

SECTION

EM

ENGINE MECHANICAL

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PRECAUTION

PRECAUTIONS

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

INFOID:0000000011616416

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 "SRS AIR BAG" and "SEAT BELT" of this Service Manual.

WARNING:

Always observe the following items for preventing accidental activation.

- To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision that would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.
- Improper maintenance, 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 "SRS AIR BAG".
- Never 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:

Always observe the following items for preventing accidental activation.

- When working near the Air Bag Diagnosis Sensor Unit or other Air Bag System sensors with the ignition ON or engine running, never 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, and wait at least 3 minutes before performing any service.

Precautions Necessary for Steering Wheel Rotation After Battery Disconnection

INFOID:0000000011616417

CAUTION:

Comply with the following cautions to prevent any error and malfunction.

- Before removing and installing any control units, first turn the ignition switch to the LOCK position, then disconnect both battery cables.
- After finishing work, confirm that all control unit connectors are connected properly, then re-connect both battery cables.
- Always use CONSULT to perform self-diagnosis as a part of each function inspection after finishing work. If a DTC is detected, perform trouble diagnosis according to self-diagnosis results.

For vehicle with steering lock unit, if the battery is disconnected or discharged, the steering wheel will lock and cannot be turned.

If turning the steering wheel is required with the battery disconnected or discharged, follow the operation procedure below before starting the repair operation.

OPERATION PROCEDURE

1. Connect both battery cables.

NOTE:

Supply power using jumper cables if battery is discharged.

2. Turn the ignition switch to ACC position.
(At this time, the steering lock will be released.)
3. Disconnect both battery cables. The steering lock will remain released with both battery cables disconnected and the steering wheel can be turned.
4. Perform the necessary repair operation.

PRECAUTIONS

[QR25DE]

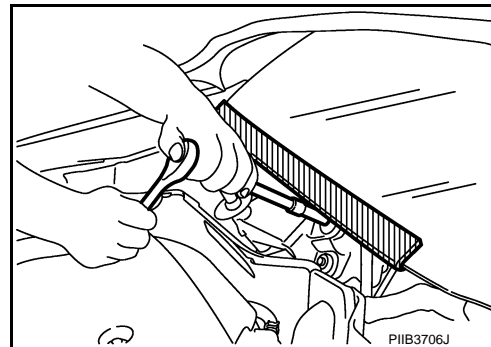
< PRECAUTION >

5. When the repair work is completed, re-connect both battery cables. With the brake pedal released, turn the ignition switch from ACC position to ON position, then to LOCK position. (The steering wheel will lock when the ignition switch is turned to LOCK position.)
6. Perform self-diagnosis check of all control units using CONSULT.

Precaution for Procedure without Cowl Top Cover

INFOID:000000011616418

When performing the procedure after removing cowl top cover, cover the lower end of windshield with urethane, etc to prevent damage to windshield.



INFOID:000000011616419

Precautions For Engine Service

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, 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.

PRECAUTIONS

< PRECAUTION >

[QR25DE]

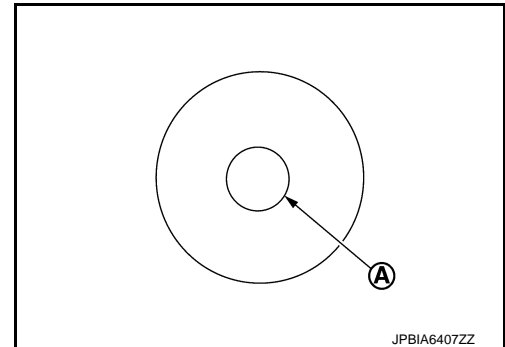
- After repairing, start the engine and increase engine speed to check engine coolant, fuel, engine oil, and exhaust gases for leakage.

Special Cautions to Ensure the Safe Disposal of Sodium-filled Exhaust Valves

INFOID:0000000011616420

Handling and disposal of sodium-filled exhaust valves requires special care and consideration. Under conditions such as breakage with subsequent contact with water, metal sodium which lines the inner portion of exhaust valve will react violently, forming sodium hydroxide and hydrogen which may result in an explosion. Sodium-filled exhaust valve is identified on the top of its stem as shown in illustration.

Identification mark of sodium-filled exhaust valve (A) :3T1



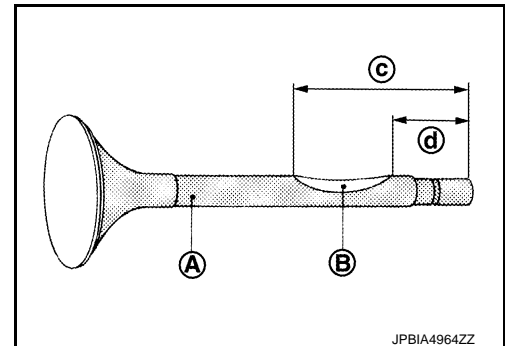
DEALER DISPOSAL INSTRUCTIONS

CAUTION:

- Use approved shatter-resistant eye protection when performing this procedure.
- Perform this and all subsequent disposal work procedures in an open room, away from flammable liquids. Keep a fire extinguisher, rated at least 10 ABC, in close proximity to the work area.
- Be sure to wear rubber gloves when performing the following operations.
- Make sure the resultant (high alkalinity) waste water does not contact your skin. If the waste water does contact you, wash the contacted area immediately with large quantities of water.
- Dealers should check their respective state and local regulations concerning any chemical treatment or waste water discharge permits which may be required to dispose of the resultant (high alkalinity) waste water.

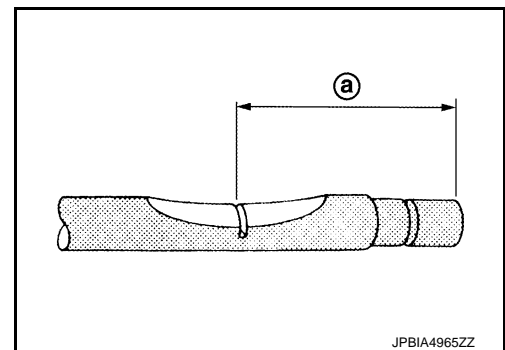
- Clamp valve stem in a vice.
- The valve has a specially-hardened surface. To cut through it, first remove a half-round section, approximately 30 mm (1.18 in) long using air-powered grinder until black color is removed and silver color appears.

- (A) : Black color
- (B) : Silver color
- (C) : 47 mm (1.85 in)
- (d) : 17 mm (0.67 in)



- Use hacksaw to cut through approximately half the diameter of valve stem. Make the serration at a point 40 mm (1.57 in) from the end of valve stem.

- (a) : 40 mm (1.57 in)

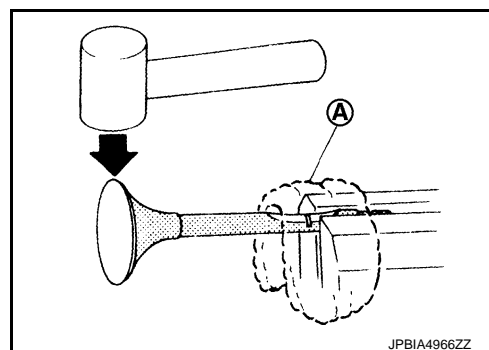


PRECAUTIONS

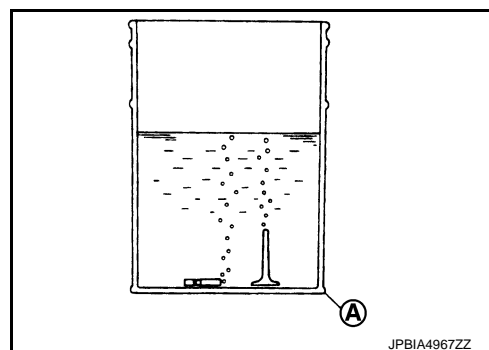
[QR25DE]

< PRECAUTION >

4. Cover the serrated end of the valve with a large shop towel (A). Strike the valve face end with a hammer, separating it into two pieces.



5. Fill a bucket (A) (such as a 20 ℓ oil can) with at least 10 ℓ (2-1/4 Imp gal) of water. Carefully place the already cut (serrated) valves into the water one-at-a-time using a set of large tweezers and quickly move away at least 2.7 m (9 ft).
6. The valves should be placed in a standing position as shown in the illustration to allow complete reaction. After the bubbling action has subsided, additional valves can be placed into the bucket allowing each subsequent chemical reaction to subside. However, no more than 8 valves should be placed in the same 10 ℓ (2-1/4 Imp gal) amount of water. The complete chemical reaction may take as long as 4 to 5 hours. Remove the valves using a set of large tweezers after the chemical reaction has stopped. Afterwards, valves can be disposed as ordinary scrap.



Parts Requiring Angle Tightening

INFOID:000000012125177

- Use the angle wrench [SST: KV10112100] for the final tightening of the following engine parts:
 - Camshaft sprocket (INT) bolt
 - Cylinder head bolts
 - Main bearing cap bolts
 - Connecting rod cap bolts
 - Crankshaft pulley bolt (No the angle wrench is required as bolt flange is provided with notches for angle tightening)
- Do not use a torque value for final tightening.
- The torque value for these parts are for a preliminary step.
- Ensure thread and seat surfaces are clean and coated with engine oil.

Liquid Gasket

INFOID:000000011616422

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.

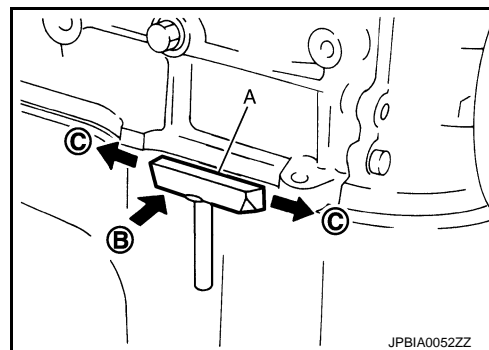
CAUTION:

Never damage the mating surfaces.

- Tap the seal cutter [SST: KV10111100] to insert it (B), and then slide it (C) 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.



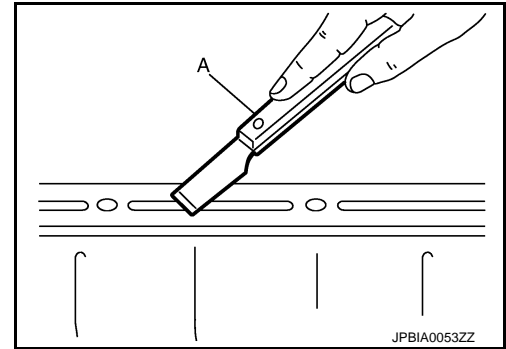
LIQUID GASKET APPLICATION PROCEDURE

PRECAUTIONS

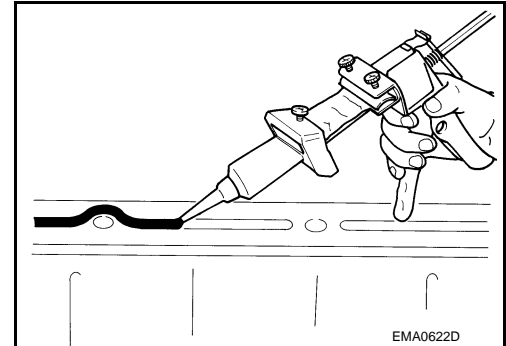
[QR25DE]

< PRECAUTION >

- 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.
- 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.



- Attach liquid gasket tube to the tube presser (commercial service tool).
Use Genuine Liquid Gasket or equivalent.
- 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.

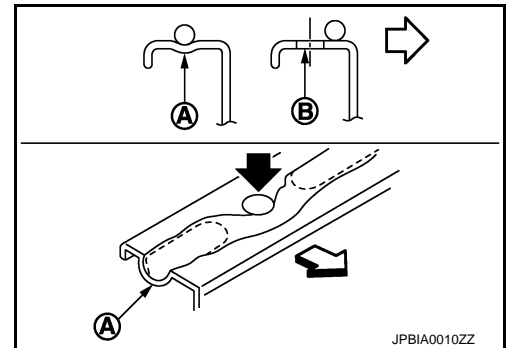


- As for bolt holes ⑥, normally apply liquid gasket inside the holes. Occasionally, it should be applied outside the holes. Check to read the text of this manual.

⑥ : 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.

Precautions for Removing Battery Terminal

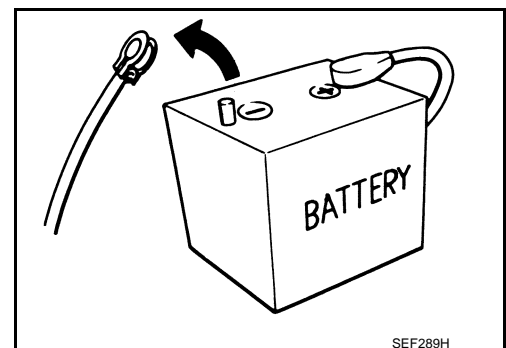
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When disconnecting the battery terminal, pay attention to the following.

- 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:



PRECAUTIONS

[QR25DE]

< PRECAUTION >

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.

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PREPARATION

< PREPARATION >

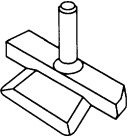
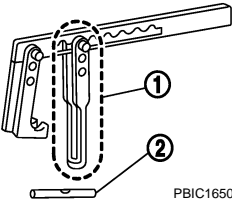
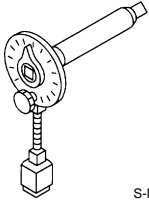
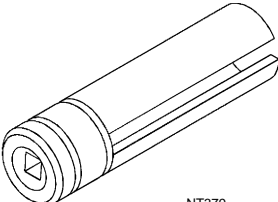
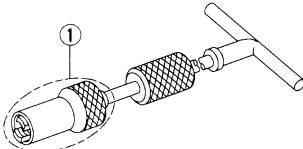
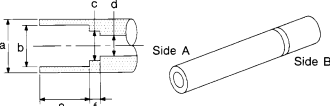
[QR25DE]

PREPARATION

PREPARATION

Special Service Tools

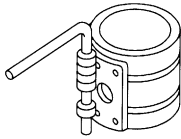
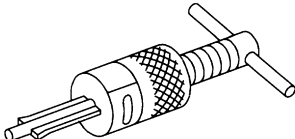
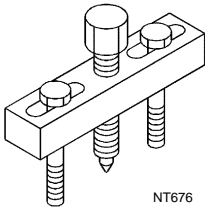
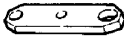
INFOID:0000000011616424

Tool number Tool name		Description
KV10111100 Seal cutter	 S-NT046	Removing oil pan and timing chain case
KV10116200 Valve spring compressor 1. KV10115900 Attachment 2. KV10109220 Adapter	 PBIC1650E	Disassembling and assembling valve mechanism Part (1) is a component of KV10116200, but Part (2) is not so.
KV10112100 Angle wrench	 S-NT014	Tightening bolts for bearing cap, cylinder head, etc.
KV10117100 Heated oxygen sensor wrench	 NT379	Loosening or tightening air fuel ratio sensor 1 with 22 mm (0.87 in) hexagon nut
KV10107902 Valve oil seal puller 1. KV10116100 Valve oil seal puller adapter	 S-NT605	Removing valve oil seal
KV10115600 Valve oil seal drift	 S-NT603	Installing valve oil seal Use side A. a: 20 (0.79) dia. d: 8 (0.31) dia. b: 13 (0.51) dia. e: 10.7 (0.421) dia. c: 10.3 (0.406) dia. f: 5 (0.20) dia. Unit: mm (in)

PREPARATION

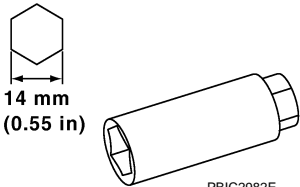

< PREPARATION >

[QR25DE]

Tool number Tool name	Description	
EM03470000 Piston ring compressor	Installing piston assembly into cylinder bore	A
 S-NT044		EM
ST16610001 Pilot bushing puller	Removing pilot bushing	C
 S-NT045		D
KV11103000 Pulley puller	Removing crankshaft pulley	E
 NT676		F
KV11105210 Stopper plate	Fixing drive plate and flywheel	G
 ZZA0009D		H

Commercial Service Tools

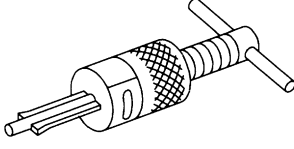
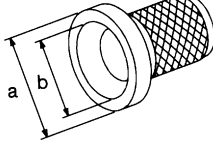
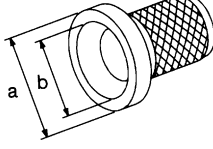
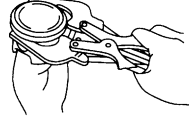
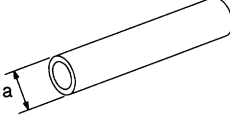

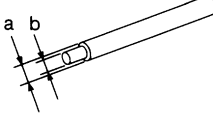
INFOID:0000000011616425

Tool name	Description	
Spark plug wrench	Removing and installing spark plug	L
 PBIC2982E		M
Pulley holder	Crankshaft pulley removing and installing	N
 ZZA1010D		O

PREPARATION

< PREPARATION >

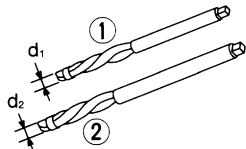
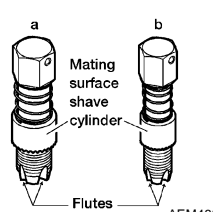

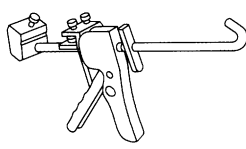
[QR25DE]

Tool name	Description
Pilot bushing puller  S-NT045	Removing pilot converter
Drift  NT086	Installing front oil seal a: 56 mm (2.20 in) dia. b: 48 mm (1.89 in) dia.
Drift  NT086	Installing rear oil seal a: 102 mm (4.02 in) dia. b: 86 mm (3.39 in) dia.
Piston ring expander  S-NT030	Removing and installing piston ring
Stick  NT083	Removing and installing piston pin a: 19 mm (0.75 in) dia.
Valve seat cutter set  S-NT048	Finishing valve seat dimensions
Valve guide drift  S-NT015	Removing and installing valve guide Intake & Exhaust: a: 9.5 mm (0.374 in) dia. b: 5.5 mm (0.217 in) dia.

PREPARATION

< PREPARATION >

[QR25DE]

Tool name	Description
Valve guide reamer  S-NT016	1: Reaming valve guide inner hole 2: Reaming hole for oversize valve guide Intake & Exhaust: d1: 6.0 mm (0.236 in) dia. d2: 10.2 mm (0.402 in) dia.
Oxygen sensor thread cleaner  AEM488	Reconditioning the exhaust system threads before installing a new air fuel ratio sensor and heated oxygen sensor (Use with anti-seize lubricant shown below.) a = 18 mm (0.71 in) dia. for zirconia heated oxygen sensor and air fuel ratio sensor b = 12 mm (0.47 in) dia. for titania heated oxygen sensor
Anti-seize lubricant i.e.: (Permatex™ 133AR or equivalent meeting MIL specification MIL-A-907)  AEM489	Lubricating oxygen sensor thread cleaning tool when reconditioning exhaust system threads
Tube presser  S-NT052	Pressing the tube of liquid gasket

Sealant or/and Lubricant

INFOID:000000012174168

Name	Description	Note
Three bond 1215	Cylinder block	Water drain plug
Three bond 1217H	<ul style="list-style-type: none"> • Rocker cover • Camshaft • Cylinder head • Oil pan and oil strainer • Timing chain • Cylinder block 	—

BASIC INSPECTION

CAMSHAFT VALVE CLEARANCE

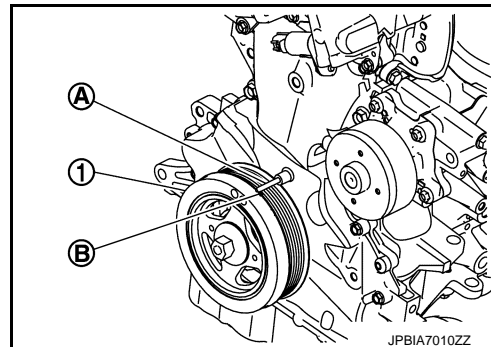
Inspection and Adjustment

INFOID:000000011616432

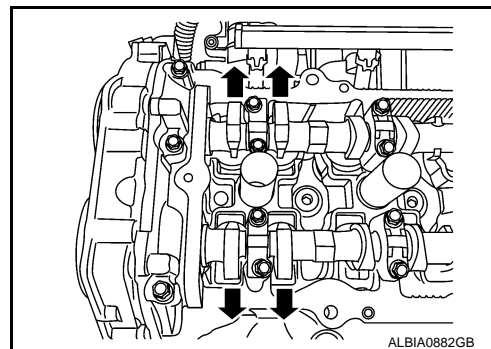
INSPECTION

Perform inspection as follows after removal, installation or replacement of camshaft or valve-related parts, or if there is unusual engine conditions regarding valve clearance.

1. Remove rocker cover. Refer to [EM-31, "Removal and Installation"](#).
2. Measure the valve clearance with the following procedure:
 - a. Set No. 1 cylinder at TDC of its compression stroke.
 - Rotate crankshaft pulley ① clockwise and align TDC mark (no paint) ② to timing indicator ③ on front cover.

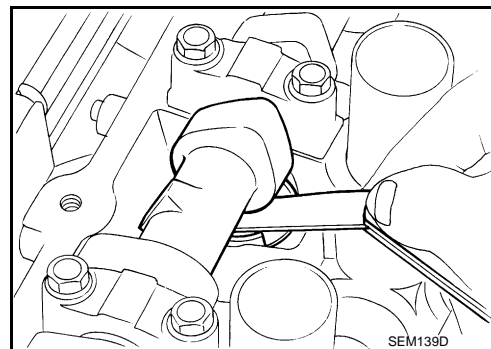


- At the same time, check that both intake and exhaust cam noses of No. 1 cylinder face outside (←) as shown in the figure.
- If they do not face outside, rotate crankshaft pulley once more (360 degrees) and align as shown in the figure.



- b. Use a feeler gauge, measure the clearance between valve lifter and camshaft.

Valve clearance : Refer to [EM-126, "Camshaft"](#).



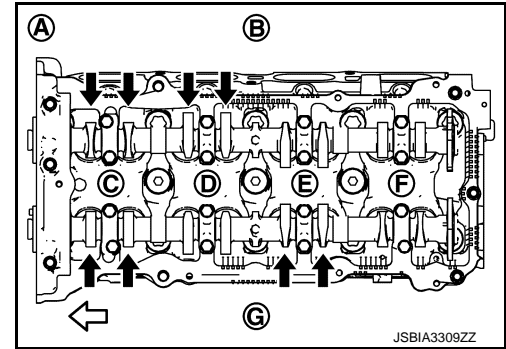
CAMSHAFT VALVE CLEARANCE

[QR25DE]

< BASIC INSPECTION >

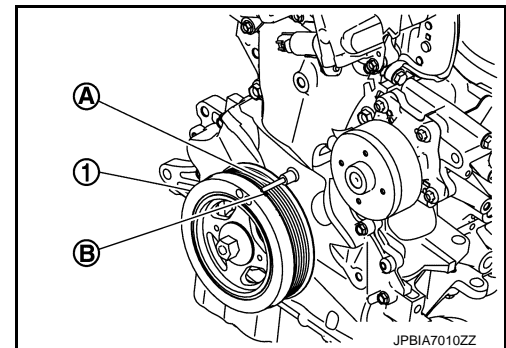
- By referring to the figure, measure the valve clearances at locations marked "x" as shown in the table below [locations indicated with black arrow (↖) in the figure] with a feeler gauge.

- (A) : No. 1 cylinder at compression TDC
 (B) : Intake side
 (C) : No. 1 cylinder
 (D) : No. 2 cylinder
 (E) : No. 3 cylinder
 (F) : No. 4 cylinder
 (G) : Exhaust side
 ↖ : Engine front



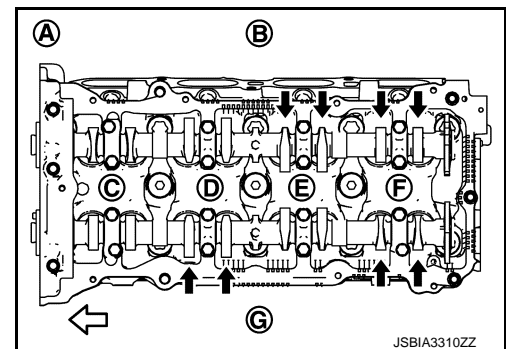
Measuring position		No. 1 CYL.	No. 2 CYL.	No. 3 CYL.	No. 4 CYL.
No. 1 cylinder at compression TDC	INT	x	x		
	EXH	x		x	

- c. Rotate crankshaft pulley ① one revolution (360 degrees) and align TDC mark (no paint) ② to timing indicator ③ on front cover.



- By referring to the figure, measure the valve clearance at locations marked "x" as shown in the table below [locations indicated with black arrow (↖) in the figure] with a feeler gauge.

- (A) : No. 4 cylinder at compression TDC
 (B) : Intake side
 (C) : No. 1 cylinder
 (D) : No. 2 cylinder
 (E) : No. 3 cylinder
 (F) : No. 4 cylinder
 (G) : Exhaust side
 ↖ : Engine front



Measuring position		No. 1 CYL.	No. 2 CYL.	No. 3 CYL.	No. 4 CYL.
No. 4 cylinder at compression TDC	INT			x	x
	EXH		x		x

3. If out of standard, perform adjustment. Refer to "ADJUSTMENT".

ADJUSTMENT

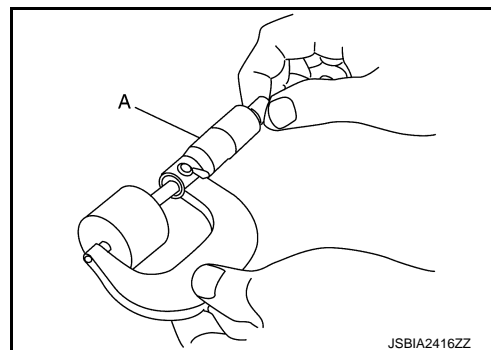
- Perform adjustment depending on selected head thickness of valve lifter.

CAMSHAFT VALVE CLEARANCE

[QR25DE]

< BASIC INSPECTION >

1. Remove camshaft. Refer to [EM-66, "Removal and Installation"](#).
2. Remove valve lifters at the locations that are out of the standard.
3. Measure the center thickness of the removed valve lifters with a micrometer (A).



4. Use the equation below to calculate valve lifter thickness for replacement.

Valve lifter thickness calculation: $t = t_1 + (C_1 - C_2)$

t = Valve lifter thickness to be replaced

t₁ = Removed valve lifter thickness

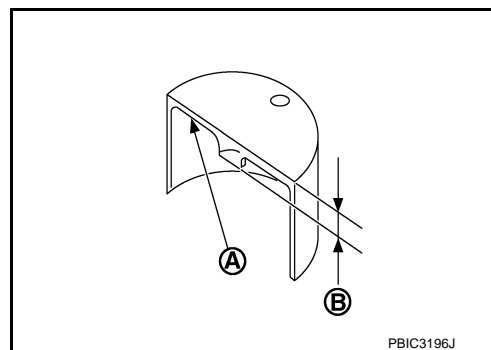
C₁ = Measured valve clearance

C₂ = Standard valve clearance:

Intake : 0.28 mm (0.011 in)

Exhaust : 0.30 mm (0.012 in)

- Thickness of new valve lifter ② can be identified by stamp mark ① on the reverse side (inside the cylinder).
- Stamp mark "300" indicates 3.00 mm (0.1181 in) in thickness.



NOTE:

Available thickness of valve lifter: 26 sizes range 3.00 to 3.50 mm (0.1181 to 0.1378 in) in steps of 0.02 mm (0.0008 in) (when manufactured at factory). Refer to [EM-126, "Camshaft"](#).

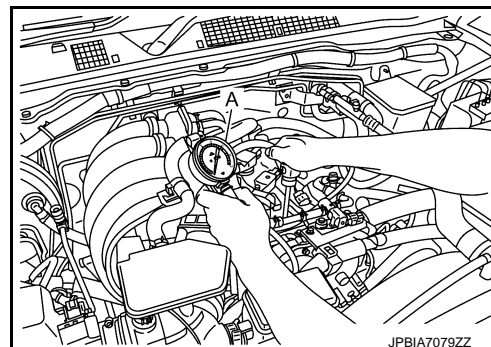
5. Install the selected valve lifter.
6. Install camshaft. Refer to [EM-66, "Removal and Installation"](#).
7. Install timing chain and related parts. Refer to [EM-55, "Removal and Installation"](#).
8. Manually rotate crankshaft pulley a few rotations.
9. Check that the valve clearances is within the standard. Refer to "INSPECTION".
10. Install remaining parts in the reverse order of removal.
11. Warm up the engine, and check for unusual noise and vibration.

COMPRESSION PRESSURE

Inspection

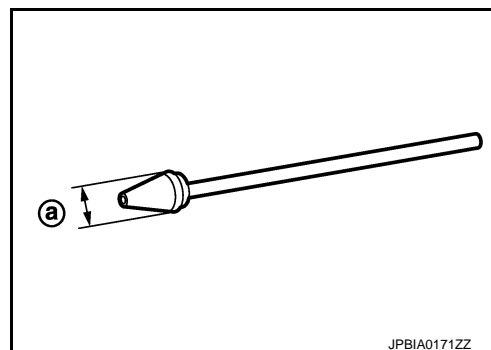
INFOID:0000000011616433

1. Warm up engine thoroughly. Then, stop it.
2. Release fuel pressure. Refer to [EC-146, "Work Procedure"](#).
3. Disconnect fuel pump fuse to avoid fuel injection during measurement. Refer to [PG-149, "Fuse, Connector and Terminal Arrangement"](#).
4. Remove ignition coil and spark plug from each cylinder. Refer to [EM-26, "Exploded View"](#).
5. Connect engine tachometer (not required in use of CONSULT).
6. Install compression tester (A) with adapter onto spark plug hole.



- Use compression tester whose end ① (rubber portion) is smaller than 25 mm (0.98 in) in diameter. Otherwise, it may be caught by cylinder head during removal.
7. With accelerator pedal fully depressed, turn ignition switch to "START" for cranking. When the gauge pointer stabilizes, read the compression pressure and engine rpm. Perform these steps to check each cylinder.

Compression pressure : Refer to [EM-125, "General Specification"](#).



CAUTION:

Always use a fully charged battery to obtain specified engine speed.

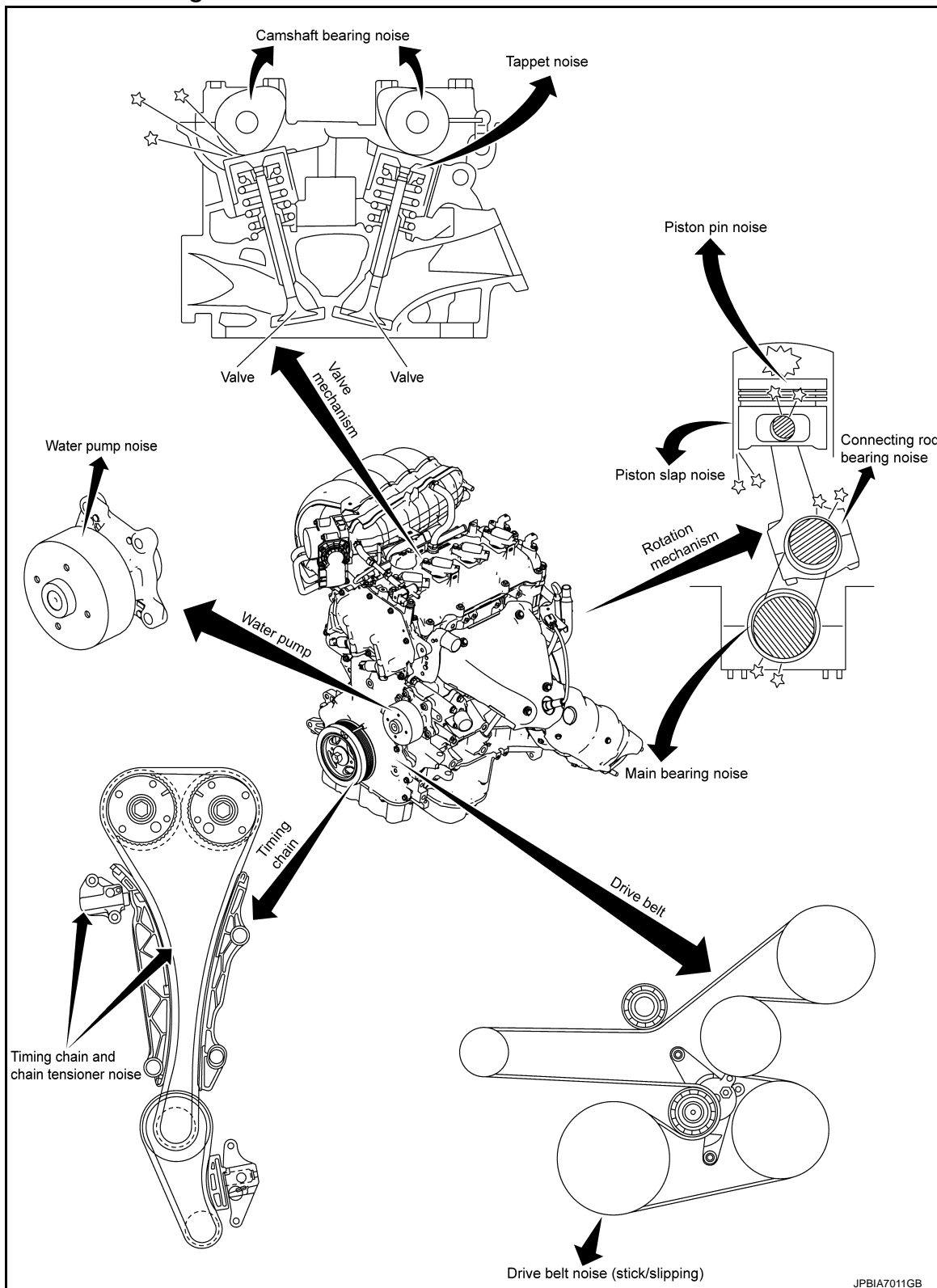
- If the engine speed is out of specified range, check battery liquid for proper gravity. Check engine speed again with normal battery gravity.
 - If compression pressure is below minimum value, check valve clearances and parts associated with combustion chamber (Valve, valve seat, piston, piston ring, cylinder bore, cylinder head, cylinder head gasket). After the checking, measure the compression pressure again.
 - If some cylinder has low compression pressure, pour small amount of engine oil into the spark plug hole of the cylinder to re-check it for compression.
 - If the added engine oil improves the compression, piston rings may be worn out or damaged. Check piston rings and replace if necessary.
 - If the compression pressure remains at low level despite the addition of engine oil, valves may be malfunctioning. Check valves for damage. Replace valve or valve seat accordingly.
 - If two adjacent cylinders have respectively low compression pressure and their compression remains low even after the addition of engine oil, gaskets are leaking. In such a case, replace cylinder head gaskets.
8. After inspection is completed, install removed parts.
 9. Start engine, and confirm that engine runs smoothly.
 10. Perform trouble diagnosis. If DTC appears, erase it. Refer to [EC-77, "CONSULT Function"](#).

SYMPTOM DIAGNOSIS

NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

NVH Troubleshooting Chart

INFOID:000000011616434



1. Locate the area where noise occurs.
2. Confirm the type of noise.
3. Specify the operating condition of engine.

NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

< SYMPTOM DIAGNOSIS >

[QR25DE]

4. Check specified noise source.

If necessary, repair or replace these parts.

Location of noise	Type of noise	Operating condition of engine						Source of noise	Check item	Reference page
		Before warm-up	After warm-up	When starting	When idling	When racing	While driving			
Top of engine Rocker cover Cylinder head	Ticking or clicking	C	A	—	A	B	—	Tappet noise	Valve clearance	EM-16
	Rattle	C	A	—	A	B	C	Camshaft bearing noise	Camshaft journal oil clearance Camshaft runout	EM-71
Crank-shaft pulley Cylinder block (Side of engine) Oil pan	Slap or knock	—	A	—	B	B	—	Piston pin noise	Piston to piston pin oil clearance Connecting rod bushing oil clearance	EM-107
	Slap or rap	A	—	—	B	B	A	Piston slap noise	Piston to cylinder bore clearance Piston ring side clearance Piston ring end gap Connecting rod bend and torsion	EM-130
	Knock	B	A	C	B	B	B	Connecting rod bearing noise	Connecting rod bushing oil clearance Connecting rod bearing oil clearance	EM-130 EM-135
	Knock	B	A	—	A	B	C	Main bearing noise	Main bearing oil clearance Crankshaft runout	EM-133 EM-130
Front of engine Front cover	Tapping or ticking	A	A	—	B	B	B	Timing chain and chain tensioner noise	Timing chain cracks and wear Timing chain tensioner operation	EM-63 EM-55
Front of engine	Squeaking or fizzing	A	B	—	B	—	C	Drive belt (Sticking or slipping)	Drive belt deflection	EM-22
	Creaking	A	B	A	B	A	B	Drive belt (Slipping)	Idler pulley bearing operation	
	Squall Creak	A	B	—	B	A	B	Water pump noise	Water pump operation	CO-24

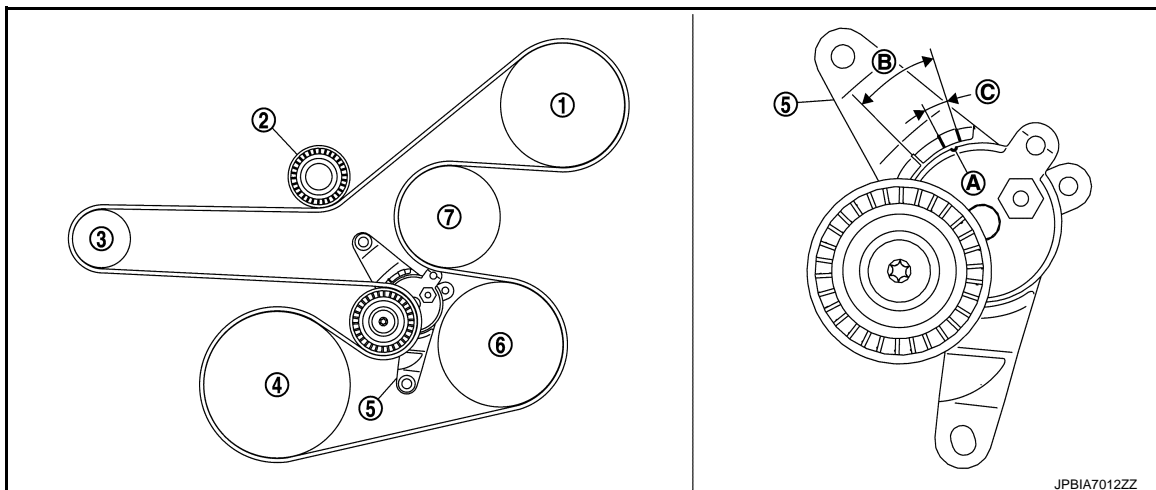
A: Closely related B: Related C: Sometimes related —: Not related

PERIODIC MAINTENANCE

DRIVE BELTS

Exploded View

INFOID:000000011616435



- | | | |
|---|-----------------------------|--|
| ① Power steering oil pump | ② Idler pulley | ③ Alternator |
| ④ Crankshaft pulley | ⑤ Drive belt auto-tensioner | ⑥ A/C compressor |
| ⑦ Water pump | | |
| (A) Indicator (notch on the fixed side) | (B) Possible use range | (C) Range when new drive belt is installed |

Removal and Installation

INFOID:000000011616436

REMOVAL

- Securely hold the hexagonal part (A) of drive belt auto-tensioner ⑤ using suitable tool, and move in the direction of arrow (➡) (loosening direction of tensioner).

CAUTION:

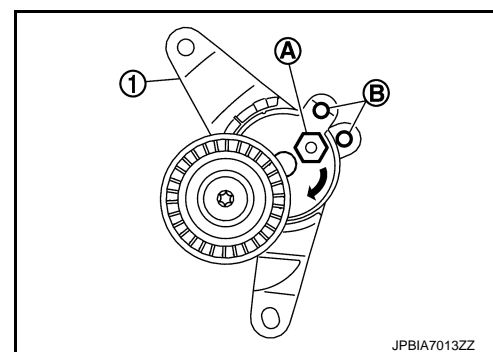
Avoid placing hand in a location where pinching may occur if the holding tool accidentally comes off.

- Insert a rod approximately 6.0 mm (0.24 in) in diameter through the rear of the drive belt auto-tensioner into retaining boss (B) to lock drive belt auto-tensioner pulley.

NOTE:

Leave drive belt auto-tensioner pulley arm locked until drive belt is installed again.

- Loosen drive belt from drive belt auto-tensioner and then remove it from the other pulleys.



INSTALLATION

- Install the drive belt onto all of the pulleys except for the drive belt auto-tensioner. Then install the drive belt onto drive belt auto-tensioner last.

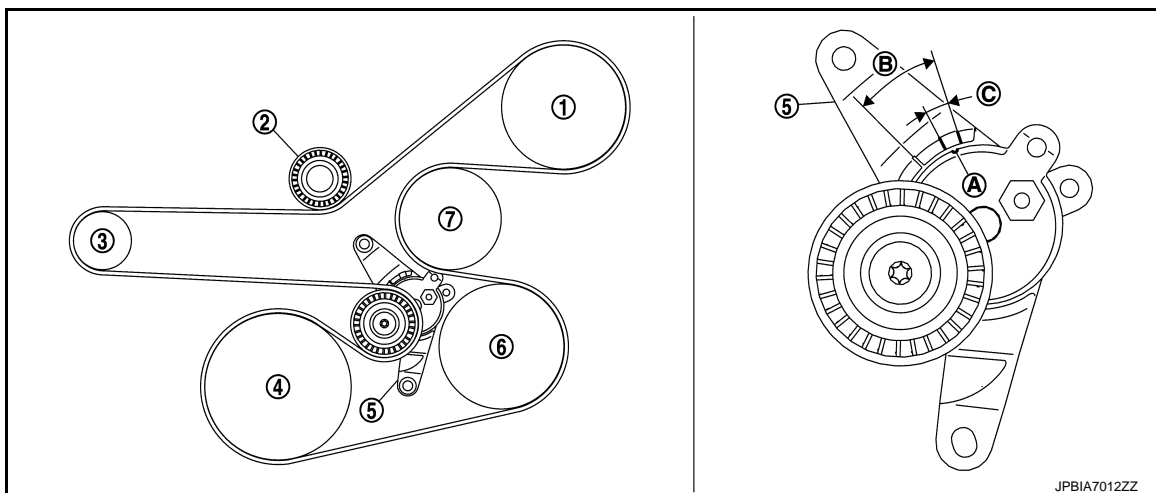
CAUTION:

Confirm belts are completely set on the pulleys.

- Release drive belt auto-tensioner, and apply tension to drive belt.
- Turn crankshaft pulley clockwise several times to equalize tension between each pulley.
- Confirm the indicator is within the possible use range. Refer to [EM-23, "Inspection"](#).
- Install air duct. Refer to [EM-29, "Removal and Installation"](#).

Inspection

INFOID:0000000011616437



- | | | |
|---------------------------------------|-----------------------------|--|
| ① Power steering oil pump | ② Idler pulley | ③ Alternator |
| ④ Crankshaft pulley | ⑤ Drive belt auto-tensioner | ⑥ A/C compressor |
| ⑦ Water pump | | |
| Ⓐ Indicator (notch on the fixed side) | Ⓑ Possible use range | Ⓒ Range when new drive belt is installed |

WARNING:

Perform this step when engine is stopped.

- Check that the indicator Ⓐ (notch on fixed side) of drive belt auto-tensioner is within the possible use range Ⓑ in the figure.

NOTE:

- Check the drive belt auto-tensioner indication when the engine is cold.
- When new drive belt is installed, the indicator (notch on fixed side) should be within the range Ⓒ in the figure.
- Visually check entire drive belt for wear, damage or cracks.
- If the indicator (notch on fixed side) is out of the possible use range or belt is damaged, replace drive belt.

Adjustment

INFOID:0000000011616438

Refer to : [EM-125, "Drive belt"](#).

AIR CLEANER FILTER

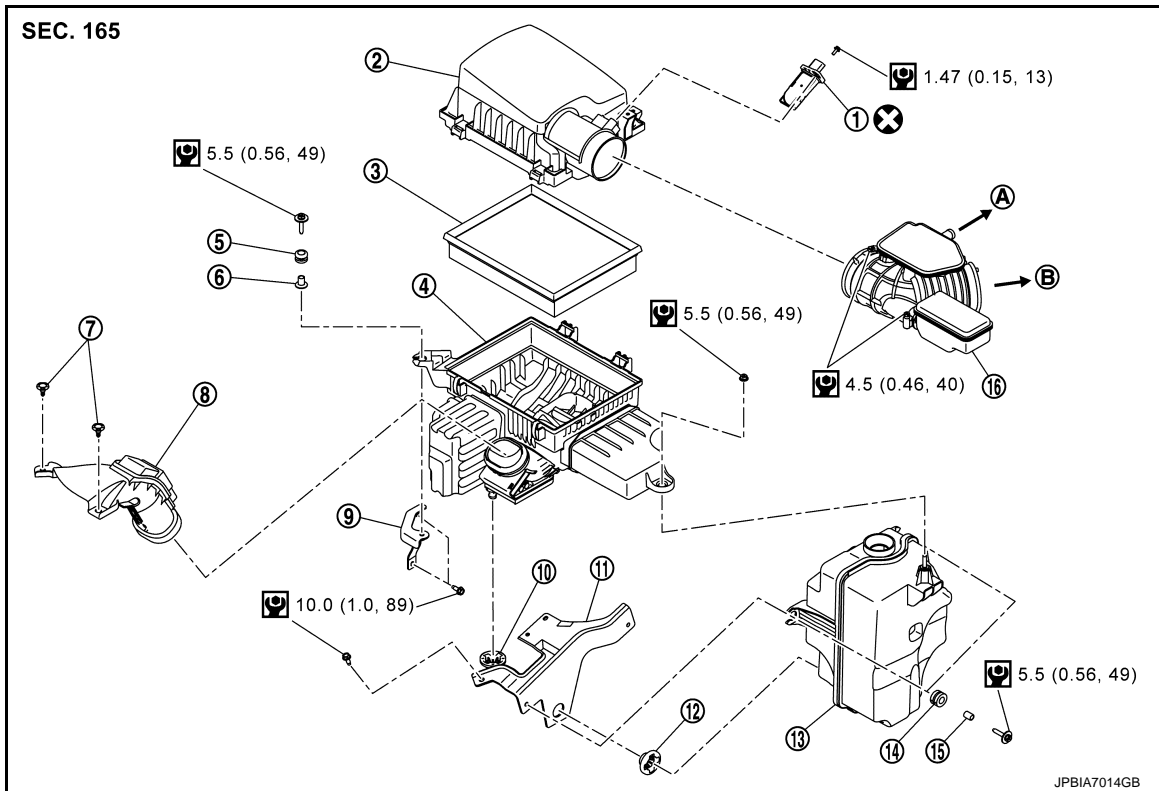
< PERIODIC MAINTENANCE >

[QR25DE]

AIR CLEANER FILTER

Exploded View

INFOID:000000011616439



- | | | |
|------------------------|---|----------------------|
| ① Mass air flow sensor | ② Air cleaner cover | ③ Air cleaner filter |
| ④ Air cleaner case | ⑤ Grommet | ⑥ Collar |
| ⑦ Clip | ⑧ Air duct (inlet) | ⑨ Bracket |
| ⑩ Grommet | ⑪ Bracket | ⑫ Grommet |
| ⑬ Resonator | ⑭ Grommet | ⑮ Collar |
| ⑯ Air duct | | |
| Ⓐ To rocker cover | Ⓑ To electric throttle control actuator | |

⊗ : Always replace after every disassembly.

Ⓜ : N·m (kg·m, in·lb)

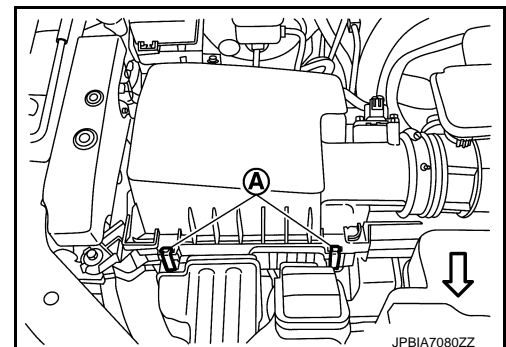
Removal and Installation

INFOID:000000011616440

REMOVAL

1. Release the air cleaner case clips Ⓐ.

↶ : Vehicle front

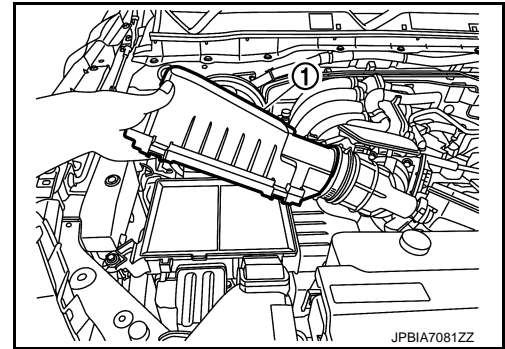


AIR CLEANER FILTER

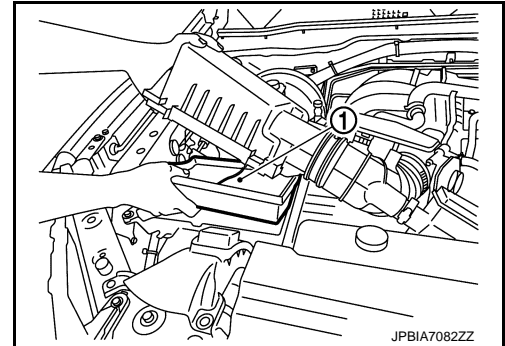
< PERIODIC MAINTENANCE >

[QR25DE]

2. Open the air cleaner cover ①.



3. Remove the air cleaner filter ①.



INSTALLATION

Install in the reverse order of removal.

Inspection (Dry Paper Type)

INFOID:0000000011616441

INSPECTION AFTER REMOVAL

Examine with eyes that there is no stain, clogging, or damage on air cleaner element.

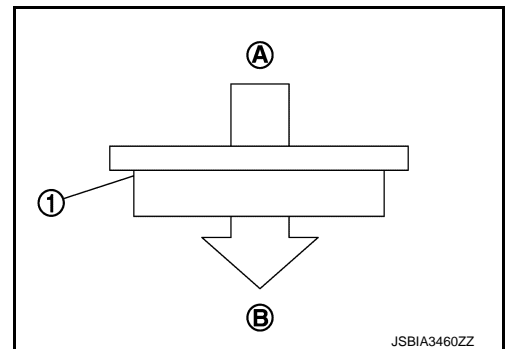
- Remove dusts (such as dead leaves) on air cleaner element surface and inside cleaner case.
- To clean air cleaner element ①, blow air on it from the air intake manifold side ① to remove trash or dust.

Ⓑ Ambient air side

⇐ Air blow direction

CAUTION:

- When blowing air on the air cleaner element, attach the cover to the air cleaner case and stay away from the vehicle as much as possible to prevent the entry of dirt into the air cleaner case.
- Never blow air from the ambient air side to prevent clogging. When the ambient air side needs to be cleaned, attach the cover to the intake manifold side and lightly dust by hand.



- If clogging or damage is observed, replace the air cleaner element.

SPARK PLUG

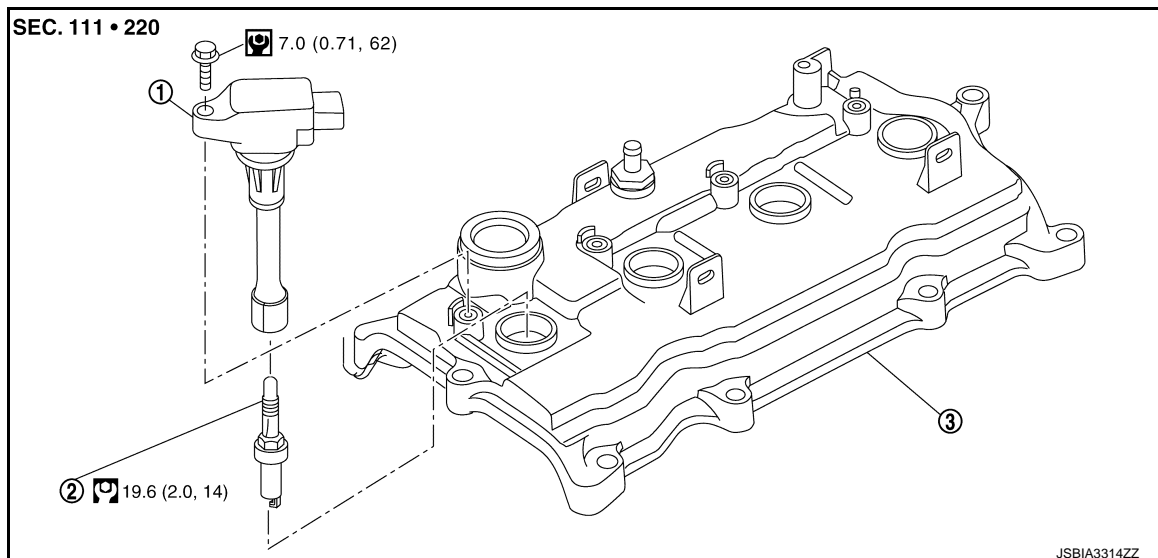
< PERIODIC MAINTENANCE >

[QR25DE]

SPARK PLUG

Exploded View

INFOID:0000000011616442



① Ignition coil

② Spark plug

③ Rocker cover

: N·m (kg-m, ft-lb)

: N·m (kg-m, in-lb)

Removal and Installation

INFOID:0000000011616443

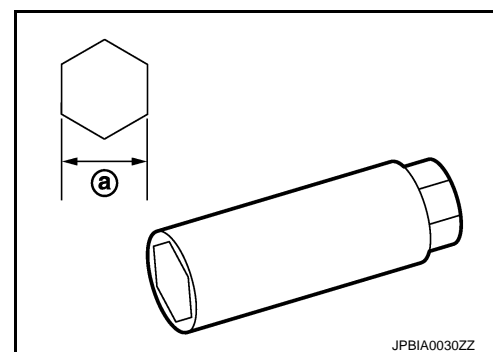
REMOVAL

1. Remove ignition coil.
2. Remove spark plug with spark plug wrench (commercial service tool).

Ⓐ: 14 mm (0.55 in)

CAUTION:

- Never drop or shock spark plug.
- Never disassemble ignition coil.



INSTALLATION

Install in the reverse order of removal.

Inspection

INFOID:0000000011616444

INSPECTION AFTER REMOVAL

Use standard type spark plug for normal condition.

Spark plug (standard) : Refer to [EM-125, "Spark Plug"](#).

Visually check the electrode for dirt and wear and the insulator for burning.

CAUTION:

SPARK PLUG

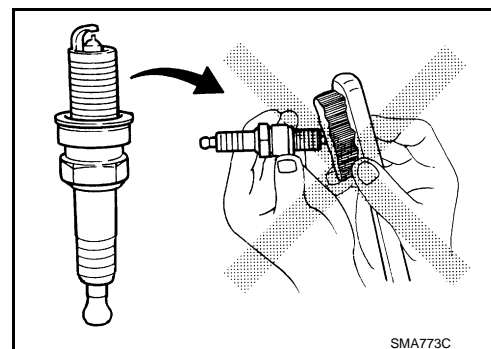
< PERIODIC MAINTENANCE >

[QR25DE]

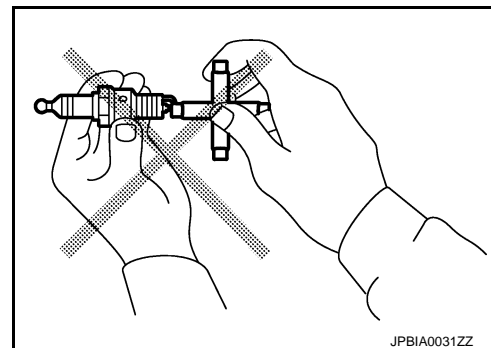
- Never drop or shock spark plug.
- Never use wire brush for cleaning.
- If plug tip is covered with carbon, spark plug cleaner may be used.

Cleaner air pressure: Less than 588 kPa (5.9 bar , 6 kg/cm², 85 psi)

Cleaning time: Less than 20 seconds



- Adjusting plug gap is not required between change intervals.



A

EM

C

D

E

F

G

H

I

J

K

L

M

N

O

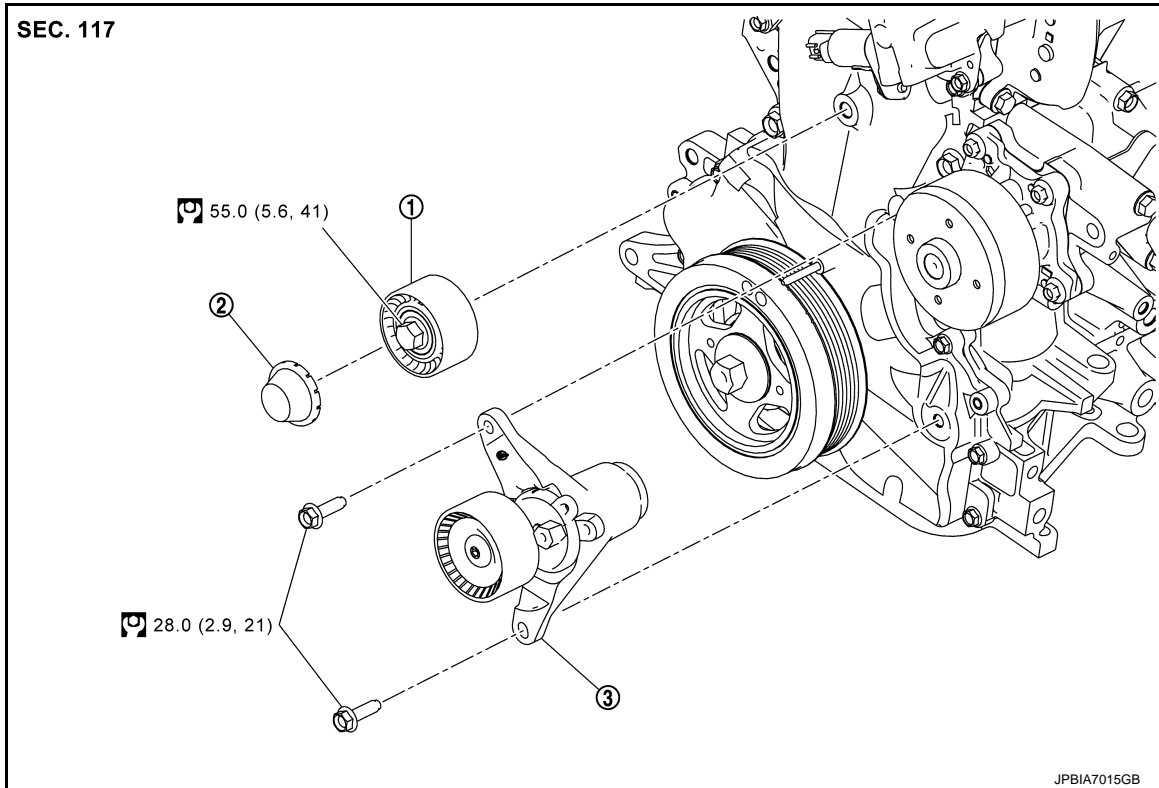
P

REMOVAL AND INSTALLATION

DRIVE BELT AUTO-TENSIONER

Exploded View

INFOID:000000011616447



① Idler pulley

② Cap

③ Drive belt auto-tensioner

: N·m (kg-m, ft-lb)

Removal and Installation

INFOID:000000011616448

Removal

CAUTION:

The complete drive belt auto-tensioner must be replaced as a unit, including the pulley.

1. Remove air duct. Refer to [EM-29, "Exploded View"](#).
2. Remove the drive belt. Refer to [EM-22, "Removal and Installation"](#).
3. Remove the drive belt auto-tensioner.

Installation

Installation is in the reverse order of removal.

CAUTION:

- When installing drive belt auto-tensioner, be careful not to interfere with water pump pulley.
- Never swap the pulley between new and old drive belt auto-tensioner.

AIR CLEANER AND AIR DUCT

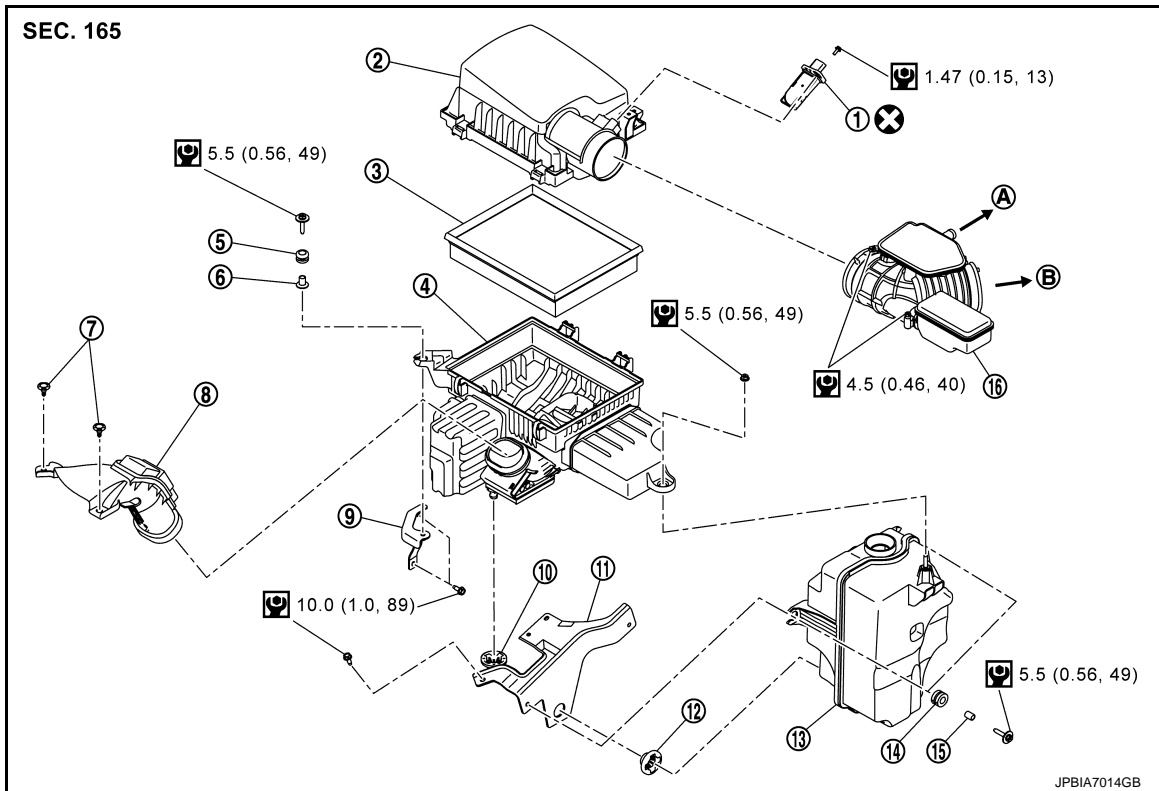
< REMOVAL AND INSTALLATION >

[QR25DE]

AIR CLEANER AND AIR DUCT

Exploded View

INFOID:000000011683128



- | | | |
|------------------------|---|----------------------|
| ① Mass air flow sensor | ② Air cleaner cover | ③ Air cleaner filter |
| ④ Air cleaner case | ⑤ Grommet | ⑥ Collar |
| ⑦ Clip | ⑧ Air duct (inlet) | ⑨ Bracket |
| ⑩ Grommet | ⑪ Bracket | ⑫ Grommet |
| ⑬ Resonator | ⑭ Grommet | ⑮ Collar |
| ⑯ Air duct | | |
| Ⓐ To rocker cover | Ⓑ To electric throttle control actuator | |

⊗ : Always replace after every disassembly.

Ⓜ : N·m (kg·m, in·lb)

Removal and Installation

INFOID:000000011616450

REMOVAL

1. Remove air duct (inlet).
2. Remove the air cleaner filter. Refer to [EM-24. "Removal and Installation"](#).

AIR CLEANER AND AIR DUCT

[QR25DE]

< REMOVAL AND INSTALLATION >

3. Disconnect the mass air flow sensor connector (A) and remove the harness retainers (B) from the air cleaner cover.

← : Vehicle front

4. Disconnect the blow-by hose from air duct side.
5. Loosen clamps at the air duct.
6. Remove the air cleaner cover with mass air flow sensor.
7. Remove air duct.
8. Remove the air cleaner case.
9. Remove resonator.
10. Remove mass air flow sensor from air cleaner case assembly, as necessary.

CAUTION:

Handle the mass air flow sensor with care:

- Do not shock it.
- Do not disassemble it.
- Do not touch the internal sensor.
- Do not reuse mass air flow sensor, if removed.

INSTALLATION

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

- Align marks. Attach each joint. Screw clamps firmly.

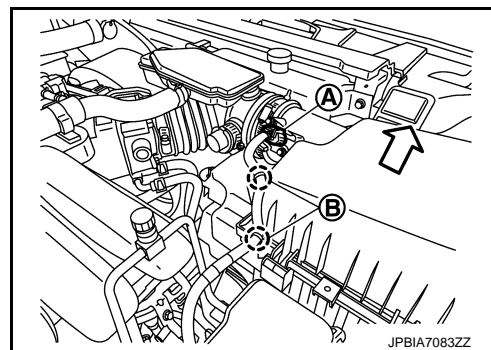
(A) : Stopper (electric throttle control actuator side)

(B) : Tab (air duct side)

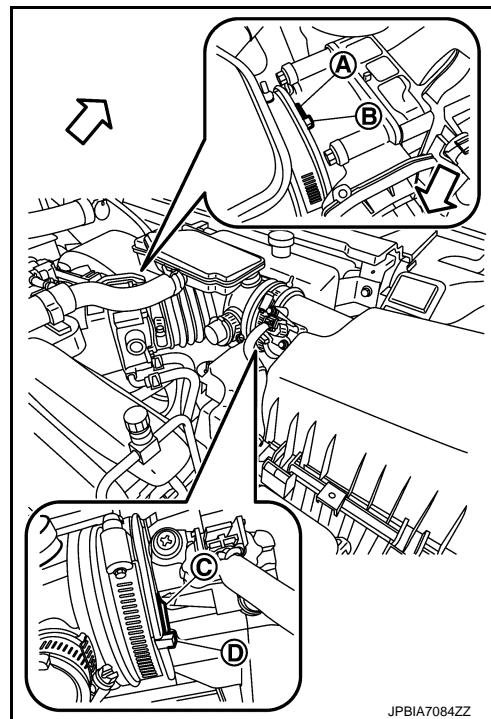
(C) : Stopper (air cleaner cover side)

(D) : Tab (air duct side)

← : Vehicle front



JPBIA7083ZZ



JPBIA7084ZZ

Inspection

INFOID:0000000011616451

INSPECTION AFTER REMOVAL

Inspect air duct and resonator assembly for crack or tear.

- If anything found, replace air duct assembly.

ROCKER COVER

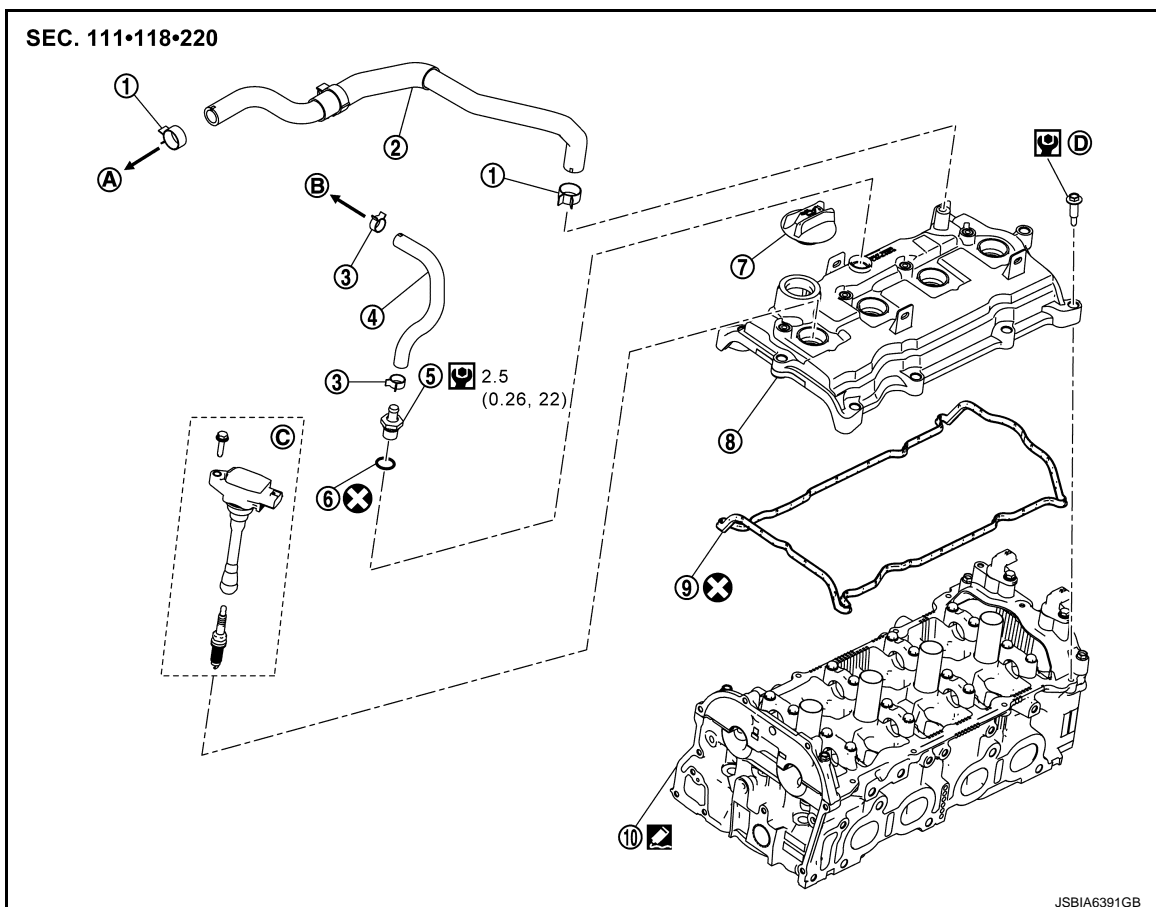
< REMOVAL AND INSTALLATION >

[QR25DE]

ROCKER COVER

Exploded View

INFOID:000000011616455



- | | | |
|--|------------------------|---|
| ① Clamp | ② Blow-by hose | ③ Clamp |
| ④ PCV hose | ⑤ PCV valve | ⑥ O-ring |
| ⑦ Oil filler cap | ⑧ Rocker cover | ⑨ Rocker cover gasket |
| ⑩ Cylinder head | | |
| (A) To air duct | (B) To intake manifold | (C) Refer to EM-26, "Exploded View" . |
| (D) Comply with the assembly procedure when tightening. Refer to EM-31 | | |
| : N·m (kg-m, in-lb) | | |
| : Always replace after every disassembly. | | |
| : Sealing point | | |

Removal and Installation

INFOID:000000011616456

REMOVAL

ROCKER COVER

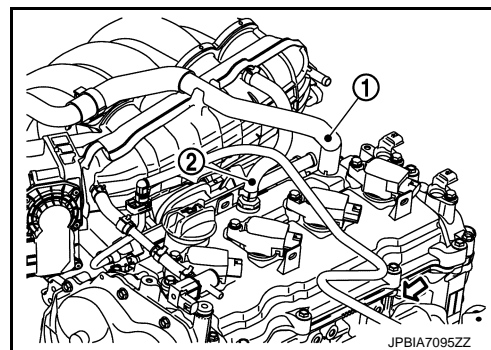
< REMOVAL AND INSTALLATION >

[QR25DE]

1. Disconnect the blow-by hose ①.

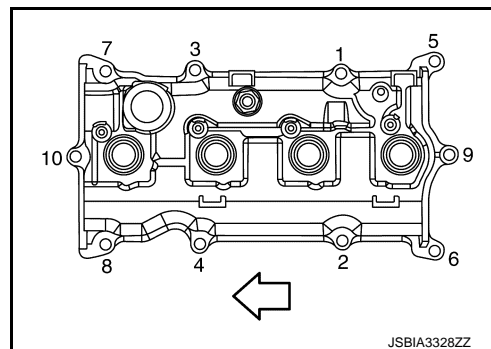
② : PCV hose
⇐ : Vehicle front

2. Disconnect the PCV hose.



3. Remove the ignition coils. Refer to [EM-26, "Exploded View"](#).
4. Loosen the bolts in the order from 10 to 1 as shown in the figure.

⇐ : Engine front



5. Remove the rocker cover and the rocker cover gasket. Discard the rocker cover gasket.

CAUTION:

Do not reuse the rocker cover gasket.

6. Remove the oil filler cap, PCV valve, and O-ring, (if necessary).

INSTALLATION

CAUTION:

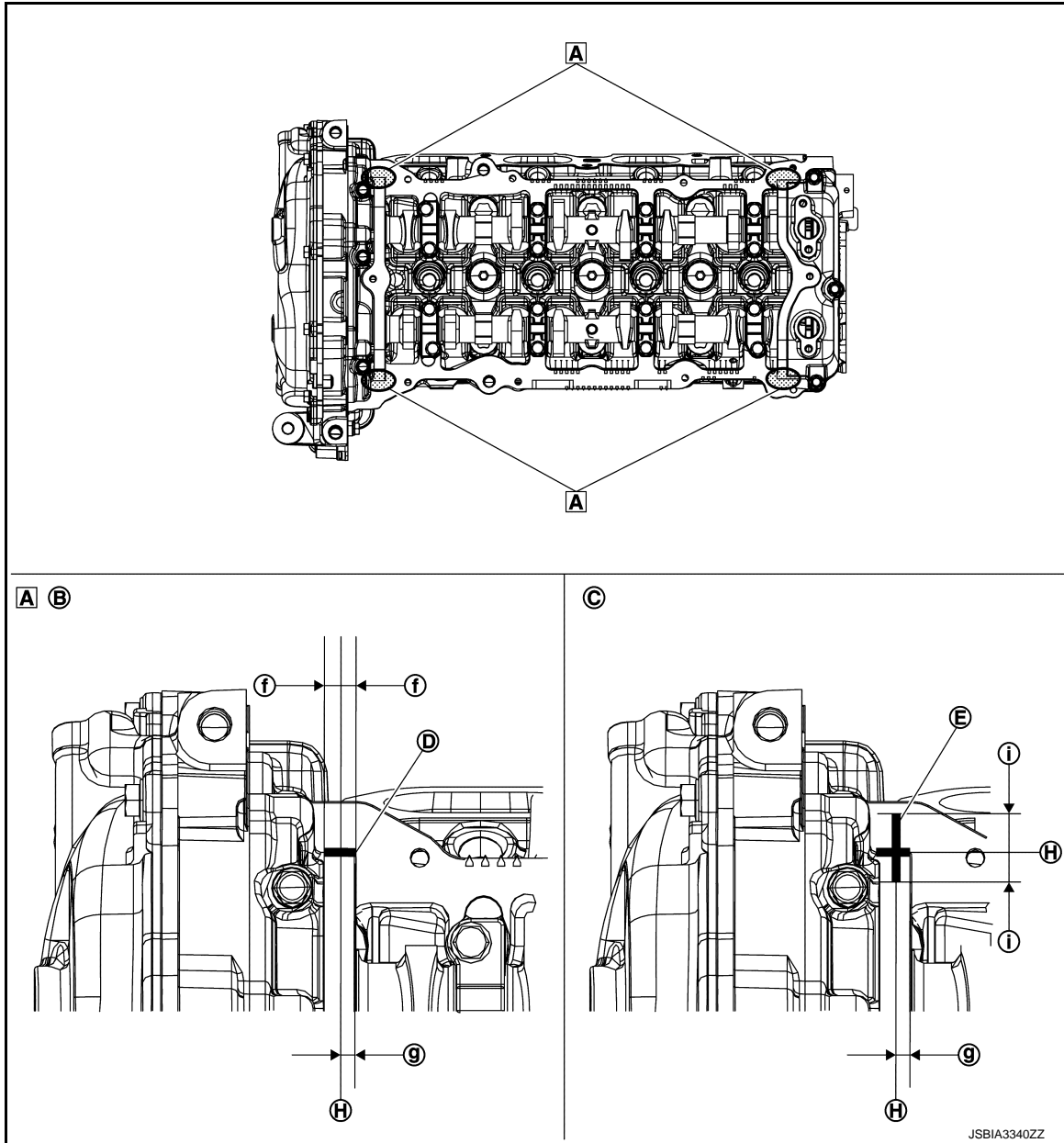
- Do not reuse the rocker cover gasket.
- Do not reuse O-ring.

ROCKER COVER

< REMOVAL AND INSTALLATION >

[QR25DE]

1. Apply liquid gasket to the position shown **A** with the following procedure:



- a. Refer to figure (B) to apply liquid gasket (D) to joint part of camshaft bracket (No. 1) camshaft position sensor bracket and cylinder head.
- b. Refer to figure (C) to apply liquid gasket (E) in 90 degrees to figure (B).
Use Genuine Liquid Gasket (Three Bond 1217H) or equivalent.
CAUTION:
Attaching should be done within 5 minutes after liquid gasket application.

- (f) : {5 mm (0.20 in), ϕ 3 mm (0.12 in)} from the liquid gasket application center point.
- (g) : Liquid gasket application center point is 4 mm (0.16 in) from the edge of camshaft bracket surface.
- (H) : Liquid gasket application center point
- (i) : {10 mm (0.39 in), ϕ 3 mm (0.12 in)} from the liquid gasket application center point.

2. Install rocker cover gasket to rocker cover.

NOTE:

The rocker cover gasket must be securely installed in the groove in the rocker cover.

3. Install the rocker cover and rocker cover gasket onto the cylinder head.

ROCKER COVER

< REMOVAL AND INSTALLATION >

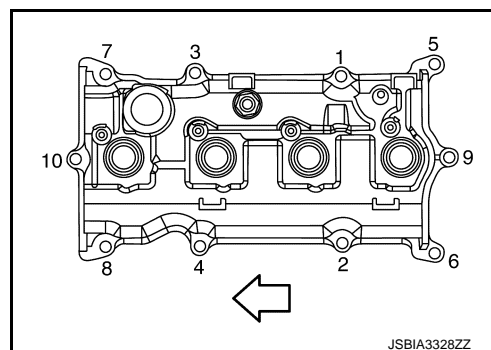
[QR25DE]

4. Tighten the rocker cover bolts to specification in two steps in the order from 1 to 10 as shown in the figure.

⇐ : Engine front

Step 1 : 1.96 N·m (0.20 kg-m, 17 in-lb)

Step 2 : 8.33 N·m (0.85 kg-m, 74 in-lb)



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

Inspection

INFOID:000000012154288

INSPECTION AFTER INSTALLATION

1. Check engine oil level and adjust engine oil. Refer to [LU-8. "Inspection"](#).
2. Start engine, and check there is no leaks of engine oil.
3. Stop engine and wait for 10 minutes.
4. Check engine oil level again. Refer to [LU-8. "Inspection"](#).

INTAKE MANIFOLD

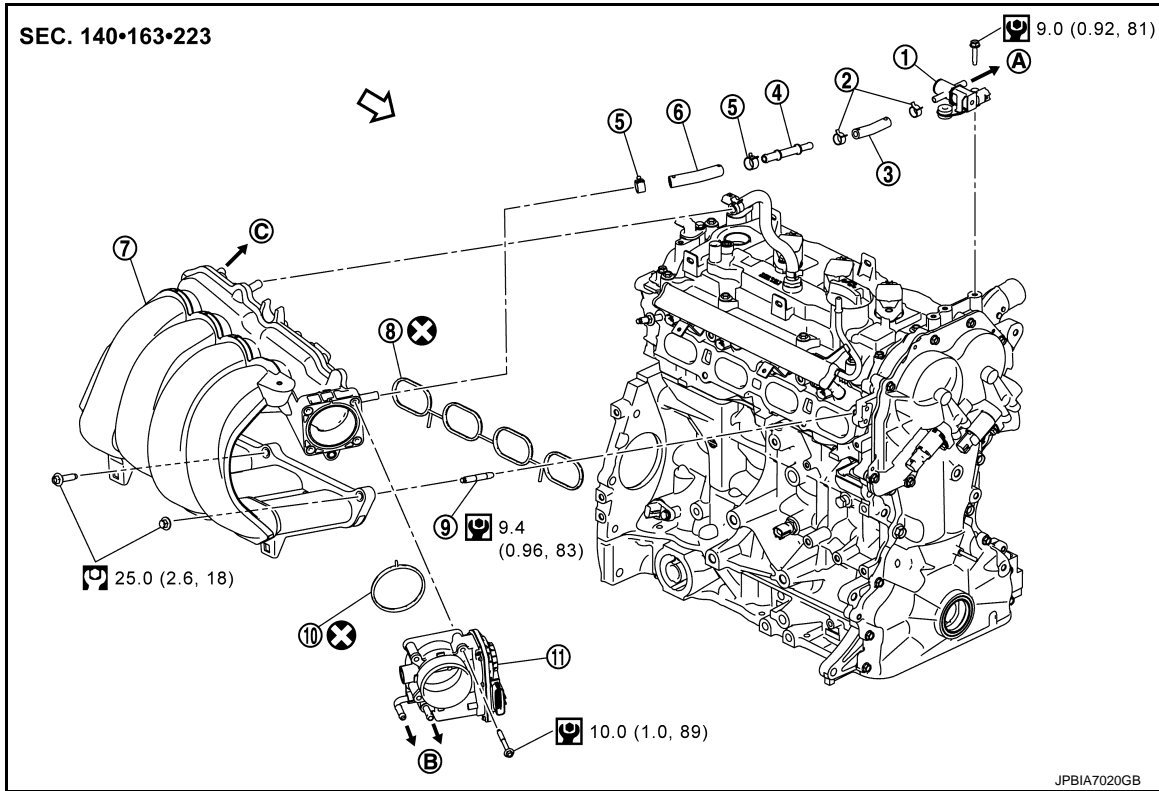
< REMOVAL AND INSTALLATION >

[QR25DE]

INTAKE MANIFOLD

Exploded View

INFOID:000000011616457



- | | | |
|---|--------------------------------------|--------------------|
| ① EVAP canister purge volume control solenoid valve | ② Clamp | ③ EVAP hose |
| ④ EVAP tube | ⑤ Clamp | ⑥ EVAP hose |
| ⑦ Intake manifold | ⑧ Gasket | ⑨ Stud bolt |
| ⑩ Gasket | ⑪ Electric throttle control actuator | |
| (A) To vacuum pipe (canister) | (B) To water outlet | (C) To vacuum line |

⇐ : Engine front

: N·m (kg-m, ft-lb)

: N·m (kg-m, in-lb)

: Always replace after every disassembly.

Removal and Installation

INFOID:000000011616458

REMOVAL

WARNING:

To avoid the danger of being scalded, never drain the coolant when the engine is hot.

NOTE:

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

1. Remove the air cleaner and air duct. Refer to [EM-29. "Removal and Installation"](#).
2. Remove blow-by hose. Refer to [EM-31. "Exploded View"](#).
3. Disconnect the PCV hose from the intake manifold.

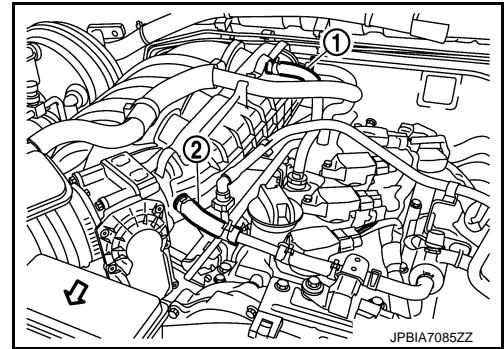
INTAKE MANIFOLD

< REMOVAL AND INSTALLATION >

[QR25DE]

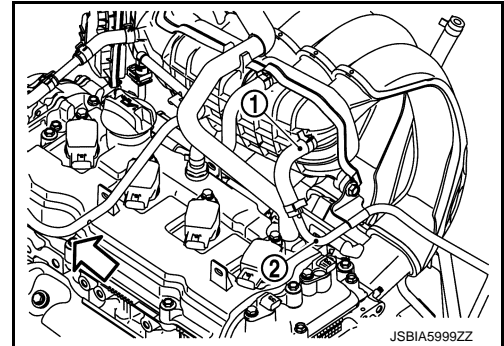
4. Disconnect the PCV hose ① and EVAP hose ② from the intake manifold.

⇐ : Vehicle front



5. Remove the brake booster vacuum hose ① and tube ② from the intake manifold.

⇐ : Vehicle front



6. Disconnect the water hoses from the electric throttle control actuator.

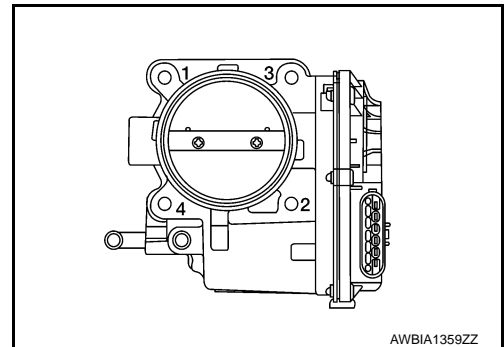
NOTE:

When removing only intake manifold, position electric throttle control actuator aside without disconnecting the water hose.

7. Loosen bolts in from 4 to 1 as shown in the figure., then remove electric throttle control actuator and gasket.

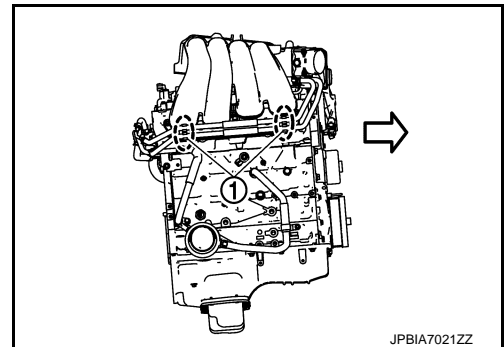
CAUTION:

Handle carefully to avoid any damage.



8. Disconnect electric throttle control actuator water hose clamp ①.

⇐ : Vehicle front



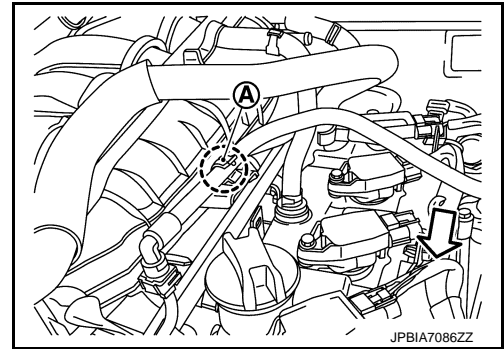
INTAKE MANIFOLD

< REMOVAL AND INSTALLATION >

[QR25DE]

- Remove the fuel tube clamp (A).

↩ : Vehicle front



- Remove the bolts and nuts in the from 5 to 1 as shown in the figure, and remove the intake manifold assembly with gasket.

↩ : Engine front

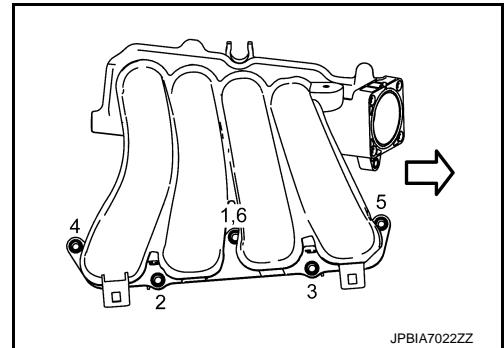
CAUTION:

Cover engine openings to prevent entry of foreign materials.

NOTE:

Disregard No. 6 when loosening.

- Remove gaskets.



INSTALLATION

Installation is in the reverse order of removal. Follow the tightening sequences and specifications below and perform the following:

- Perform the "Throttle Valve Closed Position Learning" when harness connector of electric throttle control actuator is disconnected. Refer to [EC-142, "Description"](#).
- Perform the "Idle Air Volume Learning" and "Throttle Valve Closed Position Learning" when electric throttle control actuator is replaced. Refer to [EC-143, "Description"](#) or [EC-142, "Description"](#).

Intake Manifold

- Securely install gasket to the mounting groove.

CAUTION:

Do not reuse gasket.

- If studs were removed, install them and tighten to specification.

Studs : 9.4 N·m (0.96 kg-m, 83 in-lb)

- Tighten in the order from 1 to 6 as shown in the figure.

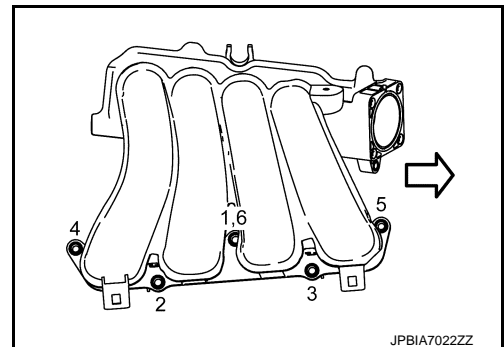
↩ : Engine front

CAUTION:

After tightening the five bolts in the order shown, the 1, 6 position designates that the first bolt tightened is to be retightened to specification.

Bolts 1, 2, 3, 6 : 25.0 N·m (2.6 kg-m, 18 ft-lb)

Nuts 4, 5 : 25.0 N·m (2.6 kg-m, 18 ft-lb)



Electric Throttle Control Actuator

- Install a new gasket on the electric throttle control actuator.

CAUTION:

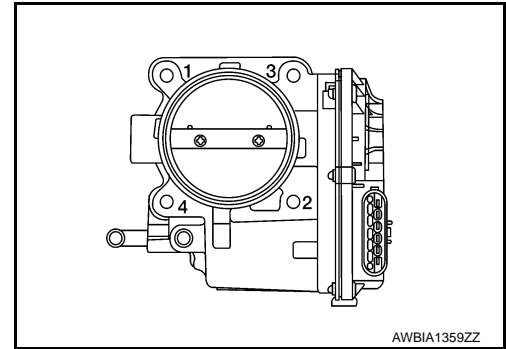
Do not reuse gasket.

INTAKE MANIFOLD

< REMOVAL AND INSTALLATION >

[QR25DE]

2. Tighten the bolts of electric throttle control actuator equally and diagonally in several steps in the order from 1 to 4 as shown in the figure.



Inspection

INFOID:0000000011616459

INSPECTION AFTER REMOVAL

1. Make sure there are no fuel leaks at connections as follows:
 - a. Apply fuel pressure to fuel lines by turning ignition switch ON (with engine stopped). Then check for fuel leaks at connections.

NOTE:

Use mirrors for checking on connections out of the direct line of sight.

- b. Start the engine and rev it up and check for fuel leaks at connections.

WARNING:

Do not touch engine immediately after stopping as engine is extremely hot.

EXHAUST MANIFOLD AND THREE WAY CATALYST

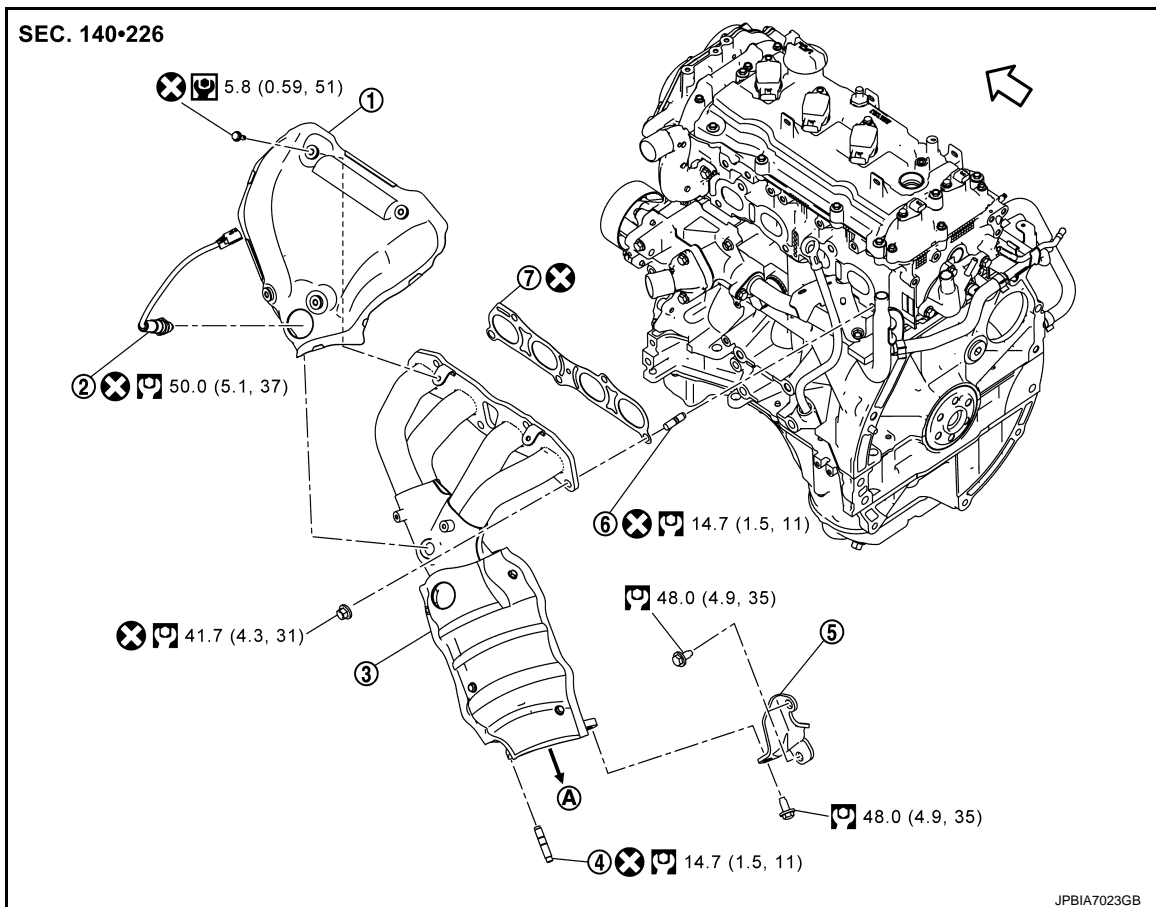
< REMOVAL AND INSTALLATION >

[QR25DE]

EXHAUST MANIFOLD AND THREE WAY CATALYST

Exploded View

INFOID:0000000011616460



- | | | |
|--------------------------|---------------------------|--|
| ① Exhaust manifold cover | ② Air fuel ratio sensor 1 | ③ Exhaust manifold and three way catalyst assembly |
| ④ Stud bolt | ⑤ Bracket | ⑥ Stud bolt |
| ⑦ Gasket | | |
- ⇐ : Engine front
 : N·m (kg-m, ft-lb)
 : N·m (kg-m, in-lb)
 : Always replace after every disassembly.

Removal and Installation

INFOID:0000000011616461

REMOVAL

1. Remove the exhaust front tube. Refer to [EX-5, "Exploded View"](#).
2. Disconnect the air fuel ratio sensor 1 harness connector.

