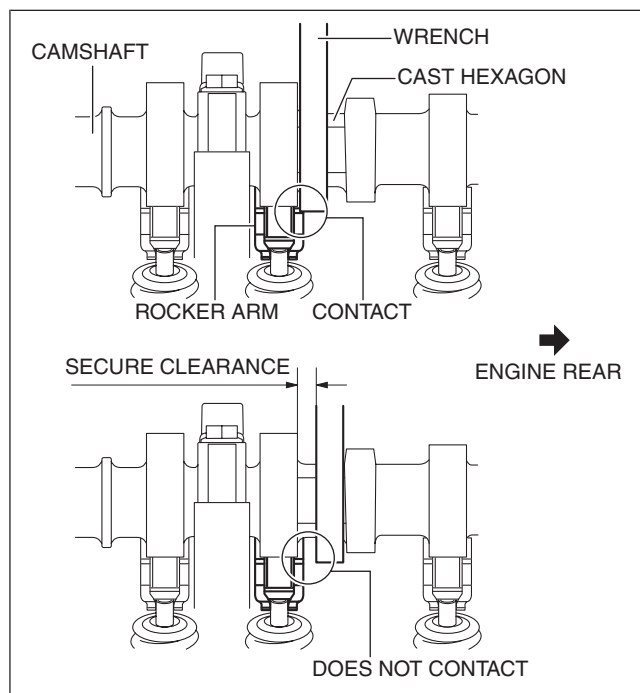


Warning

- Hot engines and engine oil can cause severe burns. Turn off the engine and wait until it and the engine oil have cooled.
- A vehicle that is lifted but not securely supported on safety stands is dangerous. It can slip or fall, causing death or serious injury. Never work around or under a lifted vehicle if it is not securely supported on safety stands.
- Continuous exposure to USED engine oil has caused skin cancer in laboratory mice. Protect your skin by washing with soap and water immediately after working with engine oil.

Caution

- If the camshaft is rotated with the timing chain removed and the piston at the top dead center position, the valve may contact the piston and the engine could be damaged. When rotating the camshaft with the timing chain removed, rotate it after lowering the piston from the top dead center position.
- When rotating the camshaft using a wrench on the cast hexagon, the wrench may contact the rocker arm and damage the rocker arm. To prevent damage to the rocker arm when holding the camshaft on the cast hexagon, use a wrench on the rear side of the engine as shown in the figure to secure a clearance between the cam.

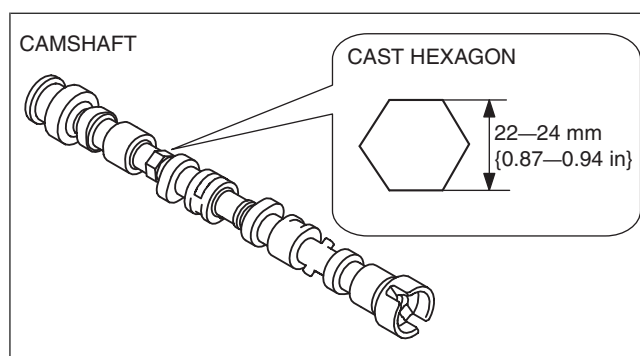


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Note

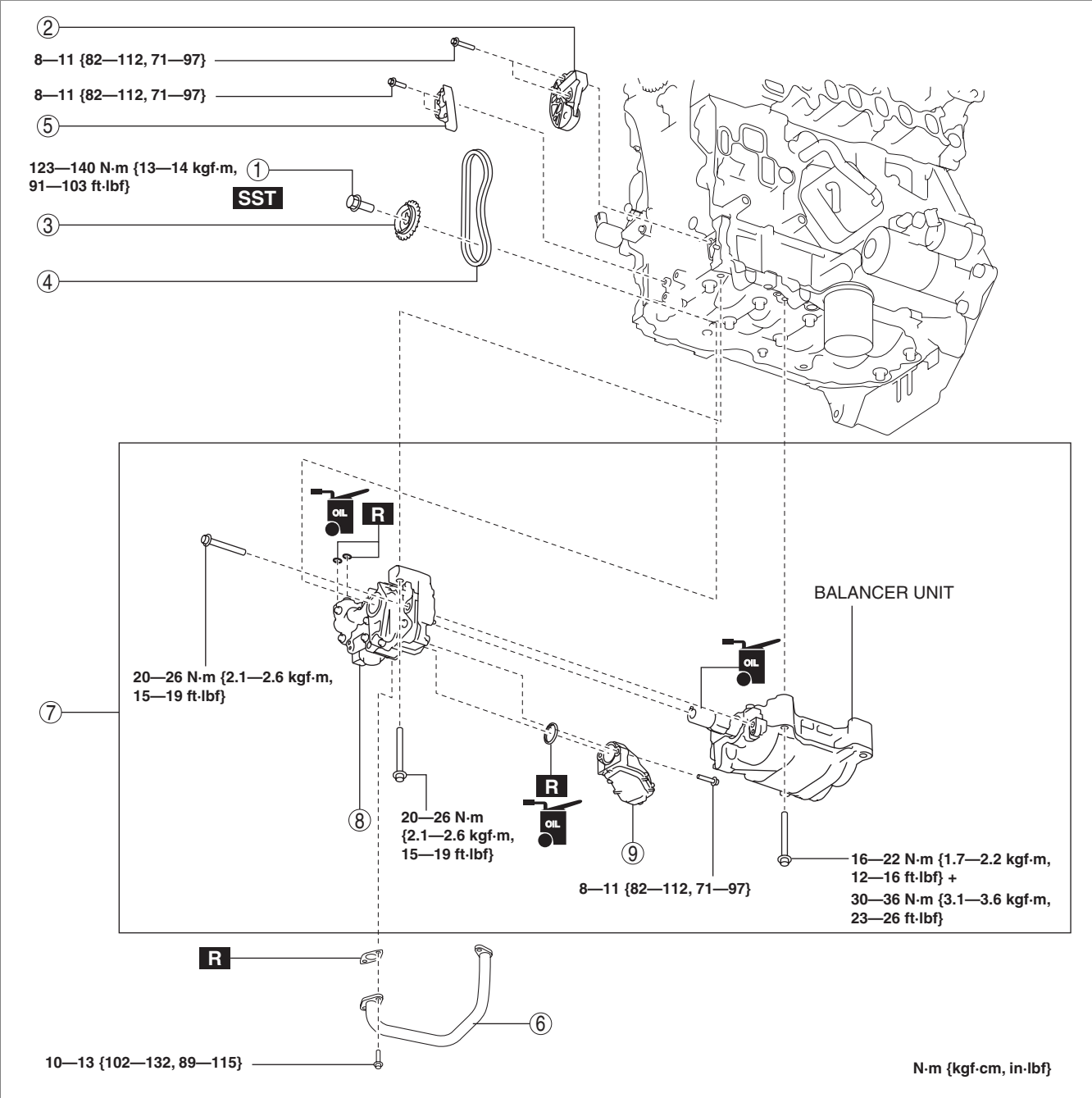
- Width at the cast hexagon of the camshaft is 22—24 mm {0.87—0.94 in}.

