2003-06 ENGINE

Engine Block - MDX

SPECIAL TOOLS

Ref. No.	Tool Number	Description	Qty
①	070AD-RCAA100	Oil Seal Driver, 64 mm	1
②	070AD-RCAA200	Driver Attachment, 106 mm	1
③	07749-0010000	Driver	1

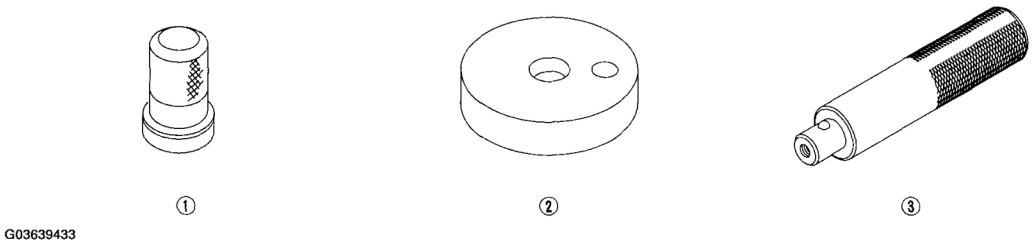

Fig. 1: Identifying Special Tool
Courtesy of AMERICAN HONDA MOTOR CO., INC.

COMPONENT LOCATION INDEX

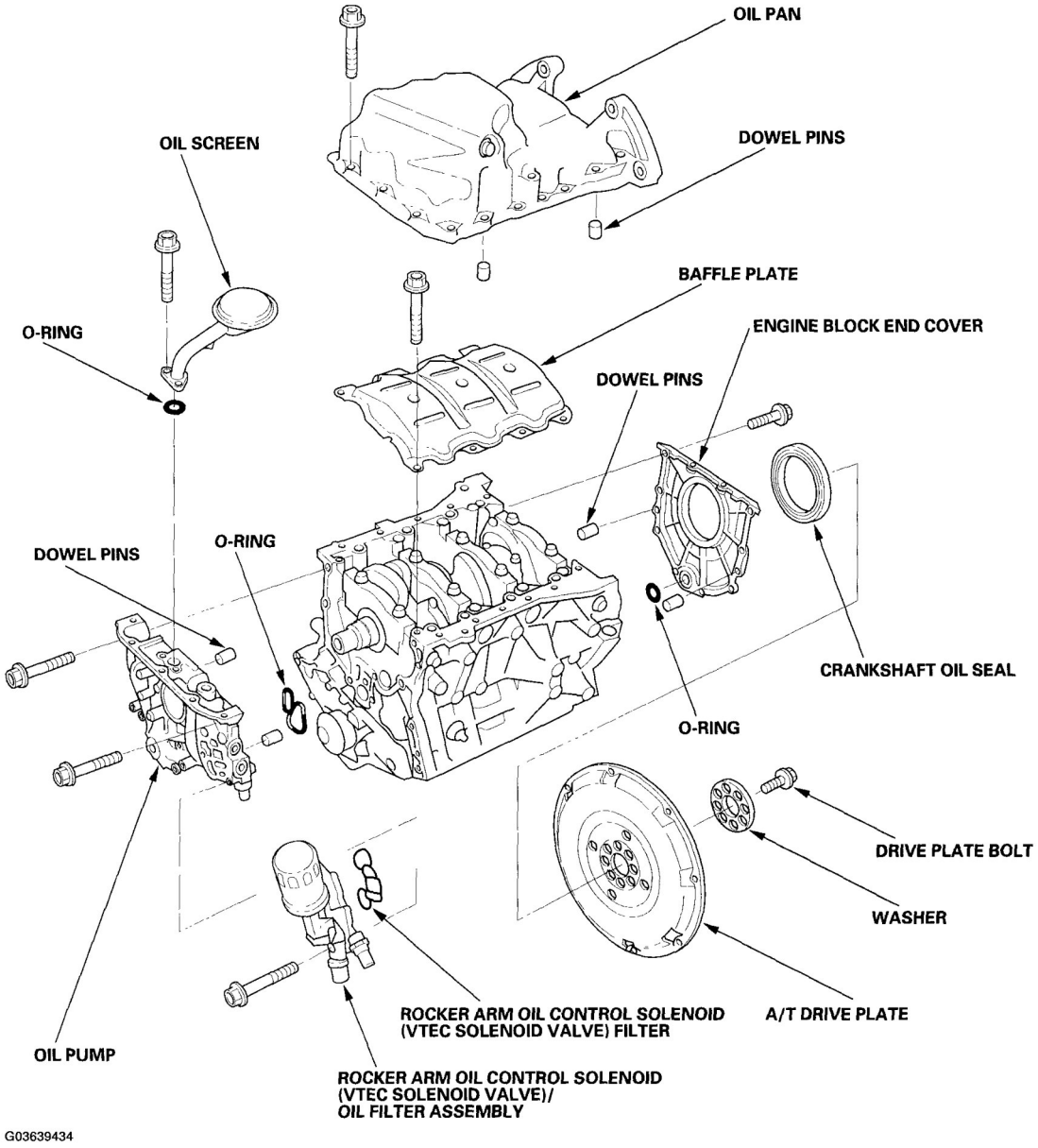

Fig. 2: Identifying Engine Block Components Location (1 Of 3)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

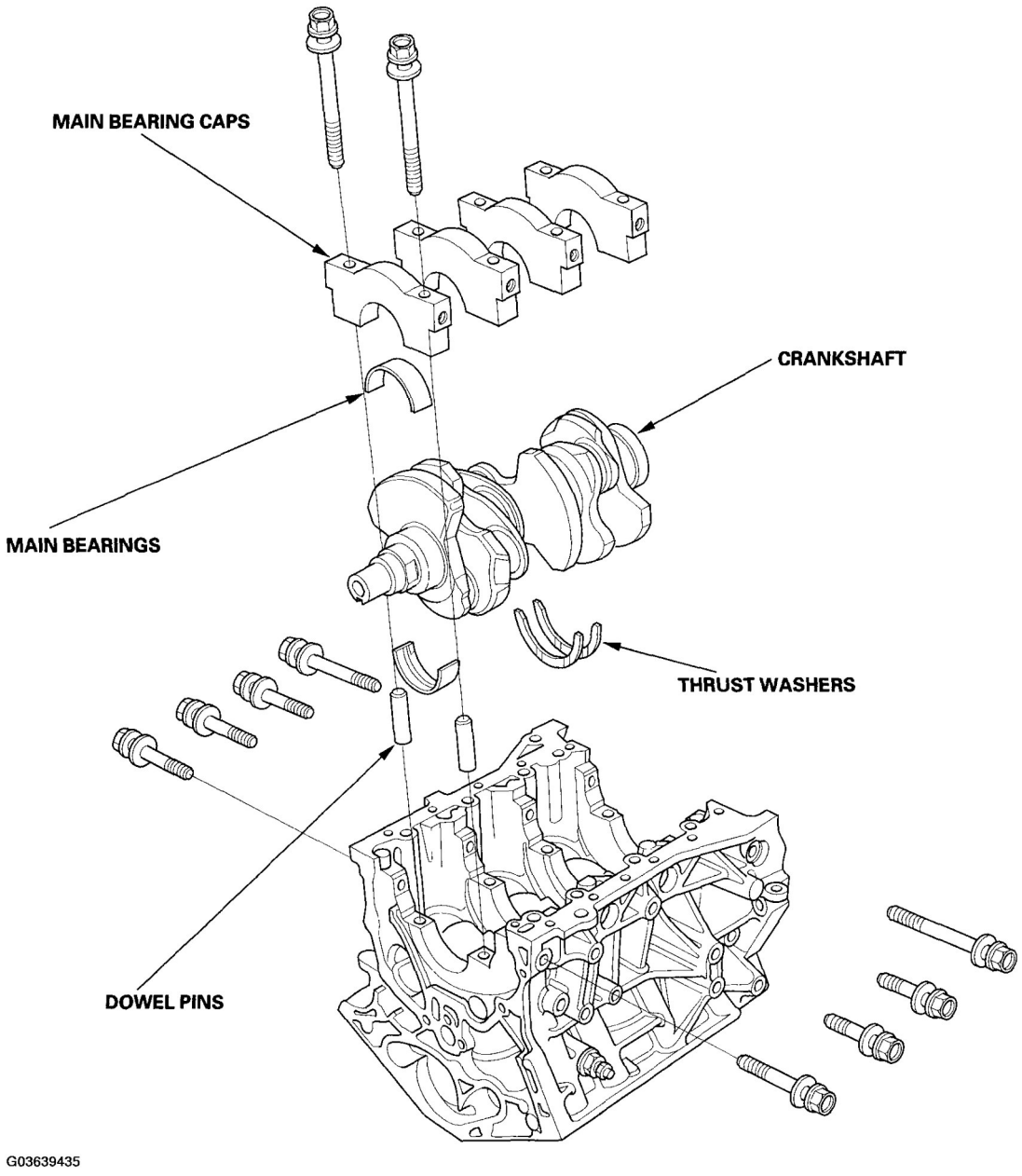

Fig. 3: Identifying Engine Block Components Location (2 Of 3)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

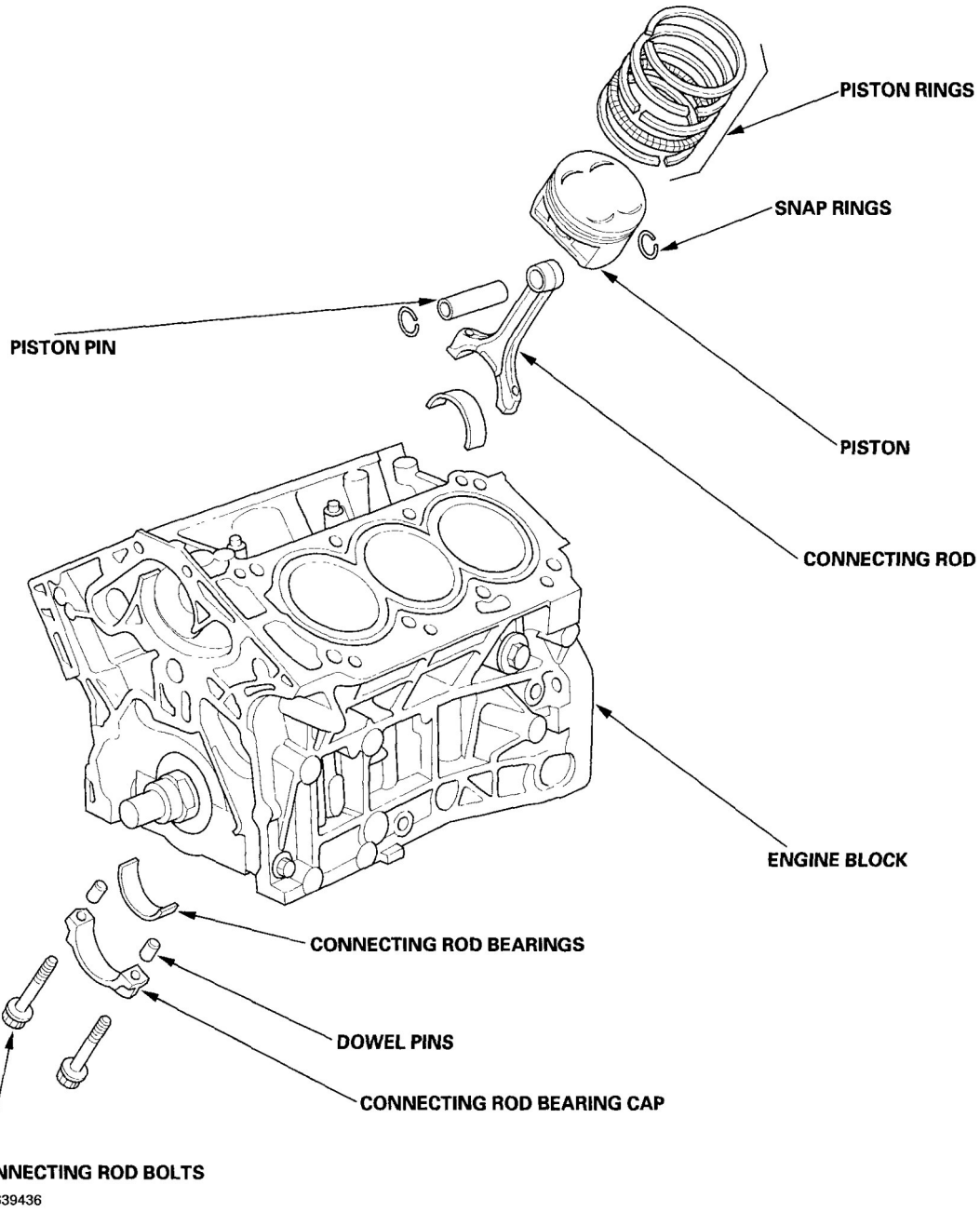

Fig. 4: Identifying Engine Block Components Location (3 Of 3)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CONNECTING ROD AND CRANKSHAFT END PLAY INSPECTION

1. Remove the oil pump (see **REMOVAL**).
2. Remove the baffle plate (see step 10 in **CRANKSHAFT AND PISTON REMOVAL** .).
3. Measure the connecting rod end play with a feeler gauge (A) between the connecting rod (B) and

crankshaft (C).

Connecting Rod End Play

Standard (New): 0.15-0.35 mm (0.006-0.014 in.)
Service Limit: 0.45 mm (0.018 in.)

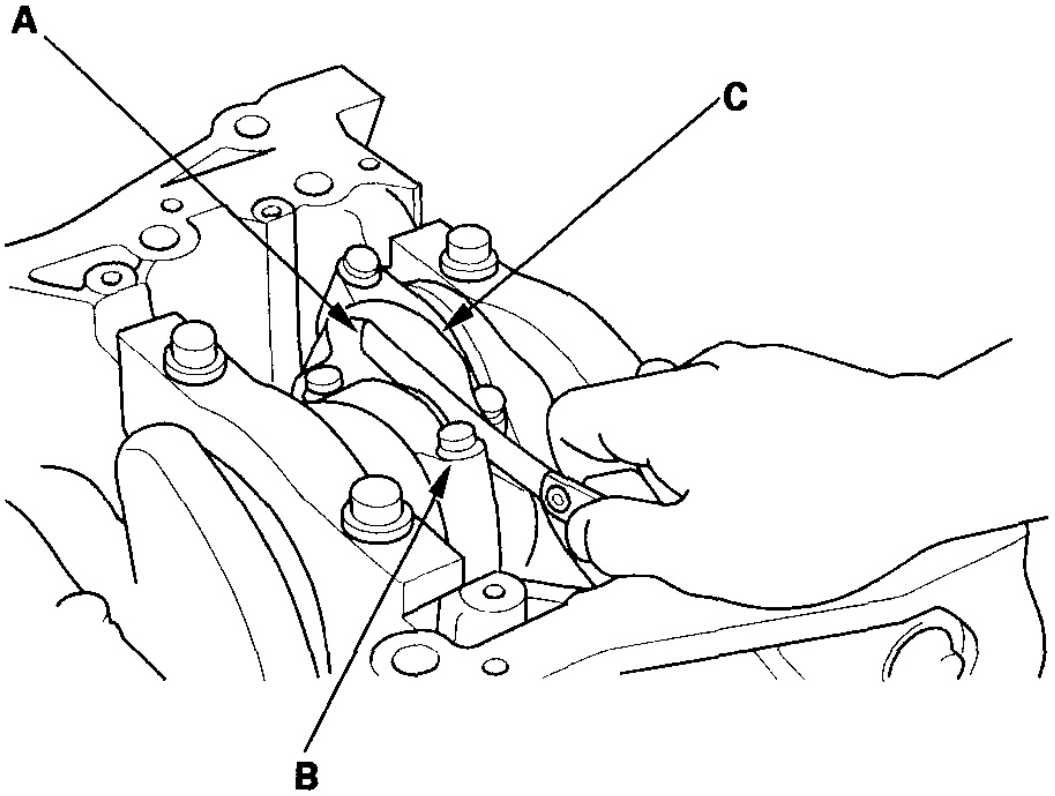

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Fig. 5: Measuring Connecting Rod End Play With Feeler Gauge Between Connecting Rod And Crankshaft
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. If the connecting rod end play is out-of-tolerance, install a new connecting rod and recheck. If it is still out-of-tolerance, replace the crankshaft (see **CRANKSHAFT AND PISTON REMOVAL**).
5. Push the crankshaft firmly away from the dial indicator, and zero the dial against the end of the crankshaft. Then pull the crankshaft firmly back toward the indicator; the dial reading should not exceed the service limit.

Crankshaft End Play

Standard (New): 0.10-0.35 mm (0.004-0.014 in.)

Service Limit: 0.45 mm (0.018 in.)

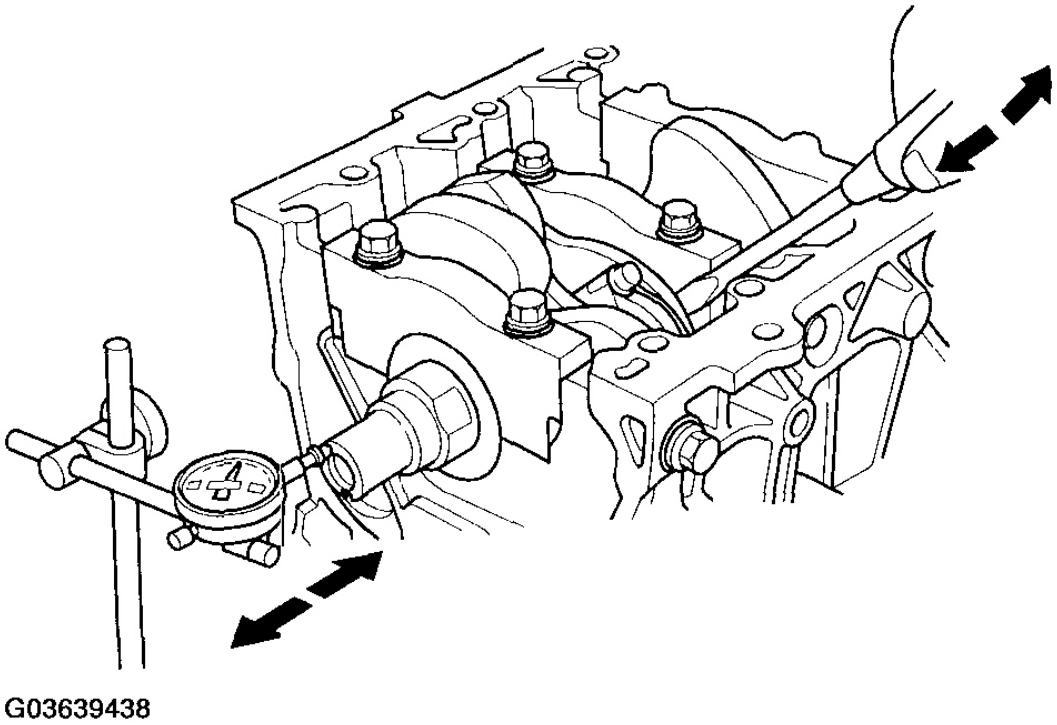

Fig. 6: Pushing Crankshaft Away From Dial Indicator
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. If the end play is excessive, replace the thrust washers and recheck. If it is still out-of-tolerance, replace the crankshaft (see **CRANKSHAFT AND PISTON REMOVAL**).

CRANKSHAFT MAIN BEARING REPLACEMENT

MAIN BEARING CLEARANCE INSPECTION

1. Remove the main bearing caps and bearing halves (see **CRANKSHAFT AND PISTON REMOVAL**).
2. Clean each main journal and bearing half with a clean shop towel.
3. Place one strip of plastigage across each main journal.

NOTE: If the engine is still in the vehicle when you bolt the main cap down to check the clearance, the weight of the crankshaft and drive plate will flatten the plastigage further than just the torque on the cap bolt and give you an incorrect reading. For an accurate reading, support the crank with

a jack under the counterweights, and check only one bearing at a time.

4. Reinstall the bearings and caps, then torque the bearing cap bolts to 74 N.m (7.5 kgf.m, 54 lbf.ft), and the bearing cap side bolts to 49 N.m (5.0 kgf.m, 36 lbf.ft).

NOTE: Do not rotate the crankshaft during inspection.

5. Remove the cap and bearing half, and measure the widest part of the plastigage.

Main Bearing-to-Journal Oil Clearance

Standard (New): 0.020-0.044 mm (0.0008-0.0017 in.)
Service Limit: 0.050 mm (0.0020 in.)

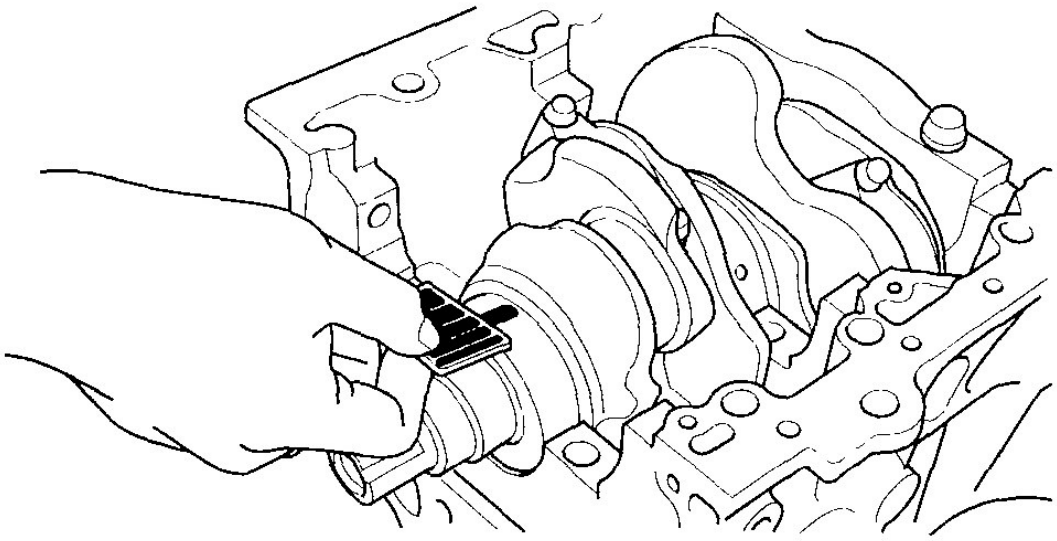

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Fig. 7: Measuring Widest Part Of Plastigage
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. If the plastigage measures too wide or too narrow, remove the crankshaft, and remove the upper half of the bearing. Install a new, complete bearing with the same color code, and recheck the clearance. Do not file, shim, or scrape the bearings or the caps to adjust clearance.
7. If the plastigage shows the clearance is still incorrect, try the next larger or smaller bearing (the color listed above or below that one), and check again. If the proper clearance cannot be obtained by using the appropriate larger or smaller bearings, replace the crankshaft and start over.

MAIN BEARING SELECTION

Crankshaft Bore Code Location

Letters or bars have been stamped on the end of the block as a code for the size of each of the four main journal bores.

Use them, and the numbers stamped on the crankshaft (codes for main journal size), to choose the correct bearings. If the codes are indecipherable because of an accumulation of dirt and dust, do not scrub them with a wire brush or scraper. Clean them only with solvent or detergent.

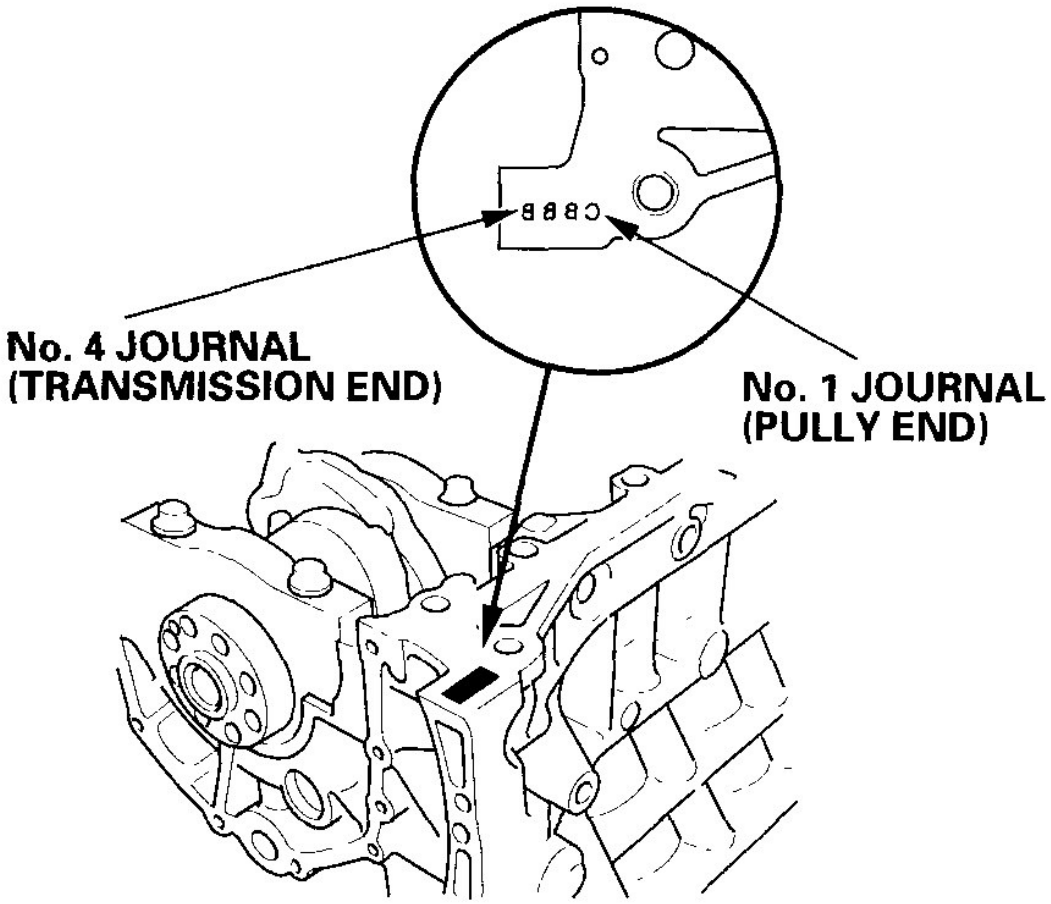

Fig. 8: Locating And Identifying Crankshaft Bore Code (1 Of 2)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

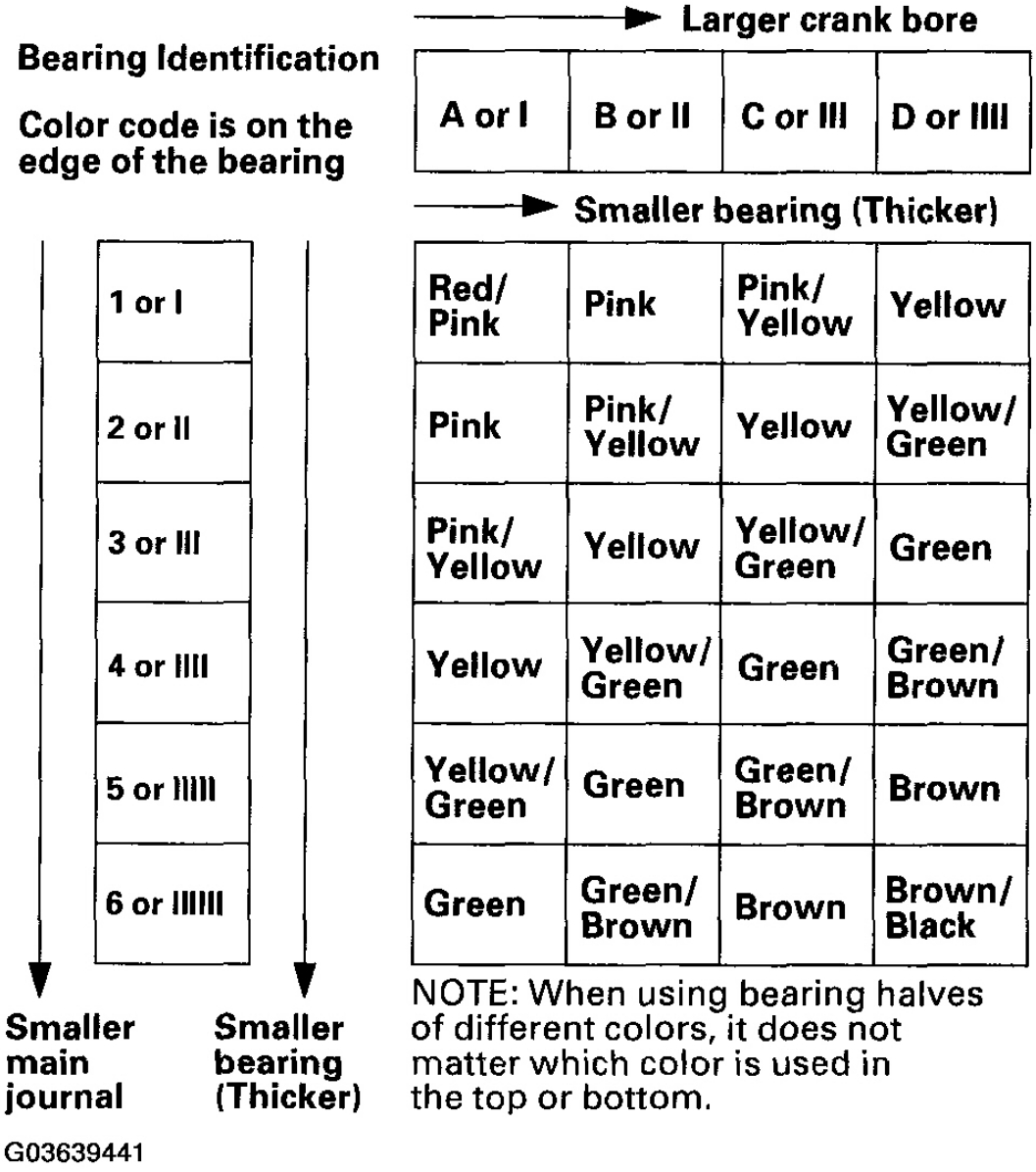

Fig. 9: Locating And Identifying Crankshaft Bore Code (2 Of 2)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Main Journal Code Locations (Numbers or Bars)

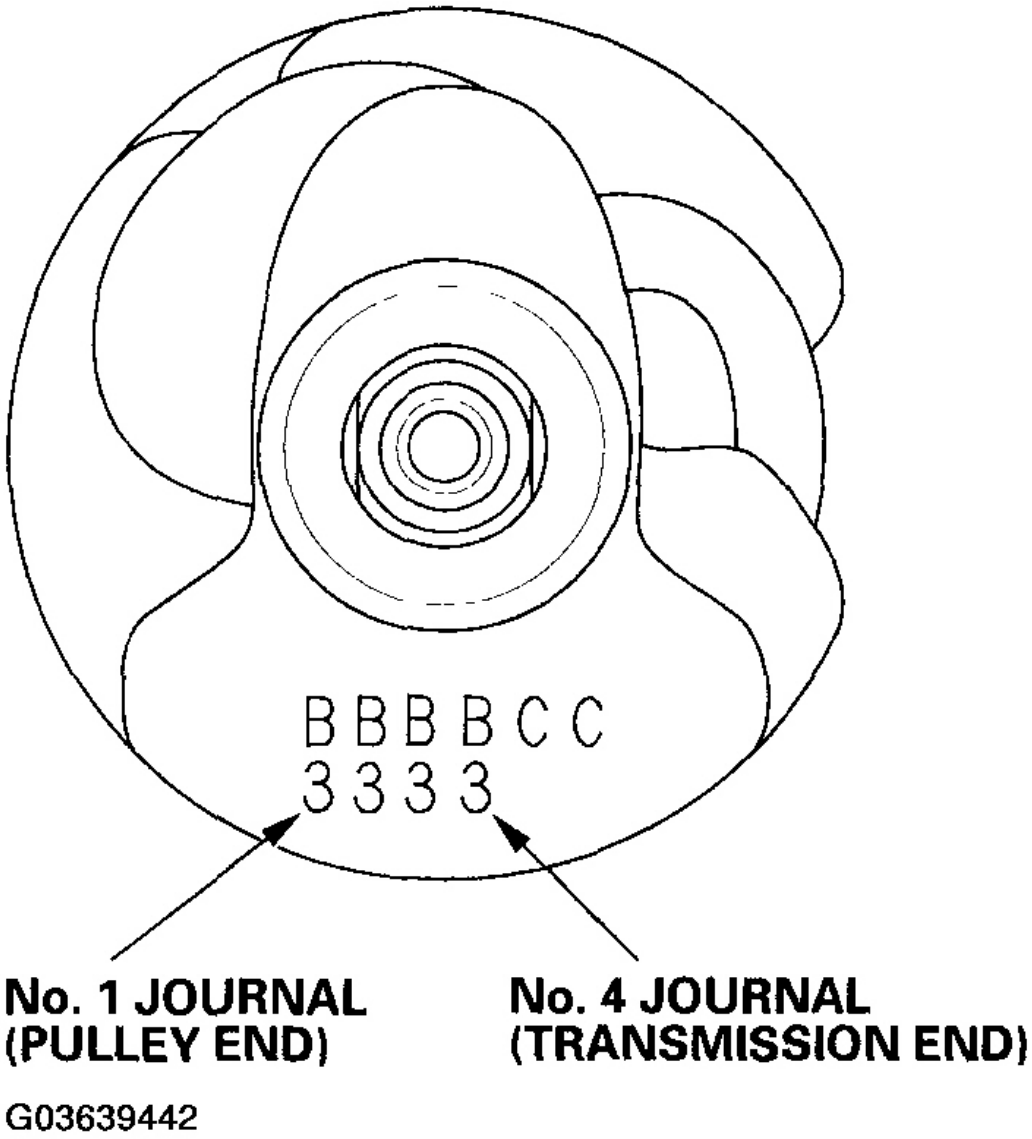

Fig. 10: Locating Main Journal Code (Numbers Or Bars)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CONNECTING ROD BEARING REPLACEMENT

ROD BEARING CLEARANCE INSPECTION

1. Remove the connecting rod cap and bearing half (see **CRANKSHAFT AND PISTON REMOVAL**).
2. Clean the crankshaft rod journal and bearing half with a clean shop towel.

