

1989 BMW 635CSi

3.5L 6-CYL 1989-90 Engine - 3.5L 6-Cylinder

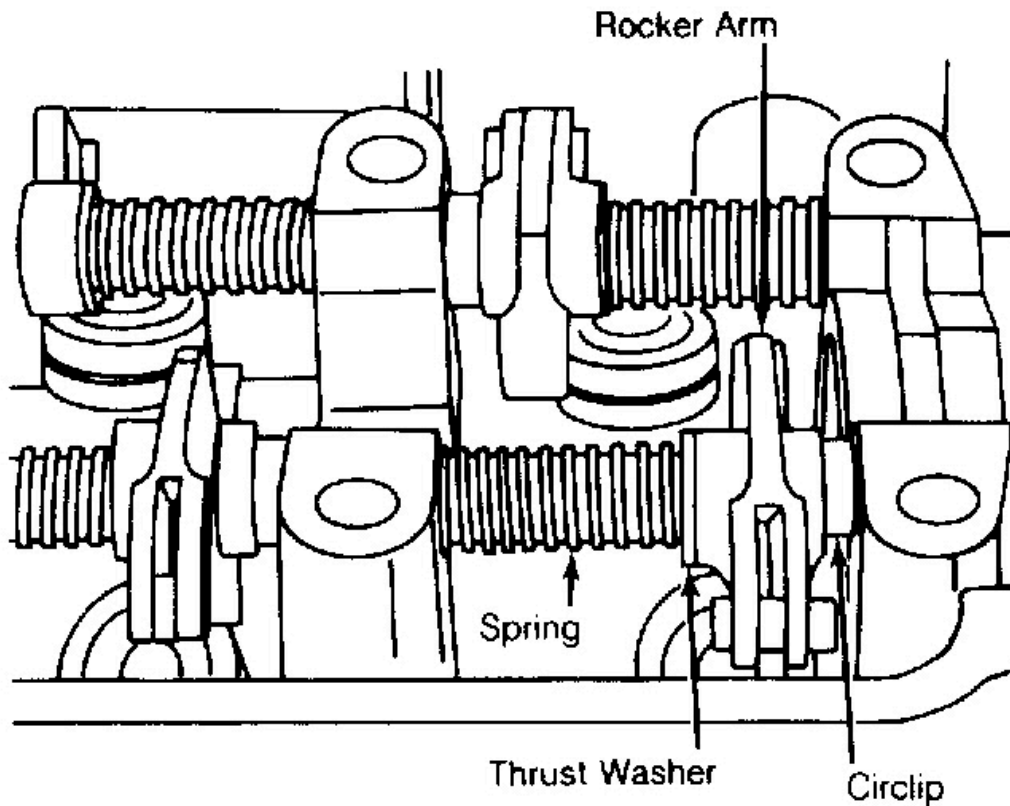


Fig. 3: Rocker Arm Assembly

Courtesy of BMW OF NORTH AMERICA, INC.

VALVE SPRINGS

NOTE: Install springs with paint stripe (tight coil end) against head.

Inspection

Check spring free length. Check spring pressure in a valve spring tester. Replace defective springs with new springs of same color code.

NOTE: The intake valve spring with "S" mark, has an installed height of 1.457-1.535" (37-39 mm).

VALVE GUIDES

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Inspection & Replacement

1. If valve-to-guide clearance is excessive, drive out guide toward combustion chamber side of head. Check size of valve guide bore in cylinder head. Valve guide bore diameter should be equal to guide outside diameter.
2. Valve guides are available in 3 oversizes. Oversize diameters are .555" (14.1 mm), .559" (14.2 mm) and .563" (14.3 mm). When installing guide, heat cylinder head to 122°F (50°C). Using Liquid Nitrogen, chill valve guide to about -238°F (-150°C).
3. Drive guide into cylinder head from top. Stepped end of valve guide must face camshaft installed guide. Guide height is .513" (13.5 mm). Ream valve guide for correct oil clearance.