1. Disconnect the negative battery cable. (See NEGATIVE BATTERY CABLE DISCONNECTION/CONNECTION [SKYACTIV-D 2.2].)
2. Remove the engine cover. (See ENGINE COVER REMOVAL/INSTALLATION [SKYACTIV-D 2.2].)
3. Remove the front under cover No.2. (See FRONT UNDER COVER No.2 REMOVAL/INSTALLATION.)
4. Remove the splash shield. (See SPLASH SHIELD REMOVAL/INSTALLATION.)
5. Remove the drive belt. (See DRIVE BELT REMOVAL/INSTALLATION [SKYACTIV-D 2.2].)
6. Drain the engine oil. (See ENGINE OIL REPLACEMENT [SKYACTIV-D 2.2].)
7. Remove the oil pan. (See OIL PAN REMOVAL/INSTALLATION [SKYACTIV-D 2.2].)
8. Remove the fuel injectors. (See FUEL INJECTOR REMOVAL/INSTALLATION [SKYACTIV-D 2.2].)
9. Drain the engine coolant. (See ENGINE COOLANT REPLACEMENT [SKYACTIV-D 2.2].)
10. Remove the timing chain. (See TIMING CHAIN REMOVAL/INSTALLATION [SKYACTIV-D 2.2].)
11. Remove in the order indicated in the table.
12. Install in the reverse order of removal.



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13. Refill with the specified type and amount of the engine oil. (See ENGINE OIL REPLACEMENT [SKYACTIV-D 2.2].)
14. Refill the engine coolant. (See ENGINE COOLANT REPLACEMENT [SKYACTIV-D 2.2].)
15. Inspect for engine coolant leakage. (See ENGINE COOLANT LEAKAGE INSPECTION [SKYACTIV-D 2.2].)
16. Start the engine and inspect and adjust the following:
 - Leakage of engine oil.
 - Oil level (See ENGINE OIL LEVEL INSPECTION [SKYACTIV-D 2.2].)
 - Runout and contact of pulley and belt.
 - Idling speed (See ENGINE TUNE-UP [SKYACTIV-D 2.2].)

