

SECTION LU

ENGINE LUBRICATION SYSTEM

CONTENTS

VK56VD

PRECAUTION	3
PRECAUTIONS	3
Precaution for Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"	3
Liquid Gasket	3
Precautions For Engine Service	3
PREPARATION	5
PREPARATION	5
Special Service Tool	5
Commercial Service Tool	5
SYSTEM DESCRIPTION	7
LUBRICATION SYSTEM	7
Engine Lubrication System	7
Engine Lubrication System Schematic	8
PERIODIC MAINTENANCE	9
ENGINE OIL	9
Inspection	9
Draining	10
Refilling	10
OIL FILTER	11
Removal and Installation	11
Inspection	11
REMOVAL AND INSTALLATION	12
OIL COOLER	12
Exploded View	12
Removal and Installation	13
Inspection	15
OIL PUMP	17
Exploded View	17

Removal and Installation	17
Inspection	18

SERVICE DATA AND SPECIFICATIONS (SDS)

Periodical Maintenance Specification	19
Engine Oil Pressure	19

CUMMINS 5.0L

PRECAUTION

PRECAUTIONS	20
Precaution for Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"	20
Precaution for Liquid Gasket	20

PREPARATION

PREPARATION	22
Special Service Tool	22
Commercial Service Tool	23

SYSTEM DESCRIPTION

LUBRICATION SYSTEM	24
System Description	24
Schematic	28
Inspection	31

PERIODIC MAINTENANCE

ENGINE OIL	33
Inspection	33
Changing Engine Oil	35

OIL FILTER

Removal and Installation	36
--------------------------------	----

REMOVAL AND INSTALLATION	38	OIL PUMP	51
OIL COOLER	38	Exploded View	51
Exploded View	38	Removal and Installation	51
Removal and Installation	38		
ENGINE OIL DIPSTICK TUBE	42	OIL THERMOSTAT	55
Exploded View	42	Exploded View	55
Removal and Installation	42	Removal and Installation	55
OIL FILTER BYPASS VALVE	44	OIL CHECK VALVE	57
Exploded View	44	Exploded View	57
Removal and Installation	44	Removal and Installation	57
OIL FILTER HEAD ADAPTER	46	OIL PRESSURE SWITCH	59
Exploded View	46	Exploded View	59
Removal and Installation	46	Removal and Installation	59
OIL PRESSURE REGULATOR (MAIN RIFLE)		SERVICE DATA AND SPECIFICATIONS (SDS)	62
	... 48	Exploded View	62
Exploded View	48	Removal and Installation	62
Removal and Installation	48	Standard and Limit	62

< PRECAUTION >

PRECAUTION

PRECAUTIONS

Precaution for Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"

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The Supplemental Restraint System such as "AIR BAG" and "SEAT BELT PRE-TENSIONER", used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. Information necessary to service the system safely is included in the SR and SB section of this Service Manual.

WARNING:

- To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, it is recommended that all maintenance and repair be performed by an authorized NISSAN/INFINITI dealer.
- Improper repair, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the SR section.
- Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harnesses or harness connectors.

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PRECAUTIONS WHEN USING POWER TOOLS (AIR OR ELECTRIC) AND HAMMERS

WARNING:

- When working near the Air Bag Diagnosis Sensor Unit or other Air Bag System sensors with the Ignition ON or engine running, DO NOT use air or electric power tools or strike near the sensor(s) with a hammer. Heavy vibration could activate the sensor(s) and deploy the air bag(s), possibly causing serious injury.
- When using air or electric power tools or hammers, always switch the Ignition OFF, disconnect the battery or batteries, and wait at least three minutes before performing any service.

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Liquid Gasket

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LIQUID GASKET APPLICATION PROCEDURE

1. Remove old liquid gasket adhering to the liquid gasket application surface and the mating surface.
 - Remove liquid gasket completely from the liquid gasket application surface, mounting bolts, and bolt holes.
2. Wipe the liquid gasket application surface and the mating surface with white gasoline (lighting and heating use) to remove adhering moisture, grease and foreign materials.
3. Apply liquid gasket to the liquid gasket application surface.
Use Genuine RTV Silicone Sealant or equivalent. Refer to [GI-22, "Recommended Chemical Products and Sealants"](#).
 - Within five minutes of liquid gasket application, install the mating component.
 - If liquid gasket protrudes, wipe it off immediately.
 - Do not retighten mounting bolts or nuts after the installation.
 - After 30 minutes or more have passed from the installation, fill engine oil and engine coolant.

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Precautions For Engine Service

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DISCONNECTING FUEL PIPING

- Before starting work, check no fire or spark producing items are in the work area.
- Release fuel pressure before disconnecting and disassembly.
- After disconnecting pipes, plug openings to stop fuel leakage.

DRAINING ENGINE COOLANT

Drain engine coolant and engine oil when the engine is cooled.

INSPECTION, REPAIR AND REPLACEMENT

PRECAUTIONS

[VK56VD]

< PRECAUTION >

Before repairing or replacing, thoroughly inspect parts. Inspect new replacement parts in the same way, and replace if necessary.

REMOVAL AND DISASSEMBLY

- When instructed to use SST, use specified tools. Always be careful to work safely, avoid forceful or un instructed operations.
- Exercise maximum care to avoid damage to mating or sliding surfaces.
- Dowel pins are used for several parts alignment. When replacing and reassembling parts with dowel pins, check that dowel pins are installed in the original position.
- Must cover openings of engine system with a tape or equivalent, to seal out foreign materials.
- Mark and arrange disassembly parts in an organized way for easy troubleshooting and reassembly.
- When loosening nuts and bolts, as a basic rule, start with the one furthest outside, then the one diagonally opposite, and so on. If the order of loosening is specified, do exactly as specified. Power tools may be used in the step.

ASSEMBLY AND INSTALLATION

- Use torque wrench to tighten bolts or nuts to specification.
- When tightening nuts and bolts, as a basic rule, equally tighten in several different steps starting with the ones in center, then ones on inside and outside diagonally in this order. If the order of tightening is specified, do exactly as specified.
- Replace with new gasket, packing, oil seal or O-ring.
- Thoroughly wash, clean, and air-blow each part. Carefully check engine oil or engine coolant passages for any restriction and blockage.
- Avoid damaging sliding or mating surfaces. Completely remove foreign materials such as cloth lint or dust. Before assembly, oil sliding surfaces well.
- After disassembling, or exposing any internal engine parts, change engine oil and replace oil filter with a new one.
- Release air within route when refilling after draining engine coolant.
- After repairing, start the engine and increase engine speed to check engine coolant, fuel, engine oil, and exhaust gases for leakage.

< PREPARATION >

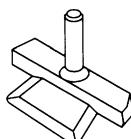
PREPARATION**PREPARATION****Special Service Tool**

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Tool number (TechMate No.) Tool name	Description
KV10111100 (J-37228) Seal cutter	Removing steel oil pan and rear timing chain case



NT046

Commercial Service Tool

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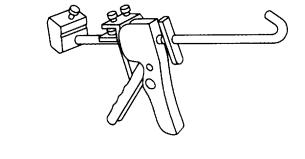
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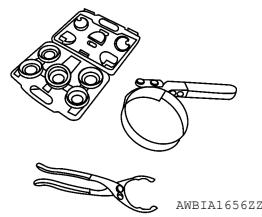
Tool name	Description
Tube presser	Pressing the tube of liquid gasket
Power tool	Loosening bolts, screws and nuts
Oil filter wrench assortment	Removing oil filter



S-NT052



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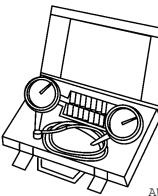
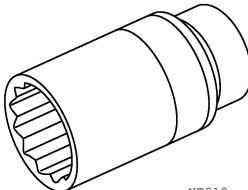


AWBIA1656Z2

PREPARATION

[VK56VD]

< PREPARATION >

Tool name	Description
Oil pressure kit	 AWBIA16572Z
Deep socket	 NT818

< SYSTEM DESCRIPTION >

SYSTEM DESCRIPTION**LUBRICATION SYSTEM****Engine Lubrication System**

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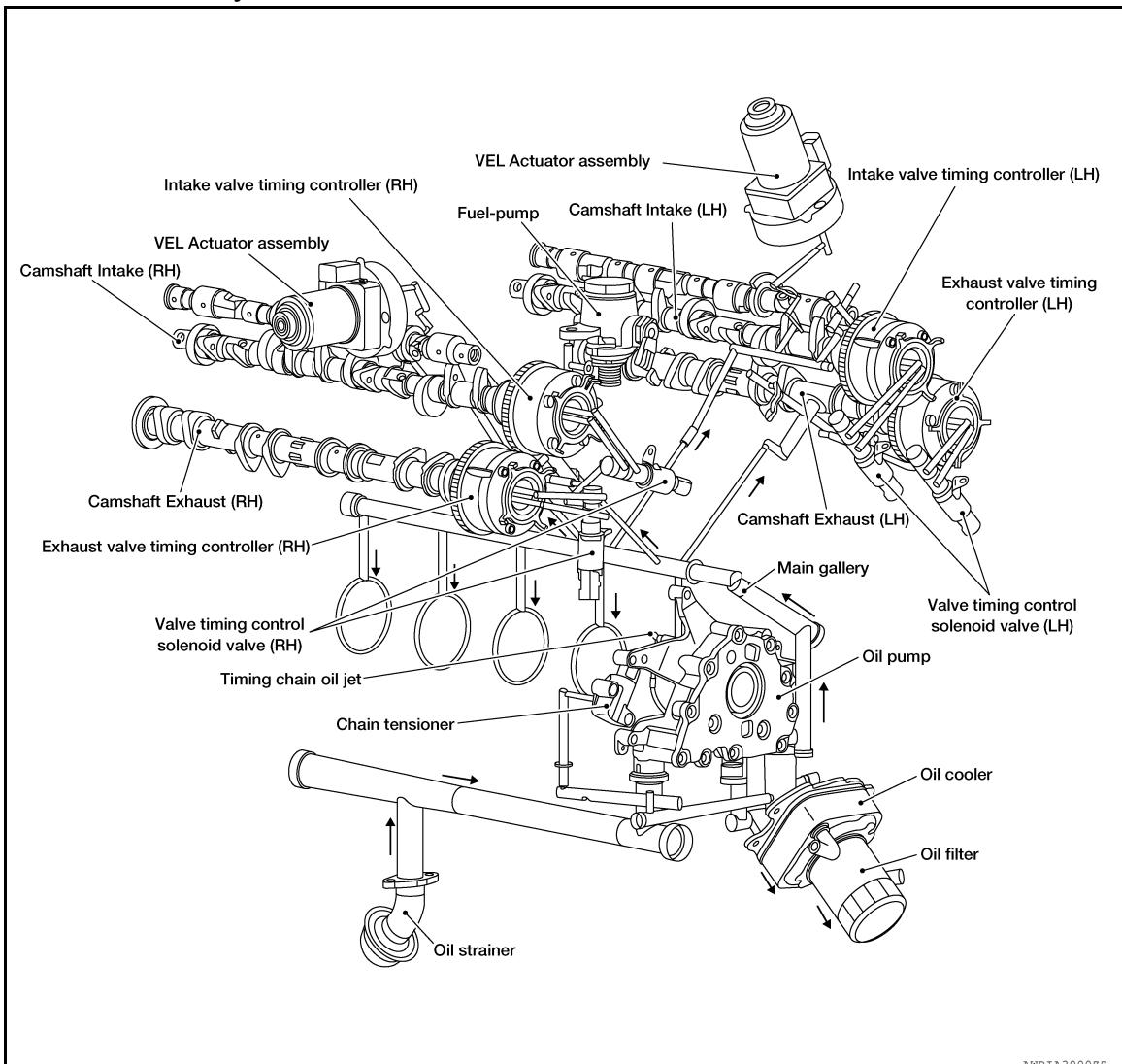
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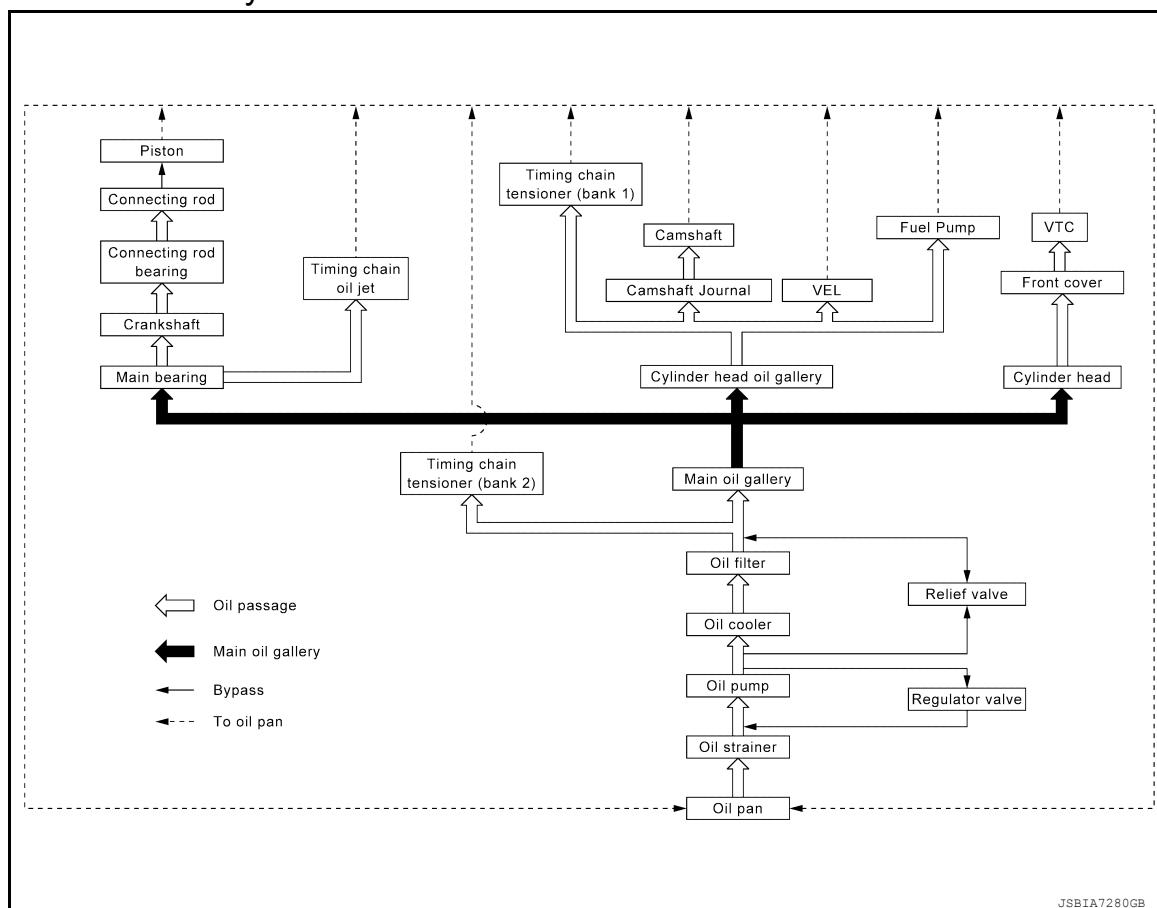
LUBRICATION SYSTEM

[VK56VD]

< SYSTEM DESCRIPTION >

Engine Lubrication System Schematic

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PERIODIC MAINTENANCE

ENGINE OIL

Inspection

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OIL LEVEL

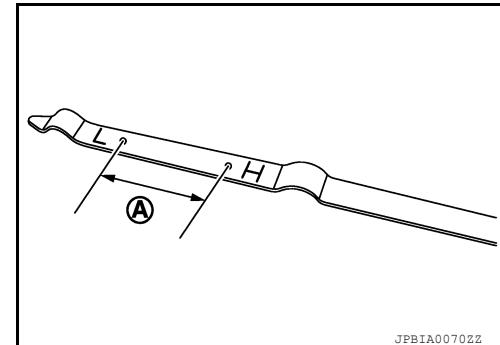
NOTE:

Before starting engine, put vehicle horizontally and check the engine oil level. If engine is already started, stop it and allow 10 minutes before checking.

1. Pull out oil level gauge and wipe it clean.
2. Insert oil level gauge and check the engine oil level is within the range (A) shown in the figure.
3. If it is out of range, adjust it.

CAUTION:

Do not overfill the engine with oil.



OIL APPEARANCE

- Check the engine oil for a white milky appearance or excessive contamination.
- If the engine oil is milky, it is highly probable that it is contaminated with engine coolant. Repair or replace damaged parts.

OIL LEAKAGE

Check for oil leakage around the following areas:

- Oil pan
- Oil pan drain plug
- Oil pressure sensor
- Oil filter
- Oil cooler
- Intake valve timing control cover
- Intake valve timing control solenoid valve
- Front cover
- Mating surface between cylinder block and cylinder head
- Mating surface between cylinder head and rocker cover
- Crankshaft oil seal (front and rear)

OIL PRESSURE CHECK

WARNING:

- Be careful not to burn yourself, as the engine and engine oil may be hot.
- Put the A/T shift selector in the Park "P" position.

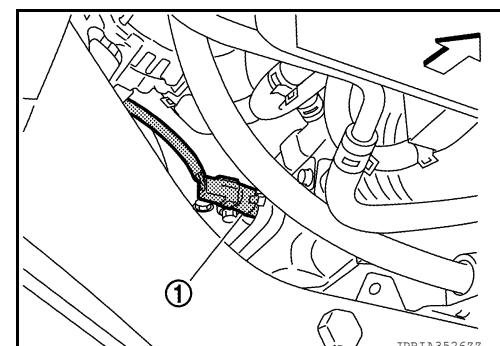
1. Check the engine oil level.
2. Remove front under cover.
3. Disconnect the oil pressure sensor (1) harness connector.

◀ : Front

4. Remove the oil pressure sensor.

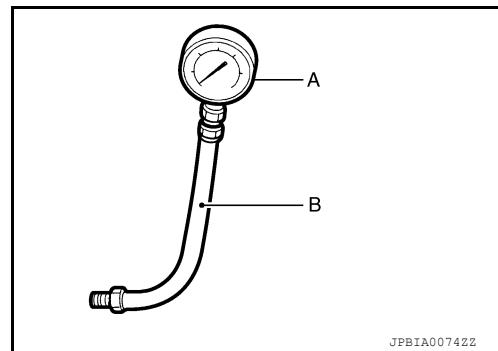
CAUTION:

Do not drop or shock oil pressure sensor.



< PERIODIC MAINTENANCE >

5. Install suitable tool (B) into oil pressure sensor hole and connect suitable tool (A).



JPBIA00742Z

6. Start the engine and warm it up to normal operating temperature.
 7. Check the engine oil pressure with engine running under no-load. Refer to [LU-19, "Engine Oil Pressure"](#).

CAUTION:

If the difference is extreme, check the oil passages and oil pump for leaks and blockages.

8. After the inspections, install oil pressure sensor as follows:
 a. Remove old liquid gasket adhering to oil pressure sensor and engine.
 b. Apply liquid gasket and tighten oil pressure sensor to the specification.
 Use Genuine RTV Silicone Sealant or equivalent. Refer to [GI-22, "Recommended Chemical Products and Sealants"](#).

Oil pressure sensor torque : Refer to [EM-70, "Exploded View"](#).

- c. After warming up engine, make sure there is no leakage of engine oil with engine running.

Draining

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WARNING:

- Be careful not to burn yourself, as the engine and engine oil may be hot.
- Prolonged and repeated contact with used engine oil may cause skin cancer; try to avoid direct skin contact with used oil. If skin contact is made, wash thoroughly with soap or hand cleaner as soon as possible.

1. Warm up the engine, and check for any oil leaks.
2. Stop the engine and wait for at least 10 minutes.
3. Remove drain plug and oil filler cap to drain the old oil.

Refilling

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1. Install drain plug with new washer.

CAUTION:

Be sure to clean drain plug and install with new washer.

Tightening torque : Refer to [EM-64, "Exploded View"](#).

2. Refill with new engine oil. Refer to [MA-13, "VK56VD Gasoline Engine : Fluids and Lubricants"](#).

CAUTION:

- The refill capacity depends on the engine oil temperature and drain time. Use these specifications for reference only.
- Always use oil level gauge to determine the proper amount of engine oil in engine.

3. Warm up the engine and check area around drain plug and oil filter for engine oil leakage.
4. Stop the engine and wait for 10 minutes.
5. Check the engine oil level. Refer to [LU-9, "Inspection"](#).

OIL FILTER

Removal and Installation

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REMOVAL

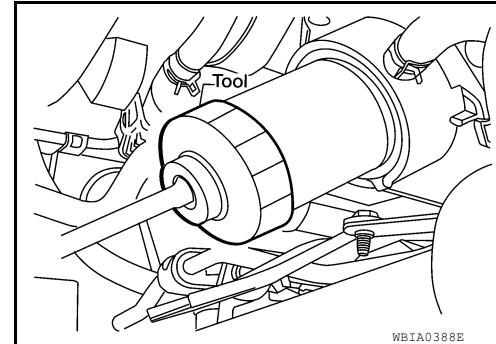
1. Remove front under cover.
2. Drain engine oil. Refer to [LU-10, "Draining"](#).
3. Remove oil filter using a suitable tool.

WARNING:

Be careful not to burn yourself, as the engine and engine oil may be hot.

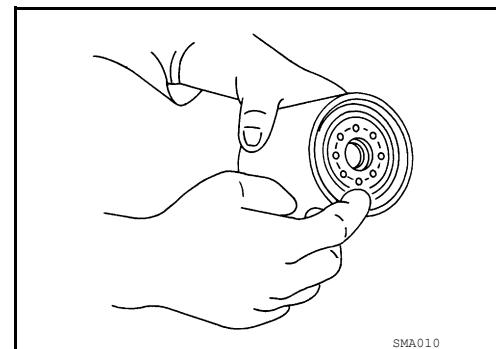
CAUTION:

- The oil filter is equipped with a pressure relief valve.
- Use Genuine NISSAN oil filter or equivalent.
- When removing, prepare a shop cloth to absorb any engine oil leaks or spills.
- Do not allow engine oil to adhere to the drive belts.
- Completely wipe off any engine oil that adheres to the engine and the vehicle.



INSTALLATION

1. Remove foreign materials adhering to the oil filter seal mating surface.
2. Apply clean engine oil to the oil filter seal circumference of the new oil filter as shown.



3. Screw on the oil filter manually until it touches the installation surface and tighten to specification.

Oil filter : 18.0 N·m (1.8 kg·m, 13 ft-lb)

4. Refill engine with new engine oil. Refer to [LU-10, "Refilling"](#).
5. Inspect engine for oil leaks. Refer to [LU-9, "Inspection"](#).
6. Install front under cover.

Inspection

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INSPECTION AFTER INSTALLATION

1. Check engine oil level. Refer to [LU-9, "Inspection"](#).
2. Start engine and check for engine oil leaks.
3. Stop engine and wait for 10 minutes.
4. Check engine oil level and add engine oil as required.