PISTON & ROD ASSEMBLY R & I

Removal

1. Remove engine. Remove cylinder head, oil pan and oil pump. If necessary, mark rod and rod cap for cylinder identification. Remove rod cap.
2. Remove ridge at top of cylinder bore. Push piston and rod assembly out top of block. Install rod cap on connecting rod from which removed.
3. If replacing pistons or rods, ensure they are in same weight class as existing piston or rods. Weight class is stamped on piston crown with a "+" or "-".

Installation

1. Install rings on piston and space end gaps 120 degrees apart. Coat piston and cylinder walls with engine oil. Install ring compressor on piston.
2. Install piston and rod assembly with arrow on piston head toward front of engine. Install rod bearings. Using new rod bolts and nuts, install and tighten rod caps.

FITTING PISTONS

1. Arrow on piston heads indicate direction of installation. Weight class is indicated by a "+" or "-" sign. All pistons must be in same weight class. Maximum weight difference between pistons can be .35 oz. (10 grams).
2. Measure piston diameter 90 degrees to pin bore and at specified height from bottom of piston skirt. See PISTON DIAMETER CHECKPOINT table. Piston crown is stamped with diameter and arrow for installation direction.

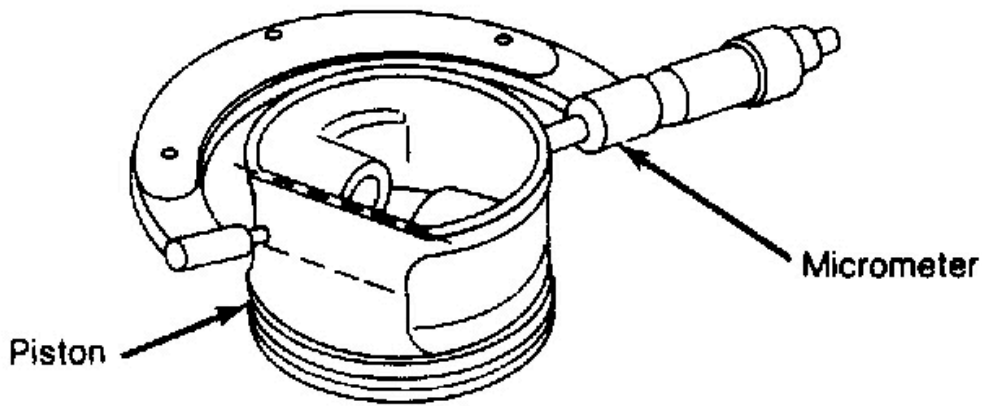


Fig. 4: Piston Diameter Checkpoint
Courtesy of BMW OF NORTH AMERICA, INC.

3. Measure cylinder at top, middle and bottom. Out-of-round and taper should not exceed .0004" (.010 mm). If oil clearance is excessive, bore and hone cylinder block for installation of oversize pistons.

FITTING RINGS

1. Place piston rings squarely into cylinder bore about 9/16" from bottom of bore. Use a feeler gauge to measure ring end gap.
2. With rings installed on piston, use a feeler gauge to measure ring side clearance. Take measurement around entire circumference of piston, between top of ring and ring land.
3. Install rings on piston with word "TOP" facing upward. Space ring end gaps 120 degrees apart.

PISTON PIN REPLACEMENT

1. Remove circlip from pin bore groove. Push pin from piston and connecting rod. Piston pins and pistons must be replaced as matched set.
2. All pistons and connecting rods must be in same weight class. **DO NOT** machine connecting rod.
3. Assemble connecting rod to piston with oil hole in rod's small end and arrow on piston head on same side. When installed, arrow on piston and rod's small end oil hole will face front of engine.

CRANKSHAFT & MAIN BEARINGS

NOTE: Crankshafts are specially treated and can only be ground by the factory.

