

#99-06-01-003: Engine Bearing Knock Noise (Re-support Crankshaft, Select-fit Rod Bearings) - (Mar 29, 1999)

Subject: Engine Bearing Knock Noise, (Re-support Crankshaft, Select-fit Undersize Connecting Rod Bearings)



Models: 1999 Cadillac Escalade
1996-99 Chevrolet and GMC C/K, G, P Models
with 5.0L or 5.7L Engine (VINs M, R - RPOs L30, L31)

Important

GM Canada Dealers require prior DSM authorization to apply this bulletin.

Condition

Some customers may comment about an engine "knocking" noise.

Cause

A condition may exist in some engines where, the crankshaft is NOT being evenly supported by all five crankshaft bearing inserts. In these engines, the number 1, 2, 3, and 4 crankshaft bearing inserts are supporting the crankshaft, and the number 5 crankshaft journal (rear) has excessive clearance relative to the number 5 crankshaft (main) bearing cap insert. In this condition, the crankshaft flexes under load, and pounds on the lower number 5 crankshaft (main) bearing insert creating the knocking sound. The engines were originally built with 0.0006 in. undersize crankshaft (main) bearing inserts in the number 2, 3, and 4 crankshaft (main) bearing locations and 0.001 in. undersize insert in the number 5 crankshaft (main) bearing location. The service procedure listed below addresses the above condition by lowering the crankshaft at the number 2, 3, and 4 crankshaft (main) bearing positions (increased crankshaft (main) bearing size of the lower crankshaft (main) bearing inserts) and raising the number 5 lower crankshaft (main) bearing insert (undersized insert) in order to properly contact the number 5 crankshaft journal surface.

These engines may also exhibit a connecting rod knocking sound. In these engines, the connecting rod knocking sound is caused by excessive connecting rod bearing clearance.

A customer concern vehicle may exhibit one or both of the above stated conditions.

Correction

Follow strategy-based diagnostics for engine noise listed in the front of Section 6 of the Service Manual.

Some additional key points:

Rod Bearing Knock -- Occurs on initial engine start-up, and can also be heard as high as 1,500-1,800 RPM. Rod bearing knock typically diminishes or completely goes away when the engine reaches normal operating temperature.

Crankshaft Bearing Knock -- Crankshaft (main) bearing knock sounds deeper in the engine and also sounds more muffled. There are two different types of crankshaft bearing knock.

- Short duration cold knock typically occurs for 1-5 seconds on engine cold start-up only, and almost always occurs on vehicles equipped with an engine oil cooler.
- Hot knock occurs less frequently, typically occurring in very hot ambient temperatures, and can be heard up to 2,000 RPM.

Technicians can increase the likelihood of reproducing bearing induced knock sounds by slightly depressing the accelerator pedal while starting the engine.

Crankshaft Bearing Service Procedure

Important: The repair procedure must be performed using all steps (addressing both the crankshaft bearings and connecting rod bearings) in order to ensure the effectiveness of the repair procedure.

