SECTION LU
ENGINE LUBRICATION SYSTEM

CONTENTS

PRECAUTION

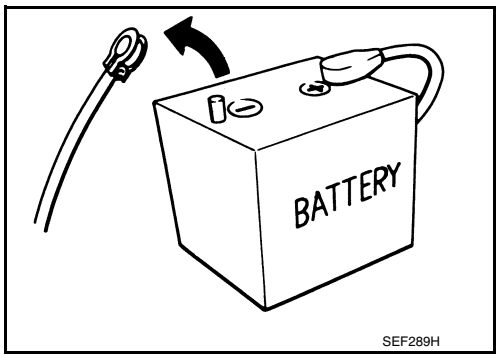
PRECAUTIONS

Precautions for Removing Battery Terminal

INFOID:0000000012958962

When disconnecting the battery terminal, pay attention to the following.
- Always use a 12V battery as power source.
- Never disconnect battery terminal while engine is running.
- When removing the 12V battery terminal, turn OFF the ignition switch and wait at least 30 seconds.
- For vehicles with the engine listed below, remove the battery terminal after a lapse of the specified time:

D4D engine	: 20 minutes	YS23DDT	: 4 minutes
HRA2DDT	: 12 minutes	YS23DDTT	: 4 minutes
K9K engine	: 4 minutes	ZD30DDTi	: 60 seconds
M9R engine	: 4 minutes	ZD30DDTT	: 60 seconds
R9M engine	: 4 minutes		
V9X engine	: 4 minutes		
YD25DDTi	: 2 minutes		



NOTE:
ECU may be active for several tens of seconds after the ignition switch is turned OFF. If the battery terminal is removed before ECU stops, then a DTC detection error or ECU data corruption may occur.
- After high-load driving, if the vehicle is equipped with the V9X engine, turn the ignition switch OFF and wait for at least 15 minutes to remove the battery terminal.

NOTE:
- Turbocharger cooling pump may operate in a few minutes after the ignition switch is turned OFF.
- Example of high-load driving
  - Driving for 30 minutes or more at 140 km/h (86 MPH) or more.
  - Driving for 30 minutes or more on a steep slope.
- For vehicles with the 2-batteries, be sure to connect the main battery and the sub battery before turning ON the ignition switch.

NOTE:
If the ignition switch is turned ON with any one of the terminals of main battery and sub battery disconnected, then DTC may be detected.
- After installing the 12V battery, always check "Self Diagnosis Result" of all ECUs and erase DTC.

NOTE:
The removal of 12V battery may cause a DTC detection error.

Precautions For Engine Service

INFOID:0000000012197466

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
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 uninstructed 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

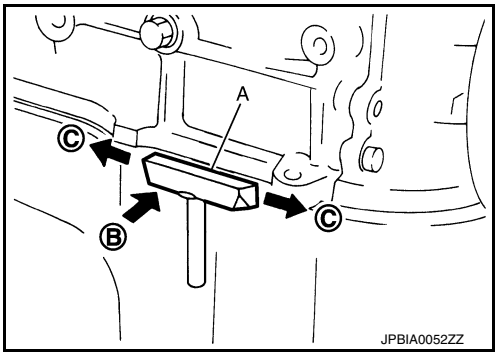
- Use torque wrench to tighten bolts or nuts to specification.
- When tightening nuts and bolts, as a basic rule, equally tighten in several different steps starting with the ones in center, then ones on inside and outside diagonally in this order. If the order of tightening is specified, do exactly 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.

Liquid Gasket

INFOID:0000000012197467

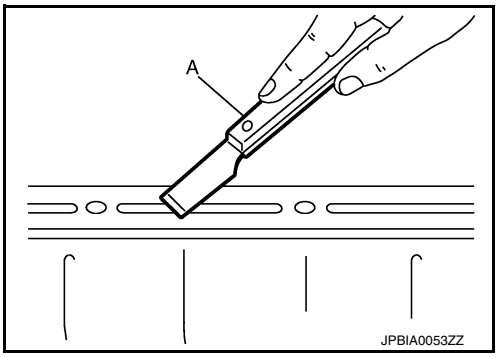
REMOVAL OF LIQUID GASKET SEALING

- After removing mounting nuts and bolts, separate the mating surface using the seal cutter [SST: KV10111100 (J-37228)] (A) and remove old liquid gasket sealing.
  CAUTION:
  Be careful not to damage the mating surfaces.
- Tap the seal cutter [SST: KV10111100 (J-37228)] to insert it (B), and then slide it (C) by tapping on the side as shown in the figure.
- In areas where the seal cutter [SST: KV10111100 (J-37228)] is difficult to use, lightly tap the parts using a plastic hammer to remove it.
  CAUTION:
  If for some unavoidable reason tool such as a screwdriver is used, be careful not to damage the mating surfaces.

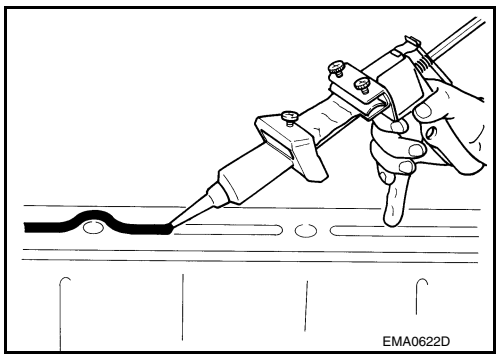


LIQUID GASKET APPLICATION PROCEDURE

1. Using a scraper (A), remove old liquid gasket adhering to the liquid gasket application surface and the mating surface.
   - Remove liquid gasket completely from the groove of 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.

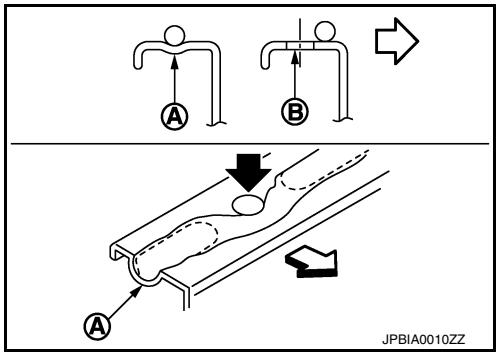


3. Attach liquid gasket tube to the tube presser (commercial service tool).
Use Genuine RTV silicon sealant or equivalent. Refer to GI-22, "Recommended Chemical Products and Sealants".
4. Apply liquid gasket without gaps to the specified location according to the specified dimensions.
• If there is a groove for liquid gasket application, apply liquid gasket to the groove.



• As for bolt holes (B), normally apply liquid gasket inside the holes. Occasionally, it should be applied outside the holes. Check to read the text of this manual.

A : Groove
⇦ : Inside



• 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.

CAUTION:
If there are specific instructions in this manual, observe them.

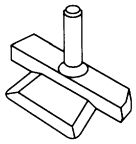
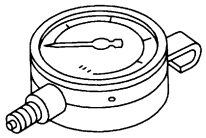
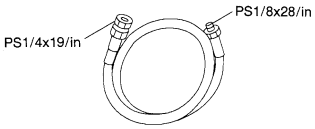
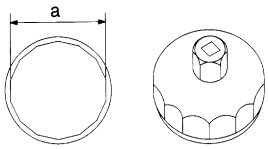
PREPARATION

PREPARATION

Special Service Tools

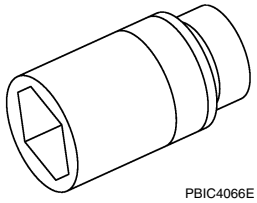
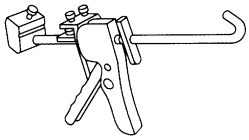
INFOID:0000000012197468

The actual shapes oh TechMate tools may differ from those of special service tools illustrated here.

Tool number (TechMate No.) Tool name	Description
KV10111100 (J-37228) Seat cutter  NT046	Removing oil pan (lower) etc.
ST25051001 (J-25695-1) Oil pressure gauge  NT050	Measuring oil pressure **Maximum measuring range: 2,452 kPa (25 kg/cm^2, 356 psi)**
ST25052000 (J-25695-2) Hose  S-NT559	Adapting oil pressure gauge to cylinder block
KV10115801 (J-38956) Oil filter wrench  S-NT375	Removing and installing oil filter **a: 64.3 mm (2.531 in)**

Commercial Service Tools

INFOID:0000000012197469

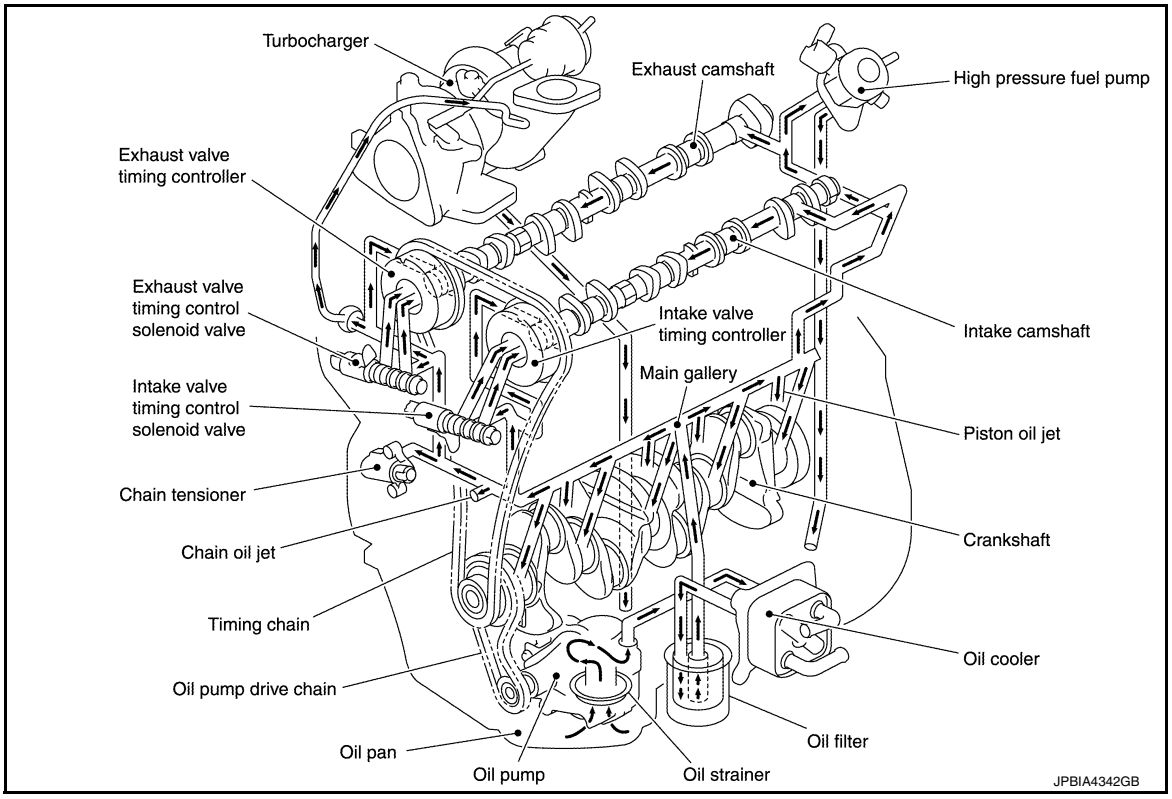
Tool name	Description
Deep socket  PBIC4066E	Removing and installing oil pressure sensor **27 mm (1.06 in)**
Tube presser  NT052	Pressing the tube of liquid gasket

