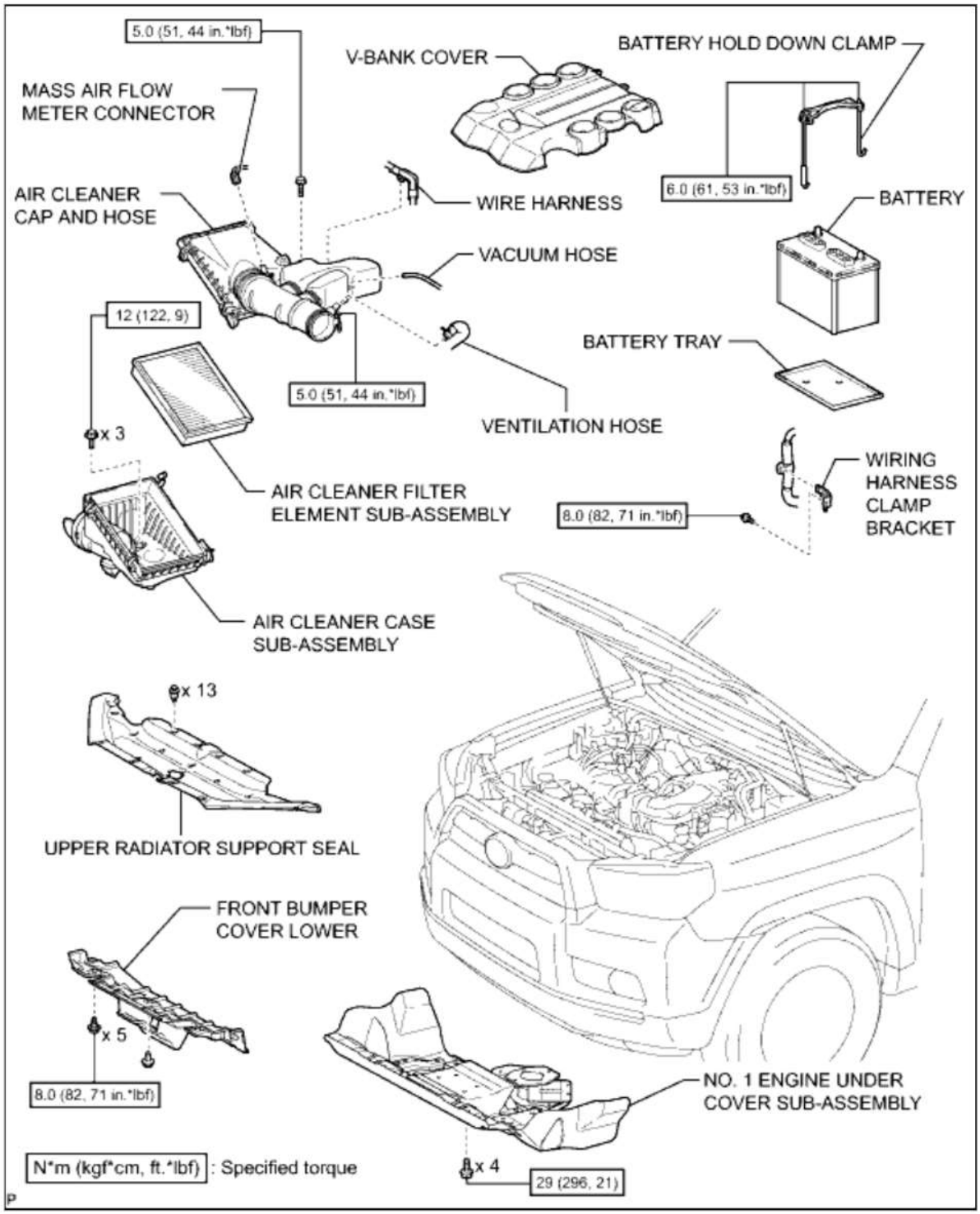
Last Modified: 5-10-2010	6.4 K	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000003B6W004X
Title: 1GR-FE ENGINE MECHANICAL: CAMSHAFT: COMPONENTS (2010 4Runner)		

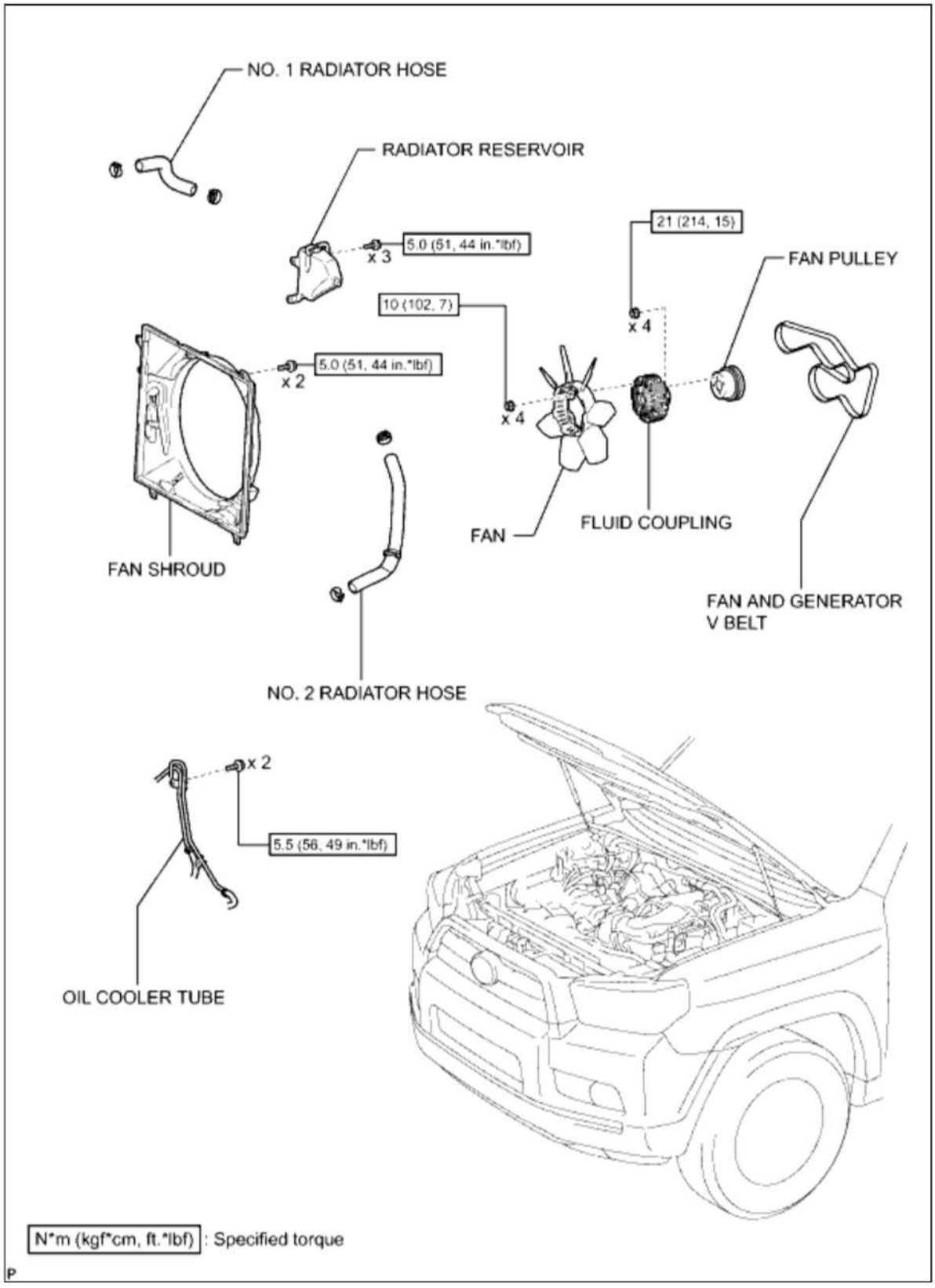
COMPONENTS

ILLUSTRATION



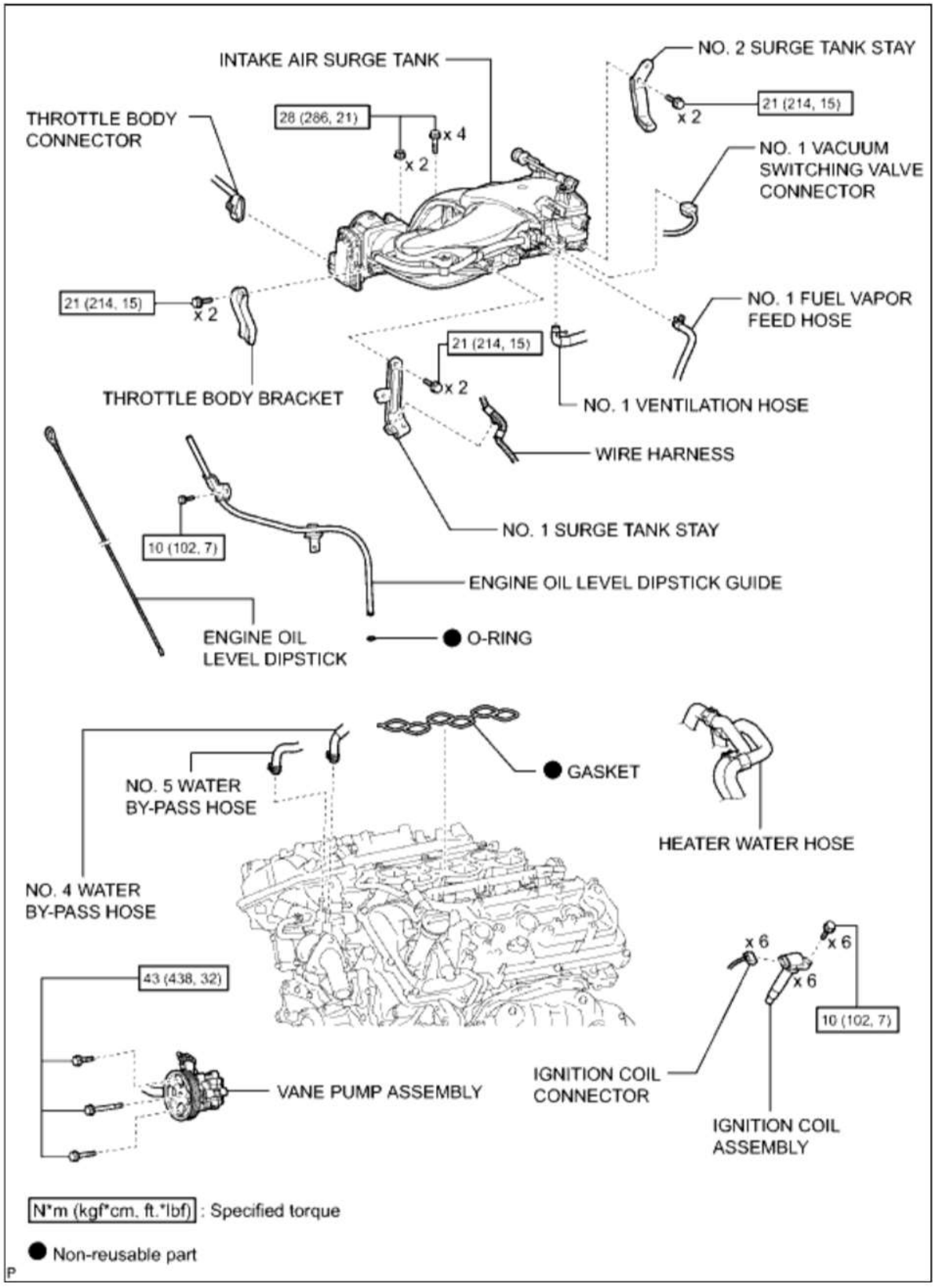
cardiagn.com

ILLUSTRATION



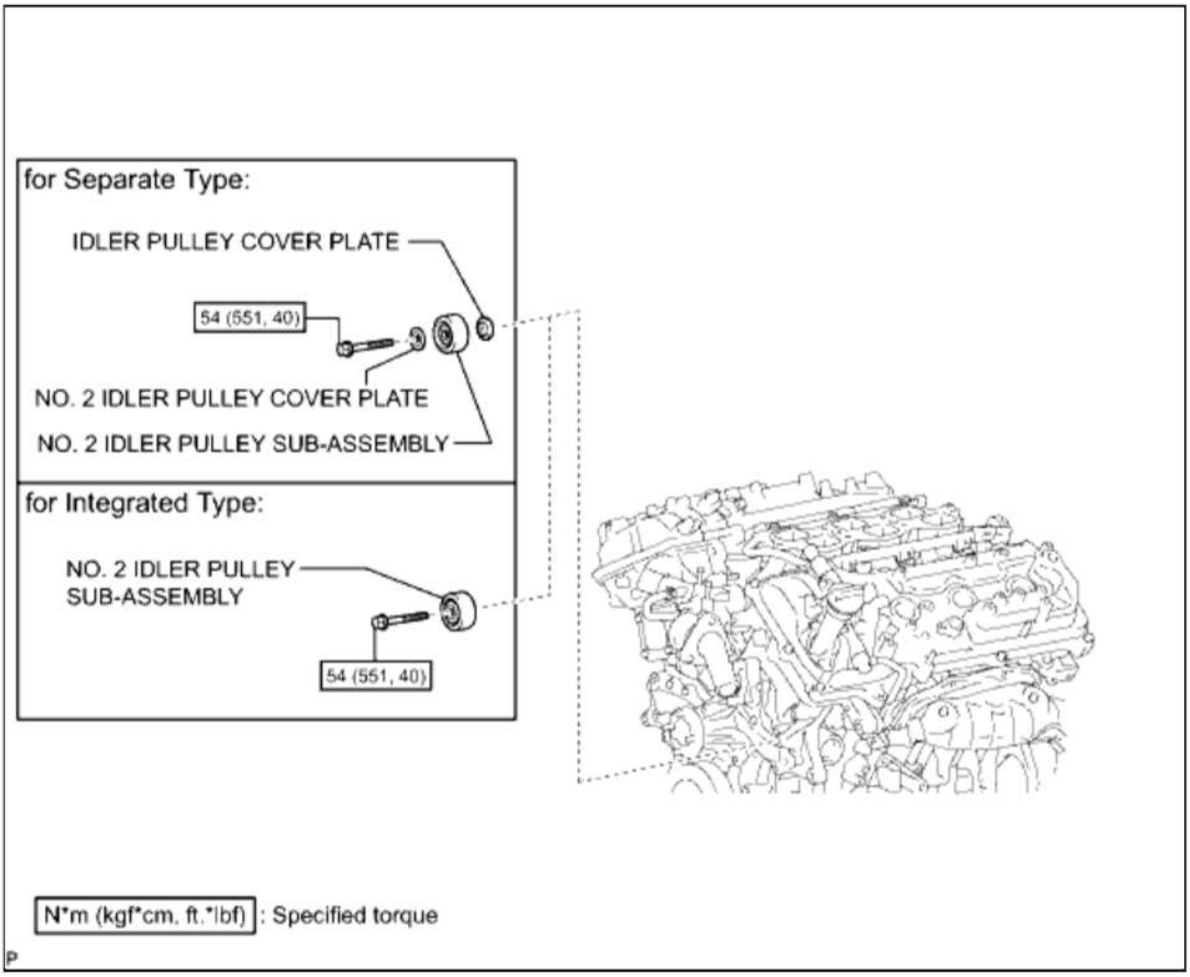
cardiagn.com

ILLUSTRATION



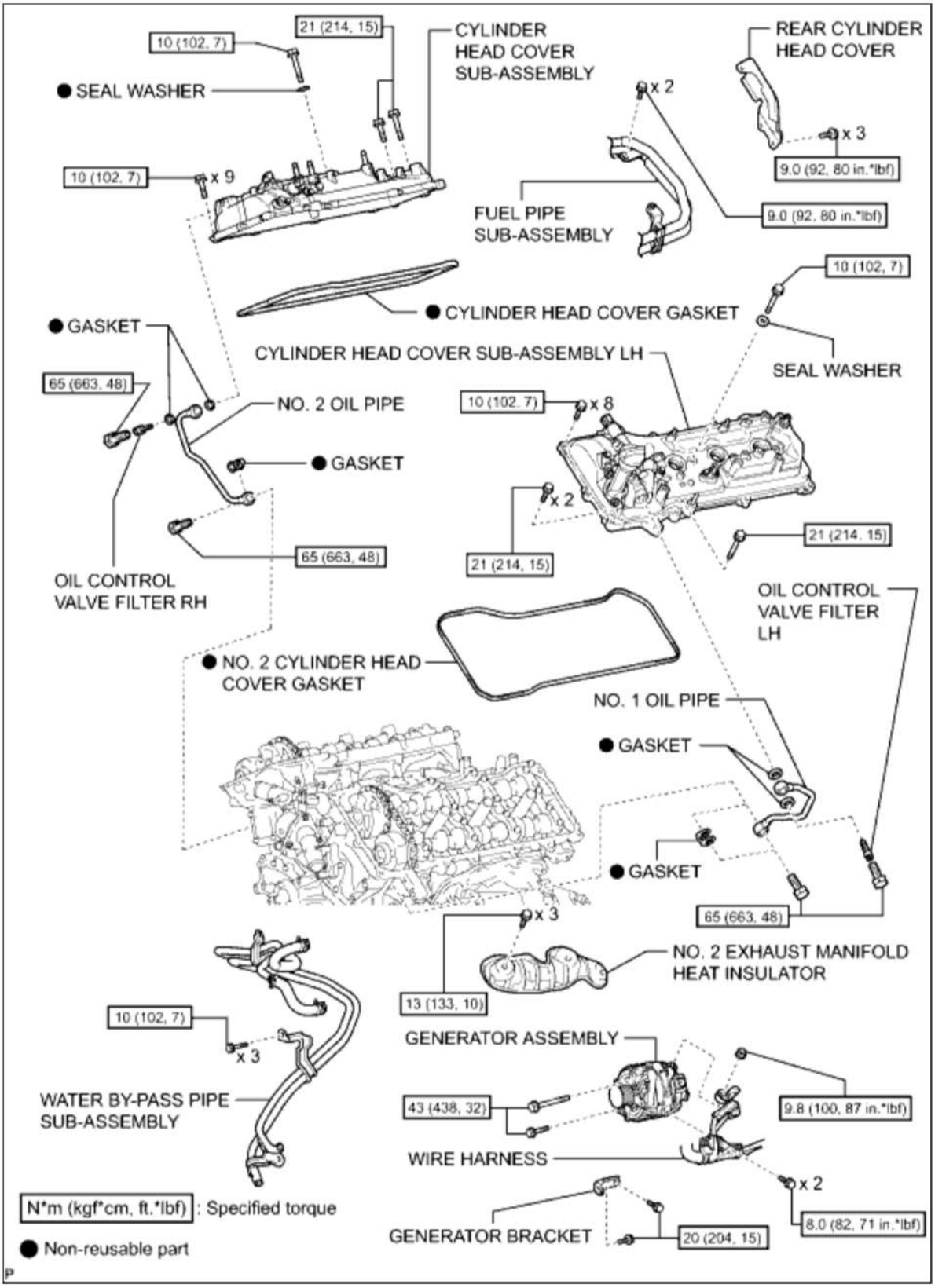
cardiagn.com

ILLUSTRATION



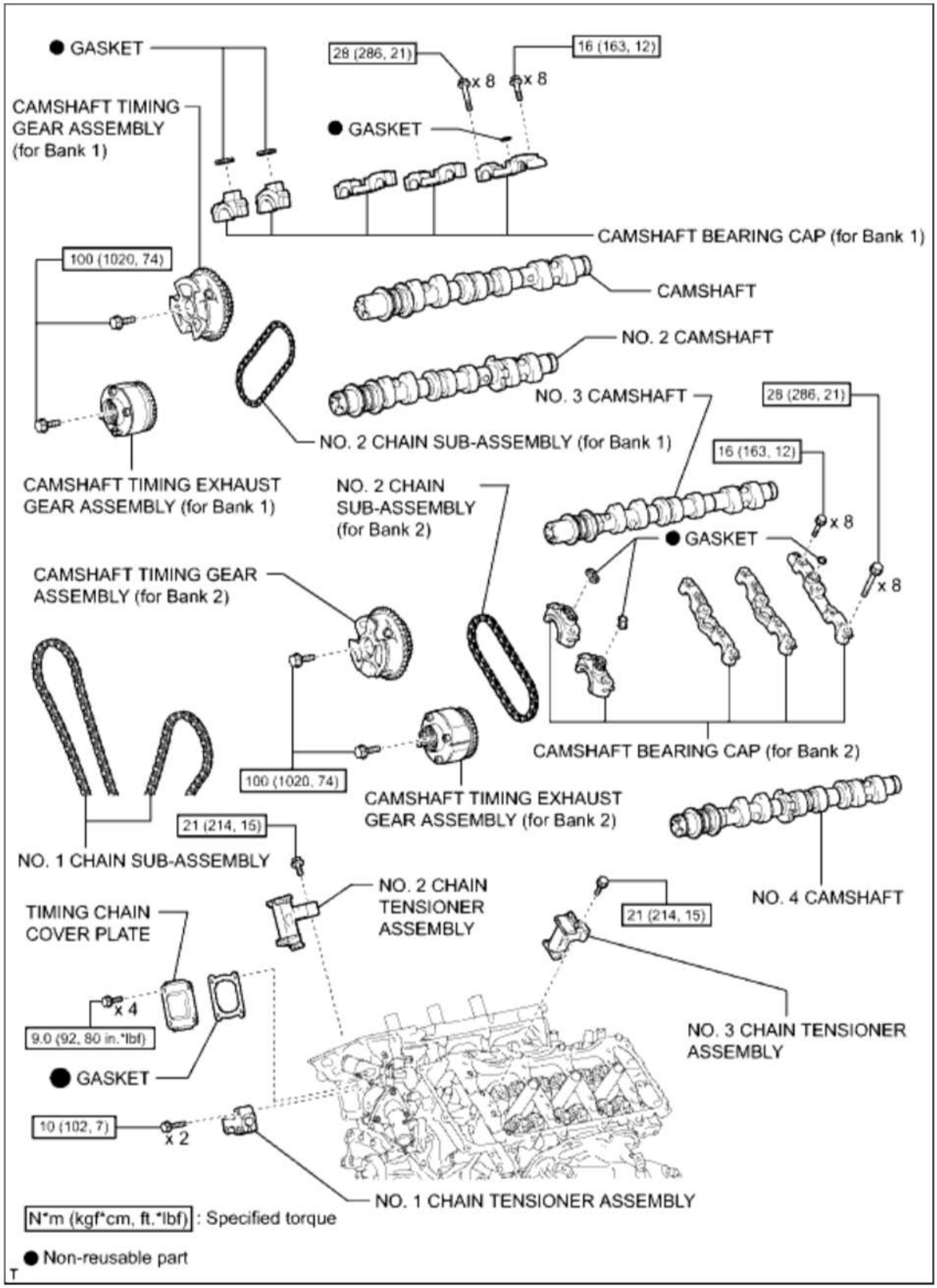
ILLUSTRATION

cardiagn.com



ILLUSTRATION

cardiagn.com



cardiagn.com

Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000003B6X004X
Title: 1GR-FE ENGINE MECHANICAL: CAMSHAFT: REMOVAL (2010 4Runner)		

REMOVAL

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

NOTICE:

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

2. REMOVE FRONT BUMPER COVER LOWER INFO

3. REMOVE NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY INFO

4. DRAIN ENGINE OIL INFO

5. DRAIN ENGINE COOLANT INFO

6. REMOVE UPPER RADIATOR SUPPORT SEAL INFO

7. DISCONNECT CABLE FROM POSITIVE BATTERY TERMINAL

8. REMOVE BATTERY HOLD DOWN CLAMP INFO

9. REMOVE BATTERY

10. REMOVE BATTERY TRAY

11. REMOVE V-BANK COVER INFO

12. REMOVE AIR CLEANER CAP AND HOSE INFO

13. REMOVE AIR CLEANER CASE SUB-ASSEMBLY INFO

14. REMOVE NO. 1 RADIATOR HOSE INFO

15. REMOVE NO. 2 RADIATOR HOSE INFO

16. REMOVE RADIATOR RESERVOIR INFO

17. DISCONNECT OIL COOLER TUBE INFO

18. REMOVE FAN SHROUD INFO

19. REMOVE INTAKE AIR SURGE TANK INFO

20. REMOVE IGNITION COIL ASSEMBLY INFO

21. DISCONNECT VANE PUMP ASSEMBLY INFO

22. REMOVE NO. 2 IDLER PULLEY SUB-ASSEMBLY INFO

23. REMOVE WIRING HARNESS CLAMP BRACKET INFO

cardiagn.com

24. REMOVE NO. 2 EXHAUST MANIFOLD HEAT INSULATOR INFO

25. REMOVE GENERATOR ASSEMBLY INFO

26. REMOVE ENGINE OIL LEVEL DIPSTICK GUIDE INFO

27. REMOVE WATER BY-PASS PIPE SUB-ASSEMBLY INFO

28. REMOVE NO. 1 OIL PIPE INFO

29. REMOVE NO. 2 OIL PIPE INFO

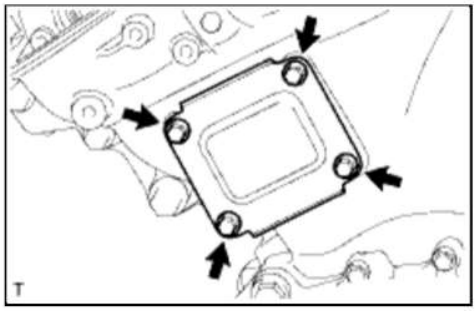
30. REMOVE REAR CYLINDER HEAD COVER INFO

31. DISCONNECT FUEL PIPE SUB-ASSEMBLY INFO

32. REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY LH INFO

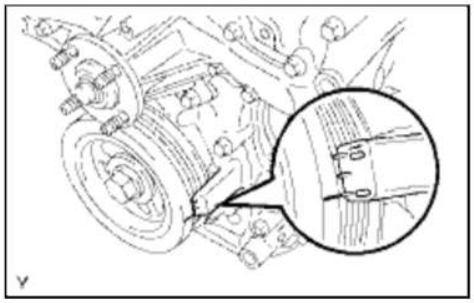
33. REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY INFO

34. REMOVE TIMING CHAIN COVER PLATE



(a) Remove the 4 bolts, timing chain cover plate and gasket.

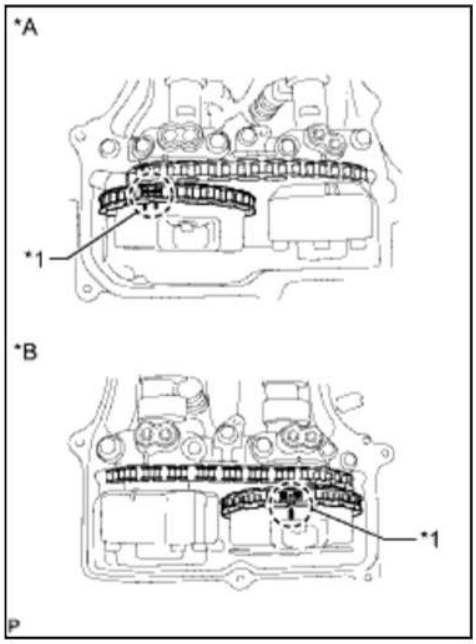
35. SET NO. 1 CYLINDER TO TDC/COMPRESSION



(a) Turn the crankshaft pulley and align the notch with the "0" timing mark of the timing chain cover.

(b) Check that the timing marks of the camshaft timing gears are aligned with the timing marks of the bearing caps as shown in the illustration.

cardiagn.com



Text in Illustration

*A	for Bank 2
*B	for Bank 1
*1	Paint Mark

HINT:

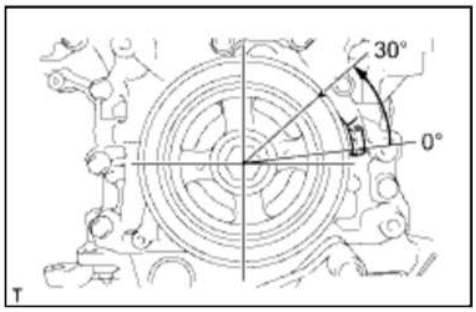
If the marks are not aligned, turn the crankshaft again to align the marks.

(c) Place paint marks on the timing marks and sprockets of each camshaft timing gear and on the links of the No. 1 chain.

HINT:

Be sure to place the paint marks on 2 links of the chain and on the sprockets of the camshaft timing gears at the locations of the timing marks of the camshaft timing gears.

36. REMOVE NO. 1 CHAIN TENSIONER ASSEMBLY



(a) Turn the crankshaft approximately 30° counterclockwise so that there is some slack in the chain.

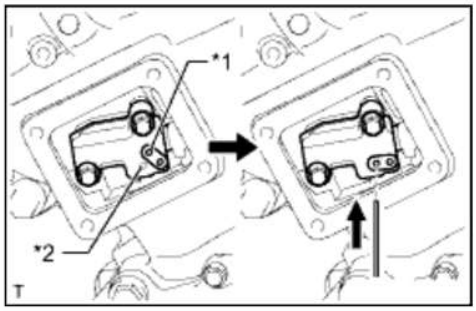
HINT:

This prevents the valves and pistons from interfering with each other.

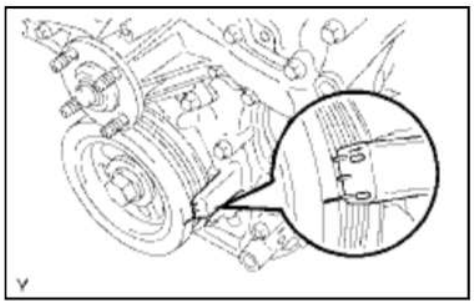
(b) Align the hole in the lever of the tensioner with the hole in the tensioner body as shown in the illustration, and then insert a pin with a diameter of 1.27 mm (0.0500 in.) into the hole.

Text in Illustration

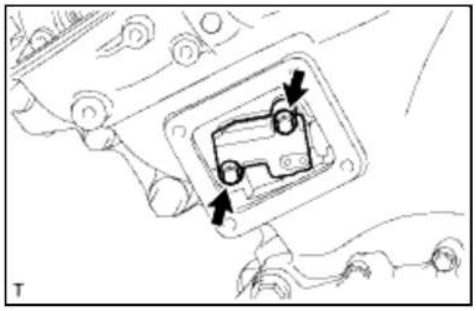
cardiagn.com



*1	Lever Hole
*2	Tensioner Hole



(c) Turn the crankshaft clockwise and align the notch with the "0" timing mark of the timing chain cover.



(d) Remove the 2 bolts and chain tensioner.

NOTICE:

Do not drop the No. 1 chain tensioner assembly or bolts into the timing chain cover.

37. DISCONNECT CHAIN SUB-ASSEMBLY (for Bank 1)

(a) Turn the crankshaft clockwise until it is in the position shown in the illustration so that there is some slack in the chain between the banks.

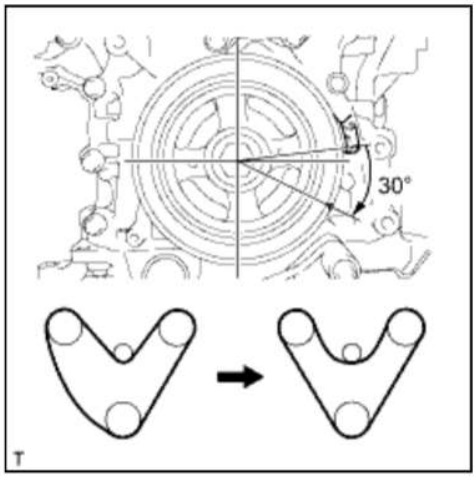
HINT:

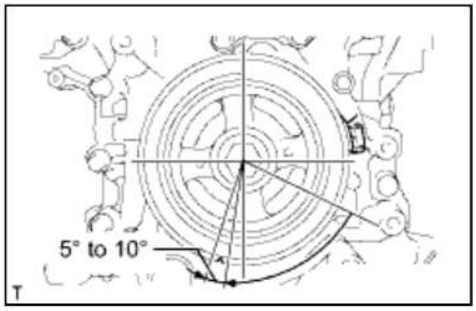
When turning the crankshaft, engine oil may spray out of the oil holes.

CAUTION:

As the camshafts turn suddenly, do not touch the camshafts or camshaft timing gears.

cardiagn.com

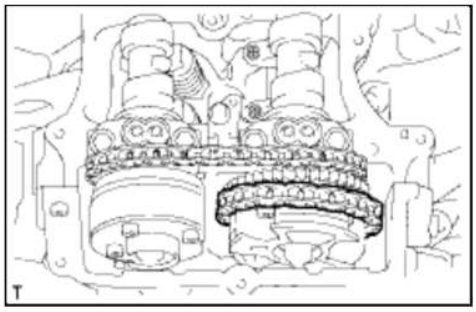




(b) Turn the crankshaft clockwise until it is in the position shown in the illustration so that the chain can be removed easily.

HINT:

When turning the crankshaft, engine oil may spray out of the oil holes.



(c) Remove the chain from the sprocket of the camshaft timing gear and set it on the gear.

CAUTION:

As the camshaft may turn suddenly and pinch your fingers when the chain is removed, pinch the chain and lift it upward to remove it from the sprocket.

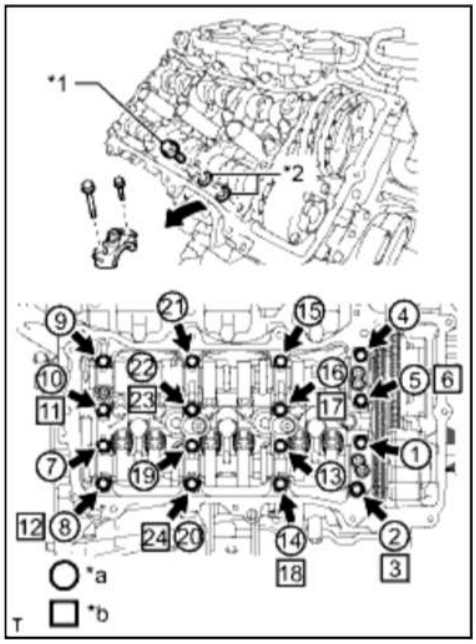
38. REMOVE CAMSHAFT BEARING CAP (for Bank 1)

(a) Remove the bolts and bearing caps in the order shown in the illustration. Immediately after removing a bearing cap, install VVT bolt kit in the order shown in the illustration.

Torque: 28 N·m (286 kgf·cm, 21ft·lbf)

Text in Illustration

cardiagn.com



*1	VVT Bolt Kit
*a	Part Removal
*b	VVT Bolt Kit Installation

VVT Bolt Kit	-

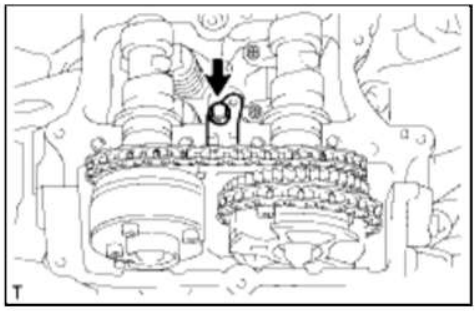
HINT:

Arrange the removed parts so that they can be reinstalled in their original locations.

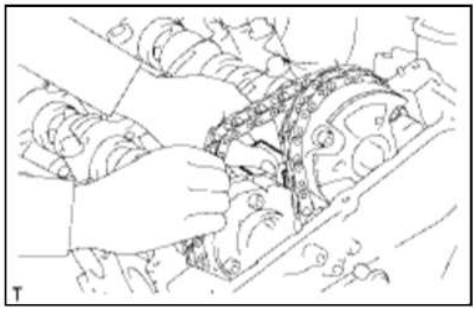
NOTICE:

- Do not install the bearing caps when installing VVT bolt kit.
- Be sure to follow the numerical order when performing this procedure.
- Do not allow the VVT bolt kit to contact the camshaft.
- Do not drop the VVT bolt kit into the cylinder head.

39. REMOVE NO. 2 CAMSHAFT

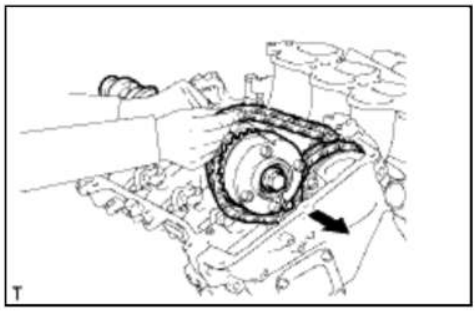


(a) Remove the bolt of the No. 2 chain tensioner assembly.



(b) Remove the No. 2 chain tensioner assembly while lifting up the No. 2 camshaft.

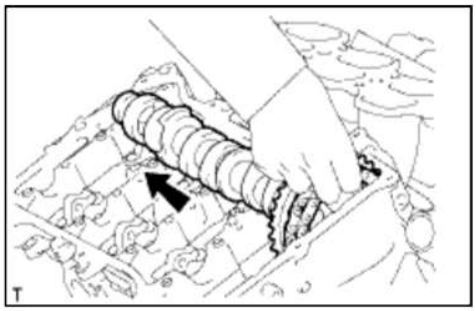
cardiagn.com



(c) While lifting up the No. 2 camshaft, pass it through the No. 2 chain and pull it out towards the front of the vehicle to remove it.

40. REMOVE CAMSHAFT

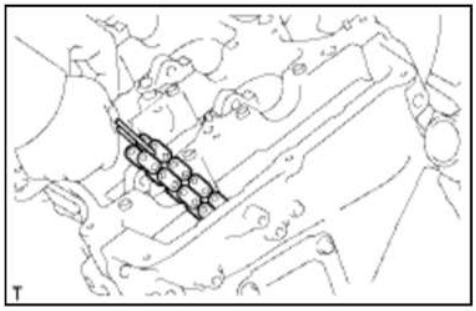
(a) Lift up the rear of the camshaft so that it is at an angle.



(b) Remove the chain from the camshaft timing gear and pull out the camshaft and No. 2 chain towards the rear of the vehicle to remove them.

NOTICE:

Do not drop the chain into the gap between the engine and cover.

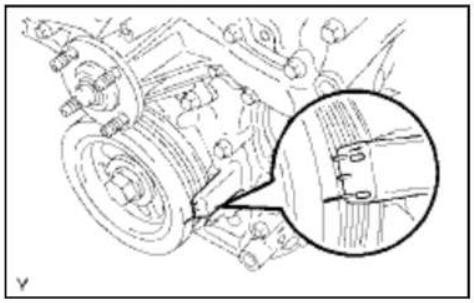


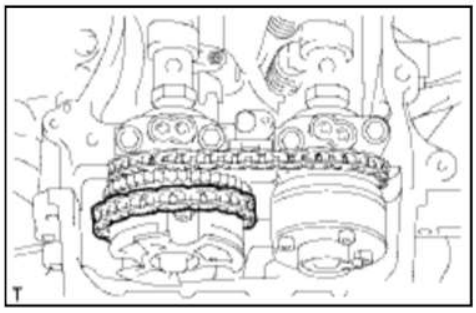
(c) Suspend the chain with a string or equivalent.

41. DISCONNECT CHAIN SUB-ASSEMBLY (for Bank 2)

(a) Turn the crankshaft counterclockwise and align the notch with the "0" timing mark of the timing chain cover.

cardiagn.com





(b) Remove the chain from the sprocket of the camshaft timing gear and set it on the gear.

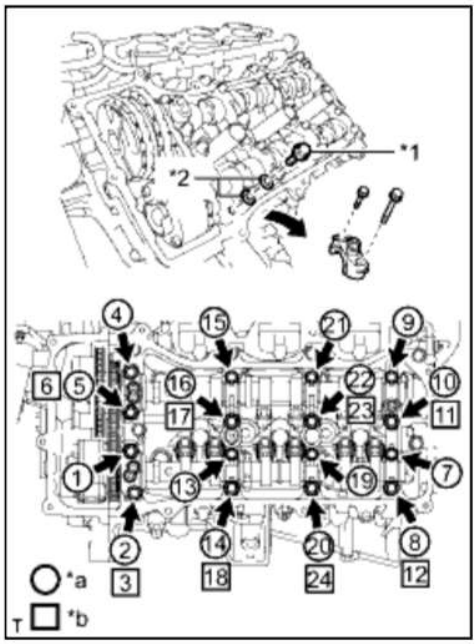
CAUTION:

As the camshaft may turn suddenly and pinch your fingers when the chain is removed, pinch the chain and lift it upward to remove it from the sprocket.

42. REMOVE CAMSHAFT BEARING CAP (for Bank 2)

(a) Remove the bolts and bearing caps in the order shown in the illustration. Immediately after removing a bearing cap, install VVT bolt kit in the order shown in the illustration.

Torque: 28 N·m (286 kgf·cm, 21ft·lbf)



Text in Illustration

*1	VVT Bolt Kit
*a	Part Removal
*b	VVT Bolt Kit Installation

VVT Bolt Kit	-

HINT:

Arrange the removed parts so that they can be reinstalled in their original locations.

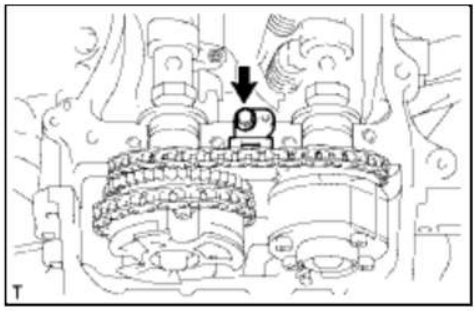
NOTICE:

- Do not install the bearing caps when installing VVT bolt kit.

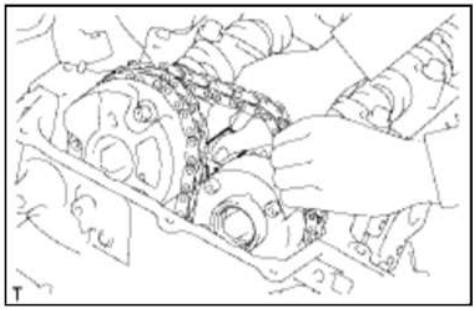
cardiagn.com

- Be sure to follow the numerical order when performing this procedure.
- Do not allow the VVT bolt kit to contact the camshaft.
- Do not drop the VVT bolt kit into the cylinder head.

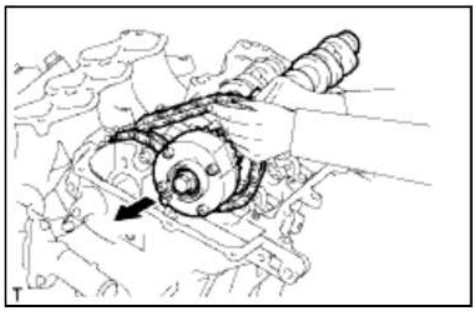
43. REMOVE NO. 4 CAMSHAFT



(a) Remove the bolt of the No. 3 chain tensioner assembly.



(b) Remove the No. 3 chain tensioner assembly while lifting up the No. 4 camshaft.



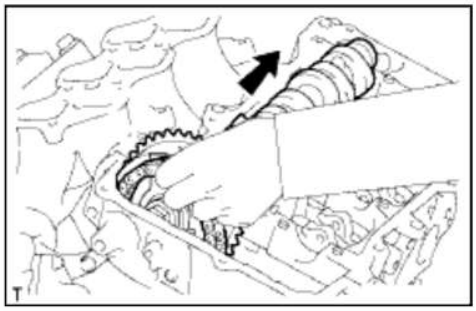
(c) While lifting up the No. 4 camshaft, pass it through the No. 2 chain and pull it out towards the front of the vehicle to remove it.

44. REMOVE NO. 3 CAMSHAFT

(a) Lift up the rear of the camshaft so that it is at an angle.

(b) Remove the chain from the camshaft timing gear and pull out the No. 3 camshaft and No. 2 chain towards the rear of

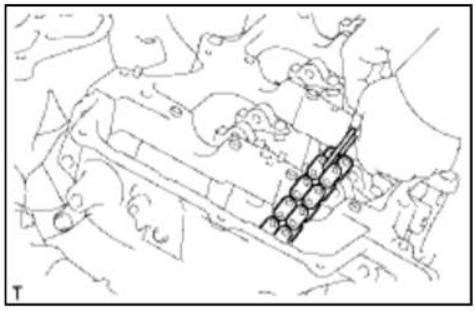
cardiagn.com



the vehicle to remove them.

NOTICE:

Do not drop the chain into the gap between the engine and cover.



(c) Suspend the chain with a string or equivalent.

45. REMOVE CAMSHAFT TIMING GEAR ASSEMBLY

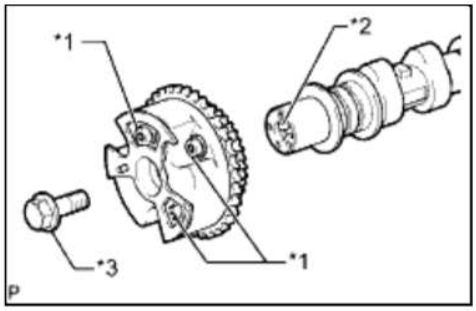
(a) Fix the camshaft in place.

NOTICE:

Be careful not to damage the camshaft.

(b) Remove the flange bolt and camshaft timing gear assembly.

Text in Illustration



*1	Do not remove
*2	Straight Pin
*3	Flange Bolt

NOTICE:

- Do not remove the other 3 bolts.
- If planning to reuse the camshaft timing gear, be sure to release the straight pin lock before installing the camshaft timing gear.

46. REMOVE CAMSHAFT TIMING EXHAUST GEAR ASSEMBLY

(a) Fix the camshaft in place.

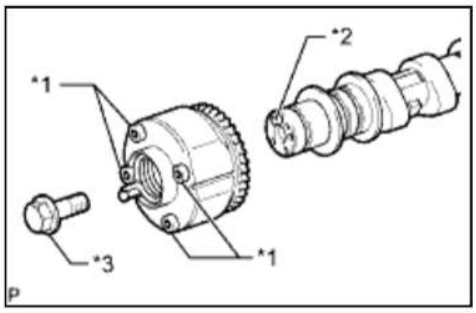
cardiagn.com

NOTICE:

Be careful not to damage the camshaft.

(b) Remove the flange bolt and camshaft timing exhaust gear assembly.

Text in Illustration



*1	Do not remove
*2	Straight Pin
*3	Flange Bolt

NOTICE:

- Be sure not to remove the other 4 bolts.
- If planning to reuse the gear, be sure to release the straight pin lock before installing the gear.

cardiagn.com

Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000003B6V004X
Title: 1GR-FE ENGINE MECHANICAL: CAMSHAFT: INSTALLATION (2010 4Runner)		

INSTALLATION

1. INSPECT CAMSHAFT TIMING GEAR ASSEMBLY INFO

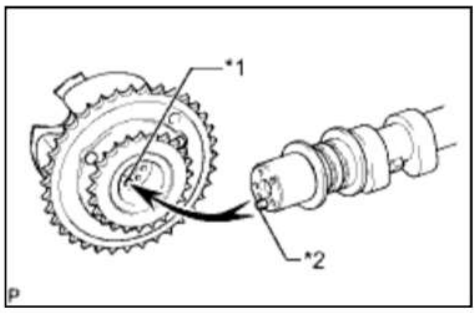
2. INSPECT CAMSHAFT TIMING EXHAUST GEAR ASSEMBLY INFO

3. INSTALL CAMSHAFT TIMING GEAR ASSEMBLY

(a) Fix the camshaft in place.

NOTICE:

Be careful not to damage the camshaft.



(b) Put the camshaft timing gear assembly and camshaft together by aligning the pin hole and straight pin.

Text in Illustration

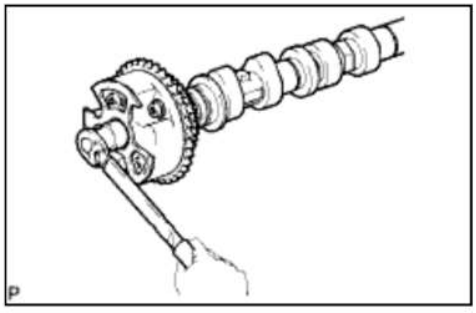
*1	Pin Hole
*2	Straight Pin

(c) Lightly press and turn the camshaft timing gear assembly against the camshaft, and press harder after the pin enters the hole.

NOTICE:

Be sure not to turn the camshaft timing gear assembly in the retard direction.

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



(e) Install the flange bolt while holding the camshaft.

Torque: 100 N·m (1020 kgf·cm, 74ft·lbf)

(f) Check the lock of the camshaft timing gear assembly.

(1) Fix the camshaft in place and confirm that the camshaft timing gear assembly is locked.

cardiagn.com

NOTICE:

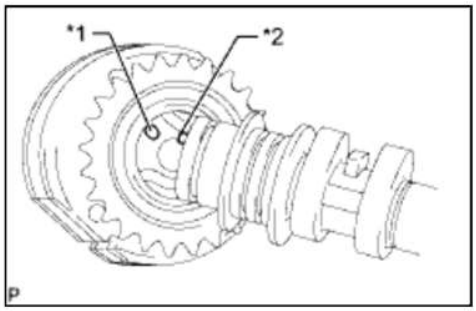
Be careful not to damage the camshaft.

4. INSTALL CAMSHAFT TIMING EXHAUST GEAR ASSEMBLY

(a) Fix the camshaft in place.

NOTICE:

Be careful not to damage the camshaft.



(b) Put the camshaft timing exhaust gear assembly and camshaft together by aligning the pin hole and straight pin.

Text in Illustration

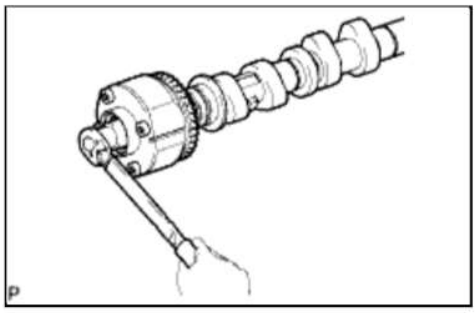
*1	Pin Hole
*2	Straight Pin

(c) Lightly press and turn the camshaft timing gear assembly against the camshaft, and press harder after the pin enters the hole.

NOTICE:

Be sure not to turn the camshaft timing exhaust gear in the advanced direction.

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



(e) Install the flange bolt while holding the camshaft.

Torque: 100 N·m (1020 kgf·cm, 74ft·lbf)

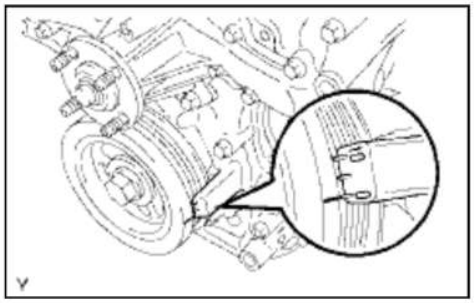
(f) Check the camshaft timing exhaust gear lock.

(1) Make sure that the camshaft timing exhaust gear assembly locks.

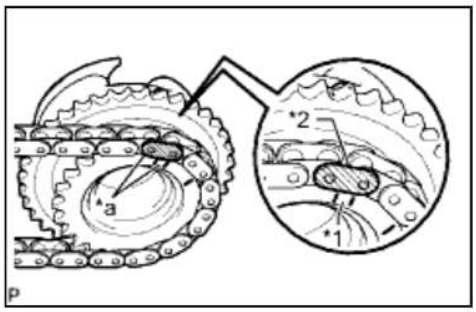
5. INSTALL NO. 3 CAMSHAFT

(a) Check that the notch is aligned with the "0" timing mark of the timing chain cover.

cardiagn.com



(b) Align the mark plate (yellow) with the timing mark of the camshaft timing gear as shown in the illustration and install the No. 2 chain to the camshaft timing gear.

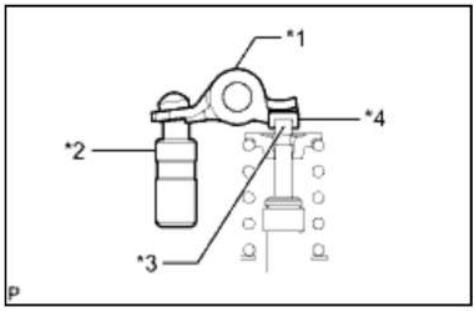


Text in Illustration

*1	Timing Mark
*2	Mark Plate (yellow)
*a	Align

(c) Clean the camshaft housing LH and camshaft journals and apply engine oil to them.

(d) Make sure that the No. 1 valve rocker arm sub-assembly is installed as shown in the illustration.



Text in Illustration

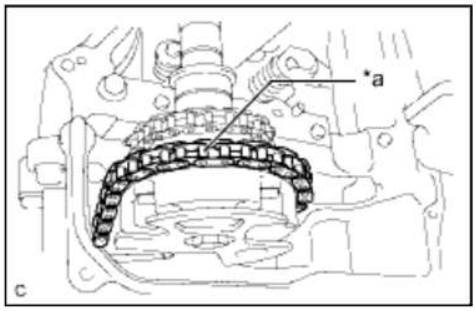
*1	Valve Rocker Arm
*2	Lash Adjuster
*3	Valve Stem
*4	Valve Stem Cap

(e) Install the chain to the No. 3 camshaft, and then install the camshaft to the camshaft housing LH.

Text in Illustration

*a	Place on camshaft timing gear

cardiagn.com

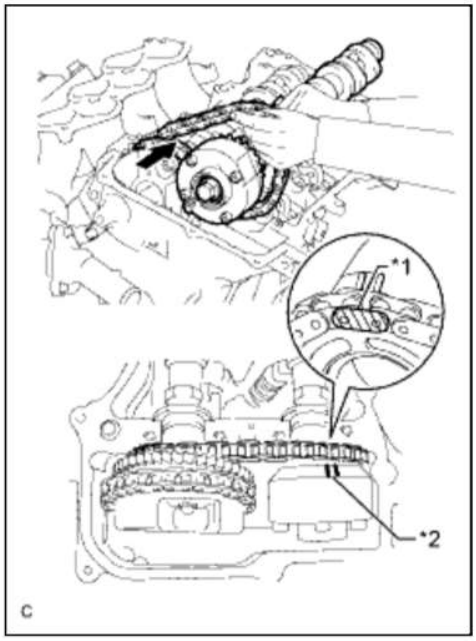


HINT:

- Place the chain on the camshaft timing gear but do not engage the teeth of the sprocket and the chain.
- Install the camshaft so that the timing mark is facing upward.

6. INSTALL NO. 4 CAMSHAFT

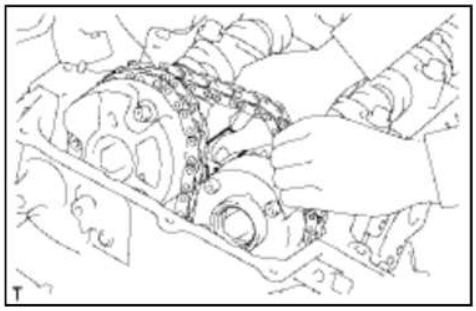
(a) Clean the camshaft housing LH and camshaft journals and apply engine oil to them.



(b) Pass the No. 4 camshaft through the No. 2 chain from the front of the vehicle, align the mark plate (yellow) with the timing mark and install the No. 2 chain to the camshaft timing exhaust gear.

Text in Illustration

*1	Mark Plate (yellow)
*2	Timing Mark



(c) While lifting up the No. 4 camshaft, pass the No. 3 chain tensioner assembly through the No. 2 chain and set it in place.

(d) Install the No. 4 camshaft to the camshaft housing LH, and then install the No. 3 chain tensioner assembly with the bolt.

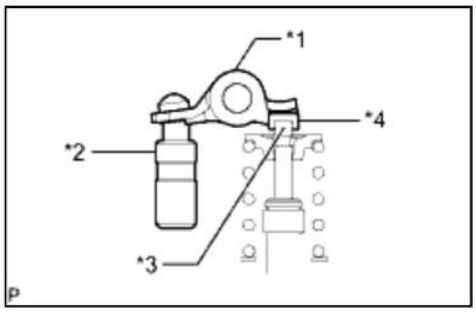
Torque: 21 N·m (214 kgf·cm, 15ft·lbf)

cardiagn.com

7. INSTALL CAMSHAFT BEARING CAP (for Bank 2)

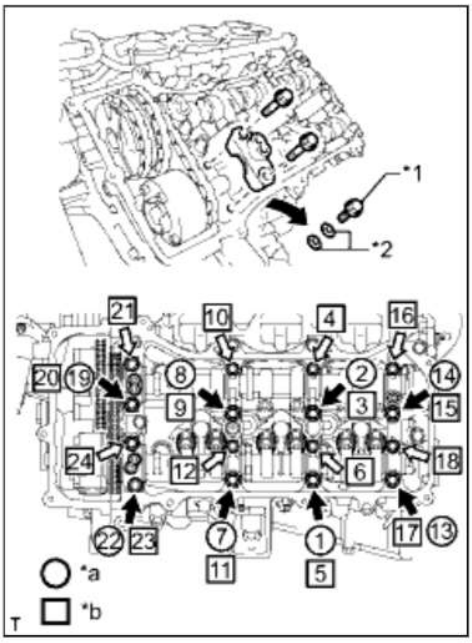
(a) Clean the camshaft bearing caps and apply engine oil to them.

(b) Make sure that the No. 1 valve rocker arm sub-assembly is installed as shown in the illustration.



Text in Illustration

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



(c) Check the marks and numbers on the camshaft bearing caps, and then remove VVT bolt kit in the order shown in the illustration. Immediately after removing VVT bolt kit in the location for a bearing cap, install the bearing cap with the bolts in the order shown in the illustration.

for bolt A - Torque: 28 N·m (286 kgf·cm, 21ft·lbf)

for bolt B - Torque: 16 N·m (163 kgf·cm, 12ft·lbf)

Text in Illustration

*1	VVT Bolt Kit
*a	VVT Bolt Kit Removal
*b	Part Installation

cardiagn.com

➡	Bolt A
⇨	Bolt B

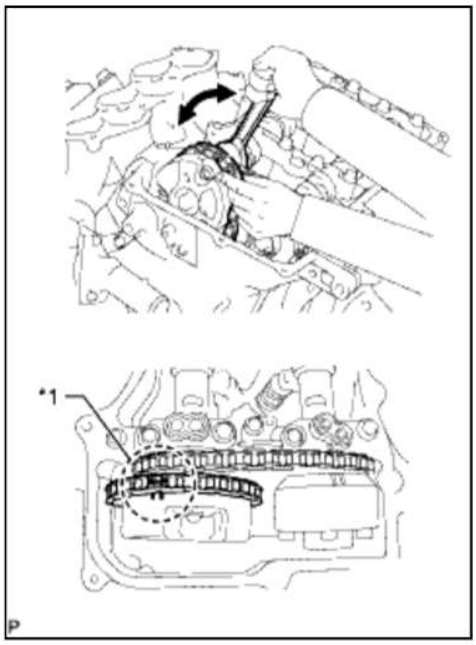
VVT Bolt Kit	-

NOTICE:

- Be sure to follow the numerical order when performing this procedure.
- Do not drop the VVT bolt kit into the cylinder head.

(d) Check the torque of each bolt again.

8. CONNECT CHAIN SUB-ASSEMBLY (for Bank 2)



(a) Align the paint marks on the camshaft timing gear and No. 1 chain and install the No. 1 chain to the camshaft timing gear.

Text in Illustration

*1	Paint Mark

HINT:

If the paint marks are not aligned, align them by turning the camshaft slightly.

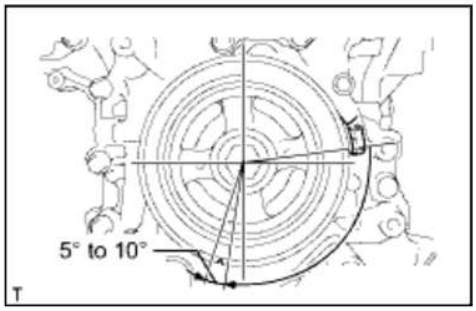
9. INSTALL CAMSHAFT

(a) Turn the crankshaft clockwise until it is in the position shown in the illustration so that the chain can be installed easily.

HINT:

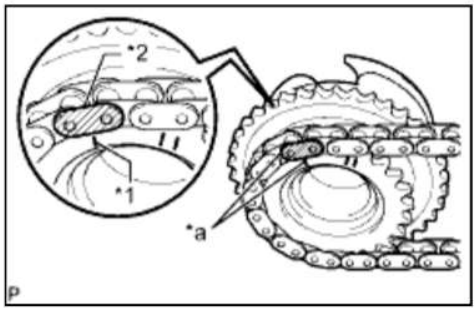
When turning the crankshaft, engine oil may spray out of the oil

cardiagn.com



holes.

(b) Align the mark plate (yellow) with the timing mark of the camshaft timing gear as shown in the illustration and install the No. 2 chain to the camshaft timing gear.

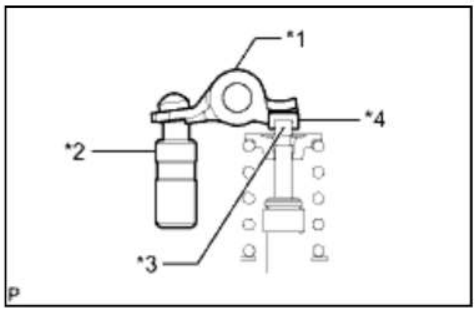


Text in Illustration

*1	Timing Mark
*2	Mark Plate (yellow)
*a	Align

(c) Clean the camshaft housing RH and camshaft journals and apply engine oil to them.

(d) Make sure that the No. 1 valve rocker arm sub-assembly is installed as shown in the illustration.



Text in Illustration

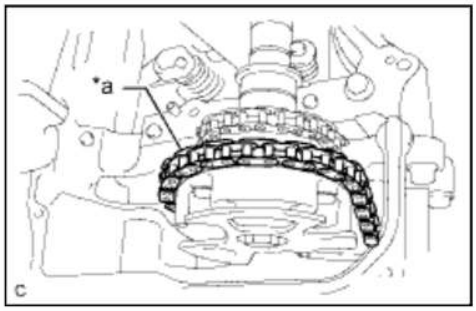
*1	Valve Rocker Arm
*2	Lash Adjuster
*3	Valve Stem
*4	Valve Stem Cap

(e) Install the chain to the camshaft, and then install the camshaft to the camshaft housing RH.

Text in Illustration

*a	Place on camshaft timing gear

cardiagn.com

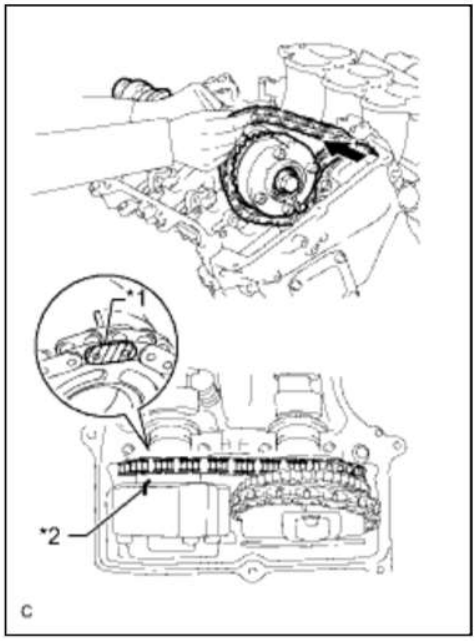


HINT:

- Place the chain on the camshaft timing gear but do not engage the teeth of the sprocket and the chain.
- Install the camshaft so that the timing mark is facing upward.

10. INSTALL NO. 2 CAMSHAFT

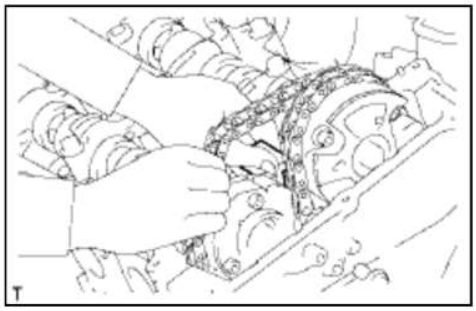
(a) Clean the camshaft housing RH and camshaft journals and apply engine oil to them.



(b) Pass the No. 2 camshaft through the No. 2 chain from the front of the vehicle, align the mark plate (yellow) with the timing mark and install the No. 2 chain to the camshaft timing exhaust gear.

Text in Illustration

*1	Mark Plate (yellow)
*2	Timing Mark



(c) While lifting up the No. 2 camshaft, pass the No. 2 chain tensioner assembly through the No. 2 chain and set it in place.

(d) Install the No. 2 camshaft to the camshaft housing RH, and then install the No. 2 chain tensioner assembly with the bolt.

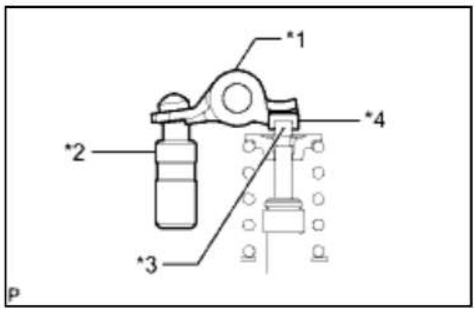
Torque: 21 N·m (214 kgf·cm, 15ft·lbf)

cardiagn.com

11. INSTALL CAMSHAFT BEARING CAP (for Bank 1)

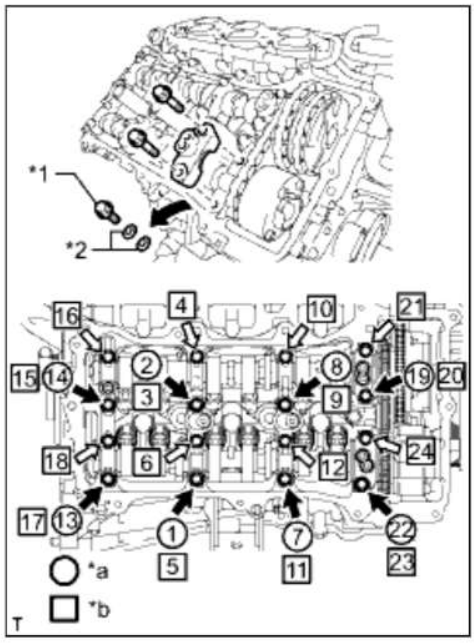
(a) Clean the camshaft bearing caps and apply engine oil to them.

(b) Make sure that the No. 1 valve rocker arm sub-assembly is installed as shown in the illustration.



Text in Illustration

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



(c) Check the marks and numbers on the camshaft bearing caps, and then remove VVT bolt kit in the order shown in the illustration. Immediately after removing VVT bolt kit in the location for a bearing cap, install the bearing cap with the bolts in the order shown in the illustration.

for bolt A - Torque: 28 N·m (286 kgf·cm, 21ft·lbf)

for bolt B - Torque: 16 N·m (163 kgf·cm, 12ft·lbf)

Text in Illustration

*1	VVT Bolt Kit
*a	VVT Bolt Kit Removal
*b	Part Installation

cardiagn.com

➡	Bolt A
⇨	Bolt B

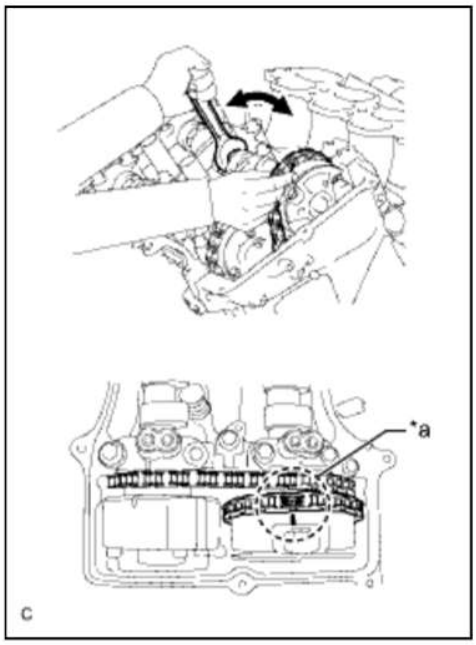
VVT Bolt Kit	-

NOTICE:

- Be sure to follow the numerical order when performing this procedure.
- Do not drop the VVT bolt kit into the cylinder head.

(d) Check the torque of each bolt again.

12. CONNECT CHAIN SUB-ASSEMBLY (for Bank 1)



(a) Align the paint marks on the camshaft timing gear and No. 1 chain and install the No. 1 chain to the camshaft timing gear.

Text in Illustration

*1	Paint Mark

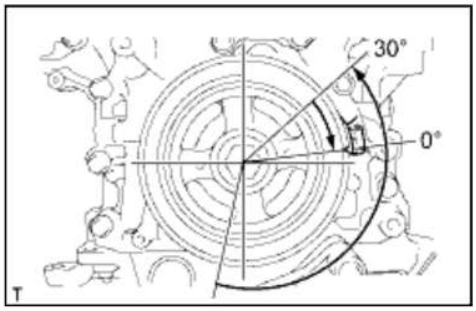
HINT:

If the paint marks are not aligned, align them by turning the camshaft slightly.

13. INSTALL NO. 1 CHAIN TENSIONER ASSEMBLY

(a) Turn the crankshaft counterclockwise 30° past the "0" timing mark, and then turn it clockwise to align the notch with the "0" timing mark.

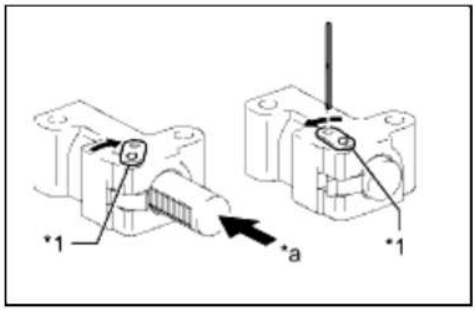
cardiagn.com



(b) Turn the crankshaft slightly to eliminate the slack in the chain.

HINT:

Make sure there is some slack in the chain around the area where the chain tensioner is installed.



(c) While turning the stopper plate of the tensioner clockwise, push in the plunger of the tensioner as shown in the illustration.

Text in Illustration

*1	Stopper Plate
*a	Push

(d) While turning the stopper plate of the tensioner counterclockwise, insert a pin of φ1.27 mm (0.0500 in.) into the holes in the stopper plate and tensioner to fix the stopper plate in place.

(e) Install the chain tensioner with the 2 bolts.

Torque: 10 N·m (102 kgf·cm, 7ft·lbf)

(f) Remove the pin from the No. 1 chain tensioner.

14. INSPECT VALVE TIMING

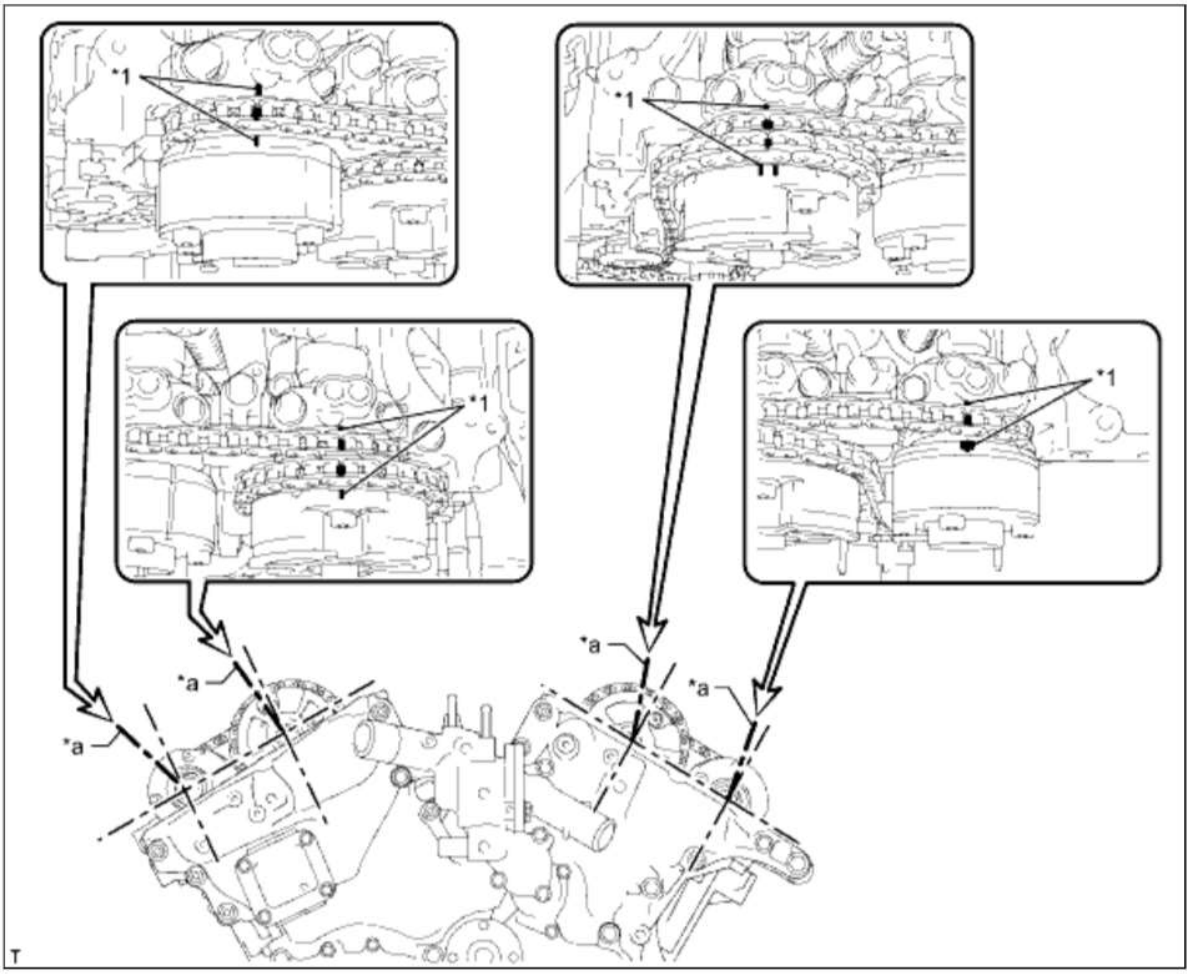
(a) Check the camshaft timing marks.

NOTICE:

- Check each timing mark from a viewpoint directly in line with the center of the camshaft and the timing mark on each camshaft timing gear.
- If the timing marks are checked from any other viewpoint, the valve timing may appear misaligned.

(b) Check that each camshaft timing mark is positioned as shown in the illustration.

cardiagn.com



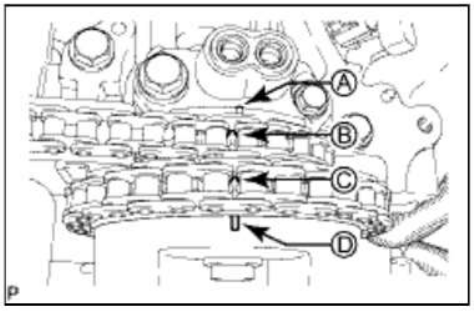
Text in Illustration

*1	Timing Mark	-	-
*a	Viewpoint	-	-

HINT:

for Intake Camshaft:

Be sure to check mark A at the point when marks B, C and D are positioned in line. If the marks are checked from any other viewpoint, they cannot be checked correctly.



(c) If the valve timing is misaligned, reinstall the timing chain.

cardiagn.com

(d) Turn the crankshaft 2 revolutions, set the No. 1 cylinder to TDC/compression and check the timing marks again.

15. INSTALL TIMING CHAIN COVER PLATE

(a) Install a new gasket and the timing chain cover plate with the 4 bolts.

Torque: 9.0 N·m (92 kgf·cm, 80in·lbf)

16. POUR ENGINE OIL INFO

17. INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY INFO

18. INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY LH INFO

19. CONNECT FUEL PIPE SUB-ASSEMBLY INFO

20. INSTALL REAR CYLINDER HEAD COVER INFO

21. INSTALL NO. 2 OIL PIPE INFO

22. INSTALL NO. 1 OIL PIPE INFO

23. INSTALL WATER BY-PASS PIPE SUB-ASSEMBLY INFO

24. INSTALL ENGINE OIL LEVEL DIPSTICK GUIDE INFO

25. INSTALL GENERATOR ASSEMBLY INFO

26. INSTALL NO. 2 EXHAUST MANIFOLD HEAT INSULATOR INFO

27. INSTALL WIRING HARNESS CLAMP BRACKET INFO

28. INSTALL NO. 2 IDLER PULLEY SUB-ASSEMBLY INFO

29. CONNECT VANE PUMP ASSEMBLY INFO

30. INSTALL IGNITION COIL ASSEMBLY INFO

31. INSTALL INTAKE AIR SURGE TANK INFO

32. INSTALL FAN SHROUD INFO

33. CONNECT OIL COOLER TUBE INFO

34. INSTALL RADIATOR RESERVOIR INFO

35. INSTALL NO. 2 RADIATOR HOSE INFO

36. INSTALL NO. 1 RADIATOR HOSE INFO

37. INSTALL AIR CLEANER CASE SUB-ASSEMBLY INFO

38. INSTALL AIR CLEANER CAP AND HOSE INFO

39. INSTALL BATTERY TRAY

cardiagn.com

40. INSTALL BATTERY

41. INSTALL BATTERY HOLD DOWN CLAMP INFO

42. CONNECT CABLE TO POSITIVE BATTERY TERMINAL

43. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

NOTICE:

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

44. ADD ENGINE COOLANT INFO

45. ADD ENGINE OIL INFO

46. INSPECT FOR COOLANT LEAK INFO

47. INSPECT FOR ENGINE OIL LEAK INFO

48. INSTALL V-BANK COVER INFO

49. INSTALL UPPER RADIATOR SUPPORT SEAL INFO

50. INSTALL NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY INFO

51. INSTALL FRONT BUMPER COVER LOWER INFO

52. INSPECT IGNITION TIMING INFO

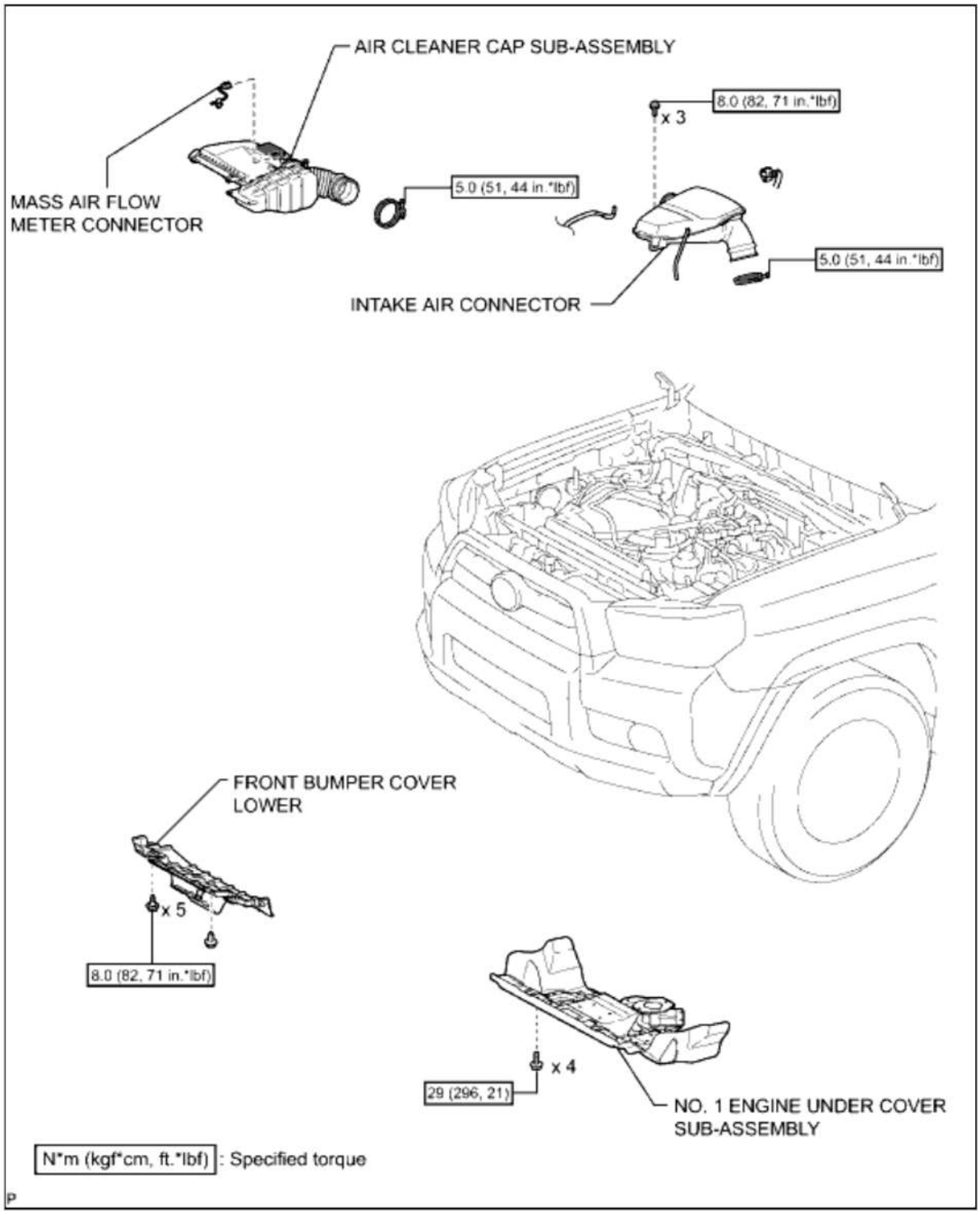


cardiagn.com

Last Modified: 5-10-2010	6.4 K	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000000YMZ00JX
Title: 2TR-FE ENGINE MECHANICAL: CAMSHAFT: COMPONENTS (2010 4Runner)		

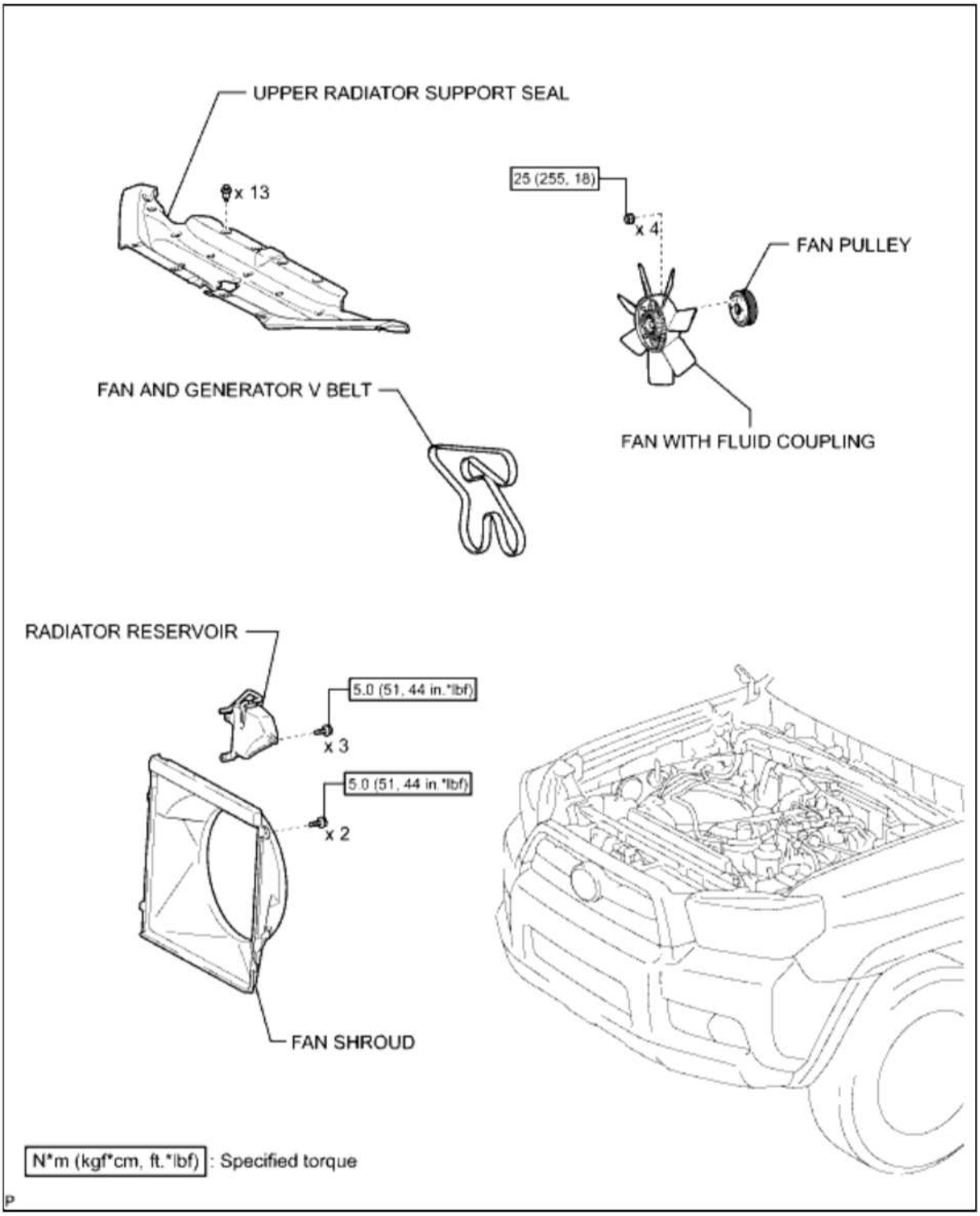
COMPONENTS

ILLUSTRATION



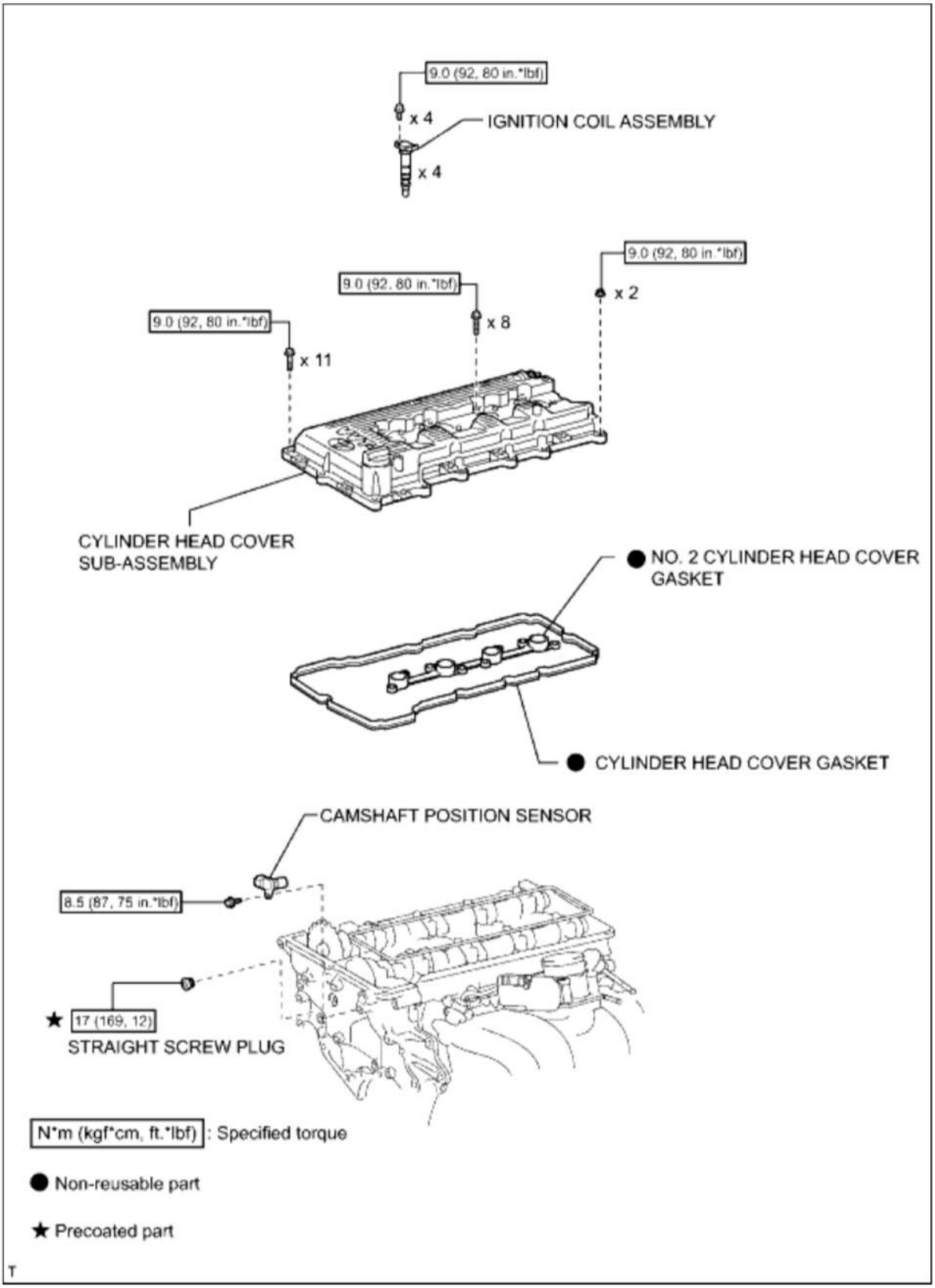
cardiagn.com

ILLUSTRATION



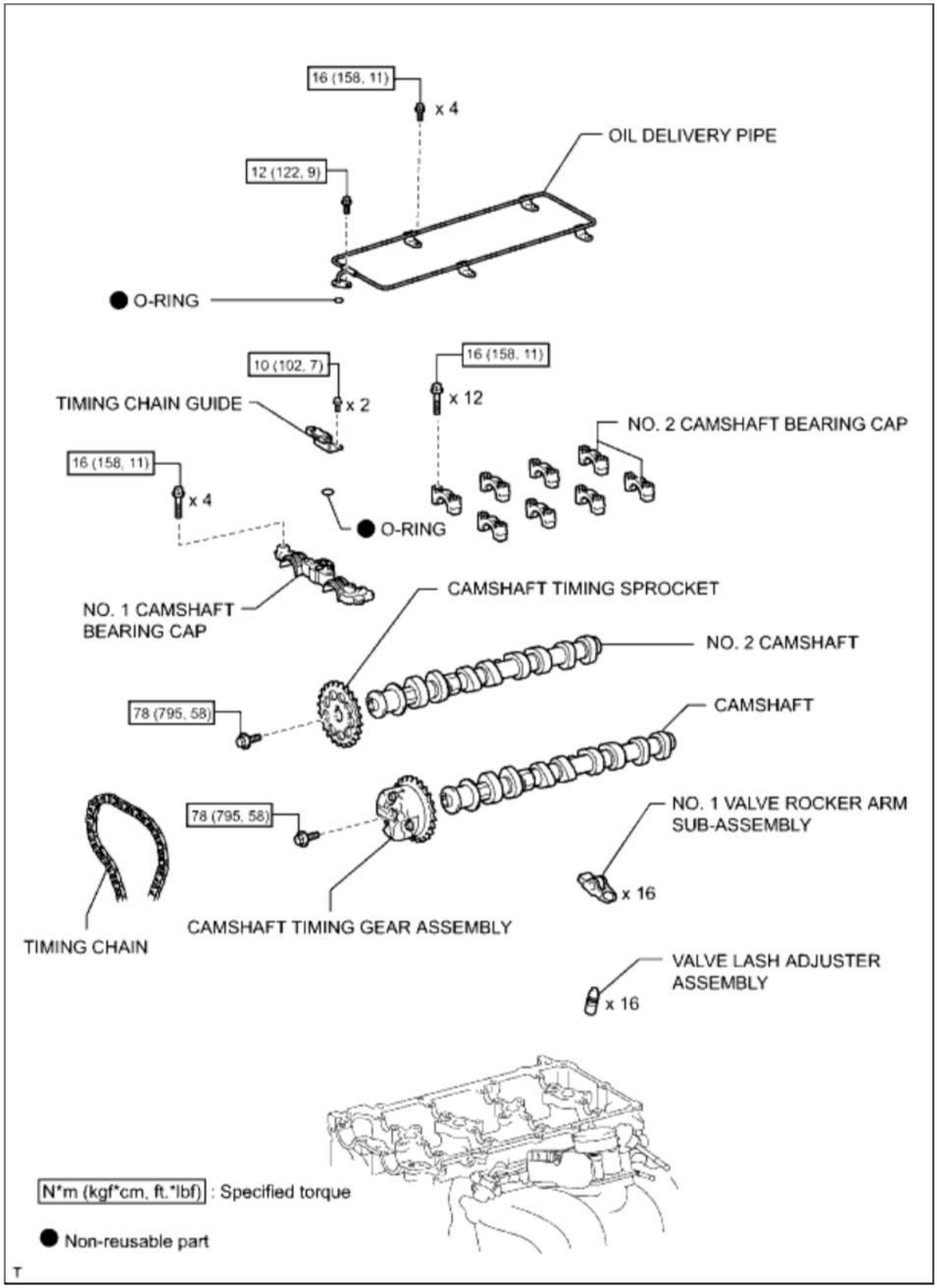
ILLUSTRATION

cardiagn.com



ILLUSTRATION

cardiagn.com



cardiagn.com

Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000000YN000JX
Title: 2TR-FE ENGINE MECHANICAL: CAMSHAFT: REMOVAL (2010 4Runner)		

REMOVAL

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

NOTICE:

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

2. REMOVE FRONT BUMPER COVER LOWER INFO

3. REMOVE NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY INFO

4. REMOVE UPPER RADIATOR SUPPORT SEAL INFO

5. DRAIN ENGINE OIL INFO

6. REMOVE AIR CLEANER CAP SUB-ASSEMBLY INFO

7. REMOVE INTAKE AIR CONNECTOR INFO

8. REMOVE RADIATOR RESERVOIR INFO

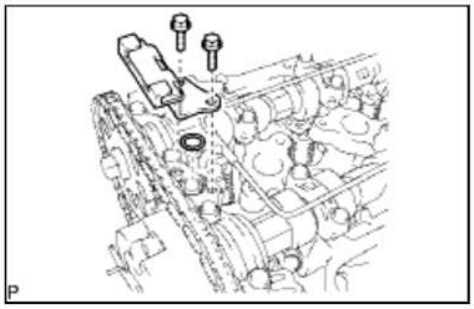
9. REMOVE FAN SHROUD INFO

10. REMOVE IGNITION COIL ASSEMBLY INFO

11. REMOVE CAMSHAFT POSITION SENSOR INFO

12. REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY INFO

13. REMOVE TIMING CHAIN GUIDE

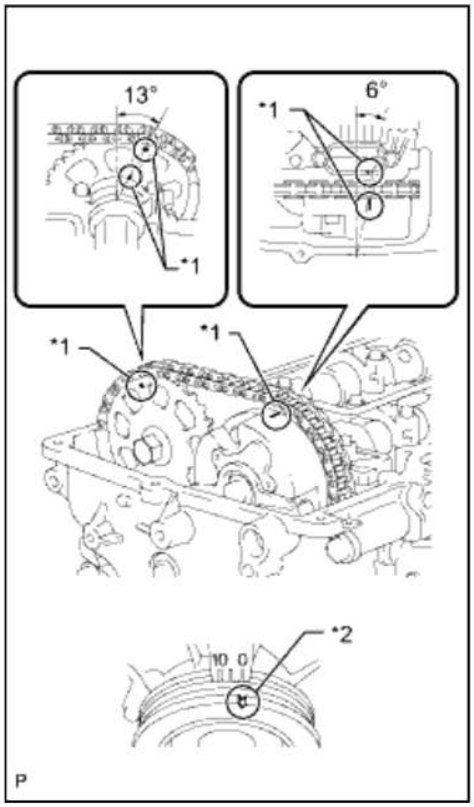


(a) Remove the 2 bolts, chain guide and O-ring.

14. REMOVE CAMSHAFT TIMING SPROCKET

(a) Turn the crankshaft pulley, and align its groove with the "0" timing mark of the timing chain cover.

cardiagn.com



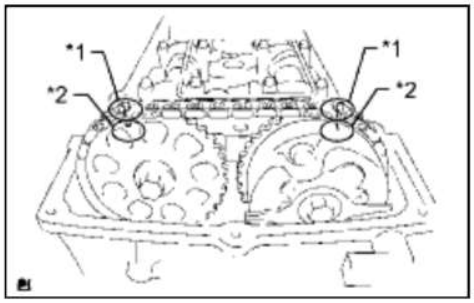
(b) Check that the timing marks of the camshaft timing gear and sprocket are aligned with the timing marks of the No. 1 bearing cap as shown in the illustration.

Text in Illustration

*1	Timing Mark
*2	Groove

HINT:

If the timing marks do not align, rotate the crankshaft clockwise again and align the timing marks.



(c) Place paint marks on the timing chain, camshaft timing gear and sprocket.

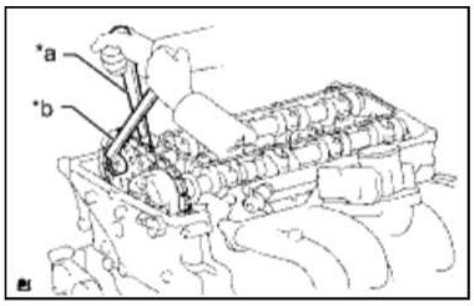
Text in Illustration

*1	Paint Mark
*2	Timing Mark

(d) Hold the camshaft with a wrench and loosen the sprocket

cardiagn.com

bolt.

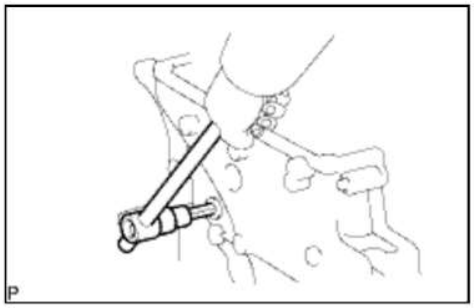


Text in Illustration

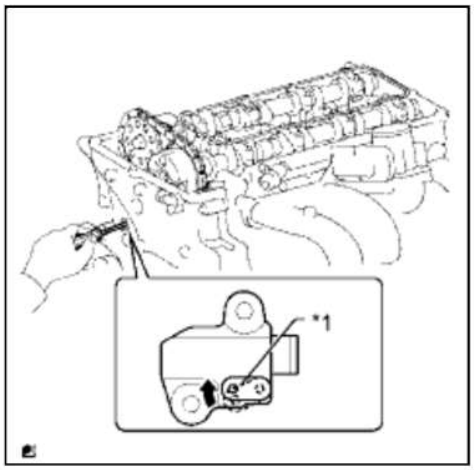
*a	Hold
*b	Loosen

NOTICE:

Be careful not to damage the oil delivery pipe.



(e) Using a 10 mm socket hexagon wrench, remove the straight screw plug.



(f) Using a screwdriver, access the tensioner stopper plate through the chain tensioner service hole. Move the stopper plate upward to release the lock. Then hold the plate in that position as shown in the illustration.

Text in Illustration

*1	Stopper Plate

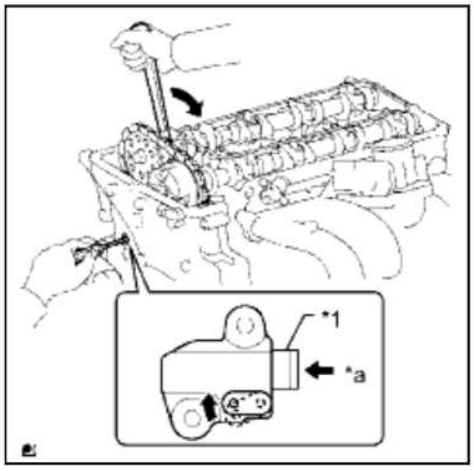
HINT:

If the lock of the stopper plate is difficult to release, slightly rotate the hexagonal part of the camshaft to the left and right.

(g) With the lock of the stopper plate released, slightly rotate the camshaft clockwise and keep it in that position.

Text in Illustration

cardiagn.com



*1	Plunger
*a	Push

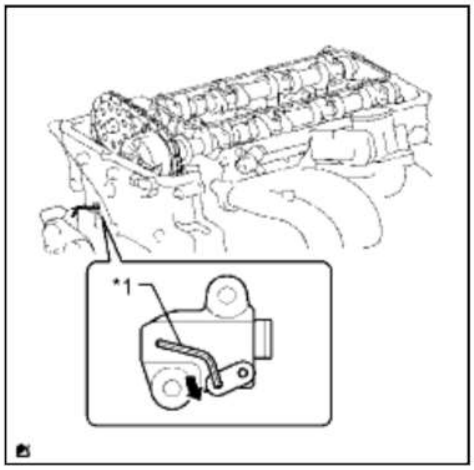
HINT:

Rotating the camshaft clockwise will cause pressure to be applied to the tensioner plunger.

NOTICE:

Be careful not to damage the oil delivery pipe.

(h) Remove the screwdriver from the chain tensioner service hole. Move the stopper plate to the position shown in the illustration. Then insert a hexagon wrench into the hole.

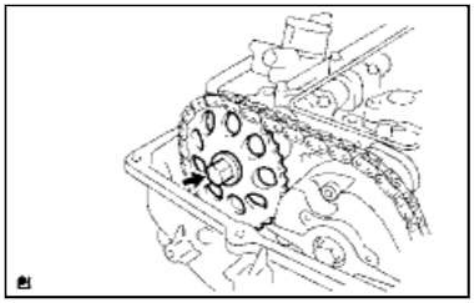


Text in Illustration

*1	Hexagon Wrench

HINT:

- If the wrench cannot fit into the hole, slightly rotate the camshaft counterclockwise and then clockwise. Then insert the wrench.
- To prevent the wrench from falling out, use tape to fix the wrench in place.

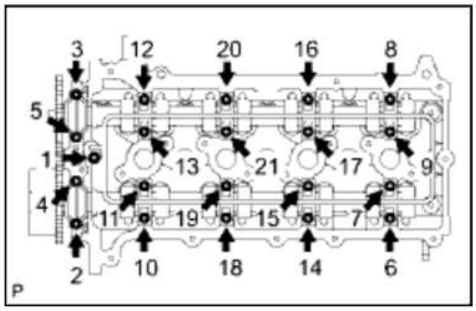


(i) Remove the camshaft timing sprocket from the No. 2 camshaft.

15. REMOVE CAMSHAFT

(a) Uniformly loosen the 21 bearing cap bolts in several

cardiagn.com

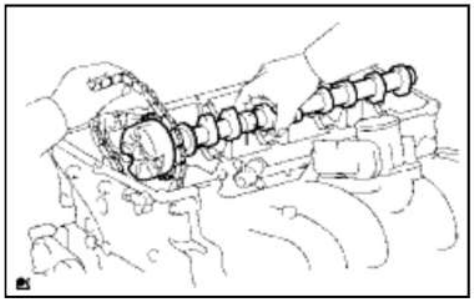


passes in the sequence shown in the illustration.

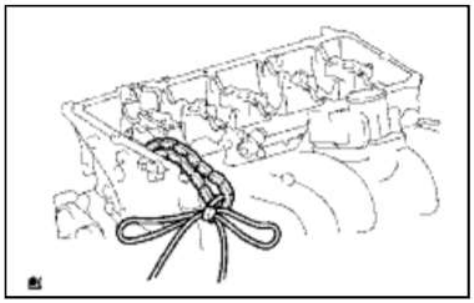
(b) Remove the 9 bearing caps, oil delivery pipe, O-ring and No. 2 camshaft.

NOTICE:

- Uniformly loosen the bolts while keeping the camshaft level.
- Do not pry the camshaft with a tool or apply excessive force to it.



(c) Remove the camshaft while holding the timing chain.



(d) Secure the timing chain with a string as shown in the illustration.

NOTICE:

Be careful not to drop anything inside the timing chain cover.

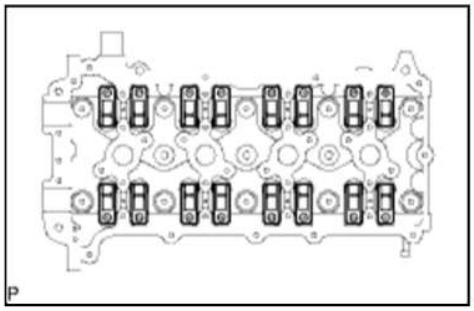
16. REMOVE NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY

(a) Remove the 16 valve rocker arms from the cylinder head.

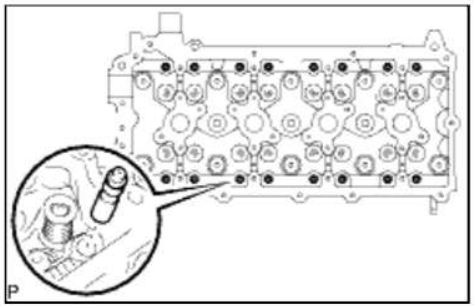
HINT:

Arrange the removed parts in the correct order.

cardiagn.com



17. REMOVE VALVE LASH ADJUSTER ASSEMBLY



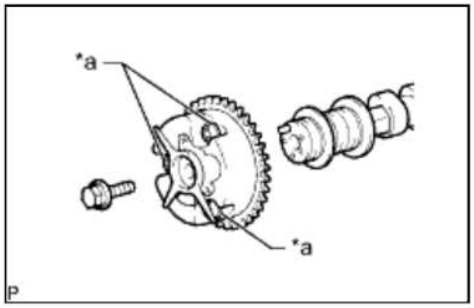
(a) Remove the 16 valve lash adjusters from the cylinder head.

HINT:

Arrange the removed parts in the correct order.

18. REMOVE CAMSHAFT TIMING GEAR ASSEMBLY

(a) Remove the flange bolt and camshaft timing gear.



Text in Illustration

*a	Do not remove

NOTICE:

- Be sure not to remove the other 3 bolts.
- If planning to reuse the gear, be sure to release the straight pin lock before installing the gear.

19. INSPECT VALVE LASH ADJUSTER ASSEMBLY INFO

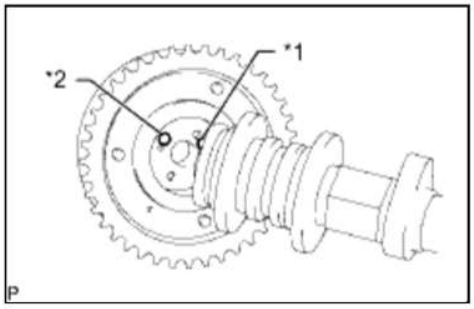
20. INSPECT CAMSHAFT TIMING GEAR ASSEMBLY INFO

cardiagn.com

Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000000YMY00JX
Title: 2TR-FE ENGINE MECHANICAL: CAMSHAFT: INSTALLATION (2010 4Runner)		

INSTALLATION

1. INSTALL CAMSHAFT TIMING GEAR ASSEMBLY



(a) Align the pin hole and straight pin and install the camshaft timing gear to the camshaft.

Text in Illustration

*1	Straight Pin
*2	Pin Hole

(b) Lightly press the gear against the camshaft and turn the gear. Push further at the position where the pin enters the groove.

(c) Check that there is no gap between the flange of the gear and the camshaft.

(d) With the camshaft timing gear fixed in place, install the flange bolt.

Torque: 78 N·m (795 kgf·cm, 58ft·lbf)

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

2. INSTALL VALVE LASH ADJUSTER ASSEMBLY

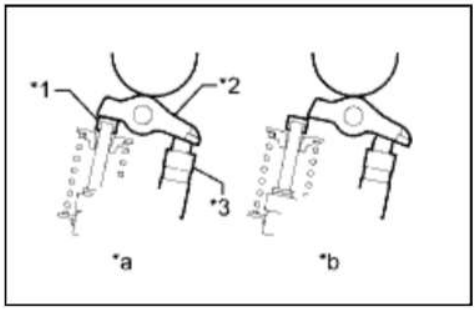
(a) Inspect each valve lash adjuster before installing it INFO .

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

NOTICE:

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

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



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

Text in Illustration

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

cardiagn.com

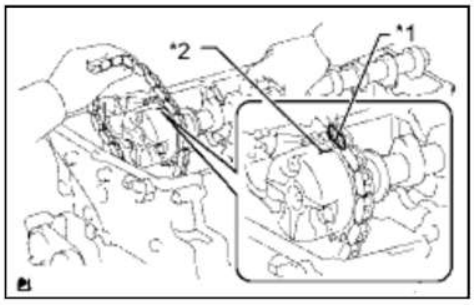
*a	CORRECT
*b	INCORRECT

(b) Install the 16 valve rocker arms as shown in the illustration.

NOTICE:

Install each valve rocker arm to the same place it was removed from.

4. INSTALL CAMSHAFT



(a) Apply clean engine oil to the camshaft cams and cylinder head journals.

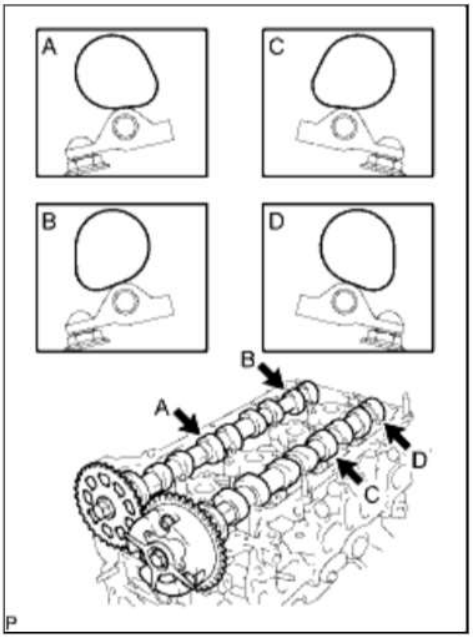
(b) Install the timing chain to the camshaft timing gear with the painted mark of the link aligned with the timing mark of the camshaft timing gear.

Text in Illustration

*1	Paint Mark
*2	Timing Mark

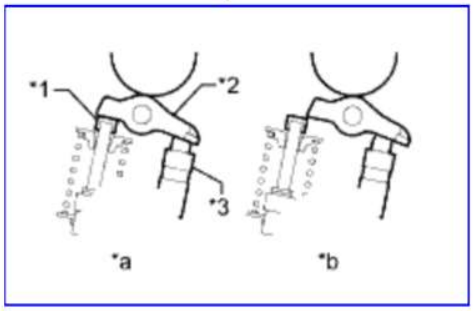
(c) Position the 2 camshafts as shown in the illustration.

cardiagn.com



NOTICE:

- Align the paint mark and timing mark before positioning the camshaft.
- Before and after positioning the camshaft and No. 2 camshaft, check that the rocker arm is firmly set on the lash adjuster.

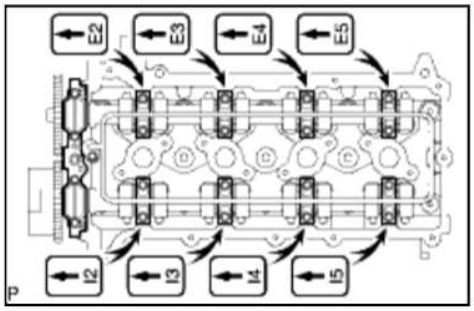


Text in Illustration

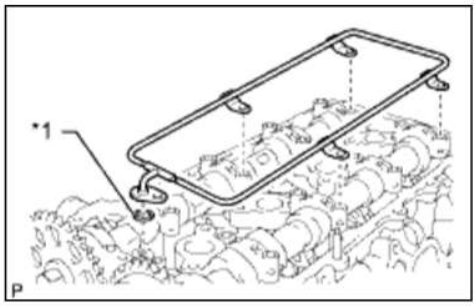
*1	Valve Stem Cap
*2	Valve Rocker Arm
*3	Valve Lash Adjuster
*a	CORRECT
*b	INCORRECT

(d) Temporarily install the No. 1 camshaft bearing cap.

cardiagn.com



(e) Check the proper location of each camshaft bearing cap and install each one.

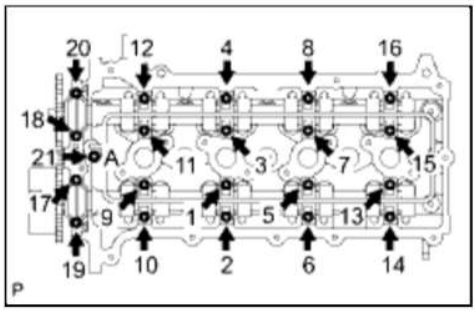


(f) Install a new O-ring to the No. 1 camshaft bearing cap.

Text in Illustration

*1	New O-Ring

(g) Temporarily install the oil delivery pipe.



(h) Install the 21 bolts and tighten them in the order shown in the illustration.

for bolt A - Torque: 12 N·m (122 kgf·cm, 9ft·lbf)
except bolt A - Torque: 16 N·m (158 kgf·cm, 11ft·lbf)

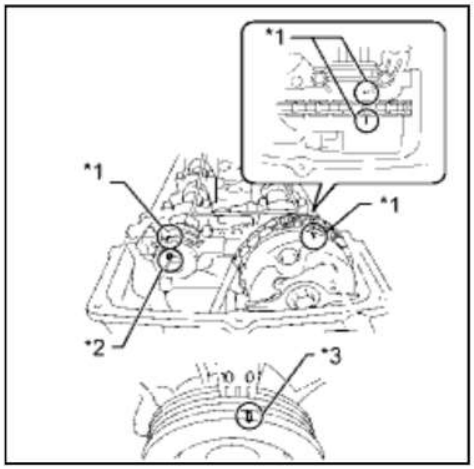
5. INSTALL CAMSHAFT TIMING SPROCKET

(a) Rotate the camshaft so that the camshaft timing mark and No. 2 camshaft knock pin are as shown in the illustration.

Text in Illustration

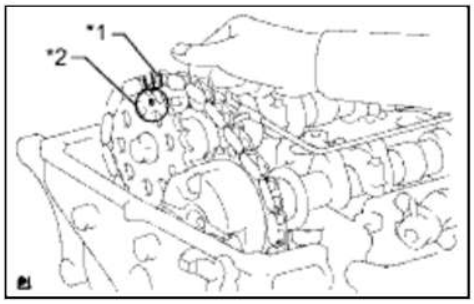
*1	Timing Mark
*2	Knock Pin

cardiagn.com



*3	Groove

(b) Turn the crankshaft pulley and align its groove with the "0" timing mark of the timing chain cover.



(c) Install the timing chain to the camshaft timing sprocket with the paint mark aligned with the timing marks on the camshaft timing sprocket.

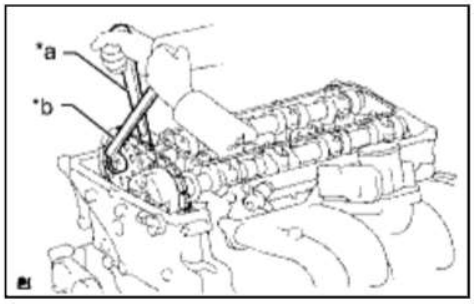
Text in Illustration

*1	Paint Mark
*2	Timing Mark

(d) Align the No. 2 camshaft knock pin and camshaft timing sprocket pin hole. Then install the camshaft timing sprocket to the No. 2 camshaft.

NOTICE:

If the knock pin and pin hole are difficult to align, slightly rotate the No. 2 camshaft back and forth using the hexagonal part of the camshaft. Then attempt alignment again.



(e) Hold the camshaft with a wrench and tighten the sprocket bolt.

Torque: 78 N·m (795 kgf·cm, 58ft·lbf)

Text in Illustration

*a	Hold
*b	Tighten

(f) Remove the hexagon wrench from the chain tensioner.

(g) Apply adhesive to 2 or 3 threads of the straight screw plug.

cardiagn.com

Adhesive:
Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

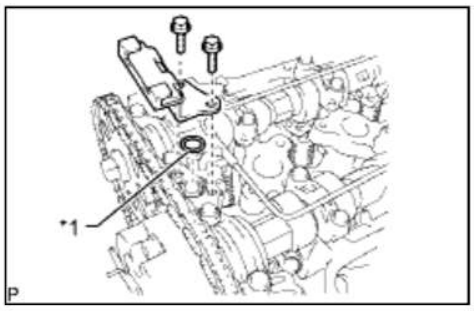
NOTICE:

Remove any oil from the bolt hole.

(h) Using a 10 mm socket hexagon wrench, install the straight screw plug.

Torque: 17 N·m (169 kgf·cm, 12ft·lbf)

6. INSTALL TIMING CHAIN GUIDE



(a) Install a new O-ring to the camshaft bearing cap.

Text in Illustration

*1	New O-Ring

(b) Install the timing chain guide with the 2 bolts.