3. Place a strip of plastigage across the rod journal.
4. Reinstall the bearing half and cap, and torque the bolts.

NOTE:

- **Apply new engine oil to the bolt threads and flanges.**
- **Do not rotate the crankshaft during inspection.**

Tightening Torque: 20 N.m (2.0 kgf.m, 14 lbf.ft) + 90°

5. Remove the rod cap and bearing half and measure the widest part of the plastigage.

   Connecting Rod Bearing-to-Journal Oil Clearance Standard (New): 0.020-0.044 mm (0.0008-0.0017 in.)

   Service Limit: 0.050 mm (0.0020 in.)

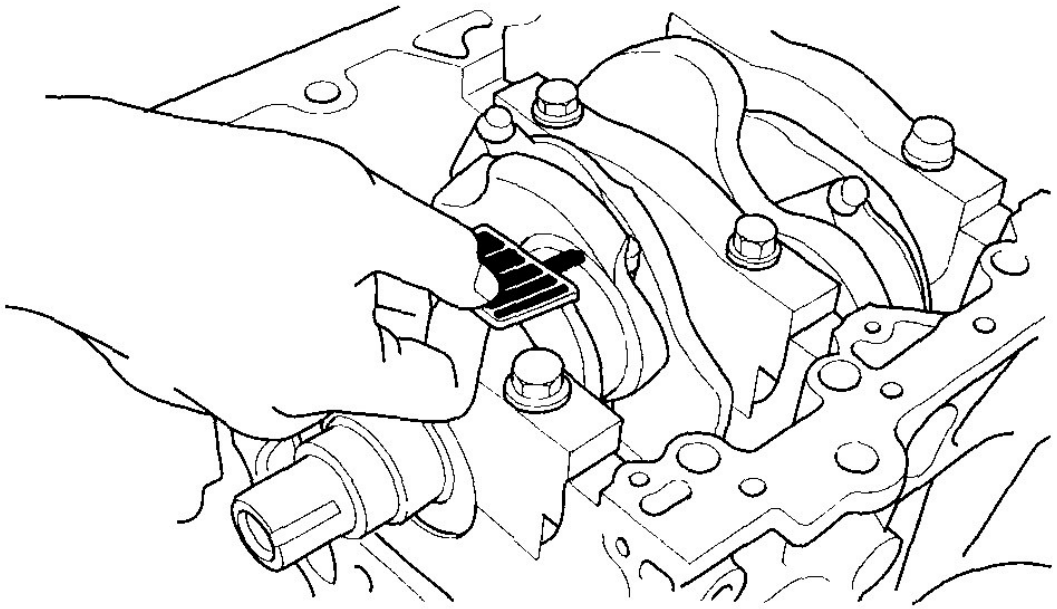

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Fig. 11: Measuring Widest Part Of Plastigage
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. If the plastigage measures too wide or too narrow, remove the upper half of the bearing, then install a new, complete bearing with the same color code, and recheck the clearance. Do not file, shim, or scrape the bearings or the caps to adjust clearance.
7. If the plastigage shows the clearance is still incorrect, try the next larger or smaller bearing (the color listed above or below that one), and check clearance again. If the proper clearance cannot be obtained by using the appropriate larger or smaller bearings, replace the crankshaft and start over.

ROD BEARING SELECTION

Each rod falls into one of four tolerance ranges (from 0 to 0.024 mm (0.0009 in.), in 0.006 mm (0.0002 in.) increments) depending on the size of its big end bore. It's then stamped with a number or bar (1, 2, 3, or 4/I, II, III, or IIII) indicating the range. You may find any combination of 1, 2, 3, or 4/I, II, III, or IIII in any engine.

Normal Bore Size: 58.0 mm (2.28 in.)

Inspect the connecting rod for cracks and heat damage.

Connecting Rod Journal Code Locations

Numbers or bars have been stamped on the side of each connecting rod as a code for the size of the big end. Use them, and the letters or bars stamped on the crank (codes for rod journal size), to choose the correct bearings. If the codes are indecipherable because of an accumulation of dirt and dust, do not scrub them with a wire brush or scraper. Clean them only with solvent or detergent.

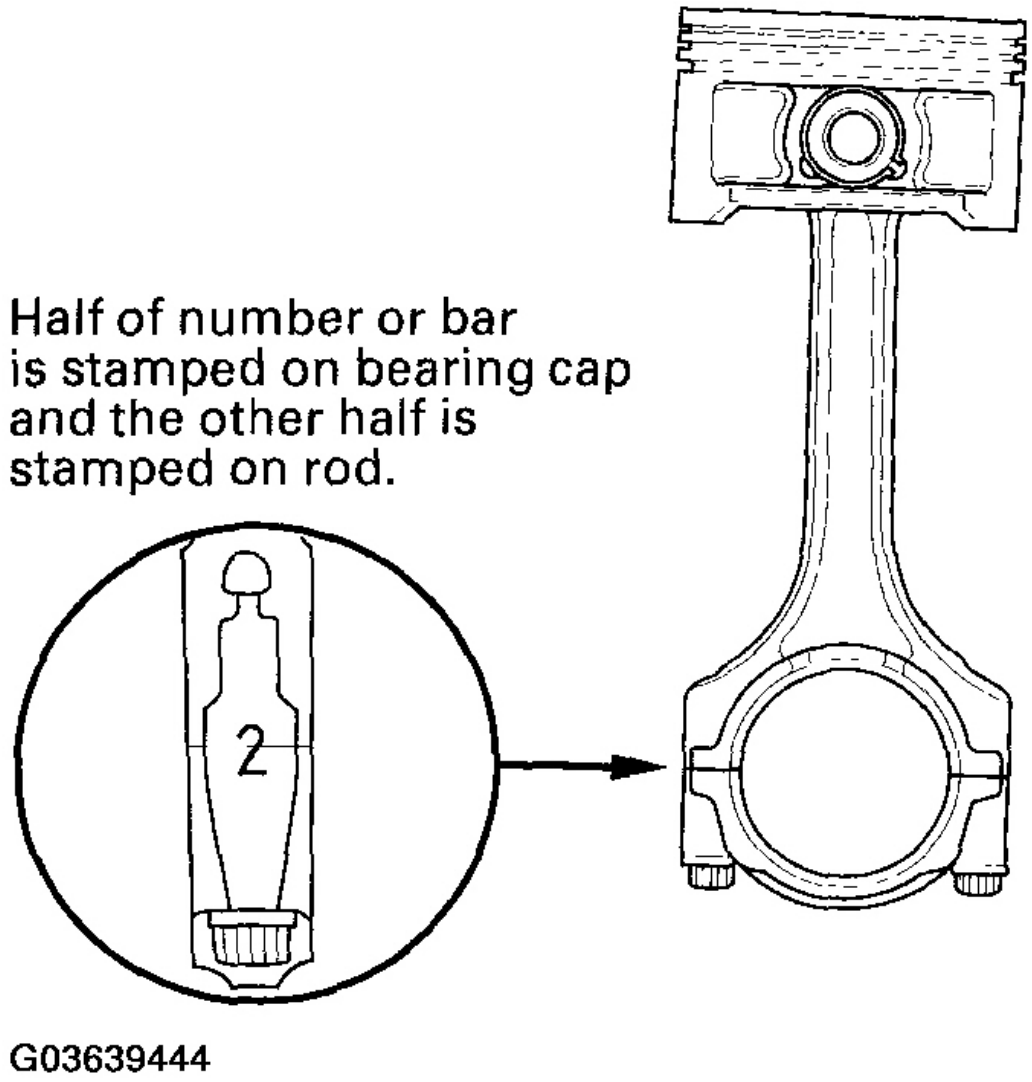

Fig. 12: Identifying And Locating Connecting Rod Journal Code (1 Of 2)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

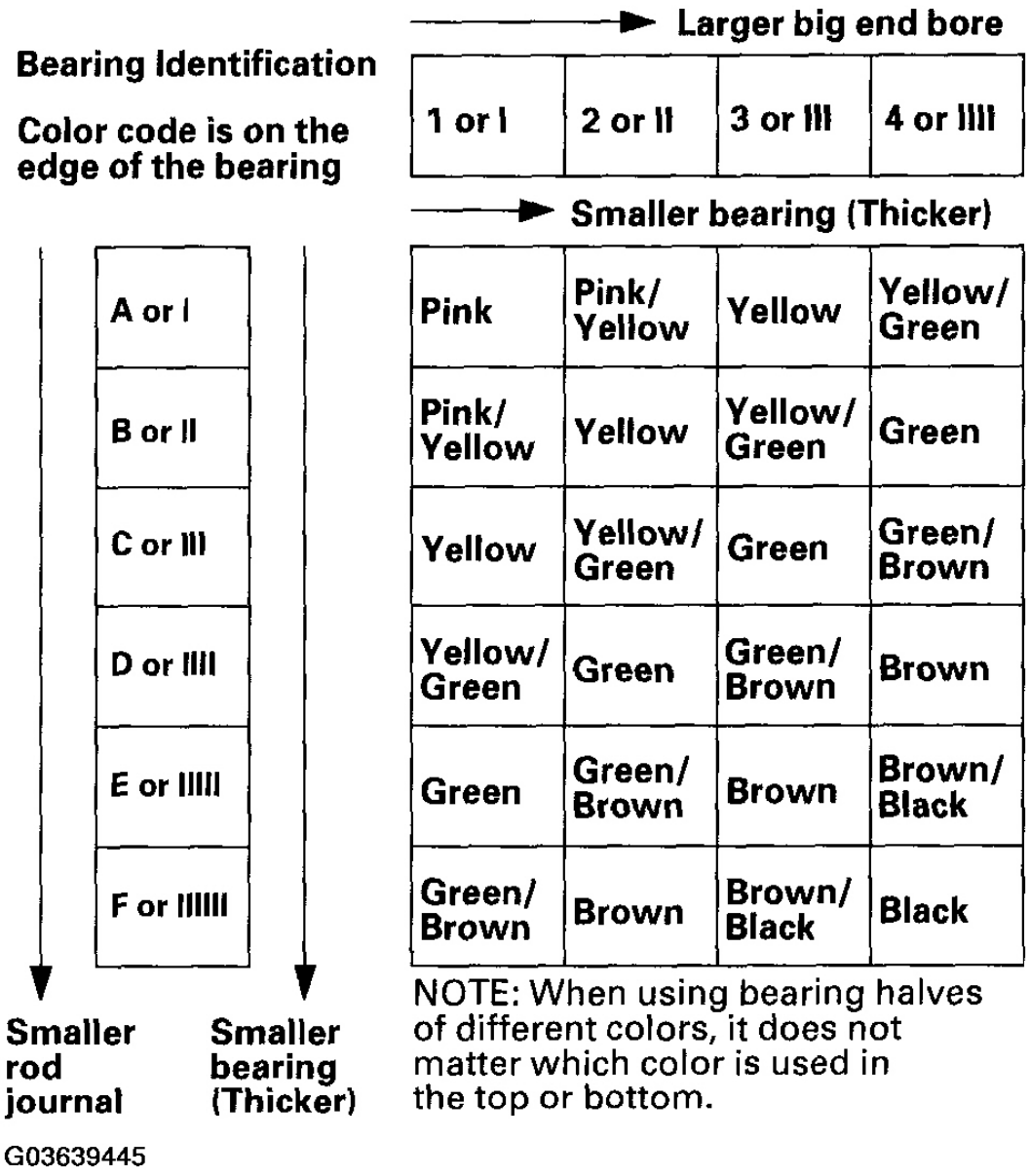

Fig. 13: Identifying And Locating Connecting Rod Journal Code (2 Of 2)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Connecting Rod Journal Code Locations (Letters or Bars)

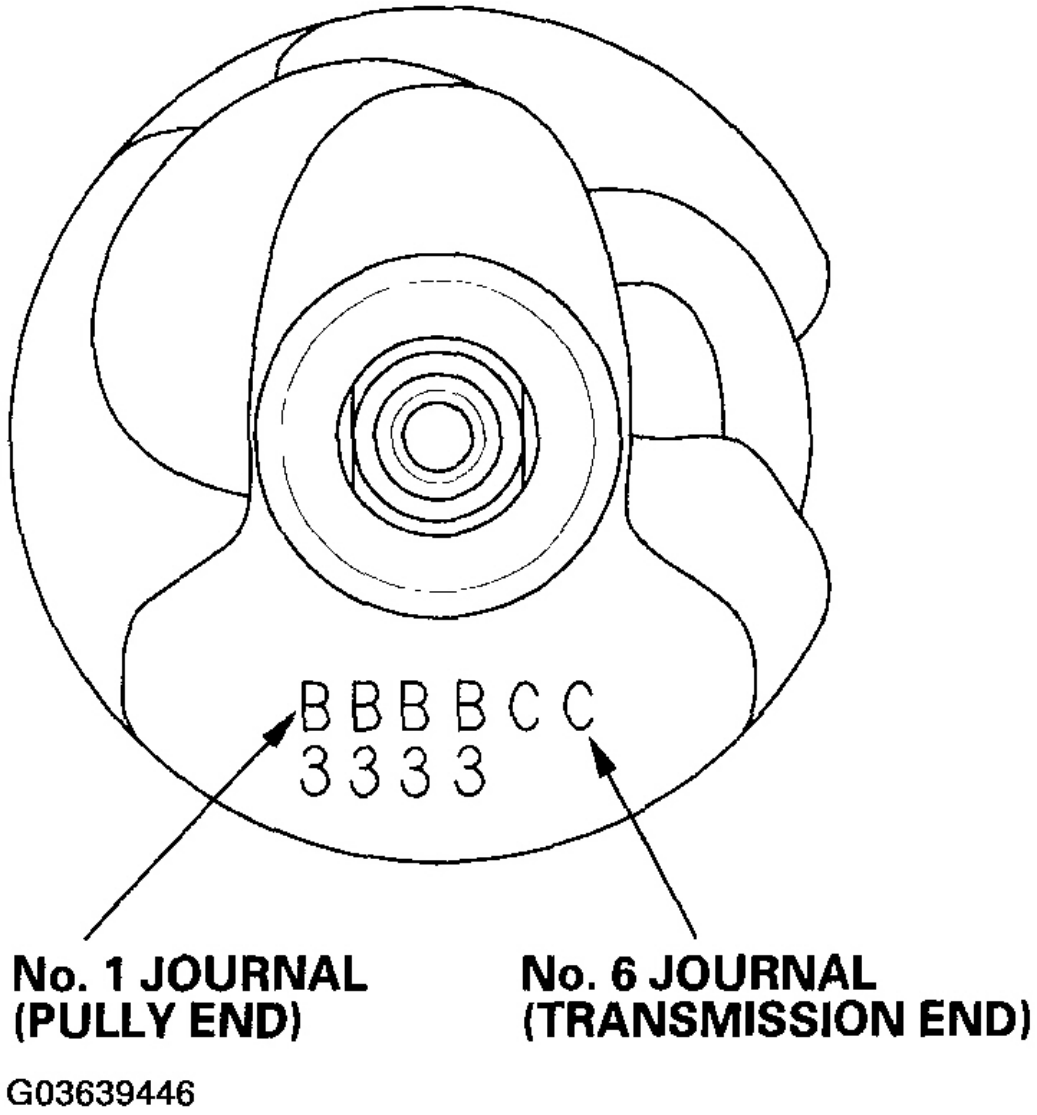

Fig. 14: Locating Connecting Rod Journal Code (Letters Or Bars)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

OIL PAN REMOVAL

1. If the engine is already out of the vehicle, go to step 6 .
2. Raise the vehicle on the hoist to full height.
3. Drain the engine oil (see **ENGINE OIL REPLACEMENT**).
4. Remove the splash shield (see step 25 in **ENGINE REMOVAL**).

5. Remove exhaust pipe A (see step 30 in **ENGINE REMOVAL**).
6. Remove the rear warm up three way catalytic converter (rear WU-TWC) bracket.

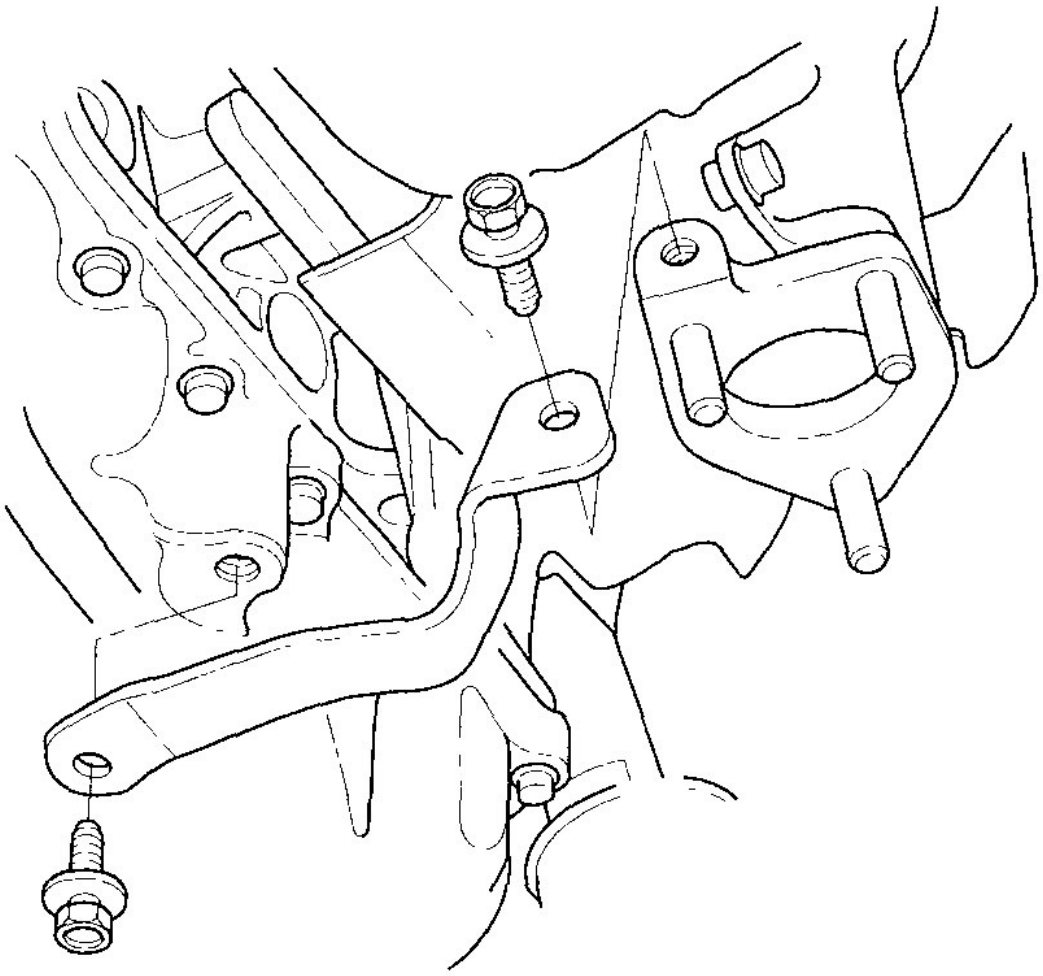

Fig. 15: Removing Rear WU-TWC Bracket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Remove the torque converter cover (A) and the four bolts (B) securing the transmission.

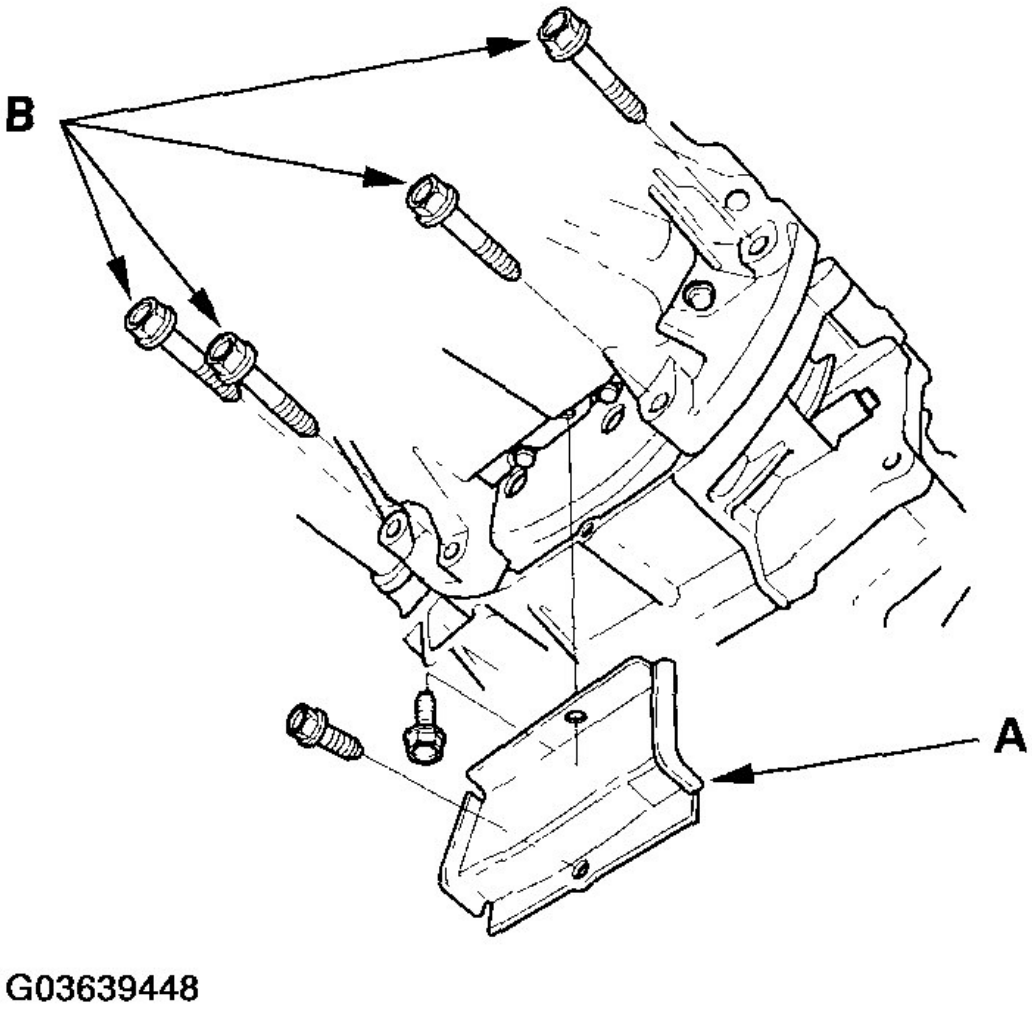

Fig. 16: Removing Torque Converter Cover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Remove the bolts securing the oil pan.
9. Using a flat blade screwdriver, separate the oil pan from the block in the places shown in **Fig. 17** .

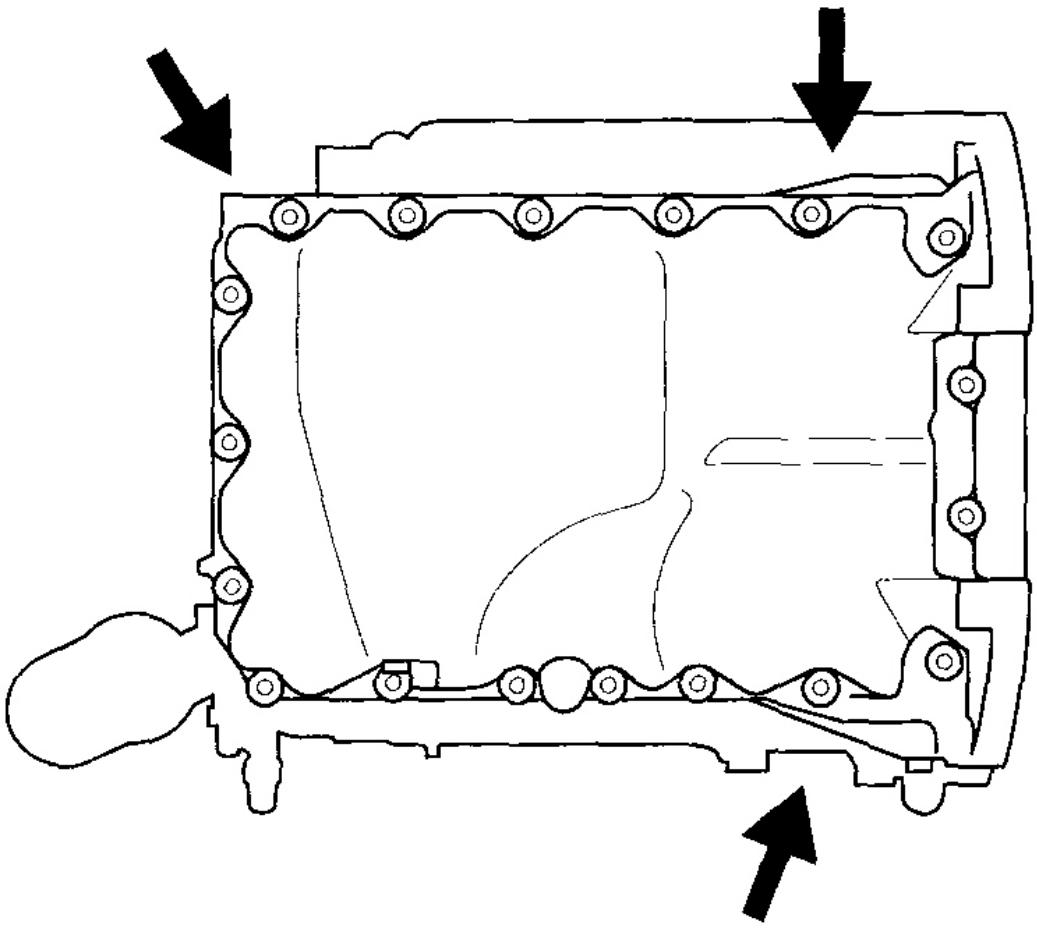

Fig. 17: Separating Oil Pan From Block
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Remove the oil pan.

CRANKSHAFT AND PISTON REMOVAL

1. Remove the engine assembly (see **ENGINE ASSEMBLY**).
2. Remove the transmission (see **TRANSMISSION REMOVAL**).
3. Remove the drive plate (see **DRIVE PLATE REMOVAL AND INSTALLATION**).
4. Remove the cylinder heads (see **CYLINDER HEAD REMOVAL**).
5. Remove the crankshaft position (CKP) sensor (see **CKP SENSOR REPLACEMENT**).
6. Remove the timing belt drive pulley from the crankshaft.

7. Remove the oil pan (see **OIL PAN REMOVAL**).
8. Remove the engine block end cover.

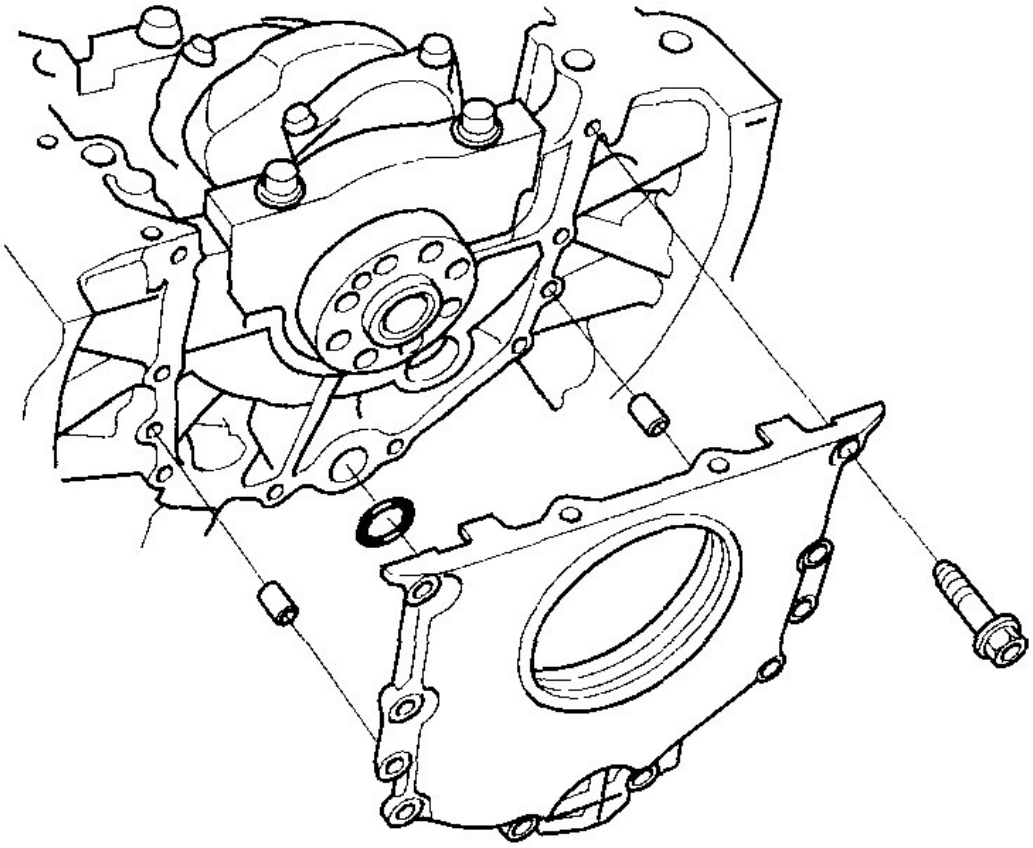

Fig. 18: Removing Engine Block End Cover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Remove the rocker arm oil control solenoid (VTEC solenoid valve)/oil filter assembly.

