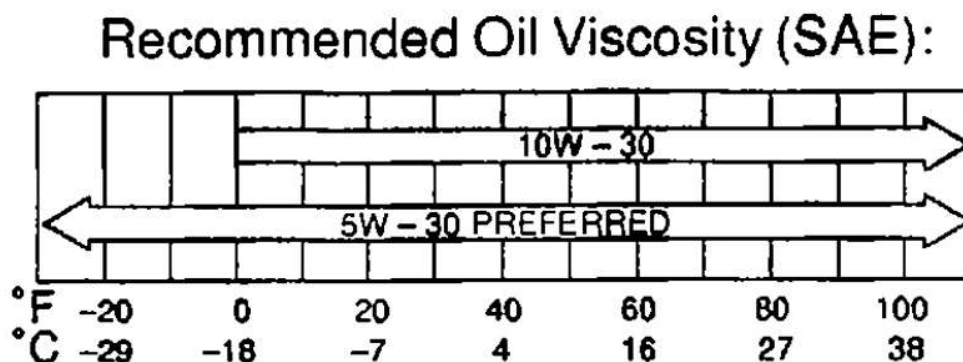


2002 ENGINE**Lubrication - RAV4****OIL AND FILTER****INSPECTION**

1. Check engine oil quality .



TEMPERATURE RANGE ANTICIPATED BEFORE NEXT OIL CHANGE

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Fig. 1: Displaying Recommended Oil Viscosity
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Check the oil for deterioration, entry of water, discoloring or thinning.

If the quality is visibly poor, replace the oil.

Oil grade:

API grade or SJ, Energy-Conserving or ILSAC multigrade engine oil is recommended. SAE 5W-30 is the best choice for your vehicle, for good fuel economy, and good starting in cold weather .

2. Check engine oil level .

After warming up the engine and then 5 minutes after the engine stop, oil level should be between the upper and lower dot marks on the dipstick.

If low, check for leakage and add oil up to the upper dot mark.

NOTE: Do not fill with engine oil above the upper dot mark.

3. Remove oil pressure switch and install oil pressure gauge .
 - a. Remove the oil pressure switch.

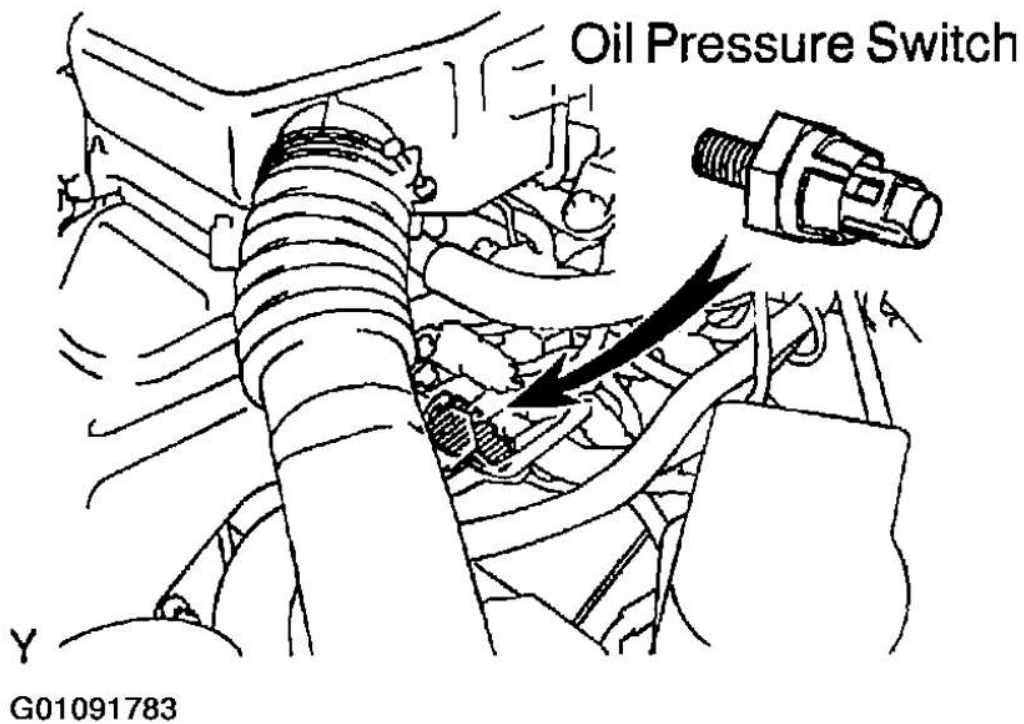


Fig. 2: Displaying Oil Pressure Switch
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the oil pressure gauge.

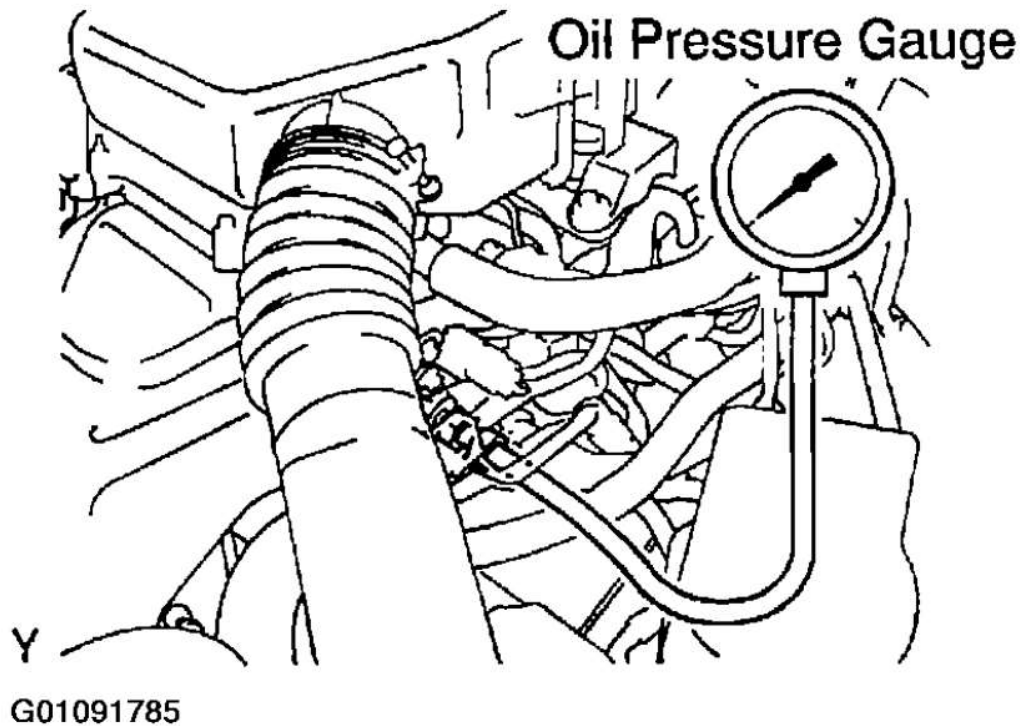


Fig. 3: Displaying Oil Pressure Gauge
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. Warm up engine .

Allow the engine to warm up to normal operating temperature.

5. Check oil pressure .

Idle	29 kPa (0.3 kgf/cm ² , 4.3 psi) or more
3,000 rpm	245 – 539 kPa (2.5 – 5.5 kgf/cm ² , 36 – 78 psi)

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Fig. 4: Displaying Oil Pressure Specifications
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. **Remove oil pressure gauge and reinstall oil pressure switch .**

- a. Remove the oil pressure gauge.
- b. Apply adhesive to 2 or 3 threads of the oil pressure switch.

Adhesive: Part No. 08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent

- c. Install the oil pressure switch.

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

7. **Start engine and check for oil leaks .**

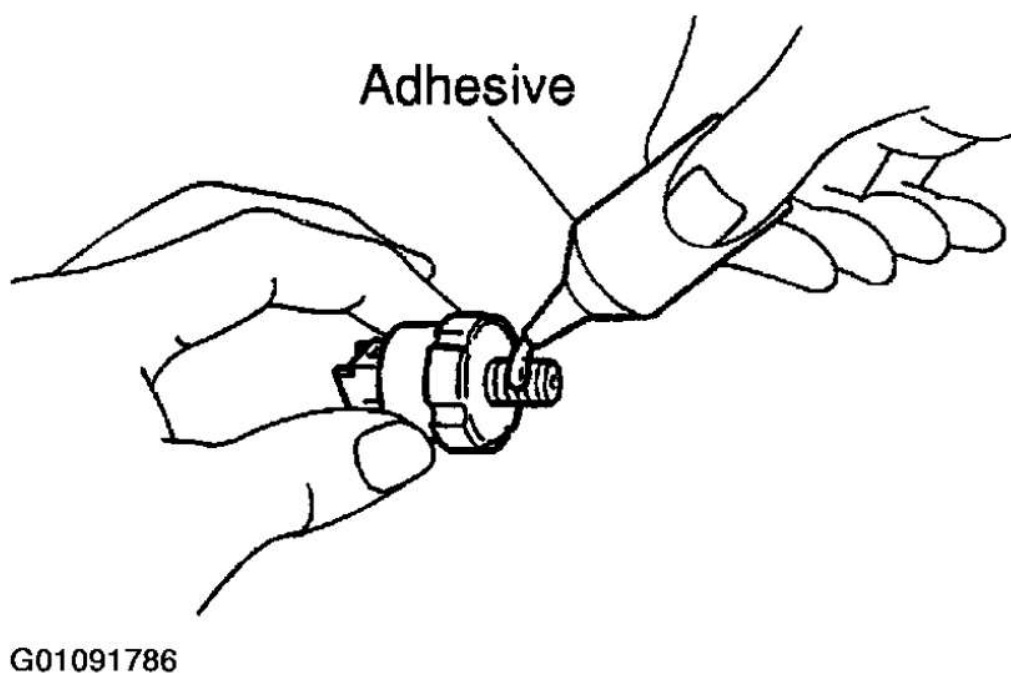


Fig. 5: Displaying Adhesive Proper Application To Oil Pressure Switch
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REPLACEMENT

CAUTION:

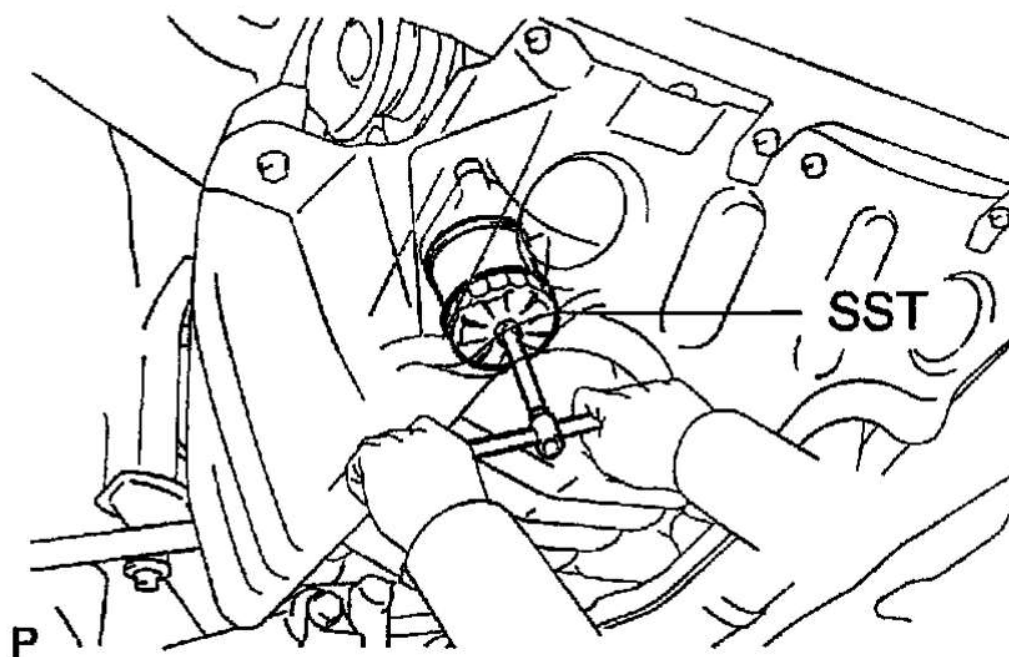
- Prolonged and repeated contact with mineral oil will result in the removal of natural fats from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer.
- Exercise caution in order to minimize the length and frequency of contact of your skin to used oil. Wear protective clothing and gloves. Wash your skin thoroughly with soap and water, or use waterless

hand cleaner, to remove any used engine oil. Do not use gasoline, thinners, or solvents.

