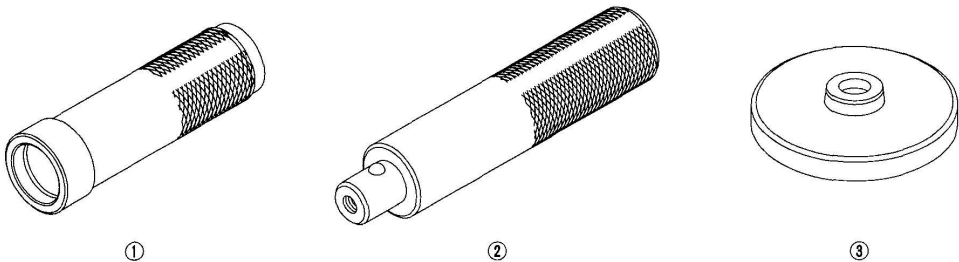


**2000-06 ENGINE**

**Engine Block - Insight**

**SPECIAL TOOLS**

Ref. No.	Tool Number	Description	Qty
①	07746-0030100	Driver 40 mm I.D.	1
②	07749-0010000	Driver	1
③	07948-SB00101	Driver Attachment	1



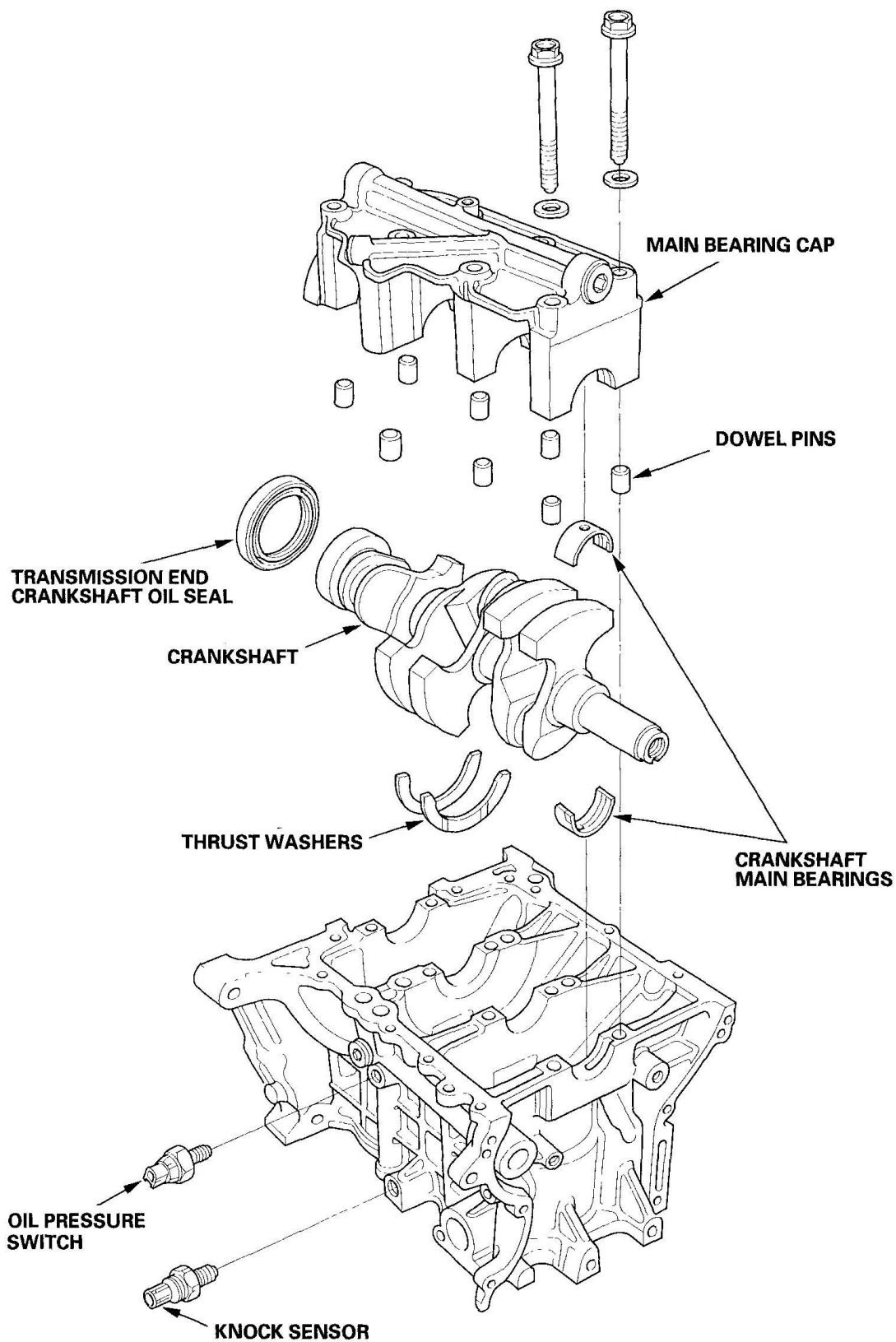
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**Fig. 1: Identifying Special Tools**  
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

**COMPONENT LOCATION INDEX**

## 2006 Honda Insight

2000-06 ENGINE Engine Block - Insight

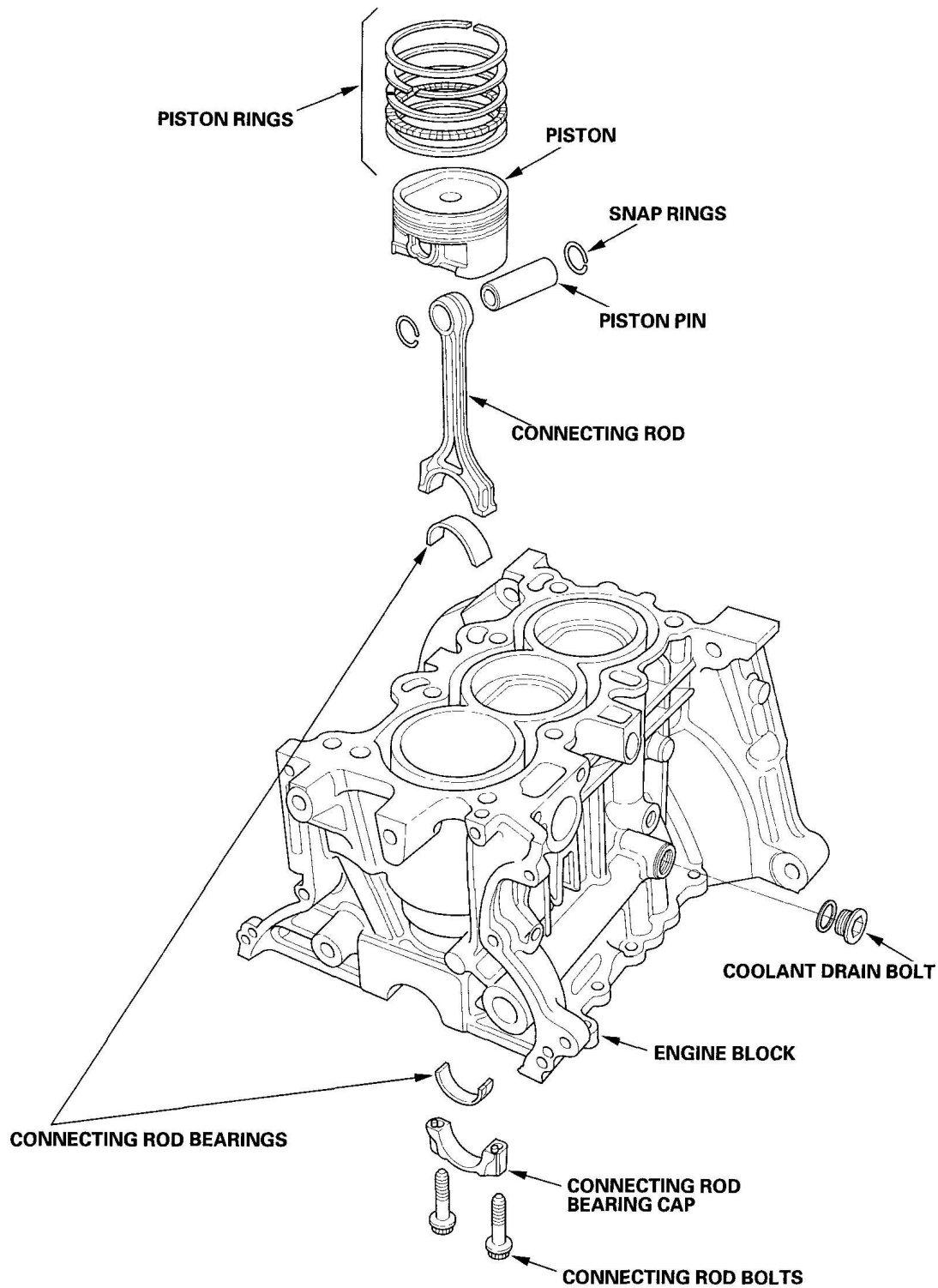


2006 Honda Insight
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**Fig. 2: Identifying Engine Block Component Location (1 Of 2)**  
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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**Fig. 3: Identifying Engine Block Component Location (2 Of 2)**

**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

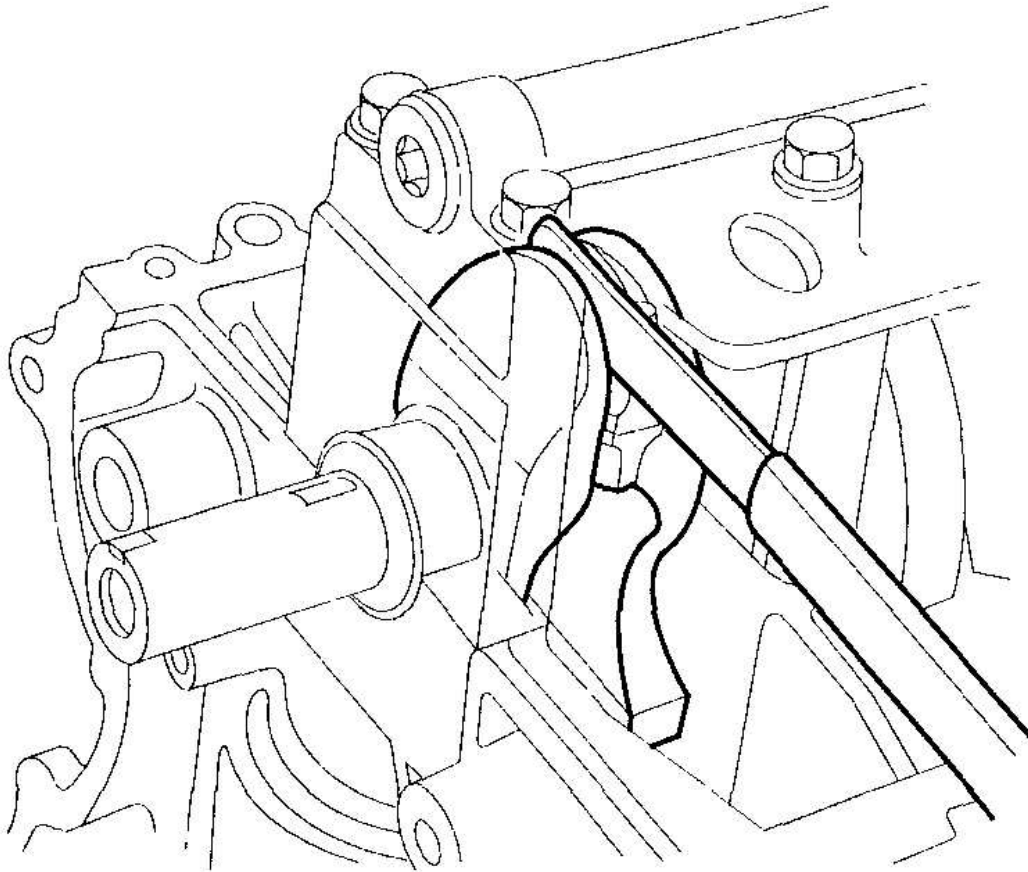
## **CONNECTING ROD AND CRANKSHAFT END PLAY INSPECTION**

1. Remove the cam chain (see **CAM CHAIN REMOVAL** ).
2. Measure the connecting rod end play with a feeler gauge between the connecting rod and crankshaft.

### **Connecting Rod End Play**

**Standard (New): 0.15-0.30 mm (0.006-0.012 in.)**

**Service Limit: 0.40 mm (0.016 in.)**



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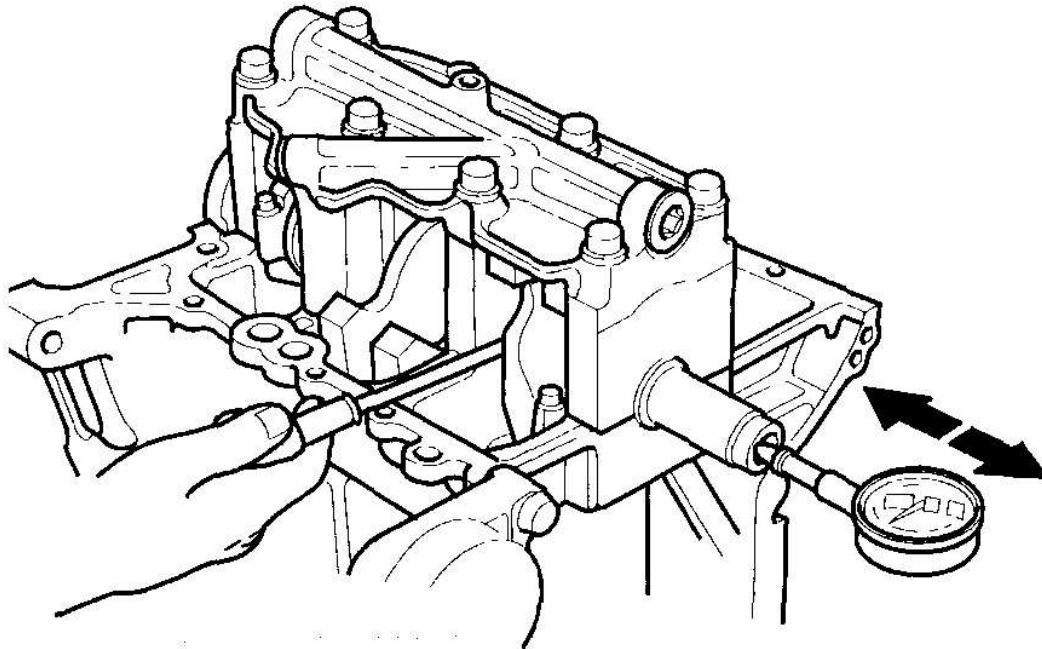
**Fig. 4: Measuring Connecting Rod End Play With Feeler Gauge**  
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

3. 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** ).
4. 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.)**



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**Fig. 5: Checking Crankshaft End Play**

**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

5. If 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 cap and bearing halves.
2. Clean each main journal and bearing half with a clean shop towel.
3. Place one strip of plastigage across each main journal.

4. Reinstall the bearings and caps, then torque the bolts to 25 N.m (2.5 kgf.m, 18 lbf.ft) +60°.

**NOTE: Do not rotate the crankshaft during inspection.**

5. Remove the caps and bearings again, and measure the widest part of the plastigage.

### **Main Bearing-to-Journal Oil Clearance**

#### **No. 1, 4 Journals:**

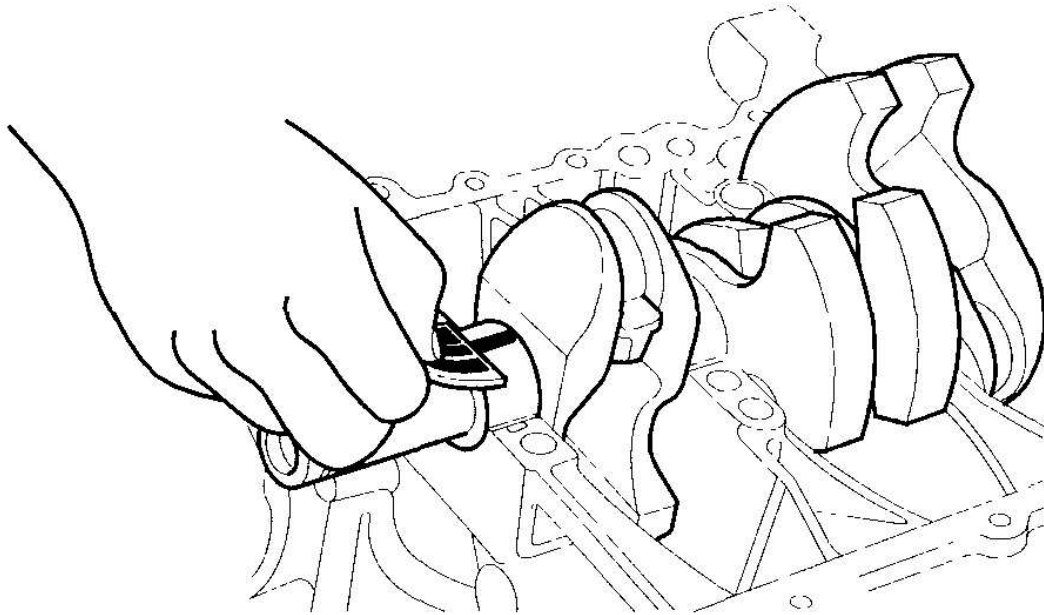
**Standard (New): 0.014-0.032 mm (0.0006-0.0013 in.)**

**Service Limit: 0.045 mm (0.0018 in.)**

**No. 2, 3 Journals: Standard (New): 0.020-0.038 mm (0.0008-0.0015 in.)**

**Service Limit: 0.050 mm (0.0020 in.)**





G03680492

**Fig. 6: Measuring Widest Part Of Plastigage**  
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

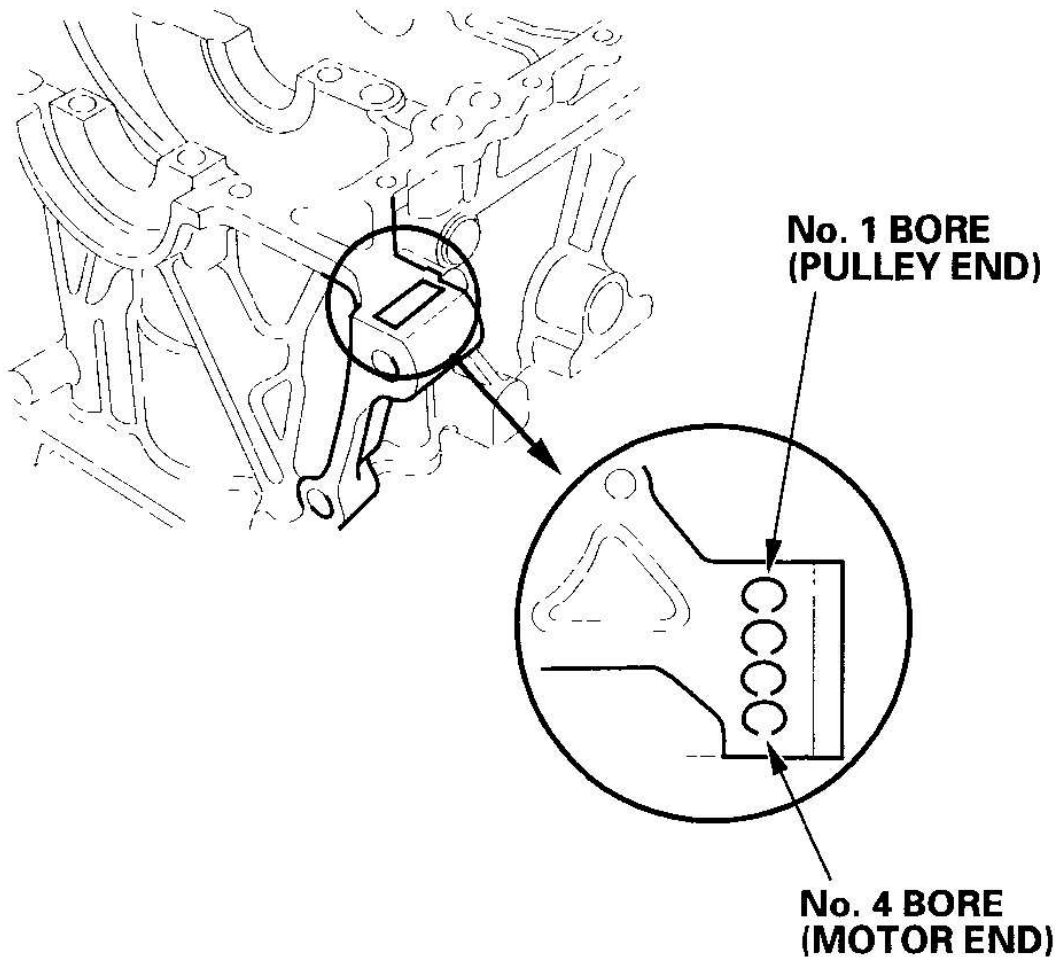
6. If the plastigage measures too wide or too narrow, remove the upper half of the bearing. Install a new, complete bearing with the same color code(s), and recheck the clearance. Do not file, shim, or scrape the bearings or the caps to adjust clearance.
7. If the plastigage shows the clearance is still 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**

1. Letters have been stamped on the end of the engine block as a code for the size of each of the four main journal bores. Write down the crank bore codes. If you can't read the codes because of accumulated dirt and dust, do not scrub them

with a wire brush or scraper. Clean them only with solvent or detergent.

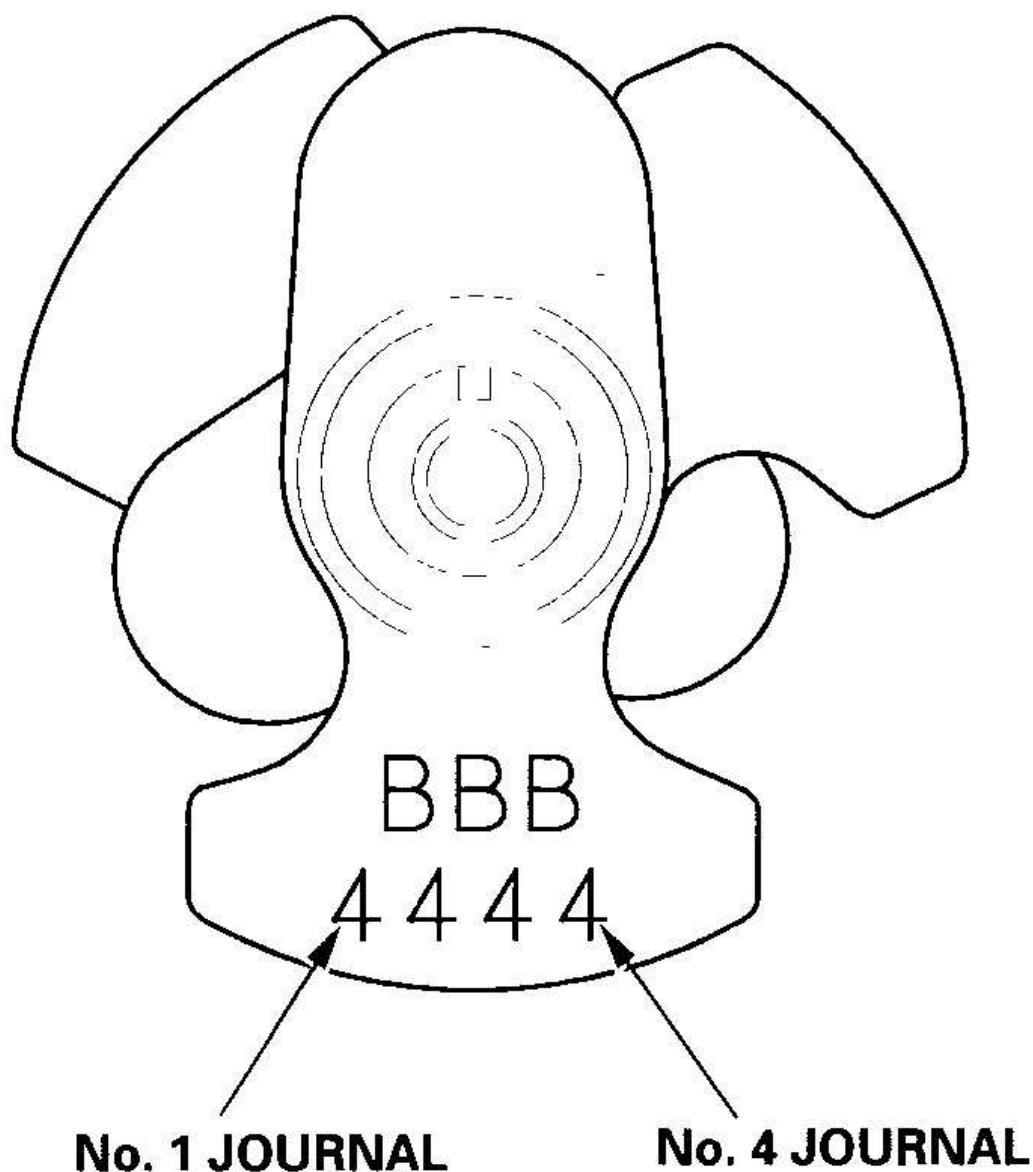


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**Fig. 7: Identifying Engine Block Code**  
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

**Main Journal Code Locations**

2. The main journal codes are stamped on the No. 1 web.



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**Fig. 8: Identifying Main Journal Code Locations**  
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

3. Use the crank bore codes and crank journal codes to select the appropriate replacement bearings from the following table.

