Engine Mechanical - 1.0L, 1.19L, or 1.2L

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Visual Identification

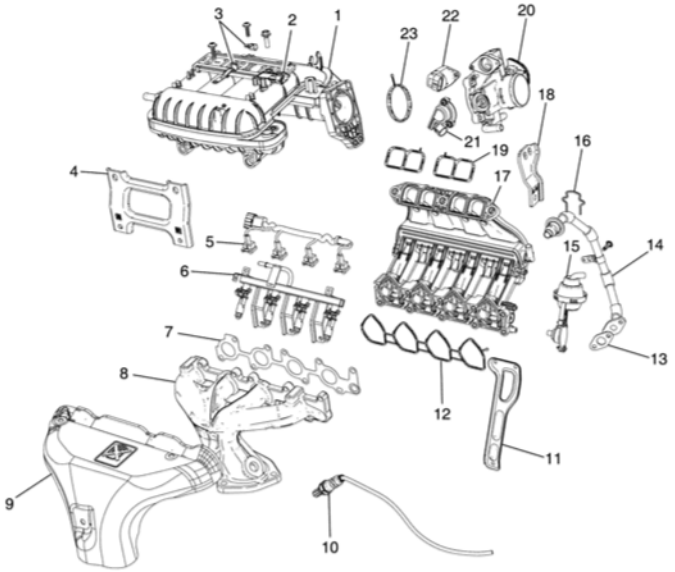
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Disassembled Views

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## 10 Matiz - Disassembled Views

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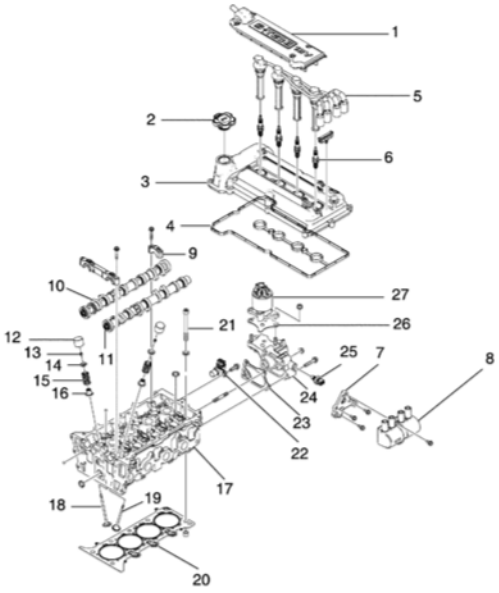
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- (1) Upper Intake Manifold
- (2) MAP Sensor
- (3) Retaining Clip
- (4) Intake Manifold Front Bracket
- (5) Fuel Injector Wiring Harness
- (6)
- (7) Exhaust Manifold Gasket
- (8) Exhaust Manifold Exhaust Manifold
- (9) Heat Shield
- (10) Oxygen Sensor
- (11) Intake Manifold Rear Bracket
- (12) Intake Manifold Seal
- (13) PCV Pipe Seal
- (14) PCV Pipe
- (15) IMRC Actuator
- (16) PCV Pipe Retaining Clip
- (17) Lower Intake Manifold
- (18) Intake Manifold Side Bracket
- (19) Intake Manifold Seal
- (20) Throttle Body
- (21) IACV
- (22) Throttle Position Sensor
- (23) Throttle Body Seal

## 10 Matiz - Disassembled Views

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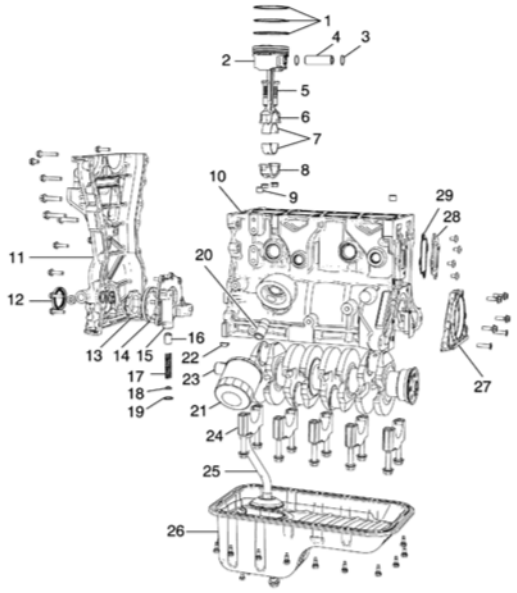
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- (1) Upper Camshaft Cover
- (2) Engine Oil Cap
- (3) Cylinder Head Cover
- (4) Cylinder Head Cover Gasket
- (5) Spark Plug Cable
- (6) Spark Plug
- (7) DIS Bracket
- (8) DIS Ignition Coil (DIS)
- (9) Camshaft Cap
- (10) Camshaft (Intake)
- (11) Camshaft (Exhaust)
- (12) Valve Tappet
- (13) Valve Key
- (14) Valve Spring Retainer
- (15) Valve Spring
- (16) Valve Stem Seal
- (17) Cylinder Head
- (18) Valve (Intake)
- (19) Valve (Exhaust)
- (20) Cylinder Head Gasket
- (21) Cylinder Head Bolt
- (22) Camshaft Position Sensor
- (23) Coolant Outlet Case Gasket
- (24) Coolant Outlet Case

- (25) Sensor Coolant Temperature Sensor
- (26) EGR Valve Gasket
- (27) EGR Valve

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## 10 Matiz - Disassembled Views




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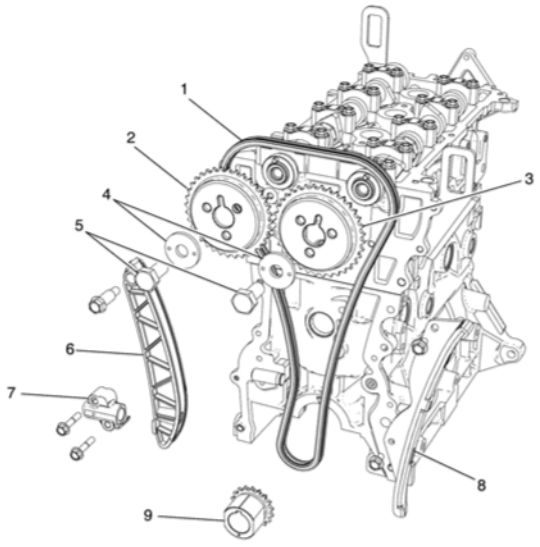
- (1) Piston Ring
- (2) Piston
- (3) Piston Pin Retainer
- (4) Piston Pin
- (5) Connecting Rod Cap Stud
- (6) Connecting Rod
- (7) Connecting Rod Bearing
- (8) Connecting Rod Cap
- (9) Dowel Pin
- (10) Cylinder Block
- (11) Timing Chain Cover
- (12) Seal Crankshaft Front Oil seal
- (13) Oil Pump Inner Rotor
- (14) Oil Pump Outer Rotor
- (15) Oil Pump Cover
- (16) Oil Relief Valve
- (17) Oil Relief Valve Spring
- (18) Oil Relief Valve Cap
- (19) Oil Relief Valve Retainer
- (20) Oil Filter Stud
- (21) Oil Filter
- (22) Key
- (23) Crankshaft
- (24) Crankshaft Bearing Cap

- (25) Oil Strainer
- (26) Oil Pan
- (27) Crankshaft Rear Oil Seal
- (28) Cylinder Block Plate Plug
- (29) Cylinder Block Plate Plug Gasket

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## 10 Matiz - Disassembled Views

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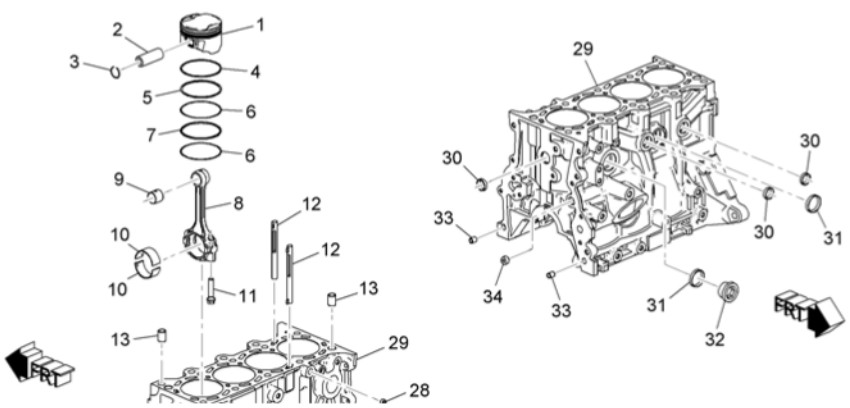
- (1) Timing Chain
- (2) Camshaft Sprocket (Intake)
- (3) Camshaft Sprocket (Exhaust)
- (4) Bushing
- (5) Camshaft Sprocket Retaining Bolts
- (6) Timing Chain Shoe
- (7) Timing Chain Tensioner
- (8) Timing Chain Guide
- (9) Crankshaft Sprocket

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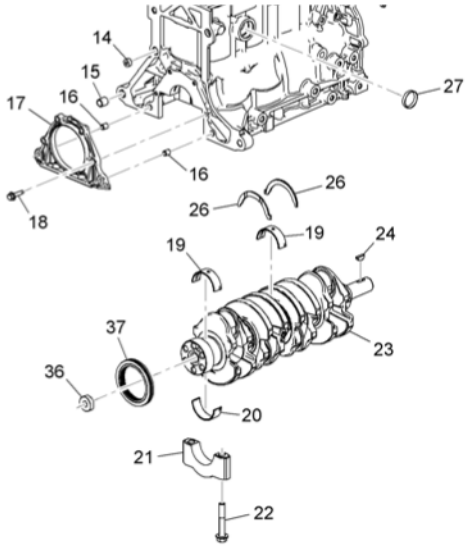
Disassembled Views (LKY)

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## Cylinder Block




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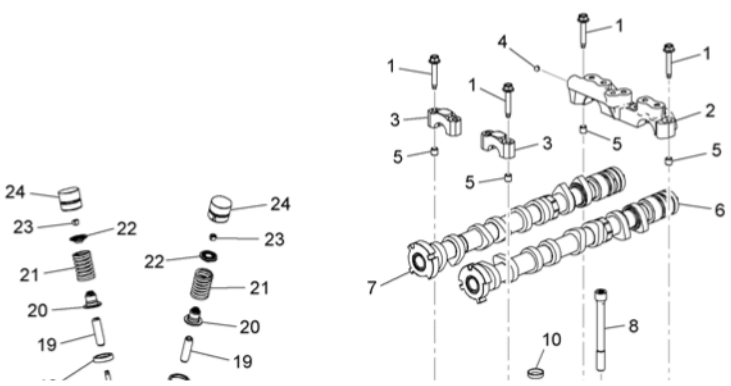
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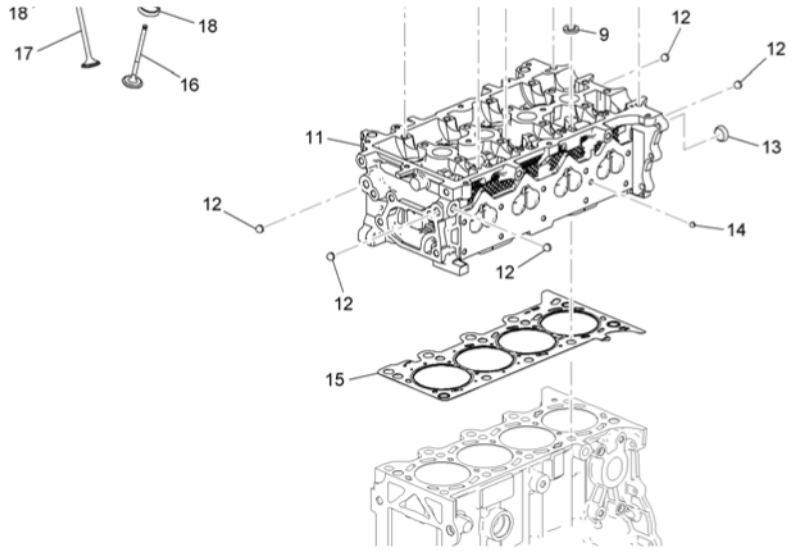
- (1) Piston Assembly
- (2) Piston Pin
- (3) Piston Pin Retainer
- (4) Piston Ring â€“ Upper
- (5) Piston Ring â€“ Lower
- (6) Piston Oil Ring Rail
- (7) Piston Oil Ring
- (8) Connecting Rod
- (9) Pin Guide
- (10) Connecting Rod Bearing
- (11) Connecting Rod Cap Bolt
- (12) Engine Cooling Guide
- (13) Dowel Pin
- (14) Plug
- (15) Dowel Pin
- (16) Dowel Pin
- (17) Crankshaft Rear Oil Seal Cover
- (18) Crankshaft Rear Oil Seal Cover Bolt
- (19) Crankshaft Upper Bearing
- (20) Crankshaft Lower Bearing
- (21) Crankshaft Bearing Cap Cover
- (22) Crankshaft Bearing Cap Cover Bolt
- (23) Crankshaft
- (24) Key
- (26) Bearing
- (27) Plug Cup
- (28) Plug
- (29) Cylinder Block
- (30) Plug Cup
- (31) Plug Cup
- (32) Plug
- (33) Dowel Pin
- (34) Plug
- (36) Plug
- (37) Crankshaft Rear Oil Seal

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## Cylinder Head

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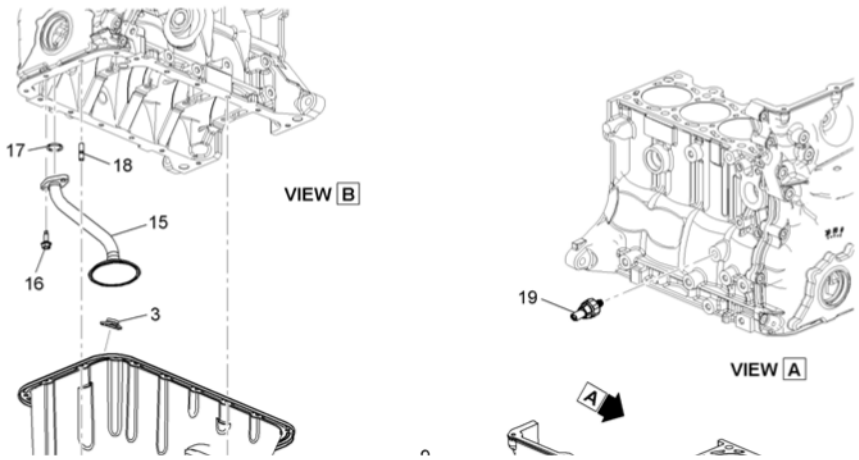
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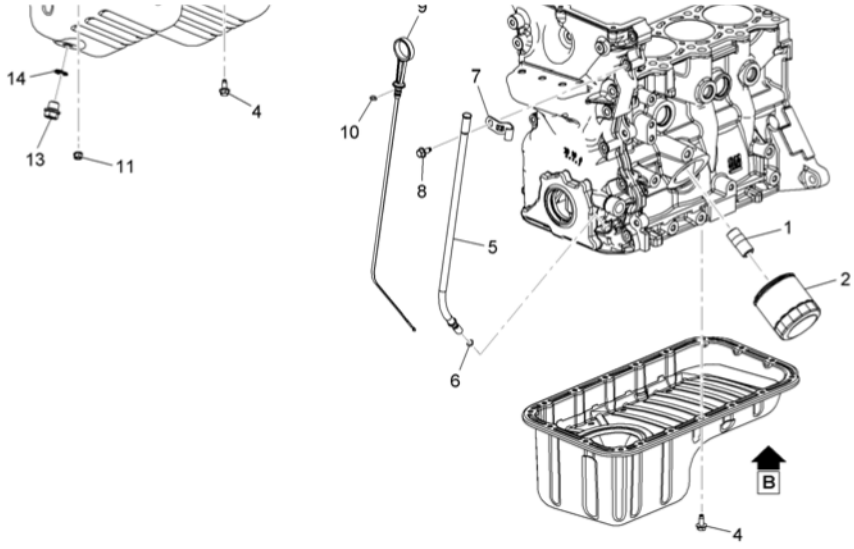
- (1) Camshaft Cap Bolt
- (2) Camshaft Front Bearing Cap
- (3) Camshaft Cap
- (4) Plug
- (5) Plug
- (6) Camshaft (Intake)
- (7) Camshaft (Exhaust)
- (8) Cylinder Head Bolt
- (9) Cylinder Head Bolt Washer
- (10) Plug
- (11) Cylinder Head
- (12) Plug
- (13) Plug
- (14) Plug
- (15) Cylinder Head Gasket
- (16) Valve (Intake)
- (17) Valve (Exhaust)
- (18) Valve Seat
- (19) Valve Guide
- (20) Valve Stem Oil Seal
- (21) Valve Spring
- (22) Valve Spring Retainer
- (23) Valve Key
- (24) Valve Tappet

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## Oil Pan

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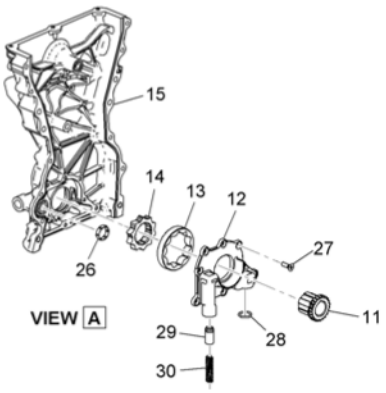
- (1) Oil Filter
- (2) Oil Filter Stud
- (3) Oil Pan Drain Plug Nut
- (4) Engine Oil Pan Bolt
- (5) Oil Level Indicator Tube
- (6) Oil Level Indicator Tube Oil Seal
- (7) Oil Level Indicator Tube Bracket
- (8) Oil Level Indicator Tube Bracket Bolt
- (9) Oil Level Indicator
- (10) Oil Level Indicator Oil Seal
- (11) Engine Oil Pan Nut
- (13) Oil Pan Drain Plug
- (14) Oil Pan Drain Plug Seal Ring
- (15) Oil Strainer
- (16) Oil Strainer Bolt
- (17) Oil Strainer Seal Ring
- (18) Bolt Stud
- (19) Oil Pressure Switch

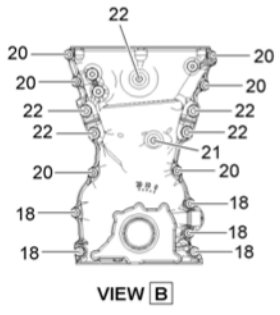
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# Timing System

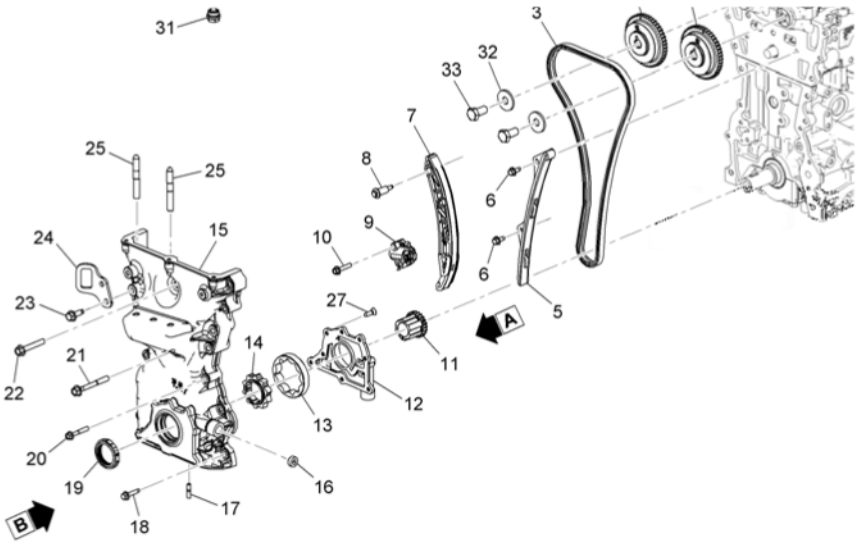
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- (1) Camshaft Sprocket (Exhaust)
- (2) Camshaft Sprocket (Intake)
- (3) Timing Chain
- (4) Camshaft Sprocket Retaining Bolt
- (5) Timing Chain Guide
- (6) Timing Chain Guide Bolt
- (7) Timing Chain Shoe
- (8) Timing Chain Shoe Bolt
- (9) Timing Chain Tensioner
- (10) Timing Chain Tensioner Bolt
- (11) Crankshaft Sprocket
- (12) Oil Pump Housing
- (13) Oil Pump Drive Gear
- (14) Oil Pump Drive Gear
- (15) Engine Front Cover
- (16) Plug
- (17) Stud Bolt
- (18) Engine Front Cover Bolt
- (19) Crankshaft Front Oil Seal
- (20) Engine Front Cover Bolt
- (21) Engine Front Cover Bolt
- (22) Engine Front Cover Bolt
- (23) Bracket Bolt
- (24) Bracket
- (25) Stud Bolt
- (26) Oil Seal
- (27) Oil Pump Housing Retaining Bolt
- (28) Oil Seal
- (29) Oil Relief Valve
- (30) Oil Relief Valve Spring
- (31) Oil Relief Valve Plug

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Description and Operation

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. DESCRIPTION AND OPERATION
4.

## Engine Component Description

Cylinder Block

The cylinder hollow frame structured 4 cylinder in-line. The block has 5 crankshaft bearings with the thrust bearing located on the third bearing from the front of the engine.

Crankshaft

The crankshaft is a steel crankshaft. It is supported in 5 main journals with main bearings which have oil clearance for lubricating. The 3rd bearing of the 5 main bearing is the thrust bearing whose the crankshaft has properly axial end play. A harmonic damper is used to control torsional vibration.

Oil Pump

The oil pump is a crankshaft driven oil pump integrated in pump module. The oil pump draws engine oil from the oil pan and feeds it under pressure to the various parts of the engine. An oil strainer is mounted before the inlet of the oil pump to remove impurities which could clog or damage the oil pump or other engine components. When the crankshaft rotates, the oil pump driven gear rotates. This causes the space between the gears to constantly open and narrow, pulling oil in from the oil pan when the space opens and pumping the oil out to the engine as it narrows. At high engine speeds, the oil pump supplies a much higher amount of oil than required for lubrication of the engine. The oil pressure regulator prevents too much oil from entering the engine lubrication passages.

Oil Pan

The oil pan is a stamping (steel) component include baffle and oil drain plug. The oil pan is attached at the engine block.

Piston and Connecting Rod

The pistons are aluminum pistons with anodized top ring groove. The connecting rods are fractured steel connecting rods with bushing and floating pin type.

Cylinder Head

This cylinder head is double over head camshaft (DOHC) type and has 2â€‰camshafts that open 4â€‰valves per cylinder with tappets. The camshaft sprocket wheels are installed in front of the camshafts. The cylinder head is made of cast aluminum alloy for better strength in hardness with light weight. The combustion chamber of the cylinder head is designed for increasing of squish and swirl efficiency and then this is maximized to gasoline combustion efficiency.

Valves

There are 2 intake and 2 exhaust valves with tappets per cylinder.

Camshaft

Two camshafts are used, one for all intake valves, the other for all exhaust valves. The camshafts are cast iron. The camshafts are driven by the crankshaft over the timing belt.

Camshaft Drive

A timing chain is used for camshaft drive. There is a tensioner to control the tension of the chain.

Intake Manifold

The intake manifold is the air flow passage to the cylinder combustion chamber through the throttle body and has an effect on engine torque, power, noise, driveability, emission, fuel economy and performance. It is made of plastic for better strength in hardness with little weight.

Exhaust Manifold

The exhaust manifold is located to the cylinder head and channels the exhaust gas out of the combustion chamber. It is designed to endure on high pressure and high temperature.

Positive Crankcase Ventilation System

The crankcase ventilation system is used to consume crankcase vapors in the combustion process instead of venting vapors to the atmosphere. Fresh air from the intake system is supplied to the crankcase, mixed with blow-by gases and then passed through a calibrated orifice into the

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throttle body. The primary control is through the positive crankcase ventilation (PCV) orifice which meters the flow at a rate depending on inlet vacuum. The PCV orifice is an integral part of the camshaft cover. If abnormal operating conditions occur, the system is designed to allow excessive amounts of blow-by gases to back flow through the crankcase vent into the intake system to be consumed by normal combustion.

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. DESCRIPTION AND OPERATION
4.

## Cleanliness and Care

An automobile engine is a combination of many machined, honed, polished, and lapped surfaces with tolerances that are measured in ten thousandths of an inch. When any internal engine parts are serviced, care and cleanliness are important. A liberal coating of engine oil should be applied to friction areas during assembly to protect and lubricate the surfaces during initial operation. Throughout this section, it should be understood that proper cleaning and protection of machined surfaces and friction areas are part of the repair procedure. This is considered standard shop practice even if not specifically stated.

When valve train components are removed for service, they should be retained in order. At the time of installation, they should be installed in the same locations and with the same mating surfaces as when removed.

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. DESCRIPTION AND OPERATION
4.

## Separating Parts

Note**:**

- Disassembly of the piston, press fit design piston pin, and connecting rod may create scoring or damage to the piston pin and piston pin bore. If the piston, pin, and connecting rod have been disassembled, replace the components as an assembly.
- Many internal engine components will develop specific wear patterns on their friction surfaces.
- When disassembling the engine, internal components MUST be separated, marked, or organized in a way to ensure installation to their original location and position.

Separate, mark, or organize the following components:

- Piston and the piston pin
- Piston to the specific cylinder bore
- Piston rings to the piston
- Connecting rod to the crankshaft journal
- Connecting rod to the bearing capâ€"A paint stick or etching/engraving type tool are recommended. Stamping the connecting rod or cap near the bearing bore may affect component geometry.
- Crankshaft main and connecting rod bearings
- Camshaft and valve tappets
- Valve to the valve guide
- Valve spring and shim to the cylinder head location
- Engine block main bearing cap location and direction
- Oil pump drive and driven gears

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. DESCRIPTION AND OPERATION
4.

## Replacing Engine Gaskets

### Gasket Reuse and Applying Sealants

- Do not reuse any gasket unless specified.
- Gaskets that can be reused will be identified in the service procedure.
- Do not apply sealant to any gasket or sealing surface unless called out in the service information.

### Separating Components

- Use a rubber mallet to separate components.
- Bump the part sideways to loosen the components.
- Bumping should be done at bends or reinforced areas to prevent distortion of parts.

### Cleaning Gasket Surfaces

- Remove all gasket and sealing material from the part using a scraping tool.
- Care must be used to avoid gouging or scraping the sealing surfaces.
- Do not use any other method or technique to remove sealant or gasket material from a part.
- Do not use abrasive pads, sand paper, or power tools to clean the gasket surfaces.
-
    - These methods of cleaning can cause damage to the component sealing surfaces.
    - Abrasive pads also produce a fine grit that the oil filter cannot remove from the oil.
    - This grit is abrasive and has been known to cause internal engine damage.

### Assembling Components

- When assembling components, use only the sealant specified or equivalent in the service procedure.
- Sealing surfaces should be clean and free of debris or oil.
- Specific components such as crankshaft oil seals or valve stem oil seals may require lubrication during assembly.
- Components requiring lubrication will be identified in the service procedure.
- When applying sealant to a component, apply the amount specified in the service procedure.
- Do not allow the sealant to enter into any blind threaded holes, as it may prevent the bolt from clamping properly or cause component damage when tightened.
- Tighten bolts to specifications. Do not over tighten.

### Cleaning Sealant (RTV) Surface and Application

- Sealant (RTV) sealing surface and mating surface must be free of any evidence oils, machining fluids and any liquid or solid residue on sealing surface to assure sealant (RTV) adhesion.
- Clean approved solvent based cleaner (LPS Precision, Zero TRI cleaner (PN03520) with dry lint-free clothes to wipe surface. Lint-free cloths cannot be reused.
- In case of maximum open time (8 minutes) with joint not closed after RTV dispensing, Remove cured sealant (RTV) squeeze-out carefully.

### Pipe Joint Compound

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Note:

Three types of sealer are commonly used in engines. These are RTV sealer, anaerobic gasket eliminator sealer, and pipe joint compound. The correct sealer and amount must be used in the proper location to prevent oil leaks. DO NOT interchange the 3 types of sealers. Use only the specific sealer or the equivalent as recommended in the service procedure.

- Pipe joint compound is a pliable sealer that does not completely harden. This type sealer is used where 2â€‰non-rigid parts, such as the oil pan and the engine block, are assembled together.
- Do not use pipe joint compound in areas where extreme temperatures are expected. These areas include: exhaust manifold, head gasket, or other surfaces where gasket eliminator is specified.
- Follow all safety recommendations and directions that are on the container.
- To remove the sealant or the gasket material.
- Apply the pipe joint compound to a clean surface. Use a bead size or quantity as specified in the procedure. Run the bead to the inside of any bolt holes. Do not allow the sealer to enter any blind threaded holes, as it may prevent the bolt from clamping properly or cause component damage when the bolt is tightened.
- Apply a continuous bead of pipe joint compound to one sealing surface. Sealing surfaces to be resealed must be clean and dry.
- Tighten the bolts to specifications. Do not over tighten.

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. DESCRIPTION AND OPERATION
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## Tools and Equipment

Special tools are listed and illustrated throughout this section with a complete listing at the end of the section. These tools, or their equivalents, are specially designed to quickly and safely accomplish the operations for which they are intended. The use of these special tools will also minimize possible damage to engine components. Some precision measuring tools are required for inspection of certain critical components. Torque wrenches and a torque angle meter are necessary for the proper tightening of various fasteners.

To properly service the engine assembly, the following items should be readily available:

- Approved eye protection and safety gloves
- A clean, well lit, work area
- A suitable parts cleaning tank
- A compressed air supply
- Trays or storage containers to keep parts and fasteners organized
- An adequate set of hand tools
- Approved engine repair stand
- An approved engine lifting device that will adequately support the weight of the components

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Diagnostic Information and Procedures

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. DIAGNOSTIC INFORMATION AND PROCEDURES
4.

## Symptoms - Engine Mechanical

### Strategy Based Diagnostics

Perform the Diagnostic System Check - Vehicle.

All diagnosis on a vehicle should follow a logical process. Strategy based diagnostics is a uniform approach for repairing all systems. The diagnostic flow may always be used in order to resolve a system condition. The diagnostic flow is the place to start when repairs are necessary.

### Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the engine.
- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.
- Inspect for the correct oil level, proper oil viscosity, and correct filter application.
- Verify the exact operating conditions under which the concern exists. Note factors such as engine RPM, ambient temperature, engine temperature, amount of engine warm-up time, and other specifics.
- Compare the engine sounds, if applicable, to a known good engine and make sure you are not trying to correct a normal condition.

### Intermittent

Test the vehicle under the same conditions that the customer reported in order to verify the system is operating properly.

### Symptom List

Refer to a symptom diagnostic procedure from the following list in order to diagnose the symptom:

- Base Engine Misfire without Internal Engine Noises
- Base Engine Misfire with Abnormal Internal Lower Engine Noises
- Base Engine Misfire with Abnormal Valve Train Noise
- Base Engine Misfire with Coolant Consumption
- Base Engine Misfire with Excessive Oil Consumption
- Engine Noise on Start-Up, but Only Lasting a Few Seconds
- Upper Engine Noise, Regardless of Engine Speed
- Lower Engine Noise, Regardless of Engine Speed
- Engine Noise Under Load
- Engine Will Not Crank - Crankshaft Will Not Rotate
- Coolant in Engine Oil
- Engine Compression Test
- Oil Pressure Diagnosis and Testing
- Oil Leak Diagnosis
- Drive Belt Chirping, Squeal, and Whine Diagnosis
- Drive Belt Rumbling and Vibration Diagnosis
- Drive Belt Falls Off and Excessive Wear Diagnosis

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. DIAGNOSTIC INFORMATION AND PROCEDURES
4.

## Oil Pressure Diagnosis and Testing (LKY)

Special Tools

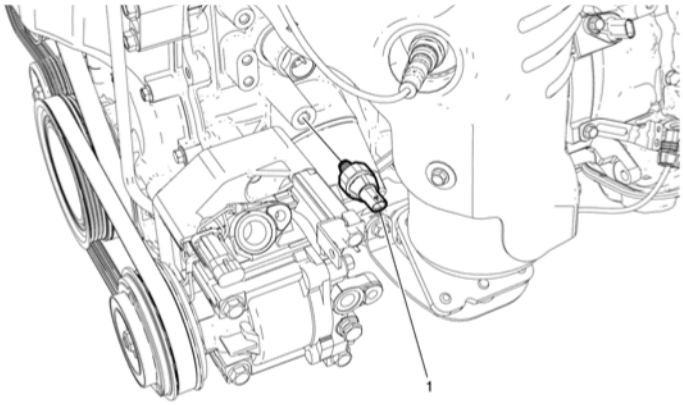
- *EN-21867-850* Adapter Oil Pressure Check
- *EN-50207* Oil Pressure Switch Remover/Installer
- *KM-498-B* Oil Pressure Gauge

For equivalent regional tools, refer to Special Tools .

### Removal Procedure

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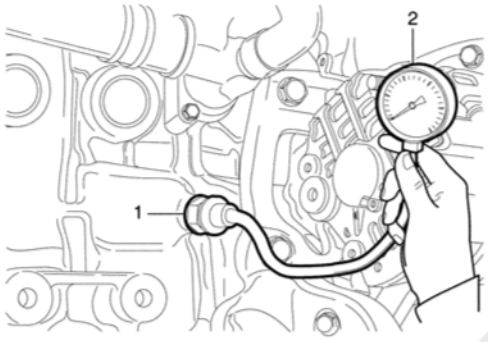





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1. Click here for full size
2. Remove the oil pressure switchâ€‰(1) using the *EN-50207* oil pressure switch remover/installer.
3. Clean the thread.

## Measurement Procedure




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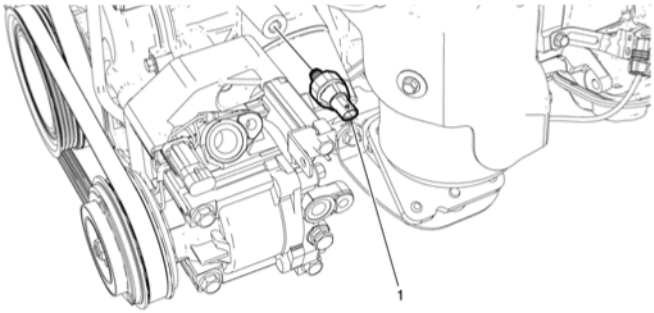
2. Install the *EN-21867-850* adapter oil pressure checkâ€¦(1) to the *KM498-B* oil pressure gaugeâ€¦(2)

2. Install the *EN-21867-050* adapter oil pressure checkâ€‰(1) to the *EN-498-B* oil pressure gaugeâ€‰(2).
3. Install the *EN-21867-01* adapter oil pressure checkâ€‰(1) with *EN 498-B* oil pressure gaugeâ€‰(2) to the oil pressure switch hole.
4. Start the engine.
5. Check oil pressure.
6. At idling speed, the oil pressure must be at least 110â€‰kPa (15.95â€‰psi) and the oil temperature must be less than or equal to 120Â°C (170Â°F).
7. Switch off the engine.
8. Remove the *EN-21867-01* adapter oil pressure checkâ€‰(1) with *EN 498-B* oil pressure gaugeâ€‰(2) from the oil pressure switch hole.

## Installation Procedure

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1. Click here for full size
2. Caution:

   Refer to Fastener Caution.

3. Install the oil pressure switch and tighten to 18â€‰N-m (13â€‰lbâ€‰ft).
4. Check the engine oil level.

1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. DIAGNOSTIC INFORMATION AND PROCEDURES
4.

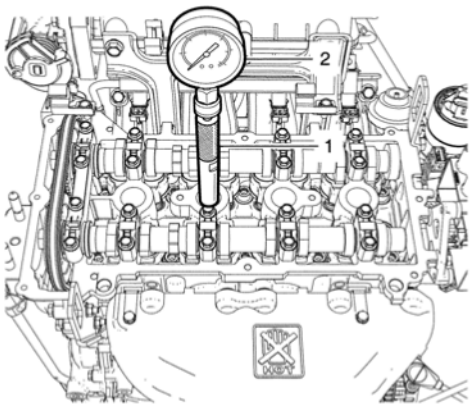
## Engine Compression Test (LKY)

### Removal Procedure

1. Remove the ignition coil cover. Refer to Ignition Coil Cover Replacement.
2. Remove the spark plugs. Refer to Spark Plug Replacement.
3. Remove the relay holder cover.
4. Remove the fuel pump relay.

### Measurement Procedure

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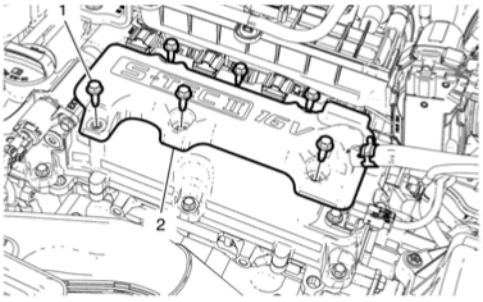
1. Click here for full size
2. Install the suitable engine compression test tool to the spark plug hole.
3. Crank the engine (approximately 4â€‰seconds).
4. Compare the compression values.
5. Note**:**

   Engine revs at least 300/min.
6. Maximum pressure differential is 100â€‰kPa (14.5â€‰psi).
7. Check compression for all cylinders.

## Installation Procedure

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1. Click here for full size
2. Remove the suitable engine compression test tool to the spark plug hole.
3. Install the fuel pump relay.
4. Install the relay carrier cover.
5. Install the spark plugs and tighten the spark plug to 20â€‰N-m (14.7â€‰lbâ€‰ft).
6. Install the ignition coil coverâ€‰(2). Refer to Ignition Coil Cover Replacement.
7. Caution:

   Refer to Fastener Caution.
8. Tighten the boltsâ€‰(1) to 10â€‰N-m (89â€‰lbâ€‰in).

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. DIAGNOSTIC INFORMATION AND PROCEDURES
4.

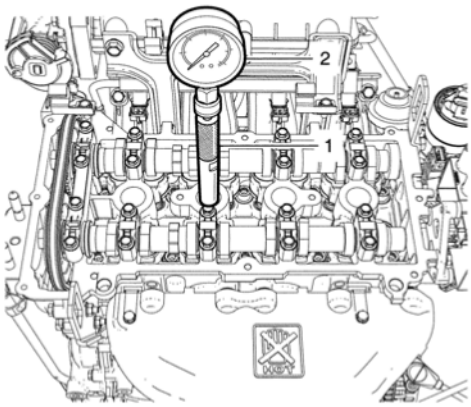
## Engine Compression Test

### Removal Procedure

1. Remove the upper intake manifold. Refer to Upper Intake Manifold Replacement.
2. Remove the upper camshaft cover.
3. Remove the spark plugs. Refer to Spark Plug Replacement.
4. Remove the relay holder cover.
5. Remove the fuel pump relay.

### Measurement Procedure

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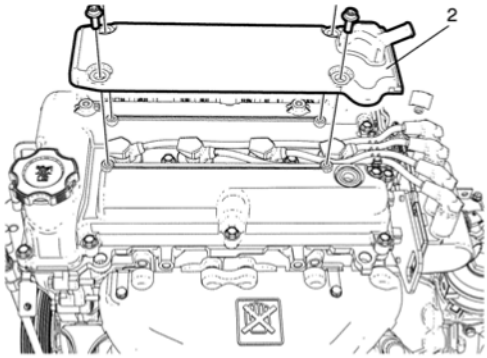
1. Click here for full size
2. Install the suitable engine compression test tool to the spark plug hole.
3. Crank the engine (approximately 4â€‰seconds).
4. Compare the compression values.
5. Note**:**

   Engine revs at least 300/min.
6. Maximum pressure differential is 100â€‰kPa (14.5â€‰psi).
7. Check compression for all cylinders.

## Installation Procedure




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1. Click here for full size
2. Remove the suitable engine compression test tool to the spark plug hole.
3. Install the fuel pump relay.
4. Install the relay carrier cover.
5. Install the spark plugs and tighten the spark plug to 27â€‰N-m (20â€‰lbâ€‰ft).
6. Install the upper camshaft cover.
7. Caution:

   Refer to Fastener Caution.
8. Tighten the boltsâ€‰(1) to 10â€‰N-m (89â€‰lbâ€‰in).
9. Install the upper intake manifold. Refer to Upper Intake Manifold Replacement.

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. DIAGNOSTIC INFORMATION AND PROCEDURES
4.

## Drive Belt Chirping, Squeal, and Whine Diagnosis

### Diagnostic Aids

- A chirping or squeal noise may be intermittent due to moisture on the drive belts or the pulleys. It may be necessary to spray a small amount of water on the drive belts in order to duplicate the customers concern. If spraying water on the drive belt duplicates the symptom, cleaning the belt pulleys may be the probable solution.
- If the noise is intermittent, verify the accessory drive components by varying their loads making sure they are operated to their maximum capacity. An overcharged A/C system, power steering system with a pinched hose or wrong fluid, or a generator failing are suggested items to inspect.
- A chirping, squeal or whine noise may be caused by a loose or improper installation of a body or suspension component. Other items of the vehicle may also cause the noise.
- The drive belts will not cause a whine noise.

### Test Description

The numbers below refer to the step numbers on the diagnostic table.

2. The noise may not be engine related. This step is to verify that the engine is making the noise. If the engine is not making the noise do not proceed further with this table.
3. The noise may be an internal engine noise. Removing the drive belts one at a time and operating the engine for a brief period will verify the noise is related to the drive belt. When removing the drive belt the water pump may not be operating and the engine may overheat. Also DTCs may set when the engine is operating with the drive belts removed.
4. Inspect all drive belt pulleys for pilling. Pilling is the small balls or pills or it can be strings in the drive belt grooves from the accumulation of rubber dust.
6. Misalignment of the pulleys may be caused from improper mounting of the accessory drive component, incorrect installation of the accessory drive component pulley, or the pulley bent inward or outward from a previous repair. Test for a misaligned pulley using a straight edge in the pulley grooves across two or three pulleys. If a misaligned pulley is found refer to that accessory drive component for the proper installation procedure for that pulley.
10. Inspecting of the fasteners can eliminate the possibility that a wrong bolt, nut, spacer, or washer was installed.
12. Inspecting the pulleys for being bent should include inspecting for a dent or other damage to the pulleys that would prevent the drive belt from not seating properly in all of the pulley grooves or on the smooth surface of a pulley when the back side of the belt is used to drive the pulley.
14. This test is to verify that the drive belt tensioner operates properly. If the drive belt tensioner is not operating properly, proper belt tension may not be achieved to keep the drive belt from slipping which could cause a squeal noise.
15. This test is to verify that the drive belt is not too long, which would prevent the drive belt tensioner from working properly. Also if an incorrect length drive belt was installed, it may not be routed properly and may be turning an accessory drive component in the wrong direction.
16. Misalignment of the pulleys may be caused from improper mounting of the accessory drive component, incorrect installation of the accessory drive component pulley, or the pulley bent inward or outward from a previous repair. Test for a misaligned pulley using a straight edge in the pulley grooves across two or three pulleys. If a misaligned pulley is found refer to that accessory drive component for the proper installation procedure for that pulley.
17. This test is to verify that the pulleys are the correct diameter or width. Using a known good vehicle compare the pulley sizes.
19. Replacing the drive belt when it is not damaged or there is not excessive pilling will only be a temporary repair.

| Step | Action | Yes | No |
|---|---|---|---|
| | | | |

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Caution:

Refer to Belt Dressing Caution .

DEFINITION: The following items are indications of chirping:

- A high pitched noise that is heard once per revolution of the drive belt or a pulley.
- Chirping may occur on cold damp start-ups and will subside once the vehicle reaches normal operating temp.

DEFINITION: The following items are indications of drive belt squeal:

- A loud screeching noise that is caused by a slipping drive belt. This is unusual for a drive belt with multiple ribs.
- The noise occurs when a heavy load is applied to the drive belt, such as an air conditioning compressor engagement snapping the throttle, or slipping on a seized pulley or a faulty accessory drive component.

DEFINITION: The following items are indications of drive belt whine:

- A high pitched continuous noise.
- The noise may be caused by an accessory drive component failed bearing.

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Did you review the drive belt symptom operation and perform the necessary inspections? | Go to Stepâ€‰2 | Go to Symptoms - Engine Mechanical |
| 2 | Verify that there is a chirping, squeal or whine noise.<br><br>Does the engine make the chirping squeal or whine noise? | Go to Stepâ€‰3 | Go to Diagnostic Aids |
| 3 | 1. Remove the drive belt.<br>2. If the engine has multiple drive belts, remove the belts one at a time and perform the test below each time a belt is removed.<br>3. Operate the engine for no longer than 30â€“40â€‰seconds.<br>4. Repeat this test if necessary by removing the remaining belt(s).<br><br>Does the chirping, squeal or whine noise still exist? | Go to Symptoms - Engine Mechanical | Go to Stepâ€‰4 |
| 4 | If diagnosing a chirping noise, inspect for severe pilling exceedingâ€‰1/3 of the belt groove depth.<br><br>If diagnosing a squeal or whine noise, proceed to stepâ€‰13.<br><br>Do the belt grooves have pilling? | Go to Stepâ€‰5 | Go to Stepâ€‰6 |
| 5 | Clean the drive belt pulleys with a suitable wire brush.<br><br>Did you complete the repair? | Go to Stepâ€‰20 | Go to Stepâ€‰6 |
| 6 | Inspect for misalignment of the pulleys.<br><br>Are any of the pulleys misaligned? | Go to Stepâ€‰7 | Go to Stepâ€‰8 |
| 7 | Replace or repair any misaligned pulleys.<br><br>Did you complete the repair? | Go to Stepâ€‰20 | Go to Stepâ€‰8 |
| 8 | Inspect for bent or cracked brackets.<br><br>Did you find any bent or cracked brackets? | Go to Stepâ€‰9 | Go to Stepâ€‰10 |
| 9 | Replace any bent or cracked brackets.<br><br>Did you complete the repair? | Go to Stepâ€‰20 | Go to Stepâ€‰10 |
| 10 | Inspect for improper, loose or missing fasteners.<br><br>Did you find the condition? | Go to Stepâ€‰11 | Go to Stepâ€‰12 |

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| Step | Action | Yes | No |
|---|---|---|---|
| 11 | 1. Caution:<br><br>Refer to Fastener Caution<br><br>2. Tighten any loose fasteners. Refer to Fastener Specifications .<br><br>3. Replace any improper or missing fasteners.<br><br>Did you complete the repair? | Go to Stepâ€‰20 | Go to Stepâ€‰12 |
| 12 | Inspect for a bent pulley.<br><br>Did you find the condition? | Go to Stepâ€‰18 | Go to Stepâ€‰19 |
| 13 | • Inspect for an accessory drive component seized bearing or a faulty accessory drive component.<br><br>• If diagnosing a whine noise and the condition still exist, proceed to Diagnostic Aids.<br><br>Did you find and correct the condition? | Go to Stepâ€‰20 | Go to Stepâ€‰14 |
| 14 | Test the drive belt tensioner for proper operation.<br><br>Did you find and correct the condition? | Go to Stepâ€‰20 | Go to Stepâ€‰15 |
| 15 | Inspect for the correct drive belt length.<br><br>Did you find and correct the condition? | Go to Stepâ€‰20 | Go to Stepâ€‰16 |
| 16 | Inspect for misalignment of a pulley.<br><br>Did you find and correct the condition? | Go to Stepâ€‰20 | Go to Stepâ€‰17 |
| 17 | Inspect for the correct pulley size.<br><br>Did you find and correct the condition? | Go to Stepâ€‰20 | Go to Diagnostic Aids |
| 18 | Replace the bent pulley.<br><br>Did you complete the repair? | Go to Stepâ€‰20 | Go to Stepâ€‰19 |
| 19 | Replace the drive belt. Refer to Water Pump and Generator Belt Replacement.<br><br>Did you complete the repair? | Go to Stepâ€‰20 | Go to Diagnostic Aids |
| 20 | Operate the system in order to verify the repair.<br><br>Did you correct the condition? | System OK | Go to Stepâ€‰3 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. DIAGNOSTIC INFORMATION AND PROCEDURES
4.

## Drive Belt Rumbling and Vibration Diagnosis

### Diagnostic Aids

The accessory drive components can have an affect on engine vibration. Vibration from the engine operating may cause a body component or another part of the vehicle to make rumbling noise. Vibration can be caused by, but not limited to the A/C system over charged, the power steering system restricted or the incorrect fluid, or an extra load on the generator. To help identify an intermittent or an improper condition, vary the loads on the accessory drive components.

The drive belt may have a rumbling condition that can not be seen or felt. Sometimes replacing the drive belt may be the only repair for the symptom.

If replacing the drive belt, completing the diagnostic table, and the noise is only heard when the drive belts are installed, there might be an accessory drive component with a failure. Varying the load on the different accessory drive components may aid in identifying which component is causing the rumbling noise.

### Test Description

The numbers below refer to the step numbers on the diagnostic table.

2. This test is to verify that the symptom is present during diagnosing. Other vehicle components may cause a similar symptom.
3. This test is to verify that one of the drive belts is causing the rumbling noise or vibration. Rumbling noise may be confused with an internal engine noise due to the similarity in the description. Remove only one drive belt at a time if the vehicle has multiple drive belts. When removing the drive belts the water pump may not be operating and the engine may overheat. Also DTCs may set when the engine is operating with the drive belts removed.
4. Inspecting the drive belts is to ensure that they are not causing the noise. Small cracks across the ribs of the drive belt will not cause the noise. Belt separation is identified by the plys of the belt separating and may be seen at the edge of the belt our felt as a lump in the belt.
5. Small amounts of pilling is normal condition and acceptable. When the pilling is severe the drive belt does not have a smooth surface for proper operation.
9. Inspecting of the fasteners can eliminate the possibility that the wrong bolt, nut, spacer, or washer was installed.
11. This step should only be performed if the water pump is driven by the drive belt. Inspect the water pump shaft for being bent. Also inspect the water pump bearings for smooth operation and excessive play. Compare the water pump with a known good water pump.
12. Accessory drive component brackets that are bent, cracked, or loose may put extra strain on that accessory component causing it to vibrate.

| Step | Action | Yes | No |
|---|---|---|---|
| | | | |

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| Step | Action | Yes | No |
|---|---|---|---|
| Caution:<br><br>Refer to Belt Dressing Caution.<br><br>DEFINITION: The following items are indications of drive belt rumbling:<br>• A low pitch tapping, knocking, or thumping noise heard at or just above idle.<br>• Heard once per revolution of the drive belt or a pulley.<br>• Rumbling may be caused from:<br>• <br>◦ Pilling, the accumulation of rubber dust that forms small ballsâ€‰(pills) or strings in the drive belt pulley groove<br>◦ The separation of the drive belt<br>◦ A damaged drive belt<br>◦ A worn drive belt idler pulley<br><br>DEFINITION: The following items are indications of drive belt vibration:<br>• The vibration is engine-speed related.<br>• The vibration may be sensitive to accessory load. | | | |
| 1 | Did you review the Drive Belt Symptom operation and perform the necessary inspections? | Go to Stepâ€‰2 | Go to Symptoms - Engine Mechanical |
| 2 | Verify that there is a rumbling noise or that the vibration is engine related.<br><br>Does the engine make the rumbling noise or vibration? | Go to Stepâ€‰3 | Go to Diagnostic Aids |
| 3 | 1. Remove the drive belt.<br>2. If the engine has multiple drive belts, remove the belts one at a time and perform the test below each time a belt is removed.<br>3. Operate the engine for no longer than 30â€“40â€‰seconds.<br>4. Repeat this test if necessary by removing the remaining belt(s).<br><br>Does the rumbling or vibration still exist? | Go to Symptoms - Engine Mechanical | Go to Stepâ€‰4 |
| 4 | Inspect the drive belts for wear, damage, separation, sections of missing ribs, and debris build-up.<br><br>Did you find any of these conditions? | Go to Stepâ€‰7 | Go to Stepâ€‰5 |
| 5 | Inspect for severe pilling of more than 1/3 of the drive belt pulley grooves.<br><br>Did you find severe pilling? | Go to Stepâ€‰6 | Go to Stepâ€‰7 |
| 6 | 1. Clean the drive belt pulleys using a suitable wire brush.<br>2. Reinstall a drive belt. Refer to Water Pump and Generator Belt Replacement.<br><br>Did you correct the condition? | Go to Stepâ€‰8 | Go to Stepâ€‰7 |
| 7 | Install a drive belt. Refer to Water Pump and Generator Belt Replacement.<br><br>Did you complete the replacement? | Go to Stepâ€‰8 | Go to Stepâ€‰9 |
| 8 | Operate the system in order to verify the repair.<br><br>Did you correct the condition? | System OK | Go to Stepâ€‰9 |
| 9 | Inspect for improper, loose or missing fasteners.<br><br>Did you find any of these conditions? | Go to Stepâ€‰10 | Go to Stepâ€‰11 |

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| Step | Action | Yes | No |
|---|---|---|---|
| 10 | 1. Caution:<br>Refer to Fastener Caution.<br>2. Tighten any loose fasteners. Refer to Fastener Specifications.<br>3. Replace improper or missing fasteners.<br>Did you complete the repair? | Go to Stepâ€‰13 | Go to Stepâ€‰11 |
| 11 | Inspect for a bent water pump shaft. Refer to Water Pump Replacement.<br>Did you find and correct the condition? | Go to Stepâ€‰13 | Go to Stepâ€‰12 |
| 12 | Inspect for bent or cracked brackets.<br>Did you find and correct the condition? | Go to Stepâ€‰13 | Go to Diagnostic Aids |
| 13 | Operate the system in order to verify the repair.<br>Did you correct the condition? | System OK | Go to Stepâ€‰3 |

## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Drive Belt | BELT,DRV | 0250A |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. DIAGNOSTIC INFORMATION AND PROCEDURES
4.

## Drive Belt Falls Off and Excessive Wear Diagnosis

### Diagnostic Aids

If the drive belt repeatedly falls off the drive belt pulleys, this is because of pulley misalignment.

An extra load that is quickly applied on released by an accessory drive component may cause the drive belt to fall off the pulleys. Verify the accessory drive components operate properly.

If the drive belt is the incorrect length, the drive belt tensioner may not keep the proper tension on the drive belt.

Excessive wear on a drive belt is usually caused by an incorrect installation or the wrong drive belt for the application.

Minor misalignment of the drive belt pulleys will not cause excessive wear, but will probably cause the drive belt to make a noise or to fall off.

Excessive misalignment of the drive belt pulleys will cause excessive wear but may also make the drive belt fall off.

### Test Description

The numbers below refer to the step numbers on the diagnostic table.

2. This inspection is to verify the condition of the drive belt. Damage may of occurred to the drive belt when the drive belt fell off. The drive belt may of been damaged, which caused the drive belt to fall off. Inspect the belt for cuts, tears, sections of ribs missing, or damaged belt plys.
4. Misalignment of the pulleys may be caused from improper mounting of the accessory drive component, incorrect installation of the accessory drive component pulley, or the pulley bent inward or outward from a previous repair. Test for a misaligned pulley using a straight edge in the pulley grooves across two or three pulleys. If a misaligned pulley is found refer to that accessory drive component for the proper installation procedure of that pulley.
5. Inspecting the pulleys for being bent should include inspecting for a dent or other damage to the pulleys that would prevent the drive belt from not seating properly in all of the pulley grooves or on the smooth surface of a pulley when the back side of the belt is used to drive the pulley.
6. Accessory drive component brackets that are bent or cracked will let the drive belt fall off.
7. Inspecting of the fasteners can eliminate the possibility that a wrong bolt, nut , spacer, or washer was installed. Missing. loose, or the wrong fasteners may cause pulley misalignment from the bracket moving under load. Over tightening of the fasteners may cause misalignment of the accessory component bracket.
13. The inspection is to verify the drive belt is correctly installed on all of the drive belt pulleys. Wear on the drive belt may be caused by mis-positioning the drive belt by one groove on a pulley.
14. The installation of a drive belt that is too wide or too narrow will cause wear on the drive belt. The drive belt ribs should match all of the grooves on all of the pulleys.
15. This inspection is to verify the drive belt is not contacting any parts of the engine or body while the engine is operating. There should be sufficient clearance when the drive belt accessory drive components load varies. The drive belt should not come in contact with an engine or a body component when snapping the throttle.

| Step | Action | Yes | No |
|---|---|---|---|
| Caution:<br><br>Refer to Belt Dressing Caution.<br><br>DEFINITION: The drive belt falls off the pulleys or may not ride correctly on the pulleys.<br><br>DEFINITION: Wear at the outside ribs of the drive belt due to an incorrectly installed drive belt. | | | |
| 1 | Did you review the drive belt symptom operation and perform the necessary inspections? | Go to Stepâ€‰2 | Go to Symptoms - Engine Mechanical |
| 2 | • If diagnosing excessive wear, proceed to step 13.<br>• If diagnosing a drive belt that falls off, inspect for a damaged drive belt.<br><br>Did you find the condition? | Go to Stepâ€‰3 | Go to Stepâ€‰4 |
| 3 | Replace the drive belt. Refer to Water Pump and Generator Belt Replacement.<br><br>Does the drive belt continue to fall off? | Go to Stepâ€‰4 | System OK |
| | | | |

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| Step | Action | Yes | No |
|---|---|---|---|
| 4 | Inspect for misalignment of the pulleys.<br><br>Did you find and repair the condition? | Go to Stepâ€‰12 | Go to Stepâ€‰5 |
| 5 | Inspect for a bent or dented pulley.<br><br>Did you find and repair the condition? | Go to Stepâ€‰12 | Go to Stepâ€‰6 |
| 6 | Inspect for a bent or a cracked bracket.<br><br>Did you find and repair the condition? | Go to Stepâ€‰12 | Go to Stepâ€‰7 |
| 7 | Inspect for improper, loose or missing fasteners.<br><br>Did you find loose or missing fasteners? | Go to Stepâ€‰8 | Go to Stepâ€‰9 |
| 8 | 1. Caution:<br><br>Refer to Fastener Caution.<br><br>2. Tighten any loose fasteners. Refer to Fastener Specifications.<br><br>3. Replace improper or missing fasteners.<br><br>Does the drive belt continue to fall off? | Go to Stepâ€‰9 | System OK |
| 9 | Test the drive belt tensioner for operating correctly.<br><br>Does the drive belt tensioner operate correctly? | Go to Stepâ€‰11 | Go to Stepâ€‰10 |
| 10 | Replace the drive belt tensioner. Refer to Generator Bracket Replacement.<br><br>Does the drive belt continue to fall off? | Go to Stepâ€‰11 | System OK |
| 11 | Inspect for failed drive belt idler and drive belt tensioner pulley bearings.<br><br>Did you find and repair the condition? | Go to Stepâ€‰12 | Go to Diagnostic Aids |
| 12 | Operate the system in order to verify the repair.<br><br>Did you correct the condition? | System OK | Go to Stepâ€‰2 |
| 13 | Replace the drive belt. Refer to Water Pump and Generator Belt Replacement.<br><br>Did you find this condition? | Go to Stepâ€‰16 | Go to Stepâ€‰14 |
| 14 | Inspect for the proper drive belt.<br><br>Did you find this condition? | Go to Stepâ€‰16 | Go to Stepâ€‰15 |
| 15 | Inspect for the drive belt rubbing against a bracket, hose, or wiring harness.<br><br>Did you find and repair the condition? | Go to Stepâ€‰17 | Go to Diagnostic Aids |
| 16 | Replace the drive belt. Refer to Water Pump and Generator Belt Replacement.<br><br>Did you complete the replacement? | Go to Stepâ€‰17 | â€” |
| 17 | Operate the system in order to verify the repair.<br><br>Did you correct the condition? | System OK | â€” |

## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Drive Belt | BELT,DRV | 0250A |

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. DIAGNOSTIC INFORMATION AND PROCEDURES
4.

## Oil Leak Diagnosis

| Step | Action | Yes | No |
|---|---|---|---|
| DEFINITION: You can repair most fluid leaks by first, visually locating the leak, repairing or replacing the component, or by resealing the gasket surface. Once the leak is identified, determine the cause of the leak. Repair the leak and the cause of the leak. | | | |
| 1 | 1. Operate the vehicle until it reaches normal operating temperature. Refer to Engine Mechanical Specifications.<br>2. Park the vehicle on a level surface over a large sheet of paper or other clean surface.<br>3. Wait 15â€‰minutes.<br>4. Inspect for drippings.<br>Are drippings present? | Go to Stepâ€‰2 | System OK |
| 2 | Can you identify the type of fluid and the approximate location of the leak? | Go to Stepâ€‰10 | Go to Stepâ€‰3 |
| 3 | 1. Visually inspect the suspected area. Use a small mirror to assist in looking at hard to see areas.<br>2. Inspect for leaks at the following locations:<br>3.<br>◦ Sealing surfaces<br>◦ Fittings<br>◦ Cracked or damaged components<br>Can you identify the type of fluid and the approximate location of the leak? | Go to Stepâ€‰10 | Go to Stepâ€‰4 |
| 4 | 1. Completely clean the entire engine and surrounding components.<br>2. Operate the vehicle for several miles at normal operating temperature and at varying speeds.<br>3. Park the vehicle on a level surface over a large sheet of paper or other clean surface.<br>4. Wait 15â€‰minutes.<br>5. Identify the type of fluid and the approximate location of the leak.<br>Can you identify the type of fluid and the approximate location of the leak? | Go to Stepâ€‰10 | Go to Stepâ€‰5 |
| 5 | 1. Visually inspect the suspected area. Use a small mirror to assist in looking at hard to see areas.<br>2. Inspect for leaks at the following locations:<br>3.<br>◦ Sealing surfaces<br>◦ Fittings<br>◦ Cracked or damaged components<br>Can you identify the type of fluid and the approximate location of the leak? | Go to Stepâ€‰10 | Go to Stepâ€‰6 |

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| Step | Action | Yes | No |
|---|---|---|---|
| 6 | 1. Completely clean the entire engine and surrounding components.<br>2. Apply an aerosol-type powder, for example, baby powder or foot powder, to the suspected area.<br>3. Operate the vehicle for several miles at normal operating temperature and at varying speeds.<br>4. Identify the type of fluid and the approximate location of the leak from the discolorations in the powder surface.<br>Can you identify the type of fluid and the approximate location of the leak? | Go to Stepâ€‰10 | Go to Stepâ€‰7 |
| 7 | 1. Visually inspect the suspected area. Use a small mirror to assist in looking at hard to see areas.<br>2. Inspect for leaks at the following locations:<br>3.<br>○ Sealing surfaces<br>○ Fittings<br>○ Cracked or damaged components<br>Can you identify the type of fluid and the approximate location of the leak? | Go to Stepâ€‰10 | Go to Stepâ€‰8 |
| 8 | Identify the type of fluid and the approximate location of the leak.<br>Can you identify the type of fluid and the approximate location of the leak? | Go to Stepâ€‰10 | Go to Stepâ€‰9 |
| 9 | 1. Visually inspect the suspected area. Use a small mirror to assist in looking at hard to see areas.<br>2. Inspect for leaks at the following locations:<br>3.<br>○ Sealing surfaces<br>○ Fittings<br>○ Cracked or damaged components<br>Can you identify the type of fluid and the approximate location of the leak? | Go to Stepâ€‰10 | System OK |
| 10 | 1. Inspect the engine for mechanical damage.<br>2. Special interest should be shown to the following areas:<br>3.<br>○ Higher than recommended fluid levels<br>○ Higher than recommended fluid pressures<br>○ Plugged or malfunctioning fluid filters or pressure bypass valves<br>○ Plugged or malfunctioning engine ventilation system<br>○ Improperly tightened or damaged fasteners<br>○ Cracked or porous components<br>○ Improper sealants or gaskets, where required<br>○ Improper sealant or gasket installation<br>○ Damaged or worn gaskets or seals<br>○ Damaged or worn sealing surfaces<br>4. Inspect the engine for customer modifications.<br>Is there mechanical damage or customer modifications to the engine? | Go to Stepâ€‰11 | System OK |

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| Step | Action | Yes | No |
|---|---|---|---|
| 11 | Repair or replace all damaged or modified components.<br><br>Did you complete the repair? | Go to Stepâ€‰1 | â€” |

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. DIAGNOSTIC INFORMATION AND PROCEDURES
4.

## Coolant in Engine Oil

| Cause | Correction |
|---|---|
| DEFINITION: Foamy or discolored oil or an engine oil overfill condition may indicate coolant entering the engine crankcase. Low coolant levels, an inoperative cooling fan, or a faulty thermostat may lead to an overtemperature condition which may cause engine component damage. Contaminated engine oil and oil filter should be changed.<br><br>1. Inspect the oil for excessive foaming or an overfill condition. Oil diluted by coolant may not properly lubricate the crankshaft bearings and may lead to component damage. Refer to lower engine noise, regardless of engine speed Lower Engine Noise, Regardless of Engine Speed.<br><br>2. Inspect by performing a cylinder leak-down test. During this test, excessive air bubbles within the cooling system may indicate a faulty gasket or damaged component.<br><br>3. Inspect by performing a cylinder compression test. Two cylinders side-by-side on the engine block with low compression may indicate a failed cylinder head gasket. Refer to Engine Compression Test. | |
| Faulty cylinder head gasket | Replace the head gasket and components as required. Refer to Engine Component Description. |
| Warped cylinder head | Replace the cylinder head and gasket. Refer to Engine Component Description. |
| Cracked cylinder head | Replace the cylinder head and gasket. |
| Cracked cylinder liner | Replace the components as required. |
| Cylinder head or block porosity | Replace the components as required. |

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. DIAGNOSTIC INFORMATION AND PROCEDURES
4.

## Engine Noise Under Load

| Cause | Correction |
|---|---|
| Low oil pressure | 1. Perform an oil pressure test. Refer to Oil Pressure Diagnosis and Testing.<br>2. Repair or replace as required. |
| Detonation or spark knock | Verify the correct operation of the ignition. Refer to Symptoms - Engine Controls. |
| Loose torque converter bolts | 1. Inspect the torque converter bolts and flywheel.<br>2. Repair as required. |
| Cracked flywheel â€“ automatic transmission | 1. Inspect the flywheel bolts and flywheel.<br>2. Repair as required. |
| Excessive connecting rod bearing clearance | Inspect the following components and repair as required:<br>1. The connecting rod bearings<br>2. The connecting rods<br>3. The crankshaft |
| Excessive crankshaft bearing clearance | Inspect the following components and repair as required:<br>1. The crankshaft bearings<br>2. The crankshaft journals<br>3. The cylinder block crankshaft bearing bore |

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. DIAGNOSTIC INFORMATION AND PROCEDURES
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## Engine Noise on Start-Up, but Only Lasting a Few Seconds

| Cause | Correction |
|---|---|
| Incorrect oil filter without anti-drainback feature | Install the correct oil filter. |
| Incorrect oil viscosity | 1. Drain the oil.<br>2. Install the correct viscosity oil. |
| High valve lash adjuster leak down rate | Replace the lash adjusters as required. |
| Worn crankshaft thrust bearing | 1. Inspect the thrust bearing and crankshaft.<br>2. Repair or replace as required. |
| Damaged or faulty oil filter by-pass valve | 1. Inspect the oil filter by-pass valve for proper operation.<br>2. Repair or replace as required. |
| Malfunctioning camshaft position actuators â€“ improper oil viscosity or contamination. The result is camshaft actuator locking pin does not lock | 1. Verify correct engine oil viscosity by changing the engine oil and filter. Reevaluate the concern.<br>2. Isolate the noise to a specific camshaft position actuator.<br>3. Replace the camshaft actuator, oil and filter. |

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. DIAGNOSTIC INFORMATION AND PROCEDURES
4.

## Base Engine Misfire without Internal Engine Noises

| Cause | Correction |
|---|---|
| • Abnormalities, severe cracking, bumps, or missing areas in the accessory drive belt<br>• Abnormalities in the accessory drive system and/or components may cause engine revolutions per minuteâ€‰(RPM) variations and lead to a misfire diagnostic trouble codeâ€‰(DTC). A misfire code may be present without an actual misfire condition. | Replace the drive belt. |
| • Worn, damaged, or mis-aligned accessory drive components or excessive pulley runout may lead to a misfire DTC.<br>• A misfire code may be present without an actual misfire condition. | Inspect the components, and repair or replace as required. |
| • A loose or improperly installed engine flywheel or crankshaft balancer<br>• A misfire code may be present without an actual misfire condition. | Repair or replace the flywheel and/or balancer as required. |
| • Restricted exhaust system<br>• A severe restriction in the exhaust flow can cause significant loss of engine performance and may set a DTC. Possible causes of restrictions include collapsed or dented pipes or plugged mufflers and/or catalytic converters. | Repair or replace as required. |
| Improperly installed or damaged vacuum hoses | Repair or replace as required. |
| Improper sealing between the intake manifold and cylinder heads or throttle body | Replace the intake manifold, gaskets, cylinder heads, and/or throttle body as required. |
| • Improperly installed or damaged manifold absolute pressureâ€‰(MAP) sensor<br>• The sealing grommet of the MAP sensor should not be torn or damaged. | Repair or replace the MAP sensor as required. |
| Damage to the MAP sensor housing | Replace the intake manifold. |
| • Worn or loose rocker arms<br>• The rocker arm bearing end caps and/or needle bearings should be intact and in the proper position. | Replace the valve rocker arms as required. |
| • Stuck valves<br>• Carbon buildup on the valve stem can cause the valve not to close properly. | Repair or replace as required. |
| Excessively worn or mis-aligned timing chain | Replace the timing chain and sprockets as required. |
| Worn camshaft lobes | Replace the camshaft and valve lifters. |
| • Excessive oil pressure<br>• A lubrication system with excessive oil pressure may lead to excessive valve lifter pump up and loss of compression. | 1. Perform an oil pressure test. Refer to Oil Pressure Diagnosis and Testing.<br>2. Repair or replace the oil pump as required. |

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| Cause | Correction |
| --- | --- |
| • Faulty cylinder head gaskets and/or cracking or other damage to the cylinder heads and engine block cooling system passages<br>• Coolant consumption may or may not cause the engine to overheat. | 1. Inspect for spark plugs saturated by coolant.<br>2. Inspect the cylinder heads, engine block, and/or head gaskets.<br>3. Repair or replace as required. |
| • Worn piston rings<br>• Oil consumption may or may not cause the engine to misfire. | 1. Inspect the spark plugs for oil deposits.<br>2. Inspect the cylinders for a loss of compression. Refer to Engine Compression Test.<br>3. Perform cylinder leak down and compression testing to identify the cause.<br>4. Repair or replace as required. |
| 1. A damaged crankshaft reluctor wheel.<br>2. A damaged crankshaft reluctor wheel can result in different symptoms depending on the severity and location of the damage.<br>• Systems with electronic communications, DIS or coil per cylinder, and severe reluctor ring damage may exhibit periodic loss of crankshaft position, stop delivering a signal, and then re-sync the crankshaft position.<br>• Systems with electronic communication, DIS or coil per cylinder, and slight reluctor ring damage may exhibit no loss of crankshaft position and no misfire may occur. However, a DTCâ€‰P0300 may be set.<br>• Systems with mechanical communications, high voltage switch, and severe reluctor ring damage may cause additional pulses and effect fuel and spark delivery to the point of generating a DTCâ€‰P0300 or P0336. | Replace the sensor and/or crankshaft as required. |

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. DIAGNOSTIC INFORMATION AND PROCEDURES
4.

## Base Engine Misfire with Abnormal Internal Lower Engine Noises

| Cause | Correction |
|---|---|
| • Abnormalities, severe cracking, bumps or missing areas in the accessory drive belt.<br>• Abnormalities in the accessory drive system and/or components may cause engine revolutions per minuteâ€‰(RPM) variations, noises similar to a faulty lower engine, and also lead to a misfire condition. A misfire code may be present without an actual misfire condition. | Replace the drive belt. |
| • Worn, damaged, or mis-aligned accessory drive components or excessive pulley runout.<br>• A misfire code may be present without an actual misfire condition. | Inspect the components, repair or replace as required. |
| • Loose or improperly installed engine flywheel or crankshaft balancer.<br>• A misfire code may be present without an actual misfire condition. | Repair or replace the flywheel and/or balancer as required. |
| • Worn piston rings.<br>• Oil consumption may or may not cause the engine to misfire. | 1. Inspect the spark plugs for oil deposits.<br>2. Inspect the cylinders for a loss of compression. Refer to Engine Compression Test.<br>3. Perform cylinder leak down and compression testing to determine the cause.<br>4. Repair or replace as required. |
| • Worn crankshaft thrust bearings.<br>• Severely worn thrust surfaces on the crankshaft and/or thrust bearing may permit fore and aft movement of the crankshaft, and create a diagnostic trouble codeâ€‰(DTC) without an actual misfire condition. | Replace the crankshaft and bearings as required. |

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. DIAGNOSTIC INFORMATION AND PROCEDURES
4.

## Base Engine Misfire with Abnormal Valve Train Noise

| Cause | Correction |
|---|---|
| • Worn or loose rocker arms.<br>• The rocker arm bearing end caps and/or needle bearings should intact within the rocker arm assembly. | Replace the valve rocker arms as required. |
| • Stuck valves<br>• Carbon buildup on the valve stem can cause the valve to not close properly. | Repair or replace as required. |
| Excessively worn or mis-aligned timing chain | Replace the timing chain and sprockets as required. |
| Worn camshaft lobes | Replace the camshaft and valve lash adjusters. |
| Sticking lifters | Replace as required. |

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. DIAGNOSTIC INFORMATION AND PROCEDURES
4.

## Base Engine Misfire with Coolant Consumption

| Cause | Correction |
|---|---|
| • Faulty cylinder head gasket and/or cracking, or other damage to the cylinder head and engine block cooling system passages.<br>• Coolant consumption may or may not cause the engine to overheat. | 1. Inspect for spark plugs saturated by coolant.<br>2. Perform a cylinder leak down test.<br>3. Inspect the cylinder head and engine block for damage to the coolant passages and/or a faulty head gasket.<br>4. Repair or replace as required. |

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2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. DIAGNOSTIC INFORMATION AND PROCEDURES
4.

## Base Engine Misfire with Excessive Oil Consumption

| Cause | Correction |
|---|---|
| Worn valves, valve guides, and/or valve stem oil seals | 1. Inspect the spark plugs for oil deposits.<br>2. Repair or replace as required. |
| • Worn piston rings<br>• Oil consumption may or may not cause the engine to misfire. | 1. Inspect the spark plugs for oil deposits.<br>2. Inspect the cylinders for a loss of compression. Refer to Engine Compression Test.<br>3. Perform cylinder leak down and compression testing to determine the cause.<br>4. Repair or replace as required. |

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
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4.

## Upper Engine Noise, Regardless of Engine Speed

| Cause | Correction |
|---|---|
| Low oil pressure | 1. Perform an oil pressure test. Refer to Oil Pressure Diagnosis and Testing.<br>2. Repair or replace as required. |
| Loose and/or worn valve rocker arm attachments | 1. Inspect the valve rocker arm stud, nut, or bolt.<br>2. Repair or replace as required. |
| Worn valve rocker arm | Replace the valve rocker arm. |
| Improper lubrication to the valve rocker arms | Inspect the following components and repair or replace as required:<br>1. The valve rocker arm<br>2. The valve lifter<br>3. The oil filter bypass valve<br>4. The oil pump and pump screen<br>5. The engine block oil galleries |
| Broken valve spring | Replace the valve spring. |
| Worn or dirty valve lifters | Replace the valve lifters. |
| Stretched or broken timing belt and/or damaged sprocket teeth | Replace the timing belt and sprockets. |
| Worn, damaged, or faulty timing belt tensioners | Replace tensioners |
| Worn engine camshaft lobes | 1. Inspect the engine camshaft lobes.<br>2. Replace the camshaft and valve lifters as required. |
| Worn valve guides or valve stems | Inspect the following components, and repair as required:<br>1. The valves<br>2. The valve guides |
| • Stuck valves<br>• Carbon on the valve stem or valve seat may cause the valve to stay open. | Inspect the following components and repair as required:<br>1. The valves<br>2. The valve guides |

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
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4.

## Lower Engine Noise, Regardless of Engine Speed

| Cause | Correction |
|---|---|
| Low oil pressure | 1. Perform an oil pressure test. Refer to Oil Pressure Diagnosis and Testing.<br>2. Repair or replace damaged components as required. |
| Worn accessory drive componentsâ€“ abnormalities, such as severe cracking, bumps, or missing areas in the accessory drive belt and/or misalignment of system components | 1. Inspect the accessory drive system.<br>2. Repair or replace as required. |
| Loose or damaged crankshaft balancer | 1. Inspect the crankshaft balancer.<br>2. Repair or replace as required. |
| Detonation or spark knock | Verify the correct operation of the ignition system. Refer to Symptoms - Engine Controls. |
| Loose torque converter bolts | 1. Inspect the torque converter bolts and flywheel.<br>2. Repair or replace as required. |
| Loose or damaged flywheel | Repair or replace the flywheel. |
| • Damaged oil pan, contacting the oil pump screen<br>• An oil pan that has been damaged, may improperly position the oil pump screen, preventing proper oil flow to the oil pump. | 1. Inspect the oil pan.<br>2. Inspect the oil pump screen.<br>3. Repair or replace as required. |
| Oil pump screen loose, damaged or restricted | 1. Inspect the oil pump screen.<br>2. Repair or replace as required. |
| Excessive piston-to-cylinder bore clearance | 1. Inspect the piston and cylinder bore.<br>2. Repair as required. |
| Excessive piston pin-to-bore clearance | 1. Inspect the piston, piston pin, and the connecting rod.<br>2. Repair or replace as required. |
| Excessive connecting rod bearing clearance | Inspect the following components and repair as required:<br>1. The connecting rod bearings<br>2. The connecting rods<br>3. The crankshaft<br>4. The crankshaft journals |
| Excessive crankshaft bearing clearance | Inspect the following components and repair as required:<br>1. The crankshaft bearings<br>2. The crankshaft journals |

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| Cause | Correction |
| --- | --- |
| • Incorrect piston, piston pin, and connecting rod installation<br>• Pistons must be installed with the mark, or dimple, on the top of the piston, facing the front of the engine. Piston pins must be centered in the connecting rod pin bore. | 1. Verify the pistons, piston pins and connecting rods are installed correctly.<br>2. Repair as required. |

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. DIAGNOSTIC INFORMATION AND PROCEDURES
4.

## Engine Will Not Crank - Crankshaft Will Not Rotate

| Cause | Correction |
|---|---|
| Seized accessory drive system component | 1. Remove accessory drive belts.<br>2. Rotate crankshaft by hand at the balancer or flywheel location. |
| Hydraulically locked cylinder<br>1. Coolant/antifreeze in cylinder<br>2. Oil in cylinder<br>3. Fuel in cylinder | 1. Remove spark plugs and check for fluid.<br>2. Inspect for broken head gasket.<br>3. Inspect for cracked engine block or cylinder head.<br>4. Inspect for a sticking fuel injector.<br>5. Inspect for cracked cylinder wall. |
| Seized automatic transmission torque converter | 1. Remove the torque converter bolts.<br>2. Rotate crankshaft by hand at the balancer or flywheel location. |
| Seized manual transmission | 1. Disengage the clutch.<br>2. Rotate crankshaft by hand at the balancer or flywheel location. |
| Broken timing chain and/or gears | 1. Inspect timing chain and gears.<br>2. Repair as required. |
| Seized balance shaft | 1. Inspect balance shaft.<br>2. Repair as required. |
| Material in cylinder<br>1. Broken valve<br>2. Piston material<br>3. Foreign material<br>4. Cracked cylinder wall | 1. Inspect cylinder for damaged components and/or foreign materials.<br>2. Inspect for fallen cylinder wall.<br>3. Repair or replace as required. |
| Seized crankshaft or connecting rod bearings | 1. Inspect crankshaft and connecting rod bearings.<br>2. Inspect for fallen cylinder wall.<br>3. Repair as required. |
| Bent or broken connecting rod | 1. Inspect connecting rods.<br>2. Repair as required. |
| Broken crankshaft | 1. Inspect crankshaft.<br>2. Repair as required. |

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
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4.

## Crankcase Ventilation System Inspection/Diagnosis

### Results of Incorrect Operation

A plugged positive crankcase ventilation (PCV) orifice or hose may cause the following conditions:

- Rough idle
- Stalling or slow idle speed
- Oil leaks
- Oil in the throttle body
- Sludge in the engine

### Functional Check

With these systems, any blow-by in excess of the system capacity, from a badly worn engine, sustained heavy load, etc., is exhausted into the throttle body and is drawn into the engine.

Proper operation of the crankcase ventilation system depends upon a sealed engine. If oil slugging or dilution is noted and the crankcase ventilation system is functioning properly, check the engine for a possible cause. Correct any problems.

If an engine is idling rough, inspect for a clogged PCV orifice, a dirty vent filter, air cleaner element, or plugged hose. Replace as required. Use the following procedure:

1. Remove the PCV hose from the cylinder head cover.
2. Operate the engine at idle.
3. Place your thumb over the end of the hose in order to check for a vacuum. If there is no vacuum at the hose, inspect for the following items:
4.
    - Plugged hoses
    - The manifold port
5. Turn OFF the engine.
6. Inspect the PCV orifice in the cylinder head cover for debris or blockage.

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Repair Instructions

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Water Pump and Generator Belt Replacement (LKY)

Special Tools

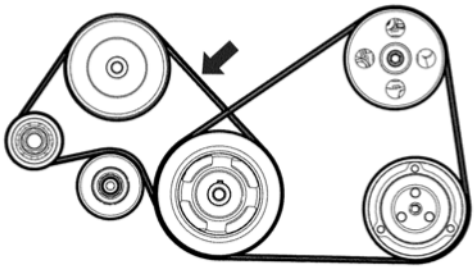
*GE-50576* Acoustic Belt Tension Tester

For equivalent regional tools, refer to Special Tools.

### Removal Procedure

1. Support and raise the vehicle. Refer to Lifting and Jacking the Vehicle.

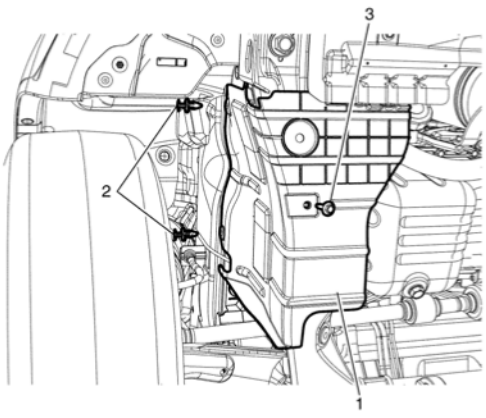
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2.
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3. Note the routing of the water pump and generator belt.

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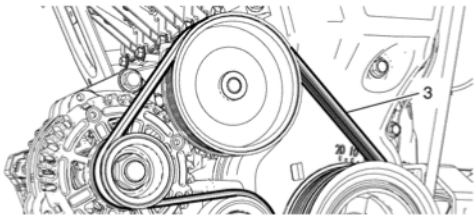


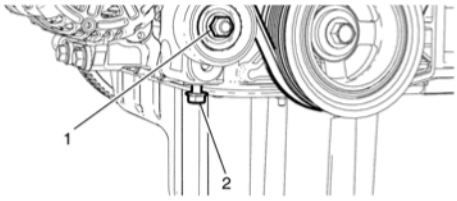
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5. Remove the front compartment splash shield retainersâ€‰(2) and boltâ€‰(3).
6. Remove the front compartment splash shieldâ€‰(1).
7. Warning:

   Always allow the engine to cool before servicing the engine system. Failure to follow this instruction may result in serious personal injury.
8. Remove the air conditioning compressor belt, if applicable. Refer to Air Conditioning Compressor Belt Replacement.

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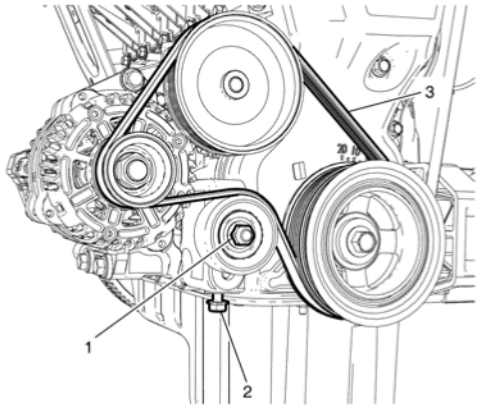



9. [Click here for full size]

10. Loosen the generator bracket with tensioner nutâ€‰(1).
11. Rotate the generator bracket with tensioner adjustment boltâ€‰(2) 12 full turns counterclockwise to relieve the belt tension.
12. Remove the water pump and generator beltâ€‰(3).

## Installation Procedure

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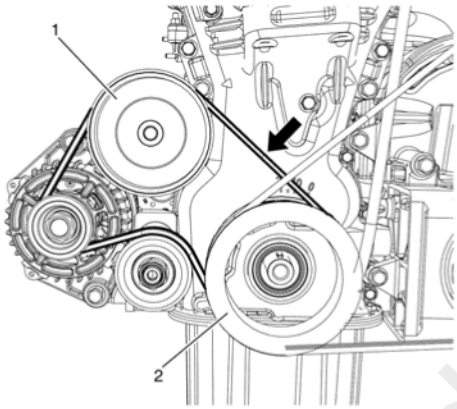

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1. Click here for full size
2. Install the water pump and generator beltâ€‰(3).
3. Note:

   Make sure tensioner adjustment bolt is properly seated and perpendicular to the pulley.
4. Apply tension to belt by rotating adjusting boltâ€‰(2) 12 full turns clockwise.
5. Caution:

   Refer to Fastener Caution.
6. Note:

   The water pump and generator belt tensioner nut must be tightened prior to measuring the tension or an inaccurate belt tension will occur.
7. Tighten the generator bracket with tensioner nutâ€‰(1) to 55â€‰N-m (41â€‰lbâ€‰ft).
8. Rotate engine one full revolution.




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9.

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10. Note:

    If there are loud sources of noise nearby, the values measured by the acoustic belt tester may not correspond to actual values.

11. Note:

    Space between tension gauge and the belt should be around 10â€‰mm apart.

12. Use *GE-50576* acoustic belt tension tester to measure the drive belt tension.

13.