- In order to preserve the environment, used oil and used oil filter must be disposed of only at designated disposal sites.

1. Remove center engine under cover .
2. Drain engine oil .
 - a. Remove the oil filter cap.
 - b. Remove the oil drain plug, and drain the oil into a container.
3. Replace oil filter .
 - a. Using SST, remove the oil filter.

SST 09228-06501



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Fig. 6: Removing Oil Filter Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Check and clean the oil filter installation surface.
- c. Check the part number of the new oil filter is as same as old one.
- d. Apply clean engine oil to the gasket of a new oil filter.

- e. Lightly screw the oil filter into place, and tighten it until the gasket contacts the seat.

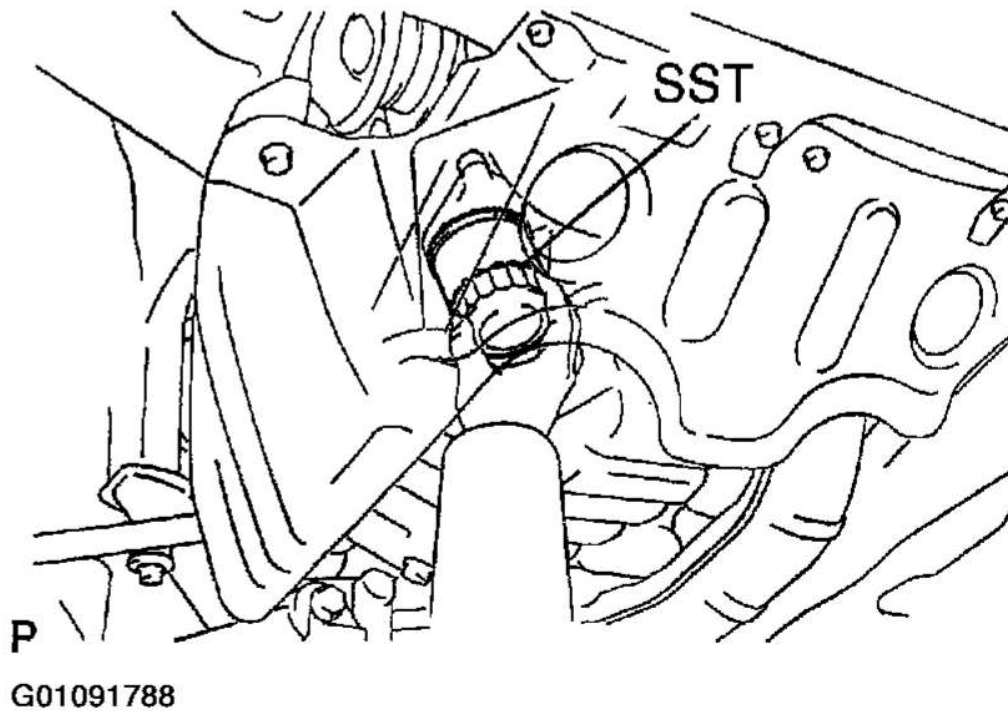


Fig. 7: Tightening Oil Filter

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- f. Using SST, tighten it an additional 3/4 turn.

SST 09228-06501

4. Refill with engine oil .

- a. Clean and install the oil drain plug with a new gasket.

Torque: 24.5 N.m (250 kgf.cm, 18 ft.lbf)

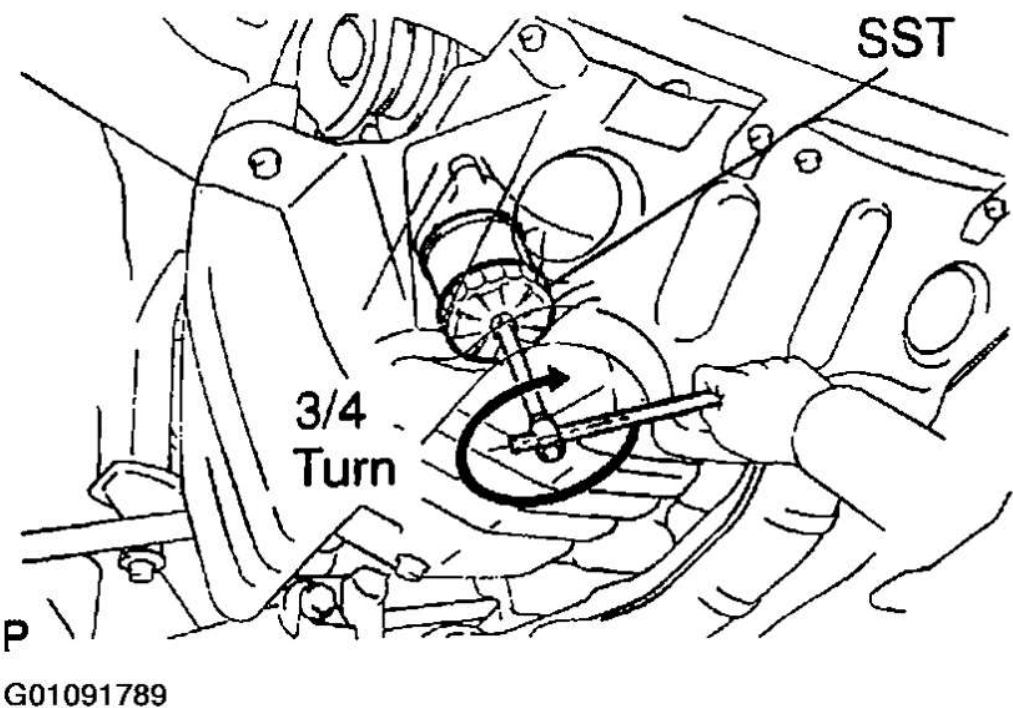


Fig. 8: Displaying Additional 3/4 Turn Tightening
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Fill with fresh engine oil.

Drain and refill	w/ Oil filter change	4.2 liters (4.6 US qts, 3.7 Imp. qts)
	w/o Oil filter change	4.0 liters (4.2 US qts, 3.5 Imp. qts)
Dry fill		4.9 liters (5.2 US qts, 4.3 Imp. qts)

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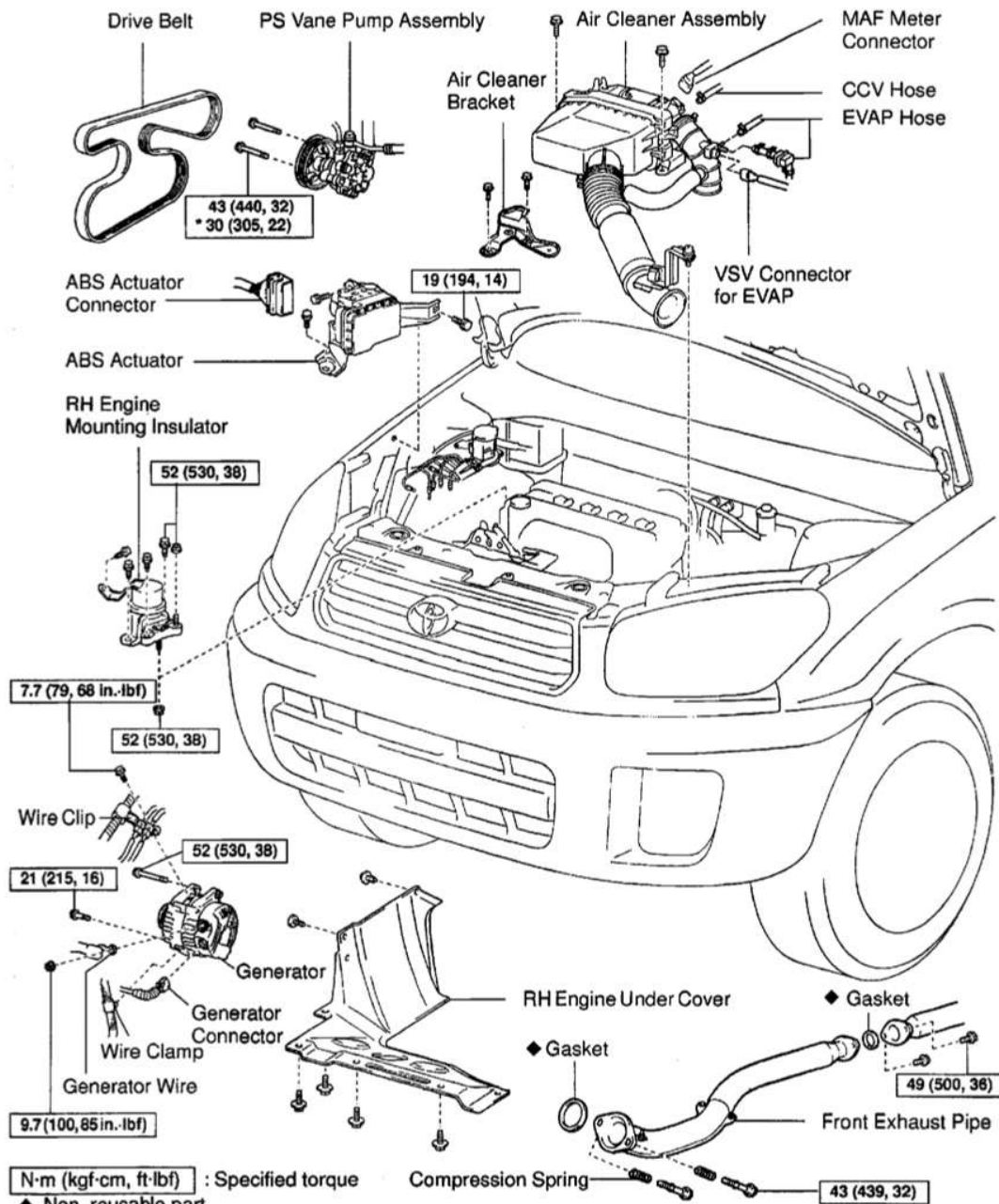
Fig. 9: Displaying Engine Oil Capacity
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Install the oil filter cap.
5. Start engine and check for oil leaks .
6. Install center engine under cover .