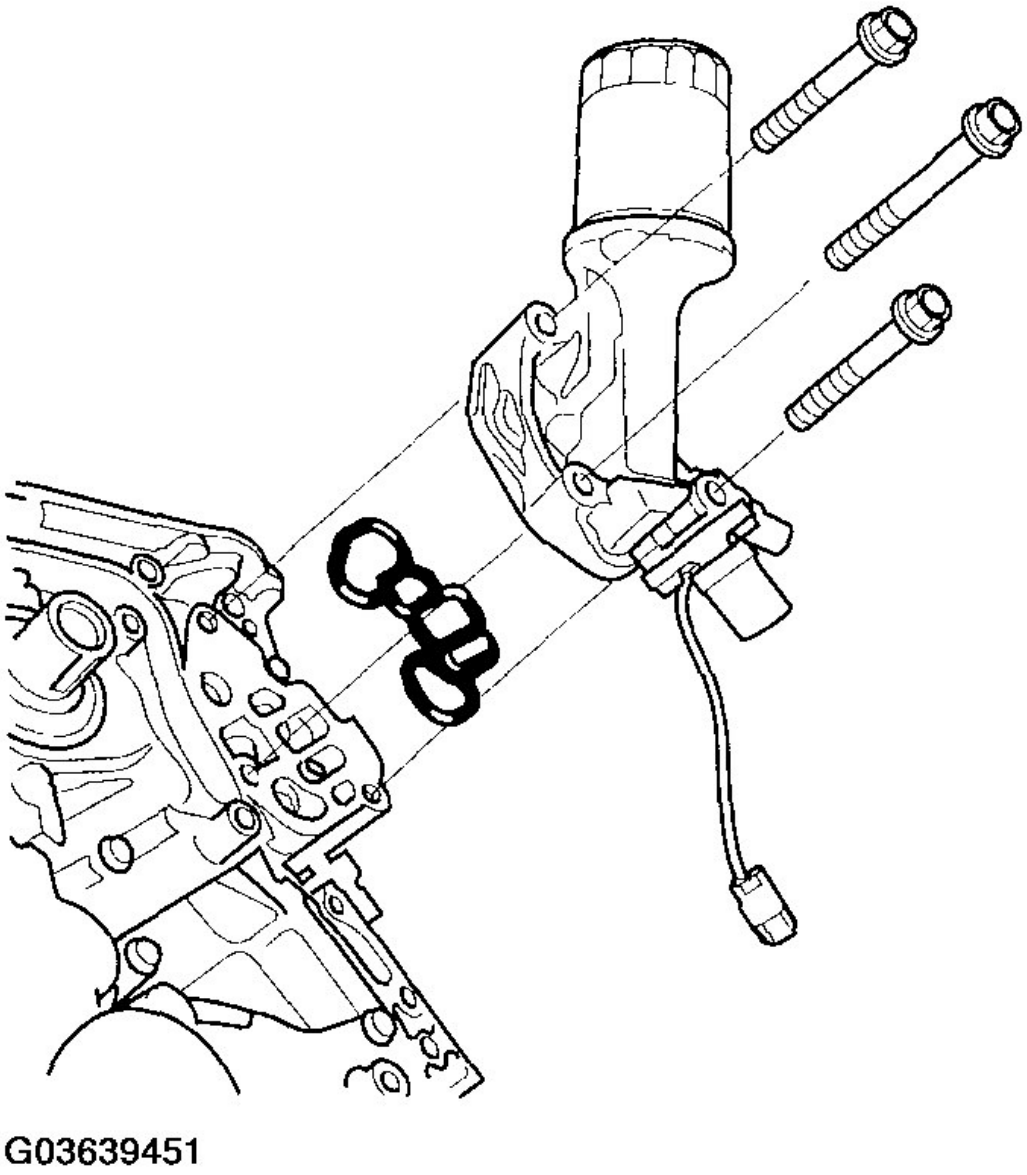

Fig. 19: Removing Rocker Arm Oil Control Solenoid (VTEC Solenoid Valve)/Oil Filter Assembly
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Remove the oil screen (A), baffle plate (B), and oil pump (C).

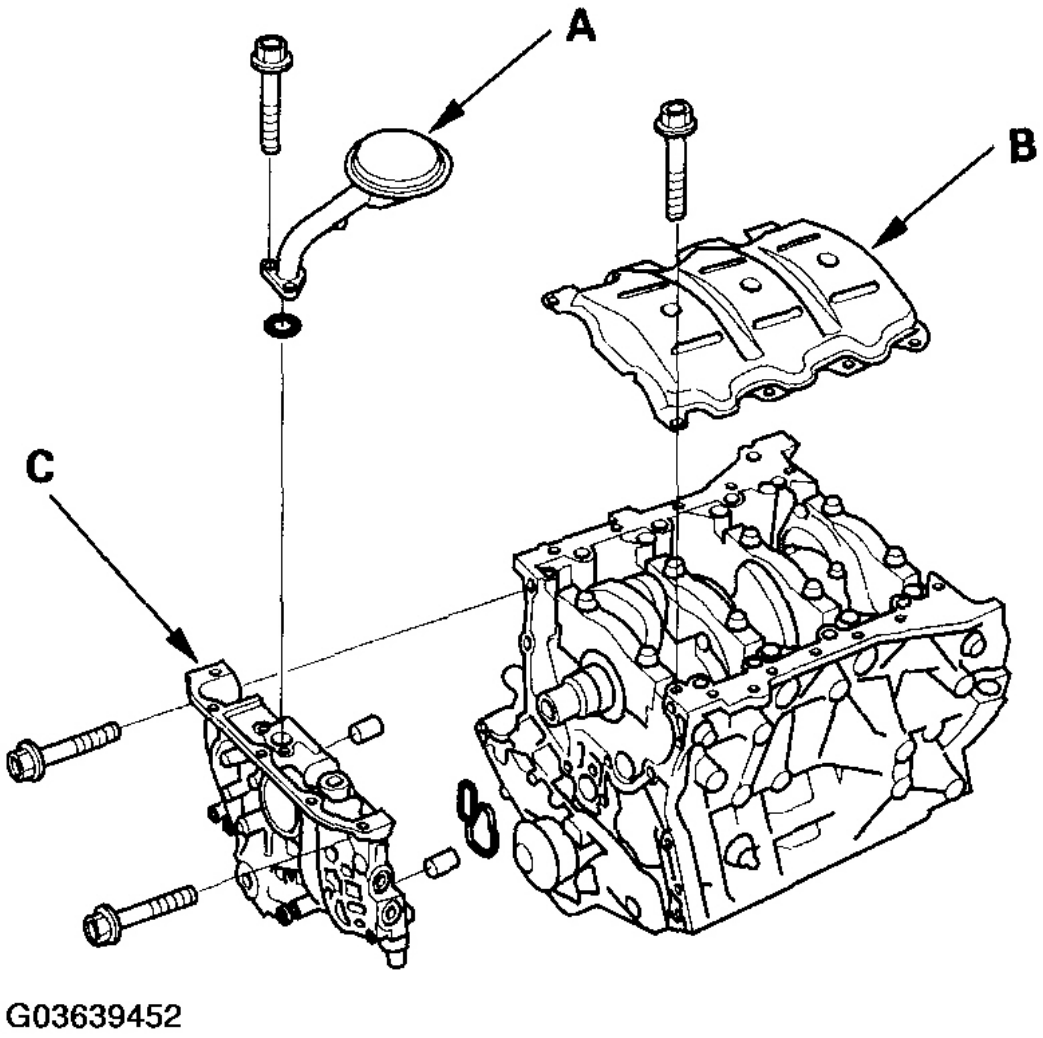

Fig. 20: Removing Oil Screen, Baffle Plate And Oil Pump
Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. If you can feel a ridge of metal or hard carbon around the top of any cylinder, remove it with a ridge reamer (A). Follow the reamer manufacturer's instructions. If the ridge is not removed, it may damage the piston as it's pushed out.

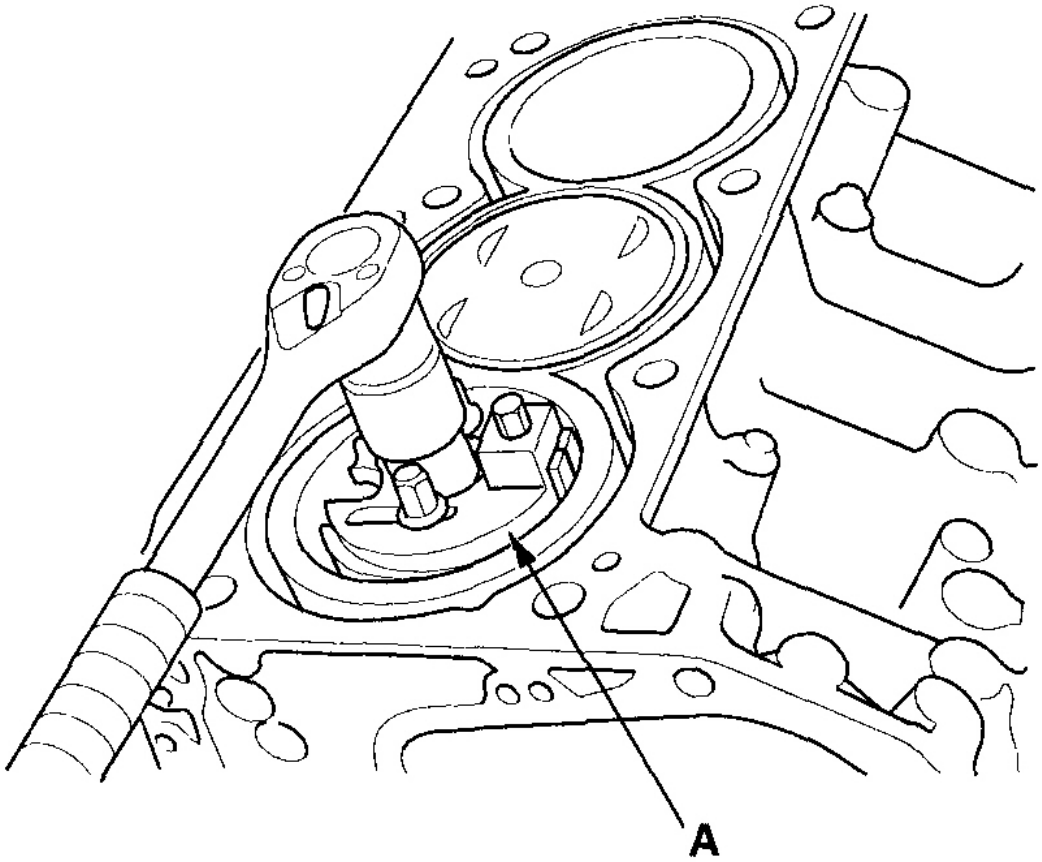

Fig. 21: Removing Metal Or Carbon Around Cylinder With Ridge Reamer
Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Remove the connecting rod caps after setting the crank pin at bottom dead center (BDC) for each cylinder. Remove the piston/connecting rod assembly by pushing on the connecting rod. Take care not to damage the crank pin or cylinder with the connecting rod.

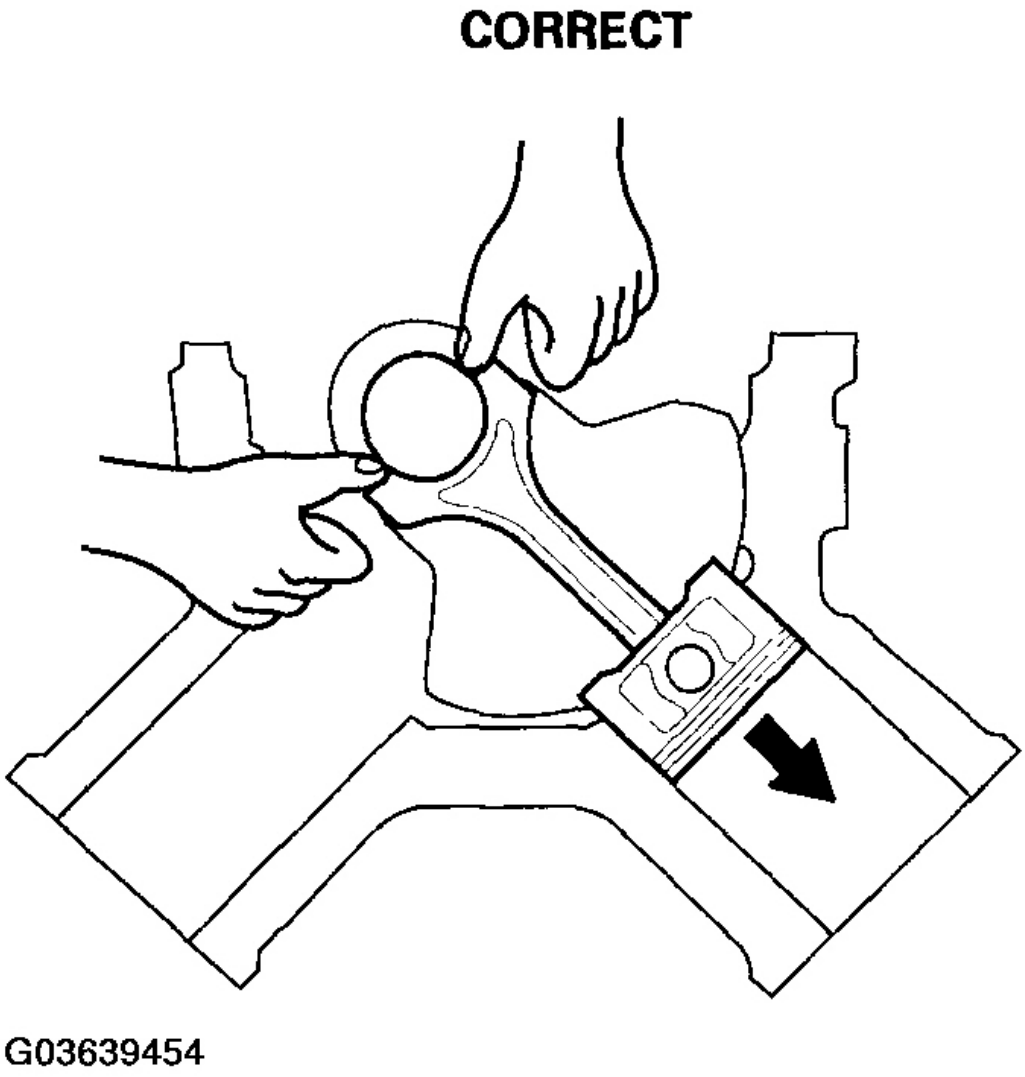

Fig. 22: Removing Piston/Connecting Rod Assembly By Pushing - Correct Method
Courtesy of AMERICAN HONDA MOTOR CO., INC.

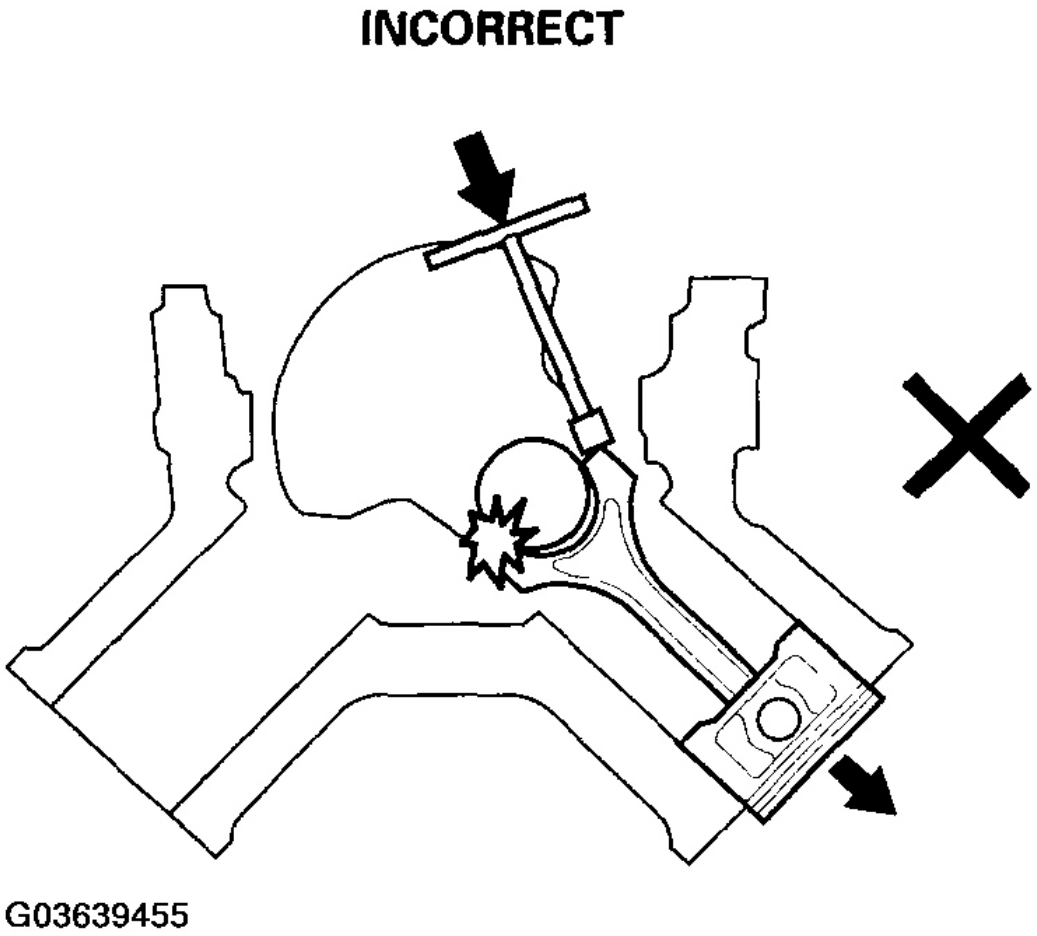

Fig. 23: Removing Piston/Connecting Rod Assembly By Pushing - Incorrect Method
Courtesy of AMERICAN HONDA MOTOR CO., INC.

13. Remove the bearing from the cap. Keep all caps/ bearings in order.
14. Remove the upper bearing halves from the connecting rods, and set them aside with their respective caps.
15. After removing a piston/connecting rod assembly, reinstall the cap on the rod.
16. To avoid mix-up during reassembly, mark each piston/connecting rod assembly with its cylinder number.
17. Unscrew the bearing cap bolts and bearing cap side bolts in sequence 1/3 turn at a time; repeat the sequence until all bolts are loosened.

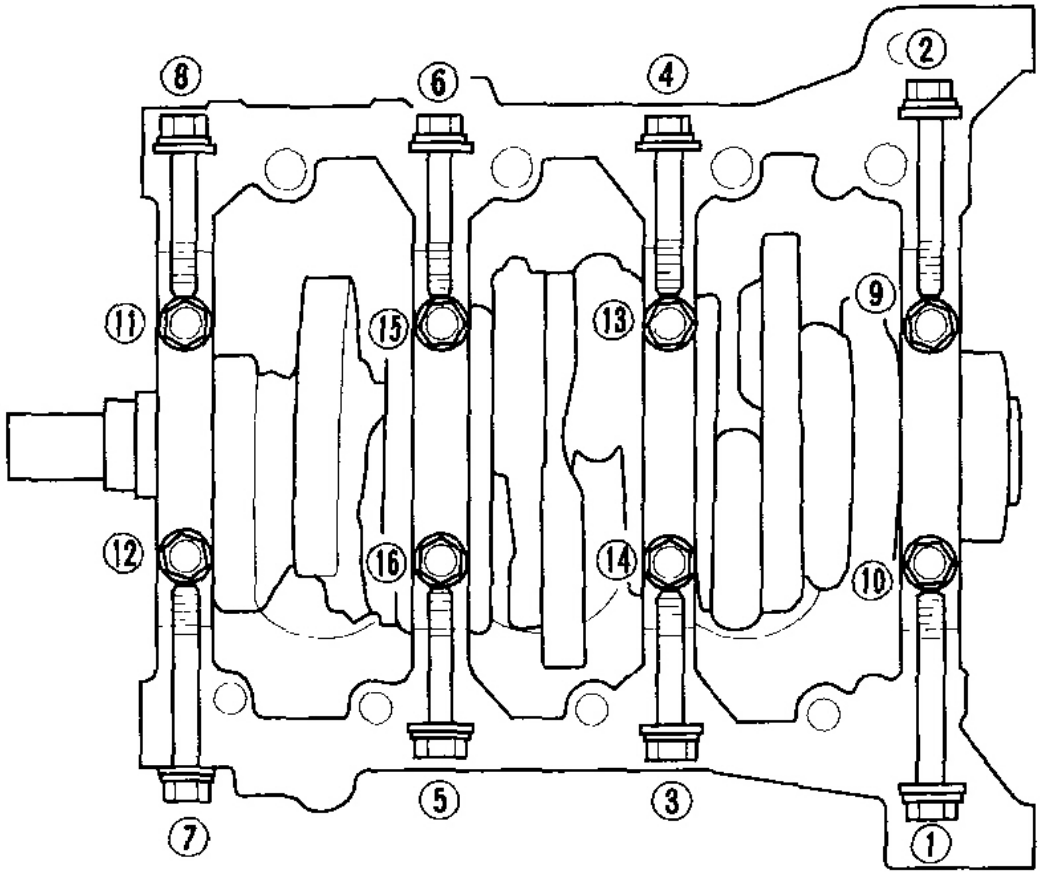

Fig. 24: Unscrewing Bearing Cap And Side Bolts In Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

18. Remove the bearing cap bolts (A) and bearing cap side bolts (B), then remove the bearing caps (C).

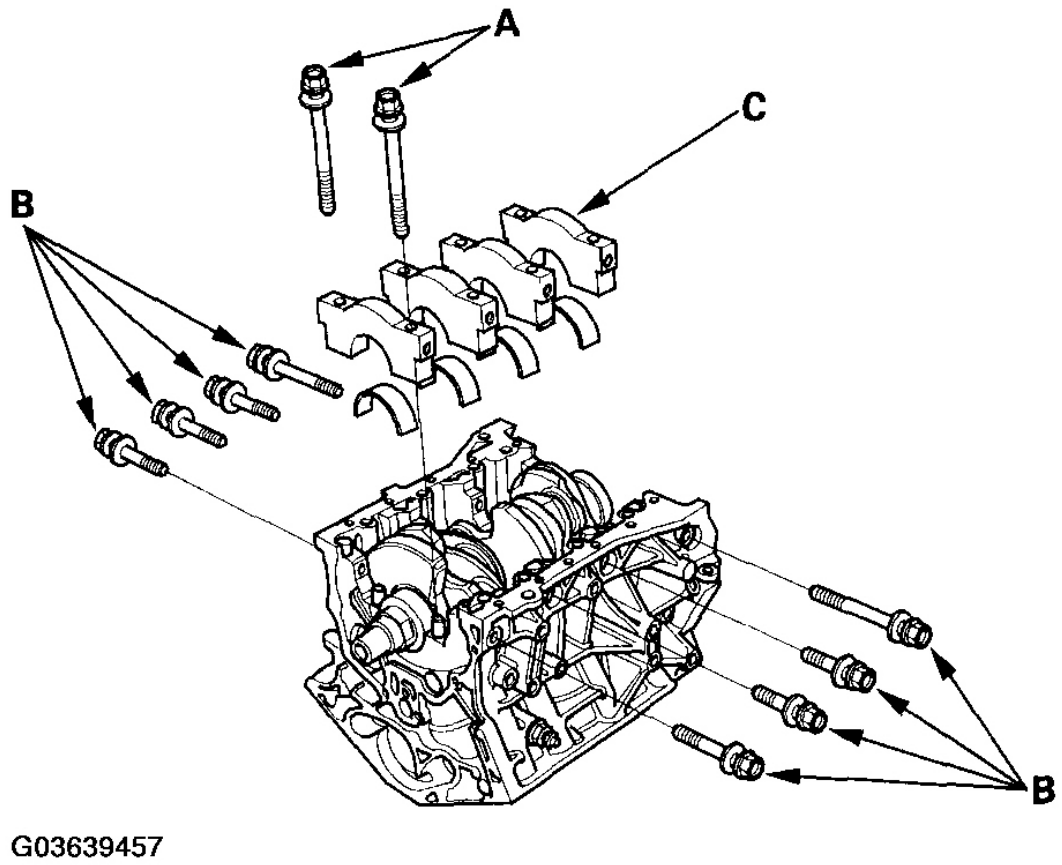

Fig. 25: Removing Bearing Cap And Bearing Cap Side Bolts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

19. Lift the crankshaft (A) out of the engine block, being careful not to damage the journals.

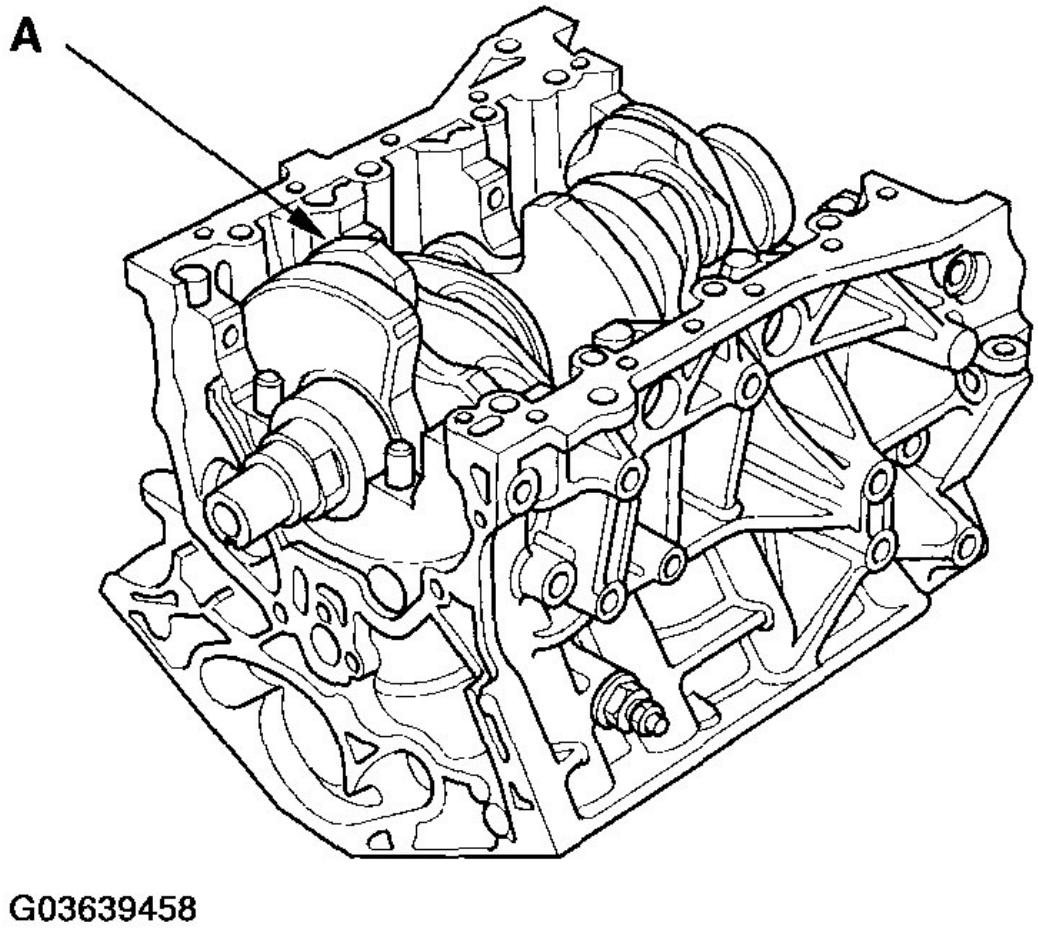

Fig. 26: Lifting Crankshaft Out Of Engine Block
Courtesy of AMERICAN HONDA MOTOR CO., INC.

20. Reinstall the main caps and bearings on the engine block in the proper order.

CRANKSHAFT INSPECTION

OUT-OF-ROUND AND TAPER

1. Remove the crankshaft from the engine block (see **CRANKSHAFT AND PISTON REMOVAL**).
2. Clean the crankshaft oil passages with pipe cleaners or a suitable brush.
3. Check the keyway and threads.
4. Measure out-of-round at the middle of each rod and main journal in two places. The difference between measurements on each journal must not be more than the service limit.

Journal Out-of-Round

Standard (New): 0.005 mm (0.0002 in.) max.
Service Limit: 0.010 mm (0.0004 in.)