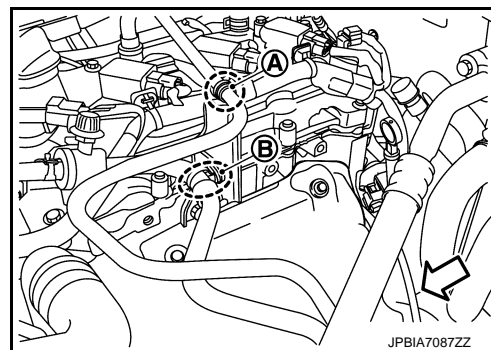
EXHAUST MANIFOLD AND THREE WAY CATALYST

< REMOVAL AND INSTALLATION >

[QR25DE]

3. Remove the fuel tube from clamp (A) and EVAP hose clamp (B).

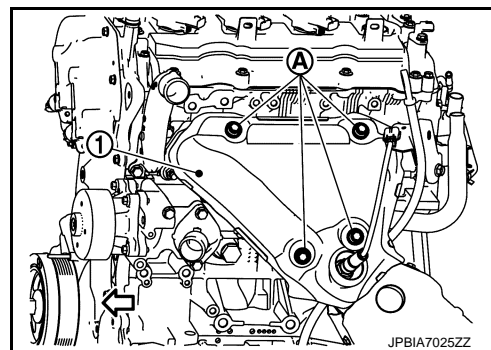
⇐ : Vehicle front



4. Remove the exhaust manifold cover (1).

(A) : Bolts

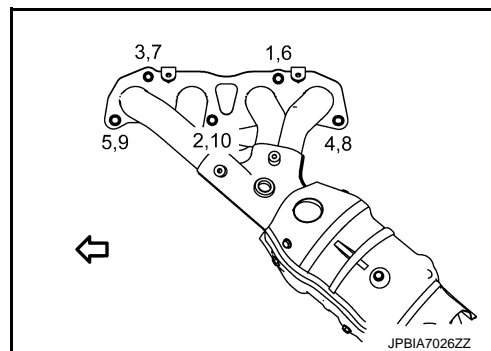
⇐ : Vehicle front



5. Loosen the exhaust manifold and three way catalyst nuts in the order from 10 to 1 as shown in the figure.

⇐ : Vehicle front

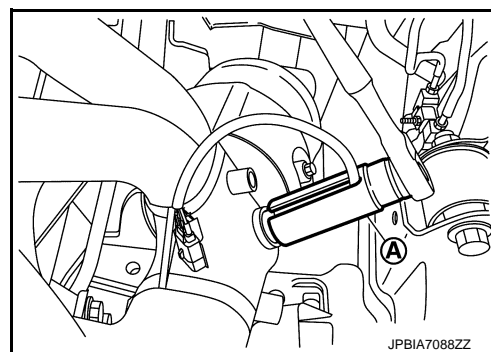
6. Remove the exhaust manifold and three way catalyst assembly and gasket.



7. Remove the air fuel ratio sensor 1 using heated oxygen sensor wrench [SST: KV10117100] (A), (if necessary).

CAUTION:

- Be careful not to damage air fuel ratio sensor.
- Discard any air fuel ratio sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; replace with a new one.



INSTALLATION

Exhaust Manifold

1. Install studs in cylinder head and exhaust manifold (if removed). Then tighten to specification.

CAUTION:

Do not reuse cylinder head or exhaust manifold studs.

EXHAUST MANIFOLD AND THREE WAY CATALYST

< REMOVAL AND INSTALLATION >

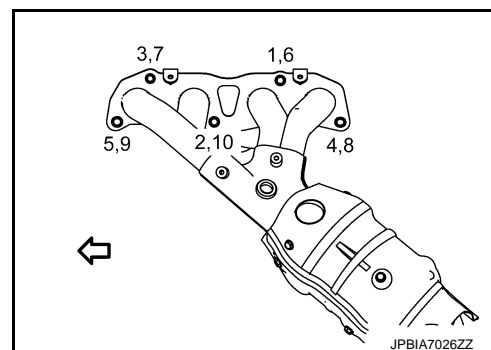
[QR25DE]

2. Install the exhaust manifold and gasket. Then tighten the nuts to specification in the order from 1 to 10 as shown in the figure.

CAUTION:

- Do not reuse gasket.
- Do not reuse nuts.

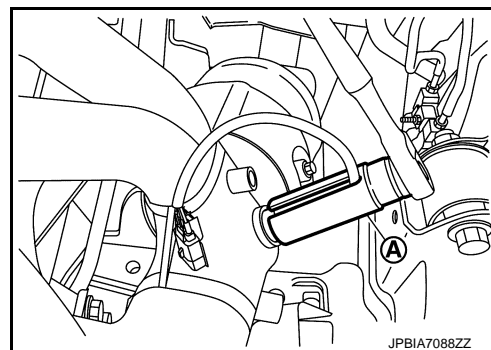
← : Vehicle front



3. Install the air fuel ratio sensor 1 using heated oxygen sensor wrench [SST: KV10117100] (A) and tighten to specification.

CAUTION:

- Be careful not to damage air fuel ratio sensor.
- Discard any air fuel ratio sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; replace with a new one.
- Do not over-tighten the air fuel ratio sensor 1. Doing so may cause damage to the air fuel ratio sensor 1, resulting in a malfunction and the MIL coming on.



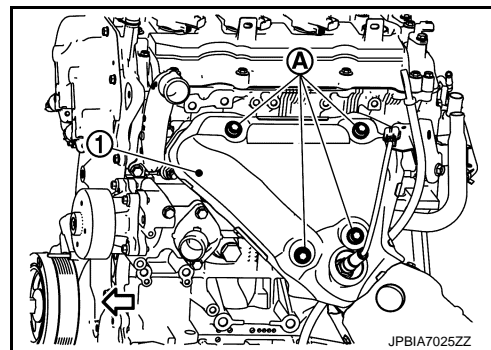
4. Install the exhaust manifold cover (1).

(A) : Bolts

← : Vehicle front

CAUTION:

Do not reuse bolts.



Inspection

INFOID:0000000011616462

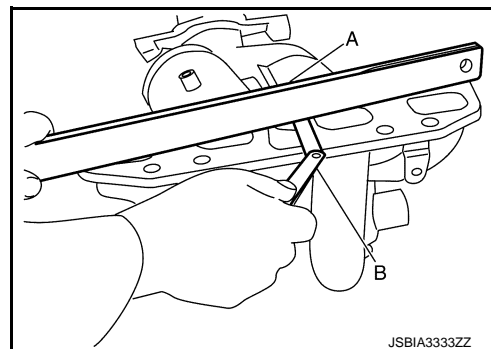
INSPECTION AFTER REMOVAL

Surface Distortion

- Check the surface distortion of the exhaust manifold mating surface with a straightedge (A) and a feeler gauge (B).

Limit : Refer to [EM-126, "Exhaust Manifold"](#).

- If it exceeds the limit, replace exhaust manifold.



FUEL INJECTOR AND FUEL TUBE

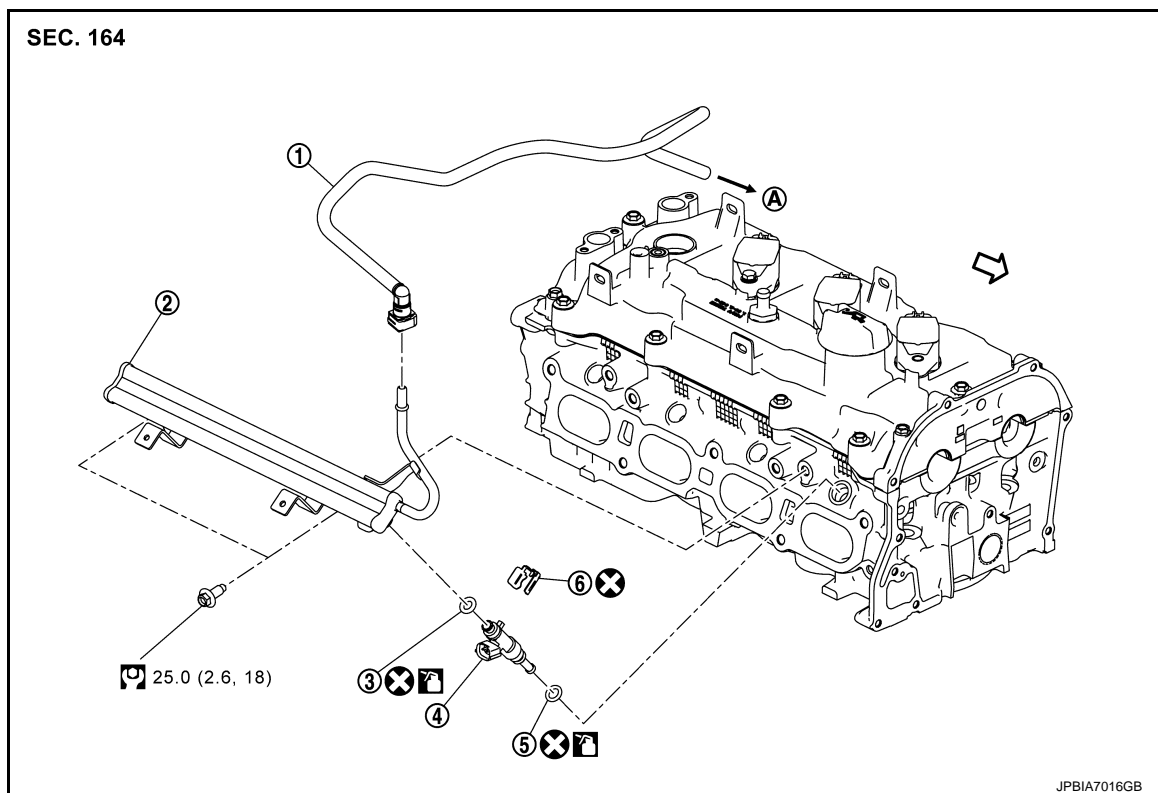
< REMOVAL AND INSTALLATION >

[QR25DE]

FUEL INJECTOR AND FUEL TUBE

Exploded View

INFOID:0000000011616452



- | | | |
|------------------|------------------|------------------|
| ① Fuel feed hose | ② Fuel tube | ③ O-ring (black) |
| ④ Fuel injector | ⑤ O-ring (green) | ⑥ Clip |

A : To under floor piping

← : Engine front

N-m (kg-m, ft-lb)

⊗ : Always replace after every disassembly.

🛢 : Should be lubricated with oil.

CAUTION:

Never remove or disassemble parts unless instructed in the figure.

Removal and Installation

INFOID:0000000011616453

WARNING:

- Put a "CAUTION: FLAMMABLE" sign in the workshop.
- Be sure to work in a well ventilated area and furnish workshop with a CO₂ fire extinguisher.
- Never smoke while servicing fuel system. Keep open flames and sparks away from the work area.

REMOVAL

1. Release the fuel pressure. Refer to [EC-146, "Work Procedure"](#).
2. Disconnect the battery negative terminal. Refer to [PG-211, "Exploded View"](#).
3. Remove the intake manifold. Refer to [EM-35, "Exploded View"](#).

FUEL INJECTOR AND FUEL TUBE

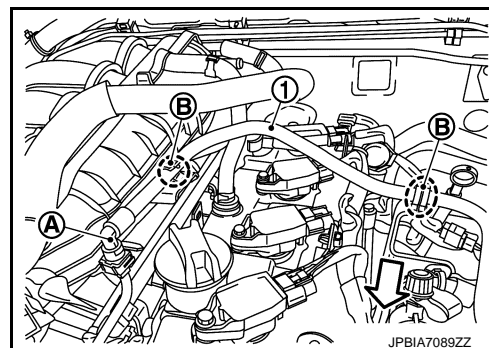
< REMOVAL AND INSTALLATION >

[QR25DE]

4. Disconnect quick connector ① with the following procedure.

↶ : Vehicle front

- a. Disconnect fuel feed hose ① from bracket hose clamp ②.



- b. Disengage ① and pull up ② the pawl of the fuel feed hose connector retainer ③ to disconnect the fuel feed hose from high pressure fuel pump.

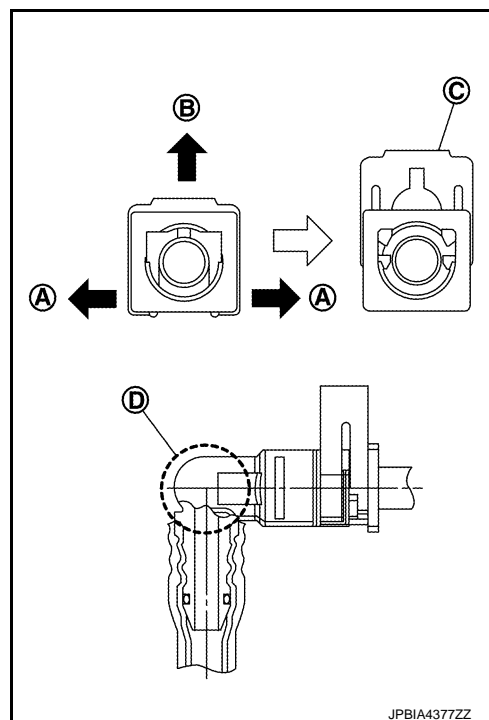
NOTE:

If the fuel feed hose is stuck, hold the fuel pipe by hand and disconnect it by pushing and pulling.

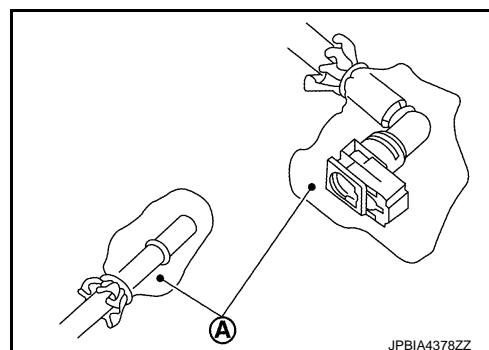
CAUTION:

- Keep parts away from heat source. Especially, be careful when welding is performed around them.
- Never expose parts to battery electrolyte or other acids.
- Never bent or twist connection between quick connector and fuel feed hose (with damper) during installation/removal.
- Pull quick connector holding ④.
- Never remove the retainer.
- Prepare a tray and waste beforehand as fuel leaks out.
- Never pull with lateral force applied. O-ring inside quick connector may be damaged.

Retainer color : Red



- To prevent damage to each joint and protect it from the entry of foreign matter, cover the joint with plastic bag ⑤ or an equivalent.



5. Disconnect harness connector from fuel injector.
6. Remove fuel tube and fuel injector assembly.

FUEL INJECTOR AND FUEL TUBE

[QR25DE]

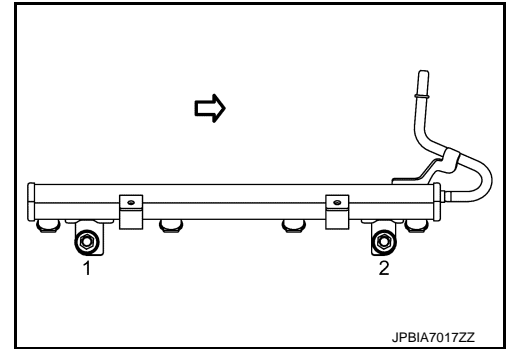
< REMOVAL AND INSTALLATION >

- Loosen mounting bolts in the order of 2, 1 as shown in the figure.

⇐ : Engine front

CAUTION:

- When removing, be careful to avoid any interference with fuel injector.
- Use a shop cloth to absorb any fuel leakage from fuel tube.



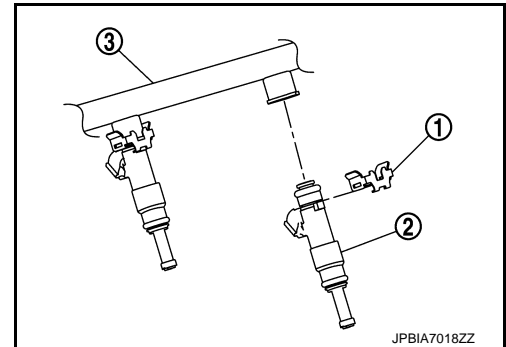
7. Remove fuel injector from fuel tube with the following procedure:

- Open and remove clip ①.
- Remove fuel injector ② from fuel tube ③ by pulling straight.

CAUTION:

- Be careful with remaining fuel that may go out from fuel tube.
- Be careful not to damage fuel injector nozzle during removal.
- Never bump or drop fuel injector.
- Never disassemble fuel injector.

- Remove O-ring.



INSTALLATION

CAUTION:

Do not reuse O-rings.

- Note the following, and install O-rings to fuel injector.

CAUTION:

- Do not reuse O-ring.
- Upper and lower O-rings are different. Be careful not to confuse them.

Fuel tube side : Black

Nozzle side : Green

- Handle O-ring with bare hands. Never wear gloves.
- Lubricate O-ring with new engine oil.
- Never clean O-ring with solvent.
- Check that O-ring and its mating part are free of foreign material.
- When installing O-ring, be careful not to scratch it with tool or fingernails. Also be careful not to twist or stretch O-ring. If O-ring is stretched while installing, never insert it quickly into fuel tube.
- Insert O-ring straight into fuel tube. Never decenter or twist it.

- Install fuel injector to fuel tube with the following procedure:

FUEL INJECTOR AND FUEL TUBE

< REMOVAL AND INSTALLATION >

[QR25DE]

- a. Insert clip ④ into clip mounting groove ① on fuel injector ①.

② : O-ring (Black)

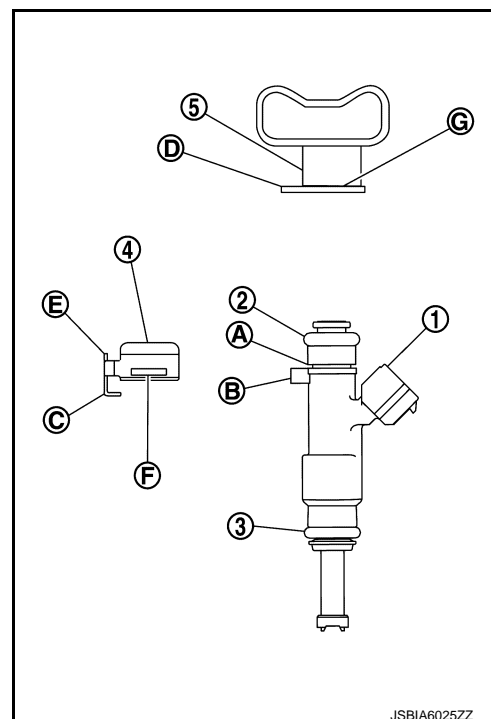
③ : O-ring (Green)

- Insert clip so that protrusion ② of fuel injector matches cut-out ③ of clip.

CAUTION:

- **Never reuse clip. Replace it with a new one.**
- **Be careful to keep clip from interfering with O-ring. If interference occurs, replace O-ring.**

- b. Insert fuel injector into fuel tube ⑤ with clip attached.
- Insert it while matching it to the axial center.
 - Insert fuel injector so that protrusion ④ of fuel tube matches cut-out ⑤ of clip.
 - Check that fuel tube flange ⑥ is securely fixed in flange fixing groove ⑦ on clip.
- c. Check that installation is complete by checking that fuel injector does not rotate or come off.



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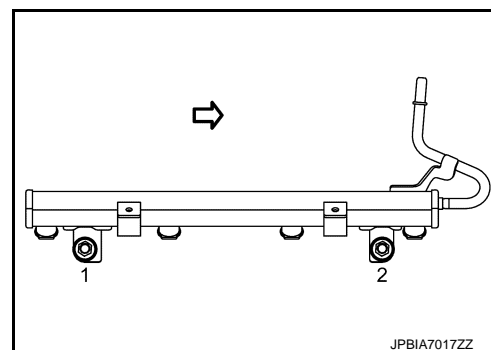
3. Set fuel tube and fuel injector assembly at its position for installation on cylinder head.

CAUTION:

For installation, be careful not to interfere with fuel injector nozzle.

4. Install fuel tube and injector assembly onto cylinder.
- Tighten mounting bolts in the order of 1, 2 as shown in the figure.

⇐ : Engine front



JPBIA7017ZZ

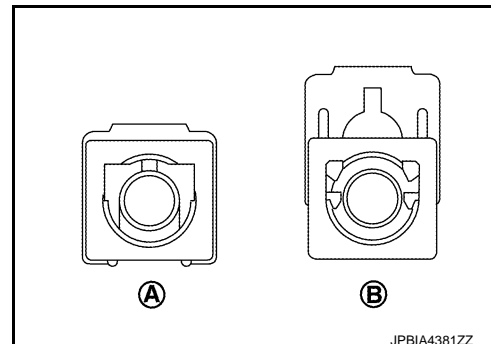
5. Connect harness connector to fuel injector.
6. Connect fuel feed hose with the following procedure, and then install the fuel feed hose.
- a. Check no foreign substances are deposited in and around matching pipe and quick connector, and no damage on them.
- b. Quick connector shall be inserted gradually, aligning with the axis of the matching pipe.
- c. Insert the retainer until it clicks and check the retainer is locked. After insertion, pull the connector and check that the connector is locked.

① : Lock position

② : Unlock position

CAUTION:

If retainer cannot be installed smoothly, quick connector may be have not been installed correctly. Check connection again.



JPBIA4381ZZ

- d. After attaching the quick connector and fix the hose to the clamp.
7. Install intake manifold. Refer to [EM-35, "Exploded View"](#).

Inspection

INFOID:0000000011616454

INSPECTION AFTER INSTALLATION

Check on Fuel Leakage

1. Turn ignition switch "ON" (with the engine stopped). With fuel pressure applied to fuel piping, check there are no fuel leaks at connection points.

NOTE:

Use mirrors for checking at points out of clear sight.

2. Start the engine. With engine speed increased, check again that there are no fuel leaks at connection points.

CAUTION:

Never touch the engine immediately after stopped, as the engine becomes extremely hot.

OIL PAN AND OIL STRAINER

< REMOVAL AND INSTALLATION >

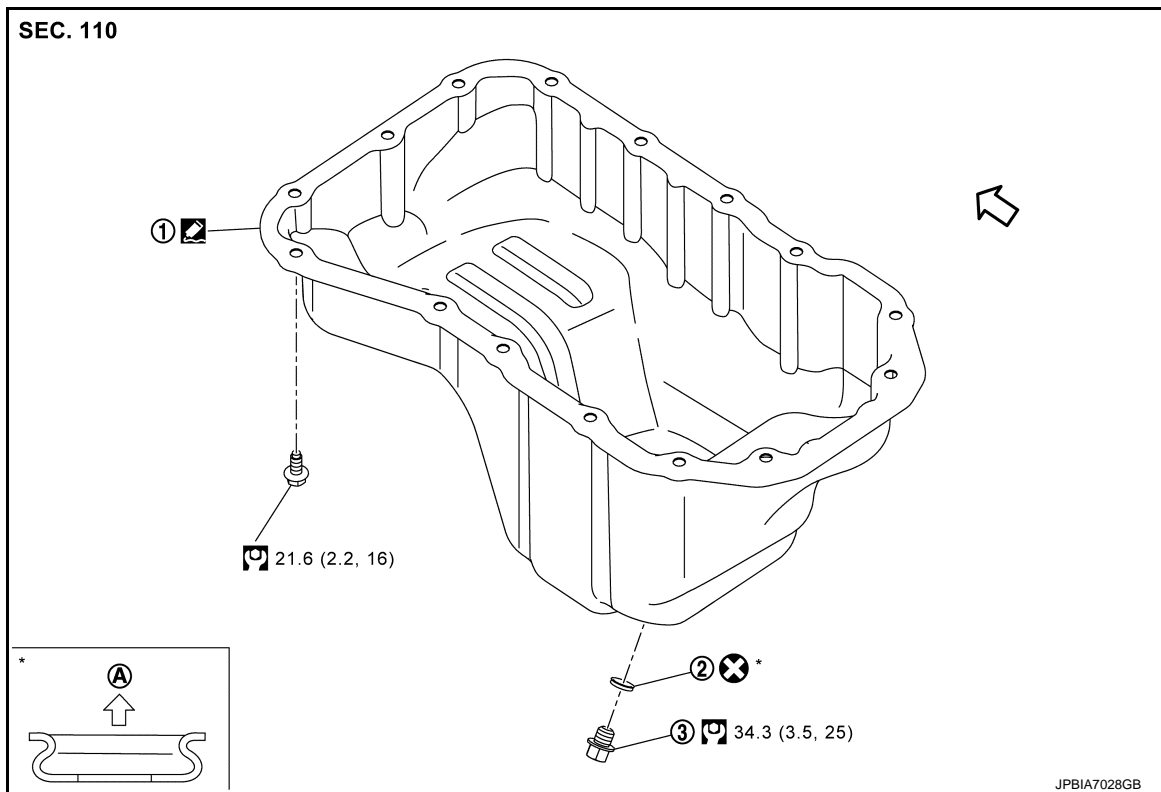
[QR25DE]

OIL PAN AND OIL STRAINER

Exploded View

INFOID:0000000011616486

SINGLE TYPE



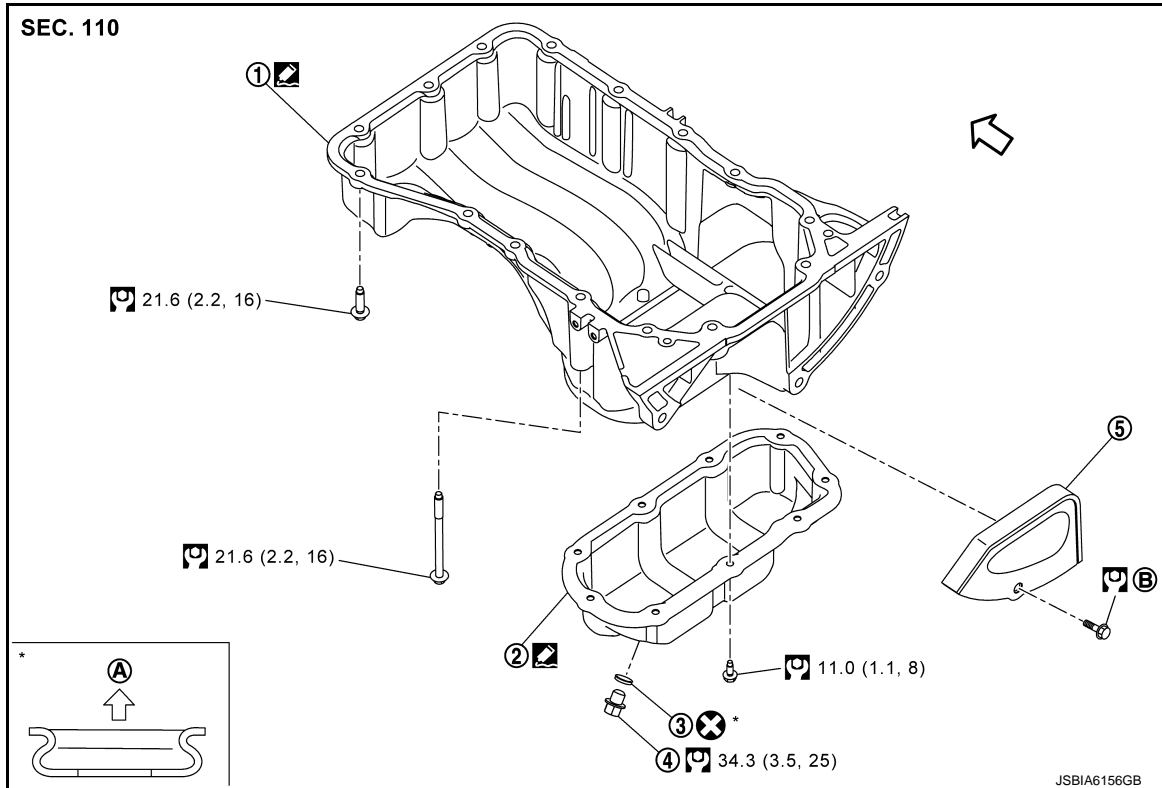
- ① Oil pan
- ② Drain plug washer
- ③ Drain plug
- A Oil pan side
- ↖ : Engine front
- ⊗ : N·m (kg-m, ft-lb)
- ⊗ : Always replace after every disassembly.
- ⊗ : Sealing point

OIL PAN AND OIL STRAINER

< REMOVAL AND INSTALLATION >

[QR25DE]

SEPARATE TYPE



① Oil pan (upper)

④ Drain plug

(A) Oil pan side

↶ : Engine front

⊞ : N·m (kg-m, ft-lb)

⊗ : Always replace after every disassembly.

⊞ : Sealing point

② Oil pan (lower)

⑤ Rear plate cover

Comply with the installation procedure when tightening. Refer to [TM-37](#), "[2WD : Removal and Installation](#)".

(B)

③ Drain plug washer

Removal and Installation

INFOID:0000000011616487

REMOVAL

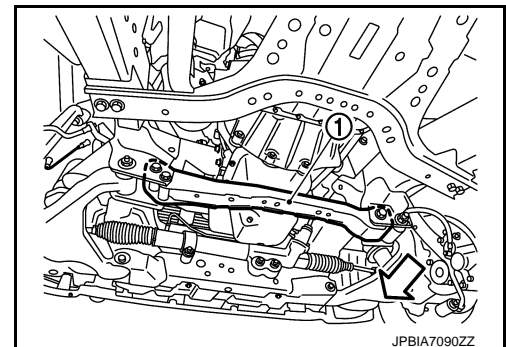
WARNING:

To avoid the danger of being scalded, never drain the engine oil when the engine is hot.

Single Type

1. Remove steering gear assembly. Refer to [ST-25](#), "[Exploded View](#)".
2. Remove front cross member assembly ①.

↶ : Vehicle front



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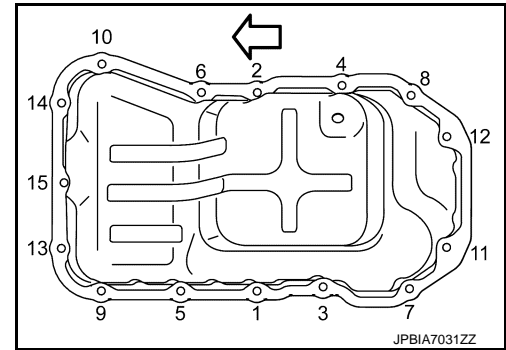
OIL PAN AND OIL STRAINER

[QR25DE]

< REMOVAL AND INSTALLATION >

3. Drain engine oil. Refer to [LU-9. "Draining"](#).
4. Remove oil pan with the following procedure:
 - a. Loosen bolts in the order from 15 to 1 as shown in the figure.

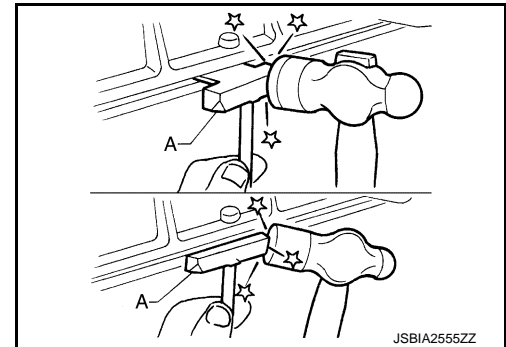
⇐ : Engine front



- b. Insert seal cutter [SST:KV10111100] (A) between oil pan and lower cylinder block, and slide it by tapping on the side of the tool with a hammer.

CAUTION:

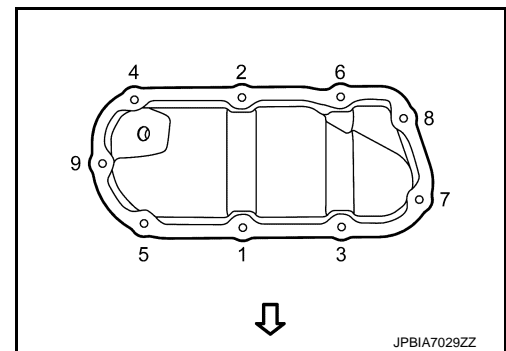
Be careful not to damage the mating surface.



Separate Type

1. Drain engine oil. Refer to [LU-9. "Draining"](#).
2. Remove oil pan (lower) with the following procedure:
 - a. Loosen bolts in the order from 9 to 1 as shown in the figure.

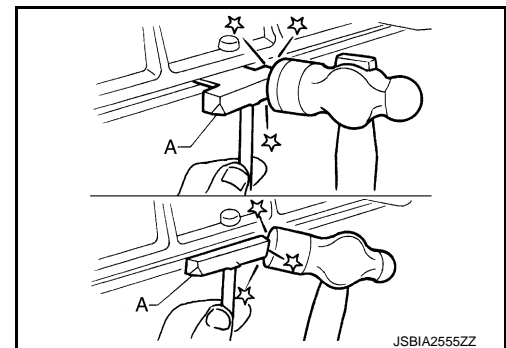
⇐ : Engine front



- b. Insert seal cutter [SST:KV10111100] (A) between oil pan (upper) and oil pan (lower), and slide it by tapping on the side of the tool with a hammer.

CAUTION:

Be careful not to damage the mating surface.



3. Remove steering gear assembly. Refer to [ST-25. "Exploded View"](#).

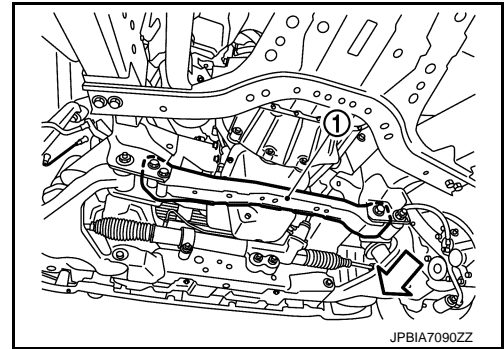
OIL PAN AND OIL STRAINER

< REMOVAL AND INSTALLATION >

[QR25DE]

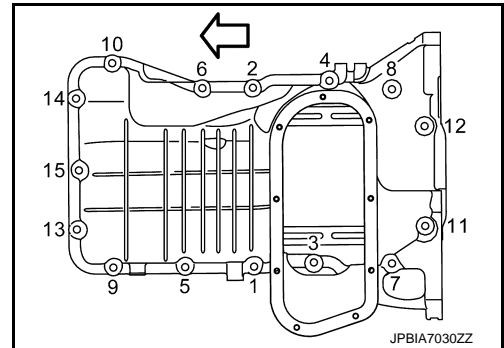
4. Remove front cross member assembly ①.

⇐ : Vehicle front



5. Remove rear plate cover, and four engine-to-transmission bolts. Refer to [TM-37, "2WD : Removal and Installation"](#).
6. Remove oil pan (upper) with the following procedure:
- a. Loosen bolts in the order from 15 to 1 as shown in the figure.

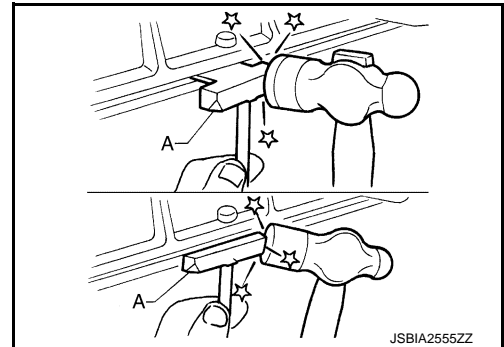
⇐ : Engine front



- b. Insert seal cutter [SST:KV10111100] (A) between oil pan (upper) and lower cylinder block, and slide it by tapping on the side of the tool with a hammer.

CAUTION:

Be careful not to damage the mating surface.



INSTALLATION

CAUTION:

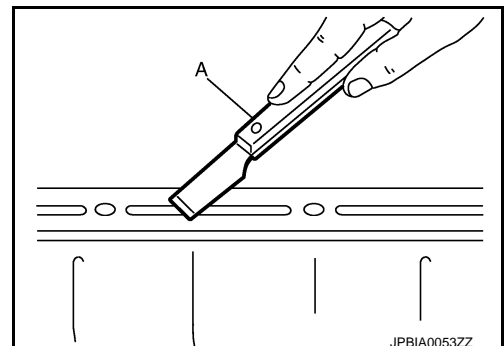
Do not reuse drain plug washer.

Single Type

1. Install oil pan with the following procedure:
- a. Use a scraper (A) to remove old liquid gasket from mating surfaces.
- Also remove the old liquid gasket from mating surface of cylinder block.
 - Remove old liquid gasket from the bolt holes and threads.

CAUTION:

Never scratch or damage the mating surfaces when cleaning off old liquid gasket.



OIL PAN AND OIL STRAINER

< REMOVAL AND INSTALLATION >

[QR25DE]

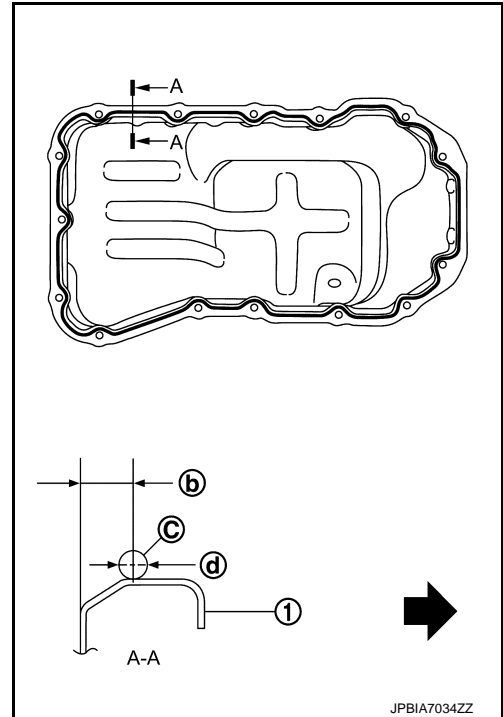
- b. Apply a continuous bead of liquid gasket © with a tube presser (commercial service tool) as shown in the figure.

- ① : Oil pan
 (b) : 7.5 - 9.5 mm (0.295 - 0.374 in)
 (d) : ϕ 4.0 - 5.0 mm (0.157 - 0.197 in)
 ← : Engine outside

Use Genuine Liquid Gasket (Three Bond 1217H) or equivalent.

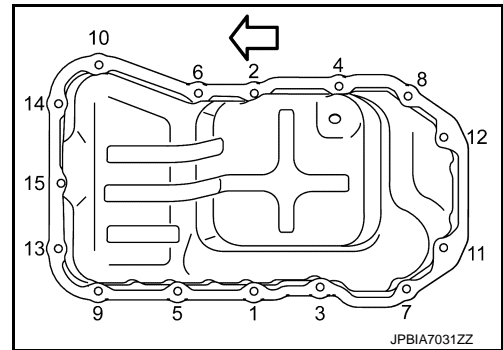
CAUTION:

- Attaching should be done within 5 minutes after liquid gasket application.



- c. Tighten bolts in the order from 1 to 15 as shown in the figure.

- ↶ : Engine front



- Install oil pan drain plug.
 - Refer to the figure of components of former page for installation direction of washer. Refer to [EM-47, "Exploded View"](#).
- Install in the reverse order of removal after this step.

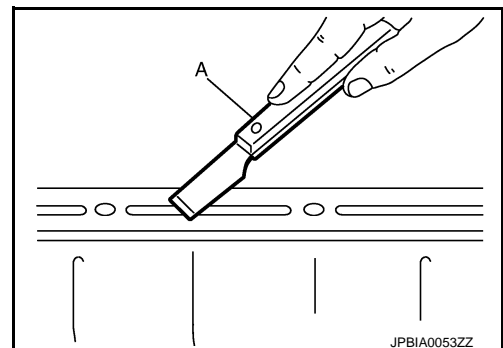
NOTE:
 Pour engine oil at least 30 minutes after oil pan is installed.

Separate Type

- Install oil pan (upper) with the following procedure:
 - Use a scraper (A) to remove old liquid gasket from mating surfaces.
 - Also remove the old liquid gasket from mating surface of cylinder block.
 - Remove old liquid gasket from the bolt holes and threads.

CAUTION:

Never scratch or damage the mating surfaces when cleaning off old liquid gasket.



OIL PAN AND OIL STRAINER

< REMOVAL AND INSTALLATION >

[QR25DE]

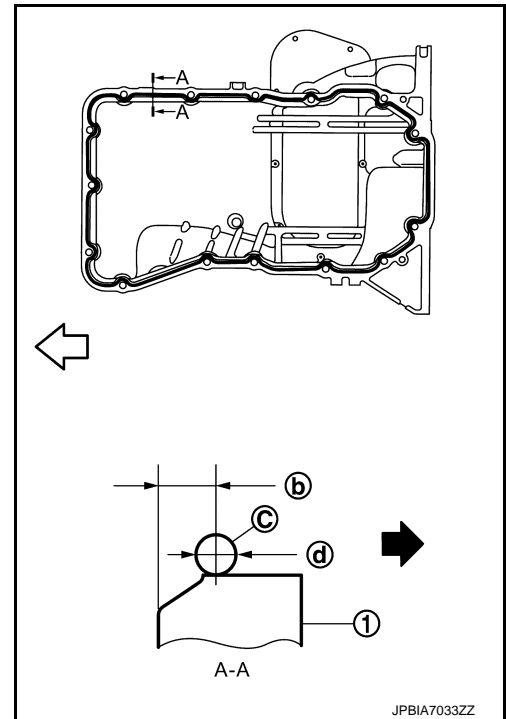
- b. Apply a continuous bead of liquid gasket © with a tube presser (commercial service tool) as shown in the figure.

- ① : Oil pan (upper)
- ⓑ : 5.5 - 7.5 mm (0.216 - 0.295 in)
- ⓒ : ϕ 4.0 - 5.0 mm (0.157 - 0.197 in)
- ← : Engine outside
- ⇐ : Engine front

Use Genuine Liquid Gasket (Three Bond 1217H) or equivalent.

CAUTION:

- Attaching should be done within 5 minutes after liquid gasket application.



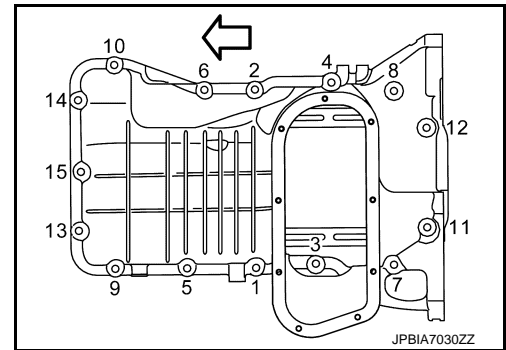
- c. Tighten bolts in the order from 1 to 15 as shown in the figure.

- ⇐ : Engine front

NOTE:

Refer to the following for locating bolts.

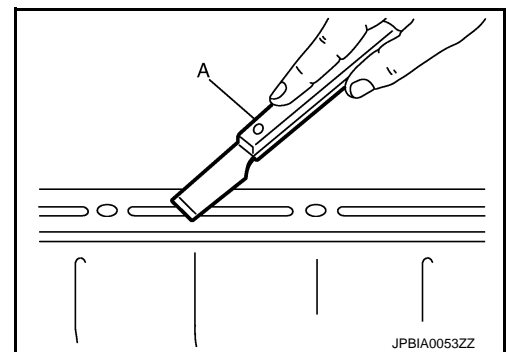
- | | |
|------------------------------|-------------------------------------|
| M8 × 25 mm (0.98 in) | : No. 1-3, 5, 6, 8-10, 12-15 |
| M8 × 100 mm (3.94 in) | : No. 4, 7, 11 |



2. Install oil pan (lower) with the following procedure:
- a. Use a scraper (A) to remove old liquid gasket from mating surfaces.
- Also remove the old liquid gasket from mating surface of oil pan (upper).
 - Remove old liquid gasket from the bolt holes and threads.

CAUTION:

Never scratch or damage the mating surfaces when cleaning off old liquid gasket.



OIL PAN AND OIL STRAINER

< REMOVAL AND INSTALLATION >

[QR25DE]

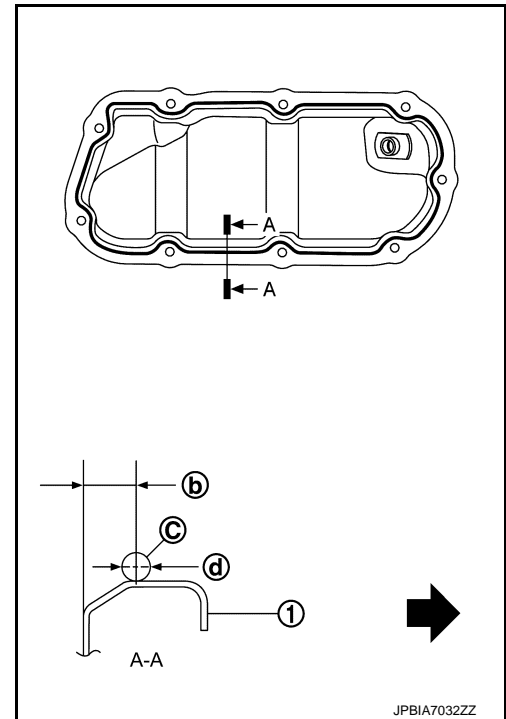
- b. Apply a continuous bead of liquid gasket © with a tube presser (commercial service tool) as shown in the figure.

- ① : Oil pan (lower)
 (b) : 7.5 - 9.5 mm (0.295 - 0.374 in)
 (d) : ϕ 4.0 - 5.0 mm (0.157 - 0.197 in)
 ← : Engine outside

Use Genuine Liquid Gasket (Three Bond 1217H) or equivalent.

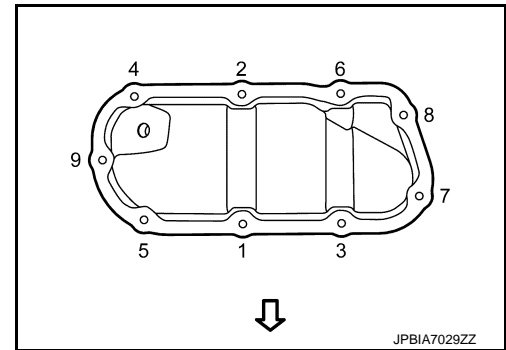
CAUTION:

- Attaching should be done within 5 minutes after liquid gasket application.



- c. Tighten bolts in the order from 1 to 9 as shown in the figure.

- ⇐ : Engine front



3. Install oil pan drain plug.
 • Refer to the figure of components of former page for installation direction of washer. Refer to [EM-47, "Exploded View"](#).
4. Install in the reverse order of removal after this step.
NOTE:
 Pour engine oil at least 30 minutes after oil pan is installed.

Inspection

INFOID:0000000011616488

INSPECTION AFTER INSTALLATION

- Check engine oil level and adjust engine oil. Refer to [LU-8, "Inspection"](#).
- Start engine, and check there is no leaks of engine oil.
- Stop engine and wait for 10 minutes.
- Check engine oil level again. Refer to [LU-8, "Inspection"](#).

TIMING CHAIN

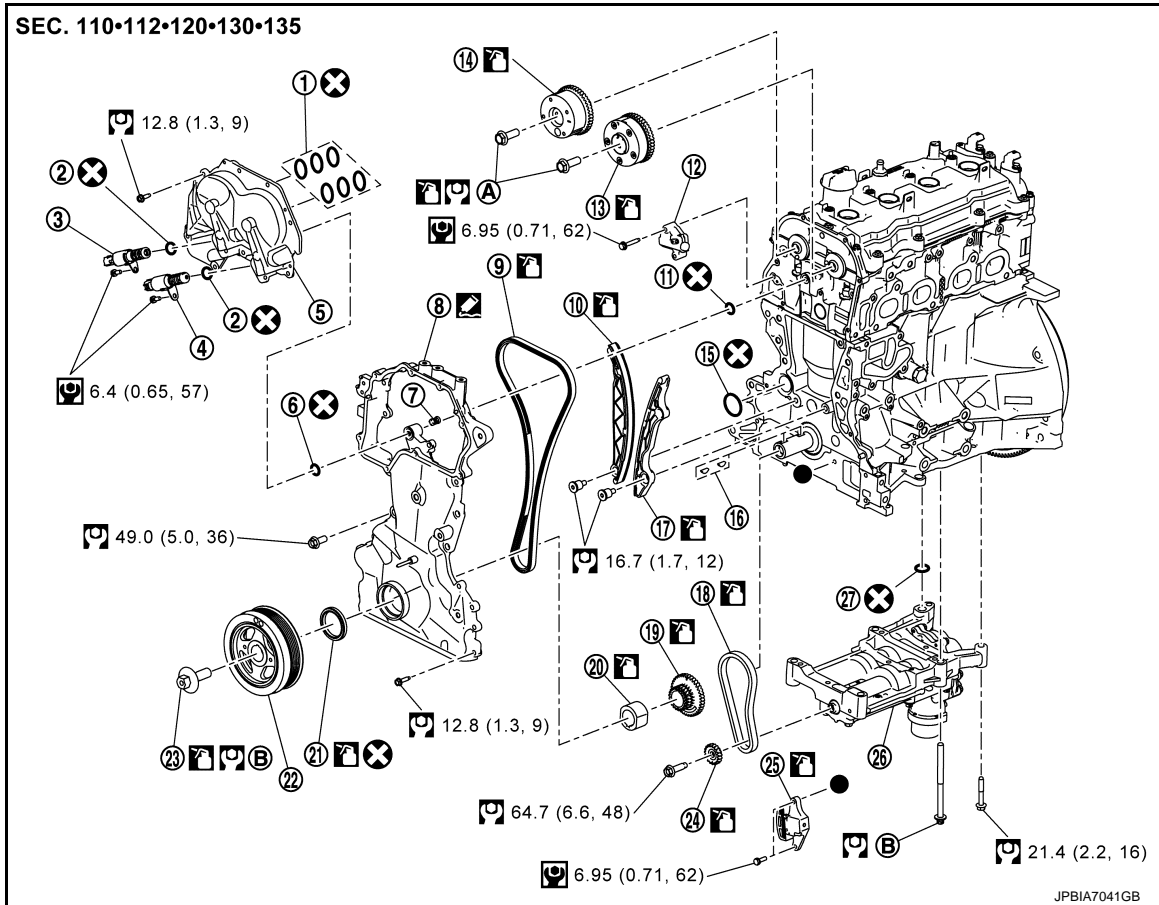
< REMOVAL AND INSTALLATION >

[QR25DE]

TIMING CHAIN

Exploded View

INFOID:0000000011616476



- | | | |
|---|------------------------------|--|
| ① O-ring | ② O-ring | ③ Intake valve timing control solenoid valve |
| ④ Exhaust valve timing control solenoid valve | ⑤ Valve timing control cover | ⑥ O-ring |
| ⑦ Oil filter | ⑧ Front cover | ⑨ Timing chain |
| ⑩ Timing chain slack guide | ⑪ O-ring | ⑫ Chain tensioner |
| ⑬ Camshaft sprocket (EXH) | ⑭ Camshaft sprocket (INT) | ⑮ O-ring |
| ⑯ Crankshaft key | ⑰ Timing chain tension guide | ⑱ Balancer unit timing chain |
| ⑲ Crankshaft sprocket | ⑳ Spacer | ㉑ Front oil seal |
| ㉒ Crankshaft pulley | ㉓ Crankshaft pulley bolt | ㉔ Balancer unit sprocket |
| ㉕ Balancer unit timing chain tensioner | ㉖ Balancer unit | ㉗ O-ring |

(A) Comply with the installation procedure when tightening. Refer to [EM-66, "Removal and Installation"](#).

(B) Comply with the installation procedure when tightening. Refer to [EM-55, "Removal and Installation"](#).

: 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 part is connected at points with same symbol in actual vehicle.

Removal and Installation

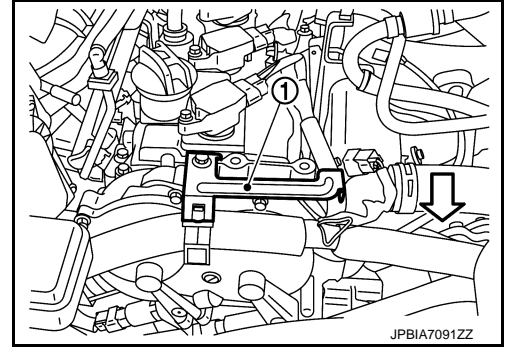
INFOID:000000011616477

REMOVAL

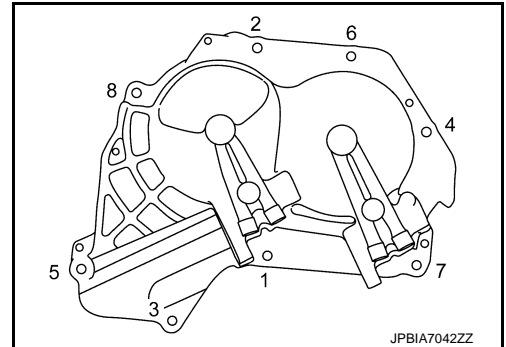
1. Remove the following parts.
 - Air cleaner cover and air duct: Refer to [EM-29, "Exploded View"](#).
 - Drive belt: Refer to [EM-22, "Removal and Installation"](#).
 - Drive belt auto-tensioner and idler pulley: Refer to [EM-28, "Exploded View"](#).
 - Radiator shroud (upper and lower): Refer to [CO-16, "Exploded View"](#).
 - Cooling fan: Refer to [CO-21, "Exploded View"](#).
 - PCV hose and blow-by hose: Refer to [EM-31, "Exploded View"](#).
 - Ignition coil: Refer to [EM-26, "Exploded View"](#).
 - EVAP canister purge volume control solenoid valve: Refer to [EM-35, "Exploded View"](#).
 - Oil pan: Refer to [EM-47, "Exploded View"](#).
2. Remove rocker cover. Refer to [EM-31, "Removal and Installation"](#).
3. Remove engine harness bracket ①.



: Vehicle front

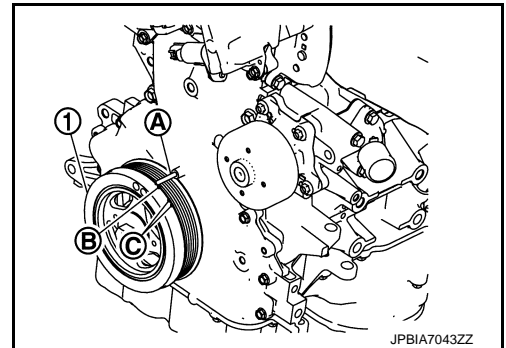


4. Remove valve timing control cover.
 - Loosen bolts in the order from 8 to 1 as shown in the figure.
 - Remove the following parts as necessary.
 - O-rings
 - Intake valve timing control solenoid valve
 - Exhaust valve timing control solenoid valve



5. Pull chain guide between camshaft sprockets out through front cover.
6. Set No. 1 cylinder at TDC on its compression stroke with the following procedure:
 - a. Rotate crankshaft pulley ① clockwise and align TDC mark (no paint) ② to timing indicator ③ on front cover.

③ : Paint mark (Not use for service)



TIMING CHAIN

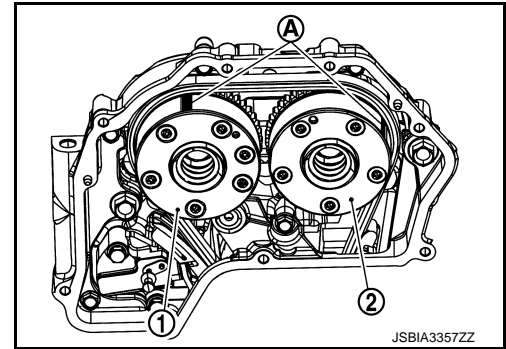
< REMOVAL AND INSTALLATION >

[QR25DE]

- b. At the same time, check that the mating marks ① on camshaft sprockets are located as shown in the figure.

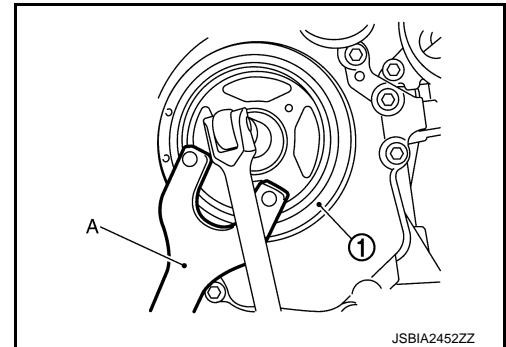
- ① : Camshaft sprocket (INT)
② : Camshaft sprocket (EXH)

- If not, rotate crankshaft pulley one more turn to align mating marks to the positions in the figure.

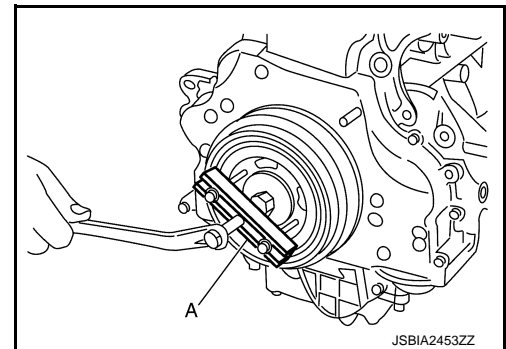


7. Remove crankshaft pulley with the following procedure:

- a. Fix crankshaft pulley ① with a pulley holder (commercial service tool) (A), loosen crankshaft pulley bolt, and locate bolt seating surface at 10 mm (0.39 in) from its original position.



- b. Attach a pulley puller [SST: KV11103000] (A) in the M6 thread hole on crankshaft pulley, and remove crankshaft pulley.



8. Remove front cover with the following procedure:

TIMING CHAIN

< REMOVAL AND INSTALLATION >

[QR25DE]

- a. Loosen mounting bolts in the order from 18 to 1 as shown in the figure, and remove them.

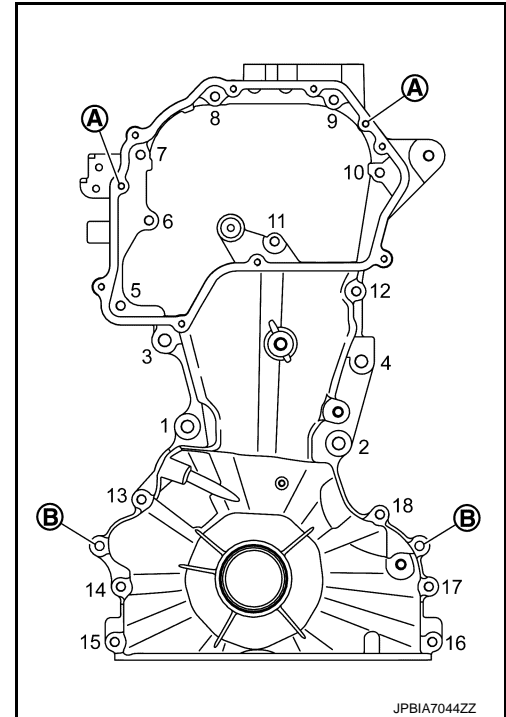
- Ⓐ : Dowel pin
Ⓑ : Dowel pin hole

9. If front oil seal needs to be replaced, lift it with a suitable tool, and remove it.

CAUTION:

Be careful not to damage front cover.

10. Remove O-rings, and then remove oil filter as necessary.

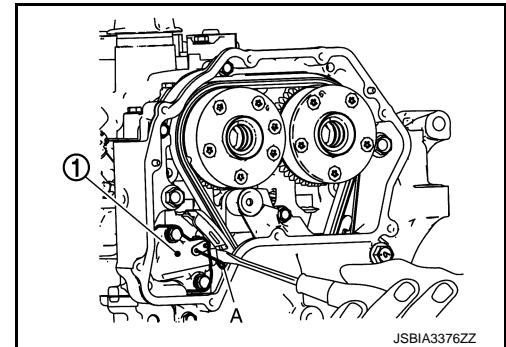


11. Remove timing chain and camshaft sprockets with the following procedure:

- a. Push in chain tensioner plunger. Insert a stopper pin (A) into hole on chain tensioner body to secure chain tensioner plunger and remove chain tensioner ①.

NOTE:

Use approx. 0.5 mm (0.02 in) dia. hard metal pin as a stopper pin.

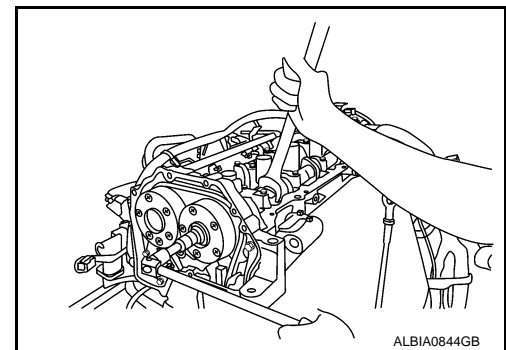


- b. Secure hexagonal part of camshaft with a wrench. Loosen camshaft sprocket mounting bolts and remove timing chain and camshaft sprockets.

CAUTION:

Never rotate crankshaft or camshaft while timing chain is removed. It causes interference between valve and piston.

12. Remove timing chain slack guide, timing chain tension guide and spacer.
13. Remove balancer unit timing chain tensioner with the following procedure:



TIMING CHAIN

[QR25DE]

< REMOVAL AND INSTALLATION >

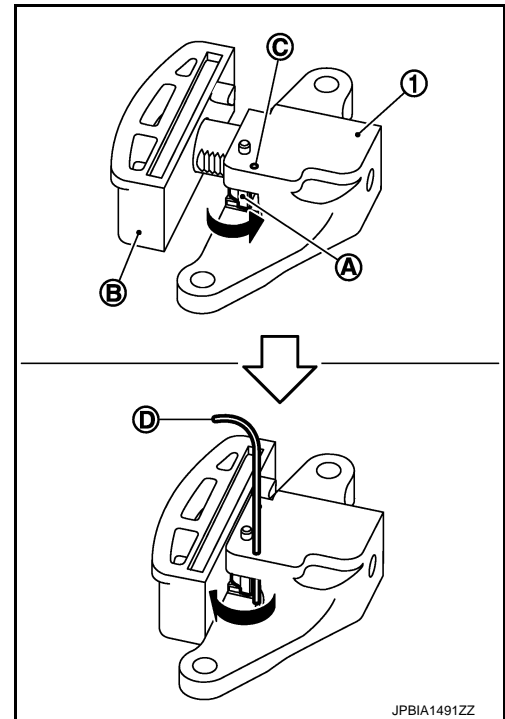
- a. Press stopper tab (A) in the direction shown in the figure to push the timing chain slack guide (B) to the bottom toward balancer unit timing chain tensioner (1).
- The slack guide is released by pressing the stopper tab. As the result, the slack guide can be moved.

- b. Insert a stopper pin (D) into tensioner body hole (C) to secure the timing chain slack guide.

NOTE:

Use a hard metal pin with the diameter of approximately 1.2 mm (0.047 in) as a stopper pin.

- c. Remove balancer unit timing chain tensioner.
- When the holes on lever and tensioner body cannot be aligned, align these holes by slightly moving the slack guide.
14. Remove balancer unit timing chain and crankshaft sprocket.
15. Remove crank shaft key.
16. Remove balancer unit sprocket as necessary.



17. Loosen mounting bolts in the order from 6 to 1 as shown in the figure, and remove balancer unit.

← : Engine front

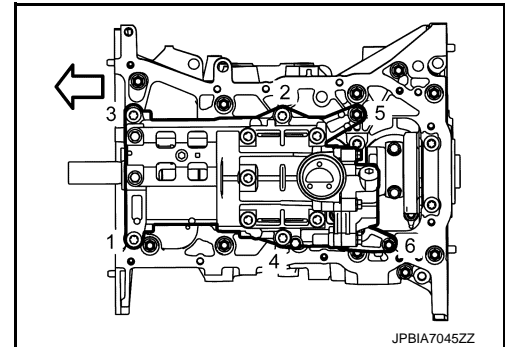
CAUTION:

Never disassemble balancer unit.

NOTE:

Use TORX socket (size E14).

18. Remove O-ring.



INSTALLATION

CAUTION:

- Do not reuse O-rings.
- Do not reuse front oil seal.

NOTE:

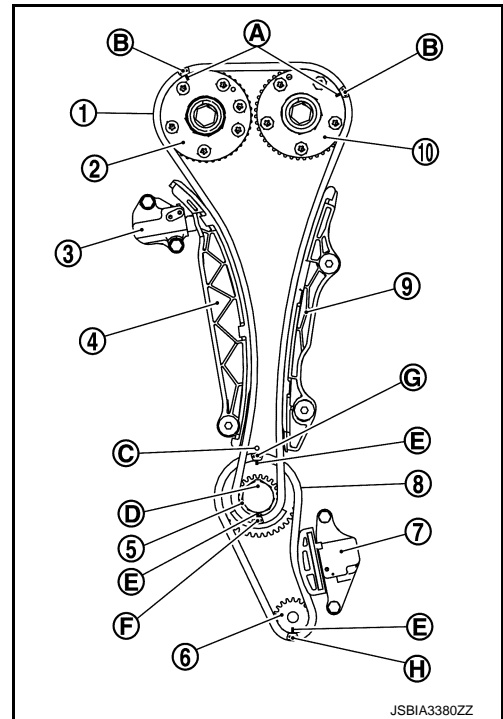
TIMING CHAIN

< REMOVAL AND INSTALLATION >

[QR25DE]

The figure shows the relationship between the mating mark on each timing chain and that on the corresponding sprocket, with the components installed.

- ① : Timing chain
- ② : Camshaft sprocket (INT)
- ③ : Chain tensioner
- ④ : Timing chain slack guide
- ⑤ : Crankshaft sprocket
- ⑥ : Balancer unit sprocket
- ⑦ : Balancer unit timing chain tensioner
- ⑧ : Balancer unit timing chain
- ⑨ : Timing chain tension guide
- ⑩ : Camshaft sprocket (EXH)
- A : Mating mark (peripheral stamp line)
- B : Orange link
- C : Mating mark (lug)
- D : Crankshaft key
- E : Mating mark (stamp)
- F : Yellow link
- G : Yellow link
- H : Pink link



1. Check that crankshaft key points straight up.
2. Tighten mounting bolts in the order from 1 to 6 as shown in the figure with the following procedure, and install balancer unit.

← : Engine front

CAUTION:

If mounting bolts are re-used, check their outer diameter before installation. Refer to [EM-63, "Inspection"](#).

- a. Apply new engine oil to threads and seat surfaces of mounting bolts.
- b. Tighten No. 1 to 4 bolts.

: 48.1 N·m (4.9 kg-m, 35 ft-lb)

- c. Tighten No. 5, 6 bolt.

: 21.35 N·m (2.2 kg-m, 16 ft-lb)

- d. Turn No. 1 to 5 bolts 120 degrees clockwise (angle tightening).

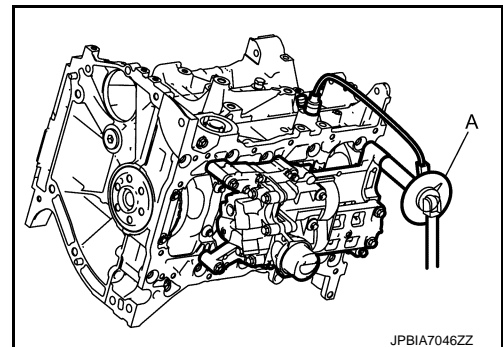
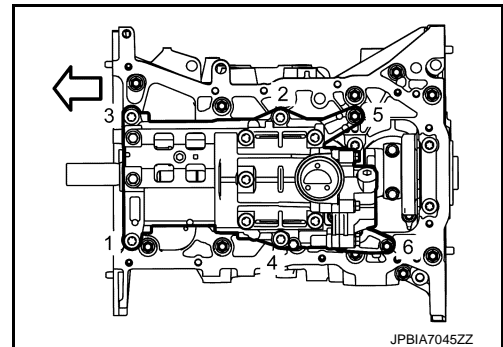
CAUTION:

Use the angle wrench [SST: KV10112100] (A) to check tightening angle. Never make judgment by visual inspection.

- e. Turn No. 6 bolt 90 degrees clockwise (angle tightening).
- f. Completely loosen all bolts.

: 0 N·m (0 kg-m, 0 ft-lb)

CAUTION:



TIMING CHAIN

< REMOVAL AND INSTALLATION >

[QR25DE]

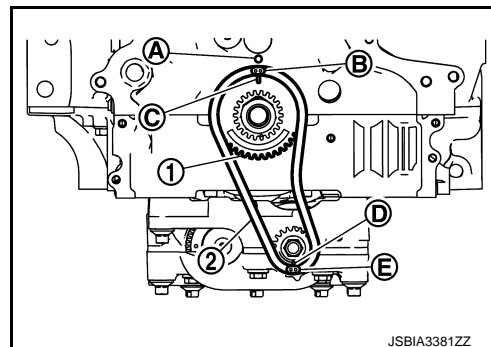
In this step, loosen bolts in reverse order as shown in the figure.

g. Repeat step "b" to "e".

3. Install crankshaft sprocket ① and balancer unit timing chain ②.

- Ⓑ : Mating mark (yellow)
- Ⓓ : Mating mark (stamp)
- Ⓔ : Mating mark (Pink)

- Check that crankshaft sprocket is positioned with mating marks Ⓐ on cylinder block and crankshaft sprocket meeting Ⓒ at the top.
- Install it by aligning mating marks on each sprocket and balancer unit timing chain.



JSBIA3381ZZ

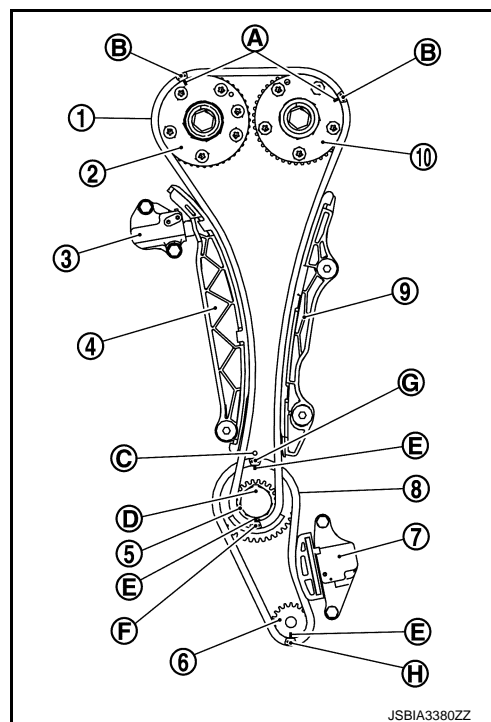
4. Install balancer unit timing chain tensioner.

- Be careful not to let mating marks of each sprocket and timing chain slip.
- After installation, check the mating marks have not slipped, then remove stopper pin and release tensioner sleeve.

5. Install timing chain and related parts.

- Install by aligning mating marks on each sprocket and timing chain.

- ① : Timing chain
- ② : Camshaft sprocket (INT)
- ③ : Chain tensioner
- ④ : Timing chain slack guide
- ⑤ : Crankshaft sprocket
- ⑥ : Balancer unit sprocket
- ⑦ : Balancer unit timing chain tensioner
- ⑧ : Balancer unit timing chain
- ⑨ : Timing chain tension guide
- ⑩ : Camshaft sprocket (EXH)
- Ⓐ : Mating mark (peripheral stamp line)
- Ⓑ : Orange link
- Ⓒ : Mating mark (lug)
- Ⓓ : Crankshaft key
- Ⓔ : Mating mark (stamp)
- Ⓕ : Yellow link
- Ⓖ : Yellow link
- Ⓗ : Pink link



JSBIA3380ZZ

- Before and after installing chain tensioner, check again to check that mating marks have not slipped.
- After installing chain tensioner, remove stopper pin, and check that tensioner moves freely.

CAUTION:

- For the following note, after the mating marks are aligned, keep them aligned by holding them with a hand.
- To avoid skipped teeth, never rotate crankshaft and camshaft until front cover is installed.

NOTE:

Before installing chain tensioner, it is possible to change the position of mating mark on timing chain for that on each sprocket for alignment.

TIMING CHAIN

< REMOVAL AND INSTALLATION >

[QR25DE]

6. Install front oil seal to front cover. Refer to [EM-91. "FRONT OIL SEAL : Removal and Installation"](#).
7. Install front cover with the following procedure:

CAUTION:

Do not reuse O-rings.

- a. Install O-rings to cylinder head and cylinder block.
- b. Apply a continuous bead of liquid gasket with the tube presser (commercial service tool) to front cover as shown in the figure.

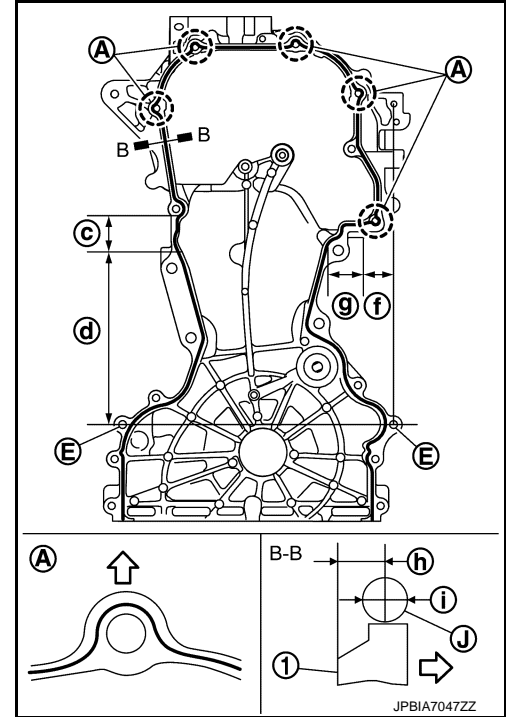
- ① : Front cover
- Ⓐ : Apply liquid gasket outside the bolt holes
- Ⓔ : Dowel pin hole
- ⓵ : Liquid gasket
- ⇐ : Engine outside

Use Genuine Liquid Gasket (Three Bond 1217H) or equivalent.

NOTE:

Application instruction differs depending on the position.

- Ⓒ : 30.6 mm (1.205 in) Apply liquid gasket ϕ 6.0 - 7.0 mm (0.236 - 0.275 in) between this area.
- Ⓓ : 179.6 mm (7.07 in)
- Ⓕ : 35.5 mm (1.398 in)
- Ⓖ : 31.3 mm (1.232 in) Apply liquid gasket ϕ 6.0 - 7.0 mm (0.236 - 0.275 in) between this area.
- Ⓗ : 4.0 - 5.6 mm (0.157 - 0.220 in)
- Ⓘ : ϕ 3.4 - 4.4 mm (0.134 - 0.173 in)



- c. Check that mating marks of timing chain and each sprocket are still aligned. Then install front cover.

CAUTION:

Be careful not to damage front oil seal by interference with front end of crankshaft.

- d. Tighten mounting bolts in the order from 1 to 18 as shown in the figure.
- e. After all bolts are tightened, retighten them to specified torque in numerical order as shown in the figure.

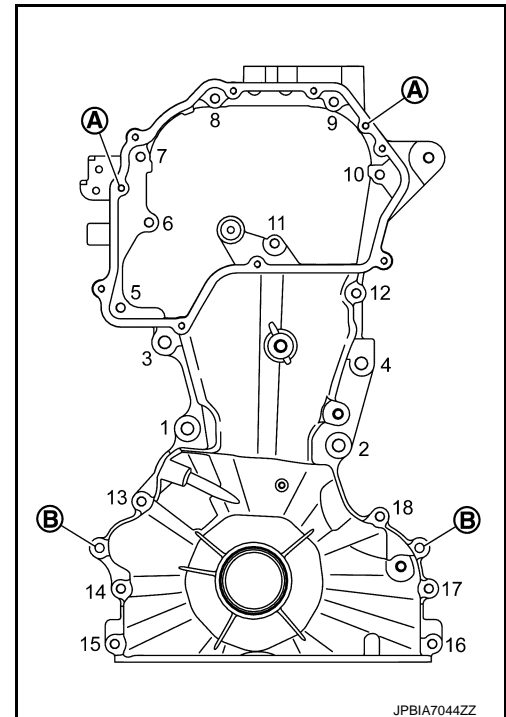
- Ⓐ : Dowel pin
- Ⓑ : Dowel pin hole

CAUTION:

Be sure to wipe off any excessive liquid gasket leaking to surface for fitting oil pan.

Tightening torque

- M10 bolt** : 49.0 N·m (5.0 kg-m, 36 ft-lb)
- M6 bolt** : 12.7 N·m (1.3 kg-m, 9 ft-lb)



8. Install chain guide between camshaft sprockets.

TIMING CHAIN

[QR25DE]

< REMOVAL AND INSTALLATION >

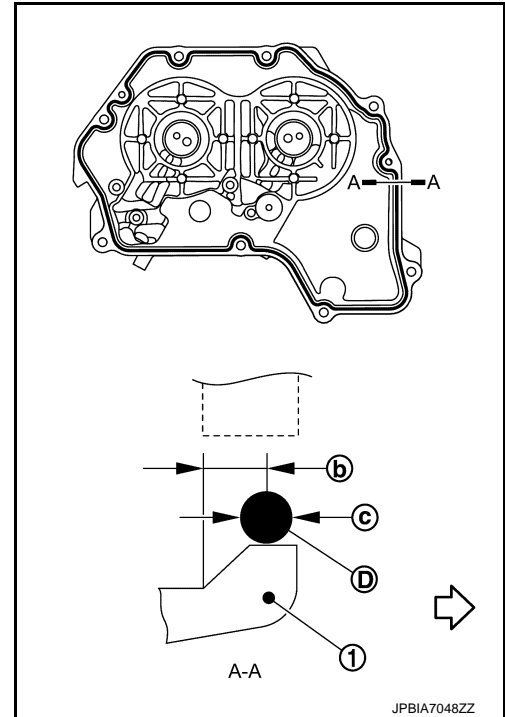
9. Install valve timing control cover with the following procedure:
 - a. Install valve timing control solenoid valves to valve timing control cover if removed.
 - b. Install new oil rings to the camshaft sprocket (INT) insertion points on backside of valve timing control cover.
 - c. Install new O-ring to front cover.
 - d. Apply a continuous bead of liquid gasket ① with a tube presser (commercial service tool) to valve timing control cover as shown in the figure.

- ① : Valve timing control cover
 (b) : 4.3 - 5.3 mm (0.169 - 0.208 in)
 (c) : ϕ 3.4 - 4.4 mm (0.134 - 0.173 in)
 ⇐ : Engine outside

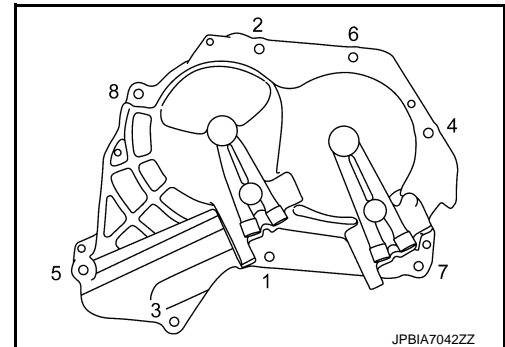
Use Genuine Liquid Gasket (Three Bond 1217H) or equivalent.

CAUTION:

- Attaching should be done within 5 minutes after liquid gasket application.
- Do not reuse O-ring.



- e. Tighten mounting bolts in the order from 1 to 8 as shown in the figure.



10. Insert crankshaft pulley by aligning with crankshaft key.
 - When inserting crankshaft pulley with a plastic hammer, tap on its center portion (not circumference).
- CAUTION:**
Install protecting front oil seal lip section from any damage.
11. Tighten crankshaft pulley bolt.
 - Secure crankshaft pulley with a pulley holder (commercial service tool), and tighten crankshaft pulley bolt.
 - Perform angle tightening with the following procedure:
 - a. Apply new engine oil to thread and seat surfaces of crankshaft pulley bolt.
 - b. Tighten crankshaft pulley bolt.

 : 42.1 N·m (4.3 kg-m, 31 ft-lb)

TIMING CHAIN

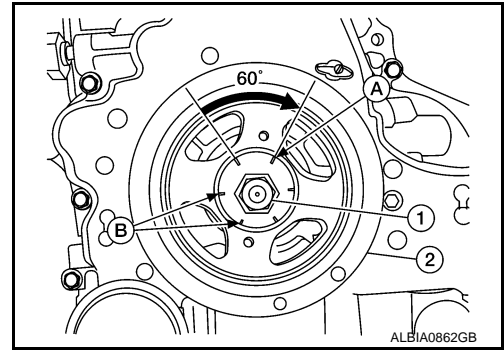
< REMOVAL AND INSTALLATION >

[QR25DE]

- c. Put a paint mark (A) on crankshaft pulley (2), mating with any one of six easy to recognize angle marks on bolt flange.

① : Crankshaft pulley bolt

- d. Turn another 60 degrees clockwise (angle tightening).
• Check the tightening angle with movement of one angle mark (B).



12. Install all removed parts in the reverse order of removal.

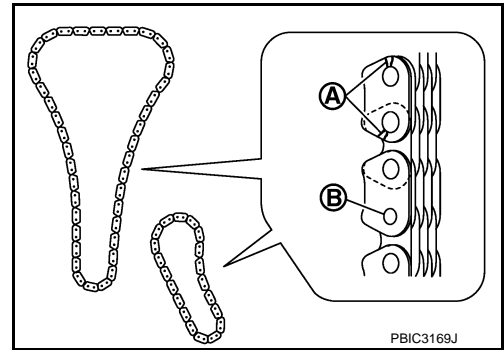
Inspection

INFOID:000000011616478

INSPECTION AFTER REMOVAL

Timing Chain

- Check timing chain for cracks (A) and any excessive wear (B) at the roller links of timing chain. Replace timing chain if necessary.

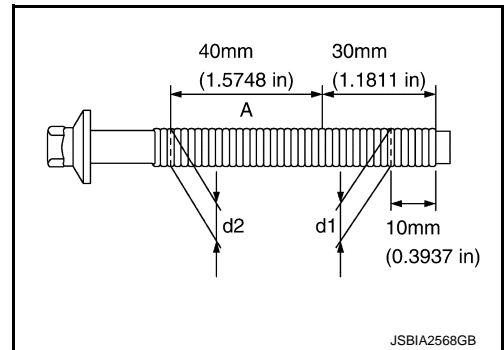


Balancer Unit Mounting Bolt Outer Diameter

- Measure the outer diameters ("d1", "d2") at two positions as shown in the figure.
- If reduction appears in "A" range, regard it as "d2".

Limit ("d1"-"d2") : 0.15 mm (0.0059 in)

- If it exceeds the limit (large difference in dimensions), replace it with a new one.



INSPECTION AFTER INSTALLATION

Inspection for Leaks

The following are procedures for checking fluids leak, lubricates leak.

- Before starting engine, check oil/fluid levels including engine coolant and engine oil. If less than required quantity, fill to the specified level. Refer to [MA-32. "Fluids and Lubricants"](#).
- Use procedure below to check for fuel leakage.
 - Turn ignition switch "ON" (with engine stopped). With fuel pressure applied to fuel piping, check for fuel leakage at connection points.
 - Start engine. With engine speed increased, check again for fuel leakage at connection points.
- Run engine to check for unusual noise and vibration.
- Warm up engine thoroughly to check there is no leakage of fuel, or any oil/fluids including engine oil and engine coolant.
- Bleed air from lines and hoses of applicable lines, such as in cooling system.
- After cooling down engine, again check oil/fluid levels including engine oil and engine coolant. Refill to the specified level, if necessary.

TIMING CHAIN

< REMOVAL AND INSTALLATION >

[QR25DE]

Summary of the inspection items:				
Items		Before starting engine	Engine running	After engine stopped
Engine coolant		Level	Leakage	Level
Engine oil		Level	Leakage	Level
Transmission / transaxle fluid	AT & CVT Models	Leakage	Level / Leakage	Leakage
	MT Models	Level / Leakage	Leakage	Level / Leakage
Other oils and fluids*		Level	Leakage	Level
Fuel		Leakage	Leakage	Leakage
Exhaust gases		—	Leakage	—

*: Power steering fluid, brake fluid, etc.

CAMSHAFT

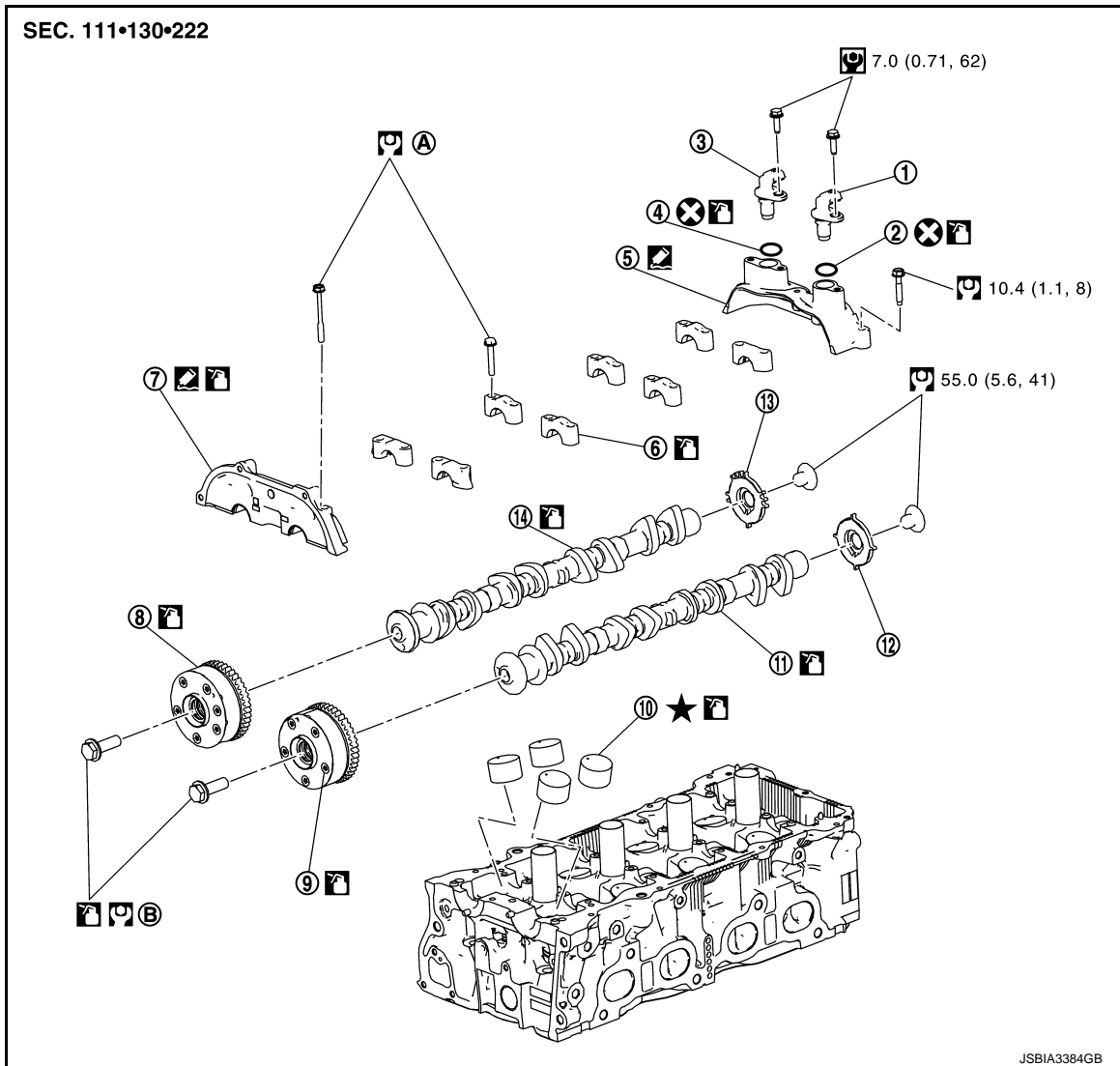
< REMOVAL AND INSTALLATION >

[QR25DE]

CAMSHAFT

Exploded View

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- | | | |
|--|--|------------------------------------|
| ① Exhaust valve timing control position sensor | ② O-ring | ③ Camshaft position sensor (PHASE) |
| ④ O-ring | ⑤ Camshaft position sensor bracket | ⑥ Camshaft bracket (No. 2 to 5) |
| ⑦ Camshaft bracket (No. 1) | ⑧ Camshaft sprocket (INT) | ⑨ Camshaft sprocket (EXH) |
| ⑩ Valve lifter | ⑪ Camshaft (EXH) | ⑫ Signal plate (EXH) |
| ⑬ Signal plate (INT) | ⑭ Camshaft (INT) | |
| (A) Comply with the installation procedure when tightening. Refer to EM-66 | (B) Comply with the installation procedure when tightening. Refer to EM-66 | |

: N·m (kg-m, ft-lb)

: N·m (kg-m, in-lb)

: Always replace after every disassembly.

: Should be lubricated with oil.

: Sealing point

★ : Select with proper thickness.

Removal and Installation

REMOVAL

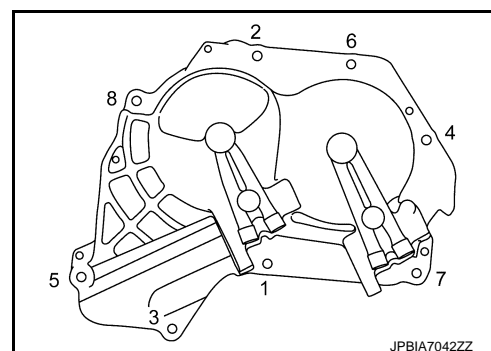
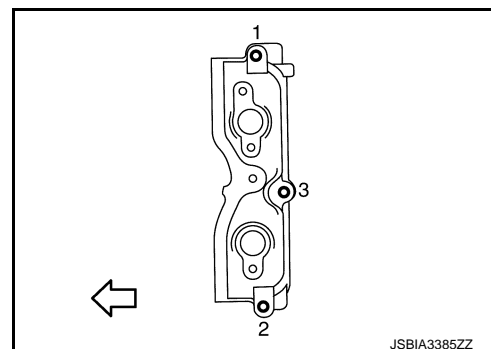
NOTE:

This section describes removal/installation procedure of camshaft without removing front cover. If front cover is removed or installed, removal of camshaft bracket (No. 1) is easier before step 9 and installation is easier after step 4. Regarding removal and installation of front cover, refer to [EM-54, "Exploded View"](#).

1. Release fuel pressure. Refer to [EC-146, "Work Procedure"](#).
2. Remove rocker cover. Refer to [EM-31, "Removal and Installation"](#).
3. Remove camshaft position sensor bracket.
 - Loosen mounting bolts in the order from 3 to 1 as shown in the figure.

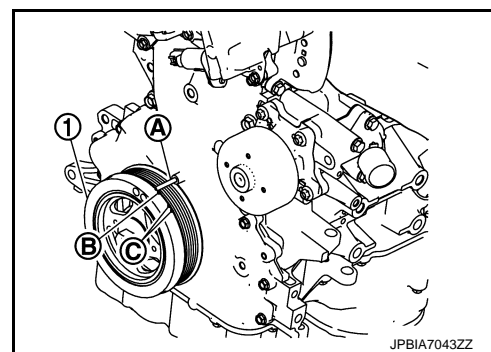
⇐ : Engine front

- Remove camshaft position sensor (PHASE), exhaust valve timing control position sensor, and O-rings as necessary.
4. Remove valve timing control cover with the following procedure:
 - a. Disconnect intake valve timing control solenoid valve harness connector and exhaust valve timing control solenoid valve harness connector.
 - b. Loosen bolts in the order from 8 to 1 as shown in the figure.
 5. Pull chain guide between camshaft sprockets out through front cover.



6. Set No. 1 cylinder at TDC on its compression stroke with the following procedure:
 - a. Rotate crankshaft pulley ① clockwise and align TDC mark (no paint) ② to timing indicator ③ on front cover.

③ : Paint mark (Not use for service)

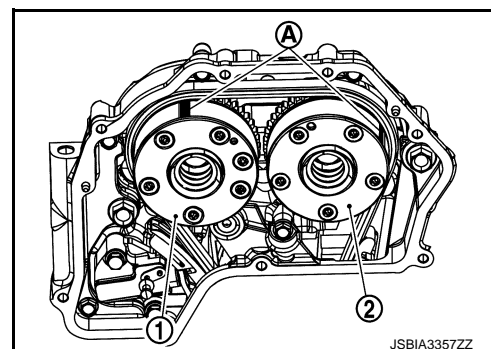


- b. At the same time, check that the mating marks ④ on camshaft sprockets are located as shown in the figure.

- ① : Camshaft sprocket (INT)
- ② : Camshaft sprocket (EXH)

- If not, rotate crankshaft pulley one more turn to align mating marks to the positions in the figure.

7. Remove camshaft sprockets with the following procedure:
 - a. Line up the mating marks on camshaft sprockets, and paint indelible mating marks on timing chain link plate.



CAMSHAFT

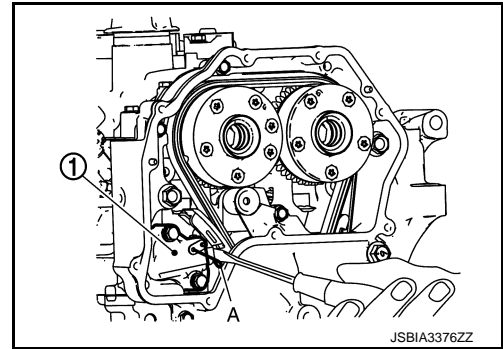
< REMOVAL AND INSTALLATION >

[QR25DE]

- b. Push in chain tensioner plunger. Insert a stopper pin (A) into hole on chain tensioner body to secure chain tensioner plunger and remove chain tensioner ①.

NOTE:

Use approx. 0.5 mm (0.02 in) dia. hard metal pin as a stopper pin.



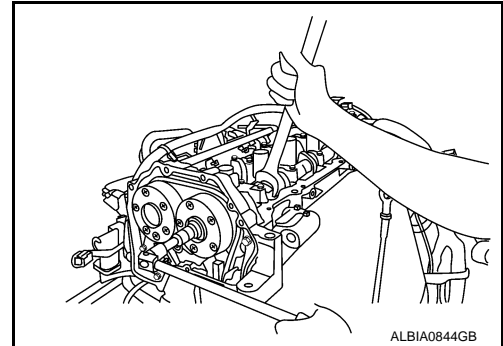
- c. Secure hexagonal part of camshaft with a wrench. Loosen camshaft sprocket mounting bolts and remove camshaft sprockets.

CAUTION:

Never rotate crankshaft or camshaft while timing chain is removed. It causes interference between valve and piston.

NOTE:

Chain tension holding work is not necessary. Crankshaft sprocket and timing chain do not disconnect structurally while front cover is attached.



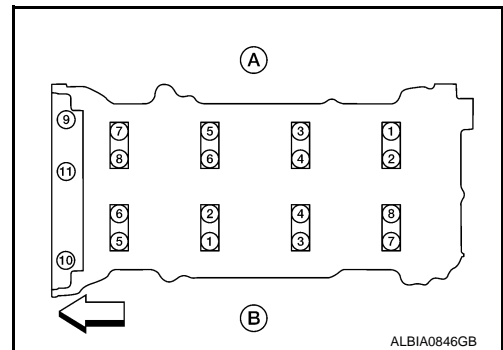
8. Loosen mounting bolts in the order from 11 to 1 as shown in the figure, and remove camshaft brackets and camshafts.

Ⓐ : Intake side

Ⓑ : Exhaust side

⇐ : Engine front

- Remove camshaft bracket (No. 1) by slightly tapping it with a plastic hammer.



9. Remove valve lifters.

- Identify installation positions, and store them without mixing them up.

INSTALLATION

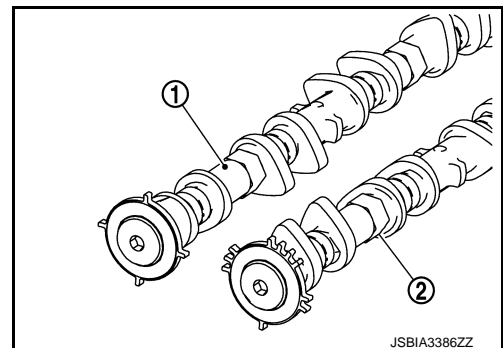
CAUTION:

Do not reuse O-rings.