7. Recheck engine oil level .

OIL PUMP

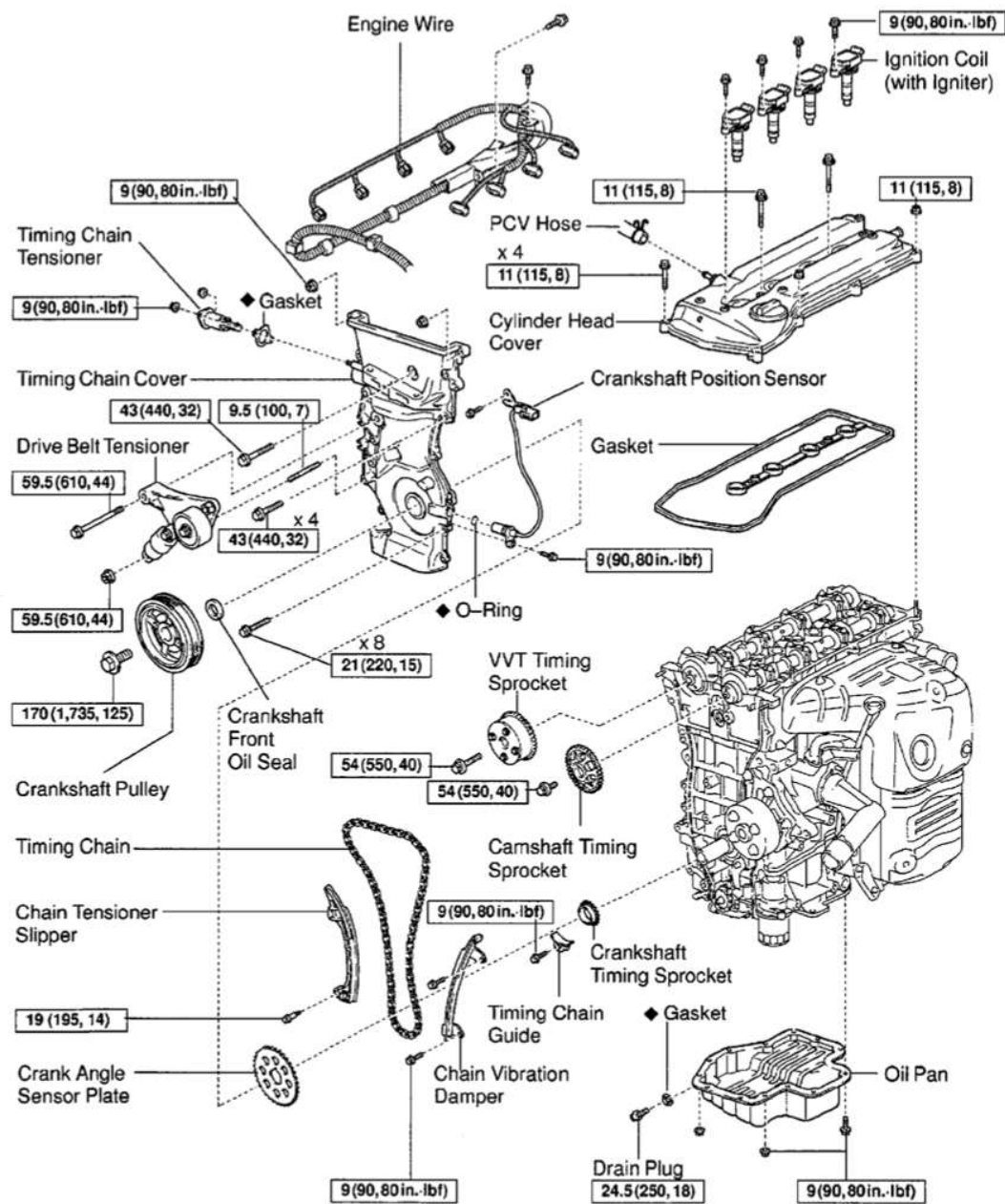
COMPONENTS



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Fig. 10: View Of Engine Components (1 Of 2)

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



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

P ♦ Non-reusable part

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Fig. 11: View Of Engine Components (2 Of 2)

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

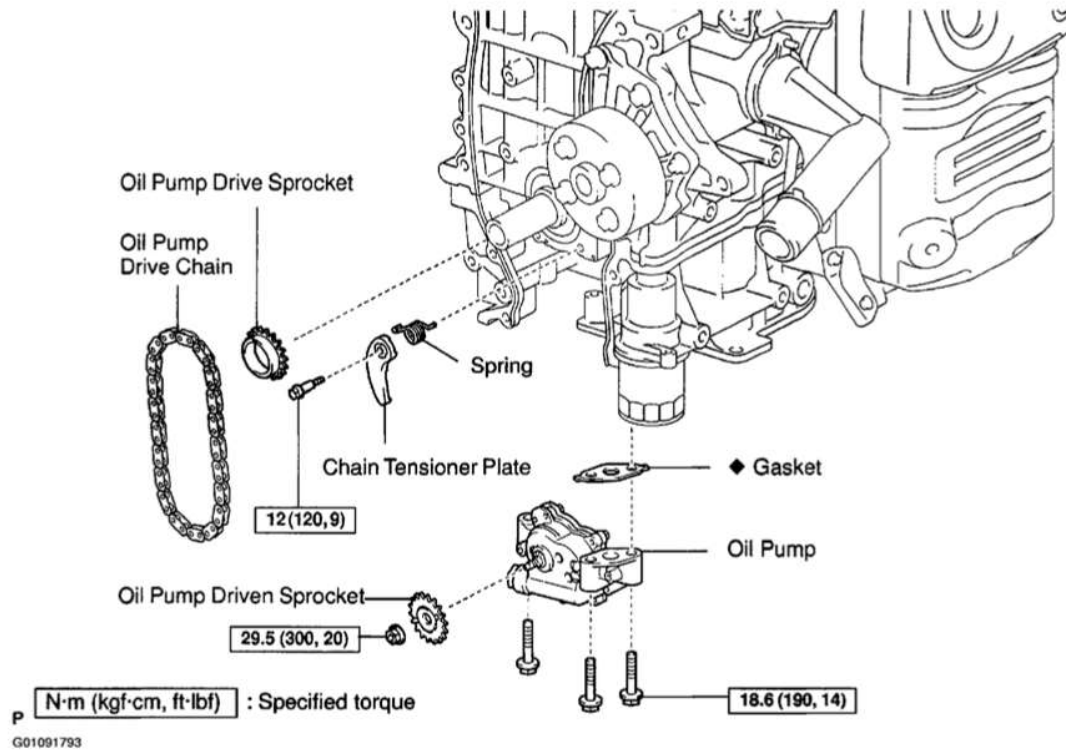


Fig. 12: Displaying Oil Pump Components (1 Of 2)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

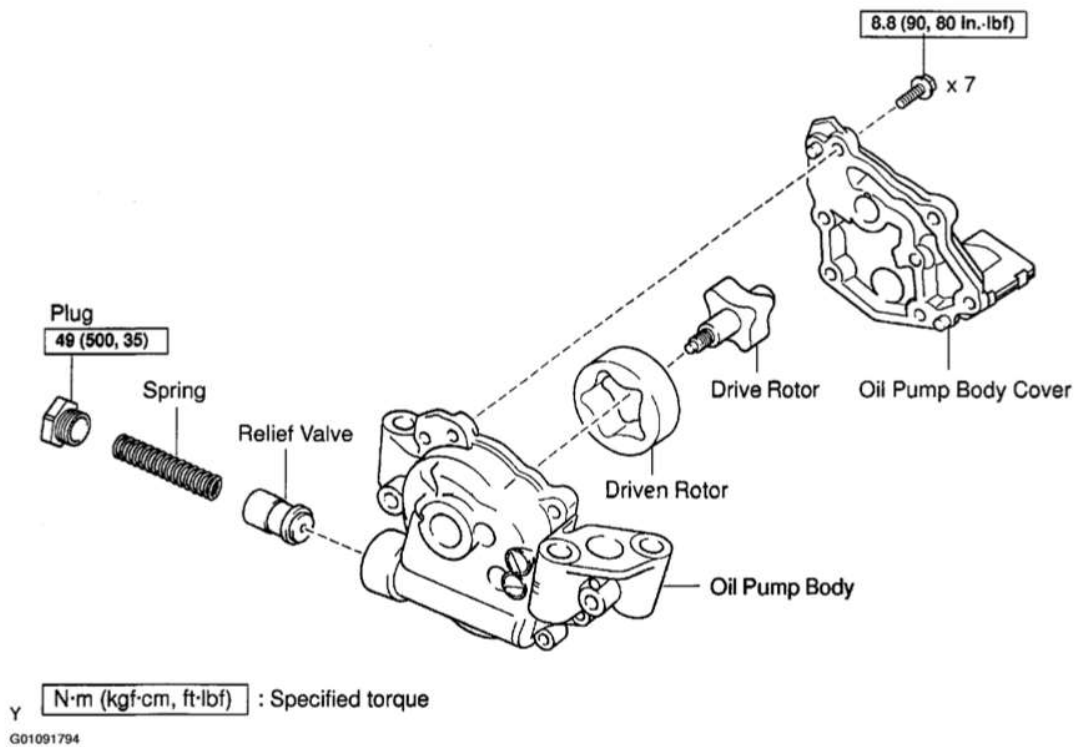


Fig. 13: Displaying Oil Pump Components (2 Of 2)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

1. Drain engine oil .
2. Remove front exhaust pipe .

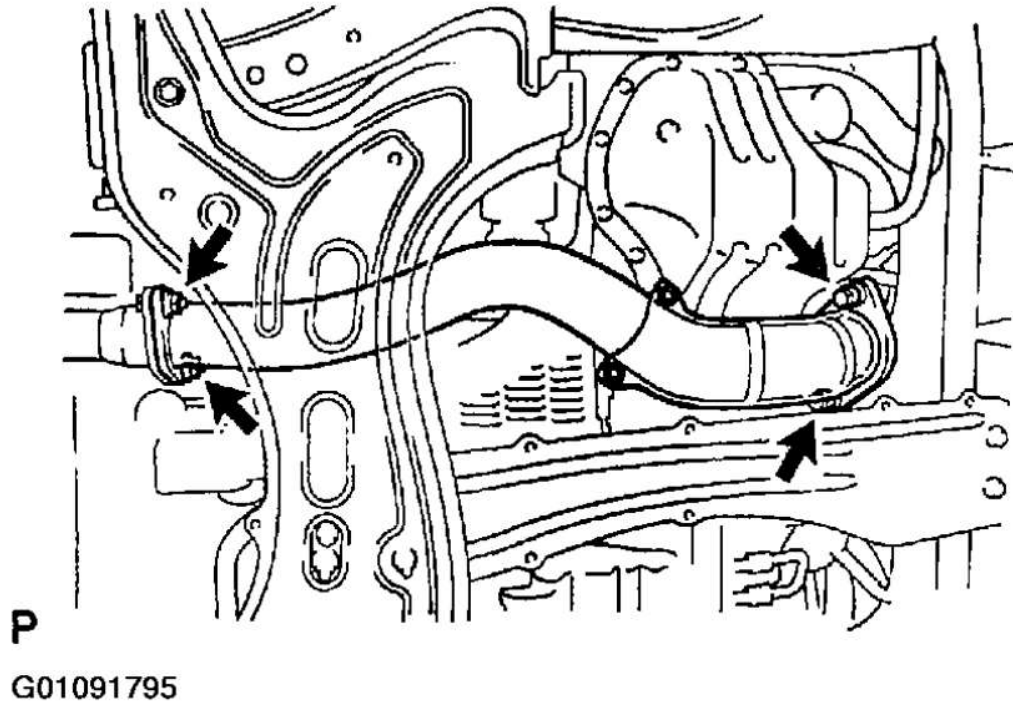


Fig. 14: Displaying Front Exhaust Pipe Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Remove 4 bolts, 2 compression springs, 2 gaskets and front exhaust pipe.

3. **Remove RH engine under cover.**
4. **Remove oil pan.**
 - a. Remove the 12 bolts and 2 nuts.

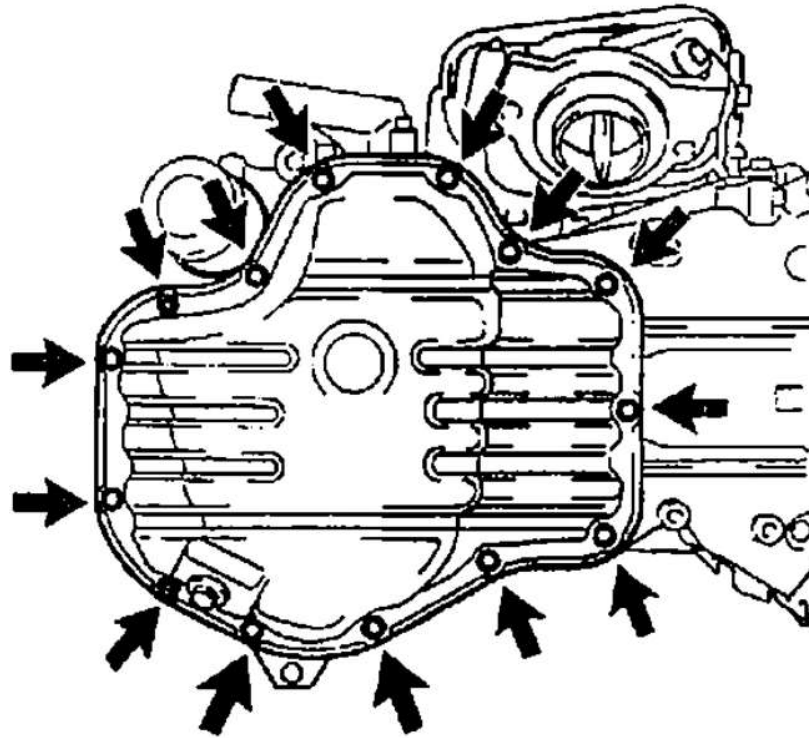
**P****G01091796**

Fig. 15: Removing Oil Pan Bolts & Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Insert the blade of SST between the crank case and oil pan, and timing chain cover and oil pan, cut off applied sealer and remove the oil pan.