Torque: 10 N·m (102 kgf·cm, 7ft·lbf)

7. INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY INFO

8. INSTALL CAMSHAFT POSITION SENSOR INFO

9. INSTALL IGNITION COIL ASSEMBLY INFO

10. INSTALL FAN SHROUD INFO

11. INSTALL RADIATOR RESERVOIR INFO

12. INSTALL INTAKE AIR CONNECTOR INFO

13. INSTALL AIR CLEANER CAP SUB-ASSEMBLY INFO

14. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

NOTICE:

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

15. ADD ENGINE OIL INFO

16. INSPECT ENGINE OIL LEVEL INFO

17. INSPECT FOR OIL LEAK INFO

18. INSPECT IGNITION TIMING INFO

19. INSPECT ENGINE IDLE SPEED INFO

cardiagn.com

20. INSTALL UPPER RADIATOR SUPPORT SEAL INFO

21. INSTALL NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY INFO

22. INSTALL FRONT BUMPER COVER LOWER INFO

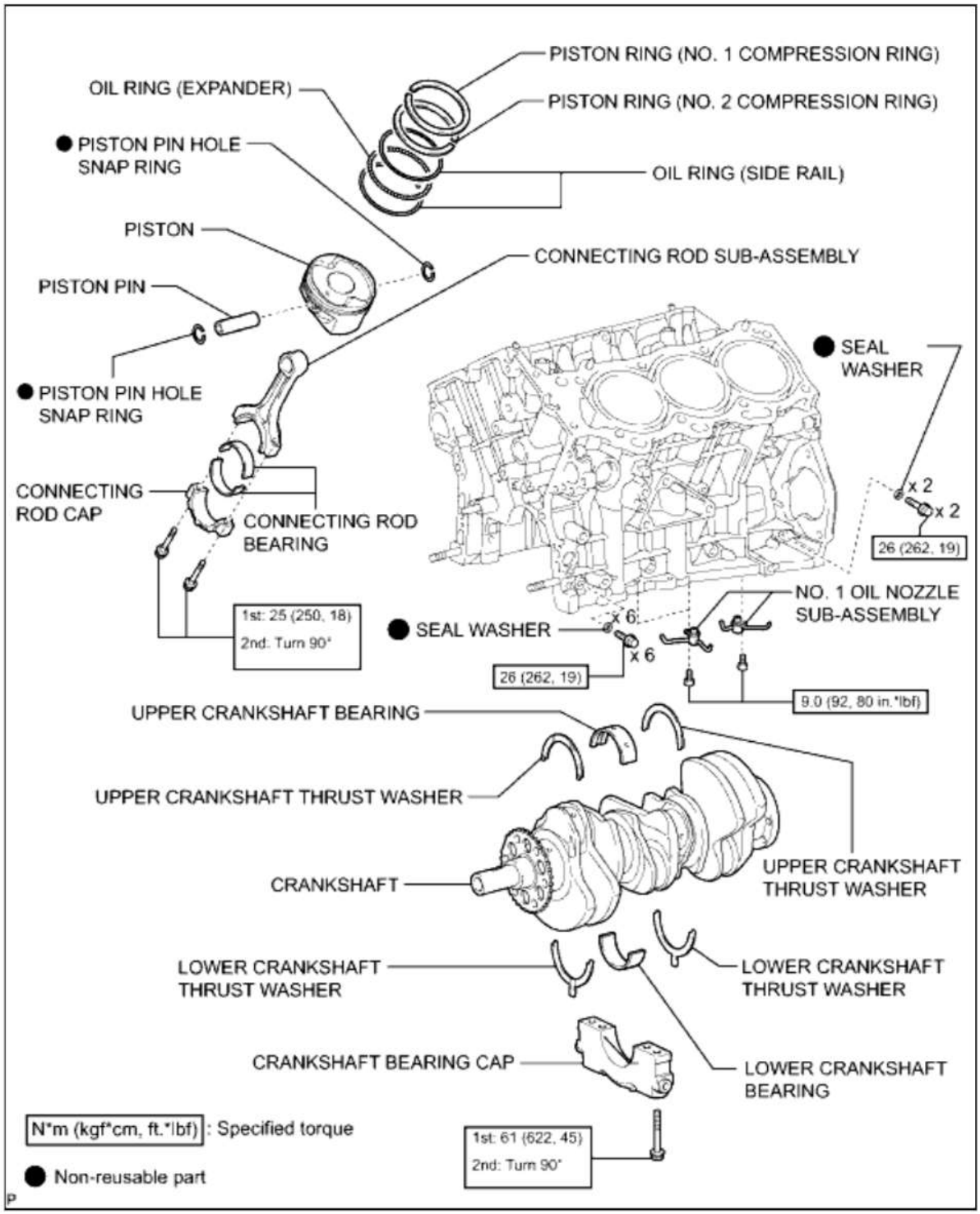


cardiagn.com

Last Modified: 5-10-2010	6.4 K	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000002YD2009X
Title: 1GR-FE ENGINE MECHANICAL: CYLINDER BLOCK: COMPONENTS (2010 4Runner)		

COMPONENTS

ILLUSTRATION



cardiagn.com

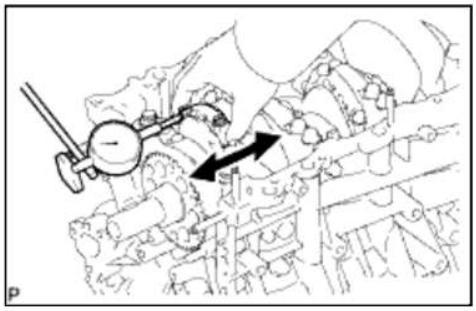


cardiagn.com

Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000002BK5016X
Title: 1GR-FE ENGINE MECHANICAL: CYLINDER BLOCK: DISASSEMBLY (2010 4Runner)		

DISASSEMBLY

1. INSPECT CONNECTING ROD THRUST CLEARANCE



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

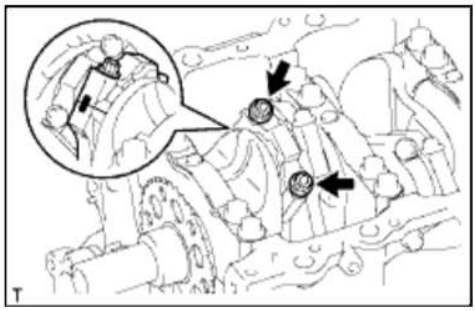
Standard thrust clearance:
0.15 to 0.30 mm (0.00591 to 0.0118 in.)
Maximum thrust clearance:
0.35 mm (0.0138 in.)

If the thrust clearance is more than the maximum, replace one or more connecting rods as necessary.

Standard connecting rod thickness:
20.80 to 20.85 mm (0.819 to 0.821 in.)

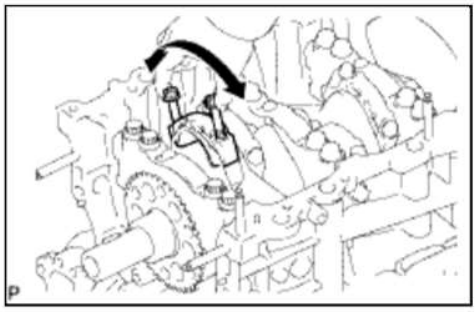
If necessary, replace the crankshaft.

2. INSPECT CONNECTING ROD OIL CLEARANCE



(a) Check the matchmarks on the connecting rod and cap to ensure correct reassembly.

(b) Remove the 2 connecting rod cap bolts.



(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.

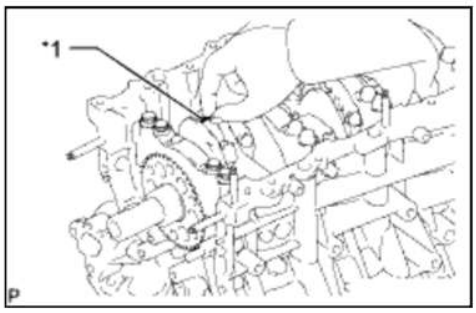
HINT:

Keep the lower bearing and connecting rod cap together.

cardiagn.com

(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.



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

Text in Illustration

*1	Plastigage

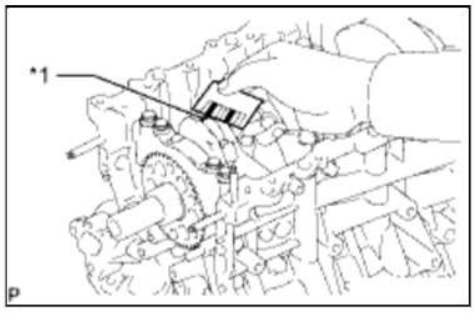
(g) Install the connecting rod cap INFO .

NOTICE:

Do not turn the crankshaft.

(h) Remove the 2 bolts, connecting rod cap and lower bearing.

(i) Measure the Plastigage at its widest point.



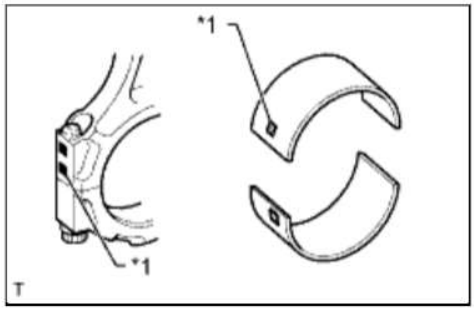
Standard oil clearance:
0.040 to 0.066 mm (0.00157 to 0.00260 in.)
Maximum oil clearance:
0.086 mm (0.00339 in.)

Text in Illustration

*1	Plastigage

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

cardiagn.com



HINT:

If replacing a bearing, replace it with one that has the same number as the number marked on the connecting rod. There are 4 sizes of standard bearings, marked "1", "2", "3" and "4" accordingly.

Connecting Rod Diameter:

ITEM	SPECIFIED CONDITION
Mark 1	59.000 to 59.006 mm (2.32283 to 2.32307 in.)
Mark 2	59.007 to 59.012 mm (2.32311 to 2.32330 in.)
Mark 3	59.013 to 59.018 mm (2.32334 to 2.32354 in.)
Mark 4	59.019 to 59.024 mm (2.32358 to 2.32377 in.)

Standard Bearing Center Wall Thickness:

ITEM	SPECIFIED CONDITION
Mark 1	1.484 to 1.487 mm (0.05843 to 0.05854 in.)
Mark 2	1.487 to 1.490 mm (0.05854 to 0.05866 in.)
Mark 3	1.490 to 1.493 mm (0.05866 to 0.05878 in.)
Mark 4	1.493 to 1.496 mm (0.05878 to 0.05900 in.)

Standard crankshaft pin diameter:
55.992 to 56.000 mm (2.2044 to 2.2047 in.)

Text in Illustration

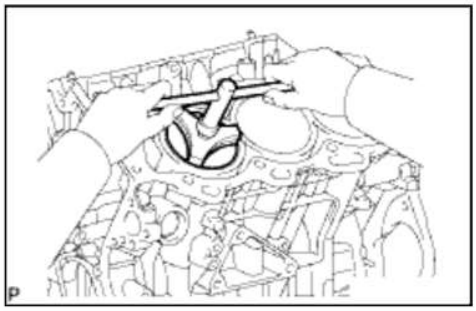
*1	Number Mark

(j) Completely remove the Plastigage.

3. REMOVE PISTON SUB-ASSEMBLY WITH CONNECTING ROD

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

cardiagn.com



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

HINT:

- Keep the bearings, connecting rod and cap together.
- Arrange the piston and connecting rod assemblies in the correct order.

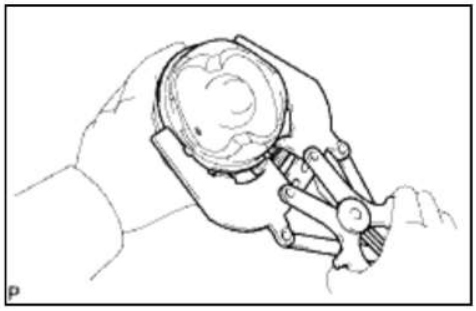
4. REMOVE CONNECTING ROD BEARING

(a) Remove the connecting rod bearings from the connecting rods and connecting rod caps.

HINT:

Arrange the removed parts in the correct order.

5. REMOVE PISTON RING SET



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

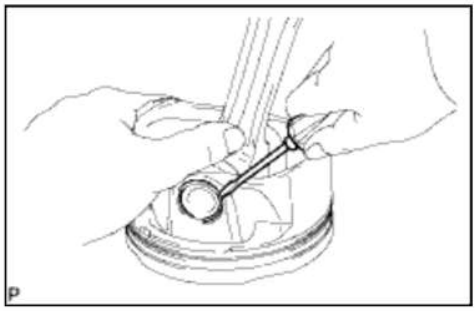
(b) Remove the 2 side rails and oil ring (expander) by hand.

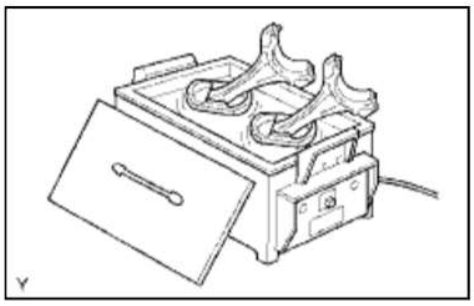
6. REMOVE PISTON WITH PIN SUB-ASSEMBLY

(a) Disconnect the connecting rod from the piston.

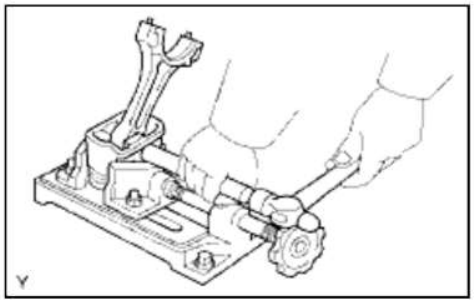
(1) Using a screwdriver, pry out the 2 snap rings.

cardiagn.com





(2) Gradually heat the piston to approximately 80°C (176°F).

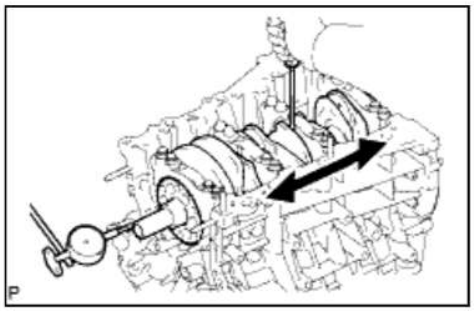


(3) Using a plastic-faced hammer and brass bar, lightly tap out the piston pin and remove the connecting rod.

HINT:

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

7. INSPECT CRANKSHAFT THRUST CLEARANCE



(a) Using a dial indicator, measure the thrust clearance while prying the crankshaft back and forth with a screwdriver.

Standard thrust clearance:
0.04 to 0.24 mm (0.00157 to 0.00945 in.)
Maximum thrust clearance:
0.30 mm (0.0118 in.)

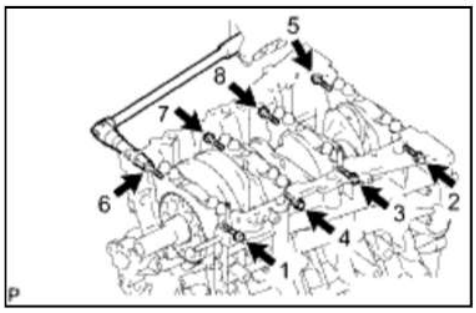
If the thrust clearance is more than the maximum, replace the thrust washers as a set.

Standard thrust washer thickness:
1.93 to 1.98 mm (0.0760 to 0.0780 in.)

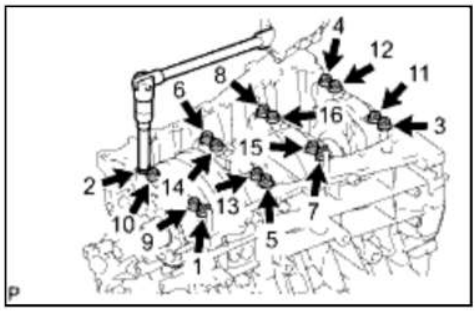
If necessary, replace the crankshaft.

cardiagn.com

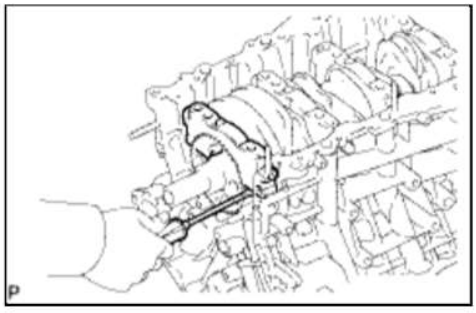
8. INSPECT CRANKSHAFT OIL CLEARANCE



(a) Uniformly loosen and remove the 8 bearing cap bolts and 8 seal washers in several steps in the sequence shown in the illustration.



(b) Uniformly loosen and remove the 16 bearing cap bolts in several steps in the sequence shown in the illustration.



(c) Using a screwdriver, pry out the bearing caps. Remove the 4 bearing caps and lower bearings.

NOTICE:

- Push up on the cap little by little, alternating between the right and left side until the cap can be removed.
- Be careful not to damage the joint surfaces of the cylinder block or bearing cap.

(d) Remove the 2 lower crankshaft thrust washers.

HINT:

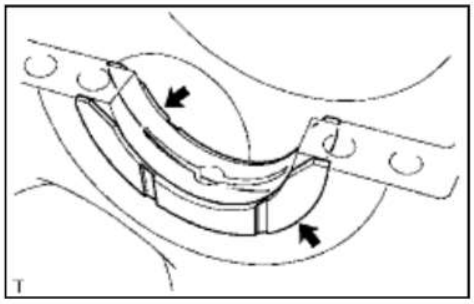
- Keep the lower bearing and crankshaft bearing cap together.
- Arrange the removed parts in the correct order.
- Be sure to arrange the bearing caps and lower thrust washers in such a way that they can be reinstalled exactly as before.

(e) Lift out the crankshaft.

(f) Remove the 2 upper thrust washers.

HINT:

cardiagn.com



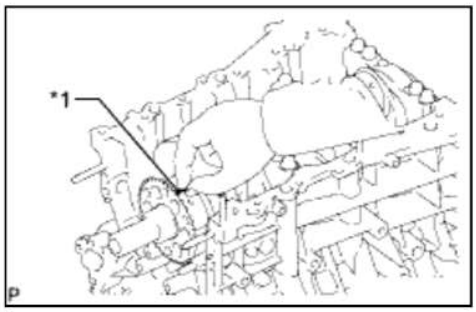
- Be sure to arrange the removed upper thrust washers in such a way that they can be reinstalled exactly as before.
- Keep the upper bearings together with the cylinder block.

(g) Clean each crankshaft journal and bearing.

(h) 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.

(i) Place the crankshaft on the cylinder block.



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

Text in Illustration

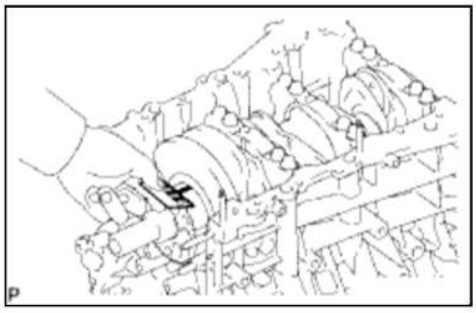
*1	Plastigage

(k) Install the crankshaft bearing cap INFO .

NOTICE:

Do not turn the crankshaft.

(l) Remove the crankshaft bearing cap.



(m) Measure the Plastigage at its widest point.

Standard oil clearance:
0.026 to 0.046 mm (0.00102 to 0.00181 in.)
Maximum clearance:
0.080 mm (0.00315 in.)

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

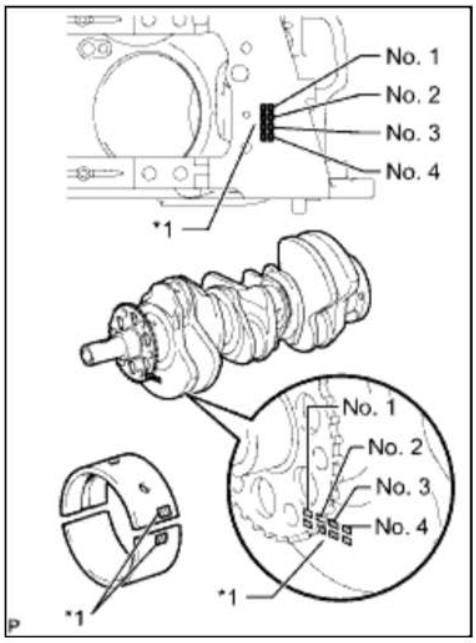
(n) If replacing a bearing, replace it with one that has the same number. If the number of the bearing cannot be determined, select the correct bearing by adding together

cardiagn.com

the numbers imprinted on the cylinder block and crankshaft, and then refer to the table below for the appropriate bearing number. There are 5 sizes of standard bearings, marked "1", "2", "3", "4" and "5" accordingly.

New Bearing:

ITEM	SPECIFIED CONDITION				
Cylinder block main journal bore diameter (A) + Crankshaft main journal diameter (B)	0 to 5	6 to 11	12 to 17	18 to 23	24 to 28
Use bearing	1	2	3	4	5



Text in Illustration

*1	Number Mark

EXAMPLE:

Cylinder block "11" (A) + Crankshaft "06" (B) = Total number 17 (Use bearing "3")

Cylinder Block Main Journal Bore Diameter (A):

MARK	SPECIFIED CONDITION
Mark 00	77.000 mm (3.03149 in.)
Mark 01	77.001 mm (3.03152 in.)
Mark 02	77.002 mm (3.03156 in.)
Mark 03	77.003 mm (3.03160 in.)
Mark 04	77.004 mm (3.03164 in.)
Mark 05	77.005 mm (3.03168 in.)
Mark 06	77.006 mm (3.03172 in.)
Mark 07	77.007 mm (3.03176 in.)
Mark 08	77.008 mm (3.03180 in.)
Mark 09	77.009 mm (3.03184 in.)
Mark 10	77.010 mm (3.03188 in.)
Mark 11	77.011 mm (3.03192 in.)
Mark 12	77.012 mm (3.03196 in.)

cardiagn.com

Mark 13	77.013 mm (3.03200 in.)
Mark 14	77.014 mm (3.03204 in.)
Mark 15	77.015 mm (3.03208 in.)
Mark 16	77.016 mm (3.03211 in.)

Crankshaft Main Journal Diameter (B):

ITEM	SPECIFIED CONDITION
Mark 00	71.999 to 72.000 mm (2.83460 to 2.83464 in.)
Mark 01	71.998 to 71.999 mm (2.83456 to 2.83460 in.)
Mark 02	71.997 to 71.998 mm (2.83452 to 2.83456 in.)
Mark 03	71.996 to 71.997 mm (2.83448 to 2.83452 in.)
Mark 04	71.995 to 71.996 mm (2.83440 to 2.83448 in.)
Mark 05	71.994 to 71.995 mm (2.83440 to 2.83444 in.)
Mark 06	71.993 to 71.994 mm (2.83436 to 2.83440 in.)
Mark 07	71.992 to 71.993 mm (2.83432 to 2.83436 in.)
Mark 08	71.991 to 71.992 mm (2.83428 to 2.83432 in.)
Mark 09	71.990 to 71.991 mm (2.83424 to 2.83428 in.)
Mark 10	71.989 to 71.990 mm (2.83420 to 2.83424 in.)
Mark 11	71.988 to 71.989 mm (2.83416 to 2.83420 in.)

Standard Bearing Center Wall Thickness:

ITEM	SPECIFIED CONDITION
Mark 1	2.488 to 2.491 mm (0.0980 to 0.0981 in.)
Mark 2	2.491 to 2.494 mm (0.0981 to 0.0982 in.)
Mark 3	2.494 to 2.497 mm (0.0982 to 0.0983 in.)
Mark 4	2.497 to 2.500 mm (0.0983 to 0.0984 in.)
Mark 5	2.500 to 2.503 mm (0.0984 to 0.0985 in.)

(o) Completely remove the Plastigage.

9. REMOVE CRANKSHAFT

(a) Lift out the crankshaft.

(b) Remove the 2 upper thrust washers.

10. REMOVE CRANKSHAFT BEARING

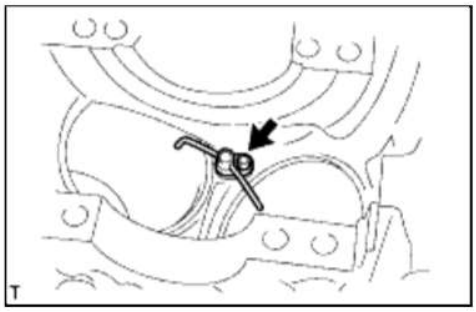
cardiagn.com

(a) Remove the crankshaft bearings from the bearing caps and cylinder block.

HINT:

Arrange the removed parts in the correct order.

11. REMOVE NO. 1 OIL NOZZLE SUB-ASSEMBLY



(a) Using a 5 mm hexagon socket wrench, remove the 3 bolts and 3 oil nozzles.

12. REMOVE STUD BOLT

NOTICE:

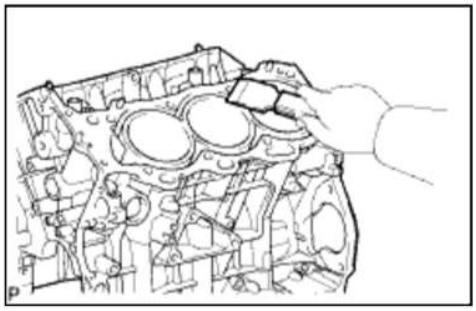
If a stud bolt is deformed or its threads are damaged, replace it.

cardiagn.com

Last Modified: 5-10-2010	6.4 G	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000002BK301DX
Title: 1GR-FE ENGINE MECHANICAL: CYLINDER BLOCK: INSPECTION (2010 4Runner)		

INSPECTION

1. CLEAN CYLINDER BLOCK SUB-ASSEMBLY



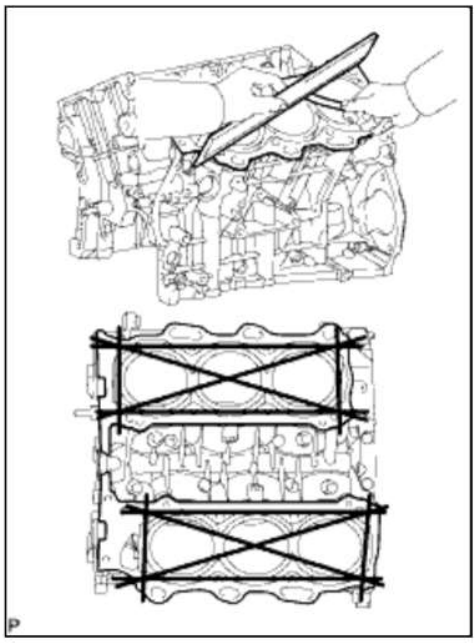
(a) Using a gasket scraper, remove all the gasket material from the top surface of the cylinder block.

(b) Using a soft brush and solvent, thoroughly clean the cylinder block.

NOTICE:

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

2. INSPECT CYLINDER BLOCK FOR WARPAGE



(a) Using a precision straightedge and feeler gauge, measure the warpage of the surfaces which contact the cylinder head gaskets.

Maximum warpage:
0.05 mm (0.00197 in.)

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

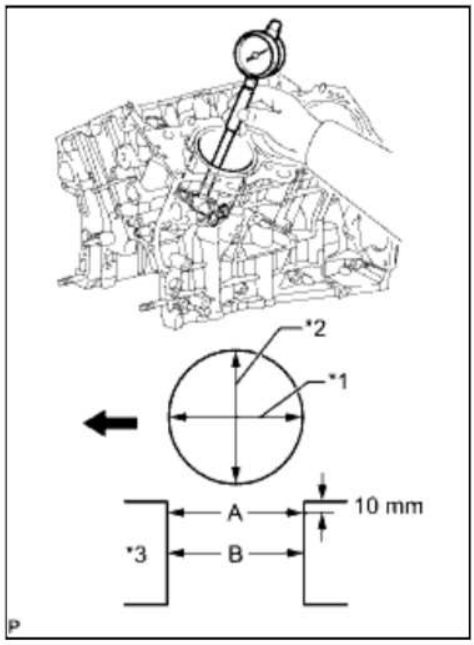
(b) Visually check the cylinder for vertical scratches. If deep scratches are present, rebore all 6 cylinders.

If necessary, replace the cylinder block.

cardiagn.com

3. INSPECT CYLINDER BORE

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



Standard diameter:
94.000 to 94.012 mm (3.7008 to 3.7013 in.)
Maximum diameter:
94.132 mm (3.7060 in.)
Measurement position (A):
10 mm (0.394 in.)

Text in Illustration

*1	Axial Direction
*2	Thrust Direction
*3	Center
➡	Engine Front

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

4. INSPECT RING GROOVE CLEARANCE

(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 0.06 mm (0.000787 to 0.00236 in.)

If the clearance is not as specified, replace the piston with pin sub-assembly.

cardiagn.com

5. INSPECT PISTON RING END GAP

(a) Insert the piston ring into the cylinder bore.

(b) Using a piston, push the piston ring a little beyond the bottom of the ring travel, 110 mm (4.33 in.) from the top of the cylinder block.

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

Standard End Gap:

ITEM	SPECIFIED CONDITION
No. 1 compression ring	0.22 to 0.32 mm (0.00866 to 0.0126 in.)
No. 2 compression ring	0.35 to 0.45 mm (0.0138 to 0.0177 in.)
Oil Ring (Side Rail)	0.10 to 0.40 mm (0.00394 to 0.0157 in.)

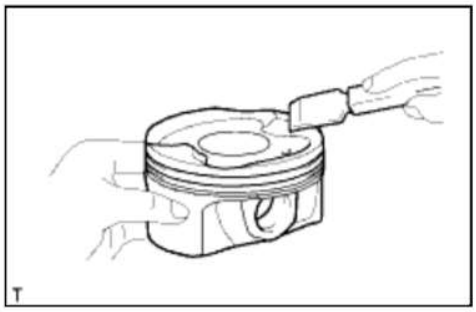
Maximum End Gap:

ITEM	SPECIFIED CONDITION
No. 1 compression ring	1.0 mm (0.0394 in.)
No. 2 compression ring	1.1 mm (0.0433 in.)
Oil Ring (Side Rail)	1.0 mm (0.0394 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, rebore all 6 cylinders or replace the cylinder block sub-assembly.

6. CLEAN PISTON WITH PIN SUB-ASSEMBLY

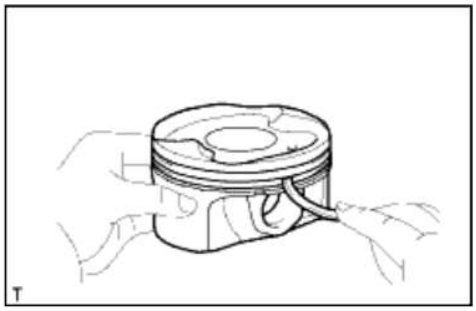
(a) Clean the piston.



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

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

cardiagn.com

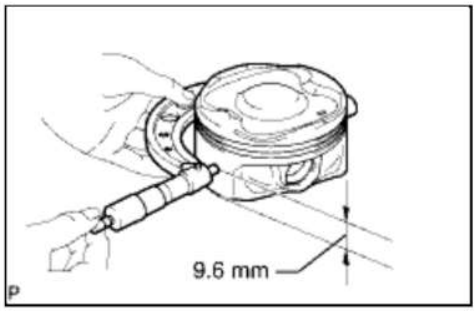


(3) Using solvent and a brush, thoroughly clean the piston.

NOTICE:

Do not use a wire brush.

7. INSPECT PISTON OIL CLEARANCE



(a) Using a micrometer, measure the piston diameter at a position that is 9.6 mm (0.378 in.) from the bottom of the piston (refer to the illustration).

Piston diameter:
93.961 to 93.991 mm (3.6992 to 3.7004 in.)

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

Standard oil clearance:
0.009 to 0.051 mm (0.000354 to 0.00201 in.)
Maximum oil clearance:
0.110 mm (0.00433 in.)

If the oil clearance is more than the maximum, replace all 6 pistons. If necessary, replace the cylinder block.

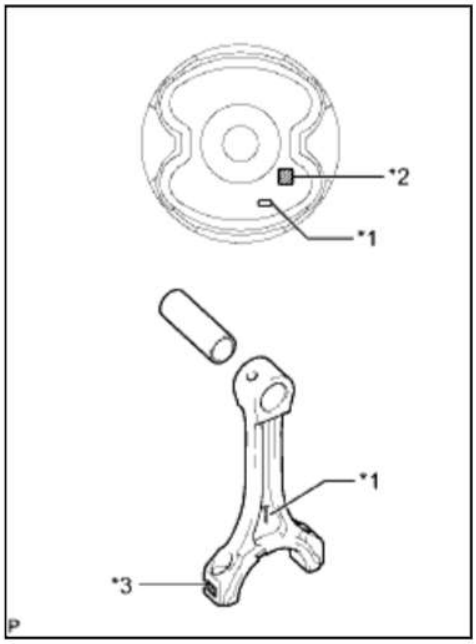
8. INSPECT PISTON PIN OIL CLEARANCE

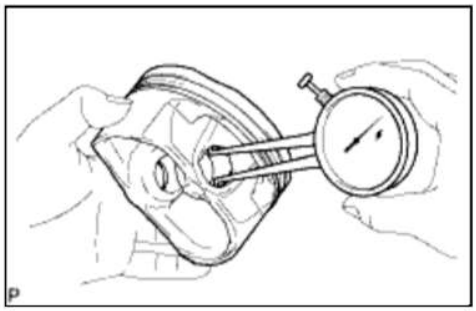
(a) Check each mark on the piston and connecting rod.

Text in Illustration

*1	Front Mark
*2	Position Pin Hole Inside Diameter Mark
*3	Connecting Rod Bush Inside Diameter Mark

cardiagn.com

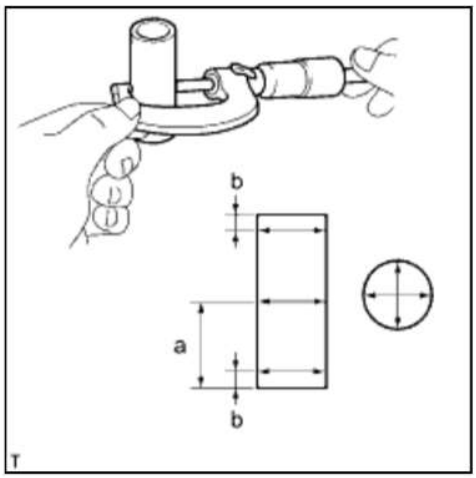




(b) Using a caliper gauge, measure the inside diameter of the piston pin hole.

Standard Piston Pin Hole Inside Diameter:

ITEM	SPECIFIED CONDITION
Mark A	22.001 to 22.004 mm (0.86618 to 0.86630 in.)
Mark B	22.005 to 22.007 mm (0.86634 to 0.86642 in.)
Mark C	22.008 to 22.010 mm (0.86645 to 0.86653 in.)



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

Measurement Position:

MEASUREMENT POSITION	PISTON PIN POSITION
a	28 mm (1.102 in.) from edge
b	5 mm (0.197 in.) from edge

Standard Piston Pin Diameter:

ITEM	SPECIFIED CONDITION
Mark A	21.997 to 22.000 mm (0.86602 to 0.86614 in.)
Mark B	22.001 to 22.003 mm (0.86618 to 0.86626 in.)

cardiagn.com

Mark C	22.004 to 22.006 mm (0.86630 to 0.86642 in.)

(d) Using a caliper gauge, measure the inside diameter of the connecting rod bush.

Standard Bush Inside Diameter:

ITEM	SPECIFIED CONDITION
Mark A	22.005 to 22.008 mm (0.86634 to 0.86645 in.)
Mark B	22.009 to 22.011 mm (0.86649 to 0.86657 in.)
Mark C	22.012 to 22.014 mm (0.86661 to 0.86669 in.)

(e) Subtract the piston pin diameter measurement from the piston pin hole diameter measurement.

Standard oil clearance:
0.001 to 0.007 mm (0.0000394 to 0.000276 in.)
Maximum oil clearance:
0.040 mm (0.00157 in.)

If the oil clearance is more than the maximum, replace the piston with pin sub-assembly.

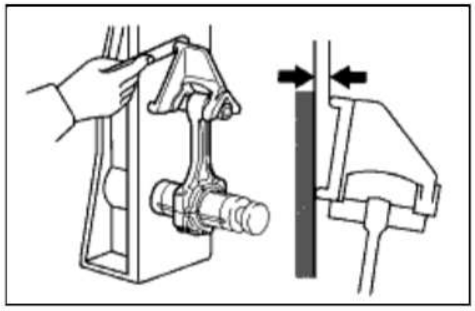
(f) Subtract the piston pin diameter measurement from the bush inside diameter measurement.

Standard oil clearance:
0.005 to 0.011 mm (0.000197 to 0.000433 in.)
Maximum oil clearance:
0.050 mm (0.00197 in.)

If the oil clearance is more than the maximum, replace the connecting rod sub-assembly. If necessary, replace the piston with pin sub-assembly.

9. INSPECT CONNECTING ROD SUB-ASSEMBLY

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

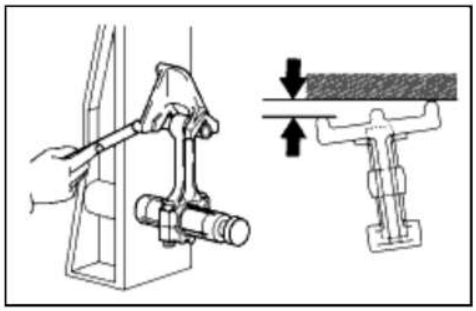


(1) Check for bend.

Maximum bend:
0.05 mm (0.00197 in.) per 100 mm (3.94 in.)

If the bend is more than the maximum, replace the connecting rod sub-assembly.

cardiagn.com



(2) Check for twist.

Maximum twist:
0.15 mm (0.00591 in.) per 100 mm (3.94 in.)

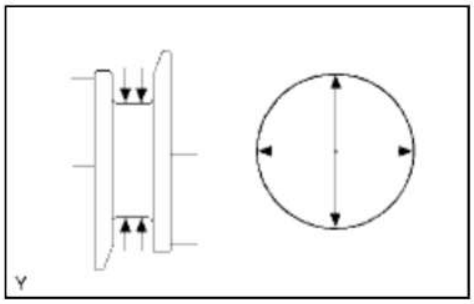
If the twist is more than the maximum, replace the connecting rod sub-assembly.

10. INSPECT CRANKSHAFT

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

Maximum circle runout:
0.06 mm (0.00236 in.)

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



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

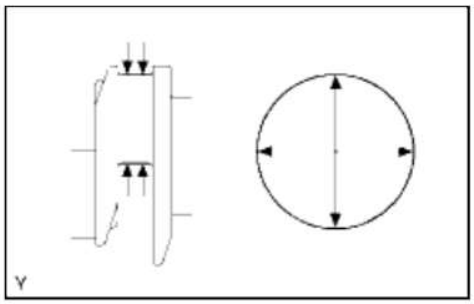
Standard diameter:
71.988 to 72.000 mm (2.8342 to 2.8346 in.)

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

(c) Check each main journal for taper and out-of-round as shown in the illustration.

Maximum taper and out-of-round:
0.02 mm (0.000787 in.)

If the taper and out-of-round is more than the maximum, replace the crankshaft.



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

Standard diameter:
55.992 to 56.000 mm (2.2044 to 2.2047 in.)

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

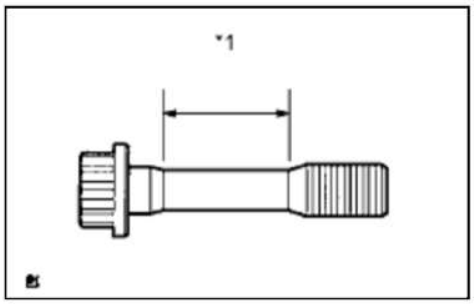
(e) Check each crank pin for taper and out-of-round as shown in the illustration.

Maximum taper and out-of-round:
0.02 mm (0.000787 in.)

cardiagn.com

If the taper and out-of-round is more than the maximum, replace the crankshaft.

11. INSPECT CONNECTING ROD BOLT



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

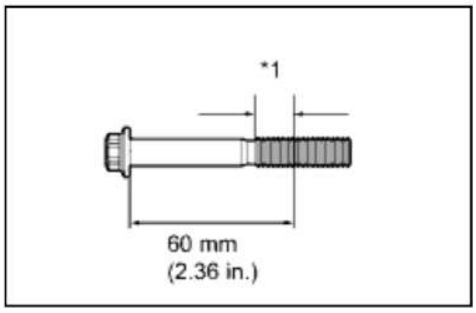
Standard diameter:
7.2 to 7.3 mm (0.283 to 0.287 in.)
Minimum diameter:
7.0 mm (0.276 in.)

Text in Illustration

*1	Measurement Area

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

12. INSPECT CRANKSHAFT BEARING CAP SET BOLT



(a) Using a vernier caliper, measure the thread outside diameter of the crankshaft bearing cap set bolt.

Standard diameter:
10.0 to 10.2 mm (0.394 to 0.402 in.)

Text in Illustration

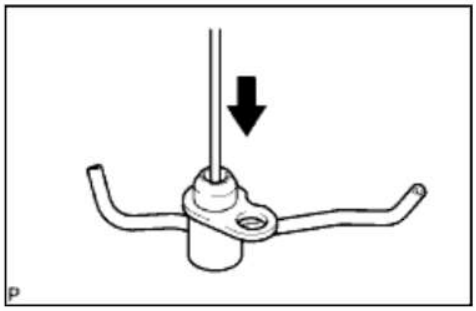
*1	Measurement Area

If the result is not as specified, replace the crankshaft bearing cap set bolt.

13. INSPECT NO. 1 OIL NOZZLE SUB-ASSEMBLY

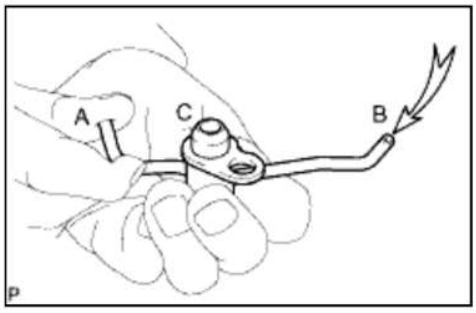
(a) Push the check valve with a pin to check if it is stuck. If stuck, replace the oil nozzle.

cardiagn.com



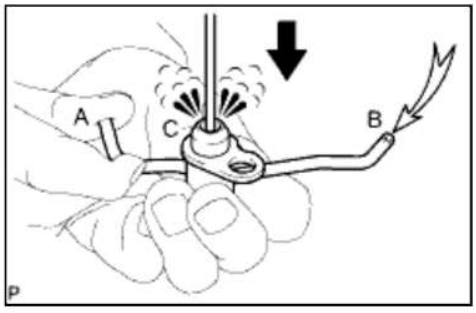
(b) Push the check valve with a pin to check if it moves smoothly.

If it does not move smoothly, clean or replace the oil nozzle.



(c) While covering A, blow air into B. Check that air does not leak through C. Perform the check again while covering B and blowing air into A.

If air leaks, clean or replace the oil nozzle.



(d) Push the check valve while covering A, and blow air into B. Check that air passes through C. Perform the check again while covering B, pushing the check valve and blowing air into A.

If air does not pass through C, clean or replace the oil nozzle.

cardiagn.com

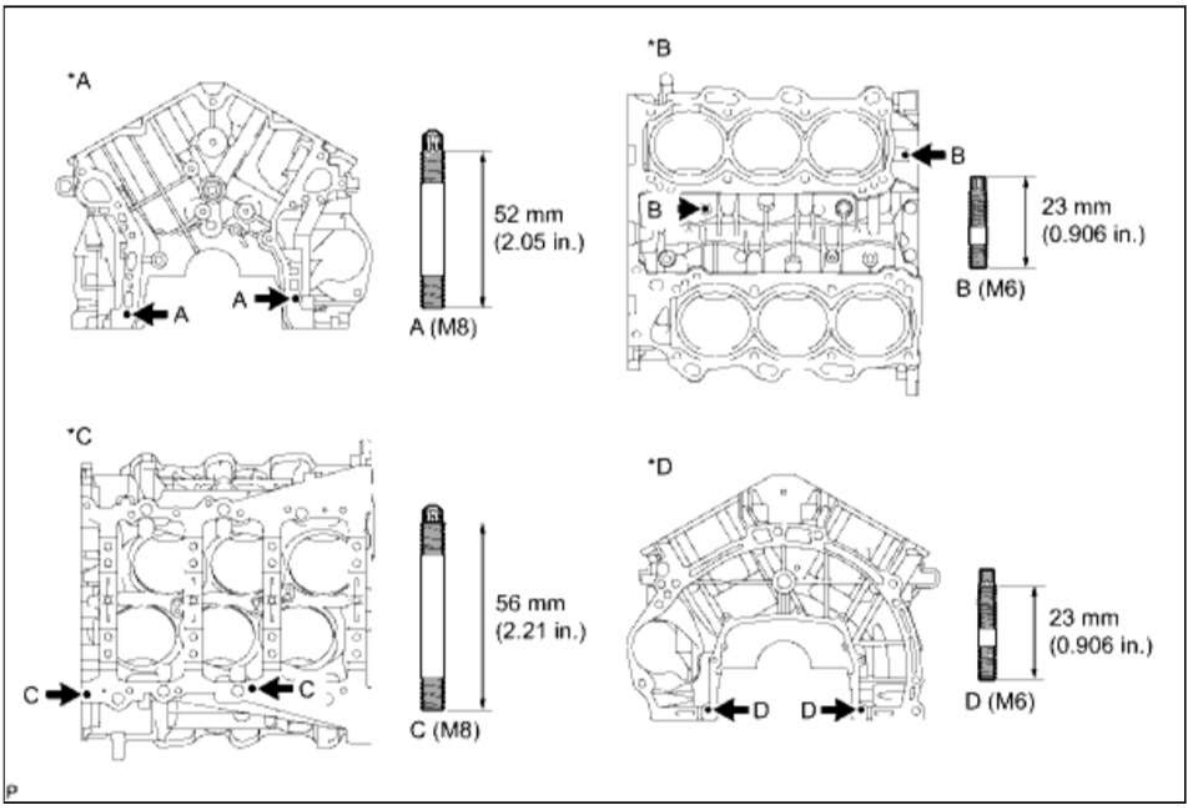
Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000002BK6016X
Title: 1GR-FE ENGINE MECHANICAL: CYLINDER BLOCK: REASSEMBLY (2010 4Runner)		

REASSEMBLY

1. INSTALL STUD BOLT

(a) Install new stud bolts.

for stud bolt A and C - Torque: 10 N·m (102 kgf·cm, 7ft·lbf)
for stud bolt B and D - Torque: 4.0 N·m (41 kgf·cm, 35in·lbf)



Text in Illustration

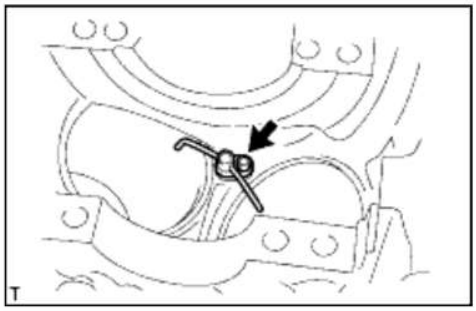
*A	Front Side	*B	Upper Side
*C	Lower Side	*D	Rear Side

2. INSTALL NO. 1 OIL NOZZLE SUB-ASSEMBLY

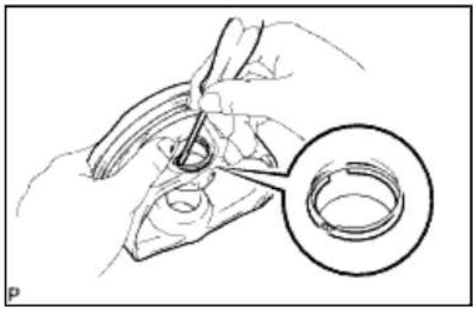
(a) Using a 5 mm hexagon socket wrench, install the 3 oil nozzles with the 3 bolts.

Torque: 9.0 N·m (92 kgf·cm, 80in·lbf)

cardiagn.com



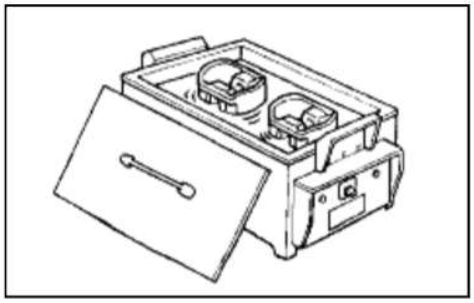
3. INSTALL PISTON WITH PIN SUB-ASSEMBLY



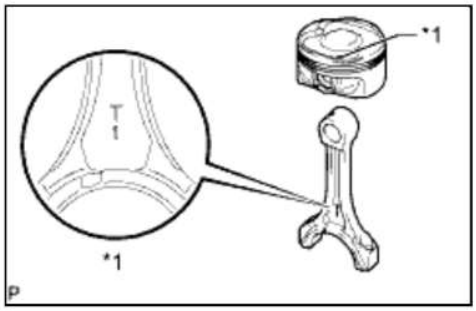
(a) Using a screwdriver, install a new snap ring on one side of the piston pin hole.

HINT:

Be 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°C (176°F).



(c) Coat the piston pin with engine oil.

(d) 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.

cardiagn.com

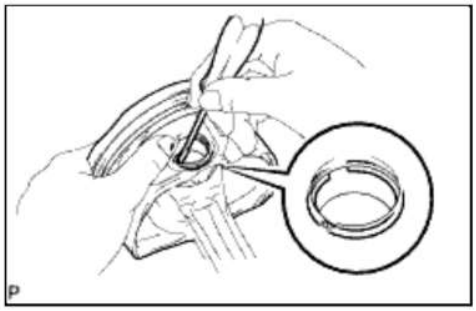
Text in Illustration

*1	Front Mark

HINT:

The piston and pin are a matched set.

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



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

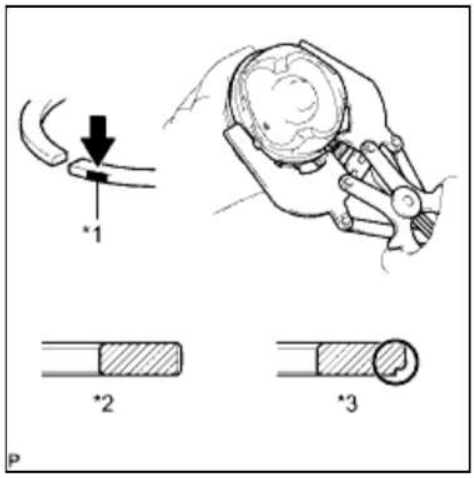
HINT:

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

4. INSTALL PISTON RING SET

(a) Install the oil ring (expander) and 2 side rails by hand.

(b) Using a piston ring expander, install the 2 compression rings with the painted mark on the right side.



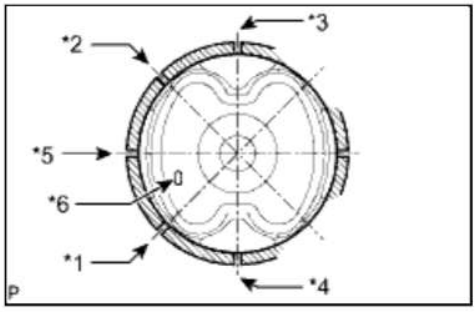
Text in Illustration

*1	Painted Mark
*2	No. 1 Compression Ring
*3	No. 2 Compression Ring

cardiagn.com

➡	Right Side

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



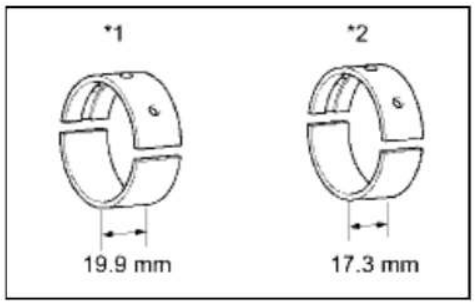
Text in Illustration

*1	No. 1 Compression Ring
*2	No. 2 Compression Ring
*3	Lower Side Rail
*4	Upper Side Rail
*5	Expander
*6	Front Mark

5. INSTALL CRANKSHAFT BEARING

HINT:

Main bearings come in widths of 17.3 mm (0.681 in.) and 19.9 mm (0.783 in.). Install the 19.9 mm (0.783 in.) bearings in the No. 1 and No. 4 cylinder block journal positions with the bearing caps. Install the 17.3 mm (0.681 in.) bearings in the No. 2 and No. 3 positions.



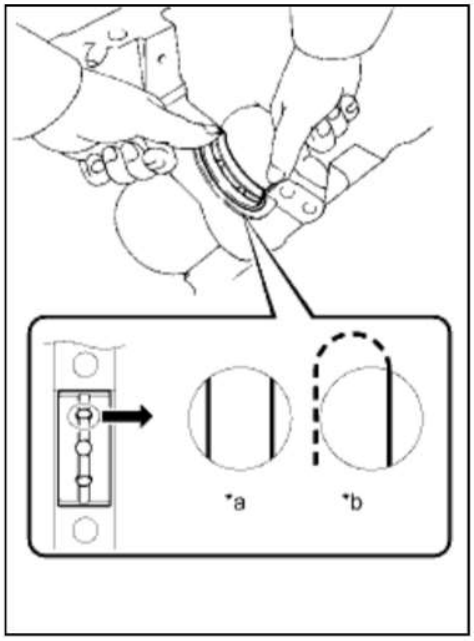
Text in Illustration

*1	No. 1 and No. 4 Journal Bearings
*2	No. 2 and No. 3 Journal Bearings

(a) Clean each main journal and bearing.

(b) Install the upper bearing.

cardiagn.com



(1) Install the upper bearing to the cylinder block as shown in the illustration.

Text in Illustration

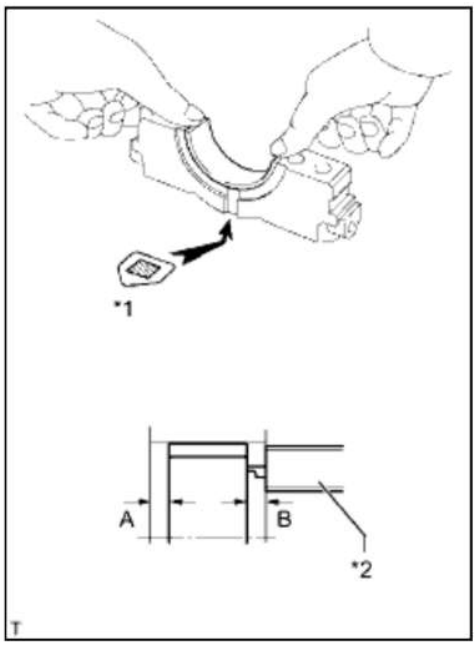
*a	CORRECT
*b	INCORRECT

NOTICE:

- Do not apply engine oil to the bearings or contact surfaces.
- 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.
- Do not allow coolant to come into contact with the inner surface of the bearing.
- If any coolant comes into contact with the inner surface of the bearing, replace the bearing with a new one.

(c) Install the lower bearing.

(1) Install the lower bearings to the crankshaft bearing caps.



Text in Illustration

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

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

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 contact surfaces.
- Do not allow coolant to come into contact with the inner surface of the bearing.
- If any coolant comes into contact with the inner surface of the bearing, replace the bearing with a new one.

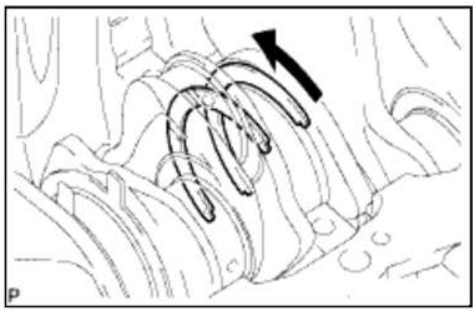
6. INSTALL CRANKSHAFT

NOTICE:

Clean the contact surface of each main journal and crank pin.

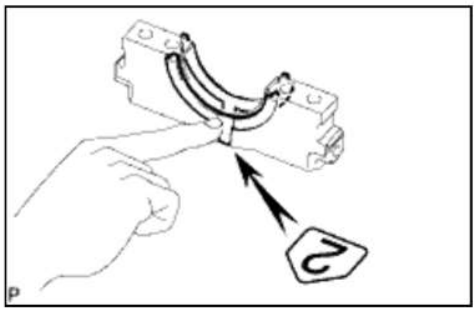
cardiagn.com

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

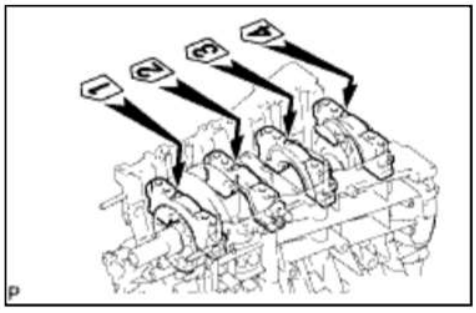


(b) Push the crankshaft in the rear thrust direction to create clearance and install a thrust washer to the No. 2 journal position with the oil groove facing the front of the engine.

(c) Push the crankshaft in the forward thrust direction to create clearance and install a thrust washer to the No. 2 journal position with the oil groove facing the rear of the engine.



(d) Install the 2 lower thrust washers to the No. 2 bearing cap with the grooves facing outward.



(e) Examine the front marks and numbers and set the crankshaft bearing caps on the cylinder block.

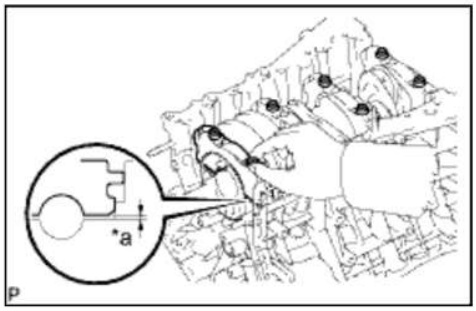
(f) Apply a light coat of engine oil to the threads of the crankshaft bearing cap bolts.

(g) Temporarily install the 8 crankshaft bearing cap bolts to the inside positions.

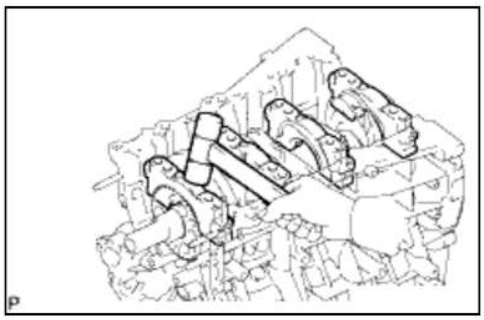
(h) Tighten the 2 bolts for each bearing cap until the clearance between the crankshaft bearing cap and the cylinder block becomes less than 6 mm (0.236 in.).

Text in Illustration

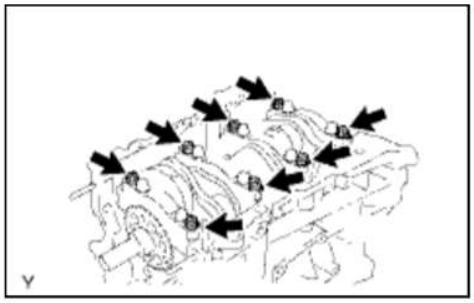
cardiagn.com



*a	Less than 6 mm



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

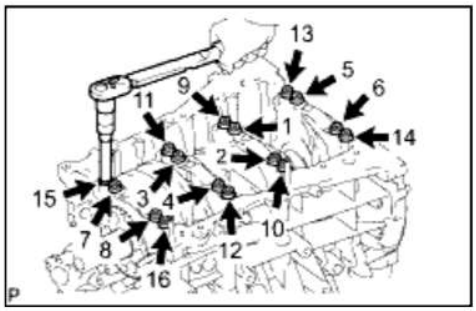


(j) Apply a light coat of engine oil to the threads of the crankshaft bearing cap bolts and temporarily install the 8 crankshaft bearing bolts to the outside positions.

(k) Tighten the crankshaft bearing cap bolts.

HINT:

The cap bolts are tightened in 2 progressive steps.



(1) Step 1:

Uniformly tighten the 16 bolts in several steps in the order shown in the illustration.

Torque: 61 N·m (622 kgf·cm, 45ft·lbf)

cardiagn.com

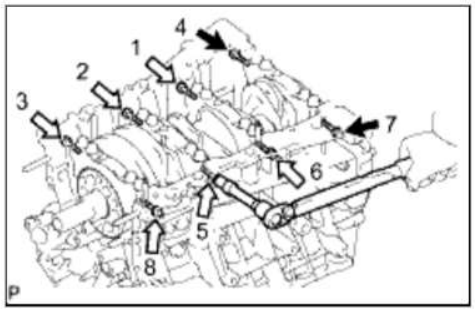
(2) Mark the front side of the crankshaft bearing cap bolts with paint.

(3) Step 2:

Tighten the bearing cap bolts 90° in the order shown in step 1.

(4) Check that the paint mark is now at a 90° angle to the front.

(l) Check that the crankshaft turns smoothly.



(m) Install and uniformly tighten the 8 main bearing cap bolts together with 8 new seal washers in several steps in the sequence shown in the illustration.

Torque: 26 N·m (262 kgf·cm, 19ft·lbf)

Standard Bolt:

ITEM	LENGTH
Bolt A	45 mm (1.77 in.)
Bolt B	30 mm (1.18 in.)

Text in Illustration

➡	Bolt A
⇨	Bolt B

(n) Check that the crankshaft turns smoothly.

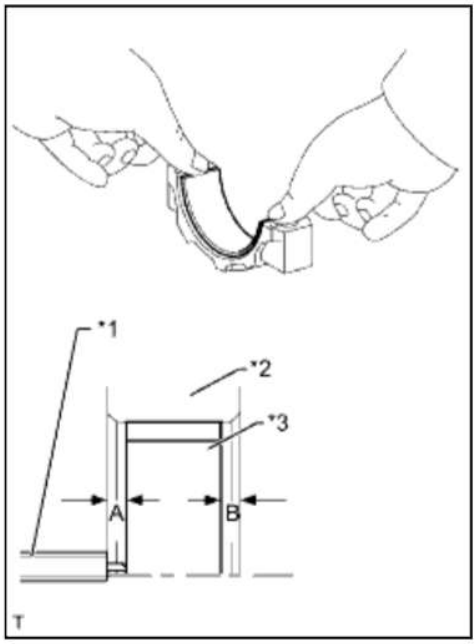
7. INSTALL CONNECTING ROD BEARING

(a) Install the bearing to the connecting rod cap.

NOTICE:

- Clean the contact surfaces of the bearing and connecting rod cap.
- Do not apply engine oil to the bearing or the surface it contacts.

cardiagn.com

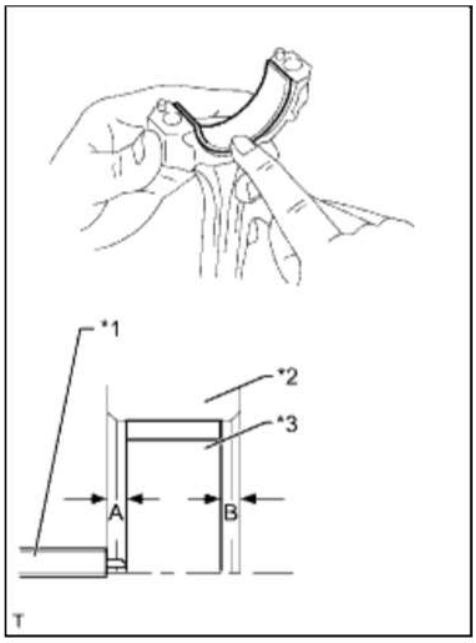


Text in Illustration

*1	Vernier Caliper
*2	Connecting Rod Cap
*3	Connecting Rod Bearing

(b) Using a vernier caliper, measure the distance between the connecting rod cap edge and connecting rod bearing edge.

Dimension A - B or B - A:
0 to 0.7 mm (0 to 0.0276 in.)



(c) Install the bearing to the connecting rod.

NOTICE:

- Clean the contact surface of the bearing and connecting rod.
- Do not apply engine oil to the bearing or the surface it contacts.

Text in Illustration

*1	Vernier Caliper
*2	Connecting Rod
*3	Connecting Rod Bearing

(d) Using a vernier caliper, measure the distance between the connecting rod edge and connecting rod bearing edge.

Dimension A - B or B - A:
0 to 0.7 mm (0 to 0.0276 in.)

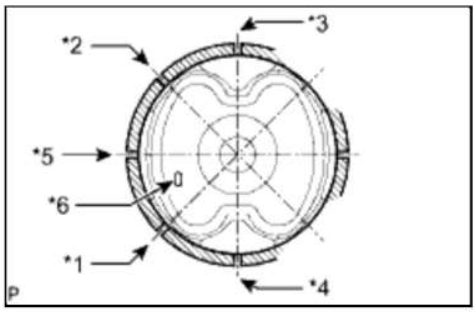
cardiagn.com

8. INSPECT CRANKSHAFT THRUST CLEARANCE INFO

9. INSTALL PISTON SUB-ASSEMBLY WITH CONNECTING ROD

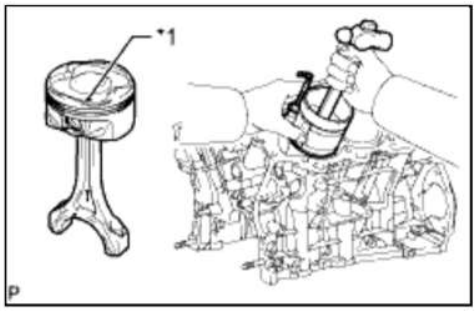
(a) Apply engine oil to the cylinder walls, pistons and surfaces of the connecting rod bearings.

(b) Check the positions of the piston ring ends.



Text in Illustration

*1	No. 1 Compression Ring
*2	No. 2 Compression Ring
*3	Lower Side Rail
*4	Upper Side Rail
*5	Expander
*6	Front Mark

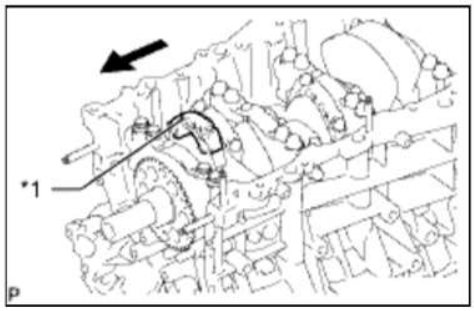


(c) Using a hammer handle and piston ring compressor, press a piston and connecting rod assembly into each cylinder with the front mark of the piston facing forward.

Text in Illustration

*1	Front Mark

(d) Install each connecting rod cap so that the protrusion is facing the correct direction.



Text in Illustration

*1	Protrusion

cardiagn.com

➡	Front

NOTICE:

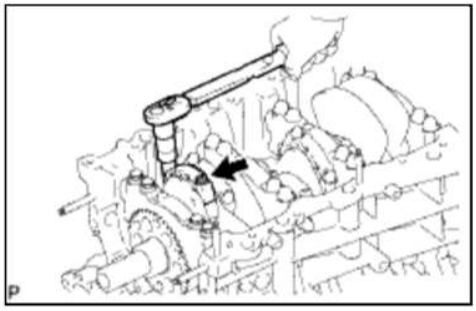
Match each numbered connecting rod cap with the correct connecting rod.

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

(f) Install the connecting rod cap bolts.

HINT:

The cap bolts are tightened in 2 progressive steps.



(1) Step 1:

Install and alternately tighten the bolts of each connecting rod cap in several steps.

Torque: 25 N·m (250 kgf·cm, 18ft·lbf)

(2) Mark the front side of each connecting rod cap bolt with paint.

(3) Step 2:

Tighten the cap bolts 90°.

(4) Check that the paint mark is now at a 90° angle to the front.

(g) Check that the crankshaft turns smoothly.

10. INSPECT CONNECTING ROD THRUST CLEARANCE

cardiagn.com

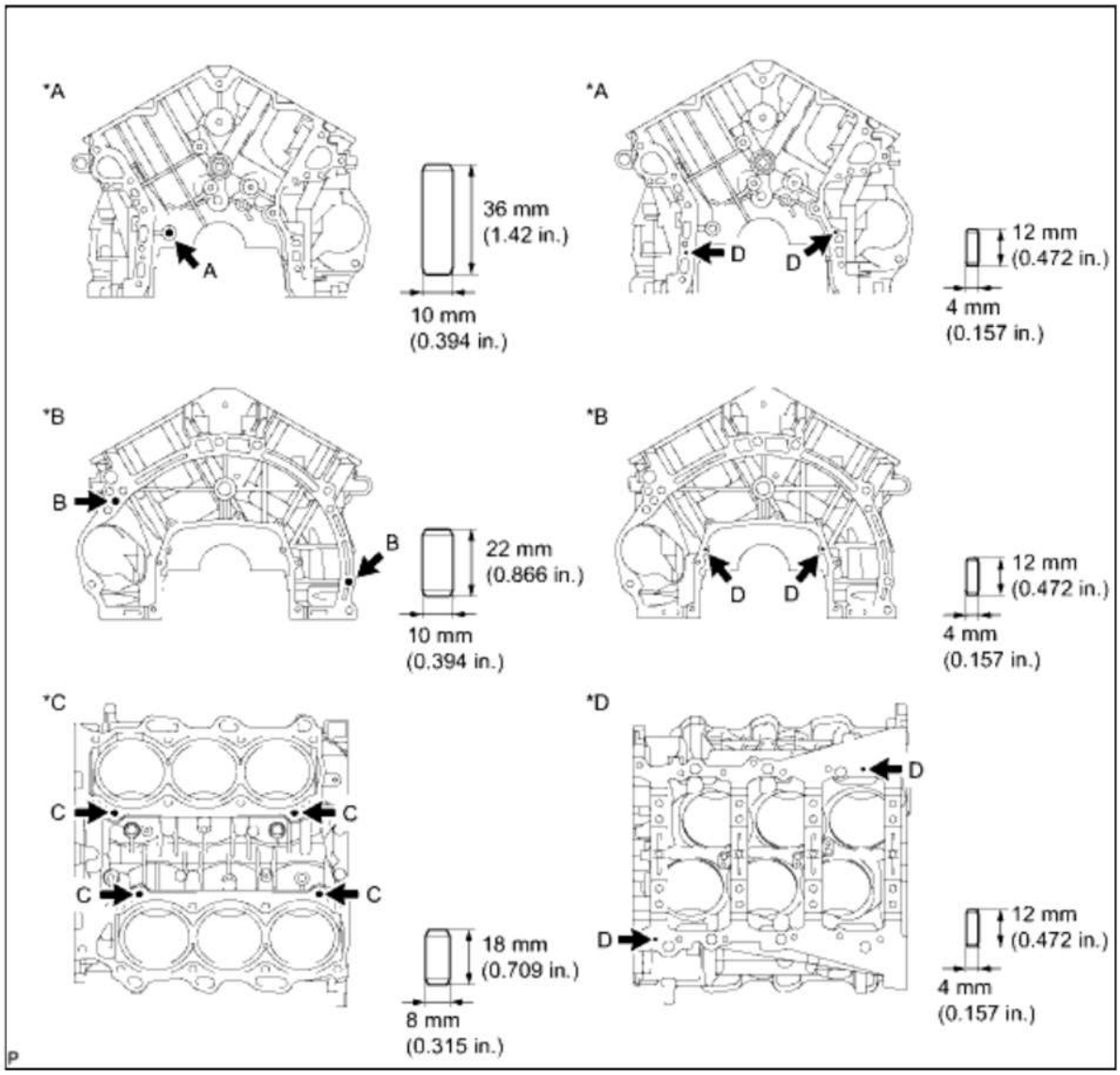
Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000002YD100DX
Title: 1GR-FE ENGINE MECHANICAL: CYLINDER BLOCK: REPLACEMENT (2010 4Runner)		

REPLACEMENT

1. REPLACE STRAIGHT PIN

NOTICE:

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



Text in Illustration

*A	Front Side	*B	Rear Side
*C	Upper Side	*D	Lower Side

(a) Remove the straight pins.

cardiagn.com

(b) Using a plastic-faced hammer, tap in new straight pins to the cylinder block.

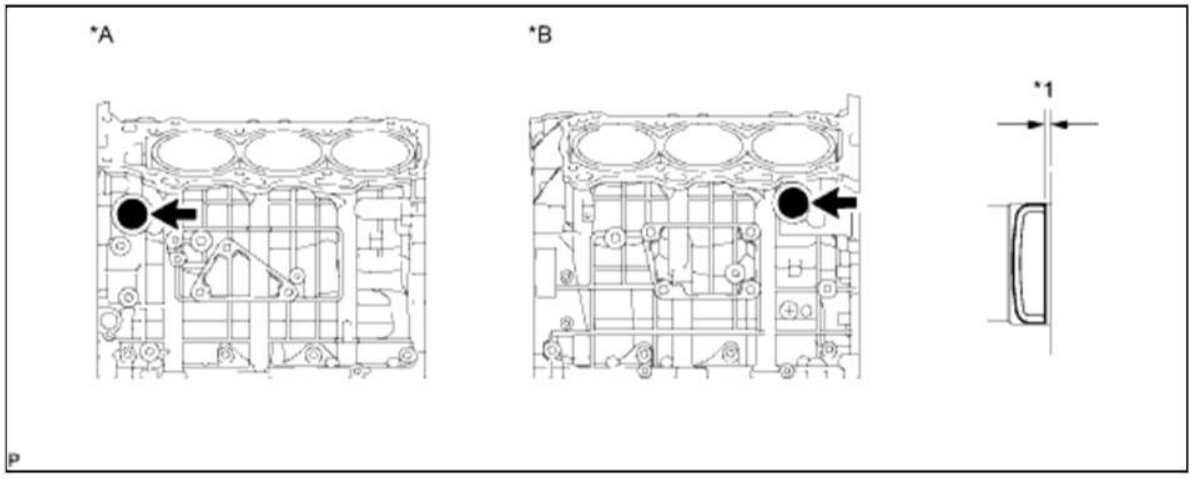
Standard Protrusion Height:

ITEM	SPECIFIED CONDITION
Pin A	22.5 to 23.5 mm (0.886 to 0.925 in.)
Pin B	10.5 to 11.5 mm (0.413 to 0.453 in.)
Pin C	8.5 to 9.5 mm (0.335 to 0.374 in.)
Pin D	5.5 to 6.5 mm (0.217 to 0.256 in.)

2. REPLACE CYLINDER BLOCK TIGHT PLUG

NOTICE:

If coolant leaks from a tight plug or a plug is corroded, replace it.



Text in Illustration

*A	LH Side	*B	RH Side
*1	Standard Depth	-	-

(a) Remove the tight plugs.

(b) Apply adhesive around new tight plugs.

Adhesive:
Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

(c) Using SST and a hammer, tap in the tight plugs to the standard depth.

SST: 09950-60010

09951-00350

SST: 09950-70010

09951-07150

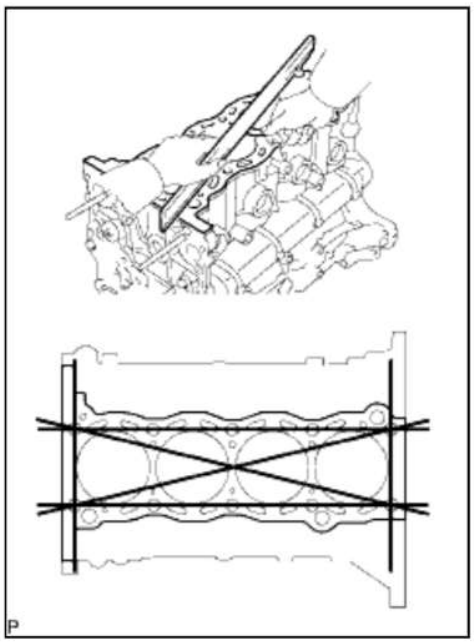
Standard depth:
0.2 to 1.2 mm (0.00787 to 0.0472 in.)

cardiagn.com

Last Modified: 5-10-2010	6.4 G	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM00000447B005X
Title: 2TR-FE ENGINE MECHANICAL: CYLINDER BLOCK: INSPECTION (2010 4Runner)		

INSPECTION

1. INSPECT CYLINDER BLOCK FOR WARPAGE



(a) Using a precision 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.

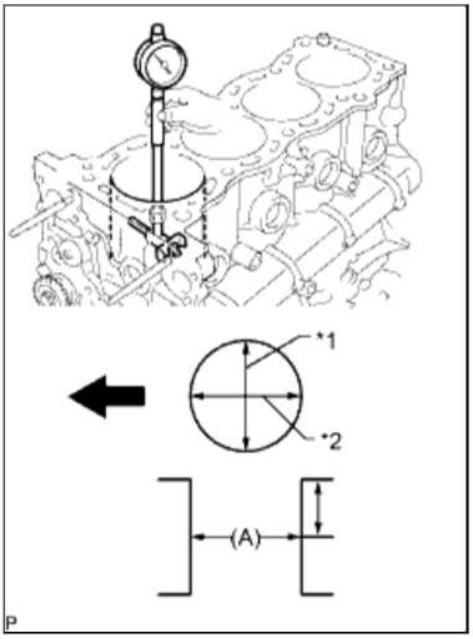
(b) Visually check the cylinder for vertical scratches.

If deep scratches are present, rebore all 4 cylinders. If necessary, replace the cylinder block.

2. INSPECT CYLINDER BORE

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

cardiagn.com



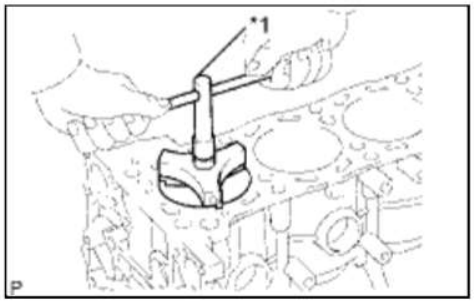
Standard diameter:
94.990 to 95.003 mm (3.7398 to 3.7403 in.)
Maximum difference in diameter:
0.2 mm (0.00787 in.)
Measurement position:
70 mm (2.76 in.)

Text in Illustration

*1	Thrust Direction
*2	Axial Direction
➡	Engine Front

If the diameter is more than the maximum, rebore all 4 cylinders. If necessary, replace the cylinder block.

(b) Inspect the cylinder ridge.



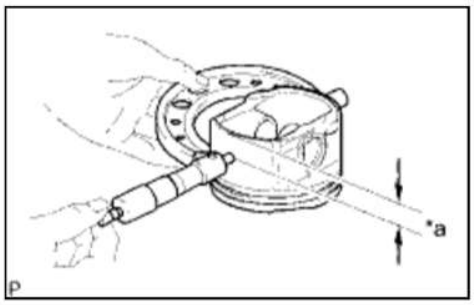
Text in Illustration

*1	Ridge Reamer

If the wear is less than 0.2 mm (0.00787 in.), using a ridge reamer, grind the top of the cylinder.

3. INSPECT PISTON DIAMETER

cardiagn.com



(a) Using a micrometer, measure the piston diameter at right angles to the piston center line where the distance from the piston end is as specified.

Distance:
13.8 mm (0.543 in.)
Standard diameter:
94.941 to 94.971 mm (3.738 to 3.739 in.)

Text in Illustration

*a	Distance

4. INSPECT PISTON OIL CLEARANCE

(a) Measure the cylinder bore diameter in the thrust direction.

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

Standard oil clearance:
0.019 to 0.052 mm (0.000748 to 0.00205 in.)

If the oil clearance is more than the standard, replace all the pistons and rebore all the cylinders. If necessary, replace the cylinder block.

5. INSPECT RING GROOVE CLEARANCE

(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	0.020 to 0.075 mm (0.000787 to 0.00295 in.)
No. 2 compression ring	0.020 to 0.065 mm (0.000787 to 0.00256 in.)
Oil ring	0.020 to 0.070 mm (0.000787 to 0.00276 in.)

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

6. INSPECT PISTON RING END GAP

(a) Insert the piston ring into the cylinder bore.

(b) Using a piston, push the piston ring a little beyond the bottom of the ring travel, 110 mm (4.33 in.) from the top of the cylinder block.

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

Standard End Gap:

ITEM	SPECIFIED CONDITION

cardiagn.com

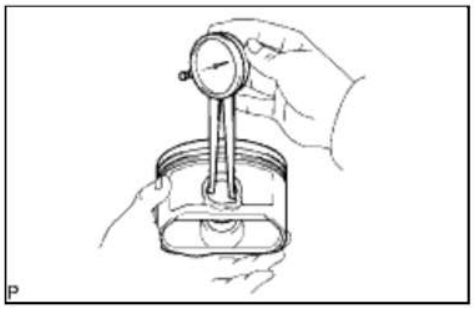
ITEM	SPECIFIED CONDITION
No. 1 compression ring	0.26 to 0.38 mm (0.0102 to 0.0150 in.)
No. 2 compression ring	0.59 to 0.71 mm (0.0232 to 0.0280 in.)
Oil ring	0.10 to 0.40 mm (0.00394 to 0.0157 in.)

Maximum End Gap:

ITEM	SPECIFIED CONDITION
No. 1 compression ring	0.90 mm (0.0354 in.)
No. 2 compression ring	1.36 mm (0.0535 in.)
Oil ring	0.75 mm (0.0295 in.)

If the end gap is more than the maximum, replace the piston ring. If the end gap is less than the standard, even with a new piston ring, rebore all 4 cylinders or replace the cylinder block.

7. INSPECT PISTON PIN OIL CLEARANCE



(a) Using a caliper gauge, measure the inside diameter of the piston pin hole.

Standard piston pin hole inside diameter:
22.001 to 22.010 mm (0.866 to 0.867 in.)

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

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

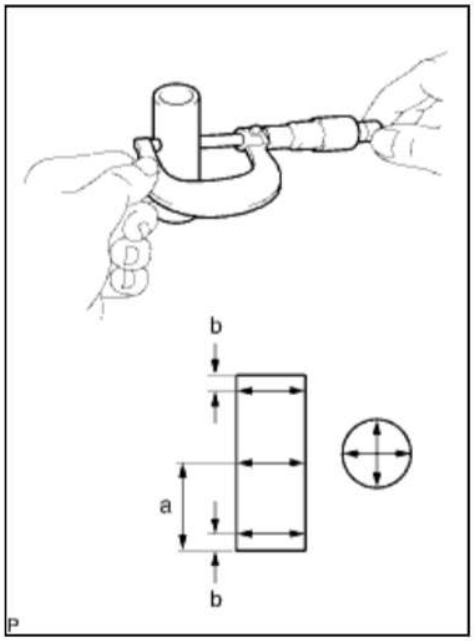
Measurement Position:

MEASUREMENT POSITION	PISTON PIN POSITION
a	31 mm (1.22 in.)
b	6 mm (0.24 in.)

Standard piston pin diameter:
21.997 to 22.009 mm (0.8660 to 0.8665 in.)

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

cardiagn.com



(c) Subtract the piston pin diameter measurement from the piston pin hole diameter measurement.

Standard oil clearance:
0.001 to 0.007 mm (0.0000394 to 0.000276 in.)
Maximum oil clearance:
0.010 mm (0.000394 in.)

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

(d) Using a caliper gauge, measure the inside diameter of the connecting rod bush.

Standard bush inside diameter:
22.005 to 22.014 mm (0.866 to 0.867 in.)

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

(e) Subtract the piston pin diameter measurement from the bush inside diameter measurement.

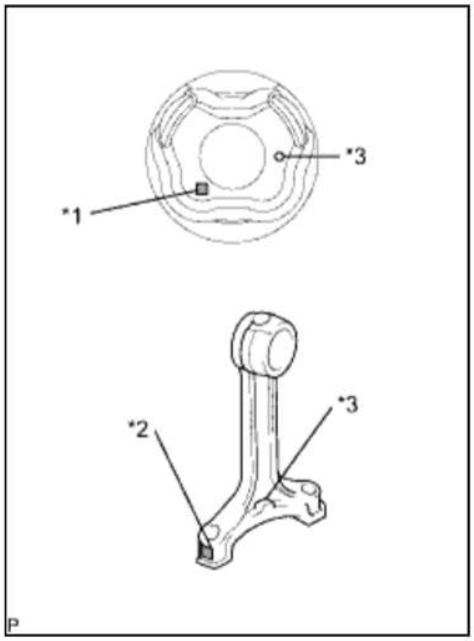
Standard oil clearance:
0.005 to 0.011 mm (0.000197 to 0.000433 in.)
Maximum oil clearance:
0.025 mm (0.000984 in.)

Text in Illustration

*1	Piston Pin Hole Inside Diameter Mark
*2	Connecting Rod Bushing Inside Diameter Mark
*3	Front Mark

If the oil clearance is more than the maximum, replace the

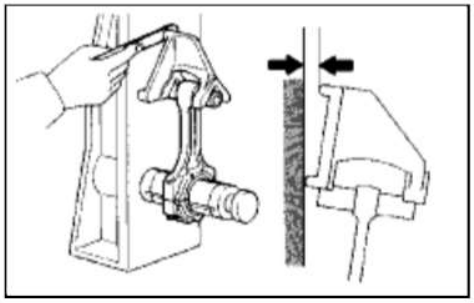
cardiagn.com



connecting rod small end bush. If necessary, replace the connecting rod and piston pin as a set.

8. INSPECT CONNECTING ROD SUB-ASSEMBLY

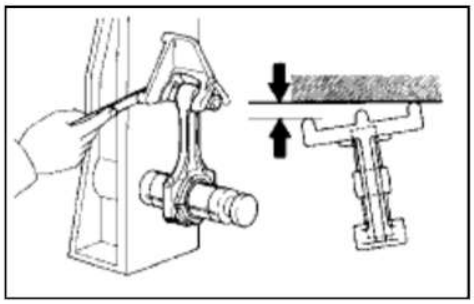
(a) Using a rod aligner and feeler gauge, check the connecting rod alignment.



(1) Check for bend.

Maximum bend:
0.03 mm (0.00118 in.) per 100 mm (3.94 in.)

If the bend is more than the maximum, replace the connecting rod sub-assembly.



(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 sub-assembly.

9. INSPECT CRANKSHAFT

(a) Inspect the circle runout.

(1) Place the crankshaft on V-blocks.

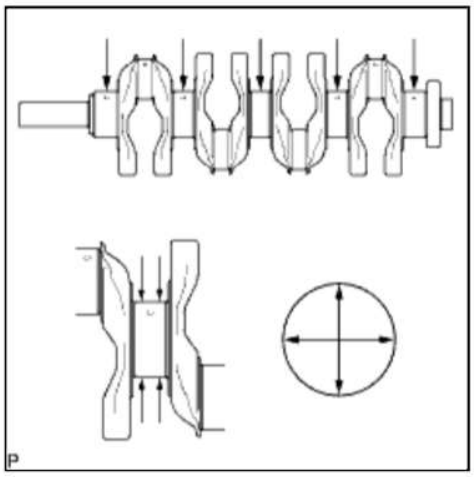
cardiagn.com

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

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.

Standard Journal Diameter:

ITEM	SPECIFIED CONDITION
No. 3 journal	59.981 to 59.994 mm (2.361 to 2.362 in.)
Except No. 3 journal	59.987 to 60.000 mm (2.3617 to 2.3622 in.)

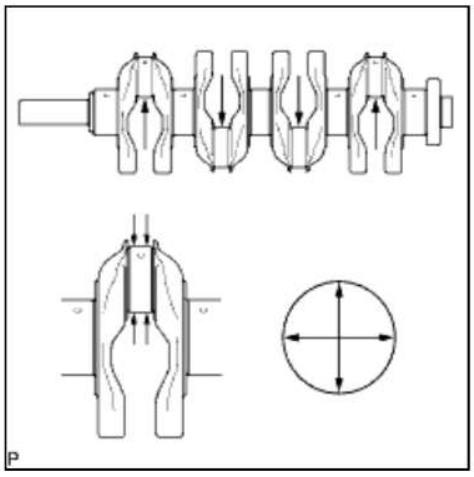
If the diameter is not as specified, check the oil clearance. If necessary, replace the crankshaft.

(2) Check each main journal for taper and out-of- round as shown in the illustration.

Maximum taper and out-of-round:
0.005 mm (0.000197 in.)

If the taper and out-of-round is more than the maximum, replace the crankshaft.

(c) Inspect the crank pin.



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

Standard diameter:
52.989 to 53.002 mm (2.086 to 2.087 in.)

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

(2) Check each crank pin for taper and out-of-round as shown in the illustration.

Maximum taper and out-of-round:
0.003 mm (0.000118 in.)

If the taper and out-of-round is more than the maximum, replace the crankshaft.

cardiagn.com

10. INSPECT CRANKSHAFT OIL CLEARANCE

HINT:

- Keep the lower bearings and crankshaft bearing caps together.
- Arrange the thrust washers in the correct order.
- Keep the upper crankshaft bearings and upper thrust washers together with the cylinder block.

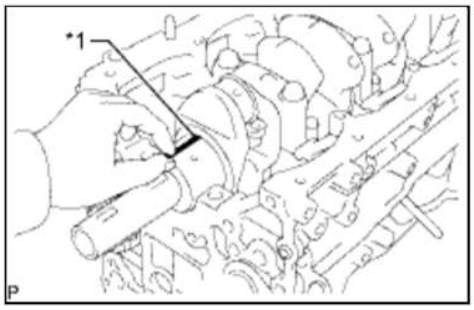
(a) Clean each main journal and bearing.

(b) Check each main journal and bearing for pitting and scratches.

If the journal or bearing is damaged, replace the bearing.

(c) Install the crankshaft bearings and upper crankshaft thrust washers.

(d) Place the crankshaft on the cylinder block.



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

Text in Illustration

*1	Plastigage

(f) Install the 5 crankshaft bearing caps with the 10 bolts INFO .

NOTICE:

Do not turn the crankshaft.

(g) Remove the 10 bolts and 5 crankshaft bearing caps INFO .

(h) Measure the Plastigage at its widest point.

Standard Oil Clearance:

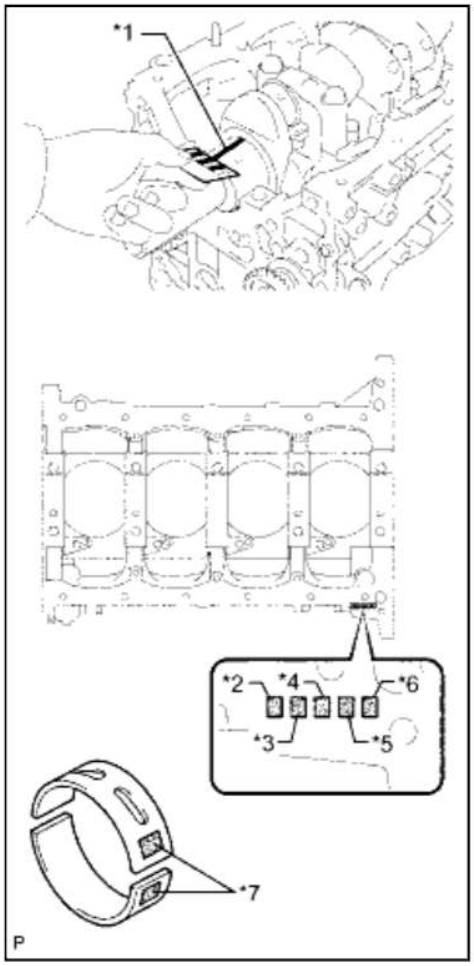
ITEM	SPECIFIED CONDITION
No. 3 journal	0.036 to 0.067 mm (0.00142 to 0.00264 in.)
Other journals	0.030 to 0.061 mm (0.00118 to 0.00240 in.)

Maximum oil clearance:
0.10 mm (0.00394 in.)

Text in Illustration

*1	Plastigage

cardiagn.com



*2	No. 1 Journal
*3	No. 2 Journal
*4	No. 3 Journal
*5	No. 4 Journal
*6	No. 5 Journal
*7	Mark 1, 2 or 3

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

If replacing the cylinder block, measure the bearing standard clearance.

If replacing a bearing, first check the number on the cylinder block for the journal of the bearing. Then replace the bearing with one that has the same number. The standard thickness of each bearing is indicated by a 1, 2 or 3 mark on its surface.

Standard Cylinder Block Main Journal Bore Diameter:

ITEM	SPECIFIED CONDITION
Mark 1	64.004 to 64.010 mm (2.51984 to 2.52007 in.)
Mark 2	64.011 to 64.016 mm (2.52011 to 2.52031 in.)
Mark 3	64.017 to 64.022 mm (2.52035 to 2.52055 in.)

Standard Bearing Center Wall Thickness:

ITEM	SPECIFIED CONDITION
Mark 1	1.987 to 1.990 mm (0.07823 to 0.07835 in.)
Mark 2	1.991 to 1.993 mm (0.07839 to 0.07846 in.)
Mark 3	1.994 to 1.996 mm (0.07850 to 0.07858 in.)

(i) Completely remove the Plastigage.

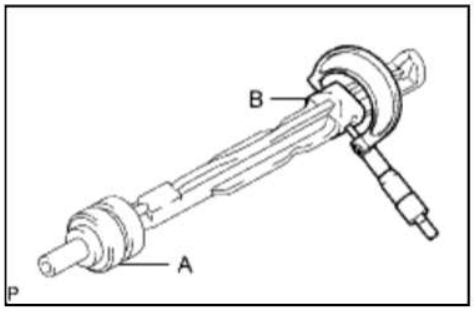
(j) Perform the inspection above for each journal.

11. INSPECT NO. 1 BALANCE SHAFT

(a) Inspect the diameter of the journal.

(1) Using a micrometer, measure the diameter of the balance shaft main journals.

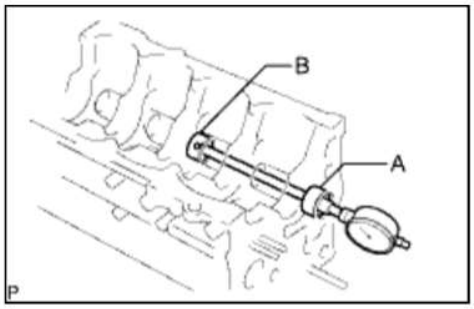
cardiagn.com



Standard Main Journal Diameter:

ITEM	SPECIFIED CONDITION
A	37.969 to 37.985 mm (1.49 to 1.50 in.)
B	37.449 to 37.465 mm (1.474 to 1.475 in.)

(b) Inspect the diameter of the bearing.



(1) Using a cylinder gauge, measure the inside diameter of the balance shaft bearing.

Standard Bearing Inside Diameter:

ITEM	SPECIFIED CONDITION
A	38.025 to 38.045 mm (1.497 to 1.498 in.)
B	37.525 to 37.545 mm (1.477 to 1.478 in.)

(c) Inspect the oil clearance.

(1) Subtract the balance shaft main journal diameter measurement from the balance shaft bearing inside diameter measurement.

Standard Oil Clearance:

ITEM	SPECIFIED CONDITION
A	0.040 to 0.076 mm (0.00157 to 0.00299 in.)
B	0.060 to 0.096 mm (0.00236 to 0.00378 in.)

Maximum oil clearance:
0.15 mm (0.00591 in.)

If the oil clearance is more than the maximum, replace the cylinder block and balance shaft.

12. INSPECT NO. 2 BALANCE SHAFT

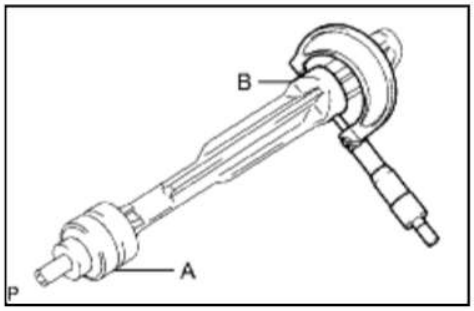
(a) Inspect the diameter of the journal.

(1) Using a micrometer, measure the diameter of the balance shaft main journals.

Standard Main Journal Diameter:

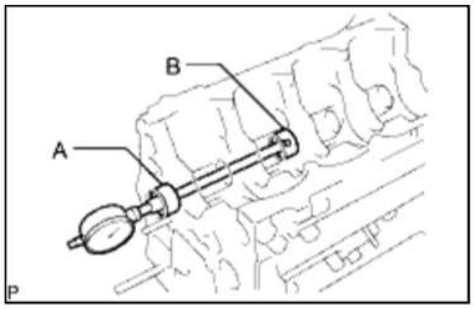
ITEM	SPECIFIED CONDITION

cardiagn.com



A	37.969 to 37.985 mm (1.49 to 1.50 in.)
B	37.449 to 37.465 mm (1.474 to 1.475 in.)

(b) Inspect the diameter of the bearing.



(1) Using a cylinder gauge, measure the inside diameter of the balance shaft bearing.

Standard Bearing Inside Diameter:

ITEM	SPECIFIED CONDITION
A	38.025 to 38.045 mm (1.497 to 1.498 in.)
B	37.525 to 37.545 mm (1.477 to 1.478 in.)

(c) Inspect the oil clearance.

(1) Subtract the balance shaft main journal diameter measurement from the balance shaft bearing inside diameter measurement.

Standard Oil Clearance:

ITEM	SPECIFIED CONDITION
A	0.040 to 0.076 mm (0.00157 to 0.00299 in.)
B	0.060 to 0.096 mm (0.00236 to 0.00378 in.)

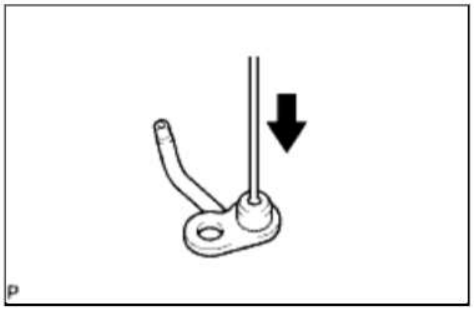
Maximum oil clearance:
0.15 mm (0.00591 in.)

If the oil clearance is more than the maximum, replace the cylinder block and balance shaft.

13. INSPECT NO. 1 OIL NOZZLE SUB-ASSEMBLY

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

cardiagn.com



Text in Illustration

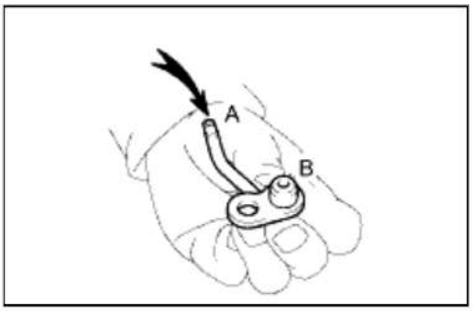
➡	Push

If the check valve is stuck, replace the No. 1 oil nozzle.

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

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

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

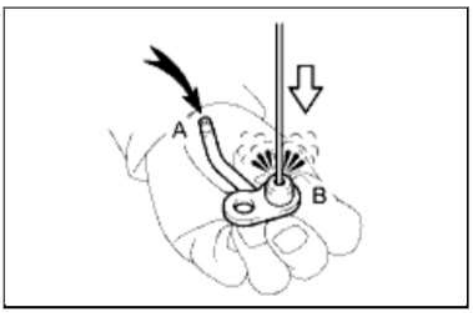


Text in Illustration

➡	Air

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

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



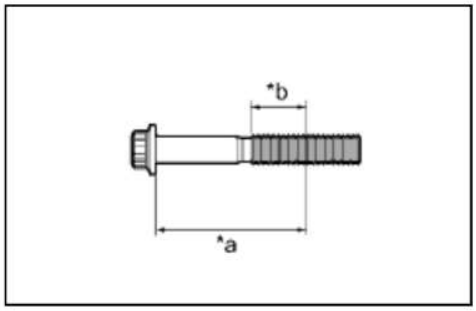
Text in Illustration

cardiagn.com

➡	Air
⇨	Push

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

14. INSPECT CRANKSHAFT BEARING CAP SET BOLT



(a) Using a vernier caliper, measure the diameter of the most elongated threads in the measuring area.

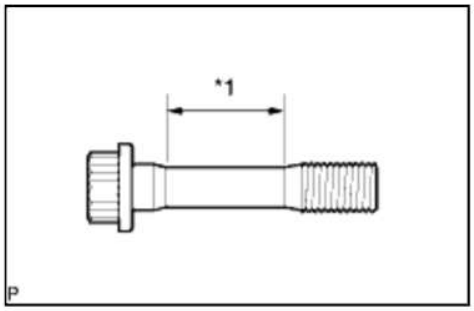
Distance:
64 mm (2.52 in.)
Standard diameter:
10.76 to 10.97 mm (0.424 to 0.432 in.)
Minimum diameter:
10.66 mm (0.420 in.)

Text in Illustration

*a	Distance
*b	Measuring Area

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

15. INSPECT CONNECTING ROD BOLT



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

Standard diameter:
7.2 to 7.3 mm (0.283 to 0.287 in.)
Minimum diameter:
7.0 mm (0.276 in.)

Text in Illustration

*1	Tension Portion

If the diameter is less than the minimum, replace the

cardiagn.com

connecting rod bolt.

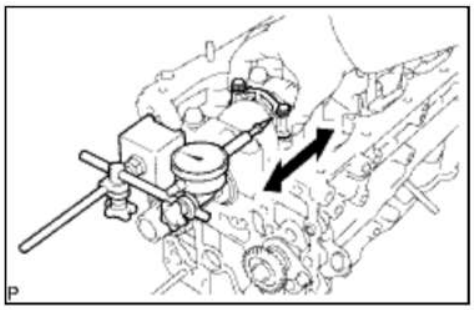


cardiagn.com

Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM00000125A024X
Title: 2TR-FE ENGINE MECHANICAL: CYLINDER BLOCK: DISASSEMBLY (2010 4Runner)		

DISASSEMBLY

1. INSPECT CONNECTING ROD THRUST CLEARANCE



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

Standard thrust clearance:
0.15 to 0.35 mm (0.00591 to 0.0138 in.)
Maximum thrust clearance:
0.40 mm (0.0157 in.)

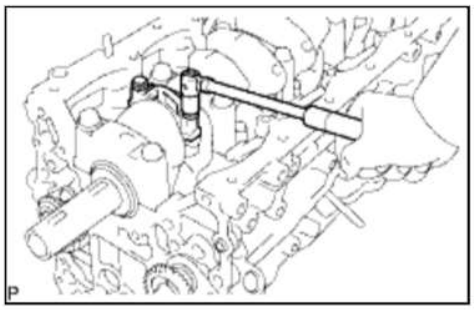
If the thrust clearance is more than the maximum, replace the connecting rod assembly. If necessary, replace the crankshaft.

2. INSPECT CONNECTING ROD OIL CLEARANCE

(a) Check that the matchmarks on the connecting rod and cap are aligned to ensure correct reassembly.

HINT:

The matchmarks on the connecting rods and caps are for ensuring correct reassembly.



(b) Remove the 2 connecting rod cap bolts.

(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.

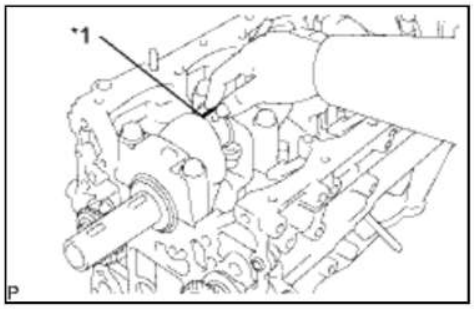
HINT:

Keep the lower bearing installed to the connecting rod cap.

(d) Clean the crank pin and bearing.

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

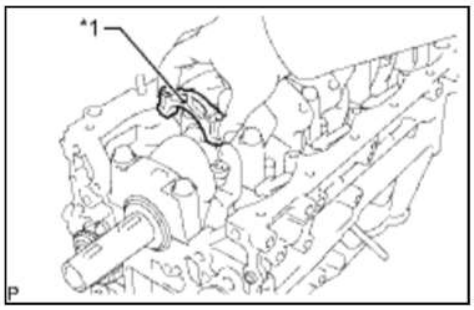
cardiagn.com



(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.

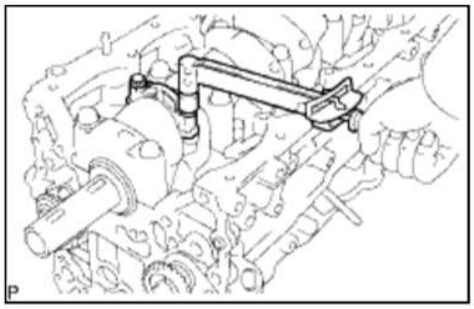
Text in Illustration

*1	Front Mark

(h) Install the connecting rod cap INFO .

NOTICE:

Do not turn the crankshaft.



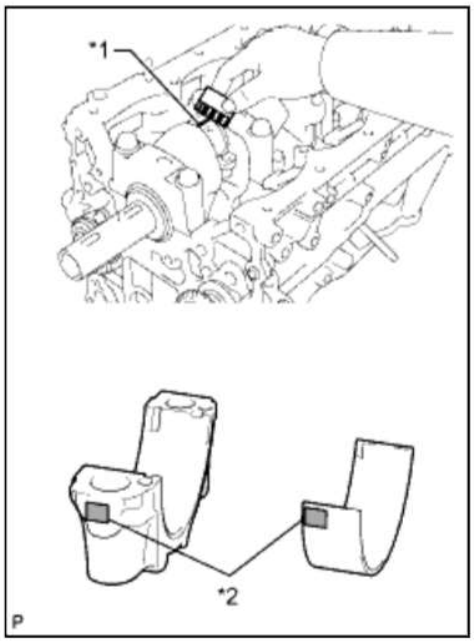
(i) Remove the 2 bolts and connecting rod cap (refer to the steps above).

(j) Measure the Plastigage at its widest point.

Standard oil clearance:
0.039 to 0.066 mm (0.00154 to 0.00260 in.)
Maximum oil clearance:
0.066 mm (0.00260 in.)

Text in Illustration

cardiagn.com



*1	Plastigage
*2	4, 5 or 6 Mark

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

If replacing a bearing, replace it with one that has the same number as its respective connecting rod cap. The standard thickness of each bearing is indicated by a 4, 5 or 6 mark on its surface.

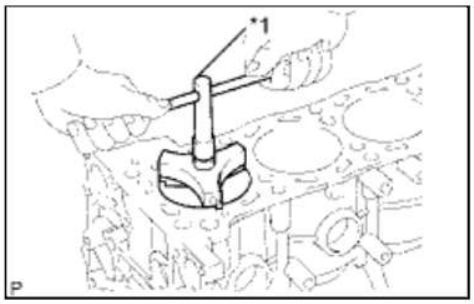
Standard crankshaft pin diameter:
52.989 to 53.002 mm (2.086 to 2.087 in.)
Standard Bearing Center Wall Thickness:

ITEM	SPECIFIED CONDITION
Mark 4	1.484 to 1.487 mm (0.05843 to 0.05854 in.)
Mark 5	1.488 to 1.490 mm (0.05858 to 0.05866 in.)
Mark 6	1.491 to 1.493 mm (0.05870 to 0.05878 in.)

(k) Completely remove the Plastigage.

(l) Perform the inspection above for each crank pin.

3. REMOVE PISTON SUB-ASSEMBLY WITH CONNECTING ROD



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

Text in Illustration

*1	Ridge Reamer

(b) Push the piston, connecting rod assembly 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.

4. REMOVE CONNECTING ROD BEARING

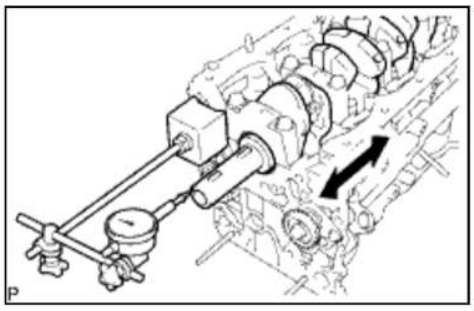
(a) Remove the connecting rod bearings from the connecting rods and connecting rod caps.

cardiagn.com

HINT:

Arrange the removed parts in the correct order.

5. INSPECT CRANKSHAFT THRUST CLEARANCE



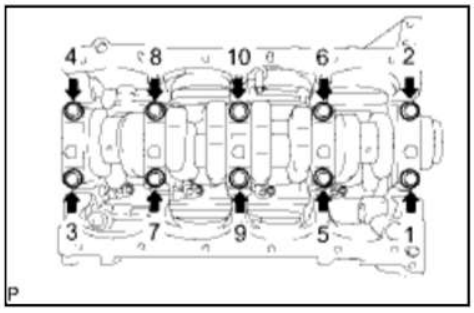
(a) Using a dial indicator, measure the thrust clearance while prying the crankshaft back and forth with a screwdriver.

Standard thrust clearance:
0.02 to 0.22 mm (0.000787 to 0.00866 in.)
Maximum thrust clearance:
0.30 mm (0.0118 in.)

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

Thrust washer thickness:
2.440 to 2.490 mm (0.0961 to 0.0980 in.)

6. REMOVE CRANKSHAFT

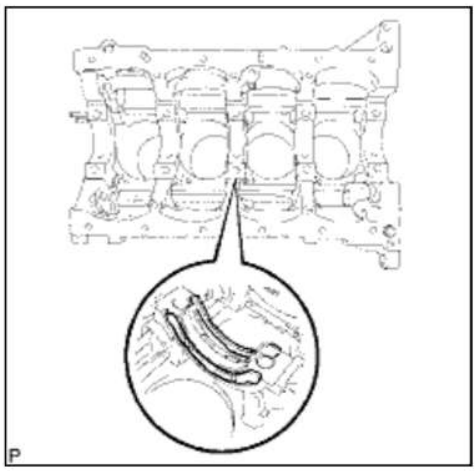


(a) Uniformly loosen the 10 bearing cap bolts in several steps in the sequence shown in the illustration.

HINT:

- Keep the lower bearings and crankshaft bearing caps together.
- Arrange the thrust washers in the correct order.

(b) Lift out the crankshaft to remove it.



(c) Remove the upper thrust washers from the cylinder block.

HINT:

Arrange the main bearing caps, bearings and thrust washers in the correct order.

cardiagn.com

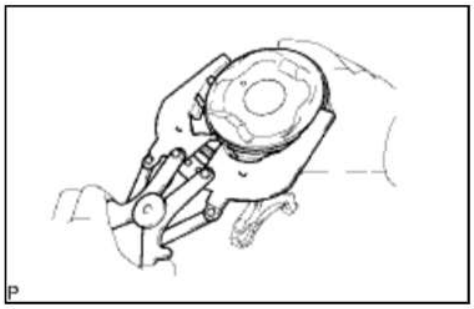
7. REMOVE CRANKSHAFT BEARING

(a) Remove the crankshaft bearings from the cylinder block and bearing caps.

HINT:

Arrange the removed parts in the correct order.

8. REMOVE PISTON RING SET



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

(b) Using a piston ring expander, remove the oil ring rail.

(c) Remove the oil ring expander by hand.

HINT:

Arrange the piston rings in the correct order.

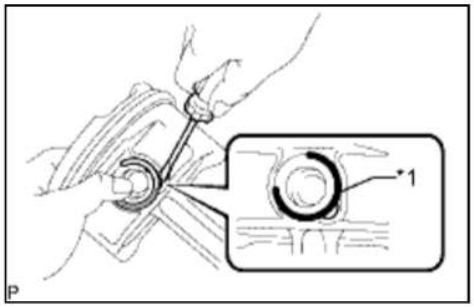
9. REMOVE PISTON WITH PIN SUB-ASSEMBLY

(a) Check the fitting condition between the piston and piston pin.

(1) Try to move the piston back and forth on the piston pin.

If any movement is felt, replace the piston and pin as a set.

(b) Disconnect the connecting rod from the piston.



(1) Using a screwdriver, pry off the snap rings from the piston.

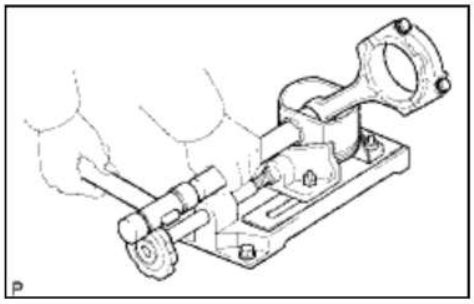
Text in Illustration

*1	Snap Ring

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

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

cardiagn.com



HINT:

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

10. CLEAN PISTON WITH PIN SUB-ASSEMBLY

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

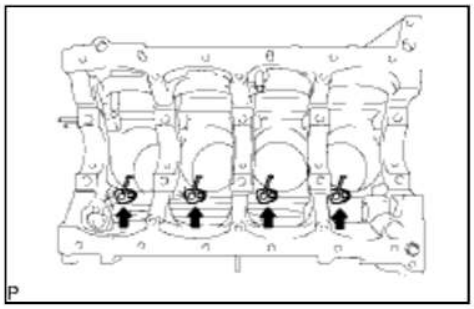
(b) Using a groove cleaning tool or broken ring, clean the piston ring grooves.

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

NOTICE:

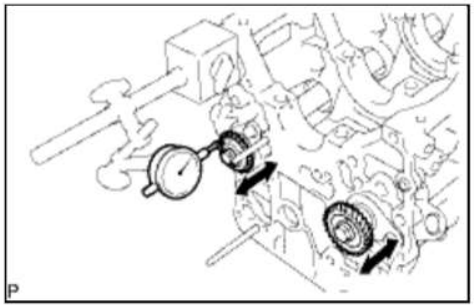
Do not use a wire brush.

11. REMOVE NO. 1 OIL NOZZLE SUB-ASSEMBLY



(a) Using a 5 mm hexagon wrench, remove the oil nozzles.

12. INSPECT BALANCE SHAFT THRUST CLEARANCE



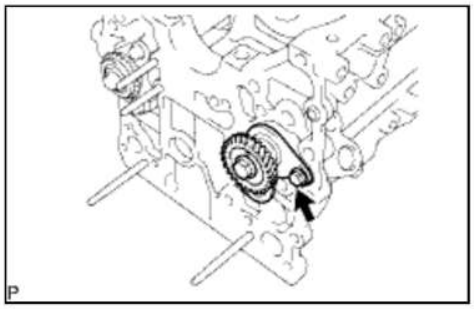
(a) Using a dial indicator, measure the thrust clearance while moving the balance shaft back and forth.

Standard thrust clearance:
0.07 to 0.13 mm (0.00276 to 0.00512 in.)
Maximum thrust clearance:
0.20 mm (0.00787 in.)

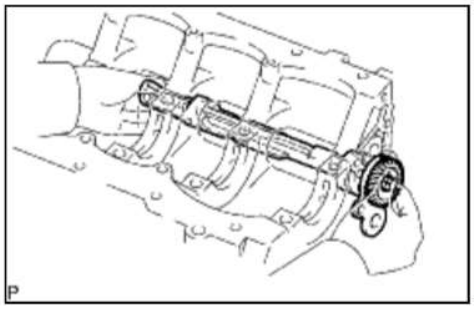
If the thrust clearance is more than the maximum, replace the balance shaft thrust washer. If necessary, replace the balance shaft.

13. REMOVE NO. 1 BALANCE SHAFT

cardiagn.com



(a) Remove the bolt.

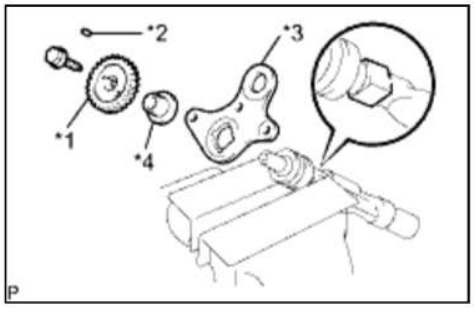


(b) Remove the balance shaft from the cylinder block.

NOTICE:

When removing the balance shaft, be sure to support the balance shaft with both hands and avoid scratching the balance shaft bearing on the cylinder block.

14. REMOVE NO. 1 BALANCE SHAFT DRIVEN GEAR



(a) Mount the head portion of the balance shaft in a vise.

NOTICE:

Do not damage the balance shaft.

(b) Remove the bolt.

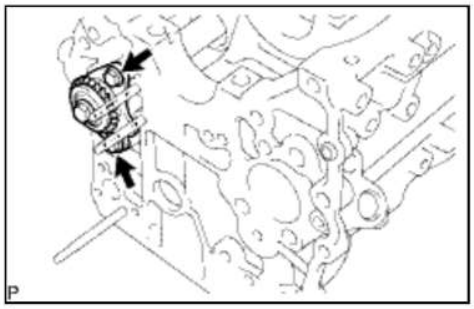
(c) Remove the No. 1 balance shaft driven gear, sliding key, balance shaft thrust washer and balance shaft thrust spacer.

Text in Illustration

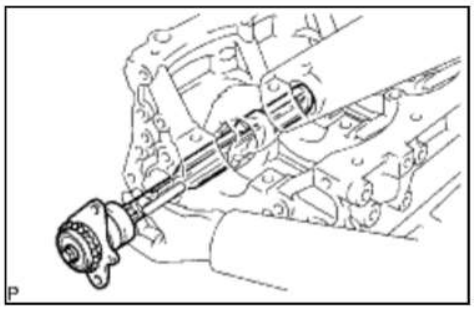
*1	No. 1 Balance Shaft Driven Gear
*2	Sliding Key
*3	Balance Shaft Thrust Washer
*4	Balance Shaft Thrust Spacer

15. REMOVE NO. 2 BALANCE SHAFT

cardiagn.com



(a) Remove the 2 bolts.

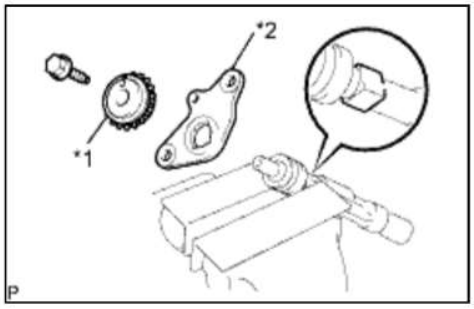


(b) Remove the balance shaft from the cylinder block.

NOTICE:

When removing the balance shaft, be sure to support the balance shaft with both hands and avoid scratching the balance shaft bearing on the cylinder block.