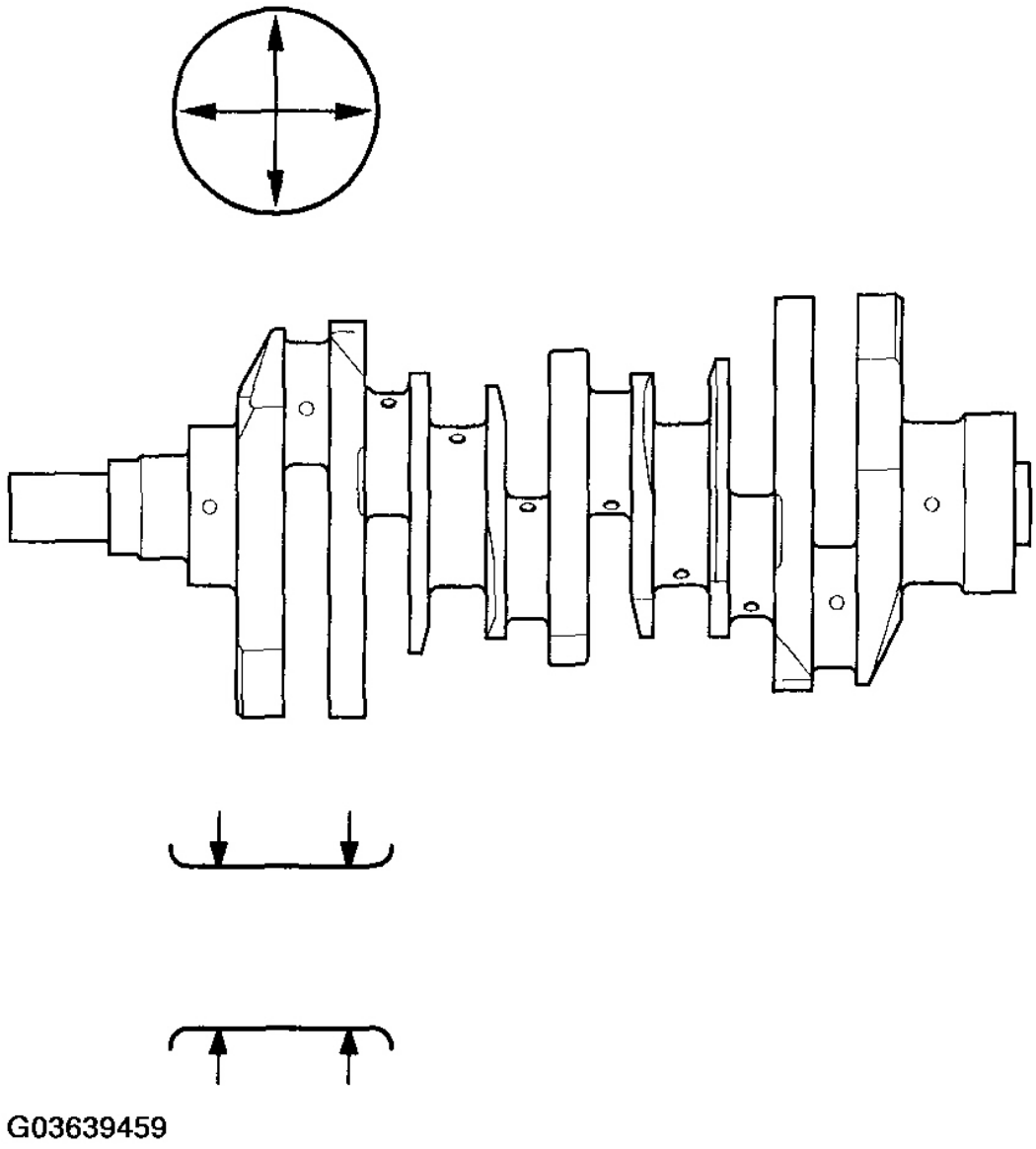

Fig. 27: Measuring Out-Of-Round At Middle Of Rod And Main Journal
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Measure taper at the edges of each rod and main journal. The difference between measurements on each journal must not be more than the service limit.

Journal Taper

Standard (New): 0.005 mm (0.0002 in.) max.
Service Limit: 0.010 mm (0.0004 in.)

Straightness

6. Place the engine block on the surface plate.
7. Clean and install the bearings on the No. 1 and No. 4 journal of the engine block.
8. Lower the crankshaft into the engine block.
9. Measure the runout on all of the main journals. Rotate the crankshaft two complete revolutions. The difference between measurements on each journal must not be more than the service limit.

Crankshaft Total Runout

Standard (New): 0.025 mm (0.0010 in.) max.
Service Limit: 0.030 mm (0.0012 in.)

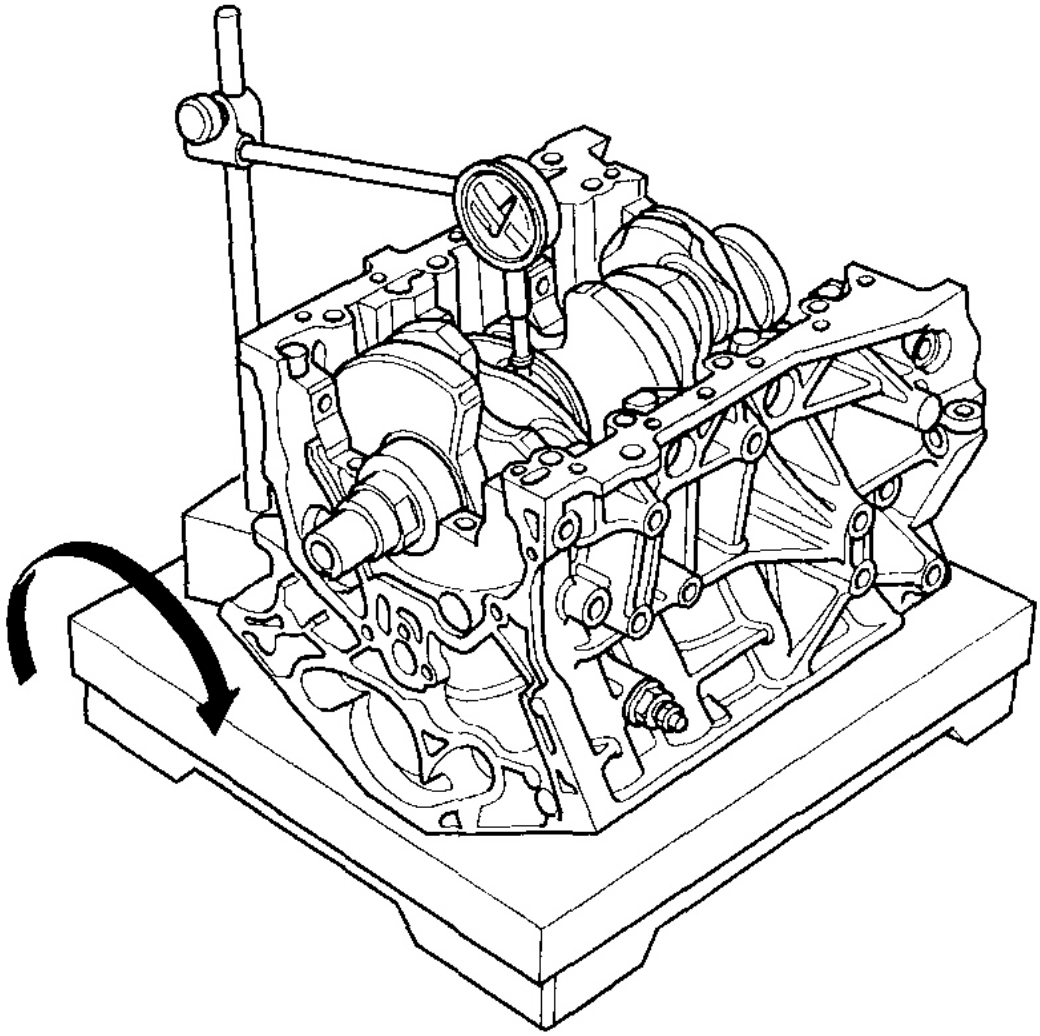

Fig. 28: Measuring Runout Of Main Journals
Courtesy of AMERICAN HONDA MOTOR CO., INC.

BLOCK AND PISTON INSPECTION

1. Remove the piston from the engine block (see **CRANKSHAFT AND PISTON REMOVAL**).
2. Check the piston for distortion or cracks.
3. Measure the piston diameter at a point 16.0 mm (0.63 in.) from the bottom of the skirt.

Piston Diameter

Standard (New): 88.975-88.985 mm (3.5029-3.5033 in.)
Service Limit: 88.965 mm (3.5026 in.)

Oversize Piston Diameter

0.25: 89.225-89.235 mm (3.5128-3.5132 in.)

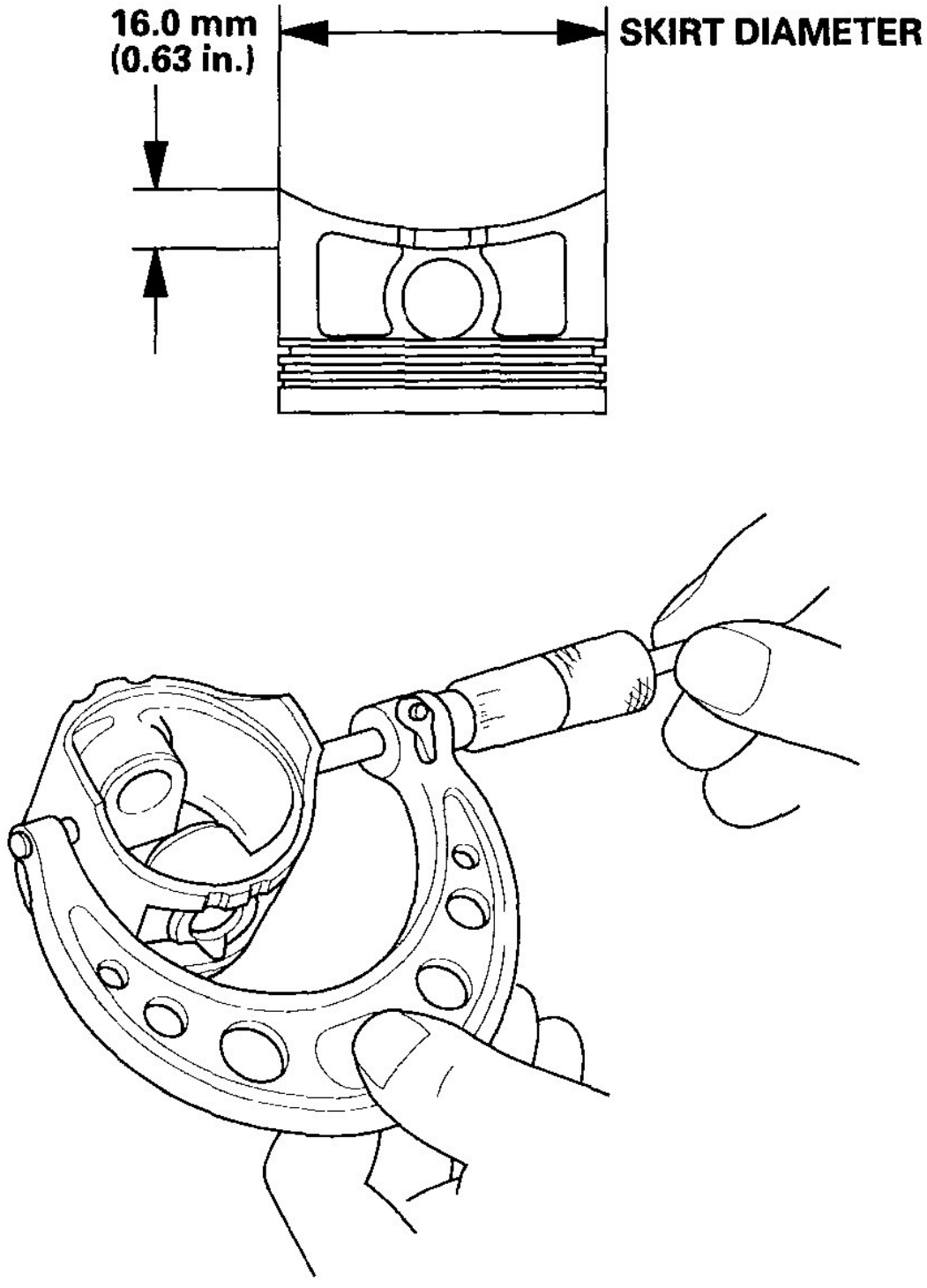

Fig. 29: Measuring Piston Diameter From Bottom Of Skirt

Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Measure wear and taper in direction X and Y at three levels in each cylinder as shown in **Fig. 30** . If measurements in any cylinder are beyond the oversize bore service limit, replace the engine block. If the engine block has to be rebored, refer to step 7 after reboring.

Cylinder Bore Size

Standard (New): 89.000-89.015 mm (3.5039-3.5045 in.)
Service Limit: 89.065 mm (3.5065 in.)

Oversize

0.25: 89.250-89.265 mm (3.5138-3.5144 in.)
Reboring Limit: 0.25 mm (0.01 in.)

Bore Taper

Limit: (Difference between first and third measurement) 0.05 mm (0.002 in.)

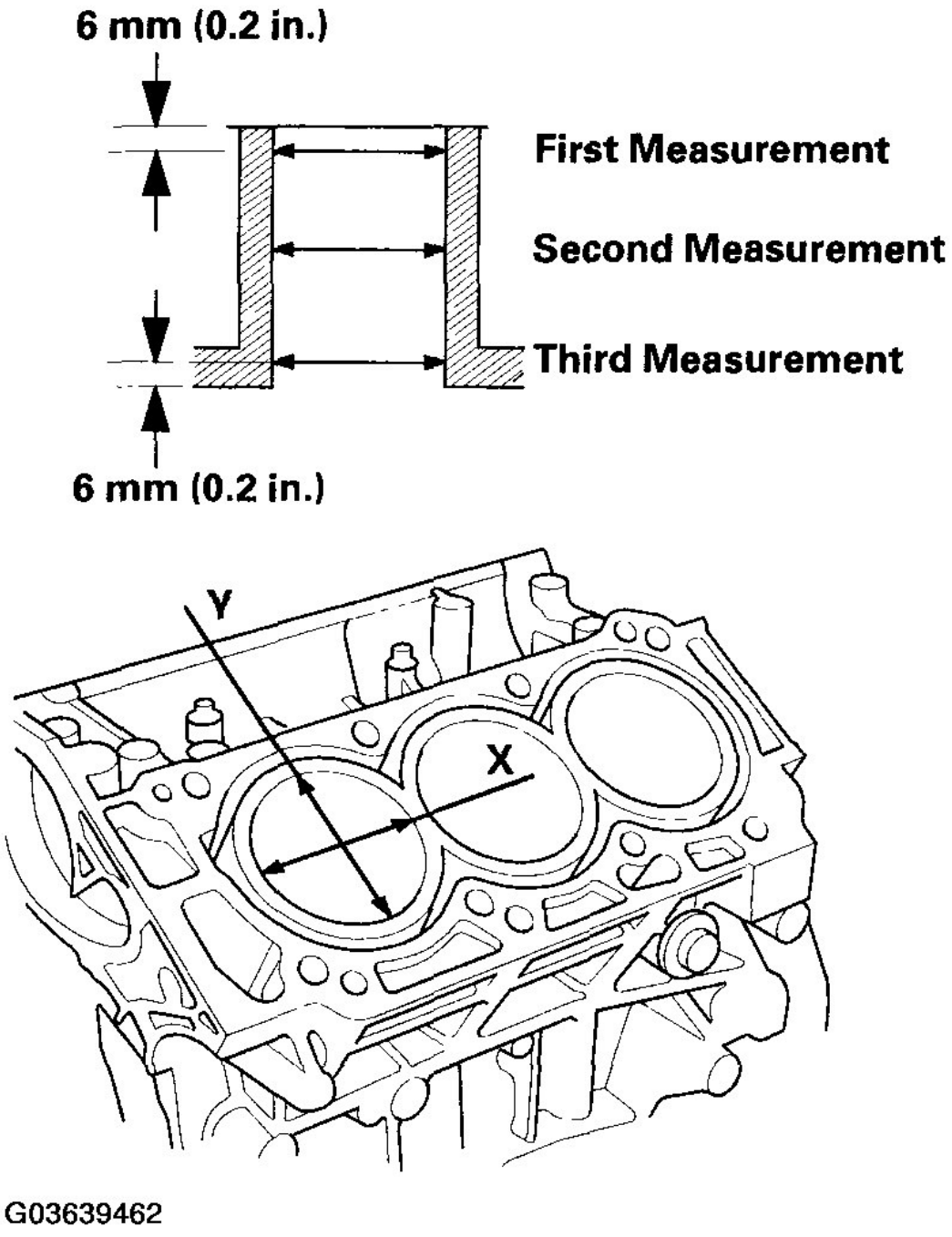

Fig. 30: Measuring Wear And Taper In Direction X And Y
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Hone any scored or scratched cylinder bores.
6. Check the top of the engine block for warpage. Measure along the edges and across the center as shown

in **Fig. 31** .

Engine Block Warpage

Standard (New): 0.07 mm (0.003 in.) max.
Service Limit: 0.10 mm (0.004 in.)

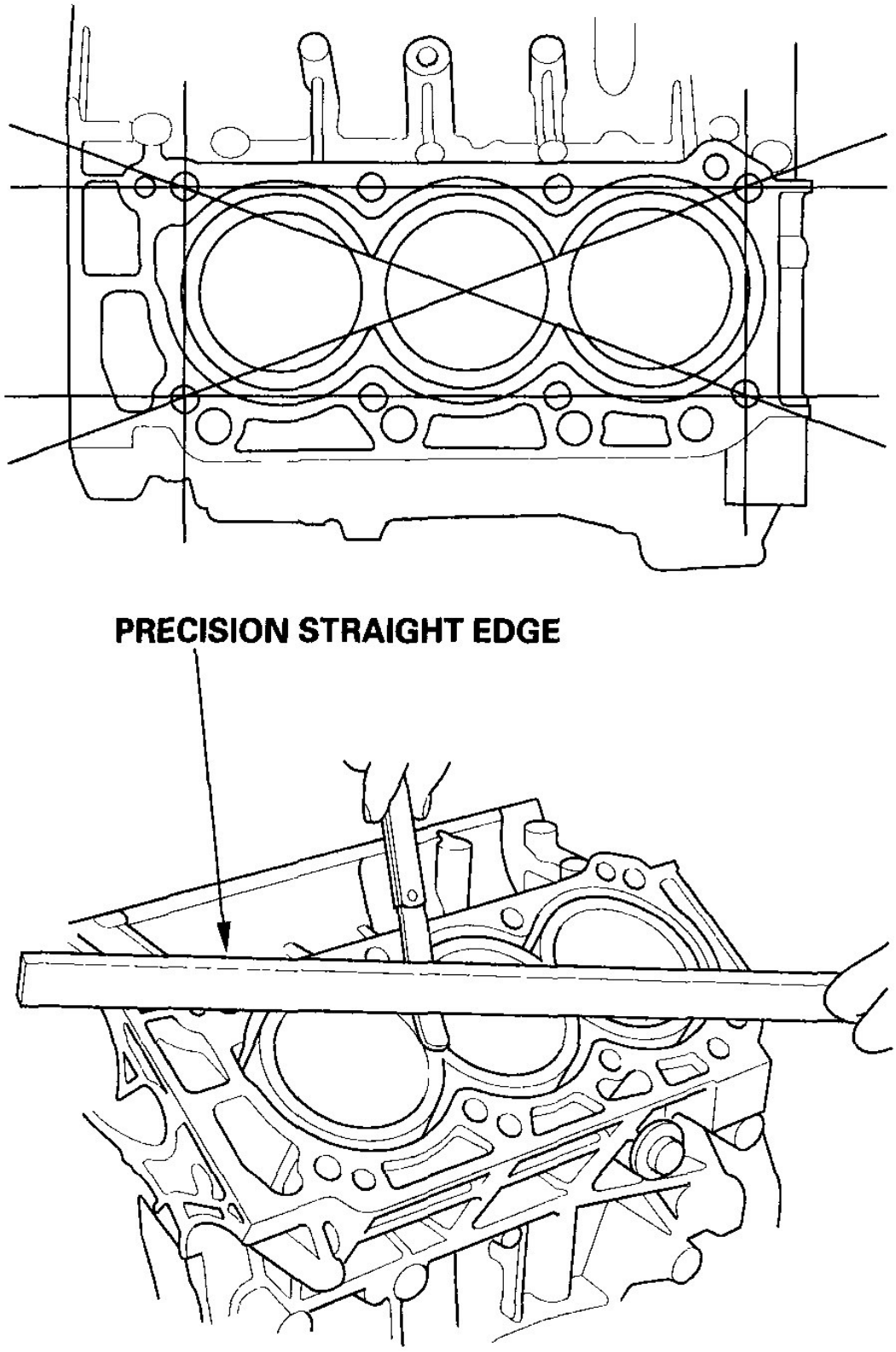

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Fig. 31: Measuring Along Edges And Across Center
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Calculate the difference between cylinder bore diameter and piston diameter. If the clearance is near or exceeds the service limit, inspect the piston and cylinder bore for excessive wear.

   Piston-to-Cylinder Bore Clearance

   Standard (New): 0.015-0.040 mm (0.0006-0.0016 in.)
   Service Limit: 0.08 mm (0.003 in.)

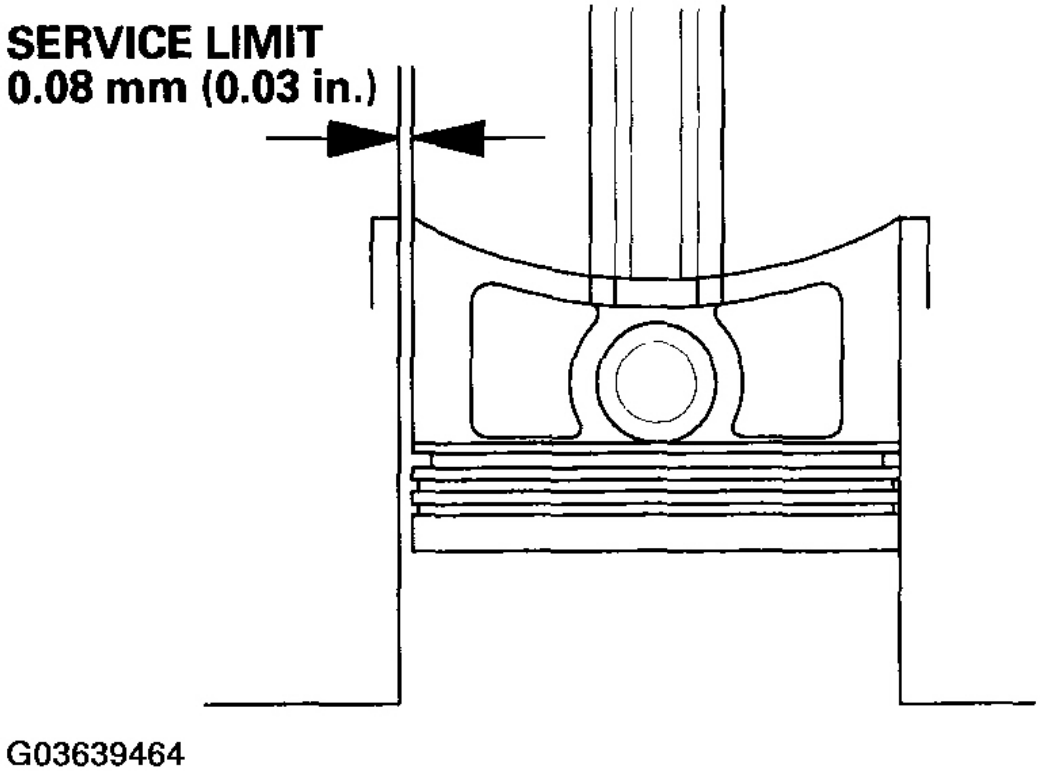

Fig. 32: Calculating Difference Between Cylinder Bore Diameter And Piston Diameter
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CYLINDER BORE HONING

1. Measure the cylinder bores (see step 4 in **BLOCK AND PISTON INSPECTION** .). If the engine block is to be reused, hone the cylinders and remeasure the bores. Only scored or scratched cylinder bores must be honed.
2. Hone the cylinder bores with honing oil and a fine (400 grit) stone in a 60 degree crosshatch pattern.

NOTE:
- **Use only a rigid hone with 400 grit or finer stone, such as Sunnen, Ammco, or equivalent.**
- **Do not use stones that are worn or broken.**

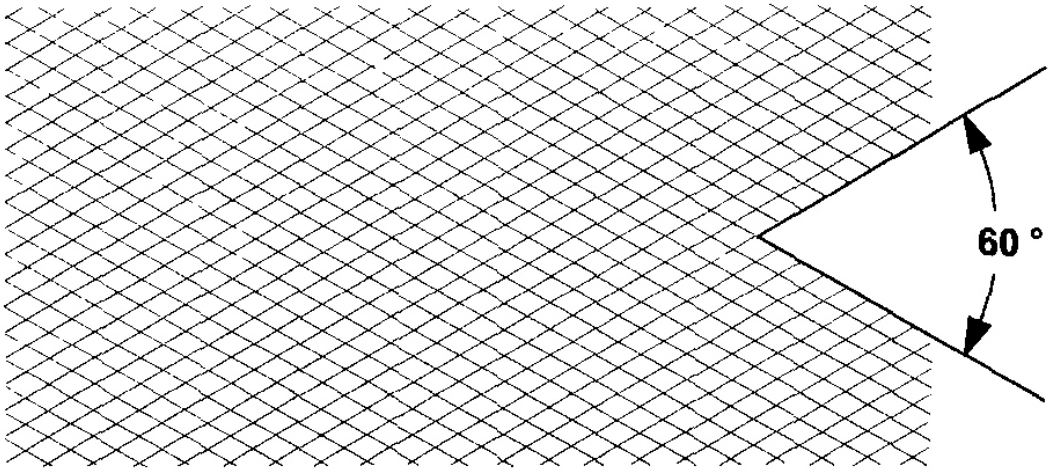

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Fig. 33: Honing Cylinder Bores With Honing Oil And Fine Stone In Crosshatch Pattern
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. When honing is complete, thoroughly clean the engine block of all metal particles. Wash the cylinder bores with hot soapy water, then dry and oil them immediately to prevent rusting. Never use solvent, it will only redistribute the grit on the cylinder walls.
4. If scoring or scratches are still present in the cylinder bores after honing to the service limit, rebore the engine block. Some light vertical scoring and scratching is acceptable if it is not deep enough to catch your fingernail and does not run the full length of the bore.

PISTON, PIN, AND CONNECTING ROD REPLACEMENT

DISASSEMBLY

1. Remove the piston from the engine block (see **CRANKSHAFT AND PISTON REMOVAL**).
2. Apply new engine oil to the piston pin snap rings (A) and turn them in the ring grooves until the end gaps are lined up with the cutouts in the piston pin bores (B).

NOTE: Take care not to damage the ring grooves.

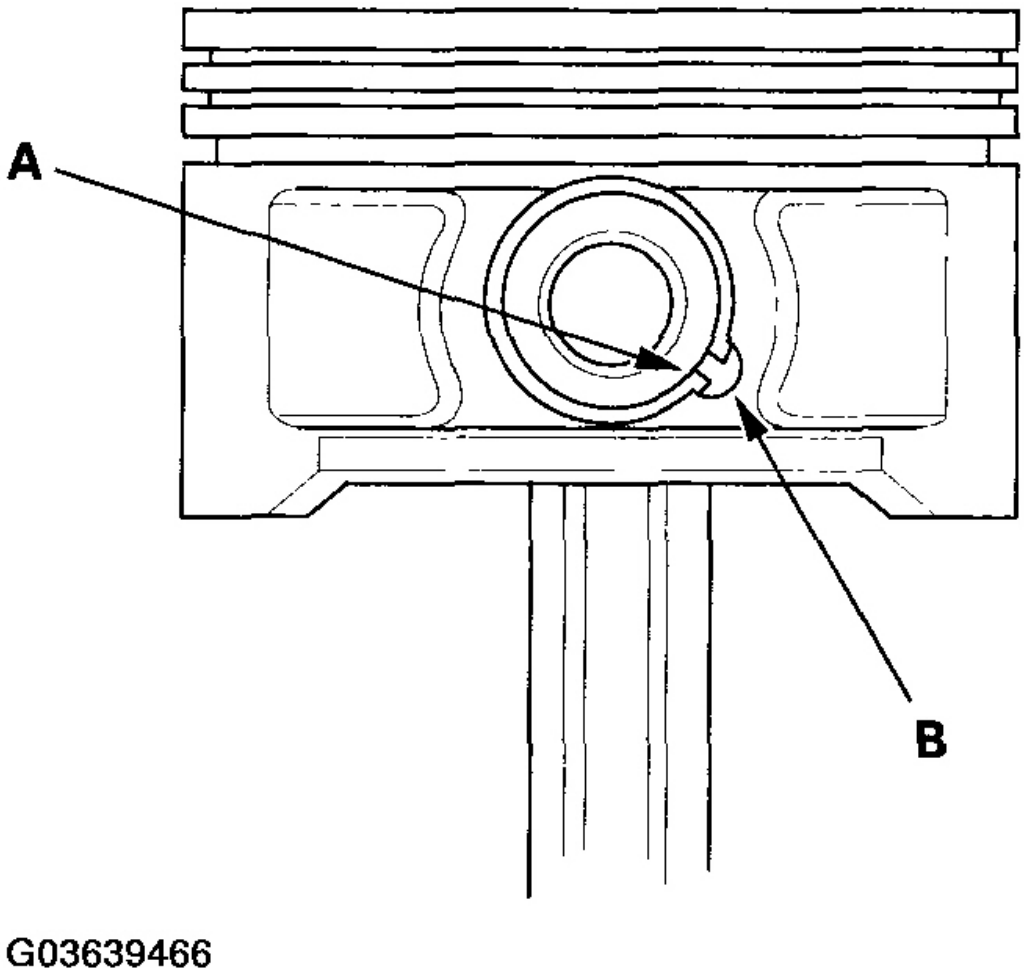

Fig. 34: Applying Engine Oil To Piston Pin Snap Rings
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Remove snap rings (A) from both sides of the piston. Start at the cutout in the piston pin bore. Remove the snap rings carefully so they do not go flying or get lost. Wear eye protection.

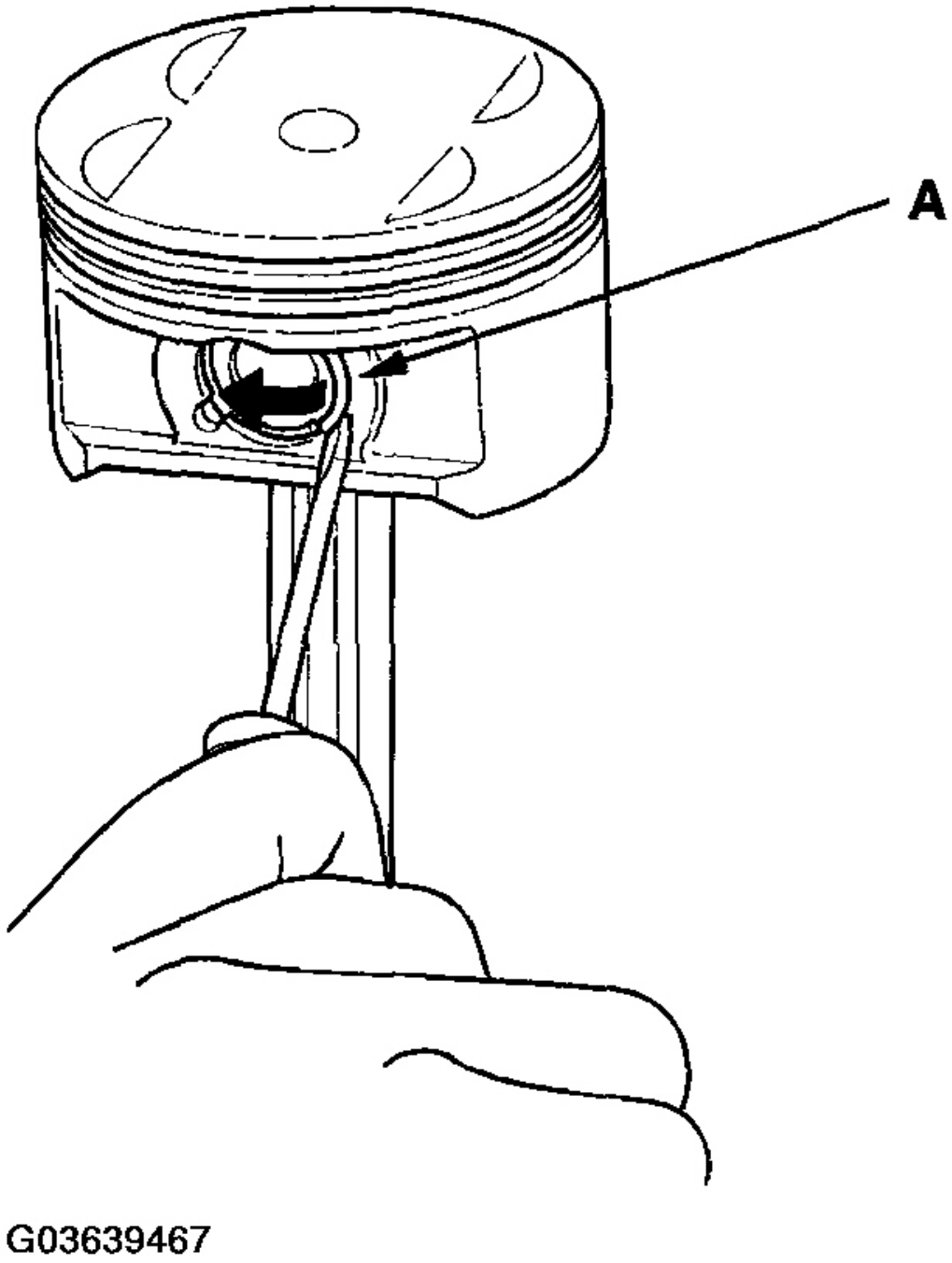

Fig. 35: Removing Snap Rings
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Heat the piston and connecting rod assembly to about 158°F (70°C), then remove the piston pin.