    1. Locate *GE-50576* acoustic belt tension tester near the center of the belt span between the water pump pulley and crankshaft pulley.
    2. Locate a finger on the center of the belt span between water pump pulleyâ€‰(1) and crankshaft pulleyâ€‰(2). Pluck the belt between the water pump pulley and the crankshaft pulley. Repeat 3 times to get an average tension result on *GE-50576* acoustic belt tension tester.
    3. The drive belt tension should be set to the following specification:
    4. Specifications
        - Used belt: 261â€“272â€‰Hz
        - New belt: 319â€“330â€‰Hz

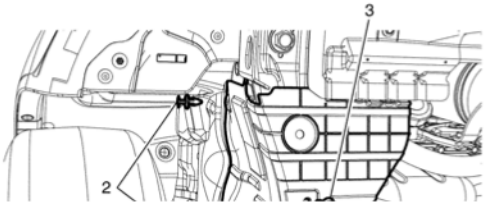
14. If the measured belt tension does not meet specification, please repeat step 2â€“5.

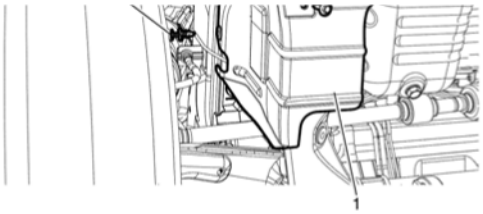
15.

    - Used belt: Vehicle driven for greater than 10â€‰miles.
    - New belt: New service parts with the vehicle driven less than 10â€‰miles.

16. Install the air conditioning compressor belt, if applicable. Refer to Air Conditioning Compressor Belt Replacement.

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17. Click here for full size
18. Install the front compartment splash shieldâ€‰(1).
19. Install the front compartment splash shield retainersâ€‰(2) and boltâ€‰(3).
20. Tighten the bolt (3) to 9â€‰N-m (80â€‰lbâ€‰in).
21. Lower the vehicle.

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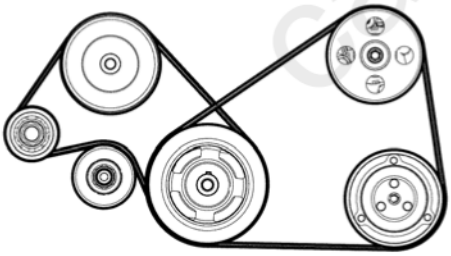
1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Drive Belt Replacement

### Removal Procedure

1. Open the hood.
2. Remove the air cleaner inlet duct. Refer to Air Cleaner Assembly Replacement.

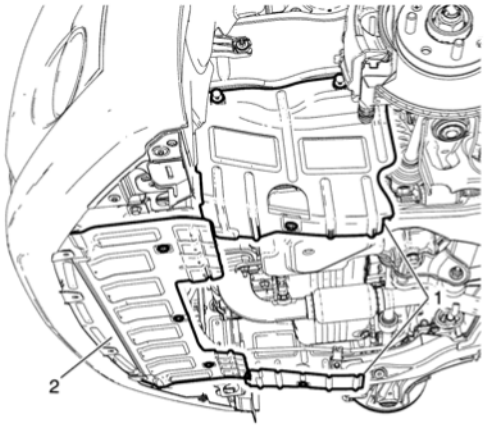
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3.
Click here for full size

4. Note the routing of the drive belt.
5. Remove the power steering pump belt. Refer to Power Steering Pump Belt Replacement.
6. Raise the vehicle.

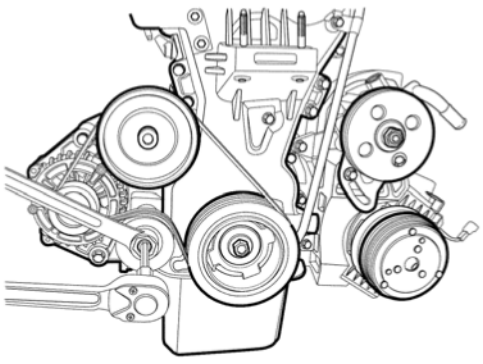
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7.
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8. Remove the right front compartment splash shieldâ€‰(1).

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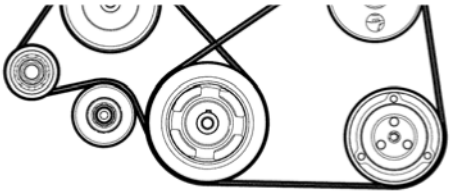


9. Click here for full size
10. Rotate the inner hex of the tensioner nut counterclockwise and loosen the nut.
11. Rotate the outer hex of the tensioner nut clockwise and put down the tensioner.
12. Remove the drive belt.

## Installation Procedure

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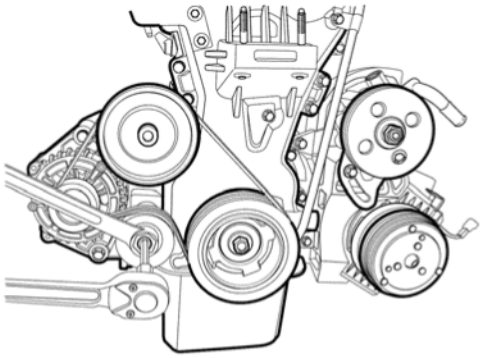


1. Click here for full size
2. Note:

   Make sure the drive belt is correctly aligned and seated into the grooves of the accessory drive pulleys.

3. Install and correctly route the drive belt around the following:
4. 
   - Water pump pulley
   - Alternator
   - Drive belt tensioner
   - Crankshaft balancer
   - Air conditioning compressor
   - Idler pulley
   - Power steering pump

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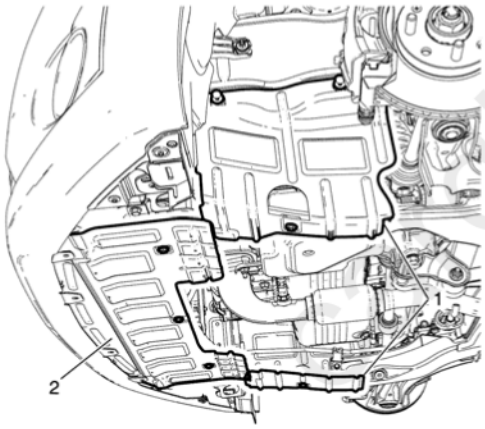


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5. Click here for full size
6. Rotate the outer hex of the tensioner nut counterclockwise and put up the tensioner with a suitable interchangeable head, click-type torque wrench.
7. Tighten
    - New Belt: 24â€‰N-m (18â€‰lbâ€‰ft)

- Used Belt: 17.5â€‰N-m (13â€‰lbâ€‰ft)

8. Rotate the inner hex of the tensioner nut clockwise and tighten the nut to 45â€‰N-m (33â€‰lbâ€‰ft).
9. Install the power steering pump belt. Refer to Power Steering Pump Belt Replacement.



10. Click here for full size

11. Install the right front compartment splash shieldâ€‰(1).

12. Lower the vehicle.

13. Install the air cleaner inlet duct. Refer to Air Cleaner Assembly Replacement.

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

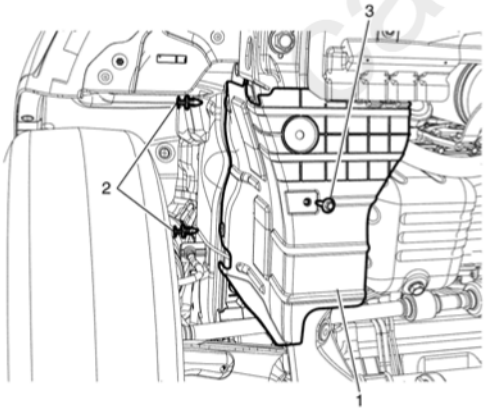
## Water Pump and Generator Belt Tension Inspection (LKY)

Special Tools

*GE-50576* Acoustic Belt Tension Tester

For equivalent regional tools, refer to Special Tools.

1. Support and raise the vehicle. Refer to Lifting and Jacking the Vehicle.



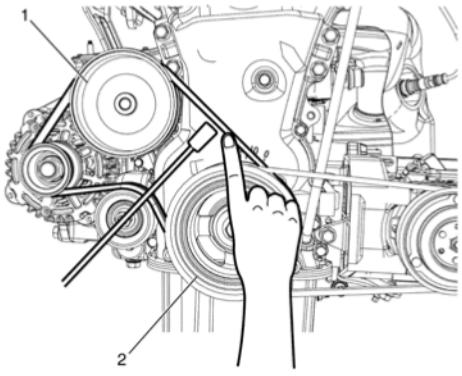

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2.
Click here for full size

3. Remove the front compartment splash shield retainersâ€‰(2) and boltâ€‰(3).

4. Remove the front compartment splash shieldâ€‰(1).

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5. Click here for full size
6. Warning:

   Always allow the engine to cool before servicing the engine system. Failure to follow this instruction may result in serious personal injury.

7. Note:

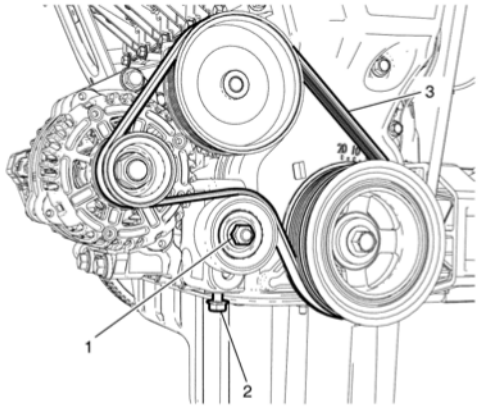
   Space between tension gauge and the belt should be around 10â€‰mm apart.

8. Use *GE-50576* acoustic belt tension tester to measure the drive belt tension.

9.

   1. Locate *GE-50576* acoustic belt tension tester near the center of the belt span between water pump pulley and crankshaft pulley.
   2. Locate a finger on the center of the belt span between water pump pulleyâ€‰(1) and crankshaft pulleyâ€‰(2). Pluck the belt between the water pump pulley and the crankshaft pulley. Repeat 3 times to get an average tension result on *GE-50576* acoustic belt tension tester.
   3. If water pump and generator belt tension is 176â€“272â€‰Hz, the belt tension is within specification. Go to stepâ€‰9.
   4. If water pump and generator belt tension is not within the specification, 176â€“272â€‰Hz, inspect the belt for excessive wear, fraying or cracking. Replace the belt as necessary. Refer to Water Pump and Generator Belt Replacement.
   5. If water pump and generator belt tension is not within the specification, 176â€“272â€‰Hz and is not worn, frayed or cracked, go to stepâ€‰5.

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10. Click here for full size
11. Loosen the generator bracket with tensioner nutâ€‰(1).
12. Adjust the belt tension by the following:
13.
    1. Apply tension to the water pump and generator belt by turning the adjusting boltâ€‰(2) clockwise.
    2. Relieve tension by turning the adjusting boltâ€‰(2) counterclockwise.
14. Caution:

    Refer to Fastener Caution.
15. Note:

    Make sure tensioner adjustment bolt is properly seated and perpendicular to the pulley.

16. Note:

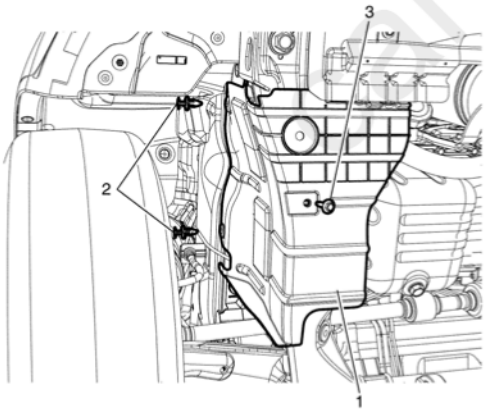
    The water pump and generator belt tensioner nut must be tightened prior to measuring the tension or an inaccurate belt tension will occur.

17. Tighten the generator bracket with tensioner nutâ€‰(1) to 55â€‰N-m (41â€‰lbâ€‰ft).

18. Check the water pump and generator belt tension using *GE-50576* acoustic belt tension tester.

19.

    1. If the measured belt tension is between 261â€“272â€‰Hz, go to stepâ€‰9.
    2. If the measured tension does not meet specification, repeat stepsâ€‰5â€“8.




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20.
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21. Install the front compartment splash shieldâ€‰(1).
22. Install the front compartment splash shield retainersâ€‰(2) and boltâ€‰(3). Tighten the boltâ€‰(3) to 9â€‰N-m (80â€‰lbâ€‰in).
23. Lower the vehicle.

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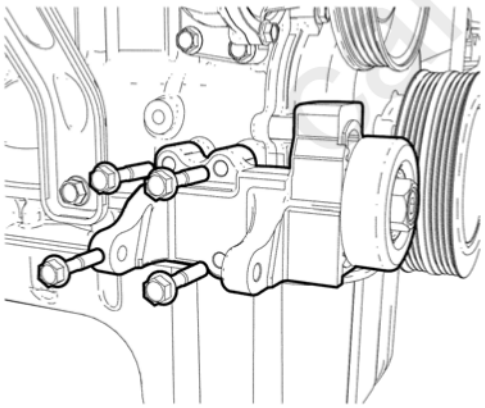
1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Drive Belt Tensioner Replacement

### Removal Procedure

1. Remove the water pump and generator belt. Refer to Water Pump and Generator Belt Replacement.
2. Remove the generator. Refer to Generator Replacement.

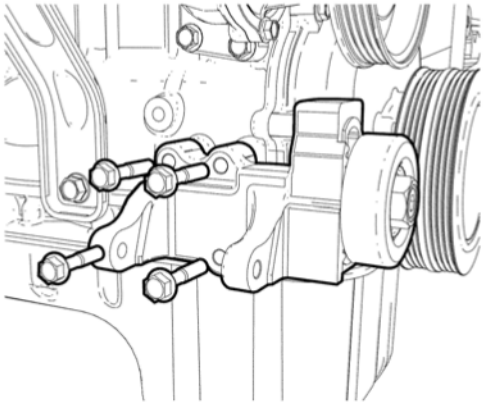
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3. Click here for full size
4. Remove the drive belt tensioner retaining bolts.
5. Remove the drive belt tensioner.

## Installation Procedure

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1. Click here for full size
2. Install the drive belt tensioner.
3. Caution:

   Refer to Fastener Caution.
4. Tighten the drive belt tensioner retaining bolts to 22â€‰N-m (16â€‰lbâ€‰ft).
5. Install the water pump and generator belt. Refer to Water Pump and Generator Belt Replacement.

## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Drive Belt Tensioner | TENSIONER,DRV BELT | 3100A |
| Drive Belt Tensioner | TENSIONER,DRV BELT | 2000A |
| Drive Belt Tensioner | TENSIONER,DRV BELT (W/BOLT) | 2002A |
| Drive Belt Tensioner | TENSIONER KIT,DRV BELT | 5619Z |
| Drive Belt Tensioner | TENSIONER,DRV BELT | 5620A |
| Drive Belt Tensioner | TENSIONER,DRV BELT | SJ266 |

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Power Steering Pump Belt Replacement

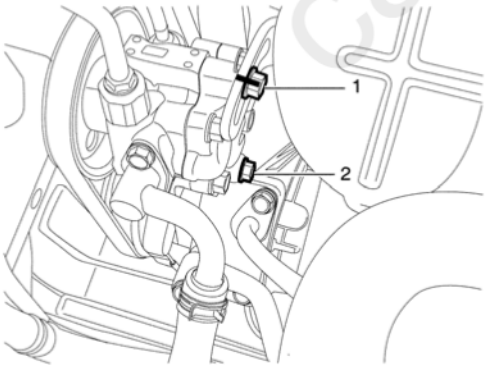
### Removal Procedure

1. Note:

   Mark on the retaining bolt with the power steering pump bracket before removal.

2. Remove the air cleaner inlet duct. Refer to Air Cleaner Assembly Replacement.

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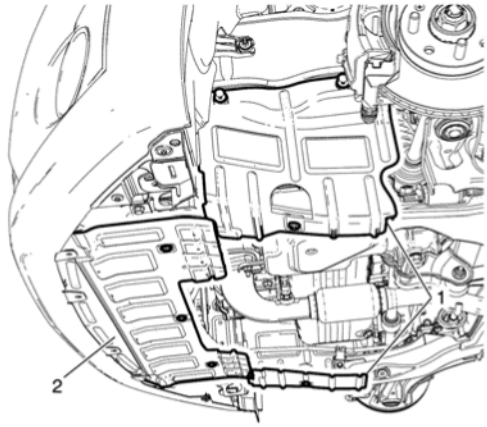
3. Click here for full size
4. Note:

   Do not remove bolts.

5. Loosen power steering pump retaining boltsâ€‰(1,2).

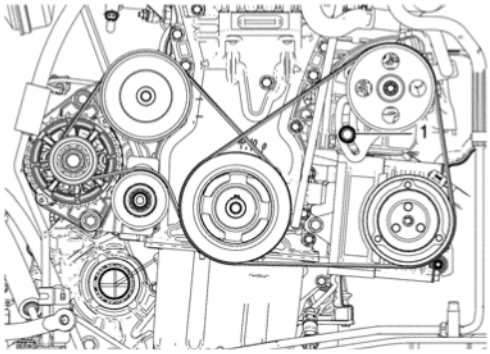
6. Raise the vehicle.

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7.
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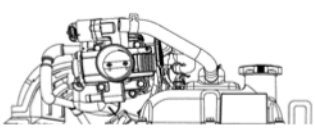
8. Remove the right front compartment splash shieldâ€‰(1).



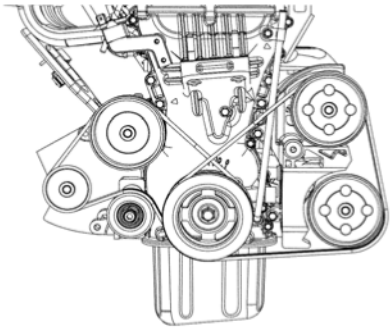

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9. Click here for full size
10. Loosen the boltâ€‰(1).
11. Remove the power steering pump belt.

## Installation Procedure

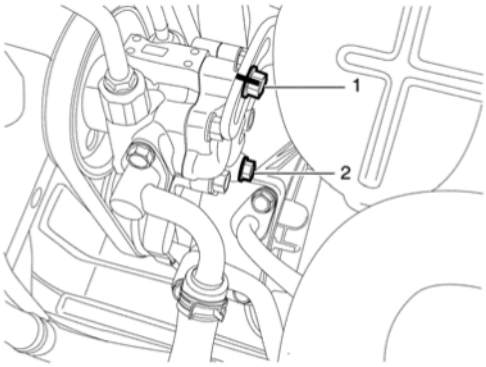


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1. Click here for full size
2. Install the power steering pump belt.
3. Lower the vehicle.

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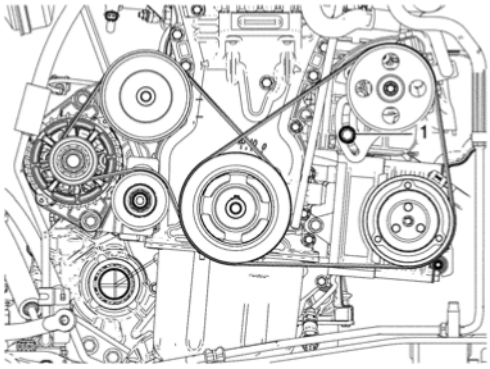



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4. Click here for full size
5. Caution:

   Refer to Fastener Caution.

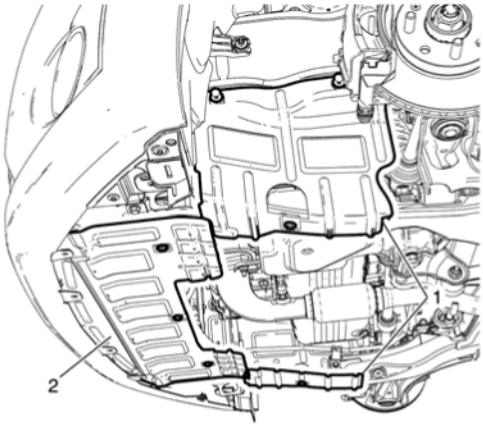
6. Pull the power steering pump to the marking position and tighten boltsâ€‰(1,2) to 22â€‰N-m (16â€‰lbâ€‰ft).
7. Raise the vehicle.




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8. Click here for full size

9. Tighten the boltâ€‰(1) to 22â€‰N-m (16â€‰lbâ€‰ft).




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10. Click here for full size
11. Install the right front compartment splash shieldâ€‰(1).
12. Lower the vehicle.
13. Install the air cleaner inlet duct. Refer to Air Cleaner Assembly Replacement.

1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Engine Mount Replacement (with CH-49290)

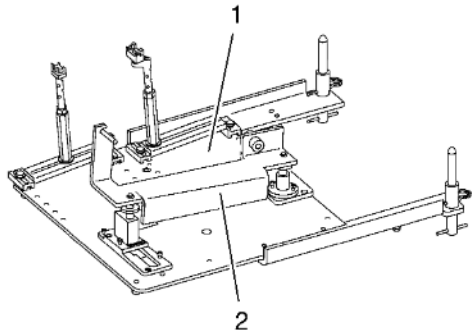
Special Tools

- *CH-904* Base Frame
- *CH-49290* Engine Support Tool

For equivalent regional tools, refer to Special Tools.

### Removal Procedure

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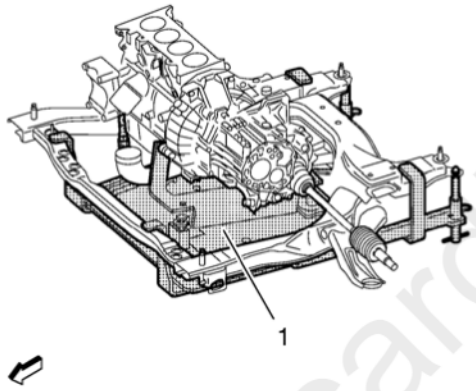

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1. Click here for full size
2. Note:

   The manual that is supplied with the special tool, is also available online. Go to https://gmtoolsandequipment.com.

3. Assemble the *CH-49290* support toolâ€‰(1) according to the details provided in the installation manual.

4. Install the torque supportâ€‰(2) to the engine.
5. Support the *CH-904* base frame on a jack.
6. Support the *CH-49290* support tool on the *CH-904* base frame.



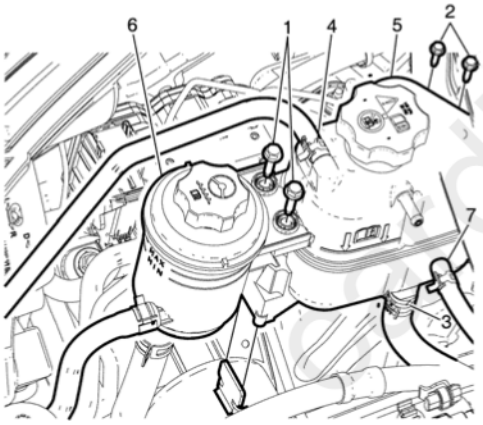

7. Click here for full size

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8. Note:

   The manual that is supplied with the special tool, is also available online. Go to https://gmtoolsandequipment.com.

9. Install the *CH-49290* support toolâ€‰(1) according to the details provided in the installation manual.



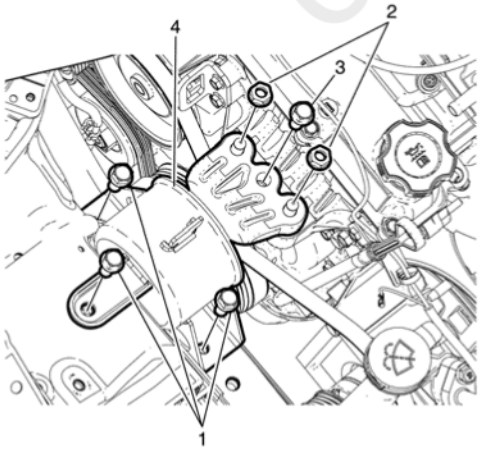

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10. Click here for full size
11. Note:

    DO not remove power steering fluid hose and coolant hose from power steering fluid reservoir and coolant surge tank.

12. Remove 2â€‰power steering fluid reservoir boltsâ€‰(1) and unclip power steering fluid reservoir and support it on the engine.
13. Remove the 2â€‰boltsâ€‰(2).
14. Reposition and retain the coolant surge tankâ€‰(5) away from the engine mount in order to provide clearance for removal of the engine mount.

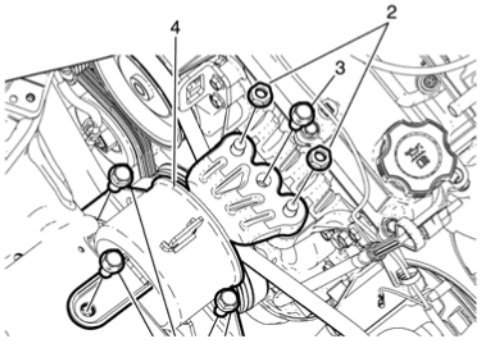
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15. Click here for full size
16. Remove the 2â€‰engine mount nutsâ€‰(2).
17. Remove the engine mount boltâ€‰(3).
18. Remove the 3â€‰engine mount to body retaining boltsâ€‰(1).
19. Remove the engine mountâ€‰(4).

## Installation Procedure

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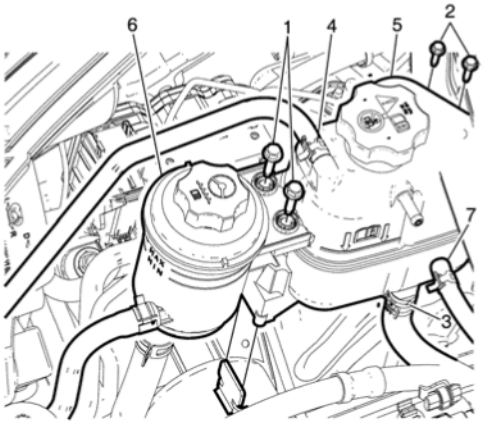





1. Click here for full size
2. Install the engine mountâ€‰(4).
3. Caution:

   Refer to Fastener Caution.
4. Install the 3â€‰engine mount to body retaining boltsâ€‰(1) and tighten to 50â€‰N-mâ€‰(37â€‰lbâ€‰ft).
5. Install the boltâ€‰(3) and tighten to 66N-m (49 lb ft).
6. Install the 2â€‰nutsâ€‰(2) and tighten to 66N-m (49 lb ft).

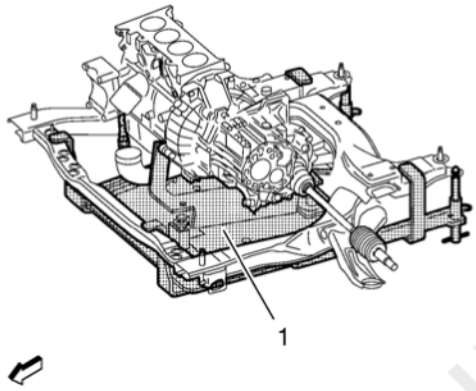
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7. [Click here for full size]

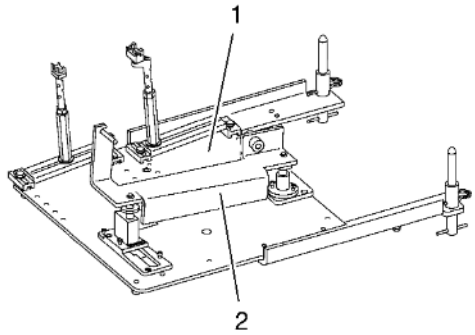
8. Install the coolant surge tankâ€‰(5).
9. Tighten 2â€‰boltsâ€‰(2) to 9â€‰N-mâ€‰(80â€‰lbâ€‰in).
10. Clip power steering fluid reservoir to coolant serge tank.
11. Tighten 2â€‰boltsâ€‰(1) to 9â€‰N-mâ€‰(80â€‰lbâ€‰in).

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12. Click here for full size
13. Remove the *CH-49290* engine support toolâ€‰(1)
14. Remove the *CH-49290* engine support tool from the *CH-904* base frame.
15. Remove the *CH-904* base frame from the jack.

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16. Click here for full size
17. Note:

    The manual that is supplied with the special tool, is also available online. Go to https://gmtoolsandequipment.com.

18. Disassemble the *CH-49290* support toolâ€‰(1) according to the details provided in the installation manual.

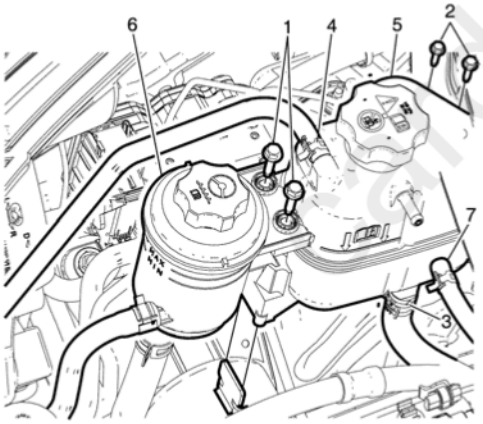
19. Remove the torque supportâ€‰(2) from the engine.

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Engine Mount Replacement (LKY)

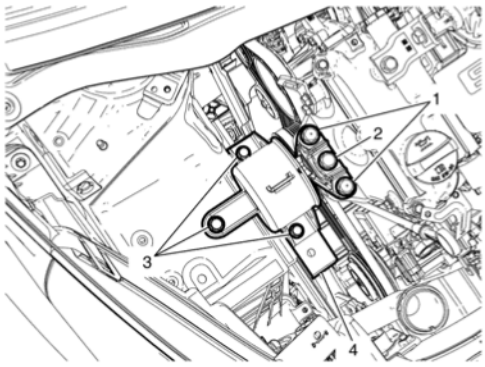
### Removal Procedure




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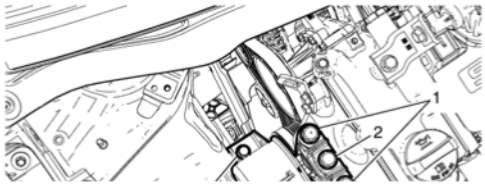
1. Click here for full size
2. Remove power steering fluid reservoir boltsâ€‰(1) and unclip power steering fluid reservoir and support it on the engine.
3. Remove the radiator surge tank mounting bolt (2) and reposition the radiator surge tank aside.
4. Install the engine support fixture. Refer to Engine Support Fixture.
5. Prior to removing the mount, mark the mount location using spray paint or a marker for correct positioning during installation.

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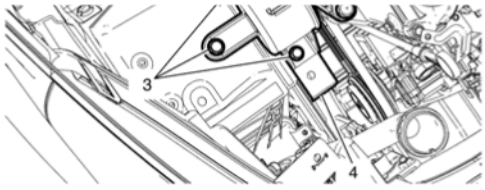


6. Click here for full size
7. Remove the engine mount nutsâ€‰(1).
8. Remove the engine mount boltâ€‰(2).
9. Remove the engine mount to body retaining boltsâ€‰(3).
10. Remove the engine mountâ€‰(4).
11. Transfer parts as necessary.

## Installation Procedure



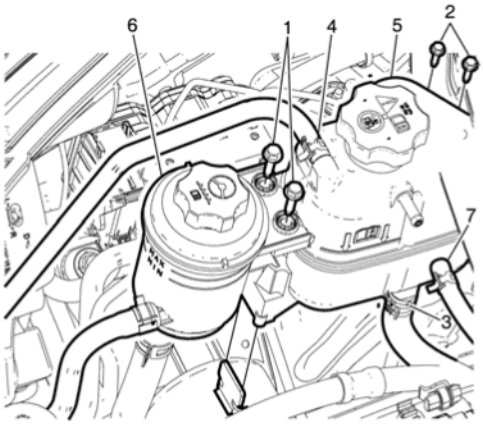

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1. Click here for full size
2. Install the engine mountâ€‰(4).
3. Caution:

   Refer to Fastener Caution.
4. Install the engine mount to body retaining boltsâ€‰(1) and tighten to 50â€‰N-m (36â€‰lbâ€‰ft).
5. Install the engine mount bolt (2), nuts (1) and tighten to 66â€‰N-m (49â€‰lbâ€‰ft).
6. Remove the engine support fixture. Refer to Engine Support Fixture.

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7. Click here for full size
8. Install the radiator surge tank mounting bolts (2) and tighten to 8â€‰N-m (71â€‰lbâ€‰in).
9. Install power steering fluid reservoir bolts (1) and tighten to 9â€‰N-m (80â€‰lbâ€‰in).

1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Engine Mount Replacement (with EN-50176)

Special Tools

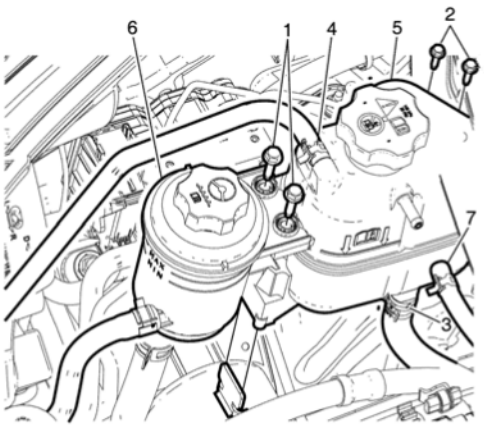
- *EN-48244* Engine Assembly Supporter
- *EN-49802* Cradle Supporter
- *EN-50177* Cradle Supporter Holder

For equivalent regional tools, refer to Special Tools.

### Removal Procedure

1. Support the engine using special tools. Refer to Engine/Transmission Mounting.

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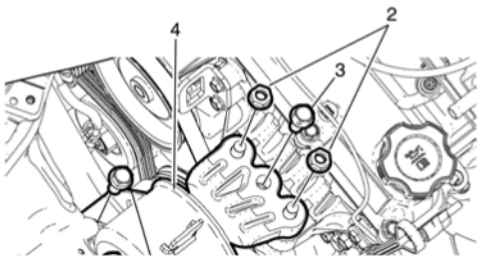


2. Click here for full size
3. Note:

   DO not remove power steering fluid hose and coolant hose from power steering fluid reservoir and coolant surge tank.

4. Remove power steering fluid reservoir boltsâ€‰(1) and unclip power steering fluid reservoir and support it on the engine.
5. Remove the boltsâ€‰(2).
6. Reposition and retain the coolant surge tankâ€‰(5) away from the engine mount in order to provide clearance for removal of the engine mount.

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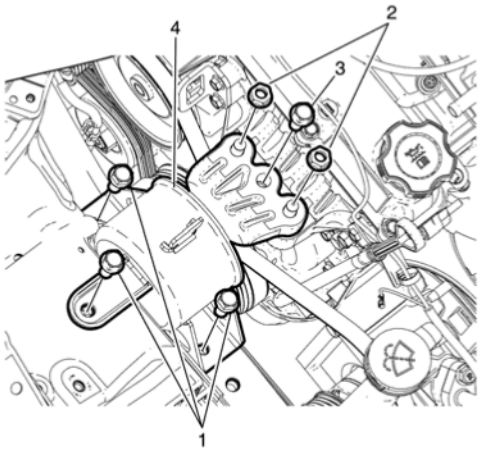





7. Click here for full size
8. Remove the engine mount nutsâ€‰(2).
9. Remove the engine mount boltâ€‰(3).
10. Remove the engine mount to body retaining boltsâ€‰(1).
11. Remove the engine mountâ€‰(4).

## Installation Procedure

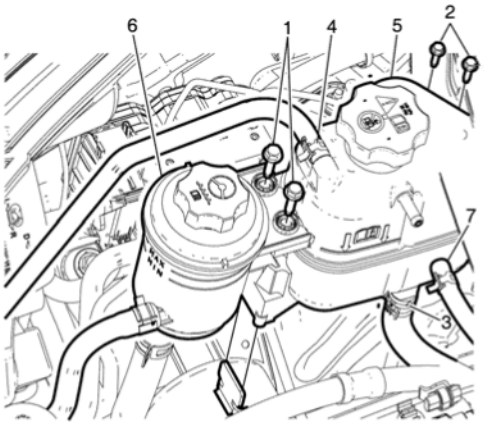
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1. Click here for full size
2. Install the engine mountâ€‰(4).
3. Caution:

   Refer to Fastener Caution.
4. Install the engine mount to body retaining boltsâ€‰(1) and tighten to 50â€‰N-m (36â€‰lbâ€‰ft).
5. Install the boltâ€‰(3) and tighten to 66N-m (49 lb ft).
6. Install the nutsâ€‰(2) and tighten to 66N-m (49 lb ft).




7. Click here for full size
8. Install the coolant surge tankâ€‰(5).
9. Tighten boltsâ€‰(2) to 9â€‰N-m (80â€‰lbâ€‰in).
10. Clip power steering fluid reservoir to coolant surge tank.

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11. Tighten boltâ€‰(1) to 9â€‰N-m (80â€‰lbâ€‰in).
12. Remove special tools. Refer to Engine/Transmission Mounting.

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Engine/Transmission Mounting (with CH-49289 and CH-49290)

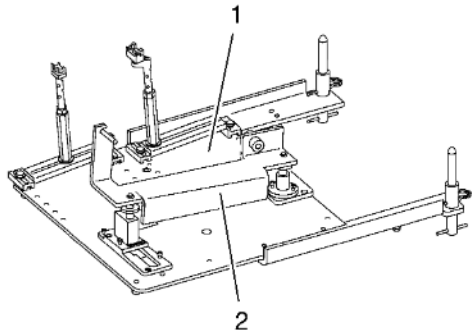
Special Tools

- *CH-904* Base Frame
- *CH-49289* Centering Frame
- *CH-49290* Engine Support Tool

For equivalent regional tools, refer to Special Tools.

Assemble the CH-49290 Engine Support Tool

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1. Click here for full size
2. Note:

   The manual that is supplied with the special tool, is also available online. Go to https://gmtoolsandequipment.com.

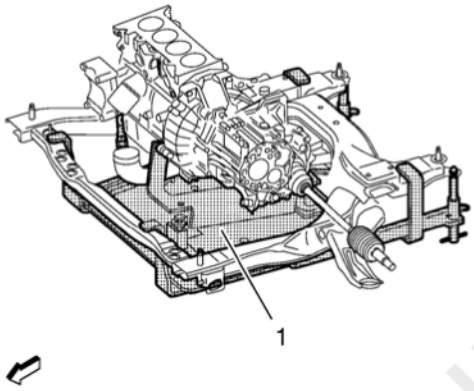
3. Assemble the *CH-49290* engine support toolâ€‰(1) according to the details provided in the installation manual.

4. Install the torque supportâ€‰(2) to the engine.

Install the CH-49290 Engine Support Tool

1. Support the *CH-904* base frame on a jack.
2. Support the *CH-49290* engine support tool on the *CH-904* base frame.

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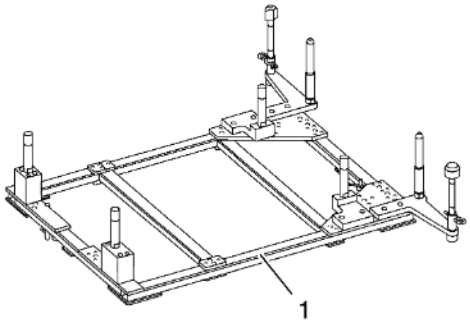

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3. Click here for full size
4. Note:

   The manual that is supplied with the special tool, is also available online. Go to https://gmtoolsandequipment.com.

5. Install the *CH-49290* engine support toolâ€‰(1) according to the details provided in the installation manual.

Assemble the CH-49289 Centering Frame




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Click here for full size

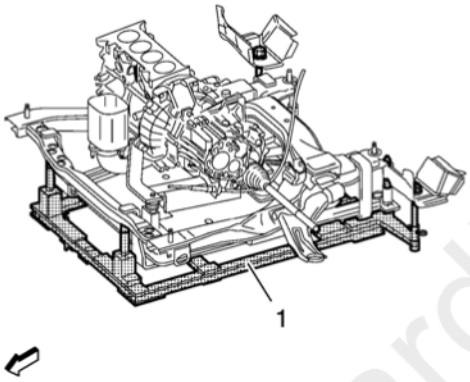
Note:

The manual that is supplied with the special tool, is also available online. Go to https://gmtoolsandequipment.com.

Assemble the *CH-49289* centering frameâ€‰(1) according to the details provided in the installation manual.

Install the CH-49289 Centering Frame

1. Support the *CH-49289* centering frame on the *CH-904* base frame.



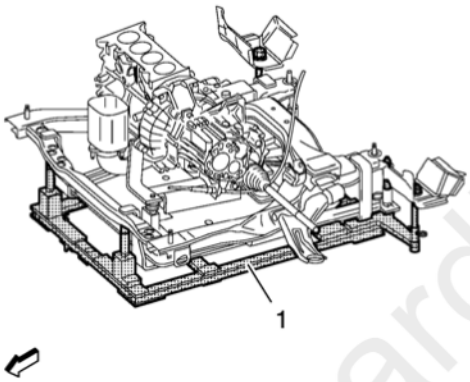

2. Click here for full size
3. Note:

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The manual that is supplied with the special tool, is also available online. Go to https://gmtoolsandequipment.com.

4. Install the *CH-49289* centering frameâ€‰(1) according to the details provided in the installation manual.

   Remove the CH-49289 Centering Frame



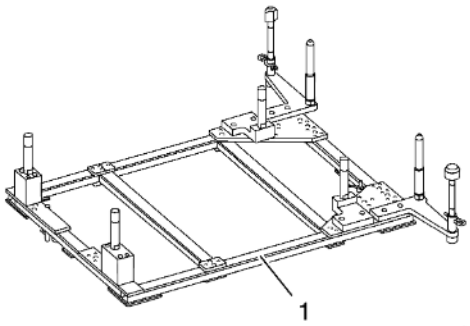

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1. Click here for full size

2. Remove the *CH-49289* centering frameâ€‰(1)

2. Remove the *CH-49289* centering frameâ€‰(1).
3. Remove the *CH-49289* centering frame from the *CH-904* base frame.

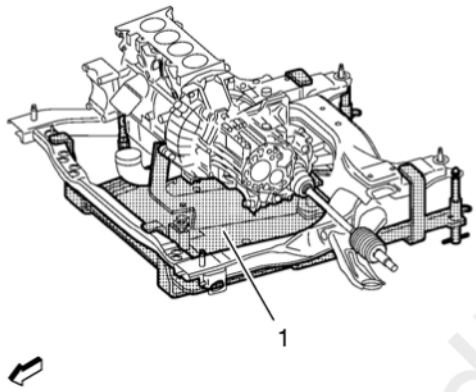
Disassemble the CH-49289 Centering Frame




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Disassemble the *CH-49289* centering frameâ€‰(1).

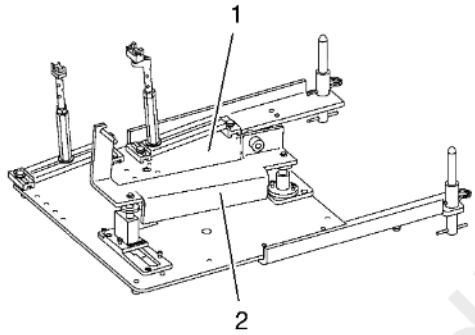



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1. Click here for full size
2. Remove the *CH-49290* engine support toolâ€‰(1).
3. Remove the *CH-49290* engine support tool from the *CH-904* base frame.

4. Remove the *CH-904* base frame from the jack.

   Disassemble the CH-49290 Engine Support Tool




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1. Click here for full size

2. Disassemble the *CH-49290* engine support toolâ€‰(1).

3. Remove the torque supportâ€‰(2) from the engine.

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Engine/Transmission Mounting (with EN-49802 and EN-50176)

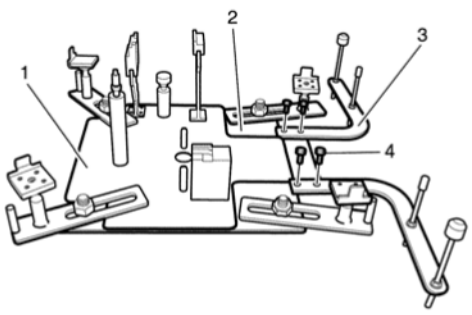
Special Tools

- *EN-50176* Powertrain Support Pallet
- *EN-50177* Cradle Supporter Holder
- *EN-49802* Cradle Supporter
- *EN-48244* Engine Assembly Remove/Install Pallet Supporter

For equivalent regional tools, refer to Special Tools.

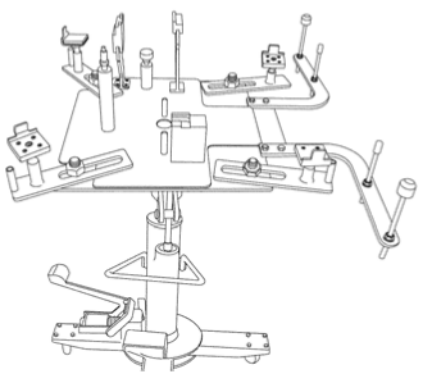
### Prepare the EN-50176 And EN-49802 for Mounting Engine/Transmission

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1. Click here for full size
2. Install the adapterâ€‰(3) to *EN-49802* cradle supporter (2).
3. Install the boltsâ€‰(4).
4. Install the *EN-50176* powertrain support pallet (1) to *EN-49802* cradle supporter (2).

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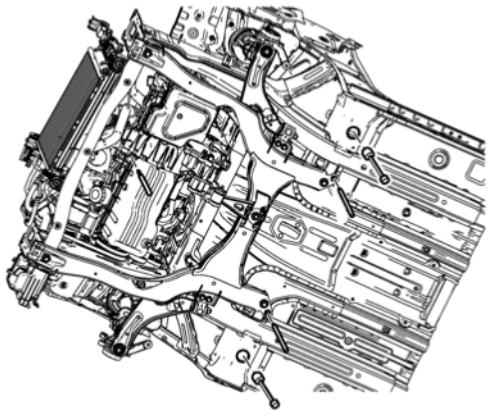


5. Click here for full size
6. Support the *EN-50176* powertrain support pallet and *EN-49802* cradle supporter with a jack.
7. To secure, install the bolts and nuts to a hole between *EN-50176* support pallet , *EN-49802* cradle supporter and a jack.

## Installation Procedure

1. Raise the vehicle to full height. Refer to Lifting and Jacking the Vehicle.
2. Remove the front compartment insulator. Refer to Front Bumper Fascia Opening Lower Cover Replacement.

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3. [Click here for full size]

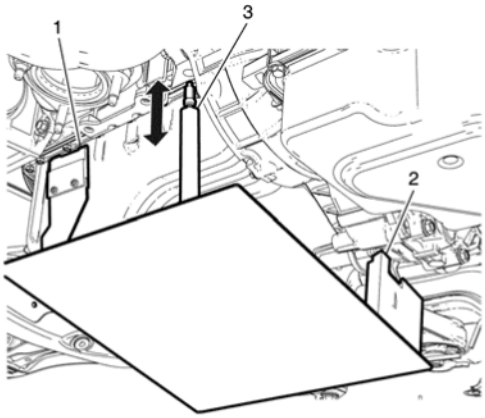
4. Position the *EN-50176* powertrain support pallet , *EN-49802* cradle supporter with a jack under the powertrain.

5. Note**:**

   Ensure that the 4â€‰pins are fixed in holes of the cradle and the body frame.

6. Observing the 5â€‰points as shown, raise the *EN-50176* powertrain support pallet , *EN-49802* cradle supporter with a jack.

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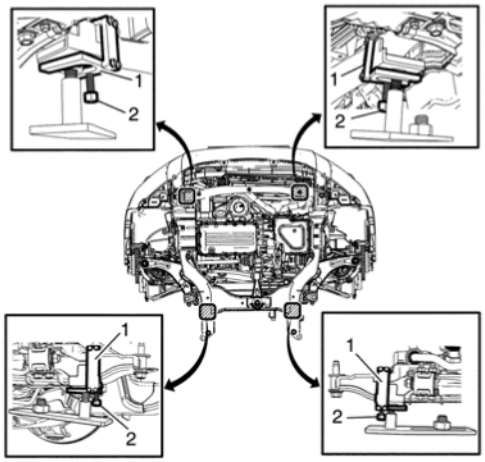

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7. Click here for full size
8. Note:

   Ensure that the 3â€‰locations (1, 2, 3) of *EN-50176* powertrain support pallet are seated against the powertrain.

9. Raise the *EN-50176* powertrain support pallet with a jack until the pointâ€‰(1), andâ€‰(2) seats solidly at the bottom of the engine block and the transmission.

10. Turn the supportingâ€‰(3) upwards until it seats solidly at the front engine hole.

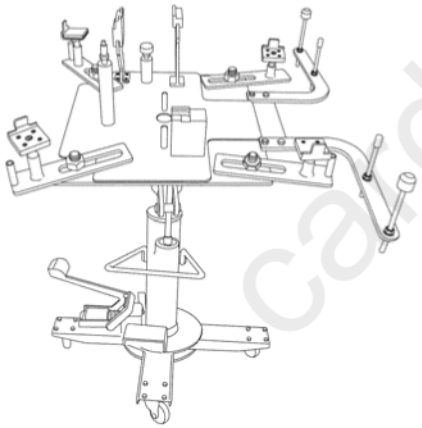



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11.
    Click here for full size
12. Note:

    Ensure that the 4â€‰cradle supporter arms seat solidly at the cradle.

13. Position the 4â€‰cradle supporter arms of the *EN-49802* cradle supporter cradle supporter to the point as shown.
14. Turn the supporting upward until it seats solidly at the cradle.
15. Install the *EN-50177* cradle supporter holder (1).
16. Tighten the boltsâ€‰(2).



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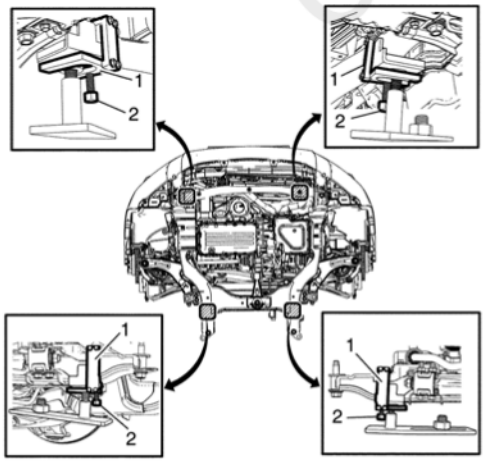
17. Click here for full size

18. Lower the jack and remove it.

## Removal Procedure

1. Support the *EN-50176* powertrain support pallet , *EN-49802* cradle supporter with a jack.
2. To secure, install the bolts and nuts to a hole between *EN-50176* powertrain support pallet , *EN-49802* cradle supporter and a jack.

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3. Click here for full size

4. Remove the *EN-50177* cradle supporter holder (1).

5. Lower a jack and remove the *EN-50176* powertrain support pallet (1), and *EN-49802* cradle supporter (2).

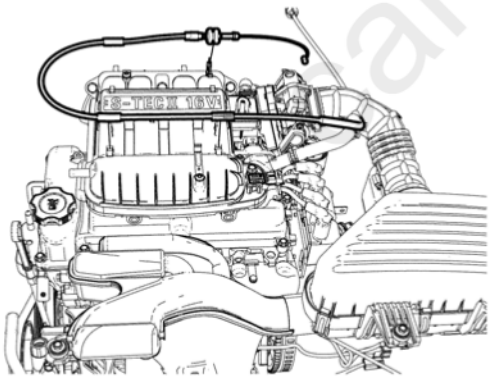
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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Upper Intake Manifold Replacement

### Removal Procedure

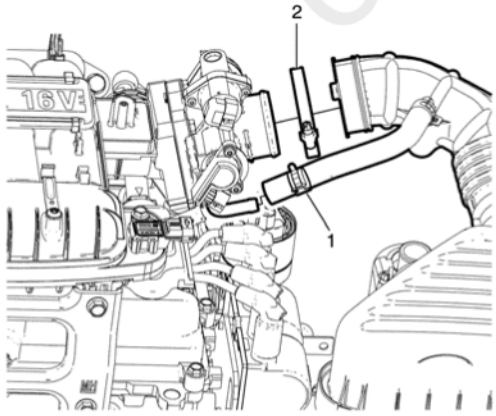
1. Open the hood.
2. Disconnect the battery negative cable. Refer to Battery Negative Cable Disconnection and Connection.



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3.
Click here for full size

4. Disconnect the accelerator cable and reposition the accelerator cable away from intake manifold.

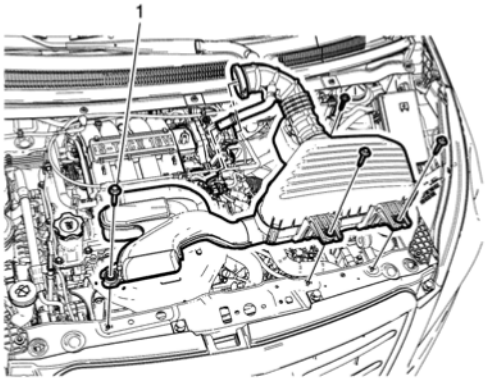



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5.
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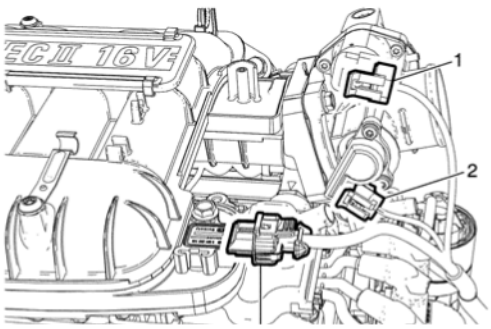
6. Remove the clamps (1, 2).
7. Twist and pull the hoses to remove throttle body assembly.

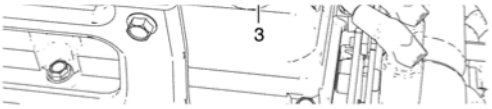
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8. Click here for full size
9. Remove the 4 air cleaner assembly bolts (1).
10. Remove the air cleaner assembly.

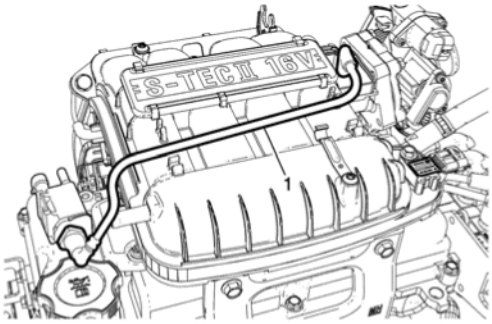
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11. Click here for full size
12. Disconnect the idle air control valve (IACV) connector (1).
13. Disconnect the throttle position sensor (TPS) connector (2).
14. Disconnect the Manifold absolute pressure (MAP) sensor connector (3).

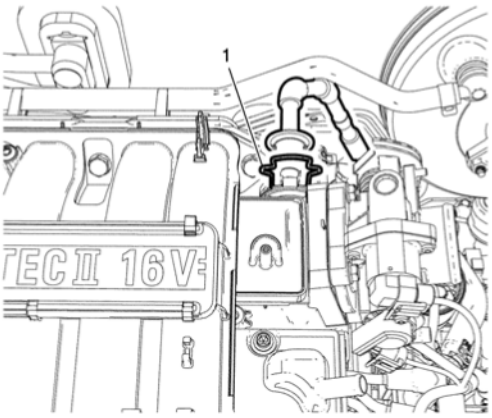
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15. Click here for full size

16. Remove the canister purge solenoid hose (1).

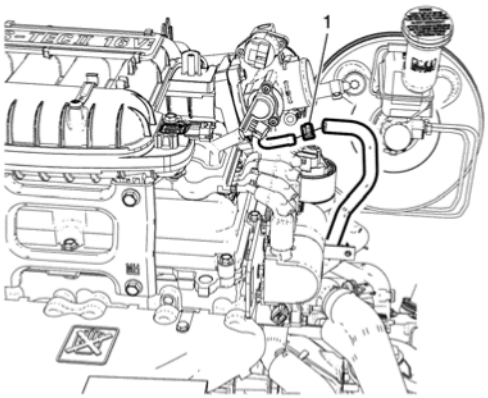
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17. Click here for full size

18. Raise the clip (1) upward with suitable tool.

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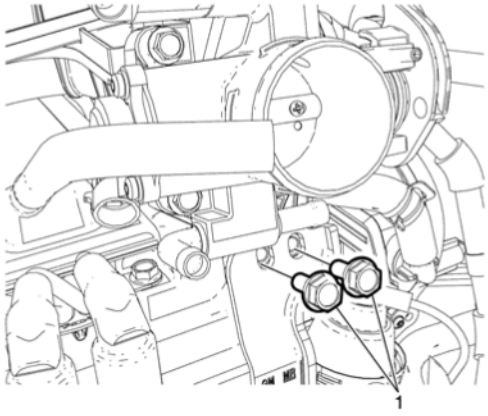
19. Click here for full size

20. Disconnect the coolant bleed hose (1) from the outlet housing.

21. Note:

    Plug or cap the hoses and inlets when separating the cooling system components, this prevents dirt and other contaminants from entering the cooling system.

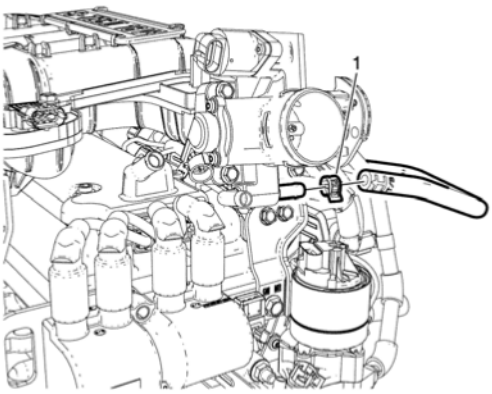
22. Plug or cap the cooling system hoses and inlets.




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23. Click here for full size

24. Remove the upper intake manifold to side bracket retaining bolts (1).




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25.

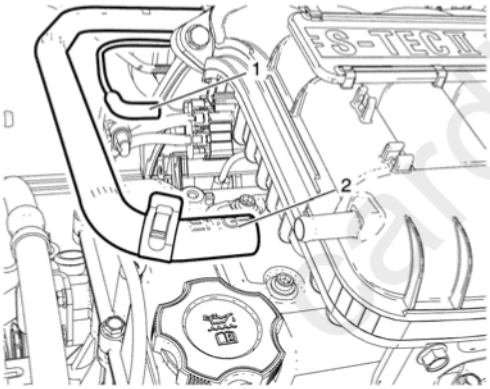
Click here for full size

26. Disconnect the coolant recovery hose (1) from the outlet housing.

27. Note:

    Plug or cap the hoses and inlets when separating the cooling system components, this prevents dirt and other contaminants from entering the cooling system.

28. Plug or cap the cooling system hoses and inlets

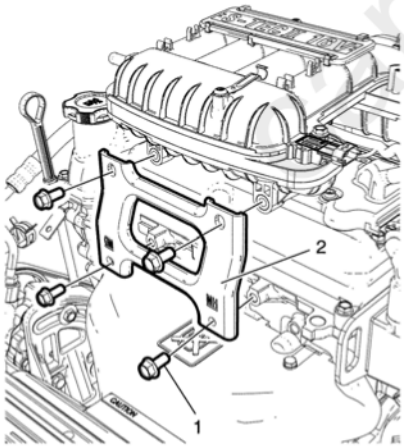



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29.

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30. Disconnect the hose (1) form the upper intake manifold.
31. Disconnect the vacuum hose (2) from the upper intake manifold.



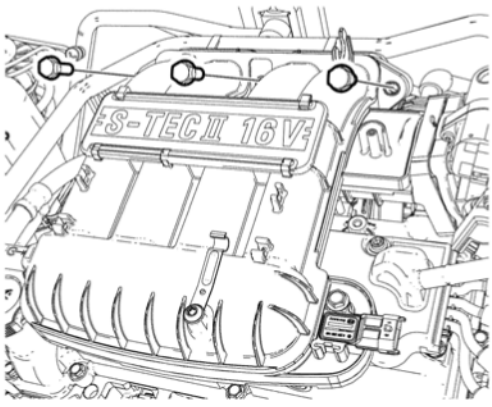

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32.
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33. Remove the upper intake manifold to front bracket bolts (1).

34. Remove the front bracket (2).

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35.
Click here for full size

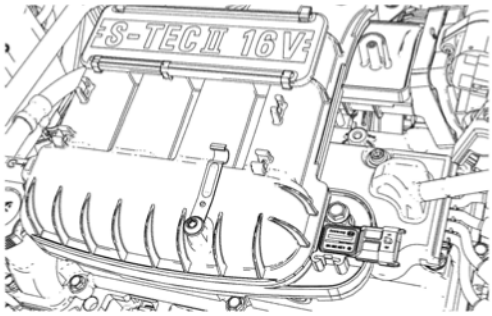
36. Remove the upper intake manifold to lower intake manifold retaining bolts.
37. Remove the upper intake manifold.
38. Remove the throttle body assembly. Refer to Throttle Body Assembly Replacement.
39. Remove the manifold absolute pressure (MAP) sensor. Refer to Manifold Absolute Pressure Sensor Replacement.

## Installation Procedure

1. Install the manifold absolute pressure (MAP) sensor. Refer to Manifold Absolute Pressure Sensor Replacement.
2. Install the throttle body assembly. Refer to Throttle Body Assembly Replacement.
3. Install the upper intake manifold.

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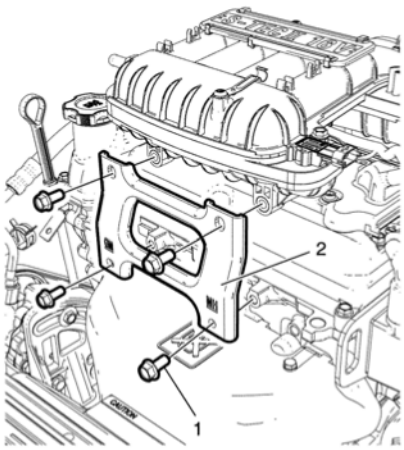



4. Click here for full size
5. Caution:

   Refer to Fastener Caution.

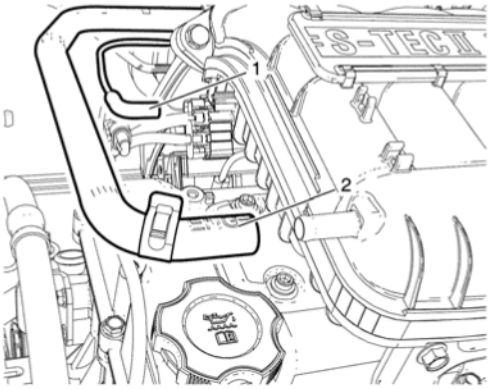
6. Tighten the upper intake manifold to lower intake manifold retaining bolts to 20â€‰N-m (14.75â€‰lbâ€‰ft).

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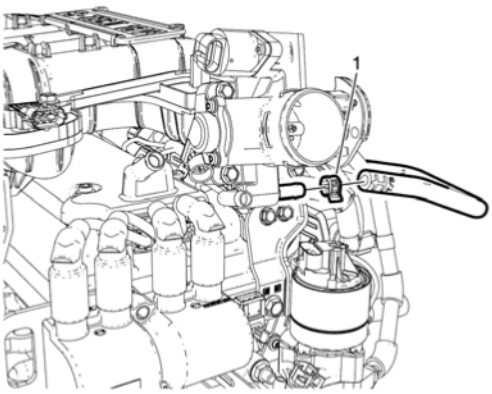

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7. Click here for full size
8. Install the front bracket (2).
9. Tighten the upper intake manifold to front bracket bolts (1) to 20â€‰N-m (14.75â€‰lbâ€‰ft).




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10. Click here for full size
11. Connect the vacuum hose (2) to the upper intake manifold.
12. Connect the hose (1) to the upper intake manifold.

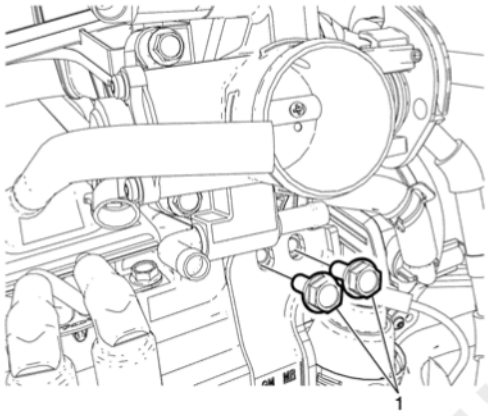



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13. Click here for full size

14. Remove the plug or cap at the coolant hose and outlet housing ends.

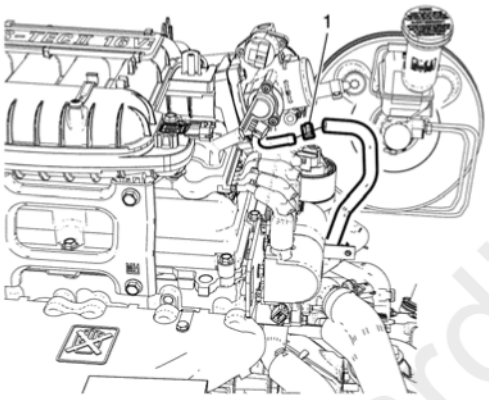
15. Connect the coolant recovery hose (1) to the outlet housing.




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17. Tighten the upper intake manifold to side bracket retaining bolts (1) to 10â€‰N-m (89â€‰lbâ€‰in).

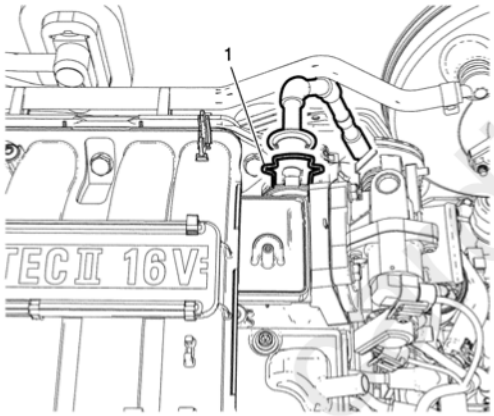



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19. Connect the coolant bleed hose (1) to the inlet housing.

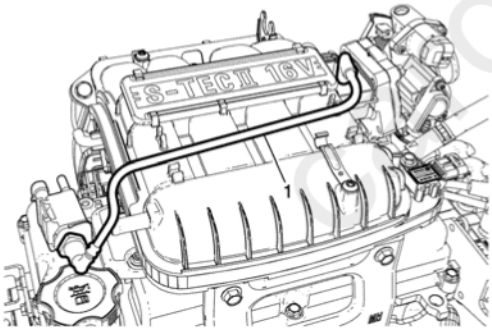



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21. Install the clip (1) while pushing the exhaust gas recirculation (EGR) pipe to the upper intake manifold.

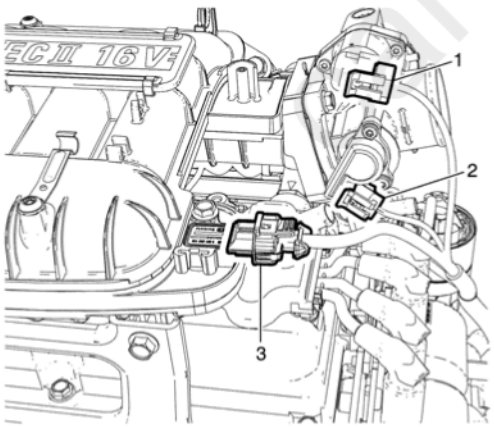



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22.

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23. Install the canister purge solenoid hose (1).

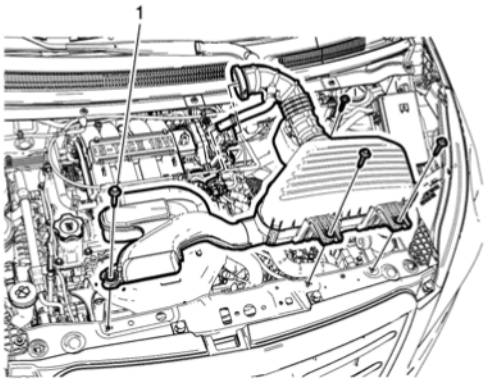



rdiagn.com

24.
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25. Connect the manifold absolute pressure (MAP) sensor connector (3).
26. Connect the throttle position sensor (TPS) connector (2).
27. Connect the idle air control valve (IACV) connector (1).

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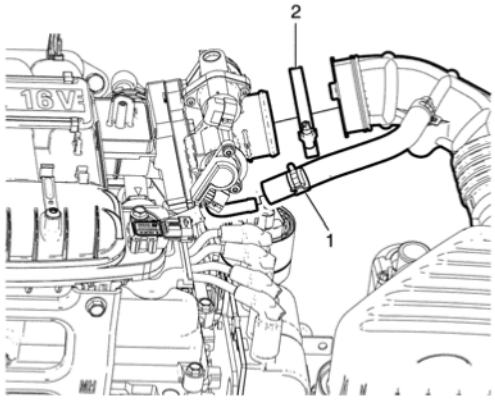


28.
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29. Install the air cleaner assembly.

30. Tighten the 4 air cleaner assembly bolts (1) to 6â€‰N-m (4â€‰lbâ€‰in).

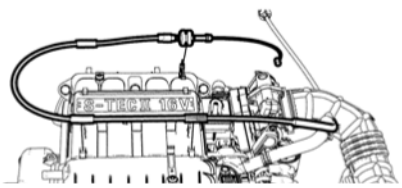
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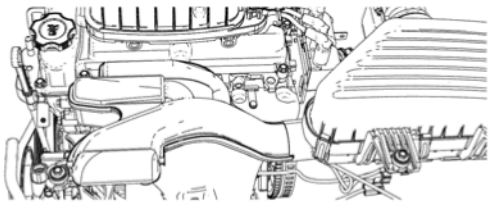
31.
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32. Twist and pull the hoses to install the throttle body assembly.

33. Tighten the clamps (1, 2).



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34. Click here for full size
35. Connect the accelerator cable.
36. Connect the battery negative cable. Refer to Battery Negative Cable Disconnection and Connection.
37. Close the hood.

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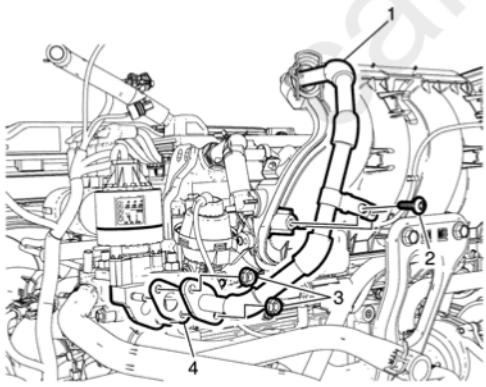
1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Lower Intake Manifold Replacement (LMT, LC5)

### Removal Procedure

1. Remove the upper intake manifold. Refer to Upper Intake Manifold Replacement
2. Remove the multiport fuel injection fuel rail and the fuel injectors from the lower intake manifold. Refer to Fuel Injection Fuel Rail Assembly Replacement

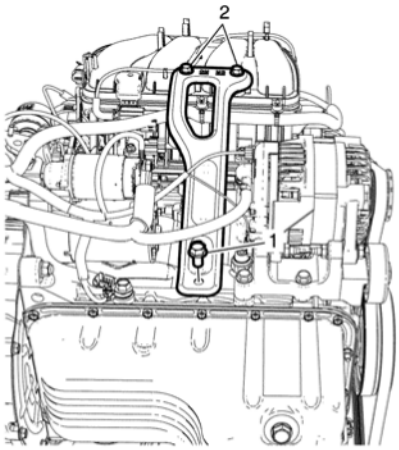
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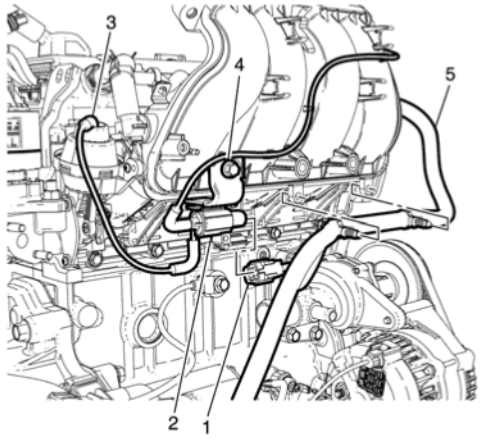
4. Remove the EGR to EGR pipe retaining nuts (3) and EGR pipe bracket to lower intake manifold retaining bolt (2).
5. Remove the EGR pipe (1) and EGR gasket (4).

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7. Remove the rear intake manifold bracket to lower intake manifold retaining bolts (2).

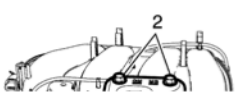


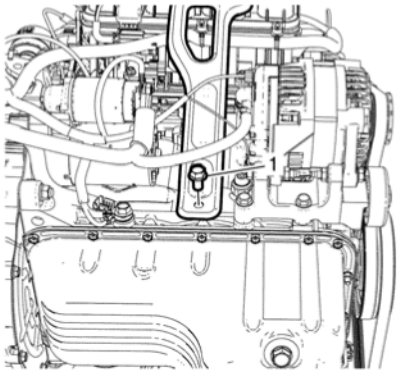

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8. Click here for full size

9. Disconnect the intake manifold runner control (IMRC) valve actuator hose (3).
10. Disconnect the IMRC valve connector (1) from IMRC valve (2).
11. Remove the bolt (4).
12. Remove the IMRC valve (2).
13. Remove the wiring harness (5) form the lower intake manifold.
14. Lower the vehicle by its full height. Refer to Lifting and Jacking the Vehicle

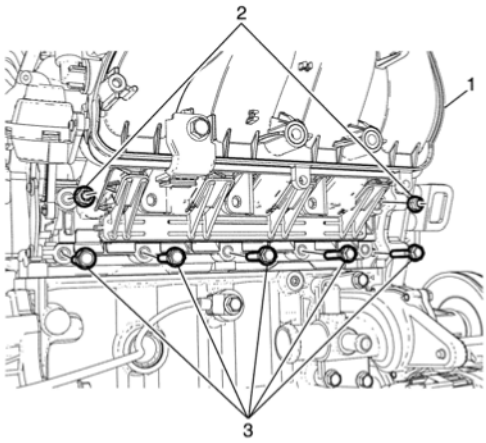
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15. Click here for full size
16. Remove the bolt (1).
17. Remove the rear intake manifold bracket.

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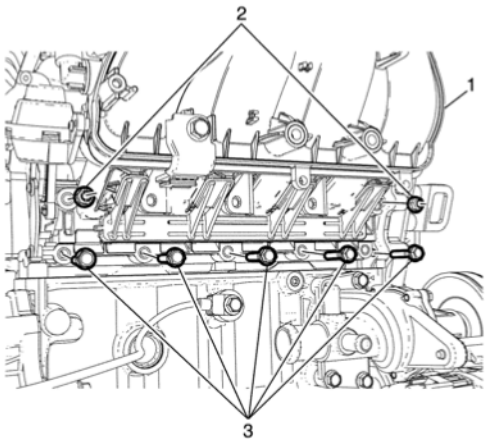



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18. Click here for full size
19. Remove the 2 nuts (2) and 5 bolts (3).
20. Remove the lower intake manifold (1).

## Installation Procedure

1. Clean the sealing surfaces.
2. Install the NEW gasket.

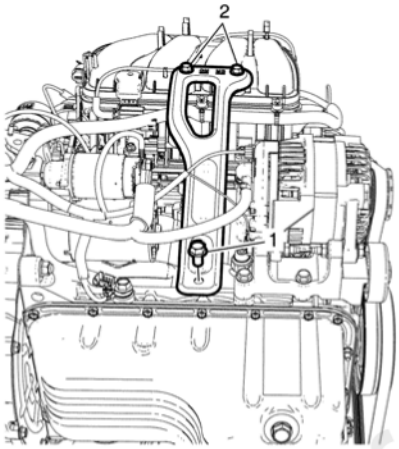



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3. Click here for full size
4. Caution:

   Refer to Fastener Caution.

5. Install the intake manifold (1) and the 5 intake manifold bolts (3) 2 nuts (2) and tighten to 10â€‰N-m (89â€‰lbâ€‰in).
6. Raise the vehicle. Refer to Lifting and Jacking the Vehicle

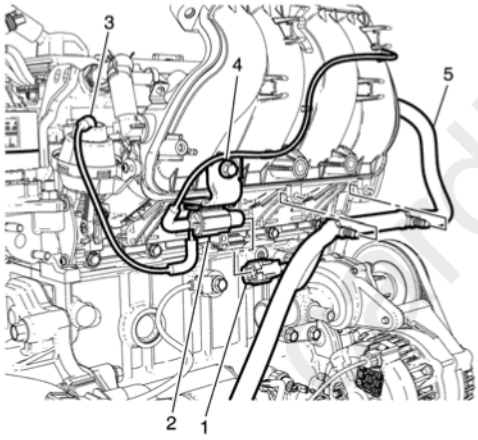



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8. Install the rear intake manifold and tighten the bolt (1) to 45â€‰N-m (33â€‰lbâ€‰ft).
9. Lower the vehicle.

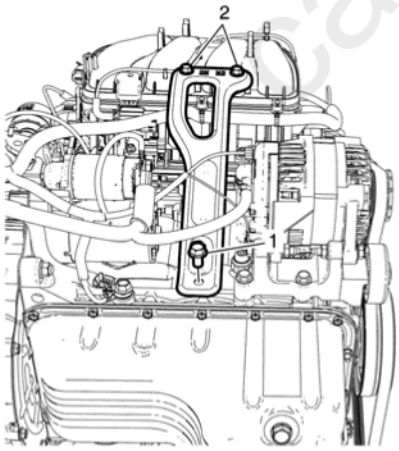



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10.
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11. Install the wiring harness (5) to intake manifold retaining hole.
12. Install intake manifold runner control (IMRC) valve (2) with bracket and tighten the bolts (4) to 10â€‰N-m (89â€‰lbâ€‰in).
13. Connect the IMRC valve connector (1) to IMRC valve (2).
14. Connect the hose (3) to IMRC valve actuator.

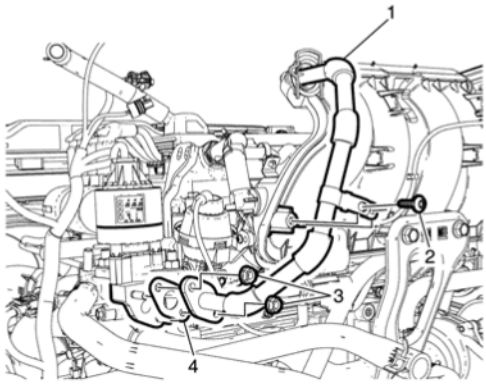
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16. Install the rear intake manifold upper bolts (2) and tighten to 20â€‰N-m (15â€‰lbâ€‰ft).

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17. 
    Click here for full size
18. Install the new EGR pipe gasket.
19. Install the EGR pipe (1) and tighten the nuts (3) to 10â€‰N-m (89â€‰lbâ€‰in) and the bolts (2) to 10â€‰N-m (89â€‰lbâ€‰in).
20. Install the multiport fuel injection fuel rail and the fuel injectors to the intake manifold. Refer to Fuel Injection Fuel Rail Assembly Replacement
21. Install the upper intake manifold. Refer to Upper Intake Manifold Replacement
22. Close the hood.

## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Lower Intake Manifold | MANIFOLD,LWR INT | X0005 |
| Lower Intake Manifold | MANIFOLD,LWR INT | X0057 |
| Lower Intake Manifold | MANIFOLD,LWR INT(CSTG) | X0103 |
| Lower Intake Manifold | MANIFOLD,LWR INT(SERV) | X0137 |
| Lower Intake Manifold | MANIFOLD KIT,LWR INT | X0140 |
| Lower Intake Manifold | MANIFOLD,LWR INT (MACH) | X0269 |
| Lower Intake Manifold | MANIFOLD,LWR INT(CSTG) | SS277 |
| Lower Intake Manifold | MANIFOLD,LWR INT | SS279 |

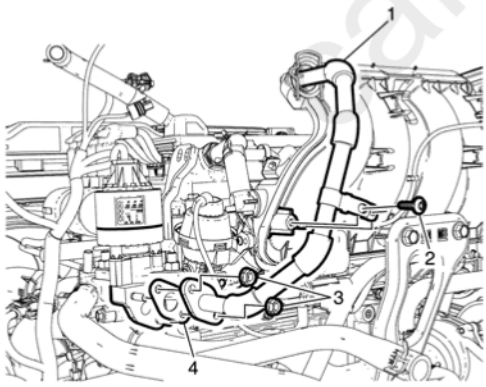
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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Lower Intake Manifold Replacement (LMU)

### Removal Procedure

1. Remove the upper intake manifold. Refer to Upper Intake Manifold Replacement
2. Remove the multiport fuel injection fuel rail and the fuel injectors from the lower intake manifold. Refer to Fuel Injection Fuel Rail Assembly Replacement

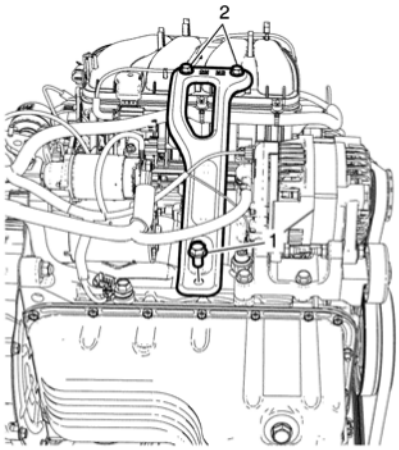



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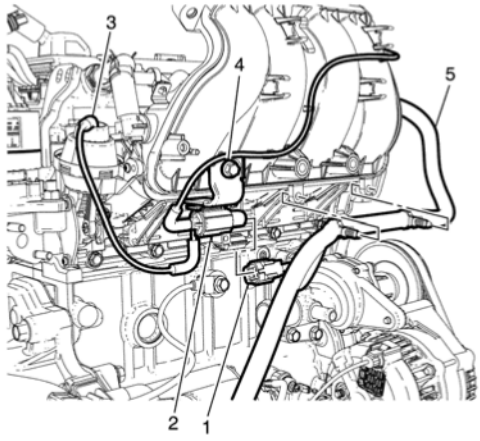
4. Remove the EGR to EGR pipe retaining nuts (3) and EGR pipe bracket to lower intake manifold retaining bolt (2).
5. Remove the EGR pipe (1) and EGR gasket (4).

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7. Remove the rear intake manifold bracket to lower intake manifold retaining bolts (2).

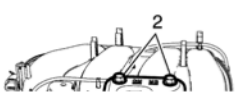


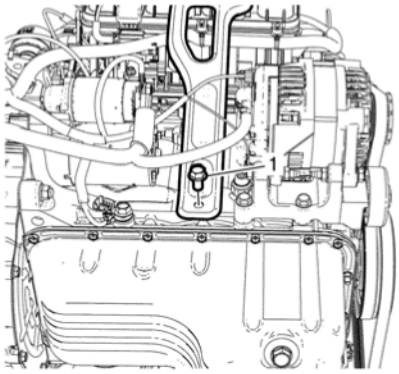

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9. Disconnect the intake manifold runner control (IMRC) valve actuator hose (3).
10. Disconnect the IMRC valve connector (1) from IMRC valve (2).
11. Remove the bolt (4).
12. Remove the IMRC valve (2).
13. Remove the wiring harness (5) form the lower intake manifold.
14. Lower the vehicle by its full height. Refer to Lifting and Jacking the Vehicle

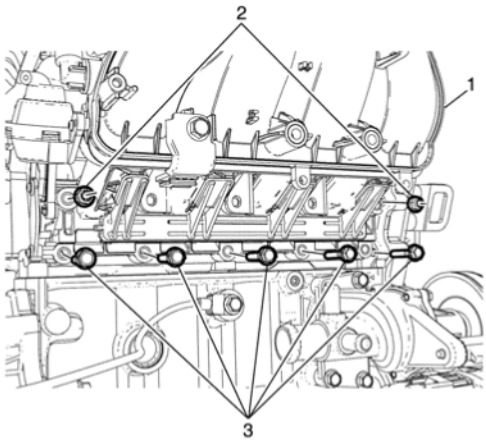
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15. Click here for full size
16. Remove the bolt (1).
17. Remove the rear intake manifold bracket.

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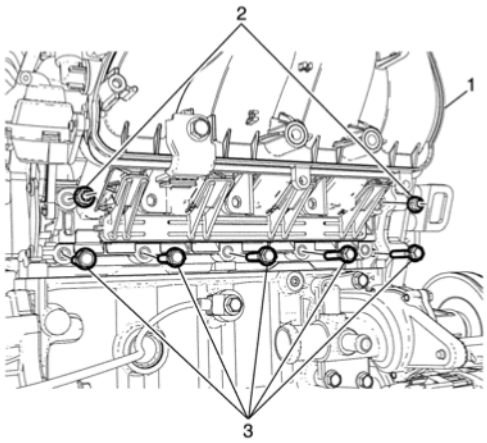



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18. Click here for full size
19. Remove the 2 nuts (2) and 5 bolts (3).
20. Remove the lower intake manifold (1).

## Installation Procedure

1. Clean the sealing surfaces.
2. Install the NEW gasket.

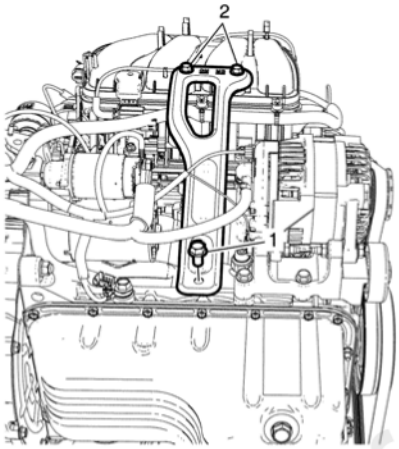



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3. Click here for full size
4. Caution:

   Refer to Fastener Caution.

5. Install the intake manifold (1) and the 5 intake manifold bolts (3) 2 nuts (2) and tighten to 10â€‰N-m (89â€‰lbâ€‰in).
6. Raise the vehicle. Refer to Lifting and Jacking the Vehicle

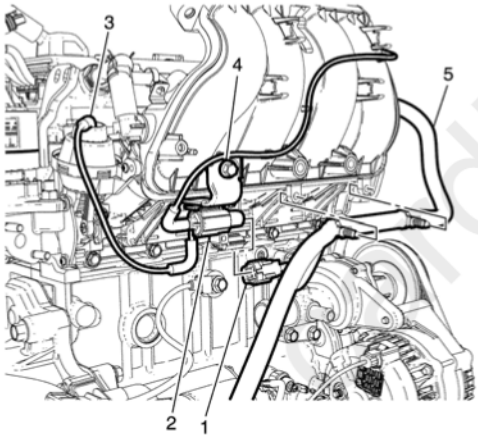



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8. Install the rear intake manifold and tighten the bolt (1) to 58â€‰N-m (43â€‰lbâ€‰ft).
9. Lower the vehicle.