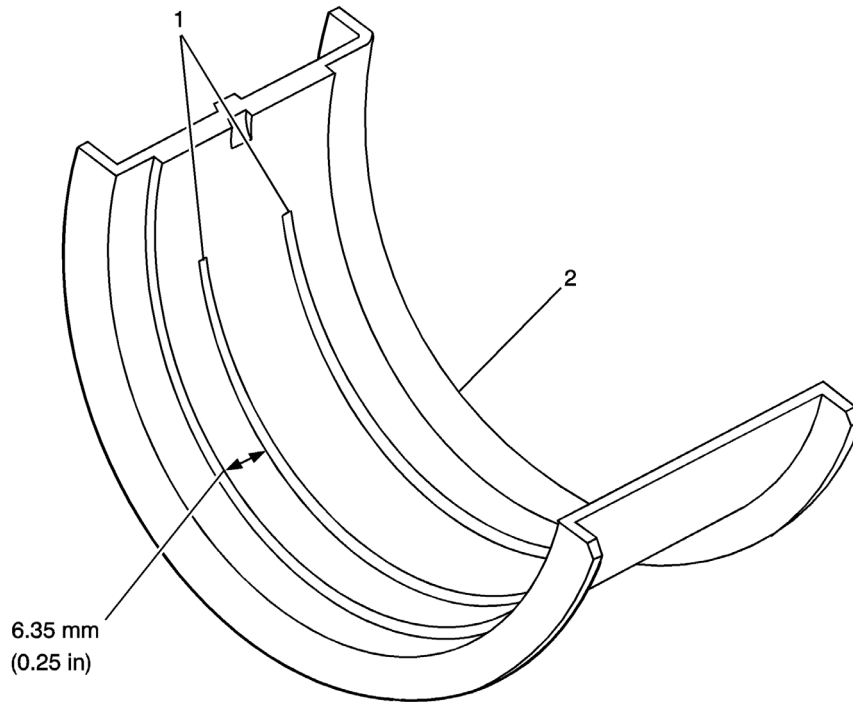
1. Remove the oil pump. Refer to Oil Pump Replacement in Engine Mechanical section of the Vehicle Service Manual.

Important: Do not loosen or attempt to service the number 1 (front) crankshaft (main) bearing cap or the number 1 crankshaft (main) bearings.

2. Mark the number 2, 3, 4, and 5 crankshaft (main) bearing caps with position and direction. The crankshaft (main) bearing caps MUST be reinstalled in the original position and direction.
3. Support the crankshaft using a screw type jack and a block of wood.
 - 3.1. Position the screw type jack and the block of wood at the center of the crankshaft in order to properly support the crankshaft.
 - 3.2. Turn the screw of the screw type jack until the crankshaft is firmly seated against the crankshaft (main) upper bearings.
4. Remove the number 5 crankshaft (main) bearing cap bolts, and the number 5 crankshaft (main) bearing cap with the crankshaft (main) lower bearing.
5. Using green plastigauge (designed for measuring 0.001-0.003 in. of clearance), lay two pieces, 2 inches in length, laterally along the number 5 lower crankshaft (main) bearing, 1/4 inch inboard from the insert outer edges. Re-install the bearing cap.

Tighten

1. Tighten the bearing cap bolts on the first pass to 20 N·m (15 lb ft).
2. Tighten the bearing cap bolts on the final pass to 73 degrees using the J 36660-A.



6. Remove the number 5 cap and measure the plastigauge using the inch scale. All 1996-99 5.0L (L30) and 5.7L (L31) engines were built with 0.001 in. undersized number 5 crankshaft bearing inserts.
7. If the measurement is:
 - Less than 0.0020 in. -- Go To Step 8
 - 0.0020 in. or greater but less than 0.0025 in. -- Go To Step 9
 - 0.0025 in. or greater but less than 0.0030 in. -- Go To Step 10
 - 0.0030 in. or greater -- Go To Step 11
8. Less than 0.0020 in.
 - 8.1. Retain production 0.001 in. undersize upper and lower bearing inserts at the number 5 crankshaft bearing position.
 - 8.2. Clean any and all plastigauge material and residue from the bearing inserts.
 - 8.3. Liberally coat bearing inserts with clean engine oil and reinstall crankshaft bearing caps and bolts.
 - 8.4. Reinstall crankshaft bearing cap, bolts and studs to the engine block, making sure that the cap, bolts, and studs retain their original position and orientation.

Tighten

1. Tighten the crankshaft bearing cap bolts and studs on the first pass to 20 N·m (15 lb ft).
2. Tighten the crankshaft bearing cap bolts on the final pass to 73 degrees using the J 36660-A.
- 8.5. Remove Screwjack used for crankshaft support.
- 8.6. Go to Step 12 Crankshaft (main) Bearing Service for Locations Number 2, 3, and 4.
9. 0.0020 in. or greater but less than 0.0025 in.
 - 9.1. Retain upper bearing shell (number 5 main bearing - production 0.001 in. undersized).
 - 9.2. Remove number 5 lower main bearing shell from the cap and discard.
 - 9.3. Install 0.002 in. undersize bearing insert (P/N 12329792) in the number 5 cap, LOWER HALF ONLY.