1. Use Plastigage to measure main bearing clearances. Standard crankshafts are marked with Red or Blue

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dots on side of counterweights or on sprocket end of crankshaft. The crankshaft is cast with a "K" on center counterweight.

2. Factory ground crankshafts are identified by paint stripes marked on 1st counterweight. This indicates either 1st, 2nd or 3rd undersize (3 undersizes are available).
3. Factory ground crankshafts are supplied with bearings which are also color coded. If Red and Blue bearing shells are used in combination, ensure shells of same color are on same side of crankshaft. For example, all Red bearings in cylinder block and all Blue in main bearing caps.
4. If 3 different color (Yellow, Green and White) bearings are used, match bearing shells to color codes on bearing journals and crankcase. If crankcase mark is missing, install both shells according to crankshaft color code.

CONNECTING ROD BEARINGS

Use Plastigage to measure connecting rod bearing clearances. Measure clearances one at a time. Mark connecting rod and cap for cylinder identification before removing caps. Whenever rod bearing caps are removed, rod cap bolts and nuts should be replaced.

CRANKSHAFT END PLAY

Attach a dial indicator to crankcase with indicator point contacting flywheel. Push flywheel forward and zero dial indicator. Pull flywheel rearward and record crankshaft end play. If end thrust is excessive, replace thrust bearing.

FRONT CRANKSHAFT OIL SEAL R & I

Removal

1. Remove radiator if engine is still in vehicle. Remove cam timing belt. Pull toothed sprocket from crankshaft. Ensure woodruff key is not lost.
2. Unscrew gear wheel of intermediate shaft. Remove washer and intermediate gear wheel. Remove 3 front oil pan bolts. Loosen remaining oil pan gasket bolts. Carefully loosen oil pan gasket from cover.
3. Remove 10 front cover bolts. Carefully remove front cover. Remove oil seals from front cover.

Installation

Using Seal Installers (11 1 273) and (11 1 272), install new seals. Coat 3 oil pan gasket holes with sealer prior to installing front cover. To complete installation, reverse removal procedure.

REAR CRANKSHAFT OIL SEAL R & I

Removal

1. Remove transmission and flywheel. Remove 2 rear oil pan bolts. Loosen remaining oil pan bolts. Carefully separate seal retainer from oil pan gasket.

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2. Remove seal retainer from rear of crankcase. Remove oil seal from seal retainer.

Installation

1. Coat oil pan gasket at seal retainer contact surface with sealing compound. Install oil seal into retainer.
2. Install Aligning Tool (11 2 213) on crankshaft. Coat seal lips with oil and install retainer and seal. Install remaining components.

ENGINE OILING SYSTEM

DESCRIPTION

A rotor-type oil pump is used. Pump is chain driven off of crankshaft sprocket. Pressure regulating valve is integral with oil pump.

Oil pump pressure feeds oil to full-flow oil filter. From oil filter, oil is circulated through drilled passages to all moving parts of the engine. Upper valve train components and timing chain are lubricated through drainage or splash method.

CRANKCASE CAPACITY

Capacity is 5.3 qts. (5.0L) without filter replacement, and 6.1 qts. (5.8L) with filter replacement.

OIL PRESSURE

Oil pressure should be 7-28 psi (0.5-2.0 kg/cm²) at idle. Maximum oil pressure at peak RPM should be about 57-71 psi (4.0-5.0 kg/cm²).

PRESSURE RELIEF VALVE

For all models, oil pressure relief valve opens at approximately 68-74 psi (4.8-5.2 kg/cm²).

OIL PAN R & I

Disconnect negative battery cable. Remove starter and/or steering components as necessary. Disconnect engine mounts from engine. Raise engine as far as possible. Remove oil pan. To install, reverse removal procedure.

OIL PUMP R & I

Removal

Remove oil pan. Remove oil pump drive sprocket and detach from chain. Remove oil pump.

Disassembly