electrical systems and the A/ C.
- When checking the ignition timing, the transaxle should be in neutral or park.

HINT:

Refer to the Techstream operator's manual for further details.

(5) Check that the ignition timing advances immediately when the engine speed is increased.

(6) Enter the following menus: Powertrain / Engine and ECT / Active Test / Connect the TC and TE1 / ON.

(7) Monitor IGN Advance of the Data List.

Standard ignition timing:

8 to 12 degrees BTDC

NOTICE:

When checking the ignition timing, the transaxle should be in neutral or park.

HINT:

Refer to the Techstream operator's manual for further details.

(8) Enter the following menus: Connect the TC and TE1 / OFF.

(9) Turn the power switch off.

(10) Turn the Techstream off.

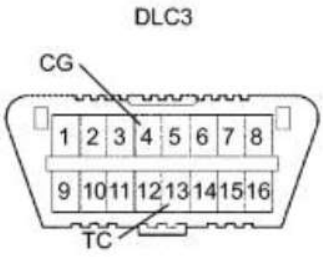
(11) Disconnect the Techstream from the DLC3.

(d) When not using the Techstream:

(1) Using SST, connect terminals 13 (TC) and 4 (CG) of the DLC3.

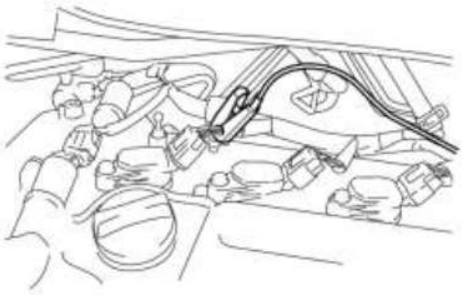
SST: 09843-18040

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- Be sure to connect the terminals correctly. Failure to do this can damage the engine.
- Check the ignition timing with the cooling fans off.
- Turn off all electrical systems and the A/ C.
- When checking the ignition timing, the transaxle should be in neutral or park.

(2) Remove the No. 2 cylinder head cover INFO.



(3) Pull out the wire harness shown in the illustration.

NOTICE:

After checking, wrap the wire harness with tape.

(4) Connect the clip of the timing light to the wire harness.

NOTICE:

Use a timing light that detects the primary signal.

(5) Inspect the ignition timing at idle.

Standard ignition timing:

8 to 12 degrees BTDC

NOTICE:

When checking the ignition timing, the transaxle should be in neutral or park.

HINT:

After running the engine at 1000 to 1300 rpm for 5 seconds, check that it returns to idle speed.

(6) Disconnect terminals 13 (TC) and 4 (CG) of the DLC3.

(7) Inspect the ignition timing at idle.

Standard ignition timing:

0 to 16 degrees BTDC

(8) Confirm that the ignition timing advances when the engine rpm is increased.

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(9) Remove the timing light.

(10) Install the No. 2 cylinder head cover INFO.

7. INSPECT ENGINE IDLE SPEED

(a) Put the engine in inspection mode INFO.

(b) Warm up and stop the engine.

(c) Connect the Techstream to the DLC3.

(d) Put the engine in inspection mode INFO.

(e) Turn the Techstream on.

(f) Enter the following menus: Powertrain / Engine and ECT / Data List / Engine Speed.

HINT:

Refer to the Techstream operator's manual for further details.

(g) Inspect the engine idle speed.

Standard idle speed:

950 to 1050 rpm

NOTICE:

- Turn all electrical systems and the A/C off.
- Inspect the idle speed with the cooling fans off.
- When checking the idle speed, the transaxle should be in neutral or park.

(h) Turn the power switch off.

(i) Turn the Techstream off.

(j) Disconnect the Techstream from the DLC3.

8. INSPECT COMPRESSION

(a) Put the engine in inspection mode INFO.

(b) Warm up and stop the engine.

(c) Remove the 4 spark plugs INFO.

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(d) Inspect the cylinder compression pressure.

(1) Insert a compression gauge into the spark plug hole.

(2) Connect the Techstream to the DLC3.

(3) Turn the power switch on (IG).

(4) Turn the Techstream on.

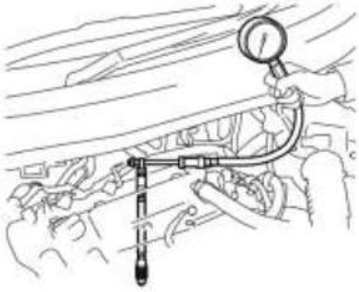
(5) Enter the following menus: Powertrain / Hybrid Control / Active Test / Compression Test / ON.

(6) Fully depress the acceleration pedal.

(7) Depress and hold the brake pedal, and turn the power switch on (READY).

NOTICE:

The measurement must be done as quickly as possible.



- Noise may emit from the transmission. However, this is not a malfunction.
- Always use a fully charged battery to obtain an engine speed of 200 rpm or more.

Standard compression pressure:

1373 kPa (14.0 kgf/cm^2, 199 psi) or more

Minimum pressure:

1079 kPa (11.0 kgf/cm^2, 157 psi)

Pressure difference between each cylinder:

98 kPa (1.0 kgf/cm^2, 14.2 psi) or less

- Inspect the other cylinders in the same way.
- Measure the compression as quickly as possible.

(8) If the cylinder compression is low, pour a small amount of engine oil into the cylinder through the spark plug hole, then inspect it again.

- If adding oil increases the compression, the piston rings and/or cylinder bore may be worn or damaged.
- If the pressure stays low, the valve may be stuck or seated improperly, or there may be leaks from the gasket.

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(e) Install the 4 spark plugs INFO.

NOTICE:

After performing all the procedures, be sure to clear DTCs stored in memory. Then, check that the normal system code is output.

9. INSPECT CO/HC

HINT:

This check determines whether or not the idle CO / HC complies with regulations.

(a) Put the engine in inspection mode INFO.

(b) Warm up the engine.

(c) Run the engine at 2500 rpm for approximately 180 seconds.

(d) Insert a CO/HC meter testing probe at least 40 cm (1.3 ft.) into the tailpipe while idling.

(e) Check the CO/HC concentration while idling and when the engine is running at 2500 rpm.

HINT:

When doing a 2 mode (with the engine idling/ running at 2500 rpm) test, the measurement procedures are determined by applicable local regulations.

If the CO/HC concentration does not comply with the regulations, troubleshoot in the order given below.

(1) Check the DTCs INFO.

(2) See the table below for possible causes, then inspect the applicable parts and repair them if necessary.

CO	HC	Problem	Possible Cause
Normal	High	Rough idle	1. Faulty ignition: ○ Incorrect timing ○ Fouled, shorted or improperly gapped plugs 2. Incorrect valve clearance 3. Leaks from intake and exhaust valves 4. Leaks from cylinders 5. Faulty EGR
Low	High	Rough idle (Fluctuating HC reading)	1. Vacuum leaks: ○ PCV hoses ○ Intake manifold ○ Throttle body ○ Brake booster line 2. Lean mixture causing misfire

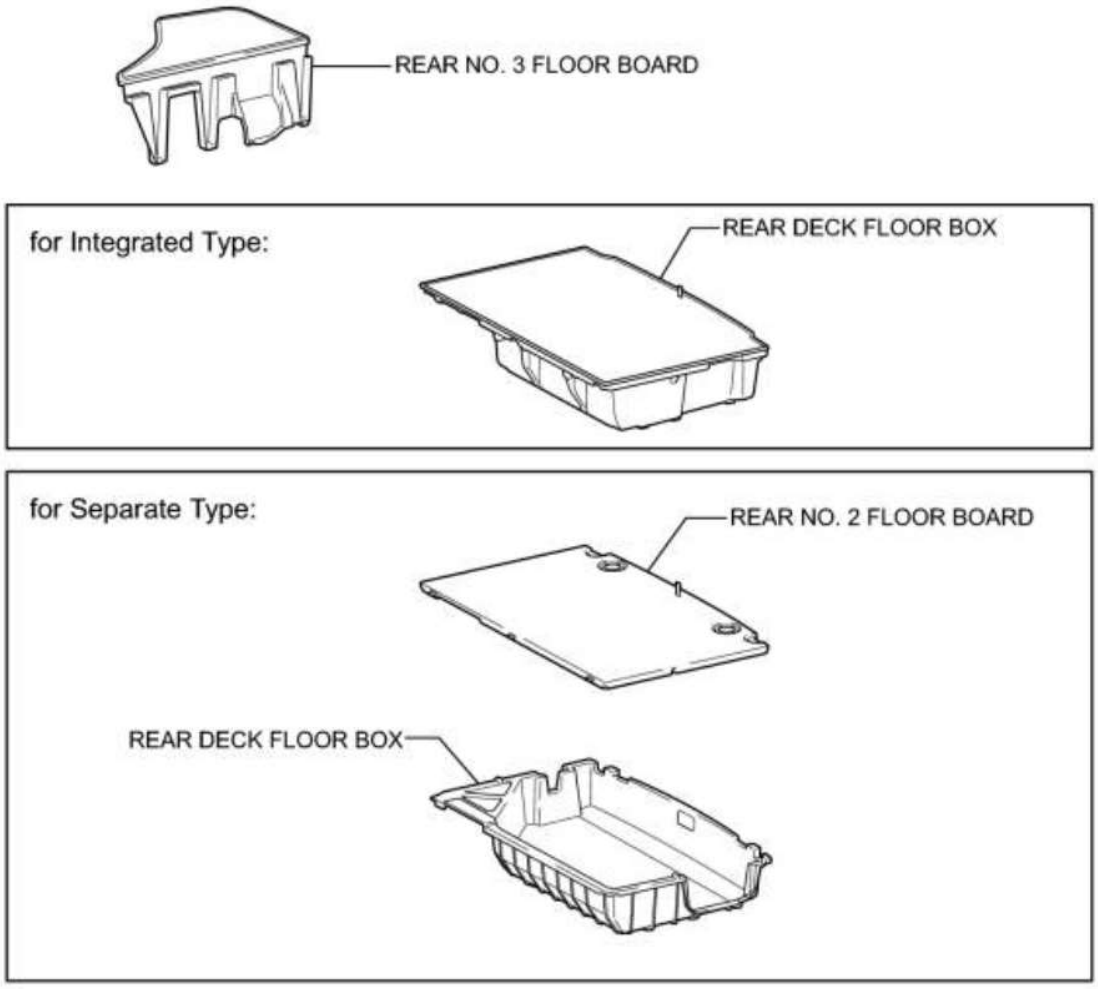
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CO	HC	Problem	Possible Cause
			3. Faulty EGR
High	High	Rough idle (Black smoke from exhaust)	1. Restricted air cleaner filter element 2. Plugged PCV valve 3. Faulty EFI systems: ○ Faulty pressure regulator ○ Faulty engine coolant temperature sensor ○ Faulty mass air flow meter ○ Faulty ECM ○ Faulty injectors ○ Throttle body 4. Faulty EGR

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COMPONENTS

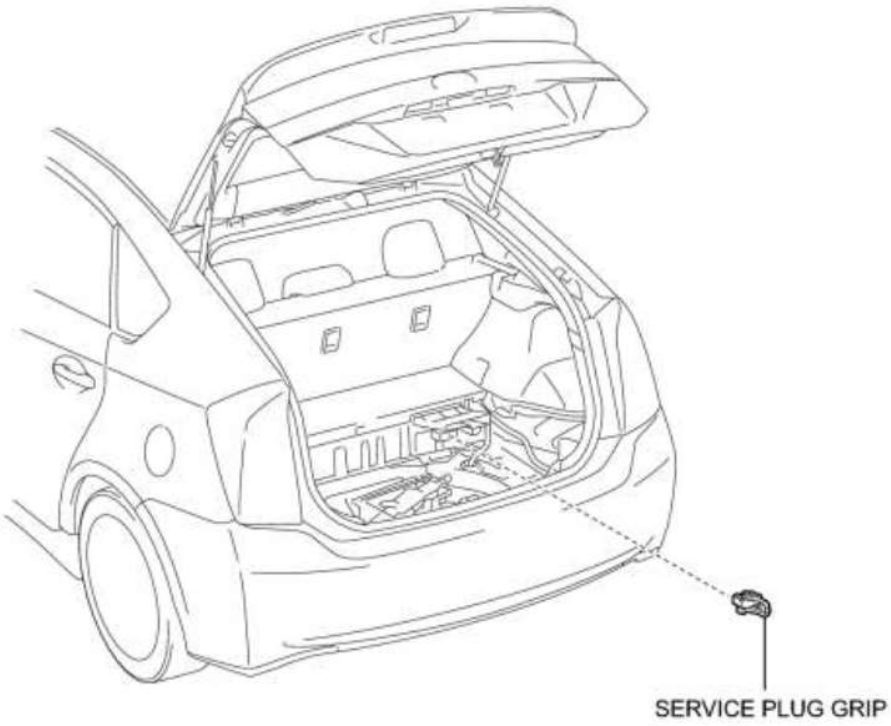
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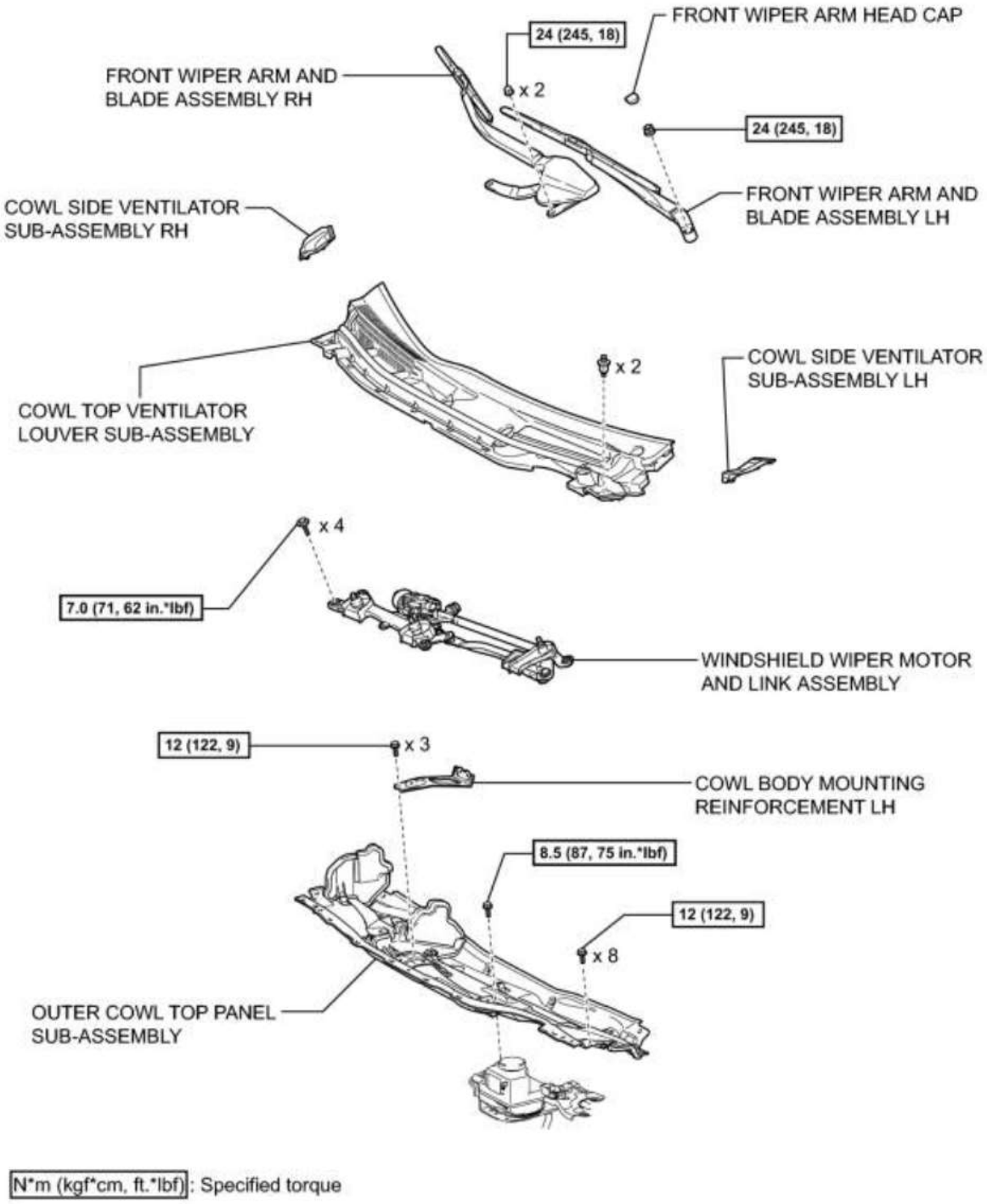
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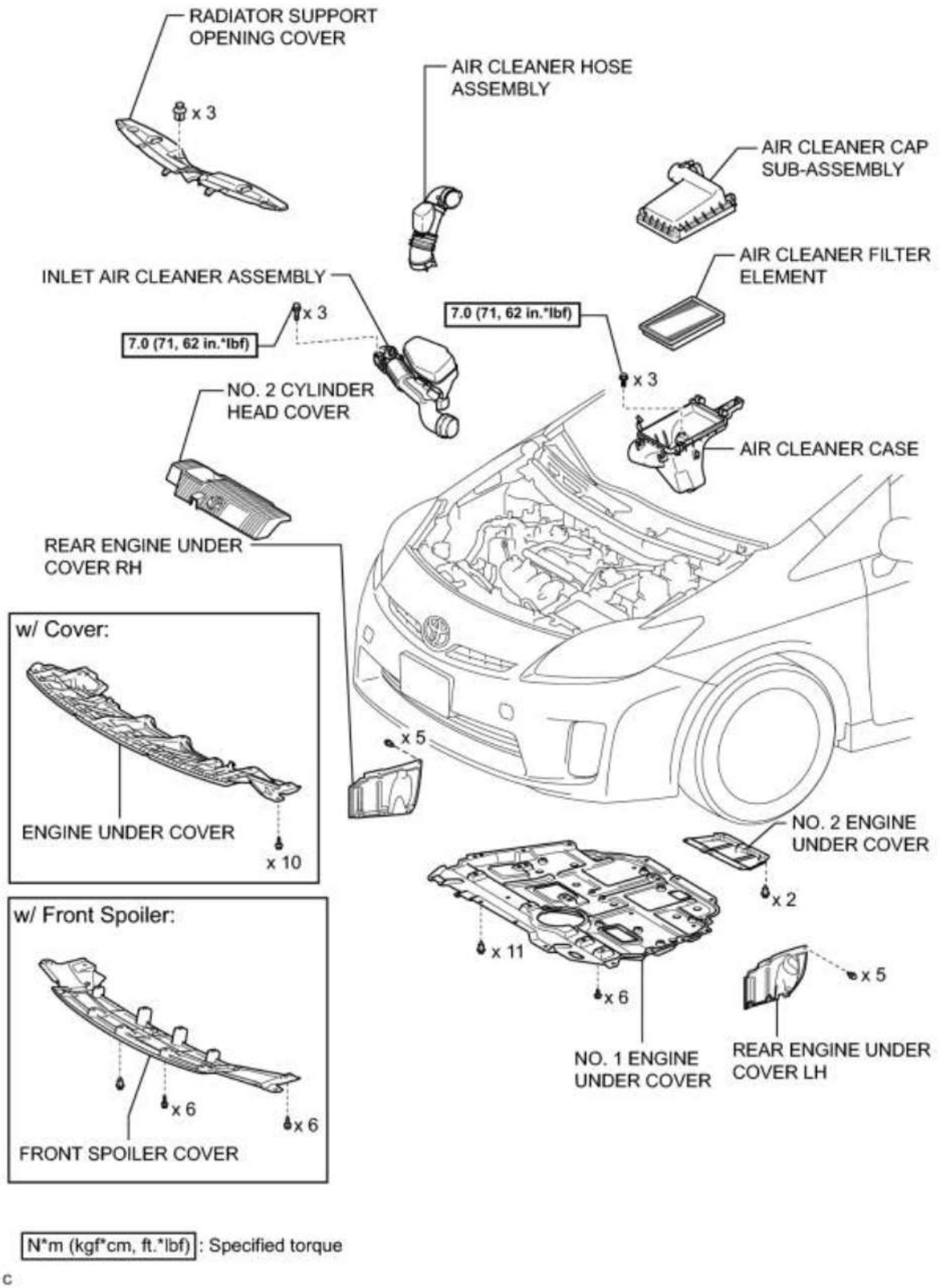
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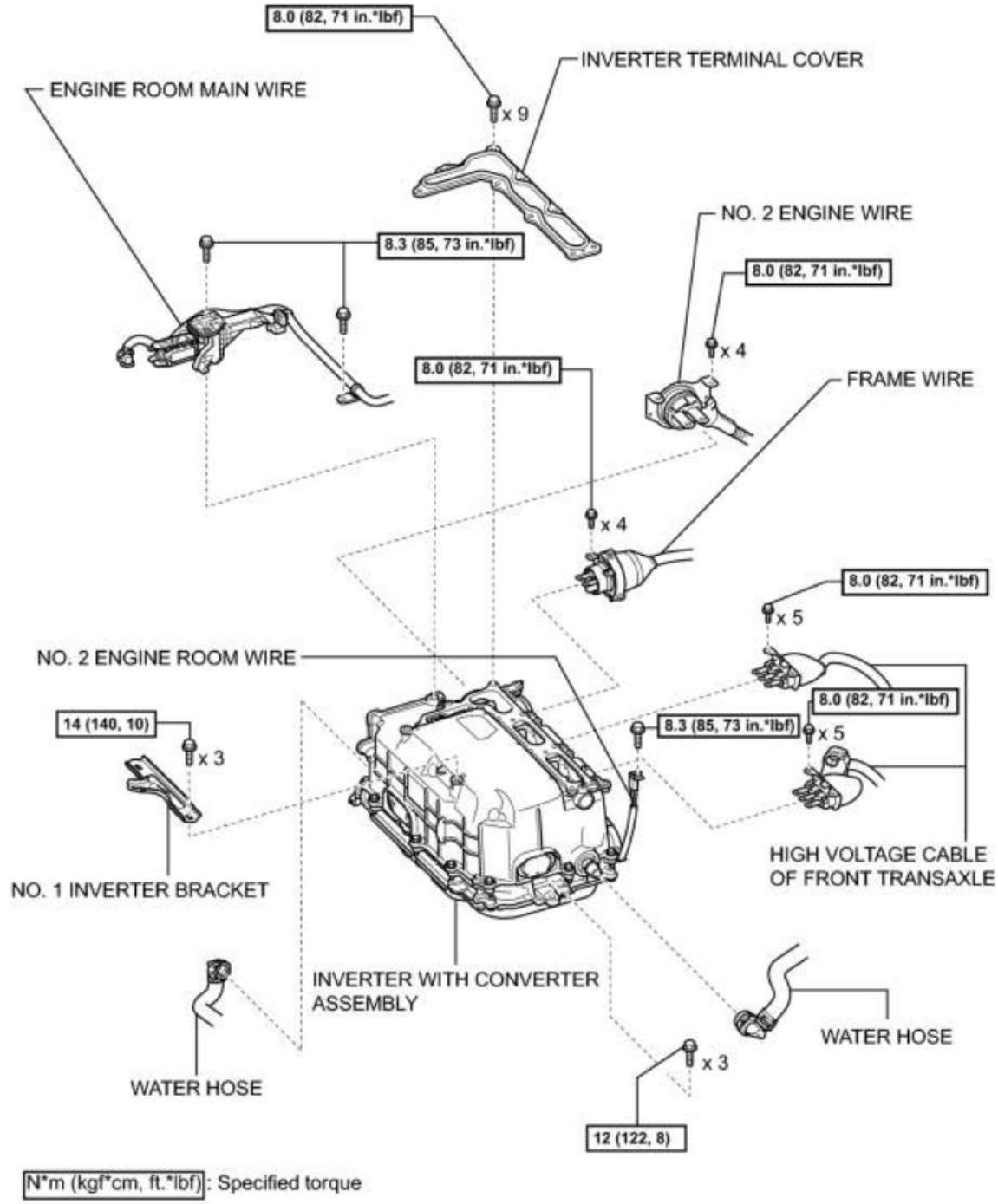
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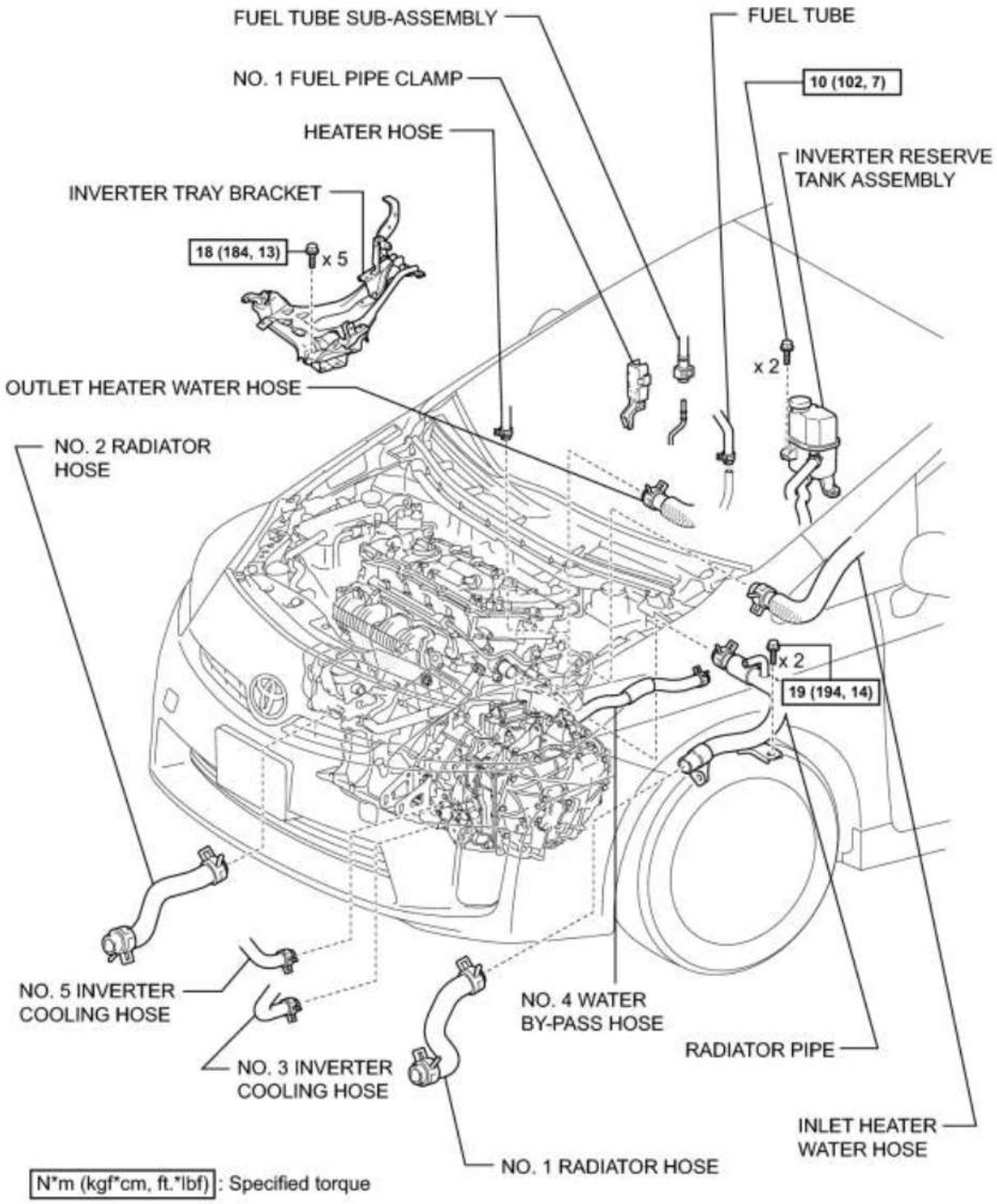
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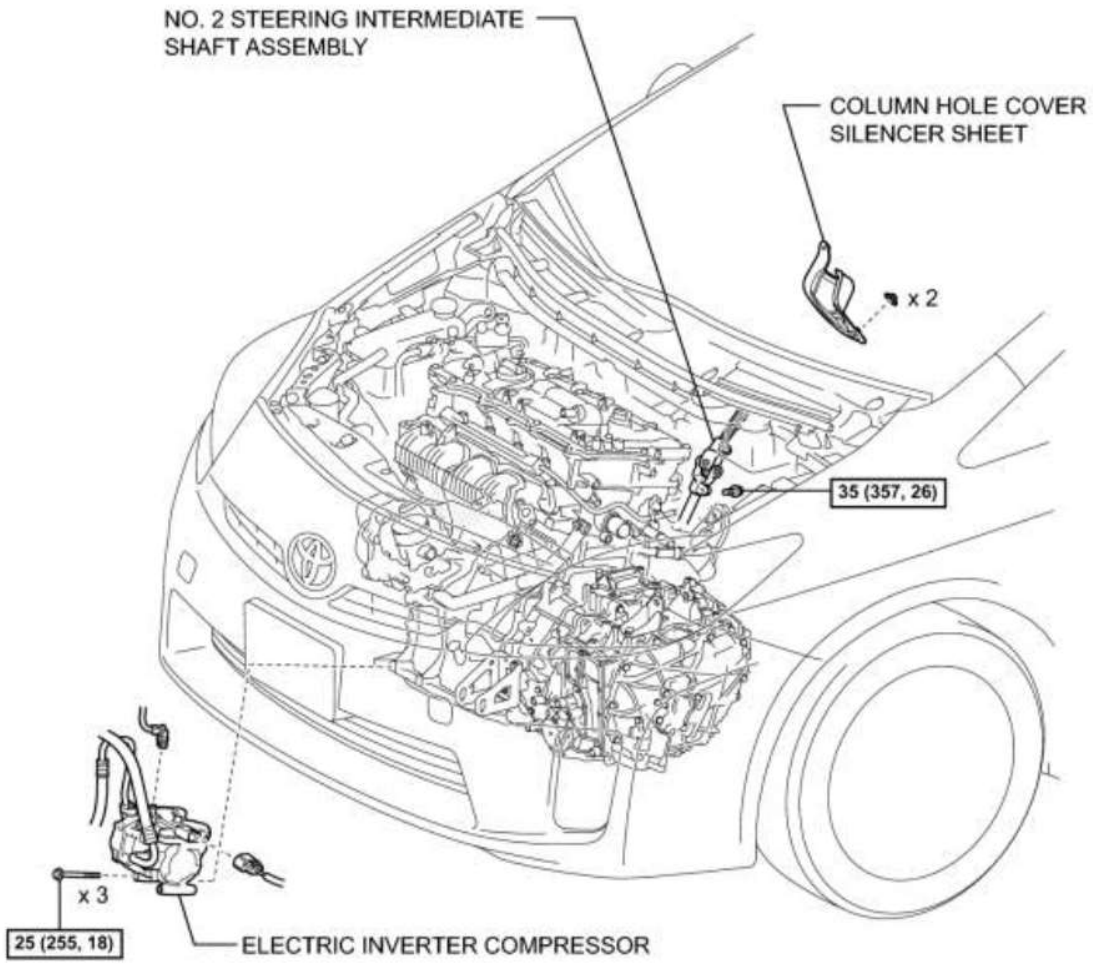
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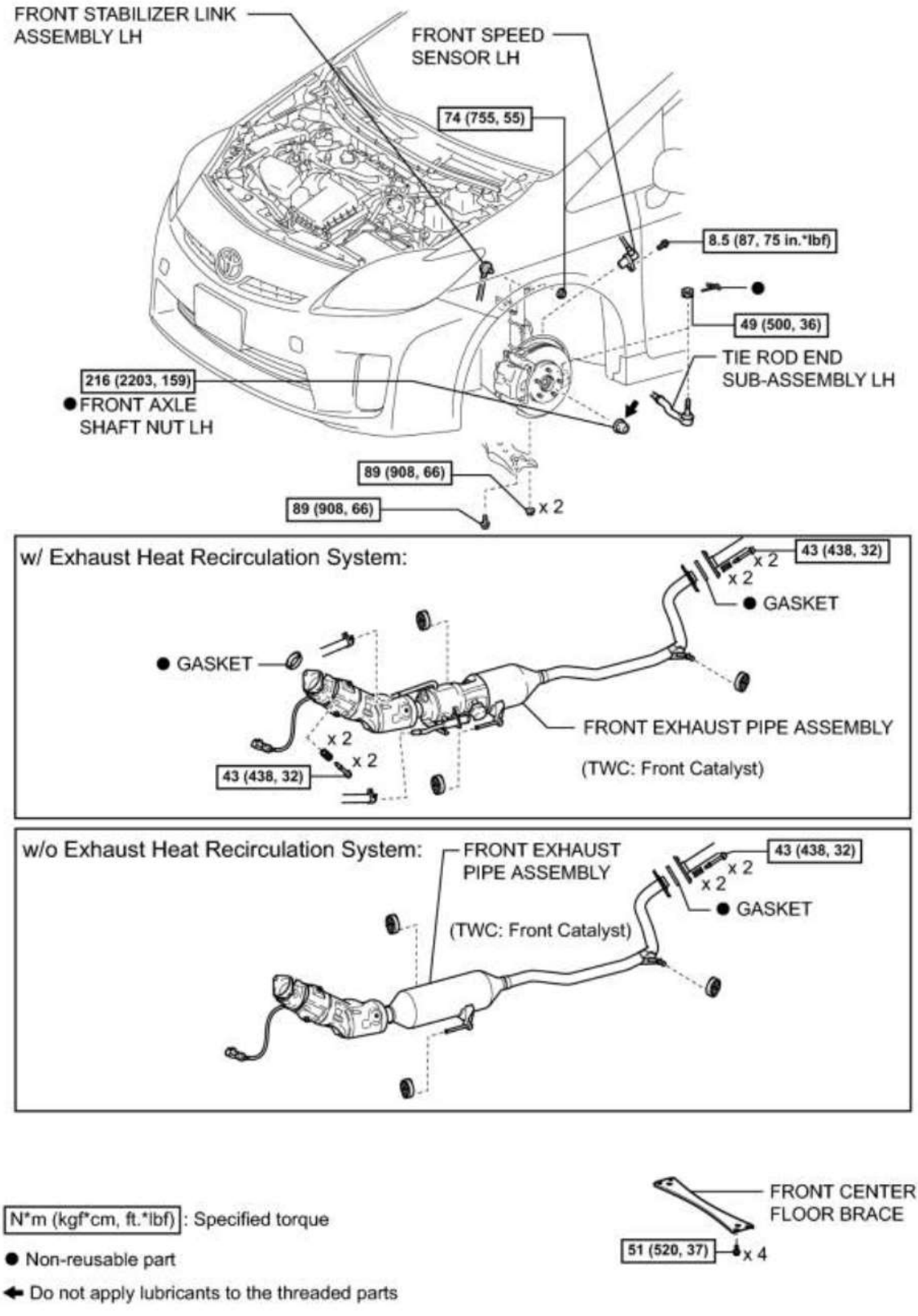