- 9.4. Apply a liberal coating of clean engine oil to the bearing surface.
- 9.5. Reinstall crankshaft bearing cap, bolts and studs to the engine block, making sure that the caps, bolts, and studs retain their original position and orientation.

Tighten

1. Tighten the crankshaft bearing cap bolts and studs on the first pass to 20 N·m (15 lb ft).
 2. Tighten the crankshaft bearing cap bolts on the final pass to 73 degrees using the J 36660-A.
- 9.6. Remove the screw jack used for crankshaft support.
- 9.7. Go to Step 12 Crankshaft (main) Bearing Service for Locations Number 2, 3, and 4.
10. 0.0025 in. or greater but less than 0.0030 in.
- 10.1. Lower jack stand from crankshaft, allowing the crankshaft to be supported by the numbers 1, 2, 3, and 4 crankshaft main bearings.
 - 10.2. Insert J 8080 into the crankshaft number 5 main bearing oil hole and rotate the crankshaft to turn the upper bearing insert out of the engine block. Discard the removed upper bearing insert.
 - 10.3. Insert J 8080 into the crankshaft number 5 main bearing oil hole.
 - 10.4. Procure the crankshaft number 5 main bearing 0.0020 in. undersize bearing upper insert (from kit P/N 12329792), apply clean engine oil to the bearing insert, and insert the plain end (without the bearing tang) of the bearing shell between the crankshaft and the notched side of the engine block web.
 - 10.5. Rotate the crankshaft to roll the upper bearing insert into the engine block.
 - 10.6. Remove the J8080 from the crankshaft.
 - 10.7. Remove the number 5 lower main bearing shell from the cap and discard.
 - 10.8. Install 0.002 in. undersize bearing lower insert (from kit P/N 12329792) in the number 5 cap.
 - 10.9. Apply a liberal coating of clean engine oil to the bearing surface.
 - 10.10. Reinstall crankshaft bearing cap, bolts and studs to the engine block, making sure that the caps, bolts, and studs retain their original position and orientation.

Tighten

Tighten the crankshaft bearing cap bolts and studs on the first pass to 20 N·m (15 lb ft).

- 10.11. Thrust the crankshaft rearward in order to set and align the crankshaft thrust bearings and the crankshaft bearing caps.
- 10.12. Thrust the crankshaft forward in order to align the rear faces of the crankshaft thrust bearings.

Tighten

Tighten the crankshaft bearing cap bolts on the final pass to 73 degrees using the J 36660-A.

- 10.13. Go to Step 12 Crankshaft (main) Bearing Service for Locations Number 2, 3, and 4.
11. 0.0030 in. or greater
- 11.1. Retain upper bearing shell (number 5 main bearing - production 0.001 in. undersized).
 - 11.2. Remove number 5 lower main bearing shell from the cap and discard.
 - 11.3. Install 0.004 in. undersize bearing insert (P/N 12561191) in the number 5 cap,

LOWER HALF ONLY.

- 11.4. Apply a liberal coating of clean engine oil to the bearing surface, reinstall crankshaft bearing cap, bolts and studs to the engine block, making sure that the caps, bolts, and studs retain their original position and orientation.

Tighten

1. Tighten the crankshaft bearing cap bolts and studs on the first pass to 20 N·m (15 lb ft).
 2. Tighten the crankshaft bearing cap bolts on the final pass to 73 degrees using the J 36660-A.
- 11.5. Remove the screw jack used for crankshaft support.
 - 11.6. Go to Step 12 Crankshaft (main) Bearing Service for Locations Number 2, 3, and 4.
12. Crankshaft (main) Bearing Service for Locations Number 2, 3, and 4

Important: Do not remove the number 1 (front) main bearing cap.