- Install valve lifters.
 - Install them in the original positions.
- Install camshafts.
 - Distinction between intake and exhaust camshafts is performed with the different shapes of rear end.

① : Camshaft (EXH)

② : Camshaft (INT)



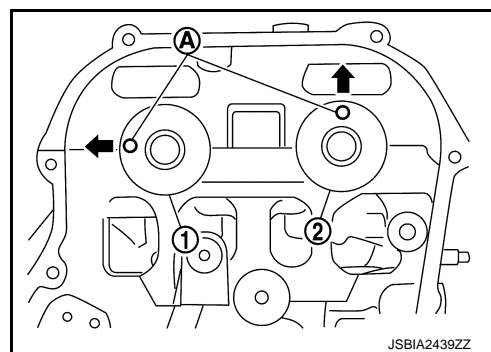
CAMSHAFT

< REMOVAL AND INSTALLATION >

[QR25DE]

- Install camshafts so that camshaft dowel pins ① on the front side are positioned (←) as shown in the figure.

- ① : Camshaft (INT)
② : Camshaft (EXH)



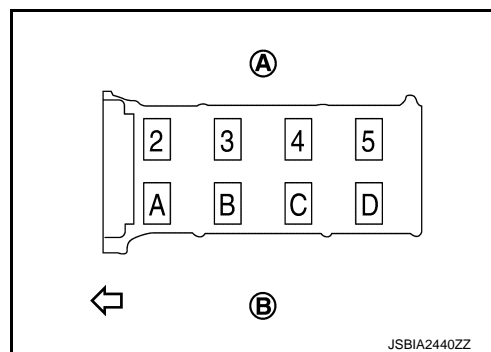
3. Install camshaft brackets with the following procedure:

- Remove foreign material completely from camshaft bracket backside and from cylinder head installation face.
- Install camshaft brackets aligning the identification marks on upper surface as shown in the figure.

- Ⓐ : Intake side
Ⓑ : Exhaust side
↔ : Engine front

NOTE:

Install so that identification mark can be correctly read when viewed from the exhaust side.



- Install camshaft bracket (No. 1) with the following procedure:

- Apply liquid gasket to camshaft bracket (No. 1) as shown in the figure.

- ↔ : Engine front

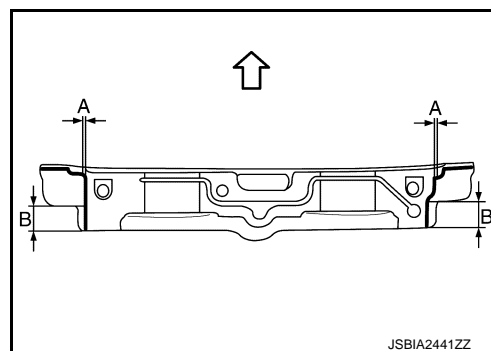
A : $\phi 2.0 - 3.0$ mm

B : 10.5 mm

Use Genuine Liquid Gasket (TB1217H) or equivalent.

CAUTION:

After installation, be sure to wipe off any excessive liquid gasket leaking.



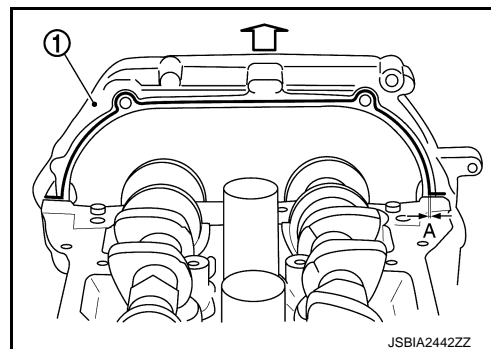
- Apply liquid gasket to camshaft bracket (No. 1) contact surface on the front cover ① backside.

- ↔ : Engine front

A : $\phi 2.6 - 3.6$ mm

Use Genuine Liquid Gasket (TB1217H) or equivalent.

- Apply liquid gasket to the outside of bolt hole on front cover.



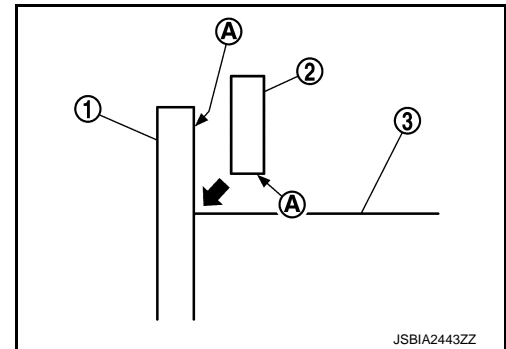
CAMSHAFT

< REMOVAL AND INSTALLATION >

[QR25DE]

- iii. Locate camshaft bracket (No. 1) ② near installation position, and install (➡) it without disturbing the liquid gasket applied to the surfaces.

- ① : Front cover
③ : Cylinder head
A : Liquid gasket application face



4. Tighten mounting bolts of camshaft brackets in the following steps, in the order from 1 to 11 as shown in the figure.

- A : Intake side
B : Exhaust side
➡ : Engine front

- a. Tighten No. 9 to 11 in numerical order.

: **1.96 N·m (0.2 kg-m, 17 in-lb)**

- b. Tighten No. 1 to 8 in numerical order.

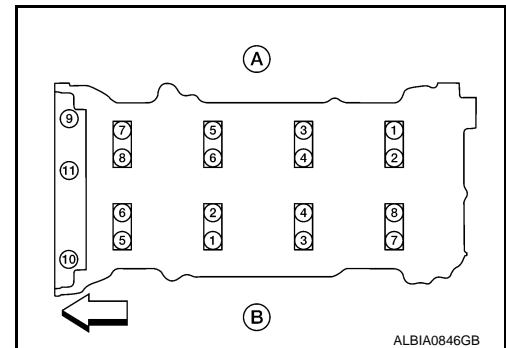
: **1.96 N·m (0.2 kg-m, 17 in-lb)**

- c. Tighten all bolts in numerical order.

: **5.88 N·m (0.6 kg-m, 52 in-lb)**

- d. Tighten all bolts in numerical order.

: **10.41 N·m (1.1 kg-m, 8 ft-lb)**



CAUTION:

After tightening mounting bolts of camshaft brackets, be sure to wipe off excessive liquid gasket from the parts listed below.

- Mating surface of rocker cover.
- Mating surface of front cover. (When installed without front cover)

5. Install the camshaft sprocket to the camshaft with the following procedure.

- a. Install them by aligning the mating marks A on each camshaft sprocket with the ones painted on timing chain link plate during removal.

- ① : Camshaft sprocket (INT)
② : Camshaft sprocket (EXH)

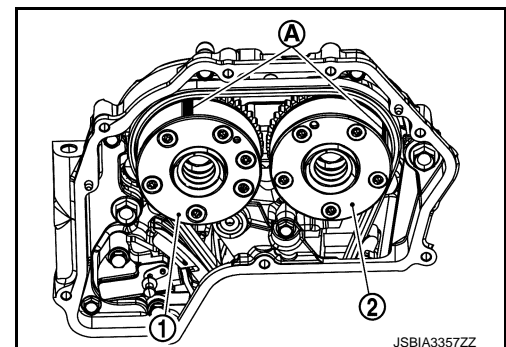
CAUTION:

- Aligned mating marks could slip. Therefore, after matching them, hold the timing chain in place by hand.
- Before and after installing chain tensioner, check again that mating marks have not slipped.

NOTE:

Before installation of chain tensioner, it is possible to re-match the marks on timing chain with the ones on each sprocket.

- b. Tighten bolts in the following steps.
- Secure the hexagonal part of camshaft using wrench to tighten mounting bolt.
- i. Tighten camshaft mounting bolt.



: 50.0 N·m (5.1 kg-m, 36.8 ft-lb)

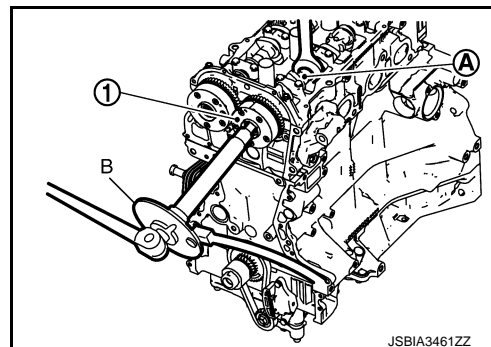
- ii. Turn 45 - 50 degrees clockwise (angle tightening).

CAUTION:

Check the tightening angle by using an angle wrench [SST: KV10112100](B) or protractor. Never judge by visual inspection without an angle wrench.

① : Camshaft sprocket

Ⓐ : Camshaft hexagonal part



6. Install chain tensioner.

CAUTION:

After installation, pull the stopper pin off completely, and check that chain tensioner plunger is released.

7. Install chain guide.

8. Install valve timing control cover with the following procedure:

- Install intake valve timing control solenoid valve and exhaust valve timing control solenoid valve to valve timing control cover if removed.
- Install new O-rings to the camshaft sprocket (INT and EXH) insertion points on backside of valve timing control cover.
- Install new O-ring to front cover.
- Apply liquid gasket ⑤ with a tube presser (Commercial Service Tool) to valve timing control cover ① as shown in the figure.

ⓑ : 4.3 - 5.3 mm (0.169 - 0.208 in)

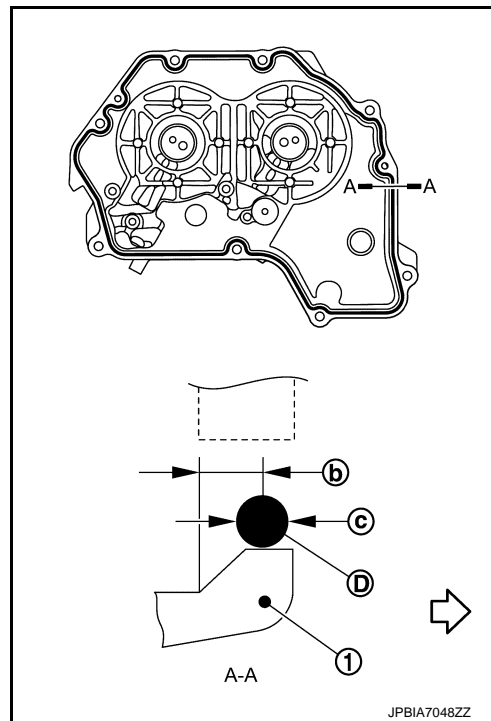
ⓒ : ϕ 3.4 - 4.4 mm (0.134 - 0.173 in)

⇐ : Engine outside

Use Genuine Liquid Gasket (TB1217H) or equivalent.

CAUTION:

Attaching should be done within 5 minutes after liquid gasket application.

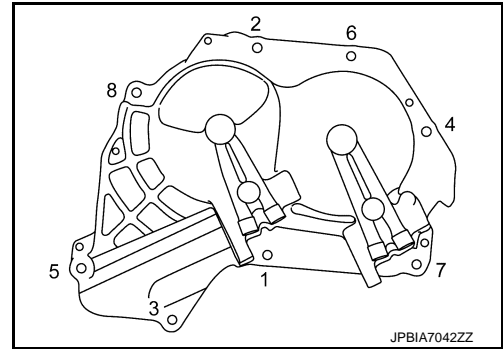


CAMSHAFT

< REMOVAL AND INSTALLATION >

[QR25DE]

- e. Tighten mounting bolts in the order from 1 to 8 as shown in the figure.



9. Install camshaft position sensor bracket.
a. Apply liquid gasket with a tube presser (commercial service tool) to camshaft position sensor bracket as shown in the figure.

⇐ : Engine front

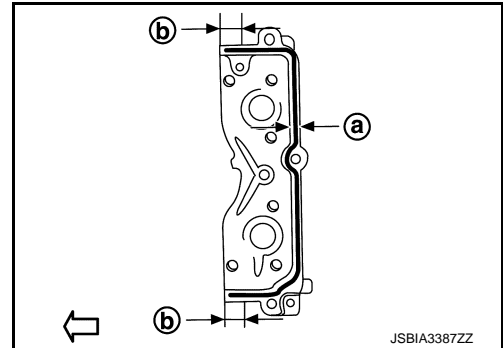
(a) : 2.0 – 3.0 mm (0.079 – 0.118 in)

(b) : 10.5 mm (0.413 in)

Use Genuine Liquid Gasket (TB1217H) or equivalent.

CAUTION:

- After installation, be sure to wipe off any excessive liquid gasket leaking from part “(b)”.
- Attaching should be done within 5 minutes after liquid gasket application.
- Do not fill the engine with engine oil for at least 30 minutes after the components are installed to allow the liquid gasket to cure.



- b. Tighten mounting bolts in the order from 1 to 3 as shown in the figure.

⇐ : Engine front

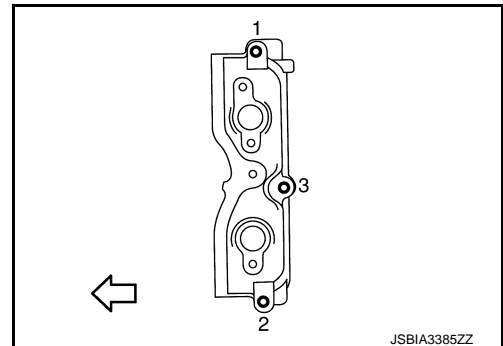
10. Install camshaft position sensor (PHASE) and exhaust valve timing control position sensor.

CAUTION:

Do not reuse O-ring.

11. Inspect and adjust valve clearance. Refer to [EM-16, "Inspection and Adjustment"](#).

12. Install in the reverse order of removal after this step.



Inspection

INFOID:0000000011616481

INSPECTION AFTER REMOVAL

Camshaft Runout

1. Put V-block on a precise flat table, and support No. 2 and 5 journal of camshaft.

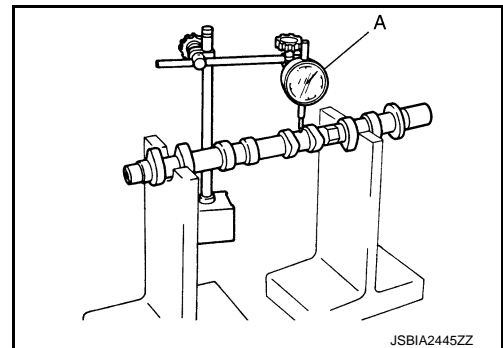
CAUTION:

Never support No. 1 journal (on the side of camshaft sprocket) because it has a different diameter from the other four locations.

2. Set dial indicator (A) vertically to No. 3 journal.
3. Turn camshaft to one direction with hands, and measure the camshaft runout on dial indicator. (Total indicator reading)

Standard : Refer to [EM-126, "Camshaft"](#).

4. If out of the standard, replace camshaft.



CAMSHAFT

< REMOVAL AND INSTALLATION >

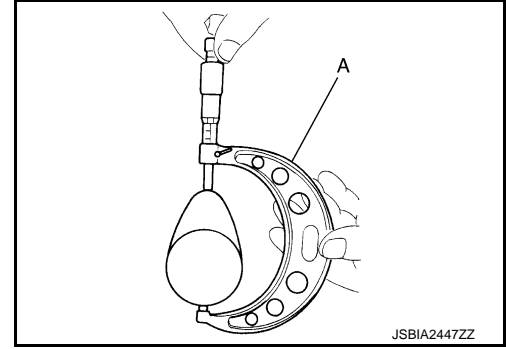
[QR25DE]

Camshaft Cam Height

1. Measure the camshaft cam height with a micrometer (A).

Standard and Limit : Refer to [EM-126, "Camshaft"](#).

2. If it exceeds the limit, replace camshaft.

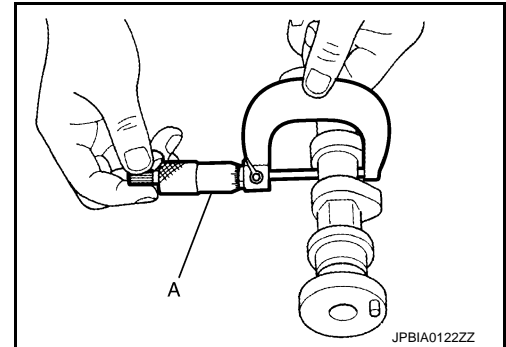


Camshaft Journal Oil Clearance

CAMSHAFT JOURNAL DIAMETER

Measure the outer diameter of camshaft journal with a micrometer (A).

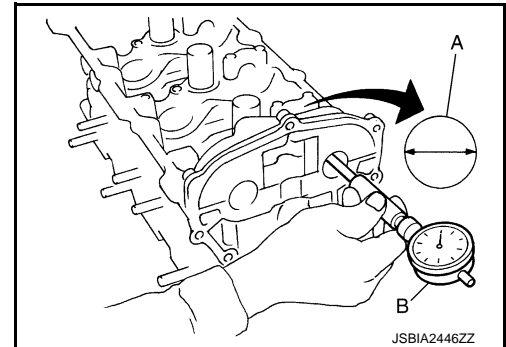
Standard : Refer to [EM-126, "Camshaft"](#).



CAMSHAFT BRACKET INNER DIAMETER

- Tighten camshaft bracket bolts with specified torque. Refer to [EM-66, "Removal and Installation"](#).
- Measure the inner diameter (A) of camshaft bracket with an cylinder gauge (B).

Standard : Refer to [EM-126, "Camshaft"](#).



CAMSHAFT JOURNAL OIL CLEARANCE

- (Oil clearance) = (Camshaft bracket inner diameter) – (Camshaft journal diameter)

Standard : Refer to [EM-126, "Camshaft"](#).

- If out of the standard, replace either or both camshaft and cylinder head.

NOTE:

Camshaft bracket cannot be replaced as a single part, because it is machined together with cylinder head. Replace whole cylinder head assembly.

Camshaft End Play

1. Install camshaft in cylinder head. Refer to [EM-66, "Removal and Installation"](#).

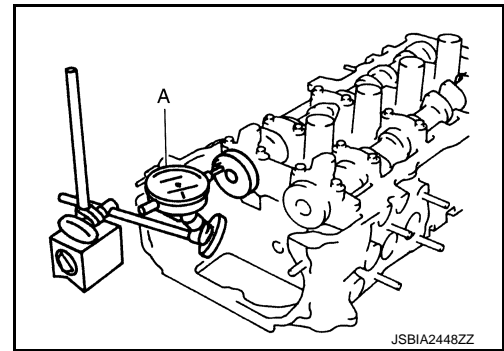
CAMSHAFT

< REMOVAL AND INSTALLATION >

[QR25DE]

- Install dial indicator (A) in thrust direction on front end of camshaft. Read the end play of dial indicator when camshaft is moved forward/backward (in direction to axis).

Standard : Refer to [EM-126, "Camshaft"](#).



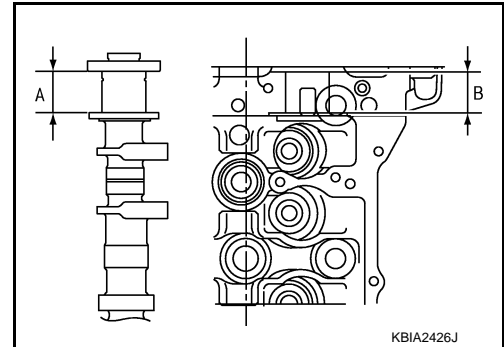
- Measure the following parts if out of the standard.
- Dimension "A" for camshaft No. 1 journal

Standard : 25.800 - 25.848 mm (1.0157 - 1.0176 in)

- Dimension "B" for cylinder head No. 1 journal

Standard : 25.660 - 25.685 mm (1.0102 - 1.0112 in)

- Refer to the standards above, and then replace camshaft and/or cylinder head.



Camshaft Sprocket Runout

- Put V-block on precise flat table, and support No. 2 and 5 journals of camshaft.

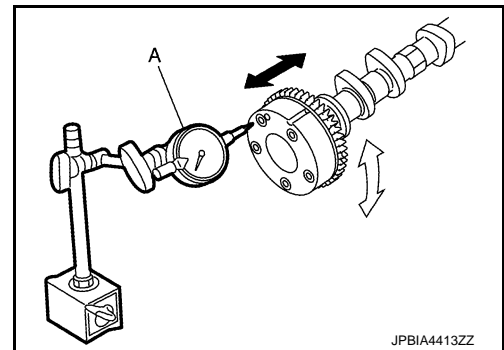
CAUTION:

Never support No. 1 journal (on the side of camshaft sprocket) because it has a different diameter from the other four locations.

- Measure the camshaft sprocket runout with a dial indicator (A). (Total indicator reading)

Limit : Refer to [EM-126, "Camshaft"](#).

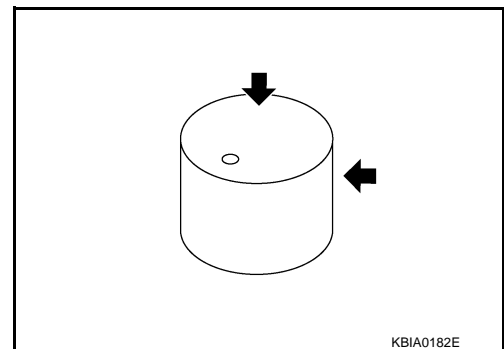
- If it exceeds the limit, replace camshaft sprocket.



Valve Lifter

Check if surface of valve lifter has any wear or cracks.

- If anything above is found, replace valve lifter. Refer to [EM-126, "Camshaft"](#).



Valve Lifter Clearance

VALVE LIFTER OUTER DIAMETER

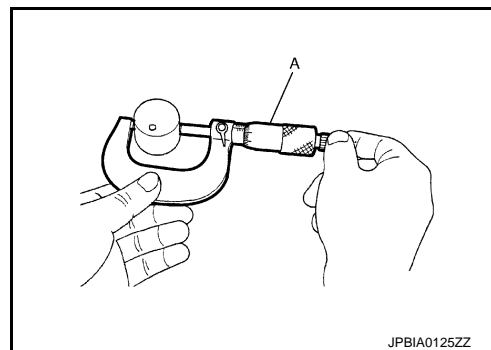
CAMSHAFT

[QR25DE]

< REMOVAL AND INSTALLATION >

- Measure the outer diameter of valve lifter with a micrometer (A).

Standard : Refer to [EM-126, "Camshaft"](#).



VALVE LIFTER HOLE DIAMETER

Measure the diameter of valve lifter hole of cylinder head with an inside micrometer (A).

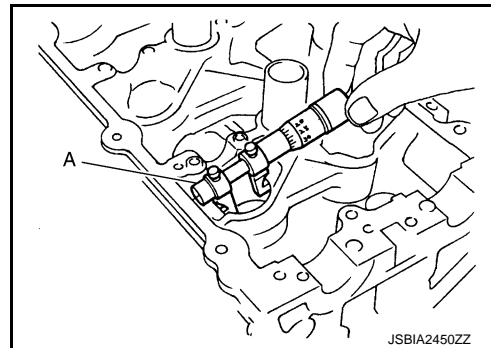
Standard : Refer to [EM-126, "Camshaft"](#).

VALVE LIFTER CLEARANCE

- (Valve lifter clearance) = (Valve lifter hole diameter) – (Valve lifter outer diameter)

Standard : Refer to [EM-126, "Camshaft"](#).

- If out of the standard, referring to the each standard of valve lifter outer diameter and valve lifter hole diameter, replace either or both valve lifter and cylinder head.



INSPECTION AFTER INSTALLATION

Inspection of Camshaft Sprocket Oil Groove.

CAUTION:

- Perform this inspection only when DTC P0011 and DTC P0014 is detected in self-diagnostic results of CONSULT and it is directed according to inspection procedure of EC section. Refer to [EC-167, "DTC Description"](#) (P0011), [EC-171, "DTC Description"](#) (P0014).
- Check when the engine is cold so as to prevent burns from any splashing engine oil.

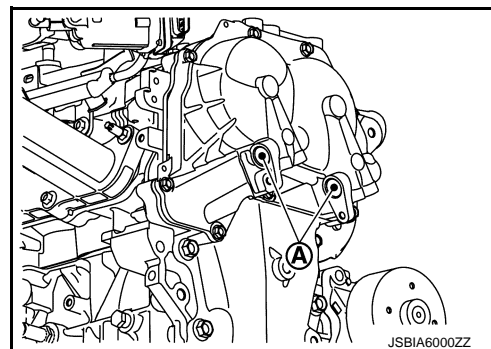
1. Check the engine oil level. Refer to [LU-8, "Inspection"](#).
2. Perform the following procedure so as to prevent the engine from being unintentionally started while checking.
 - a. Release fuel pressure. Refer to [EC-146, "Work Procedure"](#).
 - b. Disconnect ignition coil and injector harness connectors.
3. Remove intake valve timing control solenoid valve and exhaust valve timing control solenoid valve. Refer to [EM-54, "Exploded View"](#).
4. Crank the engine, and then check that engine oil comes out from valve timing control cover oil hole (A). End crank after checking.

WARNING:

Be careful not to touch rotating parts (drive belt, idler pulley, and crankshaft pulley, etc.).

CAUTION:

Engine oil may squirt from intake valve timing control solenoid valve and exhaust valve timing control solenoid valve installation hole during cranking. Use a shop cloth to prevent the engine components and the vehicle. Do not allow engine oil to get on rubber components such as drive belt or engine mount insulators. Immediately wipe off any splashed engine oil.



- Clean oil groove between oil strainer and intake valve timing control solenoid valve/ exhaust valve timing control solenoid valve if engine oil does not come out from valve timing control cover oil hole. Refer to [LU-6, "Engine Lubrication System"](#).

5. Remove components, and then check each oil groove for clogging. Clean oil groove if necessary. Refer to [LU-6, "Engine Lubrication System"](#).
 - Between intake valve timing control solenoid valve and camshaft sprocket (INT)
 - Between exhaust valve timing control solenoid valve and camshaft sprocket (EXH)
6. After inspection, install removed parts.

A
EM
C
D
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P

CYLINDER HEAD

< REMOVAL AND INSTALLATION >

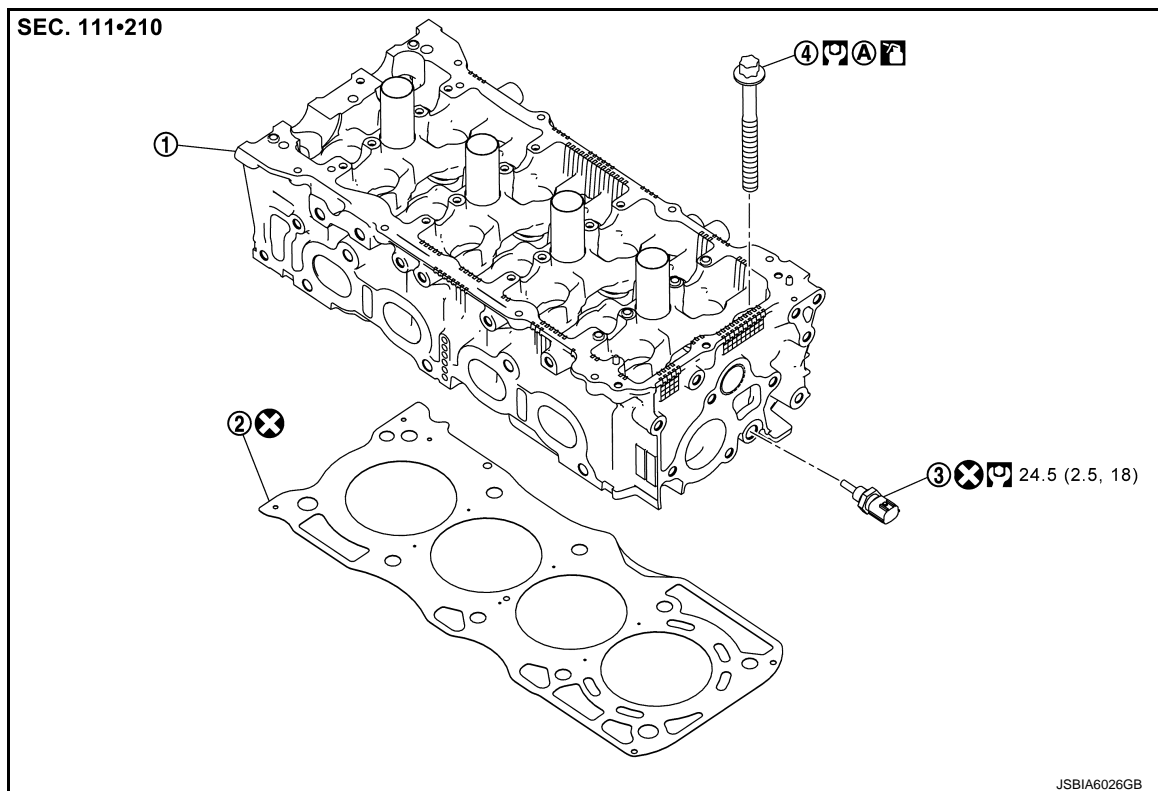
[QR25DE]

CYLINDER HEAD

Exploded View

INFOID:0000000011616482

REMOVAL

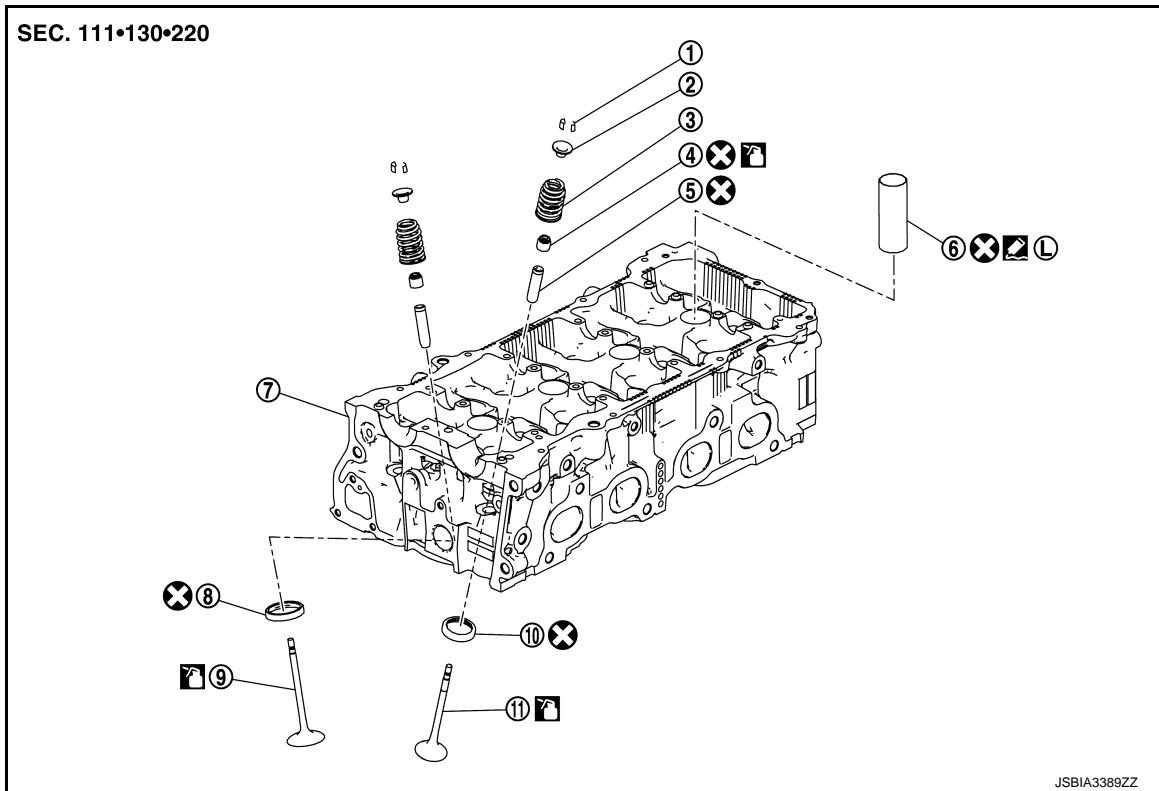


DISASSEMBLY

CYLINDER HEAD

< REMOVAL AND INSTALLATION >

[QR25DE]



- | | | |
|--------------------|-------------------------|---|
| ① Valve collet | ② Valve spring retainer | ③ Valve spring (with valve spring seat) |
| ④ Valve oil seal | ⑤ Valve guide | ⑥ Spark plug tube |
| ⑦ Cylinder head | ⑧ Valve seat (INT) | ⑨ Valve (INT) |
| ⑩ Valve seat (EXH) | ⑪ Valve (EXH) | |

(L) : Apply thread locking sealant.

(X) : Always replace after every disassembly.

(oil can) : Should be lubricated with oil.

Removal and Installation

INFOID:0000000011616483

REMOVAL

1. Drain engine oil. Refer to [LU-9, "Draining"](#).
2. Drain engine coolant. Refer to [CO-11, "Draining"](#).
3. Remove the following components and related parts.
 - Intake manifold: Refer to [EM-35, "Removal and Installation"](#).
 - Fuel tube assembly: Refer to [EM-42, "Removal and Installation"](#).
 - Exhaust manifold and three way catalyst assembly: Refer to [EM-39, "Removal and Installation"](#).
 - Water outlet: Refer to [CO-28, "Exploded View"](#).

NOTE:

Can be removed and installed even when assembled with cylinder head.

4. Remove power steering oil pump from bracket with piping connected, and temporarily secure it aside. Refer to [ST-32, "Removal and Installation"](#).
5. Remove front cover and timing chain. Refer to [EM-54, "Exploded View"](#).
6. Remove camshafts. Refer to [EM-66, "Removal and Installation"](#).

CYLINDER HEAD

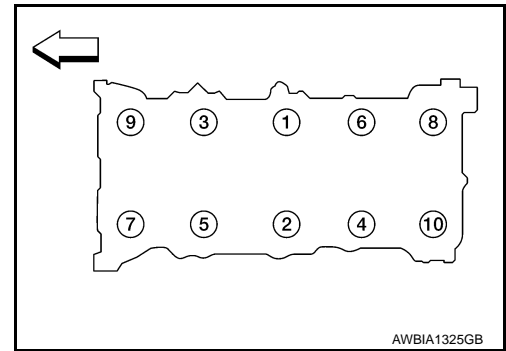
[QR25DE]

< REMOVAL AND INSTALLATION >

7. Remove cylinder head loosening bolts in the order from 10 to 1 as shown in the figure.

↩ : Engine front

- Using TORX socket (size E20), loosen cylinder head bolts.
8. Remove cylinder head gasket.
 9. Remove engine coolant temperature sensor, if necessary.



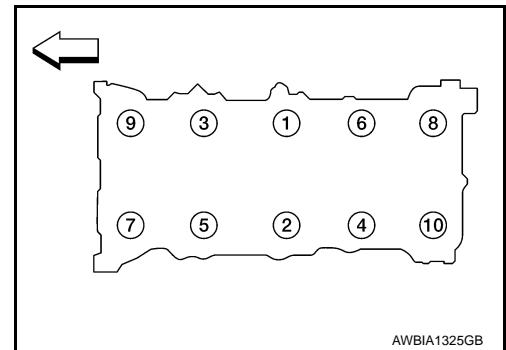
INSTALLATION


1. Install engine coolant temperature sensor, if removed.
CAUTION:
Do not reuse engine coolant temperature sensor.
2. Clean surfaces of cylinder head and cylinder block.
3. Install cylinder head gasket.
CAUTION:
Do not reuse cylinder head gasket.
4. Tighten cylinder head bolts in the order from 1 to 10 as shown in the figure with the following procedure, and install cylinder head.

↩ : Engine front

CAUTION:

- If cylinder head bolts are reused, check their outer diameters before installation. Refer to [EM-83, "Inspection"](#).
 - Clean threads and seating surfaces of bolts.
- a. Apply new engine oil to threads and seating surface of mounting bolts.
 - b. Tighten all bolts.



 : 50.0 N·m (5.1 kg-m, 37 ft-lb)

- c. Turn all bolts 60 degrees clockwise (angle tightening).
- d. Completely loosen.

 : 0 N·m (0 kg-m, 0 ft-lb)

CAUTION:

In this step, loosen bolts in reverse order of that indicated in the figure.

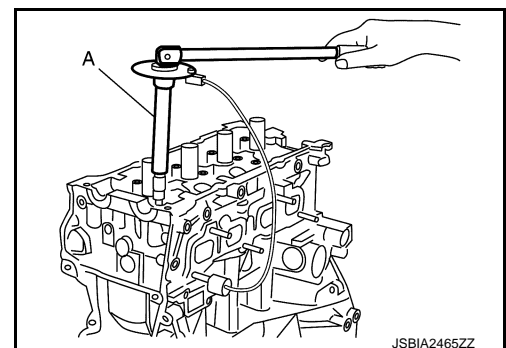
- e. Tighten all bolts.

 : 39.2 N·m (4.0 kg-m, 29 ft-lb)

- f. Turn all bolts 75 degrees clockwise (angle tightening).
- g. Turn all bolts 75 degrees clockwise again (angle tightening).

CAUTION:

Check and confirm the tightening angle by using an angle wrench [SST:KV10112100] (A) or protractor. Avoid judgment by visual inspection without the tool.



CYLINDER HEAD

< REMOVAL AND INSTALLATION >

[QR25DE]

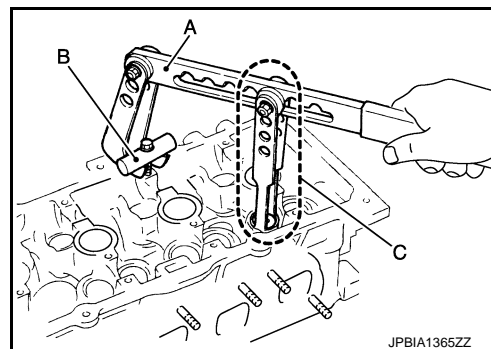
5. Install in the reverse order of removal after this step.

Disassembly and Assembly

INFOID:0000000011616484

DISASSEMBLY

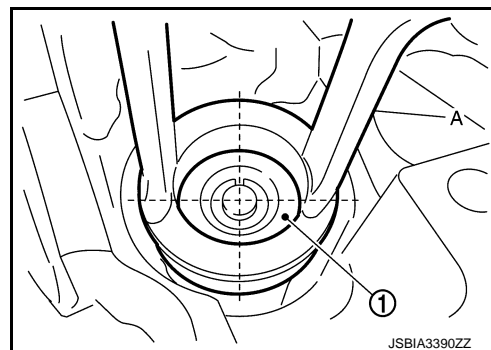
1. Remove spark plug with spark plug wrench (commercial service tool).
2. Remove spark plug tube, if necessary.
 - Using pliers, remove it from cylinder head.
- CAUTION:**
 - **Be careful not to damage cylinder head.**
 - **Never remove spark plug tube if not necessary. Once removed, spark plug tube cannot be reused because of deformation.**
3. Remove valve lifter.
 - Identify installation positions, and store them without mixing them up.
4. Remove valve collet.
 - Compress valve spring with valve spring compressor [SST: KV10116200] (A), adapter [SST: KV10109220] (B) and attachment [SST: KV10115900] (C).



CAUTION:

- **Never damage valve lifter holes.**
- **Fit the attachment [SST: KV10115900] (A) in the center of valve spring retainer to press it.**

① : Valve spring retainer

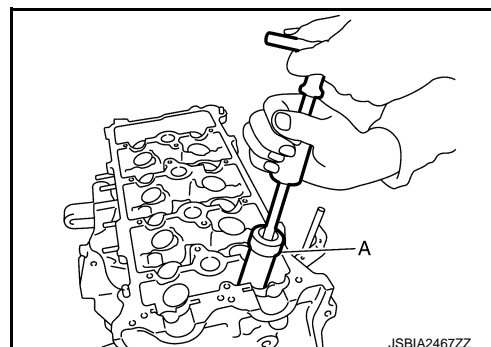


5. Remove valve spring retainer and valve spring (with valve spring seat).

CAUTION:

Never remove valve spring seat from valve spring.

6. Push valve stem to combustion chamber side, and remove valve.
 - Identify installation positions, and store them without mixing them up.
7. Remove valve oil seal with a valve oil seal puller [SST: KV10107902] (A).



CYLINDER HEAD

< REMOVAL AND INSTALLATION >

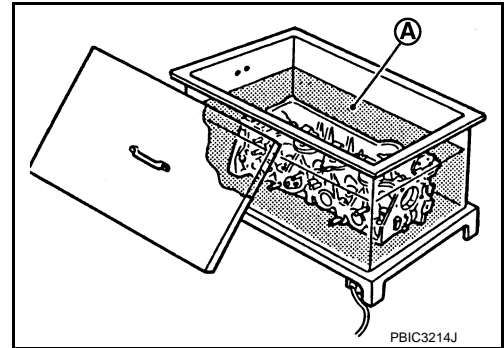
[QR25DE]

8. Remove valve seat, if valve seat must be replaced.
 - Bore out old seat until it collapses. Boring should not continue beyond the bottom face of the seat recess in cylinder head. Set the machine depth stop to ensure this. Refer to [EM-128, "Cylinder Head"](#).

CAUTION:

Prevent to scratch cylinder head by excessive boring.

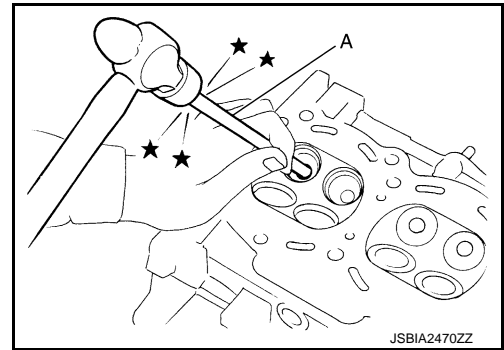
9. Remove valve guide, if valve guide must be replaced.
 - a. To remove valve guide, heat cylinder head to 110 to 130°C (230 to 266°F) by soaking in heated oil (A).



- b. Drive out valve guide with a press [under a 20 kN (2 ton, 2.2 US ton, 2.0 Imp ton) pressure] or hammer and valve guide drift (commercial service tool) (A).

CAUTION:

Cylinder head contains heat, when working, wear protective equipment to avoid getting burned.



ASSEMBLY

1. Install valve guide if removed.

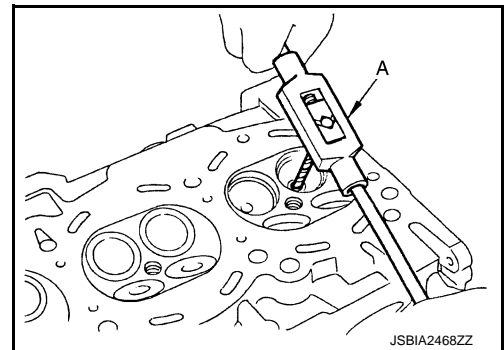
CAUTION:

Replace with oversize [0.2 mm (0.008 in)] valve guide.

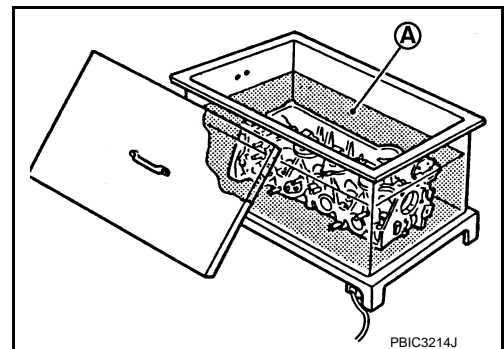
- a. Ream cylinder head valve guide hole with a valve guide reamer (commercial service tool) (A).

For service parts : Oversize [0.2 mm (0.008 in)]

Refer to [EM-128, "Cylinder Head"](#).



- b. Heat cylinder head to 110 to 130°C (230 to 266°F) by soaking in heated oil (A).



CYLINDER HEAD

< REMOVAL AND INSTALLATION >

[QR25DE]

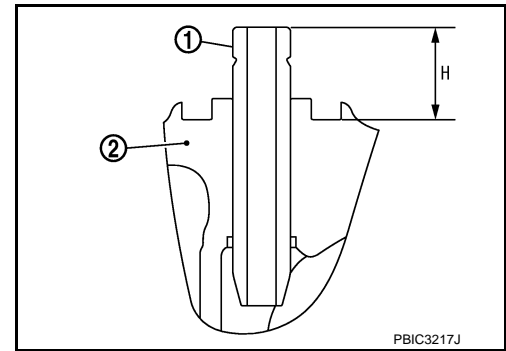
- c. Press valve guide ① from camshaft side to dimensions as shown in the figure.

② : Cylinder head

Projection "H" : Refer to [EM-128, "Cylinder Head"](#).

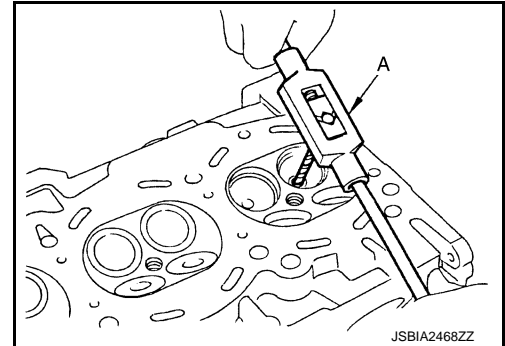
CAUTION:

Cylinder head contains heat, when working, wear protective equipment to avoid getting burned.



- d. Apply reamer finish to valve guide with a valve guide reamer (commercial service tool) (A).

Standard : Refer to [EM-128, "Cylinder Head"](#).



2. Install valve seat if removed.

CAUTION:

Replace with **oversize [0.5 mm (0.020 in)] valve seat**.

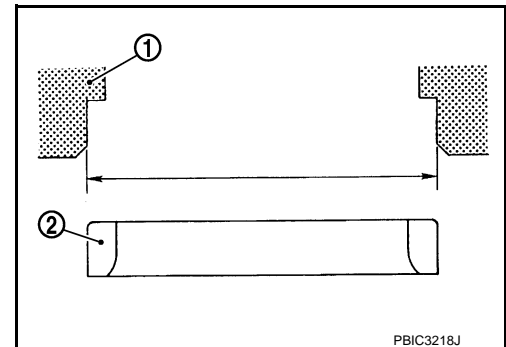
- a. Ream cylinder head ① recess diameter for service valve seat.

② : Valve seat

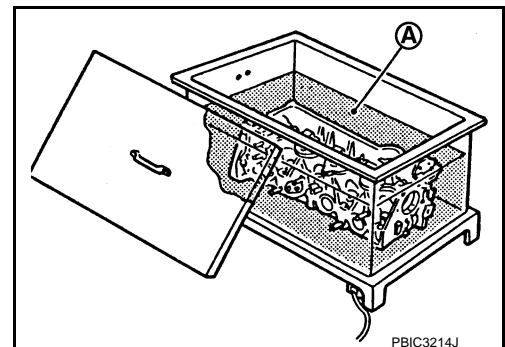
For service parts : **Oversize [0.5 mm (0.020 in)]**

Refer to [EM-128, "Cylinder Head"](#).

- Be sure to ream in circles concentric to the valve guide center. This will enable valve seat to fit correctly.



- b. Heat cylinder head to 110 to 130°C (230 to 266°F) by soaking in heated oil (A).



- c. Provide valve seats cooled well with dry ice. Press-fit valve seat into cylinder head.

CAUTION:

- **Avoid directly to touching cold valve seats.**
- **Cylinder head contains heat, when working, wear protective equipment to avoid getting burned.**

CYLINDER HEAD

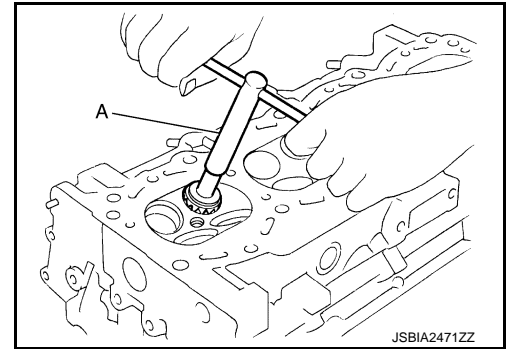
< REMOVAL AND INSTALLATION >

[QR25DE]

- d. Using valve seat cutter set (commercial service tool) (A) or valve seat grinder, finish valve seat to the specified dimensions. For dimensions, refer to [EM-128, "Cylinder Head"](#).

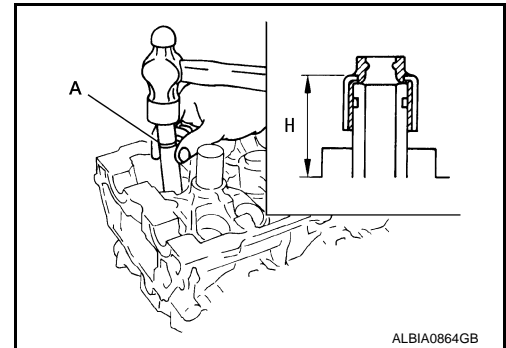
CAUTION:

When using valve seat cutter, firmly grip the cutter handle with both hands. Then, press on the contacting surface all around the circumference to cut in a single drive. Improper pressure on with the cutter or cutting many different times may result in stage valve seat.



- e. Using compound, grind to adjust valve fitting.
f. Check again for normal contact. Refer to [EM-83, "Inspection"](#).
3. Install valve oil seal.
• Install with a valve oil seal drift [SST: KV10115600] (A) to match dimension in the figure.
NOTE:
Dimension "H" is height that measured before installing valve spring (with valve spring seat).

Height "H" : 11.8 - 12.4 mm (0.465 - 0.488 in)



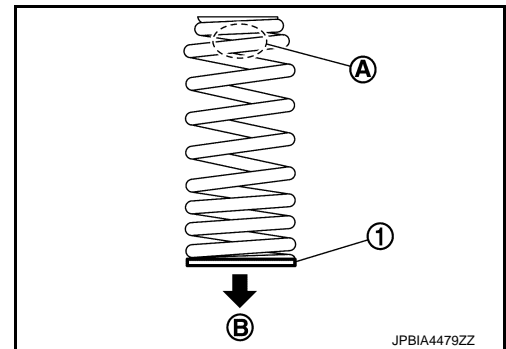
4. Install valve.
• Install larger diameter to intake side.
5. Install valve spring (with valve spring seat).
• Install smaller pitch (valve spring seat side) to cylinder head side (B).

① : Valve spring seat

- Confirm identification color (A) of valve spring.

Intake : White

Exhaust : Light blue

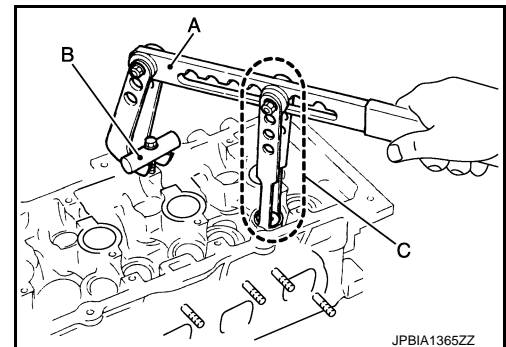


6. Install valve spring retainer.
7. Install valve collet.
• Compress valve spring with valve spring compressor [SST: KV10116200] (A), adapter [SST: KV10109220] (B) and attachment [SST: KV10115900] (C).

CAUTION:

When working, be careful not to damage valve lifter holes.

- Tap valve stem edge lightly with a plastic hammer after installation to check its installed condition.



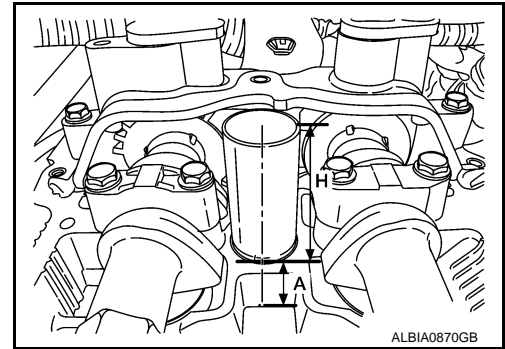
8. Install valve lifter.
• Install it in the original position.

CYLINDER HEAD

< REMOVAL AND INSTALLATION >

[QR25DE]

9. Install spark plug tube if removed.
 - Press-fit it into cylinder head with the following procedure:
- a. Remove old thread locking sealant from cylinder head side installation hole.
- b. Apply thread locking sealant all round on spark plug tube within approximately 12 mm (0.47 in) (A) width from edge of spark plug tube on the press-fit side.
Use Genuine Thread Locking Sealant or equivalent.
- c. Using a drift, press-fit spark plug tube so that height is as same as "H" shown in figure.



Standard press-fit height "H":

41.2 - 42.2 mm (1.622 - 1.661 in)

CAUTION:

- When press-fitting, be careful not to deform spark plug tube.
- After press-fitting, wipe off any protruding thread locking sealant on top surface of cylinder head.

10. Install spark plug with spark plug wrench (commercial service tool).

Inspection

INFOID:0000000011616485

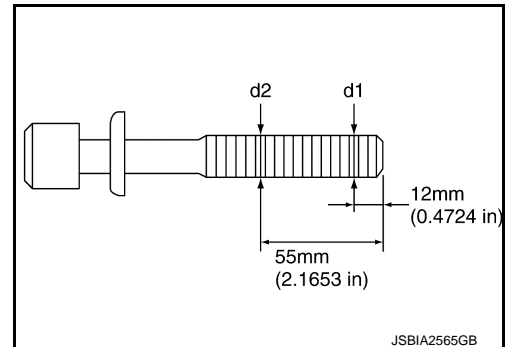
INSPECTION AFTER REMOVAL

Cylinder Head Bolts Outer Diameter

- Cylinder head bolts are tightened by plastic zone tightening method. Whenever the size difference between "d1" and "d2" exceeds the limit, replace them with a new one.

Limit ("d1" – "d2"): 0.23 mm (0.0091 in)

- If reduction of outer diameter appears in a position other than "d2", use it as "d2" point.



Cylinder Head Distortion

NOTE:

When performing this inspection, cylinder block distortion should be also checking. Refer to [EM-107, "Inspection"](#).

1. Using a scraper, wipe off oil, scale, gasket, sealant and carbon deposits from surface of cylinder head.

CAUTION:

Never allow gasket fragments to enter engine oil or engine coolant passages.

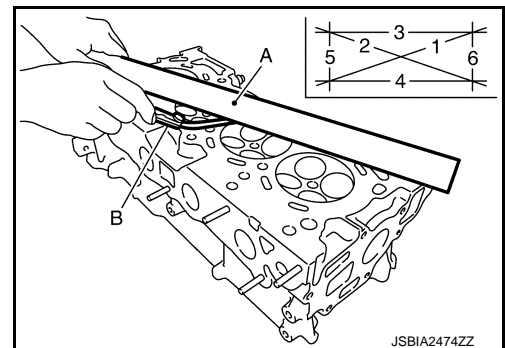
2. At each of several locations on bottom surface of cylinder head, measure the distortion in six directions.

A : Straightedge

B : Feeler gauge

Limit : Refer to [EM-128, "Cylinder Head"](#).

- If it exceeds the limit, replace cylinder head.



VALVE DIMENSIONS

- Check dimensions of each valve. For dimensions, refer to [EM-128, "Cylinder Head"](#).
- If dimensions are out of the standard, replace valve.

CYLINDER HEAD

< REMOVAL AND INSTALLATION >

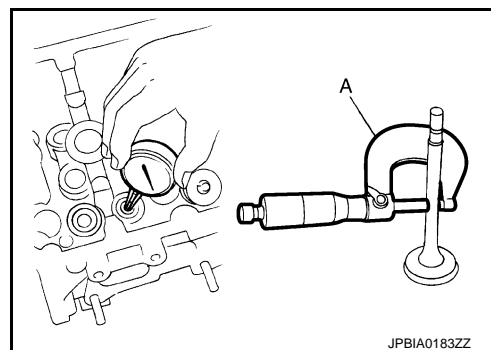
[QR25DE]

VALVE GUIDE CLEARANCE

Valve Stem Diameter

Measure the diameter of valve stem with a micrometer (A).

Standard : Refer to [EM-128, "Cylinder Head"](#).



Valve Guide Inner Diameter

Measure the inner diameter of valve guide with a bore gauge.

Standard : Refer to [EM-128, "Cylinder Head"](#).

Valve Guide Clearance

(Valve guide clearance) = (Valve guide inner diameter) – (Valve stem diameter).

Standard and Limit : Refer to [EM-128, "Cylinder Head"](#).

- If it exceeds the limit, replace valve guide and/or valve. When valve guide must be replaced. Refer to [EM-79, "Disassembly and Assembly"](#).

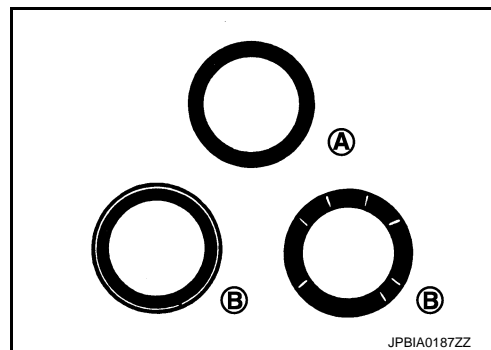
VALVE SEAT CONTACT

- After confirming that the dimensions of valve guides and valves are within specifications, perform this procedure.
- Apply prussian blue (or white lead) onto contacting surface of valve seat to check the condition of the valve contact on the surface.
- Check if the contact area band is continuous all around the circumference.

Ⓐ : OK

Ⓑ : NG

- If not, grind to adjust valve fitting and check again. If the contacting surface still has NG conditions even after the re-check, replace valve seat. Refer to [EM-79, "Disassembly and Assembly"](#).



VALVE SPRING SQUARENESS

- Set try square (A) along the side of valve spring and rotate the spring. Measure the maximum clearance between the top of valve spring and try square.

Ⓑ : Contact

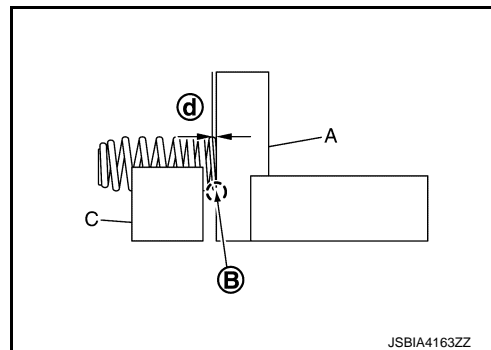
C : V-block

CAUTION:

Never remove valve spring seat from valve spring.

Limit Ⓓ : Refer to [EM-128, "Cylinder Head"](#).

- If it exceeds the limit, replace valve spring (with valve spring seat).



VALVE SPRING DIMENSIONS AND VALVE SPRING PRESSURE LOAD

CYLINDER HEAD

< REMOVAL AND INSTALLATION >

[QR25DE]

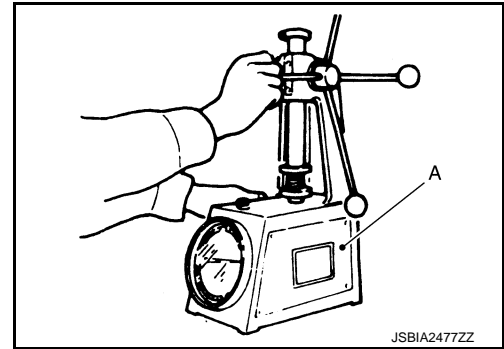
- Check valve spring pressure with valve spring seat installed at the specified spring height.

A : Valve spring tester

CAUTION:

Never remove valve spring seat from valve spring.

Standard : Refer to [EM-128, "Cylinder Head"](#).



- If the installation load or load with valve open is out of the standard, replace valve spring (with valve spring seat).

INSPECTION AFTER INSTALLATION

Inspection for Leaks

The following are procedures for checking fluids leak, lubricates leak and exhaust gases leak.

- Before starting engine, check oil/fluid levels including engine coolant and engine oil. If less than required quantity, fill to the specified level. Refer to [MA-32, "Fluids and Lubricants"](#).
- Use procedure below to check for fuel leakage.
 - Turn ignition switch "ON" (with engine stopped). With fuel pressure applied to fuel piping, check for fuel leakage at connection points.
 - Start engine. With engine speed increased, check again for fuel leakage at connection points.
- Run engine to check for unusual noise and vibration.
- Warm up engine thoroughly to check there is no leakage of fuel, exhaust gases, or any oil/fluids including engine oil and engine coolant.
- Bleed air from lines and hoses of applicable lines, such as in cooling system.
- After cooling down engine, again check oil/fluid levels including engine oil and engine coolant. Refill to the specified level, if necessary.

Summary of the inspection items:

Items		Before starting engine	Engine running	After engine stopped
Engine coolant		Level	Leakage	Level
Engine oil		Level	Leakage	Level
Transmission / transaxle fluid	AT & CVT Models	Leakage	Level / Leakage	Leakage
	MT Models	Level / Leakage	Leakage	Level / Leakage
Other oils and fluids*		Level	Leakage	Level
Fuel		Leakage	Leakage	Leakage
Exhaust gases		—	Leakage	—

*: Power steering fluid, brake fluid, etc.

FLYWHEEL

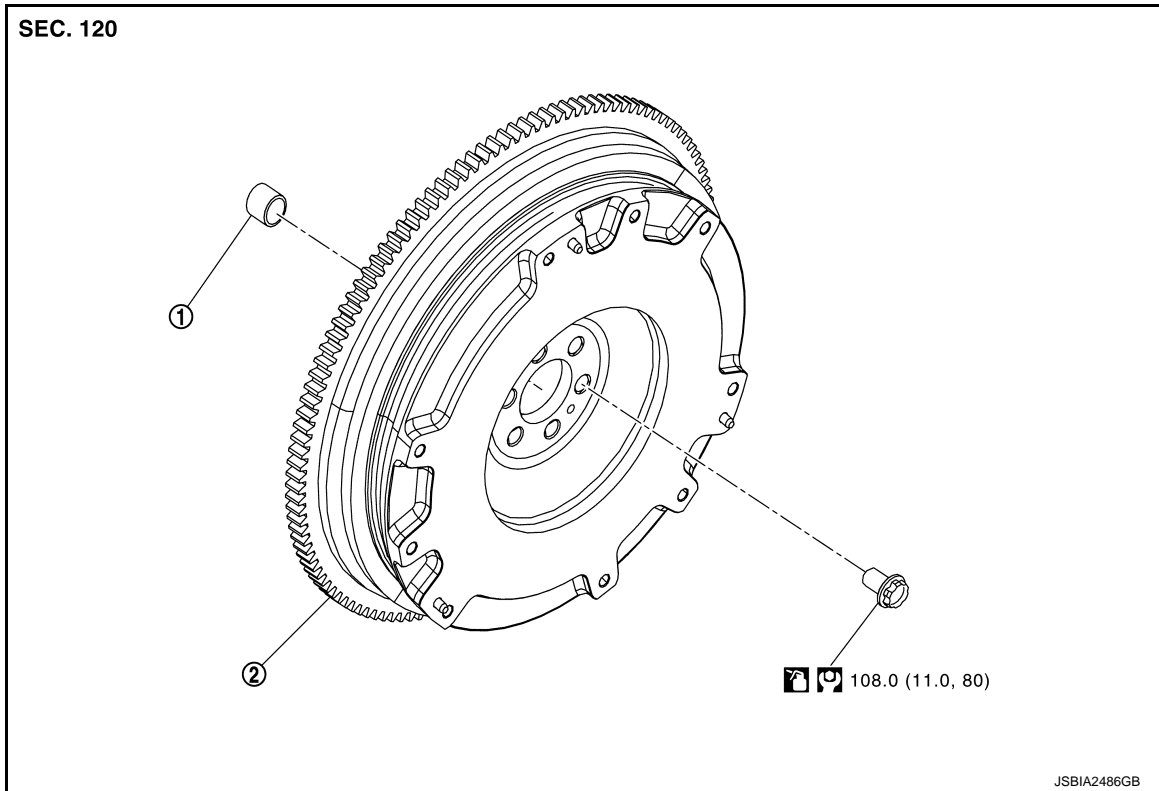
< REMOVAL AND INSTALLATION >

[QR25DE]

FLYWHEEL

Exploded View

INFOID:0000000011616473



① Pilot bushing

② Flywheel

: N·m (kg-m, ft-lb)

: Should be lubricated with oil.

Removal and Installation

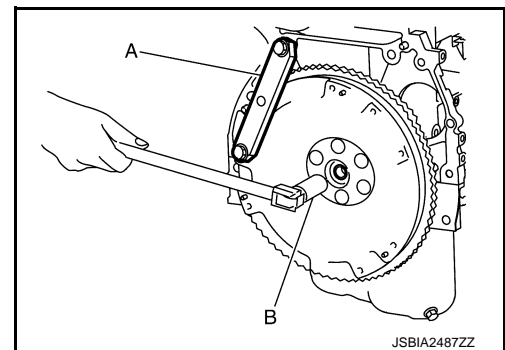
INFOID:0000000011616474

REMOVAL

1. Remove the transmission assembly from the vehicle. Refer to [TM-36, "2WD : Exploded View"](#).
2. Remove flywheel.
 - Secure flywheel with a stopper plate [SST: KV11105210] (A), and remove mounting bolts.
 - Using TORX socket (size E20) (B), loosen mounting bolts.
 - loosen mounting bolts in diagonal order.

CAUTION:

- **Never disassemble them.**

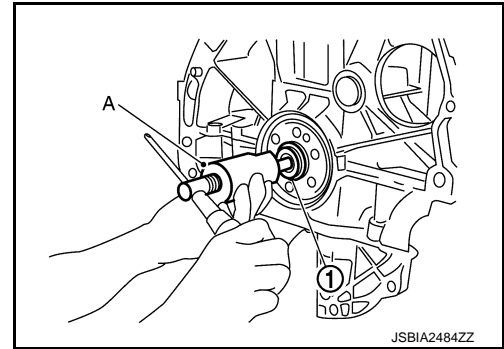


FLYWHEEL

< REMOVAL AND INSTALLATION >

[QR25DE]

3. Remove pilot bushing ①, from the rear end of the crankshaft.
Use a pilot bushing puller [SST: ST16610001] (A), if necessary.



INSTALLATION

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

- Fix crankshaft with a stopper plate [SST: KV11105210], and install mounting bolts using TORX [Size: E20].
- Install mounting bolts in diagonal order.

CAUTION:

- Be careful not to damage or scratch and contact surface for clutch disc of flywheel.
- Apply oil to mounting bolts.

Inspection

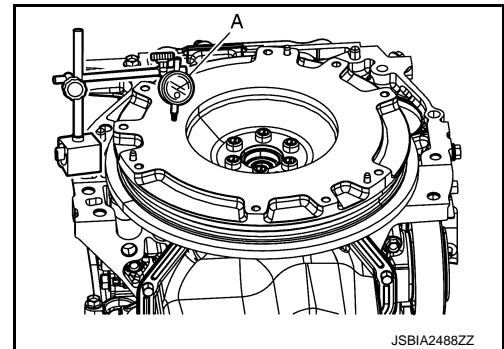
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FLYWHEEL DEFLECTION

- Measure the deflection of flywheel contact surface to torque with a dial indicator (A).
- Measure the deflection at 210 mm (8.27 in) diameter.

Limit : 0.45 mm (0.0177 in) or less.

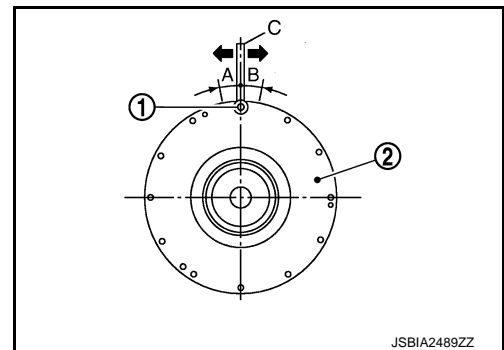
- If measured value is out of the standard, replace flywheel.
- If a trace of burn or discoloration is found on the surface, repair it with sandpaper.



MOVEMENT AMOUNT IN RADIAL (ROTATION) DIRECTION

Check the movement amount of radial (rotation) direction with the following procedure:

1. Install clutch cover mounting bolt ① to clutch cover mounting hole, and place a torque wrench (C) on the extended line of the flywheel ② center line.
 - Tighten bolt at a force of 9.8 N·m (1.0 kg-m, 87 in-lb) to keep it from loosening.
2. Put a mating mark on circumferences of the two flywheel masses without applying any load (Measurement standard points).
3. Apply a force of 9.8 N·m (1.0 kg-m, 87 in-lb) in each direction, and mark the movement amount on the mass on the transmission side.
4. Measure the dimensions of movement amounts "A" and "B" on circumference of the flywheel on the transmission side.



Limit : 35.2 mm (1.385 in) or less.

- If measured value is out of the standard, replace flywheel.

DRIVE PLATE

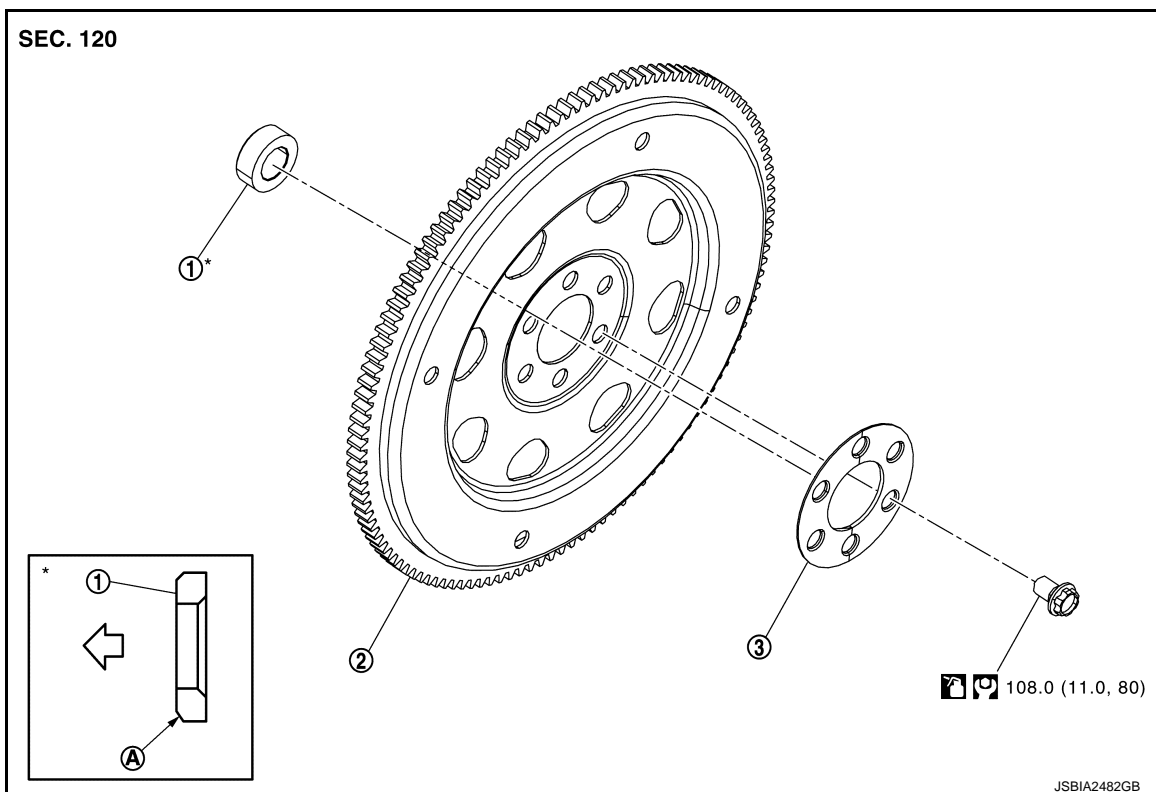
< REMOVAL AND INSTALLATION >

[QR25DE]

DRIVE PLATE

Exploded View

INFOID:000000012138476



① Pilot converter

② Drive plate

③ Reinforcement plate

Ⓐ Chamfered

⇐ :Crankshaft side

: N·m (kg-m, ft-lb)

: Should be lubricated with oil.

Removal and Installation

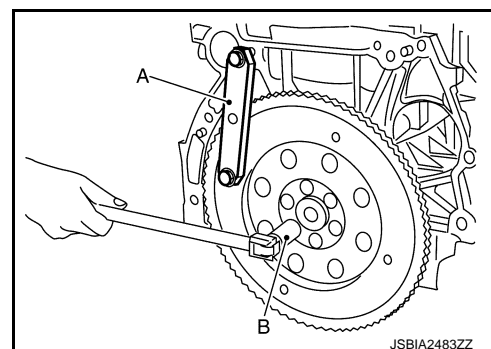
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REMOVAL

1. Remove the transmission assembly from the vehicle. Refer to [TM-327, "Removal and Installation"](#).
2. Remove drive plate with power tool. Fix crankshaft with a stopper plate [SST: KV11105210](A), and remove mounting bolts using TORX [Size: E20](B).
 - Loosen mounting bolts in diagonal order.
 - Check for deformation or damage of drive plate.

CAUTION:

- **Never disassemble them.**
- **Take care not to damage the periphery of the sensing area.**
- **Never touch drive plate with bare hands. Always use urethane coating gloves or skin gloves when removing these parts.**
- **Never use torn glove.**

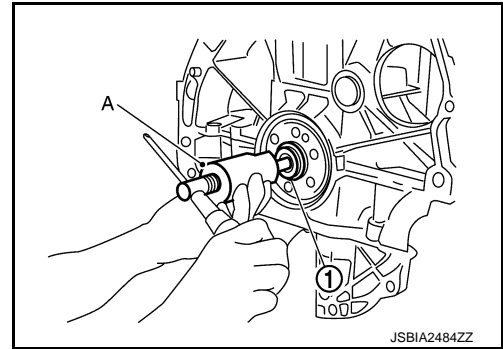


DRIVE PLATE

< REMOVAL AND INSTALLATION >

[QR25DE]

3. Remove pilot converter ①, from the rear end of the crankshaft. Use a pilot bushing puller (commercial service tool) (A), if necessary.



INSTALLATION

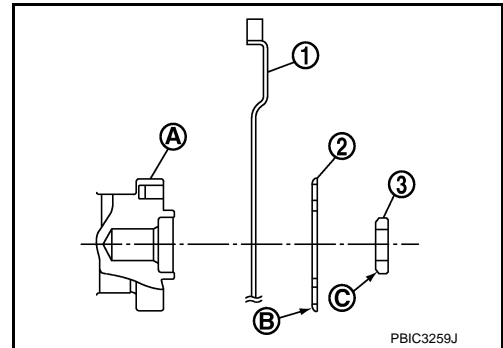
1. Install pilot converter.
2. Install drive plate in the reverse order of removal.
 - Install drive plate ①, reinforcement plate ② and pilot converter ③ as shown in figure.

- Ⓐ :Crankshaft rear end
Ⓑ :Rounded
Ⓒ :Chamfered

- Using a drift of 33 mm (1.30 in) in diameter, press-fit pilot converter into the end of crankshaft until it stops.
- Fix crankshaft with a stopper plate [SST: KV11105210], and install mounting bolts using TORX [Size: E20].
- Install mounting bolts in diagonal order.

CAUTION:

Apply oil to mounting bolts.



Inspection

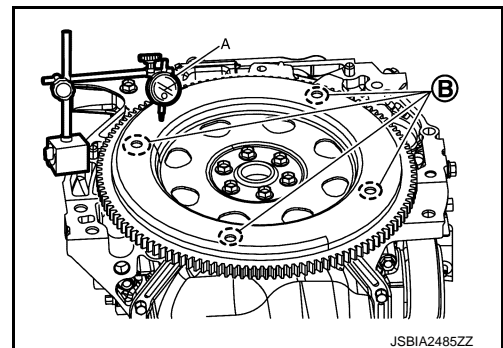
INFOID:0000000012138478

DRIVE PLATE DEFLECTION

- Measure the deflection of drive plate contact surface to torque converter with a dial indicator (A).
- Measure the deflection at the area limited between 11.0 mm(0.433 in) dia and 20.6 mm (0.811 in) dia around holeⒷ.

Limit : 0.20 mm (0.0078 in) or less.

- If measured value is out of the standard, replace drive plate.



OIL SEAL

VALVE OIL SEAL

VALVE OIL SEAL : Removal and Installation

INFOID:0000000011616466

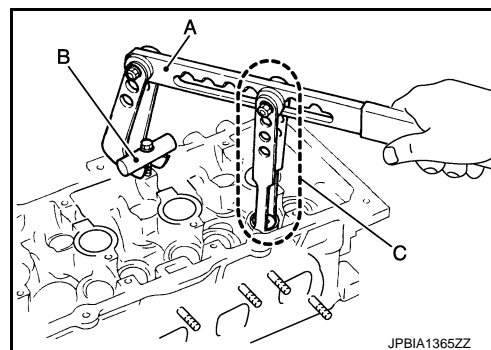
REMOVAL

1. Remove camshafts. Refer to [EM-65. "Exploded View"](#).
2. Remove valve lifters. Refer to [EM-65. "Exploded View"](#).
3. Rotate crankshaft, and set piston whose valve oil seal is to be removed to TDC. This will prevent valve from dropping into cylinder.

CAUTION:

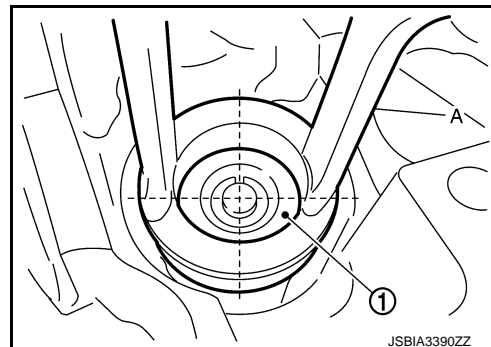
When rotating crankshaft, be careful to avoid scarring front cover with timing chain.

4. Remove valve collet.
 - Compress valve spring with valve spring compressor [SST: KV10116200] (A), attachment [SST: KV10115900] (C) and adapter [SST: KV10109220] (B). Remove valve collet with a magnet hand.

**CAUTION:**

- Be careful not to damage valve lifter holes.
- Install Tool (A) in the center of valve spring retainer to press it.

① : Valve spring retainer

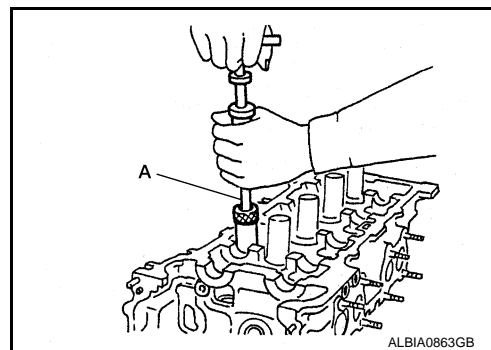


5. Remove valve spring retainer and valve spring (with valve spring seat).

CAUTION:

Never remove valve spring seat from valve spring.

6. Remove valve oil seal with a valve oil seal puller [SST: KV10107902] (A).



INSTALLATION

1. Apply new engine oil to valve oil seal joint surface and seal lip.

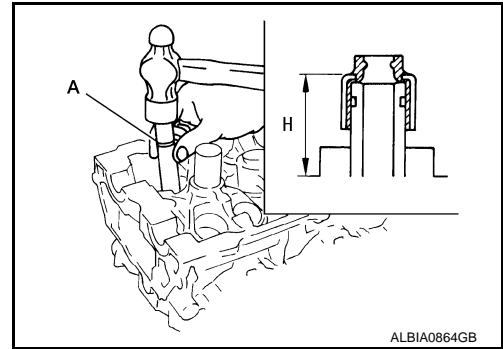
OIL SEAL

< REMOVAL AND INSTALLATION >

[QR25DE]

- Press in valve oil seal to the height "H" shown in the figure with a valve oil seal drift [SST: KV10115600] (A).

Height "H" : 11.8 - 12.4 mm (0.465 - 0.488 in)



- Install in the reverse order of removal after this step.

FRONT OIL SEAL

FRONT OIL SEAL : Removal and Installation

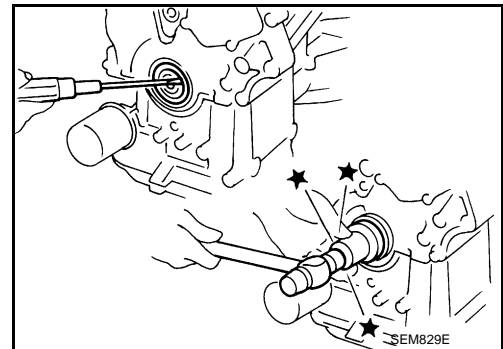
INFOID:000000011616467

REMOVAL

- Remove the following parts.
 - Front under cover: Refer to [EXT-24, "Exploded View"](#).
 - Drive belt: Refer to [EM-22, "Removal and Installation"](#).
 - Crankshaft pulley: Refer to [EM-54, "Exploded View"](#).
- Remove front oil seal with a suitable tool.

CAUTION:

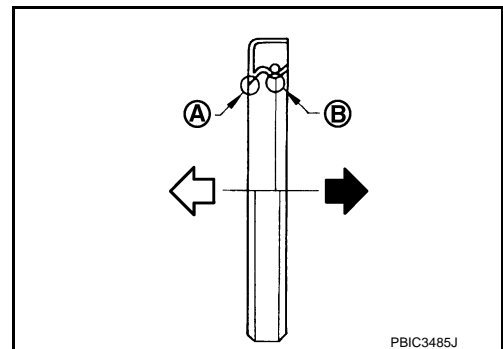
Be careful not to damage front cover and crankshaft.



INSTALLATION

- Apply new engine oil to seal lip.
- Install front oil seal so that each seal lip is oriented as shown in the figure.

- Ⓐ : Dust seal lip
Ⓑ : Oil seal lip
⇐ : Engine outside
➡ : Engine inside



OIL SEAL

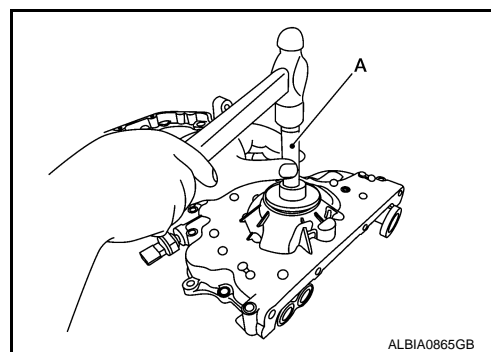
< REMOVAL AND INSTALLATION >

[QR25DE]

- Press-fit front oil seal until it is flush with front end surface of front cover using a drift (commercial service tool) (A) [outer diameter 56 mm (2.20 in) and inner diameter 48 mm (1.89 in)].

CAUTION:

- **Be careful not to damage front cover and crankshaft.**
- **Press-fit oil seal straight to avoid causing burrs or tilting.**
- **Never touch the grease applied to the oil seal lip.**



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3. Install in the reverse order of removal after this step.

REAR OIL SEAL

REAR OIL SEAL : Removal and Installation

INFOID:0000000011616468

REMOVAL

1. Remove transmission. Refer to [TM-36, "2WD : Exploded View"](#) (M/T models) or [TM-327, "Exploded View"](#) (A/T models).
2. Remove flywheel or drive plate. Refer to [EM-86, "Exploded View"](#) (flywheel) or [EM-88, "Exploded View"](#) (drive plate).
3. Remove rear oil seal with a suitable tool.

CAUTION:

Be careful not to damage crankshaft and cylinder block.

INSTALLATION

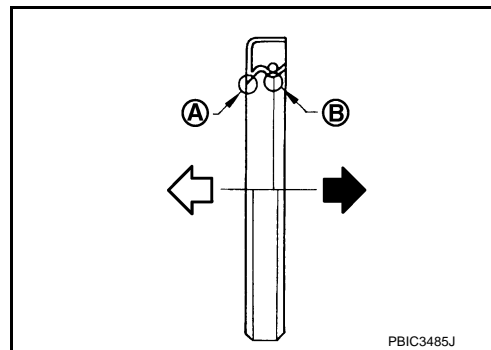
1. Apply new engine oil to seal lip.
2. Install rear oil seal so that each seal lip is oriented as shown in the figure.

Ⓐ : Dust seal lip

Ⓑ : Oil seal lip

⇐ : Drive plate side

⇐ : Engine front

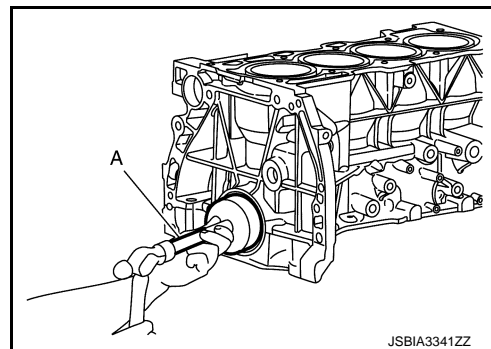


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- Press-fit rear oil seal with a drift (commercial service tool) (A) [outer diameter 102 mm (4.02 in), inner diameter 86 mm (3.39 in)].

CAUTION:

- **Be careful not to damage crankshaft and cylinder block.**
- **Press-fit oil seal straight to avoid causing burrs or tilting.**



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OIL SEAL

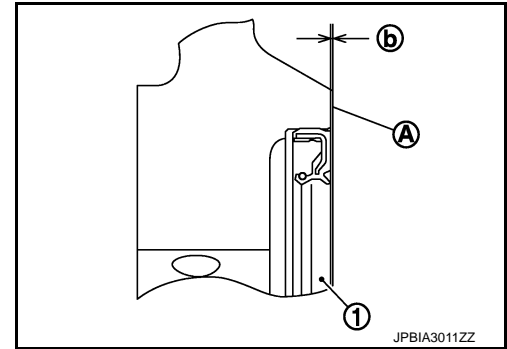
< REMOVAL AND INSTALLATION >

[QR25DE]

- Press in the new rear oil seal ① to the position ⑥ shown in the figure.

Ⓐ : Rear surface of cylinder block

⑥ : **0 - 0.5 mm (0 - 0.020 in)**



- Install in the reverse order of removal after this step.

A

EM

C

D

E

F

G

H

I

J

K

L

M

N

O

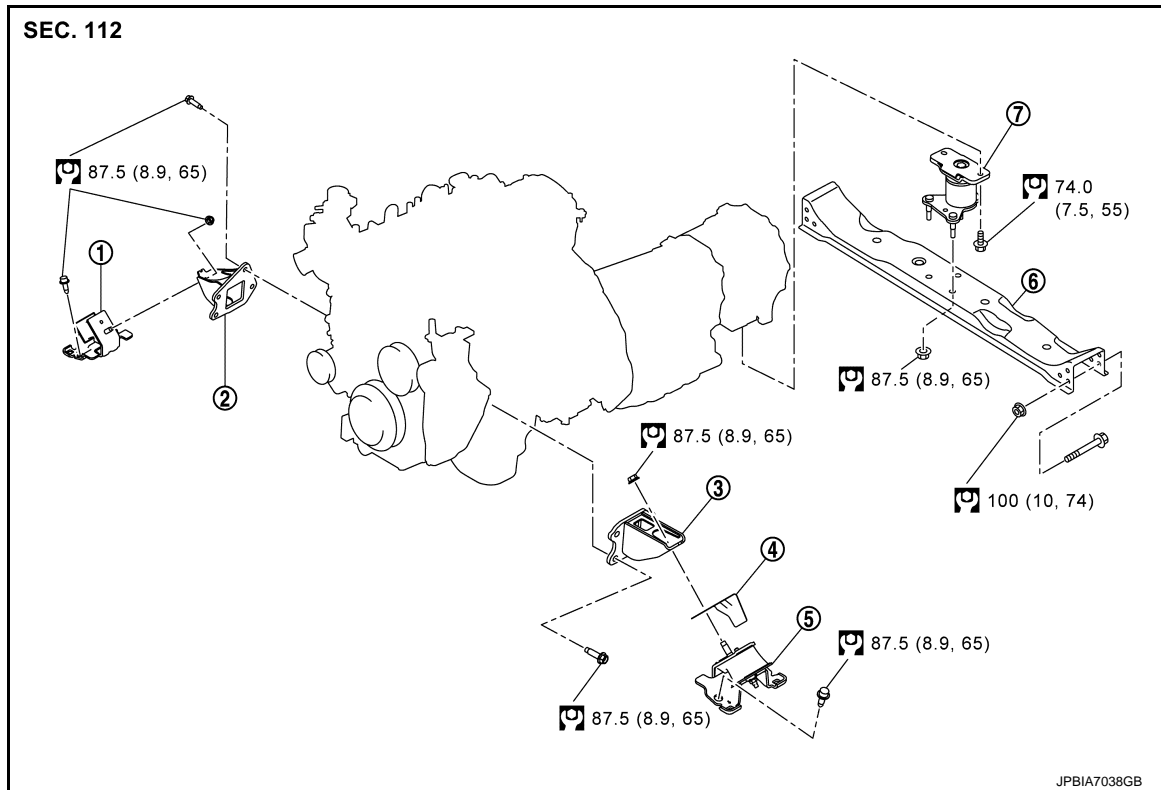
P

UNIT REMOVAL AND INSTALLATION

ENGINE ASSEMBLY

Exploded View

INFOID:0000000011616469



- | | | |
|------------------------------------|----------------------------------|--------------------------------|
| ① Engine mounting insulator (RH) | ② Engine mounting bracket (RH) | ③ Engine mounting bracket (LH) |
| ④ Heat insulator | ⑤ Engine mounting insulator (LH) | ⑥ Transmission cross member |
| ⑦ Engine mounting insulator (rear) | | |

: N·m (kg-m, ft-lb)

Removal and Installation

INFOID:0000000011616470

WARNING:

- Situate the vehicle on a flat and solid surface.
- Place chocks at front and back of rear wheels.
- Attach proper slingers and bolts described in PARTS CATALOG if engine slingers are not equipped.

CAUTION:

- Always be careful to work safely, avoid forceful or uninstructed operations.
- Never start working until exhaust system and coolant are cool enough.
- If items or work required are not covered by the engine section, refer to the applicable sections.
- Always use the support point specified for lifting.
- Use either 2-pole lift type or separate type lift as best you can. If board-on type is used for unavoidable reasons, support at the rear axle jacking point with a transmission jack or similar tool before starting work, in preparation for the backward shift of center of gravity.
- For supporting points for lifting and jacking point at rear axle, refer to [GI-30, "2-Pole Lift"](#) (for 2-pole lift) or [GI-29, "Garage Jack and Safety Stand"](#) (except for 2-pole lift).

NOTE:

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

REMOVAL

ENGINE ASSEMBLY

< UNIT REMOVAL AND INSTALLATION >

[QR25DE]

Preparation

1. Disconnect battery cable from negative terminal.
2. Drain engine coolant from radiator. Refer to [CO-11, "Draining"](#).
3. Remove the following parts.
 - Front under cover. Refer to [EXT-24, "Exploded View"](#).
 - Hood assembly: Refer to [DLK-162, "HOOD ASSEMBLY : Removal and Installation"](#) (WITH INTELLIGENT KEY SYSTEM) or [DLK-372, "HOOD ASSEMBLY : Removal and Installation"](#) (WITHOUT INTELLIGENT KEY SYSTEM).
 - Front grill. Refer to [EXT-19, "Exploded View"](#).
 - Air duct and air cleaner case: Refer to [EM-29, "Removal and Installation"](#).
 - Radiator hose (upper and lower): Refer to [CO-16, "Removal and Installation"](#).
4. Disconnect engine room harness from the engine side and set it aside for easier work.
5. Disconnect all the body-side vacuum hoses and air hoses at engine side.

Engine Room Front

1. Remove the radiator shroud (upper and lower). Refer to [CO-16, "Removal and Installation"](#).
2. Remove drive belt. Refer to [EM-22, "Removal and Installation"](#).
3. Remove the cooling fan assembly. Refer to [CO-21, "Removal and Installation"](#).
4. Remove the water pump pulley. Refer to [CO-21, "Removal and Installation"](#).

Engine Room RH

1. Remove alternator. Refer to [CHG-36, "QR25DE : Removal and Installation"](#).
2. Remove brake booster hose in engine side.
3. Remove the engine ground cable in engine side.

Engine Room LH

1. Remove power steering oil pump from bracket with piping connected, and temporarily secure it aside. Refer to [ST-32, "Removal and Installation"](#).
2. Disconnect heater hose, and install plug it to prevent engine coolant from draining. Refer to [HA-108, "HEATER & COOLING UNIT ASSEMBLY : Removal and Installation"](#). (With heater)
3. Remove A/C compressor from bracket with piping connected, and temporarily secure it aside. Refer to [HA-91, "COMPRESSOR : Removal and Installation"](#).

Vehicle Underbody

1. Remove exhaust front tube. Refer to [EX-5, "Removal and Installation"](#).
2. Remove rear propeller shaft. Refer to [DLN-143, "Exploded View"](#).
3. Remove clutch operating cylinder from transmission, and move it aside (M/T models). Refer to [CL-22, "QR25DE : Exploded View"](#).
4. Remove starter motor. Refer to [STR-43, "QR25DE : Exploded View"](#).
5. Remove A/T fluid cooler pipe. Refer to [TM-638, "Exploded View"](#). (A/T models)
6. Remove transmission assembly. Refer to [TM-36, "2WD : Exploded View"](#) (M/T models) or [TM-327, "Exploded View"](#) (A/T models).

Removal

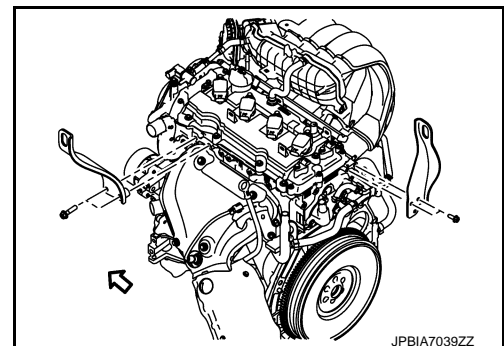
1. In order to attach the (rear) engine slinger, remove the engine cover bracket.
2. Install engine slingers into front left of cylinder head and rear right of cylinder head.

← : Engine front

Slinger bolts

Front side:  48.1 N·m (4.9 kg-m, 35 ft-lb)

Rear side:  28.0 N·m (2.9 kg-m, 21 ft-lb)



ENGINE ASSEMBLY

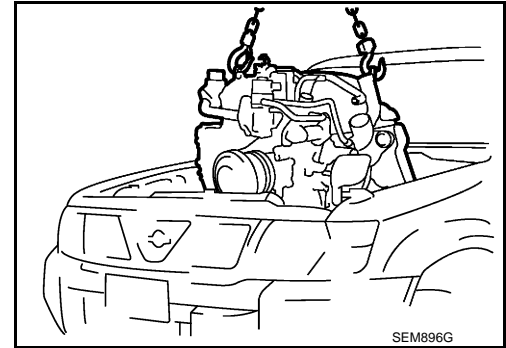
[QR25DE]

< UNIT REMOVAL AND INSTALLATION >

3. Lift with hoist and secure engine in position.
4. Loosen LH and RH engine mounting insulator mounting nuts.
5. Remove engine.

CAUTION:

- During the operation, check that no part interferes with body side.
- Before and during this lifting, always check if any harnesses are left connected.



INSTALLATION

Install in the reverse order of removal.

- Do not allow engine oil to get on mounting insulator. Be careful not to damage mounting insulator.
- When installation directions are specified, install parts according to the direction marks on them referring to figure of components.
- Check that each mounting insulator is seated properly, and tighten mounting bolts and nuts.

Inspection

INFOID:0000000011616471

INSPECTION AFTER INSTALLATION

Inspection for Leaks

The following are procedures for checking fluids leak, lubricates leak and exhaust gases leak.

- Before starting engine, check oil/fluid levels including engine coolant and engine oil. If less than required quantity, fill to the specified level. Refer to [MA-32. "Fluids and Lubricants"](#).
- Use procedure below to check for fuel leakage.
 - Turn ignition switch "ON" (with engine stopped). With fuel pressure applied to fuel piping, check for fuel leakage at connection points.
 - Start engine. With engine speed increased, check again for fuel leakage at connection points.
- Run engine to check for unusual noise and vibration.
- Warm up engine thoroughly to check there is no leakage of fuel, exhaust gases, or any oil/fluids including engine oil and engine coolant.
- Bleed air from lines and hoses of applicable lines, such as in cooling system.
- After cooling down engine, again check oil/fluid levels including engine oil and engine coolant. Refill to the specified level, if necessary.