N*m (kgf*cm, ft.*lbf): Specified torque

c

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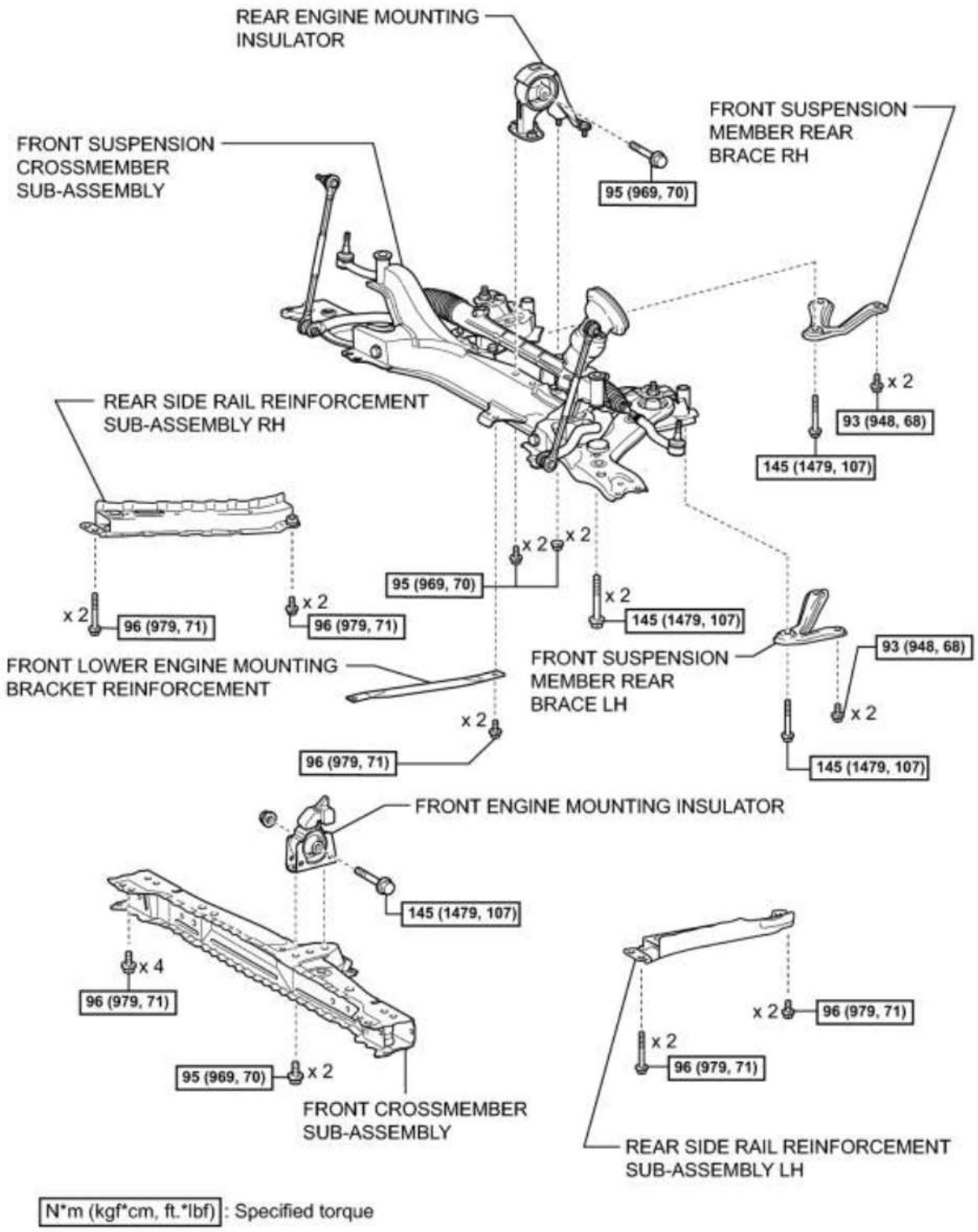
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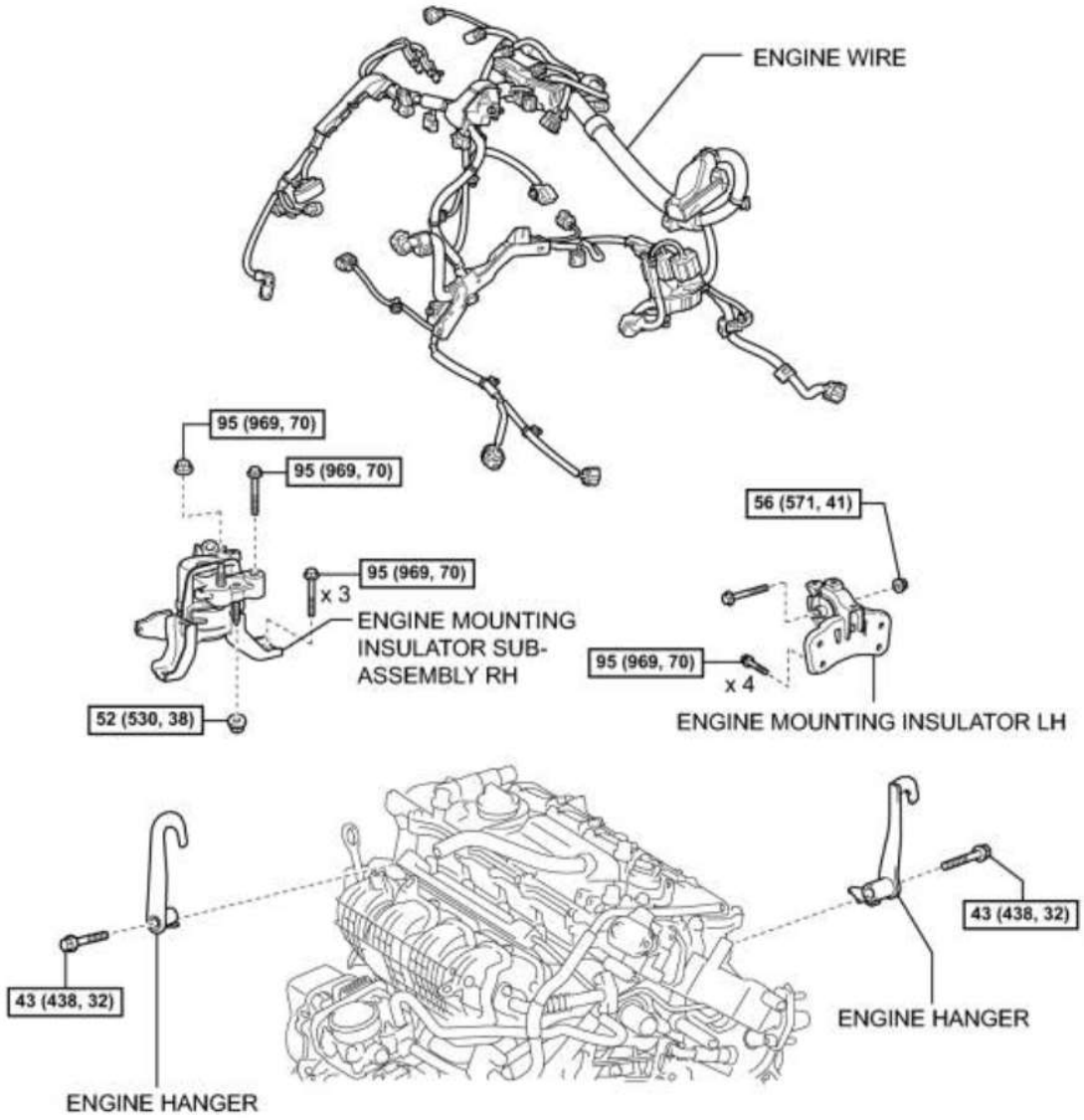


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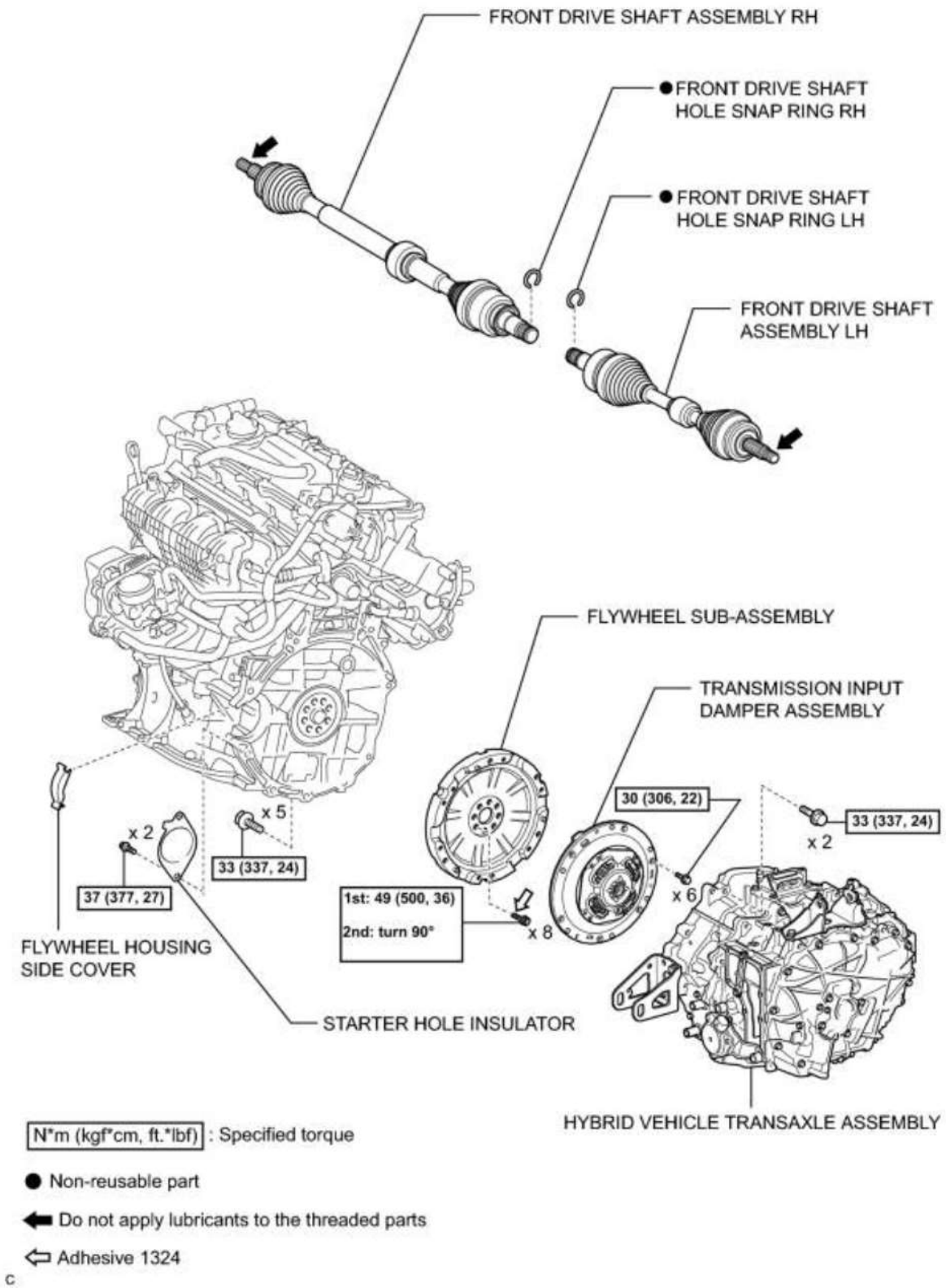


N*m (kgf*cm, ft.*lbf) : Specified torque

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REMOVAL

1. PRECAUTION

HINT: INFO.

2. DISCHARGE FUEL SYSTEM PRESSURE

HINT: INFO.

3. REMOVE REAR NO. 2 FLOOR BOARD (for Separate Type) INFO

4. REMOVE REAR DECK FLOOR BOX INFO

5. REMOVE REAR NO. 3 FLOOR BOARD INFO

6. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

NOTICE:

When disconnecting the cable, some systems need to be initialized after the cable is reconnected INFO.

7. REMOVE SERVICE PLUG GRIP INFO

8. ALIGN FRONT WHEELS FACING STRAIGHT AHEAD

9. REMOVE FRONT WHEEL

10. REMOVE REAR ENGINE UNDER COVER LH

11. REMOVE REAR ENGINE UNDER COVER RH

12. REMOVE FRONT SPOILER COVER (w/ Front Spoiler)

13. REMOVE ENGINE UNDER COVER (w/ Cover)

14. REMOVE NO. 1 ENGINE UNDER COVER

15. REMOVE NO. 2 ENGINE UNDER COVER

16. DRAIN ENGINE OIL INFO

17. DRAIN COOLANT (for Engine) INFO

18. DRAIN COOLANT (for Inverter) INFO

19. DRAIN HYBRID TRANSAXLE FLUID INFO

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20. REMOVE FRONT WIPER ARM HEAD CAP INFO

21. REMOVE FRONT WIPER ARM AND BLADE ASSEMBLY LH INFO

22. REMOVE FRONT WIPER ARM AND BLADE ASSEMBLY RH INFO

23. REMOVE COWL SIDE VENTILATOR SUB-ASSEMBLY LH INFO

24. REMOVE COWL SIDE VENTILATOR SUB-ASSEMBLY RH INFO

25. REMOVE COWL TOP VENTILATOR LOUVER SUB-ASSEMBLY INFO

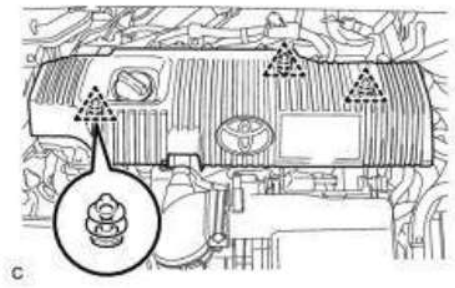
26. REMOVE WINDSHIELD WIPER MOTOR AND LINK ASSEMBLY INFO

27. REMOVE COWL BODY MOUNTING REINFORCEMENT LH INFO

28. REMOVE OUTER COWL TOP PANEL SUB-ASSEMBLY INFO

29. REMOVE NO. 2 CYLINDER HEAD COVER

(a) Remove the 3 clips and No. 2 cylinder head cover.

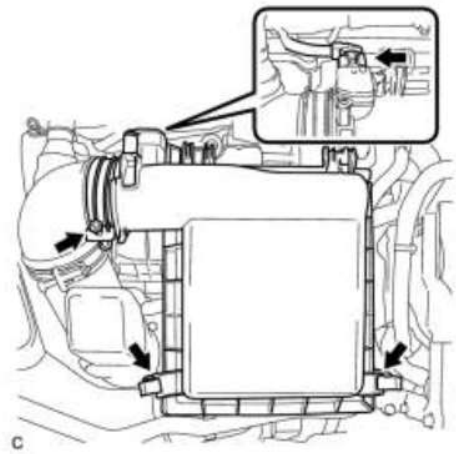


- Attempting to disengage both front and rear clips at the same time may cause the cover to break.
- Pull the cover straight up to remove. Attempting to pull the cover forward may cause it to break.

NOTICE:

Attempting to disengage both front and rear clips at the same time may cause the cover to break.

30. REMOVE AIR CLEANER CAP SUB-ASSEMBLY



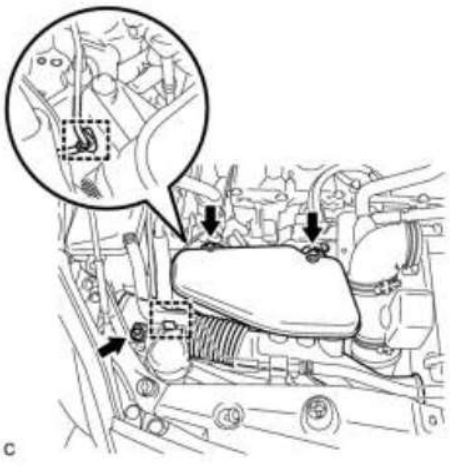
(a) Disconnect the air flow meter connector.

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(b) Disconnect the 2 clamps and hose band, and remove the air cleaner cap sub-assembly.

(c) Remove the air cleaner filter element.

31. REMOVE INLET AIR CLEANER ASSEMBLY

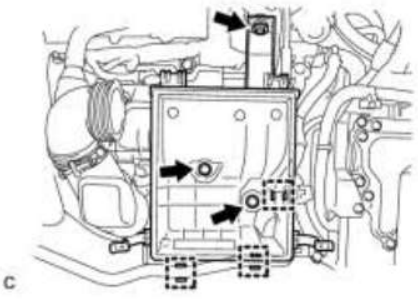


(a) Separate the water by-pass hose from the inlet air cleaner assembly.

(b) Separate the wire harness clamp from the inlet air cleaner assembly.

(c) Remove the 3 bolts and inlet air cleaner assembly.

32. REMOVE AIR CLEANER CASE



(a) Separate the No. 4 water by-pass hose from the air cleaner case.

(b) Remove the 3 bolts and air cleaner case.

33. REMOVE AIR CLEANER HOSE ASSEMBLY INFO

34. REMOVE RADIATOR SUPPORT OPENING COVER INFO

35. REMOVE NO. 1 INVERTER BRACKET INFO

36. DISCONNECT ENGINE ROOM MAIN WIRE INFO

37. REMOVE INVERTER TERMINAL COVER INFO

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38. CHECK TERMINAL VOLTAGE INFO

39. DISCONNECT FRAME WIRE INFO

40. DISCONNECT HIGH VOLTAGE CABLE OF FRONT TRANSAXLE INFO

41. DISCONNECT NO. 2 ENGINE WIRE INFO

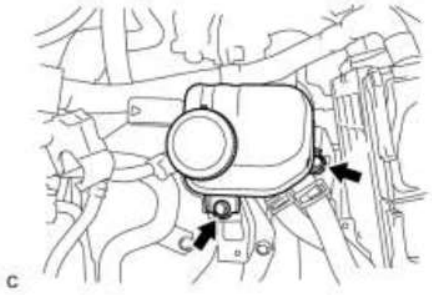
42. INSTALL INVERTER TERMINAL COVER INFO

43. DISCONNECT NO. 2 ENGINE ROOM WIRE INFO

44. DISCONNECT WATER HOSE INFO

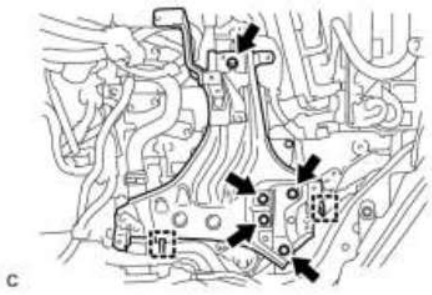
45. REMOVE INVERTER WITH CONVERTER ASSEMBLY INFO

46. REMOVE INVERTER RESERVE TANK ASSEMBLY



(a) Remove the 2 bolts and inverter reserve tank assembly.

47. REMOVE INVERTER TRAY BRACKET



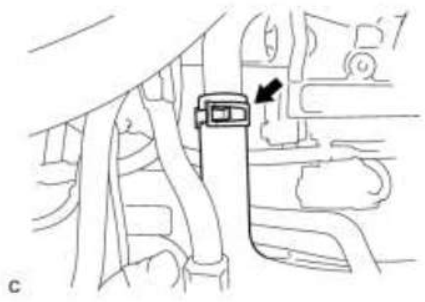
(a) Separate the 2 clamps.

(b) Remove the 5 bolts and inverter tray bracket.

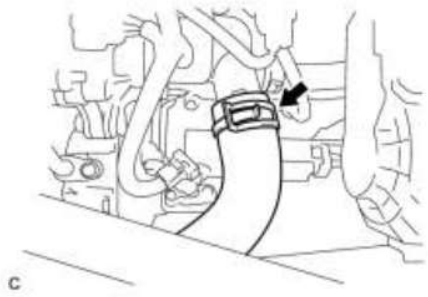
48. DISCONNECT NO. 1 RADIATOR HOSE

(a) Disconnect the No. 1 radiator hose from the radiator pipe assembly.

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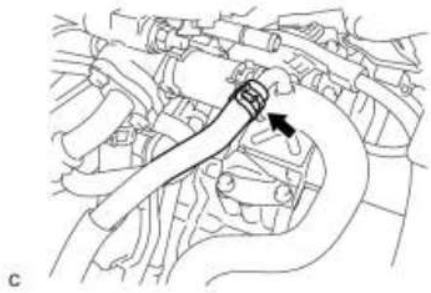


49. DISCONNECT NO. 2 RADIATOR HOSE



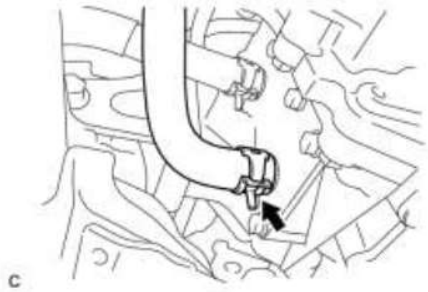
(a) Disconnect the No. 2 radiator hose from the water inlet.

50. DISCONNECT NO. 4 WATER BY-PASS HOSE



(a) Disconnect the No. 4 water by-pass hose from the radiator pipe assembly.

51. DISCONNECT NO. 3 INVERTER COOLING HOSE

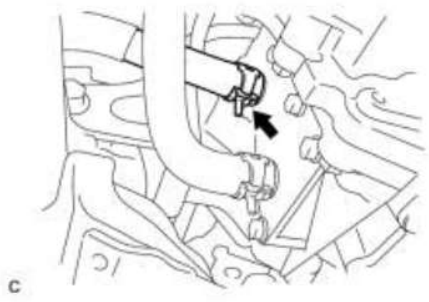


(a) Disconnect the No. 3 inverter cooling hose from the hybrid transaxle assembly.

