SECTION LU

ENGINE LUBRICATION SYSTEM

CONTENTS

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PRECAUTION 2

PRECAUTIONS 2
- Precaution for Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER" 2
- Precautions For Engine Service 2
- Precautions Concerning On-board Servicing of Hybrid Systems 3
- High Voltage Precautions 3

PREPARATION 6

PREPARATION 6
- Commercial Service Tools 6

SYSTEM DESCRIPTION 7

DESCRIPTION 7
- Engine Lubrication System 7
- Engine Lubrication System Schematic 8

PERIODIC MAINTENANCE 10

ENGINE OIL 10
- Inspection 10
- Draining 11
- Refilling 12

OIL FILTER 13
- Removal and Installation 13
- Inspection 13

REMOVAL AND INSTALLATION 14

OIL COOLER 14
- Exploded View 14
- Removal and Installation 14
- Inspection 15

OIL PUMP 16
- Exploded View 16

SERVICE DATA AND SPECIFICATIONS (SDS) 17

SERVICE DATA AND SPECIFICATIONS (SDS) 17
- Periodical Maintenance Specification 17
- Engine Oil Pressure 17

PRECAUTION

PRECAUTIONS

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

INFOID:0000000014732070

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 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.**

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

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.

NOTE:
Perform maintenance mode 5 and maintain the engine speed. Refer to GI-71, "Description".

Precautions Concerning On-board Servicing of Hybrid Systems

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CAUTION:
Be sure to turn the ignition switch OFF before performing inspection and servicing inside the engine compartment or underneath the vehicle. If the ignition switch is ON (vehicle READY state), even if the engine is stopped, the conditions of the vehicle may cause the engine to start automatically.
If it is necessary to continually operate the engine during inspection or servicing, use the designated inspection mode. GI-71, "Description".
NOTE:
The engine starts when hood is opened with the vehicle in READY state.

High Voltage Precautions

INFOID:0000000014793078

DANGER:

Since hybrid vehicles and electric vehicles contain a high voltage battery, there is the risk of electric shock, electric leakage, or similar accidents resulting in death or severe injury, if high voltage components and vehicle are mishandled. When performing an inspection or maintenance, be sure to comply with the instructions below to perform correct work procedures.

WARNING:

- **Be sure to remove the service plug in order to disconnect the high voltage circuits before performing inspection or maintenance of high voltage system harnesses and parts.**
- **The removed service plug must always be carried in a pocket of the responsible worker or placed in the tool box during the procedure to prevent the plug from being connected by mistake.**
- **Be sure to wear insulated protective equipment before beginning work on the high voltage system.**
- **Never allow workers other than the responsible person to touch the vehicle containing high voltage parts. To keep others from touching the high voltage parts, these parts must be covered with an insulating sheet except when using them.**

CAUTION:

- **Be sure to install the high voltage harness clips to the original positions to prevent damage to high voltage harness. If the clips are damaged, replace them with new ones before installing the high voltage harness.**
- **To prevent damage to parts, never allow coolant to splash on the high voltage harness connector. If coolant splashes on the high voltage harness connector, immediately remove moisture from the high voltage harness connector by using an air blow gun.**
- **Never bring the vehicle into the READY status with the service plug removed unless otherwise instructed in the Service Manual. A malfunction may occur if this is not observed.**

HIGH VOLTAGE HARNESS AND EQUIPMENT IDENTIFICATION

All the high voltage harnesses and connectors are orange. The Li-ion battery and other high voltage devices include an orange high voltage label. Never touch these harnesses and high voltage parts.

HANDLING OF HIGH VOLTAGE HARNESS AND TERMINALS

Immediately insulate disconnected high voltage connectors and terminals with insulating tape.