**NOTE:**

- Color code is on the edge of the bearing.
- When using bearing halves of different colors, it does not matter which color is used in the top or bottom.

		Crank bore code → Larger crank bore					
		A	B	C	D	E	F
		→ Smaller bearing (Thicker)					
Main journal code ↓	1	PUR	PUR/YEL	YEL	YEL/GRN	GRN	GRN/BRN
	2	PUR/YEL	YEL	YEL/GRN	GRN	GRN/BRN	BRN
	3	YEL	YEL/GRN	GRN	GRN/BRN	BRN	BRN/BLK
	4	YEL/GRN	GRN	GRN/BRN	BRN	BRN/BLK	BLK
	5	GRN	GRN/BRN	BRN	BRN/BLK	BLK	BLK/BLU
	6	GRN/BRN	BRN	BRN/BLK	BLK	BLK/BLU	BLU
Smaller main journal ↓		Smaller bearing (Thicker) ↓					

PUR: Purple  
BRN: Brown

YEL: Yellow  
BLK: Black

GRN: Green  
BLU: Blue

**Fig. 9: Color Code Table**

**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

**CONNECTING ROD BEARING REPLACEMENT**

**ROD BEARING CLEARANCE INSPECTION**

1. Remove the connecting rod cap and bearing half.
2. Clean the crankshaft rod journal and bearing half with a clean shop towel.
3. Place plastigage across the rod journal.
4. Reinstall the bearing half and cap, and torque the bolt to 9.8 N.m (1.0 kgf.m, 7.2 lbf.ft) +90°.

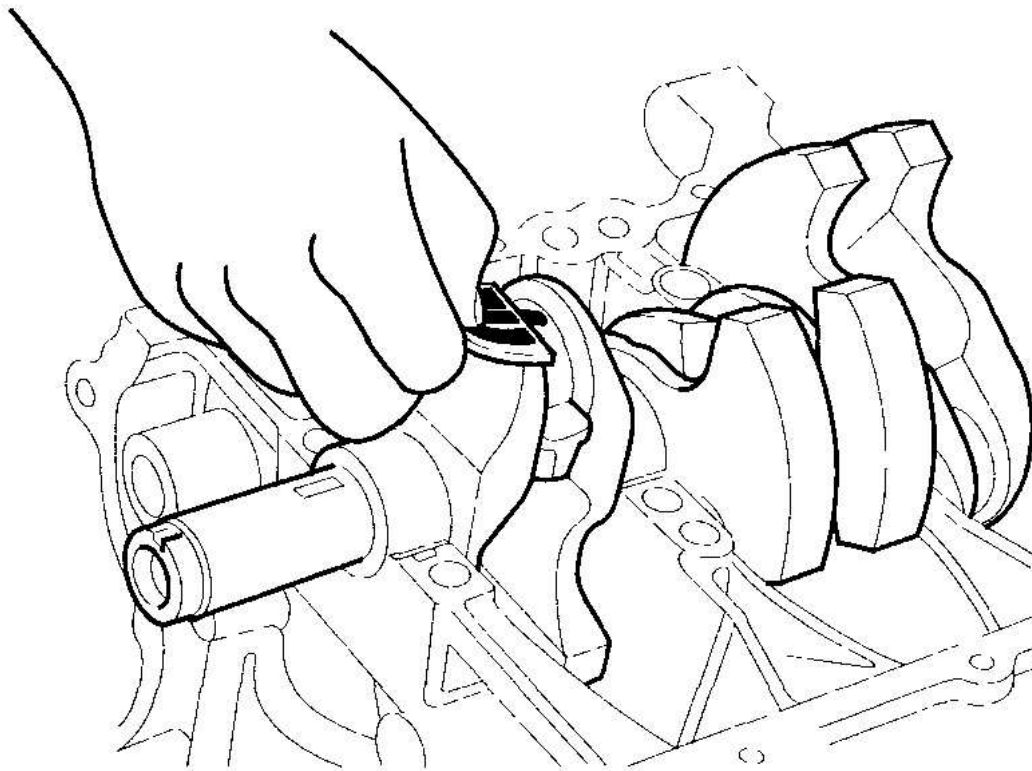
**NOTE: Do not rotate the crankshaft during inspection.**

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): 0.020-0.038 mm (0.0008-0.0015 in.)**

**Service Limit: 0.050 mm (0.0020 in.)**



**G03680496**

**Fig. 10: 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, install a new, complete bearing with the same color code(s), 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 bearing, replace the crankshaft and start over.

#### **ROD BEARING SELECTION**

1. Inspect each connecting rod for cracks and heat damage.

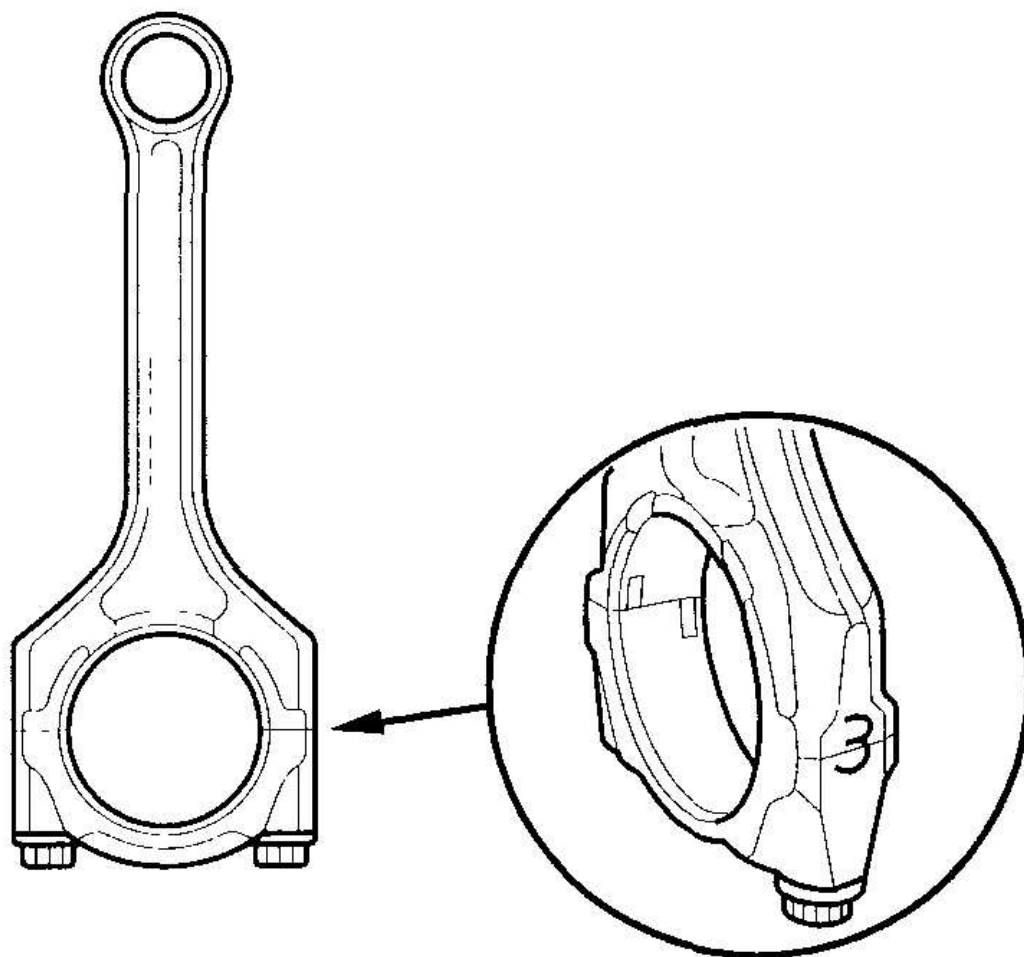
<b>2006 Honda Insight</b>
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**Connecting Rod Big End Bore Code Location**

2. Each rod has a tolerance range from 0 to 0.024 mm (0.0009 in.), and in 0.006 mm (0.0002 in.) increments, depending on the size of its big end bore. It's then stamped with a number (1, 2,3, or 4) indicating the range. You may find any combination of numbers in any engine, (half the number is stamped on the bearing cap, the other half on the rod).

If you cannot read the code because of an accumulation of oil and varnish, do not scrub them with a wire brush or scraper. Clean them only with solvent or detergent.





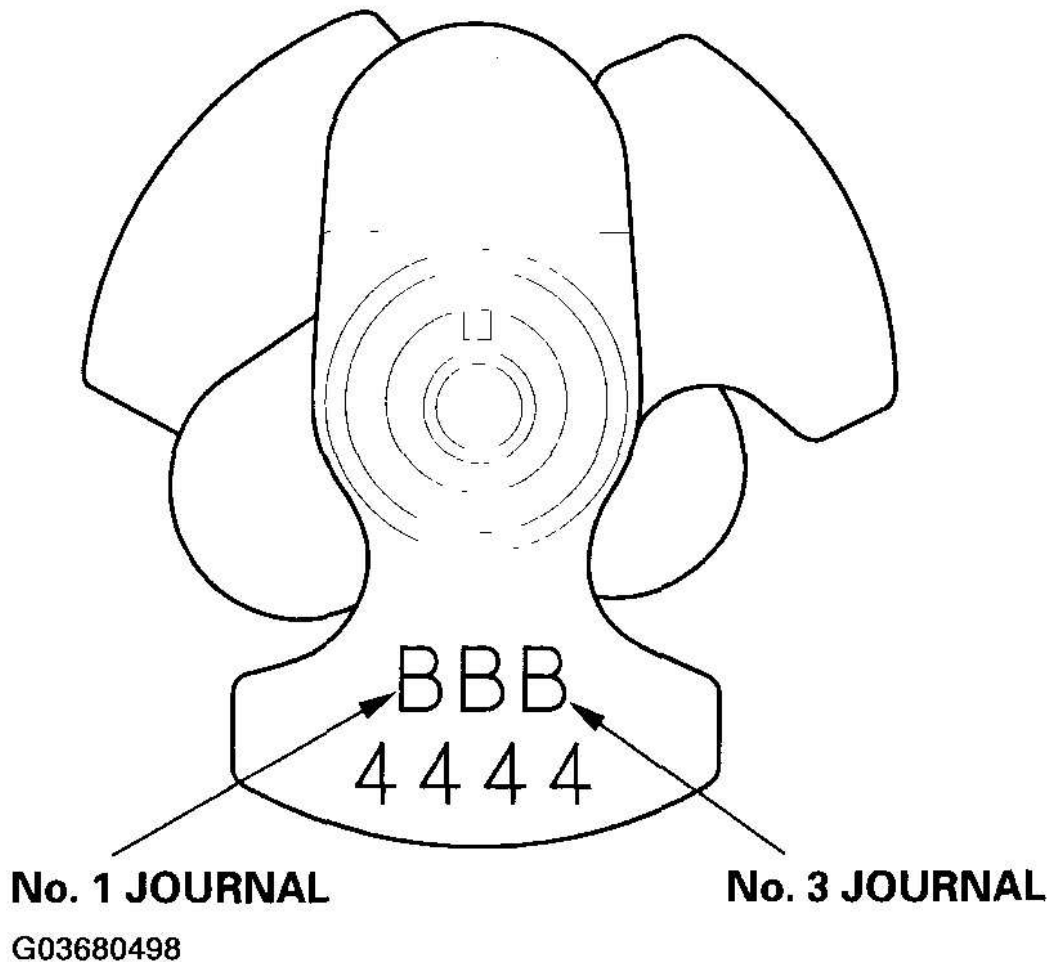
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**Fig. 11: Identifying Connecting Rod Big End Bore Code Location**  
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

**Connecting Rod Journal Code Location**

3. The connecting rod journal codes are stamped on the No. 1 web.





**Fig. 12: Identifying Connecting Rod Journal Code Location**  
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

4. Use the big end bore codes and rod journal codes to select appropriate replacement bearings from the following table.

**NOTE: Color code is on the edge of the bearing.**

		Big end bore code → Larger big end bore			
		1	2	3	4
Rod journal code ↓	A	→ Smaller bearing (Thicker)			
	B	RED	PUR	YEL	GRN
	C	PUR	YEL	GRN	BRN
	D	YEL	GRN	BRN	BLK
		GRN	BRN	BLK	BLU
Smaller rod journal		Smaller bearing (Thicker)			
RED: Red		PUR: Purple		YEL: Yellow	
GRN: Green		BRN: Brown		BLK: Black	
BLU: Blue					

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**Fig. 13: Color Code Table**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

**OIL PAN REMOVAL**

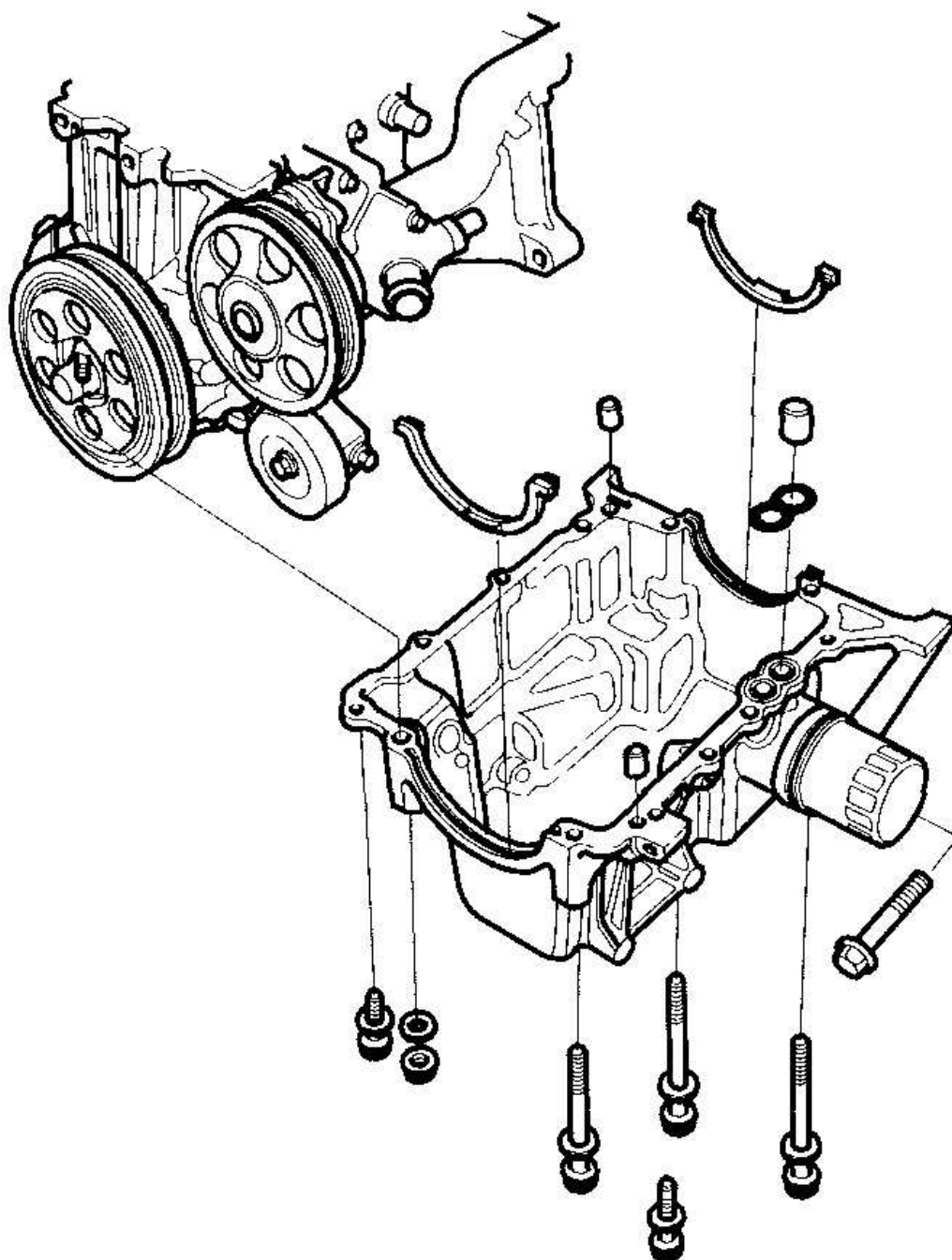
1. Raise the vehicle on the hoist to full height.
2. Remove the splash shield (see step 24 on **ENGINE ASSEMBLY** ).
3. Drain the engine oil (see **ENGINE OIL REPLACEMENT** ).
4. With A/C model: Remove the water pump-A/C compressor belt (see step 17 on **ENGINE ASSEMBLY** ).

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5. With A/C model: Remove the A/C compressor without disconnecting the A/C hoses (see step 31 on **ENGINE ASSEMBLY** ).
6. 2000-2003 models: Remove the engine oil cooler bypass hoses.
7. Remove the oil pan.

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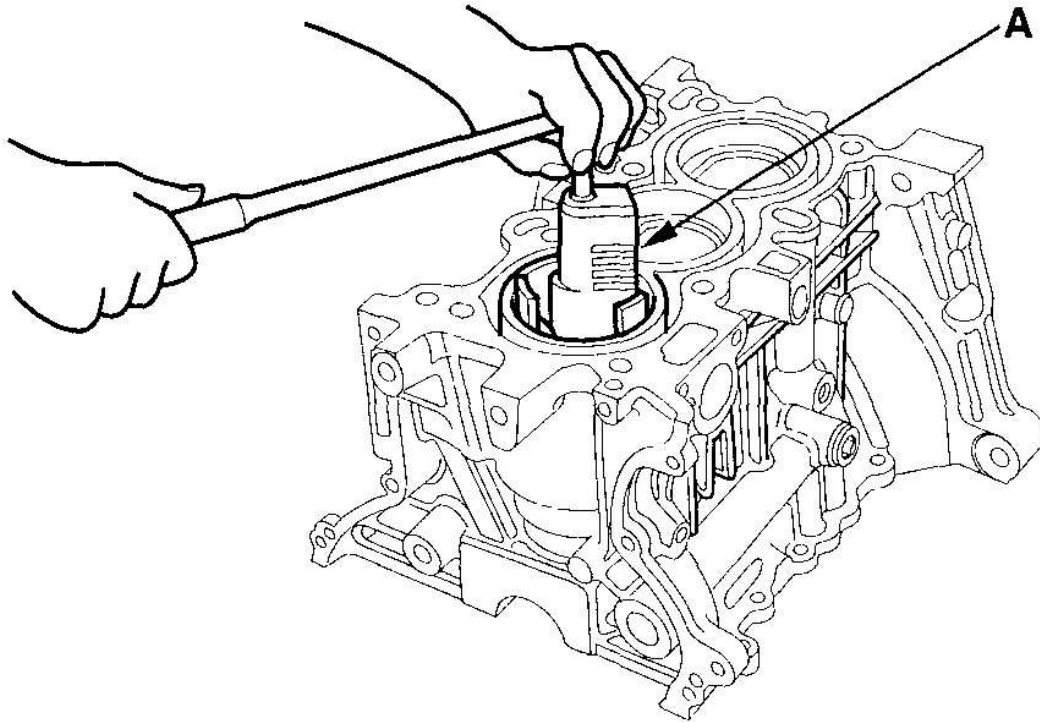
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**Fig. 14: Removing Oil Pan**

**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

## **CRANKSHAFT AND PISTON REMOVAL**

1. Remove the engine assembly (see **ENGINE REMOVAL** ).
2. Remove the transmission:
  - Manual transmission (M/T) (see **MANUAL TRANSMISSION** )
  - Continuously variable transmission (CVT) (see **TRANSMISSION REMOVAL** )
3. Remove the cylinder head (see **CYLINDER HEAD REMOVAL** ).
4. Remove the cam chain (see **CAM CHAIN REMOVAL** ).
5. If you can feel a ridge of metal or hard carbon around the top of each 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 is pushed out.

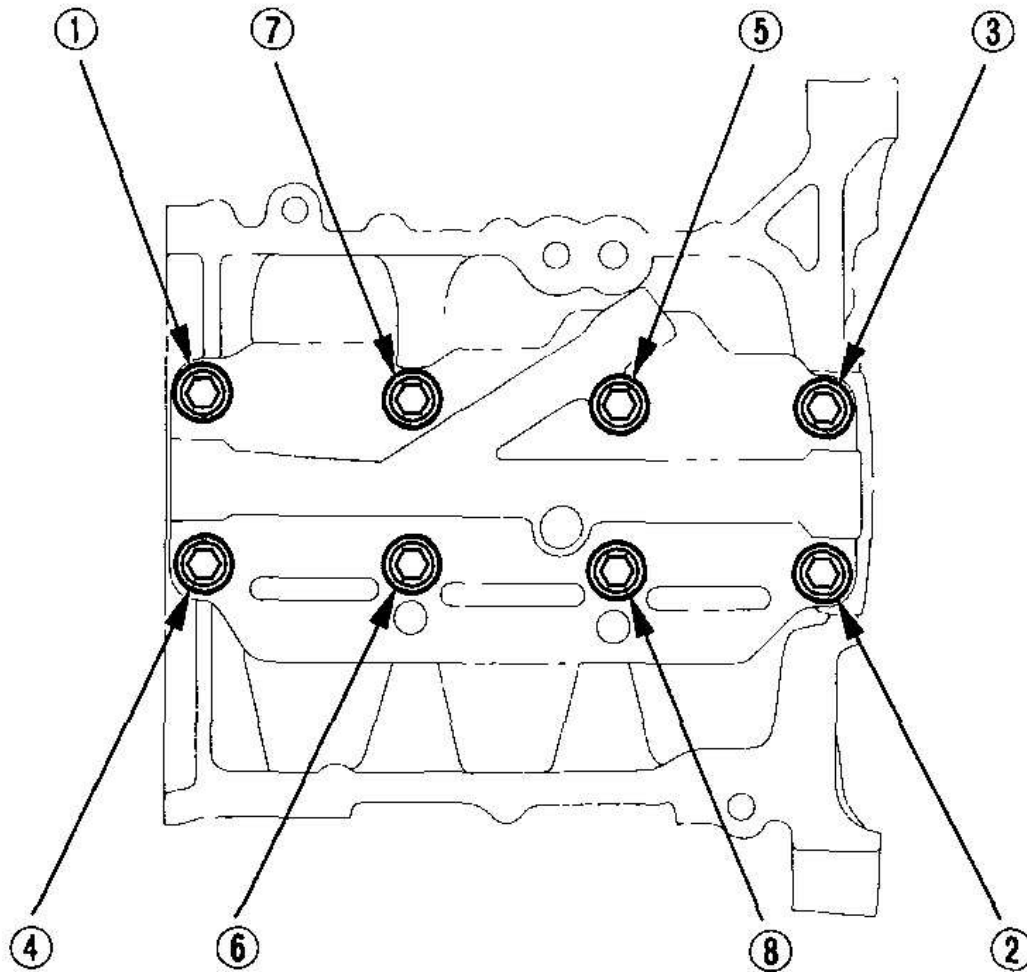


G03680501

**Fig. 15: Removing Ridge Of Metal Or Hard Carbon Around Top Of Cylinder**

**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

6. Remove the main bearing cap bolts. To prevent warpage, unscrew the bolts in sequence 1/3 turn at a time; repeat the sequence until all bolts are loosened.