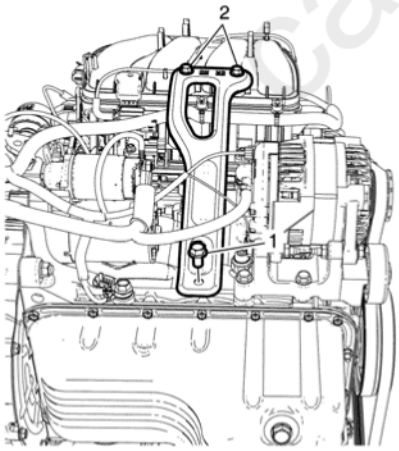



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10.
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11. Install the wiring harness (5) to intake manifold retaining hole.
12. Install intake manifold runner control (IMRC) valve (2) with bracket and tighten the bolts (4) to 10â€‰N-m (89â€‰lbâ€‰in).
13. Connect the IMRC valve connector (1) to IMRC valve (2).
14. Connect the hose (3) to IMRC valve actuator.

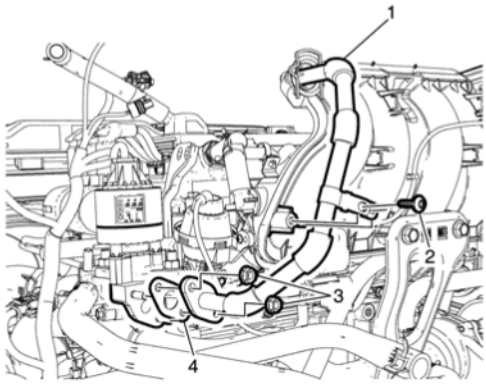
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16. Install the rear intake manifold upper bolts (2) and tighten to 22â€‰N-m (16â€‰lbâ€‰ft).

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17. Click here for full size

18. Install the new EGR pipe gasket.

19. Install the EGR pipe (1) and tighten the nuts (3) to 10â€‰N-m (89â€‰lbâ€‰in) and the bolts (2) to 10â€‰N-m (89â€‰lbâ€‰in).

20. Install the multiport fuel injection fuel rail and the fuel injectors to the intake manifold. Refer to Fuel Injection Fuel Rail Assembly Replacement

21. Install the upper intake manifold. Refer to Upper Intake Manifold Replacement

22. Close the hood.

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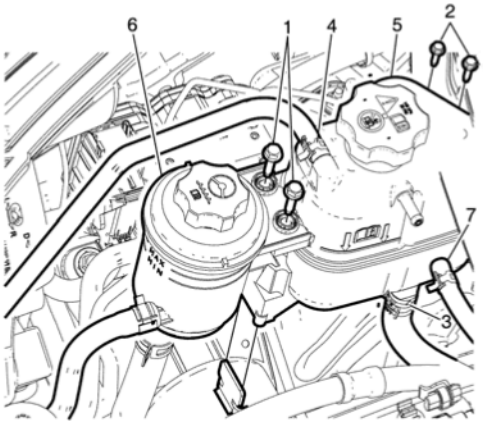
1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Intake Manifold Replacement (LKY)

### Removal Procedure

1. Open the hood.
2. Disconnect the battery negative cable. Refer to Battery Negative Cable Disconnection and Connection.
3. Drain the cooling system. Refer to Cooling System Draining and Filling.
4. Remove the air cleaner assembly. Refer to Air Cleaner Assembly Replacement.
5. Remove the throttle body assembly. Refer to Throttle Body Assembly Replacement.
6. Remove the positive crankcase ventilation hose. Refer to Positive Crankcase Ventilation Hose/Pipe/Tube Replacement.
7. Remove the manifold absolute pressure sensor. Refer to Manifold Absolute Pressure Sensor Replacement.
8. Remove the evaporative emission canister purge solenoid valve. Refer to Evaporative Emission Canister Purge Solenoid Valve Replacement.

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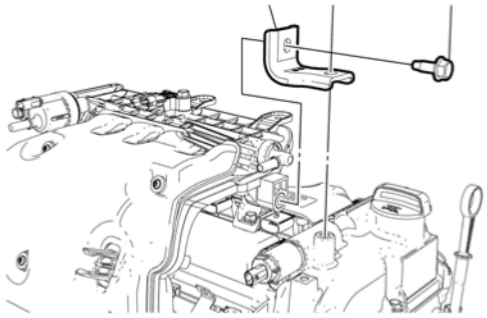


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10. Remove the coolant hose and clamp (7) from the radiator surge tank and intake manifold.
11. Remove the power steering fluid reservoir bolts (1) and reposition power steering fluid reservoir (6) aside.
12. Remove the radiator surge tank mounting bolt (2) and reposition radiator surge tank (5) aside.
13. Disconnect the power brake booster vacuum hose from intake manifold. Refer to Power Brake Booster Vacuum Hose Replacement.
14. Disconnect the fuel feed lineâ€‰quick connect fitting from the fuel rail. Refer to Metal Collar Quick Connect Fitting Service.

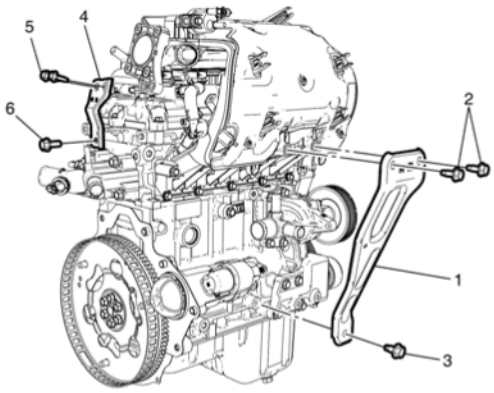
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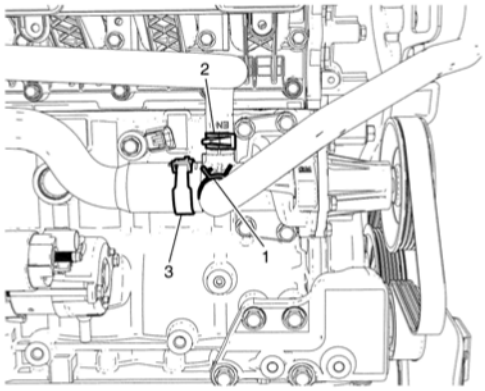
15. Click here for full size
16. Remove the intake manifold upper bracket bolts (2).
17. Remove the intake manifold upper bracket (1).

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18. Click here for full size
19. Remove the intake manifold upper bracket (4) and bolts (5, 6).
20. Raise the vehicle. Refer to Lifting and Jacking the Vehicle.
21. Remove the exhaust muffler. Refer to Exhaust Muffler Replacement - Front.
22. Remove the intake manifold support bracket (1) and bolts (2, 3).
23. Remove the starter. Refer to Starter Replacement.

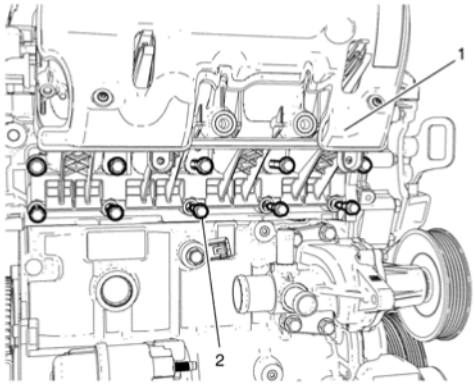
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24.
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25. Disconnect the heater outlet hose and clamp (2).

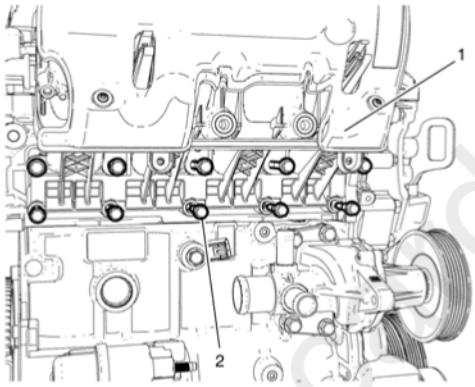



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26. Click here for full size
27. Remove the intake manifold 10 bolts (2).
28. Remove the intake manifold (1).
29. Disconnect any electrical connectors as needed.

30. Transfer parts as necessary.

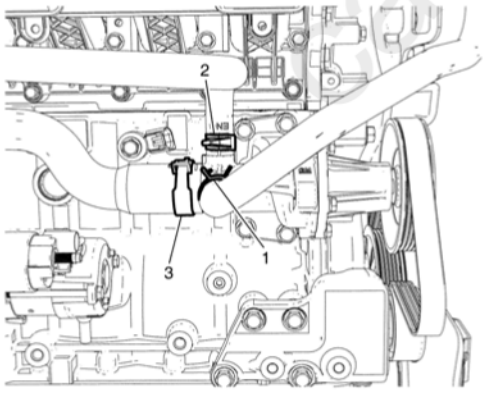
## Installation Procedure




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1. Click here for full size
2. Install the intake manifold (1).
3. Caution:

   Refer to Fastener Caution.
4. Install the intake manifold 10 bolts (2) and tighten to 10â€‰N-m (89â€‰lbâ€‰in).



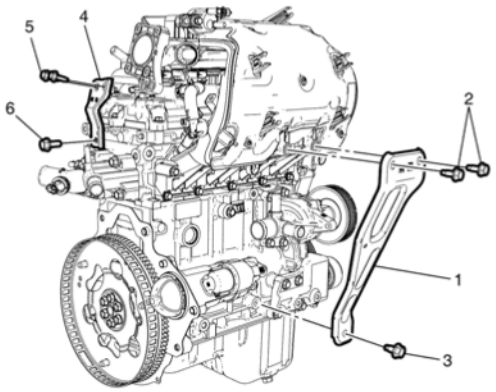

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5.
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6. Connect the heater outlet hoseâ€‰and clamp (2).

7. Install the starter. Refer to Starter Replacement.

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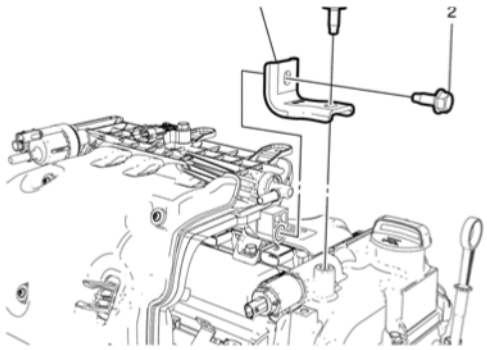


8. Click here for full size

9. Install the intake manifold support bracket (1).
10. Install the intake manifold support bracket bolts (2) and tighten to 25â€‰N-m (18â€‰lbâ€‰ft).
11. Install the intake manifold support bracket bolt (3) and tighten to 46â€‰N-m (34â€‰lbâ€‰ft).
12. Install the exhaust muffler. Refer to Exhaust Muffler Replacement - Front.
13. Lower the vehicle.
14. Install the intake manifold upper bracket (4).
15. Install the intake manifold upper bracket bolts (5) and tighten to â€‰10â€‰N-m (89â€‰lbâ€‰in).
16. Install the intake manifold upper bracket bolts (6) and tighten to 25â€‰N-m (18â€‰lbâ€‰ft).

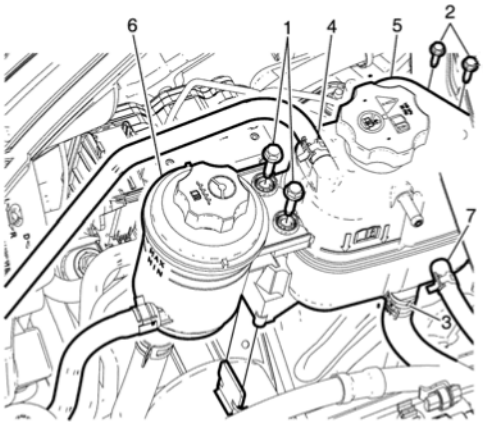
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17. Click here for full size
18. Install the intake manifold upper bracket (1).
19. Install the intake manifold upper bracket bolts (2) and tighten to 25â€‰N-m (18â€‰lbâ€‰ft).
20. Connect the fuel feed lineâ€‰quick connect fitting to the fuel rail. Refer to Metal Collar Quick Connect Fitting Service.
21. Connect the power brake booster vacuum hose to intake manifold. Refer to Power Brake Booster Vacuum Hose Replacement.

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22. Click here for full size
23. Install the radiator surge tank mounting bolts (2) and tighten to 8â€‰N-m (71â€‰lbâ€‰in).
24. Install the power steering fluid reservoir bolts (1) and tighten to 9â€‰N-m (80â€‰lbâ€‰in).
25. Install the coolant hose and clamp (7) to the radiator surge tank and intake manifold.
26. Install the evaporative emission canister purge solenoid valve. Refer to Evaporative Emission Canister Purge Solenoid Valve Replacement.
27. Install the manifold absolute pressure sensor. Refer to Manifold Absolute Pressure Sensor Replacement.
28. Install the positive crankcase ventilation hose. Refer to Positive Crankcase Ventilation Hose/Pipe/Tube Replacement.
29. Install the throttle body assembly. Refer to Throttle Body Assembly Replacement.
30. Install the air cleaner assembly. Refer to Air Cleaner Assembly Replacement.
31. Fill the cooling system. Refer to Cooling System Draining and Filling.

32. Connect the battery negative cable. Refer to Battery Negative Cable Disconnection and Connection.

33. Close the hood.

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Cylinder Head Replacement (with EN-50176)

Special Tools

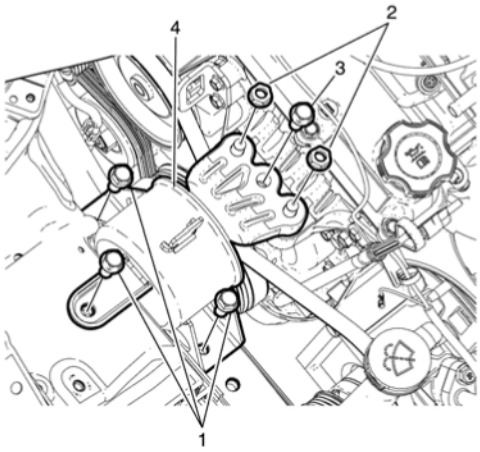
- *EN-49802* Cradle Supporter
- *EN-50176* Powertrain Support Pallet
- *EN-50177* Cradle Supporter Holder

For equivalent regional tools, refer to Special Tools.

### Removal Procedure

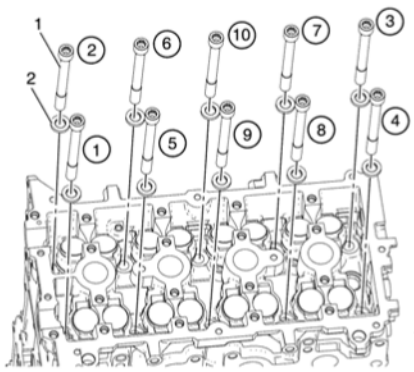
1. Open the hood.
2. Disconnect the negative battery cable. Refer to Battery Negative Cable Disconnection and Connection.
3. Drain the cooling system. Refer to Cooling System Draining and Filling.
4. Remove the upper intake manifold. Refer to Upper Intake Manifold Replacement.
5. Remove the lower intake manifold. Refer to Lower Intake Manifold Replacement.
6. Remove the exhaust manifold. Refer to Exhaust Manifold Replacement.
7. Remove the ignition coil. Refer to Ignition Coil Removal.
8. Remove the camshaft cover. Refer to Camshaft Cover Replacement.
9. Remove thermostat housing. Refer to Engine Coolant Thermostat Replacement.
10. Remove the water pump. Refer to Water Pump Replacement.
11. Remove the oil level indicator and tube. Refer to Oil Level Indicator Tube Replacement.
12. Raise the vehicle.
13. Remove the oil pan. Refer to Oil Pan Replacement.
14. Remove the drive belt. Refer to Drive Belt Replacement.
15. Remove the crankshaft balancer. Refer to Crankshaft Balancer Removal.
16. Remove the generator. Refer to Generator Replacement.
17. Remove the drive belt tensioner. Refer to Drive Belt Tensioner Removal.
18. Install the *EN-50176* powertrain support pallet, *EN-49802* cradle supporter, and *EN-50177* cradle supporter holder. Refer to Engine/Transmission Mounting.

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19. Click here for full size
20. Remove the engine mount boltsâ€‰(1,â€‰3) and nutâ€‰(2).
21. Remove the engine mountâ€‰(4).
22. Remove the engine front cover. Refer to Engine Front Cover and Oil Pump Removal.
23. Remove the timing chain. Refer to Camshaft Timing Chain Replacement and Adjustment.
24. Remove the intake, exhaust camshaft. Refer to Camshaft Replacement.




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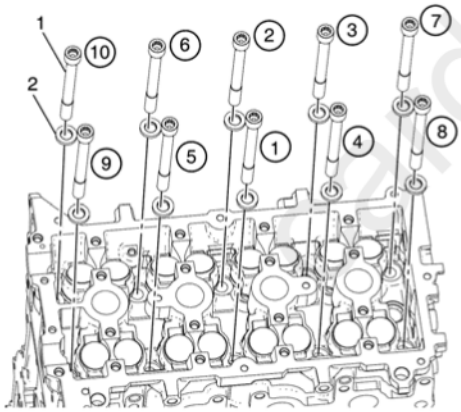
25.

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26. Remove the cylinder head. Refer to Cylinder Head Removal.

## Installation Procedure

1. Clean the sealing surfaces and remove all remains of dirt and old gasket material.
2. Install the new cylinder head gasket.



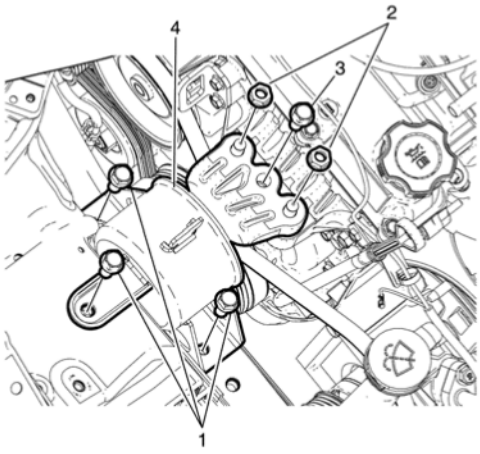

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3. Click here for full size
4. Caution:

   Refer to Fastener Caution.

5. Install the new cylinder head boltsâ€‰(1), with washersâ€‰(2) and tighten the boltâ€‰(1) to 22â€‰N-m + 102Â° (16â€‰lbâ€‰ft + 102Â°).
6. Install the camshaft. Refer to Camshaft Replacement.
7. Install the timing chain. Refer to Camshaft Timing Chain Replacement and Adjustment.
8. Install the engine front cover. Refer to Engine Front Cover and Oil Pump Installation.

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9. Click here for full size

10. Install the engine mountâ€‰(4).
11. Tighten the engine mount to engine retaining bolt (3) and nutsâ€‰(2) to 58â€‰N-m (43â€‰lbâ€‰ft).
12. Tighten the engine mount to body retaining boltâ€‰(1) to 50â€‰N-m (37â€‰lbâ€‰ft).
13. Raise the vehicle.
14. Remove the *EN-50176* powertrain support pallet, *EN-49802* cradle supporter, *EN-50177* cradle supporter holder. Refer to Engine/Transmission Mounting.
15. Install the drive belt tensioner. Refer to Drive Belt Tensioner Installation.
16. Install the generator. Refer to Generator Replacement.
17. Install the crankshaft balancer. Refer to Crankshaft Balancer Installation.
18. Install the drive belt. Refer to Drive Belt Replacement.
19. Install the oil pan. Refer to Oil Pan Replacement.
20. Lower the vehicle.
21. Install the oil level indicator and tube. Refer to Oil Level Indicator Tube Replacement.
22. Install the water pump. Refer to Water Pump Replacement.
23. Install the thermostat housing. Refer to Engine Coolant Thermostat Replacement.
24. Install the camshaft cover. Refer to Camshaft Cover Replacement.
25. Install the ignition coil. Refer to Ignition Coil Installation.
26. Install the exhaust manifold. Refer to Exhaust Manifold Replacement.
27. Install the lower intake manifold. Refer to Lower Intake Manifold Replacement.
28. Install the upper intake manifold. Refer to Upper Intake Manifold Replacement.
29. Refill the cooling system. Refer to Cooling System Draining and Filling.
30. Connect the negative battery cable. Refer to Battery Negative Cable Disconnection and Connection.
31. Close the hood.

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## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Cylinder Head | HEAD,CYL | X0001 |
| Cylinder Head | HEAD,CYL | X0016 |
| Cylinder Head | HEAD,CYL(MCHG) | X0017 |
| Cylinder Head | HEAD,CYL(CSTG) | X0018 |
| Cylinder Head | HEAD,CYL (W/VLVS) | X0019 |
| Cylinder Head | HEAD,CYL(MCHG) | X0020 |
| Cylinder Head | HEAD KIT,CYL | X0032 |
| Cylinder Head | HEAD,CYL(CSTG) | X0034 |
| Cylinder Head | HEAD,CYL | X0042 |
| Cylinder Head | HEAD,CYL(W/EXH VLV ST) | X0055 |
| Cylinder Head | HEAD,CYL (SERV PARTIAL) | X0063 |
| Cylinder Head | HEAD,CYL (W/VLV & CVR) | X0066 |
| Cylinder Head | HEAD,CYL (PARTIAL MCHG) | X0067 |
| Cylinder Head | HEAD,CYL | SS067 |
| Cylinder Head | HEAD,CYL (CSTG) | SJ303 |
| Cylinder Head | HEAD,CYL (W/ VLV) | SJ304 |
| Cylinder Head | HEAD,CYL | SS083 |
| Cylinder Head | HEAD,CYL(MCHG) | SS198 |

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Cylinder Head Replacement (with CH-49290)

Special Tools

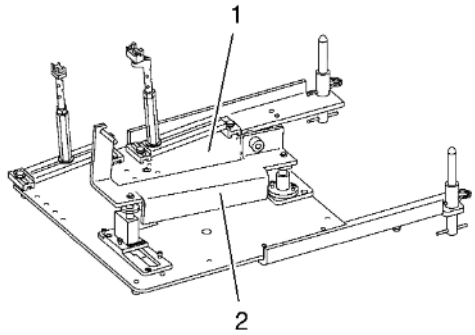
- *CH-904* Base Frame
- *CH-49290* Engine Support Tool

For equivalent regional tools, refer to Special Tools.

### Removal Procedure

1. Disconnect the negative battery cable. Refer to Battery Negative Cable Disconnection and Connection.
2. Drain the cooling system. Refer to Cooling System Draining and Filling.
3. Remove the upper intake manifold. Refer to Upper Intake Manifold Replacement.
4. Remove the lower intake manifold. Refer to Lower Intake Manifold Replacement.
5. Remove the exhaust manifold. Refer to Exhaust Manifold Replacement.
6. Remove the ignition coil. Refer to Ignition Coil Replacement.
7. Remove the camshaft cover. Refer to Camshaft Cover Replacement.
8. Remove thermostat housing. Refer to Engine Coolant Thermostat Replacement.
9. Remove the water pump. Refer to Water Pump Replacement.
10. Remove the oil level indicator and tube. Refer to Oil Level Indicator Tube Replacement.
11. Raise the vehicle.
12. Remove the oil pan. Refer to Oil Pan Replacement.
13. Remove the drive belt. Refer to Drive Belt Replacement.
14. Remove the crankshaft balancer. Refer to Crankshaft Balancer Replacement.
15. Remove the generator. Refer to Generator Replacement.
16. Remove the drive belt tensioner. Refer to Drive Belt Tensioner Replacement.

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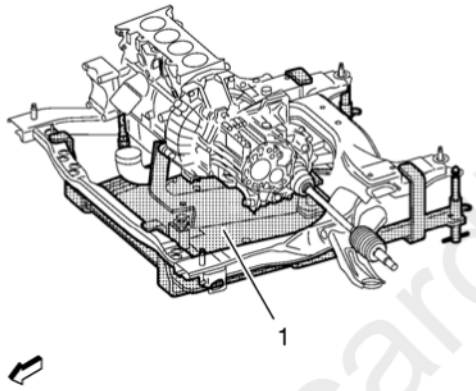

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17. Click here for full size
18. Note**:**

    The manual is supplied with the special tool and is also available online. Go to http://shop.service-solutions.com/home/.

19. Assemble the *CH-49290* support toolâ€‰(1) according to the details provided in the installation manual.

20. Install the torque supportâ€‰(2) to the engine.
21. Support the *CH-904* base frame on a jack.
22. Support the *CH-49290* support tool on the CH-904 base frame.



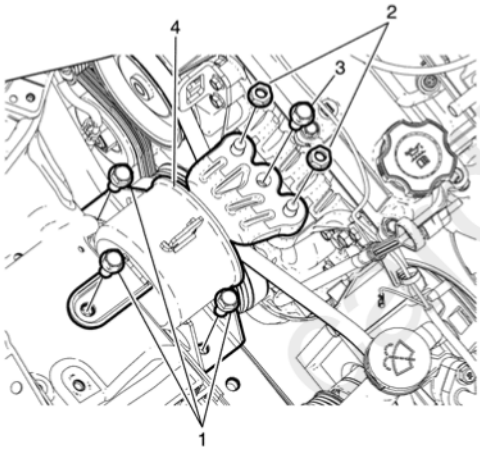

23. Click here for full size

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24. Note:

    The manual is supplied with the special tool and is also available online. Go to http://shop.service-solutions.com/home/.

25. Install the *CH-49290* support toolâ€‰(1) according to the details provided in the installation manual.




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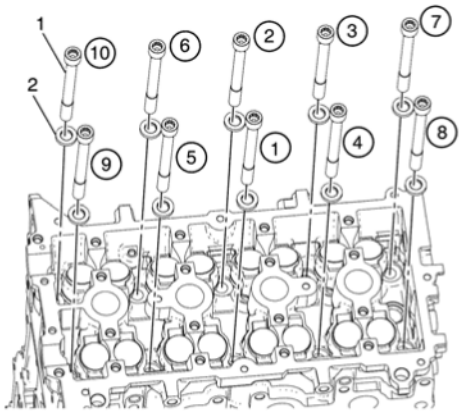
26.
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27. Remove the 4â€‰engine mount boltsâ€‰(1,â€‰3) and 2â€‰nutsâ€‰(2).
28. Remove the engine mountâ€‰(4).
29. Remove the engine front cover. Refer to Engine Front Cover and Oil Pump Removal.
30. Remove the timing chain. Refer to Camshaft Timing Chain Replacement and Adjustment.
31. Remove the intake, exhaust camshaft. Refer to Camshaft Replacement.
32. Remove the cylinder head. Refer to Cylinder Head Removal.

## Installation Procedure

1. Clean the sealing surfaces and remove all remains of dirt and old gasket material.
2. Install the new cylinder head gasket.

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3. Click here for full size
4. Caution:

   Refer to Fastener Caution.

5. Install the new cylinder head boltsâ€‰(1), with washersâ€‰(2) and tighten the boltâ€‰(1) to 22â€‰N-m + 102Â° (16â€‰lbâ€‰ft + 102Â°).

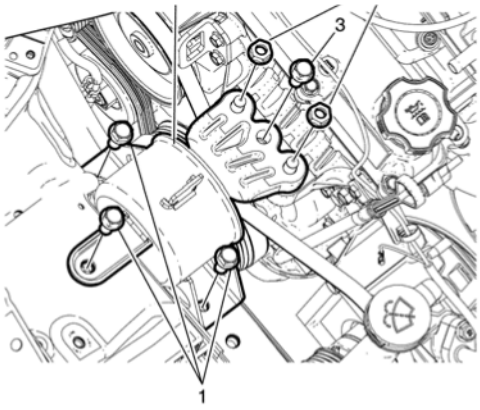
6. Install the camshaft. Refer to Camshaft Replacement.

7. Install the timing chain. Refer to Camshaft Timing Chain Replacement and Adjustment.

8. Install the engine front cover. Refer to Engine Front Cover and Oil Pump Installation.

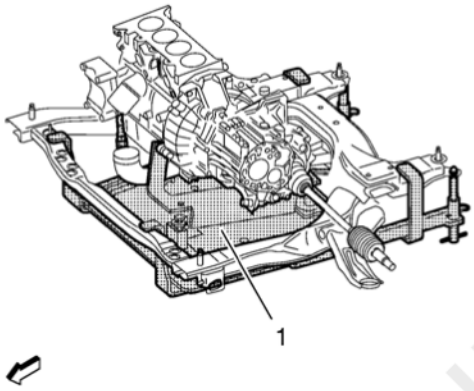
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9. Click here for full size
10. Install the engine mountâ€‰(4).
11. Tighten the engine mount to engine retaining boltâ€‰(3) and nutsâ€‰(2) to 58â€‰N-m (42â€‰lbâ€‰ft).
12. Tighten the engine mount to body retaining boltâ€‰(1) to 50â€‰N-m (37â€‰lbâ€‰ft).
13. Raise the vehicle.

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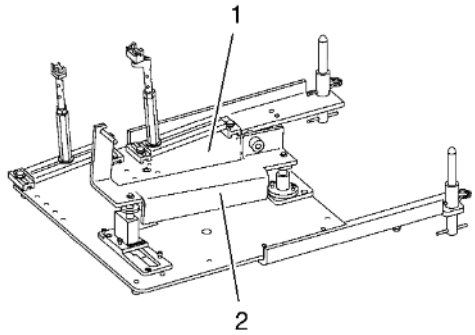

14. [Click here for full size]

15. Remove the *CH-49290* support toolâ€‰(1)

16. Remove the *CH-49290* support tool from the *CH-904* base frame.

17. Remove the *CH-904* base frame from the jack.

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18. [Click here for full size]
19. Note**:**

    The manual is supplied with the special tool and is also available online. Go to http://shop.service-solutions.com/home/.

20. Disassemble the *CH-49290* support toolâ€‰(1).

21. Remove the torque supportâ€‰(2) from the engine.
22. Install the drive belt tensioner. Refer to Drive Belt Tensioner Replacement.
23. Install the generator. Refer to Generator Replacement.
24. Install the crankshaft balancer. Refer to Crankshaft Balancer Replacement.
25. Install the drive belt. Refer to Drive Belt Replacement.
26. Install the oil pan. Refer to Oil Pan Replacement.
27. Lower the vehicle.
28. Install the oil level indicator and tube. Refer to Oil Level Indicator Tube Replacement.
29. Install the water pump. Refer to Water Pump Replacement.
30. Install the thermostat housing. Refer to Engine Coolant Thermostat Replacement.
31. Install the camshaft cover. Refer to Camshaft Cover Replacement.
32. Install the ignition coil. Refer to Ignition Coil Replacement.
33. Install the exhaust manifold. Refer to Exhaust Manifold Replacement.
34. Install the lower intake manifold. Refer to Lower Intake Manifold Replacement.
35. Install the upper intake manifold. Refer to Upper Intake Manifold Replacement.
36. Refill the cooling system. Refer to Cooling System Draining and Filling.
37. Connect the negative battery cable. Refer to Battery Negative Cable Disconnection and Connection.
38. Close the hood.

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Cylinder Head Replacement (LKY)

### Removal Procedure

1. Remove the engine from the vehicle. Refer to Engine Replacement.
2. Remove the exhaust manifold. Refer to Exhaust Manifold Removal.
3. Remove the intake manifold. Refer to Intake Manifold Removal.
4. Remove the engine coolant outlet adapter. Refer to Engine Water Outlet Adapter Removal.
5. Remove the ignition coil. Refer to Ignition Coil Removal.
6. Remove the spark plug.
7. Remove the camshaft cover. Refer to Camshaft Cover Removal.
8. Remove the oil level indicator and tube. Refer to Oil Level Indicator and Tube Removal.
9. Remove the generator. Refer to Generator Replacement.
10. Remove the drive belt tensioner. Refer to Drive Belt Tensioner Removal.
11. Remove the water pump. Refer to Water Pump Removal.
12. Remove the crankshaft balancer. Refer to Crankshaft Balancer Removal.
13. Remove the oil pan. Refer to Oil Pan Removal.
14. Remove the engine front cover. Refer to Engine Front Cover and Oil Pump Removal.
15. Remove the timing chain tensioner. Refer to Timing Chain Tensioner Removal.
16. Remove the timing chain guide. Refer to Timing Chain Guide Removal.
17. Remove the camshaft timing chain. Refer to Camshaft Timing Chain Removal.
18. Remove the crankshaft sprocket. Refer to Crankshaft Sprocket Removal.
19. Remove the camshaft. Refer to Camshaft Removal.
20. Remove the cylinder head. Refer to Cylinder Head and Gasket Removal.
21. For disassembly of the cylinder head, refer to Cylinder Head Disassemble.
22. Clean and inspect the cylinder head. Refer to Cylinder Head Cleaning and Inspection.

### Installation Procedure

1. For assembly of the cylinder head, refer to Cylinder Head Assemble.
2. Install the cylinder head. Refer to Cylinder Head and Gasket Installation.
3. Install the camshaft. Refer to Camshaft Installation.
4. Install the crankshaft sprocket. Refer to Crankshaft Sprocket Installation.
5. Install the camshaft timing chain. Refer to Camshaft Timing Chain Installation.
6. Install the timing chain guide. Refer to Timing Chain Guide Installation.
7. Install the timing chain tensioner. Refer to Timing Chain Tensioner Installation.
8. Install the engine front cover. Refer to Engine Front Cover and Oil Pump Installation.

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9. Install the oil pan. Refer to Oil Pan Installation.
10. Install the crankshaft balancer. Refer to Crankshaft Balancer Installation.
11. Install the water pump. Refer to Water Pump Installation.
12. Install the drive belt tensioner. Refer to Drive Belt Tensioner Installation.
13. Install the generator. Refer to Generator Replacement.
14. Install the oil level indicator and tube. Refer to Oil Level Indicator and Tube Installation.
15. Install the camshaft cover. Refer to Camshaft Cover Installation.
16. Caution:

    Refer to Fastener Caution.
17. Install the spark plug and tighten to 20â€‰N-m (15â€‰lbâ€‰ft).
18. Install the ignition coil. Refer to Ignition Coil Installation.
19. Install the engine coolant outlet adapter. Refer to Engine Water Outlet Adapter Installation.
20. Install the intake manifold. Refer to Intake Manifold Installation.
21. Install the exhaust manifold. Refer to Exhaust Manifold Installation.
22. Install the engine to the vehicle. Refer to Engine Replacement.

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Oil Pan Replacement (LKY)

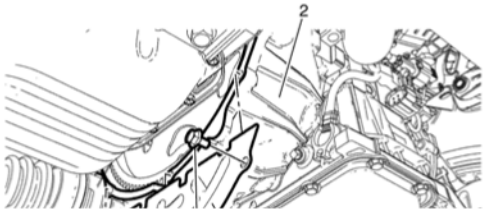
Special Tools

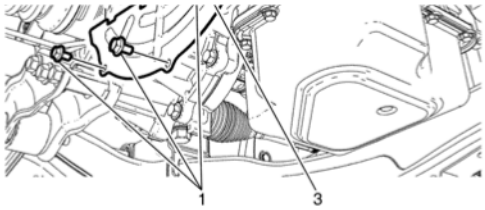
*EN-49980* Guidance Pins

### Removal Procedure

1. Open the hood.
2. Raise the vehicle by its full height. Refer to Lifting and Jacking the Vehicle.
3. Place collecting basin underneath.
4. Remove the oil drain bolt.
5. Collect the engine oil.
6. Install the oil drain bolt.
7. Lower the vehicle by its full height.
8. Remove the oil level indicator tube. Refer to Oil Level Indicator Tube Replacement.
9. Raise the vehicle by its full height.
10. Remove the front compartment splash shield. Refer to Front Compartment Splash Shield Replacement.
11. Remove the exhaust muffler. Refer to Exhaust Muffler Replacement - Front.

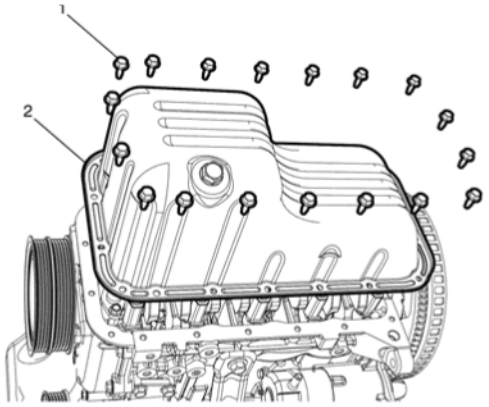
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12. Click here for full size
13. Remove the 3â€‰housing lower plate boltsâ€‰(1) from the transmissionâ€‰(2).
14. Remove the transmission housing lower plateâ€‰(3).

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15. [Click here for full size]
16. Note:

    Remove the oil pan evenly all the way around with a suitable tool. Do not damage sealing surfaces on block.

17. Remove the 18â€‰oil pan boltsâ€‰(1), and remove the oil pan (2).

## Installation Procedure

Note:

Cleaning of the sealing surfaces (1â€“4): Refer to Replacing Engine Gaskets.

1. Remove any old thread sealant, gasket material or sealant.
2. Clean the sealing surfaces of front cover and front cover components with solvent.
3. Note:

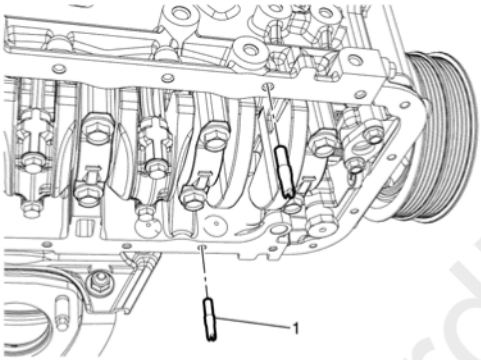
   Ensure that the sealing surface is clear of oil, grease and oil sealant material.

4. Clean out debris from the bolt holes.
5. Warning:

   Refer to Safety Glasses and Compressed Air Warning.

6. Dry the front cover and front cover components with compressed air.

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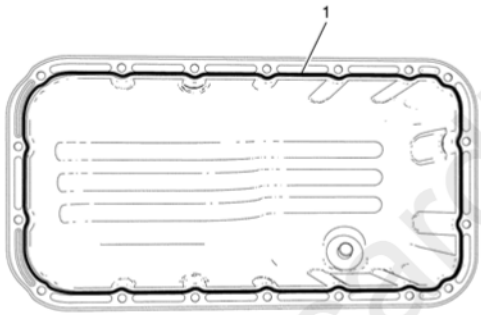



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7.

Click here for full size

8. Install the 2â€‰*EN-49980* pinsâ€‰(1) to the shown oil pan screw bores.




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9. Click here for full size
10. Note:

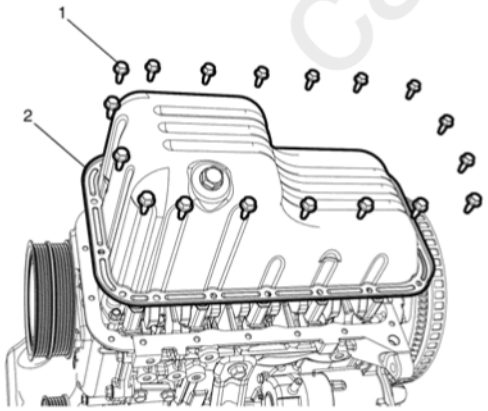
    Use a new oil pan.

11. Note:

    Do not coat sealant (RTV) on the front cover bolt holes and bolt threads

12. Apply approximately a 4.5â€‰mm (0.177â€‰in) thick bead of oil pan sealantâ€‰(1) to the oil pan.

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13.

Click here for full size

14. Caution**:**

    Refer to Fastener Caution.

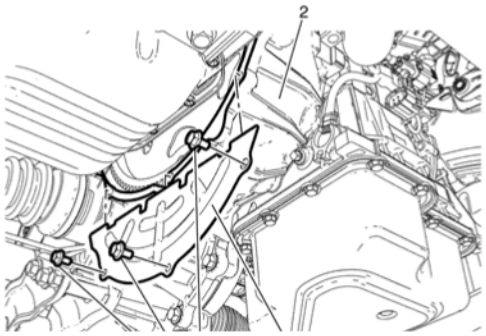
15. Note**:**

    After sealant (RTV) dispensing, the assembly completion time including torque check must be done within 8â€‰minutes.

16. Install the 16â€‰oil pan boltsâ€‰(1), 2â€‰oil pan bolts after removing 2â€‰*EN-49980* pins and tighten to 10â€‰N-m (89â€‰lbâ€‰in).

17. Install the oil drain bolt, tighten to 25â€‰N-m (18â€‰lbâ€‰ft).

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18. Click here for full size
19. Install the transmission housing lower plateâ€‰(3).
20. Install the 3â€‰housing lower plate boltsâ€‰(1) to the transmissionâ€‰(2) and tighten to 9â€‰N-m (80â€‰lbâ€‰in).
21. Install the exhaust muffler. Refer to Exhaust Muffler Replacement - Front.
22. Install the front compartment splash shield. Refer to Front Compartment Splash Shield Replacement.
23. Lower the vehicle.
24. Install the oil level indicator tube. Refer to Oil Level Indicator Tube Replacement.
25. Note:

    Inspect the engine oil level and correct if necessary.
26. Refill the collected engine oil.
27. Close the hood.

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Oil Pan Replacement

Special Tools

*EN-49980* Guidance Pins

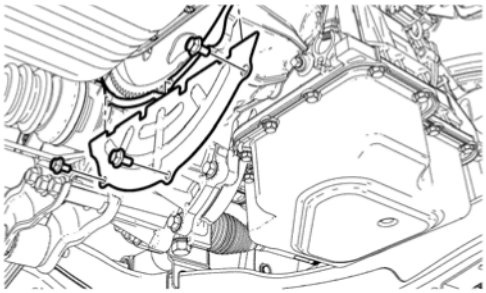
### Removal Procedure

1. Open the hood.
2. Raise the vehicle by its full height. Refer to Lifting and Jacking the Vehicle.
3. Place collecting basin underneath.
4. Remove the oil drain bolt.
5. Collect the engine oil.
6. Caution:

   Refer to Fastener Caution.
7. Install the NEW seal ring and the oil drain bolt, tighten to 8â€‰N-m (71â€‰lbâ€‰in).
8. Lower the vehicle by its full height.
9. Remove the oil level indicator tube. Refer to Oil Level Indicator Tube Replacement.
10. Raise the vehicle by its full height.
11. Remove the front compartment splash shield. Refer to Front Compartment Splash Shield Replacement.
12. Remove the exhaust flexible pipe. Refer to Exhaust Pipe Replacement.

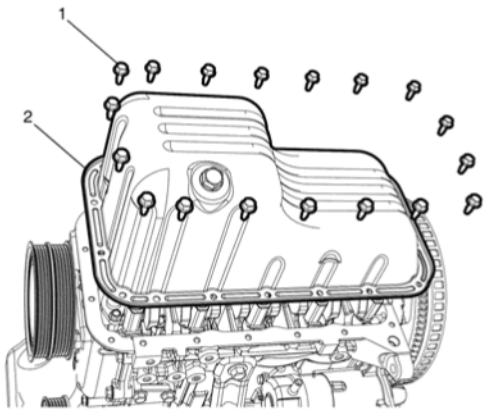
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13. Click here for full size
14. Remove the 3â€‰housing lower plate bolts from the transmission.
15. Remove the transmission housing lower plate.

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16. Click here for full size
17. Note:

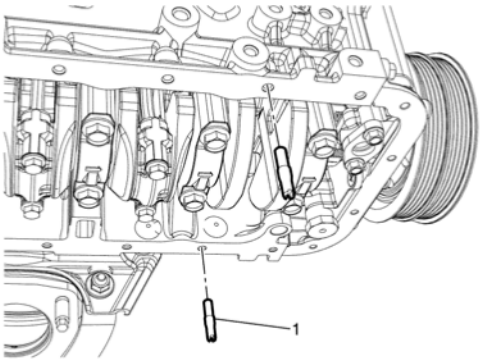
    Remove the oil pan evenly all the way around with a suitable tool.

18. Remove the 18â€‰oil pan boltsâ€‰(1), and remove the oil pan (2).

## Installation Procedure

1. Clean the sealing surfaces.

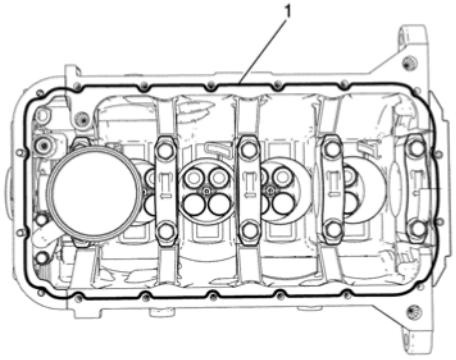
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2. Click here for full size

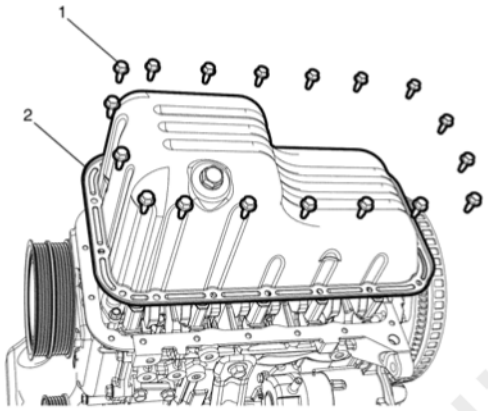
3. Install the 2â€‰*EN-49980* pinsâ€‰(1) to the shown oil pan screw bores.




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4. Click here for full size

5. Apply an approximately 3.5â€‰mm (0.14â€‰in) thick bead of oil pan sealant to the jointsâ€‰(1).




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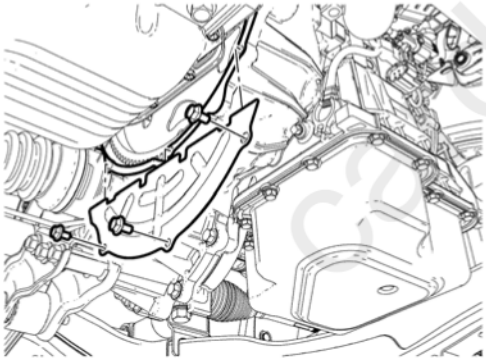
6. Click here for full size
7. Caution:

Refer to Fastener Caution.

8. Note:

   The assembly time including torque check must take no longer than 10â€‰minutes.

9. Install the 16â€‰oil pan boltsâ€‰(1), 2â€‰oil pan bolts after removing 2â€‰*EN-49980* pins and tighten to 10â€‰N-m (89â€‰lbâ€‰in).



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10.
Click here for full size

11. Install the transmission housing lower plate.
12. Install the 3â€‰housing lower plate bolts to the transmission and tighten to 10â€‰N-m (89â€‰lbâ€‰in).
13. Install the exhaust flexible pipe. Refer to Exhaust Pipe Replacement.
14. Install the front compartment splash shield. Refer to Front Compartment Splash Shield Replacement.
15. Lower the vehicle.
16. Install the oil level indicator tube. Refer to Oil Level Indicator Tube Replacement.
17. Note:

    Inspect the engine oil level and correct if necessary.
18. Refill the collected engine oil.
19. Close the hood.

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Engine Flywheel Replacement

### Removal Procedure

1. Remove the manual transmission. Refer to Transmission Replacement.
2. Remove the clutch pressure and driven plate. Refer to Clutch Pressure and Driven Plate Replacement.
3. Remove the engine flywheel. Refer to Engine Flywheel Removal.

### Installation Procedure

1. Install the engine flywheel. Refer to Engine Flywheel Installation.
2. Install the clutch pressure and driven plate. Refer to Clutch Pressure and Driven Plate Replacement.
3. Install the manual transmission. Refer to Transmission Replacement.

### Related Part Information

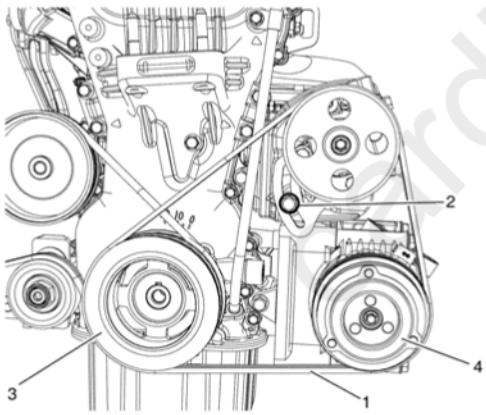
| Part Name | Catalog Name | Part Code |
|---|---|---|
| Engine Flywheel | FLYWHEEL,ENG | X0001 |
| Engine Flywheel | FLYWHEEL,ENG | SS006 |

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

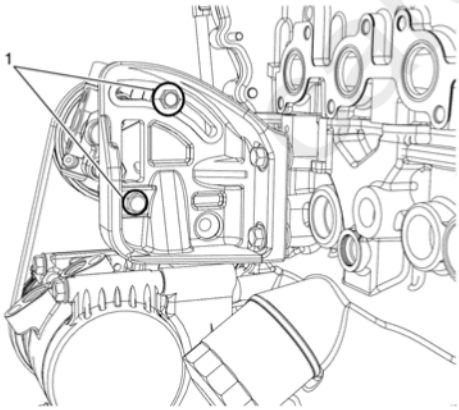
## Air Conditioning Compressor Belt Replacement (LKY)

Removal Procedure




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1. Click here for full size
2. Loosen the front shackle bolt (2) from the power steering pump.

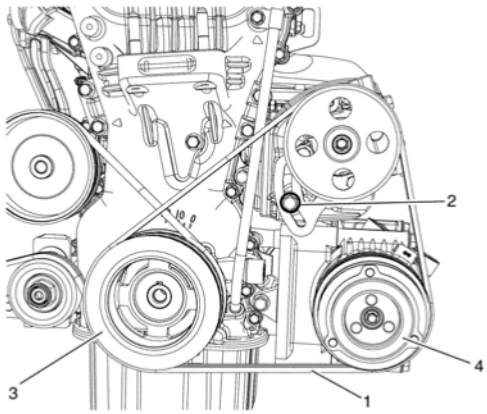



rdiagn.com

3.
Click here for full size

4. Loosen the rear shackle bolts (1) from the power steering pump.
5. Reposition the power steering pump assembly counterclockwise.

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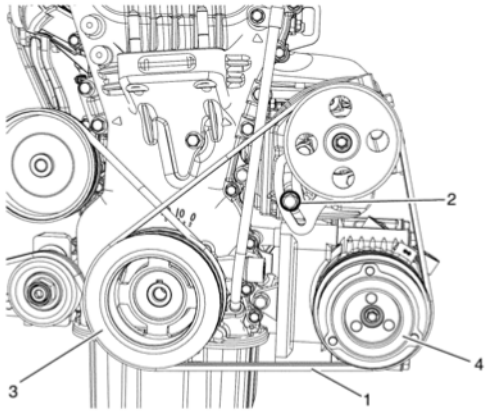
6.

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7. Remove and discard the air conditioning (A/C) belt (1).

Installation Procedure

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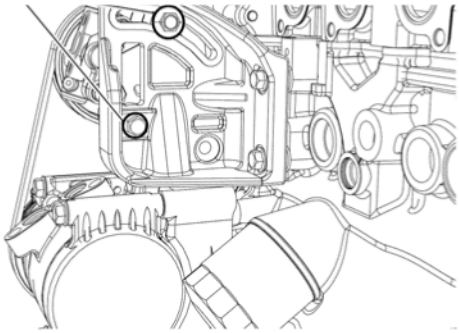


1. Click here for full size
2. Install a NEW air conditioning (A/C) belt (1) on the crankshaft pulley (3), air conditioning (A/C) compressor (4) and power steering pump pulley as shown.
3. Reposition the power steering pump assembly clockwise.
4. Caution:

   Refer to Fastener Caution.
5. Tighten the front shackle bolt (2) to 22â€‰N-m (16â€‰lbâ€‰ft).

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6. Click here for full size

7. Tighten the rear shackle bolts (1) to 22â€‰N-m (16â€‰lbâ€‰ft).

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Crankshaft Balancer Replacement (LKY)

Special Tools

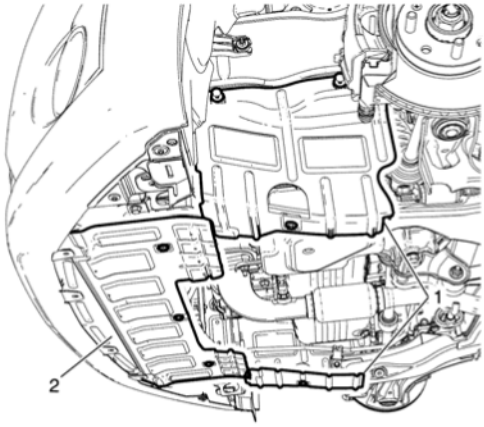
*EN 50175* Crankshaft Locking Device

For equivalent regional tools, refer to Special Tools.

### Removal Procedure

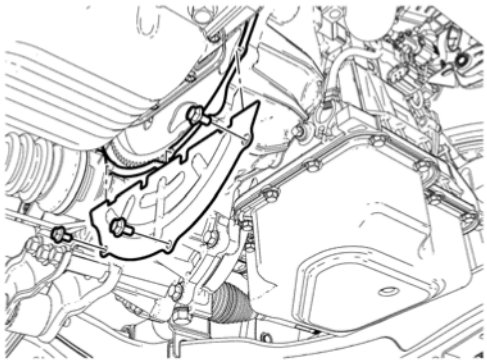
1. Open the hood.
2. Raise the vehicle by its full height. Refer to Lifting and Jacking the Vehicle.

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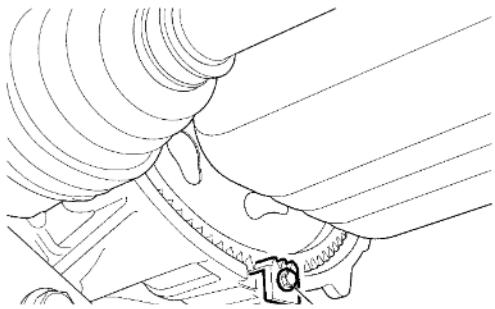
3. Click here for full size
4. Remove the compartment splash shieldâ€‰(1) right side only. Refer to Front Compartment Splash Shield Replacement.
5. Remove the water pump and generator belt. Refer to Water Pump and Generator Belt Replacement.

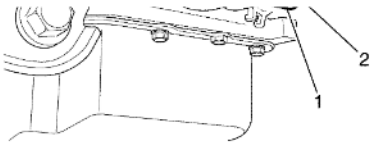
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6. Click here for full size
7. Remove the 3â€‰housing lower plate bolts from the transmission.
8. Remove the transmission housing lower plate.

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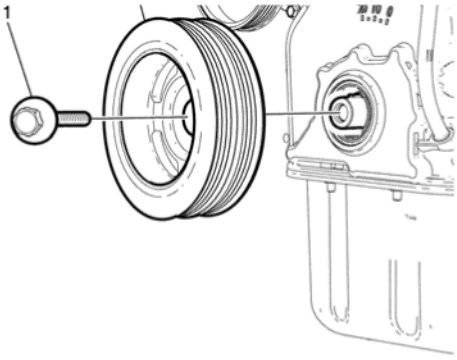





9. Click here for full size
10. Install the *EN-50175* crankshaft locking deviceâ€‰(1) to lock the crankshaft.
11. Install the boltâ€‰(2).

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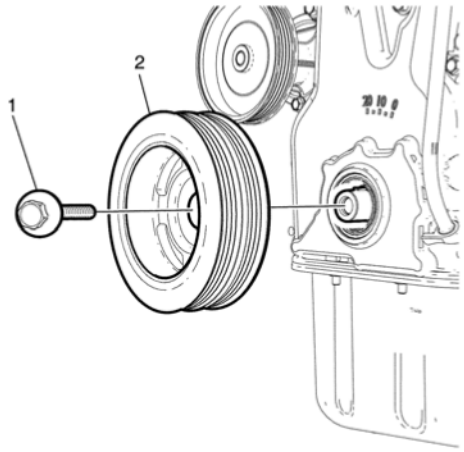





12. Click here for full size
13. Remove the crankshaft balancer boltâ€‰(1).
14. Remove the crankshaft balancerâ€‰(2).

## Installation Procedure

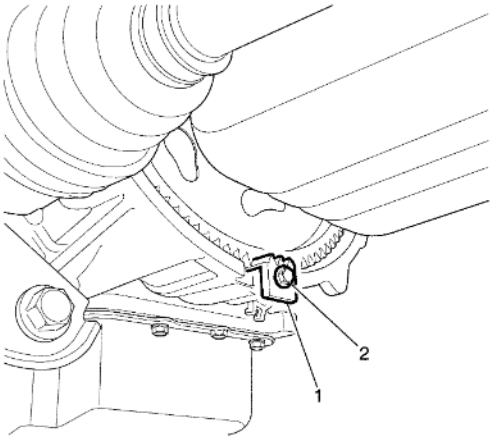
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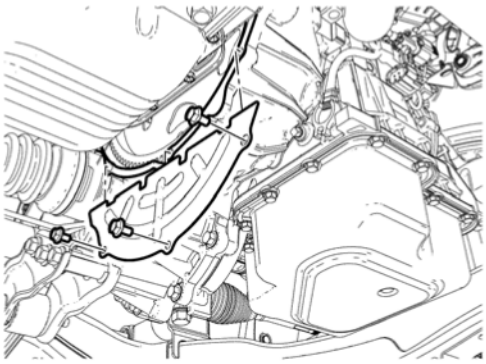
1. Click here for full size
2. Install the crankshaft balancerâ€‰(2).
3. Caution:

   Refer to Fastener Caution.
4. Install the NEW crankshaft balancer boltâ€‰(1) and tighten to 95â€‰N-m + 55Â° (70â€‰lbâ€‰ft + 55Â°).




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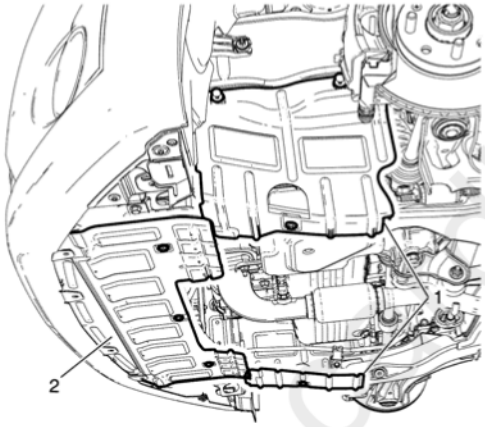
5. Click here for full size
6. Remove the boltâ€‰(1).
7. Remove the *EN 50175* crankshaft locking device(1) .



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8. Click here for full size
9. Install the transmission housing lower plate.

10. Install the 3â€‰housing lower plate bolts to the transmission and tighten to 9â€‰N-m (80â€‰lbâ€‰in).
11. Install the water pump and generator belt. Refer to Water Pump and Generator Belt Replacement.




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12.
Click here for full size

13. Install the compartment splash shield (1) right side only. Refer to Front Compartment Splash Shield Replacement
14. Lower the vehicle. Refer to Lifting and Jacking the Vehicle.
15. Close the hood.

## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Crankshaft Balancer | BALANCER,CR/SHF | X0001 |
| Crankshaft Balancer | BALANCER,CR/SHF | X0005 |
| Crankshaft Balancer | BALANCER,CR/SHF(CSTG) | X0011 |
| Crankshaft Balancer | BALANCER,CR/SHF (W/PULLEY) | X0014 |
| Crankshaft Balancer | BALANCER,CR/SHF | SJ277 |

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Crankshaft Balancer Replacement

Special Tools

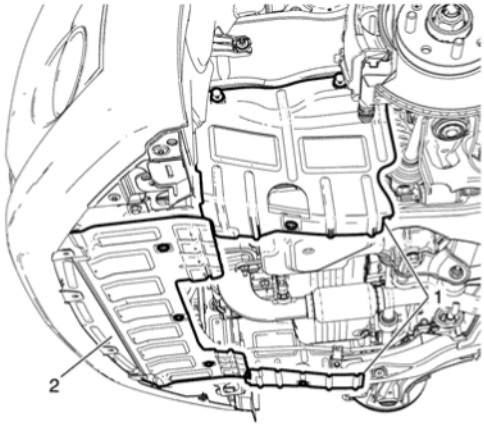
*EN 50175* Crankshaft Locking Device

For equivalent regional tools, refer to Special Tools.

### Removal Procedure

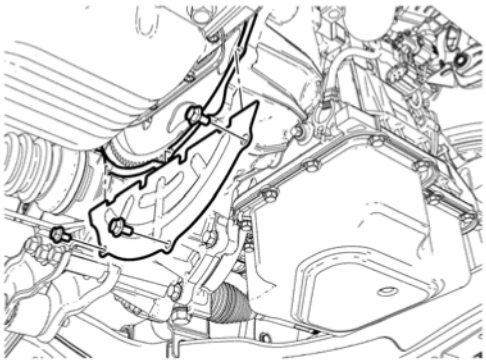
1. Open the hood.
2. Raise the vehicle by its full height. Refer to Lifting and Jacking the Vehicle.

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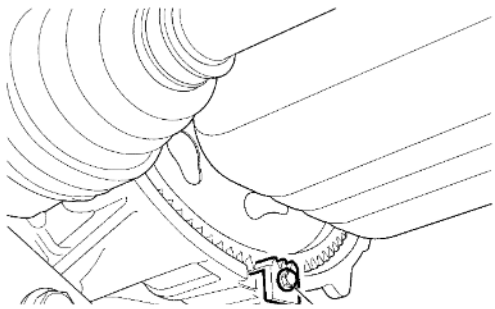
3. Click here for full size
4. Remove the compartment splash shieldâ€‰(1).
5. Remove the water pump and generator belt. Refer to Water Pump and Generator Belt Replacement.

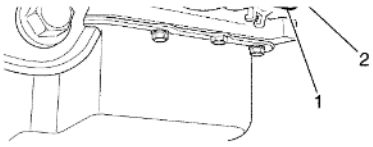
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6. Click here for full size
7. Remove the 3â€‰housing lower plate bolts from the transmission
8. Remove the transmission housing lower plate.

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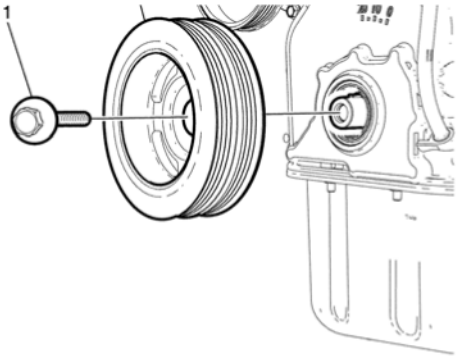





9. Click here for full size
10. Install the *EN-50175* crankshaft locking device(1) to lock the crankshaft.
11. Install the boltâ€‰(2).

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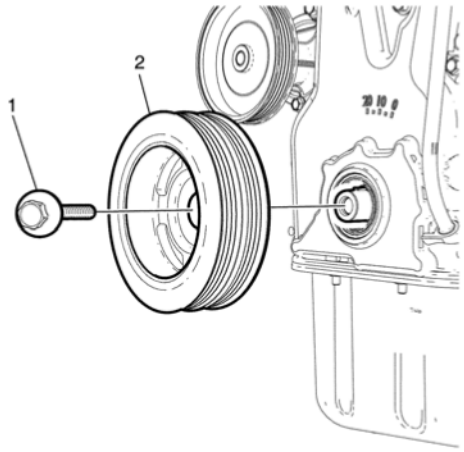





12. Click here for full size
13. Remove the crankshaft balancer boltâ€‰(1).
14. Remove the crankshaft balancerâ€‰(2).

## Installation Procedure

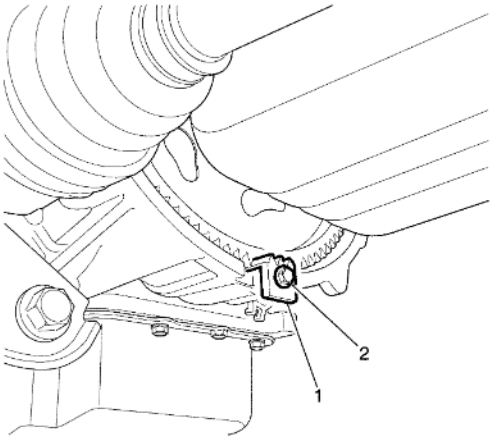
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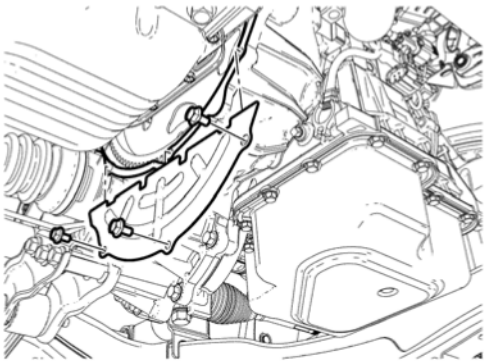
1. Click here for full size
2. Install the crankshaft balancerâ€‰(2).
3. Caution:

   Refer to Fastener Caution.
4. Install the NEW crankshaft balancer boltâ€‰(1) and tighten to 85â€‰N-m (63â€‰lbâ€‰ft).




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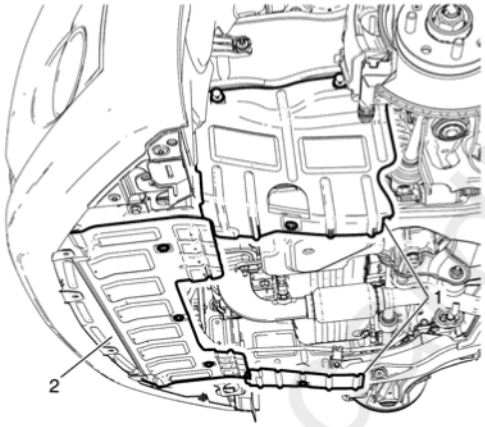
5. Click here for full size
6. Remove the boltâ€‰(1).
7. Remove the *EN 50175* crankshaft locking device(1) .



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8. Click here for full size
9. Install the transmission housing lower plate.

10. Install the 3â€‰housing lower platebolts to the transmission and tighten to 10â€‰N-m (89â€‰lbâ€‰in).
11. Install the water pump and generator belt. Refer to Water Pump and Generator Belt Replacement.




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12. Click here for full size

13. Install the compartment splash shieldâ€‰(1).

14. Lower the vehicle. Refer to Lifting and Jacking the Vehicle.

15. Close the hood.

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Crankshaft Front Oil Seal Replacement

Special Tool

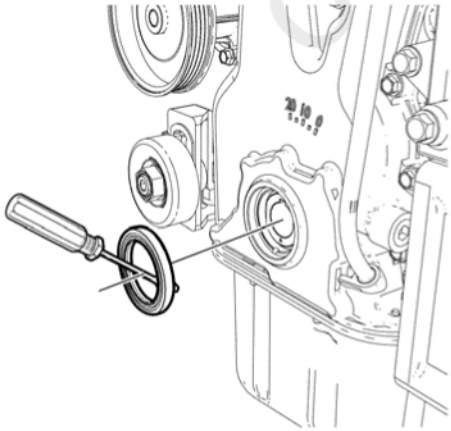
*J-50172* Crankshaft Front Oil Seal Installer

For equivalent regional tools, refer to Special Tools.

### Removal Procedure

1. Remove the crankshaft balancer. Refer to Crankshaft Balancer Replacement.

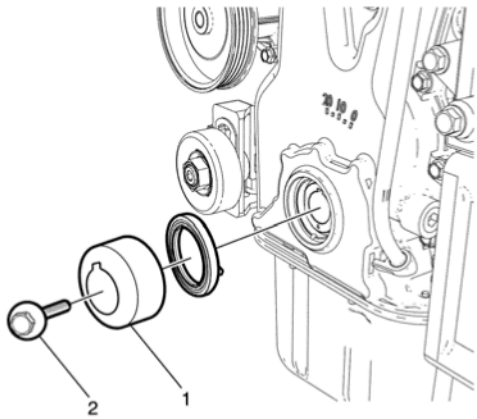
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2. Click here for full size
3. Use a flat-bladed tool to remove the seal from the front cover.

## Installation Procedure

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1. Click here for full size
2. Note:

   Use the *J-50172* crankshaft front oil seal installer in order to install the crankshaft front oil seal to the engine front cover.

3. Install the new crankshaft front oil seal to crankshaft with *J-50172* crankshaft front oil seal installerâ€‰(1).
4. Tighten the crankshaft boltâ€‰(2) till the *J-50172* crankshaft front oil seal installer seats on the engine front cover.
5. Remove the crankshaft bolt (2).
6. Install the crankshaft balancer. Refer to Crankshaft Balancer Replacement.

## Related Part Information

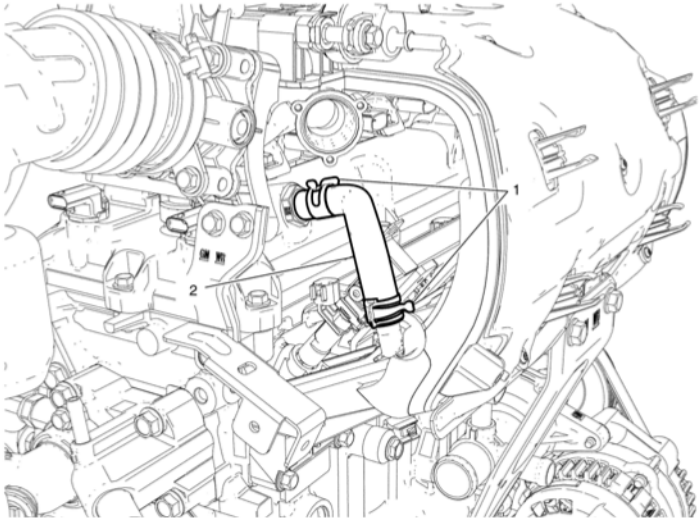
| Part Name | Catalog Name | Part Code |
|---|---|---|
| Crankshaft Front Oil Seal | SEAL,CR/SHF FRT OIL | X0019 |
| Crankshaft Front Oil Seal | SEAL,CR/SHF FRT OIL | X0020 |
| Crankshaft Front Oil Seal | SEAL KIT,CR/SHF FRT OIL | X0076 |
| Crankshaft Front Oil Seal | SEAL,CR/SHF FRT OIL | SJ233 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Positive Crankcase Ventilation Hose/Pipe/Tube Replacement (LKY)

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| Callout | Component Name |
|---|---|
| 1 | Positive Crankcase Ventilation Hose Clamp (Qty:â€‰2)<br><br>Procedure<br><br>Remove the positive crankcase ventilation hose clamp. |
| 2 | Positive Crankcase Ventilation Hose |

## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Positive Crankcase Ventilation Tube | TUBE,PCV | 0649Z |
| Positive Crankcase Ventilation Tube | TUBE,PCV | 0650A |
| Positive Crankcase Ventilation Tube | TUBE,PCV | 0700A |
| Positive Crankcase Ventilation Pipe | PIPE,PCV | 0945A |
| Positive Crankcase Ventilation Pipe | PIPE,PCV | 0945B |
| Positive Crankcase Ventilation Pipe | PIPE,PCV (W/ CHRG AIR BYPASS TUBE) | 0947A |
| Positive Crankcase Ventilation Hose | HOSE KIT,PCV | 0948Z |

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Positive Crankcase Ventilation Hose | HOSE,PCV | 0949A |
| Positive Crankcase Ventilation Hose | HOSE,PCV | 0950A |
| Positive Crankcase Ventilation Pipe | PIPE,PCV(W/TURBO WASTEGATE ACTR VAC CONT S/VLV VAC TUBE | 0952A |
| Positive Crankcase Ventilation Hose | HOSE,PCV | SJ028 |

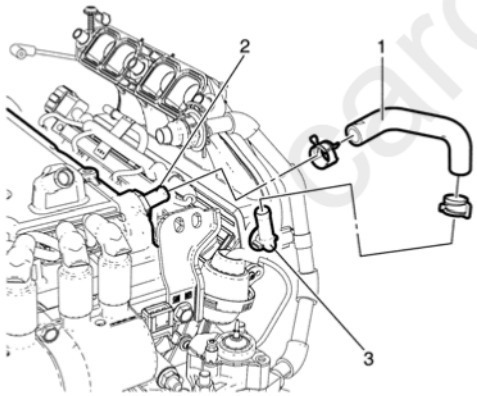
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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Positive Crankcase Ventilation Hose/Pipe/Tube Replacement

### Removal Procedure

1. Remove the upper intake manifold. Refer to Upper Intake Manifold Replacement.



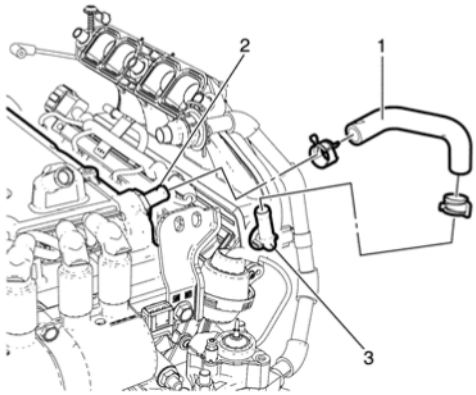

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2.
Click here for full size

3. Remove the positive crankcase ventilation tubeâ€‰(1) from the camshaft coverâ€‰(2), and lower intake manifoldâ€‰(3)
4. Remove the positive crankcase ventilation tubeâ€‰(1).

## Installation Procedure

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1. Click here for full size
2. Install the positive crankcase ventilation tubeâ€‰(1).
3. Install the upper intake manifold. Refer to Upper Intake Manifold Replacement.

## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Positive Crankcase Ventilation Tube | TUBE,PCV | 0649Z |
| Positive Crankcase Ventilation Tube | TUBE,PCV | 0650A |
| Positive Crankcase Ventilation Tube | TUBE,PCV | 0700A |
| Positive Crankcase Ventilation Pipe | PIPE,PCV | 0945A |
| Positive Crankcase Ventilation Pipe | PIPE,PCV | 0945B |
| Positive Crankcase Ventilation Pipe | PIPE,PCV (W/ CHRG AIR BYPASS TUBE) | 0947A |
| Positive Crankcase Ventilation Hose | HOSE KIT,PCV | 0948Z |
| Positive Crankcase Ventilation Hose | HOSE,PCV | 0949A |
| Positive Crankcase Ventilation Hose | HOSE,PCV | 0950A |
| Positive Crankcase Ventilation Pipe | PIPE,PCV(W/TURBO WASTEGATE ACTR VAC CONT S/VLV VAC TUBE | 0952A |
| Positive Crankcase Ventilation Hose | HOSE,PCV | SJ028 |

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Engine Front Cover with Oil Pump Replacement (with CH-49290)

Special Tools

- *CH-904* Base Frame
- *CH-49290* Engine Support Tool

For equivalent regional tools, refer to Special Tools.

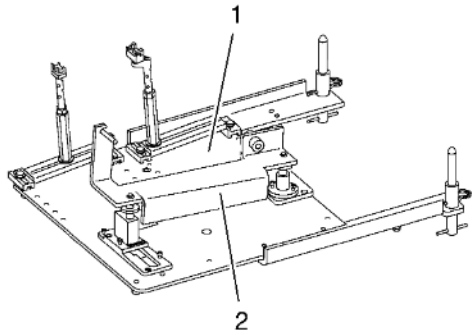
### Removal Procedure

1. Warning**:**

   Refer to Battery Disconnect Warning.

2. Disconnect the negative battery cable.
3. Drain the cooling system. Refer to Cooling System Draining and Filling.
4. Remove the upper intake manifold. Refer to Upper Intake Manifold Replacement.
5. Remove the camshaft cover. Refer to Camshaft Cover Replacement.
6. Remove the engine oil level indicator and tube. Refer to Oil Level Indicator Tube Replacement.
7. Raise the vehicle by its full height. Refer to Lifting and Jacking the Vehicle.
8. Remove the oil pan. Refer to Oil Pan Replacement.
9. Remove the drive belt. Refer to Drive Belt Replacement.
10. Remove the water pump. Refer to Water Pump Replacement.
11. Remove the crankshaft balancer. Refer to Crankshaft Balancer Removal.
12. Remove the generator. Refer to Generator Replacement.
13. Remove the drive belt tensioner. Refer to Drive Belt Tensioner Removal.

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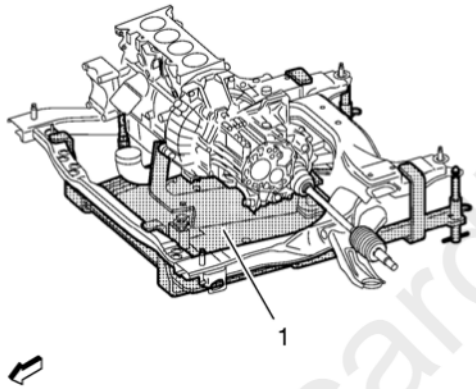

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14. Click here for full size
15. Note:

    The manual that is supplied with the special tool, is also available online. Go to https://gmtoolsandequipment.com.

16. Assemble the *CH-49290* support tool (1) according to the details provided in the installation manual.

17. Install the torque supportâ€‰(2) to the engine.
18. Support the *CH-904* base frame on a jack.
19. Support the *CH-49290* support tool on the *CH-904* base frame.




20.

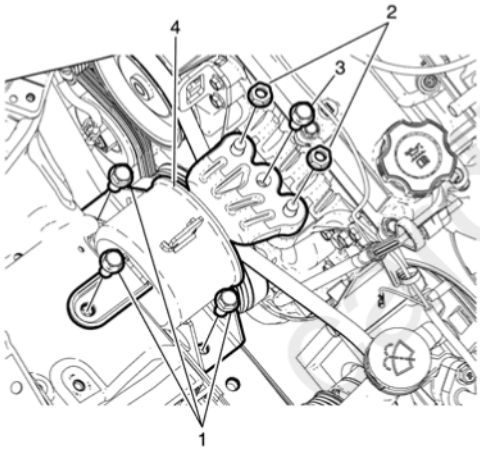
Click here for full size

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21. Note:

    The manual that is supplied with the special tool, is also available online. Go to https://gmtoolsandequipment.com.

22. Install the *CH-49290* support toolâ€‰(1) according to the details provided in the installation manual.

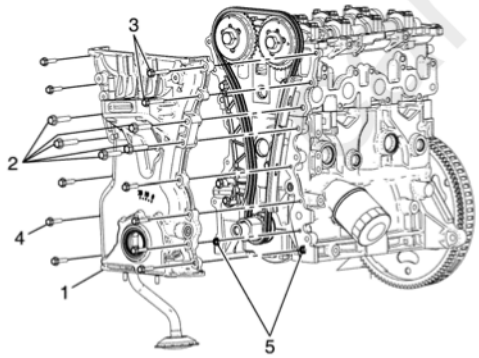



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23.
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24. Remove the engine mount boltsâ€‰(1,â€‰3) and nutsâ€‰(2).

25. Remove the engine mountâ€‰(4).

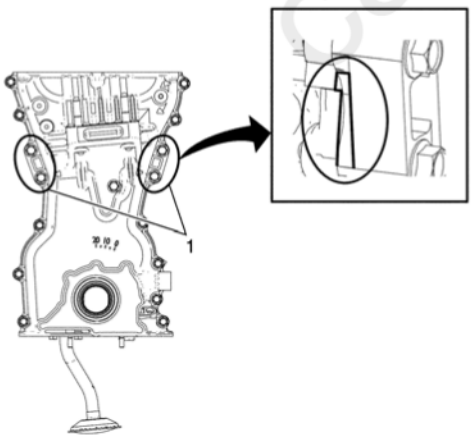



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26.

Click here for full size

27. Remove the engine front cover boltsâ€‰(2,â€‰3,â€‰4).




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28. Click here for full size
29. Note:

    Use the pry points and a bolt in the jackscrew hole in order to remove the engine front cover.

30. Using the pry pointsâ€‰(1) located at the edge of the front cover, shear the room temperature vulcanizing (RTV) sealant.
31. Remove the engine front cover evenly all the way around with a suitable tool. Refer to Engine Front Cover and Oil Pump Removal.
32. Note:

    There are no serviceable components within the oil pump. Disassemble the pump only to diagnose an oiling concern. A disassembled oil pump must not be reused. A disassembled oil pump must be replaced.

33. Disassemble the engine front cover as necessary. Refer to Oil Pump Disassemble.

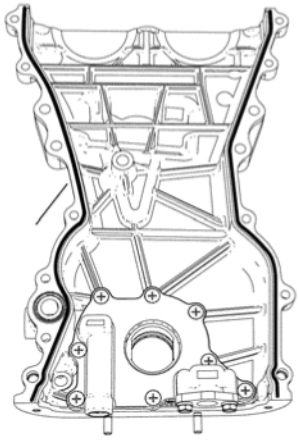
## Installation Procedure

1. Note:

   DO NOT use sharp and/or metal gasket scrapers in order to clean the sealing surfaces.

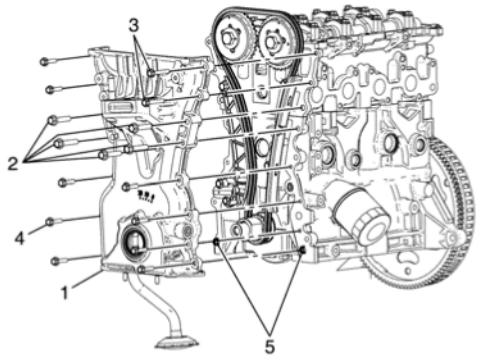
2. Carefully clean the engine front cover sealing surfaces.
3. Assemble the engine front cover as necessary. Refer to Oil Pump Assemble.

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4. Click here for full size
5. Apply an approximately 3.5â€‰mm (0.14â€‰in) thick bead of oil pan sealant
6. Install the engine front cover.

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7. Click here for full size
8. Note:

   Do not damage the sealing surfaces.

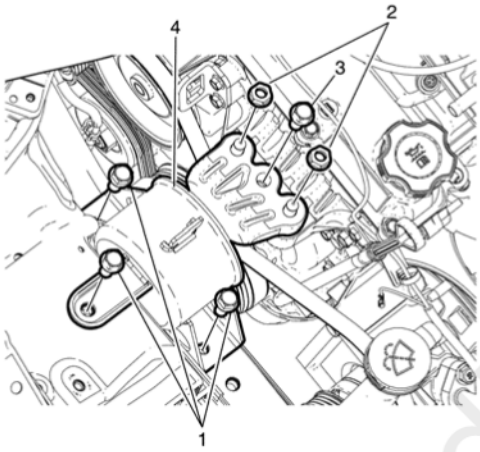
9. Install the engine front cover with the included oil pumpâ€‰(1).
10. Caution:

    Refer to Fastener Caution.

11. Note:

    Check the different screw lengths.

12. Tighten the boltsâ€‰(2,â€‰3,â€‰4) to 20â€‰N-mâ€‰(15â€‰lbâ€‰ft).



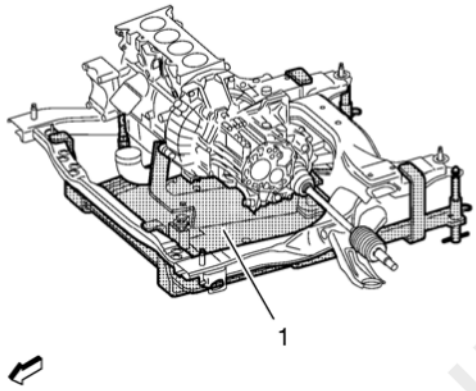

13.

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14. Install the engine mountâ€‰(4).
15. Install the boltsâ€‰(1,â€‰3) and nutsâ€‰(2).
16. Tighten the engine mount to body retaining boltsâ€‰(1) to 50â€‰N-mâ€‰(37â€‰lbâ€‰ft).
17. Tighten the engine mount to engine retaining boltâ€‰(3) and nuts (2) to 58â€‰N-mâ€‰(43â€‰lbâ€‰ft).

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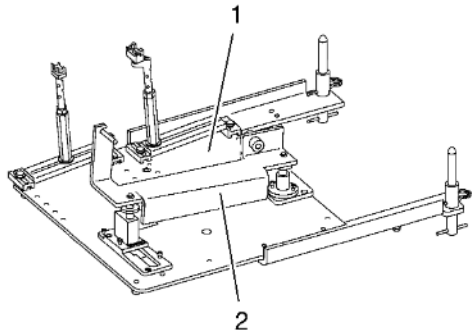

18. Click here for full size

19. Remove the *CH-49290* support toolâ€‰(1).

20. Remove the *CH-49290* support tool from the *CH-904* base frame.

21. Remove the *CH-904* base frame from the jack.

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22. [Click here for full size]
23. Note:

    The manual that is supplied with the special tool, is also available online. Go to https://gmtoolsandequipment.com.

24. Disassemble the *CH-49290* support tool (1) according to the details provided in the installation manual.

25. Remove the torque supportâ€‰(2) from the engine.
26. Install the drive belt tensioner. Refer to Drive Belt Tensioner Installation.
27. Install the generator. Refer to Generator Replacement.
28. Install the crankshaft balancer. Refer to Crankshaft Balancer Installation.
29. Install the water pump. Refer to Water Pump Replacement.
30. Install the drive belt. Refer to Drive Belt Replacement.
31. Install the oil pan. Refer to Oil Pan Replacement.
32. Lower the vehicle. Refer to Lifting and Jacking the Vehicle.
33. Install the engine oil level indicator and tube. Refer to Oil Level Indicator Tube Replacement.
34. Install the camshaft cover. Refer to Camshaft Cover Replacement.
35. Install the upper intake manifold. Refer to Upper Intake Manifold Replacement.
36. Fill the engine oil, if necessary.
37. Fill the cooling system. Refer to Cooling System Draining and Filling.
38. Connect the negative battery cable. Refer to Battery Negative Cable Disconnection and Connection.

## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Engine Front Cover | COVER,ENG FRT | X0002 |
| Engine Front Cover | COVER,ENG FRT | X0032 |
| Engine Front Cover | COVER,ENG FRT(CSTG) | X0033 |
| Engine Front Cover | COVER,ENG FRT(W/OIL FLTR ADAP,O/PMP & W/PMP) | X0034 |
| Engine Front Cover | COVER,ENG FRT(WITH O/PMP & W/PMP) | X0035 |
| Engine Front Cover | COVER,ENG FRT(W/CR/SHF FRT OIL SEAL) | X0036 |
| Engine Front Cover | COVER,ENG FRT (W/ W/PMP) | X0037 |
| Engine Front Cover | COVER,ENG FRT(W/OIL PMP) | X0038 |
| Engine Front Cover | COVER,ENG FRT(W/TMG IND) | X0066 |
| Engine Front Cover | COVER,ENG FRT (MCHG) | X0070 |
| Engine Front Cover | COVER KIT,ENG FRT | X0087 |
| Engine Front Cover | COVER,ENG FRT(CHROME) | SS024 |
| Engine Front Cover | COVER,ENG FRT | SS200 |

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

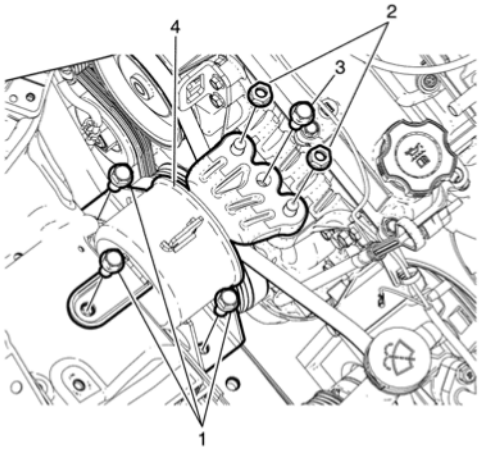
## Engine Front Cover with Oil Pump Replacement (LKY)

### Removal Procedure

1. Open the hood.
2. Warning**:**

   Refer to Battery Disconnect Warning.
3. Disconnect the negative battery cable.
4. Raise the vehicle. Refer to Lifting and Jacking the Vehicle.
5. Drain the cooling system. Refer to Cooling System Draining and Filling.
6. Drain the engine oil.
7. Remove the intake manifold. Refer to Intake Manifold Replacement.
8. Remove the ignition coil. Refer to Ignition Coil Replacement.
9. Remove the camshaft cover. Refer to Camshaft Cover Replacement.
10. Remove the engine lift rear bracket. Refer to Engine Lift Rear Bracket Removal.
11. Remove the engine oil level indicator and tube. Refer to Oil Level Indicator Tube Replacement.
12. Install the engine support fixture, and hook only the engine lift front bracket.
13. Remove the oil pan and discard. Refer to Oil Pan Replacement.
14. Remove the water pump and generator belt. Refer to Water Pump and Generator Belt Replacement.
15. Remove the generator. Refer to Generator Replacement.
16. Remove the generator bracket. Refer to Generator Bracket Removal.
17. Remove the water pump. Refer to Water Pump Replacement.
18. Remove the crankshaft balancer. Refer to Crankshaft Balancer Removal.

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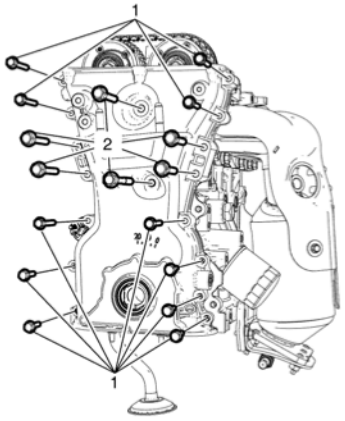



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19. Click here for full size
20. Note:

    Support the engine block with woodblocks as necessary.

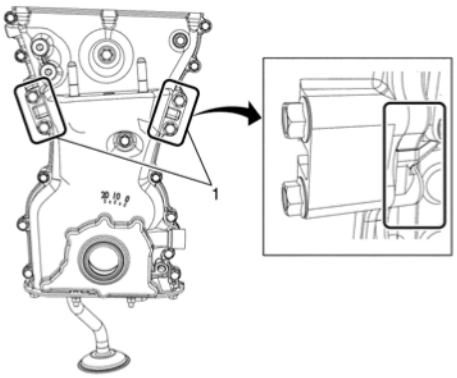
21. Prior to removing the mount, mark the mount location using a marker for correct positioning during installation.
22. Remove the engine mount boltsâ€‰(1, 3) and nutsâ€‰(2).
23. Remove the engine mount (4).




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24.
Click here for full size

25. Remove the engine front cover boltsâ€‰(1, 2).




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26. Click here for full size
27. Note**:**

    Use the pry points and a bolt in the jackscrew hole in order to remove the engine front cover.

28. Using the pry pointsâ€‰(1) located at the edge of the front cover, shear the room temperature vulcanizing (RTV) sealant.

29. Remove the engine front cover evenly all the way around with a suitable tool. Refer to Engine Front Cover and Oil Pump Removal
30. Disassemble the engine front cover, and inspect the oil pump. Refer to Oil Pump Disassemble.

## Installation Procedure

1. Note:

   DO NOT use sharp and/or gasket scrapers in order to clean the sealing surfaces.

2. Note:

   Cleaning of the sealing surfaces (1â€“4): Refer to Replacing Engine Gaskets.

3. Remove any old thread sealant, gasket material or sealant using remover such as chisel or scraper.
4. Clean the sealing surfaces of front cover and front cover components with solvent.
5. Note:

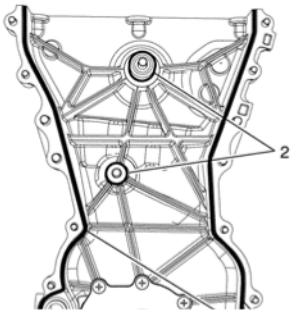
   Ensure that the sealing surface is clear of oil, grease and oil sealant material.

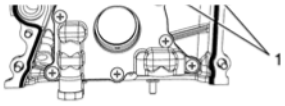
6. Clean out debris from the bolt holes.
7. Warning:

   Refer to Safety Glasses and Compressed Air Warning.

8. Dry the front cover and front cover components with compressed air.
9. Assemble the engine front cover with the oil pump. Refer to Oil Pump Assemble.

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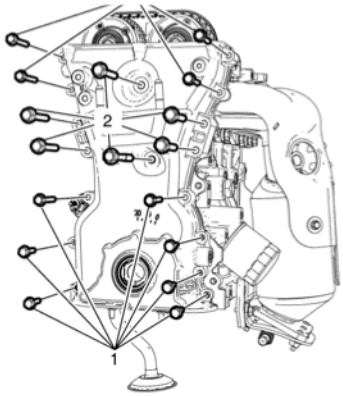



10. Click here for full size
11. Note**:**

    Apply sealant (RTV) on lines (1), and 2 hole faces (2). Apply sealant (RTV) to the edges of top and bottom step chamfers.

12. Apply approximately a 4.5â€‰mm (0.177â€‰in) thick bead of front cover sealant.
13. Install the engine front cover bolts (1, 2).

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14. [Click here for full size]
15. Caution:

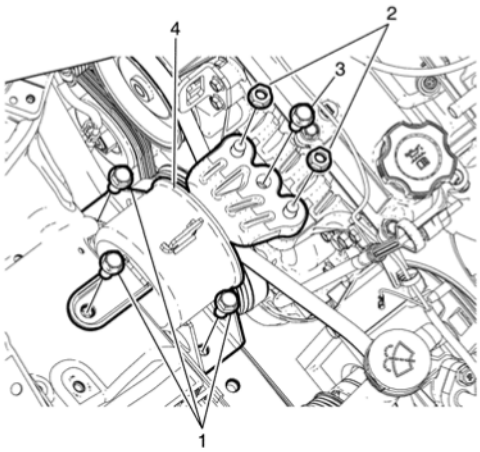
    Refer to Fastener Caution.

16. Install the engine front cover boltsâ€‰(1, 2).
17. Tighten the engine front cover boltsâ€‰(2) to 22â€‰N-m (16â€‰lbâ€‰ft).
18. Note:

    After sealant (RTV) dispensing, the assembly completion time including torque check must be done within 8 minutes.

19. Tighten the engine front cover boltsâ€‰(1) to 10â€‰N-m (89â€‰lbâ€‰in).

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20. Click here for full size
21. Note:

    Support the engine block with woodblocks as necessary.

22. Install the engine mountâ€‰â€‰(4).
23. Install the boltsâ€‰(1, 3) and nutsâ€‰(2).
24. Tighten the engine mount to body retaining boltsâ€‰(1) to 50â€‰N-m (37â€‰lbâ€‰ft).
25. Tighten the engine mount to engine retaining boltâ€‰(3) and nutsâ€‰(2) to 66â€‰N-m (49â€‰lbâ€‰ft).

26. Remove the engine fixture.
27. Install the water pump. Refer to Water Pump Replacement.
28. Install the generator bracket. Refer to Generator Bracket Installation.
29. Install the generator. Refer to Generator Replacement.
30. Install the crankshaft balancer. Refer to Crankshaft Balancer Installation.
31. Install the water pump and generator belt. Refer to Water Pump and Generator Belt Replacement.
32. Note:

    Install a new oil pan.
33. Install a new oil pan. Refer to Oil Pan Replacement.
34. Lower the vehicle. Refer to Lifting and Jacking the Vehicle.
35. Install the engine oil level indicator and tube. Refer to Oil Level Indicator Tube Replacement.
36. Install the engine lift rear bracket. Refer to Engine Lift Rear Bracket Installation.
37. Install the camshaft cover. Refer to Camshaft Cover Replacement.
38. Install the intake manifold. Refer to Intake Manifold Replacement.
39. Fill the engine oil.
40. Fill the cooling system. Refer to Cooling System Draining and Filling.
41. Connect the negative battery cable. Refer to Battery Negative Cable Disconnection and Connection.
42. Close the hood.

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Engine Front Cover with Oil Pump Replacement (wiht EN-50176)

Special Tools

- *EN-50176* Powertrain Support Pallet
- *EN-49802* Cradle Supporter
- *EN-50177* Cradle Support Holder

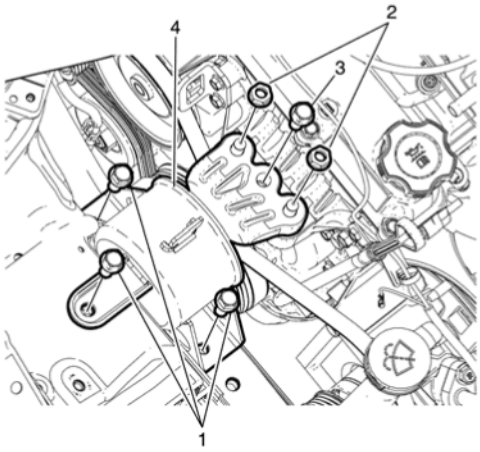
For equivalent regional tools, refer to Special Tools.

### Removal Procedure

1. Open the hood.
2. Warning**:**

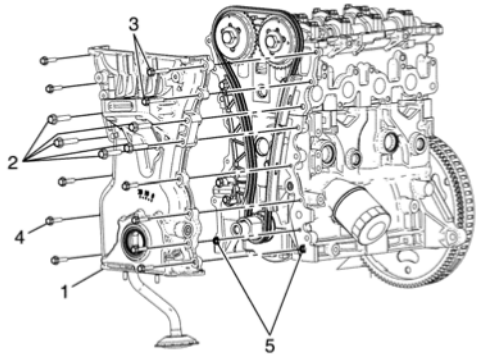
   Refer to Battery Disconnect Warning.
3. Disconnect the negative battery cable.
4. Drain the cooling system. Refer to Cooling System Draining and Filling.
5. Remove the upper intake manifold. Refer to Upper Intake Manifold Replacement.
6. Remove the camshaft cover. Refer to Camshaft Cover Replacement.
7. Remove the engine oil level indicator and tube. Refer to Oil Level Indicator Tube Replacement.
8. Raise the vehicle by its full height. Refer to Lifting and Jacking the Vehicle.
9. Remove the oil pan. Refer to Oil Pan Replacement.
10. Remove the drive belt. Refer to Drive Belt Replacement.
11. Remove the water pump. Refer to Water Pump Replacement.
12. Remove the crankshaft balancer. Refer to Crankshaft Balancer Removal.
13. Remove the generator. Refer to Generator Replacement.
14. Remove the drive belt tensioner. Refer to Drive Belt Tensioner Removal.
15. Install the *EN-50176* powertrain support pallet , *EN-49802* cradle supporter , and *EN-50177* cradle support holder to the cradle. Refer to Engine/Transmission Mounting.

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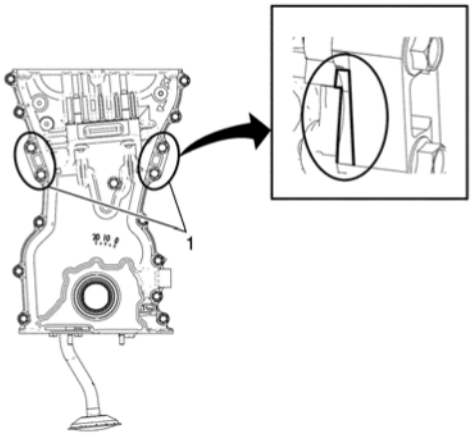
16. Click here for full size
17. Remove the engine mount bolts (1, 3) and nuts (2).
18. Remove the engine mount (4).




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19. Click here for full size

20. Remove the engine front cover bolts (2, 3, 4).




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21. [Click here for full size]
22. Note**:**

    Use the pry points and a bolt in the jackscrew hole in order to remove the engine front cover.

23. Using the pry points (1) located at the edge of the front cover, shear the room temperature vulcanizing (RTV) sealant.

24. Remove the engine front cover evenly all the way around with a suitable tool. Refer to Engine Front Cover and Oil Pump Removal.
25. Note:

    There are no serviceable components within the oil pump. Disassemble the pump only to diagnose an oiling concern. A disassembled oil pump must not be reused. A disassembled oil pump must be replaced.

26. Disassemble the engine front cover as necessary. Refer to Oil Pump Disassemble.

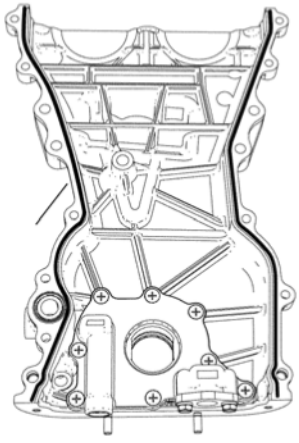
## Installation Procedure

1. Note:

   DO NOT use sharp and/or metal gasket scrapers in order to clean the sealing surfaces.

2. Carefully clean the engine front cover sealing surfaces.
3. Assemble the engine front cover as necessary. Refer to Oil Pump Assemble.

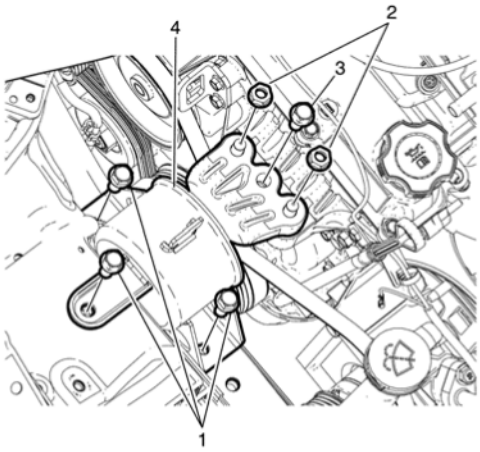
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4.
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5. Apply an approximately 3.5â€‰mm (0.14â€‰in) thick bead of oil pan sealant
6. Install the engine front cover.

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7. 
   Click here for full size
8. Caution:

   Refer to Fastener Caution.

9. Install the 16 engine front cover bolts and tighten to 20â€‰N-m (15â€‰lbâ€‰ft).
10. Install the engine mountâ€‰(4).
11. Install the bolts (1, 3) and nuts (2).
12. Tighten the engine mount to body retaining bolts (1) to 50â€‰N-m (37â€‰lbâ€‰ft).
13. Tighten the engine mount to engine retaining bolt (3) and nuts (2) to 58â€‰N-m (43â€‰lbâ€‰ft).
14. Remove the *EN-50176* powertrain support pallet , *EN-49802* cradle supporter , and *EN-50177* cradle support holder from the cradle. Refer to Engine/Transmission Mounting.
15. Install the drive belt tensioner. Refer to Drive Belt Tensioner Installation.
16. Install the generator. Refer to Generator Replacement.
17. Install the crankshaft balancer. Refer to Crankshaft Balancer Installation.
18. Install the water pump. Refer to Water Pump Replacement.
19. Install the drive belt. Refer to Drive Belt Replacement.
20. Install the oil pan. Refer to Oil Pan Replacement.
21. Lower the vehicle. Refer to Lifting and Jacking the Vehicle.
22. Install the engine oil level indicator and tube. Refer to Oil Level Indicator Tube Replacement.
23. Install the camshaft cover. Refer to Camshaft Cover Replacement.
24. Install the upper intake manifold. Refer to Engine Front Cover and Oil Pump Removal.
25. Fill the engine oil, if necessary.
26. Fill the cooling system. Refer to Cooling System Draining and Filling.
27. Connect the negative battery cable. Refer to Battery Negative Cable Disconnection and Connection.
28. Close the hood.

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Camshaft Timing Chain Replacement and Adjustment

Special Tools

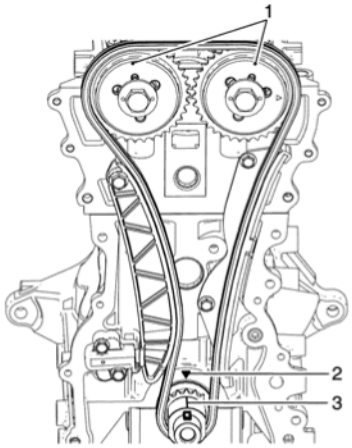
*EN-49073* Timing Chain Tensioner Pin

For equivalent regional tools, refer to Special Tools.

### Removal Procedure

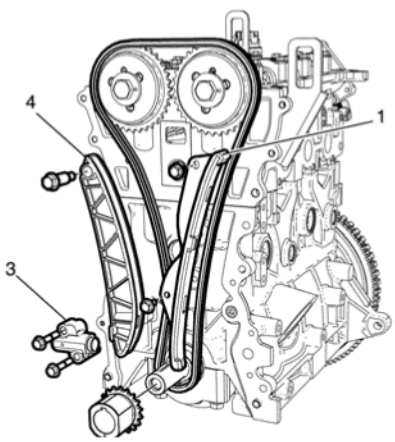
1. Remove the engine front cover evenly all the way around with a suitable tool. Refer to Engine Front Cover and Oil Pump Removal.
2. Install the crankshaft balancer bolt to crankshaft.

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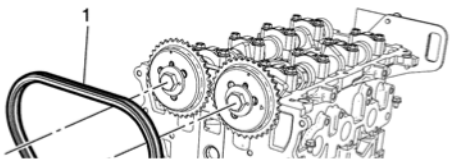
3. Click here for full size
4. Set engine to TDC. Set crankshaft in direction of engine rotation to cylinder 1 TDC of combustion stroke.
5. Align the alignment triangle mark (2) with the crankshaft alignment mark (3).
6. Ensure that the mark (1) on the both camshaft sprockets is positioned.

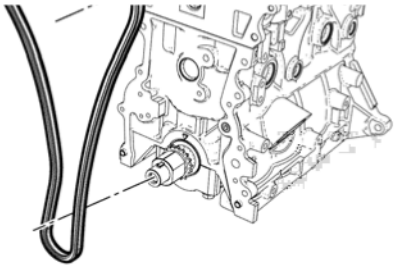
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7. Click here for full size
8. Remove the timing chain tensioner (3).
9. Remove the left timing chain shoe (4).
10. Remove the right timing chain guide (1).

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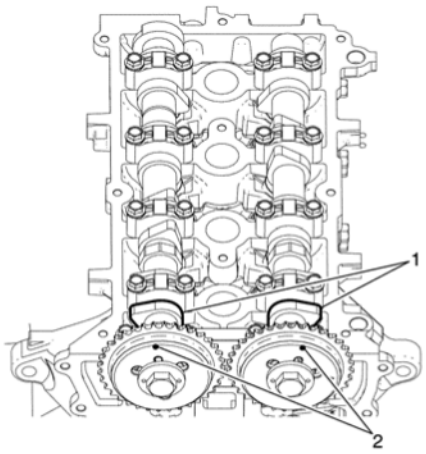




11. Click here for full size
12. Remove the timing chain.

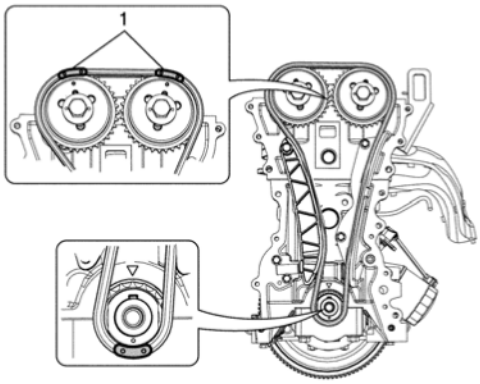
## Installation Procedure

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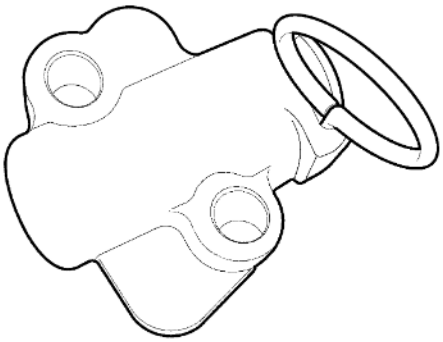

1. Click here for full size
2. Ensure that the camshaft lobes (1) in a neutral position.

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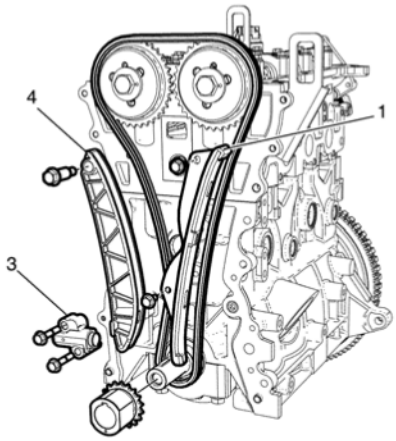
3. Click here for full size
4. Install the timing chain after aligning both the mark (1) on the camshaft sprocket and on the timing chain.
5. Align both the timing mark on the crankshaft sprocket and on the timing chain.



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6. Click here for full size

7. Push the timing chain tensioner lever and fix the lever by installing the *EN-49073* timing chain tensioner pin .




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8. Click here for full size
9. Caution:

   Refer to Fastener Caution.

10. Install the timing chain guide (1). And tighten the timing chain guide retaining bolts to 10â€‰N-m (89â€‰lbâ€‰in).
11. Install the timing chain shoe (4). And tighten the timing chain lever retaining bolts to 10â€‰N-m (89â€‰lbâ€‰in).
12. Install the timing chain tensioner (3). And tighten the timing chain tensioner retaining bolts to 10â€‰N-m (89â€‰lbâ€‰in).

13. Install the engine front cover. Refer to Engine Front Cover and Oil Pump Removal.

## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Timing Chain | CHAIN,TMG | X0056 |

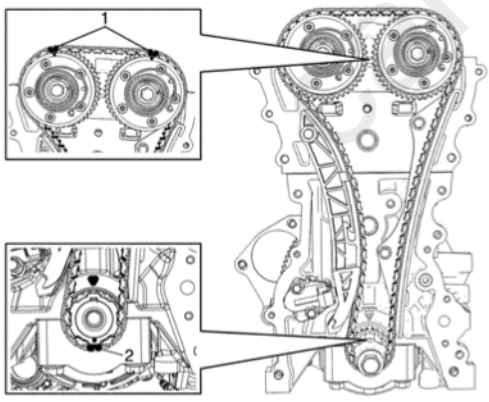
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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Camshaft Timing Chain Replacement and Adjustment (LKY)

### Removal Procedure

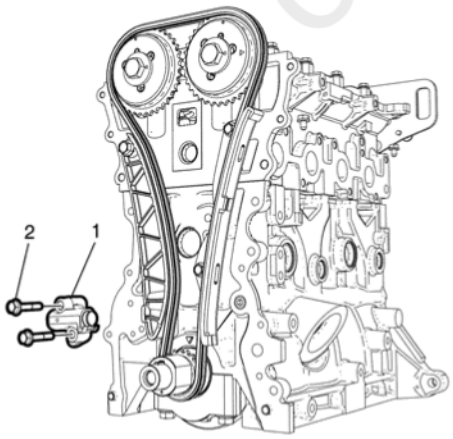
1. Remove the engine front cover evenly all the way around with a suitable tool. Refer to Engine Front Cover with Oil Pump Replacement.
2. Install the crankshaft balancer bolt to crankshaft.




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3.
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4. Rotate the crankshaft to the TDC (Top Dead Center) position.

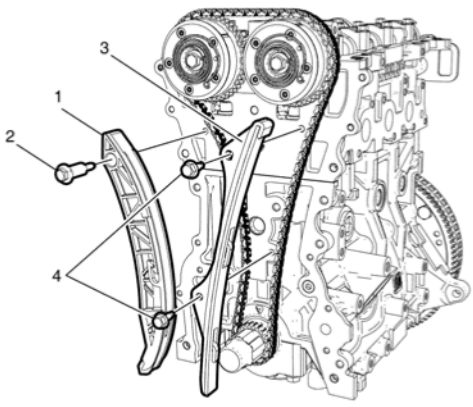



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5.
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6. Remove the timing chain tensioner boltsâ€‰(2) and the timing chain tensionerâ€‰(1) with the timing chain tensioner gasket.

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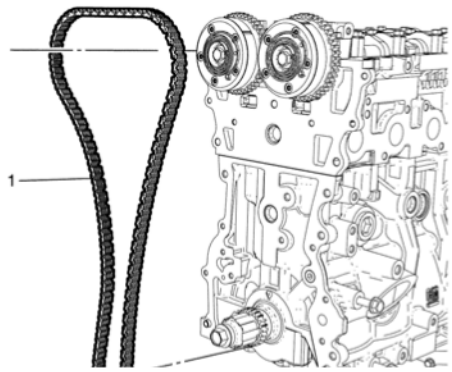


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8. Remove the left timing chain shoe retaining boltâ€‰(2) and the left timing chain shoeâ€‰(1).

9. Remove the right timing chain guide retaining boltsâ€‰(4) and the right timing chain guideâ€‰(3).

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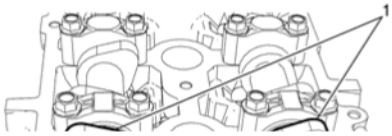


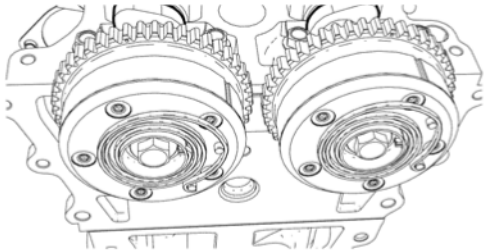


10. Click here for full size
11. Remove the timing chainâ€‰(1).

## Installation Procedure

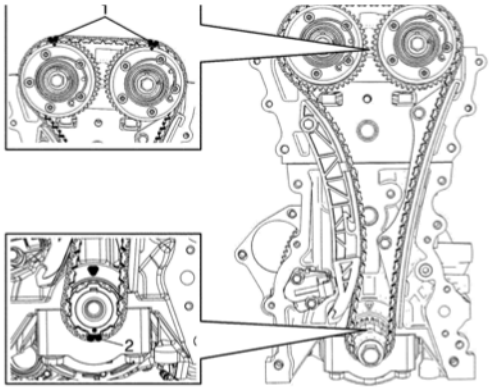
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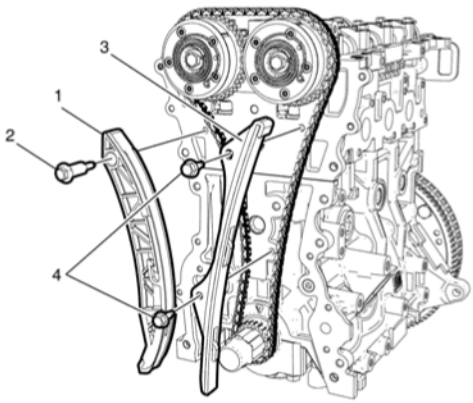
1. Click here for full size
2. Ensure that the camshaft lobesâ€‰(1) are in a neutral position.

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3. Click here for full size
4. Install the timing chain after aligning both the marksâ€‰(1) on the camshaft sprockets and on the timing chain.
5. Align the colored link with the timing mark on the camshaft sprocketâ€‰(2).

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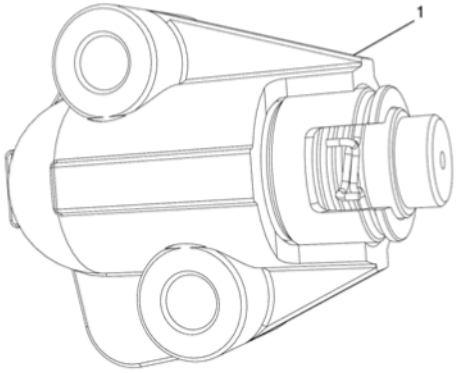



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6. Click here for full size
7. Caution:

   Refer to Fastener Caution.

8. Install the timing chain guideâ€‰(3), and tighten the timing chain guide retaining boltsâ€‰(4) to 10â€‰N-m (89â€‰lbâ€‰in).
9. Install the timing chain shoeâ€‰(1), and tighten the timing chain shoe retaining boltâ€‰(2) to 10â€‰N-m (89â€‰lbâ€‰in).

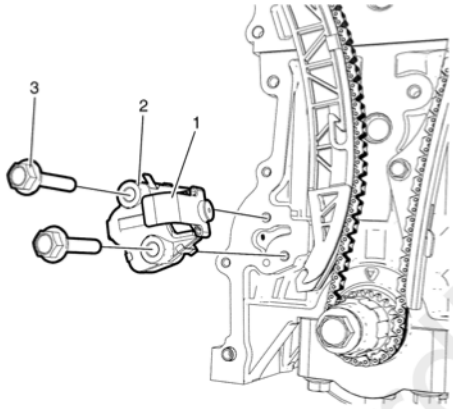



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10. [Click here for full size]
11. Note**:**

    Inspect the timing chain tensioner mounting surface on the cylinder block for burrs or any defects that may degrade the sealing of the timing chain tensioner.

12. Push the timing chain shoe towards the timing chain, and hold the timing chain shoe. Using the other hand, push the timing chain tensionerâ€‰(1) with a new timing chain tensioner gasket towards the timing chain shoe. The timing chain tensioner plunger might be pushed into the timing chain tensioner housing. While holding the timing chain tensioner, install the timing chain tensioner bolts, and tighten the timing chain tensioner retaining bolts to 10â€‰N-m (89â€‰lbâ€‰in). â€“ Old Tensioner




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14. Install a new timing tensioner assemblyâ€‰(2) including a timing chain tensioner gasket and tighten the timing tensioner retaining boltsâ€‰(3) to 10â€‰N-m (89â€‰lbâ€‰in). â€“ New Tensioner
15. Remove the timing tensioner plunger holderâ€‰(1).
16. Remove the crankshaft balancer bolt.
17. Install the engine front cover. Refer to Engine Front Cover with Oil Pump Replacement.

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Oil Pump Replacement

### Removal Procedure

1. Remove the engine front cover. Refer to Engine Front Cover with Oil Pump Replacement.
2. Note:

   There are no serviceable components within the oil pump. Disassemble the pump only to diagnose an oiling concern. A disassembled oil pump must not be reused. A disassembled oil pump must be replaced.
3. Remove the oil pump bolts and the oil pump.
4. Perform the following steps as necessary:
5.
   - Disassemble the oil pump. Refer to Oil Pump Disassemble
   - Clean and inspect the oil pump. Refer to Oil Pump Disassemble

### Installation Procedure

1. Assemble the oil pump as necessary. Refer to Oil Pump Assemble.
2. Install the oil pump. Refer to Oil Pump Assemble.
3. Install the engine front cover. Refer to Engine Front Cover with Oil Pump Replacement.

### Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Oil Pump | PUMP,OIL | X0036 |
| Oil Pump | PUMP,OIL(W/SCRN) | X0100 |
| Oil Pump | PUMP KIT,OIL | X0112 |
| Oil Pump | PUMP,OIL (W/SCRN) | SJ007 |
| Oil Pump | PUMP KIT,OIL | SJ042 |
| Oil Pump | PUMP,OIL | SS149 |

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

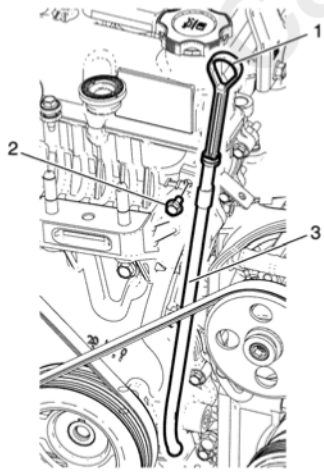
## Oil Level Indicator Tube Replacement

### Removal Procedure

1. Open the hood.
2. Note:

   If the engine oil level is at maximum, some oil may emerge when drawing out the oil dipstick guide tube.
3. Place collecting basin underneath.

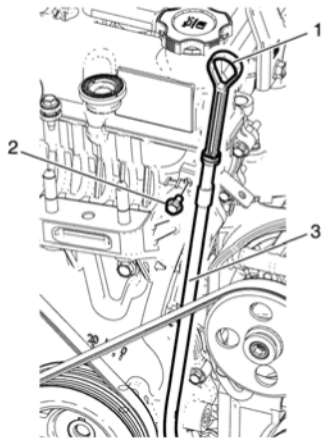
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4. Click here for full size
5. Remove the oil level indicator (1).
6. Remove the oil level indicator tube bolt (2).
7. Remove the oil level indicator tube (3).

## Installation Procedure

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1. Click here for full size
2. Install the oil level indicator tube (3).
3. Use a NEW oil level indicator tube gasket.
4. Caution:

   Refer to Fastener Caution.
5. Install the oil level indicator tube boltâ€‰(2) and tighten to 10â€‰N-m (89â€‰lbâ€‰in).
6. Install the oil level indicatorâ€‰(1).
7. Close the hood.

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

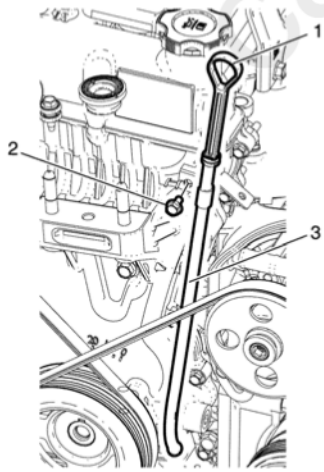
## Oil Level Indicator Tube Replacement

### Removal Procedure

1. Open the hood.
2. Note:

   If the engine oil level is at maximum, some oil may emerge when drawing out the oil dipstick guide tube.
3. Place collecting basin underneath.

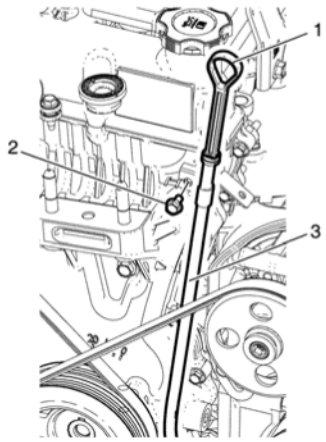
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4. Click here for full size
5. Remove the oil level indicator (1).
6. Remove the oil level indicator tube bolt (2).
7. Remove the oil level indicator tube (3).

## Installation Procedure

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1. Click here for full size
2. Install the oil level indicator tube (3).
3. Use a NEW oil level indicator tube gasket.
4. Caution:

   Refer to Fastener Caution.
5. Install the oil level indicator tube boltâ€‰(2) and tighten to 10â€‰N-m (89â€‰lbâ€‰in).
6. Install the oil level indicatorâ€‰(1).
7. Close the hood.

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

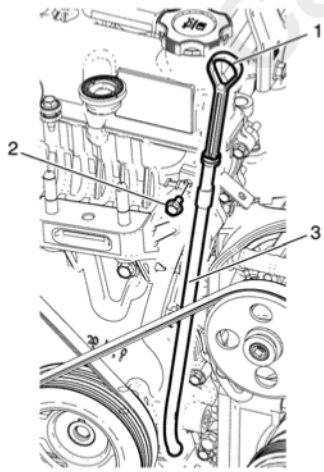
## Oil Level Indicator Tube Replacement

### Removal Procedure

1. Open the hood.
2. Note:

   If the engine oil level is at maximum, some oil may emerge when drawing out the oil dipstick guide tube.
3. Place collecting basin underneath.

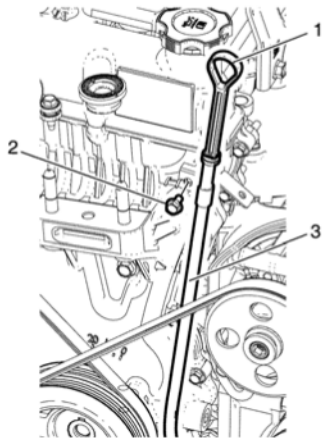
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4. Click here for full size
5. Remove the oil level indicator (1).
6. Remove the oil level indicator tube bolt (2).
7. Remove the oil level indicator tube (3).

## Installation Procedure

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1. Click here for full size
2. Install the oil level indicator tube (3).
3. Use a NEW oil level indicator tube gasket.
4. Caution:

   Refer to Fastener Caution.
5. Install the oil level indicator tube boltâ€‰(2) and tighten to 10â€‰N-m (89â€‰lbâ€‰in).
6. Install the oil level indicatorâ€‰(1).
7. Close the hood.

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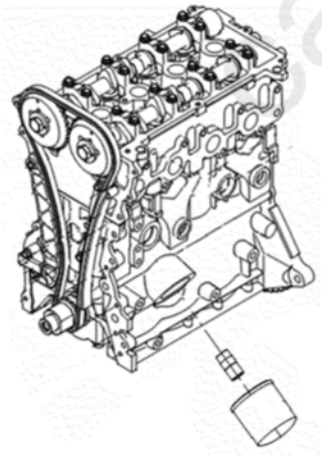
1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Engine Oil and Oil Filter Replacement (LKY)

Figure is empty after load.Figure is empty after load.

### Removal Procedure

1. Turn the ignition OFF.
2. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle.



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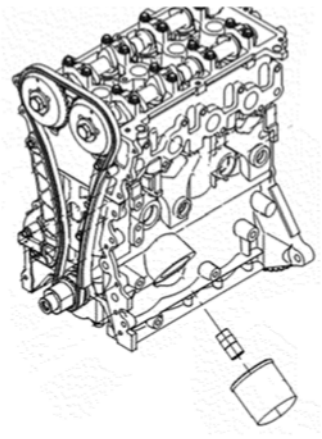
3. Click here for full size
4. Remove the oil filter, using suitable tool.
5. Discard the oil filter.
6. Click here for full size
7. Place a suitable container below the oil pan drain plugâ€‰(3).
8. Remove the oil pan drain plugâ€‰(3) with the oil pan drain plug sealâ€‰(1) from the oil panâ€‰(2).
9. Allow the oil to drain completely.

## Installation Procedure

1. Click here for full size
2. Caution**:**

   Refer to Fastener Caution.
3. Inspect the oil pan drain plugâ€‰(3) and the oil pan drain plug sealâ€‰(1) for excessive wear, cracks or damage and replace if necessary.
4. Install the oil pan drain plugâ€‰(3) with the oil pan drain plug seal â€‰(1) to the oil panâ€‰(2) and tighten the oil pan drain plug to 25â€‰N-m (18â€‰lbâ€‰ft).

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5. Click here for full size
6. Install the NEW oil filter.
7. Install the oil filter using suitable tool.
8. Tighten the oil filter to 16â€‰N-m (12â€‰lbâ€‰ft).
9. Lower the vehicle.
10. Fill the engine with the appropriate oil type and quantity. Refer to Fluid and Lubricant Recommendations and Approximate Fluid Capacities.

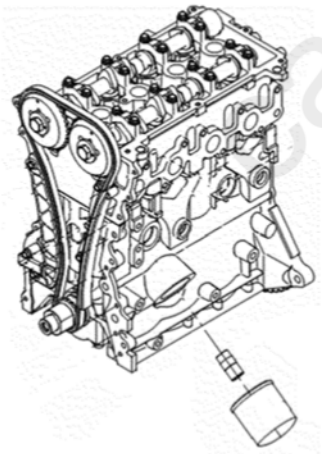
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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Engine Oil and Oil Filter Replacement (LMT, LMU, LC5)

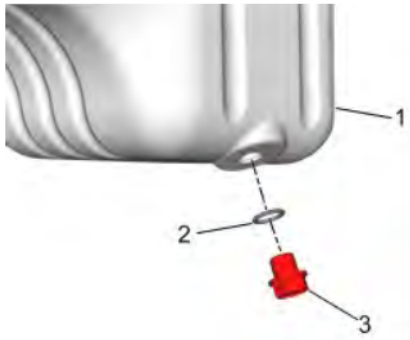
### Removal Procedure

1. Turn the ignition OFF.
2. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle.



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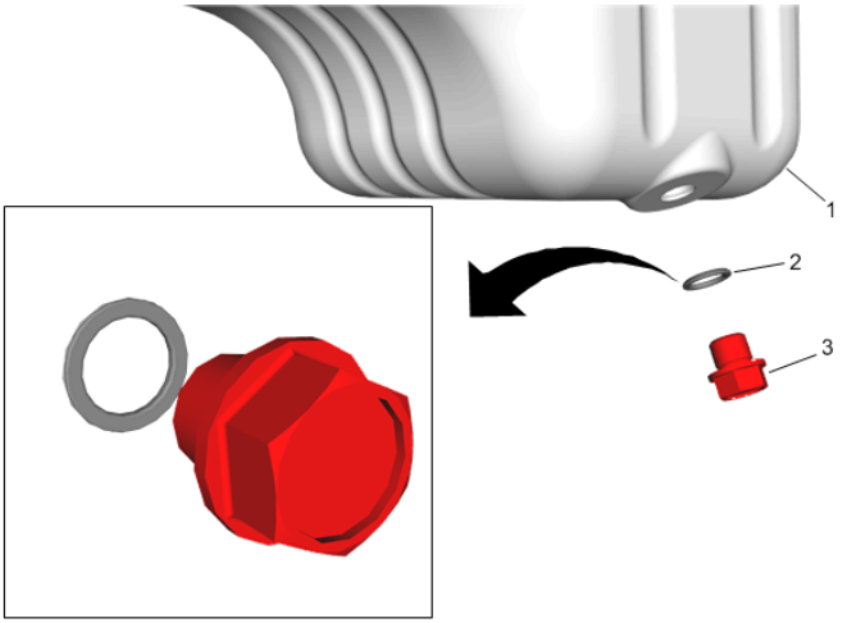
3. Click here for full size
4. Remove the oil filter, using suitable tool.
5. Discard the oil filter.




6. Click here for full size
7. Place a suitable container below the oil pan drain plugâ€‰(3).
8. Remove the oil pan drain plugâ€‰(3) from the oil panâ€‰(1).
9. Discard the oil pan drain plug gasketâ€‰(2)
10. Allow the oil to drain completely.

## Installation Procedure

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1. [Click here for full size]

2. Inspect the oil pan drain plugâ€‰(3) for excessive wear, cracks or damage and replace if necessary.

3. Note:

   Place the gasket flat surface onto the oil pan drain plug.

4. Install the NEW oil pan drain plug gasketâ€‰(2).

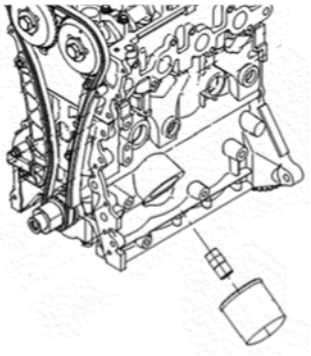
5. Caution:

   Refer to Fastener Caution.

6. Install the oil pan drain plugâ€‰(3) to the oil panâ€‰(1) and tighten the oil pan drain plug to 40â€‰N-m (30â€‰lbâ€‰ft).

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7. Click here for full size
8. Install the NEW oil filter.
9. Install the oil filter using suitable tool.
10. Tighten the oil filter to 14â€‰N-m (124â€‰lbâ€‰in).
11. Lower the vehicle.
12. Fill the engine with the appropriate oil type and quantity. Refer to Fluid and Lubricant Recommendations and Approximate Fluid Capacities.

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Piston, Connecting Rod, and Bearing Replacement (LKY)

Special Tools

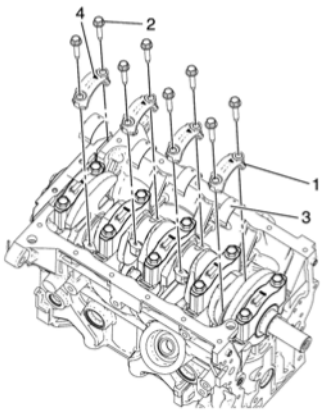
*J-8037* Piston Ring Compressor

For equivalent regional tools, refer to Special Tools

### Removal Procedure

1. Remove the cylinder head. Refer to Cylinder Head Replacement.
2. Install the crankshaft balancer bolt.
3. Set the pistons 1 and 4 to TDC in direction of engine rotation.
4. Click here for full size
5. Mark the connecting rod with the connecting rod bearing coverâ€‰(1).

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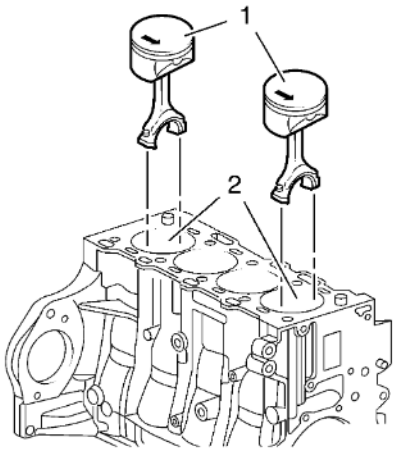


6. Click here for full size

7. Remove the 4 connecting rod bearing caps nutsâ€‰(2) of cylinder 1 and 4.

8. Remove the connecting rod bearing capsâ€‰(1) and the connecting rod bearingâ€‰(3).

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9. Click here for full size

10. Push the pistons 1 and 4â€‰(1) out of the cylinder boreâ€‰(2).

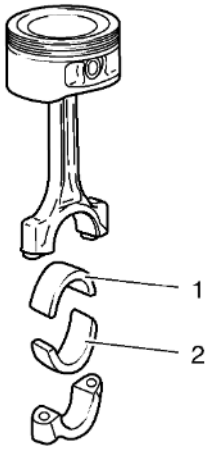
11. Note:

    The shear surfaces of the con-rod and the con-rod bearing cover form a unique fit and must not be swapped or damaged. Do not lay down

on the shear surfaces.

12. Remove the pistons 1 and 4â€‰(1).
13. Turn crankshaft on crankshaft balancer through 180â€‰degrees in direction of rotation of engine.
14. Repeat for the piston 2 and 3.

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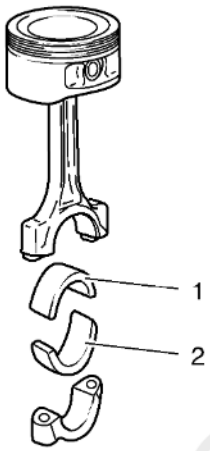
15. Click here for full size
16. Note:

    Observe correct fitting position, observe alignment.

17. Remove the connecting rod bearingâ€‰(1,â€‰2).

18. Check the components. Refer to Piston, Connecting Rod, and Bearing Cleaning and Inspection.

## Installation Procedure



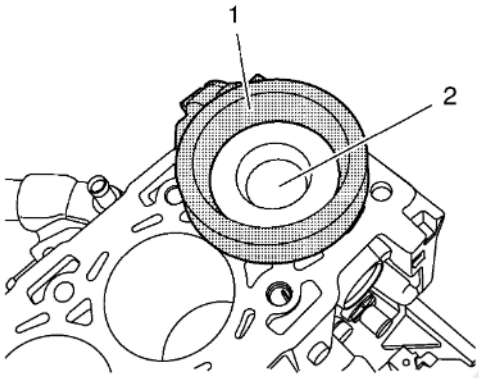

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1. Click here for full size
2. Note:

Lubricate the connection rod bearing with NEW engine oil.

3. Install the connecting rod bearingâ€‰(1,â€‰2).
4. Click here for full size
5. Set piston ring joints.
6. 
    - Piston compression upper ring in positionâ€‰(1).
    - Piston compression lower ring in positionâ€‰(4).
    - Interim ring of the piston oil ring rail in positionâ€‰(5), steel band rings of the piston oil ring rail in positionâ€‰(2) and/orâ€‰(3).

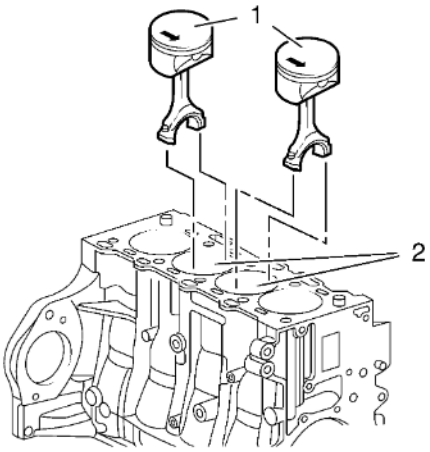
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7. Click here for full size

8. Lubricate the piston rings, pistonâ€‰(1), inner cylinder bore surface and *J-8037* piston ring compressorâ€‰(2) with clean engine oil.

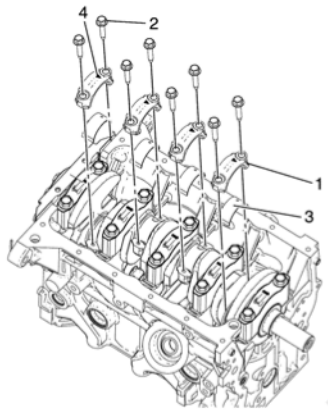



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9. [Click here for full size]
10. Note:

    Arrow on piston head points to engine timing side, front mark on the connecting rod points to engine timing side.

11. Push the pistons 2 and 3â€‰(1) into the cylinder boreâ€‰(2).




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13. Install the connecting rod bearing capsâ€‰(1) and the connecting rod bearingâ€‰(3).
14. Caution:

    Refer to Fastener Caution.
15. Install 4 NEW connecting rod bearing caps boltsâ€‰(2) of cylinder 2 and 3 and tighten to 20â€‰N-m + 90Â° (15â€‰lbâ€‰ft + 90Â°).
16. Turn crankshaft on crankshaft balancer through 180â€‰degrees in direction of rotation of engine.
17. Repeat for the piston 1 and 4.
18. Set the crankshaft in direction of engine rotation to 60â€‰degrees before UDC.
19. Install the cylinder head. Refer to Cylinder Head Replacement.

## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Engine Piston | PISTON,ENG | X0001 |
| Connecting Rod | ROD,CONN | X0002 |
| Connecting Rod Bearing | BEARING,CONN ROD | X0003 |
| Piston | PISTON,(W/CONN ROD) | X0013 |
| Piston | PISTON, | X0018 |
| Connecting Rod | ROD,CONN | X0019 |
| Connecting Rod | ROD,CONN(CSTG W/CAP) | X0021 |
| Piston | PISTON,(CSTG) | X0022 |
| Piston | PISTON,(MCHG) | X0024 |
| Connecting Rod Bearing | BEARING KIT,CONN ROD | X0026 |
| Piston | PISTON,(W/PIN) | X0027 |
| Piston | PISTON, | X0029 |
| Piston | PISTON KIT,(W/CYL SLEV) | X0032 |
| Connecting Rod | ROD,CONN (MCHG W/ CAP) | X0034 |
| Connecting Rod | ROD,CONN(FORG W/CAP) | X0035 |
| Engine Piston | PISTON KIT,ENG | X0038 |
| Connecting Rod | ROD KIT,CONN | X0041 |
| Piston | PISTON,(W/CMPRN RING) | X0047 |
| Connecting Rod | ROD,CONN(BLANK W/CAP) | X0048 |
| Connecting Rod | ROD,CONN(FORG) | X0050 |
| Piston | PISTON,(W/PIN & CMPRN & OIL RING) | X0051 |
| Piston | PISTON,(MCHG) | X0052 |
| Connecting Rod | ROD,CONN (FORG W/BUSH) | X0056 |
| Connecting Rod | ROD,CONN (MCHG) | X0058 |
| Piston | PISTON,(W/PIN) | SS045 |
| Connecting Rod | ROD PKG,CONN | SS115 |
| Piston | PISTON PKG,(W/PINS) | SS133 |
| Connecting Rod | ROD,CONN | SS159 |
| Connecting Rod | ROD PKG,CONN | SJ011 |
| Piston | PISTON KIT,(W/PIN) | SJ013 |
| Connecting Rod | ROD,CONN | SJ014 |
| Connecting Rod Bearing | BEARING,CONN ROD | SJ015 |
| Connecting Rod Bearing | BEARING PKG,CONN ROD | SJ046 |
| Connecting Rod | ROD,CONN(SEMI-FINISHED) | SS047 |
| Piston | PISTON,(W/PIN) | SS170 |
| Piston | PISTON,(W/PIN & RINGS) | SS172 |

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Piston, Connecting Rod, and Bearing Replacement

Special Tools

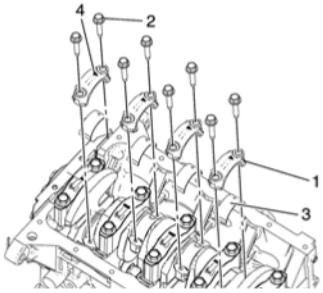
- *EN-50174* Piston Ring Compressor (1.0L only)
- *J-8037* Piston Ring Compressor

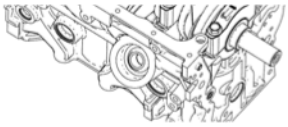
For equivalent regional tools, refer to Special Tools

### Removal Procedure

1. Remove the cylinder head. Refer to Cylinder Head Replacement.
2. Remove the oil pan. Refer to Oil Pan Replacement
3. Raise the vehicle by its full height. Refer to Lifting and Jacking the Vehicle.
4. Install the crankshaft balancer bolt.
5. Set the pistons 1 and 4 to TDC in direction of engine rotation.
6. Click here for full size
7. Mark the connecting rod with the connecting rod bearing coverâ€‰(1).

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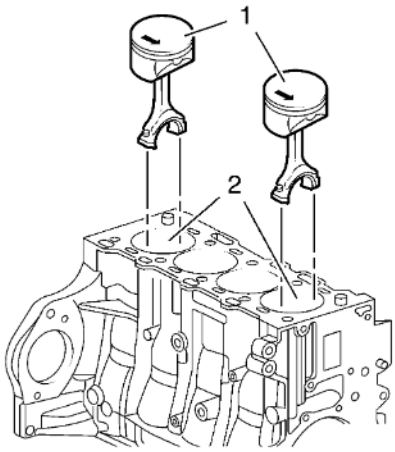


8. [Click here for full size]

9. Remove the 4 connecting rod bearing caps nutsâ€‰(2) of cylinder 1 and 4.

10. Remove the connecting rod bearing capsâ€‰(1) and the connecting rod bearingâ€‰(3).

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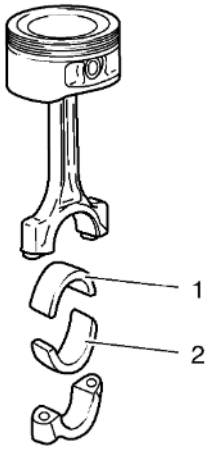

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11. Click here for full size
12. Push the pistons 1 and 4â€‰(1) out of the cylinder boreâ€‰(2).
13. Lower the vehicle.
14. Note:

The shear surfaces of the con-rod and the con-rod bearing cover form a unique fit and must not be swapped or damaged. Do not lay down on the shear surfaces.

15. Remove the pistons 1 and 4â€‰(1).
16. Raise the vehicle by its full height.
17. Turn crankshaft on crankshaft balancer through 180â€‰degrees in direction of rotation of engine.
18. Repeat for the piston 2 and 3.

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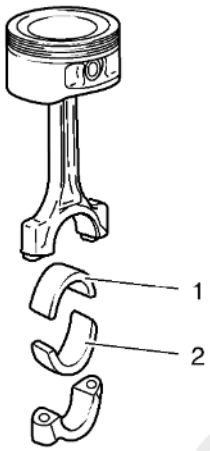
19. Click here for full size
20. Note:

    Observe correct fitting position, observe alignment.

21. Remove the connecting rod bearingâ€‰(1,â€‰2).

22. Check the components. Refer to Piston, Connecting Rod, and Bearing Cleaning and Inspection.

## Installation Procedure



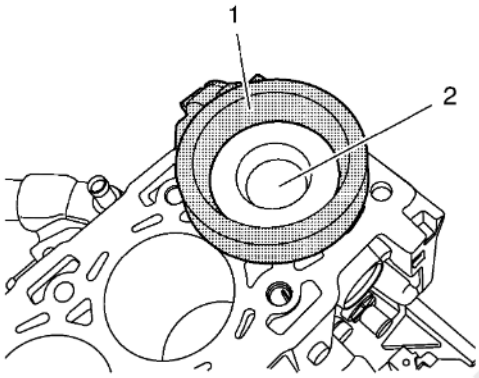

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1. Click here for full size
2. Note:

Lubricate the connection rod bearing with NEW engine oil.

3. Install the connecting rod bearingâ€‰(1,â€‰2).
4. Click here for full size
5. Set piston ring joints.
6. 
    - Piston compression upper ring in positionâ€‰(1).
    - Piston compression lower ring in positionâ€‰(4).
    - Interim ring of the piston oil ring rail in positionâ€‰(5), steel band rings of the piston oil ring rail in positionâ€‰(2) and/orâ€‰(3).

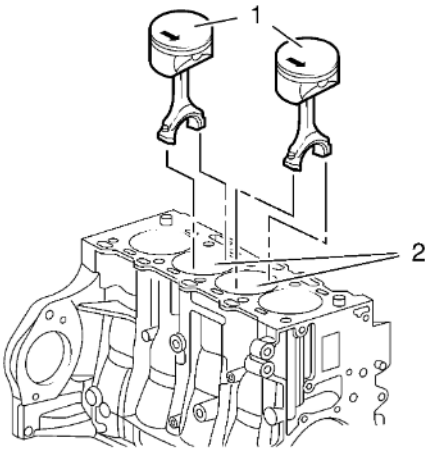
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7. Click here for full size

8. Lubricate the piston rings, pistonâ€‰(1), inner cylinder bore surface and *EN-50174 (J-8037)* piston ring compressorâ€‰(2) with clean engine oil.



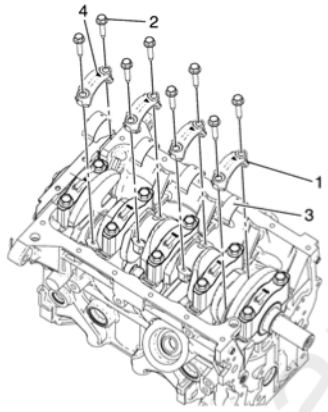

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9. [Click here for full size]
10. Note:

    Arrow on piston head points to engine timing side, front mark on the connecting rod points to engine timing side.

11. Push the pistons 2 and 3â€‰(1) into the cylinder boreâ€‰(2).

12. Raise the vehicle by its full height.




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13. Click here for full size

14. Install the connecting rod bearing capsâ€‰(1) and the connecting rod bearingâ€‰(3).

15. Caution:

    Refer to Fastener Caution.

16. Install 4 NEW connecting rod bearing caps boltsâ€‰(2) of cylinder 2 and 3 and tighten to 20â€‰N-m + 90Â° (15â€‰lbâ€‰ft + 90Â°).

17. Turn crankshaft on crankshaft balancer through 180â€‰degrees in direction of rotation of engine.

18. Repeat for the piston 1 and 4.

19. Set the crankshaft in direction of engine rotation to 60â€‰degrees before UDC.

20. Install the oil pan. Refer to Oil Pan Replacement.

21. Install the cylinder head. Refer to Cylinder Head Replacement.

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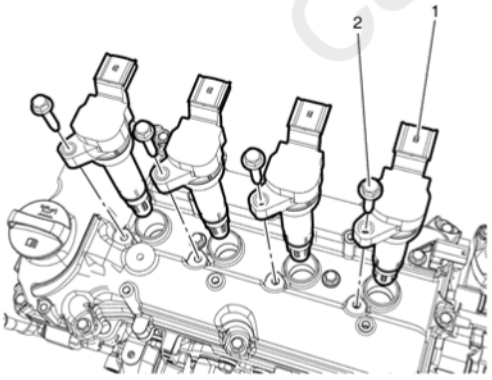
1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Camshaft Cover Replacement (LKY)

### Removal Procedure

1. Open the hood.
2. Remove the intake manifold. Refer to Intake Manifold Replacement.
3. Remove the ignition coil cover. Refer to Ignition Coil Cover Replacement.

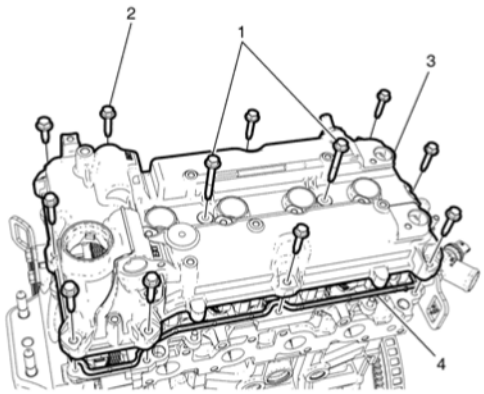
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4.
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5. Remove the ignition coil. Refer to Ignition Coil Replacement.
6. Remove the camshaft position sensor. Refer to Camshaft Position Sensor Replacement.
7. Remove the oil filler cap.

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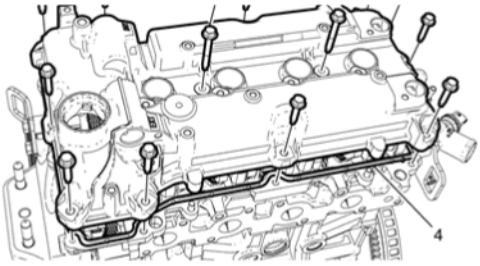


8. Click here for full size
9. Remove the 2 camshaft cover bolts (1).
10. Remove the 10 camshaft cover bolts (2).
11. Remove the camshaft cover (3).
12. Remove the camshaft cover gasket (4).

## Installation Procedure

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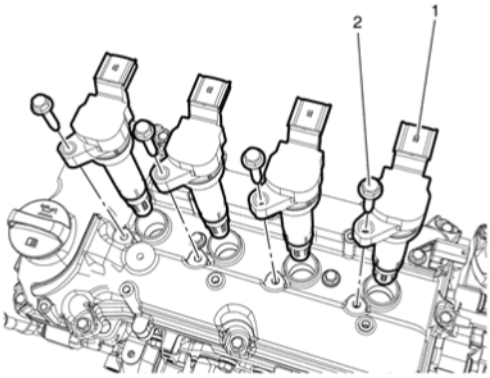





1. Click here for full size
2. Install the camshaft cover gasket (4).
3. Install the camshaft cover (3).
4. Caution:

   Refer to Fastener Caution.
5. Install the 10 camshaft cover bolts (2) and tighten to 10â€‰N-m (89â€‰lbâ€‰in).
6. Install the 2 camshaft cover bolts (1) and tighten to 10â€‰N-m (89â€‰lbâ€‰in).
7. Install the oil filler cap.

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8. Click here for full size
9. Install the ignition coil. Refer to Ignition Coil Replacement.
10. Install the camshaft position sensor. Refer to Camshaft Position Sensor Replacement.
11. Install the ignition coil cover. Refer to Ignition Coil Cover Replacement.
12. Install the intake manifold. Refer to Intake Manifold Replacement.
13. Close the hood.

## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Camshaft Cover | COVER,CM/SHF | X0210 |
| Camshaft Cover | COVER,CM/SHF | X0211 |
| Camshaft Cover | COVER,CM/SHF (CSTG) | X0503 |
| Camshaft Cover | COVER,CM/SHF(MCHG) | X0512 |
| Camshaft Cover | COVER,CM/SHF (CSTG) | X0513 |
| Camshaft Cover | COVER,CM/SHF | X0798 |
| Camshaft Cover | COVER,CM/SHF (W/BOLT & SEAL) | X0799 |
| Camshaft Cover | COVER,CM/SHF (W/SEAL) | X0820 |
| Camshaft Cover | COVER,CM/SHF | SS199 |

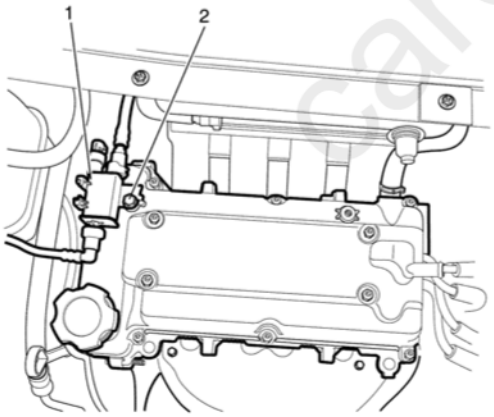
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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Camshaft Cover Replacement

### Removal Procedure

1. Open the hood.
2. Remove the upper intake manifold. Refer to Upper Intake Manifold Replacement.




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3. Click here for full size

4. Remove the canister purge solenoid to camshaft cover retaining bolt (2).

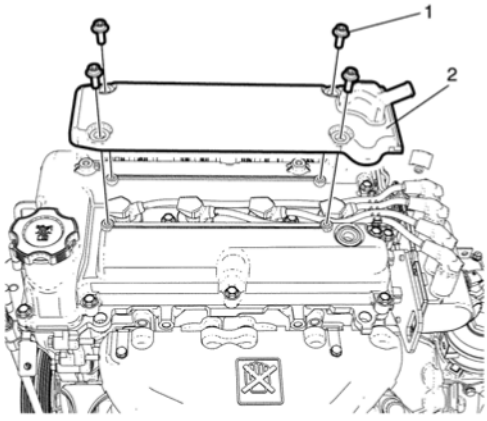
5. Note:

   It is not necessary to disconnect the canister pure solenoid connectors.

6. Reposition and retain the canister purge solenoid/hose (1) away from the camshaft cover in order to provide clearance for removal of the camshaft cover.

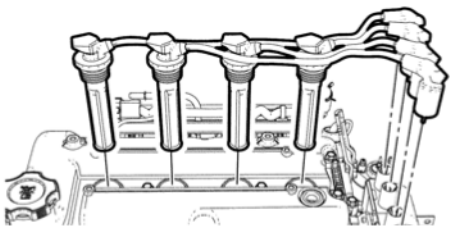
7. Remove the positive crankcase ventilation tube. Refer to Positive Crankcase Ventilation Hose/Pipe/Tube Replacement.

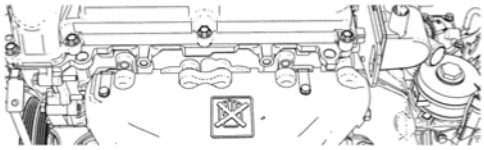
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8. Click here for full size
9. Remove the upper camshaft cover to camshaft cover retaining bolts (1).
10. Remove the upper camshaft cover (2).

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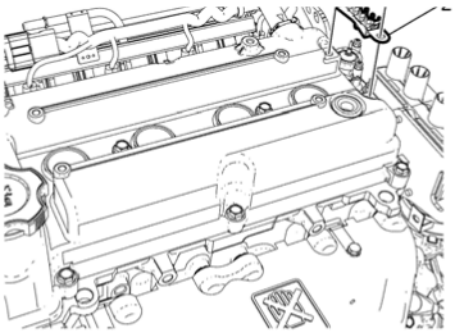


11. Click here for full size

12. Remove the ignition coil. Refer to Ignition Coil Replacement.



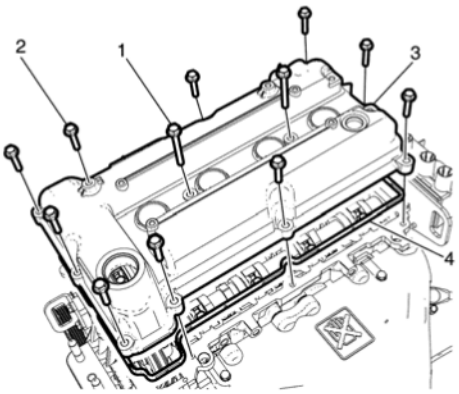

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13. Click here for full size

14. Remove the clip (2), and bolts (1).

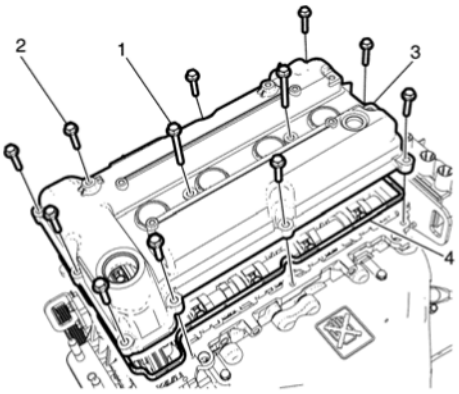
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15. Click here for full size
16. Remove the 12â€‰bolts (1, 2).
17. Remove the camshaft cover (3).

## Installation Procedure

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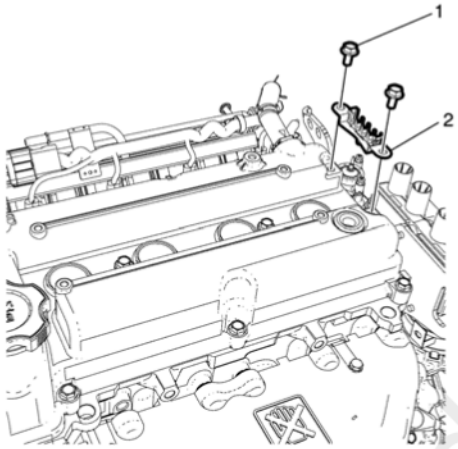
1. Click here for full size
2. Note:

   Make sure the sealing surfaces of the cylinder head and camshaft cover are clean.

3. Install a NEW camshaft cover seal (4) and NEW grommets.
4. Install the camshaft cover (3).
5. Caution:

   Refer to Fastener Caution.

6. Install the 12â€‰bolts (1, 2) and tighten to 10â€‰N-m (89â€‰lbâ€‰in).



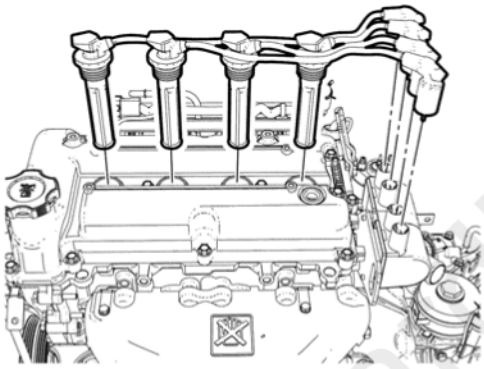

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7.

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8. Install the clip (2) and tighten the bolts (1) to 10â€¬Â±Â N·m (89â€¬Â±Â lbâ€¬Â±Â in).

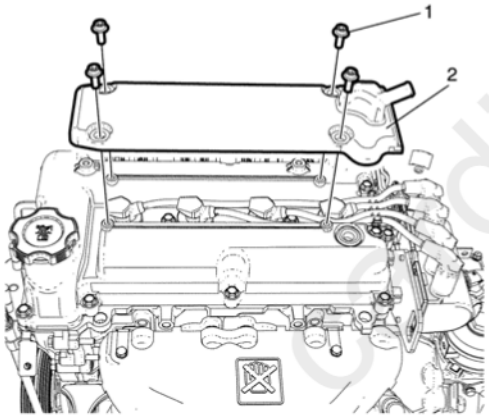
8. Install the clip (2) and tighten the bolts (1) to 10±1 N·m (89±9 lb·in).



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9.
Click here for full size

10. Install the ignition coil. Refer to Ignition Coil Replacement.

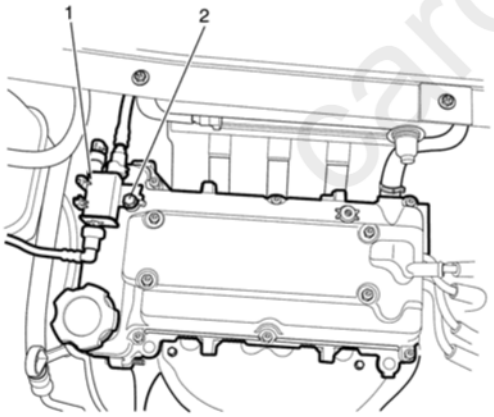



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11.
Click here for full size

12. Install the upper camshaft cove (2).

13. Install the upper camshaft cover to camshaft cover retaining bolts (1) and tighten to 10â€‰N-m (89â€‰lbâ€‰in).




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14.
Click here for full size

15. Install the positive crankcase ventilation tube. Refer to Positive Crankcase Ventilation Hose/Pipe/Tube Replacement.
16. Install the canister purge solenoid (1) to camshaft cover.
17. Install the bolt (2) and tighten to 9â€‰N-m (80â€‰lbâ€‰in).
18. Install the upper intake manifold. Refer to Upper Intake Manifold Replacement.
19. Close the hood.

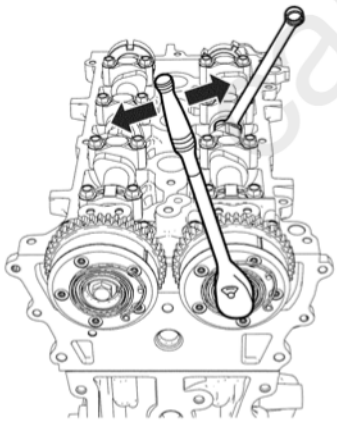
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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Camshaft Exhaust Sprocket Replacement (LKY)

### Removal Procedure

1. Remove the engine front cover. Refer to Engine Front Cover with Oil Pump Replacement.
2. Remove the timing chain. Refer to Camshaft Timing Chain Replacement and Adjustment.



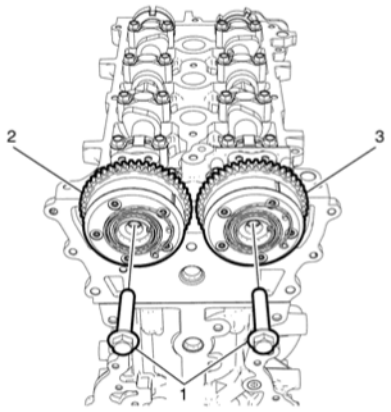
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3. Click here for full size
4. Caution:

   Use extreme care when installing the camshaft not to nick, scratch, or damage the camshaft lobes or bearing surfaces.

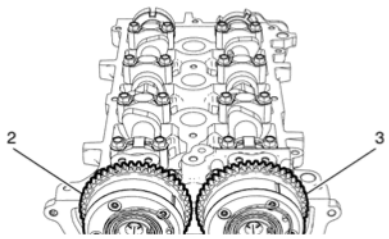
5. While holding the intake camshaft firmly in place, loosen the intake camshaft sprocket bolt.
6. While holding the exhaust camshaft firmly in place, loosen the exhaust camshaft sprocket bolt.

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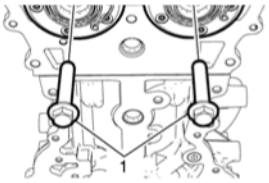


7. Click here for full size
8. Remove the intake and exhaust camshaft sprocket boltsâ€‰(1).
9. Remove the intake camshaft sprocketâ€‰(2).
10. Remove the exhaust camshaft sprocketâ€‰(3).

## Installation Procedure



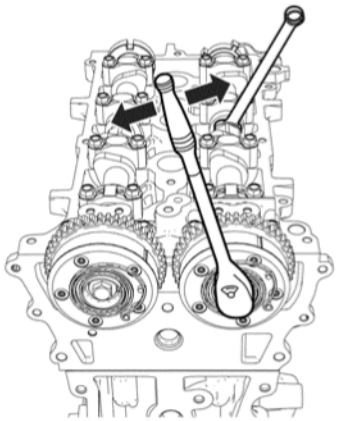

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1. Click here for full size
2. Install the exhaust camshaft sprocketâ€‰(3).
3. Install the intake camshaft sprocketâ€‰(2).
4. Caution:

   Refer to Fastener Caution.
5. Install the intake and exhaust camshaft sprocket boltsâ€‰(1).

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6. Click here for full size
7. Caution:

   Use extreme care when installing the camshaft not to nick, scratch, or damage the camshaft lobes or bearing surfaces.

8. While holding the intake camshaft firmly in place, install the intake camshaft sprocket bolt and tighten to 32â€‰N-m + 50Â° (24â€‰lbâ€‰ft + 50Â°).
9. While holding the exhaust camshaft firmly in place, tighten the exhaust camshaft sprocket bolt to 32â€‰N-m + 50Â° (24â€‰lbâ€‰ft + 50Â°).
10. Install the timing chain. Refer to Camshaft Timing Chain Replacement and Adjustment.
11. Install the engine front cover. Refer to Engine Front Cover with Oil Pump Replacement.

## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Camshaft Exhaust Sprocket | SPROCKET,CM/SHF EXH | X0430 |
| Camshaft Exhaust Sprocket | SPROCKET,CM/SHF EXH | X0763 |
| Camshaft Exhaust Sprocket | SPROCKET,CM/SHF EXH (W/CM/SHF POSN ACTR) | X0793 |

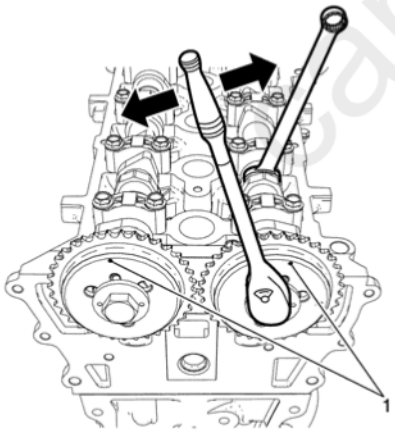
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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Camshaft Exhaust Sprocket Replacement

### Removal Procedure

1. Remove the engine front cover. Refer to Engine Front Cover with Oil Pump Replacement.
2. Remove the timing chain. Refer to Camshaft Timing Chain Replacement and Adjustment.




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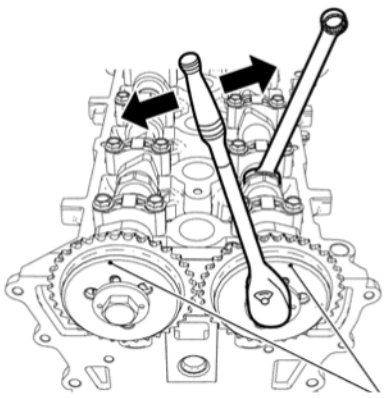
3. Click here for full size
4. Caution:

   Use extreme care when installing the camshaft not to nick, scratch, or damage the camshaft lobes or bearing surfaces.

5. While holding the intake camshaft firmly in place, remove the intake camshaft sprocket bolt.
6. Remove the intake camshaft sprocketâ€‰(1).
7. While holding the exhaust camshaft firmly in place, remove the exhaust camshaft sprocket bolt.
8. Remove the exhaust camshaft sprocket.

## Installation Procedure

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1. Click here for full size
2. Caution:

   Use extreme care when installing the camshaft not to nick, scratch, or damage the camshaft lobes or bearing surfaces.

3. Install the intake camshaft sprocketâ€‰(1).
4. Caution:

   Refer to Fastener Caution.

5. While holding the intake camshaft firmly in place, install the intake camshaft sprocket bolt and tighten to 60â€‰N-m (44â€‰lbâ€‰ft).
6. Install the exhaust camshaft sprocket.
7. While holding the exhaust camshaft firmly in place, install the exhaust camshaft gear bolt and tighten to 60â€‰N-m (44â€‰lbâ€‰ft).
8. Install the timing chain. Refer to Camshaft Timing Chain Replacement and Adjustment.
9. Install the engine front cover. Refer to Engine Front Cover with Oil Pump Replacement.

## Related Part Information

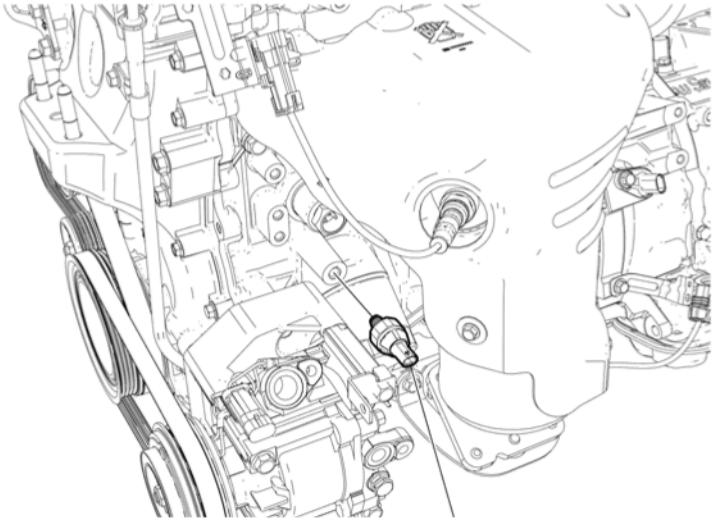
| Part Name | Catalog Name | Part Code |
|---|---|---|
| Camshaft Exhaust Sprocket | SPROCKET,CM/SHF EXH | X0430 |
| Camshaft Exhaust Sprocket | SPROCKET,CM/SHF EXH | X0763 |
| Camshaft Exhaust Sprocket | SPROCKET,CM/SHF EXH (W/CM/SHF POSN ACTR) | X0793 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Engine Oil Pressure Indicator Switch Replacement (LKY)

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| Callout | Component Name |
|---|---|
| Preliminary Procedure<br><br>Disconnect the negative battery cable. Refer to Battery Negative Cable Disconnection and Connection. | |
| 1 | Oil Pressure Indicator Switch<br><br>Caution:<br><br>Refer to Fastener Caution.<br><br>Procedure<br><br>Disconnect the oil pressure indicator switch electrical wiring harness connector and remove the oil pressure indicator switch.<br><br>Tighten<br><br>35â€‰N-m (26â€‰lbâ€‰ft) |

## Related Part Information

| Part Name | Catalog Name | Part Code |
| --- | --- | --- |
| Engine Oil Pressure Indicator Switch | SWITCH,ENG OIL PRESS IND | 3190A |
| Engine Oil Pressure Indicator Switch | SWITCH,ENG OIL PRESS IND | 3200A |

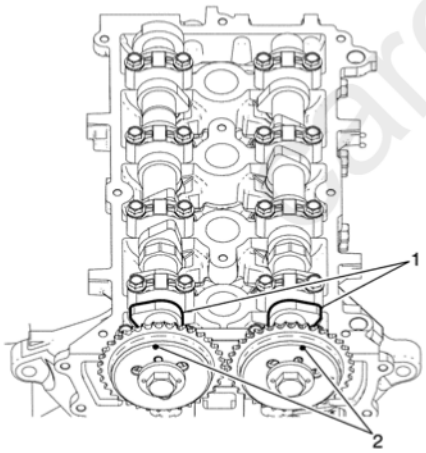
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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Camshaft Replacement

### Removal Procedure

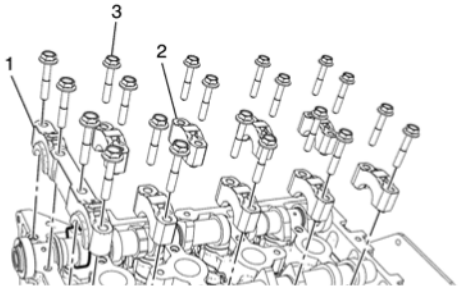
1. Remove the camshaft sprocket. Refer to Camshaft Exhaust Sprocket Replacement.

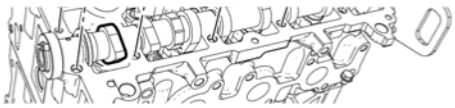



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2. Click here for full size
3. Check the camshaft lobes (1) is in a neutral position.
4. Click here for full size
5. Observe the markings on the bearing caps. Each bearing cap is marked in order to identify its location. The markings have the following meanings:
6.
    - The raised feature must always be oriented toward the center of the cylinder head.
    - The I indicates the intake camshaft.
    - The E indicates the exhaust camshaft.
    - The number indicates the journal position from the front of the cylinder block.

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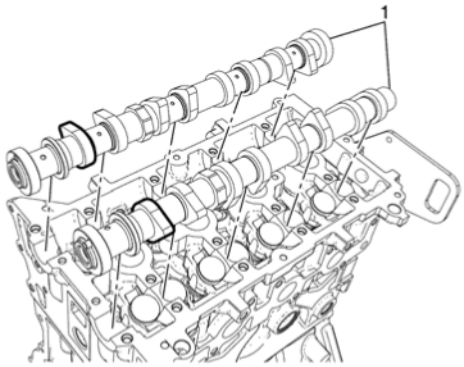




7. Click here for full size
8. Loosen the 20â€‰camshaft bearing cap bolts (3) working from outside to inside in a spiral in steps of 1/2 up to 1 turn.
9. Remove the 20â€‰camshaft bearing cap bolts (3).
10. Note:

    Mark camshaft bearing caps before removal.
11. Remove the camshaft bearing caps (1, 2) from the cylinder head.

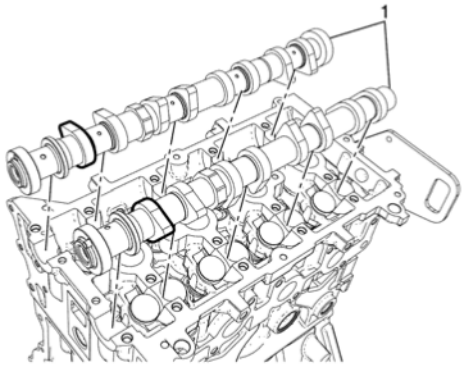
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12. Click here for full size
13. Remove the camshafts (1).