SYSTEM DESCRIPTION

DESCRIPTION

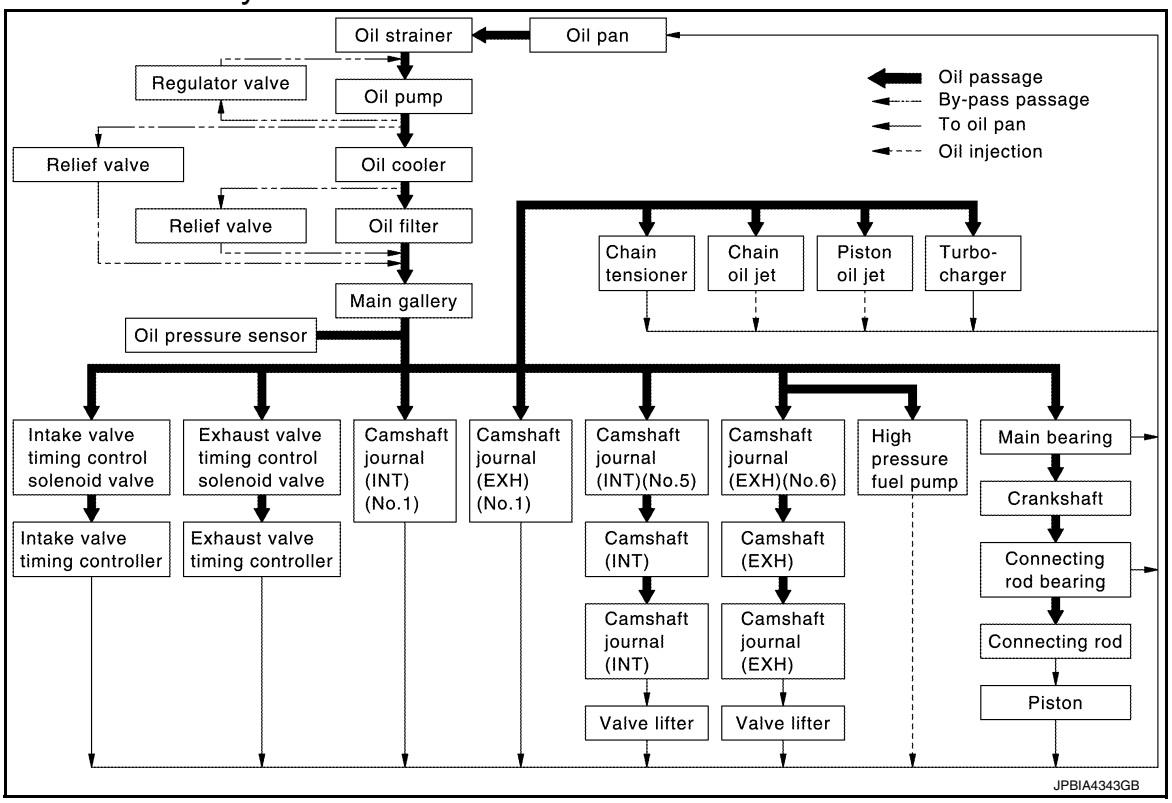
Engine Lubrication System

INFOID:0000000012197470



Engine Lubrication System Schematic

INFOID:0000000012197471



PERIODIC MAINTENANCE

ENGINE OIL

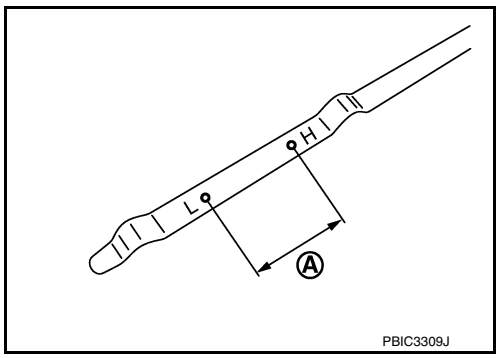
Inspection

INFOID:0000000012197472

ENGINE 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 that the engine oil level is within the range (A) shown in the figure.
3. If it is out of range, adjust it.



ENGINE OIL APPEARANCE

- Check engine oil for white turbidity or heavy contamination.
- If engine oil becomes turbid and white, it is highly probable that it is contaminated with engine coolant. Repair or replace damaged parts.

ENGINE OIL LEAKAGE

Check for engine oil leakage around the following area.

- Oil cooler
- Oil temperature sensor
- Oil pan bolt
- Oil pan (upper and lower)
- Oil pan drain plug
- Oil pressure sensor
- Oil filter
- Valve timing control cover
- Valve timing control solenoid valve (intake and exhaust)
- Front cover
- Turbocharger
- Turbocharger oil tube (feed and return)
- Turbocharger oil hose
- Mating surface between high pressure fuel pump and camshaft bracket
- Mating surface between cylinder head and camshaft bracket
- Mating surface between cylinder block and cylinder head
- Mating surface between camshaft bracket and rocker cover
- Crankshaft oil seals (front and rear)

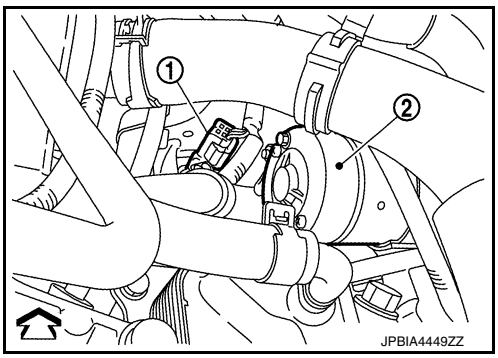
OIL PRESSURE CHECK

WARNING:

- **Be careful not to get burned, as engine oil may be hot.**
- **When checking engine oil pressure, shift position should be “Parking” (CVT models) or “Neutral” (M/T models), and apply parking brake securely.**

1. Check engine oil level.

2. Disconnect harness connector at oil pressure sensor (1), and remove oil pressure sensor using a deep socket (commercial service tool).

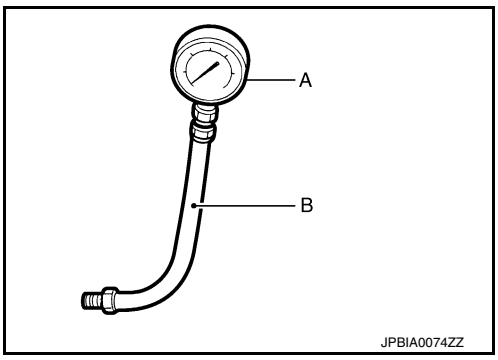


2 : Starter motor

⇦ : Engine front

CAUTION:
Never drop or shock oil pressure sensor.

3. Install oil pressure gauge [SST: ST25051001 (J-25695-1)] (A) and hose [SST: ST25052000 (J-25695-2)] (B).



4. Start engine and warm it up to normal operating temperature.
5. Check oil pressure with engine running under no-load.
NOTE:
When engine oil temperature is low, engine oil pressure becomes high.

Engine oil pressure : Refer to LU-19, "Engine Oil Pressure".

If difference is extreme, check oil passage and oil pump for oil leakage.

6. 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 specification.
Use Genuine RTV Silicon Sealant or equivalent.

Tightening torque : Refer to EM-114, "Exploded View".

c. Check engine oil level.

d. After warming up engine, check that there is no leakage of engine oil with running engine.

Draining

INFOID:0000000012197473

WARNING:
- **Be careful not to get burned, 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.**

1. Warm up the engine, and check for engine oil leakage from engine components. Refer to LU-9, "Inspection".
2. Stop the engine and wait for 10 minutes.
3. Loosen oil filler cap.
4. Remove drain plug and then drain engine oil.

Refilling

INFOID:0000000012197474

1. Install drain plug with new drain plug washer. Refer to EM-46, "Exploded View".
   CAUTION:
   Be sure to clean drain plug and install with new drain plug washer.

   Tightening torque : Refer to EM-46, "Exploded View".
2. Refill with new engine oil.
   Engine oil specification and viscosity: Refer to MA-11, "Fluids and Lubricants".

   Engine oil capacity : Refer to LU-19, "Periodical Maintenance Specification".

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

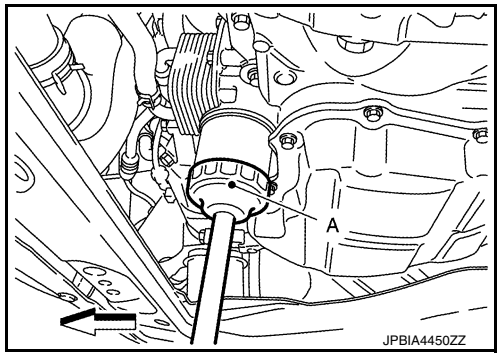
OIL FILTER

Removal and Installation

INFOID:0000000012197475

REMOVAL

1. Remove engine under cover.
2. Using oil filter wrench [SST: KV10115801 (J-38956)] (A), remove oil filter.



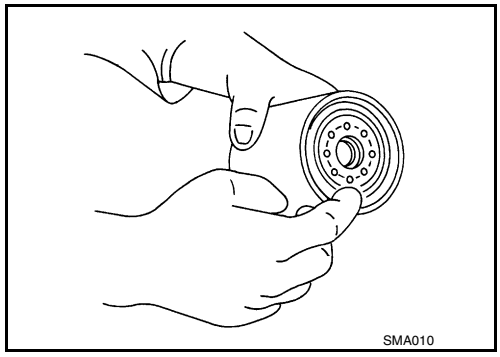
⇦ : Vehicle front

CAUTION:

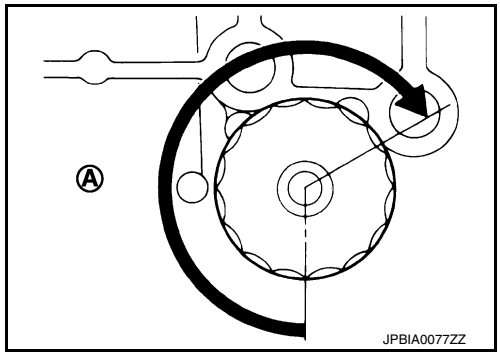
- **Oil filter is provided with relief valve. Use genuine NISSAN oil filter or equivalent.**
- **Be careful not to get burned when engine and engine oil may be hot.**
- **When removing, prepare a shop cloth to absorb any engine oil leakage or spillage.**
- **Completely wipe off any engine oil that adheres to engine and vehicle.**

INSTALLATION

1. Remove foreign materials adhering to the oil filter installation surface.
2. Apply new engine oil to the oil seal contact surface of new oil filter.



3. Screw oil filter manually until it touches the installation surface, then tighten it by 2/3 turn (A). Or tighten to specification.



Oil filter:

: 17.7 N·m (1.8 kg-m, 13 ft-lb)

Inspection

INFOID:0000000012197476

INSPECTION AFTER INSTALLATION

1. Check the engine oil level. Refer to LU-9, "Inspection".
2. Start the engine, and check that there is no leakage of engine oil.
3. Stop the engine and wait for 10 minutes.
4. Check the engine oil level, and adjust the level. Refer to LU-9, "Inspection".