52. DISCONNECT NO. 5 INVERTER COOLING HOSE

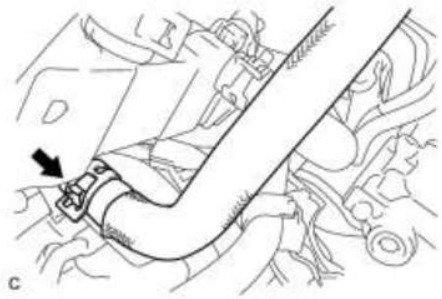
(a) Disconnect the No. 5 inverter cooling hose from the hybrid transaxle

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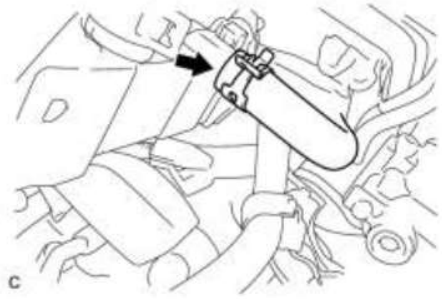
assembly.

53. DISCONNECT OUTLET HEATER WATER HOSE



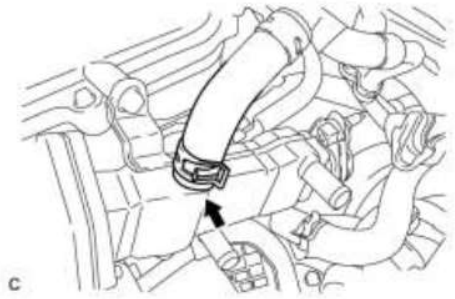
(a) Disconnect the outlet heater water hose.

54. DISCONNECT INLET HEATER WATER HOSE



(a) Disconnect the inlet heater water hose.

55. DISCONNECT HEATER HOSE

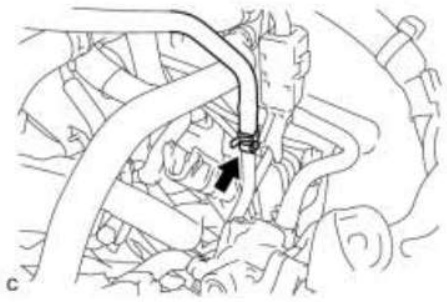


(a) Disconnect the heater hose.

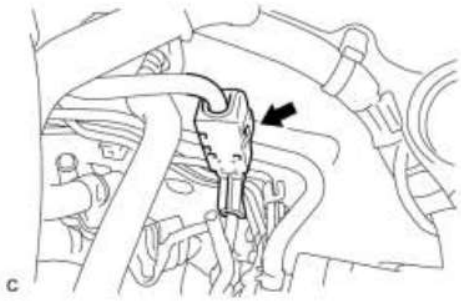
56. DISCONNECT NO. 1 FUEL VAPOR FEED HOSE

(a) Disconnect the No. 1 fuel vapor feed hose.

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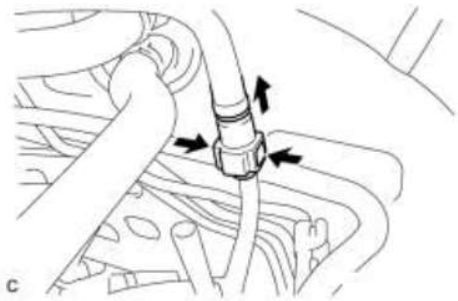


57. DISCONNECT FUEL TUBE SUB-ASSEMBLY



(a) Release the claw and remove the No. 1 fuel pipe clamp.

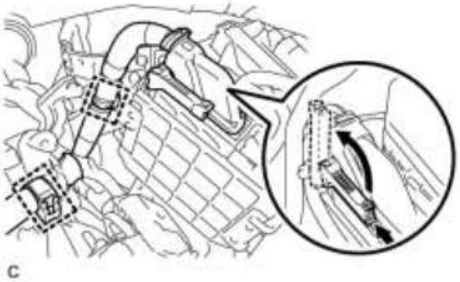
(b) Pinch the retainer as illustrated, then pull the fuel tube connector out of the pipe.



- Remove any dirt and foreign matter from the fuel tube connector before performing this work.
- Do not allow any scratches or foreign matter on the parts when disconnecting, as the fuel tube connector has the O-rings that seal the pipe.
- Perform this work by hand. Do not use any tools.
- Do not forcibly bend, kink or twist the nylon tube.
- Protect the disconnected parts by covering them with plastic bags after disconnecting the fuel tube.
- If the fuel tube connector and pipe are stuck, push and pull to release them.

58. SEPARATE ELECTRIC INVERTER COMPRESSOR INFO

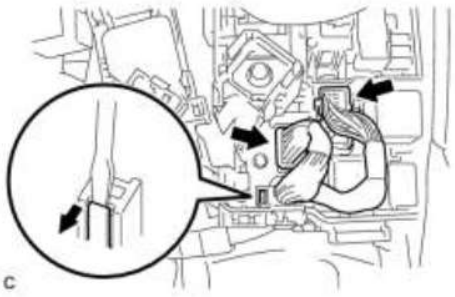
59. DISCONNECT WIRE HARNESS



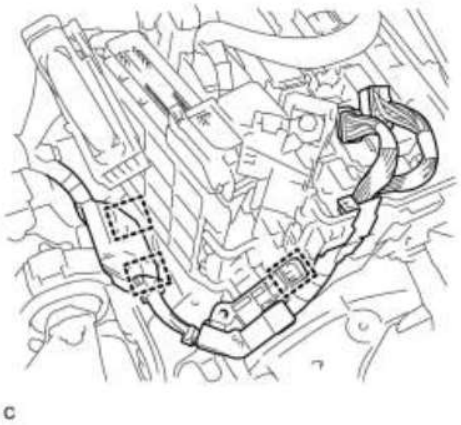
(a) Disconnect the 2 clamps.

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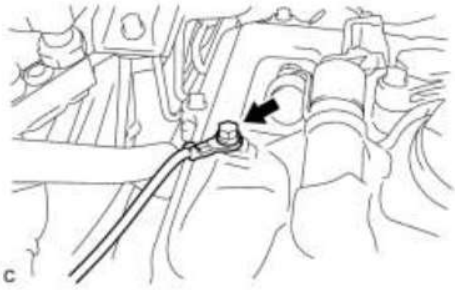
(b) Pull up the lever and disconnect the connector of the ECM.



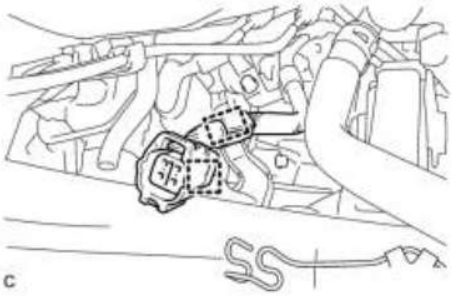
(c) Remove the 2 connectors and clamp from the engine room junction block and disconnect the wire harness.



(d) Disconnect the 3 clamps.



(e) Remove the bolt and disconnect the earth wire.



(f) Disconnect the 2 clamps and wire harness.

60. SECURE STEERING WHEEL INFO

61. REMOVE COLUMN HOLE COVER SILENCER SHEET INFO

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62. SEPARATE NO. 2 STEERING INTERMEDIATE SHAFT ASSEMBLY INFO

63. SEPARATE NO. 1 STEERING COLUMN HOLE COVER SUB-ASSEMBLY INFO

64. REMOVE TAIL EXHAUST PIPE ASSEMBLY INFO

65. REMOVE FRONT NO. 3 ENGINE UNDER COVER INFO

66. REMOVE FRONT CENTER FLOOR BRACE INFO

67. REMOVE FRONT EXHAUST PIPE ASSEMBLY (w/ Exhaust Heat Recirculation System) INFO

68. REMOVE FRONT EXHAUST PIPE ASSEMBLY (w/o Exhaust Heat Recirculation System) INFO

69. REMOVE FRONT AXLE SHAFT NUT LH INFO

70. REMOVE FRONT AXLE SHAFT NUT RH

HINT:

Perform the same procedure as for the LH side.

71. SEPARATE FRONT SPEED SENSOR LH INFO

72. SEPARATE FRONT SPEED SENSOR RH

HINT:

Perform the same procedure as for the LH side.

73. SEPARATE TIE ROD END SUB-ASSEMBLY LH INFO

74. SEPARATE TIE ROD END SUB-ASSEMBLY RH

HINT:

Perform the same procedure as for the LH side.

75. SEPARATE FRONT STABILIZER LINK ASSEMBLY LH INFO

76. SEPARATE FRONT STABILIZER LINK ASSEMBLY RH

HINT:

Perform the same procedure as for the LH side.

77. SEPARATE FRONT NO. 1 LOWER SUSPENSION ARM SUB-ASSEMBLY LH INFO

78. SEPARATE FRONT NO. 1 LOWER SUSPENSION ARM SUB-ASSEMBLY RH

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HINT:

Perform the same procedure as for the LH side.

79. SEPARATE FRONT DRIVE SHAFT ASSEMBLY LH INFO

80. REMOVE FRONT DRIVE SHAFT ASSEMBLY LH INFO

81. SEPARATE FRONT DRIVE SHAFT ASSEMBLY RH

HINT:

Perform the same procedure as for the LH side.

82. REMOVE FRONT DRIVE SHAFT ASSEMBLY RH

HINT:

Perform the same procedure as for the LH side.

83. REMOVE FRONT DRIVE SHAFT HOLE SNAP RING LH INFO

84. REMOVE FRONT DRIVE SHAFT HOLE SNAP RING RH

HINT:

Perform the same procedure as for the LH side.

85. REMOVE FRONT LOWER ENGINE MOUNTING BRACKET REINFORCEMENT INFO

86. REMOVE REAR SIDE RAIL REINFORCEMENT SUB-ASSEMBLY LH INFO

87. REMOVE REAR SIDE RAIL REINFORCEMENT SUB-ASSEMBLY RH INFO

88. REMOVE FRONT SUSPENSION MEMBER REAR BRACE LH INFO

89. REMOVE FRONT SUSPENSION MEMBER REAR BRACE RH

HINT:

Perform the same procedure as for the LH side.

90. REMOVE FRONT SUSPENSION CROSSMEMBER SUB-ASSEMBLY INFO

91. REMOVE ENGINE ASSEMBLY WITH TRANSAXLE

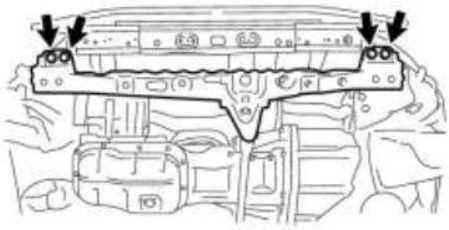
(a) Set the engine lifter.

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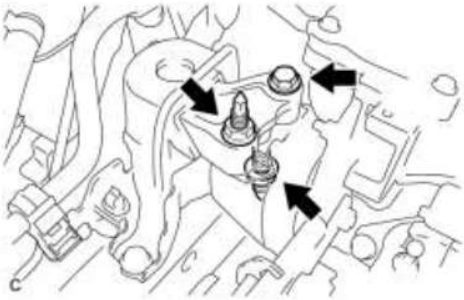


NOTICE:

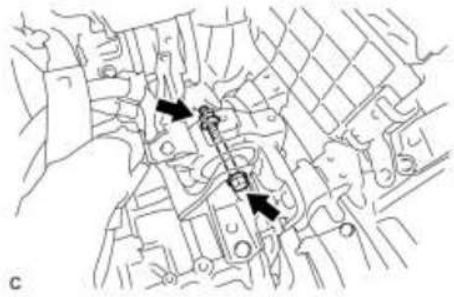
Place the engine on wooden blocks or equivalent so that the engine is level.



(b) Remove the 4 bolts and front crossmember sub-assembly.



(c) Remove the bolt and 2 nuts, and separate the engine mounting insulator RH.



(d) Remove the bolt and nut, and separate the engine mounting insulator LH.

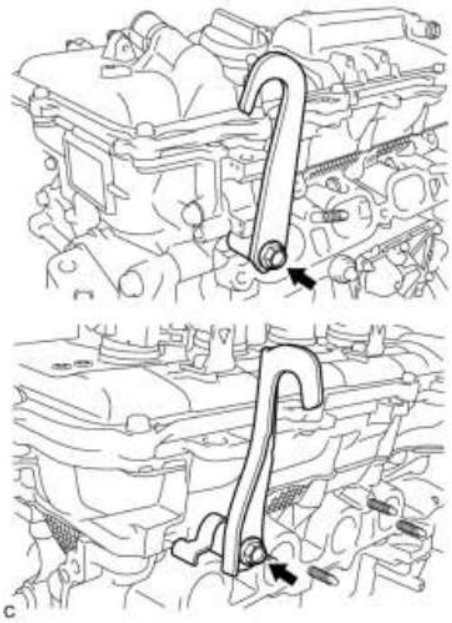
(e) Carefully remove the engine with transaxle from the vehicle.

(f) Install the 2 engine hangers with the 2 bolts.

Torque: **43 N·m (438 kgf·cm, 32ft·lbf)**

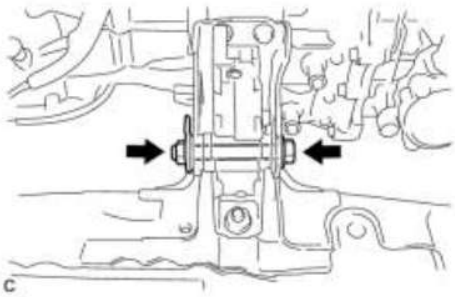
Part Name	Part No.
No. 1 engine hanger	12281-37021
No. 2 engine hanger	12282-37011
Bolt	91552-81050

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(g) Attach the sling device to the engine hangers and chain block.

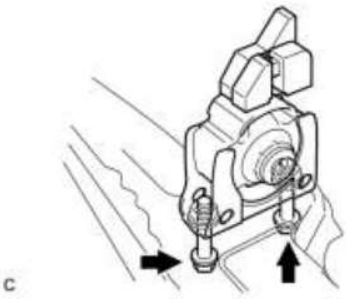
92. REMOVE FRONT CROSSMEMBER SUB-ASSEMBLY



(a) Remove the bolt and nut.

(b) Remove the front engine mounting insulator from the front engine mounting bracket.

93. REMOVE FRONT ENGINE MOUNTING INSULATOR

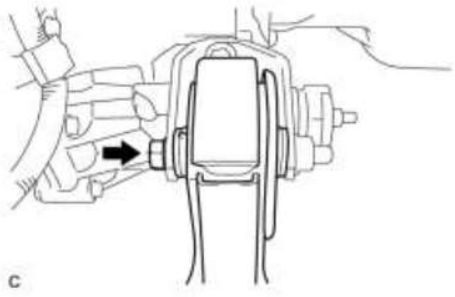


(a) Remove the 2 bolts and front engine mounting insulator.

94. REMOVE REAR ENGINE MOUNTING INSULATOR

(a) Remove the through bolt, and separate the rear engine mounting

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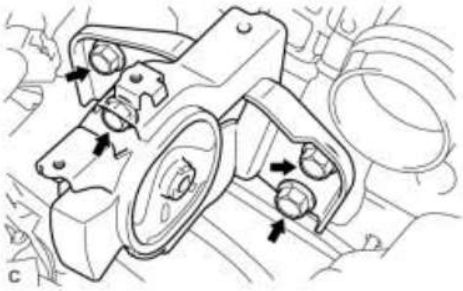


insulator.

HINT:

Perform this procedure only when replacement of the engine mounting insulator is necessary.

95. REMOVE ENGINE MOUNTING INSULATOR LH



(a) Remove the 4 bolts and engine mounting insulator LH.

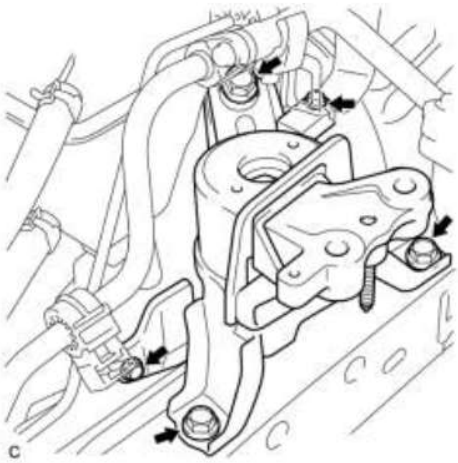
HINT:

Perform this procedure only when replacement of the engine mounting insulator is necessary.

96. REMOVE ENGINE MOUNTING INSULATOR SUB-ASSEMBLY RH

HINT:

Perform this procedure only when replacement of the engine mounting insulator is necessary.



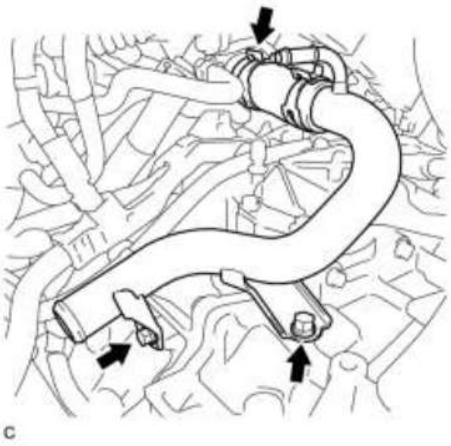
(a) Remove the 3 bolts and 2 cooler brackets.

(b) Remove the 3 bolts and engine mounting insulator sub-assembly RH.

97. REMOVE RADIATOR PIPE

(a) Separate the No. 3 radiator hose from the cylinder head.

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(b) Remove the 2 bolts and radiator pipe.

98. REMOVE FLYWHEEL HOUSING SIDE COVER INFO

99. REMOVE STARTER HOLE INSULATOR INFO

100. REMOVE ENGINE WIRE

101. REMOVE HYBRID VEHICLE TRANSAXLE ASSEMBLY

(a) Remove the hybrid vehicle transaxle assembly INFO.

NOTICE:

Be careful not to apply excess force to the transmission input damper assembly when removing or installing the hybrid vehicle transaxle assembly. If excess force is applied, the transmission input damper assembly may be damaged, or its splines may become misaligned.

102. REMOVE TRANSMISSION INPUT DAMPER ASSEMBLY

(a) Gently place the engine assembly onto wood blocks or equivalent.

NOTICE:

This step should be done while hanging the engine assembly using the engine hangers and a chain block.

(b) Remove the transmission input damper assembly INFO.

103. REMOVE FLYWHEEL SUB-ASSEMBLY

(a) Gently place the engine assembly onto wood blocks or equivalent.

NOTICE:

This step should be done while hanging the engine assembly using the engine hangers and a chain block.

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(b) Remove the flywheel sub-assembly INFO.

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INSTALLATION

1. INSTALL FLYWHEEL SUB-ASSEMBLY

(a) Gently place the engine assembly onto wood blocks or equivalent.

NOTICE:

This step should be done while hanging the engine assembly using the engine hangers and a chain block.

(b) Install the flywheel sub-assembly INFO.

2. INSTALL TRANSMISSION INPUT DAMPER ASSEMBLY

(a) Gently place the engine assembly onto wood blocks or equivalent.

NOTICE:

This step should be done while hanging the engine assembly using the engine hangers and a chain block.

(b) Install the transmission input damper assembly INFO.

3. INSTALL HYBRID VEHICLE TRANSAXLE ASSEMBLY

(a) Install the hybrid vehicle transaxle assembly INFO.

NOTICE:

Be careful not to apply excess force to the transmission input damper assembly when removing or installing the hybrid vehicle transaxle assembly. If excess force is applied, the transmission input damper assembly may be damaged, or its splines may become misaligned.

4. INSTALL ENGINE WIRE

5. INSTALL STARTER HOLE INSULATOR INFO

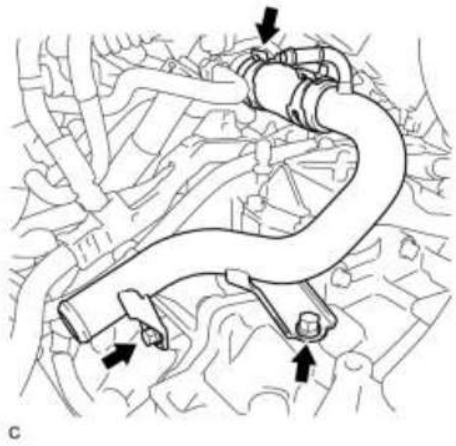
6. INSTALL FLYWHEEL HOUSING SIDE COVER INFO

7. INSTALL RADIATOR PIPE

(a) Install the radiator pipe with the 2 bolts.

Torque: **19 N·m (194 kgf·cm, 14ft·lbf)**

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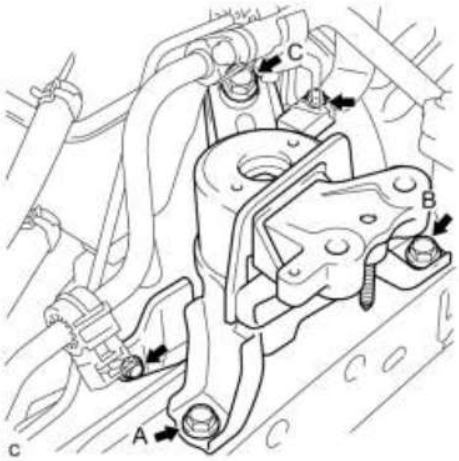


(b) Install the No. 3 radiator hose with the clamp.

8. INSTALL ENGINE MOUNTING INSULATOR SUB-ASSEMBLY RH

HINT:

Perform this procedure only when replacement of the engine mounting insulator is necessary.



(a) Position the engine mounting insulator sub-assembly RH as shown in the illustration.

(b) Temporarily install bolt A to the engine mounting insulator sub-assembly RH.

(c) Tighten the 3 bolts to the engine mounting insulator sub-assembly RH in the order the bolt B, bolt C and bolt A.

Torque: **95 N·m (969 kgf·cm, 70ft·lbf)**

(d) Install the 2 cooler brackets with the 2 bolts.

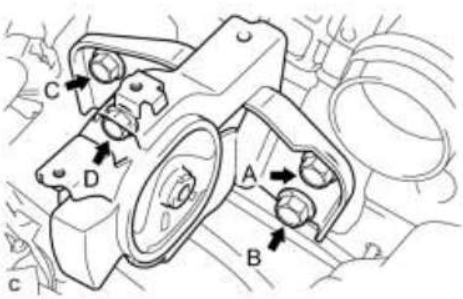
Torque: **9.8 N·m (100 kgf·cm, 87in·lbf)**

9. INSTALL ENGINE MOUNTING INSULATOR LH

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HINT:

Perform this procedure only when replacement of the engine mounting insulator is necessary.

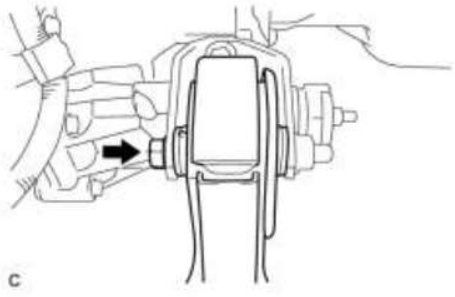


(a) Temporarily install bolt A to the engine mounting insulator LH.

(b) Tighten the 4 bolts to the engine mounting insulator LH in the order the bolt C, bolt B, bolt D and bolt A.

Torque: **95 N·m (969 kgf·cm, 70ft·lbf)**

10. INSTALL REAR ENGINE MOUNTING INSULATOR



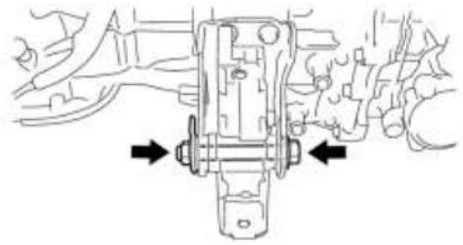
(a) Install the rear engine mounting insulator to the engine mounting bracket with the through bolt.

Torque: **95 N·m (969 kgf·cm, 70ft·lbf)**

HINT:

Perform this procedure only when replacement of the engine mounting insulator is necessary.

11. INSTALL FRONT ENGINE MOUNTING INSULATOR



(a) Temporarily install the front engine mounting insulator with the bolt and nut.

12. INSTALL ENGINE ASSEMBLY WITH TRANSAXLE

(a) Set the engine assembly with transaxle on the engine lifter.

NOTICE:

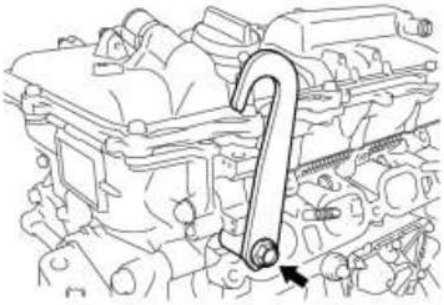
- Install a height adjustment attachment and plate lift attachment onto the engine assembly with transaxle.

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- Do not position a height adjustment attachment or plate lift attachment onto the front frame assembly.

HINT:

Place the engine on wooden blocks or equivalents so that the engine is level.





(b) Remove the 2 bolts and 2 engine hangers.



(c) Set the engine assembly with transaxle and front suspension crossmember on the engine lifter.

(d) Operate the engine lifter and lift the engine assembly with transaxle and front suspension crossmember to the position where the engine mounting insulators RH and LH can be installed.

CAUTION:

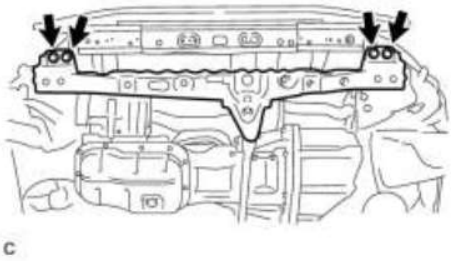
Do not raise the engine more than necessary. If the engine is raised excessively, the vehicle may also be lifted up.

NOTICE:

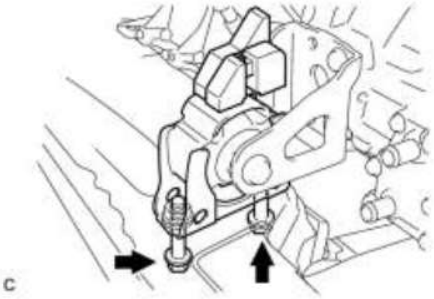
- Make sure that the engine is clear of all wiring and hoses.
- While raising the engine into the vehicle, do not allow it to contact the vehicle.

(e) Install the front crossmember with the 4 bolts.

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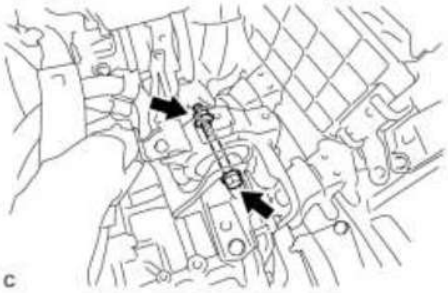


Torque: **96 N·m (979 kgf·cm, 71ft·lbf)**



(f) Install the front engine mounting insulator to the front crossmember with the 2 bolts.

Torque: **95 N·m (969 kgf·cm, 70ft·lbf)**

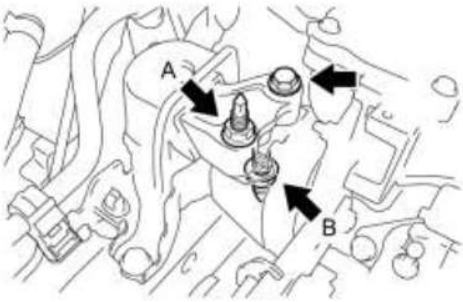


(g) Install the engine mounting insulator LH with the through bolt and nut.

Torque: **56 N·m (571 kgf·cm, 41ft·lbf)**

NOTICE:

When installing the engine mounting insulator, tighten the nut while holding the bolt.

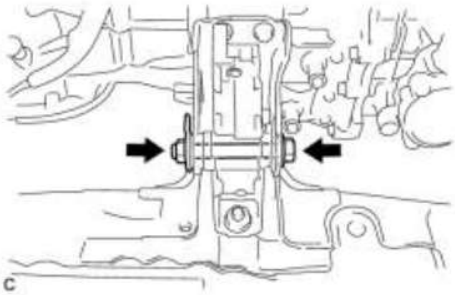


(h) Install the engine mounting insulator RH with the bolt and 2 nuts.

Nut A - Torque: **95 N·m (969 kgf·cm, 70ft·lbf)**

Nut B - Torque: **52 N·m (530 kgf·cm, 38ft·lbf)**

Bolt - Torque: **95 N·m (969 kgf·cm, 70ft·lbf)**



(i) Tighten the front engine mounting insulator with the bolt and nut.

Torque: **145 N·m (1479 kgf·cm, 107ft·lbf)**

13. INSTALL FRONT SUSPENSION CROSSMEMBER SUB-ASSEMBLY INFO

14. INSTALL FRONT SUSPENSION MEMBER REAR BRACE LH INFO

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15. INSTALL FRONT SUSPENSION MEMBER REAR BRACE RH

HINT:

Perform the same procedure as for the LH side.