Summary of the inspection items:

Items		Before starting engine	Engine running	After engine stopped
Engine coolant		Level	Leakage	Level
Engine oil		Level	Leakage	Level
Transmission / transaxle fluid	AT & CVT Models	Leakage	Level / Leakage	Leakage
	MT Models	Level / Leakage	Leakage	Level / Leakage
Other oils and fluids*		Level	Leakage	Level
Fuel		Leakage	Leakage	Leakage
Exhaust gases		—	Leakage	—

*: Power steering fluid, brake fluid, etc.

UNIT DISASSEMBLY AND ASSEMBLY

ENGINE STAND SETTING

Setting

INFOID:0000000011616472

EM

NOTE:

Explained here is how to disassemble with engine stand supporting transmission surface. When using different type of engine stand, note with difference in steps and etc.

1. Remove the engine from the vehicle. Refer to [EM-94, "Exploded View"](#).
2. Remove flywheel or drive plate. Refer to [EM-86, "Removal and Installation"](#) (flywheel) or [EM-88, "Removal and Installation"](#) (drive plate).
3. Lift the engine with a hoist to install it onto widely use engine stand.

CAUTION:

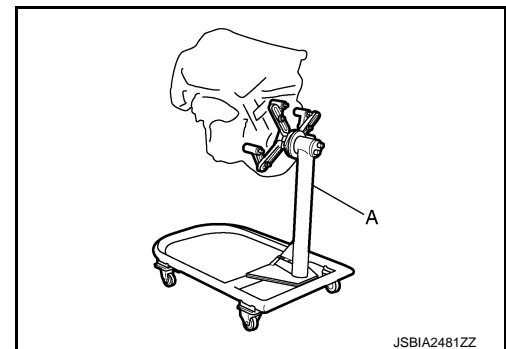
- Use the engine stand that has a load capacity [approximately 135 kg (298 lb) or more] large enough for supporting the engine weight.
- If the load capacity of stand is not adequate, remove the following parts beforehand to reduce the potential risk of overturning stand.
 - Intake manifold: Refer to [EM-35, "Exploded View"](#).
 - Exhaust manifold: Refer to [EM-39, "Exploded View"](#).
 - Rocker cover: Refer to [EM-31, "Exploded View"](#).

NOTE:

The figure shows an example of widely used engine stand (A) that can support mating surface of transmission.

CAUTION:

Before removing the hanging chains, check the engine stand is stable and there is no risk of overturning.



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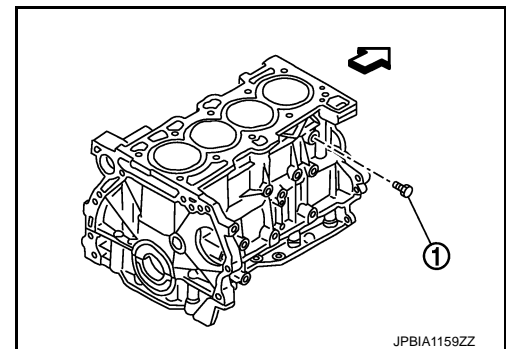
4. Drain engine oil. Refer to [LU-9, "Draining"](#).

CAUTION:

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

5. Drain engine coolant by removing water drain plug ① from inside of the engine.

← : Engine front



JPBIA1159ZZ

CYLINDER BLOCK

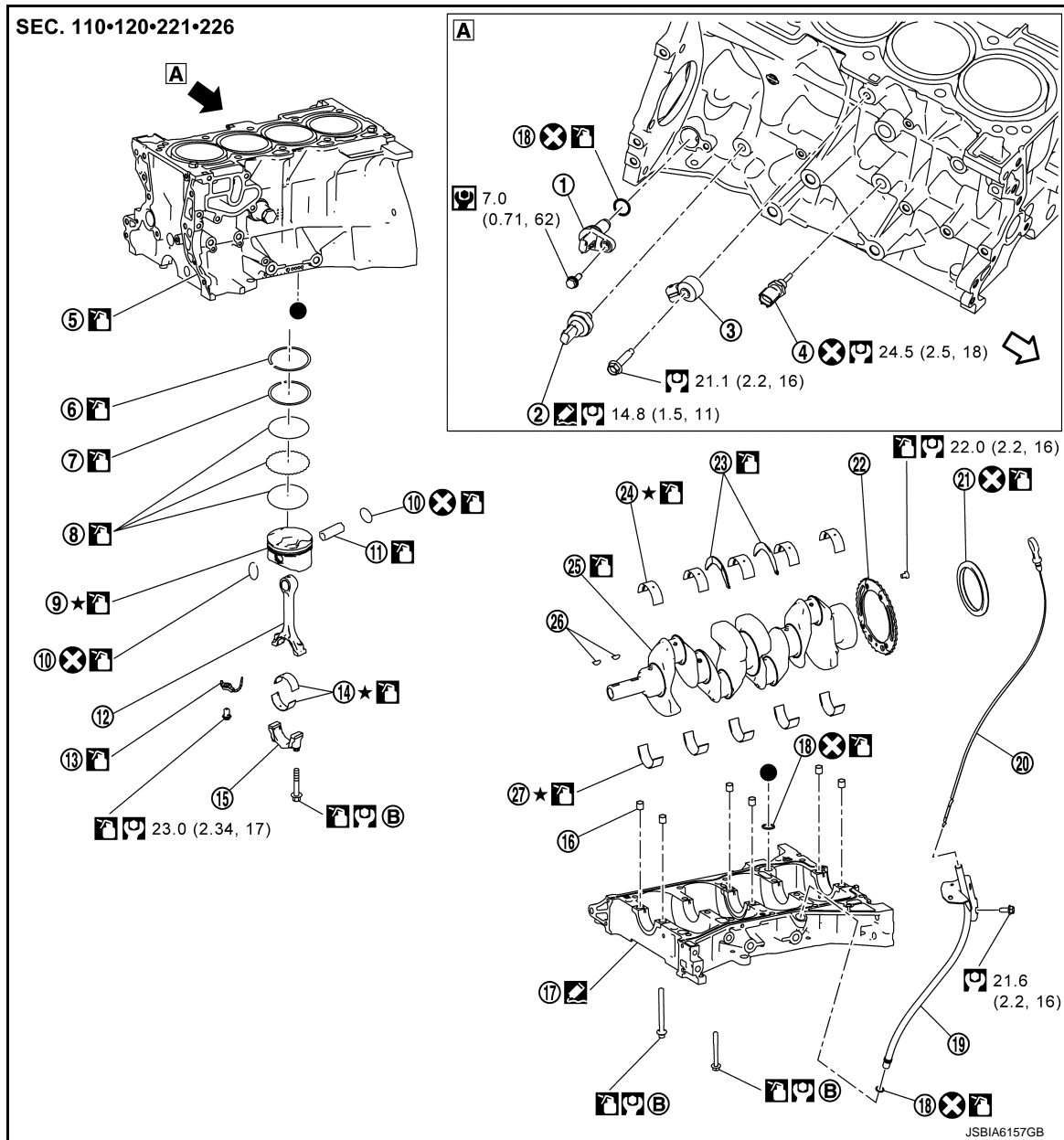
< UNIT DISASSEMBLY AND ASSEMBLY >

[QR25DE]

CYLINDER BLOCK

Exploded View

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- | | | |
|------------------------------------|--------------------------|------------------------------|
| ① Crankshaft position sensor (POS) | ② Oil pressure sensor | ③ Knock sensor |
| ④ Oil temperature sensor | ⑤ Cylinder block | ⑥ Top ring |
| ⑦ Second ring | ⑧ Oil ring | ⑨ Piston |
| ⑩ Snap ring | ⑪ Piston pin | ⑫ Connecting rod |
| ⑬ Oil jet | ⑭ Connecting rod bearing | ⑮ Connecting rod bearing cap |
| ⑯ Dowel pin | ⑰ Lower cylinder block | ⑱ O-ring |
| ⑲ Oil level gauge guide | ⑳ Oil level gauge | ㉑ Rear oil seal |
| ㉒ Signal plate | ㉓ Thrust bearing | ㉔ Main bearing upper |
| ㉕ Crankshaft | ㉖ Crankshaft key | ㉗ Main bearing lower |

A : View

B : Comply with the assembly procedure when tightening. Refer to [EM-99](#).

CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

[QR25DE]

↩ : Engine front

⊞ : N·m (kg-m, ft-lb)

⊞ : N·m (kg-m, in-lb)

⊗ : Always replace after every disassembly.

⊞ : Should be lubricated with oil.

⊞ : Sealing point

★ : Select with proper thickness.

● : Indicates that the part is connected at points with same symbol in actual vehicle.

Disassembly and Assembly

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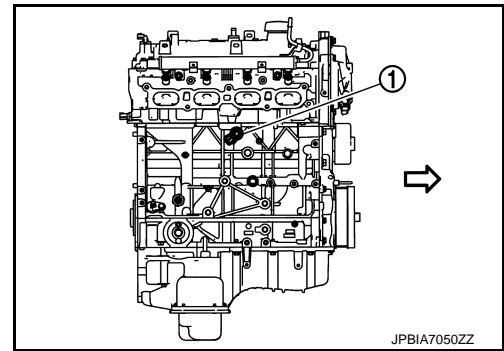
DISASSEMBLY

1. Remove cylinder head. Refer to [EM-76, "Exploded View"](#).
2. Remove knock sensor ①.

↩ : Engine front

CAUTION:

Carefully handle knock sensor avoiding shocks.



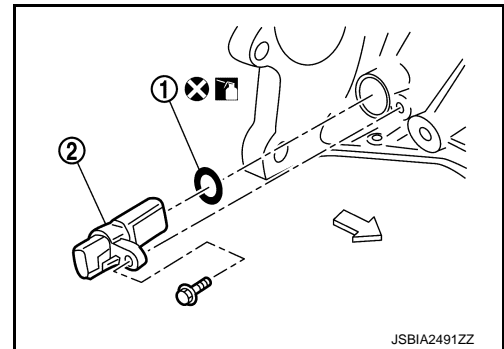
3. Remove crankshaft position sensor (POS) ②.

① : O-ring

↩ : Engine front

CAUTION:

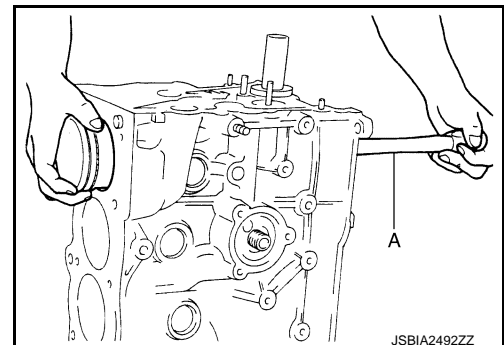
- Avoid impacts such as a dropping.
- Never disassemble.
- Keep it away from metal particles.
- Never place the sensor in a location where it is exposed to magnetism.



4. Remove oil pressure sensor and oil temperature sensor.
5. Remove piston and connecting rod assembly with the following procedure:
 - Before removing piston and connecting rod assembly, check the connecting rod side clearance. Refer to [EM-107, "Inspection"](#).
- a. Position crankshaft pin corresponding to connecting rod to be removed onto the bottom dead center.
- b. Remove connecting rod cap.
- c. Using a hammer handle or similar tool (A), push piston and connecting rod assembly out to the cylinder head side.

CAUTION:

Be careful not to damage the cylinder wall, resulting from an interference of the connecting rod big end.



CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

[QR25DE]

6. Remove connecting rod bearings.

CAUTION:

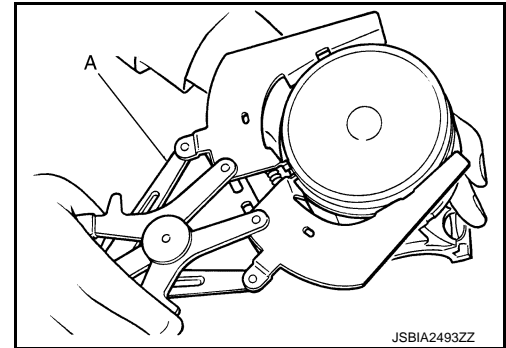
When removing them, note the installation position. Keep them in the correct order.

7. Remove piston rings from piston.

- Use a piston ring expander (commercial service tool) (A).

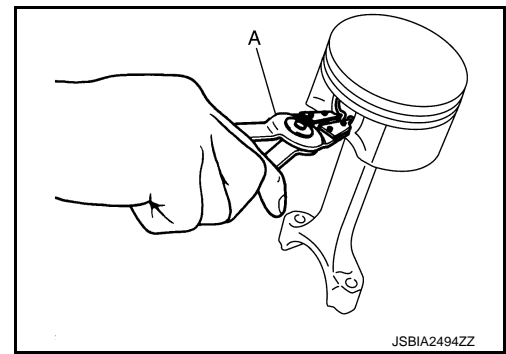
CAUTION:

- **When removing piston rings, be careful not to damage the piston.**
- **Be careful not to damage piston rings by expanding them excessively.**

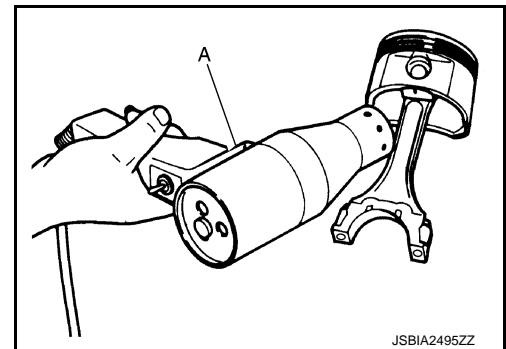


8. Remove piston from connecting rod with the following procedure:

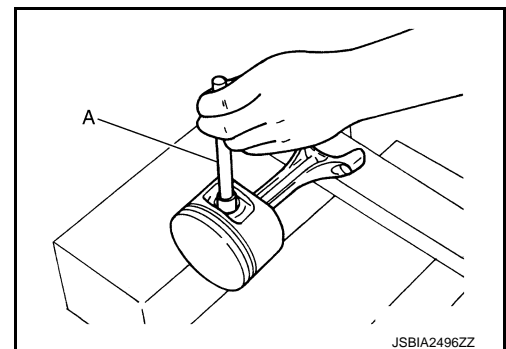
- a. Using snap ring pliers (A), remove snap ring.



- b. Heat piston to 60 to 70°C (140 to 158°F) with an industrial use drier (A) or equivalent.



- c. Push out piston pin with stick (commercial service tool) (A) [outer diameter approximately 19 mm (0.75 in)].



9. Remove lower cylinder block mounting bolts.

CYLINDER BLOCK

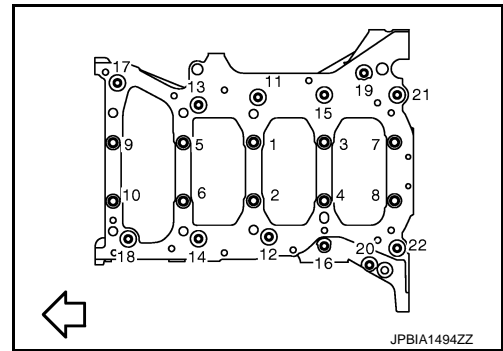
< UNIT DISASSEMBLY AND ASSEMBLY >

[QR25DE]

- Loosen them in the order from 22 to 1 as shown in the figure, and remove them.

⇐ : Engine front

- Use TORX socket (size E14) for bolts No. 1 to 10.
- Before loosening lower cylinder block mounting bolts, measure crankshaft end play. Refer to [EM-107, "Inspection"](#).



- Remove lower cylinder block.

- Use a seal cutter [SST: KV10111100] or equivalent tool to cut liquid gasket for removal.

CAUTION:

Be careful not to damage the mounting surface.

- Remove crankshaft.

CAUTION:

- Be careful not damage or deform signal plate mounted on crankshaft.

- When setting crankshaft ① on a flat floor surface, use a block of wood to avoid interference between signal plate and the floor surface.

NOTE:
When removing or installing signal plate ②, use TORX socket (size T30).

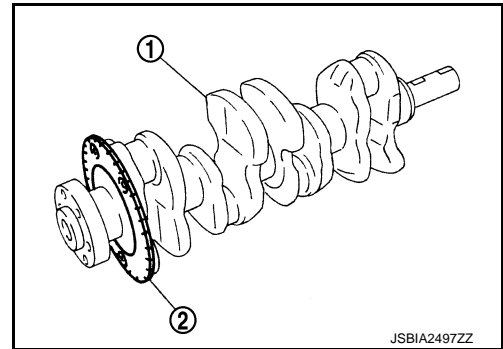
- Pull rear oil seal out from rear end of crankshaft.

NOTE:

When replacing rear oil seal without removing lower cylinder block, use a screwdriver to pull it out from between crankshaft and cylinder block.

CAUTION:

Be careful not to damage crankshaft and cylinder block.



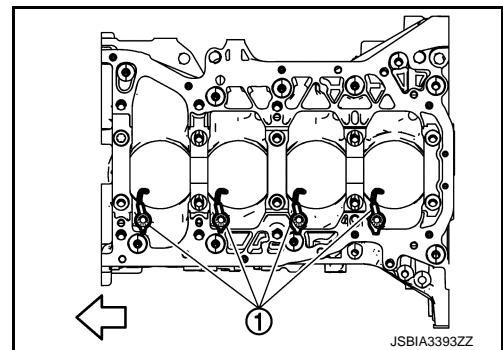
- Remove main bearings and thrust bearings from cylinder block and lower cylinder block.

CAUTION:

Identify installation positions, and store them without mixing them up.

- Remove oil jets ① if necessary.

⇐ : Engine front



ASSEMBLY

CAUTION:

Do not reuse O-rings or washers.

- Fully air-blow engine coolant and engine oil passages in cylinder block, cylinder bore and crankcase to remove any foreign material.

CAUTION:

Use a goggles to protect your eye.

CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

[QR25DE]

2. Install each plug to cylinder block as shown in the figure.

③ : Washer

⇐ : Engine front

- Apply liquid gasket to the thread of water drain plug ①.
Use Genuine Liquid Gasket (TB1215) or equivalent.

NOTE:

Do not apply liquid gasket to the thread of plug ②.

CAUTION:

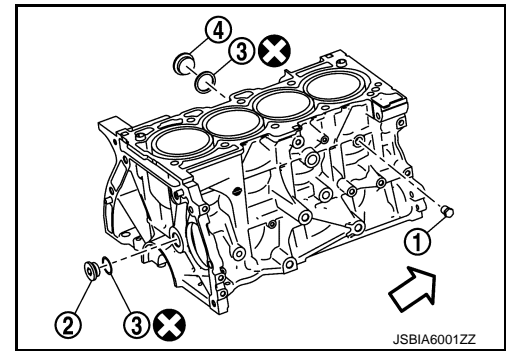
Do not reuse washers.

- Apply liquid gasket to the thread of plug ④.
Use Genuine Liquid Gasket (TB1110F) or equivalent.

CAUTION:

Do not reuse washers.

- Tighten each plug as specified below.

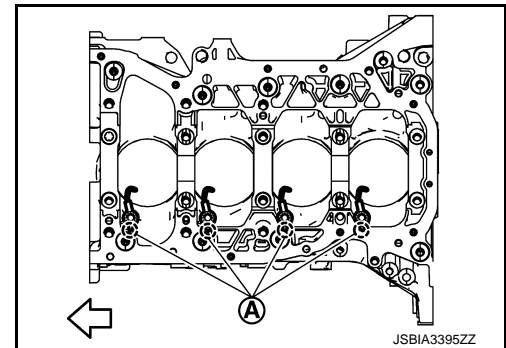


Part	Washer	Tightening torque
①	No	9.8 N·m (1.0 kg-m, 87 in-lb)
②	Yes	53.9 N·m (5.5 kg-m, 40 ft-lb)
④	Yes	62.8 N·m (6.4 kg-m, 46 ft-lb)

3. Install oil jet.

- Insert oil jet dowel pin ① into cylinder block dowel pin hole, and tighten mounting bolts.

⇐ : Engine front

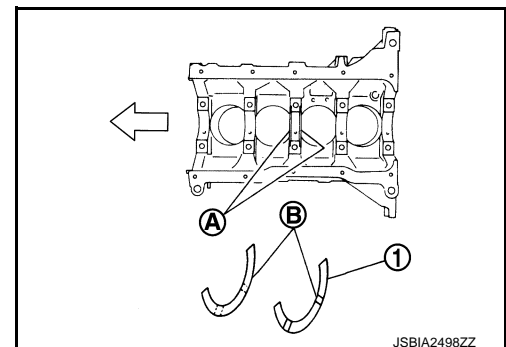


4. Install main bearings and thrust bearings with the following procedure:

- Remove dust, dirt, and engine oil on the bearing mating surfaces of cylinder block and lower cylinder block.
- Install thrust bearings to the both sides of the No. 3 journal housing ① on cylinder block.

⇐ : Engine front

- Install thrust bearings ① with the oil groove ② facing crankshaft arm (outside).



- Install the main bearings paying attention to the direction.

CYLINDER BLOCK

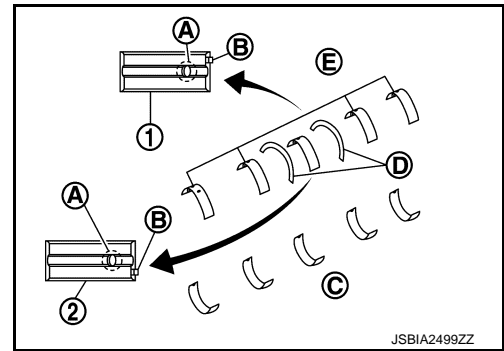
< UNIT DISASSEMBLY AND ASSEMBLY >

[QR25DE]

- Main bearing with an oil hole and groove goes on cylinder block. The one without them goes on lower cylinder block.

- ① : Journal other than No.3
- Ⓒ : Lower cylinder block side
- Ⓓ : Thrust bearing

- Only main bearing (on cylinder block) Ⓔ for No. 3 journal ② has different specifications.
- Before installing main bearings, apply new engine oil to the bearing surface (inside). Do not apply engine oil to the back surface, but thoroughly clean it.
- When installing, align main bearing stopper Ⓑ to the notch.
- Ensure the oil holes Ⓐ on cylinder block and those on the corresponding bearing are aligned.



5. Install signal plate to crankshaft if removed.

- ① : Signal plate
- ② : Crank shaft
- ③ : Dowel pin (used to position the signal plate)

- a. Position crankshaft and signal plate using dowel pin, and tighten mounting bolts.

NOTE:

Dowel pin of crankshaft and signal plate is provided as a set for each. If dowel pin is not available (when reusing crankshaft and signal plate), use M8 bolt [length 10 mm (0.39 in) or more] as a substitute.

- b. Remove dowel pin.

CAUTION:

Be sure to remove dowel pin.

6. Install crankshaft to cylinder block.
 - While turning crankshaft by hand, check that it turns smoothly.
7. Install lower cylinder block with the following procedure:

- a. Apply liquid gasket Ⓐ with a tube presser (commercial service tool) to lower cylinder block ① as shown in the figure.

- ② : Cylinder block
- Ⓒ : Apply liquid gasket to an end
- ⓓ : ϕ 3.8 mm (0.150 in)
- Ⓔ : Groove
- ⇐ : Engine front

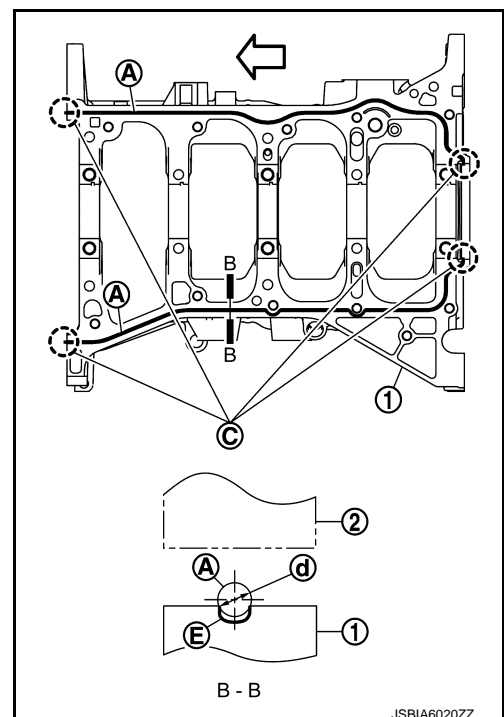
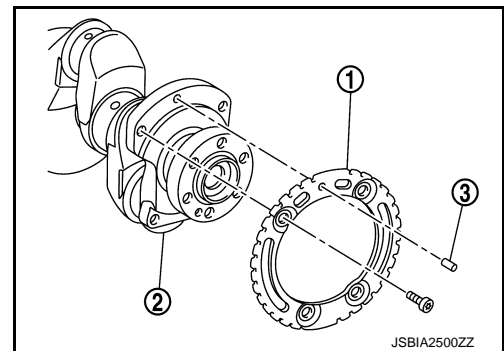
Use Genuine Liquid Gasket (TB1217H) or equivalent.

CAUTION:

After liquid gasket is applied, rear oil seal installation must be finished within 5 minutes. Therefore, the following procedure must be performed quickly.

NOTE:

Lower cylinder block cannot be replaced as a single part, because it is machined together with cylinder block.



CYLINDER BLOCK

[QR25DE]

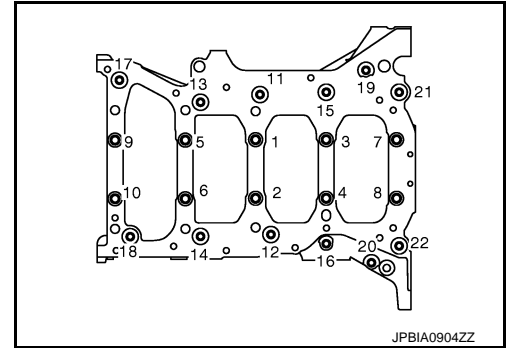
< UNIT DISASSEMBLY AND ASSEMBLY >

- b. Tighten lower cylinder block mounting bolts with the following procedure:
 - i. Apply new engine oil to threads and seat surfaces of mounting bolts.
 - ii. Tighten M8 bolts in numerical order from No. 11 to 22 in the figure.


 : 25.1 N·m (2.6 kg-m, 19 ft-lb)

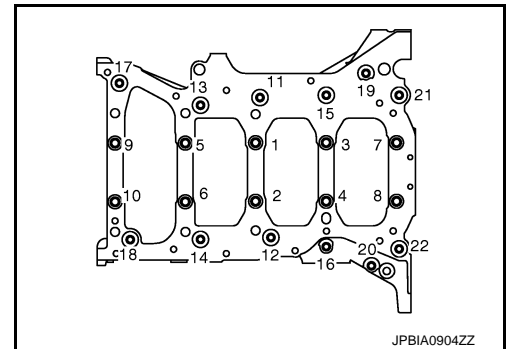
NOTE:

There are more processes to complete the tightening of mounting bolts. However stop procedure here to install rear oil seal.



- c. Install rear oil seal. Refer to [EM-92. "REAR OIL SEAL : Removal and Installation"](#).
- d. Restart tightening of lower cylinder block mounting bolts with the following procedure:
 - i. Tighten M10 bolts in numerical order from No. 1 to 10.

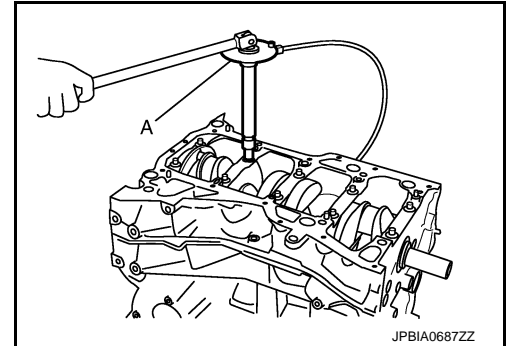
 : 39.2 N·m (4.0 kg-m, 29 ft-lb)



- ii. Turn M10 bolts 60 degrees clockwise (angle tightening) in order from No. 1 to 10 in the figure.

CAUTION:

Check and confirm the tightening angle by using an angle wrench [SST: KV10112100] (A) or protractor. Avoid judgment by visual inspection without the tool.



- After installing mounting bolts, check that crankshaft can be rotated smoothly by hand.
 - Wipe off completely any protruding liquid gasket on front side of engine.
 - Check the crankshaft end play. Refer to [EM-130. "Cylinder Block"](#).
8. Install piston to connecting rod with the following procedure:
 - a. Using snap ring pliers, install new snap ring to the groove of the piston rear side.
 - Insert it fully into groove to install.
 - b. Assemble piston to connecting rod.
 - Using an industrial drier or similar tool, heat piston until piston pin can be pushed in by hand without excess force [approximately 60 to 70°C (140 to 158°F)]. From the front to the rear, insert piston pin into piston and connecting rod.

CYLINDER BLOCK

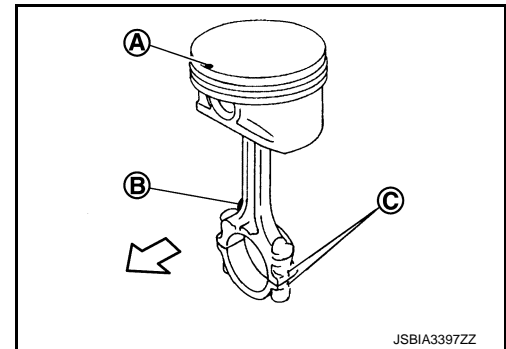
< UNIT DISASSEMBLY AND ASSEMBLY >

[QR25DE]

- Assemble so that the front mark (A) on the piston head and the oil splash (B) and the cylinder number (C) on connecting rod are positioned as shown in the figure.

← : Engine front

- Install new snap ring to the groove of the piston front side.
 - Insert it fully into groove to install.
 - After installing, check that connecting rod moves smoothly.



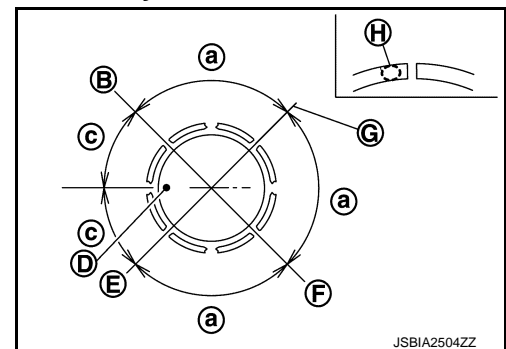
JSBIA3397ZZ

- Using a piston ring expander (commercial service tool), install piston rings.

CAUTION:

- Be careful not to damage piston.
- Be careful not to damage piston rings by expanding them excessively.
- Position each ring with the gap as shown in the figure referring to the piston front mark (D).

- (a) : 90°
- (B) : Top ring gap
- (C) : 45°
- (E) : Oil ring upper or lower rail gap (either of them)
- (F) : Second ring and oil ring spacer gap
- (G) : Oil ring upper or lower rail gap (either of them)



JSBIA2504ZZ

- Install second ring with the stamped (H) surface facing upward.

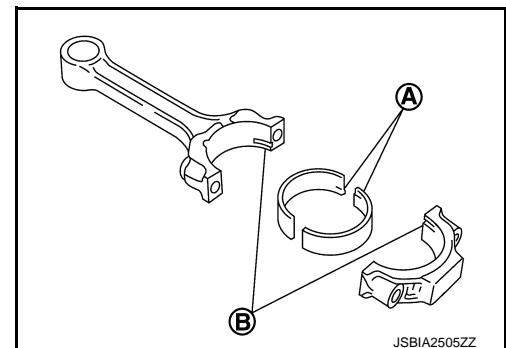
Stamped mark:

- Top ring : —
- Second ring : 2 ND

NOTE:

If there is no stamped mark on piston ring, no specific orientation is required for installation.

- Inspect outer diameter of connecting rod bolts. Refer to [EM-107. "Inspection"](#).
- Install connecting rod bearings to connecting rod and connecting rod cap.
 - When installing connecting rod bearings, apply new engine oil to the bearing surface (inside). Do not apply engine oil to the back surface, but thoroughly clean it.
 - When installing, align the connecting rod bearing stopper protrusion (A) with the cutout (B) of connecting rod and connecting rod cap to install.
 - Ensure the oil hole on connecting rod and that on the corresponding bearing are aligned.



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- Install piston and connecting rod assembly to crankshaft.
 - Position crankshaft pin corresponding to connecting rod to be installed onto the bottom dead center.
 - Apply new engine oil sufficiently to the cylinder bore, piston and crankshaft pin.
 - Match the cylinder position with the cylinder number on connecting rod to install.

CYLINDER BLOCK

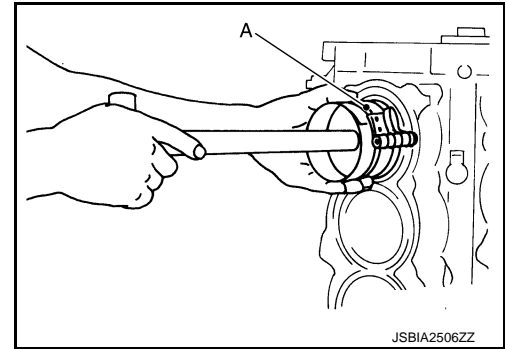
< UNIT DISASSEMBLY AND ASSEMBLY >

[QR25DE]

- Using the piston ring compressor [SST:EM03470000] (A) or suitable tool, install piston with the front mark on the piston head facing the front of the engine.

CAUTION:

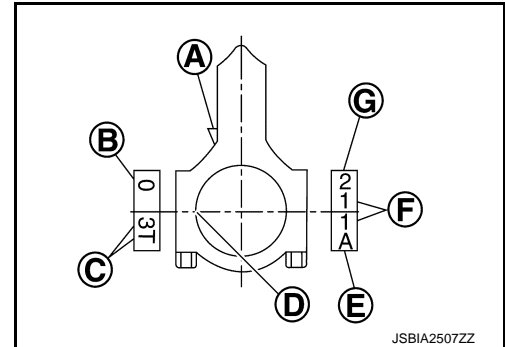
Be careful not to damage the cylinder wall and crankshaft pin, resulting from an interference of the connecting rod big end.



13. Install connecting rod cap.

- Match the stamped cylinder number marks on connecting rod with those on connecting rod cap to install.

- (A) : Oil splash
- (B) : Small end diameter grade
- (C) : Management code
- (D) : Bearing stopper groove
- (E) : Management code
- (F) : Cylinder number
- (G) : Big end diameter grade



14. Tighten connecting rod bolt with the following procedure:


- Apply new engine oil to the threads and seats of connecting rod bolts.
- Tighten bolts.

 : 27.4 N·m (2.8 kg-m, 20 ft-lb)

- Completely loosen bolts.

 : 0 N·m (0 kg-m, 0 ft-lb)

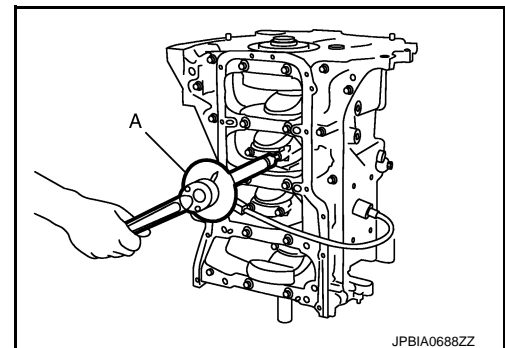
- Tighten bolts.

 : 19.6 N·m (2.0 kg-m, 14 ft-lb)

- Then turn all bolts 90 degrees clockwise (Angle tightening).

CAUTION:

Check and confirm the tightening angle by using an angle wrench [SST: KV10112100] (A) or protractor. Avoid judgment by visual inspection without the tool.



- After tightening connecting rod bolt, check that crankshaft rotates smoothly.
- Check the connecting rod side clearance. Refer to [EM-107, "Inspection"](#).

15. Install drive plate.

CAUTION:

Check that dowel pin is installed at the rear end of crankshaft.

CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

[QR25DE]

- When installing drive plate to crankshaft, check that align crankshaft side dowel pin with drive-plate side dowel pin hole correctly.

CAUTION:

If these are not aligned correctly, engine runs roughly and "MIL" turns on.

- Secure crankshaft with a stopper plate, and tighten mounting bolts crosswise over several times.

16. Install knock sensor ①.

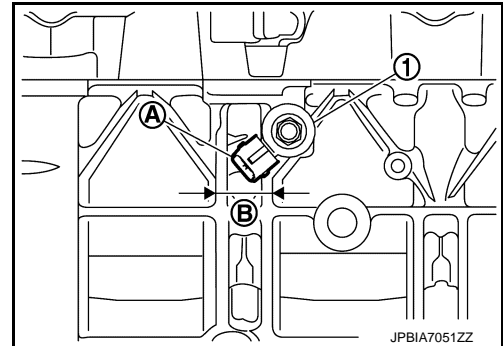
- Install knock sensor with connector facing ① between ribs ② as shown in the figure.

CAUTION:

- Never tighten mounting bolt while holding the connector.**
- If any impact by dropping is applied to knock sensor, replace it with a new one.**

NOTE:

- Check that there is no foreign material on the cylinder block mating surface and the back surface of knock sensor.
- Check that knock sensor does not interfere with other parts.



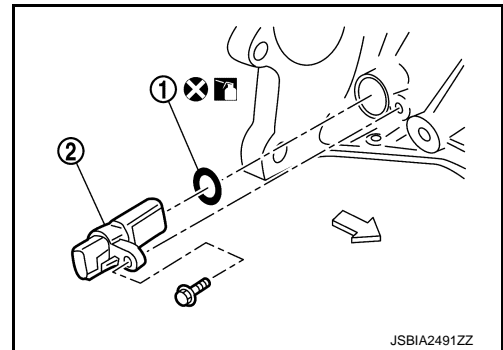
17. Install crankshaft position sensor (POS) ②.

① : O-ring

↔ : Engine front

CAUTION:

- Avoid impacts such as a dropping.**
- Never disassemble.**
- Keep it away from metal particles.**
- Never place the sensor in a location where it is exposed to magnetism.**



18. Install oil pressure sensor.

- Apply liquid gasket.

19. Install oil temperature sensor.

CAUTION:

Do not reuse oil temperature sensor.

20. Assemble in the reverse order of disassembly after this step.

Inspection

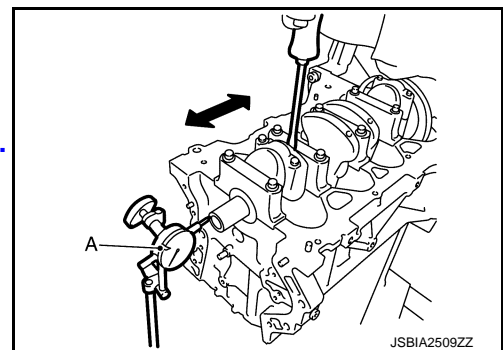
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CRANKSHAFT END PLAY

- Measure the clearance between thrust bearings and crankshaft arm when crankshaft is moved fully forward or backward with a dial indicator (A).

Standard and Limit : Refer to [EM-130, "Cylinder Block"](#).

- If the measured value exceeds the limit, replace thrust bearings, and measure again. If it still exceeds the limit, replace crankshaft also.



CONNECTING ROD SIDE CLEARANCE

CYLINDER BLOCK

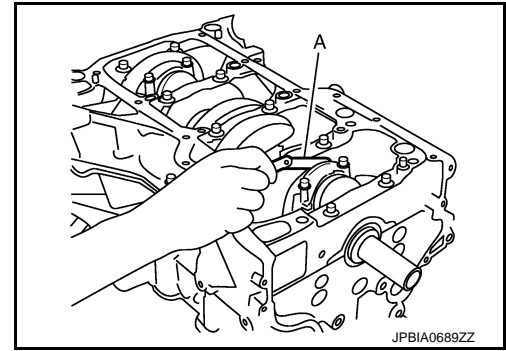
< UNIT DISASSEMBLY AND ASSEMBLY >

[QR25DE]

- Measure the side clearance between connecting rod and crankshaft arm with a feeler gauge (A).

Standard and Limit : Refer to [EM-130, "Cylinder Block"](#).

- If the measured value exceeds the limit, replace connecting rod, and measure again. If it still exceeds the limit, replace crankshaft also.

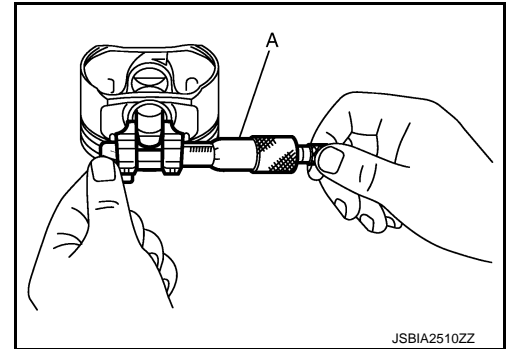


PISTON TO PISTON PIN OIL CLEARANCE

Piston Pin Hole Diameter

Measure the inner diameter of piston pin hole with an inside micrometer (A).

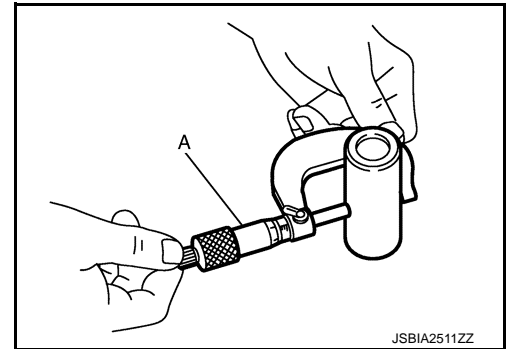
Standard : Refer to [EM-130, "Cylinder Block"](#).



Piston Pin Outer Diameter

Measure the outer diameter of piston pin with a micrometer (A).

Standard : Refer to [EM-130, "Cylinder Block"](#).



Piston to Piston Pin Oil Clearance

(Piston to piston pin oil clearance) = (Piston pin hole diameter) – (Piston pin outer diameter)

Standard : Refer to [EM-130, "Cylinder Block"](#).

- If oil clearance is out of the standard, replace piston and piston pin assembly.
- When replacing piston and piston pin assembly, refer to "PISTON TO CYLINDER BORE CLEARANCE".

NOTE:

- Piston is available together with piston pin as assembly.
- Piston pin (piston pin hole) grade is provided only for the parts installed at the plant. For service parts, no grades can be selected. (Only grade "0" is available.)

PISTON RING SIDE CLEARANCE

CYLINDER BLOCK

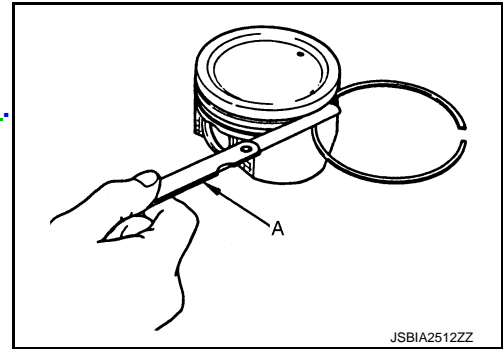
< UNIT DISASSEMBLY AND ASSEMBLY >

[QR25DE]

- Measure the side clearance of piston ring and piston ring groove with a feeler gauge (A).

Standard and Limit : Refer to [EM-130, "Cylinder Block"](#).

- If the measured value exceeds the limit, replace piston ring, and measure again. If it still exceeds the limit, replace piston also.

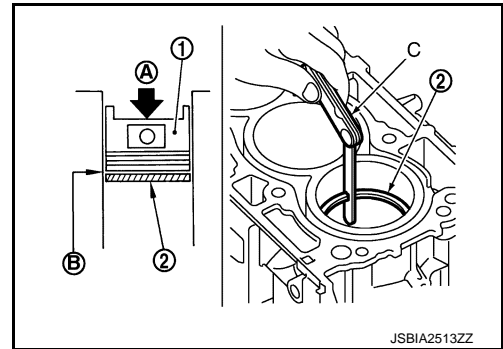


PISTON RING END GAP

- Check that cylinder bore inner diameter is within specification. Refer to "PISTON TO CYLINDER BORE CLEARANCE".
- Lubricate with new engine oil to piston ① and piston ring ②, and then insert ① piston ring until middle of cylinder ② with piston, and measure piston ring end gap with a feeler gauge (C).

Standard and Limit : Refer to [EM-130, "Cylinder Block"](#).

- If the measured value exceeds the limit, replace piston ring, and measure again. If it still exceeds the limit, replace cylinder block.



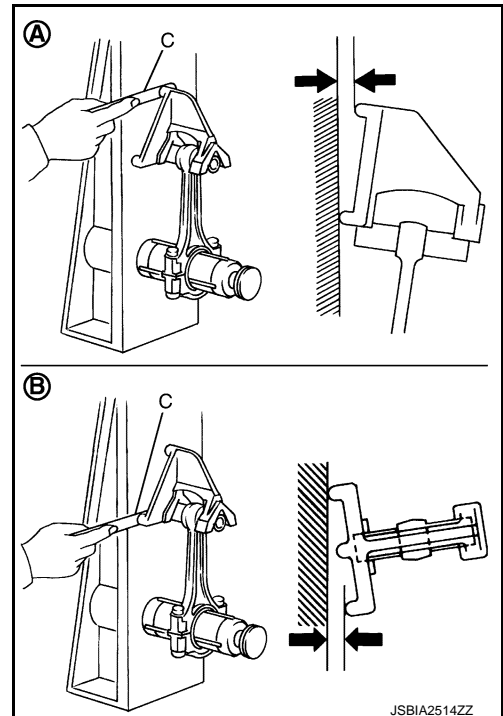
CONNECTING ROD BEND AND TORSION

- Check with a connecting rod aligner.

- ① : Bend
② : Torsion
C : Feeler gauge

Limit : Refer to [EM-130, "Cylinder Block"](#).

- If it exceeds the limit, replace connecting rod assembly.



CONNECTING ROD BIG END DIAMETER

CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

[QR25DE]

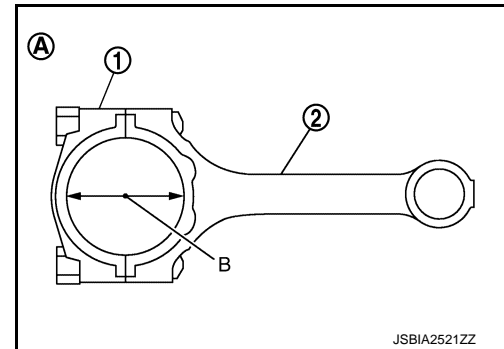
- Install connecting rod bearing cap ① without connecting rod bearing installed, and tightening connecting rod bolts to the specified torque. Refer to [EM-99, "Disassembly and Assembly"](#).

② : Connecting rod

Ⓐ : Example

B : Measuring direction of inner diameter

- Measure the inner diameter of connecting rod big end with an inside micrometer.



Standard : Refer to [EM-130, "Cylinder Block"](#).

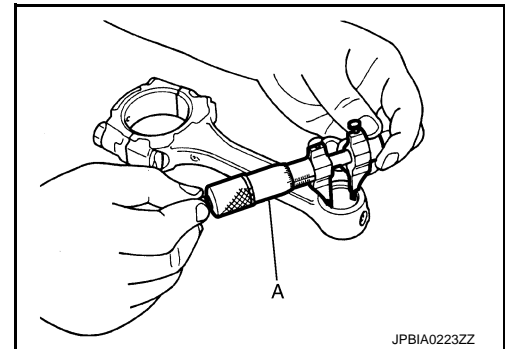
- If out of the standard, replace connecting rod assembly.

CONNECTING ROD BUSHING OIL CLEARANCE

Connecting Rod Bushing Inner Diameter

Measure the inner diameter of connecting rod bushing with an inside micrometer (A).

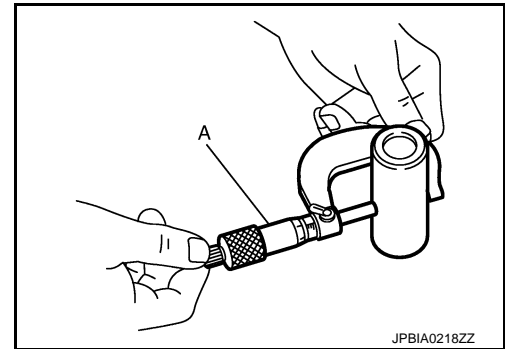
Standard : Refer to [EM-130, "Cylinder Block"](#).



Piston Pin Outer Diameter

Measure the outer diameter of piston pin with a micrometer (A).

Standard : Refer to [EM-130, "Cylinder Block"](#).



Connecting Rod Bushing Oil Clearance

(Connecting rod bushing oil clearance) = (Connecting rod bushing inner diameter) – (Piston pin outer diameter)

Standard : Refer to [EM-130, "Cylinder Block"](#).

- If the measured value is out of the standard. Replace connecting rod assembly and/or piston and piston pin assembly.
- If replacing piston and piston pin assembly. Refer to [EM-117, "Piston"](#).
- If replacing connecting rod assembly. Refer to [EM-118, "Connecting Rod Bearing"](#) to select connecting rod bearing.

CYLINDER BLOCK DISTORTION

- Using a scraper, remove gasket on the cylinder block surface, and also remove engine oil, scale, carbon, or other contamination.

CAUTION:

Be careful not to allow gasket flakes to enter engine oil or engine coolant passages.

CYLINDER BLOCK

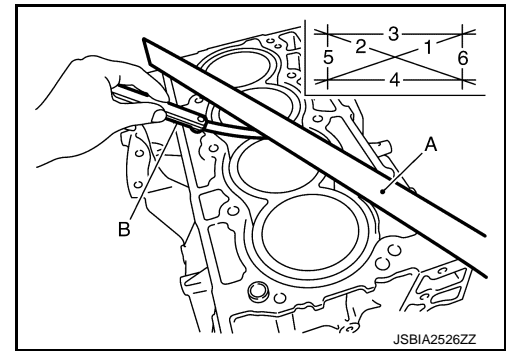
< UNIT DISASSEMBLY AND ASSEMBLY >

[QR25DE]

- Measure the distortion on the cylinder block upper face at some different points in six directions with a straight edge (A) and a feeler gauge (B).

Limit : Refer to [EM-130, "Cylinder Block"](#).

- If it exceeds the limit, replace cylinder block.



MAIN BEARING HOUSING INNER DIAMETER

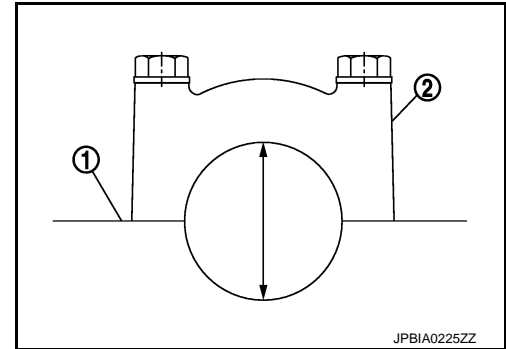
- Install lower cylinder block ② without main bearings installed, and tighten lower cylinder block mounting bolts to the specified torque. Refer to [EM-99, "Disassembly and Assembly"](#) for the tightening procedure.
- Measure the inner diameter of main bearing housing with a bore gauge.

Standard : Refer to [EM-130, "Cylinder Block"](#).

- If out of the standard, replace cylinder block ① and lower cylinder block assembly.

NOTE:

Cylinder block cannot be replaced as a single, because it is machined together with lower cylinder block.



PISTON TO CYLINDER BORE CLEARANCE

Cylinder Bore Inner Diameter

- Using a cylinder gauge, measure the cylinder bore for wear, out-of-round and taper at six different points on each cylinder. (A and B directions at C, D, and E) (A is in longitudinal direction of engine)

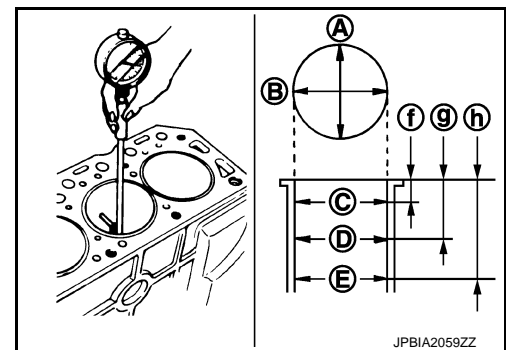
Ⓕ : 10 mm (0.39 in)

Ⓖ : 60 mm (2.36 in)

Ⓗ : 120 mm (4.72 in)

NOTE:

When determining cylinder bore grade, measure the cylinder bore Ⓑ direction at Ⓓ position.



Standard:

Cylinder bore inner diameter

: Refer to [EM-130, "Cylinder Block"](#).

Limit:

Out-of-round (Difference between A and B)

Taper (Difference between C and E)

: Refer to [EM-130, "Cylinder Block"](#).

- If the measured value exceeds the limit, or if there are scratches and/or seizure on the cylinder inner wall, replace cylinder block.

CAUTION:

When using an oversize piston, use oversize pistons for all cylinders with oversize piston rings.

Oversize (O/S): 0.2 mm (0.008 in)

CYLINDER BLOCK

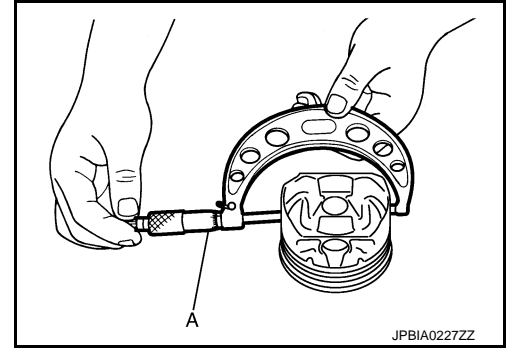
< UNIT DISASSEMBLY AND ASSEMBLY >

[QR25DE]

Piston Skirt Diameter

Measure the outer diameter of piston skirt with a micrometer (A).

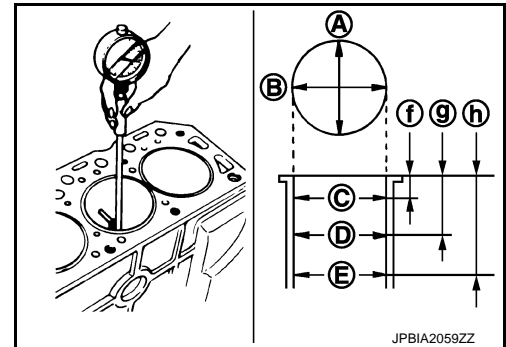
Standard : Refer to [EM-130, "Cylinder Block"](#).



Piston to Cylinder Bore Clearance

Calculate by piston skirt diameter and cylinder bore inner diameter (direction B, position D).

- Ⓐ : Direction A
- Ⓒ : Position C
- Ⓔ : Position E
- Ⓕ : 10 mm (0.39 in)
- Ⓖ : 60 mm (2.36 in)
- Ⓗ : 120 mm (4.72 in)



(Clearance) = (Cylinder bore inner diameter) – (Piston skirt diameter)

Standard and Limit : Refer to [EM-130, "Cylinder Block"](#).

- If it exceeds the limit, replace piston and piston pin assembly and/or cylinder block. Refer to [EM-130, "Cylinder Block"](#).

Re-boring Cylinder Bore

1. Cylinder bore size is determined by adding piston to cylinder bore clearance to piston skirt diameter.

Re-bored size calculation: $D = A + B - C$

where,

A: Piston diameter as measured

B: Piston - to - cylinder bore clearance (standard value)

C: Honing allowance 0.02 mm (0.0008 in)

D: Bored diameter

2. Install lower cylinder block, and tighten mounting bolts to the specified torque. Otherwise, cylinder bores may be distorted in final assembly. Refer to [EM-99, "Disassembly and Assembly"](#) for the tightening procedure.

3. Cut cylinder bores.

NOTE:

- When any cylinder needs boring, all other cylinders must also be bored.
- Do not cut too much out of cylinder bore at a time. Cut only 0.05 mm (0.0020 in) or so in diameter at a time.

- 4.hone cylinders to obtain the specified piston to cylinder bore clearance.

5. Measure the finished cylinder bore for out-of-round and taper.

NOTE:

Measurement should be done after cylinder bore cools down.

CRANKSHAFT MAIN JOURNAL DIAMETER

CYLINDER BLOCK

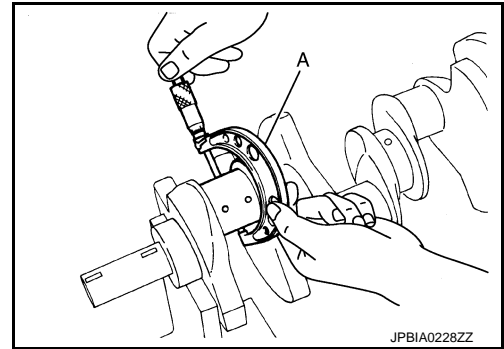
< UNIT DISASSEMBLY AND ASSEMBLY >

[QR25DE]

- Measure the outer diameter of crankshaft main journals with a micrometer (A).

Standard : Refer to [EM-130, "Cylinder Block"](#).

- If out of the standard, measure the main bearing oil clearance. Then use undersize bearing. Refer to [EM-133, "Main Bearing"](#).



CRANKSHAFT PIN JOURNAL DIAMETER

- Measure the outer diameter of crankshaft pin journal with a micrometer.

Standard : Refer to [EM-130, "Cylinder Block"](#).

- If out of the standard, measure the connecting rod bearing oil clearance. Then use undersize bearing. Refer to [EM-135, "Connecting Rod Bearing"](#).

OUT-OF-ROUND AND TAPER OF CRANKSHAFT

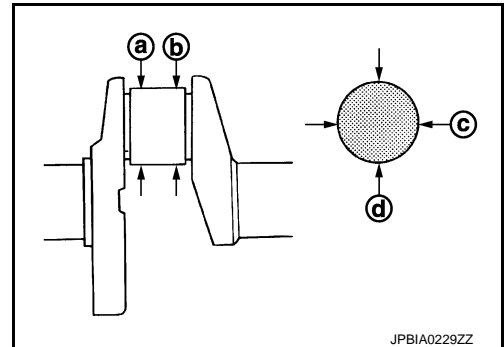
- Measure the dimensions at four different points as shown in the figure on each main journal and pin journal with a micrometer.
- Out-of-round is indicated by the difference in dimensions between (a) and (b) at (c) and (d).
- Taper is indicated by the difference in dimension between (c) and (d) at (a) and (b).

Limit:

Out-of-round [Difference between (c) and (d)]

Taper [Difference between (a) and (b)]

: Refer to [EM-130, "Cylinder Block"](#).



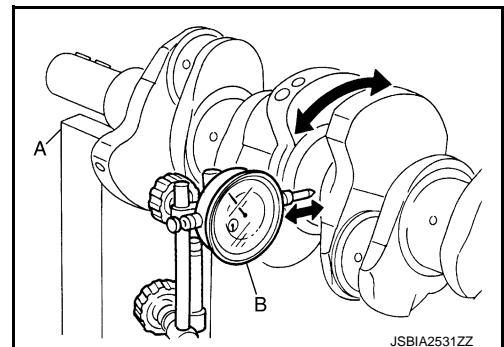
- If the measured value exceeds the limit, correct or replace crankshaft.
- If corrected, measure the bearing oil clearance of the corrected main journal and/or pin journal. Then select main bearing and/or connecting rod bearing. Refer to [EM-135, "Connecting Rod Bearing"](#) and/or [EM-133, "Main Bearing"](#).

CRANKSHAFT RUNOUT

- Place a V-block (A) on a precise flat table to support the journals on the both end of the crankshaft.
- Place a dial indicator (B) straight up on the No. 3 journal.
- While rotating crankshaft, read the movement of the pointer on the dial indicator. (Total indicator reading)

Standard and Limit : Refer to [EM-130, "Cylinder Block"](#).

- If it exceeds the limit, replace crankshaft.



CONNECTING ROD BEARING OIL CLEARANCE

Method by Calculation

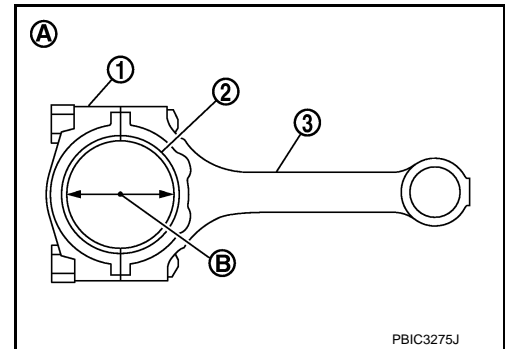
CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

[QR25DE]

- Install connecting rod bearings ② to connecting rod ③ and cap, and tighten connecting rod bolts to the specified torque. Refer to [EM-99, "Disassembly and Assembly"](#) for tightening procedure.

- ① : Connecting rod bearing cap
 (A) : Example
 (B) : Inner diameter measuring direction



- Measure the inner diameter of connecting rod bearing with an inside micrometer.
 (Bearing oil clearance) = (Connecting rod bearing inner diameter) – (Crankshaft pin journal diameter)

Standard and Limit : Refer to [EM-130, "Cylinder Block"](#).

- If clearance exceeds the limit, select proper connecting rod bearing according to connecting rod big end diameter and crankshaft pin journal diameter to obtain specified bearing oil clearance. Refer to [EM-118, "Connecting Rod Bearing"](#).

Method of Using Plastigage

- Remove engine oil and dust on crankshaft pin and the surfaces of each bearing completely.
- Cut a plastigage slightly shorter than the bearing width, and place it in crankshaft axial direction, avoiding oil holes.
- Install connecting rod bearings to connecting rod and cap, and tighten connecting rod bolts to the specified torque. Refer to [EM-99, "Disassembly and Assembly"](#) for the tightening procedure.

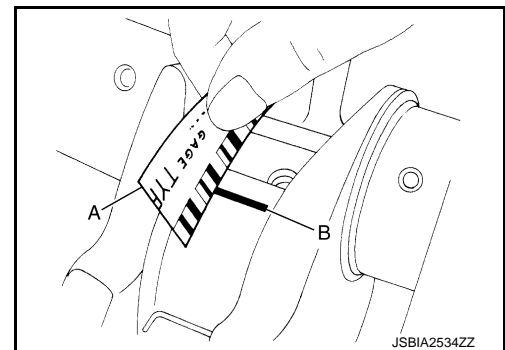
CAUTION:

Never rotate crankshaft.

- Remove connecting rod cap and bearing, and using the scale (A) on the plastigage bag, measure the plastigage (B) width.

NOTE:

The procedure when the measured value exceeds the limit is same as that described in the "Method by Calculation".



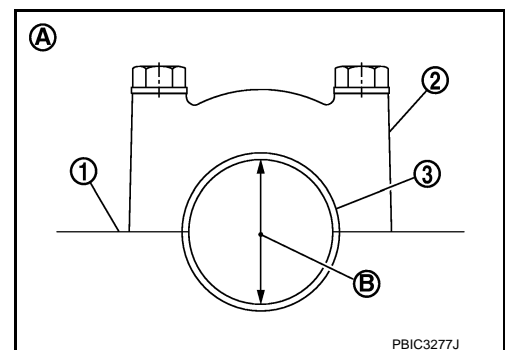
MAIN BEARING OIL CLEARANCE

Method by Calculation

- Install main bearings ③ to cylinder block ① and lower cylinder block ②, and tighten lower cylinder block mounting bolts to the specified torque. Refer to [EM-99, "Disassembly and Assembly"](#) for the tightening procedure.

- (A) : Example
 (B) : Inner diameter measuring direction

- Measure the inner diameter of main bearing with a bore gauge.
 (Bearing oil clearance) = (Main bearing inner diameter) – (Crankshaft main journal diameter)



Standard and Limit : Refer to [EM-130, "Cylinder Block"](#).

CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

[QR25DE]

- If clearance exceeds the limit, select proper main bearing according to main bearing inner diameter and crankshaft main journal diameter to obtain specified bearing oil clearance. Refer to [EM-99, "Disassembly and Assembly"](#).

Method of Using Plastigage

- Remove engine oil and dust on crankshaft main journal and the surfaces of each bearing completely.
- Cut a plastigage slightly shorter than the bearing width, and place it in crankshaft axial direction, avoiding oil holes.
- Install main bearings to cylinder block and lower cylinder block, and tighten lower cylinder block mounting bolts to the specified torque. Refer to [EM-99, "Disassembly and Assembly"](#) for the tightening procedure.

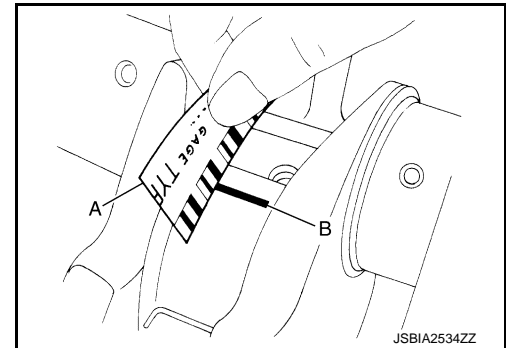
CAUTION:

Never rotate crankshaft.

- Remove main bearing cap and bearings, and using the scale (A) on the plastigage bag, measure the plastigage (B) width.

NOTE:

The procedure when the measured value exceeds the limit is same as that described in the "Method by Calculation".



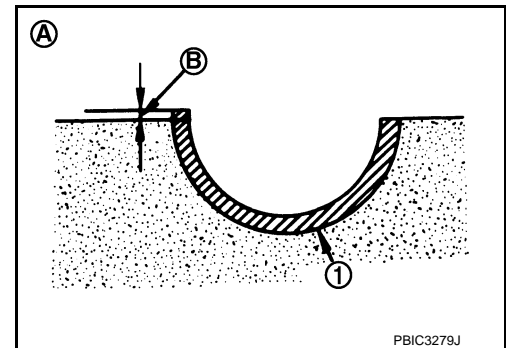
MAIN BEARING CRUSH HEIGHT

- When main bearing cap is removed after being tightened to the specified torque with main bearings ① installed, the tip end of bearing must protrude ②. Refer to [EM-99, "Disassembly and Assembly"](#).

② : Example

Standard : There must be crush height.

- If the standard is not met, replace main bearings.



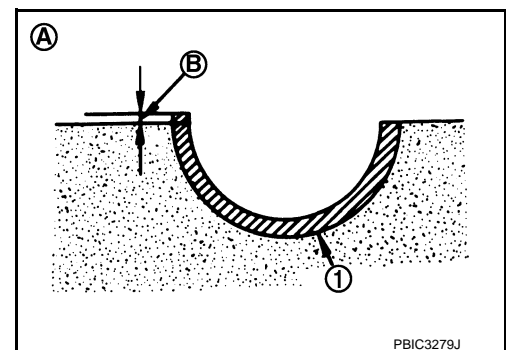
CONNECTING ROD BEARING CRUSH HEIGHT

- When connecting rod cap is removed after being tightened to the specified torque with connecting rod bearings ① installed, the tip end of bearing must protrude ②. Refer to [EM-99, "Disassembly and Assembly"](#).

② : Example

Standard : There must be crush height.

- If the standard is not met, replace connecting rod bearings.



LOWER CYLINDER BLOCK MOUNTING BOLT OUTER DIAMETER

- Perform only with M10 bolts.

CYLINDER BLOCK

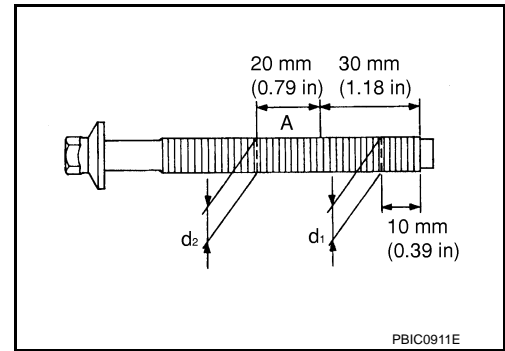
< UNIT DISASSEMBLY AND ASSEMBLY >

[QR25DE]

- Measure the outer diameters (“d1”, “d2”) at two positions as shown in the figure.
- If reduction appears in “A” range, regard it as “d2”.

Limit (“d1”–“d2”): 0.13 mm (0.0051 in)

- If it exceeds the limit (a large difference in dimensions), replace lower cylinder block mounting bolt with a new one.

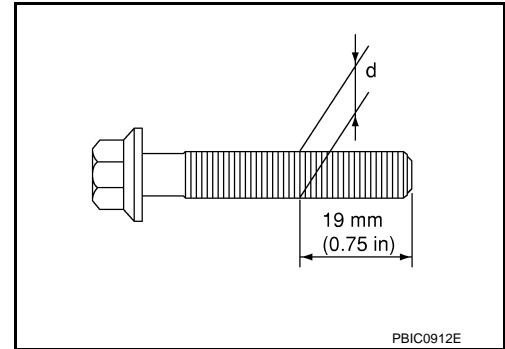


CONNECTING ROD BOLT OUTER DIAMETER

- Measure the outer diameter “d” at position as shown in the figure.
- If reduction appears in a position other than “d”, regard it as “d”.

Limit: 7.75 mm (0.3051 in)

- When “d” exceeds the limit (when it becomes thinner), replace connecting rod bolt with a new one.



HOW TO SELECT PISTON AND BEARING

< UNIT DISASSEMBLY AND ASSEMBLY >

[QR25DE]

HOW TO SELECT PISTON AND BEARING

Description

INFOID:0000000011616492

Selection points	Selection parts	Selection items	Selection methods
Between cylinder block and crankshaft	Main bearing	Main bearing grade (bearing thickness)	Determined by match of cylinder block bearing housing grade (inner diameter of housing) and crankshaft journal grade (outer diameter of journal)
Between crankshaft and connecting rod	Connecting rod bearing	Connecting rod bearing grade (bearing thickness)	Combining service grades for connecting rod big end diameter and crankshaft pin outer diameter determine connecting rod bearing selection.
Between cylinder block and piston	Piston and piston pin assembly (piston is available together with piston pin as an assembly.)	Piston grade (piston outer diameter)	Piston grade = cylinder bore grade (inner diameter of bore)
Between piston and connecting rod*	—	—	—

*For the service parts, the grade for fitting cannot be selected between piston pin and connecting rod. (Only grade "0" is available.) The information at the shipment from the plant is described as a reference.

- The identification grade stamped on each part is the grade for the dimension measured in new condition. This grade cannot apply to reused parts.
- For reused or repaired parts, measure the dimension accurately. Determine the grade by comparing the measurement with the values of each selection table.
- For details of the measurement method of each part, the reuse standards and the selection method of the selective fitting parts, refer to the text.

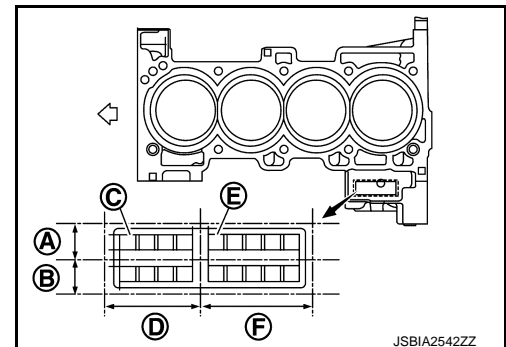
Piston

INFOID:0000000011616493

WHEN NEW CYLINDER BLOCK IS USED

- Check the cylinder bore grade on rear left side of cylinder block, and select piston of the same grade.

- (A) : Corrected stamping position
- (B) : Basic stamping position
- (C) : No.1 - 4 from left
- (D) : Cylinder bore grade
- (E) : No.1 - 5 from left
- (F) : Main bearing housing grade
- ⇐ : Engine front



- If there is a corrected stamp mark on the cylinder block, use it as a correct reference.

WHEN CYLINDER BLOCK IS REUSED

1. Measure the cylinder bore inner diameter. Refer to [EM-107, "Inspection"](#).
2. Determine the bore grade by comparing the measurement with the values under the cylinder bore inner diameter of the "Piston Selection Table".

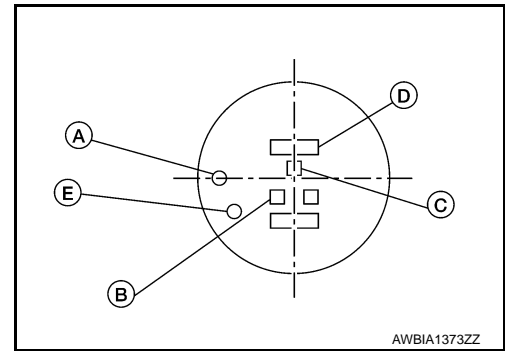
HOW TO SELECT PISTON AND BEARING

< UNIT DISASSEMBLY AND ASSEMBLY >

[QR25DE]

3. Select piston of the same grade.

- (A) : Front mark
- (B) : Piston pin bore grade number
- (C) : Piston grade identification stamp number
- (D) : Piston upper surface identification code stamp
- (E) : Identification code



PISTON SELECTION TABLE

Unit: mm (in)

Grade number (Mark)	2	3
Cylinder bore Inner diameter	89.010 - 89.020 (3.5043 - 3.5047)	89.020 - 89.030 (3.5047 - 3.5051)
Piston skirt diameter	88.990 - 89.000 (3.5035 - 3.5039)	89.000 - 89.010 (3.5039 - 3.5043)

NOTE:

- There is no piston grade "1".
- Piston is available together with piston pin as an assembly.
- The piston pin (piston pin hole) grade is provided only for the parts installed at the plant. For service parts, no grades can be selected. (Only grade "0" is available.)

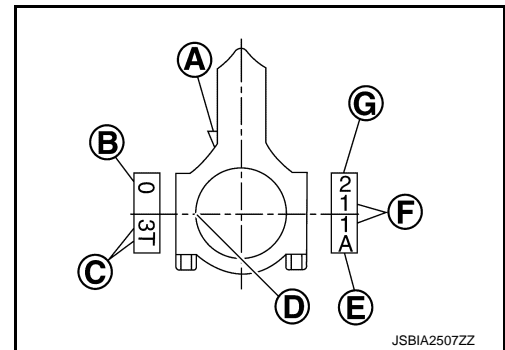
Connecting Rod Bearing

INFOID:0000000011616494

WHEN NEW CONNECTING ROD AND CRANKSHAFT ARE USED

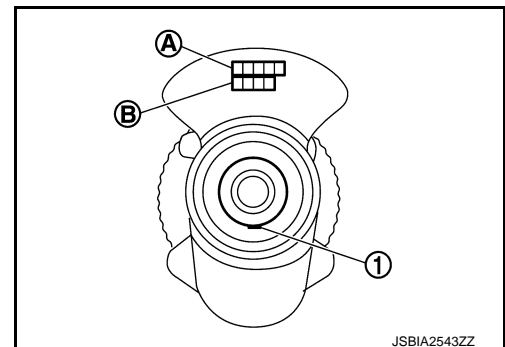
1. Apply connecting rod big end diameter grade stamped on connecting rod side face to the row in the "CONNECTING ROD BEARING SELECTION TABLE".

- (A) : Oil splash
- (B) : Small end diameter grade
- (C) : Management code
- (D) : Bearing stopper groove
- (E) : Management code
- (F) : Cylinder number
- (G) : Big end diameter grade



2. Apply crankshaft pin journal diameter grade stamped on crankshaft front side to the column in the "CONNECTING ROD BEARING SELECTION TABLE".

- ① : Key
- (A) : Main journal diameter grade (No.1 - 5 from left)
- (B) : Pin journal diameter grade (No.1 - 4 from left)



3. Read the symbol at the cross point of selected row and column in the "CONNECTING ROD BEARING SELECTION TABLE".
4. Apply the symbol obtained to the "CONNECTING ROD BEARING GRADE TABLE" to select connecting rod bearing.

HOW TO SELECT PISTON AND BEARING

< UNIT DISASSEMBLY AND ASSEMBLY >

[QR25DE]

WHEN CONNECTING ROD AND CRANKSHAFT ARE REUSED

1. Measure the dimensions of the connecting rod big end diameter and crankshaft pin journal diameter individually. Refer to [EM-107, "Inspection"](#).
2. Apply the measured dimension to the "CONNECTING ROD BEARING SELECTION TABLE".
3. Read the symbol at the cross point of selected row and column in the "CONNECTING ROD BEARING SELECTION TABLE".
4. Apply the symbol obtained to the "CONNECTING ROD BEARING GRADE TABLE" to select connecting rod bearing.

Undersize Bearings Usage Guide

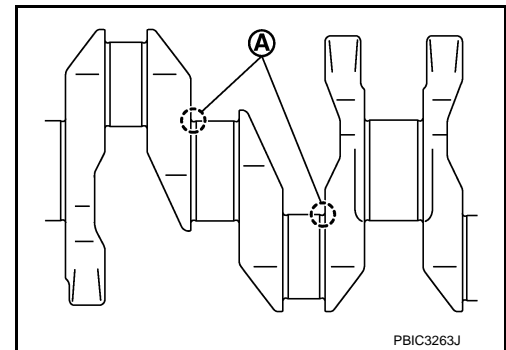
- When the specified connecting rod bearing oil clearance is not obtained with standard size connecting rod bearings, use undersize (US) bearings.
- When using undersize (US) bearing, measure the connecting rod bearing inner diameter with bearing installed, and grind the crankshaft pin so that the connecting rod bearing oil clearance satisfies the standard.

CAUTION:

In grinding crankshaft pin to use undersize bearings, keep the fillet R [1.5 - 1.7 mm (0.059 - 0.067 in)] (A).

Bearing undersize table:

Refer to [EM-135, "Connecting Rod Bearing"](#).



HOW TO SELECT PISTON AND BEARING

< UNIT DISASSEMBLY AND ASSEMBLY >

[QR25DE]

CONNECTING ROD BEARING SELECTION TABLE

<div> <div>Connecting rod big end diameter</div> <div>Crankshaft pin journal diameter</div> </div>		Mark	0	1	2	3	4	5	6	7	8	9	A	B	C
		Inner diameter Unit: mm (in)	48.000 - 48.001 (1.8898 - 1.8898)	48.001 - 48.002 (1.8898 - 1.8898)	48.002 - 48.003 (1.8898 - 1.8899)	48.003 - 48.004 (1.8899 - 1.8899)	48.004 - 48.005 (1.8899 - 1.8900)	48.005 - 48.006 (1.8900 - 1.8900)	48.006 - 48.007 (1.8900 - 1.8900)	48.007 - 48.008 (1.8900 - 1.8901)	48.008 - 48.009 (1.8901 - 1.8901)	48.009 - 48.010 (1.8901 - 1.8902)	48.010 - 48.011 (1.8902 - 1.8902)	48.011 - 48.012 (1.8902 - 1.8902)	48.012 - 48.013 (1.8902 - 1.8903)
Mark	Outer diameter Unit: mm (in)														
A	44.974 - 44.973 (1.7706 - 1.7706)		0	0	0	0	01	01	01	1	1	1	12	12	12
B	44.973 - 44.972 (1.7706 - 1.7705)		0	0	0	01	01	01	1	1	1	12	12	12	2
C	44.972 - 44.971 (1.7705 - 1.7705)		0	0	01	01	01	1	1	1	12	12	12	2	2
D	44.971 - 44.970 (1.7705 - 1.7705)		0	01	01	01	1	1	1	12	12	12	2	2	2
E	44.970 - 44.969 (1.7705 - 1.7704)		01	01	01	1	1	1	12	12	12	2	2	2	23
F	44.969 - 44.968 (1.7704 - 1.7704)		01	01	1	1	1	12	12	12	2	2	2	2	23
G	44.968 - 44.967 (1.7704 - 1.7704)		01	1	1	1	12	12	12	2	2	2	23	23	23
H	44.967 - 44.966 (1.7704 - 1.7703)		1	1	1	12	12	12	2	2	2	23	23	23	3
J	44.966 - 44.965 (1.7703 - 1.7703)		1	1	12	12	12	2	2	2	23	23	23	3	3
K	44.965 - 44.964 (1.7703 - 1.7702)		1	12	12	12	2	2	2	23	23	23	3	3	3
L	44.964 - 44.963 (1.7702 - 1.7702)		12	12	12	2	2	2	23	23	23	3	3	3	34
M	44.963 - 44.962 (1.7702 - 1.7702)		12	12	2	2	2	23	23	23	3	3	3	3	34
N	44.962 - 44.961 (1.7702 - 1.7701)		12	2	2	2	23	23	23	3	3	3	3	34	34
P	44.961 - 44.960 (1.7701 - 1.7701)		2	2	2	23	23	23	3	3	3	3	34	34	4
R	44.960 - 44.959 (1.7701 - 1.7700)		2	2	23	23	23	3	3	3	3	34	34	4	4
S	44.959 - 44.958 (1.7700 - 1.7700)		2	23	23	23	3	3	3	3	34	34	34	4	4
T	44.958 - 44.957 (1.7700 - 1.7700)		23	23	23	3	3	3	34	34	34	4	4	4	4
U	44.957 - 44.956 (1.7700 - 1.7699)		23	23	3	3	3	34	34	34	4	4	4	4	4

JPBIA0797GB

CONNECTING ROD BEARING GRADE TABLE

Connecting rod bearing grade table : Refer to [EM-135, "Connecting Rod Bearing"](#).

UNDERSIZE BEARINGS USAGE GUIDE

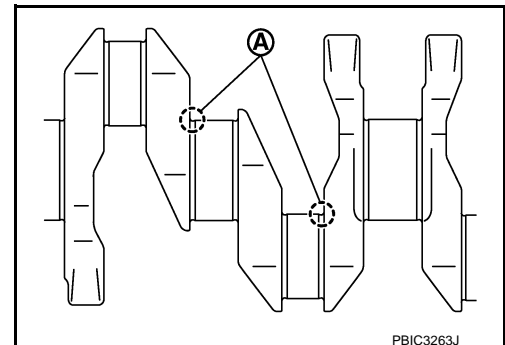
- When the specified connecting rod bearing oil clearance is not obtained with standard size connecting rod bearings, use undersize (US) bearings.
- When using undersize (US) bearing, measure the connecting rod bearing inner diameter with bearing installed, and grind the crankshaft pin so that the connecting rod bearing oil clearance satisfies the standard.

CAUTION:

In grinding crankshaft pin to use undersize bearings, keep the fillet R [1.5 - 1.7 mm (0.059 - 0.067 in)] (A).

Bearing undersize table:

Refer to [EM-135, "Connecting Rod Bearing"](#).



PBIC3263J

HOW TO SELECT PISTON AND BEARING

< UNIT DISASSEMBLY AND ASSEMBLY >

[QR25DE]

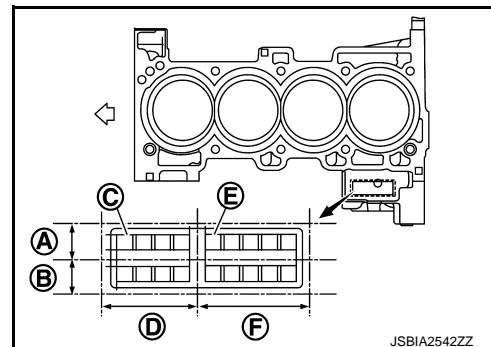
Main Bearing

INFOID:000000011616495

WHEN NEW CYLINDER BLOCK AND CRANKSHAFT ARE USED

1. "MAIN BEARING SELECTION TABLE" rows correspond to main bearing housing grade on rear-left side of cylinder block.

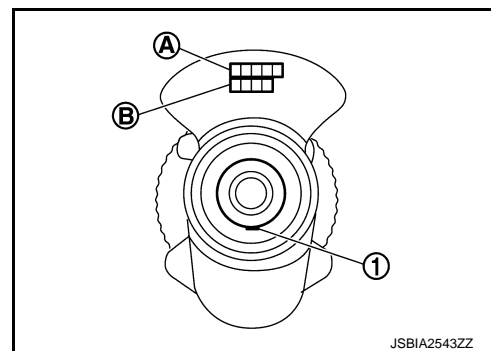
- (A) : Corrected stamping position
- (B) : Basic stamping position
- (C) : No.1 - 4 from left
- (D) : Cylinder bore grade
- (E) : No.1 - 5 from left
- (F) : Main bearing housing grade
- ↶ : Engine front



- If there is a corrected stamp mark on cylinder block, use it as a correct reference.

2. Apply main journal diameter grade stamped on crankshaft front side to column in the "MAIN BEARING SELECTION TABLE".

- ① : key
- (A) : Main journal diameter grade (No.1 - 5 from left)
- (B) : Pin journal diameter grade (No.1 - 4 from left)



3. Read the symbol at the cross point of selected row and column in the "MAIN BEARING SELECTION TABLE".

CAUTION:

There are three main bearing selection tables. Make certain to use the appropriate table. This is due to differences in the specified clearances.

4. Apply the symbol obtained to the "MAIN BEARING GRADE TABLE" to select main bearing.

NOTE:

Service part is available as a set of both upper and lower.

WHEN CYLINDER BLOCK AND CRANKSHAFT ARE REUSED

1. Measure the dimensions of the cylinder block main bearing housing inner diameter and crankshaft main journal diameter individually. Refer to [EM-107. "Inspection"](#).
2. Apply the measured dimension to the "MAIN BEARING SELECTION TABLE".
3. Read the symbol at the cross point of selected row and column in the "MAIN BEARING SELECTION TABLE".

CAUTION:

There are three main bearing selection tables. Make certain to use the appropriate table. This is due to differences in the specified clearances.

4. Apply the symbol obtained to the "MAIN BEARING GRADE TABLE" to select main bearing.

NOTE:

Service part is available as a set of both upper and lower.

HOW TO SELECT PISTON AND BEARING

< UNIT DISASSEMBLY AND ASSEMBLY >

[QR25DE]

MAIN BEARING SELECTION TABLE (No. 1 and 5 journals)

<div> <div>Cylinder block main bearing housing inner diameter</div> <div>Crankshaft main journal diameter</div> </div>		Mark	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	U	V	W	X	Y	4	7
		Inner diameter Unit: mm (in)	58.944 - 58.945 (2.3206 - 2.3207)	58.945 - 58.946 (2.3207 - 2.3207)	58.946 - 58.947 (2.3207 - 2.3207)	58.947 - 58.948 (2.3207 - 2.3208)	58.948 - 58.949 (2.3208 - 2.3208)	58.949 - 58.950 (2.3208 - 2.3209)	58.950 - 58.951 (2.3209 - 2.3209)	58.951 - 58.952 (2.3209 - 2.3209)	58.952 - 58.953 (2.3209 - 2.3210)	58.953 - 58.954 (2.3210 - 2.3210)	58.954 - 58.955 (2.3210 - 2.3211)	58.955 - 58.956 (2.3211 - 2.3211)	58.956 - 58.957 (2.3211 - 2.3211)	58.957 - 58.958 (2.3211 - 2.3212)	58.958 - 58.959 (2.3212 - 2.3212)	58.959 - 58.960 (2.3212 - 2.3213)	58.960 - 58.961 (2.3213 - 2.3213)	58.961 - 58.962 (2.3213 - 2.3213)	58.962 - 58.963 (2.3213 - 2.3214)	58.963 - 58.964 (2.3214 - 2.3214)	58.964 - 58.965 (2.3214 - 2.3215)	58.965 - 58.966 (2.3215 - 2.3215)	58.966 - 58.967 (2.3215 - 2.3215)	58.967 - 58.968 (2.3215 - 2.3216)
Mark	Outer diameter Unit: mm (in)																									
A	54.979 - 54.978 (2.1645 - 2.1645)	0	0	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	3	34	34	34	4
B	54.978 - 54.977 (2.1645 - 2.1644)	0	01	01	01	1	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	3	34	34	34	4
C	54.977 - 54.976 (2.1644 - 2.1644)	01	01	01	1	1	1	12	12	12	12	2	2	2	23	23	23	3	3	3	3	34	34	34	4	4
D	54.976 - 54.975 (2.1644 - 2.1644)	01	01	1	1	1	12	12	12	12	2	2	2	23	23	23	3	3	3	3	34	34	34	4	4	45
E	54.975 - 54.974 (2.1644 - 2.1643)	01	1	1	1	12	12	12	2	2	2	2	23	23	23	3	3	3	3	34	34	34	4	4	4	45
F	54.974 - 54.973 (2.1643 - 2.1643)	1	1	1	12	12	12	2	2	2	2	23	23	23	3	3	3	3	34	34	34	4	4	4	45	45
G	54.973 - 54.972 (2.1643 - 2.1642)	1	1	12	12	12	2	2	2	2	23	23	23	3	3	3	3	34	34	34	4	4	4	45	45	45
H	54.972 - 54.971 (2.1642 - 2.1642)	1	12	12	12	2	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	4	45	45	45	5
J	54.971 - 54.970 (2.1642 - 2.1642)	12	12	12	2	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	4	45	45	45	5	5
K	54.970 - 54.969 (2.1642 - 2.1641)	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	4	45	45	45	5	5	5	56
L	54.969 - 54.968 (2.1641 - 2.1641)	12	2	2	2	23	23	23	3	3	3	3	34	34	34	4	4	4	4	45	45	45	5	5	5	56
M	54.968 - 54.967 (2.1641 - 2.1641)	2	2	2	23	23	23	3	3	3	3	34	34	34	4	4	4	4	45	45	45	5	5	5	56	56
N	54.967 - 54.966 (2.1641 - 2.1640)	2	2	23	23	23	3	3	3	3	34	34	34	4	4	4	4	45	45	45	5	5	5	56	56	6
P	54.966 - 54.965 (2.1640 - 2.1640)	2	23	23	23	3	3	3	3	34	34	34	4	4	4	4	45	45	45	5	5	5	56	56	6	6
R	54.965 - 54.964 (2.1640 - 2.1639)	23	23	23	3	3	3	3	34	34	34	4	4	4	4	45	45	45	5	5	5	56	56	6	6	6
S	54.964 - 54.963 (2.1639 - 2.1639)	23	23	3	3	3	3	34	34	34	4	4	4	4	45	45	45	5	5	5	56	56	6	6	6	67
T	54.963 - 54.962 (2.1639 - 2.1639)	23	3	3	3	34	34	34	4	4	4	4	45	45	45	5	5	5	5	56	56	56	6	6	6	67
U	54.962 - 54.961 (2.1639 - 2.1638)	3	3	3	34	34	34	4	4	4	4	45	45	45	5	5	5	5	56	56	56	6	6	6	67	67
V	54.961 - 54.960 (2.1638 - 2.1638)	3	3	34	34	34	4	4	4	4	45	45	45	5	5	5	5	56	56	56	6	6	6	67	67	7
W	54.960 - 54.959 (2.1638 - 2.1637)	3	34	34	34	4	4	4	4	45	45	45	5	5	5	5	56	56	56	6	6	6	67	67	7	7
X	54.959 - 54.958 (2.1637 - 2.1637)	34	34	34	4	4	4	4	4	45	45	45	5	5	5	5	56	56	56	6	6	6	67	67	7	7
Y	54.958 - 54.957 (2.1637 - 2.1637)	34	34	4	4	4	4	45	45	45	5	5	5	5	56	56	56	6	6	6	6	67	67	7	7	7
4	54.957 - 54.956 (2.1637 - 2.1636)	34	4	4	4	4	45	45	45	5	5	5	5	56	56	56	6	6	6	6	67	67	67	7	7	7
7	54.956 - 54.955 (2.1636 - 2.1636)	4	4	4	4	45	45	45	5	5	5	5	56	56	56	6	6	6	6	67	67	67	7	7	7	7

PBIC2201E

HOW TO SELECT PISTON AND BEARING

< UNIT DISASSEMBLY AND ASSEMBLY >

[QR25DE]

MAIN BEARING SELECTION TABLE (No. 2 and 4 journals)

<div> <div>Cylinder block main bearing housing inner diameter</div> <div>Crankshaft main journal diameter</div> </div>		Mark	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	U	V	W	X	Y	4	7
		Inner diameter Unit: mm (in)	58.944 - 58.945 (2.3206 - 2.3207)	58.945 - 58.946 (2.3207 - 2.3207)	58.946 - 58.947 (2.3207 - 2.3207)	58.947 - 58.948 (2.3207 - 2.3208)	58.948 - 58.949 (2.3208 - 2.3208)	58.949 - 58.950 (2.3208 - 2.3209)	58.950 - 58.951 (2.3209 - 2.3209)	58.951 - 58.952 (2.3209 - 2.3209)	58.952 - 58.953 (2.3209 - 2.3210)	58.953 - 58.954 (2.3210 - 2.3210)	58.954 - 58.955 (2.3210 - 2.3211)	58.955 - 58.956 (2.3211 - 2.3211)	58.956 - 58.957 (2.3211 - 2.3212)	58.957 - 58.958 (2.3212 - 2.3212)	58.958 - 58.959 (2.3212 - 2.3212)	58.959 - 58.960 (2.3212 - 2.3213)	58.960 - 58.961 (2.3213 - 2.3213)	58.961 - 58.962 (2.3213 - 2.3213)	58.962 - 58.963 (2.3213 - 2.3214)	58.963 - 58.964 (2.3214 - 2.3214)	58.964 - 58.965 (2.3214 - 2.3215)	58.965 - 58.966 (2.3215 - 2.3215)	58.966 - 58.967 (2.3215 - 2.3215)	58.967 - 58.968 (2.3215 - 2.3216)
Mark	Outer diameter Unit: mm (in)																									
A	54.979 - 54.978 (2.1645 - 2.1645)		0	0	0	0	0	0	0	0	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3
B	54.978 - 54.977 (2.1645 - 2.1644)		0	0	0	0	0	0	0	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3
C	54.977 - 54.976 (2.1644 - 2.1644)		0	0	0	0	0	0	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3
D	54.976 - 54.975 (2.1644 - 2.1644)		0	0	0	0	0	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34
E	54.975 - 54.974 (2.1644 - 2.1643)		0	0	0	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	3	34	34
F	54.974 - 54.973 (2.1643 - 2.1643)		0	0	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	3	34	34	34
G	54.973 - 54.972 (2.1643 - 2.1642)		0	0	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	3	34	34	4
H	54.972 - 54.971 (2.1642 - 2.1642)		0	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	3	34	34	4	4
J	54.971 - 54.970 (2.1642 - 2.1642)		01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	3	34	34	4	4	4
K	54.970 - 54.969 (2.1642 - 2.1641)		01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	3	34	34	4	4	4	45
L	54.969 - 54.968 (2.1641 - 2.1641)		01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	3	34	34	4	4	4	4	45
M	54.968 - 54.967 (2.1641 - 2.1641)		1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	3	34	34	4	4	4	4	45	45
N	54.967 - 54.966 (2.1641 - 2.1640)		1	1	12	12	12	2	2	2	23	23	23	3	3	3	3	34	34	4	4	4	4	45	45	5
P	54.966 - 54.965 (2.1640 - 2.1640)		1	12	12	12	2	2	2	23	23	23	3	3	3	3	34	34	4	4	4	4	45	45	5	5
R	54.965 - 54.964 (2.1640 - 2.1639)		12	12	12	2	2	2	23	23	23	3	3	3	3	34	34	4	4	4	4	45	45	5	5	5
S	54.964 - 54.963 (2.1639 - 2.1639)		12	12	2	2	2	23	23	23	3	3	3	3	34	34	4	4	4	4	45	45	5	5	5	56
T	54.963 - 54.962 (2.1639 - 2.1639)		12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56
U	54.962 - 54.961 (2.1639 - 2.1638)		2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	56
V	54.961 - 54.960 (2.1638 - 2.1638)		2	2	23	23	23	3	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	6
W	54.960 - 54.959 (2.1638 - 2.1637)		2	23	23	23	3	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	6	6
X	54.959 - 54.958 (2.1637 - 2.1637)		23	23	23	3	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	6	6	6
Y	54.958 - 54.957 (2.1637 - 2.1637)		23	23	3	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	6	6	6	67
4	54.957 - 54.956 (2.1637 - 2.1636)		23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	56	6	6	6	67	67
7	54.956 - 54.955 (2.1636 - 2.1636)		3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	56	6	6	6	67	67	67

PBIC2202E

HOW TO SELECT PISTON AND BEARING

< UNIT DISASSEMBLY AND ASSEMBLY >

[QR25DE]

MAIN BEARING SELECTION TABLE (No. 3 journals)

<div> <div>Cylinder block main bearing housing inner diameter</div> <div>Crankshaft main journal diameter</div> </div>		Mark	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	U	V	W	X	Y	4	7
		Inner diameter Unit: mm (in)	58.944 - 58.945 (2.3206 - 2.3207)	58.945 - 58.946 (2.3207 - 2.3207)	58.946 - 58.947 (2.3207 - 2.3207)	58.947 - 58.948 (2.3207 - 2.3208)	58.948 - 58.949 (2.3208 - 2.3208)	58.949 - 58.950 (2.3208 - 2.3209)	58.950 - 58.951 (2.3209 - 2.3209)	58.951 - 58.952 (2.3209 - 2.3210)	58.952 - 58.953 (2.3210 - 2.3210)	58.953 - 58.954 (2.3210 - 2.3211)	58.954 - 58.955 (2.3211 - 2.3211)	58.955 - 58.956 (2.3211 - 2.3211)	58.956 - 58.957 (2.3211 - 2.3212)	58.957 - 58.958 (2.3212 - 2.3212)	58.958 - 58.959 (2.3212 - 2.3212)	58.959 - 58.960 (2.3212 - 2.3213)	58.960 - 58.961 (2.3213 - 2.3213)	58.961 - 58.962 (2.3213 - 2.3213)	58.962 - 58.963 (2.3213 - 2.3214)	58.963 - 58.964 (2.3214 - 2.3214)	58.964 - 58.965 (2.3214 - 2.3215)	58.965 - 58.966 (2.3215 - 2.3215)	58.966 - 58.967 (2.3215 - 2.3216)	58.967 - 58.968 (2.3216 - 2.3216)
Mark	Outer diameter Unit: mm (in)																									
A	54.979 - 54.978 (2.1645 - 2.1645)	-3	-3	-3-2	-3-2	-3-2	-2	-2	-2	-2-1	-2-1	-2-1	-1	-1	-1	-10	-10	-10	0	0	0	0	01	01	01	1
B	54.978 - 54.977 (2.1645 - 2.1644)	-3	-3-2	-3-2	-3-2	-2	-2	-2	-2	-2-1	-2-1	-2-1	-1	-1	-1	-10	-10	-10	0	0	0	0	01	01	01	1
C	54.977 - 54.976 (2.1644 - 2.1644)	-3-2	-3-2	-3-2	-2	-2	-2	-2-1	-2-1	-2-1	-2-1	-1	-1	-1	-10	-10	-10	0	0	0	0	01	01	01	1	1
D	54.976 - 54.975 (2.1644 - 2.1644)	-3-2	-3-2	-2	-2	-2	-2	-2-1	-2-1	-2-1	-1	-1	-1	-10	-10	-10	0	0	0	0	01	01	01	1	1	12
E	54.975 - 54.974 (2.1644 - 2.1643)	-3-2	-2	-2	-2	-2-1	-2-1	-2-1	-1	-1	-1	-10	-10	-10	0	0	0	0	01	01	01	1	1	1	12	12
F	54.974 - 54.973 (2.1643 - 2.1643)	-2	-2	-2	-2-1	-2-1	-2-1	-1	-1	-1	-10	-10	-10	0	0	0	0	01	01	01	1	1	1	12	12	12
G	54.973 - 54.972 (2.1643 - 2.1642)	-2	-2	-2-1	-2-1	-2-1	-1	-1	-1	-10	-10	-10	0	0	0	0	01	01	01	1	1	1	12	12	12	2
H	54.972 - 54.971 (2.1642 - 2.1642)	-2	-2-1	-2-1	-2-1	-1	-1	-1	-1	-10	-10	-10	0	0	0	01	01	01	1	1	1	12	12	12	2	2
J	54.971 - 54.970 (2.1642 - 2.1642)	-2-1	-2-1	-2-1	-1	-1	-1	-10	-10	-10	0	0	0	0	01	01	01	1	1	1	12	12	12	2	2	2
K	54.970 - 54.969 (2.1642 - 2.1641)	-2-1	-2-1	-1	-1	-1	-10	-10	-10	0	0	0	0	01	01	01	1	1	1	12	12	12	2	2	2	23
L	54.969 - 54.968 (2.1641 - 2.1641)	-2-1	-1	-1	-1	-10	-10	-10	0	0	0	0	01	01	01	1	1	1	12	12	12	2	2	2	23	23
M	54.968 - 54.967 (2.1641 - 2.1641)	-1	-1	-1	-10	-10	-10	0	0	0	0	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23
N	54.967 - 54.966 (2.1641 - 2.1640)	-1	-1	-10	-10	-10	0	0	0	0	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3
P	54.966 - 54.965 (2.1640 - 2.1640)	-1	-10	-10	-10	0	0	0	0	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3
R	54.965 - 54.964 (2.1640 - 2.1639)	-10	-10	-10	0	0	0	0	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3
S	54.964 - 54.963 (2.1639 - 2.1639)	-10	-10	0	0	0	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	3	34
T	54.963 - 54.962 (2.1639 - 2.1639)	-10	0	0	0	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	3	34	34
U	54.962 - 54.961 (2.1639 - 2.1638)	0	0	0	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	3	34	34	34
V	54.961 - 54.960 (2.1638 - 2.1638)	0	0	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	3	34	34	34	4
W	54.960 - 54.959 (2.1638 - 2.1637)	0	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	3	34	34	34	4	4
X	54.959 - 54.958 (2.1637 - 2.1637)	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	3	34	34	34	4	4	4
Y	54.958 - 54.957 (2.1637 - 2.1637)	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	3	34	34	34	4	4	4	45
4	54.957 - 54.956 (2.1637 - 2.1636)	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	3	34	34	34	4	4	4	45	45
7	54.956 - 54.955 (2.1636 - 2.1636)	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	3	34	34	34	4	4	4	45	45	45

JSBIA6021GB

MAIN BEARING GRADE TABLE (ALL JOURNALS)

Main bearing grade table (All journals) : Refer to [EM-133, "Main Bearing"](#).