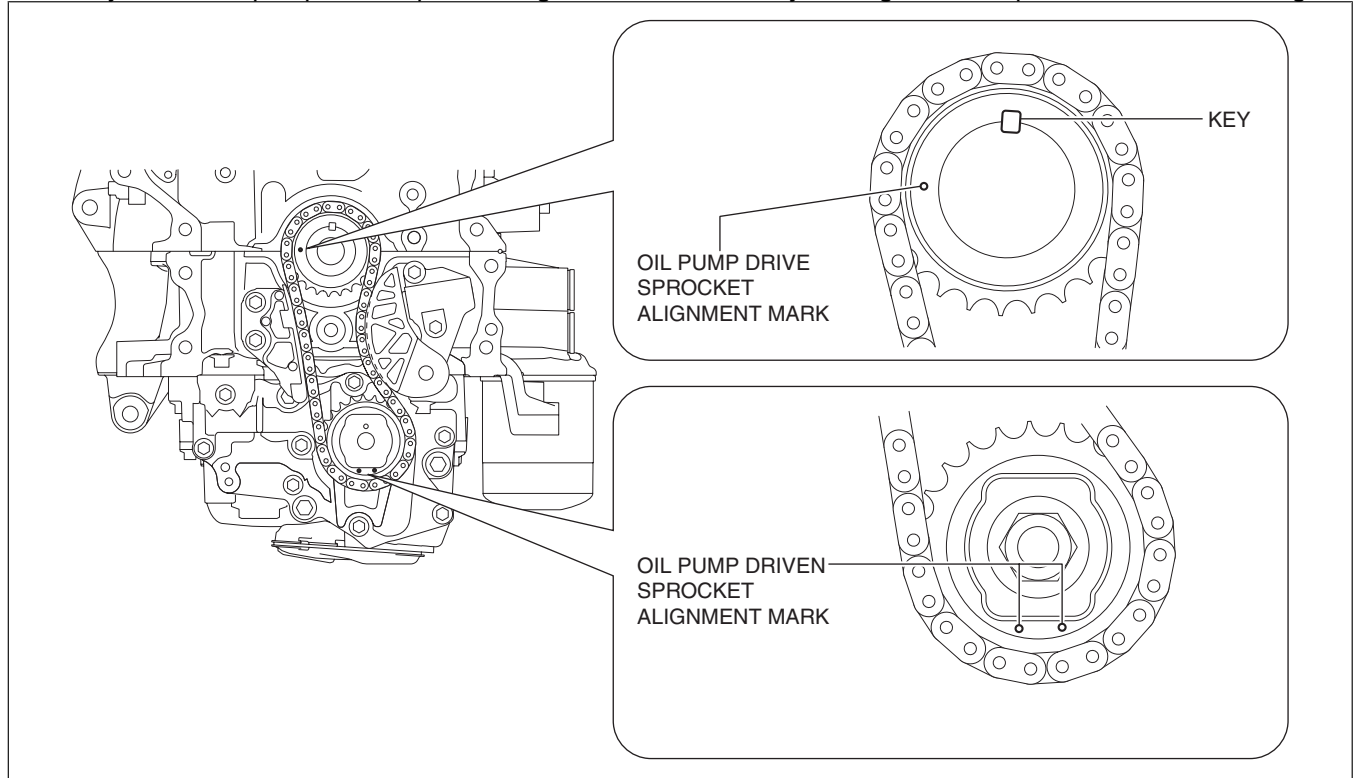


1	Oil pump driven sprocket installation bolt (See Oil Pump Chain Removal Note.) (See Oil Pump Chain Installation Note.)
2	Oil pump chain tensioner (See Oil Pump Chain Removal Note.) (See Oil Pump Chain Installation Note.)
3	Oil pump driven sprocket (See Oil Pump Chain Removal Note.) (See Oil Pump Chain Installation Note.)

4	Oil pump chain (See Oil Pump Chain Removal Note.) (See Oil Pump Chain Installation Note.)
5	Oil pump chain guide
6	Oil pipe
7	Balancer component (See Oil Pump, Balancer Unit Installation Note.)
8	Oil pump (See Oil Pump, Balancer Unit Installation Note.)

Oil Pump Chain Removal Note

1. Verify that the oil pump driven sprocket alignment marks and key are aligned to the positions shown in the figure.



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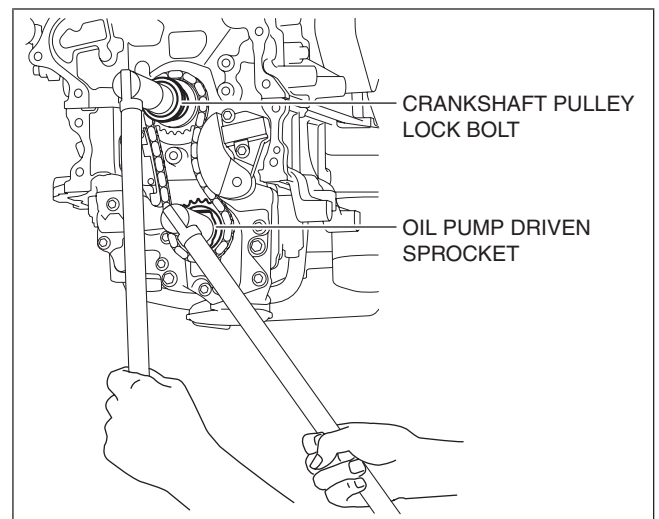
Note

- If they are not in the positions shown in the figure, rotate the crankshaft to set cylinder No.1 to top dead center (TDC).

2. Temporarily assemble the crankshaft pulley lock bolt, and lock the oil pump against rotation as shown in the figure.
3. Slightly loosen the oil pump driven sprocket installation bolt.

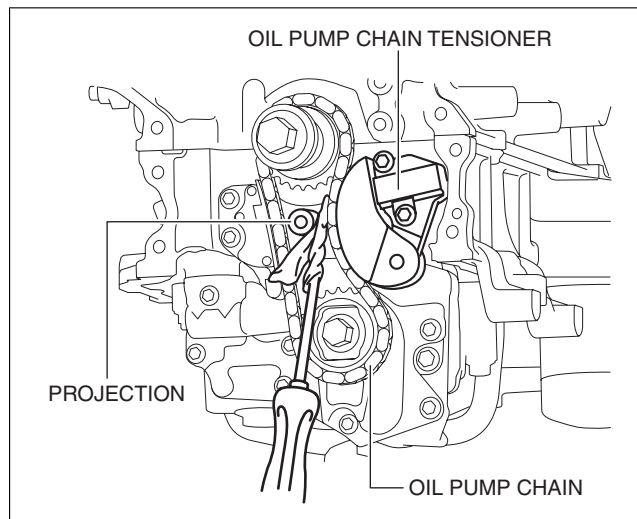
Note

- At this stage, only loosen the oil pump driven sprocket installation bolt, do not remove it. Remove the bolt after removing the oil pump chain tensioner.