SST 09032-00100

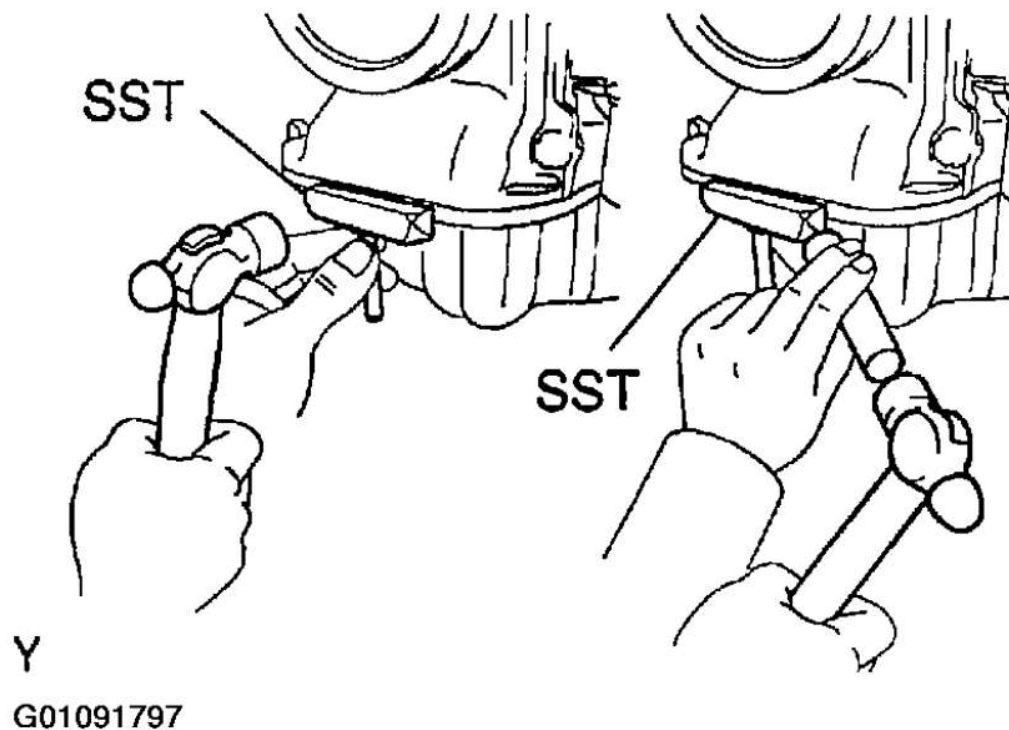


Fig. 16: Removing Oil Pan

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Be careful not to damage the contact surface of the timing chain cover, crank case and oil pan.

5. Remove air cleaner assembly (See REMOVAL) .
6. Remove ABS actuator (See ACTUATOR/ABS ECU).
7. Remove RH engine mounting insulator (See REMOVAL) .
8. Remove timing chain and crankshaft timing sprocket (See REMOVAL) .
9. Remove oil pump drive chain and sprockets .
 - a. Set the crankshaft key into the left horizontal position.
 - b. Remove the bolt, chain tensioner plate and spring.

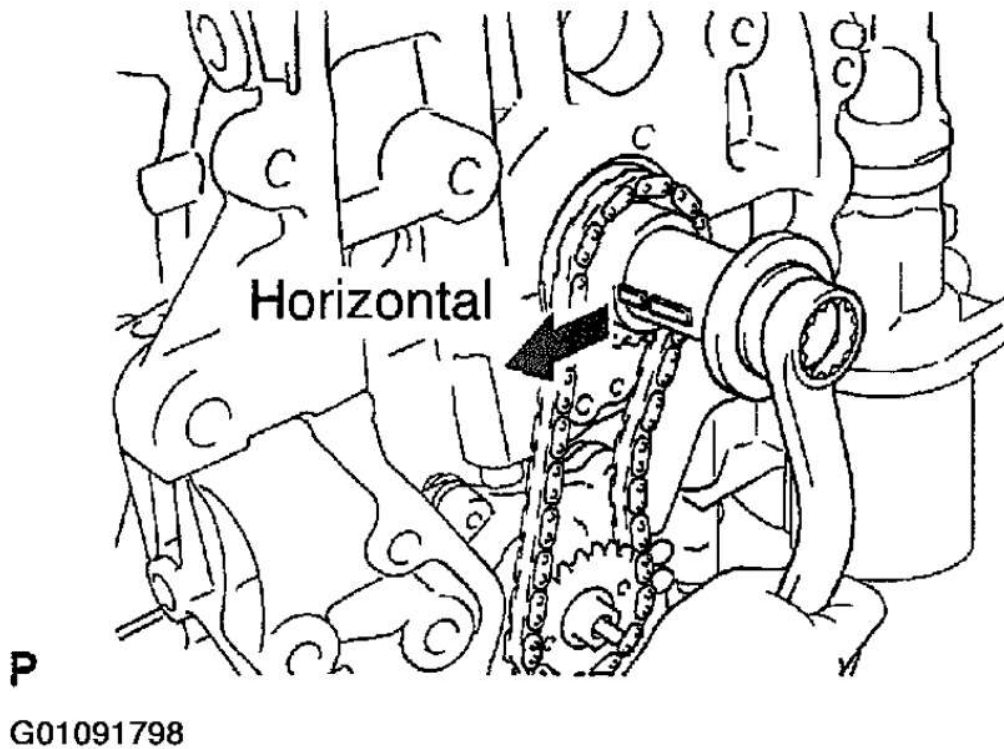


Fig. 17: Displaying Appropriate Crankshaft Setting
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Using a screwdriver, hold the oil pump drive shaft sprocket as shown in the illustration.
- d. Remove the nut, 2 sprockets and drive chain.

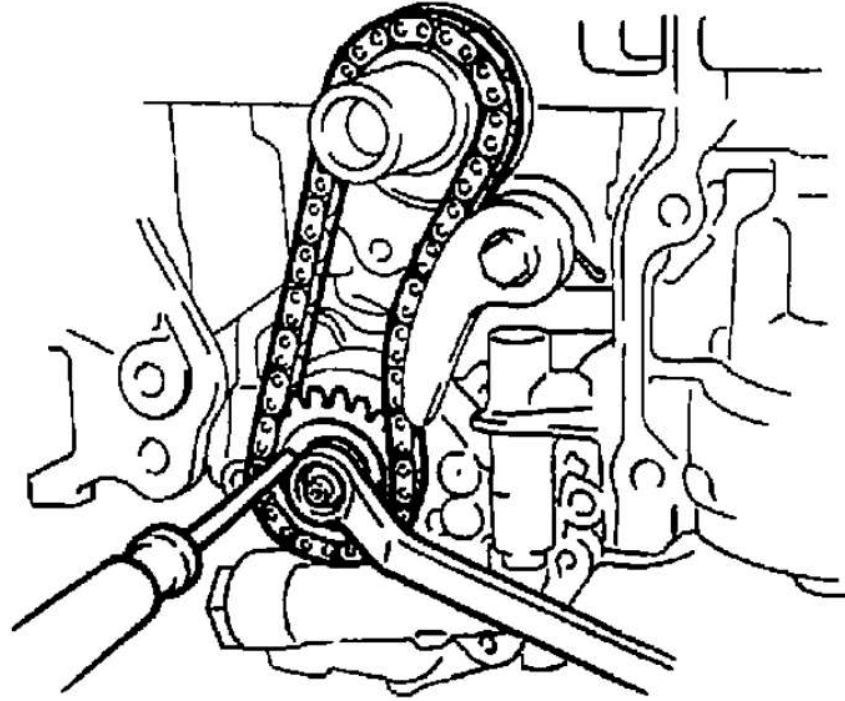
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Fig. 18: Removing Sprockets & Drive Chain
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

10. Remove oil pump .

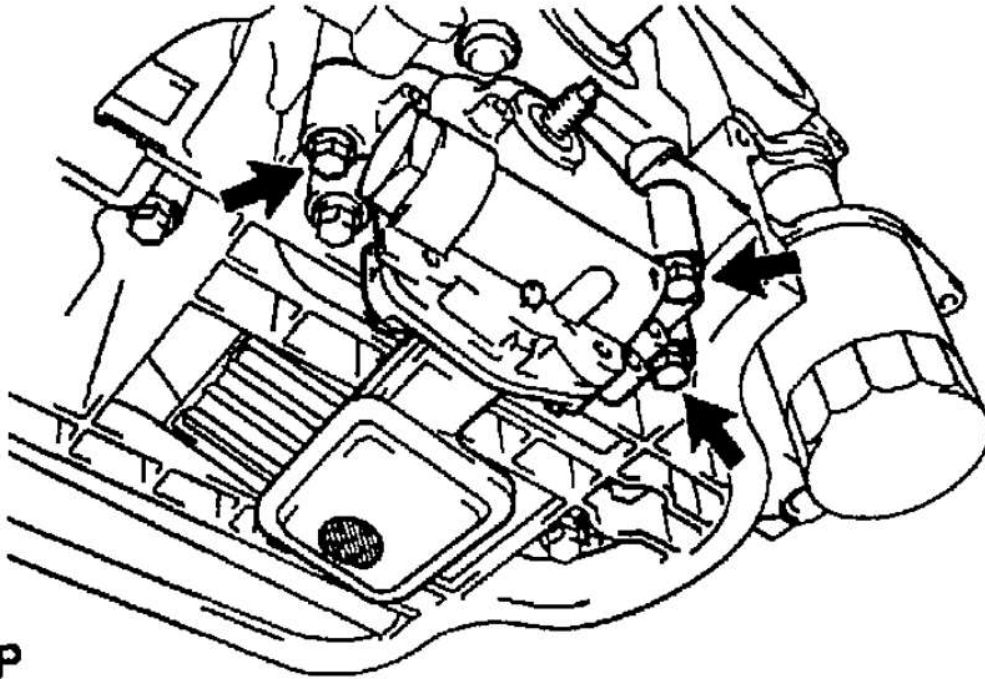
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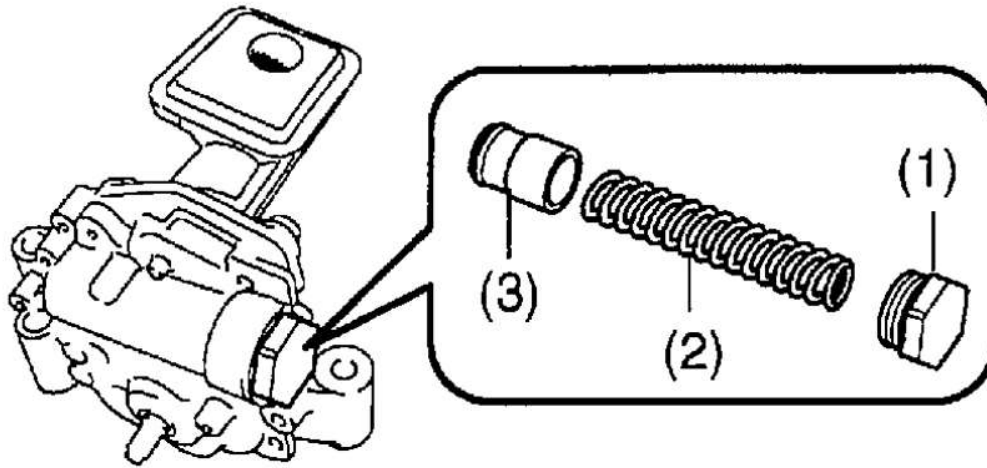
Fig. 19: Removing Oil Pump

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Remove the 3 bolts, oil pump and gasket.