16. REMOVE NO. 2 BALANCE SHAFT DRIVEN GEAR



(a) Mount the head portion of the balance shaft in a vise.

NOTICE:

Do not damage the balance shaft.

(b) Remove the bolt.

(c) Remove the No. 2 balance shaft driven gear and No. 2 balance shaft thrust washer.

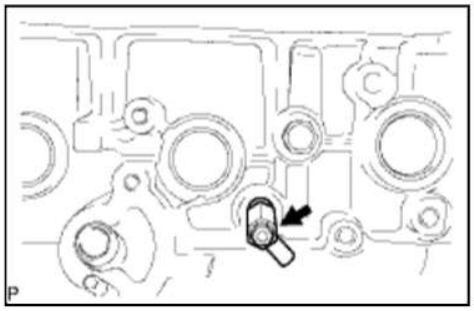
Text in Illustration

*1	No. 2 Balance Shaft Driven Gear
*2	No. 2 Balance Shaft Thrust Washer

17. REMOVE CYLINDER BLOCK WATER DRAIN COCK SUB-ASSEMBLY

(a) Remove the water drain cock from the cylinder block.

cardiagn.com



(b) Remove the water drain cock plug from the water drain cock.

18. REMOVE STUD BOLT

NOTICE:

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

cardiagn.com

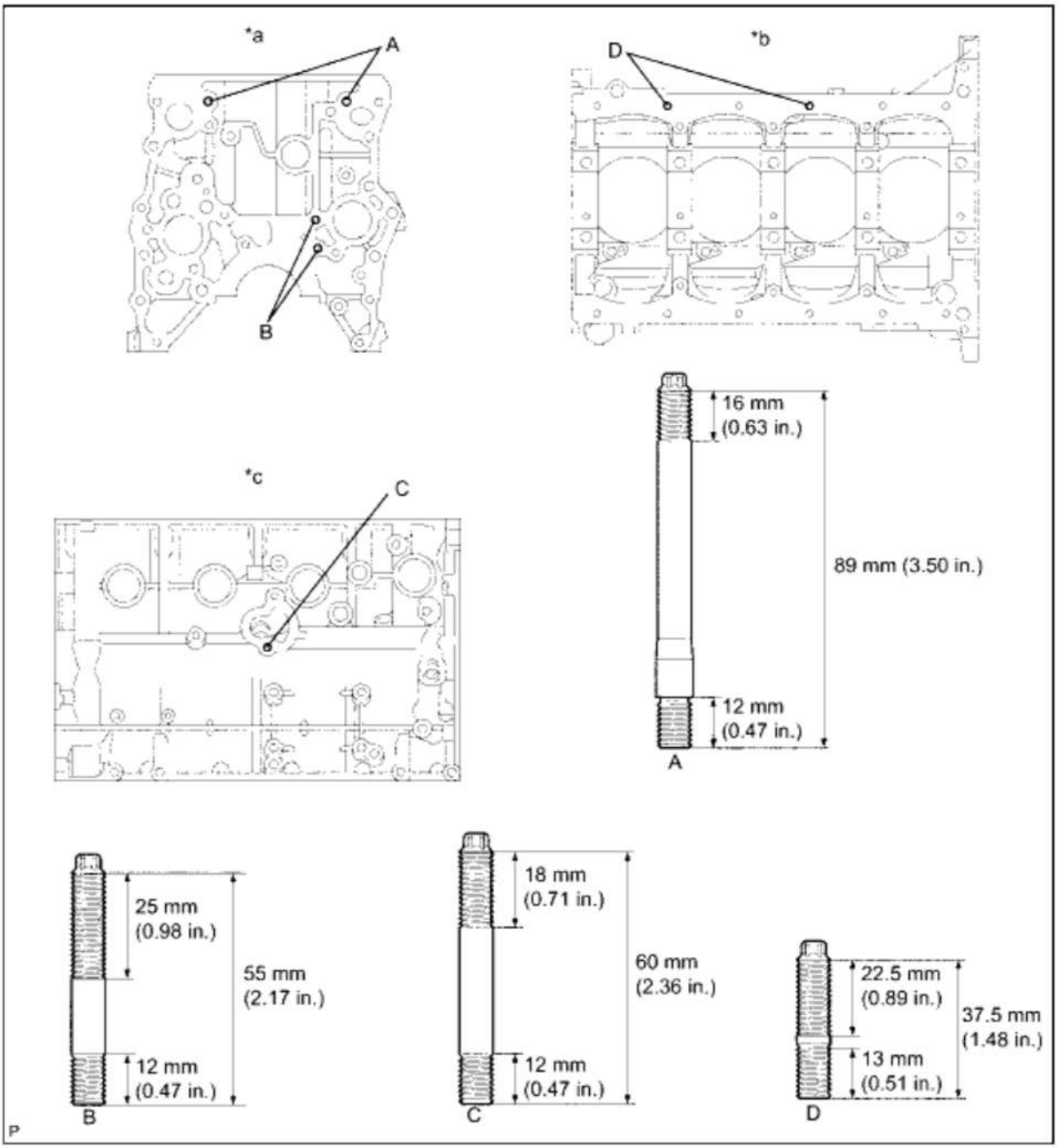
Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM00000125B021X
Title: 2TR-FE ENGINE MECHANICAL: CYLINDER BLOCK: REASSEMBLY (2010 4Runner)		

REASSEMBLY

1. INSTALL STUD BOLT

NOTICE:

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



Text in Illustration

cardiagn.com

*a	Front Side	*b	Lower Side
*c	Exhaust Side	-	-

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

Torque: 7.5 N·m (76 kgf·cm, 66in·lbf)

(b) Using an E7 "TORX" socket wrench, install the stud bolts labeled B and D.

Torque: 7.5 N·m (76 kgf·cm, 66in·lbf)

(c) Apply adhesive to the hole for the stud bolt labeled C in the cylinder block. Using an E7 "TORX" socket wrench, install the stud bolt labeled C.

Torque: 7.5 N·m (76 kgf·cm, 66in·lbf)

HINT:

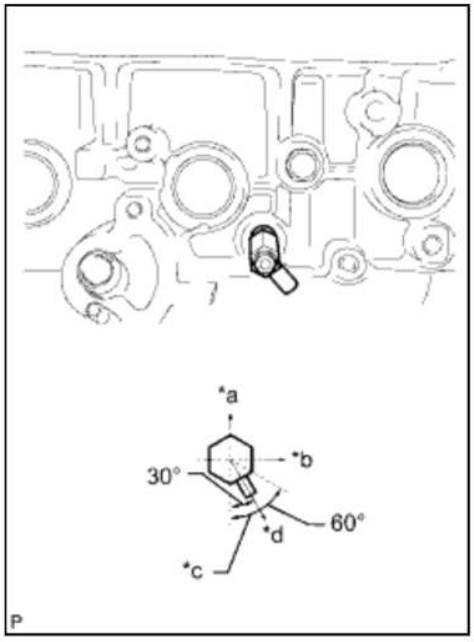
When reusing a stud bolt, apply adhesive to the bolt before installing it.

Adhesive:
Toyota Genuine Adhesive 1344, Three Bond 1344 or equivalent

2. INSTALL CYLINDER BLOCK WATER DRAIN COCK SUB-ASSEMBLY

(a) Apply adhesive to the drain cock.

Adhesive:
Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent



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

Torque: 25 N·m (250 kgf·cm, 18ft·lbf)

Text in Illustration

*a	Upper Side
*b	Front
*c	Allowable Range
*d	Target Direction

NOTICE:

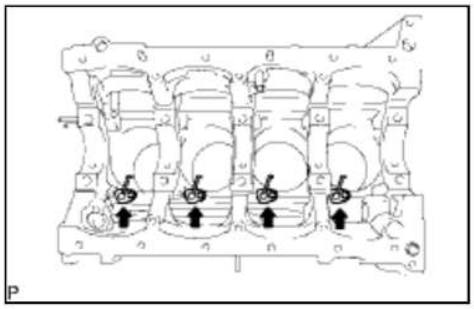
- Do not rotate the drain cock more than 1 revolution (360°) after tightening the drain cock to the specified torque.
- Do not loosen the drain cock to adjust it. If an adjustment is necessary, remove the drain cock and reinstall it.

(c) Install the water drain cock plug to the water drain cock sub-assembly.

Torque: 13 N·m (130 kgf·cm, 9ft·lbf)

3. INSTALL NO. 1 OIL NOZZLE SUB-ASSEMBLY

cardiagn.com



(a) Using a 5 mm hexagon wrench, install the oil nozzles.

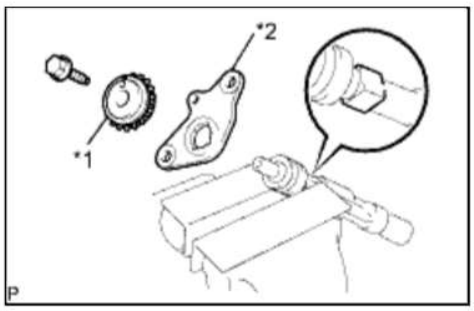
Torque: 7.0 N·m (71 kgf·cm, 62in·lbf)

4. INSTALL NO. 2 BALANCE SHAFT DRIVEN GEAR

(a) Mount the head portion of the balance shaft in a vise.

NOTICE:

Do not damage the balance shaft.



(b) Install the No. 2 balance shaft thrust washer and No. 2 balance shaft driven gear.

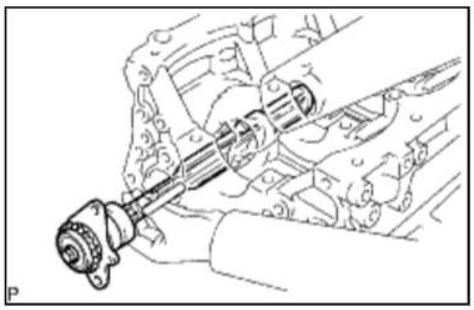
Text in Illustration

*1	No. 2 Balance Shaft Driven Gear
*2	No. 2 Balance Shaft Thrust Washer

(c) Install the bolt.

Torque: 36 N·m (367 kgf·cm, 27ft·lbf)

5. INSTALL NO. 2 BALANCE SHAFT



(a) Install the balance shaft to the cylinder block.

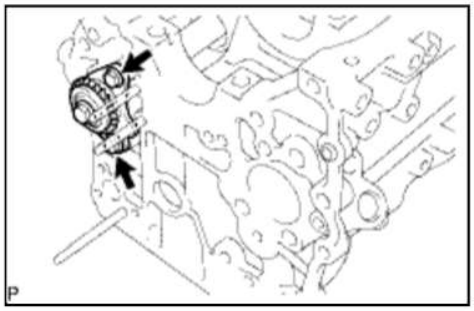
NOTICE:

When installing the balance shaft, be sure to support the balance shaft with both hands and avoid scratching the balance shaft bearing on the cylinder block.

(b) Install the 2 bolts.

Torque: 18 N·m (184 kgf·cm, 13ft·lbf)

cardiagn.com



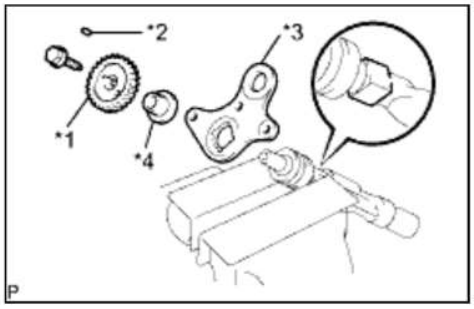
6. INSTALL NO. 1 BALANCE SHAFT DRIVEN GEAR

(a) Mount the head portion of the balance shaft in a vise.

NOTICE:

Do not damage the balance shaft.

(b) Install the No. 1 balance shaft thrust washer, balance shaft thrust spacer, sliding key and No. 1 balance shaft driven gear.



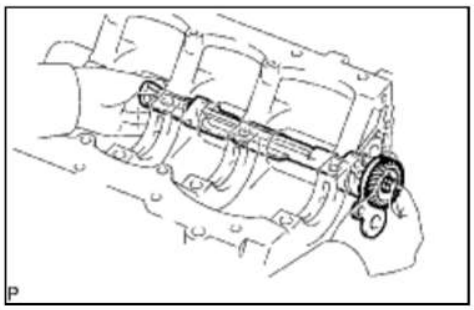
Text in Illustration

*1	No. 1 Balance Shaft Driven Gear
*2	Sliding Key
*3	Balance Shaft Thrust Washer
*4	Balance Shaft Thrust Spacer

(c) Install the bolt.

Torque: 36 N·m (367 kgf·cm, 27ft·lbf)

7. INSTALL NO. 1 BALANCE SHAFT

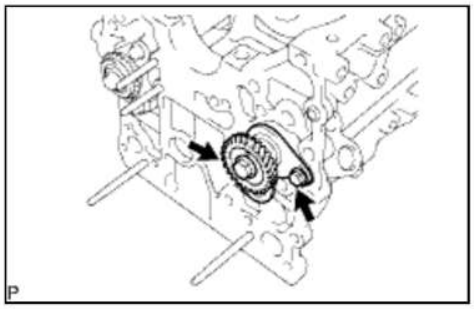


(a) Install the No. 1 balance shaft to the cylinder block.

NOTICE:

When installing the balance shaft, be sure to support the balance shaft with both hands and avoid scratching the balance shaft bearing on the cylinder block.

cardiagn.com



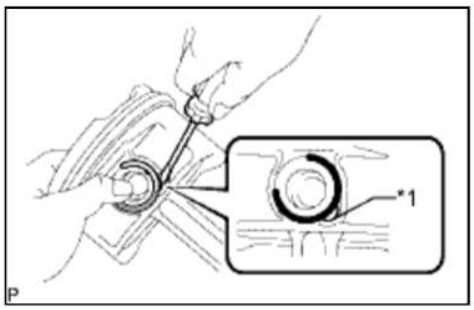
(b) Install the 2 bolts.

Torque: 18 N·m (184 kgf·cm, 13ft·lbf)

8. INSTALL PISTON WITH PIN SUB-ASSEMBLY

(a) Assemble the piston and connecting rod.

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



Text in Illustration

*1	Service Cutout

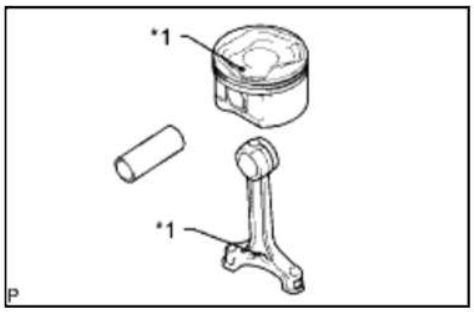
HINT:

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

(2) Gradually heat the piston to approximately 35 to 45°C (95 to 113°F).

(3) Coat the piston pin with engine oil.

(4) Align the front marks of the piston and connecting rod and push in the piston pin with your thumb.



Text in Illustration

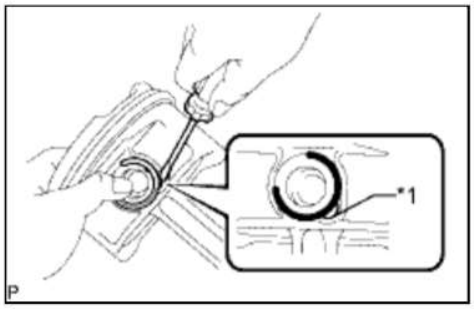
*1	Front Mark

HINT:

The piston and pin are a matched set.

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

cardiagn.com



Text in Illustration

*1	Service Cutout

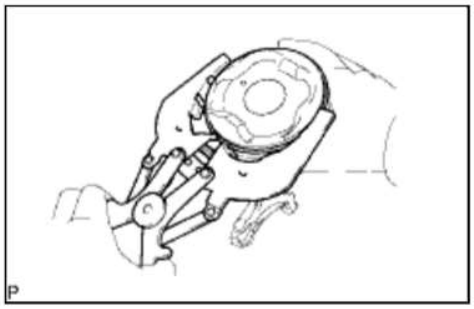
HINT:

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

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

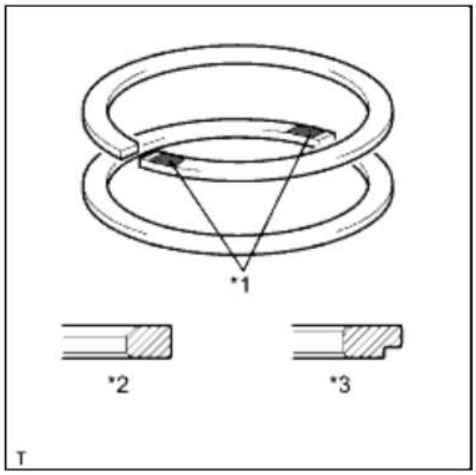
9. INSTALL PISTON RING SET

(a) Install the oil ring expander by hand.



(b) Using a piston ring expander, install the oil ring rail.

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



HINT:

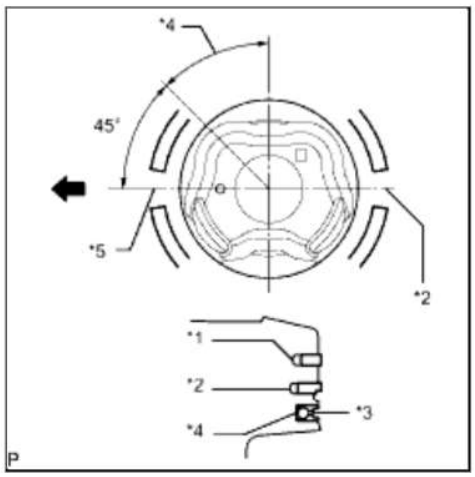
- Install the No. 1 compression ring with the code mark (1N) facing upward.
- Install the No. 2 compression ring with the code mark (2N) facing upward.

Text in Illustration

*1	Code Mark
*2	No. 1 Compression Ring
*3	No. 2 Compression Ring

cardiagn.com

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



Text in Illustration

*1	No. 1 Compression Ring
*2	No. 2 Compression Ring
*3	Oil Ring
*4	Oil Ring Expander
*5	No. 1 Compression Ring and Oil Ring
➡	Engine Front

NOTICE:

Do not align the compression ring ends.

10. INSTALL CRANKSHAFT BEARING

NOTICE:

Do not apply engine oil to the contact area or backside of the bearing.

(a) Clean the main journal and both surfaces of the bearing.

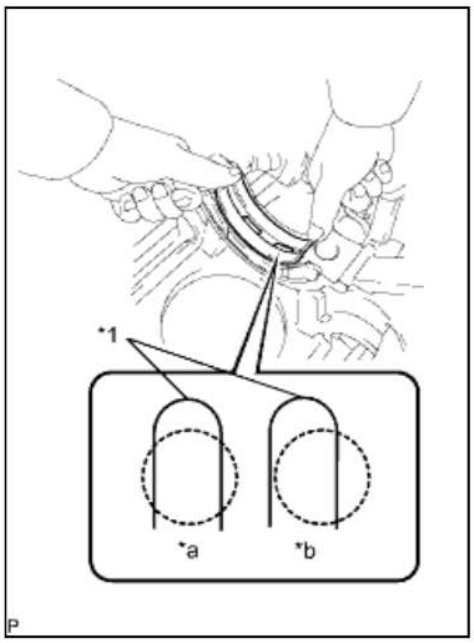
(b) Install the upper bearing.

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

Reference (Difference in Dimension of Cylinder Block and Bearing):

ITEM	SPECIFIED CONDITION
# 1, 5 journal	3.75 mm (0.148 in.)
# 3 journal	1.74 mm (0.0684 in.)

cardiagn.com



# 2, 4 journal	2.75 mm (0.108 in.)

NOTICE:

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

Text in Illustration

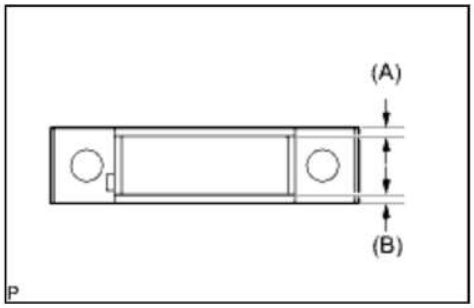
*1	Oil Groove
*a	CORRECT
*b	INCORRECT

(c) Install the lower bearing.

(1) Install the lower bearing to the bearing cap.

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

Dimension A - B or B - A:
0.3 mm (0.0118 in.) or less
Reference (Dimension of A or B):



ITEM	SPECIFIED CONDITION
# 1, 5 journal	3.75 mm (0.148 in.)
# 3 journal	1.75 mm (0.0689 in.)
# 2, 4 journal	2.75 mm (0.108 in.)

NOTICE:

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

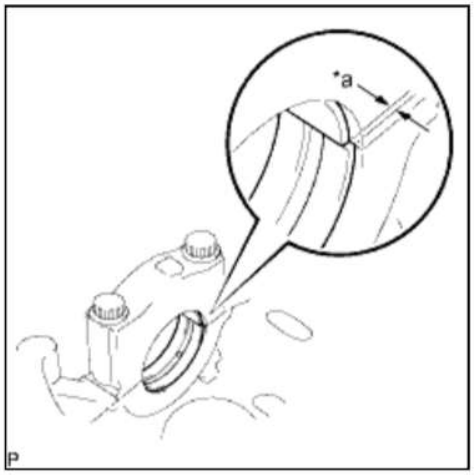
(d) With the upper bearing and lower bearing installed, use a plastic-faced hammer to install the bearing caps to the cylinder block.

NOTICE:

Make sure that the bearing caps are installed in the correct positions and facing in the correct direction.

(e) Using a vernier caliper, measure the amount of

cardiagn.com



misalignment between the upper bearing and lower bearing as shown in the illustration.

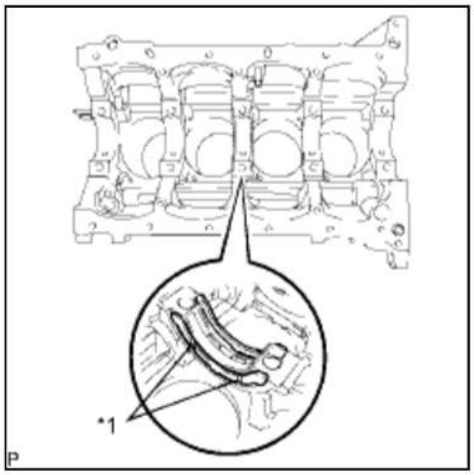
Standard misalignment:
0.9 mm (0.0354 in.) or less

Text in Illustration

*a	Misalignment

(f) Remove the bearing cap.

(g) Apply engine oil to the thrust washers.



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

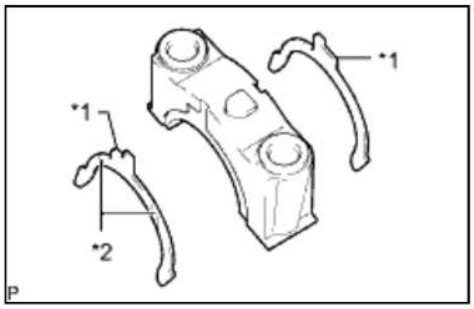
Text in Illustration

*1	Oil Groove

NOTICE:

Be careful when installing the upper and lower thrust washers as they are similar but cannot be interchanged.

(i) Install the 2 thrust washers to the No. 3 bearing cap with the grooves facing outward.



Text in Illustration

*1	Claw
*2	Oil Groove

NOTICE:

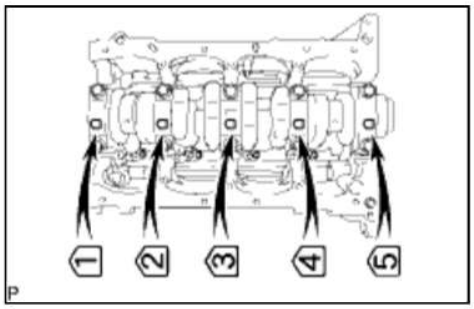
Be careful when installing the thrust bearing upper and lower as they are similar but cannot be interchanged. The bearing lower has a claw as shown in the illustration.

cardiagn.com

(j) Apply engine oil to the lower bearing.

11. INSTALL CRANKSHAFT

(a) Apply engine oil to the upper bearing, and then place the crankshaft on the cylinder block.



(b) Install the 5 crankshaft bearing caps in their proper locations.

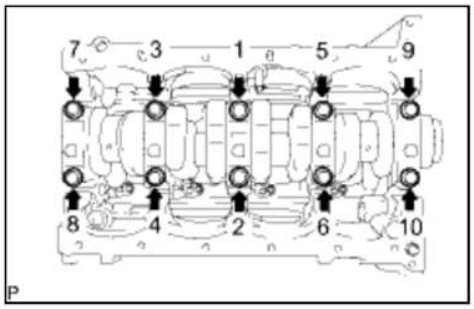
(c) Install the crankshaft bearing cap bolt.

HINT:

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

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

(2) Temporarily install the crankshaft bearing cap bolts.



(3) Step 1:

Uniformly tighten the 10 main bearing cap bolts in the sequence shown in the illustration.

Torque: 39 N·m (398 kgf·cm, 29ft·lbf)

If any of the main bearing cap bolts does not meet the torque specification, replace the main bearing cap bolt.

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

(5) Step 2:

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

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

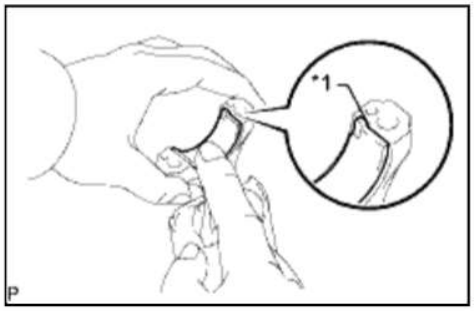
(d) Check that the crankshaft turns smoothly.

(e) Check the crankshaft thrust clearance INFO.

12. INSTALL CONNECTING ROD BEARING

(a) Align the bearing claw with the groove of the connecting rod or connecting rod cap.

cardiagn.com



Text in Illustration

*1	Claw

(b) Install the bearings to the connecting rod and connecting rod cap.

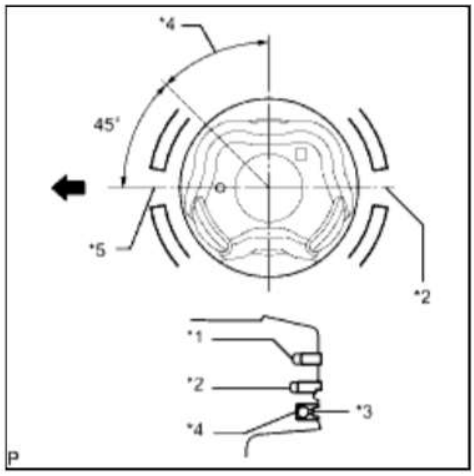
NOTICE:

Clean the backside of the bearing and the surface of the connecting rod or connecting rod cap that contacts the bearing.

13. INSTALL PISTON SUB-ASSEMBLY WITH CONNECTING ROD

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

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



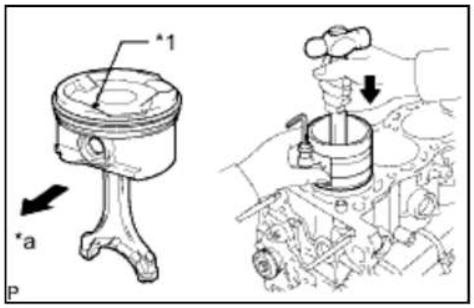
Text in Illustration

*1	No. 1 Compression Ring
*2	No. 2 Compression Ring
*3	Oil Ring
*4	Oil Ring Expander
*5	No. 1 Compression Ring and Oil Ring
➡	Engine Front

NOTICE:

Do not align the compression ring ends.

cardiagn.com

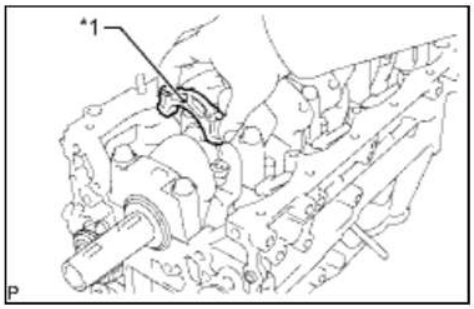


(c) Using a piston ring compressor, push the numbered piston and connecting rod assembly into the correct cylinder with the front mark of the piston facing forward.

Text in Illustration

*1	Front Mark
*a	Engine Front

(d) Match the numbered connecting rod cap with the correct connecting rod.



(e) Check that the front mark of the connecting rod cap is facing forward.

Text in Illustration

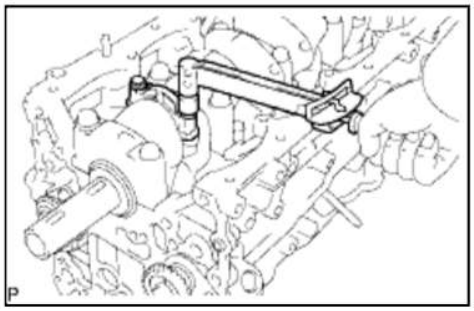
*1	Front Mark

(f) Install the connecting rod cap bolts.

HINT:

The connecting rod cap bolts are tightened in 2 progressive steps.

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



(2) Step 1:

Install and alternately tighten the bolts of the connecting rod cap in several steps.

Torque: 25 N·m (250 kgf·cm, 18ft·lbf)

(3) Mark the front of each connecting rod cap bolt with paint.

(4) Step 2:

Tighten the cap bolts 90° as shown.

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

cardiagn.com

(g) Check that the crankshaft turns smoothly.

(h) Check the connecting rod thrust clearance INFO .

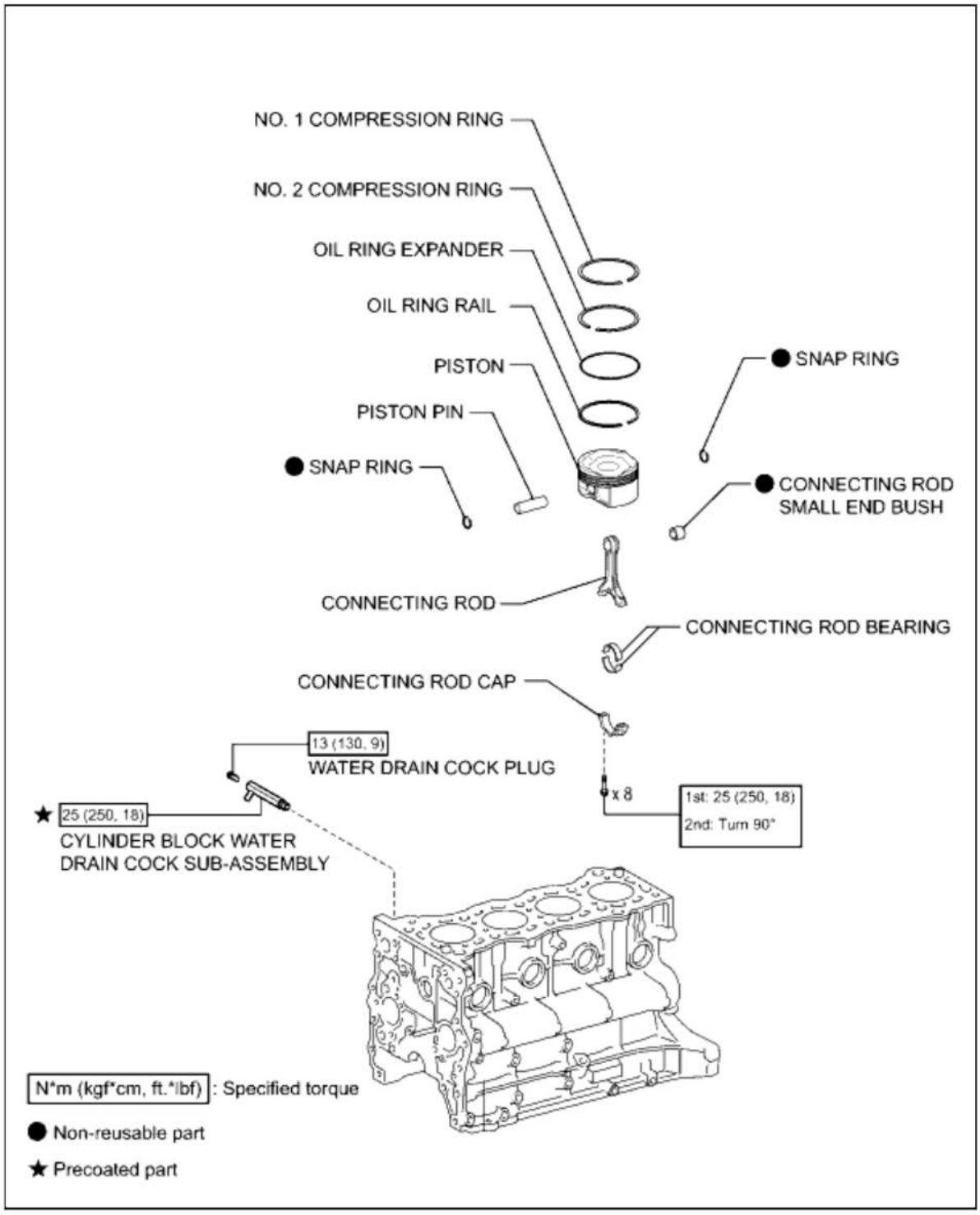


cardiagn.com

Last Modified: 5-10-2010	6.4 K	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM0000045EF002X
Title: 2TR-FE ENGINE MECHANICAL: CYLINDER BLOCK: COMPONENTS (2010 4Runner)		

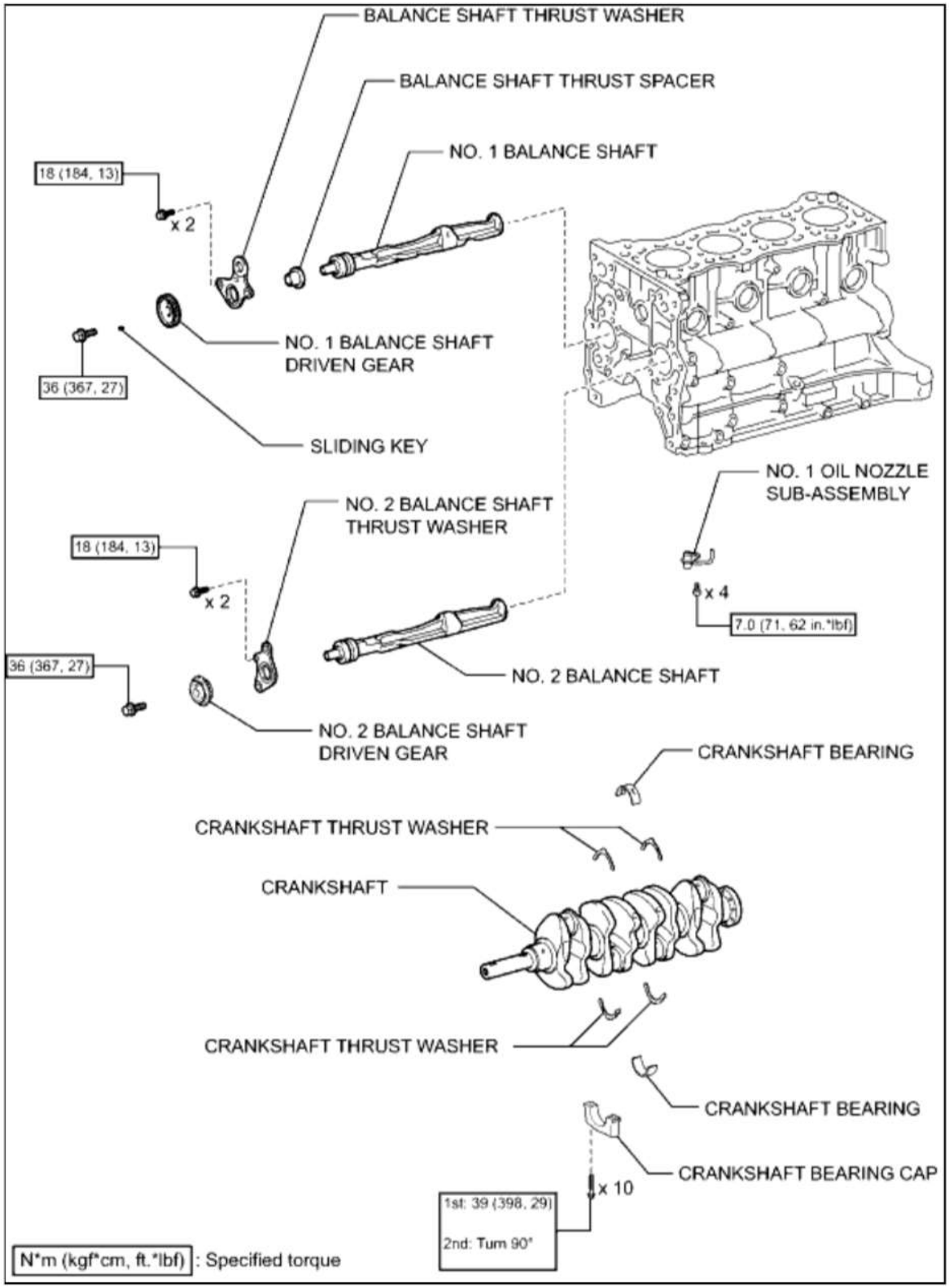
COMPONENTS

ILLUSTRATION



cardiagn.com

ILLUSTRATION

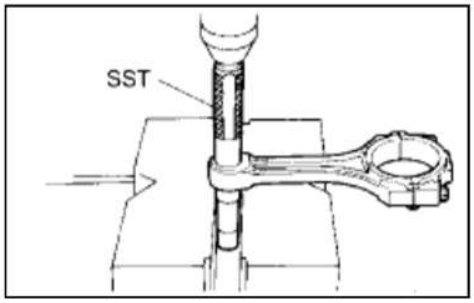


cardiagn.com

Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM00000125B020X
Title: 2TR-FE ENGINE MECHANICAL: CYLINDER BLOCK: REPLACEMENT (2010 4Runner)		

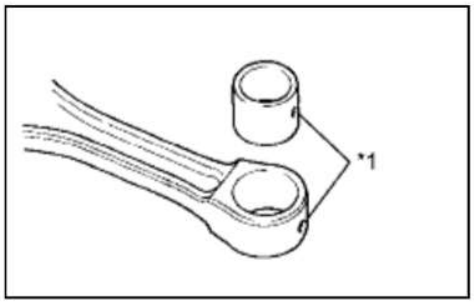
REPLACEMENT

1. REPLACE CONNECTING ROD SMALL END BUSH



(a) Using SST and a press, press out the bush.

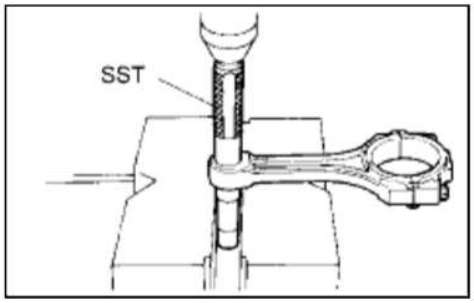
SST: 09222-30010



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

Text in Illustration

*1	Oil Hole

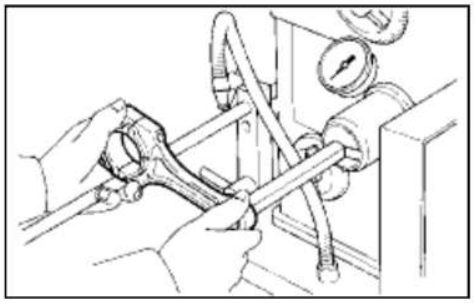


(c) Using SST and a press, press in the bush.

SST: 09222-30010

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

cardiagn.com



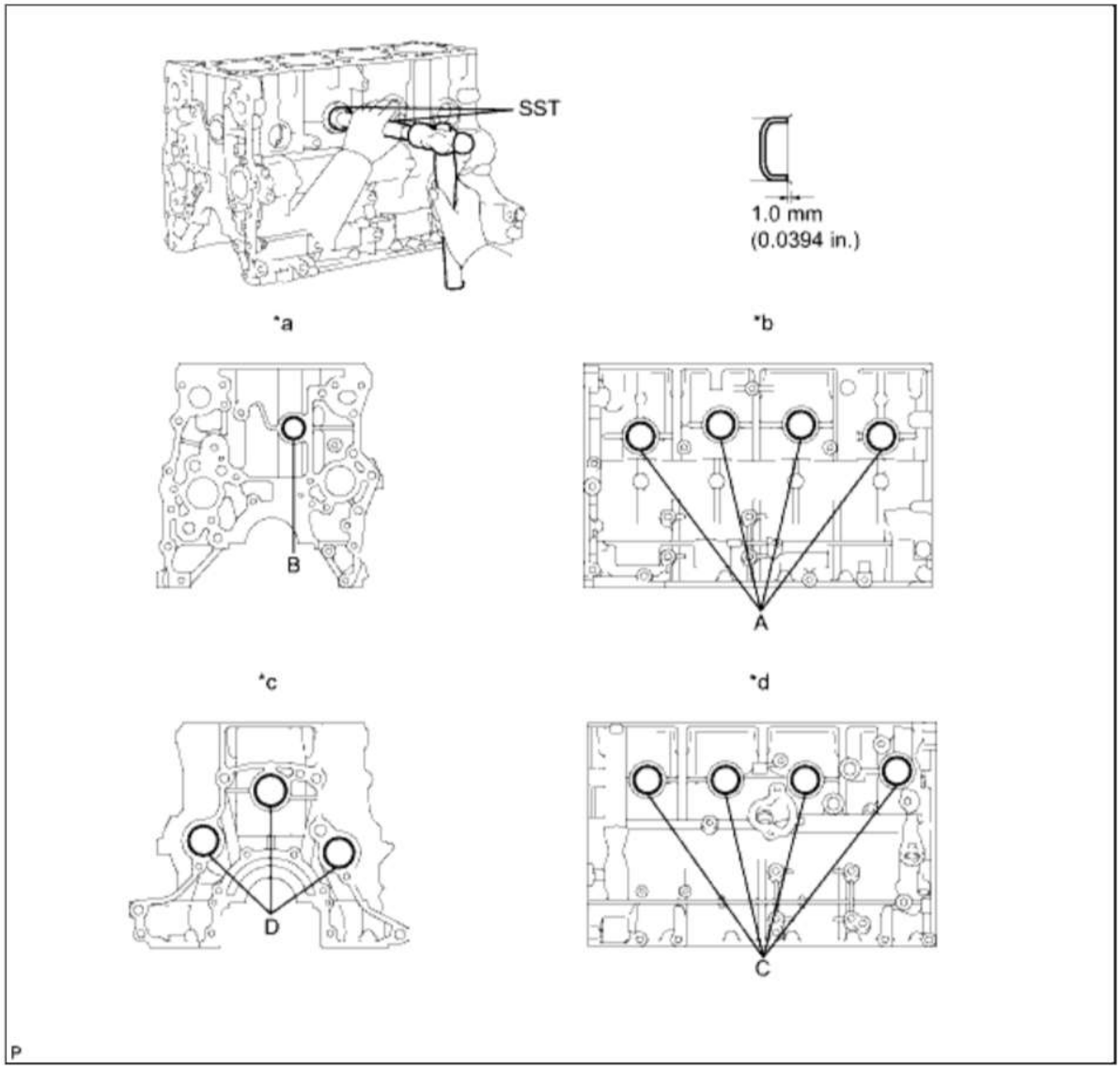
(e) Check that the piston pin fits at normal room temperature.

(1) Coat the piston pin with engine oil and push it into the connecting rod with your thumb.

2. REPLACE TIGHT PLUG

NOTICE:

If coolant leaks from the tight plug or the plug is corroded, replace it.



cardiagn.com

Text in Illustration

*a	Front Side	*b	Intake Side
*c	Rear Side	*d	Exhaust Side

(a) Apply adhesive to new tight plugs.

Adhesive:
Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent.

(b) Using SST, tap in the 8 tight plugs labeled A and C.

SST: 09950-60010
09951-00350
SST: 09950-70010
09951-07100

(c) Using SST, tap in the tight plug labeled B.

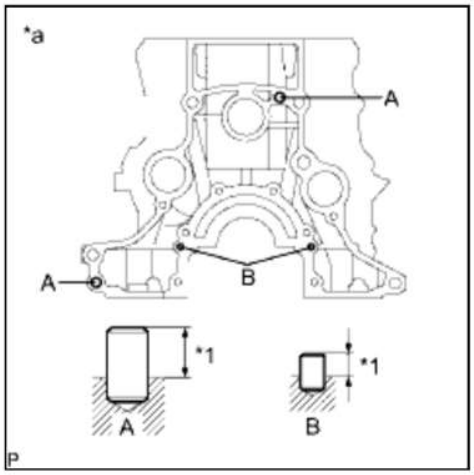
SST: 09950-60010
09951-00300
SST: 09950-70010
09951-07100

(d) Using SST, tap in the 3 tight plugs labeled D.

SST: 09950-60010
09951-00400
SST: 09950-70010
09951-07100

3. 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 new straight pins to the cylinder block.

Standard Straight Pin:

ITEM	WIDE	PROTRUSION
Pin A	10 mm (0.394 in.)	13 mm (0.512 in.)
Pin B	6.0 mm (0.236 in.)	5.5 mm (0.217 in.)

Text in Illustration

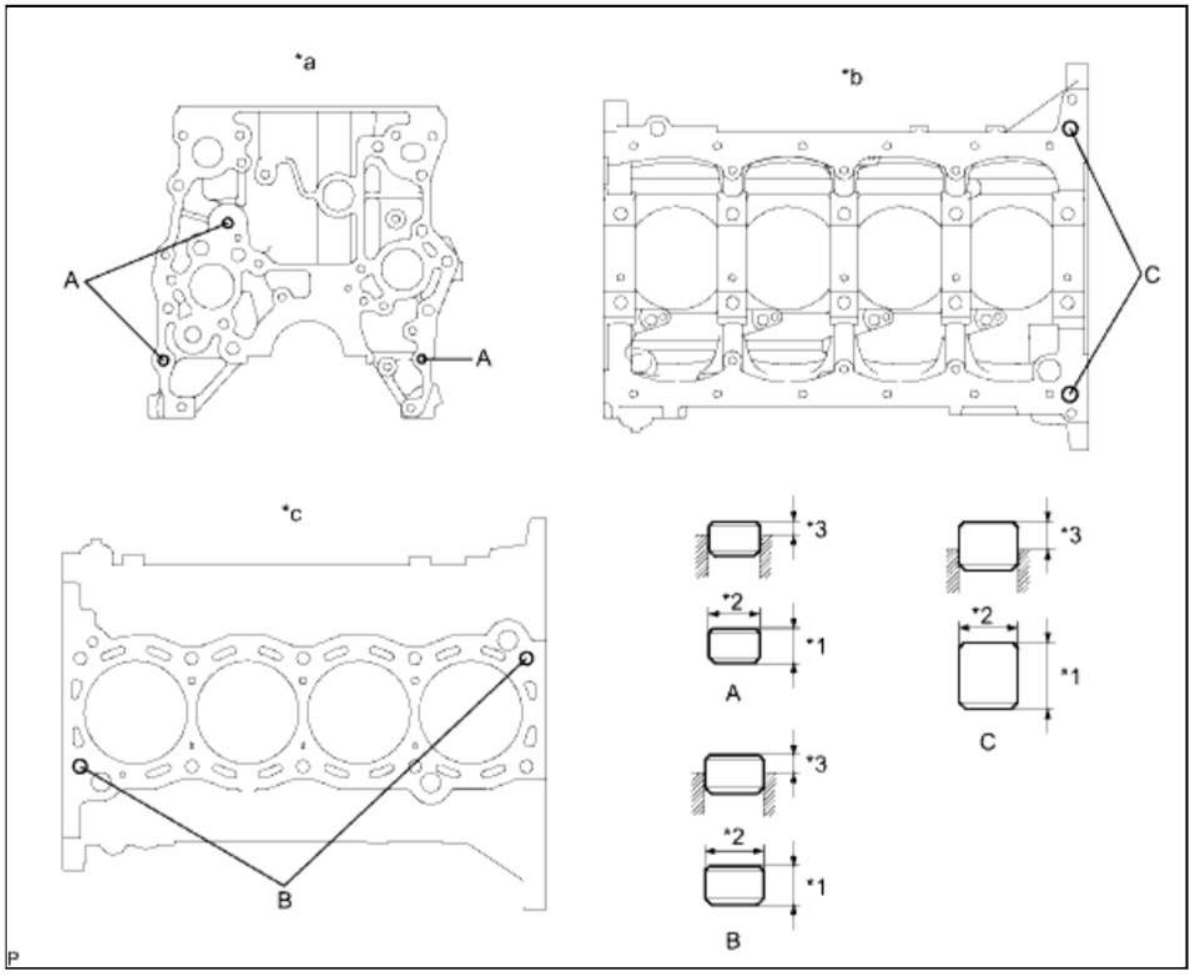
*1	Protrusion
*a	Rear Side

cardiagn.com

4. REPLACE RING PIN

NOTICE:

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



Text in Illustration

*1	Height	*2	Width
*3	Protrusion	-	-
*a	Front Side	*b	Lower Side
*c	Upper Side	-	-

(a) Using a plastic-faced hammer, tap in new ring pins to the cylinder block.

Standard Ring Pin:

ITEM	HEIGHT	WIDTH	PROTRUSION
Pin A	9.0 mm (0.354 in.)	11 mm (0.433 in.)	3.5 to 4.5 mm (0.138 to 0.177 in.)
Pin B	14 mm (0.511 in.)	15 mm (0.591 in.)	7.5 to 9.5 mm (0.295 to 0.374 in.)

cardiagn.com

ITEM	HEIGHT	WIDTH	PROTRUSION
Pin C	20 mm (0.787 in.)	14 mm (0.511 in.)	7.0 to 9.0 mm (0.276 to 0.354 in.)



cardiagn.com

Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000003E2B003X
Title: 2TR-FE ENGINE MECHANICAL: CYLINDER BLOCK: REPAIR (2010 4Runner)		

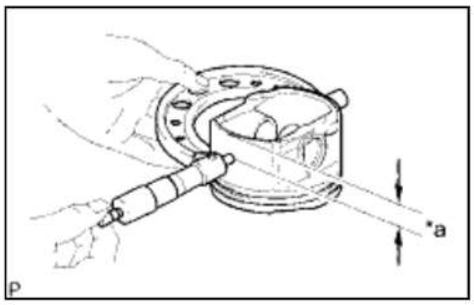
REPAIR

HINT:

- Bore all 4 cylinders to fit the O/S piston outside diameter.
- Replace all the piston rings with ones to match the O/S pistons.

1. BORE CYLINDER

(a) Prepare 4 new O/S pistons.



(b) Using a micrometer, measure the piston diameter at right angles to the piston center line where the distance from the piston end is as specified.

Standard piston diameter (O/S 0.50):
95.441 to 95.471 mm (3.758 to 3.759 in.)
Distance:
13.8 mm (0.543 in.)

Text in Illustration

*a	Distance

(c) Calculate the amount each cylinder is to be rebored as follows.

HINT:

Size to be rebored = P + C - H

P = Piston diameter

C = Piston oil clearance: 0.013 to 0.036 mm (0.000512 to 0.00142 in.)

H = Allowance for honing: 0.02 mm (0.000787 in.) or less

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

NOTICE:

Excess honing will destroy the finished roundness.

(e) Using a cylinder gauge, measure the cylinder bore diameter and calculate the honing allowance.

HINT:

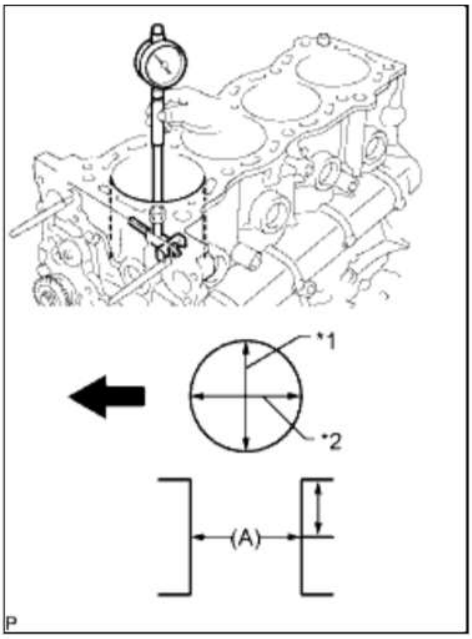
Honing allowance = cylinder bore diameter - (piston diameter + oil clearance)

(f) Finish the cylinder bore using the calculated value.

(g) Using a cylinder gauge, measure the cylinder bore diameter at position A in the thrust and axial

cardiagn.com

directions.



Standard oil clearance:
0.019 to 0.052 mm (0.000748 to 0.00205 in.)

Text in Illustration

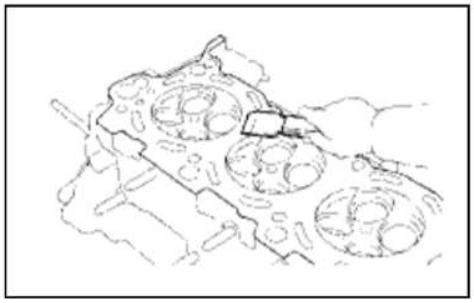
*1	Thrust Direction
*2	Axial Direction
➡	Engine Front

cardiagn.com

Last Modified: 5-10-2010	6.4 G	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000000XCV03ZX
Title: 1GR-FE ENGINE MECHANICAL: CYLINDER HEAD: INSPECTION (2010 4Runner)		

INSPECTION

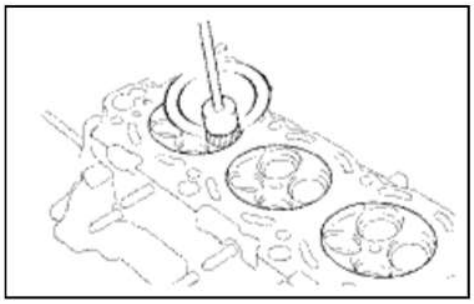
1. CLEAN CYLINDER HEAD SUB-ASSEMBLY



(a) Using a gasket scraper, remove all the gasket material from the surface which contacts the cylinder block.

NOTICE:

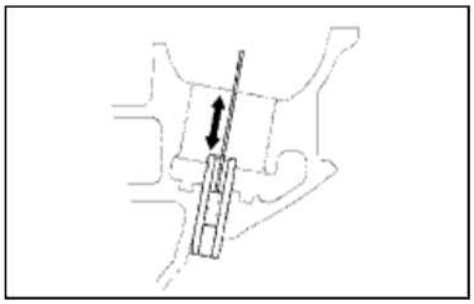
Be careful not to scratch the surface which contacts the cylinder block.



(b) Using a wire brush, remove all the carbon from the combustion chambers.

NOTICE:

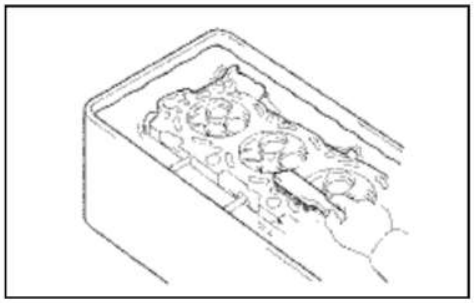
Be careful not to scratch the cylinder block contact surface.



(c) Using a valve guide bushing brush and solvent, clean all the guide bushes.

(d) Using a soft brush and solvent, thoroughly clean the cylinder head.

cardiagn.com



2. INSPECT CYLINDER HEAD SUB-ASSEMBLY

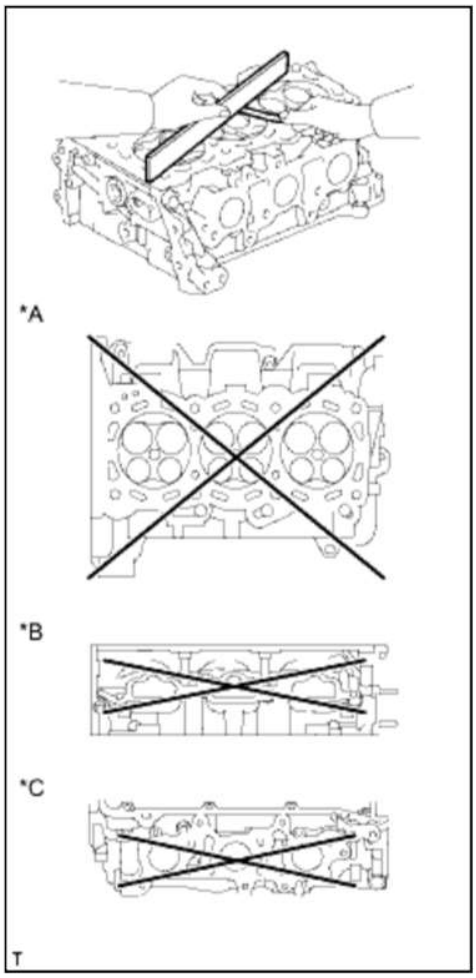
(a) Using a precision straightedge and feeler gauge, measure the warpage of the surfaces which contact the cylinder block sub-assembly and manifolds.

Standard Warpage:

ITEM	SPECIFIED CONDITION
Cylinder block side	0.05 mm (0.00197 in.)
Intake side	0.08 mm (0.00315 in.)
Exhaust side	0.08 mm (0.00315 in.)

Maximum Warpage:

ITEM	SPECIFIED CONDITION
Cylinder block side	0.10 mm (0.00394 in.)
Intake side	0.10 mm (0.00394 in.)
Exhaust side	0.10 mm (0.00394 in.)



Text in Illustration

*A	Cylinder Block Side
*B	Intake Side
*C	Exhaust Side

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

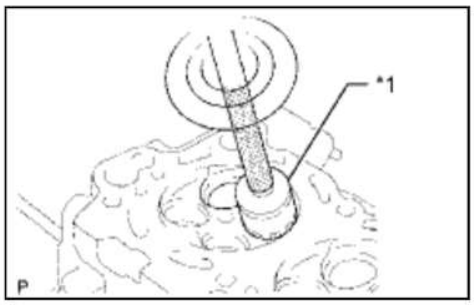
(b) Using a dye penetrant, check the intake ports, exhaust ports and cylinder surface for cracks.

If cracked, replace the cylinder head sub-assembly.

3. CLEAN VALVE SEAT

cardiagn.com

(a) Using a 45° carbon cutter, resurface the valve seats.



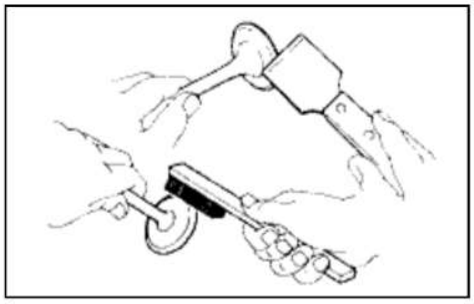
Text in Illustration

*1	45° Carbon Cutter

HINT:

Only remove the amount of metal necessary to clean the seats.

4. INSPECT INTAKE VALVE



(a) Clean the valves.

(1) Using a gasket scraper, chip off any carbon from the valve head.

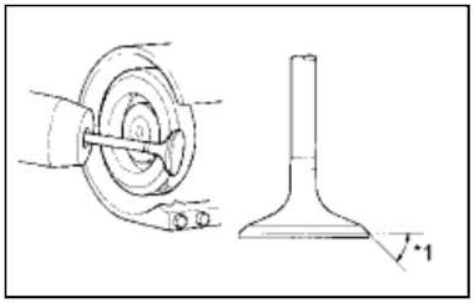
(2) Using a wire brush, thoroughly clean the valve.

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

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) Check the valve face angle.



Text in Illustration

*1	Valve Face Angle

(1) Grind the valve sufficiently to remove pits and carbon.

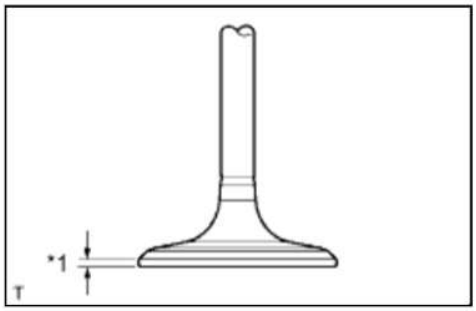
(2) Check that the valve is ground to the correct valve face angle.

Standard valve face angle:
45.5°

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

cardiagn.com

Text in Illustration



*1	Margin Thickness

Standard margin thickness:
1.25 mm (0.0492 in.)
Minimum margin thickness:
0.5 mm (0.0197 in.)

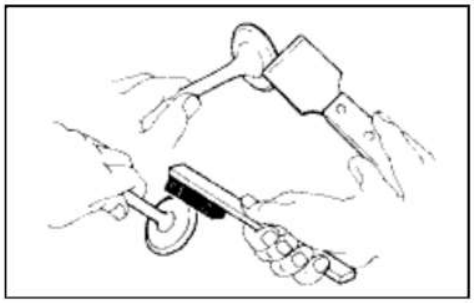
If the margin thickness is less than the minimum, replace the intake valve.

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

Standard overall length:
105.85 mm (4.17 in.)
Minimum overall length:
105.35 mm (4.15 in.)

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

5. INSPECT EXHAUST VALVE



(a) Clean the valves.

(1) Using a gasket scraper, chip off any carbon from the valve head.

(2) Using a wire brush, thoroughly clean the valve.

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

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.

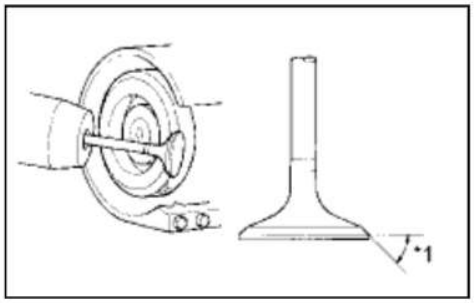
(c) Check the valve face angle.

Text in Illustration

*1	Valve Face Angle

(1) Grind the valve sufficiently to remove pits and carbon.

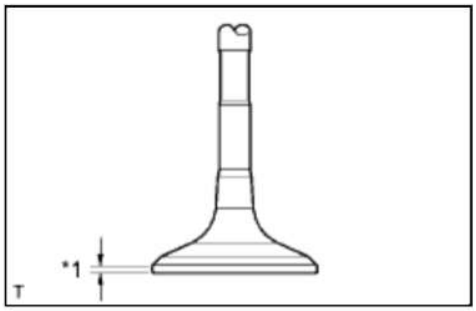
cardiagn.com



(2) Check that the valve is ground to the correct valve face angle.

Standard valve face angle:
45.5°

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



Text in Illustration

*1	Margin Thickness

Standard margin thickness:
1.4 mm (0.0551 in.)
Minimum margin thickness:
0.5 mm (0.0197 in.)

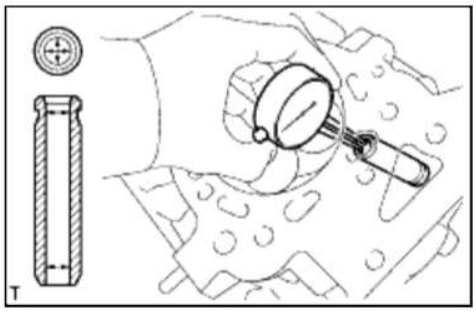
If the margin thickness is less than the minimum, replace the exhaust valve.

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

Standard overall length:
110.40 mm (4.35 in.)
Minimum overall length:
109.90 mm (4.33 in.)

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

6. INSPECT VALVE GUIDE BUSH OIL CLEARANCE



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

Bush inside diameter:
5.510 to 5.530 mm (0.217 to 0.218 in.)

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

cardiagn.com

Standard 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:

ITEM	SPECIFIED CONDITION
Intake	0.08 mm (0.00315 in.)
Exhaust	0.10 mm (0.00394 in.)

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

7. INSPECT INTAKE VALVE SEAT

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

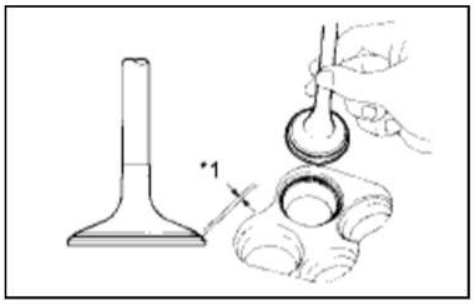
(b) Lightly press the valve face against the valve seat.

NOTICE:

Do not rotate the valve.

(c) Check the valve face and valve seat by using the following procedure:

Text in Illustration



*1	Width

(1) Check that Prussian blue appears around the entire valve face. If not, replace the valve.

(2) If Prussian blue appears around the entire valve seat, the guide and valve face are concentric. If not, resurface the valve seat.

(3) Check that the valve seat contacts the middle of the valve face with the width between 1.1 and 1.5 mm (0.0433 and 0.0591 in.).

8. INSPECT EXHAUST VALVE SEAT

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

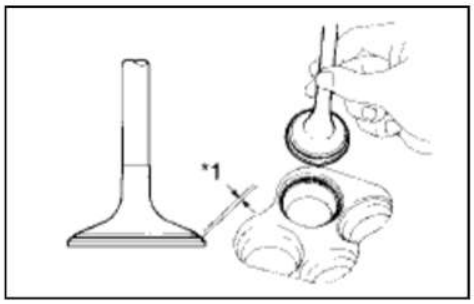
(b) Lightly press the valve face against the valve seat.

NOTICE:

Do not rotate the valve.

cardiagn.com

(c) Check the valve face and valve seat by using the following procedure:



Text in Illustration

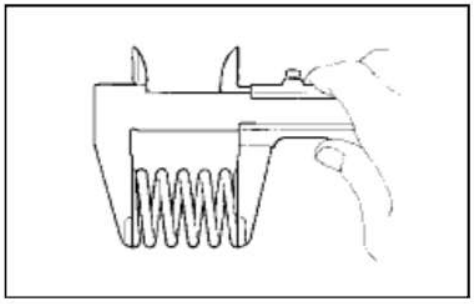
*1	Width

(1) Check that Prussian blue appears around the entire valve face. If not, replace the valve.

(2) If Prussian blue appears around the entire valve seat, the guide and valve face are concentric. If not, resurface the valve seat.

(3) Check that the valve seat contacts the middle of the valve face with the width between 1.1 and 1.5 mm (0.0433 and 0.0591 in.).

9. INSPECT INNER COMPRESSION SPRING



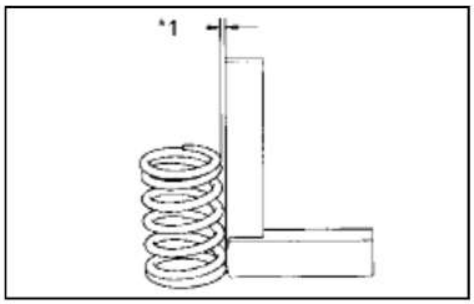
(a) Using a vernier caliper, measure the free length of the inner compression spring.

Standard free length:
48.63 mm (1.91 in.)

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

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

Maximum deviation:
1.0 mm (0.0394 in.)
Maximum angle (reference):
2°

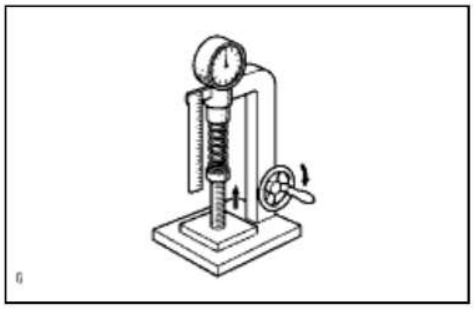


Text in Illustration

*1	Deviation

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

cardiagn.com



(c) Using a spring tester, measure the tension of the valve spring when it is compressed to the specified installation length.

Standard installed tension:

235.6 to 260.4 N (24 to 27 kgf, 53.0 to 58.5 lbf) at 36.9 mm (1.45 in.)

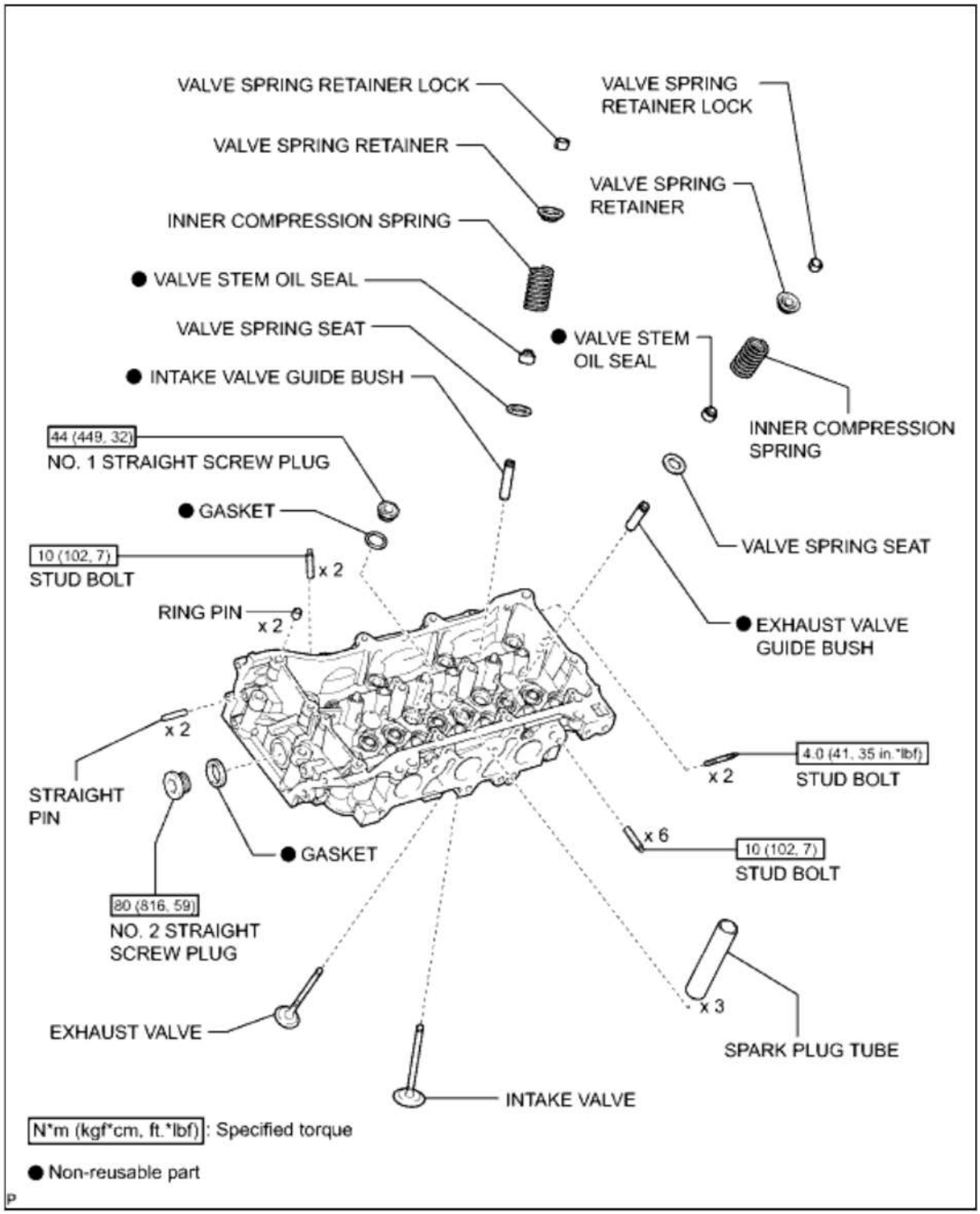
If the installed tension is not as specified, replace the valve spring.

cardiagn.com

Last Modified: 5-10-2010	6.4 K	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000000T4V03LX
Title: 1GR-FE ENGINE MECHANICAL: CYLINDER HEAD: COMPONENTS (2010 4Runner)		

COMPONENTS

ILLUSTRATION



cardiagn.com

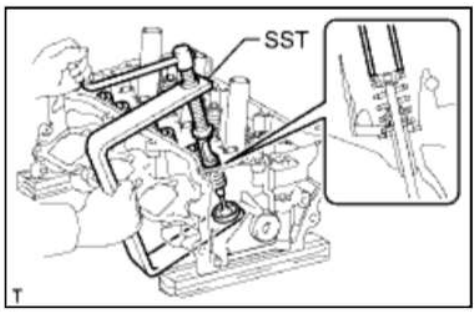


cardiagn.com

Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000000T4X03FX
Title: 1GR-FE ENGINE MECHANICAL: CYLINDER HEAD: DISASSEMBLY (2010 4Runner)		

DISASSEMBLY

1. REMOVE INTAKE VALVE



(a) Using SST, compress the inner compression spring and remove the valve spring retainer locks.

SST: 09202-70020

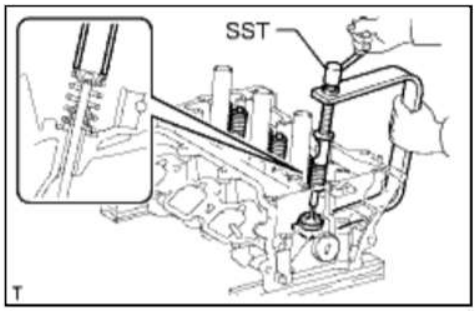
09202-00010

(b) Remove the valve spring retainer, inner compression spring and intake valve.

HINT:

Arrange the removed parts in the correct order.

2. REMOVE EXHAUST VALVE



(a) Using SST, compress the inner compression spring and remove the valve spring retainer locks.

SST: 09202-70020

09202-00010

(b) Remove the valve spring retainer, inner compression spring and exhaust valve.

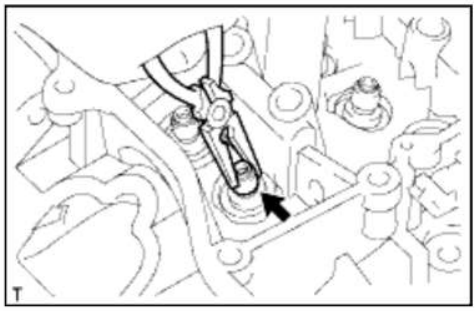
HINT:

Arrange the removed parts in the correct order.

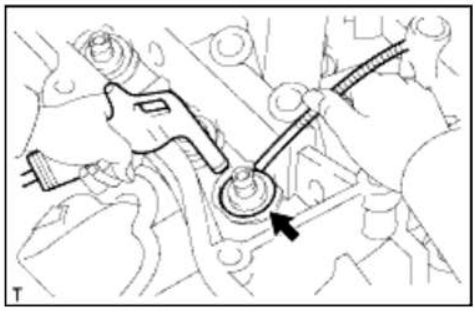
3. REMOVE VALVE STEM OIL SEAL

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

cardiagn.com

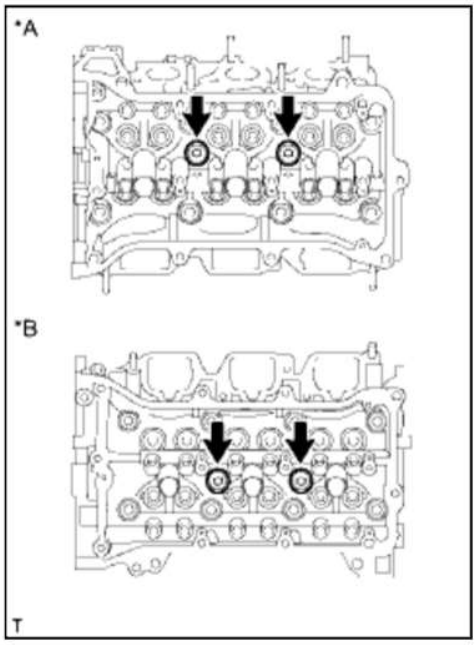


4. REMOVE VALVE SPRING SEAT



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

5. REMOVE NO. 1 STRAIGHT SCREW PLUG



(a) Using a 10 mm hexagon wrench, remove the 4 No. 1 straight screw plugs and 4 gaskets.

Text in Illustration

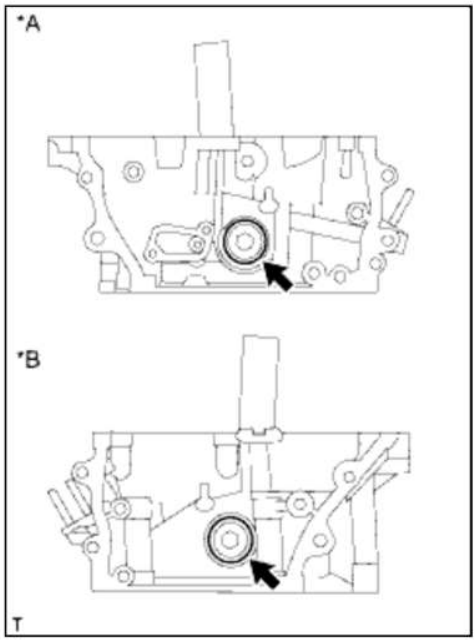
*A	RH
*B	LH

NOTICE:

If coolant leaks from a straight screw plug or a plug is corroded, replace it.

6. REMOVE NO. 2 STRAIGHT SCREW PLUG

cardiagn.com



(a) Using a 14 mm hexagon wrench, remove the 2 No. 2 straight screw plugs and 2 gaskets.

Text in Illustration

*A	RH
*B	LH

NOTICE:

If coolant leaks from a straight screw plug or a plug is corroded, replace it.

7. REMOVE STUD BOLT

NOTICE:

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

cardiagn.com

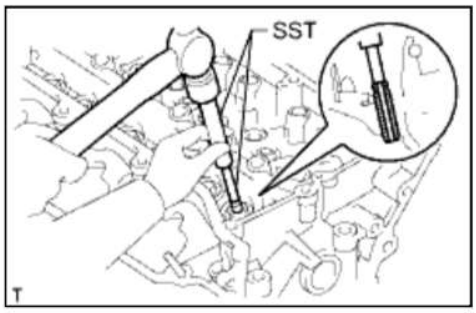
Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000000T4Y04NX
Title: 1GR-FE ENGINE MECHANICAL: CYLINDER HEAD: REPLACEMENT (2010 4Runner)		

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 intake valve guide bushes.

SST: 09201-10000

09201-01050

SST: 09950-70010

09951-07100

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

Standard Bush Bore Diameter:

ITEM	SPECIFIED CONDITION
STD	10.285 to 10.306 mm (0.4049 to 0.4057 in.)
O/S 0.05	10.335 to 10.356 mm (0.4069 to 0.4077 in.)

(e) Select a new valve guide bush.

New Guide Bush:

ITEM	SPECIFIED CONDITION	
Bush Bore Diameter	10.285 to 10.306 mm (0.4049 to 0.4057 in.)	10.335 to 10.356 mm (0.4069 to 0.4077 in.)
Use Bush	STD	O/S 0.05

If the bush bore diameter of the cylinder head is more than 10.306 mm (0.4057 in.), machine the bush bore diameter to 10.335 to 10.356 mm (0.4069 to 0.4077 in.) 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 (0.4077 in.), replace the cylinder head.

New Guide Bush Diameter:

cardiagn.com

ITEM	SPECIFIED CONDITION
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.)

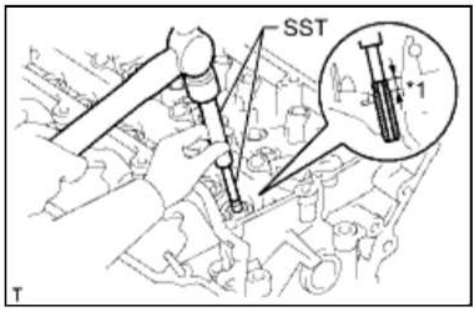
HINT:

Different bushes are used for the intake and exhaust.

Standard bush length:
41.3 to 41.7 mm (1.63 to 1.64 in.)

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

(g) Place the cylinder head on wooden blocks.

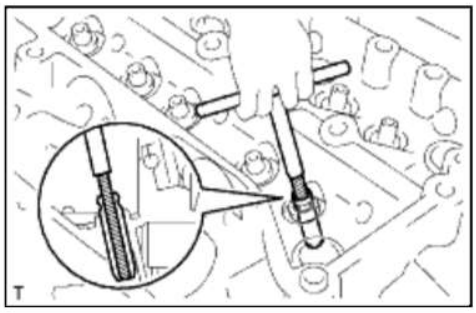


(h) Using SST, tap in the intake valve guide bushes to the specified protrusion height.

SST: 09201-10000
09201-01050
SST: 09950-70010
09951-07100
Protrusion height:
9.10 to 9.90 mm (0.358 to 0.390 in.)

Text in Illustration

*1	Protrusion Height



(i) Using a sharp 5.5 mm reamer, ream the valve guide bushes to obtain the specified clearance.

Standard oil clearance:
0.025 to 0.060 mm (0.000984 to 0.00236 in.)

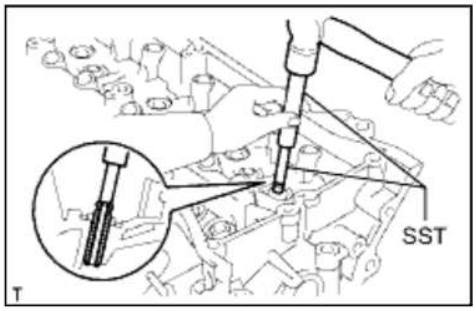
2. REPLACE EXHAUST VALVE GUIDE BUSH

(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 exhaust valve guide

cardiagn.com



bushes.

SST: 09201-10000

09201-01050

SST: 09950-70010

09951-07100

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

Standard Bush Bore Diameter:

ITEM	SPECIFIED CONDITION
STD	10.285 to 10.306 mm (0.4049 to 0.4057 in.)
O/S 0.05	10.335 to 10.356 mm (0.4069 to 0.4077 in.)

(e) Select a new valve guide bush.

New Guide Bush:

ITEM	SPECIFIED CONDITION	
Bush Bore Diameter	10.285 to 10.306 mm (0.4049 to 0.4057 in.)	10.335 to 10.356 mm (0.4069 to 0.4077 in.)
Use Bush	STD	O/S 0.05

If the bush bore diameter of the cylinder head is more than 10.306 mm (0.4057 in.), machine the bush bore diameter to 10.335 to 10.356 mm (0.4069 to 0.4077 in.) 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 (0.4077 in.), replace the cylinder head.

New Guide Bush Diameter:

ITEM	SPECIFIED CONDITION
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.)

HINT:

Different bushes are used for the intake and exhaust.

Standard bush length:
46.8 to 47.2 mm (1.84 to 1.86 in.)

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

(g) Place the cylinder head on wooden blocks.

cardiagn.com

(h) Using SST, tap in the exhaust valve guide bushes to the specified protrusion height.

SST: 09201-10000

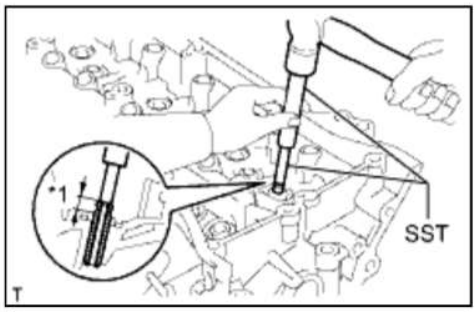
09201-01050

SST: 09950-70010

09951-07100

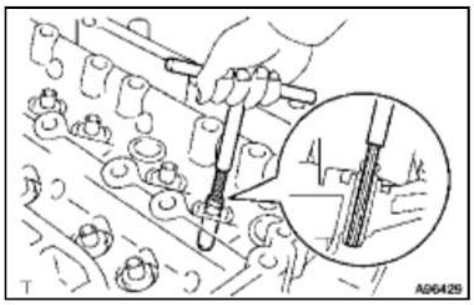
Protrusion height:

9.10 to 9.90 mm (0.358 to 0.390 in.)



Text in Illustration

*1	Protrusion Height



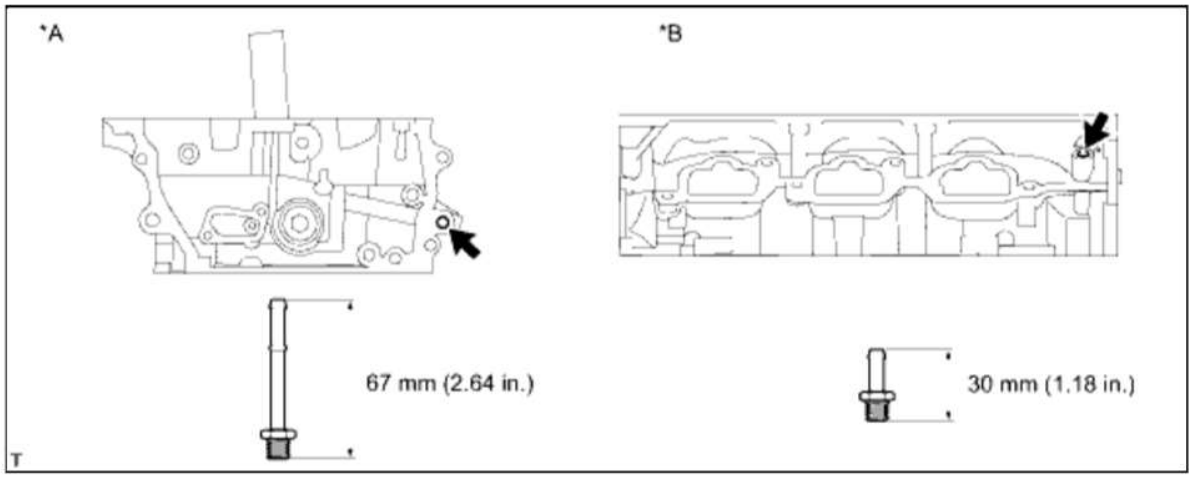
(i) Using a sharp 5.5 mm reamer, ream the valve guide bushes to obtain the specified clearance.

Standard oil clearance:

0.030 to 0.065 mm (0.00118 to 0.00256 in.)

3. REPLACE UNION

(a) Remove the union from the bank 1 cylinder head (front side) and bank 2 cylinder head (intake port side).



Text in Illustration

*A	Front Side of RH	*B	Intake Side of LH

cardiagn.com

(b) Apply adhesive to 2 or 3 threads of the bolt ends of new unions.

Adhesive:
Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

(c) Using a 12 mm deep socket wrench, install the 2 unions.

Torque: 15 N·m (150 kgf·cm, 11ft·lbf)

4. REPLACE TIGHT PLUG

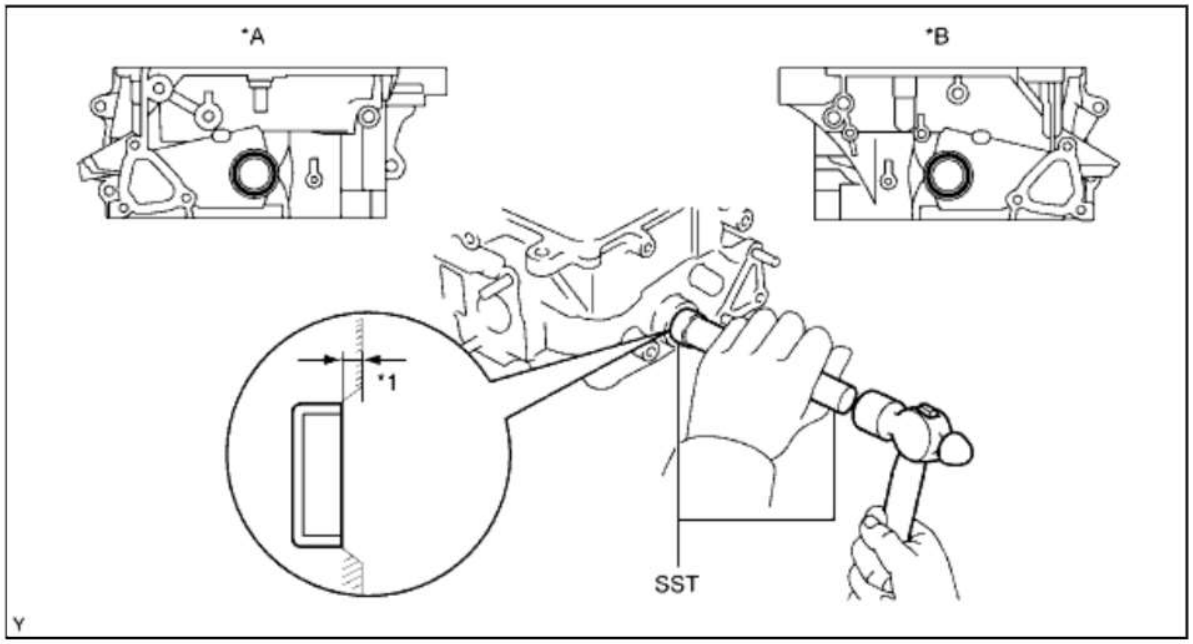
NOTICE:
If coolant leaks from a tight plug or a plug is corroded, replace it.

(a) Remove the tight plugs.

(b) Apply adhesive around new tight plugs.

Adhesive:
Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

(c) Using SST and a hammer, tap in the tight plugs to the standard depth.



SST: 09950-60010
09951-00250
SST: 09950-70010
09951-07150

Standard depth:
1.7 to 2.7 mm (0.0669 to 0.106 in.)

Text in Illustration

*A	RH	*B	LH
*1	Standard Depth	-	-

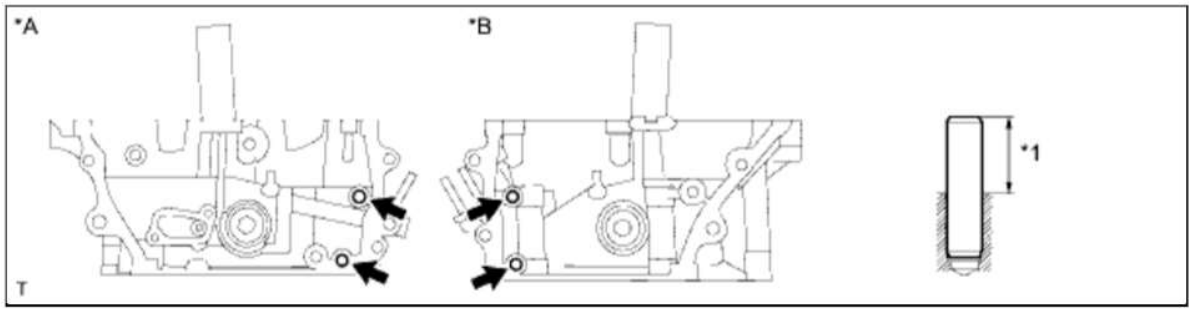
5. REPLACE STRAIGHT PIN

cardiagn.com

NOTICE:

If a straight pin is deformed, replace it.

(a) Using a plastic-faced hammer, tap in new straight pins as shown in the illustration.



Protrusion height:
18.0 to 19.0 mm (0.708 to 0.748 in.)

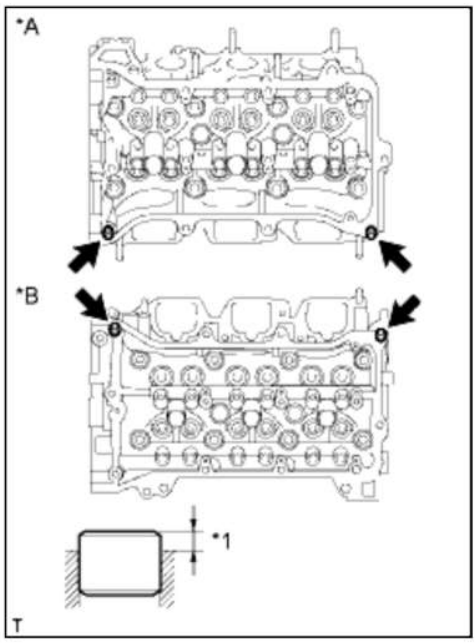
Text in Illustration

*A	RH	*B	LH
*1	Protrusion Height	-	-

6. 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 new ring pins to the specified protrusion height.

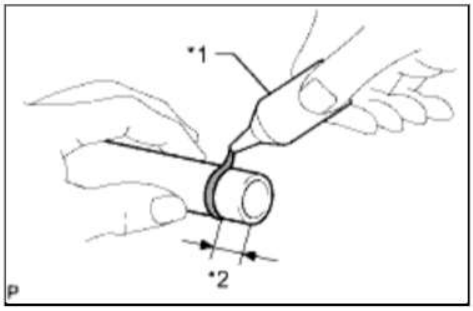
Protrusion height:
2.5 to 3.5 mm (0.0984 to 0.138 in.)

Text in Illustration

*A	RH
*B	LH
*1	Protrusion Height

7. REPLACE SPARK PLUG TUBE

cardiagn.com



HINT:

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

(a) Remove the spark plug tube.

Text in Illustration

*1	Adhesive
*2	Distance

(b) Apply adhesive to the end of a new spark plug tube.

Adhesive:
Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent.
Standard seal diameter:
1.0 to 3.0 mm (0.394 to 0.118 in.)
Distance:
9.0 to 15.0 mm (0.354 to 0.590 in.)

NOTICE:

- 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 it.

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

Standard protrusion height:
75.1 to 76.1 mm (2.96 to 3.00 in.)

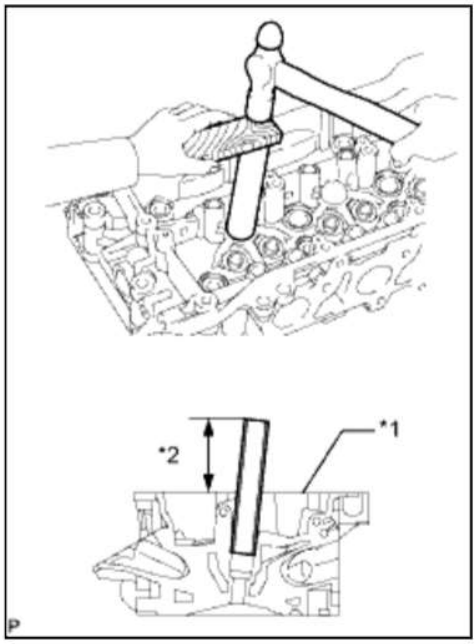
Text in Illustration

*1	Cylinder Head Top Surface
*2	Protrusion Height

NOTICE:

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

cardiagn.com



cardiagn.com

Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000000T4Y04OX
Title: 1GR-FE ENGINE MECHANICAL: CYLINDER HEAD: REASSEMBLY (2010 4Runner)		

REASSEMBLY

1. INSTALL STUD BOLT

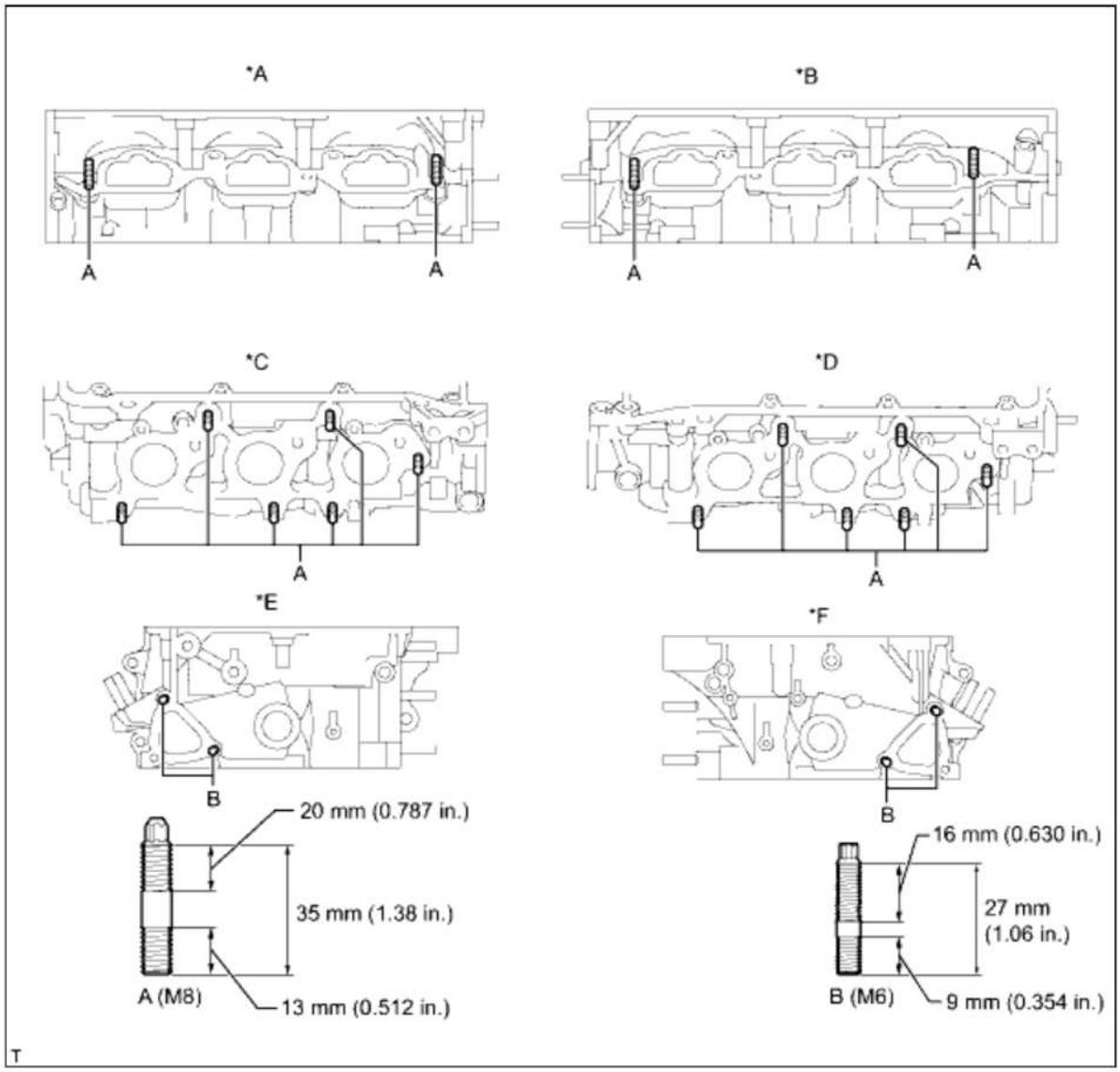
NOTICE:

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

(a) Using E6 and E8 "TORX" sockets, install the stud bolts.

for bolt A - Torque: 10 N·m (102 kgf·cm, 7ft·lbf)

for bolt B - Torque: 4.0 N·m (41 kgf·cm, 35in·lbf)



Text in Illustration

cardiagn.com

*A	Intake Side of RH	*B	Intake Side of LH
*C	Exhaust Side of RH	*D	Exhaust Side of LH
*E	Rear Side of RH	*F	Rear Side of LH

2. INSTALL NO. 2 STRAIGHT SCREW PLUG

(a) Using a 14 mm hexagon wrench, install 2 new gaskets and the 2 No. 2 straight screw plugs.

Torque: 80 N·m (816 kgf·cm, 59ft·lbf)

3. INSTALL NO. 1 STRAIGHT SCREW PLUG

(a) Using a 10 mm hexagon wrench, install 4 new gaskets and the 4 No. 1 straight screw plugs.

Torque: 44 N·m (449 kgf·cm, 32ft·lbf)

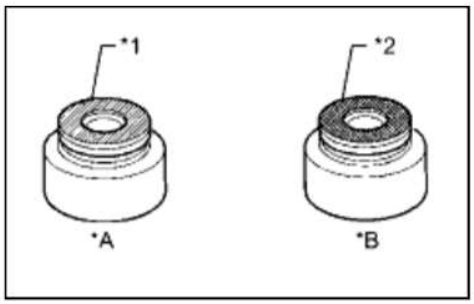
4. INSTALL VALVE SPRING SEAT

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

5. INSTALL VALVE STEM OIL SEAL

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

Text in Illustration



*A	Intake Side
*B	Exhaust Side
*1	Gray
*2	Black

HINT:

The intake valve oil seals are gray and the exhaust valve oil seals are black.

NOTICE:

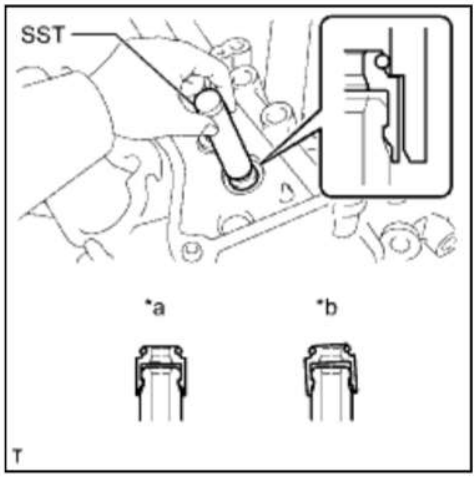
Pay attention when installing the intake and exhaust valve stem oil seals. For example, installing the intake valve stem oil seal to the exhaust side or installing the exhaust valve stem oil seal to the intake side can cause installation problems later.

(b) Using SST, push in the oil seals.

SST: 09201-41020

Text in Illustration

cardiagn.com

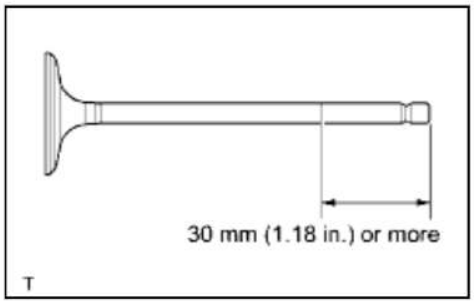


*a	CORRECT
*b	INCORRECT

NOTICE:

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

6. INSTALL INTAKE VALVE



(a) Apply a sufficient coat of engine oil to the tip area of the intake valve shown in the illustration.

(b) Install the intake valve, inner compression spring and valve spring retainer to the cylinder head.

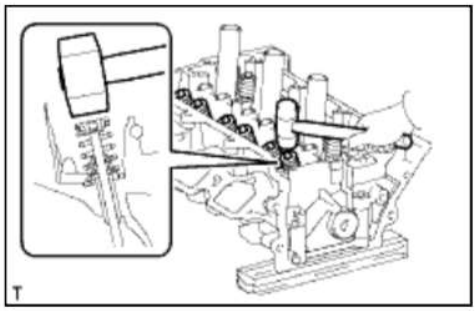
NOTICE:

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

(c) Using SST, compress the inner compression spring and install the 2 valve spring retainer locks.

SST: 09202-70020

09202-00010



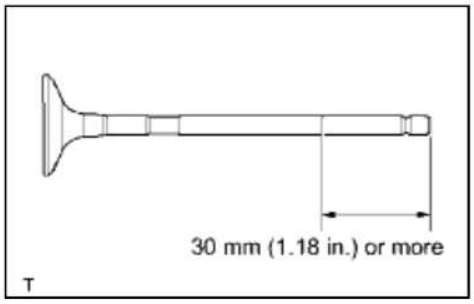
(d) Using a plastic-faced hammer, lightly tap the valve stem tip to ensure a proper fit.

NOTICE:

Be careful not to damage the retainer.

7. INSTALL EXHAUST VALVE

cardiagn.com



(a) Apply a sufficient coat of engine oil to the tip area of the exhaust valve shown in the illustration.

(b) Install the exhaust valve, inner compression spring and valve spring retainer to the cylinder head.

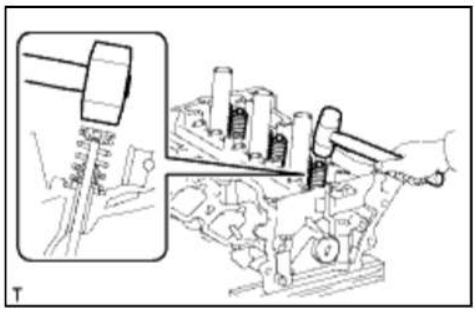
NOTICE:

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

(c) Using SST, compress the inner compression spring and install the 2 valve spring retainer locks.

SST: 09202-70020

09202-00010



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

NOTICE:

Be careful not to damage the retainer.

cardiagn.com

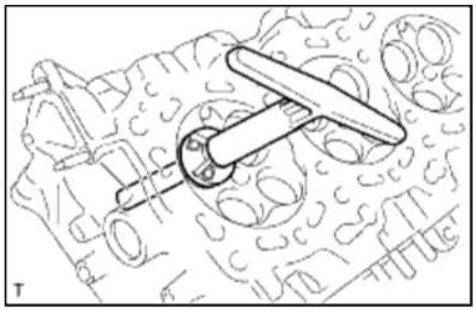
Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM0000035AU00KX
Title: 1GR-FE ENGINE MECHANICAL: CYLINDER HEAD: REPAIR (2010 4Runner)		

REPAIR

1. REPAIR INTAKE VALVE SEAT

NOTICE:

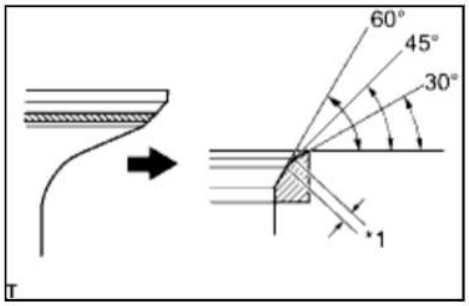
- Repair the intake valve seat while checking the seating position.
- Keep the lip free of foreign matter.



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

(b) Using 30° and 60° cutters, correct the valve seat so that the intake valve contacts the entire circumference of the seat. The contact should be in the center of the intake valve seat, and the intake valve seat width should be maintained within the specified range around the entire circumference of the intake valve seat.

Width:
1.1 to 1.5 mm (0.0433 to 0.0591 in.)



Text in Illustration

*1	Width

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

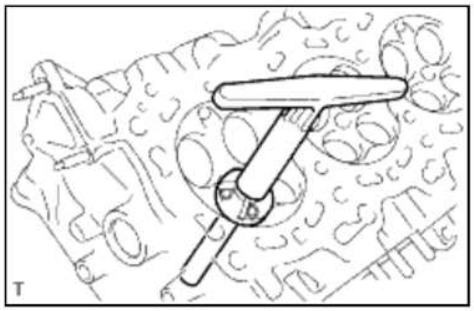
(d) Check the intake valve seating position.

2. REPAIR EXHAUST VALVE SEAT

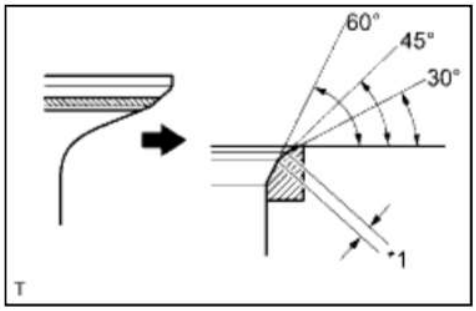
NOTICE:

- Repair the seat while checking the seating position.
- Keep the lip free of foreign matter.

cardiagn.com



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



(b) Using 30° and 60° cutters, correct the exhaust valve seat so that the exhaust valve contacts the entire circumference of the seat. The contact should be in the center of the exhaust valve seat, and the exhaust valve seat width should be maintained within the specified range around the entire circumference of the exhaust valve seat.

Width:
1.1 to 1.5 mm (0.0433 to 0.0591 in.)

Text in Illustration

*1	Width

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

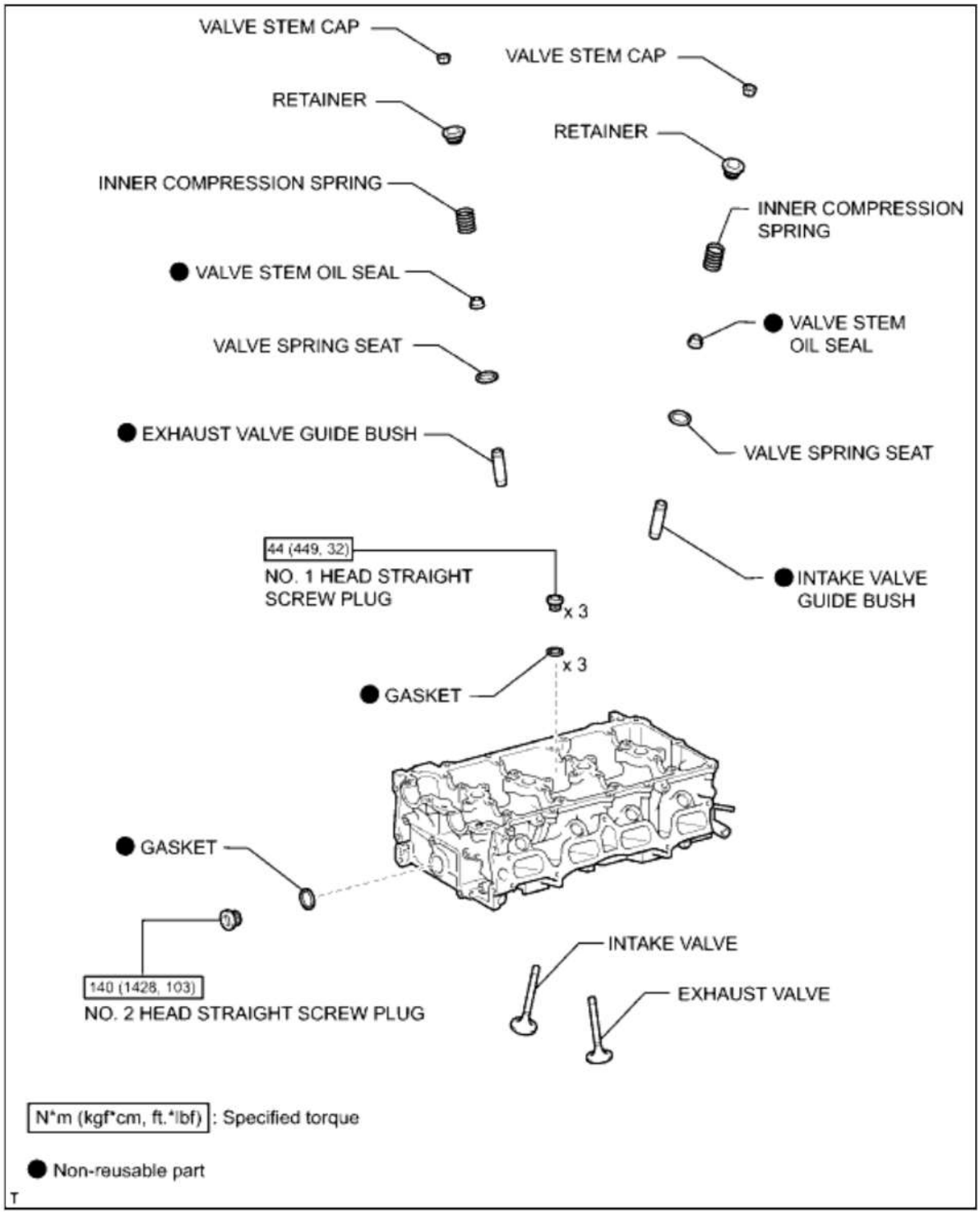
(d) Check the exhaust valve seating position.

cardiagn.com

Last Modified: 5-10-2010	6.4 K	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM0000045EE002X
Title: 2TR-FE ENGINE MECHANICAL: CYLINDER HEAD: COMPONENTS (2010 4Runner)		

COMPONENTS

ILLUSTRATION



cardiagn.com

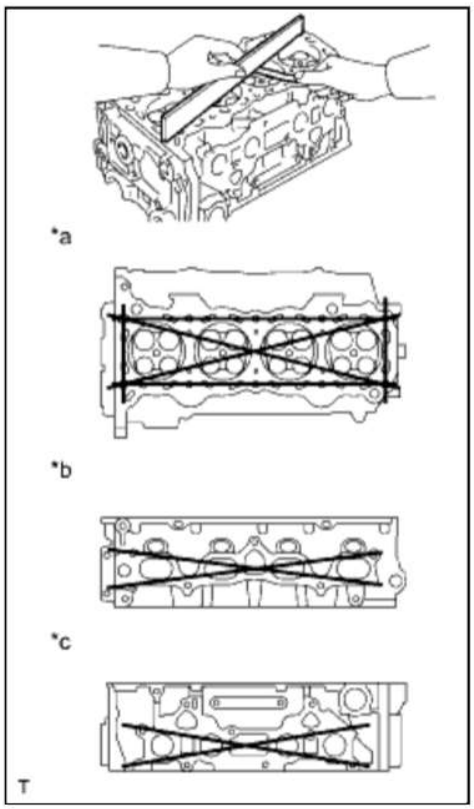


cardiagn.com

Last Modified: 5-10-2010	6.4 G	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000004491005X
Title: 2TR-FE ENGINE MECHANICAL: CYLINDER HEAD: INSPECTION (2010 4Runner)		

INSPECTION

1. INSPECT CYLINDER HEAD SUB-ASSEMBLY



(a) Using a precision straightedge and feeler gauge, measure the warpage of the surfaces that contact the cylinder block and manifolds.

Maximum warpage:
0.05 mm (0.00197 in.)

Text in Illustration

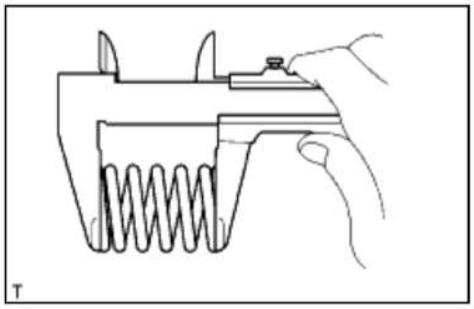
*a	Cylinder Head Lower Side
*b	Intake Manifold Side
*c	Exhaust Manifold Side

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

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

If cracked, replace the cylinder head.

2. INSPECT INNER COMPRESSION SPRING



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

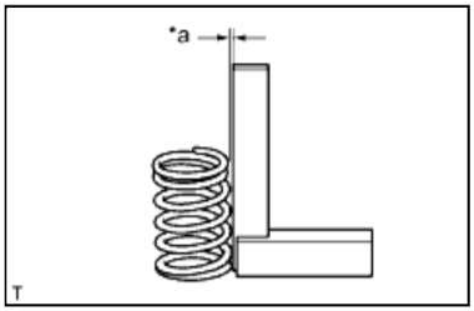
Standard free length:
48.53 mm (1.91 in.)

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

cardiagn.com

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

Maximum deviation:
1.5 mm (0.0591 in.)
Maximum angle:
2°



Text in Illustration

*a	Deviation

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

3. INSPECT INTAKE VALVE

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

Standard overall length:
106.26 mm (4.18 in.)
Minimum overall length:
105.96 mm (4.17 in.)

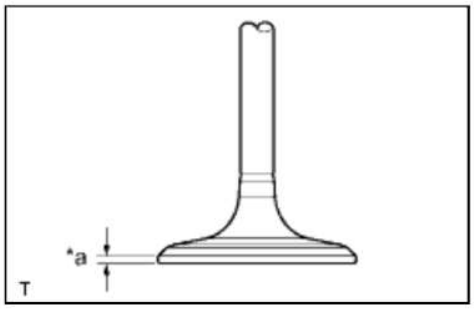
If the overall length is less than the minimum, replace the intake valve.

(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.)

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

Standard margin thickness:
1.05 to 1.45 mm (0.0413 to 0.0571 in.)
Minimum margin thickness:
0.50 mm (0.0197 in.)



Text in Illustration

*a	Margin Thickness

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

4. INSPECT EXHAUST VALVE

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

Standard overall length:

cardiagn.com

106.74 mm (4.20 in.)
Minimum overall length:
106.44 mm (4.19 in.)

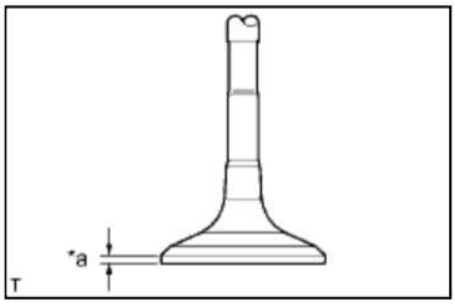
If the overall length is less than the minimum, replace the exhaust valve.

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

Standard valve stem diameter:
5.465 to 5.480 mm (0.215 to 0.216 in.)

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

Standard margin thickness:
1.2 to 1.6 mm (0.0472 to 0.0630 in.)
Minimum margin thickness:
0.50 mm (0.0197 in.)



Text in Illustration

*a	Margin Thickness

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

5. INSPECT VALVE SEAT

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

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

HINT:

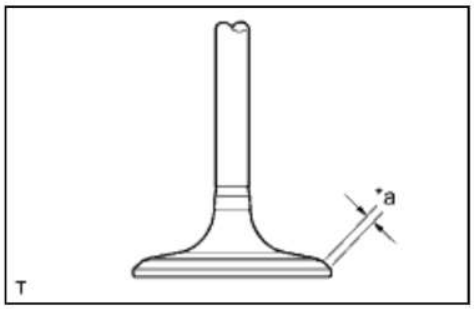
Do not rotate the valve while pressing the valve against the valve seat.

(c) Check the valve face and valve seat by using the following procedure.

(1) Check that Prussian blue appears around the entire valve face. If not, replace the valve.

(2) If Prussian blue appears around the entire valve seat, the guide and valve face are concentric. If not, resurface the valve seat.

(3) Check that the valve seat contacts the middle of the valve face with the width between 1.1 and 1.4 mm (0.0433 and 0.0551 in.).