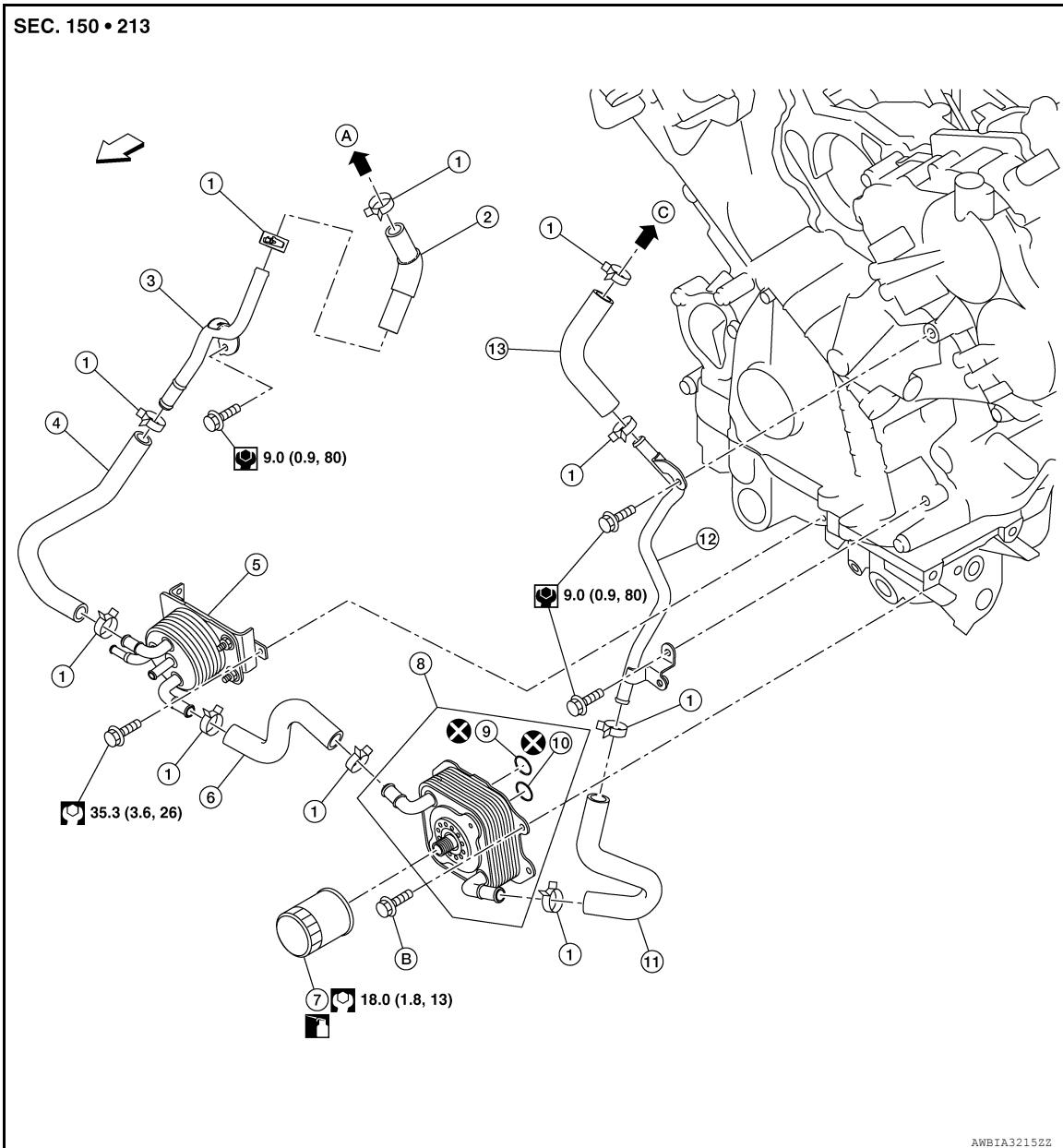
REMOVAL AND INSTALLATION

OIL COOLER

Exploded View

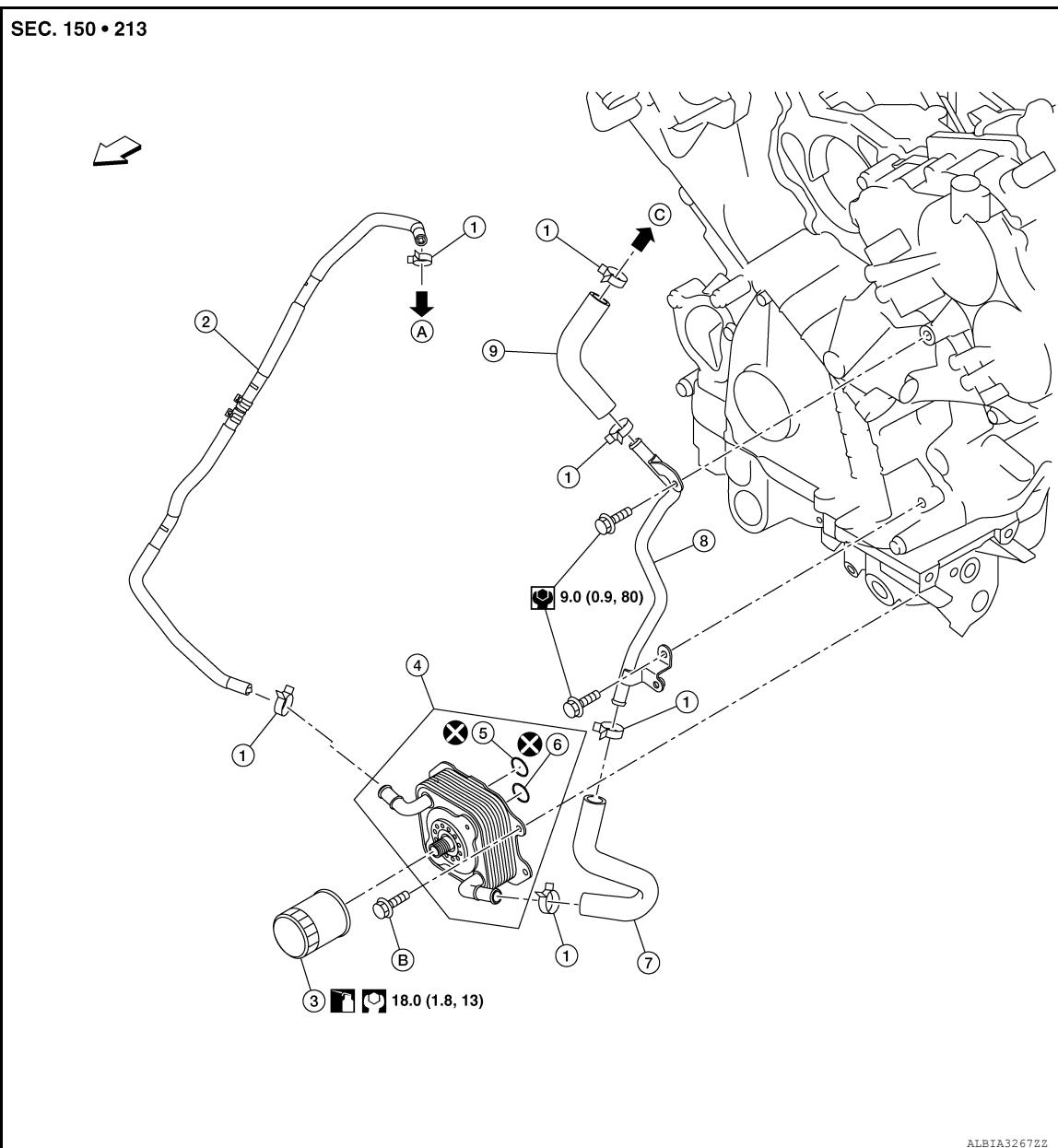
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XD Models



- | | | |
|--------------------------|-------------------------------|--------------------------|
| 1. Clamp | 2. Water hose | 3. Water pipe |
| 4. Water hose | 5. A/T fluid warmer | 6. Water hose |
| 7. Oil filter | 8. Oil cooler | 9. O-ring |
| 10. O-ring | 11. Water hose | 12. Water pipe |
| 13. Water hose | A. To multi-way control valve | B. Refer to INSTALLATION |
| C. To thermostat housing | ◀ Front | |

Non-XD Models



- | | | |
|------------------------|--------------------------|--------------------------|
| 1. Clamp | 2. Water hose | 3. Oil filter |
| 4. Oil cooler | 5. O-ring | 6. O-ring |
| 7. Water hose | 8. Water pipe | 9. Water hose |
| A. To A/T fluid warmer | B. Refer to INSTALLATION | C. To thermostat housing |
- Front

Removal and Installation

INFOID:0000000014418761

WARNING:

Be careful not to burn yourself, as the engine oil and engine coolant may be hot.

CAUTION:

- Do not spill engine coolant on the drive belt.
- Do not spill engine oil on rubber parts such as drive belts and engine mounting insulator.

REMOVAL

1. Drain engine coolant. Refer to [CO-11, "Changing Engine Coolant"](#).
2. Remove front under cover. Refer to [EXT-37, "FRONT UNDER COVER : Removal and Installation"](#).

< REMOVAL AND INSTALLATION >

3. Disconnect water hoses from oil cooler.

CAUTION:

Perform this step when engine is cold.

NOTE:

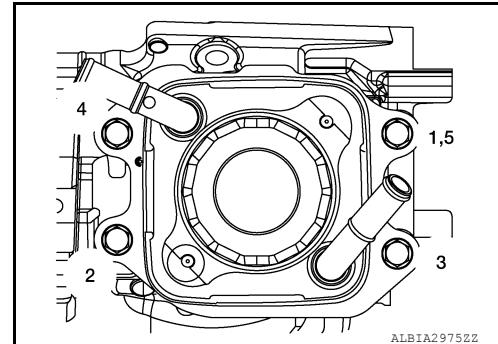
When removing components such as hoses, tubes/lines, etc., cap or plug openings to prevent fluid from spilling.

4. Remove oil filter. Refer to [LU-11, "Removal and Installation"](#).

5. Loosen oil cooler bolts in the reverse of the sequence shown and remove oil cooler.

NOTE:

When loosening, disregard number 5.



INSTALLATION

Installation is in the reverse order of removal.

CAUTION:

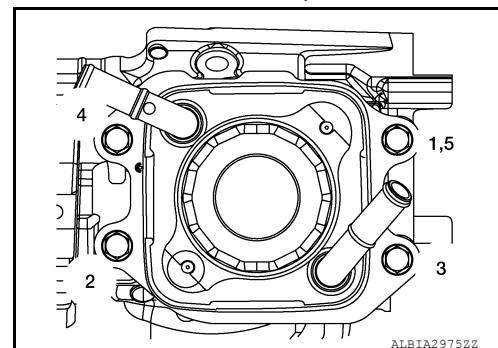
Do not reuse O-rings.

NOTE:

Note the following:

- Confirm that no foreign objects are adhering to the sealing surfaces of the oil cooler and oil pan.
- Tighten the oil cooler bolts in the order shown to the specified torque.

Oil cooler bolts 7.0 N·m (0.7 kg·m, 62 in-lb)



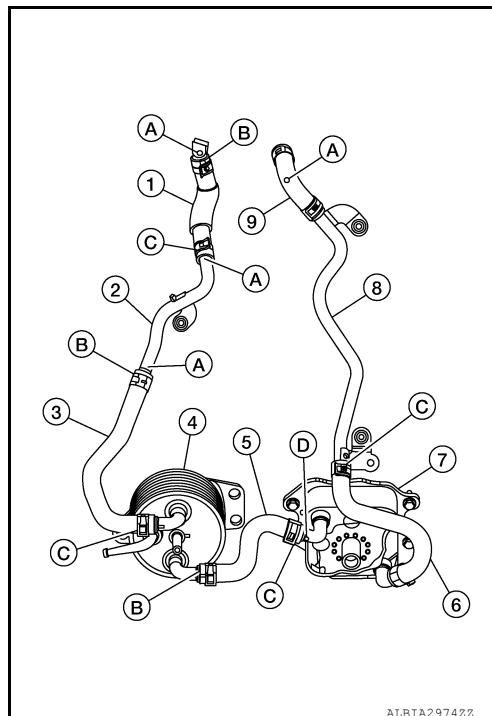
OIL COOLER

[VK56VD]

< REMOVAL AND INSTALLATION >

- For XD Models align paint marks on water hoses (1/3/5/6/9) with paint marks on oil cooler (7), A/T fluid warmer (4) and water pipes (2/8).

- (A) : White circle
(B) : Blue rectangle
(C) : Blue triangle
(D) : Black circle



- For Non-XD Models align green paint marks on water hoses with paint marks on oil cooler, A/T fluid warmer and water pipes.

CAUTION:

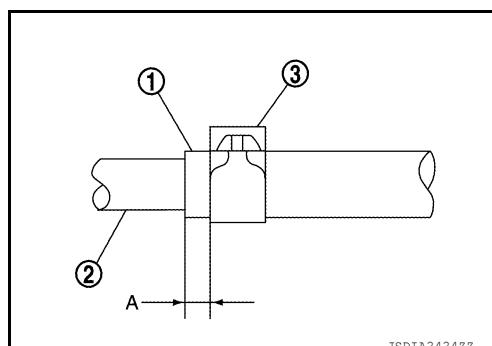
Green paint mark must face upward at hose clip locations.

- Install clamps (3) on the hoses (1) as shown.

CAUTION:

Clamp must not interfere with bulge in pipe.

- (2) : Water pipe
(A) : 3 - 7 mm (0.12 - 0.28 in)

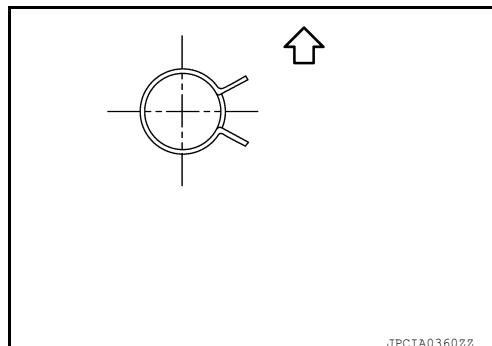


- Clamp pawls should be aligned with paint marks on hoses and pipes.
- For clamps on at multi-control valve outlet and oil cooler inlet, the clamp pawls should be orientated as shown.

- ↖ : Engine upper

NOTE:

Oil cooler inlet clamp pawl should be within 45° of horizontal.



Inspection

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INSPECTION AFTER REMOVAL

Oil Cooler

Check oil cooler for cracks. Check oil cooler for clogging by blowing compressed air through engine coolant inlet. If necessary, replace oil cooler assembly.

< REMOVAL AND INSTALLATION >

INSPECTION AFTER INSTALLATION

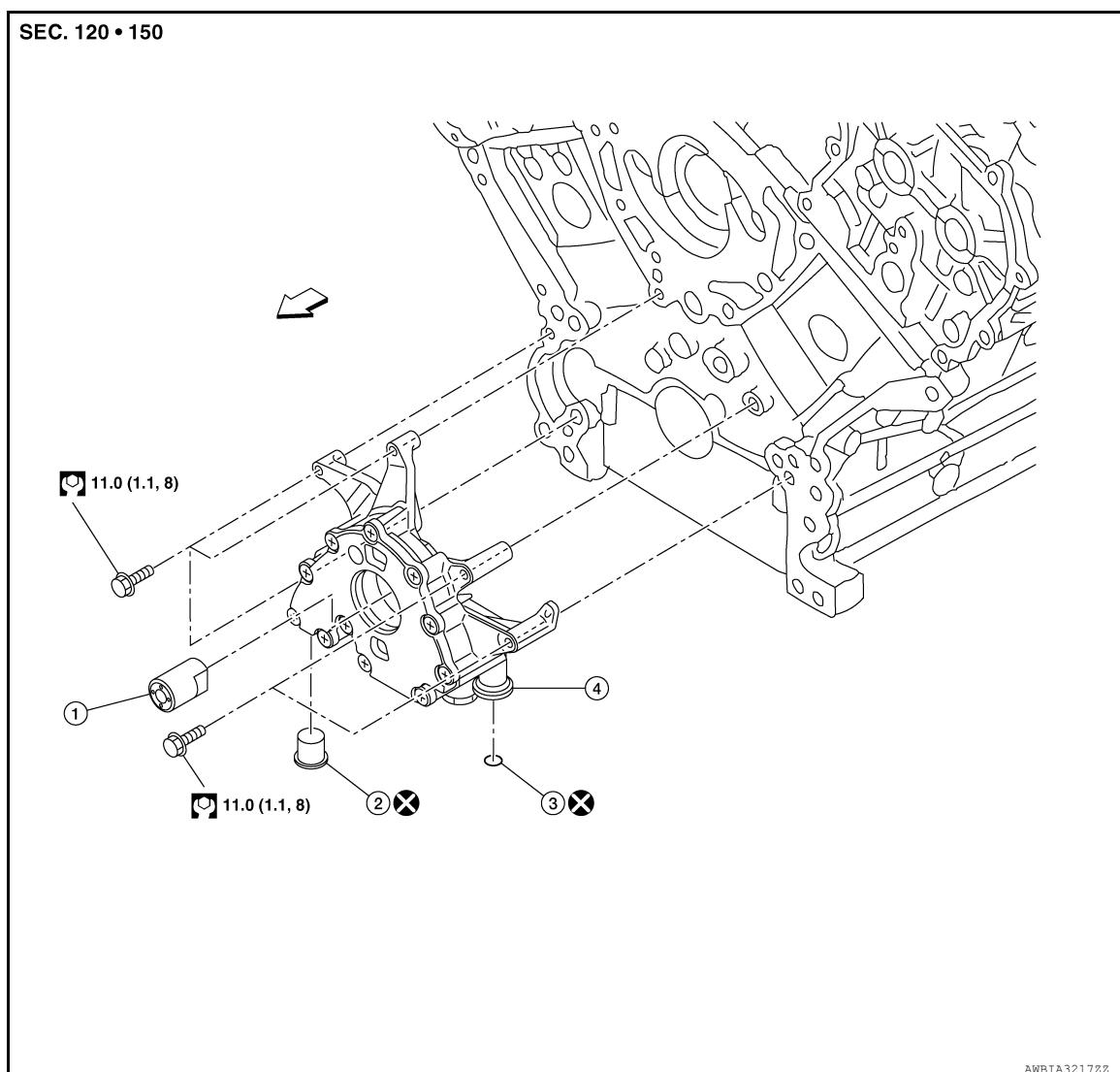
1. Check engine oil and engine coolant levels and add engine oil and engine coolant. Refer to [LU-9, "Inspection"](#) and [CO-9, "System Inspection"](#).
2. Start the engine, and check for leaks of engine oil or engine coolant.
3. Stop the engine and wait for 10 minutes.
4. Check the engine oil level and engine coolant level again. Refer to [LU-9, "Inspection"](#) and [CO-9, "System Inspection"](#).

< REMOVAL AND INSTALLATION >

OIL PUMP

Exploded View

INFOID:0000000014418763



- 1. Oil pump drive spacer
- 2. O-ring
- 3. O-ring
- 4. Oil pump assembly

Front

Removal and Installation

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REMOVAL

NOTE:

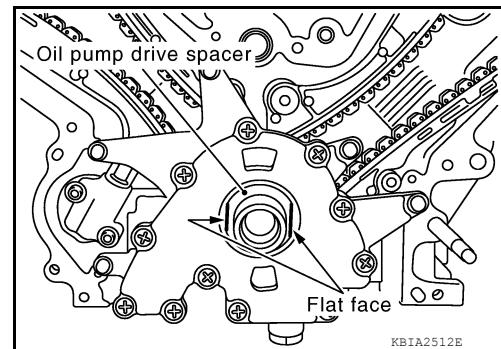
The engine assembly does not need to be removed to remove or replace oil pump assembly.

1. Remove the oil pan (upper). Refer to [EM-71, "Removal and Installation"](#).
2. Remove the front cover. Refer to [EM-74, "Exploded View"](#).

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< REMOVAL AND INSTALLATION >

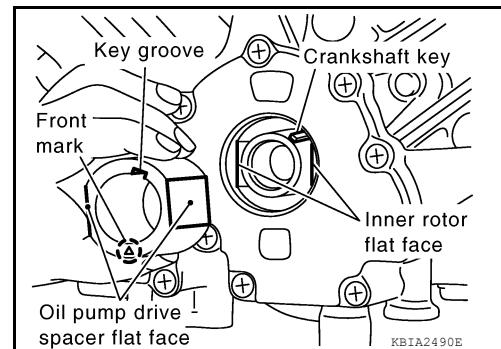
3. Remove the oil pump drive spacer.
 - Hold and remove the flat space of the oil pump drive spacer by pulling it forward.



4. Loosen oil pump assembly bolts and remove the oil pump assembly.

INSTALLATION

1. Install the oil pump.
2. Install the oil pump drive spacer as follows:
 - When inserting the oil pump drive spacer, align the crankshaft key and the flat face of the inner rotor.
 - If they are not aligned, rotate the oil pump inner rotor by hand.
 - Make sure that each part is aligned and tap lightly until it reaches the end.



3. Installation of the remaining components is in the reverse order of removal.

Inspection

INFOID:000000014418765

INSPECTION AFTER INSTALLATION

1. Check the engine oil level. Refer to [LU-9, "Inspection"](#).
2. Start the engine and check for engine oil leaks.
3. Stop the engine and wait 10 minutes.
4. Check the engine oil level and adjust the engine oil level as required. Refer to [LU-9, "Inspection"](#).

SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[VK56VD]

SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

Periodical Maintenance Specification

INFOID:000000014418766

A

ENGINE OIL CAPACITY (APPROXIMATE)

Unit: ℓ (US qt, Imp qt)

C

Drain and refill	With oil filter change	6.5 (6-7/8, 5-3/4)
	Without oil filter change	6.2 (6-1/2, 5-1/2)
Dry engine (engine overhaul)		7.6 (8, 6-3/4)

D

Engine Oil Pressure

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Unit: kPa (kg/cm², psi)

F

Engine speed	Approximate discharge pressure*
600 rpm	More than 98 (1.0, 14)
2,000 rpm	More than 294 (3.0, 43)
6,000 rpm	More than 392 (4.0, 43)

G

*: Engine oil temperature at 80°C (176°F)

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< PRECAUTION >

PRECAUTION

PRECAUTIONS

Precaution for Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"

INFOID:0000000014418768

The Supplemental Restraint System such as "AIR BAG" and "SEAT BELT PRE-TENSIONER", used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. Information necessary to service the system safely is included in the SR and SB section of this Service Manual.

WARNING:

- To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, it is recommended that all maintenance and repair be performed by an authorized NISSAN/INFINITI dealer.
- Improper repair, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the SR section.
- Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harnesses or harness connectors.

PRECAUTIONS WHEN USING POWER TOOLS (AIR OR ELECTRIC) AND HAMMERS

WARNING:

- When working near the Airbag Diagnosis Sensor Unit or other Airbag System sensors with the Ignition ON or engine running, DO NOT use air or electric power tools or strike near the sensor(s) with a hammer. Heavy vibration could activate the sensor(s) and deploy the air bag(s), possibly causing serious injury.
- When using air or electric power tools or hammers, always switch the Ignition OFF, disconnect the battery or batteries, and wait at least three minutes before performing any service.

