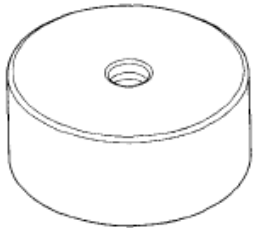


ENGINE BLOCK (K20Z3)

SPECIAL TOOLS

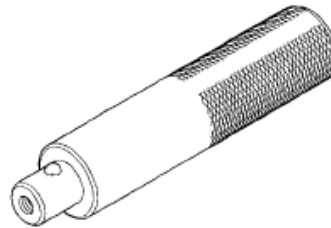
Ref. No.	Tool Number	Description	Qty
①	07ZAD-PNAA100	Oil Seal Driver Attachment 96	1
②	07746-0010700	Attachment, 24 x 26 mm	1
③	07749-0010000	Driver	1



①



②



③

Fig. 79: Identifying Special Tools

Courtesy of AMERICAN HONDA MOTOR CO., INC.

COMPONENT LOCATION INDEX

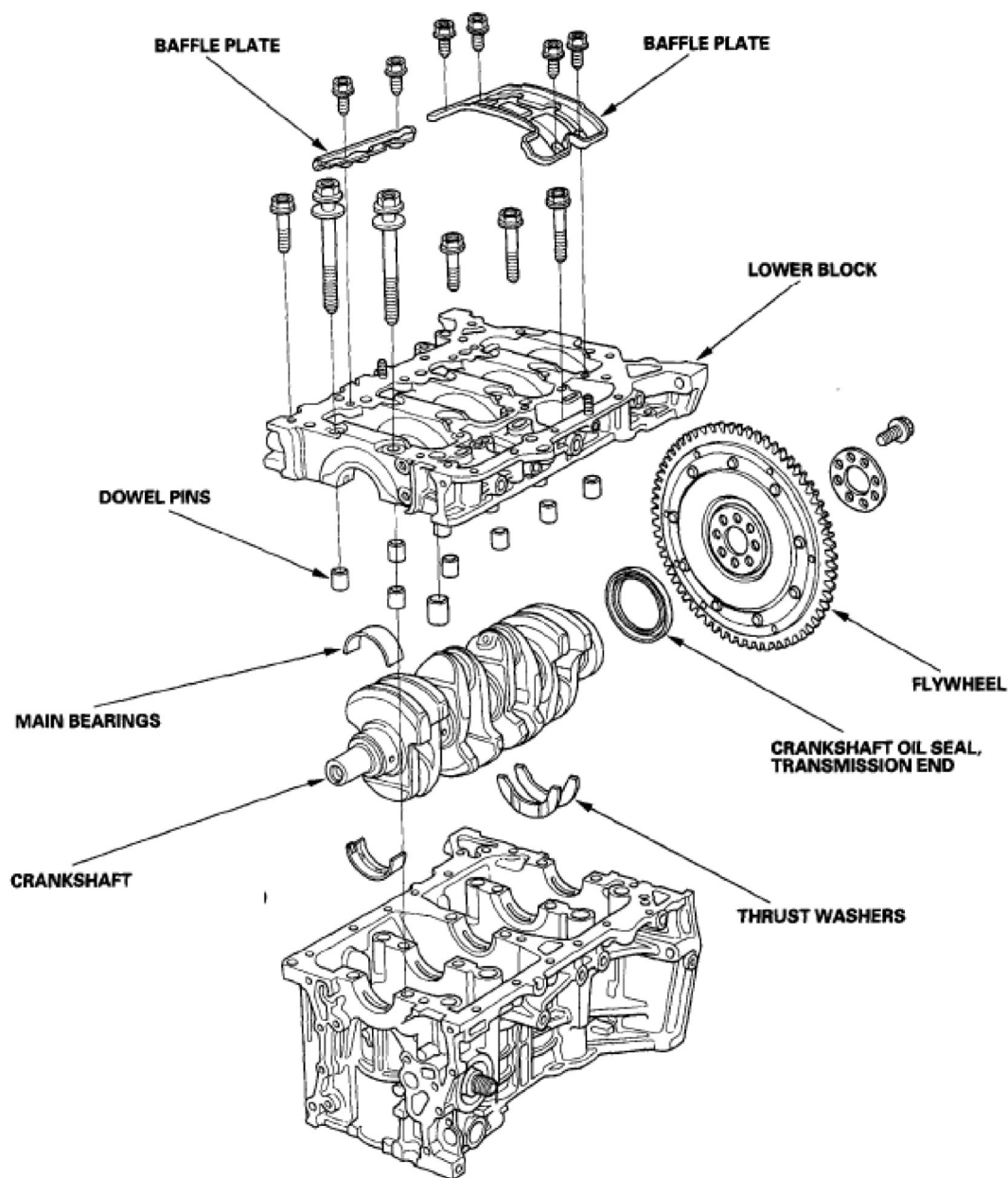


Fig. 80: Identifying Flywheel, Lower Block And Crankshaft
Courtesy of AMERICAN HONDA MOTOR CO., INC.

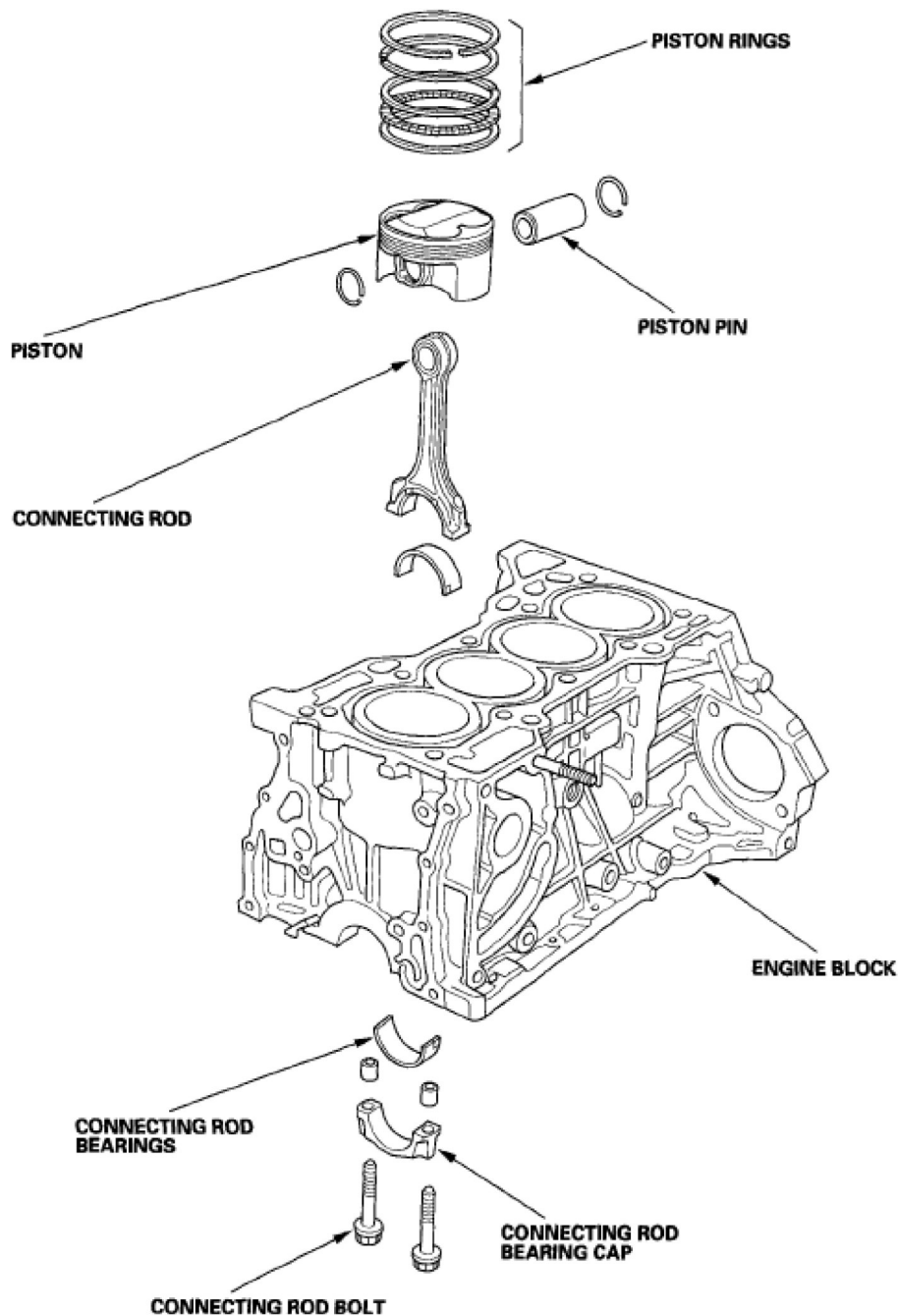


Fig. 81: Identifying Engine Block, Piston And Connecting Rod
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CONNECTING ROD AND CRANKSHAFT END PLAY INSPECTION

1. Remove the oil pump (see **OIL PUMP REMOVAL**).
2. Remove the baffle plates (see step 7).
3. Measure the connecting rod end play with a feeler gauge between the connecting rod and crankshaft.

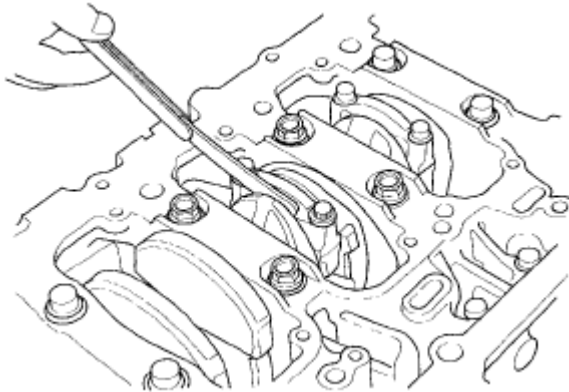
Connecting Rod End Play**Standard (New): 0.15-0.30 mm (0.006-0.012 in.)****Service Limit: 0.40 mm (0.016 in.)**

Fig. 82: Measuring Connecting Rod End Play
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. If the connecting rod end play is beyond service limit, install a new connecting rod, and recheck. If it is still beyond service limit; 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.

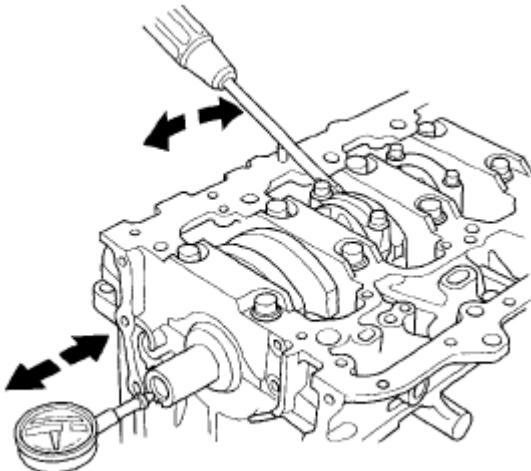
Crankshaft End Play**Standard (New): 0.15-0.35 mm (0.0059-0.0138 in.)****Service Limit: 0.45 mm (0.018 in.)**

Fig. 83: Identifying Crankshaft Firmly Away From Dial Indicator
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. If the end play is beyond service limit, replace the thrust washers and recheck, if it is still beyond service limit, replace the crankshaft (see **CRANKSHAFT AND PISTON REMOVAL**).

CRANKSHAFT MAIN BEARING REPLACEMENT

Main Bearing Clearance Inspection

1. To check main bearing-to-journal oil clearance, remove the lower block 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.
4. Reinstall the bearings and lower block, then torque the bolts to 29 N.m (3.0 kgf.m, 22 lbf.ft) + 56 ° in the proper sequence (see step 19).

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

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

Main Bearing-to-Journal Oil Clearance

No. 1, 2, 4, 5 Journals:

Standard (New): 0.017 - 0.041 mm (0.0007 - 0.0016 in.)

Service Limit: 0.050 mm (0.0020 in.)

Standard (New): 0.025 - 0.049 mm (0.0010 - 0.0019 in.)

Service Limit: 0.055 mm (0.0022 in.)

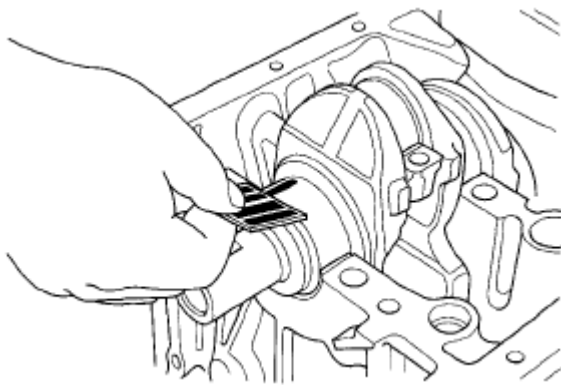


Fig. 84: Identifying Widest Part Of Plastigage
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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(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 the current 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. Numbers, letters or bars have been stamped on the end of the block as a code for the size of each of the five 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.

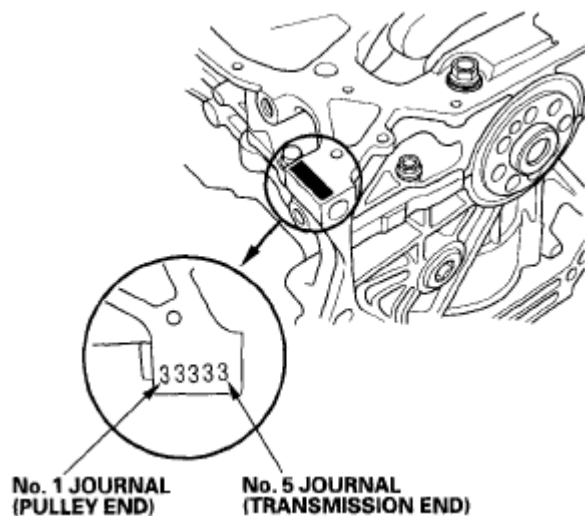


Fig. 85: Identifying Crankshaft Bore Code Location
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Main Journal Code Location

2. The main journal codes are stamped on the crankshaft in either location.

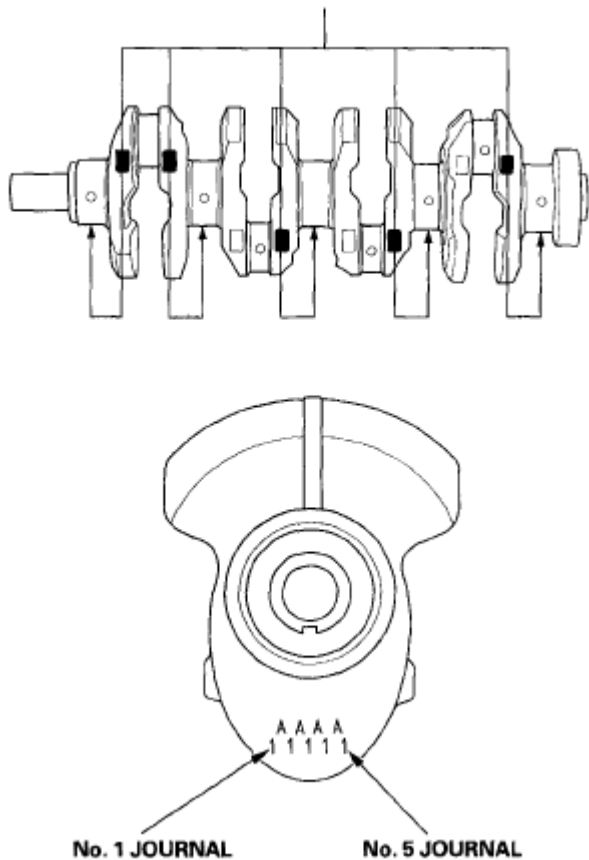


Fig. 86: Identifying Main Journal Code Location
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

NOTE:

- The 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			
		1 or A or I	2 or B or II	3 or C or III	4 or D or IIII
		Larger crank bore			
		Smaller bearing (Thicker)			
Main journal code					
1		Pink	Pink/Yellow	Yellow	Green
2		Pink/Yellow	Yellow	Green	Green/Brown
3		Yellow	Green	Green/Brown	Brown
4		Green	Green/Brown	Brown	Black
5		Green/Brown	Brown	Black	Black/Blue
6		Brown	Black	Black/Blue	Blue
	Smaller main journal		Smaller bearing (Thicker)		

Fig. 87: Identifying Crank Bore Codes And Crank Journal Codes
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

CONNECTING ROD BEARING REPLACEMENT

Rod Bearing Clearance Inspection

1. Remove the oil pump (see **OIL PUMP REMOVAL**).
2. Remove the baffle plates (see step 7).
3. Remove the connecting rod cap and bearing half.
4. Clean the crankshaft rod journal and bearing half with a clean shop towel.
5. Place plastigage across the rod journal.
6. Reinstall the bearing half and cap, and torque the bolts to 29 N.m (3.0 kgf.m, 22 lbf.ft) + 90 °

NOTE: Do not rotate the crankshaft during inspection.

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

Connecting Rod Bearing-to-Journal Oil Clearance

Standard (New): 0.032-0.066 mm (0.0013-0.0026 in.)

Service Limit: 0.077 mm (0.0030 in.)

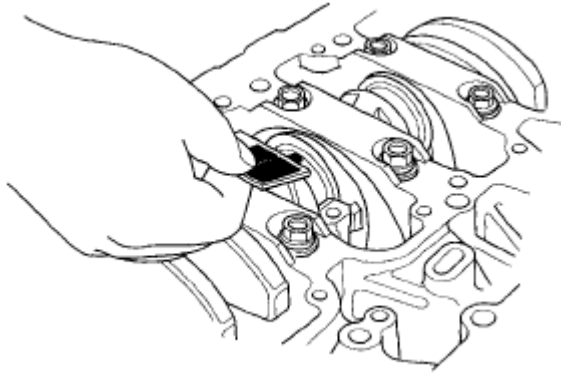


Fig. 88: Identifying Widest Part Of Plastigage
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. 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.
9. If the plastigage shows the clearance is still incorrect, try the next larger or smaller bearing (the color listed above or below the current 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.

Connecting Rod Big End Bore Code Locations

2. Each rod has a tolerance range 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 Mil) indicating the range. You may find any combination of numbers and bars in any engine. (Half the number or bar is stamped on the bearing cap, the other half is on the rod.)

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

Big End Bore Size: 51.0 mm (2.01 in.)

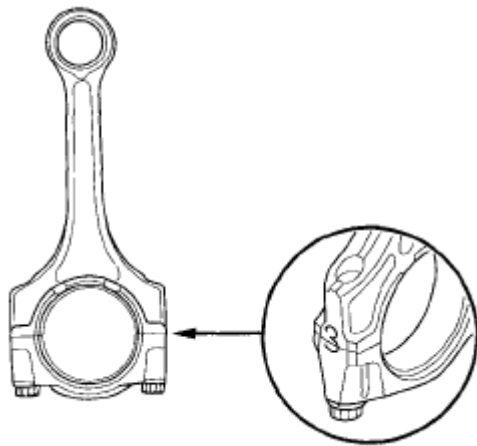


Fig. 89: Identifying Connecting Rod Big End Bore Code Locations
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

Connecting Rod Journal Code Location

3. The connecting rod journal codes are stamped on the crankshaft in either location.

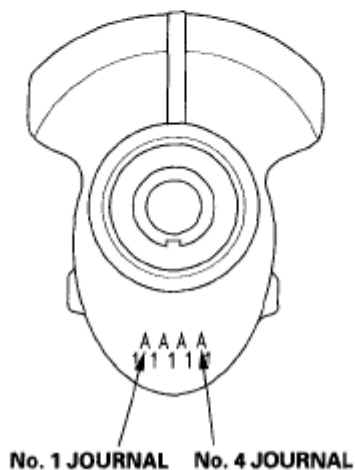
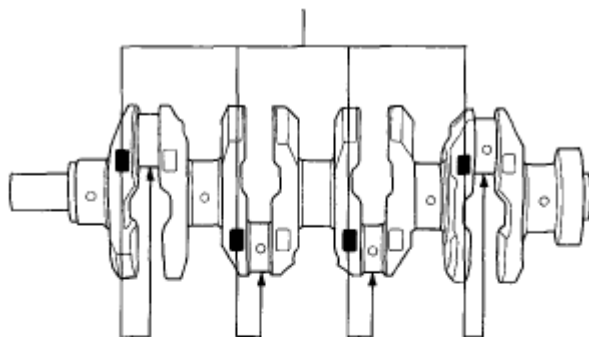


Fig. 90: Identifying Connecting Rod Journal Code Location

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:

- The 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.

		Big end bore code → Larger big end bore			
		1 or I	2 or II	3 or III	4 or IIII
Rod journal code		→ Smaller bearing (Thicker)			
	A	Pink	Pink/Yellow	Yellow/Green	Green
	B	Yellow	Yellow/Green	Green/Brown	Brown
	C	Green	Green/Yellow	Brown/Black	Black
	D	Brown	Brown/Black	Black/Blue	Blue
		↓ Smaller rod journal ↓ Smaller bearing (Thicker)			

Fig. 91: Identifying Big End Bore Codes And Rod Journal Codes
Courtesy of AMERICAN HONDA MOTOR CO., INC.

OIL PAN REMOVAL

- Engine hanger adapter VSB02C000015
- Engine support hanger, A and Reds AAR-T1256
- 2006 Civic engine hanger VSB02C000025
- Front Subframe adapter VSB02C000016

These special tools are available through Honda Tool and Equipment Program, 888-424-6857

1. If the engine is out of the vehicle, go to step 18.
2. Raise the vehicle on the lift.
3. Drain the engine oil (see **OIL PRESSURE TEST**).
4. Remove the front wheels.
5. Remove the splash shield (see step 24 on **ENGINE REMOVAL**).
6. Separate the stabilizer links (see **STABILIZER LINK REMOVAL/INSTALLATION**).
7. Separate the knuckles from the lower arms (see step 5 on **LOWER ARM REMOVAL/INSTALLATION**).

8. Remove the steering gearbox bracket. Remove the steering gearbox mounting bolt, stiffener mounting bolt, and stiffener (see step 34 on **ENGINE REMOVAL**).
9. Remove the steering gearbox mounting bolt, stiffener mounting bolt, and stiffener. Remove the harness clamp from the front subframe (see step 36 on **ENGINE REMOVAL**).
10. Lower the vehicle on the lift.
11. Attach the engine hanger adapter (VSB02C000015) to the treated hole in the cylinder head (see step 42 **ENGINE REMOVAL**).
12. Install the front leg assembly, the hook, and the wing nut to an A and Red's engine support hanger (AAR-T1256) on to the 2006 civic engine hanger (VSB02C000025). Carefully position the engine hanger on the vehicle, and attach the hook to the slotted hole in the support eyelet. Tighten the wing nut by hand to lift and support the engine/transmission (see step 43 **ENGINE REMOVAL**).
13. Raise the vehicle on the lift.
14. Remove the lower torque rod (See step 45 **ENGINE REMOVAL**).
15. Remove the front mount mounting bolt (see step 46 **ENGINE REMOVAL**).
16. Mark the appropriate reference line at both sides of the front subframe that line up with the edges on the body (see step 47 **ENGINE REMOVAL**).
17. Loosen the mid-stiffener mounting bolts on both sides (see step 48 **ENGINE REMOVAL**).
18. Attach the front subframe adapter (VSB02C000016) to the front subframe, and hang the belt of the front subframe adapter over the front of the subframe. Secure the belt with its stop, then tighten the wing nut (See step 49 **ENGINE REMOVAL**).
19. Raise the jack, and line up the slots in the front subframe adapter arms with the bolt hole on the jack base, then securely attach them with four bolts.
20. Remove the front subframe (see step 51 **ENGINE REMOVAL**).
21. Remove the lower torque rod bracket.

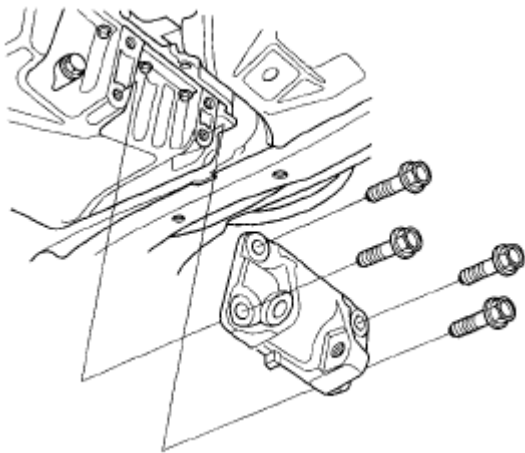


Fig. 92: Identifying Lower Torque Rod Bracket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

22. Remove the clutch cover (A) and the transmission mounting bolts (B).

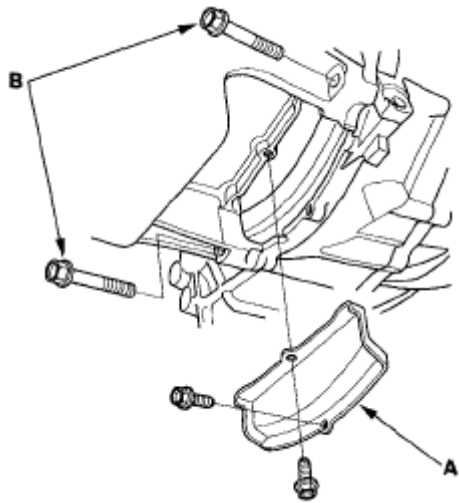


Fig. 93: Identifying Clutch Cover And Transmission Mounting Bolts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

23. Remove the bolts securing the oil pan.
24. Using a flat blade screwdriver, separate the oil pan from the lower block in the places shown.

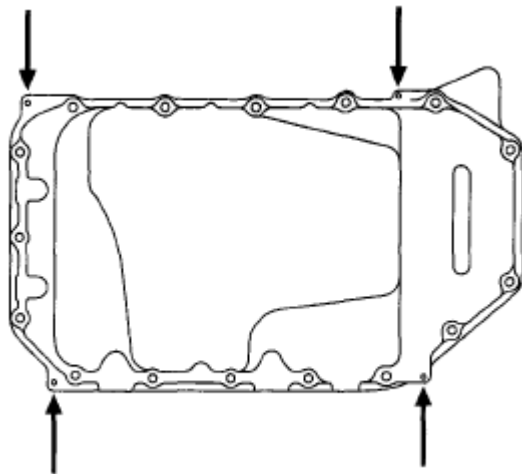


Fig. 94: Identifying Oil Pan From Block
Courtesy of AMERICAN HONDA MOTOR CO., INC.

25. Remove the oil pan.

CRANKSHAFT AND PISTON REMOVAL

1. Remove the engine assembly (see **ENGINE REMOVAL**).
2. Remove the transmission (see **TRANSMISSION REMOVAL**).
3. Remove the pressure plate , clutch disc and flywheel (see **PRESSURE PLATE AND CLUTCH DISC REMOVAL (5-SPEED MODEL)**).

4. Remove the oil pan (see **OIL PAN REMOVAL**).
5. Remove the oil pump (see **OIL PUMP REMOVAL**).
6. Remove the cylinder head (see **CYLINDER HEAD REMOVAL**).
7. Remove the baffle plates.

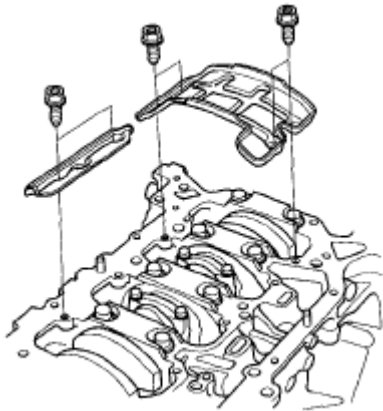


Fig. 95: Identifying Baffle Plates

Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Remove the 8 mm bolts in sequence.

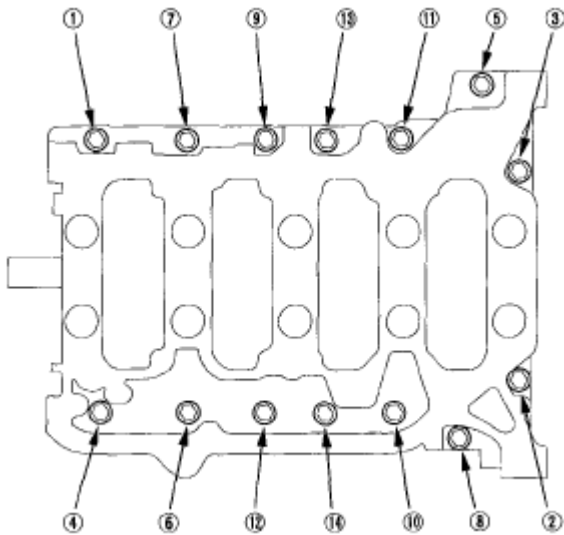


Fig. 96: Identifying 8mm Bolts Removal Sequence

Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Remove the 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.

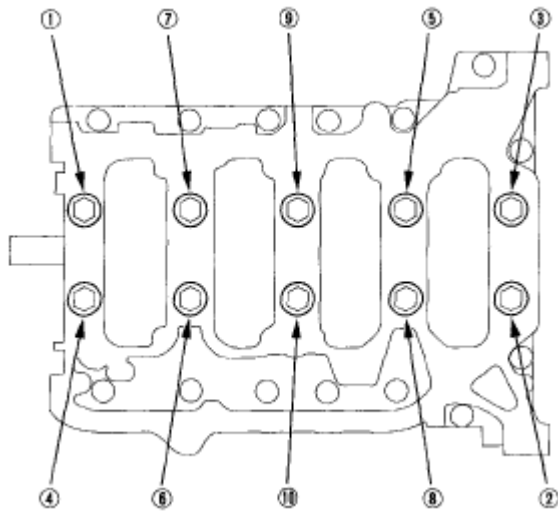


Fig. 97: Identifying Bearing Cap Bolts Removal Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Remove the lower block and bearings. Keep all the bearings in order.

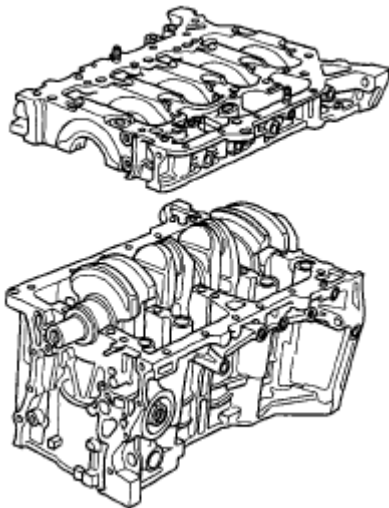


Fig. 98: Identifying Lower Block And Bearings
Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Remove the rod caps/bearings. Keep all caps/bearings in order.
12. Lift the crankshaft out of the engine. Being careful not to damage the journals.

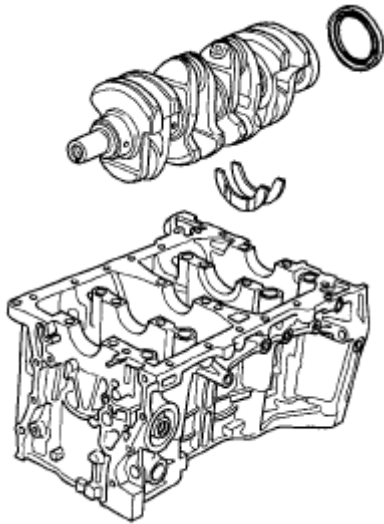


Fig. 99: Identifying Crankshaft Out Of Engine
Courtesy of AMERICAN HONDA MOTOR CO., INC.

13. Remove the upper bearing halves from the connecting rods, and set them aside with their respective caps.
14. 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 pistons as they are pushed out.

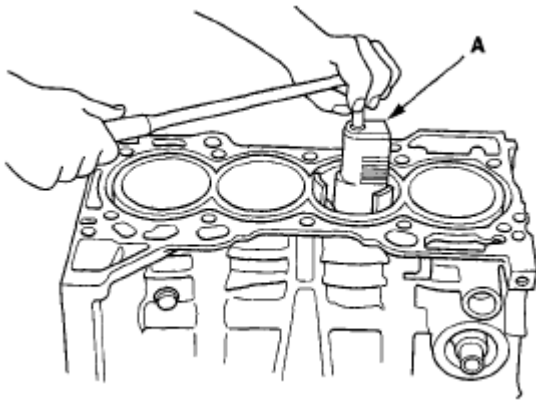


Fig. 100: Identifying Hard Carbon Around Top Of Each Cylinder
Courtesy of AMERICAN HONDA MOTOR CO., INC.

15. Use the wooden handle of a hammer (A) to drive out the piston/connecting rod assembly (B).

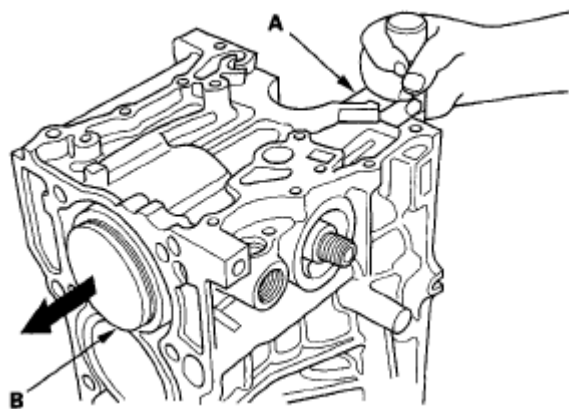


Fig. 101: Driving Out Piston/Connecting Rod Assembly
Courtesy of AMERICAN HONDA MOTOR CO., INC.