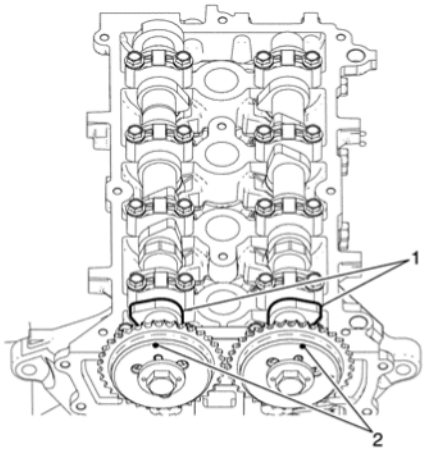
## Installation Procedure

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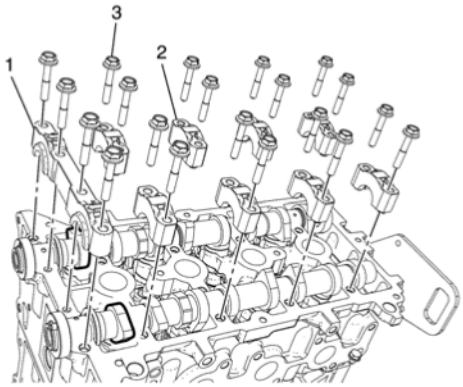
1. Click here for full size
2. Install the camshafts (1).




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3. Click here for full size

4. Check the camshaft lobesâ€‰(1) are in a neutral position.




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5. Click here for full size
6. Install the camshaft bearing thrust cap (1) in the first journal of the right cylinder head.
7. Install the remaining bearing caps (2) with their orientation mark toward the center of the cylinder head.
8. Hand start all the camshaft bearing cap to cylinder head retaining bolts (3).
9. Note:

Check and confirm the bearing cap sequence.

10. Tighten the 20â€‰camshaft bearing cap bolts (3) working from outside to inside in a spiral in steps of 1/2 up to 1 turn.
11. Tighten the 20â€‰camshaft bearing cap bolts to 10â€‰N-m (89â€‰lbâ€‰in).
12. Click here for full size
13. Observe the markings on the bearing caps. Each bearing cap is marked in order to identify its location. The markings have the following meanings:
14.
    - The raised feature must always be oriented toward the center of the cylinder head.
    - The I indicates the intake camshaft.
    - The E indicates the exhaust camshaft.
    - The number indicates the journal position from the front of the cylinder block.
15. Install the camshaft sprocket. Refer to Camshaft Exhaust Sprocket Replacement.

## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Engine Camshaft | CAMSHAFT,ENG | X0001 |
| Camshaft | CAMSHAFT, | X0106 |
| Camshaft | CAMSHAFT,(FORG) | X0130 |
| Camshaft | CAMSHAFT,(MCHG) | X0131 |
| Camshaft | CAMSHAFT,(FORG) | X0140 |
| Camshaft | CAMSHAFT,(CSTG) | X0141 |
| Camshaft | CAMSHAFT, | X0153 |
| Camshaft | CAMSHAFT,(PARTIAL MCHG) | X0198 |
| Camshaft | CAMSHAFT,(PARTIAL MCHG) | X0261 |
| Camshaft | CAMSHAFT KIT,(W/VLV LFTR) | X0300 |
| Camshaft | CAMSHAFT,(BAR) | X0371 |
| Camshaft | CAMSHAFT KIT,(W/THR WA) | X0515 |
| Camshaft | CAMSHAFT KIT,(W/VLV LFTR) | SS007 |
| Engine Camshaft | CAMSHAFT,ENG | SS094 |
| Camshaft | CAMSHAFT KIT,(W/VLV LFTR) | SS095 |
| Engine Camshaft | CAMSHAFT PKG,ENG(W/RKR ARM & VLV SPR) | SS244 |
| Engine Camshaft | CAMSHAFT PKG,ENG(W/VLV SPR) | SS286 |

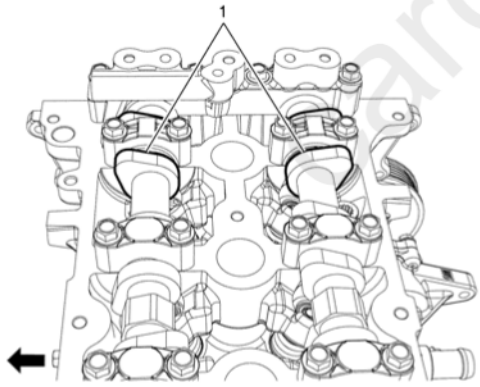
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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Camshaft Replacement (LKY)

### Removal Procedure

1. Remove the camshaft sprocket. Refer to Camshaft Exhaust Sprocket Replacement.



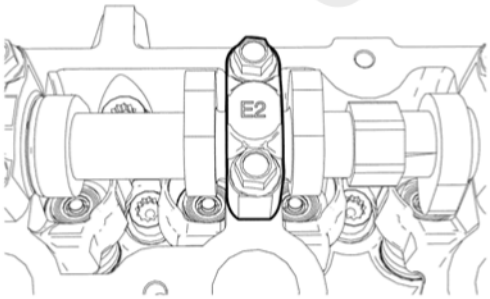

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2.

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3. Position the camshaft lobesâ€‰(1) in a neutral position.

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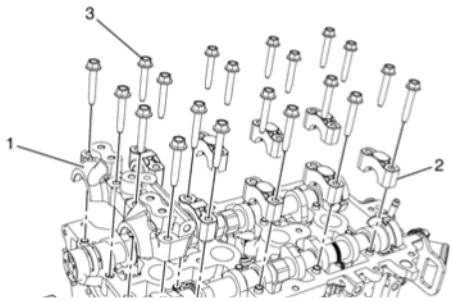


4. Click here for full size

5. Observe the markings on the bearing caps. Each bearing cap is marked in order to identify its location. The markings have the following meanings:

6.
    - The raised feature must always be oriented toward the center of the cylinder head.
    - The I indicates the intake camshaft.
    - The E indicates the exhaust camshaft.
    - The number indicates the journal position from the front of the cylinder block.

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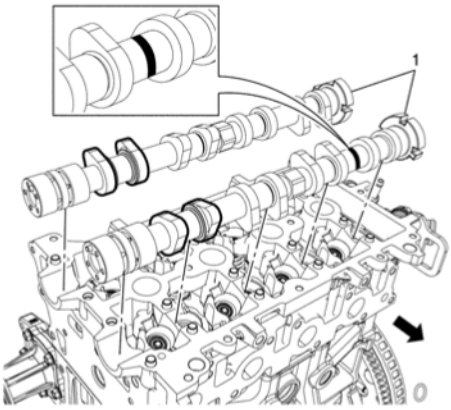




7. Click here for full size
8. Loosen the 20â€‰camshaft bearing cap boltsâ€‰(3) working from outside to inside in a spiral in steps of 1/2 up to 1 turn.
9. Remove the 20â€‰camshaft bearing cap boltsâ€‰(3).
10. Note:

    Mark camshaft bearing caps before removal.
11. Remove the camshaft bearing capsâ€‰(1, 2) from the cylinder head.

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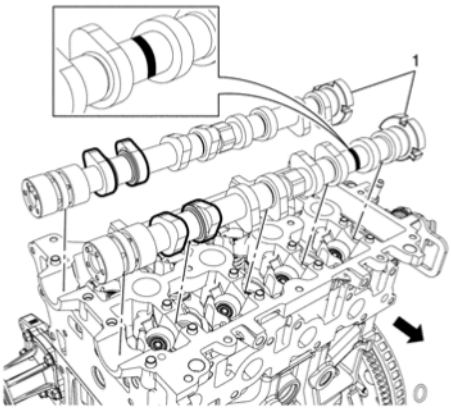

12. Click here for full size
13. Note:

    The exhaust camshaft has a groove between the No.â€‰3 journal and No.â€‰4 journal. The intake camshaft has no groove.

14. Remove the camshaftsâ€‰(1).

## Installation Procedure

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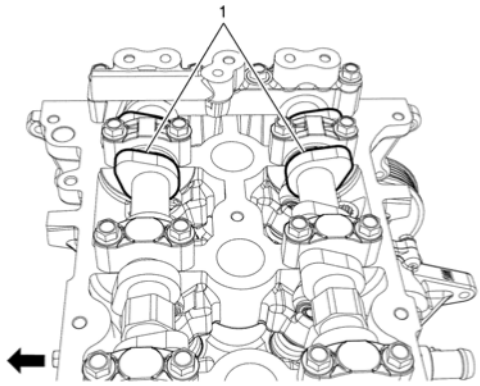



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1. Click here for full size
2. Note:

   The exhaust camshaft has a groove between the No.â€‰3 journal and No.â€‰4 journal. The intake camshaft has no groove.

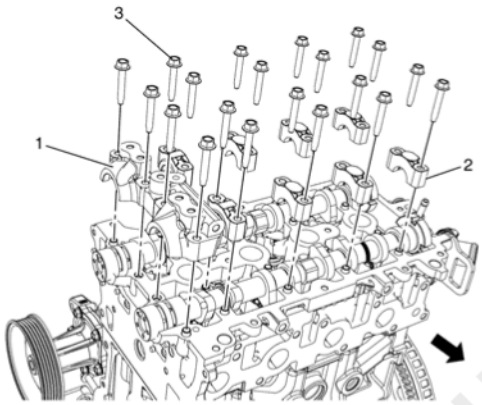
3. Install the camshaftsâ€‰(1).




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4. Click here for full size

5. Check the camshaft lobesâ€‰(1) are in a neutral position.

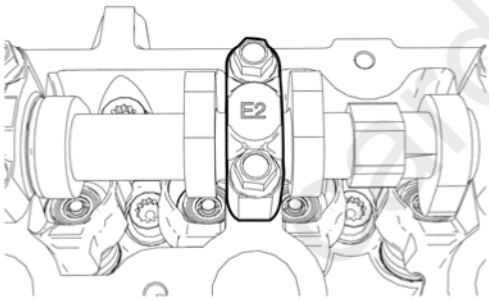



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6. Click here for full size

7. Install the camshaft bearing thrust capâ€‰(1) in the first journal of the right cylinder head.

8. Install the remaining bearing capsâ€‰(2) with their orientation mark toward the center of the cylinder head.
9. Hand start to tighten the all cylinder head retaining boltsâ€‰(3).
10. Tighten the 20â€‰camshaft bearing cap boltsâ€‰(3) working from inside to outside in a spiral.
11. Tighten the 20â€‰camshaft bearing cap bolts to 10â€‰N-m (89â€‰lbâ€‰in).




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12. Click here for full size

13. Observe the markings on the bearing caps. Each bearing cap is marked in order to identify its location. The markings have the following meanings:

14.
    - The raised feature must always be oriented toward the center of the cylinder head.
    - The I indicates the intake camshaft.
    - The E indicates the exhaust camshaft.
    - The number indicates the journal position from the front of the cylinder block.

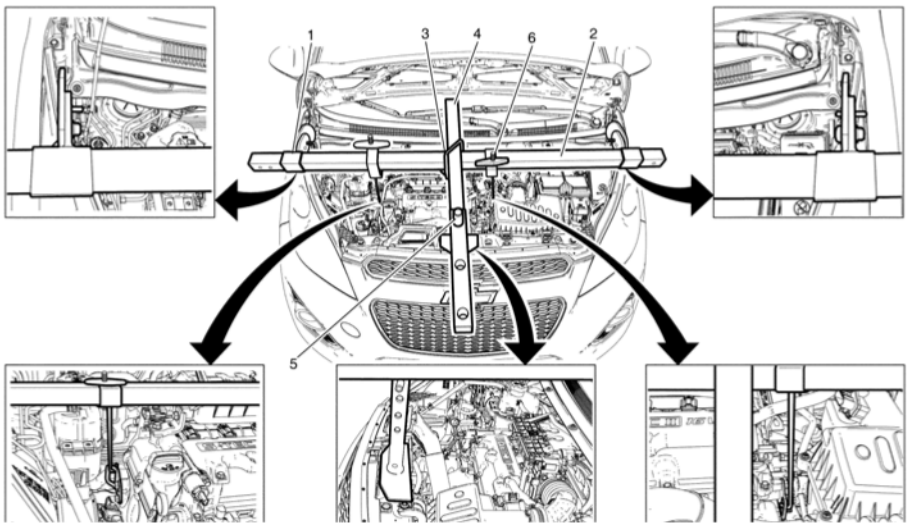
15. Install the camshaft sprocket. Refer to Camshaft Exhaust Sprocket Replacement.

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Engine Support Fixture (LKY)

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Click here for full size

| Callout | Component Name |
| --- | --- |
| | |

| Callout | Component Name |
| --- | --- |
| | Preliminary Procedure<br>1. Open the hood.<br>2. Disconnect the 2â€‰hood muckets from the fender frame.<br>• *EN-28467-300* Engine Support Fixture Adapter<br>• *J-28467-518* Main Support Beam<br>• *J-28467-1A* Cross Bracket<br>• *J-28467-5A* Strut Tower Support Assembly<br>• *J-28467-2A* Radiator Tube Shelf Assembly<br>• *J-28467-8A* Hook Assembly<br>• *J-36857* Engine Lift Bracket<br>For equivalent regional tools, refer to Special Tools. |
| 1 | Engine Support Fixture Adapter Leg (Qty:â€‰2)<br>Procedure<br>Install the bracket to fender frame. Do not install on top of fender lip. |
| 2 | Main Support Beam |
| 3 | Cross Bracket |
| 4 | Strut Tower Support Assembly<br>Procedure<br>Adjust the length of the strut tower support assembly. |
| 5 | Radiator Tube Shelf Assembly |
| 6 | Hook Assembly (Qty:â€‰2)<br>Procedure<br>Use a grade 10.9â€‰bolt to install the engine lift bracket.<br>Note:<br>If the engine is not equipped with engine lift bracket, install J-36857 in place. |

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Valve Stem Oil Seal and Valve Spring Replacement

Special Tools

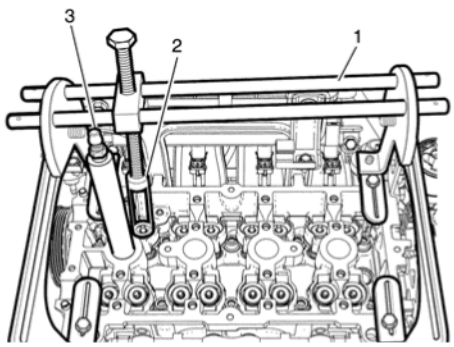
- *EN 46116* Valve Stem Seal Remover/Installer
- *EN-49075* Valve Spring Compressor Adapter
- *EN-49076* Cylinder Pressure Adapter
- *EN-50173* Universal Valve Spring Compressor
- *KM-845* Tappet Suction Device

For equivalent regional tools, refer to Special Tools.

### Removal Procedure

1. Remove the camshaft. Refer to Camshaft Replacement.
2. Click here for full size
3. Remove the valve tappet (1) using *KM-845* tappet suction device.

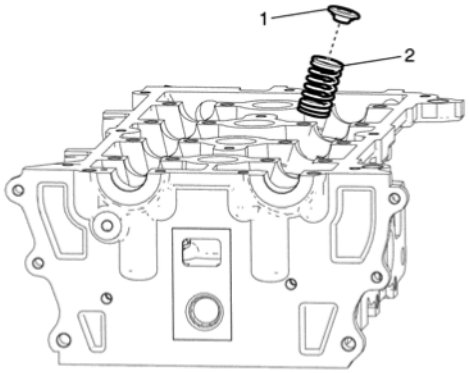
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4. Click here for full size
5. Install the *EN-50173* universal valve spring compressor (1) and *EN- 49075* valve spring compressor adapter (2).
6. Remove the spark plug and install the *EN-49076* cylinder pressure adapter.
7. Connect the compressed air hose to *EN-49076* cylinder pressure adapter. It keeps the valve not slip into the cylinder by blowing compressed air into the cylinder.
8. Use the magnet in order to remove the valve collet.

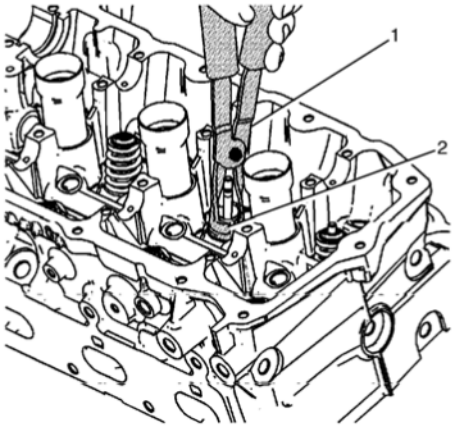
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9. [Click here for full size]

10. Remove the retainer (1) and valve spring (2).

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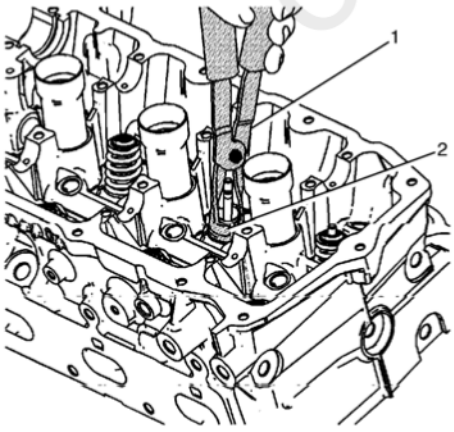



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Click here for full size

12. Remove the valve stem seal (2) using *EN 46116* valve stem seal remover/installer (1).

## Installation Procedure

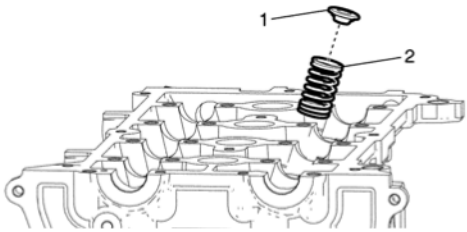


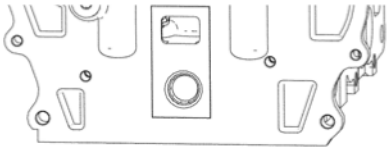

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1.
Click here for full size

2. Remove the valve stem seal (2) using *EN 46116* valve stem seal remover/installer (1).

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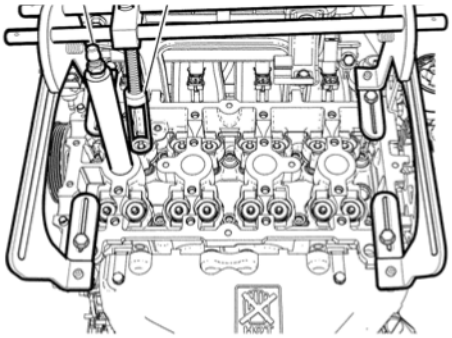


3. Click here for full size

4. Install the valve spring (2), retainer (1), and seal.




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5. Click here for full size
6. Disconnect the compressed air hose from *EN 49076* cylinder pressure adapter.
7. Caution:

   Refer to Fastener Caution.
8. Remove the *EN 49076* cylinder pressure adapter (3), install the spark plug, and tighten the spark plug to 20â€‰N-m (15â€‰lbâ€‰ft).
9. Remove the *EN-50173* universal valve spring compressor (1) and *EN-49075* valve spring compressor adapter (2).
10. Click here for full size
11. Install the valve tappet (1).
12. Install the camshaft. Refer to Camshaft Replacement.

## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Valve Spring | SPRING,VLV | X0075 |
| Valve Stem Oil Seal | SEAL,VLV STEM OIL | X0090 |
| Valve Spring | SPRING,VLV | X0110 |
| Valve Stem Oil Seal | SEAL KIT,VLV STEM OIL | X0177 |
| Valve Stem Oil Seal | SEAL,VLV STEM OIL | X0291 |
| Valve Spring | SPRING KIT,VLV | X0514 |

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| Part Name | Catalog Name | Part Code |
|---|---|---|
| Valve Spring | SPRING,VLV (RH PROC) | X0685 |
| Valve Spring | SPRING PKG,VLV | SS121 |
| Valve Stem Oil Seal | SEAL,VLV STEM OIL | SS264 |
| Valve Stem Oil Seal | SEAL PKG,VLV STEM OIL | SS269 |
| Valve Spring | SPRING PKG,VLV | SS270 |
| Valve Spring | SPRING PKG,VLV | SS272 |
| Valve Spring | SPRING,VLV | SS275 |

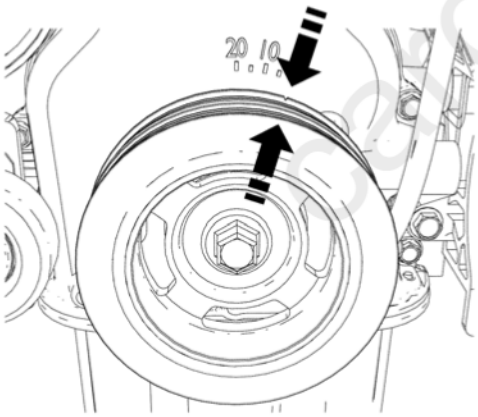
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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Valve Clearance Adjustment

### Measurement

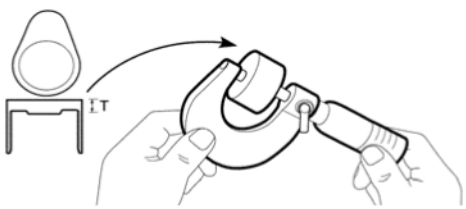
1. Remove the camshaft cover. Refer to Camshaft Cover Replacement.




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2. Click here for full size
3. Rotate the crankshaft pulley in direction of engine rotation, aligning the pulley groove with the 0 point on the cover, in order to set engine to TDC.
4. Click here for full size
5. Measure the valve clearance at positionsâ€‰(1), â€‰(2), â€‰(6) and â€‰(8).
6. Rotate the crankshaft pulley 360â€‰degrees in direction of engine rotation.
7. Measure the valve clearance at positions â€‰(3), â€‰(4), â€‰(5) andâ€‰(7).
8. If the measured values are not within specifications, replace the valve tappets.
9. Specifications
    - Intake Side: 0.075â€”0.125â€‰mm
    - Exhaust Side: 0.245â€”0.295â€‰mm

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10. Click here for full size

11. Determine the tappet size. Refer to determining replacement tappet size.

12.
    1. Remove the old tappet.
    2. Measure the old tappet.
    3. Perform the following calculation to determine the replacement tappet size:
    4. Specifications
        - Intake: value of removed tappet + measured clearance â€“ 0.1â€‰mm = new tappet size
        - Exhaust: value of removed tappet + measured clearance â€“ 0.27â€‰mm = new tappet size
    5. Example:
        - Old tappet = 3.20â€‰mm, clearance was 0.30â€‰mm, Intake clearance value is 0.1â€‰mm
        - 3.20â€‰mm + 0.30â€‰mmâ€”0.1â€‰mm = 3.40â€‰mm
        - 3.40â€‰mm = 96449615 (part number)

Tappet Selection

| Part Number | ID Number | Value (mm) |
|---|---|---|
| 96449601 | 312 | 3.120.01 |
| 96449602 | 314 | 3.140.01 |
| 96449603 | 316 | 3.160.01 |
| 96449604 | 318 | 3.180.01 |
| 96449605 | 320 | 3.200.01 |

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| Part Number | ID Number | Value (mm) |
|---|---|---|
| 96449606 | 322 | 3.220.01 |
| 96449607 | 324 | 3.240.01 |
| 96449608 | 326 | 3.260.01 |
| 96449609 | 328 | 3.280.01 |
| 96449610 | 330 | 3.300.01 |
| 96449611 | 332 | 3.320.01 |
| 96449612 | 334 | 3.340.01 |
| 96449613 | 336 | 3.360.01 |
| 96449614 | 338 | 3.380.01 |
| 96449615 | 340 | 3.400.01 |
| 96449616 | 342 | 3.420.01 |
| 96449617 | 344 | 3.440.01 |
| 96449618 | 346 | 3.460.01 |
| 96449619 | 348 | 3.480.01 |
| 96449620 | 350 | 3.500.01 |
| 96449621 | 352 | 3.520.01 |
| 96449622 | 354 | 3.540.01 |
| 96449623 | 356 | 3.560.01 |
| 96449624 | 358 | 3.580.01 |
| 96449625 | 360 | 3.600.01 |
| 96449626 | 362 | 3.620.01 |
| 96449627 | 364 | 3.640.01 |
| 96449628 | 366 | 3.660.01 |
| 96449629 | 368 | 3.680.01 |
| 96449630 | 370 | 3.700.01 |
| 96449631 | 372 | 3.720.01 |
| 96449632 | 374 | 3.740.01 |
| 96449633 | 376 | 3.760.01 |
| 96449634 | 378 | 3.780.01 |
| 96449635 | 380 | 3.800.01 |
| 96449636 | 382 | 3.820.01 |
| 96449637 | 384 | 3.840.01 |
| 96449638 | 386 | 3.860.01 |
| 96449639 | 388 | 3.880.01 |
| 96449640 | 390 | 3.900.01 |

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## Related Part Information

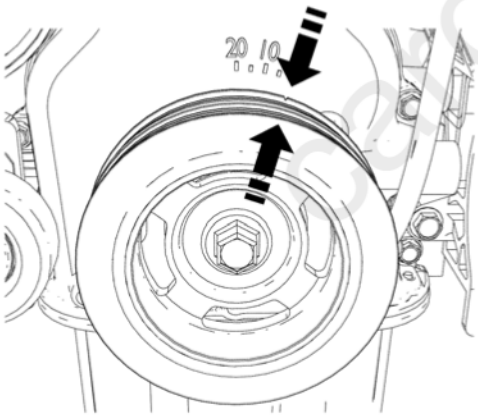
| Part Name | Catalog Name | Part Code |
|---|---|---|
| Exhaust Valve | VALVE,EXH | X0042 |
| Intake Valve | VALVE,INT | X0050 |
| Exhaust Valve | VALVE,EXH | X0197 |
| Intake Valve | VALVE,INT | X0561 |
| Intake Valve | VALVE,INT | SS062 |
| Exhaust Valve | VALVE,EXH | SS063 |
| Intake Valve | VALVE PKG,INT | SJ068 |
| Exhaust Valve | VALVE PKG,EXH | SJ069 |
| Intake Valve | VALVE,INT | SS176 |
| Exhaust Valve | VALVE,EXH | SS177 |
| Exhaust Valve | VALVE,EXH | X0133 |

1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Valve Clearance Adjustment (LKY)

### Measurement

1. Remove the camshaft cover. Refer to Camshaft Cover Replacement.



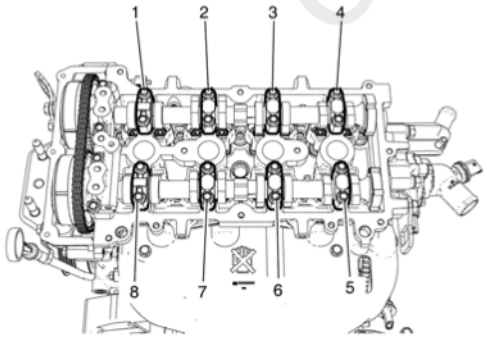

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2.

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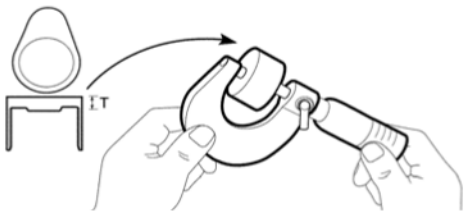
3. Rotate the crankshaft pulley in direction of engine rotation, aligning the pulley groove with the 0 point on the cover, in order to set engine to TDC.

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4. Click here for full size
5. Measure the valve clearance at positionsâ€‰(1), â€‰(2), â€‰(6) and â€‰(8).
6. Rotate the crankshaft pulley 360â€‰degrees in direction of engine rotation.
7. Measure the valve clearance at positions â€‰(3), â€‰(4), â€‰(5) andâ€‰(7).
8. If the measured values are not within specifications, replace the valve tappets.
9. Specifications
    - Intake Side: 0.075â€“0.125â€‰mm
    - Exhaust Side: 0.245â€“0.295â€‰mm

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10. Click here for full size

11. Determine the tappet size. Refer to determining replacement tappet size.

12.
    1. Remove the old tappet.
    2. Measure the old tappet.
    3. Perform the following calculation to determine the replacement tappet size:
    4. Specifications
        - Intake: value of removed tappet + measured clearance â€“ 0.1â€‰mm = new tappet size
        - Exhaust: value of removed tappet + measured clearance â€“ 0.27â€‰mm = new tappet size
        -
            Example:
            - Old tappet = 3.20â€‰mm, clearance was 0.30â€‰mm, Intake clearance value is 0.1â€‰mm
            - 3.20â€‰mm + 0.30â€‰mmâ€”0.1â€‰mm = 3.40â€‰mm
            - 3.40â€‰mm = 96449615 (part number)

Tappet Selection

| Part Number | ID Number | Value (mm) |
|---|---|---|
| 96449601 | 312 | 3.12 Â± 0.01 |
| 96449602 | 314 | 3.14 Â± 0.01 |
| 96449603 | 316 | 3.16 Â± 0.01 |
| 96449604 | 318 | 3.18 Â± 0.01 |
| 96449605 | 320 | 3.20 Â± 0.01 |

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| Part Number | ID Number | Value (mm) |
|---|---|---|
| 96449606 | 322 | 3.22 Â± 0.01 |
| 96449607 | 324 | 3.24 Â± 0.01 |
| 96449608 | 326 | 3.26 Â± 0.01 |
| 96449609 | 328 | 3.28 Â± 0.01 |
| 96449610 | 330 | 3.30 Â± 0.01 |
| 96449611 | 332 | 3.32 Â± 0.01 |
| 96449612 | 334 | 3.34 Â± 0.01 |
| 96449613 | 336 | 3.36 Â± 0.01 |
| 96449614 | 338 | 3.38 Â± 0.01 |
| 96449615 | 340 | 3.40 Â± 0.01 |
| 96449616 | 342 | 3.42 Â± 0.01 |
| 96449617 | 344 | 3.44 Â± 0.01 |
| 96449618 | 346 | 3.46 Â± 0.01 |
| 96449619 | 348 | 3.48 Â± 0.01 |
| 96449620 | 350 | 3.50 Â± 0.01 |
| 96449621 | 352 | 3.52 Â± 0.01 |
| 96449622 | 354 | 3.54 Â± 0.01 |
| 96449623 | 356 | 3.56 Â± 0.01 |
| 96449624 | 358 | 3.58 Â± 0.01 |
| 96449625 | 360 | 3.60 Â± 0.01 |
| 96449626 | 362 | 3.62 Â± 0.01 |
| 96449627 | 364 | 3.64 Â± 0.01 |
| 96449628 | 366 | 3.66 Â± 0.01 |
| 96449629 | 368 | 3.68 Â± 0.01 |
| 96449630 | 370 | 3.70 Â± 0.01 |
| 96449631 | 372 | 3.72 Â± 0.01 |
| 96449632 | 374 | 3.74 Â± 0.01 |
| 96449633 | 376 | 3.76 Â± 0.01 |
| 96449634 | 378 | 3.78 Â± 0.01 |
| 96449635 | 380 | 3.80 Â± 0.01 |
| 96449636 | 382 | 3.82 Â± 0.01 |
| 96449637 | 384 | 3.84 Â± 0.01 |
| 96449638 | 386 | 3.86 Â± 0.01 |
| 96449639 | 388 | 3.88 Â± 0.01 |
| 96449640 | 390 | 3.90 Â± 0.01 |

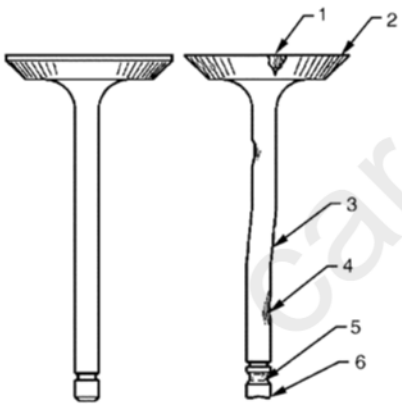
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## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Exhaust Valve | VALVE,EXH | X0042 |
| Intake Valve | VALVE,INT | X0050 |
| Exhaust Valve | VALVE,EXH | X0197 |
| Intake Valve | VALVE,INT | X0561 |
| Intake Valve | VALVE,INT | SS062 |
| Exhaust Valve | VALVE,EXH | SS063 |
| Intake Valve | VALVE PKG,INT | SJ068 |
| Exhaust Valve | VALVE PKG,EXH | SJ069 |
| Intake Valve | VALVE,INT | SS176 |
| Exhaust Valve | VALVE,EXH | SS177 |
| Exhaust Valve | VALVE,EXH | X0133 |

1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Valve Stem and Valve Guide Clearance Inspection




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1. Click here for full size
2. Inspect the valve for damage from the head to tip for the following conditions:
3. 
    - Pitting in the valve seat area (1)
    - Lack of valve margin (2)
    - Bending in the valve stem (3)
    - Pitting or excessive wear in the stem (4)
    - Worn valve key grooves (5)
    - Worn valve tip (6)
4. Replace the valve if any of these conditions exist.
5. Note**:**

    Valve guide is not removable. Replace the cylinder head if it is out of specification.
6. Measure the valve stem diameter (1) and valve guide inside diameter. If it is out of specification, replace it. Refer to Engine Mechanical Specifications.

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Crankshaft Rear Oil Seal and Housing Replacement (LKY)

Special Tools

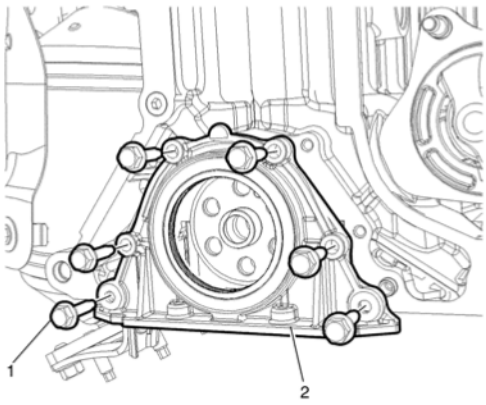
*J 45507* Crankshaft Rear Oil Seal Installer

For equivalent regional tools, refer to Special Tools.

### Removal Procedure

1. Remove the engine flywheel. Refer to Engine Flywheel Replacement.
2. Place a collecting container under the vehicle.
3. Remove the oil pan. Refer to Oil Pan Replacement.

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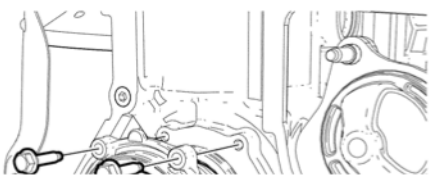


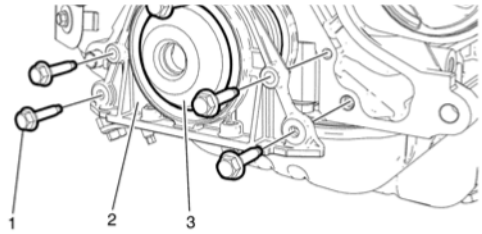
4. Click here for full size
5. Remove the 6 fastenersâ€‰(1) from the oil seal and housingâ€‰(2).
6. Clean the threads of the 6 fastenersâ€‰(1).
7. Note:

   Take care when removing the oil seal and housing to avoid damage to the crankshaft and oil pan.
8. Remove the oil seal and housing using a suitable tool.

## Installation Procedure

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1. Click here for full size
2. Apply sealant to the crankshaft rear oil seal and housing. Refer to Adhesives, Fluids, Lubricants, and Sealers.
3. Install the *J 45507* Crankshaft Rear Oil Seal Installerâ€‰(3) to the crankshaft rear oil seal and housingâ€‰(2).
4. Push the crankshaft rear oil seal and housingâ€‰(2) until the crankshaft rear oil seal and housing is flush and sits evenly in the cylinder block.
5. Remove the *J 45507* Crankshaft Rear Oil Seal Installerâ€‰(3) from the crankshaft.
6. Apply thread locker to the threads of the 6â€‰fastenersâ€‰(1). Refer to Adhesives, Fluids, Lubricants, and Sealers.
7. Caution:

   Refer to Fastener Caution.
8. Install the 6 fastenersâ€‰(1) and tighten to 10â€‰N-m (89â€‰lbâ€‰in).
9. Install the oil pan. Refer to Oil Pan Replacement.
10. Install the engine flywheel. Refer to Engine Flywheel Replacement.

## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Crankshaft Rear Oil Seal | SEAL,CR/SHF RR OIL | X0009 |
| Crankshaft Rear Oil Seal | SEAL,CR/SHF RR OIL | X0010 |
| Crankshaft Rear Oil Seal Housing | HOUSING,CR/SHF RR OIL SEAL | X0014 |
| Crankshaft Rear Oil Seal Housing | HOUSING,CR/SHF RR OIL SEAL | X0024 |
| Crankshaft Rear Oil Seal | SEAL KIT,CR/SHF RR OIL | X0033 |

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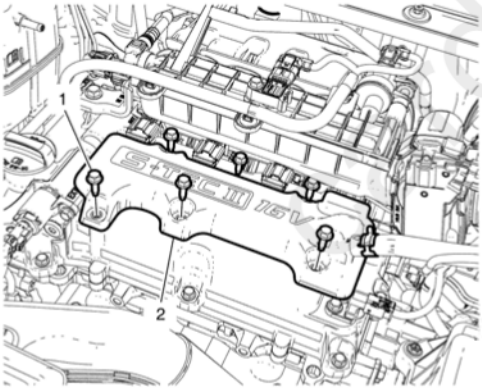
| Part Name | Catalog Name | Part Code |
|---|---|---|
| Crankshaft Rear Oil Seal Housing | HOUSING,CR/SHF RR OIL SEAL(CSTG) | X0050 |
| Crankshaft Rear Oil Seal Housing | HOUSING,CR/SHF RR OIL SEAL | X0065 |
| Crankshaft Rear Oil Seal | SEAL,CR/SHF RR OIL (W/ CR/SHF POSN SEN) | X0075 |
| Crankshaft Rear Oil Seal | SEAL,CR/SHF RR OIL | SS001 |
| Crankshaft Rear Oil Seal Housing | HOUSING PKG,CR/SHF RR OIL SEAL | SJ054 |
| Crankshaft Rear Oil Seal Housing | HOUSING,CR/SHF RR OIL SEAL | SJ095 |
| Crankshaft Rear Oil Seal | SEAL,CR/SHF RR OIL | SJ234 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Ignition Coil Cover Replacement (LKY)

### Removal Procedure

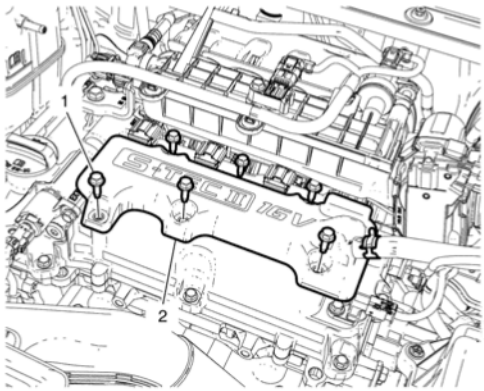



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1. Click here for full size
2. Open the hood.
3. Disconnect the breather hose and clamp from the ignition coil cover.
4. Remove the 6 ignition coil cover bolts (1).
5. Remove the ignition coil cover (2).

## Installation Procedure

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1. Click here for full size
2. Install the ignition coil cover (2).
3. Install the 6 ignition coil cover bolts (1) and tighten to 10â€‰N-m (80â€‰lbâ€‰in).
4. Connect the breather hose and clamp to the ignition coil cover.
5. Close the hood.

## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Ignition Coil Cover | COVER,IGN COIL | X0038 |
| Ignition Coil Cover | COVER,IGN COIL | X0155 |
| Ignition Coil Cover | COVER,IGN COIL | X0197 |

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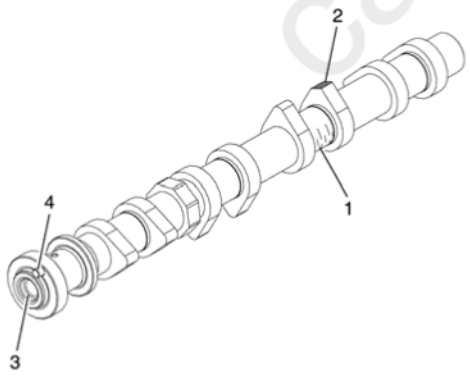
1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Camshaft Cleaning and Inspection

1. Clean the camshaft in solvent.
2. Warning**:**

   Refer to Safety Glasses Warning.
3. Dry the camshaft with compressed air.

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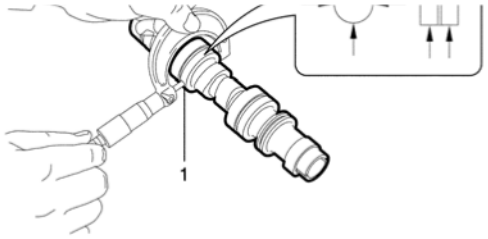
4. Click here for full size

5. Inspect the camshaft for the following conditions:

6.
    - Camshaft bearing journals (1) that are:
    -
        - Worn
        - Scored
        - Damaged
    - Worn camshaft lobes (2)
    - Damaged sprocket bolt threads (3)
    - Damaged sprocket pin

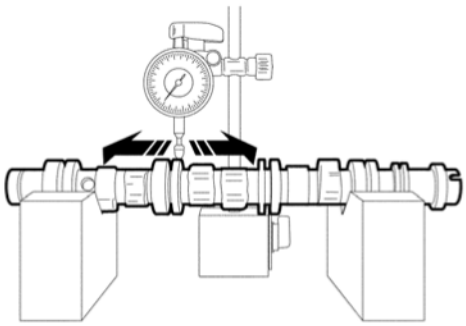
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7. Click here for full size
8. Measure the outer diameter of each journal (1) at the 4 different places.
9. Replace the camshaft if the measured value is not as specified.

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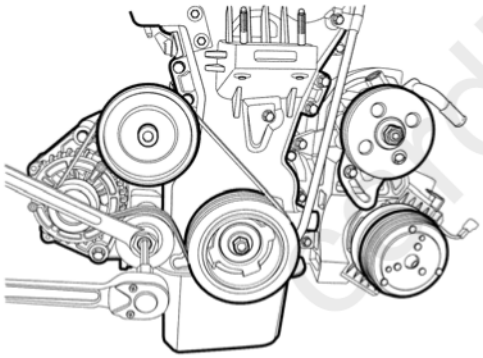


10. Click here for full size
11. Measure for excessive camshaft runout, using the indicator.
12.
    1. Mount the camshaft in a suitable fixture.
    2. Use the indicator in order to measure for a bent camshaft. Refer to Engine Mechanical Specifications.
13. Replace the camshaft if runout exceeds specifications.

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Drive Belt Removal



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1. Click here for full size
2. Rotate the inner hex of the tensioner nut counterclockwise and loosen the nut.
3. Rotate the outer hex of the tensioner nut clockwise and put down the tensioner.
4. Remove the water pump-generator belt.

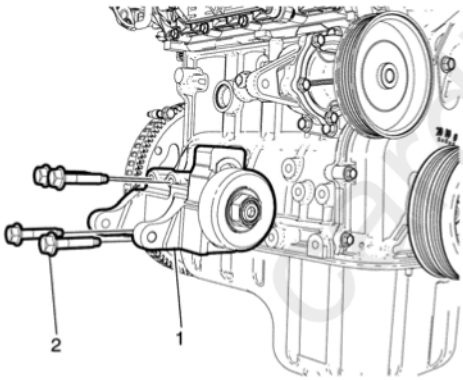
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Drive Belt | BELT,DRV | 0250A |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Drive Belt Tensioner Removal




obdiagn.com

1. Click here for full size
2. Remove the drive belt tensioner retaining bolts (2).
3. Remove the drive belt tensioner (1).

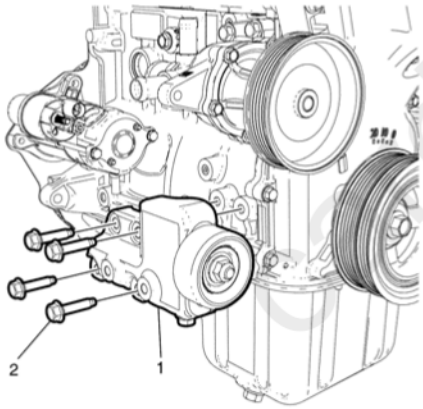
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Drive Belt Tensioner | TENSIONER,DRV BELT | 3100A |
| Drive Belt Tensioner | TENSIONER,DRV BELT | 2000A |
| Drive Belt Tensioner | TENSIONER,DRV BELT (W/BOLT) | 2002A |
| Drive Belt Tensioner | TENSIONER KIT,DRV BELT | 5619Z |
| Drive Belt Tensioner | TENSIONER,DRV BELT | 5620A |
| Drive Belt Tensioner | TENSIONER,DRV BELT | SJ266 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Generator Bracket Removal (LKY)




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1. Click here for full size
2. Remove the generator bracket retaining boltsâ€‰(2).
3. Remove the generator bracketâ€‰(1).

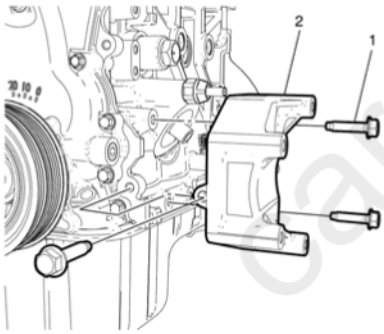
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Generator Bracket | BRACKET,GEN | 0175A |
| Generator Bracket | BRACKET,GEN | 0200A |
| Generator Bracket | BRACKET,GEN (MCHG) | 0202A |
| Generator Bracket | BRACKET,GEN (CSTG) | 0203A |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Air Conditioning Compressor Bracket Removal (LKY)




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1. Click here for full size
2. Remove the 3 air conditioning compressor bolts (1).
3. Remove the air conditioning compressor bracket (2).

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Crankshaft Balancer Removal

Special Tools

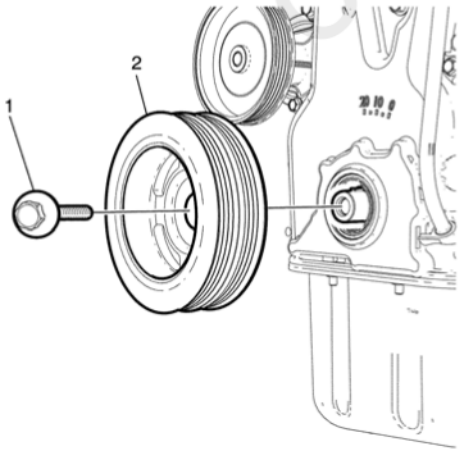
*EN-50050* Crankshaft Locking Device

For equivalent regional tools, refer to Special Tools.

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1. 
   Click here for full size
2. Install the *EN-50050* crankshaft locking device. Lock the flywheel via the starter ring gear.




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3. Click here for full size

4. Remove the bolt (1) and the crankshaft balancer (2).

5. Remove the *EN-50050* crankshaft locking device.

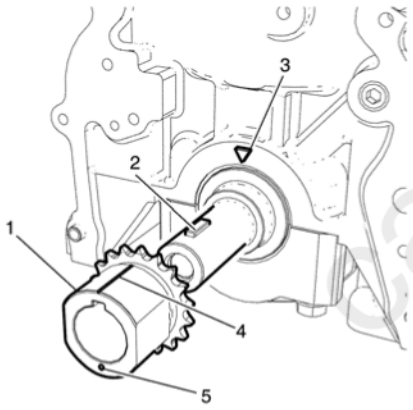
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Crankshaft Balancer | BALANCER,CR/SHF | X0001 |
| Crankshaft Balancer | BALANCER,CR/SHF | X0005 |
| Crankshaft Balancer | BALANCER,CR/SHF(CSTG) | X0011 |
| Crankshaft Balancer | BALANCER,CR/SHF (W/PULLEY) | X0014 |
| Crankshaft Balancer | BALANCER,CR/SHF | SJ277 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Crankshaft Sprocket Removal




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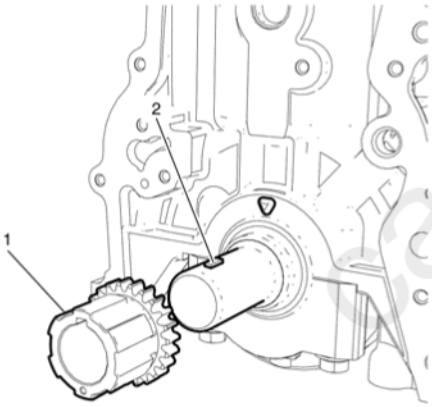
Click here for full size

Remove the crankshaft sprocket (1).

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Crankshaft Sprocket Removal (LKY)




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Click here for full size

Remove the crankshaft sprocket (1).

## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Crankshaft Sprocket | SPROCKET,CR/SHF | X0033 |
| Crankshaft Sprocket | SPROCKET,CR/SHF | X0217 |
| Crankshaft Sprocket | SPROCKET KIT,CR/SHF(W/CHAIN) | X0319 |
| Crankshaft Sprocket | SPROCKET,CR/SHF | SS201 |

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Engine Flywheel Removal

Special Tools

*EN-500501*Crankshaft Locking Device

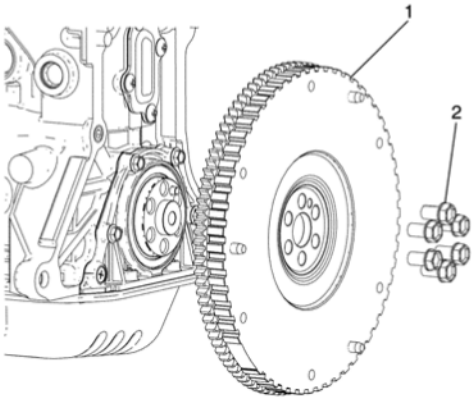
For equivalent regional tools, refer to Special Tools.

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1. Click here for full size
2. Install the *EN-500501* crankshaft locking device, lock the flywheel via the starter ring gear.
3. Loosen the flywheel bolts.
4. Remove the *EN-500501* crankshaft locking device.

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5. Click here for full size
6. Remove the 6 flywheel boltsâ€‰(2).
7. Remove the flywheel.

## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Engine Flywheel | FLYWHEEL,ENG | X0001 |
| Engine Flywheel | FLYWHEEL,ENG | SS006 |

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Automatic Transmission Flex Plate Removal

Special Tools

*EN-50050* Crankshaft Locking Device

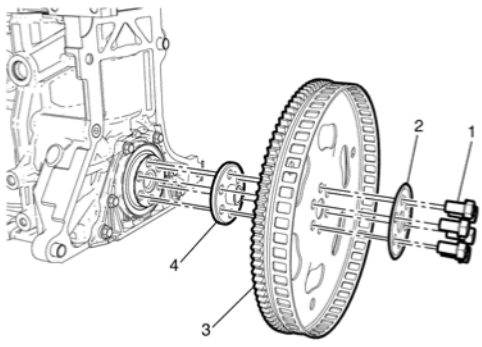
For equivalent regional tools, refer to Special Tools.

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1. Click here for full size
2. Install the *EN-50050* crankshaft locking device, lock the automatic transmission flex plate via the starter ring gear.
3. Loosen the 6 automatic transmission flex plate bolts.
4. Remove the *EN-50050* crankshaft locking device.

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5. Click here for full size
6. Remove the 6 automatic transmission flex plate boltsâ€‰(1).
7. Remove the automatic transmission flex plate retainerâ€‰(2).
8. Remove the automatic transmission flex plateâ€‰(3).
9. Remove the automatic transmission flex plate spacerâ€‰(4).

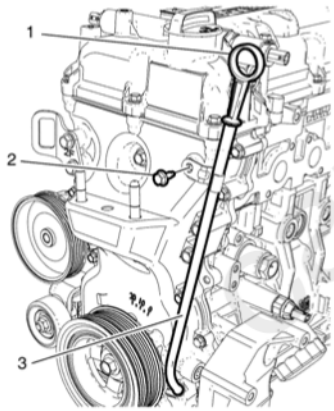
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Automatic Transmission Flex Plate | PLATE,A/TRNS FLEX(W/HUB) | 0043A |
| Automatic Transmission Flex Plate | PLATE,A/TRNS FLEX | 0044A |
| Automatic Transmission Flex Plate | PLATE KIT,A/TRNS FLEX | 0045A |
| Automatic Transmission Flex Plate | PLATE,A/TRNS FLEX | 0050A |
| Automatic Transmission Flex Plate | PLATE,A/TRNS FLEX | 0200A |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Oil Level Indicator and Tube Removal (LKY)




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1. Click here for full size
2. Remove the oil dipstickâ€‰(1).
3. Remove the oil level indicator tube boltâ€‰(2).
4. Note:

   If the engine oil level is at maximum, oil may emerge while removing the oil dipstick guide tube.
5. Remove the oil level indicator tubeâ€‰(3) and oil level indicator seal.

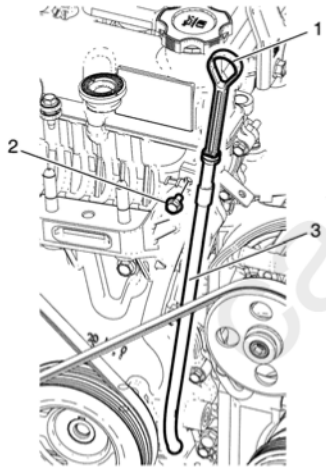
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Oil Level Indicator | INDICATOR,OIL LVL(W/IND TUBE) | 0049A |
| Oil Level Indicator | INDICATOR,OIL LVL | 0050A |
| Oil Level Indicator | INDICATOR,OIL LVL | 0050B |
| Oil Level Indicator | INDICATOR,OIL LVL (W/ IND & FILL TUBE) | 0051A |
| Oil Level Indicator Tube | TUBE,OIL LVL IND | 0100A |
| Oil Level Indicator Tube | TUBE,OIL LVL IND | 0150A |
| Oil Level Indicator | INDICATOR,OIL LVL | SJ184 |
| Oil Level Indicator Tube | TUBE,OIL LVL IND | SJ269 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Oil Level Indicator and Tube Removal




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1. Click here for full size
2. Remove the oil level indicator (1).
3. Remove the oil level indicator tube retaining bolt (2) and the oil level indicator tube (3).

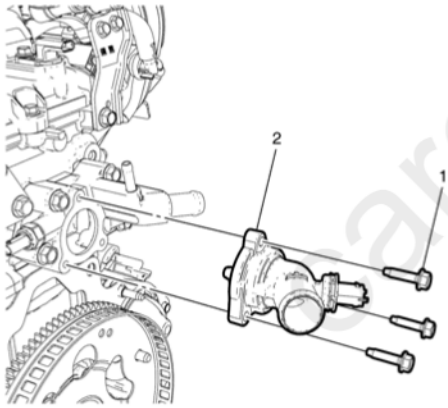
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Oil Level Indicator | INDICATOR,OIL LVL(W/IND TUBE) | 0049A |
| Oil Level Indicator | INDICATOR,OIL LVL | 0050A |
| Oil Level Indicator | INDICATOR,OIL LVL | 0050B |
| Oil Level Indicator | INDICATOR,OIL LVL (W/ IND & FILL TUBE) | 0051A |
| Oil Level Indicator Tube | TUBE,OIL LVL IND | 0100A |
| Oil Level Indicator Tube | TUBE,OIL LVL IND | 0150A |
| Oil Level Indicator | INDICATOR,OIL LVL | SJ184 |
| Oil Level Indicator Tube | TUBE,OIL LVL IND | SJ269 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Engine Coolant Thermostat Removal (LKY)



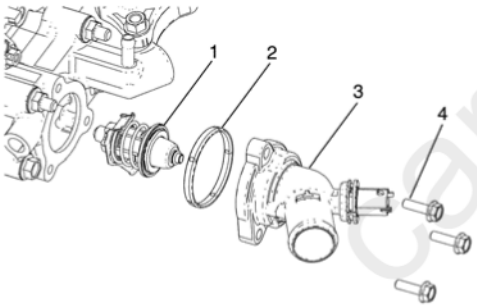

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1. Click here for full size
2. Remove the 3 engine coolant thermostat boltsâ€‰(1).
3. Remove the engine coolant thermostat assemblyâ€‰(2).

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Engine Coolant Thermostat Removal




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Click here for full size

1. Remove the 4 engine coolant thermostat bolts (4).
2. Remove the engine coolant thermostat socket (3).
3. Remove the engine coolant seal (2).
4. Remove the engine coolant thermostat (1).

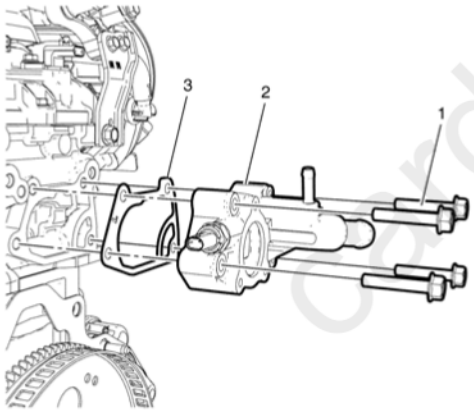
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Engine Coolant Thermostat | THERMOSTAT,ENG COOL(W/GSKT) | 0399A |
| Engine Coolant Thermostat | THERMOSTAT,ENG COOL(W/WAT INL) | 0399B |
| Engine Coolant Thermostat | THERMOSTAT,ENG COOL(W/WAT OTLT) | 0399C |
| Engine Coolant Thermostat | THERMOSTAT,ENG COOL(W/WAT OTLT & RAD OTLT PIPE) | 0399D |
| Engine Coolant Thermostat | THERMOSTAT KIT,ENG COOL | 0399Z |
| Engine Coolant Thermostat | THERMOSTAT,ENG COOL | 0400A |
| Engine Coolant Thermostat | THERMOSTAT,ENG COOL | SS129 |
| Engine Coolant Thermostat | THERMOSTAT,ENG COOL | SJ267 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Engine Water Outlet Adapter Removal (LKY)




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1. Click here for full size
2. Remove the 4â€‰engine water outlet adapter housing boltsâ€‰(1).
3. Note:

   Replace the engine water outlet housing if it is porous or cracked.
4. Remove the engine water outlet adapter housingâ€‰(2).
5. Inspect the engine water outlet adapter gasketâ€‰(3).

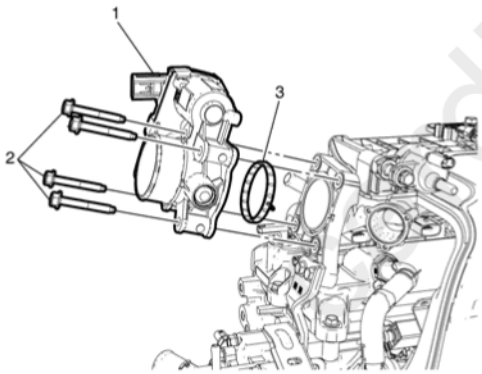
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Engine Water Outlet Adapter | ADAPTER,ENG WAT OTLT | 0174A |
| Engine Water Outlet Adapter | ADAPTER,ENG WAT OTLT | 0175A |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Throttle Body Assembly Removal (LKY)



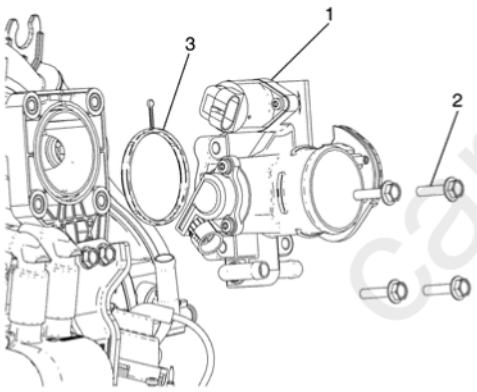

diagn.com

1. Click here for full size
2. Remove the 4 throttle body boltsâ€‰(2).
3. Remove the throttle bodyâ€‰(1).
4. Remove the throttle body sealâ€‰(3).

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Throttle Body Assembly Removal




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Click here for full size

1. Remove the 4 throttle body bolts (2).
2. Remove the throttle body (1).
3. Remove the throttle body seal (3).

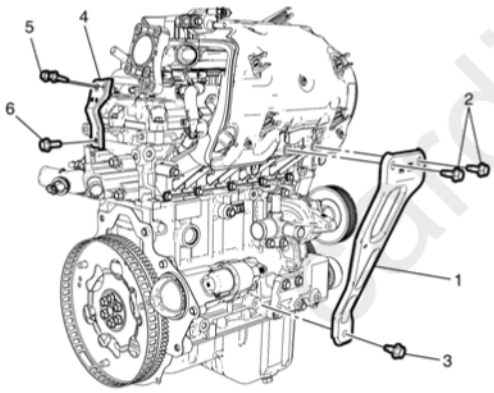
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Throttle Body | BODY,THROT (W/ THERM BYPASS PIPE) | 1767A |
| Throttle Body | BODY,THROT(W/MASS AIR FLOW SEN) | 1768A |
| Throttle Body | BODY,THROT(W/MASS AIR FLOW SEN) | 1769A |
| Throttle Body | BODY,THROT | 1770A |
| Throttle Body | BODY,THROT | 1770B |
| Throttle Body | BODY,THROT (CSTG) | 1770C |
| Throttle Body | BODY,THROT (W/SEN) | 1777A |
| Throttle Body | BODY,THROT(W/TBI) | X0213 |
| Throttle Body | BODY KIT,THROT | X0277 |
| Throttle Body | BODY KIT,THROT(W/TBI) | X0301 |
| Throttle Body | BODY KIT,THROT(W/THROT POSN SEN) | X0320 |
| Throttle Body | BODY,THROT(W/THROT ACTR) | X0474 |
| Throttle Body | BODY KIT,THROT (W/ THROT ACTR) | X0483 |
| Throttle Body | BODY,THROTTLE | SJ035 |

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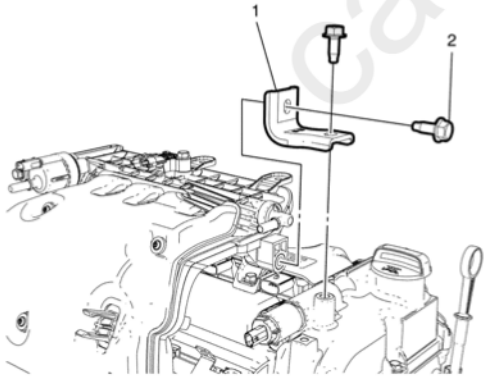
1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Intake Manifold Removal (LKY)




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1. Click here for full size
2. Remove the intake manifold rear bracketâ€‰(1) and boltsâ€‰(2, 3).
3. Remove the upper intake manifold side bracketâ€‰(4) and boltsâ€‰(5, 6).

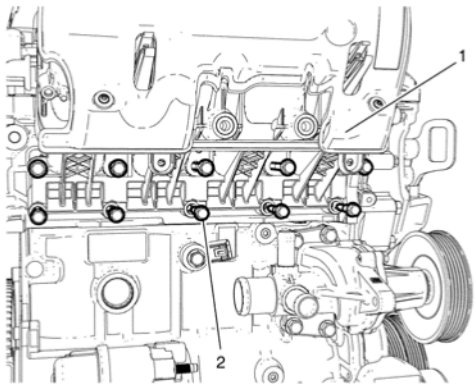



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4.
Click here for full size

5. Remove the intake manifold upper bracket boltsâ€‰(2).
6. Remove the intake manifold upper bracketâ€‰(1).

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7. Click here for full size

8. Remove the lower intake manifold 10 boltsâ€‰(2).

9. Remove the intake manifoldâ€‰(1).

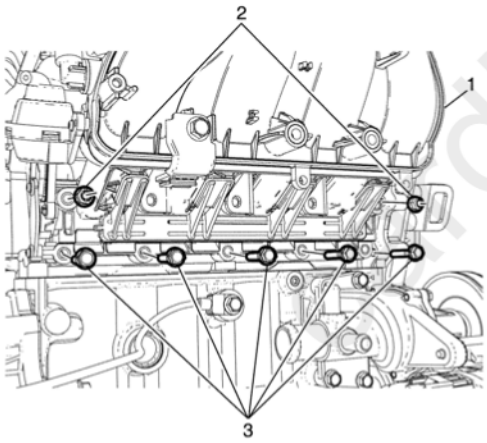
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Intake Manifold | MANIFOLD,INT | X0001 |
| Intake Manifold | MANIFOLD,INT | X0041 |
| Intake Manifold | MANIFOLD,INT(CSTG) | X0048 |
| Intake Manifold | MANIFOLD,INT | X0050 |
| Intake Manifold | MANIFOLD KIT,INT | X0114 |
| Intake Manifold | MANIFOLD KIT,INT(W/ M/PORT F/INJR & FUEL RL) | X0115 |
| Intake Manifold | MANIFOLD,INT(W/THROT BODY) | X0129 |
| Intake Manifold | MANIFOLD,INT(W/THROT BODY) | X0132 |
| Intake Manifold | MANIFOLD,INT(SERV) | X0133 |
| Intake Manifold | MANIFOLD,INT(W/M/PORT F/INJR & FUEL RL) | X0179 |
| Intake Manifold | MANIFOLD,INT (W/THROT BODY & M/PORT F/INJR & FUEL RL) | X0228 |
| Intake Manifold | MANIFOLD,INT (W/ THROT BODY, BOLTS, GSKTS) | X0293 |
| Intake Manifold | MANIFOLD,INT | SS092 |
| Intake Manifold | MANIFOLD,INT(CSTG) | SJ305 |
| Intake Manifold | MANIFOLD,INT | SS082 |
| Intake Manifold | MANIFOLD PKG,INT | SS241 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Intake Manifold Removal




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1. Click here for full size
2. Remove the the intake manifold bolts (3) and nuts (2).
3. Remove the intake manifold (1).

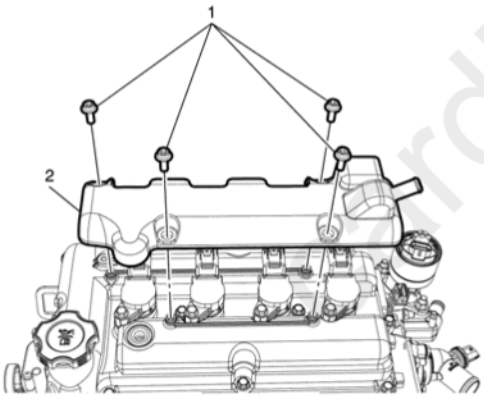
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Intake Manifold | MANIFOLD,INT | X0001 |
| Intake Manifold | MANIFOLD,INT | X0041 |
| Intake Manifold | MANIFOLD,INT(CSTG) | X0048 |
| Intake Manifold | MANIFOLD,INT | X0050 |
| Intake Manifold | MANIFOLD KIT,INT | X0114 |
| Intake Manifold | MANIFOLD KIT,INT(W/ M/PORT F/INJR & FUEL RL) | X0115 |
| Intake Manifold | MANIFOLD,INT(W/THROT BODY) | X0129 |
| Intake Manifold | MANIFOLD,INT(W/THROT BODY) | X0132 |
| Intake Manifold | MANIFOLD,INT(SERV) | X0133 |
| Intake Manifold | MANIFOLD,INT(W/M/PORT F/INJR & FUEL RL) | X0179 |
| Intake Manifold | MANIFOLD,INT (W/THROT BODY & M/PORT F/INJR & FUEL RL) | X0228 |
| Intake Manifold | MANIFOLD,INT (W/ THROT BODY, BOLTS, GSKTS) | X0293 |
| Intake Manifold | MANIFOLD,INT | SS092 |
| Intake Manifold | MANIFOLD,INT(CSTG) | SJ305 |
| Intake Manifold | MANIFOLD,INT | SS082 |
| Intake Manifold | MANIFOLD PKG,INT | SS241 |

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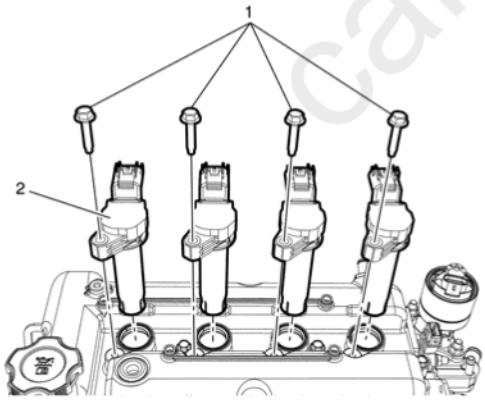
1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Ignition Coil Removal




rdiagn.com

1. Click here for full size
2. Remove the upper camshaft cover bolts (1).
3. Remove the upper camshaft cover (2).




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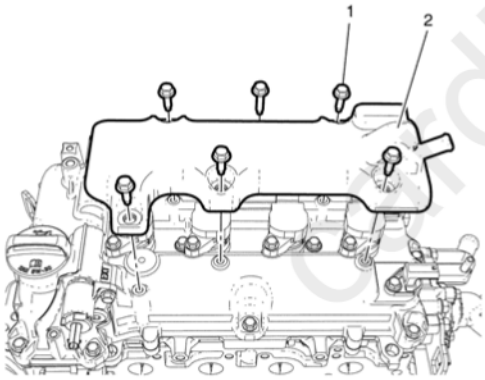
4.
Click here for full size

5. Remove the ignition coil retaining bolts (1) and the ignition coils (2).

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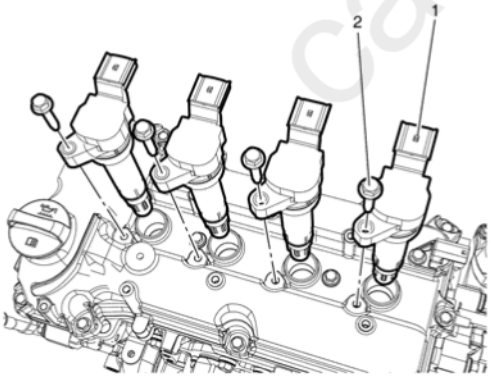
1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Ignition Coil Removal (LKY)




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1. Click here for full size
2. Remove the upper camshaft cover bolts (1).
3. Remove the upper camshaft cover (2).




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4. Click here for full size
5. Remove the ignition coil bolts (2).
6. Remove the ignition coil.

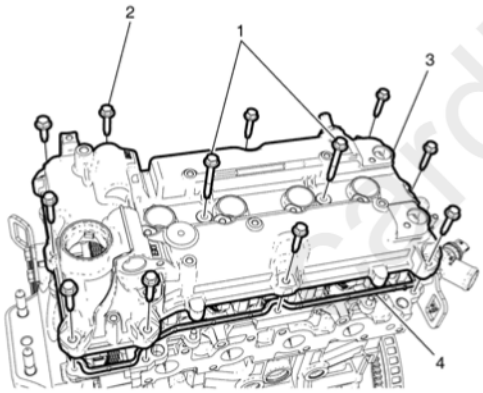
## Related Part Information

| Part Name Catalog Name | Part Code |
|---|---|
| Ignition Coil COIL KIT,IGN | 2699A |
| Ignition Coil COIL,IGN | 2700A |
| Ignition Coil COIL,IGN (W/ BRKT) | 2702A |
| Ignition Coil COIL KIT,IGN | SJ139 |
| Ignition Coil COIL,IGN | SJ140 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Camshaft Cover Removal (LKY)



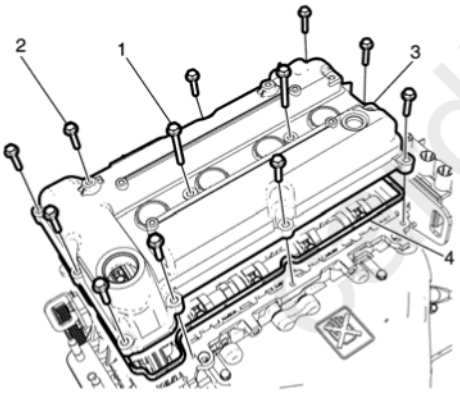

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1. Click here for full size
2. Remove the camshaft cover bolts (1, 2).
3. Remove the camshaft cover (3).
4. Remove the camshaft cover gasket (4).

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Camshaft Cover Removal




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1. Click here for full size
2. Remove the camshaft cover bolts (1, 2).
3. Remove the camshaft cover (3).
4. Remove the camshaft cover gasket (4).

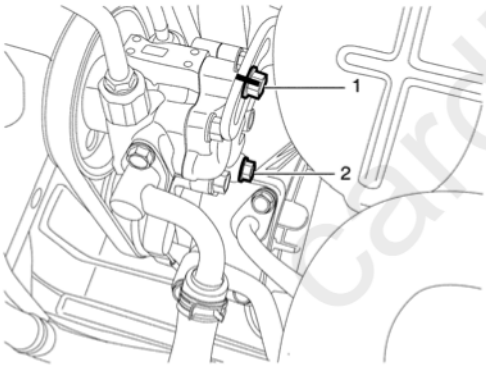
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Camshaft Cover | COVER,CM/SHF | X0210 |
| Camshaft Cover | COVER,CM/SHF | X0211 |
| Camshaft Cover | COVER,CM/SHF (CSTG) | X0503 |
| Camshaft Cover | COVER,CM/SHF(MCHG) | X0512 |
| Camshaft Cover | COVER,CM/SHF (CSTG) | X0513 |
| Camshaft Cover | COVER,CM/SHF | X0798 |
| Camshaft Cover | COVER,CM/SHF (W/BOLT & SEAL) | X0799 |
| Camshaft Cover | COVER,CM/SHF (W/SEAL) | X0820 |
| Camshaft Cover | COVER,CM/SHF | SS199 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Power Steering Pump Belt Removal

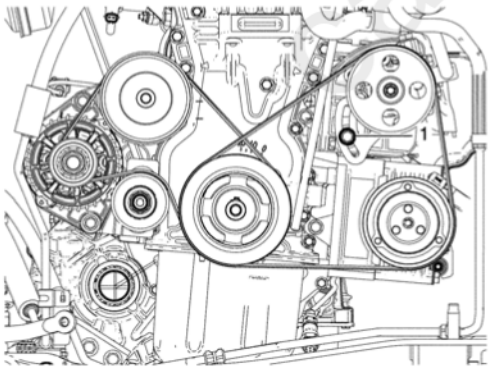



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1. Click here for full size
2. Note:

   Mark on the retaining bolt with the power steering pump bracket before removal.

3. Loosen the power steering pump bolts (1), (2).



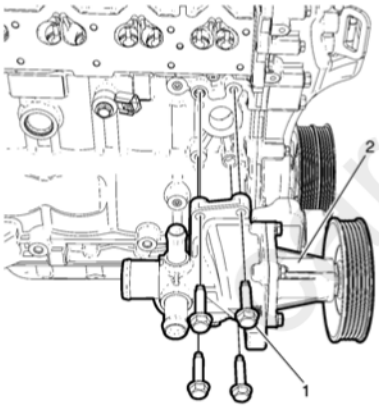

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4. Click here for full size
5. Loosen the power steering pump bolts (1).
6. Remove the power steering pump belt.

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Water Pump Removal (LKY)



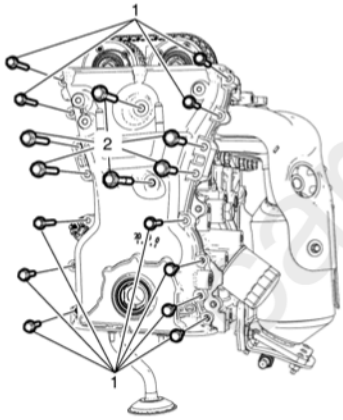

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1. Click here for full size
2. Remove the 4 water pump boltsâ€‰(1).
3. Remove the water pumpâ€‰(2).

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Engine Front Cover and Oil Pump Removal (LKY)




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1. Click here for full size
2. Note:

   Note the different screw lengths.

3. Remove the boltsâ€‰(1, 2).
4. Note:

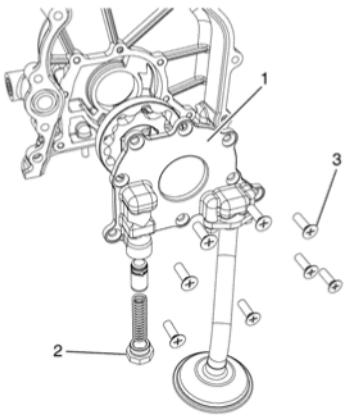
   Do not damage the sealing surfaces.

5. Remove the engine front cover with the included oil pump.
6. Note:

   There are no serviceable components within the oil pump. Disassemble the pump only to diagnose an oiling concern. A disassembled oil pump must not be reused. A disassembled oil pump must be replaced.

7. Clean the sealing surface.

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8. Click here for full size
9. Remove the oil pump screwsâ€‰(3).
10. Remove the oil pumpâ€‰(1).
11. Remove the plug, holding the plug for the oil relief valve components.
12. Remove the plug, spring and plungerâ€‰(2), from the oil pump housingâ€‰(1).

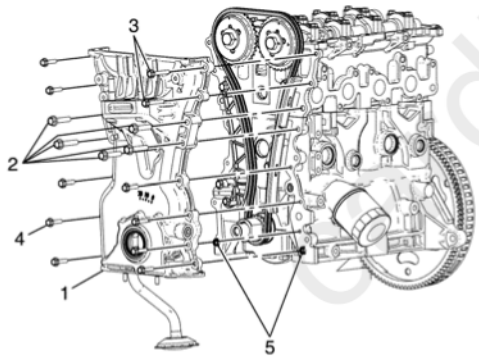
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Oil Pump | PUMP,OIL | X0036 |
| Oil Pump | PUMP,OIL(W/SCRN) | X0100 |
| Oil Pump | PUMP KIT,OIL | X0112 |
| Engine Front Cover | COVER,ENG FRT | X0002 |
| Engine Front Cover | COVER,ENG FRT | X0032 |
| Engine Front Cover | COVER,ENG FRT(CSTG) | X0033 |
| Engine Front Cover | COVER,ENG FRT(W/OIL FLTR ADAP,O/PMP & W/PMP) | X0034 |
| Engine Front Cover | COVER,ENG FRT(WITH O/PMP & W/PMP) | X0035 |
| Engine Front Cover | COVER,ENG FRT(W/CR/SHF FRT OIL SEAL) | X0036 |
| Engine Front Cover | COVER,ENG FRT (W/ W/PMP) | X0037 |
| Engine Front Cover | COVER,ENG FRT(W/OIL PMP) | X0038 |
| Engine Front Cover | COVER,ENG FRT(W/TMG IND) | X0066 |
| Engine Front Cover | COVER,ENG FRT (MCHG) | X0070 |
| Engine Front Cover | COVER KIT,ENG FRT | X0087 |
| Oil Pump | PUMP,OIL (W/SCRN) | SJ007 |
| Oil Pump | PUMP KIT,OIL | SJ042 |
| Engine Front Cover | COVER,ENG FRT(CHROME) | SS024 |
| Oil Pump | PUMP,OIL | SS149 |
| Engine Front Cover | COVER,ENG FRT | SS200 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Engine Front Cover and Oil Pump Removal




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1. Click here for full size
2. Note:

   Note the different screw lengths.

3. Remove the bolts (2, 3, 4).
4. Note:

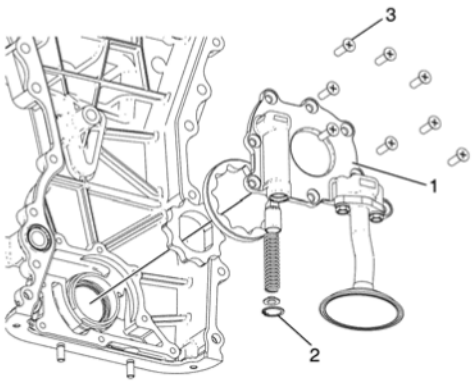
   Do not damage the sealing surfaces.

5. Remove the engine front cover with the included oil pump (4).
6. Note:

   There are no serviceable components within the oil pump. Disassemble the pump only to diagnose an oiling concern. A disassembled oil pump must not be reused. A disassembled oil pump must be replaced.

7. Clean the sealing surface.

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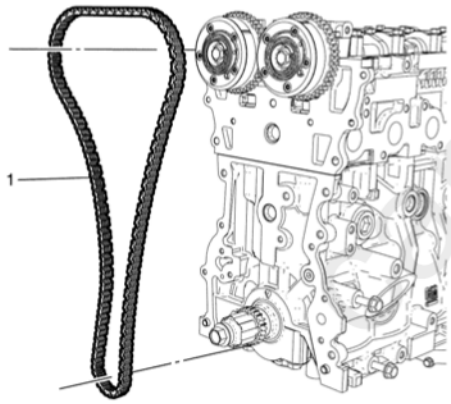


8. Click here for full size
9. Remove the oil pump screws (3).
10. Remove the oil pump (1).
11. Remove the clip, holding the cap for the oil relief valve components.
12. Remove the cap, spring and plunger (2), from the oil pump housing (1).

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Camshaft Timing Chain Removal (LKY)




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Remove the timing chain (1).

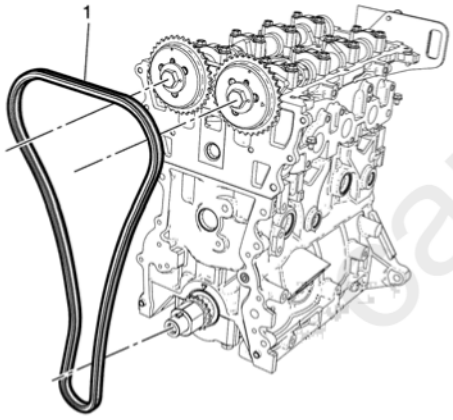
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Timing Chain | CHAIN,TMG | X0056 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Camshaft Timing Chain Removal




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Remove the timing chain (1).

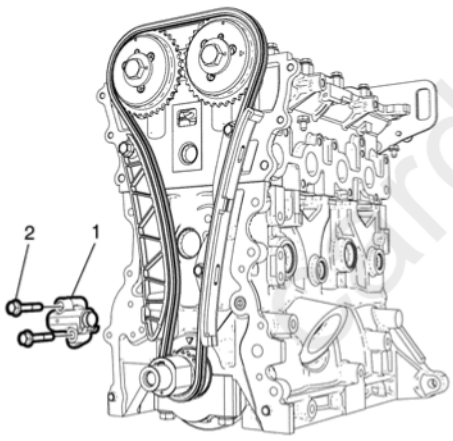
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Timing Chain | CHAIN,TMG | X0056 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Timing Chain Tensioner Removal




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1. Click here for full size
2. Remove the timing chain tensioner retaining boltsâ€‰(2).
3. Remove the timing chain tensionerâ€‰(1).
4. Inspect the timing chain tensioner mounting surface on the cylinder head for burrs or any defects that may degrade the sealing.

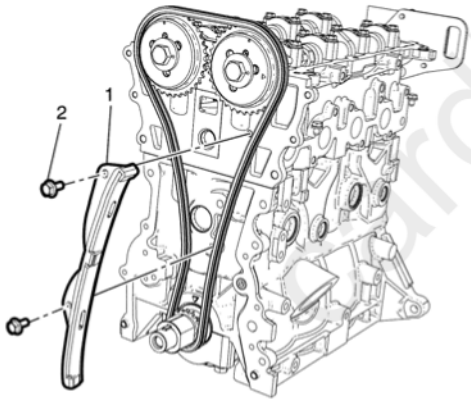
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Timing Chain Tensioner | TENSIONER,TMG CHAIN | X0062 |
| Timing Chain Tensioner | TENSIONER KIT,TMG CHAIN | X0372 |
| Timing Chain Tensioner | TENSIONER,TMG CHAIN | X0924 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Timing Chain Guide Removal




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1. Click here for full size
2. Remove the timing chain guide bolts (2).
3. Remove the timing chain guide (1).

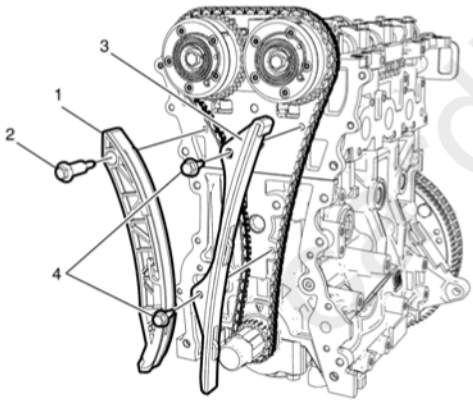
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Timing Chain Guide | GUIDE,TMG CHAIN | X0060 |
| Timing Chain Guide | GUIDE,TMG CHAIN | X0115 |
| Timing Chain Guide | GUIDE KIT,TMG CHAIN | X0537 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Timing Chain Guide Removal (LKY)




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1. Click here for full size
2. Remove the timing chain guide retaining boltsâ€‰(4).
3. Remove the timing chain guideâ€‰(3).
4. Remove the timing chain shoe retaining boltâ€‰(2).
5. Remove the timing chain shoeâ€‰(1).

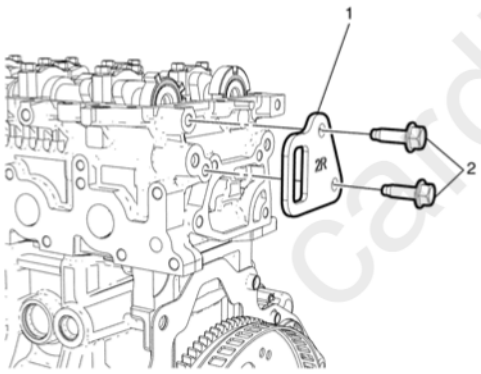
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Timing Chain Guide | GUIDE,TMG CHAIN | X0060 |
| Timing Chain Guide | GUIDE,TMG CHAIN | X0115 |
| Timing Chain Guide | GUIDE KIT,TMG CHAIN | X0537 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Engine Lift Front Bracket Removal (LKY)




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1. Click here for full size
2. Remove the engine lift front bracket boltsâ€‰(2) from the cylinder head.
3. Remove the engine lift front bracketâ€‰(1).

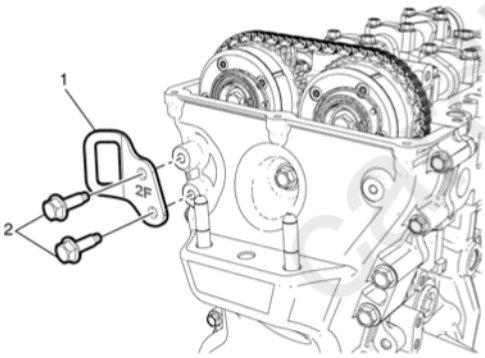
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Engine Lift Front Bracket | BRACKET,ENG LIFT FRT | 0200A |
| Engine Lift Front Bracket | BRACKET,ENG LIFT FRT | 0225A |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Engine Lift Rear Bracket Removal (LKY)




c4diagn.com

1. Click here for full size
2. Remove the engine lift rear bracket boltsâ€‰(2) from the timing chain cover.
3. Remove the engine lift rear bracketâ€‰(1).