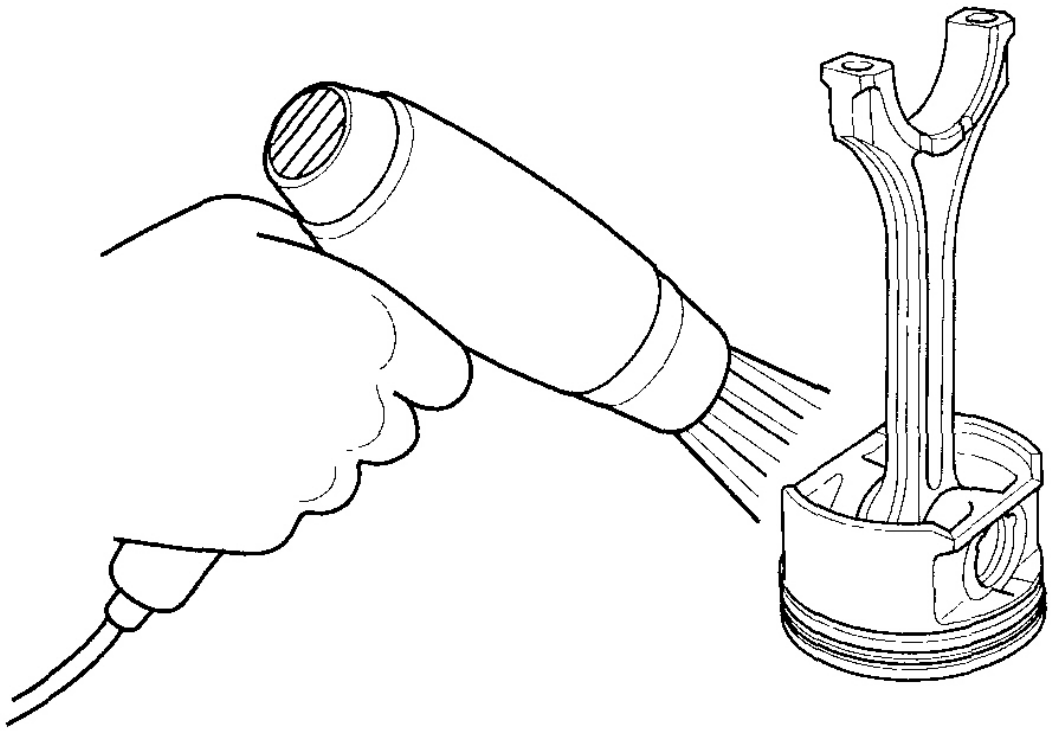

Fig. 36: Heating Piston And Connecting Rod Assembly
Courtesy of AMERICAN HONDA MOTOR CO., INC.

INSPECTION

NOTE: Inspect the piston, piston pin, and connecting rod when they are at room temperature.

1. Measure the diameter of the piston pin.

Piston Pin Diameter

Standard (New): 21.962-21.965 mm (0.8646-0.8648 in.)
Service Limit: 21.954 mm (0.8643 in.)

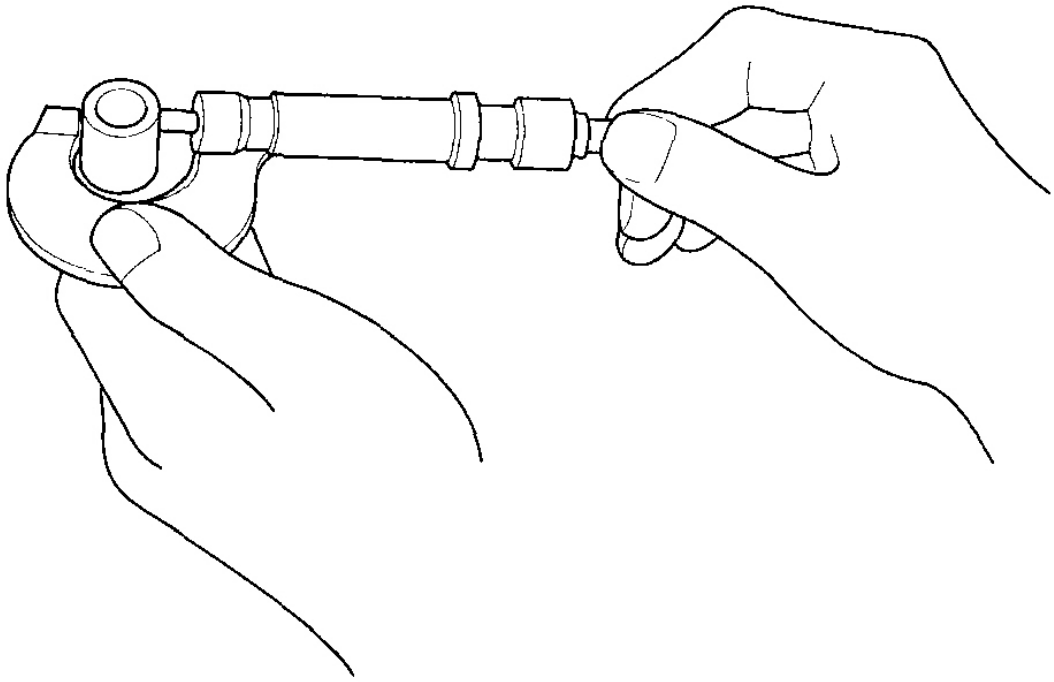

Fig. 37: Measuring Diameter Of Piston Pin
Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Zero the dial indicator to the piston pin diameter.

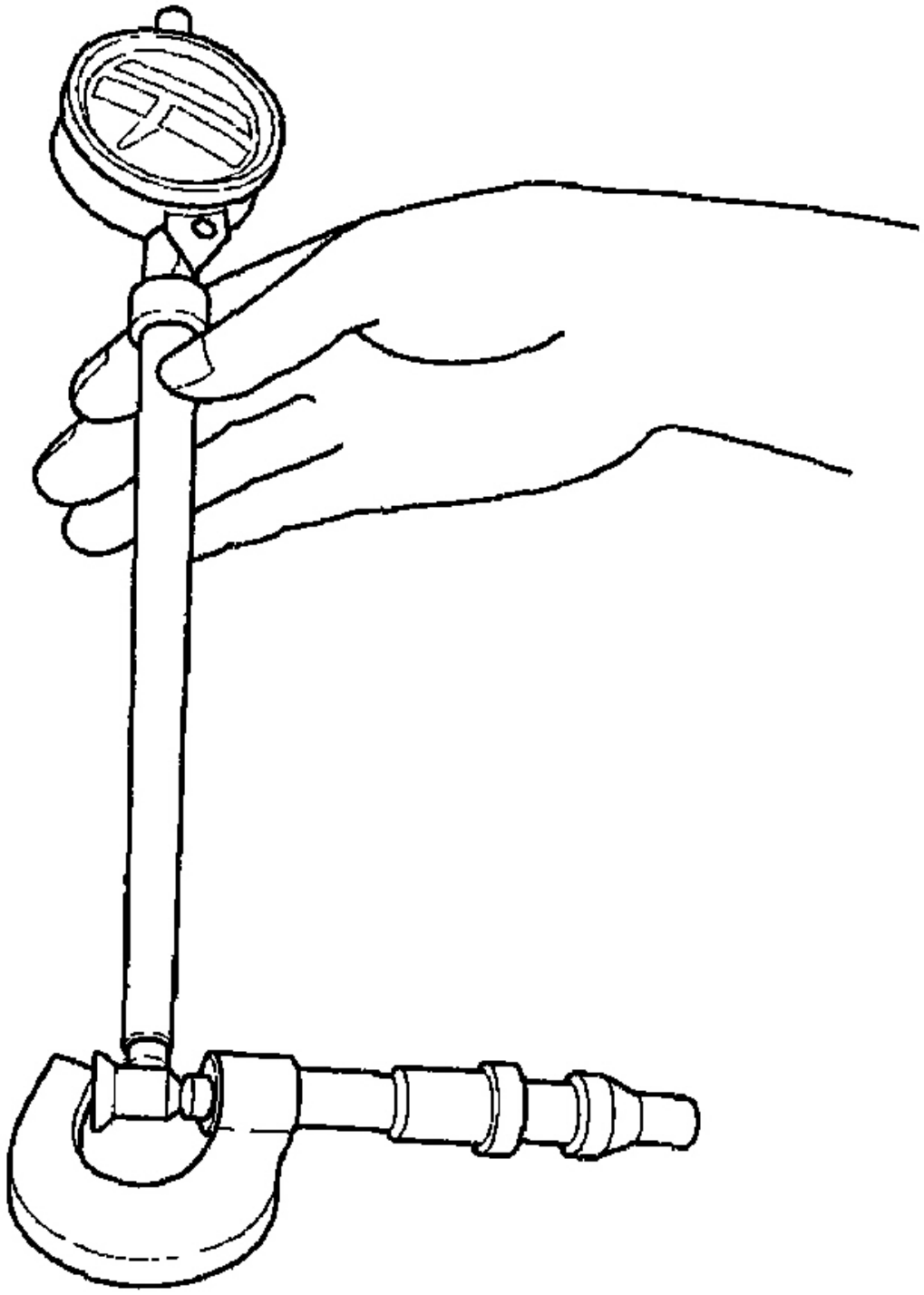

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Fig. 38: Setting Zero Dial Indicator To Piston Pin Diameter
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Check the difference between the piston pin diameter and piston pin hole diameter on the piston.

Piston Pin-to-Piston Clearance

Standard (New): -0.0050 to +0.0010 mm (-0.00020 to +0.00004 in.)
Service Limit: 0.004 mm (0.0002 in.)

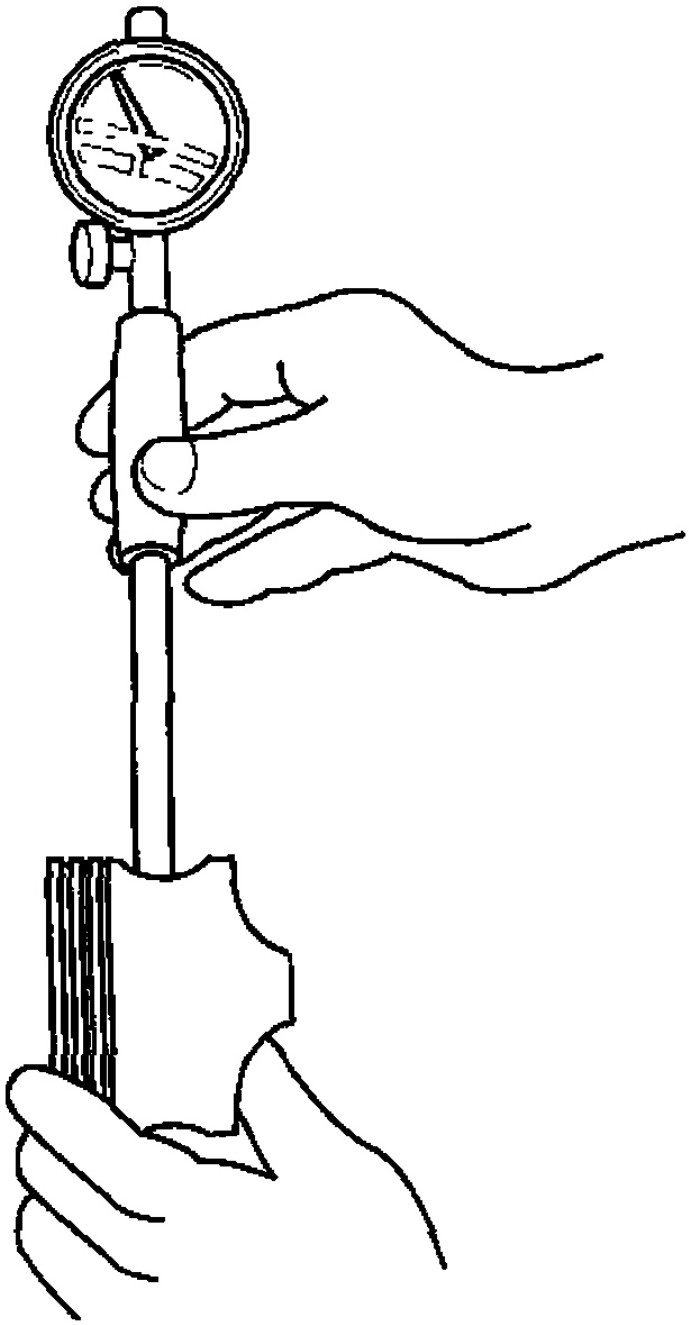


Fig. 39: Checking Difference Between Piston Pin Diameter And Piston Pin Hole Diameter
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Measure the piston pin-to-connecting rod clearance.

Piston Pin-to-Connecting Rod Clearance

Standard (New): 0.005-0.014 mm (0.0002-0.0006 in.)
Service Limit: 0.019 mm (0.0007 in.)

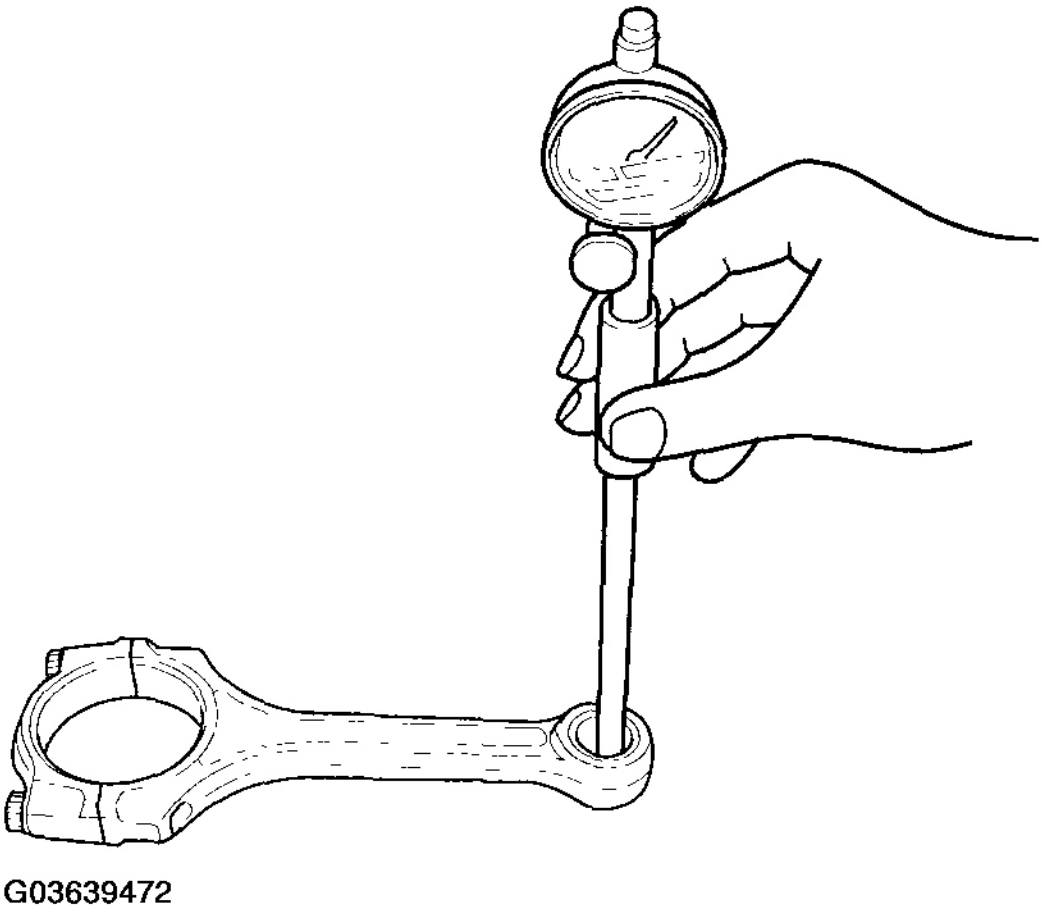


Fig. 40: Measuring Piston Pin-To-Connecting Rod Clearance
Courtesy of AMERICAN HONDA MOTOR CO., INC.

REASSEMBLY

1. Install a piston pin snap ring (A) on one side only.

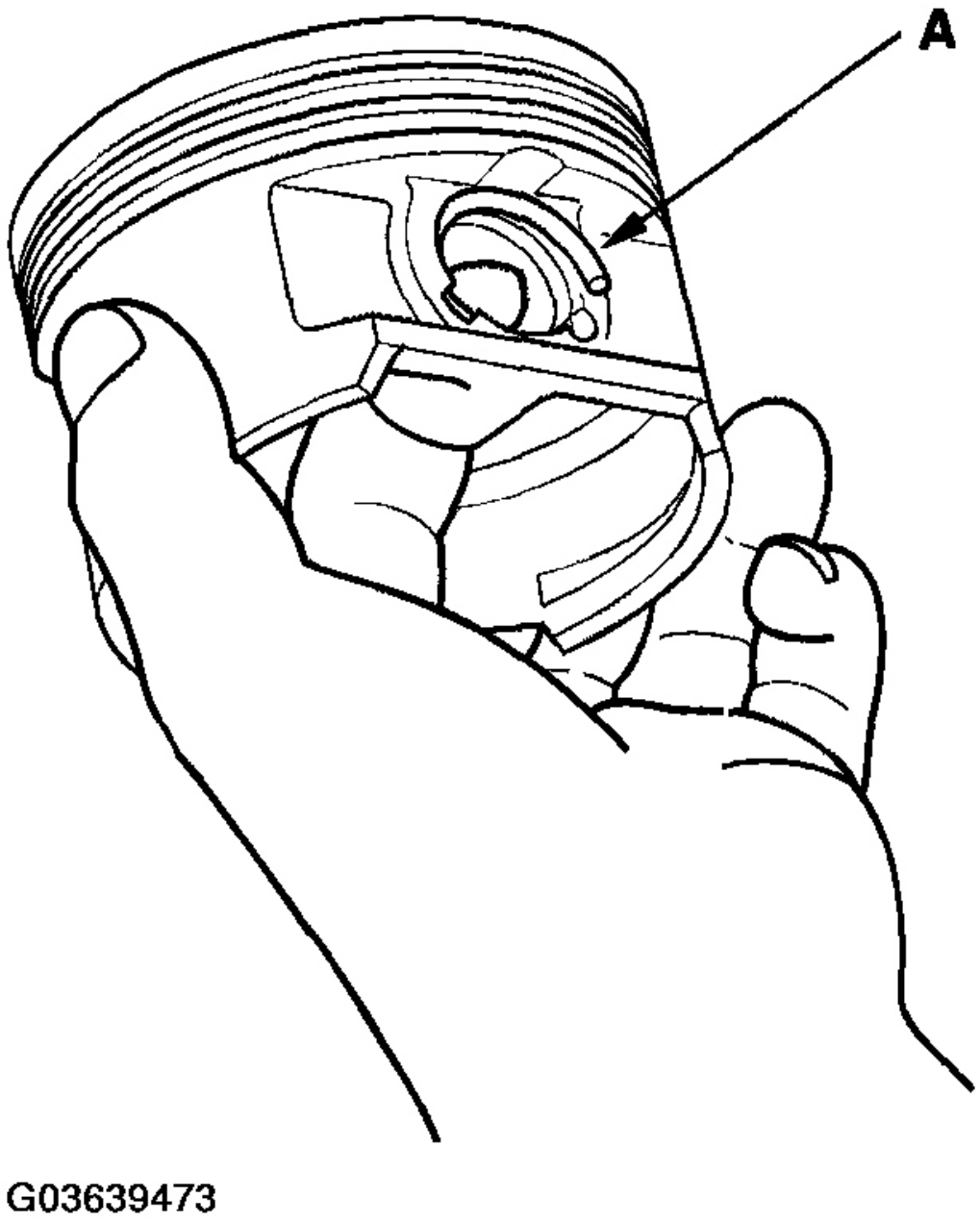


Fig. 41: Installing Piston Pin Snap Ring
Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Coat the piston pin bore in the piston, the bore in the connecting rod, and the piston pin with new engine oil.

3. Heat the piston to about 158°F (70°C).

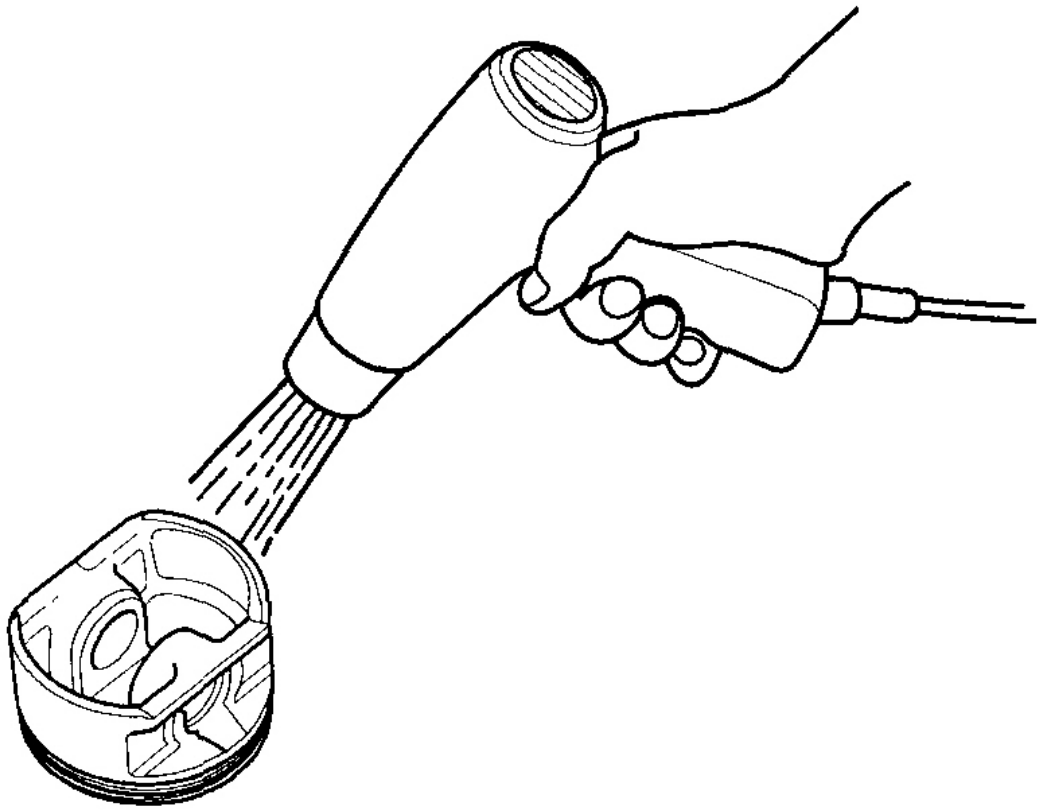


Fig. 42: Heating Piston
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Assemble the piston (A) and connecting rod (B) with the embossed marks (C) on the same side. Install the piston pin (D).

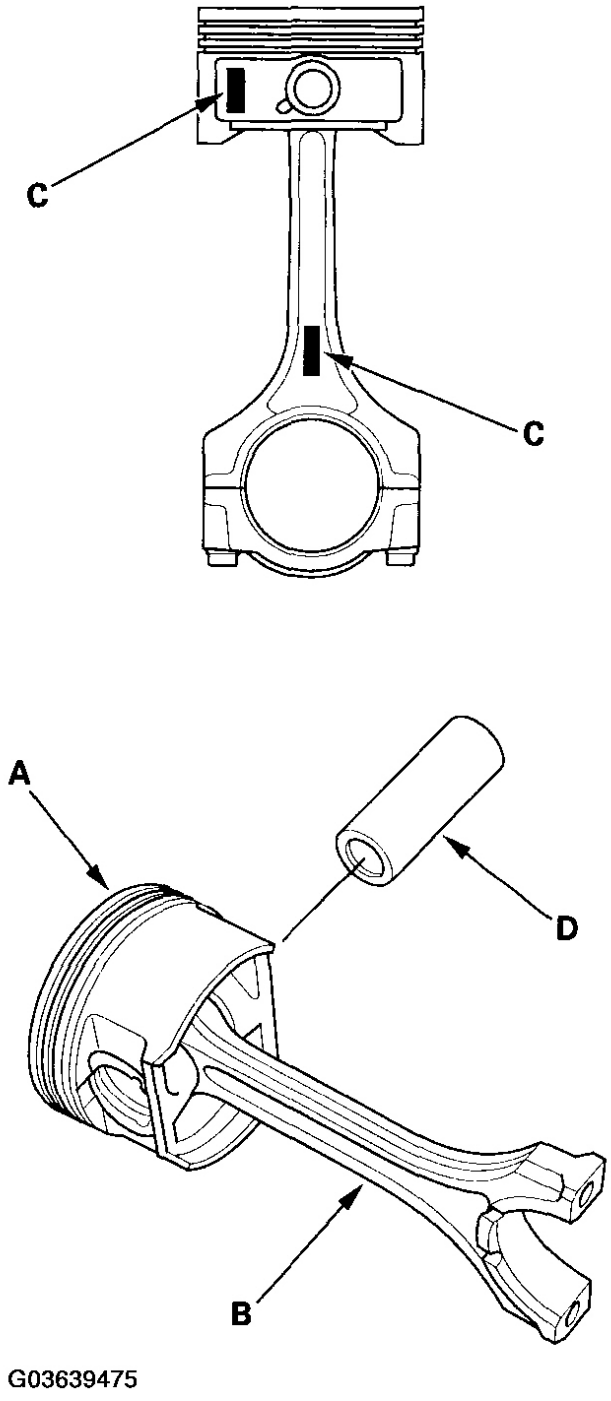


Fig. 43: Assembling Piston And Connecting Rod With Embossed Marks On Same Side
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Install the remaining snap ring.

PISTON RING REPLACEMENT

1. Remove the piston from the engine block (see **CRANKSHAFT AND PISTON REMOVAL**).
2. Using a ring expander (A), remove the old piston rings (B).

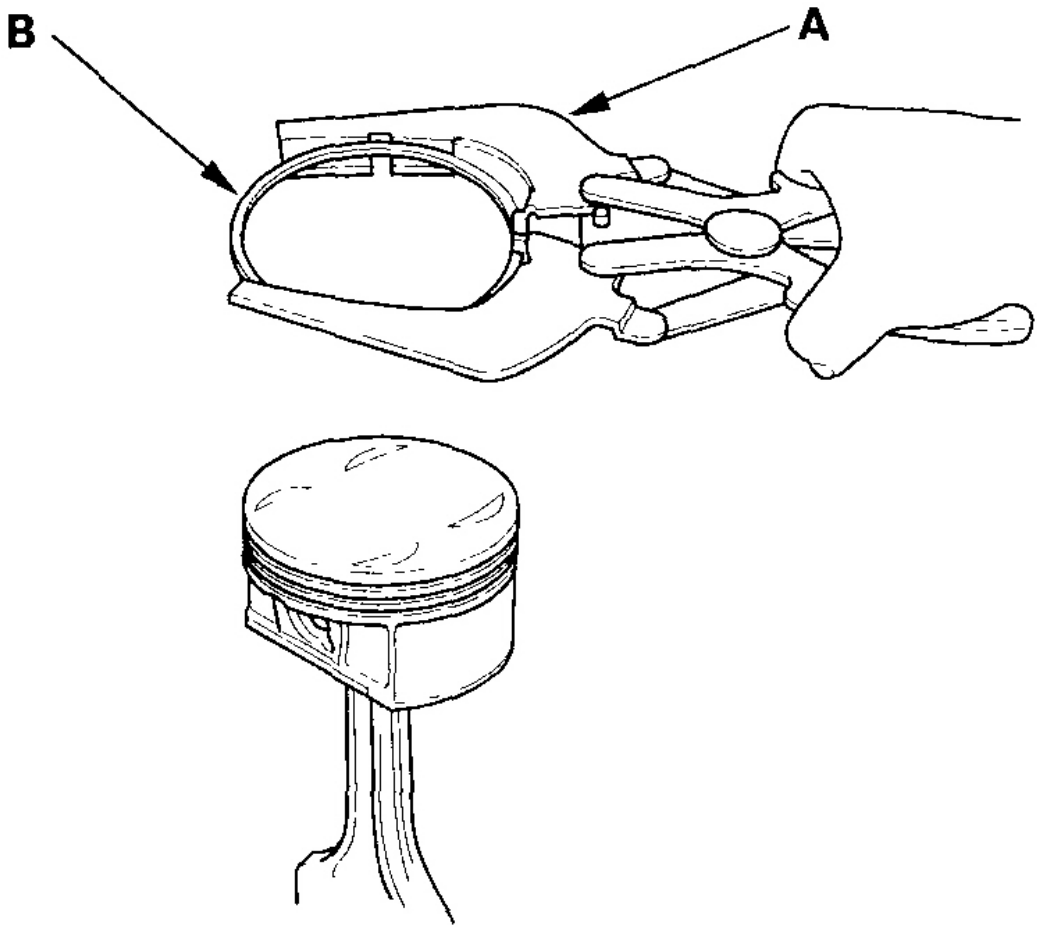


Fig. 44: Removing Old Piston Rings Using Ring Expander
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Clean all the ring grooves thoroughly with a squared-off broken ring, or a ring groove cleaner with a blade to fit the piston grooves. File down the blade, if necessary. The top ring and second ring grooves are 1.2 mm (0.05 in.) width, and the oil ring groove is 2.8 mm (0.11 in.) width. Do not use a wire brush to clean the ring grooves, or cut the ring grooves deeper with the cleaning tool.

NOTE: If the piston is to be separated from the connecting rod, do not install new rings yet.