16. INSTALL REAR SIDE RAIL REINFORCEMENT SUB-ASSEMBLY LH INFO

17. INSTALL REAR SIDE RAIL REINFORCEMENT SUB-ASSEMBLY RH INFO

18. INSTALL FRONT LOWER ENGINE MOUNTING BRACKET REINFORCEMENT INFO

19. INSTALL FRONT DRIVE SHAFT HOLE SNAP RING LH INFO

20. INSTALL FRONT DRIVE SHAFT HOLE SNAP RING RH

HINT:

Perform the same procedure as for the LH side.

21. INSTALL FRONT DRIVE SHAFT ASSEMBLY LH INFO

22. INSTALL FRONT DRIVE SHAFT ASSEMBLY RH

HINT:

Perform the same procedure as for the LH side.

23. INSTALL FRONT NO. 1 LOWER SUSPENSION ARM SUB-ASSEMBLY LH INFO

24. INSTALL FRONT NO. 1 LOWER SUSPENSION ARM SUB-ASSEMBLY RH

HINT:

Perform the same procedure as for the LH side.

25. INSTALL FRONT STABILIZER LINK ASSEMBLY LH INFO

26. INSTALL FRONT STABILIZER LINK ASSEMBLY RH

HINT:

Perform the same procedure as for the LH side.

27. CONNECT TIE ROD END SUB-ASSEMBLY LH INFO

28. CONNECT TIE ROD END SUB-ASSEMBLY RH

HINT:

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Perform the same procedure as for the LH side.

29. INSTALL FRONT SPEED SENSOR LH INFO

30. INSTALL FRONT SPEED SENSOR RH

HINT:

Perform the same procedure as for the LH side.

31. INSTALL FRONT AXLE SHAFT NUT LH INFO

32. INSTALL FRONT AXLE SHAFT NUT RH

HINT:

Perform the same procedure as for the LH side.

33. INSTALL FRONT EXHAUST PIPE ASSEMBLY (w/ Exhaust Heat Recirculation System) INFO

34. INSTALL FRONT EXHAUST PIPE ASSEMBLY (w/o Exhaust Heat Recirculation System) INFO

35. INSTALL FRONT CENTER FLOOR BRACE INFO

36. INSTALL FRONT NO. 3 ENGINE UNDER COVER INFO

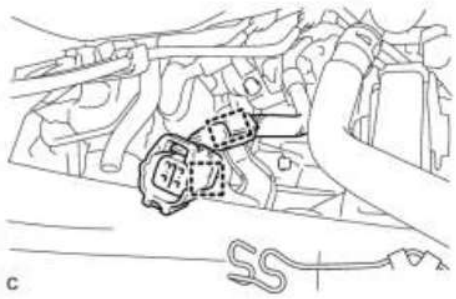
37. INSTALL TAIL EXHAUST PIPE ASSEMBLY INFO

38. INSTALL NO. 1 STEERING COLUMN HOLE COVER SUB-ASSEMBLY INFO

39. CONNECT NO. 2 STEERING INTERMEDIATE SHAFT ASSEMBLY INFO

40. INSTALL COLUMN HOLE COVER SILENCER SHEET INFO

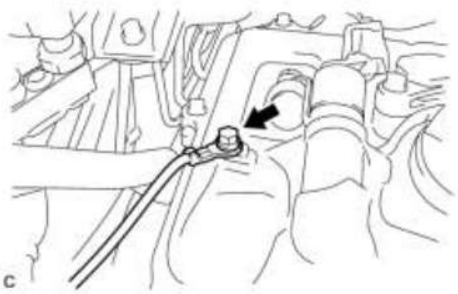
41. INSTALL WIRE HARNESS

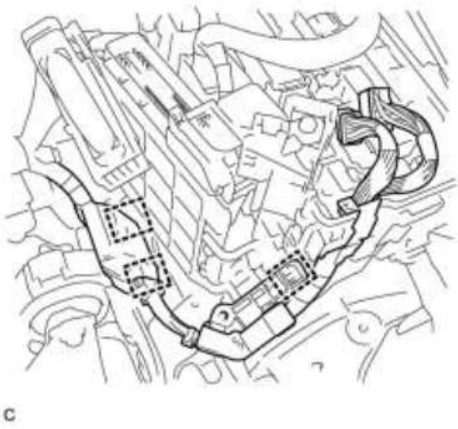


(a) Connect the wire harness with the 2 clamps.

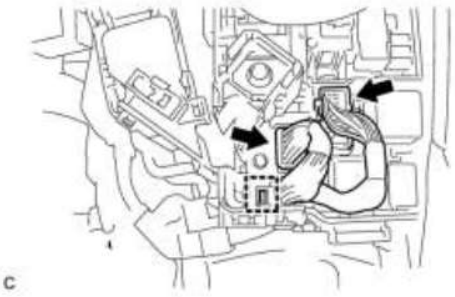
(b) Install the wire harness with the bolt.

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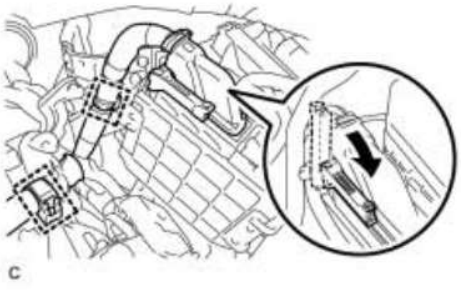


(c) Connect the wire harness with the 3 clamps.



(d) Connect the wire harness to the engine room junction block.

(e) Connect the 2 connectors to the engine room junction block.



(f) Connect the connector to the ECM with the 2 clamps and lock lever.

42. INSTALL ELECTRIC INVERTER COMPRESSOR INFO

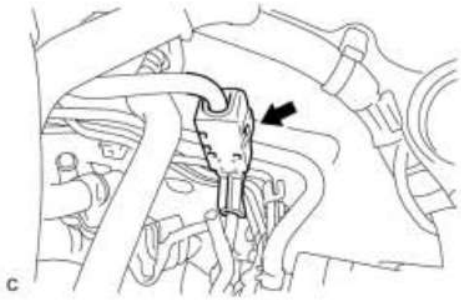
43. CONNECT FUEL TUBE SUB-ASSEMBLY

(a) Connect the fuel tube connector and fuel pipe.

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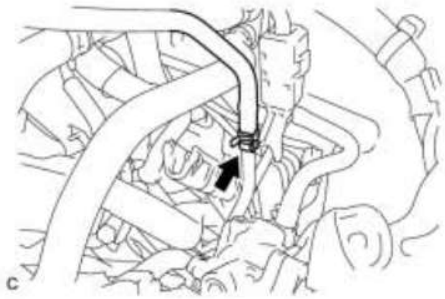
CAUTION:

Align the fuel tube connector with the pipe, then push the fuel tube connector in until the retainer makes a "click" sound. If the connection is tight, apply a small amount of engine oil to the tip of the pipe. After connecting, pull the pipe and connector to make sure that they are securely connected.



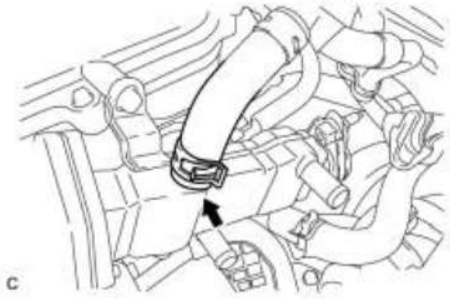
(b) Engage the claw and install the No. 1 fuel pipe clamp.

44. CONNECT NO. 1 FUEL VAPOR FEED HOSE



(a) Connect the No. 1 fuel vapor feed hose with the clamp.

45. CONNECT HEATER HOSE

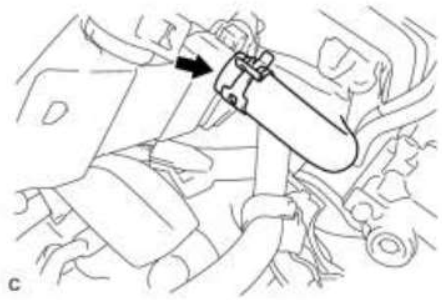


(a) Connect the heater hose with the clamp.

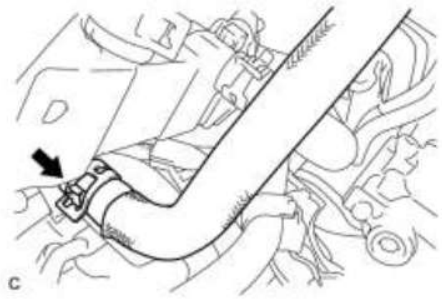
46. CONNECT INLET HEATER WATER HOSE

(a) Connect the inlet heater water hose with the clamp.

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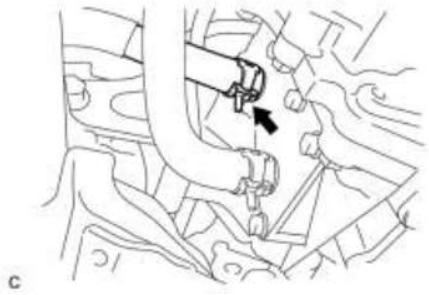


47. CONNECT OUTLET HEATER WATER HOSE



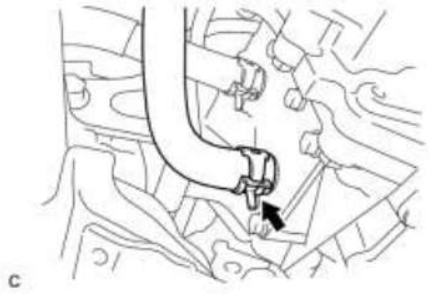
(a) Connect the outlet heater water hose with the clamp.

48. CONNECT NO. 5 INVERTER COOLING HOSE



(a) Connect the No. 5 inverter cooling hose with the clamp.

49. CONNECT NO. 3 INVERTER COOLING HOSE

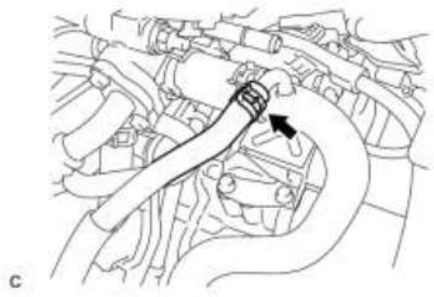


(a) Connect the No. 3 inverter cooling hose with the clamp.

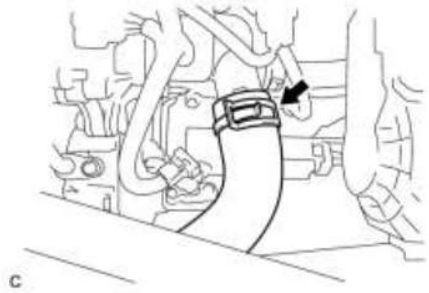
50. CONNECT NO. 4 WATER BY-PASS HOSE

(a) Connect the No. 4 water by-pass hose with the clamp.

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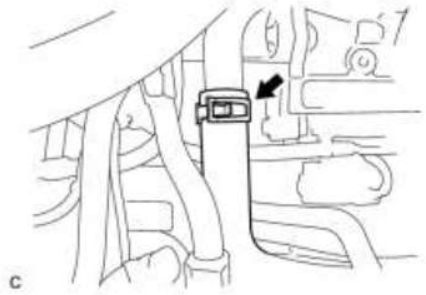


51. CONNECT NO. 2 RADIATOR HOSE



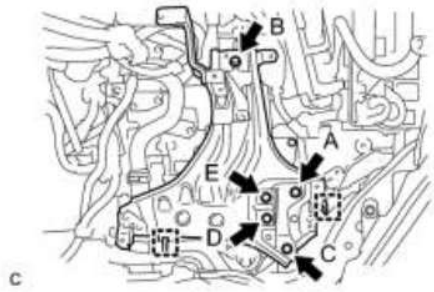
(a) Connect the No. 2 radiator hose with the clamp.

52. CONNECT NO. 1 RADIATOR HOSE



(a) Connect the No. 1 radiator hose with the clamp.

53. INSTALL INVERTER TRAY BRACKET



(a) Position the inverter tray bracket as shown in the illustration.

(b) Temporarily install bolt B to the inverter tray bracket.

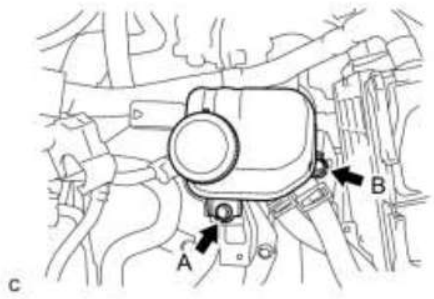
(c) Tighten the 5 bolts to the inverter tray bracket in the order the bolt A, bolt C, bolt D, bolt E and bolt B.

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Torque: **18 N·m (184 kgf·cm, 13ft·lbf)**

(d) Connect the 2 clamps to the inverter tray bracket.

54. INSTALL INVERTER RESERVE TANK ASSEMBLY



(a) Temporarily install bolt A to the inverter reserve tank assembly.

(b) Tighten the 2 bolts to the inverter reserve tank assembly in the order the bolt B and bolt A.

Torque: **10 N·m (102 kgf·cm, 7ft·lbf)**

55. INSTALL INVERTER WITH CONVERTER ASSEMBLY INFO

56. CONNECT WATER HOSE INFO

57. CONNECT NO. 2 ENGINE ROOM WIRE INFO

58. REMOVE INVERTER TERMINAL COVER INFO

59. CONNECT NO. 2 ENGINE WIRE INFO

60. CONNECT HIGH VOLTAGE CABLE OF FRONT TRANSAXLE INFO

61. CONNECT FRAME WIRE INFO

62. CHECK HIGH VOLTAGE CABLE CONNECTION INFO

63. INSTALL INVERTER TERMINAL COVER INFO

64. CONNECT ENGINE ROOM MAIN WIRE INFO

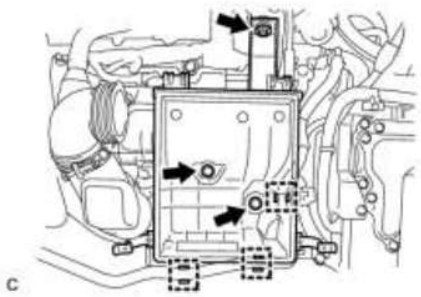
65. INSTALL NO. 1 INVERTER BRACKET INFO

66. INSTALL AIR CLEANER HOSE ASSEMBLY INFO

67. INSTALL AIR CLEANER CASE

(a) Install the air cleaner case with the 3 bolts.

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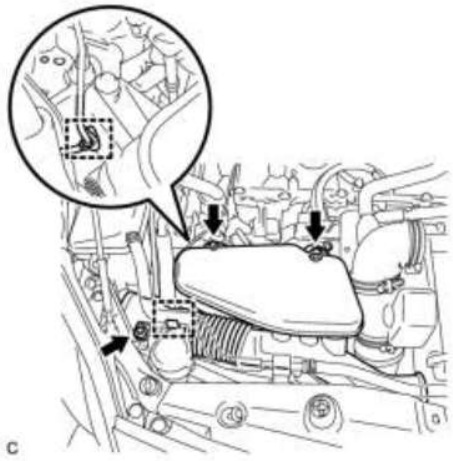


Torque: **7.0 N·m (71 kgf·cm, 62 in·lbf)**

(b) Connect the No. 4 water by-pass hose to the air cleaner case with the 3 clamps.

(c) Install the air cleaner filter element.

68. INSTALL INLET AIR CLEANER ASSEMBLY



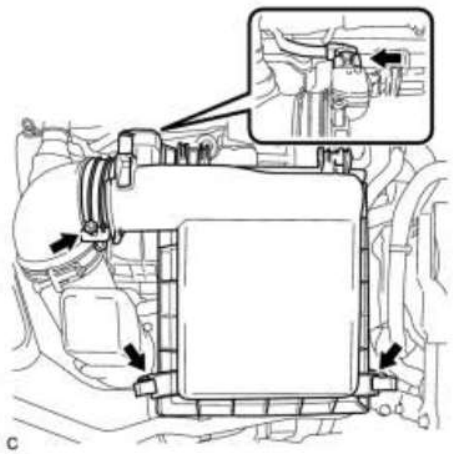
(a) Install the inlet air cleaner assembly with the 3 bolts.

Torque: **7.0 N·m (71 kgf·cm, 62 in·lbf)**

(b) Connect the wire harness clamp to the inlet air cleaner assembly.

(c) Connect the No. 4 water by-pass hose to the inlet air cleaner assembly with the clamp.

69. INSTALL AIR CLEANER CAP SUB-ASSEMBLY



(a) Install the air cleaner cap sub-assembly with the 2 clamps and hose band.

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(b) Connect the air flow meter connector.

70. INSTALL SERVICE PLUG GRIP INFO

71. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

NOTICE:

When disconnecting the cable, some systems need to be initialized after the cable is reconnected INFO.

72. INSTALL REAR NO. 3 FLOOR BOARD INFO

73. INSTALL REAR DECK FLOOR BOX INFO

74. INSTALL REAR NO. 2 FLOOR BOARD (for Separate Type) INFO

75. ADD HYBRID TRANSAXLE FLUID INFO

76. INSPECT HYBRID TRANSAXLE FLUID INFO

77. ADD COOLANT (for Engine) INFO

78. ADD COOLANT (for Inverter) INFO

79. ADD ENGINE OIL INFO

80. INSPECT ENGINE OIL LEVEL INFO

81. INSPECT FOR FUEL LEAK INFO

82. INSPECT FOR COOLANT LEAK (for Engine) INFO

83. INSPECT FOR COOLANT LEAK (for Inverter) INFO

84. INSPECT FOR OIL LEAK

85. INSPECT FOR EXHAUST GAS LEAK

86. INSTALL NO. 2 ENGINE UNDER COVER

87. INSTALL NO. 1 ENGINE UNDER COVER

88. INSTALL ENGINE UNDER COVER (w/ Cover)

89. INSTALL FRONT SPOILER COVER (w/ Front Spoiler)

90. INSTALL REAR ENGINE UNDER COVER LH

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91. INSTALL REAR ENGINE UNDER COVER RH

92. INSTALL FRONT WHEELS

Torque: **103 N·m (1050 kgf·cm, 76ft·lbf)**

93. INSPECT IGNITION TIMING INFO

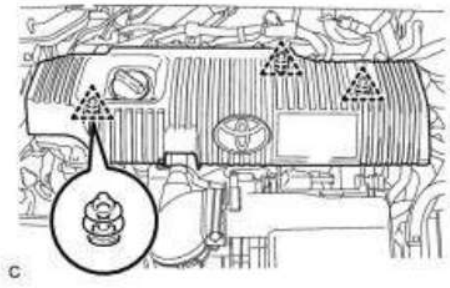
94. INSPECT ENGINE IDLE SPEED INFO

95. INSPECT CO/HC INFO

96. INSPECT AND ADJUST FRONT WHEEL ALIGNMENT

HINT: INFO.

97. INSTALL NO. 2 CYLINDER HEAD COVER



(a) Engage the 3 clips to install the cover.

- Be sure to engage the clips securely.
- Do not apply excessive force or hit the cover to engage the clips. This may cause the cover to break.

98. INSTALL RADIATOR SUPPORT OPENING COVER INFO

99. INSTALL OUTER COWL TOP PANEL SUB-ASSEMBLY INFO

100. INSTALL COWL BODY MOUNTING REINFORCEMENT LH INFO

101. INSTALL WINDSHIELD WIPER MOTOR AND LINK ASSEMBLY INFO

102. INSTALL COWL TOP VENTILATOR LOUVER SUB-ASSEMBLY INFO

103. INSTALL COWL SIDE VENTILATOR SUB-ASSEMBLY LH INFO

104. INSTALL COWL SIDE VENTILATOR SUB-ASSEMBLY RH INFO

105. INSTALL FRONT WIPER ARM AND BLADE ASSEMBLY RH INFO

106. INSTALL FRONT WIPER ARM AND BLADE ASSEMBLY LH INFO

107. INSTALL FRONT WIPER ARM HEAD CAP INFO

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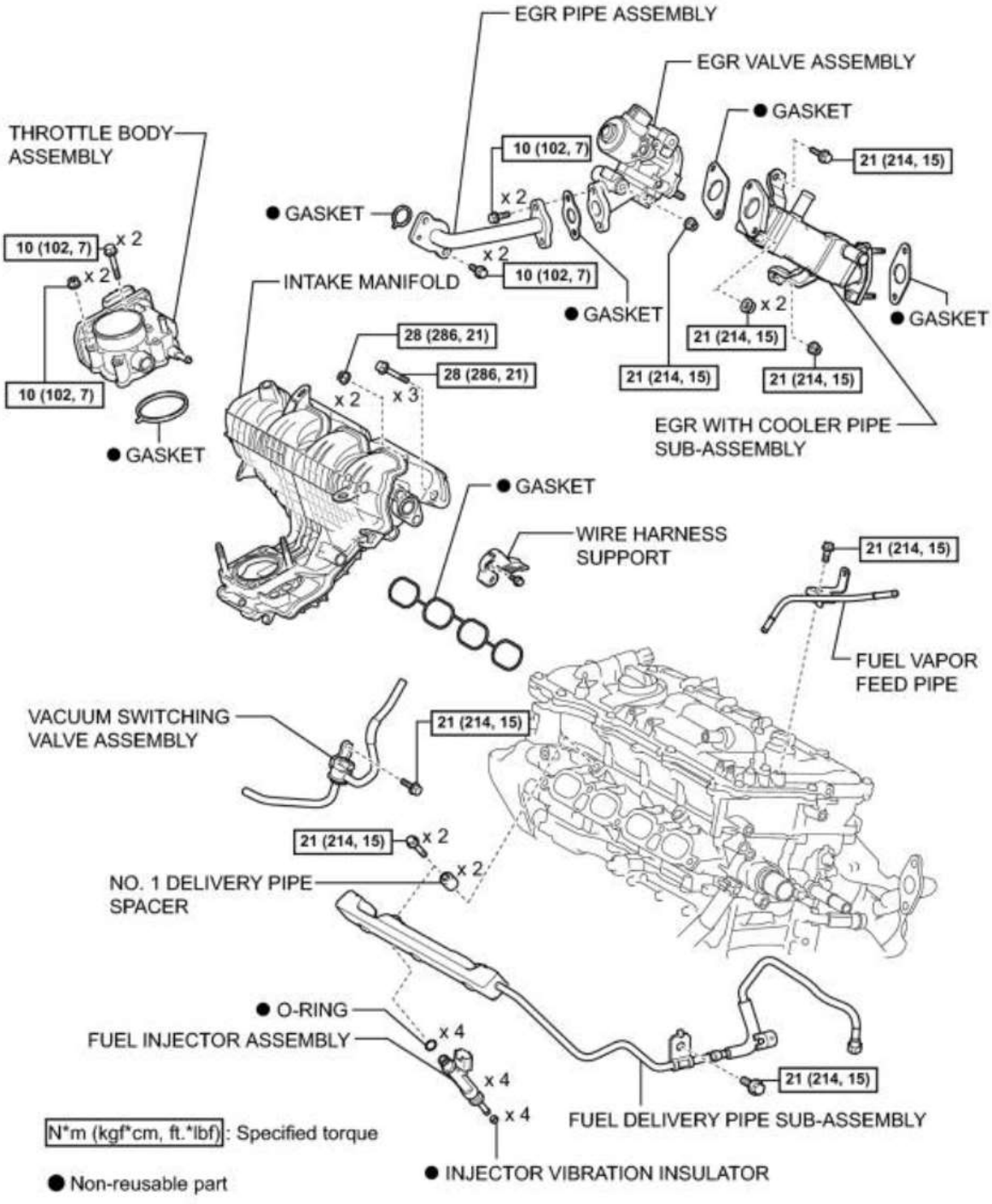
108. CHECK ABS SPEED SENSOR SIGNAL

HINT: INFO.

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COMPONENTS

ILLUSTRATION

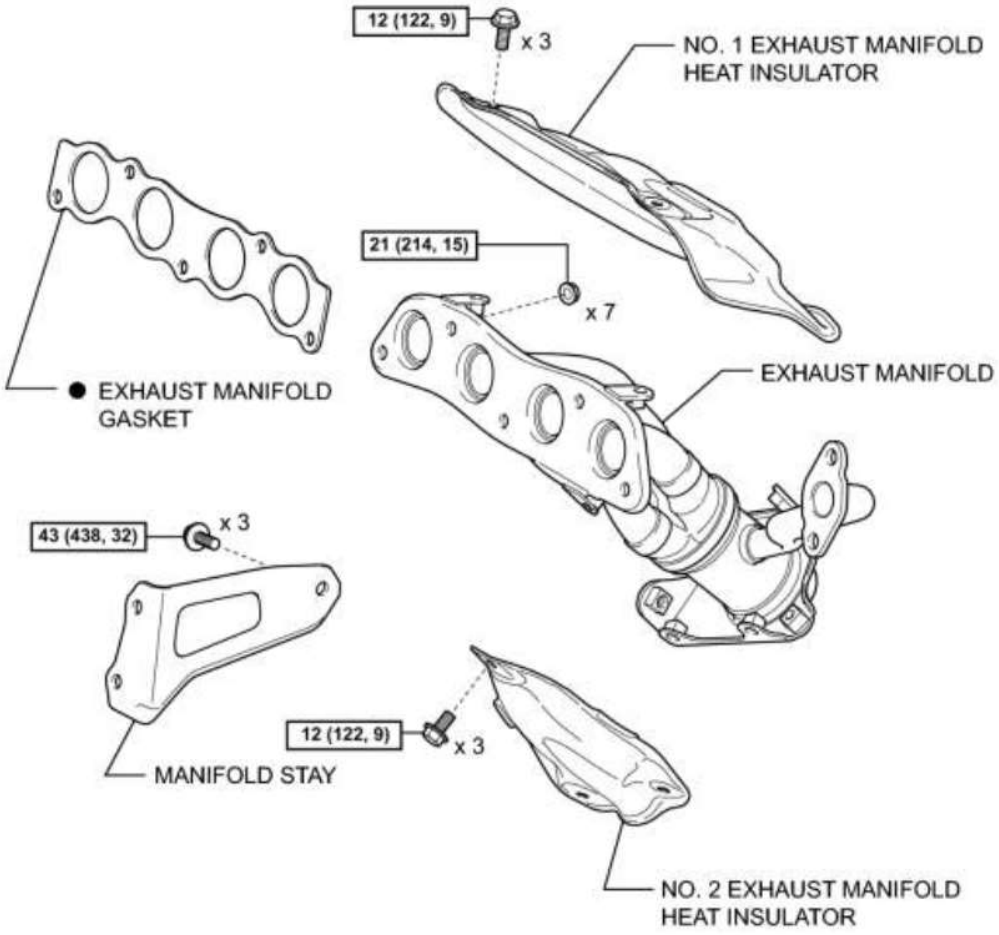


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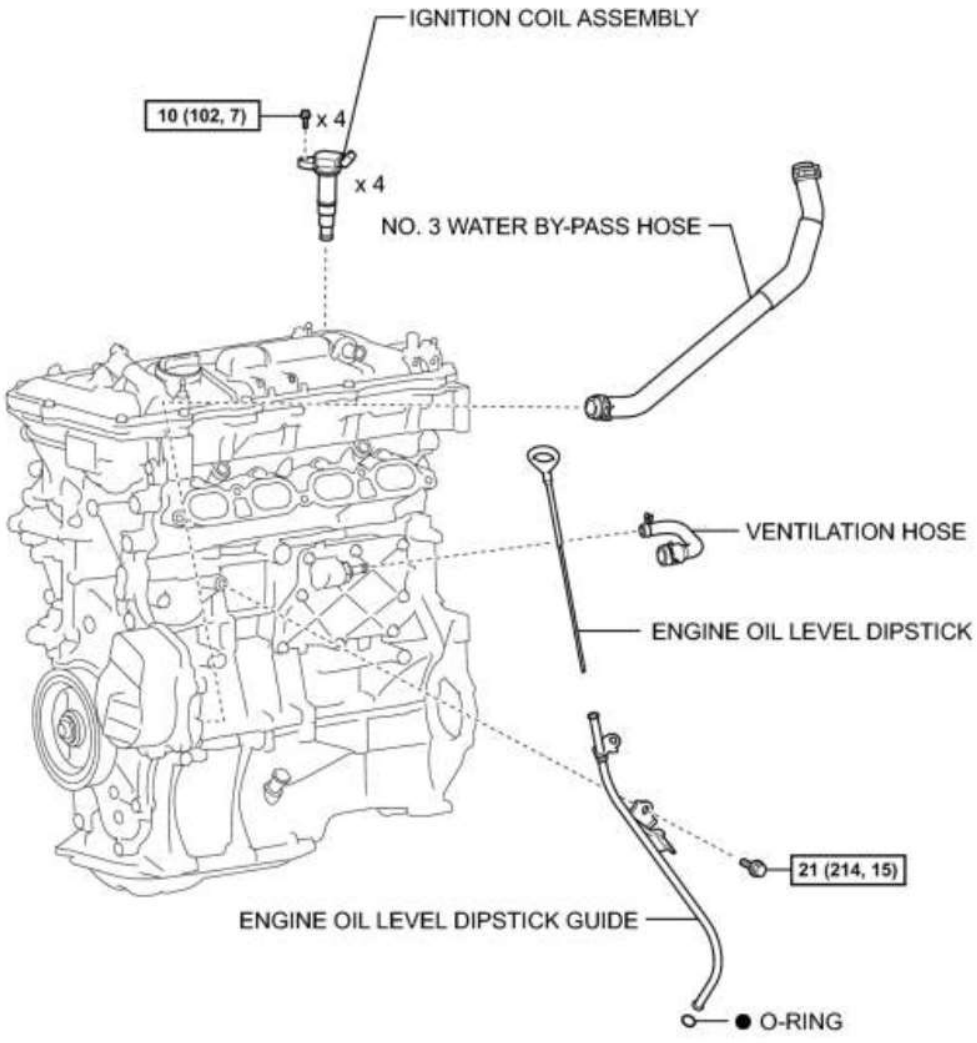
N*m (kgf*cm, ft.*lbf) : Specified torque