DISASSEMBLY

1. Remove relief valve .



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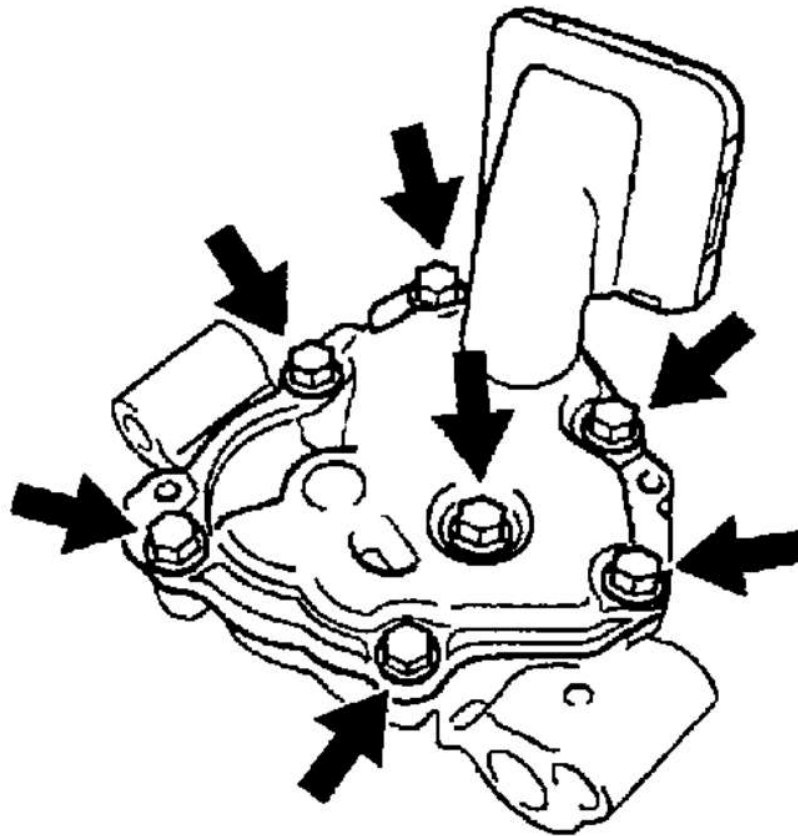
Fig. 20: Removing Relief Valve

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Remove the plug (1), spring (2) and relief valve (3).

2. Remove drive and driven rotors .

Remove the 7 bolts, pump body cover, drive and driven rotors.



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Fig. 21: Removing Drive & Driven Rotor
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION

1. Inspect oil jet.

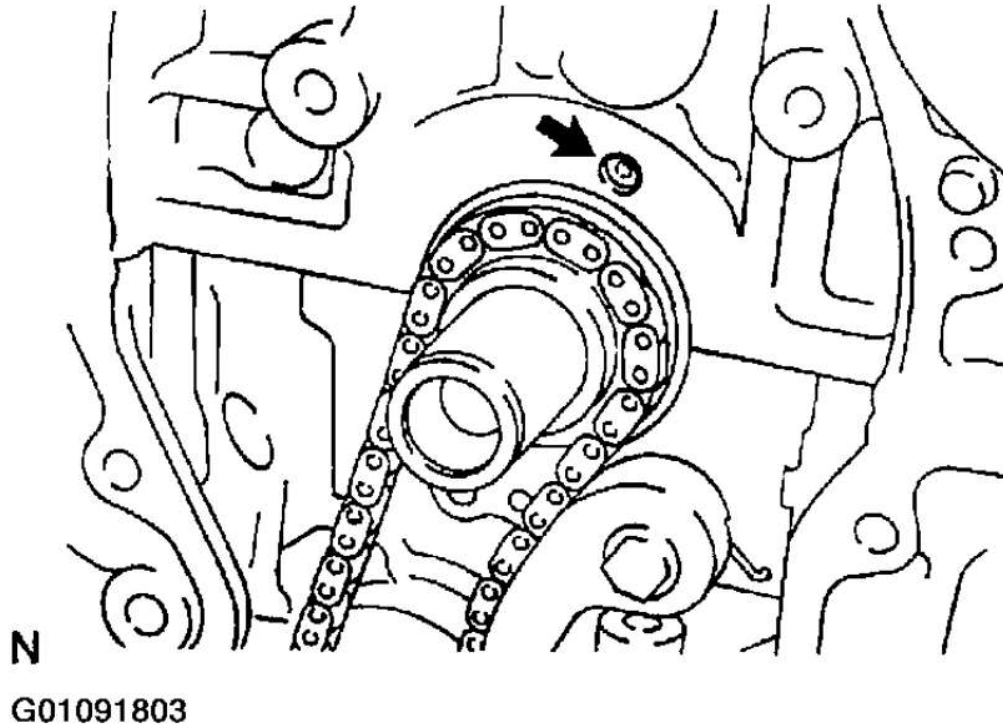


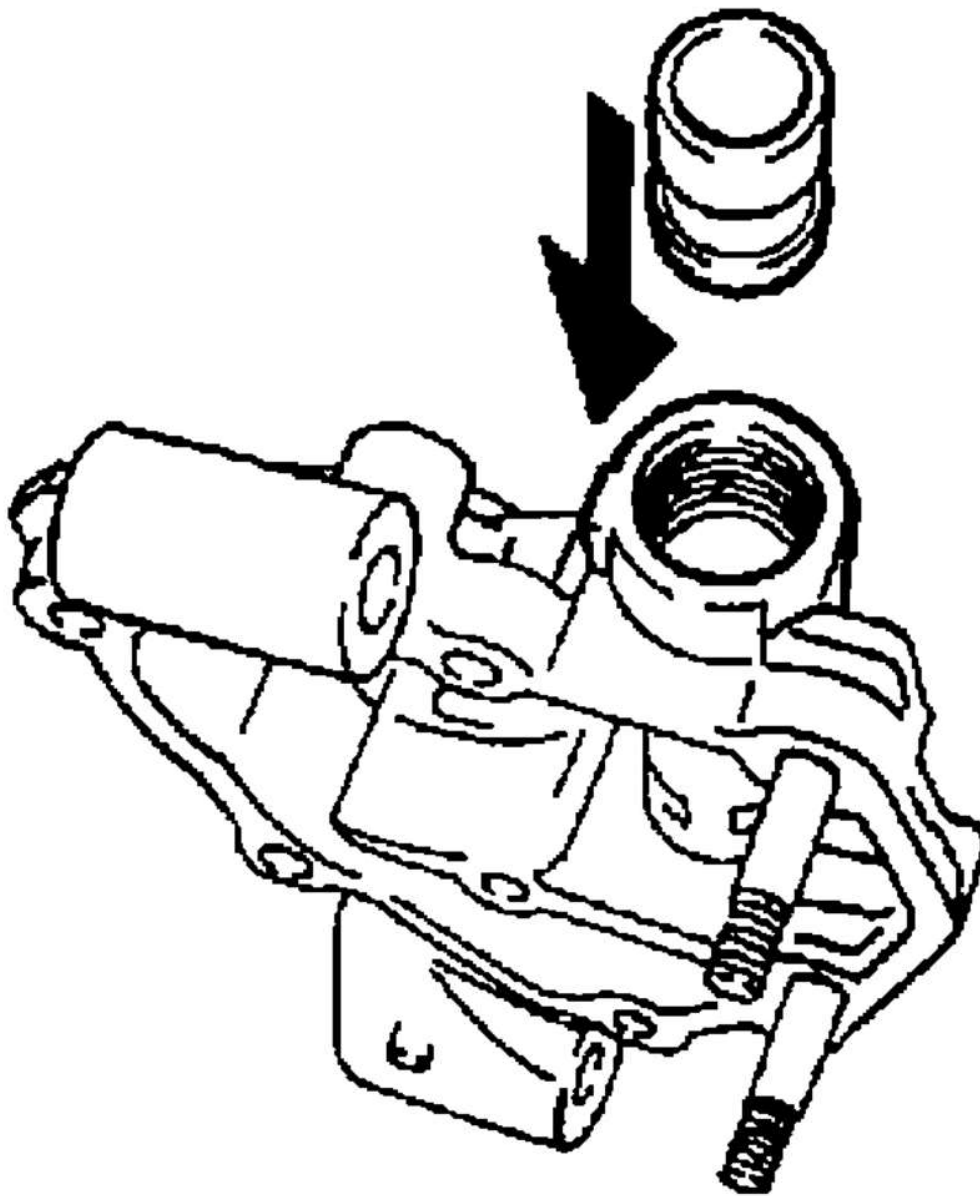
Fig. 22: Checking Oil Jet

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Check the oil jet for damage or clogging.

If necessary, replace the cylinder block.

2. Inspect relief valve .



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Fig. 23: Inspecting Relief Valve

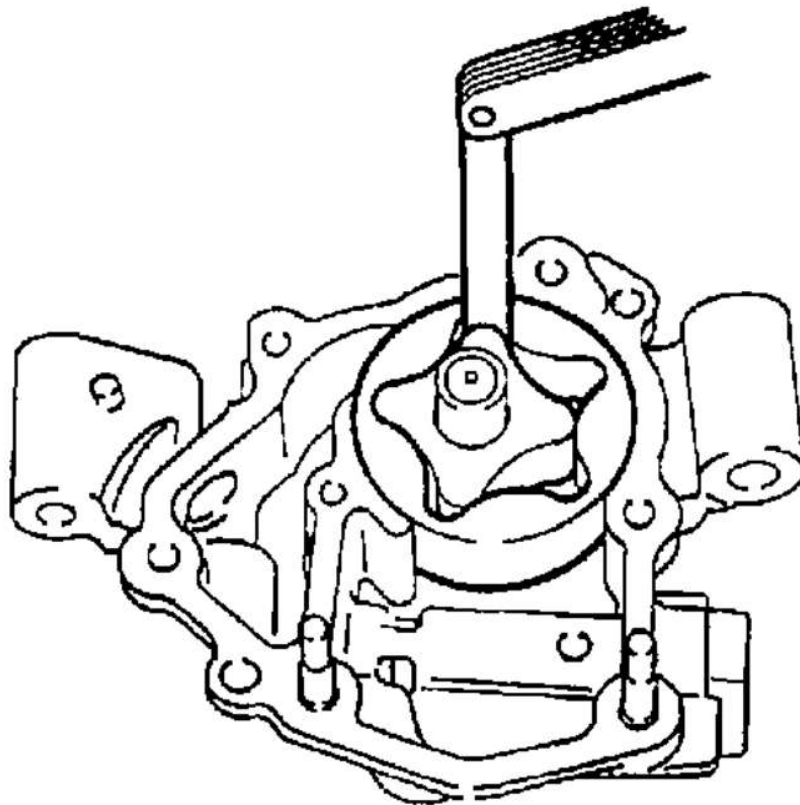
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Coat the valve with engine oil and check that it falls smoothly into the valve hole by its own weight.

If it does not, replace the relief valve. If necessary, replace the oil pump assembly.

3. **Inspect drive and driven rotors .**

- a. Place the drive and driven rotors into the oil pump body. (See **REASSEMBLY**).
- b. Inspect for the tip clearance.



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Fig. 24: Measuring Clearance Between Drive & Drive Rotor Tips
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Using a feeler gauge, measure the clearance between the drive and driven rotor tips.

Standard tip clearance: 0.080 - 0.160 mm (0.0031 - 0.0063 in.)

Maximum tip clearance: 0.35 mm (0.0138 in.)

If the tip clearance is greater than maximum, replace the rotors as a set.

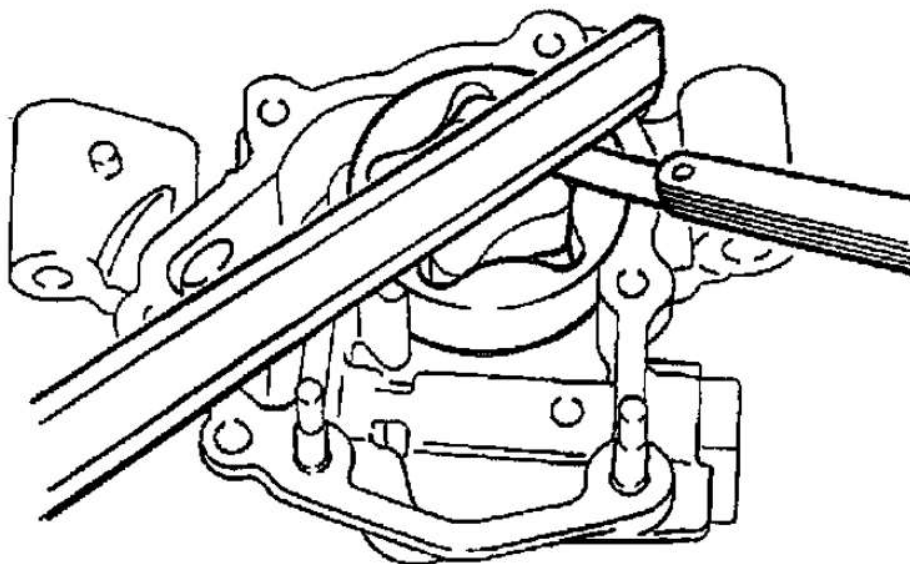
- c. Inspect for the side clearance.