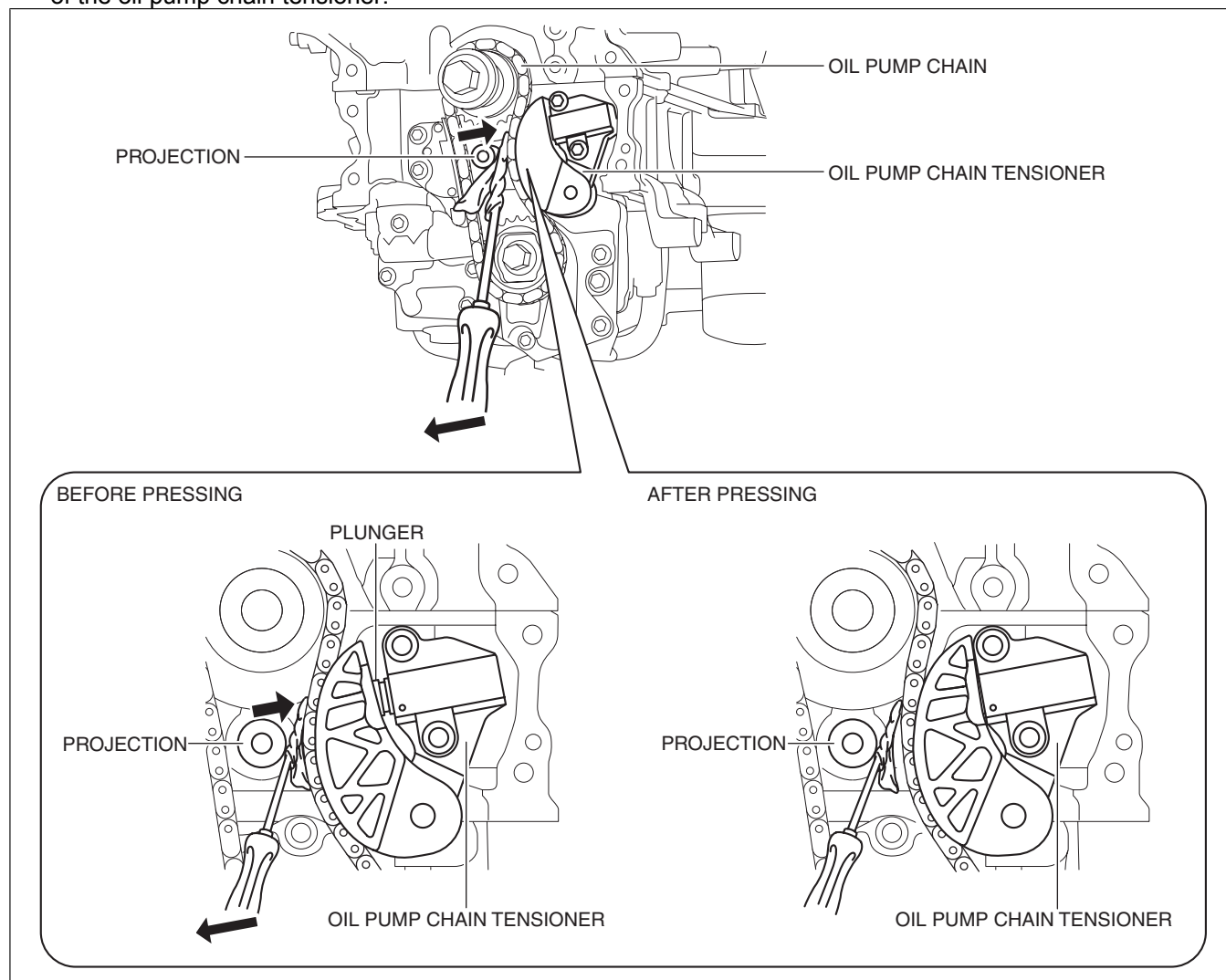
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4. Set a cloth wrapped flathead screwdriver in the gap between the lower cylinder block projection and the oil pump chain as shown in the figure.



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5. Move the screwdriver in the direction of the arrow and press the oil pump chain, and then press in the plunger of the oil pump chain tensioner.



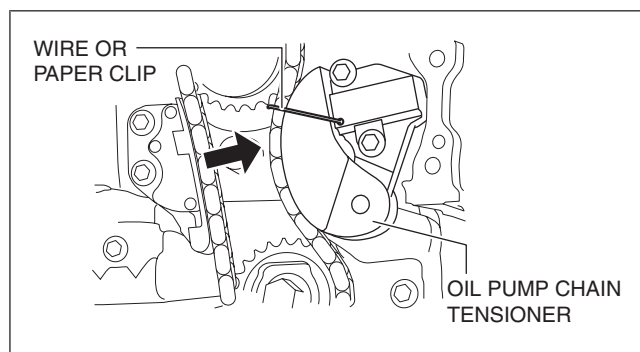
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6. Insert a wire with an approx. diameter of **1.4 mm {0.055 in}** or a paper clip into the body hole of the oil pump chain tensioner with the plunger pressed.

Note

- The wire or paper clip secures the plunger, and the tension can be released.

7. Remove the oil pump chain tensioner.
8. Remove the oil pump chain and oil pump driven sprocket as a single unit.
9. Remove the temporarily assembled crankshaft pulley lock bolt.

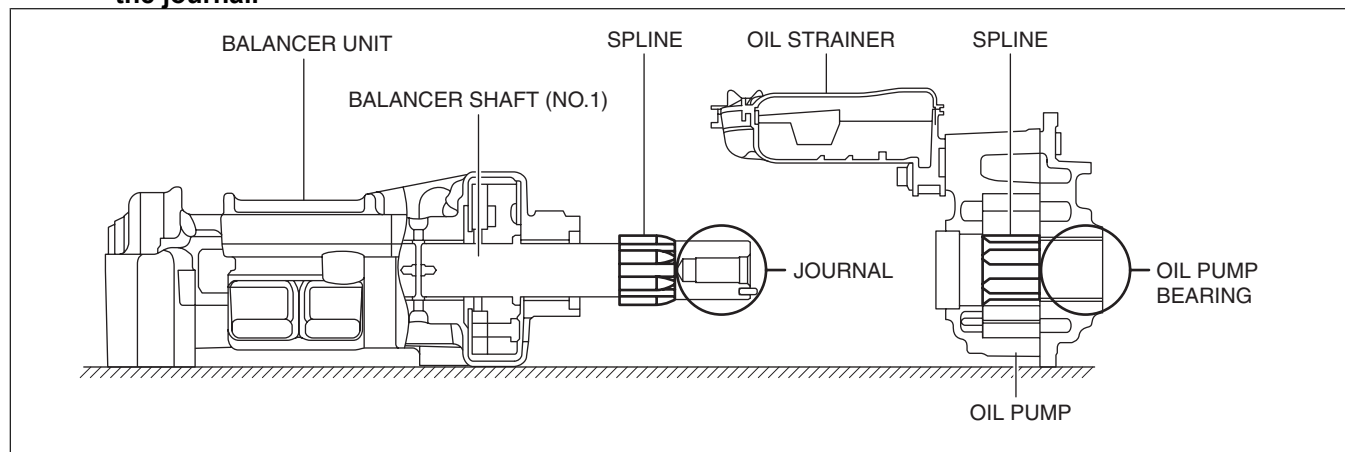


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Oil Pump, Balancer Unit Installation Note