16. Reinstall the lower block and bearings on the engine in the proper order.
17. Reinstall the connecting rod bearings and caps after removing each piston/connecting rod assembly.
18. Mark each piston/connecting rod assembly with its cylinder number to make sure they are reused in the original order.

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. Clean the keyway and threads.
4. Measure the 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.)

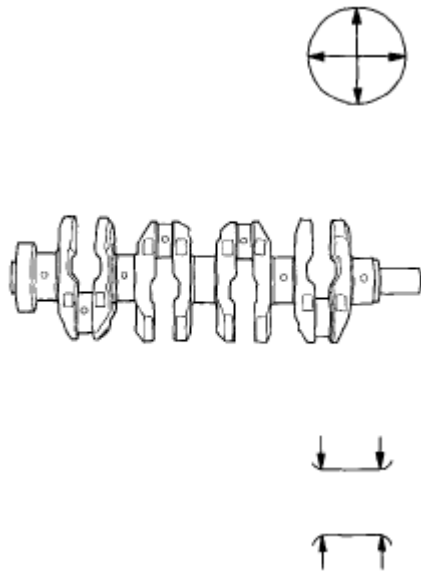


Fig. 102: Identifying Crankshaft Journal Out-Of-Round
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Measure the 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. 5 journals of the engine block.
8. Measure runout on all 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 (0.0012 in.) max.

Service Limit: 0.04 mm (0.0016 in.)

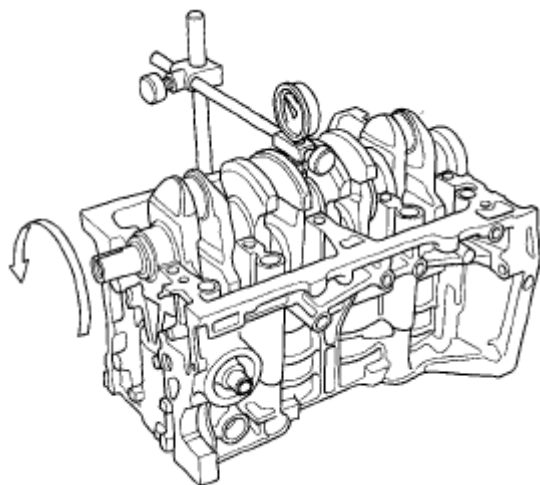


Fig. 103: Measuring Runout On Main Journals
Courtesy of AMERICAN HONDA MOTOR CO., INC.

BLOCK AND PISTON INSPECTION

1. Remove the crankshaft and pistons (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. There are two standard-size pistons (No Letter or A, and B). The letter is stamped on the top of the piston. Letters are also stamped on the block as cylinder bore sizes.

Piston Diameter

Standard (New):

No Letter (or A): B: 85.980-85.990 mm (3.3850-3.3854 in.)

B: 85.970-85.980 mm (3.3846-3.3850 in.)

Service Limit:

No Letter (or A): 85.930 mm (3.3831 in.) 85.920 mm (3.3827 in.)

Oversize Piston Diameter

0.25: 86.230-86.240 mm (3.3949-3.3953 in.)

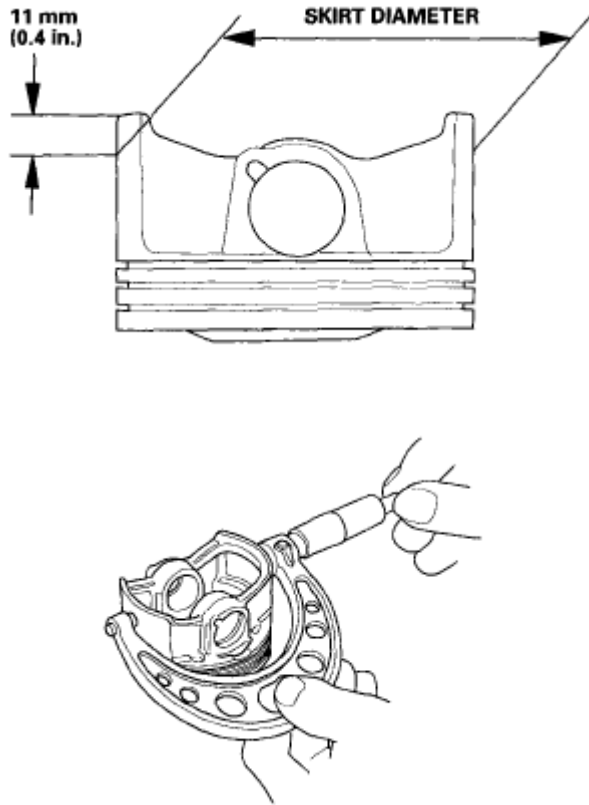


Fig. 104: Measuring Piston Diameter Point From Bottom Of Skirt
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Measure the wear and taper in direction X and Y at three levels in each cylinder as shown. If the measurements in any cylinder are beyond the Oversize Bore Service Limit, replace the engine block. If the engine block is being rebored, refer to step 7 after reboring.

Cylinder Bore Size

Standard (New):

A or I: 86.010-86.020 mm (3.3862-3.3866 in.)

B or II: 86.000-86.010 mm (3.3858-3.3862 in.)

Service Limit: 86.070 mm (3.3886 in.)

Oversize

0.25: 86.250-86.260 mm (3.3957-3.3961 in.)

Reboring Limit: 0.25 mm (0.01 in.) max.

Bore Taper

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

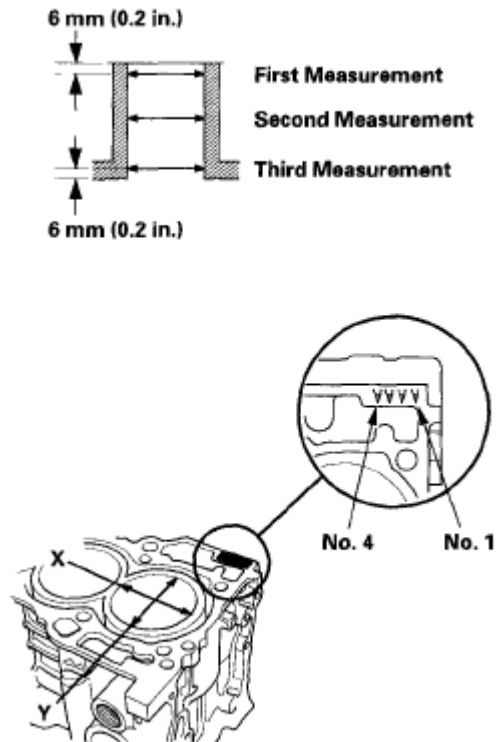


Fig. 105: Identifying Wear And Taper Direction X And Y Three Levels In Each Cylinder
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Scored or scratched cylinder bores must be honed.
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.)

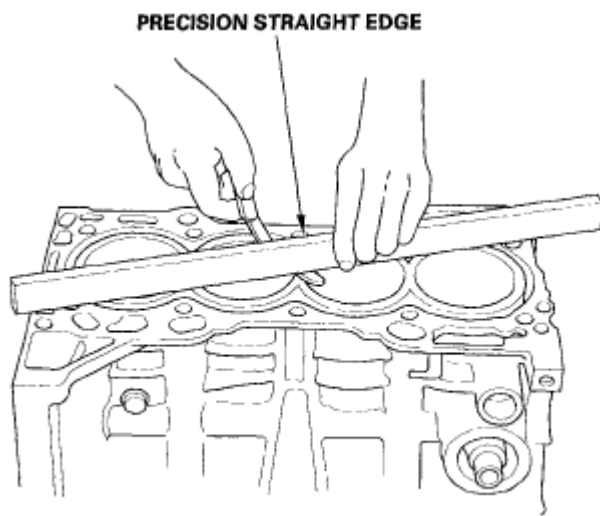
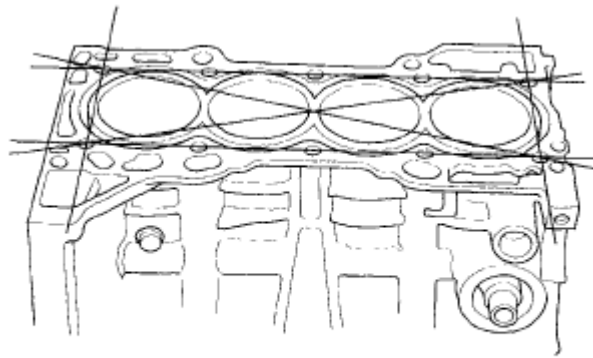


Fig. 106: Identifying Top Of Engine Block For Warpage
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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 cylinder bore for excessive wear.

Piston-to-Cylinder Bore Clearance

Standard (New): 0.020-0.040 mm (0.0008-0.0016 in.)

Service Limit: 0.05 mm (0.002 in.)

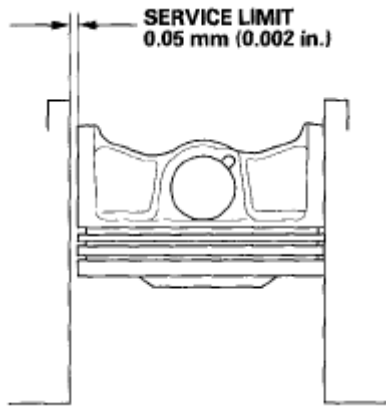


Fig. 107: Identifying Difference Between Cylinder Bore Diameter And Piston Diameter
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

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 remeasure the bores.
2. Remove the oil jets.
3. Hone the cylinder bores with honing oil and a fine (400 grit) stone in a 60 degree cross-hatch pattern (A). 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.

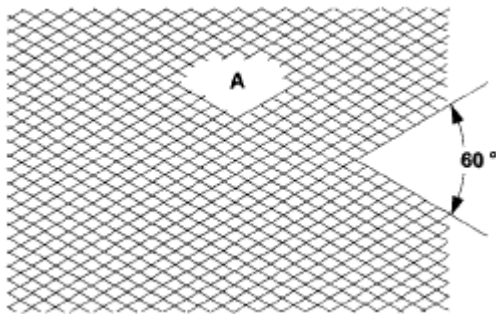


Fig. 108: Identifying Cross-Hatch Pattern
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. 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.
5. If scoring or scratches are still present in the cylinder bores after honing the engine block 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.
6. Install the oil jets.

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.

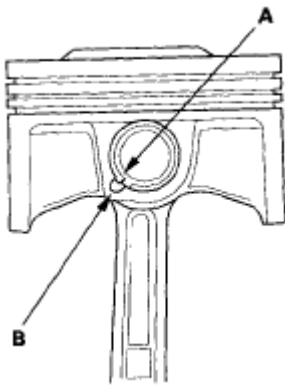


Fig. 109: Identifying Piston Pin Snap Rings And Piston Pin Bores
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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.

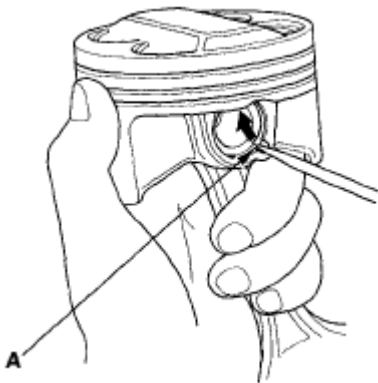


Fig. 110: Identifying Snap Rings
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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



Fig. 111: 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): 21.961-21.965 mm (0.8646-0.8648 in.)

Service Limit: 21.953 mm (0.8643 in.)

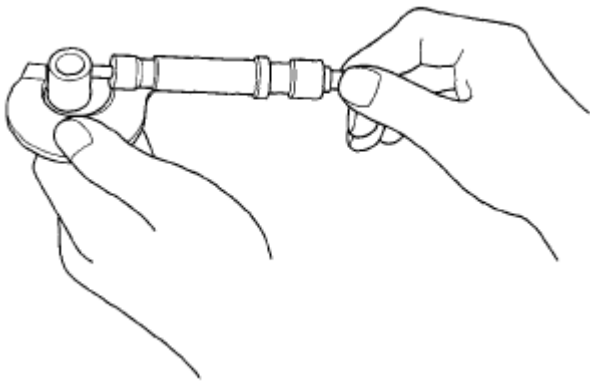


Fig. 112: Measuring Diameter Of Piston Pin
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

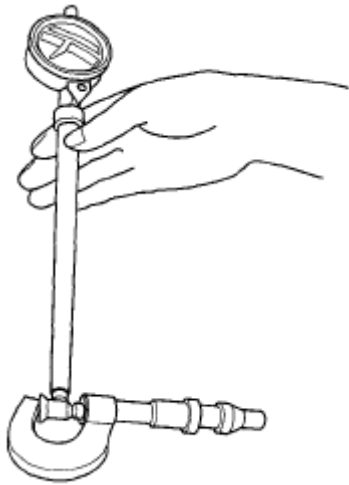


Fig. 113: Seating Dial Indicator To Piston Pin Diameter
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Piston Pin-to-Piston Clearance

Standard (New): -0.005 to +0.002 mm (-0.00020 to +0.00008 in.)

Service Limit: 0.005 mm (0.0002 in.)

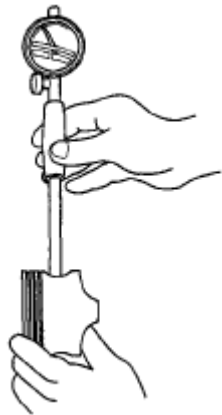


Fig. 114: Checking Difference Between Piston Pin Diameter And Piston Pin Hole Diameter In Piston
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Piston Pin-to-Connecting Rod Clearance

Standard (New): 0.005-0.015 mm (0.0002-0.0006 in.)

Service Limit: 0.02 mm (0.0008 in.)

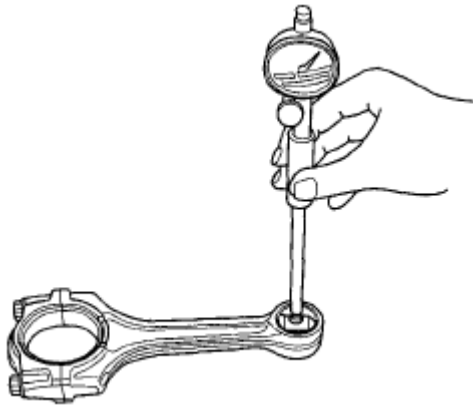


Fig. 115: Measuring Piston Pin-To-Connecting Rod Clearance
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Reassembly

1. Install a piston pin snap ring (A).

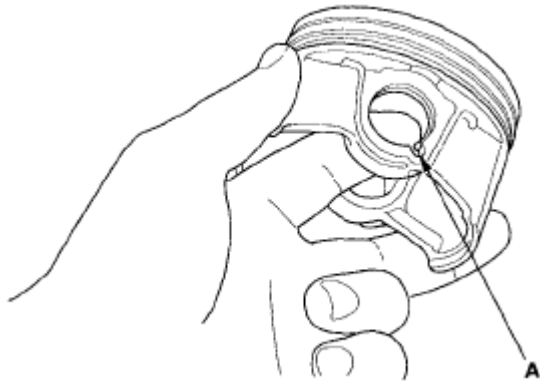


Fig. 116: Identifying Piston Pin Snap Ring
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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).

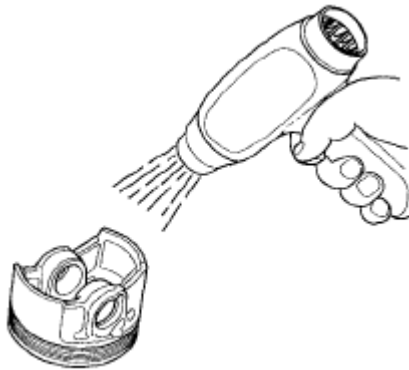


Fig. 117: Heating Piston

Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

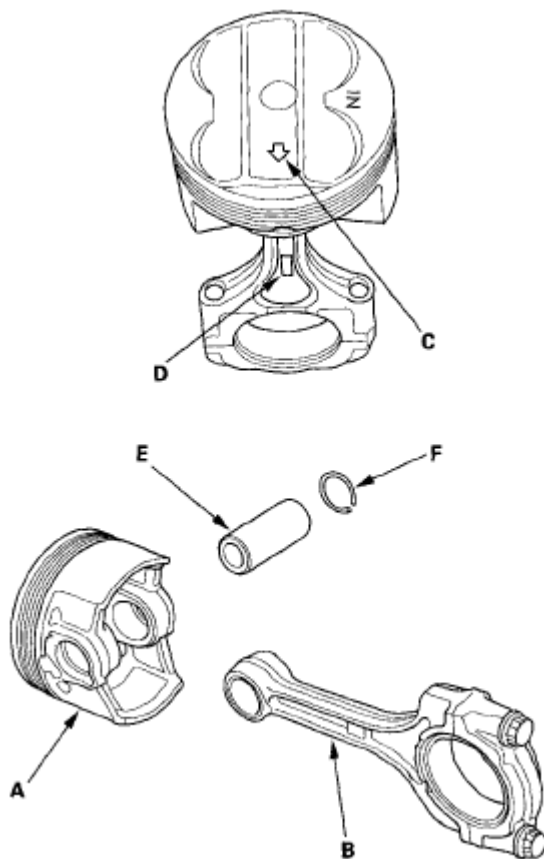


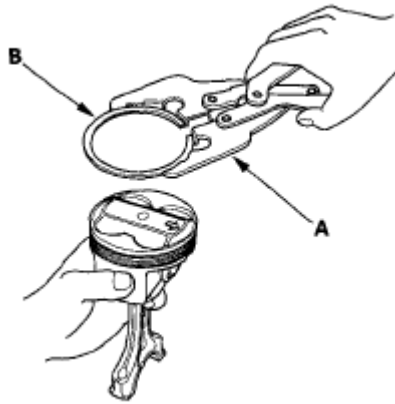
Fig. 118: Identifying Piston , Connecting Rod And Piston Pin

Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Install the remaining snap ring (F).
6. Turn the snap rings in the ring grooves until the end gaps are positioned at the bottom of the piston.

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. 119: Removing Piston Rings**

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 and 2nd ring grooves are 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 that has its rings removed, push a new ring (A) into the cylinder bore 15-20 mm (0.6-0.8 in.) from the bottom.

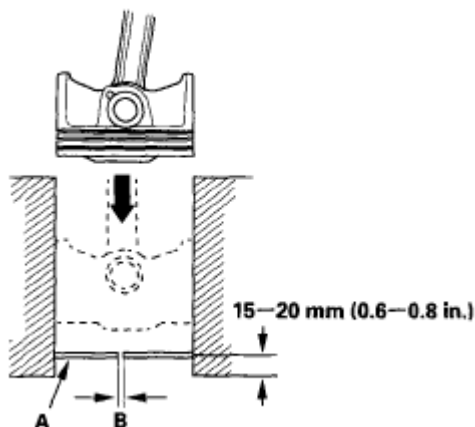
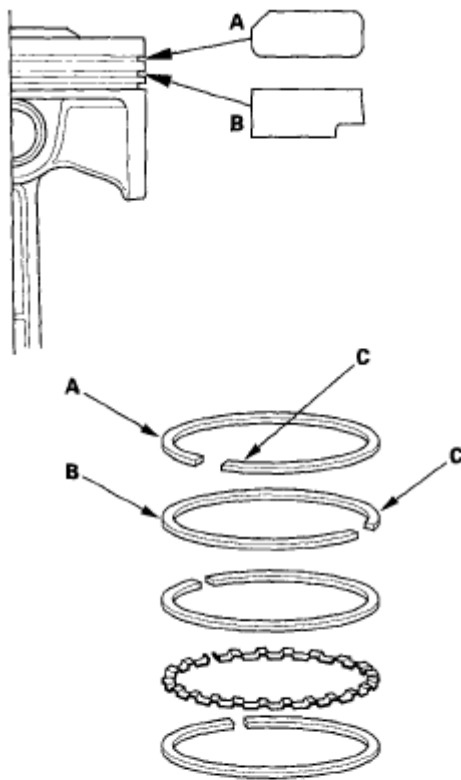


Fig. 120: Pushing Ring Into Cylinder Bore**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

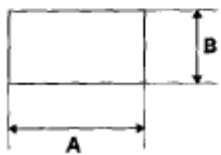
5. Measure the piston ring end-gap (B) with a feeler gauge:
 - If the gap is too small, check to see if you have the proper rings for your engine.
 - If the gap is too large, recheck the cylinder bore diameter against the wear limits (see **BLOCK AND PISTON INSPECTION**). If the bore is beyond the service 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): 0.50-0.65 mm (0.020-0.026 in.)****Service Limit: 0.75 mm (0.030 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 top ring and the second ring as shown. The top ring (A) has a 1R 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: 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.)

Fig. 121: Identifying Top Ring And Second Ring
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: About 90°

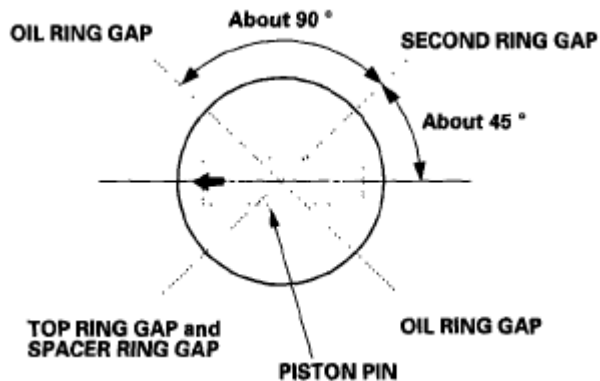


Fig. 122: Identifying Ring End Gaps Turning Angle
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Top Ring Clearance

Standard (New): 0.045-0.070 mm (0.0018-0.0028 in.)

Service Limit: 0.13 mm (0.005 in.)

Second Ring Clearance

Standard (New): 0.040-0.065 mm (0.0016-0.0026 in.)

Service Limit: 0.13 mm (0.005 in.)

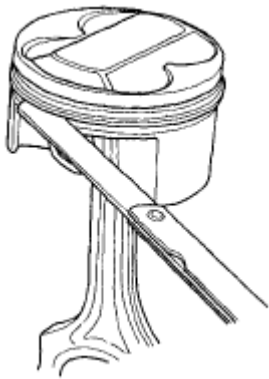


Fig. 123: Identifying Ring-To-Groove Clearances
Courtesy of AMERICAN HONDA MOTOR CO., INC.

PISTON INSTALLATION

If the Crankshaft is Already Installed

1. Set the crankshaft to bottom dead center (BDC) for each cylinder as its piston is installed.
2. Remove the connecting rod caps, then install the ring compressor. Check that the bearing is securely in place.
3. Apply new engine oil to the piston, inside of the ring compressor, and the cylinder bore, then attach the ring compressor to the piston/connecting rod assembly.
4. Position the mark (A) to face the cam chain side of the engine.

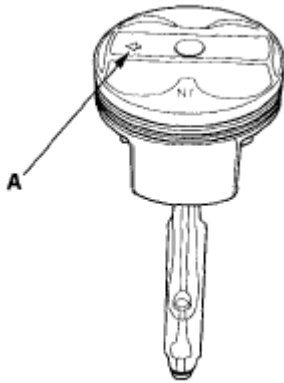


Fig. 124: Identifying Mark To Face Cam Chain Side Of Engine
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Position the piston in the cylinder, and tap it in using the wooden handle of a hammer (A). Push down on the ring compressor (B) to prevent the rings from expanding before entering the cylinder bore.

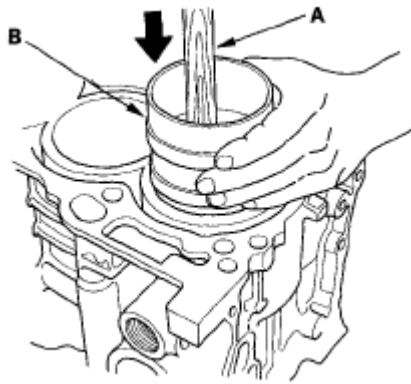


Fig. 125: Pushing Down On Ring Compressor
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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 **CONNECTING ROD BOLT INSPECTION**).
9. Install the rod caps with bearings. Torque the bolts to 29 N.m (3.0 kgf.m, 22 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.

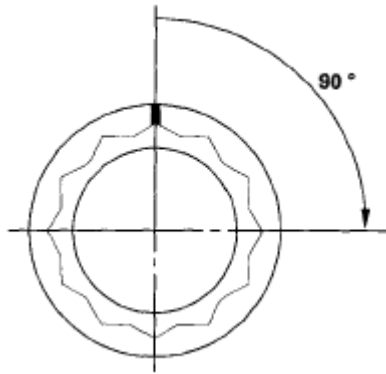


Fig. 126: Identifying Connecting Rod Bolt Tightening Angle
Courtesy of AMERICAN HONDA MOTOR CO., INC.

If the Crankshaft is Not Installed

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

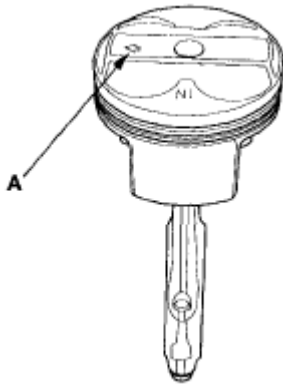


Fig. 127: Identifying Mark To Face Cam Chain Side Of Engine
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Position the piston in the cylinder, and tap it in using the wooden handle of a hammer (A). Push down on the ring compressor (B) to prevent the rings from expanding before entering the cylinder bore.

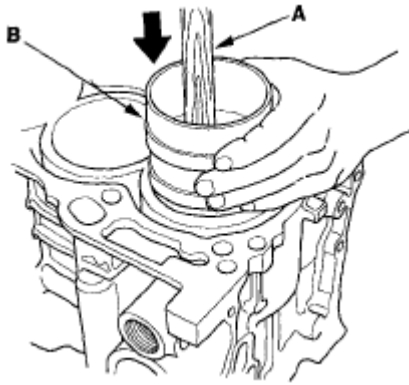


Fig. 128: Pushing Down On Ring Compressor
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

CONNECTING ROD BOLT INSPECTION

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

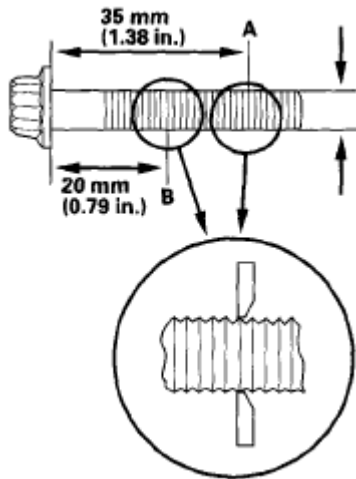


Fig. 129: Identifying Diameter Of Connecting Rod Bolt
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Point A-Point B = Difference in Diameter

Difference in Diameter

Specification: 0-0.1 mm (0-0.004 in.)

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

CRANKSHAFT INSTALLATION

Special Tools Required

- Driver 07749-0010000
- Attachment, 24 x 26 mm 07746-0010700
- Oil seal driver attachment, 96 mm 07ZAD-PNAA100

1. Install the crankshaft end bushing when replacing the crankshaft.

Using the special tools, drive in the crankshaft end bushing until the special tools bottom against the crankshaft.

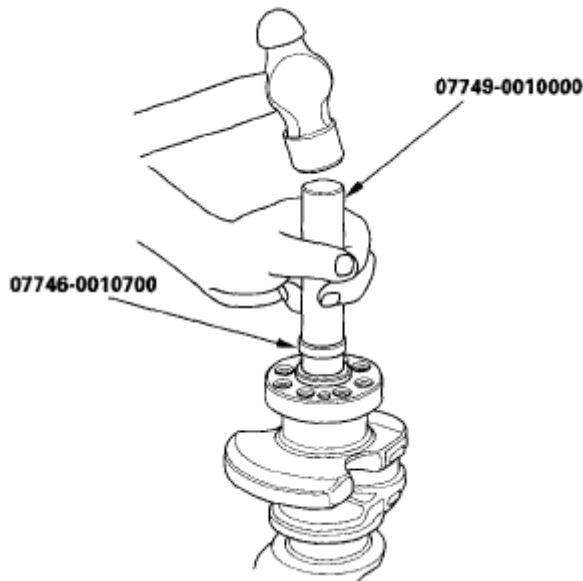


Fig. 130: Identifying Special Tool

Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Check the connecting rod bearing clearance with plastigage (see **CONNECTING ROD BEARING REPLACEMENT**).
3. Check the main bearing clearance with plastigage (see **CRANKSHAFT MAIN BEARING REPLACEMENT**).
4. Install the bearing halves in the engine block and connecting rods.
5. Apply a coat of new engine oil to the main bearings and rod bearings.
6. Hold the crankshaft so that rod journal No. 2 and rod journal No. 3 are straight up, and lower the crankshaft into the engine block.
7. Apply new engine oil to the thrust washer surfaces. Install the thrust washers (A) in the No. 4 journal of the engine block.

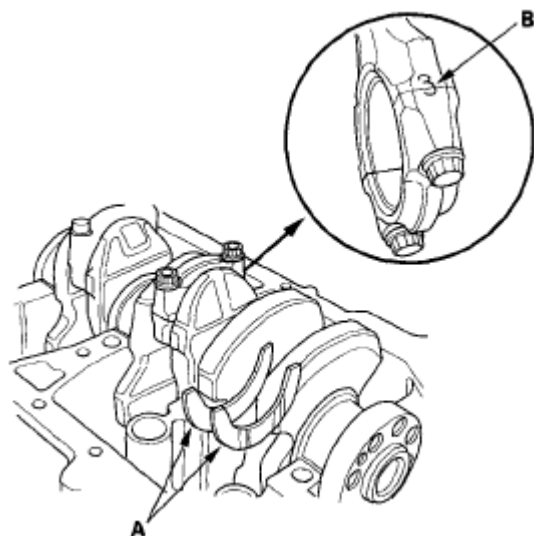


Fig. 131: Identifying Thrust Washers In Engine Block
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Inspect the connecting rod bolts (see **CONNECTING ROD BOLT INSPECTION**).
9. Apply engine oil to the threads of the connecting rod bolts.
10. Seat the rod journals into connecting rod No. 1 and connecting rod No. 4. Line up the mark (B) on the connecting rod and cap, then install the caps and bolts finger-tight.
11. Rotate the crankshaft clockwise, and seat the journals into connecting rod No. 2 and connecting rod No. 3. Line up the mark on the connecting rod and cap, then install the caps and bolts finger-tight.
12. Tighten the connecting rod bolts to 29 N.m (3.0 kgf.m, 22 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 8 of the procedure. Do not loosen it back to the specified angle.

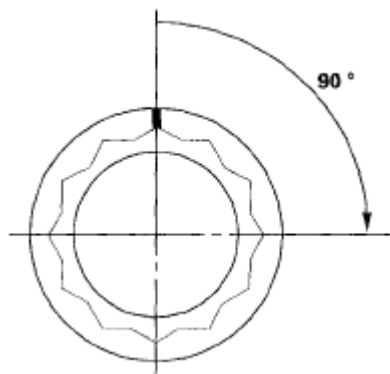


Fig. 132: Identifying Connecting Rod Bolt Tightening Angle
Courtesy of AMERICAN HONDA MOTOR CO., INC.

14. Remove all of the old liquid gasket from the lower block mating surfaces, bolts, and bolt holes.
15. Clean, and dry the lower block mating surfaces.
16. 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 lower block.

NOTE: Do not install components if too much 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.

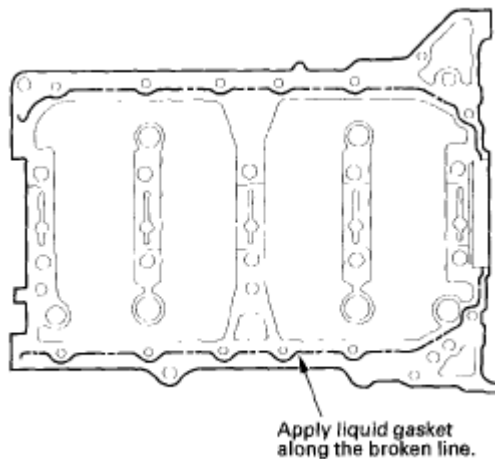


Fig. 133: Identifying Lower Block
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

17. Put the lower block on the engine block.
18. Apply new engine oil to the threads of the bearing cap bolts.
19. Tighten the bearing cap bolts, in sequence, to 29 N.m (3.0 kgf.m, 22 lbf.ft).