USE UNDERSIZE BEARING USAGE GUIDE

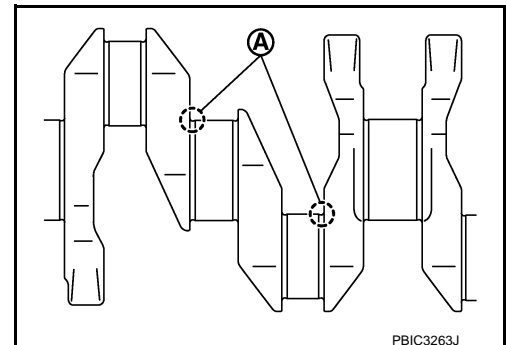
- When the specified main bearing oil clearance is not obtained with standard size main bearings, use under-size (US) bearing.
- When using undersize (US) bearing, measure the main bearing inner diameter with bearing installed, and grind main journal so that the main bearing oil clearance satisfies the standard.

CAUTION:

In grinding crankshaft main journal to use undersize bearings, keep fillet R [1.5 - 1.7 mm (0.059 - 0.067 in)] (A).

Bearing undersize table:

Refer to [EM-133, "Main Bearing"](#).



PBIC3263J

SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[QR25DE]

SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

General Specification

INFOID:0000000011616496

GENERAL SPECIFICATIONS

Engine type		QR25DE
Cylinder arrangement		In-line 4
Displacement	cm ³ (cu in)	2,488 (151.82)
Bore and stroke	mm (in)	89.0 x 100.0 (3.504 x 3.937)
Valve arrangement		DOHC
Firing order		1-3-4-2
Number of piston rings	Compression	2
	Oil	1
Compression ratio		10.0
Compression pressure kPa (bar, kg/cm ² , psi)/250 rpm	Standard	1,410 (14.1, 14.4, 204.7)
	Minimum	1,220 (12.2, 12.1, 176.3)
	Differential limit between cylinders	100 (1.0, 1.0, 14)

Unit: degree

Valve timing ↶ : Intake valve ↷ : Exhaust valve	VTC Minimum phasing (Mechanical)			VTC Maximum phasing (Mechanical)		
	a EXH valve opening angle	b INT valve opening angle	c INT open	d INT close	e EXH close	f EXH open
VTC Minimum phasing (Mechanical) *1	224	244	5 ATDC	69 ABDC	3 ATDC	41 BBDC
VTC Maximum phasing (Mechanical) *2			38 BTDC	26 ABDC	48 ATDC	4 ABDC

*1: When running at idle with engine coolant temperature more than 60°C (140°F).

*2: When the intake or exhaust valve opening angle is at the maximum.

Drive belt

INFOID:0000000011616497

DRIVE BELT

Tension of drive belt	Belt tension is not necessary, as it is automatically adjusted by drive belt auto-tensioner.
-----------------------	--

Spark Plug

INFOID:0000000011616498

SPARK PLUG

SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[QR25DE]

Unit: mm (in)

Make	DENSO
Standard type	FXE20HE11
Spark plug gap (Nominal)	1.1 (0.043)

Exhaust Manifold

INFOID:0000000011616499

EXHAUST MANIFOLD

Unit: mm (in)

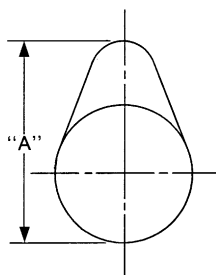
Items	Limit
Surface distortion Exhaust manifold	0.3 (0.012)

Camshaft

INFOID:0000000011616500

CAMSHAFT

Unit: mm (in)



SEM671

Items	Standard	Limit
Camshaft journal oil clearance	0.045 - 0.086 (0.0018 - 0.0034)	—
Camshaft bracket inner diameter	No. 1	28.000 - 28.021 (1.1024 - 1.1032)
	No. 2, 3, 4, 5	23.500 - 23.521 (0.9252 - 0.9260)
Camshaft journal diameter	No. 1	27.935 - 27.955 (1.0998 - 1.1006)
	No. 2, 3, 4, 5	23.435 - 23.455 (0.9226 - 0.9234)
Camshaft end play	0.115 - 0.188 (0.0045 - 0.0074)	—
Camshaft cam height "A"	Intake	45.865 - 46.055 (1.8057 - 1.8132)
	Exhaust	44.175 - 44.365 (1.7392 - 1.7467)
Camshaft runout [TIR* ²]	Less than 0.02 mm (0.0008)	—
Camshaft sprocket runout [TIR* ²]	—	0.15 (0.0059)

*1: Cam wear limit

*2: Total indicator reading

VALVE LIFTER

Unit: mm (in)

Items	Standard
Valve lifter outer diameter	33.977 - 33.987 (1.3377 - 1.3381)
Valve lifter hole diameter	34.000 - 34.021 (1.3386 - 1.3394)
Valve lifter clearance	0.010 - 0.041 (0.0004 - 0.0016)

VALVE CLEARANCE

SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[QR25DE]

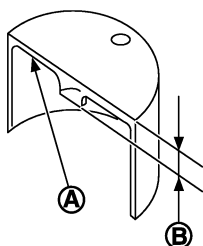
Unit: mm (in)

Items	Cold	Hot* (reference data)
Intake	0.24 - 0.32 (0.094 - 0.0126)	0.304 - 0.416 (0.0120 - 0.0164)
Exhaust	0.26 - 0.34 (0.0102 - 0.0134)	0.308 - 0.432 (0.0121 - 0.0170)

*: Approximately 80°C (176°F)

AVAILABLE VALVE LIFTER

Unit: mm (in)



JPBIA0170ZZ

Thickness (B)	Identification (stamped)* mark (A)
3.00 (0.1181)	300
3.02 (0.1189)	302
3.04 (0.1197)	304
3.06 (0.1205)	306
3.08 (0.1213)	308
3.10 (0.1220)	310
3.12 (0.1228)	312
3.14 (0.1236)	314
3.16 (0.1244)	316
3.18 (0.1252)	318
3.20 (0.1260)	320
3.22 (0.1268)	322
3.24 (0.1276)	324
3.26 (0.1283)	326
3.28 (0.1291)	328
3.30 (0.1299)	330
3.32 (0.1307)	332
3.34 (0.1315)	334
3.36 (0.1323)	336
3.38 (0.1331)	338
3.40 (0.1339)	340
3.42 (0.1346)	342
3.44 (0.1354)	344
3.46 (0.1362)	346
3.48 (0.1370)	348
3.50 (0.1378)	350

*: Always check with the Parts Department for the latest parts information.

SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

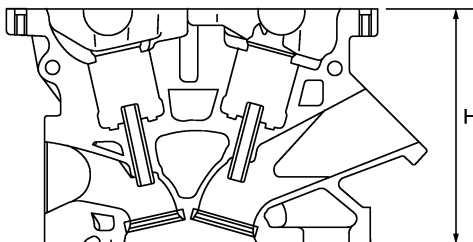
[QR25DE]

Cylinder Head

INFOID:0000000011616501

CYLINDER HEAD

Unit: mm (in)

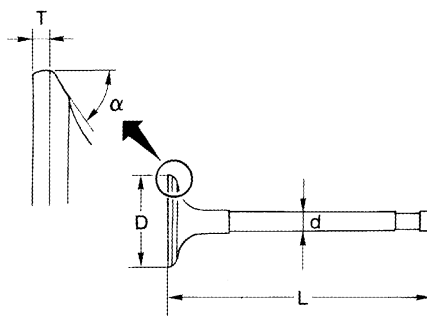


PBIC0924E

Items	Standard	Limit
Head surface distortion	Less than 0.03 (0.0012)	0.1 (0.004)
Normal cylinder head height "H"	129.4 (5.09)	—

VALVE DIMENSIONS

Unit: mm (in)



JSBIA1166ZZ

Valve head diameter "D"	Intake	35.5 - 35.8 (1.398 - 1.409)
	Exhaust	30.3 - 30.6 (1.193 - 1.205)
Valve length "L"	Intake	101.72 (4.0074)
	Exhaust	102.78 (4.0464)
Valve stem diameter "d"	Intake	5.965 - 5.980 (0.2348 - 0.2354)
	Exhaust	5.955 - 5.970 (0.2344 - 0.2350)
Valve seat angle "α"	Intake	45°15' - 45°45'
	Exhaust	
Valve margin "T"	Intake	1.3 (0.0512)
	Exhaust	1.6 (0.0630)
Valve margin "T" limit		0.5 (0.020)
Valve stem end surface grinding limit		0.2 (0.008)

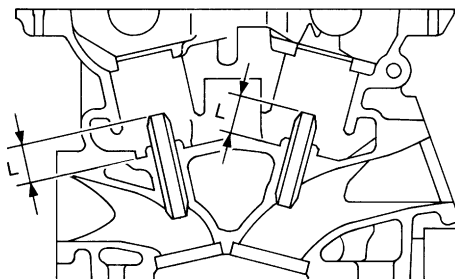
VALVE GUIDE

SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[QR25DE]

Unit: mm (in)

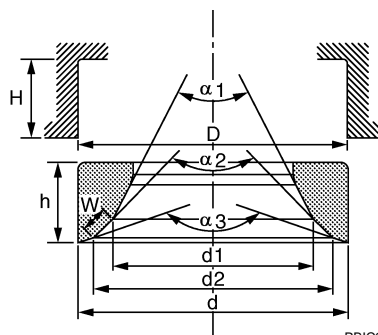


SEM950E

Items		Standard	Oversize (Service) [0.2 (0.008)]
Valve guide	Outer diameter	10.023 - 10.034 (0.3946 - 0.3950)	10.223 - 10.234 (0.4025 - 0.4029)
	Inner diameter (Finished size)	6.000 - 6.018 (0.2362 - 0.2369)	
Cylinder head valve guide hole diameter		9.975 - 9.996 (0.3927 - 0.3935)	10.175 - 10.196 (0.4006 - 0.4014)
Interference fit of valve guide		0.027 - 0.059 (0.0011 - 0.0023)	
Items		Standard	Limit
Valve guide clearance	Intake	0.020 - 0.053 (0.0008 - 0.0021)	0.08 (0.003)
	Exhaust	0.030 - 0.063 (0.0012 - 0.0025)	0.09 (0.0035)
Projection length "L"	Intake	10.1 - 10.3 (0.398 - 0.405)	
	Exhaust	10.0 - 10.4 (0.394 - 0.409)	

VALVE SEAT

Unit: mm (in)



PBIC2745E

Items		Standard	Oversize (Service) [0.5 (0.02)]
Cylinder head seat recess diameter "D"	Intake	36.500 - 36.516 (1.4370 - 1.4376)	37.000 - 37.016 (1.4567 - 1.4573)
	Exhaust	31.500 - 31.516 (1.2402 - 1.2408)	32.000 - 32.016 (1.2598 - 1.2408)
Valve seat outer diameter "d"	Intake	36.597 - 36.613 (1.4408 - 1.4415)	37.097 - 37.113 (1.4605 - 1.4611)
	Exhaust	31.600 - 31.616 (1.2441 - 1.2447)	32.100 - 32.116 (1.2638 - 1.2644)
Valve seat interference fit	Intake	0.081 - 0.113 (0.0032 - 0.0044)	
	Exhaust	0.084 - 0.116 (0.0034 - 0.0046)	
Diameter "d1"*1	Intake	33.5 (1.319)	
	Exhaust	28.0 (1.102)	
Diameter "d2"*2	Intake	34.8 - 35.3 (1.370 - 1.390)	
	Exhaust	29.6 - 30.1 (1.165 - 1.185)	
Angle "α1"	Intake	60°	
	Exhaust	60°	

SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[QR25DE]

Angle "α2"	Intake	88°75' - 90°25'	
	Exhaust	88°75' - 90°25'	
Angle "α3"	Intake	120°	
	Exhaust	120°	
Contacting width "W"*3	Intake	0.99 - 1.35 (0.0390 - 0.0531)	
	Exhaust	1.19 - 1.55 (0.0469 - 0.0610)	
Height "h"	Intake	5.9 - 6.0 (0.232 - 0.236)	5.0 - 5.1 (0.197 - 0.201)
	Exhaust	5.9 - 6.0 (0.232 - 0.236)	4.91 - 5.01 (0.1933 - 0.1972)
Depth "H"		6.0 (0.236)	

*1: Diameter made by intersection point of conic angles "α1" and "α2"

*2: Diameter made by intersection point of conic angles "α2" and "α3"

*3: Machining data

VALVE SPRING

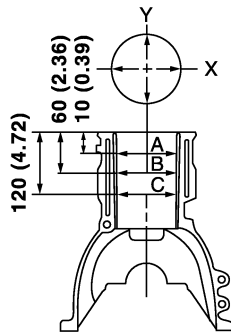
Items	Intake	Exhaust
Free height	47.02 (1.8512)	47.75 (1.8799)
Installation height	35.96 mm (1.4158 in)	35.96 mm (1.4158 in)
Installation load	153 – 173 N (15.6 – 17.6 kg, 34.4 – 38.9 lb)	153 – 173 N (15.6 – 17.6 kg, 34.4 – 38.9 lb)
Height during valve open	25.76 mm (1.0142 in)	27.46 mm (1.0811 in)
Load with valve open	337 – 381 N (34.4 – 39.1 kg, 75.8 – 86.1 lb)	302 – 340 N (30.8 – 34.7 kg, 67.9 – 76.4 lb)
Identification color	White	Light blue
Out- of- Square	1.0 mm (0.0394 in)	

Cylinder Block

INFOID:0000000011616502

CYLINDER BLOCK

Unit: mm (in)



PBIC0281E

Surface distortion		Limit		0.1 (0.004)
Cylinder bore	Inner diameter	Standard	Grade No. 2	89.010 - 89.020 (3.5043 - 3.5047)
			Grade No. 3	89.020 - 89.030 (3.5047 - 3.5051)
		Wear limit		0.2 (0.008)
Out-of-round (Difference between “X” and “Y”)		Limit		0.015 (0.0006)
Taper (Difference between “A” and “C”)				0.01 (0.0004)

SERVICE DATA AND SPECIFICATIONS (SDS)

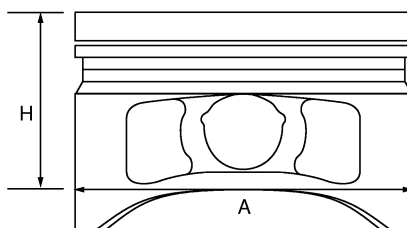
< SERVICE DATA AND SPECIFICATIONS (SDS)

[QR25DE]

Main bearing housing inner diameter grade	Grade No. A	58.944 - 58.945 (2.3206 - 2.3207)
	Grade No. B	58.945 - 58.946 (2.3207 - 2.3207)
	Grade No. C	58.946 - 58.947 (2.3207 - 2.3207)
	Grade No. D	58.947 - 58.948 (2.3207 - 2.3208)
	Grade No. E	58.948 - 58.949 (2.3208 - 2.3208)
	Grade No. F	58.949 - 58.950 (2.3208 - 2.3209)
	Grade No. G	58.950 - 58.951 (2.3209 - 2.3209)
	Grade No. H	58.951 - 58.952 (2.3209 - 2.3209)
	Grade No. J	58.952 - 58.953 (2.3209 - 2.3210)
	Grade No. K	58.953 - 58.954 (2.3210 - 2.3210)
	Grade No. L	58.954 - 58.955 (2.3210 - 2.3211)
	Grade No. M	58.955 - 58.956 (2.3211 - 2.3211)
	Grade No. N	58.956 - 58.957 (2.3211 - 2.3211)
	Grade No. P	58.957 - 58.958 (2.3211 - 2.3212)
	Grade No. R	58.958 - 58.959 (2.3212 - 2.3212)
	Grade No. S	58.959 - 58.960 (2.3212 - 2.3213)
	Grade No. T	58.960 - 58.961 (2.3213 - 2.3213)
	Grade No. U	58.961 - 58.962 (2.3213 - 2.3213)
	Grade No. V	58.962 - 58.963 (2.3213 - 2.3214)
	Grade No. W	58.963 - 58.964 (2.3214 - 2.3214)
	Grade No. X	58.964 - 58.965 (2.3214 - 2.3215)
	Grade No. Y	58.965 - 58.966 (2.3215 - 2.3215)
	Grade No. 4	58.966 - 58.967 (2.3215 - 2.3215)
	Grade No. 7	58.967 - 58.968 (2.3215 - 2.3216)
Difference in inner diameter between cylinders		Standard
		Less than 0.03 (0.0012)

AVAILABLE PISTON

Unit: mm (in)



PBIC0188E

Piston skirt diameter “A”	Standard	Grade No. 2	88.990 - 89.000 (3.5035 - 3.5039)
		Grade No. 3	89.000 - 89.010 (3.5039 - 3.5043)
		Oversize (Service) [0.20 (0.008)]	89.180 - 89.210 (3.5110 - 3.5122)
Piston height “H” dimension			37.5 (1.476)
Piston pin hole diameter	Grade No. 0		19.993 - 19.999 (0.7871 - 0.7874)
	Grade No. 1		19.999 - 20.005 (0.7874 - 0.7876)
Piston to cylinder bore clearance	Standard		0.010 - 0.030 (0.0004 - 0.0012)
	Limit		0.08 (0.0031)

PISTON RING

Unit: mm (in)

Items		Standard	Limit
Side clearance	Top	0.040 - 0.080 (0.0016 - 0.0031)	0.11 (0.0043)
	2nd	0.030 - 0.070 (0.0012 - 0.0028)	0.1 (0.004)
	Oil ring	0.045 - 0.125 (0.0018 - 0.0049)	—

SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[QR25DE]

End gap	Top	0.21 - 0.31 (0.0083 - 0.0122)	0.53 (0.0209)
	2nd	0.37 - 0.52 (0.0146 - 0.0205)	0.71 (0.0280)
	Oil (rail ring)	0.20 - 0.45 (0.008 - 0.0177)	0.80 (0.0314)

PISTON PIN

Unit: mm (in)

Items	Standard	Limit
Piston pin outer diameter	Grade No. 0	19.989 - 19.995 (0.7870 - 0.7872)
	Grade No. 1	19.995 - 20.001 (0.7872 - 0.7874)
Piston to piston pin oil clearance	0.002 - 0.006 (0.0001 - 0.0002)	—
Connecting rod bushing oil clearance	0.005 - 0.017 (0.0002 - 0.0007)	0.030 (0.0012)

CONNECTING ROD

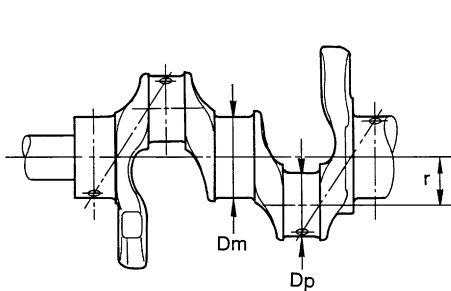
Unit: mm (in)

Center distance		143.00 - 143.10 (5.63 - 5.63)
Bend [per 100 (3.94)]	Limit	0.15 (0.0059)
Torsion [per 100 (3.94)]	Limit	0.3 (0.012)
Connecting rod small end inner diameter		21.980 - 22.000 (0.8654 - 0.8661)
Connecting rod bushing inner diameter*	Grade No. 0	20.000 - 20.006 (0.7874 - 0.7876)
	Grade No. 1	20.006 - 20.012 (0.7876 - 0.7879)
Connecting rod big end inner diameter		48.000 - 48.013 (1.8898 - 1.8903)
Side clearance	Standard	0.20 - 0.35 (0.008 - 0.0138)
	Limit	0.5 (0.020)
Connecting rod big end diameter	Grade No. 0	48.000 - 48.001 (1.8898 - 1.8898)
	Grade No. 1	48.001 - 48.002 (1.8898 - 1.8898)
	Grade No. 2	48.002 - 48.003 (1.8898 - 1.8899)
	Grade No. 3	48.003 - 48.004 (1.8899 - 1.8899)
	Grade No. 4	48.004 - 48.005 (1.8899 - 1.8900)
	Grade No. 5	48.005 - 48.006 (1.8900 - 1.8900)
	Grade No. 6	48.006 - 48.007 (1.8900 - 1.8900)
	Grade No. 7	48.007 - 48.008 (1.8900 - 1.8901)
	Grade No. 8	48.008 - 48.009 (1.8901 - 1.8901)
	Grade No. 9	48.009 - 48.010 (1.8901 - 1.8902)
	Grade No. A	48.010 - 48.011 (1.8902 - 1.8902)
	Grade No. B	48.011 - 48.012 (1.8902 - 1.8902)
	Grade No. C	48.012 - 48.013 (1.8902 - 1.8903)

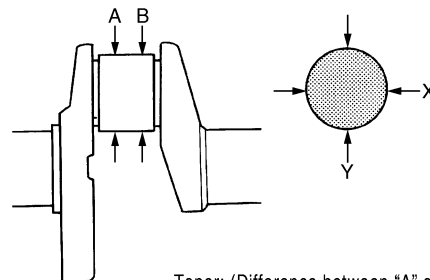
*: After installing in connecting rod

CRANKSHAFT

Unit: mm (in)



SEM645



SBIA0535E

Taper: (Difference between "A" and "B")
Out-of-round: (Difference between "X" and "Y")

Center distance "r"		49.96 - 50.04 (1.9669 - 1.9701)
Out-of-round (Difference between "X" and "Y")	Limit	0.005 (0.0002)

SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[QR25DE]

Taper (Difference between "A" and "B")	Limit	0.005 (0.0002)
Runout [TIR*]	Limit	0.05 (0.0020)
Crankshaft end play	Standard	0.10 - 0.26 (0.004 - 0.0102)
	Limit	0.3 (0.012)
Pin journal diameter grade. "Dp"	Grade No. A	44.974 - 44.973 (1.7706 - 1.7706)
	Grade No. B	44.973 - 44.972 (1.7706 - 1.7705)
	Grade No. C	44.972 - 44.971 (1.7705 - 1.7705)
	Grade No. D	44.971 - 44.970 (1.7705 - 1.7705)
	Grade No. E	44.970 - 44.969 (1.7705 - 1.7704)
	Grade No. F	44.969 - 44.968 (1.7704 - 1.7704)
	Grade No. G	44.968 - 44.967 (1.7704 - 1.7704)
	Grade No. H	44.967 - 44.966 (1.7704 - 1.7703)
	Grade No. J	44.966 - 44.965 (1.7703 - 1.7703)
	Grade No. K	44.965 - 44.964 (1.7703 - 1.7702)
	Grade No. L	44.964 - 44.963 (1.7702 - 1.7702)
	Grade No. M	44.963 - 44.962 (1.7702 - 1.7702)
	Grade No. N	44.962 - 44.961 (1.7702 - 1.7701)
	Grade No. P	44.961 - 44.960 (1.7701 - 1.7701)
	Grade No. R	44.960 - 44.959 (1.7701 - 1.7700)
	Grade No. S	44.959 - 44.958 (1.7700 - 1.7700)
	Grade No. T	44.958 - 44.957 (1.7700 - 1.7700)
	Grade No. U	44.957 - 44.956 (1.7700 - 1.7699)
Main journal diameter grade. "Dm"	Grade No. A	54.979 - 54.978 (2.1645 - 2.1645)
	Grade No. B	54.978 - 54.977 (2.1645 - 2.1644)
	Grade No. C	54.977 - 54.976 (2.1644 - 2.1644)
	Grade No. D	54.976 - 54.975 (2.1644 - 2.1644)
	Grade No. E	54.975 - 54.974 (2.1644 - 2.1643)
	Grade No. F	54.974 - 54.973 (2.1643 - 2.1643)
	Grade No. G	54.973 - 54.972 (2.1643 - 2.1642)
	Grade No. H	54.972 - 54.971 (2.1642 - 2.1642)
	Grade No. J	54.971 - 54.970 (2.1642 - 2.1642)
	Grade No. K	54.970 - 54.969 (2.1642 - 2.1641)
	Grade No. L	54.969 - 54.968 (2.1641 - 2.1641)
	Grade No. M	54.968 - 54.967 (2.1641 - 2.1641)
	Grade No. N	54.967 - 54.966 (2.1641 - 2.1640)
	Grade No. P	54.966 - 54.965 (2.1640 - 2.1640)
	Grade No. R	54.965 - 54.964 (2.1640 - 2.1639)
	Grade No. S	54.964 - 54.963 (2.1639 - 2.1639)
	Grade No. T	54.963 - 54.962 (2.1639 - 2.1639)
	Grade No. U	54.962 - 54.961 (2.1639 - 2.1638)
	Grade No. V	54.961 - 54.960 (2.1638 - 2.1638)
	Grade No. W	54.960 - 54.959 (2.1638 - 2.1637)
	Grade No. X	54.959 - 54.958 (2.1637 - 2.1637)
	Grade No. Y	54.958 - 54.957 (2.1637 - 2.1637)
	Grade No. 4	54.957 - 54.956 (2.1637 - 2.1636)
	Grade No. 7	54.956 - 54.955 (2.1636 - 2.1636)

*: Total indicator reading

Main Bearing

INFOID:0000000011616503

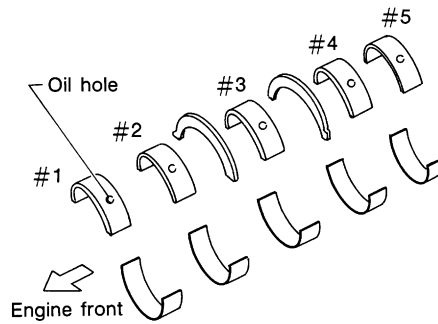
MAIN BEARING

SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[QR25DE]

Unit: mm (in)



SEM685D

Grade number		Thickness	Identification color	Remarks
-3		1.964 - 1.967 (0.0773 - 0.0774)	Blue - Green	Grade and color are the same for upper and lower bearings.
-2		1.967 - 1.970 (0.0774 - 0.0776)	Black - Green	
-1		1.970 - 1.973 (0.0776 - 0.0777)	Green - Brown	
0		1.973 - 1.976 (0.0777 - 0.0778)	Black	
1		1.976 - 1.979 (0.0778 - 0.0779)	Brown	
2		1.979 - 1.982 (0.0779 - 0.0780)	Green	
3		1.982 - 1.985 (0.0780 - 0.0781)	Yellow	
4		1.985 - 1.988 (0.0781 - 0.0783)	Blue	
5		1.988 - 1.991 (0.0783 - 0.0784)	Pink	
6		1.991 - 1.994 (0.0784 - 0.0785)	Purple	
7		1.994 - 1.997 (0.0785 - 0.0786)	White	
-3-2	UPR	1.964 - 1.967 (0.0773 - 0.0774)	Blue - Green	Grade and color are different for upper and lower bearings.
	LWR	1.967 - 1.970 (0.0774 - 0.0776)	Black - Green	
-2-1	UPR	1.967 - 1.970 (0.0774 - 0.0776)	Black - Green	
	LWR	1.970 - 1.973 (0.0776 - 0.0777)	Green - Brown	
-10	UPR	1.970 - 1.973 (0.0776 - 0.0777)	Green - Brown	
	LWR	1.973 - 1.976 (0.0777 - 0.0778)	Black	
01	UPR	1.973 - 1.976 (0.0777 - 0.0778)	Black	
	LWR	1.976 - 1.979 (0.0778 - 0.0779)	Brown	
12	UPR	1.976 - 1.979 (0.0778 - 0.0779)	Brown	
	LWR	1.979 - 1.982 (0.0779 - 0.0780)	Green	
23	UPR	1.979 - 1.982 (0.0779 - 0.0780)	Green	
	LWR	1.982 - 1.985 (0.0780 - 0.0781)	Yellow	
34	UPR	1.982 - 1.985 (0.0780 - 0.0781)	Yellow	
	LWR	1.985 - 1.988 (0.0781 - 0.0783)	Blue	
45	UPR	1.985 - 1.988 (0.0781 - 0.0783)	Blue	
	LWR	1.988 - 1.991 (0.0783 - 0.0784)	Pink	
56	UPR	1.988 - 1.991 (0.0783 - 0.0784)	Pink	
	LWR	1.991 - 1.994 (0.0784 - 0.0785)	Purple	
67	UPR	1.991 - 1.994 (0.0784 - 0.0785)	Purple	
	LWR	1.994 - 1.997 (0.0785 - 0.0786)	White	

UNDERSIZE

SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[QR25DE]

Unit: mm (in)

Items	Thickness	Main journal diameter
0.25 (0.0098)	2.106 - 2.114 (0.0829 - 0.0832)	Grind so that bearing clearance is the specified value.

MAIN BEARING OIL CLEARANCE

Unit: mm (in)

Main bearing oil clearance	Standard	No. 1 and 5	0.012 - 0.022 (0.0005 - 0.0009)
		No. 2 and 4	0.018 - 0.028 (0.0007 - 0.0011)
		No. 3	0.030 - 0.040 (0.0012 - 0.0016)
	Limit		0.1 (0.004)

Connecting Rod Bearing

INFOID:0000000011616504

CONNECTING ROD BEARING

Unit: mm (in)

Grade number	Thickness	Identification color	Remarks
0	1.493 - 1.496 (0.0588 - 0.0589)	Black - Black	Grade and color are the same for upper and lower bearings.
1	1.496 - 1.499 (0.0589 - 0.0590)	Brown - Brown	
2	1.499 - 1.502 (0.0590 - 0.0591)	Green - Green	
3	1.502 - 1.505 (0.0591 - 0.0593)	Yellow - Yellow	
4	1.505 - 1.508 (0.0593 - 0.0594)	Blue - Blue	
01	UPR	1.493 - 1.496 (0.0588 - 0.0589)	Grade and color are different for upper and lower bearings.
	LWR	1.496 - 1.499 (0.0589 - 0.0590)	
12	UPR	1.496 - 1.499 (0.0589 - 0.0590)	
	LWR	1.499 - 1.502 (0.0590 - 0.0591)	
23	UPR	1.499 - 1.502 (0.0590 - 0.0591)	
	LWR	1.502 - 1.505 (0.0591 - 0.0593)	
34	UPR	1.502 - 1.505 (0.0591 - 0.0593)	
	LWR	1.505 - 1.508 (0.0593 - 0.0594)	

UNDERSIZE

Unit: mm (in)

Items	Thickness	Crank pin journal diameter
0.25 (0.0098)	1.622 - 1.630 (0.0639 - 0.0642)	Grind so that bearing clearance is the specified value.

CONNECTING ROD BEARING OIL CLEARANCE

Unit: mm (in)

Items	Standard	Limit
Connecting rod bearing oil clearance	0.035 - 0.045 (0.0014 - 0.0018)	0.1 (0.004)

PRECAUTION

PRECAUTIONS

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

INFOID:0000000011999088

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 "SRS AIR BAG" and "SEAT BELT" of this Service Manual.

WARNING:

Always observe the following items for preventing accidental activation.

- To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision that would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.
- Improper maintenance, 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 "SRS AIR BAG".
- Never 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:

Always observe the following items for preventing accidental activation.

- When working near the Air Bag Diagnosis Sensor Unit or other Air Bag System sensors with the ignition ON or engine running, never 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, and wait at least 3 minutes before performing any service.

Precaution Necessary for Steering Wheel Rotation After Battery Disconnect

INFOID:0000000011999089

CAUTION:

Comply with the following cautions to prevent any error and malfunction.

- Before removing and installing any control units, first turn the ignition power source and accessory power source to the OFF, then disconnect both battery cables.
- After finishing work, confirm that all control unit connectors are connected properly, then re-connect both battery cables.
- Always use CONSULT to perform self-diagnosis as a part of each function inspection after finishing work. If a DTC is detected, perform trouble diagnosis according to self-diagnosis results.

For vehicle with steering lock unit, if the battery is disconnected or discharged, the steering wheel will lock and cannot be turned.

If turning the steering wheel is required with the battery disconnected or discharged, follow the operation procedure below before starting the repair operation.

OPERATION PROCEDURE

1. Connect both battery cables.

NOTE:

Supply power using jumper cables if battery is discharged.

2. Open driver door.
3. Turn the ignition switch to the ON position.
(At this time, the steering lock will be released.)
4. Turn the ignition switch to OFF position with driver door open.
5. Wait for 3 minutes or longer with driver door open.

NOTE:

- Do not close driver door because the steering wheel locks when driver door is closed.

PRECAUTIONS

[YS23DDT/YS23DDTT]

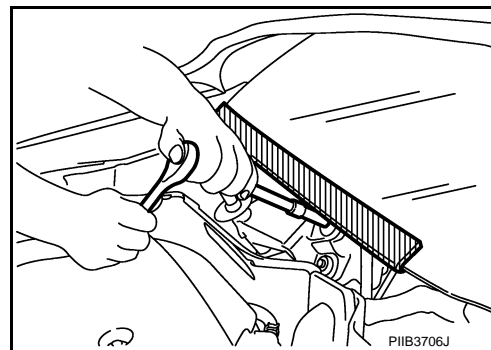
< PRECAUTION >

- The auto acc function is adapted to this vehicle. For this reason, even when the ignition switch is turned to OFF position, the accessory power source does not turned OFF and continues to be supplied for a certain amount of time.
- 6. Disconnect both battery cables. The steering lock will remain released with both battery cables disconnected and the steering wheel can be turned.
- 7. Perform the necessary repair operation.
- 8. When the repair work is completed, re-connect both battery cables. With the brake pedal released, turn the ignition switch from OFF position to ON position, then to LOCK position. (The steering wheel will lock when the ignition switch is turned to LOCK position.)
- 9. Perform self-diagnosis check of all control units using CONSULT.

Precaution for Procedure without Cowl Top Cover

INFOID:000000011999090

When performing the procedure after removing cowl top cover, cover the lower end of windshield with urethane, etc to prevent damage to windshield.



Precautions For Engine Service

INFOID:000000011999091

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.

PRECAUTIONS

< PRECAUTION >

[YS23DDT/YS23DDTT]

- 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.

Parts Requiring Angle Tightening

INFOID:000000011999092

- Use the angle wrench [SST: KV10112100] for the final tightening of the following engine parts:
 - Camshaft sprocket (INT) bolt
 - Cylinder head bolts
 - Main bearing cap bolts
 - Connecting rod cap bolts
 - Crankshaft pulley bolt (No the angle wrench is required as bolt flange is provided with notches for angle tightening)
- Do not use a torque value for final tightening.
- The torque value for these parts are for a preliminary step.
- Ensure thread and seat surfaces are clean and coated with engine oil.

Liquid Gasket

INFOID:000000011999093

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.

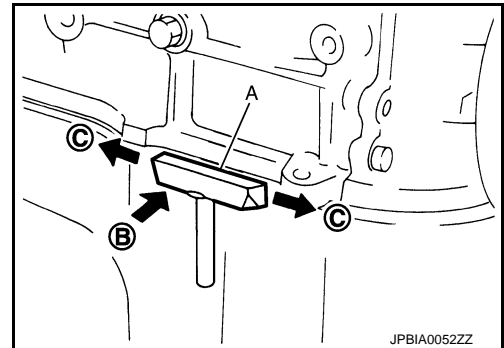
CAUTION:

Never damage the mating surfaces.

- Tap the seal cutter [SST: KV10111100] to insert it (B), and then slide it (C) 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.

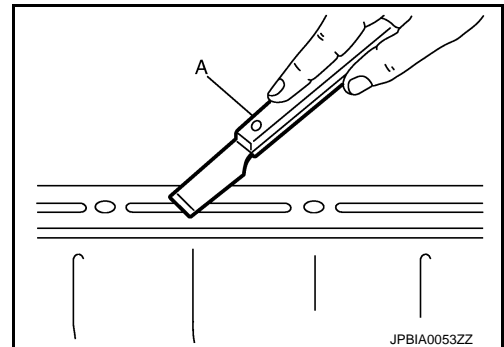
CAUTION:

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.

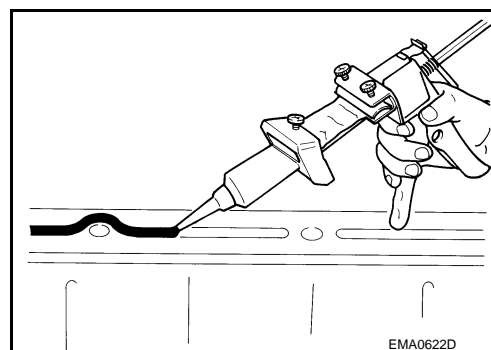


PRECAUTIONS

< PRECAUTION >

[YS23DDT/YS23DDTT]

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.

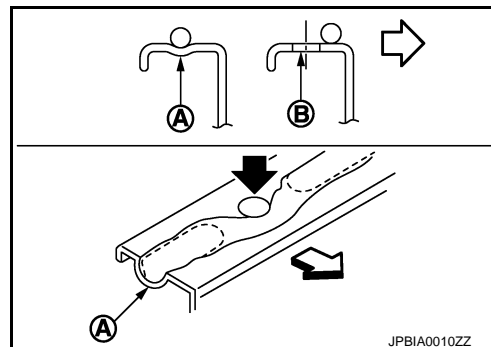


- As for bolt holes (B), normally apply liquid gasket inside the holes. Occasionally, it should be applied outside the holes. Check to read the text of this manual.

(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.

Precaution for Diesel Equipment

INFOID:0000000011999094

CLEANLINESS

CLEANLINESS INSTRUCTIONS WHICH MUST BE FOLLOWED WHEN WORKING ON THE HIGH PRESSURE DIRECT INJECTION SYSTEM

Risks relating to contamination

The system is very sensitive to contamination. The risks caused by the introduction of contamination are:

- Damage or destruction of the high pressure injection system and the engine
- Seizing or leaking of a component

All After-Sales operations must be performed under very clean conditions. This means that no impurities (particles a few microns in size) get into the system during dismantling or into the circuits via the fuel unions.

The cleanliness principle must be applied from the fuel filter to the fuel injectors.

WHAT ARE THE SOURCES OF CONTAMINATION?

Contamination is caused by:

- Metal or plastic chips
- Paint
- Fibers:
 - Boxes
 - Brushes
 - Paper
 - Clothing
 - Cloths
- Foreign bodies such as hair
- Ambient air
- Etc.

WARNING:

It is not possible to clean the engine using a high pressure fuel pump because of the risk of damaging connections. In addition, moisture may collect in the connectors and create electrical connection malfunctions

PRECAUTIONS

< PRECAUTION >

[YS23DDT/YS23DDTT]

INSTRUCTIONS TO BE FOLLOWED BEFORE ANY WORK IS CARRIED OUT ON THE INJECTION SYSTEM

- Check that you have the plugs for the unions to be opened (bag of plugs sold at the Parts Stores - Nissan part No. 16609 00Q0A, Renault part No. 77 01 209 062). Plugs are to be used once only. After use, they must be thrown away (once used they are soiled and cleaning is not sufficient to make them reusable). Unused plugs must be thrown away.
- Check that you have hermetically resealable plastic bags for storing removed parts. Stored parts will therefore be less subject to the risk of impurities. The bags must be used only once, and after use they must be thrown away.
- Lint-free towelettes to be used for fuel pump related service purpose. The use of a normal cloth or paper for cleaning purposes is forbidden. These are not lint-free and may contaminate the fuel circuit of the system. Each lint-free cloth should only be used once.

INSTRUCTIONS TO BE FOLLOWED BEFORE OPENING THE FUEL CIRCUIT

- For each operation, use new thinner (used thinner contains impurities). Pour it into a clean receptacle.
- For each operation, use a clean brush which is in good condition (the brush must not shed its bristles).
- Use a brush and thinners to clean the connections to be opened.
- Blow compressed air over the cleaned parts (tools, cleaned the same way as the parts, connections and injection system zone). Check that no bristles remain adhered.
- Wash your hands before and during the operation if necessary.
- When wearing leather protective gloves, cover these with latex gloves.

INSTRUCTIONS TO BE FOLLOWED DURING THE OPERATION

- As soon as the circuit is open, all openings must be plugged to prevent impurities from entering the system. The plugs to be used are available from the Parts Stores - Nissan part No. 16609 00Q0A, Renault part No. 77 01 209 062. They must not, under any circumstances, be reused.
- Close the hermetically sealed bag, even if it has to be reopened shortly afterwards. Ambient air carries contamination.
- All components of the injection system that are removed must be stored in a hermetically sealed plastic bag once the plugs have been inserted.
- The use of a brush, thinner, bellows, sponge or normal cloth is strictly forbidden once the circuit has been opened. These items are likely to allow impurities to enter the system.
- A new component replacing an old one must not be removed from its packaging until it is to be fitted to the vehicle.

Instructions for Fitting the Plugs

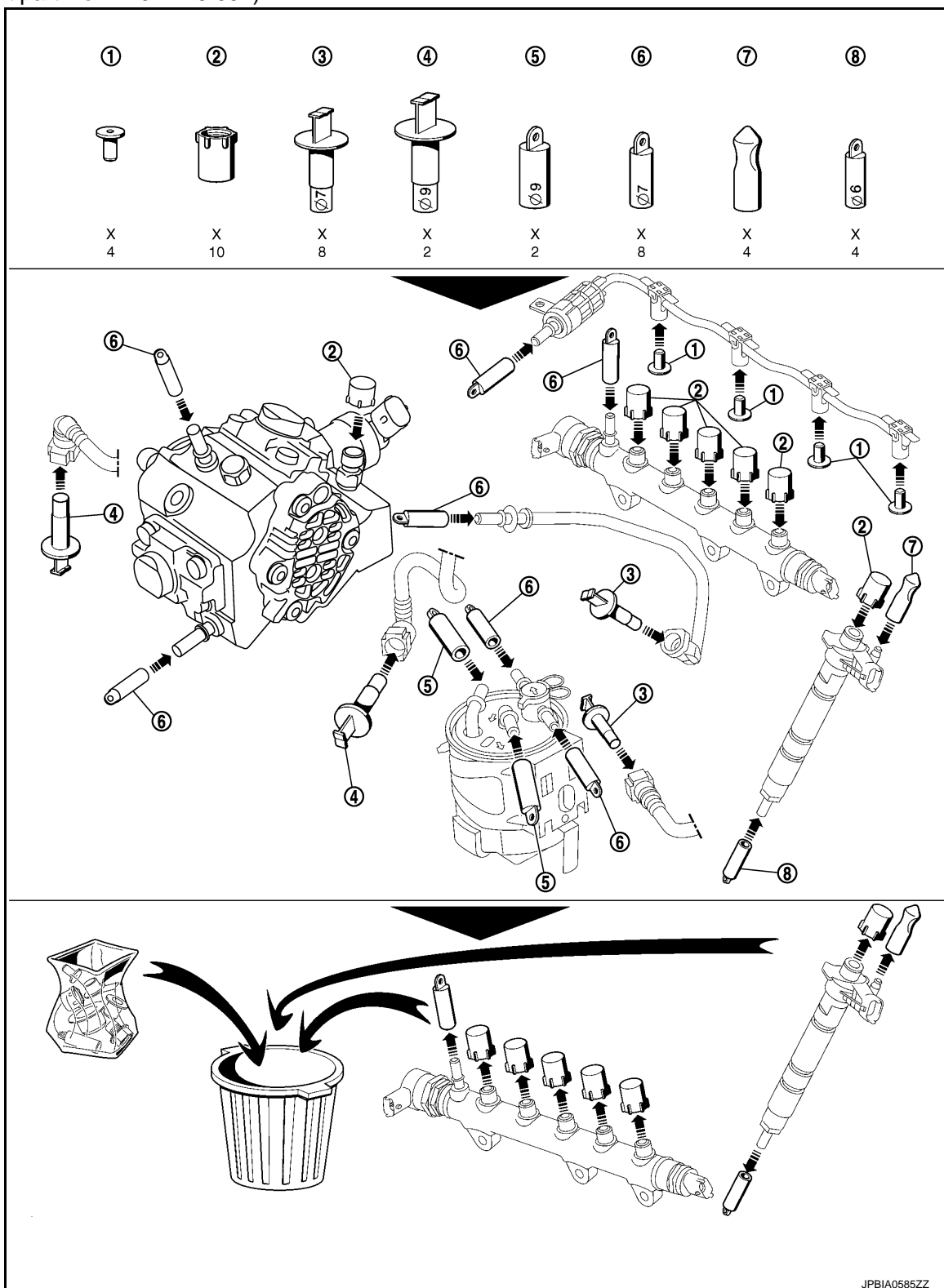
Nissan part No. 16609 00Q0C

PRECAUTIONS

[YS23DDT/YS23DDTT]

< PRECAUTION >

(Renault part No. 77 01 479 091)



SPECIAL FEATURES

CAUTION:

- The engine must not operate with:
 - Use diesel fuel required by the regulations for cetane number. Refer to [GI-27. "Fuel"](#).
 - Petrol, even in tiny quantities
- Before carrying out any work, check that the fuel rail is not under pressure and that the fuel temperature is not too high. [The system can inject the diesel into the engine at a pressure up to 160,000 kPa (1,600 bar, 1,632 kg/cm², 23,200 psi)].

PRECAUTIONS

< PRECAUTION >

[YS23DDT/YS23DDTT]

- Respect the cleaning and safety advice specified in this document for any work on the high pressure injection system.
- Remove of the interior of the fuel pump and fuel injectors is prohibited.
- For safety reasons, it is strictly forbidden to slacken an injection tube union when the engine is running.
- It is not possible to remove the fuel pressure sensor from the fuel rail because this may cause circuit contamination malfunctions. If the fuel pressure sensor fails, the fuel pressure sensor, the fuel rail and the fuel injection tubes must be replaced.
- It is strictly forbidden to remove the fuel pump pulley.
- Applying 12 volts directly to any component in the system is prohibited.
- Ultrasonic carbon removal and cleaning are prohibited.
- Never start the engine without the battery being connected correctly.

CHECKING SEALING AFTER REPAIR

CAUTION:

After any operation, check that there is no diesel leakage.

- Start the engine and check for fuel leak for one minute after starting.
- Apply tracing fluid around the high pressure connections of the pipe that has been replaced.
- Once the engine coolant temperature is above 50°C (122°F) and provided there are no malfunctions present, carry out a road test, taking the engine speed up to 4,000 rpm at least once to check that there is no leakage.
- Perform a visual inspection after the road test to check that there is no high pressure leakage.
- Clean off the tracing fluid.

Precautions for Removing Battery Terminal

INFOID:000000011999095

- With the adoption of Auto ACC function, ACC power is automatically supplied by operating the intelligent key or remote keyless entry or by opening/closing the driver side door. In addition, ACC power is supplied even after the ignition switch is turned to the OFF position, i.e. ACC power is supplied for a certain fixed time.
- When disconnecting the 12V battery terminal, turn off the ACC power before disconnecting the 12V battery terminal, observing "How to disconnect 12V battery terminal" described below.

NOTE:

Some ECUs operate for a certain fixed time even after ignition switch is turned OFF and ignition power supply is stopped. If the battery terminal is disconnected before ECU stops, accidental DTC detection or ECU data damage may occur.

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

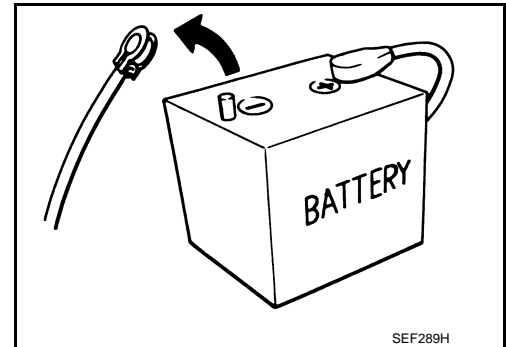
NOTE:

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.



SEF289H

HOW TO DISCONNECT 12V BATTERY TERMINAL

Disconnect 12V battery terminal according to instruction described below.

1. Open the hood.
2. Turn ignition switch to the ON position.
3. Turn ignition switch to the OFF position with the driver side door opened.
4. Get out of the vehicle and close the driver side door.
5. Wait at least 3 minutes. For vehicle 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		

PRECAUTIONS

< PRECAUTION >

[YS23DDT/YS23DDTT]

CAUTION:

While waiting, never operate the vehicle such as locking, opening, and closing doors. Violation of this caution results in the activation of ACC power supply according to the Auto ACC function.

6. Remove 12V battery terminal.

CAUTION:

After installing 12V battery, always check self-diagnosis results of all ECUs and erase DTC.

A

EM

C

D

E

F

G

H

I

J

K

L

M

N

O

P

PREPARATION

< PREPARATION >

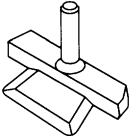
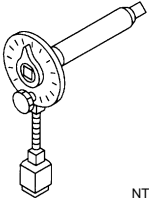
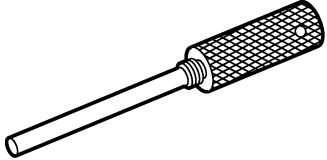
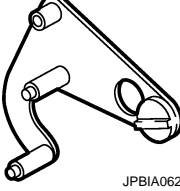
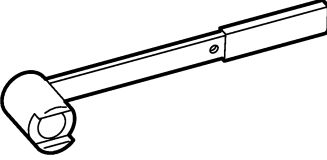
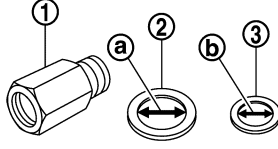
[YS23DDT/YS23DDTT]

PREPARATION

PREPARATION

Special Service Tools

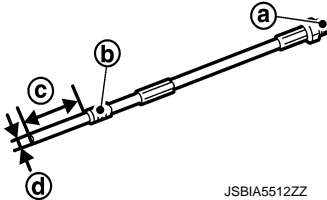
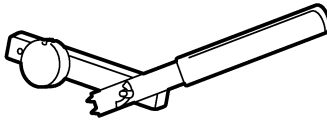
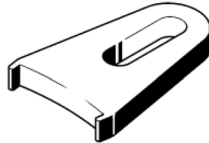
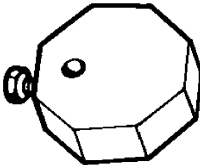
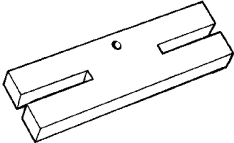
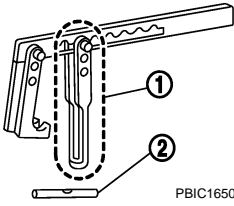
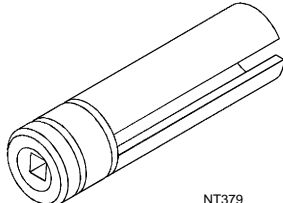
INFOID:000000011999096

NISSAN tool number (RENAULT tool No.) Tool name	Description
KV10111100 (—) Seal cutter	Removing oil pan and front cover. etc
 NT046	
KV10112100 (—) Angle wrench	Tightening bolts for bearing cap, cylinder head, etc. in angle
 NT014	
— (Mot. 1766) TDC set pin	To lock engine at TDC
 JPBIA0629ZZ	
— (Mot. 1769) Camshaft timing tool	To lock camshaft when changing timing chain
 JPBIA0628ZZ	
— (Mot. 1770) Crankshaft pulley locking tool	To lock crankshaft pulley
 JPBIA0630ZZ	
KV111063S0 Adapter set ① KV11106310 Adapter ② KV11106320 Gasket ③ KV11106330 Gasket	Connecting compression gauge and compression gauge adapter ① : ϕ 16.2 mm (0.64 in) ② : ϕ 13.1 mm (0.52 in)
 JPBIA6259ZZ	

PREPARATION

< PREPARATION >

[YS23DDT/YS23DDTT]

NISSAN tool number (RENAULT tool No.) Tool name		Description	
— (Mot. 1772) Compression gauge adapter		Connecting compression gauge and glow plug hole <ul style="list-style-type: none"> • (a) : G1/4 • (b) : M10×1.0 • (c) : 64 mm • (d) : φ8.5 mm 	A EM
— (Mot. 1773) Positioning tool		To position the gear and apply for the right clearance (wear compensation gear)	C D E
— (Mot. 1431) Flywheel locking tool		To lock flywheel	F G H
KV113B0040 (Mot. 251-01) Dial indicator stand set		Gauge stand used with KV113B0050 (Mot. 252-01)	I J
KV113B0050 (Mot. 252-01) Dial indicator stand set		Thrust plate for measuring the protrusion of piston used with KV113B0040 (Mot. 251-01)	K L M
KV10116200 Valve spring compressor 1. KV10115900 Attachment 2. KV10109220 Adapter		Disassembling and assembling valve mechanism Part ① is a component of KV10116200, but Part ② is not so.	N O
KV10117100 (—) Heated oxygen sensor wrench		Loosening or tightening heated oxygen sensor 1 For 22 mm (0.87 in) width hexagon nut	P

PREPARATION

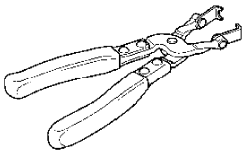
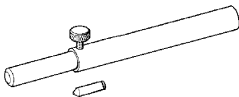
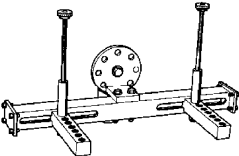
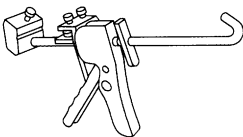
< PREPARATION >

[YS23DDT/YS23DDTT]

NISSAN tool number (RENAULT tool No.) Tool name	Description
— (Mot. 1966) Injector extractor	Removing fuel injector (Use with Mot. 2093)
— (Mot. 2093) Injector extractor	Removing fuel injector (Use with Mot. 1966)
— (Mot. 2047) High pressure pump pinion locking tool	To lock high pressure pump pinion

Commercial Service Tools

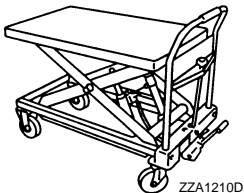
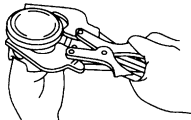
INFOID:0000000011999097

Tool name	Description
Valve seal remover  MBIB0370E	Tool for removing valve oil seals NOTE: NISSAN tool number : KV113B0090 RENAULT tool No. : Mot. 1335
Valve seal drift  MBIB0378E	Tool for installing valve oil seals NOTE: NISSAN tool number : KV113B0180 RENAULT tool No. : Mot. 1511-01
Cylinder head stand  MBIB0380E	Cylinder head and cylinder head housing support NOTE: NISSAN tool number : KV113B0200 RENAULT tool No. : Mot. 1573
Tube presser  NT052	Pressing the tube of liquid gasket

PREPARATION

< PREPARATION >

[YS23DDT/YS23DDTT]

Tool name	Description
<p>Manual lift table caddy</p>  <p>ZZA1210D</p>	<p>Removing and installing engine</p>
<p>Piston ring expander</p>  <p>NT030</p>	<p>Removing and installing piston ring</p>

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BASIC INSPECTION

COMPRESSION PRESSURE

Inspection

INFOID:000000012157949

1. PREPARATION OPERATION FOR CHECK

- Remove the glow plugs. Refer to [EM-185, "Removal and Installation"](#).
- Disconnect all the connectors of the fuel injector.
- Set the compression gauge adapter [SST: — (Mot. 1772)] in place of one of the removed glow plugs.
- Moderately tighten the compression gauge adapter [SST: — (Mot. 1772)] using an open-jawed spanner.
- Screw the conversion compression gauge adapter [SST: — (Mot. 1772)] of the diesel compression gauge onto the hose.
- **NOTE:**
If compression gauge for diesel engine cannot connect to the compression gauge adapter, use the adapter [SST: KV111063S0 (—)].

Compression gauge adapter

**: 20 N·m (2.0 kg-m, 15 ft-lb)**

- Put the vehicle under the starting conditions with the gear lever in neutral.

2. TEST OPERATION

- Turn the engine ignition key to trigger the engine starting phase.
- **NOTE:**
The engine will be driven for 20 s without starting.
- Check the compression of cylinder no. 1.

Compression pressure Refer to [EM-261, "General Specification"](#)

NOTE:

Put the vehicle back in forced + after ignition feed as soon as the starter has stopped (in order to maintain engine start inhibition and to measure the compression of the other cylinders).

NOTE:

It is necessary to wait for at least 10 seconds before starting the engine each time (the starter will not run due to its thermal protection).

- Measure the compression of the other cylinders.

3. FINAL OPERATION

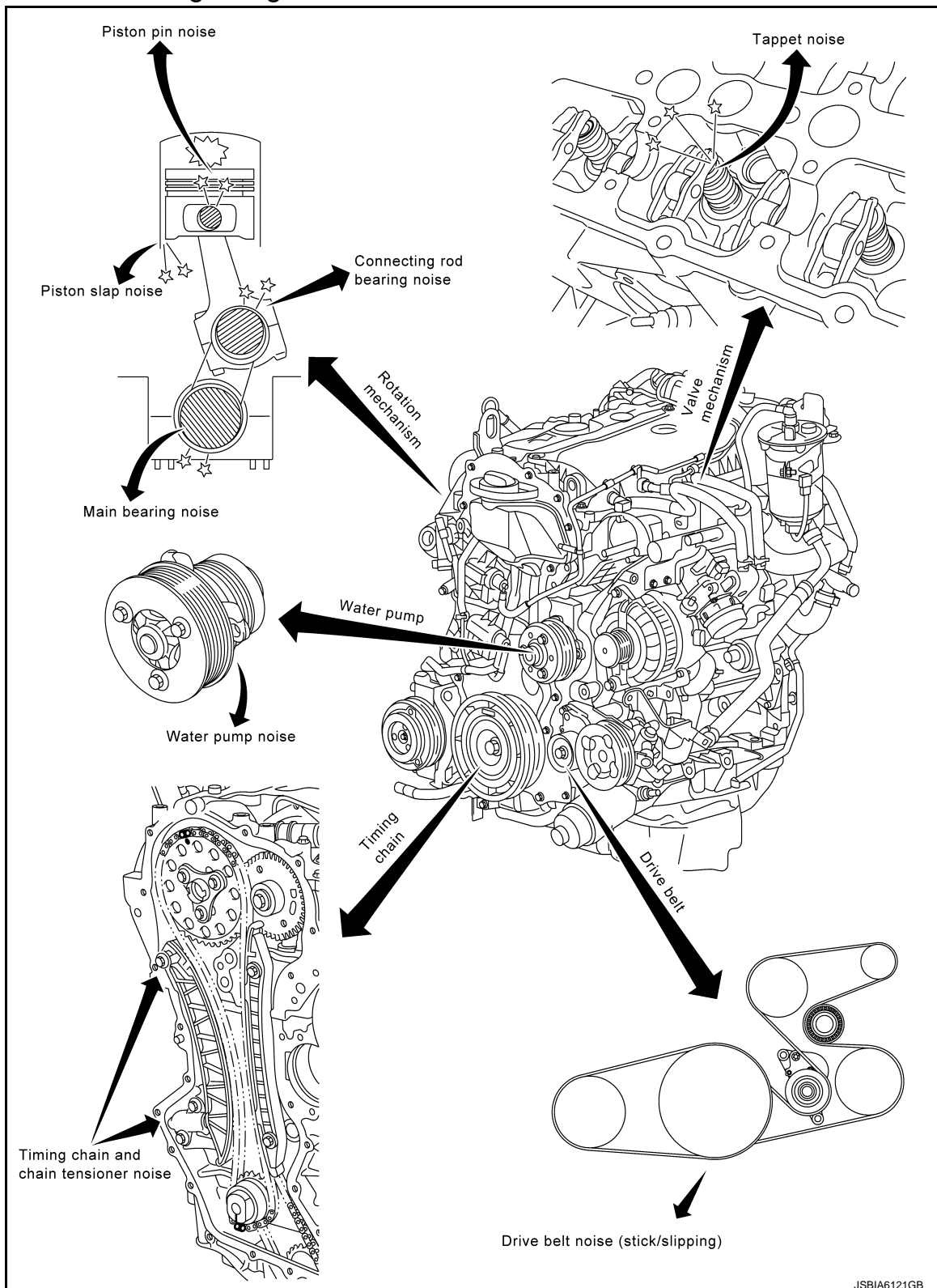
- Proceed in the reverse order to removal.
- Install the glow plugs. Refer to [EM-185, "Removal and Installation"](#).

SYMPTOM DIAGNOSIS

NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

NVH Troubleshooting - Engine Noise

INFOID:0000000011999098



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NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

< SYMPTOM DIAGNOSIS >

[YS23DDT/YS23DDTT]

Use the Chart Below to Help You Find the Cause of the Symptom

INFOID:000000011999099

1. Locate the area where noise occurs.
2. Confirm the type of noise.
3. Specify the operating condition of engine.
4. Check specified noise source.

If necessary, repair or replace these parts.

Location of noise	Type of noise	Operating condition of engine						Source of noise	Check item	Reference page
		Before warm-up	After warm-up	When starting	When idling	When racing	While driving			
Top of engine Cylinder head	Ticking or clicking	A	C	—	B	B	—	Hydraulic tappet noise	Out of oil	EM-228
	Rattle	C	A	—	A	B	C	Camshaft bearing noise	Camshaft journal oil clearance	EM-226
Crank-shaft pulley Cylinder block (Side of engine) Oil pan	Slap or knock	—	A	—	B	B	—	Piston pin noise	Piston to piston pin oil clearance Connecting rod bushing oil clearance	EM-248
	Slap or rap	A	—	—	B	B	A	Piston slap noise	Piston ring side clearance Piston ring end gap	EM-248
	Knock	A	B	C	B	B	B	Connecting rod bearing noise	Connecting rod bushing oil clearance Connecting rod bearing oil clearance	EM-248
	Knock	A	B	—	A	B	C	Main bearing noise	Main bearing oil clearance	EM-248
Front of engine Front cover	Tapping or ticking	A	A	—	B	B	B	Timing chain and chain tensioner noise	Timing chain cracks and wear Timing chain tensioner operation	EM-200
Front of engine	Squeaking or fizzing	A	B	—	B	—	C	Drive belt (Sticking or slipping)	Drive belt deflection	EM-158
	Creaking	A	B	A	B	A	B	Drive belt (Slipping)	Idler pulley bearing operation	
	Squall Creak	A	B	—	B	A	B	Water pump noise	Water pump operation	CO-55

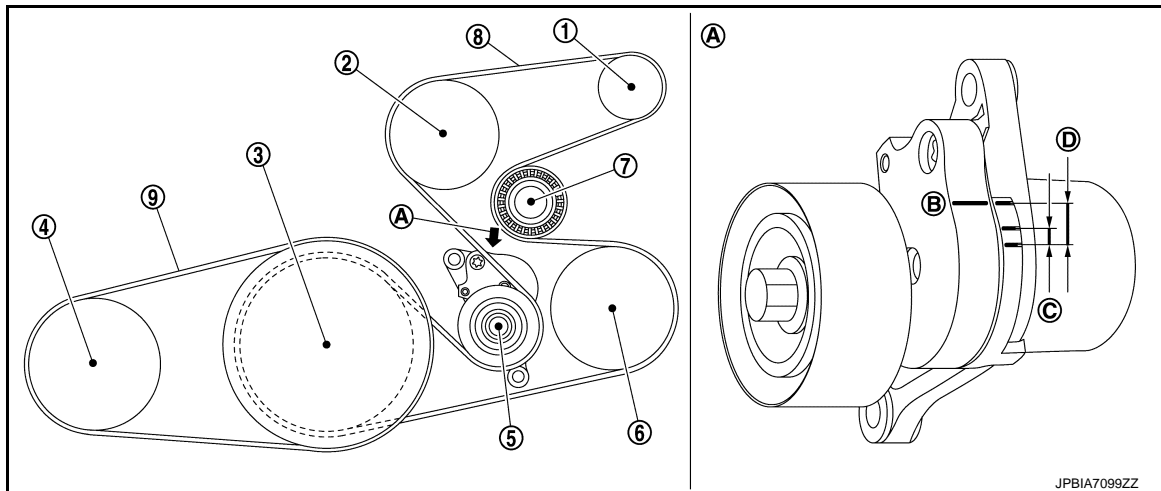
A: Closely related B: Related C: Sometimes related —: Not related

PERIODIC MAINTENANCE

DRIVE BELT

Exploded View

INFOID:0000000011999100



- | | | |
|----------------------|-----------------------------|--|
| ① Alternator | ② Water pump pulley | ③ Crankshaft pulley |
| ④ Compressor | ⑤ Drive belt auto-tensioner | ⑥ Power steering oil pump pulley |
| ⑦ Idler pulley | ⑧ Drive belt | ⑨ Compressor belt |
| Ⓐ View | Ⓑ Indicator | Ⓒ Range when new drive belt is installed |
| Ⓓ Possible use range | | |

Removal and Installation

INFOID:0000000011999101

CAUTION:

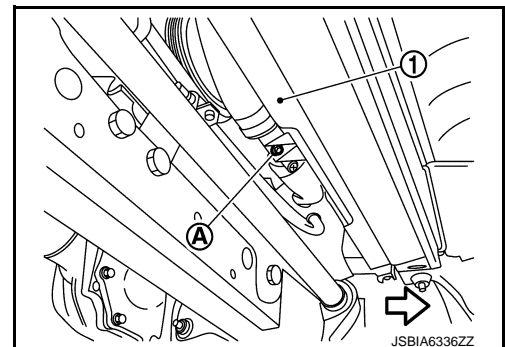
- Replace the drive belt and compressor belt that has been removed with a new one.
- Drive belt auto-tensioner and idler pulley must be replaced with new ones when the drive belt is replaced.
- Never run the engine without the drive belt to avoid damaging the crankshaft pulley.

REMOVAL

1. Remove front under cover. Refer to [EXT-24. "Removal and Installation"](#).
2. Remove radiator hose (lower) bolt Ⓐ from charge air cooler cover①.

⇐ : Vehicle front

3. Remove charge air cooler cover. Refer to [EM-162. "Removal and Installation"](#).



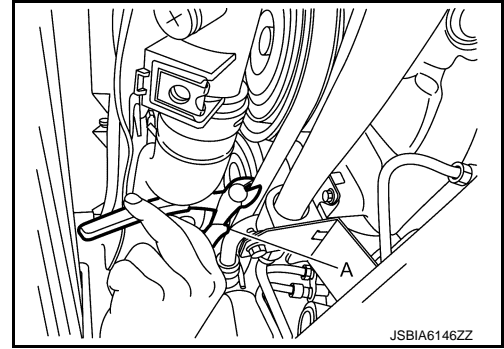
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DRIVE BELT

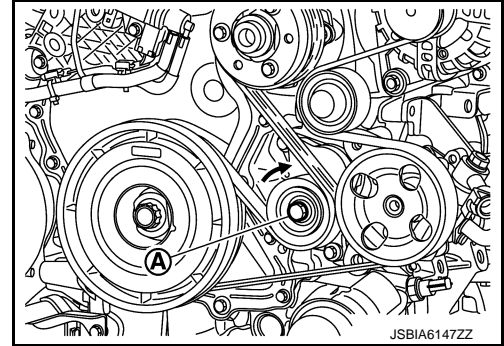
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[YS23DDT/YS23DDTT]

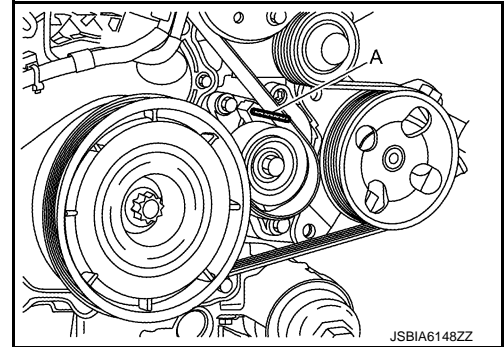
4. Remove compressor belt by cutting it with an appropriate tool (A).



5. Hold the hexagonal part (A) in center of drive belt auto-tensioner pulley with a box wrench securely. Then move the wrench handle in the direction of arrow (loosening direction arrow)



6. Insert a stopper pin (A) in diameter such as short-length screw-driver into the hole of the retaining boss to fix drive belt auto-tensioner pulley.
 - Keep drive belt auto-tensioner pulley arm locked after drive belt is removed.



7. Remove drive belt.

INSTALLATION

1. Install drive belt.

CAUTION:

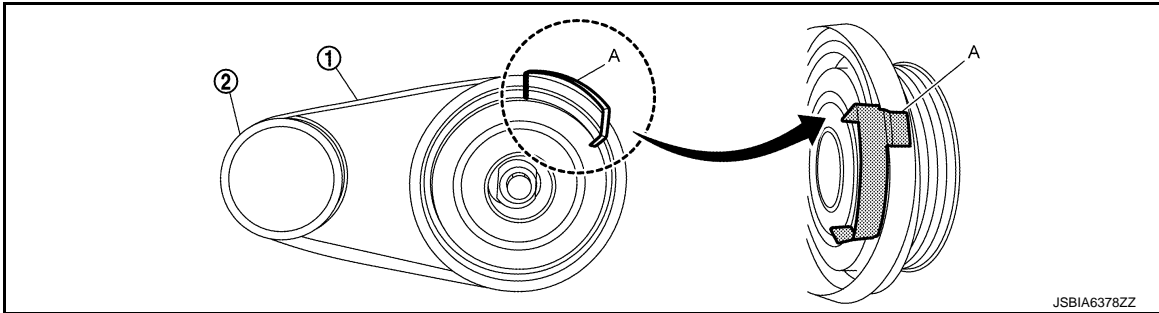
- Check that drive belt is completely set to pulleys.
 - Check for engine oil, working fluid and engine coolant are not adhered to drive belt and each pulley groove.
2. Release drive belt auto-tensioner, and apply tension to drive belt.
 3. Turn crankshaft pulley clockwise several times to equalize tension between each pulley.
 4. Check that the indicator (notch on fixed side) of drive belt auto-tensioner is within the range when new drive belt is installed. Refer to [EM-153, "Inspection"](#).
 5. Set compressor belt ① on compressor pulley ②.

DRIVE BELT

< PERIODIC MAINTENANCE >

[YS23DDT/YS23DDTT]

6. Install stretch belt service tool (A) to compressor belt as shown in the figure.



NOTE:

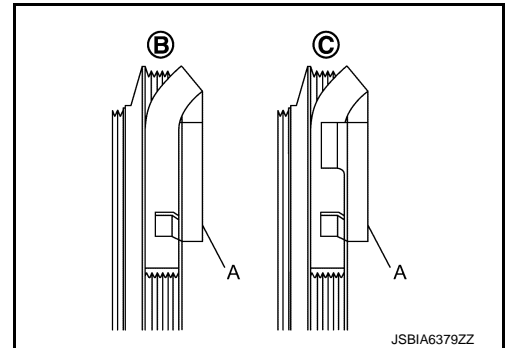
Stretch belt service tool is enclosed when compressor belt is ordered.

CAUTION:

- Install stretch belt service tool (A) as shown in the figure.

- Ⓑ : Correct
Ⓒ : Incorrect

- Check that belt is properly placed in the groove of pulley.

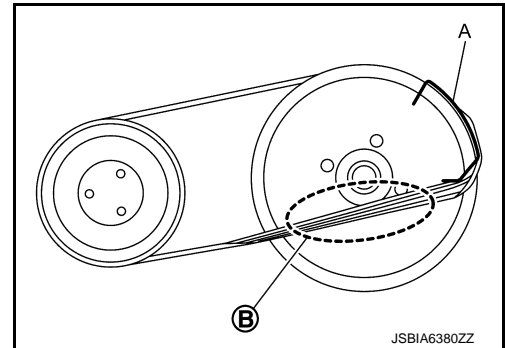


7. Since the lower part of belt Ⓑ becomes warped, rotate crankshaft pulley by holding the belt by hand.

CAUTION:

Be careful not to get fingers caught in the pulley.

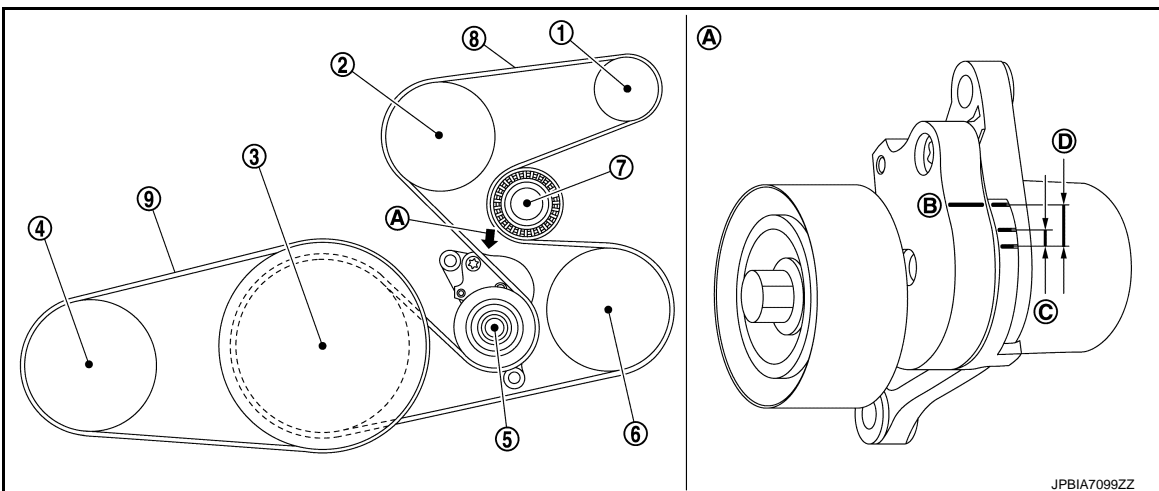
A : Stretch belt service tool



8. If stretch belt service tool comes off check if the belt is properly placed in the groove of each pulley.

Inspection

INFOID:0000000011999102



DRIVE BELT

< PERIODIC MAINTENANCE >

[YS23DDT/YS23DDTT]

- | | | |
|----------------------|-----------------------------|--|
| ① Alternator | ② Water pump pulley | ③ Crankshaft pulley |
| ④ Compressor | ⑤ Drive belt auto-tensioner | ⑥ Power steering oil pump pulley |
| ⑦ Idler pulley | ⑧ Drive belt | ⑨ Compressor belt |
| Ⓐ View | Ⓑ Indicator | Ⓒ Range when new drive belt is installed |
| Ⓓ Possible use range | | |

WARNING:

Be sure to perform this step when the engine is stopped.

- Check that the indicator Ⓑ (notch on fixed side) of drive belt auto-tensioner is within the possible use range Ⓓ.

NOTE:

- Check the drive belt auto-tensioner indication when the engine is cold.
- When new drive belt is installed, the indicator (notch on fixed side) should be within the range Ⓒ in the figure.
- Visually check entire drive belt for wear, damage or cracks.
- If the indicator (notch on fixed side) is out of the possible use range or belt is damaged, replace drive belt.

CAUTION:

Drive belt auto-tensioner and idler pulley must be replaced with new ones when the drive belt is replaced.

Adjustment

INFOID:0000000011999103

Refer to [EM-261. "Drive Belts"](#).

AIR CLEANER FILTER

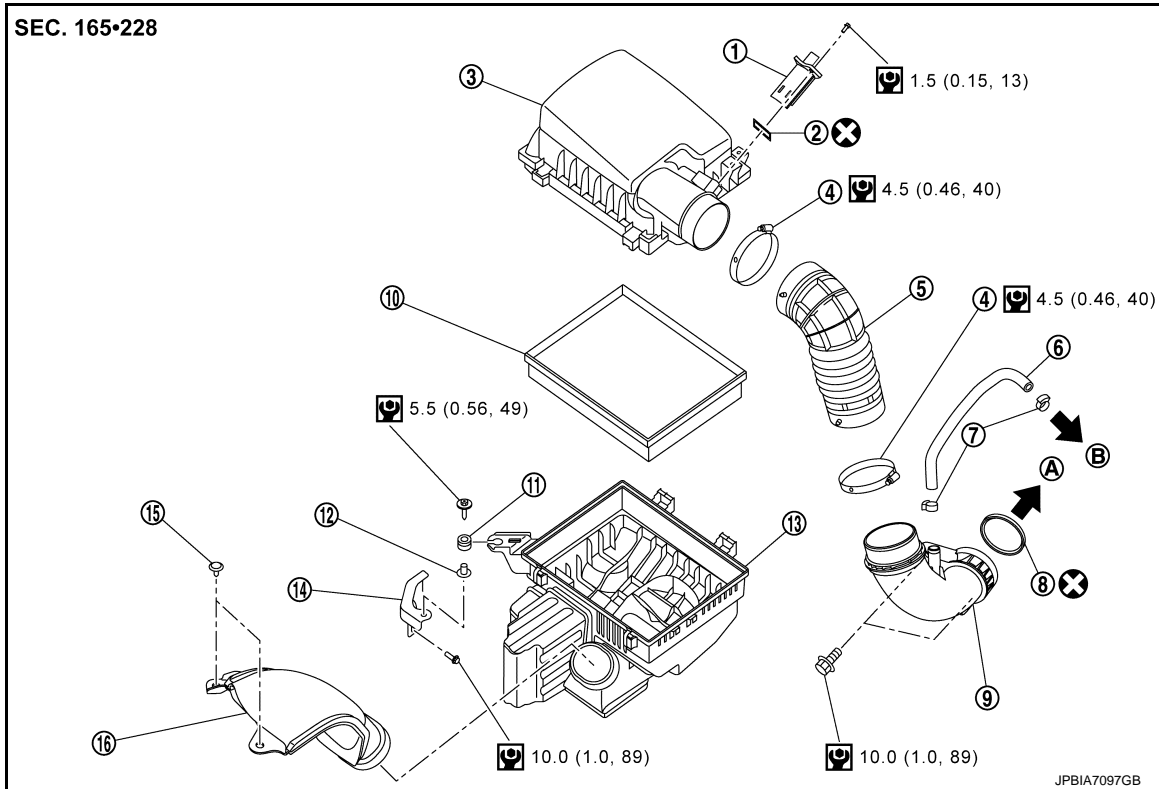
< PERIODIC MAINTENANCE >

[YS23DDT/YS23DDTT]

AIR CLEANER FILTER

Exploded View

INFOID:000000011999104



- | | | |
|--|----------------------|---------------------|
| ① Mass air flow sensor
(with intake air temperature sensor 1) | ② Gasket | ③ Air cleaner cover |
| ④ Clamp | ⑤ Air duct 1 | ⑥ Blow-by hose |
| ⑦ Clamp | ⑧ O-ring | ⑨ Air duct 2 |
| ⑩ Air cleaner filter | ⑪ Grommet | ⑫ Collar |
| ⑬ Air cleaner body | ⑭ Bracket | ⑮ Clip |
| ⑯ Air duct (inlet) | | |
| (A) To exhaust manifold and turbocharger
assembly (YS23DDT) | (B) To oil separator | |
| (B) To turbocharger (YS23DDTT) | | |

: N•m (kg-m, in-lb)

: Always replace after every disassembly.

Removal and Installation

INFOID:000000011999105

REMOVAL

CAUTION:

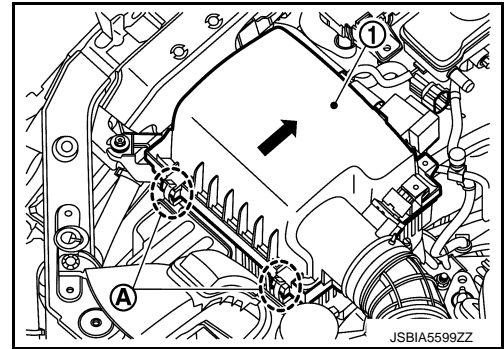
- Never shock mass air flow sensor.
- Never disassemble mass air flow sensor.
- Never touch mass air flow sensor element.

AIR CLEANER FILTER

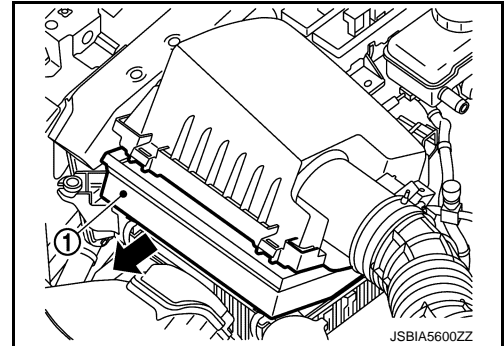
< PERIODIC MAINTENANCE >

[YS23DDT/YS23DDTT]

1. Unhook clips ① and pull up the air cleaner body cover upward ①.



2. Remove air cleaner filter ① from the air cleaner body assembly.



INSTALLATION

Install in the reverse order of removal.

Inspection (Dry Paper Type)

INFOID:0000000011999106

INSPECTION AFTER REMOVAL

Examine with eyes that there is no stain, clogging, or damage on air cleaner element.

- Remove dusts (such as dead leaves) on air cleaner element surface and inside cleaner case.
- To clean air cleaner element, blow it from intake manifold side towards air intake side to remove trash or dust.
- If clogging or damage is observed, replace the air cleaner element.

MAINTENANCE INTERVAL

Refer to [MA-9. "Periodic Maintenance"](#).

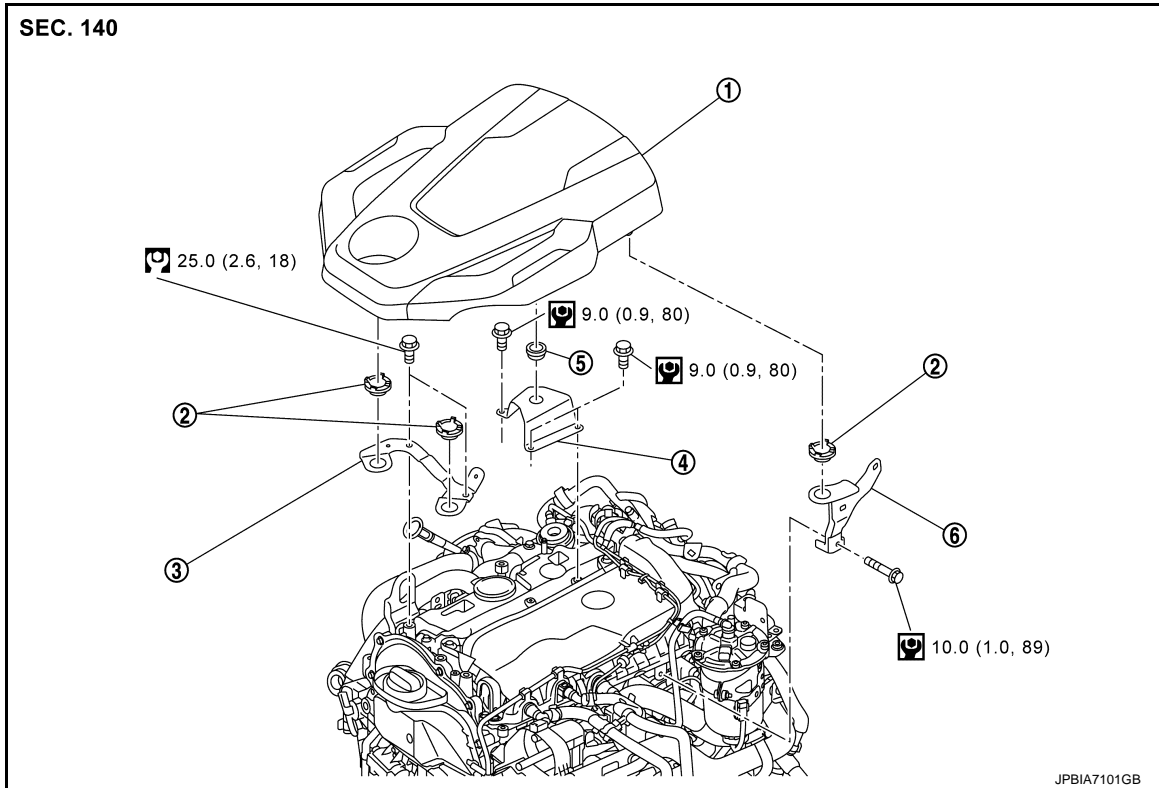
REMOVAL AND INSTALLATION

ENGINE COVER

Exploded View

INFOID:0000000011999108

EM



① Engine cover

② Grommet

③ Bracket

④ Bracket

⑤ Grommet

⑥ Bracket

: N·m (kg-m, ft-lb)

: N·m (kg-m, in-lb)

Removal and Installation

INFOID:0000000011999109

REMOVAL

Remove engine cover.

CAUTION:

- **Never pull out the engine cover forcibly.**

INSTALLATION

Install in the reverse order of removal.

DRIVE BELT AUTO TENSIONER AND IDLER PULLEY

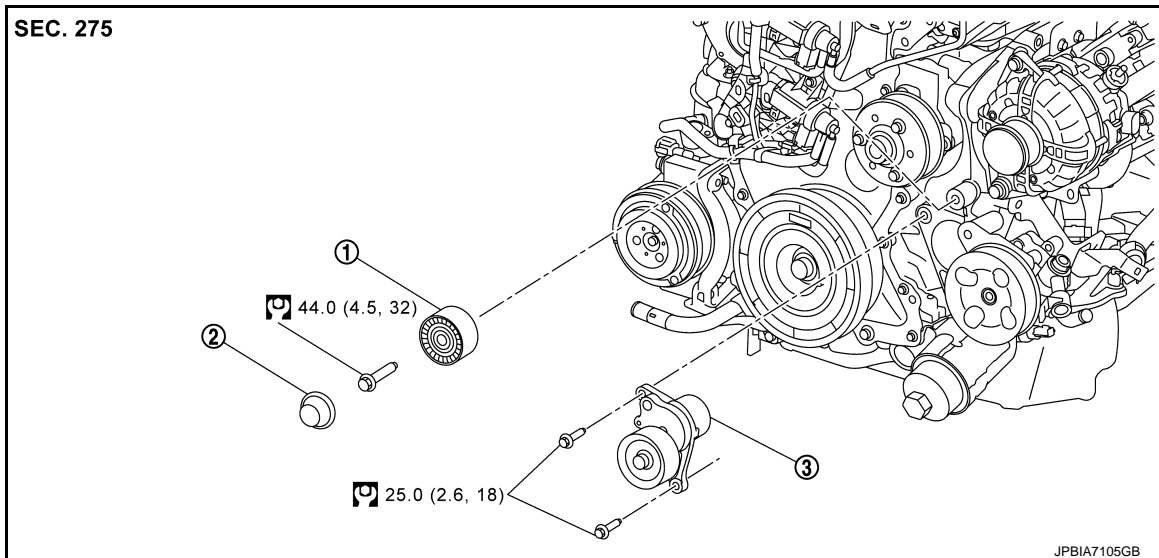
< REMOVAL AND INSTALLATION >

[YS23DDT/YS23DDTT]

DRIVE BELT AUTO TENSIONER AND IDLER PULLEY

Exploded View

INFOID:0000000011999110



① Idler pulley

② Cover

③ Drive belt auto-tensioner

: N·m (kg-m, ft-lb)

Removal and Installation

INFOID:0000000011999111

CAUTION:

- Replace the drive belt that has been removed with a new one.
- Drive belt auto-tensioner and idler pulley must be replaced with new ones when the drive belt is replaced.
- Never run the engine without the drive belt to avoid damaging the crankshaft pulley.

REMOVAL

1. Remove the radiator shroud (upper and lower). Refer to [CO-48, "Removal and Installation"](#).
2. Loosen drive belt. Refer to [EM-151, "Removal and Installation"](#).
3. Remove drive belt auto-tensioner and idler pulley.

NOTE:

Keep auto-tensioner pulley arm locked to install or remove auto-tensioner.

CAUTION:

The disassemble prohibition part. Never disassemble the drive belt auto-tensioner, because the worker shall injure by the spring jumped out.

INSTALLATION

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

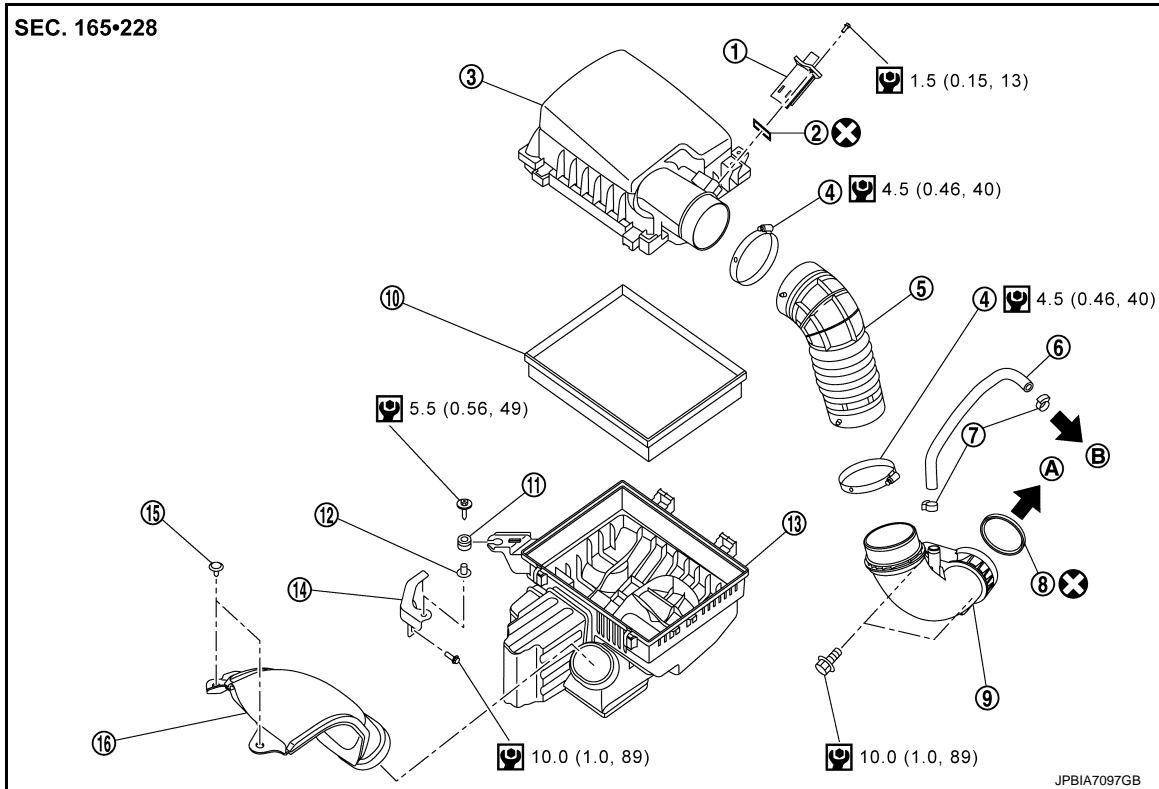
CAUTION:

If there is damage greater than peeled paint, replace drive belt auto-tensioner.