Using a feeler gauge and precision straight edge, measure the clearance between the rotors and precision straight edge.

Standard side clearance: 0.030 - 0.085 mm (0.0012 - 0.0033 in.)

Maximum side clearance: 0.16 mm (0.0063 in.)

If the side clearance is greater than maximum, replace the rotors as a set. If necessary, replace the oil pump assembly.



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Fig. 25: Measuring Clearance Between Rotor & Precision Straight Edge
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Inspect for the body clearance.

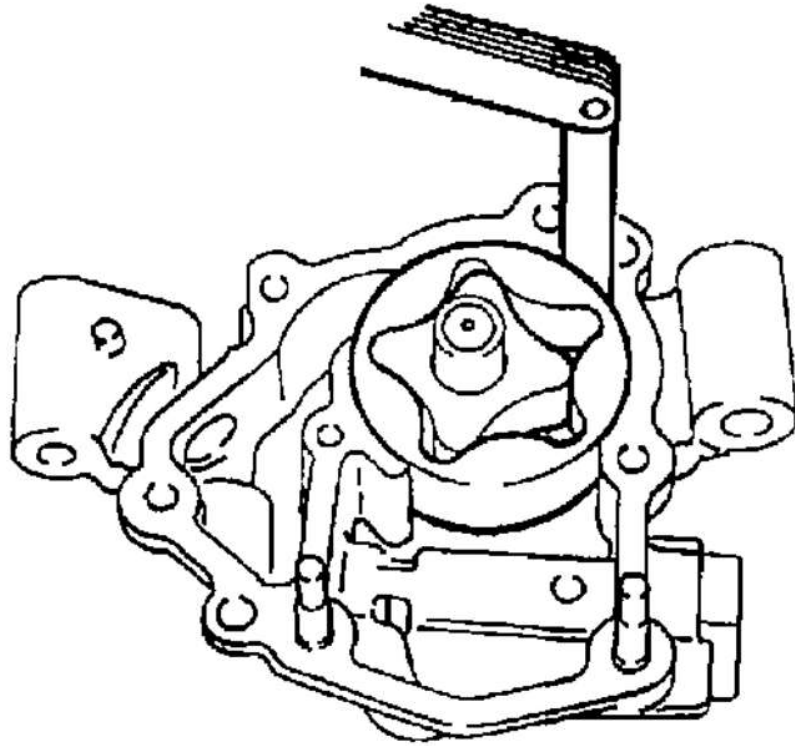
Using a feeler gauge, measure the clearance between the driven rotor and body.

Standard body clearance: 0.100 - 0.170 mm (0.0039 - 0.067 in.)

Maximum body clearance: 0.325 mm (0.0128 in.)

If the body clearance is greater than maximum, replace the rotors as a set. If necessary, replace the

oil pump assembly.



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Fig. 26: Measuring Distance Between Driven Rotor & Body
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. **Inspect oil pump drive chain and oil pump sprockets .**
 - a. Using vernier calipers, measure the length of the 8 links with the chain dully stretched.
Maximum chain elongation: 52.4 mm (2.063 in.)

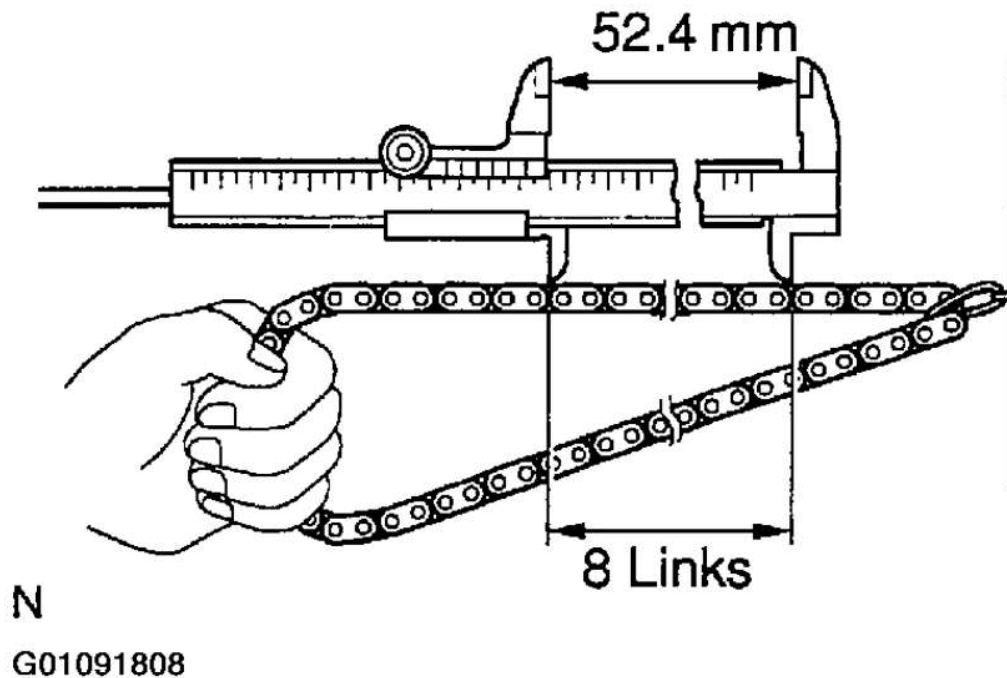


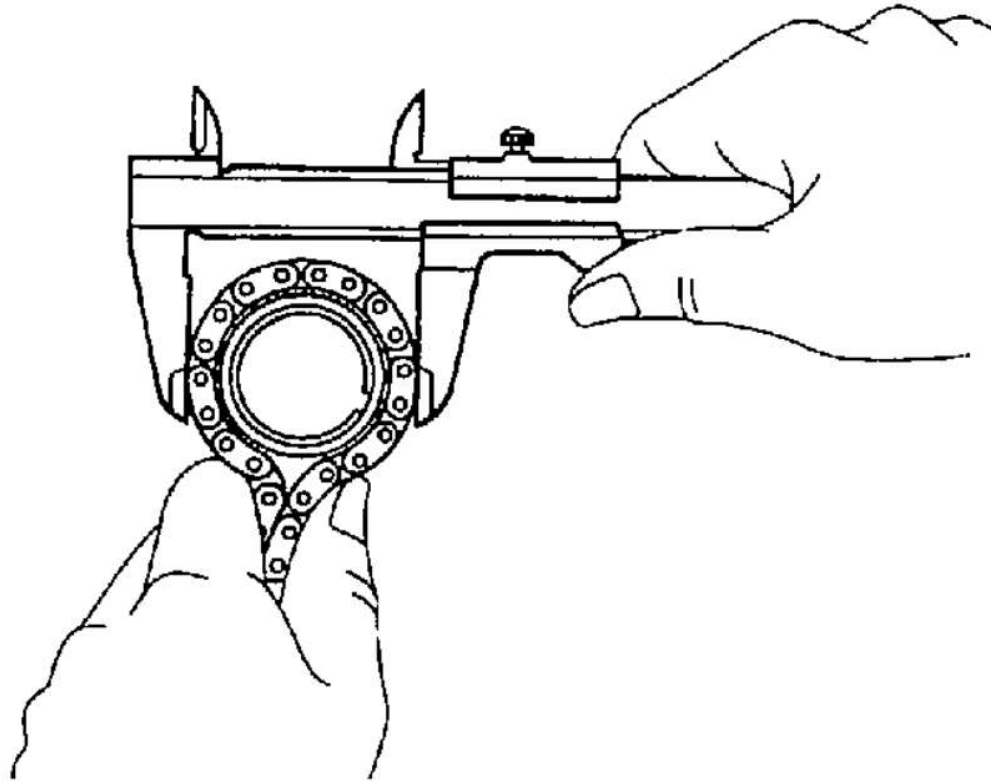
Fig. 27: Measuring Length Of The 8 Links

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

If the elongation is greater than maximum, replace the chain.

NOTE: Make the same measurements pulling at 3 or more places selected at random.

- b. Wrap the chain around the oil pump sprocket.
- c. Using vernier calipers, measure the sprocket diameter with the chain.



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Fig. 28: Measuring Sprocket Diameter

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Vernier calipers must contact the chain rollers for measuring

Minimum sprockets diameter (w/ chain): 48.2 mm (1.898 in.)

If the diameter is less than minimum, replace the chain and 2 sprockets.

5. Inspect chain tensioner plate .

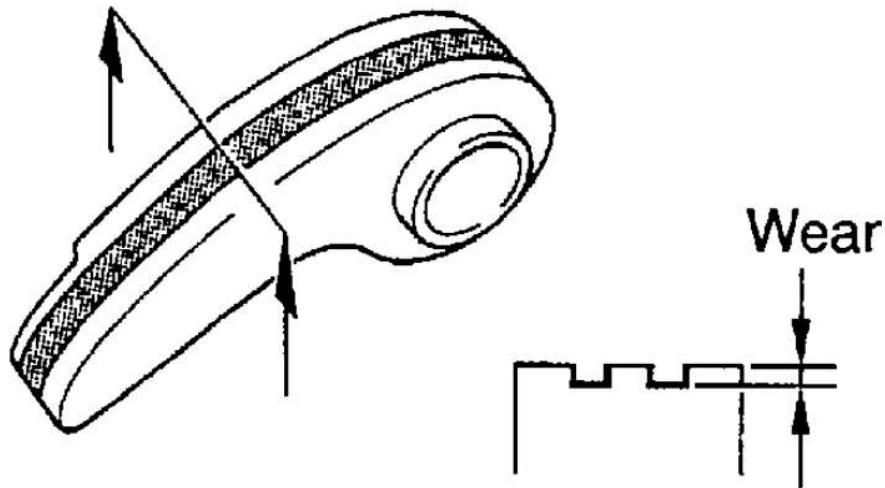
**N****G01091810**

Fig. 29: Inspecting Chain Tensioner Plate
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Measure the chain tensioner plate wear.

Maximum wear: 0.5 mm (0.020 in.)

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

REASSEMBLY

1. Install drive and driven rotors .

- Place the drive and driven rotors into the pump body with the marks facing the pump body cover side.