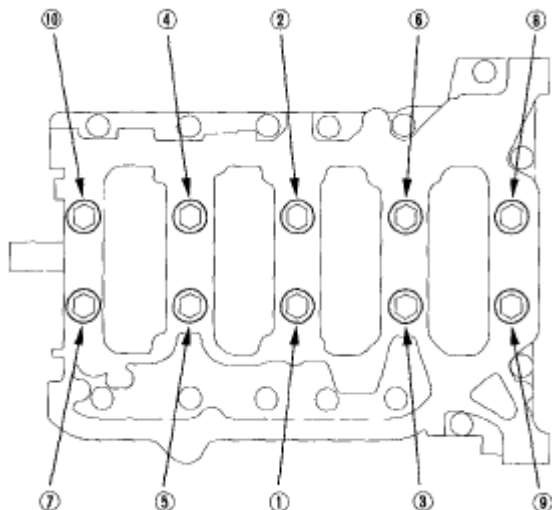


Fig. 134: Identifying Bearing Cap Bolts Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

20. Tighten the bearing cap bolts an additional 56 °.

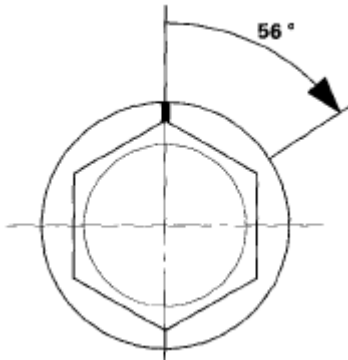


Fig. 135: Identifying Bearing Cap Bolts Tightening Angle
Courtesy of AMERICAN HONDA MOTOR CO., INC.

21. Torque the 8 mm bolts, in sequence, to 22 N.m (2.2 kgf.m, 16 lbf-ft).

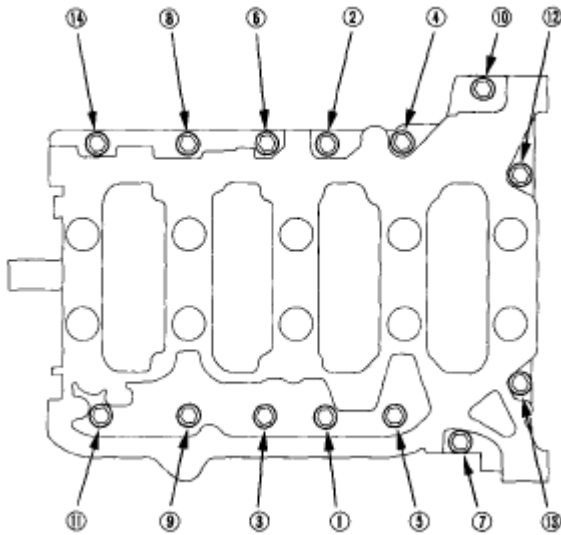


Fig. 136: Identifying 8mm Bolt Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

22. Apply a light coat of new engine oil to the crankshaft and lip of the crankshaft oil seal.
23. Use the driver handle and the oil seal driver attachment 96 to drive a new oil seal squarely into the engine block to the specified installed height.

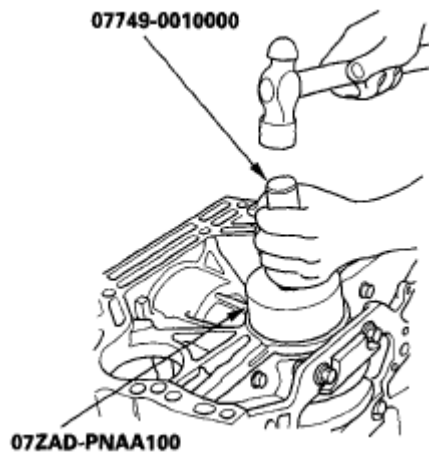


Fig. 137: Identifying Special Tool

Courtesy of AMERICAN HONDA MOTOR CO., INC.

24. Measure the distance between the engine block (A) and the crankshaft oil seal (B).

**Oil Seal Installed Height: 0.2—1.2 mm
(0.001—0.047 in.)**

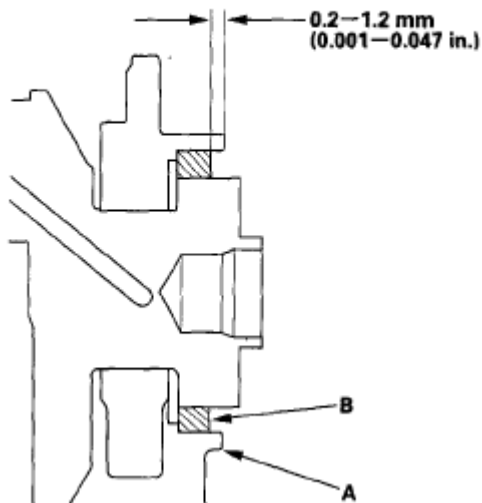


Fig. 138: Identifying Distance Between Engine Block And Oil Seal

Courtesy of AMERICAN HONDA MOTOR CO., INC.

25. Install the baffle plates.

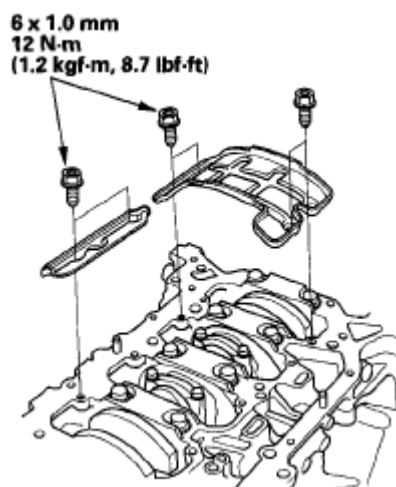


Fig. 139: Identifying Baffle Plates (With Torque Specifications)

Courtesy of AMERICAN HONDA MOTOR CO., INC.

26. Install the oil pump (see **OIL PUMP INSTALLATION**).
27. Install the oil pan (see **OIL PAN INSTALLATION**).
28. Install the cylinder head (see **CYLINDER HEAD INSTALLATION**).
29. Install the flywheel , clutch disc and pressure plate (see **PRESSURE PLATE AND CLUTCH DISC REMOVAL (6-SPEED MODEL)**).
30. Install the transmission (see **TRANSMISSION INSTALLATION**).
31. 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 idle speed until it reaches normal operating temperature, then continue to running it for about 15 minutes.

OIL PAN INSTALLATION

- Front subframe adapter VSB02C000016
- Engine support hanger, A and Red's AAR-T1256
- Engine hanger adapter VSB02C000015

These special tools are available through Honda Tool and Equipment Program, 888-424-6857

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 08718-0009, evenly to the lower engine block mating surface and to the inside edge of the bolt holes.

NOTE: Do not install components if too much 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.

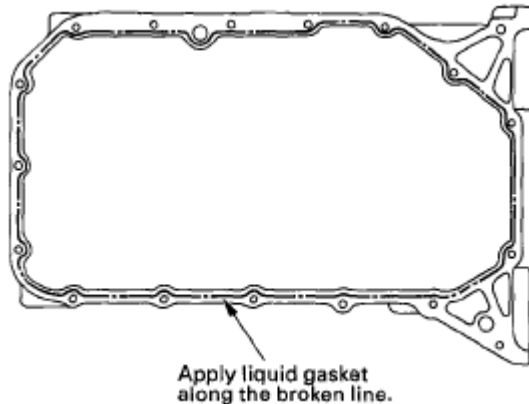


Fig. 140: Identifying Lower Engine Block Mating Surface
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Install the oil pan.
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). Wipe off the excess liquid gasket on the each side of crankshaft pulley and flywheel.

NOTE:

- Wait at least 30 minutes to allow liquid gasket to cure before filling the engine with oil.
- Do not run the engine for at least 3 hours to allow liquid gasket to cure after installing the oil pan.

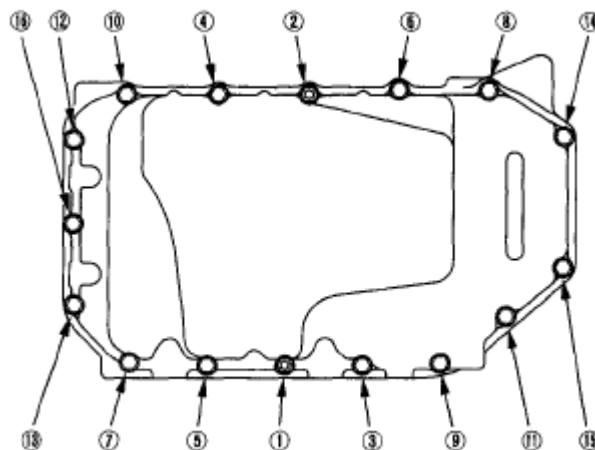


Fig. 141: Identifying Oil Pan Bolt Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Install the transmission mounting bolts (A) and clutch cover (B).

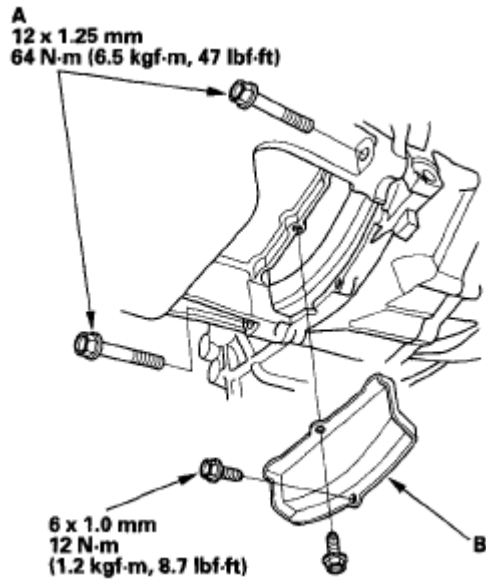


Fig. 142: Identifying Transmission Mounting Bolts And Clutch Cover (With Torque Specifications)
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Install the lower torque rod bracket.

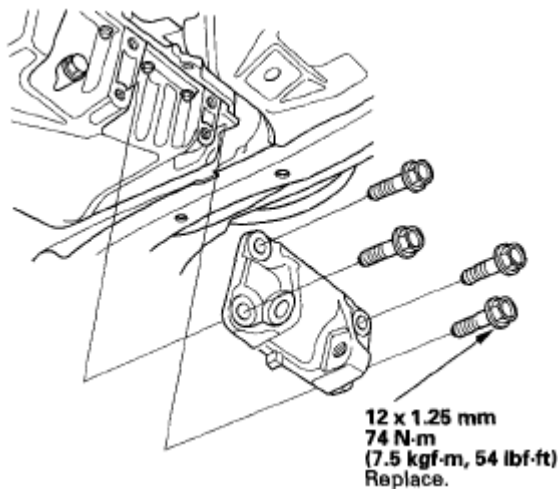


Fig. 143: Identifying Lower Torque Rod Bracket (With Torque Specifications)
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. If the engine still in the vehicle, do the following steps.
9. Attach the front subframe adapter (VSB02C000016) to the front subframe, and hang the belt of the front subframe adapter over the front of the subframe. Secure the belt with its stop, then tighten the wing nut (See step 11 **ENGINE INSTALLATION**).
10. Line up the slots in the front subframe adapter arms with the bolt holes on the corner of the jack base, then securely attach them with four bolts, then lift the front subframe up to the body.
11. Loosely install the new front subframe mounting bolts (see step 13 **ENGINE INSTALLATION**).

12. Align all reference marks on the front subframe with the body, then tighten the bolts on the front subframe to the specified torque (see step 14 on **ENGINE INSTALLATION**).
13. Remove the jack and front subframe adapter.
14. Tighten the new front subframe mid-stiffener mounting bolts on both side (see step 16 on **ENGINE INSTALLATION**).
15. Lower the vehicle on the lift.
16. Loosen the upper torque rod mounting bolt (see step 5 on **ENGINE INSTALLATION**).
17. Raise the vehicle on the lift.
18. Install the lower torque rod, then tighten the new lower torque rod mounting bolts in the numbered sequence shown (see step 17 on **ENGINE INSTALLATION**).
19. Loosely tighten the new front mount mounting bolt (see step 18 on **ENGINE INSTALLATION**).
20. Lower the vehicle on the lift.
21. Remove the engine support hanger A and Reds (AAR-T1256), the 2006 Civic engine hanger (VSB02C000025) and the engine hanger adapter (VSB02C000015).
22. Tighten the upper torque rod mounting bolt (See step 21 **ENGINE INSTALLATION**).
23. Raise the vehicle on the lift.
24. Tighten the front mount mounting bolt (see step 23 on **ENGINE INSTALLATION**).
25. Install the stiffener, then tighten the steering gearbox mounting bolt and stiffener mounting bolt. Install the harness clamp from the front subframe (see step 25 on **ENGINE INSTALLATION**).
26. Install the steering gearbox bracket. Install the stiffener, then tighten the steering gearbox mounting bolt and stiffener mounting bolt (see step 27 on **ENGINE INSTALLATION**).
27. Connect the lower arms to the knuckles (see step 5 on **LOWER ARM REMOVAL/INSTALLATION**).
28. Connect the stabilizer links (see **STABILIZER LINK REMOVAL/INSTALLATION**).
29. Install the front wheels.
30. Install the splash shield (see step 35 on **ENGINE INSTALLATION**).
31. Refill the engine with the recommended engine oil.

TRANSMISSION END CRANKSHAFT OIL SEAL INSTALLATION - IN CAR

Special Tools Required

- Driver 07749-0010000
- Oil seal driver attachment 96 07ZAD-PNAA100

1. Remove the transmission (see **TRANSMISSION REMOVAL**).
2. Remove the pressure plate , clutch disc and flywheel (see **PRESSURE PLATE AND CLUTCH DISC REMOVAL (5-SPEED MODEL)**).
3. Clean, and dry the crankshaft oil seal housing.
4. Apply a light coat of new engine oil to the crankshaft and to the lip of the crankshaft oil seal.
5. Use the driver and the oil seal driver attachment 96 to drive a new oil seal squarely into the engine block

to the specified installed height.

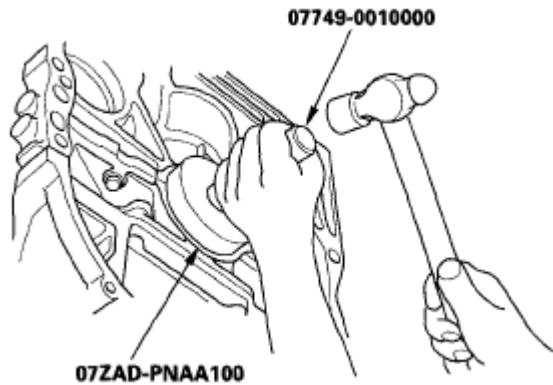


Fig. 144: Identifying Special Tool

Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Measure the distance between the engine block (A) and oil seal (B).

Oil Seal Installed Height: 0.2-1.2 mm (0.001-0.047 in.)

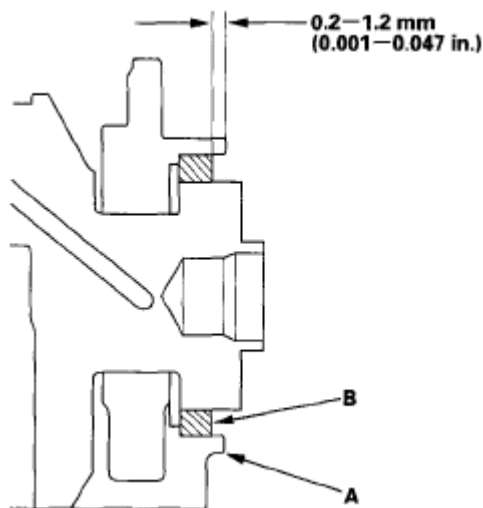


Fig. 145: Identifying Distance Between Engine Block And Oil Seal

Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Install the flywheel, clutch disc , and pressure plate (see **PRESSURE PLATE AND CLUTCH DISC REMOVAL (6-SPEED MODEL)**).
8. Install the transmission (see **TRANSMISSION INSTALLATION**).

SEALING BOLT AND JOINT PIPE INSTALLATION

NOTE:

- When installing the sealing bolt, always use a new washer.
- When installing the joint pipe, always use a new O-ring.

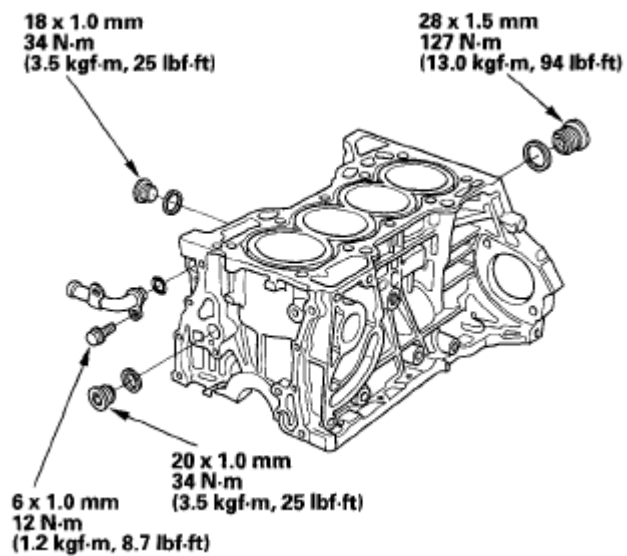


Fig. 146: Identifying Sealing Bolt And Joint Pipe (With Torque Specifications)

Courtesy of AMERICAN HONDA MOTOR CO., INC.

CYLINDER HEAD (K20Z3)

SPECIAL TOOLS

Ref. No.	Tool Number	Description	Qty
①	07AAJ-PNAA101	Air Pressure Regulator	1
②	07HAH-PJ7A100	Valve Guide Reamer, 5.5 mm	1
③	07JAA-001020A	Socket, 19 mm	1
④	07JAB-001020A	Holder Handle	1
⑤	07MAA-PR70110	Adjuster	1
⑥	07MAA-PR70120	Locknut Wrench	1
⑦	07NAB-001040A	Holder Attachment, 50 mm	1
⑧	07PAD-0010000	Stem Seal Driver	1
⑨	07ZAJ-PNAA101	VTEC Air Adapter	2
⑩	07ZAJ-PNAA200	VTEC Air Stopper	1
⑪	07ZAJ-PNAA300	Air Joint Adapter	1
⑫	07742-0010100	Valve Guide Driver, 5.5 mm	1
⑬	07746-0010400	Attachment, 52 x 55 mm	1
⑭	07749-0010000	Driver	1
⑮	07757-PJ1010A	Valve Spring Compressor Attachment	1

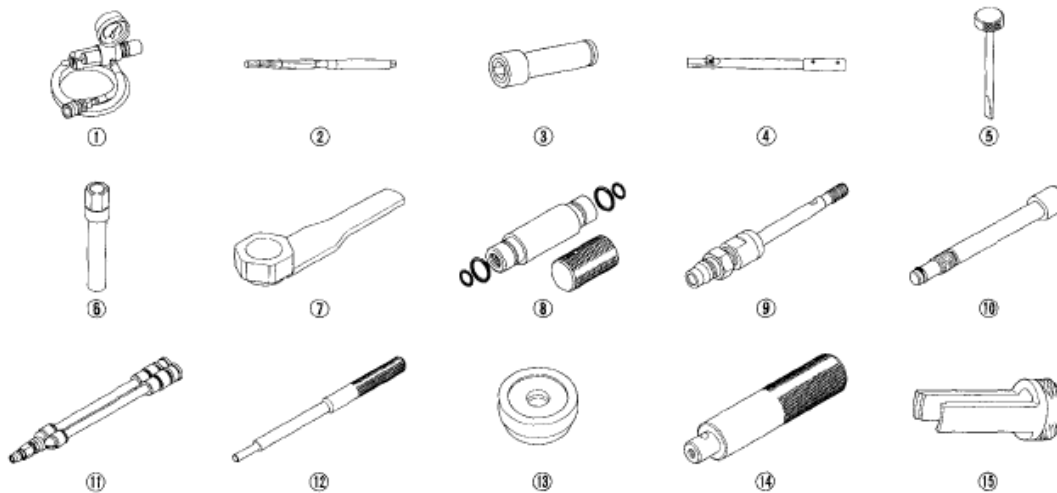


Fig. 137: Identifying Cylinder Head - Special Tools
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

COMPONENT LOCATION INDEX

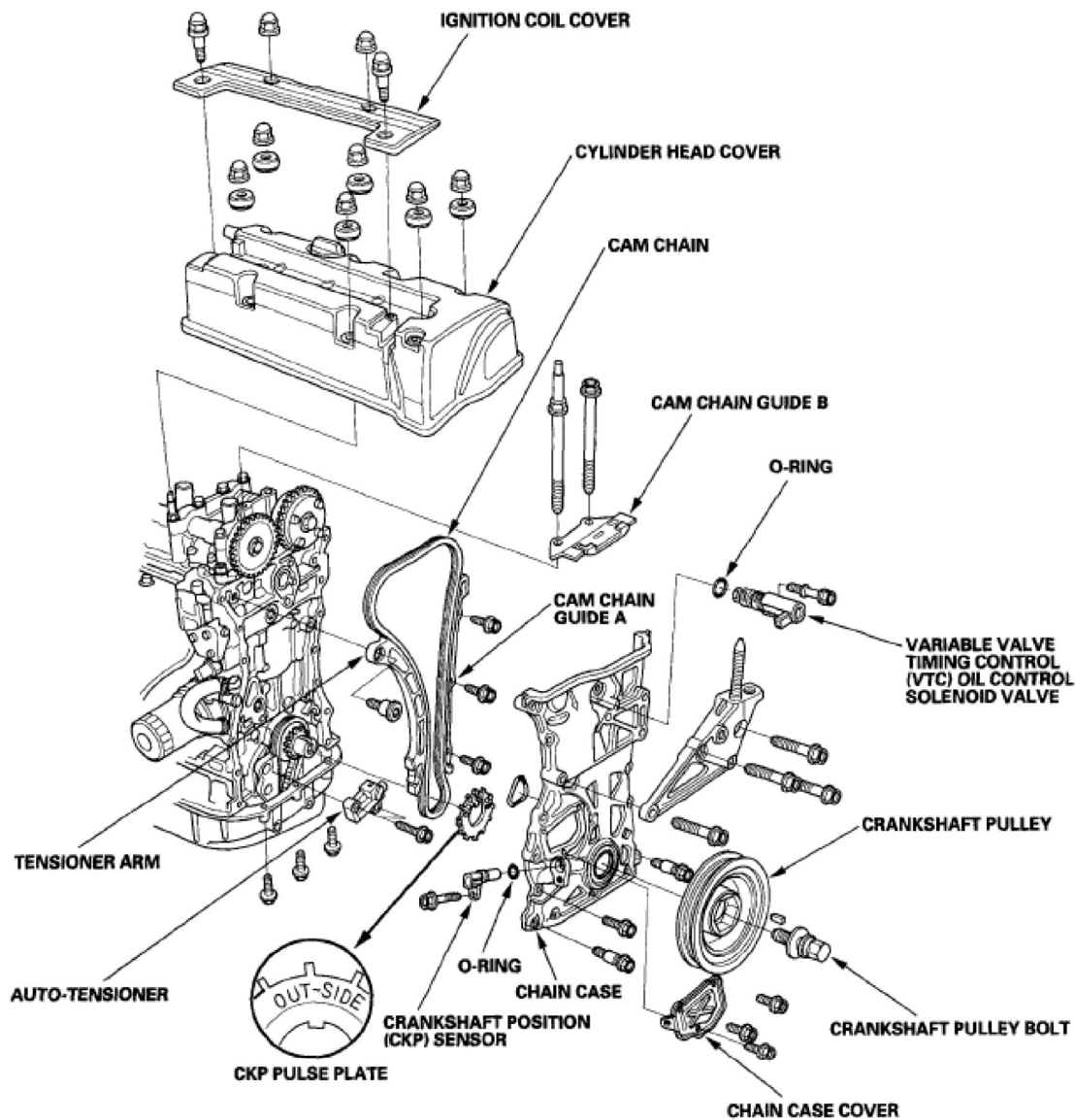


Fig. 138: Identifying Cylinder Head Component Location (1 Of 3)
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

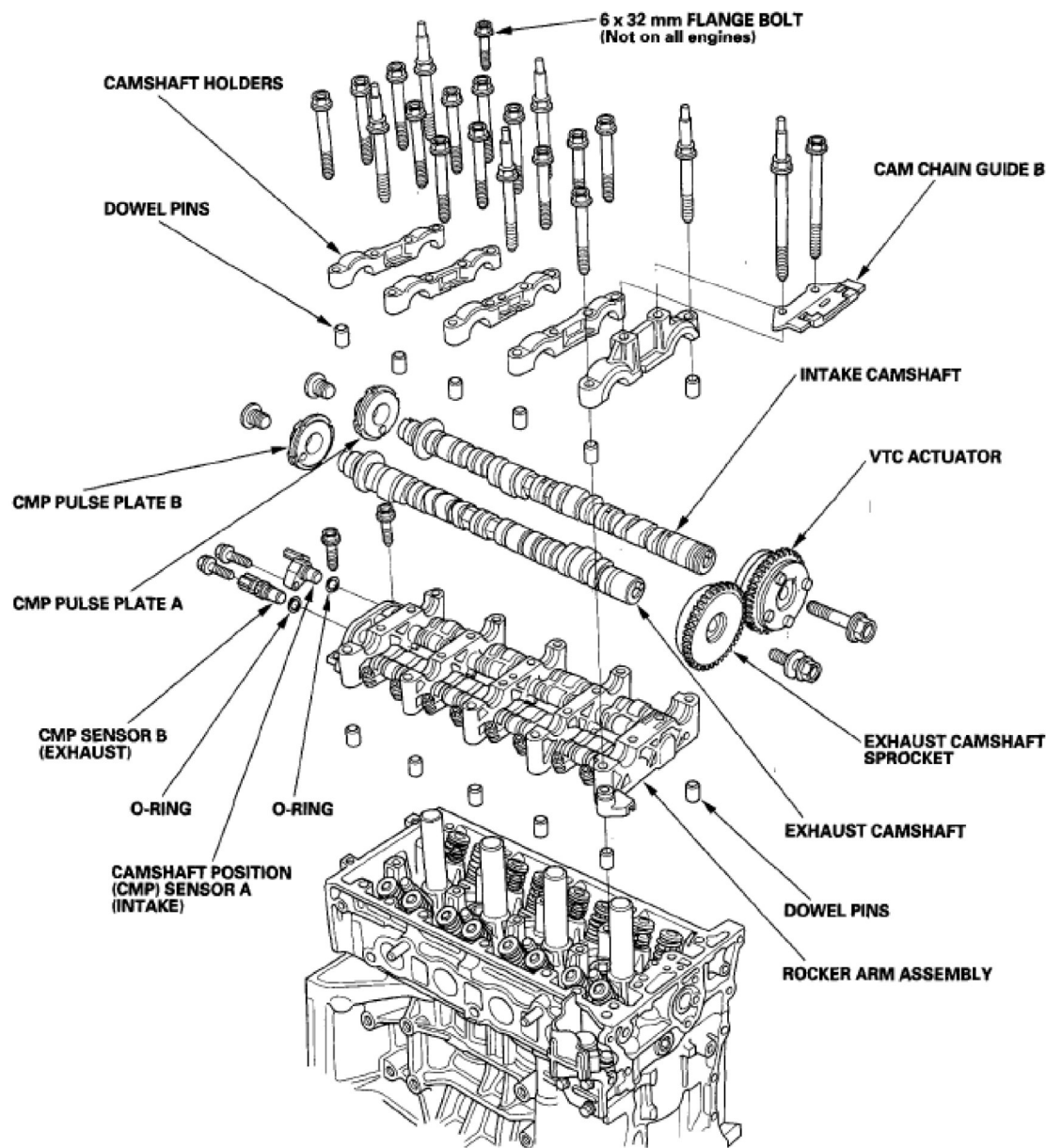


Fig. 139: Identifying Cylinder Head Component Location (2 Of 3)

Courtesy of AMERICAN HONDA MOTOR CO., INC.

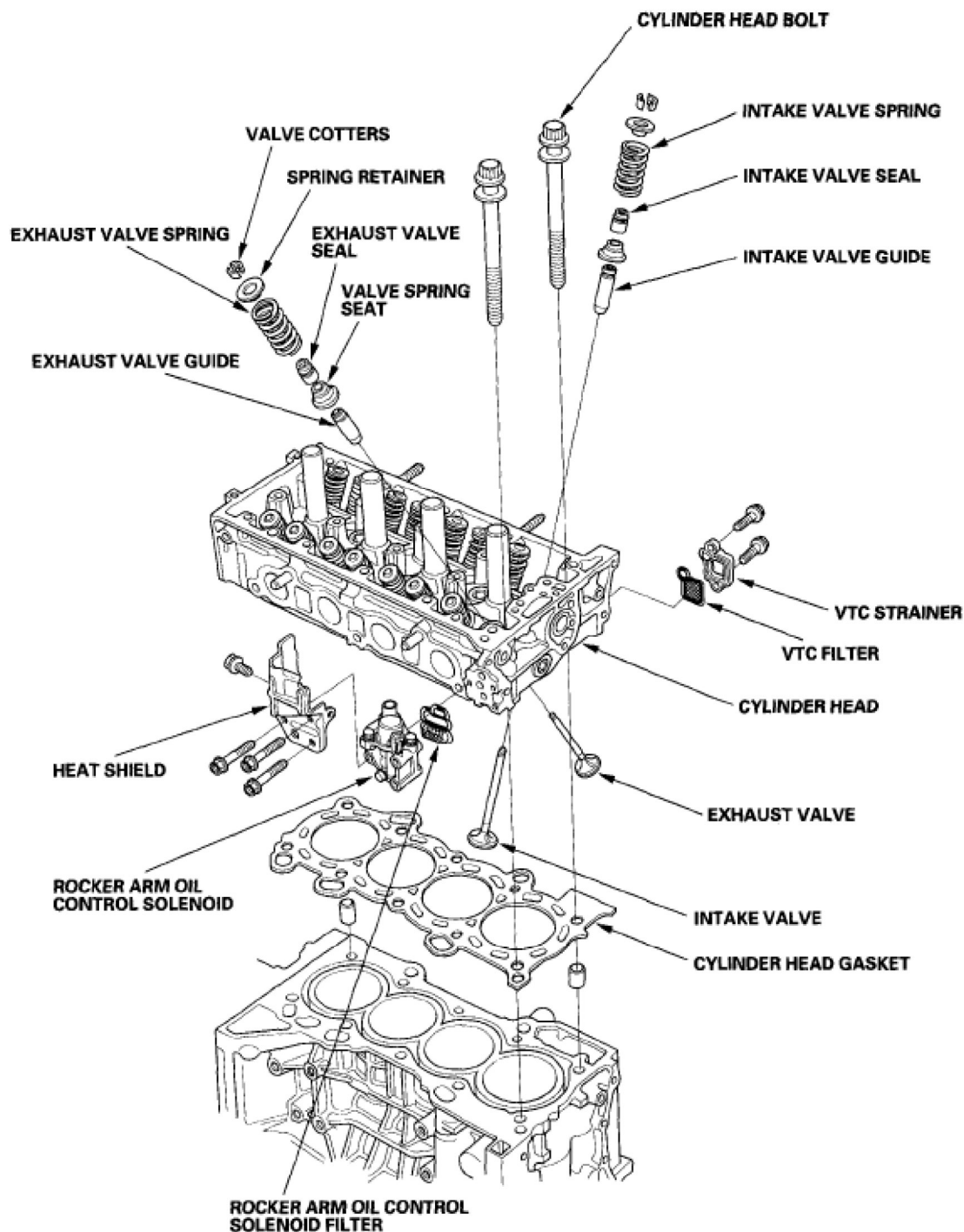


Fig. 140: Identifying Cylinder Head Component Location (3 Of 3)
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

ENGINE COMPRESSION INSPECTION

NOTE: After this inspection, you must reset the engine control module (ECM), otherwise the ECM will continue to stop the injectors from functioning.

1. Warm up the engine to normal operating temperature (cooling fan comes on).
2. Turn the ignition switch OFF.
3. Connect the HDS to the data link connector (DLC) (see step 2 on **HOW TO USE THE HDS (HONDA DIAGNOSTIC SYSTEM)**).
4. Turn the ignition switch ON (II).
5. Make sure the HDS communicates with the vehicle and the ECM. If it doesn't troubleshoot the DLC circuit (see **DLC CIRCUIT TROUBLESHOOTING**).
6. Select PGM-FI, INSPECTION, then ALL INJECTORS OFF on the HDS.
7. Turn the ignition switch to LOCK (0).
8. Remove the four ignition coils (see **IGNITION COIL REMOVAL/INSTALLATION**).
9. Remove the four spark plugs.
10. Attach the compression gauge to the spark plug hole.

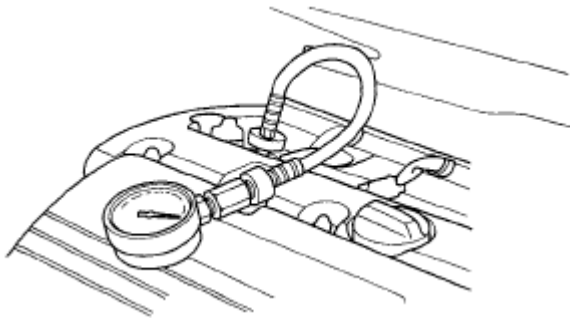


Fig. 141: Attaching Compression Gauge To Spark Plug Hole
Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Open the throttle fully, then crank the engine with the starter motor and measure the compression.

Compression Pressure:

Above 930 kPa (9.5 kgf/cm² , 135 psi)

12. Measure the compression on the remaining cylinders.

Maximum Variation:

Within 200 kPa (2.0 kgf/cm² , 28 psi)

13. If the compression is not within specifications, check the following items, then remeasure the compression.
 - Damaged or worn valves and seats
 - Damaged cylinder head gasket
 - Damaged or worn piston rings

- Damaged or worn piston and cylinder bore
14. Remove the compression gauge from the spark plug hole.
 15. Install the four spark plugs (see **SPARK PLUG INSPECTION**).
 16. Install the four ignition coils (see **IGNITION COIL REMOVAL/INSTALLATION**).
 17. Select the ECM reset (see **HDS CLEAR COMMAND**) to cancel the ALL INJECTORS OFF function on the HDS.
 18. Do the ECM idle learn procedure (see **ECM IDLE LEARN PROCEDURE**).