● Non-reusable part

c

ILLUSTRATION

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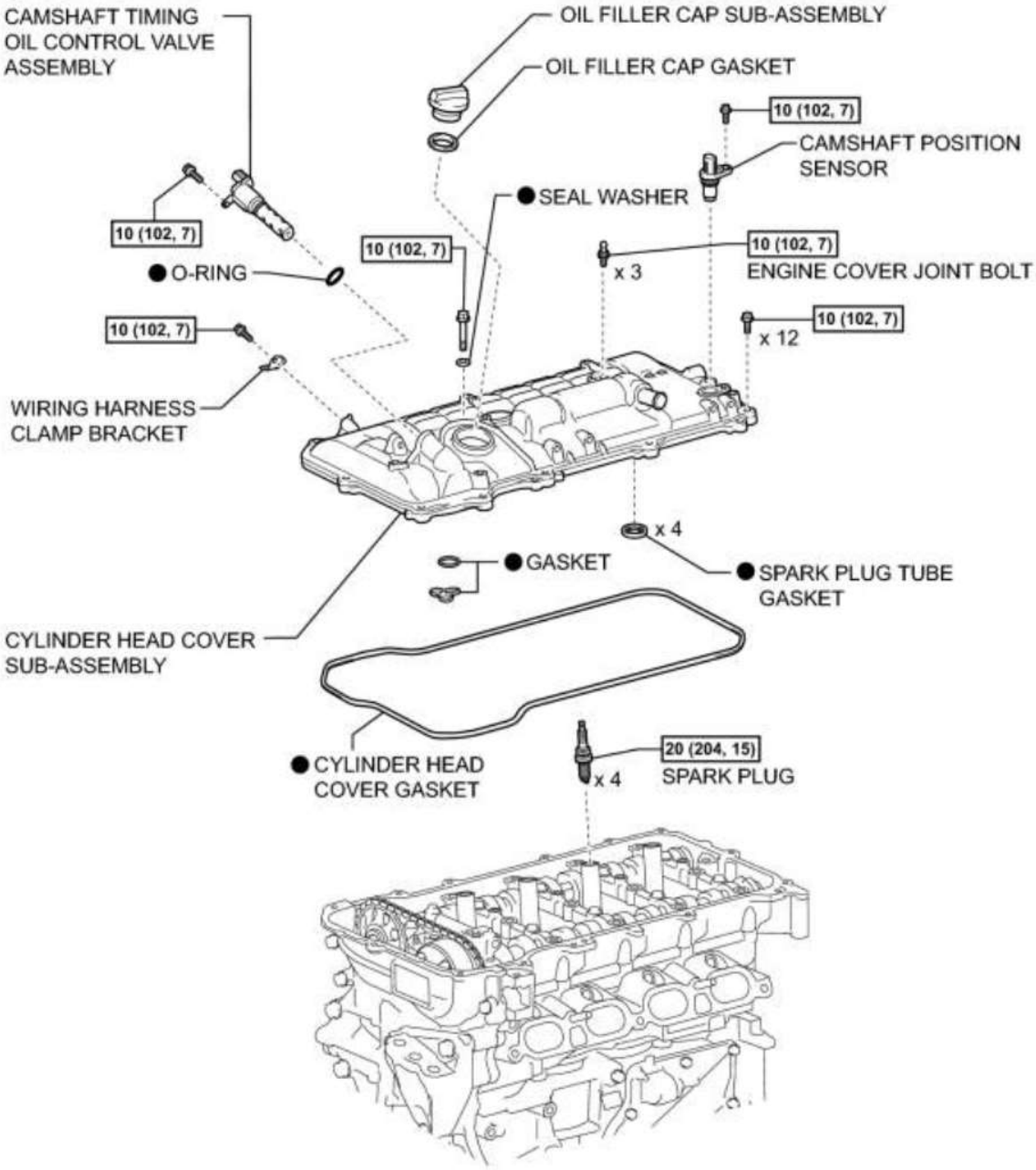
N*m (kgf*cm, ft.*lbf): Specified torque

● Non-reusable part

c

ILLUSTRATION

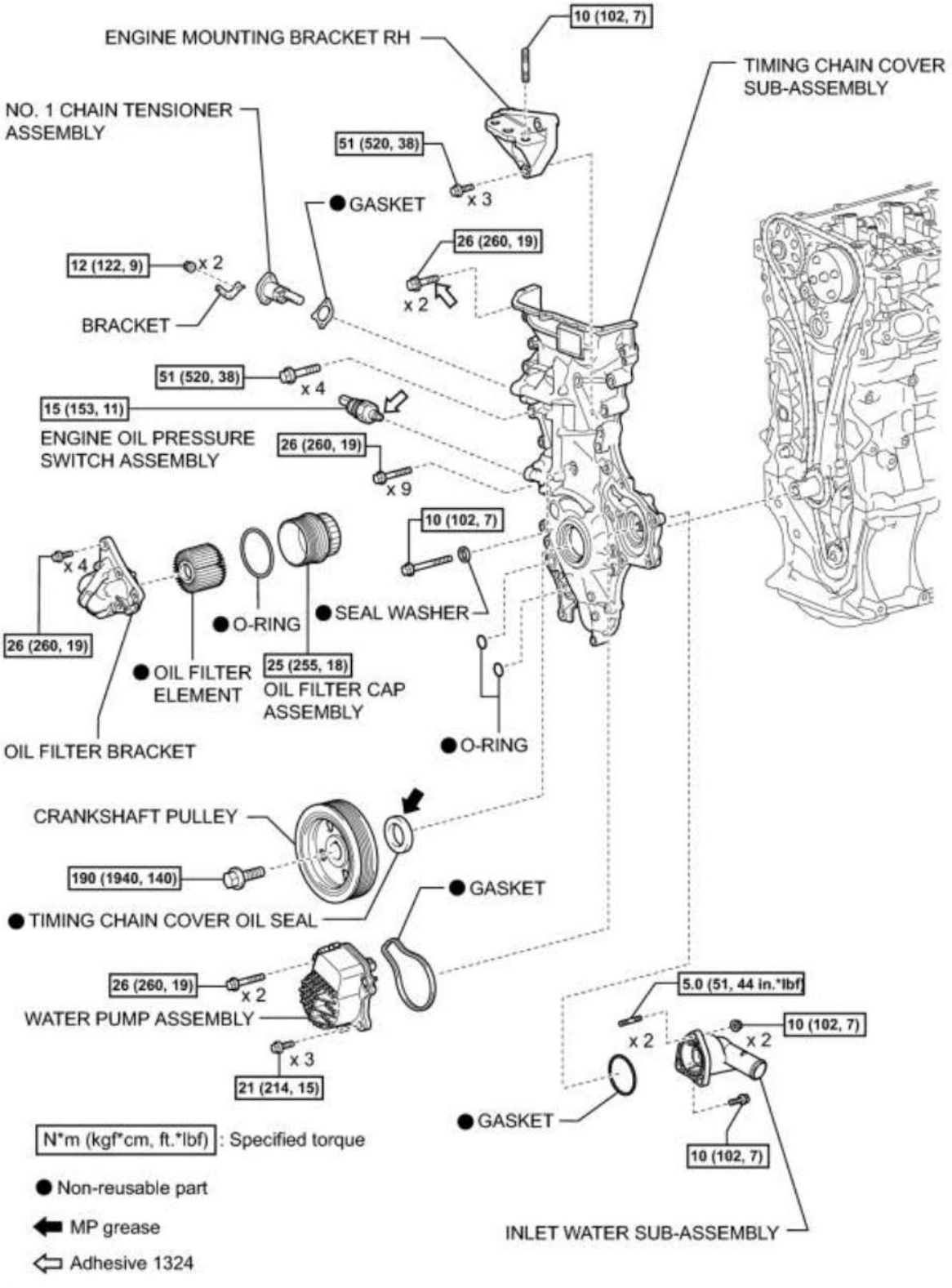
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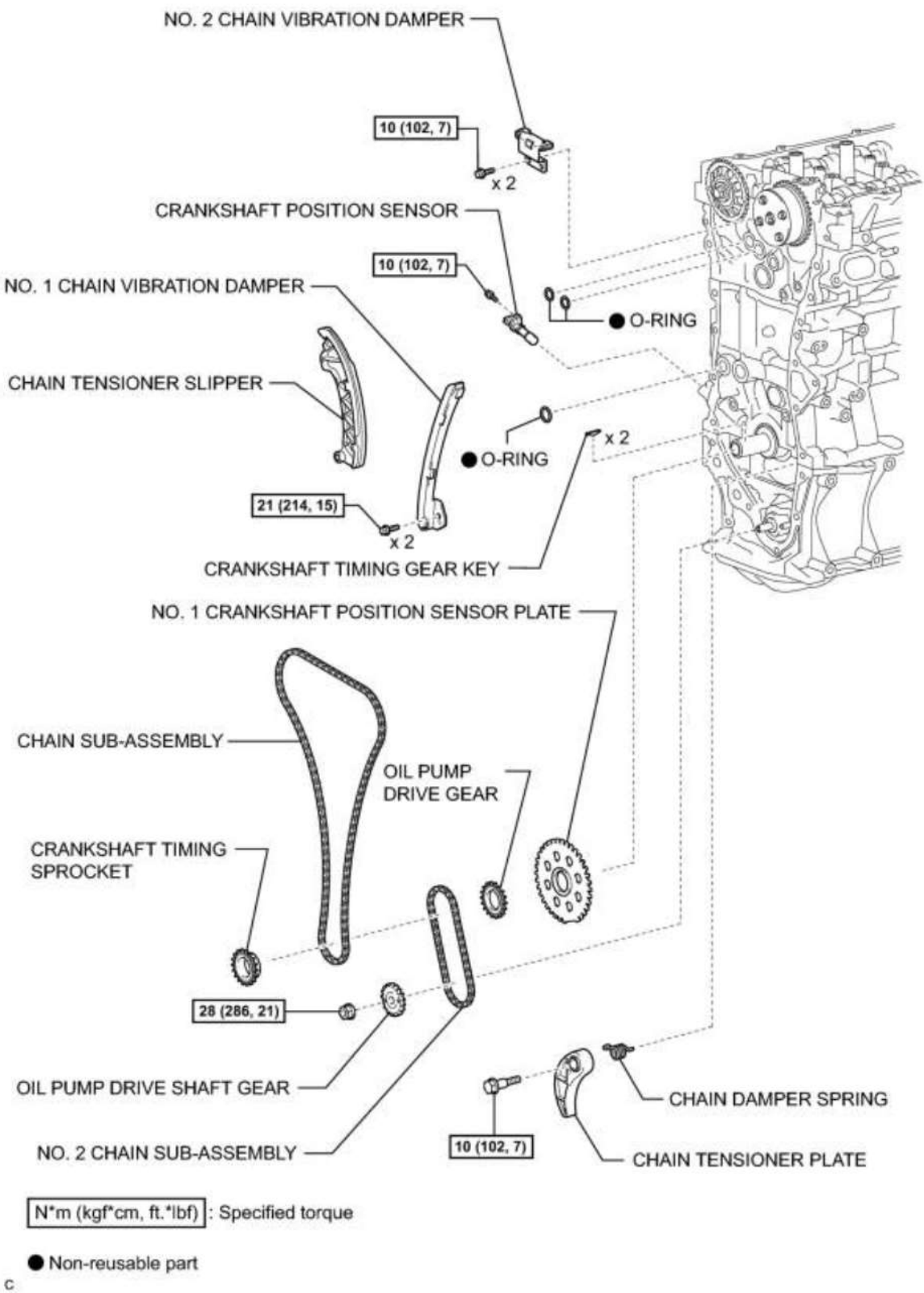


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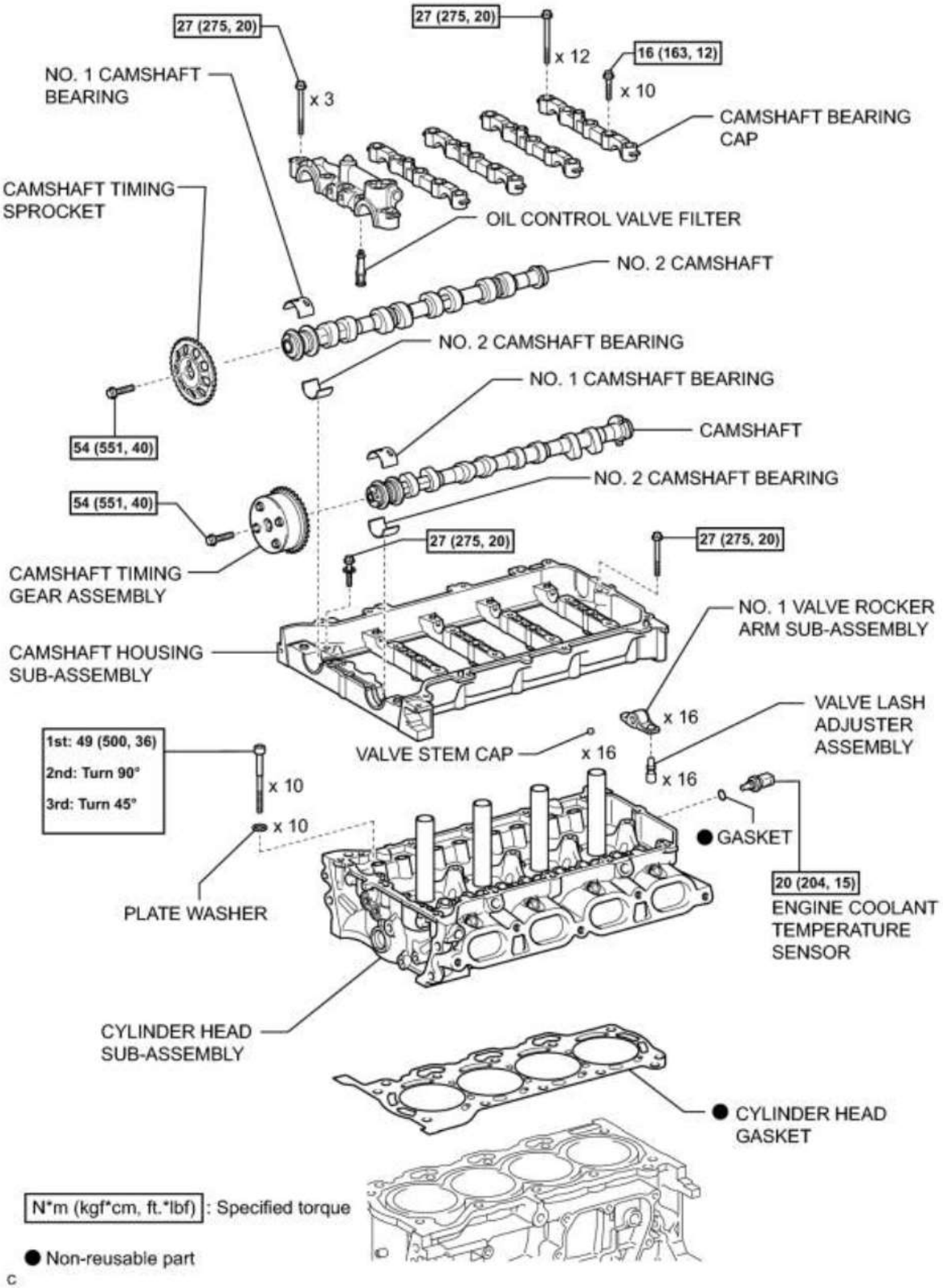
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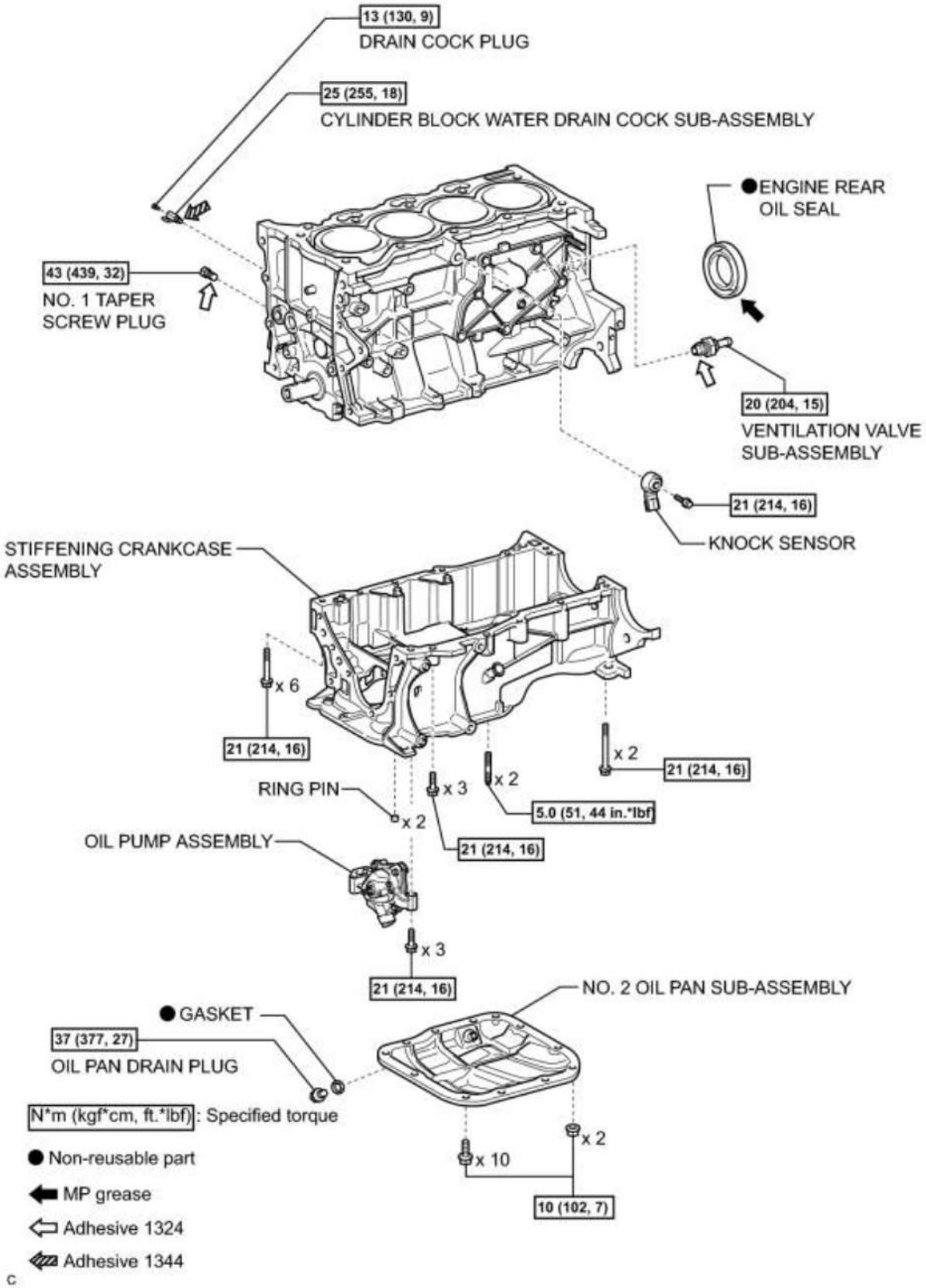
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REMOVAL

1. INSTALL ENGINE ON ENGINE STAND

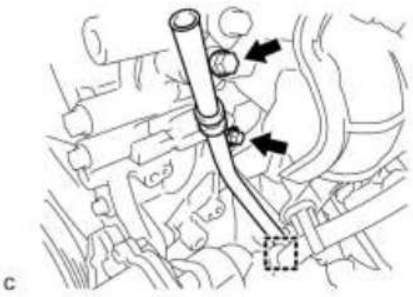
(a) Install the engine onto an engine stand with the bolts.

2. REMOVE ENGINE HANGERS

(a) Remove the 2 bolts and 2 engine hangers.

3. REMOVE THROTTLE BODY ASSEMBLY INFO

4. REMOVE ENGINE OIL LEVEL DIPSTICK GUIDE



(a) Remove the engine oil level dipstick.

(b) Remove the 2 bolts, clamp and engine oil level dipstick guide.

(c) Remove the O-ring from the engine oil level dipstick guide.

5. REMOVE EGR PIPE ASSEMBLY INFO

6. REMOVE EGR VALVE ASSEMBLY INFO

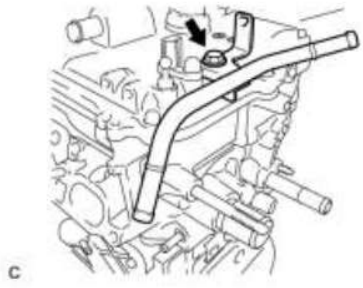
7. REMOVE EGR WITH COOLER PIPE SUB-ASSEMBLY INFO

8. REMOVE INTAKE MANIFOLD INFO

9. REMOVE FUEL VAPOR FEED PIPE

(a) Remove the bolt and fuel vapor feed pipe.

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10. REMOVE FUEL DELIVERY PIPE SUB-ASSEMBLY INFO

11. REMOVE NO. 1 DELIVERY PIPE SPACER INFO

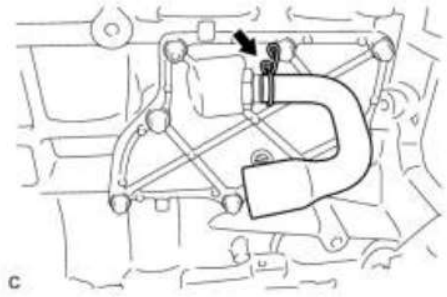
12. REMOVE FUEL INJECTOR ASSEMBLY INFO

13. REMOVE NO. 1 EXHAUST MANIFOLD HEAT INSULATOR INFO

14. REMOVE MANIFOLD STAY INFO

15. REMOVE EXHAUST MANIFOLD INFO

16. REMOVE VENTILATION HOSE



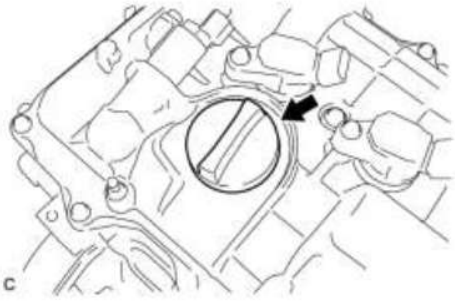
(a) Remove the ventilation hose from the ventilation valve.

17. REMOVE IGNITION COIL ASSEMBLY INFO

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DISASSEMBLY

1. REMOVE OIL FILLER CAP SUB-ASSEMBLY



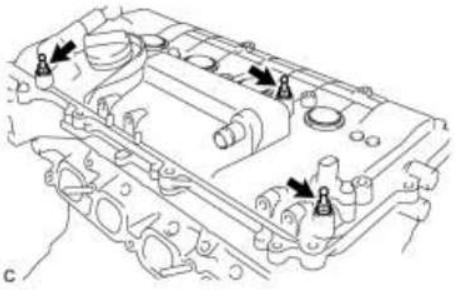
(a) Remove the oil filler cap.

2. REMOVE OIL FILLER CAP GASKET



(a) Remove the oil filler cap gasket.

3. REMOVE ENGINE COVER JOINT BOLT

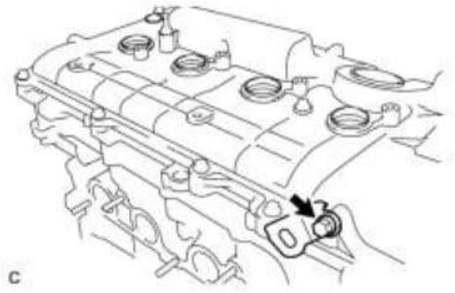


(a) Remove the 3 engine cover joint bolts.

4. REMOVE WIRING HARNESS CLAMP BRACKET

(a) Remove the bolt and wiring harness clamp bracket.

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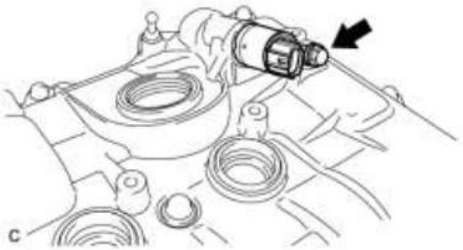
5. REMOVE SPARK PLUG INFO

6. REMOVE CAMSHAFT POSITION SENSOR



(a) Remove the bolt and camshaft position sensor.

7. REMOVE CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY



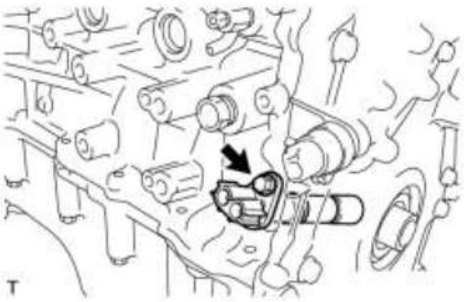
(a) Remove the bolt and camshaft timing oil control valve.

(b) Remove the O-ring from the camshaft timing oil control valve.

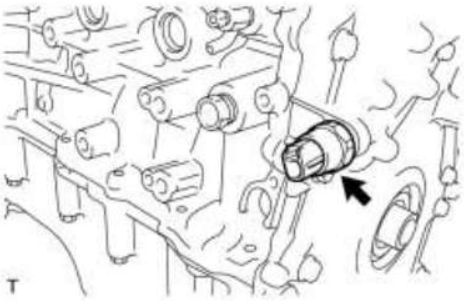
8. REMOVE CRANKSHAFT POSITION SENSOR

(a) Remove the bolt and crankshaft position sensor.

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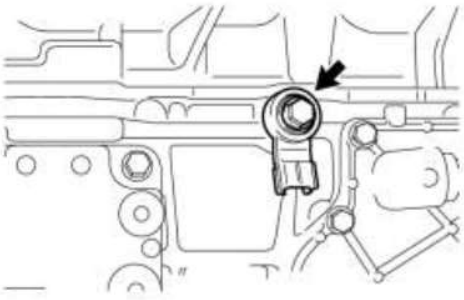


9. REMOVE ENGINE OIL PRESSURE SWITCH ASSEMBLY



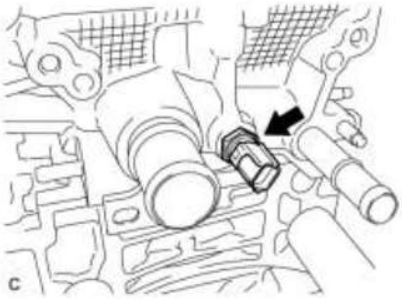
(a) Using a 24 mm deep socket wrench, remove the engine oil pressure switch assembly.

10. REMOVE KNOCK SENSOR



(a) Remove the bolt and knock sensor.

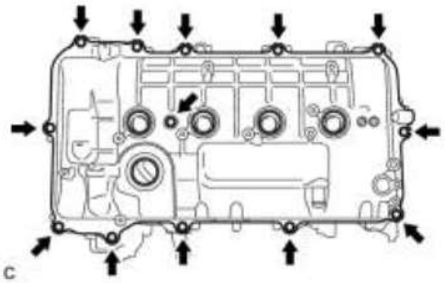
11. REMOVE ENGINE COOLANT TEMPERATURE SENSOR



(a) Remove the engine coolant temperature sensor and gasket.