AIR CLEANER AND AIR DUCT

Exploded View

INFOID:000000012149565



- | | | |
|---|--------------------|---------------------|
| ① Mass air flow sensor
(with intake air temperature sensor 1) | ② Gasket | ③ Air cleaner cover |
| ④ Clamp | ⑤ Air duct 1 | ⑥ Blow-by hose |
| ⑦ Clamp | ⑧ O-ring | ⑨ Air duct 2 |
| ⑩ Air cleaner filter | ⑪ Grommet | ⑫ Collar |
| ⑬ Air cleaner body | ⑭ Bracket | ⑮ Clip |
| ⑯ Air duct (inlet) | | |
| To exhaust manifold and turbocharger assembly (YS23DDT)
To turbocharger (YS23DDTT) | | |
| Ⓐ | Ⓑ To oil separator | |

: N·m (kg-m, in-lb)

: Always replace after every disassembly.

Removal and Installation

INFOID:0000000011999113

REMOVAL

1. Remove air duct (inlet).
2. Remove reservoir tank and move to aside. Refer to [CO-47, "Exploded View"](#).
3. Disconnect mass air flow sensor harness connector.
4. Remove the air cleaner assembly with air cleaner filter.
5. Remove air duct 1.
6. Remove air duct 2.
7. Remove mass air flow sensor from air cleaner case, if necessary.

CAUTION:

AIR CLEANER AND AIR DUCT

< REMOVAL AND INSTALLATION >

[YS23DDT/YS23DDTT]

- **Never shock mass air flow sensor.**
- **Never disassemble mass air flow sensor.**
- **Never touch mass air flow sensor element.**

INSTALLATION

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

- Align marks. Attach each joint. Screw clamps firmly.

Inspection

INFOID:0000000011999114

INSPECTION AFTER REMOVAL

Inspect air duct for crack or tear.

- If anything found, replace air duct.

CHARGE AIR COOLER

< REMOVAL AND INSTALLATION >

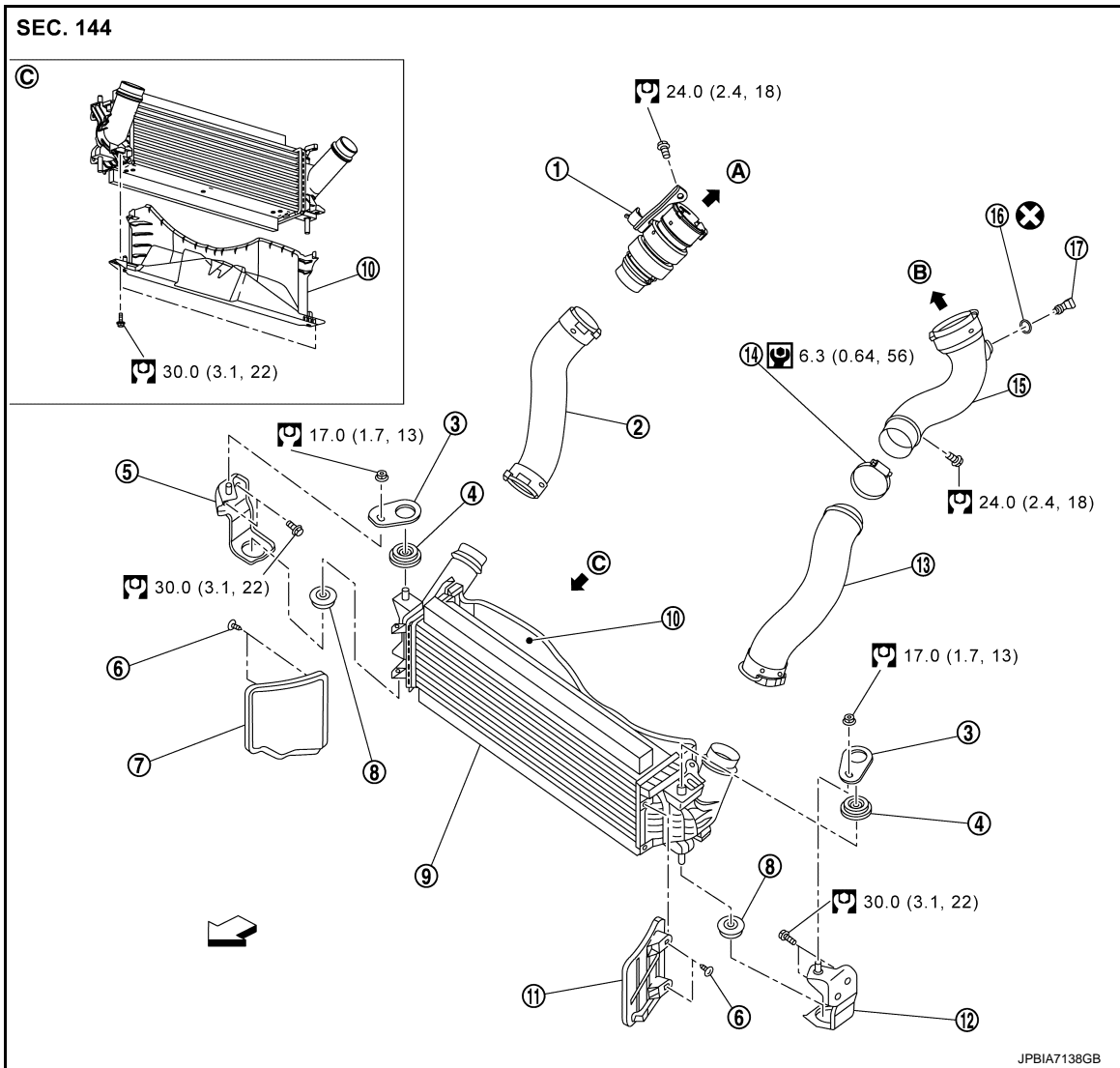
[YS23DDT/YS23DDTT]

CHARGE AIR COOLER

Exploded View

INFOID:0000000011999115

YS23DDT



- | | | |
|---|---|----------------------|
| ① Air inlet tube (silencer) | ② Air inlet hose 1 | ③ Bracket (RH upper) |
| ④ Mounting rubber (upper) | ⑤ Bracket (RH lower) | ⑥ Clip |
| ⑦ Charge air cooler seal (RH) | ⑧ Mounting rubber (lower) | ⑨ Charge air cooler |
| ⑩ Charge air cooler cover | ⑪ Charge air cooler seal (LH) | ⑫ Bracket (LH lower) |
| ⑬ Air inlet hose 2 | ⑭ Clamp | ⑮ Air inlet tube |
| ⑯ O-ring | ⑰ Intake air temperature sensor 2 | |
| Ⓐ To exhaust manifold and turbocharger assembly | Ⓑ To electric throttle control actuator | Ⓒ View |

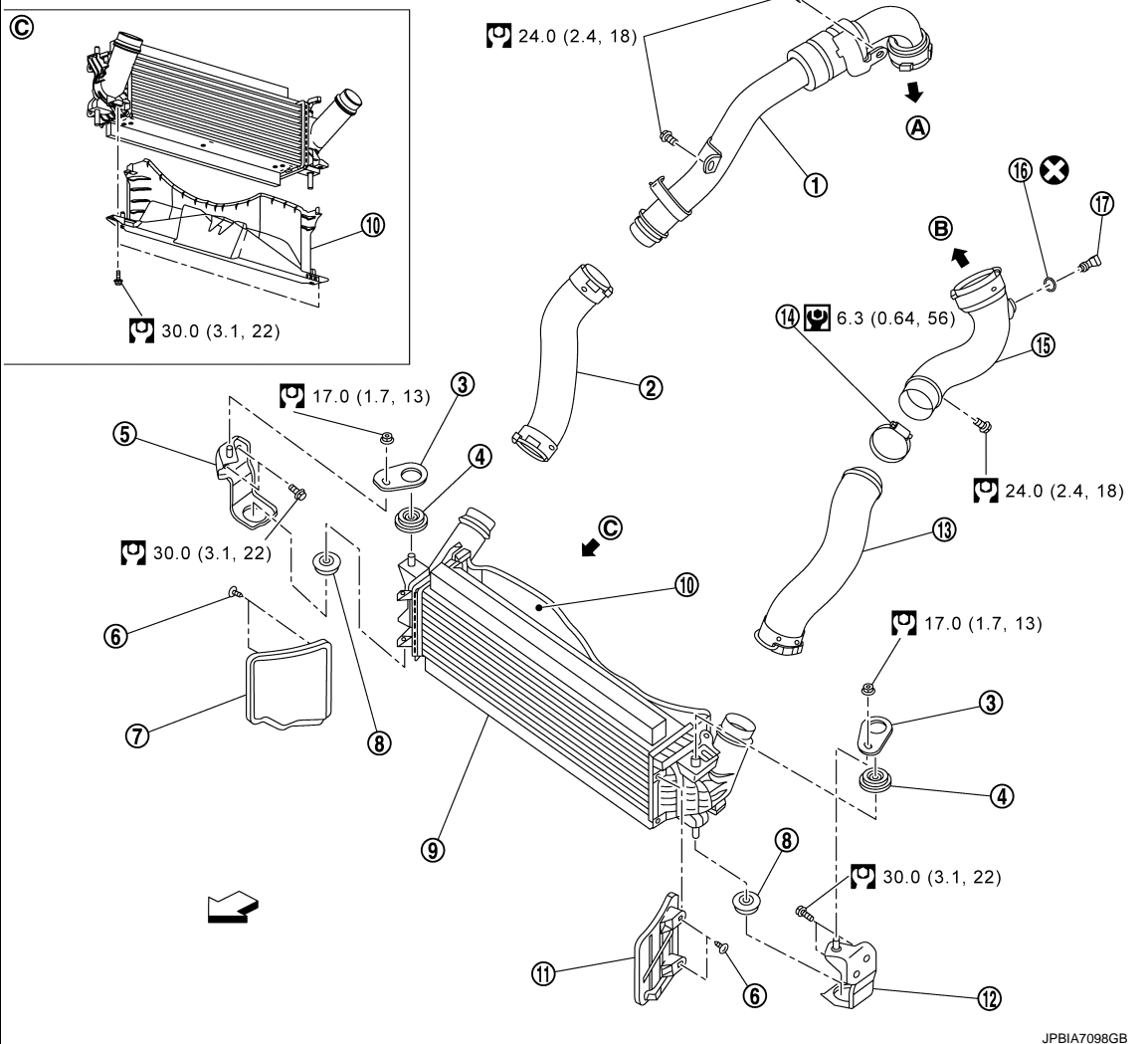
↔ : Vehicle front

: N·m (kg-m, ft-lb)

: N·m (kg-m, in-lb)


[YS23DDT/YS23DDTT]

SEC. 144



JPBIA7098GB

- | | | |
|-------------------------------|---|----------------------|
| ① Air inlet tube (silencer) | ② Air inlet hose 1 | ③ Bracket (RH upper) |
| ④ Mounting rubber (upper) | ⑤ Bracket (RH lower) | ⑥ Clip |
| ⑦ Charge air cooler seal (RH) | ⑧ Mounting rubber (lower) | ⑨ Charge air cooler |
| ⑩ Charge air cooler cover | ⑪ Charge air cooler seal (LH) | ⑫ Bracket (LH lower) |
| ⑬ Air inlet hose 2 | ⑭ Clamp | ⑮ Air inlet tube |
| ⑯ O-ring | ⑰ Intake air temperature sensor 2 | |
| Ⓐ To turbocharger | Ⓑ To electric throttle control actuator | Ⓒ View |

 : N·m (kg-m, in-lb)

INFOID:0000000011999116

Air inlet hose 1 and air inlet tube (silencer)

1. Remove front under cover. Refer to [EXT-24, "Exploded View"](#).

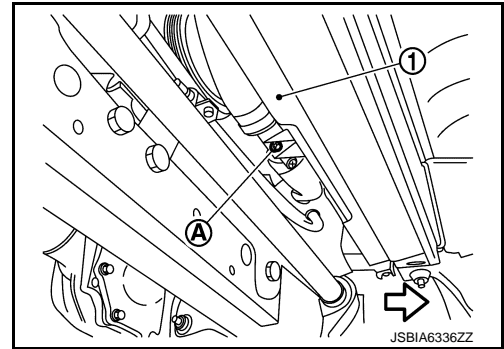
CHARGE AIR COOLER

< REMOVAL AND INSTALLATION >

[YS23DDT/YS23DDTT]

2. Remove radiator hose (lower) mounting bolt (A) from charge air cooler cover (1).

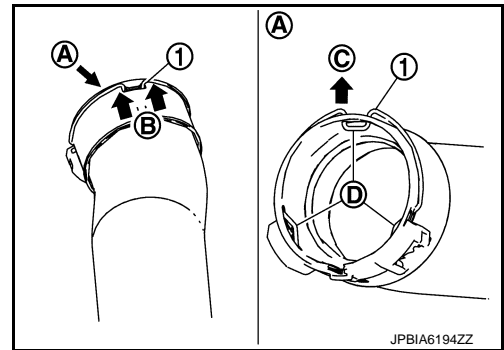
⇐ : Vehicle front



3. Remove charge air cooler cover.
4. Remove engine cover. Refer to [EM-157, "Removal and Installation"](#).
5. Remove air cleaner assembly Refer to [EM-159, "Removal and Installation"](#).
6. Remove reservoir tank and move to aside. Refer to [CO-47, "Exploded View"](#).
7. Remove air inlet hose 1 with the following procedure:
 - a. Insert suitable tool between air inlet hose 1 and retainer (1).

- (A) : View
(B) : Insert position
(C) : Movement direction of the retainer
(D) : Projection

- b. Unlock the retainer and pull out air inlet hose 1.

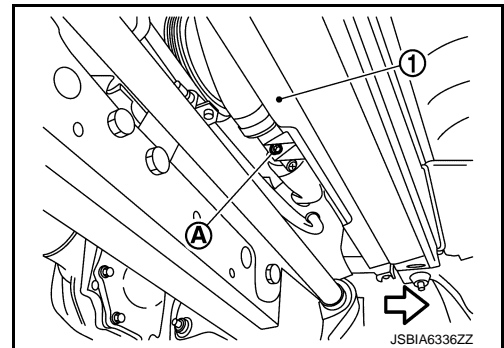


8. Remove air inlet tube (silencer).

Air inlet hose 2 and air inlet tube

1. Remove front under cover. Refer to [EXT-24, "Exploded View"](#).
2. Remove radiator hose (lower) mounting bolt (A) from charge air cooler cover (1).

⇐ : Vehicle front



3. Remove charge air cooler cover.
4. Remove engine cover. Refer to [EM-157, "Removal and Installation"](#).
5. Remove air inlet hose 2 with the following procedure:

CHARGE AIR COOLER

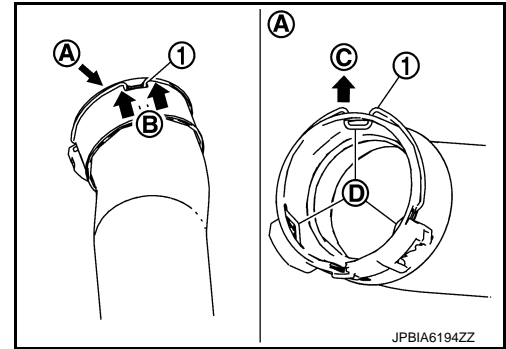
< REMOVAL AND INSTALLATION >

[YS23DDT/YS23DDTT]

- a. Insert suitable tool between air inlet hose 2 and retainer ①.

- Ⓐ : View
 Ⓑ : Insert position
 Ⓒ : Movement direction of the retainer
 Ⓓ : Projection

- b. Unlock the retainer and pull out air inlet hose 2.
 6. Remove air inlet hose 2.
 7. Separate air inlet tube from mounting part.
 8. Disconnect intake air temperature sensor 2 harness connector.
 9. Remove air inlet tube.
 10. Remove intake air temperature sensor 2, if necessary.



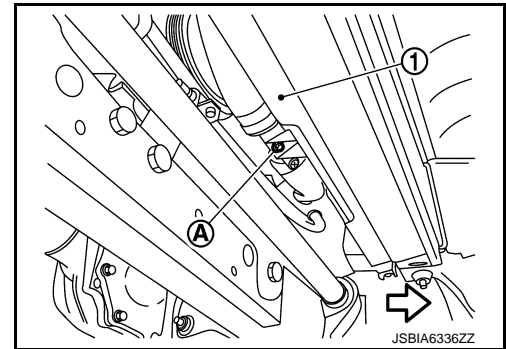
Charge air cooler

CAUTION:

When removing charge air cooler, close opening on turbocharger and on intake manifold with shop cloth or other suitable material.

1. Remove front under cover. Refer to [EXT-24, "Exploded View"](#).
 2. Remove radiator hose (lower) mounting bolt Ⓐ from charge air cooler cover ①.

⇐ : Vehicle front



3. Remove charge air cooler cover.
 4. Remove air inlet hose 1, air inlet hose 2, air inlet tube and air inlet tube (silencer).
 5. Remove charge air cooler seal (RH) and (LH).
 6. Remove vacuum hose in charge air cooler side.
 7. Remove the mounting bolt of bracket (RH lower) and bracket (LH lower), remove charge air cooler.

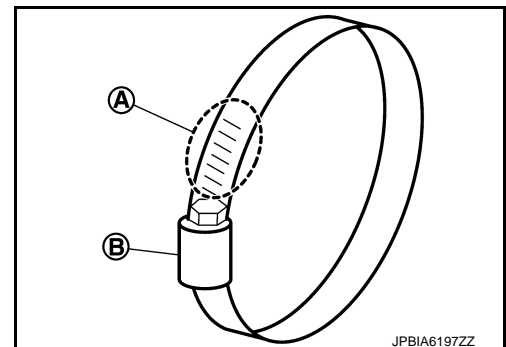
INSTALLATION

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

- When installing hoses, insert hose all the way to the end.
- When installing clamps, check that the screw Ⓑ and band Ⓐ of clamp have no damage and permanent strain. Replace with a new one if the clamp has damage of permanent strain.
- When installing air inlet hose, align identification marks (color and direction).
- Align marks. Attach each joint. Screw clamps firmly.
- Do not retighten clamp.

CAUTION:

If it is necessary to retighten a clamp, loosen it and visually check that there is no damage. After this, tighten the clamp to the specified torque.



INF0ID:0000000011999117

Inspection

INSPECTION AFTER REMOVAL

1. Check that the charge air cooler is not full of oil. In that case, clean it with cleaning agent and then let it dry.

CHARGE AIR COOLER

< REMOVAL AND INSTALLATION >

[YS23DDT/YS23DDTT]

2. Check air passages of charge air cooler core and fins for clogging, leaks or deformation. Clean or replace charge air cooler if necessary.
 - Do not deform core fins.

A

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P

INTAKE MANIFOLD

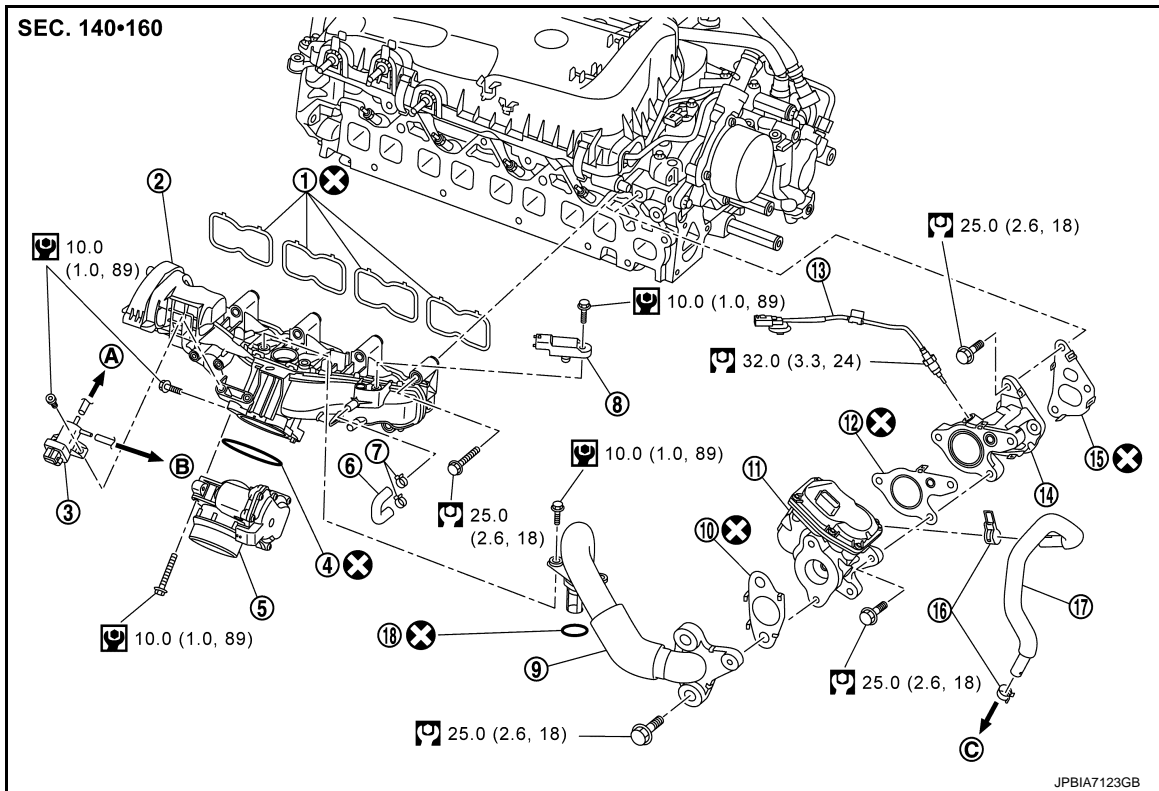
< REMOVAL AND INSTALLATION >

[YS23DDT/YS23DDTT]

INTAKE MANIFOLD

Exploded View

INFOID:0000000011999118



- | | | |
|--------------------------|--------------------------------------|---|
| ① Gasket | ② Intake manifold | ③ Thermo management valve control valve |
| ④ O-ring | ⑤ Electric throttle control actuator | ⑥ Hose |
| ⑦ Clamp | ⑧ Turbocharger boost sensor | ⑨ EGR valve manifold duct |
| ⑩ Gasket | ⑪ EGR volume control valve | ⑫ Gasket |
| ⑬ EGR temperature sensor | ⑭ EGR valve inlet pipe | ⑮ Gasket |
| ⑯ Clamp | ⑰ Water hose | ⑱ O-ring |
| Ⓐ To vacuum pump | Ⓑ To Thermo management valve | Ⓒ To water pipe |

: N·m (kg-m, ft-lb)

: N·m (kg-m, in-lb)

: Always replace after every disassembly.

Removal and Installation

INFOID:0000000011999119

REMOVAL

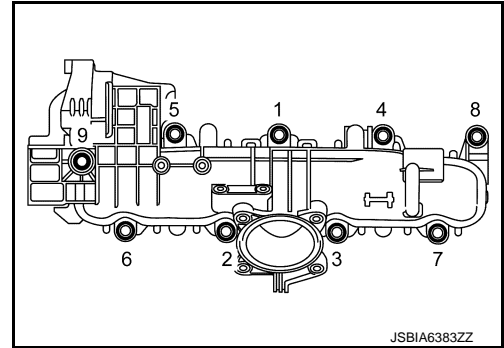
1. Remove alternator. Refer to [CHG-39, "YS23DDT, YS23DDTT : Removal and Installation"](#).
2. Remove alternator bracket. Refer to [CHG-39, "YS23DDT, YS23DDTT : Exploded View"](#).
3. Remove air inlet hose 2 and air inlet tube. Refer to [EM-162, "Removal and Installation"](#).
4. Disconnect turbocharger boost sensor harness connector.
5. Disconnect thermo management valve control valve harness connector.
6. Remove thermo management valve control valve.
7. Disconnect electric throttle control actuator harness connector.
8. Remove electric throttle control actuator and O-ring.

INTAKE MANIFOLD

< REMOVAL AND INSTALLATION >

[YS23DDT/YS23DDTT]

9. Remove intake manifold with the following procedure:
 - a. Remove EGR valve manifold duct.
 - b. Loosen mounting bolts in the order from 9 to 1 as shown in the figure.



- c. Remove intake manifold and gasket.
CAUTION:
Cover engine openings to avoid entry of foreign materials.

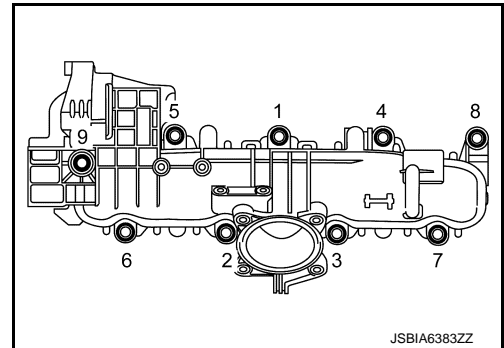
INSTALLATION

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

- CAUTION:**
- Clean each joint surface before installation.
 - Do not reuse O-ring and gaskets.

Intake Manifold

1. Install intake manifold.
 - Tighten mounting nuts in the order from 1 to 9 as shown in the figure.
2. Perform "THROTTLE VALVE POSITION LEARNING". Refer to [EC-928, "Description"](#).



INFOID:0000000011999120

Inspection

INSPECTION AFTER REMOVAL

Surface Distortion

- Check the surface distortion of the intake manifold mating surface with a straightedge and a feeler gauge.

Standard : Refer to [EM-261, "Intake Manifold"](#).

- If it exceeds the standard, replace intake manifold.

EGR SYSTEM

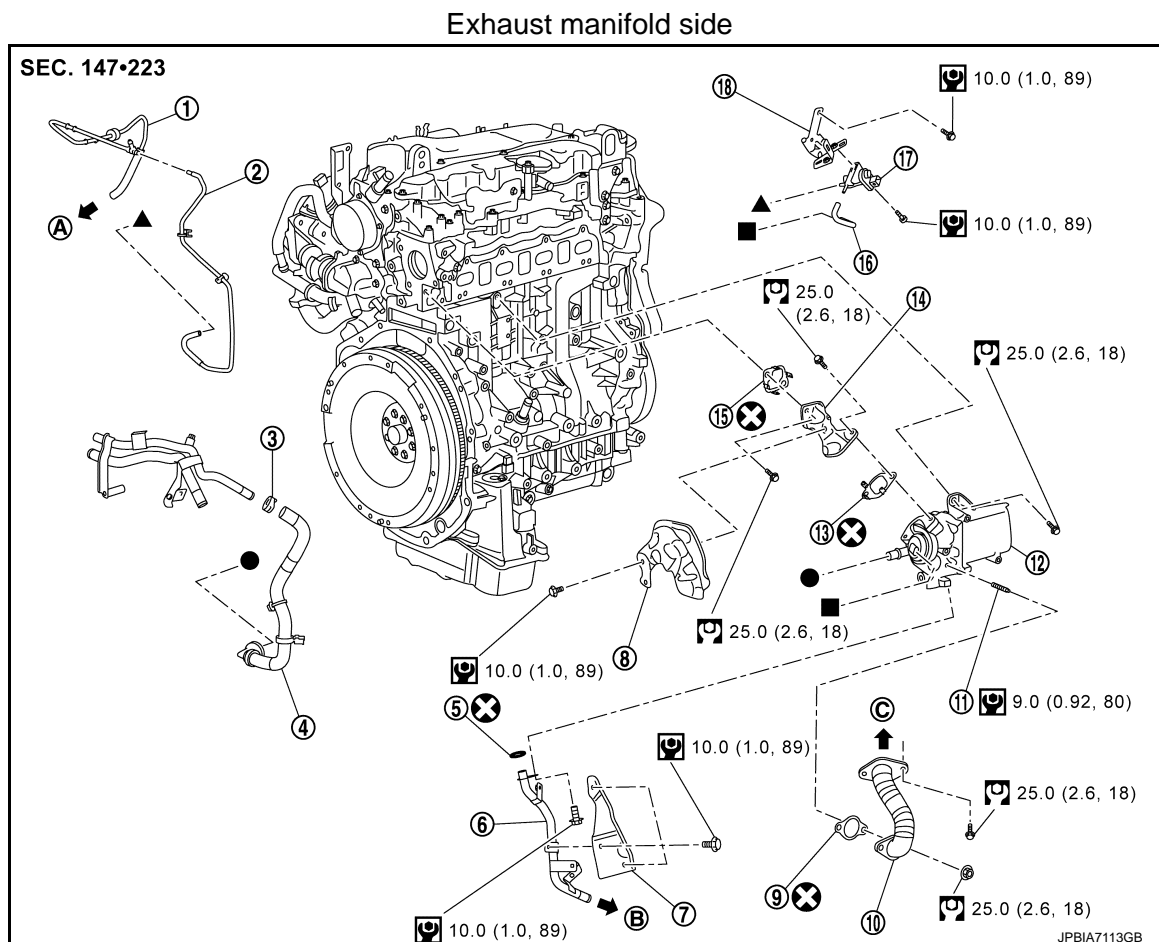
< REMOVAL AND INSTALLATION >

[YS23DDT/YS23DDTT]

EGR SYSTEM

Exploded View

INFOID:000000011999121



- | | | |
|------------------------------|--|--|
| ① Vacuum hose | ② Vacuum hose | ③ Clamp |
| ④ Water hose | ⑤ O-ring | ⑥ Water pipe |
| ⑦ Water pipe cover | ⑧ EGR heat shield | ⑨ Gasket |
| ⑩ EGR intercooler inlet duct | ⑪ Stud bolt | ⑫ EGR cooler |
| ⑬ Gasket | ⑭ EGR intercooler outlet duct | ⑮ Gasket |
| ⑯ Vacuum hose | ⑰ EGR cooler bypass valve control solenoid valve | ⑱ Bracket |
| Ⓐ To solenoid valve | Ⓑ To water pipe center | Ⓒ To exhaust manifold and turbocharger |

⊗ : Always replace after every disassembly.

Ⓜ : N·m (kg·m, in-lb)

Ⓢ : N·m (kg·m, ft-lb)

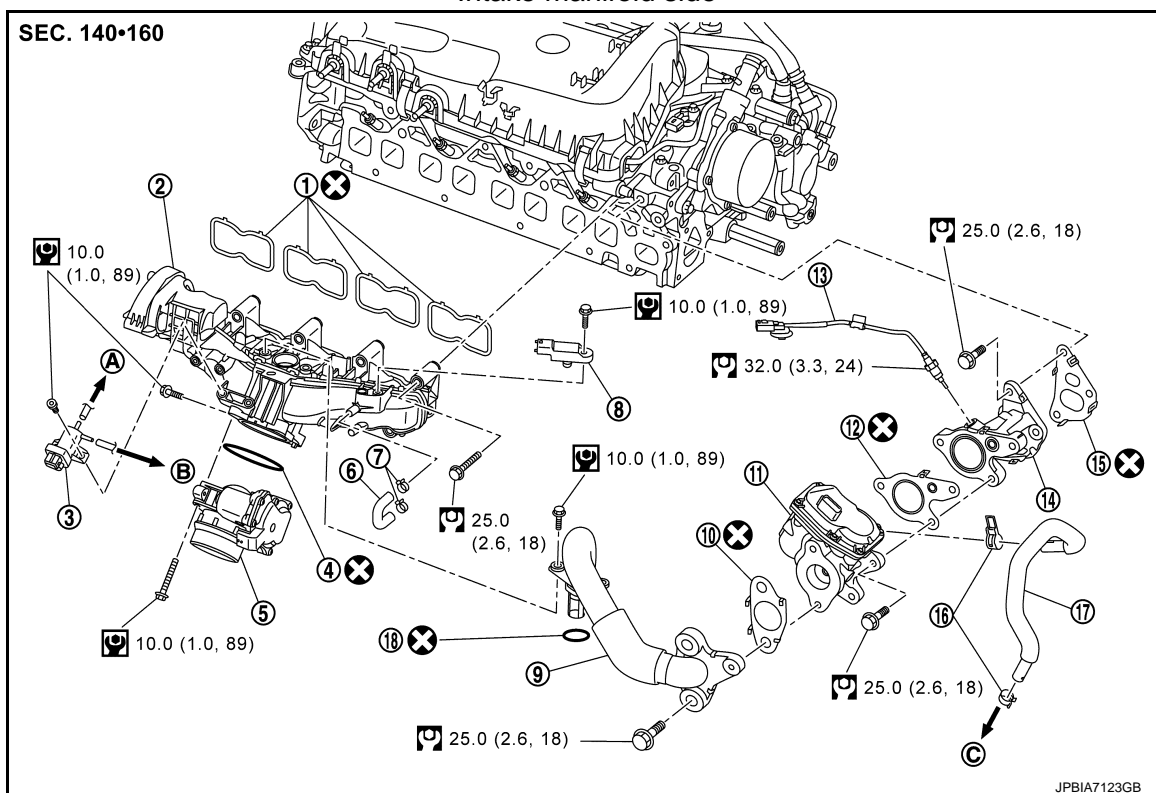
●, ▲, ■: Indicates that the parts is connected at points with same symbols in actual vehicle.

EGR SYSTEM

< REMOVAL AND INSTALLATION >

[YS23DDT/YS23DDTT]

Intake manifold side



- | | | |
|--------------------------|--------------------------------------|---|
| ① Gasket | ② Intake manifold | ③ Thermo management valve control valve |
| ④ O-ring | ⑤ Electric throttle control actuator | ⑥ Hose |
| ⑦ Clamp | ⑧ Turbocharger boost sensor | ⑨ EGR valve manifold duct |
| ⑩ Gasket | ⑪ EGR volume control valve | ⑫ Gasket |
| ⑬ EGR temperature sensor | ⑭ EGR valve inlet pipe | ⑮ Gasket |
| ⑯ Clamp | ⑰ Water hose | ⑱ O-ring |
| Ⓐ To vacuum pump | Ⓑ To thermo management valve | Ⓒ To water pipe |

: N·m (kg·m, ft·lb)

: N·m (kg·m, in·lb)

: Always replace after every disassembly.

Removal and Installation

INFOID:0000000011999122

REMOVAL

EGR volume control valve

1. Drain engine coolant. Refer to [CO-40, "Draining"](#).
2. Remove engine cover. Refer to [EM-157, "Removal and Installation"](#).
3. Remove radiator hose (upper) 2. Refer to [CO-47, "Exploded View"](#).
4. Remove air inlet hose 2 and air inlet tube. Refer to [EM-162, "Removal and Installation"](#).
5. Remove fuel filter from bracket and move to aside. Refer to [FL-29, "Exploded View"](#).
6. Remove fuel filter bracket. Refer to [FL-29, "Exploded View"](#).
7. Remove water pipe. Refer to [CO-58, "Exploded View"](#).
8. Remove EGR valve manifold duct.
9. Disconnect EGR volume control valve harness connector.
10. Remove EGR volume control valve.

CAUTION:

EGR SYSTEM

< REMOVAL AND INSTALLATION >

[YS23DDT/YS23DDTT]

- **Handle carefully to avoid any shock to EGR volume control valve.**
- **Never disassemble EGR volume control valve.**
- **Cover engine openings to avoid entry of foreign materials.**

11. Disconnect EGR temperature sensor harness connector.

12. Remove EGR valve inlet pipe.

EGR cooler

1. Drain engine coolant. Refer to [CO-40, "Draining"](#).
2. Remove turbocharger (YS23DDTT). Refer to [EM-179, "Removal and Installation"](#).
3. Remove exhaust manifold and turbocharger. Refer to [EM-174, "Removal and Installation"](#).
4. Remove EGR cooler bypass valve control solenoid valve.
5. Remove water pipe from EGR cooler.
6. Remove EGR cooler

CAUTION:

- **Never disassemble EGR cooler.**
- **Cover engine openings to avoid entry of foreign materials.**

INSTALLATION

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

CAUTION:

Clean each joint surface before installation.

EGR volume control valve

Perform the "EGR VOLUME CONTROL VALVE POSITION LEARNING" . Refer to [EC-929, "Description"](#).

DPF (DIESEL PARTICULATE FILTER)

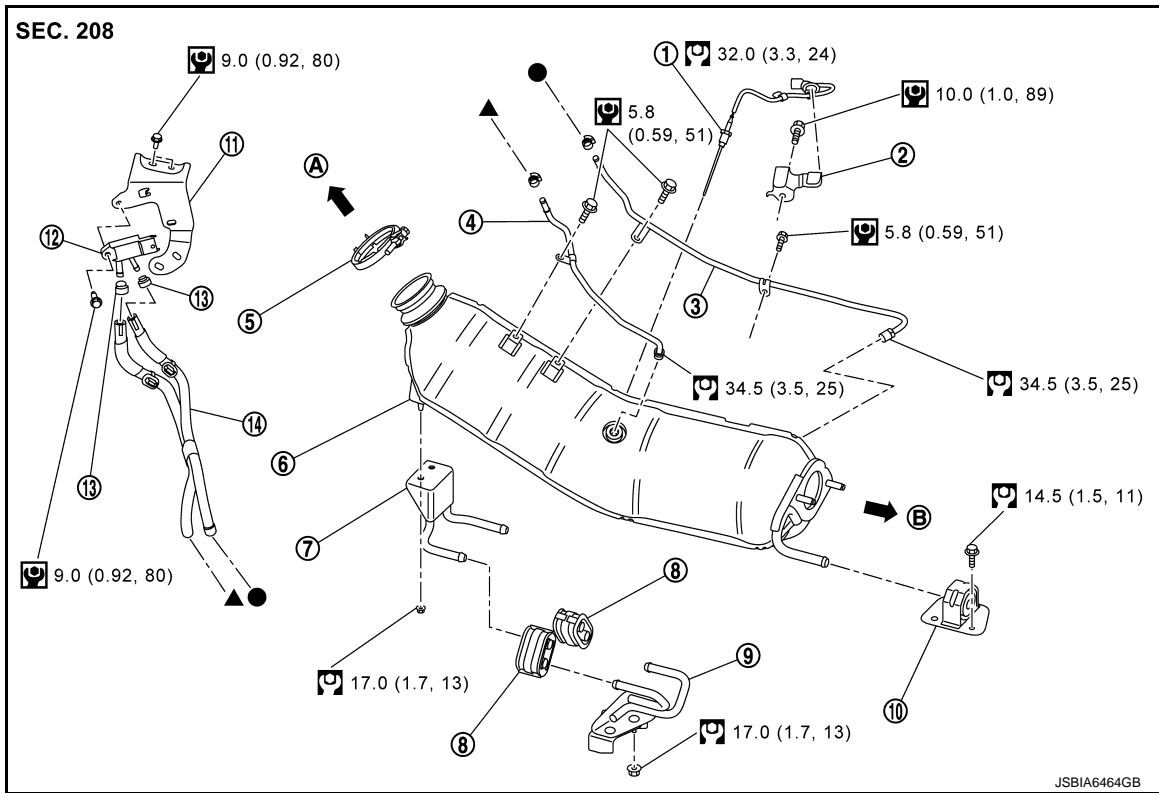
< REMOVAL AND INSTALLATION >

[YS23DDT/YS23DDTT]

DPF (DIESEL PARTICULATE FILTER)

Exploded View

INFOID:0000000011999123



- | | | |
|--|--|--|
| ① Exhaust gas temperature sensor 2 | ② Bracket | ③ DPF (diesel particulate filter) differential pressure tube |
| ④ DPF (diesel particulate filter) differential pressure tube | ⑤ Clamp | ⑥ DPF (diesel particulate filter) |
| ⑦ Bracket | ⑧ Mounting rubber | ⑨ Bracket |
| ⑩ Mounting rubber bracket | ⑪ Bracket | ⑫ DPF (diesel particulate filter) differential pressure sensor |
| ⑬ Clamp | ⑭ DPF (diesel particulate filter) differential pressure hose | |
| ➤ : To turbocharger | ➤ : To main muffler | |

⊗ : N·m (kg-m, in-lb)

⊗ : N·m (kg-m, ft-lb)

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

Removal and installation

INFOID:0000000011999124

CAUTION:

- Perform the operation with the exhaust system fully cooled down because the system is still hot just after engine stops.
- Be careful not to cut your hand on the insulator edge.

REMOVAL

1. Remove front tire (RH). Refer to [WT-7, "Exploded View"](#).
2. Remove fender protector (RH). Refer to [EXT-23, "Exploded View"](#).
3. Remove main muffler. Refer to [EX-10, "Exploded View"](#).
4. Remove DPF (diesel particulate filter) differential pressure tube.

DPF (DIESEL PARTICULATE FILTER)

[YS23DDT/YS23DDTT]

< REMOVAL AND INSTALLATION >

5. Disconnect exhaust gas temperature sensor 2 harness connector.
6. Remove mounting bracket from transmission cross member.
7. Remove front cross member. Refer to [EM-212, "Exploded View"](#).
8. Remove clamp between DPF (diesel particulate filter) and turbocharger air outlet pipe.
9. Remove bracket nuts of DPF (diesel particulate filter) side.
10. Remove DPF (diesel particulate filter)
11. Remove exhaust gas temperature sensor 2.

CAUTION:

Be careful not to impact or damage exhaust gas temperature sensor 2.

INSTALLATION

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

CAUTION:

- **Be careful not to impact or damage particle filter sensor.**
 - **When installing never use such tools as an air impact wrench.**
1. Perform "Diesel particulate filter data clear". Refer to [EC-934, "Description"](#). When replacing diesel particulate filter. Refer to [EC-921, "Description"](#)

EXHAUST MANIFOLD AND TURBOCHARGER ASSEMBLY

< REMOVAL AND INSTALLATION >

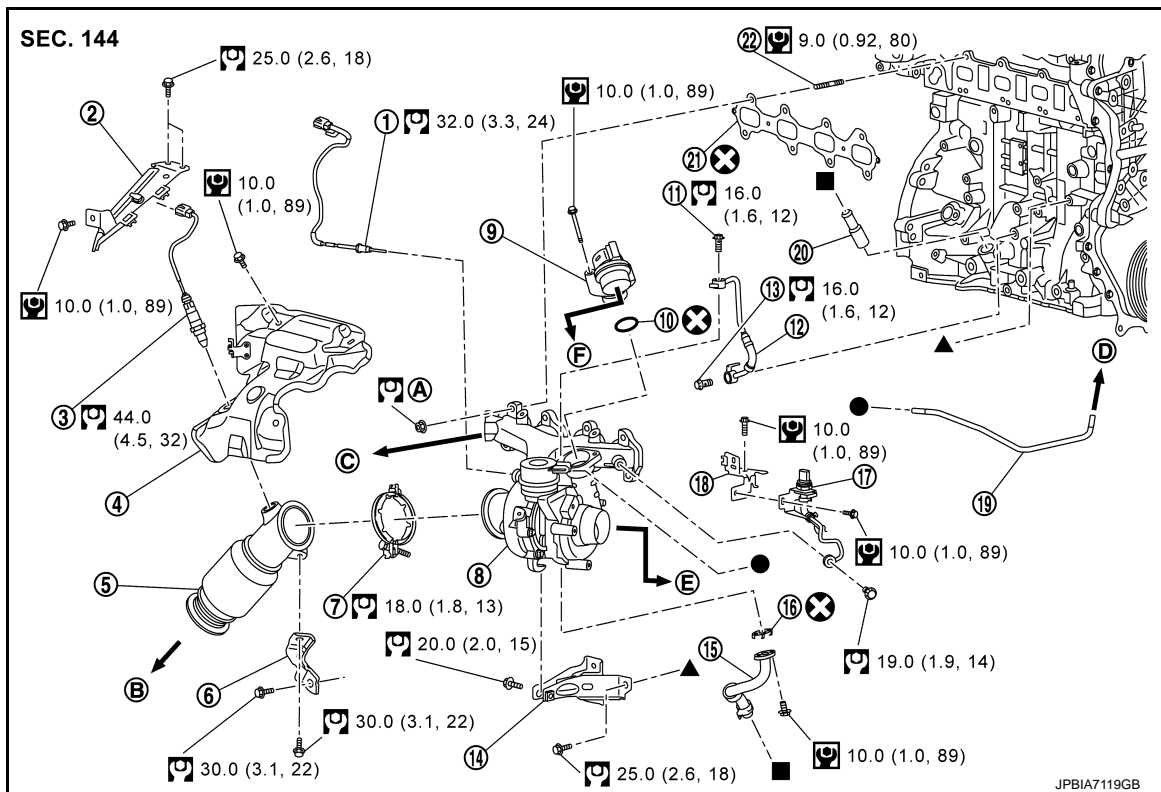
[YS23DDT/YS23DDTT]

EXHAUST MANIFOLD AND TURBOCHARGER ASSEMBLY

Exploded View

INFOID:0000000011999125

YS23DDT



- | | | |
|------------------------------------|---|-------------------------------|
| ① Exhaust gas temperature sensor 1 | ② Connector bracket | ③ A/F sensor |
| ④ Heat shield | ⑤ Turbocharger air outlet pipe | ⑥ Pipe bracket |
| ⑦ Clamp | ⑧ Exhaust manifold and turbocharger | ⑨ Turbocharger air inlet pipe |
| ⑩ Gasket | ⑪ Eye bolt | ⑫ Oil feed pipe |
| ⑬ Eye bolt | ⑭ Exhaust manifold and turbocharger bracket | ⑮ Oil return pipe |
| ⑯ Gasket | ⑰ Exhaust gas pressure sensor | ⑱ Bracket |
| ⑲ Vacuum hose | ⑳ Oil return end pipe | ㉑ Gasket |
| ㉒ Stud bolt | | |
- (A) Comply with the installation procedure when tightening. Refer to [EM-174. "Removal and Installation"](#)
- (B) To DPF (diesel particulate filter)
- (C) To EGR intercooler inlet duct
- (D) To turbocharger boost control solenoid valve
- (E) To air duct 2
- (F) To air inlet tube (silencer)

: N·m (kg-m, ft-lb)

: N·m (kg-m, in-lb)

: Always replace after every disassembly.

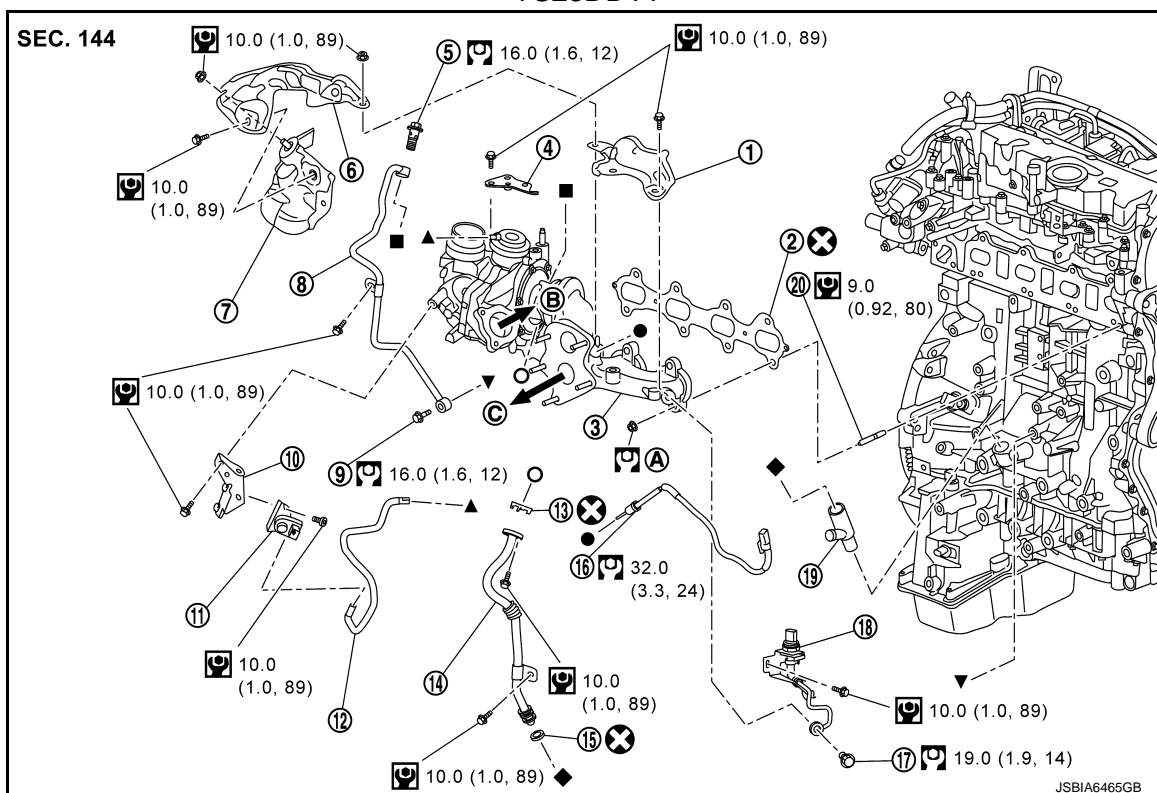
●, ▲, ■: Indicates that the parts is connected at points with same symbols in actual vehicle.

EXHAUST MANIFOLD AND TURBOCHARGER ASSEMBLY

< REMOVAL AND INSTALLATION >

[YS23DDT/YS23DDTT]

YS23DDTT



- | | | |
|---|--|--|
| ① Heat shield (right) | ② Gasket | ③ Exhaust manifold and turbocharger (HP) |
| ④ Bracket | ⑤ Eye bolt | ⑥ Heat shield (left) |
| ⑦ Heat shield | ⑧ Oil feed pipe | ⑨ Eye bolt |
| ⑩ Bracket | ⑪ High pressure compressor bypass valve control solenoid valve | ⑫ Vacuum hose |
| ⑬ Gasket | ⑭ Oil return pipe | ⑮ O-ring |
| ⑯ Exhaust gas temperature sensor 1 | ⑰ Eye bolt | ⑱ Exhaust gas pressure sensor |
| ⑲ Oil return end pipe | ⑳ Stud bolt | |
| Comply with the installation procedure when tightening. Refer to EM-174, "Removal and Installation" | | |
| (A) | (B) To turbocharger duct | (C) To turbocharger |

: N·m (kg-m, ft-lb)

: N·m (kg-m, in-lb)

: Always replace after every disassembly.

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

Removal and Installation

INFOID:0000000011999126

REMOVAL

YS23DDT

1. Remove front tire (RH). Refer to [WT-7, "Exploded View"](#).
2. Remove fender protector (RH). Refer to [EXT-23, "Exploded View"](#).
3. Remove main muffler. Refer to [EX-10, "Removal and Installation"](#).
4. Remove DPF (diesel particulate filter). Refer to [EM-171, "Removal and installation"](#).
5. Remove air cleaner assembly. Refer to [EM-159, "Exploded View"](#).
6. Remove air duct 1 and air duct 2. Refer to [EM-159, "Exploded View"](#).

EXHAUST MANIFOLD AND TURBOCHARGER ASSEMBLY

< REMOVAL AND INSTALLATION >

[YS23DDT/YS23DDTT]

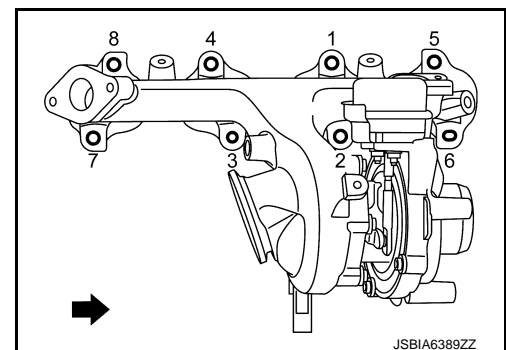
7. Remove air inlet tube (silencer) and air inlet hose 1. Refer to [EM-162. "Removal and Installation"](#).
8. Disconnect A/F sensor harness connector.
9. Remove A/F sensor.
10. Remove heat shield.
11. Remove water pipe cover. Refer to [EM-168. "Exploded View"](#).
12. Remove engine oil level gauge guide. Refer to [EM-182. "Exploded View"](#).
13. Remove EGR heat shield. Refer to [EM-168. "Exploded View"](#).
14. Disconnect exhaust gas temperature sensor 1 harness connector.
15. Remove turbocharger air inlet pipe.
16. Remove exhaust gas pressure sensor.
17. Remove oil return pipe and oil feed pipe.

CAUTION:

- Be careful not to deform oil feed and return tube.

18. Remove exhaust manifold and turbocharger bracket.
19. Loosen exhaust manifold and turbocharger nuts in the order from 8 to 1 as show in the figure.

← : Engine front



20. Remove exhaust manifold and turbocharger.
- CAUTION:**
- Never disassemble or adjust the turbocharger.
 - Be careful not to contact with the vehicle.
 - Never hold turbocharger boost control actuator and actuator rod.
21. Remove gasket.
 22. Remove exhaust gas temperature sensor 1, if necessary.
 23. Remove stud bolt from cylinder head, if necessary.

Oil Tube and Water Tube

- Clean inside of oil feed tube and oil return tube and water tube, and check tubes for clogging.
- Replace oil feed tube and oil return tube and/or water tube if clogging still exists after cleaning.

YS23DDTT

1. Remove turbocharger. Refer to [EM-179. "Removal and Installation"](#).
 2. Remove heat shield (right) and heat shield (left).
 3. Remove oil feed pipe and oil return pipe.
- CAUTION:**
- Be careful not to deform oil feed and return tube.
4. Disconnect exhaust gas temperature sensor 1 harness connector.
 5. Remove exhaust gas pressure sensor.

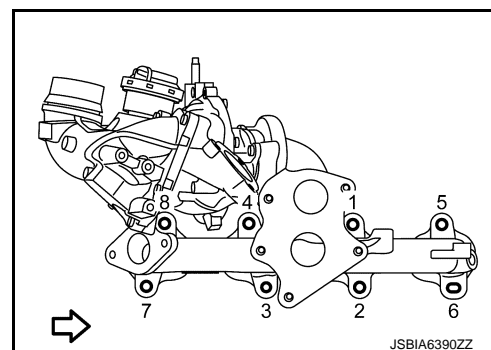
EXHAUST MANIFOLD AND TURBOCHARGER ASSEMBLY

[YS23DDT/YS23DDTT]

< REMOVAL AND INSTALLATION >

- Loosen exhaust manifold and turbocharger nuts in the order from 8 to 1 as show in the figure.

↩ : Engine front



- Remove exhaust manifold and turbocharger.

CAUTION:

- Never disassemble or adjust the turbocharger.
- Be careful not to contact with the vehicle.
- Never hold turbocharger boost control actuator and actuator rod.

- Remove gasket.
- Remove exhaust gas temperature sensor 1, if necessary.
- Remove stud bolt from cylinder head, if necessary.

Oil Tube and Water Tube

- Clean inside of oil feed tube and oil return tube and water tube, and check tubes for clogging.
- Replace oil feed tube and oil return tube and/or water tube if clogging still exists after cleaning.

INSTALLATION

- If stud bolts were removed, replace them with new ones.
- Tighten the exhaust manifold and turbocharger mounting nuts in the following procedure:

- Install gasket to cylinder head.
- Tighten exhaust manifold and turbocharger nuts in the order from 1 to 8 as shown in the figure.

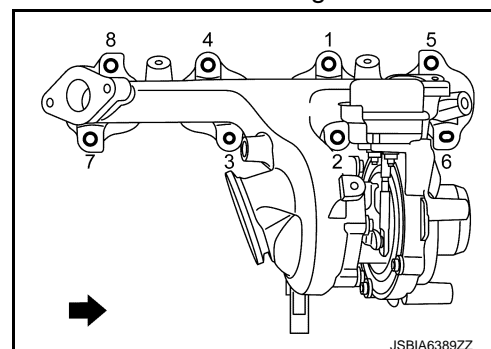
• YS23DDT

 **1st step: 10.0 N·m (1.0 kg-m, 89 in-lb)**

 **2nd step: 20.0 N·m (2.0 kg-m, 15 ft-lb)**

 **3rd step: 30.0 N·m (3.1 kg-m, 22 ft-lb)**

↩ : Engine front



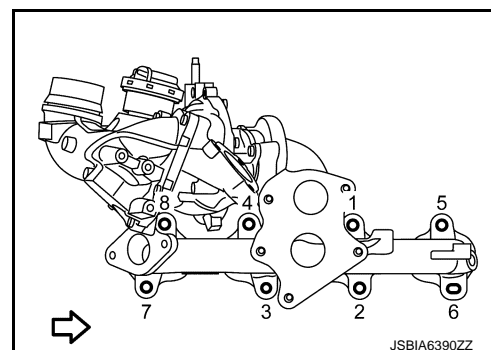
• YS23DDTT

 **1st step: 10.0 N·m (1.0 kg-m, 89 in-lb)**

 **2nd step: 20.0 N·m (2.0 kg-m, 15 ft-lb)**

 **3rd step: 30.0 N·m (3.1 kg-m, 22 ft-lb)**

↩ : Engine front



- Install in the reverse order of removal.

EXHAUST MANIFOLD AND TURBOCHARGER ASSEMBLY

< REMOVAL AND INSTALLATION >

[YS23DDT/YS23DDTT]

Inspection

INFOID:0000000011999127

TROUBLE DIAGNOSIS OF TURBOCHARGER

Preliminary check:

- Check that the engine oil level is between MIN and MAX of the oil level gauge. (When engine oil amount is more than MAX, engine oil flows into the inlet duct through blow-by gas passage, and turbocharger is misjudged malfunction.)
- Ask the customer if he/she always runs the vehicle in idle engine speed to cool the engine oil down after driving.
- Replace the turbocharger assembly when any malfunction is found after unit inspections specified in the table below.
- If no malfunction is found after the unit inspections, judge that the turbocharger body has no malfunction. Check the other parts again.

Inspection item	Inspection result	Symptom (when each inspection item meets each inspection result)			
		Engine oil leakage	Smoke	Noise	Insufficient power/acceleration malfunction
Turbine wheel	Engine oil leaks	C	A	C	C
	Carbon is accumulated	C	A	B	B
	Friction with housing	C	B	A	B
	Blades are bent or broken	—	—	A	A
Compressor wheel	Inside the air inlet is seriously contaminated by engine oil.	B	B	—	—
	Friction with housing	C	B	A	B
	Blades are bent or broken	—	—	A	A
After checking both turbine and compressor, inspect rotor shaft end play.	There is resistance when the rotor shaft is rotated by your fingertips.	—	C	C	B
	The rotor shaft sometimes does not rotate by your fingertips.	—	—	—	A
	There is too much play in the bearing.	C	C	B	C
Oil return port	Carbon or sludge is accumulated in the waste oil hole.	C	A	C	C

A: Large possibility

B: Medium possibility

C: Small possibility

INSPECTION AFTER INSTALLATION

Inspection for Leakage

The following are procedures for checking fluid leakage, lubricant leakage.

- Before starting engine, check oil/fluid levels including engine coolant and engine oil. If any are less than the required quantity, fill them to the specified level. Refer to [MA-32, "Fluids and Lubricants"](#).
- Follow the procedure below to check for fuel leakage.
 - Turn ignition switch to the "ON" position (with engine stopped). With fuel pressure applied to fuel piping, check for fuel leakage at connection points.
 - Start engine. With engine speed increased, check again for fuel leakage at connection points.
- Run engine to check for unusual noise and vibration.

NOTE:

If hydraulic pressure inside chain tensioner drops after removal/installation, slack in guide may generate a pounding noise during and just after the engine start. However, this does not indicate a malfunction. The noise will stop after hydraulic pressure rises.

- Start engine and raise engine speed to check no exhaust emission leaks.
- Warm up engine thoroughly to check that there is no leakage of fuel, or any oil/fluids including engine oil and engine coolant.
- Bleed air from lines and hoses of applicable lines, such as in cooling system.

EXHAUST MANIFOLD AND TURBOCHARGER ASSEMBLY

< REMOVAL AND INSTALLATION >

[YS23DDT/YS23DDTT]

- After cooling down engine, again check oil/fluid levels including engine oil and engine coolant. Refill them to the specified level, if necessary.

Summary of the inspection items:

Items		Before starting engine	Engine running	After engine stopped
Engine coolant		Level	Leakage	Level
Engine oil		Level	Leakage	Level
Transmission / transaxle fluid	AT & CVT Models	Leakage	Level / Leakage	Leakage
	MT Models	Level / Leakage	Leakage	Level / Leakage
Other oils and fluids*		Level	Leakage	Level
Fuel		Leakage	Leakage	Leakage
Exhaust gases		—	Leakage	—

*: Power steering fluid, brake fluid, etc.

TURBOCHARGER

< REMOVAL AND INSTALLATION >

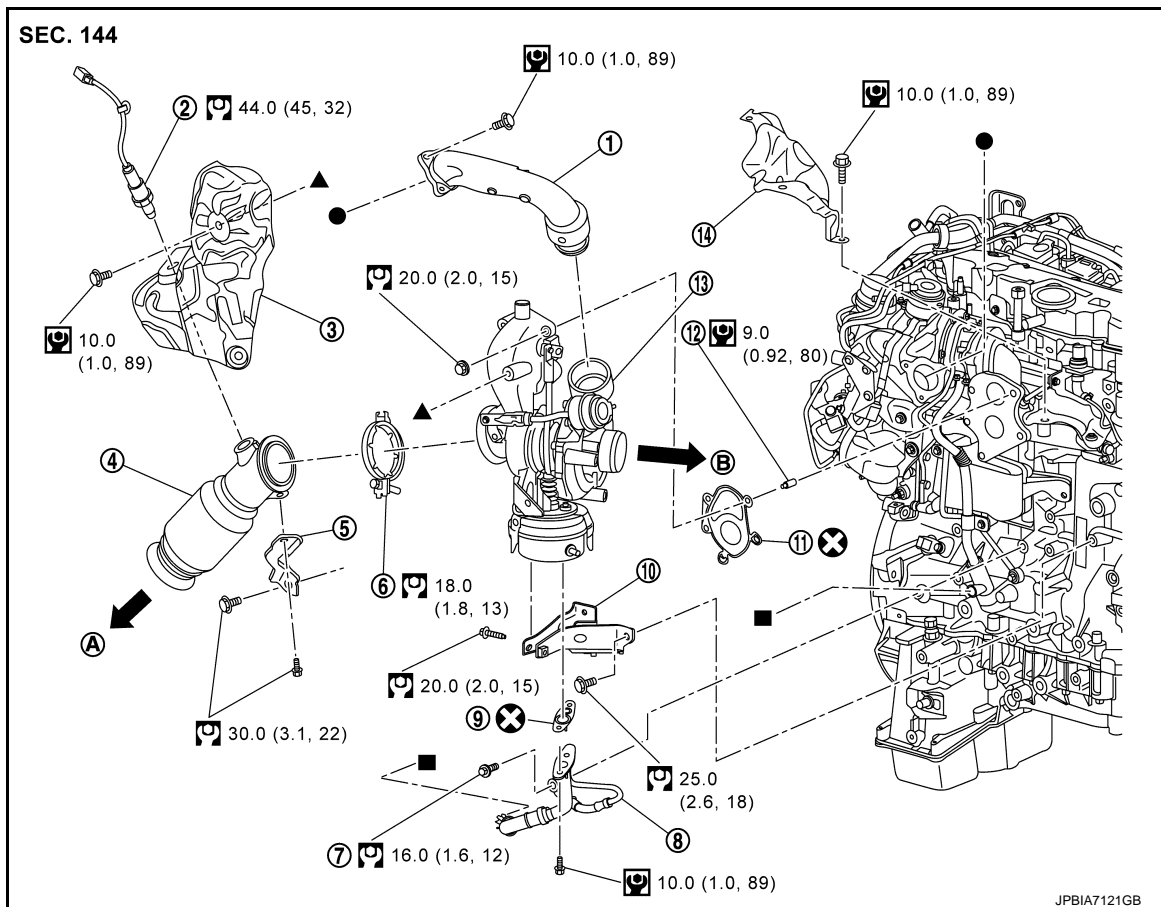
[YS23DDT/YS23DDTT]

TURBOCHARGER

Exploded View

INFOID:000000011999128

YS23DDTT



- | | | |
|--------------------------------------|----------------------------|---------------|
| ① Turbcharger duct | ② A/F sensor | ③ Heat shield |
| ④ Turbocharger air outlet pipe | ⑤ Pipe bracket | ⑥ Clamp |
| ⑦ Eye bolt | ⑧ Oil feed and return pipe | ⑨ Gasket |
| ⑩ Turbocharger bracket | ⑪ Gasket | ⑫ Stud bolt |
| ⑬ Turbocharger (LP) | ⑭ Heat shield | |
| Ⓐ To DPF (diesel particulate filter) | Ⓑ To air duct 2 | |

Ⓐ : N-m (kg-m, ft-lb)

Ⓑ : N-m (kg-m, in-lb)

ⓧ : Always replace after every disassembly.

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

Removal and Installation

INFOID:000000011999129

REMOVAL

1. Remove front tire (RH). Refer to [WT-7, "Exploded View"](#).
2. Remove fender protector (RH). Refer to [EXT-23, "Exploded View"](#).
3. Remove main muffler. Refer to [EX-10, "Removal and Installation"](#).
4. Remove DPF (diesel particulate filter). Refer to [EM-171, "Removal and installation"](#).
5. Remove air cleaner assembly. Refer to [EM-159, "Exploded View"](#).

TURBOCHARGER

[YS23DDT/YS23DDTT]

< REMOVAL AND INSTALLATION >

6. Remove air duct 1 and air duct 2. Refer to [EM-159, "Exploded View"](#).
7. Remove air inlet tube (silencer) and air inlet hose 1. Refer to [EM-162, "Removal and Installation"](#).
8. Disconnect A/F sensor harness connector.
9. Remove A/F sensor.
10. Remove heat shield.
11. Remove water pipe cover. Refer to [EM-168, "Exploded View"](#).
12. Remove engine oil level gauge guide. Refer to [EM-217, "Exploded View"](#).
13. Remove high pressure compressor bypass valve control solenoid valve.
14. Remove turbocharger air outlet pipe.
15. Remove oil feed and return pipe.
CAUTION:
 - **Be careful not to deform water tube and oil feed and return tube.**
16. Remove turbocharger bracket.
17. Remove turbocharger from exhaust manifold and turbocharger.
CAUTION:
 - **Never disassemble or adjust the turbocharger.**
 - **Be careful not to contact with the vehicle.**
 - **Never hold turbocharger boost control actuator and actuator rod.**
18. Remove gasket.
19. Remove stud bolt from exhaust manifold and turbocharger, if necessary.

INSTALLATION

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

CAUTION:

- **Clean each joint surface before installation.**

Inspection

INFOID:0000000011999130

TROUBLE DIAGNOSIS OF TURBOCHARGER

Preliminary check:

- Check that the engine oil level is between MIN and MAX of the oil level gauge. (When engine oil amount is more than MAX, engine oil flows into the inlet duct through blow-by gas passage, and turbocharger is misjudged malfunction.)
- Ask the customer if he/she always runs the vehicle in idle engine speed to cool the engine oil down after driving.
- Replace the turbocharger assembly when any malfunction is found after unit inspections specified in the table below.
- If no malfunction is found after the unit inspections, judge that the turbocharger body has no malfunction. Check the other parts again.

Inspection item	Inspection result	Symptom (when each inspection item meets each inspection result)			
		Engine oil leakage	Smoke	Noise	Insufficient power/acceleration malfunction
Turbine wheel	Engine oil leaks	C	A	C	C
	Carbon is accumulated	C	A	B	B
	Friction with housing	C	B	A	B
	Blades are bent or broken	—	—	A	A
Compressor wheel	Inside the air inlet is seriously contaminated by engine oil.	B	B	—	—
	Friction with housing	C	B	A	B
	Blades are bent or broken	—	—	A	A

TURBOCHARGER

< REMOVAL AND INSTALLATION >

[YS23DDT/YS23DDTT]

Inspection item	Inspection result	Symptom (when each inspection item meets each inspection result)			
		Engine oil leakage	Smoke	Noise	Insufficient power/acceleration malfunction
After checking both turbine and compressor, inspect rotor shaft end play.	There is resistance when the rotor shaft is rotated by your fingertips.	—	C	C	B
	The rotor shaft sometimes does not rotate by your fingertips.	—	—	—	A
	There is too much play in the bearing.	C	C	B	C
Oil return port	Carbon or sludge is accumulated in the waste oil hole.	C	A	C	C

A: Large possibility

B: Medium possibility

C: Small possibility

INSPECTION AFTER INSTALLATION

Inspection for Leakage

The following are procedures for checking fluid leakage, lubricant leakage.

- Before starting engine, check oil/fluid levels including engine coolant and engine oil. If any are less than the required quantity, fill them to the specified level. Refer to [MA-32, "Fluids and Lubricants"](#).
- Follow the procedure below to check for fuel leakage.
 - Turn ignition switch to the "ON" position (with engine stopped). With fuel pressure applied to fuel piping, check for fuel leakage at connection points.
 - Start engine. With engine speed increased, check again for fuel leakage at connection points.
- Run engine to check for unusual noise and vibration.

NOTE:

If hydraulic pressure inside chain tensioner drops after removal/installation, slack in guide may generate a pounding noise during and just after the engine start. However, this does not indicate a malfunction. The noise will stop after hydraulic pressure rises.

- Start engine and raise engine speed to check no exhaust emission leaks.
- Warm up engine thoroughly to check that there is no leakage of fuel, or any oil/fluids including engine oil and engine coolant.
- Bleed air from lines and hoses of applicable lines, such as in cooling system.
- After cooling down engine, again check oil/fluid levels including engine oil and engine coolant. Refill them to the specified level, if necessary.

Summary of the inspection items:

Items		Before starting engine	Engine running	After engine stopped
Engine coolant		Level	Leakage	Level
Engine oil		Level	Leakage	Level
Transmission / transaxle fluid	AT & CVT Models	Leakage	Level / Leakage	Leakage
	MT Models	Level / Leakage	Leakage	Level / Leakage
Other oils and fluids*		Level	Leakage	Level
Fuel		Leakage	Leakage	Leakage
Exhaust gases		—	Leakage	—

*: Power steering fluid, brake fluid, etc.

OIL PAN (LOWER)

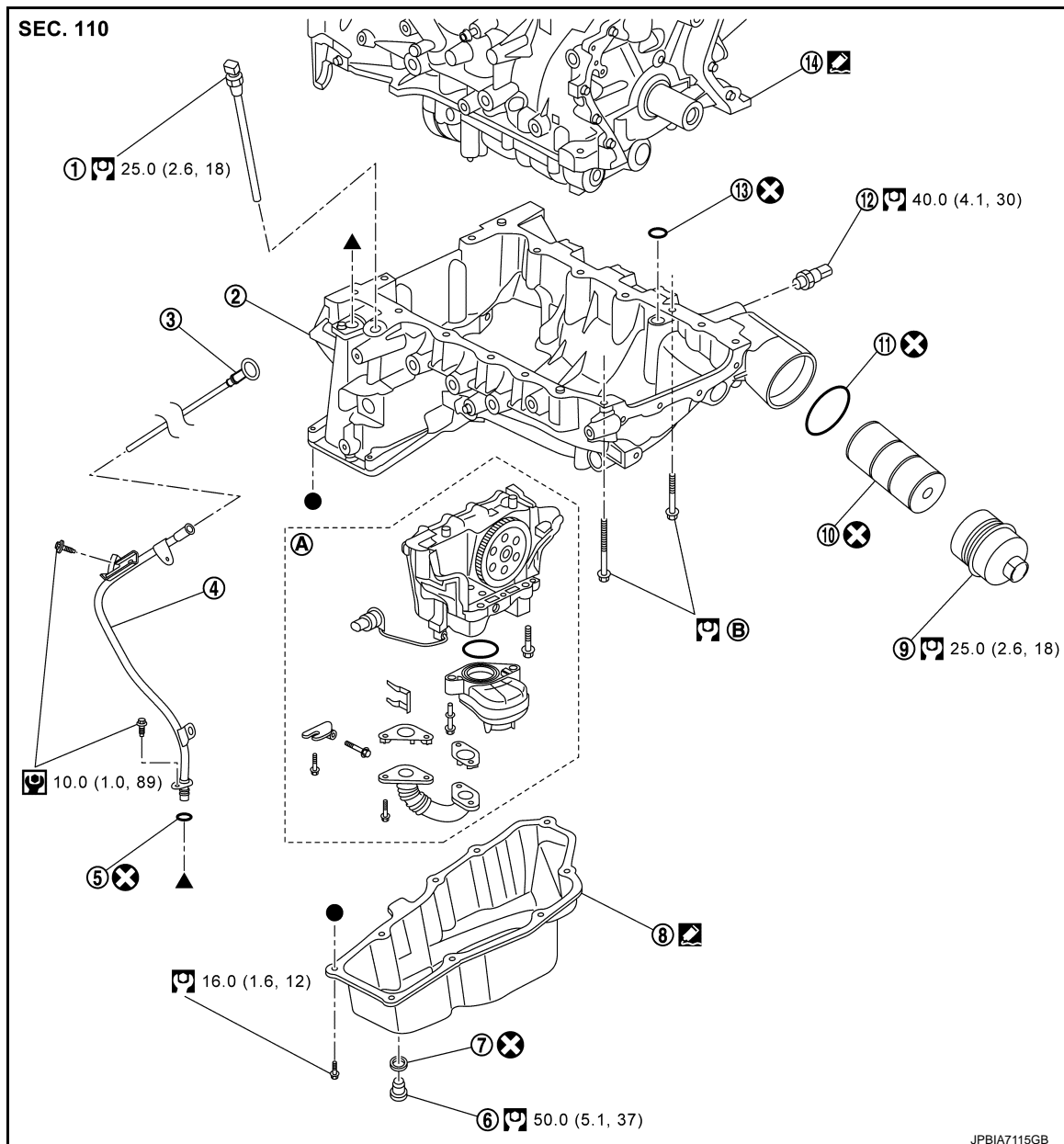
[YS23DDT/YS23DDTT]

< REMOVAL AND INSTALLATION >

OIL PAN (LOWER)

Exploded View

INFOID:0000000011999131



- | | | |
|---------------------------|-------------------|------------------------------|
| ① Engine oil level sensor | ② Oil pan (upper) | ③ Oil level gauge |
| ④ Oil level gauge guide | ⑤ O-ring | ⑥ Oil pan drain plug |
| ⑦ Drain plug washer | ⑧ Oil pan (lower) | ⑨ Oil filter body |
| ⑩ Oil filter | ⑪ O-ring | ⑫ Engine oil pressure switch |
| ⑬ O-ring | ⑭ Cylinder block | |
- Comply with the removal procedure.
 (A) Refer to [LU-28, "Removal and Installation"](#)
 Comply with the installation procedure when tightening. Refer to [EM-218, "Removal and Installation"](#)
 (B)

: N·m (kg-m, ft-lb)


: N·m (kg-m, in-lb)

: Always replace after every disassembly.

OIL PAN (LOWER)

< REMOVAL AND INSTALLATION >

[YS23DDT/YS23DDTT]

 : Sealing point

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

Removal and Installation

INFOID:0000000011999132

EM


REMOVAL

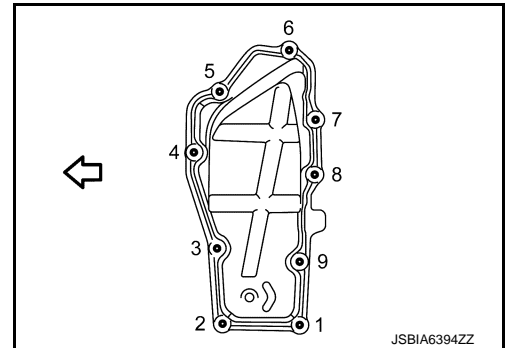
1. Drain engine oil. Refer to [LU-23, "Draining"](#).

CAUTION:

Perform this step when engine is cold.

2. Remove oil pan (lower) with the following procedure:
 - a. Loosen mounting bolts in the order from 9 to 1 as shown in the figure.

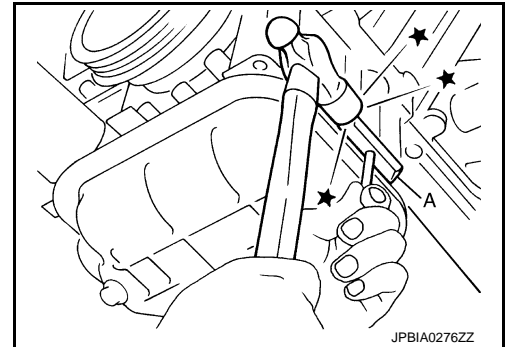
 : Engine front



- b. Insert the seal cutter [SST:KV10111100 (—)] (A) between oil pan (upper) and oil pan (lower). Slide tool by tapping on the side of the tool with a hammer.

CAUTION:

- Be careful not to damage mating surface.
- Never insert screwdriver, or oil pan flange will be deformed.



- c. Remove oil pan (lower).

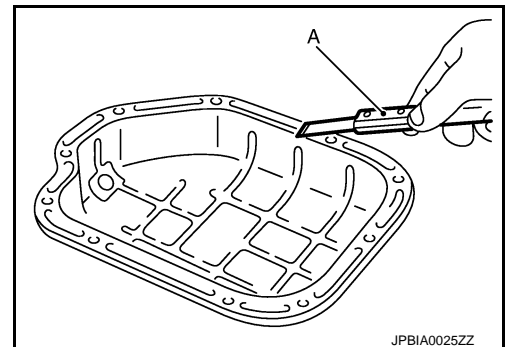
INSTALLATION

1. Install oil pan (lower) with the following procedure:
 - a. Use a scraper (A) to remove old liquid gasket from mating surfaces.

CAUTION:

Never scratch or damage the mating surfaces when cleaning off old liquid gasket.

- Remove old liquid gasket from the bolt holes and threads.



OIL PAN (LOWER)

< REMOVAL AND INSTALLATION >

[YS23DDT/YS23DDTT]

- b. Apply a continuous bead of liquid gasket with the tube presser (commercial service tool) as shown in the figure.

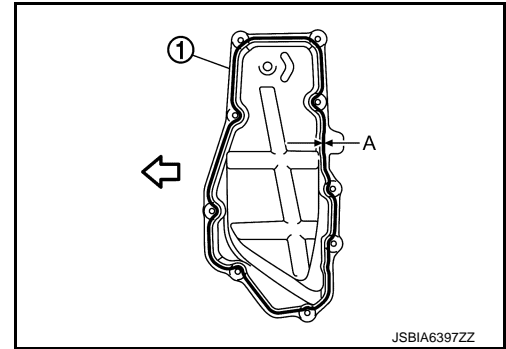
① : Oil pan (lower)

A : 2.5 - 4.5 mm (0.098 - 0.177 in)

⇐ : Engine front

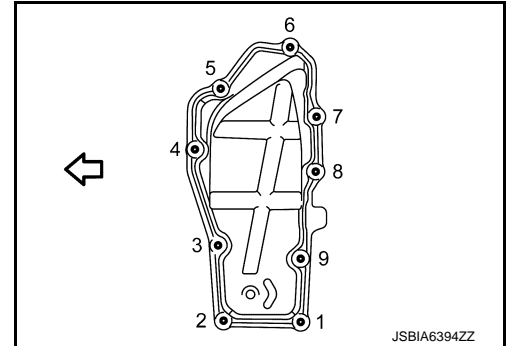
Use Genuine Liquid Gasket or equivalent

CAUTION:
Attaching should be done within 5 minutes after coating.



- c. Tighten mounting bolts in the order from 1 to 9 as shown in the figure.

⇐ : Engine front



2. Install in the reverse order of removal, for the rest of parts.

NOTE:

At least 30 minutes after oil pan is installed, pour engine oil.

Inspection

INFOID:0000000011999133

INSPECTION AFTER REMOVAL

Clean oil strainer if any object attached.

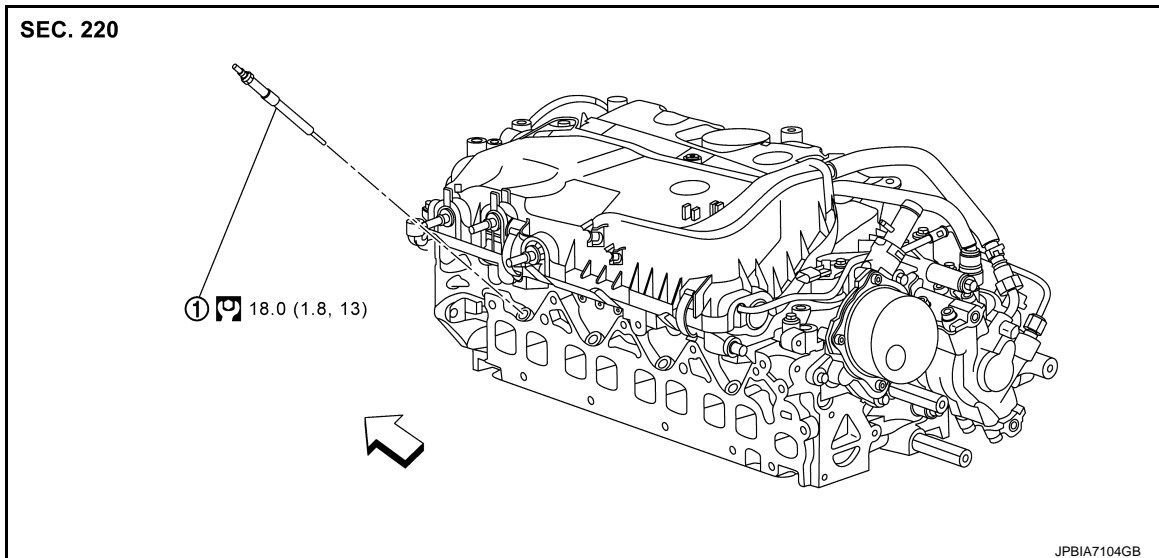
INSPECTION AFTER INSTALLATION

1. Check the engine oil level and adjust engine oil. Refer to [LU-22, "Inspection"](#).
2. Start engine, and check there is no leak of engine oil.
3. Stop engine and wait for 10 minutes.
4. Check the engine oil level again. Refer to [LU-22, "Inspection"](#).

GLOW PLUG

Exploded View

INFOID:0000000011999134



① Glow plug

: N·m (kg·m, ft·lb)

: Vehicle front

Removal and Installation

INFOID:0000000011999135

REMOVAL

CAUTION:

Remove glow plug only if necessary. If carbon adheres, it may be stuck and broken.

1. Remove engine cover. Refer to [EM-157, "Removal and Installation"](#).
2. Remove injector rail protector. Refer to [EM-189, "Exploded View"](#).
3. Remove fuel filter from fuel filter bracket, and move to aside it. Refer to [FL-29, "Exploded View"](#).
4. Remove fuel filter bracket. Refer to [FL-29, "Exploded View"](#).
5. Disconnect fuel return hose from cylinder head housing, and move to aside.
6. Disconnect harness connector from glow plug.
7. Remove glow plug.

CAUTION:

- When removing or installing, never use such tools as an air impact wrench.
- Handle it carefully without giving any impact, even after removal.

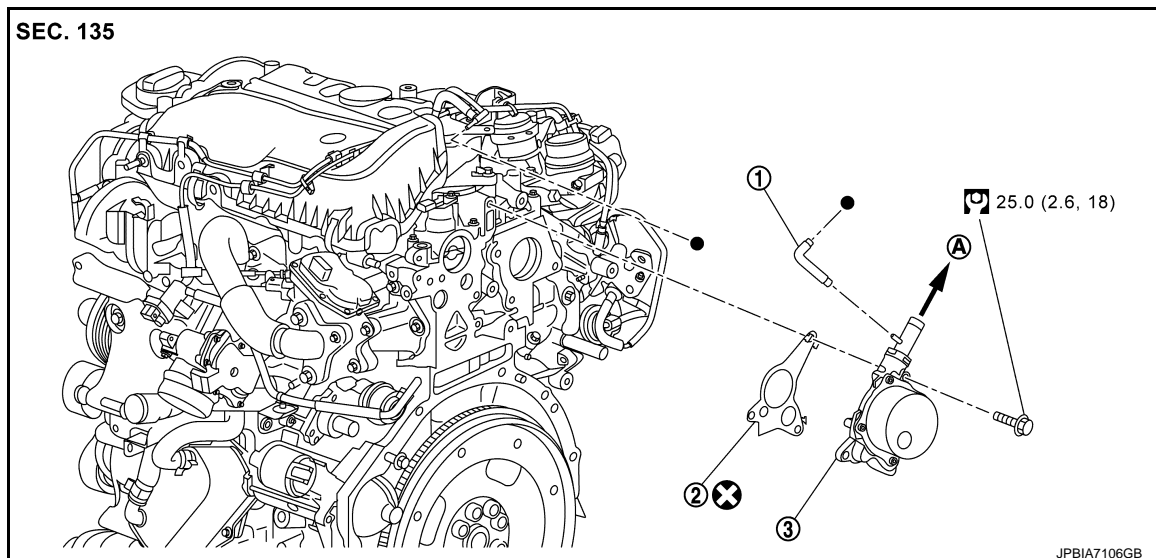
INSTALLATION

1. Remove adhered carbon from glow plug installation hole with a reamer.
2. Install glow plug.
3. Install remaining parts, in the reverse order of removal.

VACUUM PUMP

Exploded View

INFOID:0000000011999136



- ① Vacuum hose ② Gasket ③ Vacuum pump

- (A) To vacuum hose (for brake booster)

: N·m (kg-m, ft-lb)

: Always replace after every disassembly.

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

Removal and Installation

INFOID:0000000011999137

REMOVAL

1. Remove engine cover. Refer to [EM-157. "Removal and Installation"](#).
2. Drain engine coolant. Refer to [CO-40. "Draining"](#).
3. Remove engine slinger (rear). Refer to [EM-228. "Exploded View"](#).
4. Remove injector rail protector. Refer to [EM-189. "Exploded View"](#).
5. Disconnect vacuum hose from vacuum pump.
6. Remove water pipe assembly. Refer to [CO-58. "Exploded View"](#).
7. Remove vacuum pump.

INSTALLATION

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

Vacuum pump

CAUTION:

Be sure to check that the vacuum pump is in contact with the cylinder head before tightening the mounting bolts.

OIL SEPARATOR

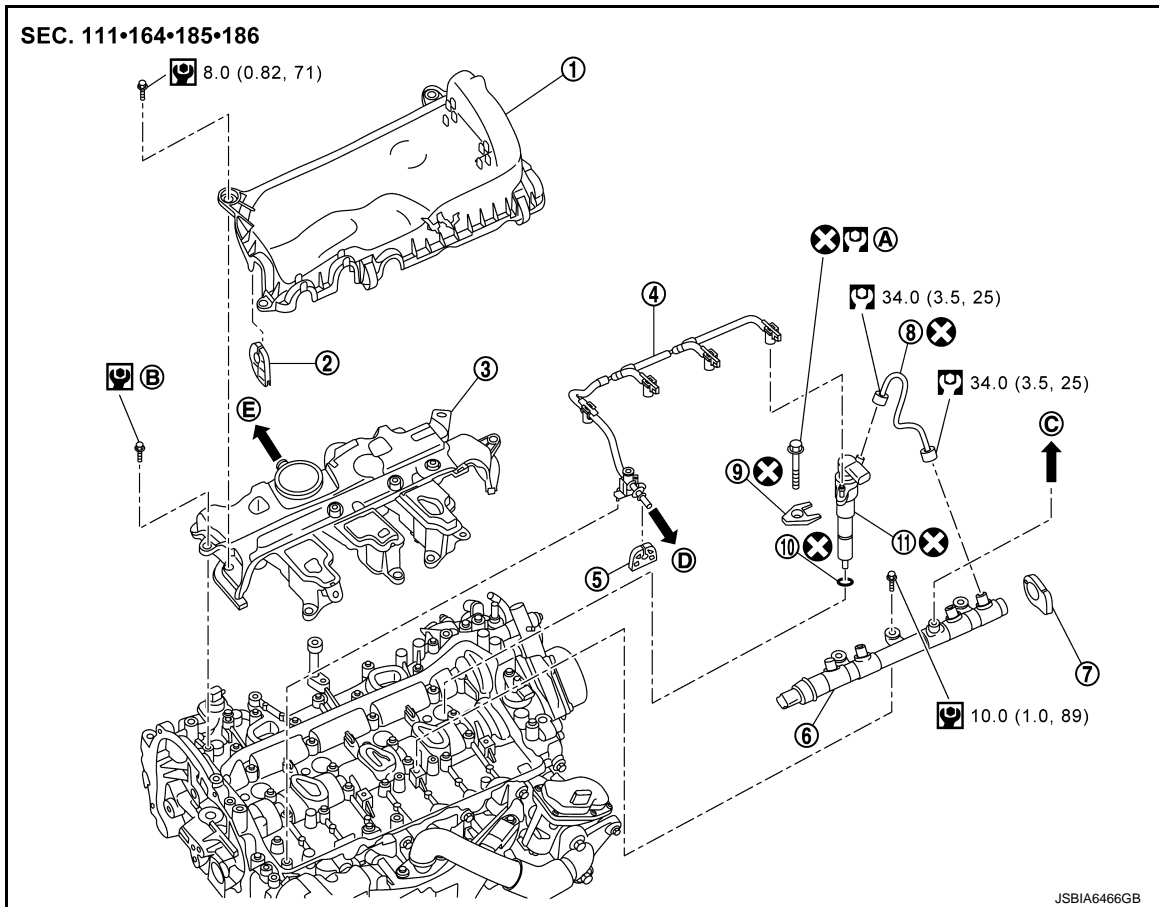
< REMOVAL AND INSTALLATION >

[YS23DDT/YS23DDTT]

OIL SEPARATOR

Exploded View

INFOID:000000011999138



- | | | |
|---|---|-------------------------|
| ① Injector rail protector | ② Injector rail protector seal | ③ Oil separator |
| ④ Fuel return hose | ⑤ Fuel return hose protector seal | ⑥ Fuel injector rail |
| ⑦ Fuel injector rail protector seal | ⑧ Injection tube | ⑨ Fuel injector support |
| ⑩ Fuel injector spacer | ⑪ Fuel injector | |
| Ⓐ Comply with the installation procedure when tightening. Refer to EM-189, "Removal and Installation" | Ⓑ Comply with the installation procedure when tightening. Refer to EM-187, "Removal and Installation" | Ⓒ To fuel tube |
| Ⓓ To fuel return hose | Ⓔ To blow-by hose | |

: N·m (kg-m, ft-lb)

: N·m (kg-m, in-lb)

: Always replace after every disassembly.

Removal and Installation

INFOID:000000011999139

REMOVAL

1. Remove engine cover. Refer to [EM-157, "Removal and Installation"](#).
2. Remove engine cover bracket. Refer to [EM-157, "Exploded View"](#).
3. Remove injector rail protector.
4. Disconnect blow-by hose from oil separator. Refer to [EM-159, "Exploded View"](#).

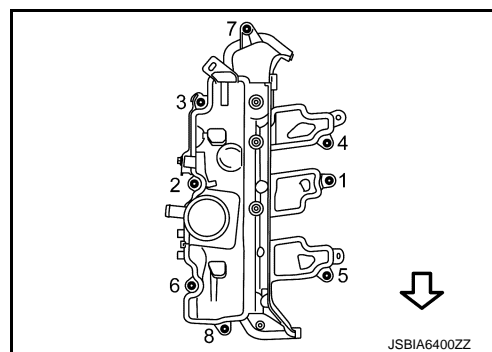
OIL SEPARATOR

[YS23DDT/YS23DDTT]

< REMOVAL AND INSTALLATION >

5. Loosen oil separator mounting bolts in the order from 8 to 1 as shown in the figure.

← : Engine front



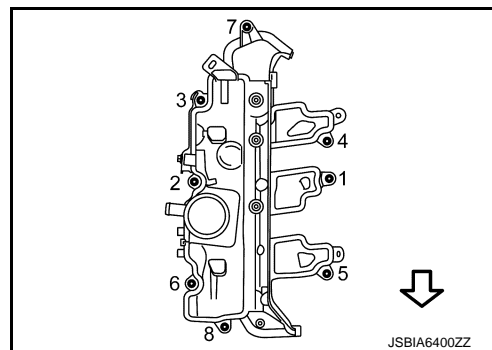
INSTALLATION

1. Install oil separator.
 - Tighten mounting bolts in the order from 1 to 8 as shown in the figure.

 **1st step: 5.0 N·m (0.51 kg-m, 44 in-lb)**

 **2nd step: 10.0 N·m (1.0 kg-m, 89 in-lb)**

← : Engine front



2. Install in the reverse order of removal after this step.

[YS23DDT/YS23DDTT]

INFOID:0000000012006032



- : Always replace after every disassembly.

INFOID:0000000011999141

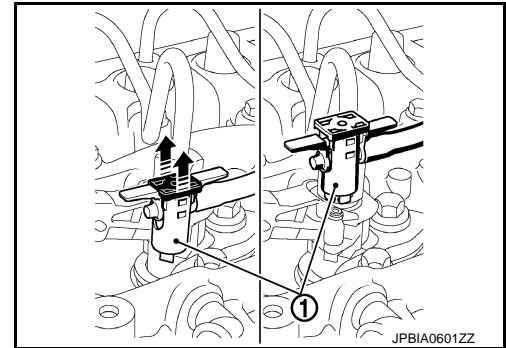
D23

INJECTION TUBE AND FUEL INJECTOR

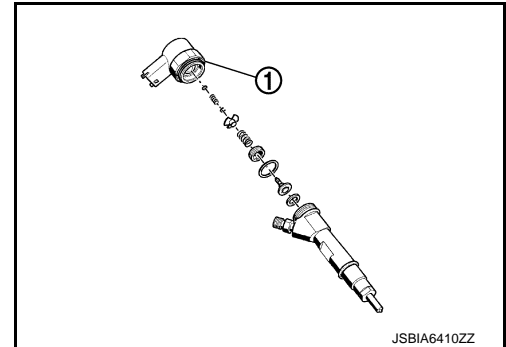
< REMOVAL AND INSTALLATION >

[YS23DDT/YS23DDTT]

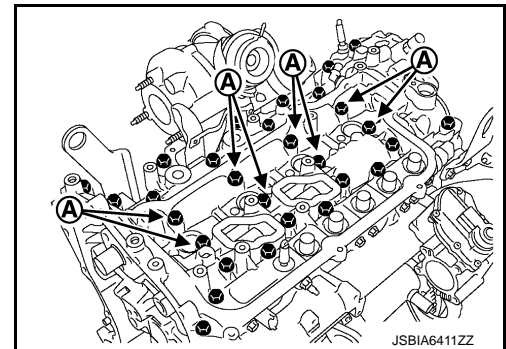
1. Disconnect battery cable from negative terminal.
2. Remove oil separator. Refer to [EM-187, "Removal and Installation"](#).
3. Disconnect fuel injector harness connector.
4. Remove injection tube.
 - Put a paint mark or tag on injection tubes to identify each cylinder.
5. Remove fuel return hose ①.
 - Lift the movable sections of the injector unions away from the fuel return hose.