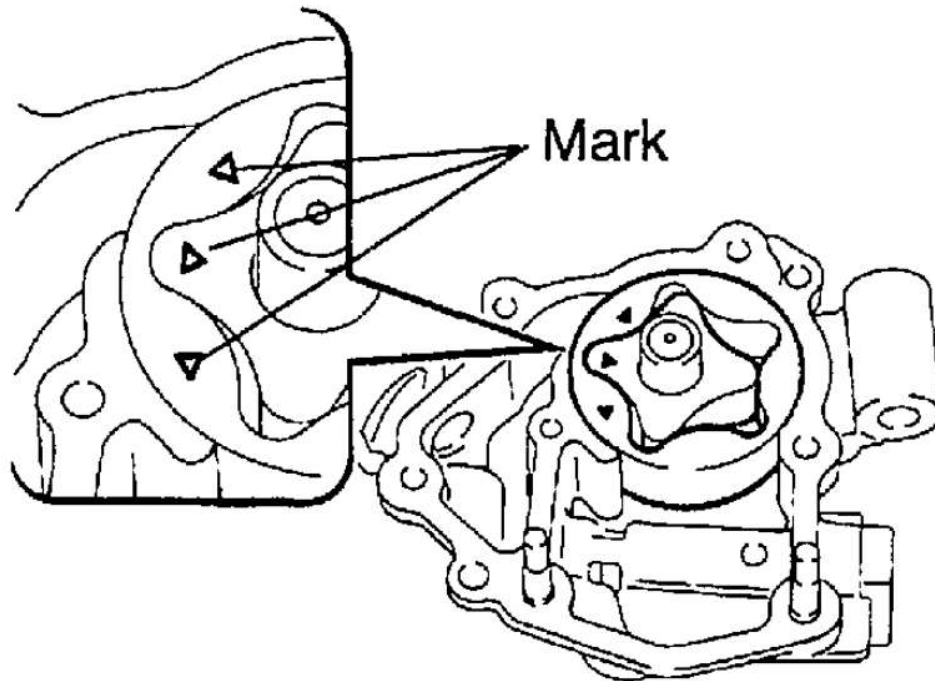
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Fig. 30: Displaying Marks On Drive & Driven Rotor
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the pump body cover with the 7 bolts.
Torque: 8.8 N.m (90 kgf.cm, 80 in..lbf)

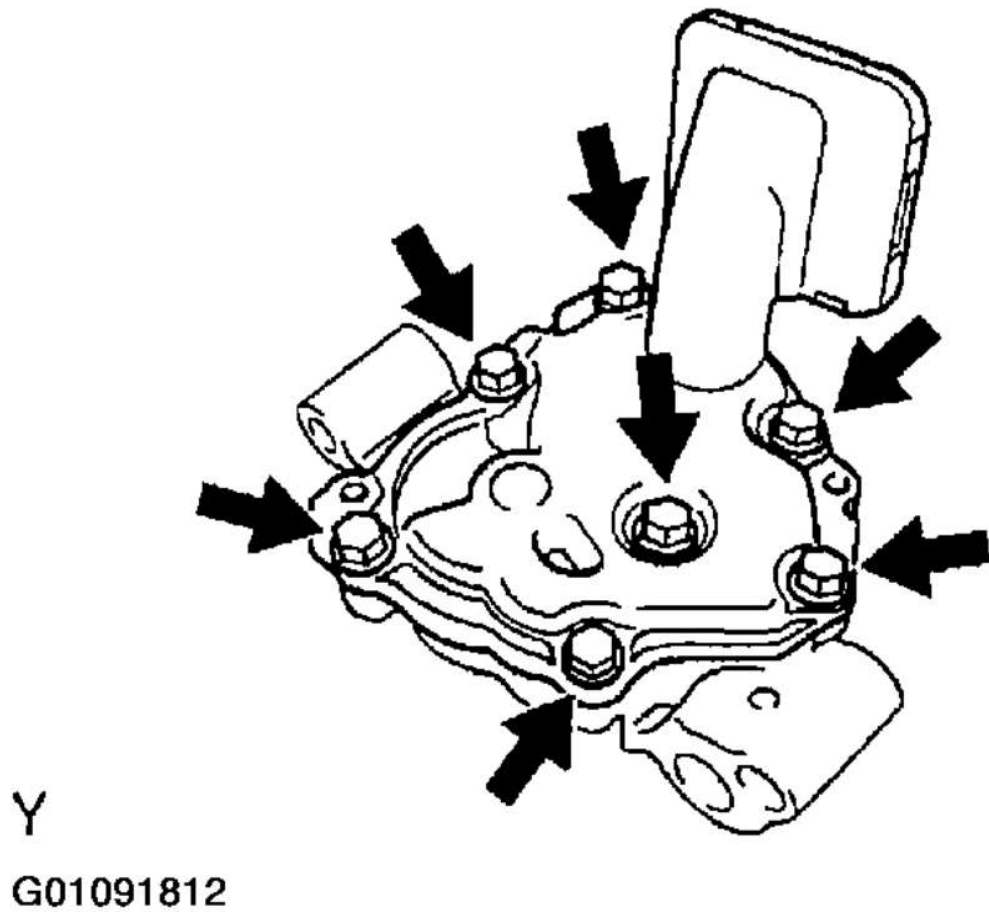
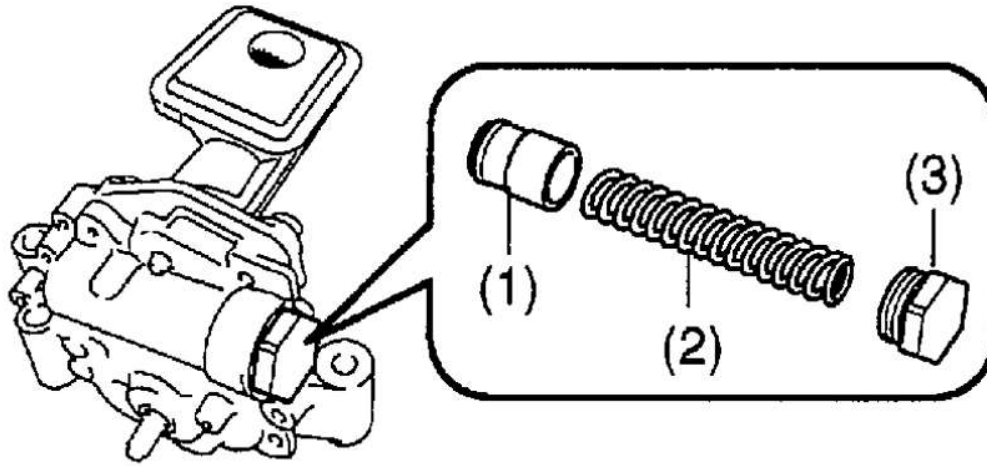


Fig. 31: Installing Pump Body Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. Install relief valve .



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Fig. 32: Installing Relief Valve

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Insert the relief valve (1) and spring (2) into the pump body hole, and install the plug (3).

Torque: 49 N.m (500 kgf.cm, 35 ft.lbf)**INSTALLATION**

1. Install oil pump .

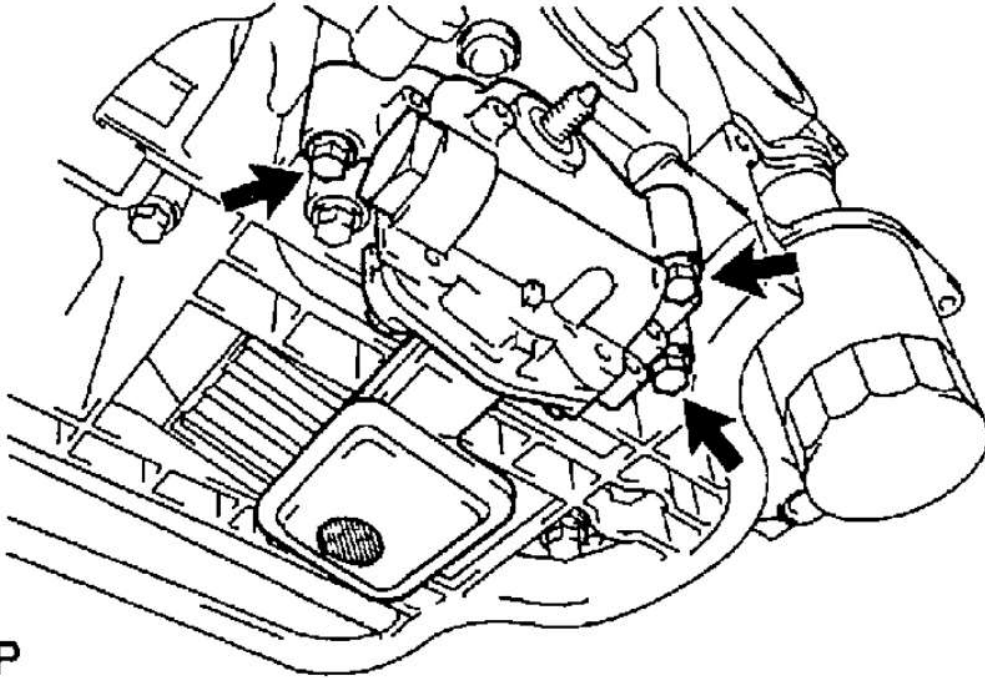
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Fig. 33: Installing Oil Pump

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Install a new gasket and the oil pump with the 3 bolts.

Torque: 18.6 N.m (190 kgf.cm, 14 ft.lbf)

2. Install drive chain and sprockets .

- a. Set the crankshaft key into the left horizontal position and turn the cutout of the drive shaft to the top.

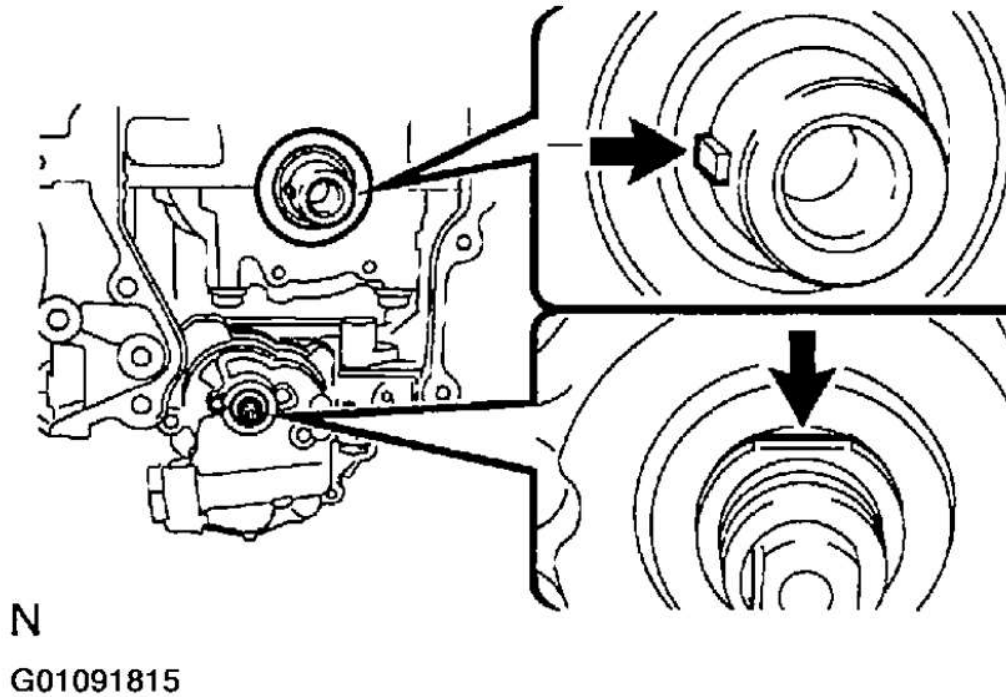


Fig. 34: Installing Drive & Sprockets

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Set the chain on the 2 sprockets as shown in the illustration.

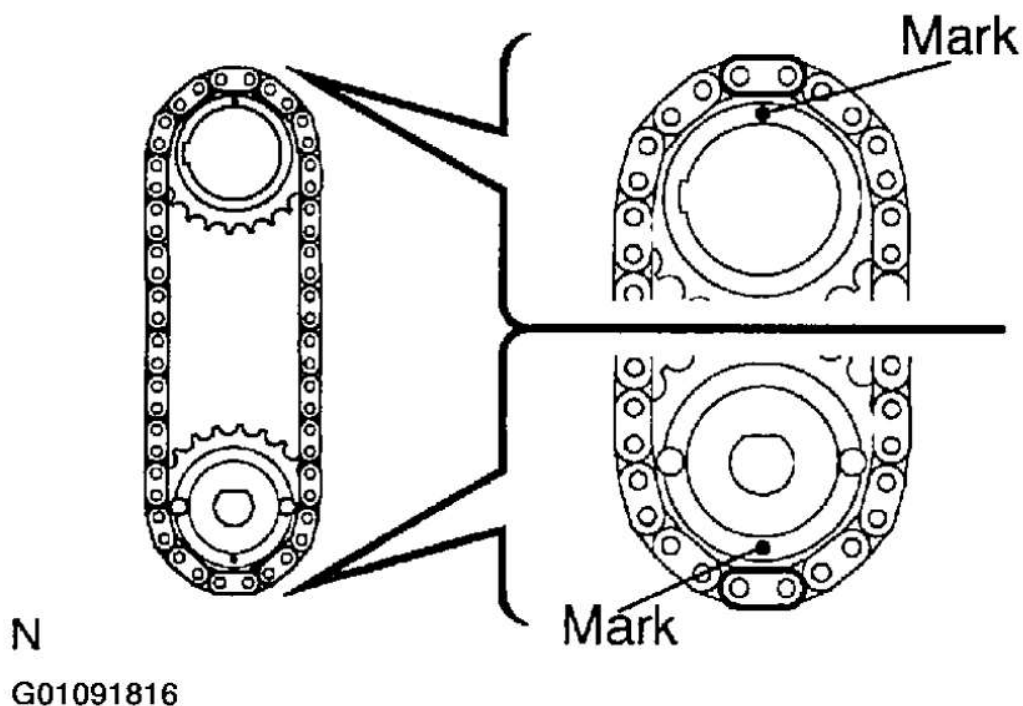


Fig. 35: Setting Chain On 2 Sprockets

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

- Set the mark on the oil pump drive sprocket at the colored link in the chain.
- Set the mark on the oil pump drive shaft sprocket at the colored link.

