

Component Procedures: Camshaft

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Component Procedures: Camshaft

Parts and Labor (itype_189)

Parts

| Qualifier | Part # | Name | Price | Note |
|----------------------------|----------|---------------|--------|------|
| Camshaft > Intake > Right | 12632275 | 13 - Camshaft | 47.18 | |
| Camshaft > Intake > Left | 12632272 | 13 - Camshaft | 125.85 | |
| Camshaft > Exhaust > Right | 12632274 | 13 - Camshaft | 133.52 | |
| Camshaft > Exhaust > Left | 12632270 | 13 - Camshaft | 120.12 | |

Labor

| Operation | Qualifier Path | Skill | Std Hrs | Wty Hrs |
|------------------|--|-------|---------|---------|
| Remove & Replace | Camshaft & Timing > Camshaft, R&R > Left Bank? | B | 4.3 | 0.0 |
| Remove & Replace | Camshaft & Timing > Camshaft, R&R > Left Bank? | B | 3.8 | 2.6 |
| Remove & Replace | Camshaft & Timing > Camshaft, R&R > Left Bank? | B | 3.8 | 2.6 |
| Remove & Replace | Camshaft & Timing > Camshaft, R&R > Right Ban? | B | 4.0 | 0.0 |
| Remove & Replace | Camshaft & Timing > Camshaft, R&R > Right Ban? | B | 3.5 | 2.4 |
| Remove & Replace | Camshaft & Timing > Camshaft, R&R > Right Ban? | B | 3.5 | 2.4 |

Camshaft Replacement - Left Side (Article 12162)

Removal Procedure

- Remove the fuel pump. Refer to Fuel Pump Replacement .
- Remove the camshaft position actuators. Refer to Camshaft Position Actuator Replacement - Bank 2 .
- Observe the markings on the bearing caps (1). Each bearing cap is marked in order to identify its location. The markings have the following meanings: [Click for full-size image](#)
- The raised feature must always be oriented toward the center of the cylinder head .
- The I indicates the intake camshaft .
- The E indicates the exhaust camshaft .
- The number indicates the journal position from the front of the engine.
- Remove the camshaft bearing cap bolts (1). [Click for full-size image](#)
- Remove the camshaft bearing caps (2).
- Remove the camshafts (1). [Click for full-size image](#)

Installation Procedure

- Ensure that the camshaft sealing rings (1) are in place in the camshaft grooves. Camshaft sealing rings must be in place below the surface of the camshaft journal in order to avoid being pinched between the cylinder head and the camshaft caps. [Click for full-size image](#)
- Apply a liberal amount of lubricant (1) to the camshaft journals and the left cylinder head camshaft carriers. Refer to Adhesives, Fluids, Lubricants, and Sealers for recommended lubricant. [Click for full-size image](#)
- Place the left intake (1) and left exhaust (2) camshafts in position in the left cylinder head. [Click for full-size image](#)
- Position the camshaft lobes in a neutral position with the flats on the back of the camshafts up and parallel (1) with the left cylinder head camshaft cover rail. [Click for full-size image](#)
- Observe the markings on the left cylinder head camshaft bearing caps. Each bearing cap is marked in order to identify its location. The markings have the following meanings: [Click for full-size image](#)
- The raised feature (1) must always be oriented toward the center of the cylinder head.
- The I indicates the intake camshaft.
- The E indicates the exhaust camshaft.
- The number 2, 4, 6 indicates the cylinder position from the front of the engine.
- Apply a liberal amount of lubricant to the camshaft bearing caps. Refer to Adhesives, Fluids, Lubricants, and Sealers for recommended lubricant.
- Apply a liberal amount of lubricant to the camshaft bearing cap (1) and camshaft thrust surface (2). Refer to Adhesives, Fluids, Lubricants, and Sealers for recommended lubricant. [Click for full-size image](#)
- Install the camshaft bearing thrust cap (1) in the first journal of the left cylinder head. [Click for full-size image](#)
- Install the remaining bearing caps (2) with their orientation mark toward the center of the cylinder head.
- Hand start all the camshaft bearing cap bolts.

- Tighten the camshaft bearing cap bolts in the sequence shown and tighten to 10 Nm (89 lb in) . Click for full-size image
- Loosen the center intake camshaft bearing cap bolts 1, 2 and the center exhaust camshaft bearing cap bolts 3, 4.
- Retighten the center camshaft bearing cap bolts 1, 2, 3, 4 and retighten the camshaft bearing cap bolts to 10 Nm (89 lb in) .
- Install the camshaft position actuators. Refer to Camshaft Position Actuator Replacement - Bank 2 .
- Install the fuel pump. Refer to Fuel Pump Replacement .

Camshaft Replacement - Right Side (Article 12163)

Removal Procedure

- Remove the camshaft position actuators. Refer to Camshaft Position Actuator Replacement - Bank 1 .
- Observe the markings on the bearing caps (1). Each bearing cap is marked in order to identify its location. The markings have the following meanings: Click for full-size image
- The raised feature must always be oriented toward the center of the cylinder head .
- The I indicates the intake camshaft .
- The E indicates the exhaust camshaft .
- The number indicates the journal position from the front of the engine.
- Remove the camshaft bearing cap bolts (1). Click for full-size image
- Remove the camshaft bearing caps (2).
- Remove the camshafts (1). Click for full-size image

Installation Procedure

- Ensure that the camshaft sealing rings (1) are in place in the camshaft grooves. Camshaft sealing rings must be in place below the surface of the camshaft journal in order to avoid being pinched between the cylinder head and the camshaft caps. Click for full-size image
- Apply a liberal amount of lubricant (1) to the camshaft journals and the right cylinder head camshaft carriers. Refer to Adhesives, Fluids, Lubricants, and Sealers for recommended lubricant. Click for full-size image
- Place the right intake (1) and right exhaust (2) camshafts in position in the right cylinder head (3). Click for full-size image
- Position the camshaft lobes in a neutral position with the flats on the back of the camshafts up and parallel (1) with the right cylinder head camshaft cover rail. Click for full-size image
- Observe the markings on the right cylinder head camshaft bearing caps. Each bearing cap is marked in order to identify its location. The markings have the following meanings: Click for full-size image
- The raised feature (1) must always be oriented toward the center of the cylinder head.
- The I indicates the intake camshaft.
- The E indicates the exhaust camshaft.
- The number 1, 3, 5 indicates the cylinder position from the front of the engine.
- Apply a liberal amount of lubricant to the camshaft bearing caps. Refer to Adhesives, Fluids, Lubricants, and Sealers for recommended lubricant.
- Apply a liberal amount of lubricant to the camshaft bearing cap (1) and camshaft thrust surface (2). Refer to Adhesives, Fluids, Lubricants, and Sealers for recommended lubricant. Click for full-size image
- Install the camshaft bearing thrust caps (1) in the first journal of the right cylinder head. Click for full-size image
- Install the remaining bearing caps (2) with their orientation mark toward the center of the cylinder head.
- Hand start all the camshaft bearing cap bolts.
- Tighten the camshaft bearing cap bolts in the sequence shown and tighten to 10 Nm (89 lb in) . Click for full-size image
- Loosen the center intake camshaft bearing cap bolts (1, 2) and the center exhaust camshaft bearing cap bolts (3, 4).
- Retighten the center camshaft bearing cap bolts (1, 2, 3, 4) and retighten the camshaft bearing cap bolts to 10 Nm (89 lb in) .
- Install the camshaft position actuators. Refer to Camshaft Position Actuator Replacement - Bank 1 .