4. Using a piston, push a new ring (A) into the cylinder bore 15-20 mm (0.6-0.8 in.) from the bottom.

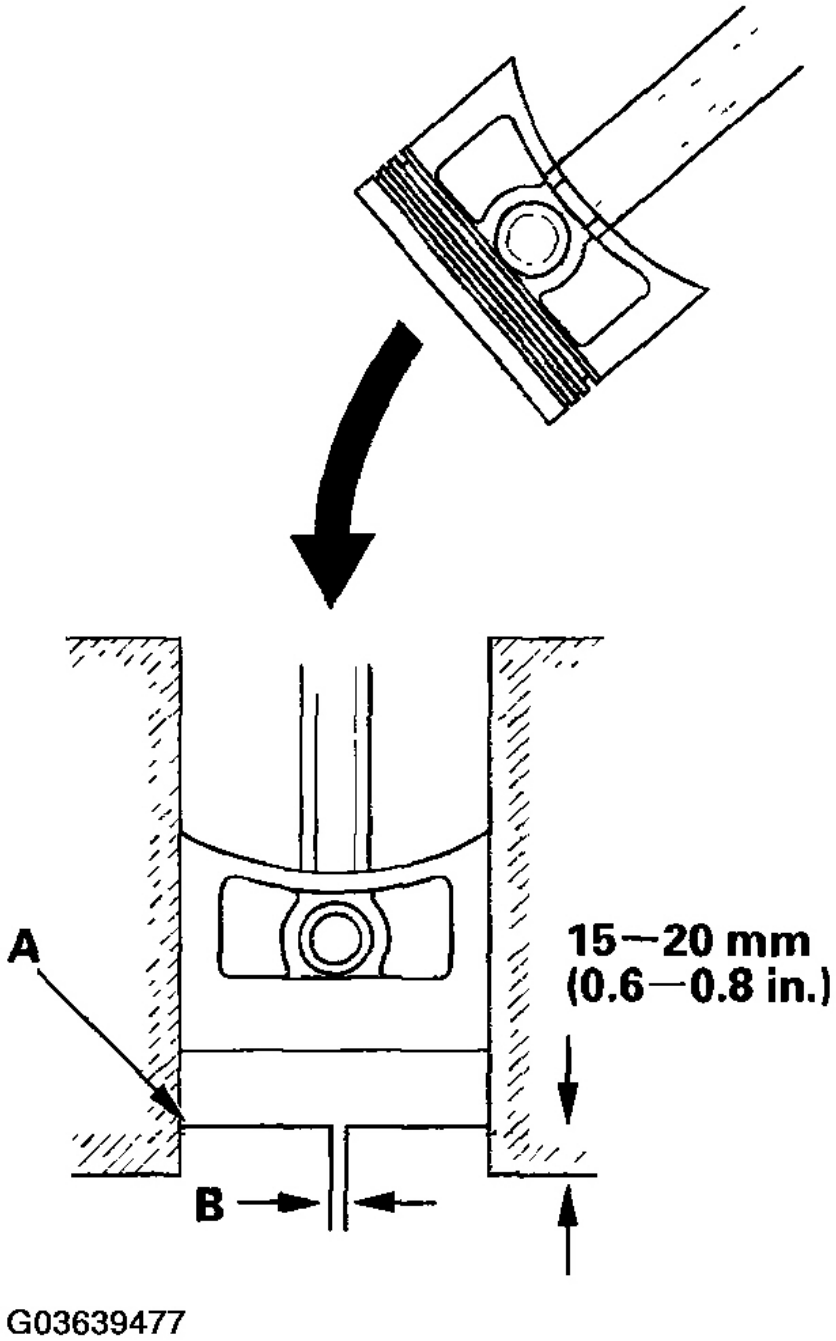


Fig. 45: Pushing New Ring Into Cylinder Bore
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Measure the piston ring end-gap (B) with a feeler gauge:
   - If the gap is too small, check to see if you have the proper rings for your engine.
   - If the gap is too large, recheck the cylinder bore diameter against the wear limits (see step 4 in **BLOCK AND PISTON INSPECTION** .). If the bore is over the service limit, the engine block must be rebored.

   Piston Ring End-Gap

   Top Ring:

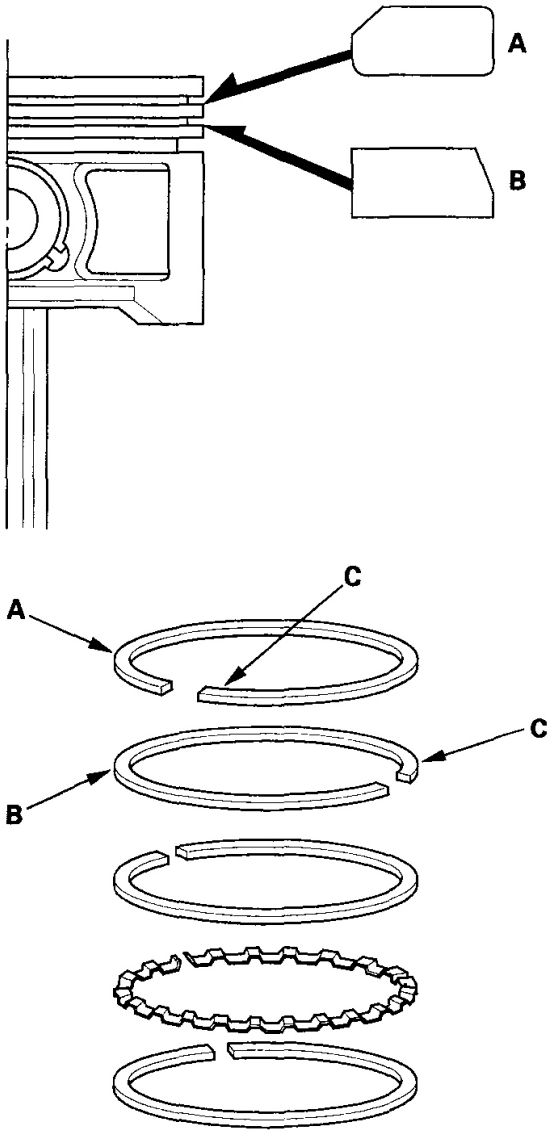
   Standard (New): 0.20-0.35 mm (0.008-0.014 in.)
   Service Limit: 0.60 mm (0.024 in.)

   Second Ring:

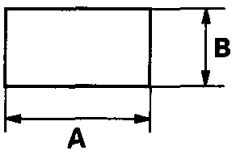
   Standard (New): 0.40-0.55 mm (0.016-0.022 in.)
   Service Limit: 0.70 mm (0.028 in.)

   Oil Ring:

   Standard (New): 0.20-0.70 mm (0.008-0.028 in.)
   Service Limit: 0.80 mm (0.031 in.)
6. Install the rings as shown in **Fig. 46** . The top ring (A) has a 1D mark and the second ring (B) has a 2C mark. The manufacturing marks (C) must be facing upward.



Piston Ring Dimensions:



Top Ring (Standard)
A: 3.1 mm (0.12 in.)
B: 1.2 mm (0.05 in.)

Second Ring (Standard)
A: 3.4 mm (0.13 in.)
B: 1.2 mm (0.05 in.)

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Fig. 46: Installing Rings
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. After installing a new set of rings, measure the ring-to-groove clearance:

Top Ring Clearance

Standard (New): 0.055-0.080 mm (0.0022-0.0031 in.)
Service Limit: 0.15 mm (0.006 in.)

Second Ring Clearance

Standard (New): 0.030-0.055 mm (0.0012-0.0022 in.)
Service Limit: 0.13 mm (0.005 in.)

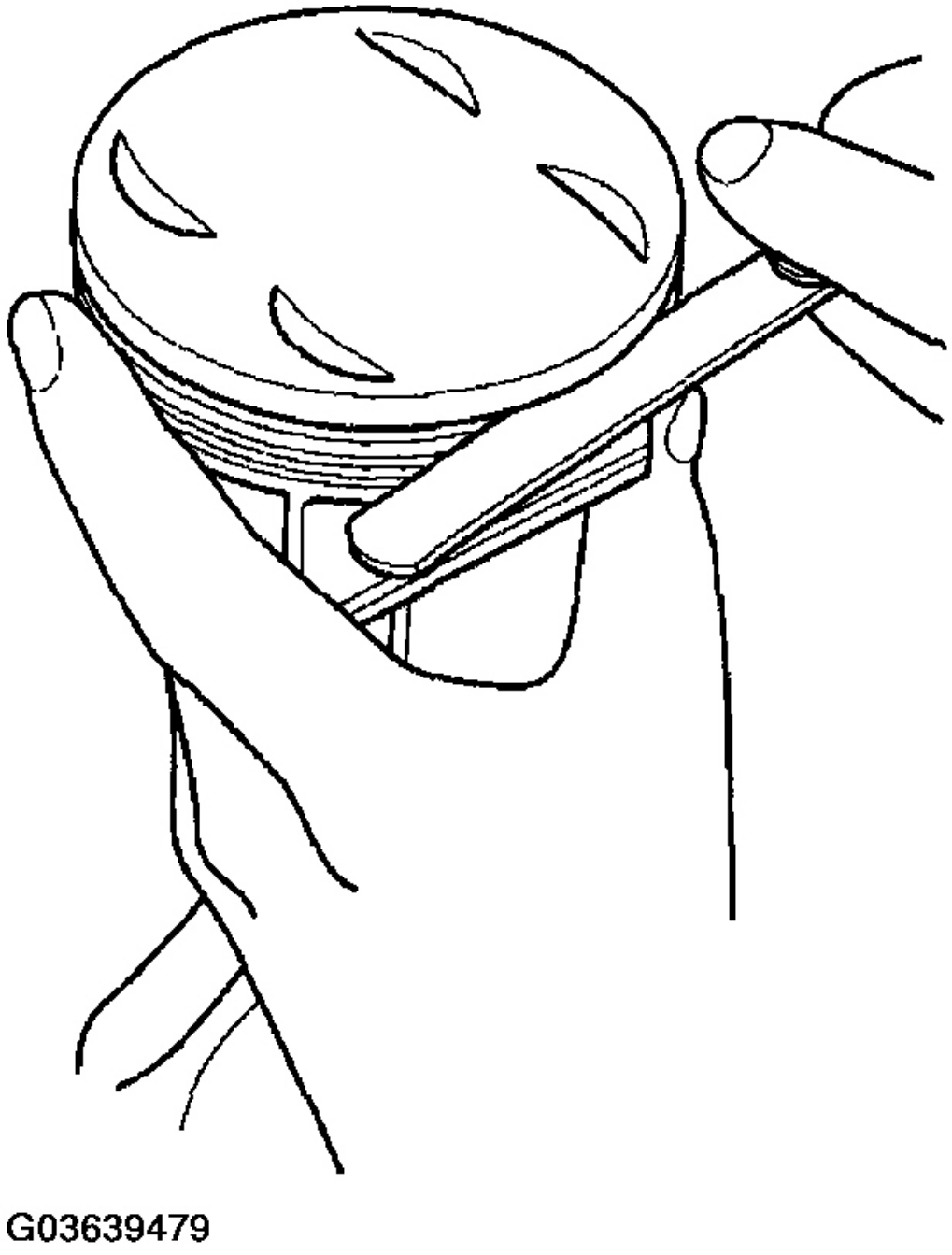

Fig. 47: Measuring Ring-To-Groove Clearance
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Rotate the rings in their grooves to make sure they do not bind.

9. Position the ring end gaps as shown in **Fig. 48** .

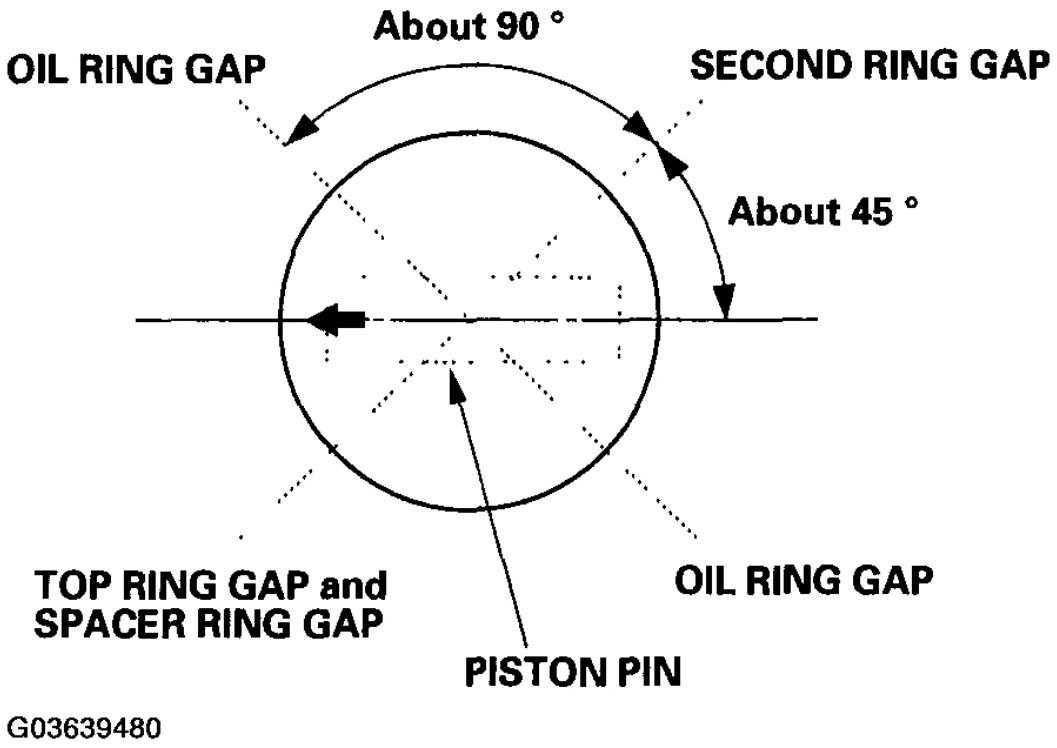

Fig. 48: Positioning Ring End Gaps
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CRANKSHAFT AND PISTON INSTALLATION

Special Tools Required

- Driver 07749-0010000
- Driver attachment, 106 mm 070AD-RCAA200

1. Check the connecting rod bearing clearance with plastigage (see **CONNECTING ROD BEARING REPLACEMENT**).
2. Check the main bearing clearance with plastigage (see **CRANKSHAFT MAIN BEARING REPLACEMENT**).
3. Install the bearing halves in the engine block and connecting rods.
4. Apply new engine oil to inside of the main bearings and rod bearings.
5. Lower the crankshaft (A) into the engine block.

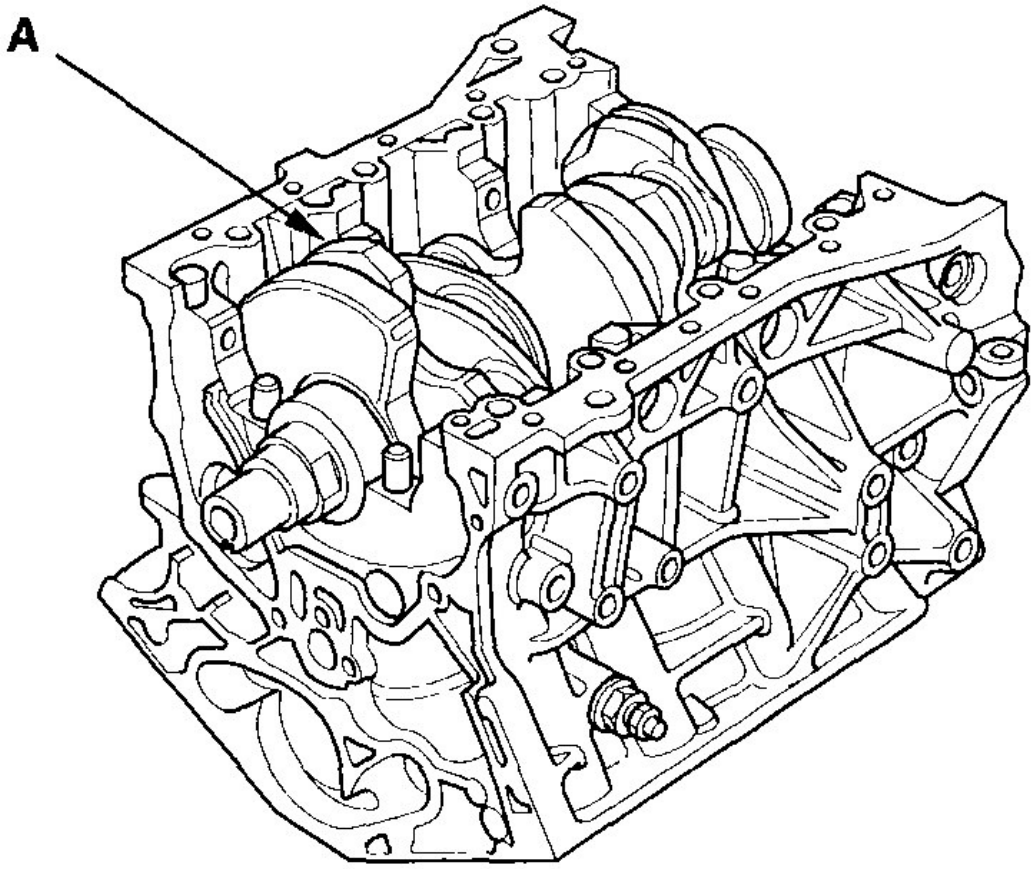

Fig. 49: Lowering Crankshaft Into Engine Block
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Apply new engine oil to the side with the thrust washer groove. Install the thrust washers (A) in the No. 3 journal.

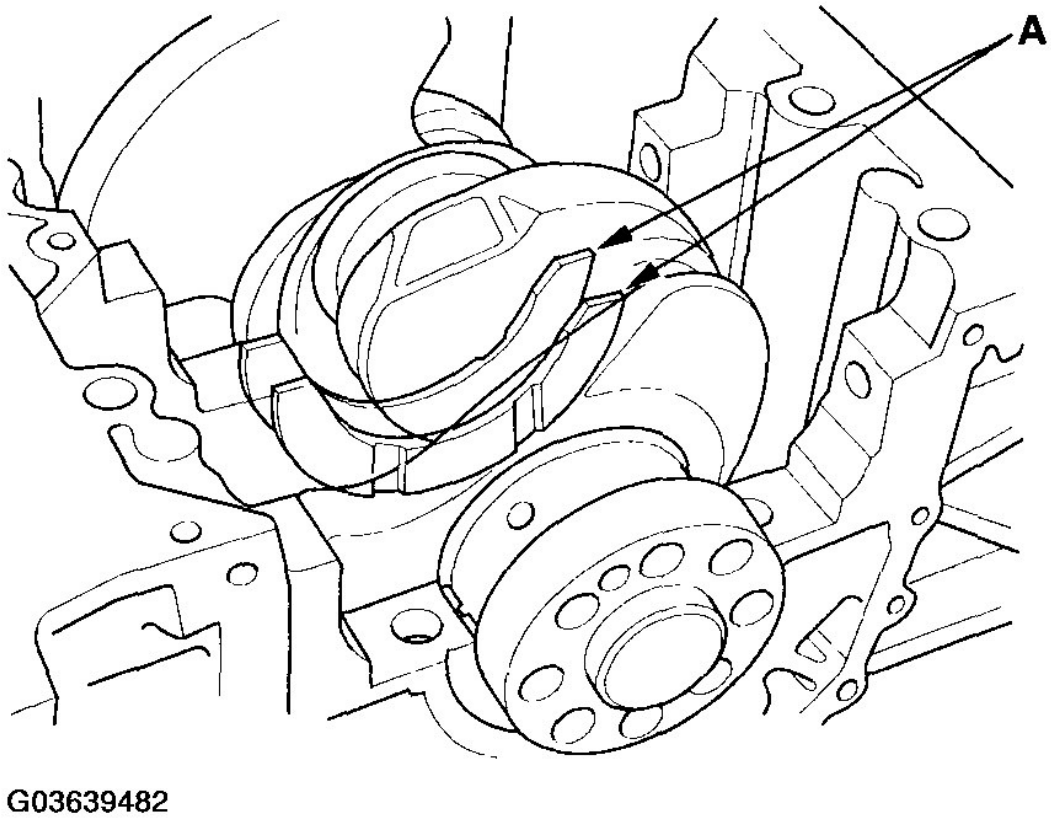

Fig. 50: Installing Thrust Washers In No. 3 Journal
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Install the bearings (A) and bearing caps (B) with the arrow (C) facing the timing belt end of the engine.

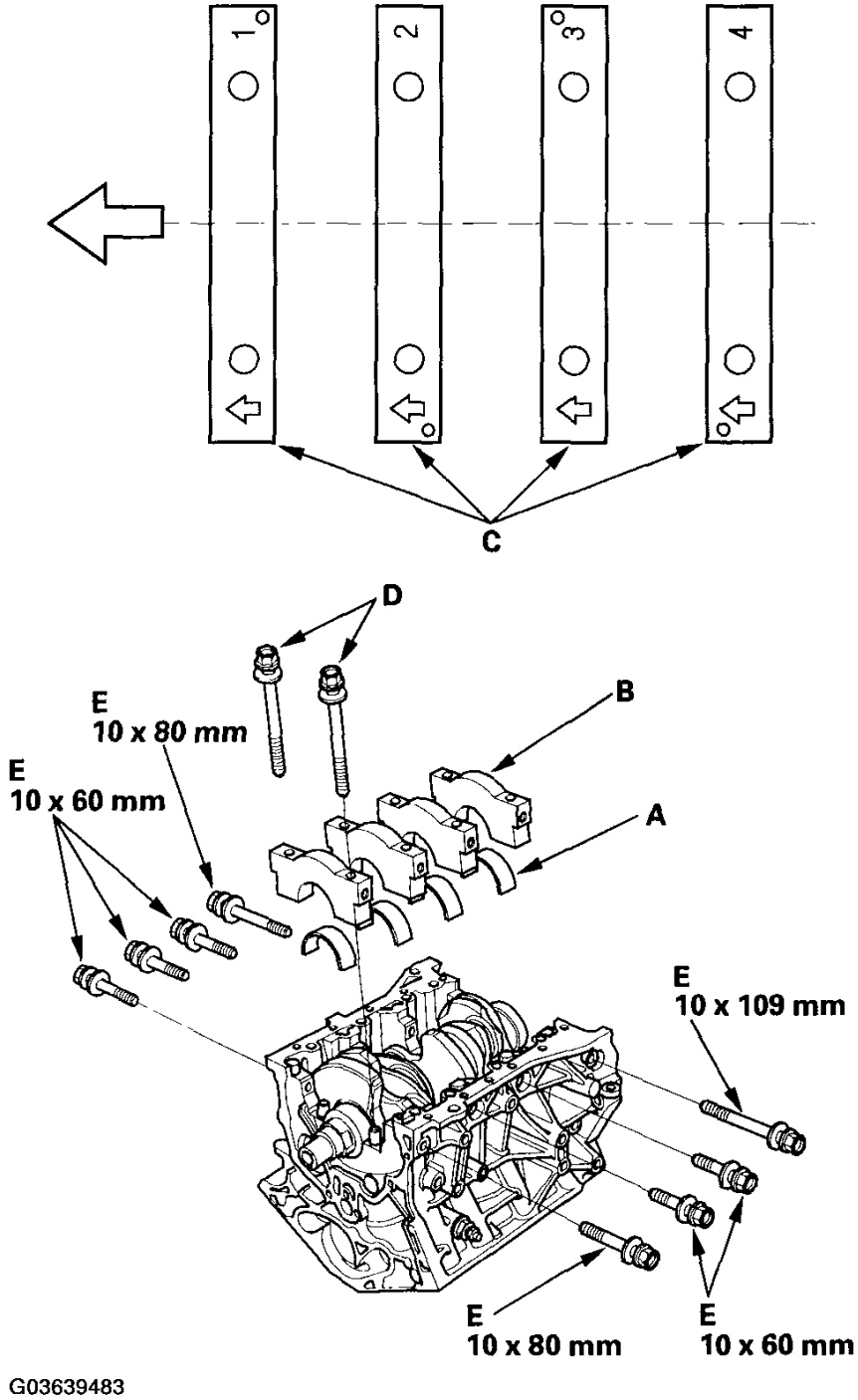

Fig. 51: Installing Bearings And Cap With Arrow Facing Timing Belt
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Apply new engine oil to the bolt threads and flanges, then loosely install the bearing cap bolts (D) and bearing cap side bolts (E).

9. Set the crankshaft to bottom dead center (BDC) for the cylinder you are installing the piston in.
10. Apply new engine oil to the piston, inside of the ring compressor, and the cylinder bore.
11. Attach the ring compressor to the piston/ connecting rod assembly, and check that the bearing is securely in place.
12. Position the piston/connecting rod assembly with the arrow (A) facing the timing belt side of the engine.

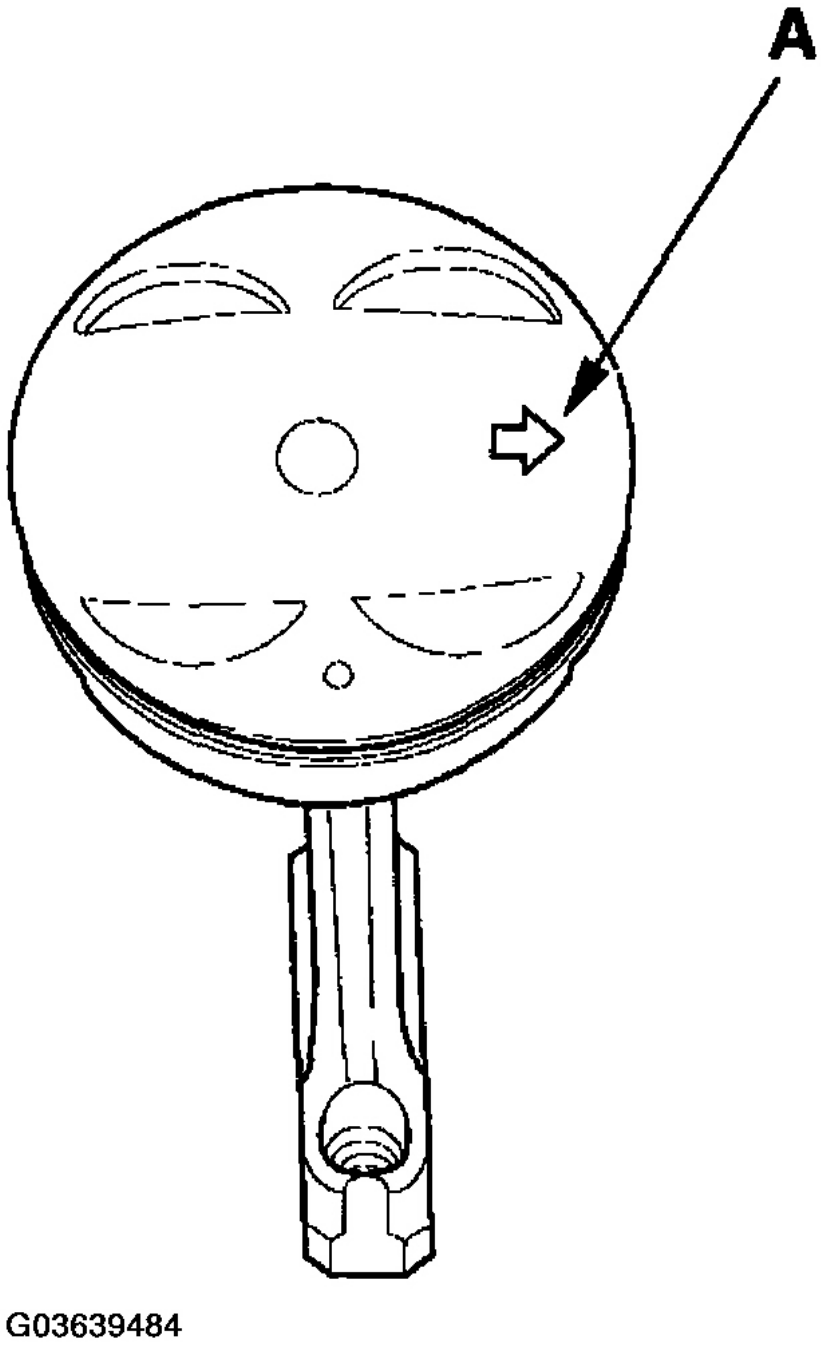

Fig. 52: Positioning Piston/Connecting Rod Assembly With Arrow Facing Timing Belt
Courtesy of AMERICAN HONDA MOTOR CO., INC.

13. Position the piston/connecting rod assembly in the cylinder, and tap it in using the wooden handle of a hammer (A). Maintain downward force on the ring compressor (B) to prevent the rings from expanding

before entering the cylinder bore.

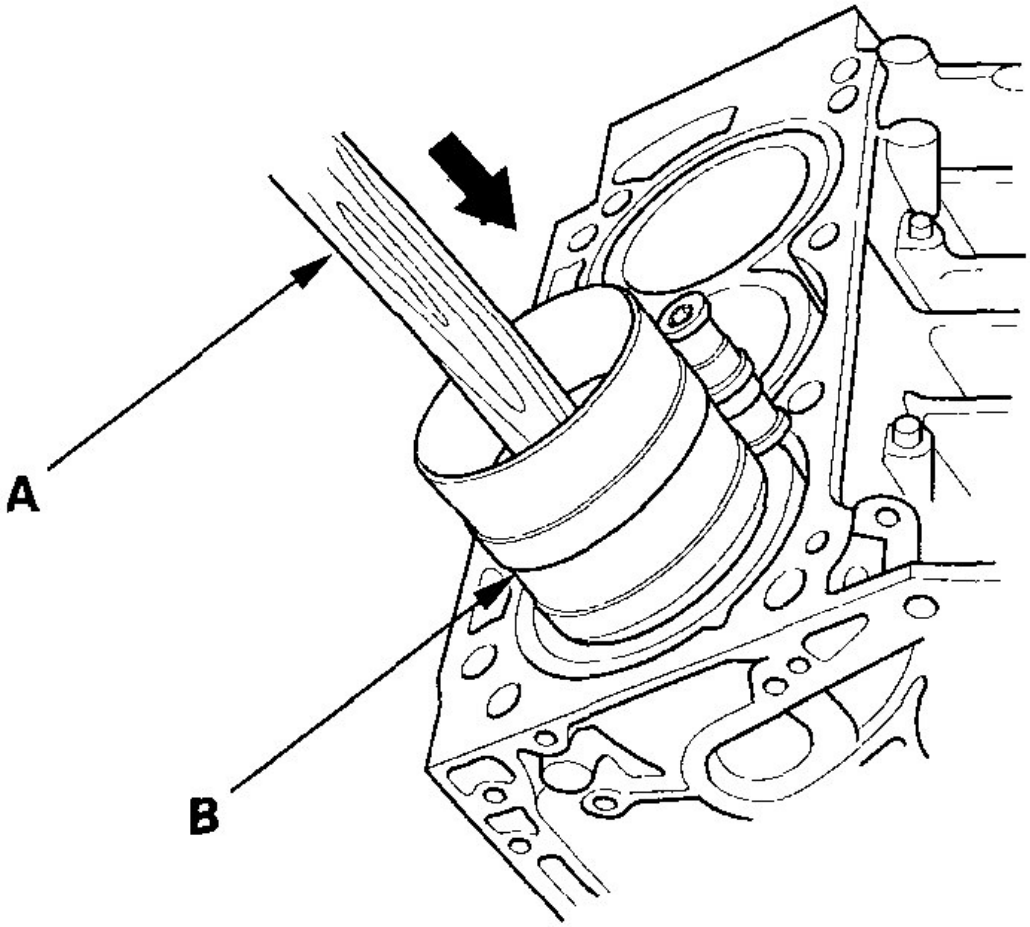

Fig. 53: Positioning Piston/Connecting Rod Assembly In Cylinder
Courtesy of AMERICAN HONDA MOTOR CO., INC.