GUIDELINES ON WORKERS WITH MEDICAL ELECTRONICS

WARNING:

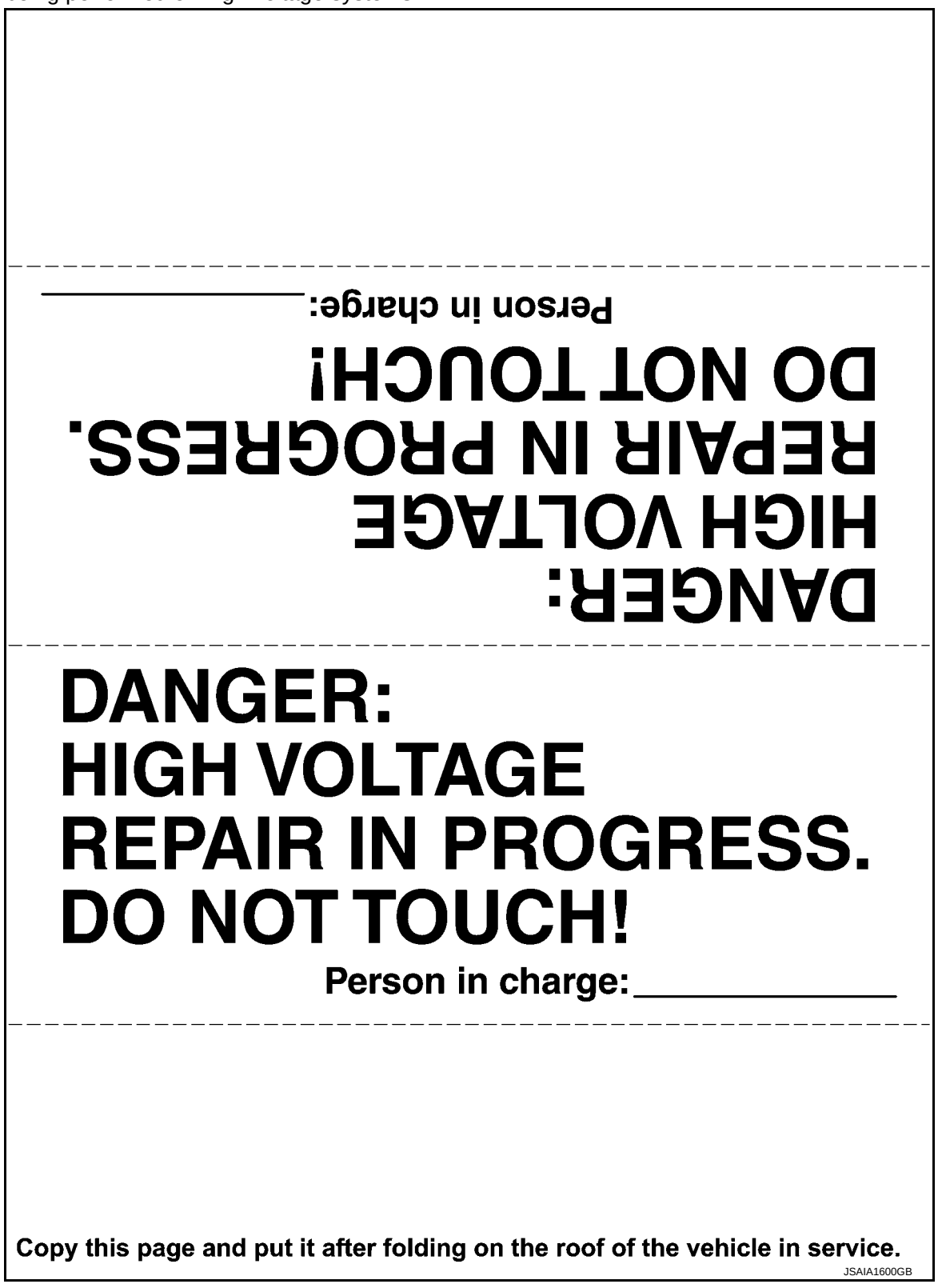
The vehicle contains parts that contain powerful magnets. If a person who is wearing a heart pacemaker or other medical device is close to these parts, the medical device may be affected by the magnets. Such persons must not perform work on the vehicle.

PROHIBITED ITEMS TO CARRY DURING THE WORK

Hybrid vehicles and electric vehicles contain parts with high voltage and intense magnetic force. Never carry metal products and magnetic recording media (e.g. credit card, debit card) to repair/inspect high voltage parts. If this is not observed, the metal products may create a risk of short circuit and the magnetic recording media may lose their magnetic recording.

POST A SIGN OF “DANGER! HIGH VOLTAGE AREA. KEEP OUT”

Call the attention of other workers and indicate "High voltage work in progress." Do not touch vehicles where work is being performed on high voltage systems.