- c. Install the chain and 2 sprockets with the nut.

Torque: 29.5 N.m (300 kgf.cm, 20 ft.lbf)

3. Install chain tensioner .

Install the spring and plate with the bolt.

Torque: 12 N.m (120 kgf.cm, 9ft.lbf)

4. Install oil pan .

- a. Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the timing chain/crank case and oil pan.
- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the

gasket surfaces and sealing grooves.

- Thoroughly clean all components to remove all the loose material.
- Using a non-residue solvent, clean both sealing surfaces.

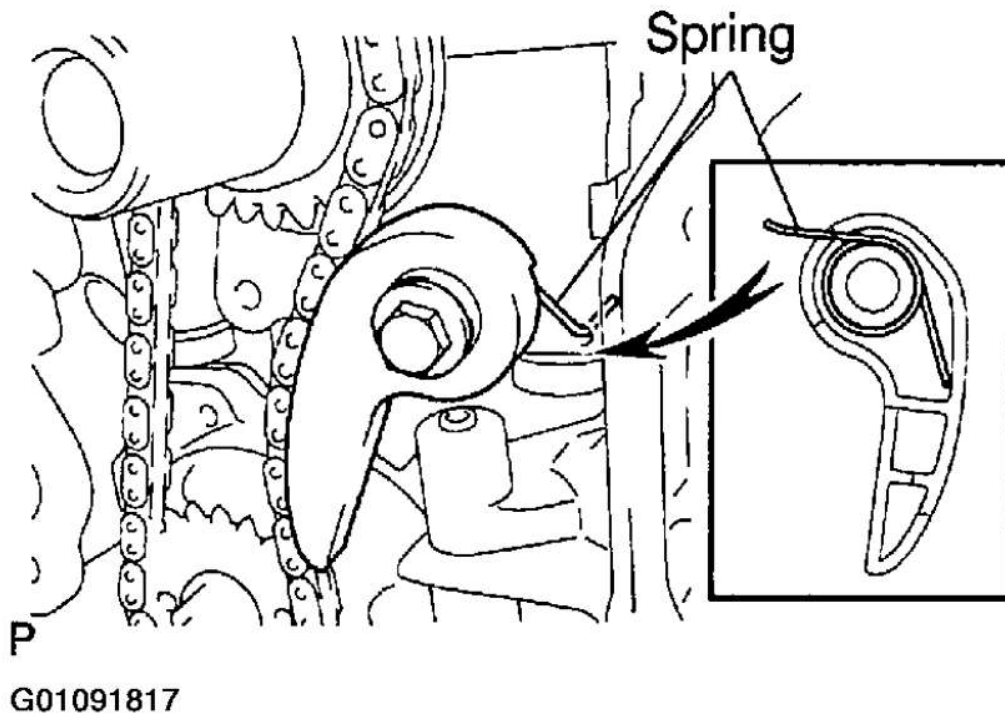


Fig. 36: Displaying Spring Proper Installation

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Do not use a solvent which will affect the painted surfaces.

- b. Apply seal packing to the oil pan as shown in the illustration.

Seal packing: Part No. 08826 - 00080 or equivalent

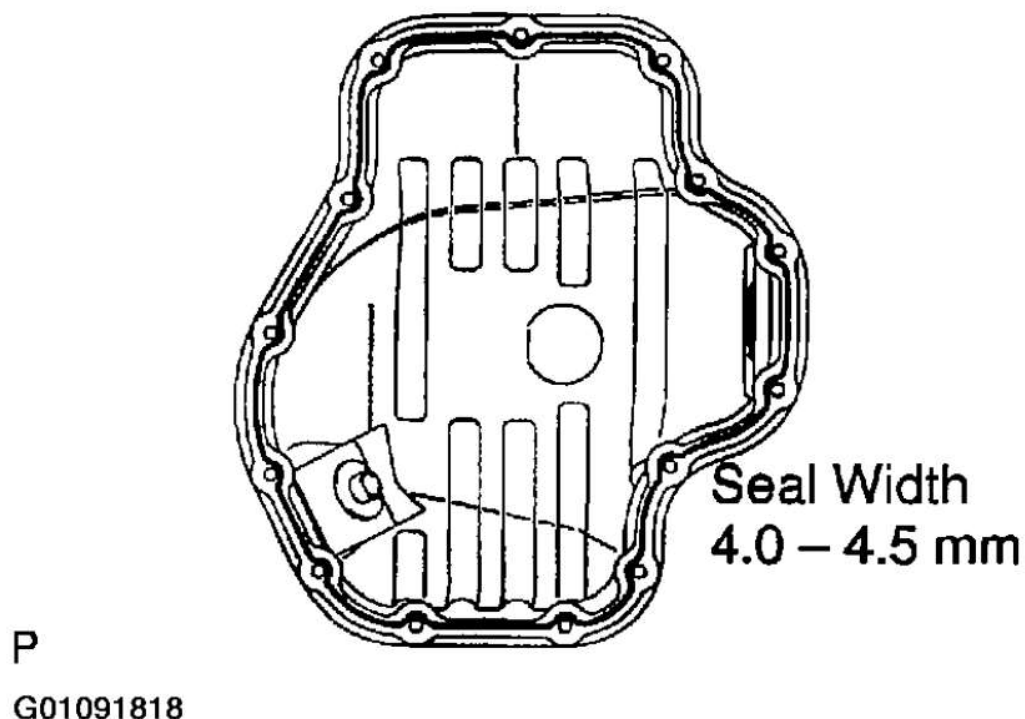


Fig. 37: Displaying Oil Pan & Seal Packing Width
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

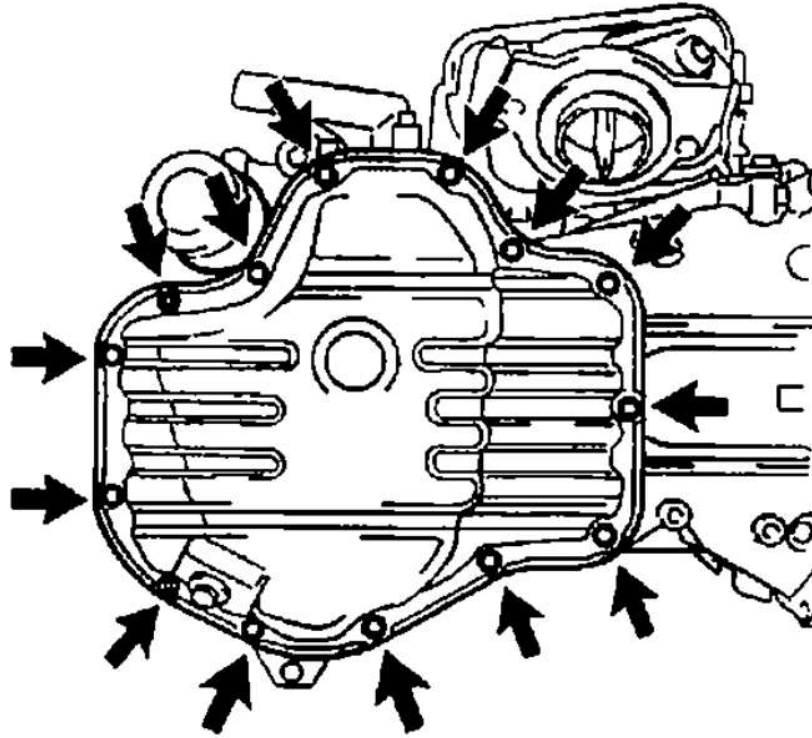
- Install a nozzle that has been cut to a 4.0 - 4.5 mm (0.16 - 0.18 in.) opening.

NOTE: **Avoid applying an excessive amount to the surface.**

- Parts must be assembled within 3 minutes of application. Otherwise the material must be removed and reapplied.
 - Immediately remove nozzle from the tube and reinstall cap.
- c. Install the oil pan with the 12 bolts and 2 nuts.

Torque: 9 N.m (90 kgf.cm, 80 in..lbf)

5. Install crankshaft timing sprocket and timing chain (See INSTALLATION) .
6. Install RH engine mounting insulator (See INSTALLATION) .
7. Install ABS actuator (See ACTUATOR/ABS ECU) .
8. Install air cleaner assembly (See INSTALLATION) .



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Fig. 38: Installing Oil Pan

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

9. Install front exhaust pipe .

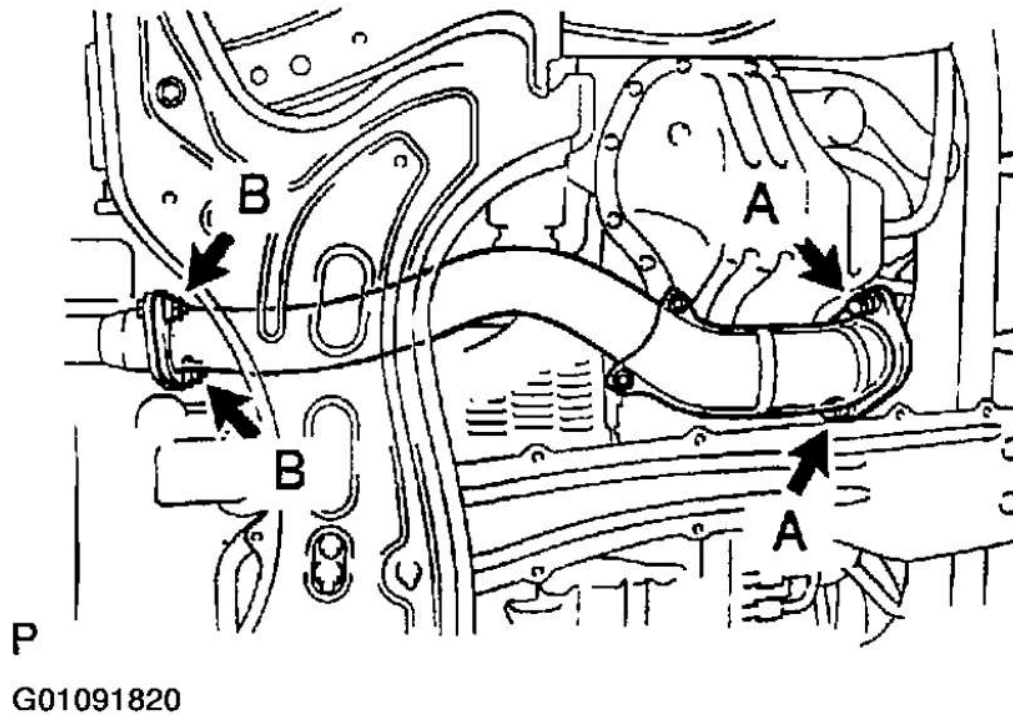


Fig. 39: Installing Front Exhaust Pipe

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Install 2 new gaskets and front exhaust pipe with the 2 compression springs and 4 bolts.

Torque:

43 N.m (439 kgf.cm, 32 ft.lbf) for bolt A

49 N.m (500 kgf.cm, 36 ft.lbf) for bolt B

10. **Install engine under cover .**
11. **Fill engine with oil .**
12. **Start engine and check for leaks .**
13. **Recheck engine oil level .**