Precaution for Liquid Gasket

INFOID:0000000014418769

REMOVAL OF LIQUID GASKET

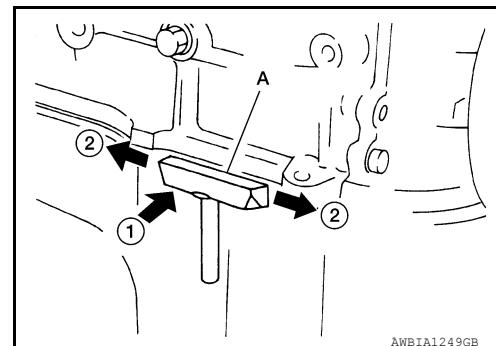
- After removing the bolts and nuts, separate the mating surface and remove the old liquid gasket using Tool (A).

Tool number : KV10111100 (J-37228)

CAUTION:

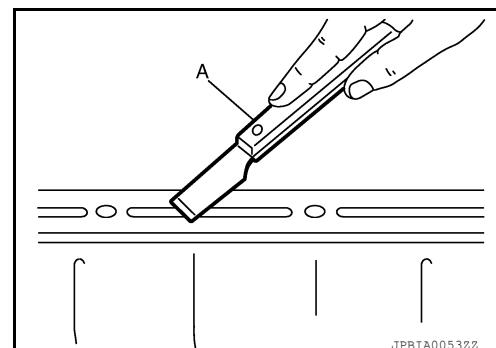
Do not damage the mating surfaces.

- Tap the seal cutter to insert it (1).
- In areas where the Tool is difficult to use, lightly tap to slide it (2).



LIQUID GASKET APPLICATION PROCEDURE

1. Remove the old liquid gasket adhering to the gasket application surface and the mating surface using suitable tool (A).
 - Remove the liquid gasket completely from the groove of the liquid gasket application surface, bolts, and bolt holes.
2. Thoroughly clean the mating surfaces and remove adhering moisture, grease and foreign material.

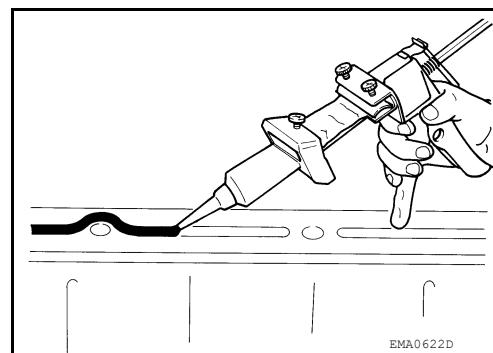


PRECAUTIONS

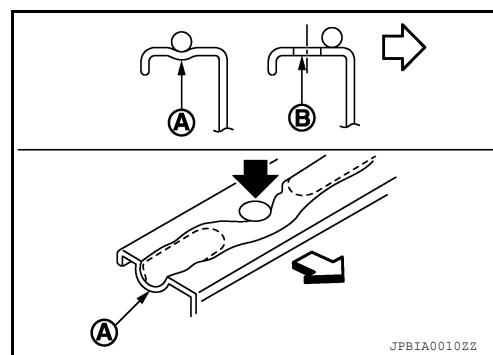
[CUMMINS 5.0L]

< PRECAUTION >

3. Attach the liquid gasket tube to the suitable tool.
Use Genuine RTV Silicone Sealant or equivalent. Refer to [GI-22, "Recommended Chemical Products and Sealants"](#).
4. Apply the liquid gasket without breaks to the specified location with the specified dimensions.



- If there is a groove (A) for the liquid gasket application, apply the liquid gasket to the groove.
- Normally apply the liquid gasket on the inside edge of the bolt holes. Also apply to the outside edge of the bolt holes (B) when specified in the procedure.
- Within five minutes of liquid gasket application, install the mating component.
- If the liquid gasket protrudes, wipe it off immediately.
- Do not retighten after the installation.
- Wait 30 minutes or more after installation before refilling the engine with oil or coolant. Refer to [LU-35, "Changing Engine Oil"](#) and [CO-47, "Changing Engine Coolant"](#).



CAUTION:

If there are more specific instructions in the procedures contained in this manual concerning liquid gasket application, observe them.

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< PREPARATION >

PREPARATION

PREPARATION

Special Service Tool

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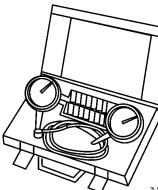
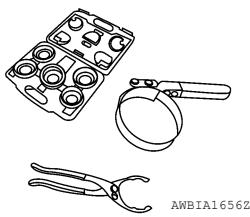
The actual shape of the tools may differ from those illustrated here.

Tool number (TechMate No.) Tool name	Description
— (J-54429) Air Pressure Regulator	Regulate air pressure for pressure/leak tests
— (J-54417) Compu-check Fitting, Male, with Handle	Adapting to pressure tester
— (J-54416) Compu-check Quick-connect Coupling, Female	Adapting to pressure tester
— (J-54413) Oil Cooler Test Adapter	Test oil cooler for leaks
— (J-54412) Oil Switch T Adapter	Thread into cylinder block to test engine oil pressure

PREPARATION

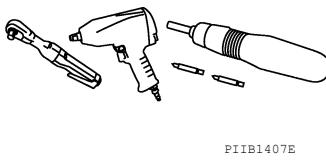
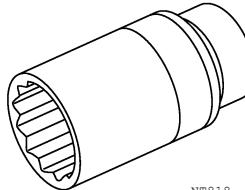
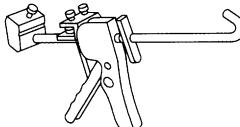
[CUMMINS 5.0L]

< PREPARATION >

Tool number (TechMate No.) Tool name	Description
(16-5610) (—) Oil pressure kit	 <p>Measuring oil pressure. Comes with adapter and hose. Designed to be used both static and on-road testing.</p>
(223-50000) (—) Oil filter wrench assortment	 <p>Removing oil filter</p>

Commercial Service Tool

INFOID:0000000014418771

Tool name	Description
Power tool	 <p>Loosening nuts, screws and bolts</p>
Deep socket	 <p>Removing and installing oil pressure switch Deep socket 26 mm, 3/8 drive</p>
Tube presser	 <p>Pressing the tube of liquid gasket</p>

< SYSTEM DESCRIPTION >

SYSTEM DESCRIPTION

LUBRICATION SYSTEM

System Description

INFOID:000000014418772

LUBRICATING OIL

WARNING:

To avoid the risk of personal injury:

- Be careful not to burn yourself, as engine oil may be hot.
- Prolonged and repeated contact with used engine oil may cause skin cancer; try to avoid direct skin contact with used engine oil. If skin contact is made, wash thoroughly with soap or hand cleaner as soon as possible. Avoid inhalation of vapors, ingestion, and prolonged contact with used engine oil.
- If not reused, dispose of in accordance with local environmental regulations.

It is recommended to use a high quality 10W-30 engine oil, which meets the American Petroleum Institutes (API) CJ-4 rating.

NOTE:

For lubricating oil requirements and maintenance intervals. Refer to [MA-63, "Engine Oil Recommendation"](#).

ARCTIC OPERATION ENGINE OIL

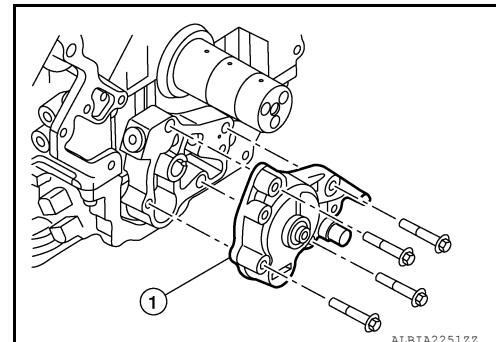
In arctic conditions, it is recommended to use a high quality 5W-40 fully synthetic, heavy-duty engine oil, which meets the API performance classification for CJ-4 rating. Refer to [MA-63, "Engine Oil Recommendation"](#).

LUBRICATING SYSTEM COMPONENTS

1. When diagnosing lubricating system malfunctions, check all obvious items related to oil pressure, such as gauges, high and low oil level, excessive oil contamination, and oil viscosity. Refer to [LU-33, "Inspection"](#).

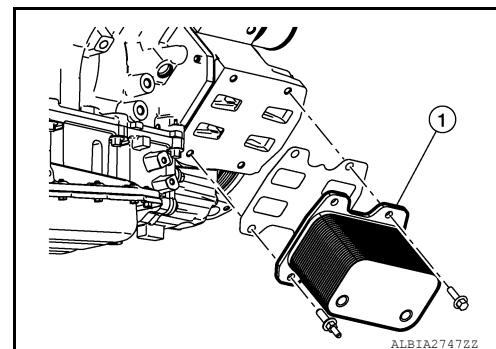
2. Oil Pump

The oil pump (1) is located on the block stiffener plate of the engine and is driven by the front crankshaft gear. Refer to [LU-51, "Removal and Installation"](#).



3. Oil Cooler

A full-flow, plate-type oil cooler (1) is used. The oil cooler is located on the passenger-side of the front cover on the engine. Engine oil flows through the plates of the oil cooler where it is cooled by engine coolant flowing past the plates.



4. Oil Filter

A full-flow oil filter is used for engine oil filtration. The oil filter is located on the driver side of the front cover on the engine.

It is recommended that the oil filter be pre-filled when changed to prevent engine oil pressure delay at start up.

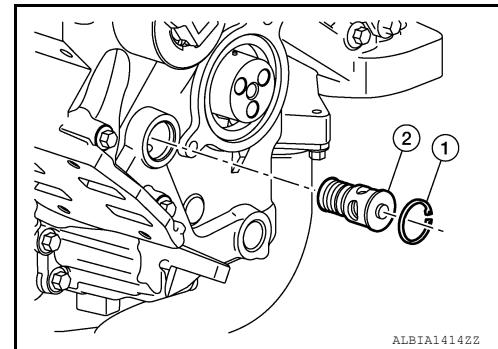
NOTE:

< SYSTEM DESCRIPTION >

Be careful that debris is **not** poured into the filter. If using an oil supply with a metallic or plastic seal under the cap, be careful to peel the seal back. Puncturing the seal with a knife or sharp object can put debris in the oil container.

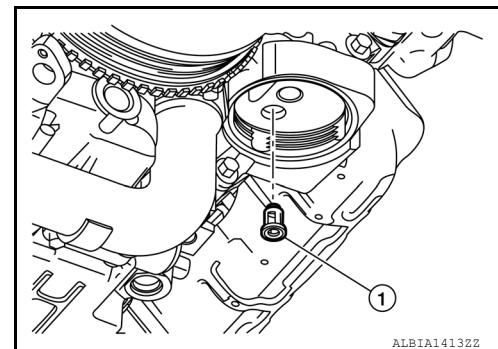
5. Oil Thermostat

The oil thermostat (2) is located in the front cover, underneath a snap ring (1) near the oil cooler. The oil thermostat operates using a wax motor similar to the coolant thermostat. The oil thermostat controls the engine oil temperature. When the oil temperature is below the operating range of the thermostat, engine oil bypasses the oil cooler. When the oil temperature reaches operating range, the thermostat opens, seals off the bypass, and forces engine oil to flow through the oil cooler.



6. Oil Filter Bypass Valve

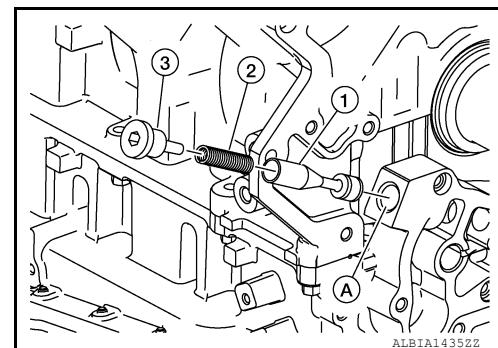
The oil filter bypass valve (1) is pressed into the front cover above the oil filter. When the pressure drop across the oil filter is high enough, the oil filter bypass valve opens. This allows unfiltered engine oil to continue to flow to the engine's lubricating oil system.



7. Oil Pressure Regulator (Main Rifle)

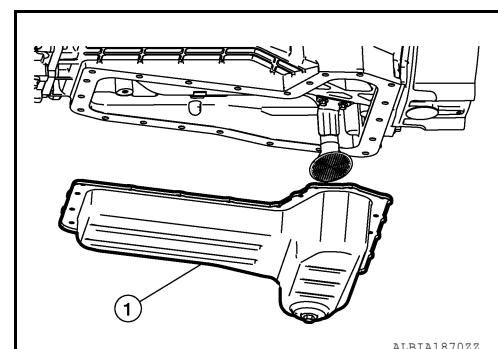
The oil pressure regulator is used to maintain optimum oil pressure in the lubrication system. The oil pressure regulator is located in the block stiffener plate on the front side of the engine, behind the front gear cover. The oil pressure regulator consists of a cap (3), a spring (2), and a plunger (1).

(A) : Oil pressure regulator bore



8. Oil Pan

The oil pan (1) is located on the bottom of the block stiffener plate on the engine. Make sure to follow proper removal techniques to prevent damaging the oil pan flange. Refer to [EM-307, "Removal and Installation"](#).



9. Oil Suction Tube

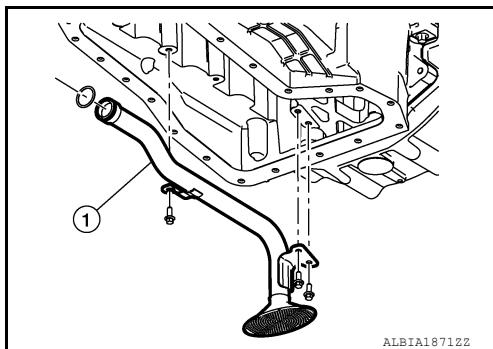
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LUBRICATION SYSTEM

[CUMMINS 5.0L]

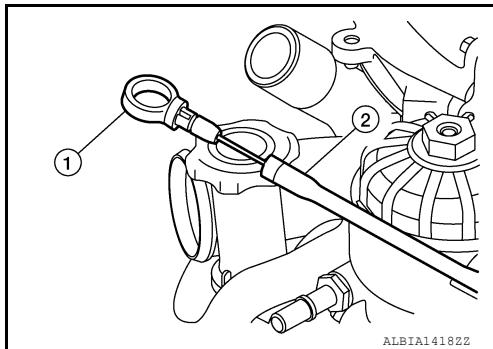
< SYSTEM DESCRIPTION >

The oil suction tube (1) is a formed steel tube that mounts to the block stiffener plate on the bottom of the engine. The submersed portion of the tube in engine oil is perforated to prevent any large debris particles from entering the lubricating oil system.



10. Engine Oil Dipstick Tube

The engine oil dipstick tube is located above the rocker lever cover on the drivers side of the engine. The engine oil dipstick tube (2) is a press fit type. Make certain that the O-ring on the dipstick (1) is fully seated in the O-ring groove in the dipstick tube when installing the dipstick.

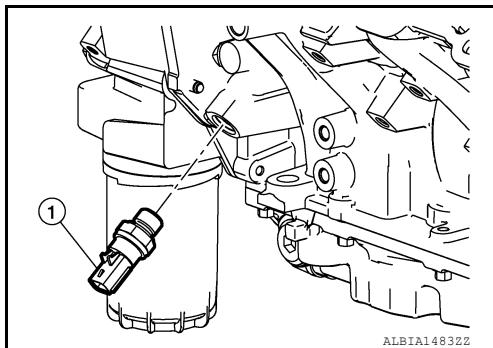


11. Oil Pressure Switch

To monitor oil pressure, an oil pressure switch (1) is used. If the oil pressure drops below a preset value, a P-code will be recorded in the engine control module (ECM) and a dash light will illuminate to notify the driver that there is a problem with the engine.

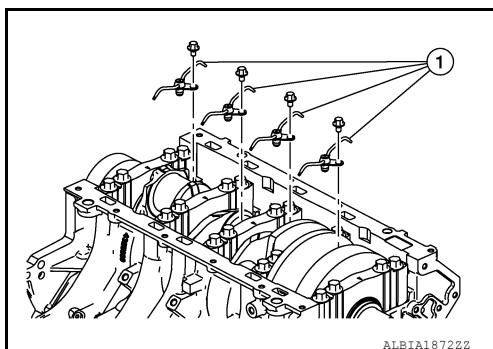
NOTE:

The oil pressure switch is located in the cylinder block on the front left side of the engine, near the front cover.



12. Oil Jets

The oil jets (1) are located between the main bearing saddles on the bottom side of the engine cylinder block. Oil is supplied to the oil jets from the main oil passage in the cylinder block of the engine.



Engine Oil Flow Description

- **Oil Pump** - The engine uses a gerotor-type oil pump. Lubricating oil flow through the engine enters the suction tube and travels into the gerotor-type oil pump. The oil is then pressurized and fed into the oil cooler cover through the pressure regulating valve.
- **Oil Pressure Regulator** - The oil pressure regulator is designed to keep the oil pressure from exceeding 379 kPa (3.87 kg/cm², 55 psi). When the oil pressure from the pump is greater than 379 kPa (3.87 kg/cm², 55 psi), the valve opens, uncovering the dump port so part of the engine oil is routed back to the oil pan.

< SYSTEM DESCRIPTION >

Because of manufacturing tolerances of the components and the oil passages, the oil pressure can differ as much as 69 kPa (0.70 kg/cm², 10 psi) between engines.

- Oil Thermostat - Engine oil continues to the oil thermostat. If the engine oil temperatures are at the operating range, the thermostat will be open, allowing oil to flow through the oil cooler and to the rest of the lubrication system. If the engine oil temperature is below operating range, the oil thermostat will be closed and engine oil will bypass the oil cooler and flow to the rest of the lubrication system.
- Oil Filter Bypass Valve - Engine oil continues through the oil cooler to the oil filter bypass valve. The oil filter bypass valve will open if pressure across the oil filter exceeds 345 kPa (3.52 kg/cm², 50 psi).
- Oil Filter - Engine oil from the oil cooler flows through the oil filter. Oil exiting the oil filter is directed to the main oil gallery(s) of the cylinder block.
- Lubrication for the Turbocharger - The turbocharger is the first component to receive filtered, cooled, and pressurized engine oil through a passage in the cylinder block that supplies oil to the turbocharger. A drain tube connected to the bottom of the turbocharger housing returns the engine oil to the oil pan through a port in the cylinder block.

Lubrication for the Power Components

- Oil Jet - Engine oil leaving the oil filter supplies oil to the piston-cooling nozzles through the main oil passage in the cylinder block. Spray from the nozzles is directed at the underside of the pistons to an internal passage in the piston for cooling.
- Main Oil Passage - Engine oil from the oil filter also supplies oil to the main oil passage through the center of the cylinder block. The main bearings, overhead components, and accessory drive are lubricated by pressurized oil directly from the main oil passage. The other power components, connecting rods, pistons, and camshaft receive pressurized oil directly from the main oil passage.
- The drillings in the crankshaft supply oil to the connecting rod bearings. The oil is supplied to the camshaft journals through drillings in the main bearing saddle.
- Lubrication for the overhead components is supplied through separate drillings in the block. The oil flows through the drillings and across the slot in the cylinder head gasket.
- Lubrication for the Overhead Components - From the cylinder block, the drillings continue in both banks of the vee into the cylinder heads. Internal drillings in the cylinder heads supply lubricating oil to the hydraulic lash adjusters, to the camshaft towers, and to the rocker levers.
- Lubrication for Chain Drive and Tensioners - From the main oil passage, oil is supplied to a drilling in the cylinder block that feeds the chain drive and each chain tensioner. Return oil from the chain drive is returned to the oil pan through the front gear housing.