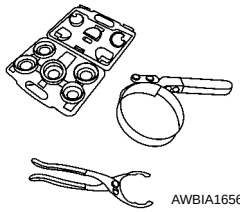
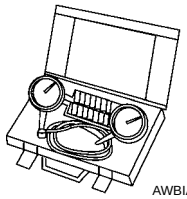
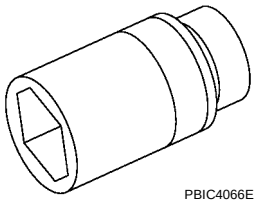


PREPARATION

PREPARATION

Commercial Service Tools

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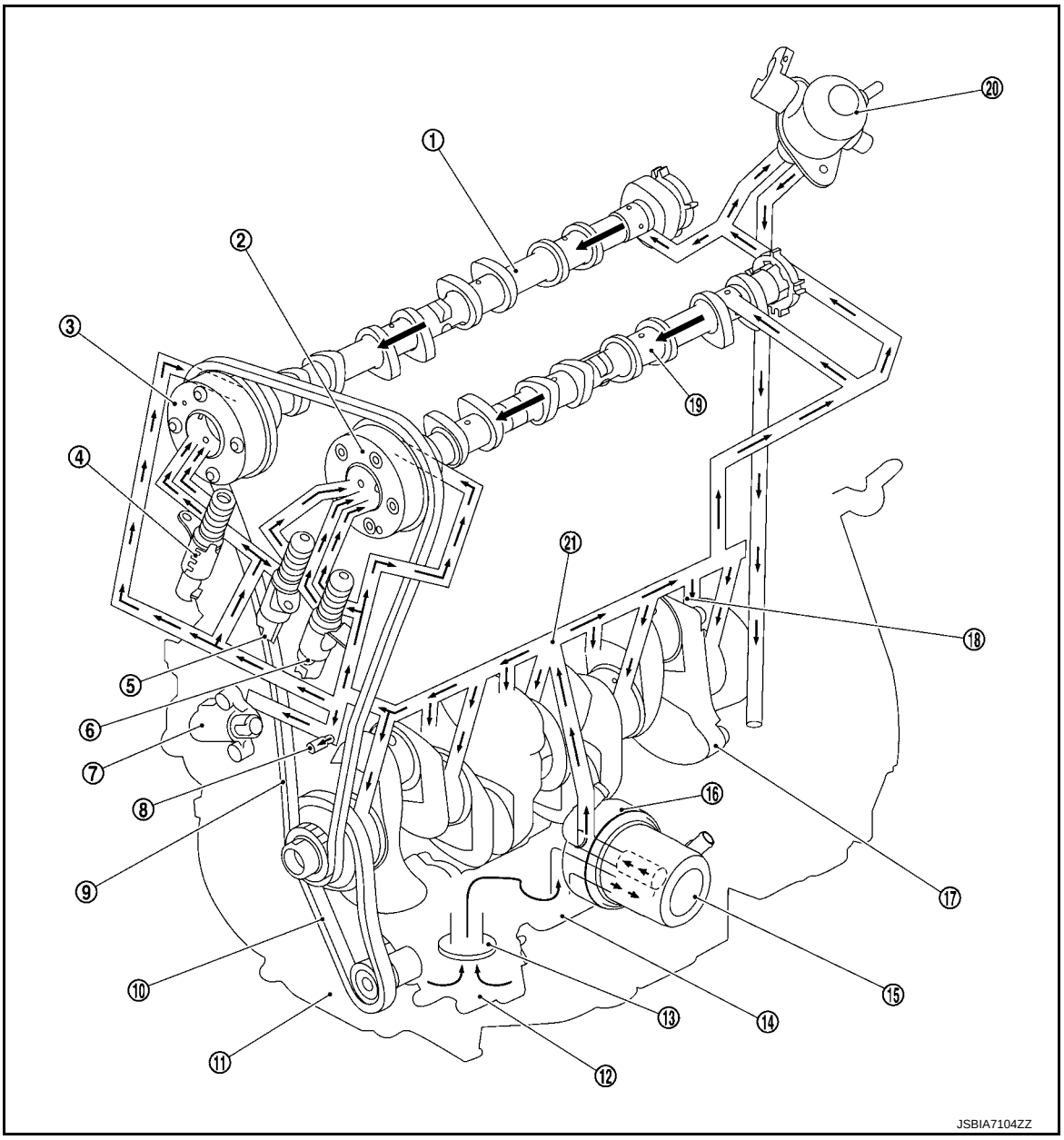
Tool name	Description
Oil filter wrench assortment  AWBIA1656ZZ	Removing oil filter
Oil pressure kit  AWBIA1657ZZ	Measuring oil pressure. Comes with adapter and hose. Designed to be used for both static and on road testing.
Deep socket  PBIC4066E	Removing and installing oil pressure switch **27 mm (1.06 in)**