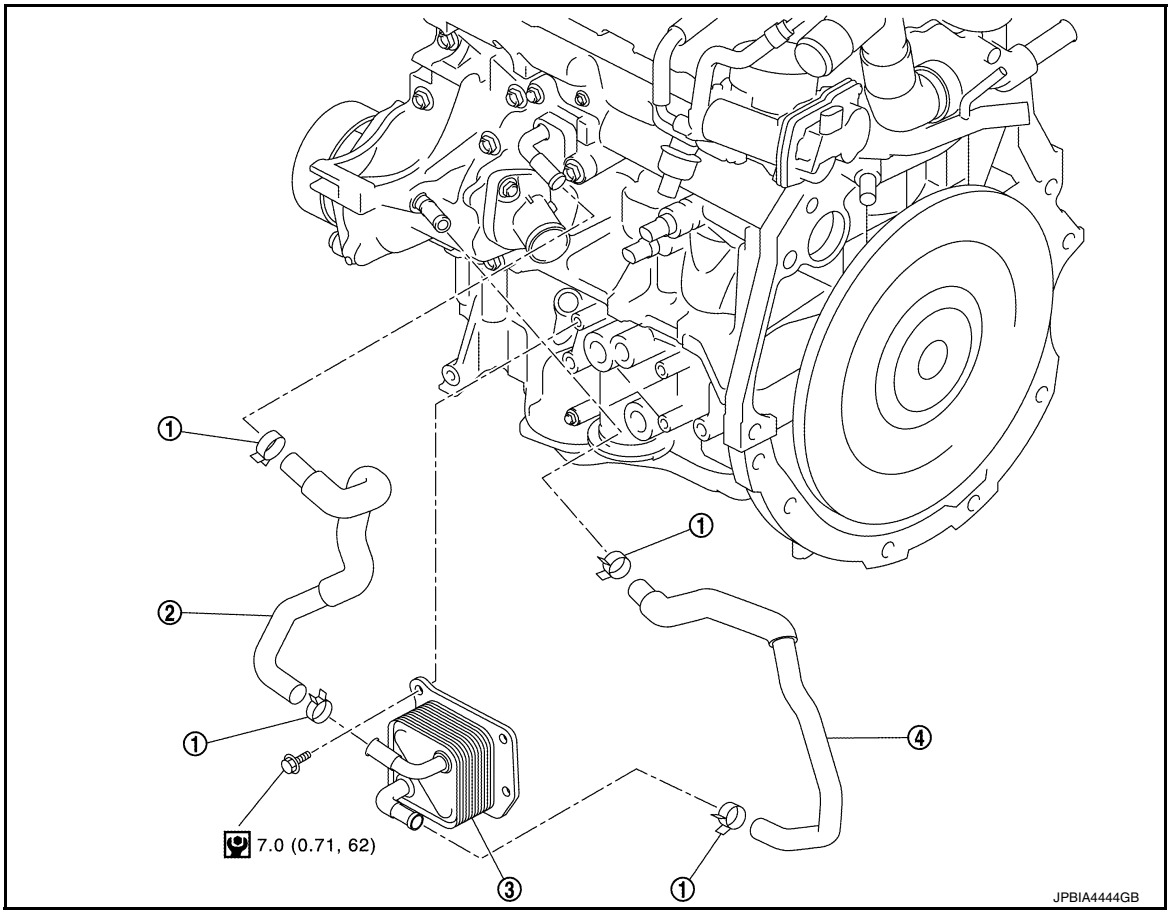
REMOVAL AND INSTALLATION

OIL COOLER

Exploded View

INFOID:0000000012197477

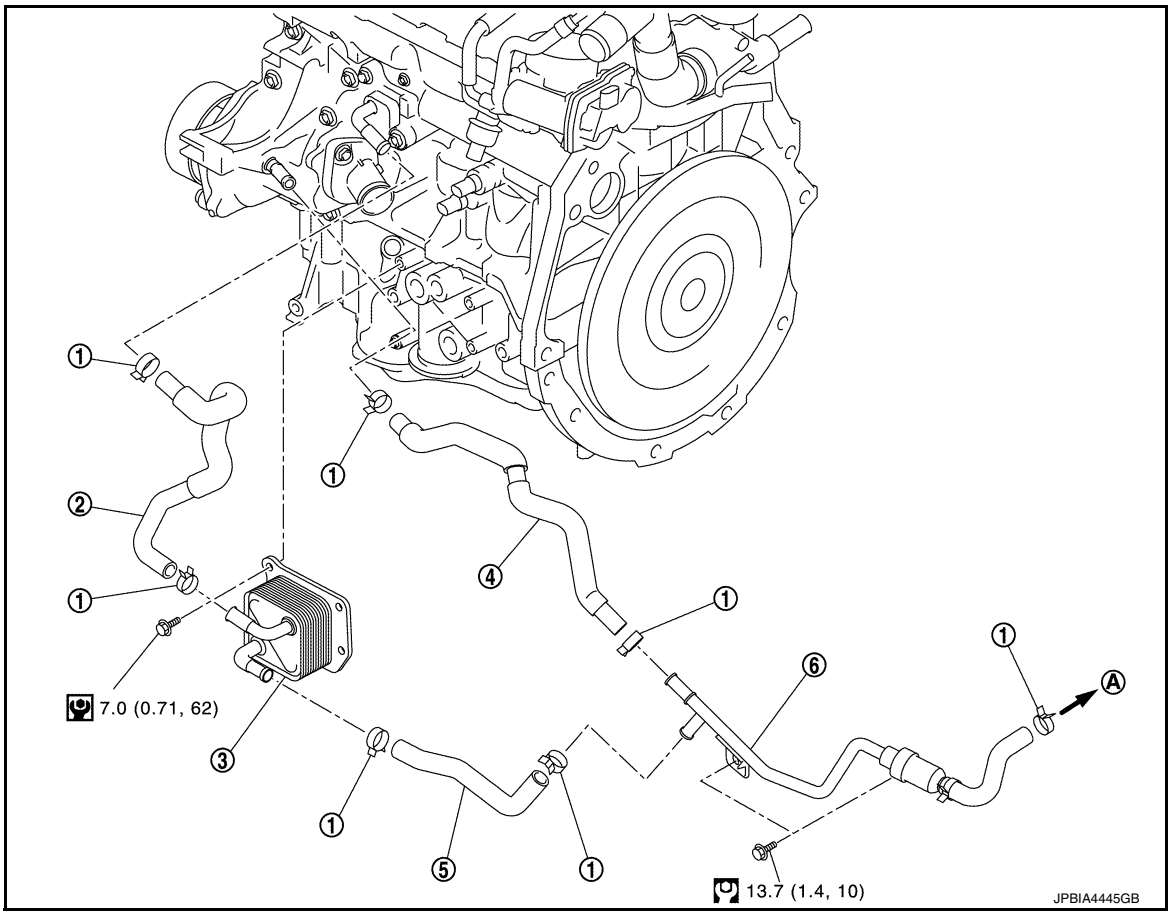
M/T models



1. Clamp
2. Water hose
3. Oil cooler
4. Water hose

: N·m (kg-m, in-lb)

CVT models



1. Clamp
2. Water hose
3. Oil cooler
4. Water hose
5. Water hose
6. Heater thermostat
A. To CVT oil warmer

: N·m (kg-m, in-lb)

: N·m (kg-m, ft-lb)

Removal and Installation

INFOID:0000000012197478

REMOVAL

1. Drain engine coolant. Refer to CO-10, "Draining".
   CAUTION:
   Perform when engine is cold.
2. Remove front bumper. Refer to EXT-12, "Exploded View".
3. Remove charge air cooler. Refer to EM-32, "Exploded View".
4. Remove water hose.
5. Remove oil cooler.

INSTALLATION

Installation is in reverse order of removal.

Inspection

INFOID:0000000012197479

INSPECTION AFTER REMOVAL

Oil Cooler

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

INSPECTION AFTER INSTALLATION

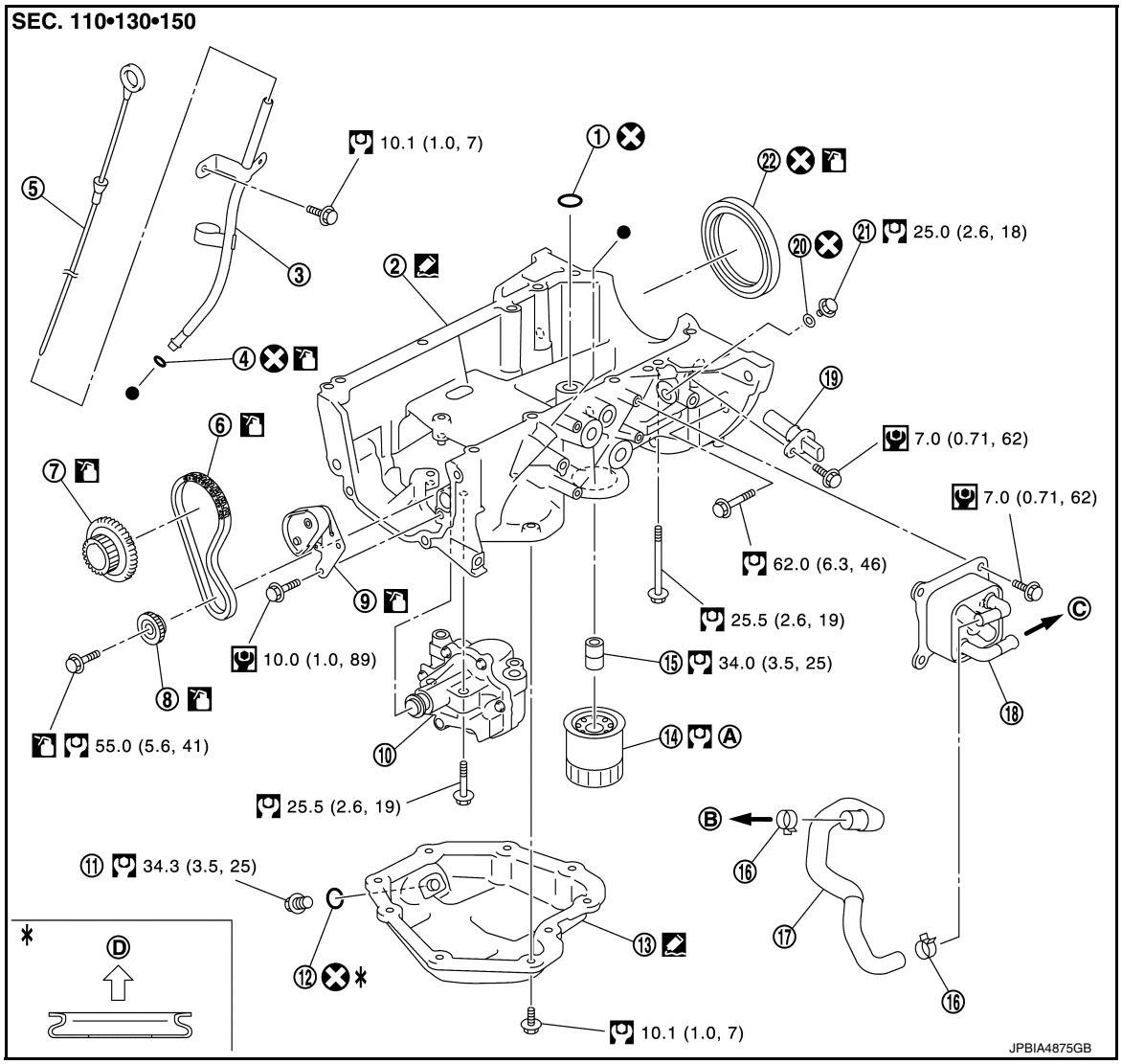
1. Check the engine oil level and the engine coolant level and add engine oil and engine coolant. Refer to LU-9, "Inspection" and CO-10, "Inspection".
2. Start the engine, and check that there is no leakage of engine oil or engine coolant.
3. Stop the engine and wait for 10 minutes.
4. Check the engine oil level and the engine coolant level again. Refer to LU-9, "Inspection" and CO-10, "Inspection".