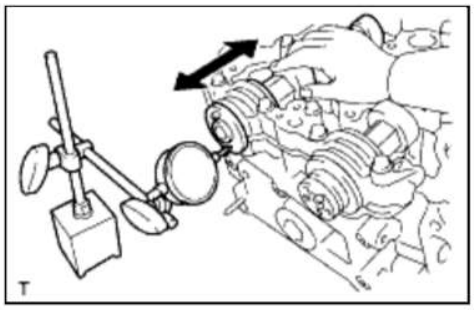


Text in Illustration

cardiagn.com

*a	Width

6. INSPECT CAMSHAFT THRUST CLEARANCE



(a) Install the camshafts INFO .

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

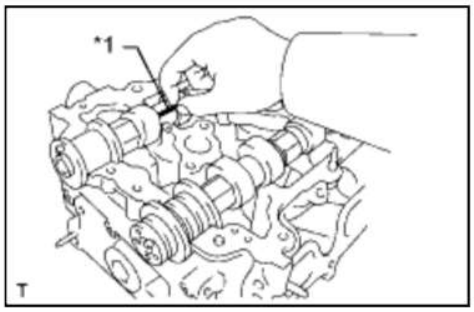
Standard thrust clearance:
0.10 to 0.24 mm (0.00394 to 0.00945 in.)
Maximum thrust clearance:
0.26 mm (0.0102 in.)

If the thrust clearance is more than the maximum, replace the cylinder head. If the thrust surface is damaged, replace the camshaft.

7. INSPECT CAMSHAFT OIL CLEARANCE

(a) Clean the bearing caps and camshaft journals.

(b) Place the camshafts on the cylinder head.



(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 camshafts.

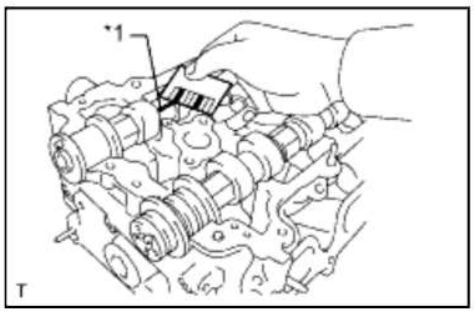
(e) Remove the bearing caps INFO .

cardiagn.com

(f) Measure the Plastigage at its widest point.

Standard Oil Clearance:

ITEM	SPECIFIED CONDITION
No. 1 journal	0.035 to 0.072 mm (0.00138 to 0.00283 in.)
Other journals	0.025 to 0.062 mm (0.000984 to 0.00244 in.)



Maximum oil clearance:
0.08 mm (0.00315 in.)

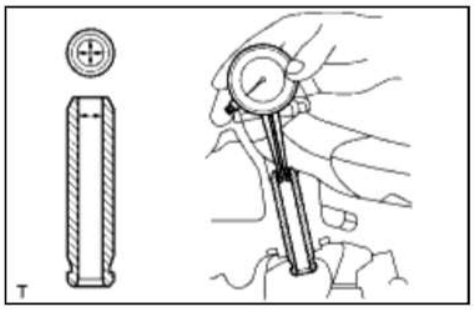
Text in Illustration

*1	Plastigage

If the oil clearance is more than the maximum, replace the camshaft. If necessary, replace the cylinder head sub-assembly.

(g) Completely remove the Plastigage.

8. INSPECT VALVE GUIDE BUSH OIL CLEARANCE



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

Standard bush inside diameter:
5.51 to 5.53 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:

cardiagn.com

ITEM	SPECIFIED CONDITION
Intake	0.08 mm (0.00315 in.)
Exhaust	0.10 mm (0.00397 in.)

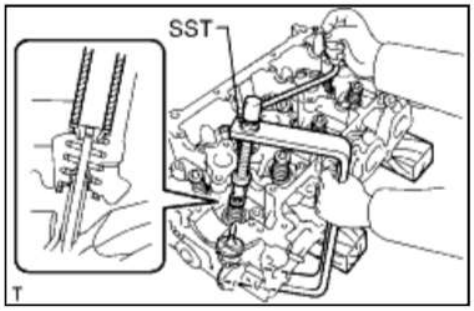
If the clearance is more than the maximum, replace the valve and valve guide bush.

cardiagn.com

Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM00000125A022X
Title: 2TR-FE ENGINE MECHANICAL: CYLINDER HEAD: DISASSEMBLY (2010 4Runner)		

DISASSEMBLY

1. REMOVE INTAKE VALVE



(a) Using SST and wooden blocks, compress the compression spring and remove the valve retainer locks.

SST: 09202-70020

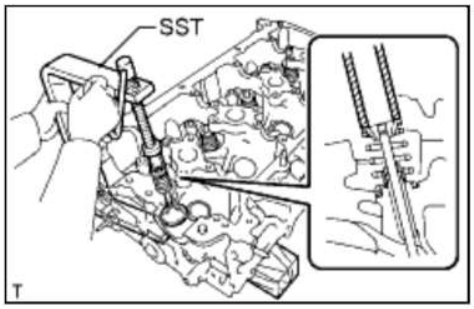
09202-00010

(b) Remove the retainer, compression spring and valve.

HINT:

Arrange the removed parts in the correct order.

2. REMOVE EXHAUST VALVE



(a) Using SST and wooden blocks, compress the compression spring and remove the valve retainer locks.

SST: 09202-70020

09202-00010

(b) Remove the retainer, compression 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 16 oil seals.

4. REMOVE VALVE SPRING SEAT

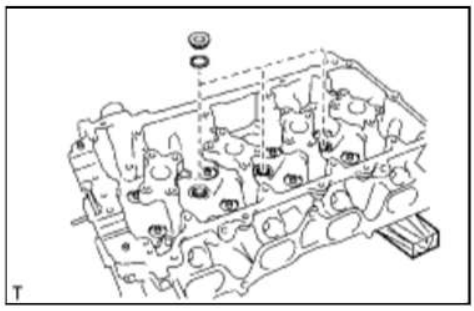
(a) Remove the 16 valve spring seats from the cylinder head.

5. REMOVE NO. 1 HEAD STRAIGHT SCREW PLUG

cardiagn.com

NOTICE:

If coolant leaks from the No. 1 head straight screw plug or the plug is corroded, replace it.

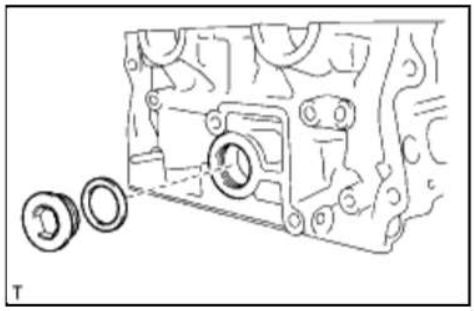


(a) Using a 10 mm hexagon wrench, remove the 3 screw plugs and 3 gaskets.

6. REMOVE NO. 2 HEAD STRAIGHT SCREW PLUG

NOTICE:

If coolant leaks from the No. 2 head straight screw plug or the plug is corroded, replace it.



(a) Using a 19 mm hexagon wrench, remove the screw plug and gasket.

7. REMOVE STUD BOLT

NOTICE:

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

cardiagn.com

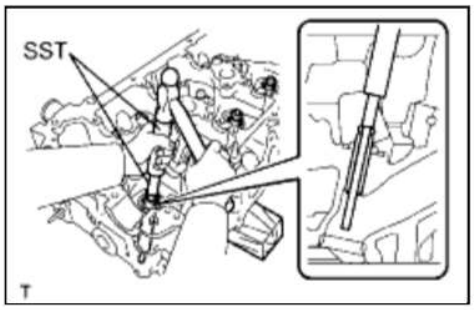
Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM00000125A021X
Title: 2TR-FE ENGINE MECHANICAL: CYLINDER HEAD: REPLACEMENT (2010 4Runner)		

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: 09201-01055

SST: 09950-70010

09951-07100

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

Standard Bush Bore Diameter:

ITEM	SPECIFIED CONDITION
STD	10.285 to 10.306 mm (0.405 to 0.406 in.)
O/S 0.05	10.335 to 10.356 mm (0.407 to 0.408 in.)

(e) Select a new valve guide bush.

New Valve Guide Bush:

ITEM	SPECIFIED CONDITION	
Bush bore diameter	10.285 to 10.306 mm (0.405 to 0.406 in.)	10.335 to 10.356 mm (0.407 to 0.408 in.)
Use bush	STD	O/S 0.05

If the bush bore diameter of the cylinder head is more than 10.306 mm (0.406 in.), machine the bush bore so that the diameter is between 10.335 and 10.356 mm (0.407 and 0.408 in.).

If the bush bore diameter of the cylinder head is more than 10.356 mm (0.408 in.), replace the cylinder head.

New Guide Bush Diameter:

ITEM	SPECIFIED CONDITION

cardiagn.com

ITEM	SPECIFIED CONDITION
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.)

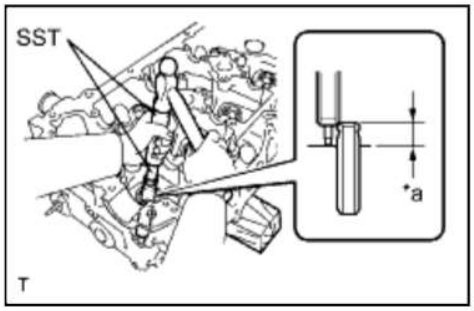
HINT:

Different bushes are used for the intake and exhaust.

Standard bush length:
43.0 to 44.0 mm (1.69 to 1.73 in.)

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

(g) Place the cylinder head on wooden blocks.

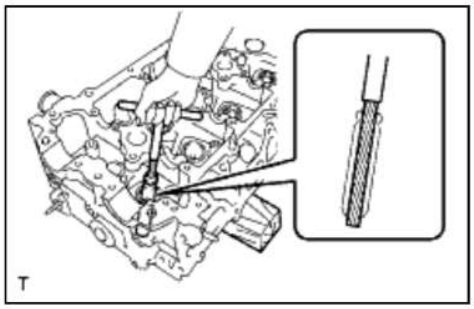


(h) Using SST and a hammer, tap in a new valve guide bush to the specified protrusion height.

SST: 09201-01055
SST: 09950-70010
09951-07100
Standard protrusion height:
9.8 to 10.2 mm (0.386 to 0.402 in.)

Text in Illustration

*a	Height



(i) Using a sharp 5.5 mm reamer, ream the valve 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.)

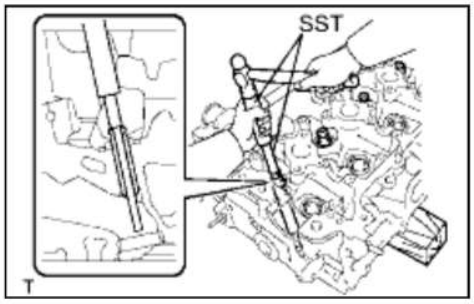
2. REPLACE EXHAUST VALVE GUIDE BUSH

(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.

cardiagn.com



SST: 09201-01055
SST: 09950-70010
09951-07100

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

Standard Bush Bore Diameter:

ITEM	SPECIFIED CONDITION
STD	10.285 to 10.306 mm (0.405 to 0.406 in.)
O/S 0.05	10.335 to 10.356 mm (0.407 to 0.408 in.)

(e) Select a new valve guide bush.

New Valve Guide Bush:

ITEM	SPECIFIED CONDITION	
Bush bore diameter	10.333 to 10.344 mm (0.4068 to 0.4072 in.)	10.383 to 10.394 mm (0.4088 to 0.4092 in.)
Use bush	STD	O/S 0.05

If the bush bore diameter of the cylinder head is more than 10.306 mm (0.406 in.), machine the bush bore so that the diameter is between 10.335 and 10.356 mm (0.407 and 0.408 in.).

If the bush bore diameter of the cylinder head is more than 10.356 mm (0.408 in.), replace the cylinder head.

New Guide Bush Diameter:

ITEM	SPECIFIED CONDITION
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.)

HINT:

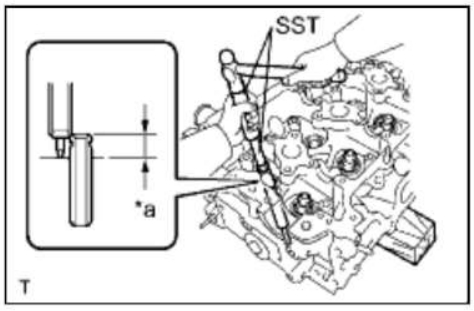
Different bushes are used for the intake and exhaust.

Standard bush length:
43.0 to 44.0 mm (1.69 to 1.73 in.)

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

(g) Place the cylinder head on wooden blocks.

cardiagn.com



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

SST: 09201-01055

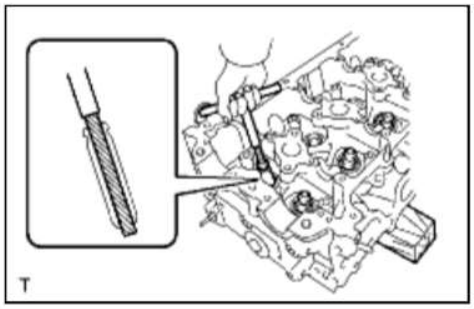
SST: 09950-70010

09951-07100

Standard protrusion height:
7.6 to 8.0 mm (0.299 to 0.315 in.)

Text in Illustration

*a	Height



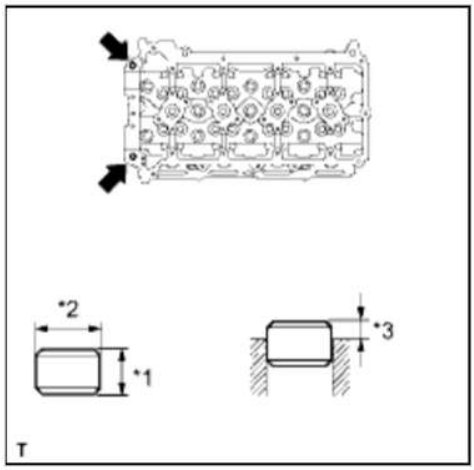
(i) Using a sharp 5.5 mm reamer, ream the valve guide bush to obtain the standard clearance between the guide bush and valve stem.

Standard oil clearance:
0.030 to 0.065 mm (0.00118 to 0.00256 in.)

3. REPLACE CAMSHAFT BEARING CAP SETTING RING PIN

NOTICE:

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 until the pin stops.

Standard Ring Pin:

cardiagn.com

ITEM	HEIGHT	WIDTH	PROTRUSION HEIGHT
Ring pin	7 mm (0.276 in.)	10 mm (0.394 in.)	2.5 to 3.8 mm (0.0984 to 0.150 in.)

Text in Illustration

*1	Height
*2	Width
*3	Protrusion Height

cardiagn.com

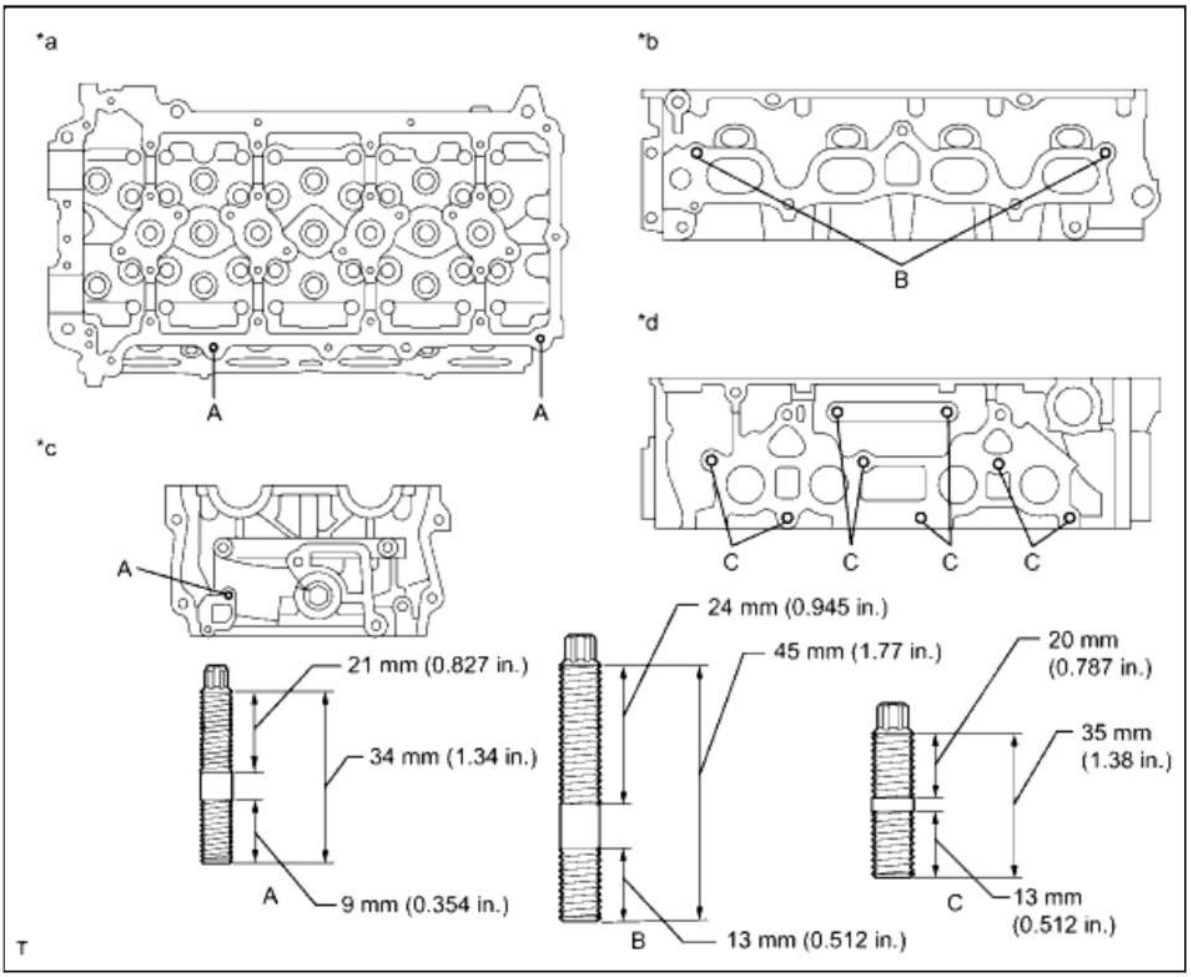
Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM00000125B01ZX
Title: 2TR-FE ENGINE MECHANICAL: CYLINDER HEAD: REASSEMBLY (2010 4Runner)		

REASSEMBLY

1. INSTALL STUD BOLT

NOTICE:

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



Text in Illustration

*a	Cylinder Head Upper Side	*b	Intake Side
*c	Front Side	*d	Exhaust Side

(a) Using E6, E7 and E8 "TORX" socket wrenches, install the stud bolts.

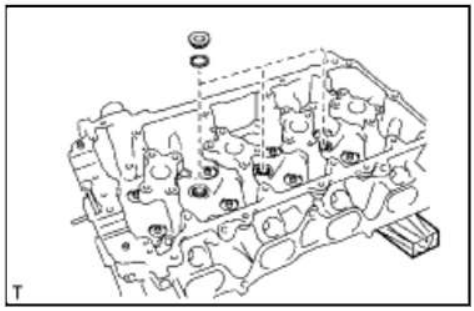
for stud bolt A - Torque: 3.0 N·m (31 kgf·cm, 27in·lbf)
for stud bolt B - Torque: 7.5 N·m (76 kgf·cm, 66in·lbf)
for stud bolt C - Torque: 7.5 N·m (76 kgf·cm, 66in·lbf)

cardiagn.com

2. INSTALL NO. 1 HEAD STRAIGHT SCREW PLUG

NOTICE:

If coolant leaks from the No. 1 head straight screw plug or the plug is corroded, replace it.



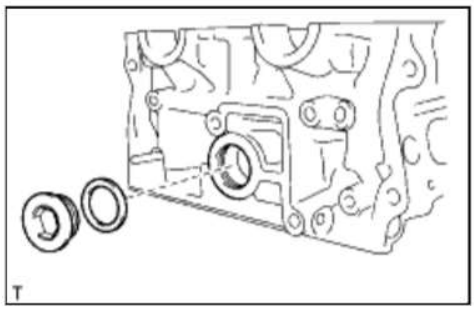
(a) Using a 10 mm hexagon wrench, install 3 new gaskets and the straight screw plugs.

Torque: 44 N·m (449 kgf·cm, 32ft·lbf)

3. INSTALL NO. 2 HEAD STRAIGHT SCREW PLUG

NOTICE:

If coolant leaks from the No. 2 head straight screw plug or the plug is corroded, replace it.



(a) Using a 19 mm hexagon wrench, install a new gasket and the straight screw plug.

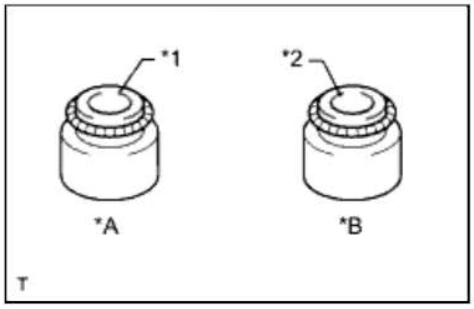
Torque: 140 N·m (1428 kgf·cm, 103ft·lbf)

4. INSTALL VALVE SPRING SEAT

(a) Install the 16 valve spring seats to the cylinder head.

5. INSTALL VALVE STEM OIL SEAL

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



Text in Illustration

*A	Intake Side
*B	Exhaust Side
*1	Gray

cardiagn.com

*2	Black

NOTICE:

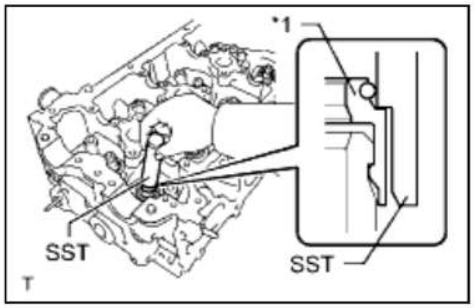
Pay attention when installing the intake and exhaust oil seals. For example, installing an intake oil seal to the exhaust side or installing an exhaust oil seal to the intake side can cause installation problems later.

HINT:

The intake valve oil seals are gray and the exhaust valve oil seals are black.

(b) Using SST, push in the 16 oil seals to install them.

SST: 09201-41020



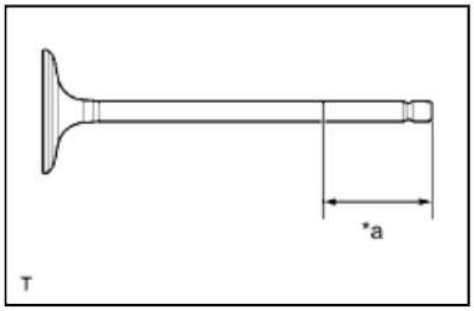
Text in Illustration

*1	Valve Stem Oil Seal

NOTICE:

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

6. INSTALL INTAKE VALVE



(a) Apply plenty of engine oil to the tip area of the intake valve shown in the illustration.

Text in Illustration

*a	30 mm (1.18 in.) or more

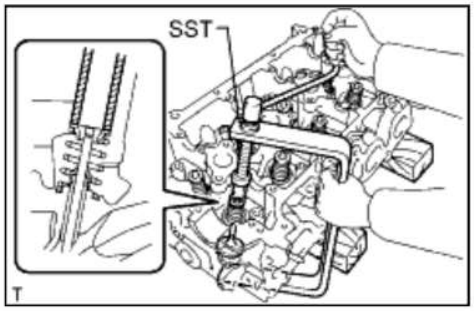
(b) Install the valve, compression spring and spring retainer to the cylinder head.

NOTICE:

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

(c) Using SST and wooden blocks, compress the spring and install the 2 retainer locks.

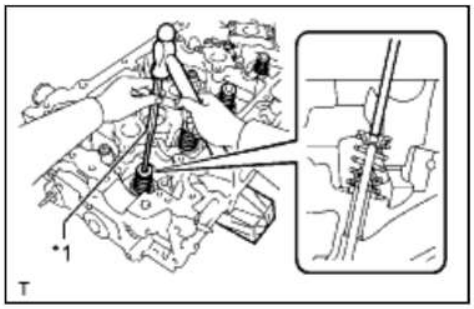
cardiagn.com



SST: 09202-70020

09202-00010

(d) Using a 5 mm pin punch and plastic-faced hammer, lightly tap the valve stem tip to ensure a proper fit.



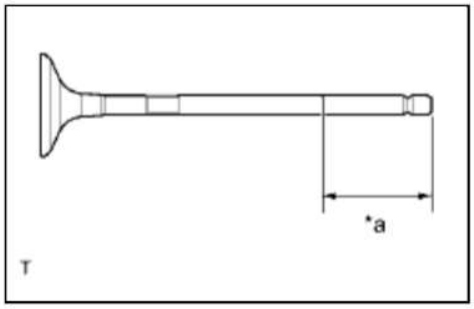
Text in Illustration

*1	5 mm Pin Punch

NOTICE:

Do not damage the valve stem tip.

7. INSTALL EXHAUST VALVE



(a) Apply plenty of engine oil to the tip area of the intake valve shown in the illustration.

Text in Illustration

*a	30 mm (1.18 in.) or more

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

NOTICE:

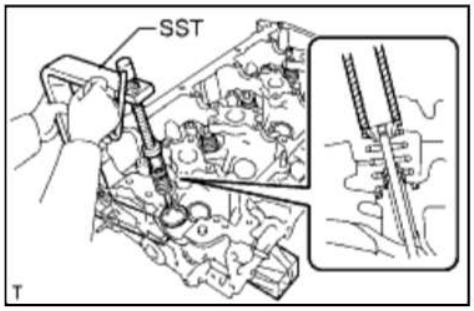
Install the same parts in the same combination to the original locations.

(c) Using SST and wooden blocks, compress the spring and install the 2 retainer locks.

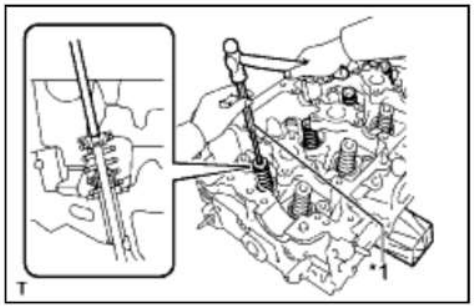
SST: 09202-70020

09202-00010

cardiagn.com



(d) Using a 5 mm pin punch and plastic-faced hammer, lightly tap the valve stem tip to ensure a proper fit.



Text in Illustration

*1	5 mm Pin Punch

NOTICE:

Do not damage the valve stem tip.

cardiagn.com

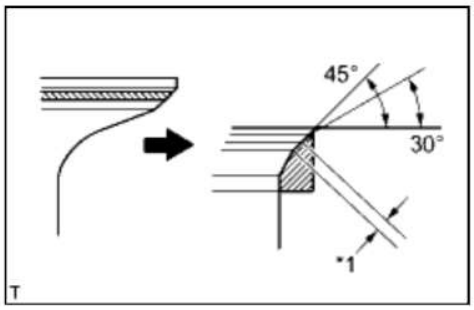
Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM00000125A023X
Title: 2TR-FE ENGINE MECHANICAL: CYLINDER HEAD: REPAIR (2010 4Runner)		

REPAIR

1. REPAIR INTAKE VALVE SEAT

NOTICE:

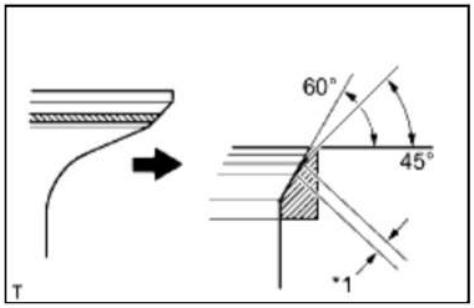
- Repair the seat while checking the seating position.
- Keep the lip free of foreign matter.
- Take off the cutter gradually to make the intake valve seat smooth.



(a) If the seating is too high on the valve face, use 30° and 45° cutters to correct the seat.

Text in Illustration

*1	Width



(b) If the seating is too low on the valve face, use 60° and 45° cutters to correct the seat.

Text in Illustration

*1	Width

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

(d) Check the valve seating position.

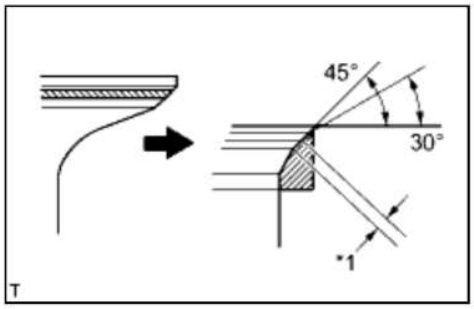
Standard width:
1.1 to 1.4 mm (0.0433 to 0.0551 in.)

2. REPAIR EXHAUST VALVE SEAT

NOTICE:

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

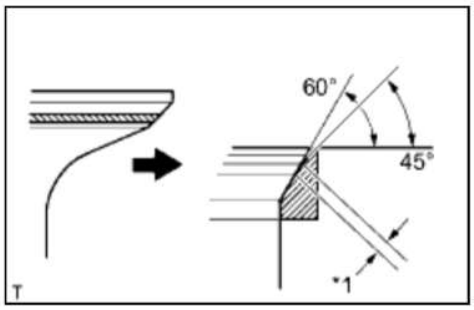
cardiagn.com



(a) If the seating is too high on the valve face, use 30° and 45° cutters to correct the seat.

Text in Illustration

*1	Width



(b) If the seating is too low on the valve face, use 60° and 45° cutters to correct the seat.

Text in Illustration

*1	Width

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

(d) Check the valve seating position.

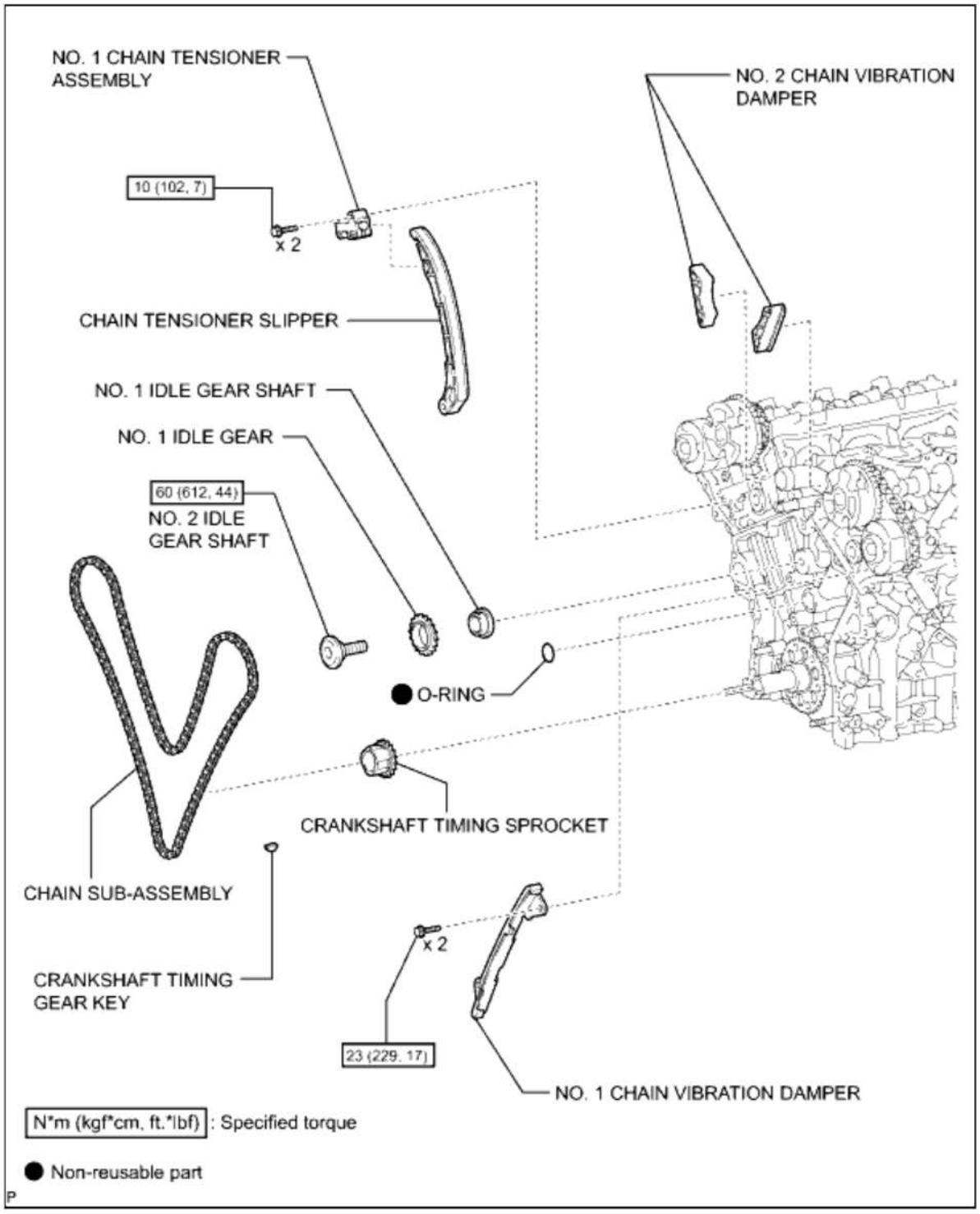
Standard width:
1.1 to 1.4 mm (0.0433 to 0.0551 in.)

cardiagn.com

Last Modified: 5-10-2010	6.4 K	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000002BZD00DX
Title: 1GR-FE ENGINE MECHANICAL: CYLINDER HEAD GASKET: COMPONENTS (2010 4Runner)		

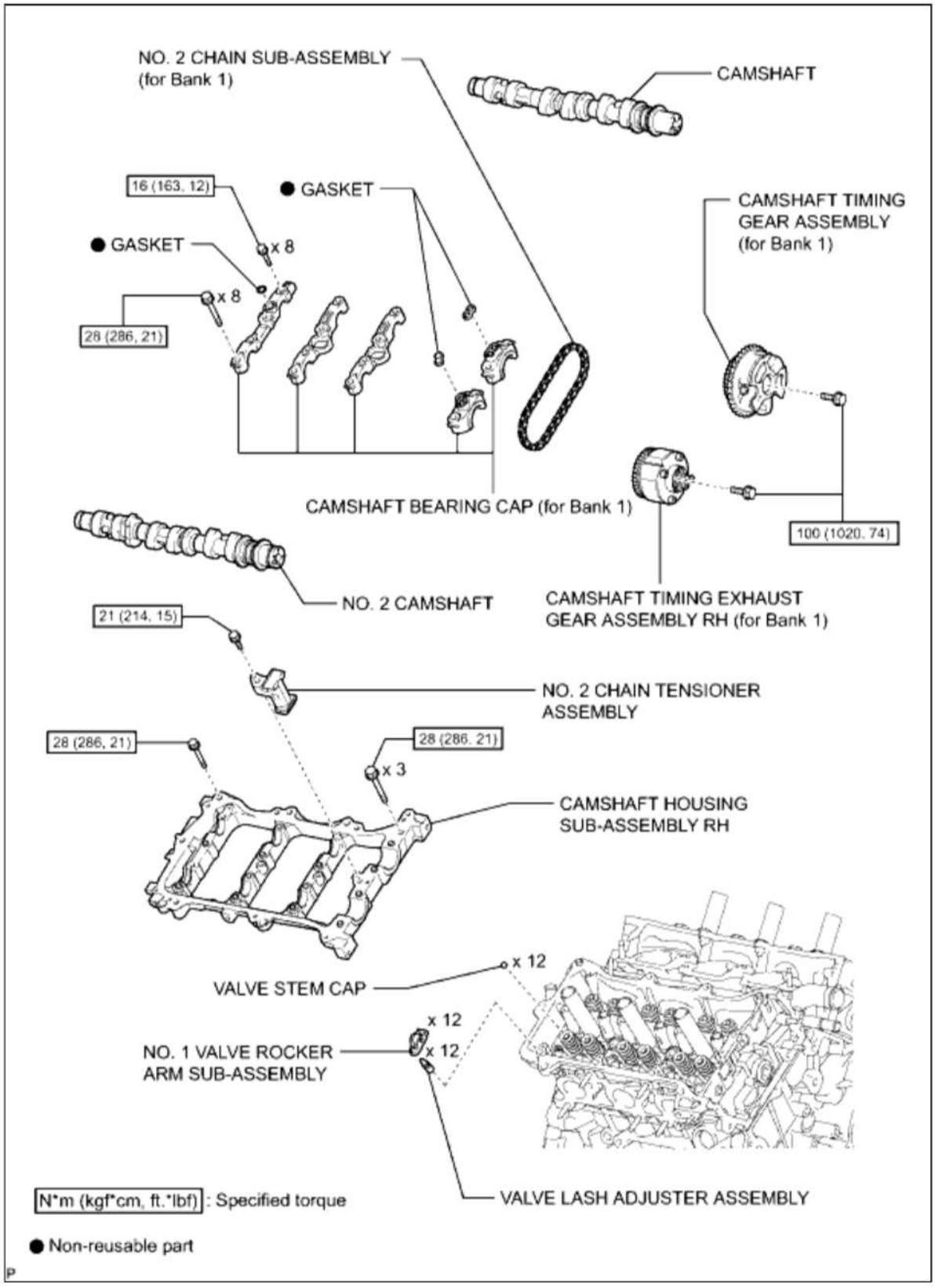
COMPONENTS

ILLUSTRATION



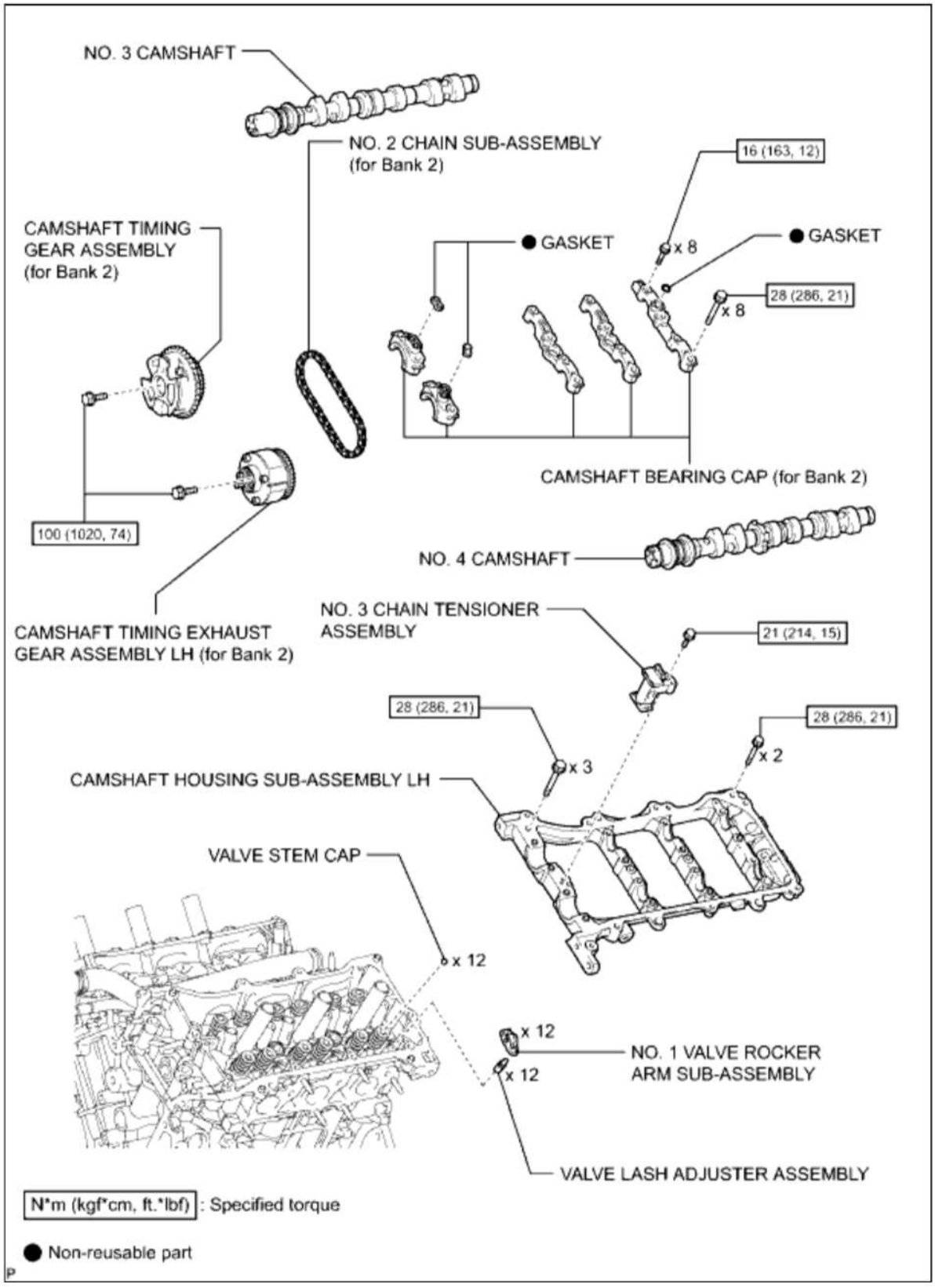
cardiagn.com

ILLUSTRATION



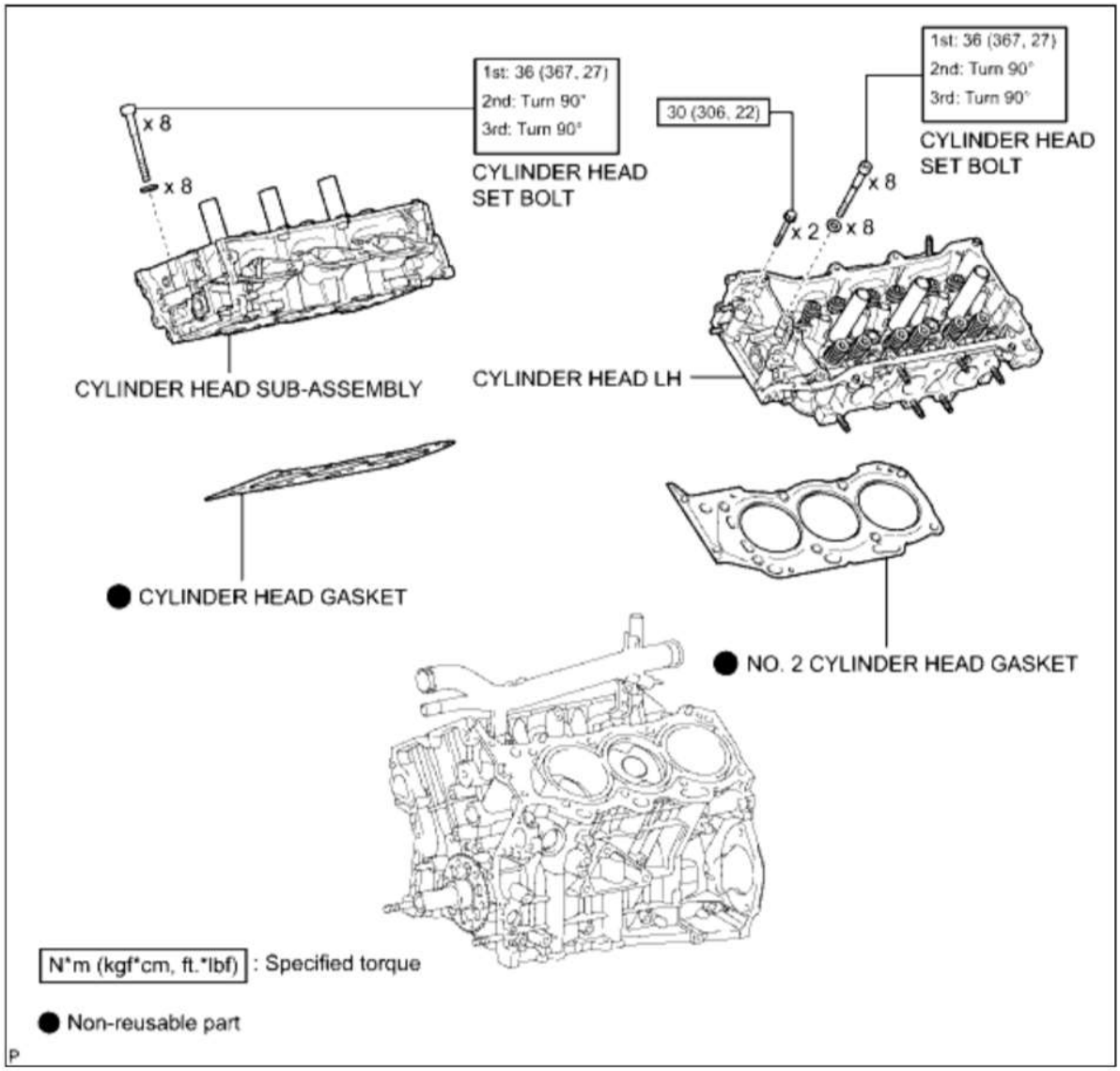
cardiagn.com

ILLUSTRATION



cardiagn.com

ILLUSTRATION



cardiagn.com

Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000002BK5012X
Title: 1GR-FE ENGINE MECHANICAL: CYLINDER HEAD GASKET: REMOVAL (2010 4Runner)		

REMOVAL

1. REMOVE TIMING CHAIN COVER SUB-ASSEMBLY

(a) Remove the timing chain cover INFO .

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

3. REMOVE NO. 1 CHAIN TENSIONER ASSEMBLY INFO

4. REMOVE CHAIN TENSIONER SLIPPER INFO

5. REMOVE CHAIN SUB-ASSEMBLY INFO

6. REMOVE NO. 1 IDLE GEAR SHAFT INFO

7. REMOVE NO. 1 CHAIN VIBRATION DAMPER INFO

8. REMOVE NO. 2 CHAIN VIBRATION DAMPER INFO

9. REMOVE CRANKSHAFT TIMING SPROCKET INFO

10. REMOVE CAMSHAFT TIMING GEARS AND NO. 2 CHAIN (for Bank 1) INFO

11. REMOVE NO. 2 CHAIN TENSIONER ASSEMBLY INFO

12. REMOVE CAMSHAFT BEARING CAP (for Bank 1) INFO

13. REMOVE CAMSHAFT HOUSING SUB-ASSEMBLY RH INFO

14. REMOVE CAMSHAFT TIMING GEARS AND NO. 2 CHAIN (for Bank 2) INFO

15. REMOVE NO. 3 CHAIN TENSIONER ASSEMBLY INFO

16. REMOVE CAMSHAFT BEARING CAP (for Bank 2) INFO

17. REMOVE CAMSHAFT HOUSING SUB-ASSEMBLY LH INFO

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

19. REMOVE VALVE LASH ADJUSTER ASSEMBLY INFO

20. REMOVE VALVE STEM CAP INFO

21. REMOVE CYLINDER HEAD SUB-ASSEMBLY

(a) Using a 10 mm bi-hexagon wrench, uniformly loosen the 8 cylinder head bolts in the sequence shown in the

cardiagn.com

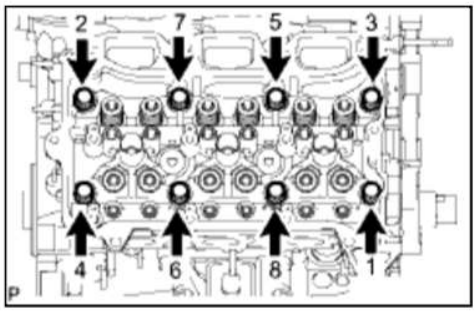


illustration. Remove the 8 cylinder head bolts and plate washers.

NOTICE:

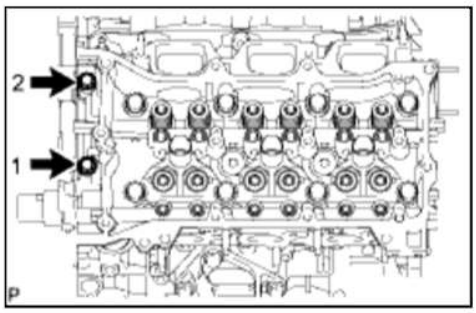
- Be careful not to drop washers into the cylinder head sub-assembly.
- Cylinder head warpage or cracking could result from removing bolts in an incorrect order.

HINT:

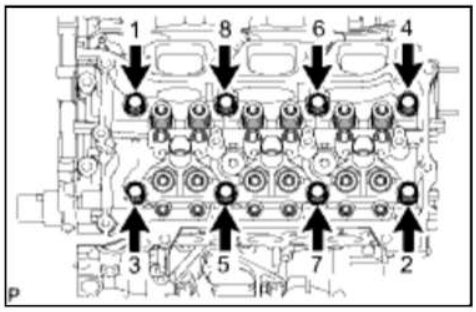
Arrange the removed parts in the correct order.

(b) Remove the cylinder head sub-assembly.

22. REMOVE CYLINDER HEAD LH



(a) Uniformly loosen and remove the 2 cylinder head set bolts in several steps in the sequence shown in the illustration.



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

NOTICE:

- Be careful not to drop washers into the cylinder head sub-assembly.
- Cylinder head warpage or cracking could result from removing bolts in an incorrect order.

HINT:

Be sure to keep the removed parts for each installation position separate.

(c) Remove the cylinder head LH.

23. REMOVE CYLINDER HEAD GASKET

24. REMOVE NO. 2 CYLINDER HEAD GASKET

cardiagn.com

Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000002BK6012X
Title: 1GR-FE ENGINE MECHANICAL: CYLINDER HEAD GASKET: INSTALLATION (2010 4Runner)		

INSTALLATION

1. INSPECT CYLINDER HEAD SET BOLT

2. INSPECT CYLINDER HEAD SUB-ASSEMBLY

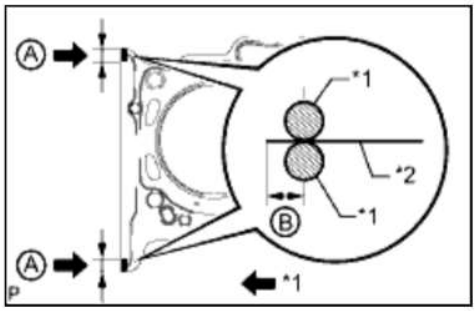
3. INSTALL CYLINDER HEAD GASKET

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the cylinder head or cylinder block.

(b) Apply seal packing to a new cylinder head gasket as shown in the illustration.

Seal packing:
Toyota Genuine Seal Packing Black, Three Bond 1207B or equivalent
Standard seal diameter:
2.5 to 3.0 mm (0.0984 to 0.118 in.)

Seal Packing Application Range



A	10 to 15 mm (0.394 to 0.591 in.)
B	1.25 to 1.5 mm (0.0492 to 0.0591 in.)

Text in Illustration

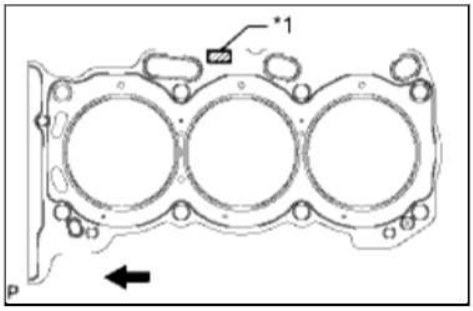
*1	Seal Packing
*2	Gasket

NOTICE:

- Remove any oil from the contact surface.
- Install the cylinder head gasket within 3 minutes and tighten the bolts within 15 minutes after applying seal packing.
- Do not add engine oil within 2 hours of installation.

(c) Place the cylinder head gasket on the cylinder block surface with the front face of the Lot No. stamp upward.

cardiagn.com



NOTICE:

Make sure that the gasket is installed facing the proper direction.

Text in Illustration

*1	Lot No.
➡	Engine Front

4. INSTALL CYLINDER HEAD SUB-ASSEMBLY

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

NOTICE:

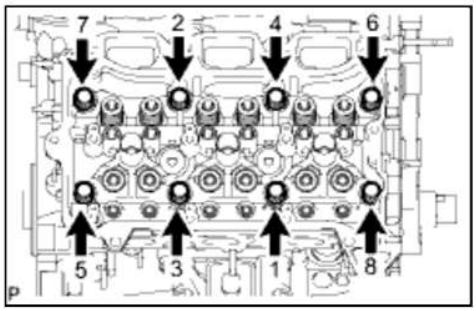
- Gently place the cylinder head in order not to damage the gasket with the bottom part of the head.
- Make sure that no oil is on the mounting surface of the cylinder head.

HINT:

The cylinder head bolts are tightened in 3 progressive steps.

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

(c) Step 1:



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

Torque: 36 N·m (367 kgf·cm, 27ft·lbf)

(d) Step 2:

(1) Mark the front side of each cylinder head bolt head with paint.

(2) Tighten the cylinder head bolts another 90°.

(e) Step 3:

(1) Tighten the cylinder head bolts an additional 90°.

cardiagn.com

(2) Check that the paint mark is now at a 180° angle to the front.

NOTICE:

Thoroughly wipe clean any seal packing.

5. INSTALL NO. 2 CYLINDER HEAD GASKET

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the cylinder head or cylinder block.

(b) Apply seal packing to a new cylinder head gasket as shown in the illustration.

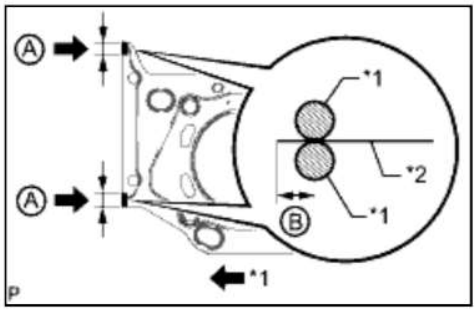
Seal packing:

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

Standard seal diameter:

2.5 to 3.0 mm (0.0984 to 0.118 in.)

Seal Packing Application Range



A	10 to 15 mm (0.394 to 0.591 in.)
B	1.25 to 1.5 mm (0.0492 to 0.0591 in.)

Text in Illustration

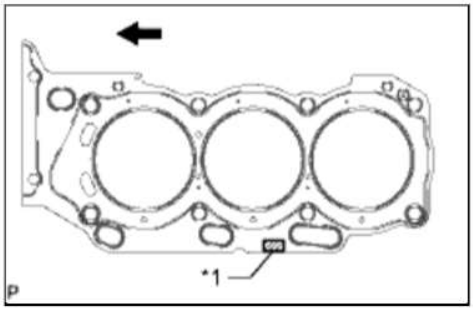
*1	Seal Packing
*2	Gasket

NOTICE:

- Remove any oil from the contact surface.
- Install the cylinder head gasket within 3 minutes and tighten the bolts within 15 minutes after applying seal packing.
- Do not add engine oil within 2 hours of installation.

(c) Place the cylinder head gasket on the cylinder block surface with the front face of the Lot No. stamp upward.

cardiagn.com



NOTICE:

Make sure that the gasket is installed facing the proper direction.

Text in Illustration

*1	Lot No.
➡	Engine Front

6. INSTALL CYLINDER HEAD LH

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

NOTICE:

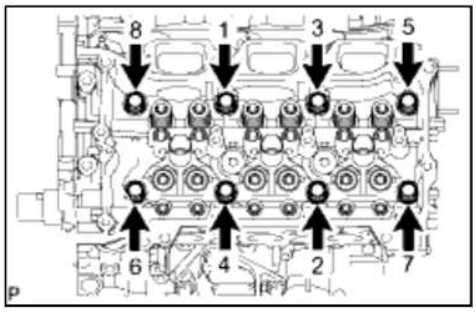
- Gently place the cylinder head in order not to damage the gasket with the bottom part of the head.
- Make sure that no oil is on the mounting surface of the cylinder head.

HINT:

The cylinder head bolts are tightened in 3 progressive steps.

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

(c) Step 1:



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

Torque: 36 N·m (367 kgf·cm, 27ft·lbf)

(d) Step 2:

(1) Mark the front side of each cylinder head bolt head with paint.

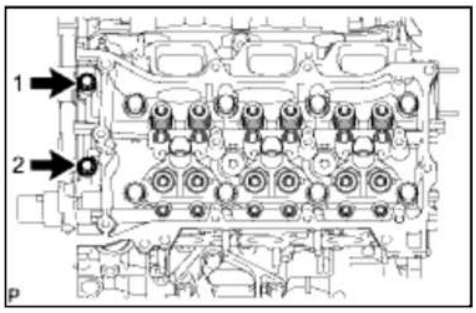
(2) Tighten the cylinder head bolts another 90°.

(e) Step 3:

(1) Tighten the cylinder head bolts an additional 90°.

cardiagn.com

(2) Check that the paint mark is now at a 180° angle to the front.



(f) Tighten the 2 bolts in the order shown in the illustration.

Torque: 30 N·m (306 kgf·cm, 22ft·lbf)

NOTICE:

Thoroughly wipe clean any seal packing.

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 CAMSHAFT BEARING CAP (for Bank 2) INFO

11. INSTALL CAMSHAFT HOUSING SUB-ASSEMBLY LH INFO

12. INSTALL CAMSHAFT BEARING CAP (for Bank 1) INFO

13. INSTALL CAMSHAFT HOUSING SUB-ASSEMBLY RH INFO

14. INSTALL NO. 3 CHAIN TENSIONER ASSEMBLY INFO

15. INSTALL CAMSHAFT TIMING GEARS AND NO. 2 CHAIN (for Bank 2) INFO

16. INSTALL NO. 2 CHAIN TENSIONER ASSEMBLY INFO

17. INSTALL CAMSHAFT TIMING GEARS AND NO. 2 CHAIN (for Bank 1) INFO

18. INSTALL NO. 1 CHAIN VIBRATION DAMPER INFO

19. INSTALL NO. 2 CHAIN VIBRATION DAMPER INFO

20. INSTALL CRANKSHAFT TIMING SPROCKET INFO

21. INSTALL NO. 1 IDLE GEAR SHAFT INFO

22. INSTALL CHAIN SUB-ASSEMBLY INFO

23. INSTALL CHAIN TENSIONER SLIPPER INFO

24. INSTALL NO. 1 CHAIN TENSIONER ASSEMBLY INFO

25. INSPECT VALVE TIMING INFO

26. INSTALL TIMING CHAIN COVER SUB-ASSEMBLY

cardiagn.com

(a) Install the timing chain cover INFO .

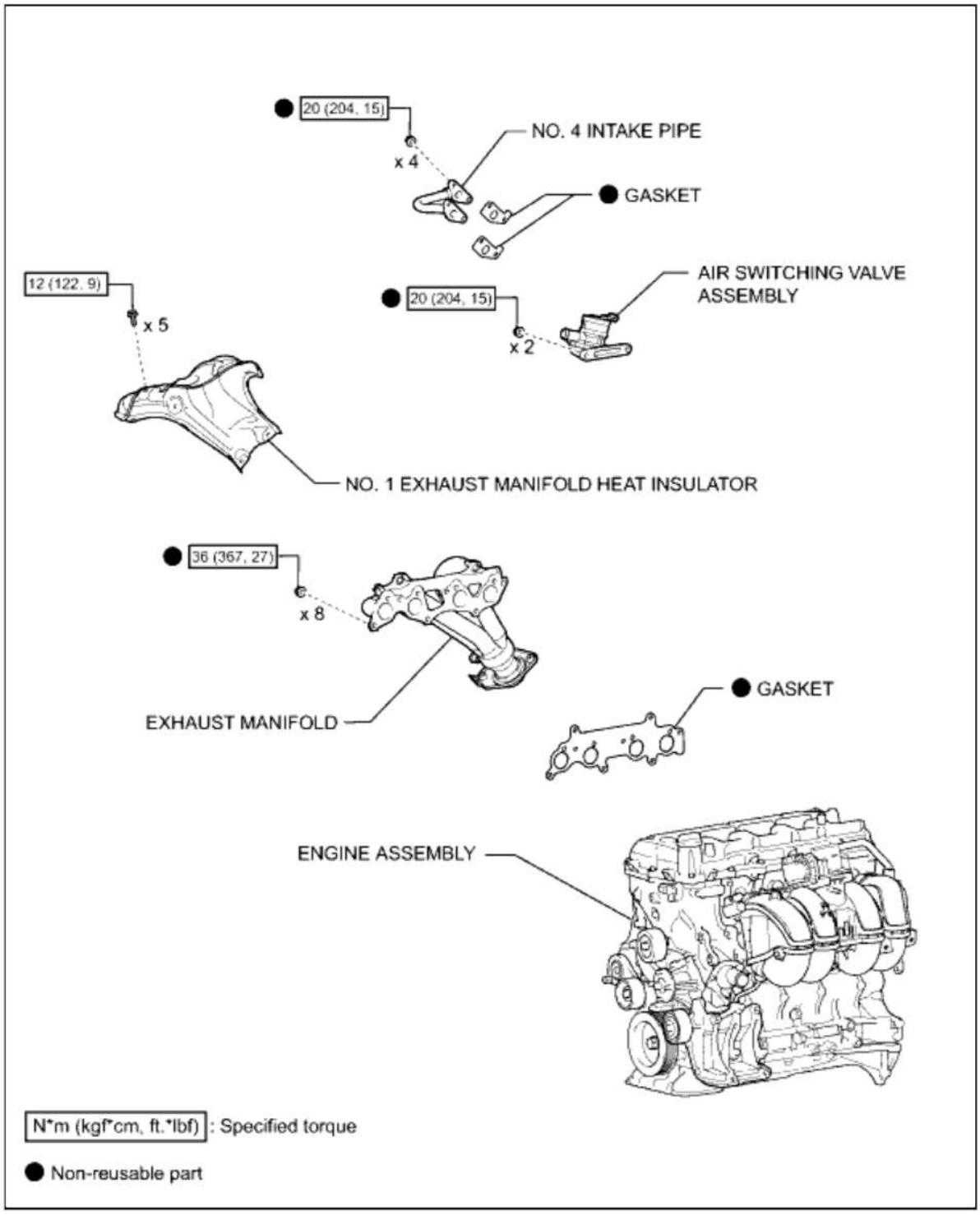


cardiagn.com

Last Modified: 5-10-2010	6.4 K	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM0000017OK008X
Title: 2TR-FE ENGINE MECHANICAL: CYLINDER HEAD GASKET: COMPONENTS (2010 4Runner)		

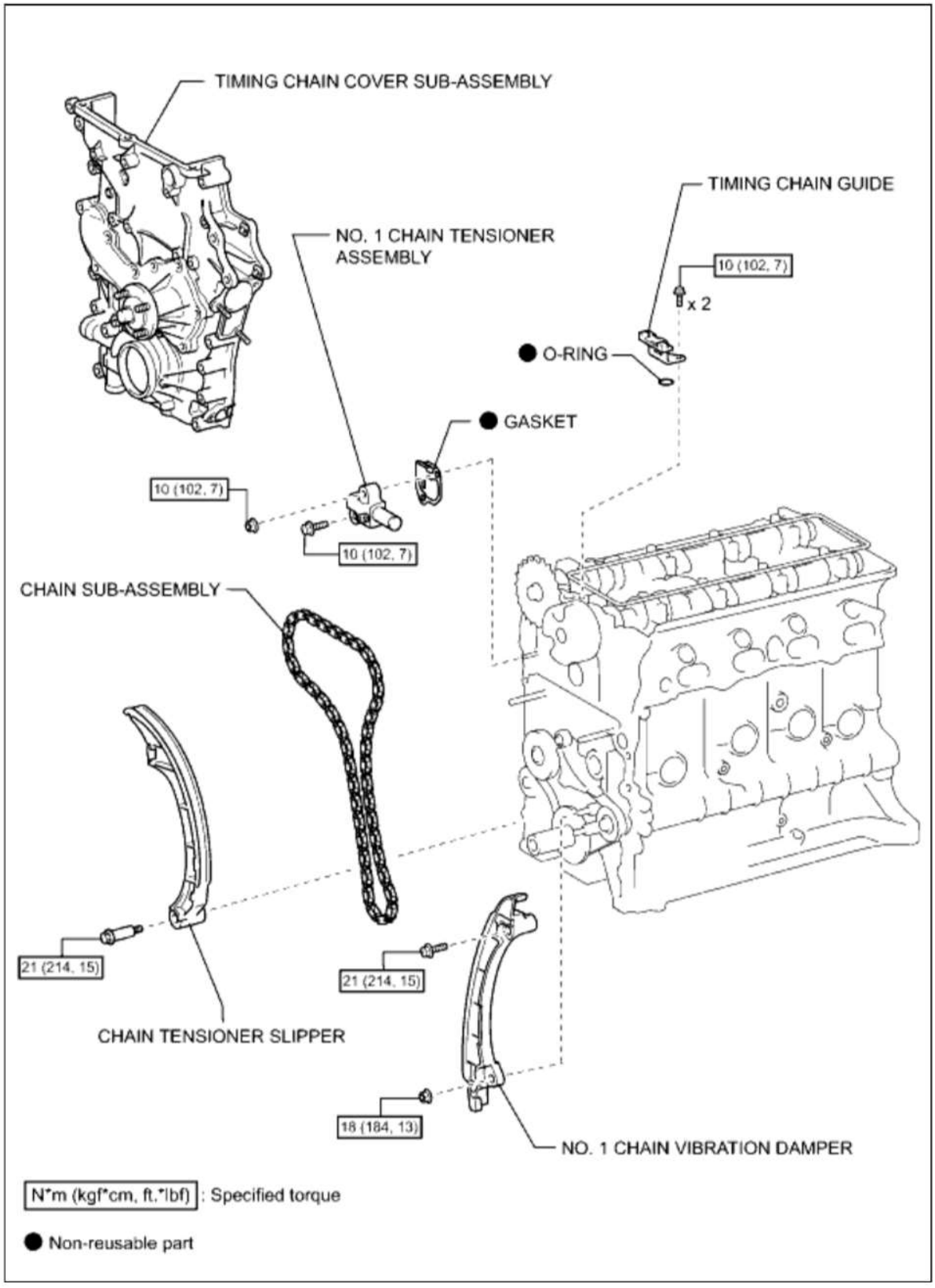
COMPONENTS

ILLUSTRATION



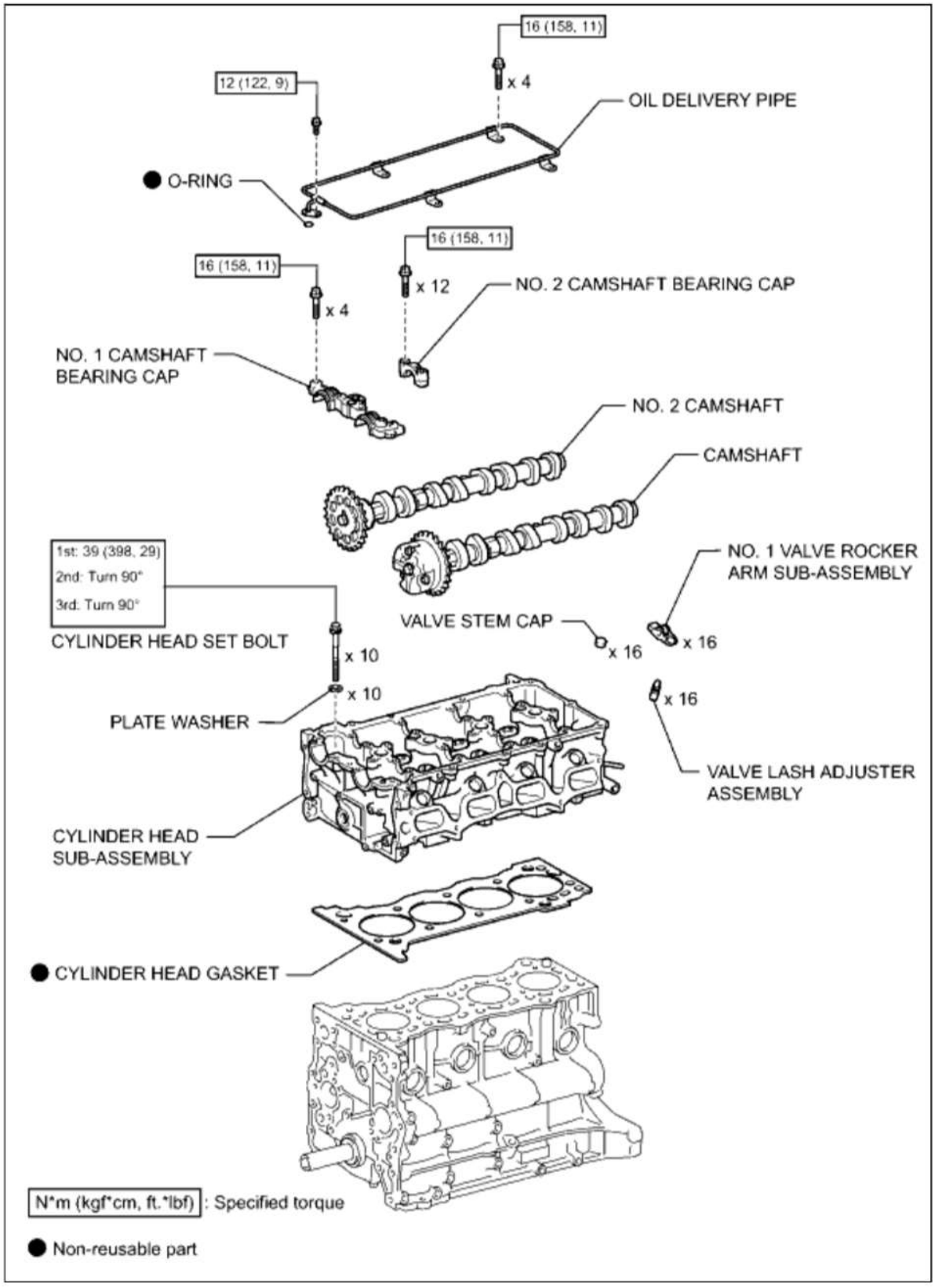
cardiagn.com

ILLUSTRATION



cardiagn.com

ILLUSTRATION



cardiagn.com

Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM0000017KN009X
Title: 2TR-FE ENGINE MECHANICAL: CYLINDER HEAD GASKET: REMOVAL (2010 4Runner)		

REMOVAL

1. REMOVE ENGINE ASSEMBLY

(a) Remove the engine INFO .

2. REMOVE NO. 1 EXHAUST MANIFOLD HEAT INSULATOR INFO

3. REMOVE NO. 4 INTAKE PIPE INFO

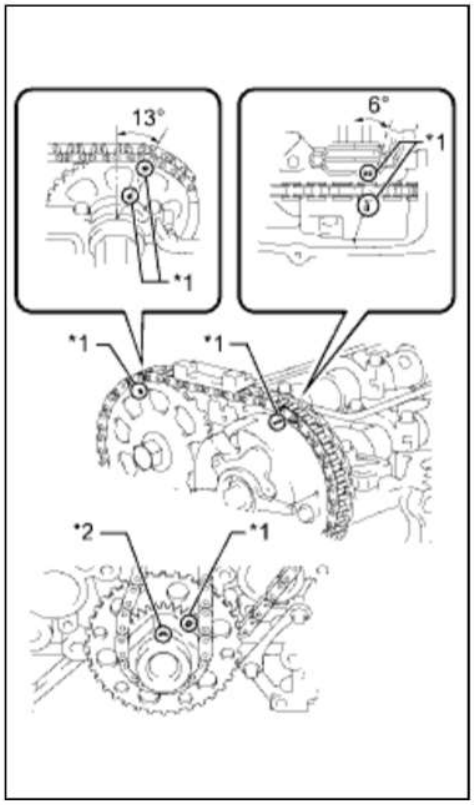
4. REMOVE AIR SWITCHING VALVE ASSEMBLY INFO

5. REMOVE EXHAUST MANIFOLD INFO

6. REMOVE TIMING CHAIN COVER SUB-ASSEMBLY

(a) Remove the timing chain cover INFO .

7. SET NO. 1 CYLINDER TO TDC/COMPRESSION



(a) Temporarily install the crankshaft pulley bolt.

(b) Rotate the crankshaft clockwise so that the timing marks on the crankshaft timing gear and camshaft timing gears are as shown in the illustration.

Text in Illustration

cardiagn.com

*1	Timing Mark
*2	Key

HINT:

If the timing marks do not align, rotate the crankshaft clockwise again and align the timing marks.

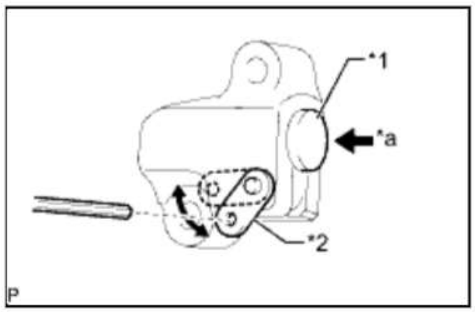
(c) Remove the crankshaft pulley bolt.

8. REMOVE TIMING CHAIN GUIDE INFO

9. REMOVE NO. 1 CHAIN TENSIONER ASSEMBLY

NOTICE:

- When the chain tensioner is removed, do not rotate the crankshaft.
- When the chain is removed and the camshaft needs to be rotated, rotate the crankshaft 90° to the right.

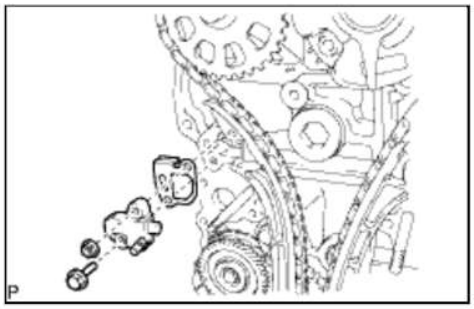


(a) Move the stopper plate upward to release the lock and push the plunger deep into the tensioner.

Text in Illustration

*1	Plunger
*2	Stopper Plate
*a	Push

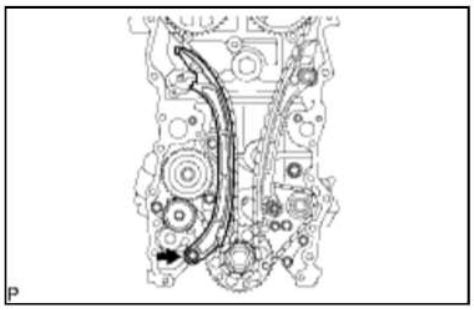
(b) Move the stopper plate downward to set the lock and insert a 3.0 mm (0.118 in.) diameter bar into the stopper plate hole.



(c) Remove the bolt, nut, chain tensioner and gasket.

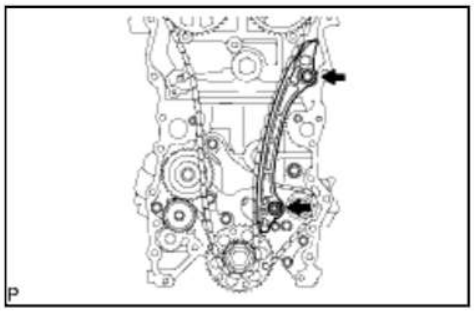
cardiagn.com

10. REMOVE CHAIN TENSIONER SLIPPER



(a) Remove the bolt and tensioner slipper.

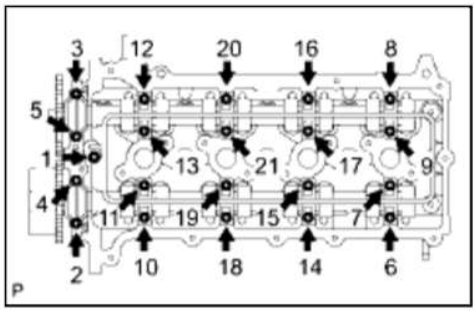
11. REMOVE NO. 1 CHAIN VIBRATION DAMPER



(a) Remove the 2 bolts and vibration damper.

12. REMOVE CHAIN SUB-ASSEMBLY

13. REMOVE CAMSHAFT BEARING CAP



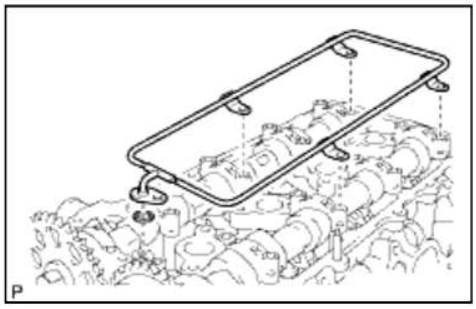
(a) Uniformly loosen and remove the 21 bearing cap bolts in the sequence shown in the illustration.

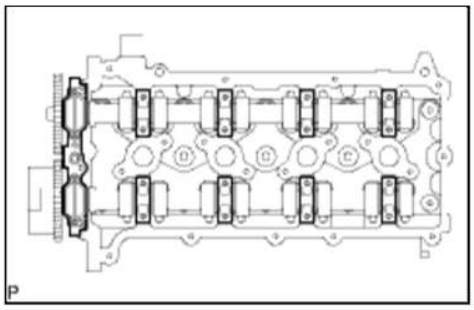
NOTICE:

Uniformly loosen the bolts while keeping the camshaft level.

(b) Remove the oil delivery pipe and O-ring from the bearing caps.

cardiagn.com

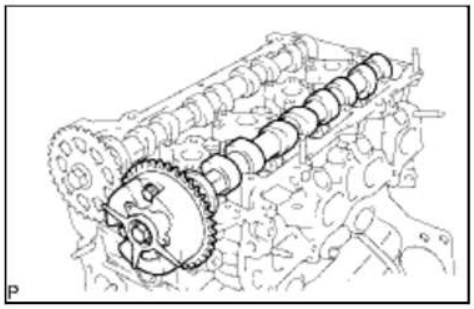




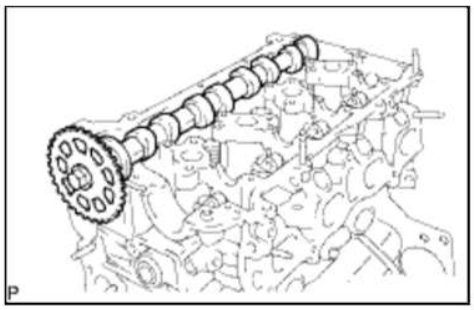
(c) Remove the 9 bearing caps.

HINT:

Arrange the removed parts in the correct order.



14. REMOVE CAMSHAFT



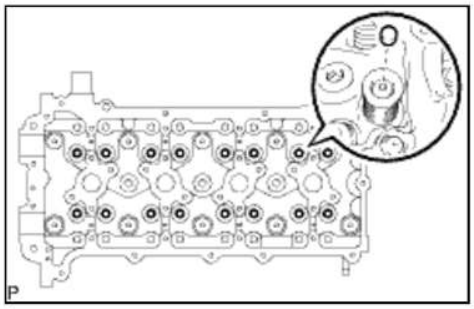
15. REMOVE NO. 2 CAMSHAFT

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

17. REMOVE VALVE LASH ADJUSTER ASSEMBLY INFO

18. REMOVE VALVE STEM CAP

cardiagn.com

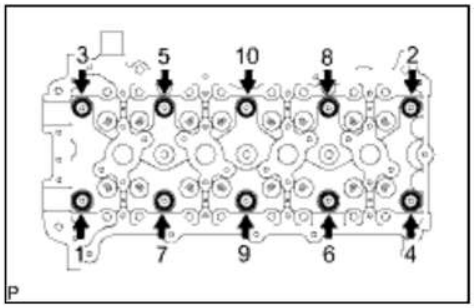


(a) Remove the valve stem caps from the cylinder head.

HINT:

Arrange the removed parts in the correct order.

19. REMOVE CYLINDER HEAD SUB-ASSEMBLY



(a) Uniformly loosen the 10 bolts in the sequence shown in the illustration. Remove the 10 cylinder head bolts and plate washers.

NOTICE:

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

20. REMOVE CYLINDER HEAD GASKET

(a) Remove the cylinder head gasket from the cylinder block.

21. INSPECT CYLINDER HEAD SET BOLT INFO

22. INSPECT CYLINDER HEAD SUB-ASSEMBLY INFO

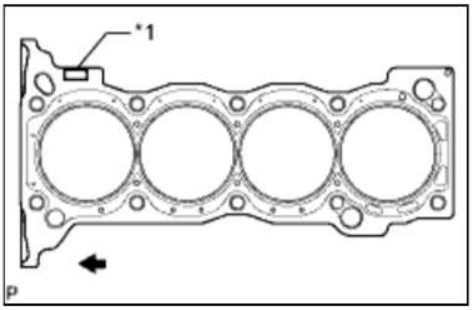
cardiagn.com

Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM0000017OI009X
Title: 2TR-FE ENGINE MECHANICAL: CYLINDER HEAD GASKET: INSTALLATION (2010 4Runner)		

INSTALLATION

1. INSTALL CYLINDER HEAD GASKET

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



Text in Illustration

*1	Lot No.
➡	Front

NOTICE:

Make sure that the cylinder head gasket is installed so that it is facing in the correct direction.

2. INSTALL CYLINDER HEAD SUB-ASSEMBLY

(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 cylinder head bolts.

HINT:

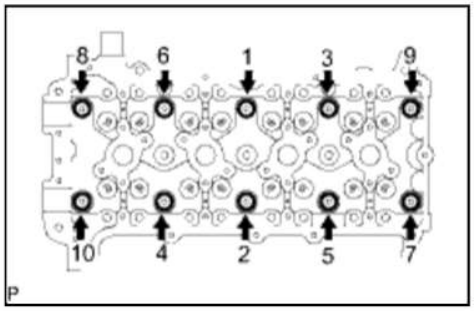
The cylinder head bolts are tightened in 3 successive steps.

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

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

(3) Step 1:

cardiagn.com



Using several steps, install and uniformly tighten the 10 cylinder head bolts with plate washers in the sequence shown in the illustration.

Torque: 39 N·m (398 kgf·cm, 29ft·lbf)

(4) Mark the front of each cylinder head bolt head with paint.

(5) Step 2:

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

(6) Step 3:

Tighten the cylinder head bolts another 90° in the sequence shown in step 1.

(7) Check that the paint marks are now at a 180° angle to the front.

3. 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.

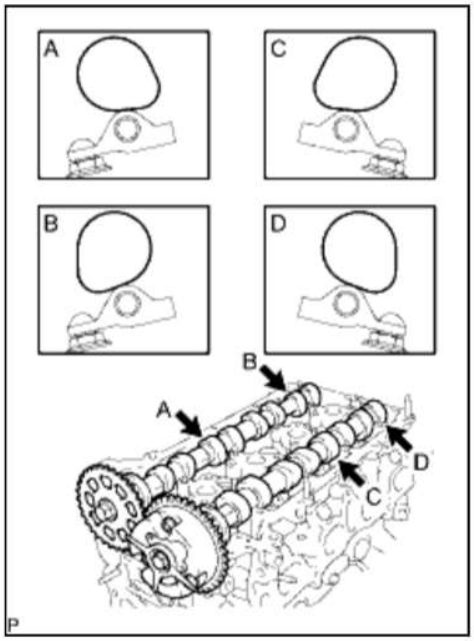
4. INSTALL VALVE LASH ADJUSTER ASSEMBLY INFO

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

6. INSTALL CAMSHAFT

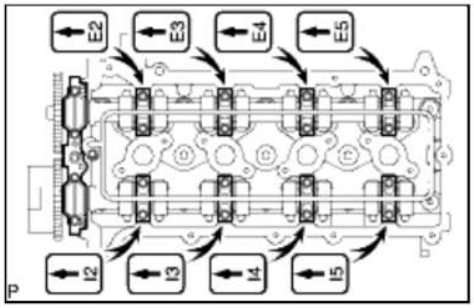
(a) Apply clean engine oil to the camshaft cams and cylinder head journals.

cardiagn.com



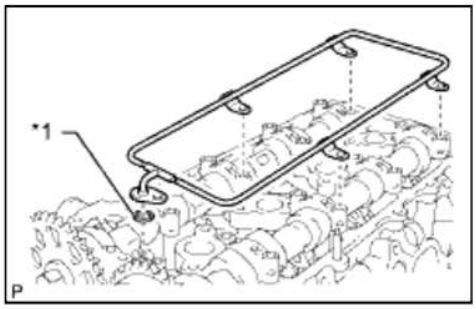
(b) Position the camshaft and No. 2 camshaft as shown in the illustration.

7. INSTALL CAMSHAFT BEARING CAP



(a) Temporarily install the No. 1 camshaft bearing cap.

(b) Check the proper location of each No. 2 camshaft bearing cap and install them.



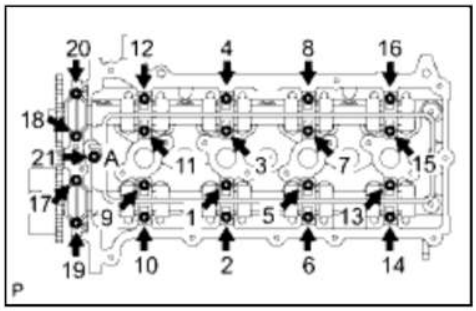
(c) Install a new O-ring to the No. 1 camshaft bearing cap.

Text in Illustration

*1	New O-Ring

(d) Temporarily install the oil delivery pipe.

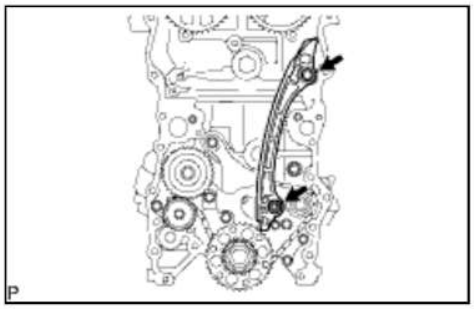
cardiagn.com



(e) Install the 21 bolts and tighten them in the order shown in the illustration.

for bolt A - Torque: 12 N·m (122 kgf·cm, 9ft·lbf)
except bolt A - Torque: 16 N·m (158 kgf·cm, 11ft·lbf)

8. INSTALL NO. 1 CHAIN VIBRATION DAMPER



(a) Install the vibration damper with the bolt and nut.

for bolt - Torque: 21 N·m (214 kgf·cm, 15ft·lbf)
for nut - Torque: 18 N·m (184 kgf·cm, 13ft·lbf)

9. INSTALL CHAIN SUB-ASSEMBLY

(a) As shown in the illustration, install the chain to the sprocket and gear with the mark plates aligned with the timing marks on the sprocket and gear.

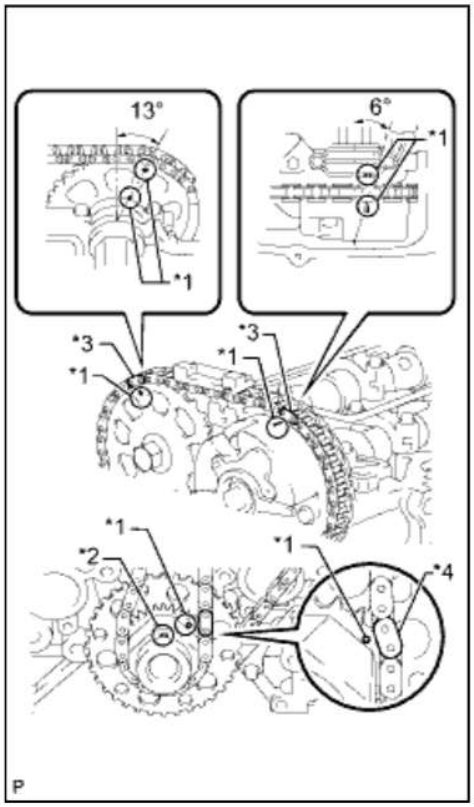
Text in Illustration

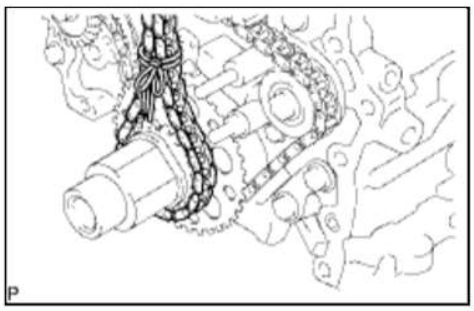
*1	Timing Mark
*2	Key
*3	Mark Plate (Orange)
*4	Mark Plate (Yellow)

HINT:

- The camshaft mark plate is orange.
- The crankshaft mark plate is yellow.

cardiagn.com





(b) Use a rope to secure the chain of the crankshaft timing sprocket. Tie the rope near the sprocket.

NOTICE:

After the chain tensioner has been installed, the rope must be removed.

HINT:

The rope is used to prevent the chain from jumping a tooth.

10. INSTALL CHAIN TENSIONER SLIPPER

(a) Install the tensioner slipper with the bolt.

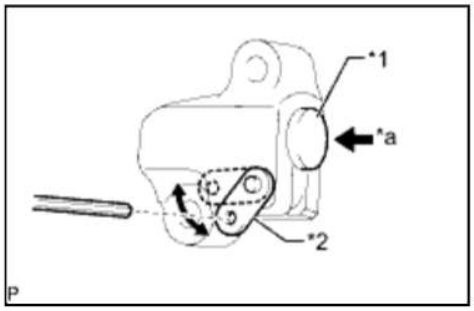
Torque: 21 N·m (214 kgf·cm, 15ft·lbf)

11. INSTALL NO. 1 CHAIN TENSIONER ASSEMBLY

(a) Move the stopper plate upward to release the lock and push the plunger deep into the tensioner.

Text in Illustration

cardiagn.com



*1	Plunger
*2	Stopper Plate
*a	Push

(b) Move the stopper plate downward to set the lock and insert a hexagon wrench into the hole of the stopper plate.

(c) Install a new gasket and the chain tensioner with the bolt and nut.

Torque: 10 N·m (102 kgf·cm, 7ft·lbf)

12. INSTALL TIMING CHAIN GUIDE INFO

13. INSTALL TIMING CHAIN COVER SUB-ASSEMBLY

(a) Install the timing chain cover INFO .

14. INSTALL EXHAUST MANIFOLD INFO

15. INSTALL AIR SWITCHING VALVE ASSEMBLY INFO

16. INSTALL NO. 4 INTAKE PIPE INFO

17. INSTALL NO. 1 EXHAUST MANIFOLD HEAT INSULATOR INFO

18. INSTALL ENGINE ASSEMBLY

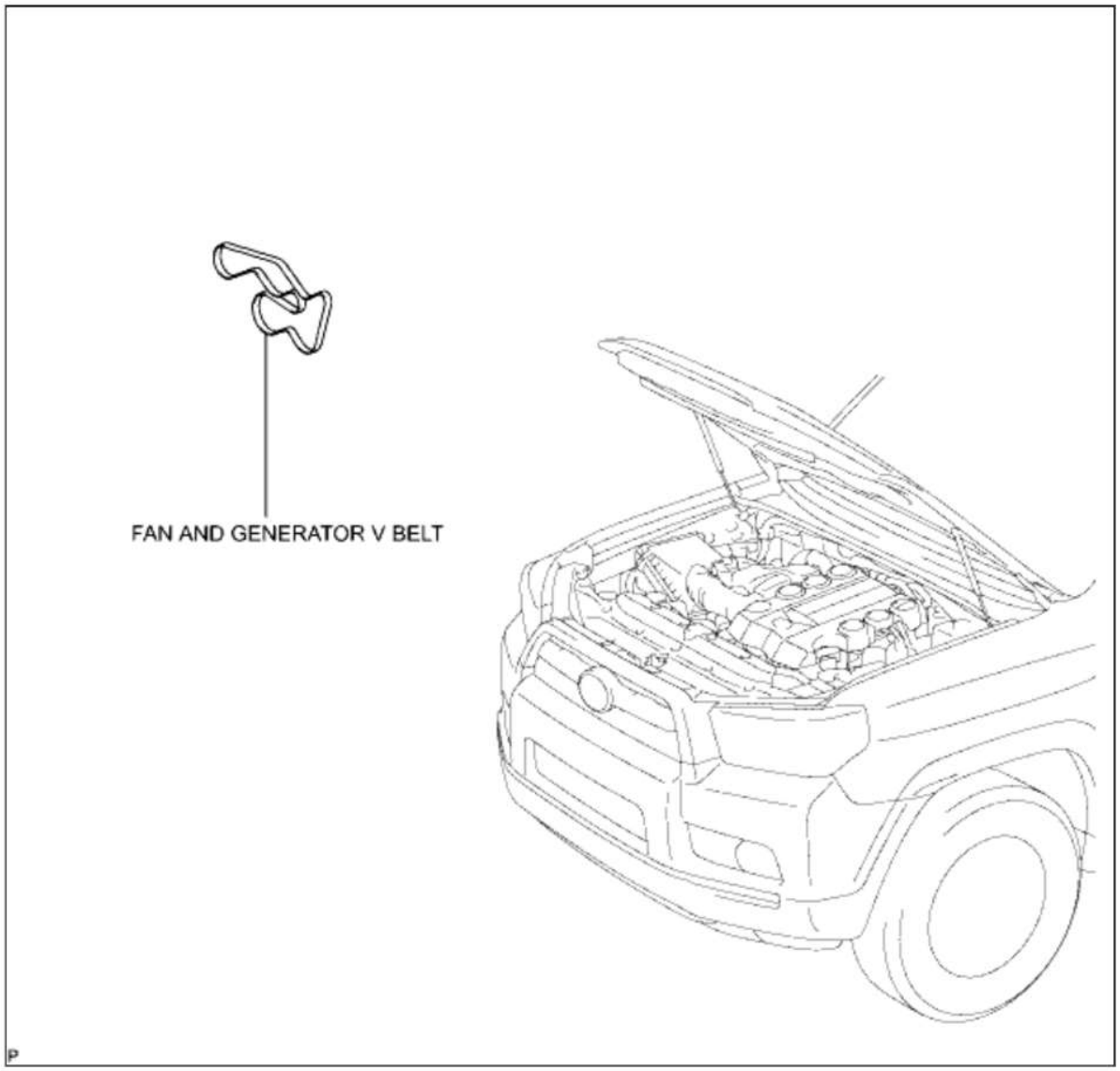
(a) Install the engine INFO .

cardiagn.com

Last Modified: 5-10-2010	6.4 K	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000002CXS00DX
Title: 1GR-FE ENGINE MECHANICAL: DRIVE BELT: COMPONENTS (2010 4Runner)		

COMPONENTS

ILLUSTRATION

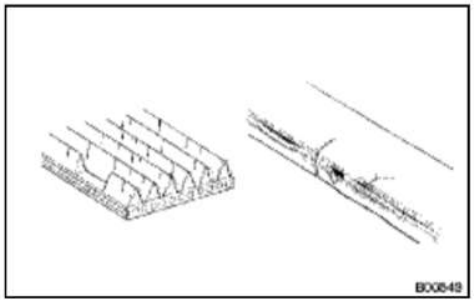


cardiagn.com

Last Modified: 5-10-2010	6.4 G	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000001ZYL015X
Title: 1GR-FE ENGINE MECHANICAL: DRIVE BELT: ON-VEHICLE INSPECTION (2010 4Runner)		

ON-VEHICLE INSPECTION

1. INSPECT FAN AND GENERATOR V BELT



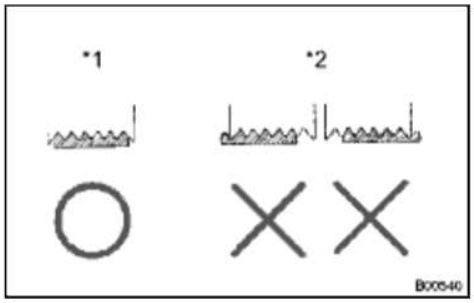
(a) Check the belt for wear, cracks or other signs of damage.

If any of the following defects is found, replace the fan and generator V belt.

- The belt is cracked.
- The belt is worn out to the extent that the cords are exposed.
- The belt has chunks missing from the ribs.

(b) Check that the belt fits properly in the ribbed grooves.

Text in Illustration



*1	CORRECT
*2	INCORRECT

HINT:

Check with your hand to confirm that the belt has not slipped out of the grooves on the bottom of the pulley. If it has slipped out, replace the fan and generator V belt. Install a new fan and generator V belt correctly.

2. INSPECT V-RIBBED BELT TENSIONER ASSEMBLY

(a) Check that nothing gets caught in the tensioner by turning it clockwise and counterclockwise.

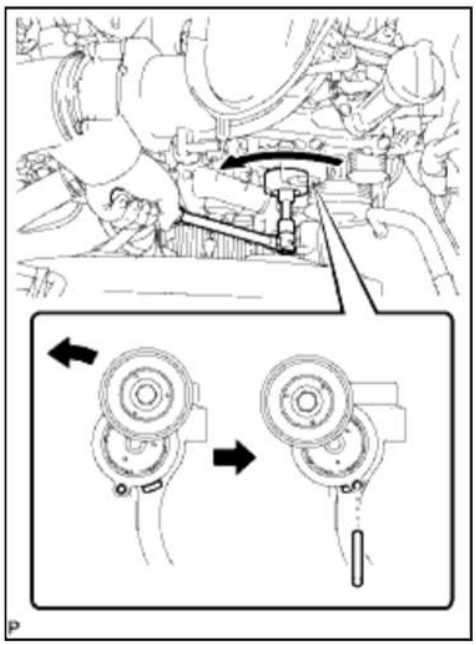
If the result is not as specified, replace the tensioner.

cardiagn.com

Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM0000017LA00NX
Title: 1GR-FE ENGINE MECHANICAL: DRIVE BELT: REMOVAL (2010 4Runner)		

REMOVAL

1. REMOVE FAN AND GENERATOR V BELT



(a) While turning the belt tensioner counterclockwise, align the service hole for the belt tensioner and the belt tensioner fixing position, and then insert a bar of φ 6 mm (0.236 in.) into the service hole to fix the belt tensioner in place.

HINT:

The pulley bolt for the belt tensioner has a left-hand thread.

(b) Remove the V belt.

cardiagn.com

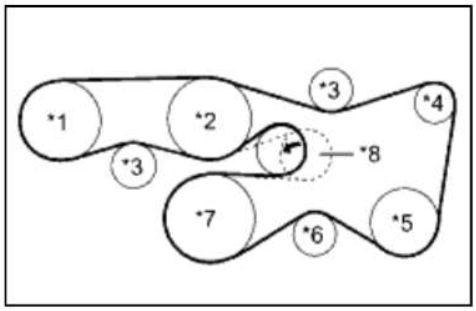
Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM0000017L900NX
Title: 1GR-FE ENGINE MECHANICAL: DRIVE BELT: INSTALLATION (2010 4Runner)		

INSTALLATION

1. INSTALL FAN AND GENERATOR V BELT

(a) Set the V belt onto every part.

Text in Illustration



*1	Vane Pump
*2	Water Pump
*3	No. 2 Idler
*4	Generator
*5	Cooler Compressor
*6	No. 1 Idler
*7	Crankshaft
*8	V-ribbed Belt Tensioner

(b) While turning the belt tensioner counterclockwise, remove the pin.

NOTICE:

Make sure that the V belt is properly installed to each pulley.

(c) Check that the belt fits properly in the ribbed grooves.

HINT:

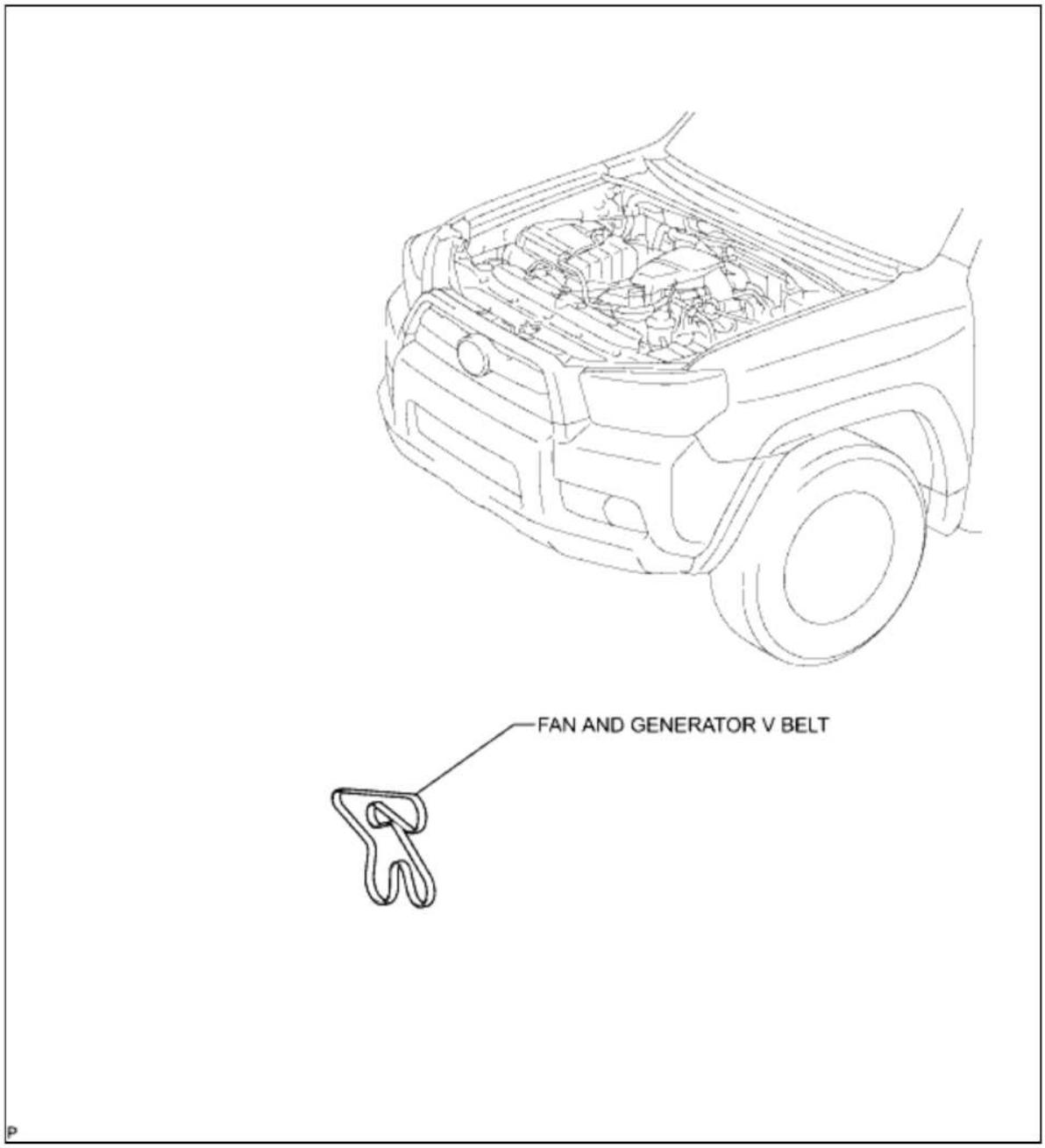
Make sure to check by hand that the belt has not slipped out of the grooves on the bottom of the pulley.

cardiagn.com

Last Modified: 5-10-2010	6.4 K	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM0000044GQ003X
Title: 2TR-FE ENGINE MECHANICAL: DRIVE BELT: COMPONENTS (2010 4Runner)		

COMPONENTS

ILLUSTRATION

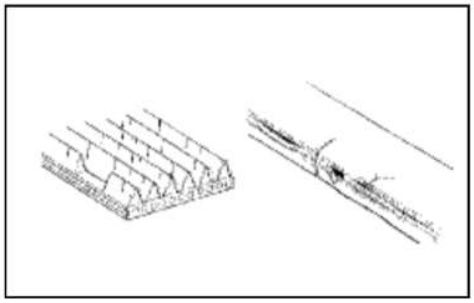


cardiagn.com

Last Modified: 5-10-2010	6.4 G	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000003V6X00CX
Title: 2TR-FE ENGINE MECHANICAL: DRIVE BELT: ON-VEHICLE INSPECTION (2010 4Runner)		

ON-VEHICLE INSPECTION

1. INSPECT FAN AND GENERATOR V BELT

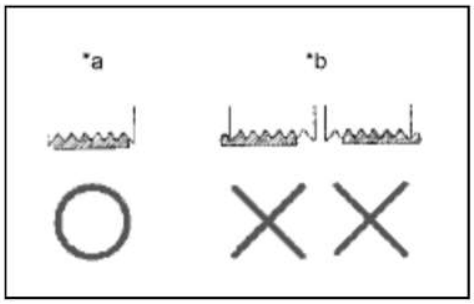


(a) Check the belt for wear, cracks or other signs of damage.

If any of the following defects is found, replace the fan and generator V belt.

- The belt is cracked.
- The belt is worn out to the extent that the cords are exposed.
- The belt has chunks missing from the ribs.

(b) Check that the belt fits properly in the ribbed grooves.



Text in Illustration

*a	CORRECT
*b	INCORRECT

HINT:

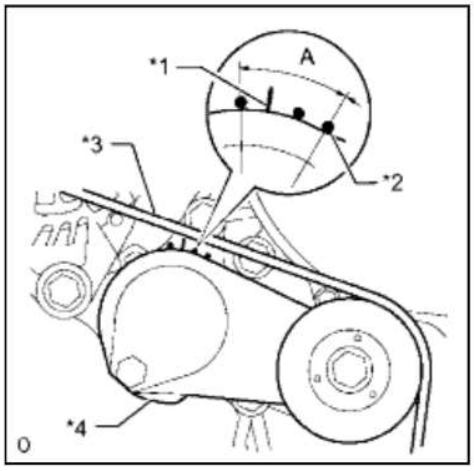
Check with your hand to confirm that the belt has not slipped out of the grooves on the bottom of the pulley. If it has slipped out, replace the V belt. Install a new V belt correctly.

(c) Check that the tensioner indicator mark is within range A shown in the illustration.

Text in Illustration

*1	Bracket Side Indicator
*2	Arm Side Indicator
*3	Fan and Generator V Belt
*4	Tensioner

cardiagn.com



If the mark is not within range A, replace the fan and generator V belt.

2. INSPECT V-RIBBED BELT TENSIONER ASSEMBLY

(a) Check that nothing gets caught in the tensioner by turning it clockwise and counterclockwise.

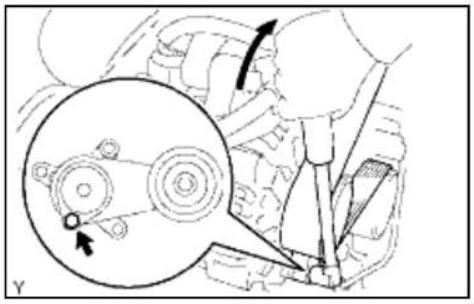
If the result is not as specified, replace the tensioner.

cardiagn.com

Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000000YMP00LX
Title: 2TR-FE ENGINE MECHANICAL: DRIVE BELT: REMOVAL (2010 4Runner)		

REMOVAL

1. REMOVE FAN AND GENERATOR V BELT



(a) Use the hexagonal part indicated by the arrow in the illustration to move the tensioner pulley downward and decrease the tension in the V belt. Then remove the V belt.

NOTICE:

When removing the V belt, do not use the bolt of the idle pulley.

HINT:

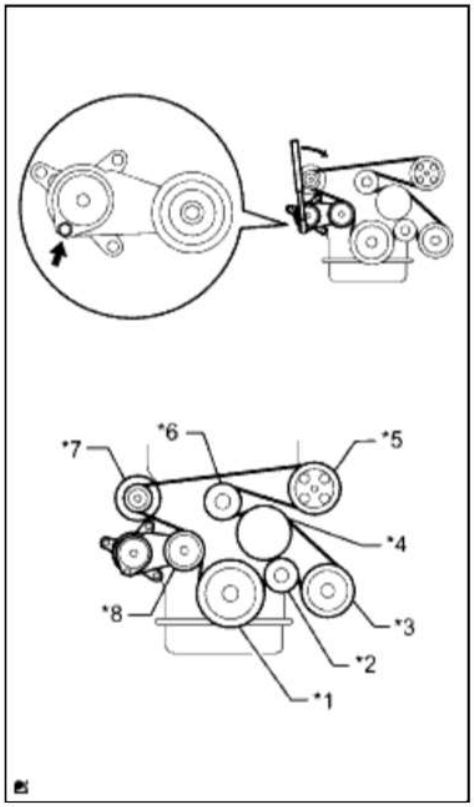
After removing the V belt, move the tensioner upward to the maximum amount.

cardiagn.com

Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000000YMN00LX
Title: 2TR-FE ENGINE MECHANICAL: DRIVE BELT: INSTALLATION (2010 4Runner)		

INSTALLATION

1. INSTALL FAN AND GENERATOR V BELT



(a) Set the V belt onto every part.

Text in Illustration

*1	Crankshaft Pulley
*2	Idler
*3	Cooler Compressor
*4	Fan Pulley
*5	Vane Pump
*6	No. 1 Idler
*7	Generator
*8	V-ribbed Belt Tensioner

(b) Use the hexagonal part indicated by the arrow in the illustration to move the tensioner pulley downward and install the V belt to the tensioner pulley.

NOTICE:

Make sure to check by hand that the belt has not slipped out of the grooves on the bottom of the pulley.

cardiagn.com

Last Modified: 5-10-2010	6.4 G	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000002ZLZ01CX
Title: 2TR-FE ENGINE MECHANICAL: ENGINE: ON-VEHICLE INSPECTION (2010 4Runner)		

ON-VEHICLE INSPECTION

1. INSPECT ENGINE COOLANT INFO

2. INSPECT ENGINE OIL INFO

3. INSPECT BATTERY INFO

4. INSPECT AIR CLEANER FILTER ELEMENT SUB-ASSEMBLY

(a) Remove the air cleaner cap.

(b) Remove the air filter element.

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

If necessary, replace the air cleaner filter element.

5. INSPECT SPARK PLUG INFO

6. INSPECT FAN AND GENERATOR V BELT INFO

7. INSPECT VALVE LASH ADJUSTER NOISE

(a) Rev 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 more than 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 .

8. INSPECT IGNITION TIMING

(a) Warm up and stop the engine.

(b) When using the Techstream:

(1) Connect the Techstream to the DLC3.

(2) Start the engine and idle it.

(3) Turn the Techstream on.

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

Standard ignition timing:
3 to 13° BTDC @ idle

HINT:

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

If the ignition timing is not as specified, check the valve timing.

NOTICE:

- When checking the ignition timing, the transmission should be in N or P.
- Switch off all the accessories and the A/C before connecting the Techstream.

cardiagn.com

(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 CG.

(7) Monitor IGN Advance.

(8) Perform the Active Test.

Standard ignition timing:
3 to 7° BTDC @ idle

HINT:

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

If the ignition timing is not as specified, check the valve timing.

NOTICE:

When checking the ignition timing, the transmission should be in N or P.

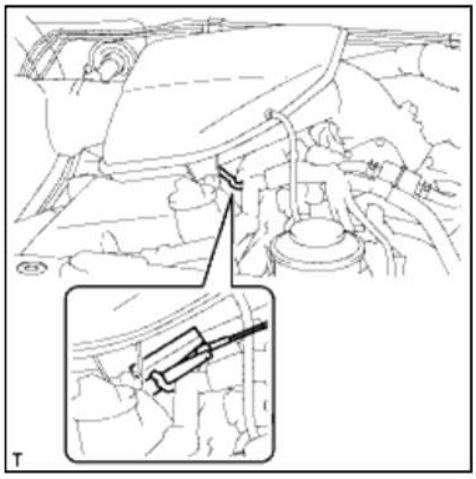
(c) When not using the Techstream:

(1) Loosen the hose clamp from the throttle body side.

(2) Remove the 3 bolts and disconnect the intake air connector.

HINT:

Move the intake air connector so that the tester probe of a timing light can be connected to the wire of the ignition coil for the No. 1 cylinder.



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

NOTICE:

Use a timing light that detects primary signals.

(4) Connect the intake air connector.

HINT:

Return the parts to their original positions so that the engine can be started.

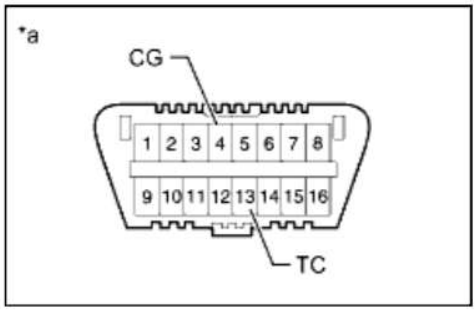
(5) Start the engine and idle it.

(6) Using SST, connect terminals 13 (TC) and 4 (CG) of

cardiagn.com

the DLC3.

SST: 09843-18040



Text in Illustration

*a	Front view of DLC3

NOTICE:

- Confirm the terminal numbers before connecting the terminals. Connecting the wrong terminals can damage the engine.
- When checking the ignition timing, the shift lever should be in N or P.

(7) Using the timing light, check the ignition timing.

Standard ignition timing:
3 to 7° BTDC @ idle

NOTICE:

- Turn all the electrical systems and the A/C off.
- When checking the ignition timing, the shift lever should be in N or P.

(8) Remove SST from the DLC3.

(9) Check the ignition timing.

Standard ignition timing:
3 to 13° BTDC @ idle

If the ignition timing is not as specified, check the valve timing.

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

(11) Turn the ignition switch off.

(12) Disconnect the timing light from the engine.

(13) Connect the intake air connector with the 3 bolts.

Torque: 8.0 N·m (82 kgf·cm, 71in·lbf)

(14) Tighten the hose clamp.

Torque: 5.0 N·m (51 kgf·cm, 44in·lbf)

9. INSPECT ENGINE IDLE SPEED

(a) Warm up and stop the engine.

(b) When using the Techstream:

(1) Connect the Techstream to the DLC3.

(2) Start the engine and idle it.

(3) Turn the Techstream on.

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

Standard idle speed:

cardiagn.com

600 to 700 rpm

HINT:

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

NOTICE:

- Turn all the electrical systems and the A/C off.
- When checking the idling speed, the shift lever should be in N or P.

(5) Turn the ignition switch off.

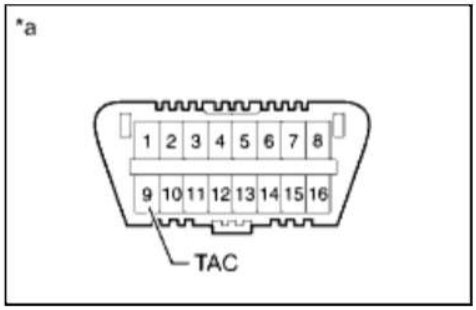
(6) Disconnect the Techstream from the DLC3.

(c) When not using the Techstream:

(1) Using SST, connect a tachometer probe to terminal 9 (TAC) of the DLC3.

SST: 09843-18030

Text in Illustration



*a	Front view of DLC3

NOTICE:

- Confirm the terminal number before connecting the probe. Connection with a wrong terminal can damage the engine.
- Turn all the electrical systems and the A/C off.
- When checking the idling speed, the shift lever should be in N or P.

(2) Check the idle speed.

Standard idle speed:
600 to 700 rpm

(3) Disconnect the tachometer probe from the DLC3.

10. INSPECT IDLE SPEED CONTROL SYSTEM

(a) Warm up and stop the engine.

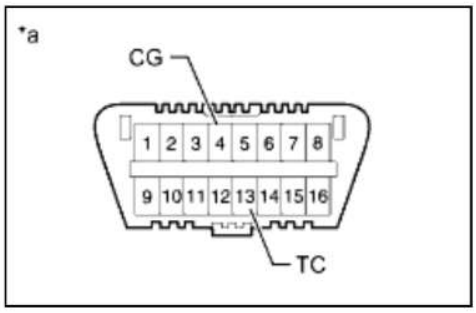
(b) Check the idle speed control system.

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

SST: 09843-18040

Text in Illustration

cardiagn.com



*a	Front view of DLC3

NOTICE:

- Confirm the terminal numbers before connecting the terminals. Connecting the wrong terminals can damage the engine.
- Turn off all the electrical systems before connecting the terminals.

(2) Start the engine and run it at idle.

NOTICE:

When checking the idle speed control function, the transmission should be in N.

(c) After connecting terminals 13 (TC) and 4 (CG), check that the engine speed changes to approximately 1000 to 1500 rpm for 5 seconds, and then returns to idle speed.

If the result is not as specified, check the throttle body INFO, DTCs INFO and wire harness.

11. INSPECT COMPRESSION

(a) Warm up and stop the engine.

(b) Check for DTCs INFO.

(c) Remove the 4 bolts and 4 ignition coils.

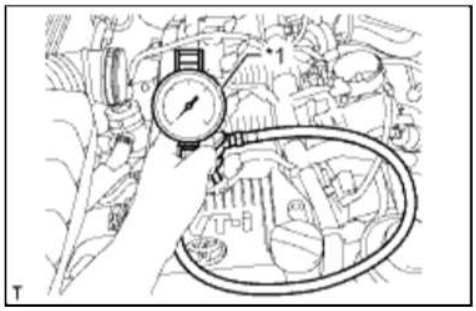
(d) Remove the 4 spark plugs.

(e) Disconnect the 4 fuel injector connectors.

(f) Inspect the cylinder compression pressure.

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

Text in Illustration



*1	Compression Gauge

(2) Fully open the throttle.

(3) While cranking the engine, measure the compression pressure.

Standard compression pressure:
1230 kPa (12.5 kgf/cm^2, 178 psi) or higher
Minimum pressure:
880 kPa (9.0 kgf/cm^2, 128 psi)
Difference between each cylinder:
68 kPa (0.7 kgf/cm^2, 9.8 psi) or less

HINT:

cardiagn.com

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

- If adding oil increases the compression pressure, 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 leakage from the gasket.

NOTICE:

- Use a fully-charged battery so the engine speed can be increased to 250 rpm or more.
- Inspect the other cylinders in the same way.
- Measure the compression in as short a time as possible.