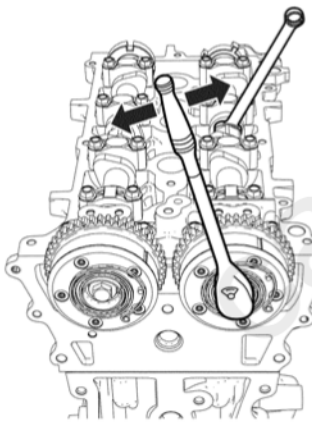
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Engine Lift Rear Bracket | BRACKET,ENG LIFT RR | 0250A |
| Engine Lift Rear Bracket | BRACKET,ENG LIFT RR | 0250B |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Camshaft Sprocket Removal



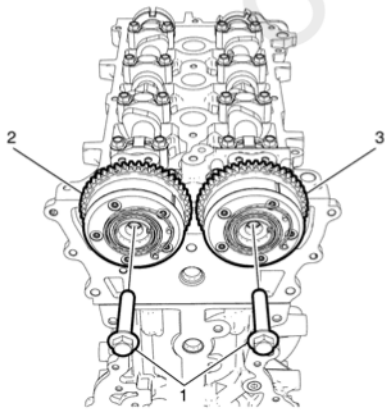
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1. Click here for full size
2. Caution:

   Use extreme care when installing the camshaft not to nick, scratch, or damage the camshaft lobes or bearing surfaces.

3. While holding the intake camshaft firmly in place, loosen the intake camshaft sprocket bolt.
4. While holding the exhaust camshaft firmly in place, loosen the exhaust camshaft sprocket bolt.

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5. Click here for full size
6. Remove the intake and exhaust camshaft sprocket boltsâ€‰(1).
7. Remove the intake camshaft sprocketâ€‰(2).
8. Remove the exhaust camshaft sprocketâ€‰(3).

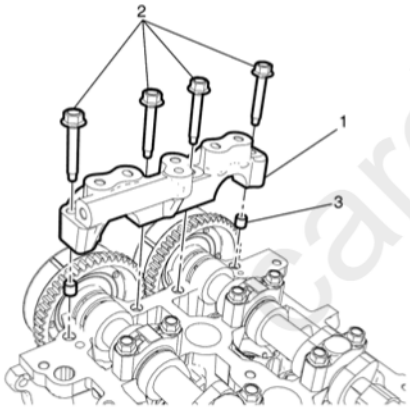
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Camshaft Sprocket | SPROCKET,CM/SHF | X0007 |
| Camshaft Sprocket | SPROCKET,CM/SHF | X0151 |
| Camshaft Sprocket | SPROCKET,CM/SHF(W/ CM/SHF POSN ACTR) | X0389 |
| Camshaft Sprocket | SPROCKET,CM/SHF (BLANK) | X0700 |
| Camshaft Sprocket | SPROCKET KIT,CM/SHF | X0880 |
| Camshaft Sprocket | SPROCKET,CM/SHF | SS209 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

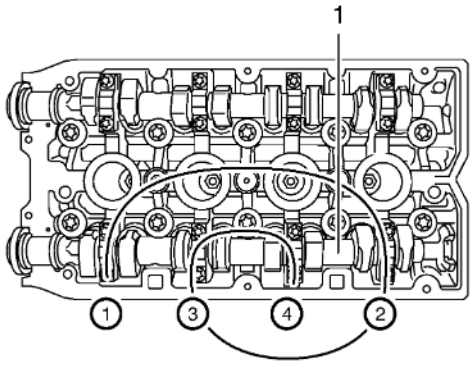
## Camshaft Removal (LKY)




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1. Click here for full size
2. Remove the first camshaft bearing cap bolts (2).
3. Remove the first camshaft bearing cap (1) and dowel pin (3).

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4. [Click here for full size]
5. Note**:**

   Note removal sequence 1â€“4.

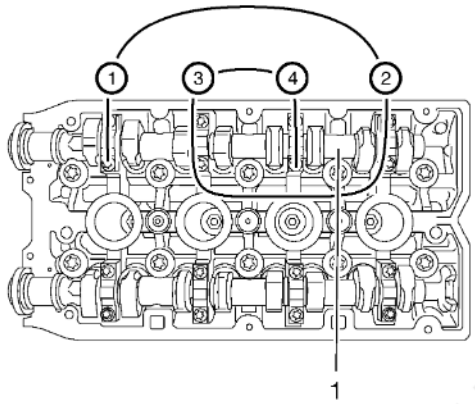
6. Loosen the 8 exhaust camshaft bearing cap bolts working from outside to inside in a spiral in steps of 1/2 up to 1 turn.

7. Note:

   Mark camshaft bearing caps before removal.

8. Remove the 8 exhaust camshaft bearing cap bolts.
9. Remove the 4 exhaust camshaft bearing caps numbers 6â€“9 from the cylinder head.
10. Remove the exhaust camshaft.

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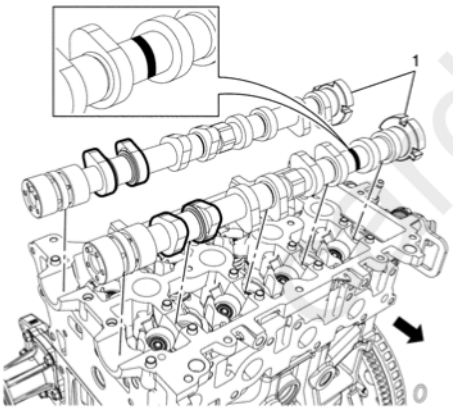
11. Click here for full size
12. Note:

    Note removal sequence 1â€“4.

13. Loosen the 8 intake camshaft bearing cap bolts working from outside to inside in a spiral in steps of 1/2 up to 1 turn.

14. Remove the 8 intake camshaft bearing cap bolts.
15. Note:

    Mark camshaft bearing caps before removal.
16. Remove the 4 intake camshaft bearing caps numbers 2â€“5 from the cylinder head.




diagn.com

17. Click here for full size
18. Note:

    The exhaust camshaft has a groove between the No.â€‰3 journal and No.â€‰4 journal. The intake camshaft has no groove.

19. Remove the intake camshaft and the exhaust camshaft (1).

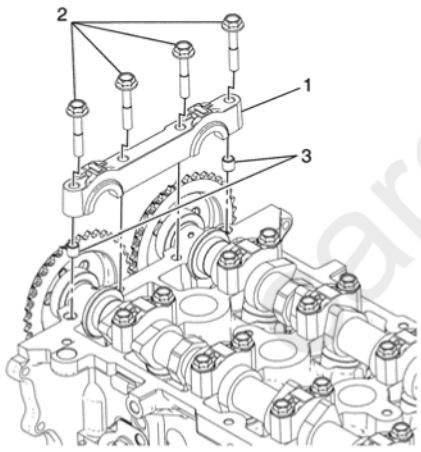
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Engine Camshaft | CAMSHAFT,ENG | X0001 |
| Camshaft | CAMSHAFT, | X0106 |
| Camshaft | CAMSHAFT,(FORG) | X0130 |
| Camshaft | CAMSHAFT,(MCHG) | X0131 |
| Camshaft | CAMSHAFT,(FORG) | X0140 |
| Camshaft | CAMSHAFT,(CSTG) | X0141 |
| Camshaft | CAMSHAFT, | X0153 |
| Camshaft | CAMSHAFT,(PARTIAL MCHG) | X0198 |
| Camshaft | CAMSHAFT,(PARTIAL MCHG) | X0261 |
| Camshaft | CAMSHAFT KIT,(W/VLV LFTR) | X0300 |
| Camshaft | CAMSHAFT,(BAR) | X0371 |
| Camshaft | CAMSHAFT KIT,(W/THR WA) | X0515 |
| Camshaft | CAMSHAFT KIT,(W/VLV LFTR) | SS007 |
| Engine Camshaft | CAMSHAFT,ENG | SS094 |
| Camshaft | CAMSHAFT KIT,(W/VLV LFTR) | SS095 |
| Engine Camshaft | CAMSHAFT PKG,ENG(W/RKR ARM & VLV SPR) | SS244 |
| Engine Camshaft | CAMSHAFT PKG,ENG(W/VLV SPR) | SS286 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
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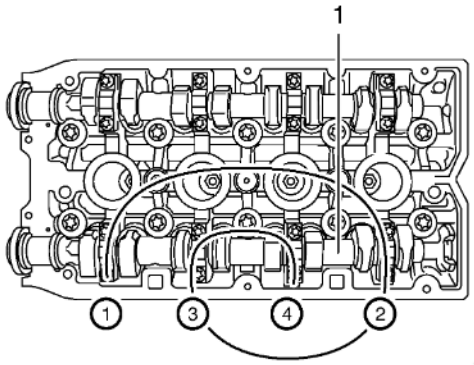
## Camshaft Removal




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1. Click here for full size
2. Remove the first camshaft bearing cap (1).

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3. Click here for full size
4. Note:

   Note removal sequenceâ€‰1â€“4.

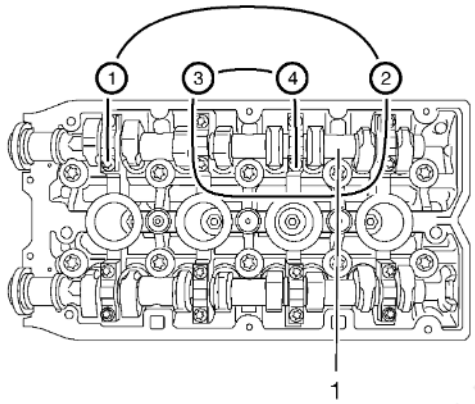
5. Loosen the 8â€‰exhaust camshaft bearing cap bolts working from outside to inside in a spiral in steps of 1/2 up to 1â€‰turn.

6. Note:

   Mark camshaft bearing caps before removal.

7. Remove the 8â€‰exhaust camshaft bearing cap bolts.
8. Remove the 4â€‰exhaust camshaft bearing caps numbersâ€‰6â€“9 from the cylinder head.
9. Remove the exhaust camshaft.

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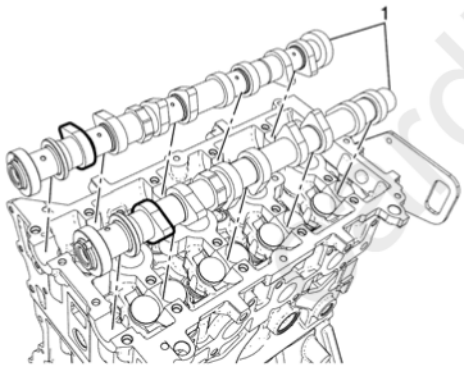
10. Click here for full size
11. Note:

    Note removal sequenceâ€‰1â€“4.

12. Loosen the 8â€‰intake camshaft bearing cap bolts working from outside to inside in a spiral in steps of 1/2 up to 1â€‰turn.

13. Remove the 8â€‰intake camshaft bearing cap bolts.
14. Note:

    Mark camshaft bearing caps before removal.
15. Remove the 4â€‰intake camshaft bearing caps numbersâ€‰2â€“5 from the cylinder head.




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16.
Click here for full size

17. Remove the intake and exhaustâ€‰(1) camshaft.

## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Engine Camshaft | CAMSHAFT,ENG | X0001 |
| Camshaft | CAMSHAFT, | X0106 |
| Camshaft | CAMSHAFT,(FORG) | X0130 |
| Camshaft | CAMSHAFT,(MCHG) | X0131 |
| Camshaft | CAMSHAFT,(FORG) | X0140 |
| Camshaft | CAMSHAFT,(CSTG) | X0141 |
| Camshaft | CAMSHAFT, | X0153 |
| Camshaft | CAMSHAFT,(PARTIAL MCHG) | X0198 |
| Camshaft | CAMSHAFT,(PARTIAL MCHG) | X0261 |
| Camshaft | CAMSHAFT KIT,(W/VLV LFTR) | X0300 |
| Camshaft | CAMSHAFT,(BAR) | X0371 |
| Camshaft | CAMSHAFT KIT,(W/THR WA) | X0515 |
| Camshaft | CAMSHAFT KIT,(W/VLV LFTR) | SS007 |
| Engine Camshaft | CAMSHAFT,ENG | SS094 |
| Camshaft | CAMSHAFT KIT,(W/VLV LFTR) | SS095 |
| Engine Camshaft | CAMSHAFT PKG,ENG(W/RKR ARM & VLV SPR) | SS244 |
| Engine Camshaft | CAMSHAFT PKG,ENG(W/VLV SPR) | SS286 |

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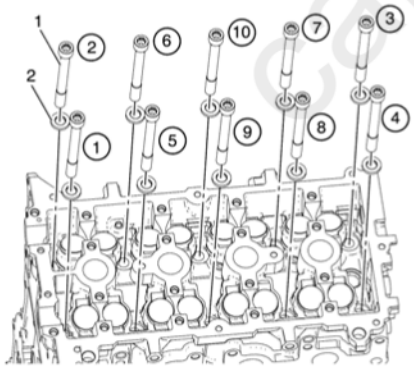
1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Cylinder Head and Gasket Removal (LKY)

Special Tools

*GE-42072* Cylinder Head Bolt Remover/Installer

For equivalent regional tools, refer to Special Tools.




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1. 
   Click here for full size
2. Note**:**

   The cylinder head bolts require a 10 mm 12 point triple square tool for proper servicing. Use *GE-42072* Cylinder Head Bolt Remover/Installer or equivalent when servicing head bolts.

3. Remove the 10 cylinder head bolts with the *GE-42072* cylinder head bolt remover/installerâ€‰(1) in sequence as shown

4. 
   1. Loosen the 10 bolts 90Â°.
   2. Loosen the 10 bolts 180Â°.

5. Remove the cylinder head and place on a suitable base.

6. Remove the cylinder head gasket.

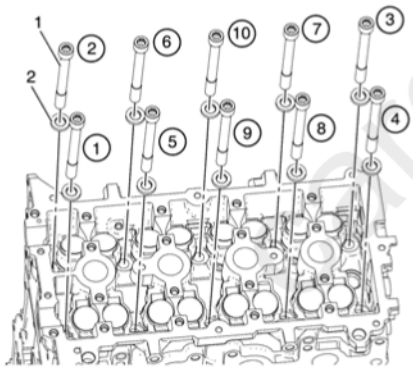
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Cylinder Head | HEAD,CYL | X0001 |
| Cylinder Head Gasket | GASKET,CYL HD | X0003 |
| Cylinder Head | HEAD,CYL | X0016 |
| Cylinder Head | HEAD,CYL(MCHG) | X0017 |
| Cylinder Head | HEAD,CYL(CSTG) | X0018 |
| Cylinder Head | HEAD,CYL (W/VLVS) | X0019 |
| Cylinder Head | HEAD,CYL(MCHG) | X0020 |
| Cylinder Head Gasket | GASKET KIT,CYL HD | X0022 |
| Cylinder Head | HEAD KIT,CYL | X0032 |
| Cylinder Head | HEAD,CYL(CSTG) | X0034 |
| Cylinder Head | HEAD,CYL | X0042 |
| Cylinder Head Gasket | GASKET,CYL HD | X0053 |
| Cylinder Head | HEAD,CYL(W/EXH VLV ST) | X0055 |
| Cylinder Head | HEAD,CYL (SERV PARTIAL) | X0063 |
| Cylinder Head | HEAD,CYL (W/VLV & CVR) | X0066 |
| Cylinder Head | HEAD,CYL (PARTIAL MCHG) | X0067 |
| Cylinder Head Gasket | GASKET KIT,CYL HD | SJ023 |
| Cylinder Head Gasket | GASKET,CYL HD | SS033 |
| Cylinder Head | HEAD,CYL | SS067 |
| Cylinder Head Gasket | GASKET KIT,CYL HD | SJ004 |
| Cylinder Head | HEAD,CYL (CSTG) | SJ303 |
| Cylinder Head | HEAD,CYL (W/ VLV) | SJ304 |
| Cylinder Head | HEAD,CYL | SS083 |
| Cylinder Head Gasket | GASKET,CYL HD | SS100 |
| Cylinder Head | HEAD,CYL(MCHG) | SS198 |
| Cylinder Head Gasket | GASKET PKG,CYL HD | SS239 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Cylinder Head Removal




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1. Click here for full size
2. Remove the 10 cylinder head bolts (1) in sequence as shown.
3. 
    1. Loosen the 10â€‰bolts 90â€‰degrees.
    2. Loosen the 10â€‰bolts 180â€‰degrees.
4. Remove the cylinder head and place on a suitable base.
5. Remove the cylinder head gasket.

## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Cylinder Head | HEAD,CYL | X0001 |
| Cylinder Head | HEAD,CYL | X0016 |
| Cylinder Head | HEAD,CYL(MCHG) | X0017 |
| Cylinder Head | HEAD,CYL(CSTG) | X0018 |
| Cylinder Head | HEAD,CYL (W/VLVS) | X0019 |
| Cylinder Head | HEAD,CYL(MCHG) | X0020 |
| Cylinder Head | HEAD KIT,CYL | X0032 |
| Cylinder Head | HEAD,CYL(CSTG) | X0034 |
| Cylinder Head | HEAD,CYL | X0042 |
| Cylinder Head | HEAD,CYL(W/EXH VLV ST) | X0055 |
| Cylinder Head | HEAD,CYL (SERV PARTIAL) | X0063 |
| Cylinder Head | HEAD,CYL (W/VLV & CVR) | X0066 |
| Cylinder Head | HEAD,CYL (PARTIAL MCHG) | X0067 |
| Cylinder Head | HEAD,CYL | SS067 |
| Cylinder Head | HEAD,CYL (CSTG) | SJ303 |
| Cylinder Head | HEAD,CYL (W/ VLV) | SJ304 |
| Cylinder Head | HEAD,CYL | SS083 |
| Cylinder Head | HEAD,CYL(MCHG) | SS198 |

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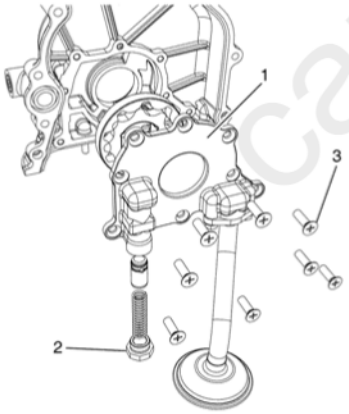
1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Oil Pump Disassemble

Note**:**

There are no serviceable components within the oil pump. Disassemble the pump only to diagnose an oiling concern. A disassembled oil pump must not be reused. A disassembled oil pump must be replaced.

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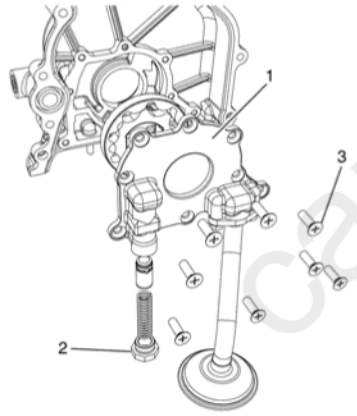


1. Click here for full size
2. Remove the oil pump housing retaining boltsâ€‰(3).
3. Remove the oil pump housingâ€‰(1).
4. Remove the inner oil pump drive gear.
5. Remove the outer oil pump driven gear.
6. Remove the plugâ€‰(2), holding the plug, for the oil relief valve components.
7. Remove the plug, spring and plunger from the oil pump housingâ€‰(1).

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Oil Pump Assemble




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1. Click here for full size
2. Install the oil relief components to oil pump housingâ€‰(1).
3. Install the plugâ€‰(2).
4. Note:

   The dimpled surface must be face-up in the pump body.
5. Install the inner oil pump drive gear and the outer oil pump driven gear in the engine front cover in the same orientation as removed.
6. Install the oil pump housingâ€‰(1) to the engine front cover.
7. Caution:

   Refer to Fastener Caution.
8. Install the oil pump housing retaining boltsâ€‰(3) and tighten to 10â€‰N-m (89â€‰lbâ€‰in).

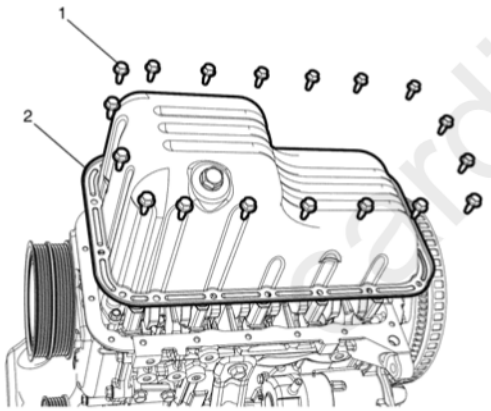
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Oil Pump | PUMP,OIL | X0036 |
| Oil Pump | PUMP,OIL(W/SCRN) | X0100 |
| Oil Pump | PUMP KIT,OIL | X0112 |
| Oil Pump | PUMP,OIL (W/SCRN) | SJ007 |
| Oil Pump | PUMP KIT,OIL | SJ042 |
| Oil Pump | PUMP,OIL | SS149 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Oil Pan Removal (LKY)




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1. Click here for full size
2. Remove the 18â€‰oil pan boltsâ€‰(1) from the engine block.
3. Use a suitable tool to remove the oil panâ€‰(2) evenly all the way around.
4. Discard the oil pan.

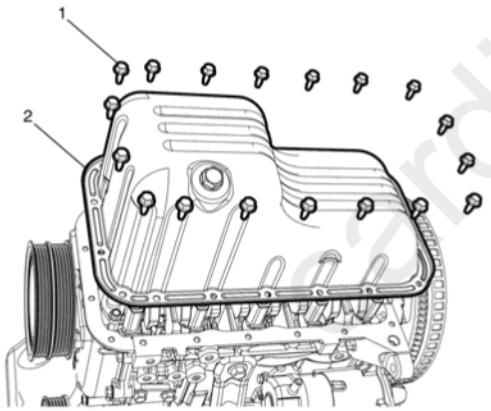
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Oil Pan | PAN KIT,OIL(W/GSKT) | SF277 |
| Oil Pan | PAN,OIL | X0001 |
| Oil Pan | PAN,OIL | X0016 |
| Oil Pan | PAN,OIL(CSTG) | X0044 |
| Oil Pan | PAN,OIL | X0073 |
| Oil Pan | PAN KIT,OIL | X0081 |
| Oil Pan | PAN,OIL (W/ENG OIL LVL SEN) | X0082 |
| Engine Oil Pan | PAN,ENG OIL | SS245 |
| Engine Oil Pan | PAN KIT,ENG OIL | SS246 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Oil Pan Removal




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1. Click here for full size
2. Remove the 18â€‰oil pan boltsâ€‰(1) from the engine block.
3. Use a suitable tool to remove the oil panâ€‰(2) evenly all the way around.

## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Oil Pan | PAN KIT,OIL(W/GSKT) | SF277 |
| Oil Pan | PAN,OIL | X0001 |
| Oil Pan | PAN,OIL | X0016 |
| Oil Pan | PAN,OIL(CSTG) | X0044 |
| Oil Pan | PAN,OIL | X0073 |
| Oil Pan | PAN KIT,OIL | X0081 |
| Oil Pan | PAN,OIL (W/ENG OIL LVL SEN) | X0082 |
| Engine Oil Pan | PAN,ENG OIL | SS245 |
| Engine Oil Pan | PAN KIT,ENG OIL | SS246 |

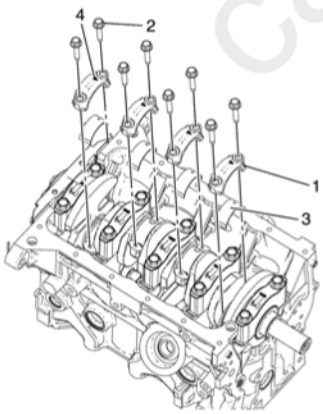
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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Piston, Connecting Rod, and Bearing Removal (LKY)

1. Install the crankshaft balancer bolt.
2. Set the pistonsâ€‰1 and 4 to BDC in direction of engine rotation.
3. Click here for full size
4. Mark the connecting rod with the connecting rod bearing coverâ€‰(1).

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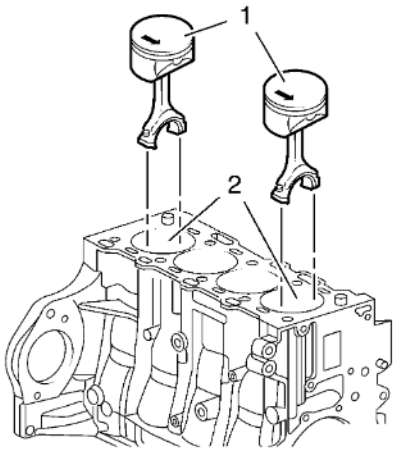


5. Click here for full size

6. Remove the 4â€‰connecting rod bearing caps boltsâ€‰(2) of cylinderâ€‰1 and 4.

7. Remove the connecting rod bearing capsâ€‰(1) and the connecting rod bearingâ€‰(3).

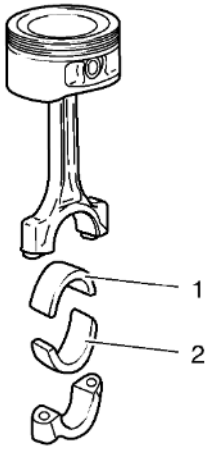
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8. Click here for full size
9. Push the pistonsâ€‰1 and 4 (1) out of the cylinder boreâ€‰(2).
10. Remove the pistonsâ€‰1 and 4 (1).
11. Turn crankshaft on crankshaft balancer through 180 degrees in direction of rotation of engine.

12. Repeat for the pistonâ€‰2 and 3.




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13. Click here for full size
14. Note:

    Observe correct fitting position, observe alignment.

15. Remove the connecting rod bearingâ€‰(1, 2).

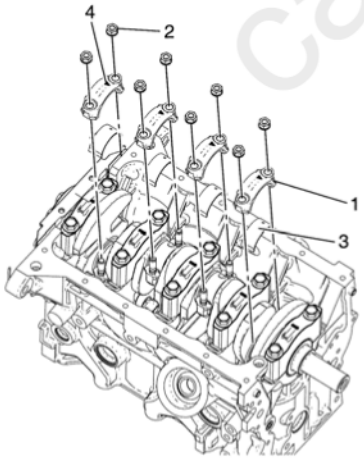
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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Piston, Connecting Rod, and Bearing Removal

1. Install the crankshaft balancer bolt.
2. Set the pistons 1 and 4 to BDC in direction of engine rotation.
3. Click here for full size
4. Mark the connecting rod with the connecting rod bearing cover (1).

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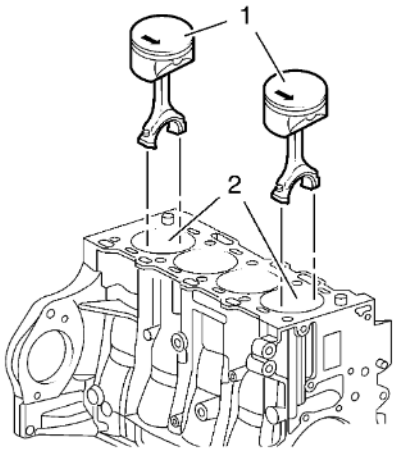


5. Click here for full size

6. Remove the 4 connecting rod bearing caps nuts (2) of cylinder 1 and 4.

7. Remove the connecting rod bearing caps (1) and the connecting rod bearing (3).

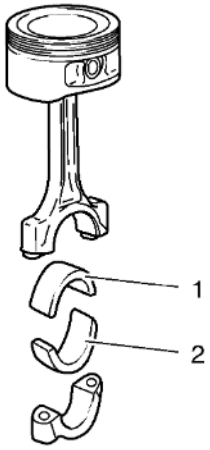
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8. Click here for full size
9. Push the pistons 1 and 4 (1) out of the cylinder bore (2).
10. Remove the pistons 1 and 4 (1).
11. Turn crankshaft on crankshaft balancer through 180â€‰degrees in direction of rotation of engine.

12. Repeat for the piston 2 and 3.




13. [Click here for full size]
14. Note:

    Observe correct fitting position, observe alignment.

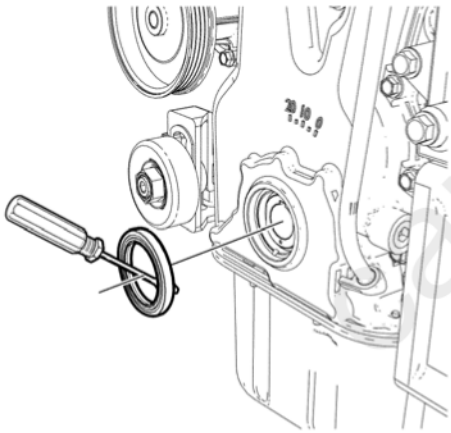
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15. Remove the connecting rod bearing (1, 2).

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Crankshaft Front Oil Seal Removal



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Caution:

Clean the crankshaft sealing surface with a clean, lint-free towel. Inspect lead-in edge of crankshaft for burrs/sharp edges that could damage the rear main oil seal. Remove burrs/sharp edges with crocus cloth before proceeding.

Using the suitable tool, remove the crankshaft front oil seal from the crankshaft.

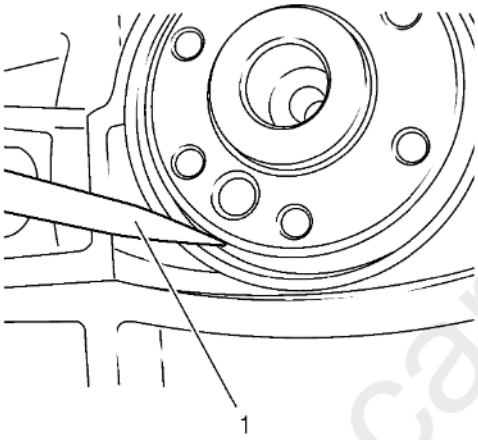
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Crankshaft Front Oil Seal | SEAL,CR/SHF FRT OIL | X0019 |
| Crankshaft Front Oil Seal | SEAL,CR/SHF FRT OIL | X0020 |
| Crankshaft Front Oil Seal | SEAL KIT,CR/SHF FRT OIL | X0076 |
| Crankshaft Front Oil Seal | SEAL,CR/SHF FRT OIL | SJ233 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Crankshaft Rear Oil Seal Removal




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Using a suitable tool (1), remove the crankshaft rear oil seal.

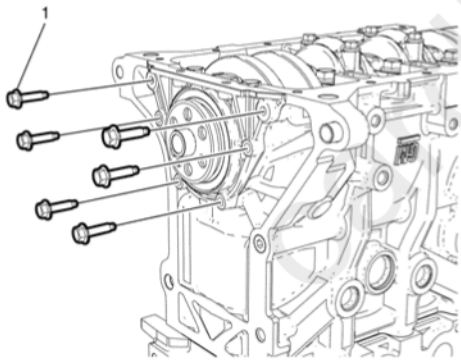
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Crankshaft Rear Oil Seal | SEAL,CR/SHF RR OIL | X0009 |
| Crankshaft Rear Oil Seal | SEAL,CR/SHF RR OIL | X0010 |
| Crankshaft Rear Oil Seal | SEAL KIT,CR/SHF RR OIL | X0033 |
| Crankshaft Rear Oil Seal | SEAL,CR/SHF RR OIL (W/ CR/SHF POSN SEN) | X0075 |
| Crankshaft Rear Oil Seal | SEAL,CR/SHF RR OIL | SS001 |
| Crankshaft Rear Oil Seal | SEAL,CR/SHF RR OIL | SJ234 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

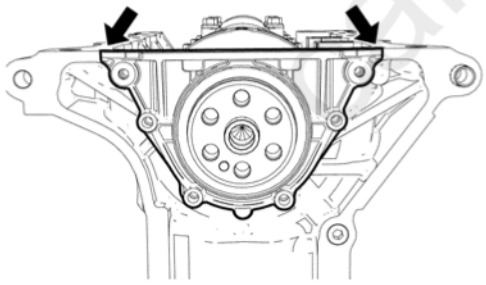
## Crankshaft Rear Oil Seal and Housing Removal (LKY)




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1. Click here for full size

2. Remove the crankshaft rear oil seal housing boltsâ€‰(1).

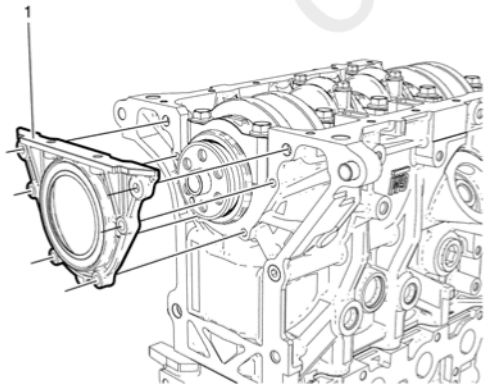


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3.
Click here for full size

4. Use the pry points located at the edge of the crankshaft rear oil seal housing to separate the RTV sealant.

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5. Click here for full size

6. Remove and discard the crankshaft rear oil seal and housingâ€‰(1).

## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Crankshaft Rear Oil Seal | SEAL,CR/SHF RR OIL | X0009 |
| Crankshaft Rear Oil Seal | SEAL,CR/SHF RR OIL | X0010 |
| Crankshaft Rear Oil Seal Housing | HOUSING,CR/SHF RR OIL SEAL | X0014 |
| Crankshaft Rear Oil Seal Housing | HOUSING,CR/SHF RR OIL SEAL | X0024 |
| Crankshaft Rear Oil Seal | SEAL KIT,CR/SHF RR OIL | X0033 |
| Crankshaft Rear Oil Seal Housing | HOUSING,CR/SHF RR OIL SEAL(CSTG) | X0050 |
| Crankshaft Rear Oil Seal Housing | HOUSING,CR/SHF RR OIL SEAL | X0065 |
| Crankshaft Rear Oil Seal | SEAL,CR/SHF RR OIL (W/ CR/SHF POSN SEN) | X0075 |
| Crankshaft Rear Oil Seal | SEAL,CR/SHF RR OIL | SS001 |
| Crankshaft Rear Oil Seal Housing | HOUSING PKG,CR/SHF RR OIL SEAL | SJ054 |
| Crankshaft Rear Oil Seal Housing | HOUSING,CR/SHF RR OIL SEAL | SJ095 |
| Crankshaft Rear Oil Seal | SEAL,CR/SHF RR OIL | SJ234 |

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3. REPAIR INSTRUCTIONS
4.

## Crankshaft and Bearing Removal

Note**:**

Take extreme care to prevent any scratches, nicks or damage to the inner side of the cylinder and bearings.

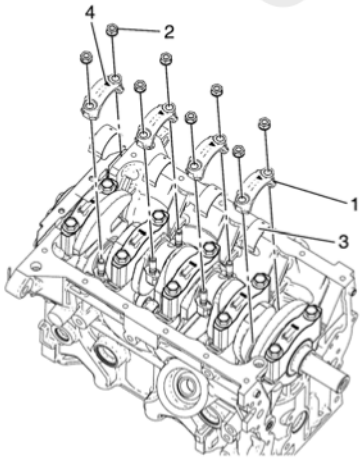
Note**:**

Check and confirm the sequence of the crankshaft caps and bearings.

Other List:graphic

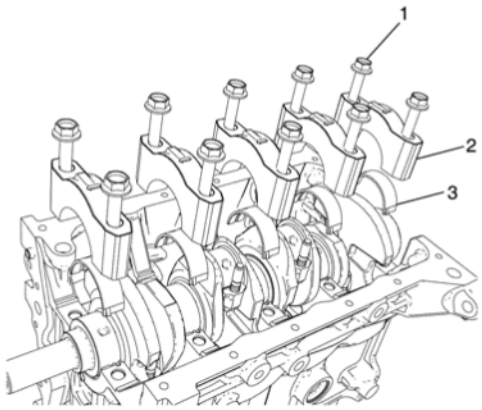
1. Remove the crankshaft rear oil seal with housing.

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2. Click here for full size
3. Remove the nuts (2).
4. Remove the connecting rod bearing caps (1) and bearing (3).

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5. Click here for full size
6. Identify the crankshaft bearing caps.
7. Remove the 10 bolts (1).
8. Remove the crankshaft bearing caps (2).
9. Remove the crankshaft bearing cap bearing (3).
10. Remove the crankshaft.

## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Crankshaft Bearing | BEARING,CR/SHF | X0028 |
| Crankshaft Bearing | BEARING KIT,CR/SHF | X0039 |
| Crankshaft Bearing | BEARING SET,CR/SHF | X0133 |
| Crankshaft | CRANKSHAFT,(W/ CLU PRESS PLT) | 0010A |
| Crankshaft | CRANKSHAFT, | X0001 |
| Crankshaft | CRANKSHAFT, | X0023 |
| Crankshaft | CRANKSHAFT,(CSTG) | X0025 |
| Crankshaft | CRANKSHAFT,(MCHG) | X0026 |
| Crankshaft | CRANKSHAFT,(W/FLYWHL) | X0040 |
| Crankshaft | CRANKSHAFT,(FORG) | X0042 |
| Crankshaft | CRANKSHAFT KIT, | X0049 |
| Crankshaft | CRANKSHAFT, | X0068 |
| Crankshaft | CRANKSHAFT, | SS142 |
| Crankshaft Bearing | BEARING,CR/SHF | SJ018 |
| Crankshaft Bearing | BEARING PKG,CR/SHF | SJ049 |
| Crankshaft | CRANKSHAFT,(SEMI-FINISHED) | SS048 |
| Crankshaft | CRANKSHAFT,(FORG) | SS108 |
| Crankshaft | CRANKSHAFT, | SS139 |
| Crankshaft Bearing | BEARING KIT,CR/SHF | SS167 |

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2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Crankshaft and Bearing Removal (LKY)

Note**:**

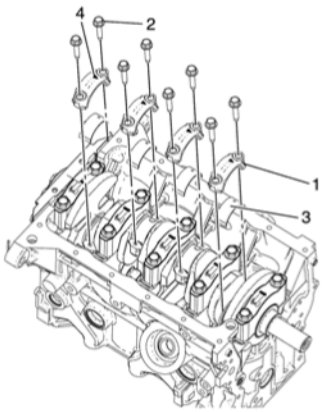
Take extreme care to prevent any scratches, nicks or damage to the inner side of the cylinder and bearings.

Note**:**

Check and confirm the sequence of the crankshaft caps and bearings.

1. Click here for full size
2. Remove the crankshaft rear oil seal with housing.

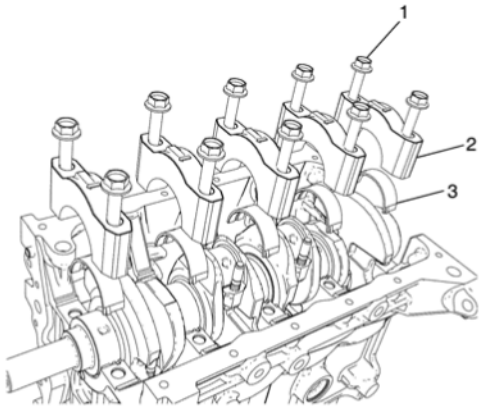
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3.
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4. Remove the connecting rod bearing cap bolts (2).
5. Remove the connecting rod bearing caps (1) and bearing (3).

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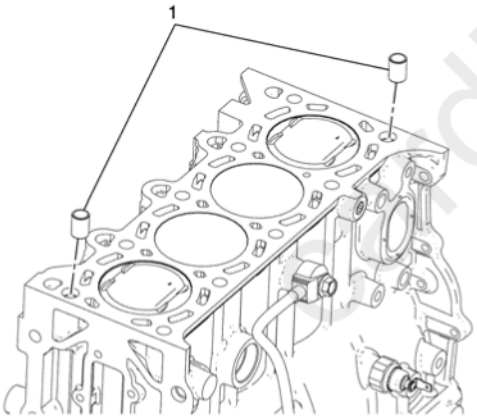


6. Click here for full size
7. Identify the crankshaft bearing caps.
8. Remove the 10 bolts (1).
9. Remove the crankshaft bearing caps (2).
10. Remove the crankshaft bearing cap bearing (3).
11. Remove the crankshaft.

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4.

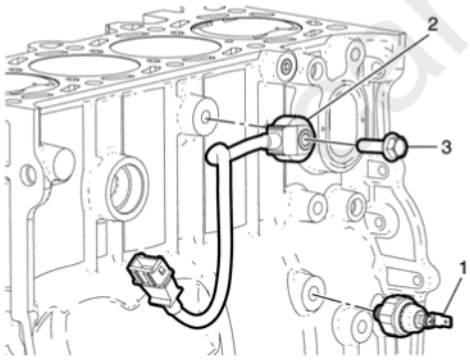
## Engine Block Disassemble




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1.
   Click here for full size

2. Remove the cylinder head locating (1).




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3. Click here for full size

4. Remove the oil pressure switch (1).

5. Remove the knock sensor bolt (3) and the knock sensor (2).

6. Clean the thread.

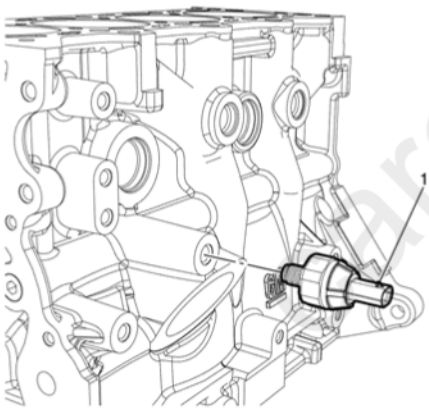
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Engine Block | BLOCK,ENG (W/ PSTNS & CR/SHFT) | 0350A |
| Engine Block | BLOCK,ENG | X0018 |
| Engine Block | BLOCK,ENG | X0026 |
| Engine Block | BLOCK,ENG(W/PSTNS) | X0031 |
| Engine Block | BLOCK,ENG(CSTG) | X0033 |
| Engine Block | BLOCK,ENG(MCHG) | X0036 |
| Engine Block | BLOCK,ENG(CSTG) | X0084 |
| Engine Block | BLOCK,ENG(MCHG) | X0142 |
| Engine Block | BLOCK,ENG (PARTIAL MCHG) | X0174 |
| Engine Block | BLOCK,ENG | SS093 |
| Engine Block | BLOCK,ENG (CSTG) | SJ093 |
| Engine Block | BLOCK,ENG | SS194 |
| Engine Block | BLOCK,ENG(MCHG) | SS274 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
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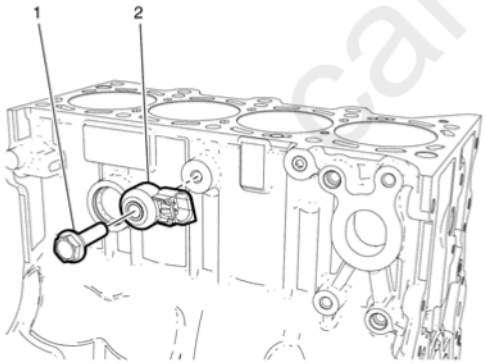
## Engine Block Disassemble (LKY)




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1.
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2. Remove the oil pressure switch (1).

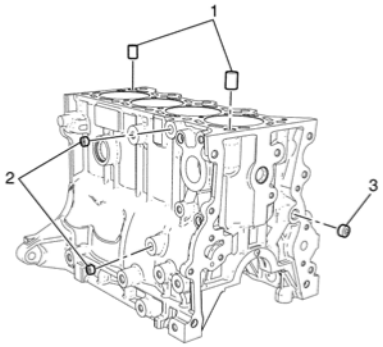



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3.
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4. Remove the knock sensor bolt (1) and the knock sensor (2).
5. Clean the thread.

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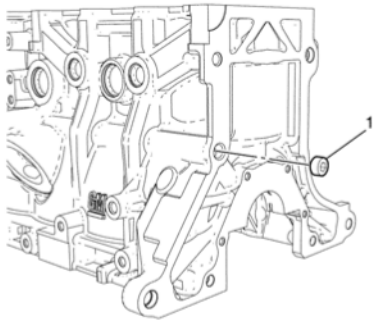


6.
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7. Remove the cylinder head locatingâ€‰(1).

8. Remove the engine block oil gallery plugsâ€‰(2, 3).

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9. Click here for full size

10. Remove the engine block oil gallery plugâ€‰(1).

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Piston, Connecting Rod, and Bearing Cleaning and Inspection

### Cleaning Procedure

Note:

DO NOT use a wire brush any part of the piston.

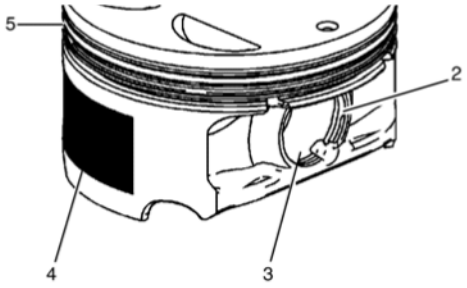
1. Clean the piston skirts and the pins with a cleaning solvent.
2. Clean the piston ring grooves with a groove cleaner. Ensure that the oil ring holes and slots are clean.
3. Warning:

   Refer to Safety Glasses and Compressed Air Warning.
4. Dry the piston with compressed air.

### Piston Inspection Procedure

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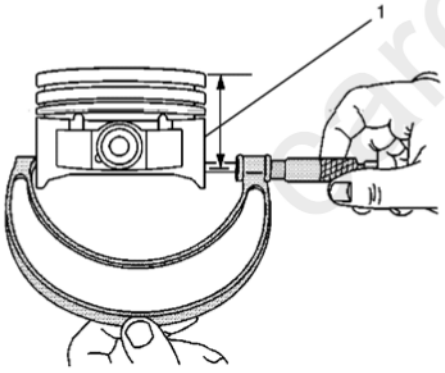





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1. Click here for full size
2. Inspect the pistons for the following conditions:
3. 
    - Ring grooves for nicks, burrs that may cause binding (5)
    - Warped or worn ring lands (5)
    - Piston pin retainer grooves for burrs (2)
    - Eroded areas at the top of the piston (1)
    - Scuffed or damaged skirt coating (4)
    - Worn piston pin bores or worn piston pins (3)
4. Replace pistons that show any signs of damage or wear above acceptable tolerances.

### Piston Measurement Procedure




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1. Click here for full size

2. Measure piston width using the following procedure:

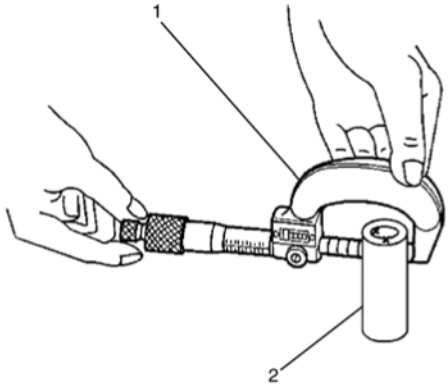
3.

    1. Using an outside micrometer, measure the width of the piston at 30â€‰mm (1.181â€‰in) below the crown, top (1), at the thrust surfaces of the piston, perpendicular to the piston pin centerline.

    2. Compare your results with the engine mechanical specifications. Refer to Engine Mechanical Specifications

    3. If the clearance obtained through measurement is greater than the provided specifications and the cylinder bores are within specification, replace the piston.

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4. Click here for full size

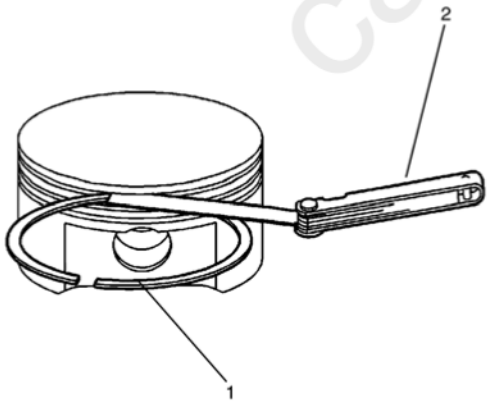
5. Measure the piston pin bore to piston pin (2) clearances using the following procedure:

6.

    1. Piston pin bores and pins must be free of varnish or scuffing.

2. Use an outside micrometer (1) to measure the piston pin in the piston contact areas.

## Piston Ring Measurement Procedure




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1. Click here for full size

2. Measure the piston ring (1) side clearance using the following procedure:

3.

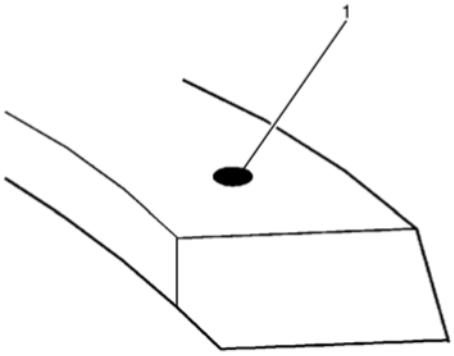
    1. Roll the piston ring (1) entirely around the piston ring groove. If any binding is caused by the ring groove, dress the groove with a fine file. If any binding is caused by a distorted piston ring (1), replace the piston ring (1).

    2. With the piston ring (1) on the piston, use feeler gauges (2) to check clearance at multiple locations.

    3. Compare the measurements with piston ring side clearance listed in the .

    4. If the clearance is greater than specifications, replace the piston ring (1).

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4. Click here for full size

5. There is a locating marking 'R' (1) on the compression rings near the end for identification. Install the compression rings with the dimple

facing up.

6. If the new ring does not reduce the clearance to the correct specification, install a new piston.
7. If the new piston does not meet clearance specifications, the cylinder block may need to be oversized to 0.25â€‰mm (0.010â€‰in). There is only one size of oversized pistons and rings available for service.

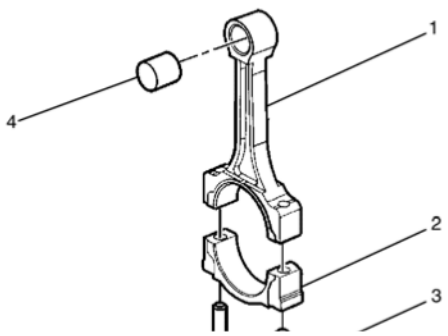
## Connecting Rod Cleaning Procedure

1. Clean the connecting rods in solvent.
2. Warning**:**

   Refer to Safety Glasses and Compressed Air Warning.
3. Dry the connecting rod using compressed air.

## Connecting Rod Visual Inspection Procedure

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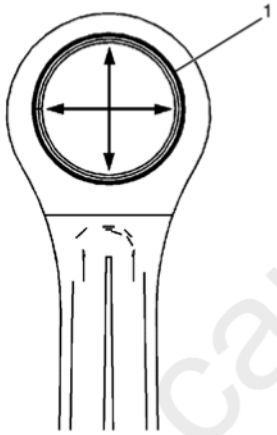


1. Click here for full size
2. Inspect the piston pin bushing (4) for scoring or damage.
3. Inspect the connecting rod beam (1) for twisting or bending.
4. Inspect the rod cap (2) for any nicks or damage caused by possible interference.
5. Inspect for scratches or abrasion on the rod bearing seating surface.
6. Note**:**

   DO NOT scrape the rod or rod cap.
7. If the connecting rod bores contain minor scratches or abrasions, clean the bores in a circular direction with a light emery paper.
8. Inspect the connecting rod bolts (3) for damage or stretching.

## Connecting Rod Measurement Procedure

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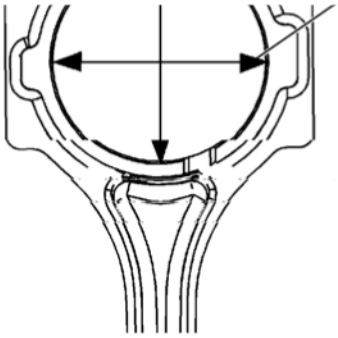



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1. Click here for full size
2. Using an inside micrometer, measure the connecting rod piston pin bore (1).
3. Subtract the piston pin diameter from the piston pin bore (1).
4. Compare the clearance measurements with the.
5. If the clearance is above acceptable tolerances, replace the piston pin. If a new pin does not resolve the clearance condition, replace the connecting rod.

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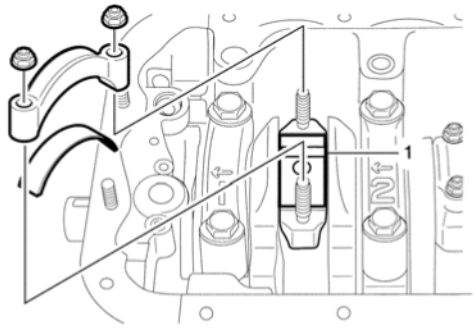




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6. Click here for full size
7. Using an inside micrometer, measure the connecting rod crankshaft bearing bore (1).
8. Compare the bore measurements with the.
9. Replace the connecting rod if the connecting rod crankshaft bearing bore (1) is out of specifications. DO NOT recondition the connecting rod.

## Connecting Rod Bearing Clearance Measurement Procedure â€“ Using Plastic Gaging



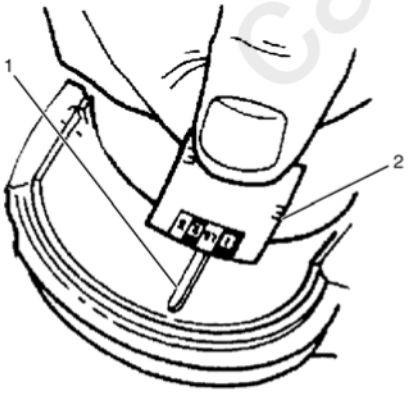

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1. Click here for full size
2. Cut the plastic gauge (1) the same length as the bearing width and put it on the crankshaft bearing. It should be parallel with the crankshaft.
3. Caution:

   Refer to Fastener Caution.

4. Install the connecting rod bearing and caps, tighten to 33â€‰N-m (24â€‰lbâ€‰ft).
5. Remove the connecting rod cap and bearing.

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6. Click here for full size

7. Determine the connecting rod bearing clearance by comparing the width of the flattened plastic gauging material (1) at its widest point with the graduation on the gauging material container (2).

8. Compare your measurements with the engine mechanical specifications. Refer to Engine Mechanical Specifications. If the new bearings DO NOT provide the proper crankshaft to connecting rod bearing clearance, inspect the following: Engine Mechanical Specifications.

9. Clean the plastic gaging material from the connecting rod bearing journals using a soft lint-free cloth.

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Piston, Connecting Rod, and Bearing Cleaning and Inspection (LKY)

### Cleaning Procedure

Note:

DO NOT use a wire brush any part of the piston.

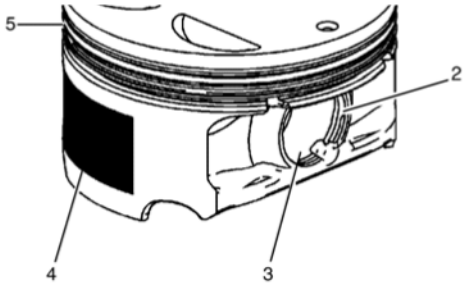
1. Clean the piston skirts and the pins with a cleaning solvent.
2. Clean the piston ring grooves with a groove cleaner. Ensure that the oil ring holes and slots are clean.
3. Warning:

   Refer to Safety Glasses and Compressed Air Warning.
4. Dry the piston with compressed air.

### Piston Inspection Procedure

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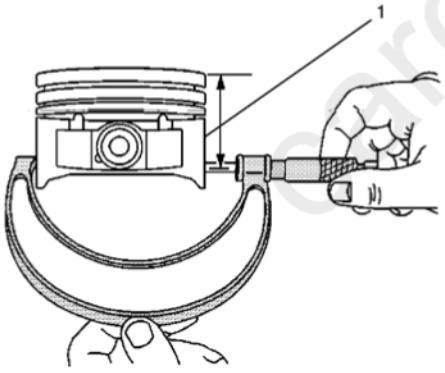





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1. Click here for full size
2. Inspect the pistons for the following conditions:
3. 
    - Ring grooves for nicks, burrs that may cause binding (5)
    - Warped or worn ring lands (5)
    - Piston pin retainer grooves for burrs (2)
    - Eroded areas at the top of the piston (1)
    - Scuffed or damaged skirt coating (4)
    - Worn piston pin bores or worn piston pins (3)
4. Replace pistons that show any signs of damage or wear above acceptable tolerances.

### Piston Measurement Procedure



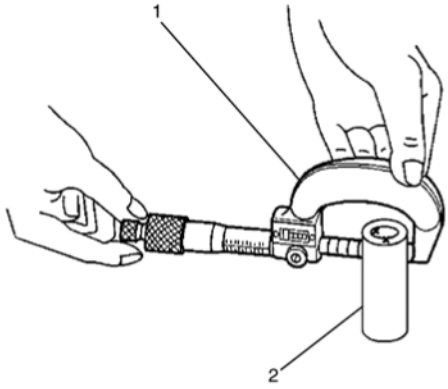

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1. Click here for full size

2. Measure piston width using the following procedure:

3.
    1. Using an outside micrometer, measure the width of the piston at 8.5â€‰mm (0.335â€‰in) from the skirt bottom endâ€‰(1), at the thrust surfaces of the piston, perpendicular to the piston pin centerline.
    2. Compare your results with the engine mechanical specifications. Refer to Engine Mechanical Specifications.
    3. If the clearance obtained through measurement is greater than the provided specifications and the cylinder bores are within specification, replace the piston.

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4. Click here for full size

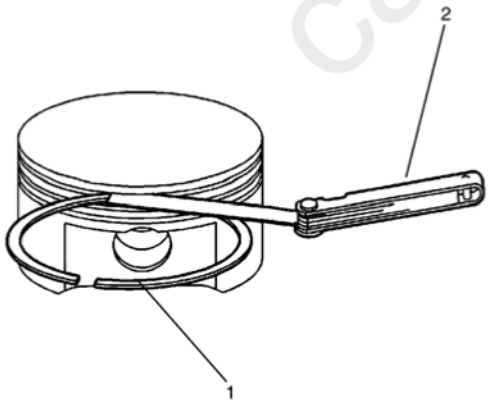
5. Measure the piston pin bore to piston pinâ€‰(2) clearances using the following procedure:

6.

    1. Piston pin bores and pins must be free of varnish or scuffing.

2. Use an outside micrometerâ€‰(1) to measure the piston pin in the piston contact areas.

## Piston Ring Measurement Procedure




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1. Click here for full size

2. Measure the piston ringâ€‰(1) side clearance using the following procedure:

3.

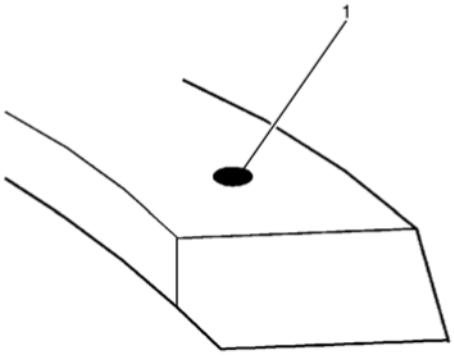
    1. Roll the piston ringâ€‰(1) entirely around the piston ring groove. If any binding is caused by the ring groove, dress the groove with a fine file. If any binding is caused by a distorted piston ringâ€‰(1), replace the piston ringâ€‰(1).

    2. With the piston ringâ€‰(1) on the piston, use feeler gaugesâ€‰(2) to check clearance at multiple locations.

    3. Compare the measurements with piston ring side clearance listed in the .

    4. If the clearance is greater than specifications, replace the piston ringâ€‰(1).

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4. Click here for full size

5. There is a locating markingâ€‰'R'â€‰(1) on the compression rings near the end for identification. Install the compression rings with the

dimple facing up.

6. If the new ring does not reduce the clearance to the correct specification, install a new piston.
7. If the new piston does not meet clearance specifications, the cylinder block may need to be oversized to 0.25â€‰mm (0.010â€‰in). There is only one size of oversized pistons and rings available for service.

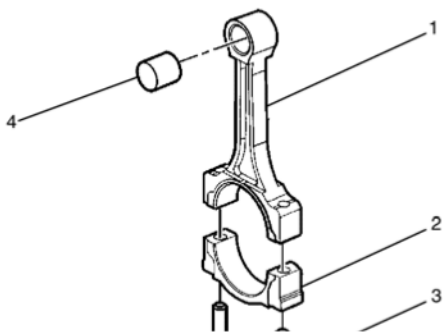
## Connecting Rod Cleaning Procedure

1. Clean the connecting rods in solvent.
2. Warning**:**

   Refer to Safety Glasses and Compressed Air Warning.
3. Dry the connecting rod using compressed air.

## Connecting Rod Visual Inspection Procedure

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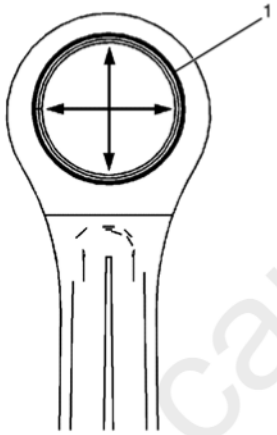


1. Click here for full size
2. Inspect the piston pin bushingâ€‰(4) for scoring or damage.
3. Inspect the connecting rod beamâ€‰(1) for twisting or bending.
4. Inspect the rod capâ€‰(2) for any nicks or damage caused by possible interference.
5. Inspect for scratches or abrasion on the rod bearing seating surface.
6. Note**:**

   DO NOT scrape the rod or rod cap.
7. If the connecting rod bores contain minor scratches or abrasions, clean the bores in a circular direction with a light emery paper.
8. Inspect the connecting rod boltsâ€‰(3) for damage or stretching.

## Connecting Rod Measurement Procedure

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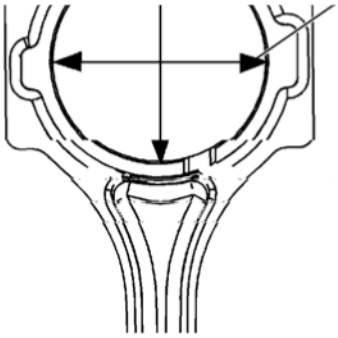



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1. Click here for full size
2. Using an inside micrometer, measure the connecting rod piston pin boreâ€‰(1).
3. Subtract the piston pin diameter from the piston pin boreâ€‰(1).
4. Compare the clearance measurements with the.
5. If the clearance is above acceptable tolerances, replace the piston pin. If a new pin does not resolve the clearance condition, replace the connecting rod.

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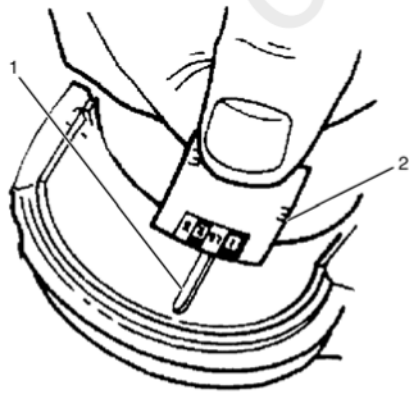
6. Click here for full size
7. Using an inside micrometer, measure the connecting rod crankshaft bearing boreâ€‰(1).
8. Compare the bore measurements with the.
9. Replace the connecting rod if the connecting rod crankshaft bearing boreâ€‰(1) is out of specifications. DO NOT recondition the connecting rod.

## Connecting Rod Bearing Clearance Measurement Procedure â€“ Using Plastic Gaging

1. Click here for full size
2. Cut the plastic gaugeâ€‰(1) the same length as the bearing width and put it on the crankshaft bearing. It should be parallel with the crankshaft.
3. Caution:

Refer to Fastener Caution.

4. Install the connecting rod bearing and caps, tighten to 20â€‰N-m + 90Â° (15â€‰lbâ€‰ft + 90Â°).
5. Remove the connecting rod cap and bearing.




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6. Click here for full size

7. Determine the connecting rod bearing clearance by comparing the width of the flattened plastic gauging materialâ€‰(1) at its widest point with the graduation on the gauging material containerâ€‰(2).

8. Compare your measurements with the engine mechanical specifications. Refer to Engine Mechanical Specifications. If the new bearings DO NOT provide the proper crankshaft to connecting rod bearing clearance, inspect the following: Engine Mechanical Specifications.

9. Clean the plastic gaging material from the connecting rod bearing journals using a soft lint-free cloth.

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

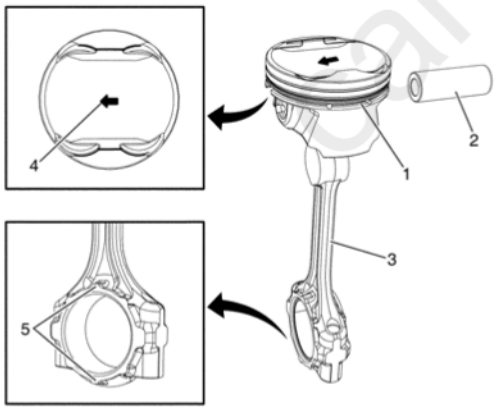
## Piston and Connecting Rod Assemble

### Special Tools

*EN-49941* Remover/Installer Piston Retainer Ring

For equivalent regional tools, refer to Special Tools.

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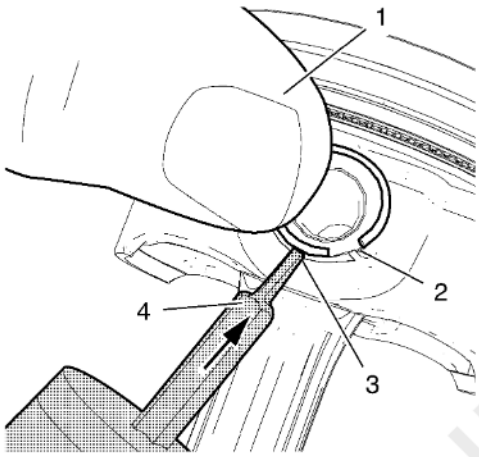
1. Click here for full size
2. Note:

   When installing the piston and connecting rod assembly, the arrow (4) on the top of the piston and the front mark (5) on the connecting rod should face the engine timing side.

3. Coat the piston pin with oil.

4. Install the connecting rod (3) and the piston pin (2) to the piston (1).

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5. [Click here for full size]
6. Warning**:**

   Use extreme care when removing snap rings. Always wear adequate eye protection in order to avoid personal injury.

7. Warning**:**

Use care when removing or installing the piston retainer ring. Ensure the EN-49941 remover/installer is installed properly onto the retainer ring and that hands and fingers are kept clear from the front of the tool. Otherwise, bodily injury may occur.

8. Note**:**

   Use a NEW retainer.

9. Note**:**

   Notchâ€‰(2) on right side.

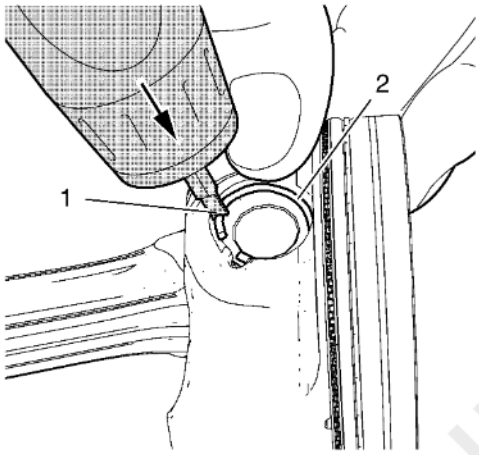
10. Push the piston pin retainer down with the thumb in the shown positionâ€‰(1) and hold.

11. Note**:**

    The *EN-49941* installer should be applied in a perpendicular position to the piston pin retainer.

12. Apply the *EN-49941* installer (4) to the piston pin retainer in the position shownâ€‰(3) and push in direction of the arrow while pushing down with the thumb.

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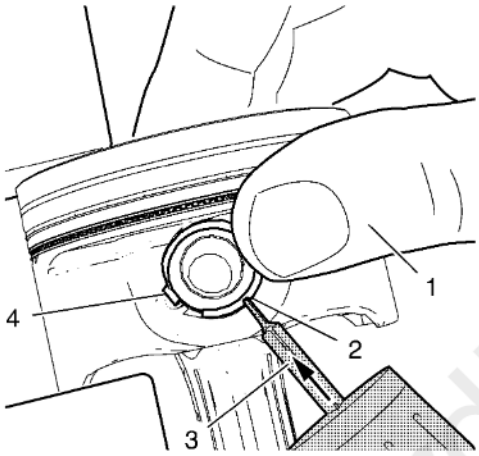

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13. [Click here for full size]
14. Note**:**

    Push the piston pin retainer down in the position shownâ€‰(2).

15. Move the *EN-49941* installerâ€‰(1) carefully to the position shown while pushing in direction of the arrow until the piston pin retainer engages in the piston pin retainer groove.

16. Push down the piston ring retainer to get a proper seat in the groove.




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17. Click here for full size
18. Note**:**

    Notchâ€‰(4) on left side. The *EN-49941* installer should be used with left hand.

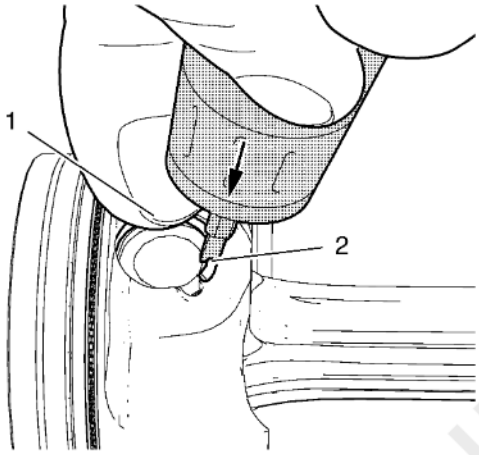
19. Push the piston pin retainer down with the thumb in the position shownâ€‰(1) and hold.

20. Note**:**

    The *EN-49941* installer should be applied in a perpendicular position to the piston pin retainer.

21. Apply the *EN-49941* installer (3) to the piston pin retainer in the position shownâ€‰(2) and push in direction of the arrow while pushing down with the thumb.

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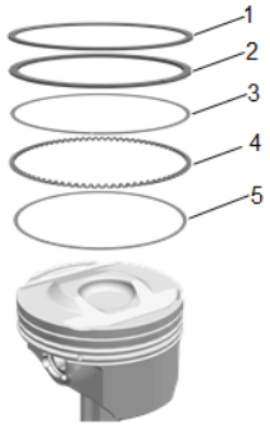



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22. Click here for full size
23. Note**:**

    Push the piston pin retainer down in the position shownâ€‰(1).

24. Move the *EN-49941* installer â€‰(2) carefully to the position shown while pushing in direction of the arrow until the piston pin retainer engages in the piston pin retainer groove.

25. Push down the piston ring retainer to get a proper seat in the groove.
26. Remove the piston and connecting rod assembly from the bench vise.
27. Ensure that the piston moves freely.
28. 

[Click here for full size]
29. Caution**:**

    Use a piston ring expander to install the piston rings. The rings may be damaged if expanded more than necessary.
30. Install the following components of the oil control ring assembly:
31.
    1. The piston oil ring railâ€‰(5)
    2. The piston oil ring rail spacerâ€‰(4)
    3. The second piston oil ring railâ€‰(3)
32. Install the piston lower compression ringâ€‰(2). Place the manufacturer's mark facing up.
33. Install the piston upper compression ringâ€‰(1).

## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Engine Piston | PISTON,ENG | X0001 |
| Connecting Rod | ROD,CONN | X0002 |
| Piston | PISTON,(W/CONN ROD) | X0013 |
| Piston | PISTON, | X0018 |
| Connecting Rod | ROD,CONN | X0019 |
| Connecting Rod | ROD,CONN(CSTG W/CAP) | X0021 |
| Piston | PISTON,(CSTG) | X0022 |
| Piston | PISTON,(MCHG) | X0024 |
| Piston | PISTON,(W/PIN) | X0027 |
| Piston | PISTON, | X0029 |
| Piston | PISTON KIT,(W/CYL SLEV) | X0032 |
| Connecting Rod | ROD,CONN (MCHG W/ CAP) | X0034 |
| Connecting Rod | ROD,CONN(FORG W/CAP) | X0035 |
| Engine Piston | PISTON KIT,ENG | X0038 |
| Connecting Rod | ROD KIT,CONN | X0041 |
| Piston | PISTON,(W/CMPRN RING) | X0047 |
| Connecting Rod | ROD,CONN(BLANK W/CAP) | X0048 |
| Connecting Rod | ROD,CONN(FORG) | X0050 |
| Piston | PISTON,(W/PIN & CMPRN & OIL RING) | X0051 |
| Piston | PISTON,(MCHG) | X0052 |

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| Part Name | Catalog Name | Part Code |
|---|---|---|
| Connecting Rod | ROD,CONN (FORG W/BUSH) | X0056 |
| Connecting Rod | ROD,CONN (MCHG) | X0058 |
| Piston | PISTON,(W/PIN) | SS045 |
| Connecting Rod | ROD PKG,CONN | SS115 |
| Piston | PISTON PKG,(W/PINS) | SS133 |
| Connecting Rod | ROD,CONN | SS159 |
| Connecting Rod | ROD PKG,CONN | SJ011 |
| Piston | PISTON KIT,(W/PIN) | SJ013 |
| Connecting Rod | ROD,CONN | SJ014 |
| Connecting Rod | ROD,CONN(SEMI-FINISHED) | SS047 |
| Piston | PISTON,(W/PIN) | SS170 |
| Piston | PISTON,(W/PIN & RINGS) | SS172 |

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

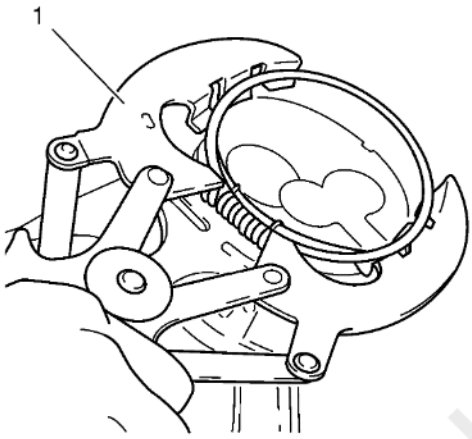
## Piston and Connecting Rod Disassemble

### Special Tools

*EN-49941* Remover/Installer Piston Retainer Ring

For equivalent regional tools, refer to Special Tools.

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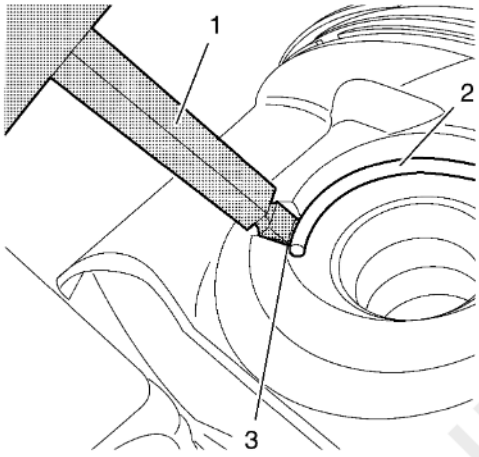



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1. [Click here for full size]
2. Warning**:**

   Handle the piston carefully. Worn piston rings are sharp and may cause bodily injury.

3. Remove the piston rings. Use piston ring pliersâ€‰(1). The piston rings must not be reused.

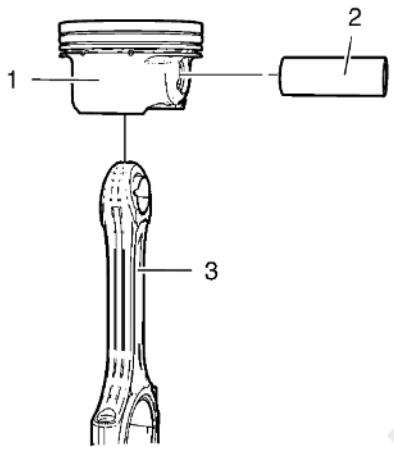



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4. Click here for full size
5. Warning**:**

   Use extreme care when removing snap rings. Always wear adequate eye protection in order to avoid personal injury.

6. Apply the *EN-49941* removerâ€‰(1) in the notchâ€‰(3) to the piston pin retainerâ€‰(2) and remove it.




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7. Click here for full size

8. Remove the piston pinâ€‰(2) and the connecting rodâ€‰(3) from the pistonâ€‰(1).

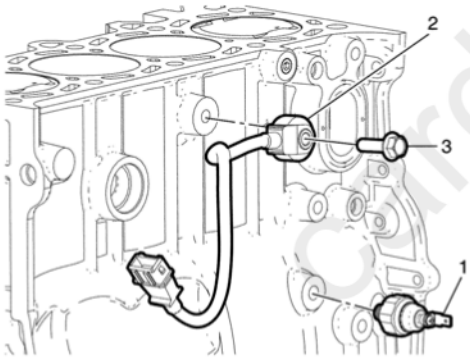
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Engine Piston | PISTON,ENG | X0001 |
| Connecting Rod | ROD,CONN | X0002 |
| Piston | PISTON,(W/CONN ROD) | X0013 |
| Piston | PISTON, | X0018 |
| Connecting Rod | ROD,CONN | X0019 |
| Connecting Rod | ROD,CONN(CSTG W/CAP) | X0021 |
| Piston | PISTON,(CSTG) | X0022 |
| Piston | PISTON,(MCHG) | X0024 |
| Piston | PISTON,(W/PIN) | X0027 |
| Piston | PISTON, | X0029 |
| Piston | PISTON KIT,(W/CYL SLEV) | X0032 |
| Connecting Rod | ROD,CONN (MCHG W/ CAP) | X0034 |
| Connecting Rod | ROD,CONN(FORG W/CAP) | X0035 |
| Engine Piston | PISTON KIT,ENG | X0038 |
| Connecting Rod | ROD KIT,CONN | X0041 |
| Piston | PISTON,(W/CMPRN RING) | X0047 |
| Connecting Rod | ROD,CONN(BLANK W/CAP) | X0048 |
| Connecting Rod | ROD,CONN(FORG) | X0050 |
| Piston | PISTON,(W/PIN & CMPRN & OIL RING) | X0051 |
| Piston | PISTON,(MCHG) | X0052 |
| Connecting Rod | ROD,CONN (FORG W/BUSH) | X0056 |
| Connecting Rod | ROD,CONN (MCHG) | X0058 |
| Piston | PISTON,(W/PIN) | SS045 |
| Connecting Rod | ROD PKG,CONN | SS115 |
| Piston | PISTON PKG,(W/PINS) | SS133 |
| Connecting Rod | ROD,CONN | SS159 |
| Connecting Rod | ROD PKG,CONN | SJ011 |
| Piston | PISTON KIT,(W/PIN) | SJ013 |
| Connecting Rod | ROD,CONN | SJ014 |
| Connecting Rod | ROD,CONN(SEMI-FINISHED) | SS047 |
| Piston | PISTON,(W/PIN) | SS170 |
| Piston | PISTON,(W/PIN & RINGS) | SS172 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Engine Block Assemble

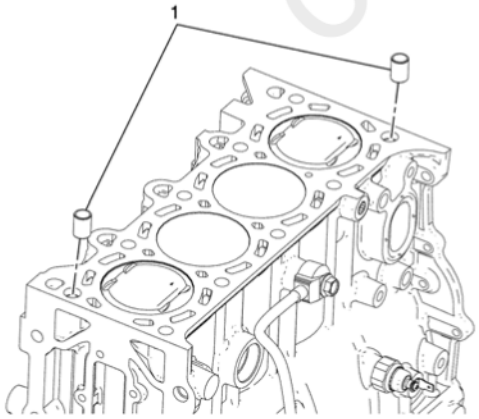



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1. Click here for full size
2. Caution:

   Refer to Fastener Caution.

3. Install the knock sensor (2) and the knock sensor bolt (3) and tighten to 22â€‰N-m (15â€‰lbâ€‰ft).
4. Install the oil pressure switch (1) and tighten to 18â€‰N-m (13â€‰lbâ€‰ft).




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5.
Click here for full size

6. Install the cylinder head locating (1).

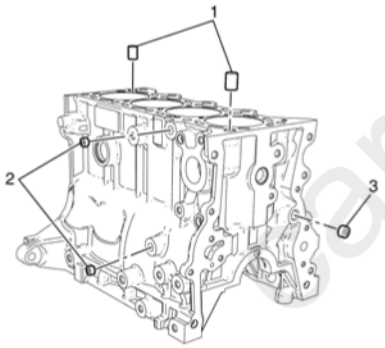
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Engine Block | BLOCK,ENG (W/ PSTNS & CR/SHFT) | 0350A |
| Engine Block | BLOCK,ENG | X0018 |
| Engine Block | BLOCK,ENG | X0026 |
| Engine Block | BLOCK,ENG(W/PSTNS) | X0031 |
| Engine Block | BLOCK,ENG(CSTG) | X0033 |
| Engine Block | BLOCK,ENG(MCHG) | X0036 |
| Engine Block | BLOCK,ENG(CSTG) | X0084 |
| Engine Block | BLOCK,ENG(MCHG) | X0142 |
| Engine Block | BLOCK,ENG (PARTIAL MCHG) | X0174 |
| Engine Block | BLOCK,ENG | SS093 |
| Engine Block | BLOCK,ENG (CSTG) | SJ093 |
| Engine Block | BLOCK,ENG | SS194 |
| Engine Block | BLOCK,ENG(MCHG) | SS274 |

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Engine Block Assemble (LKY)




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1. Click here for full size
2. Note:

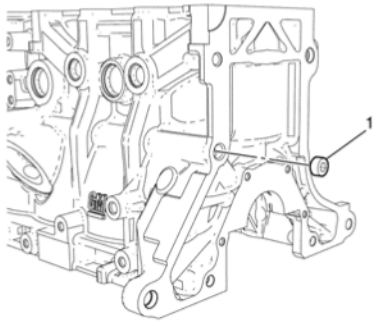
   Use a new engine block oil gallery plug.

3. Install the cylinder head locating (1).
4. Clean the thread of engine block and apply sealant to all plugs prior to installation. Refer to Adhesives, Fluids, Lubricants, and Sealers.
5. Caution:

   Refer to Fastener Caution.

6. Install the new engine block oil gallery plugs (2, 3) and tighten to 12.5â€‰N-m (9â€‰lbâ€‰ft).

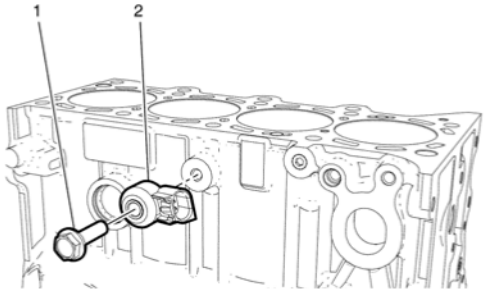
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7. Click here for full size
8. Note:

   Use a new engine block oil gallery plug.

9. Install the new engine block oil gallery plug (1) and tighten to 12.5â€‰N-m (9â€‰lbâ€‰ft).



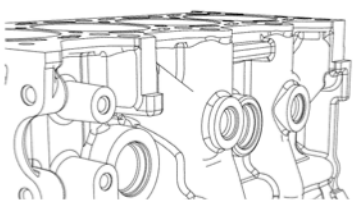

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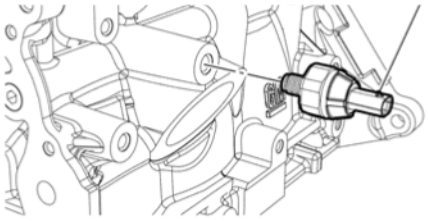


10.
Click here for full size

11. Install the knock sensor (2) and the knock sensor bolt (1) and tighten to 25â€‰N-m (18â€‰lbâ€‰ft).

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12. Click here for full size

13. Install the oil pressure switch (1) and tighten to 35â€‰N-m (26â€‰lbâ€‰ft).

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Service Prior to Assembly

The importance of cleanliness during assembly cannot be overstated. Dirt or debris will cause engine damage. An automobile engine is a combination of many machined, honed, polished and lapped surfaces with minor tolerances. When any internal engine parts are serviced, care and cleanliness are important. A liberal coating of engine oil should be applied to friction areas during assembly in order to protect and lubricate the surfaces on initial operation. Throughout this section, it should be understood that proper cleaning and protection of machined surfaces and friction areas are part of the repair procedure. This is considered standard shop practice even if not specifically stated.

Use the proper tools to measure the components when checking for excessive wear. Components not within the manufacturer's specification must be repaired or replaced.

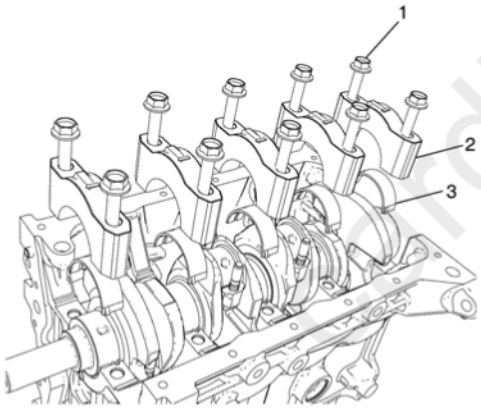
Lubricate all moving parts with engine oil or a specified assembly lubricant. This will provide lubrication for initial start up.

When the components are reinstalled into an engine, return the components to their original location, position, and direction.

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Crankshaft and Bearing Installation (LKY)




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1. Click here for full size
2. Note:

   Inspect the installation position.

3. Install the crankshaft.
4. Note:

   Inspect the installation position.

5. Install the crankshaft bearing (3).
6. Note:

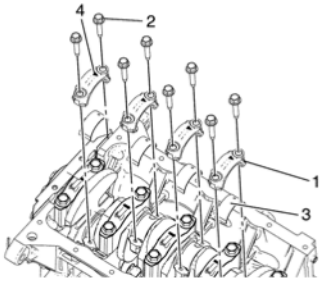
   Inspect the installation position.

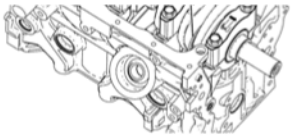
7. Install the crankshaft bearing cap (2).
8. Caution:

   Refer to Fastener Caution.

9. Install the crankshaft bearing cap bolts (1) and tighten to 30â€‰N-m + 30Â° (22â€‰lbâ€‰ft + 30Â°).

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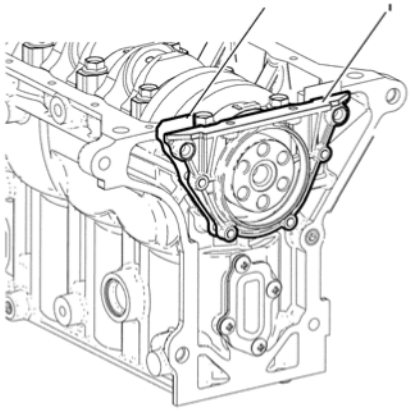


10. Click here for full size
11. Note**:**

    Inspect the installation position.