UNIT DISASSEMBLY AND ASSEMBLY

OIL PUMP

Exploded View

INFOID:0000000012197480



1.	O-ring	2.	Oil pan (upper)	3.	Oil level gauge guide
4.	O-ring	5.	Oil level gauge	6.	Oil pump drive chain
7.	Crankshaft sprocket	8.	Oil pump sprocket	9.	Oil pump chain tensioner
10.	Oil pump	11.	Drain plug	12.	Drain plug washer
13.	Oil pan (lower)	14.	Oil filter	15.	Connector bolt
16.	Clamp	17.	Oil cooler hose	18.	Oil cooler
19.	Crankshaft position sensor	20.	Gasket	21.	Oil pan bolt
22.	Rear oil seal				
A.	Comply with the assembly procedure when tightening. Refer to LU-12	B.	To thermostat housing	C.	To thermostat housing (M/T models) To CVT oil warmer (CVT models)
D.	Oil pan side				

: N·m (kg-m, ft-lb)

: N·m (kg-m, in-lb)

: Always replace after every disassembly.

: Should be lubricated with oil.

: Sealing point

: Indicates that the parts is connected at points with same symbols in actual vehicle.

Removal and Installation

INFOID:0000000012197481

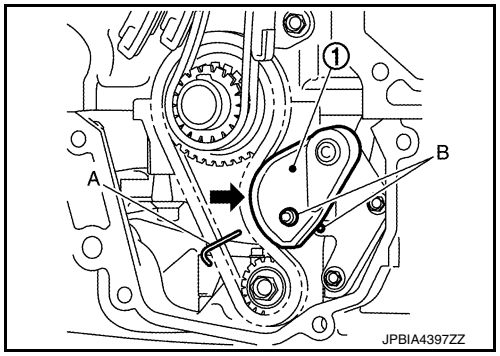
REMOVAL

1. Remove engine assembly. Refer to EM-62, "2WD : Exploded View" (2WD) , EM-68, "AWD : Exploded View" (AWD).
2. Remove oil pan (lower). Refer to EM-47, "Removal and Installation".
3. Remove front cover, and other related parts. Refer to EM-76, "Exploded View".
4. Remove oil pump sprocket with the following procedure:
   • Add matching mark if necessary for easier installation.

a. Push oil pump drive chain tensioner (1) in the direction show in the figure.

b. Insert a stopper pin (A) into the body hole (B).

c. Remove oil pump chain tensioner.
   • When the holes on lever and tensioner body cannot be aligned, align these holes by slightly moving the oil pump chain tensioner slack guide.



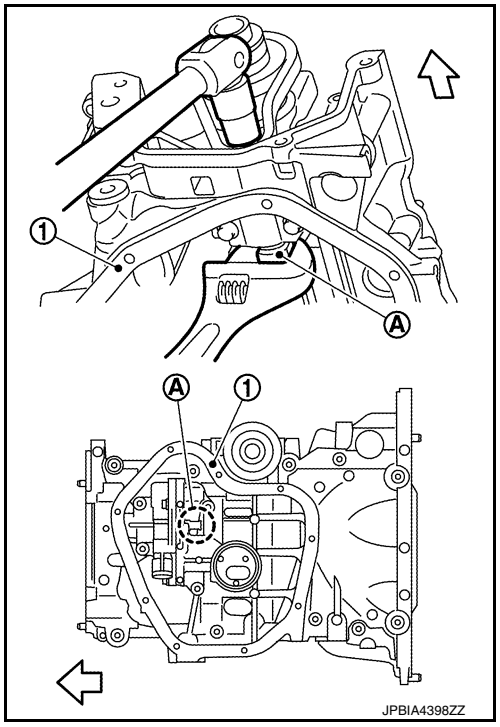
d. Hold the WAF part of oil pump shaft [WAF: 10 mm (0.39 in)] (A), and then loosen the oil pump sprocket bolt and remove it.

1 : Oil pan (upper)

⇦ : Engine front

CAUTION:
- **Secure the oil pump shaft with the WAF part.**
- **Never loosen the oil pump sprocket bolt by tightening the oil pump drive chain.**

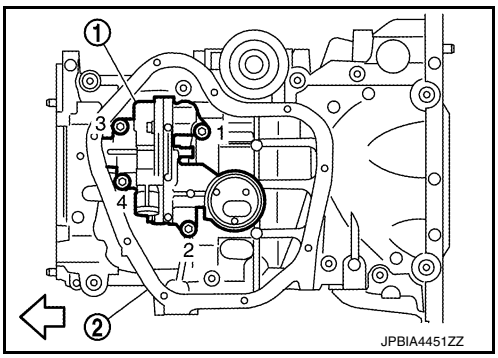
e. Remove oil pump sprocket.



5. Remove oil pump.

• Loosen bolts in reverse order as shown in the figure.

1 : Oil pump
2 : Oil pan (upper)
⇦ : Engine front



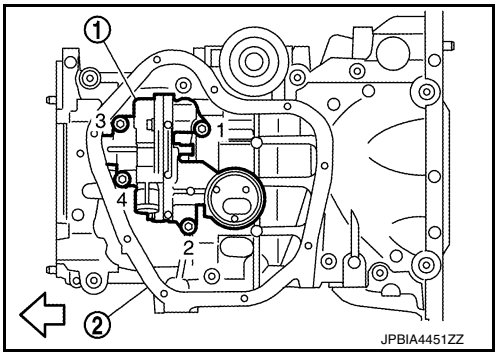
INSTALLATION

Note the following, and install in the reverse order of removal.

Oil Pump

• Tighten bolts in numerical order as shown in the figure.

1 : Oil pump
2 : Oil pan (upper)
⇦ : Engine front



Inspection

INFOID:0000000012197482

INSPECTION AFTER INSTALLATION

1. Check the engine oil level. Refer to LU-9, "Inspection".
2. Start the engine, and check that there is no leakage of engine oil.
3. Stop the engine and wait for 10 minutes.
4. Check the engine oil level, and adjust the level. Refer to LU-9, "Inspection".

SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

Periodical Maintenance Specification

INFOID:0000000012197483

ENGINE OIL CAPACITY (APPROXIMATE)

Unit: ℓ (US qt, Imp qt)

Drain and refill	With oil filter change	4.5 (4-6/8, 4)
	Without oil filter change	4.3 (4-4/8, 3-6/8)
Dry engine (Overhaul)		5.4 (5-6/8, 4-6/8)

Engine Oil Pressure

INFOID:0000000012197484

Unit: kPa (kg/cm^2, psi)

Engine speed	Approximate discharge pressure*
Idle speed	90 (0.92, 13.1)
2,000 rpm	260 (2.65, 37.7)

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

PRECAUTION

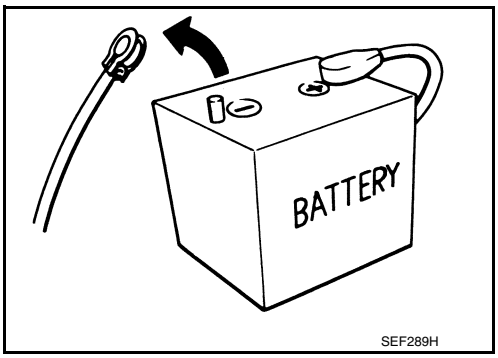
PRECAUTIONS

Precautions for Removing Battery Terminal

INFOID:0000000012958963

When disconnecting the battery terminal, pay attention to the following.
- Always use a 12V battery as power source.
- Never disconnect battery terminal while engine is running.
- When removing the 12V battery terminal, turn OFF the ignition switch and wait at least 30 seconds.
- For vehicles with the engine listed below, remove the battery terminal after a lapse of the specified time:

D4D engine	: 20 minutes	YS23DDT	: 4 minutes
HRA2DDT	: 12 minutes	YS23DDTT	: 4 minutes
K9K engine	: 4 minutes	ZD30DDTi	: 60 seconds
M9R engine	: 4 minutes	ZD30DDTT	: 60 seconds
R9M engine	: 4 minutes		
V9X engine	: 4 minutes		
YD25DDTi	: 2 minutes		



SEF289H

NOTE:
ECU may be active for several tens of seconds after the ignition switch is turned OFF. If the battery terminal is removed before ECU stops, then a DTC detection error or ECU data corruption may occur.

- After high-load driving, if the vehicle is equipped with the V9X engine, turn the ignition switch OFF and wait for at least 15 minutes to remove the battery terminal.

NOTE:
- Turbocharger cooling pump may operate in a few minutes after the ignition switch is turned OFF.
- Example of high-load driving
  - Driving for 30 minutes or more at 140 km/h (86 MPH) or more.
  - Driving for 30 minutes or more on a steep slope.

- For vehicles with the 2-batteries, be sure to connect the main battery and the sub battery before turning ON the ignition switch.

NOTE:
If the ignition switch is turned ON with any one of the terminals of main battery and sub battery disconnected, then DTC may be detected.

- After installing the 12V battery, always check "Self Diagnosis Result" of all ECUs and erase DTC.

NOTE:
The removal of 12V battery may cause a DTC detection error.

Precautions For Engine Service

INFOID:0000000012197486

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
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 uninstructed 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

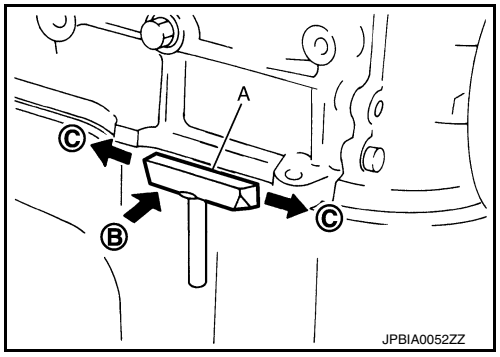
- Use torque wrench to tighten bolts or nuts to specification.
- When tightening nuts and bolts, as a basic rule, equally tighten in several different steps starting with the ones in center, then ones on inside and outside diagonally in this order. If the order of tightening is specified, do exactly 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. Check for leakages of engine coolant, fuel, engine oil, and exhaust gases.