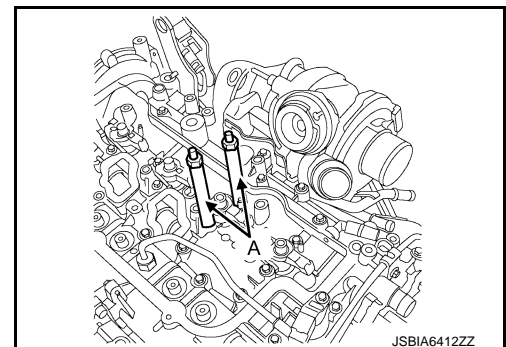
6. Remove fuel injectors with the following procedure:
 - a. Remove fuel injector support.
 - b. Remove fuel injector head ①



- c. Remove cylinder head housing bolts (A)



- d. Install the support leg (A) of injector extractor [SST: — (Mot. 1966)] on the cylinder head housing in place of the cylinder head housing bolts.

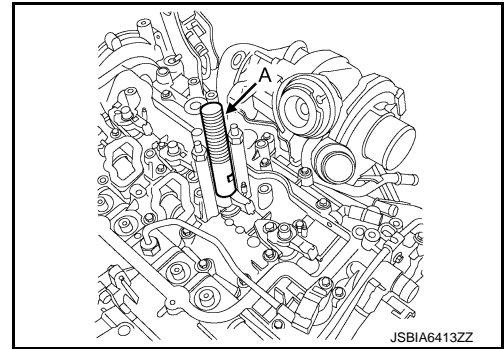


INJECTION TUBE AND FUEL INJECTOR

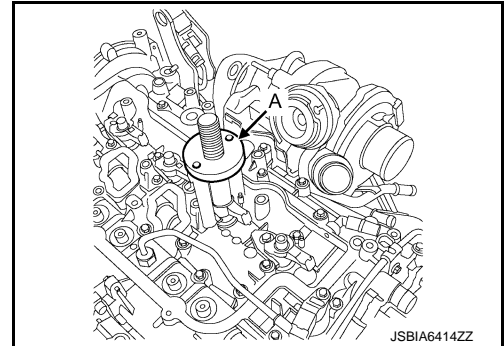
< REMOVAL AND INSTALLATION >

[YS23DDT/YS23DDTT]

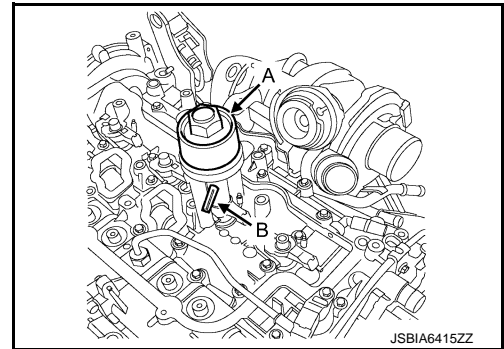
- e. Install the pull rod (A) of injector extractor [SST: — (Mot. 2093)] on the fuel injector.



- f. Install the pressure plate (A) of injector extractor [SST: — (Mot. 1966)].



- g. Install the pin (B) of injector extractor [SST: — (Mot. 1966)] to prevent the pull rod from rotating.
• Grease the threads of the pull rod.
- h. Install the ball nut (A) of injector extractor [SST: — (Mot. 1966)].



- i. Tighten the ball nut until the fuel injector detaches.

CAUTION:

Do not reuse fuel injector.

INSTALLATION

1. Install fuel injector with the following procedure:
- a. Install fuel injector spacer to fuel injector, and insert them into cylinder head housing.
CAUTION:
• **Completely remove any foreign material among fuel injector and cylinder head housing.**
- b. Install fuel injector support.
CAUTION:
Be sure to fit fuel injector support without looseness.
- c. Tighten fuel injector support bolt.

 : 5 N·m (0.51 kg-m, 44 in-lb)

- d. Turn fuel injector support bolt 185 degrees clockwise (angle tightening).
CAUTION:
Check and confirm the tightening angle by using an angle wrench [SST: KV10112100 (—)] or protractor. Avoid judgment by visual inspection without the tool.
- e. Turn fuel injector support bolt 5 degrees clockwise (angle tightening).
CAUTION:

INJECTION TUBE AND FUEL INJECTOR

< REMOVAL AND INSTALLATION >

[YS23DDT/YS23DDTT]

Check and confirm the tightening angle by using an angle wrench [SST: KV10112100 (—)] or protractor. Avoid judgment by visual inspection without the tool.

2. Install in the reverse order of removal, for the rest of parts.

- When replacing fuel injector, this procedure must be performed. Refer to [EC-926, "Description"](#)

Inspection

INFOID:0000000011999142

INSPECTION AFTER INSTALLATION

- When replacing fuel injector, this procedure must be performed. Refer to [EC-921, "Description"](#)
- Start the engine and check for fuel leak for one minute after starting.

CAUTION:

After any operation, check that there are no diesel leaks. Refer to [EM-139, "Precaution for Diesel Equipment"](#).

TIMING CHAIN

< REMOVAL AND INSTALLATION >

[YS23DDT/YS23DDTT]

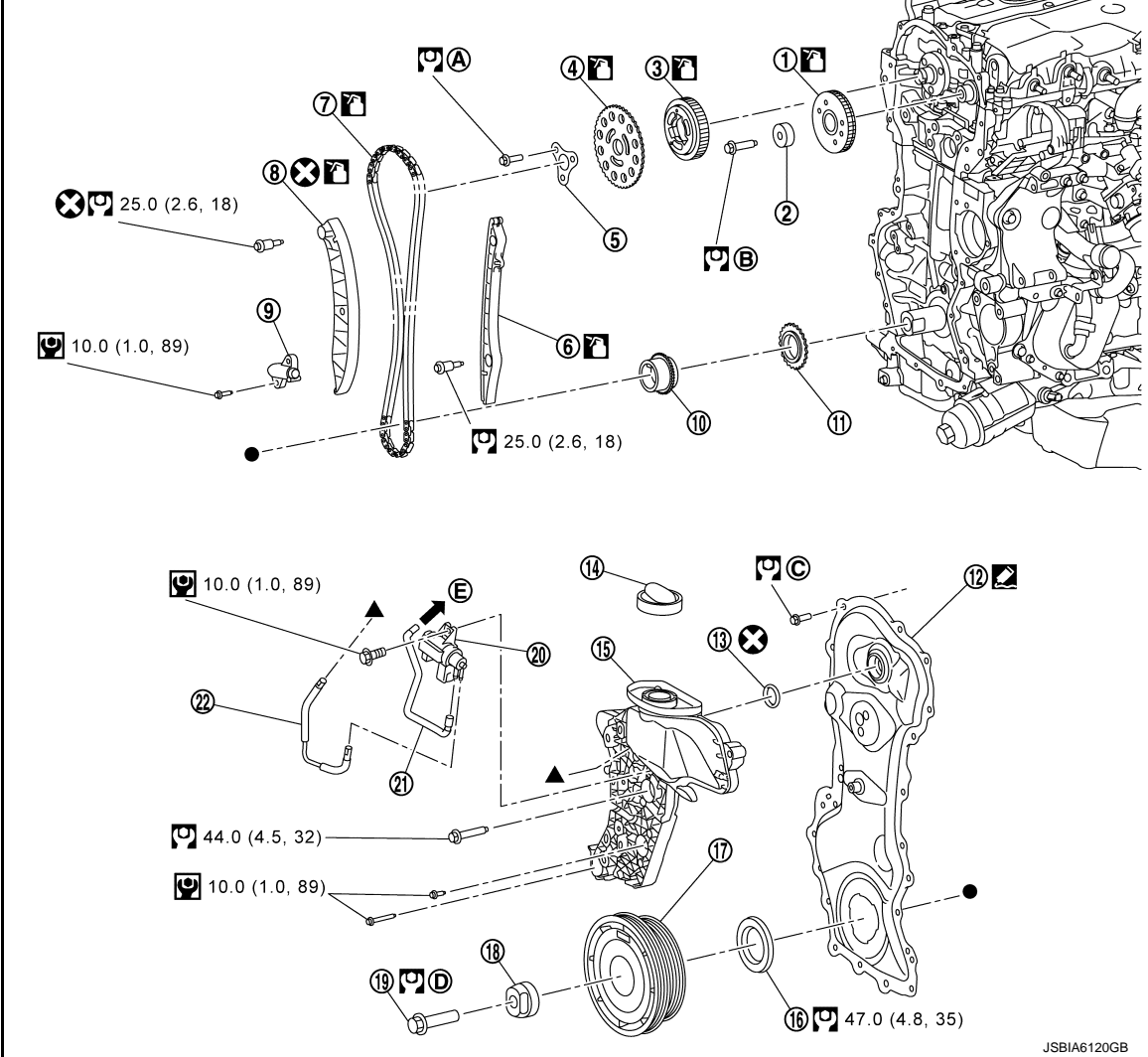
TIMING CHAIN

Exploded View

INFOID:000000011999148

YS23DDT

SEC. 130•135



- | | | |
|--|---|--|
| ① Intake camshaft timing sprocket | ② Intake camshaft timing sprocket spacer | ③ Exhaust camshaft timing sprocket (rear) |
| ④ Exhaust camshaft timing sprocket (front) | ⑤ Timing sprocket spacer | ⑥ Tension guide |
| ⑦ Timing chain | ⑧ Slack guide | ⑨ Timing chain tensioner |
| ⑩ Crankshaft spacer (crankshaft side) | ⑪ Crankshaft sprocket | ⑫ Front cover |
| ⑬ O-ring | ⑭ Oil filler cap | ⑮ Vacuum tank |
| ⑯ Front oil seal | ⑰ Crankshaft pulley | ⑱ Crankshaft spacer (crankshaft pulley side) |
| ⑲ Crankshaft pulley bolt | ⑳ Turbocharger boost control solenoid valve | ㉑ Vacuum hose |
| ㉒ Vacuum hose | | |

(A) Comply with the installation procedure when tightening. Refer to [EM-195, "Removal and Installation"](#).

(B) Comply with the installation procedure when tightening. Refer to [EM-203, "Removal and installation"](#).

(C) Comply with the installation procedure when tightening. Refer to [EM-195, "Removal and Installation"](#).

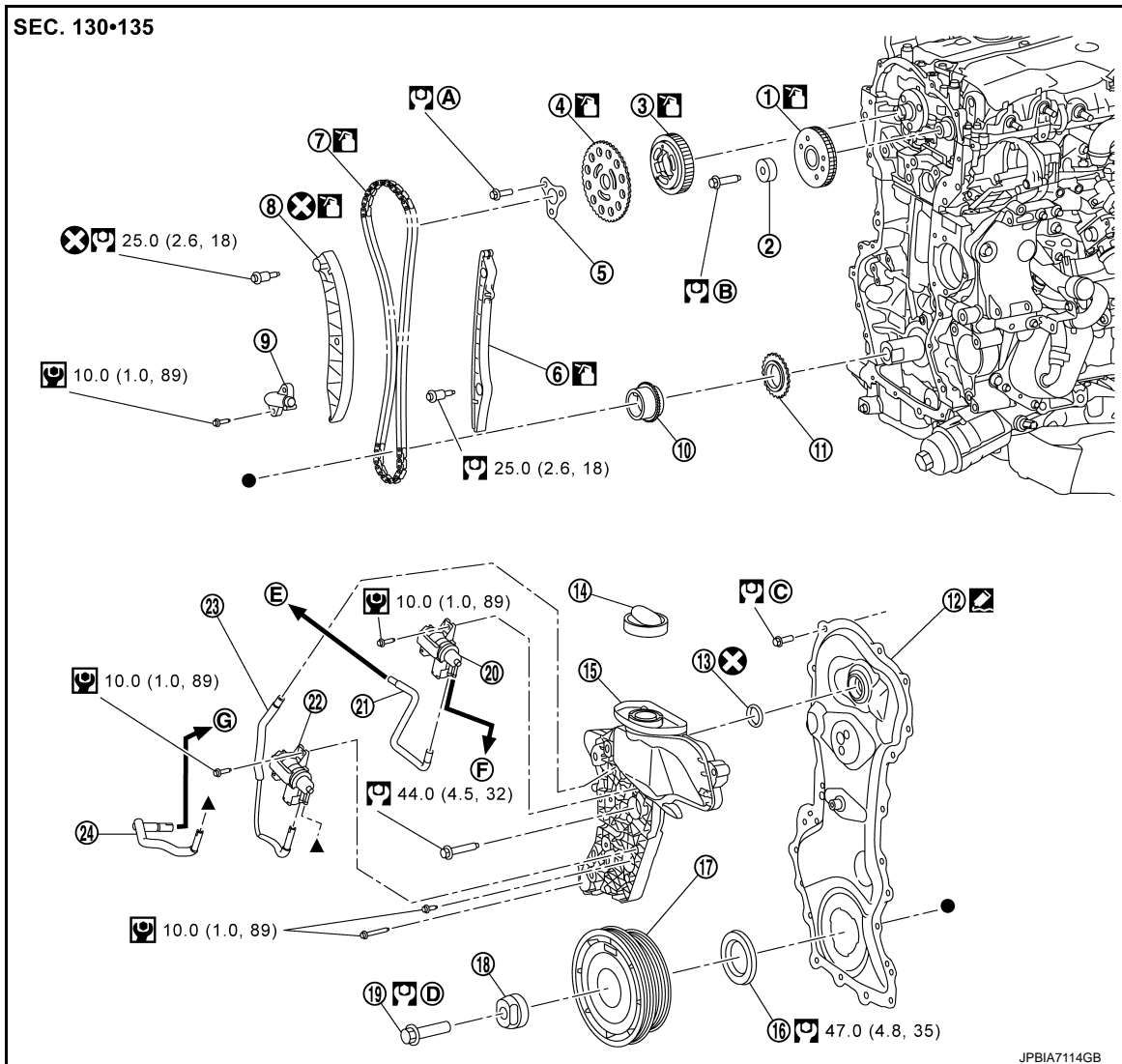
TIMING CHAIN

< REMOVAL AND INSTALLATION >

[YS23DDT/YS23DDTT]

- Comply with the installation procedure when tightening. Refer to [EM-195](#), "Removal and Installation".
- Ⓐ : 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 part is connected at points with same symbol in actual vehicle.

YS23DDTT



- | | | |
|--|--|--|
| ① Intake camshaft timing sprocket | ② Intake camshaft timing sprocket spacer | ③ Exhaust camshaft timing sprocket (rear) |
| ④ Exhaust camshaft timing sprocket (front) | ⑤ Timing sprocket spacer | ⑥ Tension guide |
| ⑦ Timing chain | ⑧ Slack guide | ⑨ Timing chain tensioner |
| ⑩ Crankshaft spacer (crankshaft side) | ⑪ Crankshaft sprocket | ⑫ Front cover |
| ⑬ O-ring | ⑭ Oil filler cap | ⑮ Vacuum tank |
| ⑯ Front oil seal | ⑰ Crankshaft pulley | ⑱ Crankshaft spacer (crankshaft pulley side) |

TIMING CHAIN

< REMOVAL AND INSTALLATION >

[YS23DDT/YS23DDTT]

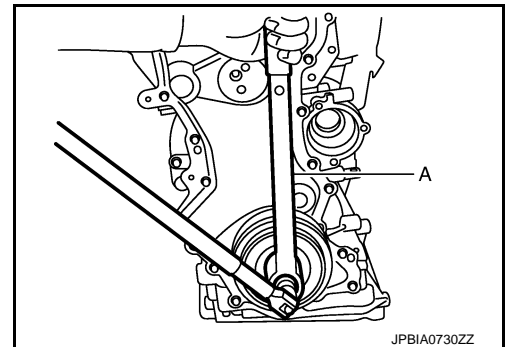
- | | | |
|---|---|---|
| ①⑨ Crankshaft pulley bolt | ②⑩ High pressure turbine bypass valve control solenoid valve | ②① Vacuum hose |
| ②② Low pressure wastegate valve control solenoid valve | ②③ Vacuum hose | ②④ Vacuum hose |
| Ⓐ Comply with the installation procedure when tightening. Refer to EM-195, "Removal and Installation" . | Ⓑ Comply with the installation procedure when tightening. Refer to EM-203, "Removal and installation" . | Ⓒ Comply with the installation procedure when tightening. Refer to EM-195, "Removal and Installation" . |
| Ⓓ Comply with the installation procedure when tightening. Refer to EM-195, "Removal and Installation" . | Ⓔ To turbocharger | Ⓕ To vacuum pump |
| Ⓖ To turbocharger | | |
| Ⓗ : 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 part is connected at points with same symbol in actual vehicle. | | |

Removal and Installation

INFOID:0000000011999149

REMOVAL

- Drain engine oil. Refer to [LU-23, "Draining"](#).
CAUTION:
Perform this step when the engine is cold.
- Remove engine cover. Refer to [EM-157, "Removal and Installation"](#).
- Remove engine cover bracket. Refer to [EM-157, "Exploded View"](#).
- Remove drive belt and compressor belt. Refer to [EM-151, "Removal and Installation"](#).
- Remove cooling fan. Refer to [CO-52, "Removal and Installation"](#).
- Remove water pump pulley. Refer to [CO-54, "Exploded View"](#).
- Remove compressor and move to aside. Refer to [HA-141, "Exploded View"](#).
- Remove compressor bracket. Refer to [HA-141, "Exploded View"](#).
- Remove turbocharger boost control solenoid valve (YS23DDT) or high pressure turbine bypass valve control solenoid valve and low pressure wastegate valve control solenoid valve (YS23DDTT).
- Remove vacuum tank.
- Remove crankshaft pulley with the following procedure:
 - Set the crankshaft pulley locking tool [SST: — (Mot.1770)] (A).
 - Remove crankshaft pulley.**CAUTION:**
Be careful not to damage front oil seal lip.

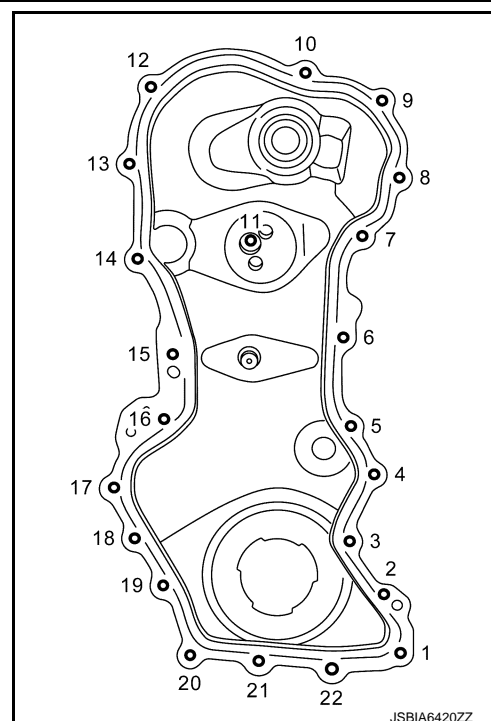


TIMING CHAIN

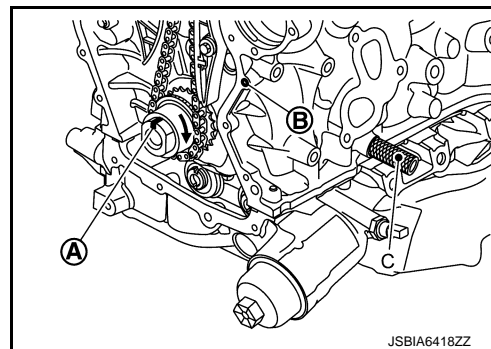
< REMOVAL AND INSTALLATION >

[YS23DDT/YS23DDTT]

12. Loosen front cover bolts in the order from 22 to 1 as shown in the figure.



13. Align the groove (A) on the crankshaft with the hole (B) on the cylinder block (pistons at mid-stroke).
 14. Install the TDC set pin [SST: — (Mot.1766)] (C).



15. Turn the crankshaft counterclockwise until it makes contact with the tool.

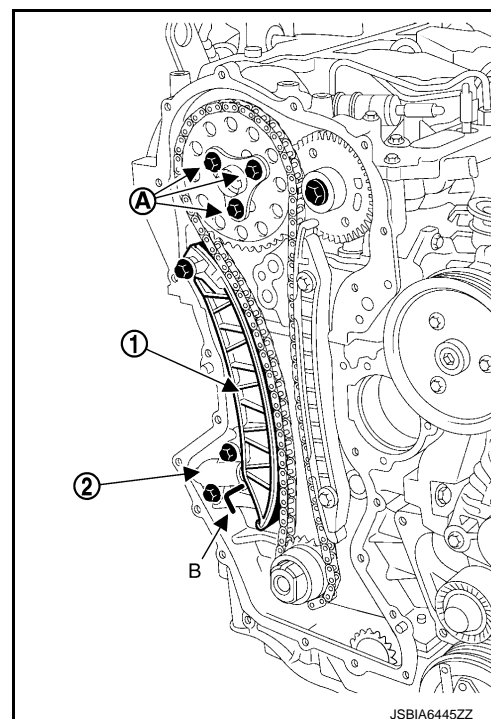
16. Loosen the bolts (A) of the exhaust camshaft timing sprocket.

17. Compress the timing chain tensioner (2) with the slack guide (1).

18. Lock the timing chain tensioner using a locking pin (B).

19. Remove the followings:

- the timing chain tensioner,
- the slack guide,
- the tension guide,
- the washer of the timing chain sprocket on the camshaft side,
- the “timing chain sprocket on the camshaft side - timing chain - timing chain sprocket on the crankshaft side” assemble



20. Remove TDC set pin [SST: — (Mot.1766)].

INSTALLATION

REFITTING PREPARATION OPERATION

- Use SUPER CLEANING AGENT FOR JOINT FACES to clean:
 - the joint face of the front cover on the cylinder block and on the cylinder head,
 - the front cover.

WARNING:

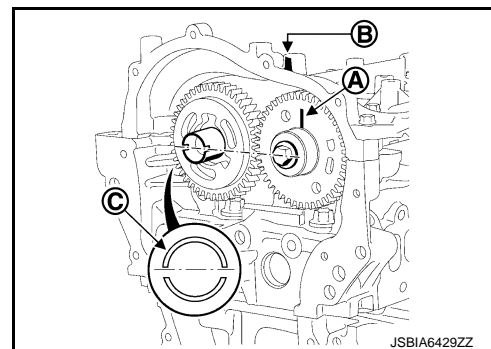
Do not scrape the joint faces of the aluminium, any damage caused to the joint face will result in a risk of leaks.

- Remove the residue using a plastic spatula.
- Finish cleaning the joint faces using a GREY ABRASIVE PAD.

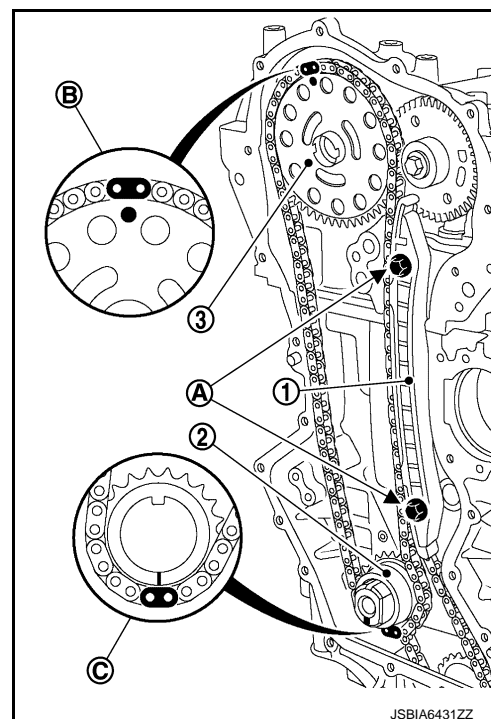
WARNING:

To ensure proper sealing, the gasket surfaces must be clean, dry and not greasy (avoid any finger marks).

1. Set the engine at TDC.
2. Install the TDC set pin [SST: — (Mot.1766)].
3. Check that the mark **(A)** on the intake camshaft timing sprocket is opposite the rocker cover boss **(B)**.
4. Check that the groove on the exhaust camshaft is horizontal (large offset **(C)** facing upwards).
5. Refit the tension guide.



6. Install tension guide **(1)**.
 7. Tighten tension guide bolts **(A)**.
 8. Install crankshaft spacer (crankshaft side) **(2)**.
- NOTE:**
The timing chain does not have a direction of fitting.
9. Align the mark on the sprocket with the copper chain links **(B)**.
 10. Install exhaust camshaft timing sprocket (front) **(3)**.
 11. Align the mark on the crankshaft spacer (crankshaft side) with the copper chain links **(C)**.



TIMING CHAIN

< REMOVAL AND INSTALLATION >

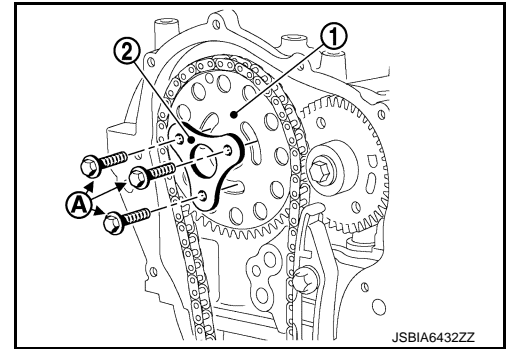
[YS23DDT/YS23DDTT]

12. Install timing sprocket spacer ② to the exhaust camshaft timing sprocket (front) ①.

13. Finger tighten the bolts ④.

NOTE:

Allow the exhaust camshaft timing sprocket (front) to rotate freely.



14. Install timing chain tensioner.

15. Install slack guide ①.

16. Tighten slack guide bolt ④.

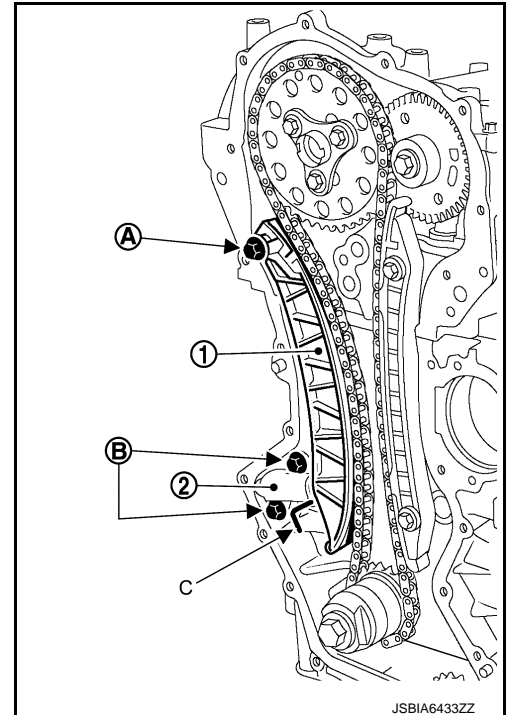
17. Install timing chain tensioner ② with its locking pin (C).

NOTE:

Check that the timing chain tensioner is in contact with the cylinder block before tightening the bolts.

18. Tighten timing chain tensioner bolts ⑤.

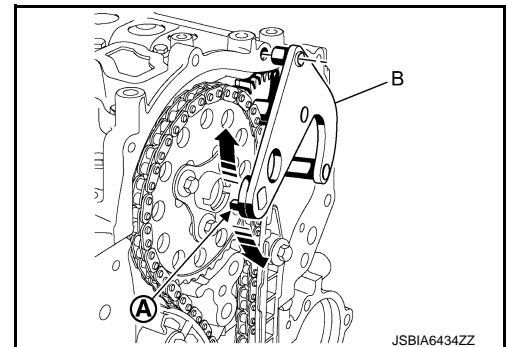
19. Remove locking pin.



20. Engage the collet ④ of the camshaft timing tool [SST: — (Mot. 1769)] (B) into the camshaft groove.

NOTE:

Do not engage the pins of the camshaft timing tool [SST: — (Mot. 1769)] in the holes of the intake camshaft timing sprocket.



TIMING CHAIN

< REMOVAL AND INSTALLATION >

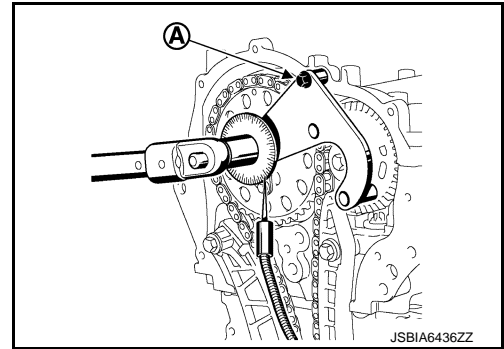
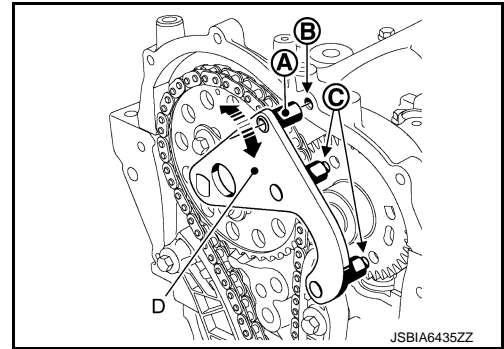
[YS23DDT/YS23DDTT]

21. Turn the camshaft timing tool [SST: — (Mot. 1769)] (D) to align the shafts on the spacer (A) and the hole (B).
22. Detach the collet of the camshaft timing tool [SST: — (Mot. 1769)] from the camshaft groove.
23. Engage the pins (C) of the camshaft timing tool [SST: — (Mot. 1769)] in the holes of the intake camshaft timing sprocket.

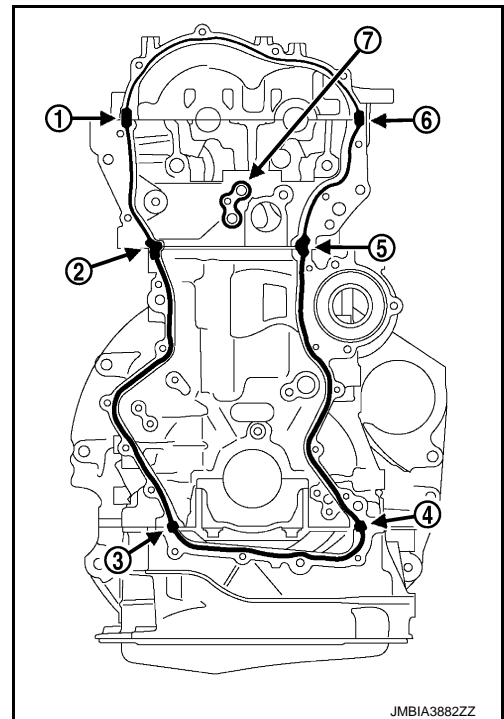
NOTE:

Do not fit the collet of the camshaft timing tool [SST: — (Mot. 1769)] into the camshaft groove.

24. Turn the camshaft timing tool [SST: — (Mot. 1769)] to align the shafts on the spacer and the hole.
25. Fit the collet of the camshaft timing tool [SST: — (Mot. 1769)] into the groove on the camshaft, without forcing it (if necessary, start the previous operations again).
26. Fit the bolt (A) (M6 - 50 mm long) onto the camshaft timing tool [SST: — (Mot. 1769)].
27. Torque tighten the bolts of the timing chain sprocket on the camshaft side.



28. Apply liquid gasket to the front cover side.
 - Apply a bead of SILICONE ADHESIVE SEALANT to the timing face:
 - 1 bead of 5 ± 2 mm (0.20 ± 0.08 in): on the outline of the rocker cover, from ① to ⑥ passing by the points ②, ③, ④ and ⑤.
 - 1 bead of 11 ± 2 mm (0.43 ± 0.08 in) for a length of 10 to 15 mm. on the points ①, ②, ③, ④, ⑤, ⑥.
 - 1 bead of 3.5 ± 1 mm (0.138 ± 0.04 in) on the outline of the cylinder head and of the cylinder block, from ⑥ to ①, on the edge ⑦.

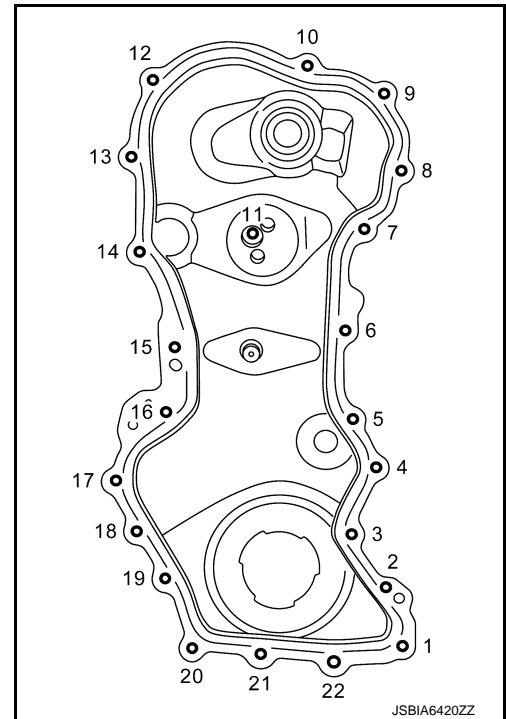


TIMING CHAIN

< REMOVAL AND INSTALLATION >

[YS23DDT/YS23DDTT]

29. Tighten front cover bolts in the order from 1 to 22 as shown in the figure.



30. Install crankshaft pulley with the following procedure:

a. Tighten crankshaft pulley bolt.

 : 50 N·m (5.1 kg-m, 37 ft-lb)

b. Turn 120 degrees clockwise (angle tightening)

31. Install in the reverse order of removal, for rest of the parts.

Inspection

INFOID:0000000011999150

INSPECTION AFTER INSTALLATION

Inspection for Leaks

- Before starting engine, check oil/fluid levels including engine coolant and engine oil. If less than required quantity, fill to the specified level. Refer to [MA-32, "Fluids and Lubricants"](#).
- Use procedure below to check for fuel leakage.
 - Start engine. With engine speed increased, check again for fuel leakage at connection points.
- Run engine to check for unusual noise and vibration.
- Warm up engine thoroughly to check there is no leakage of fuel, exhaust gases, or any oil/fluids including engine oil and engine coolant.
- Bleed air from lines and hoses of applicable lines, such as in cooling system.
- After cooling down engine, again check oil/fluid levels including engine oil and engine coolant. Refill to the specified level, if necessary.

Summary of the inspection items:

Items		Before starting engine	Engine running	After engine stopped
Engine coolant		Level	Leakage	Level
Engine oil		Level	Leakage	Level
Transmission / transaxle fluid	AT & CVT Models	Leakage	Level / Leakage	Leakage
	MT Models	Level / Leakage	Leakage	Level / Leakage
Other oils and fluids*		Level	Leakage	Level
Fuel		Leakage	Leakage	Leakage
Exhaust gases		—	Leakage	—

*: Power steering fluid, brake fluid, etc.

TIMING SPROCKET

< REMOVAL AND INSTALLATION >

[YS23DDT/YS23DDTT]

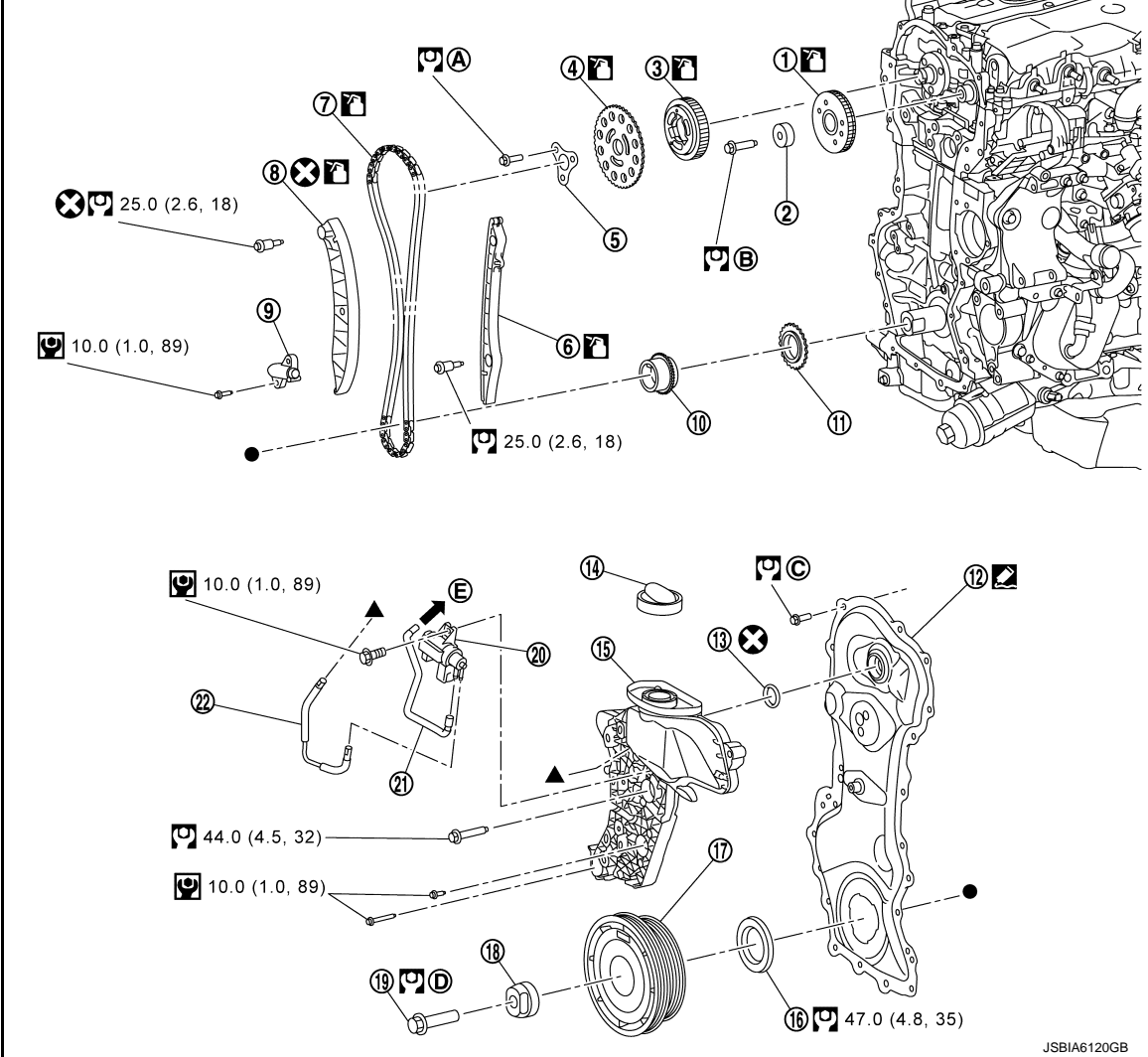
TIMING SPROCKET

Exploded View

INFOID:000000011999151

YS23DDT

SEC. 130•135



- | | | |
|--|---|--|
| ① Intake camshaft timing sprocket | ② Intake camshaft timing sprocket spacer | ③ Exhaust camshaft timing sprocket (rear) |
| ④ Exhaust camshaft timing sprocket (front) | ⑤ Timing sprocket spacer | ⑥ Tension guide |
| ⑦ Timing chain | ⑧ Slack guide | ⑨ Timing chain tensioner |
| ⑩ Crankshaft spacer (crankshaft side) | ⑪ Crankshaft sprocket | ⑫ Front cover |
| ⑬ O-ring | ⑭ Oil filler cap | ⑮ Vacuum tank |
| ⑯ Front oil seal | ⑰ Crankshaft pulley | ⑱ Crankshaft spacer (crankshaft pulley side) |
| ⑲ Crankshaft pulley bolt | ⑳ Turbocharger boost control solenoid valve | ㉑ Vacuum hose |
| ㉒ Vacuum hose | | |

(A) Comply with the installation procedure when tightening. Refer to [EM-195, "Removal and Installation"](#).

(B) Comply with the installation procedure when tightening. Refer to [EM-203, "Removal and installation"](#).

(C) Comply with the installation procedure when tightening. Refer to [EM-195, "Removal and Installation"](#).

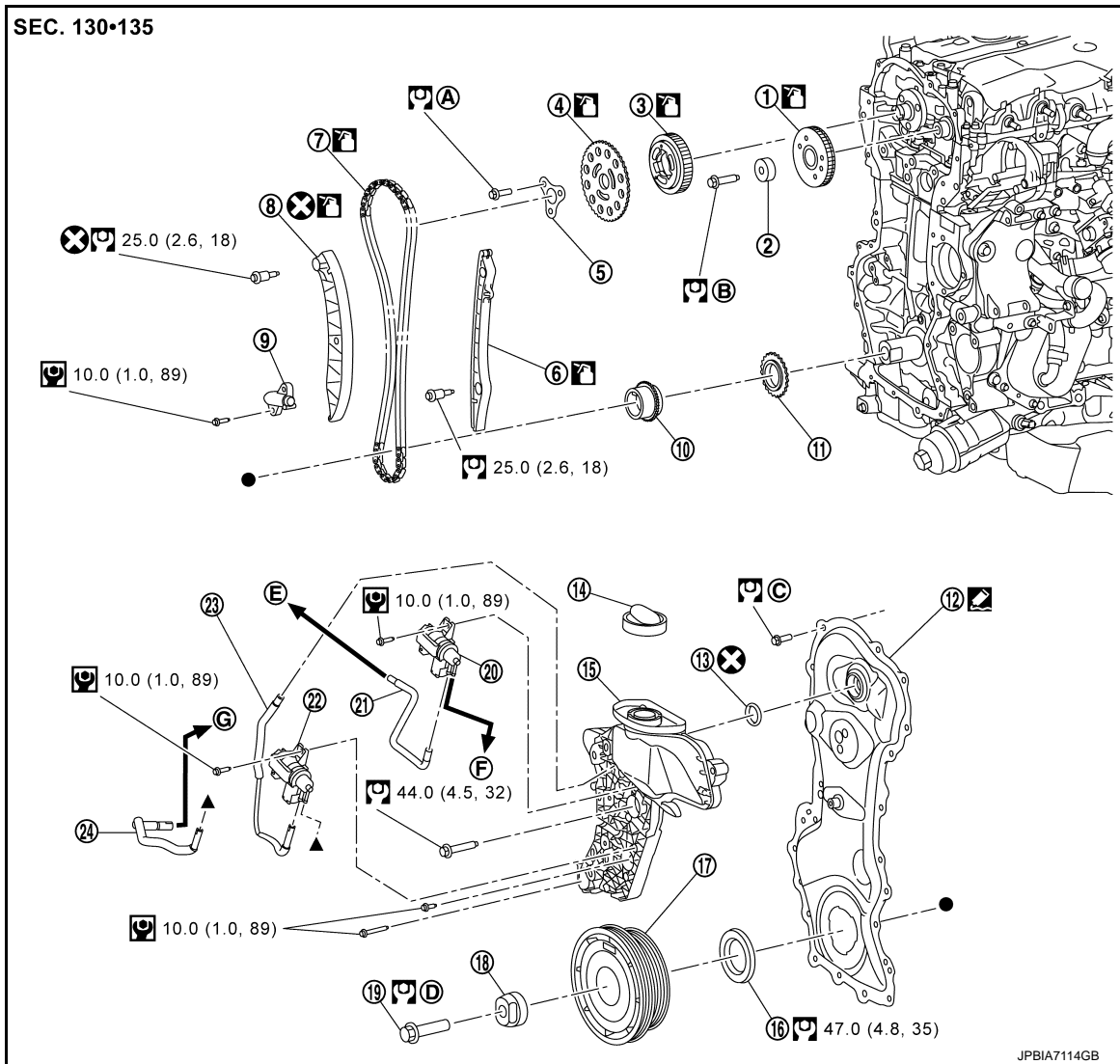
TIMING SPROCKET

< REMOVAL AND INSTALLATION >

[YS23DDT/YS23DDTT]

- Comply with the installation procedure when tightening. Refer to [EM-195](#), "Removal and Installation".
- Ⓐ : 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 part is connected at points with same symbol in actual vehicle.

YS23DDTT



- | | | |
|--|--|--|
| ① Intake camshaft timing sprocket | ② Intake camshaft timing sprocket spacer | ③ Exhaust camshaft timing sprocket (rear) |
| ④ Exhaust camshaft timing sprocket (front) | ⑤ Timing sprocket spacer | ⑥ Tension guide |
| ⑦ Timing chain | ⑧ Slack guide | ⑨ Timing chain tensioner |
| ⑩ Crankshaft spacer (crankshaft side) | ⑪ Crankshaft sprocket | ⑫ Front cover |
| ⑬ O-ring | ⑭ Oil filler cap | ⑮ Vacuum tank |
| ⑯ Front oil seal | ⑰ Crankshaft pulley | ⑱ Crankshaft spacer (crankshaft pulley side) |

TIMING SPROCKET

< REMOVAL AND INSTALLATION >

[YS23DDT/YS23DDTT]

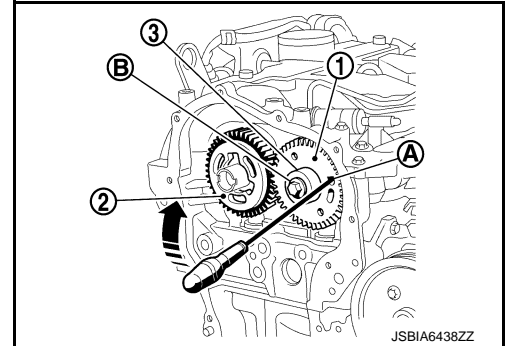
- | | | |
|---|---|---|
| ①9 Crankshaft pulley bolt | ②0 High pressure turbine bypass valve control solenoid valve | ②1 Vacuum hose |
| ②2 Low pressure wastegate valve control solenoid valve | ②3 Vacuum hose | ②4 Vacuum hose |
| Ⓐ Comply with the installation procedure when tightening. Refer to EM-195, "Removal and Installation" . | Ⓑ Comply with the installation procedure when tightening. Refer to EM-203, "Removal and installation" . | Ⓒ Comply with the installation procedure when tightening. Refer to EM-195, "Removal and Installation" . |
| Ⓓ Comply with the installation procedure when tightening. Refer to EM-195, "Removal and Installation" . | Ⓔ To turbocharger | Ⓕ To vacuum pump |
| Ⓖ To turbocharger | | |
| : 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 part is connected at points with same symbol in actual vehicle. | | |

Removal and installation

INFOID:0000000011999152

REMOVAL

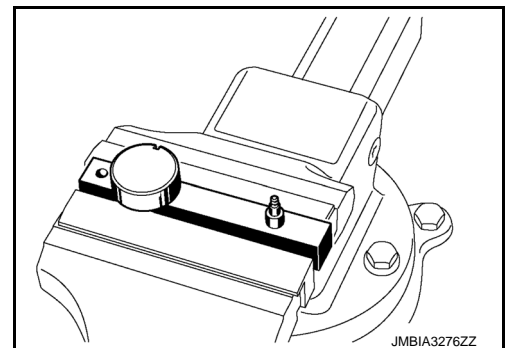
- Remove the timing chain. Refer to [EM-195, "Removal and Installation"](#).
- Immobilize the intake camshaft timing sprocket using camshaft timing tool [SST: — (Mot. 1769)].
- Loosen the intake camshaft timing sprocket bolt.
- Place a flat-blade screwdriver in the hole Ⓐ, compress the spring of the intake camshaft timing sprocket ① and remove the exhaust camshaft timing sprocket (rear) ②.
- Remove the exhaust camshaft timing sprocket bolt.
- Remove the flat-blade screwdriver.
- Remove the intake camshaft timing sprocket bolt Ⓑ.
- Remove the intake camshaft timing sprocket spacer ③.
- Remove the intake camshaft timing sprocket.



INSTALLATION

NOTE:

- Clean the sprockets using SURFACE CLEANER.
 - Check that the teeth on the sprockets are not broken, chipped or scratched.
- Place the base plate of the positioning tool [SST: — (Mot. 1773)] in a vice fitted with jaws.

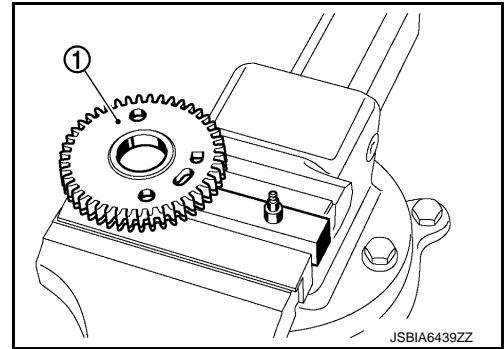


TIMING SPROCKET

< REMOVAL AND INSTALLATION >

[YS23DDT/YS23DDTT]

2. Fit the key of the intake camshaft timing sprocket ① into the tool groove to stop the sprocket hub from rotating on the intake camshaft timing sprocket.

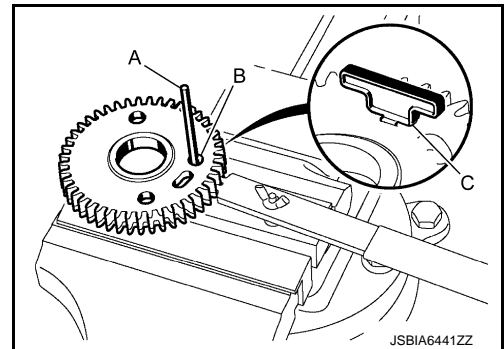


3. Place the lever of the positioning tool [SST: — (Mot. 1773)] onto the shaft of the base plate.
4. Fit the lever teeth into the lower teeth of the intake camshaft timing sprocket.
5. Tighten the butterfly nut of the positioning tool [SST: — (Mot. 1773)].
6. Turn the lever counterclockwise to align the two pinion teeth.
7. Place a 4 mm (0.16 in) diameter pin (A) (or a roll pin punch) in the intake camshaft timing sprocket hole (B).

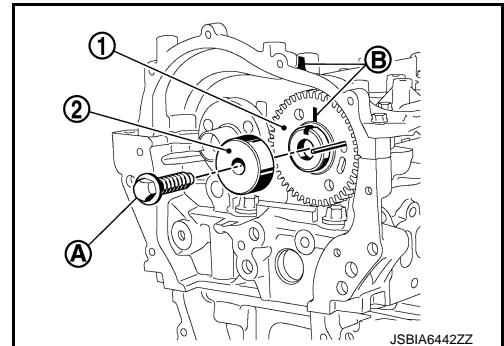
NOTE:

The Parts Department supplies the new intake camshaft timing sprocket with a locking pin (C).

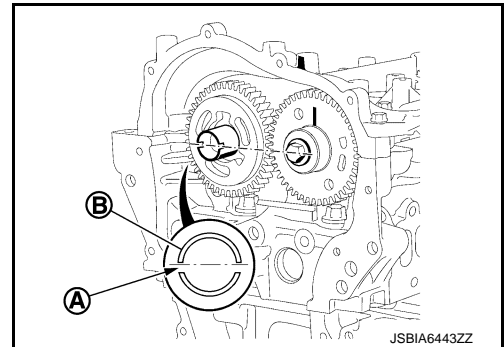
8. Release the lever to lock the pin.



9. Install intake camshaft timing sprocket ① and intake camshaft timing sprocket spacer ②.
10. Tighten the bolt ③ by hand.
11. Align the mark ④ with the rocker cover boss.



12. Check that the groove ⑤ is horizontal (large ring ⑥ facing upwards).



TIMING SPROCKET

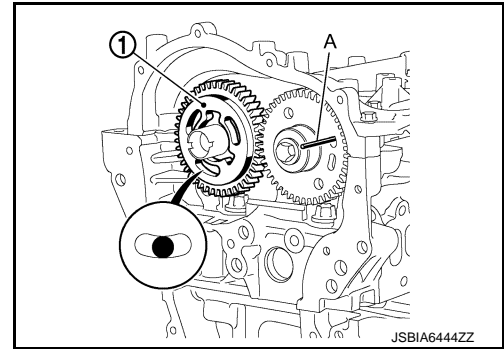
< REMOVAL AND INSTALLATION >

[YS23DDT/YS23DDTT]

13. Center the exhaust camshaft timing sprocket (rear) ① openings on the camshaft hub holes.
14. Fit the exhaust camshaft timing sprocket (rear) fully onto the camshaft hub.
15. Remove the locking pin (A).
16. Install the camshaft timing tool [SST: — (Mot. 1769)] to immobilize the intake camshaft timing sprocket.
17. Tighten the bolt on the intake camshaft timing sprocket.



: 20 N.m (2.0 kg-m, 15 ft-lb)



18. Turn 35 degrees clockwise (angle tightening)
19. Install the timing chain. Refer to [EM-195, "Removal and Installation"](#).

A

EM

C

D

E

F

G

H

I

J

K

L

M

N

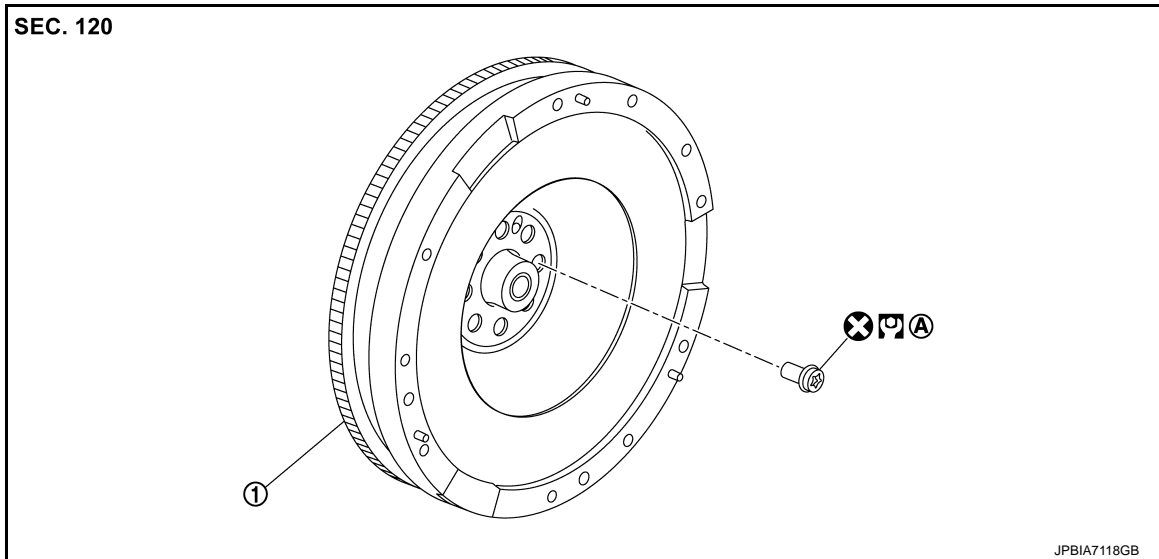
O

P

FLYWHEEL

Exploded View

INFOID:0000000011999162



① Flywheel

Ⓐ Comply with the installation procedure when tightening. Refer to [EM-206, "Removal and Installation"](#).

Ⓜ : N·m (kg·m, ft·lb)

⊗ : Always replace after every disassembly.

Removal and Installation

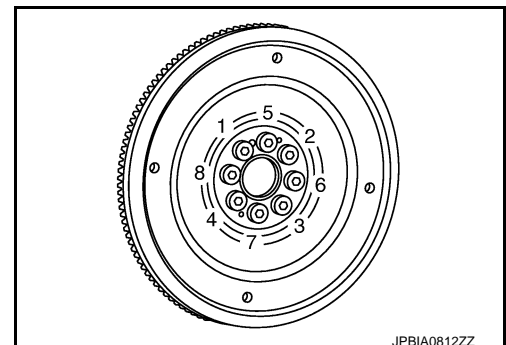
INFOID:0000000011999163

REMOVAL

1. Remove the transmission. Refer to [TM-37, "2WD : Removal and Installation"](#) (2WD) or [TM-41, "4WD : Removal and Installation"](#) (4WD).
2. Remove clutch cover and clutch disk. Refer to [CL-41, "Removal and Installation"](#).
3. Remove flywheel.
 - a. Fix flywheel using flywheel locking tool [SST: — (Mot. 1431)]

CAUTION:

 - **Never disassemble them.**
 - **Never place them with signal plate facing down.**
 - **When handling signal plate, take care not to damage or scratch them.**
 - **Handle signal plate in a manner that prevents them from becoming magnetized.**
 - b. Loosen bolts in the order from 8 to 1 as shown in the figure.



FLYWHEEL

< REMOVAL AND INSTALLATION >

[YS23DDT/YS23DDTT]

INSTALLATION

CAUTION:

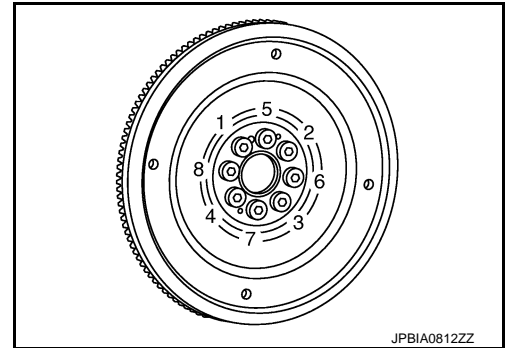
Never damage or scratch and contact surface for clutch disc of flywheel.

- Tighten bolts in the order from 1 to 8 as shown in the figure with the following procedure:
 - Tighten mounting bolts.



: 40.0 N·m (4.1 kg-m, 30 ft-lb)

- Turn 34 degrees clockwise (angle tightening).



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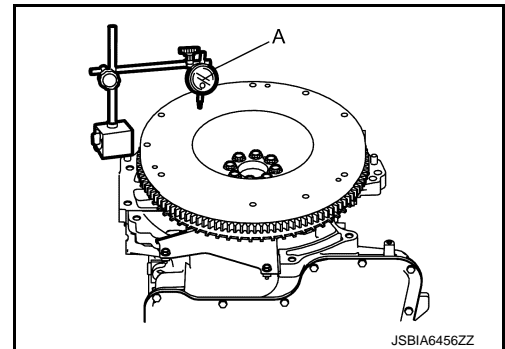
Inspection

DRIVE PLATE DEFLECTION

- Measure the deflection of flywheel contact surface to torque converter with a dial indicator (A).

Limit : 0.10 mm (0.0039 in) or less.

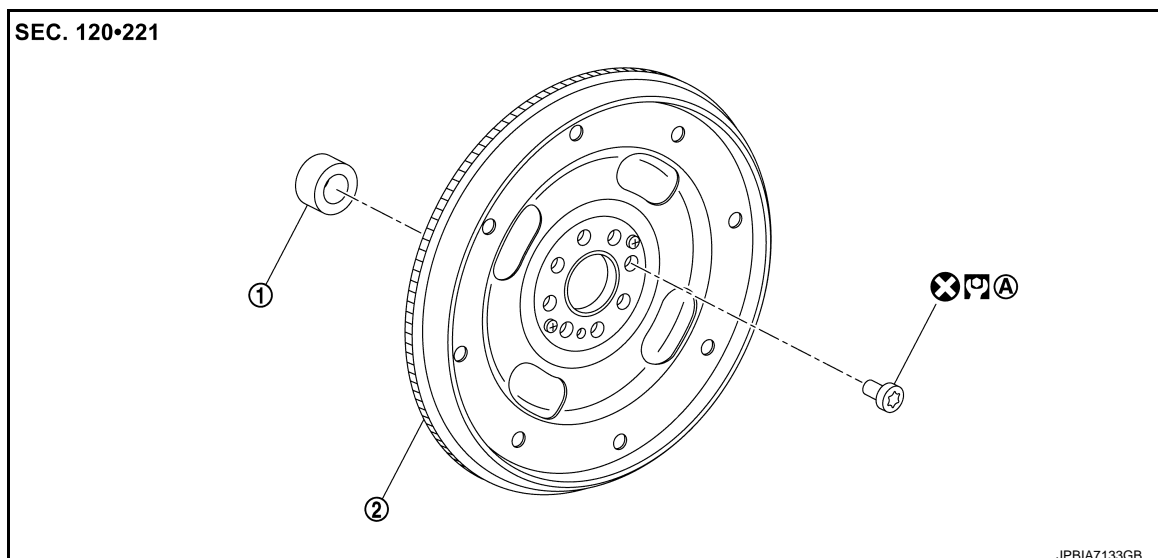
- If measured value is out of the standard, replace flywheel.
- If a trace of burn or discoloration is found on the surface, repair it with sandpaper.



DRIVE PLATE

Exploded View

INFOID:0000000011999164



- ① Pilot bushing ② Drive plate

Ⓐ Comply with the installation procedure when tightening. Refer to [EM-208, "Removal and Installation"](#).

⊗ : Always replace after every disassembly.

Ⓐ : N·m (kg-m, ft-lb)

Removal and Installation

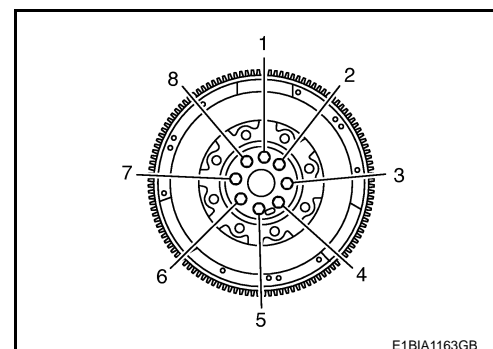
INFOID:0000000011999165

REMOVAL

1. Remove the transmission. Refer to [TM-644, "2WD : Removal and Installation"](#) (2WD) or [TM-649, "4WD : Removal and Installation"](#) (4WD).
2. Remove drive plate.

CAUTION:

 - **Never disassemble them.**
 - a. Fix drive plate using flywheel locking tool [SST: — (Mot.1431)].
 - b. Loosen bolts in the order from 8 to 1 as shown in the figure.
3. Remove pilot bushing using the pilot bushing puller (commercial service tool), if necessary.



INSTALLATION

1. Install pilot bushing.
 - Using the drift, force fit the pilot bushing until its front end contacts crankshaft.
2. Install drive plate.
 - a. Install bolts without tightening them.

DRIVE PLATE

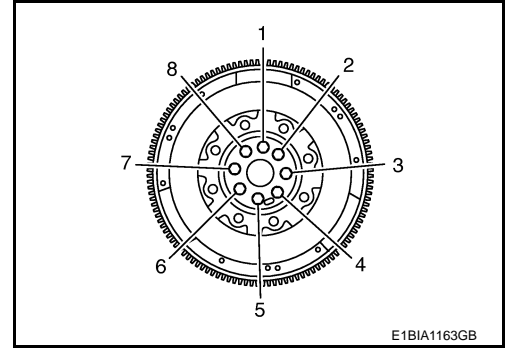
< REMOVAL AND INSTALLATION >

[YS23DDT/YS23DDTT]

- b. Fix drive plate using flywheel locking tool [SST: — (Mot.1431)].
- c. Tighten bolts in the order from 1 to 8 as shown in the figure.



: 50.0 N·m (5.1 kg-m, 37 ft-lb)



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OIL SEAL

FRONT OIL SEAL

FRONT OIL SEAL : Removal and Installation

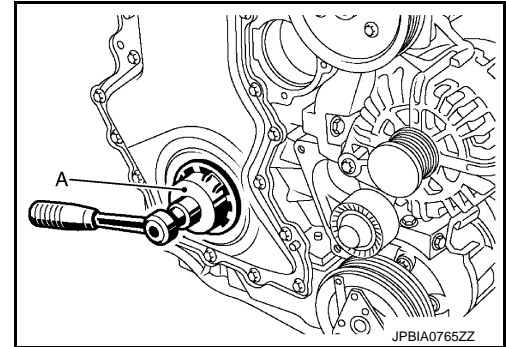
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REMOVAL

1. Remove the following parts.
 - Drive belt and air compressor belt: Refer to [EM-151, "Removal and Installation"](#).
 - Cooling fan: Refer to [CO-52, "Removal and Installation"](#).
 - Crankshaft pulley: Refer to [EM-193, "Exploded View"](#).
2. Remove front oil seal using service tool (A).

NOTE:

The service tool is supplied in the new seal parts kit.

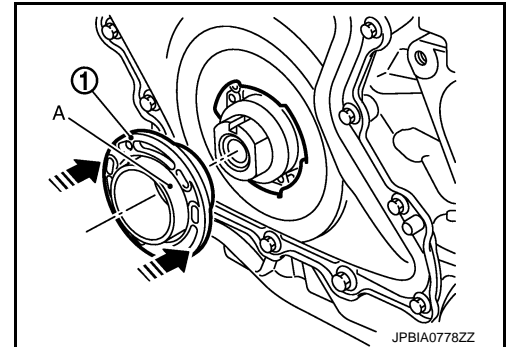


INSTALLATION

1. Install front oil seal with the following procedure:
 - a. Fit the protector (A) to front oil seal ①.
 - Align the front oil seal notches with front cover notches.

NOTE:

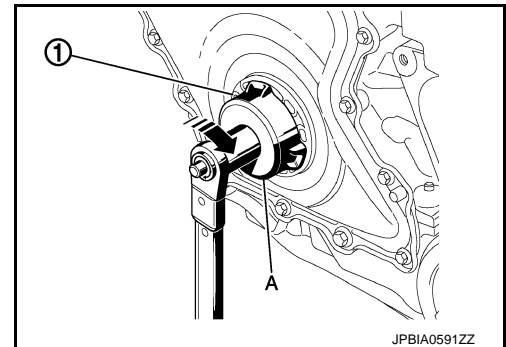
The protector is supplied in the new seal parts kit.



- b. Tighten to front oil seal ① using service tool (A).

NOTE:

The service tool is supplied in the new seal parts kit.



- c. Remove the protector.
2. Install in the reverse order of removal, for the rest of parts.

REAR OIL SEAL

REAR OIL SEAL : Removal and Installation

INFOID:0000000011999157

REMOVAL

1. Remove transmission. Refer to followings:

OIL SEAL

< REMOVAL AND INSTALLATION >

[YS23DDT/YS23DDTT]

- M/T models (2WD): Refer to [TM-37, "2WD : Removal and Installation"](#).
 - M/T models (4WD): Refer to [TM-41, "4WD : Removal and Installation"](#).
 - A/T models (2WD): Refer to [TM-644, "2WD : Removal and Installation"](#).
 - A/T models (4WD): Refer to [TM-649, "4WD : Removal and Installation"](#).
2. Remove clutch cover and clutch disk. Refer to [CL-41, "Exploded View"](#) (M/T models).
 3. Remove flywheel or drive plate. Refer to [EM-206, "Exploded View"](#) (flywheel) or [EM-208, "Exploded View"](#) (drive plate).
 4. Remove rear oil seal retainer.

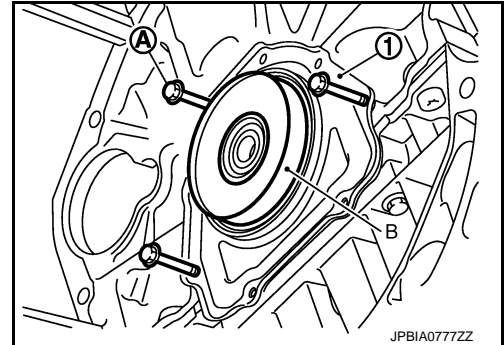
INSTALLATION

1. Install rear oil seal retainer with the following procedure:
 - a. Set guide bolt (A) and protector (B) to rear oil seal retainer (1).

NOTE:

The protector is supplied in the new seal parts kit.

- b. Move the rear oil seal retainer evenly by hand until it makes contact with the cylinder block.



- c. Remove guide bolts and protector.
 - d. Tighten mounting bolts in two steps separately in numerical order as shown in the figure.

- i. Tighten bolts No. 1 and 5.

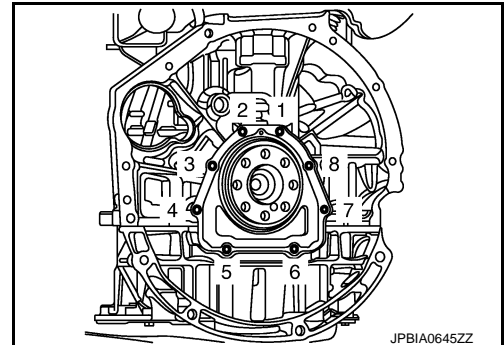


: 5.0 N·m (0.51 kg-m, 44 in-lb)

- ii. Tighten No. 1 to 8 in numerical order as shown.



: 12.0 N·m (1.2 kg-m, 9 ft-lb)



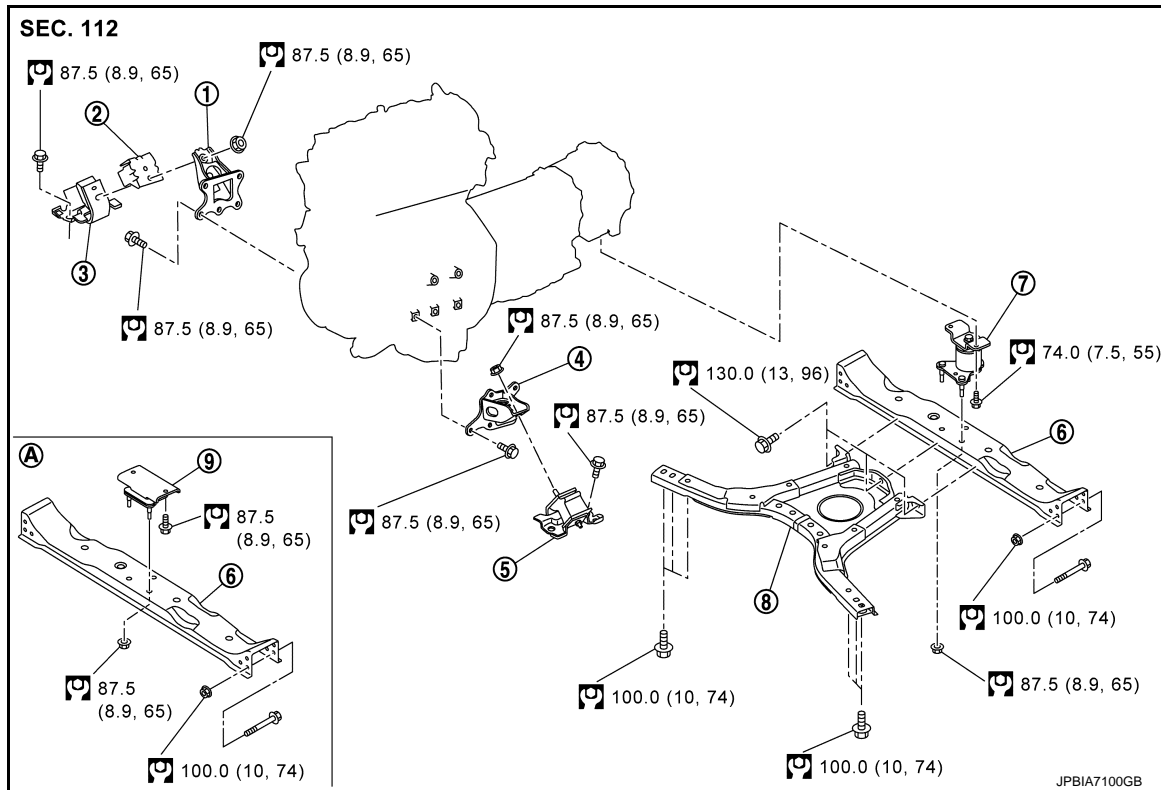
2. Install in the reverse order of removal, for the rest of parts.


UNIT REMOVAL AND INSTALLATION

ENGINE ASSEMBLY

Exploded View

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- | | | |
|---|----------------------------------|------------------------------------|
| ① Engine mounting bracket (RH) | ② Heat insulator | ③ Engine mounting insulator (RH) |
| ④ Engine mounting bracket (LH) | ⑤ Engine mounting insulator (LH) | ⑥ Transmission cross member |
| ⑦ Engine mounting insulator (rear) | ⑧ Front cross member | ⑨ Engine mounting insulator (rear) |
| Ⓐ A/T models | | |
|  : N·m (kg-m, ft-lb) | | |

Removal and Installation

INFOID:0000000011999159

WARNING:

- Situate the vehicle on a flat and solid surface.
- Place chocks at front and back of rear wheels.

CAUTION:

- Always be careful to work safely, avoid forceful or uninstructed operations.
- Never start working until exhaust system and coolant are cool enough.
- If items or work required are not covered by the engine section, refer to the applicable sections.
- Always use the support point specified for lifting.
- Use either 2-pole lift type or separate type lift as best you can. If board-on type is used for unavoidable reasons, support at the rear axle jacking point with a transmission jack or similar tool before starting work, in preparation for the backward shift of center of gravity. Refer to [GI-30, "2-Pole Lift"](#).
- For supporting points for lifting and jacking point at rear axle, refer to [GI-29, "Garage Jack and Safety Stand"](#).

NOTE:

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

REMOVAL

Description of work

Remove transmission assembly from vehicle downward. Then hoist the engine from vehicle upward.

Preparation

1. Disconnect battery cable from negative terminal. Refer to [PG-211, "Exploded View"](#).
2. Drain engine coolant from radiator. Refer to [CO-40, "Draining"](#).
3. Remove the following parts.
 - Front under cover: Refer to [EXT-24, "Exploded View"](#).
 - Hood assembly: Refer to [DLK-162, "HOOD ASSEMBLY : Removal and Installation"](#) (WITH INTELLIGENT KEY SYSTEM) or [DLK-372, "HOOD ASSEMBLY : Removal and Installation"](#) (WITHOUT INTELLIGENT KEY SYSTEM).
 - Front grill: Refer to [EXT-19, "Exploded View"](#).
 - Engine cover: Refer to [EM-157, "Exploded View"](#).
 - Air duct (inlet), air duct, and air cleaner case: Refer to [EM-159, "Exploded View"](#).
 - Brake pipe lines, fuel pipe lines brackets.
 - Radiator hose (upper and lower): Refer to [CO-47, "Exploded View"](#).
4. Discharge refrigerant from A/C circuit. Refer to [HA-132, "Recycle Refrigerant"](#).
5. Disconnect engine room harness from the engine side and set it aside for easier work.
6. Disconnect all the body-side vacuum hoses and air hoses at engine side.
7. Remove air inlet hose. Refer to [EM-161, "Exploded View"](#).

Engine Room Front

1. Remove radiator reservoir tank. Refer to [CO-47, "Exploded View"](#).
2. Remove the radiator shroud (upper and lower). Refer to [CO-47, "Exploded View"](#).
3. Remove compressor belt and drive belt. Refer to [EM-151, "Removal and Installation"](#).
4. Remove the cooling fan assembly. Refer to [CO-52, "Exploded View"](#).
5. Remove the water pump pulley. Refer to [CO-54, "Removal and Installation"](#).
6. Separate the cooler pipe (HI) (LOW) from condenser side. Refer to [HA-145, "Exploded View"](#).
7. Remove the refrigerant pressure sensor harness connector. Refer to [HA-151, "REFRIGERANT PRESSURE SENSOR : Removal and Installation"](#).
8. Separate A/T fluid cooler from the condenser (A/T models). Refer to [TM-639, "Removal and Installation"](#).
9. Disconnect A/T fluid cooler hose from the radiator (A/T models). Refer to [TM-639, "Removal and Installation"](#).
10. Remove radiator assembly along with condenser. Refer to [CO-48, "Removal and Installation"](#).
11. Remove alternator. Refer to [CHG-39, "YS23DDT, YS23DDTT : Removal and Installation"](#).
12. Remove power steering oil pump mounting bolt, move to the position which does not interfere the work of power steering oil pump. Refer to [ST-31, "Exploded View"](#).

Engine Room RH

1. Remove brake booster hose in brake booster side. Refer to [BR-124, "Removal and Installation"](#).
2. Remove air inlet tube (silencer) and air inlet hose. Refer to [EM-161, "Exploded View"](#).
3. Remove compressor. Refer to [HA-142, "COMPRESSOR : Removal and Installation"](#).
4. Remove low-pressure flexible hose. Refer to [HA-145, "Exploded View"](#).

Engine Room LH

1. Disconnect fuel feed hose and return hose, and plug it to prevent fuel from draining. Refer to [FL-29, "Exploded View"](#).
2. Disconnect fuel filter harness connector. Refer to [FL-29, "Removal and Installation"](#).
3. Remove fuel filter and fuel filter bracket mounting bolt. Refer to [FL-29, "Exploded View"](#).
4. Remove fuel filter and fuel filter bracket. Refer to [FL-29, "Exploded View"](#).
5. Disconnect A/C piping from heater unit. Refer to [HA-145, "Exploded View"](#).
6. Disconnect heater hose, and install plug it to prevent engine coolant from draining. Refer to [HA-157, "HEATER & COOLING UNIT ASSEMBLY : Removal and Installation"](#).

ENGINE ASSEMBLY

< UNIT REMOVAL AND INSTALLATION >

[YS23DDT/YS23DDTT]

Vehicle Underbody

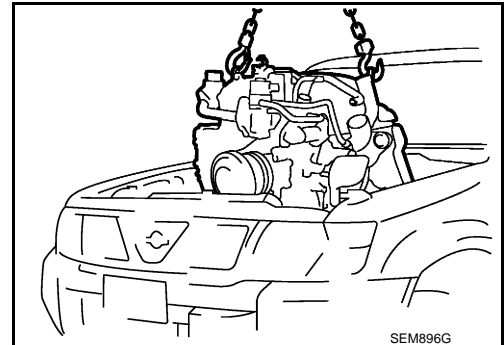
1. Remove Main muffler. Refer to [EX-10, "Exploded View"](#).
2. Remove DPF (diesel particulate filter). Refer to [EM-171, "Removal and installation"](#).
3. Remove front propeller shaft. (4WD) Refer to [DLN-132, "Exploded View"](#).
4. Remove rear propeller shaft. Refer to [DLN-143, "Exploded View"](#) (2WD) or [DLN-154, "Exploded View"](#) (4WD).
5. Separate the lower joint from the steering gear assembly. Refer to [ST-20, "Exploded View"](#).
6. Remove clutch operating cylinder from transmission, and move it aside (M/T models). Refer to [CL-28, "YS23DDT, YS23DDTT : Exploded View"](#).
7. Remove starter motor. Refer to [STR-55, "YS23DDT, YS23DDTT : Exploded View"](#).
8. Remove A/T fluid cooler tube B. (A/T models) Refer to [TM-638, "Exploded View"](#).
9. Remove front cross member.
10. Remove transmission cross member.
11. Remove transmission assembly. Refer to followings:
 - M/T models (2WD): [TM-37, "2WD : Removal and Installation"](#).
 - M/T models (4WD): [TM-41, "4WD : Removal and Installation"](#).
 - A/T models (2WD): [TM-644, "2WD : Removal and Installation"](#).
 - A/T models (4WD): [TM-649, "4WD : Removal and Installation"](#).

Removal

1. Lift with hoist and secure engine in position.
2. Loosen LH and RH engine mounting insulator mounting nuts.
3. Remove engine.

CAUTION:

- During the operation, check that no part interferes with body side.
- Before and during this lifting, always check if any harnesses are left connected.



INSTALLATION

Install in the reverse order of removal.

- Do not allow engine oil to get on mounting insulator. Be careful not to damage mounting insulator.
- When installation directions are specified, install parts according to the direction marks on them referring to figure of components.
- Check that each mounting insulator is seated properly, and tighten mounting bolts and nuts.
- Insert vacuum hose to vacuum gallery until vacuum hose comes in contact with the stopper when a stopper is provided at vacuum gallery.
- Insert vacuum hose up to 15 mm (0. 59 in) when a stopper is not provided at vacuum gallery.

Inspection

INFOID:0000000011999160

INSPECTION AFTER INSTALLATION

Inspection for Leaks

- Before starting engine, check oil/fluid levels including engine coolant and engine oil. If less than required quantity, fill to the specified level. Refer to [MA-32, "Fluids and Lubricants"](#).
- Use procedure below to check for fuel leakage.
 - Turn ignition switch "ON" (with engine stopped). With fuel pressure applied to fuel piping, check for fuel leakage at connection points.
 - Start engine. With engine speed increased, check again for fuel leakage at connection points.
- Run engine to check for unusual noise and vibration.

ENGINE ASSEMBLY

< UNIT REMOVAL AND INSTALLATION >

[YS23DDT/YS23DDTT]

- Warm up engine thoroughly to make sure there is no leakage of fuel, exhaust gases, or any oil/fluids including engine oil and engine coolant.
- Bleed air from lines and hoses of applicable lines, such as in cooling system.
- After cooling down engine, again check oil/fluid levels including engine oil and engine coolant. Refill to the specified level, if necessary.

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Summary of the inspection items:

Items		Before starting engine	Engine running	After engine stopped
Engine coolant		Level	Leakage	Level
Engine oil		Level	Leakage	Level
Transmission / transaxle fluid	AT & CVT Models	Leakage	Level / Leakage	Leakage
	MT Models	Level / Leakage	Leakage	Level / Leakage
Other oils and fluids*		Level	Leakage	Level
Fuel		Leakage	Leakage	Leakage
Exhaust gases		—	Leakage	—

*: Power steering fluid, brake fluid, etc.

UNIT DISASSEMBLY AND ASSEMBLY

ENGINE STAND SETTING

Setting

INFOID:0000000011999161

NOTE:

Explained here is how to disassemble with engine stand supporting transaxle surface. When using different type of engine stand, note with difference in steps and etc.

1. Install engine to engine stand with the following procedure:
 - a. Remove flywheel or drive plate. Refer to [EM-206, "Exploded View"](#) (M/T models) or [EM-208, "Exploded View"](#) (A/T models).
 - b. Lift the engine with a hoist to install it onto widely use engine stand.

CAUTION:

Use the engine stand that has a load capacity [approximately 225 kg (496 lb) or more] large enough for supporting the engine weight.

- If the load capacity of stand is not adequate, remove the following parts beforehand to reduce the potential risk of overturning stand.

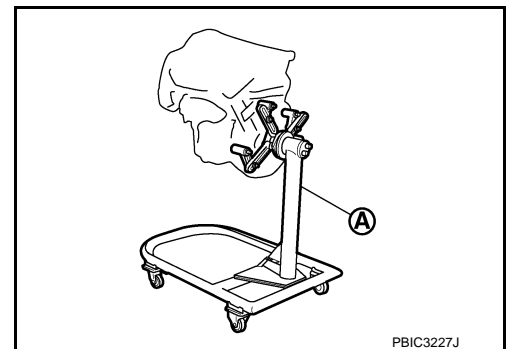
- Intake manifold: Refer to [EM-166, "Removal and Installation"](#).
- Exhaust manifold: Refer to [EM-174, "Removal and Installation"](#).
- Oil separator: Refer to [EM-187, "Removal and Installation"](#).

NOTE:

The figure shows an example of widely used engine stand ① that can support mating surface of transaxle with flywheel removed.

CAUTION:

Before removing the hanging chains, check the engine stand is stable and there is no risk of overturning.



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2. Drain engine oil. Refer to [LU-23, "Draining"](#).

CAUTION:

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

OIL PAN (UPPER)

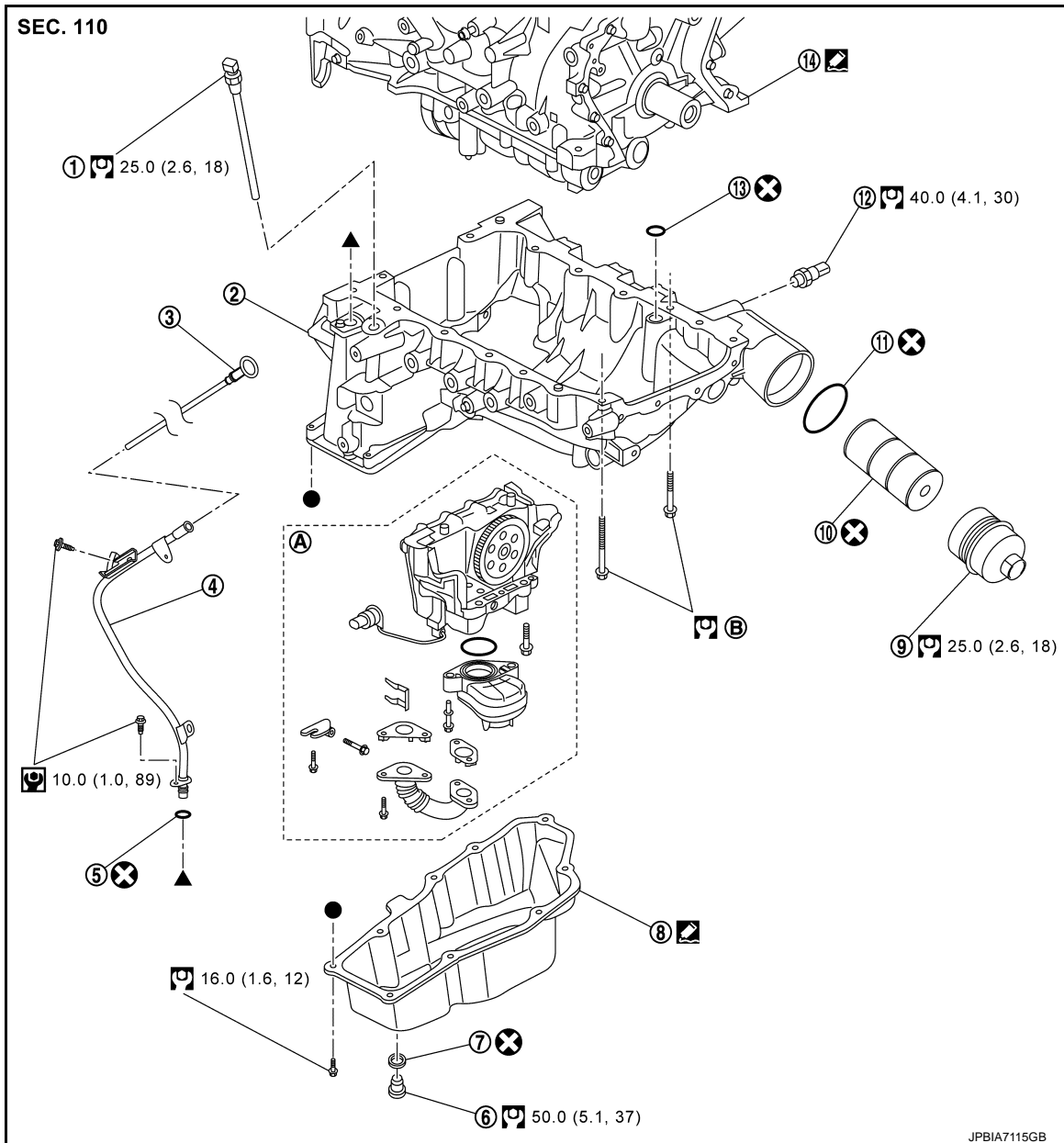
< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]

OIL PAN (UPPER)

Exploded View

INFOID:0000000011999166



- | | | |
|--------------------------------|-------------------|------------------------------|
| ① Engine oil level sensor | ② Oil pan (upper) | ③ Engine oil level gauge |
| ④ Engine oil level gauge guide | ⑤ O-ring | ⑥ Oil pan drain plug |
| ⑦ Drain plug washer | ⑧ Oil pan (lower) | ⑨ Oil filter body |
| ⑩ Oil filter | ⑪ O-ring | ⑫ Engine oil pressure switch |

A Comply with the installation procedure when tightening. Refer to [LU-28, "Removal and Installation"](#)

B Comply with the installation procedure when tightening. Refer to [EM-218, "Removal and Installation"](#)

: N·m (kg-m, ft-lb)

: N·m (kg-m, in-lb)

: Always replace after every disassembly.

OIL PAN (UPPER)

< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]

 : Sealing point

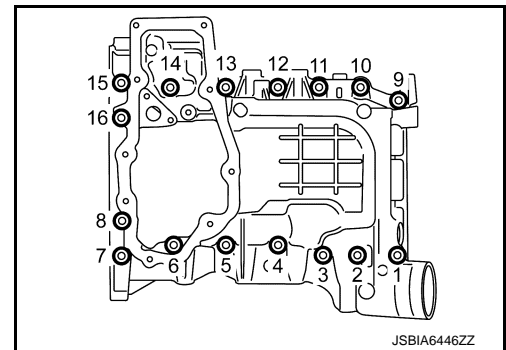
●, ▲ : Indicates that the parts is connected ato points with same symbols in actual vehcele.

Removal and Installation

INFOID:0000000011999167

REMOVAL

1. Remove oil pan (lower). Refer to [EM-183, "Removal and Installation"](#).
2. Remove front cover. Refer to [EM-193, "Exploded View"](#).
3. Remove oil filter. Refer to [LU-24, "Removal and Installation"](#).
4. Remove engine oil pressure switch.
5. Remove engine oil level sensor.
6. Remove engine oil gauge guide.
7. Remove rear oil seal retainer. Refer to [EM-234, "Exploded View"](#)
8. Remove oil pan (upper) with the following procedure:
 - a. Loosen mounting bolts in reverse order as shown in the figure.



INSTALLATION

1. Install oil pan (upper) with the following procedure:
 - a. Use a scraper to remove old liquid gasket from mating surfaces.

CAUTION:

Never scratch or damage the mating surfaces when cleaning off old liquid gasket.

- Also remove old liquid gasket from mating surface of cylinder block.
- Remove old liquid gasket from the bolt holes and threads.

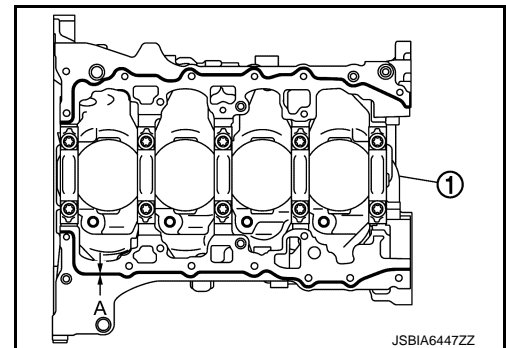
- b. Apply a continuous bead of liquid gasket to cylinder block ① with the tube presser (commercial service tool) to areas shown in the figure.

A : $\phi 3.0 - 7.0$ mm (0.118 - 0.276 in)

Use Genuine Liquid Gasket or equivalent

CAUTION:

Attaching should be done within 5 minutes after coating.



OIL PAN (UPPER)

< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]

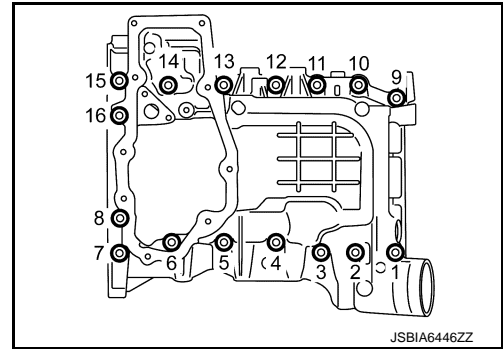
- c. Tighten mounting bolts in two steps separately in the order from 1 to 16 as shown in the figure.



1st step: 5.0 N·m (0.5 kg-m, 44 in-lb)



2nd step: 25.0 N·m (2.6 kg-m, 18 ft-lb)



2. Install rear oil seal retainer. Refer to [EM-234, "Exploded View"](#).
3. Install in the reverse order of removal, for the rest of parts.

NOTE:

At least 30 minutes after oil pan is installed, pour engine oil.

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FUEL PUMP

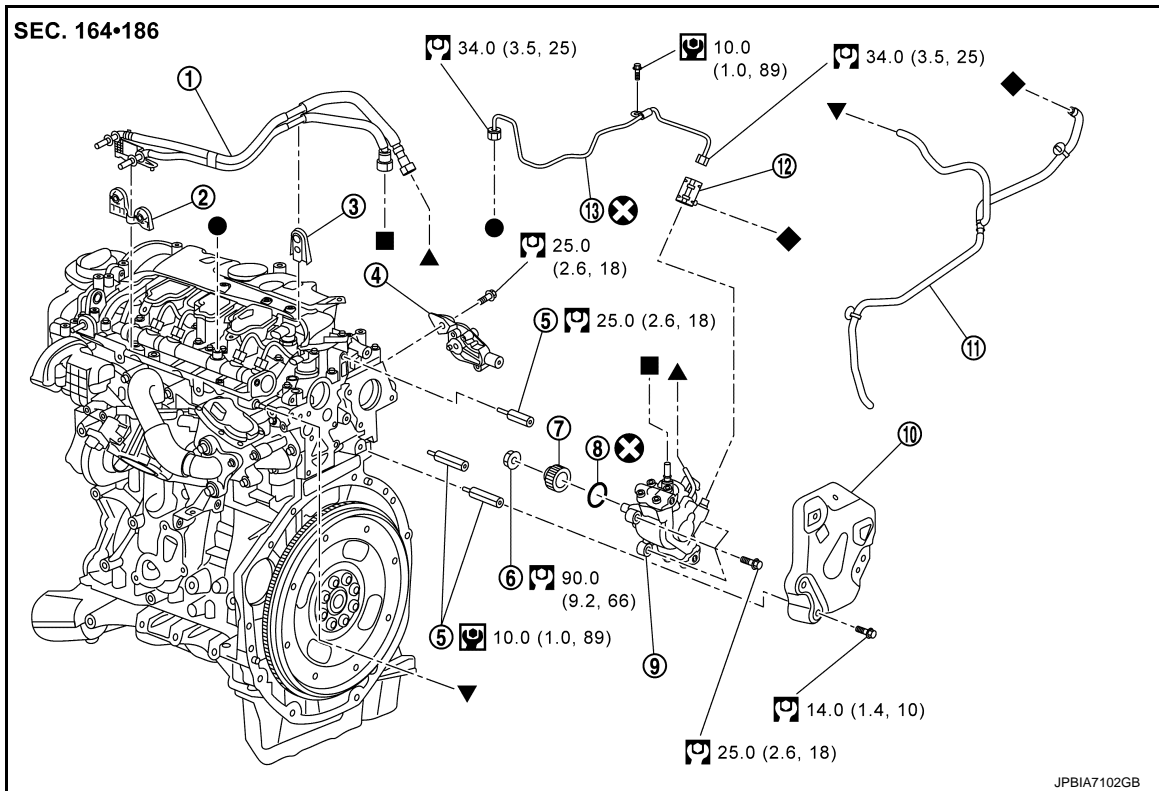
< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]

FUEL PUMP

Exploded View

INFOID:0000000011999143



- | | | |
|-------------------|----------------------------|----------------------------|
| ① Fuel hose | ② Fuel hose protector seal | ③ Fuel hose protector seal |
| ④ Bracket | ⑤ Fuel pump cover stud | ⑥ Fuel pump gear nut |
| ⑦ Fuel pump gear | ⑧ O-ring | ⑨ High pressure fuel pump |
| ⑩ Fuel pump cover | ⑪ Drain hose | ⑫ Fuel collector |
| ⑬ Fuel tube | | |

: N·m (kg-m, ft-lb)

: N·m (kg-m, in-lb)

: Always replace after every disassembly.

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

Removal and Installation

INFOID:0000000011999144

REMOVAL

CAUTION:

- Be sure to read "Precautions for Diesel Equipment". Refer to [EM-139. "Precaution for Diesel Equipment"](#).
 - Wait until the fuel temperature drops before carrying out any work.
 - Order the special high pressure injection circuit plug kit.
 - Never disassemble or adjust the fuel pump body.
1. Remove the engine assembly. Refer to [EM-212. "Removal and Installation"](#).
 2. Remove water connector pipe. Refer to [CO-58. "Exploded View"](#)
 3. Remove fuel pump cover.
 4. Remove fuel hose from fuel pump.
 5. Remove fuel collector and remove fuel tube.

FUEL PUMP

< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]

6. Remove fuel pump.
7. In case of replacement of the fuel pump you need to install the old fuel pump sprocket on the new fuel pump. Refer to [EM-221, "Disassembly and Assembly"](#).

INSTALLATION

Note the followings, install in the reverse order of removal.

- Fuel pump.