12. Install the connecting rod bearing (3) and connecting rod bearing caps (1) and tighten the 8 connecting rod bearing cap bolts to 20â€‰N-m + 90Â° (15â€‰lbâ€‰ft + 90Â°).

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13. Click here for full size
14. Install the crankshaft rear oil seal housing (1) with the new gasket (2) and tighten to 10â€‰N-m (89â€‰lbâ€‰in).

## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Crankshaft Bearing | BEARING,CR/SHF | X0028 |
| Crankshaft Bearing | BEARING KIT,CR/SHF | X0039 |
| Crankshaft Bearing | BEARING SET,CR/SHF | X0133 |
| Crankshaft | CRANKSHAFT,(W/ CLU PRESS PLT) | 0010A |
| Crankshaft | CRANKSHAFT, | X0001 |
| Crankshaft | CRANKSHAFT, | X0023 |
| Crankshaft | CRANKSHAFT,(CSTG) | X0025 |
| Crankshaft | CRANKSHAFT,(MCHG) | X0026 |
| Crankshaft | CRANKSHAFT,(W/FLYWHL) | X0040 |
| Crankshaft | CRANKSHAFT,(FORG) | X0042 |
| Crankshaft | CRANKSHAFT KIT, | X0049 |
| Crankshaft | CRANKSHAFT, | X0068 |
| Crankshaft | CRANKSHAFT, | SS142 |
| Crankshaft Bearing | BEARING,CR/SHF | SJ018 |
| Crankshaft Bearing | BEARING PKG,CR/SHF | SJ049 |
| Crankshaft | CRANKSHAFT,(SEMI-FINISHED) | SS048 |

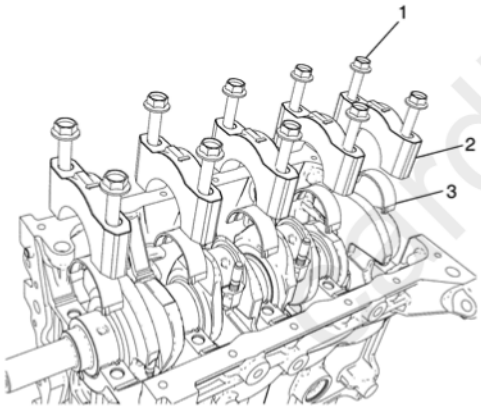
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| Part Name | Catalog Name | Part Code |
|---|---|---|
| Crankshaft | CRANKSHAFT,(FORG) | SS108 |
| Crankshaft | CRANKSHAFT, | SS139 |
| Crankshaft Bearing | BEARING KIT,CR/SHF | SS167 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Crankshaft and Bearing Installation




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1. Click here for full size
2. Note:

   Inspect the installation position.

3. Install the crankshaft.
4. Note:

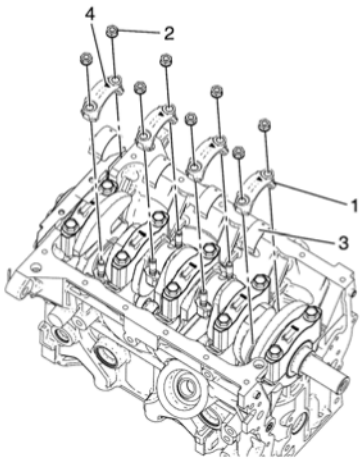
   Inspect the installation position.

5. Install the crankshaft bearing (3).
6. Note:

   Inspect the installation position.

7. Install the crankshaft bearing cap (2).

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8. [Click here for full size]
9. Caution**:**

   Refer to Fastener Caution.

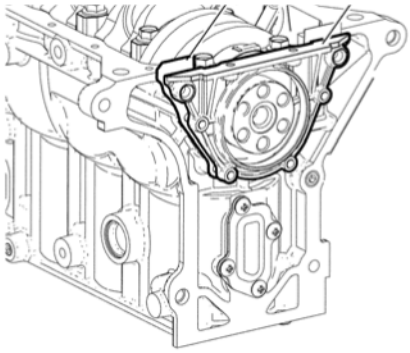
10. Note**:**

    Inspect the installation position.

11. Install the connecting rod bearing (3) and connecting rod bearing caps (1) and tighten the 10 connecting rod bearing cap nuts to 33â€‰N-m (24â€‰lbâ€‰ft).

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12. Click here for full size

13. Install the crankshaft rear oil seal housing (1) with the new gasket (2) and tighten to 10â€‰N-m (89â€‰lbâ€‰in).

## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Crankshaft Bearing | BEARING,CR/SHF | X0028 |
| Crankshaft Bearing | BEARING KIT,CR/SHF | X0039 |
| Crankshaft Bearing | BEARING SET,CR/SHF | X0133 |
| Crankshaft | CRANKSHAFT,(W/ CLU PRESS PLT) | 0010A |
| Crankshaft | CRANKSHAFT, | X0001 |
| Crankshaft | CRANKSHAFT, | X0023 |
| Crankshaft | CRANKSHAFT,(CSTG) | X0025 |
| Crankshaft | CRANKSHAFT,(MCHG) | X0026 |
| Crankshaft | CRANKSHAFT,(W/FLYWHL) | X0040 |
| Crankshaft | CRANKSHAFT,(FORG) | X0042 |
| Crankshaft | CRANKSHAFT KIT, | X0049 |
| Crankshaft | CRANKSHAFT, | X0068 |
| Crankshaft | CRANKSHAFT, | SS142 |
| Crankshaft Bearing | BEARING,CR/SHF | SJ018 |
| Crankshaft Bearing | BEARING PKG,CR/SHF | SJ049 |
| Crankshaft | CRANKSHAFT,(SEMI-FINISHED) | SS048 |

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| Part Name | Catalog Name | Part Code |
|---|---|---|
| Crankshaft | CRANKSHAFT,(FORG) | SS108 |
| Crankshaft | CRANKSHAFT, | SS139 |
| Crankshaft Bearing | BEARING KIT,CR/SHF | SS167 |

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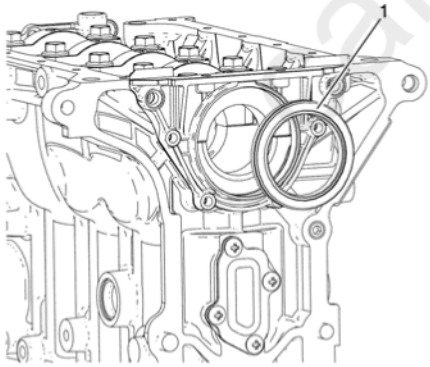
1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Crankshaft Rear Oil Seal Installation

Special Tools

*EN-50171* Crankshaft Rear Oil Seal Installer

For equivalent regional tools, refer to Special Tools.

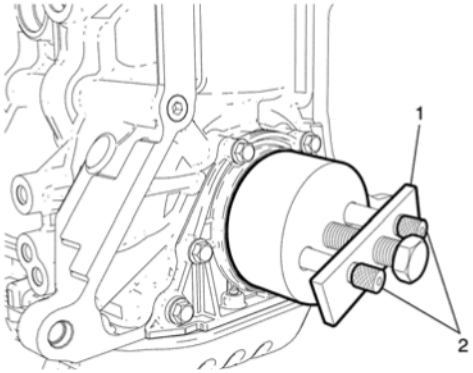



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1. Click here for full size
2. Position the NEW crankshaft rear oil seal (1).
3. 
    1. Position the crankshaft rear oil seal in such a way that the crankshaft rear oil seal housing is over the corresponding cut-out on the cylinder block.
    2. Note**:**

       Do not press in the seal ring all the way.
    3. Slide the crankshaft rear oil seal over the crankshaft. Push, until the crankshaft rear oil seal is flush and sits evenly in the cylinder block.

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4. Click here for full size
5. Install the *EN-50171* crankshaft rear oil seal installer (1) to the crankshaft.
6. Tighten the *EN-50171* crankshaft rear oil seal installer to crankshaft retaining bolt (2).
7. Using the *EN-50171* crankshaft rear oil seal installer, install the crankshaft rear oil seal.
8. Remove the *EN-50171* crankshaft rear oil seal installer (1).

## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Crankshaft Rear Oil Seal | SEAL,CR/SHF RR OIL | X0009 |
| Crankshaft Rear Oil Seal | SEAL,CR/SHF RR OIL | X0010 |
| Crankshaft Rear Oil Seal | SEAL KIT,CR/SHF RR OIL | X0033 |
| Crankshaft Rear Oil Seal | SEAL,CR/SHF RR OIL (W/ CR/SHF POSN SEN) | X0075 |
| Crankshaft Rear Oil Seal | SEAL,CR/SHF RR OIL | SS001 |
| Crankshaft Rear Oil Seal | SEAL,CR/SHF RR OIL | SJ234 |

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

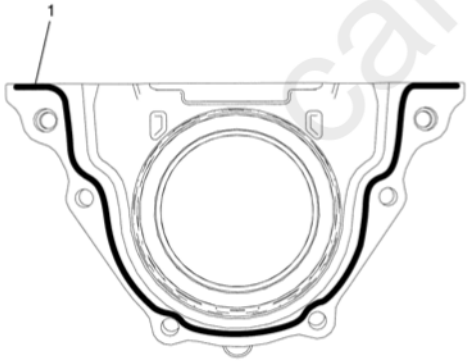
## Crankshaft Rear Oil Seal and Housing Installation (LKY)

Special Tools

*J 45507* Crankshaft Rear Oil Seal Installer

For equivalent regional tools, refer to Special Tools.

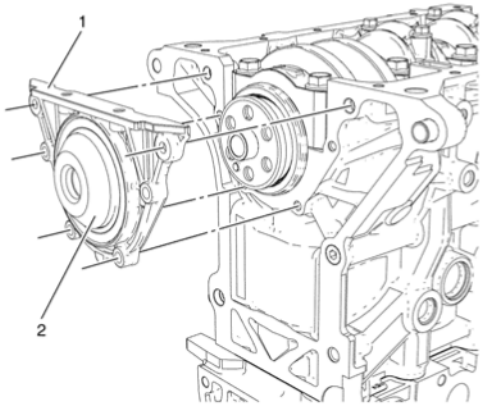
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1.
Click here for full size

2. Place a 3â€‰mm (0.118â€‰in) bead of RTV sealant to the NEW crankshaft rear oil seal housing as shownâ€‰(1). Refer to Adhesives, Fluids, Lubricants, and Sealers for recommended sealant.

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3. Click here for full size
4. Note**:**

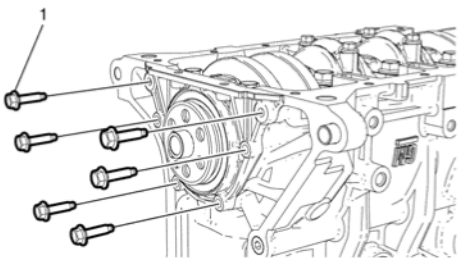
   DO NOT allow any engine oil on the area where the crankshaft rear oil seal housing is to be installed.

5. Install the *J 45507* Crankshaft Rear Oil Seal Installerâ€‰(2) to the crankshaft rear oil seal and housingâ€‰(1).

6. Push the crankshaft rear oil seal and housingâ€‰(1) until the crankshaft rear oil seal and housing is flush and sits evenly in the cylinder block.

7. Remove the *J 45507* Crankshaft Rear Oil Seal Installerâ€‰(2) from the crankshaft.

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8. Click here for full size
9. Caution:

   Refer to Fastener Caution.

10. Install the crankshaft rear oil seal housing boltsâ€‰(1) and tighten to 10â€‰N-m (89â€‰lbâ€‰in).

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Piston, Connecting Rod, and Bearing Installation

Special Tools

- *EN-8037* Piston Ring Compressor
- *EN-51454* Connecting Rod Guides

For equivalent regional tools, refer to Special Tools.

1. Click here for full size
2. Rotate the crankshaft to a position where the connecting rod bolts are in the best situation for install.
3. Note:

   Arrow on piston head points to engine timing side, front mark on the connecting rod points to engine timing side.
4. Install the piston and connecting rod assemblyâ€‰(1).
5. 
   1. Install the *EN-51454* guides into the connecting rod bolt holes. This protects the crankshaft journal during piston and connecting rod installation.
   2. Note:

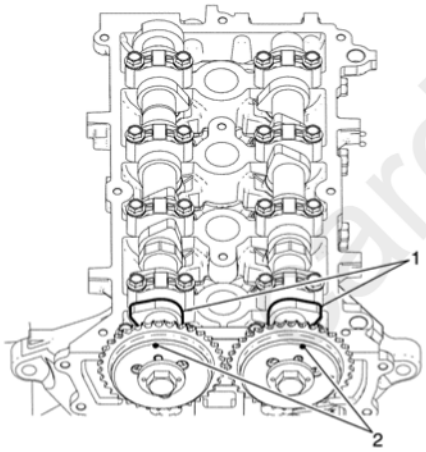
      Ensure to stagger each piston ring end gap equally around the piston.
   3. Install the *EN-8037* compressor on the piston.
   4. Ensure each piston ring end gap is spaced equally around the piston.
   5. Lubricate the piston and the piston rings with engine oil. Do not disturb the piston ring end gap location.
   6. Lubricate the correct engine bore for the piston.
   7. Position the piston so that the arrow mark on the top of the piston points to engine timing side.
   8. Install *EN-8037* compressor, the piston, and the connecting rod to the correct bore
   9. Tap the piston into the bore with a hammer handle. Guide the connecting rod to the connecting rod journal while tapping the piston into place.
   10. Hold the *EN-8037* compressor against the engine block until all the rings have entered the cylinder bore.
   11. Remove the connecting rod guides from the connecting rod bolt holes.
6. Install the connecting rod bearingâ€‰(2).
7. Assemble the caps and connecting rods in the marked position. Install the connecting rod capâ€‰(3).
8. Caution:

   Refer to Fastener Caution.
9. Install the connecting rod bearing boltsâ€‰(4) and tighten to 20â€‰N-m + 90Â° (15â€‰lbâ€‰ft + 90Â°).

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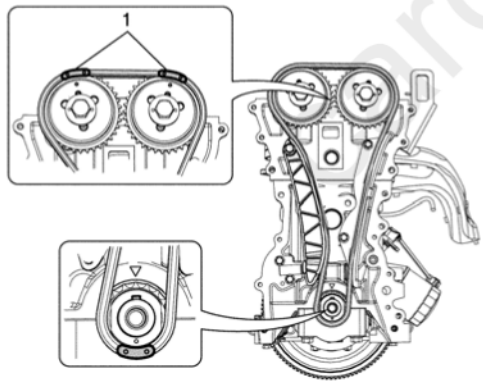
1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Camshaft Timing Chain Installation




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1. Click here for full size
2. Position the camshaft lobes in a neutral position.




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3. Click here for full size

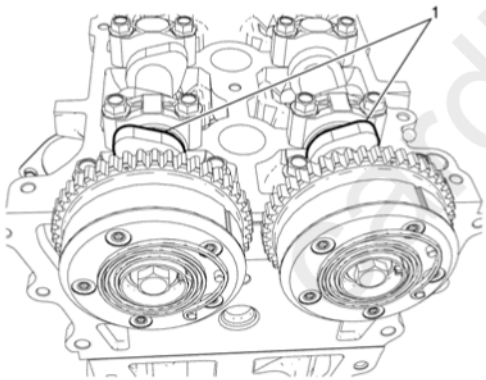
4. Install the timing chain after aligning both the mark (1) on the camshaft sprocket and on the timing chain.

5. Align both the timing mark on the crankshaft sprocket and on the timing chain.

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

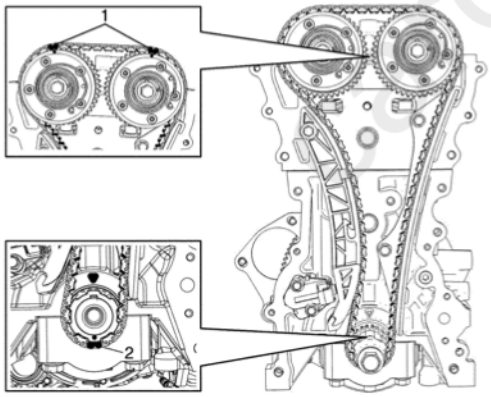
## Camshaft Timing Chain Installation (LKY)




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1.
   Click here for full size

2. Position the camshaft lobes in a neutral position.




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3. Click here for full size

4. Install the timing chain after aligning both the marks (1) on the camshaft sprockets and on the timing chain.

5. Align both the timing marks on the crankshaft sprocket and on the timing chain (2).

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

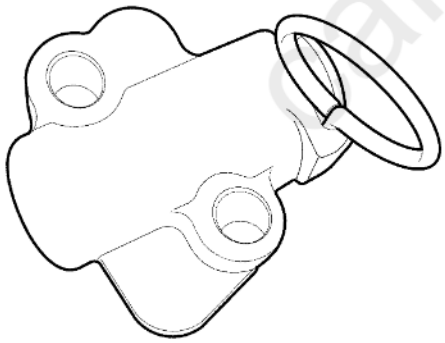
## Timing Chain Tensioner Installation

Special Tools

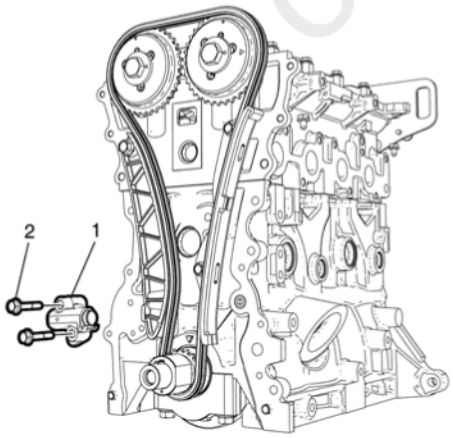
*EN-49073* Timing Chain Tensioner Pin

For equivalent regional tools, refer to Special Tools.

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1. Click here for full size
2. Push the timing chain tensioner plunger and fix the plunger by installing the *EN-49073* timing chain tensioner pin .




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3. Click here for full size

4. Inspect the timing chain tensioner mounting surface on the cylinder head for burrs or any defects that may degrade the sealing of the timing chain tensioner .

5. Install the timing chain tensioner (1).

6. Caution:

   Refer to Fastener Caution.

7. Tighten the timing chain tensioner to cylinder block retaining bolts (1) to 10â€‰N-m (89â€‰lbâ€‰in).

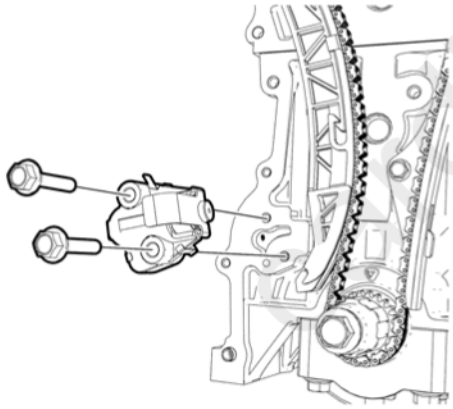
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Timing Chain Tensioner | TENSIONER,TMG CHAIN | X0062 |
| Timing Chain Tensioner | TENSIONER KIT,TMG CHAIN | X0372 |
| Timing Chain Tensioner | TENSIONER,TMG CHAIN | X0924 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Timing Chain Tensioner Installation (LKY)



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1. Click here for full size

2. Inspect the timing chain tensioner mounting surface on the cylinder block for burrs or any defects that may degrade the sealing of the timing chain tensioner.

3. Caution:

   Refer to Fastener Caution.

4. Push the timing chain shoe towards the timing chain, and hold the timing chain shoe. Using the other hand, push the timing chain tensioner with the gasket towards the timing chain shoe. The timing chain tensioner plunger might be pushed into the timing chain tensioner housing. While holding the timing chain tensioner, install the timing chain tensioner bolts, and tighten the timing chain tensioner retaining bolts to 10â€‰N-m (89â€‰lbâ€‰in).

5. Pull out the shipping clip.

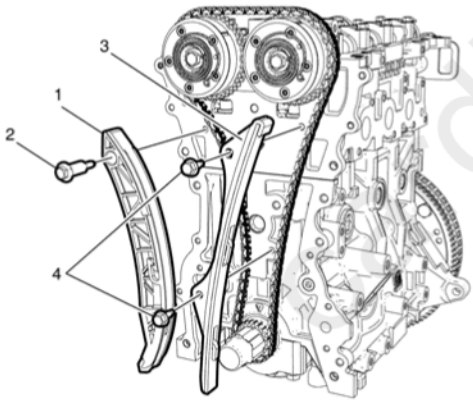
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Timing Chain Tensioner | TENSIONER,TMG CHAIN | X0062 |
| Timing Chain Tensioner | TENSIONER KIT,TMG CHAIN | X0372 |
| Timing Chain Tensioner | TENSIONER,TMG CHAIN | X0924 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Timing Chain Guide Installation (LKY)




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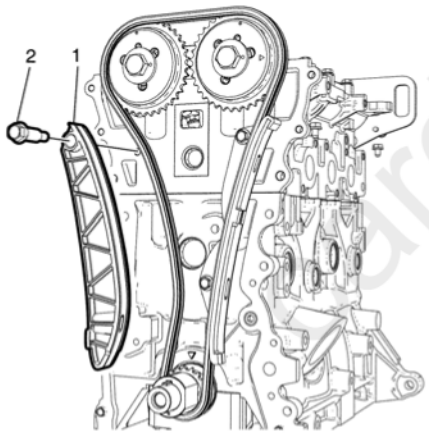
1. Click here for full size
2. Install the timing chain shoeâ€‰(1).
3. Caution:

   Refer to Fastener Caution.
4. Tighten the timing chain shoe retaining boltâ€‰(2) to 10â€‰N-m (89â€‰lbâ€‰in)
5. Install the timing chain guideâ€‰(3).
6. Install the timing chain guide retaining boltsâ€‰(4) to 10â€‰N-m (89â€‰lbâ€‰in).

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
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## Timing Chain Guide Installation




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1. Click here for full size
2. Install the camshaft timing chain shoeâ€‰(1).
3. Caution:

   Refer to Fastener Caution.
4. Tighten the camshaft timing chain shoe to cylinder block retaining boltâ€‰(1) to 10â€‰N-m (89â€‰lbâ€‰in).

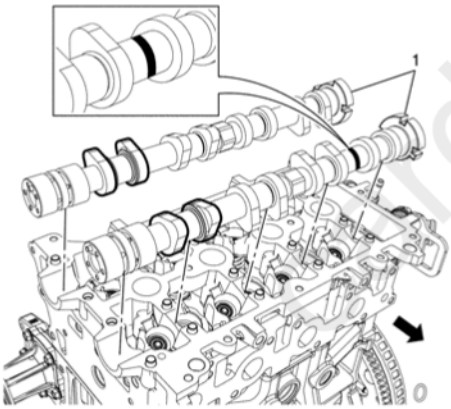
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Timing Chain Guide | GUIDE,TMG CHAIN | X0060 |
| Timing Chain Guide | GUIDE,TMG CHAIN | X0115 |
| Timing Chain Guide | GUIDE KIT,TMG CHAIN | X0537 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Camshaft Installation (LKY)




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1. Click here for full size
2. Note:

   The exhaust camshaft has a groove between the No.â€‰3 journal and No.â€‰4 journal. The intake camshaft has no groove.

3. Install the intake camshaft and the exhaust camshaft (1).
4. Click here for full size
5. Position the camshaft lobes in a neutral position.
6. Note:

   Note the identification marking on the camshaft bearing cover.

7. Install the 4 intake camshaft bearing caps numbers 2â€“5 from the cylinder head.
8. Caution:

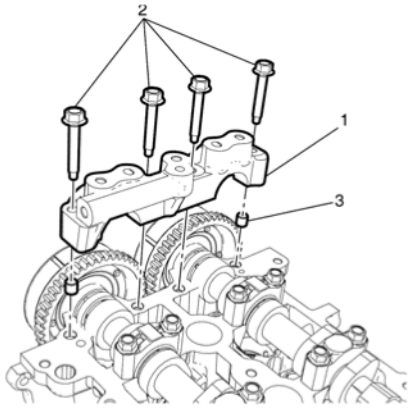
   Refer to Fastener Caution.

9. Tighten the 8 intake camshaft bearing cap bolts working from inside to outside in a spiral to 10â€‰N-m (89â€‰lbâ€‰in).
10. Click here for full size
11. Note:

    Note the identification marking on the camshaft bearing cover.

12. Install the 4 exhaust camshaft bearing caps numbers 6â€“9 from the cylinder head.
13. Tighten the 8 exhaust camshaft bearing cap bolts working from inside to outside in a spiral to 10â€‰N-m (89â€‰lbâ€‰in).

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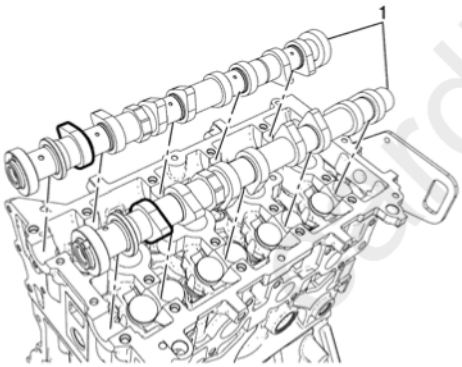

14. [Click here for full size]

15. Clean sealing surfaces of the first camshaft bearing support and the cylinder head with a suitable tool.
16. Clean oil duct from any sealant residue.
17. Install the first camshaft bearing cap (1) and dowel pin (3).
18. Tighten camshaft bearing cap bolts (2) to 10â€‰N-m (89â€‰lbâ€‰in).

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
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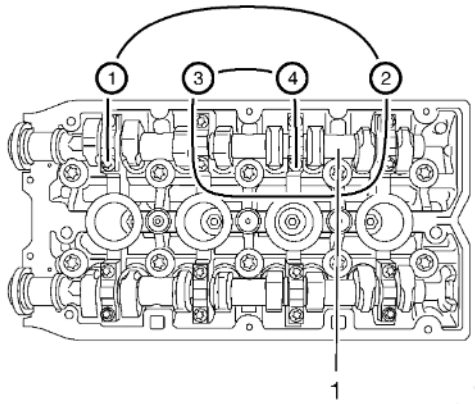
## Camshaft Installation




ordiagn.com

1. Click here for full size
2. Install the camshaft (1).
3. Position the camshaft lobes in a neutral position.

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4. [Click here for full size]
5. Note:

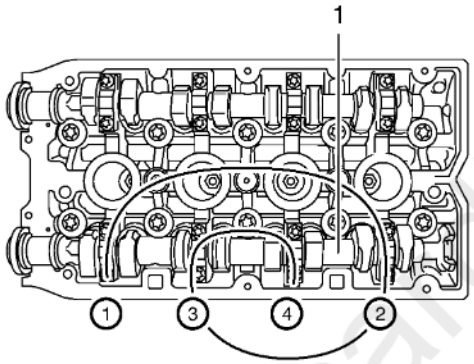
   Note the identification marking on the camshaft bearing cover.

6. Install the 4 intake camshaft bearing caps numbers 2â€“5 from the cylinder head.

7. Caution:

   Refer to Fastener Caution.

8. Tighten the 8 intake camshaft bearing cap bolts working from outside to inside in a spiral in steps of 1/2 up to 1 turn to 10â€‰N-m (89â€‰lbâ€‰in).




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9.

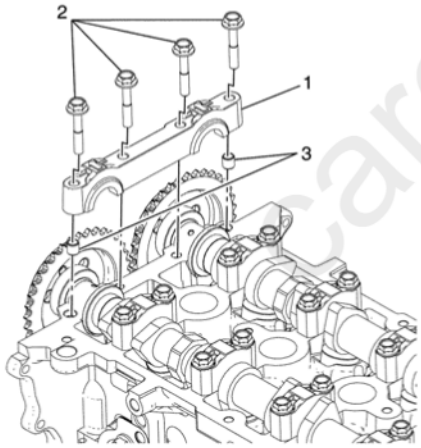
Click here for full size

10. Note:

    Note the identification marking on the camshaft bearing cover.

11. Install the 4 exhaust camshaft bearing caps numbers 6â€“9 from the cylinder head.

12. Tighten the 8 exhaust camshaft bearing cap bolts working from outside to inside in a spiral in steps of 1/2 up to 1 turn to 10â€‰N-m (89â€‰lbâ€‰in).




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13. Click here for full size

14. Clean sealing surfaces of the first camshaft bearing support and the cylinder head with a suitable tool.

15. Clean oil duct from any sealant residue.

16. Install the first (1) and dowel pin (3).

17. Tighten camshaft bearing cap bolts (2) to 10â€‰N-m (89â€‰lbâ€‰in).

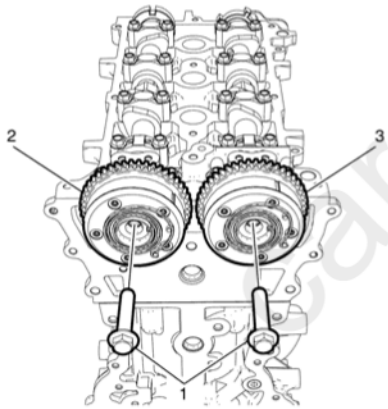
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Engine Camshaft | CAMSHAFT,ENG | X0001 |
| Camshaft | CAMSHAFT, | X0106 |
| Camshaft | CAMSHAFT,(FORG) | X0130 |
| Camshaft | CAMSHAFT,(MCHG) | X0131 |
| Camshaft | CAMSHAFT,(FORG) | X0140 |
| Camshaft | CAMSHAFT,(CSTG) | X0141 |
| Camshaft | CAMSHAFT, | X0153 |
| Camshaft | CAMSHAFT,(PARTIAL MCHG) | X0198 |
| Camshaft | CAMSHAFT,(PARTIAL MCHG) | X0261 |
| Camshaft | CAMSHAFT KIT,(W/VLV LFTR) | X0300 |
| Camshaft | CAMSHAFT,(BAR) | X0371 |
| Camshaft | CAMSHAFT KIT,(W/THR WA) | X0515 |
| Camshaft | CAMSHAFT KIT,(W/VLV LFTR) | SS007 |
| Engine Camshaft | CAMSHAFT,ENG | SS094 |
| Camshaft | CAMSHAFT KIT,(W/VLV LFTR) | SS095 |
| Engine Camshaft | CAMSHAFT PKG,ENG(W/RKR ARM & VLV SPR) | SS244 |
| Engine Camshaft | CAMSHAFT PKG,ENG(W/VLV SPR) | SS286 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
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## Camshaft Sprocket Installation

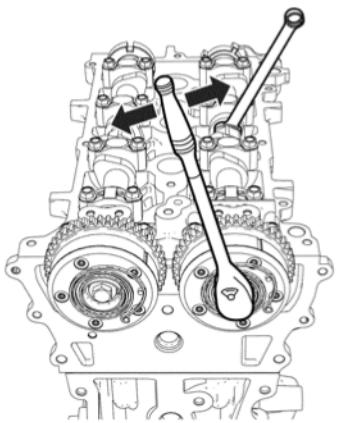



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1. Click here for full size
2. Install the exhaust camshaft sprocketâ€‰(3).
3. Install the intake camshaft sprocketâ€‰(2).
4. Caution:

   Refer to Fastener Caution.
5. Install the intake and exhaust camshaft sprocket boltsâ€‰(1).

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6. Click here for full size
7. Caution:

   Use extreme care when installing the camshaft not to nick, scratch, or damage the camshaft lobes or bearing surfaces.

8. While holding the intake camshaft firmly in place, install the intake camshaft sprocket bolt and tighten to 32â€‰N-m + 50Â° (24â€‰lbâ€‰ft + 50Â°).

9. While holding the exhaust camshaft firmly in place, tighten the exhaust camshaft sprocket bolt to 32â€‰N-m + 50Â° (24â€‰lbâ€‰ft + 50Â°).

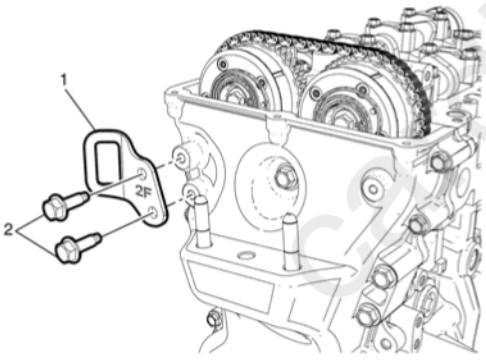
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Camshaft Sprocket | SPROCKET,CM/SHF | X0007 |
| Camshaft Sprocket | SPROCKET,CM/SHF | X0151 |
| Camshaft Sprocket | SPROCKET,CM/SHF(W/ CM/SHF POSN ACTR) | X0389 |
| Camshaft Sprocket | SPROCKET,CM/SHF (BLANK) | X0700 |
| Camshaft Sprocket | SPROCKET KIT,CM/SHF | X0880 |
| Camshaft Sprocket | SPROCKET,CM/SHF | SS209 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Engine Lift Rear Bracket Installation (LKY)




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1. Click here for full size
2. Install the engine lift rear bracketâ€‰(1).
3. Caution:

   Refer to Fastener Caution.
4. Install the engine lift rear bracket boltsâ€‰(2) to the engine lift rear bracketâ€‰(1) and tighten to 25â€‰N-m (18â€‰lbâ€‰ft).

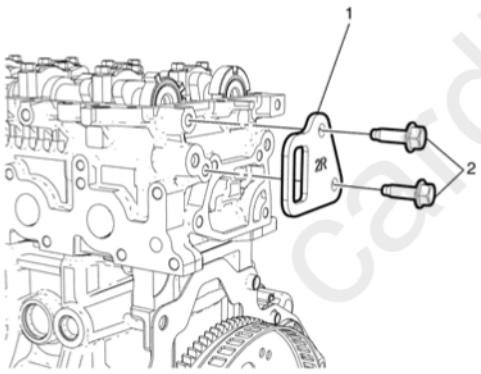
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Engine Lift Rear Bracket | BRACKET,ENG LIFT RR | 0250A |
| Engine Lift Rear Bracket | BRACKET,ENG LIFT RR | 0250B |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
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## Engine Lift Front Bracket Installation (LKY)




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1. Click here for full size
2. Install the engine lift front bracketâ€‰(1).
3. Caution:

   Refer to Fastener Caution.
4. Install the engine lift front bracket boltsâ€‰(2) to the engine lift front bracket and tighten to 25â€‰N-m (18â€‰lbâ€‰ft).

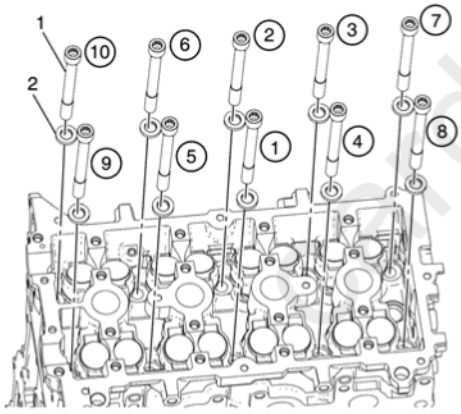
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Engine Lift Front Bracket | BRACKET,ENG LIFT FRT | 0200A |
| Engine Lift Front Bracket | BRACKET,ENG LIFT FRT | 0225A |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
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## Cylinder Head Installation




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1. Click here for full size
2. Note:

   Do not reuse the old cylinder head bolts and the old cylinder head gasket.
3. Clean the sealing surfaces.
4. Inspect for plane surface.
5. 
   - Cylinder block, cylinder head
   - Straight-edge, feeler gage
6. Install the NEW cylinder head gasket.
7. Install the cylinder head.
8. Caution:

   Refer to Fastener Caution.
9. Install the 10 NEW cylinder head bolts in sequence as shown.
10. Tighten to 22â€‰N-m + 102Â° (16â€‰lbâ€‰ft + 102Â°).
11. 
    1. 10â€‰bolts 22â€‰N-m (16â€‰lbâ€‰ft)
    2. Recheck for 10â€‰bolts tightening torque for getting 22â€‰N-m (16â€‰lbâ€‰ft) balance.
    3. 10â€‰bolts 102Â°

## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Cylinder Head | HEAD,CYL | X0001 |
| Cylinder Head | HEAD,CYL | X0016 |
| Cylinder Head | HEAD,CYL(MCHG) | X0017 |
| Cylinder Head | HEAD,CYL(CSTG) | X0018 |
| Cylinder Head | HEAD,CYL (W/VLVS) | X0019 |
| Cylinder Head | HEAD,CYL(MCHG) | X0020 |
| Cylinder Head | HEAD KIT,CYL | X0032 |
| Cylinder Head | HEAD,CYL(CSTG) | X0034 |
| Cylinder Head | HEAD,CYL | X0042 |
| Cylinder Head | HEAD,CYL(W/EXH VLV ST) | X0055 |
| Cylinder Head | HEAD,CYL (SERV PARTIAL) | X0063 |
| Cylinder Head | HEAD,CYL (W/VLV & CVR) | X0066 |
| Cylinder Head | HEAD,CYL (PARTIAL MCHG) | X0067 |
| Cylinder Head | HEAD,CYL | SS067 |
| Cylinder Head | HEAD,CYL (CSTG) | SJ303 |
| Cylinder Head | HEAD,CYL (W/ VLV) | SJ304 |
| Cylinder Head | HEAD,CYL | SS083 |
| Cylinder Head | HEAD,CYL(MCHG) | SS198 |

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
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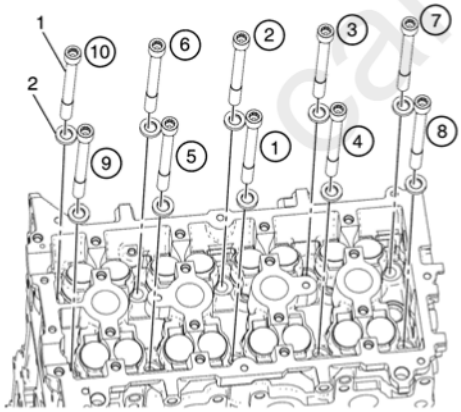
## Cylinder Head and Gasket Installation (LKY)

Special Tools

*GE-42072* Cylinder Head Bolt Remover/Installer

For equivalent regional tools, refer to Special Tools.

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1. Click here for full size
2. Note:

   The cylinder head bolts require a 10 mm 12 point triple square tool for proper servicing. Use *GE-42072* Cylinder Head Bolt Remover/Installer or equivalent when servicing head bolts.

3. Note:

   Do not reuse the old cylinder head bolts and the old cylinder head gasket.

4. Clean the sealing surfaces.
5. Inspect for plane surface.
6. 
   - Cylinder block, cylinder head
   - Straight-edge, feeler gauge
7. Install the NEW cylinder head gasket.
8. Install the cylinder head.
9. Caution:

   Refer to Fastener Caution.

10. Install the 10 NEW cylinder head bolts with the *GE-42072* cylinder head bolt remover/installerâ€‰(1) in sequence as shown.
11. Tighten to 22â€‰N-m + 82Â° (16â€‰lbâ€‰ft + 82Â°)
12. 
    1. 10 bolts 22â€‰N-m (16â€‰lbâ€‰ft)
    2. Recheck for 10 bolts tightening torque for getting 22â€‰N-m balance.
    3. 10 bolts 82Â°

## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Cylinder Head | HEAD,CYL | X0001 |
| Cylinder Head Gasket | GASKET,CYL HD | X0003 |
| Cylinder Head | HEAD,CYL | X0016 |
| Cylinder Head | HEAD,CYL(MCHG) | X0017 |
| Cylinder Head | HEAD,CYL(CSTG) | X0018 |
| Cylinder Head | HEAD,CYL (W/VLVS) | X0019 |
| Cylinder Head | HEAD,CYL(MCHG) | X0020 |
| Cylinder Head Gasket | GASKET KIT,CYL HD | X0022 |
| Cylinder Head | HEAD KIT,CYL | X0032 |
| Cylinder Head | HEAD,CYL(CSTG) | X0034 |

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| Part Name | Catalog Name | Part Code |
|---|---|---|
| Cylinder Head | HEAD,CYL | X0042 |
| Cylinder Head Gasket | GASKET,CYL HD | X0053 |
| Cylinder Head | HEAD,CYL(W/EXH VLV ST) | X0055 |
| Cylinder Head | HEAD,CYL (SERV PARTIAL) | X0063 |
| Cylinder Head | HEAD,CYL (W/VLV & CVR) | X0066 |
| Cylinder Head | HEAD,CYL (PARTIAL MCHG) | X0067 |
| Cylinder Head Gasket | GASKET KIT,CYL HD | SJ023 |
| Cylinder Head Gasket | GASKET,CYL HD | SS033 |
| Cylinder Head | HEAD,CYL | SS067 |
| Cylinder Head Gasket | GASKET KIT,CYL HD | SJ004 |
| Cylinder Head | HEAD,CYL (CSTG) | SJ303 |
| Cylinder Head | HEAD,CYL (W/ VLV) | SJ304 |
| Cylinder Head | HEAD,CYL | SS083 |
| Cylinder Head Gasket | GASKET,CYL HD | SS100 |
| Cylinder Head | HEAD,CYL(MCHG) | SS198 |
| Cylinder Head Gasket | GASKET PKG,CYL HD | SS239 |

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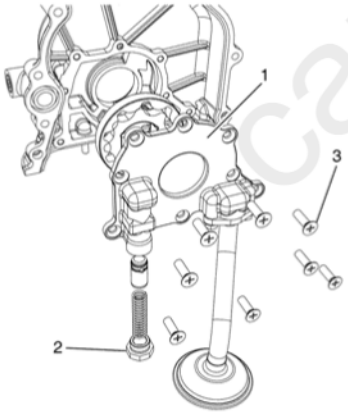
1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
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4.

## Engine Front Cover and Oil Pump Installation (LKY)

Note**:**

There are no serviceable components within the oil pump. Disassemble the pump only to diagnose an oiling concern. A disassembled oil pump must not be reused. A disassembled oil pump must be replaced.

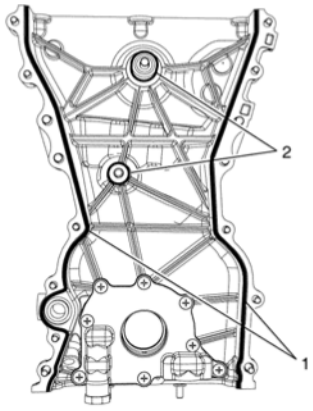
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1. Click here for full size
2. Install the oil relief valve components, and plug to oil pump housingâ€‰(1).
3. Caution:

   Refer to Fastener Caution.
4. Tighten the oil pump housing retaining boltsâ€‰(3) to 10â€‰N-m (89â€‰lbâ€‰in).

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5. 
   Click here for full size
6. Note:

   Do not damage the sealing surfaces.

7. Note:

   Cleaning of the sealing surfaces (3â€“6): Refer to Replacing Engine Gaskets.

8. Remove any old thread sealant, gasket material or sealant using remover such as chisel or scraper.

9. Clean the sealing surfaces of front cover and front cover components with solvent.

10. Note:

    Ensure that the sealing surface is clear of oil, grease and oil sealant material.

11. Clean out debris from the bolt holes.

12. Warning:

    Refer to Safety Glasses and Compressed Air Warning.

13. Dry the front cover and front cover components with compressed air.

14. Note:

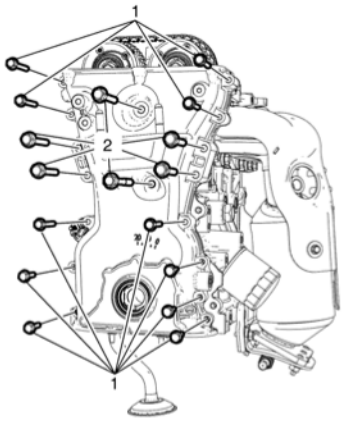
    Do not coat sealant (RTV) on the front cover bolt holes and bolt threads

15. Note:

    Apply sealant (RTV) on lines (1), and 2 hole faces (2). Apply sealant (RTV) to the edges of top and bottom step chamfers.

16. Apply approximately a 4.5â€‰mm (0.177â€‰in) thick bead of oil pan sealantâ€‰(1) to the oil pan.

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17. Click here for full size

18. Install the engine front cover with the included oil pump.

19. Note:

    Check the different screw lengths.

20. Install the engine front cover boltsâ€‰(1) and tighten to 10â€‰N-m (89â€‰lbâ€‰in).

21. Note:

After sealant (RTV) dispensing, the assembly completion time including torque check must be done within 8 minutes.

22. Install the engine front cover boltsâ€‰(2) and tighten to 22â€‰N-m (16â€‰lbâ€‰ft).

## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Oil Pump | PUMP,OIL | X0036 |
| Oil Pump | PUMP,OIL(W/SCRN) | X0100 |
| Oil Pump | PUMP KIT,OIL | X0112 |
| Engine Front Cover | COVER,ENG FRT | X0002 |
| Engine Front Cover | COVER,ENG FRT | X0032 |
| Engine Front Cover | COVER,ENG FRT(CSTG) | X0033 |
| Engine Front Cover | COVER,ENG FRT(W/OIL FLTR ADAP,O/PMP & W/PMP) | X0034 |
| Engine Front Cover | COVER,ENG FRT(WITH O/PMP & W/PMP) | X0035 |
| Engine Front Cover | COVER,ENG FRT(W/CR/SHF FRT OIL SEAL) | X0036 |
| Engine Front Cover | COVER,ENG FRT (W/ W/PMP) | X0037 |
| Engine Front Cover | COVER,ENG FRT(W/OIL PMP) | X0038 |
| Engine Front Cover | COVER,ENG FRT(W/TMG IND) | X0066 |
| Engine Front Cover | COVER,ENG FRT (MCHG) | X0070 |
| Engine Front Cover | COVER KIT,ENG FRT | X0087 |
| Oil Pump | PUMP,OIL (W/SCRN) | SJ007 |
| Oil Pump | PUMP KIT,OIL | SJ042 |
| Engine Front Cover | COVER,ENG FRT(CHROME) | SS024 |
| Oil Pump | PUMP,OIL | SS149 |
| Engine Front Cover | COVER,ENG FRT | SS200 |

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1. **ENGINE/PROPULSION**
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## Engine Front Cover and Oil Pump Installation

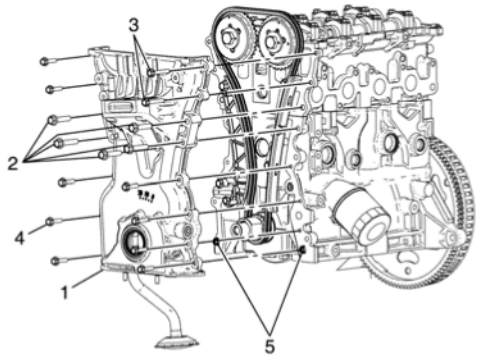
Note**:**

There are no serviceable components within the oil pump. Disassemble the pump only to diagnose an oiling concern. A disassembled oil pump must not be reused. A disassembled oil pump must be replaced.

Other List:graphic

1. Install the oil relief valve components, and clip to oil pump housing (1).
2. Tighten the oil pump hausing to engine front cover retaining bolts (3).

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3. Click here for full size
4. Note:

   Do not damage the sealing surfaces.

5. Install the engine front cover with the included oil pump (1).
6. Caution:

   Refer to Fastener Caution.

7. Note:

   Check the different screw lengths.

8. Tighten the bolts (2, 3, 4) to 20â€‰N-m (15â€‰lbâ€‰ft).

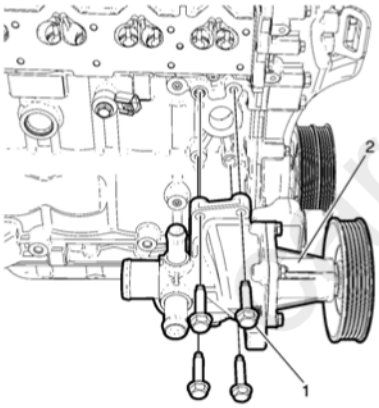
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Oil Pump | PUMP,OIL | X0036 |
| Oil Pump | PUMP,OIL(W/SCRN) | X0100 |
| Oil Pump | PUMP KIT,OIL | X0112 |
| Engine Front Cover | COVER,ENG FRT | X0002 |
| Engine Front Cover | COVER,ENG FRT | X0032 |
| Engine Front Cover | COVER,ENG FRT(CSTG) | X0033 |
| Engine Front Cover | COVER,ENG FRT(W/OIL FLTR ADAP,O/PMP & W/PMP) | X0034 |
| Engine Front Cover | COVER,ENG FRT(WITH O/PMP & W/PMP) | X0035 |
| Engine Front Cover | COVER,ENG FRT(W/CR/SHF FRT OIL SEAL) | X0036 |
| Engine Front Cover | COVER,ENG FRT (W/ W/PMP) | X0037 |
| Engine Front Cover | COVER,ENG FRT(W/OIL PMP) | X0038 |
| Engine Front Cover | COVER,ENG FRT(W/TMG IND) | X0066 |
| Engine Front Cover | COVER,ENG FRT (MCHG) | X0070 |
| Engine Front Cover | COVER KIT,ENG FRT | X0087 |
| Oil Pump | PUMP,OIL (W/SCRN) | SJ007 |
| Oil Pump | PUMP KIT,OIL | SJ042 |
| Engine Front Cover | COVER,ENG FRT(CHROME) | SS024 |
| Oil Pump | PUMP,OIL | SS149 |
| Engine Front Cover | COVER,ENG FRT | SS200 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Water Pump Installation (LKY)




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1. Click here for full size
2. Clean the sealing surfaces and the water pump threads.
3. Caution:

   Refer to Fastener Caution.
4. Caution:

   Refer to Torque-to-Yield Fastener Caution.
5. Install the water pumpâ€‰(2) and the 4 NEW water pump boltsâ€‰(1).
6. Tighten the water pump bolts to 25â€‰N-m (18â€‰lbâ€‰ft).

## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Water Pump | PUMP,WAT | X0022 |
| Water Pump | PUMP KIT,WAT | X0045 |
| Water Pump | PUMP,WAT | X0127 |
| Water Pump | PUMP,WAT (W/ MANIF) | X0133 |
| Water Pump | PUMP,WAT | X0195 |
| Water Pump | PUMP KIT,WAT | SS137 |
| Water Pump | PUMP KIT,WAT | SS141 |
| Water Pump | PUMP KIT,WAT | SJ220 |
| Water Pump | PUMP,WAT | SS132 |

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

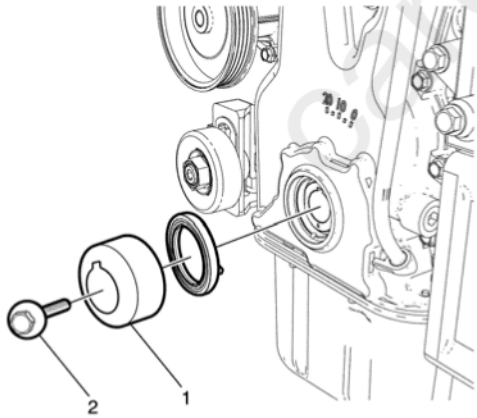
## Crankshaft Front Oil Seal Installation

Special Tools

*EN 50172* Crankshaft Front Oil Seal Installer

For equivalent regional tools, refer to Special Tools.

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1. Click here for full size

2. Position the NEW crankshaft front oil seal.

3.
    1. Position the crankshaft front oil seal in such a way that the engine front cover is over the corresponding cut-out on the cylinder block.
    2. Note**:**

       Do not press in the seal ring all the way.
    3. Slide the crankshaft front oil seal over the crankshaft. Push, until the crankshaft front oil seal is flush and sits evenly in the cylinder block.

4. Install the *EN 50172* crankshaft front oil seal installer (1) to the crankshaft.

5. Tighten the *EN 50172* crankshaft front oil seal installer to crankshaft pulley retaining bolt (2).

6. Using the *EN 50172* crankshaft front oil seal installer, install the crankshaft front oil seal.

7. Remove the *EN 50172* crankshaft front oil seal installer (1).

## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Crankshaft Front Oil Seal | SEAL,CR/SHF FRT OIL | X0019 |
| Crankshaft Front Oil Seal | SEAL,CR/SHF FRT OIL | X0020 |
| Crankshaft Front Oil Seal | SEAL KIT,CR/SHF FRT OIL | X0076 |
| Crankshaft Front Oil Seal | SEAL,CR/SHF FRT OIL | SJ233 |

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Oil Pan Installation

Special Tools

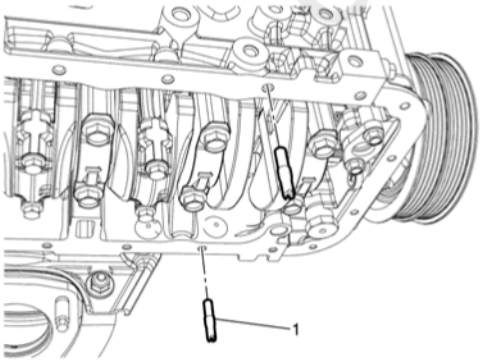
*EN-49980* Guidance Pins

Note**:**

The assembly time, including torque check, must take no longer than 10 minutes.

1. Clean the sealing surfaces.

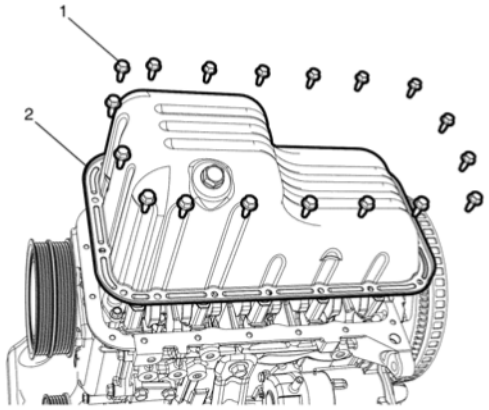
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2.
Click here for full size

3. Install the 2â€‰*EN-49980* pinsâ€‰(1) to the shown oil pan screw bores.
4. Apply approximately a 2.5â€“3â€‰mm (0.0983â€“0.118â€‰in) thick bead of oil pan sealant (1) to the oil pan.

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5. Click here for full size

6. Install the oil pan (2).

7. Install the 18â€‰oil pan boltsâ€‰(1).

8. Caution:

   Refer to Fastener Caution.

9. Tighten the oil pan bolts on the cylinder block to 10â€‰N-m (89â€‰lbâ€‰in).

## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Oil Pan | PAN KIT,OIL(W/GSKT) | SF277 |
| Oil Pan | PAN,OIL | X0001 |
| Oil Pan | PAN,OIL | X0016 |
| Oil Pan | PAN,OIL(CSTG) | X0044 |
| Oil Pan | PAN,OIL | X0073 |
| Oil Pan | PAN KIT,OIL | X0081 |
| Oil Pan | PAN,OIL (W/ENG OIL LVL SEN) | X0082 |
| Engine Oil Pan | PAN,ENG OIL | SS245 |
| Engine Oil Pan | PAN KIT,ENG OIL | SS246 |

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Oil Pan Installation

Special Tools

*EN-49980* Guidance Pins

Note**:**

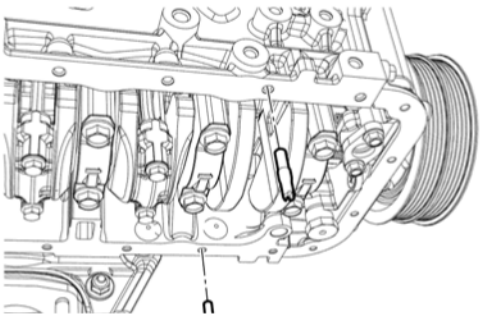
Cleaning of the sealing surfaces (1â€“4): Refer to Replacing Engine Gaskets.

1. Remove any old thread sealant, gasket material or sealant.
2. Clean the sealing surfaces of front cover and front cover components with solvent.
3. Note**:**

   Ensure that the sealing surface is clear of oil, grease and oil sealant material.
4. Clean out debris from the bolt holes.
5. Warning**:**

   Refer to Safety Glasses and Compressed Air Warning.
6. Dry the front cover and front cover components with compressed air.

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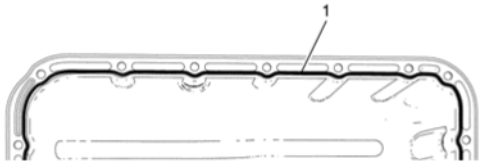


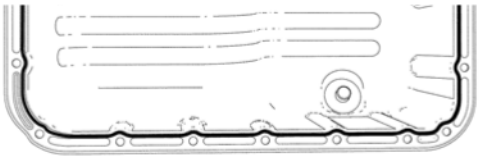



7. Click here for full size

8. Install the 2â€‰*EN-49980* pinsâ€‰(1) to the shown oil pan screw bores.

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9. Click here for full size
10. Note**:**

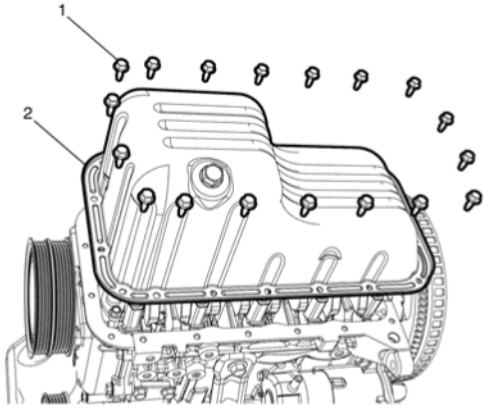
    Use a new oil pan.

11. Note**:**

    Do not coat sealant (RTV) on the front cover bolt holes and bolt threads

12. Apply approximately a 4.5â€‰mm (0.177â€‰in) thick bead of oil pan sealantâ€‰(1) to the oil pan.

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13. Click here for full size
14. Install the oil pan (2).
15. Install the 18â€‰oil pan boltsâ€‰(1).
16. Caution:

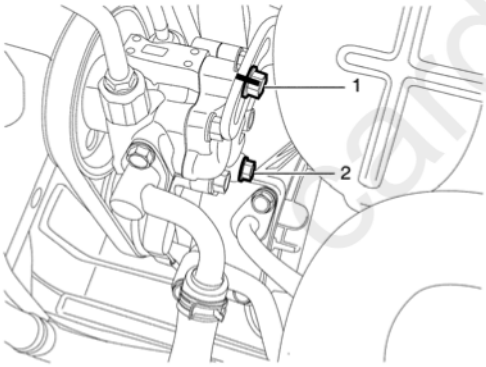
    Refer to Fastener Caution.
17. Note:

    After sealant (RTV) dispensing, the assembly completion time including torque check must be done within 8 minutes.
18. Tighten the oil pan bolts on the cylinder block to 10â€‰N-m (89â€‰lbâ€‰in).

1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Power Steering Pump Belt Installation

1. Install the power steering pump belt.

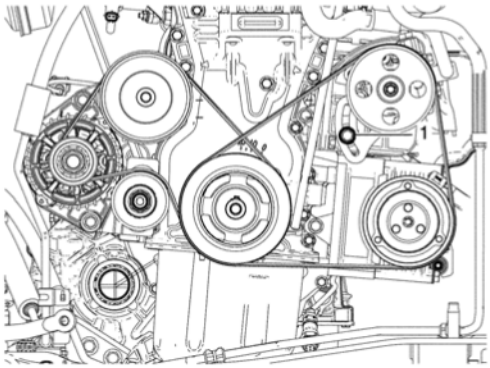



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2. Click here for full size
3. Pull the power streering pump till the marking on the power steering pump bracket with bolt.
4. Caution:

   Refer to Fastener Caution.
5. Tighten the bolt (1) to 22â€‰N-m (16â€‰lbâ€‰ft).

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6. Click here for full size
7. Install the bolts (1) and tighten to 22â€‰N-m (16â€‰lbâ€‰ft).
8. Check the belt is installed clearly.

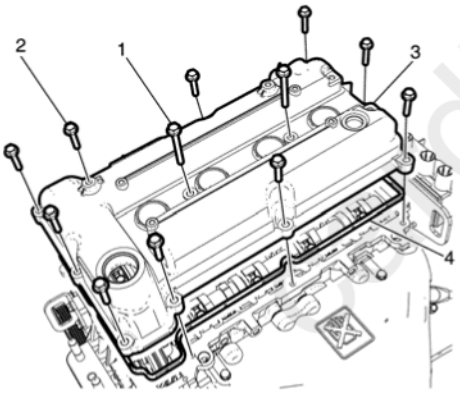
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Power Steering Pump Belt | BELT KIT,P/S PUMP | 3649Z |
| Power Steering Pump Belt | BELT,P/S PUMP | 3650A |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Camshaft Cover Installation




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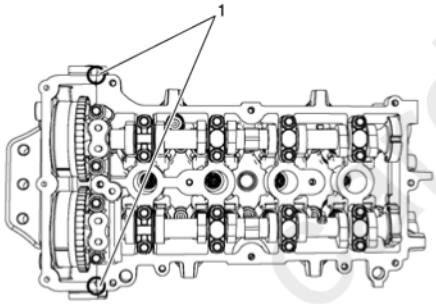
1. Click here for full size
2. Insert a NEW gasket (4) in the camshaft cover.
3. Install the camshaft cover (3).
4. Caution:

   Refer to Fastener Caution.
5. Install the 12â€‰bolts (1, 2) and tighten to 10â€‰N-m (89â€‰lbâ€‰in).

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Camshaft Cover Installation (LKY)

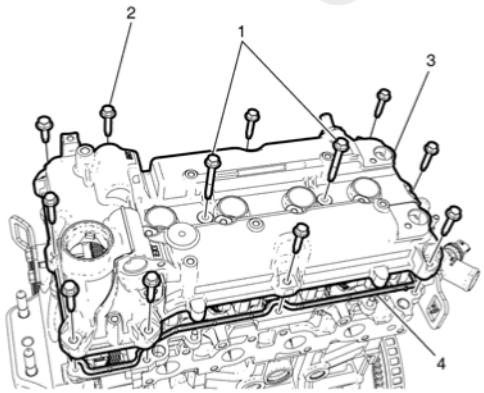



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1. Click here for full size
2. Remove the cured RTV carefully (1) and then clean the sealing surfaces.
3. Note:

   After RTV applying, the assembly completion time including torque check must be done within 8 minutes.
4. Apply RTV sealant to T-joint between cylinder head and front cover (1).

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5. Click here for full size

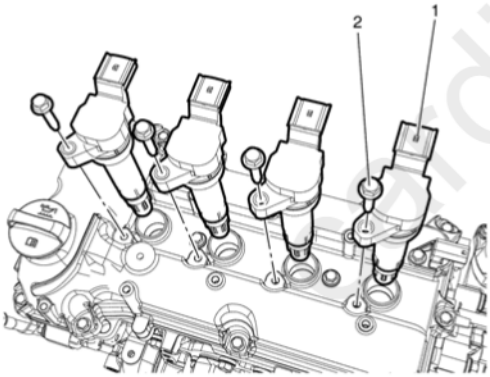
6. Insert a NEW gasket (4) in the camshaft cover.
7. Install the camshaft cover (3).
8. Caution:

   Refer to Fastener Caution.
9. Install the camshaft cover 12 bolts (1, 2) and tighten to 10â€‰N-m (89â€‰lbâ€‰in).

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Ignition Coil Installation (LKY)

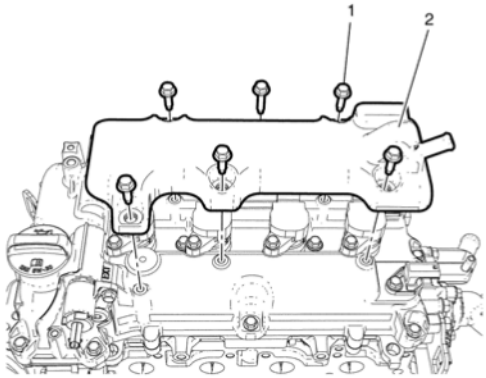



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1. Click here for full size
2. Install the ignition coil (1).
3. Caution:

   Refer to Fastener Caution.
4. Install the ignition coil bolts (2) and tighten to 10â€‰N-m (89â€‰lbâ€‰in).

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5. Click here for full size

6. Install the upper camshaft cover (2) and tighten the bolts (1) to 10â€‰N-m (89â€‰lbâ€‰in).

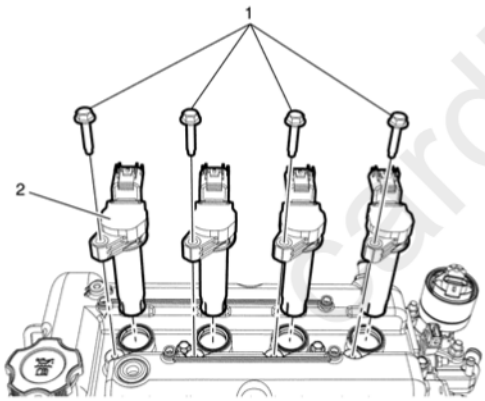
## Related Part Information

| Part Name Catalog Name | Part Code |
|---|---|
| Ignition Coil COIL KIT,IGN | 2699A |
| Ignition Coil COIL,IGN | 2700A |
| Ignition Coil COIL,IGN (W/ BRKT) | 2702A |
| Ignition Coil COIL KIT,IGN | SJ139 |
| Ignition Coil COIL,IGN | SJ140 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Ignition Coil Installation

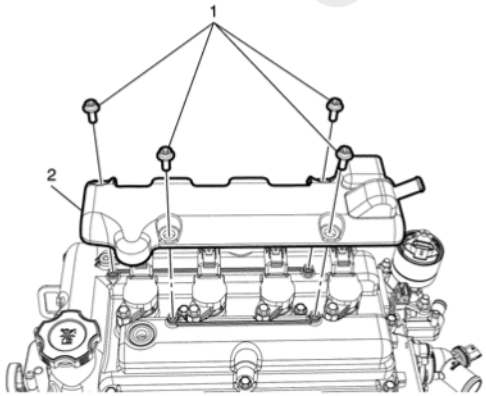



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1. Click here for full size
2. Install the ignition coils (2).
3. Caution:

   Refer to Fastener Caution.
4. Install the ignition coil retaining boltsâ€‰(1) and tighten to 10â€‰N-m (89â€‰lbâ€‰in).

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5. Click here for full size
6. Install the upper camshaft coverâ€‰(2).
7. Install the upper camshaft cover boltsâ€‰(1) and tighten to 10â€‰N-m (89â€‰lbâ€‰in).

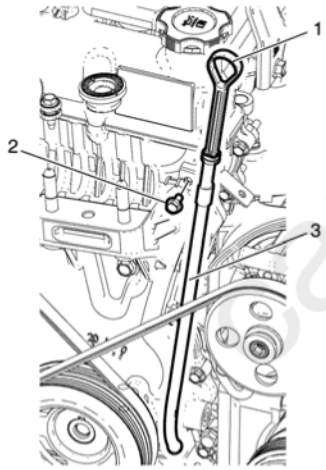
## Related Part Information

| Part Name Catalog Name | Part Code |
|---|---|
| Ignition Coil COIL KIT,IGN | 2699A |
| Ignition Coil COIL,IGN | 2700A |
| Ignition Coil COIL,IGN (W/ BRKT) | 2702A |
| Ignition Coil COIL KIT,IGN | SJ139 |
| Ignition Coil COIL,IGN | SJ140 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Oil Level Indicator and Tube Installation




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1. Click here for full size
2. Caution:

   Refer to Fastener Caution.

3. Install the oil level indicator tube (3) and oil level indicator seal and tighten to 10â€‰N-m (89â€‰lbâ€‰in).
4. Install the oil dipstick.

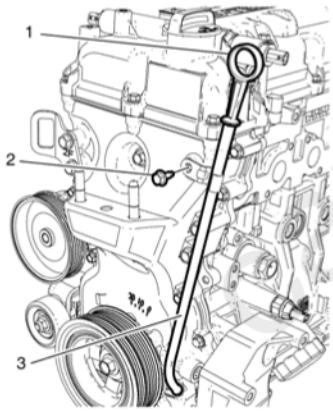
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Oil Level Indicator | INDICATOR,OIL LVL(W/IND TUBE) | 0049A |
| Oil Level Indicator | INDICATOR,OIL LVL | 0050A |
| Oil Level Indicator | INDICATOR,OIL LVL | 0050B |
| Oil Level Indicator | INDICATOR,OIL LVL (W/ IND & FILL TUBE) | 0051A |
| Oil Level Indicator Tube | TUBE,OIL LVL IND | 0100A |
| Oil Level Indicator Tube | TUBE,OIL LVL IND | 0150A |
| Oil Level Indicator | INDICATOR,OIL LVL | SJ184 |
| Oil Level Indicator Tube | TUBE,OIL LVL IND | SJ269 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Oil Level Indicator and Tube Installation (LKY)




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1. Click here for full size
2. Caution:

   Refer to Fastener Caution.

3. Install the oil level indicator tubeâ€‰(3) and oil level indicator seal and tighten the oil level indicator tube boltâ€‰(2) to 10â€‰N-m (89â€‰lbâ€‰in).

4. Install the oil dipstickâ€‰(1).

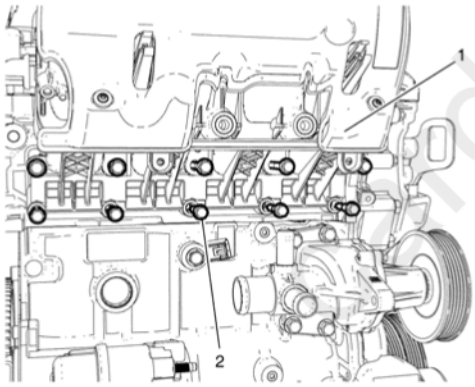
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Oil Level Indicator | INDICATOR,OIL LVL(W/IND TUBE) | 0049A |
| Oil Level Indicator | INDICATOR,OIL LVL | 0050A |
| Oil Level Indicator | INDICATOR,OIL LVL | 0050B |
| Oil Level Indicator | INDICATOR,OIL LVL (W/ IND & FILL TUBE) | 0051A |
| Oil Level Indicator Tube | TUBE,OIL LVL IND | 0100A |
| Oil Level Indicator Tube | TUBE,OIL LVL IND | 0150A |
| Oil Level Indicator | INDICATOR,OIL LVL | SJ184 |
| Oil Level Indicator Tube | TUBE,OIL LVL IND | SJ269 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Intake Manifold Installation (LKY)

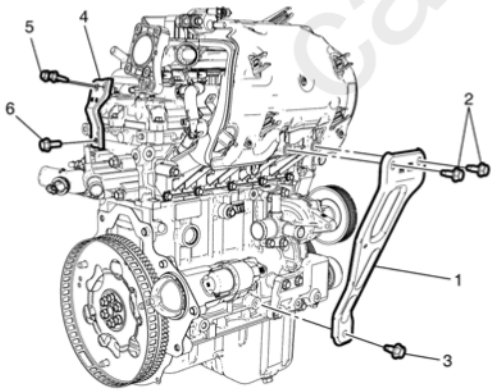



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1. Click here for full size
2. Caution:

   Refer to Fastener Caution.

3. Install the lower intake manifoldâ€‰(1) and tighten the boltsâ€‰(2) to 10â€‰N-m (89â€‰lbâ€‰in)

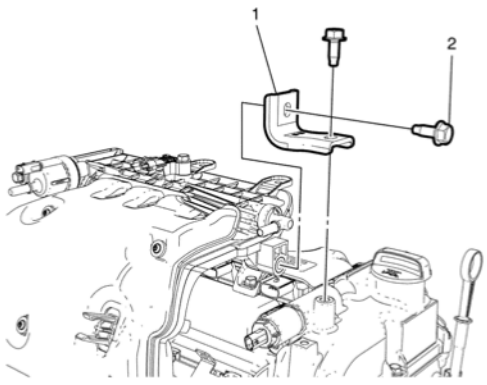



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4.
Click here for full size

5. Install the intake manifold rear bracketâ€‰(1) and tighten the boltsâ€‰(2) to 22â€‰N-m (18â€‰lbâ€‰ft).
6. Install the intake manifold rear bracket boltâ€‰(3) and tighten to 58â€‰N-m (42â€‰lbâ€‰ft).
7. Install the upper intake manifold side bracketâ€‰(4) and tighten the boltsâ€‰(5) to 10â€‰N-m (89â€‰lbâ€‰in).
8. Install the upper intake manifold side bracket boltâ€‰(6) and tighten to 10â€‰N-m (89â€‰lbâ€‰in)

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9. Click here for full size

10. Install the intake manifold upper bracketâ€‰(1) tighten the boltsâ€‰(2) to 25â€‰N-m (18â€‰lbâ€‰ft).

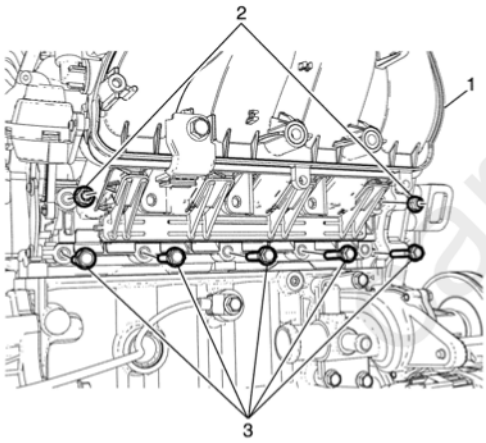
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Intake Manifold | MANIFOLD,INT | X0001 |
| Intake Manifold | MANIFOLD,INT | X0041 |
| Intake Manifold | MANIFOLD,INT(CSTG) | X0048 |
| Intake Manifold | MANIFOLD,INT | X0050 |
| Intake Manifold | MANIFOLD KIT,INT | X0114 |
| Intake Manifold | MANIFOLD KIT,INT(W/ M/PORT F/INJR & FUEL RL) | X0115 |
| Intake Manifold | MANIFOLD,INT(W/THROT BODY) | X0129 |
| Intake Manifold | MANIFOLD,INT(W/THROT BODY) | X0132 |
| Intake Manifold | MANIFOLD,INT(SERV) | X0133 |
| Intake Manifold | MANIFOLD,INT(W/M/PORT F/INJR & FUEL RL) | X0179 |
| Intake Manifold | MANIFOLD,INT (W/THROT BODY & M/PORT F/INJR & FUEL RL) | X0228 |
| Intake Manifold | MANIFOLD,INT (W/ THROT BODY, BOLTS, GSKTS) | X0293 |
| Intake Manifold | MANIFOLD,INT | SS092 |
| Intake Manifold | MANIFOLD,INT(CSTG) | SJ305 |
| Intake Manifold | MANIFOLD,INT | SS082 |
| Intake Manifold | MANIFOLD PKG,INT | SS241 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Intake Manifold Installation




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Install the intake manifold (1) and tighten the bolts (3), nuts (2) to 10â€‰N-m (89â€‰lbâ€‰in).

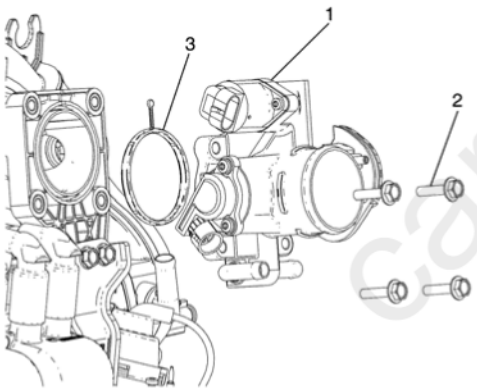
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Intake Manifold | MANIFOLD,INT | X0001 |
| Intake Manifold | MANIFOLD,INT | X0041 |
| Intake Manifold | MANIFOLD,INT(CSTG) | X0048 |
| Intake Manifold | MANIFOLD,INT | X0050 |
| Intake Manifold | MANIFOLD KIT,INT | X0114 |
| Intake Manifold | MANIFOLD KIT,INT(W/ M/PORT F/INJR & FUEL RL) | X0115 |
| Intake Manifold | MANIFOLD,INT(W/THROT BODY) | X0129 |
| Intake Manifold | MANIFOLD,INT(W/THROT BODY) | X0132 |
| Intake Manifold | MANIFOLD,INT(SERV) | X0133 |
| Intake Manifold | MANIFOLD,INT(W/M/PORT F/INJR & FUEL RL) | X0179 |
| Intake Manifold | MANIFOLD,INT (W/THROT BODY & M/PORT F/INJR & FUEL RL) | X0228 |
| Intake Manifold | MANIFOLD,INT (W/ THROT BODY, BOLTS, GSKTS) | X0293 |
| Intake Manifold | MANIFOLD,INT | SS092 |
| Intake Manifold | MANIFOLD,INT(CSTG) | SJ305 |
| Intake Manifold | MANIFOLD,INT | SS082 |
| Intake Manifold | MANIFOLD PKG,INT | SS241 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Throttle Body Assembly Installation




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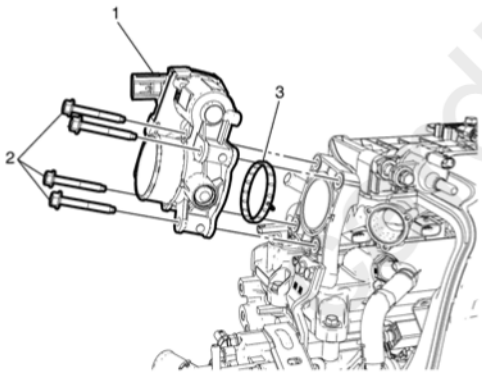
Click here for full size

1. Install the new throttle body seal (3).
2. Install the4 throttle body (1) bolts and tighten to 11â€‰N-m (97â€‰lbâ€‰in).

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Throttle Body Assembly Installation (LKY)




diagn.com

1. Click here for full size
2. Install the new throttle body sealâ€‰(3).
3. Install the throttle bodyâ€‰(1).
4. Caution:

   Refer to Fastener Caution.
5. Install the 4 throttle body boltsâ€‰(2) and tighten to 10â€‰N-m (89â€‰lbâ€‰in).

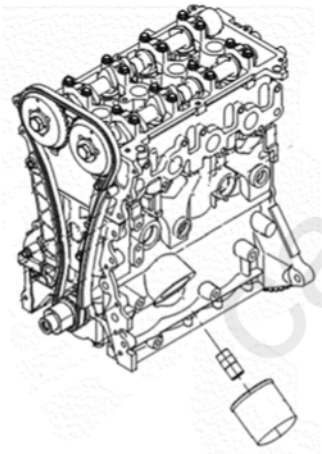
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Throttle Body | BODY,THROT (W/ THERM BYPASS PIPE) | 1767A |
| Throttle Body | BODY,THROT(W/MASS AIR FLOW SEN) | 1768A |
| Throttle Body | BODY,THROT(W/MASS AIR FLOW SEN) | 1769A |
| Throttle Body | BODY,THROT | 1770A |
| Throttle Body | BODY,THROT | 1770B |
| Throttle Body | BODY,THROT (CSTG) | 1770C |
| Throttle Body | BODY,THROT (W/SEN) | 1777A |
| Throttle Body | BODY,THROT(W/TBI) | X0213 |
| Throttle Body | BODY KIT,THROT | X0277 |
| Throttle Body | BODY KIT,THROT(W/TBI) | X0301 |
| Throttle Body | BODY KIT,THROT(W/THROT POSN SEN) | X0320 |
| Throttle Body | BODY,THROT(W/THROT ACTR) | X0474 |
| Throttle Body | BODY KIT,THROT (W/ THROT ACTR) | X0483 |
| Throttle Body | BODY,THROTTLE | SJ035 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Draining Fluids and Oil Filter Removal



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1. Click here for full size
2. Place a drip pan underneath.
3. Using the suitable tool, remove the oil filter.
4. Remove the oil drain bolt.
5. Drain the engine oil into the drip pan.

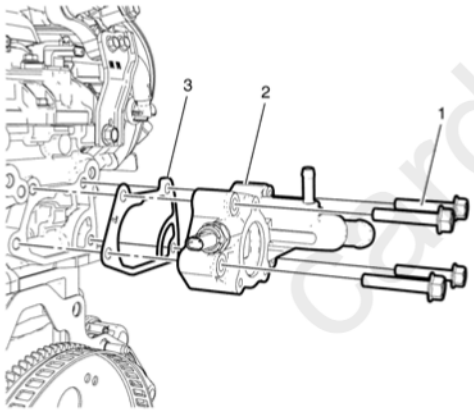
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Oil Filter | FILTER KIT,OIL | 0003A |
| Oil Filter | FILTER KIT,OIL (W/ ADAP) | 0003Z |
| Oil Filter | FILTER,OIL(W/ADAP) | 0004A |
| Oil Filter | FILTER,OIL | 0005A |
| Oil Filter | FILTER,OIL | 0005B |
| Oil Filter | FILTER,OIL (W/TURBO OIL PIPE HOLE) | 0007A |
| Oil Filter | FILTER,OIL | SJ158 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Engine Water Outlet Adapter Installation (LKY)




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1. Click here for full size
2. Install the engine coolant outlet adapter housingâ€‰(2) and a NEW gasketâ€‰(3) .
3. Caution:

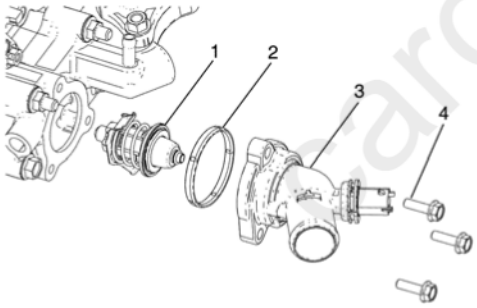
   Refer to Fastener Caution.
4. Install the 4â€‰engine coolant outlet adapter housing boltsâ€‰(1) and tighten to 25â€‰N-m (18â€‰lbâ€‰ft).

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Engine Coolant Thermostat Installation

1. Clean the engine coolant sealing surfaces.




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2. Click here for full size

3. Install the engine coolant thermostat (1).
4. Install the engine coolant seal (2).
5. Install the engine coolant thermostat socket (3).
6. Warning:

   Refer to Safety Glasses and Compressed Air Warning.

7. Caution:

   Refer to Fastener Caution.

8. Install the 4 engine coolant thermostat bolts (4) and tighten to 10â€‰N-m (89â€‰lbâ€‰in).

## Related Part Information

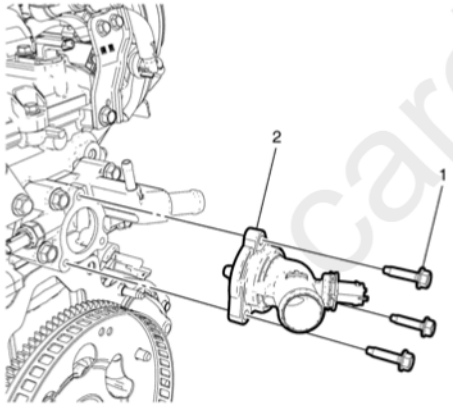
| Part Name | Catalog Name | Part Code |
|---|---|---|
| Engine Coolant Thermostat | THERMOSTAT,ENG COOL(W/GSKT) | 0399A |
| Engine Coolant Thermostat | THERMOSTAT,ENG COOL(W/WAT INL) | 0399B |
| Engine Coolant Thermostat | THERMOSTAT,ENG COOL(W/WAT OTLT) | 0399C |
| Engine Coolant Thermostat | THERMOSTAT,ENG COOL(W/WAT OTLT & RAD OTLT PIPE) | 0399D |
| Engine Coolant Thermostat | THERMOSTAT KIT,ENG COOL | 0399Z |
| Engine Coolant Thermostat | THERMOSTAT,ENG COOL | 0400A |
| Engine Coolant Thermostat | THERMOSTAT,ENG COOL | SS129 |
| Engine Coolant Thermostat | THERMOSTAT,ENG COOL | SJ267 |

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Engine Coolant Thermostat Installation (LKY)

1. Clean the engine coolant sealing surfaces.




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2. Click here for full size

3. Install the engine coolant thermostat assemblyâ€‰(2).

4. Warning:

   Refer to Safety Glasses and Compressed Air Warning.

5. Caution:

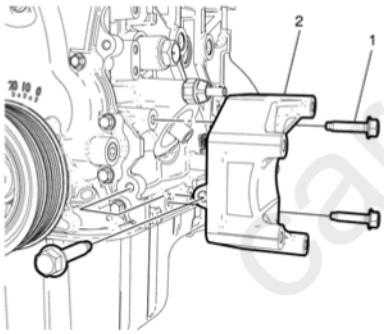
   Refer to Fastener Caution.

6. Install the 3â€‰engine coolant thermostat boltsâ€‰(1) and tighten to 10â€‰N-m (89â€‰lbâ€‰ft).

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Air Conditioning Compressor Bracket Installation (LKY)




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1. Click here for full size
2. Install the air conditioning compressor bracket (2).
3. Caution:

   Refer to Fastener Caution.
4. Install the 3 air conditioning compressor bracket bolts (1) and tighten to 22â€‰N-m (16â€‰lbâ€‰ft).

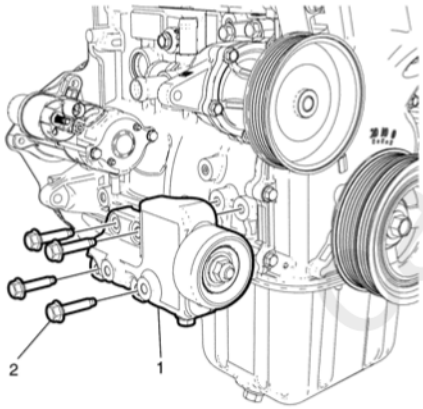
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Air Conditioning Compressor Bracket | BRACKET,A/C CMPR | 2350A |
| Air Conditioning Compressor Bracket | BRACKET,A/C CMPR | 2400A |
| Air Conditioning Compressor Bracket | BRACKET,A/C CMPR (MCHG) | 2400L |
| Air Conditioning Compressor Bracket | BRACKET,A/C CMPR (CSTG) | 2400M |
| Air Conditioning Compressor Bracket | BRACKET,A/C CMPR | SJ128 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Generator Bracket Installation (LKY)




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Caution:

Refer to Fastener Caution.

Install the generator bracketâ€‰(1), boltsâ€‰(2), and tighten to 22â€‰N-m (16â€‰lbâ€‰ft).