Liquid Gasket

INFOID:0000000012197487

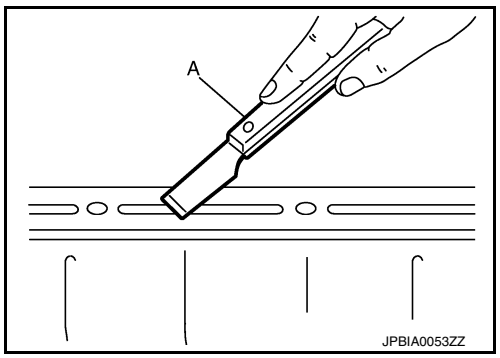
REMOVAL OF LIQUID GASKET SEALING

- After removing mounting nuts and bolts, separate the mating surface using the seal cutter [SST: KV10111100] (A) and remove old liquid gasket sealing.
  CAUTION:
  Never damage the mating surfaces.
- Tap the seal cutter [SST: KV10111100] to insert it Ⓑ, and then slide it Ⓒ by tapping on the side as shown in the figure.
- In areas where the seal cutter [SST: KV10111100] is difficult to use, lightly tap the parts using a plastic hammer to remove it.
  CAUTION:
  If for some unavoidable reason tool such as a screwdriver is used, be careful not to damage the mating surfaces.

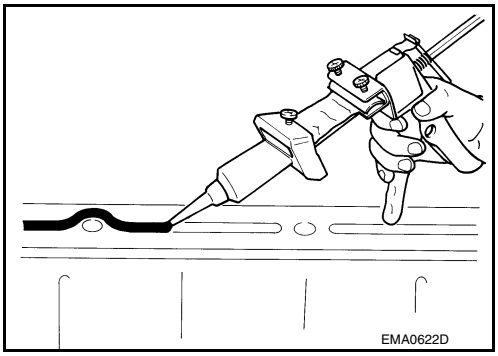


LIQUID GASKET APPLICATION PROCEDURE

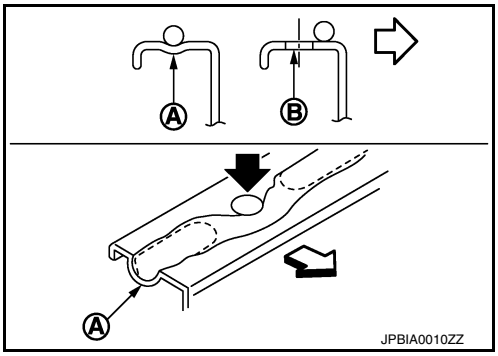
1. Using a scraper (A), remove old liquid gasket adhering to the liquid gasket application surface and the mating surface.
   - Remove liquid gasket completely from the groove of the liquid gasket application surface, mounting bolts, and bolt holes.
2. Wipe the liquid gasket application surface and the mating surface with white gasoline (lighting and heating use) to remove adhering moisture, grease and foreign materials.



3. Attach liquid gasket tube to the tube presser (commercial service tool).
Use Genuine Liquid Gasket or equivalent.
4. Apply liquid gasket without gaps to the specified location according to the specified dimensions.
   - If there is a groove for liquid gasket application, apply liquid gasket to the groove.



   - As for bolt holes Ⓑ, normally apply liquid gasket inside the holes. Occasionally, it should be applied outside the holes. Check to read the text of this manual.



   Ⓐ : Groove

   ⇦ : Inside

   - 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.

CAUTION:
If there are specific instructions in this manual, observe them.

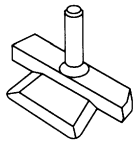
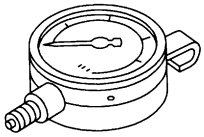
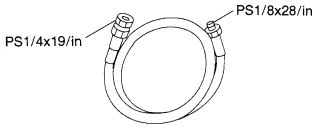
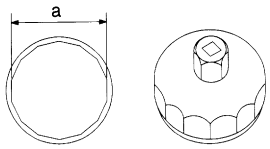
PREPARATION

PREPARATION

Special Service Tools

INFOID:0000000012197488

The actual shapes of TechMate tools may differ from those of special service tools illustrated here.

Tool number (TechMate No.) Tool name	Description
KV10111100 (J-37228) Seal cutter  NT046	Removing oil pan (lower), etc.
ST25051001 (J-25695-1) Oil pressure gauge  NT050	Measuring oil pressure **Maximum measuring range: 2,452 kPa (25 kg/cm^2, 356 psi)**
ST25052000 (J-25695-2) Hose  S-NT559	Adapting oil pressure gauge to cylinder block
KV10115801 (J-38956) Oil filter wrench  S-NT375	Removing and installing oil filter **a: 64.3 mm (2.531 in)**

SYSTEM DESCRIPTION

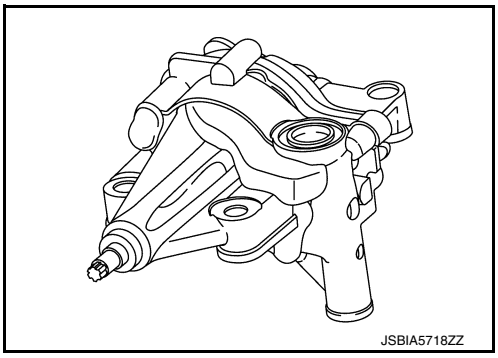
COMPONENT PARTS

Oil Pump

INFOID:0000000012197489

- A variable capacity electronic control oil pump is used for minimizing oil pump drive loss.
- The variable engine oil pressure control solenoid valve switches between high and low engine oil pressure. This stops the spray of oil from the piston oil jet when the pressure is low, reducing oil pump drive resistance and reducing the stirring resistance from rotating parts caused by the oil. The objective is to improve fuel economy.

For control, refer to EC-635, "ENGINE OIL PRESSURE CONTROL SYSTEM : System Description".



Oil Cooler

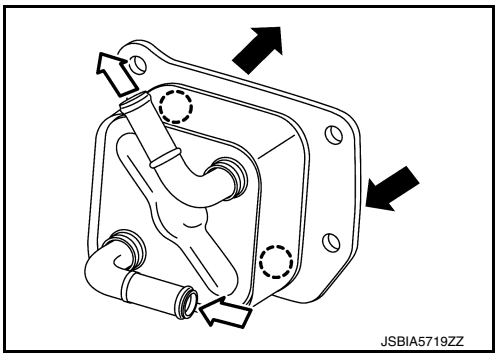
INFOID:0000000012197490

- For minimizing oil pump drive loss, an oil cooler that reduces pressure loss by approximately 30% compared to the previous oil cooler is adopted.
- For maintaining a stable oil temperature, an oil cooler is adopted for the coolant system.

: Engine oil

: Engine coolant

- It is installed directly to the oil pan (upper).

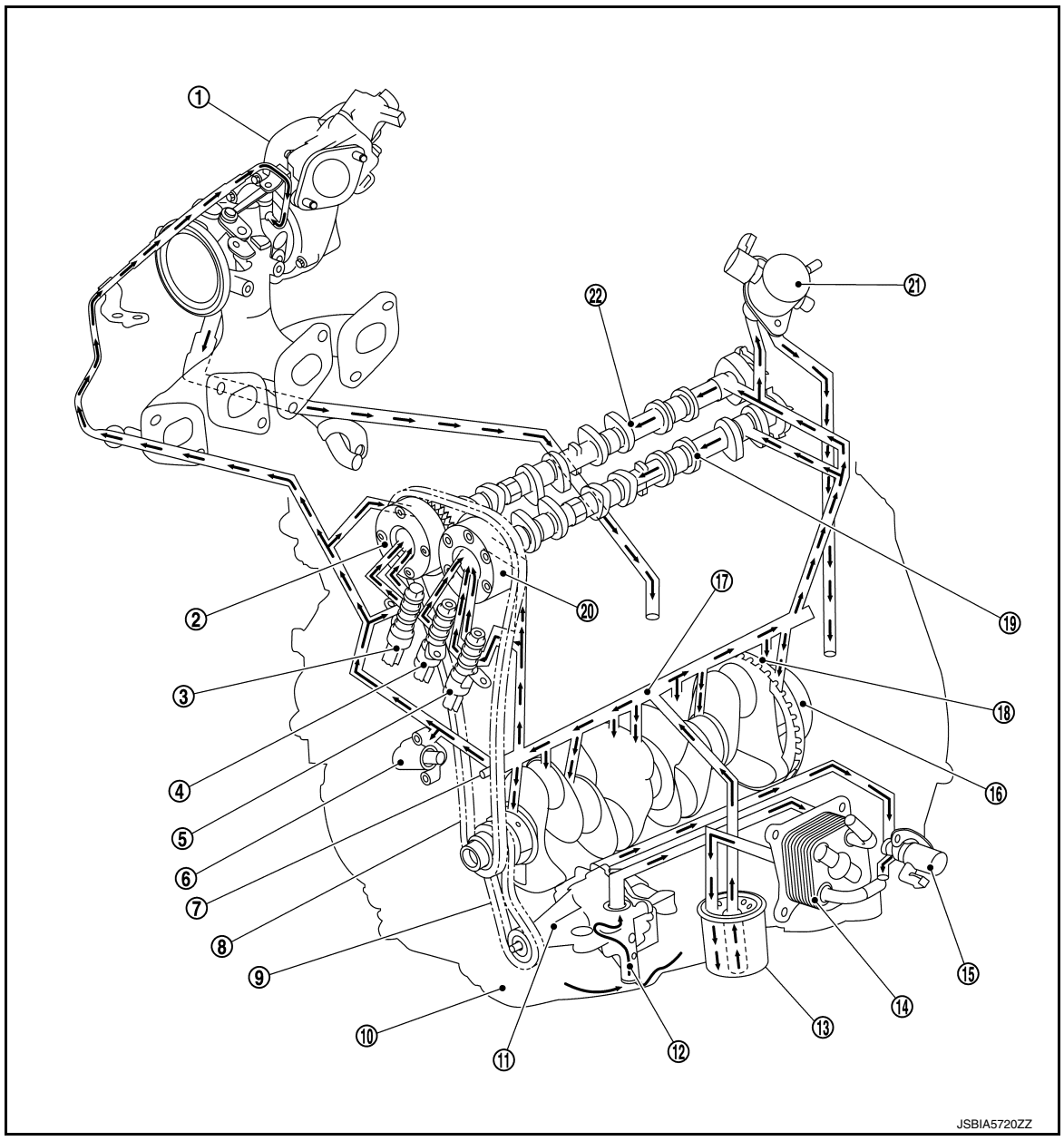


SYSTEM

Engine Lubrication System

INFOID:0000000012197491

- An oil pump integrated in the oil pan and that uses a chain-driven system is adopted.
- A small-sized oil filter is adopted, and is installed directly to the oil pan.
- An oil cooler is adopted, and is installed directly to the oil pan.