(g) Connect the 4 fuel injector connectors.

(h) Install the 4 spark plugs.

Torque: 18 N·m (184 kgf·cm, 13ft·lbf)

(i) Install the 4 ignition coils with the 4 bolts.

Torque: 9.0 N·m (92 kgf·cm, 80in·lbf)

(j) Clear the DTCs INFO .

12. INSPECT CO/HC

(a) Start the engine.

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

(c) Insert a CO/HC meter testing probe at least 40 cm (1.31 ft.) into the tailpipe while idling the engine.

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

HINT:

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

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

(1) Check the air fuel ratio sensor INFO and heated oxygen sensor INFO .

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

CO	HC	PROBLEMS	POSSIBLE CAUSES
Normal	High	Rough idling	1. Faulty ignition: o Incorrect timing o Plugs are contaminated or shorted, or gaps are incorrect

cardiagn.com

CO	HC	PROBLEMS	POSSIBLE CAUSES
			2. Incorrect valve clearance 3. Leakage from intake or exhaust valves 4. Leakage from cylinders
Low	High	Rough idling (Fluctuating HC reading)	1. Vacuum leaks: o PCV hoses o Intake manifold o Throttle body 2. Lean mixture causing misfire
High	High	Rough idling (Black smoke from exhaust)	1. Restricted air cleaner filter element 2. Plugged PCV valve 3. Faulty SFI system: o Faulty pressure regulator o Faulty engine coolant temperature sensor o Faulty mass air flow meter o Faulty ECM o Faulty injectors o Faulty throttle body



cardiagn.com

Last Modified: 5-10-2010	6.4 G	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM0000017L800NX
Title: 1GR-FE ENGINE MECHANICAL: ENGINE: ON-VEHICLE INSPECTION (2010 4Runner)		

ON-VEHICLE INSPECTION

1. INSPECT IGNITION TIMING

NOTICE:

- Turn all electrical systems off.
- Perform the inspection when the cooling fan motor is turned off.

(a) Warm up the engine.

(b) When using the Techstream:

(1) Connect the Techstream to the DLC3.

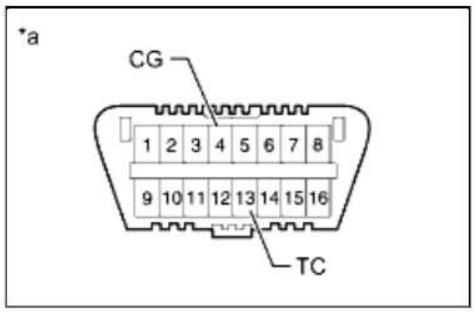
(2) Enter the following menus: Powertrain / Engine and ECT / Data List / All Data / IGN Advance.

(3) Inspect the ignition timing during idling.

Standard ignition timing:
8 to 12° BTDC @ idle (transmission in neutral and A/C switch off)

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

(c) When not using the Techstream:



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

SST: 09843-18040

Text in Illustration

*a	Front view of DLC3

NOTICE:

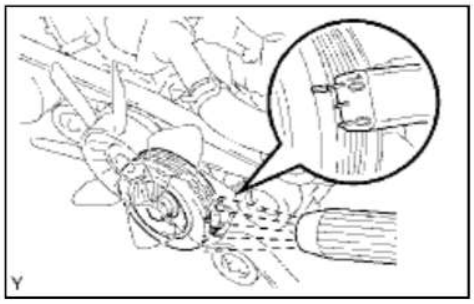
Be sure not to improperly connect the terminals. This may damage the engine.

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

NOTICE:

- Use a timing light that detects primary signals.
- After the inspection, be sure to wrap the wire harness with tape.

cardiagn.com



(3) Inspect the ignition timing during idling.

Standard ignition timing:
8 to 12° BTDC @ idle (transmission in neutral and A/C switch off)

(4) Remove SST from the DLC3.

(5) Inspect the ignition timing during idling.

Standard ignition timing:
7 to 24° BTDC @ idle (transmission in neutral and A/C switch off)

(6) Disconnect the timing light from the engine.

2. INSPECT ENGINE IDLE SPEED

NOTICE:

- Turn all the electrical systems off.
- Perform the inspection when the cooling fan motor is turned off.

(a) Warm up the engine.

(b) When using the Techstream:

(1) Connect the Techstream to the DLC3.

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

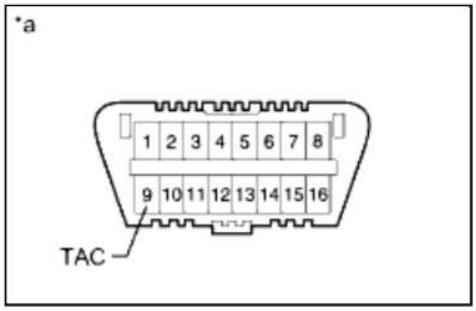
(3) Inspect the engine idle speed.

Standard idle speed:
690 to 790 rpm (transmission in neutral and A/C switch off)

(c) When not using the Techstream:

(1) Connect SST to terminal 9 (TAC) of the DLC3.

SST: 09843-18030



Text in Illustration

*a	Front view of DLC3

(2) Race the engine at 2500 rpm for approximately 90 seconds.

(3) Inspect the engine idle speed.

Standard idle speed:
690 to 790 rpm (transmission in neutral and A/C switch

cardiagn.com

off)

3. INSPECT COMPRESSION

(a) Warm up and stop the engine.

(b) Remove the intake air surge tank INFO .

(c) Remove the 6 spark plugs INFO .

(d) Disconnect the 6 fuel injector connectors.

(e) Inspect the cylinder compression pressure.

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

(2) While cranking the engine, measure the compression pressure. (Procedure B)

Compression pressure:
1400 kPa (14.3 kgf/cm^2, 203 psi) or higher
Minimum pressure:
1100 kPa (11.2 kgf/cm^2, 160 psi)
Difference between each cylinder:
100 kPa (1.0 kgf/cm^2, 15 psi) or less

HINT:

- Use a fully-charged battery so that the engine speed can be increased to 250 rpm or more.
- Measure the compression in as short a time as possible.

(3) Repeat procedures A and B for each cylinder.

(4) If the cylinder compression is low, pour a small amount of engine oil into the cylinder through the spark plug hole and repeat procedures A and B for cylinders with low compression.

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

(f) Connect the 6 injector connectors.

(g) Install the 6 spark plugs INFO .

(h) Install the intake air surge tank INFO .

4. INSPECT CO/HC

HINT:

This check is to determine whether or not the idle CO/HC concentration complies with regulations.

(a) Start the engine.

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

(c) Insert the CO/HC meter testing probe at least 40 cm (1.31 ft) into the tailpipe during idling.

(d) Immediately check the CO/HC concentration during idling and/or at 2500 rpm.

HINT:

When carrying out the 2 tests (idling and 2500 rpm), the measurement orders are prescribed by the applicable

cardiagn.com

local regulations.

(e) If the CO/HC concentration does not comply with regulations, perform troubleshooting in the order given below.

(1) Check the A/F sensor operation INFO and heated oxygen sensor operation INFO.

(2) See the table below for possible causes, and then inspect and correct the corresponding causes if necessary.

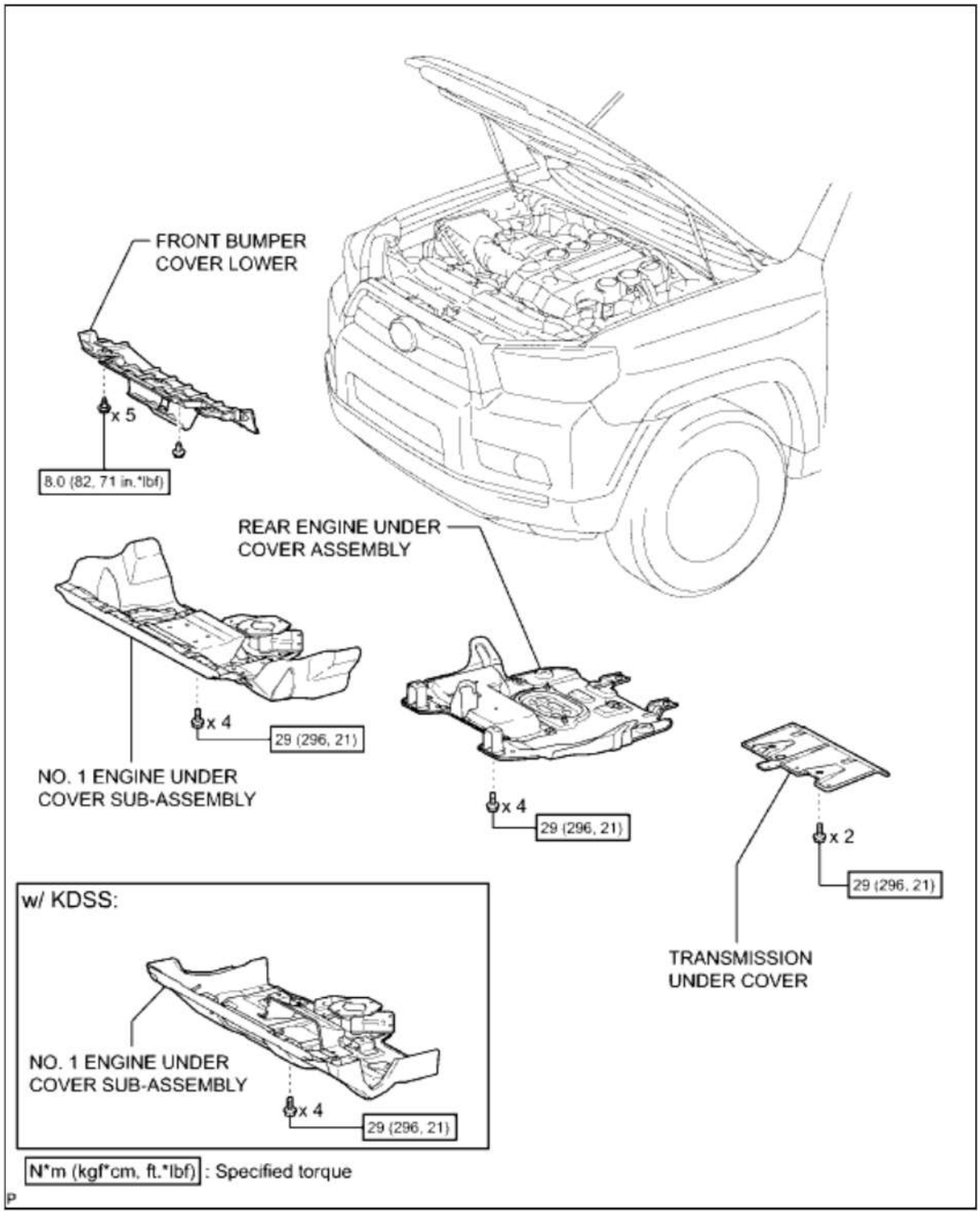
CO	HC	SYMPTOM	CAUSES
Normal	High	Rough idling	1. Faulty ignition: o Incorrect timing o Plugs are contaminated or shorted, or plug gaps are incorrect 2. Incorrect valve clearance 3. Leaky intake and exhaust valves 4. Leaky cylinders
Low	High	Rough idling (Fluctuating HC reading)	1. Vacuum leaks: o Ventilation hoses o Intake manifold o Throttle body 2. Lean mixture causing misfire
High	High	Rough idle (Black smoke from exhaust)	1. Restricted air filter 2. Plugged PCV valve 3. Faulty SFI system: o Faulty pressure regulator o Defective engine coolant temperature sensor o Faulty mass air flow meter o Faulty ECM o Faulty injectors o Faulty throttle position sensor

cardiagn.com

Last Modified: 5-10-2010	6.4 K	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000002ZFX008X
Title: 1GR-FE ENGINE MECHANICAL: ENGINE ASSEMBLY: COMPONENTS (2010 4Runner)		

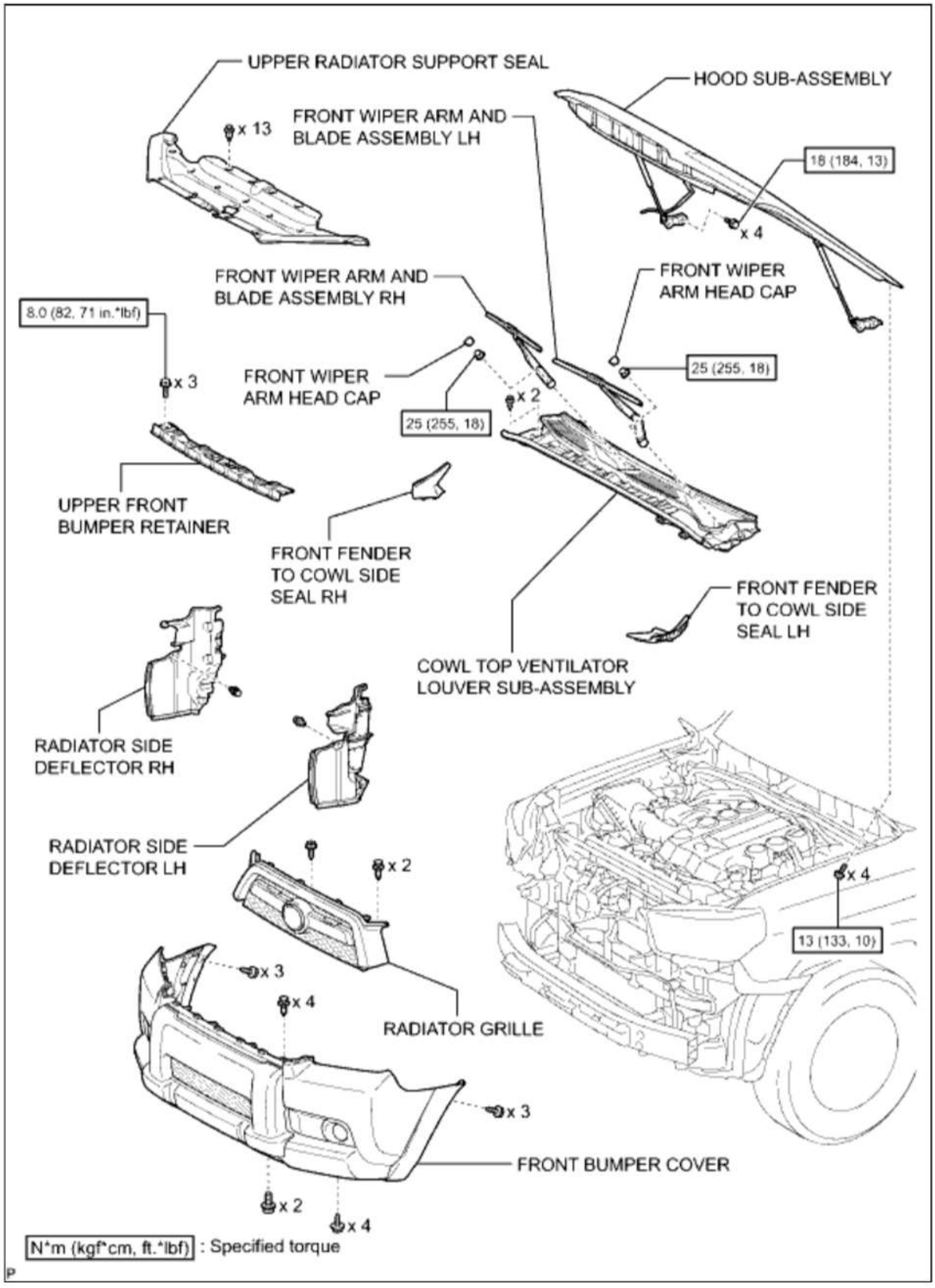
COMPONENTS

ILLUSTRATION



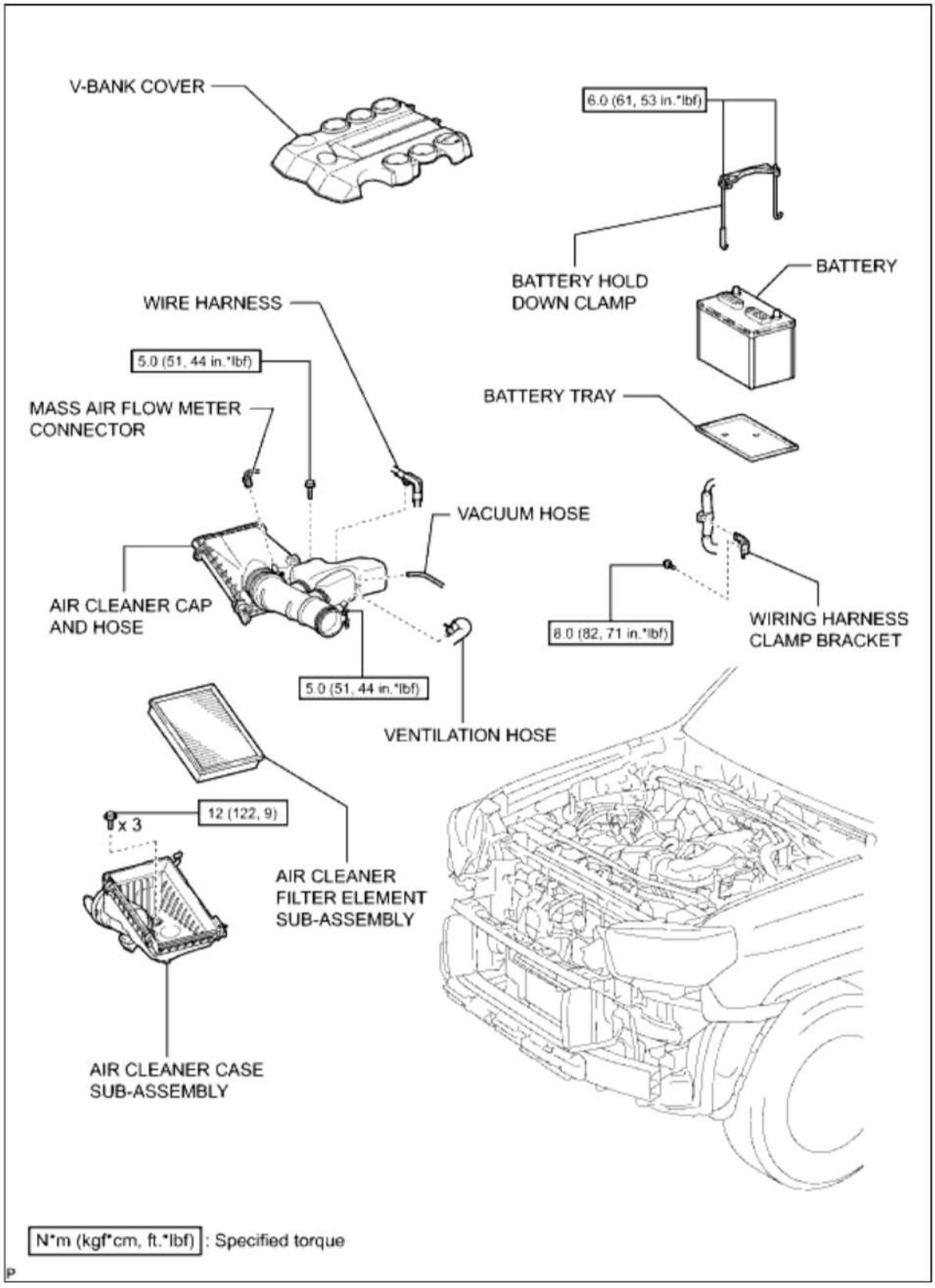
cardiagn.com

ILLUSTRATION



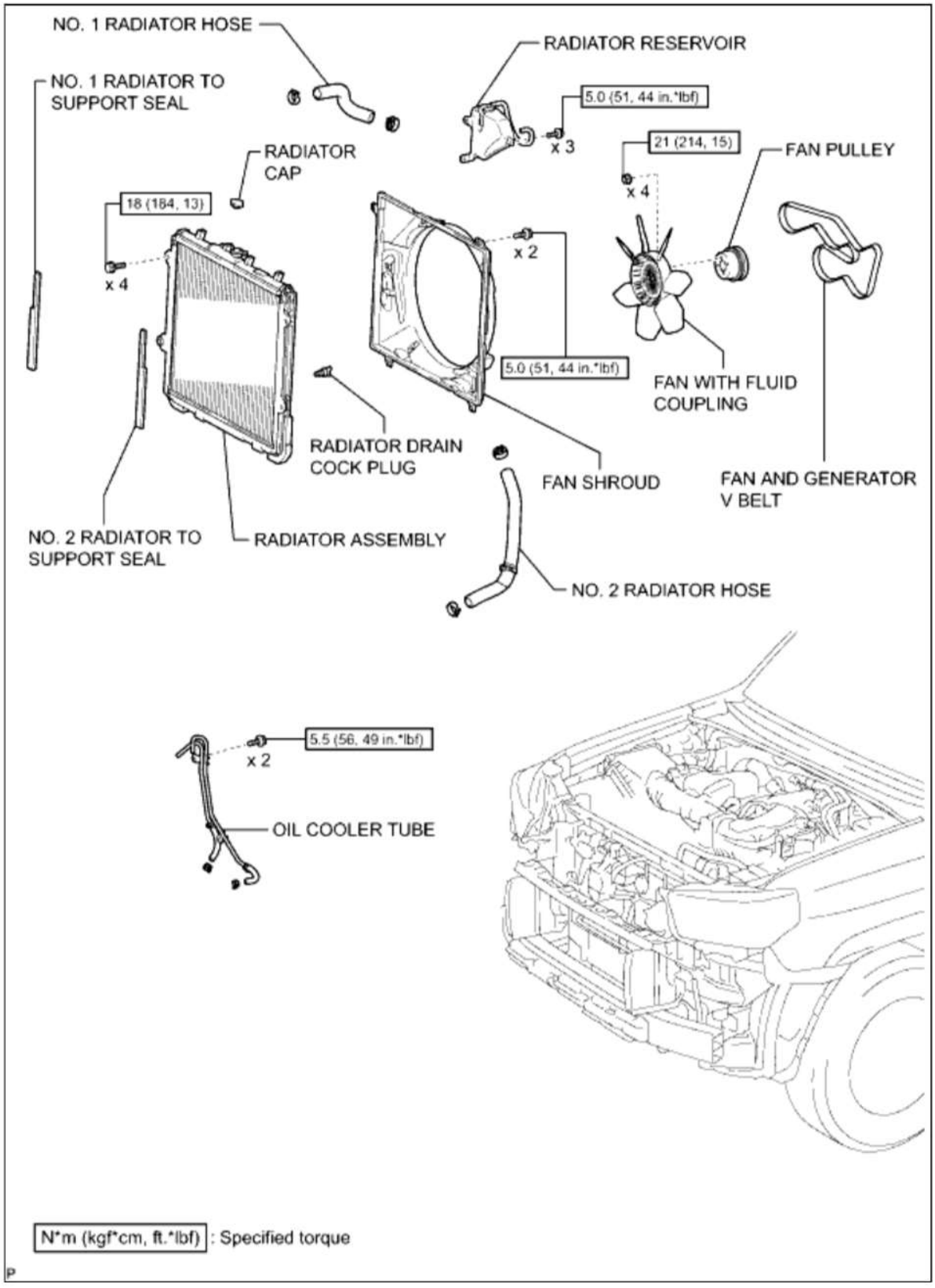
cardiagn.com

ILLUSTRATION



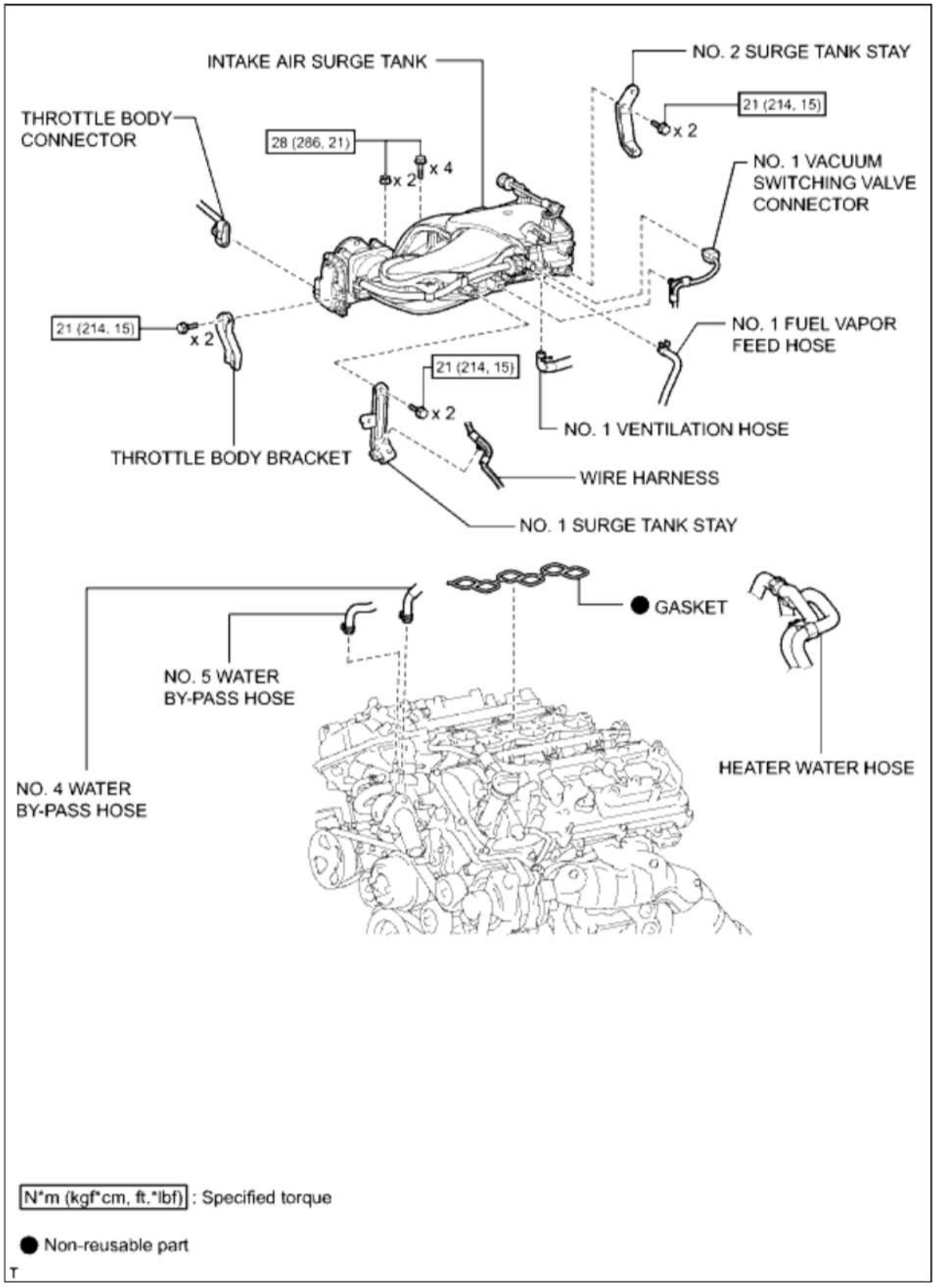
cardiagn.com

ILLUSTRATION



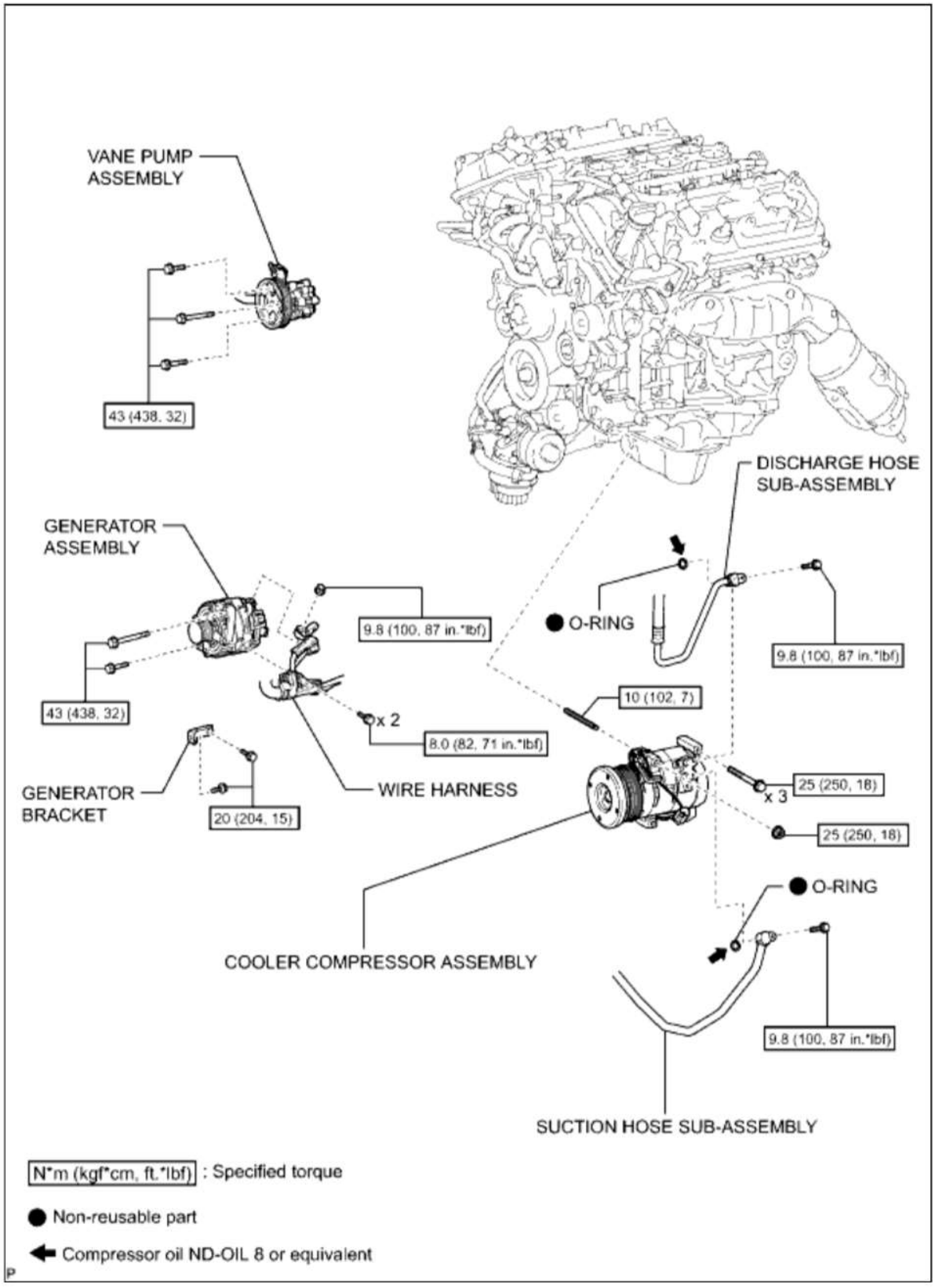
cardiagn.com

ILLUSTRATION



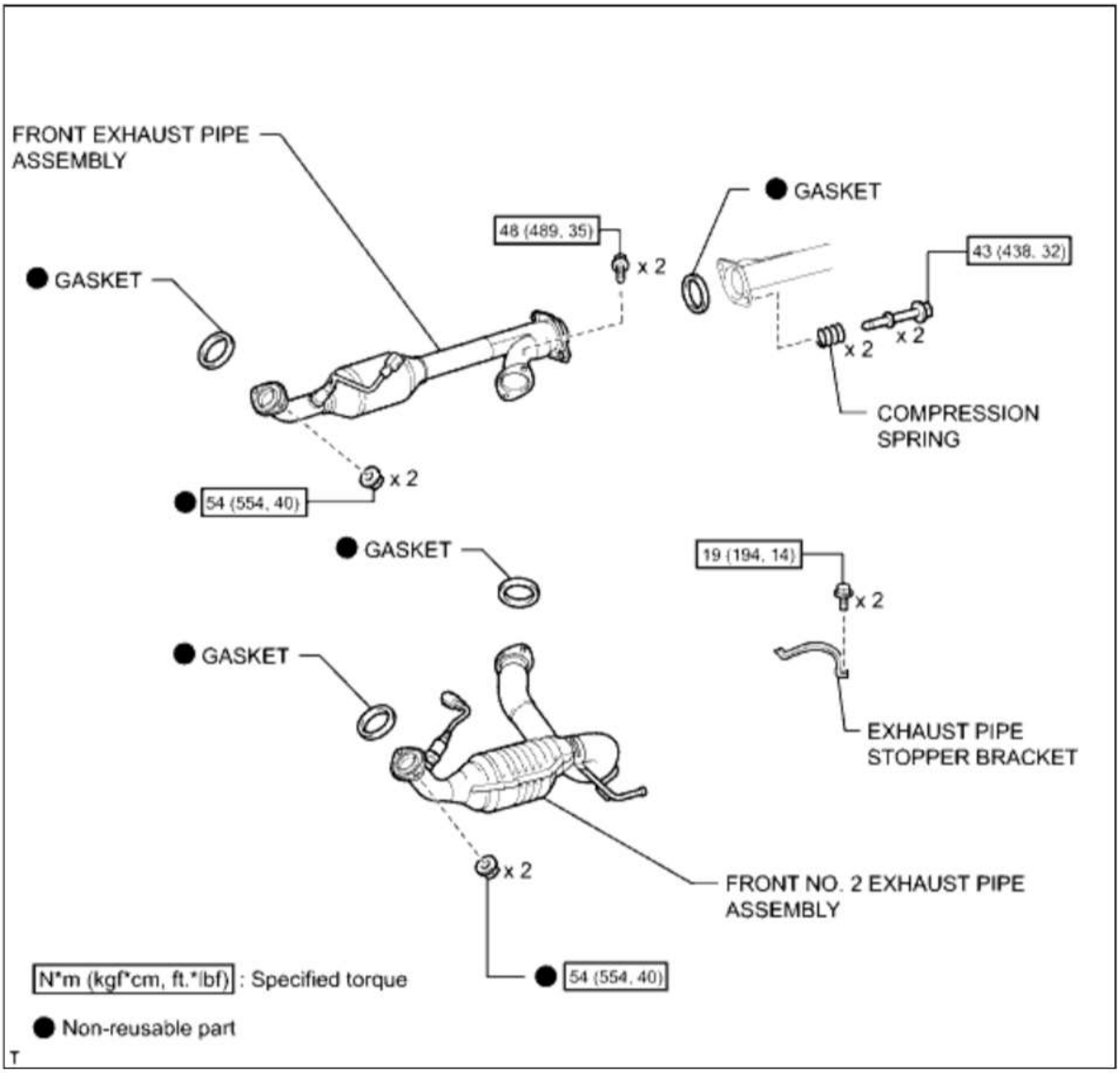
cardiagn.com

ILLUSTRATION



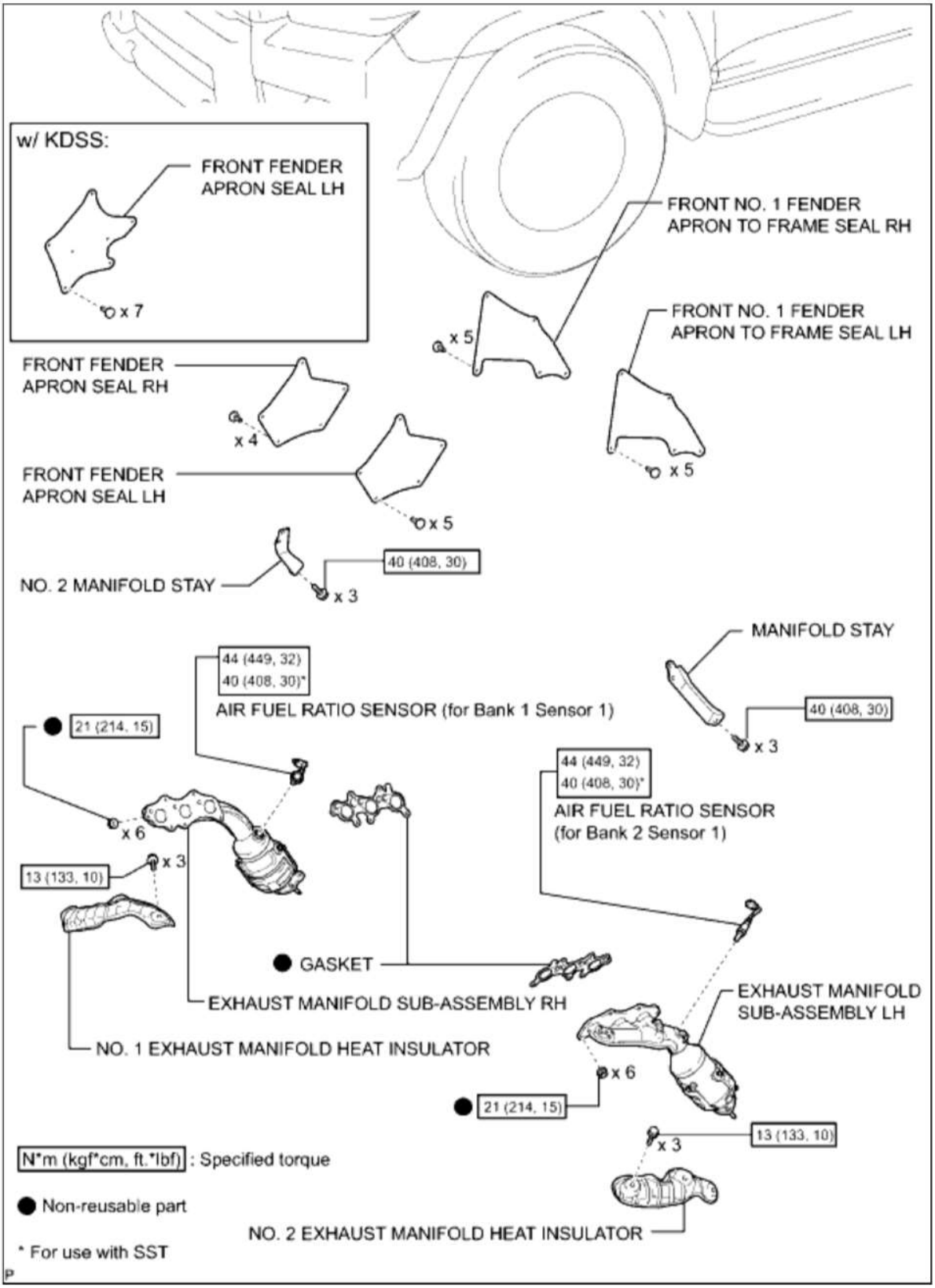
cardiagn.com

ILLUSTRATION



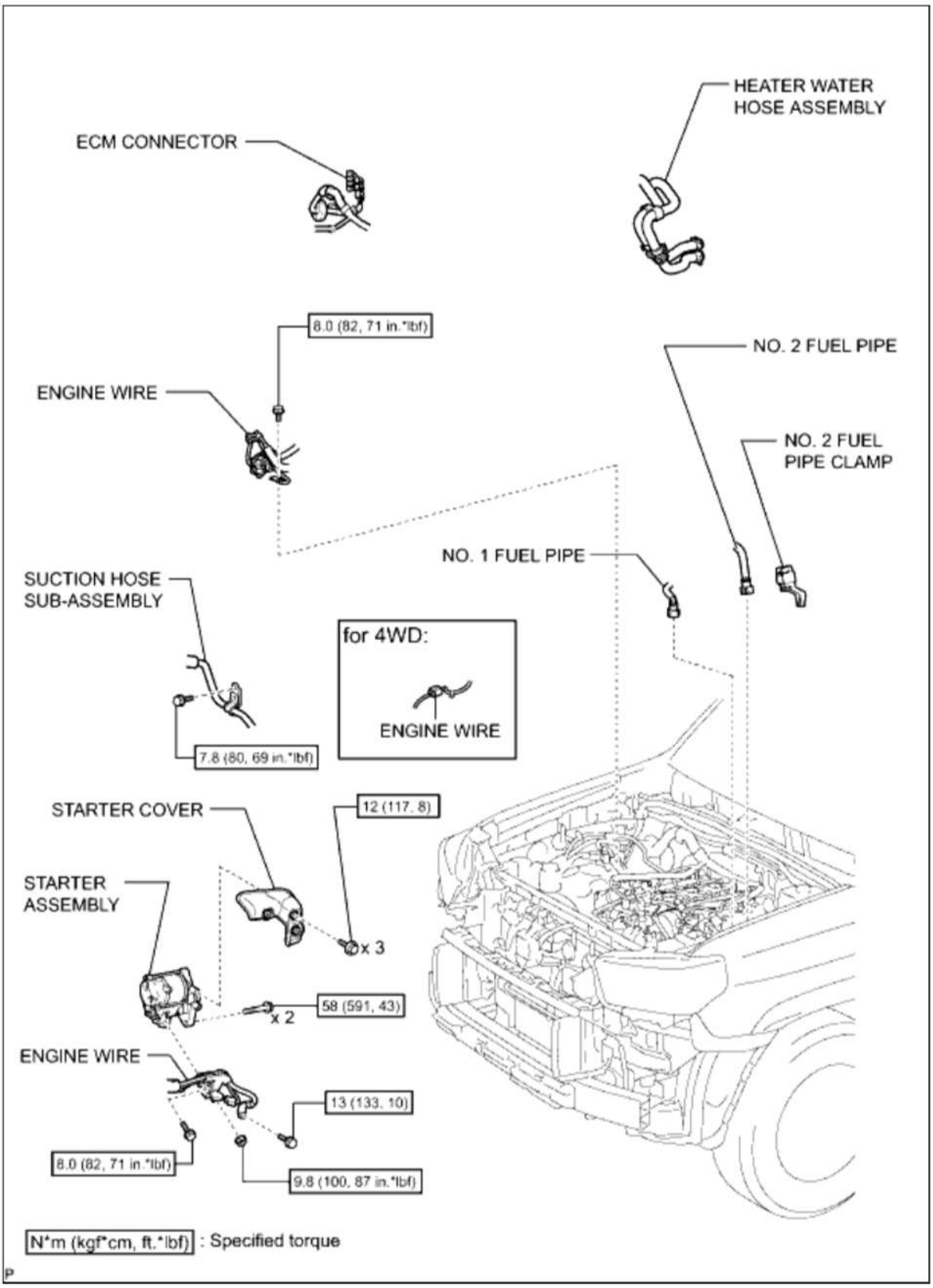
ILLUSTRATION

cardiagn.com



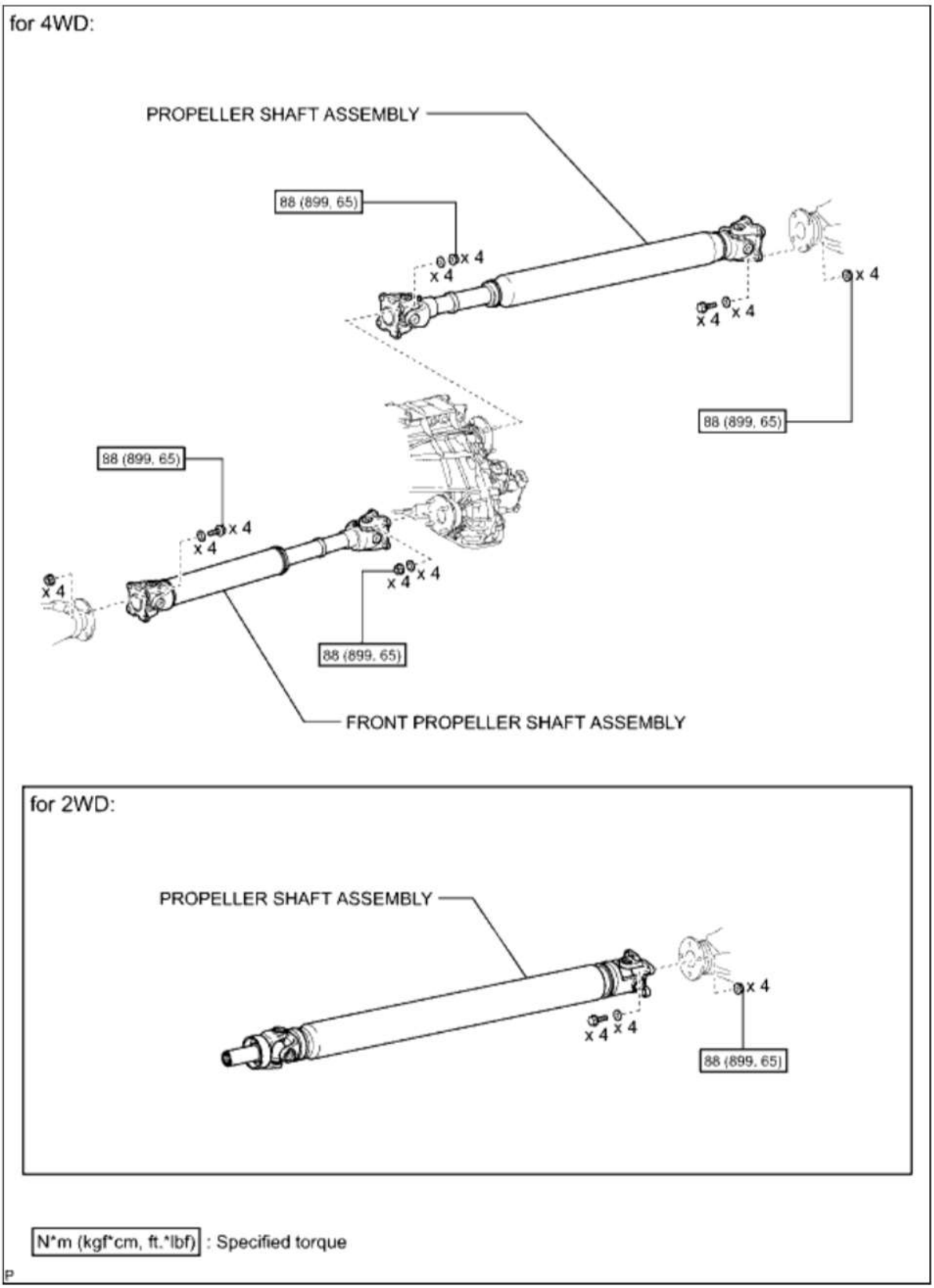
ILLUSTRATION

cardiagn.com



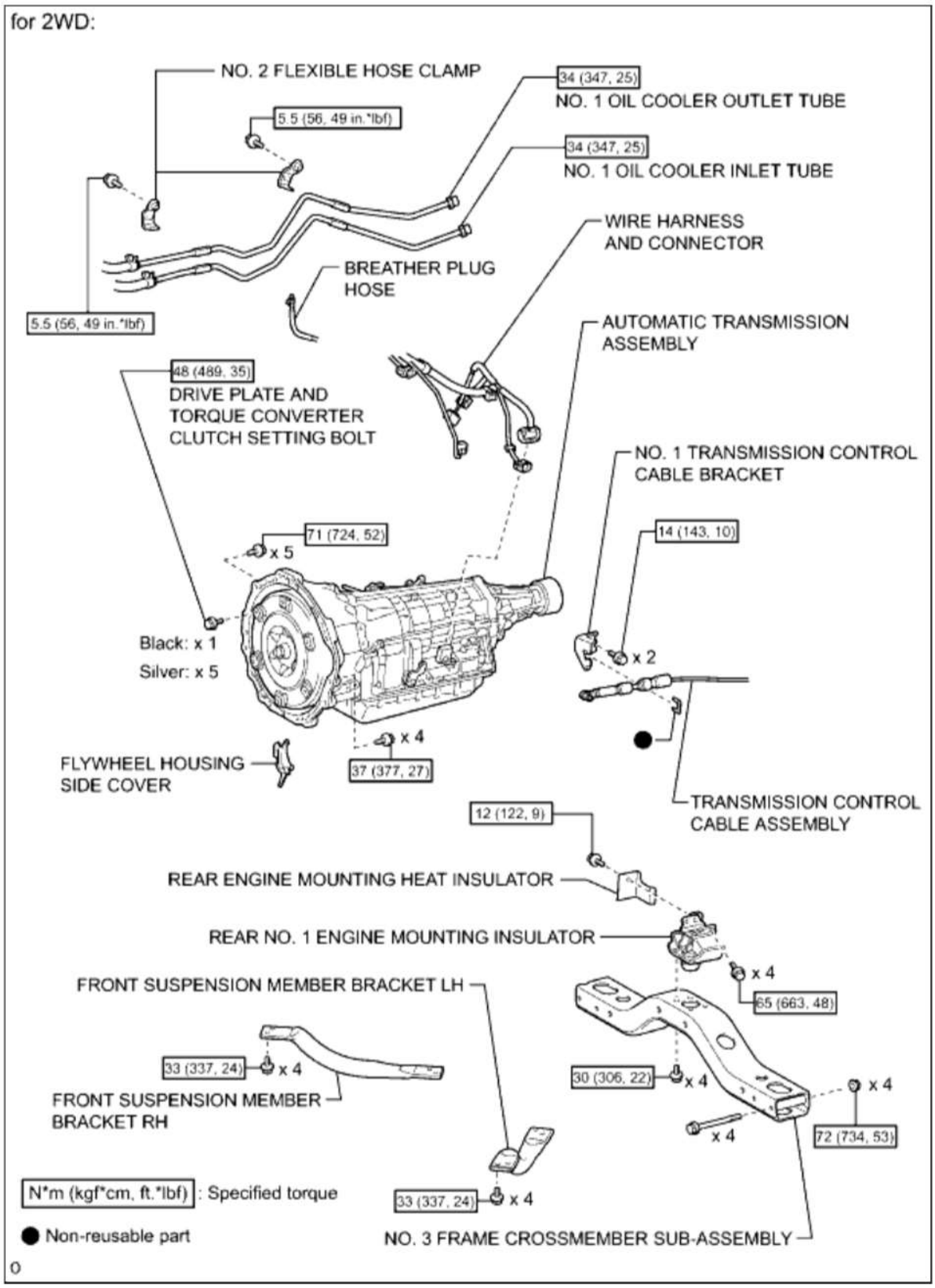
ILLUSTRATION

cardiagn.com



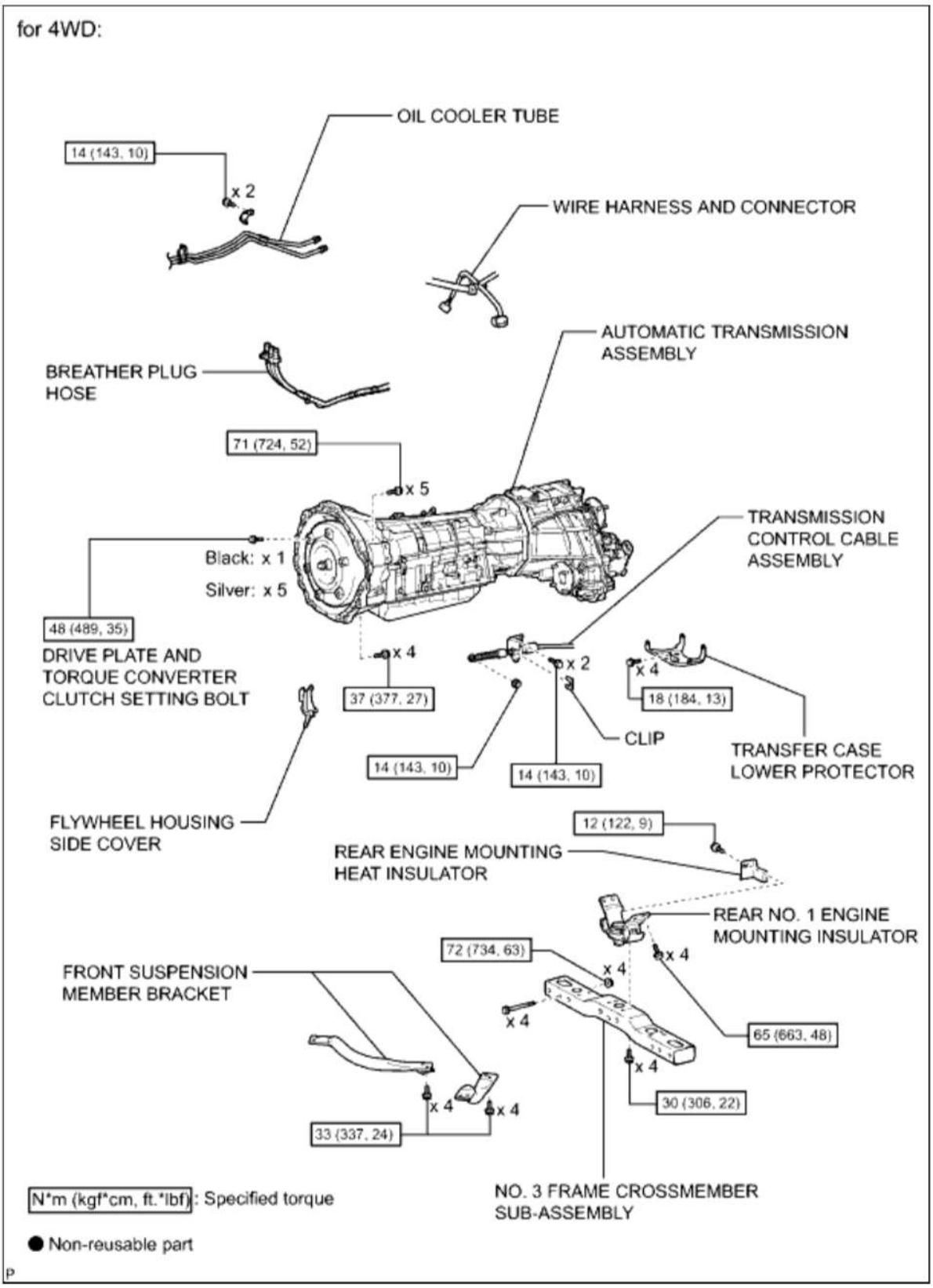
ILLUSTRATION

cardiagn.com



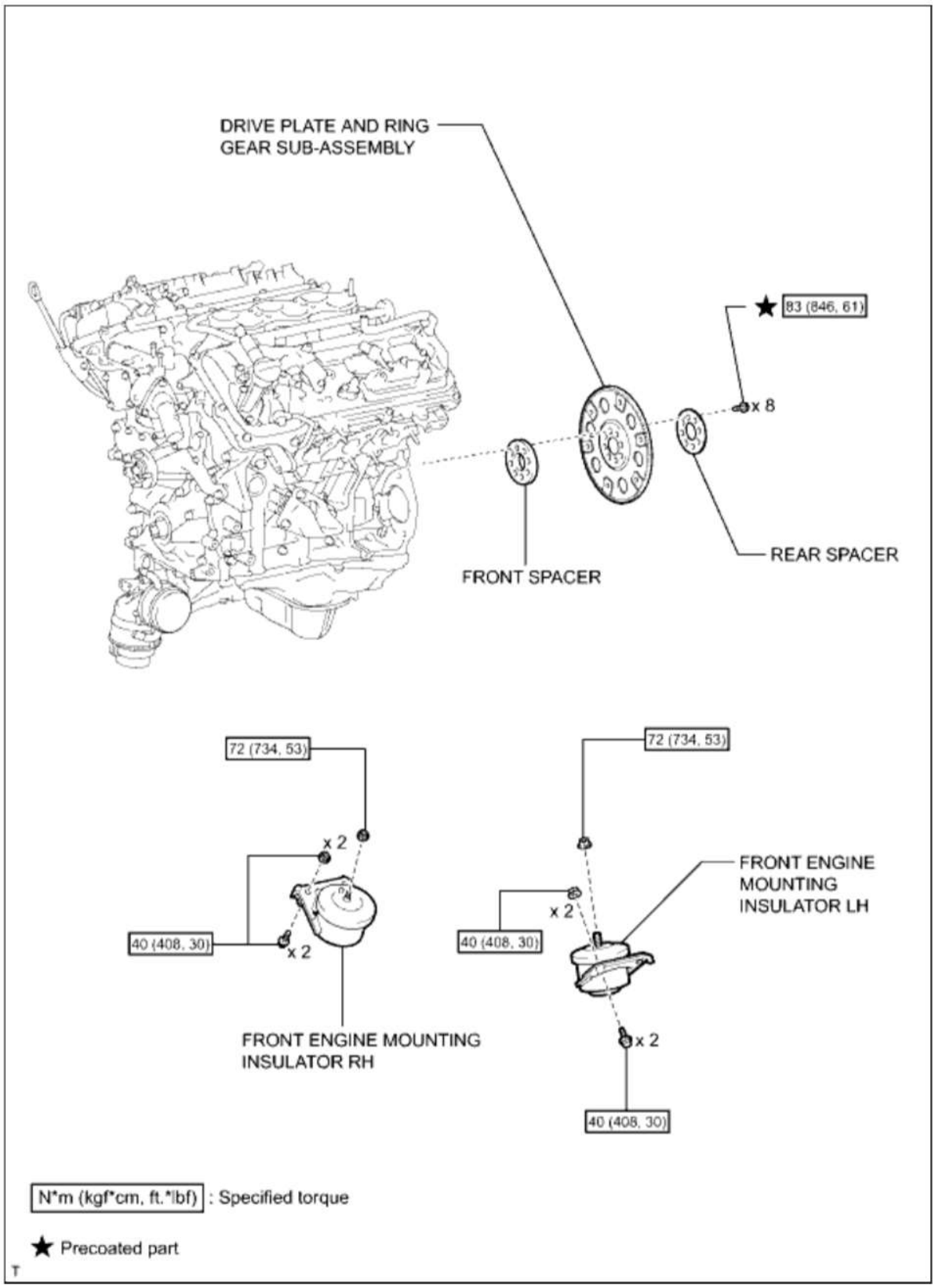
ILLUSTRATION

cardiagn.com



ILLUSTRATION

cardiagn.com



cardiagn.com

Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000002B5L00DX
Title: 1GR-FE ENGINE MECHANICAL: ENGINE ASSEMBLY: REMOVAL (2010 4Runner)		

REMOVAL

1. RECOVER REFRIGERANT FROM REFRIGERATION SYSTEM

2. DISCHARGE FUEL SYSTEM PRESSURE

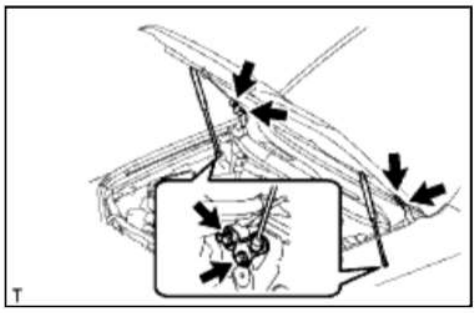
3. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

NOTICE:

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

4. REMOVE HOOD SUB-ASSEMBLY

(a) Disconnect the washer nozzle hose.



(b) Remove the 8 bolts and hood.

NOTICE:

If the hood support is detached from the ball joint, it become non-reusable. Therefore, do not detach the hood support from the ball joint unless replacing it.

5. REMOVE COWL TOP VENTILATOR LOUVER SUB-ASSEMBLY

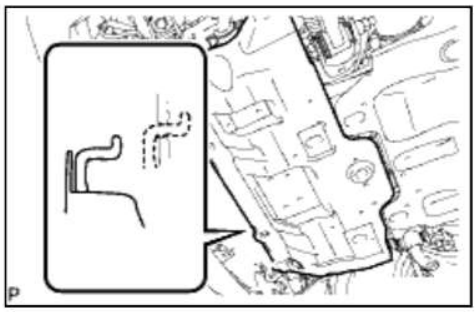
(a) Remove the cowl top ventilator louver .

6. REMOVE FRONT BUMPER COVER LOWER

(a) Remove the clip, 5 bolts and front bumper cover lower.

7. REMOVE NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY

(a) Remove the 4 bolts.



(b) Unhook the engine under cover from the vehicle body as shown in the illustration.

cardiagn.com

8. REMOVE TRANSMISSION UNDER COVER

(a) Remove the 2 bolts and transmission under cover.

9. REMOVE REAR ENGINE UNDER COVER ASSEMBLY

(a) Remove the 4 bolts and rear engine under cover.

10. REMOVE FRONT FENDER APRON SEAL LH

(a) Remove the 5 clips and front fender apron seal.

11. REMOVE FRONT FENDER APRON SEAL RH

(a) Remove the 5 clips and front fender apron seal.

12. REMOVE NO. 1 FRONT FENDER APRON TO FRAME SEAL LH

(a) Remove the 5 clips and No. 1 front fender apron to frame seal.

13. REMOVE NO. 1 FRONT FENDER APRON TO FRAME SEAL RH

(a) Remove the 5 clips and No. 1 front fender apron to frame seal.

14. REMOVE UPPER RADIATOR SUPPORT SEAL

(a) Remove the 13 clips and upper radiator support seal.

15. DRAIN ENGINE OIL INFO

16. DRAIN ENGINE COOLANT INFO

17. DISCONNECT CABLE FROM POSITIVE BATTERY TERMINAL

18. REMOVE BATTERY HOLD DOWN CLAMP INFO

19. REMOVE BATTERY

20. REMOVE BATTERY TRAY

21. REMOVE V-BANK COVER INFO

22. REMOVE FRONT BUMPER COVER

(a) Remove the front bumper cover INFO .

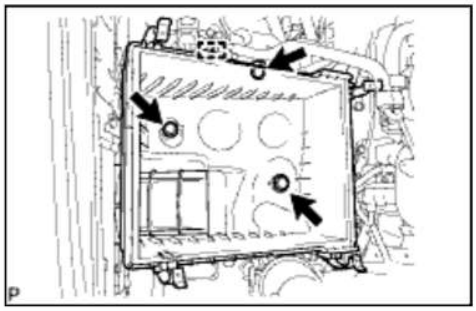
23. REMOVE AIR CLEANER CAP AND HOSE INFO

24. REMOVE AIR CLEANER CASE SUB-ASSEMBLY

(a) Remove the air cleaner filter element.

(b) Detach the wire harness clamp.

cardiagn.com



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

25. REMOVE UPPER FRONT BUMPER RETAINER INFO

26. REMOVE RADIATOR SIDE DEFLECTOR RH INFO

27. REMOVE RADIATOR SIDE DEFLECTOR LH INFO

28. REMOVE NO. 1 RADIATOR HOSE INFO

29. REMOVE NO. 2 RADIATOR HOSE INFO

30. REMOVE RADIATOR RESERVOIR INFO

31. DISCONNECT OIL COOLER TUBE INFO

32. REMOVE FAN SHROUD INFO

33. REMOVE RADIATOR ASSEMBLY INFO

34. REMOVE INTAKE AIR SURGE TANK INFO

35. REMOVE FAN AND GENERATOR V BELT INFO

36. DISCONNECT VANE PUMP ASSEMBLY INFO

37. DISCONNECT DISCHARGE HOSE SUB-ASSEMBLY INFO

38. DISCONNECT SUCTION HOSE SUB-ASSEMBLY INFO

39. REMOVE COOLER COMPRESSOR ASSEMBLY INFO

40. REMOVE FRONT EXHAUST PIPE ASSEMBLY

(a) Remove the front exhaust pipe INFO .

41. REMOVE MANIFOLD STAY INFO

42. REMOVE NO. 1 EXHAUST MANIFOLD HEAT INSULATOR INFO

43. REMOVE EXHAUST MANIFOLD SUB-ASSEMBLY RH INFO

44. REMOVE NO. 2 MANIFOLD STAY INFO

cardiagn.com

45. REMOVE NO. 2 EXHAUST MANIFOLD HEAT INSULATOR INFO

46. REMOVE EXHAUST MANIFOLD SUB-ASSEMBLY LH INFO

47. REMOVE WIRING HARNESS CLAMP BRACKET INFO

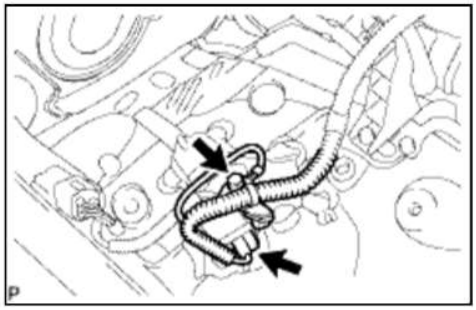
48. REMOVE GENERATOR ASSEMBLY INFO

49. REMOVE STARTER COVER INFO

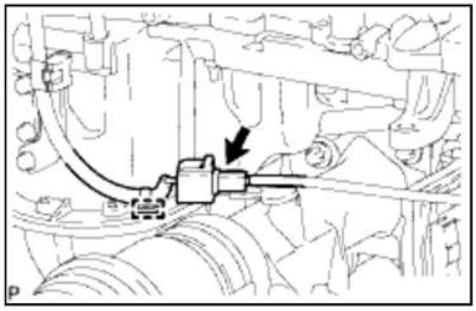
50. REMOVE STARTER ASSEMBLY INFO

51. REMOVE FLYWHEEL HOUSING SIDE COVER INFO

52. DISCONNECT ENGINE WIRE



(a) Remove the bolt and disconnect the connector.



(b) for 4WD:

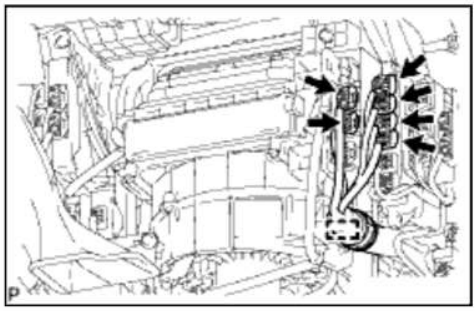
Disconnect the connector and detach the clamp.

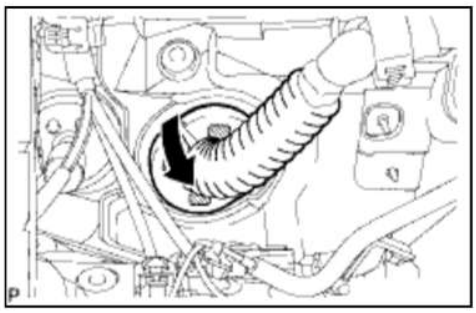
(c) Remove the lower instrument panel INFO .

(d) Disconnect the ECM connector.

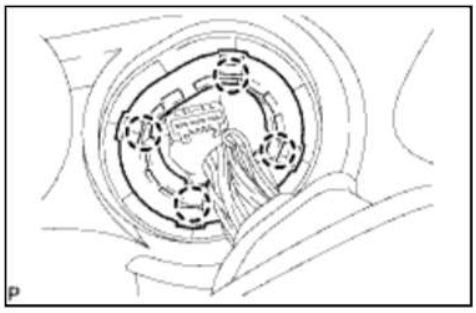
(1) Detach the clamp and disconnect the 6 connectors.

cardiagn.com





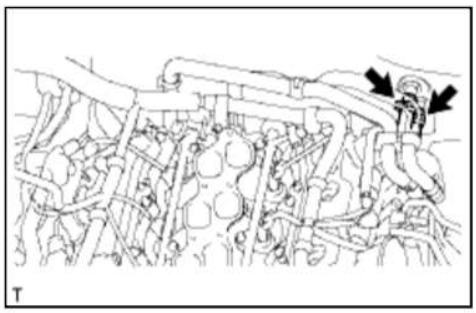
(2) Detach the grommet from the wire harness support.



(3) Detach the 4 claws to remove the wire harness support from the vehicle, and then pull out the ECM connector to remove it from the vehicle.

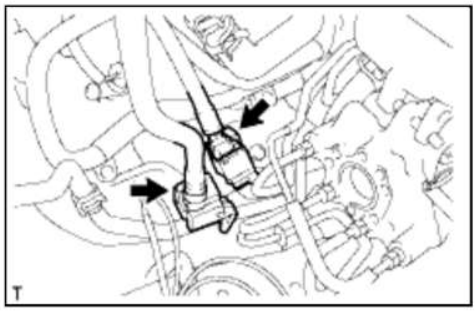
cardiagn.com

53. DISCONNECT HEATER WATER HOSE ASSEMBLY



(a) Disconnect the 2 hoses and heater water hose.

54. DISCONNECT NO. 1 AND NO. 2 FUEL PIPES



(a) Remove the fuel pipe clamp from the fuel tube connector.

(b) Disconnect the No. 1 and No. 2 fuel pipes INFO .

55. REMOVE FRONT PROPELLER SHAFT ASSEMBLY (for 4WD) INFO

56. REMOVE PROPELLER SHAFT ASSEMBLY (for 2WD) INFO

57. REMOVE PROPELLER SHAFT ASSEMBLY (for 4WD) INFO

58. REMOVE AUTOMATIC TRANSMISSION ASSEMBLY

(a) for 2WD:

Remove the automatic transmission from the vehicle INFO .

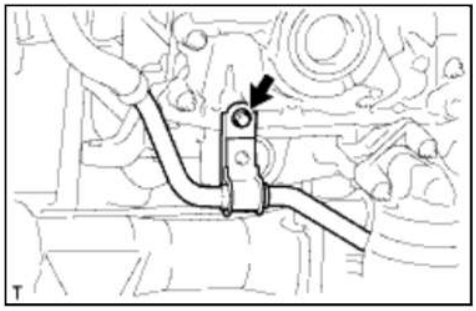
(b) for 4WD:

Remove the automatic transmission from the vehicle INFO .

59. REMOVE REAR NO. 1 ENGINE MOUNTING INSULATOR (for 2WD) INFO

60. REMOVE REAR NO. 1 ENGINE MOUNTING INSULATOR (for 4WD) INFO

61. DISCONNECT SUCTION HOSE SUB-ASSEMBLY



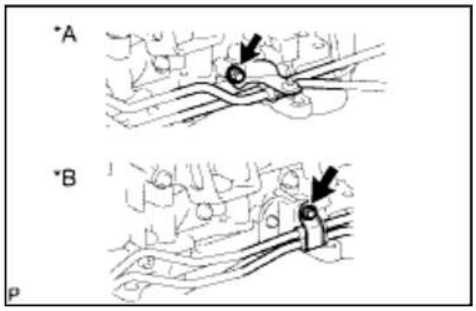
(a) Remove the bolt and disconnect the suction hose.

62. DISCONNECT OIL COOLER TUBE SUB-ASSEMBLY

(a) Remove the bolt and disconnect the oil cooler tube.

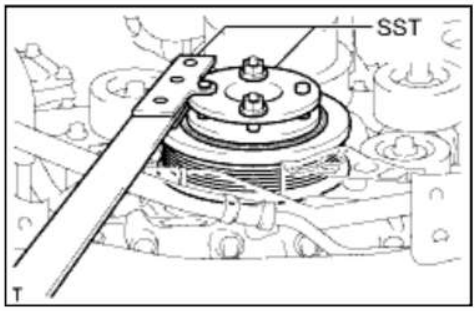
Text in Illustration

cardiagn.com



*A	w/o Air Cooled Transmission Oil Cooler
*B	w/ Air Cooled Transmission Oil Cooler

63. REMOVE DRIVE PLATE AND RING GEAR SUB-ASSEMBLY

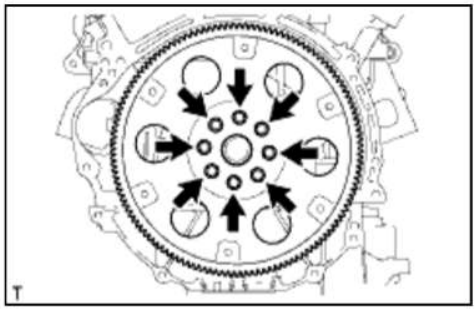


(a) Using SST, hold the crankshaft.

SST: 09213-54015

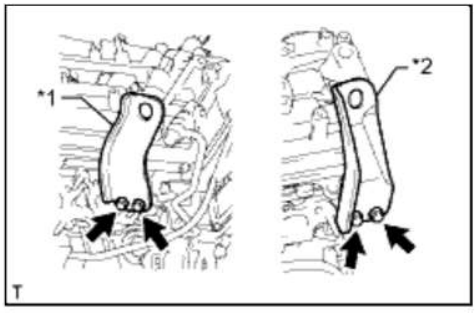
91651-60855

SST: 09330-00021



(b) Remove the 8 bolts, rear spacer, drive plate and front spacer.

64. REMOVE ENGINE ASSEMBLY



(a) Install 2 engine hangers with 4 bolts as shown in the illustration.

Torque: 33 N·m (337 kgf·cm, 24ft·lbf)

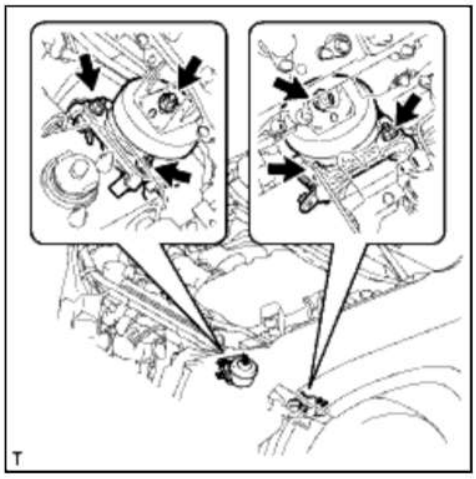
Text in Illustration

*1	No. 1 Engine Hanger
*2	No. 2 Engine Hanger

cardiagn.com

No. 1 Engine Hanger	12281-31110
No. 2 Engine Hanger	12282-31140
Bolt	91671-C0830

(b) Attach an engine sling device and hang the engine with a chain block.



(c) Remove the 6 nuts from the front engine mounting insulator LH and RH.

(d) Lift the engine out of the vehicle carefully.

NOTICE:

Make sure the engine is clear of all wiring and hoses.

(e) Remove the front engine mounting insulator LH and RH.

(f) Place the engine onto a work bench.

65. INSTALL ENGINE STAND

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

cardiagn.com

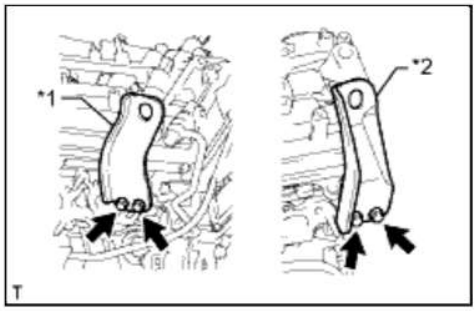
Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000002B5J00DX
Title: 1GR-FE ENGINE MECHANICAL: ENGINE ASSEMBLY: INSTALLATION (2010 4Runner)		

INSTALLATION

1. INSTALL ENGINE HANGER

(a) Install 2 engine hangers with 4 bolts as shown in the illustration.

Torque: 33 N·m (337 kgf·cm, 24ft·lbf)



Text in Illustration

*1	No. 1 Engine Hanger
*2	No. 2 Engine Hanger

No. 1 Engine Hanger	12281-31110
No. 2 Engine Hanger	12282-31140
Bolt	91671-C0830

2. REMOVE ENGINE STAND

(a) Attach an engine sling device and hang the engine with a chain block.

(b) Lift the engine and remove it from the engine stand.

(c) Place the engine onto a work bench.

3. INSTALL ENGINE ASSEMBLY

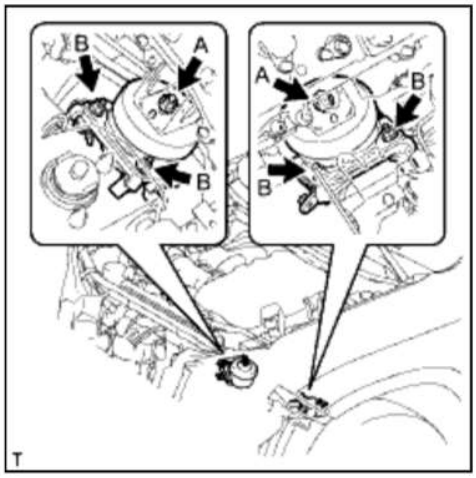
(a) Attach an engine sling device and hang the engine with a chain block.

(b) Slowly lower the engine into the engine compartment.

(c) Install the front engine mounting insulator LH with the 3 nuts.

for nut A - Torque: 72 N·m (734 kgf·cm, 53ft·lbf)
for nut B - Torque: 40 N·m (408 kgf·cm, 30ft·lbf)

cardiagn.com



(d) Install the front engine mounting insulator RH with the 3 nuts.

for nut A - Torque: 72 N·m (734 kgf·cm, 53ft·lbf)

for nut B - Torque: 40 N·m (408 kgf·cm, 30ft·lbf)

(e) Remove the 4 bolts and 2 engine hangers.

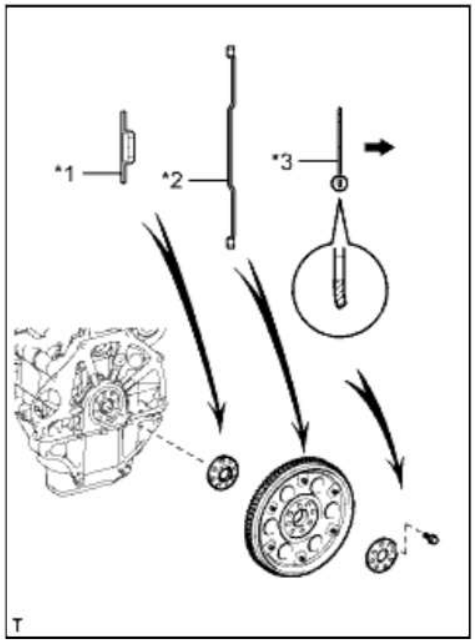
4. INSTALL DRIVE PLATE AND RING GEAR SUB-ASSEMBLY

(a) Using SST, hold the crankshaft.

SST: 09213-54015

91651-60855

SST: 09330-00021



(b) Install the front spacer, drive plate and rear spacer to the crankshaft.

Text in Illustration

cardiagn.com

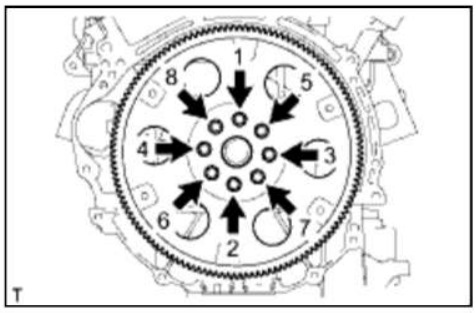
*1	Front Spacer
*2	Drive Plate and Ring Gear
*3	Rear Spacer
➡	Automatic Transmission Side

HINT:

As the front spacer, drive plate and ring gear and rear spacer are not reversible, be sure to install it in the direction shown in the illustration.

(c) Apply adhesive to 2 or 3 threads at the end of the 8 bolts.

Adhesive:
Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent



(d) Uniformly install and tighten the 8 bolts in several steps in the sequence shown in the illustration.

Torque: 83 N·m (846 kgf·cm, 61ft·lbf)

NOTICE:

Do not start the engine for at least 1 hour after installing.

5. CONNECT OIL COOLER TUBE SUB-ASSEMBLY (for Automatic Transmission)

(a) Connect the oil cooler tube with the bolt.

Torque: 14 N·m (143 kgf·cm, 10ft·lbf)

6. CONNECT SUCTION HOSE SUB-ASSEMBLY

(a) Connect the suction hose with the bolt.

Torque: 7.8 N·m (80 kgf·cm, 69in·lbf)

7. INSTALL REAR NO. 1 ENGINE MOUNTING INSULATOR (for 4WD) INFO

8. INSTALL REAR NO. 1 ENGINE MOUNTING INSULATOR (for 2WD) INFO

9. INSTALL AUTOMATIC TRANSMISSION ASSEMBLY

(a) for 4WD:

Install the automatic transmission to the vehicle INFO.

(b) for 2WD:

Install the automatic transmission to the vehicle INFO.

10. INSTALL PROPELLER SHAFT ASSEMBLY (for 4WD) INFO

cardiagn.com

11. INSTALL PROPELLER SHAFT ASSEMBLY (for 2WD) INFO

12. INSTALL FRONT PROPELLER SHAFT ASSEMBLY (for 4WD) INFO

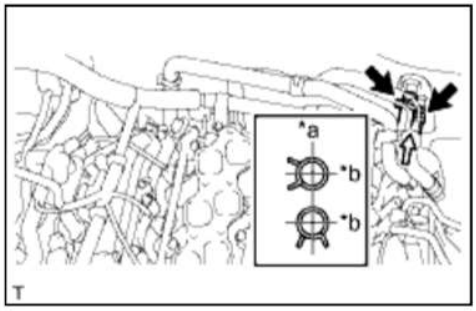
13. CONNECT NO. 1 AND NO. 2 FUEL PIPES

(a) Connect the No. 1 and No. 2 fuel pipes INFO .

(b) Install the fuel pipe clamp to the connector.

14. CONNECT HEATER WATER HOSE ASSEMBLY

(a) Connect the 2 hoses and heater water hose.



HINT:

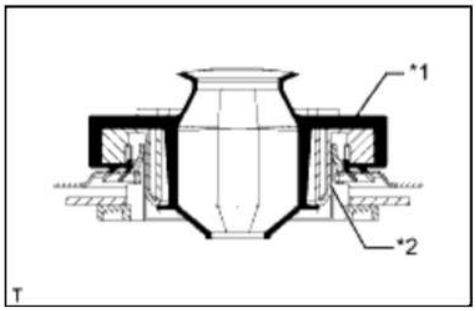
The direction of the hose clamp is indicated in the illustration.

Text in Illustration

*a	Top
*b	LH

15. CONNECT ENGINE WIRE

(a) Connect the ECM connector.



(1) Attach the grommet to the wire harness support.

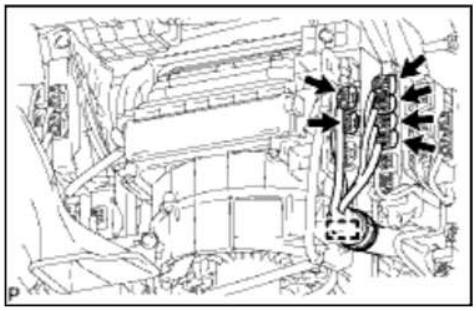
Text in Illustration

*1	Grommet
*2	Wire Harness Support

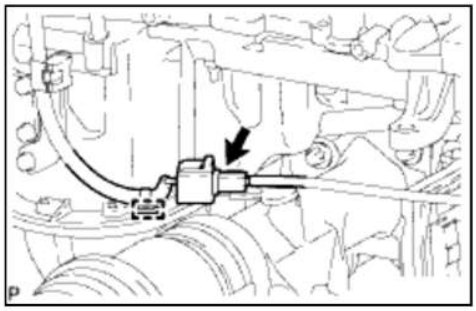
(2) Pass the wire harness into the vehicle and install the wire harness support.

(3) Connect the 6 connectors and attach the clamp.

cardiagn.com

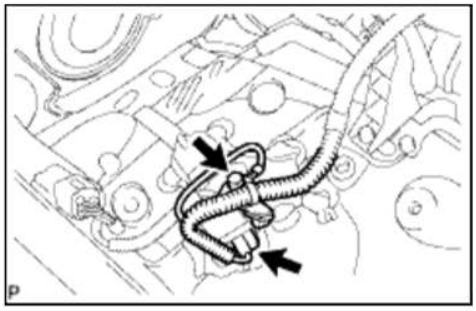


(b) Install the lower instrument panel INFO .



(c) for 4WD:

Attach the clamp and connect the connector.



(d) Connect the connector and install the bolt.

Torque: 8.0 N·m (82 kgf·cm, 71in·lbf)

16. INSTALL FLYWHEEL HOUSING SIDE COVER

17. INSTALL STARTER ASSEMBLY INFO

18. INSTALL STARTER COVER INFO

19. INSTALL GENERATOR ASSEMBLY INFO

20. INSTALL WIRING HARNESS CLAMP BRACKET INFO

21. INSTALL EXHAUST MANIFOLD SUB-ASSEMBLY LH INFO

22. INSTALL NO. 2 EXHAUST MANIFOLD HEAT INSULATOR INFO

23. INSTALL MANIFOLD STAY INFO

cardiagn.com

24. INSTALL EXHAUST MANIFOLD SUB-ASSEMBLY RH INFO

25. INSTALL NO. 1 EXHAUST MANIFOLD HEAT INSULATOR INFO

26. INSTALL NO. 2 MANIFOLD STAY INFO

27. INSTALL FRONT EXHAUST PIPE ASSEMBLY

(a) Install the front exhaust pipe INFO .

28. INSTALL COOLER COMPRESSOR ASSEMBLY INFO

29. CONNECT SUCTION HOSE SUB-ASSEMBLY INFO

30. CONNECT DISCHARGE HOSE SUB-ASSEMBLY INFO

31. CONNECT VANE PUMP ASSEMBLY INFO

32. INSTALL FAN AND GENERATOR V BELT INFO

33. INSTALL INTAKE AIR SURGE TANK INFO

34. INSTALL RADIATOR ASSEMBLY INFO

35. INSTALL FAN SHROUD INFO

36. CONNECT OIL COOLER TUBE INFO

37. INSTALL RADIATOR RESERVOIR INFO

38. INSTALL NO. 2 RADIATOR HOSE INFO

39. INSTALL NO. 1 RADIATOR HOSE INFO

40. INSTALL RADIATOR SIDE DEFLECTOR LH INFO

41. INSTALL RADIATOR SIDE DEFLECTOR RH INFO

42. INSTALL UPPER FRONT BUMPER RETAINER INFO

43. INSTALL AIR CLEANER CASE SUB-ASSEMBLY

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

Torque: 12 N·m (122 kgf·cm, 9ft·lbf)

(b) Attach the wire harness clamp.

(c) Install the air cleaner filter element.

44. INSTALL AIR CLEANER CAP AND HOSE INFO

45. INSTALL FRONT BUMPER COVER

(a) Install the front bumper cover INFO .

46. INSTALL V-BANK COVER INFO

cardiagn.com

47. INSTALL BATTERY TRAY

48. INSTALL BATTERY

49. INSTALL BATTERY HOLD DOWN CLAMP INFO

50. CONNECT CABLE TO POSITIVE BATTERY TERMINAL

51. ADD ENGINE COOLANT INFO

52. ADD ENGINE OIL INFO

53. INSTALL COWL TOP VENTILATOR LOUVER SUB-ASSEMBLY

(a) Install the cowl top ventilator louver INFO .

54. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

NOTICE:

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

55. INSPECT FOR FUEL LEAK INFO

56. INSPECT FOR ENGINE OIL LEAK INFO

57. INSPECT FOR EXHAUST GAS LEAK

58. CHECK ENGINE OIL LEVEL INFO

59. INSTALL UPPER RADIATOR SUPPORT SEAL

(a) Install the upper radiator support seal with the 13 clips.

60. INSTALL NO. 1 FRONT FENDER APRON TO FRAME SEAL RH

(a) Install the No. 1 front fender apron to frame seal with the 5 clips.

61. INSTALL NO. 1 FRONT FENDER APRON TO FRAME SEAL LH

(a) Install the No. 1 front fender apron to frame seal with the 5 clips.

62. INSTALL FRONT FENDER APRON SEAL RH

(a) Install the front fender apron seal with the 5 clips.

63. INSTALL FRONT FENDER APRON SEAL LH

(a) Install the front fender apron seal with the 5 clips.

64. INSTALL REAR ENGINE UNDER COVER ASSEMBLY

(a) Install the rear engine under cover with the 4 bolts.

Torque: 29 N·m (296 kgf·cm, 21ft·lbf)

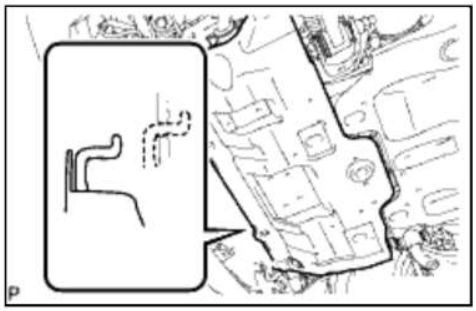
65. INSTALL TRANSMISSION UNDER COVER

(a) Install the transmission under cover with the 2 bolts.

Torque: 29 N·m (296 kgf·cm, 21ft·lbf)

66. INSTALL NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY

cardiagn.com



(a) Hook the engine under cover to the vehicle body as shown in the illustration.

(b) Install the 4 bolts.

Torque: 29 N·m (296 kgf·cm, 21ft·lbf)

67. INSTALL FRONT BUMPER COVER LOWER

(a) Install the front bumper cover lower with the 5 bolts and clip.

Torque: 8.0 N·m (82 kgf·cm, 71in·lbf)

68. PERFORM RESET MEMORY

(a) for 2WD:

Perform the Reset Memory procedures INFO .

(b) for 4WD:

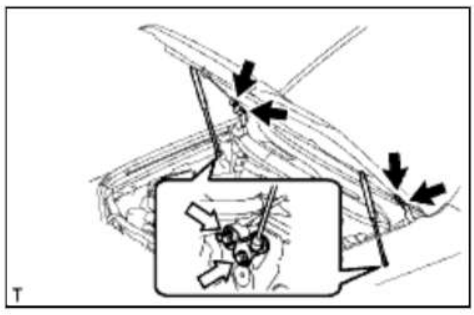
Perform the Reset Memory procedures INFO .

69. INSPECT IGNITION TIMING INFO

70. INSPECT ENGINE IDLE SPEED INFO

71. INSPECT CO/HC INFO

72. INSTALL HOOD SUB-ASSEMBLY



(a) Install the hood with the 8 bolts.

for bolt A - Torque: 13 N·m (133 kgf·cm, 10ft·lbf)
for bolt B - Torque: 18 N·m (184 kgf·cm, 13ft·lbf)

Text in Illustration

cardiagn.com

	Bolt A
	Bolt B

(b) Connect the washer nozzle hose.

73. ADJUST HOOD SUB-ASSEMBLY INFO

74. CHARGE REFRIGERANT INFO

75. WARM UP ENGINE INFO

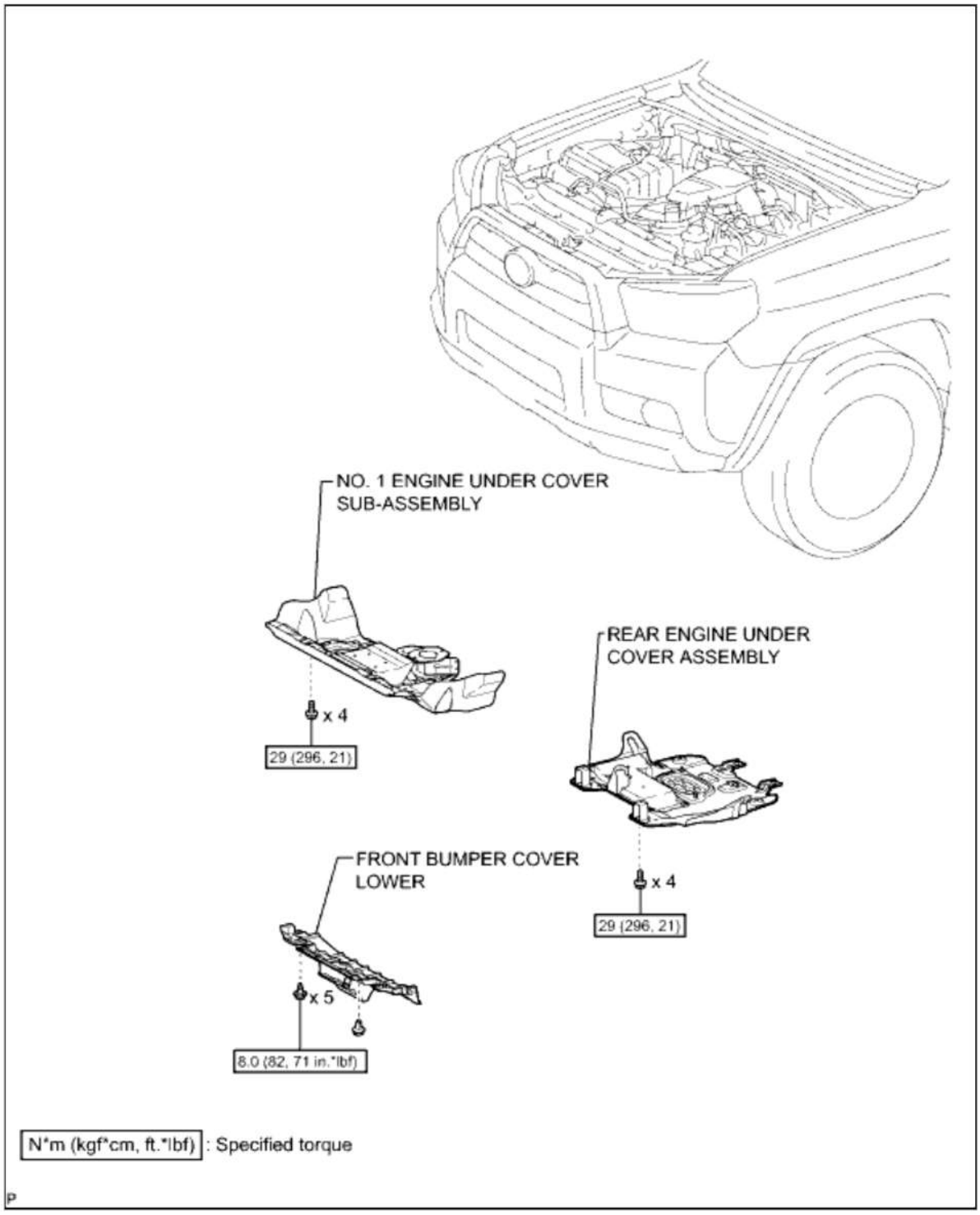
76. CHECK FOR REFRIGERANT GAS LEAK INFO

cardiagn.com

Last Modified: 5-10-2010	6.4 K	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000004636003X
Title: 2TR-FE ENGINE MECHANICAL: ENGINE ASSEMBLY: COMPONENTS (2010 4Runner)		

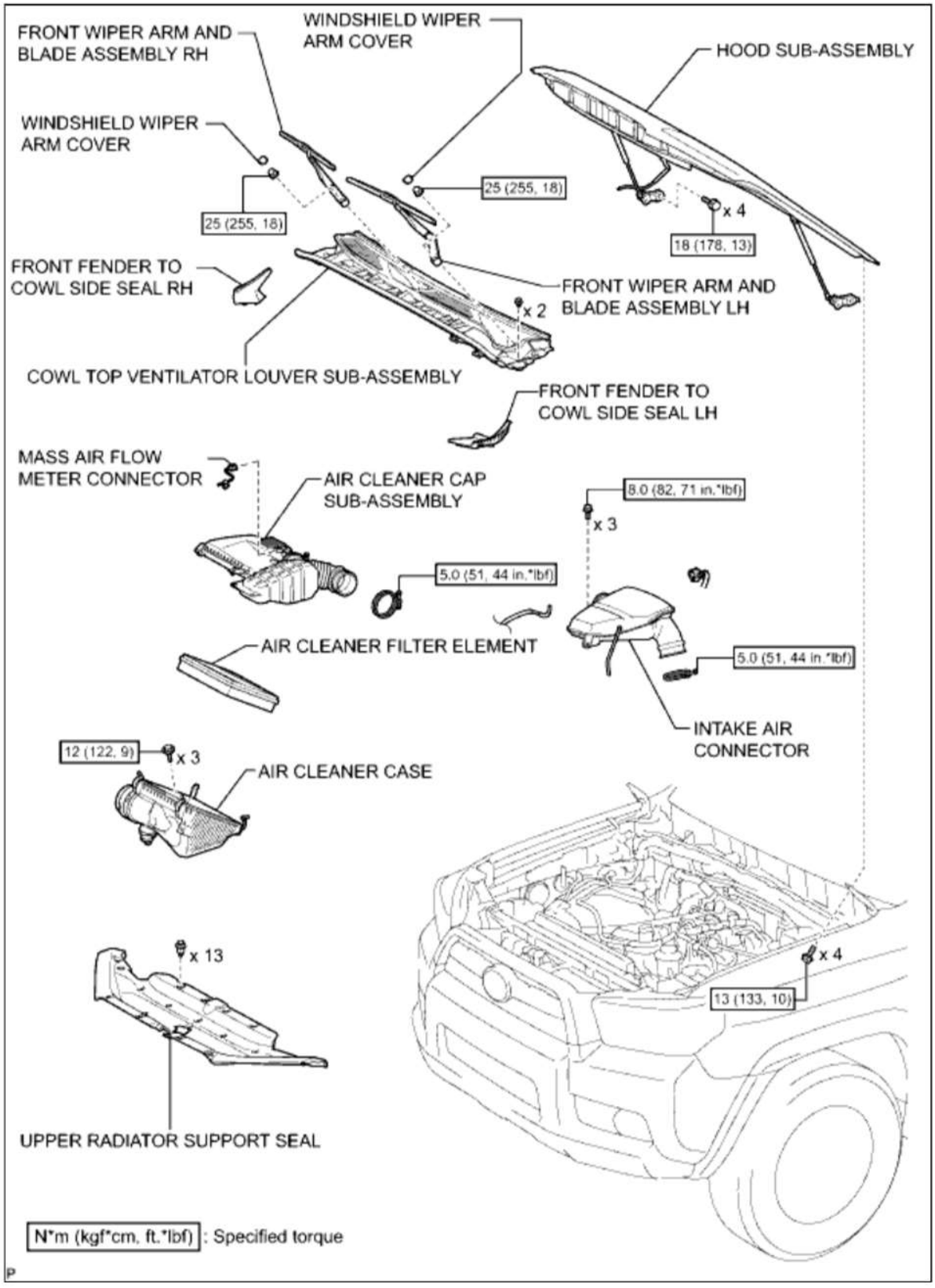
COMPONENTS

ILLUSTRATION



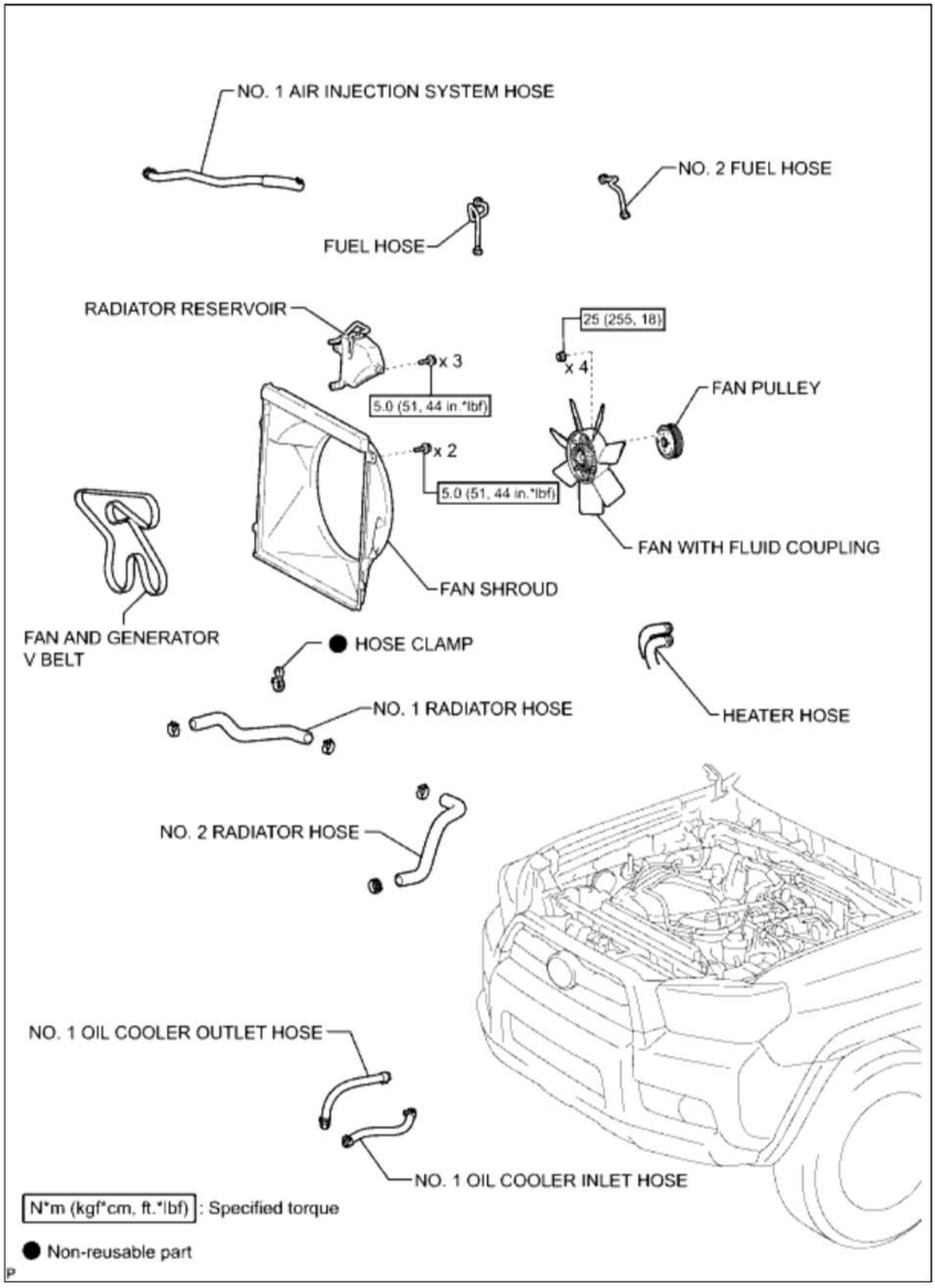
cardiagn.com

ILLUSTRATION



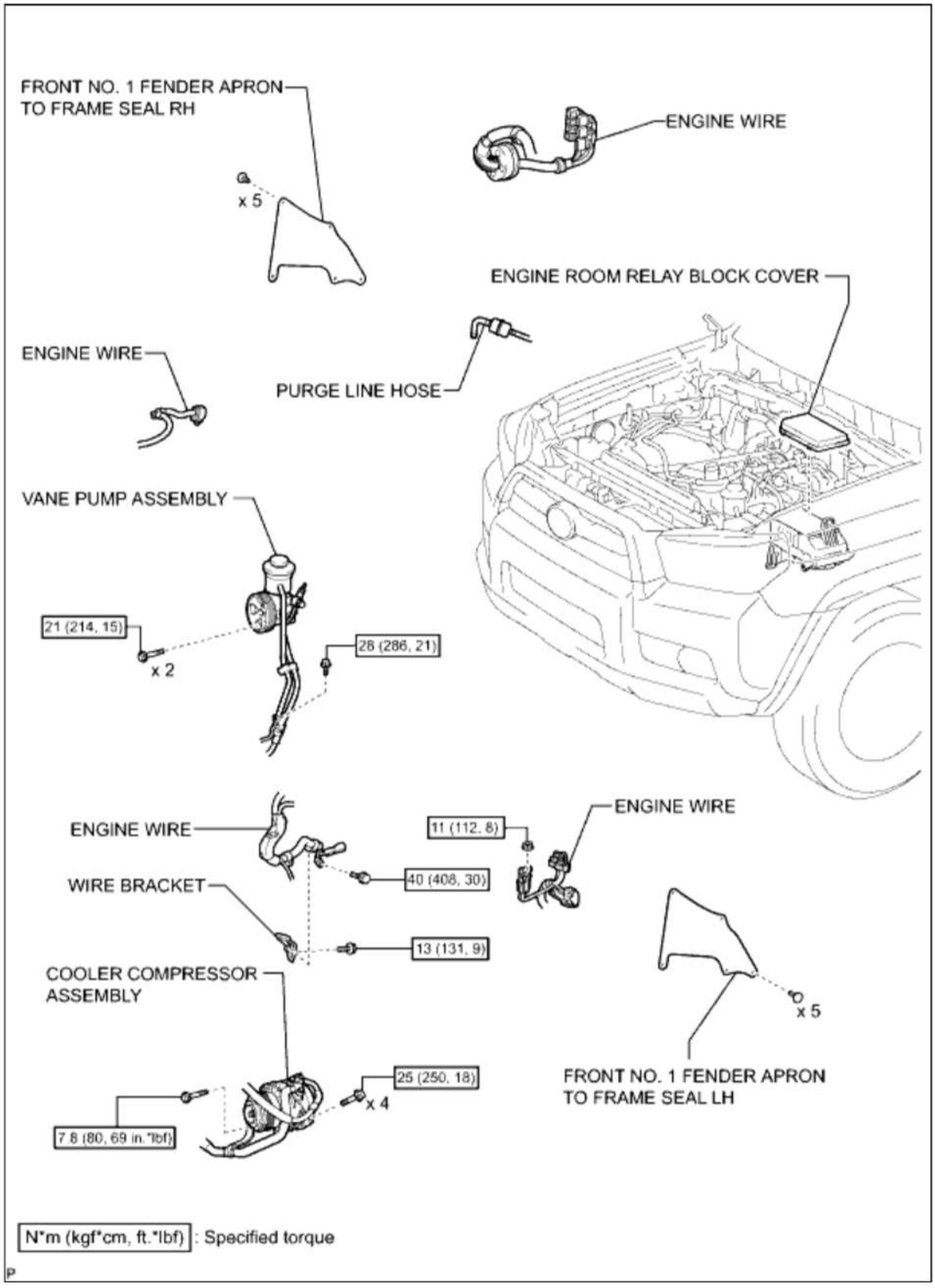
cardiagn.com

ILLUSTRATION



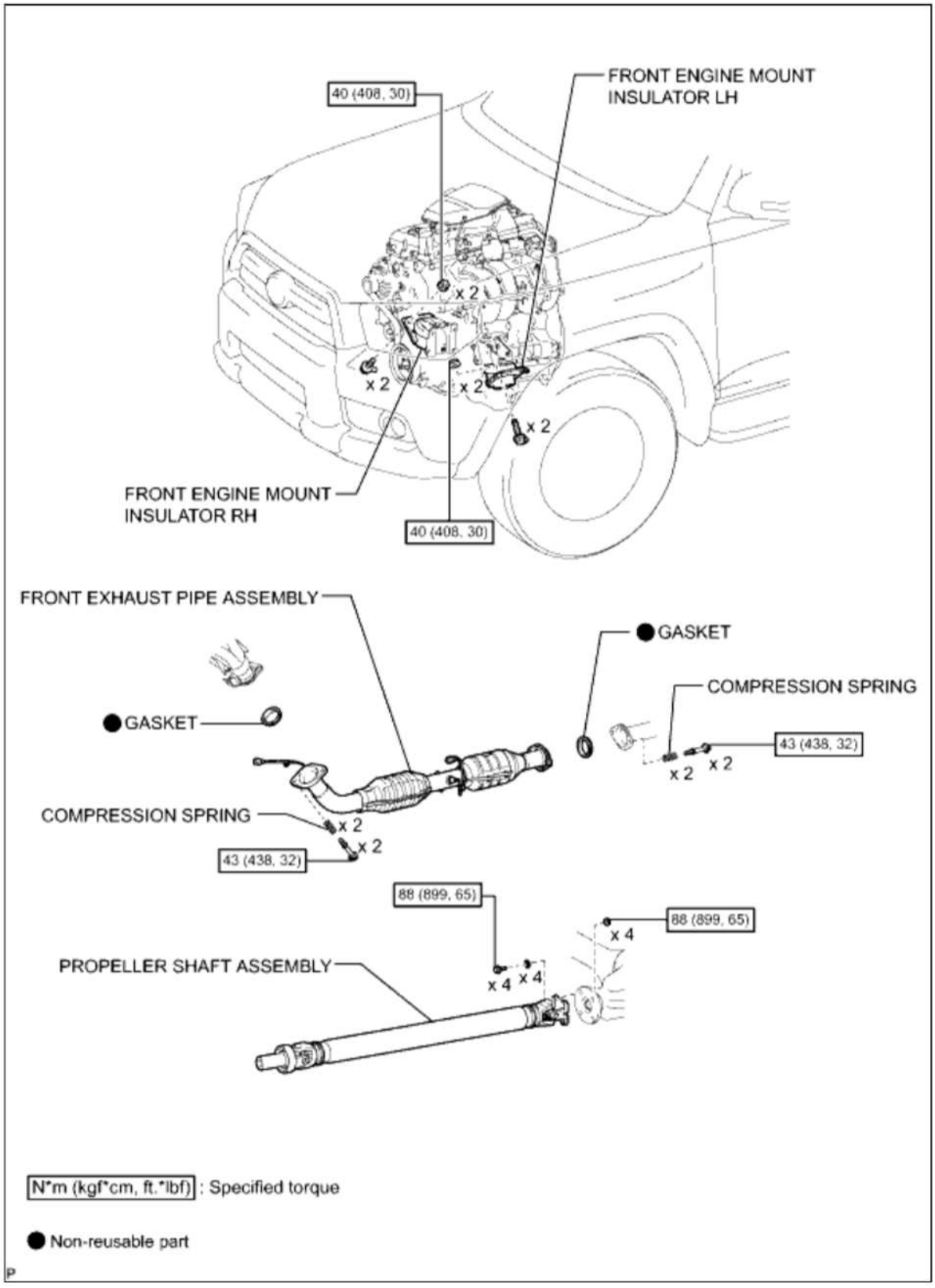
cardiagn.com

ILLUSTRATION



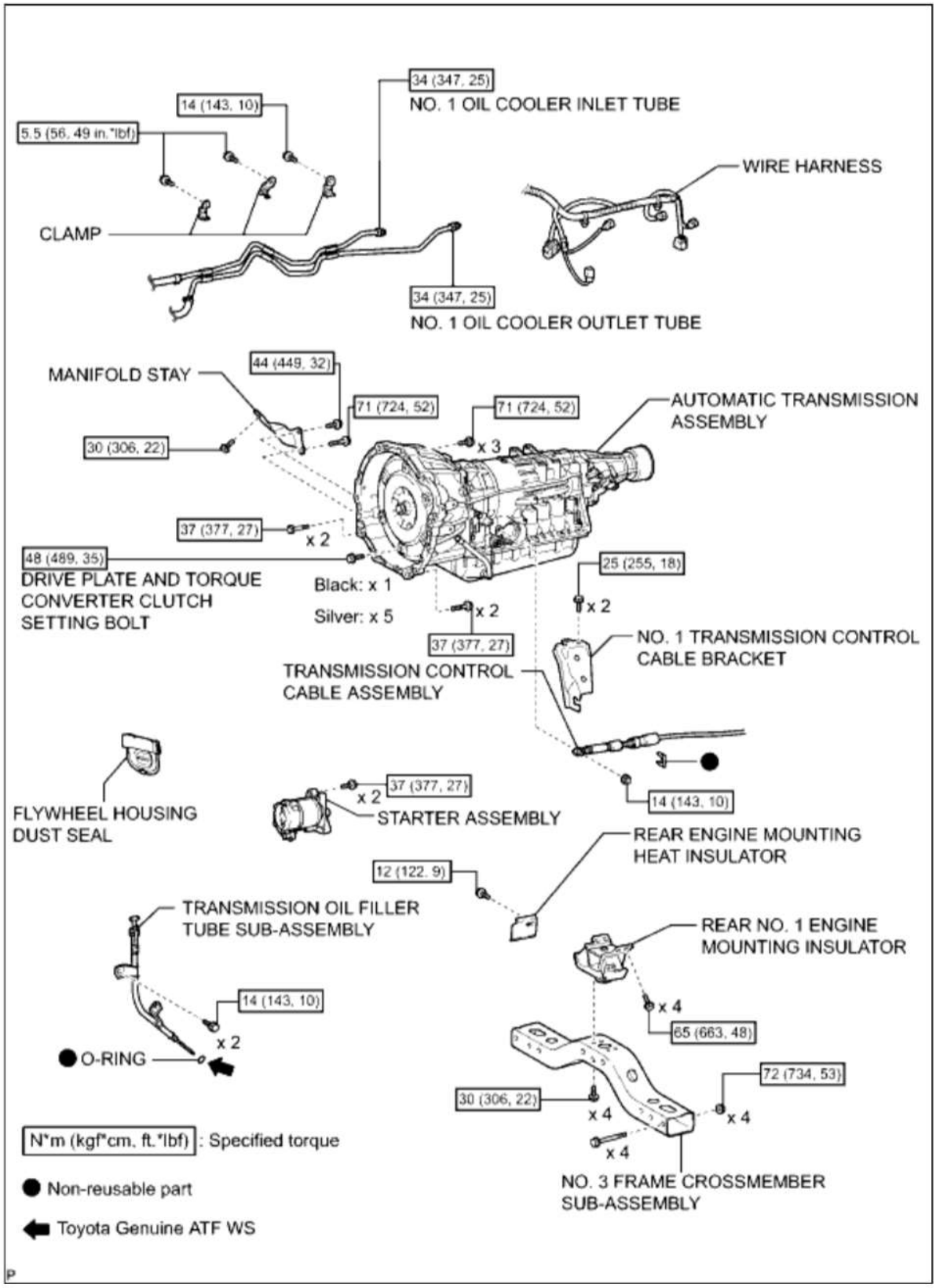
cardiagn.com

ILLUSTRATION



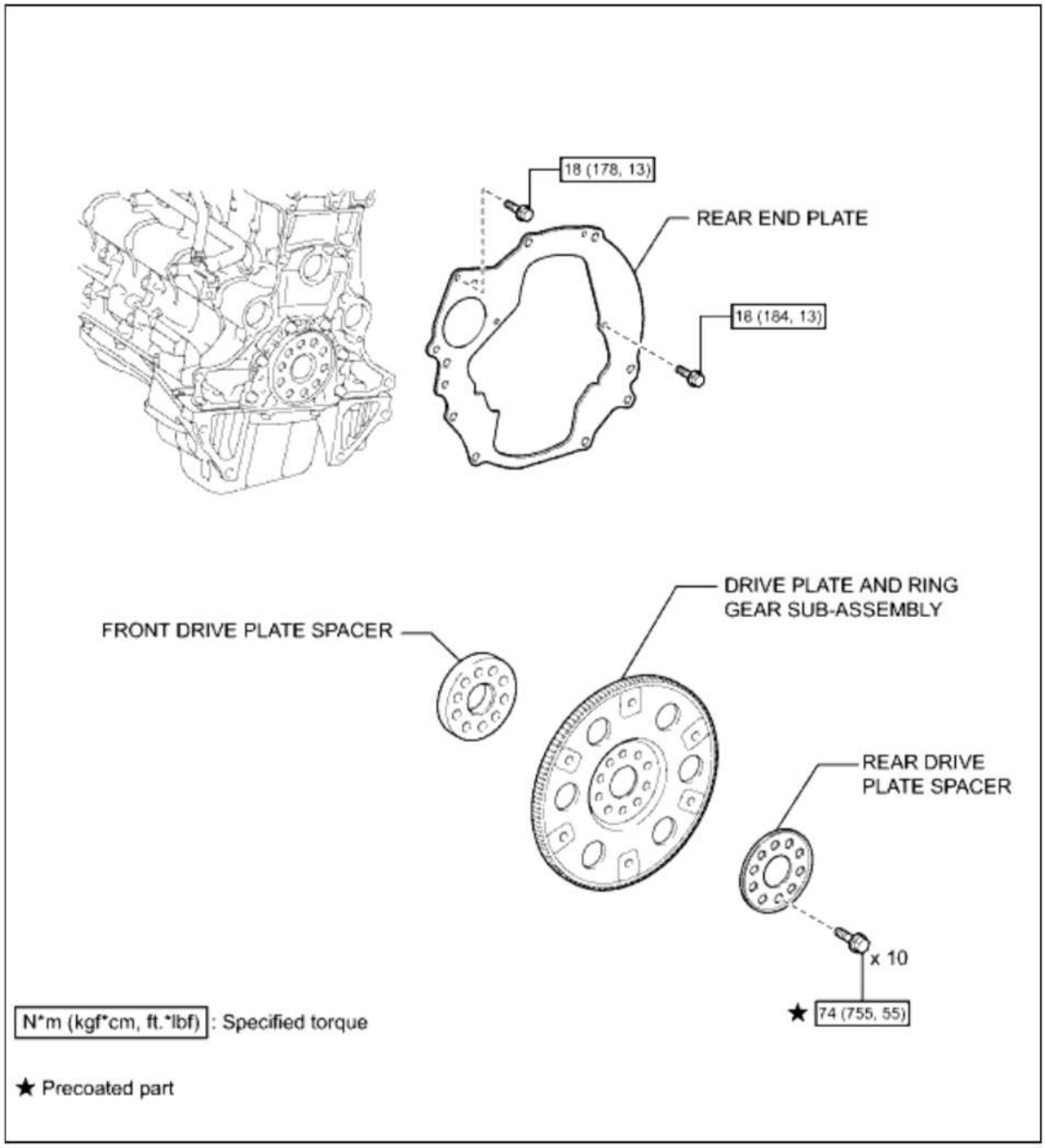
cardiagn.com

ILLUSTRATION



cardiagn.com

ILLUSTRATION



cardiagn.com

Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000004637003X
Title: 2TR-FE ENGINE MECHANICAL: ENGINE ASSEMBLY: REMOVAL (2010 4Runner)		

REMOVAL

1. DISCHARGE FUEL SYSTEM PRESSURE INFO

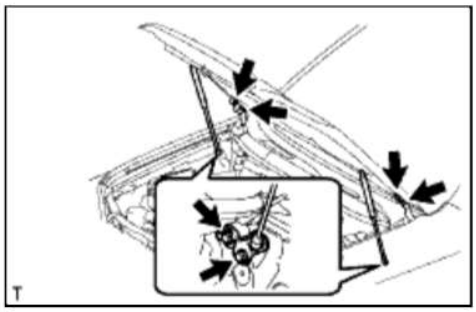
2. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

NOTICE:

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

3. REMOVE HOOD SUB-ASSEMBLY

(a) Disconnect the washer nozzle hose.



(b) Remove the 8 bolts and hood.