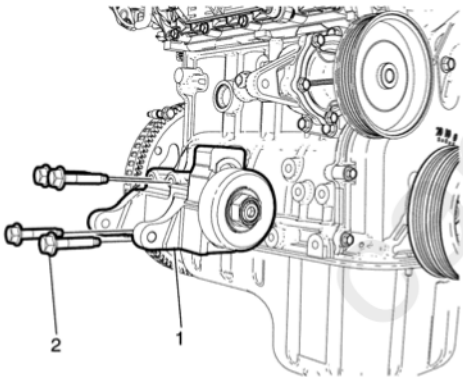
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Generator Bracket | BRACKET,GEN | 0175A |
| Generator Bracket | BRACKET,GEN | 0200A |
| Generator Bracket | BRACKET,GEN (MCHG) | 0202A |
| Generator Bracket | BRACKET,GEN (CSTG) | 0203A |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Drive Belt Tensioner Installation




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Caution:

Refer to Fastener Caution.

Install the drive belt tensioner (1), bolt (2), and tighten to 22â€‰N-m (16â€‰lbâ€‰ft).

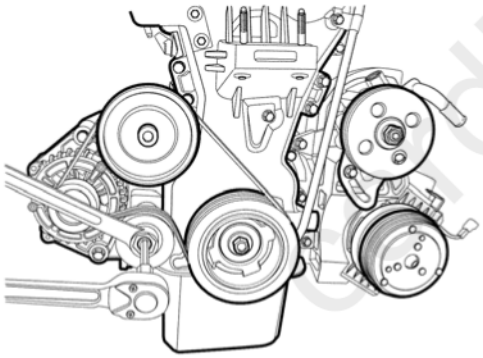
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Drive Belt Tensioner | TENSIONER,DRV BELT | 3100A |
| Drive Belt Tensioner | TENSIONER,DRV BELT | 2000A |
| Drive Belt Tensioner | TENSIONER,DRV BELT (W/BOLT) | 2002A |
| Drive Belt Tensioner | TENSIONER KIT,DRV BELT | 5619Z |
| Drive Belt Tensioner | TENSIONER,DRV BELT | 5620A |
| Drive Belt Tensioner | TENSIONER,DRV BELT | SJ266 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Drive Belt Installation



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1. Click here for full size

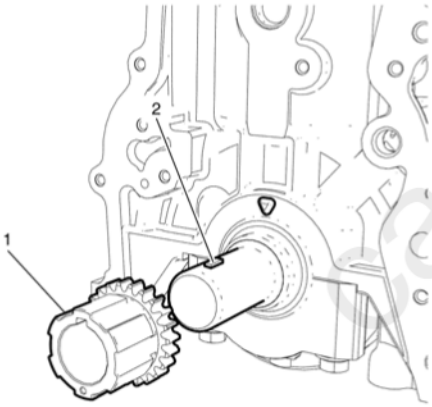
2. Install the water pump-generator belt.
3. Rotate the outer hex of the tensioner nut counterclockwise and put up the tensioner with a suitable interchangeable head, click-type torque wrench.
4. Tighten
   - New Belt: 24â€‰N-m (18â€‰lbâ€‰ft)
   - Used Belt: 17.5â€‰N-m (13â€‰lbâ€‰ft)
5. Caution:

   Refer to Fastener Caution.
6. Tighten the inner hex of the tensioner clockwise to 45â€‰N-m (33â€‰lbâ€‰ft).

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Crankshaft Sprocket Installation (LKY)




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Note:

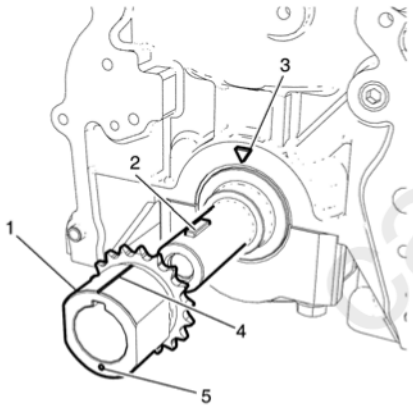
When installing the crankshaft sprocket, the cam and the groove must align (2).

Install the crankshaft sprocket (1).

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Crankshaft Sprocket Installation




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Note:

When installing the crankshaft sprocket, the cam and the groove must align (2).

Install the crankshaft sprocket (1).

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Crankshaft Balancer Installation

Special Tools

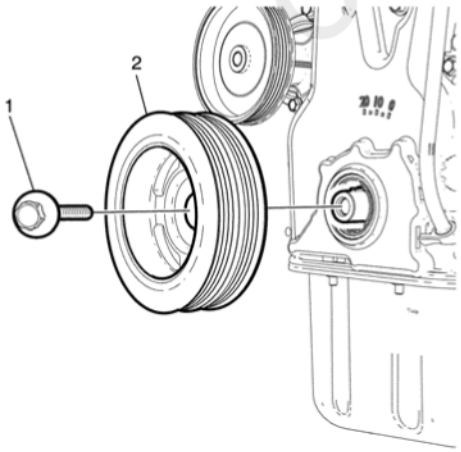
*EN-50050* Crankshaft Locking Device

For equivalent regional tools, refer to Special Tools.

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1. 
   Click here for full size
2. Install the *EN-50050* crankshaft locking device. Lock the flywheel via the starter ring gear.




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3. 
   Click here for full size
4. Caution:

   Refer to Fastener Caution.

5. Note:

   When installing the crankshaft balancer, the cam and the groove must align.

6. Install the crankshaft balancer (2) to the crankshaft and tighten the bolt (1) to 95â€‰N-m + 55Â° (70â€‰lbâ€‰ft + 55Â°).

## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Crankshaft Balancer | BALANCER,CR/SHF | X0001 |
| Crankshaft Balancer | BALANCER,CR/SHF | X0005 |
| Crankshaft Balancer | BALANCER,CR/SHF(CSTG) | X0011 |
| Crankshaft Balancer | BALANCER,CR/SHF (W/PULLEY) | X0014 |
| Crankshaft Balancer | BALANCER,CR/SHF | SJ277 |

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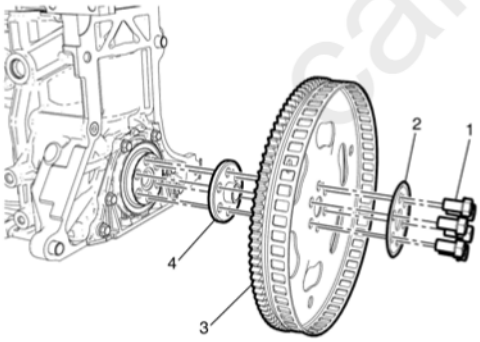
1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Automatic Transmission Flex Plate Installation

Special Tools

*EN-50050* Crankshaft Locking Device

For equivalent regional tools, refer to Special Tools.




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1. Click here for full size
2. Install the automatic transmission flex plate spacerâ€‰(4).
3. Install the automatic transmission flex plateâ€‰(3).
4. Install the automatic transmission flex plate retainerâ€‰(2).
5. Install the 6 automatic transmission flex plate boltsâ€‰(1).

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6. Click here for full size

7. Install the *EN-50050* crankshaft locking device, lock the automatic transmission flex plate via the starter ring gear.

8. Caution:

   Refer to Fastener Caution.

9. Tighten the 6 automatic transmission flex plate bolts to 20â€‰N-m + 25Â° (15â€‰lbâ€‰ft + 25Â°).

10. Remove the *EN-50050* crankshaft locking device.

## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Automatic Transmission Flex Plate | PLATE,A/TRNS FLEX(W/HUB) | 0043A |
| Automatic Transmission Flex Plate | PLATE,A/TRNS FLEX | 0044A |
| Automatic Transmission Flex Plate | PLATE KIT,A/TRNS FLEX | 0045A |
| Automatic Transmission Flex Plate | PLATE,A/TRNS FLEX | 0050A |
| Automatic Transmission Flex Plate | PLATE,A/TRNS FLEX | 0200A |

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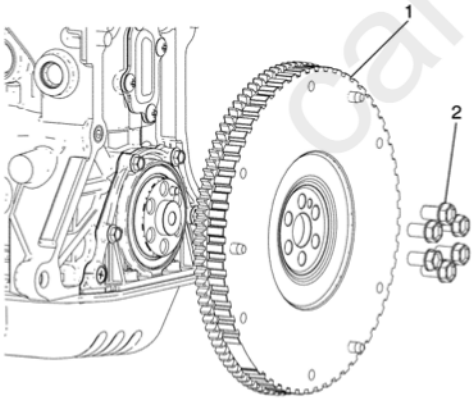
1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Engine Flywheel Installation

Special Tools

*EN-500501*Crankshaft Locking Device

For equivalent regional tools, refer to Special Tools.




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1. Click here for full size
2. Install the flywheelâ€‰(1).
3. Install the NEW 6â€‰flywheel boltsâ€‰(2).
4. Install the *EN-500501*crankshaft locking device and lock the flywheel via the starter ring gear.
5. Caution**:**

   Refer to Fastener Caution.
6. Tighten the 6â€‰flywheel bolts to 20â€‰N-m + 35Â° (15â€‰lbâ€‰ft + 35Â°).
7. Remove the *EN-500501*crankshaft locking device .

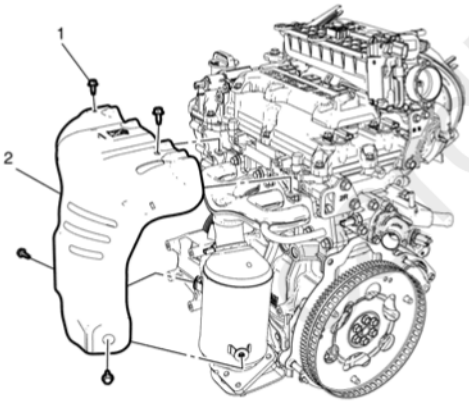
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Engine Flywheel | FLYWHEEL,ENG | X0001 |
| Engine Flywheel | FLYWHEEL,ENG | SS006 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Exhaust Manifold Heat Shield Removal (LKY)




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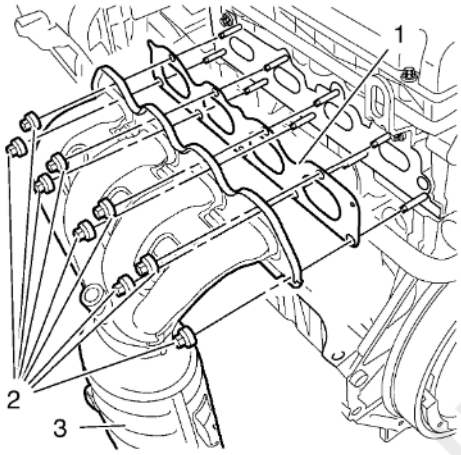
1. Click here for full size
2. Remove the 4â€‰exhaust manifold heat shield boltsâ€‰(1).
3. Remove the exhaust manifold heat shieldâ€‰(2).

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Exhaust Manifold Removal

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1. Click here for full size
2. Remove the 9 exhaust manifold nuts (2).
3. Remove the exhaust manifold (3) and gasket (1).
4. Clean all of the gasket surfaces.

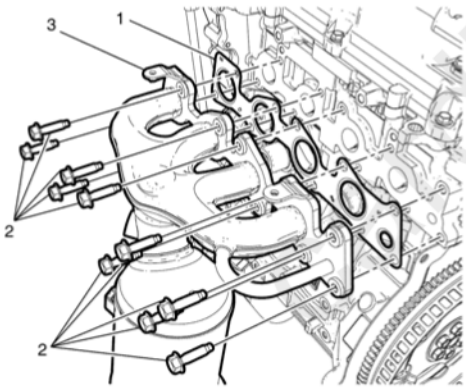
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Exhaust Manifold | MANIFOLD,EXH(W/TURBO) | 0024A |
| Exhaust Manifold | MANIFOLD,EXH | 0025A |
| Exhaust Manifold | MANIFOLD,EXH(W/H/SHLD) | 0025B |
| Exhaust Manifold | MANIFOLD,EXH(W/C/OVR PIPE & H/SHLD) | 0025C |
| Exhaust Manifold | MANIFOLD,EXH(W/C/OVR PIPE) | 0025D |
| Exhaust Manifold | MANIFOLD,EXH(W/CTLTC CONV) | 0025H |
| Exhaust Manifold | MANIFOLD,EXH(W/OXIDN CTLTC CONV) | 0025J |
| Exhaust Manifold | MANIFOLD,EXH(W/3WAY + OXIDN CTLTC CONV) | 0025K |
| Exhaust Manifold | MANIFOLD,EXH(W/3WAY CTLTC CONV) | 0025L |
| Exhaust Manifold | MANIFOLD,EXH(W/W/UP OXIDN CTLTC CONV) | 0025M |
| Exhaust Manifold | MANIFOLD,EXH(W/W/UP 3WAY CTLTC CONV) | 0025N |
| Exhaust Manifold | MANIFOLD,EXH | X0005 |
| Exhaust Manifold | MANIFOLD,EXH(CSTG) | X0010 |
| Exhaust Manifold | MANIFOLD,EXH | X0013 |
| Exhaust Manifold | MANIFOLD,EXH | X0014 |
| Exhaust Manifold | MANIFOLD,EXH (BLANK) | X0025 |
| Exhaust Manifold | MANIFOLD,EXH (MCHG) | X0048 |
| Exhaust Manifold | MANIFOLD KIT,EXH | X0049 |
| Exhaust Manifold | MANIFOLD,EXH (LH PROC) (RPR) | X0050 |
| Exhaust Manifold | MANIFOLD,EXH (RH PROC) (RPR) | X0051 |
| Exhaust Manifold | MANIFOLD,EXH | SJ564 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Exhaust Manifold Removal (LKY)




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1. Click here for full size
2. Remove the 10â€‰exhaust manifold boltsâ€‰(2).
3. Remove the exhaust manifoldâ€‰(3) and gasketâ€‰(1).
4. Clean all of the gasket surfaces.

## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Exhaust Manifold | MANIFOLD,EXH(W/TURBO) | 0024A |
| Exhaust Manifold | MANIFOLD,EXH | 0025A |
| Exhaust Manifold | MANIFOLD,EXH(W/H/SHLD) | 0025B |
| Exhaust Manifold | MANIFOLD,EXH(W/C/OVR PIPE & H/SHLD) | 0025C |
| Exhaust Manifold | MANIFOLD,EXH(W/C/OVR PIPE) | 0025D |
| Exhaust Manifold | MANIFOLD,EXH(W/CTLTC CONV) | 0025H |
| Exhaust Manifold | MANIFOLD,EXH(W/OXIDN CTLTC CONV) | 0025J |
| Exhaust Manifold | MANIFOLD,EXH(W/3WAY + OXIDN CTLTC CONV) | 0025K |
| Exhaust Manifold | MANIFOLD,EXH(W/3WAY CTLTC CONV) | 0025L |
| Exhaust Manifold | MANIFOLD,EXH(W/W/UP OXIDN CTLTC CONV) | 0025M |
| Exhaust Manifold | MANIFOLD,EXH(W/W/UP 3WAY CTLTC CONV) | 0025N |
| Exhaust Manifold | MANIFOLD,EXH | X0005 |
| Exhaust Manifold | MANIFOLD,EXH(CSTG) | X0010 |
| Exhaust Manifold | MANIFOLD,EXH | X0013 |
| Exhaust Manifold | MANIFOLD,EXH | X0014 |
| Exhaust Manifold | MANIFOLD,EXH (BLANK) | X0025 |
| Exhaust Manifold | MANIFOLD,EXH (MCHG) | X0048 |
| Exhaust Manifold | MANIFOLD KIT,EXH | X0049 |
| Exhaust Manifold | MANIFOLD,EXH (LH PROC) (RPR) | X0050 |
| Exhaust Manifold | MANIFOLD,EXH (RH PROC) (RPR) | X0051 |
| Exhaust Manifold | MANIFOLD,EXH | SJ564 |

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

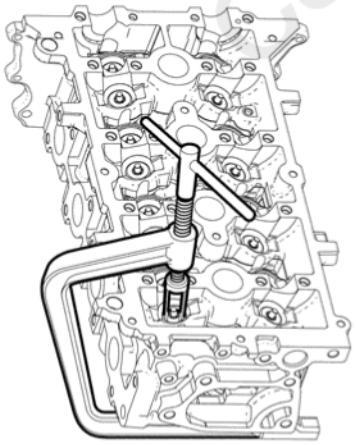
## Cylinder Head Disassemble

Special Tools

- *EN 46116* Valve Stem Seal Remover/Installer
- *EN 46569* Valve Spring Compressor â€“ Head Off
- *EN 49075* Valve Spring Compressor Adapter

For equivalent regional tools, refer to Special Tools.

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1. 
   Click here for full size
2. Warning**:**

   Compressed valve springs have high tension against the valve spring compressor. Valve springs that are not properly compressed by or released from the valve spring compressor can be ejected from the valve spring compressor with intense force. Use care when compressing or releasing the valve spring with the valve spring compressor and when removing or installing the valve stem keys. Failing to use care may cause personal injury.

3. Caution**:**

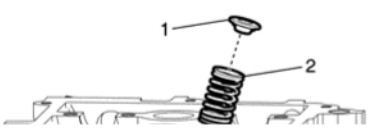
   Do not compress the valve springs to less than 24.0â€‰mm (0.943â€‰in). Contact between the valve spring retainer and the valve stem oil seal can cause potential valve stem oil seal damage.

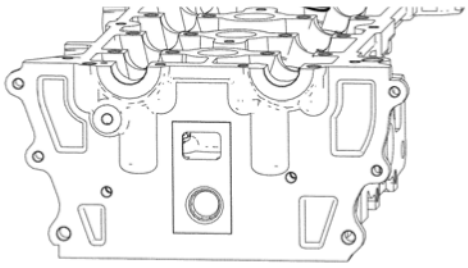
4. Compress the valve spring using the *EN 46569* valve spring compressor â€“ head off and the *EN 49075* valve spring compressor adapter .

5. Use the magnet of the in order to remove the valve collets.

6. Remove the valve spring compressor and the adapter.

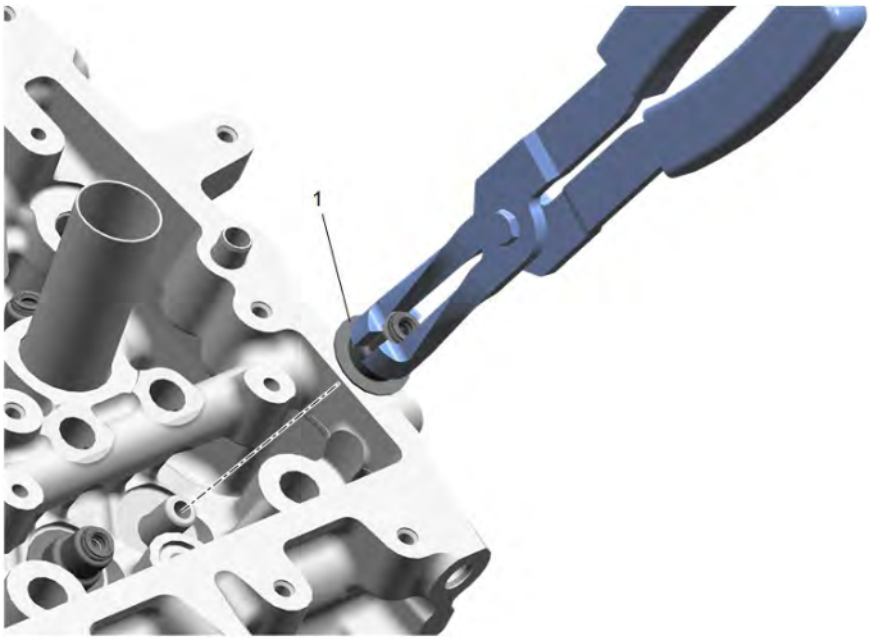
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7. Click here for full size
8. Remove the valve spring retainer (1).
9. Remove the valve spring (2).

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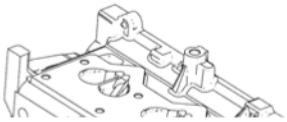


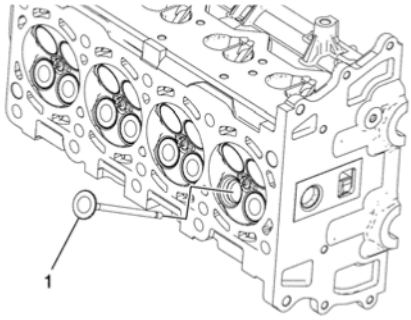

10. [Click here for full size]
11. Note:

    NEVER reuse a valve stem oil seal.

12. Remove the valve stem oil seal using the *EN 46116* valve stem seal remover/installer.
13. Discard the valve stem oil seals.

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14. Click here for full size
15. Remove the valve (1).
16. Repeat these procedures for the remaining valves.

## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Cylinder Head | HEAD,CYL | X0001 |
| Cylinder Head | HEAD,CYL | X0016 |
| Cylinder Head | HEAD,CYL(MCHG) | X0017 |
| Cylinder Head | HEAD,CYL(CSTG) | X0018 |
| Cylinder Head | HEAD,CYL (W/VLVS) | X0019 |
| Cylinder Head | HEAD,CYL(MCHG) | X0020 |
| Cylinder Head | HEAD KIT,CYL | X0032 |
| Cylinder Head | HEAD,CYL(CSTG) | X0034 |
| Cylinder Head | HEAD,CYL | X0042 |
| Cylinder Head | HEAD,CYL(W/EXH VLV ST) | X0055 |
| Cylinder Head | HEAD,CYL (SERV PARTIAL) | X0063 |
| Cylinder Head | HEAD,CYL (W/VLV & CVR) | X0066 |
| Cylinder Head | HEAD,CYL (PARTIAL MCHG) | X0067 |
| Cylinder Head | HEAD,CYL | SS067 |
| Cylinder Head | HEAD,CYL (CSTG) | SJ303 |
| Cylinder Head | HEAD,CYL (W/ VLV) | SJ304 |

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| Part Name | Catalog Name | Part Code |
|---|---|---|
| Cylinder Head | HEAD,CYL | SS083 |
| Cylinder Head | HEAD,CYL(MCHG) | SS198 |

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Cylinder Head Cleaning and Inspection

### Cleaning Procedure

1. Remove any old thread sealant, gasket material or sealant.
2. Clean all cylinder head surfaces with non-corrosive solvent.
3. Warning**:**

   Refer to Safety Glasses and Compressed Air Warning.
4. Blow out all the oil galleries using compressed air.
5. Remove any carbon deposits from the combustion chambers.
6. Clean any debris or build-up from the lifter pockets.

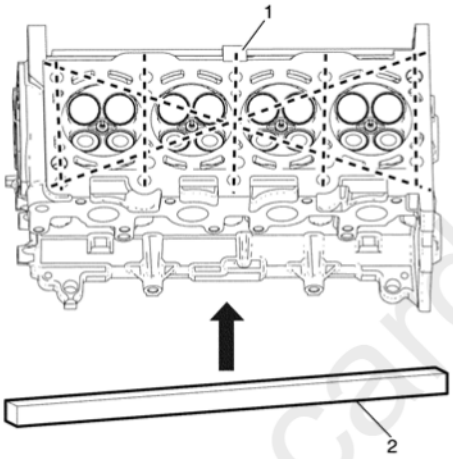
### Visual Inspection

1. Inspect the cylinder head camshaft bearing surfaces for the following conditions:
2.
   - Scoring or pitting above acceptable tolerances
   - Discoloration from overheating
   - Deformation from wear above acceptable tolerances
   - If the camshaft bearing journals appear to be scored or damaged, you must replace the cylinder head. DO NOT machine the camshaft bearing journals.
3. If any of the above conditions exist on the camshaft bearing surfaces, replace the cylinder head.
4. Inspect the cylinder head for the following:
5.
   - Cracks, damage or pitting in the combustion chambers
   - Debris in the oil galleriesâ€”Continue to clean the galleries until all debris is removed.
   - Coolant leaks or damage to the deck face sealing surfaceâ€”If coolant leaks are present, measure the surface warpage as described under Cylinder Head Measurement â€“ Deck Flatness Inspection.
   - Burrs or any defects that may degrade the sealing of the NEW secondary camshaft drive chain tensioner gasket
   - Damage to any gasket surfaces
   - Damage to any threaded bolt holes
   - Burnt or eroded areas in the combustion chamber
   - Cracks in the exhaust ports and combustion chambers
   - External cracks in the water passages
   - Restrictions in the intake or exhaust passages
   - Restrictions in the cooling system passages
   - Rusted, damaged or leaking core plugs
6. If the cylinder head is cracked or damaged, it must be replaced. No welding or patching of the cylinder head is recommended.

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## Cylinder Head Measurement

Deck Flatness Inspection




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1. Click here for full size
2. Ensure the cylinder head (1) decks are clean and free of gasket material.
3. Inspect the surface for any imperfections or scratches that may inhibit correct cylinder head gasket sealing.
4. Place a straight-edge (2) diagonally across the cylinder head (1) deck face surface.
5. Measure the clearance between the straight-edge (2) and the cylinder head (1) deck face using a feeler gage at 4 points along the straight-edge (2).
6. 
    - If the warpage is more than 0.05â€‰mm (0.002â€‰in) or any imperfections or scratches that may inhibit correct cylinder head gasket sealing are present, the cylinder headâ€‰(1) must be replaced. Do not machine the cylinder head.

## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Cylinder Head | HEAD,CYL | X0001 |
| Cylinder Head | HEAD,CYL | X0016 |
| Cylinder Head | HEAD,CYL(MCHG) | X0017 |
| Cylinder Head | HEAD,CYL(CSTG) | X0018 |
| Cylinder Head | HEAD,CYL (W/VLVS) | X0019 |
| Cylinder Head | HEAD,CYL(MCHG) | X0020 |
| Cylinder Head | HEAD KIT,CYL | X0032 |
| Cylinder Head | HEAD,CYL(CSTG) | X0034 |
| Cylinder Head | HEAD,CYL | X0042 |
| Cylinder Head | HEAD,CYL(W/EXH VLV ST) | X0055 |
| Cylinder Head | HEAD,CYL (SERV PARTIAL) | X0063 |
| Cylinder Head | HEAD,CYL (W/VLV & CVR) | X0066 |
| Cylinder Head | HEAD,CYL (PARTIAL MCHG) | X0067 |
| Cylinder Head | HEAD,CYL | SS067 |
| Cylinder Head | HEAD,CYL (CSTG) | SJ303 |
| Cylinder Head | HEAD,CYL (W/ VLV) | SJ304 |
| Cylinder Head | HEAD,CYL | SS083 |
| Cylinder Head | HEAD,CYL(MCHG) | SS198 |

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

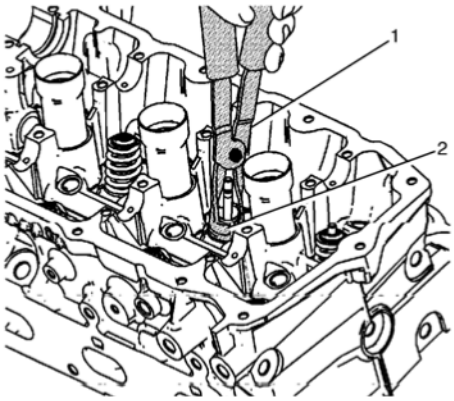
## Cylinder Head Assemble

Special Tools

- *EN 46116* Valve Stem Seal Remover/Installer
- *EN 46569* Valve Spring Compressor â€“ Head Off
- *EN 49075* Valve Spring Compressor Adapter

For equivalent regional tools, refer to Special Tools.

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1. Click here for full size
2. Note:

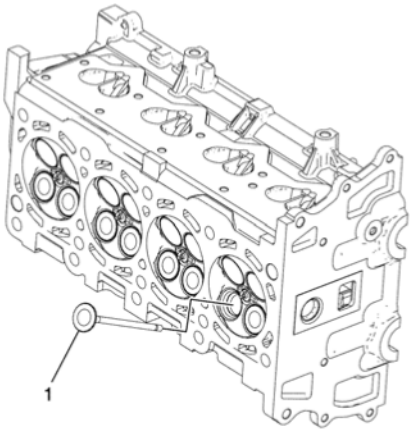
   NEVER reuse a valve stem oil seal (2). Always use new seals when assembling the cylinder head.

3. Mount a new valve stem oil seal (2) using the *EN 46116* valve stem seal remover/installer.
4. Note:

   Force should only be applied to the valve spring contact area of the new valve stem oil seal (2) during installation.

5. Push and twist the valve stem oil seal (2) into position on the valve guide until the seal positively locks on the guide using the *EN 46116* valve stem seal remover/installer.
6. Lubricate the valve stem and valve guide ID with clean engine oil.

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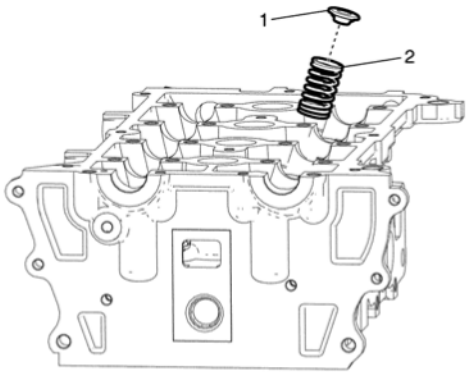



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7. Click here for full size
8. Note:

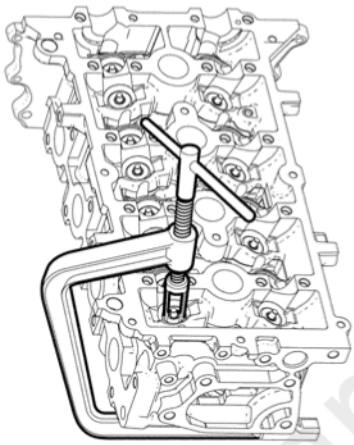
   The valve stem oil seal must not come loose from the valve guide when the valve is installed.

9. Insert the valve (1) into the valve guide until it bottoms on the valve seat.




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10. Click here for full size
11. Install the valve spring (2).
12. Place the valve spring retainer (1) onto the valve spring (2).



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13. 
    Click here for full size
14. Warning:

    Compressed valve springs have high tension against the valve spring compressor. Valve springs that are not properly compressed by or released from the valve spring compressor can be ejected from the valve spring compressor with intense force. Use care when compressing or releasing the valve spring with the valve spring compressor and when removing or installing the valve stem keys. Failing to use care may cause personal injury.

15. Caution:

    Do not compress the valve springs to less than 24.0â€‰mm (0.943â€‰in). Contact between the valve spring retainer and the valve stem oil seal can cause potential valve stem oil seal damage.

16. Compress the valve spring using the *EN 46569* valve spring compressor â€“ head off and the *EN 49075* valve spring compressor adapter .

17. Note:

    Ensure correct directional placement of valve collets. The valve collets must be installed with the tapered end towards the valve stem seal.

18. With the spring compressed, install the valve collets.

19. Remove the *EN 46569* valve spring compressor â€“ head off and the *EN 49075* valve spring compressor adapter .

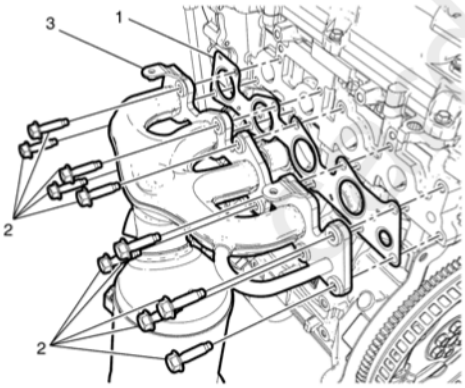
20. Verify that the valve collets are installed by placing a rag over the valve tip and tapping with a dead-blow hammer. The valve keepers and the spring should remain in place.

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Exhaust Manifold Installation (LKY)

1. Clean the exhaust manifold sealing surface.




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2. Click here for full size

3. Install a NEW exhaust manifold gasketâ€‰(1) to the exhaust manifold.

4. Install the exhaust manifoldâ€‰(3) .

5. Caution:

   Refer to Fastener Caution.

6. Install the new exhaust manifold boltsâ€‰(2) and tighten to 20â€‰N-m (15â€‰lbâ€‰ft).

## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Exhaust Manifold | MANIFOLD,EXH(W/TURBO) | 0024A |
| Exhaust Manifold | MANIFOLD,EXH | 0025A |
| Exhaust Manifold | MANIFOLD,EXH(W/H/SHLD) | 0025B |
| Exhaust Manifold | MANIFOLD,EXH(W/C/OVR PIPE & H/SHLD) | 0025C |
| Exhaust Manifold | MANIFOLD,EXH(W/C/OVR PIPE) | 0025D |
| Exhaust Manifold | MANIFOLD,EXH(W/CTLTC CONV) | 0025H |
| Exhaust Manifold | MANIFOLD,EXH(W/OXIDN CTLTC CONV) | 0025J |
| Exhaust Manifold | MANIFOLD,EXH(W/3WAY + OXIDN CTLTC CONV) | 0025K |
| Exhaust Manifold | MANIFOLD,EXH(W/3WAY CTLTC CONV) | 0025L |
| Exhaust Manifold | MANIFOLD,EXH(W/W/UP OXIDN CTLTC CONV) | 0025M |
| Exhaust Manifold | MANIFOLD,EXH(W/W/UP 3WAY CTLTC CONV) | 0025N |
| Exhaust Manifold | MANIFOLD,EXH | X0005 |
| Exhaust Manifold | MANIFOLD,EXH(CSTG) | X0010 |
| Exhaust Manifold | MANIFOLD,EXH | X0013 |
| Exhaust Manifold | MANIFOLD,EXH | X0014 |
| Exhaust Manifold | MANIFOLD,EXH (BLANK) | X0025 |
| Exhaust Manifold | MANIFOLD,EXH (MCHG) | X0048 |
| Exhaust Manifold | MANIFOLD KIT,EXH | X0049 |
| Exhaust Manifold | MANIFOLD,EXH (LH PROC) (RPR) | X0050 |
| Exhaust Manifold | MANIFOLD,EXH (RH PROC) (RPR) | X0051 |
| Exhaust Manifold | MANIFOLD,EXH | SJ564 |

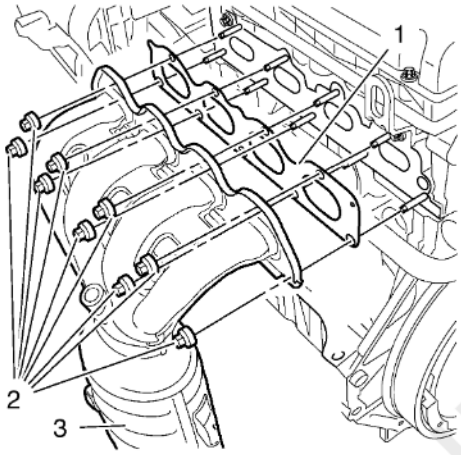
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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Exhaust Manifold Installation

1. Clean the exhaust manifold sealing surface.

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2. Click here for full size

3. Install a NEW exhaust manifold gasket to the exhaust manifold.

4. Caution:

   Refer to Fastener Caution.

5. Install the exhaust manifold (3)
6. Install the new exhaust manifold nuts and tighten to 20â€‰N-m (18â€‰lbâ€‰ft).

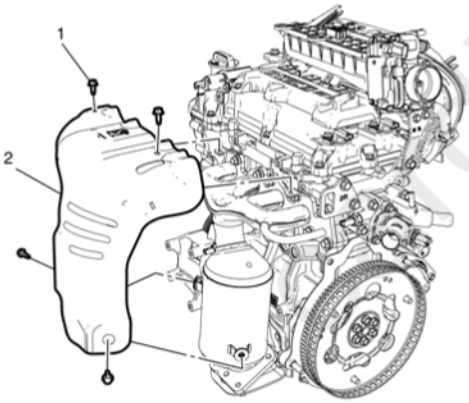
## Related Part Information

| Part Name | Catalog Name | Part Code |
|---|---|---|
| Exhaust Manifold | MANIFOLD,EXH(W/TURBO) | 0024A |
| Exhaust Manifold | MANIFOLD,EXH | 0025A |
| Exhaust Manifold | MANIFOLD,EXH(W/H/SHLD) | 0025B |
| Exhaust Manifold | MANIFOLD,EXH(W/C/OVR PIPE & H/SHLD) | 0025C |
| Exhaust Manifold | MANIFOLD,EXH(W/C/OVR PIPE) | 0025D |
| Exhaust Manifold | MANIFOLD,EXH(W/CTLTC CONV) | 0025H |
| Exhaust Manifold | MANIFOLD,EXH(W/OXIDN CTLTC CONV) | 0025J |
| Exhaust Manifold | MANIFOLD,EXH(W/3WAY + OXIDN CTLTC CONV) | 0025K |
| Exhaust Manifold | MANIFOLD,EXH(W/3WAY CTLTC CONV) | 0025L |
| Exhaust Manifold | MANIFOLD,EXH(W/W/UP OXIDN CTLTC CONV) | 0025M |
| Exhaust Manifold | MANIFOLD,EXH(W/W/UP 3WAY CTLTC CONV) | 0025N |
| Exhaust Manifold | MANIFOLD,EXH | X0005 |
| Exhaust Manifold | MANIFOLD,EXH(CSTG) | X0010 |
| Exhaust Manifold | MANIFOLD,EXH | X0013 |
| Exhaust Manifold | MANIFOLD,EXH | X0014 |
| Exhaust Manifold | MANIFOLD,EXH (BLANK) | X0025 |
| Exhaust Manifold | MANIFOLD,EXH (MCHG) | X0048 |
| Exhaust Manifold | MANIFOLD KIT,EXH | X0049 |
| Exhaust Manifold | MANIFOLD,EXH (LH PROC) (RPR) | X0050 |
| Exhaust Manifold | MANIFOLD,EXH (RH PROC) (RPR) | X0051 |
| Exhaust Manifold | MANIFOLD,EXH | SJ564 |

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1. ENGINE/PROPULSION
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. REPAIR INSTRUCTIONS
4.

## Exhaust Manifold Heat Shield Installation (LKY)




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1. Click here for full size
2. Install the exhaust manifold heat shieldâ€‰(2).
3. Caution:

   Refer to Fastener Caution.
4. Install the 4â€‰exhaust manifold heat shield boltsâ€‰(1) and tighten to 9â€‰N-m (80â€‰lbâ€‰in).

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Specifications

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. SPECIFICATIONS
4.

## Fastener Specifications

Single Use Non-Threaded Fasteners/Components

| Application |
|---|
| Note:<br><br>All fasteners/components listed in this table MUST BE DISCARDED and replaced with NEW after removal. |
| A/C suction/discharge pipe sealing O-ring |
| Camshaft Cover Gasket |
| Crankshaft Front Oil Seal |
| Crankshaft Rear Oil Seal Housing Gasket |
| Crankshaft Rear Oil Seal |
| Cylinder Head Bolt Washer |
| Cylinder Head Gasket |
| Exhaust Gas Recirculation Pipe Gasket |
| Engine Water Outlet Adapter Gasket |
| Exhaust Manifold Gasket |
| Lower Intake Manifold Gasket |
| Oil Level Indicator Tube Gasket |
| Oil Pan Seal Ring |
| Piston Ring |
| Throttle Body Seal |
| Timing Chain Tensioner Gasket |
| Valve Stem Oil Seal |

Single Use Threaded Fastener/Component Tightening Specifications

| Application | Specification |
|---|---|
| | Metric (English) |
| Note:<br><br>All fasteners/components listed in this table MUST BE DISCARDED and replaced with NEW after removal. | |
| Connecting Rod Bearing Cap Bolt | |
| • First Pass: | 20â€‰N-mâ€‰(15â€‰lbâ€‰ft) |
| • Final Pass: | 90â€‰Degrees |
| Crankshaft Balancer Bolt (LKY) | |
| • First Pass: | 95â€‰N-mâ€‰(70â€‰lbâ€‰ft) |
| • Final Pass: | 55â€‰Degrees |
| Crankshaft Balancer Bolt | 85â€‰N-mâ€‰(63â€‰lbâ€‰ft) |
| Cylinder Head Bolt | |
| • First Pass: | 22â€‰N-mâ€‰(16â€‰lbâ€‰ft) |
| • Final Pass: | 102â€‰Degrees |
| Engine Block Oil Gallery Plug | 12.5â€‰N-mâ€‰(9â€‰lbâ€‰ft) |
| Exhaust Manifold Bolt | 20â€‰N-mâ€‰(15â€‰lbâ€‰ft) |
| Exhaust Manifold Nut | 20â€‰N-mâ€‰(15â€‰lbâ€‰ft) |
| Flywheel Retaining Bolt | 25â€‰N-mâ€‰+ 35Â°â€‰(18â€‰lbâ€‰ftâ€‰+ 35Â°) |
| Water Pump Bolt | 25â€‰N-mâ€‰(18â€‰lbâ€‰ft) |

Reusable Threaded Fastener Tightening Specifications

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| Application | Specification |
|---|---|
| | Metric (English) |
| Note:<br><br>All fasteners listed in this table can be reused after removal. | |
| A/C Compressor Bracket Retaining Bolt | 22â€‰N-mâ€‰(16â€‰lbâ€‰ft) |
| A/C Compressor Retaining Bolt | 22â€‰N-mâ€‰(16â€‰lbâ€‰ft) |
| Camshaft Bearing Cap Retaining Bolt | 10â€‰N-mâ€‰(89â€‰lbâ€‰in) |
| Camshaft Cover Retaining Bolt | 10â€‰N-mâ€‰(89â€‰lbâ€‰in) |
| Camshaft Position Sensor Retaining Bolt | 12â€‰N-mâ€‰(106â€‰lbâ€‰in) |
| Camshaft Sprocket Retaining Bolt | 60â€‰N-mâ€‰(44â€‰lbâ€‰ft) |
| Canister Purge Valve Retaining Bolt | 9â€‰N-mâ€‰(80â€‰lbâ€‰in) |
| Clutch Pressure Plate | 36â€‰N-mâ€‰(27â€‰lbâ€‰ft) |
| Connecting Rod Bearing Cap Retaining Bolt | 33â€‰N-mâ€‰(24â€‰lbâ€‰ft) |
| Coolant Surge Tank Retaining Bolt | 9â€‰N-mâ€‰(80â€‰lbâ€‰in) |
| Cradle â€“ Body Mounting Retaining Bolt | 170â€‰N-mâ€‰(125â€‰lbâ€‰ft) |
| Crankshaft Bearing Cap Retaining Bolt | 57â€‰N-mâ€‰(42â€‰lbâ€‰ft) |
| Crankshaft Pulley Retaining Bolt | 85â€‰N-mâ€‰(63â€‰lbâ€‰ft) |
| Crankshaft Rear Oil Seal Housing Retaining Bolt | 10â€‰N-mâ€‰(89â€‰lbâ€‰in) |
| Drive Tensioner Inner Bolt | 45â€‰N-mâ€‰(33â€‰lbâ€‰ft) |
| EGR Pipe Bolt | 8â€‰N-mâ€‰(71â€‰lbâ€‰in) |
| EGR Pipe Retaining Nut | 10â€‰N-mâ€‰(89â€‰lbâ€‰in) |
| EGR Valve Retaining Nut | 22â€‰N-mâ€‰(16â€‰lbâ€‰ft) |
| Engine Block Core Hole Plate | 10â€‰N-mâ€‰(89â€‰lbâ€‰in) |
| Engine Coolant Outlet Case Retaining Boltâ€‰(2â€‰EA), Nutâ€‰(2â€‰EA) | 20â€‰N-mâ€‰(15â€‰lbâ€‰ft) |
| Engine Coolant Outlet Case Stud | 20â€‰N-mâ€‰(15â€‰lbâ€‰ft) |
| Engine Coolant Thermostat housing Retaining Bolt | 10â€‰N-mâ€‰(89â€‰lbâ€‰in) |
| Engine Front Cover Retaining Bolt | 20â€‰N-mâ€‰(15â€‰lbâ€‰ft) |
| Engine Lift Front Bracket | 10â€‰N-mâ€‰(89â€‰lbâ€‰in) |
| Engine Lift Rear Bracket | 10â€‰N-mâ€‰(89â€‰lbâ€‰in) |
| Engine Mount â€“ Body Retaining Bolt | 50â€‰N-mâ€‰(44â€‰lbâ€‰ft) |
| Engine Mount â€“ Engine Retaining Bolt | 58â€‰N-mâ€‰(50â€‰lbâ€‰ft) |
| Engine Mount â€“ Engine Retaining Nut | 58â€‰N-mâ€‰(50â€‰lbâ€‰ft) |
| Engine Oil Pressure Switch | 18â€‰N-mâ€‰(13â€‰lbâ€‰ft) |
| Engine Wiring Harness â€“ Cylinder Block Ground Retaining Bolt | 50â€‰N-mâ€‰(44â€‰lbâ€‰ft) |
| Exhaust Manifold Studâ€‰(9â€‰EA) | 25â€‰N-mâ€‰(18â€‰lbâ€‰ft) |
| Generator Bracket Retaining Bolt | 25â€‰N-mâ€‰+ 25Â°â€‰(18â€‰lbâ€‰ftâ€‰+ 25Â°) |
| Generator Lower Retaining Bolt, Nut | 22â€‰N-mâ€‰(16â€‰lbâ€‰ft) |
| Generator Upper Retaining Bolt | 22â€‰N-mâ€‰(16â€‰lbâ€‰ft) |
| Ignition Coil Bracket Retaining Bolt | 9â€‰N-mâ€‰(80â€‰lbâ€‰in) |
| Ignition Coil Retaining Bolt | 10â€‰N-mâ€‰(89â€‰lbâ€‰in) |
| Intake Manifold Front Bracket Lower Retaining Bolt (2â€‰EA) | 20â€‰N-mâ€‰(15â€‰lbâ€‰ft) |
| Intake Manifold Front Bracket Upper Retaining Bolt (2â€‰EA) | 20â€‰N-mâ€‰(15â€‰lbâ€‰ft) |
| Intake Manifold Rear Bracket Lower Retaining Bolt (1â€‰EA) (LMT, LC5) | 45â€‰N-mâ€‰(33â€‰lbâ€‰ft) |
| Intake Manifold Rear Bracket Lower Retaining Bolt (1â€‰EA) (LMU) | 58â€‰N-mâ€‰(43â€‰lbâ€‰ft) |
| Intake Manifold Rear Bracket Upper Retaining Bolt (2â€‰EA) (LMT, LC5) | 20â€‰N-mâ€‰(15â€‰lbâ€‰ft) |
| Intake Manifold Rear Bracket Upper Retaining Bolt (2â€‰EA) (LMU) | 22â€‰N-mâ€‰(16â€‰lbâ€‰ft) |
| Intake Manifold Retaining Bolt (Rear Cylinder Head â€“ Intake Manifold 5â€‰EA) | 10â€‰N-mâ€‰(89â€‰lbâ€‰in) |
| Intake Manifold Retaining Nut (Rear Cylinder Head â€“ Intake Manifold 5â€‰EA) | 10â€‰N-mâ€‰(89â€‰lbâ€‰in) |
| Intake Manifold Side Bracket Lower Retaining Bolt (1â€‰EA) | 20â€‰N-mâ€‰(15â€‰lbâ€‰ft) |
| Intake Manifold Side Bracket Upper Retaining Bolt (2â€‰EA) | 10â€‰N-mâ€‰(89â€‰lbâ€‰in) |
| Intake Manifold Stud (5â€‰EA) | 10â€‰N-mâ€‰(89â€‰lbâ€‰in) |

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| Application | Specification |
|---|---|
| | Metric (English) |
| Knock Sensor Retaining Bolt | 20â€‰N-mâ€‰(15â€‰lbâ€‰ft) |
| MAP Sensor Retaining Bolt | 8â€‰N-mâ€‰(71â€‰lbâ€‰in) |
| Oil Filter | 14â€‰N-mâ€‰(124â€‰lbâ€‰in) |
| Oil Filter Stud | 22â€‰N-mâ€‰(16â€‰lbâ€‰ft) |
| Oil Level Indicator Tube Retaining Bolt | 10â€‰N-mâ€‰(89â€‰lbâ€‰in) |
| Oil Pan Drain Plug | 40â€‰N-mâ€‰(30â€‰lbâ€‰ft) |
| Oil Pan Retaining Bolt | 10â€‰N-mâ€‰(89â€‰lbâ€‰in) |
| Oil Pan Retaining Nut | 10â€‰N-mâ€‰(89â€‰lbâ€‰in) |
| Oil Pump Suction Pipe Retaining Bolt (2â€‰EA) | 10â€‰N-mâ€‰(89â€‰lbâ€‰in) |
| Oxygen Sensor | 41â€‰N-mâ€‰(30â€‰lbâ€‰ft) |
| Power Steering Pump Bracket Retaining Bolt | 22â€‰N-mâ€‰(16â€‰lbâ€‰ft) |
| Power Steering Pump Retaining Bolt | 22â€‰N-mâ€‰(16â€‰lbâ€‰ft) |
| Power Steering Surge Tank Retaining Bolt | 9â€‰N-mâ€‰(80â€‰lbâ€‰in) |
| Spark Plug (Gas and LPG) | 27â€‰N-mâ€‰(20â€‰lbâ€‰ft) |
| Spark Plug (LPG) | 27â€‰N-mâ€‰(20â€‰lbâ€‰ft) |
| Throttle Body Retaining Bolt (4â€‰EA) | 11â€‰N-mâ€‰(97â€‰lbâ€‰in) |
| Timing Chain Guide Retaining Bolt (2â€‰EA) | 10â€‰N-mâ€‰(89â€‰lbâ€‰in) |
| Timing Chain Shoe Retaining Bolt (1â€‰EA) | 10â€‰N-mâ€‰(89â€‰lbâ€‰in) |
| Timing Chain Tensioner Retaining Bolt (2â€‰EA) | 10â€‰N-mâ€‰(89â€‰lbâ€‰in) |
| Transmission Mount â€“ Body Retaining Bolt | 50â€‰N-mâ€‰(37â€‰lbâ€‰ft) |
| Transmission Mount â€“ Transmission Retaining Bolt | 75â€‰N-mâ€‰(55â€‰lbâ€‰ft) |
| Transmission Mount â€“ Transmission Retaining Nut | 75â€‰N-mâ€‰(55â€‰lbâ€‰ft) |
| Upper Camshaft Cover Retaining Bolt | 10â€‰N-mâ€‰(89â€‰lbâ€‰in) |

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. SPECIFICATIONS
4.

## Approximate Fluid Capacities

| Application | Specification | |
|---|---|---|
| | Metric | US English |
| 1.0â€‰L DOHC B10D Engine | | |
| • Oil Capacity - with Filter | 3.75â€‰L | 3.96â€‰qt |
| • Oil Capacity - without Filter | 3.50â€‰L | 3.70â€‰qt |
| 1.2â€‰L DOHC B12D Engine | | |
| • Oil Capacity - with Filter | 3.75â€‰L | 3.96â€‰qt. |
| • Oil Capacity - without Filter | 3.50â€‰L | 3.70â€‰qt. |

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. SPECIFICATIONS
4.

## Engine Mechanical Specifications (LKY)

1.2L (LKY)

| Application | Specification | |
|---|---|---|
| | Metric | English |
| General Data | | |
| • Engine Type | 4â€‰Cylinder (In-Line) | |
| • Displacement | 1249â€‰cmÂ³ | |
| • Bore â€“ Stroke | 70.5â€“80â€‰mm | 2.7756â€“ 3.1496â€‰in |
| • Compression Ratio | 10.5 | |
| • Firing Order | 1-3-4-2 | |
| • Engine Idle Speed | 670 RPM (A/C OFF)<br>800 RPM (A/C ON) | |
| Cylinder Bore | | |
| • Diameter | 70.5â€‰mm | 2.7756â€‰in |
| • Out of Round (Maximum) | 0.0005â€‰mm | 0.0000197â€‰in |
| Piston | | |
| • Diameter | 70.5â€‰mm | 2.7756â€‰in |
| • Clearance to Bore | 0.023â€“0.053â€‰mm | 0.00091â€“0.00209â€‰in |
| Piston Rings | | |
| Piston Ring End Gap | | |
| • Top Ring | 0.15â€“0.30â€‰mm | 0.0059â€“0.0118â€‰in |
| • 2nd Ring | 0.30â€“0.45â€‰mm | 0.0118â€“0.0177â€‰in |
| • Oil Ring | 0.20â€“0.70â€‰mm | 0.0079â€“0.0276â€‰in |
| Groove Clearance | | |
| • Top Ring | 0.03â€“0.07â€‰mm | 0.00118â€“0.00276â€‰in |
| • 2nd Ring | 0.03â€“0.07â€‰mm | 0.00118â€“0.00276â€‰in |
| • Oil Ring | 0.04â€“0.12â€‰mm | 0.00157â€“0.00472â€‰in |
| Piston Pin | | |
| • Diameter | 17.996â€“18.000â€‰mm | 0.7085â€“0.7087â€‰in |
| • Pin Clearance | 0.006â€“0.014â€‰mm | 0.00024â€“0.00055â€‰in |
| Camshaft | | |
| • End Play | 0.08â€“0.26â€‰mm | 0.00314â€“0.01024â€‰in |
| Journal OD | | |
| • No.â€‰1 | 31.934â€“31.95â€‰mm | 1.2572â€“1.2579â€‰in |
| • No.â€‰2 | 22.939â€“22.96â€‰mm | 0.9031â€“0.9039â€‰in |
| | | |

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| Application | Specification | |
|---|---|---|
| | Metric | English |
| • No.â€‰3 | 22.939â€“22.96â€‰mm | 0.9031â€“0.9039â€‰in |
| • No.â€‰4 | 22.939â€“22.96â€‰mm | 0.9031â€“0.9039â€‰in |
| • No.â€‰5 | 22.939â€“22.96â€‰mm | 0.9031â€“0.9039â€‰in |
| Journal ID | | |
| • No.â€‰1 | 32â€“32.021â€‰mm | 1.2598â€“1.2607â€‰in |
| • No.â€‰2 | 23â€“23.021â€‰mm | 0.9055â€“0.9063â€‰in |
| • No.â€‰3 | 23â€“23.021â€‰mm | 0.9055â€“0.9063â€‰in |
| • No.â€‰4 | 23â€“23.021â€‰mm | 0.9055â€“0.9063â€‰in |
| • No.â€‰5 | 23â€“23.021â€‰mm | 0.9055â€“0.9063â€‰in |
| Crankshaft | | |
| Main Journal | | |
| • Diameter (All) | 48.979â€“48.995â€‰mm | 1.9283â€“1.9289â€‰in |
| • Main Bearing Clearance (All) | 0.018â€“0.058â€‰mm | 0.00071â€“0.00228â€‰in |
| • Crankshaft End Play | 0.08â€“0.29â€‰mm | 0.00314â€“0.01142â€‰in |
| Connecting Rod Journal | | |
| • Diameter (All) | 37.979â€“37.995â€‰mm | 1.4952â€“1.4959â€‰in |
| • Rod Bearing Clearance (All) | 0.02â€“0.06â€‰mm | 0.00079â€“0.00236â€‰in |
| • End Play | 0.1â€“0.25â€‰mm | 0.00393â€“0.00984â€‰in |
| Valve System | | |
| Seat Inner Diameter | | |
| • Intake | 23.862â€‰mm | 0.9394â€‰in |
| • Exhaust | 21.079â€‰mm | 0.8299â€‰in |
| • Valve Guide Inside Diameter (All) | 5.0â€“5.012â€‰mm | 0.1969â€“0.1973â€‰in |
| Valve Stem Diameter | | |
| • Intake | 4.972 Â± 0.007â€‰mm | 0.1957 Â± 0.00028â€‰in |
| • Exhaust | 4.963â€“0.007â€‰mm | 0.1954â€“0.00028â€‰in |
| Valve Length | | |
| • Intake | 98.945â€“99.395â€‰mm | 3.895â€“3.913â€‰in |
| • Exhaust | 99.785â€“100.235â€‰mm | 3.929â€“3.946â€‰in |
| Valve Spring | | |
| • Free Length | 44.33â€‰mm | 1.745â€‰in |
| • Valve Closed | 118 N-m (36.53â€‰lbâ€‰ft) @ 34â€‰mm (1.34â€‰in) | |

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. SPECIFICATIONS
4.

## Engine Mechanical Specifications

1.0L (LMT)

| Application | Specification | |
|---|---|---|
| | Metric | English |
| General Data | | |
| • Engine Type | 4â€‰Cylinder (In-Line) | |
| • Displacement | 995â€‰cmÂ³ | |
| • Bore â€“ Stroke | 68.5â€“67.5â€‰mm | 2.6968â€“ 2.6574â€‰in |
| • Compression Ratio | 9.8 | |
| • Firing Order | 1-3-4-2 | |
| • Engine Idle Speed | 670 RPM (A/C OFF)<br>800 RPM (A/C ON) | |
| Cylinder Bore | | |
| • Diameter | 68.51â€‰mm | 2.6972â€‰in |
| • Out of Round (Maximum) | 0.005â€‰mm | 0.000197â€‰in |
| Piston | | |
| • Diameter | 68.472â€‰mm | 2.6957â€‰in |
| • Clearance to Bore | 0.038 Â± 0.015â€‰mm | 0.001496 Â± 0.000591â€‰in |
| Piston Rings | | |
| Piston Ring End Gap | | |
| • Top Ring | 0.15â€“0.30â€‰mm | 0.0059â€“0.0118â€‰in |
| • 2nd Ring | 0.30â€“0.45â€‰mm | 0.0118â€“0.0177â€‰in |
| • Oil Ring | 0.20â€“0.70â€‰mm | 0.0078â€“0.0275â€‰in |
| Groove Clearance | | |
| • Top Ring | 0.03â€“0.07â€‰mm | 0.00078â€“0.00236â€‰in |
| • 2nd Ring | 0.03â€“0.07â€‰mm | 0.00078â€“0.00236â€‰in |
| • Oil Ring | 0.04â€“0.12â€‰mm | 0.00157â€“0.00472â€‰in |
| Piston Pin | | |
| • Diameter | 16.995â€“17.000â€‰mm | 0.6691â€“0.6693â€‰in |
| • Pin Clearance | 0.006 Â± 0.019â€‰mm | 0.00078 Â± 0.00236â€‰in |
| Camshaft | | |
| • End Play | 0.08â€“0.26â€‰mm | 0.0032â€“0.0102â€‰in |
| Journal OD | | |
| • No.â€‰1 | 22.939â€“22.96â€‰mm | 0.9031â€“0.9039â€‰in |
| • No.â€‰2 | 22.939â€“22.96â€‰mm | 0.9031â€“0.9039â€‰in |

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| Application | Specification | |
|---|---|---|
| | Metric | English |
| • No.â€‰3 | 22.939â€“22.96â€‰mm | 0.9031â€“0.9039â€‰in |
| • No.â€‰4 | 22.939â€“22.96â€‰mm | 0.9031â€“0.9039â€‰in |
| • No.â€‰5 | 22.939â€“22.96â€‰mm | 0.9031â€“0.9039â€‰in |
| Journal ID | | |
| • No.â€‰1 | 23â€“23.021â€‰mm | 0.9055â€“0.9063â€‰in |
| • No.â€‰2 | 23â€“23.021â€‰mm | 0.9055â€“0.9063â€‰in |
| • No.â€‰3 | 23â€“23.021â€‰mm | 0.9055â€“0.9063â€‰in |
| • No.â€‰4 | 23â€“23.021â€‰mm | 0.9055â€“0.9063â€‰in |
| • No.â€‰5 | 23-23.021â€‰mm | 0.9055â€“0.9063â€‰in |
| Crankshaft | | |
| Main Journal | | |
| • Diameter (All) | 48.982â€“49.000â€‰mm | 1.9284â€“1.9291â€‰in |
| • Main Bearing Clearance (All) | 0.020â€“0.040â€‰mm | 0.00079â€“0.00158â€‰in |
| • Crankshaft End Play | 0.08â€“0.29â€‰mm | 0.0032â€“0.0102â€‰in |
| Connecting Rod Journal | | |
| • Diameter (All) | 41.000â€“41.018â€‰mm | 1.6142â€“1.6149â€‰in |
| • Rod Bearing Clearance (All) | 0.02â€“0.04â€‰mm | 0.0008â€“0.0016â€‰in |
| • End Play | 0.1â€“0.25â€‰mm | 0.0039â€“0.0177â€‰in |
| Valve System | | |
| Seat Inner Diameter | | |
| • Intake | 23.862â€‰mm | 0.9394â€‰in |
| • Exhaust | 21.079â€‰mm | 0.8299â€‰in |
| • Valve Guide Inside Diameter (All) | 5.0â€“5.012â€‰mm | 0.1968â€“0.1973â€‰in |
| Valve Stem Diameter | | |
| • Intake | 4.972 Â± 0.007â€‰mm | 0.9657â€“0.0002â€‰in |
| • Exhaust | 4.963â€“0.007â€‰mm | 0.1954â€“0.0002â€‰in |
| Valve Length | | |
| • Intake | 99.170.225â€‰mm | 3.904 Â± 0.009â€‰in |
| • Exhaust | 100.01 Â± 0.225â€‰mm | 3.937 Â± 0.009â€‰in |
| Valve Spring | | |
| • Free Length | 43.57â€‰mm | 1.715â€‰in |
| • Valve Closed | 260 Â± 13â€‰N (1919.6â€‰lbs) @ 32â€‰mm (1.25â€‰in) | |

1.19L (LC5)

| Application | Specification | |
|---|---|---|
| | Metric | English |
| General Data | | |
| | | |

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| Application | Specification | |
|---|---|---|
| | Metric | English |
| • Engine Type | 4â€‰Cylinder (In-Line) | |
| • Displacement | 1199â€‰cc | |
| • Bore â€“ Stroke | 69.5 Â± 0.05â€‰mm | 69.5 Â± 0.05â€‰mm |
| • Compression Ratio | 9.8 | |
| • Firing Order | 1-3-4-2 | |
| • Engine Idle Speed | 670 RPM (A/C OFF)<br>800 RPM (A/C ON) | |
| Cylinder Bore | | |
| • Diameter | 69.5â€‰mm | 2.7362â€‰in |
| • Out of Round (Maximum) | 0.0005â€‰mm | 0.0000197â€‰in |
| Piston | | |
| • Diameter | 69.465â€‰mm | 2.7348â€‰in |
| • Clearance to Bore | 0.035 Â± 0.00â€‰ mm | 0.00137 Â± 0.00027â€‰in |
| Piston Rings | | |
| Piston Ring End Gap | | |
| • Top Ring | 0.15â€“0.30â€‰mm | 0.0059â€“0.0118â€‰in |
| • 2nd Ring | 0.30â€“0.45â€‰mm | 0.0118â€“0.0177â€‰in |
| • Oil Ring | 0.20â€“0.70â€‰mm | 0.0078â€“0.0275â€‰in |
| Groove Clearance | | |
| • Top Ring | 0.02â€“0.06â€‰mm | 0.0007874â€“0.002362â€‰in |
| • 2nd Ring | 0.02â€“0.06â€‰mm | 0.0007874â€“0.002362â€‰in |
| • Oil Ring | 0.04â€“0.12â€‰mm | 0.00157â€“0.00472â€‰in |
| Piston Pin | | |
| • Diameter | 17.995â€“18.00â€‰ mm | 0.7084â€“0.7086â€‰in |
| • Pin Clearance | 0.006 Â± 0.019â€‰mm | 0.00078 Â± 0.00236â€‰in |
| Camshaft | | |
| • End Play | 0.08â€“0.26â€‰mm | 0.0032â€“0.0102â€‰in |
| Journal OD | | |
| • No.â€‰1 | 22.939â€“22.96â€‰mm | 0.9031â€“0.9039â€‰in |
| • No.â€‰2 | 22.939â€“22.96â€‰mm | 0.9031â€“0.9039â€‰in |
| • No.â€‰3 | 22.939â€“22.96â€‰mm | 0.9031â€“0.9039â€‰in |
| • No.â€‰4 | 22.939â€“22.96â€‰mm | 0.9031â€“0.9039â€‰in |
| • No.â€‰5 | 22.939â€“22.96â€‰mm | 0.9031â€“0.9039â€‰in |
| Journal ID | | |
| • No.â€‰1 | 23â€“23.021â€‰mm | 0.9055â€“0.9063â€‰in |

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| Application | Specification | |
|---|---|---|
| | Metric | English |
| • No.â€‰2 | 23â€“23.021â€‰mm | 0.9055â€“0.9063â€‰in |
| • No.â€‰3 | 23â€“23.021â€‰mm | 0.9055â€“0.9063â€‰in |
| • No.â€‰4 | 23â€“23.021â€‰mm | 0.9055â€“0.9063â€‰in |
| • No.â€‰5 | 23-23.021â€‰mm | 0.9055â€“0.9063â€‰in |
| Crankshaft | | |
| Main Journal | | |
| • Diameter (All) | 48.982â€“49.000â€‰mm | 1.9284â€“1.9291â€‰in |
| • Main Bearing Clearance (All) | 0.020â€“0.040â€‰mm | 0.00079â€“0.00158â€‰in |
| • Crankshaft End Play | 0.08â€“0.29â€‰mm | 0.0032â€“0.0102â€‰in |
| Connecting Rod Journal | | |
| • Diameter (All) | 41.000â€“41.018â€‰mm | 1.6142â€“1.6149â€‰in |
| • Rod Bearing Clearance (All) | 0.02â€“0.04â€‰mm | 0.0008â€“0.0016â€‰in |
| • End Play | 0.1â€“0.25â€‰mm | 0.0039â€“0.0177â€‰in |
| Valve System | | |
| Seat Inner Diameter | | |
| • Intake | 23.862â€‰mm | 0.9394â€‰in |
| • Exhaust | 21.079â€‰mm | 0.8299â€‰in |
| • Valve Guide Inside Diameter (All) | 5.0â€“5.012â€‰mm | 0.1968â€“0.1973â€‰in |
| Valve Stem Diameter | | |
| • Intake | 4.972â€‰Â±â€‰0.007â€‰mm | 0.9657â€“0.0002â€‰in |
| • Exhaust | 4.963â€“0.007â€‰mm | 0.1954â€“0.0002â€‰in |
| Valve Length | | |
| • Intake | 99.170.225â€‰mm | 3.904â€‰Â±â€‰0.009â€‰in |
| • Exhaust | 100.01â€‰Â±â€‰0.225â€‰mm | 3.937â€‰Â±â€‰0.009â€‰in |
| Valve Spring | | |
| • Free Length | 43.57â€‰mm | 1.715â€‰in |
| • Valve Closed | 260â€‰Â±â€‰13â€‰N (1919.6â€‰lbs) @ 32â€‰mm (1.25â€‰in) | |

1.2L (LMU)

| Application | Specification | |
|---|---|---|
| | Metric | English |
| General Data | | |
| • Engine Type | 4â€‰Cylinder (In-Line) | |
| • Displacement | 1206â€‰cmÂ³ | |
| • Bore â€“ Stroke | 69.7â€“79â€‰mm | 2.744â€‰in |
| • Compression Ratio | 9.8 | |
| • Firing Order | 1-3-4-2 | |

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| Application | Specification | |
|---|---|---|
| | Metric | English |
| • Engine Idle Speed | 670 RPM (A/C OFF)<br>800 RPM (A/C ON) | |
| Cylinder Bore | | |
| • Diameter | 69.71â€‰mm | 2.7445â€‰in |
| • Out of Round (Maximum) | 0.005â€‰mm | 0.000197â€‰in |
| Piston | | |
| • Diameter | 69.672 | 2.7430â€‰in |
| • Clearance to Bore | 0.038 Â± 0.015â€‰mm | (0.0014.96 Â± 0.000591â€‰in) |
| Piston Rings | | |
| Piston Ring End Gap | | |
| • Top Ring | 0.15â€“0.30â€‰mm | 0.0059â€“0.0118â€‰in |
| • 2nd Ring | 0.30â€“0.45â€‰mm | 0.0118â€–0.0177â€‰in |
| • Oil Ring | 0.20â€–0.70â€‰mm | 0.0078â€–0.0275â€‰in |
| Groove Clearance | | |
| • Top Ring | 0.02â€–0.06â€‰mm | 0.0007874â€–0.002362â€‰in |
| • 2nd Ring | 0.02â€–0.06â€‰mm | 0.0007874â€–0.002362â€‰in |
| • Oil Ring | 0.04â€–0.12â€‰mm | 0.00157â€–0.00472â€‰in |
| Piston Pin | | |
| • Diameter | 16.995â€“17.000â€‰mm | 0.6691â€–0.6693â€‰in |
| • Pin Clearance | 0.006â€‰Â±â€‰0.019â€‰mm | 0.00078â€‰Â±â€‰0.00236â€‰in |
| Camshaft | | |
| • End Play | 0.08â€–0.26â€‰mm | 0.0032â€–0.0102â€‰in |
| Journal OD | | |
| • No.â€‰1 | 22.939â€“22.96â€‰mm | 0.9031â€–0.9039â€‰in |
| • No.â€‰2 | 22.939â€“22.96â€‰mm | 0.9031â€–0.9039â€‰in |
| • No.â€‰3 | 22.939â€“22.96â€‰mm | 0.9031â€–0.9039â€‰in |
| • No.â€‰4 | 22.939â€“22.96â€‰mm | 0.9031â€–0.9039â€‰in |
| • No.â€‰5 | 22.939â€“22.96â€‰mm | 0.9031â€–0.9039â€‰in |
| Journal ID | | |
| • No.â€‰1 | 23â€“23.021â€‰mm | 0.9055â€–0.9063â€‰in |
| • No.â€‰2 | 23â€“23.021â€‰mm | 0.9055â€–0.9063â€‰in |
| • No.â€‰3 | 23â€“23.021â€‰mm | 0.9055â€–0.9063â€‰in |
| • No.â€‰4 | 23â€“23.021â€‰mm | 0.9055â€–0.9063â€‰in |
| • No.â€‰5 | 23-23.021â€‰mm | 0.9055â€–0.9063â€‰in |
| Crankshaft | | |
| Main Journal | | |

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| Application | Specification | |
|---|---|---|
| | Metric | English |
| • Diameter (All) | 48.982â€“49.000â€‰mm | 1.9284â€“1.9291â€‰in |
| • Main Bearing Clearance (All) | 0.020â€“0.040â€‰mm | 0.00079â€“0.00158â€‰in |
| • Crankshaft End Play | 0.08â€“0.29â€‰mm | 0.0032â€“0.0102â€‰in |
| Connecting Rod Journal | | |
| • Diameter (All) | 41.000â€“41.018â€‰mm | 1.6142â€“1.6149â€‰in |
| • Rod Bearing Clearance (All) | 0.02â€“0.04â€‰mm | 0.0008â€“0.0016â€‰in |
| • End Play | 0.1â€“0.25â€‰mm | 0.0039â€“0.0177â€‰in |
| Valve System | | |
| Seat Inner Diameter | | |
| • Intake | 23.862â€‰mm | 0.9394â€‰in |
| • Exhaust | 21.079â€‰mm | 0.8299â€‰in |
| • Valve Guide Inside Diameter (All) | 5.0â€“5.012â€‰mm | 0.1968â€“0.1973â€‰in |
| Valve Stem Diameter | | |
| • Intake | 4.972â€‰Â±â€‰0.007â€‰mm | 0.9657â€“0.0002â€‰in |
| • Exhaust | 4.963â€“0.007â€‰mm | 0.1954â€“0.0002â€‰in |
| Valve Length | | |
| • Intake | 99.17 Â± 0.225â€‰mm | 3.9040.009â€‰in |
| • Exhaust | 100.01 Â± 0.225â€‰mm | 3.937 Â± 0.009â€‰in |
| Valve Spring | | |
| • Free Length | 43.57â€‰mm | 1.715â€‰in |
| • Valve Closed | 260 Â± 13â€‰N (1919.6â€‰lbs) @ 32â€‰mm (1.25â€‰in) | |

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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. SPECIFICATIONS
4.

## Adhesives, Fluids, Lubricants, and Sealers (LKY)

| Application | Type of Material | GM Part Number |
|---|---|---|
| Bolt Connections | Screw Locking Compound | Refer to Electronic Parts Catalog |
| Engine Block Oil Gallery Plug | Sealant | Refer to Electronic Parts Catalog |
| Engine Oil | Dexos 1, 5W-20<br><br>Extreme cold area â^'20Â°C below: 0W-20 or 0W-30 | Refer to Electronic Parts Catalog |
| First Camshaft Bearing Cap | Surface Sealant | Refer to Electronic Parts Catalog |
| Oil Pan | RTV Sealant | Refer to Electronic Parts Catalog |
| Oxygen Sensor | Assembly Paste | Refer to Electronic Parts Catalog |
| Seal Rings | Silicon Grease | Refer to Electronic Parts Catalog |

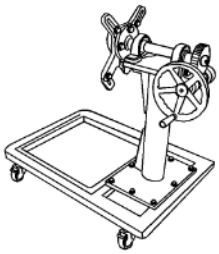
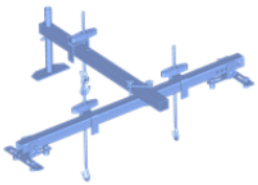
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Special Tools and Equipment

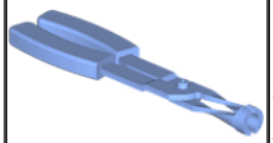
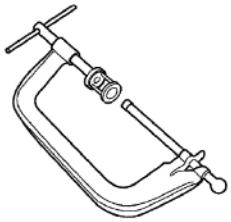
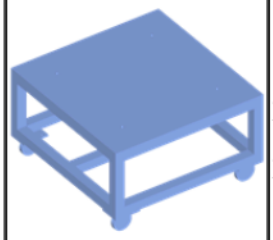
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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. SPECIAL TOOLS AND EQUIPMENT
4.

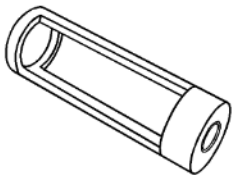
## Special Tools (LKY)

| Illustration | Tool Number/ Description |
|---|---|
|  Click here for full size | EN-50057<br>Engine Overhaul Stand |
|  Click here for full size | EN-36857<br>J-36857<br>Engine Lift Bracket |
|  Click here for full size | EN-28467-B<br>J-28467-B<br>Universal Engine Support Fixture |
| | |

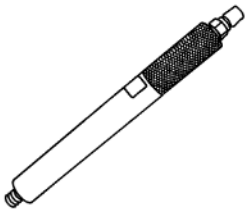
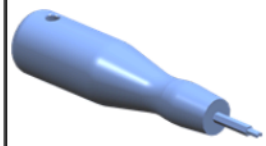
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| Illustration | Tool Number/ Description |
| --- | --- |
|  Click here for full size | EN-46116<br>Valve Stem Seal Remover |
|  Click here for full size | EN 46569<br>J-8062<br>Valve Spring Compressor (Off Vehicle) |
|  Click here for full size | EN-48244<br>Engine Assembly Remove/Install Pallet Supporter |
| | |

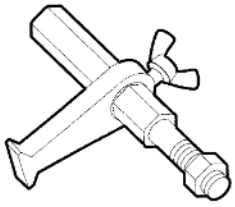
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| Illustration | Tool Number/ Description |
| --- | --- |
|  <br>Click here for full size | EN-49075<br>EN-50717<br>Valve Spring Compressor Adapter |

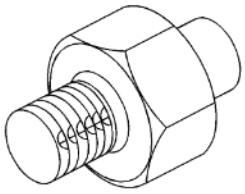
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| Illustration | Tool Number/ Description |
| --- | --- |
|  Click here for full size | EN-49076<br>Cylinder Pressure Adapter |
|  Click here for full size | EN-49941<br>Remover/Installer Piston Retainer Ring |

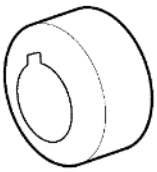
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| Illustration | Tool Number/ Description |
| --- | --- |
|  <br>Click here for full size | EN-50050<br>DT-47562<br>09924-17810<br>Crankshaft Locking Device (Off vehicle) |

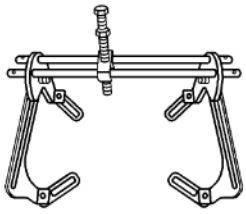
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| Illustration | Tool Number/ Description |
| --- | --- |
|  Click here for full size | EN-50170-01<br>Engine Oil Pressure Gauge Adapter |

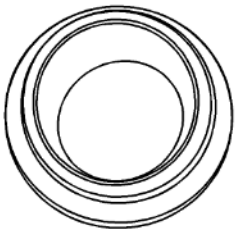
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| Illustration | Tool Number/ Description |
| --- | --- |
|  Click here for full size | EN-50172<br>Crankshaft Front Seal Installer |

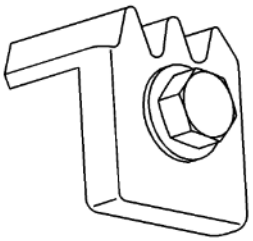
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| Illustration | Tool Number/ Description |
| --- | --- |
|  <br>Click here for full size | EN-50173<br>EN-50717<br>Universal Valve Spring Compressor |

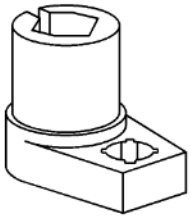
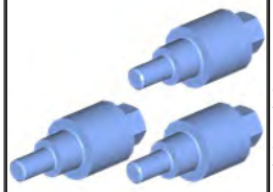
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| Illustration | Tool Number/ Description |
| --- | --- |
|  Click here for full size | EN-50174<br>J-8037<br>Piston Installer |

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| Illustration | Tool Number/ Description |
| --- | --- |
|  <br>Click here for full size | EN-50175<br>Crankshaft Locking Device (On Vehicle) |
| | |

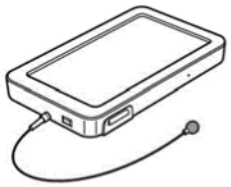
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| Illustration | Tool Number/ Description |
| --- | --- |
|  Click here for full size | EN-50207<br>Oil Pressure Switch Remover/Installer |
|  Click here for full size | EN-51768<br>Engine Support Fixture Adapter Bolts M8 |
|  Click here for full size | EN-52059<br>Engine Support Fixture Adapter Bolts M10 |

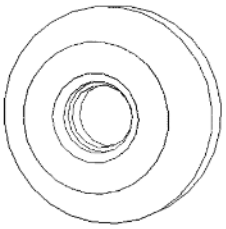
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| Illustration | Tool Number/ Description |
| --- | --- |
|  <br>Click here for full size | GE-42072<br>Cylinder Head Bolt Remover/Installer |
| | |

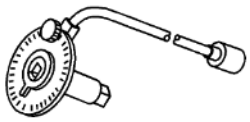
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| Illustration | Tool Number/ Description |
| --- | --- |
|  <br>Click here for full size | GE-50576<br>Acoustic Belt Tension Tester |

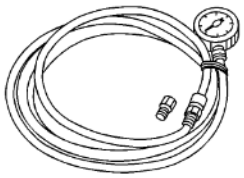
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| Illustration | Tool Number/ Description |
| --- | --- |
|  Click here for full size | J-45507<br>Crankshaft Rear Oil Seal Installer |

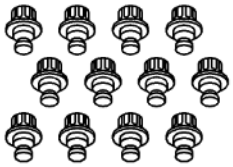
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| Illustration | Tool Number/ Description |
| --- | --- |
|  <br>Click here for full size | KM-470-B<br>J-45059<br>Angular Torque Gauge |

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| Illustration | Tool Number/ Description |
| --- | --- |
|  Click here for full size | KM-498-B<br>Pressure Gauge |

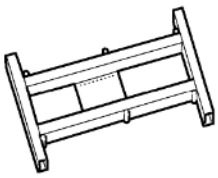
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| Illustration | Tool Number/ Description |
| --- | --- |
|  <br>Click here for full size | KM-845<br>Tappet Suction Device |

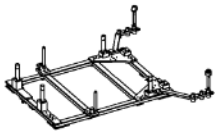
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1. **ENGINE/PROPULSION**
2. ENGINE MECHANICAL - 1.0L, 1.19L, OR 1.2L
3. SPECIAL TOOLS AND EQUIPMENT
4.

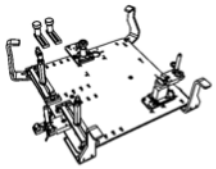
## Special Tools

| Illustration | Tool Number/ Description |
|---|---|
|  Click here for full size | CH-904<br>KM-904<br>Base Frame |

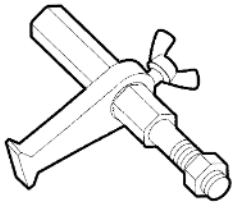
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| Illustration | Tool Number/ Description |
| --- | --- |
|  <br>Click here for full size | CH-49289<br>Centering Frame |
| | |

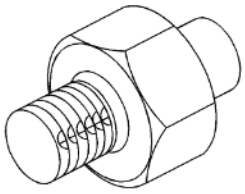
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| Illustration | Tool Number/ Description |
| --- | --- |
|  <br>Click here for full size | CH-49290<br>Engine Support Tool |

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| Illustration | Tool Number/ Description |
| --- | --- |
|  <br>Click here for full size | EN-50050<br>09924-17810<br>Crankshaft Locking Device(Off vehicle) |

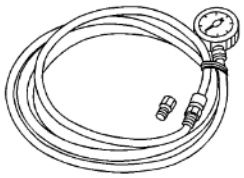
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| Illustration | Tool Number/ Description |
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|  Click here for full size | EN-50170-01<br>Engine Oil Pressure Gauge Adapter |

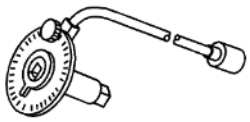
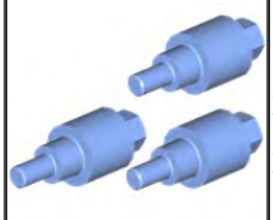
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| Illustration | Tool Number/ Description |
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|  <br>Click here for full size | DW100-030<br>EN-49271<br>Engine Overhaul Stand |
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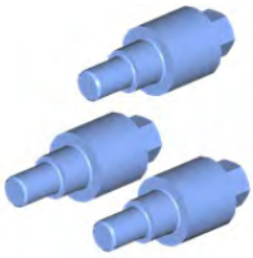
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| Illustration | Tool Number/ Description |
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|  Click here for full size | KM-498-B<br>Pressure Gauge |

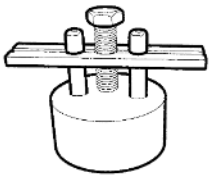
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| Illustration | Tool Number/ Description |
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|  <br>Click here for full size | KM-470-B<br>Angular Torque Gauge |
|  <br>Click here for full size | EN-51768<br>Engine Support Fixture Adapter Bolts M8 |
| | |

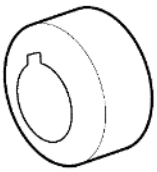
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| Illustration | Tool Number/ Description |
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|  Click here for full size | EN-52059<br>Engine Support Fixture Adapter Bolts M10 |

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| Illustration | Tool Number/ Description |
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|  <br>Click here for full size | EN-50171<br>Crankshaft Rear Seal Installer |

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| Illustration | Tool Number/ Description |
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|  Click here for full size | EN-50172<br>Crankshaft Front Seal Installer |

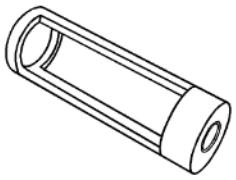
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| Illustration | Tool Number/ Description |
| --- | --- |
|  <br>Click here for full size | EN-49073<br>Timing Chain Tensioner Pin |

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| Illustration | Tool Number/ Description |
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|  <br>Click here for full size | EN-50173<br>Universal Valve Spring Compressor |

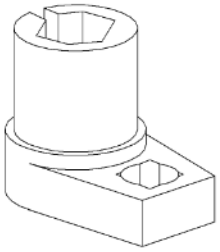
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| Illustration | Tool Number/ Description |
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|  <br>Click here for full size | EN-49075<br>Valve Spring Compressor Adapter |

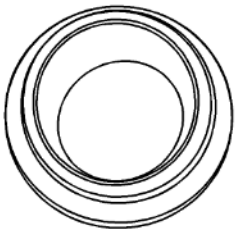
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| Illustration | Tool Number/ Description |
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|  Click here for full size | EN-49076<br>Cylinder Pressure Adapter |

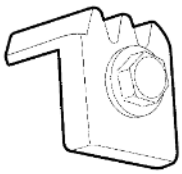
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| Illustration | Tool Number/ Description |
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|  Click here for full size | EN-49259<br>Oxygen Sensor Remover/ Installer |
|  Click here for full size | EN-36857<br>J-36857<br>Engine Lift Bracket |

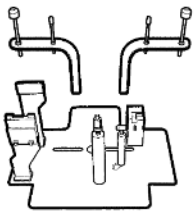
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| Illustration | Tool Number/ Description |
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|  <br>Click here for full size | EN-50174<br>Piston Installer |

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| Illustration | Tool Number/ Description |
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|  Click here for full size | EN-50175<br>Crankshaft Locking Device (on vehicle) |

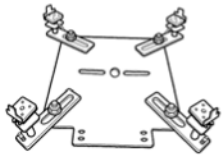
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| Illustration | Tool Number/ Description |
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|  <br>Click here for full size | EN-50176<br>Powertrain Support Pallet |

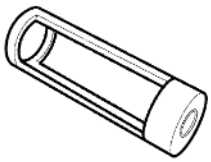
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| Illustration | Tool Number/ Description |
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|  <br>Click here for full size | EN-50177<br>Credle Supporter Holder |

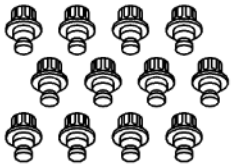
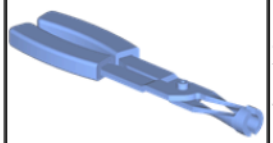
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| Illustration | Tool Number/ Description |
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|  <br>Click here for full size | EN-49802<br>Cradle Supporter |

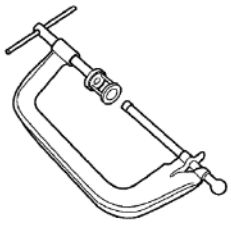
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| Illustration | Tool Number/ Description |
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|  Click here for full size | EN-48244<br>Engine Assembly Remove/Install Pallet Supporter |

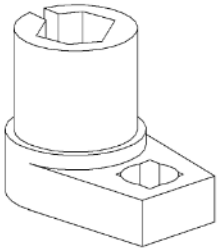
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| Illustration | Tool Number/ Description |
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|  <br>Click here for full size | KM-845<br>Tappet Suction Device |
|  <br>Click here for full size | EN-46116<br>Valve Stem Seal Remover |

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| Illustration | Tool Number/ Description |
| --- | --- |
|  <br>Click here for full size | EN 46569<br>Valve Spring Compressor (Off Vehicle) |
| | |

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| Illustration | Tool Number/ Description |
| --- | --- |
|  <br>Click here for full size | EN-50207<br>Oil Pressure Switch Remover/Installer |

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