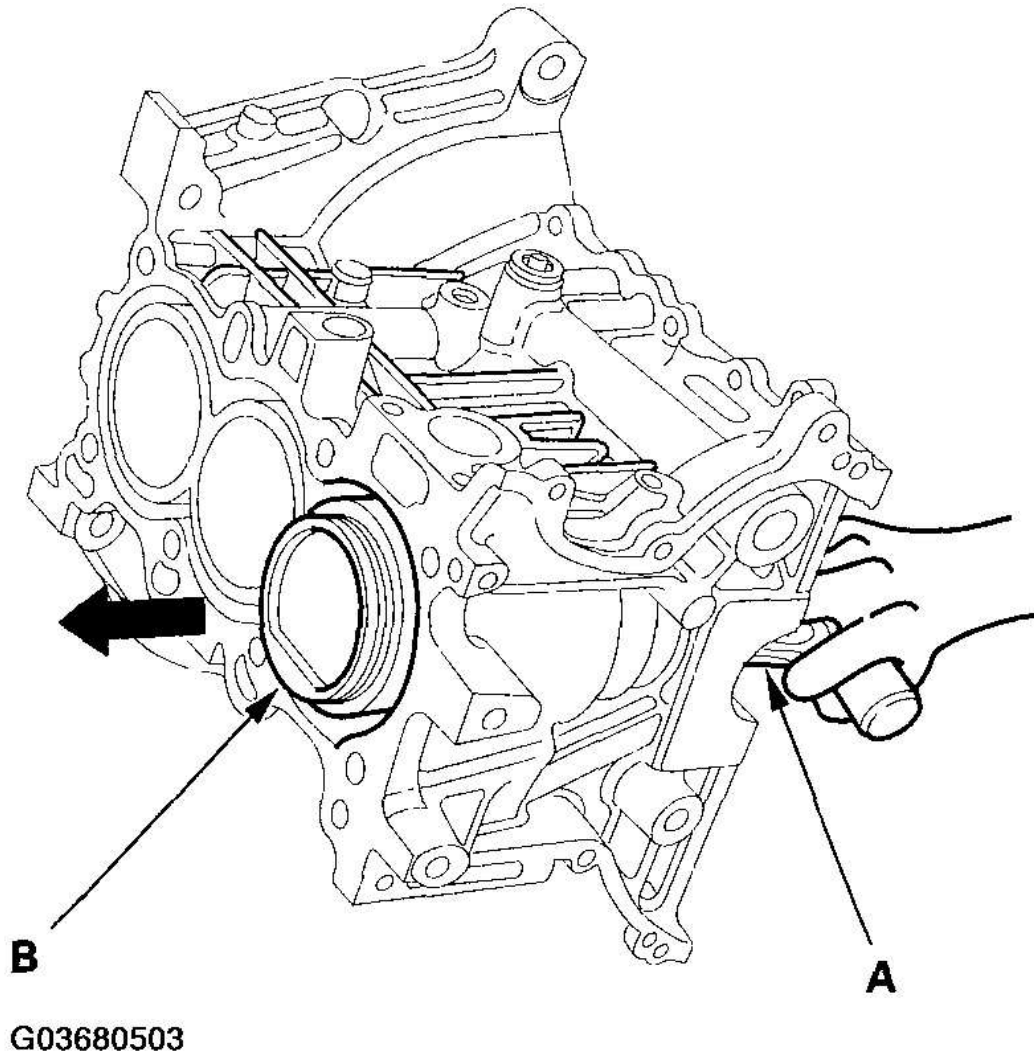


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**Fig. 16: Removing Main Bearing Cap Bolts**  
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

7. Remove the main bearing cap. Keep all bearings in order.
8. Remove the connecting rod bearing caps/bearings. Keep all caps/bearings in order.
9. Lift the crankshaft out of the engine, being careful not to damage the journals.
10. Use the wooden handle of a hammer (A) to drive out the piston (B).





**Fig. 17: Sliding Piston In Cylinder Block**  
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

11. Reinstall the connecting rod bearings and caps after removing each piston/connecting rod assembly.
12. To avoid mix-up on reassembly, mark each piston connecting rod assembly with its cylinder number.

**NOTE:** The existing number on the connecting rod does not



**indicate its position in the engine, it indicates the rod bore size.**

## **CRANKSHAFT INSPECTION**

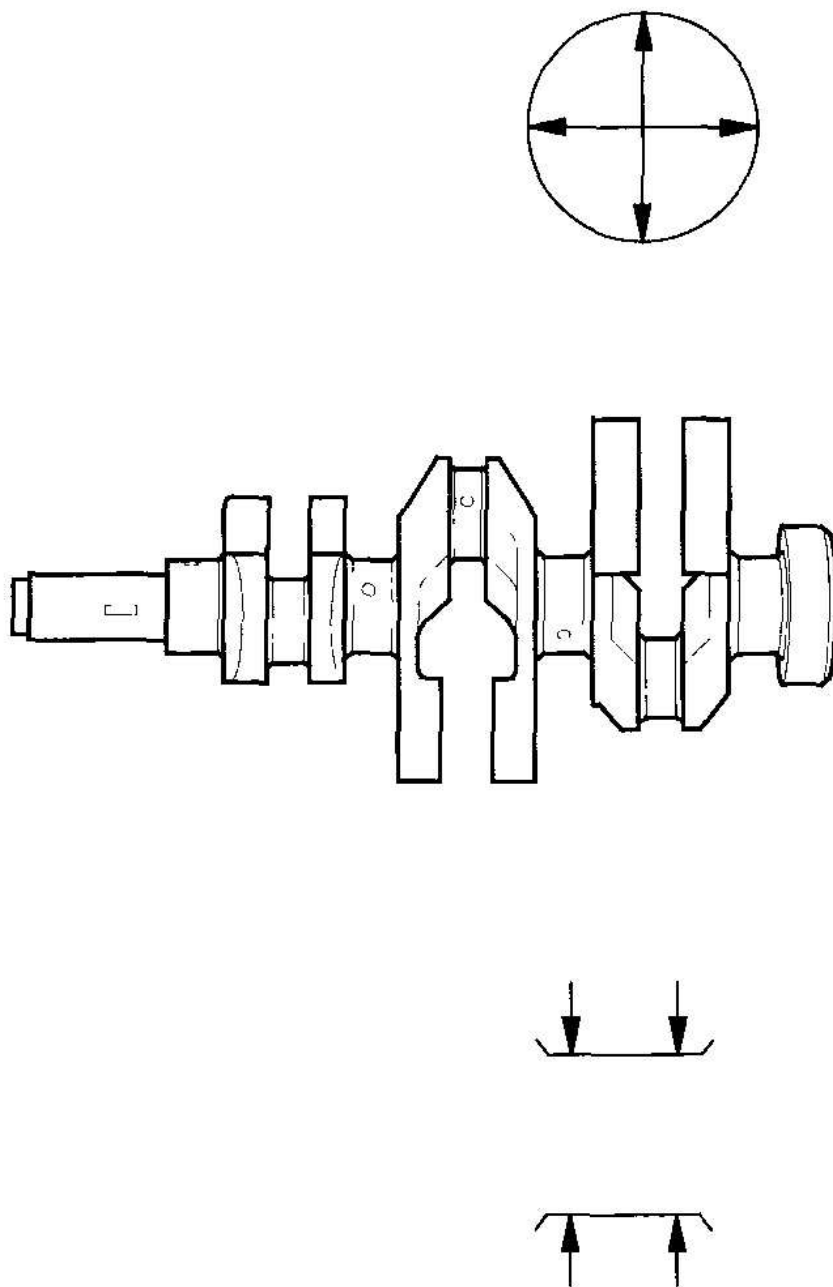
### **OUT-OF-ROUND AND TAPER**

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): 0.0040 mm (0.00016 in.) max.**

**Service Limit: 0.010 mm (0.0004 in.)**



G03680504

**Fig. 18: Measuring Out-Of-Round At Middle And Main Journal**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Measure taper at the edge 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): 0.0025 mm (0.000098 in.) max.**

**Service Limit: 0.006 mm (0.0002 in.)**

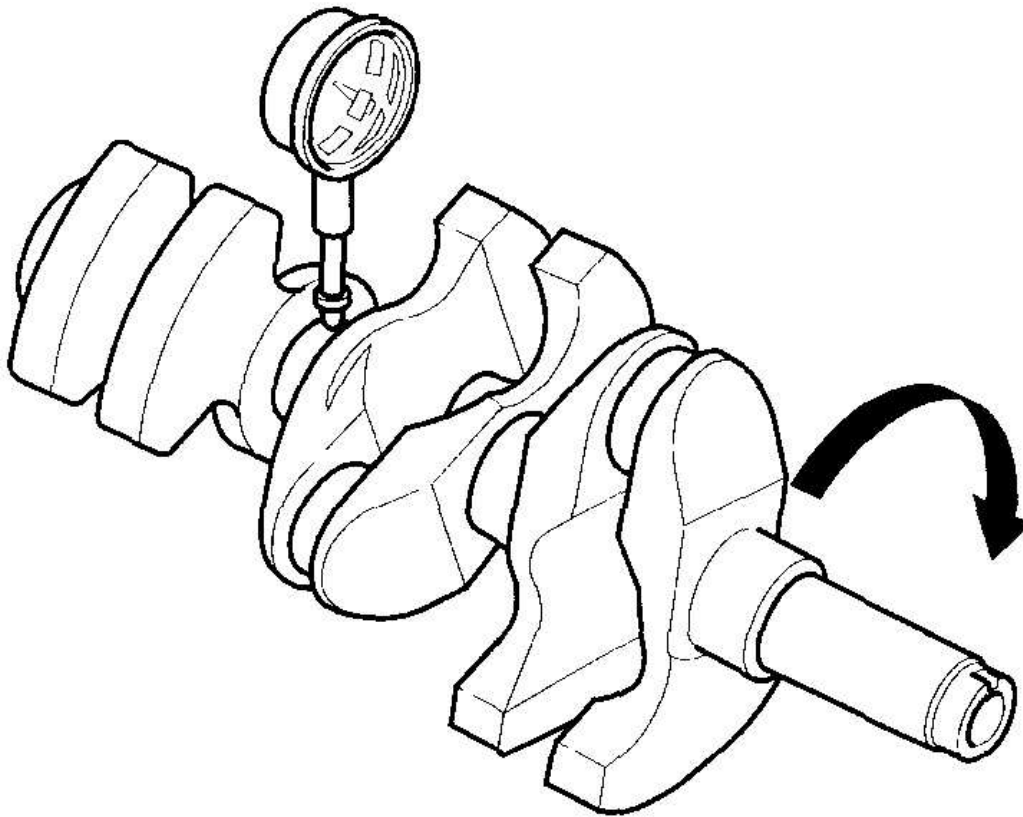
### **STRAIGHTNESS**

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): 0.03 mm (0.001 in.) max.**

**Service Limit: 0.04 mm (0.002 in.)**



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**Fig. 19: 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 11 mm (0.4 in.) from the bottom of the skirt.

### **Piston Diameter**

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**Standard (New): 71.977-71.995 mm (2.8337-2.8344 in.)**

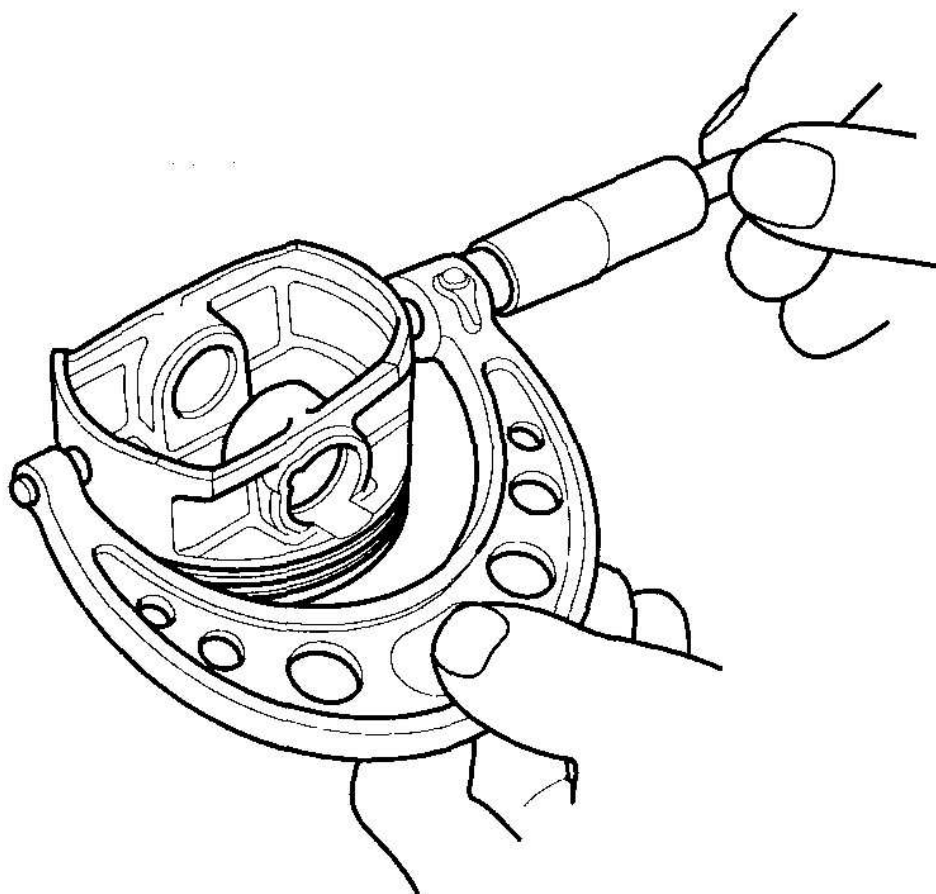
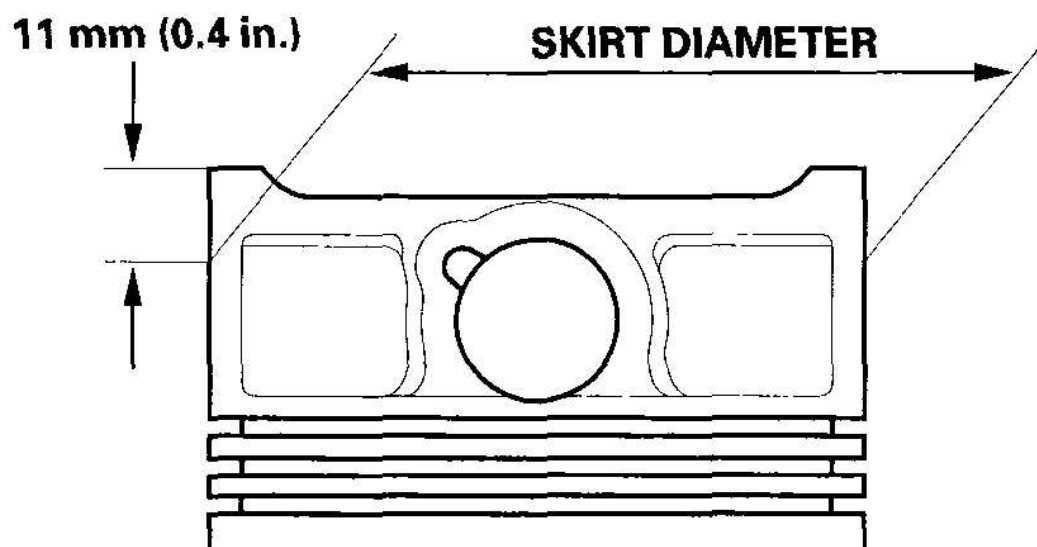
**Service Limit: 71.97 mm (2.833 in.)**

**Oversize Piston Diameter**

**0.25: 72.227-72.245 mm (2.8436-2.8443 in.)**

**2006 Honda Insight**

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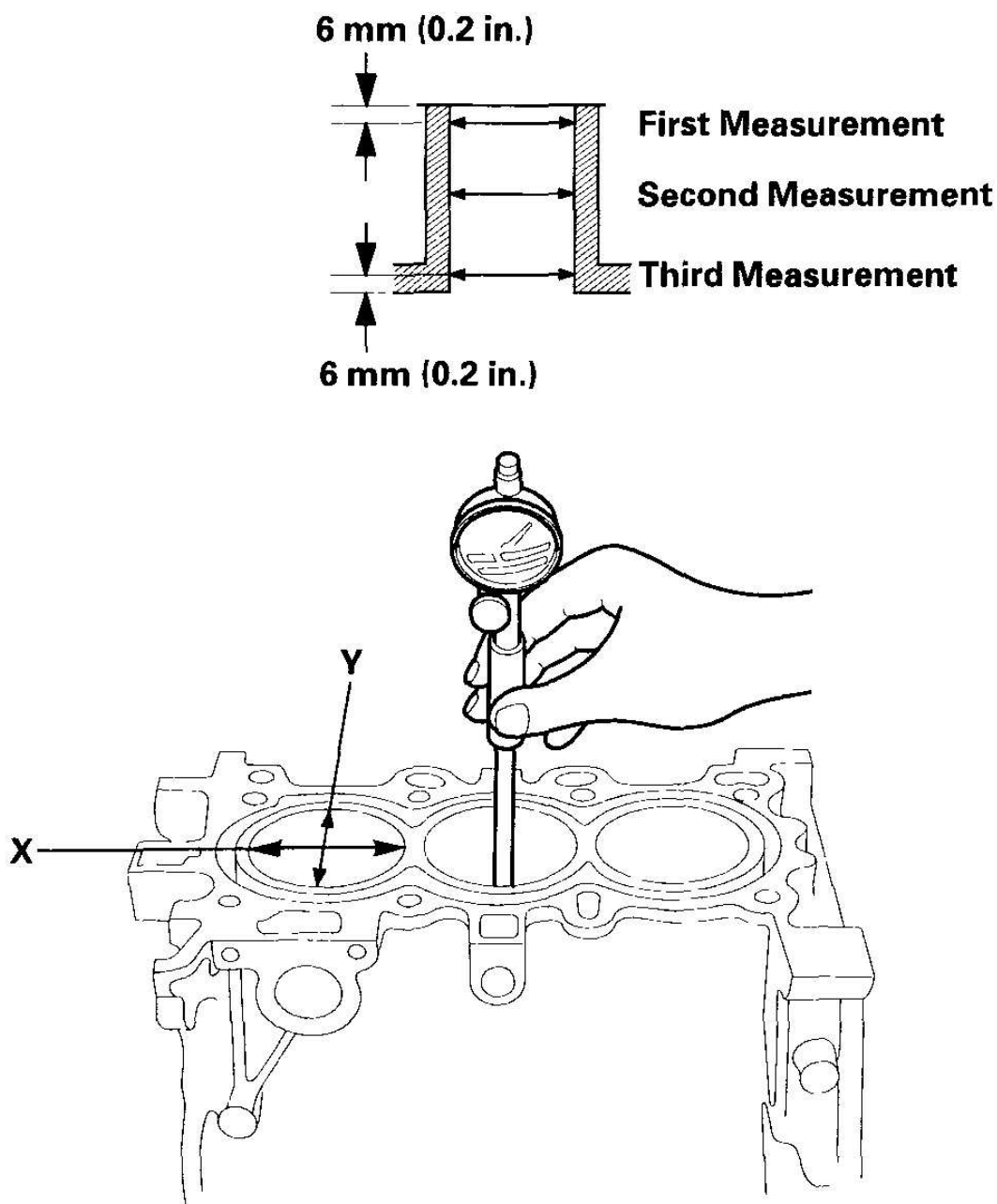


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**Fig. 20: Measuring Piston Diameter****Courtesy of AMERICAN HONDA MOTOR CO., INC.**

4. Measure wear and taper in direction X and Y at three levels in each cylinder as shown. If measurements in any cylinder are beyond the oversize bore service limit, replace the engine block. If the engine block is to be rebored, refer to step 6 after reboring.

**Cylinder Bore Size****Standard (New): 72.000-72.020 mm (2.8346-2.8354 in.)****Service Limit: 72.07 mm (2.837 in.)****Oversize****0.25: 72.250-72.270 mm (2.8445-2.8453 in.)****Reboring Limit: 0.25 mm (0.010 in.) max.****Bore Taper****Limit: (Difference between first and third measurement) 0.05 mm (0.002 in.)**



G03680507

**Fig. 21: Measuring Cylinder Bore Size**  
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

5. Scored or scratched cylinder bores must be honed.



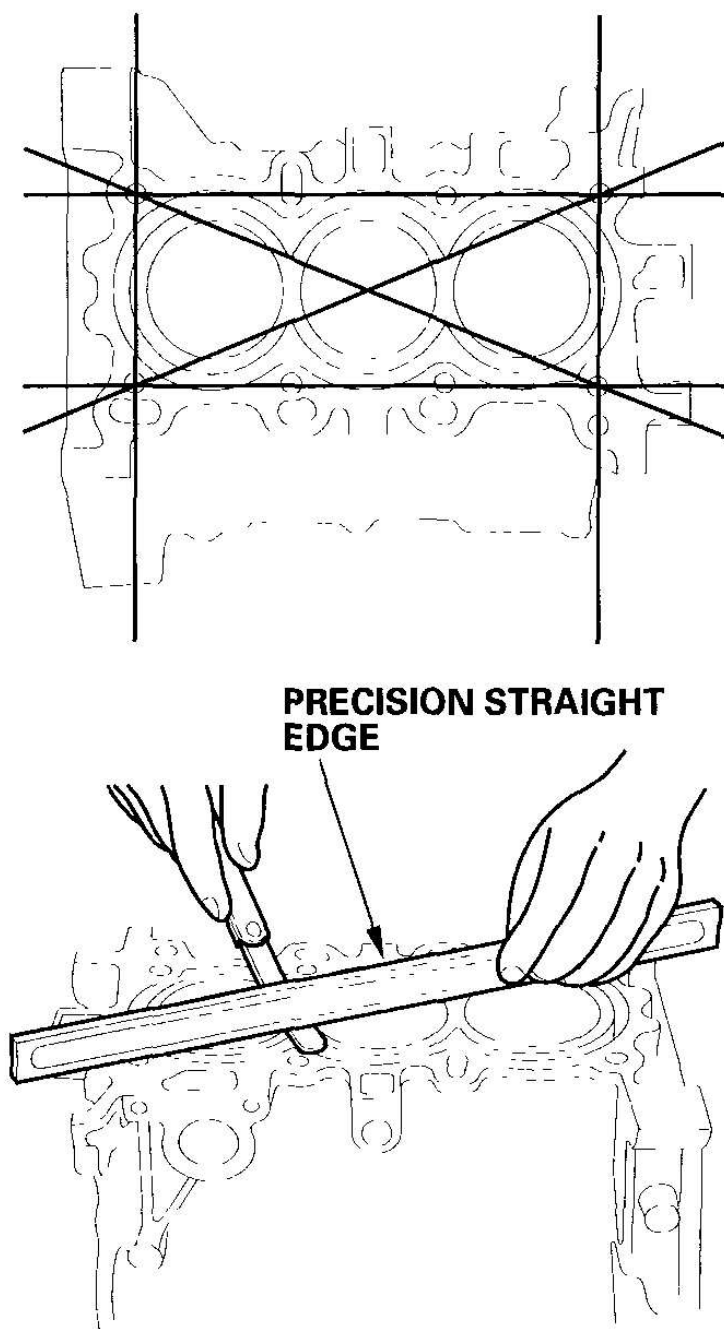
<b>2006 Honda Insight</b>
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6. Check the top of the engine block for warpage. Measure along the edges and across the center as shown.