SYSTEM DESCRIPTION

DESCRIPTION

Engine Lubrication System

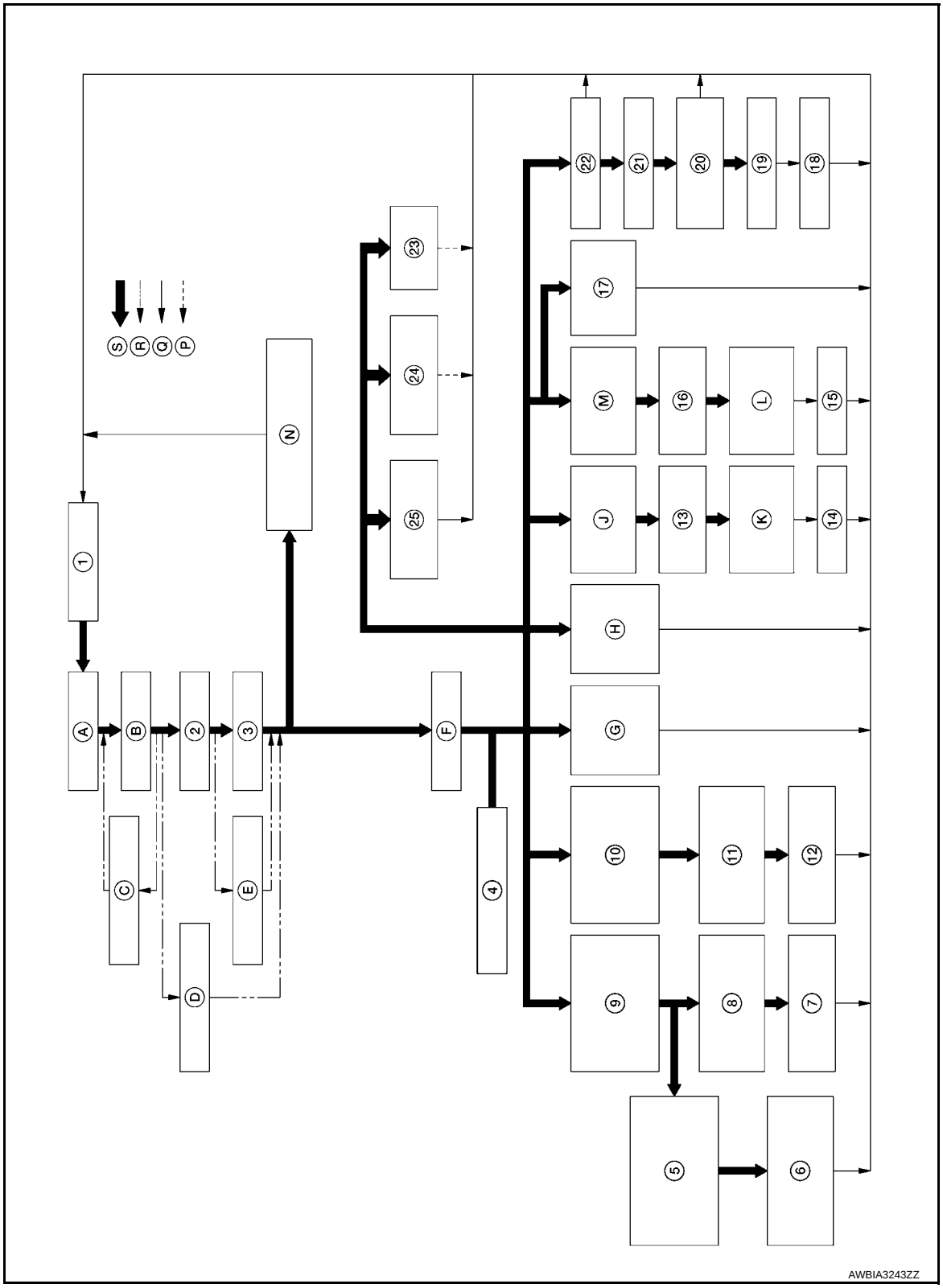
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1. Camshaft (EXH)
2. Intake valve timing controller
3. Exhaust valve timing controller
4. Exhaust valve timing control solenoid valve
5. Intake valve timing intermediate lock control solenoid valve
6. Intake valve timing control solenoid valve
7. Timing chain tensioner
8. Timing chain oil jet
9. Timing chain
10. Oil pump drive chain
11. Oil pan
12. Oil pump
13. Oil strainer
14. Balancer unit
15. Oil filter
16. Oil cooler
17. Crankshaft
18. Piston oil jet
19. Camshaft (INT)
20. High pressure fuel pump
21. Main gallery