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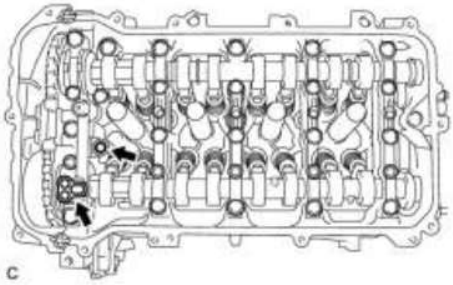
12. REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY



(a) Remove the 13 bolts, seal washer and cylinder head cover.

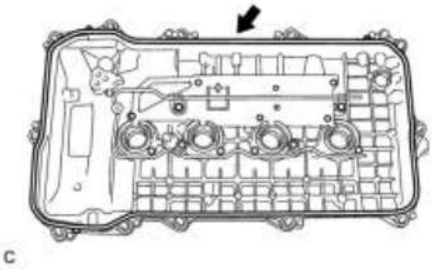
NOTICE:

As gasket may stick to the cylinder head cover, be careful not to drop any of the gaskets into the engine when removing the cylinder head cover.



(b) Remove the 2 gaskets from the camshaft bearing cap.

13. REMOVE CYLINDER HEAD COVER GASKET



(a) Remove the cylinder head cover gasket.

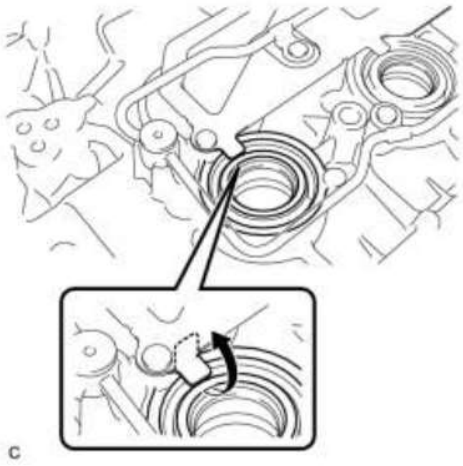
14. REMOVE SPARK PLUG TUBE GASKET

(a) Pry up the 4 claws of the ventilation baffle plate.

NOTICE:

Do not deform the claws of the baffle plate more than necessary.

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(b) Remove the 4 gaskets from the cylinder head cover.

HINT:

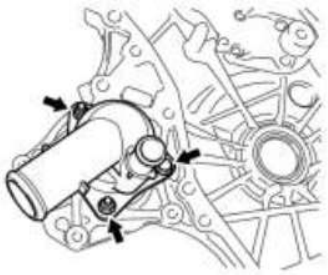
Prevent the plug tube gaskets from being deformed as much as possible. The removed gaskets will be used when installing new gaskets.

NOTICE:

Be careful not to damage the cylinder head cover.

15. REMOVE OIL FILTER CAP ASSEMBLY INFO

16. REMOVE INLET WATER SUB-ASSEMBLY



(a) Remove the bolt, 2 nuts, inlet water sub-assembly and gasket.

C

17. REMOVE INLET WATER SUB-ASSEMBLY STUD BOLT

NOTICE:

If a stud bolt is deformed or its threads are damaged, replace it.

18. SET NO. 1 CYLINDER TO TDC/COMPRESSION INFO

19. REMOVE CRANKSHAFT PULLEY INFO

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20. REMOVE NO. 1 CHAIN TENSIONER ASSEMBLY INFO

21. REMOVE TIMING CHAIN COVER SUB-ASSEMBLY INFO

22. REMOVE TIMING CHAIN COVER OIL SEAL INFO

23. REMOVE CHAIN TENSIONER SLIPPER INFO

24. REMOVE NO. 1 CHAIN VIBRATION DAMPER INFO

25. REMOVE NO. 2 CHAIN VIBRATION DAMPER INFO

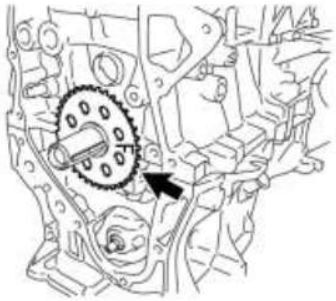
26. REMOVE CHAIN SUB-ASSEMBLY INFO

27. REMOVE CRANKSHAFT TIMING SPROCKET INFO

28. REMOVE NO. 2 CHAIN SUB-ASSEMBLY INFO

29. REMOVE NO. 1 CRANKSHAFT POSITION SENSOR PLATE

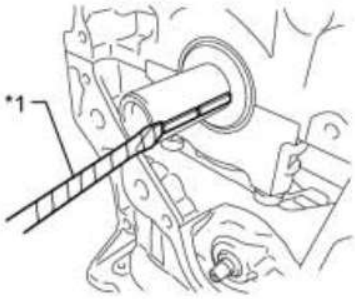
T



(a) Remove the crankshaft position sensor plate.

30. REMOVE CRANKSHAFT TIMING GEAR KEY

T



(a) Using a screwdriver, remove the 2 crankshaft timing gear keys.

Text in Illustration

*1	Protective Tape

HINT:

Tape the screwdriver tip before use.

31. INSPECT CAMSHAFT TIMING GEAR ASSEMBLY INFO

32. REMOVE CAMSHAFT TIMING GEAR ASSEMBLY INFO

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33. REMOVE CAMSHAFT TIMING SPROCKET INFO

34. REMOVE CAMSHAFT BEARING CAP INFO

35. REMOVE CAMSHAFT INFO

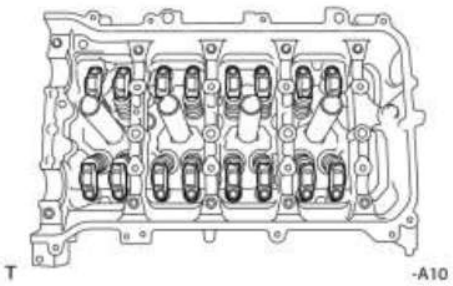
36. REMOVE NO. 2 CAMSHAFT INFO

37. REMOVE CAMSHAFT HOUSING STRAIGHT PIN

NOTICE:

It is not necessary to remove a straight pin unless it is being replaced.

38. REMOVE NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY

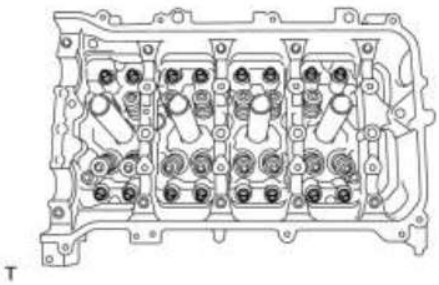


(a) Remove the 16 valve rocker arms.

HINT:

Arrange the removed parts in the correct order.

39. REMOVE VALVE LASH ADJUSTER ASSEMBLY



(a) Remove the 16 valve lash adjusters from the cylinder head.

HINT:

Arrange the removed parts in the correct order.

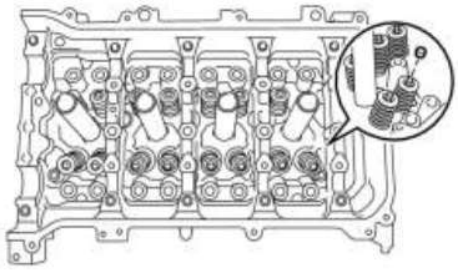
40. REMOVE VALVE STEM CAP

(a) Remove the 16 valve stem caps.

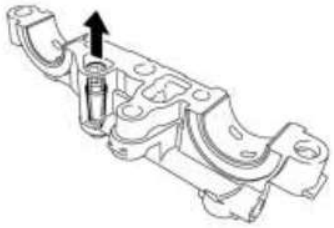
HINT:

Arrange the removed parts in the correct order.

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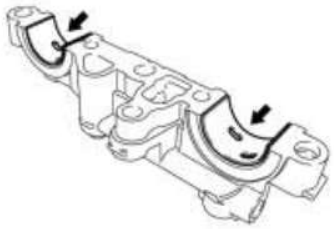
41. REMOVE OIL CONTROL VALVE FILTER



C

(a) Remove the oil control valve filter from the No. 1 camshaft bearing cap.

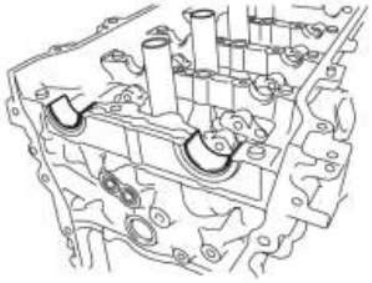
42. REMOVE NO. 1 CAMSHAFT BEARING



C

(a) Remove the 2 camshaft bearings

43. REMOVE NO. 2 CAMSHAFT BEARING



T

(a) Remove the 2 camshaft bearings.

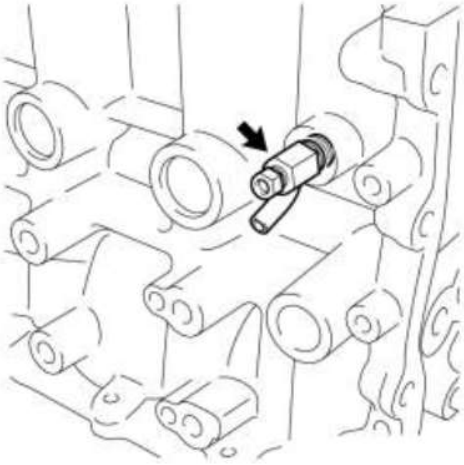
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44. REMOVE CAMSHAFT HOUSING SUB-ASSEMBLY INFO

45. REMOVE CYLINDER HEAD SUB-ASSEMBLY INFO

46. REMOVE CYLINDER HEAD GASKET INFO

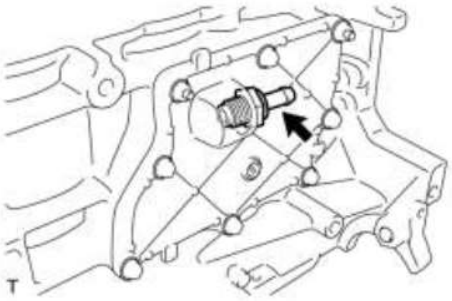
47. REMOVE CYLINDER BLOCK WATER DRAIN COCK SUB-ASSEMBLY



(a) Remove the drain cock plug from the drain cock.

(b) Remove the drain cock from the cylinder block.

48. REMOVE VENTILATION VALVE SUB-ASSEMBLY

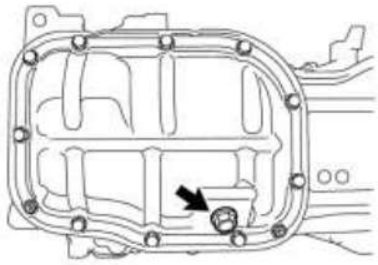


(a) Remove the ventilation valve sub-assembly.

49. REMOVE OIL PAN DRAIN PLUG

(a) Remove the drain plug and gasket.

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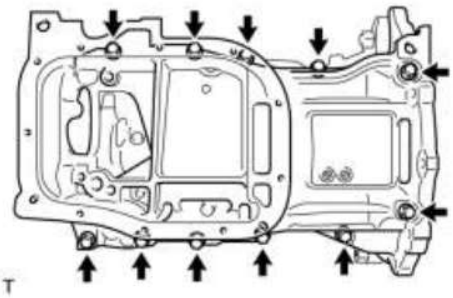


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50. REMOVE NO. 2 OIL PAN SUB-ASSEMBLY INFO

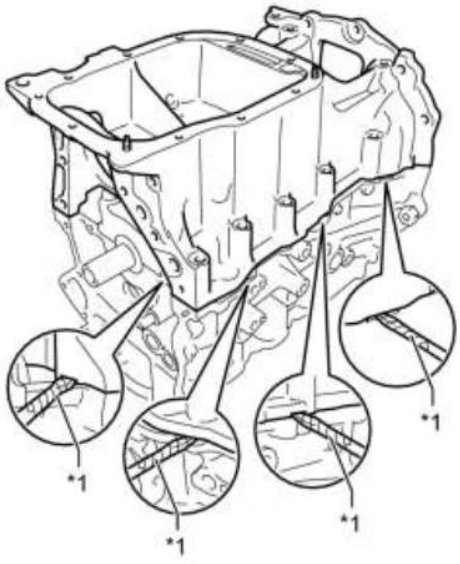
51. REMOVE OIL PUMP ASSEMBLY INFO

52. REMOVE STIFFENING CRANKCASE ASSEMBLY



T

(a) Uniformly loosen and remove the 11 bolts.



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(b) Using a screwdriver, remove the stiffening crankcase by prying between the stiffening crankcase and cylinder block.

Text in Illustration

*1	Protective Tape

HINT:

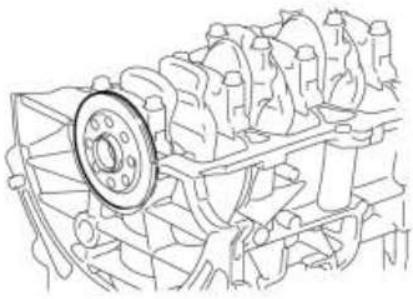
Tape the screwdriver tip before use.

NOTICE:

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

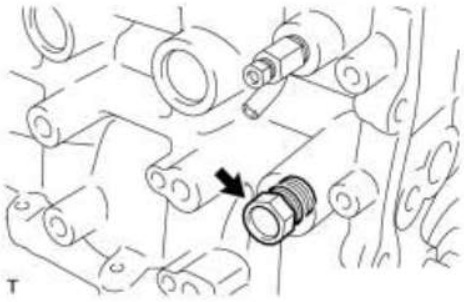
53. REMOVE ENGINE REAR OIL SEAL

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(a) Remove the engine rear oil seal from the cylinder block.

54. REMOVE NO. 1 TAPER SCREW PLUG



(a) Remove the screw plug.

55. REMOVE STIFFENING CRANKCASE STUD BOLT

NOTICE:

If a stud bolt is deformed or its threads are damaged, replace it.

56. REMOVE STIFFENING CRANKCASE RING PIN

NOTICE:

It is not necessary to remove a ring pin unless it is being replaced.

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INSPECTION

1. INSPECT NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY



(a) Turn the roller by hand to check that it turns smoothly.

If the roller does not turn smoothly, replace the No. 1 valve rocker arm sub-assembly.

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2. INSPECT VALVE LASH ADJUSTER ASSEMBLY

NOTICE:

- Keep the valve lash adjuster free from dirt and foreign matter.
- Only use clean engine oil.

(a) Place the lash adjuster into a container full of new engine oil.

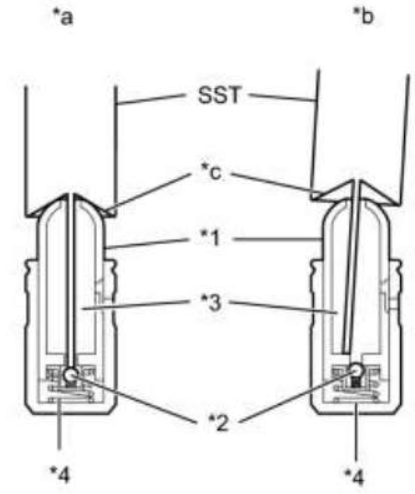
(b) Insert the tip of SST into the lash adjuster plunger and use the tip to press down on the check ball inside the plunger.

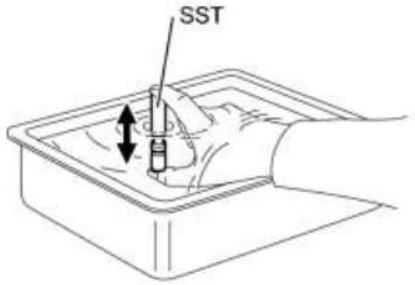
Text in Illustration

*1	Plunger
*2	Check Ball
*3	Low Pressure Chamber
*4	High Pressure Chamber
*a	CORRECT
*b	INCORRECT
*c	Taper Part

SST: 09276-75010

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(c) Squeeze SST and the valve lash adjuster together to move the plunger up and down 5 to 6 times.

(d) Check the movement of the plunger and bleed the air.

OK:

Plunger moves up and down.

NOTICE:

When bleeding high-pressure air from the compression chamber, make sure that the tip of SST is actually pressing the check ball as shown in the illustration. If the check ball is not pressed, air bleeding is not possible.

(e) After bleeding the air, remove SST. Then try to quickly and firmly press the plunger with your fingers.

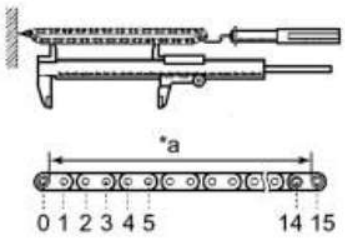
OK:

Plunger can be pressed 3 times.

If the plunger can still be compressed after pressing it 3 times, replace the valve lash adjuster with a new one.

3. INSPECT CHAIN SUB-ASSEMBLY

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(a) Pull the chain with a force of 147 N (15 kgf, 33.0 lbf) as shown in the illustration.

Text in Illustration

*a	Measurement Length

(b) Using a vernier caliper, measure the length of 15 links.

Maximum chain elongation:

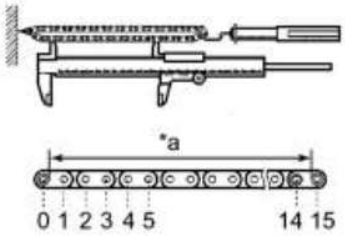
115.2 mm (4.54 in.)

NOTICE:

Perform the measurement at 3 random places. Use the average of the measurements.

If the average elongation is more than the maximum, replace the chain sub-assembly.

4. INSPECT NO. 2 CHAIN SUB-ASSEMBLY



(a) Pull the chain with a force of 147 N (15 kgf, 33.0 lbf) as shown in the illustration.

Text in Illustration

*a	Measurement Length

(b) Using a vernier caliper, measure the length of 15 links.

Maximum chain elongation:

102.1 mm (4.02 in.)

NOTICE:

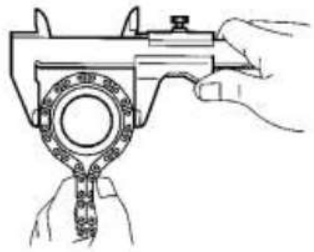
Perform the measurement at 3 random places. Use the average of the measurements.

If the average elongation is more than the maximum, replace the No. 2 chain sub-assembly.

5. INSPECT OIL PUMP DRIVE GEAR

(a) Place the chain around the oil pump drive gear.

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(b) Using a vernier caliper, measure the diameter of the oil pump drive gear and chain.

Minimum gear diameter (with chain):

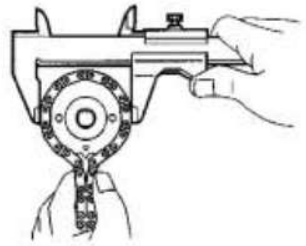
48.2 mm (1.90 in.)

NOTICE:

The vernier caliper must be in contact with the chain rollers when measuring.

If the diameter is less than the minimum, replace the chain and oil pump drive gear.

6. INSPECT OIL PUMP DRIVE SHAFT GEAR



(a) Place the chain around the oil pump drive shaft gear.

(b) Using a vernier caliper, measure the diameter of the oil pump drive shaft gear and chain.

Minimum gear diameter (with chain):

48.2 mm (1.90 in.)

NOTICE:

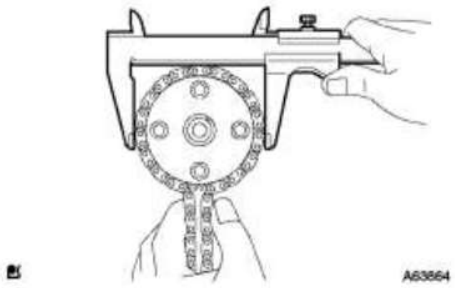
The vernier caliper must be in contact with the chain rollers when measuring.

If the diameter is less than the minimum, replace the chain and oil pump drive shaft gear.

7. INSPECT CAMSHAFT TIMING GEAR ASSEMBLY

(a) Place the chain around the camshaft timing gear assembly.

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(b) Using a vernier caliper, measure the diameter of the camshaft timing gear assembly and chain.

Minimum gear diameter (with chain):

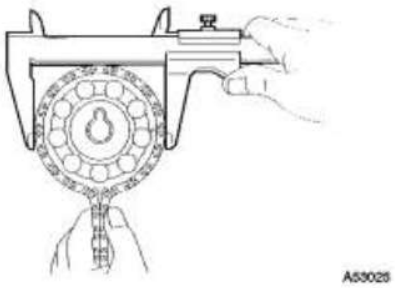
96.8 mm (3.81 in.)

NOTICE:

The vernier caliper must be in contact with the chain rollers when measuring.

If the diameter is less than the minimum, replace the chain and camshaft timing gear assembly.

8. INSPECT CAMSHAFT TIMING SPROCKET



(a) Place the chain around the camshaft timing sprocket.

(b) Using a vernier caliper, measure the diameter of the camshaft timing sprocket and chain.

Minimum gear diameter (with chain):

96.8 mm (3.81 in.)

NOTICE:

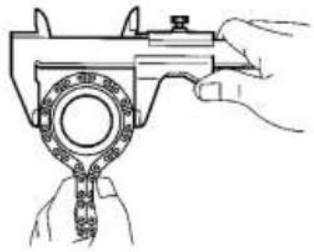
The vernier caliper must be in contact with the chain rollers when measuring.

If the diameter is less than the minimum, replace the chain and camshaft timing sprocket.

9. INSPECT CRANKSHAFT TIMING GEAR

(a) Place the chain around the crankshaft timing gear.

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(b) Using a vernier caliper, measure the diameter of the crankshaft timing gear and chain.

Minimum gear diameter (with chain):

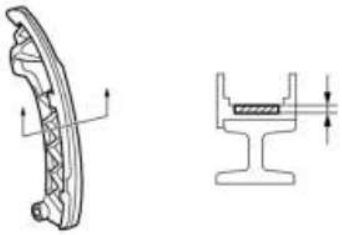
51.1 mm (2.01 in.)

NOTICE:

The vernier caliper must be in contact with the chain rollers when measuring.

If the diameter is less than the minimum, replace the chain and crankshaft timing gear.

10. INSPECT CHAIN TENSIONER SLIPPER



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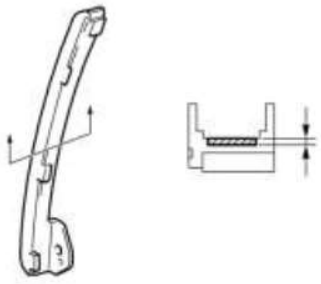
(a) Using a vernier caliper, measure the chain tensioner slipper wear.

Maximum wear:

1.0 mm (0.0394 in.)

If the wear is more than the maximum, replace the chain tensioner slipper.

11. INSPECT NO. 1 CHAIN VIBRATION DAMPER



T

(a) Using a vernier caliper, measure the No. 1 chain vibration damper wear.

Maximum wear:

1.0 mm (0.0394 in.)

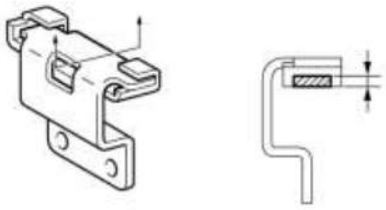
If the wear is more than the maximum, replace the No. 1 chain vibration damper.

12. INSPECT NO. 2 CHAIN VIBRATION DAMPER

(a) Using a vernier caliper, measure the No. 2 chain vibration damper

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wear.



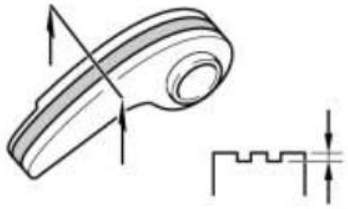
T

Maximum wear:

1.0 mm (0.0394 in.)

If the wear is more than the maximum, replace the No. 2 chain vibration damper.

13. INSPECT CHAIN TENSIONER PLATE



T

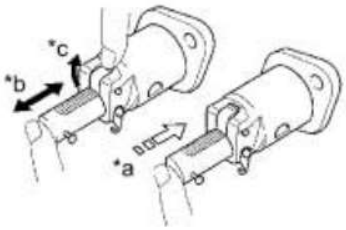
(a) Using a vernier caliper, measure the chain tensioner plate wear.

Maximum wear:

1.0 mm (0.0394 in.)

If the wear is more than the maximum, replace the chain tensioner plate.

14. INSPECT NO. 1 CHAIN TENSIONER



(a) Check that the plunger moves smoothly when the cam is raised with your finger.

Text in Illustration

*a	Lock
*b	Move
*c	Raise

(b) Release the cam, then check that the plunger is locked in place by the cam and does not move when pushing with your finger.

If necessary, replace the No. 1 chain tensioner.

15. INSPECT CAMSHAFT

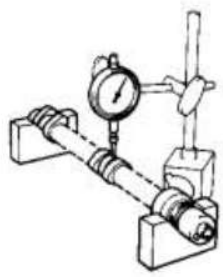
(a) Inspect the camshaft for runout.

(1) Place the camshaft on V-blocks.

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

Maximum circle runout:

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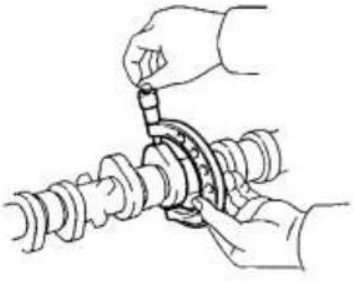


0.04 mm (0.00157 in.)

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

(b) Inspect the cam lobes.

(1) Using a micrometer, measure the cam lobe height.



Standard cam lobe height:

41.779 to 41.879 mm (1.6448 to 1.6488 in.)

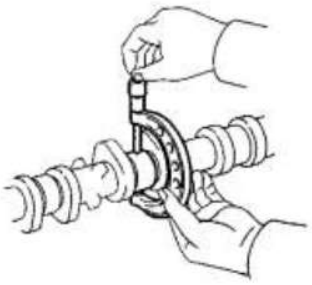
Minimum cam lobe height:

41.629 mm (1.6389 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:

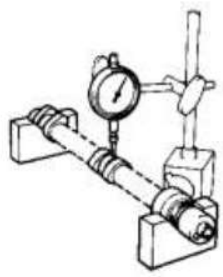
Journal Position	Specified Condition
No. 1	34.449 to 34.465 mm (1.3563 to 1.3569 in.)
Other	22.949 to 22.965 mm (0.90350 to 0.90413 in.)

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

16. INSPECT NO. 2 CAMSHAFT

(a) Inspect the No. 2 camshaft for runout.

(1) Place the No. 2 camshaft on V-blocks.



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

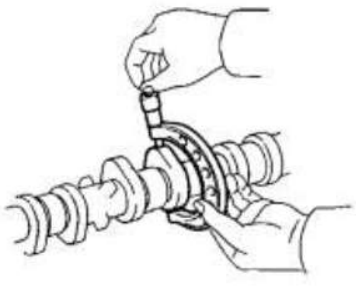
Maximum circle runout:

0.04 mm (0.00157 in.)

If the circle runout is more than the maximum, replace the No. 2 camshaft.

(b) Inspect the cam lobes.

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(1) Using a micrometer, measure the cam lobe height.

Standard cam lobe height:

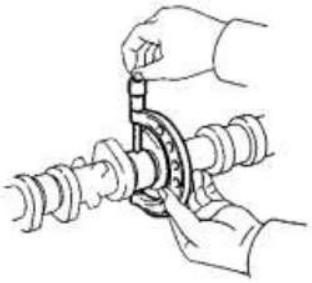
43.346 to 43.446 mm (1.7065 to 1.7105 in.)

Minimum cam lobe height:

43.196 mm (1.7006 in.)

If the cam lobe height is less than the minimum, replace the No. 2 camshaft.

(c) Inspect the camshaft journals.



(1) Using a micrometer, measure the journal diameter.

Standard Journal Diameter:

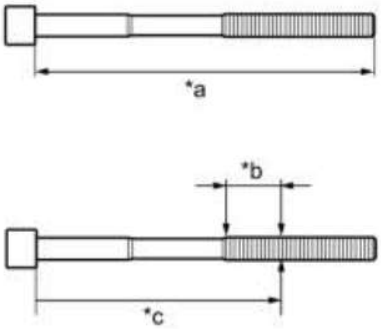
Journal Position	Specified Condition
No. 1	34.449 to 34.465 mm (1.3563 to 1.3569 in.)
Other	22.949 to 22.965 mm (0.90350 to 0.90413 in.)

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

17. INSPECT CYLINDER HEAD SET BOLT

(a) Using a vernier caliper, measure the length of the cylinder head set bolt from the seat to the end.

Text in Illustration



*a	Measurement Length
*b	Measurement Area
*c	Distance

Standard length:

146.8 to 148.2 mm (5.78 to 5.83 in.)