NOTICE:

If the hood support is detached from the ball joint, it becomes non-reusable. Therefore, do not detach the hood support from the ball joint unless replacing it.

4. REMOVE COWL TOP VENTILATOR LOUVER SUB-ASSEMBLY

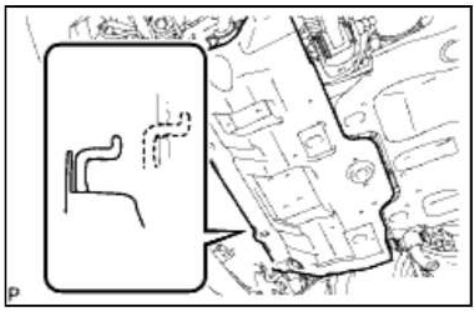
(a) Remove the cowl top ventilator louver INFO .

5. REMOVE FRONT BUMPER COVER LOWER

(a) Remove the clip, 5 bolts and front bumper cover lower.

6. REMOVE NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY

(a) Remove the 4 bolts.



(b) Unhook the No. 1 engine under cover from the vehicle body as shown in the illustration.

7. REMOVE REAR ENGINE UNDER COVER ASSEMBLY

cardiagn.com

(a) Remove the 4 bolts and rear engine under cover.

8. REMOVE UPPER RADIATOR SUPPORT SEAL

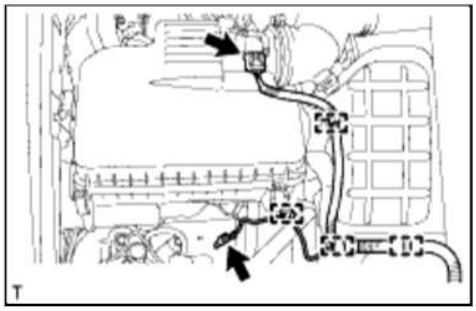
(a) Remove the 13 clips and upper radiator support seal.

9. DRAIN ENGINE COOLANT INFO

10. DRAIN ENGINE OIL INFO

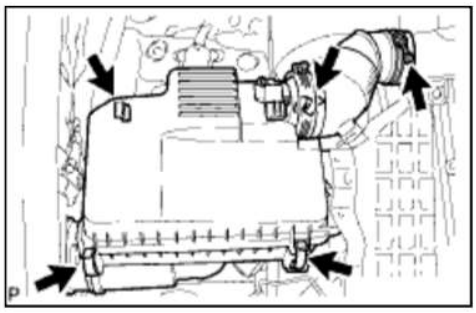
11. DRAIN AUTOMATIC TRANSMISSION FLUID INFO

12. REMOVE AIR CLEANER CAP SUB-ASSEMBLY



(a) Detach the 3 clamps and disconnect the mass air flow meter connector.

(b) Remove the bolt, detach the clamp and disconnect the ground wire.



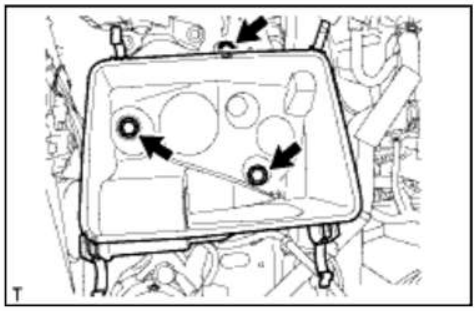
(c) Detach the 4 clamps.

(d) Loosen the hose clamp and remove the air cleaner cap.

13. REMOVE AIR CLEANER CASE

(a) Remove the air cleaner filter element.

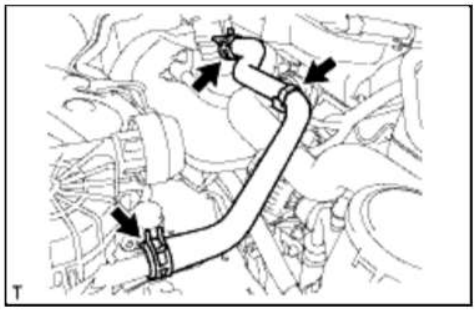
cardiagn.com



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

14. REMOVE INTAKE AIR CONNECTOR INFO

15. REMOVE NO. 1 AIR INJECTION SYSTEM HOSE



(a) Remove the hose clamp.

NOTICE:

Do not reuse the hose clamp.

(b) Using needle-nose pliers, grip the claws of the clamps and slide the clamps to remove the No. 1 air injection system hose.

16. REMOVE RADIATOR RESERVOIR INFO

17. REMOVE NO. 1 RADIATOR HOSE

(a) Using needle-nose pliers, grip the claws of the clamps and slide the clamps to remove the No. 1 radiator hose.

18. REMOVE NO. 2 RADIATOR HOSE

(a) Using needle-nose pliers, grip the claws of the clamps and slide the clamps to remove the No. 2 radiator hose.

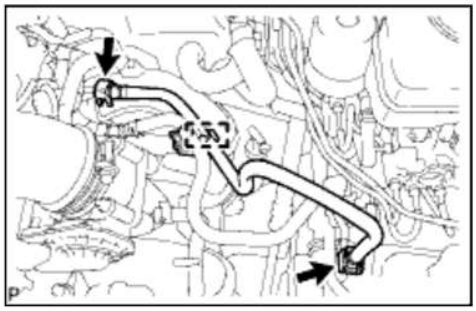
19. REMOVE FAN SHROUD INFO

20. REMOVE NO. 1 OIL COOLER INLET HOSE AND NO. 1 OIL COOLER OUTLET HOSE INFO

21. REMOVE FUEL HOSE

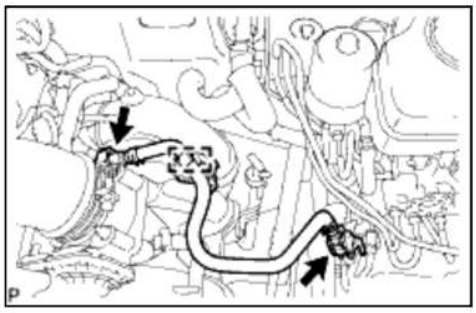
(a) Detach the clamp.

cardiagn.com



(b) Remove the fuel hose INFO .

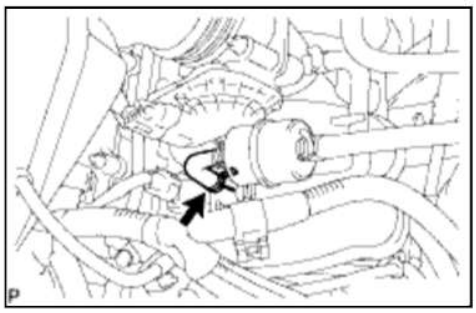
22. REMOVE NO. 2 FUEL HOSE



(a) Detach the clamp.

(b) Remove the No. 2 fuel hose INFO .

23. DISCONNECT PURGE LINE HOSE

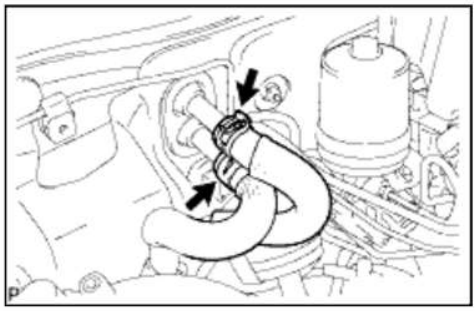


(a) Disconnect the purge line hose from the purge VSV.

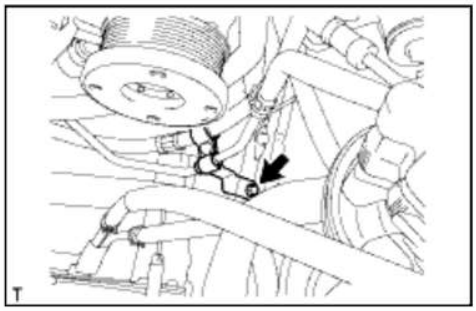
24. DISCONNECT HEATER HOSE

(a) Using needle-nose pliers, grip the claws of the clamps and slide the 2 clamps to disconnect the 2 heater hoses.

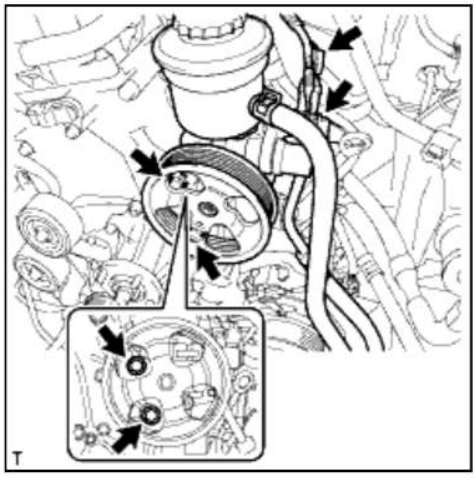
cardiagn.com



25. DISCONNECT VANE PUMP ASSEMBLY



(a) Remove the bolt and disconnect the pressure feed tube.



(b) Disconnect the 2 connectors.

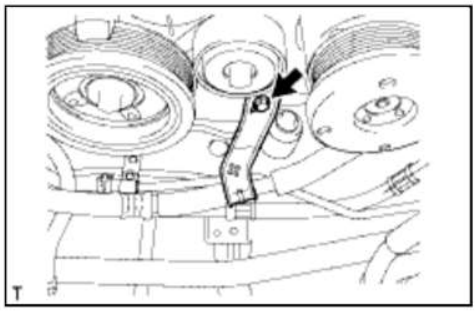
(c) Remove the 2 bolts and disconnect the vane pump.

HINT:

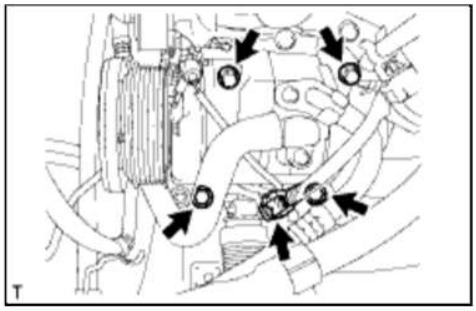
It is not necessary to completely remove the vane pump. With the hoses connected to the vane pump, hang the vane pump on the vehicle body with a rope.

26. DISCONNECT COOLER COMPRESSOR ASSEMBLY

cardiagn.com



(a) Remove the bolt and disconnect the suction hose from the engine.



(b) Disconnect the connector.

(c) Remove the 4 bolts and disconnect the cooler compressor.

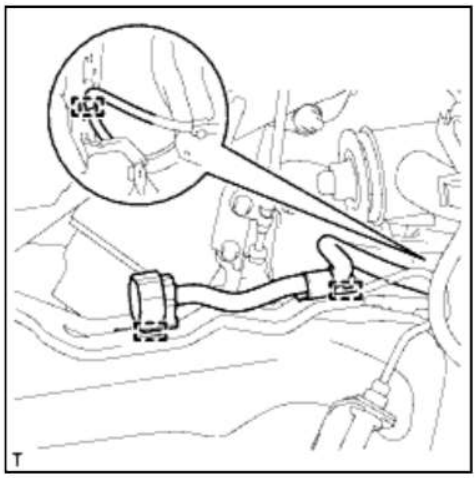
HINT:

It is not necessary to completely remove the cooler compressor. With the hoses connected to the compressor, hang the compressor on the vehicle body with a rope.

27. REMOVE FRONT NO. 1 FENDER APRON TO FRAME SEAL RH INFO

28. REMOVE FRONT NO. 1 FENDER APRON TO FRAME SEAL LH INFO

29. DISCONNECT ENGINE WIRE

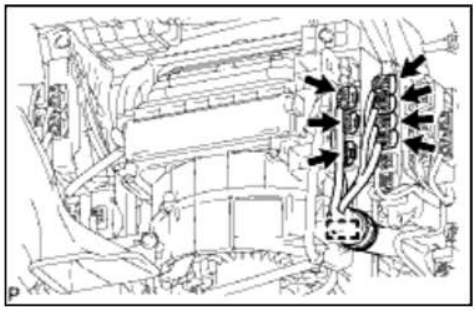


(a) Detach the 3 clamps and disconnect the engine wire from the vehicle RH side.

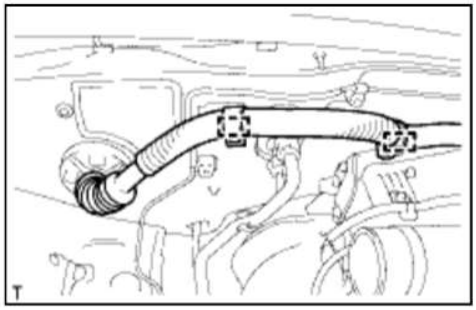
cardiagn.com

(b) Disconnect the ECM connector.

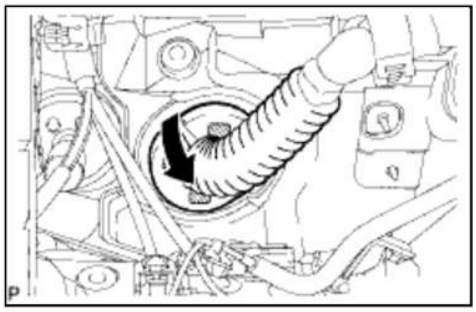
(1) Remove the lower instrument panel INFO .



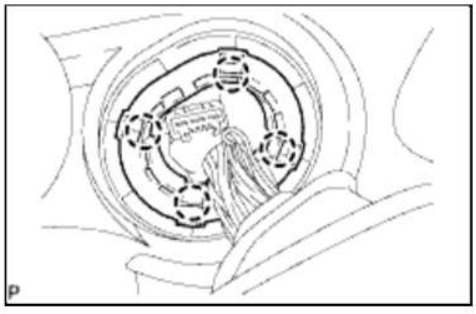
(2) Detach the clamp and disconnect the 7 connectors.



(3) Detach the 2 clamps.

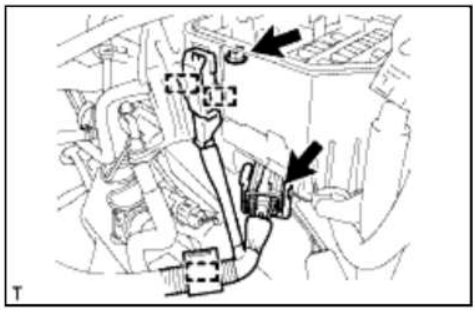


(4) Detach the grommet from the wire harness support.



(5) Detach the 4 claws to remove the wire harness support from the vehicle, and then pull out the ECM connector to remove it from the vehicle.

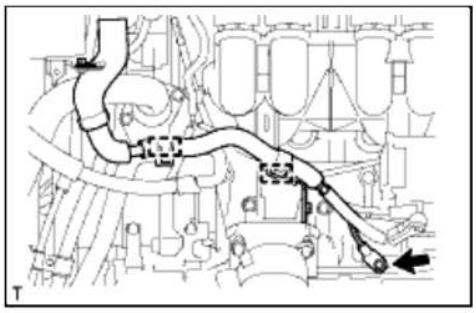
cardiagn.com



(c) Disconnect the connector and detach the clamp.

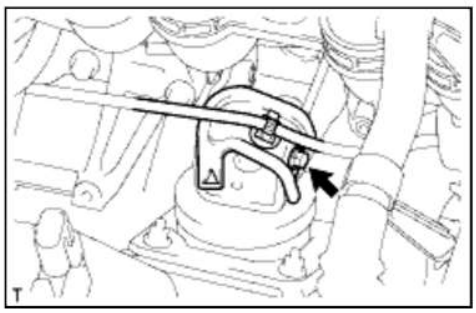
(d) Remove the nut from the engine room No. 1 relay block.

(e) Detach the 2 clamps and disconnect the wire harness from the engine room No. 1 relay block.



(f) Detach the 2 clamps.

(g) Remove the bolt and disconnect the ground wire.



(h) Remove the bolt and disconnect the bracket from the front engine mounting bracket LH.

30. REMOVE FRONT EXHAUST PIPE ASSEMBLY INFO

31. REMOVE MANIFOLD STAY INFO

32. REMOVE PROPELLER SHAFT ASSEMBLY INFO

33. REMOVE DRIVE PLATE AND TORQUE CONVERTER CLUTCH SETTING BOLT INFO

34. REMOVE STARTER ASSEMBLY

(a) Remove the starter INFO

cardiagn.com

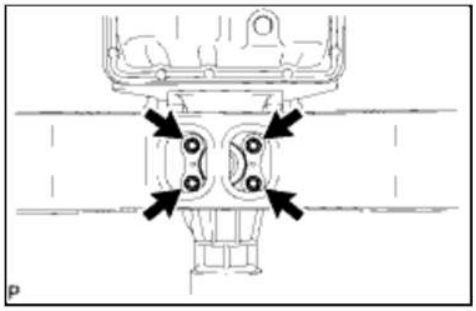
35. REMOVE AUTOMATIC TRANSMISSION ASSEMBLY

(a) Remove the automatic transmission INFO .

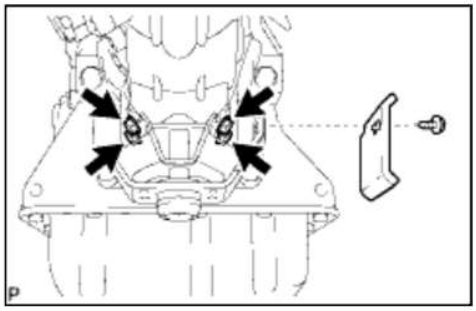
36. REMOVE REAR NO. 1 ENGINE MOUNTING INSULATOR

HINT:

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



(a) Remove the 4 bolts of the rear engine mounting insulator.



(b) Remove the bolt and rear engine mounting heat insulator.

(c) Remove the 4 bolts and engine mounting insulator from the transmission.

37. REMOVE DRIVE PLATE AND RING GEAR SUB-ASSEMBLY INFO

38. REMOVE REAR END PLATE

(a) Detach the flywheel housing dust seal.

(b) Remove the 2 bolts and rear end plate.

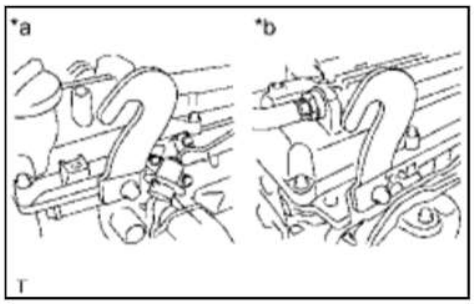
39. INSTALL NO. 1 ENGINE HANGER

(a) Install 2 engine hangers with 2 bolts as shown in the illustration.

Torque: 42 N·m (428 kgf·cm, 31ft·lbf)

Text in Illustration

cardiagn.com



*a	LH Side
*b	RH Side

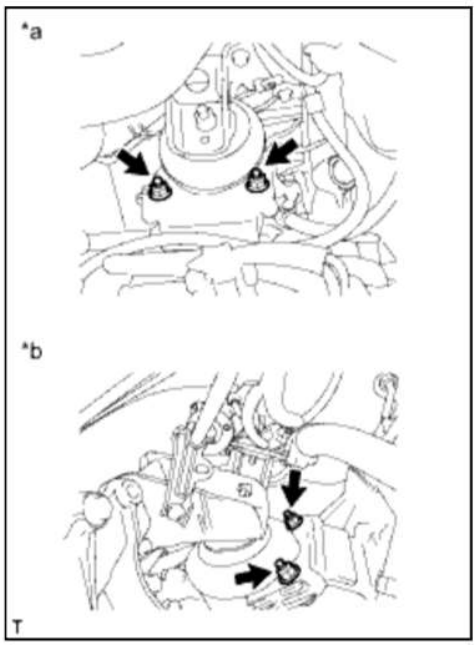
No. 1 Engine Hanger	12281-75040
Bolt	91552-A1020

40. REMOVE ENGINE ASSEMBLY

(a) Attach an engine sling device and hang the engine with a chain block.

NOTICE:

Pay attention to the angle of the sling device as the engine assembly or engine hanger may be damaged or deformed if the angle is incorrect.



(b) Remove the 4 bolts and 4 nuts.

Text in Illustration

*a	RH Side
*b	LH Side

(c) Lift the engine out from the vehicle slowly and carefully.

NOTICE:

Make sure the engine is clear of all wiring, hoses and cables.

41. INSTALL ENGINE TO ENGINE STAND

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

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

cardiagn.com

Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000004635003X
Title: 2TR-FE ENGINE MECHANICAL: ENGINE ASSEMBLY: INSTALLATION (2010 4Runner)		

INSTALLATION

1. INSTALL NO. 1 ENGINE HANGER

2. REMOVE ENGINE FROM ENGINE STAND

(a) Attach an engine sling device and hang the engine with a chain block.

NOTICE:

Pay attention to the angle of the sling device as the engine assembly or No. 1 engine hanger may be damaged or deformed if the angle is incorrect.

(b) Lift the engine and remove it from the engine stand.

3. INSTALL ENGINE ASSEMBLY

(a) Slowly lower the engine assembly into the engine compartment.

NOTICE:

Make sure that the engine is clear of all wiring and hoses.

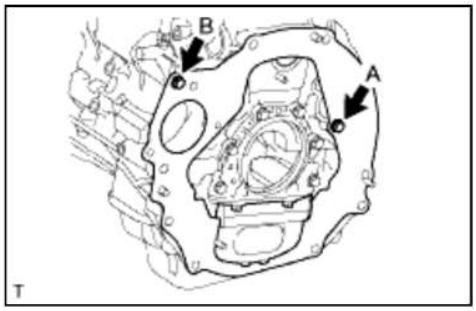
(b) Attach the engine mounting insulators to the vehicle.

(c) Install the 4 bolts and 4 nuts.

Torque: 40 N·m (408 kgf·cm, 30ft·lbf)

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

4. INSTALL REAR END PLATE



(a) Install the rear end plate with the 2 bolts.

for bolt A - Torque: 18 N·m (184 kgf·cm, 13ft·lbf)
for bolt B - Torque: 18 N·m (178 kgf·cm, 13ft·lbf)

(b) Attach the flywheel housing dust seal.

5. INSTALL DRIVE PLATE AND RING GEAR SUB-ASSEMBLY

6. INSTALL REAR NO. 1 ENGINE MOUNTING INSULATOR

HINT:

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

(a) Install the engine mounting insulator to the transmission with the 4 bolts.

cardiagn.com

Torque: 65 N·m (663 kgf·cm, 48ft·lbf)

(b) Install the rear engine mounting heat insulator to the rear No. 1 engine mounting insulator.

Torque: 12 N·m (122 kgf·cm, 9ft·lbf)

(c) Install the No. 3 frame crossmember to the rear No. 1 engine mounting insulator with the 4 bolts.

Torque: 30 N·m (306 kgf·cm, 22ft·lbf)

7. INSTALL AUTOMATIC TRANSMISSION ASSEMBLY

(a) Install the automatic transmission INFO .

8. INSTALL STARTER ASSEMBLY

(a) Install the starter INFO .

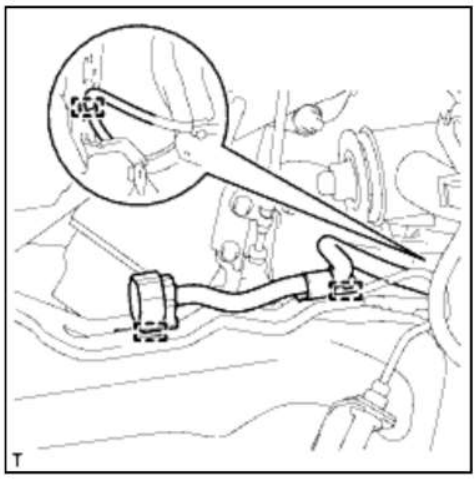
9. INSTALL DRIVE PLATE AND TORQUE CONVERTER CLUTCH SETTING BOLT INFO

10. INSTALL PROPELLER SHAFT ASSEMBLY INFO

11. INSTALL MANIFOLD STAY INFO

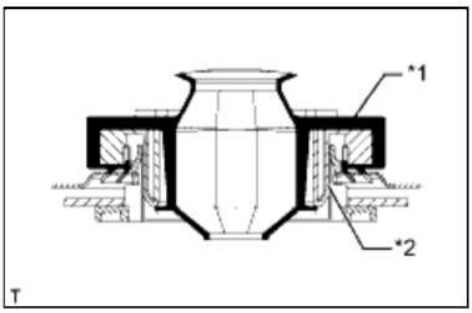
12. INSTALL FRONT EXHAUST PIPE ASSEMBLY INFO

13. CONNECT ENGINE WIRE



(a) Attach the 3 clamps and connect the engine wire to the vehicle RH side.

(b) Connect the ECM connector.



(1) Attach the grommet to the wire harness support.

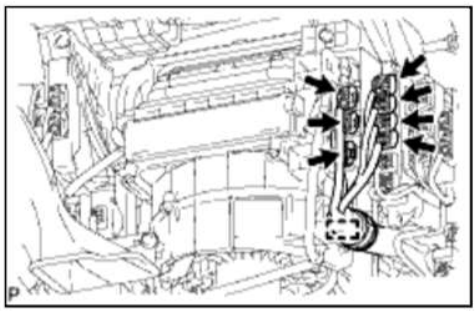
cardiagn.com

Text in Illustration

*1	Grommet
*2	Wire Harness Support

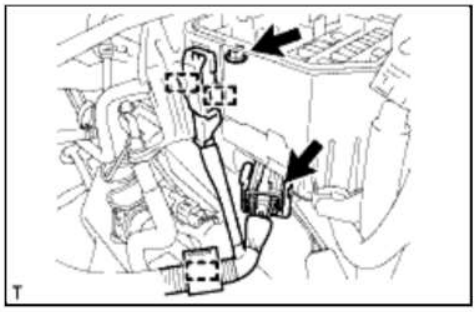
(2) Pass the wire harness into the vehicle and install the wire harness support.

(3) Attach the 2 clamps.



(4) Connect the 7 connectors and attach the clamp.

(5) Install the lower instrument panel sub-assembly INFO .



(c) Connect the connector and attach the clamp.

(d) Connect the wire harness, attach the 2 clamps and install the nut.

Torque: 11 N·m (112 kgf·cm, 8ft·lbf)

(e) Connect the ground wire and engine wire with the 2 clamps and bolt.

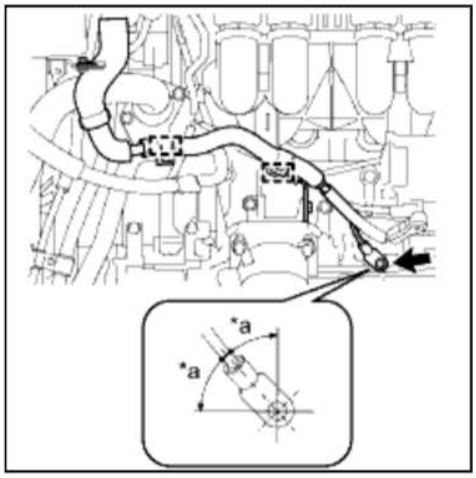
Torque: 40 N·m (408 kgf·cm, 30ft·lbf)

Text in Illustration

*a	45° or less

HINT:

cardiagn.com



When tightening the terminal, make sure that they are positioned as shown in the illustration.

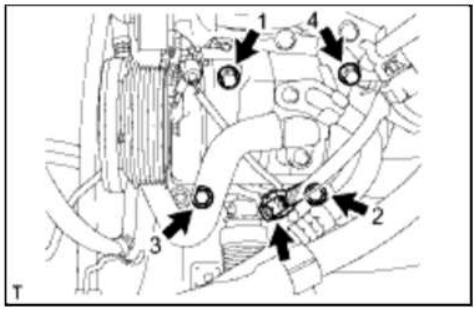
(f) Install the bracket to the engine mounting bracket LH with the bolt.

Torque: 13 N·m (131 kgf·cm, 9ft·lbf)

14. INSTALL FRONT NO. 1 FENDER APRON TO FRAME SEAL LH INFO

15. INSTALL FRONT NO. 1 FENDER APRON TO FRAME SEAL RH INFO

16. CONNECT COOLER COMPRESSOR ASSEMBLY



(a) Temporarily install the cooler compressor with the 4 bolts.

(b) Tighten the bolts in the order shown in the illustration.

Torque: 25 N·m (250 kgf·cm, 18ft·lbf)

(c) Connect the connector.

(d) Connect the suction hose with the bolt.

Torque: 7.8 N·m (80 kgf·cm, 69in·lbf)

17. CONNECT VANE PUMP ASSEMBLY

(a) Connect the vane pump with the 2 bolts.

Torque: 21 N·m (214 kgf·cm, 15ft·lbf)

(b) Connect the 2 connectors.

(c) Connect the pressure feed tube with the bolt.

Torque: 28 N·m (286 kgf·cm, 21ft·lbf)

cardiagn.com

18. CONNECT HEATER HOSE

(a) Using needle-nose pliers, grip the claws of the clamp and slide the 2 clamps to connect the heater hoses.

19. CONNECT PURGE LINE HOSE

(a) Connect the purge line hose to the purge VSV.

20. INSTALL NO. 2 FUEL HOSE

(a) Install the fuel hose INFO .

(b) Attach the clamp.

21. INSTALL FUEL HOSE

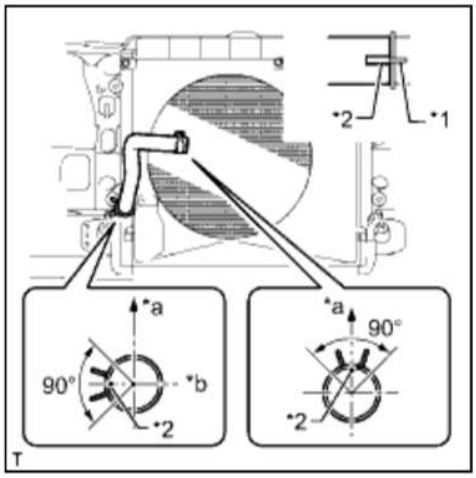
(a) Install the fuel hose INFO .

(b) Attach the clamp.

22. CONNECT NO. 1 OIL COOLER INLET HOSE AND NO. 1 OIL COOLER OUTLET HOSE INFO

23. INSTALL FAN SHROUD INFO

24. INSTALL NO. 2 RADIATOR HOSE



(a) Install the No. 2 radiator hose so that its paint mark aligns with the radiator and water inlet protrusion as shown in the illustration.

Text in Illustration

*1	Protrusion
*2	Paint Mark
*a	Top
*b	RH Side

HINT:

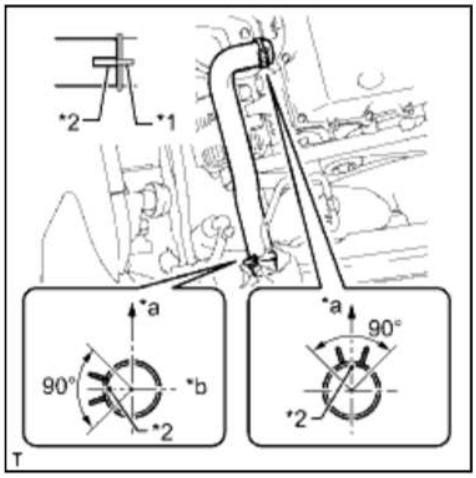
The direction of each hose clamp is indicated in the illustration.

25. INSTALL NO. 1 RADIATOR HOSE

(a) Install the No. 1 radiator hose so that its paint marks align with the radiator and cylinder head protrusions as shown in the illustration.

Text in Illustration

cardiagn.com



*1	Protrusion
*2	Paint Mark
*a	Top
*b	LH Side

HINT:

The direction of each hose clamp is indicated in the illustration.

26. INSTALL RADIATOR RESERVOIR

27. INSTALL NO. 1 AIR INJECTION SYSTEM HOSE

(a) Using needle-nose pliers, grip the claws of the clamp and slide the 2 clamps to install the No. 1 air injection system hose.

(b) Install a new hose clamp.

28. INSTALL INTAKE AIR CONNECTOR

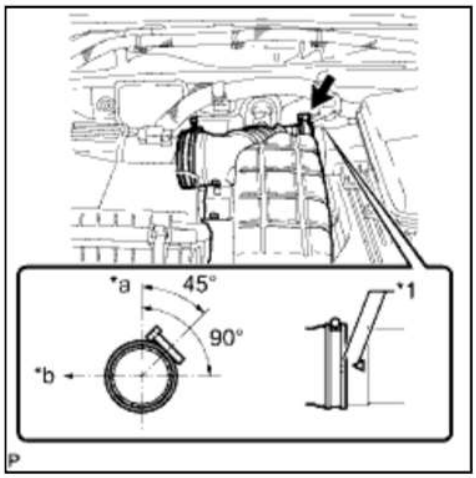
29. INSTALL AIR CLEANER CASE

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

Torque: 12 N·m (122 kgf·cm, 9ft·lbf)

(b) Install the air cleaner filter element.

30. INSTALL AIR CLEANER CAP SUB-ASSEMBLY



(a) Install the air cleaner hose, align its matchmark with the matchmark of the air cleaner cap as shown in the illustration.

Text in Illustration

*1	Matchmark
*a	Upper Side
*b	Front

(b) Tighten the hose clamp.

Torque: 5.0 N·m (51 kgf·cm, 44in·lbf)

cardiagn.com

(c) Attach the 4 clamps.

(d) Install the ground wire and clamp with the bolt.

Torque: 8.5 N·m (87 kgf·cm, 75in·lbf)

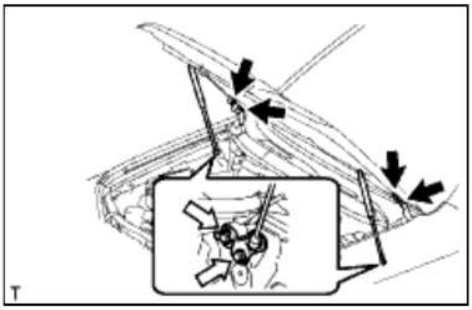
(e) Connect the mass air flow meter connector and attach the 3 clamps.

31. INSTALL COWL TOP VENTILATOR LOUVER SUB-ASSEMBLY

(a) Install the cowl top ventilator louver INFO .

32. INSTALL HOOD SUB-ASSEMBLY

(a) Install the hood with the 8 bolts.



for bolt A - Torque: 13 N·m (133 kgf·cm, 10ft·lbf)

for bolt B - Torque: 18 N·m (178 kgf·cm, 13ft·lbf)

Text in Illustration

➡	Bolt A
⇨	Bolt B

(b) Connect the washer nozzle hose.

33. ADJUST HOOD SUB-ASSEMBLY INFO

34. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

NOTICE:

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

35. ADD AUTOMATIC TRANSMISSION FLUID INFO

36. ADD ENGINE OIL INFO

37. ADD ENGINE COOLANT INFO

38. INSPECT SHIFT LEVER POSITION INFO

39. INSPECT ENGINE OIL LEVEL INFO

cardiagn.com

40. CHECK TRANSMISSION FLUID LEVEL INFO

41. INSPECT FOR COOLANT LEAK INFO

42. INSPECT FOR OIL LEAK INFO

43. INSPECT FOR FUEL LEAK INFO

44. INSPECT FOR EXHAUST GAS LEAK INFO

45. INSPECT IGNITION TIMING INFO

46. INSPECT ENGINE IDLE SPEED INFO

47. INSPECT CO/HC INFO

48. INSTALL UPPER RADIATOR SUPPORT SEAL

(a) Install the upper radiator support seal with the 13 clips.

49. INSTALL REAR ENGINE UNDER COVER ASSEMBLY

(a) Install the rear engine under cover with the 4 bolts.

Torque: 29 N·m (296 kgf·cm, 21ft·lbf)

50. INSTALL NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY



(a) Hook the engine No. 1 under cover to the vehicle body as shown in the illustration.

(b) Install the 4 bolts.

Torque: 29 N·m (296 kgf·cm, 21ft·lbf)

51. INSTALL FRONT BUMPER COVER LOWER

(a) Install the front bumper cover lower with the 5 bolts and clip.

Torque: 8.0 N·m (82 kgf·cm, 71in·lbf)

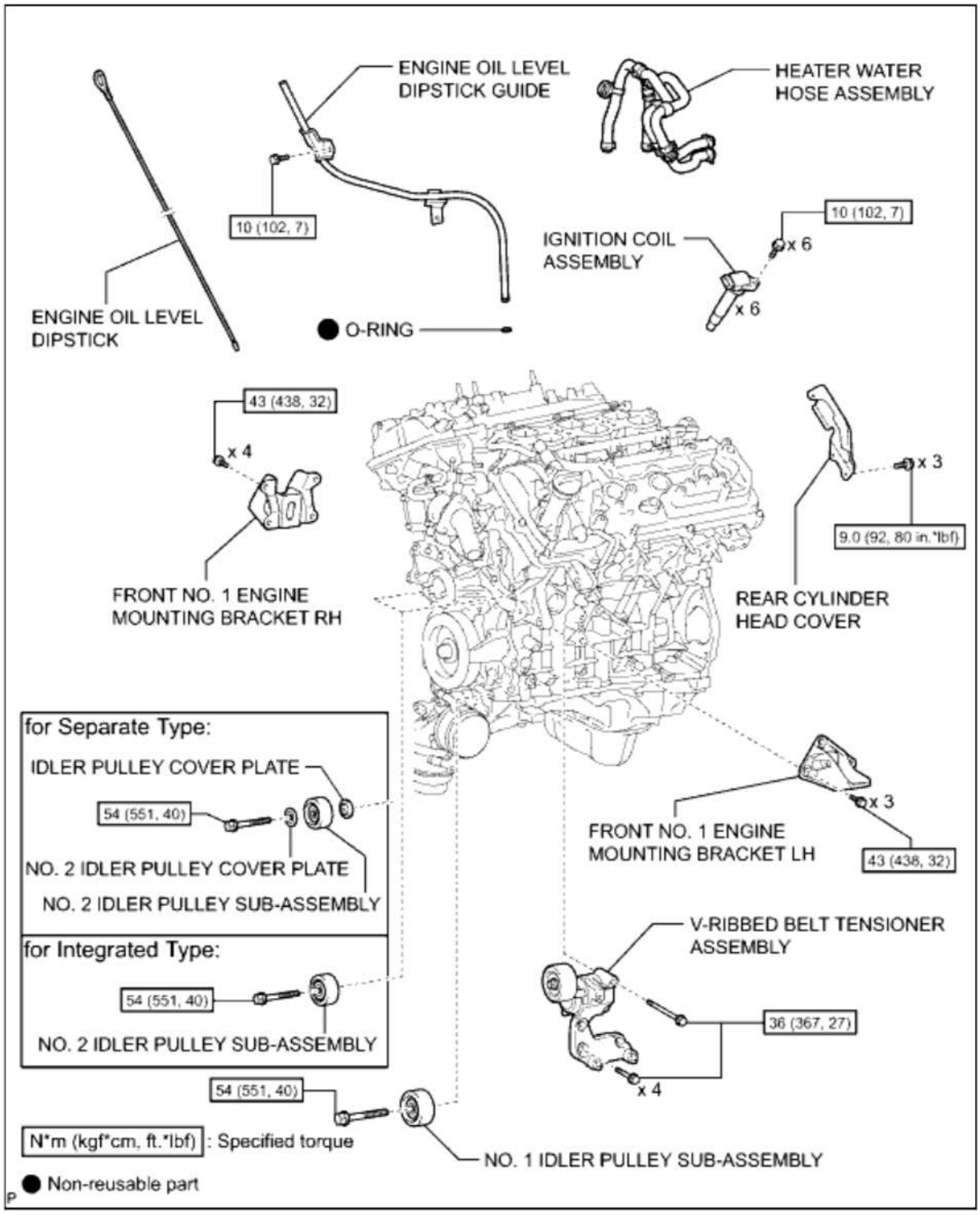
52. INSPECT ENGINE COOLANT LEVEL INFO

cardiagn.com

Last Modified: 5-10-2010	6.4 K	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000002BK400EX
Title: 1GR-FE ENGINE MECHANICAL: ENGINE UNIT: COMPONENTS (2010 4Runner)		

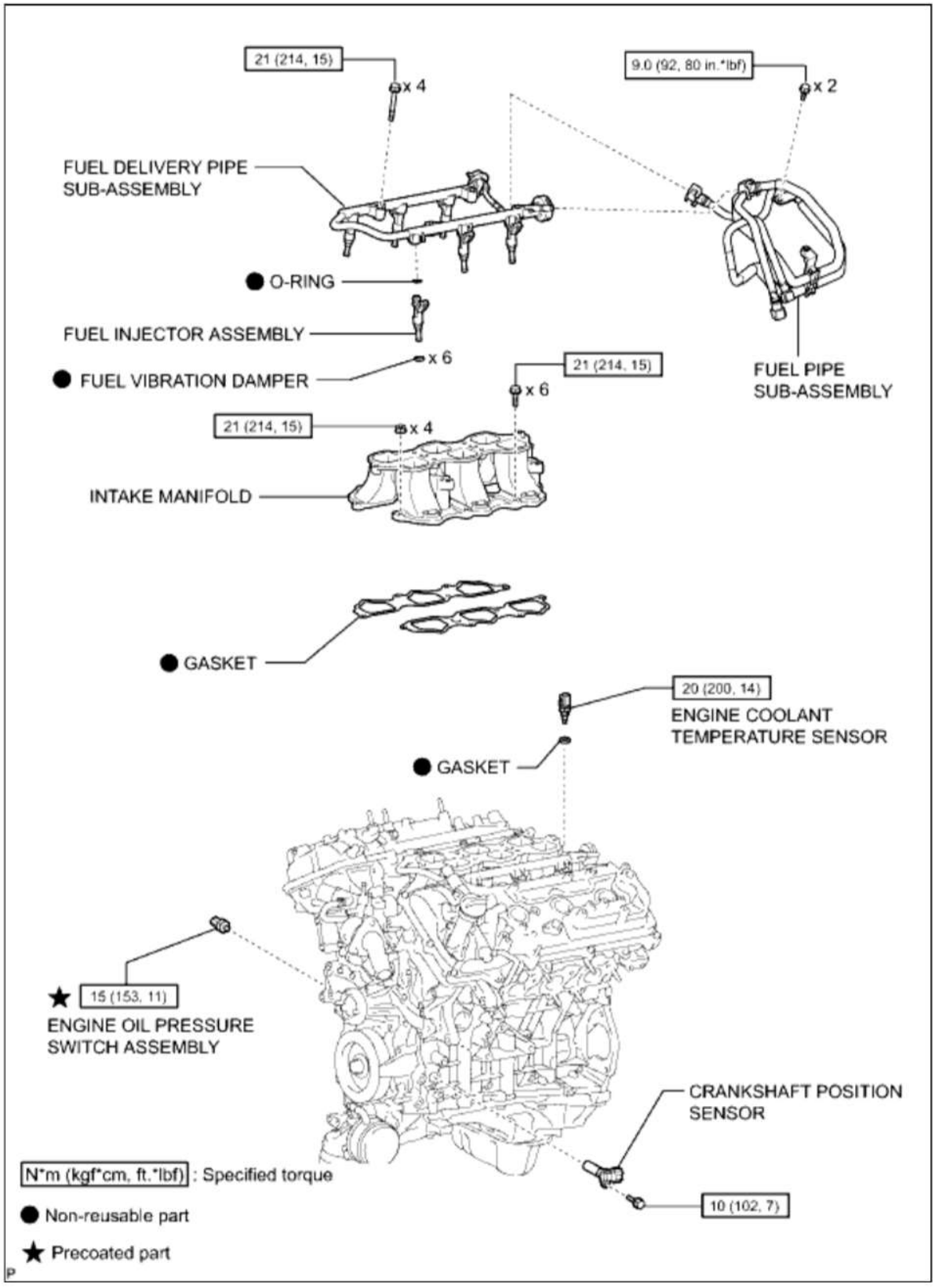
COMPONENTS

ILLUSTRATION



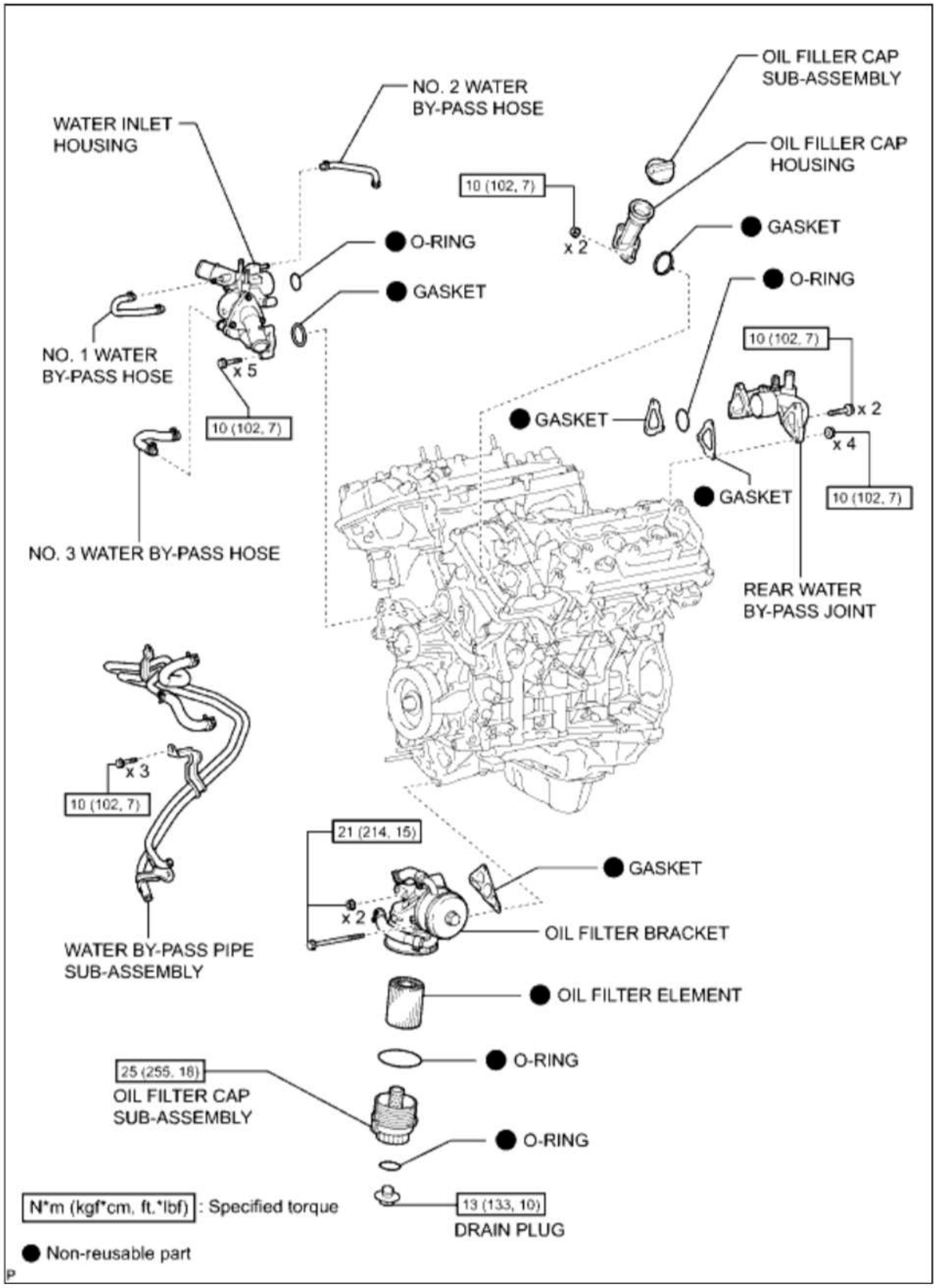
cardiagn.com

ILLUSTRATION



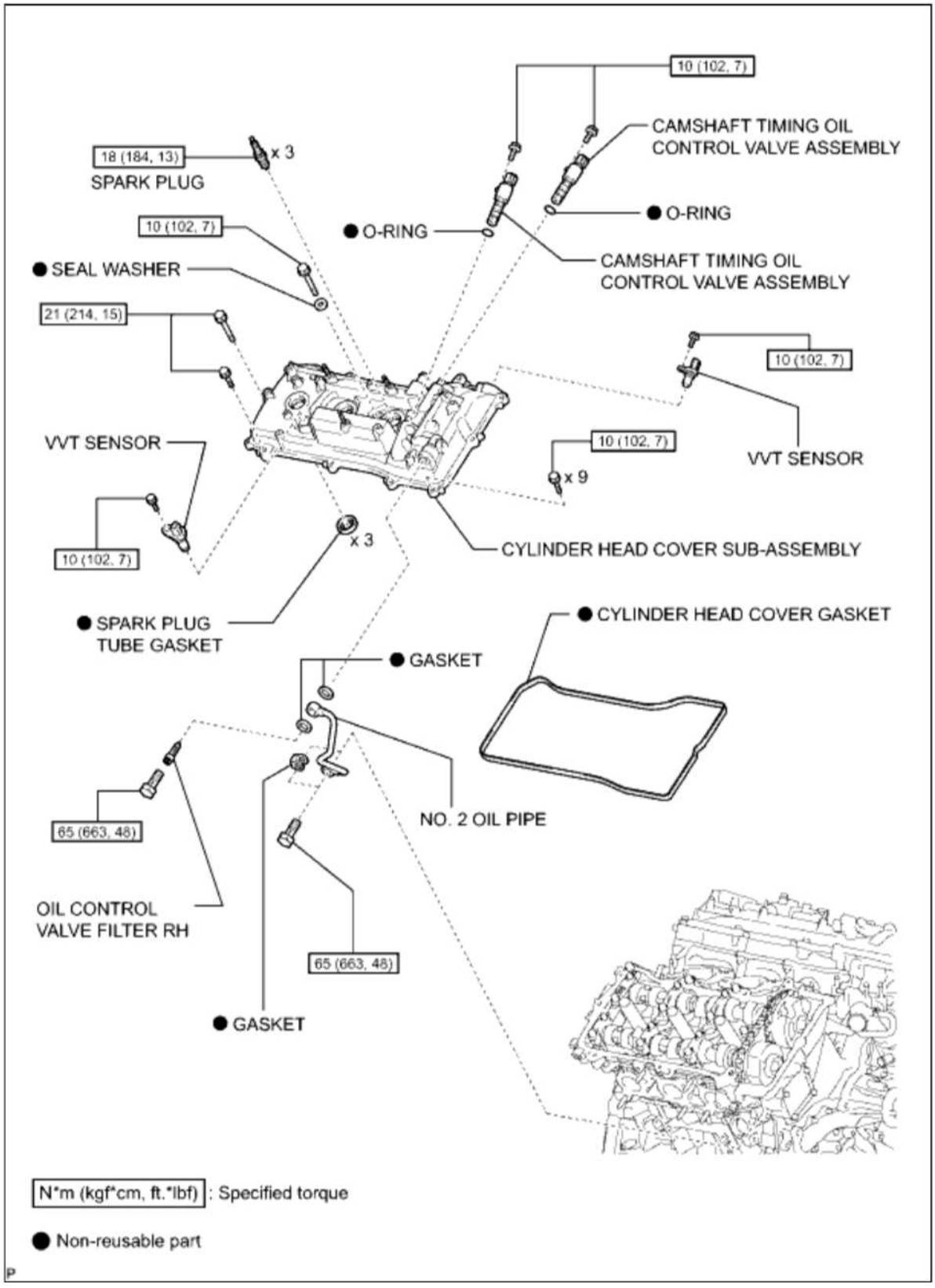
cardiagn.com

ILLUSTRATION



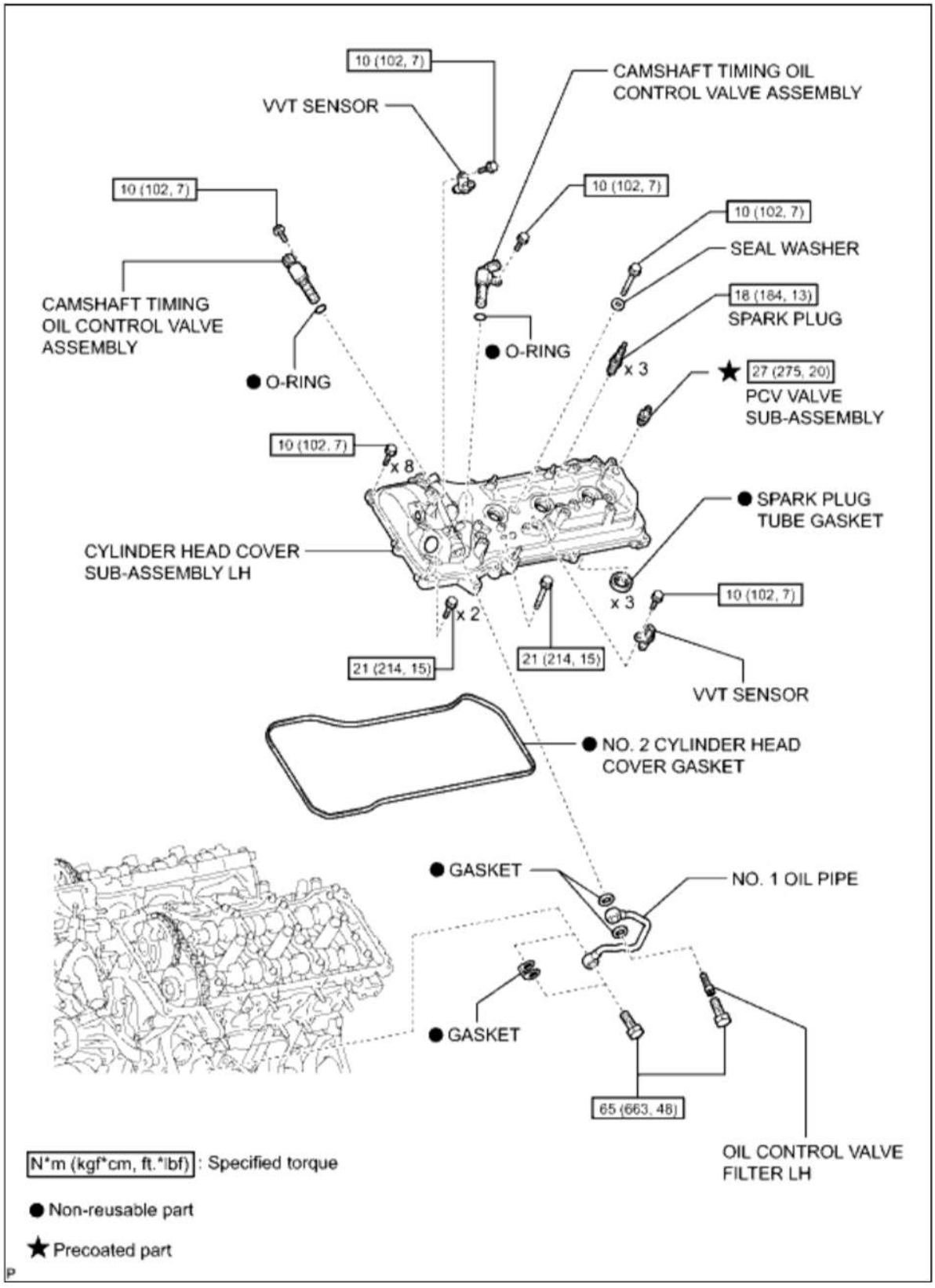
cardiagn.com

ILLUSTRATION



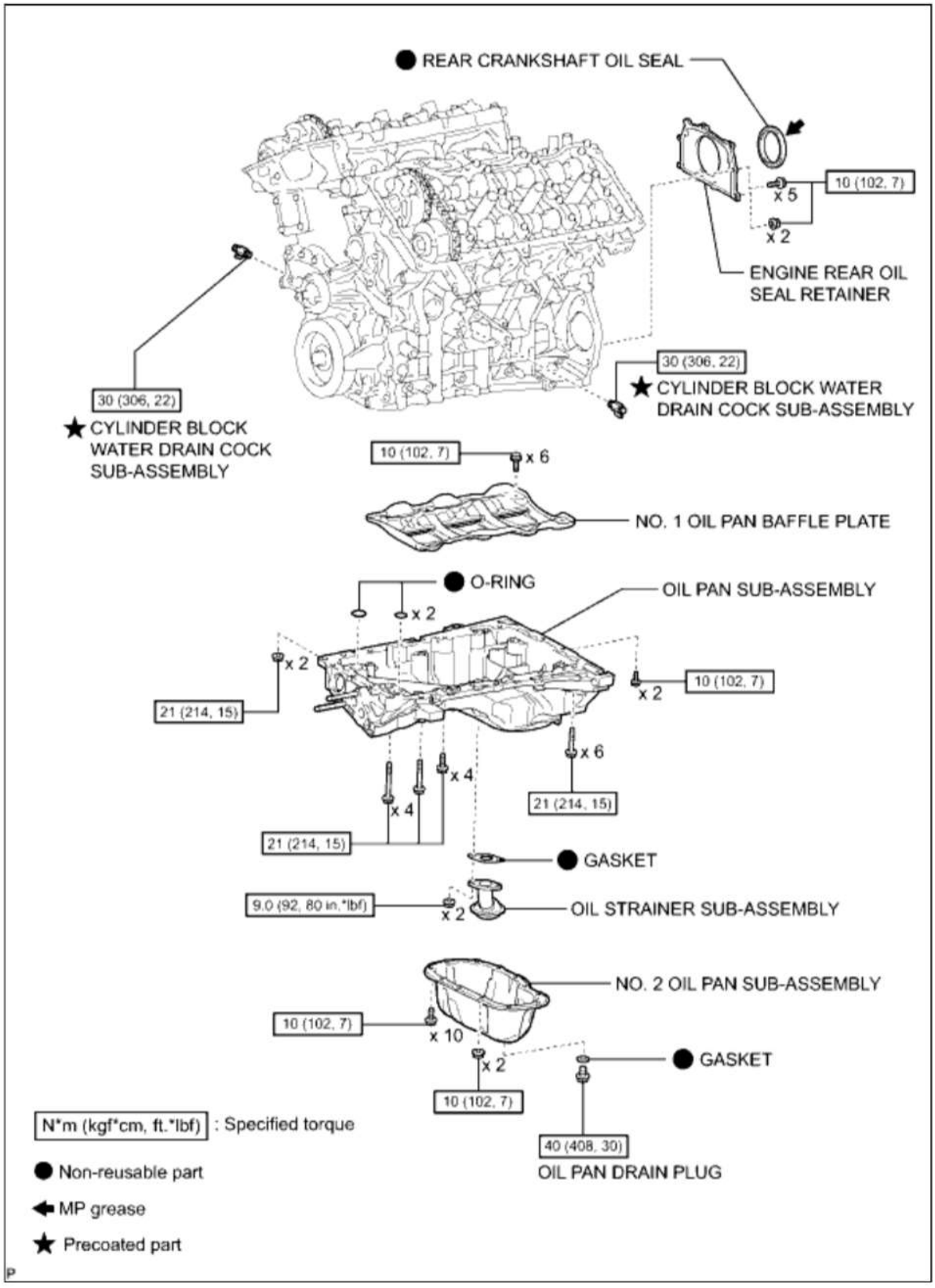
cardiagn.com

ILLUSTRATION



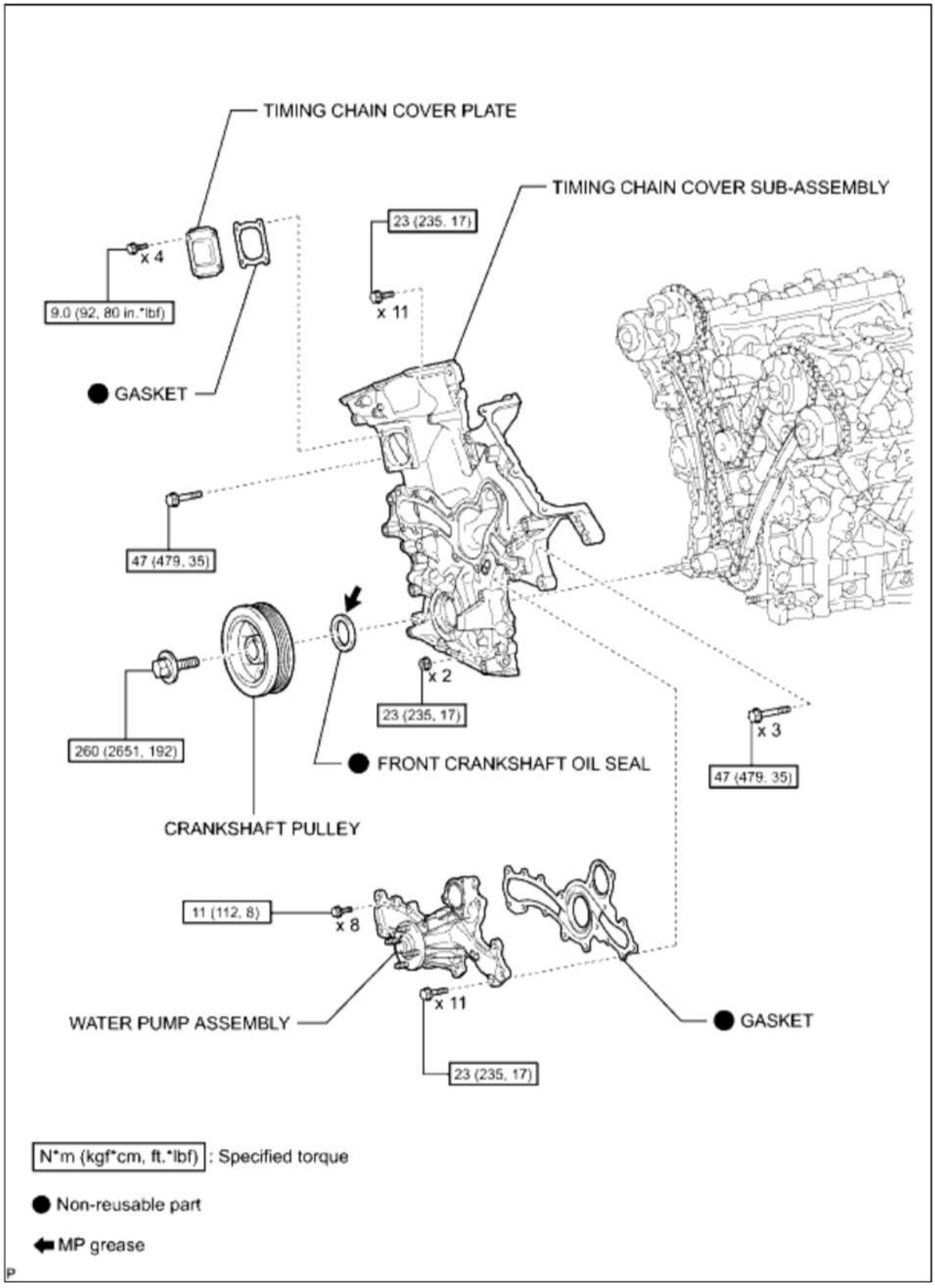
cardiagn.com

ILLUSTRATION



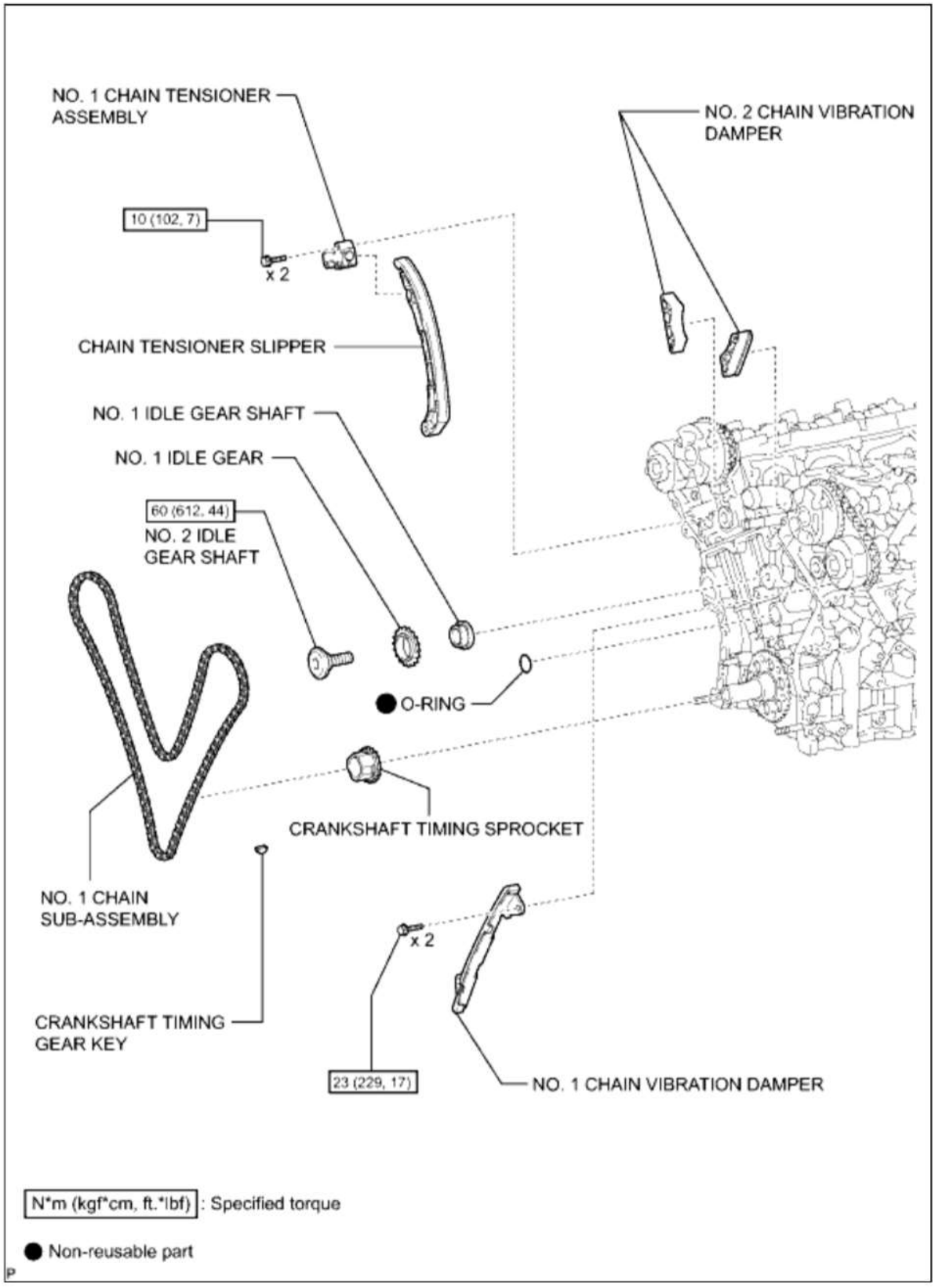
cardiagn.com

ILLUSTRATION



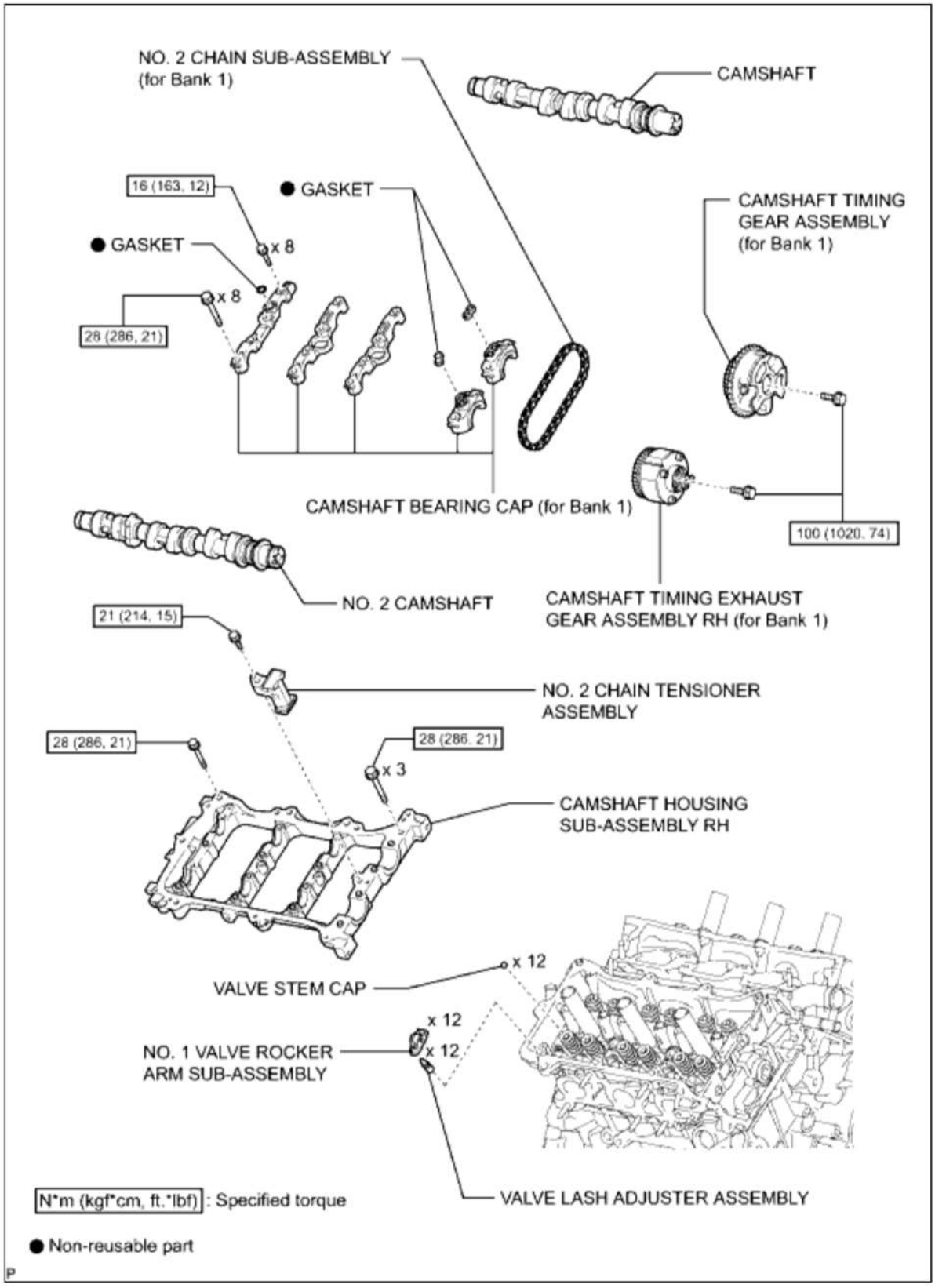
cardiagn.com

ILLUSTRATION



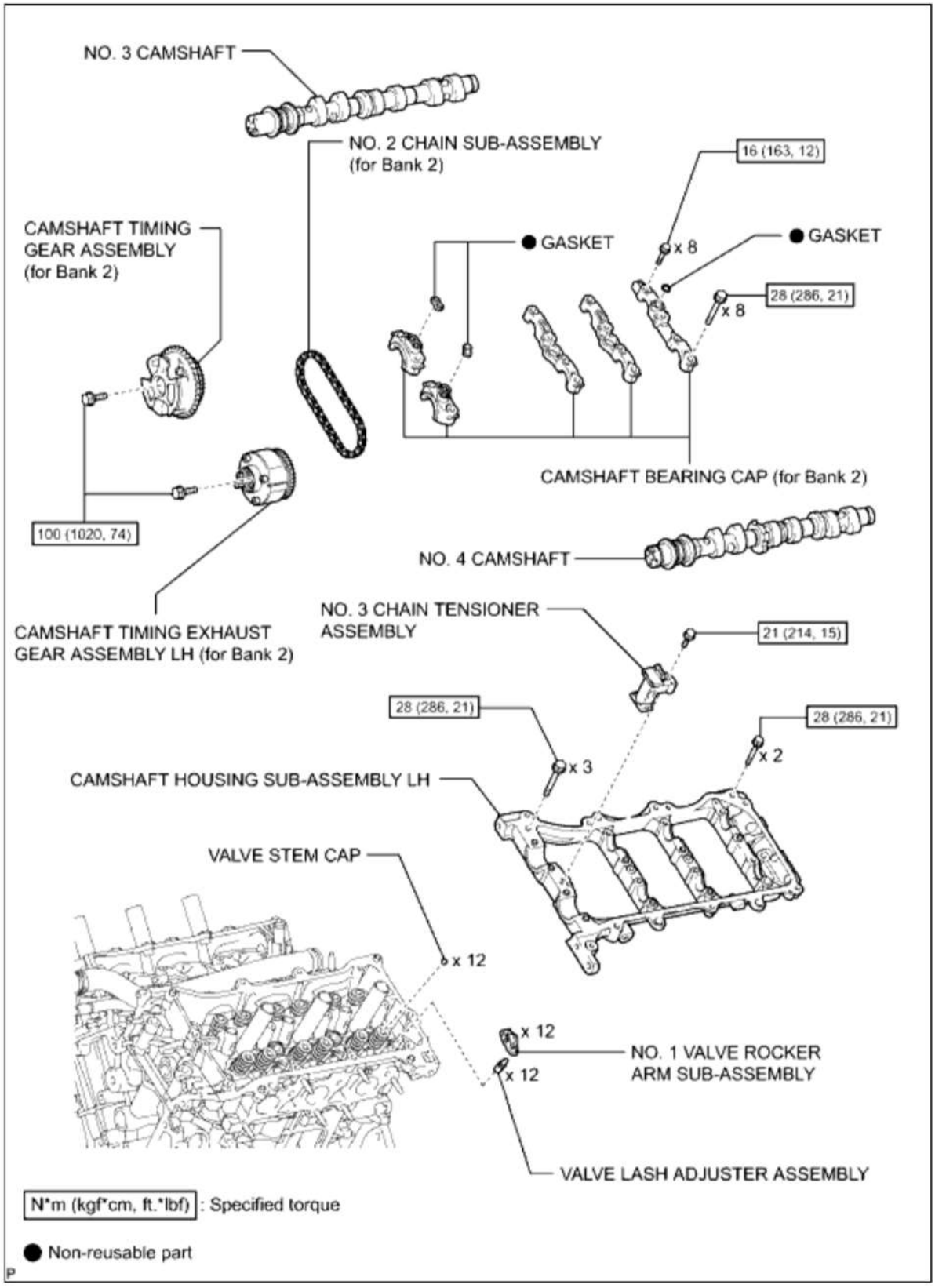
cardiagn.com

ILLUSTRATION



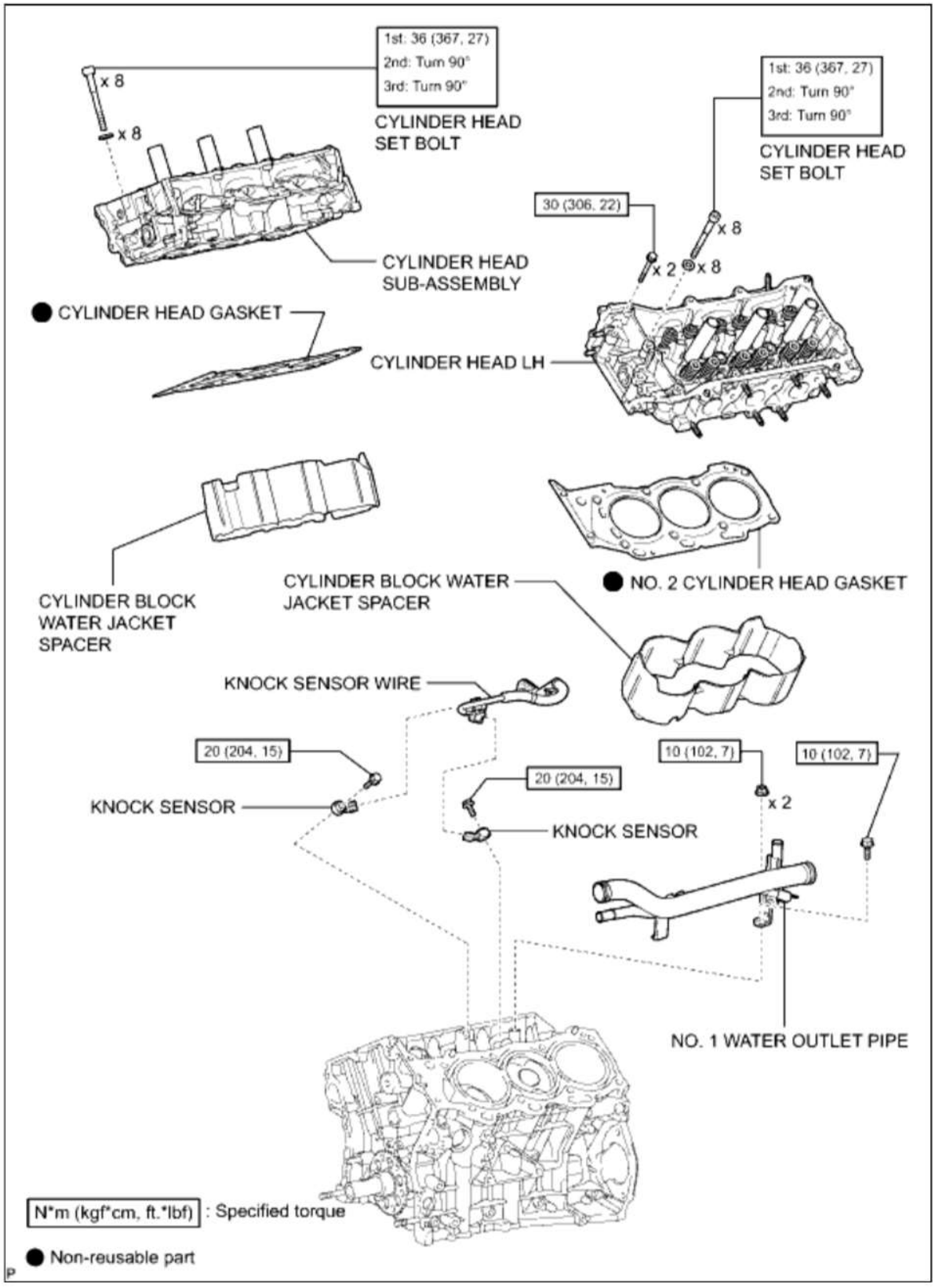
cardiagn.com

ILLUSTRATION



cardiagn.com

ILLUSTRATION



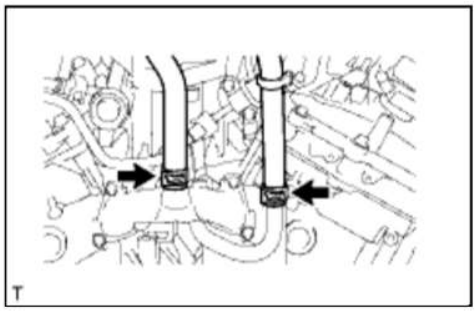
cardiagn.com

Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000002YYZ009X
Title: 1GR-FE ENGINE MECHANICAL: ENGINE UNIT: REMOVAL (2010 4Runner)		

REMOVAL

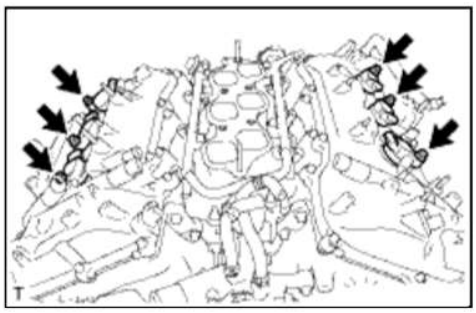
1. REMOVE ENGINE WIRE

2. DISCONNECT HEATER WATER HOSE ASSEMBLY



(a) Disconnect the 2 hoses and remove the heater water hose assembly.

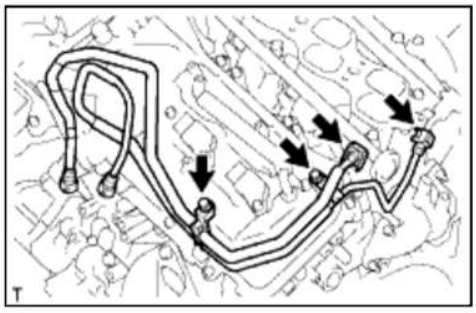
3. REMOVE IGNITION COIL ASSEMBLY



(a) Remove the 6 bolts and 6 ignition coils.

4. REMOVE REAR CYLINDER HEAD COVER INFO

5. REMOVE FUEL PIPE SUB-ASSEMBLY



(a) Disconnect the 2 fuel pipes INFO .

cardiagn.com

(b) Remove the 2 bolts and fuel pipe.

6. REMOVE FUEL DELIVERY PIPE SUB-ASSEMBLY INFO

7. REMOVE FUEL INJECTOR ASSEMBLY INFO

8. REMOVE INTAKE MANIFOLD INFO

9. REMOVE WATER BY-PASS PIPE SUB-ASSEMBLY INFO

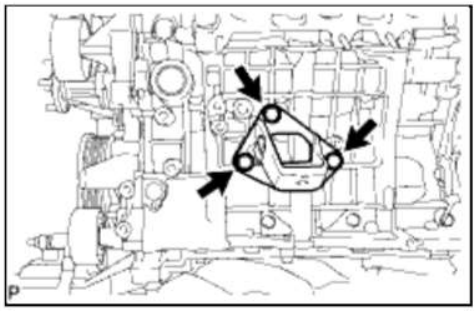
10. REMOVE NO. 1 IDLER PULLEY SUB-ASSEMBLY INFO

11. REMOVE NO. 2 IDLER PULLEY SUB-ASSEMBLY INFO

12. REMOVE V-RIBBED BELT TENSIONER ASSEMBLY INFO

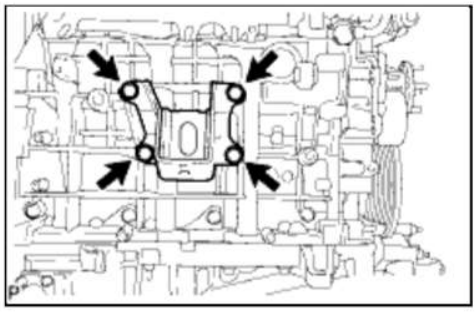
13. REMOVE ENGINE OIL LEVEL DIPSTICK GUIDE INFO

14. REMOVE FRONT NO. 1 ENGINE MOUNTING BRACKET LH



(a) Remove the 3 bolts and front No. 1 engine mounting bracket LH.

15. REMOVE FRONT NO. 1 ENGINE MOUNTING BRACKET RH



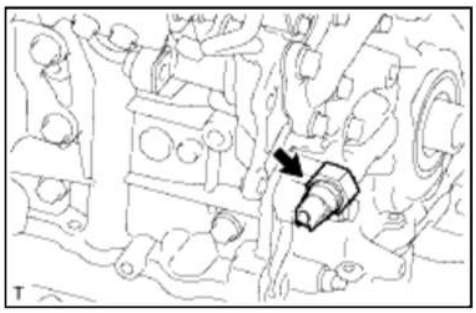
(a) Remove the 4 bolts and front No. 1 engine mounting bracket RH.

cardiagn.com

Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000002BK5015X
Title: 1GR-FE ENGINE MECHANICAL: ENGINE UNIT: DISASSEMBLY (2010 4Runner)		

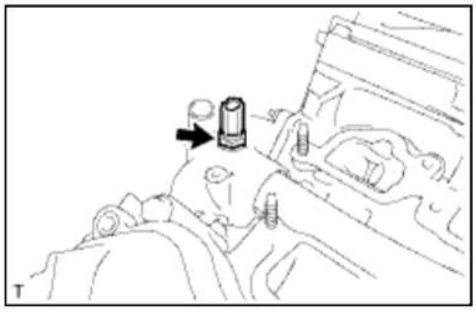
DISASSEMBLY

1. REMOVE ENGINE OIL PRESSURE SWITCH ASSEMBLY



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

2. REMOVE ENGINE COOLANT TEMPERATURE SENSOR



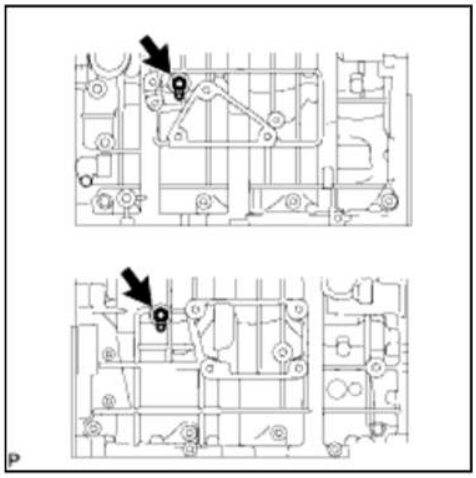
(a) Using a 19 mm deep socket wrench, remove the sensor.

(b) Remove the gasket from the sensor.

3. REMOVE CYLINDER BLOCK WATER DRAIN COCK SUB-ASSEMBLY

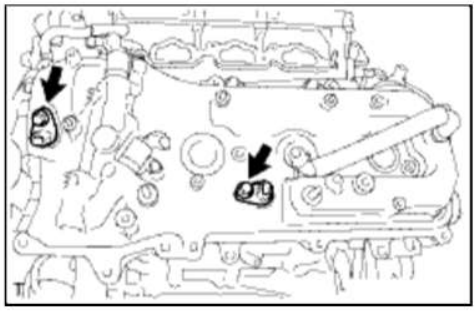
(a) Remove the 2 water drain cock plugs from the water drain cocks.

cardiagn.com



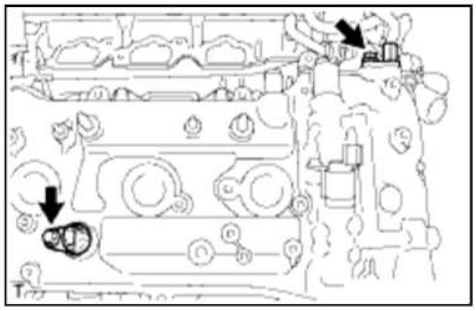
(b) Remove the 2 water drain cocks from the cylinder block.

4. REMOVE VVT SENSOR



(a) LH:

Remove the 2 bolts and 2 VVT sensors.



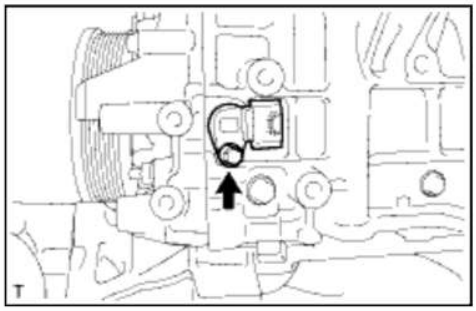
(b) RH:

Remove the 2 bolts and 2 VVT sensors.

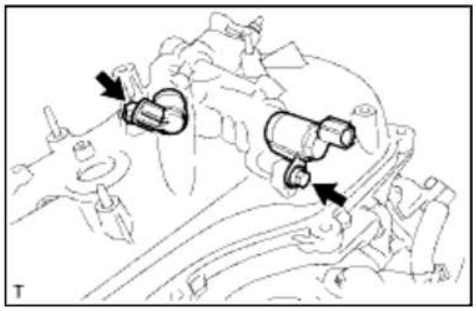
5. REMOVE CRANKSHAFT POSITION SENSOR

(a) Remove the bolt and crankshaft position sensor.

cardiagn.com

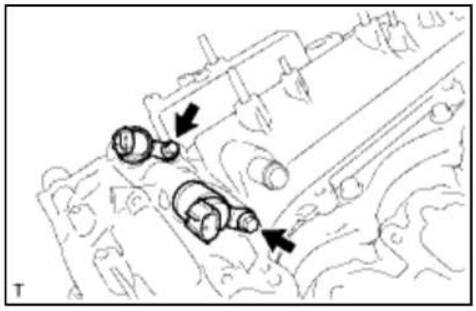


6. REMOVE CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY RH



(a) LH:

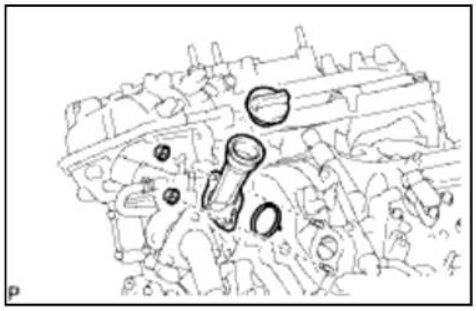
Remove the 2 bolts and 2 oil control valves.



(b) RH:

Remove the 2 bolts and 2 oil control valves.

7. REMOVE OIL FILLER CAP HOUSING



(a) Remove the oil filler cap.

(b) Remove the 2 nuts, oil filler cap housing and gasket.

cardiagn.com

8. REMOVE NO. 1 OIL PIPE INFO

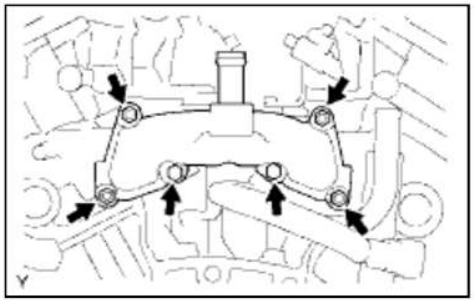
9. REMOVE NO. 2 OIL PIPE INFO

10. REMOVE OIL FILTER ELEMENT INFO

11. REMOVE OIL FILTER BRACKET INFO

12. REMOVE WATER INLET HOUSING INFO

13. REMOVE REAR WATER BY-PASS JOINT

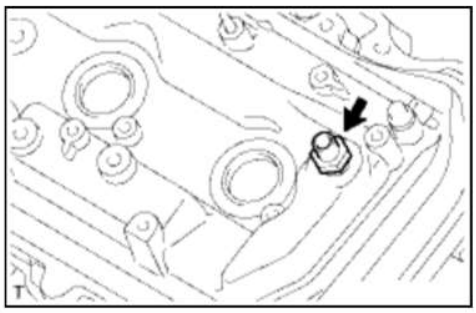


(a) Remove the 2 bolts, 4 nuts, rear water by-pass joint and 2 gaskets.

(b) Remove the O-ring from the No. 1 water outlet pipe.

14. REMOVE SPARK PLUG INFO

15. REMOVE PCV VALVE SUB-ASSEMBLY



(a) Remove the PCV valve hose.

(b) Remove the PCV valve.

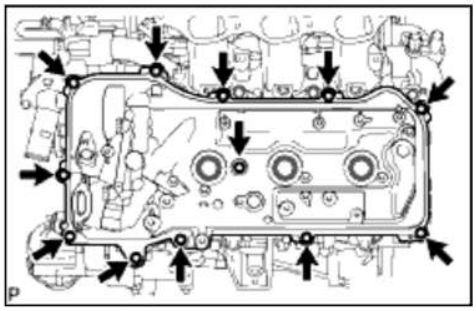
16. REMOVE CRANKSHAFT PULLEY INFO

17. REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY LH

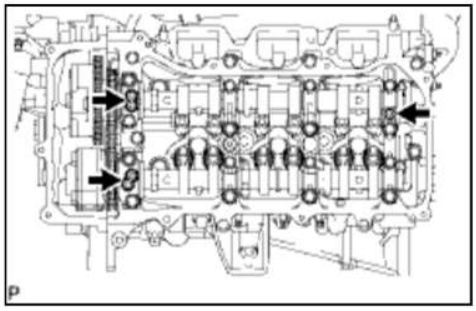
(a) Remove the 12 bolts, seal washer, cylinder head cover and gasket.

HINT:

cardiagn.com

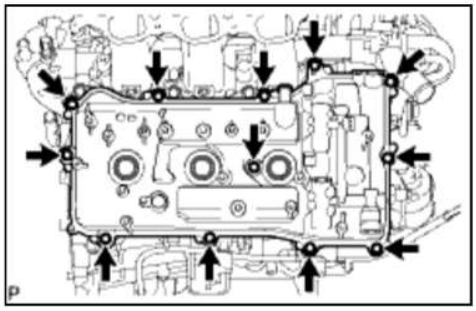


Make sure the removed parts are returned to the same places they were removed from.



(b) Remove the 3 gaskets.

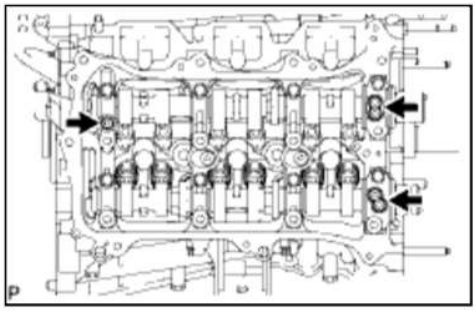
18. REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY



(a) Remove the 12 bolts, seal washer, cylinder head cover and gasket.

HINT:

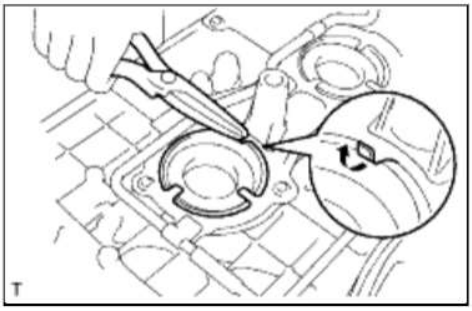
Make sure the removed parts are returned to the same places they were removed from.



(b) Remove the 3 gaskets.

19. REMOVE SPARK PLUG TUBE GASKET

cardiagn.com



(a) Bend the ventilation baffle plate claws on the cylinder head cover to an angle of 90° or more.

Text in Illustration

➡	Pry

(b) Remove the 6 spark plug tube gaskets.

HINT:

Be careful not to damage the gasket when removing it as the removed gasket needs to be used when installing a new one.

20. REMOVE OIL PAN DRAIN PLUG

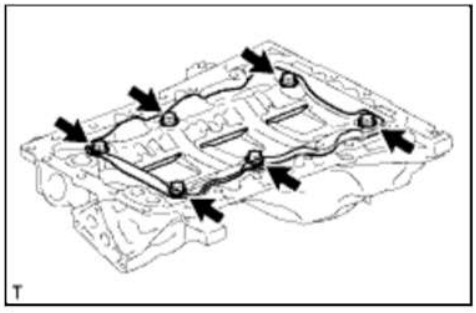
(a) Remove the drain plug and gasket.

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

22. REMOVE OIL STRAINER SUB-ASSEMBLY INFO

23. REMOVE OIL PAN SUB-ASSEMBLY INFO

24. REMOVE NO. 1 OIL PAN BAFFLE PLATE

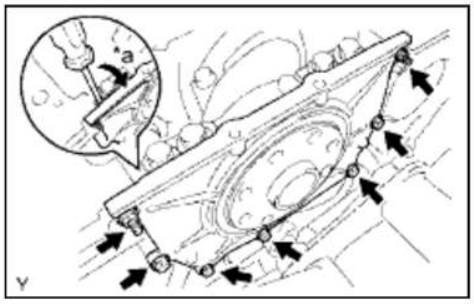


(a) Remove the 6 bolts and No. 1 oil pan baffle plate.

25. REMOVE ENGINE REAR OIL SEAL RETAINER

(a) Remove the 5 bolts and 2 nuts.

cardiagn.com



(b) Using a screwdriver, remove the oil seal retainer by prying between the oil seal retainer and crankshaft bearing cap.

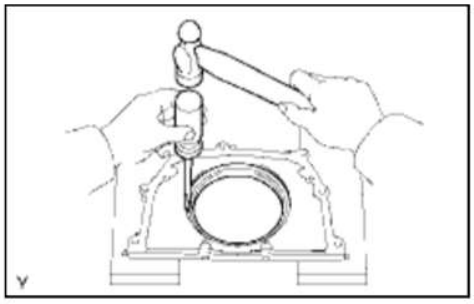
Text in Illustration

*a	Pry

HINT:

Tape the screwdriver tip before use.

26. REMOVE REAR CRANKSHAFT OIL SEAL



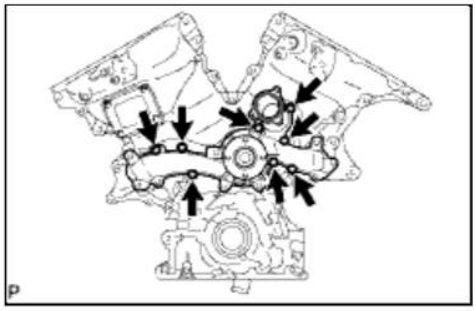
(a) Using a screwdriver and hammer, tap out the oil seal.

NOTICE:

Be careful not to damage the rear oil seal retainer.

27. REMOVE TIMING CHAIN COVER SUB-ASSEMBLY INFO

28. REMOVE WATER PUMP ASSEMBLY



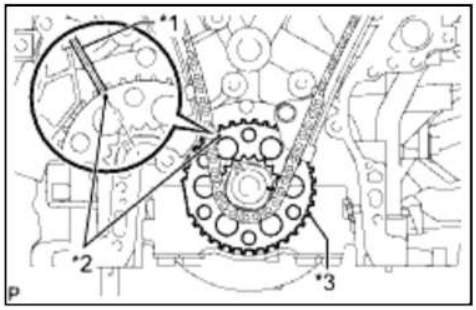
(a) Remove the 8 bolts, water pump and gasket.

cardiagn.com

29. REMOVE FRONT CRANKSHAFT OIL SEAL

30. SET NO. 1 CYLINDER TO TDC/COMPRESSION

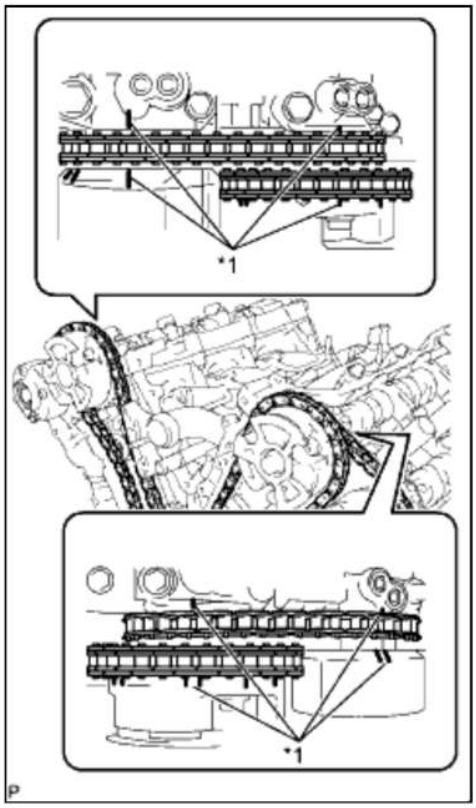
(a) Temporarily install the pulley set bolt.



(b) Turn the crankshaft clockwise to align the timing mark on the crank angle sensor plate with the RH block bore center line (TDC/compression).

Text in Illustration

*1	Center Line
*2	Timing Mark
*3	Sensor Plate



(c) Check that the timing marks of the camshaft timing gears are aligned with the timing marks of the bearing caps as shown in the illustration.

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

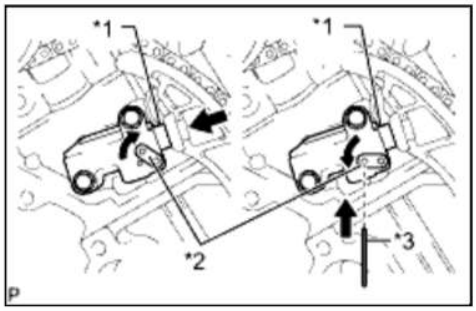
Text in Illustration

*1	Timing Mark

31. REMOVE NO. 1 CHAIN TENSIONER ASSEMBLY

(a) Move the stopper plate upward to release the lock, and push the plunger deep into the tensioner.

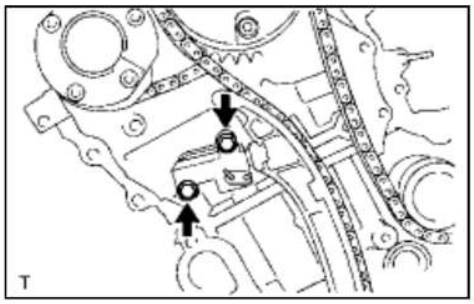
cardiagn.com



Text in Illustration

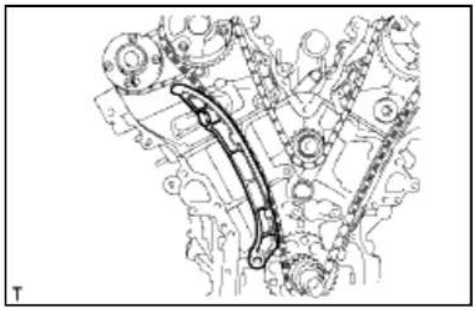
*1	Plunger
*2	Stopper Plate
*3	Pin

(b) Move the stopper plate downward to set the lock, and insert a pin of φ1.27 mm (0.0500 in.) into the stopper plate hole.



(c) Remove the 2 bolts and No. 1 chain tensioner assembly.

32. REMOVE CHAIN TENSIONER SLIPPER



(a) Remove the chain tensioner slipper.

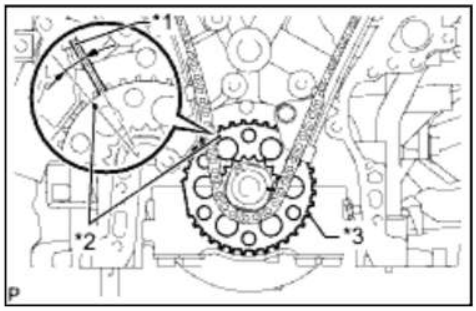
33. REMOVE NO. 1 CHAIN SUB-ASSEMBLY

(a) Turn the crankshaft counterclockwise 10° to loosen the chain of the crankshaft timing sprocket.

Text in Illustration

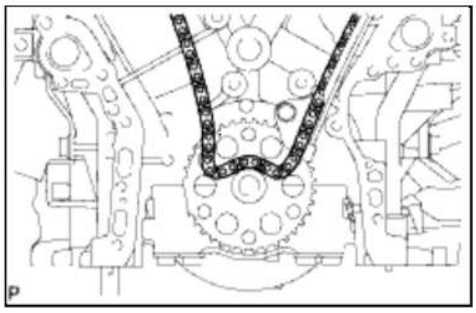
*1	Center Line

cardiagn.com

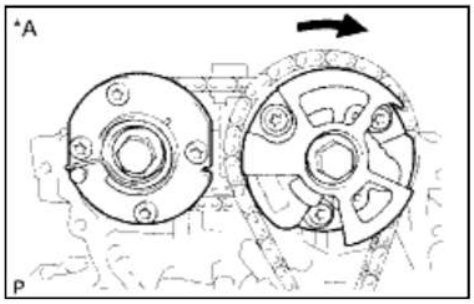


*2	Timing Mark
*3	Sensor Plate

(b) Remove the pulley set bolt.



(c) Remove the chain sub-assembly from the crankshaft timing sprocket and place it on the crankshaft.



(d) Turn the camshaft timing gear assembly on bank 1 clockwise approximately 60° so that it is as shown in the illustration. Be sure to loosen the chain sub-assembly between the banks.

(e) Remove the chain sub-assembly.

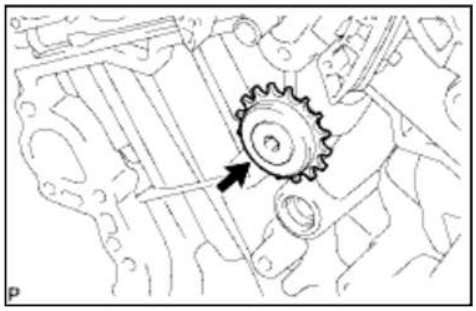
Text in Illustration

*A	for Bank 1

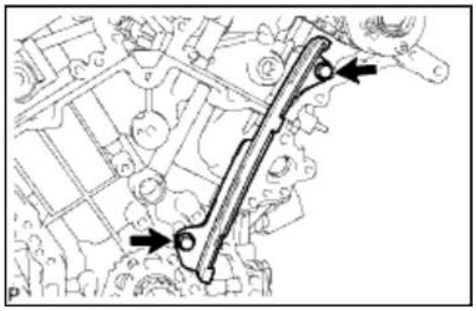
34. REMOVE NO. 1 IDLE GEAR SHAFT

(a) Using a 10 mm hexagon wrench, remove the No. 2 idle gear shaft, No. 1 idle gear and No. 1 idle gear shaft.

cardiagn.com

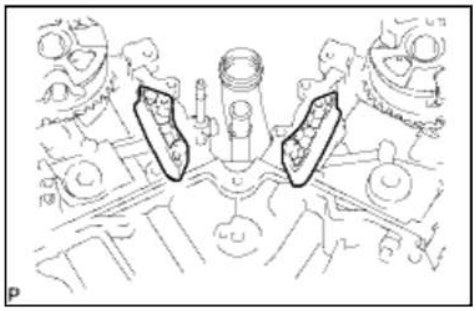


35. REMOVE NO. 1 CHAIN VIBRATION DAMPER



(a) Remove the 2 bolts and No. 1 chain vibration damper.

36. REMOVE NO. 2 CHAIN VIBRATION DAMPER

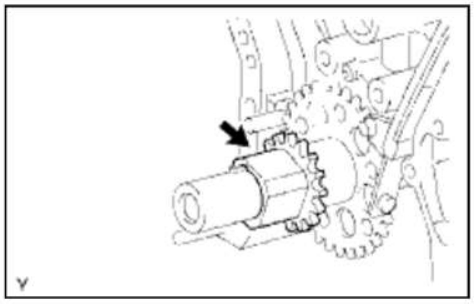


(a) Remove the 2 No. 2 chain vibration dampers.

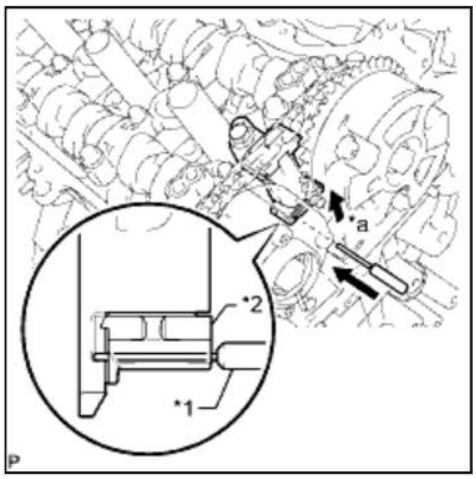
37. REMOVE CRANKSHAFT TIMING SPROCKET

(a) Remove the crankshaft timing sprocket.

cardiagn.com



38. REMOVE CAMSHAFT TIMING GEARS AND NO. 2 CHAIN (for Bank 1)



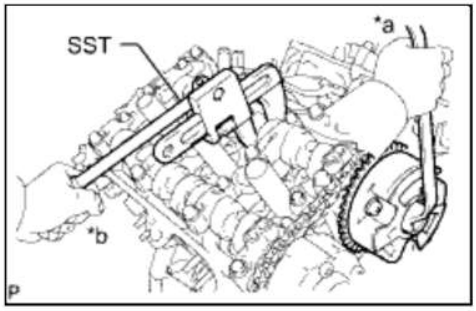
(a) While raising the No. 2 chain tensioner assembly, insert a pin with a diameter of 1.0 mm (0.0394 in.) into the hole to hold the No. 2 chain tensioner assembly.

Text in Illustration

*1	Pin
*2	Plunger
*a	Push

(b) Using SST to hold the hexagonal portion of each camshaft, loosen the bolts of the camshaft timing gear assembly and camshaft timing exhaust gear assembly.

SST: 09922-10010



Text in Illustration

*a	Turn
*b	Hold

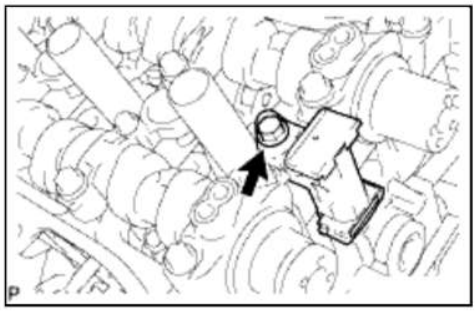
NOTICE:

Do not loosen the other 4 bolts. If any of the 4 bolts is loosened, replace the camshaft timing gear assembly and/or camshaft timing exhaust gear assembly with a new one.

(c) Remove the 2 bolts and camshaft timing gear assembly together with the No. 2 chain.

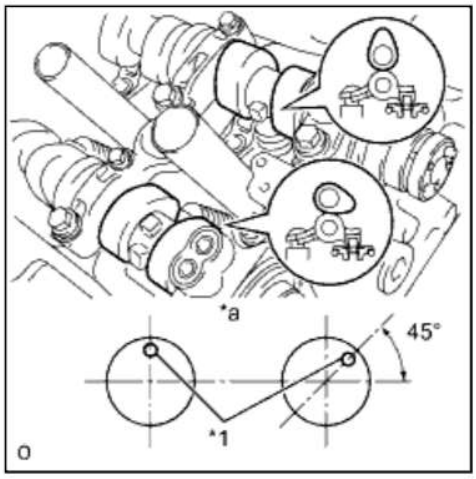
39. REMOVE NO. 2 CHAIN TENSIONER ASSEMBLY

cardiagn.com



(a) Remove the bolt and No. 2 chain tensioner assembly.

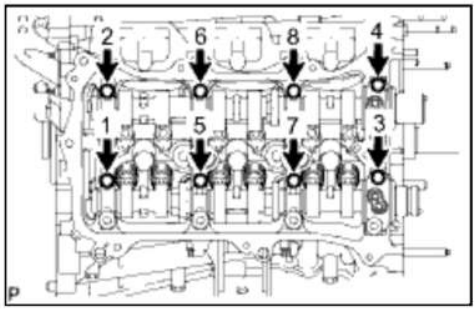
40. REMOVE CAMSHAFT BEARING CAP (for Bank 1)



(a) Check that the camshafts are positioned as shown in the illustration.

Text in Illustration

*1	Knock Pin
*a	Front View



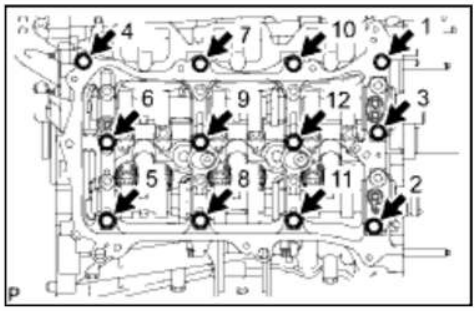
(b) Uniformly loosen and remove the 8 bearing cap bolts in several steps in the sequence shown in the illustration.

(c) Uniformly loosen and remove the 12 bearing cap bolts in several steps in the sequence shown in the illustration.

NOTICE:

Uniformly loosen the bolts while keeping the camshaft level.

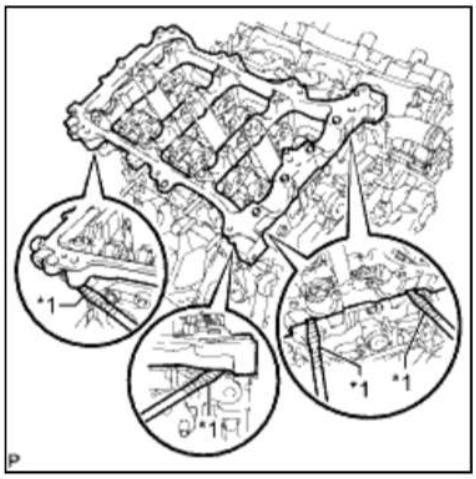
cardiagn.com



(d) Remove the 5 camshaft bearing caps.

(e) Remove the camshaft and No. 2 camshaft.

41. REMOVE CAMSHAFT HOUSING SUB-ASSEMBLY RH



(a) Remove the camshaft housing sub-assembly RH by prying between the cylinder head and camshaft housing sub-assembly RH with a screwdriver.

Text in Illustration

*1	Protective Tape

HINT:

Tape the screwdriver tip before use.

NOTICE:

Be careful not to damage the contact surfaces of the cylinder head and camshaft housing sub-assembly RH.

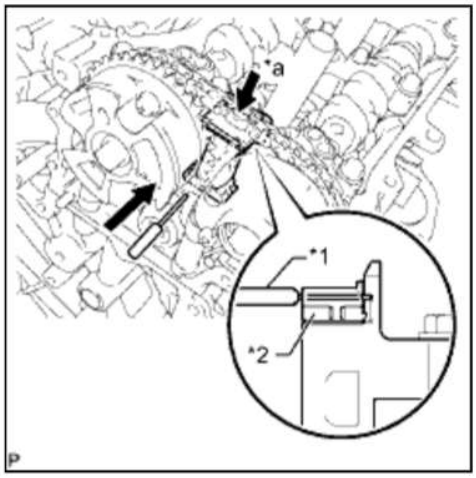
42. REMOVE CAMSHAFT TIMING GEARS AND NO. 2 CHAIN (for Bank 2)

(a) While pushing down the No. 3 chain tensioner assembly, insert a pin with a diameter of 1.0 mm (0.0394 in.) into the hole to hold the No. 3 chain tensioner assembly.

Text in Illustration

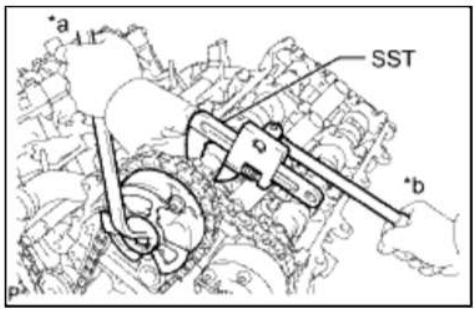
*1	Pin
*2	Plunger
*a	Push

cardiagn.com



(b) Using SST to hold the hexagonal portion of each camshaft, loosen the bolts of the camshaft timing gear assembly and camshaft timing exhaust gear assembly.

SST: 09922-10010



Text in Illustration

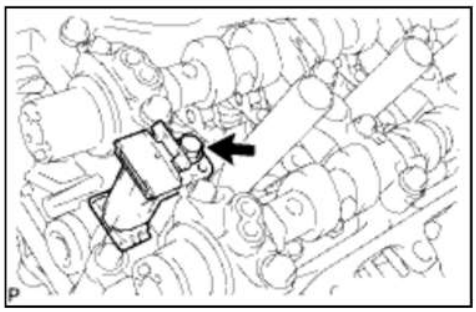
*a	Turn
*b	Hold

NOTICE:

Do not loosen the other 4 bolts. If any of the 4 bolts is loosened, replace the camshaft timing gear assembly and/or camshaft timing exhaust gear assembly with a new one.

(c) Remove the 2 bolts and camshaft timing gear together with the No. 2 chain.

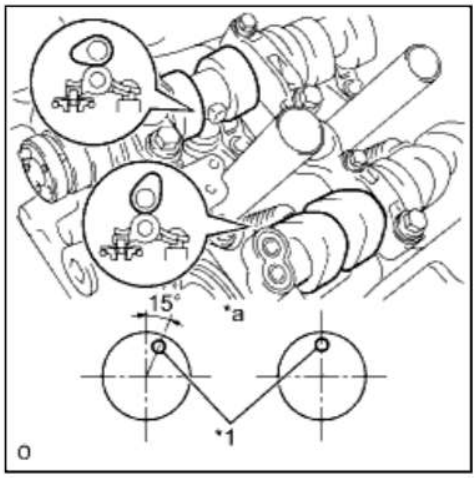
43. REMOVE NO. 3 CHAIN TENSIONER ASSEMBLY



(a) Remove the bolt and No. 3 chain tensioner assembly.

44. REMOVE CAMSHAFT BEARING CAP (for Bank 2)

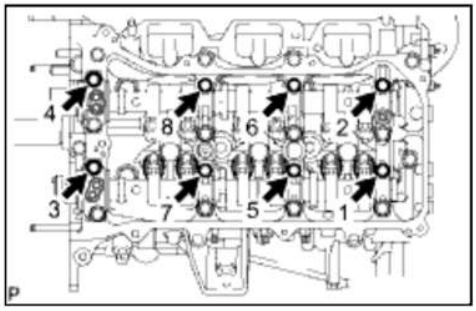
cardiagn.com



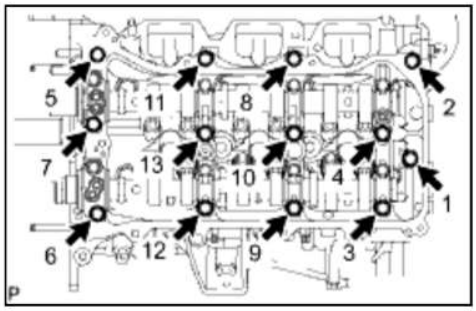
(a) Check that the camshafts are positioned as shown in the illustration.

Text in Illustration

*1	Knock Pin
*a	Front View



(b) Uniformly loosen and remove the 8 bearing cap bolts in several steps in the sequence shown in the illustration.



(c) Uniformly loosen and remove the 13 bearing cap bolts in several steps in the sequence shown in the illustration.

NOTICE:

Uniformly loosen the bolts while keeping the camshaft level.

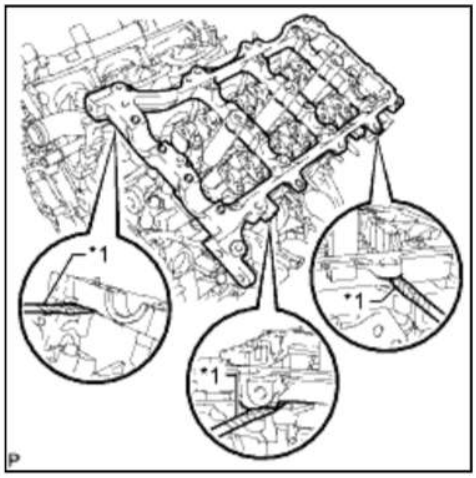
(d) Remove the 5 camshaft bearing caps.