14. Stop after the ring compressor pops free, and check the connecting rod-to-crank journal alignment before pushing the piston into place.
15. Measure the diameter of each connecting rod bolt at point A and point B.

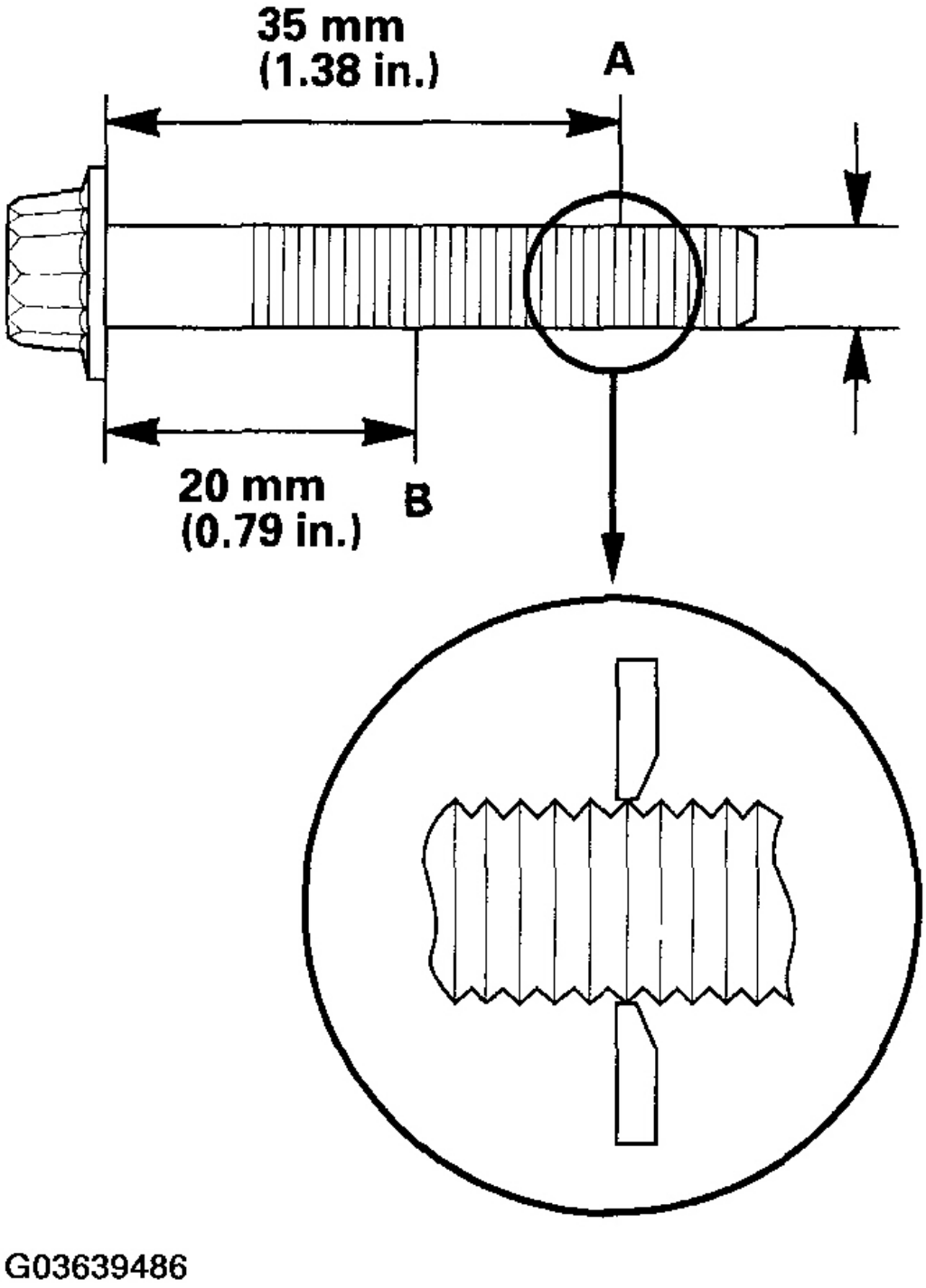

Fig. 54: Measuring Diameter Of Each Connecting Rod Bolt At Point A And B
Courtesy of AMERICAN HONDA MOTOR CO., INC.

16. Calculate the difference in diameter between point A and point B.

    Point A-Point B = Difference in Diameter

    Difference in Diameter

    Specification: 0-0.1 mm (0-0.004 in.)
17. If the difference in diameter is out of tolerance, replace the connecting rod bolt.
18. Line up the mark (A) on the connecting rod and cap, then install the cap.

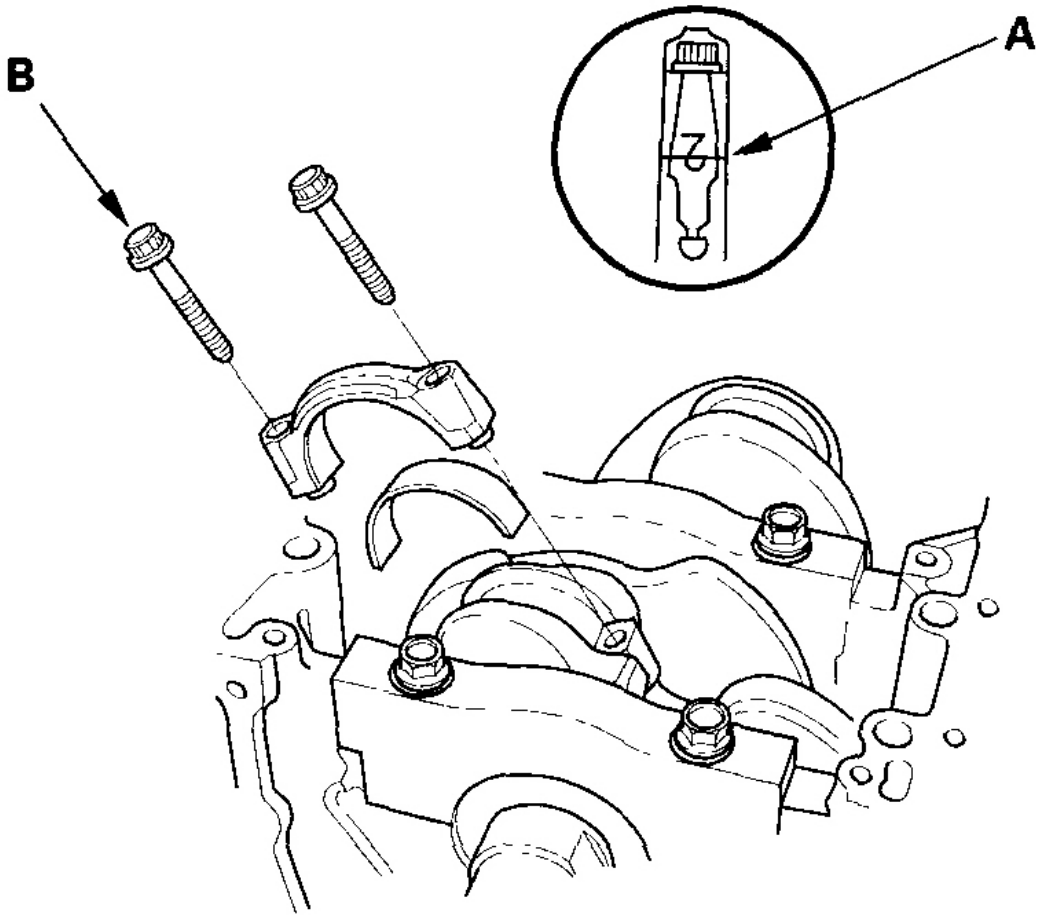

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Fig. 55: Lining Up Mark On Connecting Rod And Cap
Courtesy of AMERICAN HONDA MOTOR CO., INC.

19. Apply new engine oil to the bolt threads and flanges. Torque the bolts (B) to 20 N.m (2.0 kgf.m, 14

lbf.ft).

20. Mark the connecting rod (A) and bolt head (B) as shown in **Fig. 56** .

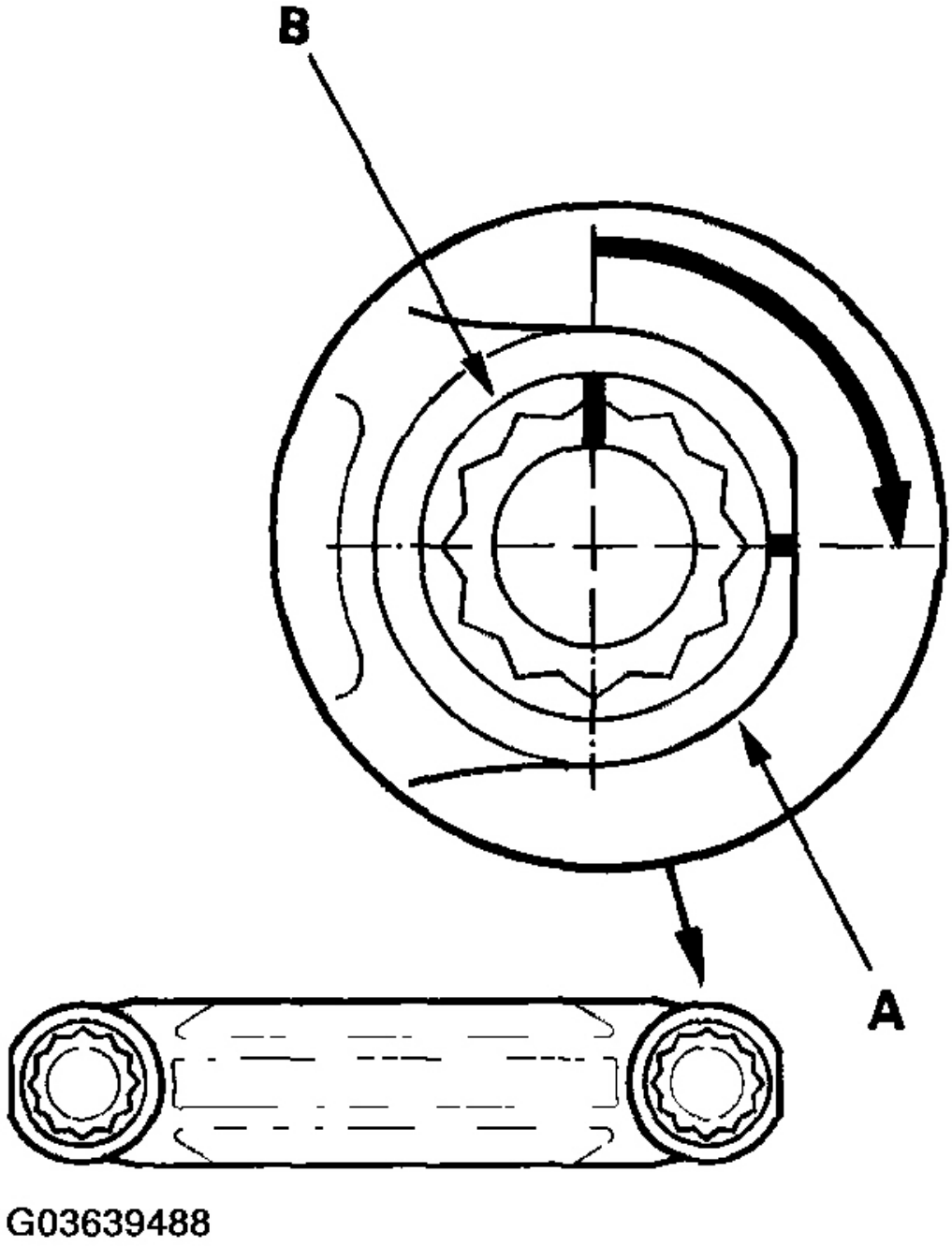

Fig. 56: Marking Connecting Rod And Bolt Head

Courtesy of AMERICAN HONDA MOTOR CO., INC.

21. Tighten the bolt until the mark on the bolt head lines up with the mark on the connecting rod (turn the bolt 90°).

NOTE: Remove the connecting rod bolt if you tightened it beyond the specified angle, and go back to step 15 of the procedure. Do not loosen it back to the specified angle.

22. Tighten the bearing cap bolts, and then the bearing cap side bolts to the specified torque in the sequence as shown in **Fig. 57** . Repeat the torque sequence again to ensure the bolts are properly torqued.

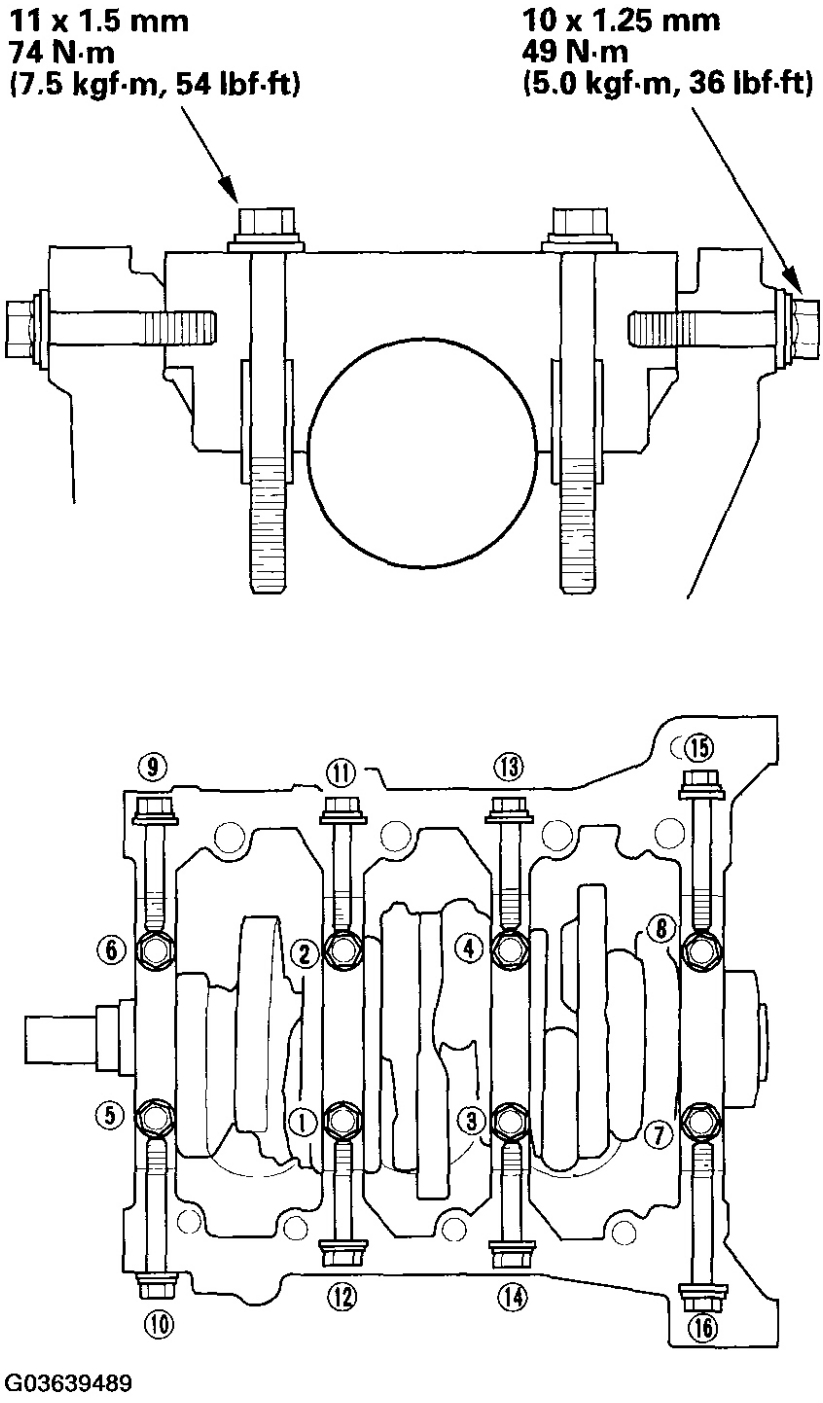

Fig. 57: Tightening Bearing Cap Bolts In Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

23. Apply a light coat of multipurpose grease to the crankshaft and to the lip of the seal.
24. Drive the new crankshaft oil seal until the driver attachment bottoms on the engine block end cover.

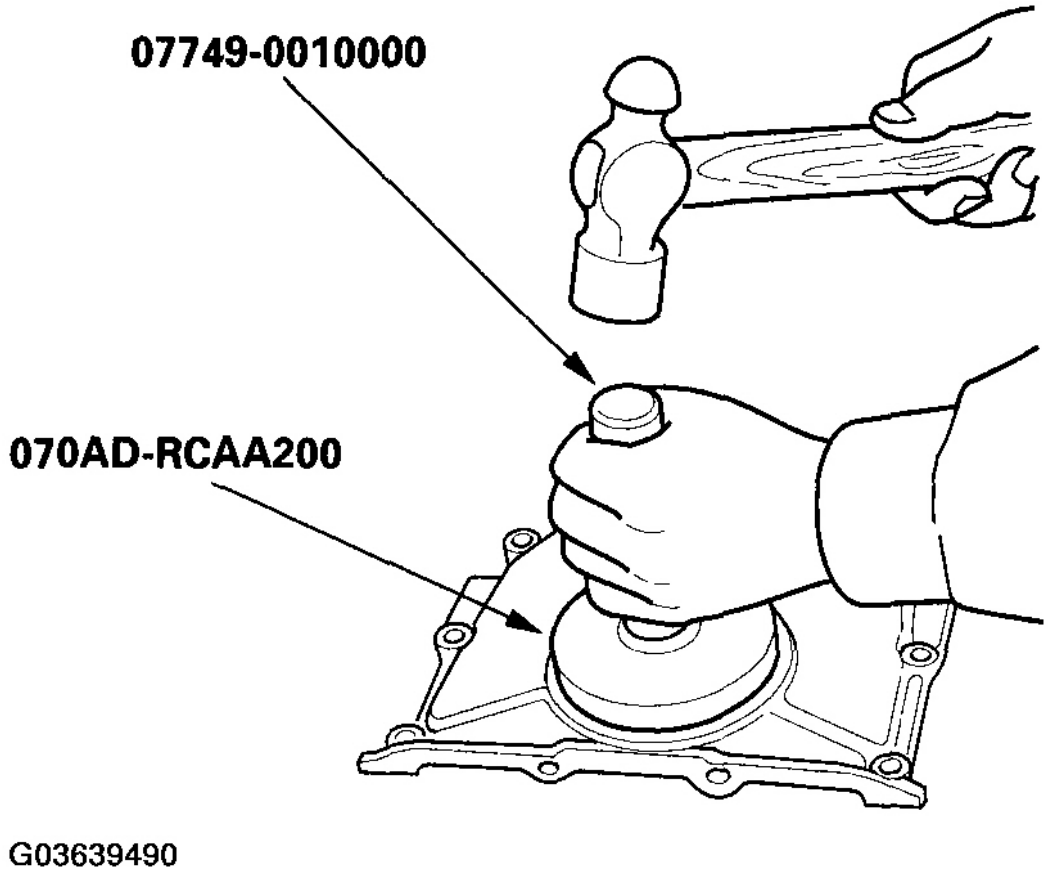

Fig. 58: Driving In Crankshaft Oil Seal
Courtesy of AMERICAN HONDA MOTOR CO., INC.

25. Remove all of the old liquid gasket from the engine block end cover mating surfaces, bolts, and bolt holes.
26. Clean and dry the engine block end cover mating surfaces.
27. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0002, 08718-0003, or 08718-0009, evenly to the engine block mating surface of the engine block end cover.

NOTE: Do not install components if too mach time has passed after applying the liquid gasket (for P/N 08718-0002, no more than 4 minutes, for all others, no more than 5 minutes). Instead, remove the old residue and reapply the liquid gasket.

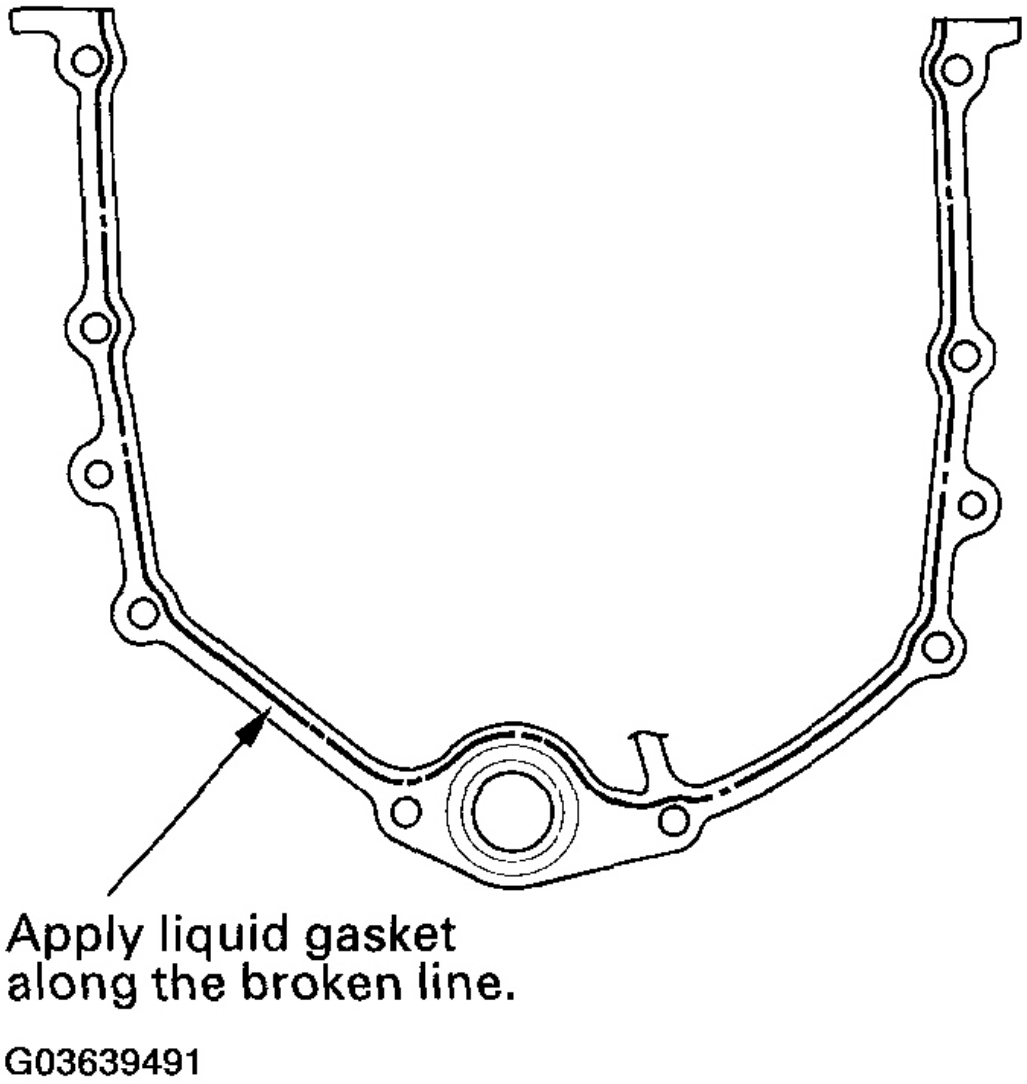

Fig. 59: Applying Liquid Gasket To Engine Block Mating Surface
Courtesy of AMERICAN HONDA MOTOR CO., INC.

28. Install the dowel pins (A), new O-ring (B), and the engine block end cover (C) on the engine block.

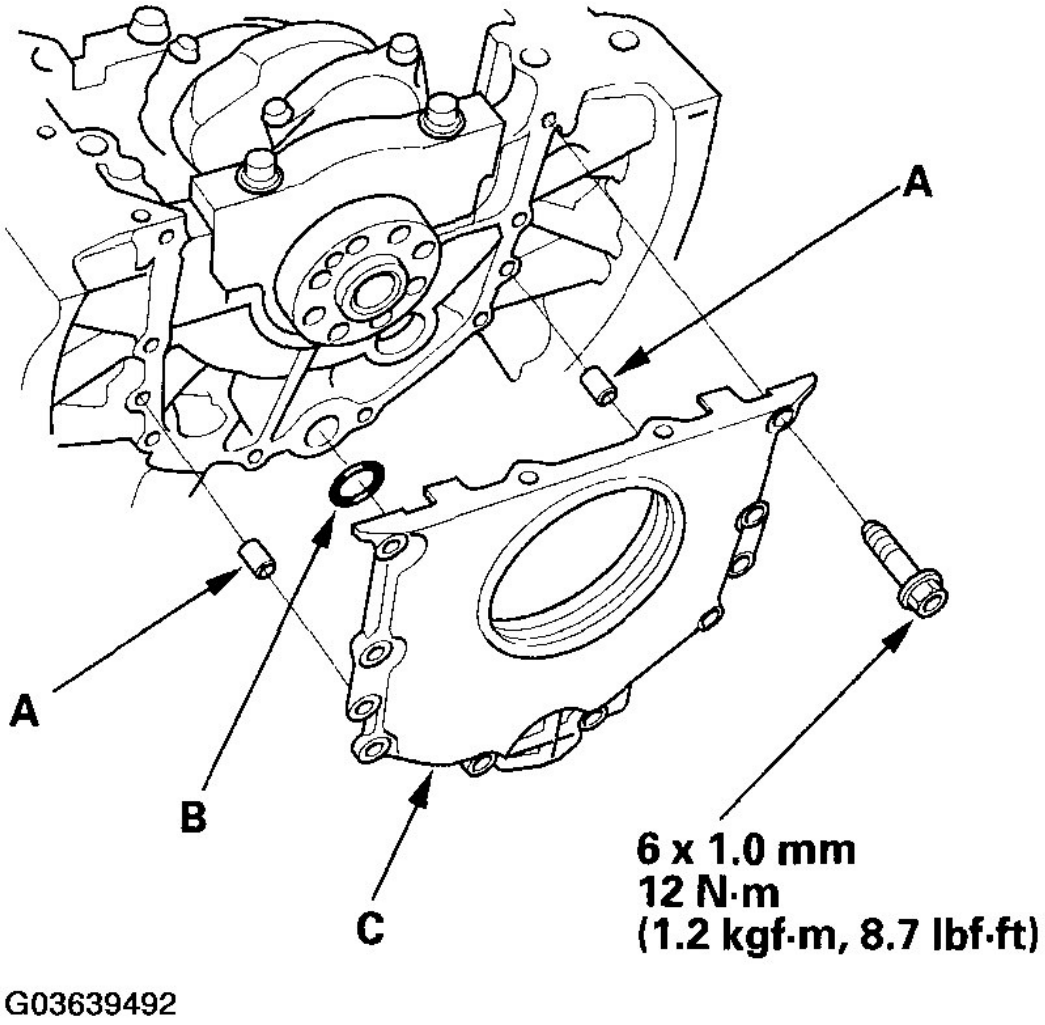

Fig. 60: Installing Dowel Pins
Courtesy of AMERICAN HONDA MOTOR CO., INC.

29. Clean the excess grease off the crankshaft, and check the seal for distortion.
30. Install a new crankshaft oil seal in the oil pump (see step 2 in **INSTALLATION**).
31. Remove all of the old liquid gasket from the oil pump mating surfaces, bolts, and bolt holes.
32. Clean and dry the oil pump mating surfaces.
33. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0002, 08718-0003, or 08718-0009, evenly to the engine block mating surface of the oil pump.

NOTE: Do not install components if too mach time has passed after applying the liquid gasket (for P/N 08718-0002, no more than 4 minutes, for all others,

no more than 5 minutes). Instead, remove the old residue and reapply the liquid gasket.

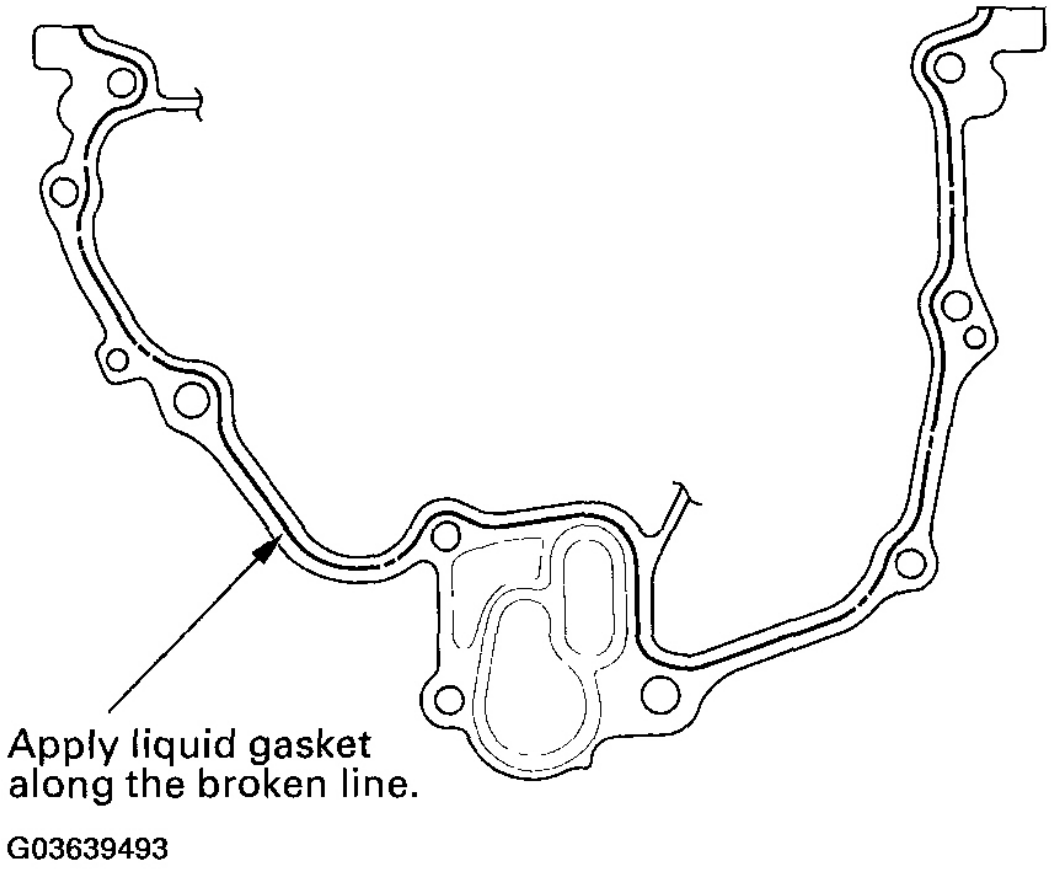

Fig. 61: Applying Liquid Gasket To Engine Block Mating Surface
Courtesy of AMERICAN HONDA MOTOR CO., INC.