Maximum length:

149.2 mm (5.87 in.)

If the length is more than the maximum, replace the cylinder head set bolt.

(b) Using a vernier caliper, measure the diameter of the elongated thread at the measurement point.

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Measurement point:

115 mm (4.53 in.)

Standard diameter:

9.77 to 9.96 mm (0.385 to 0.392 in.)

Minimum diameter:

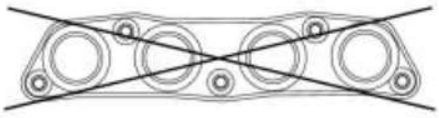
9.4 mm (0.370 in.)

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

HINT:

If a visual check reveals no excessively thin areas, check the center of the bolt (refer to illustration) and find the area that has the smallest diameter.

18. INSPECT EXHAUST MANIFOLD



(a) Using a precision straightedge and feeler gauge, measure the warpage on the surface that contacts the cylinder head.

Maximum warpage:

0.7 mm (0.0276 in.)

If the warpage is more than the maximum, replace the exhaust manifold.

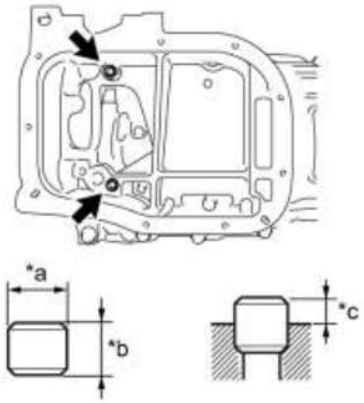
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REASSEMBLY

1. INSTALL STIFFENING CRANKCASE RING PIN

NOTICE:

It is not necessary to remove a ring pin unless it is being replaced.



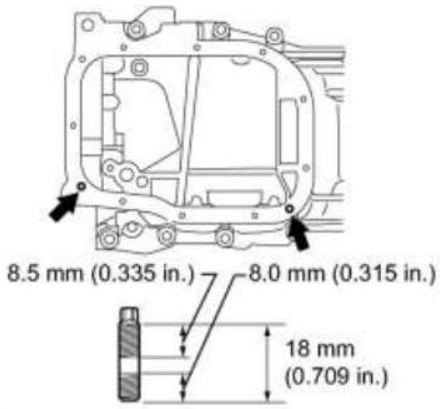
Text in Illustration

*a	Width
*b	Height
*c	Protrusion Height

(a) Using a plastic-faced hammer, tap in 2 new ring pins until they stop.

Standard Ring Pin:

Item	Protrusion Height	Height	Width
Ring pin	3.0 mm (0.118 in.)	11 mm (0.433 in.)	8 mm (0.315 in.)



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2. INSTALL STIFFENING CRANKCASE STUD BOLT

NOTICE:

If a stud bolt is deformed or the threads are damaged, replace it.

(a) Using an E6 "TORX" socket wrench, install the stud bolts as shown in the illustration.

Torque: **5.0 N·m (51 kgf·cm, 44in·lbf)**

3. INSTALL STIFFENING CRANKCASE ASSEMBLY

(a) Apply seal packing in a continuous line as shown in the illustration.

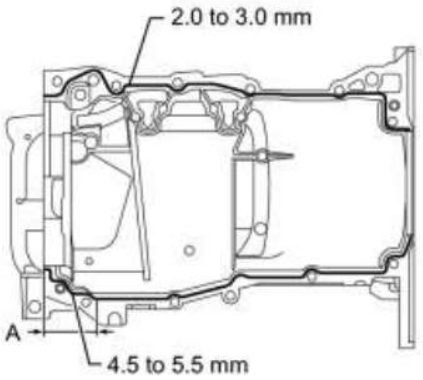
Seal packing:

Toyota Genuine Seal Packing Black, Three bond 1207B or equivalent

Standard Seal Diameter:

Area	Specified Condition

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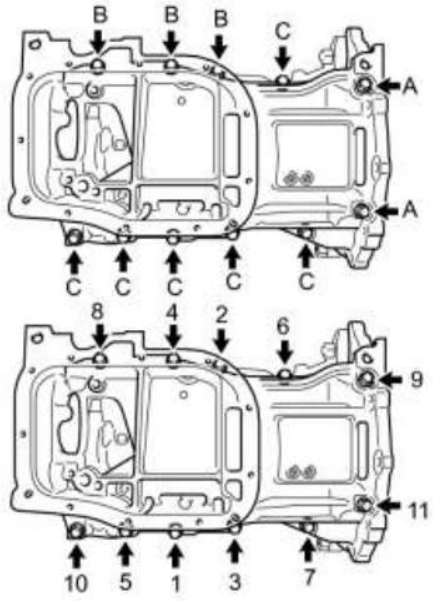
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Continuous Line	2.0 to 3.0 mm (0.0787 to 0.118 in.)
A	4.5 to 5.5 mm (0.177 to 0.217 in.)

Application Length A:

56 mm (2.20 in.)

- Remove any oil from the contact surfaces.
- Install the crankcase within 3 minutes and tighten the bolts within 15 minutes of applying seal packing.
- Do not start the engine for at least 2 hours after installing the stiffening crankcase assembly.



(b) Install the stiffening crankcase with the 11 bolts in the sequence shown in the illustration.

Torque: **21 N·m (214 kgf·cm, 15ft·lbf)**

Bolt Length:

Item	Specified Condition
Bolt A	138 mm (5.43 in.)
Bolt B	35 mm (1.38 in.)
Bolt C	70 mm (2.76 in.)

(c) Recheck the torque for bolts 1 and 2.

Torque: **21 N·m (214 kgf·cm, 15ft·lbf)**

(d) Wipe off any excess seal packing with a clean piece of cloth.

4. INSTALL OIL PUMP ASSEMBLY INFO

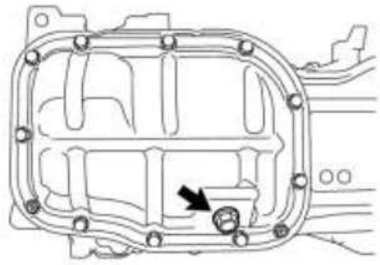
5. INSTALL NO. 2 OIL PAN SUB-ASSEMBLY INFO

6. INSTALL OIL PAN DRAIN PLUG

(a) Install a new gasket and the drain plug.

Torque: **37 N·m (377 kgf·cm, 27ft·lbf)**

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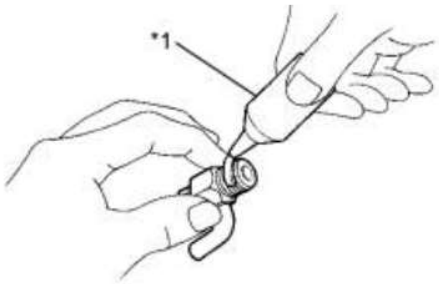


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7. INSTALL ENGINE REAR OIL SEAL INFO

8. INSTALL CYLINDER BLOCK WATER DRAIN COCK SUB-ASSEMBLY

(a) Apply adhesive to the threads of the cylinder block water drain cock.

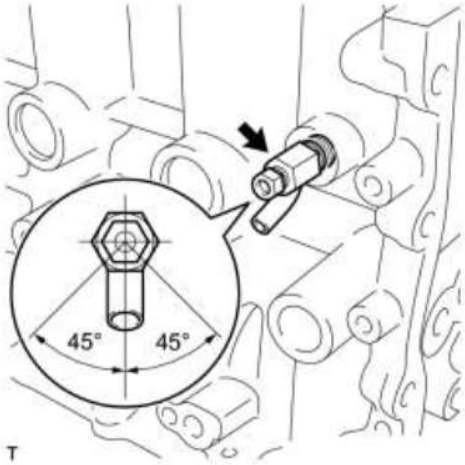


Text in Illustration

*1	Adhesive

Adhesive:

Toyota Genuine Adhesive 1344, Three Bond 1344 or equivalent



T

(b) Install the drain cock as shown in the illustration.

Torque: **25 N·m (255 kgf·cm, 18ft·lbf)**

- Do not rotate the drain cock more than 1 revolution (360°) after tightening it to the specified torque.
- Do not loosen the drain cock to adjust it. If an adjustment is necessary, remove the drain cock and reinstall it.
- Install the drain cock within 3 minutes of applying adhesive.
- Do not start the engine for at least 1 hour after installing the drain cock.

(c) Install the drain cock plug to the drain cock.

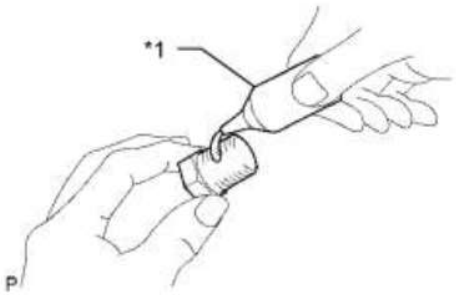
Torque: **13 N·m (130 kgf·cm, 9ft·lbf)**

9. INSTALL NO. 1 TAPER SCREW PLUG

(a) Apply adhesive to 2 or 3 threads of the taper screw plug.

Text in Illustration

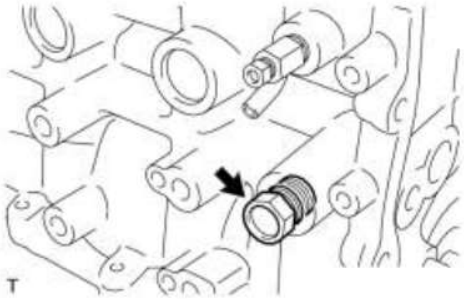
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*1	Adhesive

Adhesive:

Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent



(b) Install the taper screw plug.

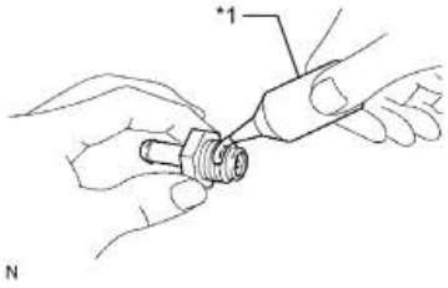
Torque: **43 N·m (438 kgf·cm, 32ft·lbf)**

- Install the plug within 3 minutes of applying adhesive.
- Do not start the engine for at least 1 hour after installation.

10. INSTALL VENTILATION VALVE SUB-ASSEMBLY

(a) Apply adhesive to the threads of the ventilation valve sub-assembly.

Text in Illustration

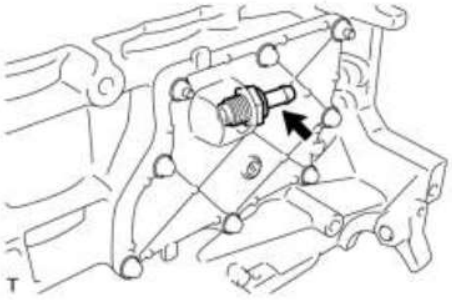


*1	Adhesive

Adhesive:

Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

- Install the ventilation valve sub-assembly within 3 minutes after applying seal packing.
- Do not start the engine for at least 2 hours after installing the ventilation valve sub-assembly.



(b) Install the ventilation valve sub-assembly.

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

11. INSTALL CYLINDER HEAD GASKET INFO

12. INSTALL CYLINDER HEAD SUB-ASSEMBLY INFO

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13. INSTALL VALVE STEM CAP

(a) Apply a light coat of engine oil to the valve stem ends.

(b) Install the 16 valve stem caps to the cylinder head.

NOTICE:

Do not drop the valve stem caps into the cylinder head.

14. INSTALL VALVE LASH ADJUSTER ASSEMBLY

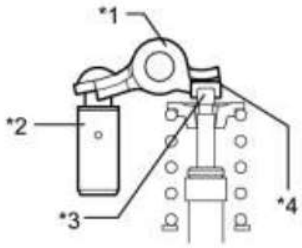
(a) Inspect each valve lash adjuster before installing it INFO.

(b) Install the 16 valve lash adjusters to the cylinder head.

NOTICE:

Install the valve lash adjuster to the same place it was removed from.

15. INSTALL NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY



P

(a) Apply engine oil to the valve lash adjuster tips and valve stem cap ends.

Text in Illustration

*1	Valve Rocker Arm
*2	Valve Lash Adjuster
*3	Valve Stem
*4	Valve Stem Cap

(b) Make sure that the No. 1 valve rocker arms are installed as shown in the illustration.

16. INSTALL CAMSHAFT HOUSING STRAIGHT PIN

NOTICE:

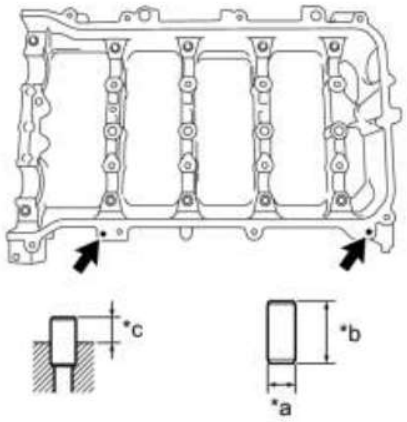
It is not necessary to remove a straight pin unless it is being replaced.

(a) Using a plastic-faced hammer, tap in a new straight pin to the specified protrusion height.

Text in Illustration

*a	Width
*b	Height

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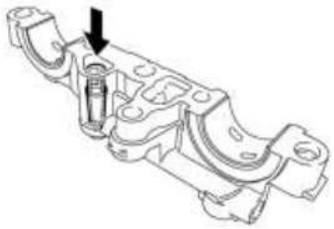
*c	Protrusion Height

Standard Straight Pin:

Item	Protrusion Height	Height	Width
Straight pin	6.5 to 7.5 mm (0.256 to 0.295 in.)	14 mm (0.551 in.)	6.0 mm (0.236 in.)

17. INSTALL NO. 1 CAMSHAFT BEARING INFO

18. INSTALL OIL CONTROL VALVE FILTER



(a) Check that no foreign matter is on the mesh part of the oil control valve filter.

(b) Install the oil control valve filter.

NOTICE:

Do not touch the mesh when installing the oil control valve filter.

19. INSTALL NO. 2 CAMSHAFT BEARING INFO

20. INSTALL NO. 2 CAMSHAFT INFO

21. INSTALL CAMSHAFT INFO

22. INSTALL CAMSHAFT BEARING CAP INFO

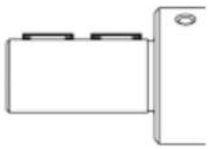
23. INSTALL CAMSHAFT HOUSING SUB-ASSEMBLY INFO

24. INSTALL CAMSHAFT TIMING SPROCKET INFO

25. INSTALL CAMSHAFT TIMING GEAR ASSEMBLY INFO

26. INSTALL CRANKSHAFT TIMING GEAR KEY

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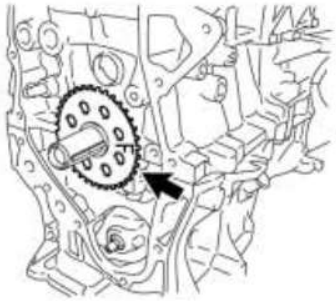


(a) Using a plastic-faced hammer, tap in the 2 crankshaft timing gear keys.

HINT:

Tap in the crankshaft timing gear keys until they contact the crankshaft as shown in the illustration.

27. INSTALL NO. 1 CRANKSHAFT POSITION SENSOR PLATE



(a) Install the crankshaft position sensor plate with the "F" mark facing forward.

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28. INSTALL NO. 2 CHAIN SUB-ASSEMBLY INFO

29. INSTALL CRANKSHAFT TIMING SPROCKET INFO

30. INSTALL NO. 1 CHAIN VIBRATION DAMPER INFO

31. SET NO. 1 CYLINDER TO TDC/COMPRESSION INFO

32. INSTALL CHAIN SUB-ASSEMBLY INFO

33. CHECK NO. 1 CYLINDER TO TDC/COMPRESSION INFO

34. INSTALL CHAIN TENSIONER SLIPPER INFO

35. INSTALL NO. 2 CHAIN VIBRATION DAMPER INFO

36. INSTALL INLET WATER SUB-ASSEMBLY STUD BOLT

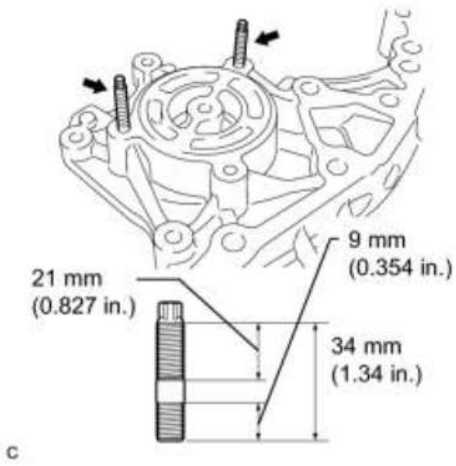
NOTICE:

If a stud bolt is deformed or the threads are damaged, replace it.

(a) Using an E5 "TORX" socket wrench, install the stud bolts as shown in the illustration.

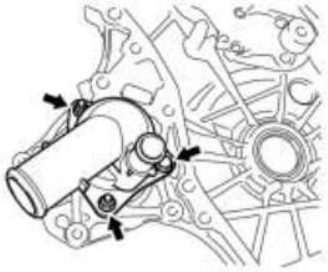
Torque: **5.0 N·m (51 kgf·cm, 44in·lbf)**

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37. INSTALL INLET WATER SUB-ASSEMBLY



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(a) Install a new gasket and the inlet water sub-assembly with the bolt and 2 nuts.

Torque: **10 N·m (102 kgf·cm, 7ft·lbf)**

38. INSTALL TIMING CHAIN COVER SUB-ASSEMBLY INFO

39. INSTALL TIMING CHAIN COVER OIL SEAL INFO

40. INSTALL CRANKSHAFT PULLEY INFO

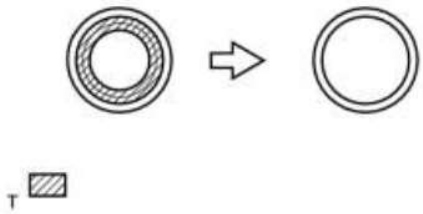
41. INSTALL NO. 1 CHAIN TENSIONER ASSEMBLY INFO

42. INSTALL OIL FILTER CAP ASSEMBLY INFO

43. INSTALL SPARK PLUG TUBE GASKET

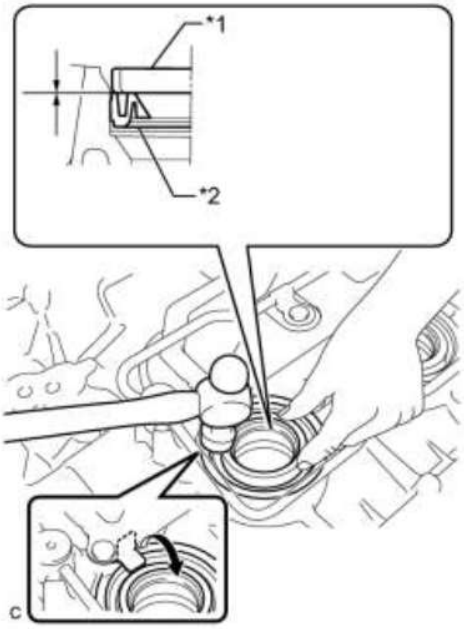
(a) Using a cutter knife, cut off the seal part of the removed gasket.

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Text in Illustration

	Part to Cut Off



(b) Using a hammer and the plug tube gasket which has had the sealing part cut off, uniformly tap in a new plug tube gasket all the way.

Text in Illustration

*1	Plug Tube Gasket without Sealing Part
*2	New Plug Tube Gasket

- Keep the lip free of foreign matter.
- Do not tap in the plug tube gasket.

HINT:

If a plug tube gasket that will be used to install a new gasket is deformed, and cannot be positioned on a new gasket, correct the deformation using pliers.

(c) Return the claws of the ventilation baffle plate to their original positions.

44. INSTALL CYLINDER HEAD COVER GASKET

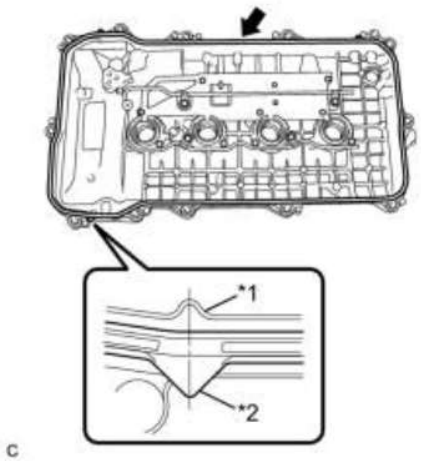
(a) Install a new cylinder head cover gasket to the cylinder head cover.

Text in Illustration

*1	Cylinder Head Cover
*2	Cylinder Head Cover Gasket

- Remove any oil from the contact surfaces.
- Misalignment between the center of the cylinder head cover rib

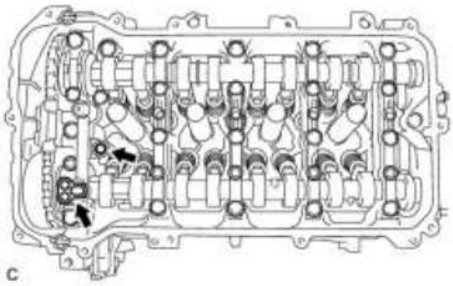
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and the center of the cylinder head gasket tab is within 4 mm (0.157 in.).

45. INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY

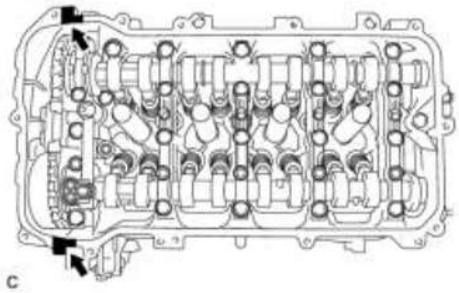


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(a) Install 2 new gaskets to the camshaft bearing cap.

(b) Apply seal packing as shown the illustration.

Seal packing:



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Toyota Genuine Seal Packing Black, Three Bond 1207B or equivalent

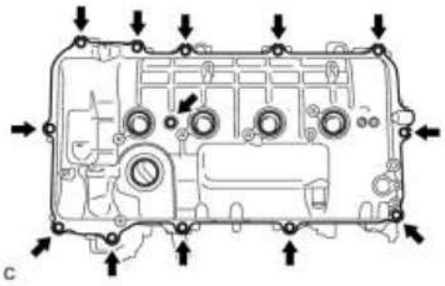
Standard diameter:

4.0 mm (0.157 in.)

- Remove any oil from the contact surfaces.
- Install the cylinder head cover sub-assembly within 3 minutes and tighten the bolts within 15 minutes of applying seal packing.
- Do not start the engine for at least 2 hours after the installation.

(c) Install the cylinder head cover with a new seal washer and the 13 bolts.

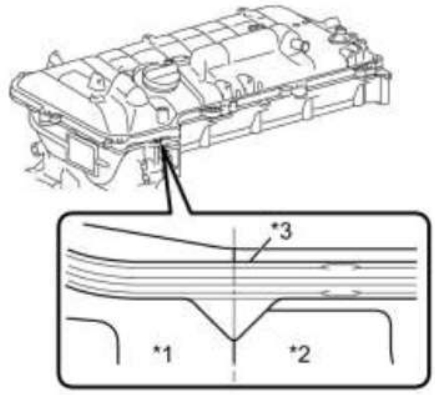
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Torque: **10 N·m (102 kgf·cm, 7ft·lbf)**

NOTICE:

Misalignment between the contact surfaces of the timing chain cover and the camshaft housing and the center of the cylinder head gasket tab is within 4 mm (0.157 in.).



Text in Illustration

*1	Timing Chain Cover
*2	Camshaft Housing
*3	Cylinder Head Cover Gasket

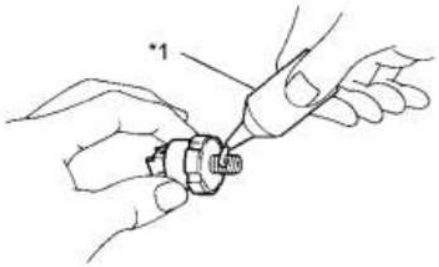
46. INSTALL ENGINE OIL PRESSURE SWITCH ASSEMBLY

(a) Apply adhesive to 2 or 3 threads of the engine oil pressure switch assembly.

Text in Illustration

*1	Adhesive

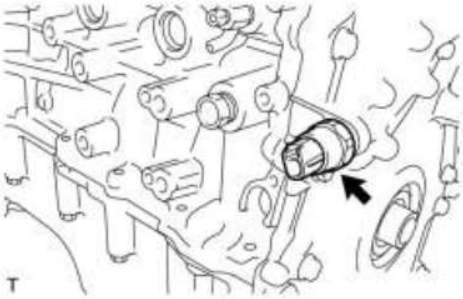
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Adhesive:

Toyota Genuine Adhesive 1344, Three Bond 1344 or equivalent

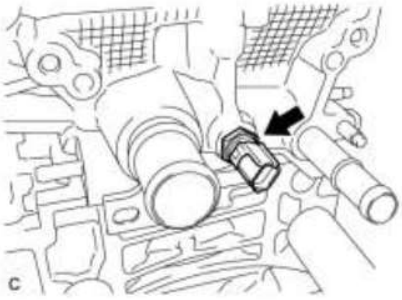
- Install the oil pressure switch within 3 minutes after applying adhesive.
- Do not start the engine within 1 hour after installation.



(b) Using a 24 mm deep socket wrench, install the engine oil pressure switch assembly.

Torque: **15 N·m (153 kgf·cm, 11ft·lbf)**

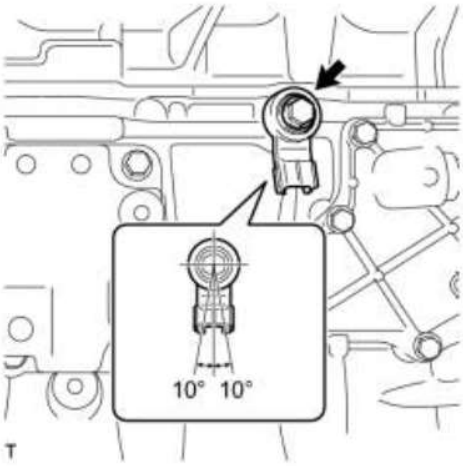
47. INSTALL ENGINE COOLANT TEMPERATURE SENSOR



(a) Install a new gasket and the engine coolant temperature sensor.

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

48. INSTALL KNOCK SENSOR



(a) Install the knock sensor with the bolt.

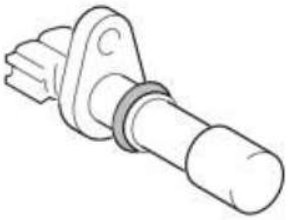
Torque: **21 N·m (214 kgf·cm, 15ft·lbf)**

NOTICE:

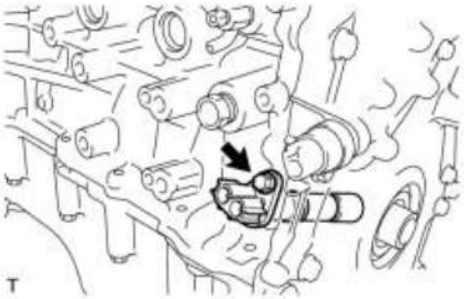
Make sure that the knock sensor is in the correct position.

49. INSTALL CRANKSHAFT POSITION SENSOR

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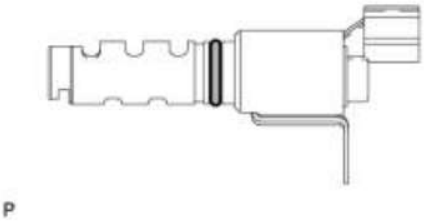
(a) Apply a light coat of engine oil to the O-ring of the sensor.



(b) Install the crankshaft position sensor with the bolt.

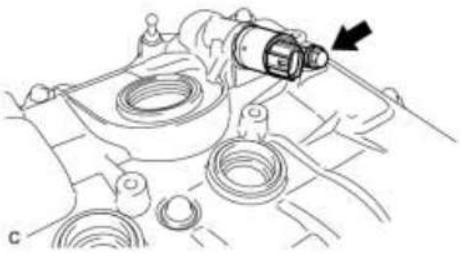
Torque: **10 N·m (102 kgf·cm, 7ft·lbf)**

50. INSTALL CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY



(a) Apply a light coat of engine oil to a new O-ring and install it to the camshaft timing oil control valve.

(b) Install the camshaft timing oil control valve with the bolt.