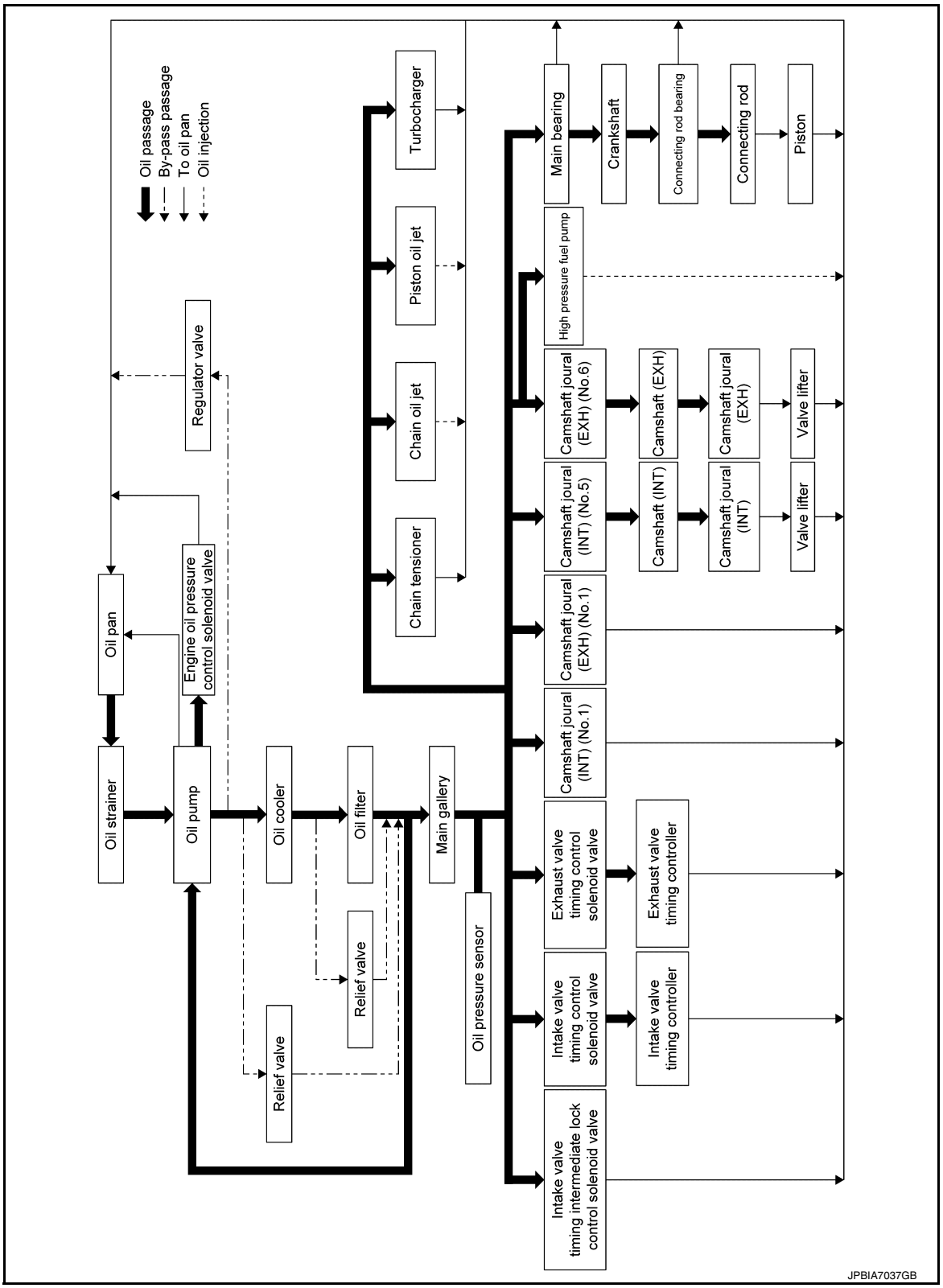


1.	Turbocharger	2.	Camshaft sprocket (EXH)	3.	Exhaust valve timing control solenoid valve
4.	Intake valve timing intermediate lock control solenoid valve	5.	Intake valve timing control solenoid valve	6.	Chain tensioner
7.	Chain oil jet	8.	Timing chain	9.	Oil pump drive chain
10.	Oil pan	11.	Oil pump	12.	Oil strainer
13.	Oil filter	14.	Oil cooler	15.	Engine oil pressure control solenoid valve
16.	Crankshaft	17.	Main gallery	18.	Piston oil jet

19. Camshaft (INT) 20. Camshaft sprocket (INT) 21 High-pressure fuel pump
22. Camshaft (EXH)

Engine Lubrication System Schematic

INFOID:0000000012197492



BASIC INSPECTION

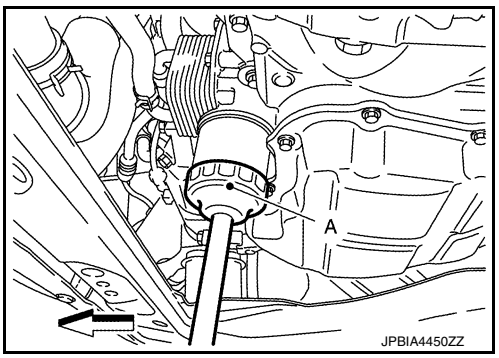
OIL FILTER

Removal and Installation

INFOID:0000000012197493

REMOVAL

1. Remove oil filter using an oil filter wrench [SST: KV10115801] (A).

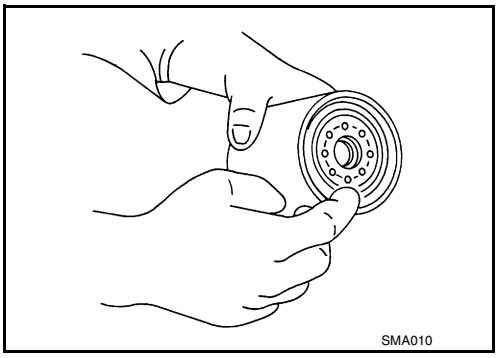


⇦ : Vehicle front

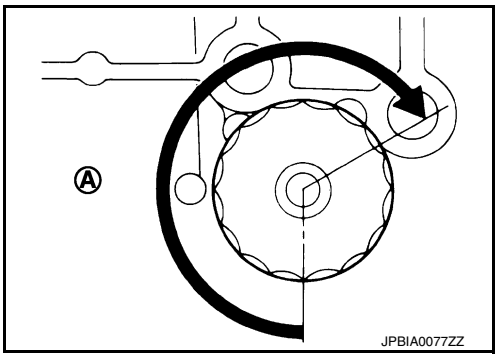
CAUTION:
- **Never get burned when engine or engine oil is heated.**
- **Use a shop cloth to absorb engine oil leakage when removing.**
- **Never spill engine oil on the drive belt.**
- **Completely wipe away any engine oil spilled on the engine and vehicle.**

INSTALLATION

1. Eliminate foreign materials on the oil filter mounting surface.
2. Apply engine oil to the full circumference of the oil seal on a new oil filter.



3. Screw in oil filter by hand until it contacts mounting surface on the engine, and then screw in another 2/3 of a turn (A).
   NOTE:
   Tightening torque is 17.7 N·m (1.8 kg-m).



Inspection

INFOID:0000000012197494

INSPECTION AFTER INSTALLATION

1. Use the oil level gauge and check that the oil level is within the standard. Refer to LU-28, "Inspection".
2. Start the engine. Check for fuel leakage.
3. Stop the engine. After stopping it, leave it for 10 minutes or more.
4. Check the engine oil level again. Fill with engine oil to adjust oil level if necessary. Refer to LU-28, "Inspection".

PERIODIC MAINTENANCE

ENGINE OIL

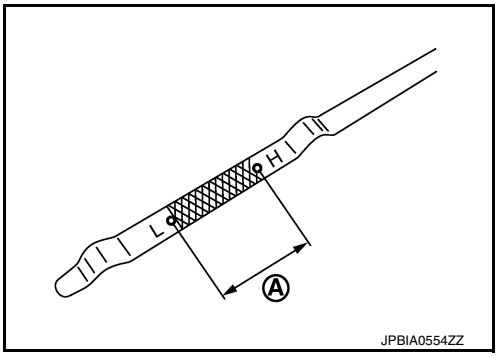
Inspection

INFOID:0000000012197495

ENGINE OIL LEVEL AND CONTAMINATION

- Check engine oil level on a horizontal area before starting the engine. Wait for 10 minutes or more to check oil level when the engine is started.
- Check that oil level is within the range between level L and level H.

A : Level must be within this range.



- Fill with engine oil if oil level is outside the range.
- Check for white contamination or significant dirt in the engine oil.
- If the oil contains white contamination, the most likely cause is contamination from engine coolant. Repair the cause of the contamination.
- When inserting the oil level gauge into the oil level gauge guide, apply engine oil to the rubber seal on the grip.

ENGINE OIL LEAKAGE

Check for engine oil leakage at the following parts.

- Oil pan
- Oil pan drain plug
- Oil filter
- Oil cooler
- Oil pressure sensor
- Oil temperature sensor
- Front cover
- VTC cover
- Intake valve timing control solenoid valve
- Intake valve timing intermediate-lock control solenoid valve
- Exhaust valve timing control solenoid valve
- Turbocharger assembly
- Turbocharger oil tube and hose
- Mating surface of cylinder head and rocker cover
- Mating surface of high-pressure fuel pump and camshaft bracket
- Mating surface of camshaft bracket and cylinder head
- Mating surface of cylinder block and cylinder head
- Crankshaft oil seal (front, rear)

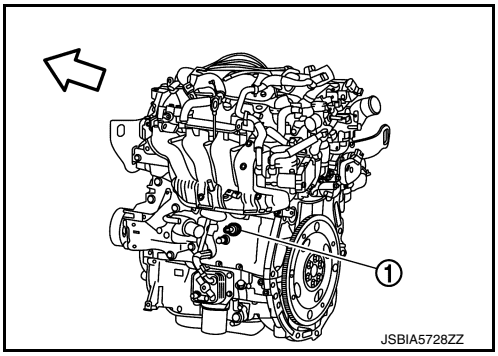
ENGINE OIL PRESSURE CHECK

CAUTION:

Be careful not to get burned, as engine oil may be hot.

1. Remove the oil pressure sensor (1).

⇦ : Engine front

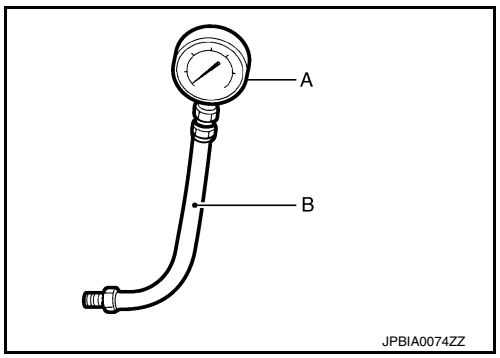


CAUTION:

Handle parts carefully and never subject them to impact.

2. Check the engine oil level.

3. Install oil pressure gauge [SST: ST25051001 (J-25695-1)] (A) and hose [SST: ST25052000 (J-25695-2)] (B).



4. Start engine and warm it up to normal operating temperature.
5. Check oil pressure with engine running under no-load.
NOTE:
When engine oil temperature is low, engine oil pressure becomes high.

Engine oil pressure : Refer to LU-38, "Engine Oil Pressure".

If difference is extreme, check oil passage and oil pump for oil leakage.

6. 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 specification.
Use Genuine RTV Silicon Sealant or equivalent.

Tightening torque : Refer to EM-286, "Exploded View".

c. Check engine oil level.
d. After warming up engine, check that there is no leakage of engine oil with running engine.
e. Check engine oil level.
f. After warming up engine, check that there is no leakage of engine oil with running engine.

Draining

INFOID:0000000012197496

WARNING:
- **Be careful not to get burned, 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.**

1. Warm up the engine, and check for engine oil leakage from engine components. Refer to LU-28, "Inspection".
2. Stop the engine and wait for 10 minutes.
3. Loosen oil filler cap.
4. Remove drain plug and then drain engine oil.