VTEC ROCKER ARM TEST

Special Tools Required

- Air pressure regulator 07AAJ-PNAA101
 - VTEC air adapter 07ZAJ-PNAA101
 - VTEC air stopper 07ZAJ-PNAA200
 - Air joint adapter 07ZAJ-PNAA300
1. Start the engine and let it run for 5 minutes, then turn the ignition switch OFF.
 2. Remove the cylinder head cover (see **CYLINDER HEAD COVER REMOVAL**).
 3. Set the No. 1 piston at TDC (see step 6).
 4. Move the secondary rocker arm (A) for No. 1 cylinder. The secondary rocker arm should move independently of the mid rocker arm (B).
 - If the secondary rocker arm does not move, remove the mid, primary, and secondary rocker arms as an assembly, and check that the pistons in the rocker arms move smoothly. If any rocker arm needs replacing, replace the mid, primary, and secondary rocker arms as an assembly, and test.
 - If the secondary rocker arm moves freely, go to step 5.

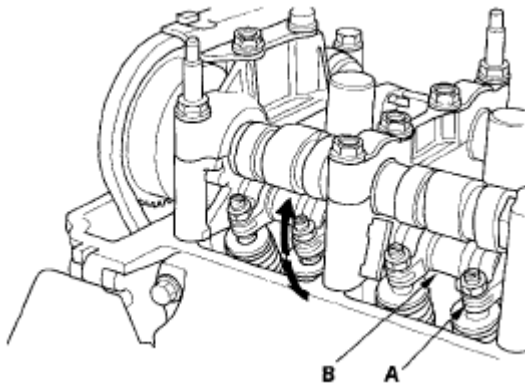


Fig. 142: Identifying Mid, Primary And Secondary Rocker Arms
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Repeat step 4 on the remaining secondary rocker arms with each piston at TDC. When all the secondary rocker arms pass the test, go to step 6.

6. Check that the air pressure on the shop air compressor gauge indicates over 400 kPa (4.0 kgf/cm² , 57 psi).
7. Inspect the valve clearance (see **VALVE CLEARANCE ADJUSTMENT**).
8. Remove the sealing bolt (A) from the relief hole, and install the VTEC air stopper (B).

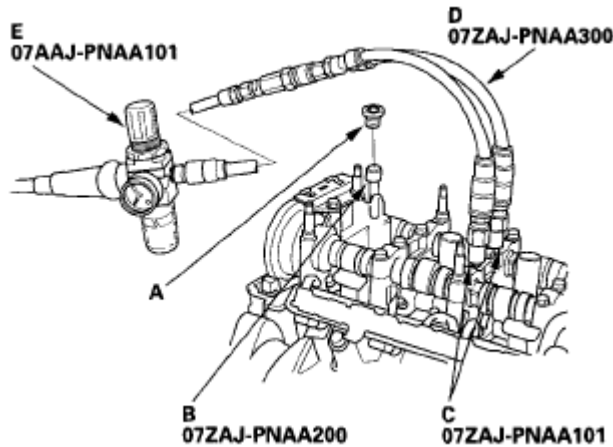


Fig. 143: Identifying Special Tools

Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Remove the No. 2 and No. 3 camshaft holder bolts, and install the VTEC air adapters (C) finger-tight.
10. Connect the air joint adapter (D) and air pressure regulator (E).
11. Loosen the valve on the regulator, and apply the specified air pressure.

Specified Air Pressure: 290 kPa (3.0 kgf/cm² , 42 psi)

NOTE: If the synchronizing piston does not move after applying air pressure; move the rocker arm up and down manually by rotating the crankshaft clockwise.

12. With the specified air pressure applied, move the secondary rocker arm (A) for the No. 1 cylinder. The mid rocker arm (B), primary rocker arm (C), and secondary rocker arm should move together.
 - If the mid and primary rocker arms do not move together with the secondary rocker arm, remove the mid, primary, and secondary rocker arms as an assembly, and check that the pistons in the rocker arms move smoothly. If any rocker arm needs replacing, replace the mid, primary, and secondary rocker arms as an assembly, and retest.

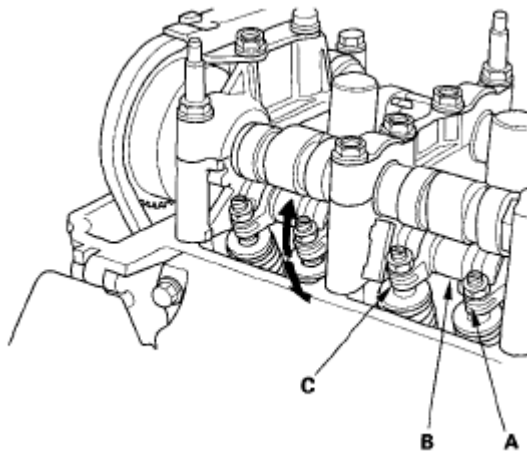


Fig. 144: Identifying Mid, Primary And Secondary Rocker Arms
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

13. Remove the special tools.
14. Tighten the camshaft holder mounting bolts to 22 N.m (2.2 kgf.m, 16 lbf.ft).
15. Tighten the sealing bolt to 20 N.m (2.0 kgf.m, 14 lbf.ft).
16. Install the cylinder head cover (see **CYLINDER HEAD COVER INSTALLATION**).

VTC ACTUATOR INSPECTION

1. Remove the cam chain (see **CAM CHAIN REMOVAL**).
2. Loosen the rocker arm adjusting screws (see step 2).
3. Remove the camshaft holder (see step 3).
4. Remove the intake camshaft.
5. Check that the variable valve timing control (VTC) actuator is locked by turning the VTC actuator clockwise and counterclockwise. If the VTC actuator is not locked, replace the VTC actuator.
6. Seal the advance holes (A) and retard holes (B) in the No. 1 camshaft journal with tape.

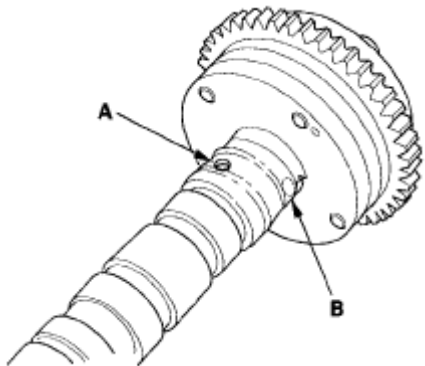


Fig. 145: Identifying Advance And Retard Holes
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Punch a hole in the tape over one of the advance holes.
8. Apply air to the advance hole to release the lock.

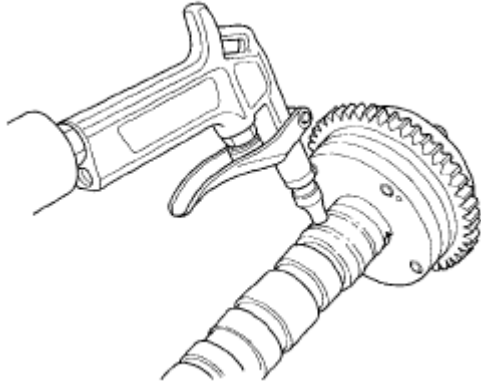


Fig. 146: Applying Air To Advance Hole
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Check that the VTC actuator moves smoothly. If the VTC actuator does not move smoothly, replace the VTC actuator.

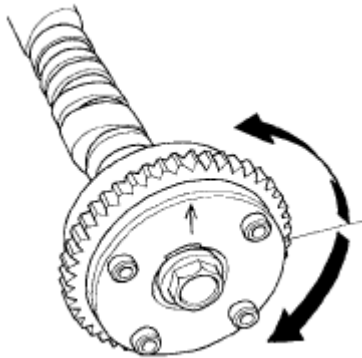


Fig. 147: Identifying VTC Actuator
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Remove the tape and adhesive residue from the No. 1 camshaft journal.
11. Make sure the punch marks on the VTC actuator and exhaust camshaft sprocket are facing up, then set the camshafts in the rocker shaft holder (see step 6).
12. Set the camshaft holders and chain guide B in place (see step 7).
13. Tighten the camshaft holder bolts to the specified torque (see step 8).
14. Hold the camshaft, and turn the VTC actuator clockwise until you hear it click. Make sure to lock the VTC actuator by turning it.
15. Install the cam chain (see **CAM CHAIN INSTALLATION**).
16. Adjust the valve clearance (see **VALVE CLEARANCE ADJUSTMENT**).

VALVE CLEARANCE ADJUSTMENT

Special Tools Required

- Adjuster 07MAA-PR70110
- Locknut wrench 07MAA-PR70120

NOTE: **Adjust the valves only when the cylinder head temperature is less than 100°F (38°C).**

1. Remove the cylinder head cover (see **CYLINDER HEAD COVER REMOVAL**).
2. Set the No. 1 piston at top dead center (TDC). The punch mark (A) on the variable valve timing control (VTC) actuator and the punch mark (B) on the exhaust camshaft sprocket should be at the top. Align the TDC marks (C) on the VTC actuator and exhaust camshaft sprocket.

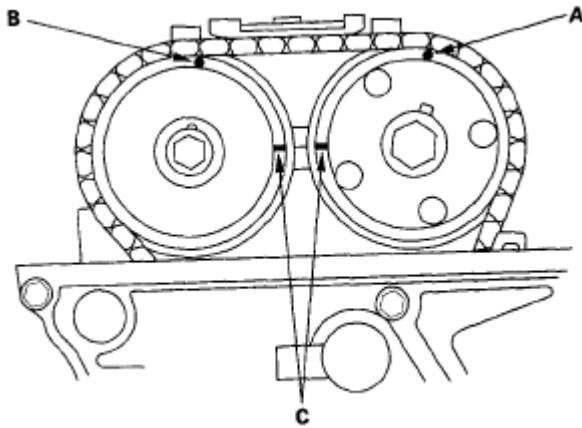


Fig. 148: Aligning TDC Marks On VTC Actuator And Exhaust Camshaft Sprocket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Select the correct thickness feeler gauge for the valves you're going to check.

Valve Clearance

Intake: 0.21-0.25 mm (0.008-0.010 in.)

Exhaust: 0.25-0.29 mm (0.010-0.011 in.)

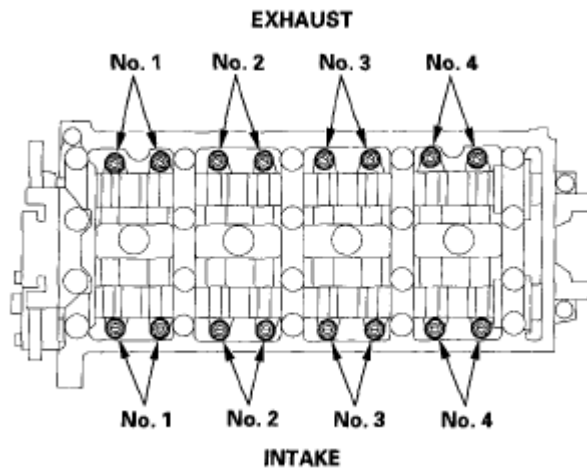


Fig. 149: Identifying Intake And Exhaust Valve
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Insert the feeler gauge (A) between the adjusting screw (B) and the end of the valve stem, and slide it back and forth; you should feel a slight amount of drag.

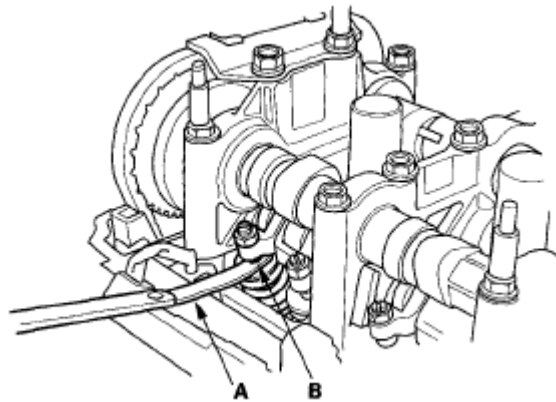
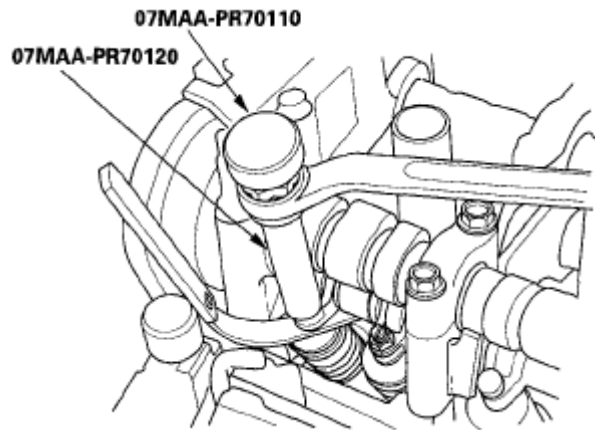


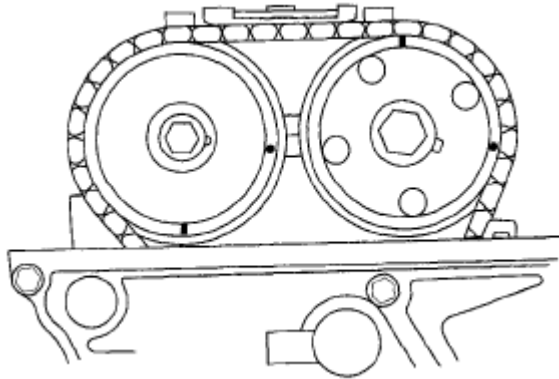
Fig. 150: Identifying Feeler Gauge
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. If you feel too much or too little drag, loosen the locknut with the special tools, and turn the adjusting screw until the drag on the feeler gauge is correct.

**Fig. 151: Identifying Adjusting Screw**

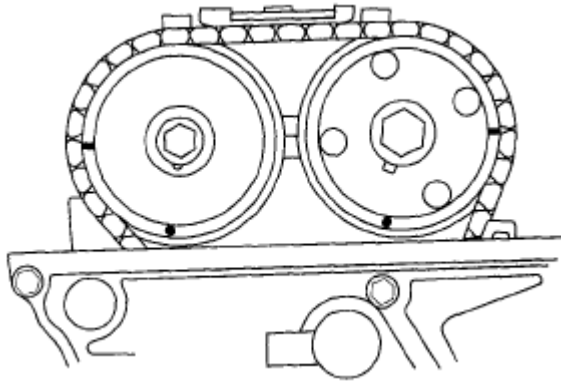
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Tighten the locknut to 20 N.m (2.0 kgf.m, 14 lbf.ft), and recheck the clearance. Repeat the adjustment if necessary.
7. Rotate the crankshaft 180° clockwise (camshaft pulley turns 90°).

**Fig. 152: Rotating Crankshaft**

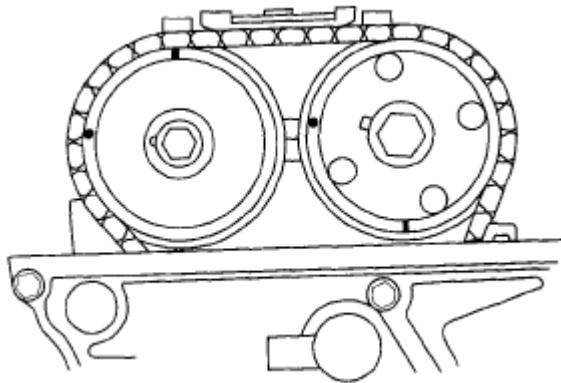
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Check and, if necessary, adjust the valve clearance on No. 3 cylinder.
9. Rotate the crankshaft 180° clockwise (camshaft pulley turns 90°).

**Fig. 153: Rotating Crankshaft**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Check and, if necessary, adjust the valve clearance on No. 4 cylinder.
11. Rotate the crankshaft 180° clockwise (camshaft pulley turns 90°).

**Fig. 154: Rotating Crankshaft**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Check and, if necessary, adjust the valve clearance on No. 2 cylinder.
13. Install the cylinder head cover (see **CYLINDER HEAD COVER INSTALLATION**).

CRANKSHAFT PULLEY REMOVAL AND INSTALLATION

Special Tools Required

- Holder handle 07JAB-001020A
- Crankshaft pulley holder 070AB-RJA0100
- Socket, 19 mm 07JAA-001020A or a commercially available 19 mm socket

Removal

1. Remove the front wheels.

2. Remove the splash shield .
3. Remove the drive belt (see **DRIVE BELT INSPECTION**).
4. Hold the pulley with holder handle (A) and holder attachment (B).

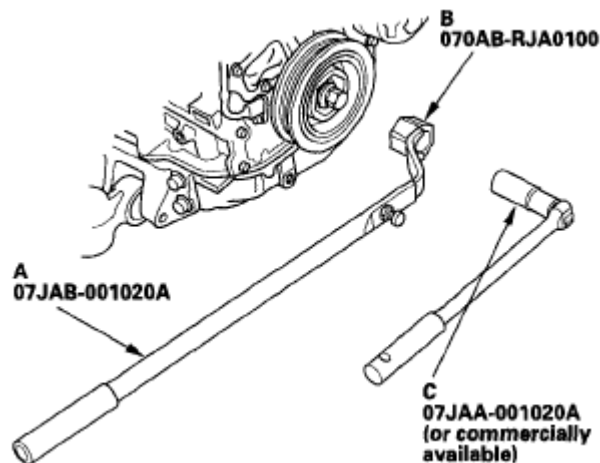


Fig. 155: Identifying Special Tools
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Remove the bolt with a 19 mm socket (C) and breaker bar, then remove the crankshaft.

Installation

1. Clean the crankshaft pulley (A), crankshaft (B), bolt (C), and washer (D). Lubricate as shown.

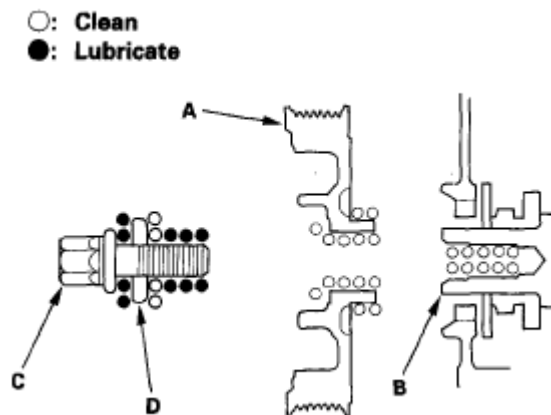


Fig. 156: Identifying Crankshaft Pulley Bolt
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Install the crankshaft pulley, and hold the pulley with holder handle (A) and holder attachment (B).

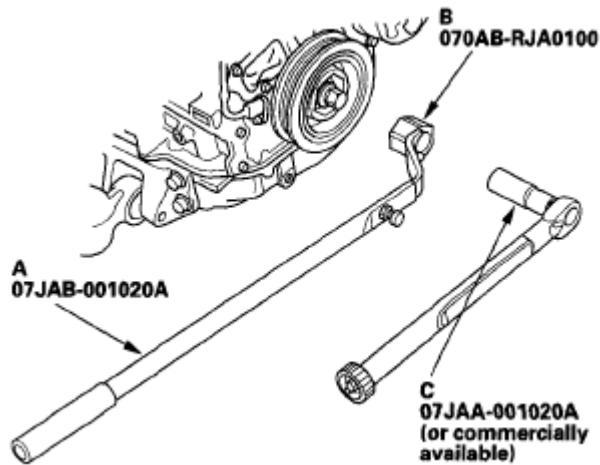


Fig. 157: Identifying Special Tools

Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Tighten the bolt to 49 N.m (5.0 kgf.m, 36 lbf.ft) with a torque wrench and 19 mm socket (C). Do not use an impact wrench.
4. Mark the bolt head (A) and the crankshaft pulley (B) as shown, then tighten the bolt an additional 90° (The mark on the bolt head line up with the mark on the crankshaft pulley).

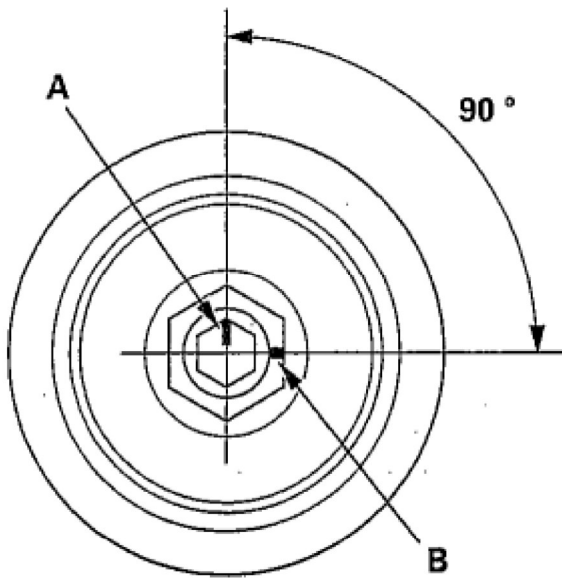


Fig. 158: Marking The Bolt Head And The Crankshaft Pulley

Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Install the drive belt (see **DRIVE BELT INSPECTION**).
6. Install the splash shield .
7. Install the right front wheel.

CAM CHAIN REMOVAL

NOTE: Keep the cam chain away from magnetic fields.

1. Remove the front wheels.
2. Remove the splash shield .
3. Drain the engine coolant (see COOLANT CHECK).
4. Remove the drive belt (see DRIVE BELT INSPECTION).
5. Remove the cylinder head cover (see CYLINDER HEAD COVER REMOVAL).
6. Set the No. 1 piston at top dead center (TDC). The punch mark (A) on the variable valve timing control (VTC) actuator and the punch mark (B) on the exhaust camshaft sprocket should be at the top. Align the TDC marks (C) on the VTC actuator and exhaust camshaft sprocket.

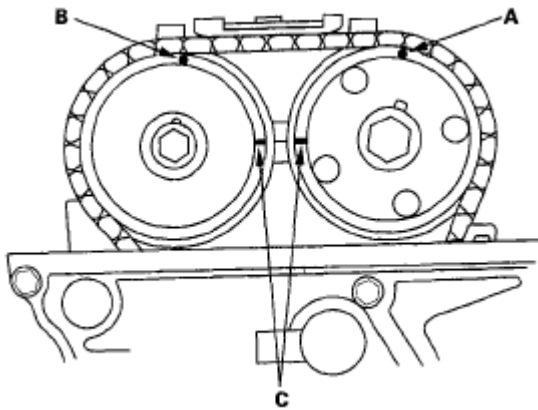


Fig. 159: Aligning TDC Marks On VTC Actuator And Exhaust Camshaft Sprocket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Remove the oil cooler hose joint pipe from the water pump.

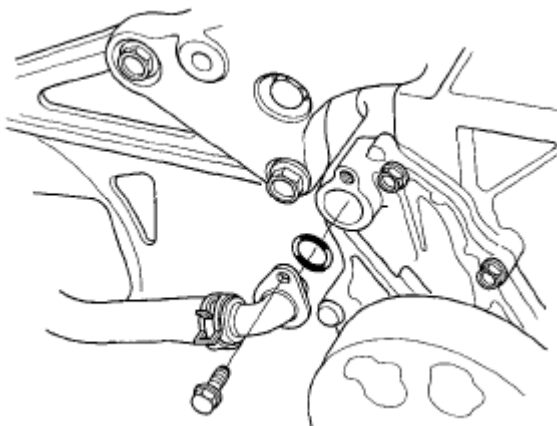


Fig. 160: Identifying Oil Cooler Hose Joint Pipe
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Disconnect the crankshaft position (CKP) sensor connector (A) and VTC oil control solenoid valve connector (B).

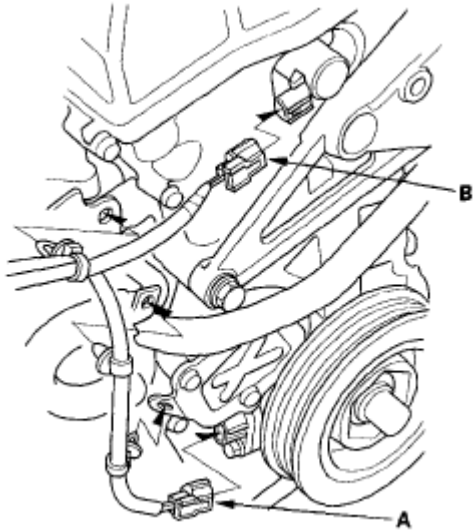


Fig. 161: Identifying Crankshaft Position (CKP) Sensor Connector
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Remove the VTC oil control solenoid valve (see **VTC OIL CONTROL SOLENOID VALVE REMOVAL/TEST/INSTALLATION**).
10. Remove the crankshaft pulley (see **CRANKSHAFT PULLEY REMOVAL AND INSTALLATION**).
11. Support the engine with a jack and a wood block under the oil pan.
12. Remove the upper torque rod (A).

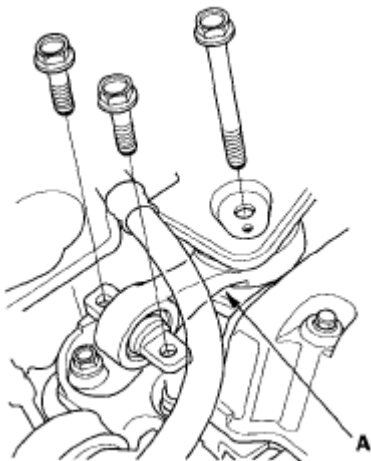


Fig. 162: Identifying Upper Torque Rod
Courtesy of AMERICAN HONDA MOTOR CO., INC.

13. Remove the ground cable (A), then remove the side engine mount bracket (B).

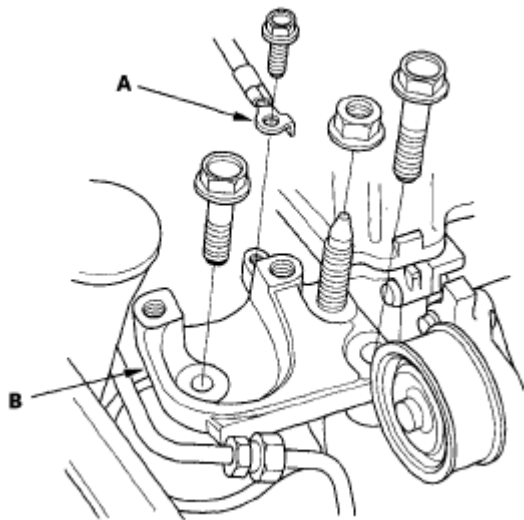


Fig. 163: Identifying Ground Cable And Side Engine Mount Bracket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

14. Remove the side engine mount bracket.

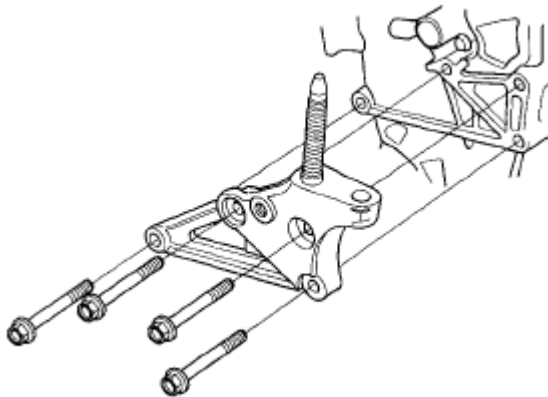


Fig. 164: Identifying Side Engine Mount Bracket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

15. Remove the cam chain case.

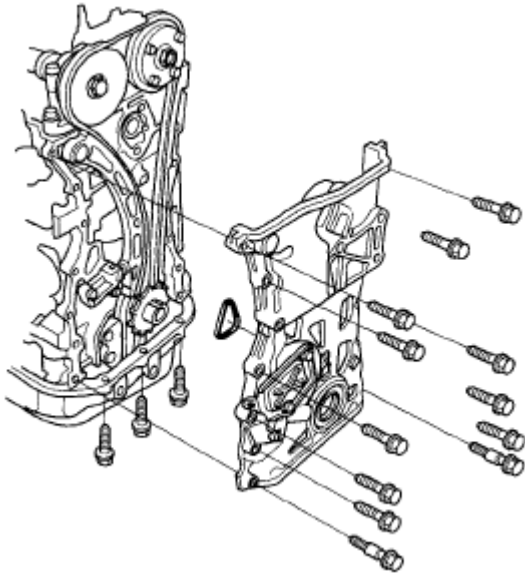


Fig. 165: Identifying Cam Chain Case

Courtesy of AMERICAN HONDA MOTOR CO., INC.

16. Loosely install the crankshaft pulley.
17. Turn the crankshaft counterclockwise to compress the auto-tensioner.

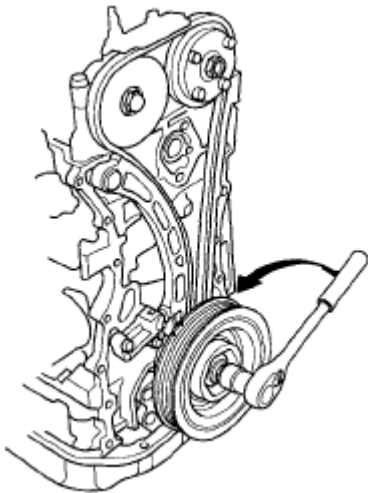


Fig. 166: Turning Crankshaft

Courtesy of AMERICAN HONDA MOTOR CO., INC.

18. Align the holes on the lock (A) and the auto-tensioner (B), then insert a 1.2 mm (0.05 in.) diameter pin or lock pin (P/N 14511-PNA-003) (C) into the holes. Turn the crankshaft clockwise to secure the pin.

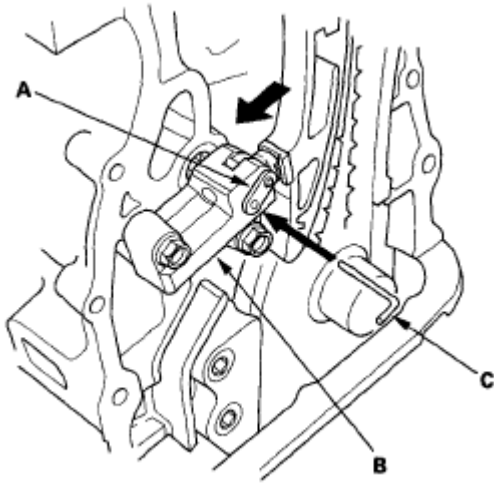


Fig. 167: Aligning Holes On Lock And Auto-Tensioner
Courtesy of AMERICAN HONDA MOTOR CO., INC.

19. Remove the auto-tensioner.

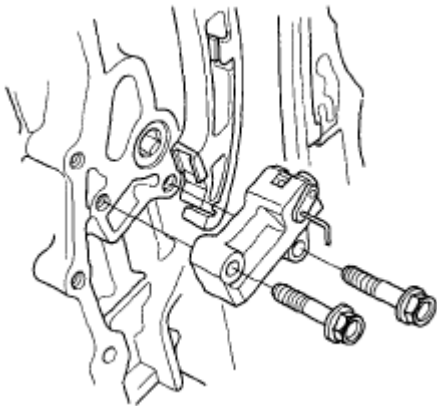


Fig. 168: Identifying Auto-Tensioner
Courtesy of AMERICAN HONDA MOTOR CO., INC.

20. Remove the crankshaft pulley.
21. Remove the cam chain guide B.

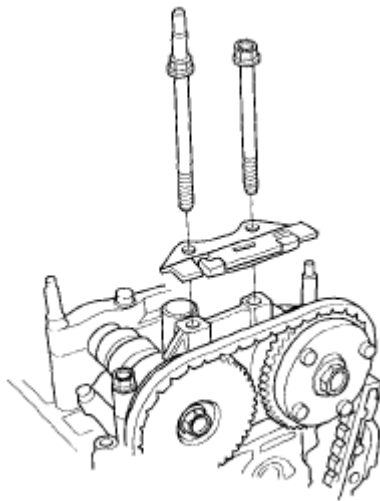


Fig. 169: Identifying Cam Chain Guide

Courtesy of AMERICAN HONDA MOTOR CO., INC.

22. Remove the cam chain guide A (A) and tensioner arm (B).

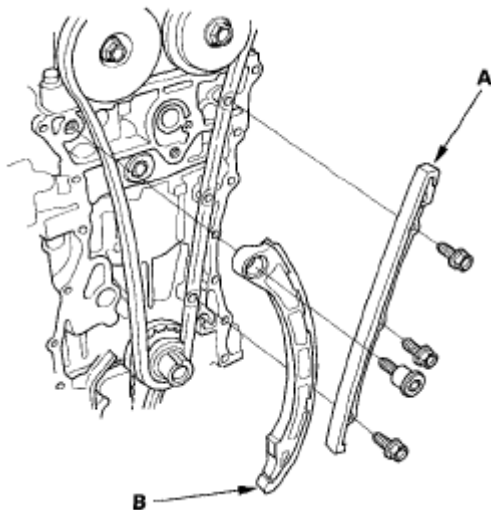


Fig. 170: Identifying Cam Chain Guide And Tensioner Arm

Courtesy of AMERICAN HONDA MOTOR CO., INC.