Engine Lubrication System Schematic

INFOID:0000000014729339



1. Oil pan
2. Oil cooler
3. Oil filter
4. Engine oil pressure sensor
5. Intake valve timing intermediate lock control solenoid valve
6. Intake valve timing intermediate lock controller
7. Intake valve timing controller
8. Intake valve timing control solenoid valve
9. Intake valve timing control solenoid valve oil filter

10. Exhaust valve timing control solenoid valve oil filter
11. Exhaust valve timing control solenoid valve
12. Exhaust valve timing controller
13. Camshaft (INT)
14. Valve lifter (INT)
15. Valve lifter (EXH)
16. Camshaft (EXH)
17. High pressure fuel pump
18. Piston
19. Connecting rod
20. Connecting rod bearing
21. Crankshaft
22. Main bearing
23. Piston oil jet
24. Timing chain oil jet
25. Timing chain tensioner
A. Oil strainer
B. Oil pump
C. Regulator valve
D. Relief valve
E. Relief valve
F. Main gallery
G. Camshaft journal [INT (No. 1)]
H. Camshaft journal [EXH (No.1)]
J. Camshaft journal [INT (No. 5)]
K. Camshaft journal (INT)
L. Camshaft journal (EXH)
M. Camshaft journal [EXH (No. 6)]
N. Balancer unit [Built in oil pan (upper)]
P. Oil injection
Q. To oil pan
R. By-pass passage
S. Oil passage

PERIODIC MAINTENANCE

ENGINE OIL

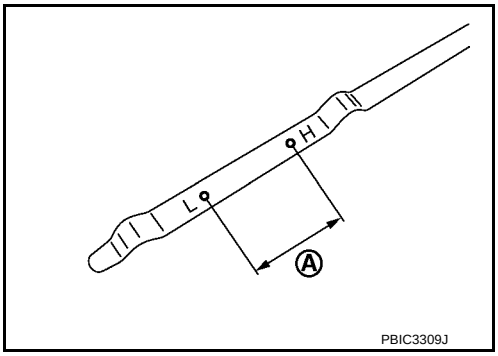
Inspection

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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.
3. If it is out of range, add oil as necessary until the oil level gauge indicates the correct level.



ENGINE OIL APPEARANCE

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

ENGINE OIL LEAKS

Check for engine oil leaks around the following area:

- Oil pan (upper and lower)
- Oil pan drain plug
- Engine oil pressure sensor
- Oil filter
- Oil cooler
- Intake valve timing control solenoid valve
- Intake valve timing intermediate lock control solenoid valve
- Exhaust valve timing control solenoid valve
- Front cover
- VTC cover
- Mating surface between cylinder block and cylinder head
- Mating surface between cylinder head and camshaft bracket
- Mating surface between camshaft bracket and rocker cover
- Mating surface between camshaft bracket and high pressure fuel pump
- Crankshaft oil seals (front and rear)