Caution

- If the balancer shaft (No.1) spline is scratched or damaged, the engagement with the oil pump spline could worsen and it may not be possible to assemble the oil pump. Therefore, be careful not to scratch or damage the spline.
- Because the balancer shaft (No.1) journal slides with oil pump bearing, if the journal is scratched or damaged, the bearing could become damaged. Therefore, be careful not to scratch or damage the journal.



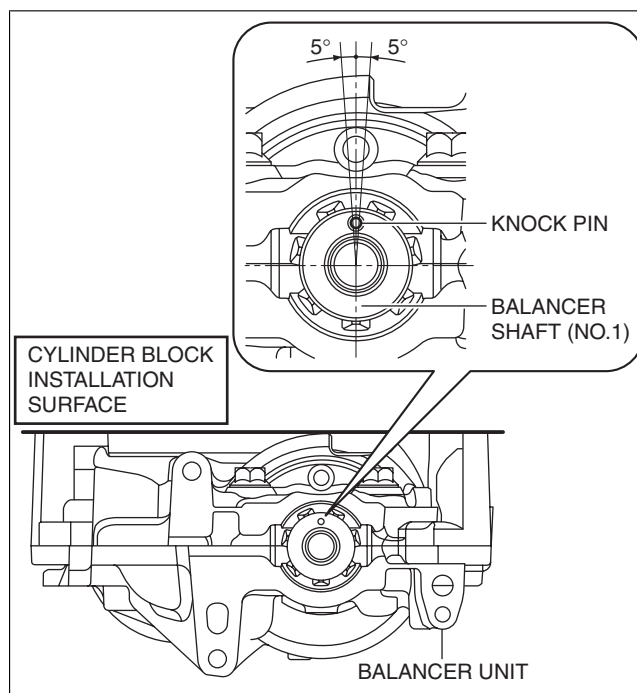
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1. Install the oil pump and balancer component using the following procedure:
 - (1) Apply clean engine oil to a new oil strainer O-ring.
 - (2) Assemble the oil strainer to the oil pump.

- (3) Verify that the balancer shaft (No.1) knock pin position is perpendicular to the cylinder block installation surface.
 - If the knock pin position has deviated, rotate the balancer shaft (No.1) and correct.
- (4) Apply engine oil to the balancer shaft (No.1) journal area.
- (5) Align the heights of the balancer shaft (No.1) spline and oil pump spline and install the oil pump to the balancer unit.

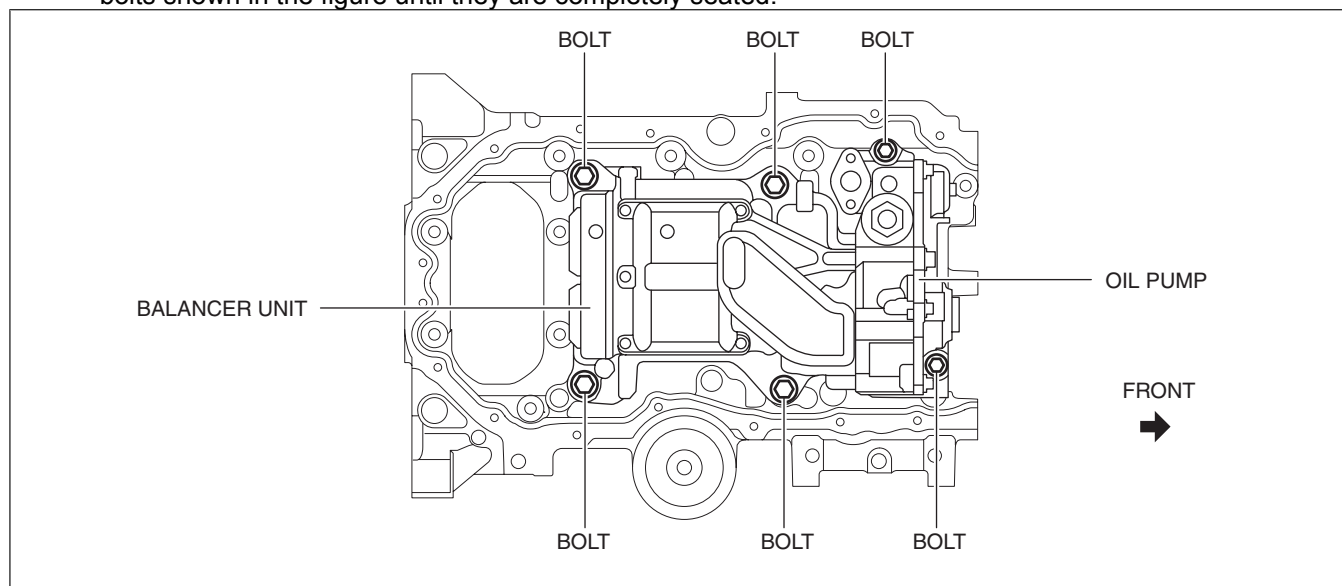
Note

- The balancer shaft (No.1) spline and oil pump spline timing does not need to be matched.
- (6) Temporarily tighten the bolts until the seating surfaces of the oil pump installation bolts are completely seated.