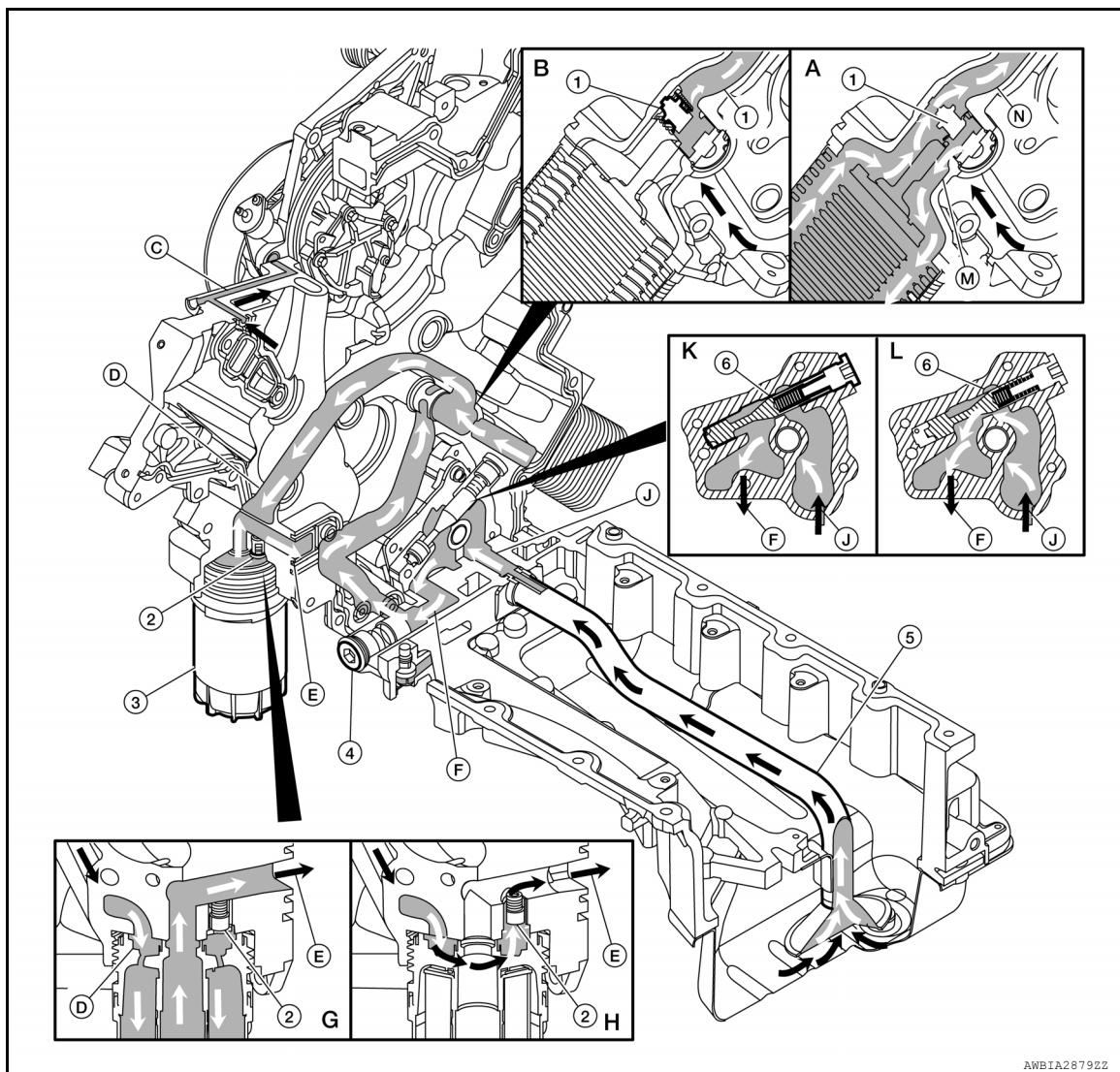
LUBRICATION SYSTEM

< SYSTEM DESCRIPTION >

[CUMMINS 5.0L]

Schematic

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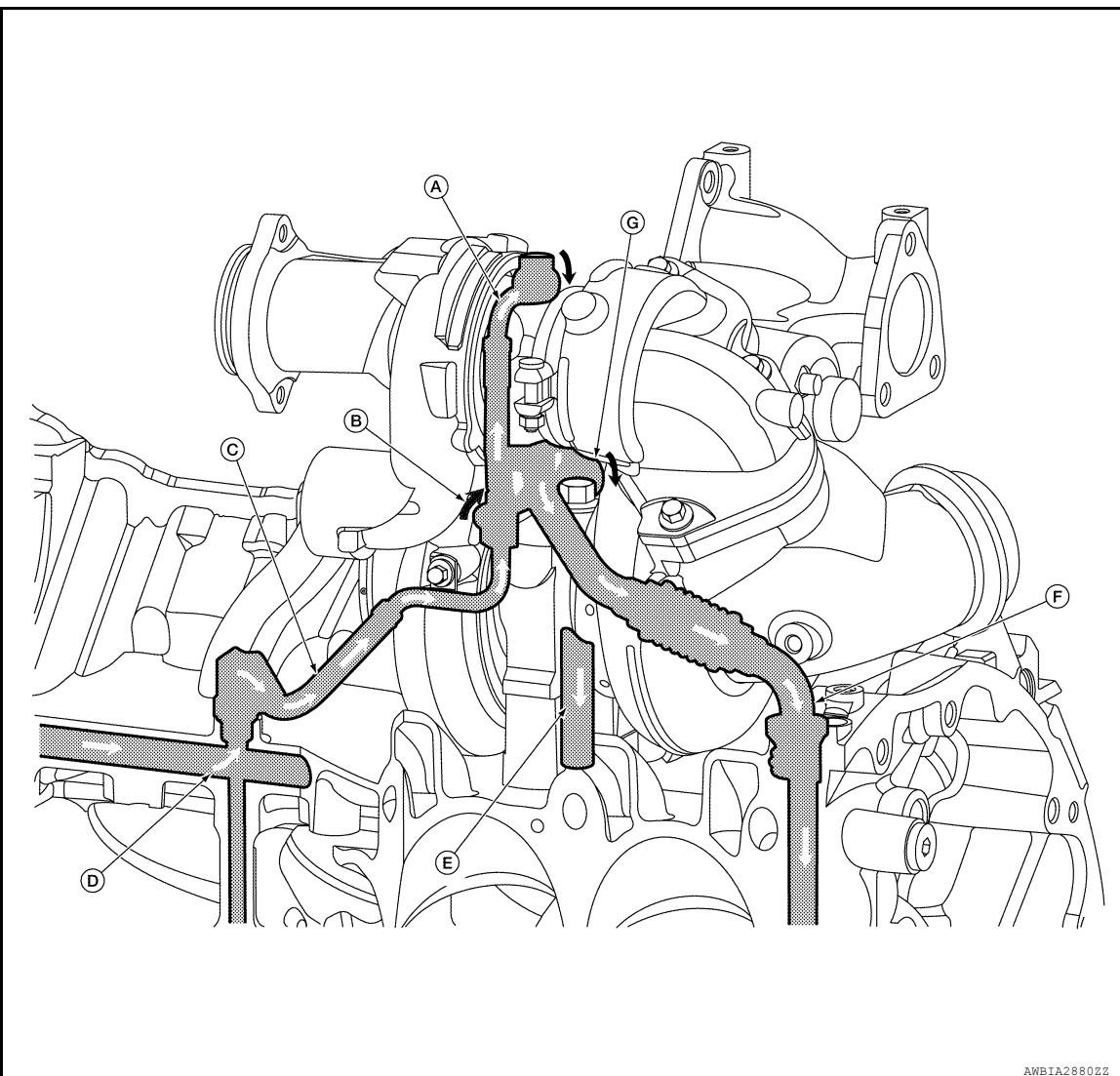
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|-------------------------------------|---|---|
| 1. Oil thermostat | 2. Oil filter bypass valve | 3. Oil filter |
| 4. Oil check valve | 5. Oil suction tube | 6. Oil pressure regulator |
| A. Oil thermostat (open) | B. Oil thermostat (closed) | C. Engine oil supply to vacuum pump from cylinder head (bank 2) |
| D. To oil filter | E. Engine oil flow from oil filter to main engine oil passage | F. From oil pump |
| G. Oil filter bypass valve (closed) | H. Oil filter bypass valve (open) | J. Block stiffening plate to oil pump |
| K. Oil pressure regulator (closed) | L. Oil pressure regulator (open) | M. To oil cooler |

LUBRICATION SYSTEM

< SYSTEM DESCRIPTION >

[CUMMINS 5.0L]



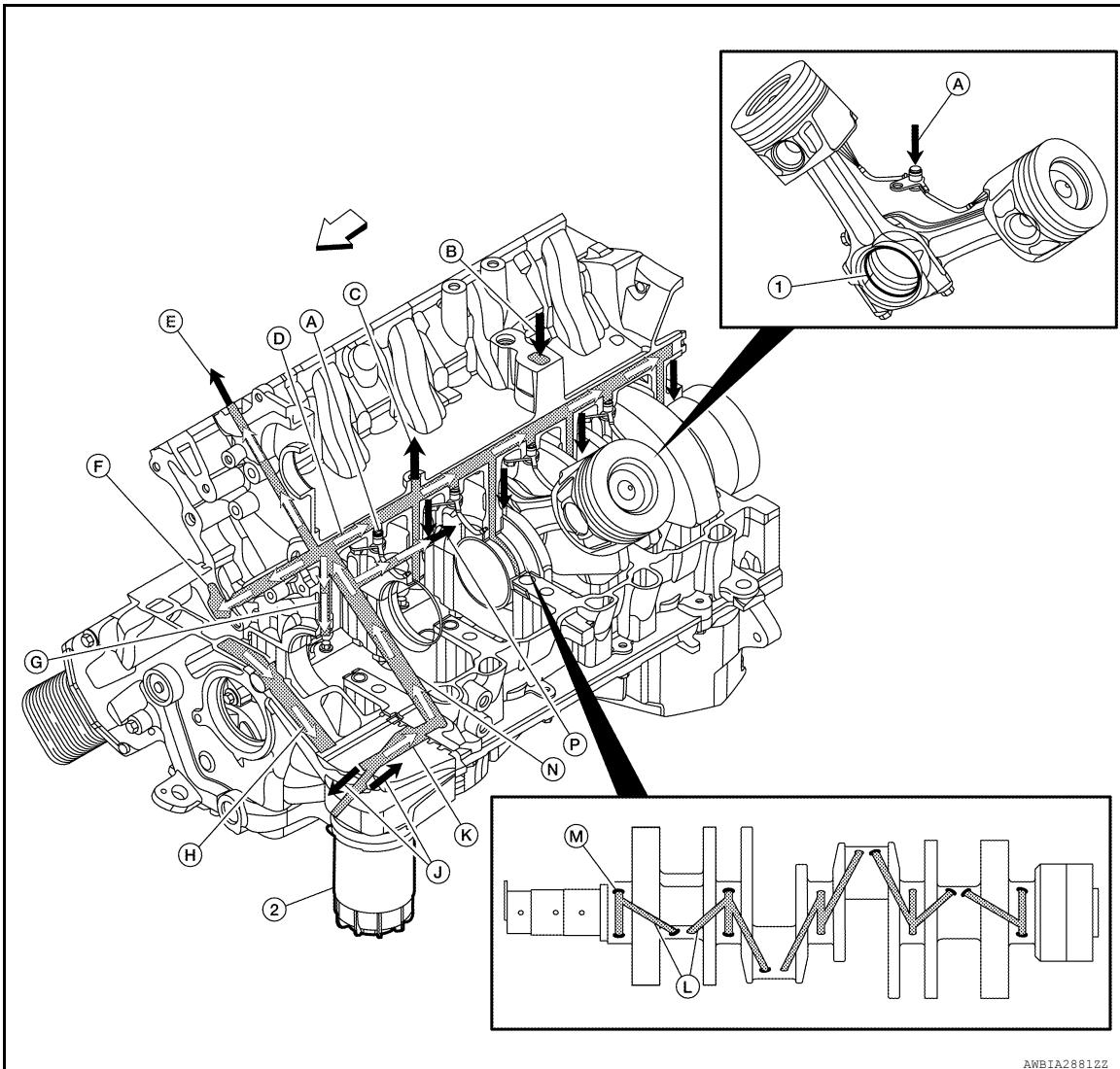
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- A. High-pressure turbocharger engine oil supply
- B. Low-pressure turbocharger engine oil supply
- C. Engine oil supply to turbochargers from main engine oil passage
- D. Engine oil supply to turbochargers from main engine oil passage
- E. Low-pressure turbocharger oil drain to cylinder block
- F. High-pressure turbocharger oil drain to cylinder block
- G. Low-pressure turbocharger engine oil supply

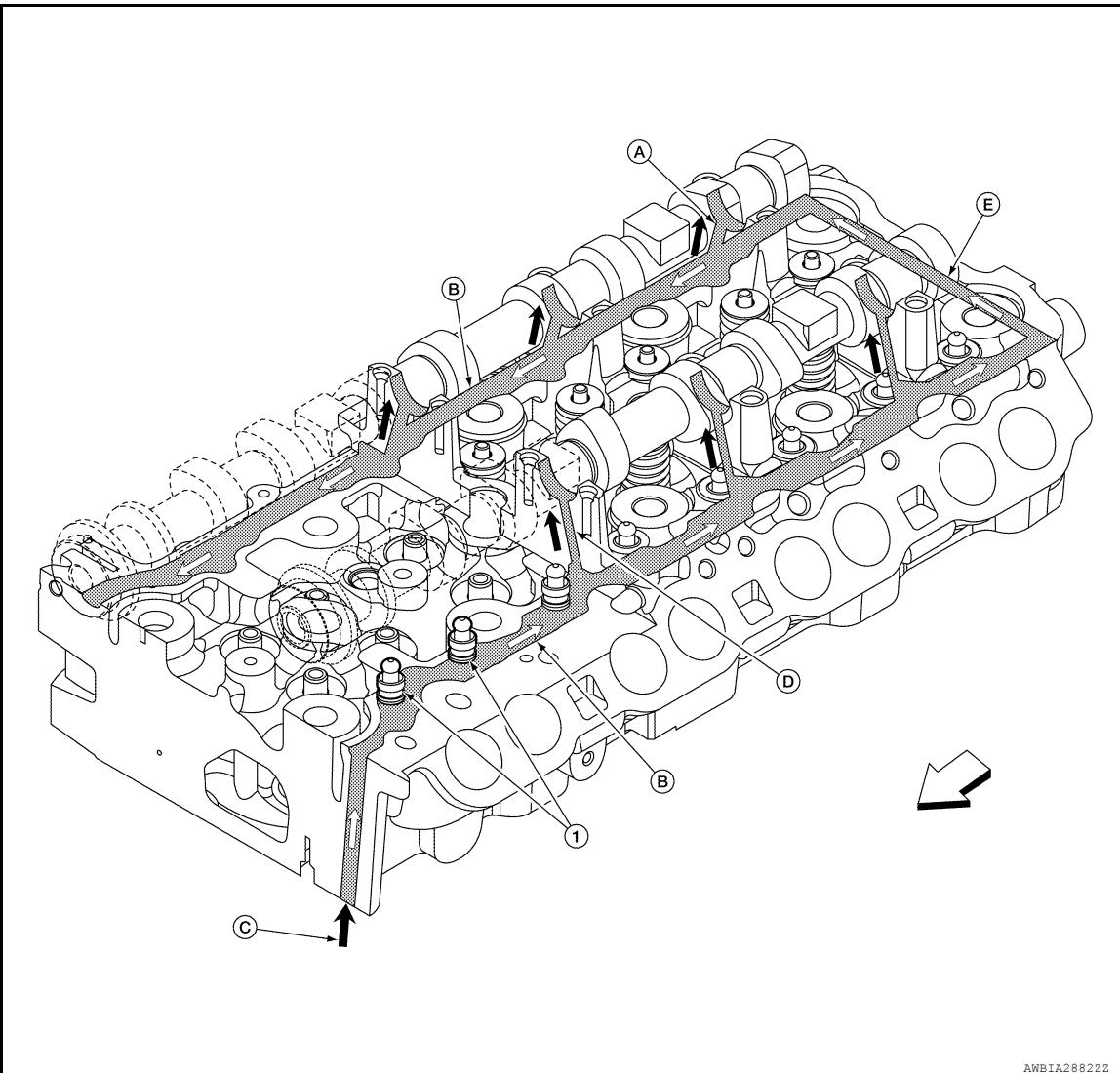
LUBRICATION SYSTEM

< SYSTEM DESCRIPTION >

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| 1. Connecting rod bearing | 2. Oil filter | A. Engine oil supply to oil jets |
| B. Engine oil drain from low-pressure turbocharger | C. Engine oil supply to turbochargers | D. Engine oil main passage |
| E. Engine oil flow to bank 1 overhead | F. Engine oil flow to chain tensioner | G. Engine oil supply to crankshaft upper main bearings |
| H. Engine oil flow to oil filter | J. Engine oil flow to dual chain tensioner | K. Engine oil flow from oil filter to cylinder block |
| L. Engine oil flow to connecting rod bearings | M. Crankshaft main bearing oil passage | N. Engine oil flow to main engine oil passage |
| P. Engine oil flow to bank 2 overhead | Front | |



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| 1. Hydraulic lash adjuster | A. Cam tower engine oil passage to camshaft | B. Cylinder head engine oil rifle |
| C. Engine oil flow from cylinder block to bank 1 cylinder head (bank 2 similar) | D. Cam tower engine oil passage to camshaft | E. Engine oil passage to remaining hydraulic lash adjusters |

Front

Inspection

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Lubricating Oil Pressure

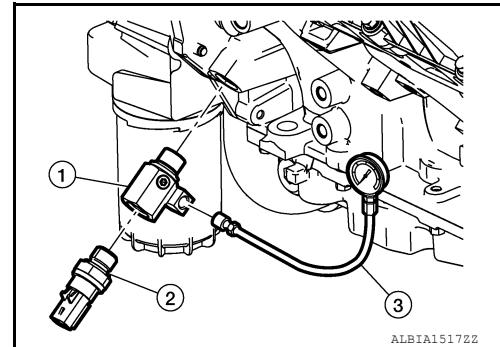
1. When diagnosing lubricating system malfunctions, check all obvious items related to oil pressure, such as gauges, high and low oil level, excessive oil contamination, and oil viscosity.
2. High lubricating oil pressure occurs after the engine is first started in cold weather. Cold start oil pressure typically will be approximately 689 – 827 kPa (7.03 – 8.44 kg/cm², 100 – 120 psi). If the pressure regulator plunger is operating properly, the oil pressure is between 310 – 379 kPa (3.16 – 3.87 kg/cm², 45 – 55 psi) when normal operating temperature is reached.
3. The engine will have high oil pressure at normal operating temperature if the oil pressure regulator valve sticks in the closed position.
Check the regulator for freedom of movement. Refer to [LU-48, "Removal and Installation"](#).
4. Low engine oil pressure (or no oil pressure) can be caused by several lubricating system related malfunctions. To begin the investigation, determine the engine operating conditions when the low pressure was first observed. The following are conditions of low lubricating oil pressure:
 - At idle **only**.

LUBRICATION SYSTEM

[CUMMINS 5.0L]

< SYSTEM DESCRIPTION >

- Operating on a steep grade.
5. High engine oil level can cause low oil pressure. If the engine oil level is high enough for the connecting rods to dip into the oil while operating, the oil can become aerated, resulting in low oil pressure.
 6. Low oil level will **not** normally appear as low oil pressure. Typically, it will appear as an intermittent loss of oil pressure when rounding a corner or operating on a steep grade. This condition exists when the oil level is extremely low and the suction tube can **not** pick up oil during all modes of operation.
 7. A plugged oil filter will cause a gradual loss of oil pressure by approximately 69 kPa (0.70 kg/cm², 10 psi). The pressure will return to normal when the oil filter bypass valve opens. If **not** corrected, this will result in severe engine wear, as the engine is running on unfiltered oil when the oil filter bypass valve is open.
 8. Verify the pressure with a manual gauge to make sure the lubricating oil gauge and the sending unit are operating correctly.
 - To check the engine oil pressure, remove the oil pressure switch from the engine block. Refer to [LU-59, "Removal and Installation"](#).
 - Install and tighten tool (1) into the oil pressure switch port in the cylinder block.
 - Install the oil pressure switch (2) onto the tool. Hold the tool with a suitable tool and tighten the oil pressure switch.
 - Install and tighten tool (3) into the side of the tool.
 - Operate the engine to measure engine oil pressure with the tool.
 - After confirming with the tool that the vehicle oil gauge and the sending unit are operating properly, remove the tool and reinstall the oil pressure switch. Refer to [LU-59, "Removal and Installation"](#).
 9. A loose oil suction tube, damaged gasket, or crack in the suction tube can cause a loss of prime for the oil pump. The engine will have low pressure or no oil pressure during starting, followed by normal oil pressure.
 10. A steady decrease in oil pressure over a long period can be an indication of worn bearings or excessive oil pump wear.



PERIODIC MAINTENANCE

ENGINE OIL

Inspection

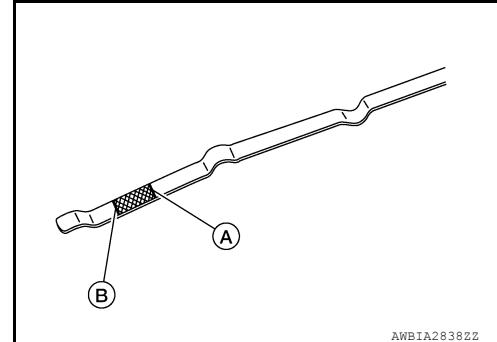
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OIL LEVEL

- Before starting the engine make sure the vehicle is parked on a flat and level surface, then check the oil level. If the engine is already running, turn it off and allow 10 minutes before checking.
- Check that the oil level is within the low (B) and high (A) range as indicated on the dipstick.
- If the engine oil level is out of range, add oil as necessary. Refer to [LU-62, "Standard and Limit"](#).



OIL APPEARANCE

- Check the engine oil for a white milky appearance or excessive contamination.
- If the engine oil is milky, it is highly probable that it is contaminated with engine coolant. Repair the broken parts.

OIL LEAKS

Check for oil leaks around the following areas:

- Oil pan
- Oil pan drain plug
- Oil pressure switch
- Oil filter
- Oil cooler
- Front cover
- Mating surface between cylinder block and cylinder head
- Mating surface between cylinder head and rocker cover
- Crankshaft oil seal (front and rear)
- Block stiffener

OIL LEAK INSPECTION

- Use a steam cleaner or high-pressure washer to clean the engine.

WARNING:

When using high-pressure water or steam cleaning equipment, to avoid the risk of personal injury from flying debris and hot steam:

- Wear appropriate eye protection and protective clothing including gloves and a face shield.

- Add Tool before running the engine.
 - Using Tool, inspect the engine for source of the leak.

Tool : — (J-28431-6)

- Operate the engine until the coolant temperature reaches 82°C (180°F). If necessary, operate the engine under load to create the conditions of the oil leak. Perform stall tests or a road test. Inspect the exterior of the engine for leaking gaskets, seals, O-rings, pipe plugs, or fittings.

NOTE:

Before replacing any gaskets, check the bolts to make sure they are tightened to the correct torque values.

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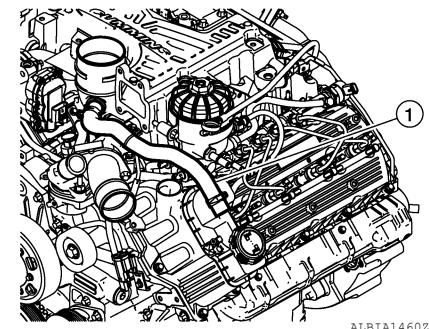
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ENGINE OIL

[CUMMINS 5.0L]

< PERIODIC MAINTENANCE >

4. Inspect the engine crankcase breather tube (1) and hose for restrictions or leaks. Refer to [EM-332, "Removal and Installation".](#)



5. Check for a loose or missing oil dipstick tube, dipstick, or oil fill cap.

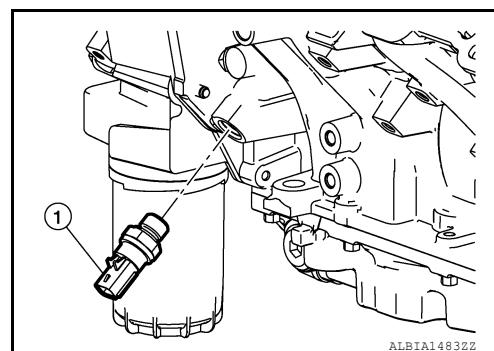
OIL PRESSURE CHECK

1. Remove the oil pressure switch (1) from the cylinder block on the front left side of the engine. Refer to [LU-59, "Exploded View".](#)

WARNING:

To avoid the risk of personal injury:

- Be careful not to burn yourself, as engine oil may be hot.
- Prolonged and repeated contact with used engine oil may cause skin cancer; try to avoid direct skin contact with used engine oil. If skin contact is made, wash thoroughly with soap or hand cleaner as soon as possible. Avoid inhalation of vapors, ingestion, and prolonged contact with used engine oil.
- If not reused, dispose of in accordance with local environmental regulations



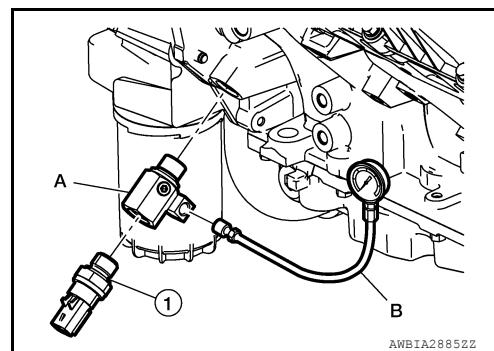
2. Install Tool (A) into the port and install the oil pressure switch (1) into the other end of the tool and thread Tool into Tool (A).

Tool : — (J-54412)
: — (J-54417)

3. Connect suitable tool (B) and start the engine.

CAUTION:

If the lubricating oil pressure does not develop within 15 seconds, shut down the engine to reduce the possibility of internal damage.