(e) Remove the No. 3 camshaft and No. 4 camshaft.

45. REMOVE CAMSHAFT HOUSING SUB-ASSEMBLY LH

(a) Remove the camshaft housing sub-assembly LH by prying between the cylinder head and camshaft housing sub-assembly LH with a screwdriver.

cardiagn.com



Text in Illustration

*1	Protective Tape

HINT:

Tape the screwdriver tip before use.

NOTICE:

Be careful not to damage the contact surfaces of the cylinder head and camshaft housing sub-assembly LH.

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

(a) Remove the 24 valve rocker arms from the cylinder head.

HINT:

Arrange the removed parts in the correct order.

47. REMOVE VALVE LASH ADJUSTER ASSEMBLY

(a) Remove the 24 valve lash adjusters from the cylinder head.

HINT:

Arrange the removed parts in the correct order.

48. REMOVE VALVE STEM CAP

(a) Remove the 24 valve stem caps from the cylinder head.

HINT:

Arrange the removed parts in the correct order.

49. REMOVE CYLINDER HEAD SUB-ASSEMBLY INFO

50. REMOVE CYLINDER HEAD LH INFO

51. REMOVE CYLINDER HEAD GASKET

52. REMOVE NO. 2 CYLINDER HEAD GASKET

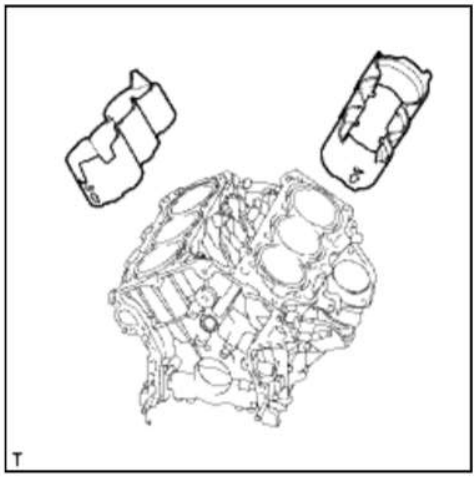
53. REMOVE NO. 1 WATER OUTLET PIPE INFO

54. REMOVE KNOCK SENSOR INFO

55. REMOVE CYLINDER BLOCK WATER JACKET SPACER

(a) Remove the 2 water jacket spacers from the cylinder head.

cardiagn.com



NOTICE:

Be sure to remove the water jacket spacers. If not, they may fall and become damaged when the cylinder block is inverted.

56. REMOVE STRAIGHT PIN

NOTICE:

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

57. REMOVE RING PIN

NOTICE:

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

58. REMOVE STUD BOLT

NOTICE:

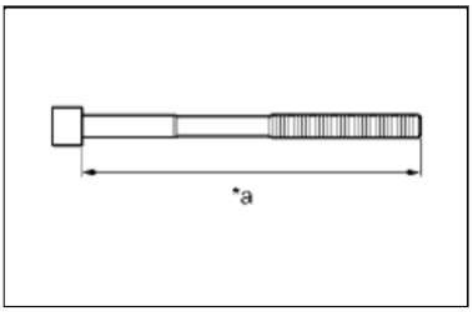
It is not necessary to remove a stud bolt unless it is being replaced.

cardiagn.com

Last Modified: 5-10-2010	6.4 G	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000002BK301CX
Title: 1GR-FE ENGINE MECHANICAL: ENGINE UNIT: INSPECTION (2010 4Runner)		

INSPECTION

1. INSPECT CYLINDER HEAD SET BOLT



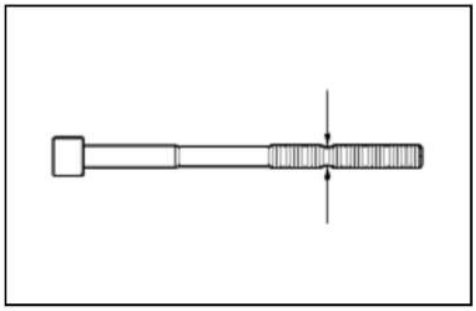
(a) Using a vernier caliper, measure the length of the cylinder head set bolt from the seat to the end.

Text in Illustration

*a	Measurement Length

Standard length:
141.3 to 142.7 mm (5.56 to 5.62 in.)
Maximum length:
143.7 mm (5.66 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 narrowest visible area.

Standard diameter:
10.73 to 10.97 mm (0.422 to 0.432 in.)
Minimum diameter:
10.40 mm (0.409 in.)

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

2. 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.

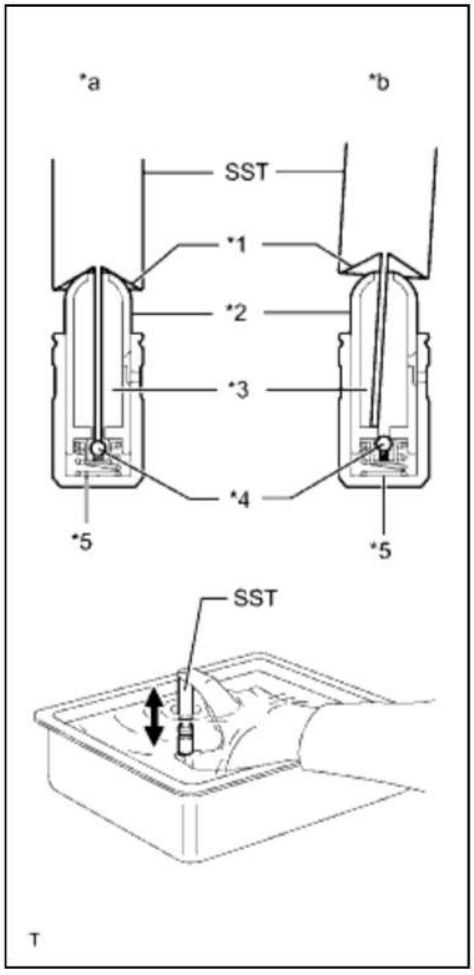
cardiagn.com

3. INSPECT VALVE LASH ADJUSTER ASSEMBLY

NOTICE:

- Keep the valve lash adjuster assembly free of dirt and foreign objects.
- Only use clean engine oil.

(a) Place the valve lash adjuster assembly into a container filled with engine oil.



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

SST: 09276-75010

Text in Illustration

*1	Tapered Path
*2	Plunger
*3	Low Pressure Chamber
*4	Check Ball
*5	High Pressure Chamber
*a	CORRECT
*b	INCORRECT

(c) Squeeze SST and the valve lash adjuster assembly 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 air from the high-pressure 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 will not bleed.

(e) After bleeding the air, remove SST. Then try to quickly and firmly press the plunger by hand.

OK:

Plunger is very difficult to move.

If the result is not as specified, replace the valve lash adjuster assembly.

cardiagn.com

4. INSPECT CAMSHAFT

(a) Inspect the camshaft runout.

(1) Place the camshaft on V-blocks.

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

Maximum runout:
0.04 mm (0.00157 in.)

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

HINT:

Check the oil clearance after replacing the camshaft.

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

Standard Cam Lobe Height:

ITEM	SPECIFIED CONDITION
Intake camshaft	43.890 to 43.990 mm (1.728 to 1.732 in.)
Exhaust camshaft	44.262 to 44.362 mm (1.743 to 1.747 in.)

Minimum Cam Lobe Height:

ITEM	SPECIFIED CONDITION
Intake camshaft	43.840 mm (1.726 in.)
Exhaust camshaft	44.212 mm (1.741 in.)

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

Standard Journal Diameter:

ITEM	SPECIFIED CONDITION
No. 1 journal	35.946 to 35.960 mm (1.4152 to 1.4157 in.)
Other journals	25.959 to 25.975 mm (1.0221 to 1.0226 in.)

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

5. INSPECT CAMSHAFT TIMING GEAR ASSEMBLY

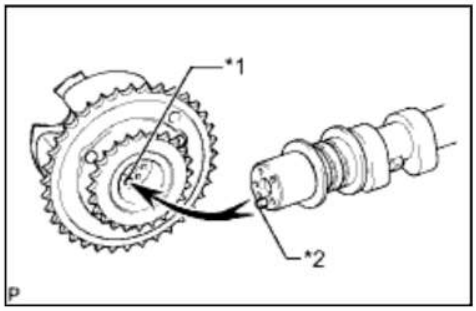
(a) Fix the camshaft in place.

NOTICE:
Be careful not to damage the camshaft.

(b) Put the camshaft timing gear assembly and camshaft together by aligning the pin hole and straight pin.

Text in Illustration

cardiagn.com



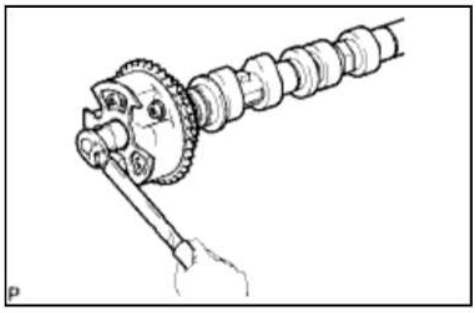
*1	Pin Hole
*2	Straight Pin

(c) Lightly press and turn the camshaft timing gear assembly against the camshaft, and press harder after the pin enters the hole.

NOTICE:

Be sure not to turn the camshaft timing gear assembly in the retard direction.

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



(e) Tighten the flange bolt while holding the camshaft.

Torque: 100 N·m (1020 kgf·cm, 74ft·lbf)

(f) Check the lock of the camshaft timing gear assembly.

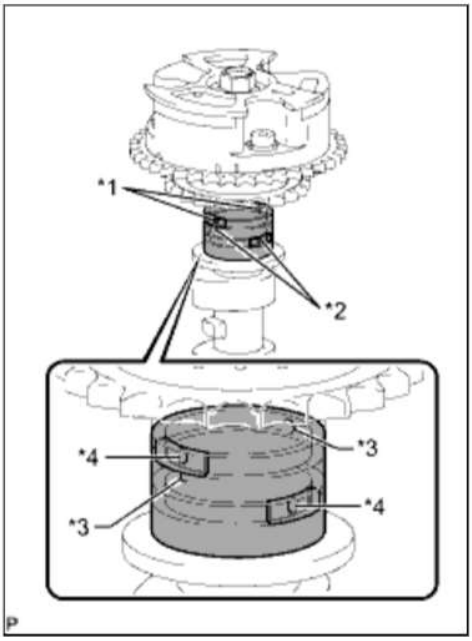
(1) Fix the camshaft in place and confirm that the camshaft timing gear assembly is locked.

NOTICE:

Be careful not to damage the camshaft.

(g) Release the lock pin.

cardiagn.com



(1) Cover the 4 oil paths of the cam journal with vinyl tape as shown in the illustration.

Text in Illustration

*1	Advance Side Path
*2	Retard Side Path
*3	Open
*4	Close
	Rubber
	Vinyl Tape

HINT:

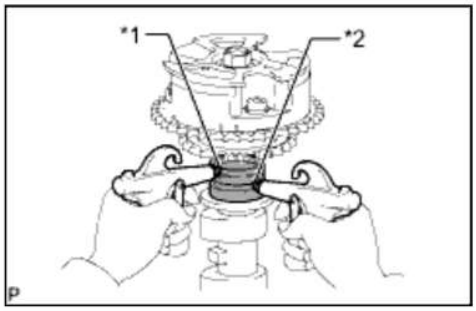
The 2 advance side paths are located in the camshaft groove. Plug one of the paths with a rubber piece.

(2) Break through the tape on the advance side path and the retard side path on the opposite side of the hole of the advance side path, as shown in the illustration.

(3) Apply air at approximately 200 kPa (2.0 kgf/cm2, 28 psi) to the 2 open paths.

Text in Illustration

cardiagn.com



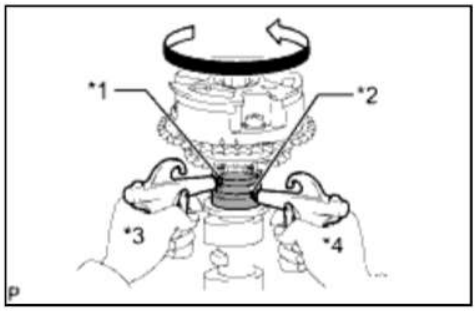
*1	Advance Side Path
*2	Retard Side Path

CAUTION:

Cover the paths with a piece of cloth when applying pressure to prevent oil from spraying.

(4) Check that the camshaft timing gear assembly rotates in the advance direction when reducing the air pressure applied to the retard side path.

Text in Illustration



*1	Advance Side Path
*2	Retard Side Path
*3	Hold Pressure
*4	Decompress

HINT:

This operation releases the lock pin at the most retarded position.

(5) When the camshaft timing gear assembly reaches the most advanced position, release the air pressure first from the retard side path and next from the advance side path.

NOTICE:

Do not release the air pressure from the advance side path first. The gear may abruptly shift in the retard direction and break the lock pin.

(h) Check for smooth rotation.

(1) Turn the camshaft timing gear assembly within its movable range (21°) 2 or 3 times, but do not turn it to the most retarded position. Make sure that the gear turns smoothly.

NOTICE:

Do not use air pressure to perform the smooth operation check.

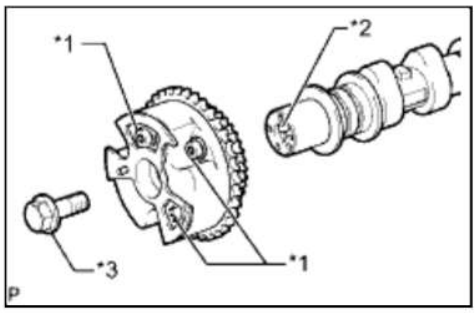
(i) Check the lock in the most retarded position.

(1) Confirm that the camshaft timing gear assembly locks at the most retarded position.

(j) Remove the flange bolt and camshaft timing gear assembly.

Text in Illustration

cardiagn.com



*1	Do not remove
*2	Straight Pin
*3	Flange Bolt

NOTICE:

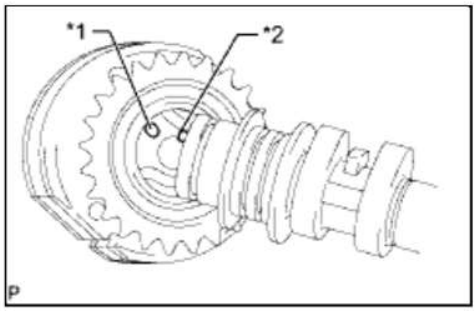
- Do not remove the other 3 bolts.
- If planning to reuse the camshaft timing gear, be sure to release the straight pin lock before installing the camshaft timing gear.

6. INSPECT CAMSHAFT TIMING EXHAUST GEAR ASSEMBLY

(a) Fix the camshaft in place.

NOTICE:

Be careful not to damage the camshaft.



(b) Put the camshaft timing exhaust gear assembly and camshaft together by aligning the pin hole and straight pin.

Text in Illustration

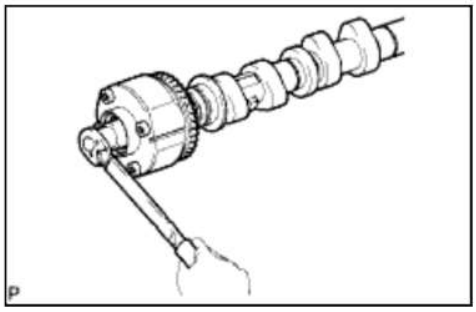
*1	Pin Hole
*2	Straight Pin

(c) Lightly press and turn the camshaft timing gear assembly against the camshaft, and press harder after the pin enters the hole.

NOTICE:

Be sure not to turn the camshaft timing exhaust gear in the advanced direction.

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



(e) Tighten the flange bolt while holding the camshaft.

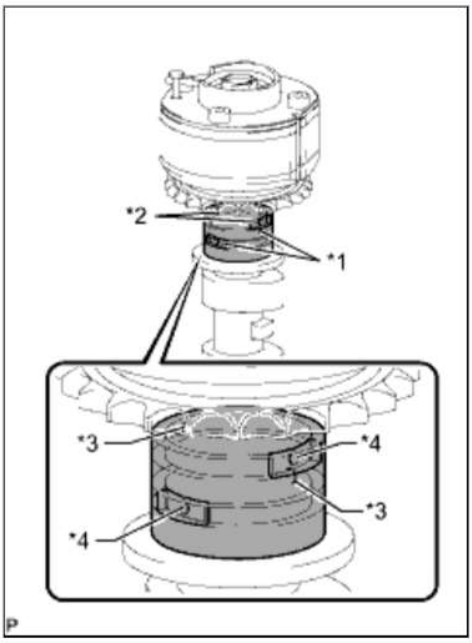
Torque: 100 N·m (1020 kgf·cm, 74ft·lbf)

cardiagn.com

(f) Check the camshaft timing exhaust gear lock.

(1) Make sure that the camshaft timing exhaust gear assembly locks.

(g) Release the lock pin.



(1) Cover the 4 oil paths of the cam journal with vinyl tape as shown in the illustration.

Text in Illustration

*1	Advance Side Path
*2	Retard Side Path
*3	Open
*4	Close
	Rubber
	Vinyl Tape

HINT:

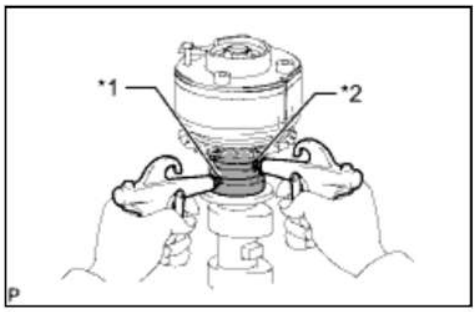
The 2 advance side paths are located in the camshaft groove. Plug one of the paths with a rubber piece.

(2) Break through the tape on the advance side path and the retard side path on the opposite side of the hole of the advance side path, as shown in the illustration.

(3) Apply air at approximately 200 kPa (2.0 kgf/cm2, 28

cardiagn.com

psi) to the 2 open paths (the advance side path and retard side path).



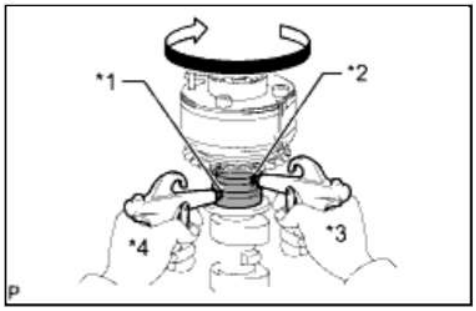
Text in Illustration

*1	Advance Side Path
*2	Retard Side Path

CAUTION:

Cover the paths with a piece of cloth when applying pressure to prevent oil from spraying.

(4) Make sure that the camshaft timing exhaust gear assembly rotates in the retard direction when reducing the air pressure applied to the advance side path.



Text in Illustration

*1	Advance Side Path
*2	Retard Side Path
*3	Hold Pressure
*4	Decompress

HINT:

The lock pin is released and the camshaft timing exhaust gear assembly turns in the retard direction.

(5) When the camshaft timing exhaust gear assembly moves to the most retarded position, release the air pressure first from the advance side path, and then release the air pressure from the retard side path.

NOTICE:

Be sure to release the air pressure from the advance side path first. If the air pressure of the retard side path is released first, the camshaft timing exhaust gear assembly may abruptly shift in the advance direction and break the lock pin or other parts.

(h) Check for smooth rotation.

(1) Turn the camshaft timing exhaust gear assembly within its movable range (18.5°) 2 or 3 times, but do not turn it to the most advanced position. Make sure that the gear assembly turns smoothly.

NOTICE:

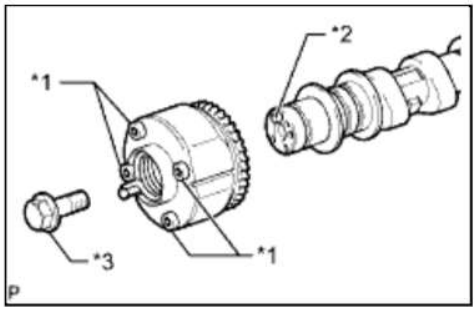
When the air pressure is released from the advance side path and then from the retard side path, the gear assembly automatically returns to the most advanced position due to the advance assist spring operation and locks. Gradually release the air pressure from the retard side path before performing the smooth rotation check.

cardiagn.com

(i) Check the lock at the most advanced position.

(1) Make sure that the camshaft timing exhaust gear assembly locks at the most advanced position.

(j) Remove the flange bolt and camshaft timing exhaust gear assembly.



Text in Illustration

*1	Do not remove
*2	Straight Pin
*3	Flange Bolt

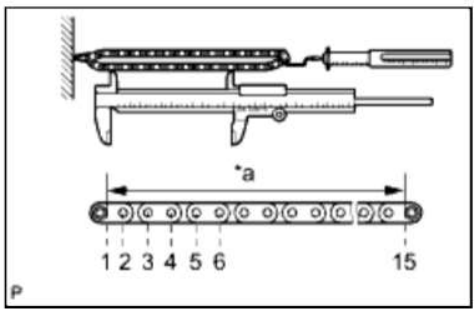
NOTICE:

- Be sure not to remove the other 4 bolts.
- If planning to reuse the gear, be sure to release the straight pin lock before installing the gear.

7. INSPECT NO. 1 CHAIN SUB-ASSEMBLY

(a) Using a spring scale, pull the No. 1 chain with a force of 147 N (15 kgf, 33 lbf) and measure the length of the No. 1 chain using a vernier caliper.

Maximum chain elongation:
136.9 mm (5.39 in.)



Text in Illustration

*a	Measurement Area

HINT:

Perform the measurement at 3 random places.

If a measurement is more than the maximum, replace the No. 1 chain.

8. INSPECT NO. 2 CHAIN SUB-ASSEMBLY

(a) Using a spring scale, pull the No. 2 chain with a force of 147 N (15 kgf, 33 lbf) and measure the length of the No. 2 chain using a vernier caliper.

Maximum chain elongation:
137.6 mm (5.42 in.)

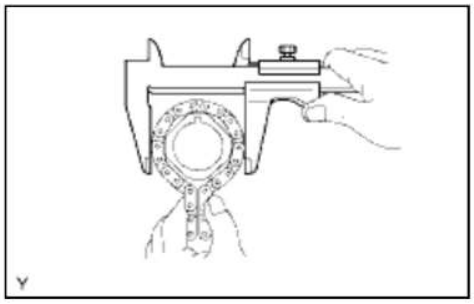
cardiagn.com

HINT:

Perform the measurement at 3 random places.

If a measurement is more than the maximum, replace the No. 2 chain.

9. INSPECT CRANKSHAFT TIMING SPROCKET



(a) Wrap the No. 1 chain around the sprocket.

(b) Using a vernier caliper, measure the crankshaft timing sprocket diameter with the No. 1 chain.

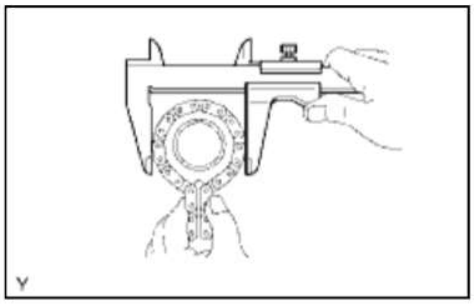
Minimum gear diameter (with chain):
61.0 mm (2.40 in.)

HINT:

The vernier caliper must contact the chain rollers for the measurement.

If the diameter is less than the minimum, replace the No. 1 chain and crankshaft timing sprocket.

10. INSPECT NO. 1 IDLE GEAR



(a) Wrap the No. 1 chain around the gear.

(b) Using a vernier caliper, measure the No. 1 idle gear diameter with the No. 1 chain.

Minimum gear diameter (with chain):
61.0 mm (2.40 in.)

HINT:

The vernier caliper must contact the chain rollers for the measurement.

If the diameter is less than the minimum, replace the No. 1 chain and No. 1 idle gear.

11. INSPECT NO. 1 IDLE GEAR SHAFT OIL CLEARANCE

cardiagn.com

(a) Using a micrometer, measure the No. 1 idle gear shaft diameter.

Standard idle gear shaft diameter:
22.987 to 23.000 mm (0.905 to 0.906 in.)

(b) Using a caliper gauge, measure the inside diameter of the idle gear.

Standard idle gear inside diameter:
23.02 to 23.03 mm (0.906 to 0.907 in.)

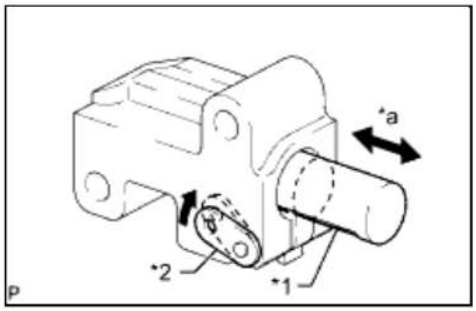
(c) Subtract the idle gear shaft diameter measurement from the idle gear inside diameter measurement.

Standard oil clearance:
0.020 to 0.043 mm (0.000787 to 0.00169 in.)
Maximum oil clearance:
0.093 mm (0.00366 in.)

If the shaft oil clearance is more than the maximum, replace the idle gear shaft and idle gear.

12. INSPECT NO. 1 CHAIN TENSIONER ASSEMBLY

(a) Move the stopper plate upward to release the lock. Push the plunger and check that it moves smoothly.



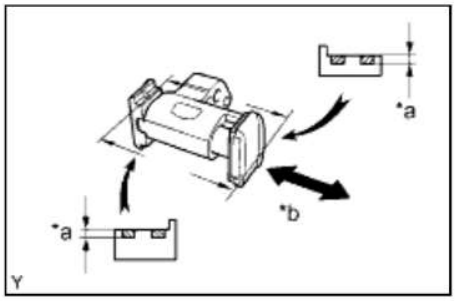
Text in Illustration

*1	Plunger
*2	Stopper Plate
*a	Moves Smoothly

If necessary, replace the No. 1 chain tensioner.

13. INSPECT NO. 2 CHAIN TENSIONER ASSEMBLY

(a) Check that the plunger moves smoothly.



Text in Illustration

*a	Depth
*b	Moves Smoothly

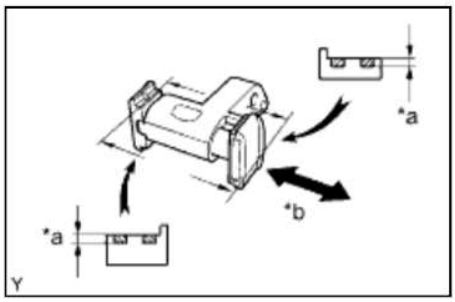
(b) Measure the depth of wear of the chain tensioner.

Maximum depth:
1.0 mm (0.0394 in.)

If the depth is more than the maximum, replace the No. 2 chain tensioner.

cardiagn.com

14. INSPECT NO. 3 CHAIN TENSIONER ASSEMBLY



(a) Check that the plunger moves smoothly.

Text in Illustration

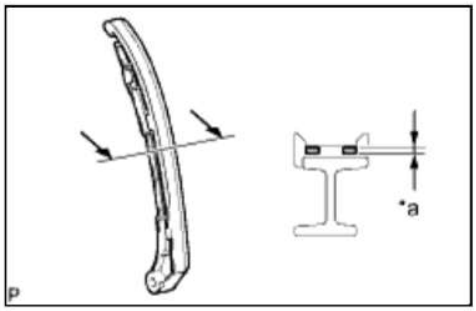
*a	Depth
*b	Moves Smoothly

(b) Measure the depth of wear of the chain tensioner.

Maximum depth:
1.0 mm (0.0394 in.)

If the depth is more than the maximum, replace the No. 3 chain tensioner.

15. INSPECT CHAIN TENSIONER SLIPPER



(a) Measure the depth of wear of the chain tensioner slipper.

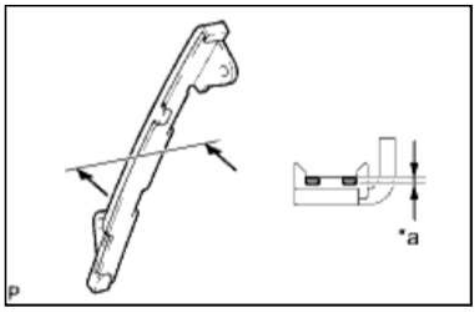
Maximum depth:
1.0 mm (0.0394 in.)

Text in Illustration

*a	Depth

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

16. INSPECT NO. 1 CHAIN VIBRATION DAMPER



(a) Measure the depth of wear of the No. 1 chain vibration damper.

Maximum depth:
1.0 mm (0.0394 in.)

Text in Illustration

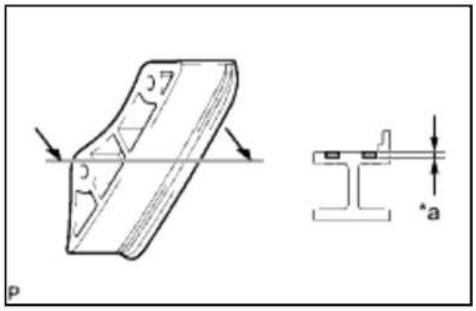
*a	Depth

If the depth is more than the maximum, replace the No. 1

cardiagn.com

chain vibration damper.

17. INSPECT NO. 2 CHAIN VIBRATION DAMPER



(a) Measure the depth of wear of the No. 2 chain vibration damper.

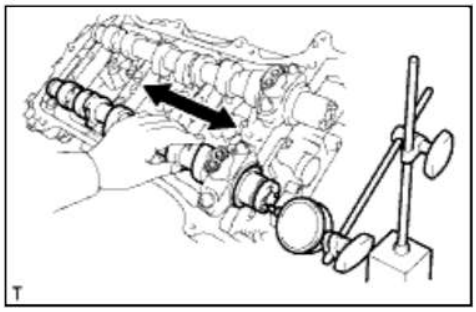
Maximum depth:
1.0 mm (0.0394 in.)

Text in Illustration

*a	Depth

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

18. INSPECT CAMSHAFT THRUST CLEARANCE



(a) Install the camshafts INFO .

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

Standard thrust clearance:
0.08 to 0.13 mm (0.00315 to 0.00512 in.)
Maximum thrust clearance:
0.15 mm (0.00591 in.)

If the thrust clearance is more than the maximum, replace the camshafts.

If necessary, replace the camshaft bearing caps and cylinder head as a set.

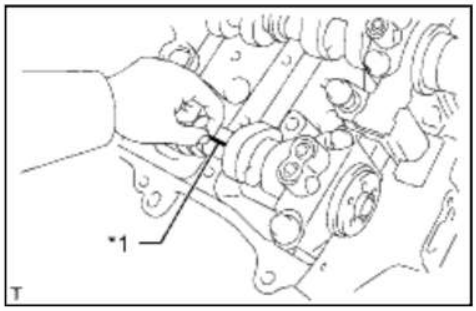
19. INSPECT CAMSHAFT OIL CLEARANCE

(a) Clean the camshaft bearing caps, camshaft housing and camshaft journals.

(b) Place the camshafts on the camshaft housing.

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

cardiagn.com



Text in Illustration

*1	Plastigage

(d) Install the camshaft bearing caps INFO .

NOTICE:

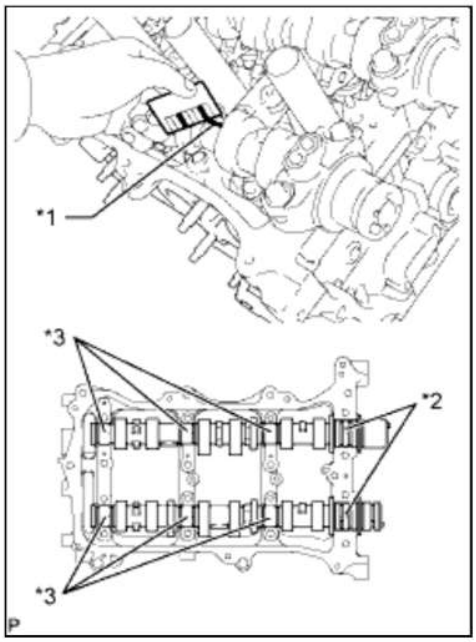
Do not turn the camshaft.

(e) Remove the camshaft bearing caps INFO .

(f) Measure the Plastigage at its widest point.

Standard Oil Clearance:

ITEM	SPECIFIED CONDITION
No. 1 journal	0.032 to 0.063 mm (0.00126 to 0.00248 in.)
Other journals	0.025 to 0.062 mm (0.000984 to 0.00244 in.)



Maximum Oil Clearance:

ITEM	SPECIFIED CONDITION
No. 1 journal	0.10 mm (0.00394 in.)
Other journals	0.09 mm (0.00354 in.)

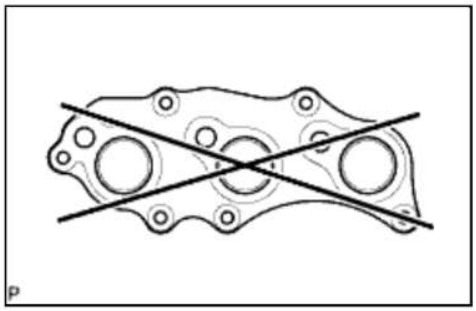
Text in Illustration

*1	Plastigage
*2	No. 1 Journal
*3	Other Journals

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

20. INSPECT EXHAUST MANIFOLD SUB-ASSEMBLY

cardiagn.com

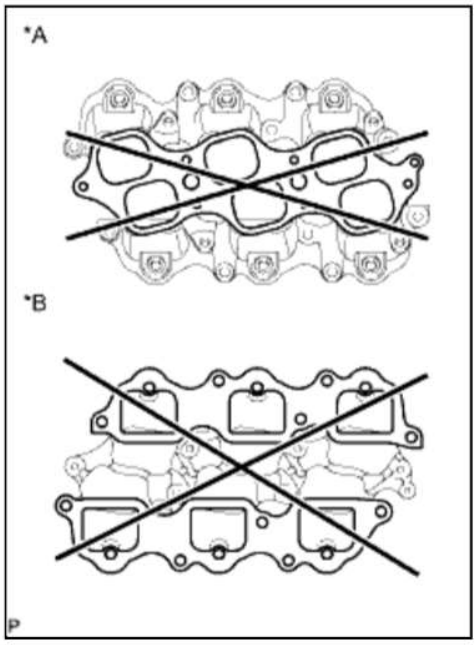


(a) Using a precision straightedge and feeler gauge, measure the warpage of the surface which contacts the cylinder head.

Maximum warpage:
0.70 mm (0.0276 in.)

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

21. INSPECT INTAKE MANIFOLD FOR FLATNESS



(a) Using a precision straightedge and feeler gauge, measure the warpage of the surfaces which contact the cylinder head and intake air surge tank.

Maximum Warpage:

ITEM	SPECIFIED CONDITION
Intake air surge tank side	0.80 mm (0.0315 in.)
Cylinder head side	0.20 mm (0.00787 in.)

Text in Illustration

*A	Intake Air Surge Tank Side
*B	Cylinder Head Side

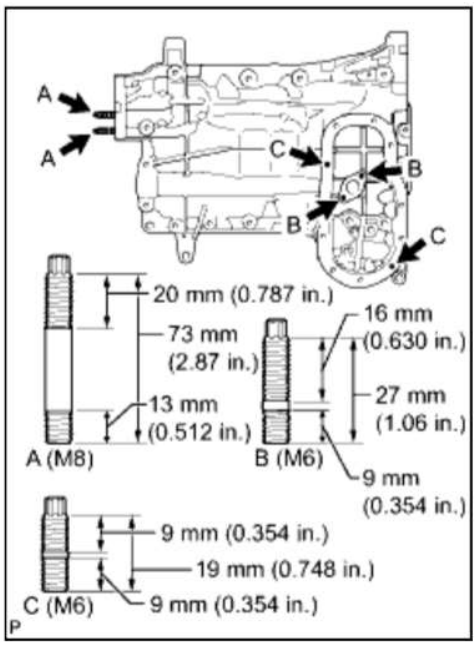
If the warpage is more than the maximum, replace the intake manifold.

cardiagn.com

Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000002BK6015X
Title: 1GR-FE ENGINE MECHANICAL: ENGINE UNIT: REASSEMBLY (2010 4Runner)		

REASSEMBLY

1. INSTALL STUD BOLT

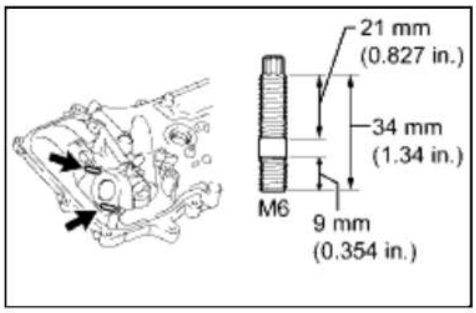


(a) Install the oil pan stud bolt.

(1) Using E6 and E8 "TORX" socket wrenches, install the 6 stud bolts as shown in the illustration.

for stud bolt A - Torque: 10 N·m (102 kgf·cm, 7ft·lbf)

for stud bolt B and C - Torque: 4.0 N·m (41 kgf·cm, 35in·lbf)



(b) Install the cylinder head cover LH stud bolt.

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

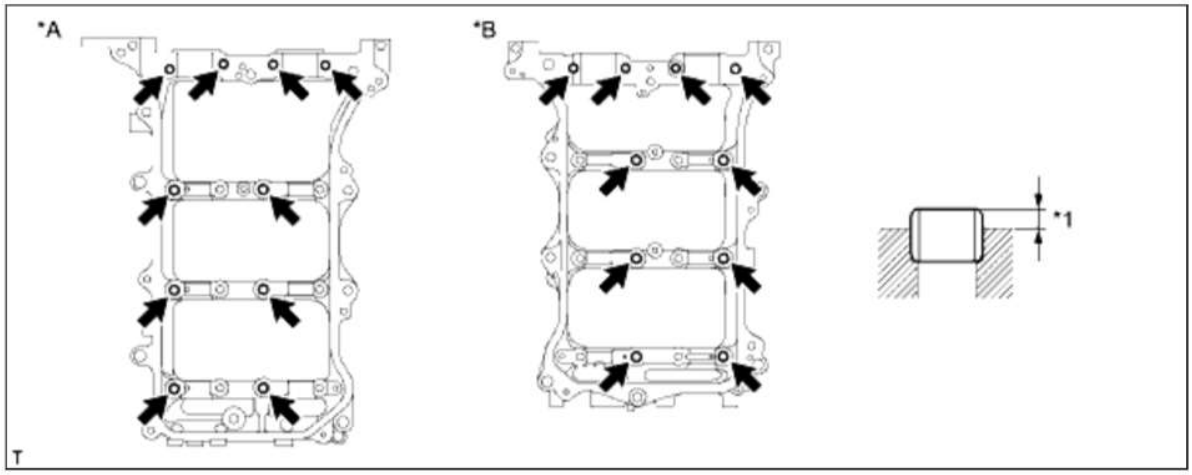
Torque: 4.0 N·m (41 kgf·cm, 35in·lbf)

2. INSTALL RING PIN

(a) Using a plastic-faced hammer, tap in new ring pins to the camshaft housing.

Standard protrusion height:
2.7 to 3.3 mm (0.106 to 0.130 in.)

cardiagn.com



Text in Illustration

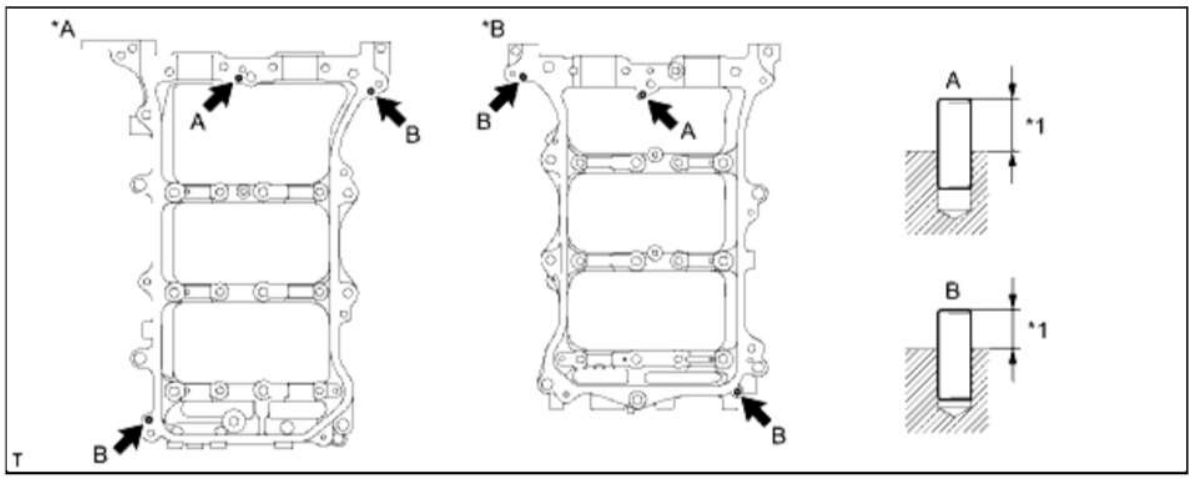
*A	LH	*B	RH
*1	Protrusion Height	-	-

3. INSTALL STRAIGHT PIN

(a) Using a plastic-faced hammer, tap in new straight pins to the camshaft housing.

Standard Protrusion Height:

ITEM	SPECIFIED CONDITION
Ring pin A	7.7 to 8.3 mm (0.303 to 0.327 in.)
Ring pin B	5.7 to 6.3 mm (0.224 to 0.248 in.)

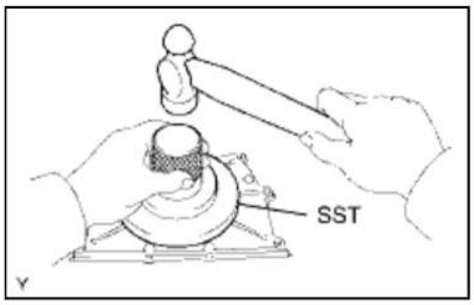


Text in Illustration

*A	LH	*B	RH
*1	Protrusion Height	-	-

cardiagn.com

4. INSTALL REAR CRANKSHAFT OIL SEAL



(a) Using SST and a hammer, tap in a new oil seal until its surface is flush with the rear oil seal retainer edge.

SST: 09223-78010

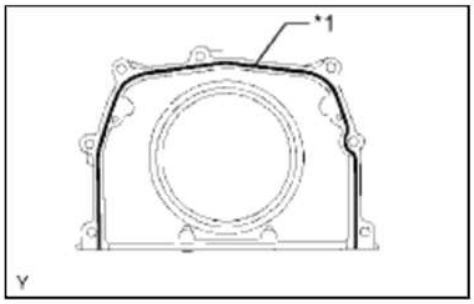
(b) Apply MP grease to the lip of the oil seal.

5. INSTALL ENGINE REAR OIL SEAL RETAINER

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the oil seal retainer or cylinder block.

(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



Text in Illustration

*1	Seal Packing

NOTICE:

- Remove any oil from the contact surfaces.
- Install the oil seal retainer within 3 minutes after applying seal packing.

Standard seal diameter:
2 to 3 mm (0.0787 to 0.118 in.)

(c) Install the oil seal retainer with the 5 bolts and 2 nuts.

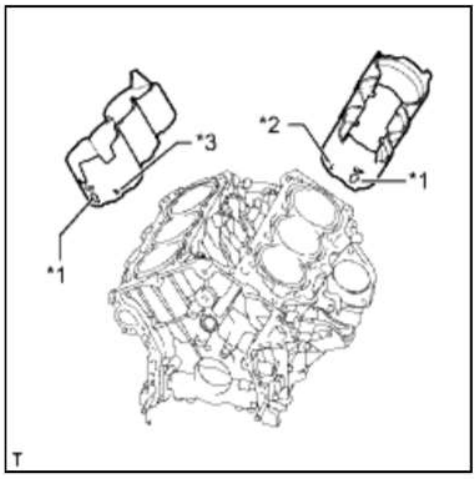
Torque: 10 N·m (102 kgf·cm, 7ft·lbf)

NOTICE:

- When installing the oil seal retainer, make sure the lip of the oil seal is not damaged.
- When installing the oil seal retainer, make sure the lip of the oil seal is not folded incorrectly.
- Do not start the engine for at least 2 hours after installation.

6. INSTALL CYLINDER BLOCK WATER JACKET SPACER

cardiagn.com



(a) Install the 2 water jacket spacers as shown in the illustration.

Text in Illustration

*1	UP Mark
*2	L Mark
*3	R Mark

NOTICE:

Make sure that face the "L mark", "R mark" and "UP mark" are oriented as shown in the illustration.

7. INSTALL KNOCK SENSOR INFO

8. INSTALL NO. 1 WATER OUTLET PIPE INFO

9. INSTALL CYLINDER HEAD GASKET INFO

10. INSTALL CYLINDER HEAD SUB-ASSEMBLY INFO

11. INSTALL NO. 2 CYLINDER HEAD GASKET INFO

12. INSTALL CYLINDER HEAD LH INFO

13. INSTALL VALVE STEM CAP

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

(b) Install the 24 valve stem caps to the cylinder head.

14. INSTALL VALVE LASH ADJUSTER ASSEMBLY

(a) Inspect the valve lash adjuster INFO .

(b) Install the 24 valve lash adjusters to the cylinder head.

NOTICE:

Install the lash adjuster at the same place it was removed from.

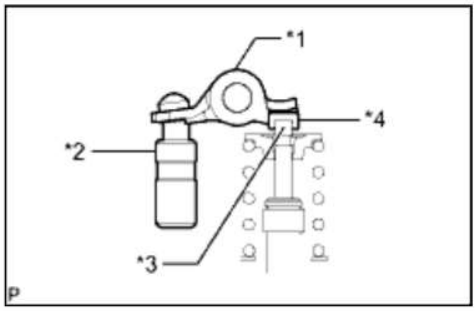
15. INSTALL NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY

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

(b) Install the 24 valve rocker arms as shown in the illustration.

Text in Illustration

cardiagn.com

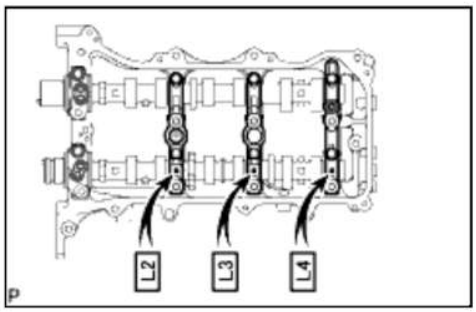


*1	Valve Rocker Arm
*2	Lash Adjuster
*3	Valve Stem
*4	Valve Stem Cap

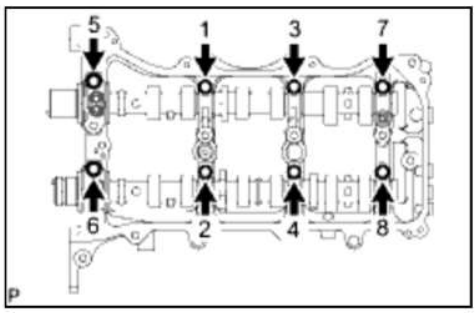
16. INSTALL CAMSHAFT BEARING CAP (for Bank 2)

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

(b) Install the No. 3 camshaft and No. 4 camshaft to the camshaft housing.



(c) Check the marks and numbers on the camshaft bearing caps and place each of them in the proper position facing the proper direction.



(d) Temporarily install the 8 bolts in the order shown in the illustration.

Torque: 10 N·m (102 kgf·cm, 7ft·lbf)

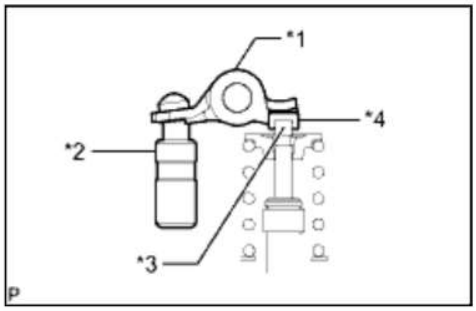
17. INSTALL CAMSHAFT HOUSING SUB-ASSEMBLY LH

(a) Make sure that the valve rocker arm is installed as shown in the illustration.

Text in Illustration

*1	Valve Rocker Arm

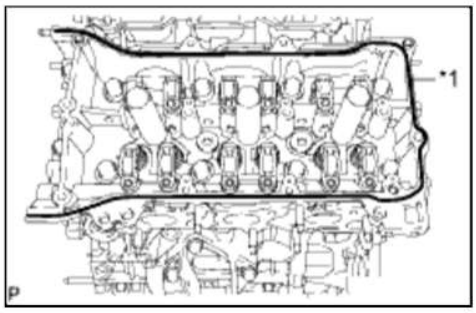
cardiagn.com



*2	Lash Adjuster
*3	Valve Stem
*4	Valve Stem Cap

(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
Seal diameter:
3.5 to 4.5 mm (0.138 to 0.177 in.)



Text in Illustration

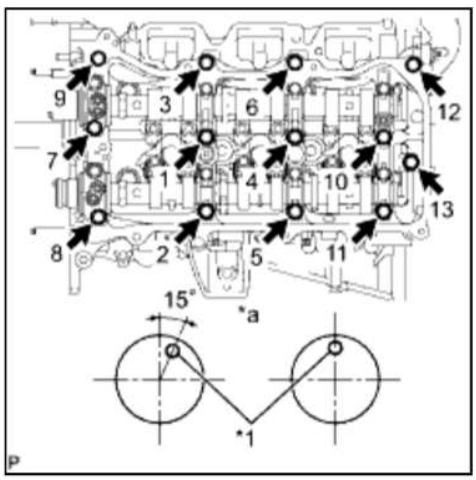
*1	Seal Packing

NOTICE:

- Remove any oil from the contact surface.
- Install the camshaft housing within 3 minutes and tighten the bolts within 15 minutes after applying seal packing.

(c) Install the camshaft housing sub-assembly LH and tighten the 13 bolts in the order shown in the illustration.

Torque: 28 N·m (286 kgf·cm, 21ft·lbf)



Text in Illustration

*1	Knock Pin
*a	Front View

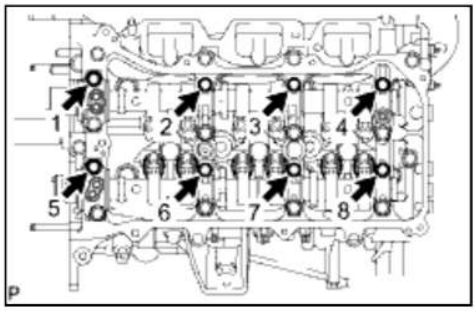
NOTICE:

- When installing the camshaft housing sub-assembly LH, it is necessary to correctly position the camshafts as shown in the illustration. Failure to correctly position these parts may result in damage due to contact between the pistons and valves. If a camshaft is rotated with a piston at TDC,

cardiagn.com

valve contact will occur.

- If any of the bolts are loosened during installation, remove the camshaft housing sub-assembly LH, clean the installation surfaces and reapply seal packing.
- If the camshaft housing sub-assembly LH is removed because any of the bolts are loosened during installation, make sure that the previously applied seal packing does not enter any oil passages.
- Do not start the engine for at least 2 hours after installing.



(d) Tighten the 8 bolts in the order shown in the illustration.

Torque: 16 N·m (163 kgf·cm, 12ft·lbf)

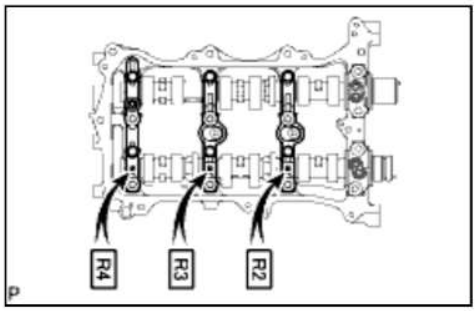
NOTICE:

Thoroughly wipe clean any seal packing.

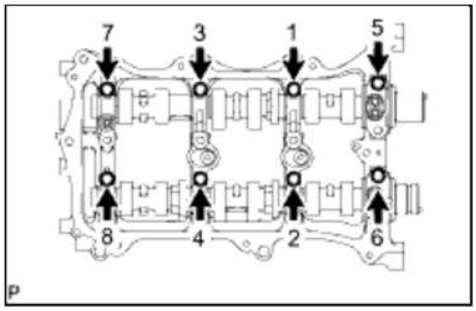
18. INSTALL CAMSHAFT BEARING CAP (for Bank 1)

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

(b) Install the camshaft and No. 2 camshaft to the camshaft housing.



(c) Check the marks and numbers on the camshaft bearing caps and place each of them in the proper position facing the proper direction.



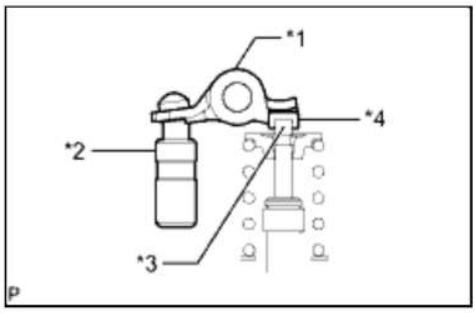
(d) Temporarily install the 8 bearing cap bolts in the order shown in the illustration.

Torque: 10 N·m (102 kgf·cm, 7ft·lbf)

cardiagn.com

19. INSTALL CAMSHAFT HOUSING SUB-ASSEMBLY RH

(a) Make sure that the No. 1 valve rocker arm sub-assembly is installed as shown in the illustration.

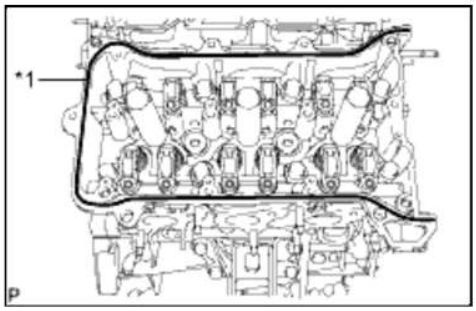


Text in Illustration

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

(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
Seal diameter:
3.5 to 4.5 mm (0.138 to 0.177 in.)



Text in Illustration

*1	Seal Packing

NOTICE:

- Remove any oil from the contact surface.
- Install the camshaft housing within 3 minutes and tighten the bolts within 15 minutes after applying seal packing.

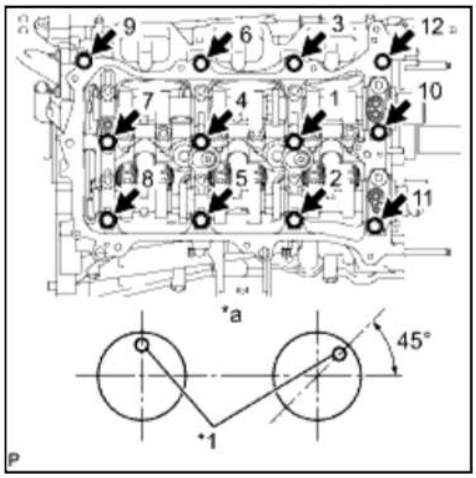
(c) Install the camshaft housing sub-assembly RH and tighten the 12 bolts in the order shown in the illustration.

Torque: 28 N·m (286 kgf·cm, 21ft·lbf)

Text in Illustration

*1	Knock Pin
*a	Front View

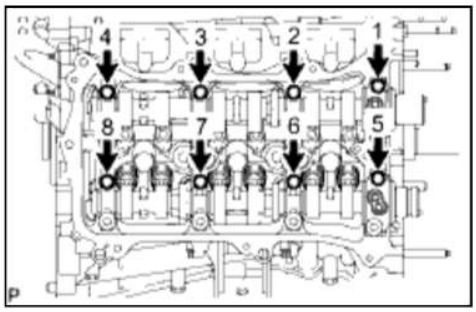
cardiagn.com



NOTICE:

- When installing the camshaft housing RH, it is necessary to correctly position the camshafts as shown in the illustration.

  Failure to correctly position these parts may result in damage due to contact between the pistons and valves. If a camshaft is rotated with a piston at TDC, valve contact will occur.
- If any of the bolts are loosened during installation, remove the camshaft housing sub-assembly RH, clean the installation surfaces and reapply seal packing.
- If the camshaft housing sub-assembly RH is removed because any of the bolts are loosened during installation, make sure that the previously applied seal packing does not enter any oil passages.
- Do not start the engine for at least 2 hours after installing.



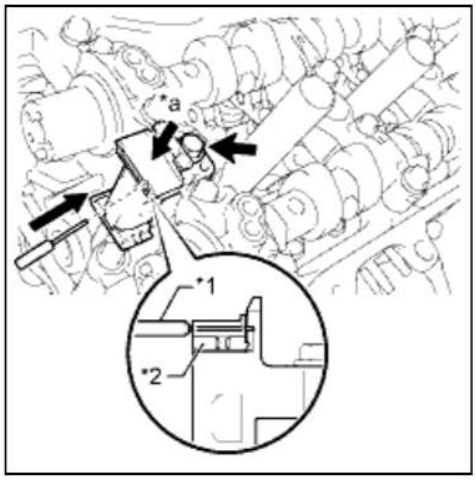
(d) Tighten the 8 bolts in the order shown in the illustration.

Torque: 16 N·m (163 kgf·cm, 12ft·lbf)

NOTICE:

Thoroughly wipe clean any seal packing.

20. INSTALL NO. 3 CHAIN TENSIONER ASSEMBLY (for Bank 2)



(a) Install the No. 3 chain tensioner assembly with the bolt.

Torque: 21 N·m (214 kgf·cm, 15ft·lbf)

(b) Push in the tensioner and insert a pin with a diameter of 1.0 mm (0.0394 in.) into the hole to hold

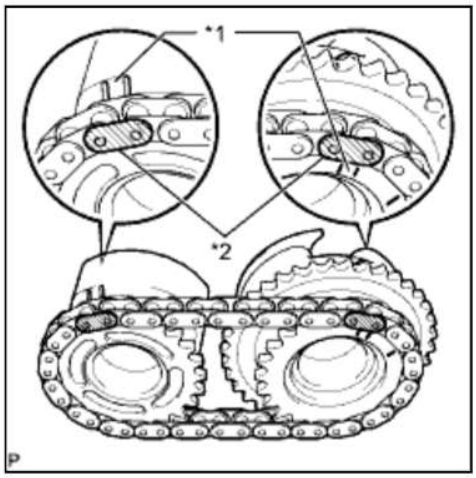
cardiagn.com

the tensioner.

Text in Illustration

*1	Pin
*2	Plunger
*a	Push

21. INSTALL CAMSHAFT TIMING GEARS AND NO. 2 CHAIN (for Bank 2)



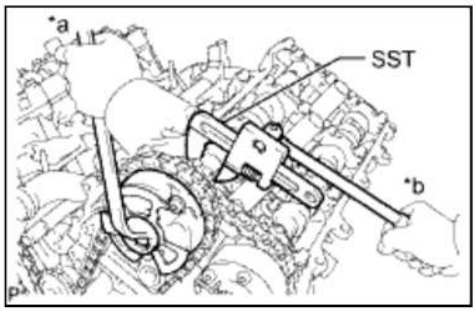
(a) Align the mark plates (yellow) with the timing marks of the camshaft timing gear assemblies as shown in the illustration.

Text in Illustration

*1	Timing Mark
*2	Mark Plate

(b) Apply a light coat of engine oil to the bolt threads and bolt-seating surface.

(c) Align the knock pin of the camshaft with the pin hole of the camshaft timing gear assembly. Install the camshaft timing gear assembly and camshaft timing exhaust gear LH with the No. 2 chain sub-assembly installed.



(d) Using SST to hold the hexagonal portion of each camshaft, tighten the bolts of the camshaft timing gear assembly and camshaft timing exhaust gear assembly.

SST: 09922-10010

Torque: 100 N·m (1020 kgf·cm, 74ft·lbf)

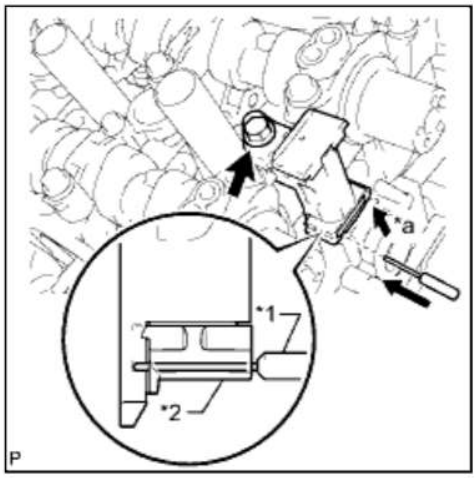
Text in Illustration

*a	Turn
*b	Hold

(e) Remove the pin from the No. 3 chain tensioner assembly.

22. INSTALL NO. 2 CHAIN TENSIONER ASSEMBLY (for Bank 1)

cardiagn.com



(a) Install the No. 2 chain tensioner assembly with the bolt.

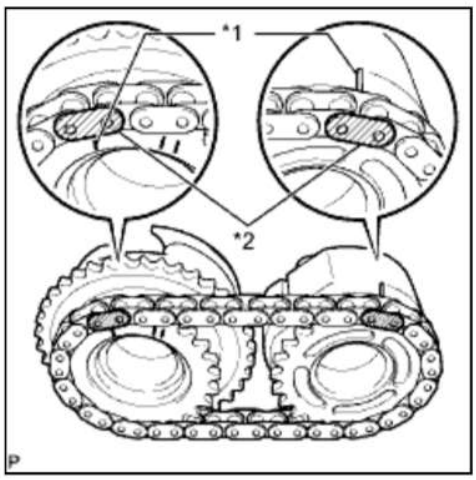
Torque: 21 N·m (214 kgf·cm, 15ft·lbf)

(b) Push in the No. 2 chain tensioner assembly and insert a pin with a diameter of 1.0 mm (0.0394 in.) into the hole to hold the tensioner.

Text in Illustration

*1	Pin
*2	Plunger
*a	Push

23. INSTALL CAMSHAFT TIMING GEARS AND NO. 2 CHAIN (for Bank 1)



(a) Align the mark plates (yellow) with the timing marks of the camshaft timing gear assemblies as shown in the illustration.

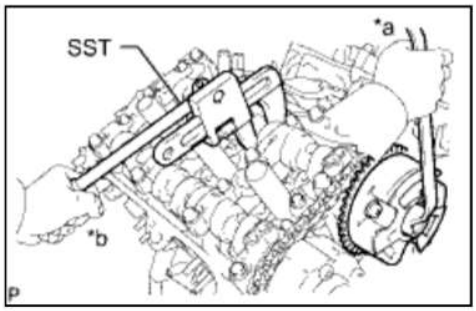
Text in Illustration

*1	Timing Mark
*2	Mark Plate

(b) Apply a light coat of engine oil to the bolt threads and bolt-seating surface.

(c) Align the knock pin of the camshaft with the pin hole of the camshaft timing gear assembly. Install the camshaft timing gear assembly and camshaft timing exhaust gear assembly with the No. 2 chain sub-assembly installed.

cardiagn.com



(d) Using SST to hold the hexagonal portion of each camshaft, tighten the bolts of the camshaft timing gear assembly and camshaft timing exhaust gear assembly.

SST: 09922-10010

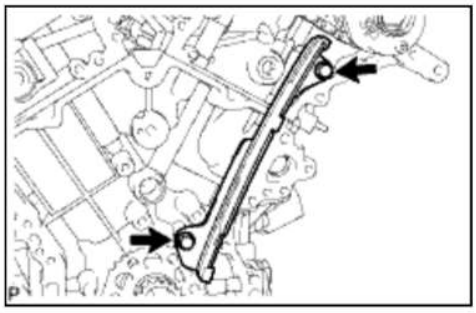
Torque: 100 N·m (1020 kgf·cm, 74ft·lbf)

Text in Illustration

*a	Turn
*b	Hold

(e) Remove the pin from the No. 2 chain tensioner assembly.

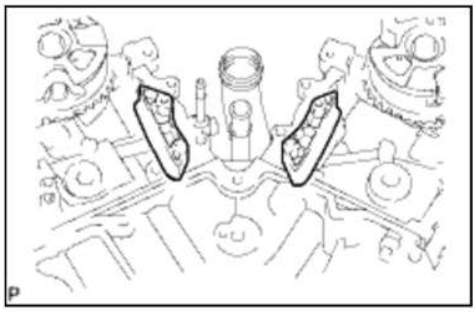
24. INSTALL NO. 1 CHAIN VIBRATION DAMPER



(a) Install the No. 1 chain vibration damper with the 2 bolts.

Torque: 23 N·m (229 kgf·cm, 17ft·lbf)

25. INSTALL NO. 2 CHAIN VIBRATION DAMPER

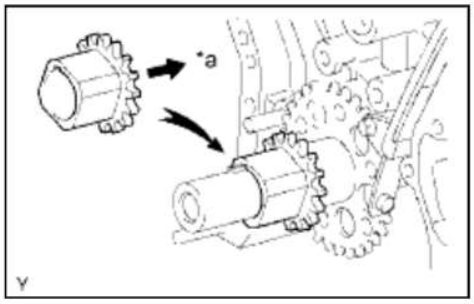


(a) Install the 2 No. 2 chain vibration dampers.

26. INSTALL CRANKSHAFT TIMING SPROCKET

(a) Align the key groove of the timing sprocket with the timing sprocket set key.

cardiagn.com



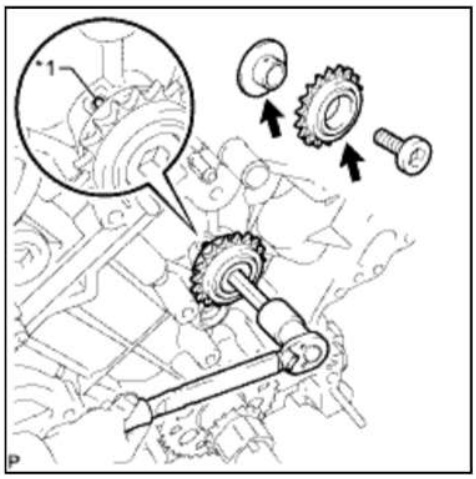
(b) Install the timing sprocket to the crankshaft with the sprocket facing inward as shown in the illustration.

Text in Illustration

*a	Inward

27. INSTALL NO. 1 IDLE GEAR SHAFT

(a) Apply a light coat of engine oil to the sliding surface of the No. 1 idle gear shaft.



(b) Temporarily install the No. 1 idle gear shaft and No. 1 idle gear with the No. 2 idle gear shaft while aligning the knock pin of the No. 1 idle gear shaft with the knock pin groove of the cylinder block.

Text in Illustration

*1	Knock Pin

NOTICE:

Make sure that the idle gear is installed facing the proper direction.

(c) Using a 10 mm hexagon wrench, tighten the No. 2 idle gear shaft.

Torque: 60 N·m (612 kgf·cm, 44ft·lbf)

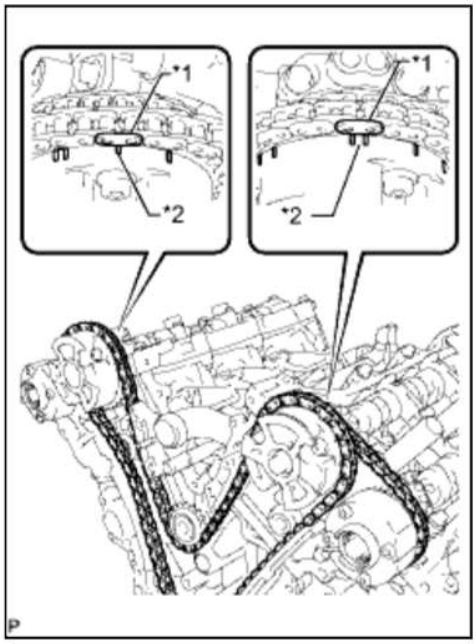
(d) Remove the bar from the chain tensioner.

28. INSTALL NO. 1 CHAIN SUB-ASSEMBLY

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

Text in Illustration

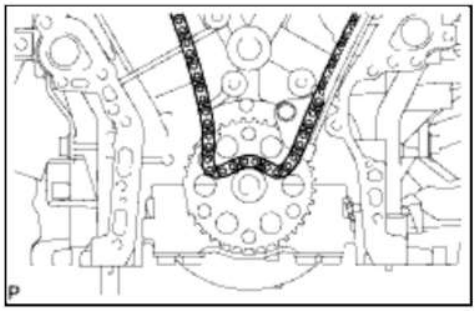
cardiagn.com



*1	Mark Plate
*2	Timing Mark

HINT:

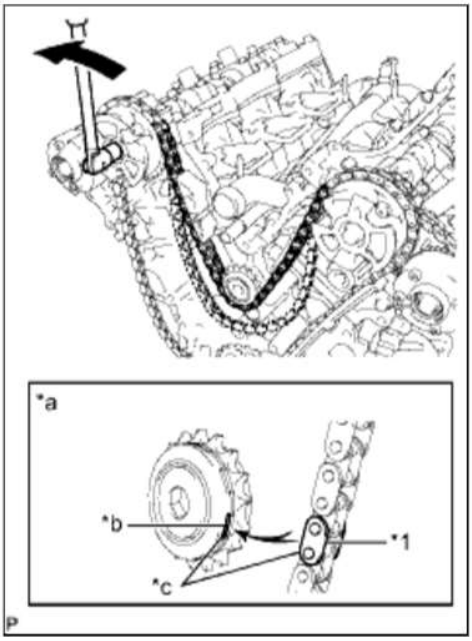
The camshaft mark plates are orange.



(b) Do not pass the chain around the crankshaft, just temporarily place it on the crankshaft.

(c) Turn the camshaft timing gear assembly on bank 1 counterclockwise to tighten the chain between the banks.

cardiagn.com



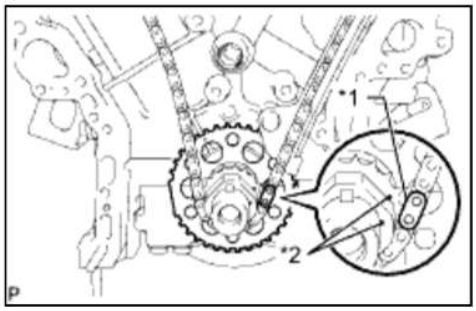
Text in Illustration

*1	Chain Plate
*a	When idle sprocket is reused
*b	Mark
*c	Align
➡	Turn

NOTICE:

When the idle sprocket assembly is reused, align the chain plate with the mark where the plate had been when tightening the chain between the banks.

(d) Align the mark plate and timing marks as shown in the illustration and install the chain to the crankshaft timing sprocket.



Text in Illustration

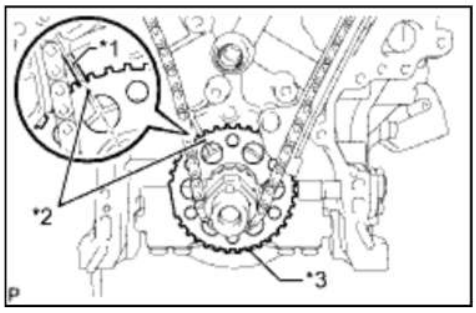
*1	Mark Plate
*2	Timing Mark

HINT:

The crankshaft mark plate is yellow.

(e) Temporarily install the pulley set bolt.

cardiagn.com

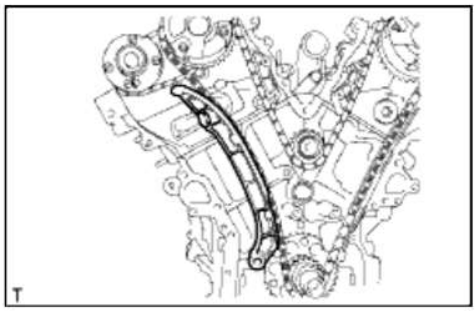


(f) Turn the crankshaft clockwise to set it to the RH block bore center line (TDC/compression).

Text in Illustration

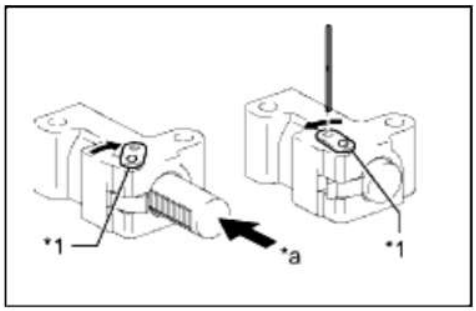
*1	Center Line
*2	Timing Mark
*3	Sensor Plate

29. INSTALL CHAIN TENSIONER SLIPPER



(a) Install the chain tensioner slipper.

30. INSTALL NO. 1 CHAIN TENSIONER ASSEMBLY



(a) Turn the stopper plate of the tensioner clockwise and push in the plunger of the tensioner as shown in the illustration.

Text in Illustration

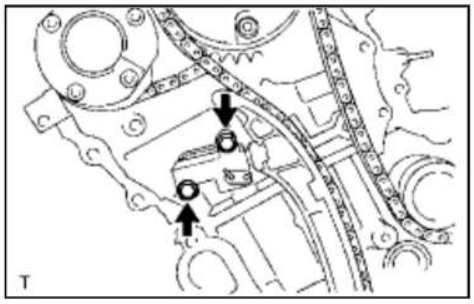
*1	Stopper Plate
*a	Push

(b) Turn the stopper plate of the tensioner counterclockwise and insert a pin of φ1.27 mm (0.0500 in.) into the holes on the stopper plate and tensioner to fix the stopper plate in place.

(c) Install the chain tensioner with the 2 bolts.

Torque: 10 N·m (102 kgf·cm, 7ft·lbf)

cardiagn.com



(d) Remove the pin from the No. 1 chain tensioner.

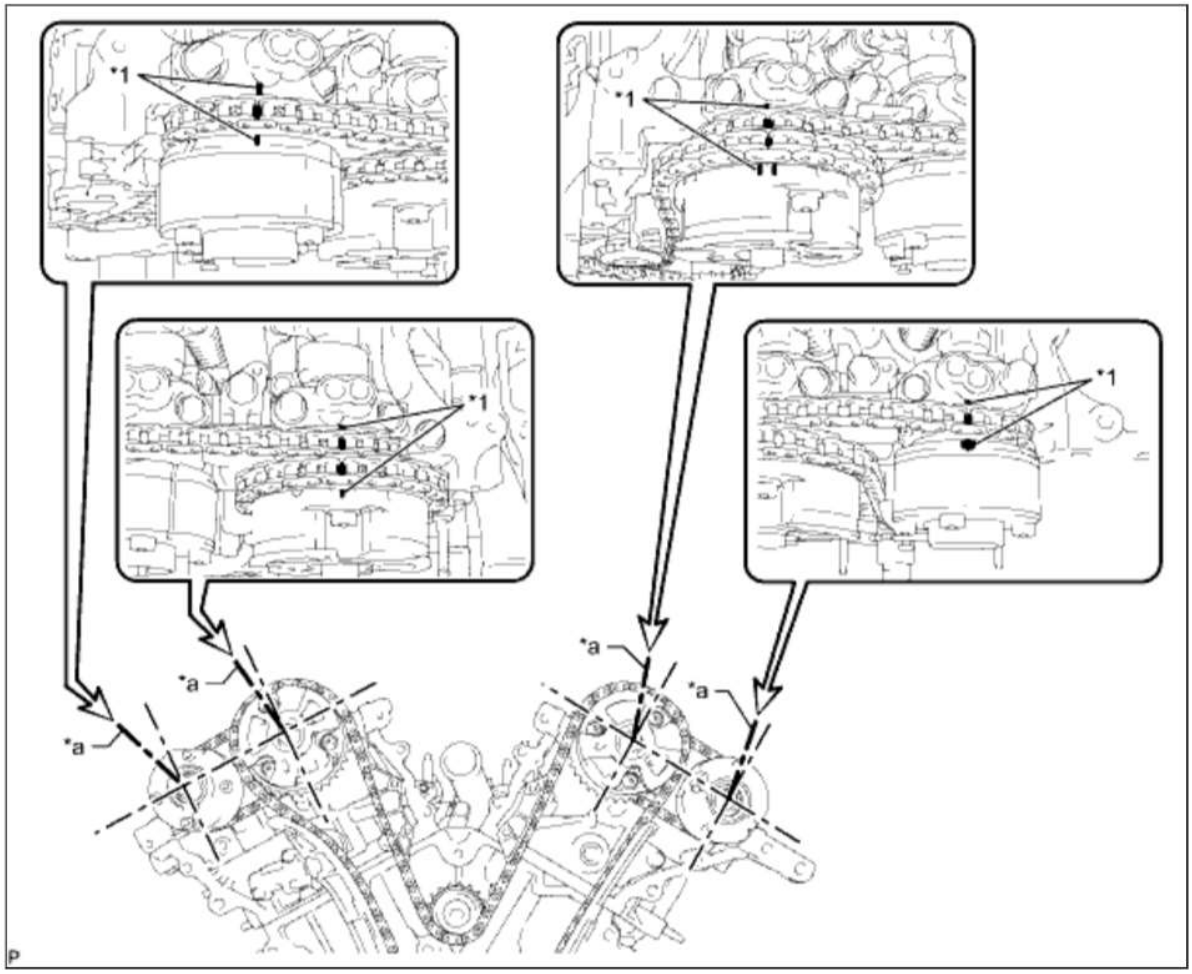
31. INSPECT VALVE TIMING

(a) Check the camshaft timing marks.

NOTICE:

- Check each timing mark from a viewpoint directly in line with the center of the camshaft and the timing mark on each camshaft timing gear.
- If the timing marks are checked from any other viewpoint, the valve timing may appear misaligned.

(b) Check that each camshaft timing mark is positioned as shown in the illustration.



cardiagn.com

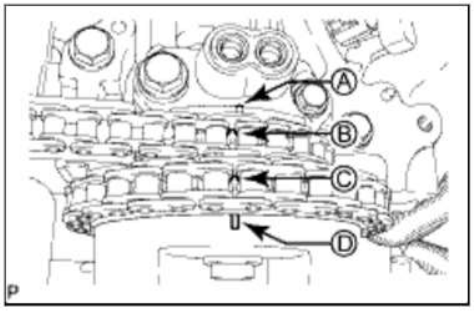
Text in Illustration

*1	Timing Mark	-	-
*a	Viewpoint	-	-

HINT:

for Intake Camshaft:

Be sure to check mark A at the point when marks B, C and D are positioned in line. If the marks are checked from any other viewpoint, they cannot be checked correctly.

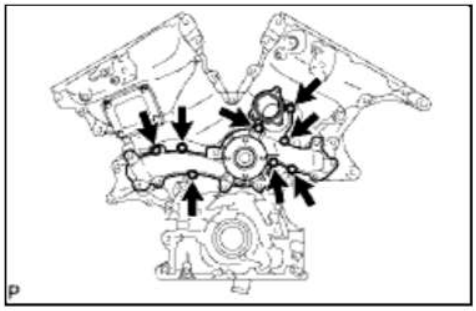


(c) If the valve timing is misaligned, reinstall the timing chain.

(d) Remove the pulley set bolt.

32. INSTALL FRONT CRANKSHAFT OIL SEAL INFO

33. INSTALL WATER PUMP ASSEMBLY



(a) Install a new gasket and the water pump with the 8 bolts.

Torque: 11 N·m (112 kgf·cm, 8ft·lbf)

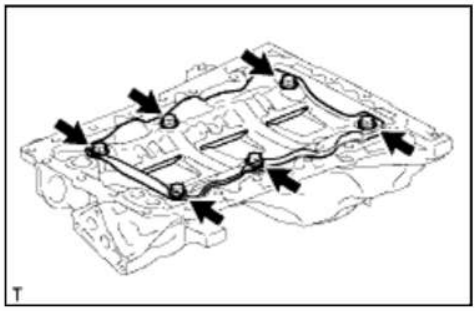
34. INSTALL TIMING CHAIN COVER SUB-ASSEMBLY INFO

35. INSTALL NO. 1 OIL PAN BAFFLE PLATE

(a) Install the No. 1 oil pan baffle plate with the 6 bolts.

Torque: 10 N·m (102 kgf·cm, 7ft·lbf)

cardiagn.com



36. INSTALL OIL PAN SUB-ASSEMBLY INFO

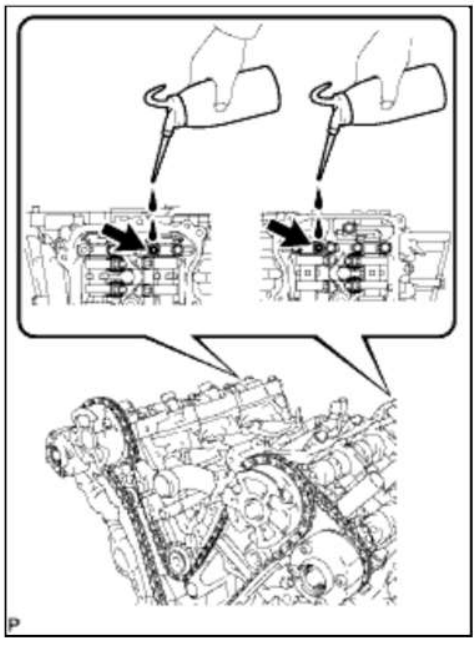
37. INSTALL OIL STRAINER SUB-ASSEMBLY INFO

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

39. INSTALL OIL PAN DRAIN PLUG

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

Torque: 40 N·m (408 kgf·cm, 30ft·lbf)



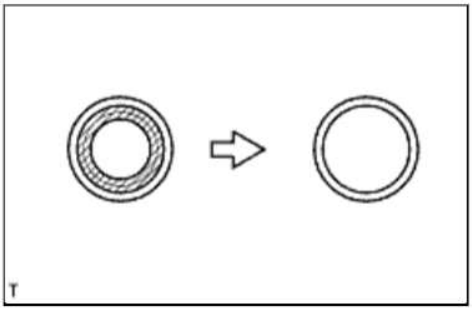
40. POUR ENGINE OIL

HINT:

Before installing the cylinder head cover, pour engine oil into the locations shown in the illustration.

41. INSTALL SPARK PLUG TUBE GASKET

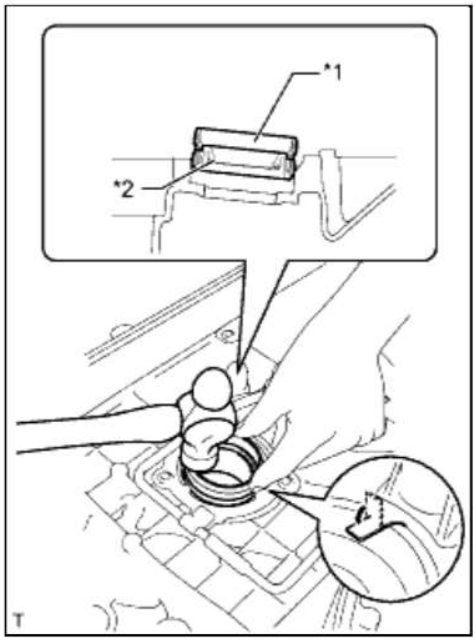
cardiagn.com



(a) Using a cutter knife, cut off the seal part of the removed gasket.

Text in Illustration

	Area to cut off



(b) Using the removed gasket and a hammer, tap in a new gasket until it stops.

Text in Illustration

*1	Removed Gasket
*2	New Gasket

HINT:

If the removed gasket does not fit on the new one, correct the removed one with pliers.

(c) Apply a light coat of MP grease to the gasket lip.

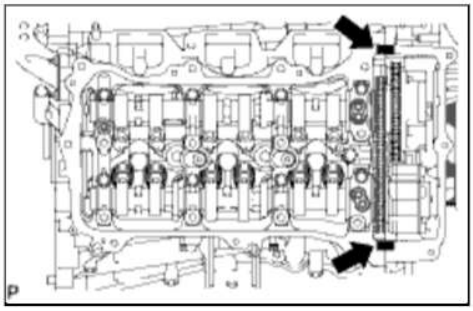
(d) Return the ventilation baffle plate claws to their original positions.

42. INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the cylinder head, timing chain cover or cylinder head cover.

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

cardiagn.com



Seal packing:

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

Standard seal diameter:

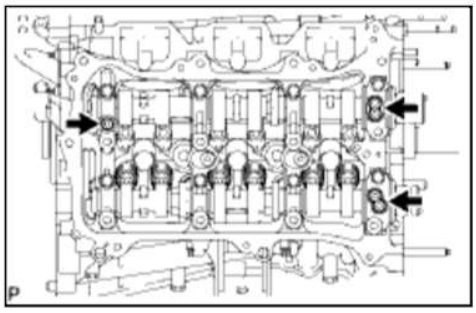
2 to 3 mm (0.0787 to 0.118 in.)

Text in Illustration

➡	Seal Packing

NOTICE:

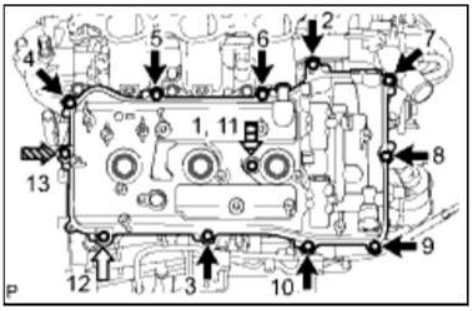
- Remove any oil from the contact surface.
- Install the cylinder head cover within 3 minutes and tighten the bolts within 15 minutes after applying seal packing.



(c) Install 3 new gaskets as shown in the illustration.

(d) Install a new gasket to the cylinder head cover.

(e) Install the seal washers to the bolts.



(f) Temporarily install the cylinder head cover with the 12 bolts. Tighten the bolts uniformly in several steps.

cardiagn.com

for bolt A and D - Torque: 10 N·m (102 kgf·cm, 7ft·lbf)
for bolt B and C - Torque: 21 N·m (214 kgf·cm, 15ft·lbf)
Standard Bolt:

ITEM	LENGTH
A	25 mm (0.984 in.)
B	35 mm (1.38 in.)
C	65 mm (2.56 in.)
D	60 mm (2.36 in.)

Text in Illustration

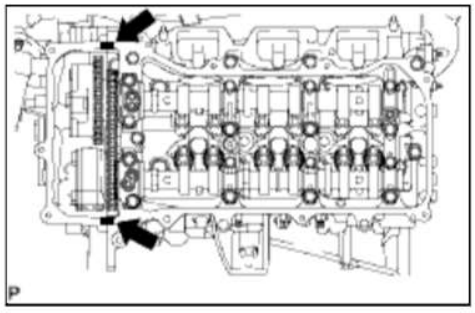
➡	Bolt A
⇨	Bolt B
⇛	Bolt C
⇨	Bolt D

NOTICE:
Do not start the engine for at least 2 hours after the installation.

43. INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY LH

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the cylinder head, timing chain cover or cylinder head cover.

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



Seal packing:
Toyota Genuine Seal Packing Black, Three Bond 1207B or equivalent
Standard seal diameter:

cardiagn.com

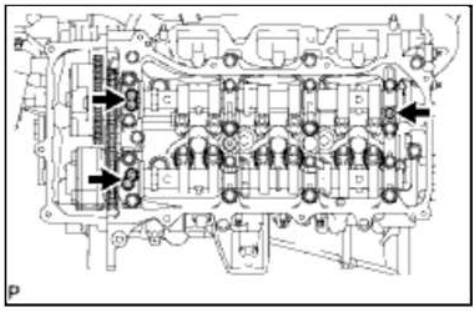
2 to 3 mm (0.0787 to 0.118 in.)

Text in Illustration

➡	Seal Packing

NOTICE:

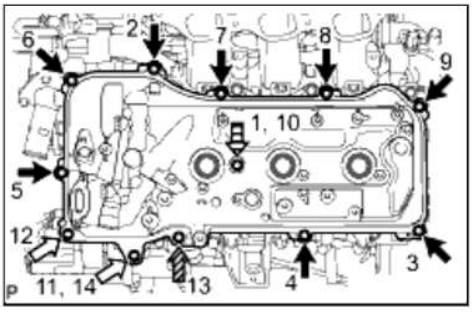
- Remove any oil from the contact surface.
- Install the cylinder head cover within 3 minutes and tighten the bolts within 15 minutes after applying seal packing.



(c) Install 3 new gaskets as shown in the illustration.

(d) Install a new gasket to the cylinder head cover.

(e) Install the seal washers to the bolts.



(f) Temporarily install the cylinder head cover with the 12 bolts. Tighten the bolts uniformly in several steps.

for bolt A and D - Torque: 10 N·m (102 kgf·cm, 7ft·lbf)

for bolt B and C - Torque: 21 N·m (214 kgf·cm, 15ft·lbf)

Standard Bolt:

ITEM	LENGTH
A	25 mm (0.984 in.)
B	35 mm (1.38 in.)
C	70 mm (2.76 in.)

cardiagn.com

ITEM	LENGTH
D	60 mm (2.36 in.)

Text in Illustration

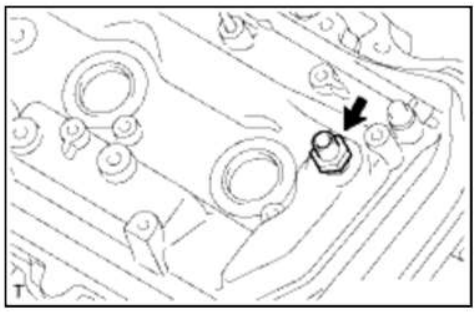
➡	Bolt A
⇨	Bolt B
⇨	Bolt C
⇨	Bolt D

NOTICE:

Do not start the engine for at least 2 hours after the installation.

44. INSTALL CRANKSHAFT PULLEY INFO

45. INSTALL PCV VALVE SUB-ASSEMBLY



(a) Apply adhesive to 2 or 3 threads of the PCV valve.

Adhesive:
Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

(b) Install the PCV valve.

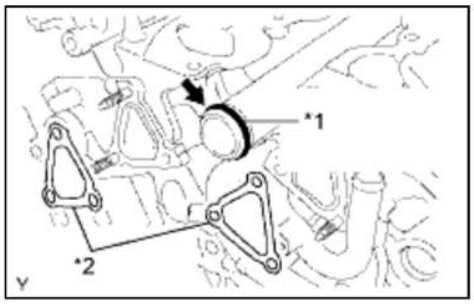
Torque: 27 N·m (275 kgf·cm, 20ft·lbf)

(c) Install the PCV valve hose.

46. INSTALL SPARK PLUG INFO

47. INSTALL REAR WATER BY-PASS JOINT

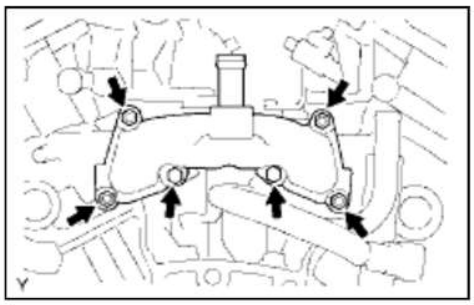
cardiagn.com



(a) Apply soapy water to a new O-ring and install it to the water outlet pipe. Then install 2 new gaskets to the water ports LH and RH.

Text in Illustration

*1	New O-Ring
*2	New Gasket



(b) Install the rear water by-pass joint with the 2 bolts and 4 nuts.

Torque: 10 N·m (102 kgf·cm, 7ft·lbf)

48. INSTALL WATER INLET HOUSING INFO

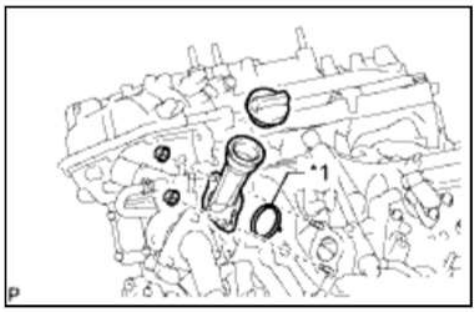
49. INSTALL OIL FILTER BRACKET INFO

50. INSTALL OIL FILTER ELEMENT INFO

51. INSTALL NO. 2 OIL PIPE INFO

52. INSTALL NO. 1 OIL PIPE INFO

53. INSTALL OIL FILLER CAP HOUSING



(a) Install a new gasket and the oil filler cap housing with the 2 nuts.

Torque: 10 N·m (102 kgf·cm, 7ft·lbf)

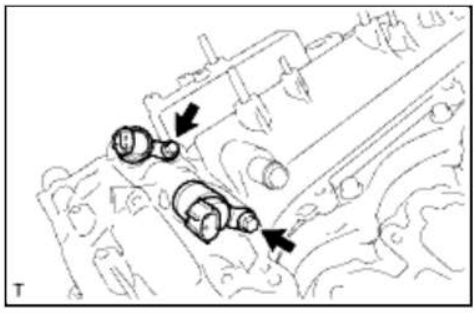
Text in Illustration

*1	New Gasket

(b) Install the oil filler cap.

54. INSTALL CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY

cardiagn.com



(a) RH:

(1) Apply a light coat of engine oil to 2 new O-rings.

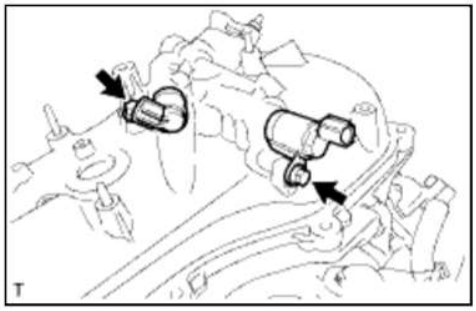
(2) Install the 2 O-rings to the 2 oil control valves.

(3) Install the 2 oil control valves with the 2 bolts.

Torque: 10 N·m (102 kgf·cm, 7ft·lbf)

NOTICE:

Be careful that the O-ring is not cracked when installing the camshaft timing oil control valve.



(b) LH:

(1) Apply a light coat of engine oil to 2 new O-rings.

(2) Install the 2 O-rings to the 2 oil control valves.

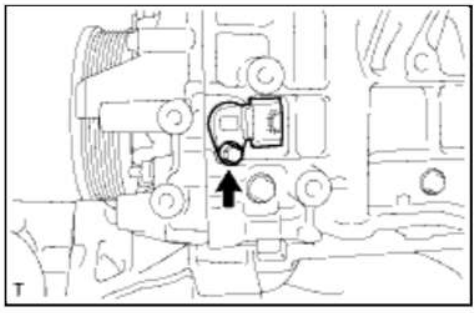
(3) Install the 2 oil control valves with the 2 bolts.

Torque: 10 N·m (102 kgf·cm, 7ft·lbf)

NOTICE:

Be careful that the O-ring is not cracked when installing the camshaft timing oil control valve.

55. INSTALL CRANKSHAFT POSITION SENSOR



(a) Install the sensor with the bolt.

Torque: 10 N·m (102 kgf·cm, 7ft·lbf)

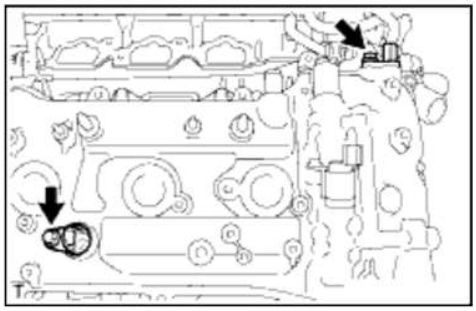
56. INSTALL VVT SENSOR

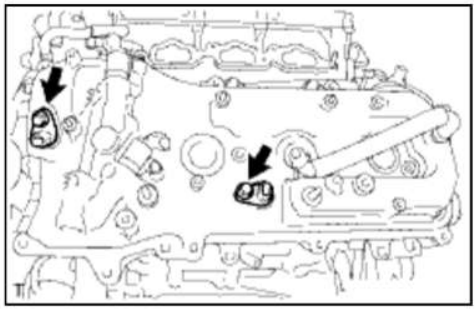
(a) RH:

Install the 2 VVT sensors with the 2 bolts.

Torque: 10 N·m (102 kgf·cm, 7ft·lbf)

cardiagn.com





(b) LH:

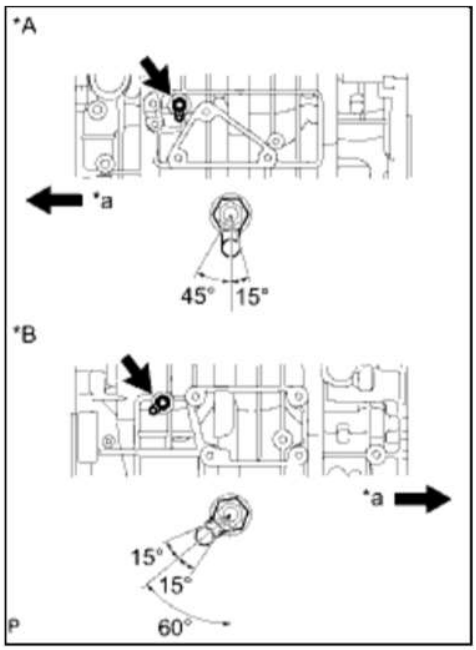
Install the 2 VVT sensors with the 2 bolts.

Torque: 10 N·m (102 kgf·cm, 7ft·lbf)

57. INSTALL CYLINDER BLOCK WATER DRAIN COCK SUB-ASSEMBLY

(a) Apply adhesive to 2 or 3 threads of the drain cock end.

Adhesive:
Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent



(b) Install the drain cock.

Torque: 30 N·m (306 kgf·cm, 22ft·lbf)

Text in Illustration

*A	LH
*B	RH
*a	Front

NOTICE:

- Install the drain cock within 3 minutes after applying adhesive.
- Do not expose the drain cock to coolant within 1 hour of the installation.

(c) Rotate the drain cock clockwise to the position shown in the illustration.

cardiagn.com

NOTICE:

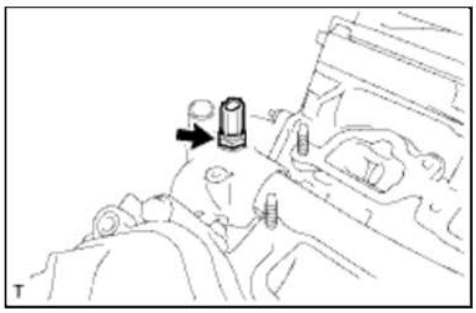
- Do not rotate the drain cock by more than 1 revolution (360°) after tightening the drain cock to the specified torque.
- Do not loosen the drain cock after setting it correctly.

(d) Install the water drain cock plugs to the water drain cocks.

Torque: 13 N·m (130 kgf·cm, 9ft·lbf)

58. INSTALL ENGINE COOLANT TEMPERATURE SENSOR

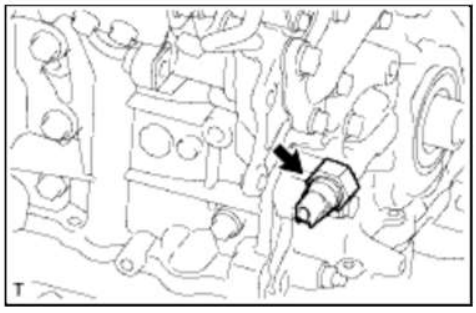
(a) Install a new gasket to the sensor.



(b) Using a 19 mm deep socket wrench, install the sensor.

Torque: 20 N·m (200 kgf·cm, 14ft·lbf)

59. INSTALL ENGINE OIL PRESSURE SWITCH ASSEMBLY



(a) Using a 24 mm deep socket wrench, install the oil pressure switch.

Torque: 15 N·m (153 kgf·cm, 11ft·lbf)

cardiagn.com

Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000002YYY009X
Title: 1GR-FE ENGINE MECHANICAL: ENGINE UNIT: INSTALLATION (2010 4Runner)		

INSTALLATION

1. INSTALL FRONT NO. 1 ENGINE MOUNTING BRACKET RH

(a) Install the front No. 1 engine mounting bracket RH with the 4 bolts.

Torque: 43 N·m (438 kgf·cm, 32ft·lbf)

2. INSTALL FRONT NO. 1 ENGINE MOUNTING BRACKET LH

(a) Install the front No. 1 engine mounting bracket LH with the 3 bolts.

Torque: 43 N·m (438 kgf·cm, 32ft·lbf)

3. INSTALL ENGINE OIL LEVEL DIPSTICK GUIDE INFO

4. INSTALL V-RIBBED BELT TENSIONER ASSEMBLY INFO

5. INSTALL NO. 2 IDLER PULLEY SUB-ASSEMBLY INFO

6. INSTALL NO. 1 IDLER PULLEY SUB-ASSEMBLY INFO

7. INSTALL WATER BY-PASS PIPE SUB-ASSEMBLY INFO

8. INSTALL INTAKE MANIFOLD INFO

9. INSTALL FUEL INJECTOR ASSEMBLY INFO

10. INSTALL FUEL DELIVERY PIPE SUB-ASSEMBLY INFO

11. INSTALL FUEL PIPE SUB-ASSEMBLY

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

Torque: 9.0 N·m (92 kgf·cm, 80in·lbf)

(b) Connect the 2 fuel pipes INFO.

12. INSTALL REAR CYLINDER HEAD COVER INFO

13. INSTALL IGNITION COIL ASSEMBLY

(a) Install the 6 ignition coils with the 6 bolts.

Torque: 10 N·m (102 kgf·cm, 7ft·lbf)

14. INSTALL HEATER WATER HOSE ASSEMBLY

(a) Install the heater water hose assembly and connect the 2 hoses.

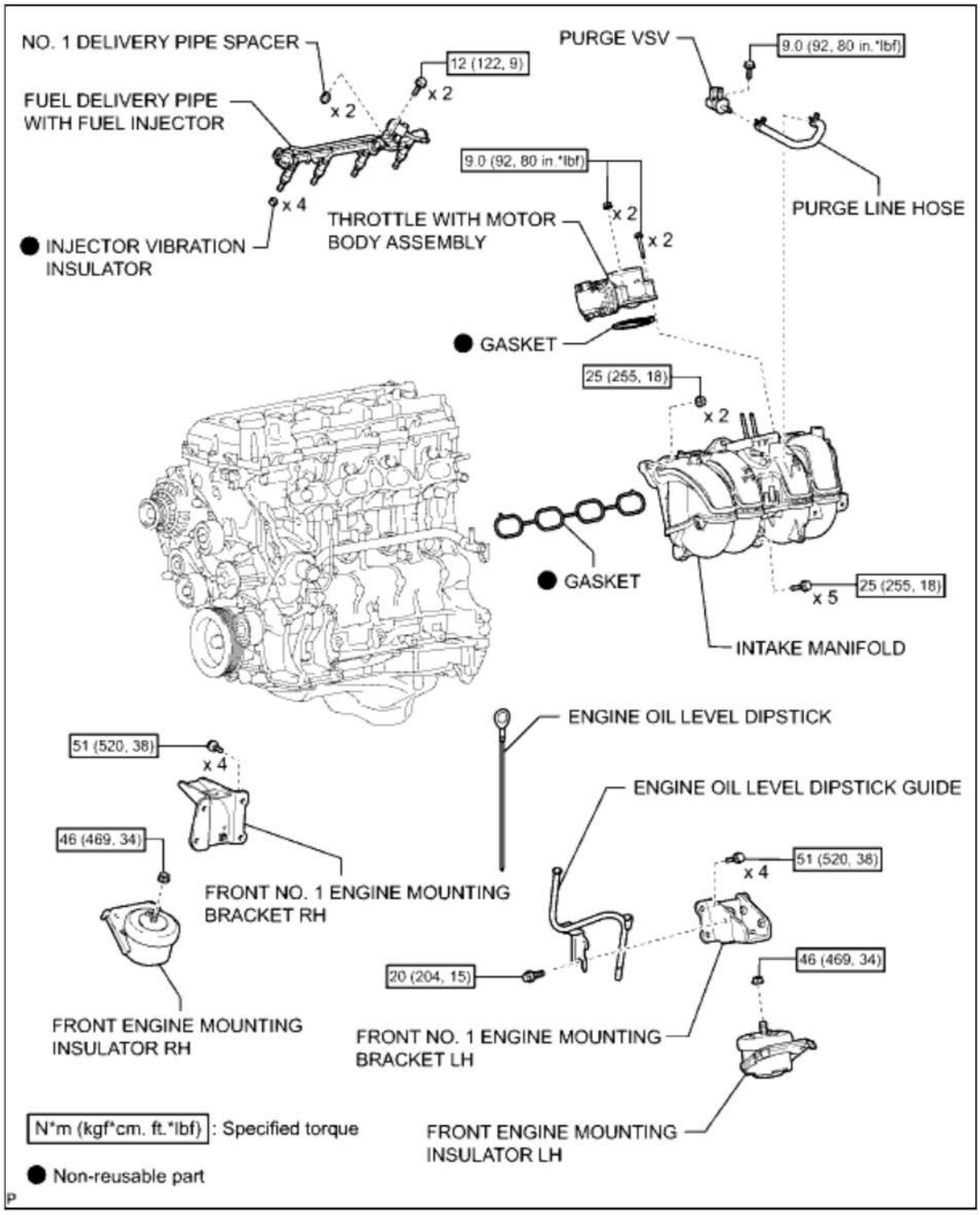
15. INSTALL ENGINE WIRE

cardiagn.com

Last Modified: 5-10-2010	6.4 K	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM0000045ED002X
Title: 2TR-FE ENGINE MECHANICAL: ENGINE UNIT: COMPONENTS (2010 4Runner)		

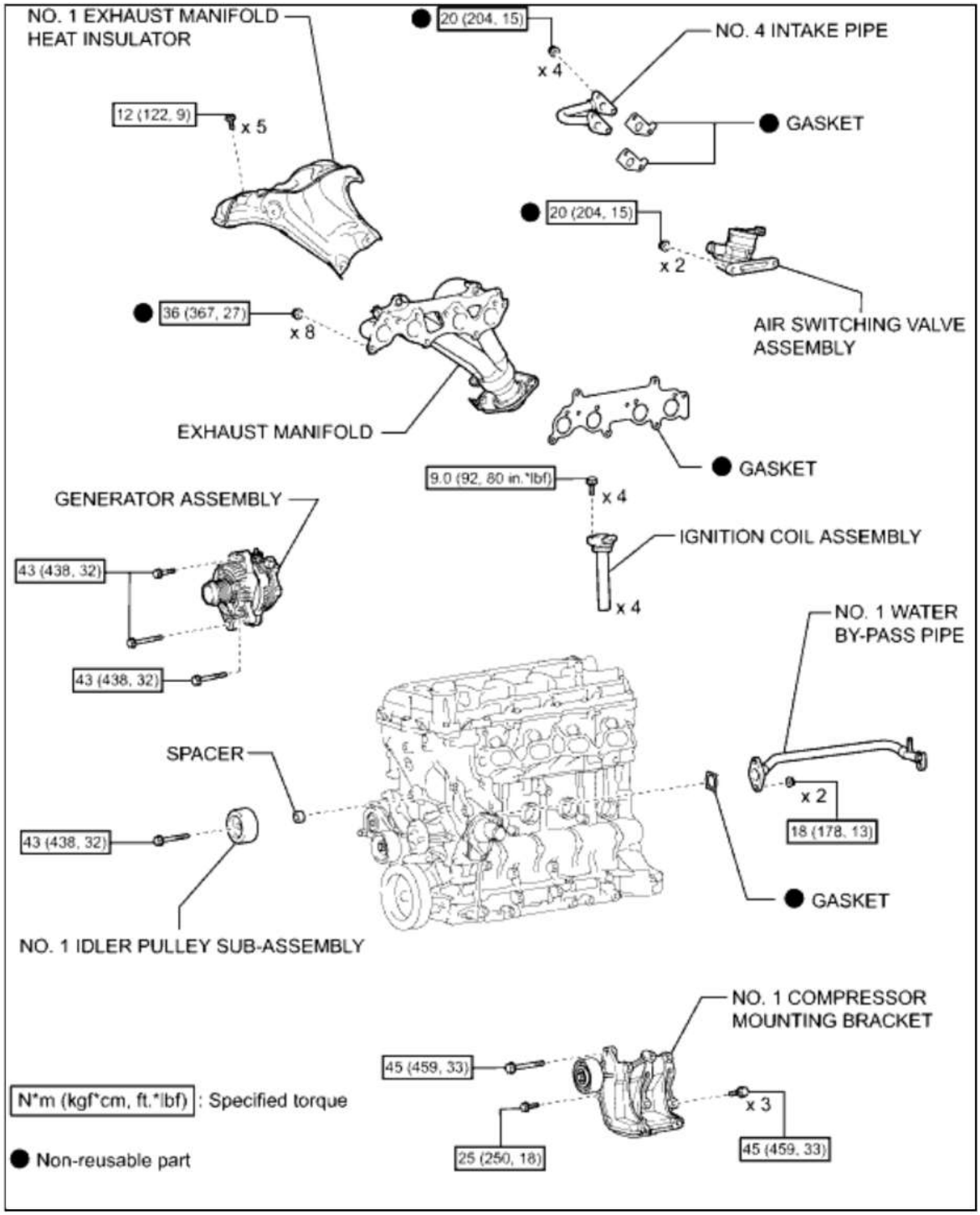
COMPONENTS

ILLUSTRATION



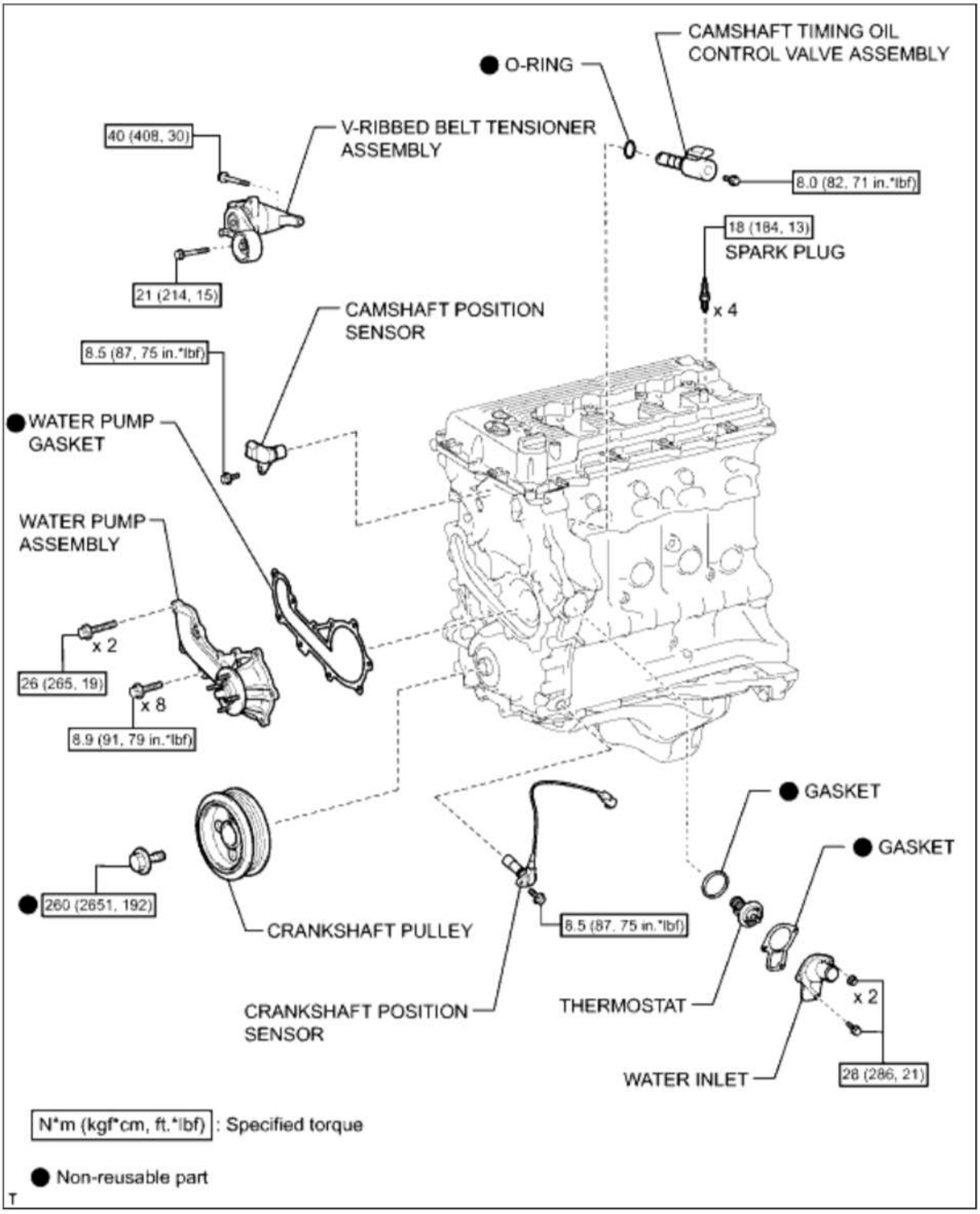
cardiagn.com

ILLUSTRATION



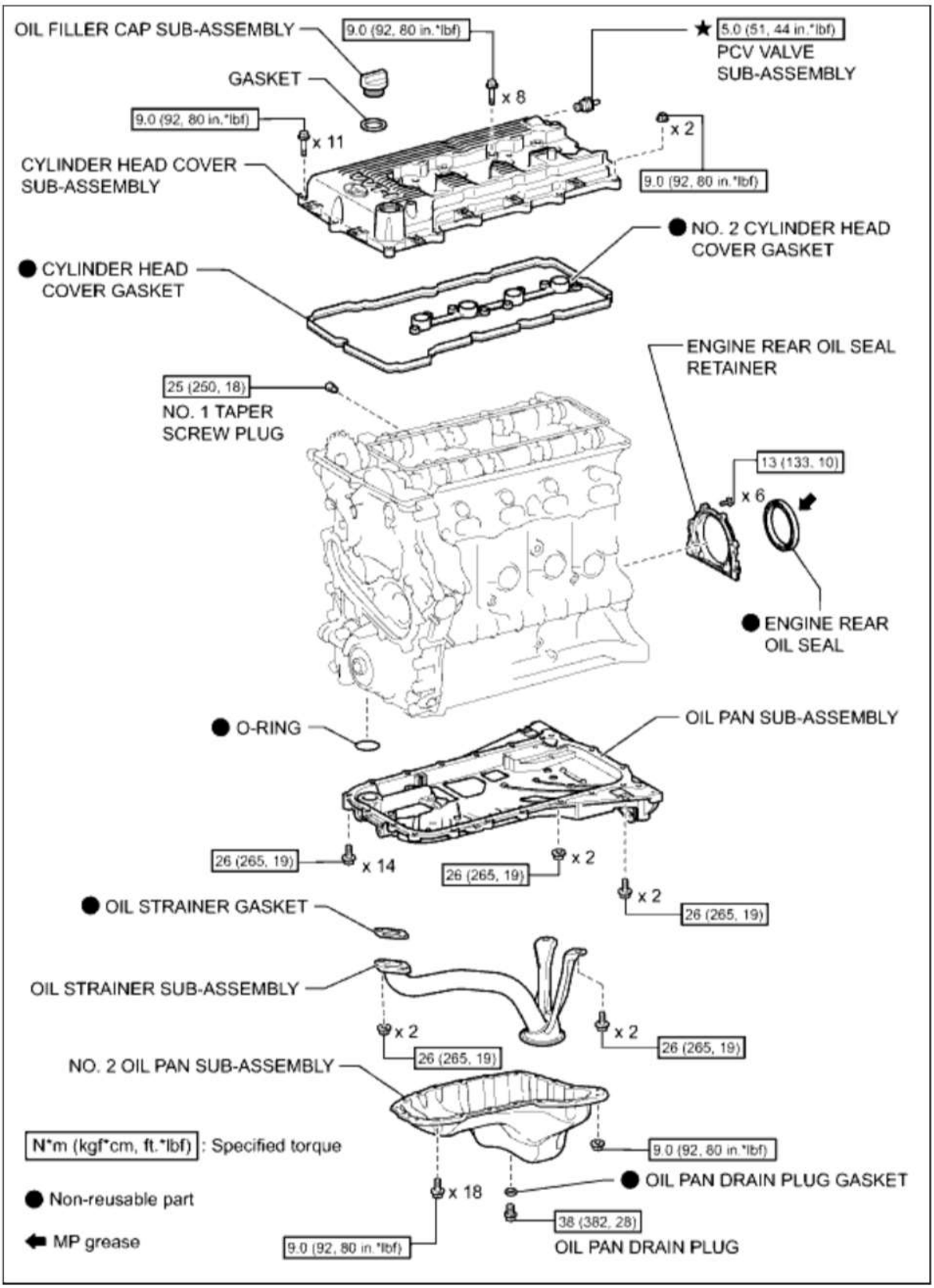
ILLUSTRATION

cardiagn.com



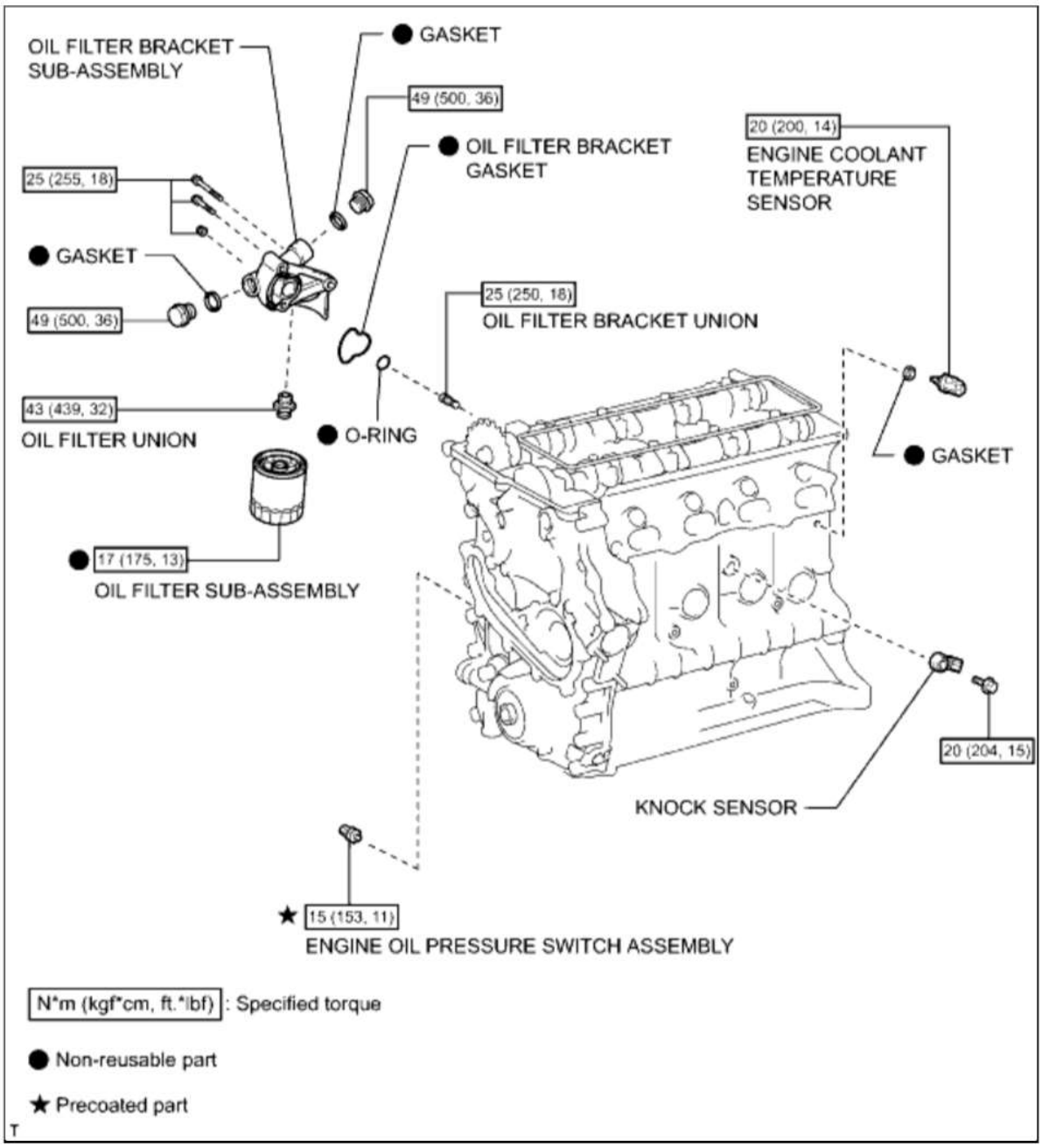
ILLUSTRATION

cardiagn.com



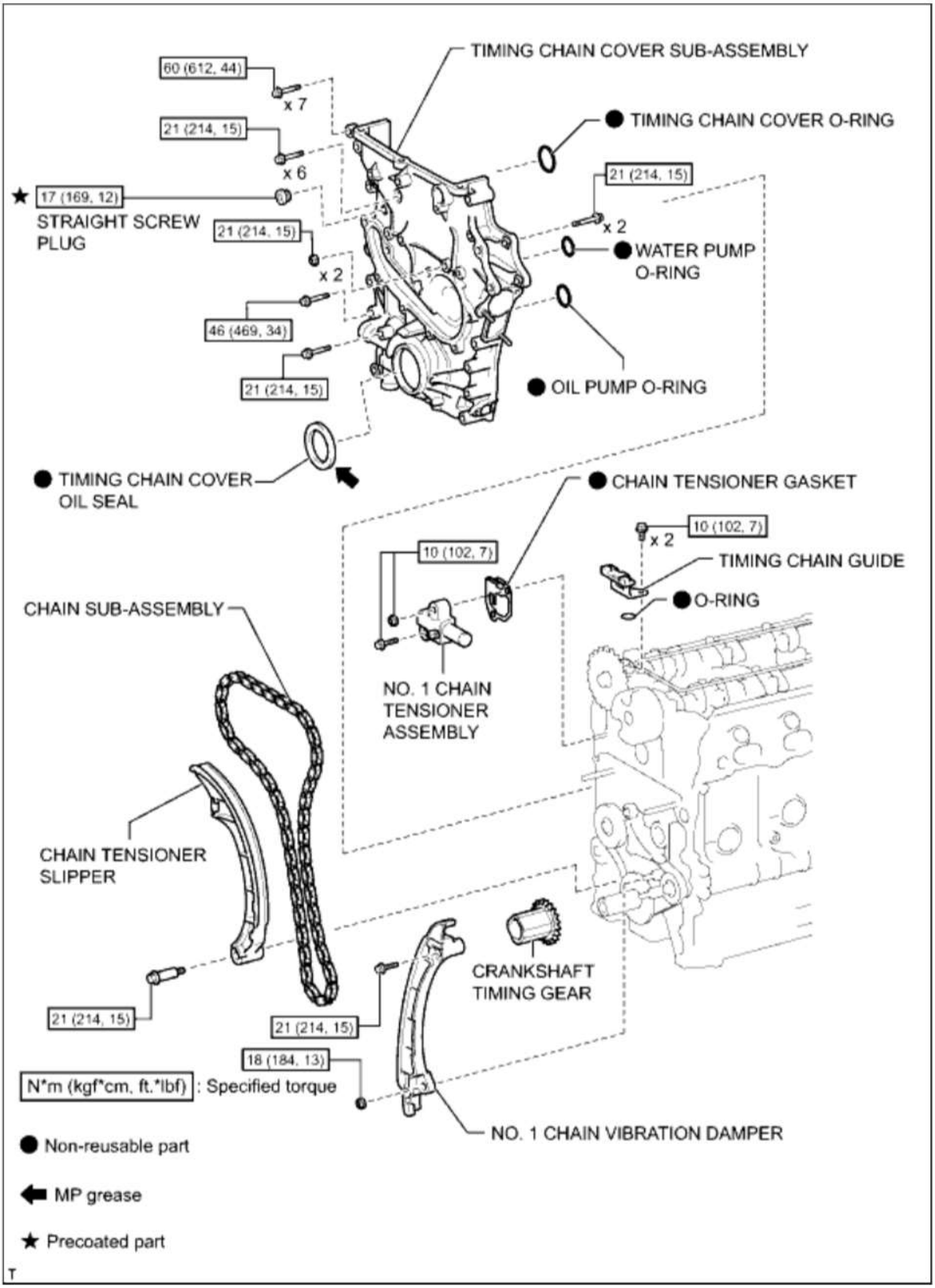
ILLUSTRATION

cardiagn.com



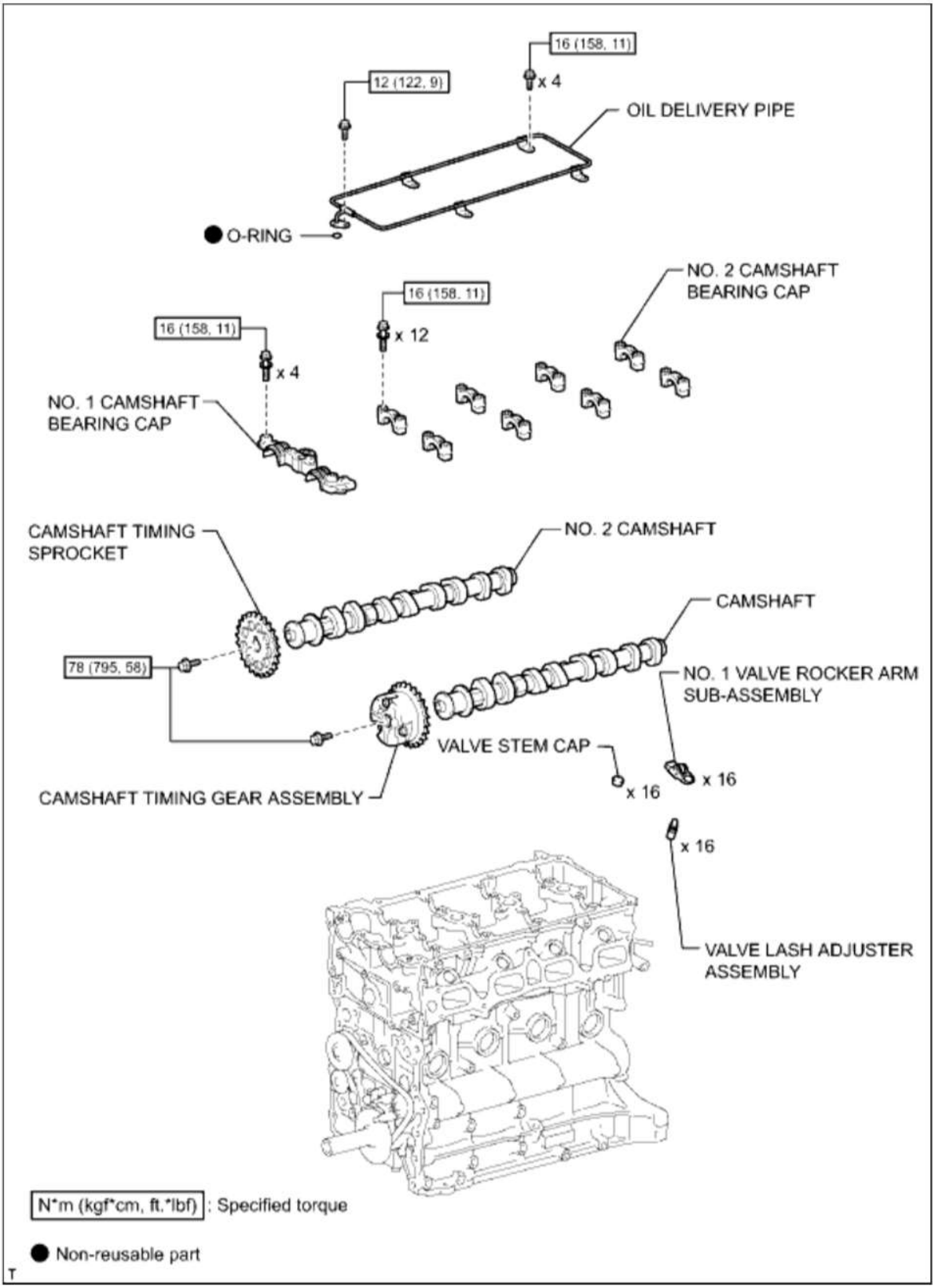
ILLUSTRATION

cardiagn.com



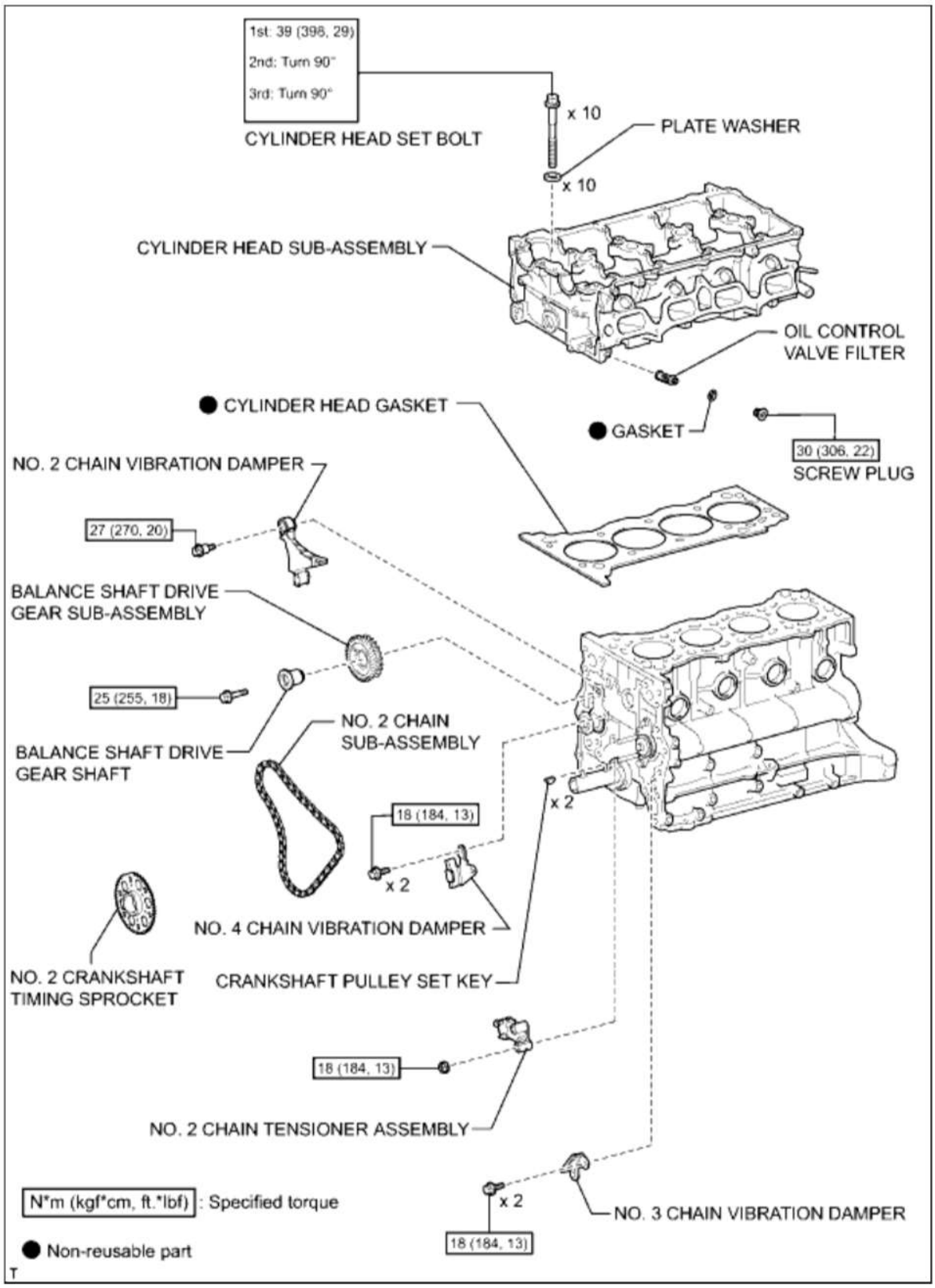
ILLUSTRATION

cardiagn.com



ILLUSTRATION

cardiagn.com



cardiagn.com

Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM0000048C6002X
Title: 2TR-FE ENGINE MECHANICAL: ENGINE UNIT: REMOVAL (2010 4Runner)		

REMOVAL

1. REMOVE IGNITION COIL ASSEMBLY INFO

2. REMOVE GENERATOR ASSEMBLY INFO

3. REMOVE NO. 1 EXHAUST MANIFOLD HEAT INSULATOR INFO

4. REMOVE NO. 4 INTAKE PIPE INFO

5. REMOVE AIR SWITCHING VALVE ASSEMBLY INFO

6. REMOVE EXHAUST MANIFOLD INFO

7. REMOVE THROTTLE WITH MOTOR BODY ASSEMBLY INFO

8. REMOVE FUEL DELIVERY PIPE WITH FUEL INJECTOR

(a) Remove the fuel delivery pipe with fuel injector INFO .