**Engine Block Warpage**

**Standard (New): 0.07 mm (0.003 in.) max.**

**Service Limit: 0.10 mm (0.004 in.)**



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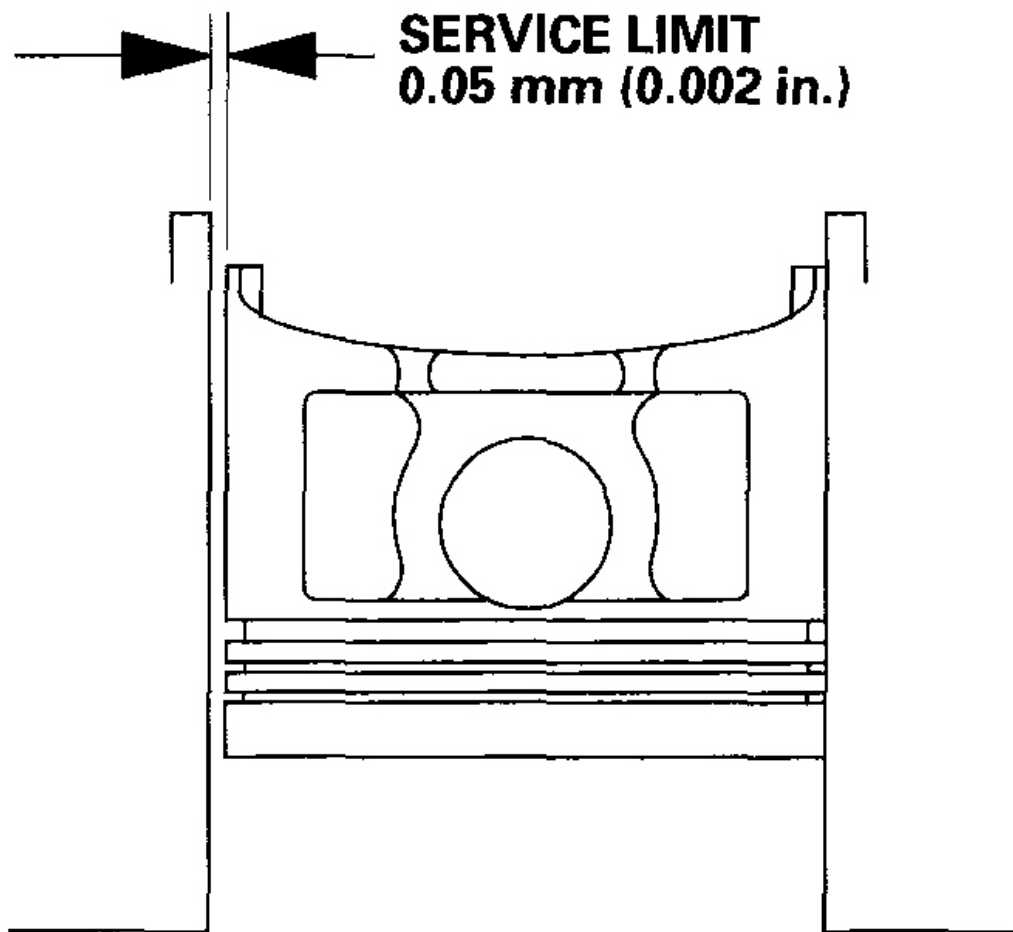
**Fig. 22: Checking Engine Block For Warpage**  
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

### **Piston-to-Cylinder Bore Clearance**

**Standard (New): 0.005-0.043 mm (0.0002-0.0017 in.)**

**Service Limit: 0.05 mm (0.002 in.)**



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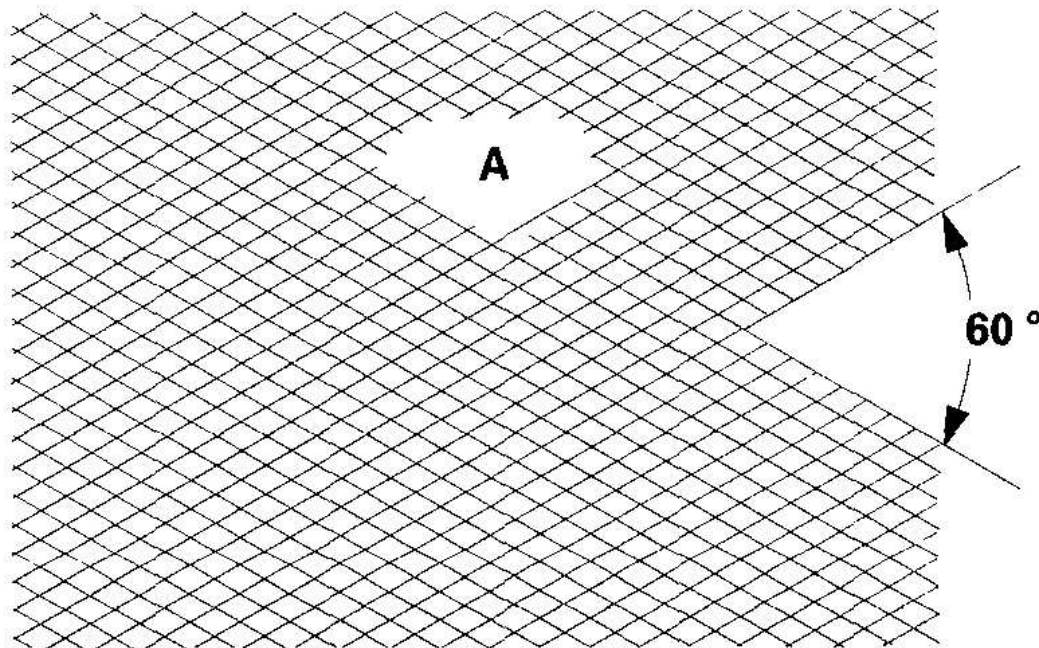
**Fig. 23: Identifying Piston-To-Cylinder Bore Clearance**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

## CYLINDER BORE HONING

Only a scored or scratched cylinder bore must be honed.

1. Measure the cylinder bores (see **BLOCK AND PISTON INSPECTION** ). If the engine block is to be reused, hone the cylinders and re-measure the bores.
2. Hone the cylinder bores with honing oil and a fine (400 grit) stone in a 60 degree cross-hatch pattern (A).

**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. 24: Identifying Rigid Hone Angle**

## **Courtesy of AMERICAN HONDA MOTOR CO., INC.**

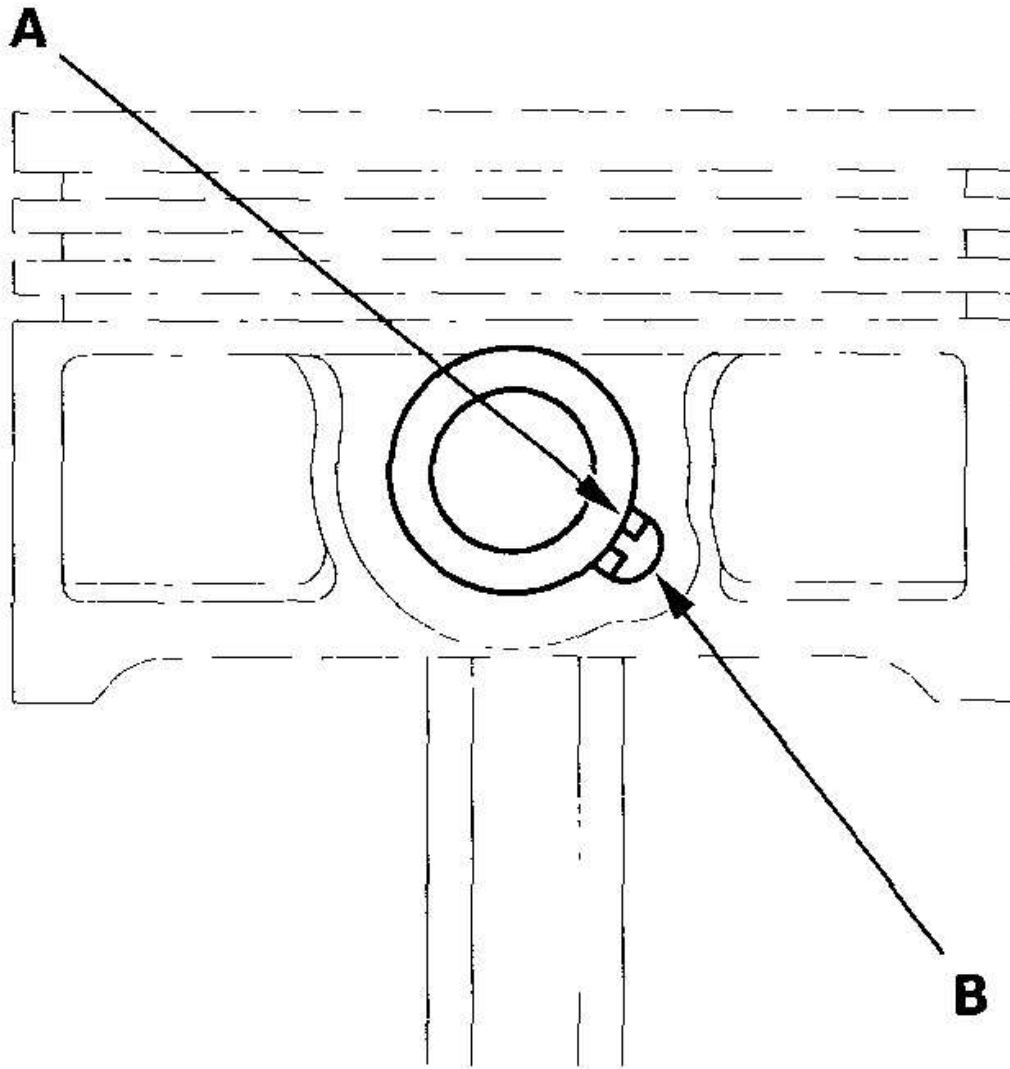
3. When honing is complete, thoroughly clean the engine block of all metal particles. Wash the cylinder bores with hot soapy water, then dry and oil them immediately to prevent rusting. Never use solvent, it will only redistribute the grit on the cylinder walls.
4. If scoring or scratches are still present 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).

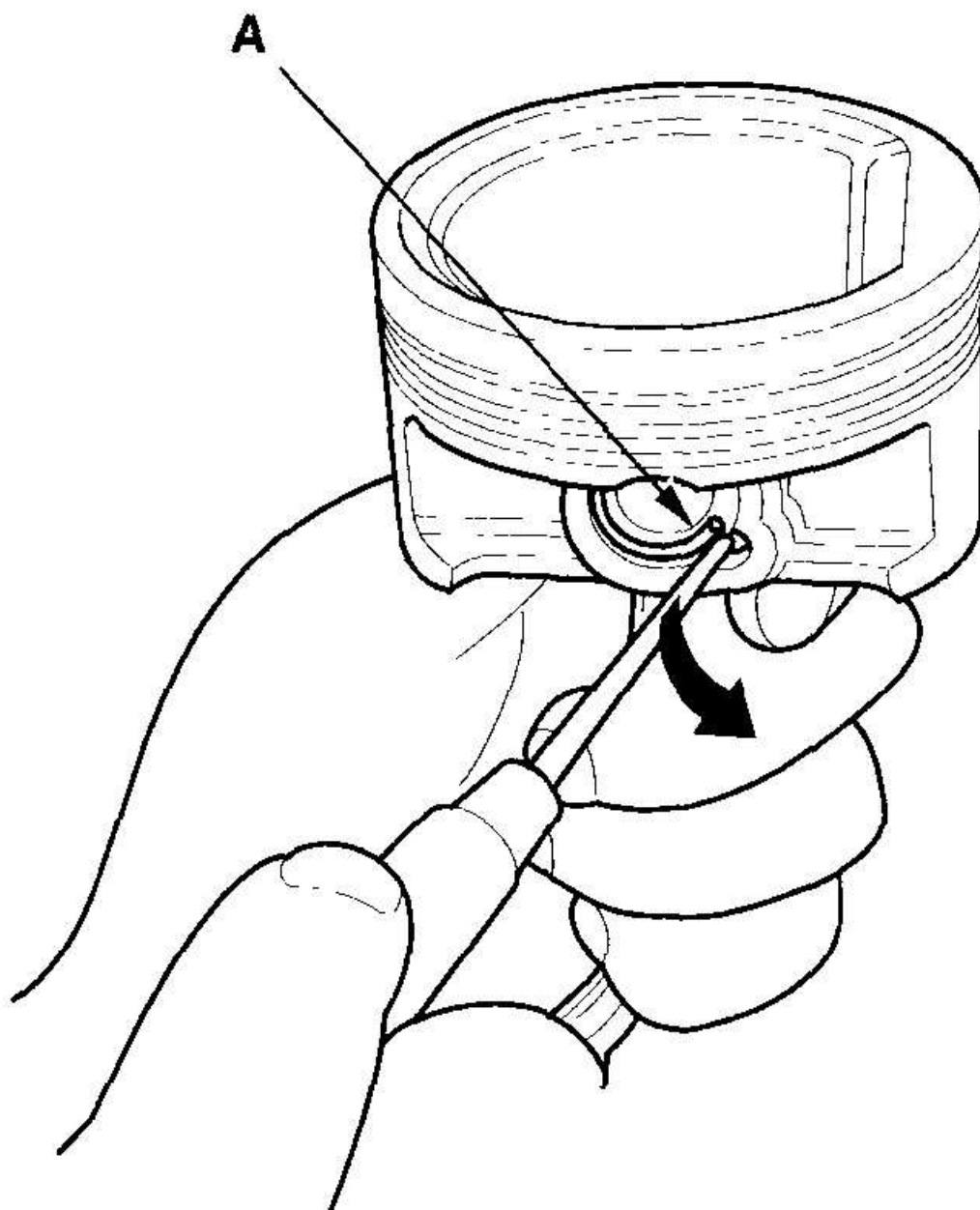
**NOTE:     Take care not to damage the ring grooves.**



G03680511

**Fig. 25: Applying Engine Oil To Piston Pin Snap Rings**  
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

3. Remove both snap rings (A). 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.



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**Fig. 26: 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.



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**Fig. 27: Applying Heat 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.

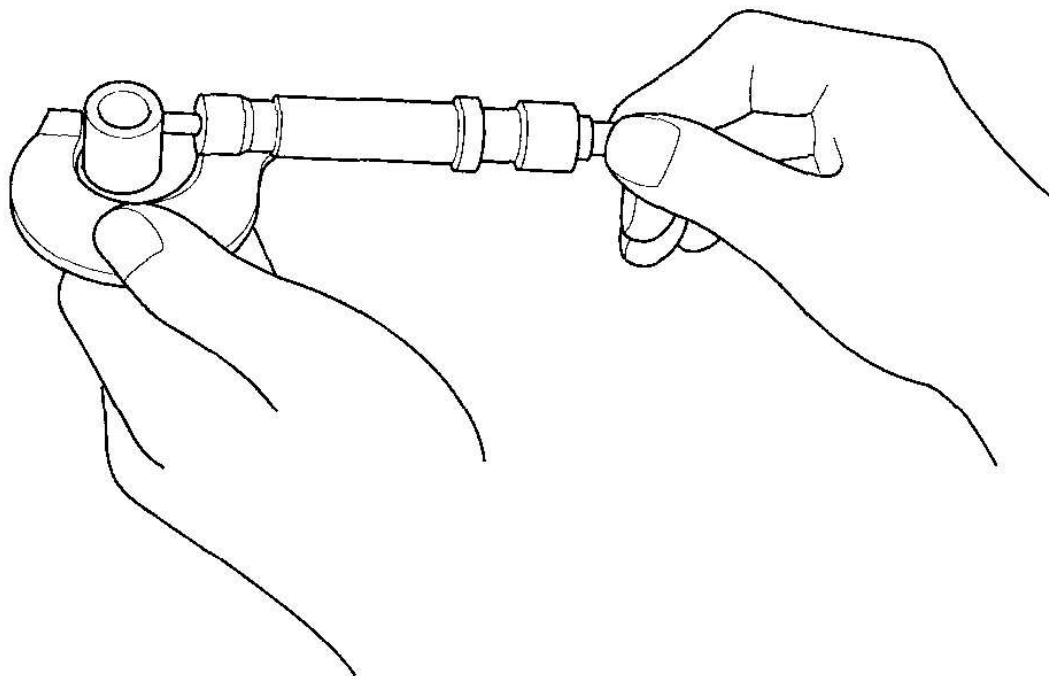
1. Measure the diameter of the piston pin.

#### **Piston Pin Diameter**

**Standard (New): 16.961 - 16.965 mm (0.6678-0.6679 in.)**

**Service Limit: 16.953 mm (0.6674 in.)**



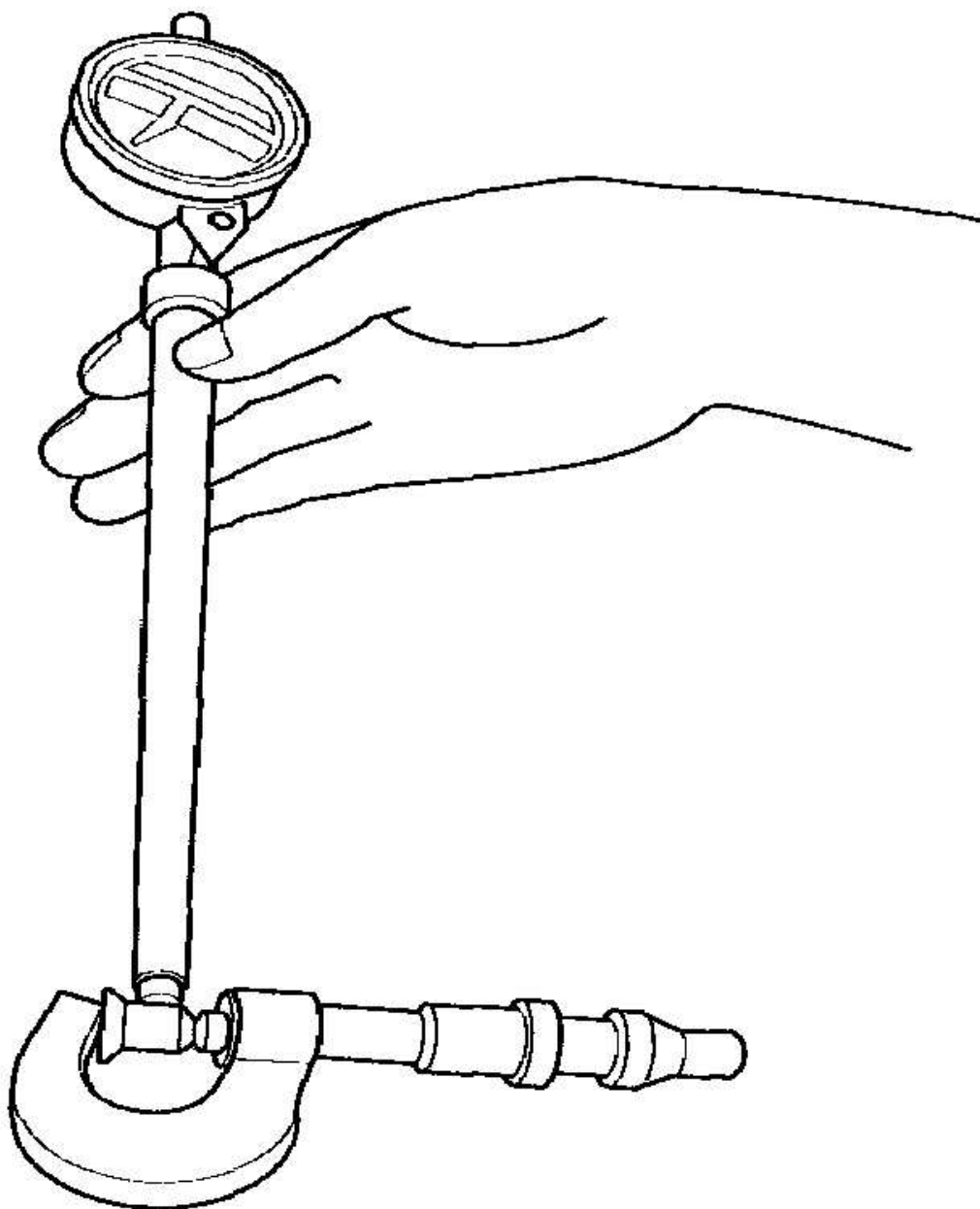


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**Fig. 28: Measuring Piston Pin Diameter**

**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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



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**Fig. 29: Identifying Zero Dial Indicator To Piston Pin Diameter**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

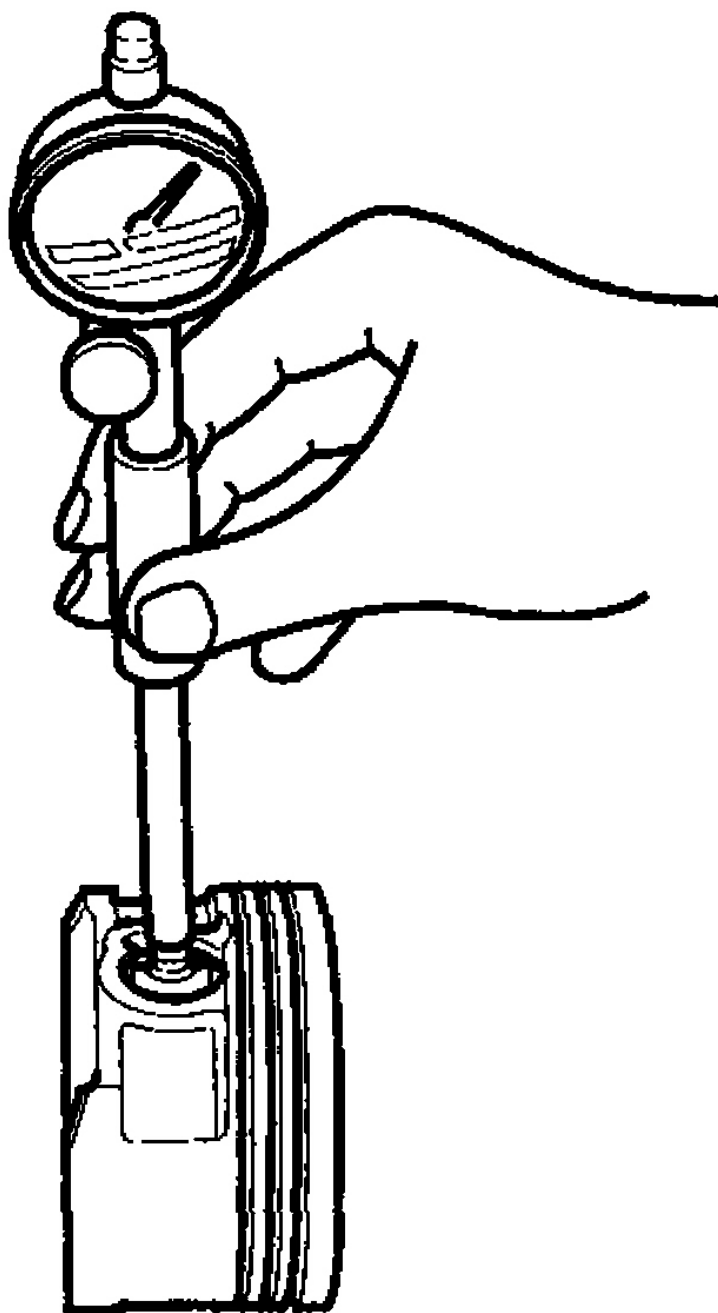
<b>2006 Honda Insight</b>
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3. Check the difference between the piston pin diameter and piston pin hole diameter in the piston.