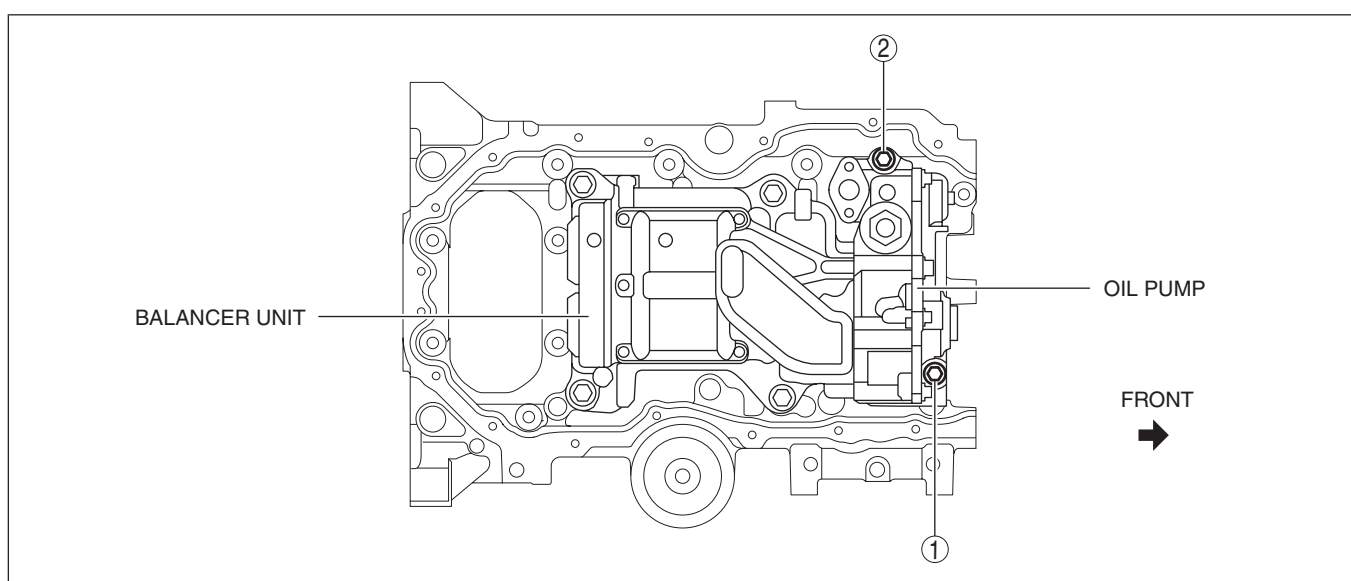
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- (7) Install the oil pump and balancer unit to the cylinder block and temporarily tighten the seating face of the bolts shown in the figure until they are completely seated.



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- (8) Tighten oil pump installation bolts in the order shown in the figure to the specified torque.

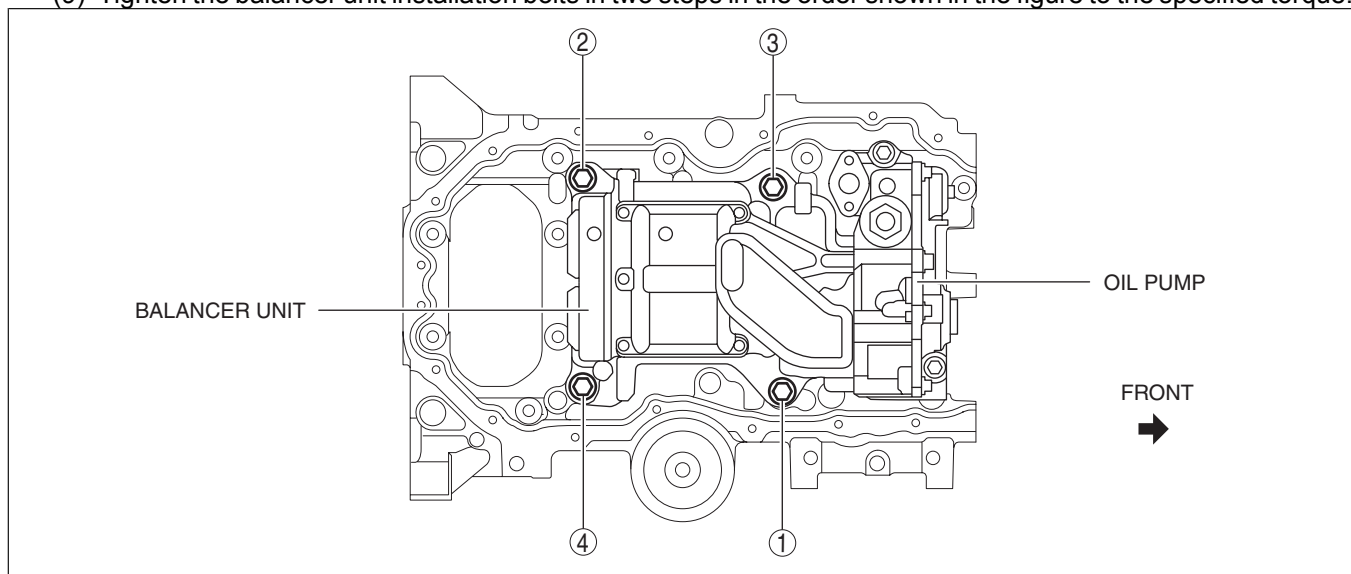


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Tightening torque

20—26 N·m {2.1—2.6 kgf·m, 15—19 ft·lbf}

(9) Tighten the balancer unit installation bolts in two steps in the order shown in the figure to the specified torque.