4. Allow the engine to operate and achieve operating temperature. Check for leaks. Record the engine oil pressure reading at idle.

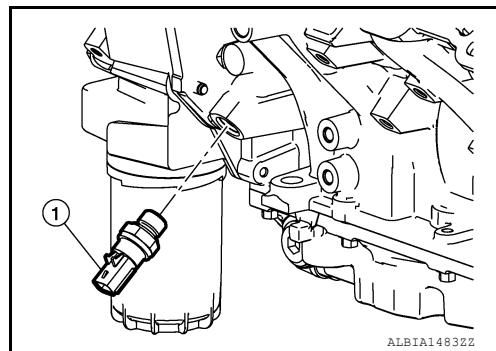
Oil Pressure at Low idle Minimum : 69 kPa (0.70 kg/cm², 10 psi)

5. Increase engine speed to rated speed and hold for 30 seconds. Record the lubricating oil pressure reading at rated engine speed.

Oil Pressure at Rated Engine Speed : 279 kPa (2.85 kg/cm², 40.5 psi)
Minimum

< PERIODIC MAINTENANCE >

6. Remove the tool assembly from the port and install the oil pressure switch (1). Refer to [LU-59, "Exploded View"](#).



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Changing Engine Oil

WARNING:

To avoid the risk of personal injury:

- Be careful not to burn yourself, as engine oil may be hot.
- Prolonged and repeated contact with used engine oil may cause skin cancer; try to avoid direct skin contact with used engine oil. If skin contact is made, wash thoroughly with soap or hand cleaner as soon as possible. Avoid inhalation of vapors, ingestion, and prolonged contact with used engine oil.
- If not reused, dispose of in accordance with local environmental regulations

1. Remove engine under cover. Refer to [EXT-39, "ENGINE UNDER COVER : Removal and Installation"](#).
2. Warm up engine, and check for engine oil leaks. Refer to [LU-33, "Inspection"](#).

NOTE:

Operate the engine until the coolant temperature reaches 60°C (140°F).

3. Stop engine and wait for 10 minutes.
4. Loosen oil filler cap, then remove drain plug.
5. Drain engine oil.

NOTE:

- Be sure to use a container that can hold at least 12 quarts of lubricating oil.
- The factory fill oil may include a red dye that is added for manufacturing quality processes. The dye makes the oil appear to be red. This is normal. The red dye will be flushed from the engine after approximately 4-5 oil changes.

6. Install oil pan drain plug.

Oil pan drain plug : 34 N·m (3.5 kg-m, 25 ft-lb)

7. Refill with new engine oil. Refer to [LU-62, "Standard and Limit"](#).

CAUTION:

- The refill capacity depends on the engine oil temperature and drain time. Use these specifications for reference only.
- Always use the oil level gauge to determine when the proper amount of engine oil is in the engine.

8. Warm up engine and check area around drain plug and oil filter for oil leaks.

NOTE:

- Operate the engine until the coolant temperature reaches 60°C (140°F).
- Engine oil pressure **must** be indicated on the gauge within 15 seconds after starting. If oil pressure is **not** registered within 15 seconds, shut the engine off immediately to reduce the possibility of engine damage. Confirm that the correct oil level is in the oil pan.

9. Shut the engine off. Wait approximately 10 minutes to let the oil drain from the upper parts of the engine. Check the level again.

NOTE:

Add oil as necessary to bring the oil level to the H (high) mark on the dipstick.

10. Install engine under cover. Refer to [EXT-39, "ENGINE UNDER COVER : Removal and Installation"](#).

11. Check engine oil level. Refer to [LU-33, "Inspection"](#).

OIL FILTER**Removal and Installation**

INFOID:000000014418777

REMOVAL

1. Remove the front under cover. Refer to [EXT-37, "FRONT UNDER COVER : Removal and Installation"](#).
2. Drain the engine oil. Refer to [LU-35, "Changing Engine Oil"](#).
3. Remove the oil filter using Tool.

Tool number : (223-50000)**WARNING:****To avoid the risk of personal injury:**

- Be careful not to burn yourself, as engine oil may be hot.
- Prolonged and repeated contact with used engine oil may cause skin cancer; try to avoid direct skin contact with used engine oil. If skin contact is made, wash thoroughly with soap or hand cleaner as soon as possible. Avoid inhalation of vapors, ingestion, and prolonged contact with used engine oil.
- If not reused, dispose of in accordance with local environmental regulations.

NOTE:

- Clean the area around the oil filter before removing.
- The oil filter sealing ring can stick on the oil filter head. Be sure that the sealing ring is removed and discarded.

INSPECTION AFTER REMOVAL

- Clean the filter head mating surface with a clean lint-free cloth.
- Check for damage to the filter head threads and sealing surface.

INSTALLATION

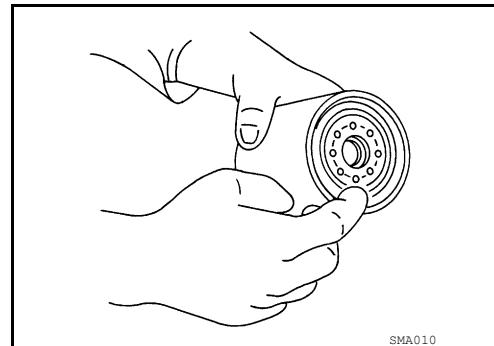
1. Remove foreign materials adhering to the oil filter installation surface.
2. Use clean engine oil to coat the gasket surface of the filter and fill the oil filter with clean engine oil. Refer to [MA-63, "Engine Oil Recommendation"](#).

CAUTION:

The lack of lubrication during the delay until the filter is pumped full of oil at start-up can damage the engine.

NOTE:

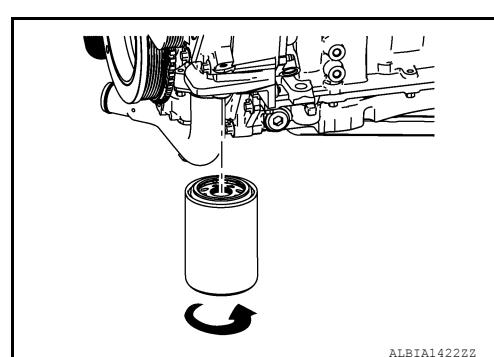
Be careful that no debris is poured into the filter. If using an oil supply with a metallic or plastic seal under the cap, be careful to peel the seal back. Puncturing the seal with a knife or sharp object can create debris in the oil filter.



3. Install the oil filter onto the front cover, turning by hand until the gasket contacts the front gear cover. Once the gasket contacts the front cover, continue to tighten for an additional 270 degrees (3/4 turn).

CAUTION:

Mechanical overtightening of the filter can distort the threads or damage the filter element seal.



4. Refill the engine with new engine oil. Refer to [MA-63, "Engine Oil Recommendation"](#).
5. Start the engine and check for engine oil leaks.

CAUTION:

If the engine does not produce oil pressure in 15 seconds after starting the engine, shut off the engine to reduce the possibility of component damage.

OIL FILTER

[CUMMINS 5.0L]

< PERIODIC MAINTENANCE >

6. Shut down the engine and check the oil level. Refer to [LU-33, "Inspection"](#).
7. Install the front under cover. Refer to [EXT-37, "FRONT UNDER COVER : Removal and Installation"](#).

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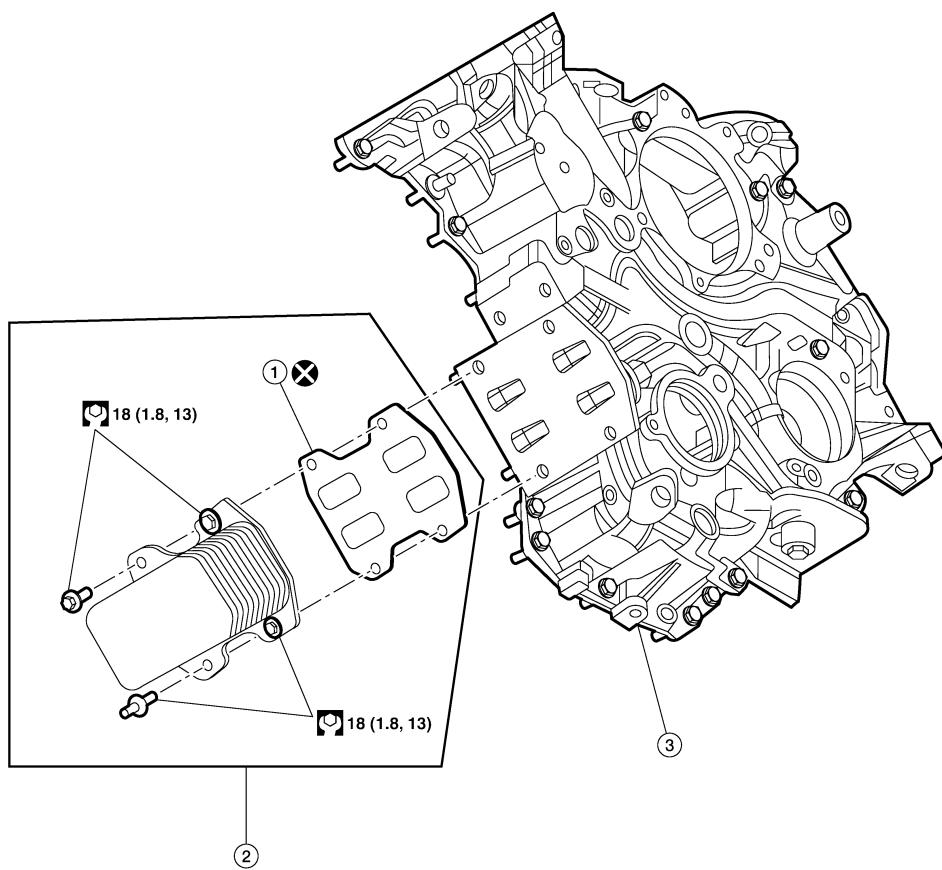
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REMOVAL AND INSTALLATION**OIL COOLER****Exploded View**

INFOID:0000000014418778

SEC. 213



AWBIA2989ZZ

1. Oil cooler gasket

2. Oil cooler

3. Front cover

Removal and Installation

INFOID:0000000014418779

REMOVAL**WARNING:**

- Coolant is toxic and can be fatal if swallowed. Keep away from pets and children. If not reused, dispose of in accordance with local environmental regulations.
- To avoid the risk of personal injury, do not remove the radiator cap when the engine is hot. Serious burns could occur from high-pressure engine coolant escaping from the radiator. Wrap a thick cloth around the cap. Slowly turn it a quarter of a turn to release built-up pressure. Carefully remove the radiator cap by turning it all the way.
- To avoid the risk of personal injury:
 - Be careful not to burn yourself, as engine oil may be hot.

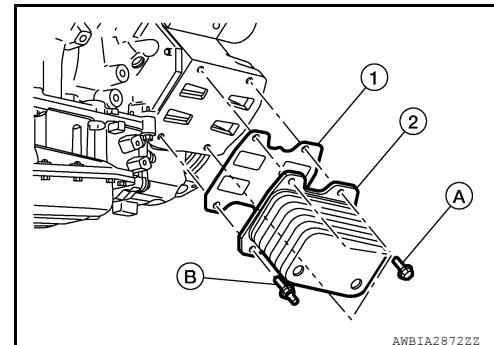
< REMOVAL AND INSTALLATION >

- Prolonged and repeated contact with used engine oil may cause skin cancer; try to avoid direct skin contact with used engine oil. If skin contact is made, wash thoroughly with soap or hand cleaner as soon as possible. Avoid inhalation of vapors, ingestion, and prolonged contact with used engine oil.
- If not reused, dispose of in accordance with local environmental regulations.

1. Disconnect the battery or batteries. Refer to [PG-185, "Battery Disconnect"](#).
2. Drain the engine coolant. Refer to [CO-47, "Changing Engine Coolant"](#).
3. Remove the undercover. Refer to [EXT-37, "FRONT UNDER COVER : Removal and Installation"](#).
4. Clean the area around the oil cooler.
5. Remove the bolts (A) and stud (B) and remove the oil cooler (2).

CAUTION:

Do not reuse the oil cooler gasket (1).



INSPECTION AFTER REMOVAL

- Use solvent to clean the oil cooler housing and cover.

WARNING:

To avoid the risk of injury to eyes and skin, when using caustic solutions, solvents, acids, or alkaline materials follow the manufacturer's recommendations for use and wear appropriate eye protection and protective clothing. Some of these materials are also flammable. To avoid risk of fire or burns, never smoke or allow sparks or flames (such as pilot lights, electrical switches, or welding equipment) in the work area. Avoid spilling onto a hot exhaust manifold which can cause a fire.

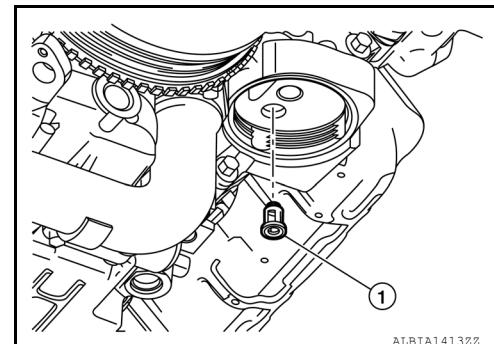
CAUTION:

Use a solvent that will not harm copper to clean the oil cooler elements.

NOTE:

Replace the oil cooler if any debris is found, or if the engine has had a debris-generating malfunction.

- Inspect the oil cooler for signs of corrosion, leaking, or damage.
- Inspect the mounting location for signs of cracking or wear.
- Clean the mounting location with a quick dry solvent.
- Clean the oil cooler with solvent and dry with compressed air.
- If any debris is suspected to have flowed through the lubricating oil system, check the oil pump and the oil check valve for proper operation. Refer to [LU-51, "Removal and Installation"](#) (Oil pump) or [LU-57, "Removal and Installation"](#) (Oil check valve).
- If any debris is suspected to have flowed through the lubricating oil system or if troubleshooting a lubricating oil pressure issue, remove and inspect the oil pressure regulator. Refer to [LU-48, "Removal and Installation"](#).
- If any debris is suspected to have flowed through the lubricating oil system, inspect the oil bypass valve (1). Make sure the valve is fully seated and free of obstruction. Replace if necessary. Refer to [LU-44, "Removal and Installation"](#).

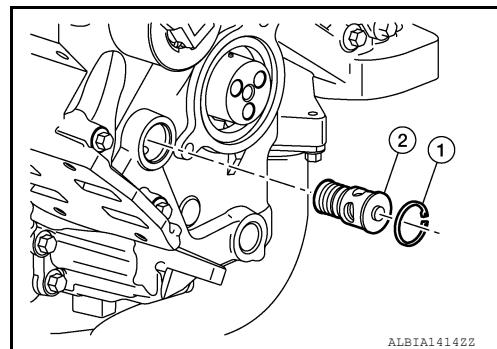


OIL COOLER

[CUMMINS 5.0L]

< REMOVAL AND INSTALLATION >

- If any debris is suspected to have flowed through the lubricating oil system, inspect the oil thermostat (2) located in the front cover, behind a retaining clip (1) just above the oil cooler mounting location. Make sure the thermostat is fully seated and free of obstruction. Replace if necessary. Refer to [LU-55, "Removal and Installation"](#).



LEAK TEST

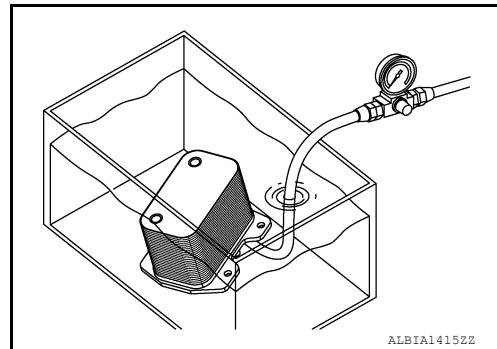
Use the Tool to pressure test the oil cooler, checking for leaks. If leaks are detected, replace the oil cooler.

Air Pressure Test

Minimum : 449 kPa (4.58 kg/cm², 65.1 psi)

Maximum : 518 kPa (5.28 kg/cm², 75.1 psi)

Tool : — (J-54413)



INSTALLATION

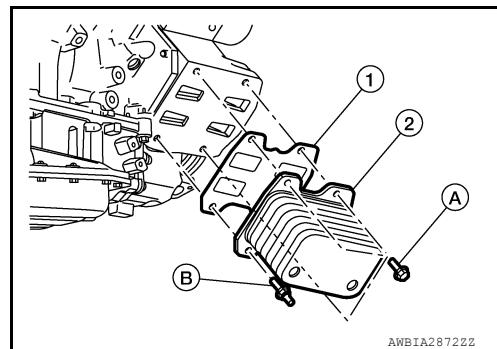
- Install the oil cooler (2) and hand-tighten the bolts (A) and stud (B).

CAUTION:

Do not reuse the oil cooler gasket (1).

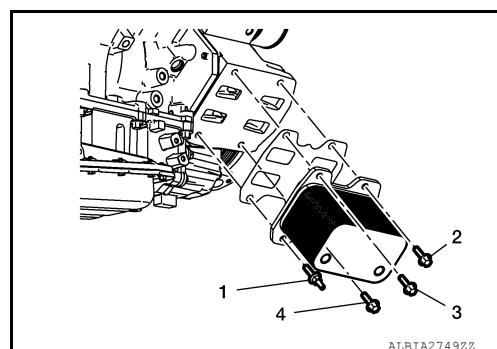
NOTE:

- If replacing the oil cooler, be sure to remove all of the shipping plugs from the ports in the new oil cooler.



- Tighten the bolts in the following order.

Oil cooler bolts : 18 N·m (1.8 kg-m, 13 ft-lb)



- Refill the engine oil. Refer to [MA-62, "Cummins 5.0L Engine : Fluids and Lubricants"](#).
 - Refill the engine coolant. Refer to [MA-62, "Cummins 5.0L Engine : Fluids and Lubricants"](#).
 - Operate the engine and check for leaks.
- ### CAUTION:
- If the engine does not produce oil pressure in 15 seconds after starting the engine, shut off the engine to reduce the possibility of component damage.
- Install the front undercover. Refer to [EXT-37, "FRONT UNDER COVER : Removal and Installation"](#).

OIL COOLER

[CUMMINS 5.0L]

< REMOVAL AND INSTALLATION >

7. Stop the engine, and check the coolant and lubricating oil levels. Refer to [LU-33, "Inspection"](#) and [CO-45, "System Inspection"](#).

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ENGINE OIL DIPSTICK TUBE

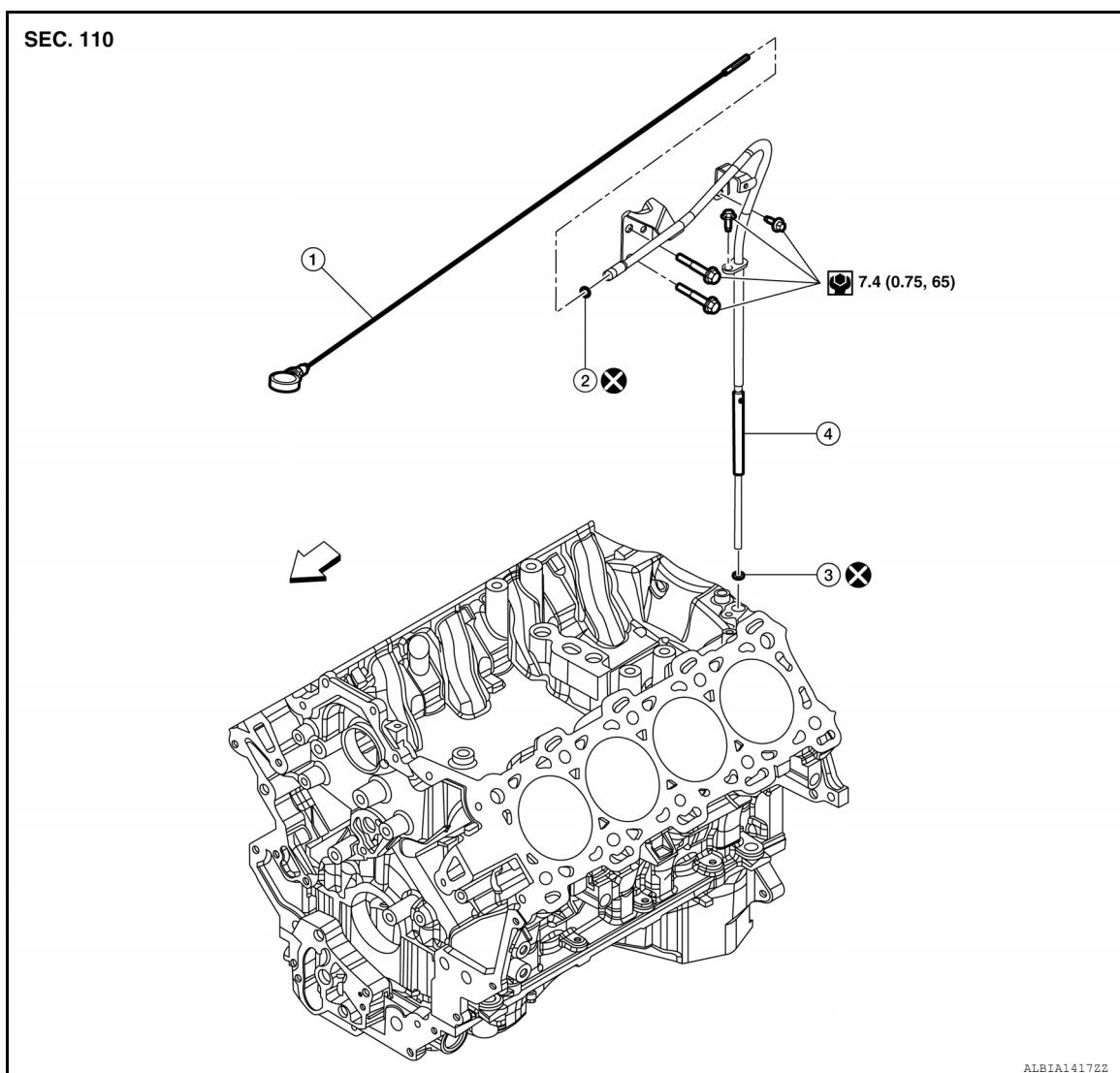
< REMOVAL AND INSTALLATION >

[CUMMINS 5.0L]

ENGINE OIL DIPSTICK TUBE

Exploded View

INFOID:0000000014418780



- | | | |
|-----------------------------|-----------|-----------|
| 1. Engine oil dipstick | 2. O-ring | 3. O-ring |
| 4. Engine oil dipstick tube | Front | |

Removal and Installation

INFOID:0000000014418781

REMOVAL

1. Remove the cowl top extension. Refer to [EXT-36, "Removal and Installation - Cowl Top Extension"](#).
2. Clean the area around the engine oil dipstick tube before removing to reduce the possibility of debris entering the lubrication system.