**Piston Pin-to-Piston Clearance**

**Standard (New): -0.0050 to +0.0020 mm (-0.00020 to +0.00008 in.)**

**Service Limit: 0.006 mm (0.0002 in.)**



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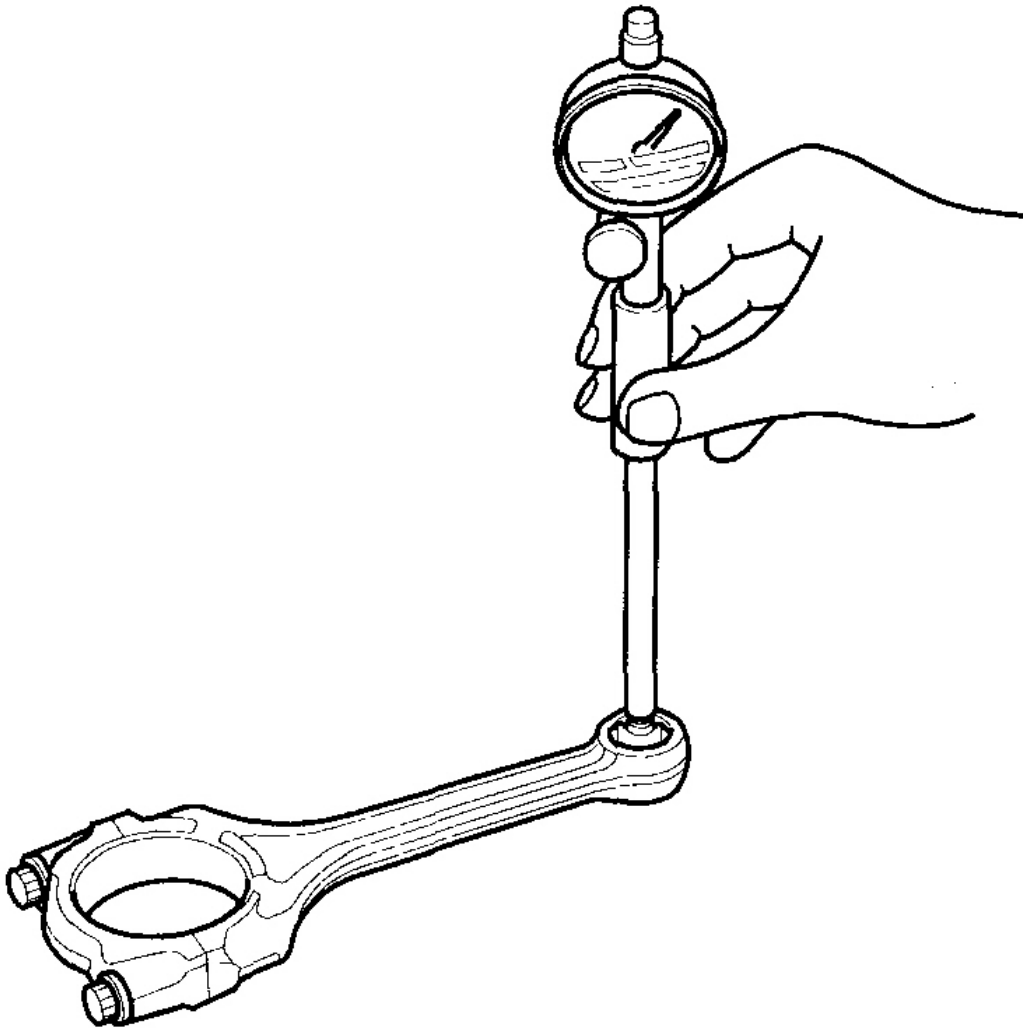
**Fig. 30: Checking Piston Pin-To-Piston Clearance**  
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

### **Piston Pin-to-Connecting Rod Clearance**

**Standard (New): 0.016-0.033 mm (0.0006-0.0013 in.)**

**Service Limit: 0.038 mm (0.0015 in.)**



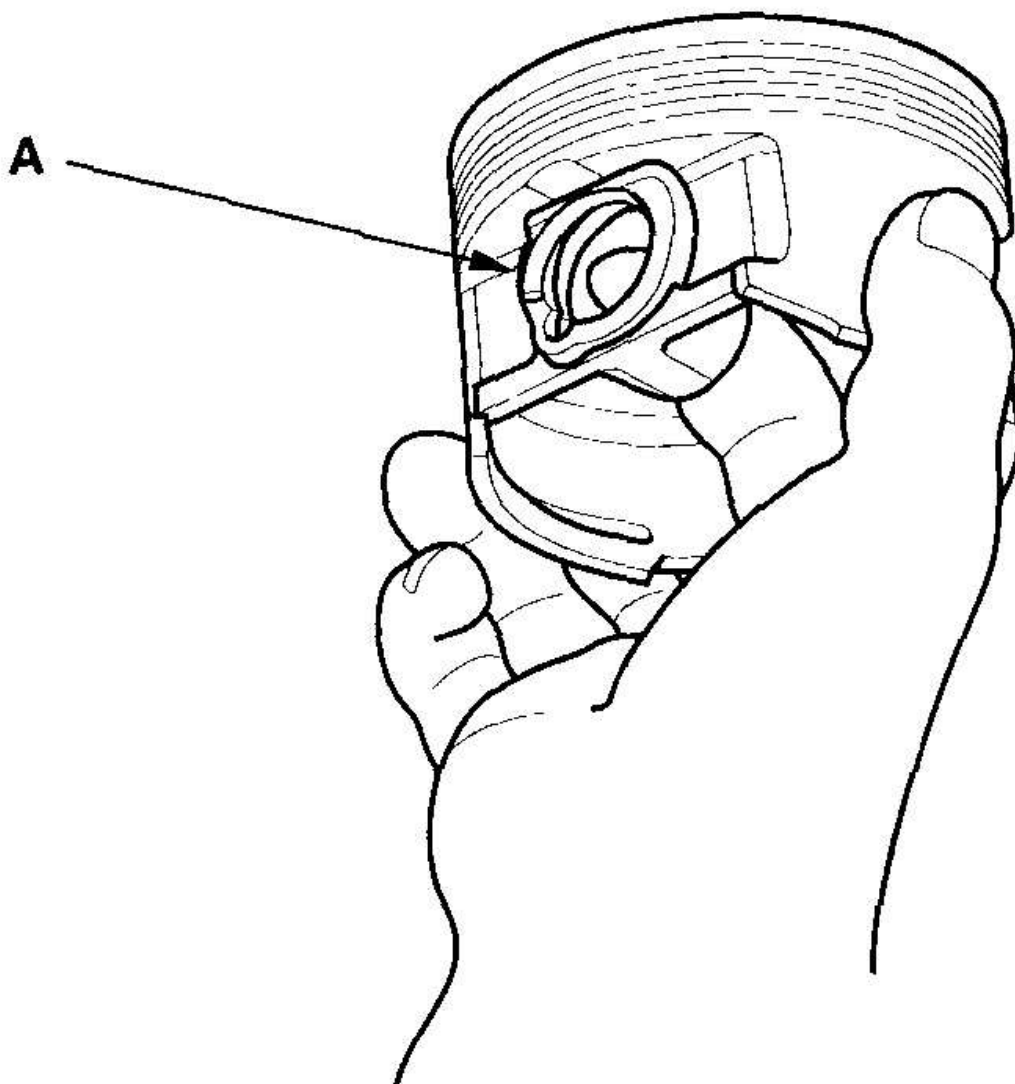
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**Fig. 31: Measuring Piston Pin-To-Connecting Rod Clearance**

**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

**REASSEMBLY**

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



**G03680518**

**Fig. 32: 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).

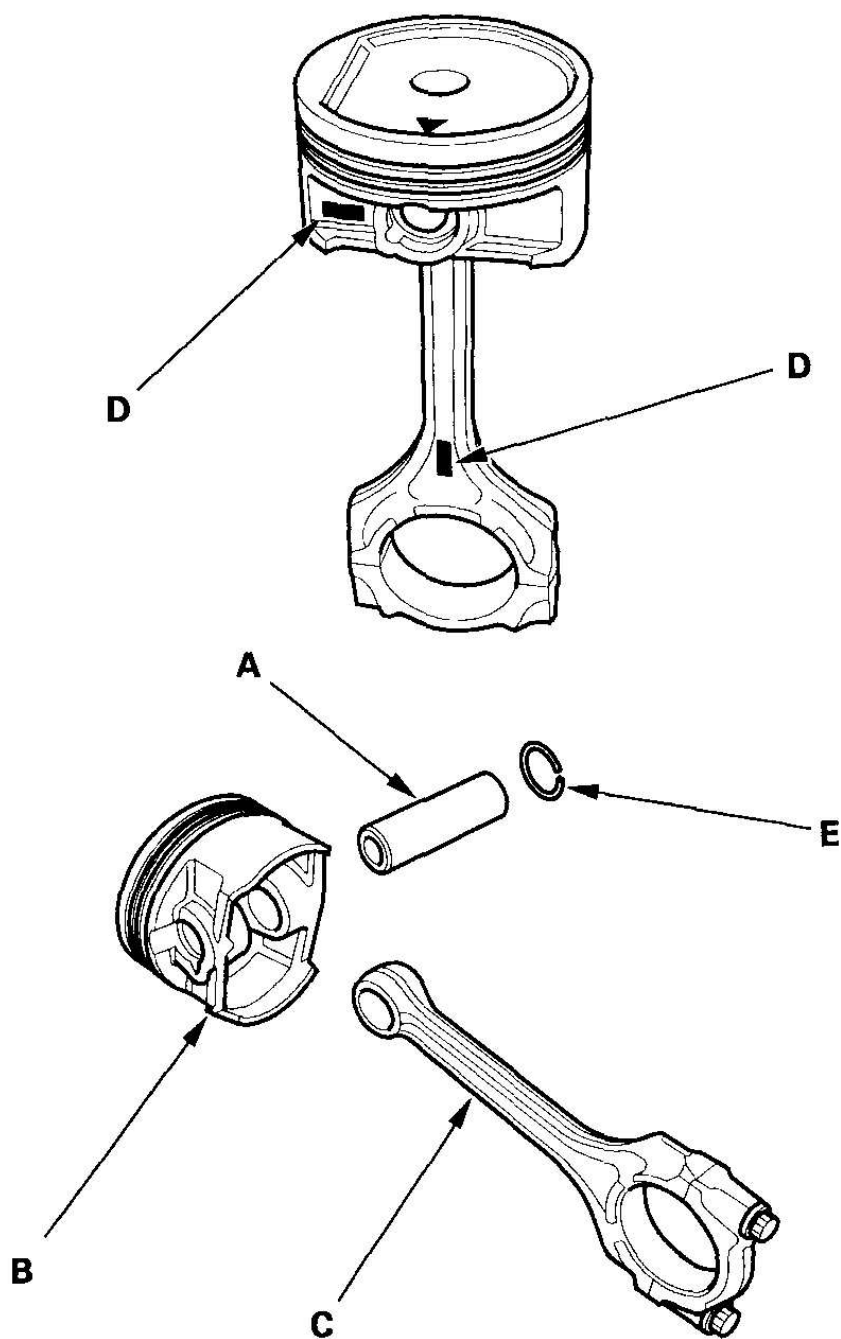


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**Fig. 33: Applying Heat To Piston**

**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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



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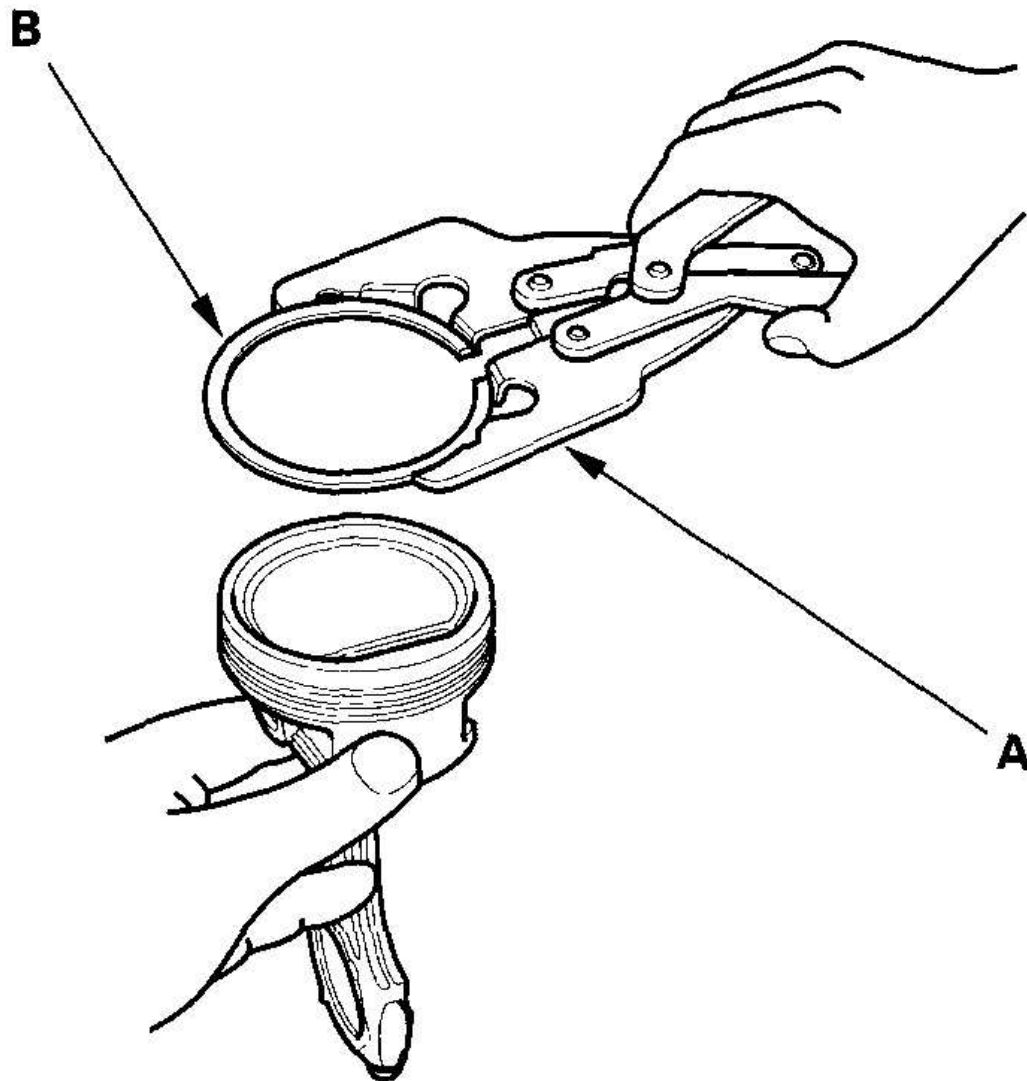
**Fig. 34: Assembling Piston And Connecting Rod With Embossed Marks**  
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**



5. Install the remaining snap ring (E).

## **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).



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**Fig. 35: Removing Piston Rings With Ring Expander**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Clean all ring grooves thoroughly with a squared-off broken ring or ring groove cleaner with a blade to fit the piston grooves.
  - The top ring groove is 1.0 mm (0.04 in.) wide.

## 2006 Honda Insight

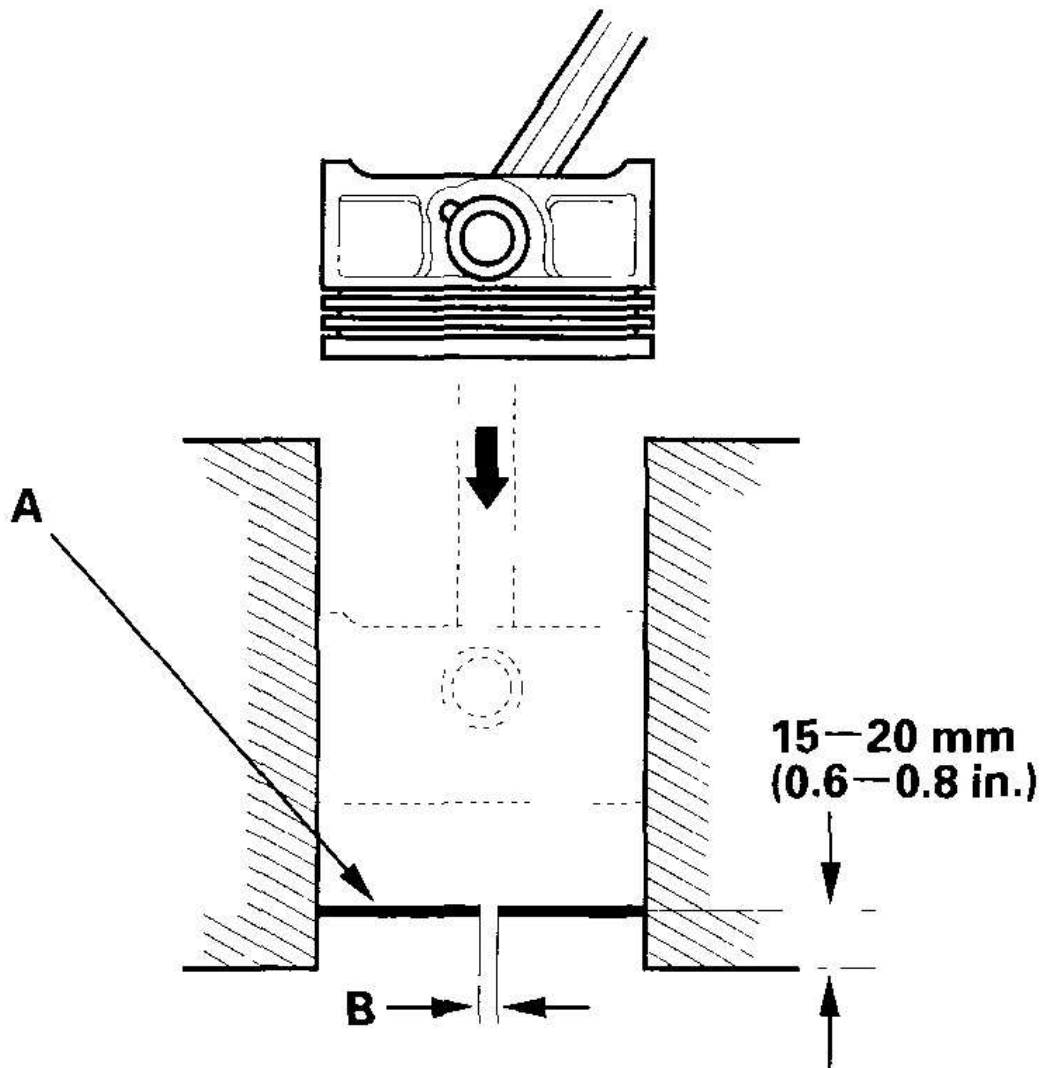
2000-06 ENGINE Engine Block - Insight

- The 2nd ring groove is 1.2 mm (0.05 in.) wide.
- The oil ring groove is 2.0 mm (0.08 in.) wide.
- File down a blade if necessary.

Do not use a wire brush to clean the ring grooves, or cut the ring grooves deeper with the cleaning tools.

**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.



G03680522

**Fig. 36: Identifying Piston Ring Clearance**  
**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 **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): 0.15-0.30 mm (0.006-0.012 in.)**

**Service Limit: 0.50 mm (0.020 in.)**

#### **Second Ring:**

**Standard (New): 0.35-0.50 mm (0.014-0.020 in.)**

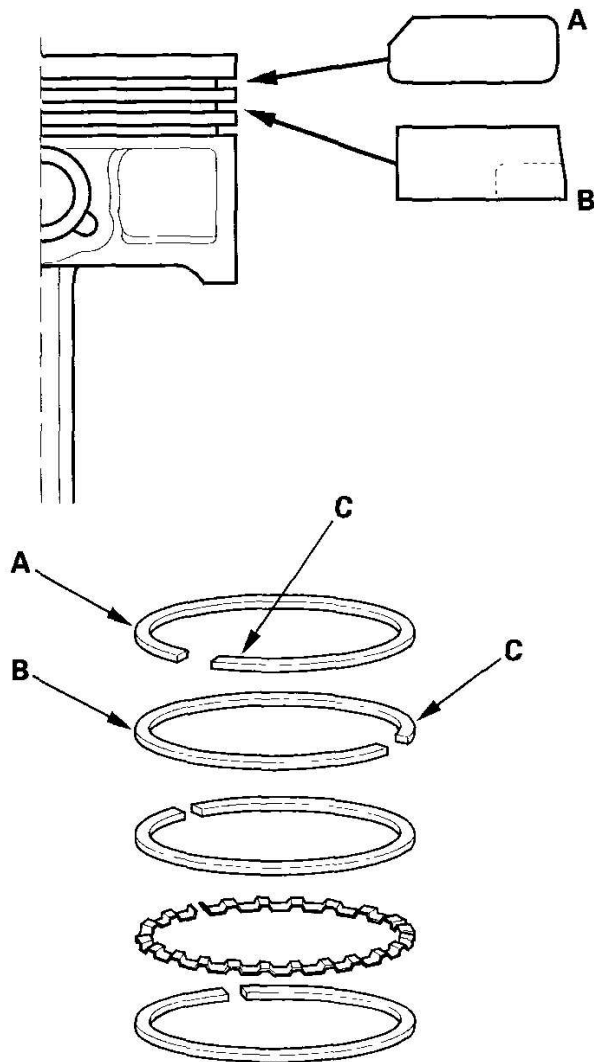
**Service Limit: 0.70 mm (0.028 in.)**

#### **Oil Ring:**

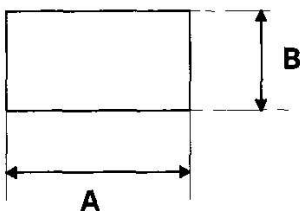
**Standard (New): 0.20-0.70 mm (0.008-0.028 in.)**

**Service Limit: 0.80 mm (0.031 in.)**

6. Install the rings as shown. The top ring (A) has a 1 Ft mark and the second ring (B) has a 2R mark. The manufacturing marks (C) must be facing upward.



**Piston Ring Dimensions:**



**Top Ring (Standard):**

A: 2.3 mm (0.09 in.)

B: 1.0 mm (0.04 in.)

**Second Ring (Standard):**

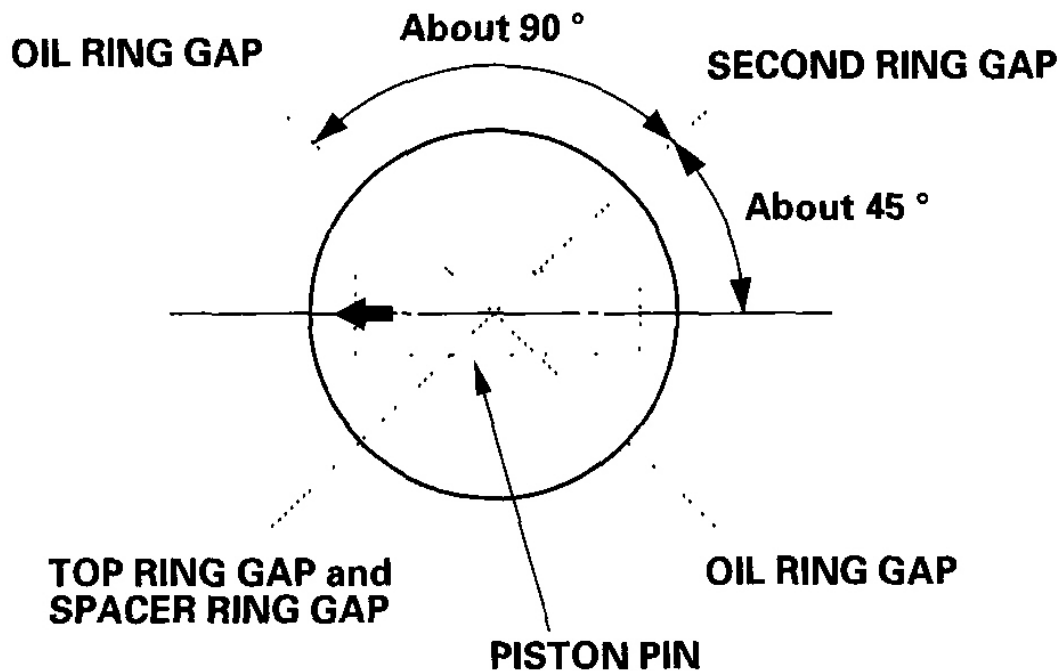
A: 3.0 mm (0.12 in.)