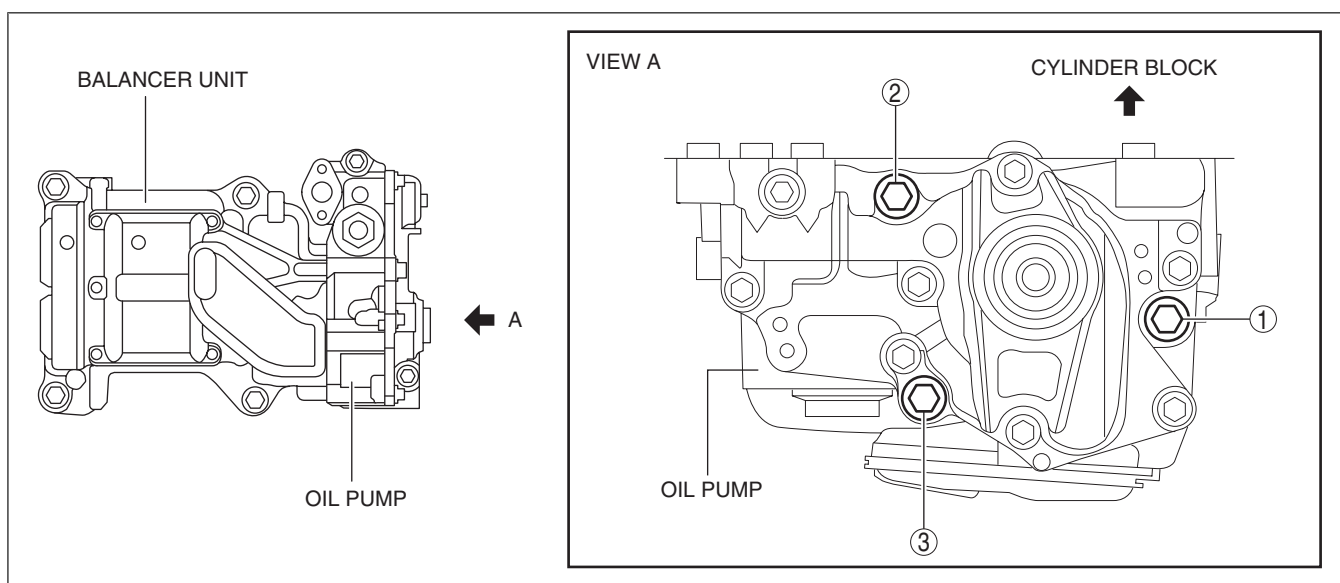
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Tightening torque

First step: 16—22 N·m {1.7—2.2 kgf·m, 12—16 ft·lbf}

Second step: 30—36 N·m {3.1—3.6 kgf·m, 23—26 ft·lbf}

(10) Tighten the oil pump installation bolts in the order shown in the figure.



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Tightening torque

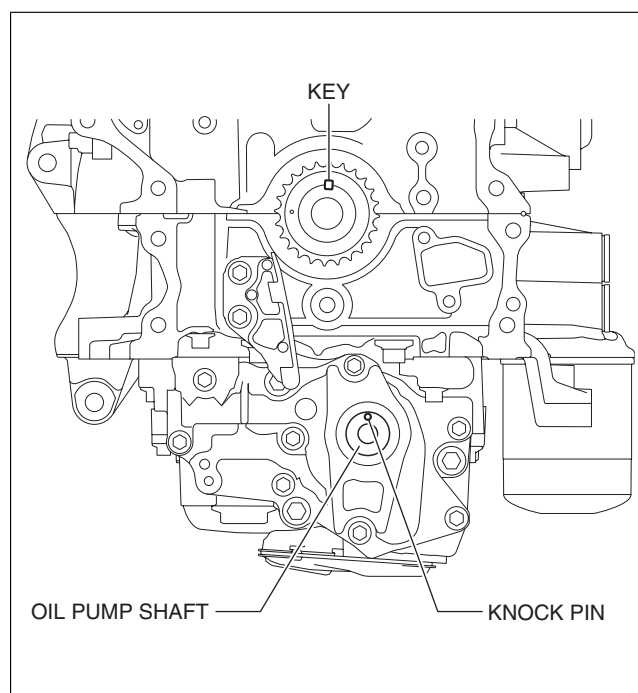
20—26 N·m {2.1—2.6 kgf·m, 15—19 ft·lbf}

Oil Pump Chain Installation Note

1. Verify that the key and knock pin are aligned to the positions shown in the figure.
 - If they are not in the positions shown in the figure, rotate the crankshaft and balancer shaft (No.1) to set cylinder No.1 to top dead center (TDC).

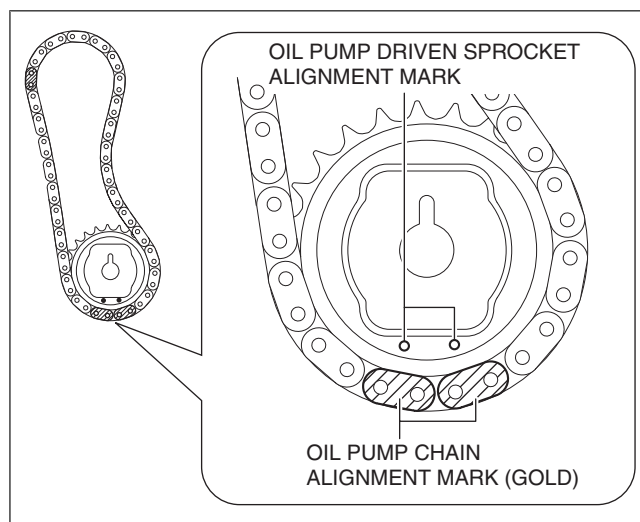
Note

- When rotating the balancer shaft (No.1), temporarily assemble the oil pump driven sprocket and rotate while holding the sprocket with a hand.