WARNING:

When using high-pressure water or steam cleaning equipment, to avoid the risk of personal injury from flying debris and hot steam:

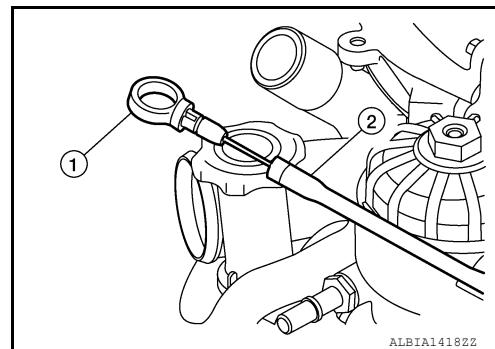
- Wear appropriate eye protection and protective clothing including gloves and a face shield.

ENGINE OIL DIPSTICK TUBE

[CUMMINS 5.0L]

< REMOVAL AND INSTALLATION >

3. Remove the engine oil dipstick (1) from the engine oil dipstick tube (2).



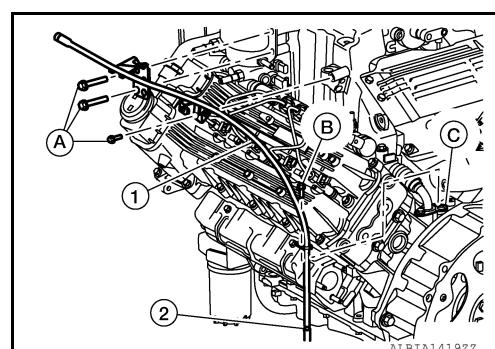
4. Remove the engine oil dipstick tube bolts (A) and (B) and remove the engine oil dipstick tube (1) from the cylinder block.

CAUTION:

Do not reuse the O-ring.

NOTE:

- Make sure the rubber O-ring (2) was removed from the cylinder block (C) with the engine oil dipstick tube.
- Access to the bolt (B) in the cylinder block (C) may be difficult and is often overlooked. Make certain to remove this bolt to avoid damaging the engine oil dipstick tube.



INSPECTION AFTER REMOVAL

- Clean any residue from the outside of the tube.
- Inspect the ends and length of the tube for cracking or straining.
- Inspect the engine oil dipstick tube mounting holes for stripped threads or missing hardware. Replace components as necessary.
- Inspect the engine oil dipstick for damage.
- Inspect the engine oil dipstick handle for damage. If damage is found, replace the dipstick.

INSTALLATION

1. Insert the engine oil dipstick tube (1) into the cylinder block bore (C), pressing into the bore until the bolt (B) can be installed.

CAUTION:

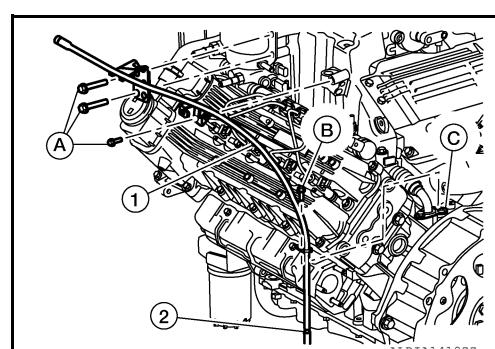
Do not reuse the O-ring.

NOTE:

- Make sure the mounting flange is fully seated in the block and that the dipstick tube is aligned properly.
- Lubricate the O-ring with clean engine oil.

2. Install bolts (A) that secure the engine oil dipstick tube (1).

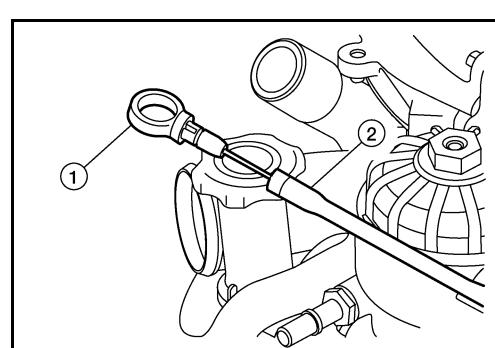
(2) : O-ring



3. Install the engine oil dipstick (1) into the engine oil dipstick tube (2).

NOTE:

- Check the engine oil level on the engine oil dipstick to confirm that the engine oil dipstick tube is installed properly into the engine block.
- Be sure that the O-ring on the dipstick is fully seated into the dipstick tube.



4. Install the cowl top extension. Refer to [EXT-36, "Removal and Installation - Cowl Top Extension"](#).
5. Operate the engine and check for leaks.

OIL FILTER BYPASS VALVE

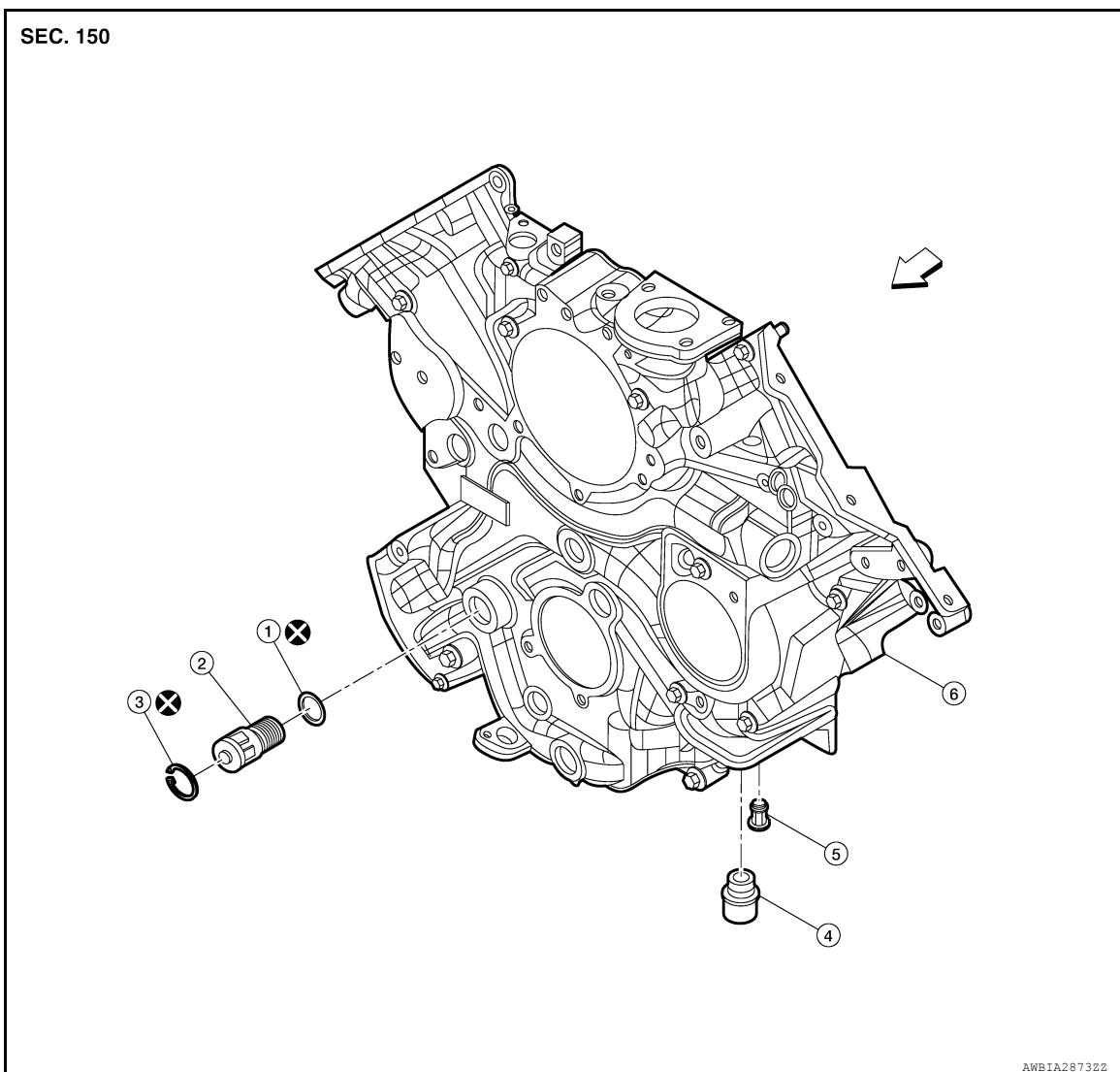
< REMOVAL AND INSTALLATION >

[CUMMINS 5.0L]

OIL FILTER BYPASS VALVE

Exploded View

INFOID:0000000014418782



- 1. O-ring
- 2. Oil thermostat
- 3. Snap ring
- 4. Oil filter head adapter
- 5. Oil filter bypass valve
- 6. Front cover

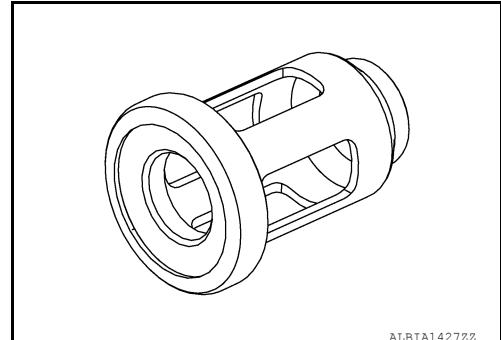
Front

Removal and Installation

INFOID:0000000014418783

GENERAL INFORMATION

- If the pressure drop across the oil filter exceeds a predetermined set point, the oil filter bypass valve opens and allows engine oil to bypass the oil filter.
- This condition can occur during cold ambient (cold engine oil) engine start-ups.
- The purpose of the oil filter bypass valve is to maintain engine oil flow to the engine and to prevent an oil filter collapse.



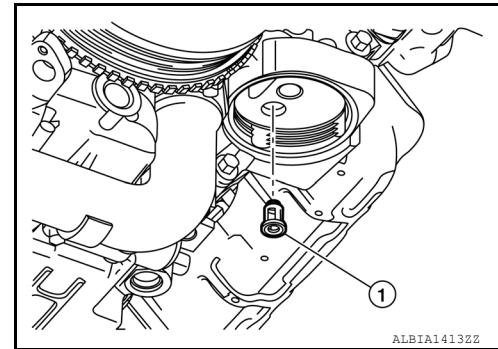
REMOVAL

1. Drain the engine oil. Refer to [LU-35, "Changing Engine Oil"](#).

WARNING:

To avoid the risk of personal injury:

- Be careful not to burn yourself, as engine oil may be hot.
 - Prolonged and repeated contact with used engine oil may cause skin cancer; try to avoid direct skin contact with used engine oil. If skin contact is made, wash thoroughly with soap or hand cleaner as soon as possible. Avoid inhalation of vapors, ingestion, and prolonged contact with used engine oil.
 - If not reused, dispose of in accordance with local environmental regulations.
2. Remove the oil filter. Refer to [LU-36, "Removal and Installation"](#).
 3. Remove the oil filter bypass valve (1) from the filter head on the front cover.



ALBIA1413Z2

INSPECTION AFTER REMOVAL

WARNING:

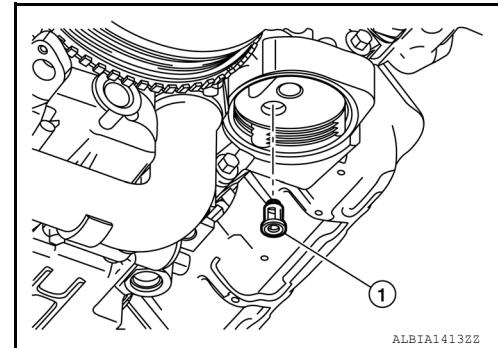
- To avoid the risk of injury to eyes and skin, when using caustic solutions, solvents, acids, or alkaline materials follow the manufacturers recommendations for use and wear appropriate eye protection and protective clothing. Some of these materials are also flammable. To avoid risk of fire or burns, never smoke or allow sparks or flames (such as pilot lights, electrical switches, or welding equipment) in the work area. Avoid spilling onto a hot exhaust manifold which can cause a fire.
- When using compressed air for cleaning, to avoid the risk of personal injury from flying debris and dirt:
 - Do not exceed 30psi (270 kPa).
 - Wear appropriate eye protection and protective clothing including gloves.
- Clean the oil filter bypass valve with solvent.
- Dry with compressed air.
- Inspect the oil filter bypass valve seat for damage. If damage is present, replace the oil filter bypass valve.

INSTALLATION

1. Install the oil filter bypass valve (1) into the filter head in the front cover. Gently push the bypass valve into the bore until it seats.

NOTE:

Lubricate the oil filter bypass valve with clean engine oil.



ALBIA1413Z2

2. Install the oil filter. Refer to [LU-36, "Removal and Installation"](#).
3. Refill the engine oil. Refer to [MA-62, "Cummins 5.0L Engine : Fluids and Lubricants"](#).
4. Operate the engine and check for leaks.

CAUTION:

If the engine does not produce oil pressure in 15 seconds after starting the engine, shut off the engine to reduce the possibility of component damage.

OIL FILTER HEAD ADAPTER

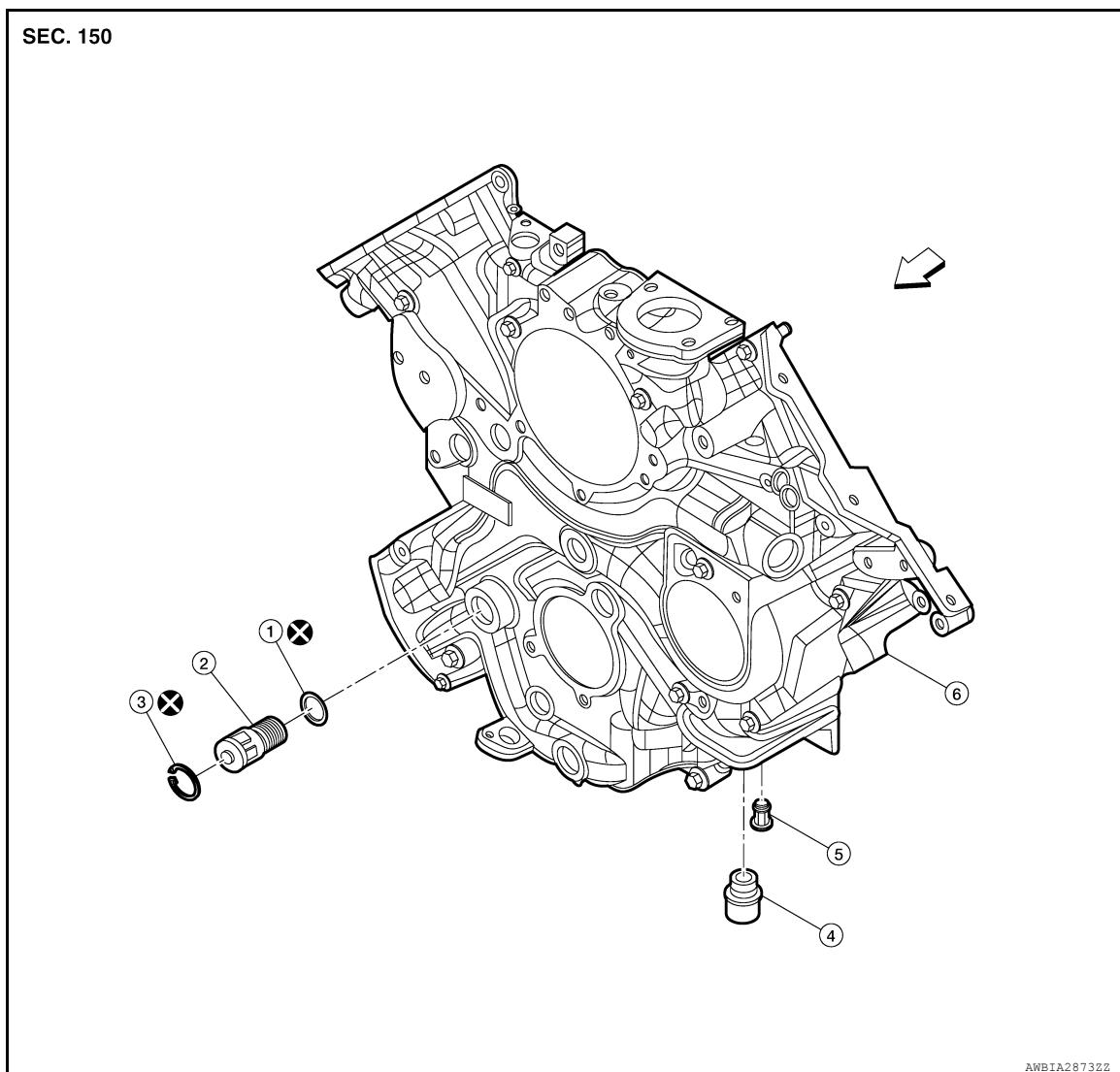
< REMOVAL AND INSTALLATION >

[CUMMINS 5.0L]

OIL FILTER HEAD ADAPTER

Exploded View

INFOID:0000000014418784



- 1. O-ring
- 2. Oil thermostat
- 3. Snap ring
- 4. Oil filter head adapter
- 5. Oil filter bypass valve
- 6. Front cover

Front

Removal and Installation

INFOID:0000000014418785

REMOVAL

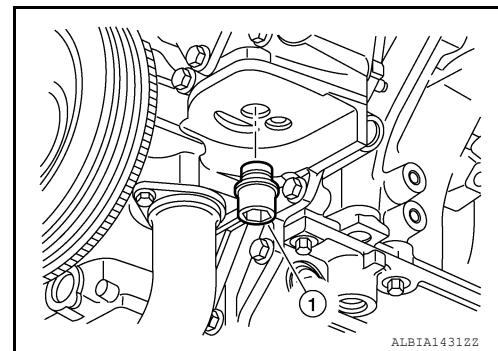
1. Drain the engine oil. Refer to [LU-35, "Changing Engine Oil"](#).
2. Remove the oil filter. Refer to [LU-36, "Removal and Installation"](#).

OIL FILTER HEAD ADAPTER

< REMOVAL AND INSTALLATION >

[CUMMINS 5.0L]

3. Use a suitable tool to remove the oil filter head adapter (1).



INSPECTION AFTER REMOVAL

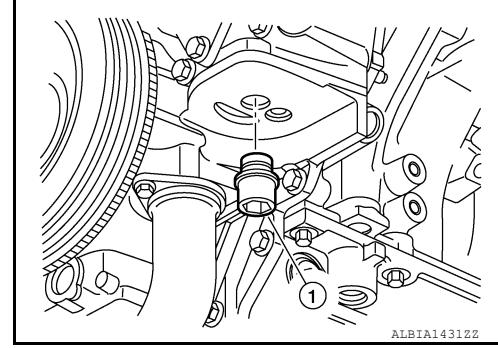
WARNING:

- To avoid the risk of injury to eyes and skin, when using caustic solutions, solvents, acids, or alkaline materials follow the manufacturers recommendations for use and wear appropriate eye protection and protective clothing. Some of these materials are also flammable. To avoid risk of fire or burns, never smoke or allow sparks or flames (such as pilot lights, electrical switches, or welding equipment) in the work area. Avoid spilling onto a hot exhaust manifold which can cause a fire.
 - Some solvents are flammable and toxic. Read the manufacturer's instructions before using.
 - Use solvent to clean the parts.
 - Dry with compressed air.
-
- Inspect the threads in the front cover for damage. If damage is found, replace the front cover.
 - Inspect the threads on the oil filter head adapter for damage. If damage is found, replace the oil filter head adapter.

INSTALLATION

1. Use a suitable tool to install the oil filter head adapter (1).

Oil filter head adapter : 62 N·m (6.3 kg·m, 46 ft-lb)



2. Install the oil filter. Refer to [LU-36, "Removal and Installation"](#).
3. Refill the engine oil. Refer to [MA-62, "Cummins 5.0L Engine : Fluids and Lubricants"](#).
4. Operate the engine and check for leaks.

CAUTION:

If the engine does not produce oil pressure in 15 seconds after starting the engine, shut off the engine to reduce the possibility of component damage.

OIL PRESSURE REGULATOR (MAIN RIFLE)

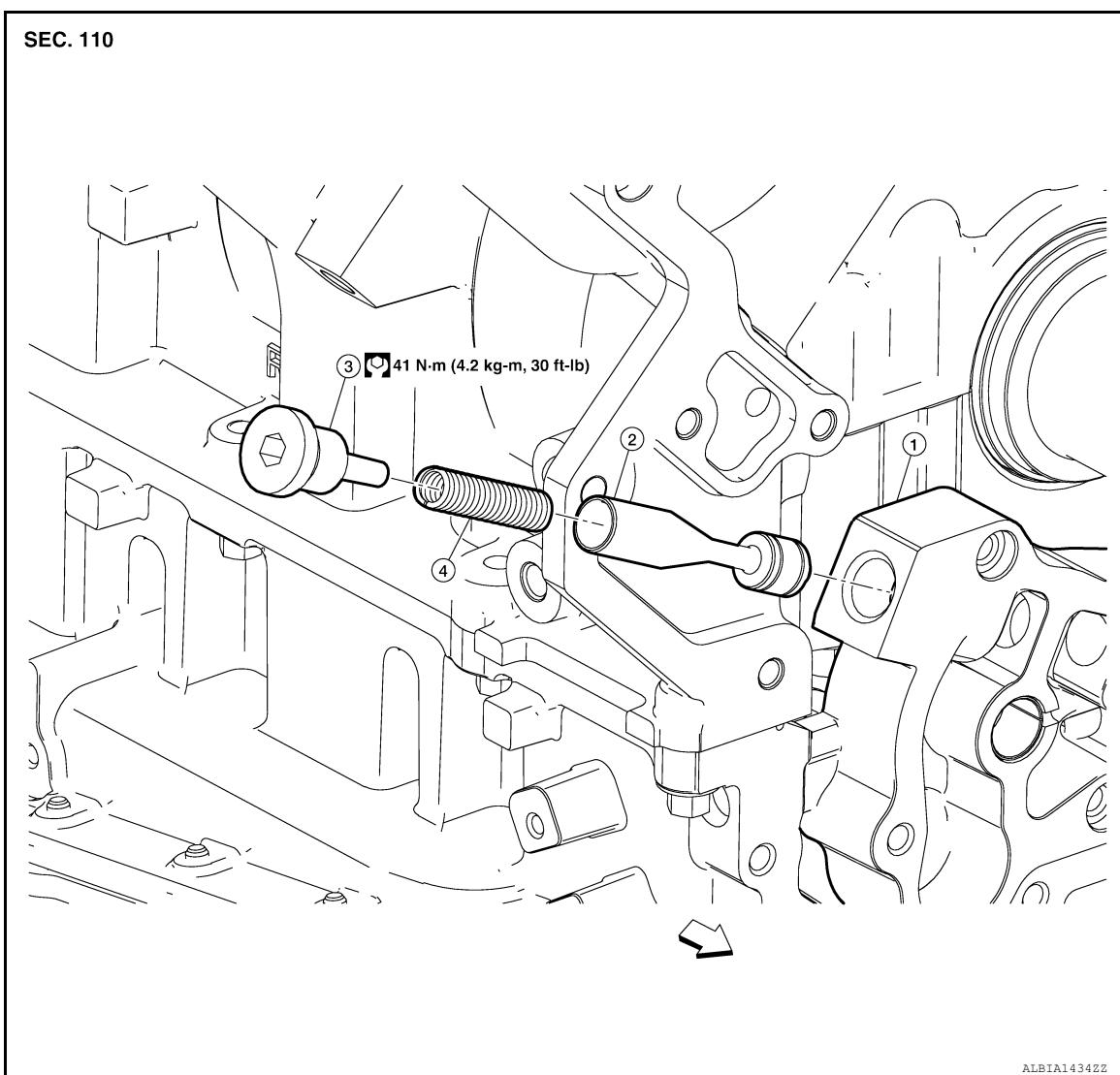
< REMOVAL AND INSTALLATION >

[CUMMINS 5.0L]

OIL PRESSURE REGULATOR (MAIN RIFLE)

Exploded View

INFOID:0000000014418786



- 1. Block stiffener
- 2. Oil pressure regulator (main rifle)
- 3. Plug
- 4. Oil pressure regulator spring

Front

Removal and Installation

INFOID:0000000014418787

REMOVAL

WARNING:

To avoid the risk of injury to eyes and skin, when using caustic solutions, solvents, acids, or alkaline materials follow the manufacturers recommendations for use and wear appropriate eye protection and protective clothing. Some of these materials are also flammable. To avoid risk of fire or burns, never smoke or allow sparks or flames (such as pilot lights, electrical switches, or welding equipment) in the work area. Avoid spilling onto a hot exhaust manifold which can cause a fire.