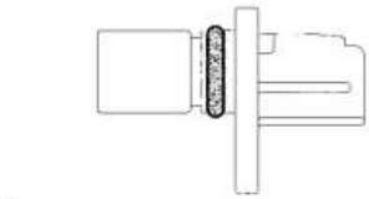
Torque: **10 N·m (102 kgf·cm, 7ft·lbf)**

- Do not allow foreign matter to contact the oil seal face of the oil control valve (connecting surface with cylinder head cover).
- Be careful that the O-ring is not cracked or moved out of place when installing the oil control valve.

51. INSTALL CAMSHAFT POSITION SENSOR

(a) Apply a light coat of engine oil to the O-ring of the sensor.

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(b) Install the camshaft position sensor with the bolt.



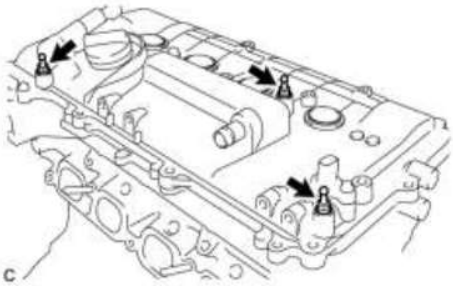
Torque: **10 N·m (102 kgf·cm, 7ft·lbf)**

NOTICE:

Make sure that the O-ring is not cracked or jammed when installing the sensor.

52. INSTALL SPARK PLUG INFO

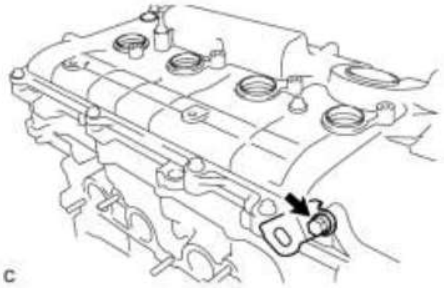
53. INSTALL ENGINE COVER JOINT BOLT



(a) Install the 3 engine cover joint bolts.

Torque: **10 N·m (102 kgf·cm, 7ft·lbf)**

54. INSTALL WIRING HARNESS CLAMP BRACKET



(a) Install the wiring harness clamp bracket with the bolt.

Torque: **10 N·m (102 kgf·cm, 7ft·lbf)**

55. INSTALL OIL FILLER CAP GASKET

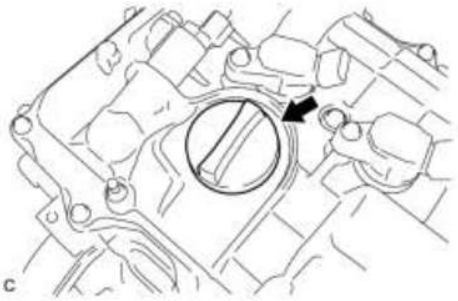
(a) Install the gasket to the oil filler cap.

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56. INSTALL OIL FILLER CAP SUB-ASSEMBLY



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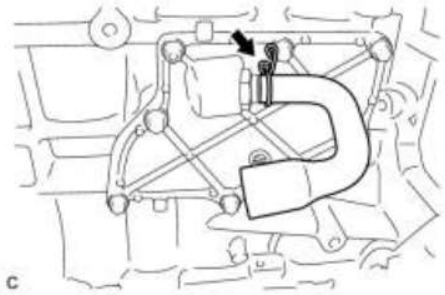
(a) Install the oil filler cap.

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INSTALLATION

1. INSTALL IGNITION COIL ASSEMBLY INFO

2. INSTALL VENTILATION HOSE



(a) Install the ventilation hose to the ventilation valve.

3. INSTALL EXHAUST MANIFOLD INFO

4. INSTALL MANIFOLD STAY INFO

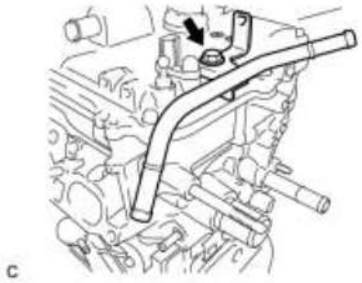
5. INSTALL NO. 1 EXHAUST MANIFOLD HEAT INSULATOR INFO

6. INSTALL FUEL INJECTOR ASSEMBLY INFO

7. INSTALL NO. 1 DELIVERY PIPE SPACER INFO

8. INSTALL FUEL DELIVERY PIPE SUB-ASSEMBLY INFO

9. INSTALL FUEL VAPOR FEED PIPE



(a) Install the fuel vapor feed pipe with the bolt.

Torque: **21 N·m (214 kgf·cm, 15ft·lbf)**

10. INSTALL INTAKE MANIFOLD INFO

11. INSTALL EGR WITH COOLER PIPE SUB-ASSEMBLY INFO

12. INSTALL EGR VALVE ASSEMBLY INFO

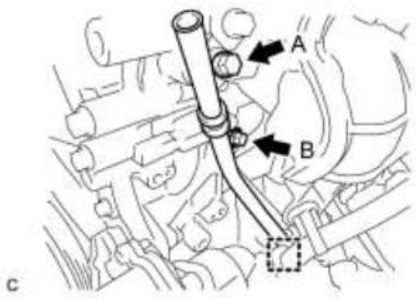
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13. INSTALL EGR PIPE ASSEMBLY INFO

14. INSTALL ENGINE OIL LEVEL DIPSTICK GUIDE

(a) Apply a light coat of engine oil to a new O-ring.

(b) Install the O-ring to the engine oil level dipstick guide.



(c) Install the engine oil level dipstick guide with the 2 bolts.

Bolt A - Torque: **28 N·m (286 kgf·cm, 21ft·lbf)**

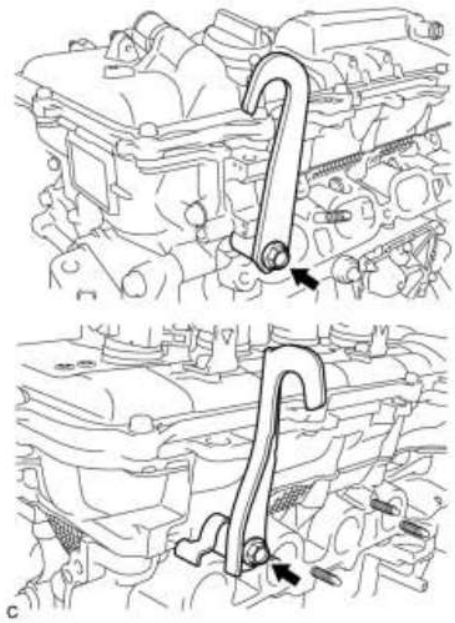
Bolt B - Torque: **21 N·m (214 kgf·cm, 15ft·lbf)**

(d) Connect the clamp to the engine oil level dipstick guide.

(e) Install the oil dipstick.

15. INSTALL THROTTLE BODY ASSEMBLY INFO

16. INSTALL ENGINE HANGERS



(a) Install the 2 engine hangers with the 2 bolts.

Torque: **43 N·m (438 kgf·cm, 32ft·lbf)**

Part Name	Part No.
No. 1 engine hanger	12281-37021
No. 2 engine hanger	12282-37011
Bolt	91552-81050

17. REMOVE ENGINE ON ENGINE STAND

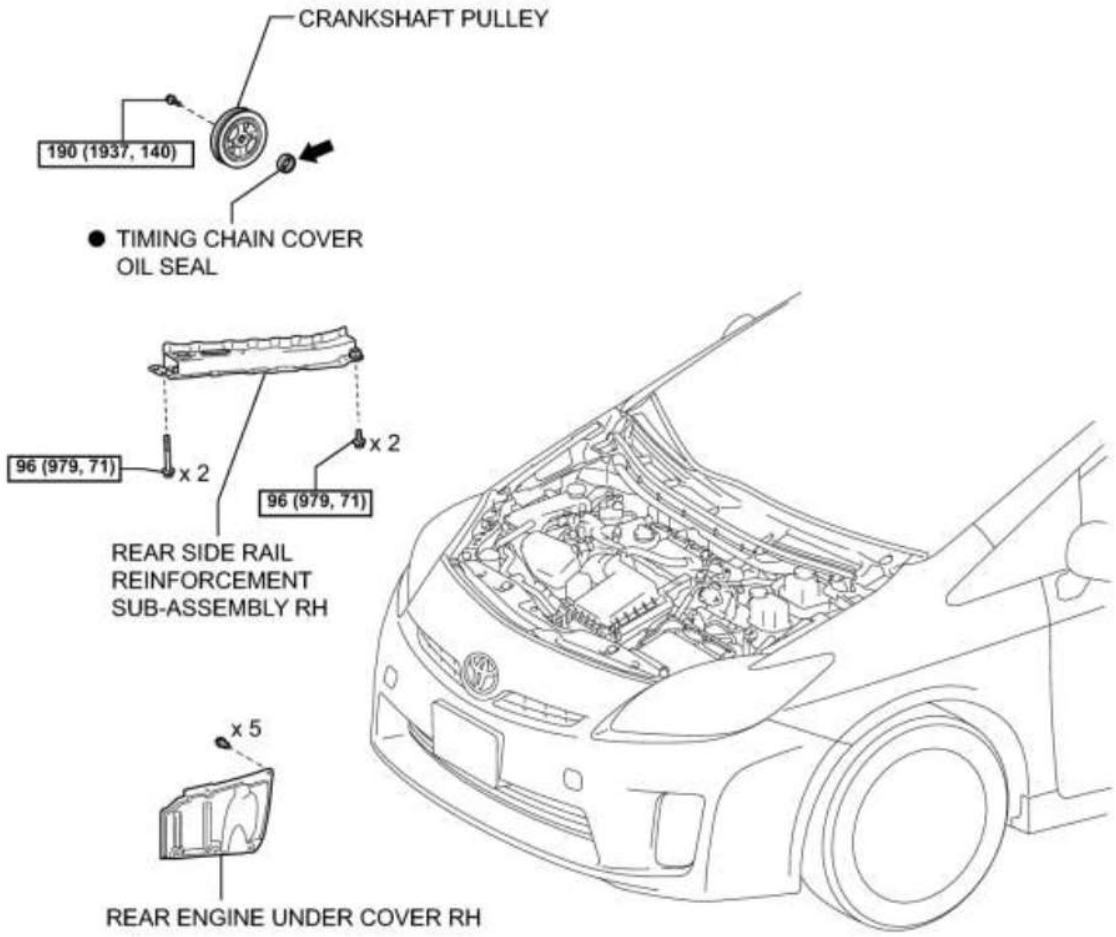
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(a) Remove the bolts and engine on engine stand.

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COMPONENTS

ILLUSTRATION



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

● Non-reusable part

⬅ MP Grease

c

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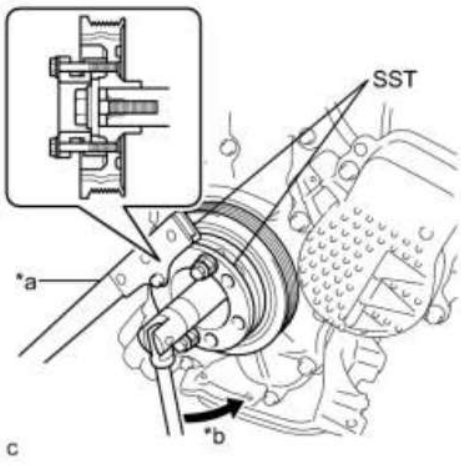
REMOVAL

1. REMOVE FRONT WHEEL RH

2. REMOVE REAR ENGINE UNDER COVER RH

3. REMOVE REAR SIDE RAIL REINFORCEMENT SUB-ASSEMBLY RH INFO

4. REMOVE CRANKSHAFT PULLEY



(a) Using SST, hold the pulley in place and loosen the pulley bolt.

Text in Illustration

*a	Hold
*b	Turn

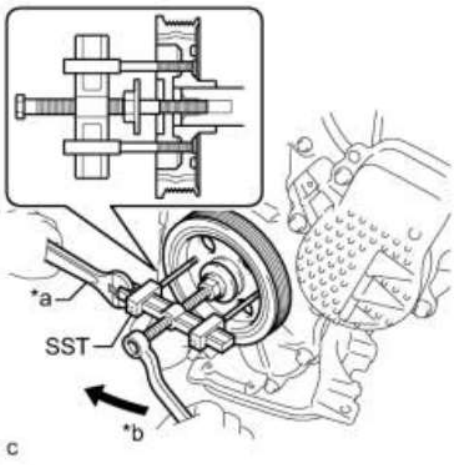
SST: 09213-58014

91551-80840

SST: 09330-00021

(b) Using SST, remove the crankshaft pulley and pulley bolt.

Text in Illustration



*a	Hold
*b	Turn

SST: 09950-50013

09951-05010

09952-05010

09953-05020

09954-05021

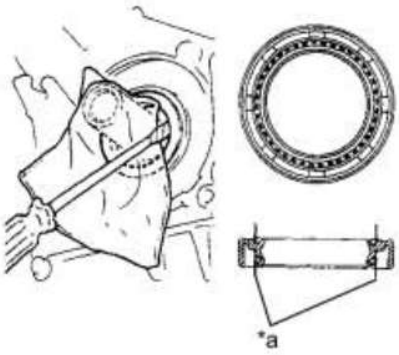
HINT:

If necessary, remove the pulley and pulley bolt using SST.

5. REMOVE TIMING CHAIN COVER OIL SEAL

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(a) Using a knife, cut off the lip of the oil seal.



(b) Using a screwdriver with its tip wrapped with tape, pry out the oil seal.

Text in Illustration

*a	Cut Position

NOTICE:

After removing, check the crankshaft for damage. If damaged, smooth the surface with 400-grit sandpaper.

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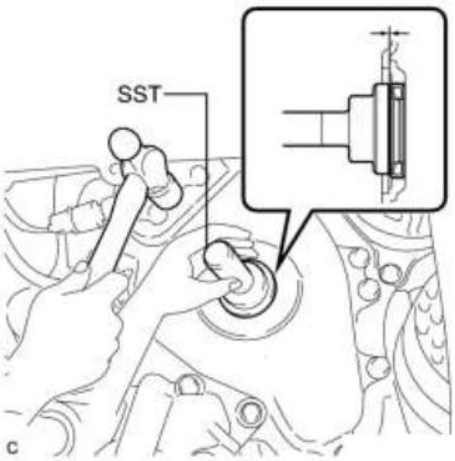
INSTALLATION

1. INSTALL TIMING CHAIN COVER OIL SEAL

(a) Apply MP grease to the lip of a new oil seal.

NOTICE:

Keep the lip free from foreign matter.



(b) Using SST and a hammer, tap in the oil seal until its surface is flush with the front oil seal retainer edge.

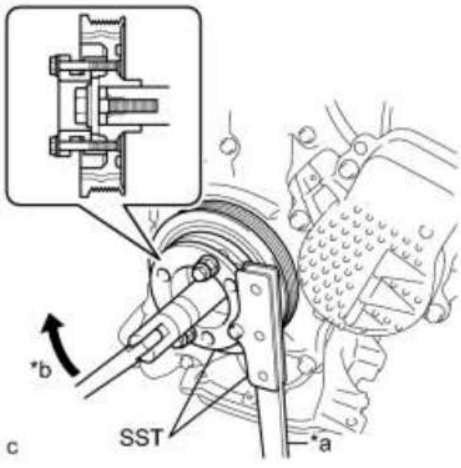
SST: 09223-22010

- Wipe off extra grease from the crankshaft.
- Do not tap the oil seal at an angle.

2. INSTALL CRANKSHAFT PULLEY

(a) Align the pulley set key with the key groove of the pulley.

(b) Using SST, hold the pulley in place and tighten the bolt.



Text in Illustration

*a	Hold
*b	Turn

SST: 09213-58014

91551-80840

SST: 09330-00021

Torque: **190 N·m (1937 kgf·cm, 140ft·lbf)**

3. INSTALL REAR SIDE RAIL REINFORCEMENT SUB-ASSEMBLY RH INFO

4. INSTALL FRONT WHEEL RH

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Torque: **103 N·m (1050 kgf·cm, 76ft·lbf)**

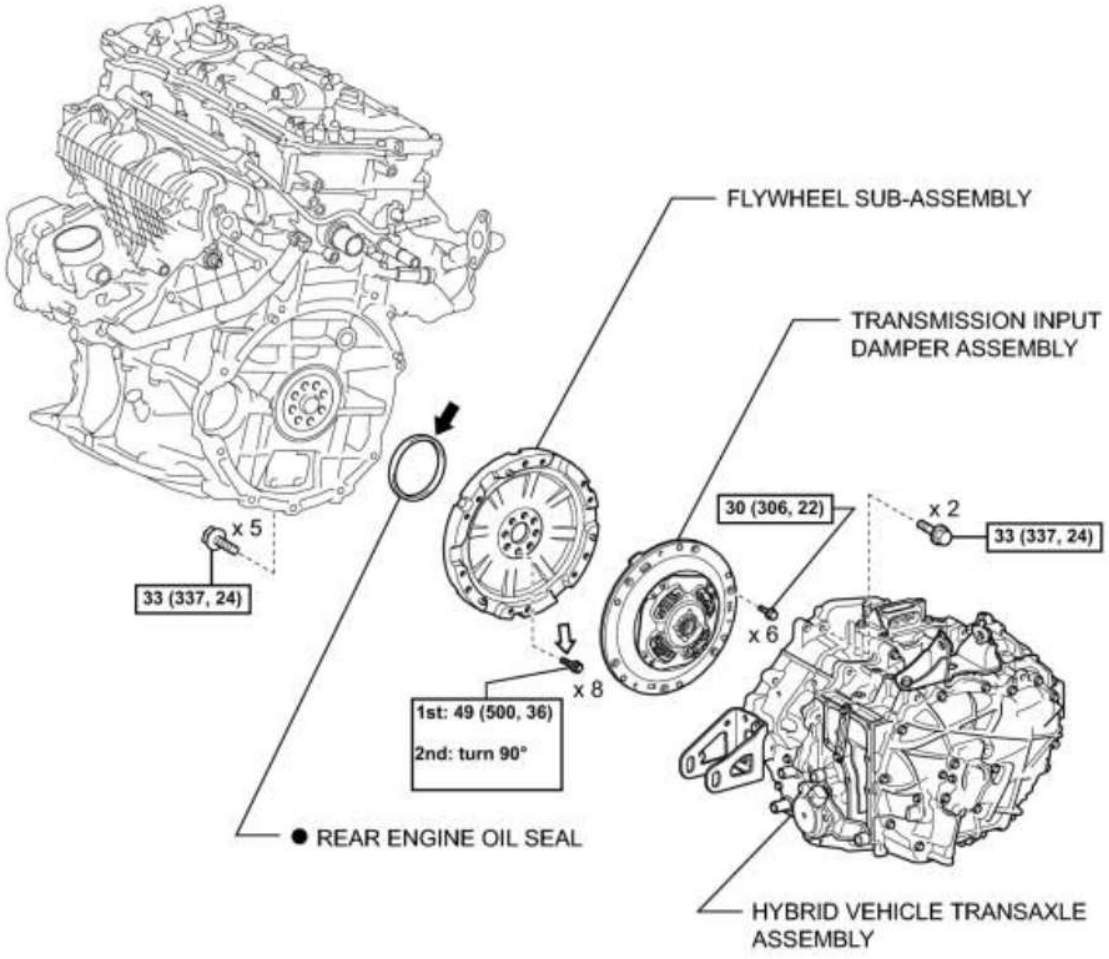
5. INSPECT FOR OIL LEAK

6. INSTALL REAR ENGINE UNDER COVER RH

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COMPONENTS

ILLUSTRATION



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

● Non-reusable part

⬅ MP Grease

⇦ Adhesive 1324

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REMOVAL

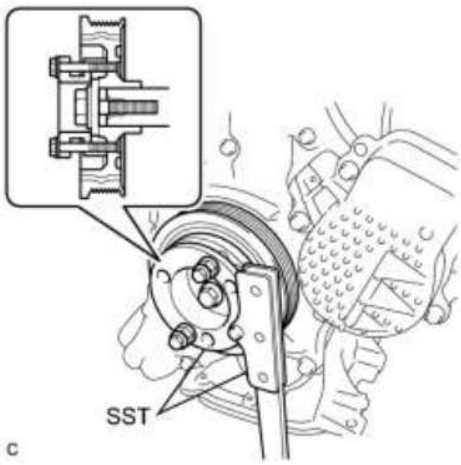
1. REMOVE HYBRID VEHICLE TRANSAXLE ASSEMBLY

(a) Remove the hybrid vehicle transaxle assembly INFO.

NOTICE:

Be careful not to apply excess force to the transmission input damper assembly when removing or installing the hybrid vehicle transaxle assembly. If excess force is applied, the transmission input damper assembly may be damaged, or its splines may become misaligned.

2. REMOVE TRANSMISSION INPUT DAMPER ASSEMBLY

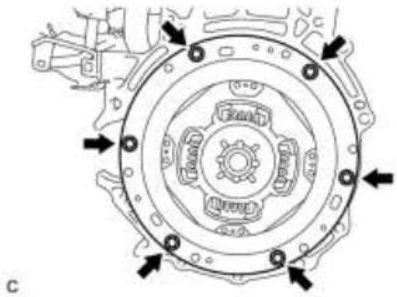


(a) Using SST, hold the crankshaft damper.

SST: 09213-58014

91551-80840

SST: 09330-00021



(b) Remove the 6 bolts and transmission input damper assembly from the flywheel sub-assembly.

3. REMOVE FLYWHEEL SUB-ASSEMBLY

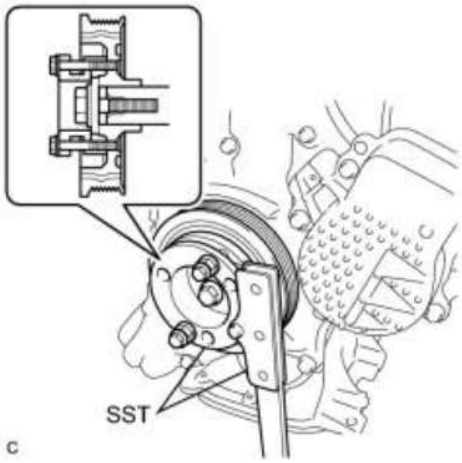
(a) Using SST, hold the crankshaft damper.

SST: 09213-58014

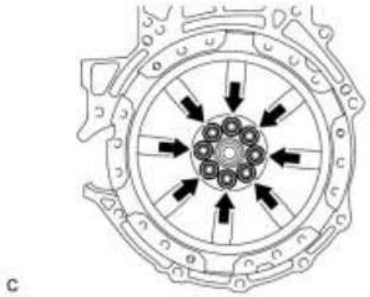
91551-80840

SST: 09330-00021

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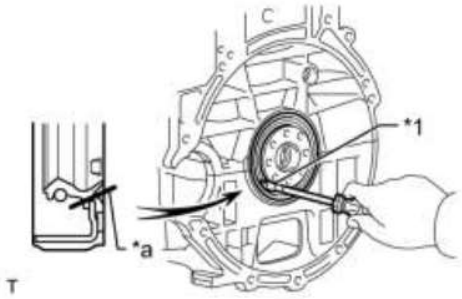
C



C

(b) Remove the 8 bolts and the flywheel.

4. REMOVE REAR ENGINE OIL SEAL



T

(a) Using a knife, cut off the lip of the oil seal.

Text in Illustration

*1	Protective Tape
*a	Cut Position

(b) Using a screwdriver with its tip wrapped with tape, pry out the oil seal.

NOTICE:

After removing, check the crankshaft for damage. If damaged, smooth the surface with 400-grit sandpaper.

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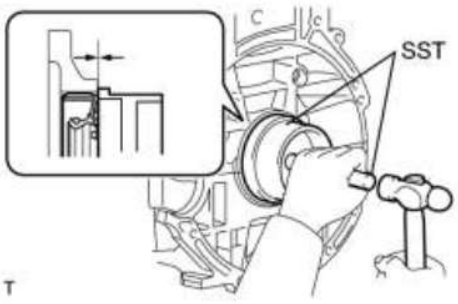
INSTALLATION

1. INSTALL REAR ENGINE OIL SEAL

(a) Apply MP grease to the lip of a new oil seal.

NOTICE:

Keep the lip free from foreign matter.



(b) Using SST and a hammer, tap in the oil seal until its surface is flush with the rear oil seal retainer edge.

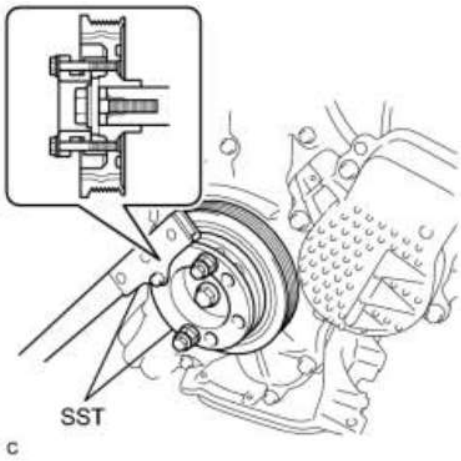
SST: 09223-15030

SST: 09950-70010

09951-07100

- Wipe any extra grease off the crankshaft.
- Do not tap the oil seal at an angle.

2. INSTALL FLYWHEEL SUB-ASSEMBLY



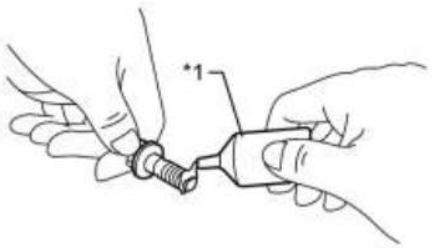
(a) Using SST, hold the crankshaft.

SST: 09213-58014

91551-80840

SST: 09330-00021

(b) Apply adhesive to the 2 or 3 end threads of the bolts.



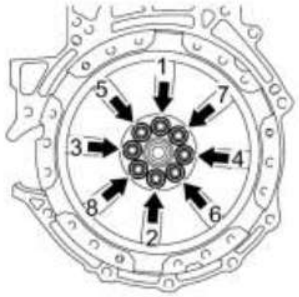
Text in Illustration

*1	Adhesive

Adhesive:

Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

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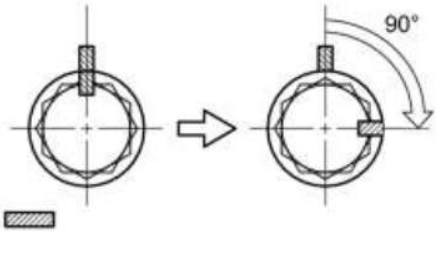


C

(c) Using several steps, uniformly install and tighten the 8 bolts in the sequence shown in the illustration.

Torque: **49 N·m (500 kgf·cm, 36ft·lbf)**

(d) Mark the front of the bolts with paint.



P

Text in Illustration

▨	Paint Mark

(e) Retighten the 8 bolts 90° in the same sequence.

(f) Check that the paint marks are now at a 90° angle to the front.

(g) Check that the crankshaft turns smoothly.

3. INSTALL TRANSMISSION INPUT DAMPER ASSEMBLY

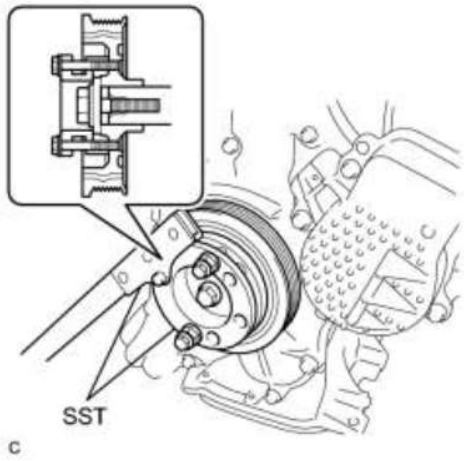
(a) Using SST, hold the crankshaft.

SST: 09213-58014

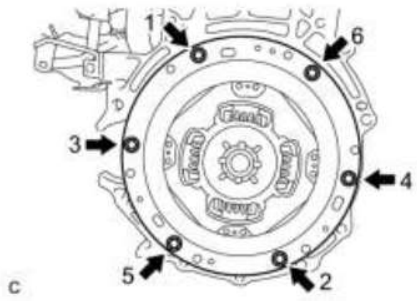
91551-80840

SST: 09330-00021

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(b) Install the transmission input damper.



(c) In several steps, uniformly install and tighten the 6 bolts in the sequence shown in the illustration.

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

NOTICE:

Take care not to insert the transmission input damper in a wrong direction.

4. INSTALL HYBRID VEHICLE TRANSAXLE ASSEMBLY

(a) Install the hybrid vehicle transaxle assembly INFO.

NOTICE:

Be careful not to apply excess force to the transmission input damper assembly when removing or installing the hybrid vehicle transaxle assembly. If excess force is applied, the transmission input damper assembly may be damaged, or its splines may become misaligned.

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