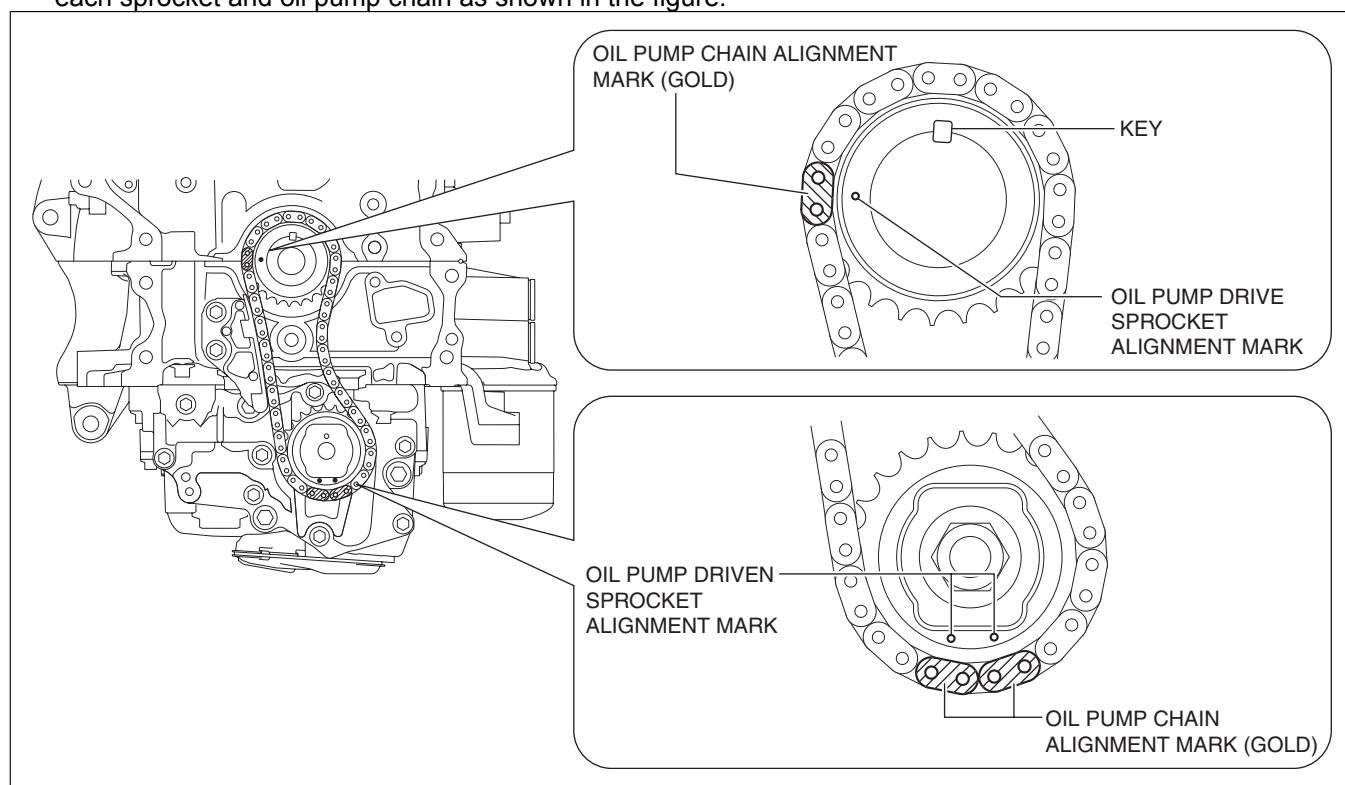
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2. Align the oil pump chain alignment marks with the oil pump driven sprocket alignment marks.



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3. Install the oil pump chain and oil pump driven sprocket as a single unit while aligning the alignment marks on each sprocket and oil pump chain as shown in the figure.



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4. Temporarily tighten the oil pump driven sprocket installation bolt.
5. Install the oil pump chain tensioner.

Caution

- At this stage, do not remove the wire or paper clip installed to the oil pump chain tensioner.

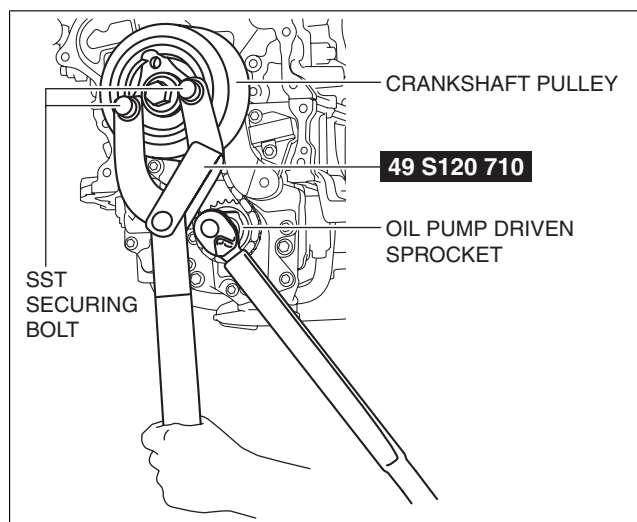
6. Tighten the oil pump driven sprocket installation bolt using the following procedure:
 - (1) Temporarily assemble the crankshaft pulley and crankshaft pulley lock bolt.

- (2) Install the **SST** shown in the figure and lock the oil pump against rotation. (See FRONT OIL SEAL REPLACEMENT [SKYACTIV-D 2.2].)
- (3) Tighten the oil pump driven sprocket installation bolt.

Tightening torque

123—140 N·m {13—14 kgf·m, 91—103 ft·lbf}

7. Remove the temporarily assembled crankshaft pulley and crankshaft pulley lock bolt.
8. Remove the wire or paper clip installed to the oil pump chain tensioner and apply tension to the oil pump chain.
 - If a new oil pump chain tensioner is used, remove the installed stopper.



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