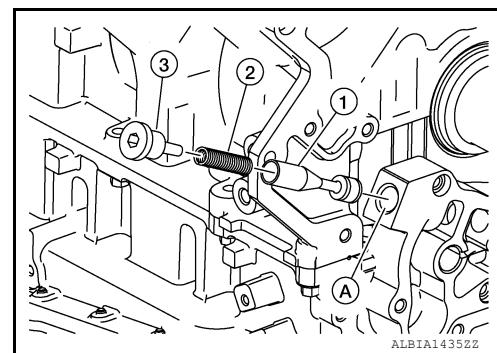
1. Disconnect the battery or batteries. Refer to [PG-185, "Battery Disconnect"](#).
2. Remove the front cover. Refer to [EM-338, "Removal and Installation"](#).
3. Thoroughly clean the area around the oil pressure regulator plug with clean solvent to prevent debris from falling into the plunger bore when the plug is removed.

OIL PRESSURE REGULATOR (MAIN RIFLE)

[CUMMINS 5.0L]

< REMOVAL AND INSTALLATION >

4. Remove the threaded plug (3) from the plunger bore (A).
5. Remove the oil pressure regulator spring (2) and oil pressure regulator (1).



INSPECTION AFTER REMOVAL

WARNING:

- To avoid the risk of injury to eyes and skin, when using caustic solutions, solvents, acids, or alkaline materials follow the manufacturer's recommendations for use and wear appropriate eye protection and protective clothing. Some of these materials are also flammable. To avoid risk of fire or burns, never smoke or allow sparks or flames (such as pilot lights, electrical switches, or welding equipment) in the work area. Avoid spilling onto a hot exhaust manifold which can cause a fire.
- Some solvents are flammable and toxic. Read the manufacturer's instructions before use.
- When using compressed air for cleaning, to avoid the risk of personal injury from flying debris and dirt:
 - Do not exceed 30 psi (207 kPa).
 - Wear appropriate eye protection and protective clothing including gloves.

CAUTION:

Compressed air used for cleaning should not exceed 207 kPa (30 psi). Failure to do so can cause engine component damage.

- Thoroughly clean all components with solvent.
- Dry with compressed air.
- Clean the pressure regulator valve bore with solvent.
- Dry with compressed air.

NOTE:

If it is suspected that debris flowed through the oil pump, the block stiffener plate should be removed to thoroughly clean all the passages and the oil filter **must** be changed. Clean the oil passages with a suitable tool.

OIL PRESSURE REGULATOR

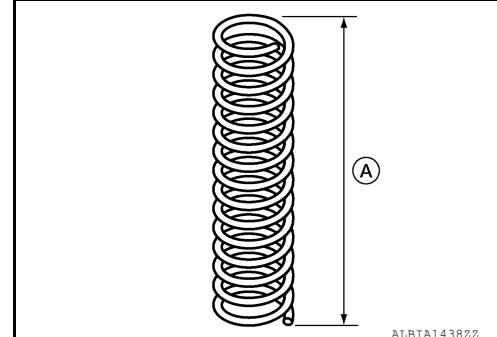
- Inspect the valve bore for signs of wear or damage. If damage is present, replace the block stiffening plate. Refer to [EM-310, "Removal and Installation"](#).
- Inspect the oil pressure regulator for proper movement, plugged holes, and scratches. If damage is present, replace the oil pressure regulator.

OIL PRESSURE REGULATOR SPRING

- Inspect the oil pressure regulator spring for damage or rust and verify the uncompressed height (A) of the spring.

Height (A) : 59.4 mm (2.34 in)

- If damage is present, replace the oil pressure regulator, spring, and oil pump. Refer to [LU-51, "Removal and Installation"](#).



INSTALLATION

OIL PRESSURE REGULATOR (MAIN RIFLE)

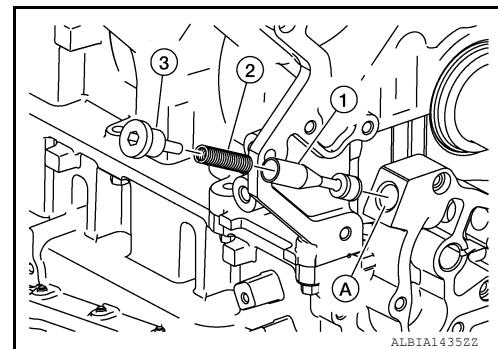
< REMOVAL AND INSTALLATION >

[CUMMINS 5.0L]

1. Install the oil pressure regulator (1), oil pressure regulator spring (2), and threaded plug (3) into the plunger bore (A).

NOTE:

Check the plug (3) to be sure it is fully seated.



2. Install the front cover. Refer to [EM-338, "Removal and Installation"](#).
3. Connect the battery or batteries. Refer to [PG-185, "Battery Disconnect"](#).
4. Operate the engine and check for leaks.

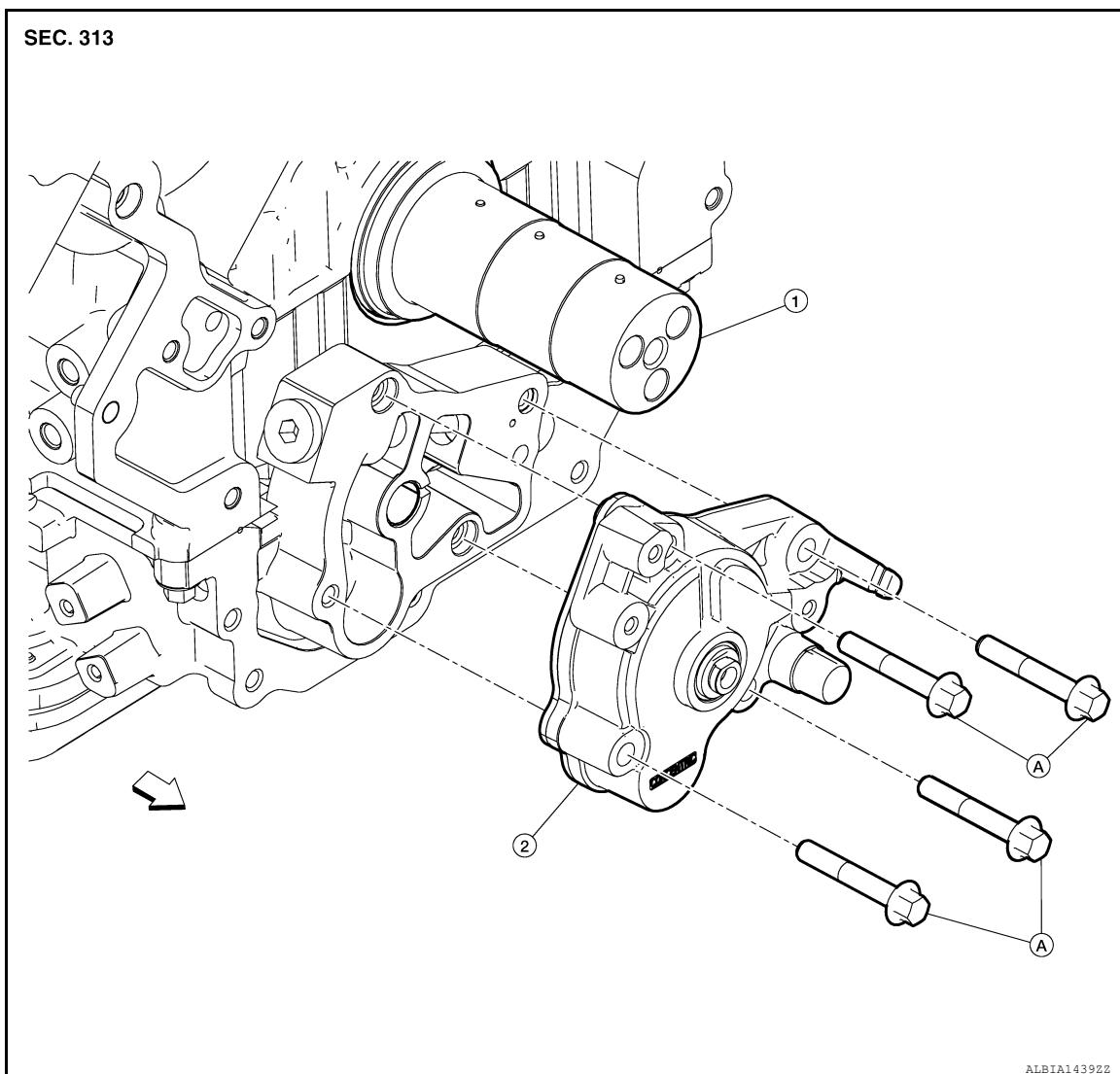
CAUTION:

If the engine does not produce oil pressure in 15 seconds after starting the engine, shut off the engine to reduce the possibility of component damage.

< REMOVAL AND INSTALLATION >

OIL PUMP**Exploded View**

INFOID:000000014418788



1. Crankshaft

Front

2. Oil pump

A. Refer to INSTALLATION

Removal and Installation

INFOID:000000014418789

REMOVAL

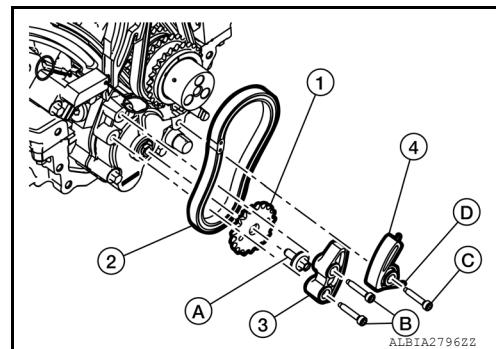
1. Remove the front cover. Refer to [EM-338, "Removal and Installation"](#).

OIL PUMP

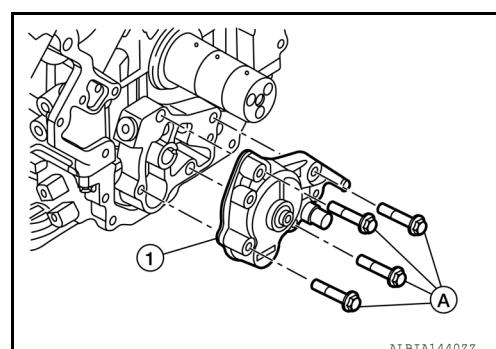
[CUMMINS 5.0L]

< REMOVAL AND INSTALLATION >

- Release the spring (D) and remove bolt (C) along with the oil pump slack guide (4).
- Remove bolts (B) and remove the oil pump chain tension guide (3).
- Hold the oil pump sprocket (1) with a suitable tool and remove bolt (A).
- Remove the oil pump sprocket (1) and oil pump chain (2).



- Remove the bolts (A) and remove the oil pump (1) from the block stiffening plate.



INSPECTION AFTER REMOVAL

OIL PUMP

- WARNING:**

- To avoid the risk of injury to eyes and skin, when using caustic solutions, solvents, acids, or alkaline materials follow the manufacturers recommendations for use and wear appropriate eye protection and protective clothing. Some of these materials are also flammable. To avoid risk of fire or burns, never smoke or allow sparks or flames (such as pilot lights, electrical switches, or welding equipment) in the work area. Avoid spilling onto a hot exhaust manifold which can cause a fire.
- Some solvents are flammable and toxic. Read the manufacturer's instructions before using.
- When using compressed air for cleaning, to avoid the risk of personal injury from flying debris and dirt:
 - Do not exceed 30 psi (207 kPa).
 - Wear appropriate eye protection and protective clothing including gloves.
- Clean the oil pump with solvent.
- Dry with compressed air.
- Inspect the oil pump for damage and correct operation. If damage is present, replace the oil pump.
- Inspect the oil pump gears for chips, cracks, and excessive wear. If damage is present, replace the oil pump.
- Inspect the oil pump housing and rotor drive for damage and excessive wear.
- If the oil pump is damaged, the oil pump **must** be replaced.

NOTE:

The oil pump is serviced/replaced as an assembly. No internal parts are available for rebuild/replacement.

BLOCK STIFFENING PLATE

- WARNING:**

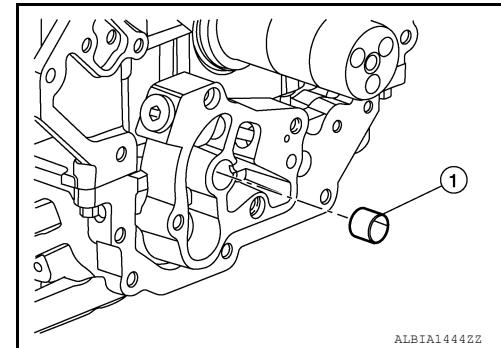
- To avoid the risk of injury to eyes and skin, when using caustic solutions, solvents, acids, or alkaline materials follow the manufacturers recommendations for use and wear appropriate eye protection and protective clothing. Some of these materials are also flammable. To avoid risk of fire or burns, never smoke or allow sparks or flames (such as pilot lights, electrical switches, or welding equipment) in the work area. Avoid spilling onto a hot exhaust manifold which can cause a fire.
- Some solvents are flammable and toxic. Read the manufacturer's instructions before using.
- When using compressed air for cleaning, to avoid the risk of personal injury from flying debris and dirt:
 - Do not exceed 30 psi (207 kPa).
 - Wear appropriate eye protection and protective clothing including gloves.

- CAUTION:**

< REMOVAL AND INSTALLATION >

Do not allow solvents to enter the lubricating oil system. Solvents can reduce the ability of the lubricating oil to minimize component wear.

- Use solvent to clean the block stiffener plate cavity while the pump is removed.
- Dry with compressed air.
- Remove and inspect the oil check valve in the block stiffening plate for proper operation. Refer to [LU-57, "Removal and Installation"](#).
- Inspect the oil pressure regulator in the block stiffener plate. Refer to [LU-48, "Removal and Installation"](#).
- Inspect the oil pump bushing (1) in the block stiffening plate. If the bushing is worn or damaged, the block stiffening plate **must** be replaced. Refer to [EM-310, "Removal and Installation"](#).



INSTALLATION

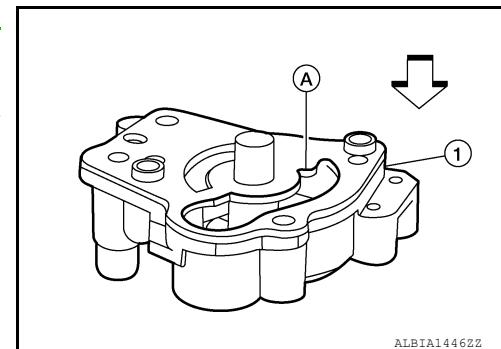
1. Fill the oil pump (1) with clean engine oil through opening (A).

Use recommended engine oil or equivalent. Refer to [MA-62, "Cummins 5.0L Engine : Fluids and Lubricants"](#).

CAUTION:

Failure to fill the pump with oil during installation can result in a slow prime at initial engine start-up, resulting in severe engine damage.

◀ : Front



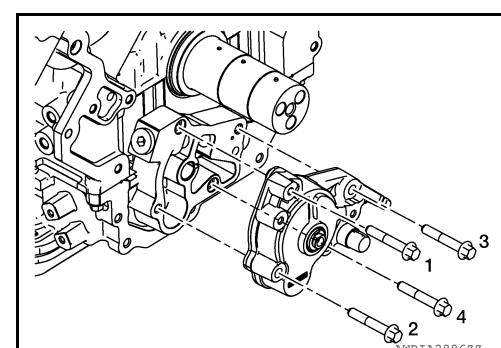
2. Install the oil pump onto the block stiffening plate and hand tighten the bolts.

NOTE:

Turn the pump to check for proper rotation using a suitable tool.

3. Tighten the oil pump bolts in the order shown.

Oil pump bolts : 20 N·m (2.0 kg-m, 15 ft-lb)

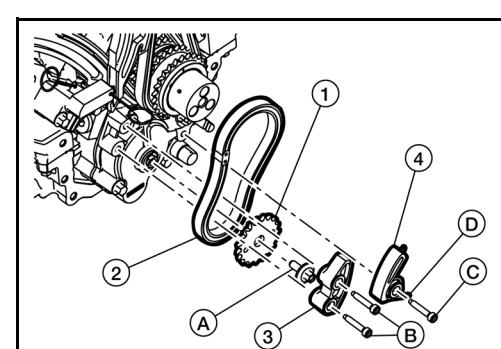


4. Install the oil pump sprocket (1) and oil pump chain (2).
5. Install bolt (A) and tighten hand-tight.
6. Install the oil pump chain tension guide (3) and tighten bolts (B).
7. Install the oil pump slack guide (4) and tighten bolt (C) then install the spring (D).
8. Hold the oil pump sprocket (1) with a suitable tool and tighten.

Bolts (B) : 7.4 N·m (0.75 kg-m, 65 in-lb)

Bolt (C) : 7.4 N·m (0.75 kg-m, 65 in-lb)

Bolt (A) : 23 N·m (2.3 kg-m, 17 ft-lb)



9. Install the front cover. Refer to [EM-338, "Removal and Installation"](#).

10. Connect the battery or batteries. Refer to [PG-185, "Battery Disconnect"](#).

< REMOVAL AND INSTALLATION >

11. Operate the engine and check for leaks.

CAUTION:

If the engine does not produce oil pressure in 15 seconds after starting the engine, shut off the engine to reduce the possibility of component damage.

INSPECTION AFTER INSTALLATION

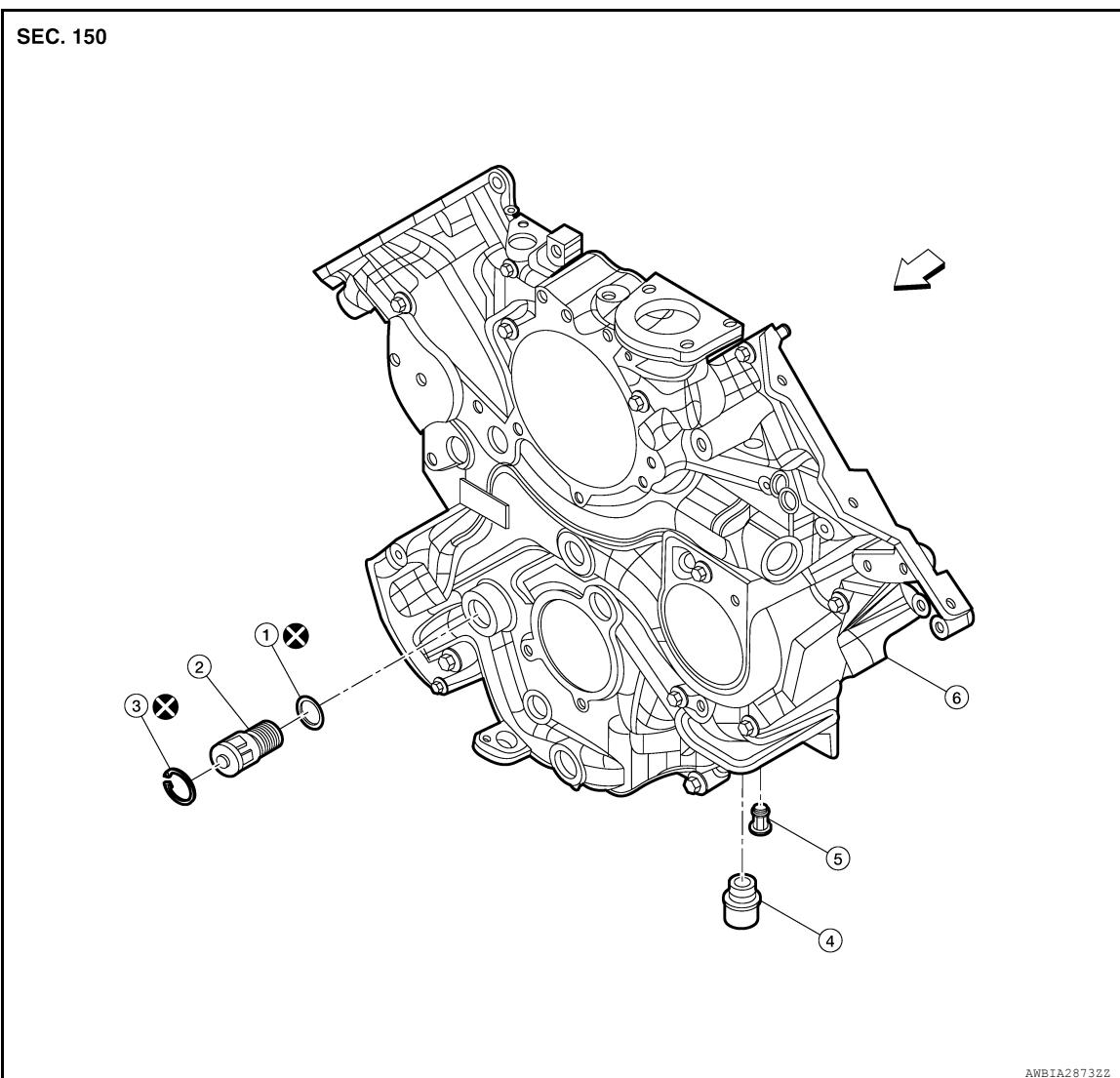
- Start the engine, and check for engine oil and engine coolant leaks and repair as necessary.
- Stop engine and wait 10 minutes.
- Check level and add engine oil as required. Refer to [LU-33, "Inspection".](#)

< REMOVAL AND INSTALLATION >

OIL THERMOSTAT

Exploded View

INFOID:0000000014418790



- 1. O-ring
- 2. Oil thermostat
- 3. Snap ring

- 4. Oil filter head adapter
- 5. Oil filter bypass valve
- 6. Front cover

Front

Removal and Installation

INFOID:0000000014418791

REMOVAL

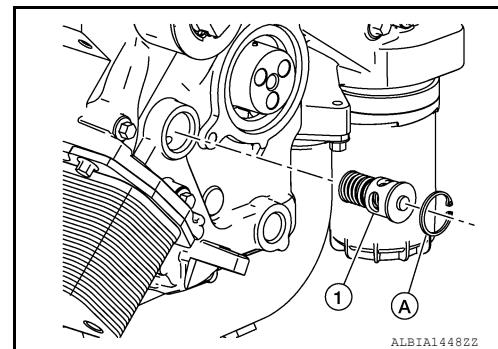
1. Disconnect the battery or batteries. Refer to [PG-185, "Battery Disconnect"](#).
2. Remove the vibration damper. Refer to [EM-489, "Removal and Installation"](#).