OIL PRESSURE CHECK

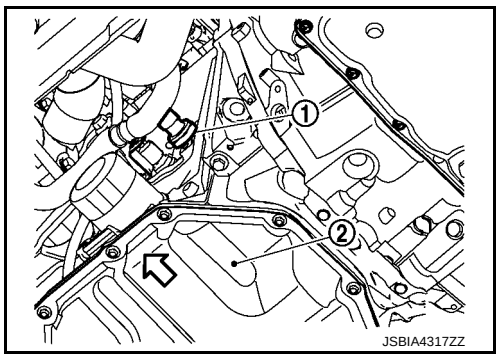
WARNING:

- **Be careful not to get burned, as engine oil may be hot.**
- **When checking engine oil pressure, shift position should be “Parking position”, and apply parking brake securely.**

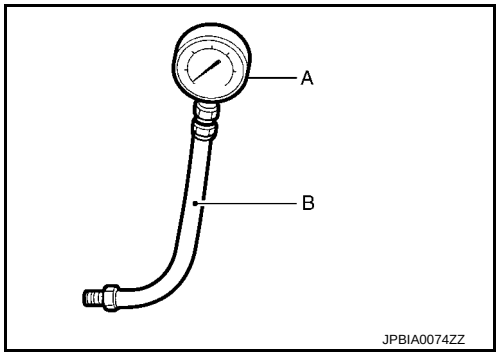
1. Check engine oil level.

2. Disconnect the harness connector from the oil pressure sensor (1), and remove oil pressure sensor using a suitable tool
CAUTION:
Do not drop or shock engine oil pressure sensor.

(2) : Oil pan (lower)
⇦ : Vehicle front



3. Install suitable tools (A/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-17, "Engine Oil Pressure".

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

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

Tightening torque : Refer to EM-116, "Exploded View".

c. Check engine oil level.
d. After warming up engine, check that there is no leaks.

Draining

INFOID:0000000014729341

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 leaks from engine components. Refer to LU-10, "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:0000000014729342

1. Install drain plug with new drain plug washer.
   CAUTION:
   - **Do not reuse drain plug washer.**
   - **Be sure to clean drain plug and install with new drain plug washer.**

   Tightening torque : Refer to EM-40, "Exploded View".
2. Refill with new engine oil.
   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.**

   Engine oil specification and capacity : Refer to MA-11, "Fluids and Lubricants".
3. Warm up engine and check area around drain plug and oil filter for engine oil leaks.
4. Stop engine and wait for 10 minutes.
5. Check the engine oil level. Refer to LU-10, "Inspection".

OIL FILTER

Removal and Installation

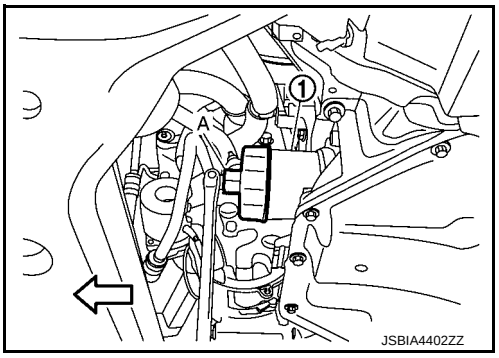
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REMOVAL

- Using suitable tool (A), remove the oil filter (1).

CAUTION:

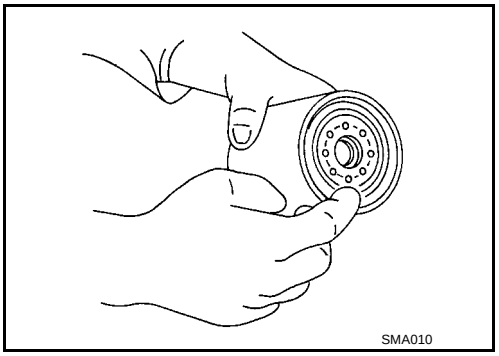
- **Oil filter is provided with relief valve. Use Genuine NISSAN Oil Filter or equivalent.**
- **Be careful not to get burned when engine and engine oil may be hot.**
- **When removing, prepare a shop cloth to absorb any engine oil leaks or spills.**
- **Completely wipe off any engine oil that adheres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