B: 1.2 mm (0.05 in.)

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**Fig. 37: Installing Rings With Manufacturing Marks**  
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

7. Rotate the rings in their grooves to make sure they do not bind.
8. Position the ring end gaps as shown:



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**Fig. 38: Positioning Ring End Gaps**

**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

**Top Ring Clearance**

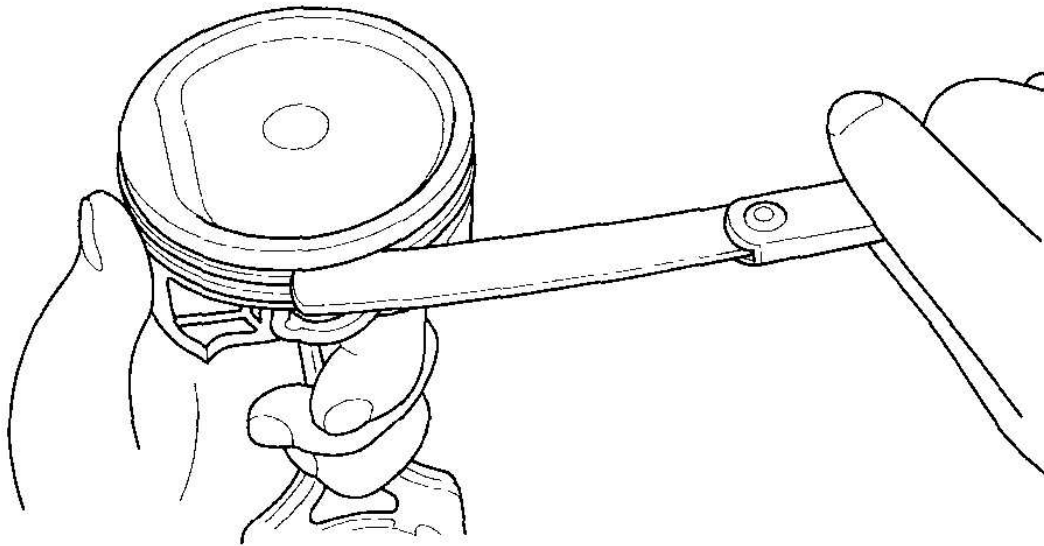
**Standard (New): 0.055-0.080 mm (0.0022-0.0031 in.)**

**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.)**



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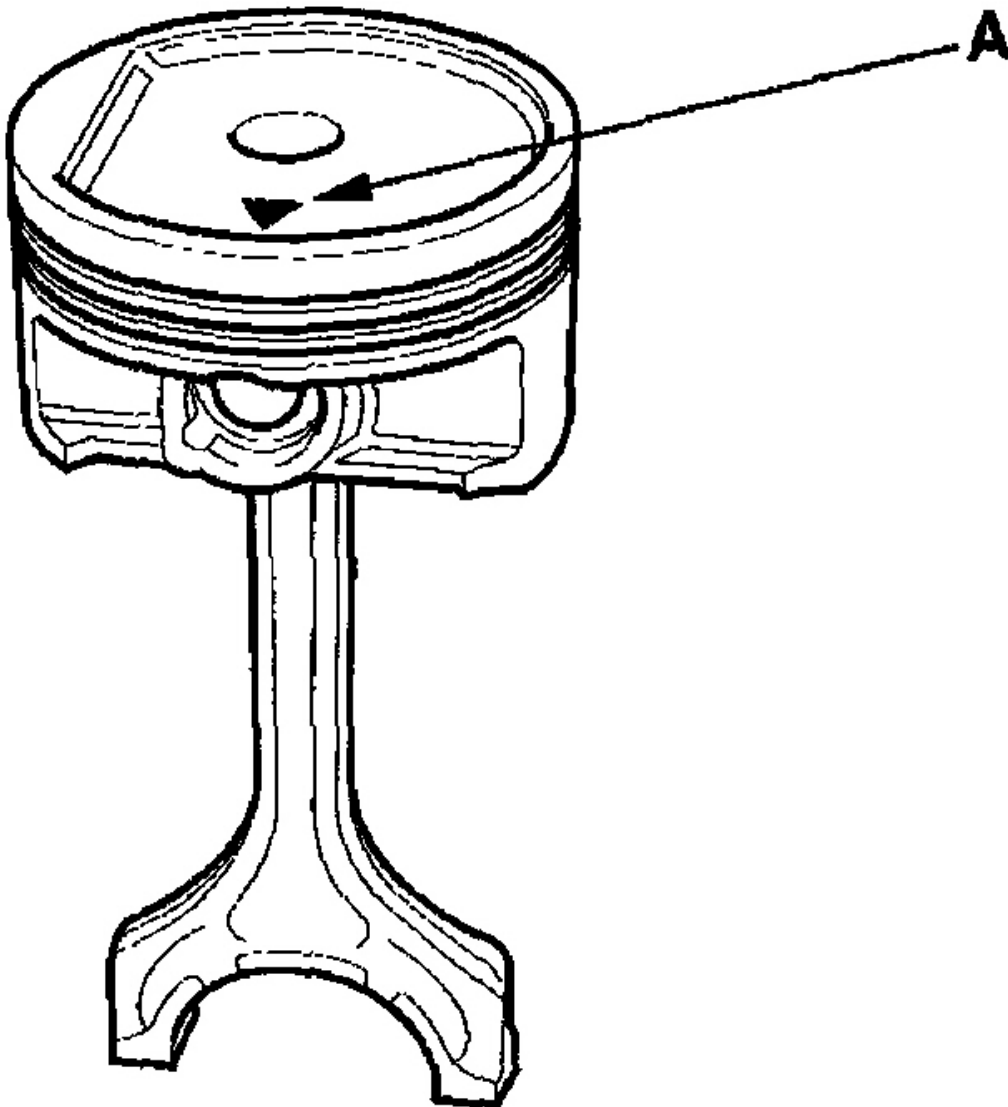
**Fig. 39: Measuring Ring-To-Groove Clearances**  
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

## **PISTON INSTALLATION**

### **IF THE CRANKSHAFT IS ALREADY INSTALLED**

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





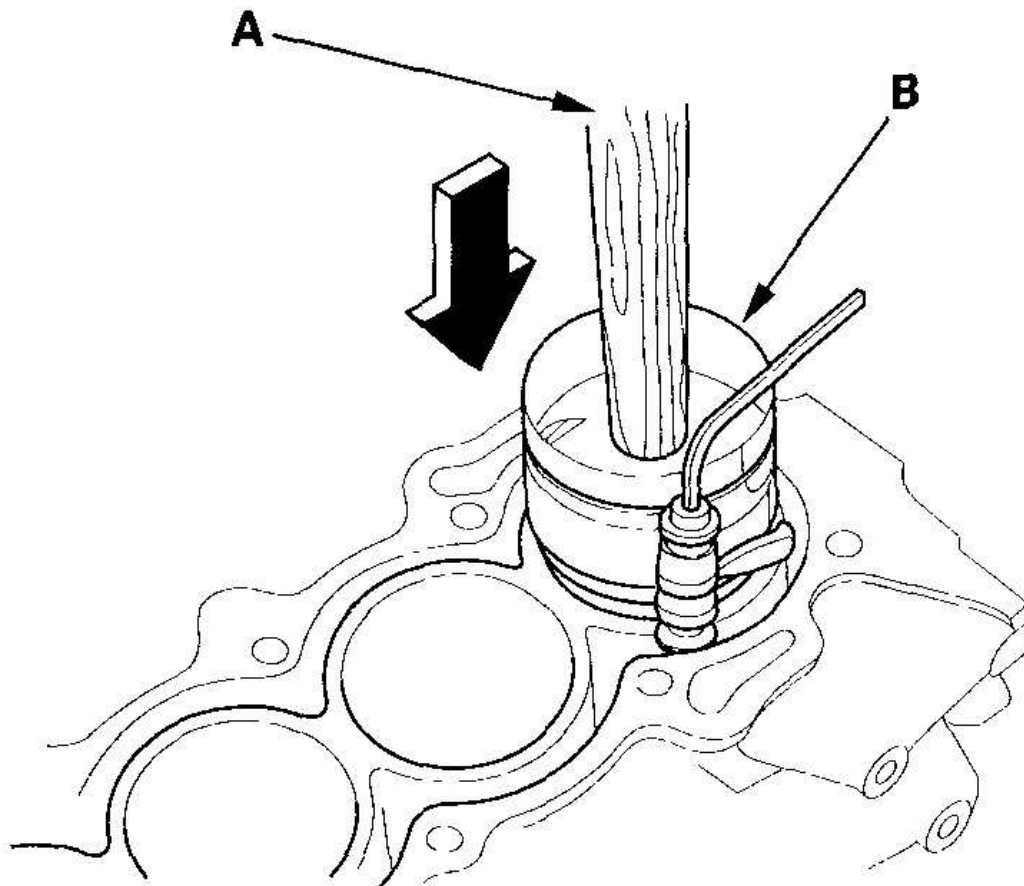
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**Fig. 40: Identifying Piston Arrow Mark**

**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

5. 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.



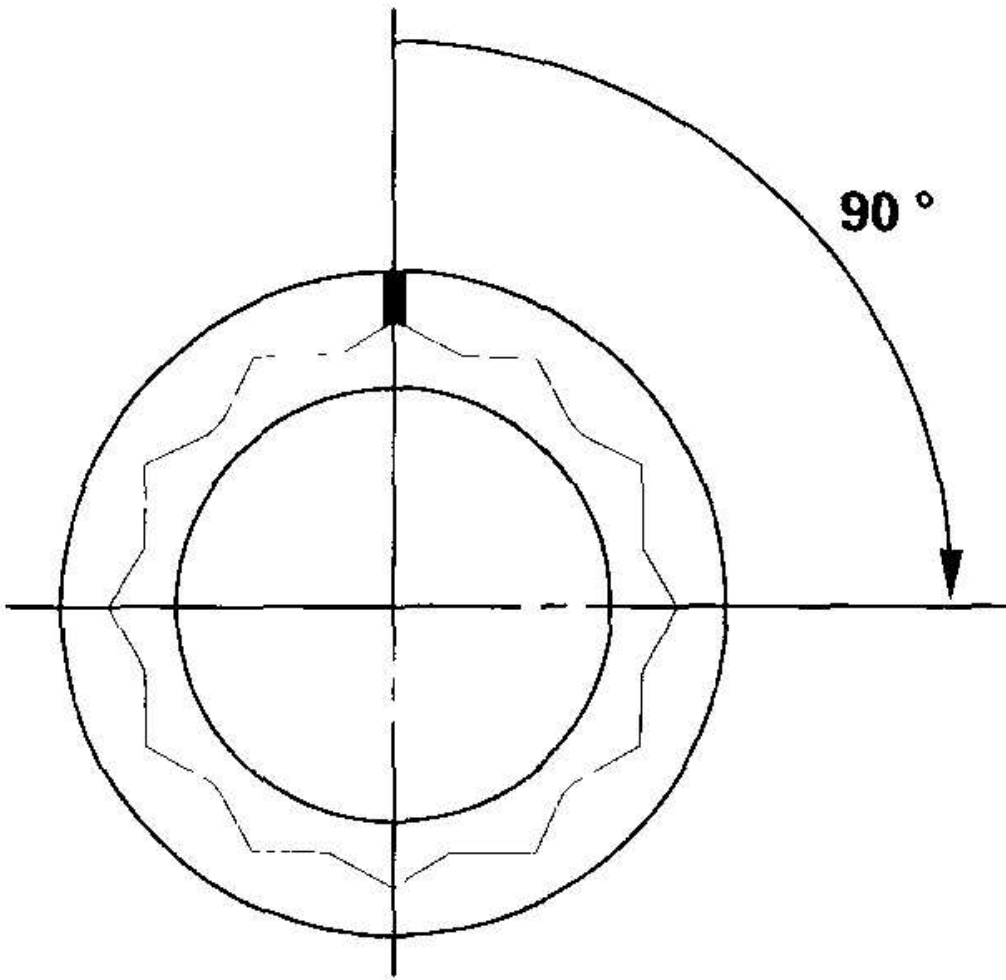
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**Fig. 41: Positioning Piston/Connecting Rod Assembly In Cylinder**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Stop after the ring compressor pops free, and check the connecting rod-to-crank journal alignment before pushing the piston into place.
7. Check the connecting rod bearing clearance with plastigage (see **CONNECTING ROD BEARING REPLACEMENT** ).
8. Inspect the connecting rod bolts (see **INSPECT THE CONNECTING ROD BOLTS** ).

9. Apply engine oil to the bolt threads, then install the rod caps with bearings. Torque the bolts to 9.8 N.m (1.0 kgf.m, 7.2 lbf.ft).
10. Tighten the connecting rod bolts an additional 90°.

**NOTE:** Remove the connecting rod bolt if you tightened it beyond the specified angle, and go back to step 8 of the procedure. Do not loosen it back to the specified angle.

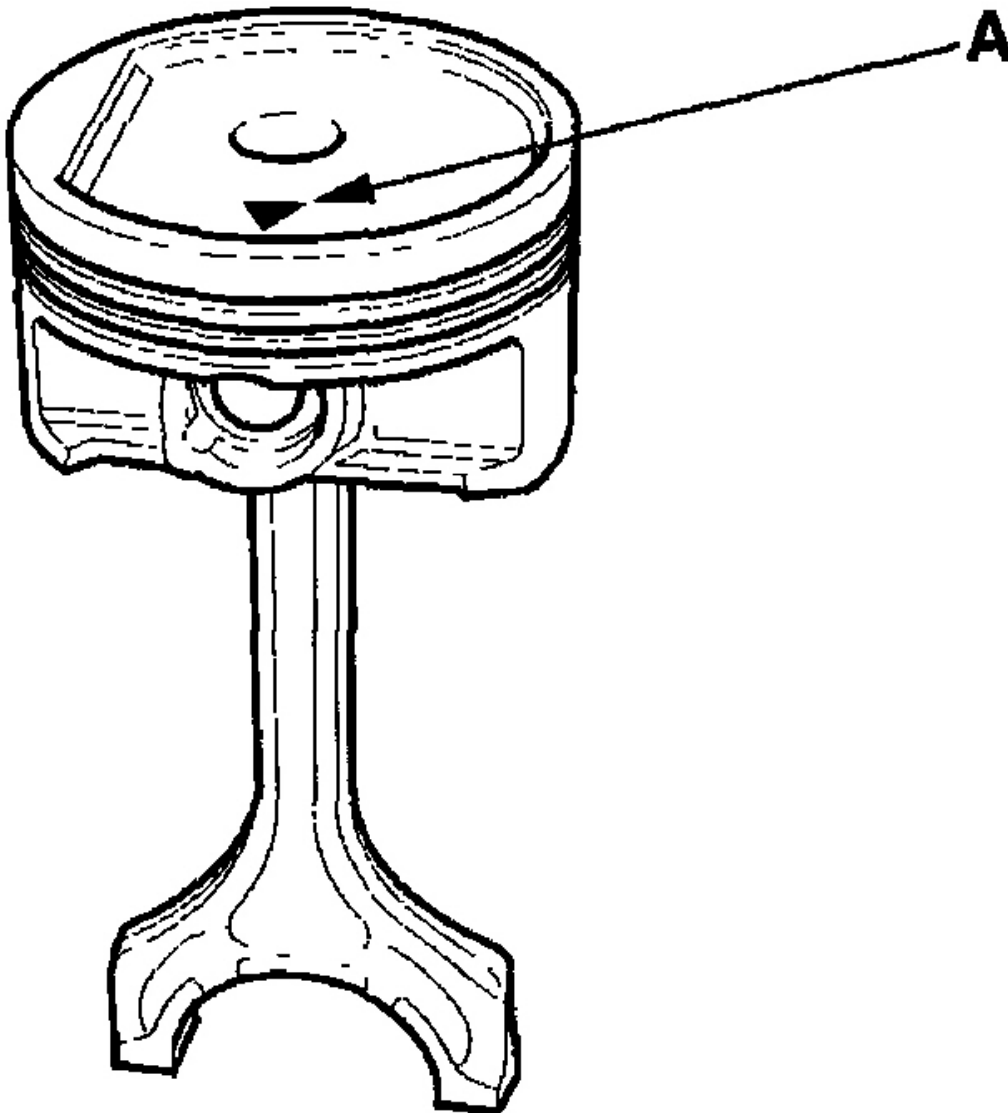


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**Fig. 42: Identifying Connecting Rod Bolts Angle**  
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

**IF THE CRANKSHAFT IS NOT INSTALLED**

1. Remove the connecting rod caps. Check that the bearing is securely in place.
2. Apply new engine oil to the piston, inside of the ring compressor, and cylinder bore, then attach the ring compressor to the piston/connecting rod assembly.
3. Position the arrow (A) facing the timing chain side of the engine.



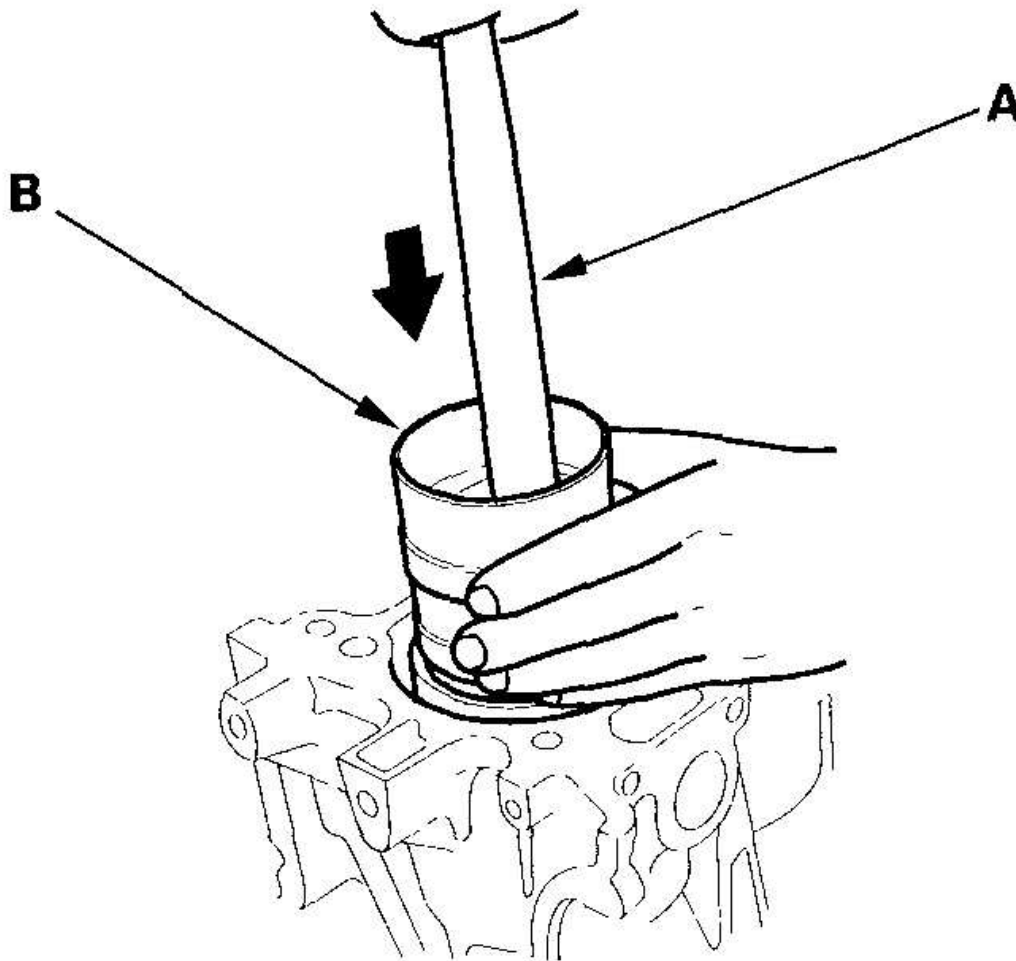
G03680529

**Fig. 43: Identifying Piston Arrow Mark**

**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

4. 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.



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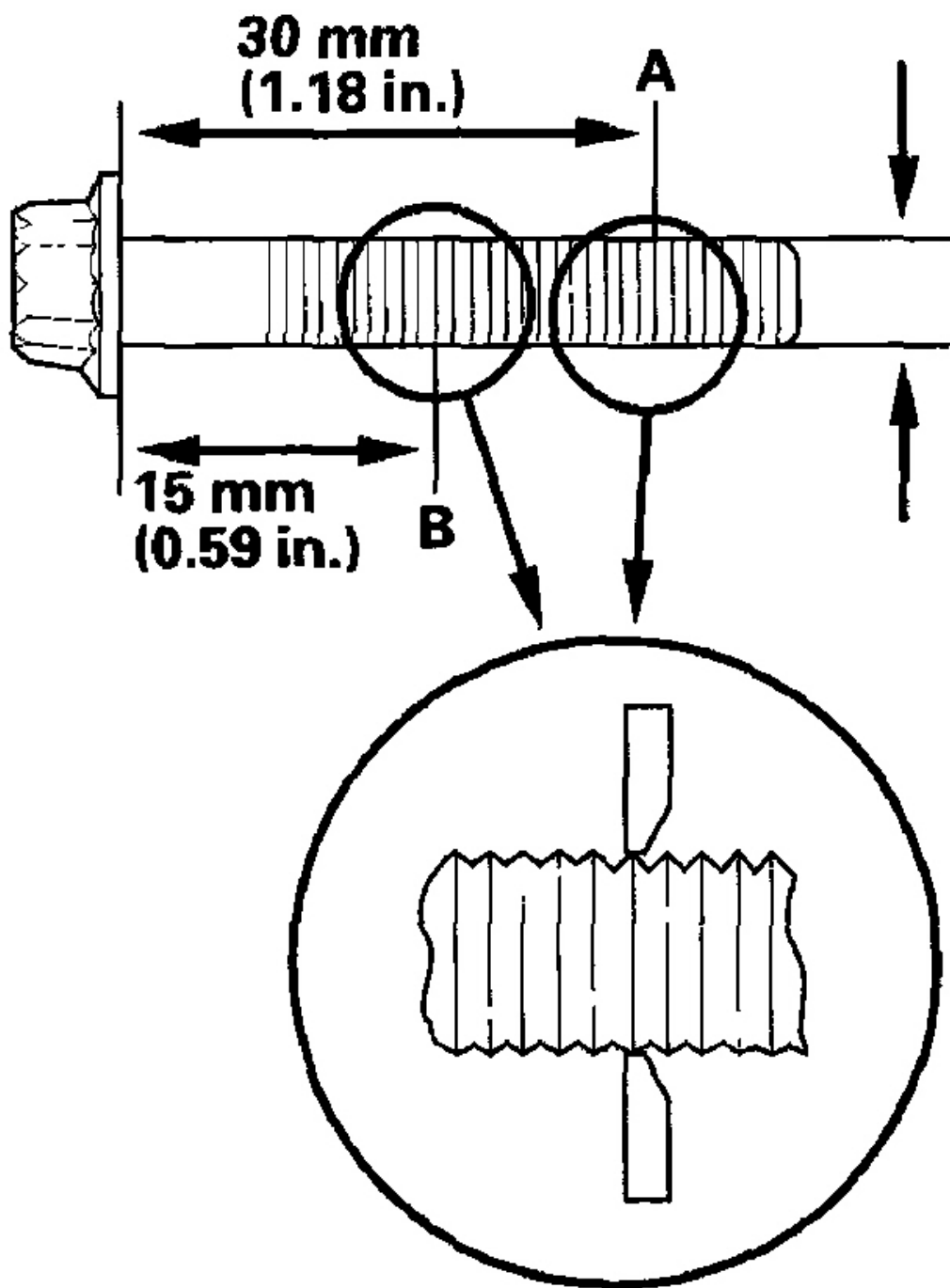
**Fig. 44: Positioning Piston/Connecting Rod Assembly In Cylinder**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Position all pistons at top dead center (TDC).