23. Remove the cam chain.

CAM CHAIN INSTALLATION

NOTE:

- Keep the cam chain away from magnetic fields.
- Before this procedure, check that the variable valve timing control (VTC) actuator is locked by turning the VTC actuator counterclockwise. If not locked, turn the VTC actuator clockwise until it stops, then recheck it. If it

is still not locked, replace the VTC actuator.

1. Set the crankshaft to top dead center (TDC). Align the TDC mark (A) on the crankshaft sprocket with the pointer (B) on the engine block.

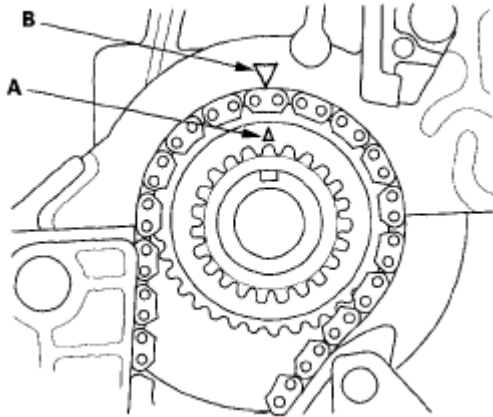


Fig. 171: Aligning TDC Mark On Crankshaft Sprocket With Pointer On Engine Block
Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Set the camshafts to TDC. The punch mark (A) on the variable valve timing control (VTC) actuator and the punch mark (B) on the exhaust camshaft sprocket should be at the top. Align the TDC marks (C) on the VTC actuator and exhaust camshaft sprocket.

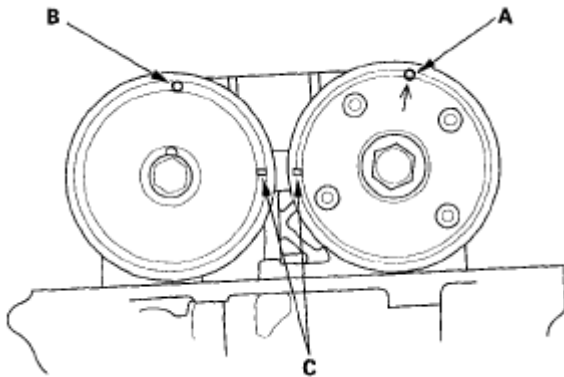


Fig. 172: Aligning TDC Marks On VTC Actuator And Exhaust Camshaft Sprocket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. To hold the intake camshaft, insert a cam holder sets (07AAB-RWCA120) (A) into the maintenance hole in camshaft position (CMP) pulse plate A (B) and through No. 5 rocker shaft holder (C).

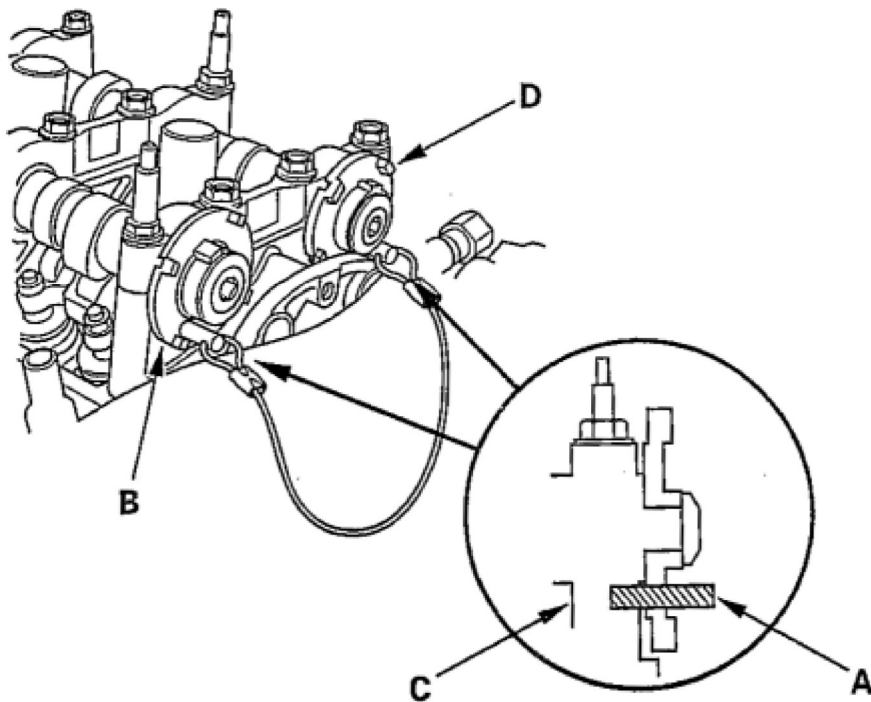


Fig. 173: Cam Holder Sets Inserted Into The Maintenance Hole In Camshaft Position Pulse Plate A And Through No. 5 Rocker Shaft Holder
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. To hold the exhaust camshaft, cam holder sets (A) into the maintenance hole in CMP pulse plate B (D) and through No. 4 rocker shaft holder (C).
5. Install the cam chain on the crankshaft sprocket with the colored link plate (A) aligned with the mark (B) on the crankshaft sprocket.

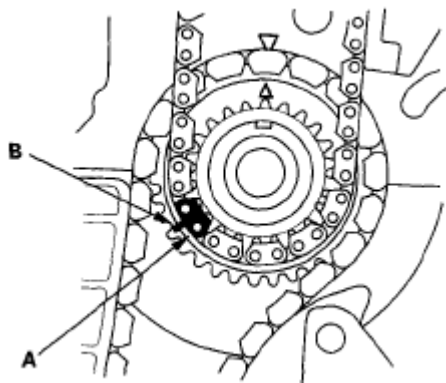


Fig. 174: Identifying Colored Link Plate
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Install the cam chain on the VTC actuator and the exhaust camshaft sprocket with the punch marks (A) aligned with the two colored link plates (B).

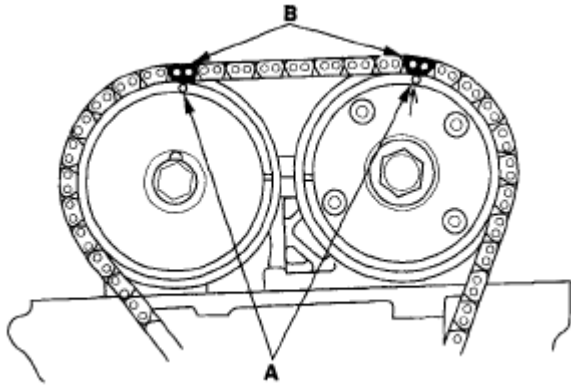


Fig. 175: Identifying Colored Link Plates

Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Install the cam chain guide A (A) and tensioner arm (B).

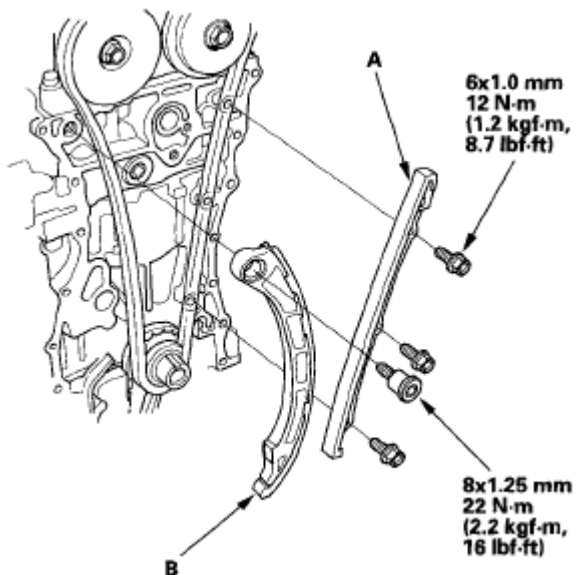


Fig. 176: Identifying Cam Chain Guide And Tensioner Arm (With Torque Specifications)

Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Install the auto-tensioner.

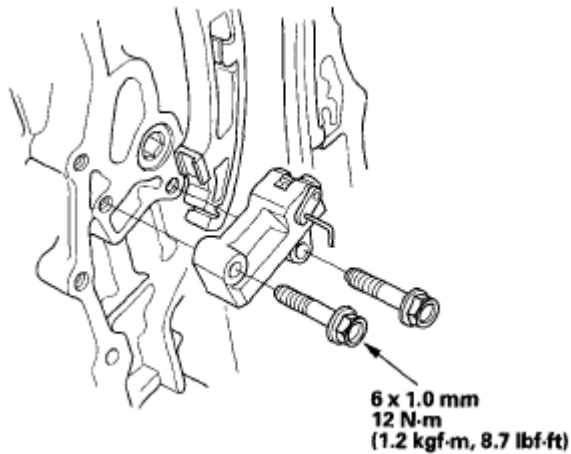


Fig. 177: Identifying Auto-Tensioner (With Torque Specifications)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Install the cam chain guide B.

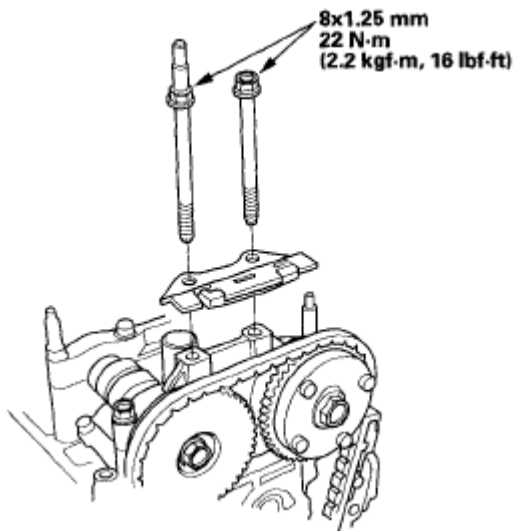


Fig. 178: Identifying Cam Chain Guide (With Torque Specifications)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Remove the pin or lock pin (P/N 14511-PNA-003) from the auto-tensioner.

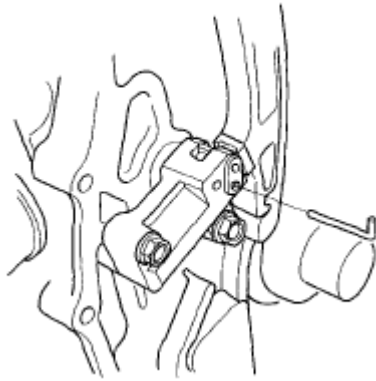


Fig. 179: Identifying Lock Pin

Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Remove the cam holder sets.

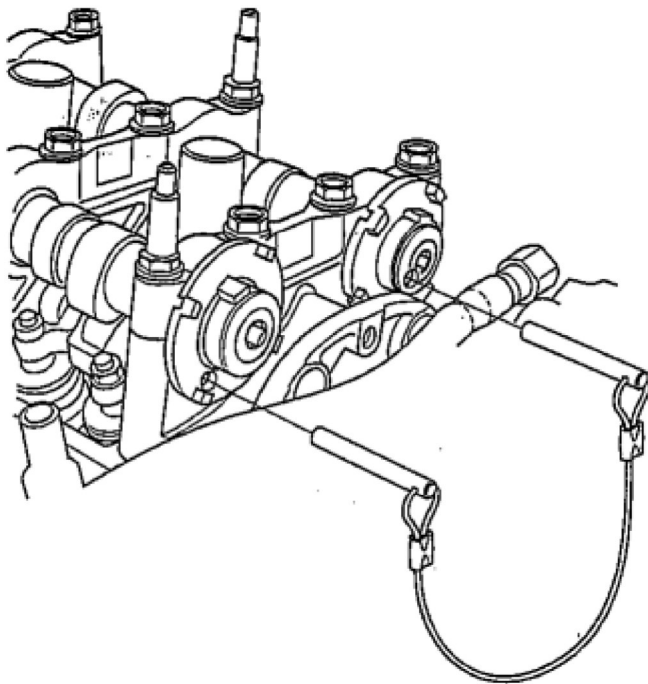


Fig. 180: Removing the cam holder sets

Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Install the CKP pulse plate.

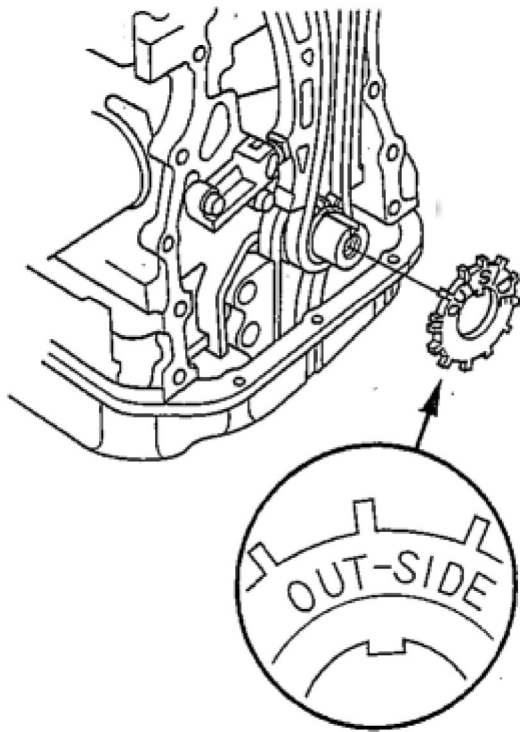


Fig. 181: Installing The CKP Pulse Plate

Courtesy of AMERICAN HONDA MOTOR CO., INC.

13. Check the chain case oil seal for damage. If the oil seal is damaged, replace the chain case oil seal (see **CHAIN CASE OIL SEAL INSTALLATION**).
14. Remove old liquid gasket from the chain case mating surfaces, bolts, and bolt holes.
15. Clean, and dry the chain case mating surfaces.
16. 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 chain case.

NOTE:

- If you apply liquid gasket, P/N 08718-0012, the component must be installed within 4 minutes.
- If too much time has passed after applying the liquid gasket, remove the old liquid gasket and residue, then reapply new liquid gasket.

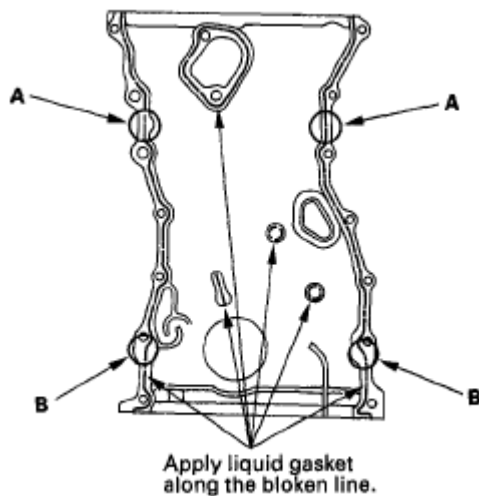


Fig. 182: Identifying Liquid Gasket Applying Area

Courtesy of AMERICAN HONDA MOTOR CO., INC.

17. Apply liquid gasket to the engine block upper surface contact areas (A) on the chain case and lower block upper surface contact areas (B) on the chain case.
18. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0002, 08718-0003, or 08718-0009, evenly to the oil pan mating surface of the chain case.

NOTE:

- If you apply liquid gasket, P/N 08718-0012, the component must be installed within 4 minutes.
- If too much time has passed after applying the liquid gasket, remove the old liquid gasket and residual, then reapply new liquid gasket.

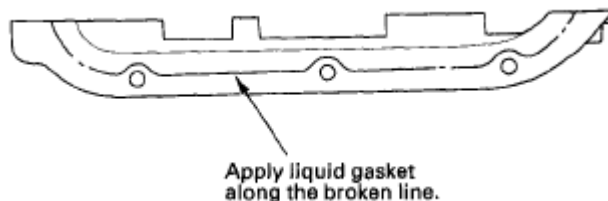


Fig. 183: Identifying Broken Line Of Liquid Gasket

Courtesy of AMERICAN HONDA MOTOR CO., INC.

19. Install a new O-ring (A) on the chain case. Set the edge of the chain case (B) to the edge of the oil pan (C), then install the chain case on the engine block (D). Wipe off the excess liquid gasket on the oil pan and chain case mating area.

NOTE:

- When installing the chain case, do not slide the bottom surface onto the oil pan mounting surface.
- Wait at least 30 minutes to allow liquid gasket to cure before filling the engine with oil.

- Do not run the engine for at least 3 hours to allow liquid gasket to cure after installing the chain case.

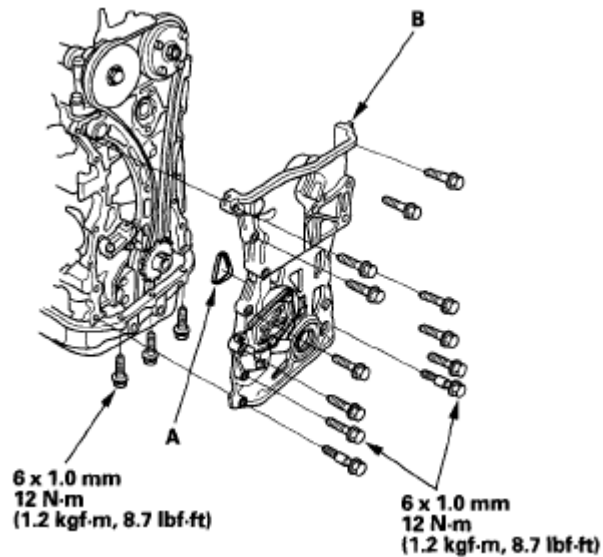


Fig. 184: Identifying Chain Case (With Torque Specifications)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

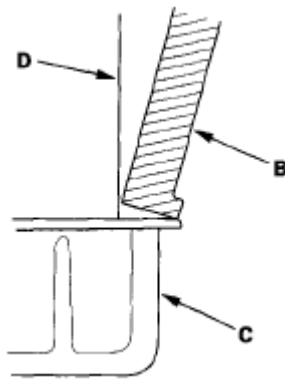


Fig. 185: Identifying Oil Pan
Courtesy of AMERICAN HONDA MOTOR CO., INC.

20. Install the side engine mount bracket.

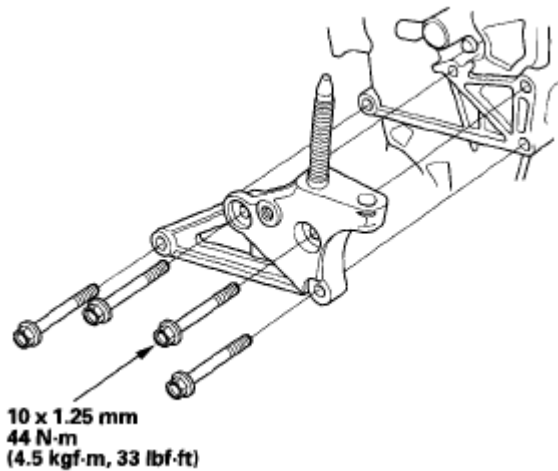


Fig. 186: Identifying Side Engine Mount Bracket (With Torque Specifications)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

21. Install the side engine mount bracket (A), then loosely tighten the new bolt and nut (B), and loosely tighten the bolt (C).

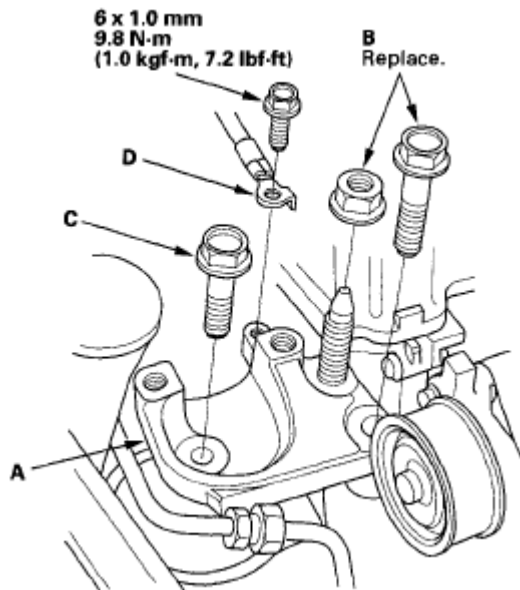


Fig. 187: Identifying Side Engine Mount Bracket (With Torque Specifications)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

22. Install the ground cable (D).
23. Remove the air cleaner assembly (see **AIR CLEANER REMOVAL/INSTALLATION**).
24. Loosen the transmission mounting bolt and nuts (A).

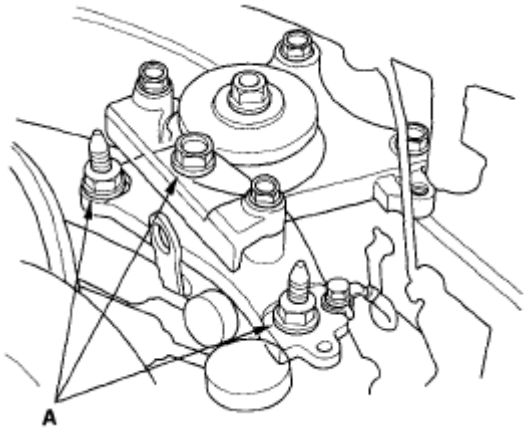


Fig. 188: Identifying Transmission Mounting Bolt And Nuts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

25. Raise the vehicle on the lift to full height.
26. Loosen the lower torque rod mounting bolt (A).

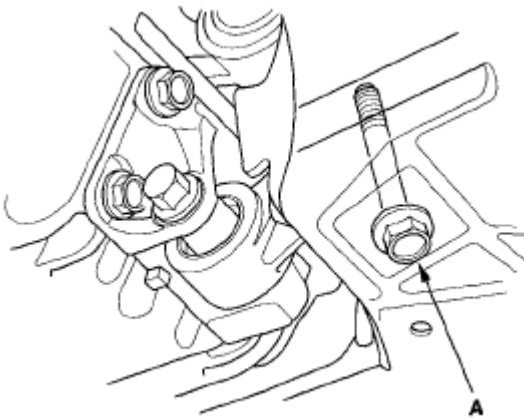


Fig. 189: Identifying Lower Torque Rod Mounting Bolt
Courtesy of AMERICAN HONDA MOTOR CO., INC.

27. Loosen the front mount mounting bolt (A).

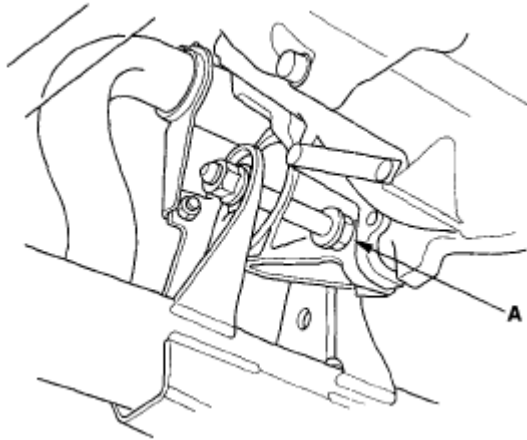


Fig. 190: Identifying Front Mount Mounting Bolt
Courtesy of AMERICAN HONDA MOTOR CO., INC.

28. Lower the vehicle on the lift.
29. Tighten the side engine mount mounting bolts and nut.

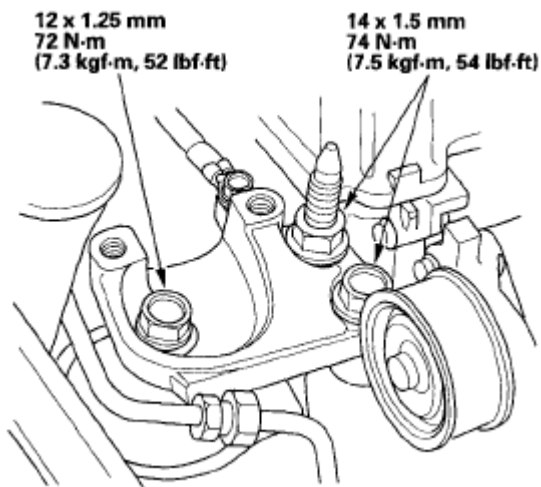


Fig. 191: Identifying Side Engine Mount Mounting Bolts And Nut (With Torque Specifications)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

30. Tighten the transmission mounting bolt and nuts.

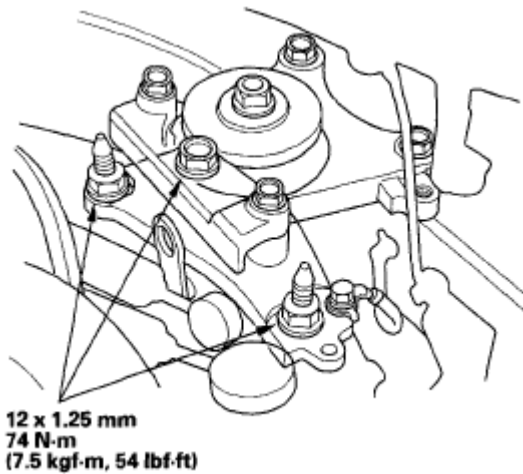


Fig. 192: Identifying Transmission Mounting Bolt And Nuts (With Torque Specifications)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

31. Raise the vehicle on the lift to full height.
32. Tighten the lower torque rod mounting bolt.

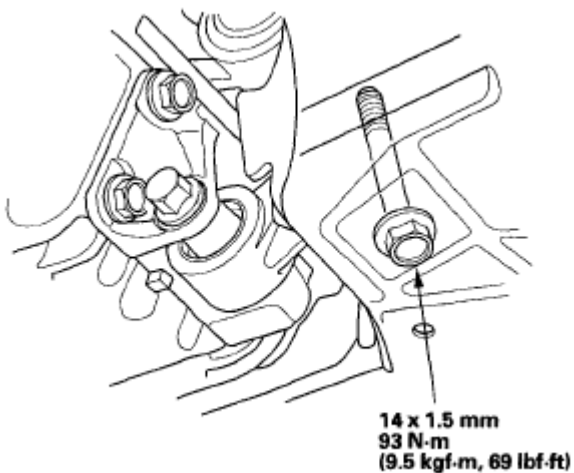


Fig. 193: Identifying Lower Torque Rod Mounting Bolt (With Torque Specifications)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

33. Lower the vehicle on the lift.
34. Install the air cleaner assembly (see **AIR CLEANER REMOVAL/INSTALLATION**).
35. Install the upper torque rod, then tighten the new upper torque rod mounting bolts in the numbered sequence shown.

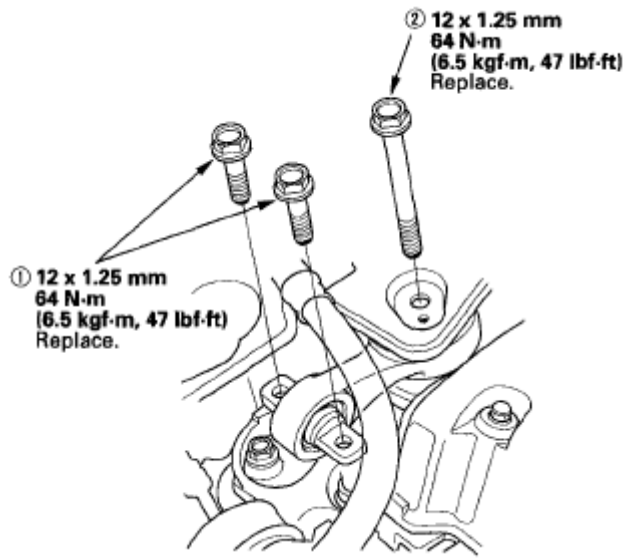


Fig. 194: Identifying Upper Torque Rod Mounting Bolts (With Torque Specifications)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

36. Raise the hoist to full height, and tighten the front mount mounting bolt.

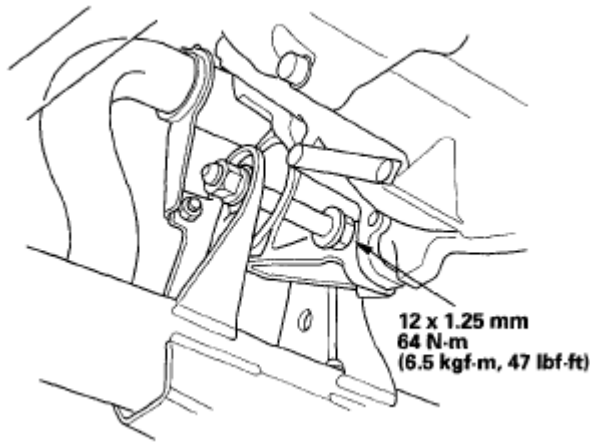


Fig. 195: Identifying Front Mount Mounting Bolt (With Torque Specifications)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

37. Install the crankshaft pulley (see **CAM CHAIN REMOVAL**).
38. Install the splash shield .
39. Lower the vehicle on the lift.
40. Install the variable valve timing control (VTC) oil control solenoid valve (see **VTC OIL CONTROL SOLENOID VALVE REMOVAL/TEST/INSTALLATION**).
41. Connect the crankshaft position (CKP) sensor connector (A) and VTC oil control solenoid valve connector (B).

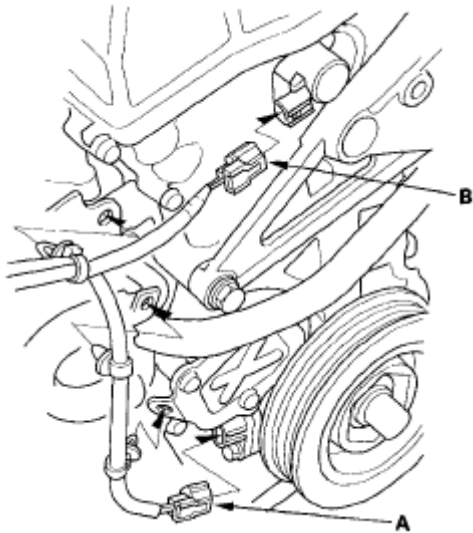


Fig. 196: Identifying Crankshaft Position (CKP) Sensor Connector
Courtesy of AMERICAN HONDA MOTOR CO., INC.

42. Install the oil cooler hose joint pipe (A) with a new O-ring (B).

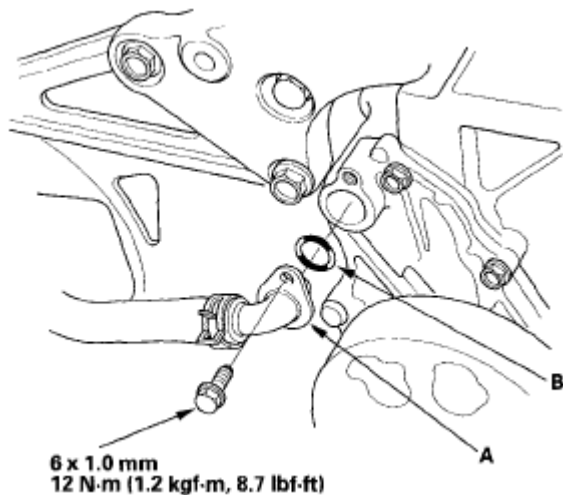


Fig. 197: Identifying Oil Cooler Hose Joint Pipe (With Torque Specifications)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

43. Install the cylinder head cover (see **CYLINDER HEAD COVER INSTALLATION**).
44. Install the drive belt (see **DRIVE BELT INSPECTION**).
45. Refill the radiator with engine coolant, and bleed air from the cooling system with the heater valve open (see step 6 on **COOLANT CHECK**).
46. Do the CKP pattern clear/CKP learn procedure (see **HDS CLEAR COMMAND**).

CAM CHAIN AUTO-TENSIONER REMOVAL AND INSTALLATION

Removal

1. Remove the chain case cover.

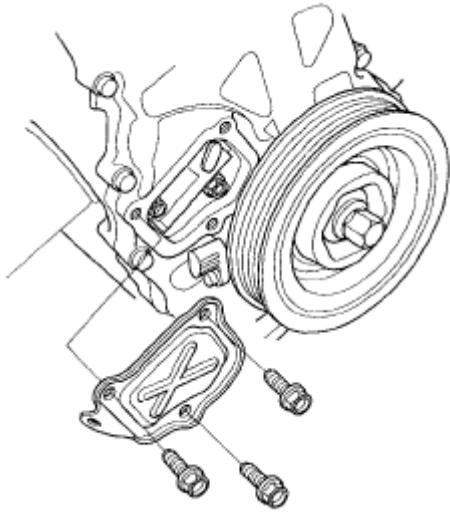


Fig. 198: Identifying Chain Case Cover

Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Turn the crankshaft counterclockwise to compress the auto-tensioner.

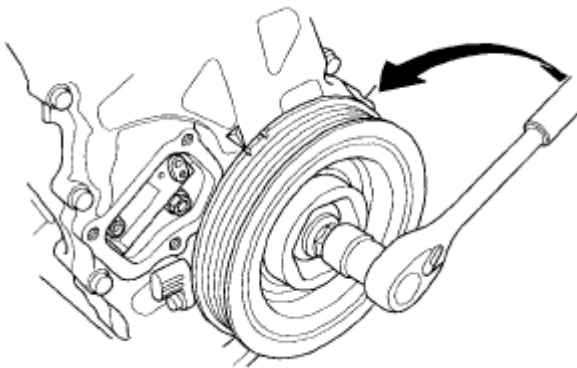


Fig. 199: Turning Crankshaft

Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Align the holes on the lock (A) and the auto-tensioner (B), then insert a 1.2 mm (0.05 in.) diameter pin or lock pin (P/N 14511-PNA-003) (C) into the holes. Turn the crankshaft clockwise to secure the pin.