OIL THERMOSTAT

[CUMMINS 5.0L]

< REMOVAL AND INSTALLATION >

3. Remove the snap ring (A) that retains the oil thermostat (1) in its location in the front cover and remove the oil thermostat.

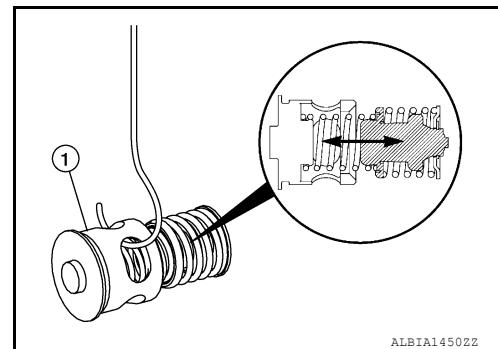


INSPECTION AFTER REMOVAL

- Clean and inspect the oil thermostat bore in the front cover before assembly.
- Inspect for a damaged O-ring, broken spring, or other damage.
- If damage is found, the component **must** be replaced.

OIL THERMOSTAT TEST

1. Suspend the oil thermostat (1) and a thermometer (capable of at least 116°C [240°F]) in a container of new engine oil. Do **not** allow the oil thermostat to contact the sides of the container.
2. Heat the lubricating oil.
NOTE:
Note the temperature when the thermostat valve is fully expanded. The oil thermostat should **not** be fully expanded when the temperature reaches 116°C (240°F).
3. Replace the oil thermostat if it does **not** operate as described.



INSTALLATION

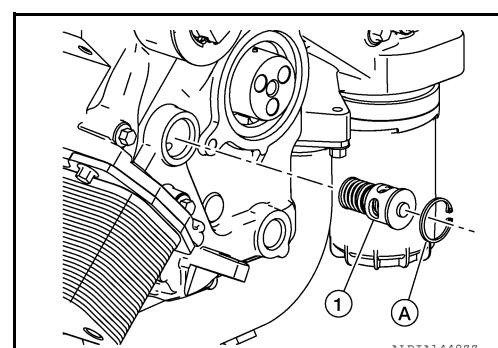
1. Install the oil thermostat (1) into the front cover and install the snap ring (A).

CAUTION:

Do not reuse the O-ring.

NOTE:

Lubricate the O-ring with clean engine oil.



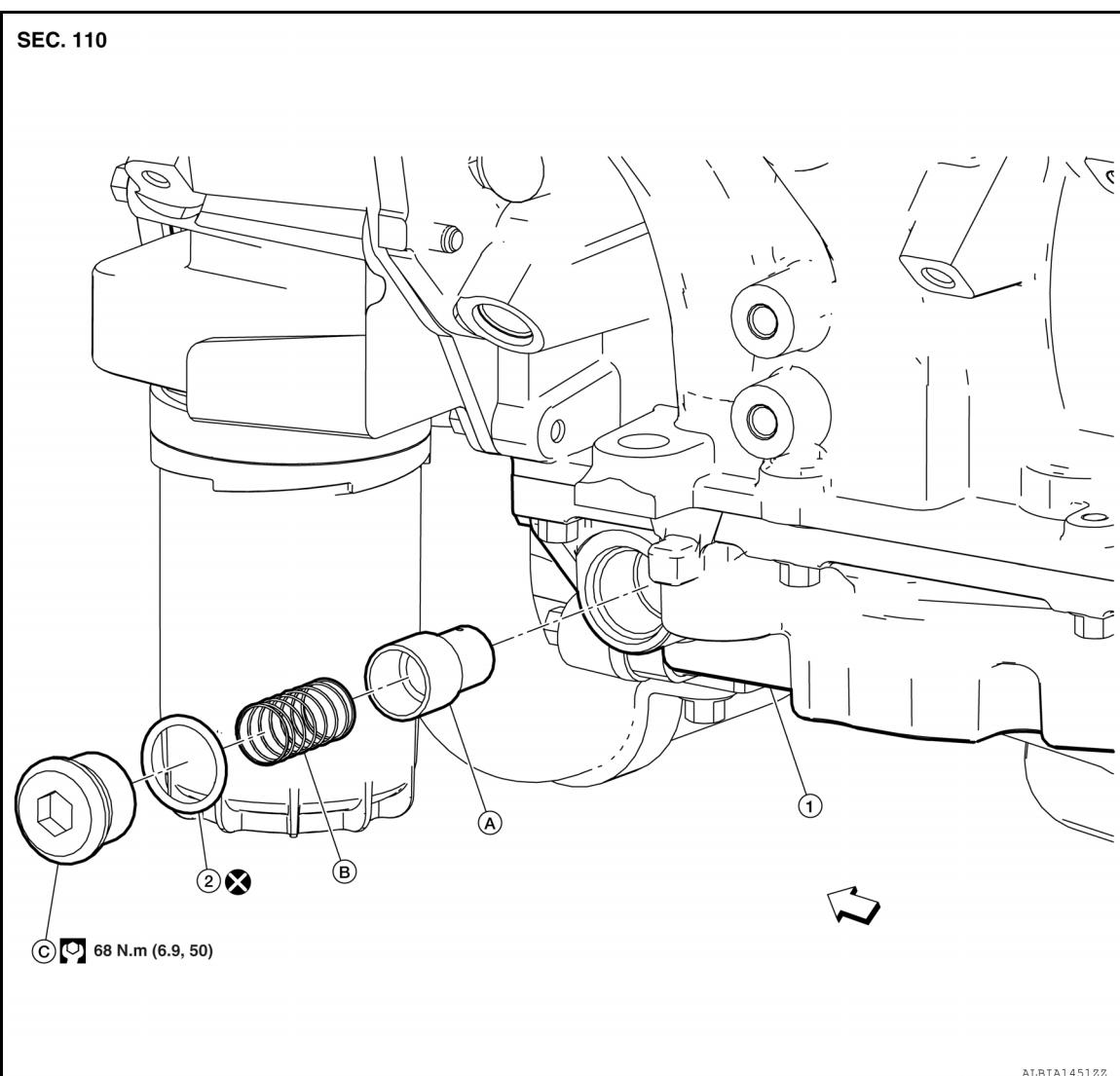
2. Install the vibration damper. Refer to [EM-489, "Removal and Installation"](#).
3. Connect the battery or batteries. Refer to [PG-185, "Battery Disconnect"](#).
4. Operate the engine and check for leaks.

< REMOVAL AND INSTALLATION >

OIL CHECK VALVE

Exploded View

INFOID:000000014418792



- | | | |
|---------------------------|------------------|--------------------|
| 1. Block stiffening plate | 2. O-ring | A. Oil check valve |
| B. Oil check valve spring | C. Threaded plug | Front |

Removal and Installation

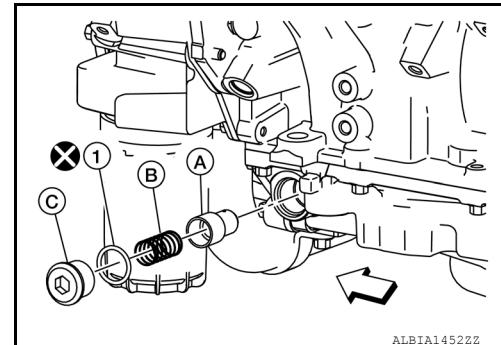
INFOID:000000014418793

REMOVAL

1. Remove the front undercover. Refer to [EXT-37, "FRONT UNDER COVER : Removal and Installation"](#).
2. Drain the engine oil. Refer to [LU-35, "Changing Engine Oil"](#).
3. Remove the threaded plug (C) and remove the oil check valve spring (B) and oil check valve (A) from the block stiffening plate.

CAUTION:**Do not reuse the O-ring (1).**

Front



INSPECTION AFTER REMOVAL

• **WARNING:**

To avoid the risk of injury to eyes and skin, when using caustic solutions, solvents, acids, or alkaline materials follow the manufacturer's recommendations for use and wear appropriate eye protection and protective clothing. Some of these materials are also flammable. To avoid risk of fire or burns, never smoke or allow sparks or flames (such as pilot lights, electrical switches, or welding equipment) in the work area. Avoid spilling onto a hot exhaust manifold which can cause a fire.

- Thoroughly clean all check valve components with solvent. Dry with compressed air.
- Inspect the lubricating oil check valve for proper operation and inspect the valve bore for signs of wear and damage. If damage is present in the check valve, replace the valve. If the valve bore shows signs of wear or damage, replace the block stiffening plate. Refer to [EM-310, "Exploded View"](#).

NOTE:

- Slight wear scuffs from normal use are acceptable.
- If it is suspected that debris has flowed through the oil pump, the block stiffening plate should be removed to thoroughly clean all of the passages. Clean the oil passages with a suitable tool.

INSTALLATION

1. Install the oil check valve (A), oil check valve spring (B), and threaded plug (C) into the bore and tighten the plug.

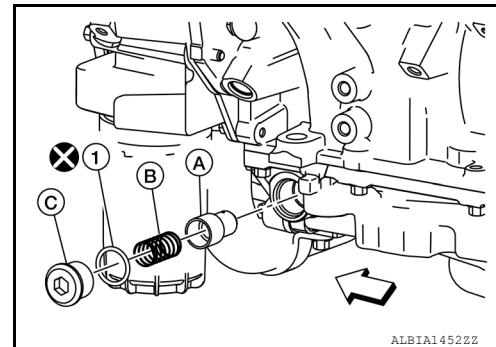
CAUTION:

Do not reuse the O-ring (1).

NOTE:

- Lubricate the oil check valve assembly with clean engine oil.
- Do not use any water-based lubricants to lubricate the oil check valve assembly.

◀ : Front



ALBIA1452ZZ

2. Refill the engine oil. Refer to [LU-35, "Changing Engine Oil"](#).
3. Connect the battery or batteries. Refer to [PG-185, "Battery Disconnect"](#).
4. Operate the engine and check for leaks.

CAUTION:

If engine does not produce oil pressure in 15 seconds after starting engine, shut off the engine to reduce the possibility of component damage.

5. Install the front undercover. Refer to [EXT-37, "FRONT UNDER COVER : Removal and Installation"](#).

OIL PRESSURE SWITCH

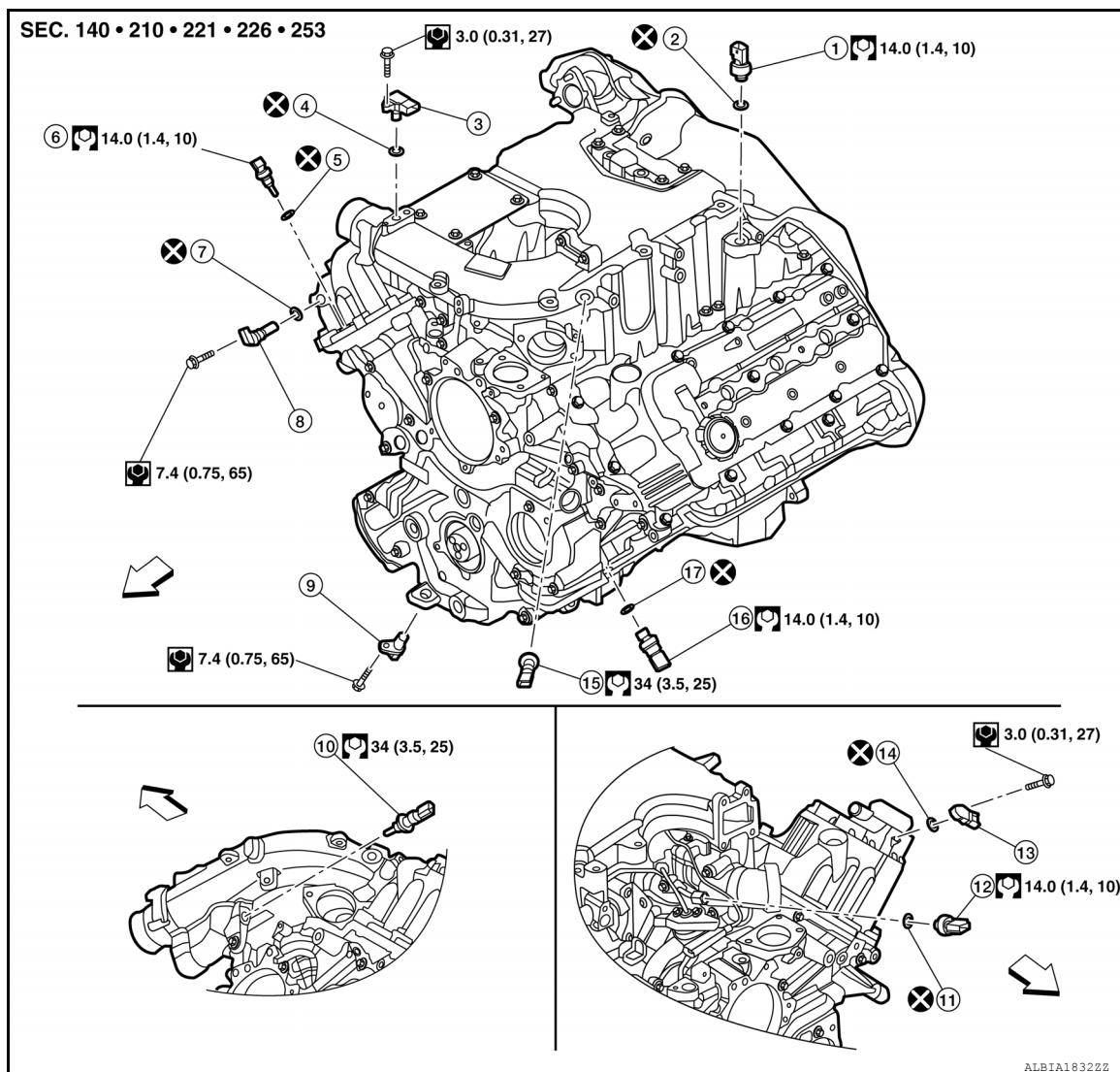
< REMOVAL AND INSTALLATION >

[CUMMINS 5.0L]

OIL PRESSURE SWITCH

Exploded View

INFOID:0000000014418794



- | | | |
|--------------------------------|-----------------------------|--|
| 1. Exhaust gas pressure sensor | 2. O-ring | 3. Engine charge-air cooler outlet pressure/temperature sensor |
| 4. O-ring | 5. O-ring | 6. Engine coolant temperature sensor |
| 7. O-ring | 8. Camshaft position sensor | 9. Crankshaft position sensor |
| 10. EGR temperature sensor | 11. O-ring | 12. Low pressure turbocharger boost pressure sensor |
| 13. Crankcase pressure sensor | 14. O-ring | 15. Intake manifold air temperature sensor |
| 16. Oil pressure switch | 17. O-ring | Front |

Removal and Installation

INFOID:0000000014418795

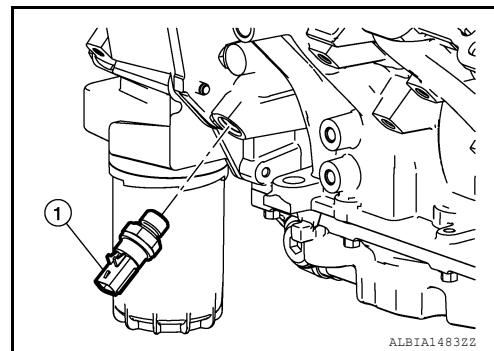
GENERAL INFORMATION

OIL PRESSURE SWITCH

[CUMMINS 5.0L]

< REMOVAL AND INSTALLATION >

- The engine oil pressure switch (1) is a normally closed switch and opens when it detects pressure between 31 - 72 kPa (0.32 - 0.73 kg/cm², 4.5 - 10.5 psi). The engine oil pressure switch measures the oil pressure after the oil has passed through the oil filter and at the oil rifle. Reference the lubrication oil system flow diagram in the following procedure. Refer to [LU-28, "Schematic"](#)
- The oil pressure switch is located on the left side of the block behind the oil filter. Refer to [LU-24, "System Description"](#).



REMOVAL

- Remove the front undercover. Refer to [EXT-37, "FRONT UNDER COVER : Removal and Installation"](#).
- Clean the area around the oil pressure switch.
- Disconnect the harness connector from the oil pressure switch.

MEASURE

WARNING:

To avoid the risk of personal injury:

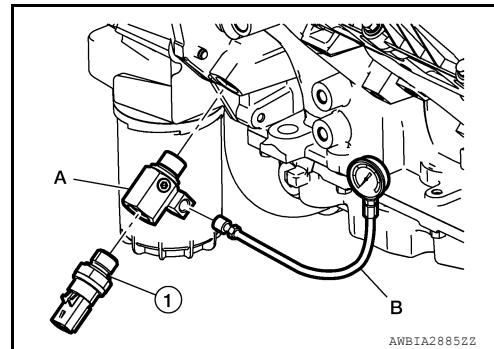
- Be careful not to burn yourself, as engine oil may be hot.
- Prolonged and repeated contact with used engine oil may cause skin cancer; try to avoid direct skin contact with used engine oil. If skin contact is made, wash thoroughly with soap or hand cleaner as soon as possible. Avoid inhalation of vapors, ingestion, and prolonged contact with used engine oil.
- If not reused, dispose of in accordance with local environmental regulations.

- Install Tool (A) into the port from which the oil pressure switch (1) was removed and install the oil pressure switch into the other end of the Tool.
- Install Tool into Tool (A).

Tool : — (J-54412)

Tool : — (J-54417)

- Use CONSULT to monitor the value of the oil pressure switch with the keyswitch in the ON position and the engine OFF. The status of the oil pressure switch should indicate OFF, pressure not detected, or 0 kPa (0 psi).
- Connect suitable tool (B). Start the engine.



CAUTION:

If the lubricating oil pressure does not develop within 15 seconds, shut down the engine to reduce the possibility of internal damage.

- Allow the engine to operate and achieve operating temperature. Check for leaks.
- Record the lubricating oil pressure reading at idle.

Oil Pressure at Low Idle (Minimum) : 69 kPa (0.70 kg/cm², 10 psi)

- Monitor the value of the pressure switch with the CONSULT while the engine is idling. The status of the oil pressure switch should indicate ON, pressure detected, or a pressure value.

NOTE:

If no pressure is detected while the engine is running, check the engine wiring for continuity. Refer to [EC-856, "Wiring Diagram"](#). If continuity in the harness is less than 10 ohms, replace the oil pressure switch.

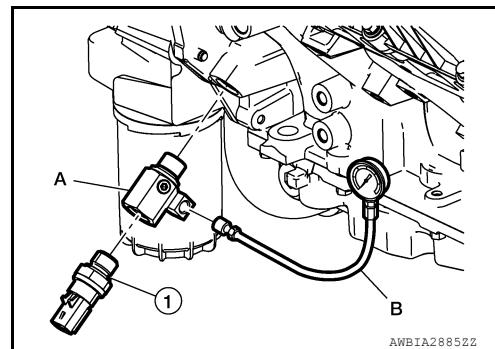
OIL PRESSURE SWITCH

[CUMMINS 5.0L]

< REMOVAL AND INSTALLATION >

8. Remove the Tool (A) and suitable tool (B) from the port and install the oil pressure switch (1).

Tool : — (J-54412)
Tool : — (J-54417)



INSPECTION AFTER REMOVAL

OIL PRESSURE SWITCH HARNESS CONNECTOR

- Inspect the engine harness connector and the oil pressure switch for the following:
 - Cracked or broken connector shell
 - Missing or damaged connector seals
 - Dirt, debris, or moisture in or on the connector pins
 - Corroded, bent, broken, pushed back, or expanded pins.
- Repair or replace the engine harness connector as needed.

OIL PRESSURE SWITCH

- Inspect the oil pressure switch for the following:
 - Damaged seal surface
 - Damaged seal surface on the switch
 - Damaged switch hex surfaces
 - Corrosion on the switch mounting threads.
- Replace the oil pressure switch if damage is found.

INSTALLATION

1. Install and tighten the engine oil pressure switch and connect the harness connector.

CAUTION:

Do not reuse the O-ring.

2. Connect the battery or batteries. Refer to [PG-185, "Battery Disconnect"](#).

WARNING:

Battery acid and battery acid fumes are extremely dangerous and can cause severe burns and explosion. To help reduce the risk of personal injury:

- Wear appropriate goggles and protective clothing.
- Always properly ventilate the area where the service is being performed.
- Never allow battery fluid to come in contact with skin, eyes, fabrics, or painted surfaces.
- To avoid arcing, remove the negative (-) battery cable first and attach the negative (-) battery cable last.
- If acid contacts eyes, skin or clothing, immediately flush with water for 15 minutes and seek medical attention.

3. Operate the engine and check for leaks.

NOTE:

Shut engine off and wait 10 minutes. Check the engine oil level. Refer to [LU-33, "Inspection"](#)

4. Install the front undercover. Refer to [EXT-37, "FRONT UNDER COVER : Removal and Installation"](#).

SERVICE DATA AND SPECIFICATIONS (SDS)**SERVICE DATA AND SPECIFICATIONS (SDS)****Standard and Limit**

INFOID:000000014418796

OIL PRESSUREUnit: kPa (kg/cm², psi)

Oil pressure	310 - 379 (3.16 - 3.87, 45 - 55)
Minimum oil pressure (low idle)	69 (0.70, 10)
Minimum oil pressure (rated speed)	279 (2.85, 40.5)

*: At normal operating temperature

ENGINE OIL CAPACITY (APPROXIMATE)Unit: ℓ (US qt, Imp qt)

Drain and refill	With oil filter change	9.5 (10, 8-3/8)
	Without oil filter change	9.1 (9-5/8, 8)
High to Low (Engine Dipstick)		1.9 (2, 1-5/8)

OIL PRESSURE REGULATORUnit: kPa (kg/cm², psi)

Opening pressure range	310 - 379 (3.16 - 3.87, 45 - 55)
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OIL FILTER BYPASS VALVEUnit: kPa (kg/cm², psi)

Bypass differential pressure opening	345 (3.52, 45 - 50)
--------------------------------------	---------------------

OIL CONSUMPTION

Maximum acceptable (quart)	650 km (400 miles) or 10 hours
Maximum acceptable (liter)	675 km (425 miles) or 10.6 hours