## CONNECTING ROD BOLT INSPECTION

<b>2006 Honda Insight</b>
2000-06 ENGINE Engine Block - Insight

1. Measure the diameter of each connecting rod bolt at point A and point B.



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**Fig. 45: Measuring Diameter Of Connecting Rod Bolt**  
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

**Point A-Point B = Difference in Diameter**

**Difference in Diameter:**

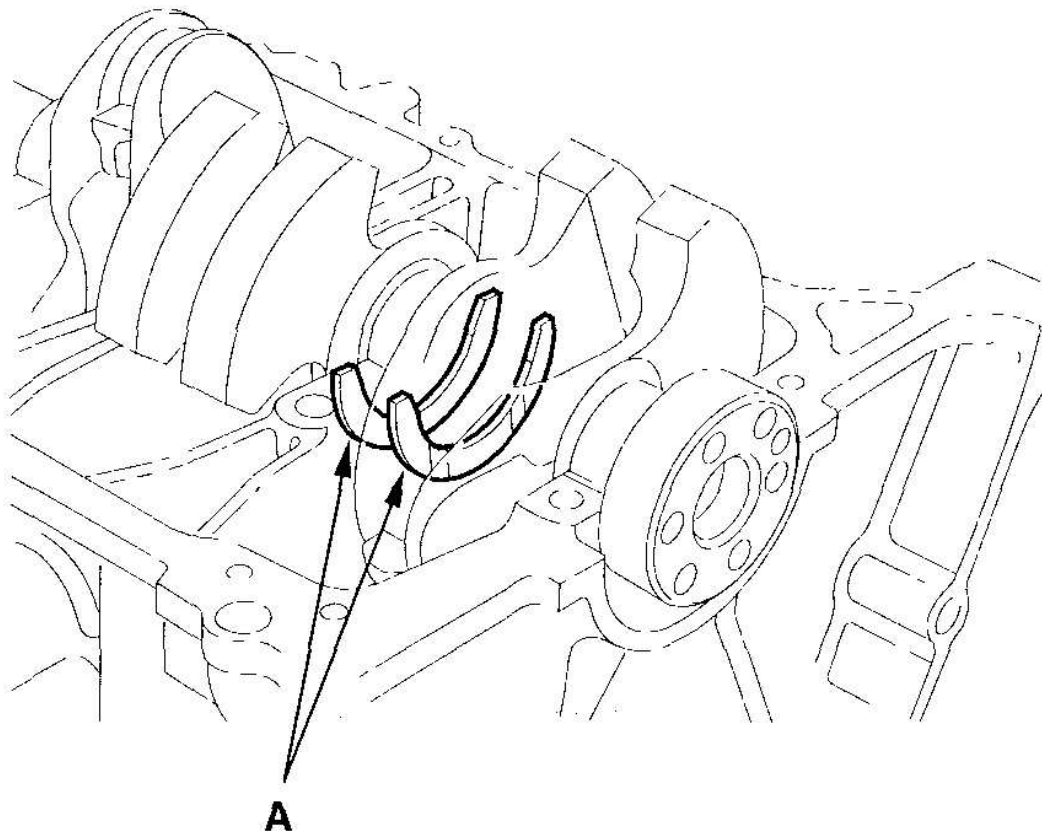
**Specification: 0-0.05 mm (0-0.002 in.)**

3. If the difference in diameter is out of tolerance, replace the connecting rod bolt.

## **CRANKSHAFT INSTALLATION**

### **Special Tools Required**

- Driver 07749-0010000
  - Driver attachment 07948-SB00101
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 the main bearings and rod bearings.
  5. Hold the crankshaft so rod journal No. 1 is straight up, and lower the crankshaft into the engine block.
  6. Install the thrust washers (A) on both edges of the No. 3 main bearing recess.



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**Fig. 46: Installing Thrust Washers**

**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

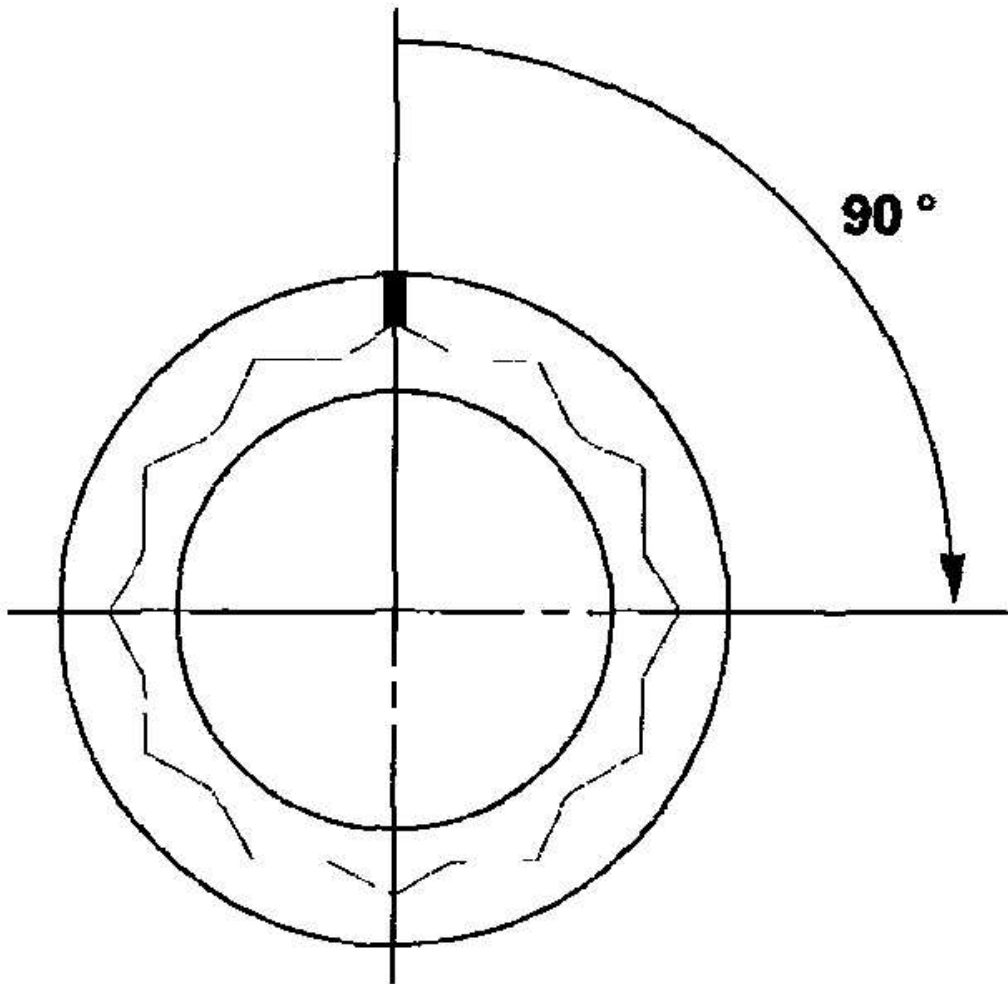
7. Inspect the connecting rod bolts (see **INSPECT THE CONNECTING ROD BOLTS** ).
8. Apply new engine oil to the threads of the connecting rod bolts.
9. Seat the rod journal into connecting rod No. 1. Install the connecting rod cap and bolts finger-tight. Install the cap so the bearing recess is on the same side as the recess in the rod.
10. Rotate the crankshaft clockwise, and seat the journal into connecting rod No. 2. Install the connecting rod cap and bolts finger-tight.
11. Rotate the crankshaft clockwise, and seat the journal into connecting rod No. 3.

Install the connecting rod cap and bolts finger-tight.

12. Tighten the connecting rod bolts to 9.8 N.m (1.0 kgf.m, 7.2 lbf.ft).

13. Tighten the connecting rod bolts an additional 90°.

**NOTE:** Remove the connecting rod bolt if you tightened it beyond the specified angle, and go back to step 7 of the procedure. Do not loosen it back to the specified angle.

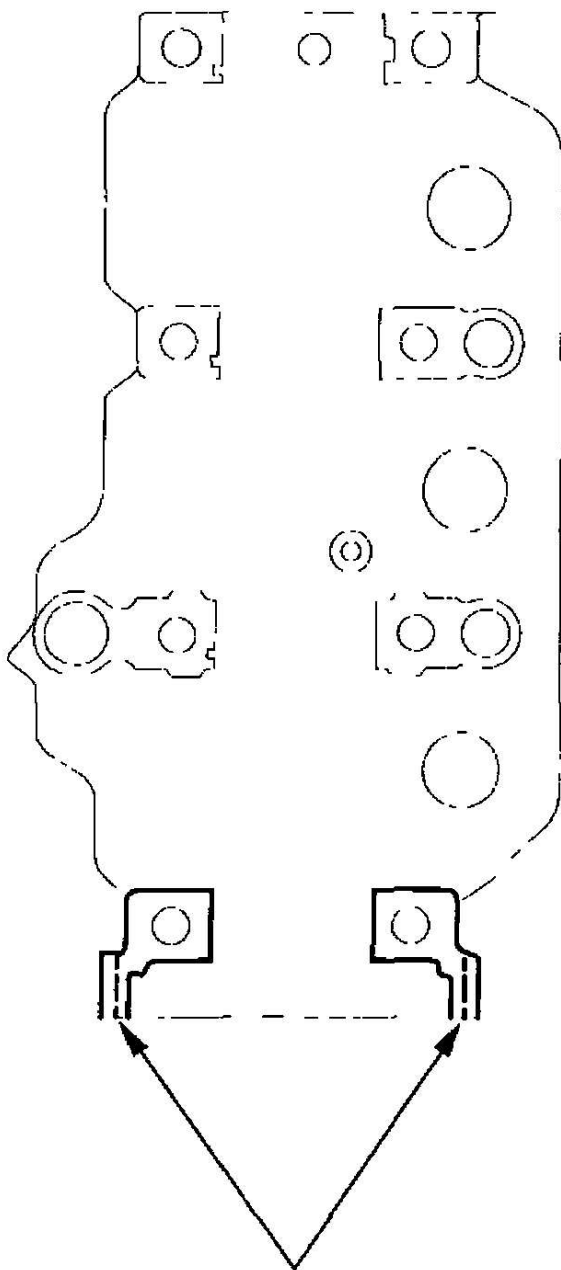


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**Fig. 47: Identifying Connecting Rod Bolt Angle**  
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

14. Apply liquid gasket, P/N 08717-0004 or 08718-0001, along the broken line.

**NOTE:** Do not install the parts if 5 minutes or more have elapsed since applying liquid gasket. Instead, reapply liquid gasket after removing the old residue.

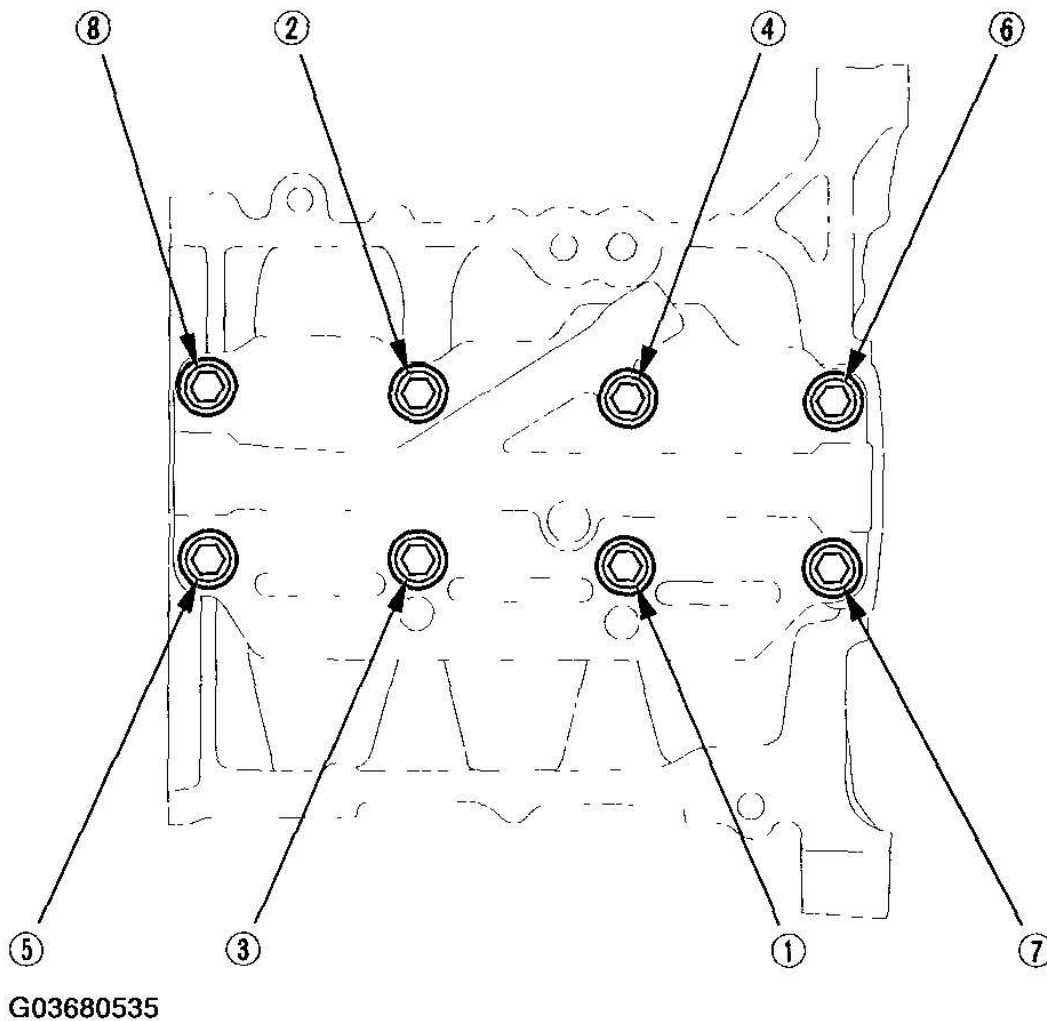


**Apply liquid gasket  
along the broken line.**

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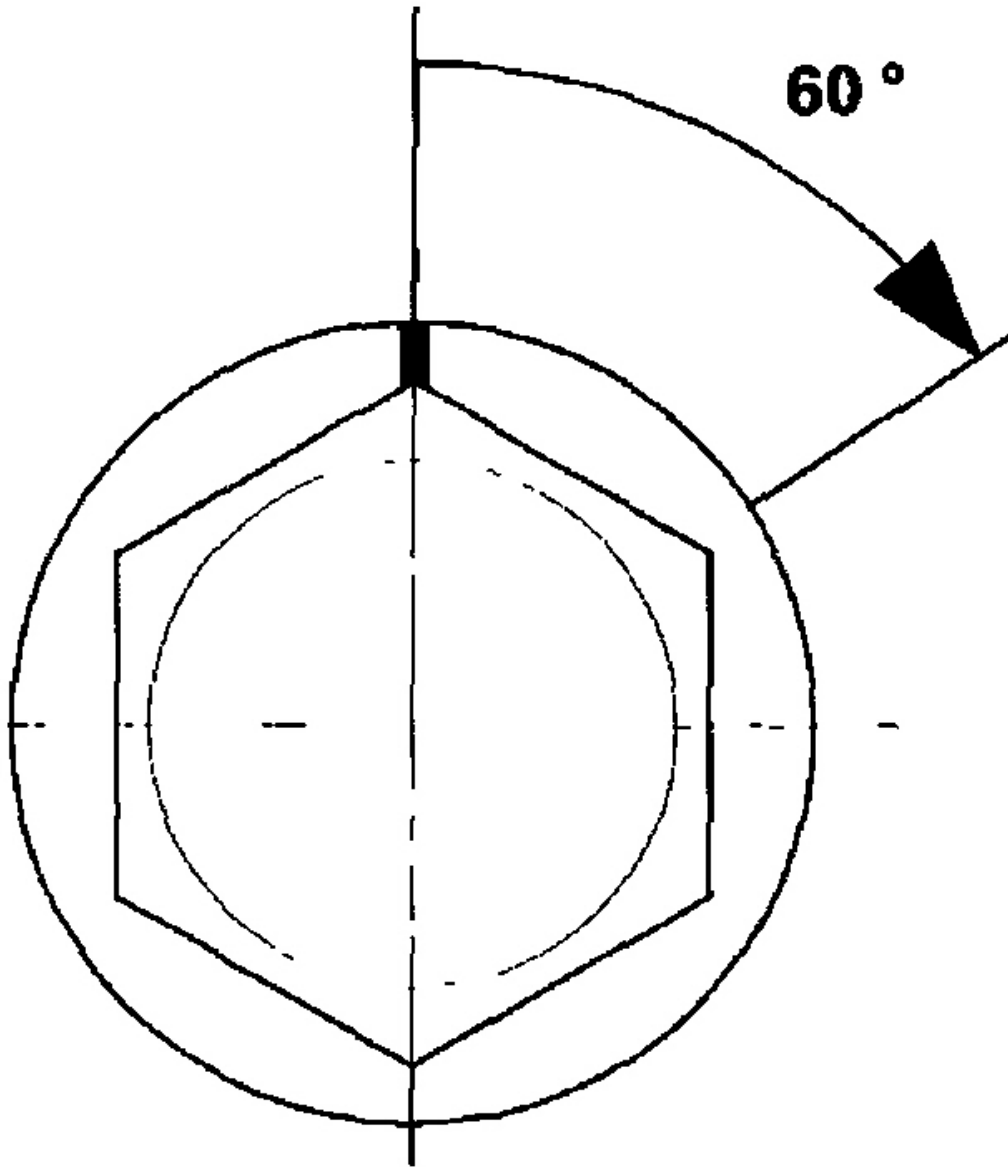
**Fig. 48: Applying Liquid Gasket**  
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

15. Put the main bearing cap on the engine block.
16. Apply new engine oil to the threads of the bearing cap bolts.
17. Tighten the bearing cap bolts in sequence to 25 N.m (2.5 kgf.m, 18 lbf.ft).  
Verify that all the bolts are torqued properly.



**Fig. 49: Tightening Bearing Cap Bolts In Sequence**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

18. Tighten the bearing cap bolts an additional 60°.

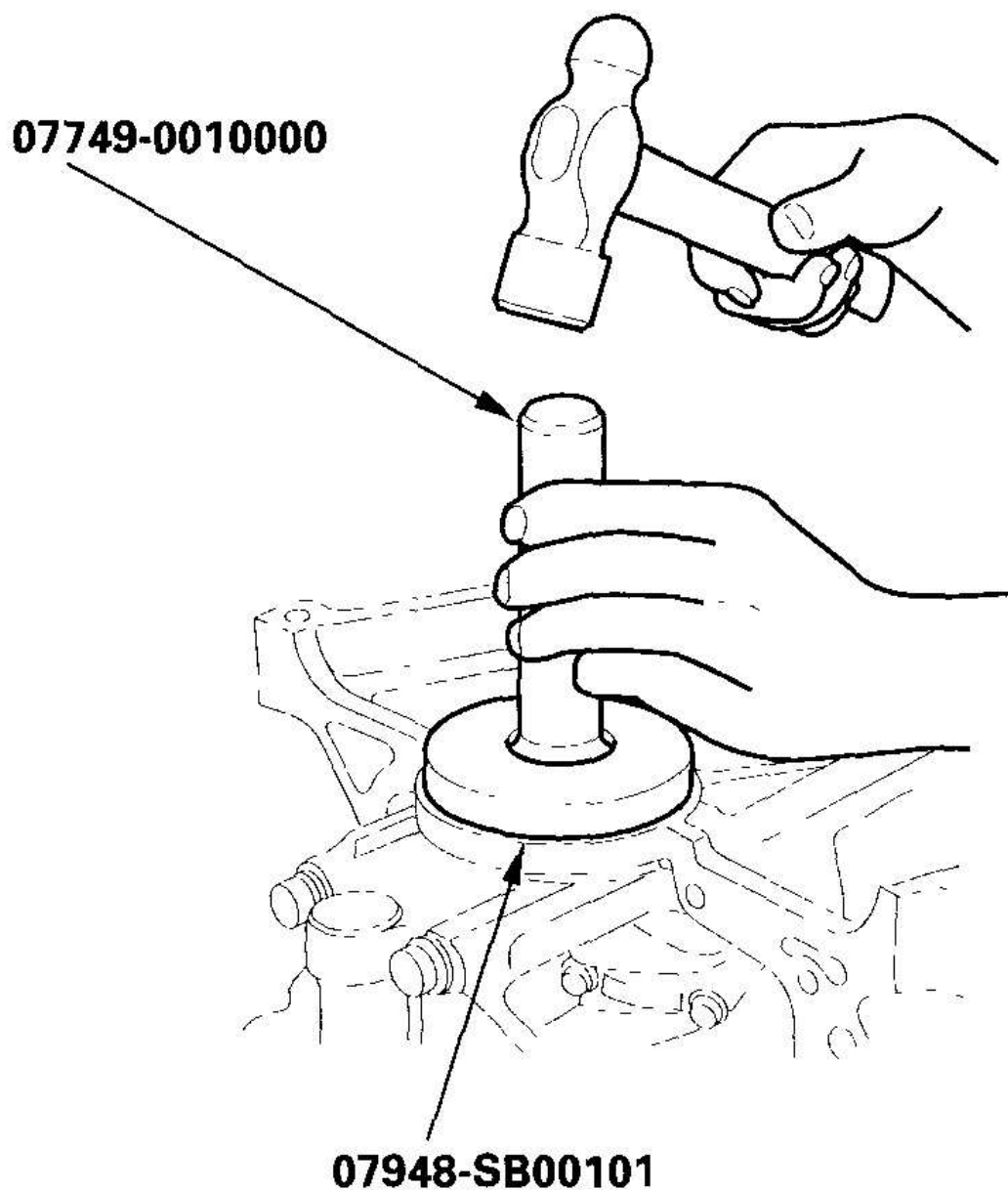


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**Fig. 50: Identifying Bearing Cap Bolts Angle**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

19. Use the special tools to install a new oil seal. Drive the seal in until the special

tool bottoms on the engine block.