⇦ : Vehicle front

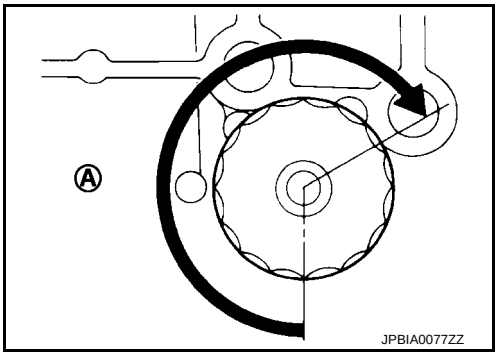
INSTALLATION

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:0000000014729344

INSPECTION AFTER INSTALLATION

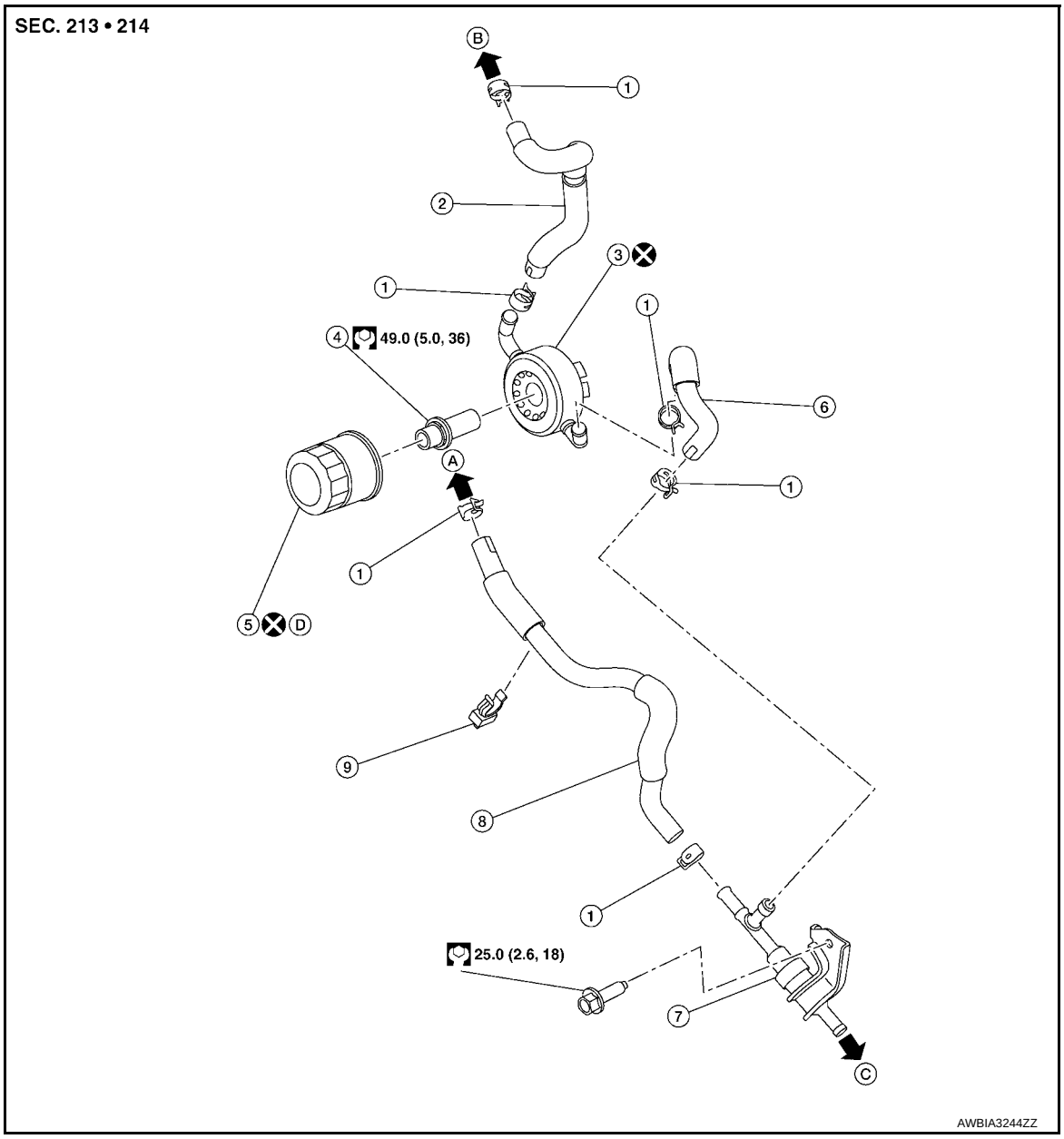
1. Check the engine oil level. Refer to LU-10, "Inspection".
2. Start the engine, and check there is no leaks of engine oil.
3. Stop the engine and wait for 10 minutes.
4. Check the engine oil level and adjust the level. Refer to LU-10, "Inspection".