- 12.1. Mark and remove the bearing caps from crankshaft bearings number 2, 3, and 4.
- 12.2. Install new bearing inserts P/N 10120990 (standard size - lower inserts only) to the numbers 2, 3, and 4 crankshaft bearing caps.

Important: Bearing caps must be installed in the proper location and orientation or engine damage could result.

- 12.3. Apply a liberal coating of clean engine oil to the bearing surface, and reinstall the bearing cap and bolts.

Tighten

1. Tighten the bearing cap bolts on the first pass to 20 N·m (15 lb ft).
 2. Final Pass (two bolt main bearing caps) -- Tighten the bearing cap bolts on the final pass to 73 degrees using the J 36660-A.
 3. Final Pass (four bolt main bearing caps) -- Tighten the crankshaft bearing cap OUTBOARD bolts and studs to 43 degrees using the J 36660-A.
 4. Final Pass (four bolt main bearing caps) -- Tighten the crankshaft bearing cap INNER bolts and studs to 73 degrees using the J 36660-A.
- 12.4. Go to Step 13 Connecting Rod Bearing Service.
13. Connecting Rod Bearing Service

Important: Do not disassemble connecting rod bearing caps for bearing clearance measurement. The design of the connecting rods in these engines does not permit accurate bearing clearance measurements when the connecting rod caps are disassembled from the connecting rods. Conventional methods of measuring bearing clearance, such as Plastigauge, cannot accurately be performed on these engines. GM Powertrain has developed a new, accurate and time-efficient means for measuring connecting rod bearing clearance without disassembly of the connecting rods. In early 1999, SPX/Kent-Moore Tool will be releasing a new essential tool to dealers in the United States to facilitate this new procedure. Until this new, essential tool is released -Contact: SPX/Kent-Moore Tool at 1 (810) 345-2233 who will then arrange for dealers to borrow a special connecting rod bearing clearance measuring tool and associated instruction sheet and video. Using this methodology, measure and refit connecting rod bearing inserts in each of the connecting rods. Use undersize connecting rod bearing inserts (listed in the table below) to selectively fit each connecting rod bearing for a clearance of 0.001-0.002 in.

- 13.1. Center the connecting rod journal to be worked on in the 6 o'clock position. Using screw jacks, lock the crankshaft in position as close to the bearing being worked on as possible. Tighten the screw jack sufficiently to displace the oil film from the upper main bearings. To avoid damage to the crankshaft, use a cushioning material, such as a block of wood, between the crankshaft and jack.
- 13.2. Check rod bearing clearance using a bearing loading and unloading tool and test indicator capable of measuring 0.0001 inch increments.

Important: A test indicator is required for this procedure, do not substitute a dial indicator. A dial indicator uses a plunger and will not provide repeatable results. Likewise, Plastigauge is not effective in this repair and should not be used for this procedure. To ensure this analysis technique will be accurate, do not disassemble the rod assembly.

- 13.3. With the rod bearing to be worked on in the 6 o'clock position, install the test indicator. Tighten the thumb screw until snug. Install the base bracket to the oil pan rail and center it so that the handle can move freely in the slot provided. The link pin on the connecting rod bearing clearance measuring tool should line up with the centerline of the connecting rod, and have a push/pull action in line with the connecting rod. This alignment is crucial for accurate and repeatable measurements.
- 13.4. Screw the attaching stud of the flexible dial indicator support into a convenient oil pan rail bolt hole. Position the dial indicator so that the stylus is centered on the connecting rod cap and lock the flexible dial indicator support into position.
- 13.5. Using the fine adjustment feature on the flexible dial indicator support (knob near dial indicator), adjust so that the dial indicator needle has sufficient travel in both directions to take an accurate measurement.
- 13.6. Load the connecting rod in the upward direction of piston travel and zero the test indicator. Load the connecting rod in the reverse direction, and record the reading off the indicator. Repeat this process 2-3 times, applying consistent pressure in each direction to ensure the oil film is pushed out of the journal. Record these readings.
- 13.7. In order to accurately determine which rod or rods is causing the knock, perform this procedure on all eight rod assemblies.
- 13.8. Analyze the measurements from all eight rods. Select bearings that will put the total clearance for each rod at 0.001-0.002 inch clearance. Install new upper and lower bearing inserts as required, being sure to lubricate liberally with clean engine oil.