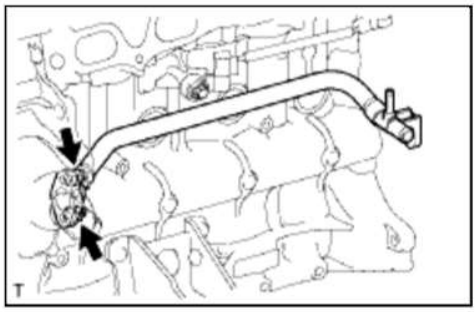
9. REMOVE PURGE VSV INFO

10. REMOVE INTAKE MANIFOLD INFO

11. REMOVE NO. 1 COMPRESSOR MOUNTING BRACKET INFO

12. REMOVE NO. 1 IDLER PULLEY SUB-ASSEMBLY INFO

13. REMOVE NO. 1 WATER BY-PASS PIPE



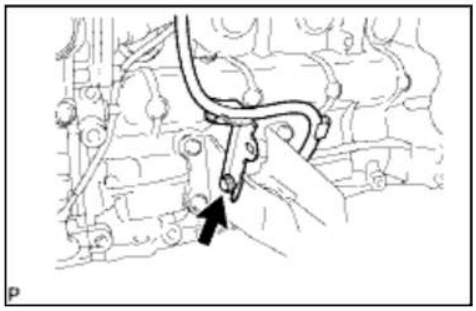
(a) Remove the 2 nuts, water by-pass pipe and gasket.

14. REMOVE ENGINE OIL LEVEL DIPSTICK GUIDE

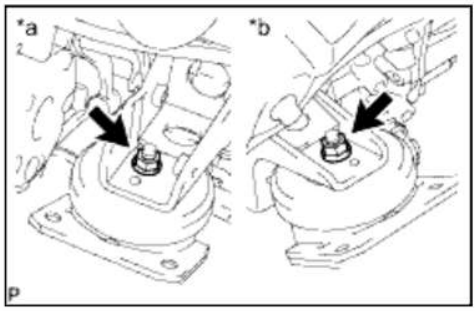
(a) Remove the oil level dipstick.

(b) Remove the bolt and oil level dipstick guide.

cardiagn.com



15. REMOVE FRONT ENGINE MOUNTING INSULATOR

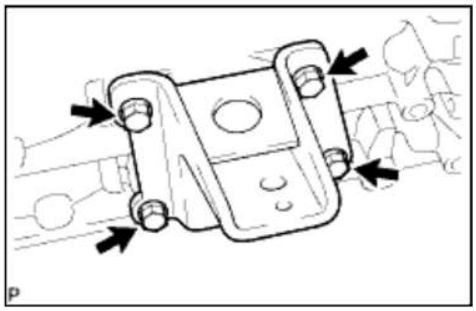


(a) Remove the 2 nuts and 2 engine mounting insulators.

Text in Illustration

*a	LH Side
*b	RH Side

16. REMOVE FRONT NO. 1 ENGINE MOUNTING BRACKET LH

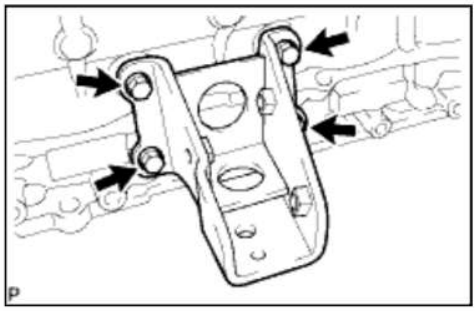


(a) Remove the 4 bolts and engine mounting bracket.

17. REMOVE FRONT NO. 1 ENGINE MOUNTING BRACKET RH

(a) Remove the 4 bolts and engine mounting bracket.

cardiagn.com



cardiagn.com

Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM00000125A020X
Title: 2TR-FE ENGINE MECHANICAL: ENGINE UNIT: DISASSEMBLY (2010 4Runner)		

DISASSEMBLY

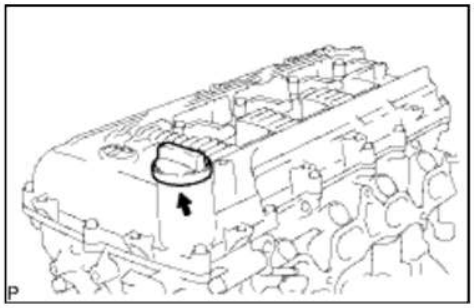
1. REMOVE SPARK PLUG INFO

2. REMOVE ENGINE OIL PRESSURE SWITCH ASSEMBLY INFO

3. REMOVE KNOCK SENSOR INFO

4. REMOVE ENGINE COOLANT TEMPERATURE SENSOR INFO

5. REMOVE OIL FILLER CAP SUB-ASSEMBLY



(a) Remove the oil filler cap.

(b) Remove the gasket from the oil filler cap.

6. REMOVE PCV VALVE SUB-ASSEMBLY INFO

7. REMOVE CAMSHAFT POSITION SENSOR INFO

8. REMOVE CRANKSHAFT POSITION SENSOR INFO

9. REMOVE CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY INFO

10. REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY INFO

11. REMOVE WATER INLET INFO

12. REMOVE THERMOSTAT INFO

13. REMOVE CRANKSHAFT PULLEY INFO

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

15. REMOVE OIL STRAINER SUB-ASSEMBLY INFO

16. REMOVE OIL PAN SUB-ASSEMBLY INFO

17. REMOVE OIL PAN STUD BOLT

cardiagn.com

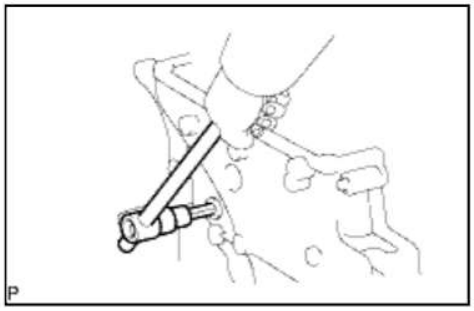
NOTICE:

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

18. REMOVE V-RIBBED BELT TENSIONER ASSEMBLY INFO

19. REMOVE TIMING CHAIN COVER SUB-ASSEMBLY INFO

20. REMOVE STRAIGHT SCREW PLUG



(a) Using a 10 mm socket hexagon wrench, remove the straight screw plug.

21. REMOVE WATER PUMP ASSEMBLY INFO

22. REMOVE TIMING CHAIN COVER OIL SEAL INFO

23. REMOVE OIL PUMP RELIEF VALVE INFO

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

25. REMOVE TIMING CHAIN GUIDE INFO

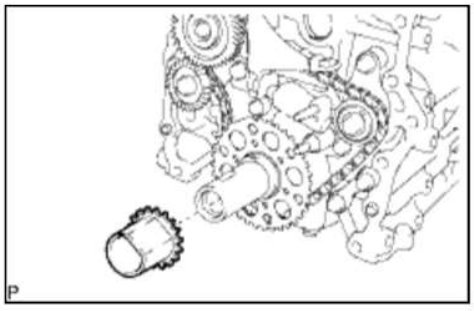
26. REMOVE NO. 1 CHAIN TENSIONER ASSEMBLY INFO

27. REMOVE CHAIN TENSIONER SLIPPER INFO

28. REMOVE NO. 1 CHAIN VIBRATION DAMPER INFO

29. REMOVE CHAIN SUB-ASSEMBLY

30. REMOVE CRANKSHAFT TIMING GEAR



(a) Remove the crankshaft timing gear from the crankshaft.

cardiagn.com

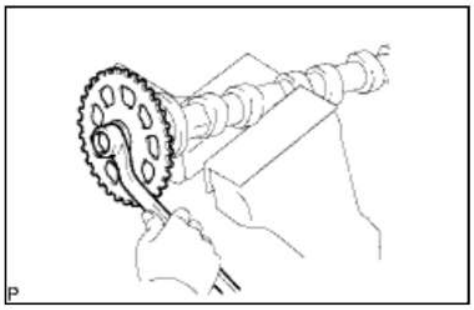
31. REMOVE CAMSHAFT BEARING CAP INFO

32. REMOVE CAMSHAFT INFO

33. REMOVE NO. 2 CAMSHAFT INFO

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

35. REMOVE CAMSHAFT TIMING SPROCKET



(a) Mount the camshaft in a vise and remove the sprocket bolt and camshaft timing sprocket.

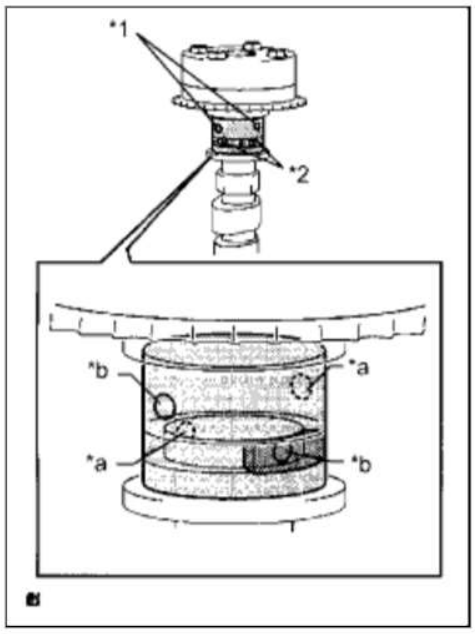
NOTICE:

Do not damage the camshaft.

36. INSPECT CAMSHAFT TIMING GEAR ASSEMBLY

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

(1) Mount the camshaft in a vise and confirm that the camshaft timing gear is locked.



Text in Illustration

*1	Retard Side Path
*2	Advance Side Path

cardiagn.com

*a	Open
*b	Close
	Rubber Piece
	Vinyl Tape

NOTICE:

Do not damage the camshaft.

(b) Release the lock pin.

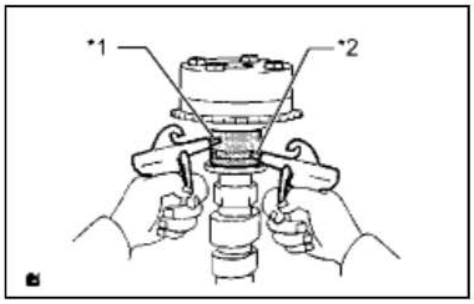
(1) Cover the 4 oil paths of the cam journal with vinyl tape as shown in the illustration.

HINT:

2 advance side paths are provided in the groove of the camshaft. Plug one of the paths with a rubber piece.

(2) Break through the tape over the advance side path, and then break through the tape over the retard side path on the opposite side of the hole over the advance side path as shown in the illustration.

(3) Apply compressed air at approximately 200 kPa (2.0 kgf/cm2, 28 psi) to the two paths accessible through the holes in the tape.



Text in Illustration

*1	Retard Side Path
*2	Advance Side Path

CAUTION:

Some oil splashing will occur. Cover the paths with a piece of cloth.

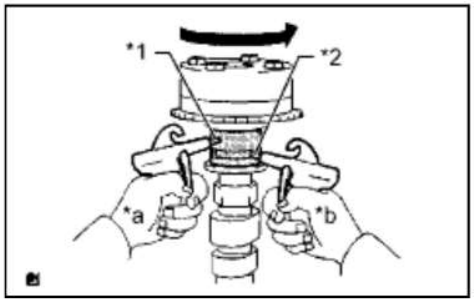
(4) Check that the camshaft timing gear revolves in the advance direction when reducing the air pressure applied to the retard side path.

OK:

Gear rotates in the advance direction.

Text in Illustration

cardiagn.com



*1	Retard Side Path
*2	Advance Side Path
*a	Decompress
*b	Hold Pressure

HINT:

This operation releases the lock pin which holds the timing gear in the most retarded position.

(5) When the camshaft timing gear reaches the most advanced position, release the air pressure from the retard side path and advance side path in that order.

NOTICE:

Do not release the air pressure from the advance side path first. The gear may abruptly shift in the retard direction and break the lock pin.

(c) Check for smooth rotation.

(1) Rotate the camshaft timing gear within its movable range several times, but do not turn it to the most retarded position. Check that the gear rotates smoothly.

CAUTION:

Do not use air pressure to perform the smooth operation check.

(d) Check the lock in the most retarded position.

(1) Confirm that the camshaft timing gear becomes locked at the most retarded position.

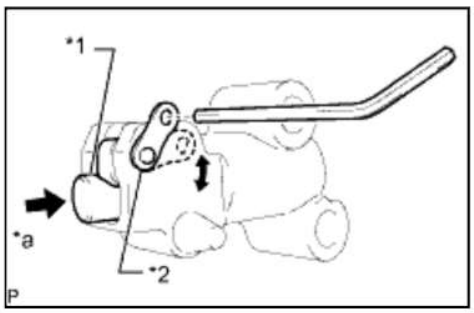
37. REMOVE CAMSHAFT TIMING GEAR ASSEMBLY INFO

38. REMOVE CYLINDER HEAD SUB-ASSEMBLY INFO

39. REMOVE CYLINDER HEAD GASKET INFO

40. REMOVE NO. 2 CHAIN VIBRATION DAMPER

(a) Move the stopper plate downward to release the lock and push the plunger deep into the tensioner.



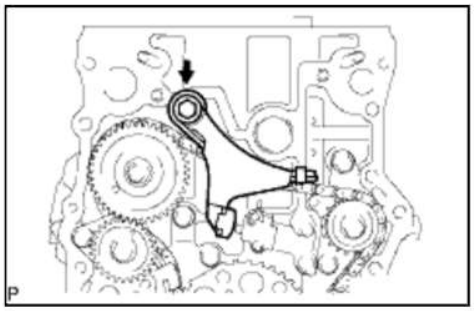
Text in Illustration

*1	Plunger
*2	Stopper Plate
*a	Push

(b) Move the stopper plate upward to set the lock and insert a hexagon wrench into the stopper plate

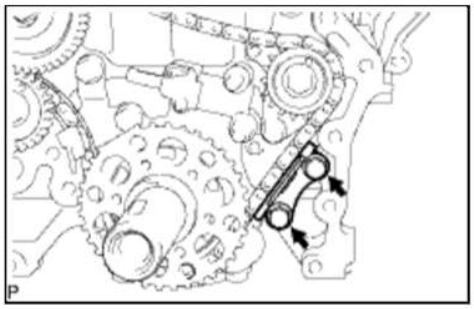
cardiagn.com

hole.



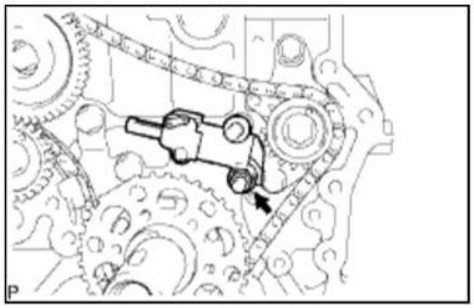
(c) Remove the bolt and chain vibration damper.

41. REMOVE NO. 3 CHAIN VIBRATION DAMPER



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

42. REMOVE NO. 2 CHAIN TENSIONER ASSEMBLY



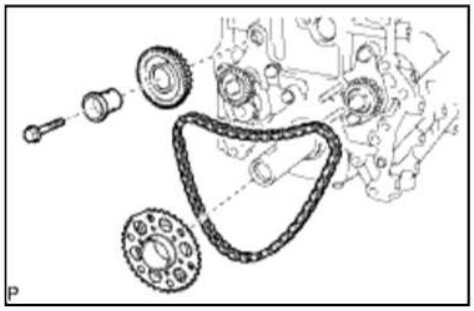
(a) Remove the hexagon wrench from the tensioner assembly.

(b) Remove the nut and chain tensioner assembly.

43. REMOVE NO. 2 CHAIN SUB-ASSEMBLY

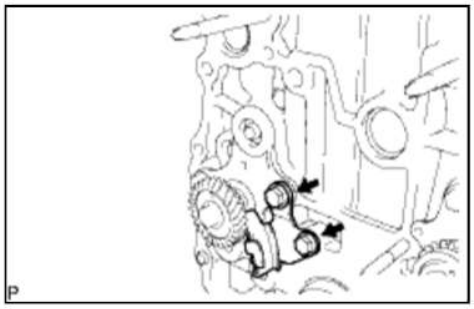
(a) Remove the bolt, balance shaft drive gear shaft and balance shaft drive gear.

cardiagn.com



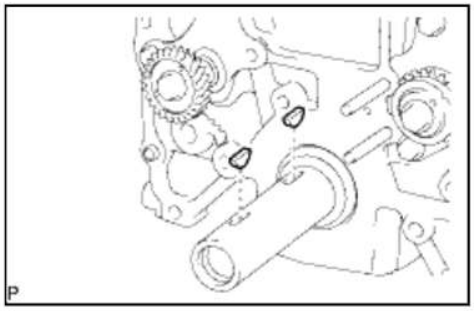
(b) Remove the crankshaft timing sprocket and chain.

44. REMOVE NO. 4 CHAIN VIBRATION DAMPER



(a) Remove the 2 bolts and vibration damper.

45. REMOVE CRANKSHAFT PULLEY SET KEY



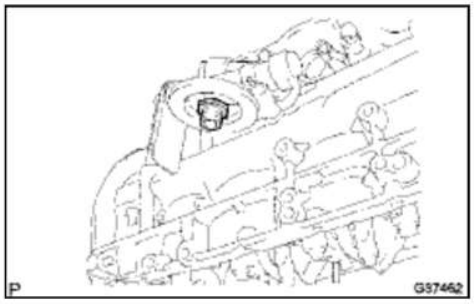
(a) Remove the 2 pulley set keys from the crankshaft.

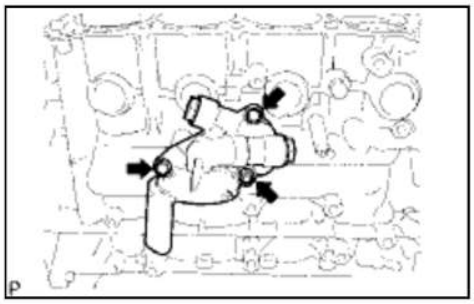
46. REMOVE OIL FILTER SUB-ASSEMBLY INFO

47. REMOVE OIL FILTER BRACKET SUB-ASSEMBLY

(a) Using a 27 mm socket wrench, remove the oil filter union.

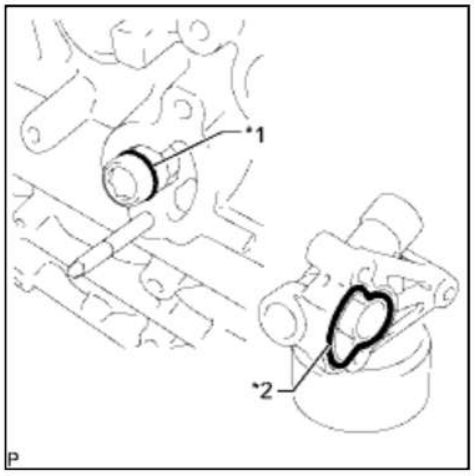
cardiagn.com





(b) Remove the 2 bolts, nut and the oil filter bracket.

(c) Remove the 2 screw plugs and 2 gaskets from the oil filter bracket.



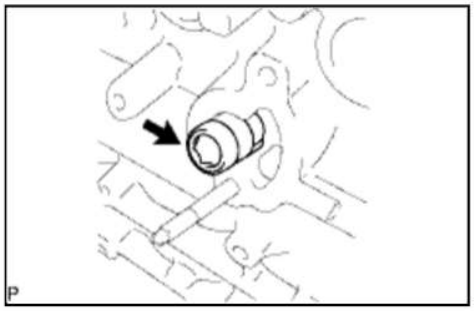
(d) Remove the oil filter bracket gasket and O-ring.

Text in Illustration

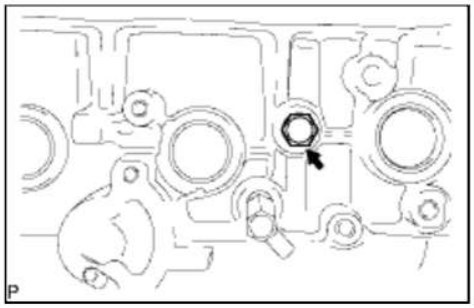
*1	O-Ring
*2	Oil Filter Bracket Gasket

(e) Using a hexagon wrench, remove the oil filter bracket union.

cardiagn.com

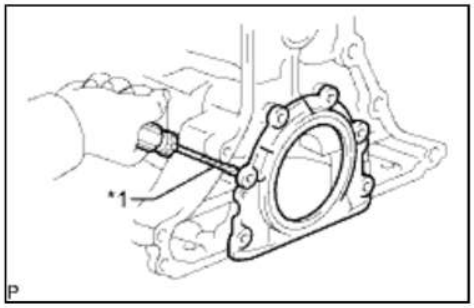


48. REMOVE NO. 1 TAPER SCREW PLUG



(a) Remove the taper screw plug from the cylinder block.

49. REMOVE ENGINE REAR OIL SEAL RETAINER



(a) Remove the 6 bolts.

(b) Using a screwdriver, pry out the oil seal retainer.

Text in Illustration

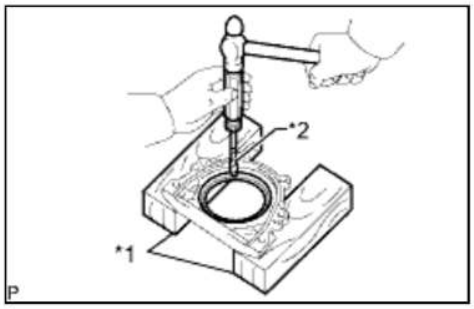
*1	Protective Tape

HINT:

Tape the screwdriver tip before use.

50. REMOVE ENGINE REAR OIL SEAL

cardiagn.com



(a) Place the oil seal retainer on wooden blocks.

Text in Illustration

*1	Wooden Block
*2	Protective Tape

(b) Using a screwdriver and hammer, tap out the oil seal.

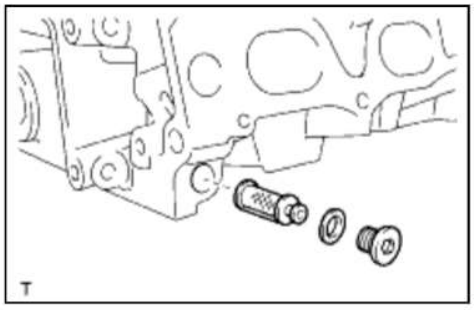
HINT:

Tape the screwdriver tip before use.

51. REMOVE VALVE STEM CAP INFO

52. REMOVE VALVE LASH ADJUSTER ASSEMBLY INFO

53. REMOVE OIL CONTROL VALVE FILTER



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

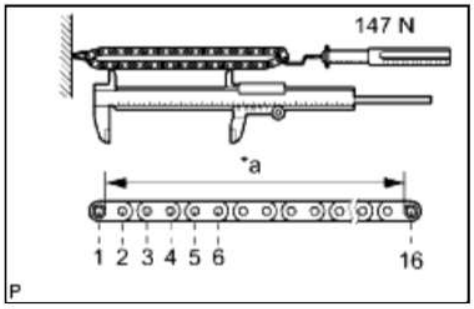
(b) Remove the oil control valve filter and gasket.

cardiagn.com

Last Modified: 5-10-2010	6.4 G	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM00000447K005X
Title: 2TR-FE ENGINE MECHANICAL: ENGINE UNIT: INSPECTION (2010 4Runner)		

INSPECTION

1. INSPECT CHAIN SUB-ASSEMBLY



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

(b) Using a vernier caliper, measure the length of 16 links.

Maximum chain elongation:
147.5 mm (5.81 in.)

Text in Illustration

*a	Measuring Area

NOTICE:

Perform the measurement at 3 random places.

If the elongation is more than the maximum, replace the chain.

2. INSPECT NO. 2 CHAIN SUB-ASSEMBLY

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

(b) Using a vernier caliper, measure the length of 16 links.

Maximum chain elongation:
123.6 mm (4.87 in.)

NOTICE:

Perform the measurement at 3 random places.

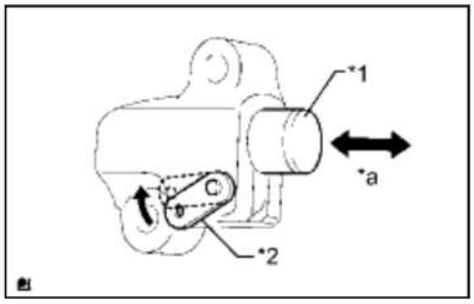
If the elongation is more than the maximum, replace the chain.

3. INSPECT NO. 1 CHAIN TENSIONER ASSEMBLY

(a) Move the stopper plate upward to release the lock. Push the plunger and check that it moves smoothly.

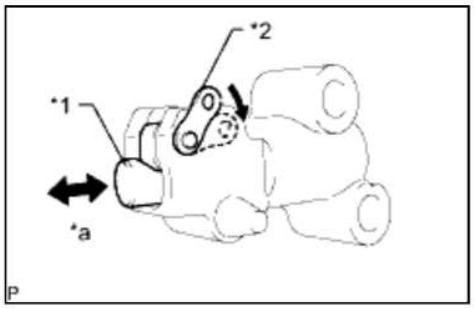
Text in Illustration

cardiagn.com



*1	Plunger
*2	Stopper Plate
*a	Moves Smoothly

4. INSPECT NO. 2 CHAIN TENSIONER ASSEMBLY



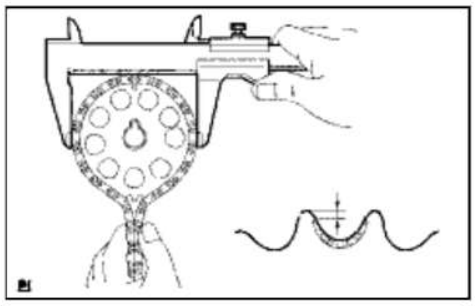
(a) Move the stopper plate downward to release the lock. Push the plunger and check that it moves smoothly.

Text in Illustration

*1	Plunger
*2	Stopper Plate
*a	Moves Smoothly

5. INSPECT CAMSHAFT TIMING SPROCKET

(a) Measure the distance between the most worn out sprocket tip and the beginning of the worn area below the tip.



Minimum distance:
1.0 mm (0.0394 in.)

Text in Illustration

	Worn Area

If the distance is less than the minimum, replace the sprocket.

If the worn area is too small or difficult to distinguish from a normal area, perform the following 2

cardiagn.com

steps.

(b) Wrap the chain around the sprocket.

(c) Using a vernier caliper, measure the sprocket diameter with the chain.

Minimum sprocket diameter (with chain):
113.8 mm (4.48 in.)

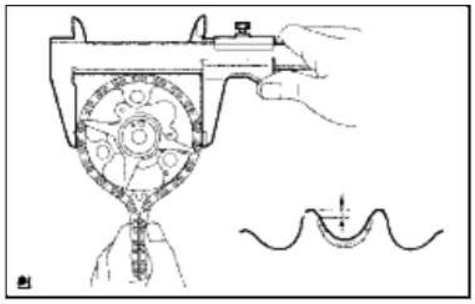
HINT:

The vernier caliper must contact the chain rollers for the measurement.

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

6. INSPECT CAMSHAFT TIMING GEAR ASSEMBLY

(a) Measure the distance between the most worn out timing gear tip and the beginning of the worn area below the tip.



Minimum distance:
1.0 mm (0.0394 in.)

Text in Illustration

	Worn Area

If the distance is less than the minimum, replace the timing gear.

If the worn area is too small or difficult to distinguish from a normal area, perform the following 2 steps.

(b) Wrap the chain around the timing gear.

(c) Using a vernier caliper, measure the sprocket diameter with the chain.

Minimum sprocket diameter (with chain):
113.8 mm (4.48 in.)

HINT:

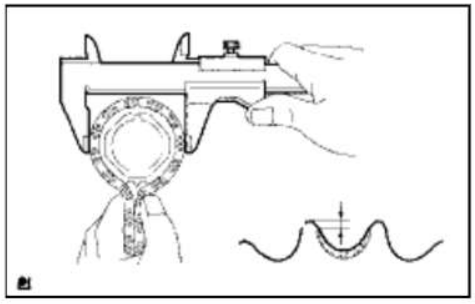
The vernier caliper must contact the chain rollers for the measurement.

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

7. INSPECT CRANKSHAFT TIMING GEAR

(a) Measure the distance between the most worn out sprocket tip and the beginning of the worn area below the tip.

cardiagn.com



Minimum distance:
1.0 mm (0.0394 in.)

Text in Illustration

	Worn Area

If the distance is less than the minimum, replace the sprocket.

If the worn area is too small or difficult to distinguish from a normal area, perform the following 2 steps.

(b) Wrap the chain around the drive sprocket.

(c) Using a vernier caliper, measure the sprocket diameter with the chain.

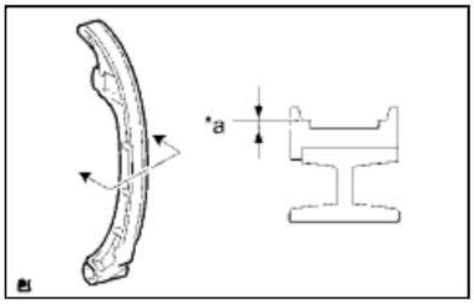
Minimum sprocket diameter (with chain):
59.4 mm (2.34 in.)

HINT:

The vernier caliper must contact the chain rollers for the measurement.

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

8. INSPECT CHAIN TENSIONER SLIPPER



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

Maximum depth:
2.0 mm (0.0787 in.)

Text in Illustration

*a	Depth

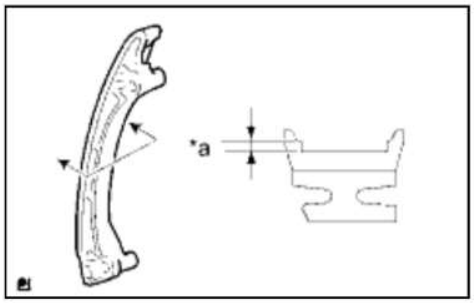
If the depth is more than the maximum, replace the tensioner slipper.

9. INSPECT NO. 1 CHAIN VIBRATION DAMPER

cardiagn.com

(a) Using a vernier caliper, measure the vibration damper depth.

Maximum depth:
2.0 mm (0.0787 in.)



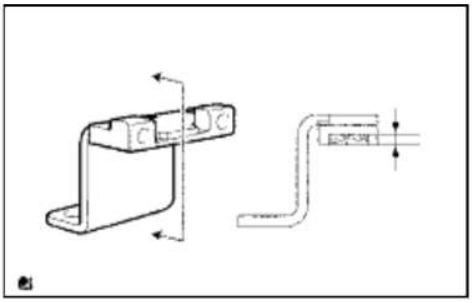
Text in Illustration

*a	Depth

If the depth is more than the maximum, replace the vibration damper.

10. INSPECT TIMING CHAIN GUIDE

(a) Using a vernier caliper, measure the chain guide depth.



Maximum depth:
0.5 mm (0.0197 in.)

Text in Illustration

	Depth

If the depth is more than the maximum, replace the timing chain guide.

11. INSPECT NO. 2 CRANKSHAFT TIMING SPROCKET

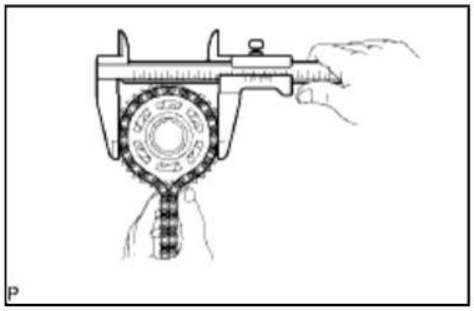
(a) Wrap the chain around the sprocket.

(b) Using a vernier caliper, measure the sprocket diameter with the chain.

Minimum sprocket diameter (with chain):
96.7 mm (3.81 in.)

HINT:

cardiagn.com

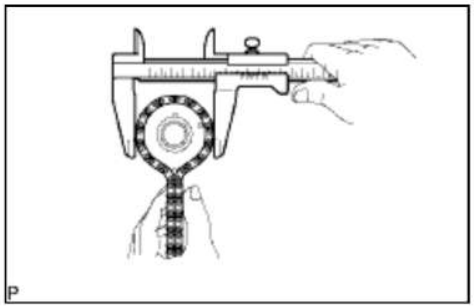


The vernier caliper must contact the chain rollers for the measurement.

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

12. INSPECT BALANCE SHAFT DRIVE GEAR SUB-ASSEMBLY

(a) Wrap the chain around the sprocket.



(b) Using a vernier caliper, measure the sprocket diameter with the chain.

Minimum sprocket diameter (with chain):
75.9 mm (2.99 in.)

HINT:

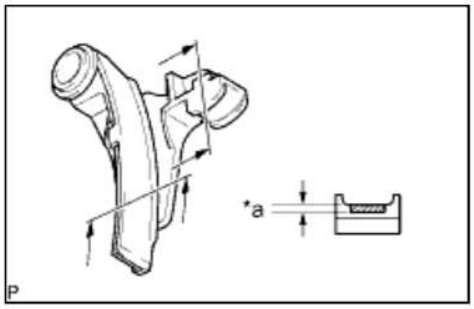
The vernier caliper must contact the chain rollers for the measurement.

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

13. INSPECT NO. 2 CHAIN VIBRATION DAMPER

(a) Using a vernier caliper, measure the vibration damper depth.

Maximum depth:
1.0 mm (0.0394 in.)



Text in Illustration

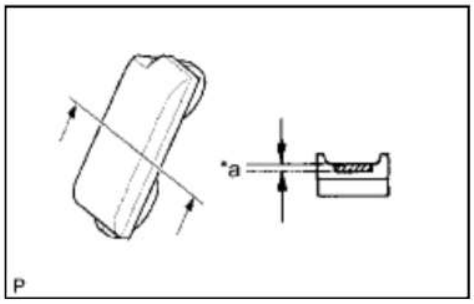
*a	Depth

If the depth is more than the maximum, replace the vibration damper.

14. INSPECT NO. 3 CHAIN VIBRATION DAMPER

(a) Using a vernier caliper, measure the vibration damper depth.

cardiagn.com



Maximum depth:
1.0 mm (0.0394 in.)

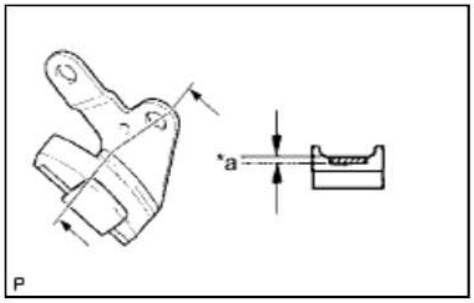
Text in Illustration

*a	Depth

If the depth is more than the maximum, replace the vibration damper.

15. INSPECT NO. 4 CHAIN VIBRATION DAMPER

(a) Using a vernier caliper, measure the vibration damper depth.



Maximum depth:
1.0 mm (0.0394 in.)

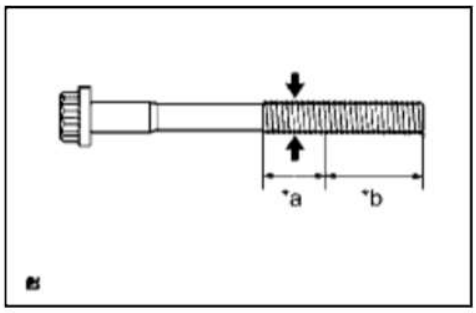
Text in Illustration

*a	Depth

If the depth is more than the maximum, replace the vibration damper.

16. INSPECT CYLINDER HEAD SET BOLT

(a) Using a vernier caliper, measure the diameter of the most elongated threads in the measuring area.



Standard outside diameter:
10.76 to 10.97 mm (0.424 to 0.432 in.)
Minimum outside diameter:
10.40 mm (0.409 in.)
Distance:
30 mm (1.18 in.)

Text in Illustration

*a	Measuring area
*b	Distance

If a visual check reveals no excessively thin areas, check

cardiagn.com

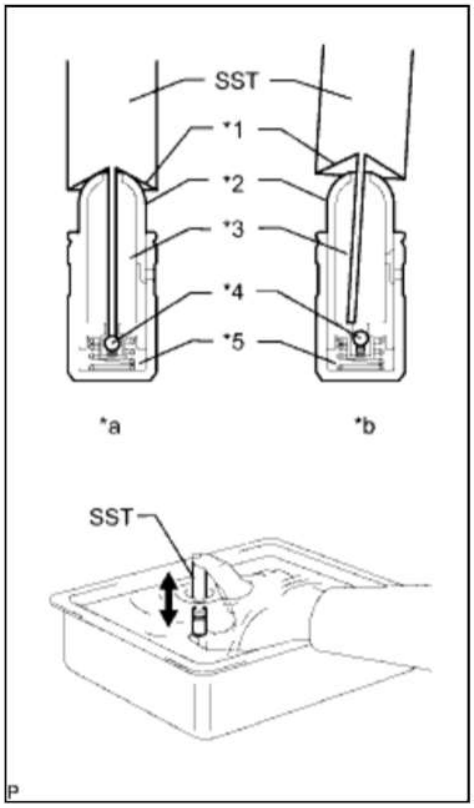
the center of the measuring area (see illustration) and find the area that has the smallest diameter.

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

17. INSPECT VALVE LASH ADJUSTER ASSEMBLY

NOTICE:

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



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

Text in Illustration

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

(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.

SST: 09276-75010

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

(d) Check the movement of the plunger and bleed 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 will not bleed.

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

cardiagn.com

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.

18. INSPECT CAMSHAFT

(a) Check the camshaft runout.

(1) Place the camshaft on V-blocks.

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

Maximum circle runout:
0.03 mm (0.00118 in.)

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

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

Standard cam lobe height:
42.855 to 42.955 mm (1.687 to 1.691 in.)
Minimum cam lobe height:
42.855 mm (1.687 in.)

If the cam lobe height is less than the minimum, replace the camshaft.

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

Standard Journal Diameter:

ITEM	SPECIFIED CONDITION
No. 1 journal	35.949 to 35.965 mm (1.415 to 1.416 in.)
Other journals	26.959 to 26.975 mm (1.061 to 1.062 in.)

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

19. INSPECT NO. 2 CAMSHAFT

(a) Check the camshaft runout.

(1) Place the camshaft on V-blocks.

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

Maximum circle runout:
0.03 mm (0.00118 in.)

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

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

Standard cam lobe height:
42.854 to 42.954 mm (1.687 to 1.691 in.)
Minimum cam lobe height:
42.854 mm (1.687 in.)

If the cam lobe height is less than the minimum, replace the camshaft.

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

Standard Journal Diameter:

cardiagn.com

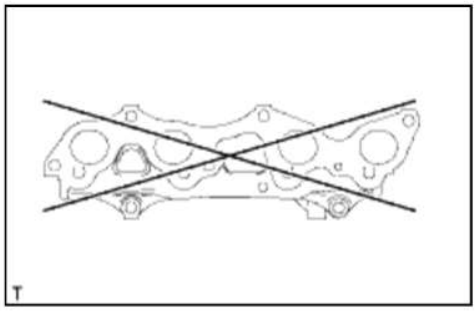
ITEM	SPECIFIED CONDITION
No. 1 journal	35.949 to 35.965 mm (1.415 to 1.416 in.)
Other journals	26.959 to 26.975 mm (1.061 to 1.062 in.)

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

20. INSPECT CAMSHAFT THRUST CLEARANCE INFO

21. INSPECT CAMSHAFT OIL CLEARANCE INFO

22. INSPECT EXHAUST MANIFOLD



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

Maximum warpage:
0.7 mm (0.0276 in.)

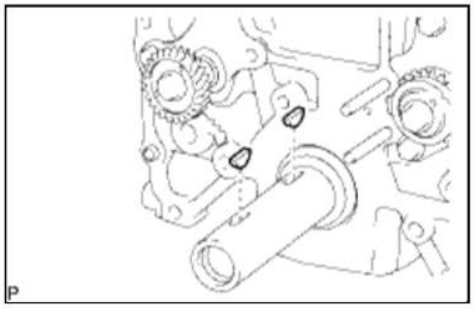
If the warpage is more than the maximum, replace the exhaust manifold.

cardiagn.com

Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM00000125B01YX
Title: 2TR-FE ENGINE MECHANICAL: ENGINE UNIT: REASSEMBLY (2010 4Runner)		

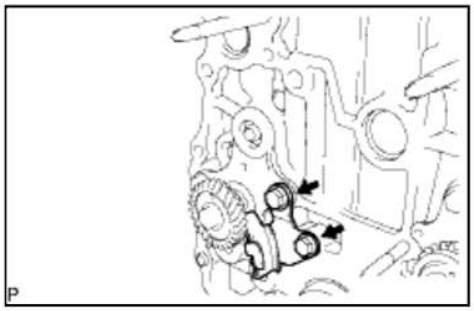
REASSEMBLY

1. INSTALL CRANKSHAFT PULLEY SET KEY



(a) Install the 2 pulley keys to the crankshaft.

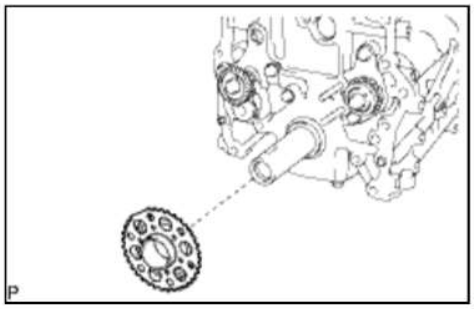
2. INSTALL NO. 4 CHAIN VIBRATION DAMPER



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

Torque: 18 N·m (184 kgf·cm, 13ft·lbf)

3. INSTALL NO. 2 CHAIN SUB-ASSEMBLY



(a) Install the timing sprocket as shown in the illustration.

NOTICE:

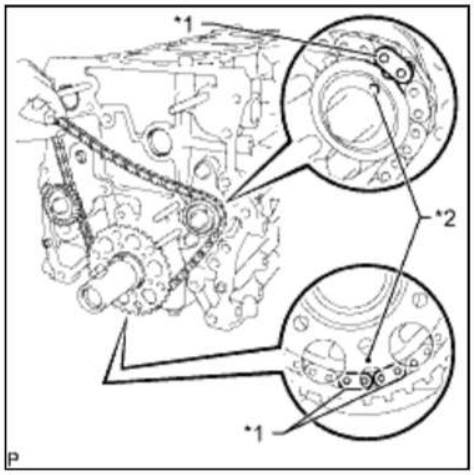
Check that the No. 1 cylinder is at TDC and that the weights of the No. 1 and No. 2 balance shafts are at the bottom.

HINT:

Install the timing sprocket with the front mark facing forward.

(b) As shown in the illustration, install the chain to the

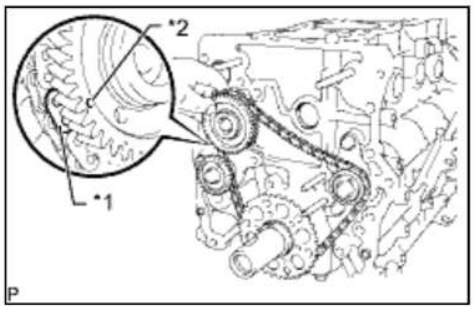
cardiagn.com



sprocket and gear with the mark plates aligned with the timing marks on the sprocket and gear.

Text in Illustration

*1	Mark Plate (Yellow)
*2	Timing Mark

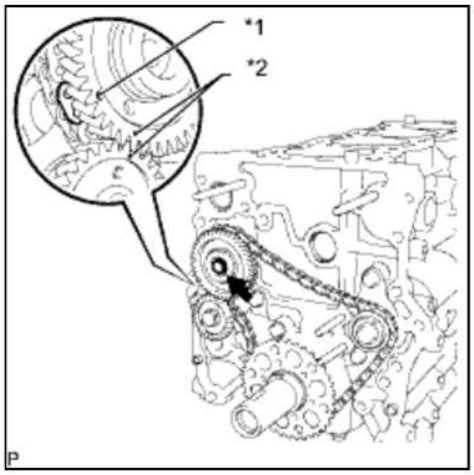


(c) Fit the other mark plate of the chain behind the large timing mark of the balance shaft drive gear.

Text in Illustration

*1	Mark Plate (Yellow)
*2	Large Timing Mark

(d) Insert the balance shaft drive gear shaft through the balance shaft drive gear so that it fits into the thrust plate hole.



(e) Align the small timing mark of the balance shaft drive gear with the large timing mark of the balance shaft timing gear.

Text in Illustration

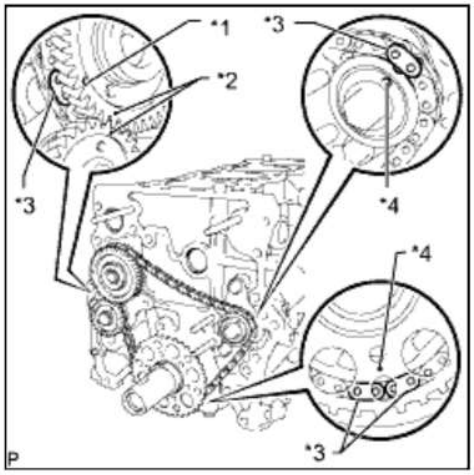
*1	Large Timing Mark
*2	Small Timing Mark

(f) Install the bolt to the balance shaft drive gear.

Torque: 25 N·m (255 kgf·cm, 18ft·lbf)

cardiagn.com

(g) Check that each timing mark is aligned with the corresponding mark plate.



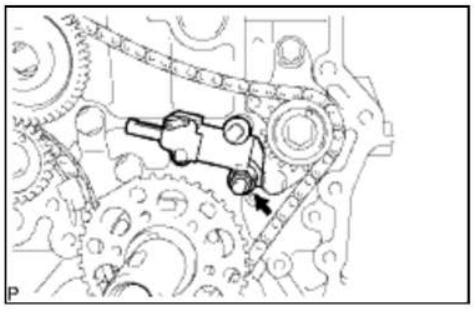
Text in Illustration

*1	Large Timing Mark
*2	Small Timing Mark
*3	Mark Plate (Yellow)
*4	Timing Mark

NOTICE:

Check that the No. 1 cylinder is at TDC and that the weights of the No. 1 and No. 2 balance shafts are at the bottom.

4. INSTALL NO. 2 CHAIN TENSIONER ASSEMBLY



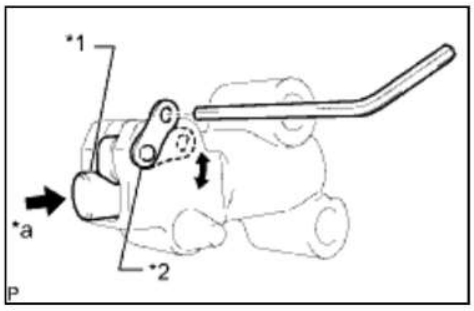
(a) Install the chain tensioner assembly with the nut.

Torque: 18 N·m (184 kgf·cm, 13ft·lbf)

NOTICE:

Install the chain tensioner with the pin installed, and then remove the pin after installation. When performing this step, do not push the vibration damper against the chain.

(b) Move the stopper plate downward to release the lock and push the plunger deep into the tensioner.



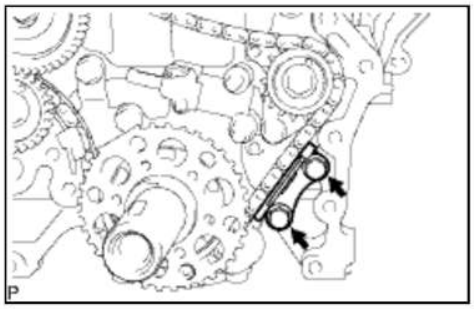
Text in Illustration

*1	Plunger
*2	Stopper Plate
*a	Push

(c) Move the stopper plate upward to set the lock and insert a hexagon wrench into the stopper plate hole.

5. INSTALL NO. 3 CHAIN VIBRATION DAMPER

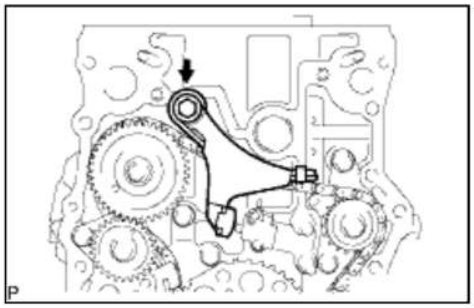
cardiagn.com



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

Torque: 18 N·m (184 kgf·cm, 13ft·lbf)

6. INSTALL NO. 2 CHAIN VIBRATION DAMPER

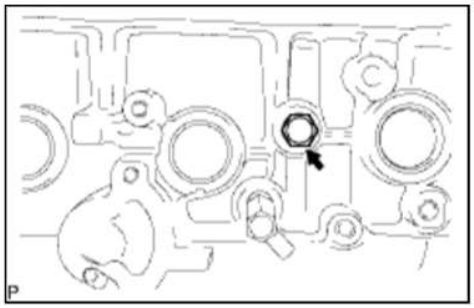


(a) Install the chain vibration damper with the bolt.

Torque: 27 N·m (270 kgf·cm, 20ft·lbf)

(b) Remove the pin from the chain tensioner assembly and release the plunger.

7. INSTALL NO. 1 TAPER SCREW PLUG



(a) Install the screw plug to the cylinder block.

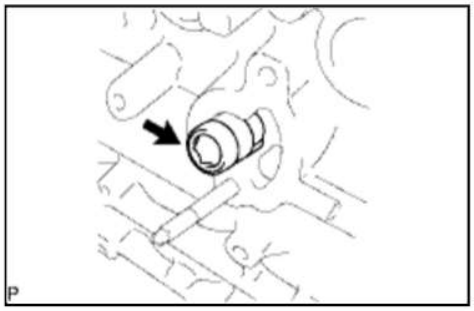
Torque: 25 N·m (250 kgf·cm, 18ft·lbf)

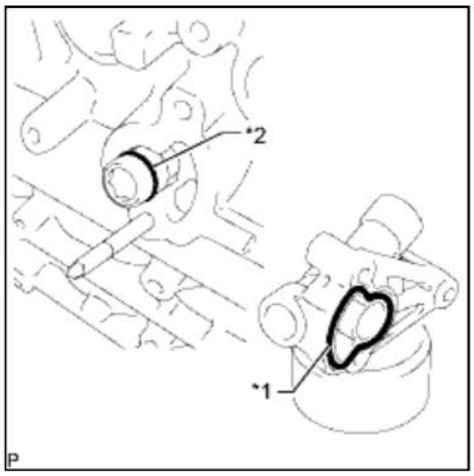
8. INSTALL OIL FILTER BRACKET SUB-ASSEMBLY

(a) Using a hexagon wrench, install the oil filter bracket union.

Torque: 25 N·m (250 kgf·cm, 18ft·lbf)

cardiagn.com





(b) Install a new oil filter bracket gasket to the oil filter bracket.

Text in Illustration

*1	New Oil Filter Bracket Gasket
*2	New O-Ring

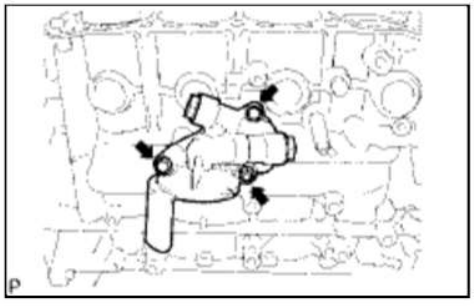
(c) Install a new O-ring to the oil filter bracket union.

NOTICE:

Apply a light coat of engine oil to the O-ring and oil filter bracket.

(d) Install 2 new gaskets and the 2 screw plugs to the oil filter bracket.

Torque: 49 N·m (500 kgf·cm, 36ft·lbf)



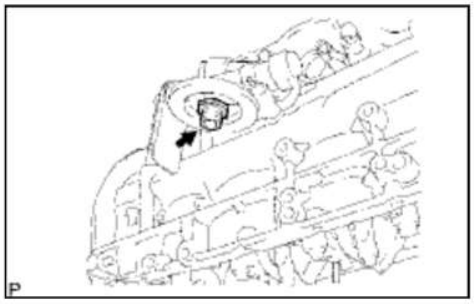
(e) Install the oil filter bracket with the 2 bolts and nut.

Torque: 25 N·m (255 kgf·cm, 18ft·lbf)

(f) Using a 27 mm socket wrench, install the oil filter union.

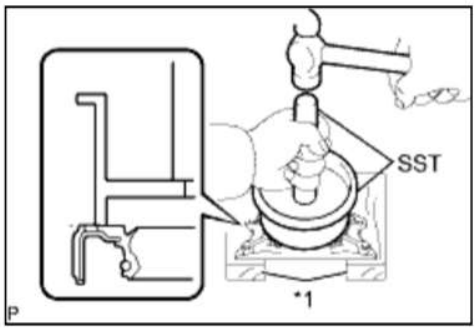
Torque: 43 N·m (439 kgf·cm, 32ft·lbf)

cardiagn.com



9. INSTALL OIL FILTER SUB-ASSEMBLY

10. INSTALL ENGINE REAR OIL SEAL



(a) Place the oil seal retainer on wooden blocks.

Text in Illustration

*1	Wooden Block

(b) Apply a light coat of MP grease to the lip of a new oil seal.

NOTICE:

- Do not allow foreign matter to contact the lip of the oil seal.
- Do not allow MP grease to contact the dust seal.

(c) 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

09951-07150

NOTICE:

- The acceptable depth from the top of the oil seal retainer is 0 to 1.0 mm (0 to 0.394 in.)
- Do not tap in the oil seal at an angle.
- Make sure that the oil seal is properly installed.

11. INSTALL ENGINE REAR OIL SEAL RETAINER

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

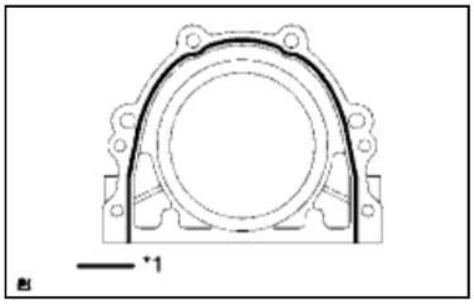
Seal packing:
Toyota Genuine Seal Packing Black, Three Bond 1207B or

cardiagn.com

equivalent

Seal width

2.0 to 3.0 mm (0.079 to 0.118 in.)



Text in Illustration

*1	Seal Packing

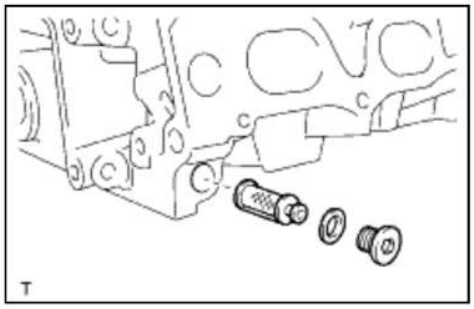
NOTICE:

- Remove any oil from the contact surface.
- Install the rear oil seal retainer within 3 minutes after applying seal packing.
- Do not start the engine for at least 4 hours after installation.

(b) Install the oil seal retainer with the 6 bolts.

Torque: 13 N·m (133 kgf·cm, 10ft·lbf)

12. INSTALL OIL CONTROL VALVE FILTER



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

If foreign matter is present, clean the part thoroughly.

(b) Using an 8 mm hexagon wrench, install a new gasket and the oil control valve filter with the screw plug.

Torque: 30 N·m (306 kgf·cm, 22ft·lbf)

13. INSTALL CYLINDER HEAD GASKET INFO

14. INSTALL CYLINDER HEAD SUB-ASSEMBLY INFO

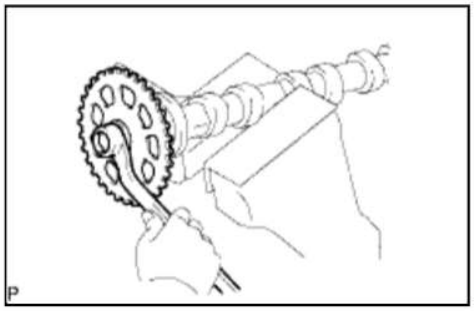
15. INSTALL CAMSHAFT TIMING SPROCKET

(a) Mount the camshaft in a vise and install the camshaft timing sprocket to the camshaft with the sprocket bolt.

Torque: 78 N·m (795 kgf·cm, 58ft·lbf)

NOTICE:

cardiagn.com



Do not damage the camshaft the vise.

16. INSTALL CAMSHAFT TIMING GEAR ASSEMBLY INFO

17. INSTALL VALVE LASH ADJUSTER ASSEMBLY INFO

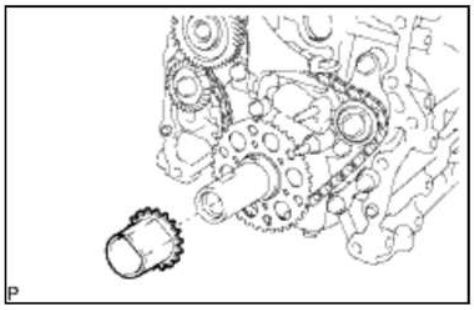
18. INSTALL VALVE STEM CAP INFO

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

20. INSTALL CAMSHAFT INFO

21. INSTALL CAMSHAFT BEARING CAP INFO

22. INSTALL CRANKSHAFT TIMING GEAR



(a) Install the timing gear as shown in the illustration.

23. INSTALL NO. 1 CHAIN VIBRATION DAMPER INFO

24. INSTALL CHAIN SUB-ASSEMBLY INFO

25. INSTALL CHAIN TENSIONER SLIPPER INFO

26. INSTALL NO. 1 CHAIN TENSIONER ASSEMBLY INFO

27. INSTALL TIMING CHAIN GUIDE INFO

28. INSTALL WATER PUMP ASSEMBLY INFO

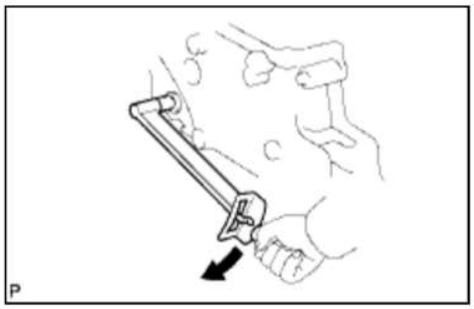
29. INSTALL OIL PUMP RELIEF VALVE INFO

30. INSTALL TIMING CHAIN COVER SUB-ASSEMBLY INFO

cardiagn.com

31. INSTALL V-RIBBED BELT TENSIONER ASSEMBLY INFO

32. INSTALL STRAIGHT SCREW PLUG



(a) Apply adhesive to the straight screw plug.

Adhesive:
Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

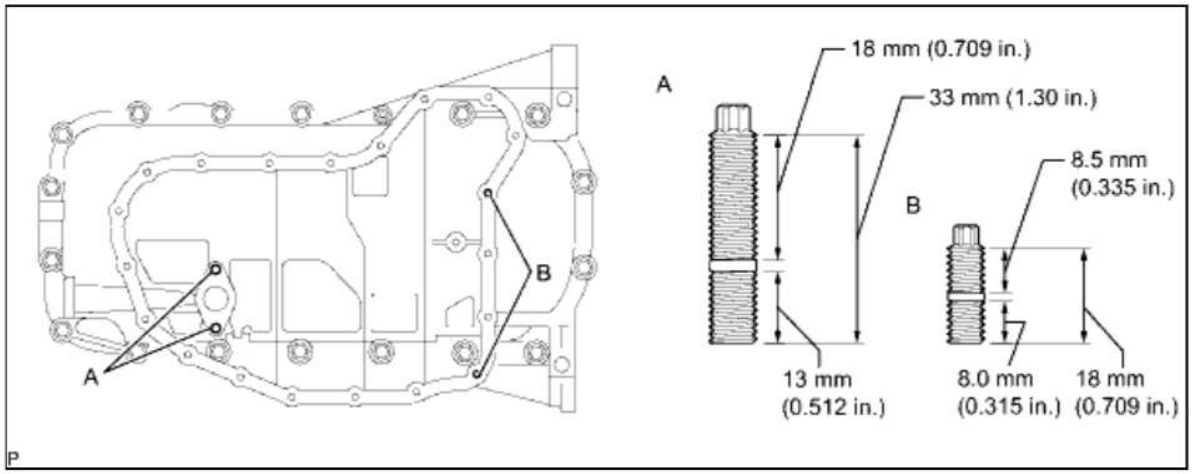
(b) Using a 10 mm socket hexagon wrench, install the straight screw plug.

Torque: 17 N·m (169 kgf·cm, 12ft·lbf)

33. INSTALL TIMING CHAIN COVER OIL SEAL INFO

34. INSTALL OIL PAN STUD BOLT

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



(a) Using E5 and E7 "TORX" socket wrenches, install the stud bolts.

for stud bolt A - Torque: 7.5 N·m (76 kgf·cm, 66in·lbf)
for stud bolt B - Torque: 3.0 N·m (31 kgf·cm, 27in·lbf)

35. INSTALL OIL PAN SUB-ASSEMBLY INFO

36. INSTALL OIL STRAINER SUB-ASSEMBLY INFO

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

38. INSTALL CRANKSHAFT PULLEY INFO

cardiagn.com

39. INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY INFO

40. INSTALL THERMOSTAT INFO

41. INSTALL WATER INLET INFO

42. INSTALL CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY INFO

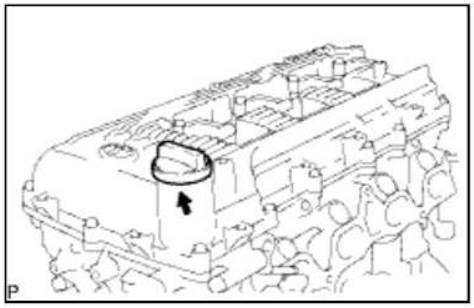
43. INSTALL CRANKSHAFT POSITION SENSOR INFO

44. INSTALL CAMSHAFT POSITION SENSOR INFO

45. INSTALL PCV VALVE SUB-ASSEMBLY INFO

46. INSTALL OIL FILLER CAP SUB-ASSEMBLY

(a) Install the gasket to the oil filler cap.



(b) Install the oil filler cap.

47. INSTALL ENGINE COOLANT TEMPERATURE SENSOR INFO

48. INSTALL KNOCK SENSOR INFO

49. INSTALL ENGINE OIL PRESSURE SWITCH ASSEMBLY INFO

50. INSTALL SPARK PLUG INFO

cardiagn.com

Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM0000048C5002X
Title: 2TR-FE ENGINE MECHANICAL: ENGINE UNIT: INSTALLATION (2010 4Runner)		

INSTALLATION

1. INSTALL FRONT NO. 1 ENGINE MOUNTING BRACKET RH

(a) Install the engine mounting bracket with the 4 bolts.

Torque: 51 N·m (520 kgf·cm, 38ft·lbf)

2. INSTALL FRONT NO. 1 ENGINE MOUNTING BRACKET LH

(a) Install the engine mounting bracket with the 4 bolts.

Torque: 51 N·m (520 kgf·cm, 38ft·lbf)

3. INSTALL FRONT ENGINE MOUNTING INSULATOR

(a) Install the 2 mounting insulators with the 2 nuts.

Torque: 46 N·m (469 kgf·cm, 34ft·lbf)

4. INSTALL ENGINE OIL LEVEL DIPSTICK GUIDE

(a) Install the oil level dipstick guide with the bolt.

Torque: 20 N·m (204 kgf·cm, 15ft·lbf)

5. INSTALL NO. 1 WATER BY-PASS PIPE

(a) Install a new gasket and the water by-pass pipe with the 2 nuts.

Torque: 18 N·m (178 kgf·cm, 13ft·lbf)

6. INSTALL NO. 1 IDLER PULLEY SUB-ASSEMBLY INFO

7. INSTALL NO. 1 COMPRESSOR MOUNTING BRACKET INFO

8. INSTALL INTAKE MANIFOLD INFO

9. INSTALL PURGE VSV INFO

10. INSTALL FUEL DELIVERY PIPE WITH FUEL INJECTOR

(a) Install the fuel delivery pipe with fuel injector INFO .

11. INSTALL THROTTLE WITH MOTOR BODY ASSEMBLY INFO

12. INSTALL EXHAUST MANIFOLD INFO

13. INSTALL AIR SWITCHING VALVE ASSEMBLY INFO

14. INSTALL NO. 4 INTAKE PIPE INFO

15. INSTALL NO. 1 EXHAUST MANIFOLD HEAT INSULATOR INFO

16. INSTALL GENERATOR ASSEMBLY INFO

cardiagn.com

17. INSTALL IGNITION COIL ASSEMBLY INFO

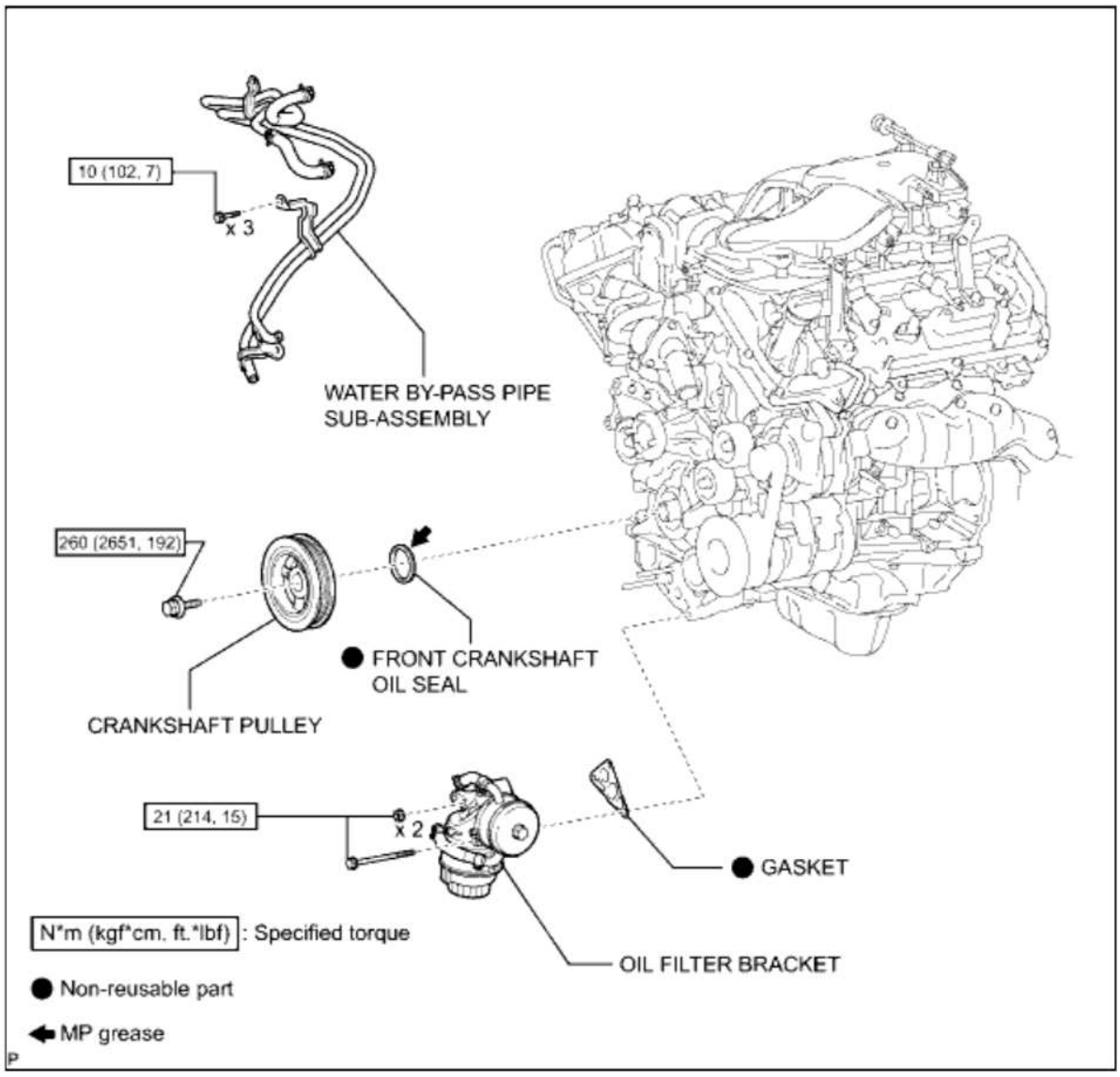


cardiagn.com

Last Modified: 5-10-2010	6.4 K	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000002B4L00DX
Title: 1GR-FE ENGINE MECHANICAL: FRONT CRANKSHAFT OIL SEAL: COMPONENTS (2010 4Runner)		

COMPONENTS

ILLUSTRATION



cardiagn.com

Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000002B4M00DX
Title: 1GR-FE ENGINE MECHANICAL: FRONT CRANKSHAFT OIL SEAL: REMOVAL (2010 4Runner)		

REMOVAL

1. REMOVE RADIATOR ASSEMBLY

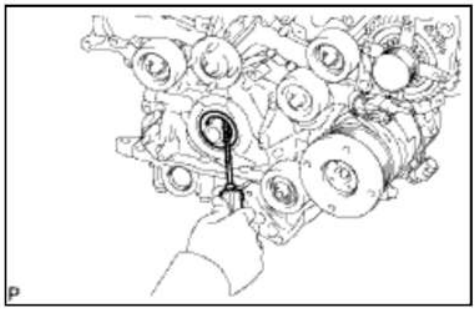
(a) Remove the radiator INFO .

2. DISCONNECT WATER BY-PASS PIPE SUB-ASSEMBLY INFO

3. REMOVE OIL FILTER BRACKET INFO

4. REMOVE CRANKSHAFT PULLEY INFO

5. REMOVE FRONT CRANKSHAFT OIL SEAL



(a) Using a screwdriver, pry out the oil seal.

HINT:

Tape the screwdriver tip before use.

NOTICE:

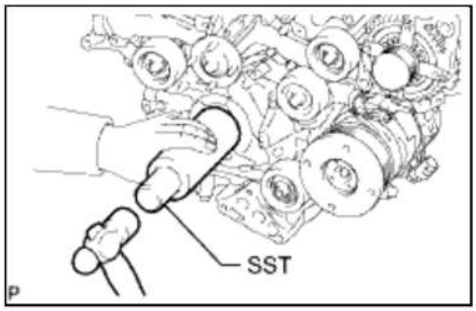
Do not damage the surface of the oil seal press fit hole or crankshaft.

cardiagn.com

Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000002B4K00DX
Title: 1GR-FE ENGINE MECHANICAL: FRONT CRANKSHAFT OIL SEAL: INSTALLATION (2010 4Runner)		

INSTALLATION

1. INSTALL FRONT CRANKSHAFT OIL SEAL



(a) Apply MP grease to the lip of a new oil seal.

(b) Using SST and a hammer, tap in the oil seal until its surface is flush with the timing chain cover edge.

SST: 09226-10010

NOTICE:

- Keep the lip free from foreign matter.
- Do not tap the oil seal at an angle.

2. INSTALL CRANKSHAFT PULLEY INFO

3. INSTALL OIL FILTER BRACKET INFO

4. CONNECT WATER BY-PASS PIPE SUB-ASSEMBLY INFO

5. INSTALL RADIATOR ASSEMBLY

(a) Install the radiator INFO .

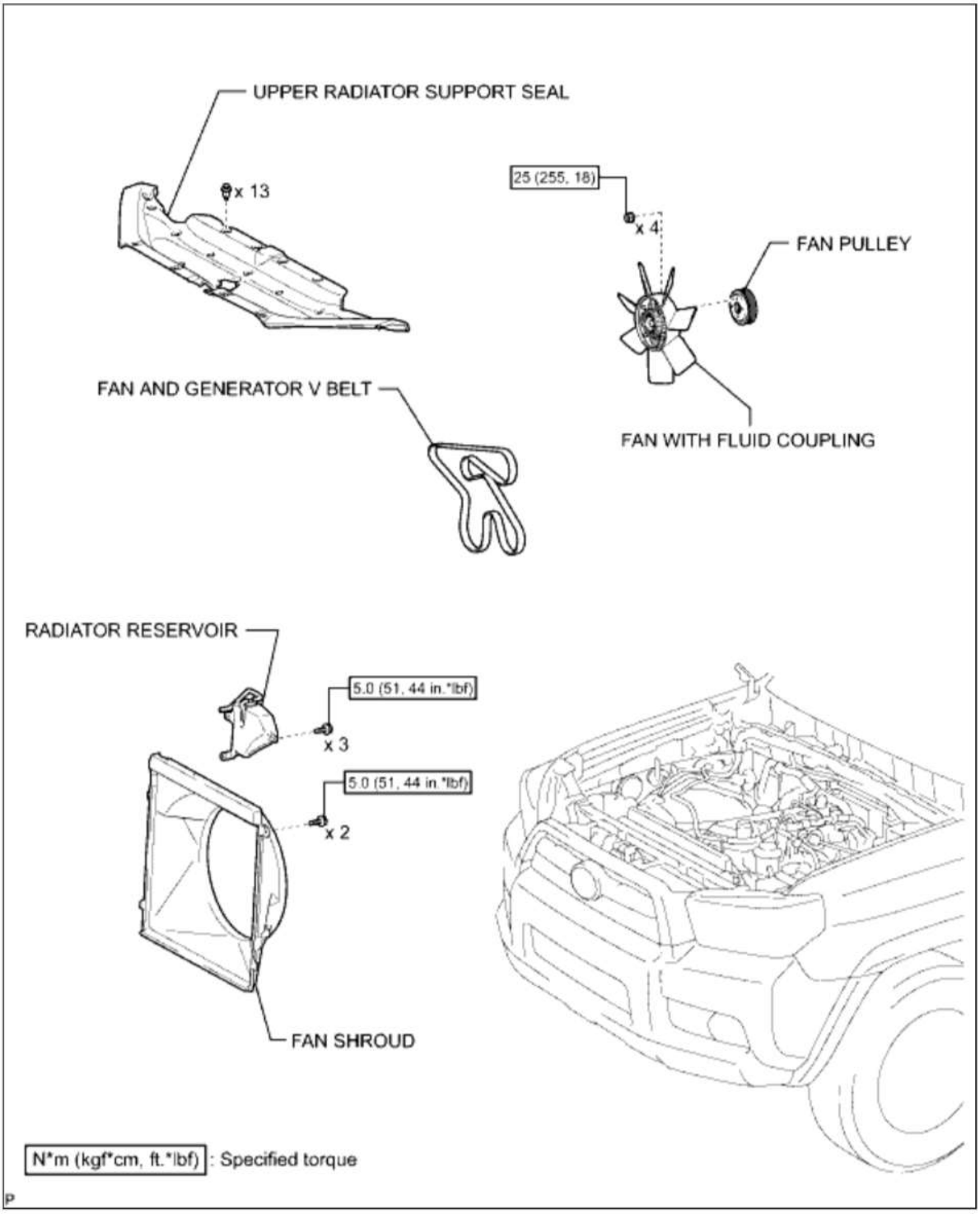
cardiagn.com

Last Modified: 5-10-2010	6.4 K	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000004639002X
Title: 2TR-FE ENGINE MECHANICAL: FRONT CRANKSHAFT OIL SEAL: COMPONENTS (2010 4Runner)		

COMPONENTS

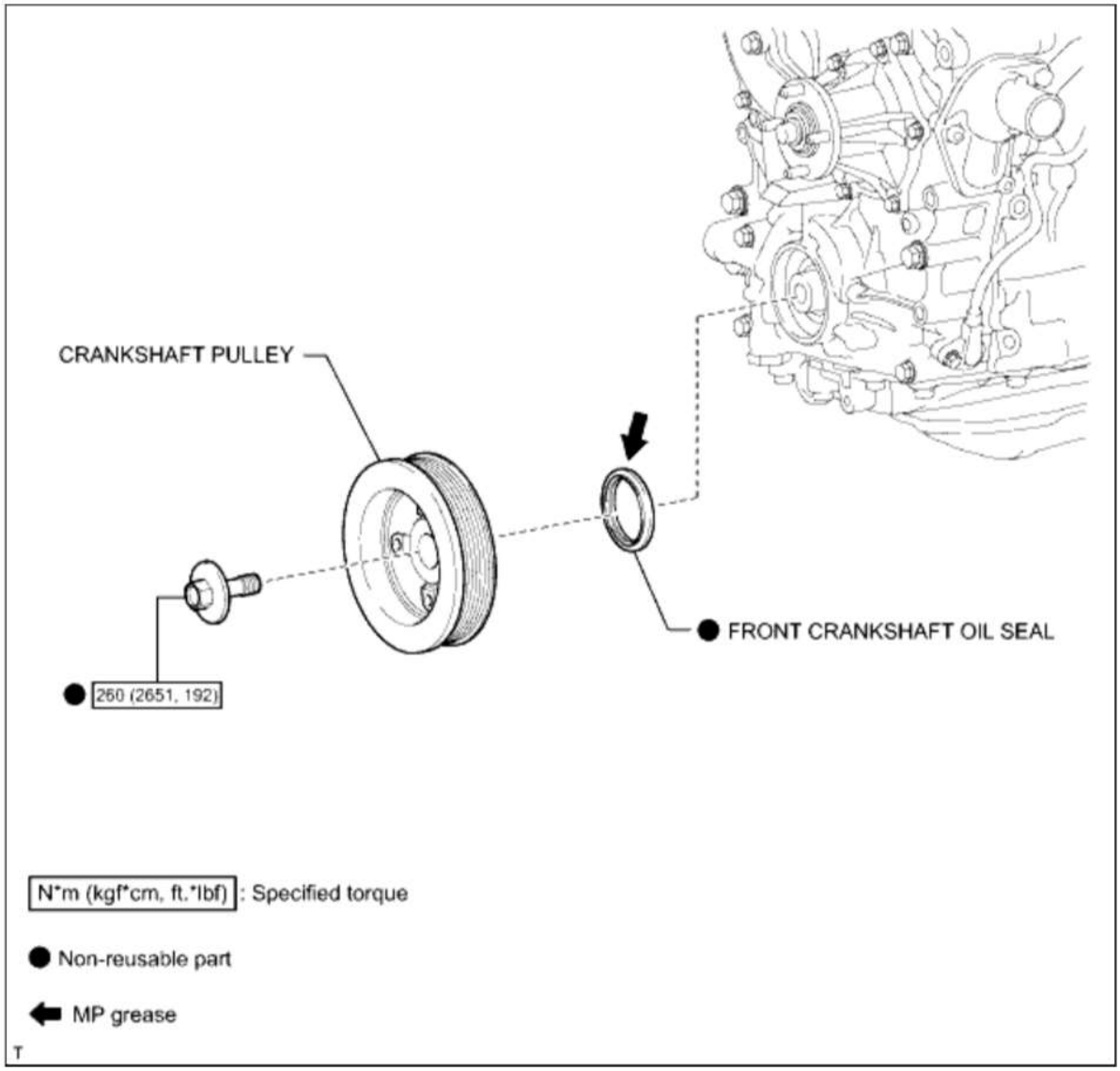
ILLUSTRATION

cardiagn.com



ILLUSTRATION

cardiagn.com



cardiagn.com

Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM00000463A002X
Title: 2TR-FE ENGINE MECHANICAL: FRONT CRANKSHAFT OIL SEAL: REMOVAL (2010 4Runner)		

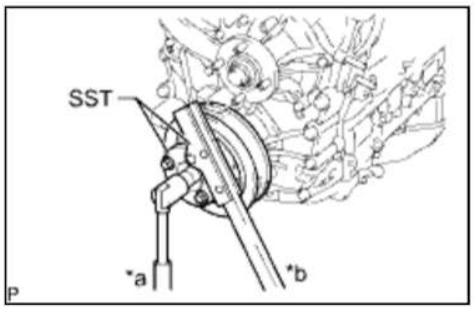
REMOVAL

1. REMOVE UPPER RADIATOR SUPPORT SEAL INFO

2. REMOVE RADIATOR RESERVOIR INFO

3. REMOVE FAN SHROUD INFO

4. REMOVE CRANKSHAFT PULLEY



(a) Using SST, hold the crankshaft pulley and loosen the pulley bolt until 2 or 3 threads are screwed into the crankshaft.

SST: 09213-54015

91651-60855

SST: 09330-00021

Text in Illustration

*a	Loosen
*b	Hold

(b) Using SST and the pulley bolt, remove the crankshaft pulley.

SST: 09950-50013

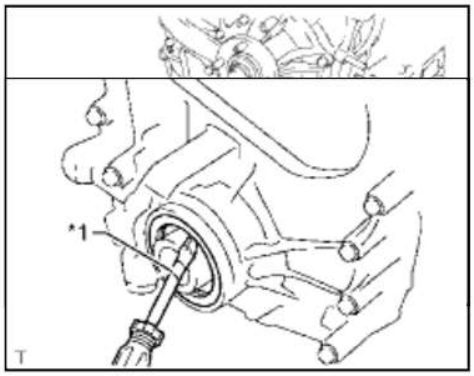
09951-05010

09952-05010

09953-05010

09954-05021

5. REMOVE FRONT CRANKSHAFT OIL SEAL



(a) Using a screwdriver, pry out the oil seal.

Text in Illustration

Text in Illustration

*1	Protective Tape

HINT: *a Loosen

*b Hold

Tape the screwdriver tip before use.

NOTICE:

HINT: Do not damage the surface of the oil seal press fit hole or the crankshaft.

Apply lubricant to the threads and end of SST.

cardiagn.com

- Check the crankshaft for damage after removing the oil seal. If the crankshaft is damaged, smooth the surface with 400-grit sandpaper.

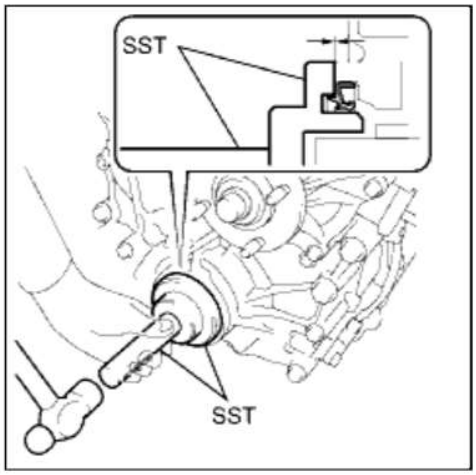


cardiagn.com

Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000004638002X
Title: 2TR-FE ENGINE MECHANICAL: FRONT CRANKSHAFT OIL SEAL: INSTALLATION (2010 4Runner)		

INSTALLATION

1. INSTALL FRONT CRANKSHAFT OIL SEAL



(a) Apply MP grease to the lip of a new oil seal.

NOTICE:

- Do not allow foreign matter to contact the lip of the oil seal.
- Do not allow MP grease to contact the dust seal.

(b) Temporarily install the oil seal to the timing chain cover.

(c) Using SST and a hammer, tap in the oil seal until its surface is flush with the chain cover edge.

SST: 09223-75010

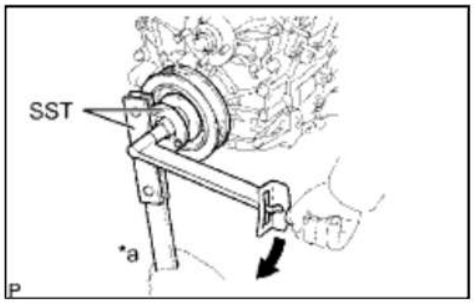
SST: 09950-70010

09951-07100

NOTICE:

- Keep the lip free from foreign matter.
- Do not tap the oil seal at an angle.

2. INSTALL CRANKSHAFT PULLEY



(a) Align the key groove of the pulley with the pulley set key and slide on the pulley.

(b) Using SST, install a new crankshaft pulley bolt.

cardiagn.com

SST: 09213-54015

91651-60855

SST: 09330-00021

Torque: 260 N·m (2651 kgf·cm, 192ft·lbf)

Text in Illustration

*a	Hold
	Turn

NOTICE:

Do not reuse the pulley bolt.

3. INSTALL FAN SHROUD INFO

4. INSTALL RADIATOR RESERVOIR INFO

5. INSTALL UPPER RADIATOR SUPPORT SEAL INFO

6. INSPECT FOR OIL LEAK INFO

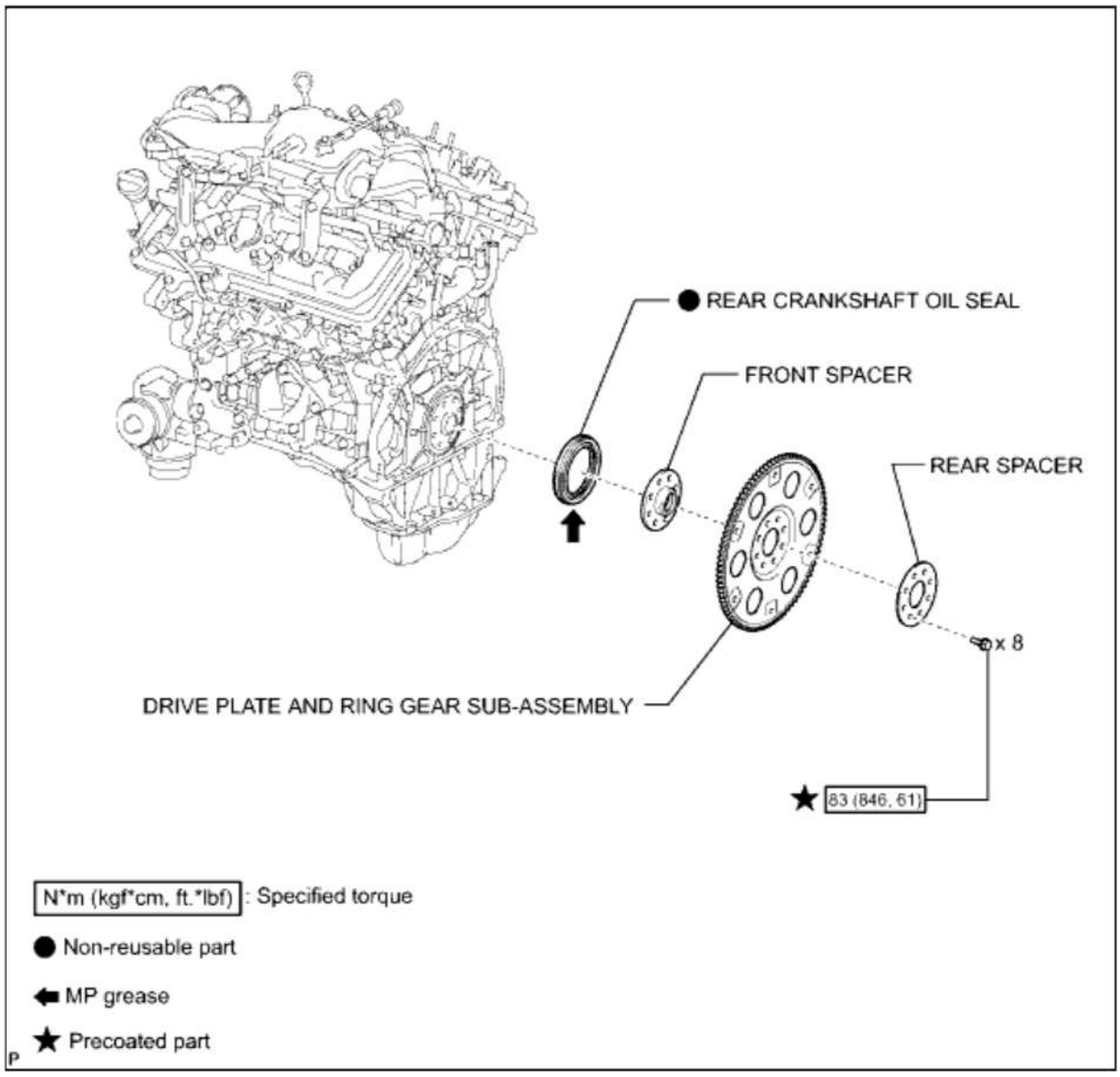
7. INSPECT ENGINE OIL LEVEL INFO

cardiagn.com

Last Modified: 5-10-2010	6.4 K	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000002B4W00DX
Title: 1GR-FE ENGINE MECHANICAL: REAR CRANKSHAFT OIL SEAL: COMPONENTS (2010 4Runner)		

COMPONENTS

ILLUSTRATION



cardiagn.com

Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000002B4X00DX
Title: 1GR-FE ENGINE MECHANICAL: REAR CRANKSHAFT OIL SEAL: REMOVAL (2010 4Runner)		

REMOVAL

1. REMOVE AUTOMATIC TRANSMISSION ASSEMBLY

(a) for 2WD:

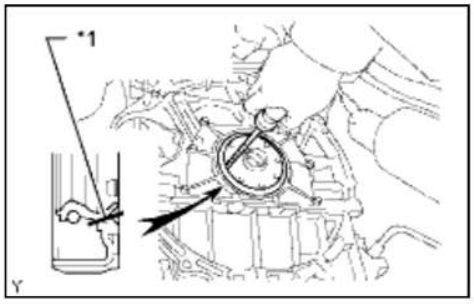
Remove the automatic transmission INFO .

(b) for 4WD:

Remove the automatic transmission INFO .

2. REMOVE DRIVE PLATE AND RING GEAR SUB-ASSEMBLY INFO

3. REMOVE REAR CRANKSHAFT OIL SEAL



(a) Using a knife, cut off the lip of the oil seal.

Text in Illustration

*1	Cut Position

(b) Using a screwdriver, pry out the oil seal.

HINT:

Tape the screwdriver tip before use.

NOTICE:

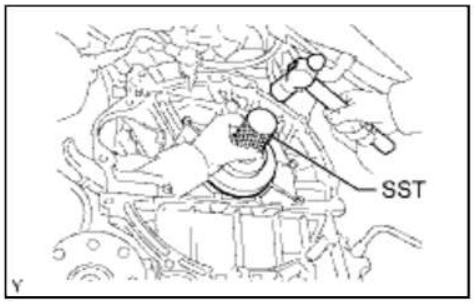
Do not damage the surface of the oil seal press fit hole or crankshaft.

cardiagn.com

Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM000002B4V00DX
Title: 1GR-FE ENGINE MECHANICAL: REAR CRANKSHAFT OIL SEAL: INSTALLATION (2010 4Runner)		

INSTALLATION

1. INSTALL REAR CRANKSHAFT OIL SEAL



(a) Apply MP grease to the lip of a new oil seal.

(b) Using SST and a hammer, tap in the oil seal until its surface is flush with the rear oil seal retainer edge.

SST: 09223-78010

NOTICE:

- Keep the lip free from foreign matter.
- Do not tap the oil seal at an angle.

2. INSTALL DRIVE PLATE AND RING GEAR SUB-ASSEMBLY INFO

3. INSTALL AUTOMATIC TRANSMISSION ASSEMBLY

(a) for 4WD:

Install the automatic transmission INFO .

(b) for 2WD:

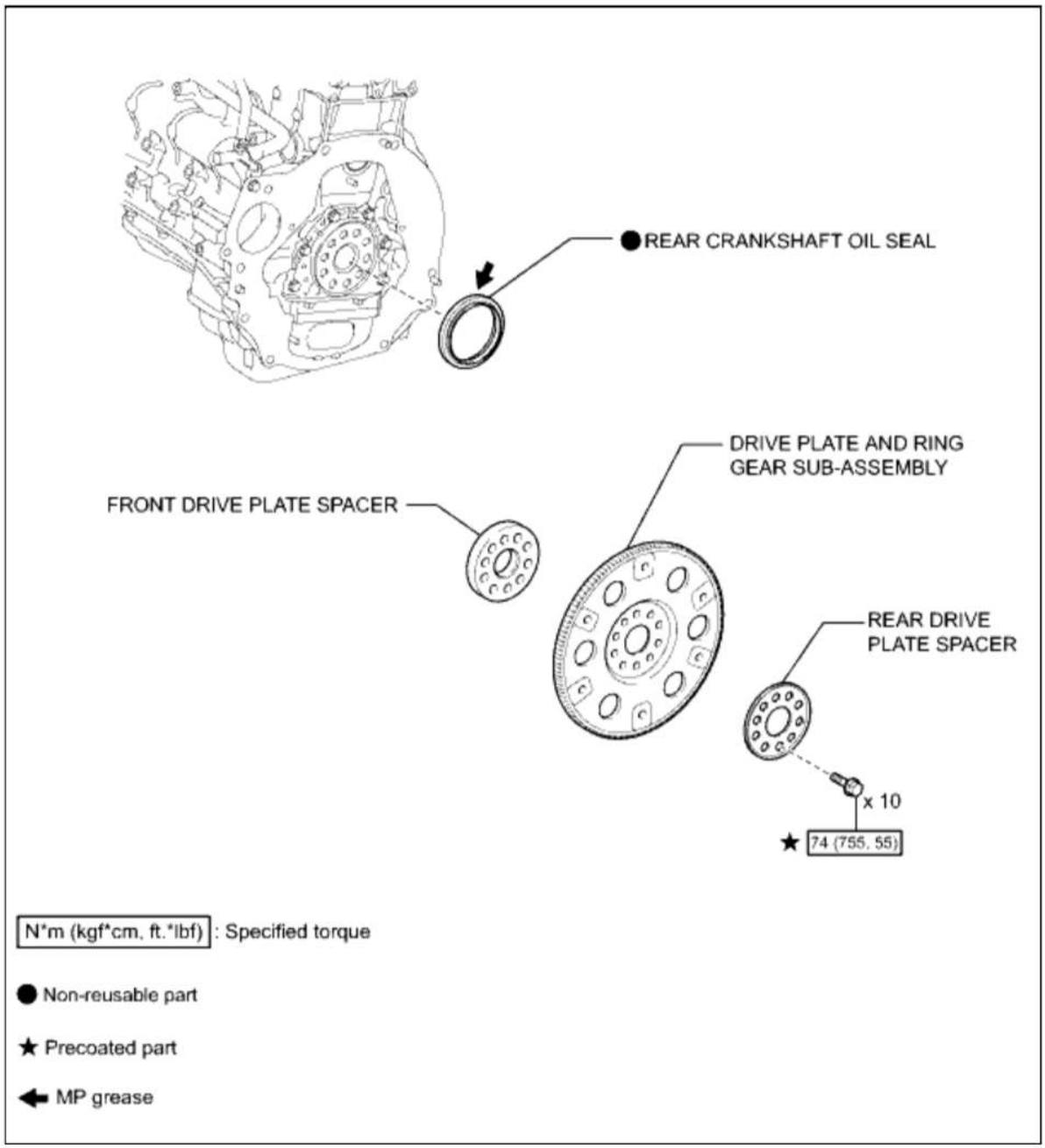
Install the automatic transmission INFO .

cardiagn.com

Last Modified: 5-10-2010	6.4 K	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM00000463C002X
Title: 2TR-FE ENGINE MECHANICAL: REAR CRANKSHAFT OIL SEAL: COMPONENTS (2010 4Runner)		

COMPONENTS

ILLUSTRATION



cardiagn.com

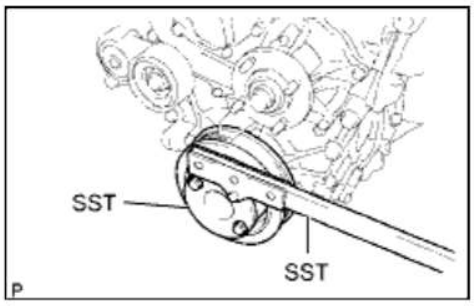
Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM0000027IH020X
Title: 2TR-FE ENGINE MECHANICAL: REAR CRANKSHAFT OIL SEAL: REMOVAL (2010 4Runner)		

REMOVAL

1. REMOVE AUTOMATIC TRANSMISSION ASSEMBLY

(a) Remove the automatic transmission INFO .

2. REMOVE DRIVE PLATE AND RING GEAR SUB-ASSEMBLY

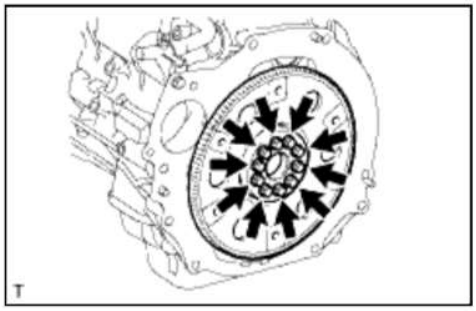


(a) Using SST, hold the crankshaft pulley.

SST: 09213-54015

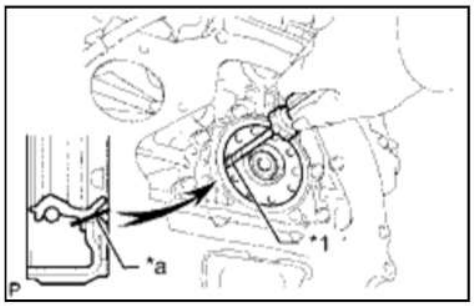
91651-60855

SST: 09330-00021



(b) Remove the 10 bolts, rear drive plate spacer, drive plate and front drive plate spacer.

3. REMOVE REAR CRANKSHAFT OIL SEAL



(a) Using a knife, cut off the lip of the oil seal.

Text in Illustration

*a	Cut Position
*1	Protective Tape

(b) Using a screwdriver pry out the oil seal.

cardiagn.com

HINT:

Tape the screwdriver tip before use.

NOTICE:

- Do not damage the surface of the oil seal press fit hole or the crankshaft.
- After removing the oil seal, check the crankshaft for damage. If damaged, smooth the surface with 400-grit sandpaper.

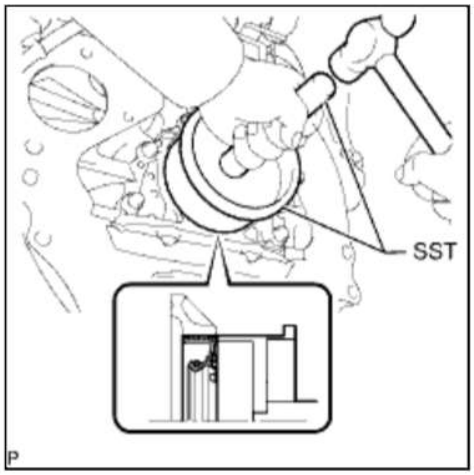


cardiagn.com

Last Modified: 5-10-2010	6.4 A	**From:** 200908
Model Year: 2010	**Model:** 4Runner	**Doc ID:** RM0000027IF020X
Title: 2TR-FE ENGINE MECHANICAL: REAR CRANKSHAFT OIL SEAL: INSTALLATION (2010 4Runner)		

INSTALLATION

1. INSTALL REAR CRANKSHAFT OIL SEAL



(a) Apply a light coat of MP grease to the lip of a new oil seal.

NOTICE:

- Do not allow foreign matter to contact the lip of the oil seal.
- Do not allow MP grease to contact the dust seal.

(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

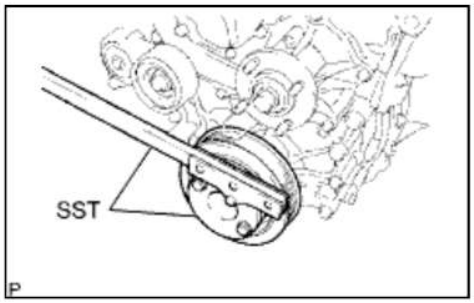
SST: 09950-70010

09951-07150

NOTICE:

- The acceptable depth from the top of the oil seal retainer is 0 to 1.0 mm (0 to 0.394 in.)
- Do not tap in the oil seal at an angle.
- Make sure that the oil seal is properly installed.

2. INSTALL DRIVE PLATE AND RING GEAR SUB-ASSEMBLY



(a) Using SST, hold the crankshaft pulley.

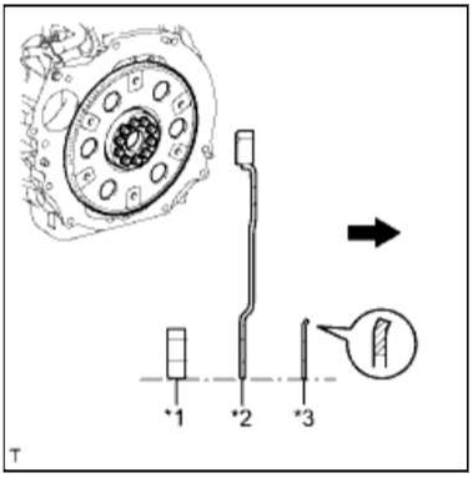
SST: 09213-54015

91651-60855

SST: 09330-00021

(b) Install the front drive plate spacer, drive plate and rear drive plate spacer to the crankshaft.

cardiagn.com



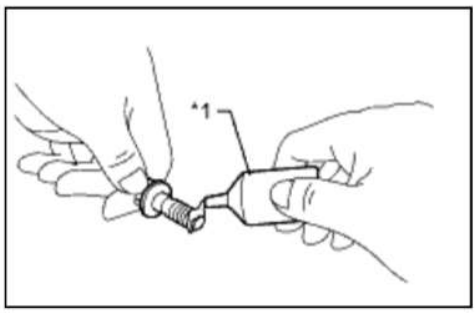
Text in Illustration

*1	Front Drive Plate Spacer
*2	Drive Plate and Ring Gear
*3	Rear Drive Plate Spacer
➡	Transmission Side

HINT:

- The front drive plate spacer is reversible.
- As the rear drive plate spacer and drive plate and ring gear are not reversible, be sure to install it so that it is facing in the direction shown in the illustration.

(c) Clean the bolts and bolt holes.



(d) Apply adhesive to 2 or 3 threads at the end of each of the 10 bolts.

Adhesive:
Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

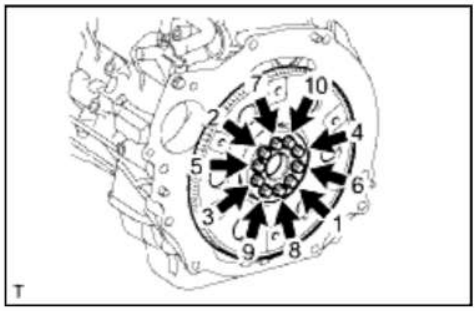
Text in Illustration

*1	Adhesive

(e) Install and uniformly tighten the 10 bolts in several steps in the sequence shown in the illustration.

Torque: 74 N·m (755 kgf·cm, 55ft·lbf)

cardiagn.com



NOTICE:

Do not start the engine for at least an hour after installing the drive plate.

3. INSTALL AUTOMATIC TRANSMISSION ASSEMBLY

(a) Install the automatic transmission INFO .

TOYOTA

cardiagn.com