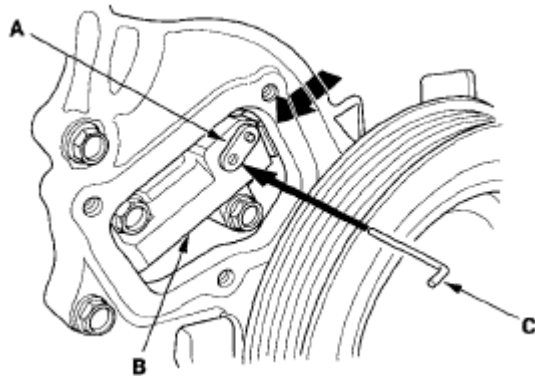


Fig. 200: Aligning Holes On Lock And Auto-Tensioner
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Remove the auto-tensioner.

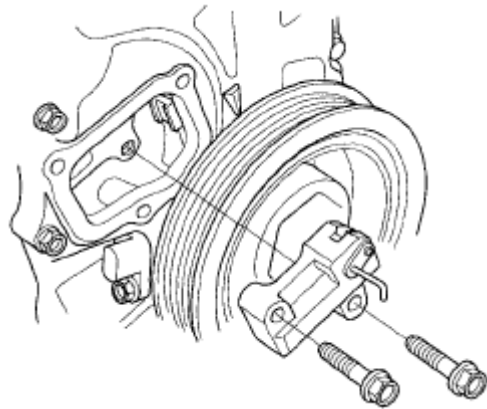


Fig. 201: Identifying Auto-Tensioner
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Installation

1. Install the auto-tensioner.

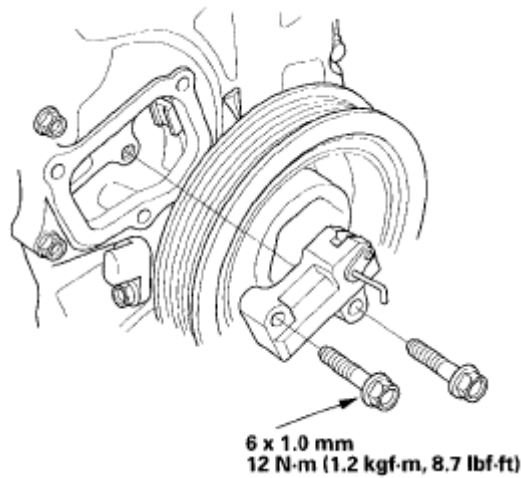


Fig. 202: Identifying Auto-Tensioner (With Torque Specifications)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Remove the pin or lock pin (P/N 14511-PNA-003) from the auto-tensioner.

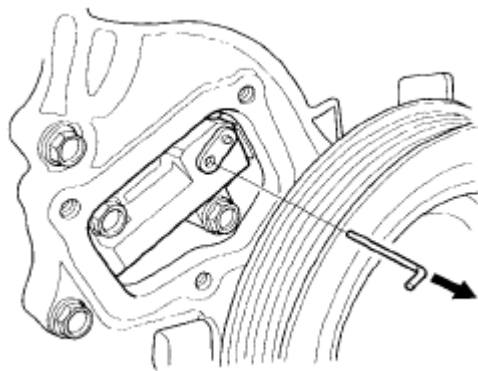


Fig. 203: Identifying Lock Pin
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Remove all of the old liquid gasket from the chain case cover mating surfaces, bolts, and bolt holes.
4. Clean, and dry the chain case cover mating surfaces.
5. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0002, 08718-0003, or 08718-0009, evenly to the chain case mating surface of the chain case cover.

NOTE:

- If you apply liquid gasket, P/N 08718-0012, the component must be installed within 4 minutes.
- If too much time has passed after applying the liquid gasket, remove the old liquid gasket and residual, then reapply new liquid gasket.

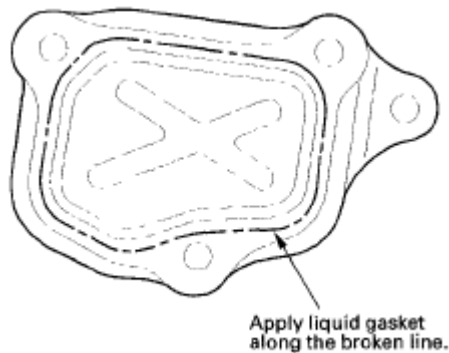


Fig. 204: Identifying Liquid Gasket Applying Area
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Install the chain case cover.

NOTE:

- Wait at least 30 minutes to allow liquid gasket to cure before filling the engine with oil.
- Do not run the engine for at least 3 hours to allow liquid gasket to cure after installing the chain case cover.

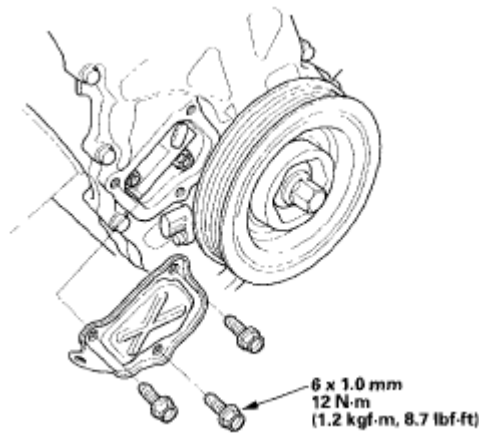


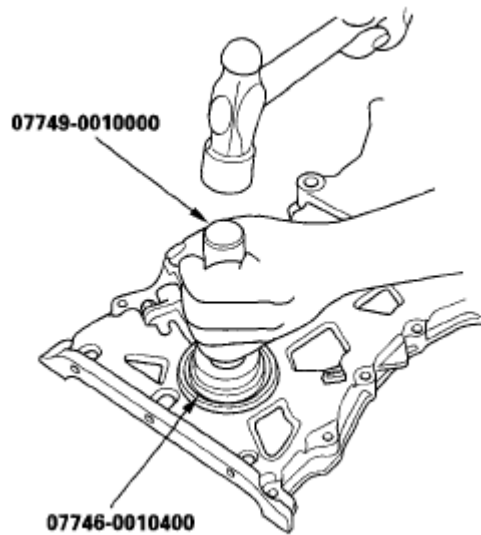
Fig. 205: Identifying Chain Case Cover (With Torque Specifications)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CHAIN CASE OIL SEAL INSTALLATION

Special Tools Required

- Driver 07749-0010000
- Attachment, 52 x 55 mm 07746-0010400

1. Use the special tools to drive a new oil seal squarely into the chain case to the specified installed height.

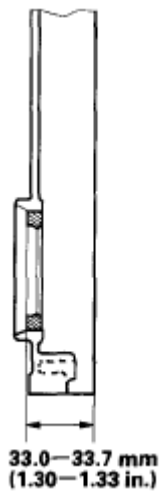
**Fig. 206: Installing Oil Seal**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Measure the distance between the chain case surface and oil seal.

Oil Seal Installed Height:

33.0-33.7 mm (1.30-1.33 in.)

**Fig. 207: Measuring Distance Between Chain Case Surface And Oil Seal**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

CAM CHAIN INSPECTION

1. Remove the front wheels.
2. Remove the splash shield .
3. Drain the engine coolant (see **COOLANT CHECK**).

4. Remove the drive belt (see **DRIVE BELT INSPECTION**).
5. Remove the cylinder head cover (see **CYLINDER HEAD COVER REMOVAL**).
6. Set the No. 1 piston at top dead center (TDC). The punch mark on the variable valve timing control (VTC) actuator and the punch mark on the exhaust camshaft sprocket should be at the top. Align the TDC marks on the VTC actuator and exhaust camshaft sprocket (see step 6).
7. Remove the oil cooler hose joint pipe from the water pump (see step 7).
8. Disconnect the crankshaft position (CKP) sensor connector and VTC oil control solenoid valve connector (see step 8).
9. Remove the VTC oil control solenoid valve (see **VTC OIL CONTROL SOLENOID VALVE REMOVAL/TEST/INSTALLATION**).
10. Remove the crankshaft pulley (see **CRANKSHAFT PULLEY REMOVAL AND INSTALLATION**).
11. Support the engine with a jack and a wood block under the oil pan.
12. Remove the upper torque rod (see step 12).
13. Remove the ground cable, then remove the side engine mount bracket (see step 13).
14. Remove the side engine mount bracket (see step 14).
15. Remove the cam chain case (see step 15).
16. Measure the tensioner rod length between the tensioner body and bottom of the flat surface section on the tensioner rod. If the length is more than the service limit, replace the cam chain and the oil pump chain.

Tensioner Rod Length

Service Limit: 13.5 mm (0.53 in.)

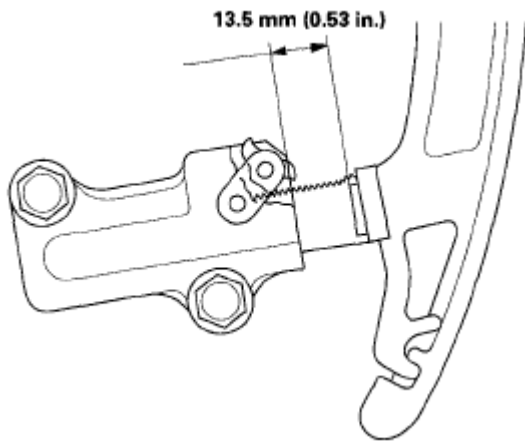


Fig. 208: Checking Tensioner Rod Length

Courtesy of AMERICAN HONDA MOTOR CO., INC.

17. Check the chain case oil seal for damage. If the oil seal is damaged, replace the chain case oil seal (see **CHAIN CASE OIL SEAL INSTALLATION**).
18. Remove all of the old liquid gasket from the chain case mating surfaces, bolt and bolt holes.
19. Clean, and dry the chain case mating surfaces.

20. 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 chain case (see step 16).

NOTE:

- If you apply liquid gasket, P/N 08718-0012, the component must be installed within 4 minutes.
- If too much time has passed after applying the liquid gasket, remove the old liquid gasket and residual, then reapply new liquid gasket.

21. Apply liquid gasket to the engine block upper surface contact areas on the chain case and lower block upper surface contact areas on the chain case (see step 17).
22. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0002, 08718-0003, or 08718-0009, evenly to the oil pan mating surface of the chain case (see step 18).

NOTE:

- If you apply liquid gasket, P/N 08718-0012, the component must be installed within 4 minutes.
- If too much time has passed after applying the liquid gasket, remove the old liquid gasket and residual, then reapply new liquid gasket.

23. Install the new O-ring on the chain case. Set the edge of the chain case to the edge of the oil pan, then install the chain case on the engine block (see step 19). Wipe off the excess liquid gasket on the oil pan and chain case mating area.

NOTE:

- When installing the chain case, do not slide the bottom surface onto the oil pan mounting surface.
- Wait at least 30 minutes to allow liquid gasket to cure before filling the engine with oil.
- Do not run the engine for at least 3 hours to allow liquid gasket to cure after installing the chain case.

24. Install the side engine mount bracket (see step 20).
25. Install the side engine mount bracket, then loosely tighten the new bolt and nut, and loosely tighten the bolt. Install the ground cable (see step 21).
26. Remove the air cleaner assembly (see **AIR CLEANER REMOVAL/INSTALLATION**).
27. Loosen the transmission mounting bolt and nuts (see step 24).
28. Raise the hoist to full height.
29. Loosen the lower torque rod mounting bolt (see step 26).
30. Loosen the front mount mounting bolt (see step 27).
31. Lower the vehicle on the hoist.
32. Tighten the side engine mount mounting bolts and nut (see step 29).
33. Tighten the transmission mounting bolt and nuts (see step 30).
34. Raise the vehicle on the lift to full height.

35. Tighten the lower torque rod mounting bolt (see step 32).
36. Lower the vehicle on the lift.
37. Install the air cleaner assembly (see **AIR CLEANER REMOVAL/INSTALLATION**).
38. Install the upper torque rod, then tighten the new upper torque rod mounting bolts in the numbered sequence shown (see step 35).
39. Raise the vehicle on the lift to full height, and tighten the front mount mounting bolt (see step 36).
40. Install the splash shield .
41. Lower the vehicle on the lift.
42. Install the variable valve timing control (VTC) oil control solenoid valve (see **VTC OIL CONTROL SOLENOID VALVE REMOVAL/TEST/INSTALLATION**).
43. Connect the crankshaft position (CKP) sensor connector and VTC oil control solenoid valve connector (see step 41).
44. Install the oil cooler hose joint pipe to the water pump (see step 42).
45. Install the crankshaft pulley (see **CAM CHAIN REMOVAL**).
46. Install the cylinder head cover (see **CYLINDER HEAD COVER INSTALLATION**).
47. Install the drive belt (see **DRIVE BELT INSPECTION**).
48. Refill the radiator with engine coolant, and bleed air from the cooling system with the heater valve open (see step 6 on **COOLANT CHECK**).
49. Do the CKP pattern clear/CKP learn procedure (see **HDS CLEAR COMMAND**).

CKP PULSE PLATE REPLACEMENT

1. Remove the front wheels.
2. Remove the splash shield .
3. Drain the engine coolant (see **COOLANT CHECK**).
4. Remove the drive belt (see **DRIVE BELT INSPECTION**).
5. Remove the cylinder head cover (see **CYLINDER HEAD COVER REMOVAL**).
6. Set the No. 1 piston at top dead center (TDC). The punch mark on the variable valve timing control (VTC) actuator and the punch mark on the exhaust camshaft sprocket should be at the top. Align the TDC marks on the VTC actuator and exhaust camshaft sprocket (see step 6).
7. Remove the oil cooler hose joint pipe from the water pump (see step 7).
8. Disconnect the crankshaft position (CKP) sensor connector and VTC oil control solenoid valve connector (see step 8).
9. Remove the VTC oil control solenoid valve (see **VTC OIL CONTROL SOLENOID VALVE REMOVAL/TEST/INSTALLATION**).
10. Remove the crankshaft pulley (see **CRANKSHAFT PULLEY REMOVAL AND INSTALLATION**).
11. Support the engine with a jack and a wood block under the oil pan.
12. Remove the upper torque rod (see step 12).
13. Remove the ground cable, then remove the side engine mount bracket (see step 13).
14. Remove the side engine mount bracket (see step 14).

15. Remove the cam chain case (see step 15).
16. Remove the CKP pulse plate.

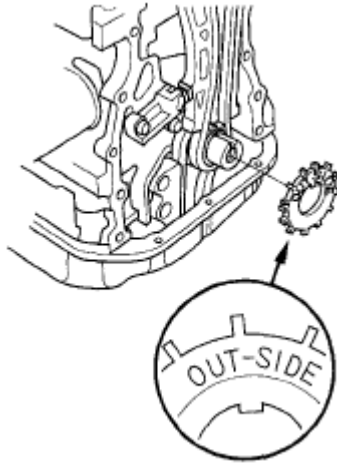


Fig. 209: Identifying CKP Pulse Plate

Courtesy of AMERICAN HONDA MOTOR CO., INC.

17. Install the CKP pulse plate.
18. Check the chain case oil seal for damage. If the oil seal is damaged, replace the chain case oil seal (see **CHAIN CASE OIL SEAL INSTALLATION**).
19. Remove all of the old liquid gasket from the chain case mating surfaces, bolt and bolt holes.
20. Clean, and dry the chain case mating surfaces.
21. 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 chain case (see step 16).

NOTE:

- If you apply liquid gasket, P/N 08718-0012, the component must be installed within 4 minutes.
- If too much time has passed after applying the liquid gasket, remove the old liquid gasket and residual, then reapply new liquid gasket.

22. Apply liquid gasket to the engine block upper surface contact areas on the chain case and lower block upper surface contact areas on the chain case (see step 17).
23. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0002, 08718-0003, or 08718-0009, evenly to the oil pan mating surface of the chain case (see step 18).

NOTE:

- If you apply liquid gasket, P/N 08718-0012, the component must be installed within 4 minutes.
- If too much time has passed after applying the liquid gasket, remove the old liquid gasket and residual, then reapply new liquid gasket.

24. Install a new O-ring on the chain case. Set the edge of the chain case to the edge of the oil pan, then

install the chain case on the engine block (see step 19). Wipe off the excess liquid gasket on the oil pan and chain case mating area.

NOTE:

- **When installing the chain case, do not slide the bottom surface onto the oil pan mounting surface.**
- **Wait at least 30 minutes to allow liquid gasket to cure before filling the engine with oil.**
- **Do not run the engine for at least 3 hours to allow liquid gasket to cure after installing the chain case.**

25. Install the side engine mount bracket (see step 20).
26. Install the side engine mount bracket, then loosely tighten the new bolt and nut, and loosely tighten the bolt. Install the ground cable (see step 21).
27. Remove the air cleaner assembly (see **AIR CLEANER REMOVAL/INSTALLATION**).
28. Loosen the transmission mounting bolt and nuts (see step 24).
29. Raise the vehicle on the lift to full height.
30. Loosen the lower torque rod mounting bolt (see step 26).
31. Loosen the front mount mounting bolt (see step 27 on).
32. Lower the vehicle on the lift.
33. Tighten the side engine mount mounting bolts and nut (see step 29 on).
34. Tighten the transmission mounting bolt and nuts (see step 30 on).
35. Raise the vehicle on the lift to full height.
36. Tighten the lower torque rod mounting bolt (see step 32 on).
37. Lower the vehicle on the lift.
38. Install the air cleaner assembly (see **AIR CLEANER REMOVAL/INSTALLATION**).
39. Install the upper torque rod, then tighten the new upper torque rod mounting bolts in the numbered sequence shown (see step 35 on).
40. Raise the vehicle on the lift to full height, and tighten the front mount mounting bolt (see step 36 on).
41. Install the splash shield .
42. Lower the vehicle on the lift.
43. Install the variable valve timing control (VTC) oil control solenoid valve (see **VTC OIL CONTROL SOLENOID VALVE REMOVAL/TEST/INSTALLATION**).
44. Connect the crankshaft position (CKP) sensor connector and VTC oil control solenoid valve connector (see step 41 on).
45. Install the oil cooler hose joint pipe to the water pump (see step 42 on).
46. Install the crankshaft pulley (see **CAM CHAIN REMOVAL**).
47. Install the cylinder head cover (see **CYLINDER HEAD COVER INSTALLATION**).
48. Install the drive belt (see **DRIVE BELT INSPECTION**).
49. Refill the radiator with engine coolant, and bleed air from the cooling system with the heater valve open (see step 6 on **COOLANT CHECK**).

50. Do the CKP pattern clear/CKP learn procedure (see **HDS CLEAR COMMAND**).

CYLINDER HEAD COVER REMOVAL

1. Remove the engine cover.

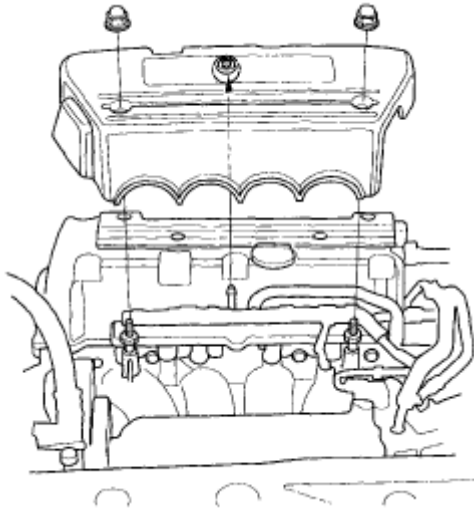


Fig. 210: Identifying Engine Cover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Remove the four ignition coils (see **IGNITION COIL REMOVAL/INSTALLATION**).
3. Disconnect the evaporative emission (EVAP) canister purge valve connector.
4. Remove the dipstick (A) and the breather hose (B).

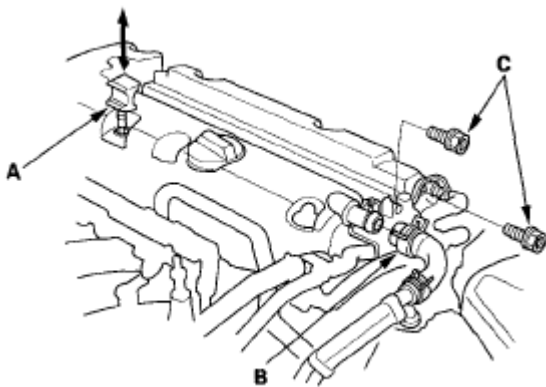


Fig. 211: Identifying Dipstick And Breather Hose
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Remove two bolts (C) securing the evaporative emission (EVAP) canister purge valve bracket.
6. Remove the cylinder head cover.

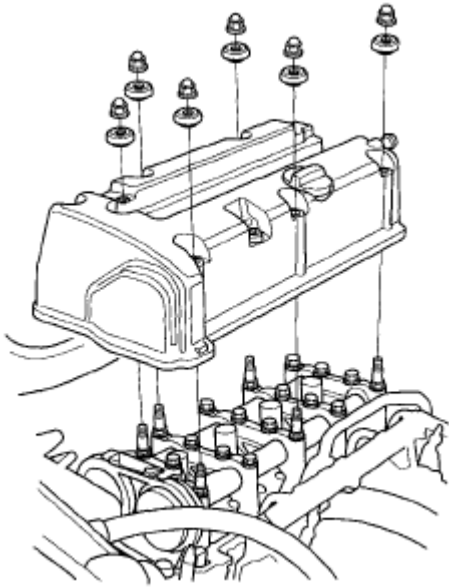


Fig. 212: Identifying Cylinder Head Cover

Courtesy of AMERICAN HONDA MOTOR CO., INC.

CYLINDER HEAD COVER INSTALLATION

1. Check the spark plug seals for damage. Replace as needed.
2. Thoroughly clean the head cover gasket and the groove.
3. Install the head cover gasket (A) in the groove of the cylinder head cover (B).

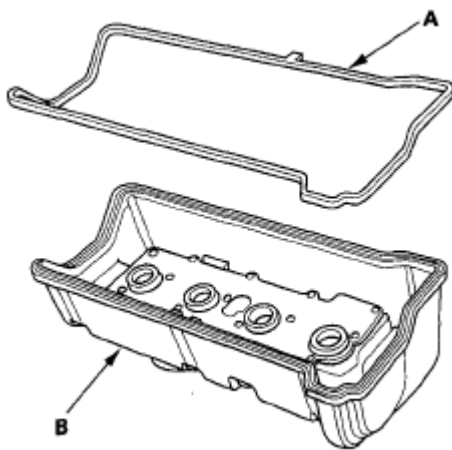


Fig. 213: Identifying Head Cover Gasket

Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Check that the mating surfaces are clean and dry.
5. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0002, 08718-0003, or 08718-0009, on the chain case and the No. 5 rocker shaft holder mating areas.

NOTE:

- If you apply liquid gasket, P/N 08718-0012, the component must be installed within 4 minutes.
- If too much time has passed after applying the liquid gasket, remove the old liquid gasket and residual, then reapply new liquid gasket.

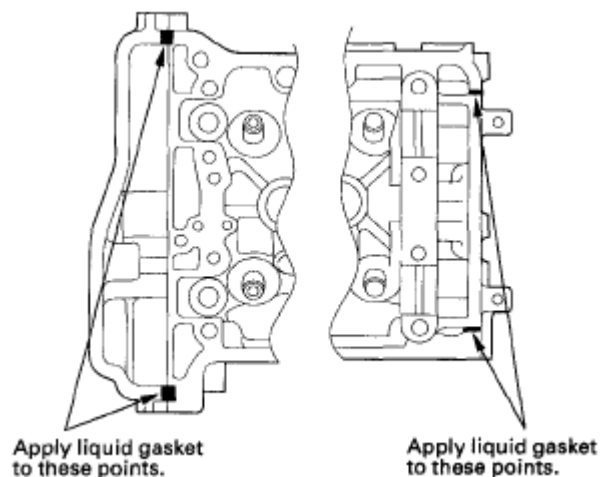


Fig. 214: Identifying Liquid Gasket Applying Points
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Set the spark plug seals (A) on the spark plug tubes. Place the cylinder head cover (B) on the cylinder head, then slide the cover slightly back and forth to seat the head cover gasket.

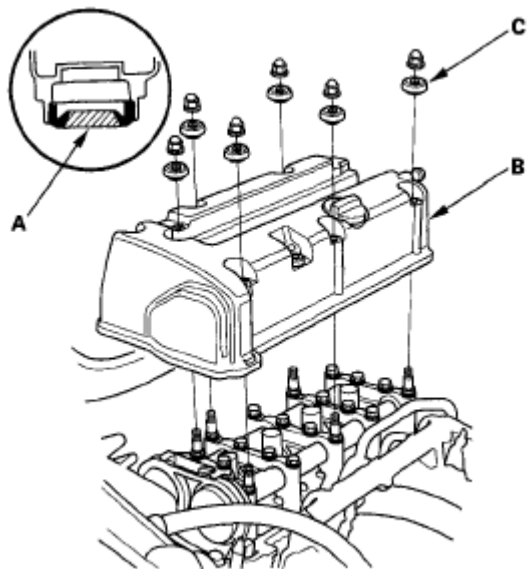


Fig. 215: Identifying Spark Plug Seals And Cylinder Head Cover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Inspect the cover washers (C). Replace any washer that is damaged or deteriorated.

8. 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:

- Wait at least 30 minutes to allow liquid gasket to cure before filling the engine with oil.
- Do not run the engine for at least 3 hours to allow liquid gasket to cure after installing the head cover.

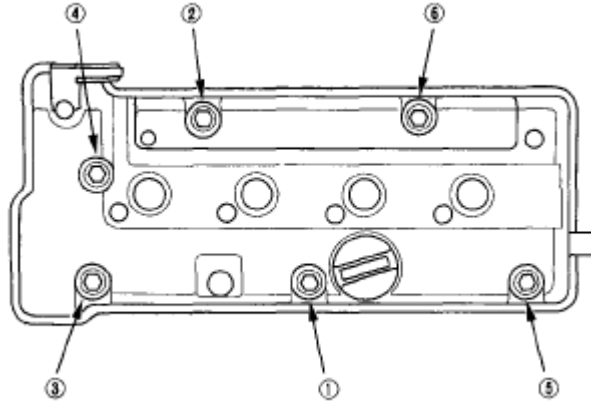


Fig. 216: Identifying Cylinder Head Cover Bolts Tightening Sequence
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Install two bolts (A) securing the evaporative emission (EVAP) canister purge valve bracket.

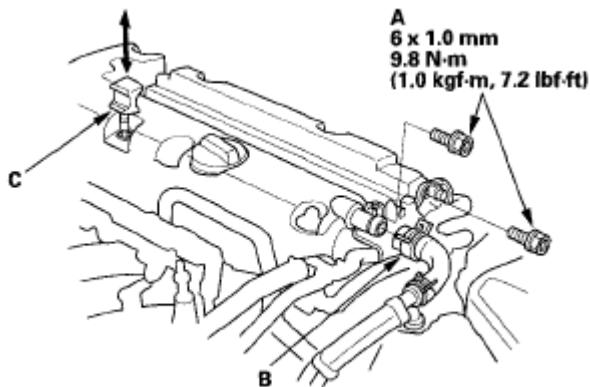


Fig. 217: Identifying Breather Hose And Dipstick (With Torque Specifications)
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Install the breather hose (B) and the dipstick (C).
11. Connect the evaporative emission (EVAP) canister purge valve connector.
12. Install the four ignition coils, (see **IGNITION COIL REMOVAL/INSTALLATION**).
13. Install the engine cover.

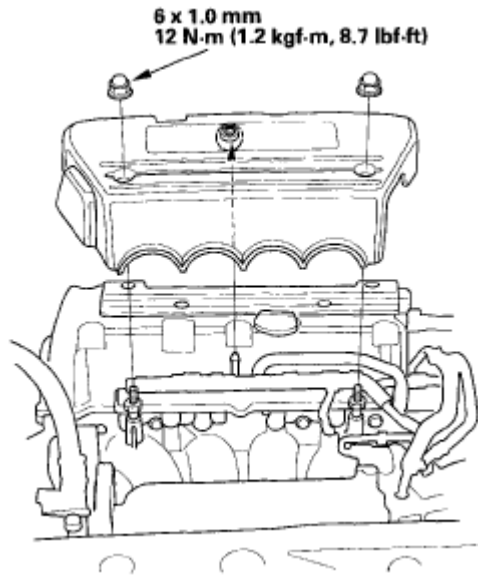


Fig. 218: Identifying Engine Cover (With Torque Specifications)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CYLINDER HEAD REMOVAL

NOTE:

- Use fender covers to avoid damaging painted surfaces.
- To avoid damaging the wiring and terminals, unplug the wiring connectors carefully while holding the connector portion.
- To avoid damaging the cylinder head, wait until the engine coolant temperature drops below 100°F (38°C) before loosening the cylinder head bolts.
- Mark all wiring and hoses to avoid misconnection. Also, be sure that they do not contact other wiring or hoses, or interfere with other parts.

1. Relieve fuel pressure (see **FUEL PRESSURE RELIEVING**).
2. Drain the engine coolant (see **COOLANT CHECK**).
3. Remove the air cleaner assembly (see **AIR CLEANER REMOVAL/INSTALLATION**).
4. Remove the drive belt (see **DRIVE BELT INSPECTION**).
5. Remove the intake manifold (see **REMOVAL**).
6. Remove the exhaust manifold (see **EXHAUST MANIFOLD REMOVAL AND INSTALLATION**).
7. Remove the evaporative emission (EVAP) canister hose (A) and brake booster vacuum hose (B).

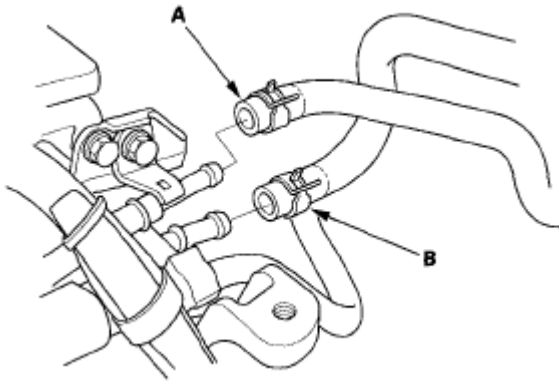


Fig. 219: Identifying Evaporative Emission (EVAP) Canister Hose
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Remove the quick-connect fitting cover (A), then disconnect the fuel feed hose (see **FUEL LINE/QUICK-CONNECT FITTING REMOVAL**).

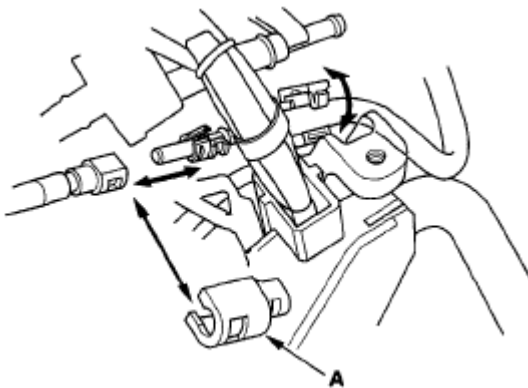


Fig. 220: Identifying Quick-Connect Fitting Cover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Remove the harness holder (A) from the bracket, then remove the harness holder bracket (B).

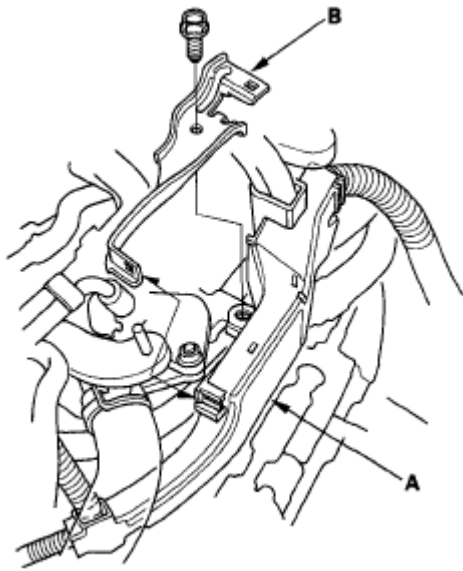


Fig. 221: Identifying Harness Holder Bracket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Remove the upper radiator hose (A) and heater hoses (B).

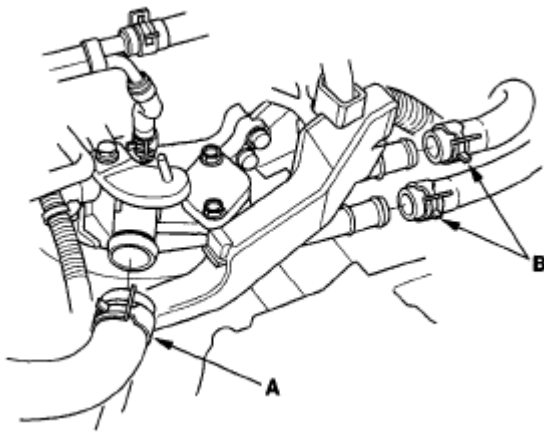


Fig. 222: Identifying Upper Radiator Hose And Heater Hoses
Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Remove the bolt securing the connecting pipe.