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**Fig. 51: Installing Oil Seal With Special Tools**  
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**



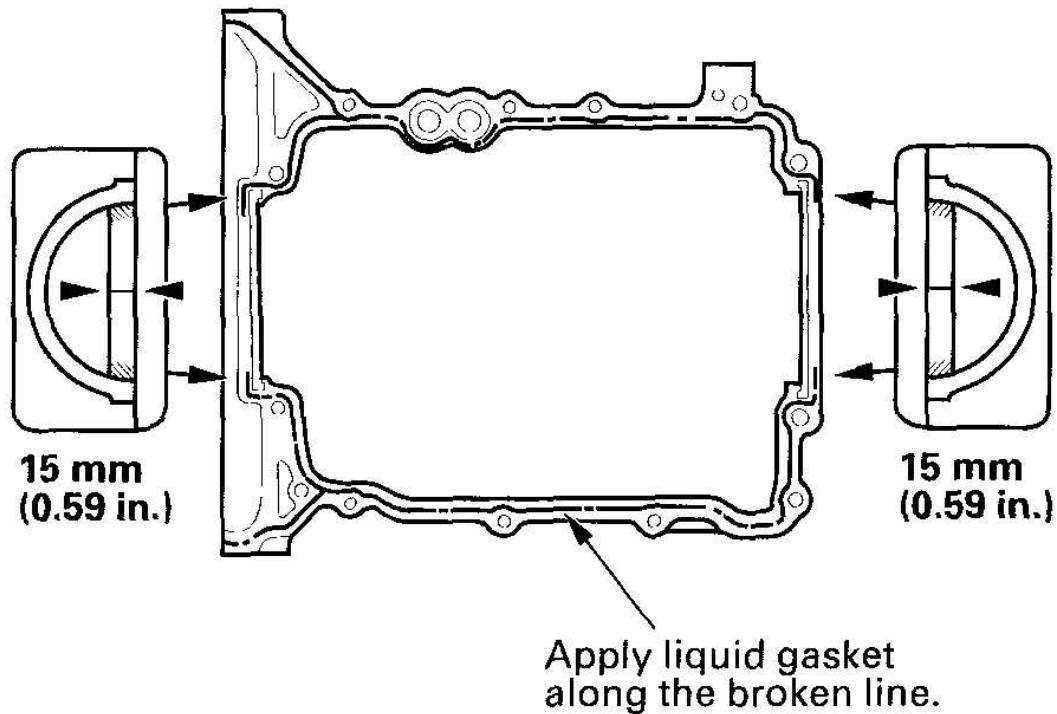
20. Install the cam chain (see CAM CHAIN INSTALLATION ).
21. Install the cylinder head (see CAMSHAFT AND ROCKER ARM INSTALLATION ).
22. Install the transmission:
  - Manual transmission (M/T) (see MANUAL TRANSMISSION ).
  - Continuously variable transmission (CVT) (see TRANSMISSION INSTALLATION ).
23. Install the engine assembly (see ENGINE INSTALLATION ).

**NOTE:** Whenever any crankshaft or connecting rod bearing is replaced, it is necessary after reassembly 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. Clean and dry the oil pan mating surfaces.
2. Apply liquid gasket P/N 08718-0001 to the engine block mating surface of the oil pan (see step 8 on CYLINDER HEAD ).

**NOTE:** Do not install the parts if 5 minutes or more have elapsed since applying liquid gasket. Instead, reapply liquid gasket after removing the old residue.

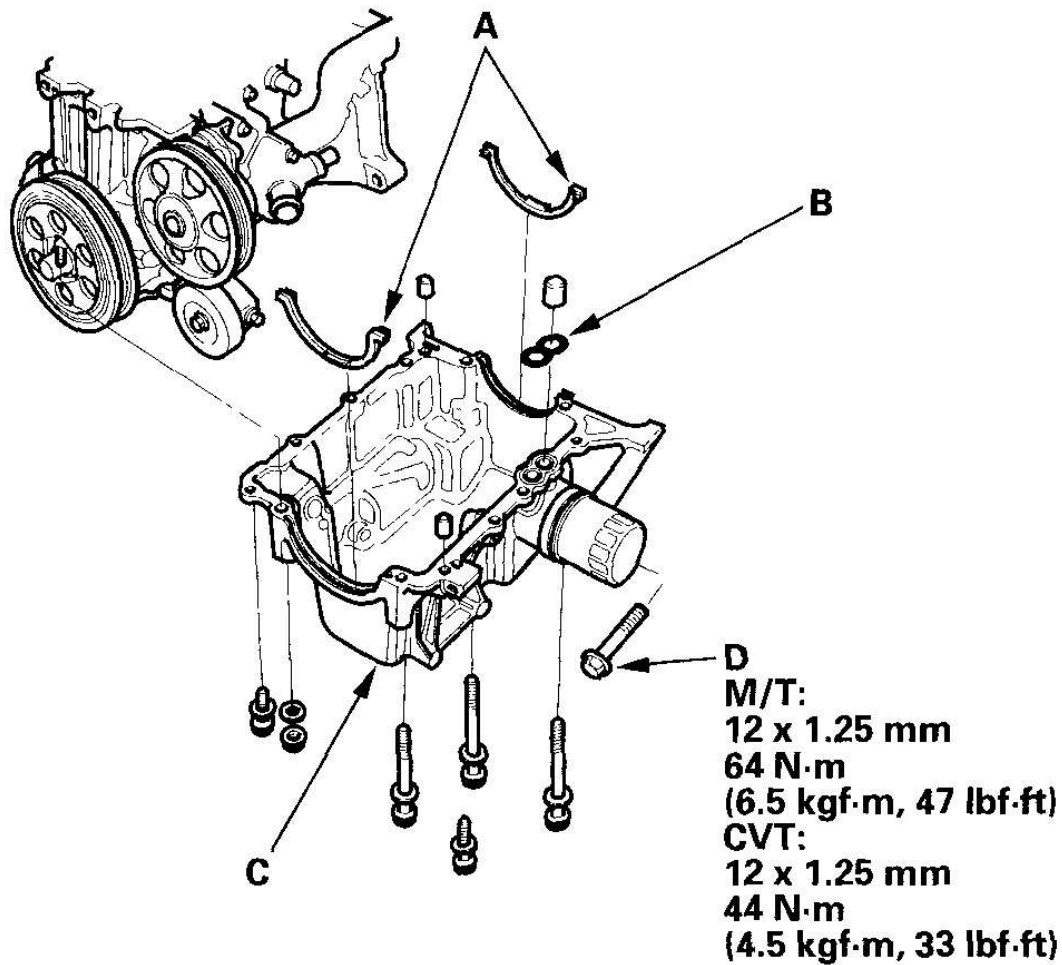


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**Fig. 52: Applying Liquid Gasket To Engine Block Mating Surface Of Oil Pan**

**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

3. Install the new oil pan gaskets (A) and a new O-ring (B) on the oil pan, then install the oil pan (C). Tighten the transmission housing mounting bolts (D).



G03680539

**Fig. 53: Installing Oil Pan Gaskets And O-Ring On Oil Pan And Torque Specifications**

**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

4. Tighten the bolts and nuts to the specified torque.

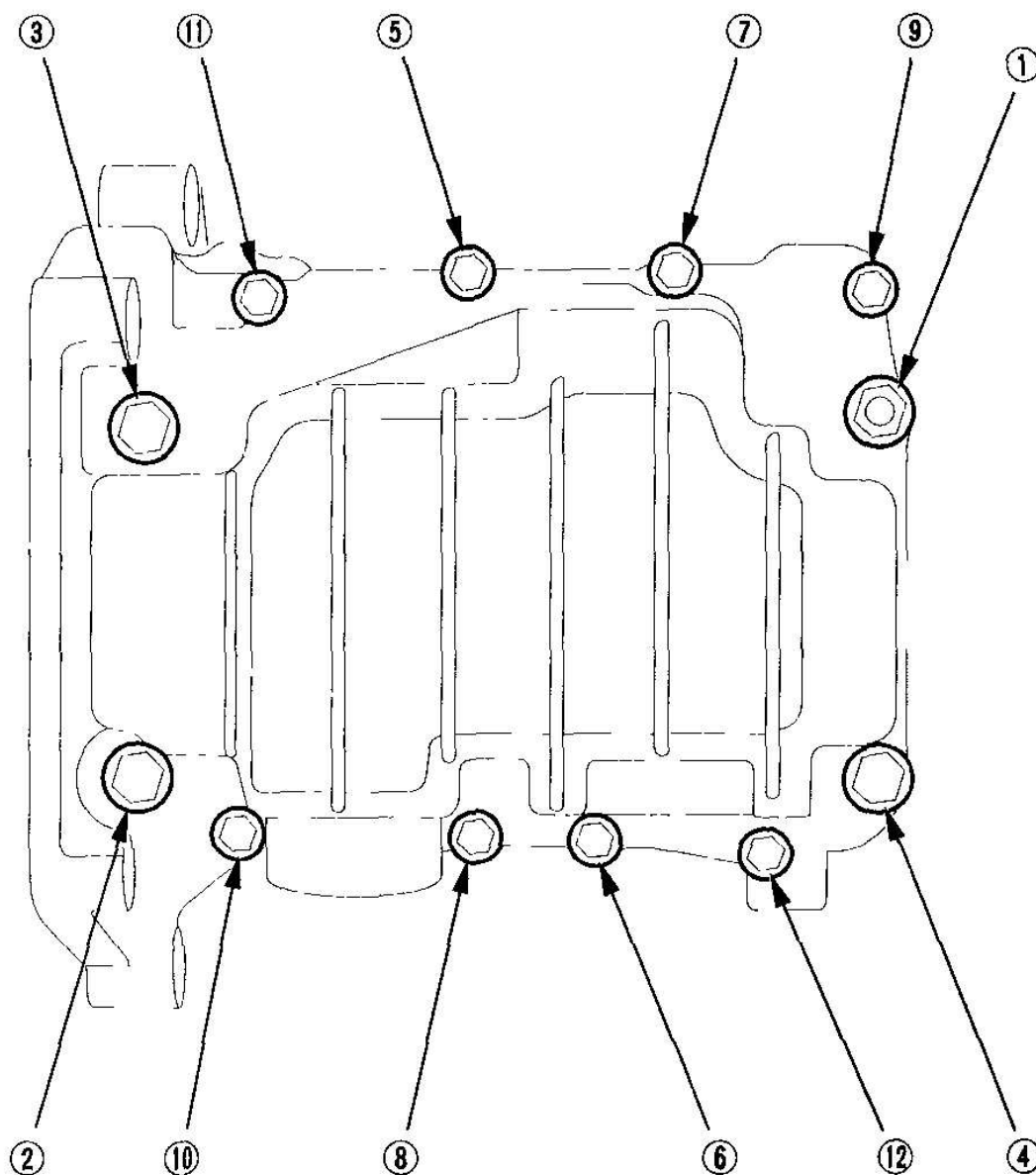
### **Specified Torque**

**8 x 1.25 mm:**

**22 N.m (2.2 kgf.m, 16 lbf.ft)**

**6 x 1.0 mm:**

**12 N.m (1.2 kgf.m, 8.7 lbf.ft)**



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**Fig. 54: Tightening Bolts And Nuts**

**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

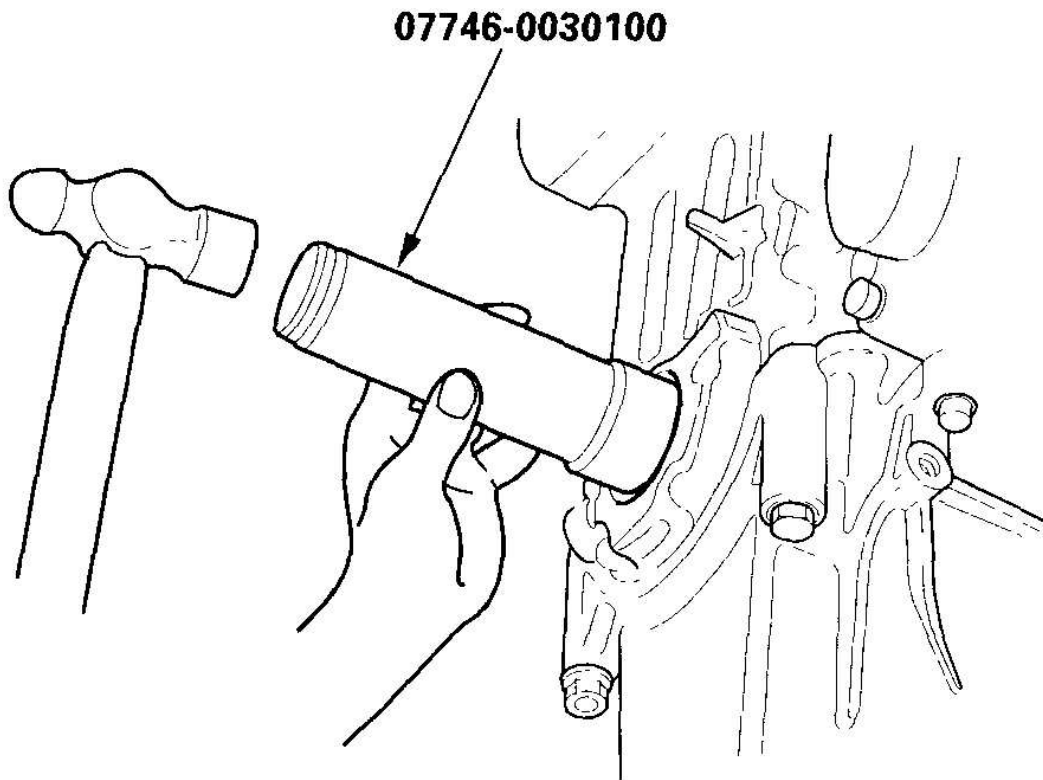
5. 2000-2003 models: Install the engine oil cooler bypass hose.
6. With A/C model: Install the A/C compressor (see step 17 on **ENGINE ASSEMBLY** ).
7. With A/C model: Install and adjust the water pump-A/C compressor belt (see **WATER PUMP-A/C COMPRESSOR BELT INSPECTION AND** ).
8. Refill the engine with engine oil (see **ENGINE OIL REPLACEMENT** ).
9. Install the splash shields (see step 21 on **ENGINE ASSEMBLY** ).

## **PULLEY END CRANKSHAFT OIL SEAL INSTALLATION - IN CAR**

### **Special Tools Required**

Driver 40 mm I.D. 07746-0030100

1. Clean and dry the crankshaft oil seal housing.
2. Apply a light coat of multipurpose grease to the crankshaft and to the lip of the seal.
3. Using the seal driver, 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. 55: Installing Crankshaft Oil Seal**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

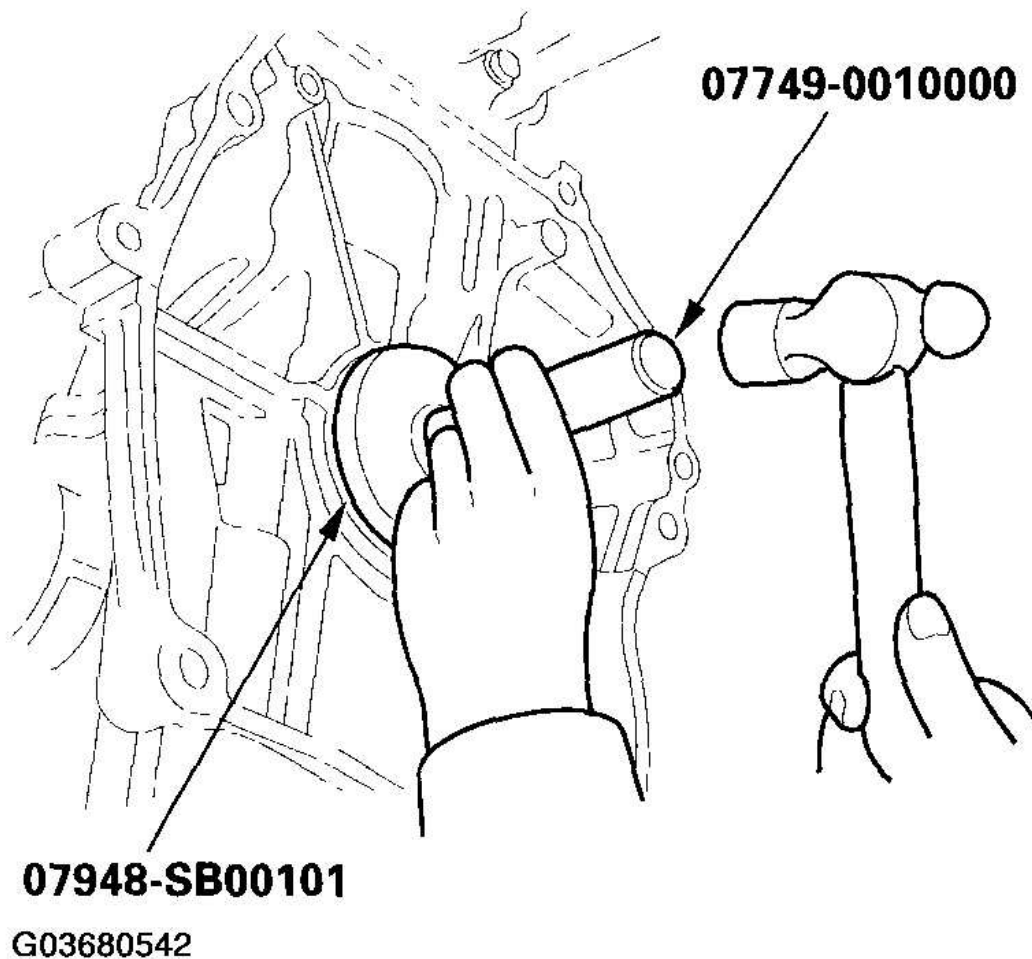
## TRANSMISSION END CRANKSHAFT OIL SEAL INSTALLATION - IN CAR

### Special Tools Required

- Driver 07749-0010000
- Driver attachment 07948-SB00101

1. Clean and dry the crankshaft oil seal housing.
2. Apply a light coat of multipurpose grease to the crankshaft and to the lip of the seal.
3. Using the special tools, drive in the crankshaft oil seal until the driver bottoms against the engine block. When the seal is in place, clean any excess grease off

the crankshaft and check that the oil seal lip is not distorted.



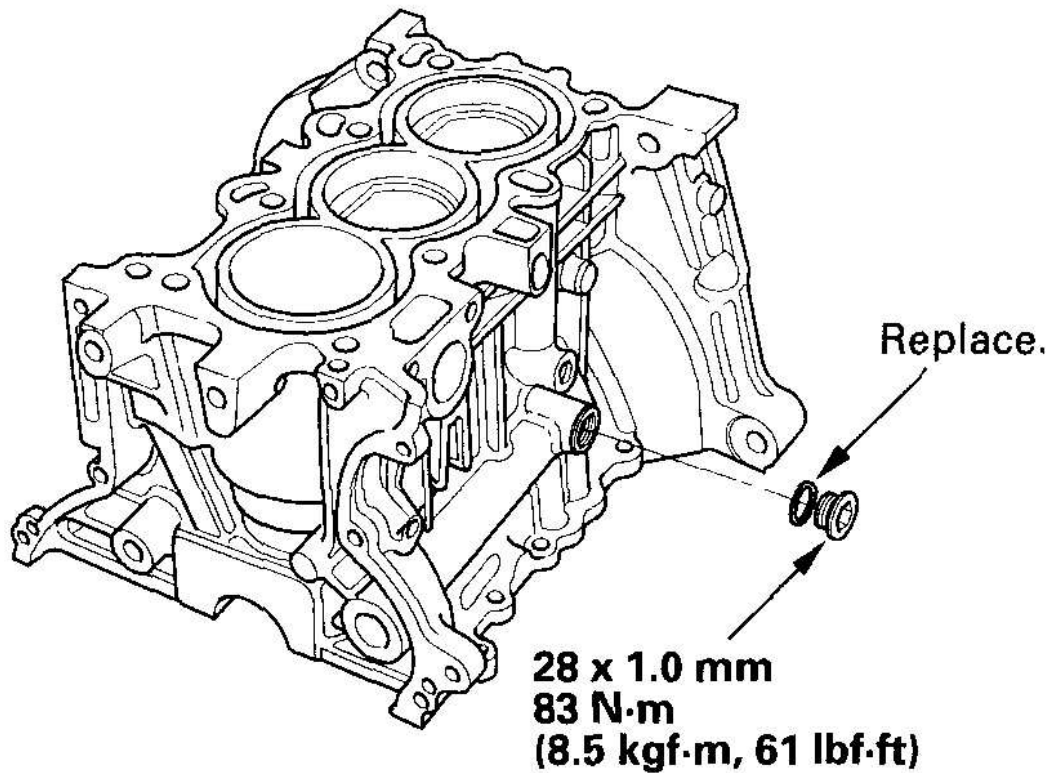
**Fig. 56: Installing Crankshaft Oil Seal**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

## COOLANT DRAIN BOLT INSTALLATION

**NOTE:** When installing the drain bolt, always use new washer.





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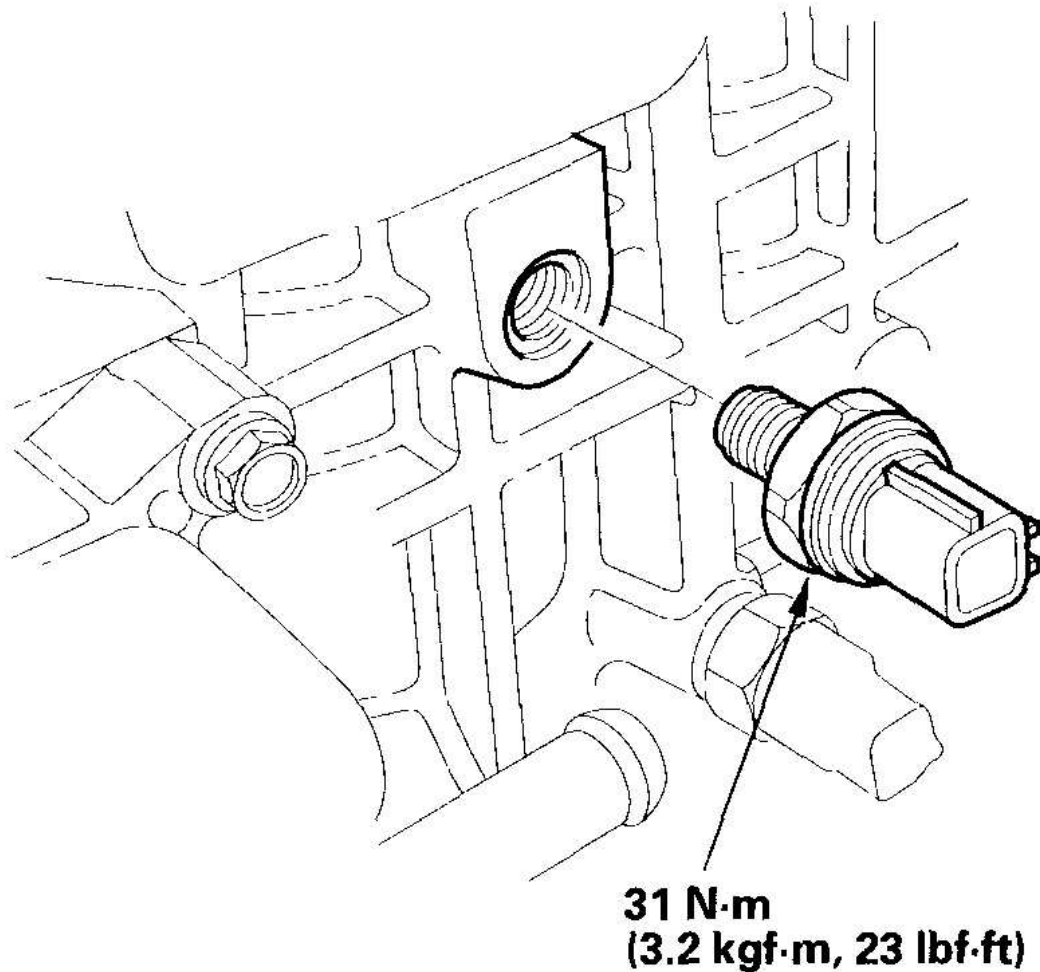
**Fig. 57: Installing Drain Bolt**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

## **KNOCK SENSOR REPLACEMENT**

1. Remove the throttle body (see **THROTTLE BODY REMOVAL/INSTALLATION** ).
2. Disconnect the knock sensor connector, then remove the knock sensor.





G03680544

**Fig. 58: Disconnecting Knock Sensor Connector And Knock Sensor With Torque Specifications**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Install the knock sensor.
4. Install the throttle body (see **THROTTLE BODY REMOVAL/INSTALLATION** ).