Tighten

1. Tighten the rod bearing caps on the first pass to 27 N·m (20 lb ft).
 2. Tighten the rod bearing caps on the final pass to 55 degrees.
- 13.9. Reinstall the oil pump to the crankshaft rear bearing cap.

Tighten

1. Tighten the oil pump bolt on the first pass to 20 N·m (15 lb ft).
 2. Tighten the oil pump bolt on the final pass to 65 degrees using the J 36660-A.
14. Reassemble as required. Use Service Manual procedure -- Re-install Oil Pan.

Crankshaft Number 5 (main) Bearing Clearance (per		Greater than 0.002 in, but less	0.0025 in and greater, but less	
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Plastigauge Measurement	0.002 in or less	than 0.0025 in	than 0.0030 in	0.0030 in or greater
Number 5 (rear)	UPPER Do Not Service	UPPER Do Not Service	UPPER 0.002 us P/N 12329792	UPPER Do Not Service
	LOWER Do Not Service	LOWER 0.002 us P/N 12329792 (use 1/2 kit)	LOWER 0.002 us P/N 12329792 (use 1 kit)	LOWER 0.004 us P/N 12561191 (use 1 kit)
Number 4	UPPER Do Not Service	UPPER Do Not Service	UPPER Do Not Service	UPPER Do Not Service
	LOWER P/N 10120990 (use 1/2 kit)	LOWER P/N 10120990 (use 1/2 kit)	LOWER P/N 10120990 (use 1/2 kit)	LOWER P/N 10120990 (use 1/2 kit)
Number 3	UPPER Do Not Service	UPPER Do Not Service	UPPER Do Not Service	UPPER Do Not Service
	LOWER P/N 10120990 (use 1/2 kit)	LOWER P/N 10120990 (use 1/2 kit)	LOWER P/N 10120990 (use 1/2 kit)	LOWER P/N 10120990 (use 1/2 kit)
Number 2	UPPER Do Not Service	UPPER Do Not Service	UPPER Do Not Service	UPPER Do Not Service
	LOWER P/N 10120990 (use 1/2 kit)	LOWER P/N 10120990 (use 1/2 kit)	LOWER P/N 10120990 (use 1/2 kit)	LOWER P/N 10120990 (use 1/2 kit)
Number 1 (front)	Do Not Service	Do Not Service	Do Not Service	Do Not Service

Parts Information

Part Name	Description	P/N	Comments
Crankshaft bearing insert	Number 5 (rear) 0.002 in. undersize	12329792	1 kit services 1 journal
	Number 5 (rear) 0.004 in.		1 kit services lower bearing

(Grp. 0.213)	undersize	12561191	shell only
	Intermediate (Number 2, 3, 4) std.	10120990	1 kit services 1 journal
Connecting Rod Bearing Insert (Grp. 0.616)	0.0010 in. undersize	12523925	1 kit services 1 journal
	0.0020 in. undersize	12329426	1 kit services 1 journal

Parts are currently available from GMSPO.

Warranty Information

For vehicles repaired under warranty, use:

Labor Operation	Labor Time
J1150	Use published labor time

GM bulletins are intended for use by professional technicians, NOT a "do-it-yourselfer". They are written to inform these technicians of conditions that may occur on some vehicles, or to provide information that could assist in the proper service of a vehicle. Properly trained technicians have the equipment, tools, safety instructions, and know-how to do a job properly and safely. If a condition is described, DO NOT assume that the bulletin applies to your vehicle, or that your vehicle will have that condition. See your GM dealer for information on whether your vehicle may benefit from the information.