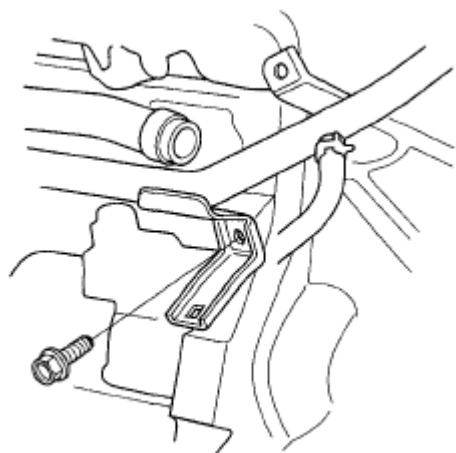


Fig. 223: Identifying Connecting Pipe Bolt

Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Remove the engine wire harness connectors and wire harness clamps from the cylinder head.
 - Four fuel injector connectors
 - Engine coolant temperature (ECT) sensor 1 connector
 - Camshaft position (CMP) sensor A (Intake) connector
 - Camshaft position (CMP) sensor B (Exhaust) connector
 - Rocker arm oil control solenoid connector
 - Rocker arm oil pressure switch connector
 - EVAP canister purge valve connector
13. Remove the cam chain (see **CAM CHAIN REMOVAL**).
14. Remove the rocker arm assembly (see **ROCKER ARM ASSEMBLY REMOVAL**).
15. Remove the cylinder head bolts. To prevent warpage, unscrew the bolts in sequence 1/3 turn at a time; repeat the sequence until all bolts are loosened.

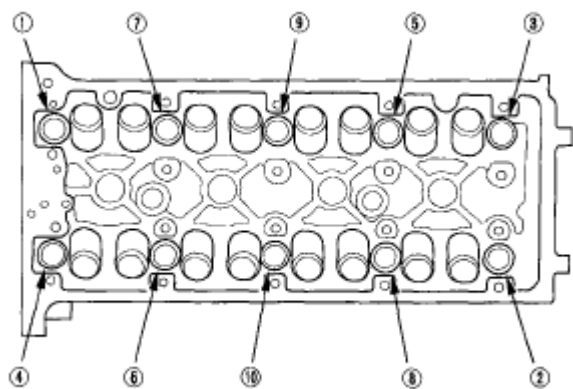


Fig. 224: Identifying Cylinder Head Bolts Loosening Sequence

Courtesy of AMERICAN HONDA MOTOR CO., INC.

16. Remove the cylinder head.

CMP PULSE PLATE A REPLACEMENT

1. Remove the cylinder head cover (see **CYLINDER HEAD COVER REMOVAL**).
2. Hold the intake camshaft with a 27mm open-end wrench, then loosen the bolt.

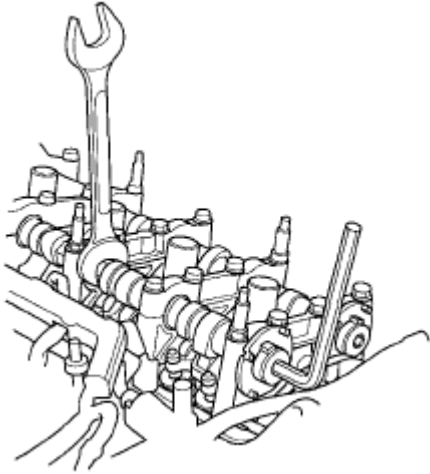


Fig. 225: Holding Camshaft

Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Remove CMP pulse Plate A.

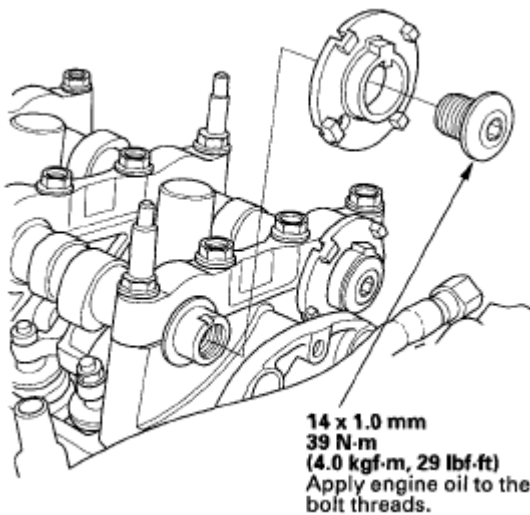


Fig. 226: Identifying Camshaft Position (CMP) Pulse Plate A (With Torque Specifications)

Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Install CMP pulse plate A in the Reverse order of removal.

CMP PULSE PLATE B REPLACEMENT

1. Remove the cylinder head cover (see **CYLINDER HEAD COVER REMOVAL**).

2. Hold the camshaft with a 27 mm open-end wrench, then loosen the bolt.

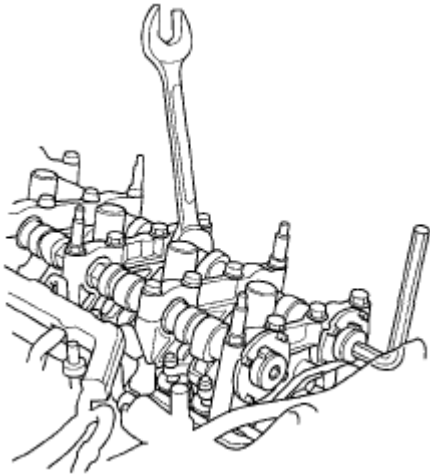


Fig. 227: Identifying Hold Camshaft

Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Remove camshaft position (CMP) pulse plate B.

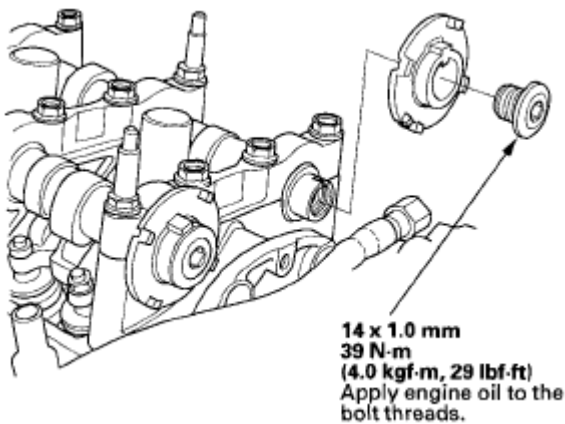


Fig. 228: Identifying Camshaft Position (CMP) Pulse Plate B (With Torque Specifications)

Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Install CMP pulse plate B in the reverse order of removal.

VTC ACTUATOR, EXHAUST CAMSHAFT SPROCKET REPLACEMENT

Removal

1. Remove the cam chain (see **CAM CHAIN REMOVAL**).
2. Hold the camshaft with a 27 mm open-end wrench, then loosen the variable valve timing control (VTC) actuator mounting bolt and exhaust camshaft sprocket mounting bolt.

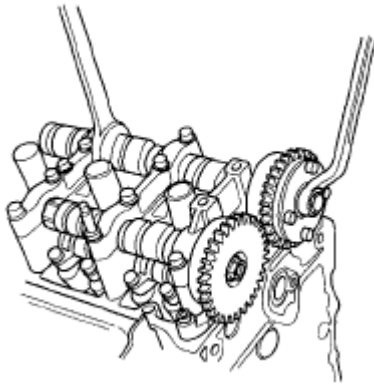


Fig. 229: Removing Exhaust Camshaft Sprocket Mounting Bolt
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. To the VTC actuator is reused, do the following steps.
 - 1 Remove the intake camshaft, and seal the advance holes and retard holes in the No. 1 camshaft journal with tape (see step 6).
 - 2 Punch a hole in the tape over one of the advance holes (see step 7).
 - 3 Apply air to the advance hole to release the lock (see step 8).
 - 4 Remove the tape from the No. 1 camshaft journal.
4. Remove the VTC actuator and exhaust camshaft sprocket.

Installation

1. Install the VTC actuator and exhaust camshaft sprocket.

NOTE: **Install the VTC actuator to unlock position.**

2. Apply engine oil to the threads of the VTC actuator mounting bolt and exhaust camshaft mounting bolt, then install them.
3. Hold the camshaft with an open-end wrench, then tighten the bolts.

Specified Torque

VTC Actuator Mounting Bolt:

12 x 1.25 mm

113 N.m (11.5 kgf.m, 83 lbf.ft)

Exhaust Camshaft Sprocket Mounting Bolt: 10 x 1.25 mm

72 N.m (7.3 kgf.m, 53 lbf.ft)

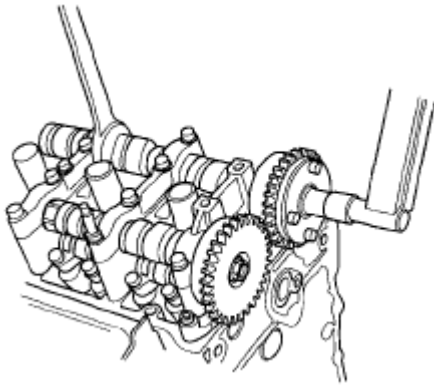


Fig. 230: Installing Exhaust Camshaft Sprocket Mounting Bolt
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Hold the camshaft, and turn the VTC actuator clockwise until you hear it click. Make sure to lock the VTC actuator by turning it.
5. Install the cam chain (see **CAM CHAIN INSTALLATION**).

CYLINDER HEAD INSPECTION FOR WARPAGE

1. Remove the cylinder head (see **CYLINDER HEAD REMOVAL**).
2. Inspect the camshaft (see **CAMSHAFT INSPECTION**).
3. Check the cylinder head for warpage. Measure along the edges, and three ways across the center.
 - If warpage is less than 0.05 mm (0.002 in.), cylinder head resurfacing is not required.
 - If warpage is between 0.05 mm (0.002 in.) and 0.2 mm (0.008 in.), resurface the cylinder head.
 - Maximum resurface limit is 0.2 mm (0.008 in.) based on a height of 104 mm (4.09 in.).

Cylinder Head Height

Standard (New): 103.95-104.05 mm (4.093-4.096 in.)

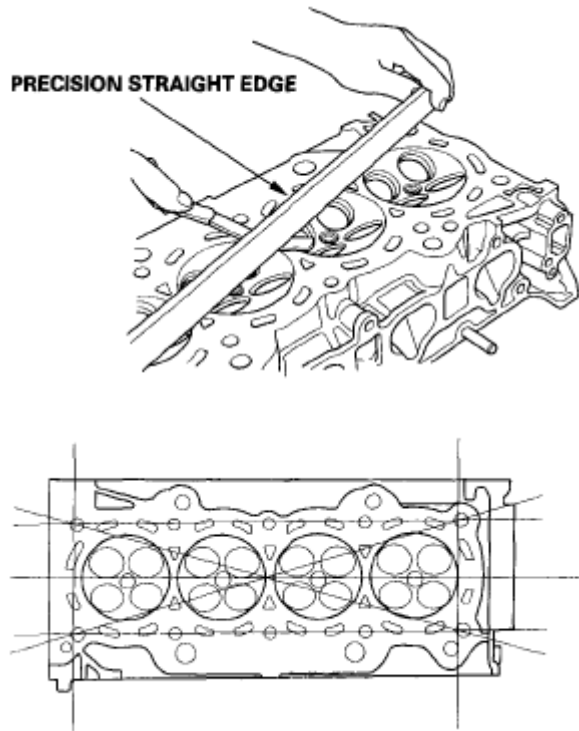


Fig. 231: Checking Cylinder Head For Warpage
Courtesy of AMERICAN HONDA MOTOR CO., INC.

ROCKER ARM ASSEMBLY REMOVAL

1. Remove the cam chain (see **CAM CHAIN REMOVAL**).
2. Loosen the rocker arm adjusting screws (A).

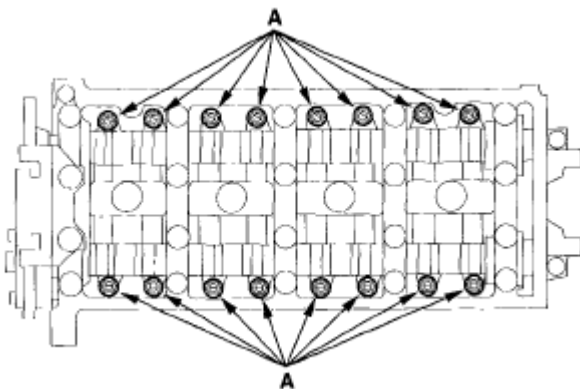


Fig. 232: Identifying Rocker Arm Adjusting Screws
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Remove the camshaft holder bolts. To prevent damaging the camshafts, unscrew the bolts, in sequence, two turns at a time.

NOTE: Bolt (1) is not on all engines.

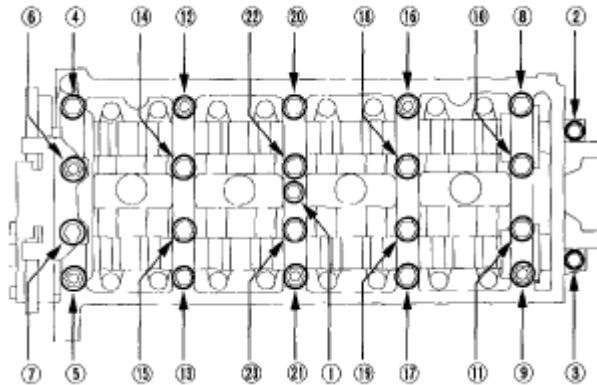


Fig. 233: Identifying Camshaft Holder Bolts Loosening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Remove the cam chain guide B, camshaft holders, and camshafts.
5. Insert the bolts (A) into the rocker shaft holder, then remove the rocker arm assembly (B).

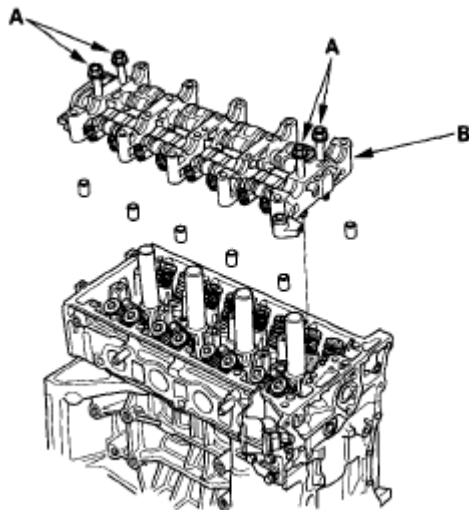


Fig. 234: Identifying Rocker Arm Assembly
Courtesy of AMERICAN HONDA MOTOR CO., INC.

ROCKER ARM AND SHAFT DISASSEMBLY/REASSEMBLY

NOTE:

- Identify each part as it is removed so that each item can be installed.
- Inspect the rocker arm shaft and rocker arms (see ROCKER ARM AND SHAFT INSPECTION).
- If reused, the rocker arms must be installed in the same positions.
- When removing, or installing the rocker arm assembly, do not remove the camshaft holder bolts. The bolts will keep the holders and rocker arms on

the shaft.

- Prior to reassembling, clean all the parts in solvent, dry them, and apply lubricant to any contact points.
- Bundle the rocker arms with rubber bands to keep them together as a set.
- When replacing the VTEC rocker arm assembly, remove the fastening hardware from the new VTEC rocker arm assembly.

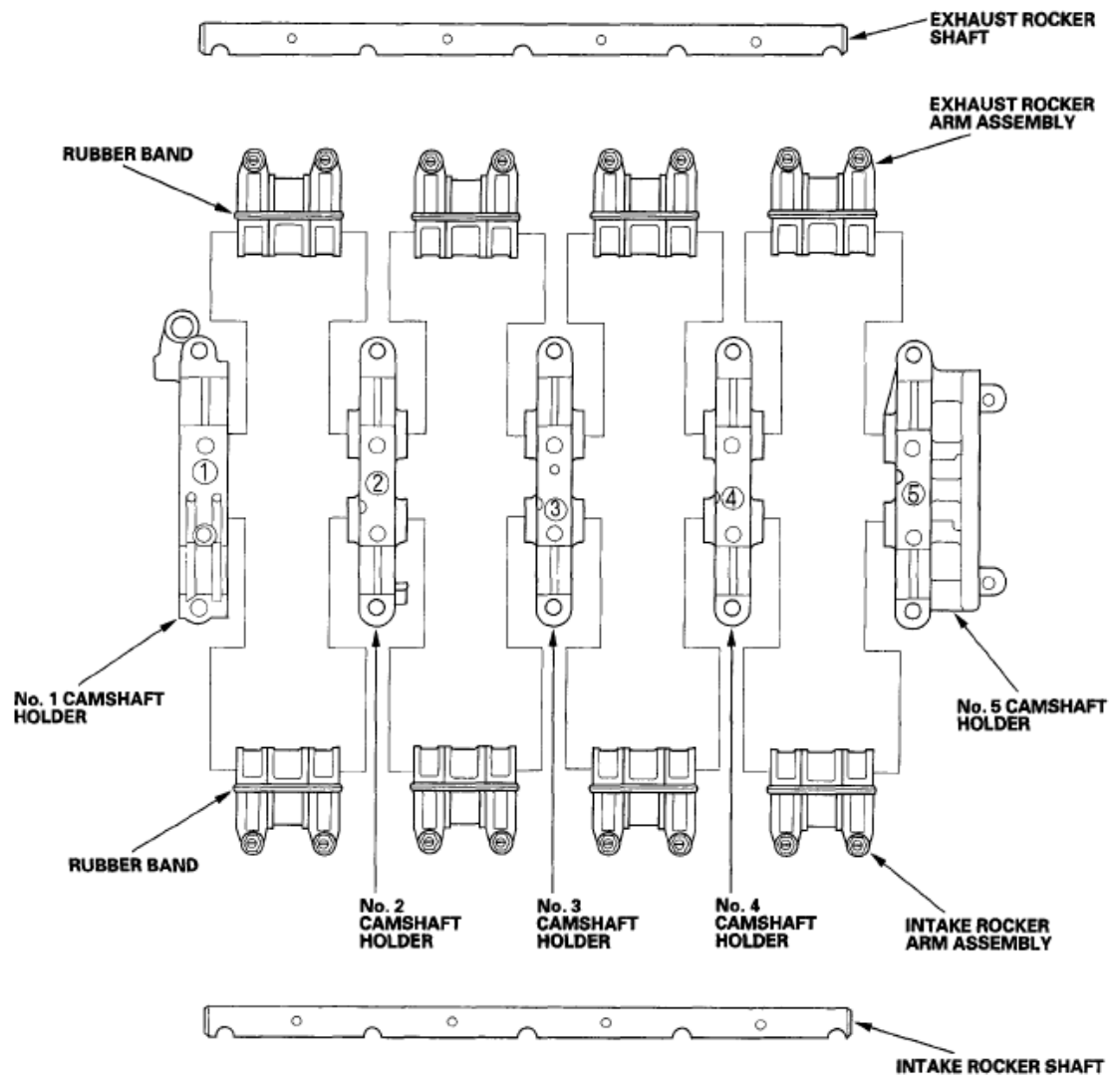


Fig. 235: Exploded View Of Rocker Arm And Shaft
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

ROCKER ARM AND SHAFT INSPECTION

1. Remove the rocker arm assembly (see **ROCKER ARM ASSEMBLY REMOVAL**).
2. Disassemble the rocker arm assembly (see **ROCKER ARM AND SHAFT DISASSEMBLY/REASSEMBLY**).

3. Measure the diameter of the shaft at the first rocker location.

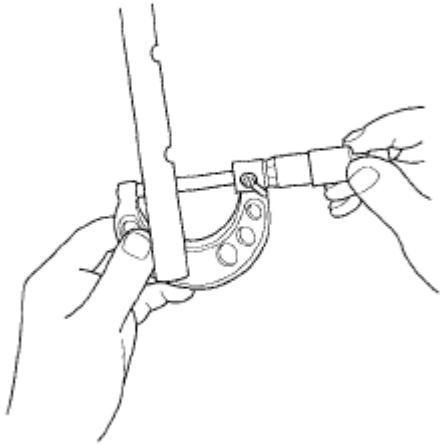


Fig. 236: Measuring Diameter Of Shaft At First Rocker Location
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Zero the gauge (A) to the shaft diameter.

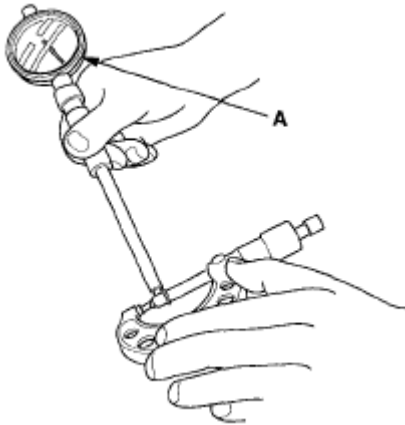


Fig. 237: Checking Shaft Diameter
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Measure the inside diameter of the rocker arm, and check it for an out-of-round condition.

Rocker Arm-to-Shaft Clearance

Standard (New): 0.025-0.052 mm (0.0010-0.0020 in.)

Service Limit: 0.08 mm (0.003 in.)

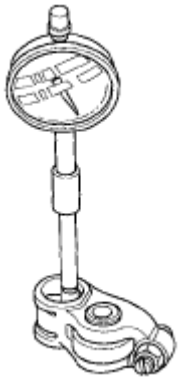


Fig. 238: Measuring Inside Diameter Of Rocker Arm
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Repeat for all rocker arms and both shafts. If the clearance is beyond the service limit, replace the rocker shaft and all out of service limit rocker arms. If any VTEC rocker arm needs replacement, replace the rocker arms (primary, mid, and secondary), as a set.
7. Inspect the rocker arm pistons (A). Push each piston manually.

If it does not move smoothly, replace the rocker arm set.

NOTE: Apply oil to the pistons when reassembling.

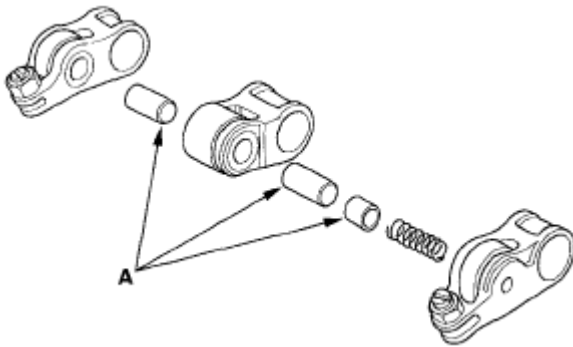


Fig. 239: Identifying Rocker Arm Pistons
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Install the rocker arm assembly (see **ROCKER ARM ASSEMBLY INSTALLATION**).

CAMSHAFT INSPECTION

NOTE: Do not rotate the camshaft during inspection.

1. Remove the rocker arm assembly (see **ROCKER ARM ASSEMBLY REMOVAL**).
2. Put the rocker shaft holders, camshaft, and camshaft holders on the cylinder head, then tighten the bolts in sequence to the specified torque.

NOTE: If the engine does not have bolt (21), skip it and continue the torque sequence.

Specified Torque

8x1.25 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)

6 x 1.0 mm Bolts: (21), (22), (23)

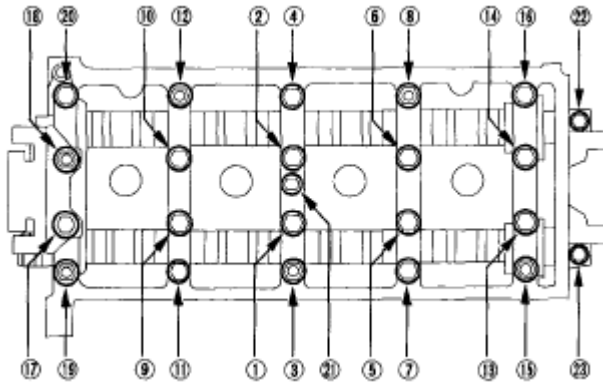


Fig. 240: Identifying Cylinder Head Bolts Tightening Sequence

Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Seat the camshaft by pushing it away from the camshaft pulley end of the cylinder head.
4. Zero the dial indicator against the end of the camshaft, then push the camshaft back and forth and read the end play. If the end play is beyond the service limit, replace the cylinder head and recheck. If it is still beyond the service limit, replace the camshaft.

Camshaft End Play

Standard (New): 0.05-0.20 mm (0.002-0.008 in.)

Service Limit: 0.4 mm (0.02 in.)

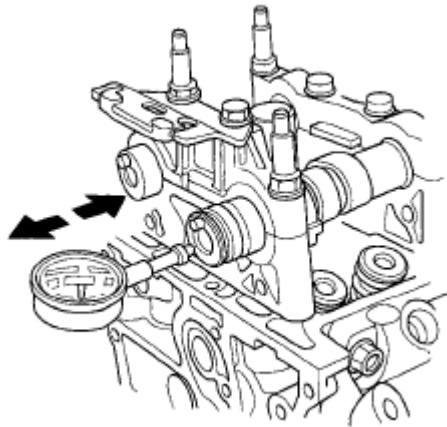


Fig. 241: Measuring Camshaft End Play

Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Unscrew the camshaft holder bolts two turns at a time, in a crisscross pattern. Then remove the camshaft holders from the cylinder head.
6. Lift the camshafts out of the cylinder head, wipe them clean, then inspect the lift ramps. Replace the camshaft if any lobes are pitted, scored, or excessively worn.
7. Clean the camshaft journal surfaces in the cylinder head, then set the camshafts back in place. Place a plastigage strip across each journal.
8. Install the camshaft holders, then tighten the bolts to the specified torque as shown in step 2.
9. Remove the camshaft holders. Measure the widest portion of plastigage on each journal.
 - If the camshaft-to-holder clearance is within limits, go to step 11.
 - If the camshaft-to-holder clearance is beyond the service limit and the camshaft has been replaced, replace the cylinder head.
 - If the camshaft-to-holder clearance is beyond the service limit and the camshaft has not been replaced, go to step 10.

Camshaft-to-Holder Oil Clearance

Standard (New):

No. 1 Journal: 0.030-0.069 mm

(0.001-0.003 in.)

No. 2, 3, 4, 5 Journals: 0.060-0.099 mm

(0.002-0.004 in.)

Service Limit: 0.15 mm (0.006 in.)

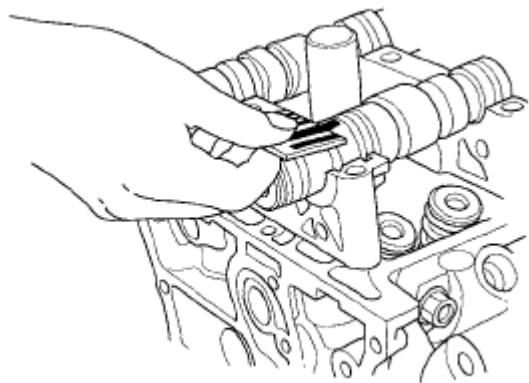


Fig. 242: Checking Camshaft-To-Holder Oil Clearance
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Check the total runout with the camshaft supported on V-blocks.
 - If the total runout of the camshaft is within the service limit, replace the cylinder head.
 - If the total runout is beyond the service limit, replace the camshaft and recheck the camshaft-to-holder oil clearance. If the oil clearance is still beyond the service limit, replace the cylinder head.

Camshaft Total Runout

Standard (New): 0.03 mm (0.001 in.) max.

Service Limit: 0.04 mm (0.002 in.)

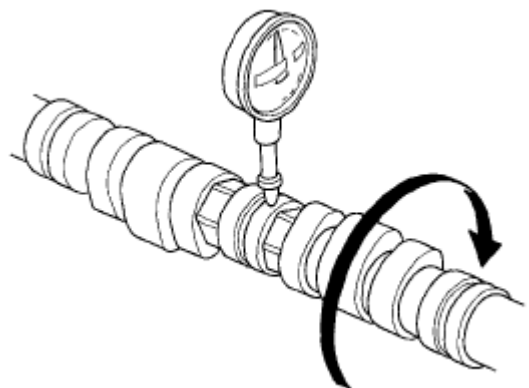


Fig. 243: Measuring Camshaft Total Runout
Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Measure cam lobe height.

CAM LOBE HEIGHT STANDARD

	INTAKE	EXHAUST
PRI	32.791 mm (1.2910 in.)	32.772 mm (1.2902 in.)
MID	35.534 mm (1.3990 in.)	34.768 mm (1.3688 in.)

SEC | 32.678 mm (1.2865 in.) | 32.661 mm (1.2859 in.)

PRI: Primary

C/C: Cam Chain

MID: Mid

SEC: Secondary

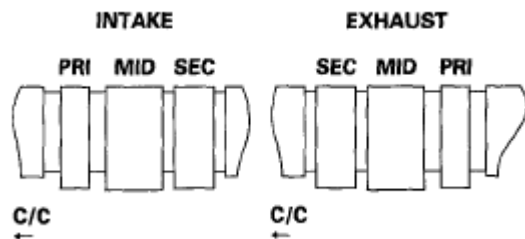


Fig. 244: Measuring Cam Lobe Height
Courtesy of AMERICAN HONDA MOTOR CO., INC.

VALVE, SPRING, AND VALVE SEAL REMOVAL

Special Tools Required

Valve spring compressor attachment 07757-PJ1010A

Identify the valves and valve springs as they are removed so that each item can be reinstalled in its original position.

1. Remove the cylinder head (see **CYLINDER HEAD REMOVAL**).
2. Using an appropriate-sized socket (A) and plastic mallet (B), lightly tap the valve retainer to loosen the valve cotteners.

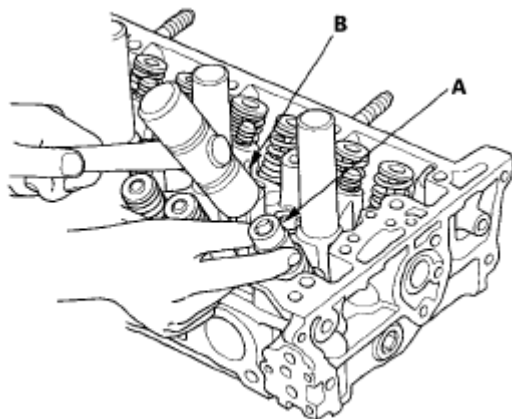


Fig. 245: Tapping Valve Retainer

Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Install the valve spring compressor attachment and valve spring compressor. Compress the spring, and remove the valve cotteners.

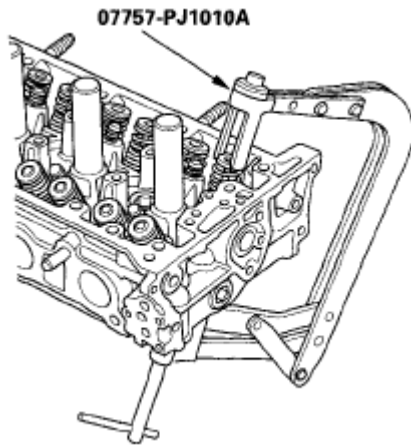


Fig. 246: Compressing Spring

Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Remove the valve spring compressor attachment and valve spring compressor, then remove the valve retainer and valve spring.
5. Install the valve guide seal remover.

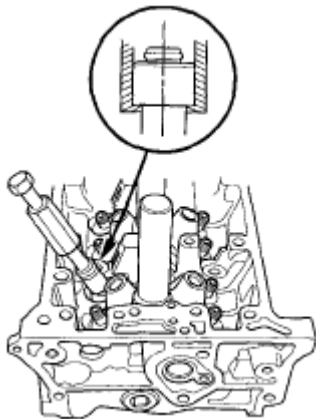
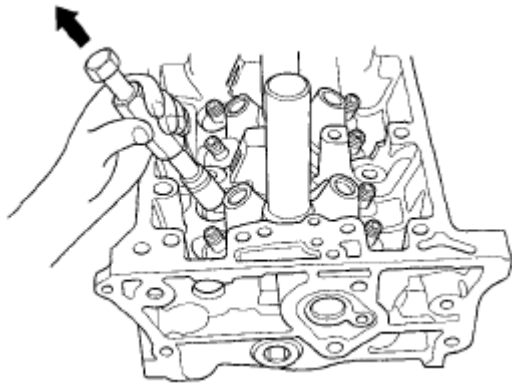


Fig. 247: Identifying Valve Guide Seal Remover

Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Remove the valve seal.

**Fig. 248: Identifying Valve Seal**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

VALVE INSPECTION

1. Remove the valves (see VALVE, SPRING, AND VALVE SEAL REMOVAL).
2. Measure the valve in these areas.

Intake Valve Dimensions

A Standard (New): 34.85-35.15 mm (1.372-1.384 in.)

B Standard (New): 108.5-109.1 mm (4.272-4.295 in.)

C Standard (New): 5.475-5.485 mm (0.2156-0.2159 in.)

C Service Limit: 5.445 mm (0.214 in.)

Exhaust Valve Dimensions

A Standard (New): 29.90-30.10 mm (1.177-1.185 in.)

B Standard (New): 108.4-109.0 mm (4.268-4.291 in.)

C Standard (New): 5.450-5.460 mm (0.2146-0.2150 in.)

C Service Limit: 5.42 mm (0.213 in.)

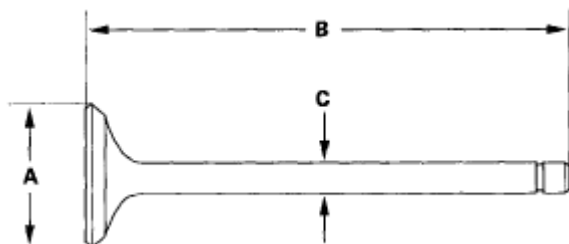


Fig. 249: Identifying Exhaust Valve Dimensions
Courtesy of AMERICAN HONDA MOTOR CO., INC.