34. Grease the lip of the oil seal, and apply oil to the new O-ring (A).

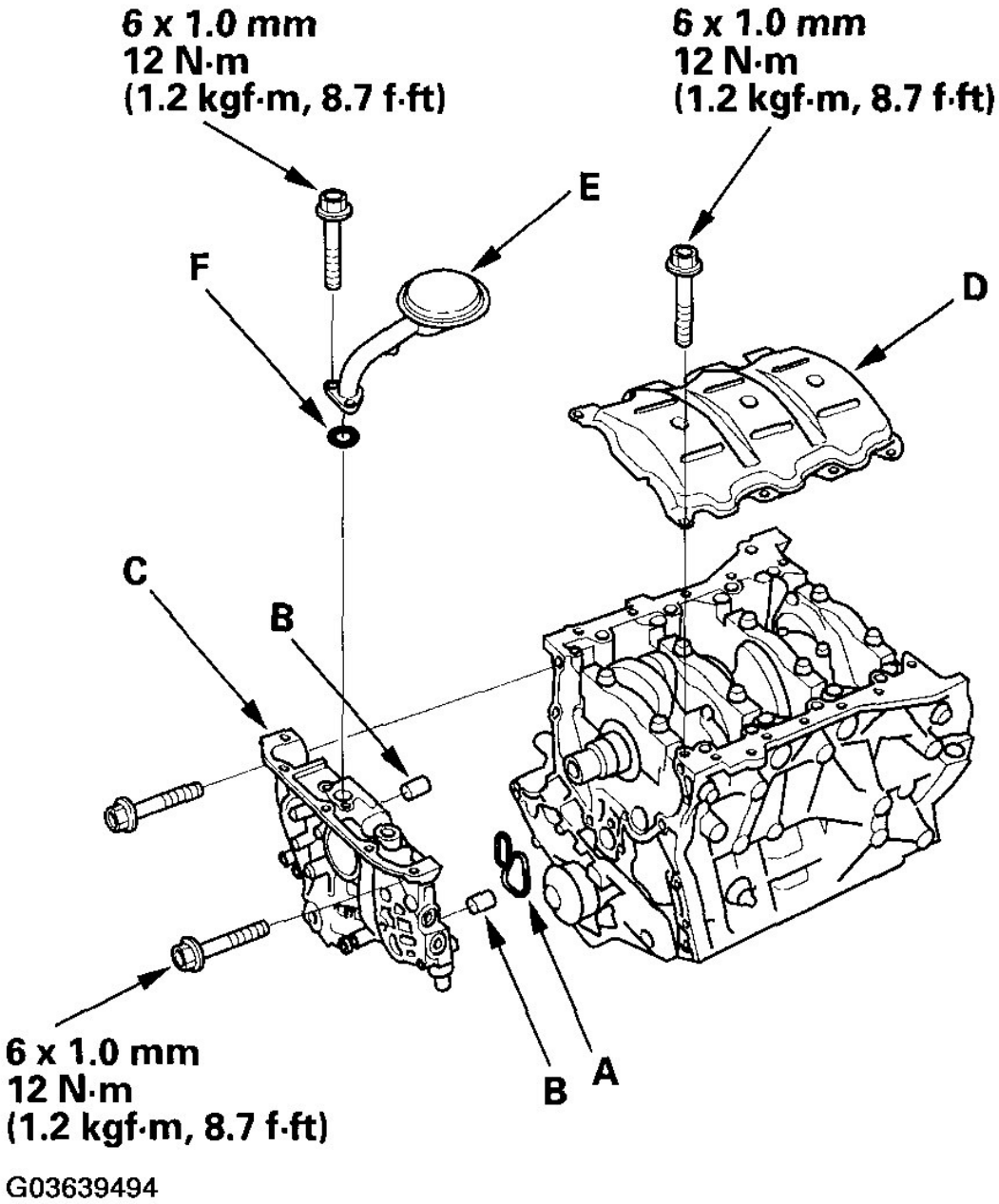

Fig. 62: Applying Oil To O-Ring
Courtesy of AMERICAN HONDA MOTOR CO., INC.

35. Install the dowel pins (B), then align the inner rotor with the crankshaft, and install the oil pump (C).
36. Clean the excess grease off the crankshaft, and check the seal for distortion.
37. Install the baffle plate (D), then install the oil screen (E) with new O-ring (F).
38. Install the rocker arm oil control solenoid (VTEC solenoid valve)/oil filter assembly (A), with a new

rocker arm oil control solenoid (VTEC solenoid valve) filter (B).

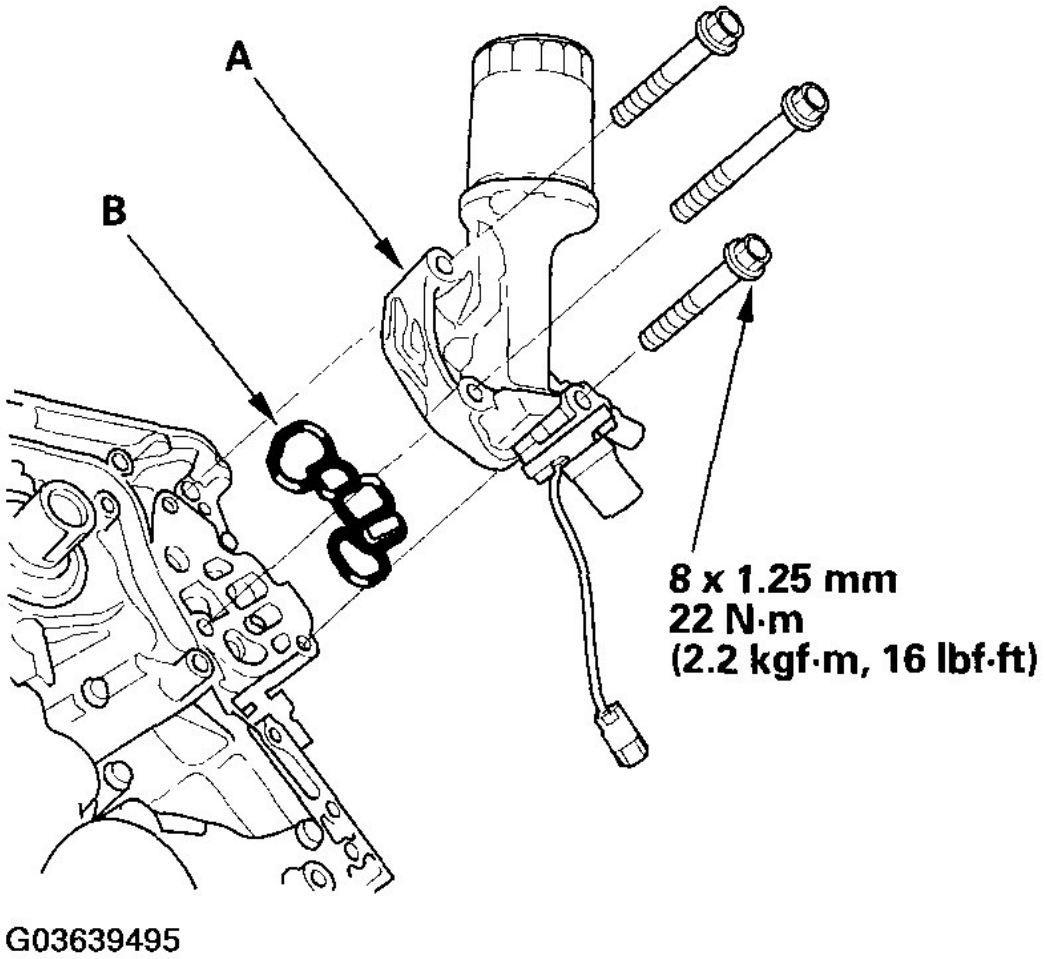

Fig. 63: Installing Rocker Arm Oil Control Solenoid (VTEC Solenoid)/Oil Filter Assembly
Courtesy of AMERICAN HONDA MOTOR CO., INC.

39. Install the oil pan (see **OIL PAN INSTALLATION**).
40. Install the crankshaft position (CKP) sensor (see **CKP SENSOR REPLACEMENT**).
41. Install the cylinder heads (see **CYLINDER HEAD INSTALLATION**).
42. Install the drive plate (see **DRIVE PLATE REMOVAL AND INSTALLATION**).
43. Install the transmission (see **TRANSMISSION INSTALLATION**).
44. Install the engine assembly (see **ENGINE INSTALLATION**).

NOTE: When any crankshaft or connecting rod bearing is replaced, after assembly it is necessary to run the engine at idling speed until it reaches

normal operating temperature, then continue to run it for about 15 minutes.

OIL PAN INSTALLATION

1. Remove all of the old liquid gasket from the oil pan mating surfaces, bolts, and bolt holes.
2. Clean and dry the oil pan mating surfaces.
3. Apply liquid gasket, P/N 08717-0004,08718-0001, 08718-0002, 08718-0003, or 08718-009, evenly to the oil pan mating surface of the engine block.

NOTE: Do not install components if too mach time has passed after applying the liquid gasket (for P/N 08718-0002, no more than 4 minutes, for all others, no more than 5 minutes). Instead, remove the old residue and reapply the liquid gasket.

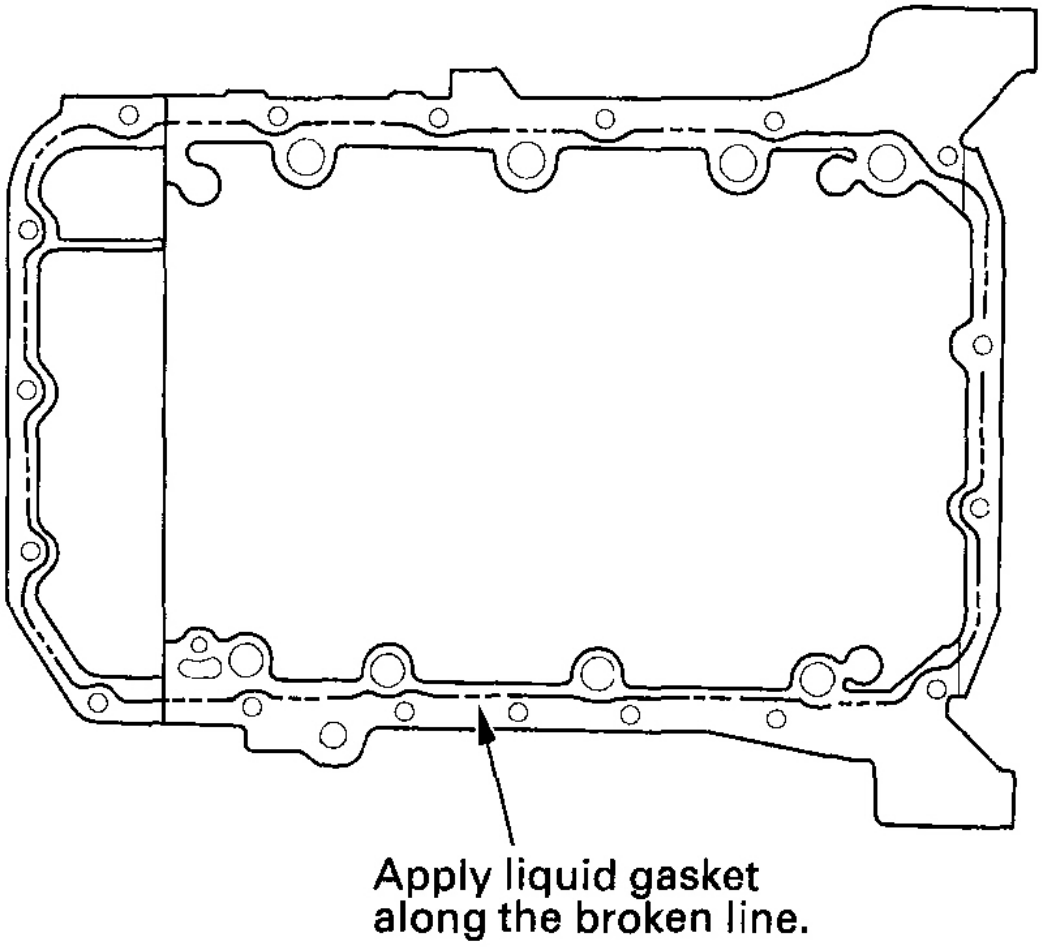

Fig. 64: Applying Liquid Gasket to Oil Pan Mating Surface
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Install the oil pan on the engine block.
5. Tighten the bolts in two or three steps. In the final step, tighten all bolts, in sequence, to 12 N.m (1.2 kgf.m, 8.7 lbf.ft).

NOTE: After assembly, wait at least 30 minutes before filling the engine with oil.

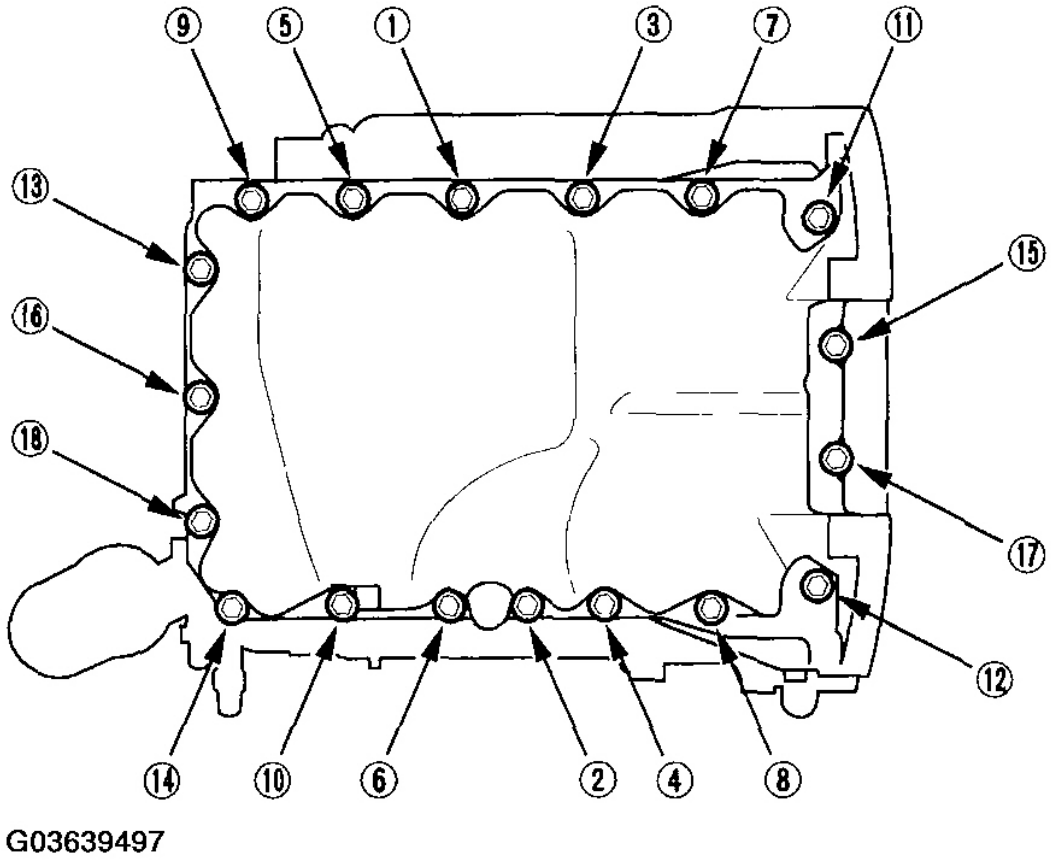

Fig. 65: Tightening Oil Pan Bolts In Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Tighten the four bolts (A) securing the transmission, then install the torque converter cover (B).

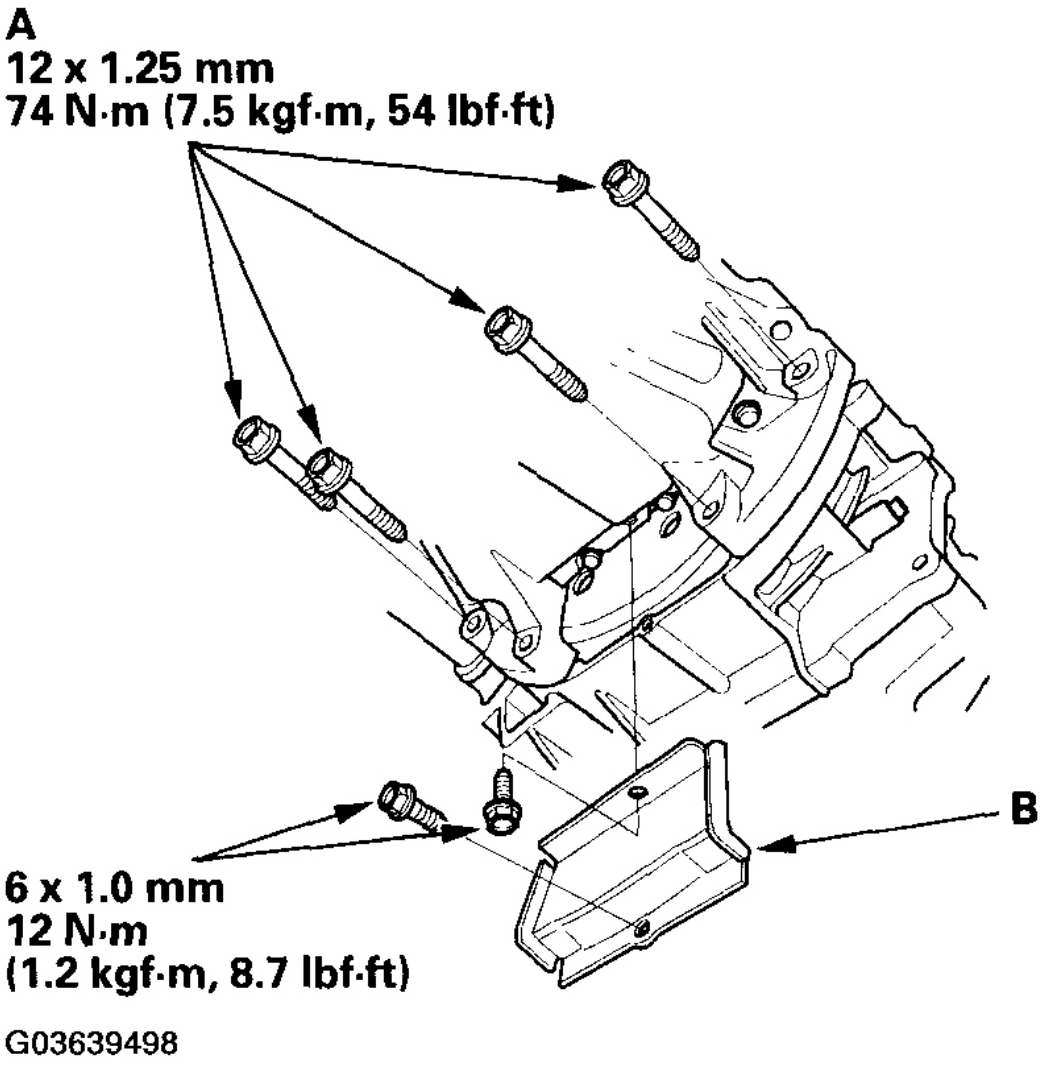

Fig. 66: Tightening Transmission Bolts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Install the rear warm up three way catalytic converter (rear WU-TWC) bracket.

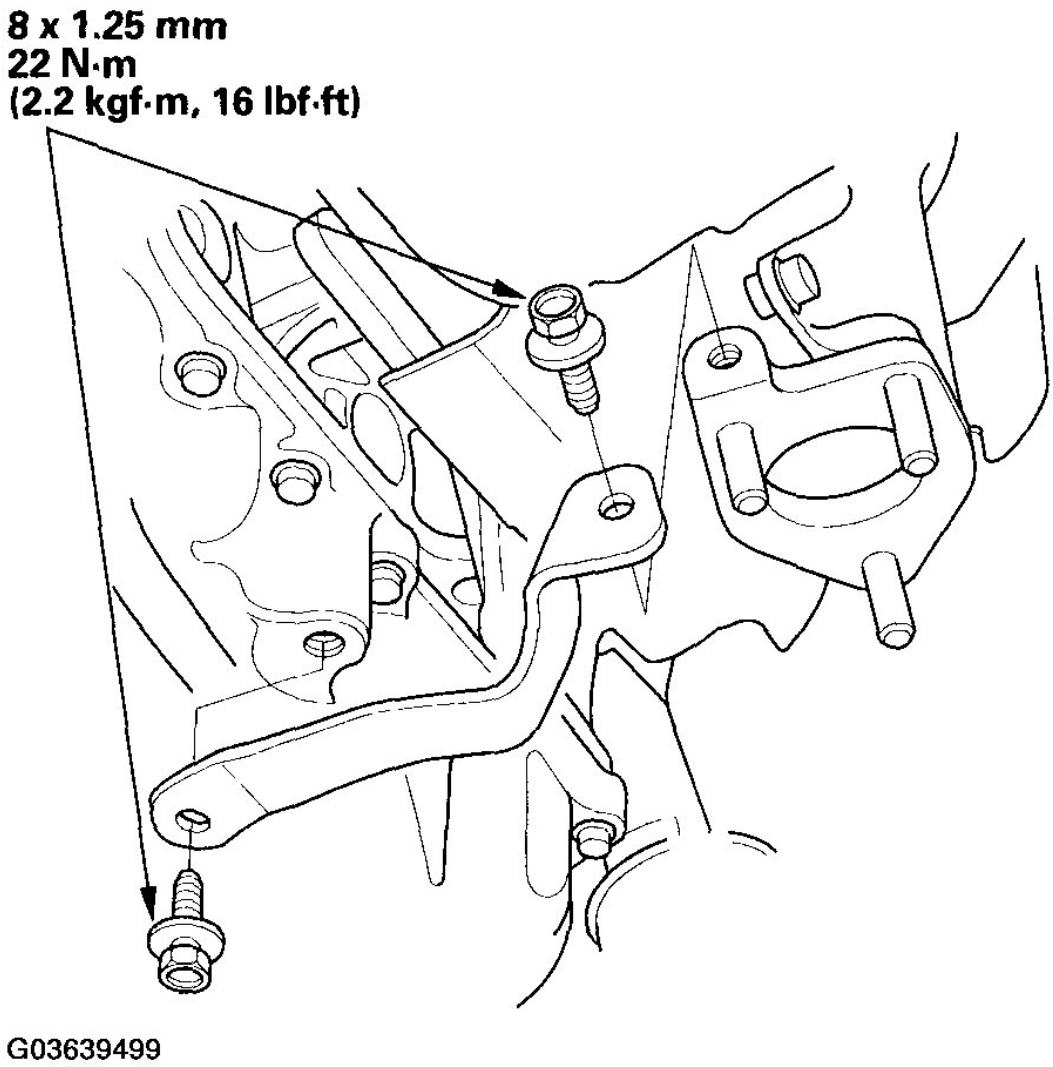

Fig. 67: Installing Rear WU-TWC Bracket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. If the engine is still in the vehicle, do the following steps.
9. Install exhaust pipe A using new gaskets and new self-locking nuts (see step 24 in **ENGINE INSTALLATION**).
10. Install the splash shield (see step 27 in **ENGINE INSTALLATION**).
11. Refill the engine with engine oil (see step 4 in **ENGINE OIL REPLACEMENT**).
12. Lower the vehicle on the hoist.

PULLEY END CRANKSHAFT OIL SEAL INSTALLATION - IN CAR

Special Tools Required

Oil seal driver, 64 mm 070AD-RCAA100

1. Remove the crankshaft position (CKP) sensor, timing belt, and timing belt drive pulley (see **TIMING BELT DRIVE PULLEY REPLACEMENT**).
2. Remove the pulley end crankshaft oil seal.
3. Clean and dry the crankshaft oil seal housing.
4. Apply a light coat of multipurpose grease to the crankshaft and to the lip of the seal.
5. Using the special tool, drive in the crankshaft oil seal until the driver bottoms against the oil pump. When the seal is in place, clean any excess grease off the crankshaft, and check that the oil seal lip is not distorted.

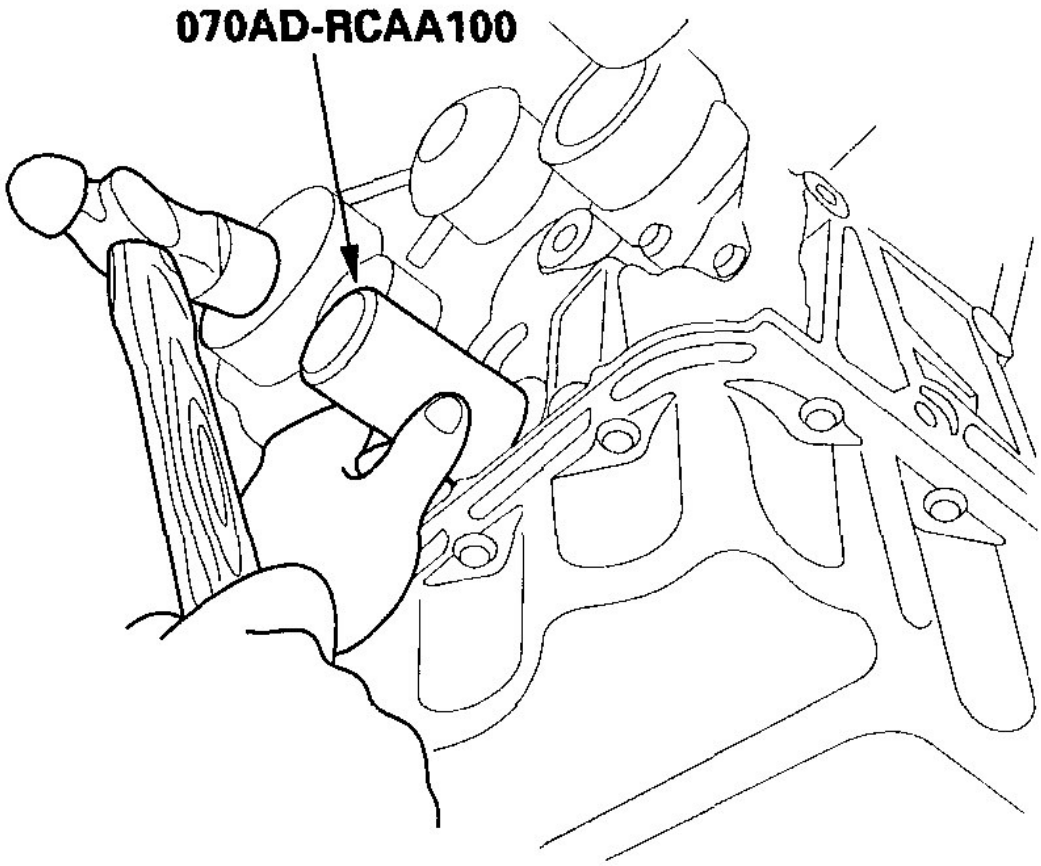

Fig. 68: Driving In Crankshaft Oil Seal
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Install the timing belt drive pulley, CKP sensor, and timing belt (see **TIMING BELT DRIVE PULLEY REPLACEMENT**).

TRANSMISSION END CRANKSHAFT OIL SEAL INSTALLATION - IN CAR

Special Tools Required

- Driver 07749-0010000
- Driver attachment, 106 mm 070AD-RCAA200

1. Remove the transmission (see **TRANSMISSION REMOVAL**) and the drive plate (see **DRIVE PLATE REMOVAL AND INSTALLATION**).
2. Clean and dry the crankshaft oil seal housing.
3. Apply a light coat of multipurpose grease to the crankshaft and to the lip of the seal.
4. Using the special tools, drive in the crankshaft oil seal until the driver attachment bottoms against the engine block end cover. Align the hole in the driver attachment with the pin on the crankshaft.

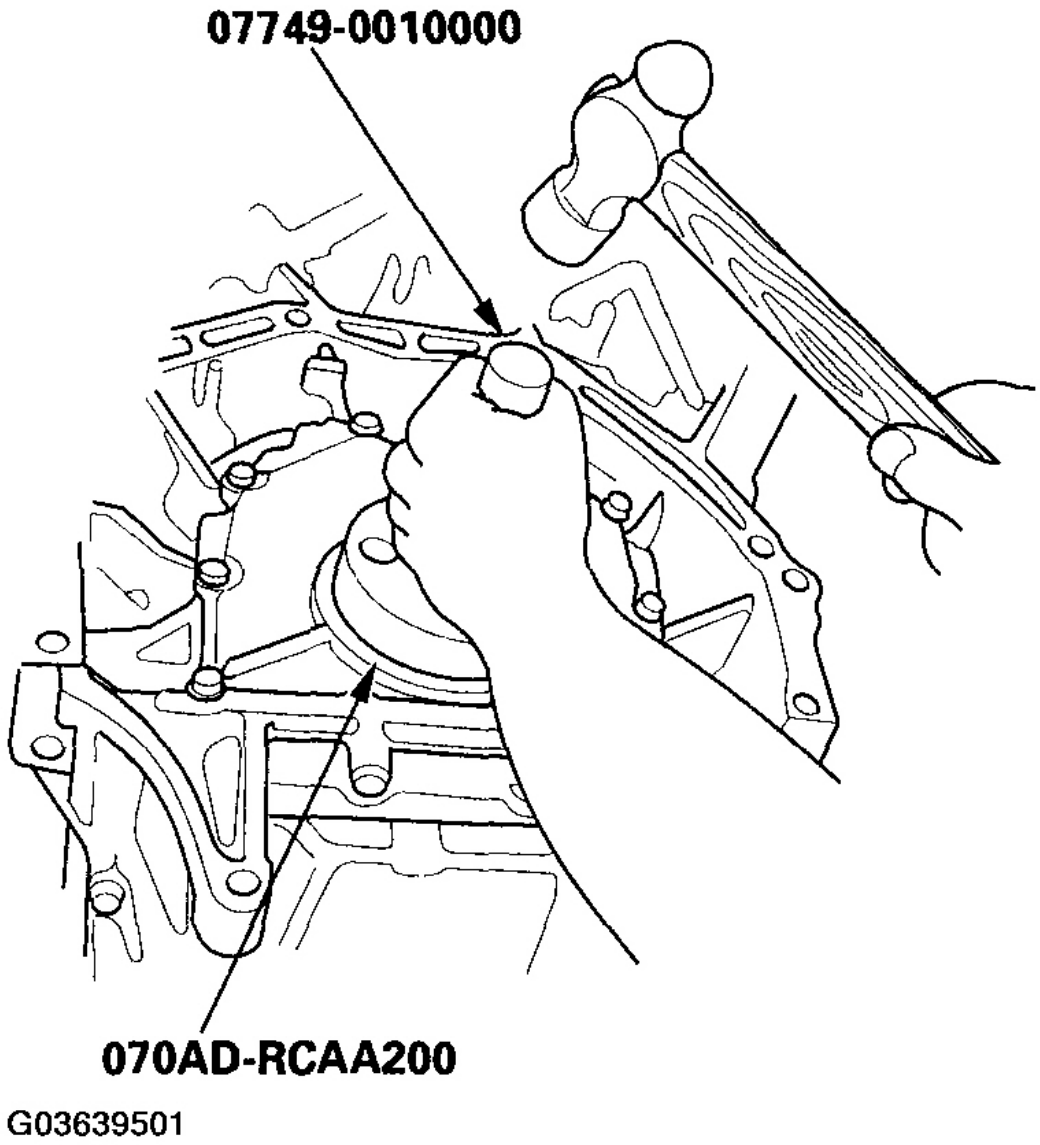

Fig. 69: Driving In Crankshaft Oil Seal
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Clean any excess grease off the crankshaft, and check that the oil seal lip is not distorted.
6. Install the drive plate (see **DRIVE PLATE REMOVAL AND INSTALLATION**) and the transmission (see **TRANSMISSION INSTALLATION**).