Refilling

INFOID:0000000012197497

1. Install drain plug with new drain plug washer. Refer to EM-200, "Exploded View".
CAUTION:
Be sure to clean drain plug and install with new drain plug washer.

Tightening torque : Refer to EM-200, "Exploded View".

2. Refill with new engine oil.
Engine oil specification and viscosity: Refer to MA-11, "Fluids and Lubricants".

Engine oil capacity : Refer to LU-38, "Periodical Maintenance Specification".

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 the engine.**

3. Warm up engine and check area around drain plug and oil filter for engine oil leakage.
4. Stop engine and wait for 10 minutes.
5. Check the engine oil level. Refer to LU-28, "Inspection".

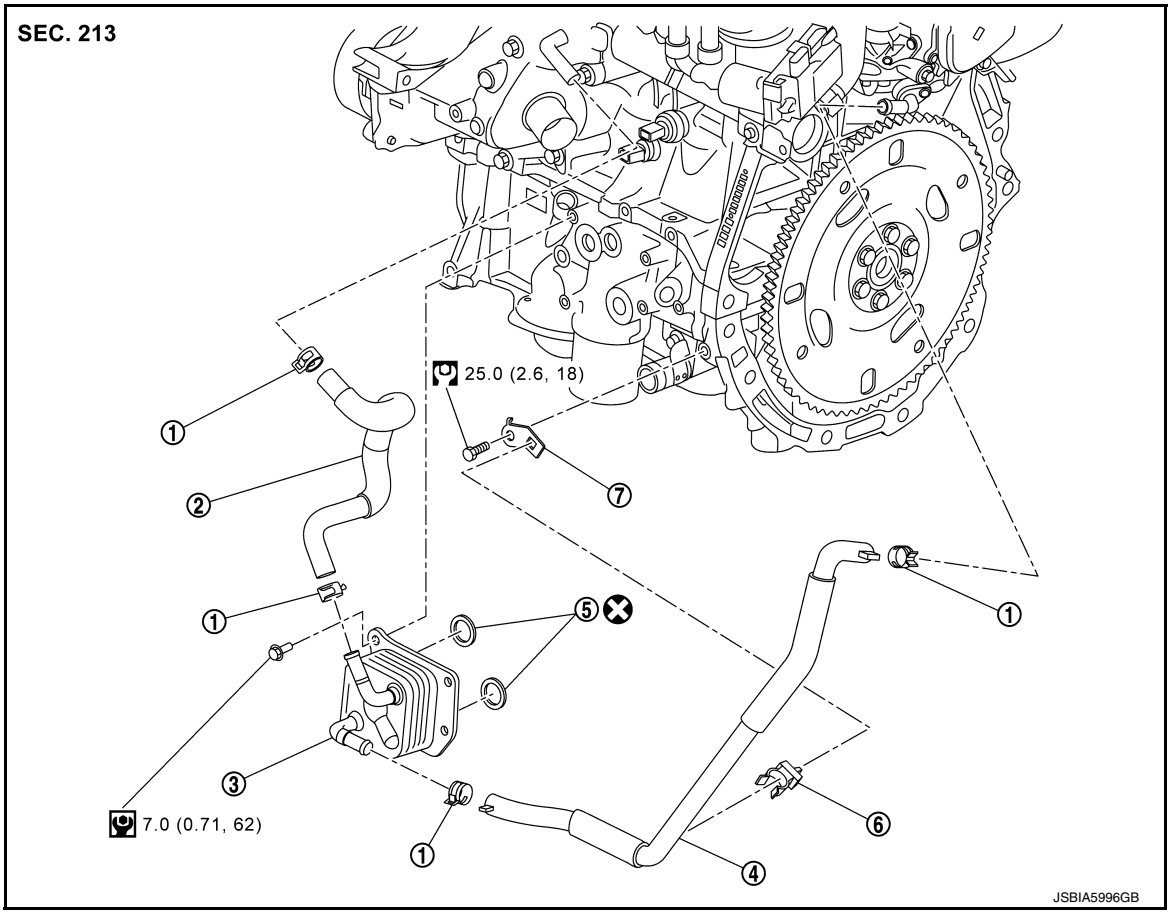
REMOVAL AND INSTALLATION

OIL COOLER

Exploded View

INFOID:0000000012197498

M/T models



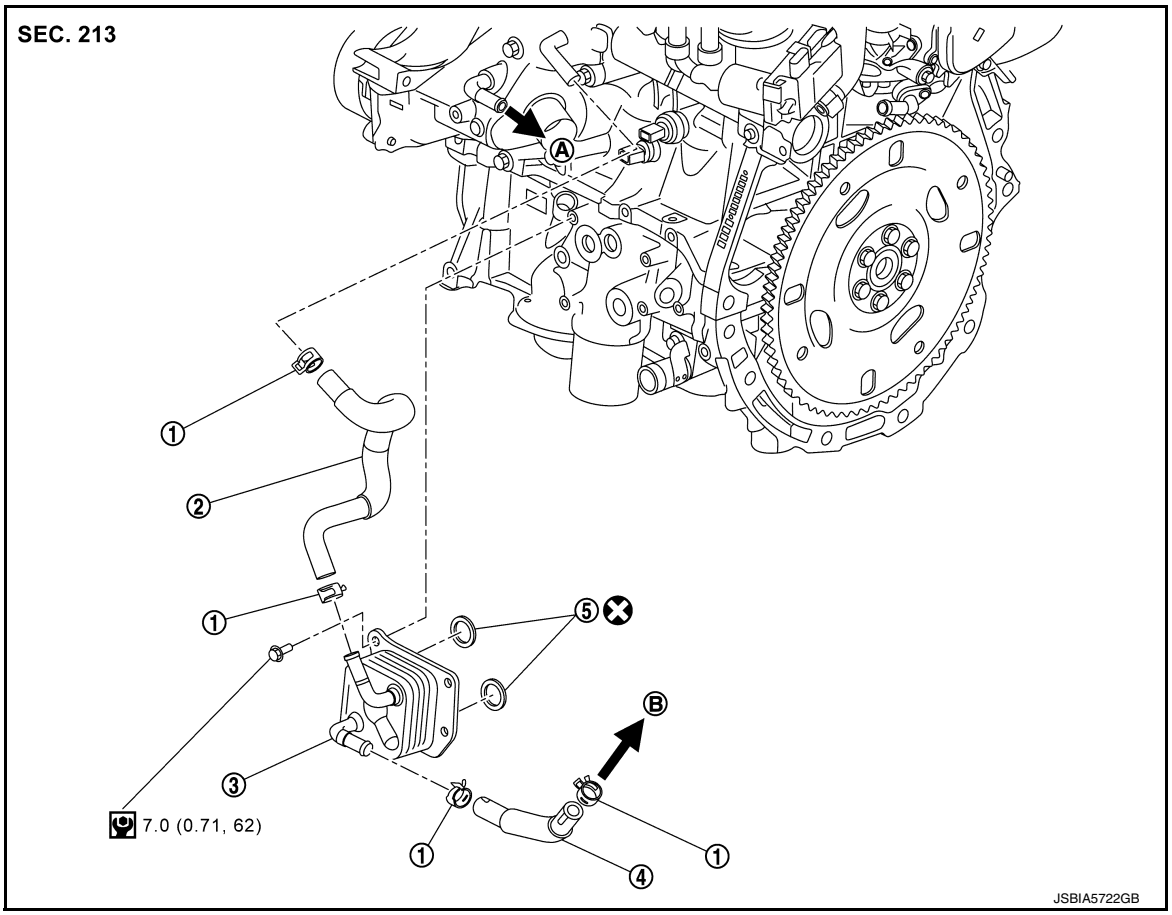
1. Clamp
2. Water hose
3. Oil cooler
4. Water hose
5. O-ring
6. Hose clip
7. Water hose bracket

: Always replace after every disassembly.

: N·m (kg-m, ft-lb)

: N·m (kg-m, in-lb)

CVT models



1. Clamp
2. Water hose
3. Oil cooler
4. Water hose
5. O-ring
A. To CVT fluid warmer
B. To multi-way valve

: Always replace after every disassembly.

: N·m (kg-m, in-lb)

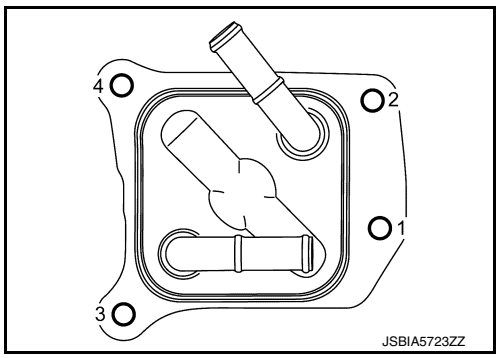
Removal and Installation

INFOID:0000000012197499

REMOVAL

1. Drain coolant. Refer to CO-40, "Draining and Filling".
   CAUTION:
   Allow the engine to cool before beginning.
2. Remove the front bumper. Refer to EXT-17, "Removal and Installation".
3. Remove the charge air cooler. Refer to EM-194, "Removal and Installation".
4. Disconnect each water hose.
5. Remove the oil cooler.

- Loosen bolts in the reverse order of the numerical order as shown in the figure.



INSTALLATION

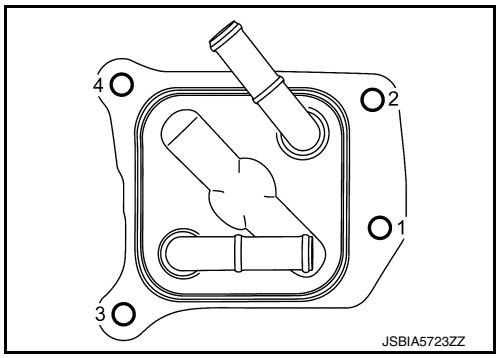
Note the following, and install in the reverse order of removal.

Oil Cooler

CAUTION:

Never reuse-ring. Always replace it with a new one.

- Tighten the oil cooler mounting bolts in numerical order as shown in the figure.



Inspection

INFOID:0000000012197500

INSPECTION AFTER REMOVAL

Check visually and by other means for cracks or damage of the oil cooler. If any abnormality is found, replace the oil cooler.