VALVE STEM-TO-GUIDE CLEARANCE INSPECTION

1. Remove the valves (see **VALVE, SPRING, AND VALVE SEAL REMOVAL**).
2. Subtract the O.D. of the valve stem, measured with a micrometer, from the I.D. of the valve guide, measured with an inside micrometer or ball gauge. Take the measurements in three places along the valve stem and three places inside the valve guide. The difference between the largest guide measurement and the smallest stem measurement should not exceed the service limit.

Intake Valve Stem-to-Guide Clearance

Standard (New): 0.030-0.055 mm (0.0012-0.0022 in.)

Service Limit: 0.08 mm (0.003 in.)

Exhaust Valve Stem-to-Guide Clearance

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

Service Limit: 0.11 mm (0.004 in.)



Fig. 250: Checking Intake Valve Stem-To-Guide Clearance
Courtesy of AMERICAN HONDA MOTOR CO., INC.

VALVE GUIDE REPLACEMENT

Special Tools Required

- Valve guide driver, 5.5 mm 07742-0010100
- Valve guide reamer, 5.5 mm 07HAH-PJ7A100

1. Inspect valve stem-to-guide clearance (see **VALVE INSPECTION**).
2. As illustrated, use a commercially available air-impact valve guide driver (A) modified to fit the diameter of the valve guides. In most cases, the same procedure can be done using the special tool and a conventional hammer.

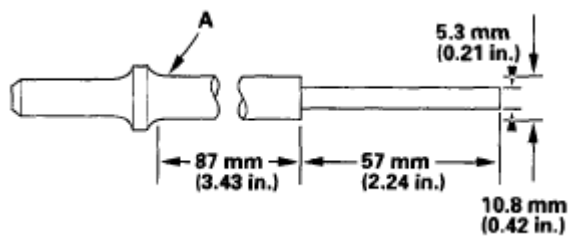


Fig. 251: Identifying Air-Impact Valve Guide Driver
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Select the proper replacement guides, and chill them in the freezer section of a refrigerator for about an hour.
4. Use a hot plate or oven to evenly heat the cylinder head to 300°F (150°C). Monitor the temperature with a cooking thermometer. Do not get the head hotter than 300°F (150°C); excessive heat may loosen the valve seats.

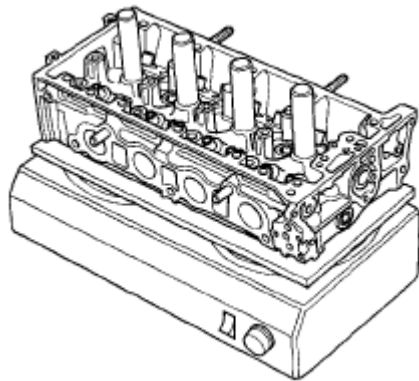
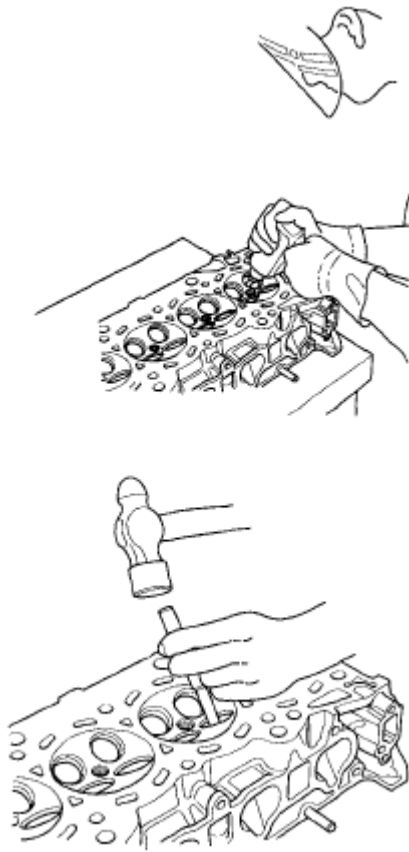


Fig. 252: Heating Cylinder Head
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Working from the camshaft side, use the driver and an air hammer to drive the guide about 2 mm (0.1 in.) towards the combustion chamber. This will knock off some of the carbon and make removal easier. Hold the air hammer directly in line with the valve guide to prevent damaging the driver.
6. Turn the head over, and drive the guide out toward the camshaft side of the head.

**Fig. 253: Tapping Valve Guide**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. If a valve guide won't move, drill it out with a 8 mm (5/16 in.) bit, then try again. Drill guides only in extreme cases; you could damage the cylinder head if the guide breaks.
8. Take out the new guide(s) from the freezer, one at a time, as you need them.
9. Apply a thin coat of clean engine oil to the outside of the new valve guide. Install the guide from the camshaft side of the head; use the special tool to drive the guide in to the specified installed height (A) of the guide (B). If you have all 16 guides to do, you may have to reheat the head.

Valve Guide Installed Height

Intake: 15.2-16.2 mm (0.598-0.638 in.)

Exhaust: 15.5-16.5 mm (0.610-0.650 in.)

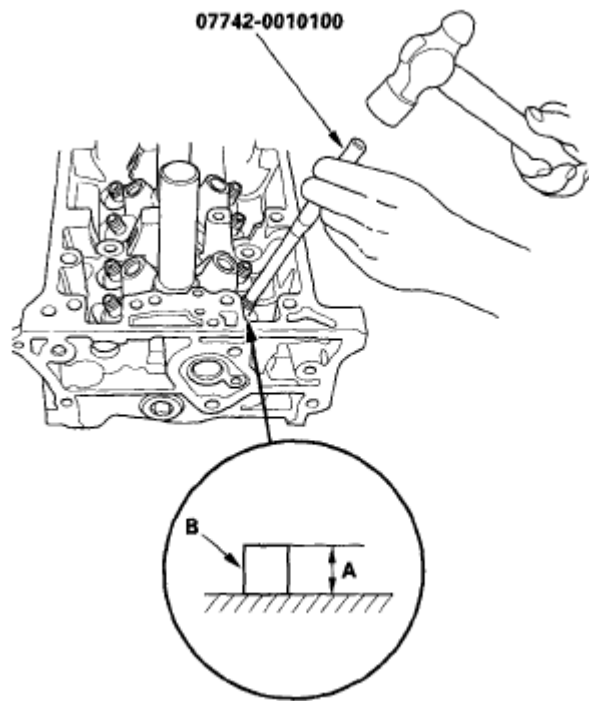


Fig. 254: Identifying Valve Guide Installed Height
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Coat both reamer and the valve guide with cutting oil.
11. Rotate the reamer clockwise the full length of the valve guide bore.

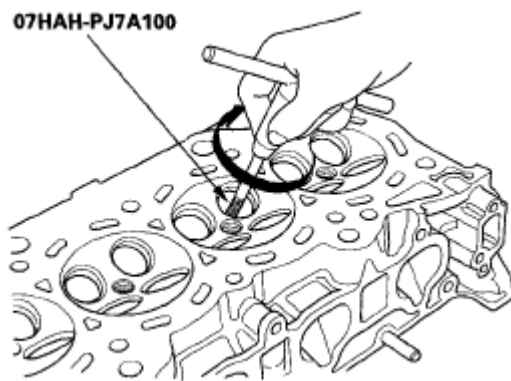


Fig. 255: Rotating Reamer To Full Length Of Valve Guide Bore
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Continue to rotate the reamer clockwise while removing it from the bore.
13. Thoroughly wash the guide in detergent and water to remove any cutting residue.
14. Check the clearances with a valve (see **VALVE INSPECTION**). Verify that a valve slides into the intake and exhaust valve guides without getting stuck.
15. Inspect the valve seating. if necessary, renew the valve seat using a valve seat cutter (see **Valve Seat**

Reconditioning).

VALVE SEAT RECONDITIONING

1. Inspect the valve stem-to-guide clearance (see **VALVE INSPECTION**). If the valve guides are worn, replace them (see **VALVE GUIDE REPLACEMENT**) before cutting the valve seats.
2. Renew the valve seats in the cylinder head using a valve seat cutter.



Fig. 256: Cutting Valve Seats Using Valve Seat Cutter
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Carefully cut a 45 ° seat, removing only enough material to ensure a smooth and concentric seat.
4. Bevel the upper and lower edges at the angles shown in the illustration. Check the width of the seat and adjust accordingly.

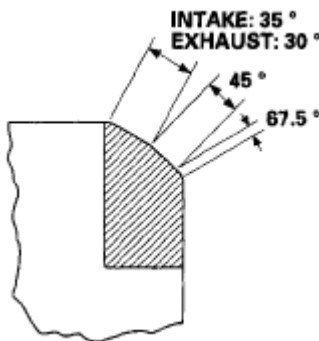


Fig. 257: Identifying Bevel Upper And Lower Edges Angles
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Make one more very light pass with the 45 ° cutter to remove any possible burrs caused by the other cutters.

Valve Seat Width

Standard (New): 1.25-1.55 mm (0.049-0.061 in.)

Service Limit: 2.00 mm (0.079 in.)

6. After resurfacing the seat, inspect for even valve seating: Apply Prussian Blue compound (A) to the valve face. Insert the valve in its original location in the head, then lift it and snap it closed against the seat several times.

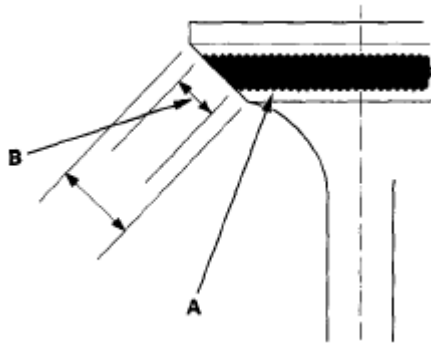


Fig. 258: Identifying Valve Seat Width

Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. The actual valve seating surface (B), as shown by the blue compound, should be centered on the seat.
 - If it is too high (closer to the valve stem), you must make a second cut with the 67.5° cutter to move it down, then one more cut with the 45° cutter to restore seat width.
 - If it is too low (close to the valve edge), you must make a second cut with the 35° cutter (intake side) or the 30° cutter (exhaust side) to move it up, then make one more cut with the 45° cutter to restore seat width.

NOTE: The final cut should always be made with the 45° cutter.

8. Insert the intake and exhaust valves in the head, and measure valve stem installed height (A).

Intake Valve Stem Installed Height

Standard (New): 44.0-44.5 mm (1.73-1.75 in.)

Service Limit: 44.7 mm (1.76 in.)

Exhaust Valve Stem Installed Height Standard (New): 44.1-44.6 mm (1.74-1.76 in.)

Service Limit: 44.8 mm (1.76 in.)

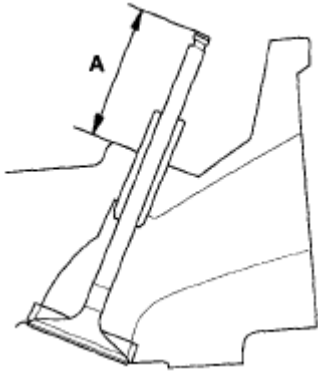


Fig. 259: Identifying Exhaust Valve Stem Installed Height
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. If valve stem installed height is beyond the service limit, replace the valve and recheck. If it is still beyond the service limit, replace the cylinder head; the valve seat in the head is too deep.

VALVE, SPRING, AND VALVE SEAL INSTALLATION

Special Tools Required

- Stem seal driver 07PAD-0010000
 - Valve spring compressor attachment 07757-PJ1010A
1. Coat the valve stems with engine oil. Install the valves in the valve guides.
 2. Check that the valves move up and down smoothly.
 3. Install the spring seats on the cylinder head.
 4. Install the new valve seals (A) using the stem seal driver (B).

NOTE: The exhaust valve seal (C) has a black spring (D), and the intake valve seal (E) has a white spring (F). They are not interchangeable.

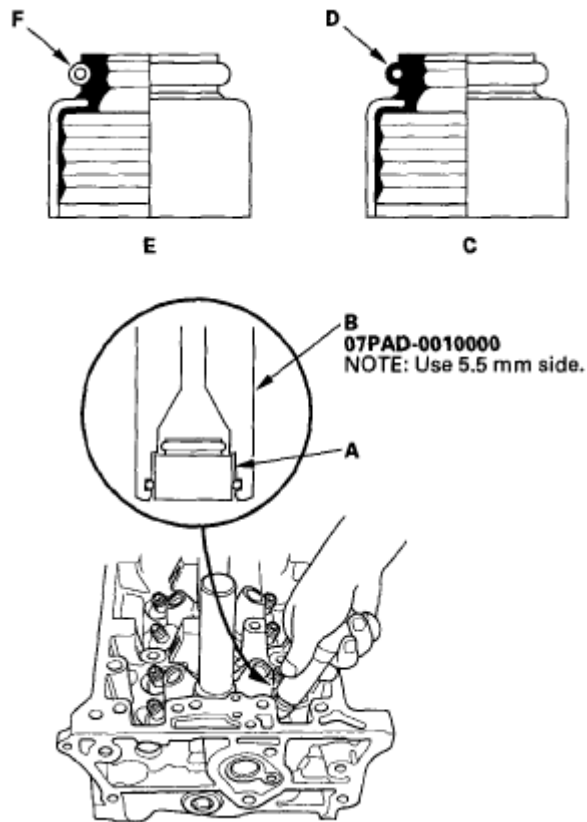


Fig. 260: Identifying Valve Seals

Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Install the valve spring and spring retainer. Place the end of the valve spring with closely wound coils toward the cylinder head.
6. Install the valve spring compressor attachment and valve spring compressor. Compress the spring, and install the valve cotters.

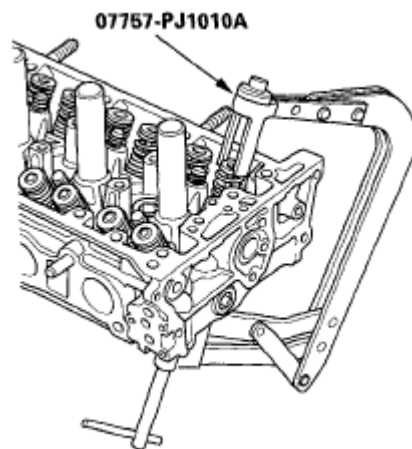


Fig. 261: Compressing Spring

Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Remove the valve spring compressor and valve spring compressor attachment.
8. Lightly tap the end of each valve stem two or three times with a plastic mallet (A) to ensure proper seating of the valve and valve cotters. Tap the valve stem only along its axis so you do not bend the stem.

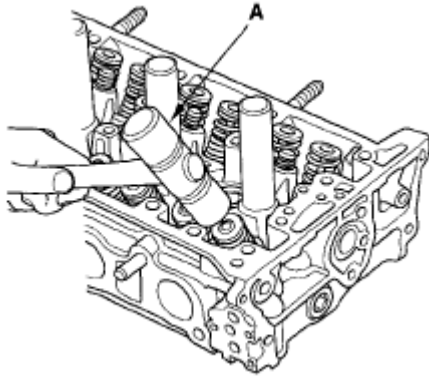


Fig. 262: Tapping Valve Stem

Courtesy of AMERICAN HONDA MOTOR CO., INC.

ROCKER ARM ASSEMBLY INSTALLATION

1. Reassemble the rocker arm assembly (see **ROCKER ARM AND SHAFT DISASSEMBLY/REASSEMBLY**).
2. Clean and dry the No. 5 rocker shaft holder mating surface.
3. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0002, 08718-0003, or 08718-0009, evenly to the cylinder head mating surface of the No. 5 rocker shaft holder.

NOTE:

- If you apply liquid gasket, P/N 08718-0012, the component must be installed within 4 minutes.
- If too much time has passed after applying the liquid gasket, remove the old liquid gasket and residual, then reapply new liquid gasket.

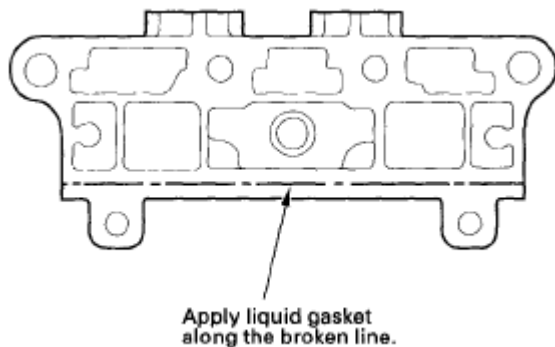


Fig. 263: Identifying Liquid Gasket Applying Area

Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Insert the bolts (A) into the rocker shaft holder, then install the rocker arm assembly (B) on the cylinder head.

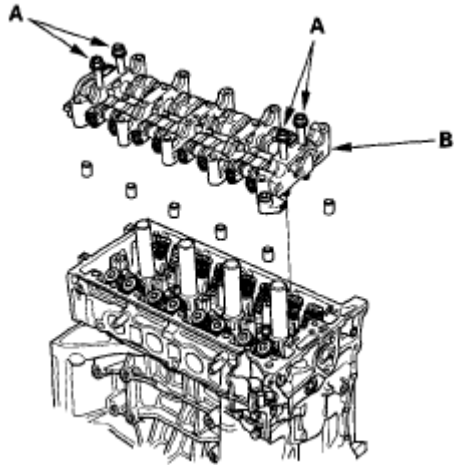


Fig. 264: Identifying Rocker Arm Assembly

Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Remove the bolts from the rocker shaft holder.
6. Make sure the punch marks on the variable valve timing control (VTC) actuator and exhaust camshaft sprocket are facing up, then set the camshafts (A) in the holder.

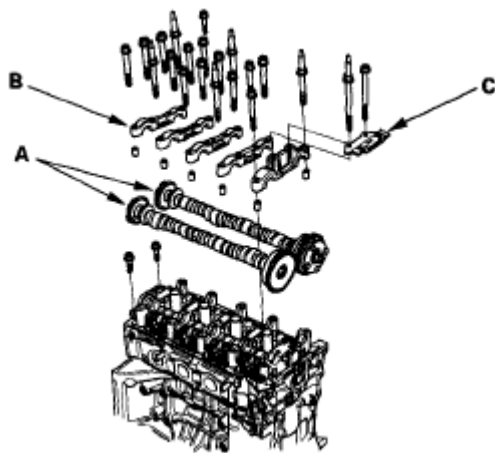


Fig. 265: Identifying Camshafts And Camshaft Holders

Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Set the camshaft holders (B) and cam chain guide B (C) in place.
8. Tighten the bolts in sequence to the specified torque.

NOTE: If the engine does not have bolt (21), skip it and continue the torque sequence.

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)

6 x 1.0 mm Bolts: (21), (22), (23)

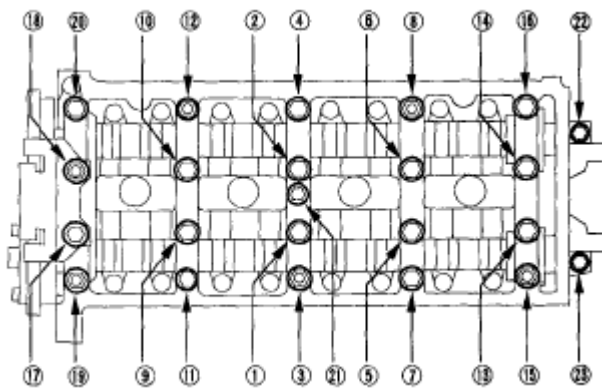


Fig. 266: Identifying Camshaft Holder Bolts Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Install the cam chain (see CAM CHAIN INSTALLATION), and adjust the valve clearance (see VALVE CLEARANCE ADJUSTMENT).

CYLINDER HEAD INSTALLATION

1. Install the new coolant separator in the engine block when replacing the engine block.

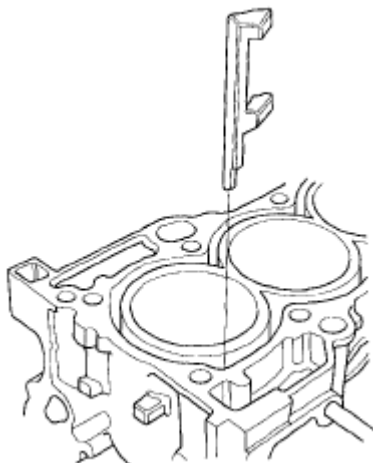
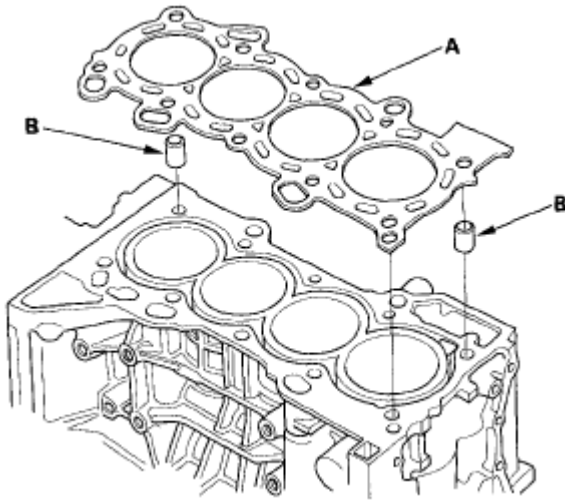


Fig. 267: Identifying Coolant Separator

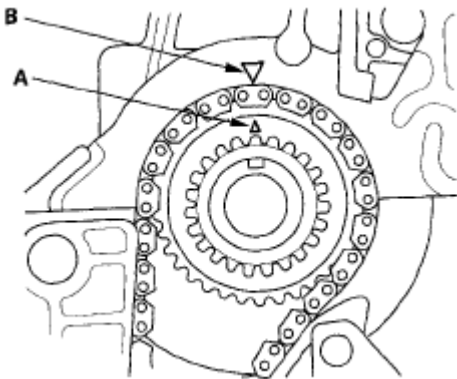
Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Clean the cylinder head and engine block surface.
3. Install the new cylinder head gasket (A) and dowel pins (B) on the engine block. Always use a new cylinder head gasket.

**Fig. 268: Identifying Cylinder Head Gasket And Dowel Pins**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Set the crankshaft to top dead center (TDC). Align the TDC mark (A) on the crankshaft sprocket with the pointer (B) on the engine block.

**Fig. 269: Aligning TDC Mark On Crankshaft Sprocket With Pointer On Engine Block**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Set the camshaft pulley to TDC (see step 2 under **CAM CHAIN INSTALLATION**).
6. Install the cylinder head on the engine block.
7. Measure the diameter of each cylinder head bolt at point A and point B.

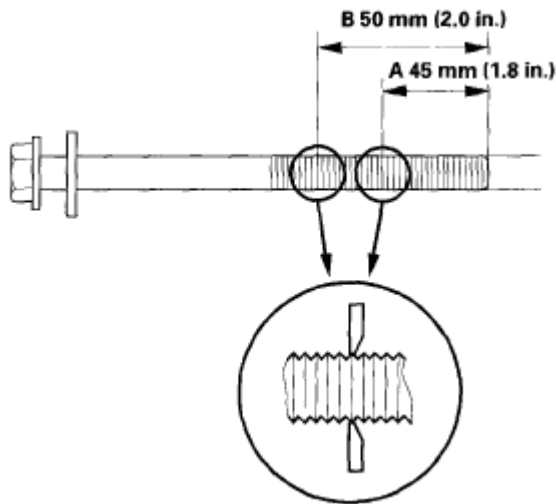


Fig. 270: Measuring Diameter Of Cylinder Head Bolt
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. If either diameter is less than 10.6 mm (0.42 in.), replace the cylinder head bolt.
9. Apply engine oil to the threads and under the bolt heads of all cylinder head bolts.
10. Tighten the cylinder head bolts in sequence to 39 N.m (4.0 kgf.m, 29 lbf.ft). Use a beam-type torque wrench. When using a preset-type torque wrench, be sure to tighten slowly and do not overtighten. If a bolt makes any noise while you are torquing it, loosen the bolt and retighten it from the first step.

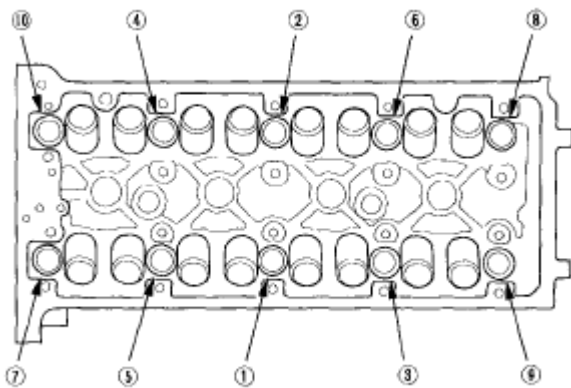


Fig. 271: Identifying Cylinder Head Bolts Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. After torquing, tighten all cylinder head bolts in two steps (90° per step). If you are using a new cylinder head bolt, tighten the bolt an extra 90°.

NOTE: Remove the cylinder head 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.

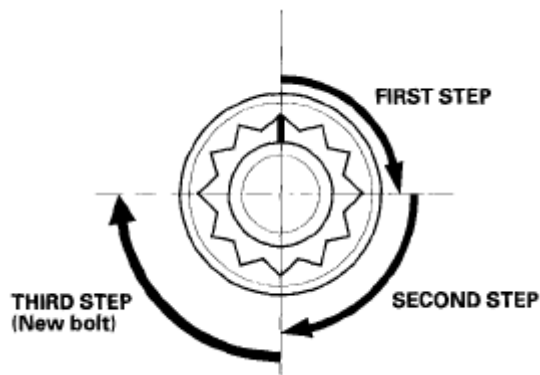


Fig. 272: Identifying Cylinder Head Bolt Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Install the rocker arm assembly (see **ROCKER ARM ASSEMBLY INSTALLATION**).
13. Install the cam chain (see **CAM CHAIN INSTALLATION**).
14. Connect the engine wire harness connectors, and install the wire harness clamps to the cylinder head.
 - Four fuel injector connectors
 - Engine coolant temperature (ECT) sensor 1 connector
 - Camshaft position (CMP) sensor A (Intake) connector
 - Camshaft position (CMP) sensor B (Exhaust) connector
 - Rocker arm oil control solenoid connector
 - Rocker arm oil pressure switch connector
 - EVAP canister purge valve connector
15. Install the bolt securing the connecting pipe.

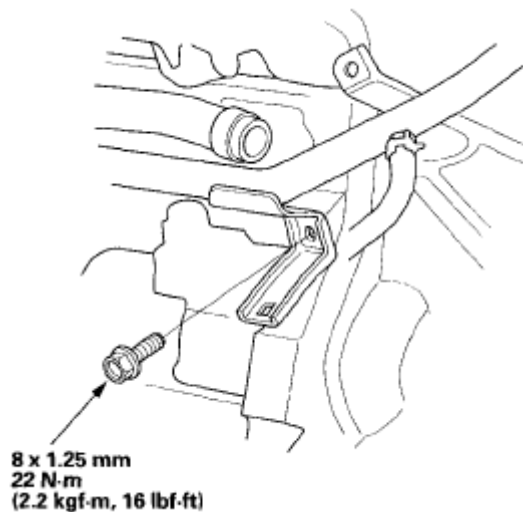


Fig. 273: Identifying Connecting Pipe Bolt (With Torque Specifications)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

16. Connect the upper radiator hose (A) and heater hoses (B).

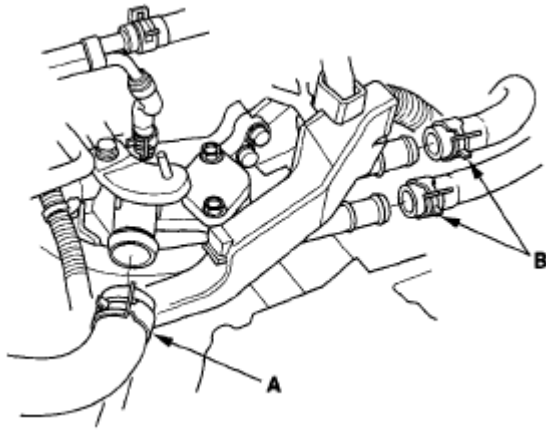


Fig. 274: Identifying Upper Radiator And Heater Hoses
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

17. Install the harness holder bracket (A), then install the harness holder (B).

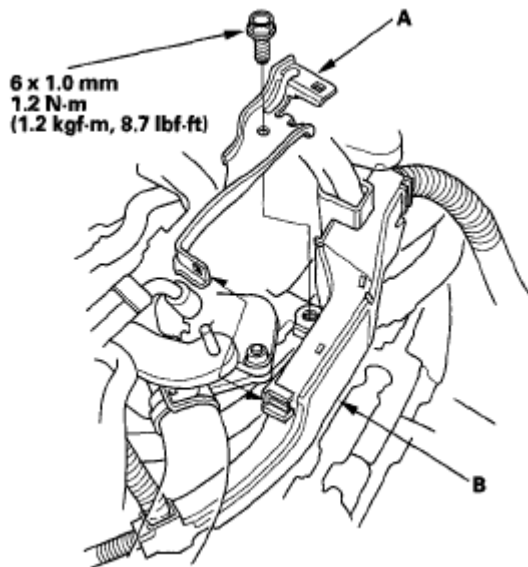


Fig. 275: Identifying Harness Holder Bracket (With Torque Specifications)
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

18. Connect the fuel feed hose (see **FUEL LINE/QUICK-CONNECT FITTING INSTALLATION**), then install the quick-connect fitting cover (A).

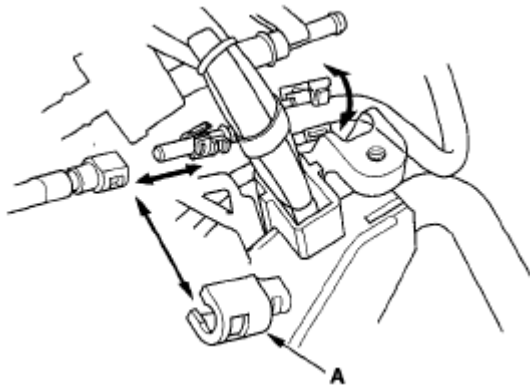


Fig. 276: Identifying Quick-Connect Fitting Cover
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

19. Connect the evaporative emission (EVAP) canister hose (A) and brake booster vacuum hose (B).

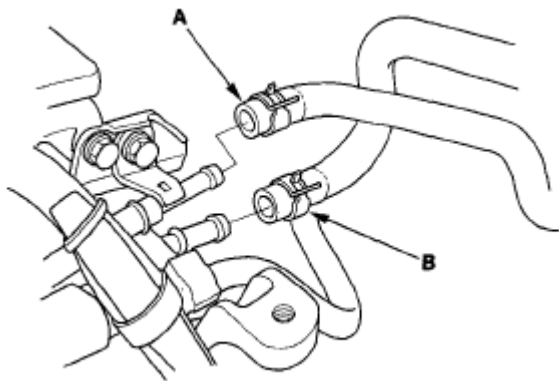


Fig. 277: Identifying Evaporative Emission (EVAP) Canister Hose
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

20. Install the exhaust manifold (see **EXHAUST MANIFOLD REMOVAL AND INSTALLATION**).
21. Install the intake manifold (see **INSTALLATION**).
22. Install the drive belt (see **DRIVE BELT INSPECTION**).
23. Install the air cleaner assembly (see **AIR CLEANER REMOVAL/INSTALLATION**).
24. After installation, check that all tubes, hoses and connectors are installed correctly.
25. Inspect for fuel leaks. Turn the ignition switch ON (II) (do not operate the starter) so that the fuel pump runs for about 2 seconds and pressurizes the fuel line. Repeat this operation two or three times, then check for fuel leakage at any point in the fuel line.
26. Refill the radiator with engine coolant, and bleed the air from the cooling system with the heater valve open (see step 6 on **COOLANT CHECK**).
27. Check for fluid leaks.
28. Do the engine control module (ECM) idle learn procedure (see **ECM IDLE LEARN PROCEDURE**).
29. Do the crankshaft position (CKP) pattern clear/CKP pattern learn procedure (see **HDS CLEAR COMMAND**).

30. Inspect the idle speed (see **IDLE SPEED INSPECTION**).
31. Inspect the ignition timing (see **IGNITION TIMING INSPECTION**).

SEALING BOLT INSTALLATION

NOTE: When installing the sealing bolt (A), always use a new washer (B).

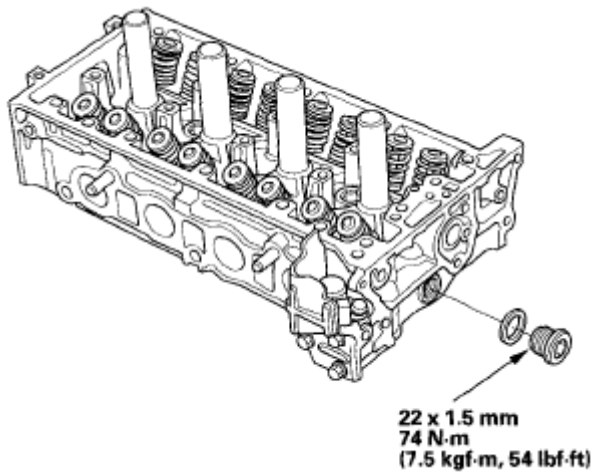


Fig. 278: Identifying Sealing Bolt (With Torque Specifications)
Courtesy of AMERICAN HONDA MOTOR CO., INC.