REMOVAL AND INSTALLATION

OIL COOLER

Exploded View

INFOID:0000000014729345



1.	Clamp	2.	Water hose 1	3.	Oil cooler
4.	Connector bolt	5.	Oil filter	6.	Water hose 2
7.	Heater thermostat	8.	Water hose 3	9.	Clip
A.	To thermostat housing	B.	To thermostat housing	C.	To CVT oil warmer
D.	Refer to LU-13, "Removal and Installation".				

Removal and Installation

INFOID:0000000014729346

REMOVAL

WARNING:

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

1. Drain engine coolant from radiator and cylinder block. Refer to CO-10, "Draining".
   NOTE:
   Perform this step when removing water hoses.
2. Remove under cover. Refer to EXT-49, "ENGINE UNDER COVER : Removal and Installation".
3. Remove the oil filter. Refer to LU-13, "Removal and Installation".
4. Disconnect water hose 1 and water hose 2 from the oil cooler.
   - When removing oil cooler only, pinch water hoses near oil cooler to prevent engine coolant from spilling out.
   - Remaining engine coolant in piping will come out. Use a tray to collect it.

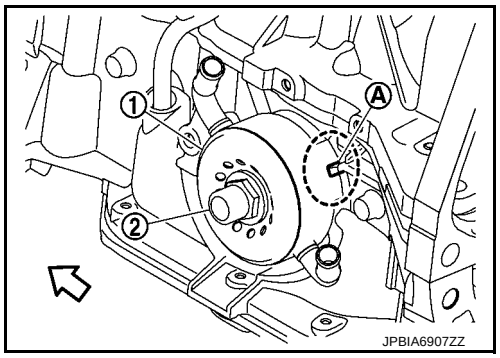
   CAUTION:
   Perform this step when the engine is cold.
5. Loosen the connector bolt and remove the connector bolt and oil cooler.

INSTALLATION

Installation is the reverse order of removal.

- Tighten the connector bolt (2) after aligning the stopper (A) on the oil pan (upper) side with protrusion of oil cooler (1).

⇦ : Engine front



Inspection

INFOID:0000000014729347

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.

INSPECTION AFTER INSTALLATION

1. Check the engine oil level and the engine coolant level and add engine oil and engine coolant. Refer to LU-10, "Inspection" and CO-10, "Inspection".
2. Start the engine, and check that there is no leakage of engine oil or engine coolant.
   NOTE:
   Perform maintenance mode 5 and maintain the engine speed. Refer to HBC-115, "Work Procedure (Inspection Mode 5)".
3. Stop the engine and wait for 10 minutes.
4. Check the engine oil level and the engine coolant level again. Refer to LU-10, "Inspection" and CO-10, "Inspection".

OIL PUMP

Exploded View

INFOID:0000000014736425

Oil pump is integrated in the oil pan (upper). Refer to EM-43, "Exploded View".

SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

Periodical Maintenance Specification

INFOID:0000000014729349

ENGINE OIL CAPACITY (APPROXIMATE)

Unit: ℓ (US qt, Imp qt)

Drain and refill	With oil filter change	3.9 (4-1/8, 3-3/8)
	Without oil filter change	3.6 (3-3/4, 3-1/8)
Dry engine (Overhaul)		4.4 (4-5/8, 3-7/8)

Engine Oil Pressure

INFOID:0000000014729350

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

Engine speed	Approximate discharge pressure*
1,000 rpm	More than 71.5 (0.715, 0.729, 10.37)
2,000 rpm	More than 200 (2.0, 2.04, 29.0)
6,000 rpm	More than 380 (3.80, 3.88, 55.1)

*: Engine oil temperature at 140°C (284°F)