INSPECTION AFTER INSTALLATION

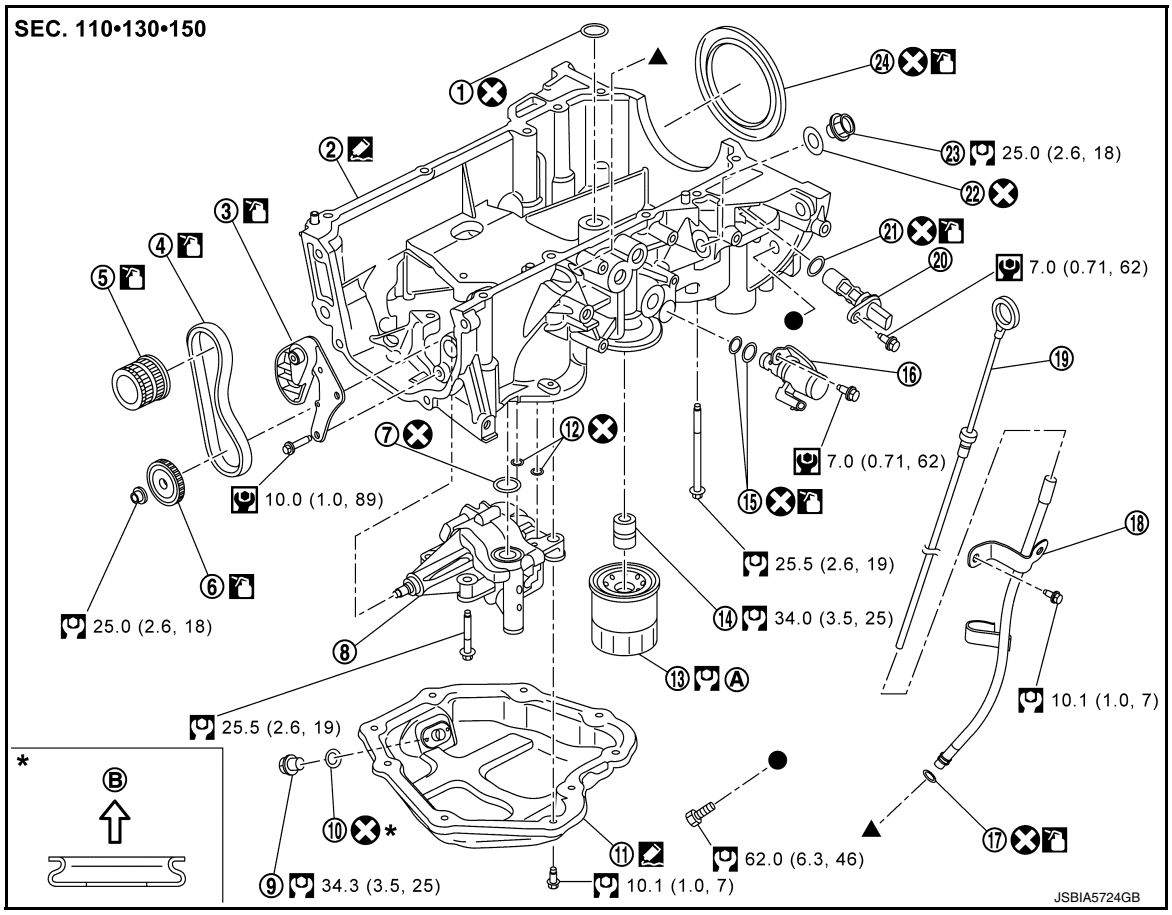
1. Use the oil level gauge and check that the oil level is within the standard. Refer to LU-28, "Inspection".
2. Check the coolant level. Refer to CO-40, "Inspection".
3. Start the engine. Check for engine oil or coolant leakage.
4. Stop the engine. After stopping it, leave it for 10 minutes or more.
5. Check the engine oil level and coolant level again. Fill or adjust fluid levels if necessary.

UNIT DISASSEMBLY AND ASSEMBLY

OIL PUMP

Exploded View

INFOID:0000000012197501



1. O-ring
2. Oil pan (upper)
3. Oil pump drive chain tensioner
4. Oil pump drive chain
5. Crankshaft sprocket
6. Oil pump sprocket
7. O-ring
8. Oil pump
9. Oil pan drain plug
10. Drain plug washer
11. Oil pan (lower)
12. O-ring
13. Oil filter
14. Oil filter stud
15. O-ring
16. Engine oil pressure control solenoid valve
17. O-ring
18. Oil level gauge guide
19. Oil level gauge
20. Crankshaft position sensor
21. O-ring
22. Gasket
23. Plug
24. Rear oil seal

A. Refer to LU-27.
B. Oil pan side

: N·m (kg-m, ft-lb)

: N·m (kg-m, in-lb)

: Always replace after every disassembly.

: Should be lubricated with oil.

: Sealing point

●, ▲ : Indicates that the parts is connected at points with same symbols in actual vehicle.

Removal and Installation

INFOID:0000000012197502

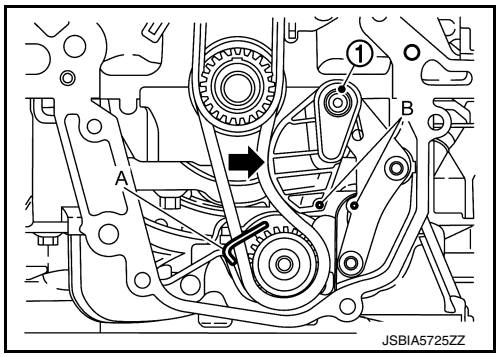
REMOVAL

1. Remove the engine unit by lowering it from the vehicle. Refer to EM-217, "2WD : Removal and Installation" (2WD) or EM-221, "AWD : Removal and Installation" (AWD).
2. Remove oil pan (lower). Refer to EM-282, "Removal and Installation".
3. Remove front cover. Refer to EM-249, "Removal and Installation".
4. Remove the oil pump sprocket with the following procedure.

a. Push the cam (1) of the oil pump drive chain tensioner in the direction of the arrow (⬅) as shown in the figure, and then push the plunger into the tensioner.

b. Insert the stopper pin (A) into the chain tensioner hole (B), and then fix it in place with the plunger pushed in.

c. Remove the oil pump drive chain tensioner.



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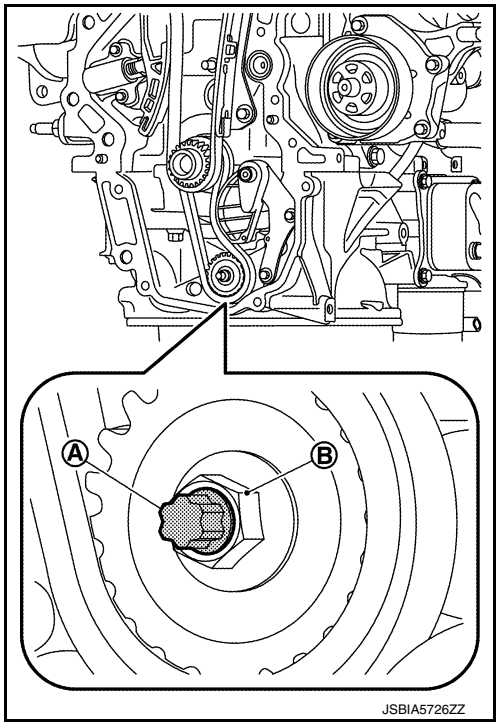
d. Hold the oil pump shaft end (A), and then loosen and remove the oil pump sprocket mounting nut (B).

CAUTION:

- **Be sure to hold the end of the shaft.**
- **The chain tension must not loosen the oil pump sprocket mounting nut.**



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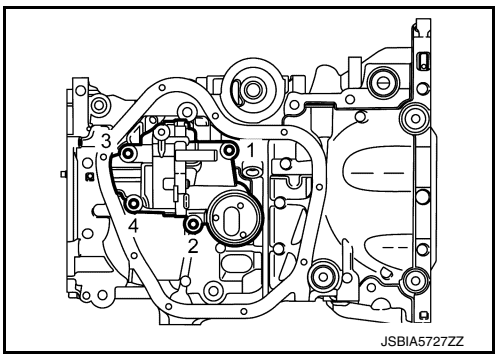
e. Remove the oil pump sprocket.

5. Remove oil pump.

- Loosen bolts in the reverse order of the numerical order as shown in the figure.



INSTALLATION

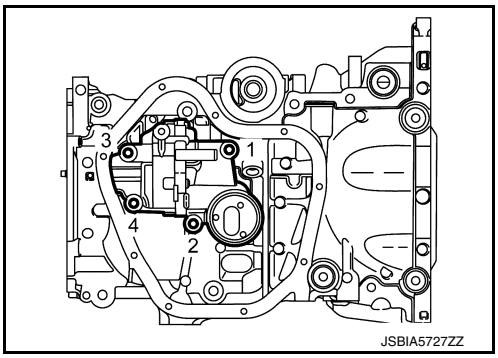
Note the following, and install in the reverse order of removal.

Oil Pump

CAUTION:

Never reuse O-ring. Always replace it with a new one.

- Tighten the mounting bolts in numerical order as shown in the figure.

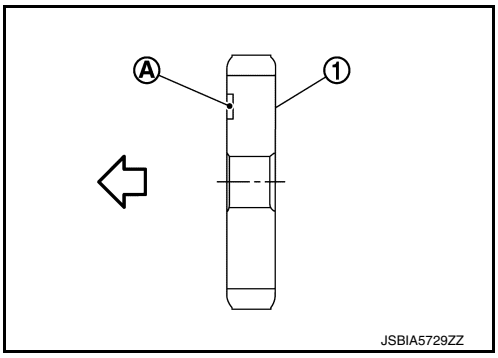


Oil Pump Sprocket

- Install the oil pump sprocket (1) in the direction shown in the figure.

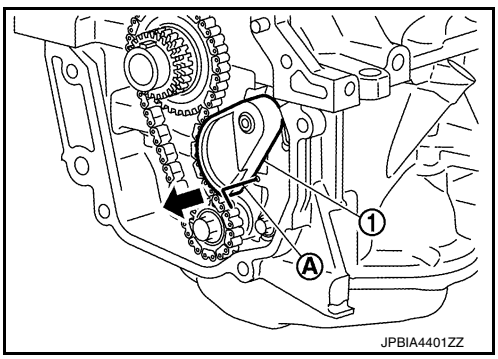
A : Identification mark

⇦ : Engine front



Oil Pump Drive Chain Tensioner

- Fix the tensioner surface at the most compressed position using a stopper pin (A), and then install it.
- After installing the oil pump drive chain tensioner (1), securely pull out the stopper pin (⬅).



Inspection

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INSPECTION AFTER INSTALLATION

1. Use the oil level gauge and check that the oil level is within the standard. Refer to LU-28, "Inspection".

2. Start the engine. Check for fuel leakage.
3. Stop the engine. After stopping it, leave it for 10 minutes or more.
4. Check the engine oil level again, and fill with engine oil if necessary. Refer to LU-28, "Inspection".

SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

Periodical Maintenance Specification

INFOID:0000000012197504

ENGINE OIL CAPACITY (APPROXIMATE)

Unit: ℓ (US qt, Imp qt)

Drain and refill	With oil filter change	4.3 (4-4/8, 3-6/8)
	Without oil filter change	4.1 (4-3/8, 3-5/8)
Dry engine (Overhaul)		5.2 (5-4/8, 4-5/8)

Engine Oil Pressure

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Discharge pressure	[kPa (kg/cm^2 , psi) / rpm]	Approx.110 (1.122, 15.95) / 600	
		Approx.320 (3.264, 46.4) / 2000	
Discharge amount	[liters (US qt, Imp qt)/min] / rpm	7.3 (7-6/8, 6-3/8) or more / 600	
		29.8 (31-4/8, 26-2/8) or more / 2000	
Regulator valve opening pressure/ Engine speed	[kPa (kg/cm^2 , psi) / rpm]	During low oil pressure control (no lord driving)	150 - 200 (1.53 - 2.04, 21.75 - 29.0)
		During low oil pressure control (high lord driving)	290 - 370 (2.958 - 3.774, 42.05 - 53.65)

NOTE:

Oil pump unit performance [oil: 0W-20, oil temp: 80°C (176°F)]