CAUTION:

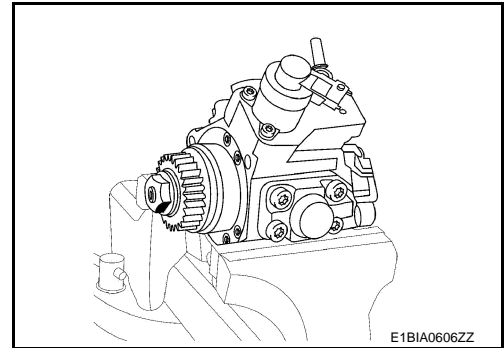
Be sure to check that the fuel pump is in contact with the cylinder head before tightening the mounting bolts.

Disassembly and Assembly

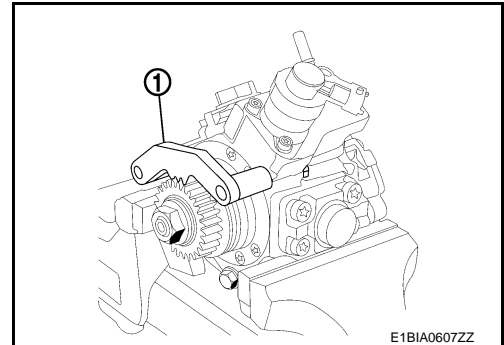
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REMOVAL

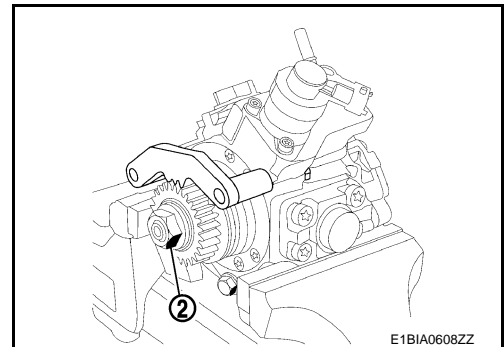
1. Lock the fuel pump on the work-bench in a vice with protective jaws.



2. Using the high pressure pump pinion locking tool [SST: — (Mot.2047)] ①, lock the fuel pump gear.



3. Remove the nut ②.

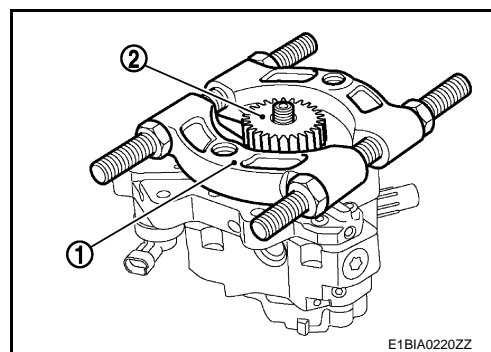


FUEL PUMP

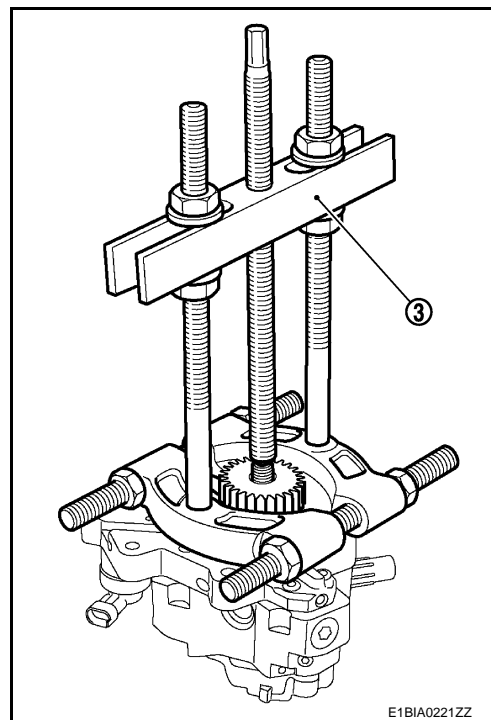
< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]

4. Fit a separator ① from the puller kit under the fuel pump gear ②.



5. Put the bracket ③ on the separator.



6. Remove the fuel pump gear.

INSTALLATION

1. Refit the fuel pump gear to the new fuel pump.
2. Screw in the new fuel pump gear on the work-bench, without tightening it.
3. Lock the fuel pump on the work-bench in a vice with protective jaws.
4. Tighten the nut.

Inspection

INFOID:0000000011999145

INSPECTION AFTER INSTALLATION

- Start the engine and check for fuel leak for one minute after starting.

CAUTION:

After any operation, check that there are no diesel leaks. Refer to [EM-139, "Precaution for Diesel Equipment"](#).

CAMSHAFT

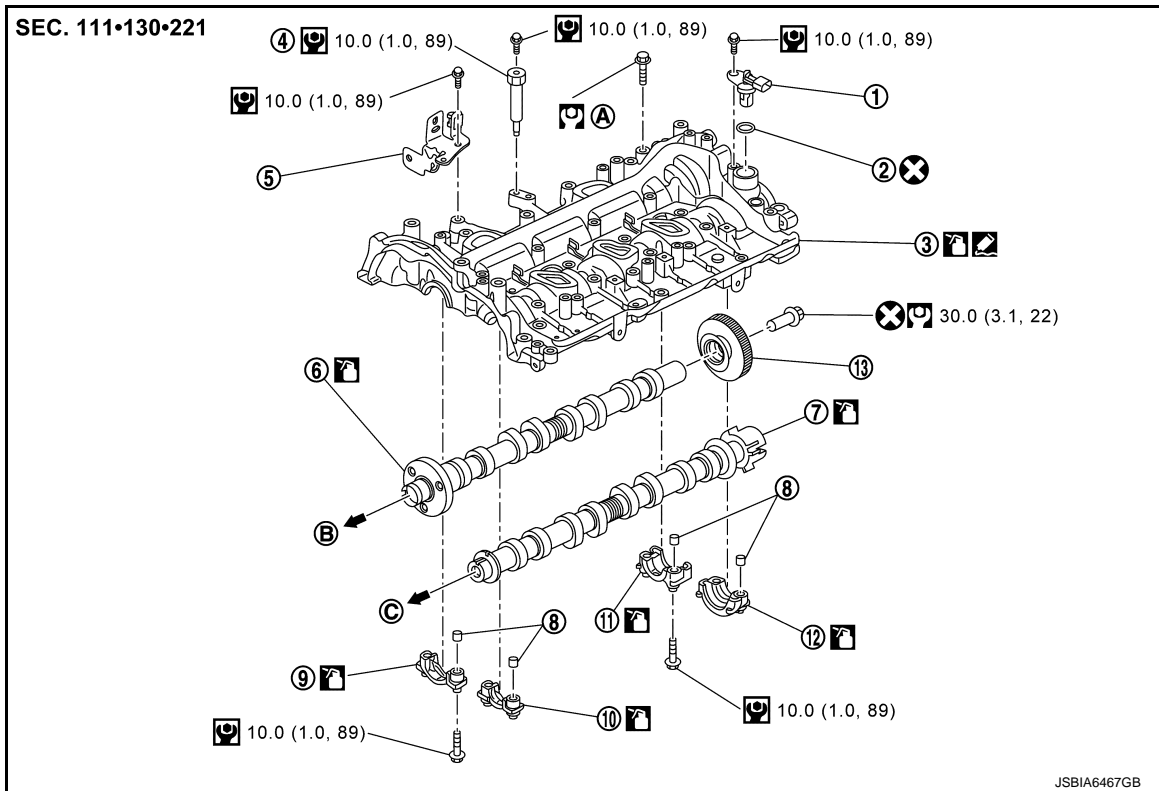
< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]

CAMSHAFT

Exploded View

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- | | | |
|--------------------------------|------------------------|-------------------------|
| ① Camshaft position sensor | ② O-ring | ③ Cylinder head housing |
| ④ Pillar | ⑤ Bracket | ⑥ Exhaust camshaft |
| ⑦ Intake camshaft | ⑧ Camshaft bracket pin | ⑨ Camshaft bracket |
| ⑩ Camshaft bracket | ⑪ Camshaft bracket | ⑫ Camshaft bracket |
| ⑬ High pressure fuel pump gear | | |
- Comply with the installation procedure when tightening. Refer to [EM-195, "Removal and Installation"](#).
- ⑧ To exhaust camshaft timing sprocket ⑨ To intake camshaft timing sprocket

: N·m (kg-m, ft-lb)

: N·m (kg-m, in-lb)

: Always replace after every disassembly.

: Should be lubricated with oil.

: Sealing point

Removal and Installation

INFOID:0000000011999154

REMOVAL

- Remove the following parts.
 - Oil separator: Refer to [EM-187, "Removal and Installation"](#).
 - Fuel injector: Refer to [EM-189, "Removal and Installation"](#).
 - Fuel injector rail: Refer to [EM-189, "Exploded View"](#).
 - Front cover and timing chain related parts: Refer to [EM-193, "Exploded View"](#).
 - High pressure fuel pump: Refer to [EM-220, "Exploded View"](#).
 - Vacuum pump: Refer to [EM-186, "Exploded View"](#).

CAMSHAFT

< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]

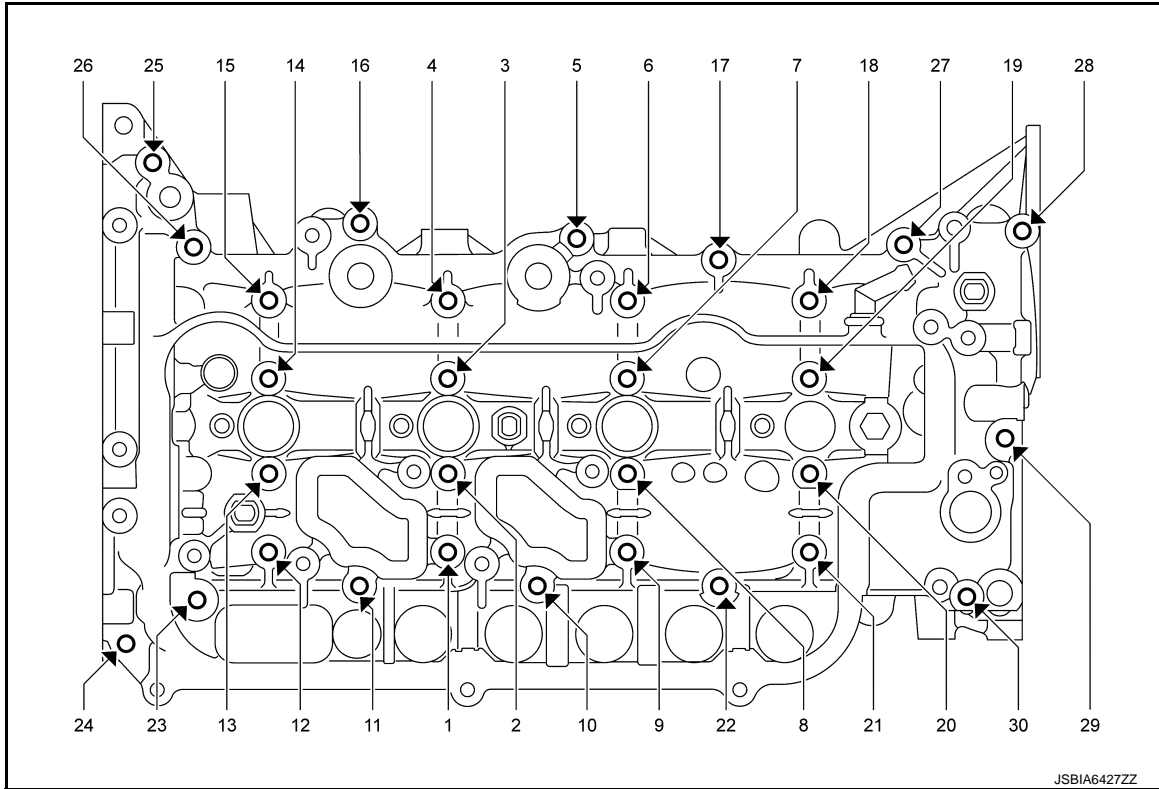
2. Remove camshaft position sensor.

CAUTION:

- Handle camshaft position sensor carefully and avoid impacts.
- Never disassemble camshaft position sensor.
- Never place sensor where it is exposed to magnetism.

3. Remove cylinder head housing with the following procedure:

- a. Loosen mounting bolts in the order from 30 to 1 as shown in the figure.

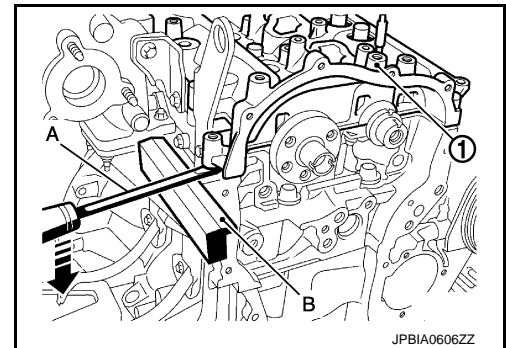


- b. Remove the cylinder head housing ① using a flat-blade screwdriver (A).

B : Protective shim (suitable tool)

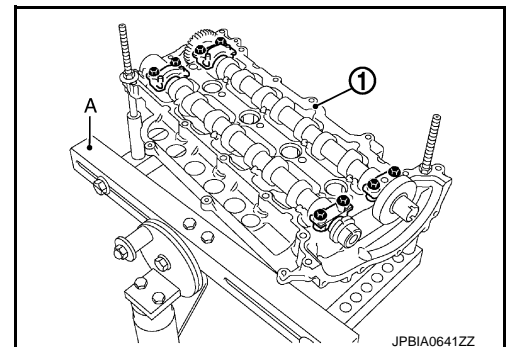
CAUTION:

Be careful not to damage the mating surface.



4. Remove camshafts with the following procedure:

- a. Install cylinder head housing ① to cylinder head stand [commercial service tool: KV113B0200 (Mot.1573)] (A).
- b. Loosen mounting bolts, and remove camshaft brackets and camshafts.
- Mark camshafts and camshaft brackets so they are placed in the same position and direction for installation.



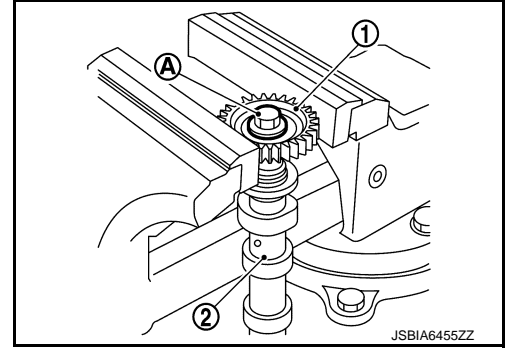
5. Remove fuel pump gear from camshaft (right side), if necessary.

CAMSHAFT

< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]

- Carry out this operation only when replacing the exhaust side camshaft or the high pressure pump drive pinion.
- Immobilize the fuel pump gear ① using a vice with jaws.
- Remove the bolt ① from the pinion, holding the camshaft ② steady by hand.



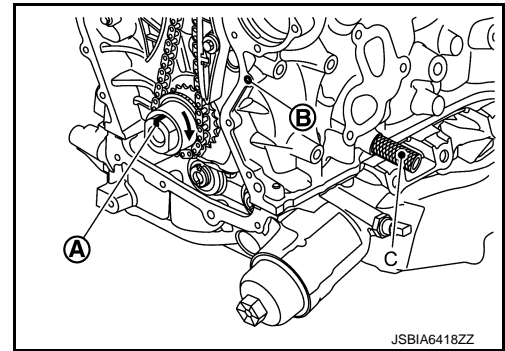
INSTALLATION

1. Install cylinder head housing with the following procedure:
 - a. Align the crankshaft groove ① with the cylinder block hole ②.

C : TDC set pin [SST: — (Mot. 1766)]

NOTE:

This is for the purpose of preventing interferences of valve and piston head.

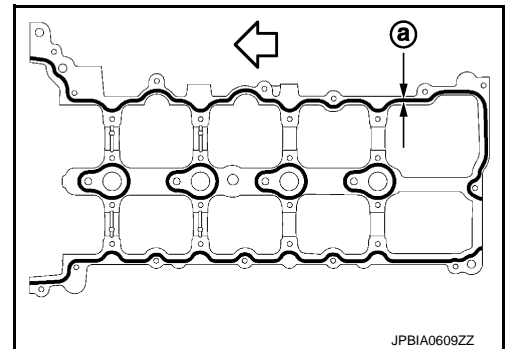


- b. Remove foreign material completely from cylinder head housing backside and cylinder head installation face.
- c. Apply liquid gasket to cylinder head as shown in the figure.

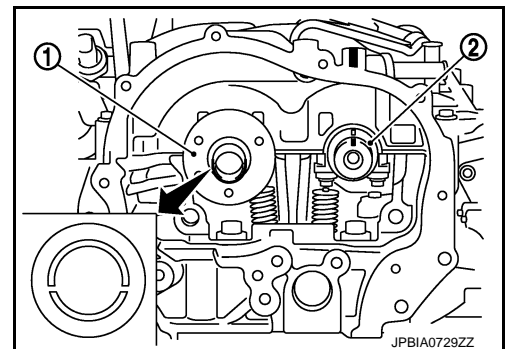
① : 0.5 - 2.5 mm (0.020 - 0.098 in)

⇐ : Engine front

Use Genuine Liquid Gasket or equivalent.



- d. Install so that camshafts are positioned in the directions shown in the figure.
 - Parallelize the groove of camshaft (right side) ① to face the offset side upward.
 - Fit the groove of camshaft (left side) ② and boss of cylinder head housing.

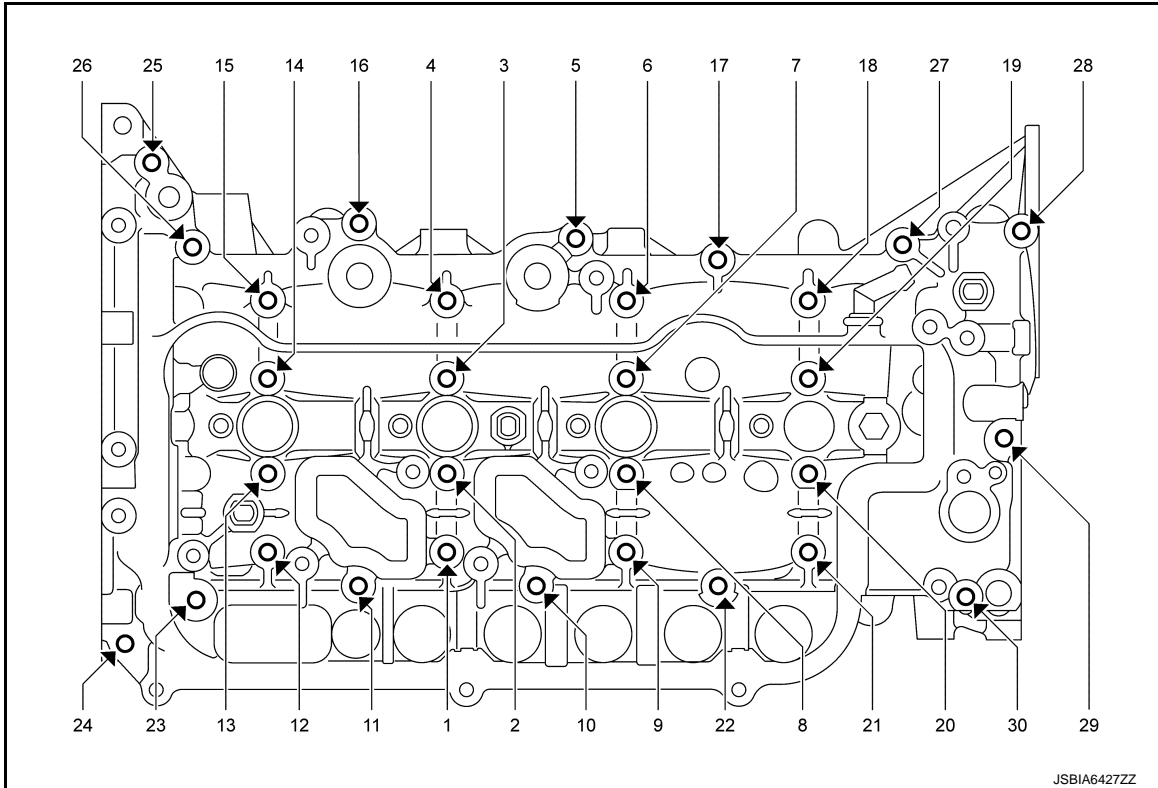


CAMSHAFT

< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]


- e. Note the following, tighten mounting bolts of cylinder head housing in the order from 1 to 30.



- i. Tighten bolts in numerical order.

 : 5.0 N·m (0.51 kg-m, 44 in-lb)

- ii. Tighten bolts in numerical order.

 : 15.0 N·m (1.5 kg-m, 11 ft-lb)

CAUTION:

After tightening mounting bolts of cylinder head housing, be sure to wipe off excessive liquid gasket from the mating surface of cylinder head.

2. Install in the reverse order of removal, for the rest of parts

Inspection

INFOID:0000000011999155

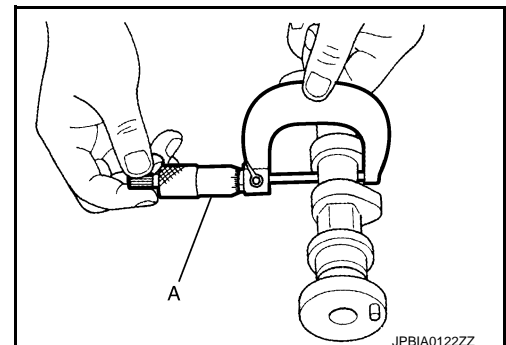
INSPECTION AFTER REMOVAL

Camshaft Journal Oil Clearance

CAMSHAFT JOURNAL

- Measure the camshaft journal with a micrometer (A).

Standard : Refer to [EM-261, "Camshaft"](#).



CYLINDER HEAD HOUSING AND CAMSHAFT BRACKET INNER DIAMETER

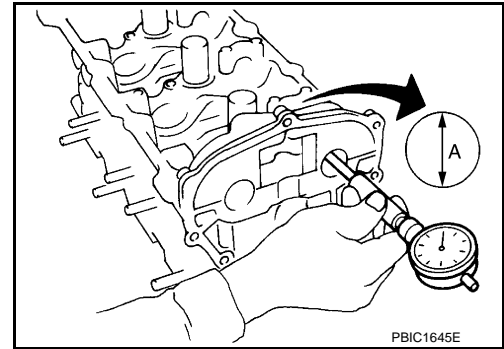
CAMSHAFT

< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]

- Measure the inner diameter (A) of cylinder head housing and camshaft bracket with a bore gauge.

Standard : Refer to [EM-261, "Camshaft"](#).



CAMSHAFT JOURNAL OIL CLEARANCE

- (Oil clearance) = (Bracket inner diameter) – (Camshaft journal diameter)

Standard : Refer to [EM-261, "Camshaft"](#).

- If it exceeds the standard, replace camshaft or/and cylinder head housing and cylinder head.

INSPECTION AFTER INSTALLATION

Inspection for Leaks

- Before starting engine, check oil/fluid levels including engine coolant and engine oil. If less than required quantity, fill to the specified level. Refer to [MA-32, "Fluids and Lubricants"](#).
- Use procedure below to check for fuel leakage.
 - Start engine. With engine speed increased, check again for fuel leakage at connection points.
- Run engine to check for unusual noise and vibration.
- Warm up engine thoroughly to check there is no leakage of fuel, exhaust gases, or any oil/fluids including engine oil and engine coolant.
- Bleed air from lines and hoses of applicable lines, such as in cooling system.
- After cooling down engine, again check oil/fluid levels including engine oil and engine coolant. Refill to the specified level, if necessary.

Summary of the inspection items:

Items		Before starting engine	Engine running	After engine stopped
Engine coolant		Level	Leakage	Level
Engine oil		Level	Leakage	Level
Transmission / transaxle fluid	AT & CVT Models	Leakage	Level / Leakage	Leakage
	MT Models	Level / Leakage	Leakage	Level / Leakage
Other oils and fluids*		Level	Leakage	Level
Fuel		Leakage	Leakage	Leakage
Exhaust gases		—	Leakage	—

*: Power steering fluid, brake fluid, etc.

CYLINDER HEAD

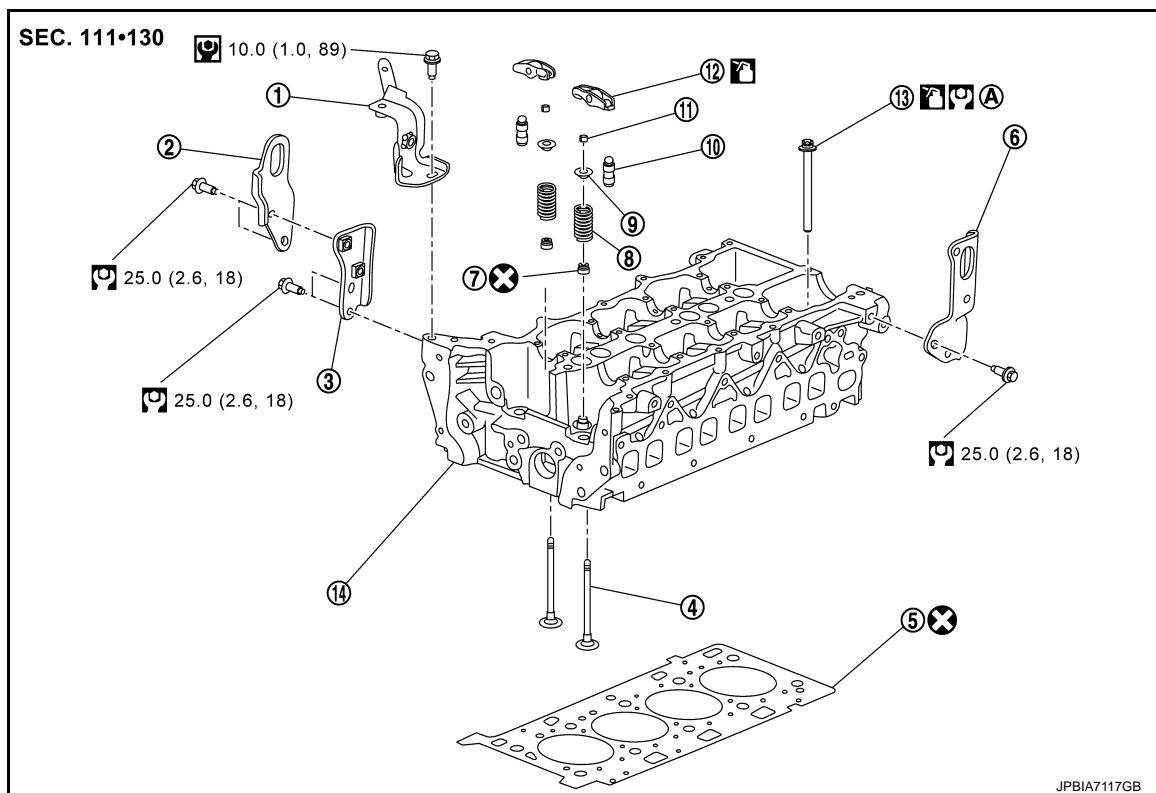
< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]

CYLINDER HEAD

Exploded View

INFOID:0000000011999168



- | | | |
|----------------------|--------------------------|--------------------------|
| ① Bracket | ② Engine slinger (front) | ③ Engine slinger bracket |
| ④ Valve | ⑤ Cylinder head gasket | ⑥ Engine slinger (rear) |
| ⑦ Valve oil seal | ⑧ Valve spring | ⑨ Valve spring retainer |
| ⑩ Hydraulic tappet | ⑪ Valve collet | ⑫ Rocker arm |
| ⑬ Cylinder head bolt | ⑭ Cylinder head | |

Comply with the assembly procedure when

- Ⓐ tightening. Refer to [EM-235, "Disassembly and Assembly"](#)

: N·m (kg-m, ft-lb)

: N·m (kg-m, in-lb)

: Always replace after every disassembly.

: Should be lubricated with oil.

Removal and Installation

INFOID:0000000011999169

REMOVAL

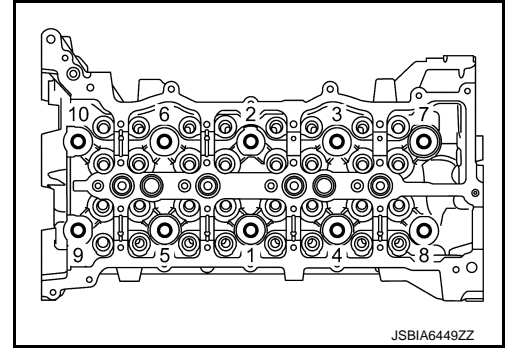
- Remove the following components and related parts.
 - Intake manifold: Refer to [EM-166, "Exploded View"](#).
 - Turbocharger: Refer to [EM-173, "Exploded View"](#).
 - Exhaust manifold and turbocharger assembly: Refer to [EM-173, "Exploded View"](#).
 - Water outlet: Refer to [CO-58, "Exploded View"](#).
 - Front cover, timing chain: Refer to [EM-193, "Exploded View"](#).
 - Camshaft: Refer to [EM-223, "Exploded View"](#).
 - High pressure fuel pump: Refer to [EM-220, "Exploded View"](#).

CYLINDER HEAD

< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]

- Vacuum pump. Refer to [EM-186](#). "Exploded View".
2. Remove cylinder head.
 - Loosen mounting bolts in the order from 10 to 1 as shown in the figure.



3. Remove cylinder head gasket.

INSTALLATION

1. Install cylinder head gasket with the following procedure:

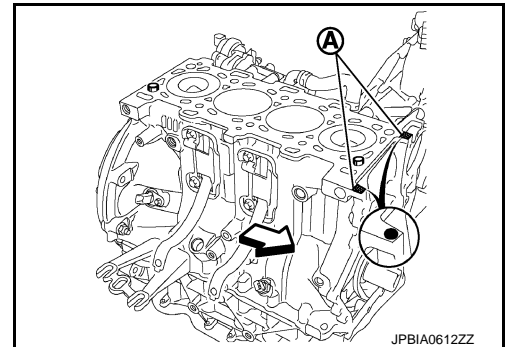
CAUTION:

Before installing cylinder head, inspect piston protrusion.

- a. Apply liquid gasket to position ① shown in the figure.

↩ : Engine front

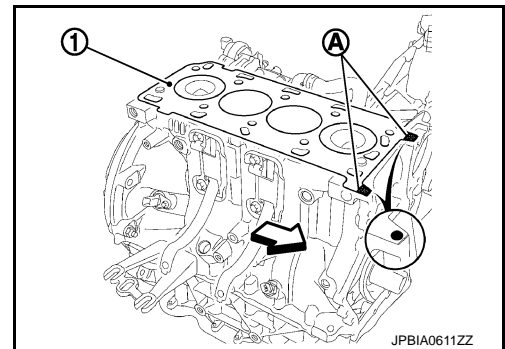
Use Genuine Liquid Gasket or equivalent.



- b. Install cylinder head gasket ①, and apply liquid gasket to position ① shown in the figure.

↩ : Engine front

Use Genuine Liquid Gasket or equivalent.



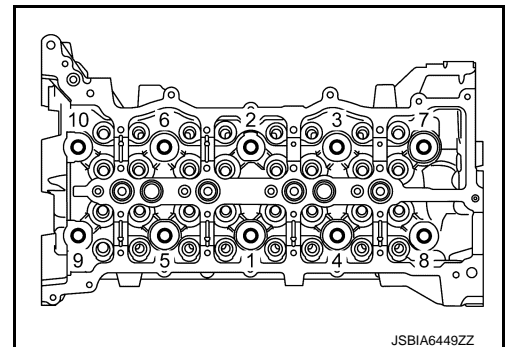
2. Install cylinder head, and tighten mounting bolts in the order from 1 to 10 as shown in figure with the following procedure:

- a. Tighten all bolts.

 : **5.0 N·m (0.51 kg-m, 44 in-lb)**

- b. Tighten all bolts.

 : **30.0 N·m (3.1 kg-m, 22 ft-lb)**



CYLINDER HEAD

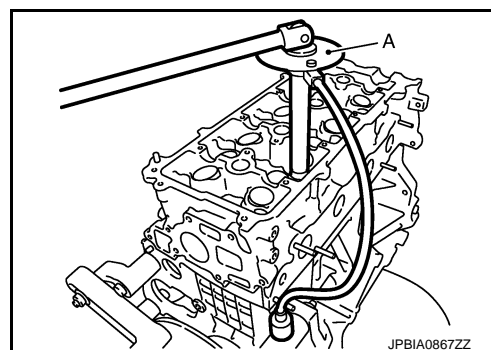
< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]

- c. Turn all bolts 300 degrees clockwise (angle tightening).

CAUTION:

Check and confirm the tightening angle by using an angle wrench [SST: KV10112100 (—)] (A) or protractor. Never judge by visual inspection without the tool.



3. Assemble in the reverse order of disassembly, for the rest of parts.

Disassembly and Assembly

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DISASSEMBLY

1. Set the cylinder head assembly to the cylinder head stand [commercial service tool: KV113B0200 (Mot.1573)].
2. Remove rocker arm.
3. Remove hydraulic tappet.
4. Remove valve collet.
 - Compress valve spring with valve spring compressor (commercial service too).

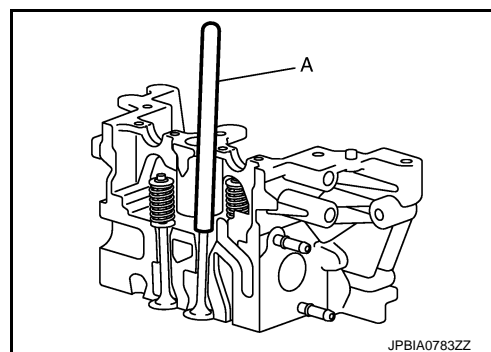
5. Remove valve spring retainer and valve spring.

6. Check dimension of valve oil seal mounting position before removing valve and valve oil seal with the following procedure:

- a. Install the push rod (A) of valve seal drift [commercial service tool: KV113B0180 (Mot.1511-01)] on the valve oil seal.

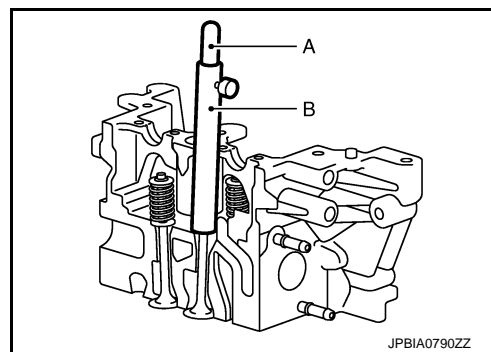
NOTE:

The inner diameter of the push rod must be identical to that of the valve. In addition, the bottom of the push rod must come into contact with the metal upper section of the valve oil seal.



- b. Install the guide tube (B) over the push rod (A) until the guide tube comes into contact with the cylinder head, locking the push rod with the knurled wheel.

- Remove the guide tube assembly plus push rod, being careful not to loosen the knurled wheel.



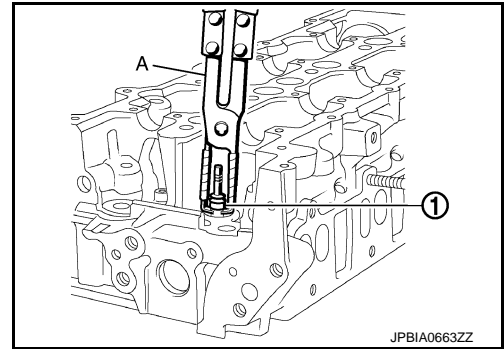
7. Push valve stem to combustion chamber side, and remove valve.
 - Identify installation positions, and store them without mixing them up.

CYLINDER HEAD

< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]

8. Remove valve oil seal ① with a valve oil seal puller [commercial service tool: KV113B0090 (Mot.1335)] (A).



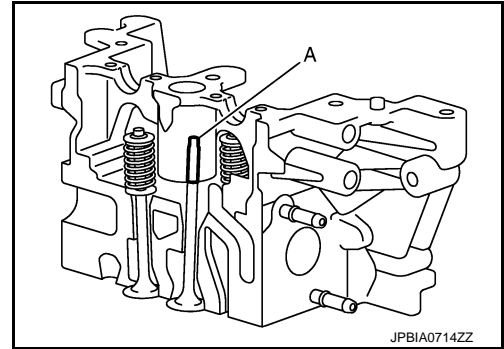
ASSEMBLY

1. Install valve.

NOTE:

Install larger diameter to intake side.

2. Install valve oil seal with the following procedure:
 - a. Position the protector (A) of valve seal drift [commercial service tool: KV113B0180 (Mot.1511-01)] on the valve.

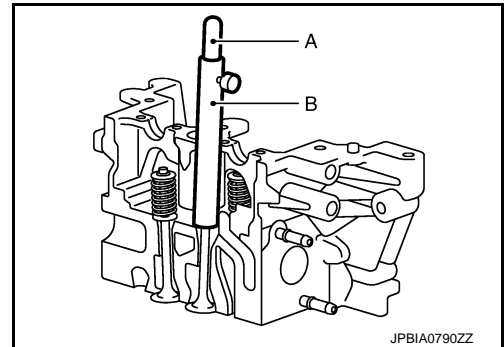


- b. Position a valve oil seal on the protector. Move the valve oil seal past the protector.

CAUTION:

Never lubricate valve oil seal.

- c. Remove the protector.
 - d. Push in the push rod (A) of valve seal drift [commercial service tool: KV113B0180 (Mot. 1511-01)] with palm of the hand until the guide tube (B) makes contact with the cylinder head.



3. Install valve spring.

NOTE:

The intake and exhaust valve springs are identical.

4. Install valve spring retainer.
5. Install valve collet.
 - Compress valve spring with a valve spring compressor (commercial service tool).
 - Tap valve stem edge lightly with a plastic hammer after installation to check its installed condition.
6. Install hydraulic tappet.
 - Check that the tappets are filled with oil before refitting them.
7. Install rocker arm.

Inspection

INSPECTION AFTER DISASSEMBLY

Cylinder Head Distortion

NOTE:

When performing this inspection, cylinder block distortion should be also checked.

1. Wipe off engine oil and remove water scale (like deposit), gasket, sealant, carbon, etc. with a scraper.

CAUTION:

Never allow gasket debris to enter passages for engine oil or water.

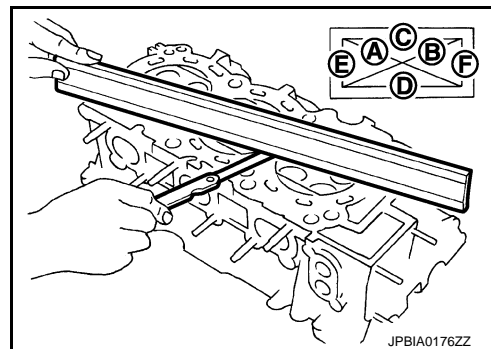
2. At each of several locations on bottom surface of cylinder head, measure the distortion in six directions (A - F).

Standard: Refer to [EM-262, "Cylinder Head"](#).

- If it exceeds the standard, replace cylinder head and cylinder head housing.

NOTE:

Cylinder head cannot be replaced as a single part, because it is machined together with cylinder head housing. Replace whole cylinder head housing and cylinder head assembly.



Valve Dimensions

- Check the dimensions of each valve. For the dimensions, refer to [EM-262, "Cylinder Head"](#).
- If dimensions are out of the standard, replace valve and check valve seat contact.

Valve Guide Clearance

Valve stem diameter

- Measure the diameter of valve stem with micrometer (A).

Standard : Refer to [EM-262, "Cylinder Head"](#).

Valve guide inner diameter

- Measure the inner diameter of valve guide with bore gauge.

Standard : Refer to [EM-262, "Cylinder Head"](#).

Valve guide clearance

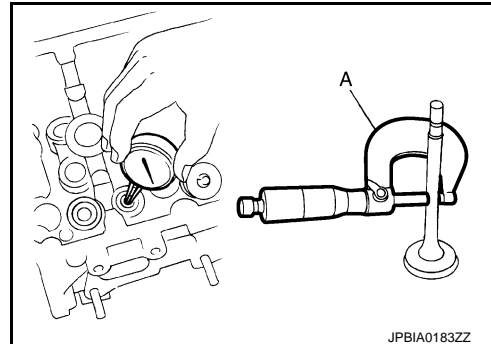
- (Valve guide clearance) = (Valve guide inner diameter) – (Valve stem diameter)

Standard : Refer to [EM-262, "Cylinder Head"](#).

- If it exceeds the standard, replace valve and/or cylinder head and cylinder head housing.

Valve Seat Contact

- After confirming that the dimensions of valve guides and valves are within the specifications, perform this procedure.
- Apply prussian blue (or white lead) onto contacting surface of valve seat to check the condition of the valve contact on the surface.



CYLINDER HEAD

< UNIT DISASSEMBLY AND ASSEMBLY >

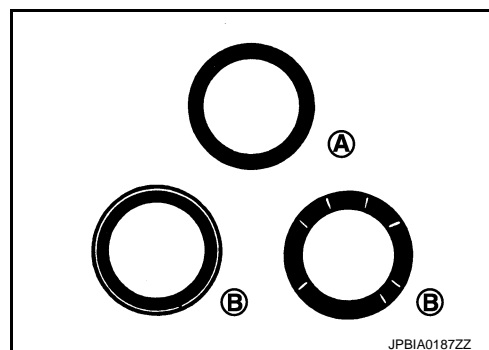
[YS23DDT/YS23DDTT]

- Check if the contact area band is continuous all around the circumference.

Ⓐ : OK

Ⓑ : NG

- If not, grind to adjust valve fitting and check again. If the contacting surface still has “NG” conditions even after the re-check, replace cylinder head and cylinder head housing.

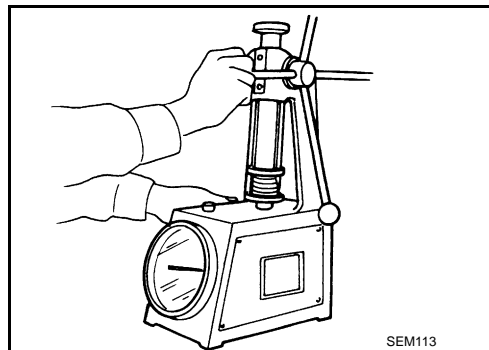


Valve Spring Dimensions And Valve Spring Pressure Load

- Check valve spring pressure with valve spring seat installed at the specified spring height.

Standard : Refer to [EM-262, "Cylinder Head"](#).

- If the pressure height is out of the standard, replace valve spring.



A

EM

C

D

E

F

G

H

I

J

K

L

M

N

O

P

CYLINDER BLOCK

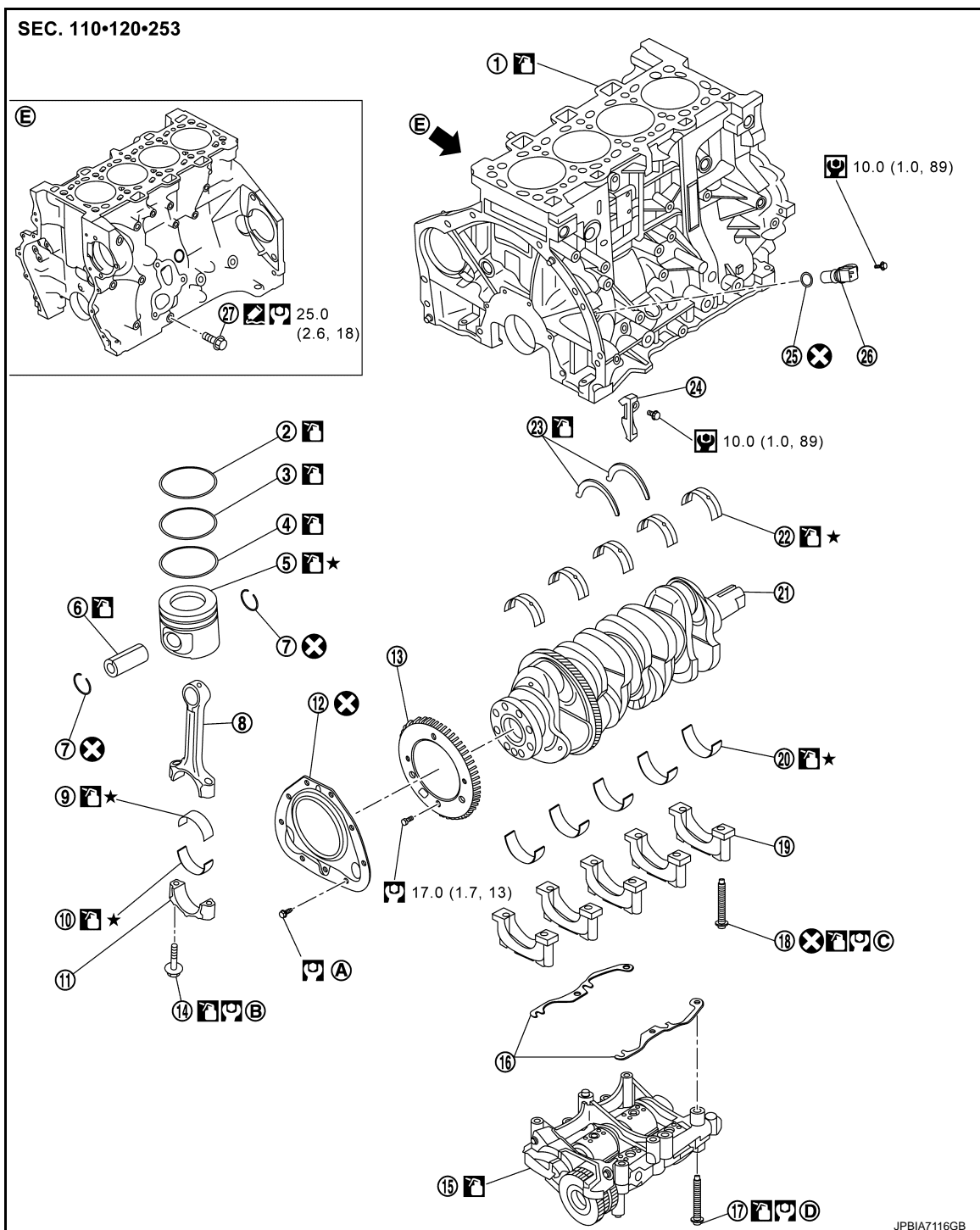
< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]

CYLINDER BLOCK

Exploded View

INFOID:000000011999172



- | | | |
|-------------------------------------|------------------------------|--------------------------------|
| ① Cylinder block | ② Compression ring | ③ Sealing ring |
| ④ Scraper ring | ⑤ Piston | ⑥ Piston pin |
| ⑦ Snap ring | ⑧ Connecting rod | ⑨ Connecting rod bearing shell |
| ⑩ Connecting rod bearing shell | ⑪ Connecting rod bearing cap | ⑫ Rear oil seal retainer |
| ⑬ Crankshaft position sensor target | ⑭ Connecting rod bolt | ⑮ Balancer unit |
| ⑯ Adjust shim | ⑰ Balancer unit bolt | ⑱ Crankshaft bearing cap bolt |

CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]

- | | | |
|---|---|---|
| ①⑨ Crankshaft bearing cap | ②⑩ Main bearing (lower) | ②① Crankshaft |
| ②② Main bearing (upper) | ②③ Thrust washer | ②④ Cover |
| ②⑤ O-ring | ②⑥ Crankshaft position sensor | ②⑦ TDC hole plug |
| Comply with the assembly procedure when tightening. Refer to EM-235, "Disassembly and Assembly" | Comply with the assembly procedure when tightening. Refer to EM-235, "Disassembly and Assembly" | Comply with the assembly procedure when tightening. Refer to EM-235, "Disassembly and Assembly" |
| ④ Comply with the assembly procedure when tightening. Refer to EM-235, "Disassembly and Assembly" | ⑤ View | |
| : N·m (kg-m, ft-lb) | | |
| : N·m (kg-m, in-lb) | | |
| : Always replace after every disassembly. | | |
| : Should be lubricated with oil. | | |
| : Sealing point | | |
| ★ : Select with proper thickness. | | |

Disassembly and Assembly

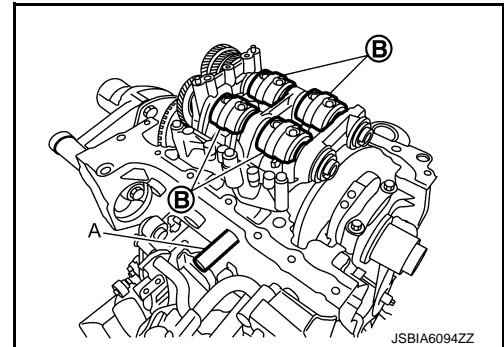
INFOID:0000000011999173

Disassembly

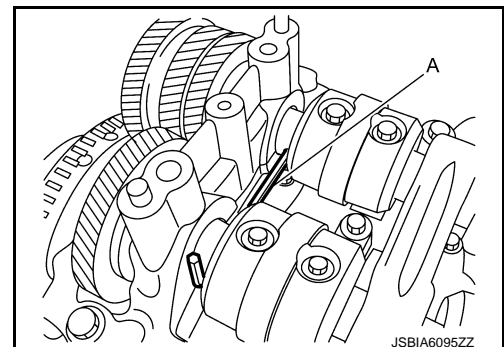
- Remove cylinder head. Refer to [EM-228, "Removal and Installation"](#).
- Remove crankshaft position sensor.
- Remove engine oil cooler. Refer to [LU-26, "Removal and Installation"](#).
- Remove rear oil seal retainer. Refer to [EM-210, "REAR OIL SEAL : Removal and Installation"](#).
- Remove oil pan (upper). Refer to [EM-218, "Removal and Installation"](#).
- Remove oil pump. Refer to [LU-28, "Removal and Installation"](#).
- Remove balancer unit with the following procedure:
 - Set No.1 cylinder at TDC of its compression stroke using TDC set pin [SST: Mot 1766] (A).

CAUTION:

Check that weigh ② of balancer unit faces the opposite side (oil pan side) of crankshaft.



- Insert fixing pin (A) into the shaft part of balancer unit.
- NOTE:**
Leave the balancer unit fixed with fixing pin until installed.



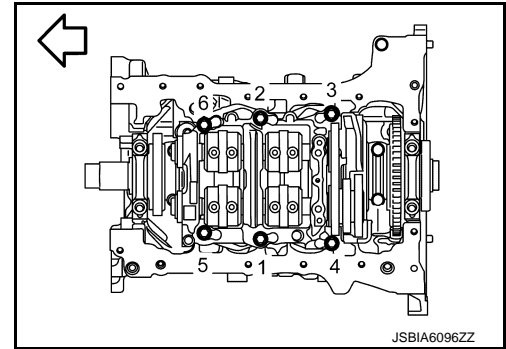
CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

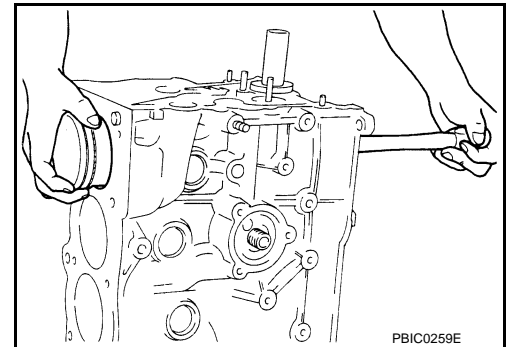
[YS23DDT/YS23DDTT]

- c. Loosen mounting bolts in the order of 6 to 1 as shown in the figure.

↩ : Engine front

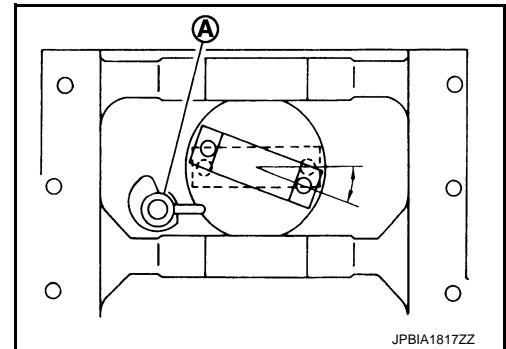


- d. Remove balancer unit and baffle plate.
e. Remove adjust shims.
f. Remove TDC set pin.
8. Remove piston and connecting rod assembly with the following procedure:
• Before removing piston and connecting rod assembly, check the connecting rod side clearance. Refer to [EM-248. "Inspection"](#).
a. Position crankshaft pin corresponding to connecting rod to be removed onto the bottom dead center.
b. Remove connecting rod cap.
• Put a paint mark on cap to identify each cylinder.
c. Using a hammer handle or similar tool, push piston and connecting rod assembly out to the cylinder head side.



CAUTION:

- Be careful not to damage oil jets (A), cylinder wall and crankshaft pin, resulting from an interference of the connecting rod big end.
- Never disassemble oil jets.



9. Remove connecting rod bearing shells.

CAUTION:

When removing them, note the installation position. Keep them in the correct.

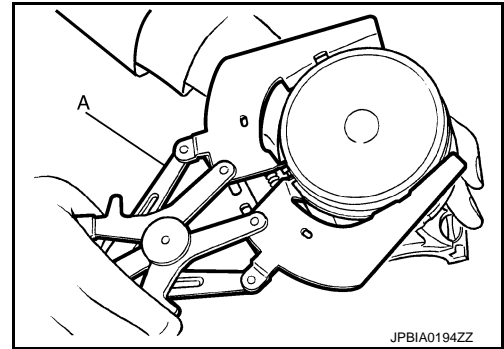
10. Remove piston rings from piston.
• Before removing piston rings, check the piston ring side clearance. Refer to [EM-248. "Inspection"](#).

CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

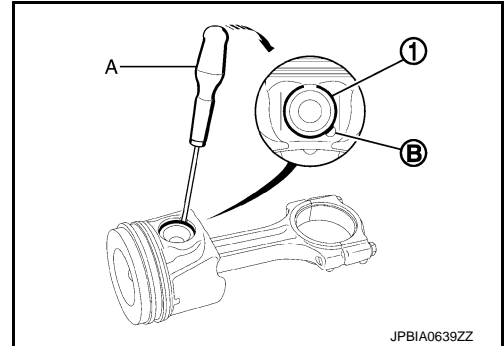
[YS23DDT/YS23DDTT]

- Use a piston ring expander (commercial service tool) (A).
- CAUTION:**
- When removing piston rings, be careful not to damage the piston.
 - Be careful not to damage piston rings by expanding them excessively.



11. Remove the snap rings ① using a screwdriver (A), and then release the piston pin.

Ⓑ : Channel

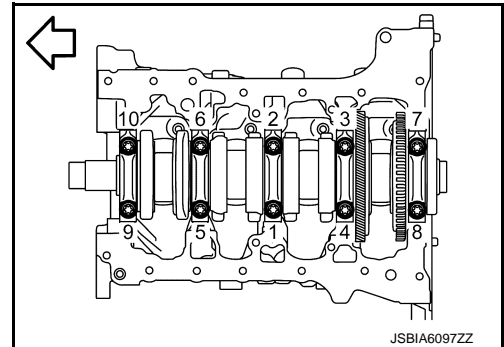


12. Remove main bearing cap mounting bolts with the following procedure:

- Measure crankshaft end play before loosening main bearing cap mounting bolts. Refer to [EM-248](#), "Inspection".

- a. Loosen mounting bolts in the order of 10 to 1 as shown in the figure.

⇐ : Engine front



- b. Remove crankshaft bearing caps.
c. Remove crankshaft.
d. Remove crankshaft bearing shells.

NOTE:

Always mark the position of each crankshaft bearing shell using an indelible marker pen, in relation to the crankshaft bearing number

13. Remove crankshaft position sensor target.

Assembly

1. Fully air-blow engine coolant and engine oil passages in the cylinder block, cylinder bore and crankcase to remove any foreign matter.

CAUTION:

Use a goggles to protect your eye.

2. Install main bearings and thrust bearings with the following procedure:

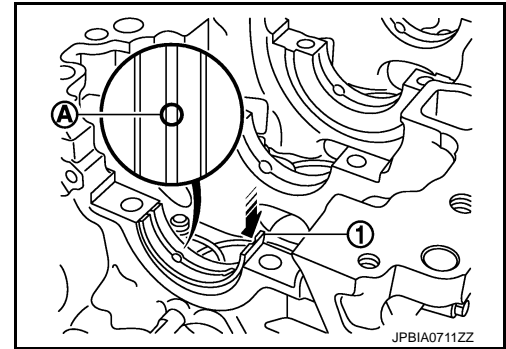
- a. Remove dust, dirt, and engine oil from the bearing mating surfaces of the cylinder block and main bearing cap.

CYLINDER BLOCK

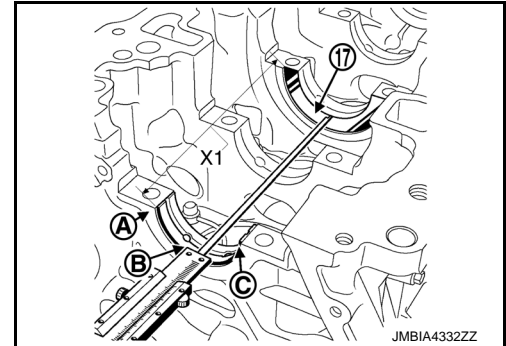
< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]

- b. Center the grooved bearing shell on bearing No.1 of the cylinder block while aligning the groove of the bearing shell with the hole of the bearing (A).
- Secure the flush bearing shell (1) and push from the opposite side the position of the bearing shell flush with the bearing.

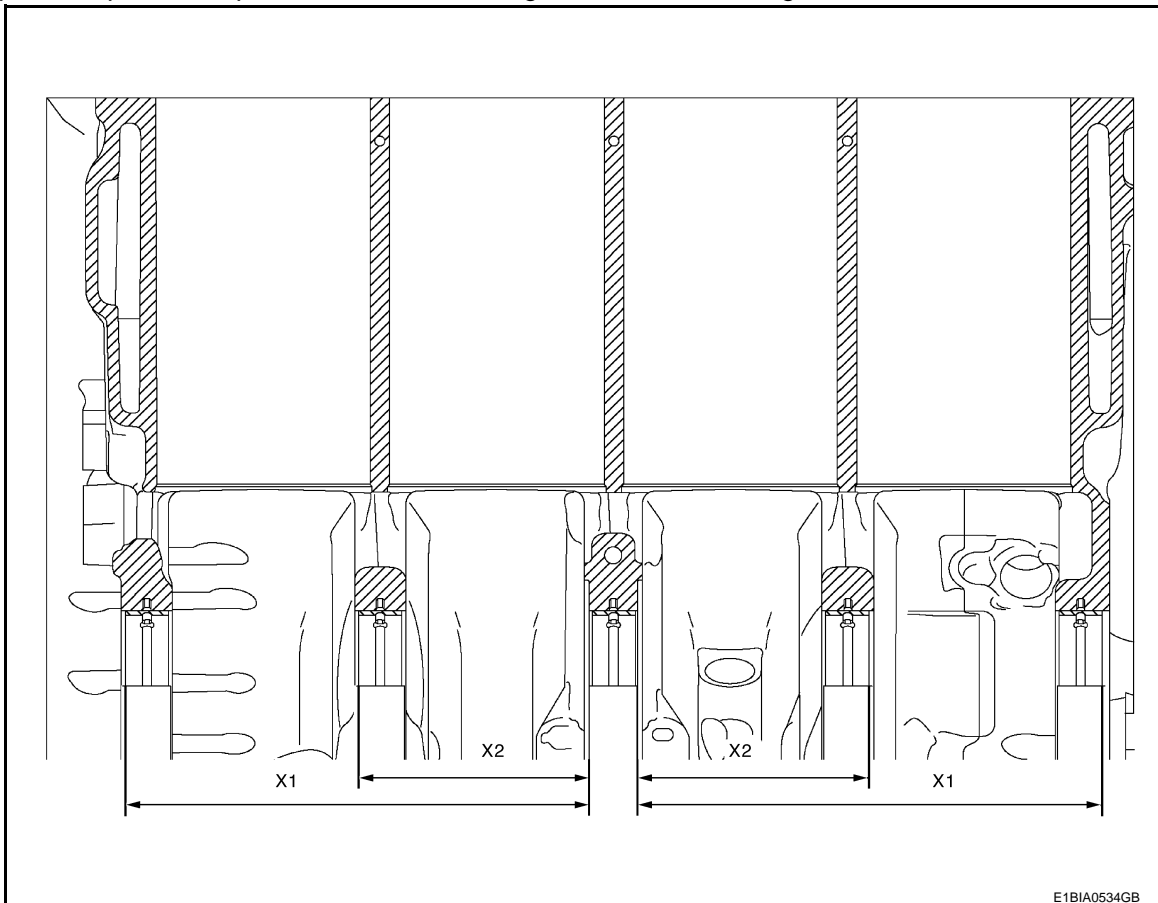


- c. Measure the distance (X1) between the bearing face (17) and the edge of the bearing shell at points (A), (B) and (C) using a depth gauge.
- d. If necessary, adjust the position of the bearing shell to the value (X1).



X1 : 182.61 - 182.81 mm (7.19 - 7.20 in)

- e. Repeat the previous operations for the bearing shells of the bearings No 2, 4 and 5.



- f. If necessary, adjust the position of the bearing shells.
- Bearings No. 2 and 4 to the value (X2)

X2 : 90.61 - 90.81 mm (3.5673 - 3.5752 in)

CYLINDER BLOCK

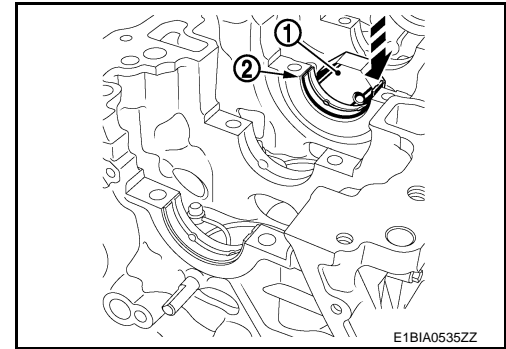
< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]

- g. Secure the flush bearing shell against the rectified shim ② and push from the opposite side to position the bearing shell flush with the bearing.

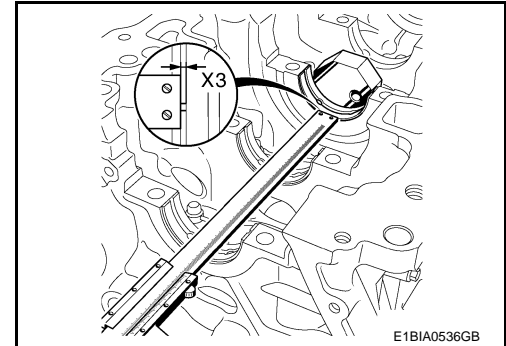
Place:

- Dial indicator stand set [SST: KV113B0040 (Mot.251-01)] ① against the mating face of the crankshaft thrust washer on bearing No.3
- the grooved bearing shell against the rectified shim.



- h. Measure the distance (X3) between the bearing face of the thrust washer and the bearing shell edge using a depth gauge.

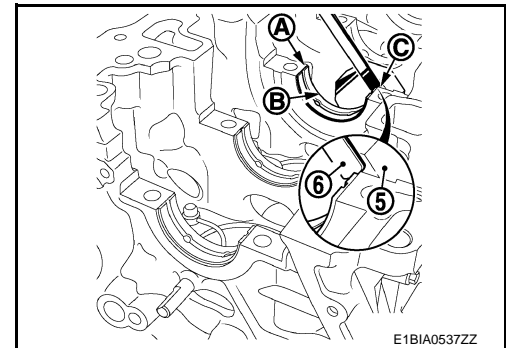
X3 : 1.9 - 2.1 mm (0.075 - 0.083 in)



- i. Center the grooved bearing shell on the bearing, aligning the shell with the hole groove.

- Adjust the position of the bearing shell at points (A), (B) and (C) using the dial indicator stand set [SST: KV113B0040 (Mot.251-01)] ⑤ and a set of feeler gauges (thickness of the shim ⑥).

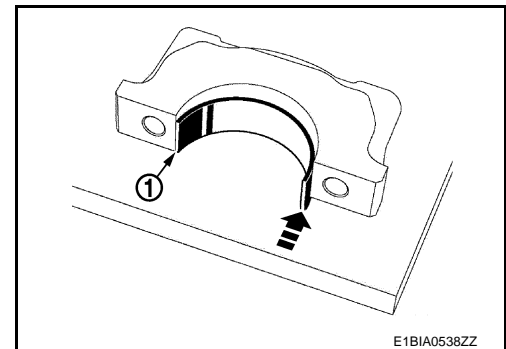
Thickness of the shim : 1.9 - 2.1 mm (0.075 - 0.083 in)



- j. Secure the flush bearing shell with the bearing cap at ① and push from the opposite side to bring the bearing shell flush with the bearing cap.

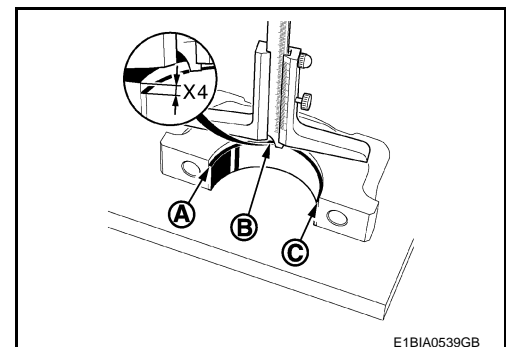
Place:

- the bearing cap on a bench,
- a non-grooved bearing shell against the bench.



- k. Measure the distance (X4) between the edge of the bearing shell and the wall of the bearing cap at points (A), (B) and (C) using a depth gauge.

X4 : 1.9 - 2.1 mm (0.075 - 0.083 in)



A

EM

C

D

E

F

G

H

I

J

K

L

M

N

O

P

CYLINDER BLOCK

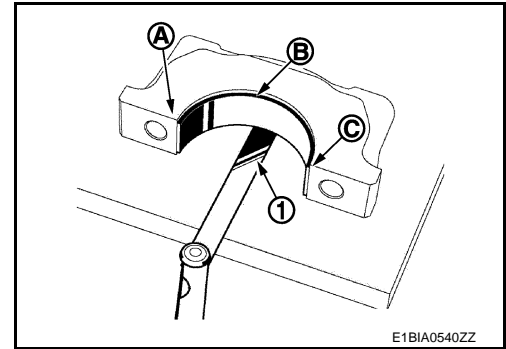
< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]

- I. Adjust the position of the bearing shell at point (A), (B) and (C) using a set of feeler gauges (thickness of the shim ①).

Thickness of the shim : 1.9 - 2.1 mm (0.075 - 0.083 in)

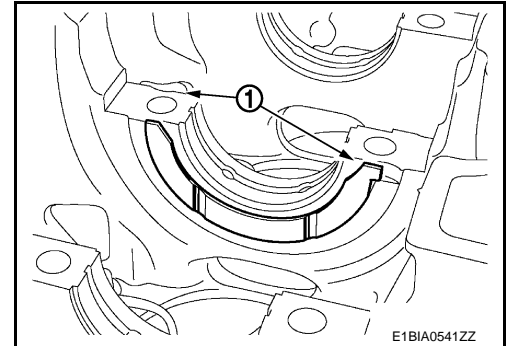
- Repeat the previous operations for the other bearing caps.



- m. Position the crankshaft thrust washers on the cylinder block (washer plug ① in the cylinder block notch)
 - Use engine oil to lubricate the crankshaft journal bearing shells and thrust washers (only the face making contact with the crankshaft).

NOTE:

Ensure the bearing shells and the thrust washers do not move when refitting the crankshaft and bearing caps.



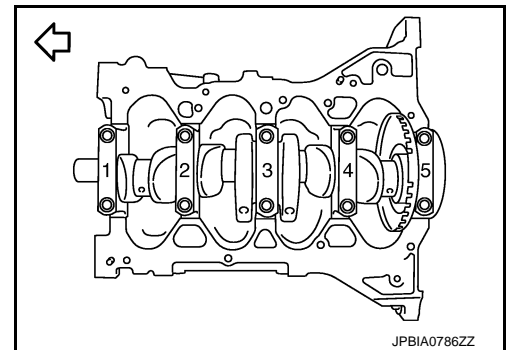
3. Install crankshaft position target.
4. Install crankshaft, the bearing caps and the crankshaft bearing bolts.

NOTE:

Check that the bearing caps are in contact with the cylinder block before tightening the bearing cap bolts.

5. Align the identification number to the journal position to install as shown in the figure.

← : Engine front

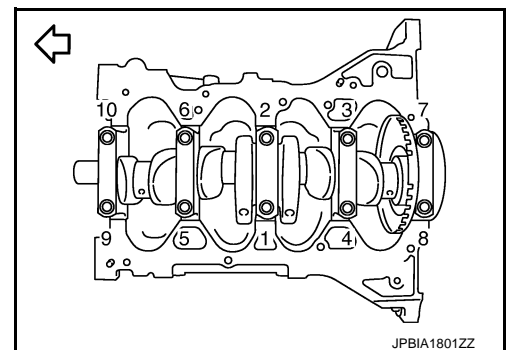


6. Tighten main bearing cap bolts with the following procedure:
 - a. Tighten main bearing cap bolts in the order from 1 to 10 as shown in the figure

← : Engine front

 : 20.0 N·m (2.0 kg-m, 15 ft-lb)

- b. Turn main bearing cap bolts 70 degrees clockwise (angle tightening) in the order from 1 to 10 as shown in the figure.



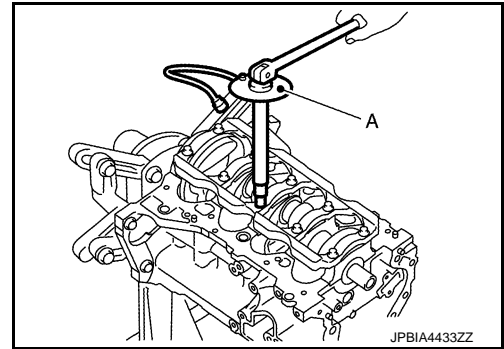
CAUTION:

CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]

Confirm the tightening angle by using angle wrench [SST: KV10112100] (A) or protractor. Never judge by visual inspection without the tool.



7. After installing mounting bolts, check that crankshaft can be rotated smoothly by hand.
8. Check crankshaft end play. Refer to [EM-248, "Inspection"](#).
- If replacing the crankshaft, always identify the piston height category to refit in each cylinder to guarantee that the piston protrusion in relation to the cylinder block remains within the tolerance, before refitting the connecting rod - piston assemblies. Refer to [EM-248, "Inspection"](#).

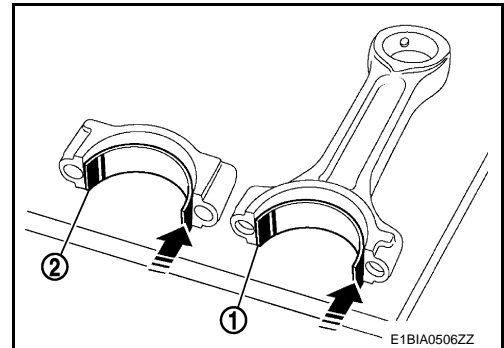
9. Install piston to connecting rod with the following procedure:

CAUTION:

When replacing connecting rod or the piston, identify the new piston grade to fit on the engine by calculating the height of the piston pin to guarantee a piston protrusion in relation to the cylinder block within the tolerances

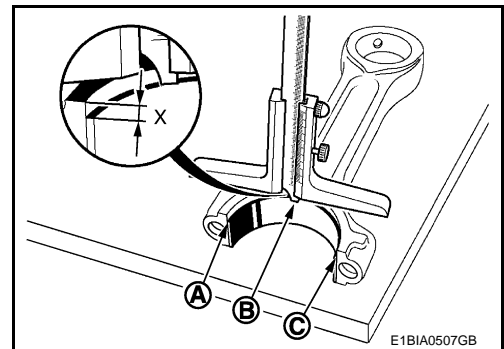
- a. Install connecting rod bearing (upper) and connecting rod bearing (lower) to connecting rod and connecting rod cap.
 - i. Place the connecting rod body on the bench.
 - ii. Secure the flush bearing shell of the connecting rod body mating face on side ① and push from the opposite side ② until the connecting rod body mating face is flush.

Flush bearing	Upper	: 19.3 mm (0.76 in)
shell width	Lower	: 18.3 mm (0.72 in)



- b. Measure the distance (X) between the edge of the bearing shell and the wall of the connecting rod body at points (A), (B) and (C) .

X : 1.9 - 2.1 mm (0.075 - 0.083 in)



CYLINDER BLOCK

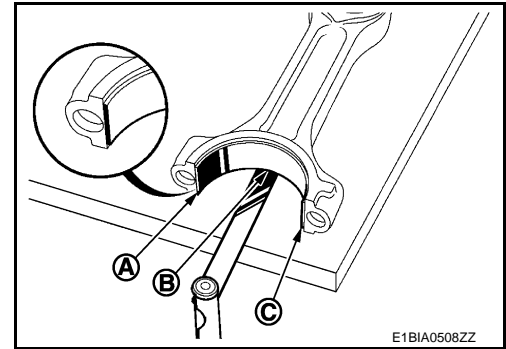
< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]

- c. Center the bearing shell on the connecting rod body.
- Adjust the position of the bearing shell at points (A), (B) and (C) using a set of feeler gauges.

Feeler gauges : 1.9 - 2.1 mm (0.075 - 0.083 in)

- Repeat the previous operations on the remaining connecting rod bodies and caps

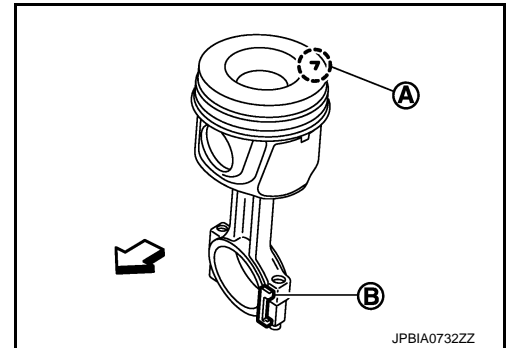


E1BIA0508ZZ

- d. Install snap ring to the groove of the piston rear side.
- Insert it fully into the groove.
- e. Assemble piston to connecting rod.
- Point the mark engraved (A) on the piston head facing and the bosses (B) of the big end as shown in the figure.

↔ : Engine front

- Piston pin can be pushed in by hand without excessive force. From the front to the rear, insert piston pin into piston and connecting rod.

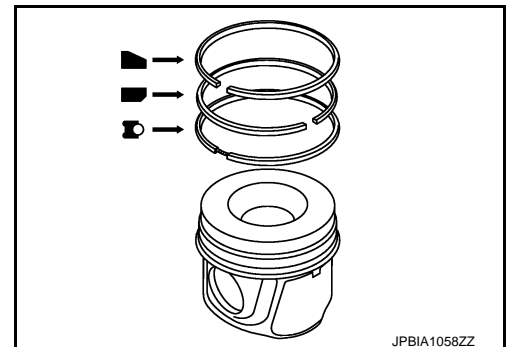


JPBIA0732ZZ

- f. Install snap ring to the groove of the piston front side.
- Insert it fully into the groove.
 - After installing, check that connecting rod moves smoothly.
10. Using a piston ring expander (commercial service tool), install piston rings.

CAUTION:

- Be careful not to damage piston.
- Be careful not to damage piston rings by expanding them excessively.
- Position each ring with the gap as shown in the figure referring to the piston front mark.

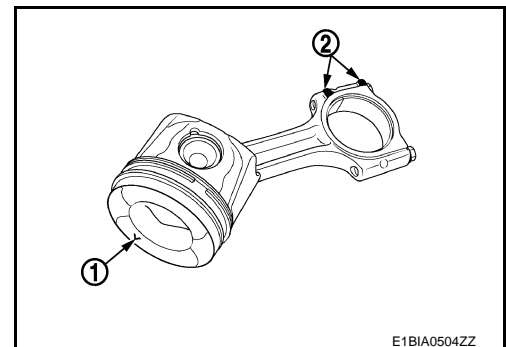


JPBIA1058ZZ

11. Lubricate piston pin with engine oil.
- Position the connecting rod in relation to the piston (piston marking ① "V" is opposite the machined bosses ② on the big end)

NOTE:

Piston marking V engine flywheel or drive plate end, connecting rod marking (machined bosses) timing end.



E1BIA0504ZZ

12. Engage the pin in the piston and in the small end.

CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]

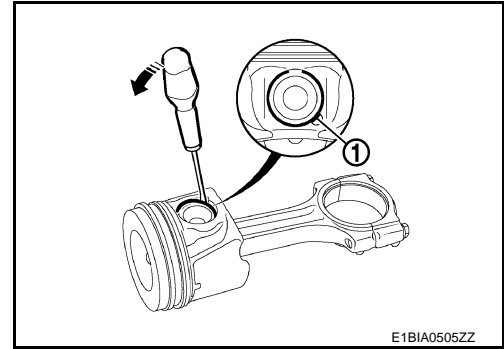
NOTE:

Check that the piston pin slides and rotates easily in the piston and the small end.

13. Refit the snap ring to the piston pin using a flat screwdriver (apply pressure in the groove ①).

NOTE:

Position the opening in the snap ring towards the piston crown.

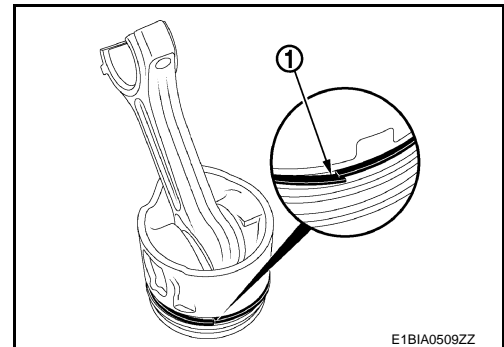


14. Install piston and connecting rod assembly to crankshaft with the following procedure:

- a. Lubricate with engine oil the following parts
- Cylinder block barrels
 - Piston rings
 - Piston skirts
 - Crankshaft crank pins
- b. Check that the piston rings are correctly engaged in the piston grooves
- Put the piston on a plane and clean surface.
 - Verify the absence of over lap ① of the tips of the scraper ring.

NOTE:

Manipulate the piston exclusively by the skirt or the connecting rod, without touching the scraper ring.



- c. Position crankshaft pin corresponding to connecting rod to be installed onto the bottom dead center.
- d. Place the position in the mounting ring [allow the piston skirt to protrude by approximately 1 cm (0.39 in)].
- e. Compress the piston rings by tightening the bolts ⑩.
- f. Check that the pistons correspond to the cylinder block barrels (No.1 timing end)
- g. Place the connecting rod and piston assembly in the cylinder.
- h. Position the point of the "V" ⑰ engaged on the piston towards the flywheel end or drive plate end.

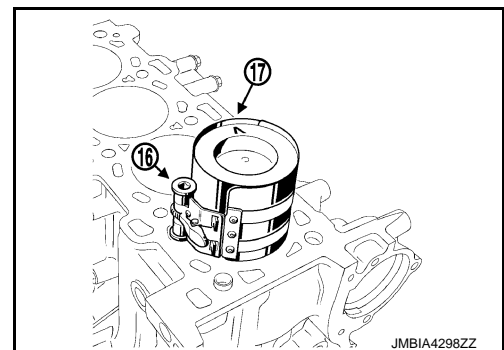
WARNING:

Failure to observe the following procedure may result in destruction of the engine.

- Gradually insert the "connecting rod - piston" assembly in the cylinder (avoid any contact between the connecting rod and the oil jet) using only of the hand.
- Position the big end on the crankshaft crank pin.
- Refit the connecting rod cap, ensuring that the connecting rod caps and bodies correspond. Refer to [EM-248, "Inspection"](#).

CAUTION:

The piston ring compressor tool on the piston has to be made without forcing. If resistance during the engagement occurs, put off the tool and to re-engage it.




15. Install connecting rod cap bolts with the following procedure:

- a. Tighten new connecting rod cap bolts.

CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]

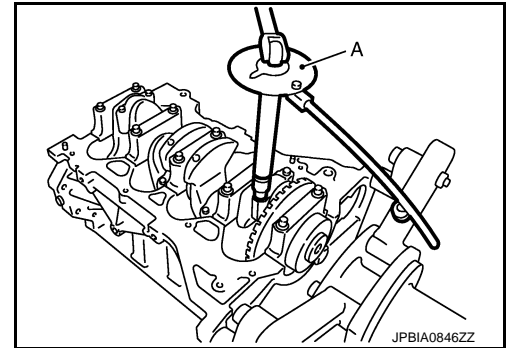
 : 25.0 N·m (2.6 kg-m, 18 ft-lb)

- b. Turn bolts 55 degrees clockwise (angle tightening).

CAUTION:

Confirm the tightening angle by using an angle wrench [SST: KV10112100 (—)] (A) or protractor. Never judge by visual inspection without the tool.

- After tightening connecting rod cap bolt, check that crankshaft rotates smoothly.
- Check the connecting rod side clearance. Refer to [EM-248, "Inspection"](#).
- Check the piston protrusion. Refer to [EM-248, "Inspection"](#).



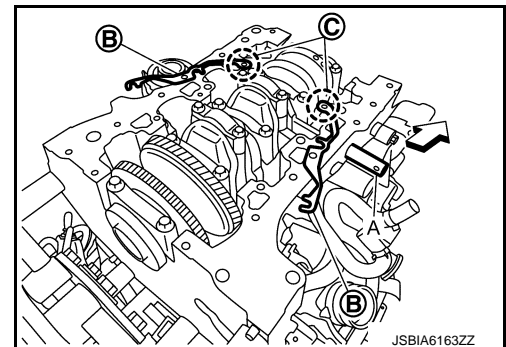
16. Install balancer unit with the following procedure:

CAUTION:

When any one of the parts listed below is replaced, adjust backlash of the balancer unit. Refer to [EM-245, "Backlash Adjustment"](#).

- Crankshaft
- Cylinder block
- Balancer unit

- a. Obtain No.1 cylinder at the TDC of its compression stroke. Refer to [EM-148, "Inspection"](#).
 b. Screw in the TDC set pin [SST: — (Mot. 1766)] (A).
 c. Align the bolt hole of the balancer unit shim with bolt hole (C) on the cylinder block side, and place shim (B) of balancer unit as shown in the figure.



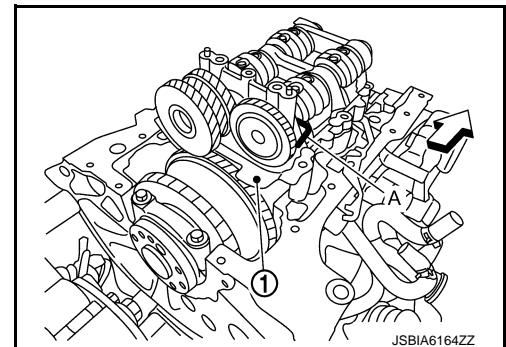
⇐ : Engine front

- d. Install the balancer unit fixed with fixing pin (A) to cylinder block together with baffle plate (1).

⇐ : Engine front

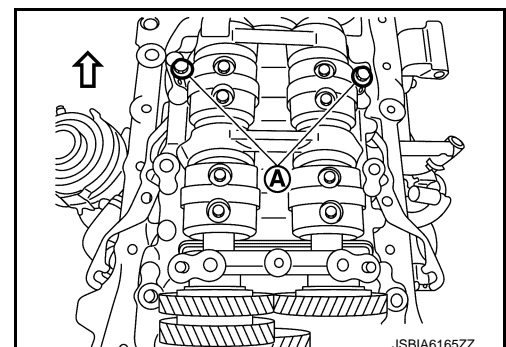
CAUTION:

The balancer unit weights must be positioned on the opposite side to the crankshaft.



- e. Temporarily tighten balancer unit mounting bolt (A).

⇐ : Engine front



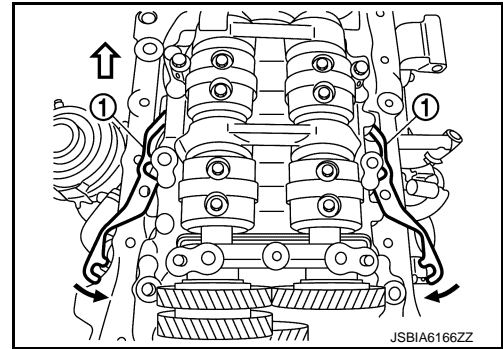
CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]

- f. Press shim ① of balancer unit to the mounting bolt side (in the direction shown by arrow).

↩: Engine front



- g. Tighten new balancer unit bolts in the order from 1 to 6 as shown in the figure with the following procedure:

↩: Engine front

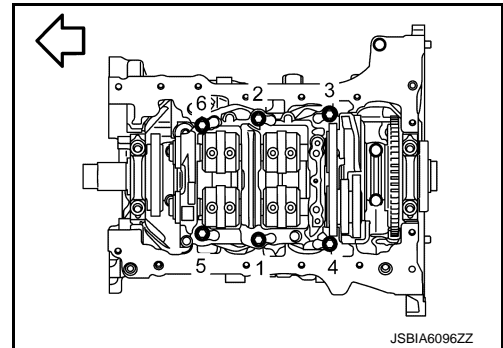
- i. Tighten balancer unit bolts.

: 15.0 N·m (1.5 kg-m, 11 ft-lb)

- ii. Turn bolts 85 degrees clockwise (angle tightening).

CAUTION:

Confirm the tightening angle by using an angle wrench [SST: KV10112100 (—)] or protractor. Never judge by visual inspection without the tool.



- h. Remove the TDC set pin [SST: — (Mot. 1766)].

- i. Remove fixing pin.

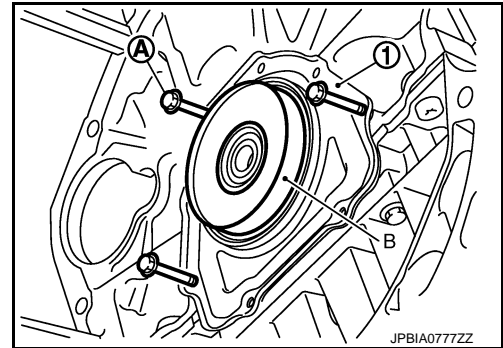
17. Install rear oil seal retainer with the following procedure:

- a. Set guide bolt (A) and protector (B) to rear oil seal retainer ①.

NOTE:

The protector is supplied in the new oil seal parts kit.

- b. Move the rear oil seal retainer evenly by hand until it makes contact with the cylinder block.



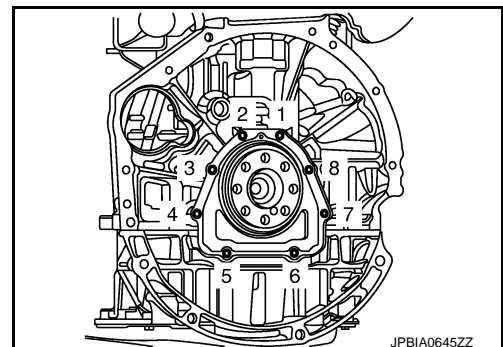
- c. Tighten mounting bolts in two steps separately in numerical order as shown in the figure.

- i. Tighten mounting bolts No.1 and 5.

: 5.0 N·m (0.51 kg-m, 44 in-lb)

- ii. Tighten mounting bolts No. 1 to 8 in numerical order as shown.

: 12.0 N·m (1.2 kg-m, 9 ft-lb)



18. Assemble in the reverse order of disassembly.

Backlash Adjustment

CAUTION:

When any one of the parts listed below is replaced, adjust backlash as per the following steps.

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CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]

- Crankshaft
- Cylinder block
- Balancer unit

1. Measure the backlash between gears of balancer unit and crank shaft, according to the following instructions.

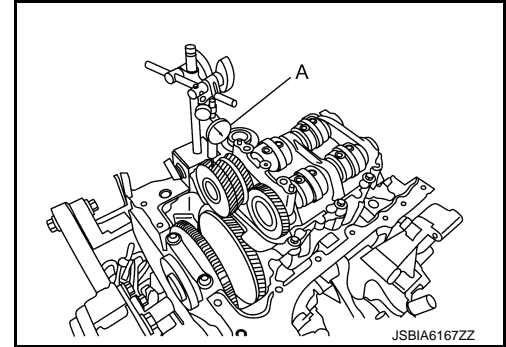
CAUTION:

To measure backlash, use adjust shim [2.80 mm (0.11 in)] for shim of balancer unit.

- a. Set dial gauge (A) on the gear of balancer unit.

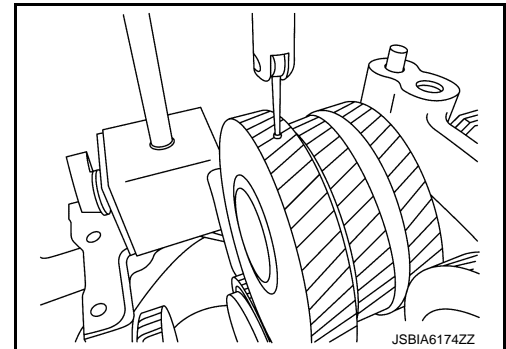
CAUTION:

TDC set pin and balancer unit fixing pin must be removed beforehand.



NOTE:

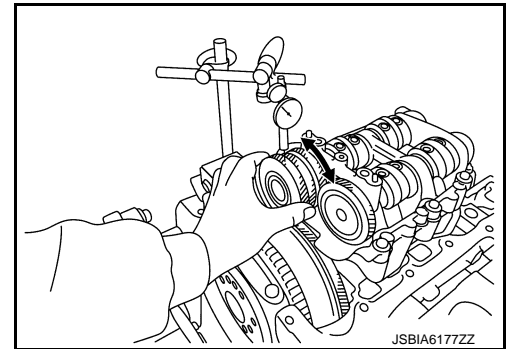
Set dial gauge in the center of gear



- b. Measure backlash as shown in the figure.

CAUTION:

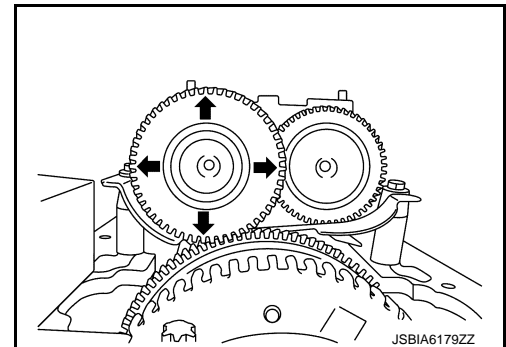
Never rotate the gear of balancer unit 360 degrees.



NOTE:

- To measure backlash with a dial gauge, rotate crank shaft in steps of 90 degrees in the rotation direction of the engine and measure backlash at 4 points.

← : Measuring point



2. Select shim of balancer unit according to the instructions below.

CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]

- Calculate the mean value of the backlash measured at 4 points.
- Plug the calculated mean value into the following formula and calculate the dimensions of the shim of balancer unit.

$$2.80 - [0.5 - (\text{mean value of backlash}) / 2]$$
- Refer to the shim selection table and select shim of balancer unit.

NOTE:

Round off to two decimal places.

Shim selection table

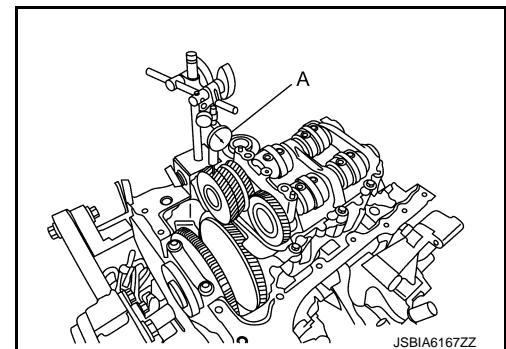
Grade of shim	Backlash measure	Grade of shim	Backlash measure
12 43 758 79R	2.4	12 43 725 59R	2.62
12 43 754 23R	2.42	12 43 788 07R	2.64
12 43 744 53R	2.44	12 43 702 42R	2.66
12 43 709 80R	2.46	12 43 713 60R	2.68
12 43 717 52R	2.48	12 43 715 52R	2.70
12 43 761 79R	2.50	12 43 700 24R	2.72
12 43 751 88R	2.52	12 43 706 11R	2.74
12 43 797 98R	2.54	12 43 757 00R	2.76
12 43 786 07R	2.56	12 43 725 83R	2.80
12 43 774 62R	2.58	12 43 739 19R	2.62
12 43 718 09R	2.60		

- Remove balancer unit. Refer to [EM-235, "Disassembly and Assembly"](#).
- Install balancer unit by using the selected shim. Refer to [EM-235, "Disassembly and Assembly"](#).
- Measure the backlash between gears of balancer unit and crank shaft, according to the following instructions.

- Set dial gauge (A) on the gear of balancer unit.

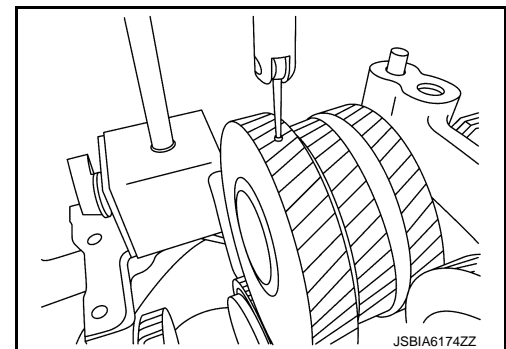
CAUTION:

TDC set pin and balancer unit fixing pin must be removed beforehand.



NOTE:

Set dial gauge in the center of gear.



CYLINDER BLOCK

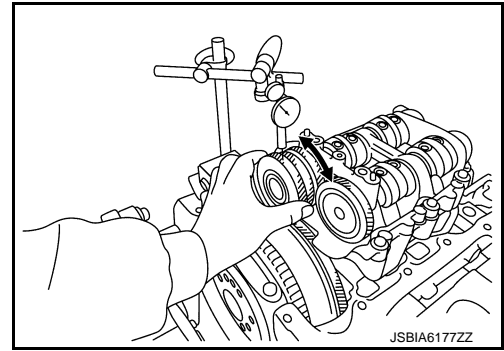
< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]

- b. Measure backlash as shown in the figure.

CAUTION:

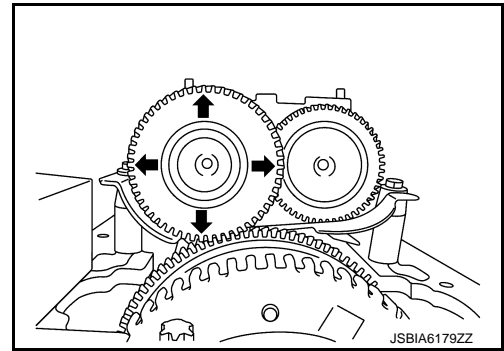
Never rotate the gear of balancer unit 360 degrees.



NOTE:

To measure backlash with a dial gauge, rotate crank shaft in steps of 90 degrees in the rotation direction of the engine and measure backlash at 4 points.

← : Measuring point



- c. Check that the mean value of the four measured values is within the reference values.

Standard $0.05 \pm 0.03 \text{ mm}$ ($0.002 \pm 0.0012 \text{ in}$)

- d. If the mean value is outside the reference value, then select a shim of balancer unit.

Inspection

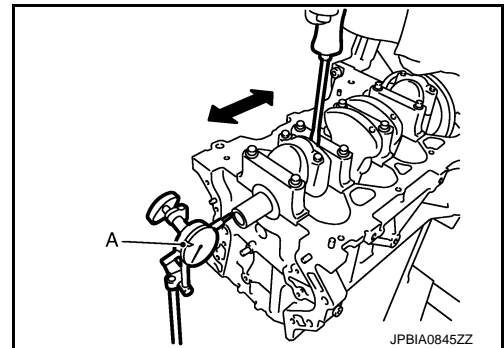
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CRANKSHAFT END PLAY

- Measure the clearance between thrust bearings and crankshaft arm when crankshaft is moved fully forward or backward with a dial indicator (A).

Standard : Refer to [EM-263, "Cylinder Block"](#).

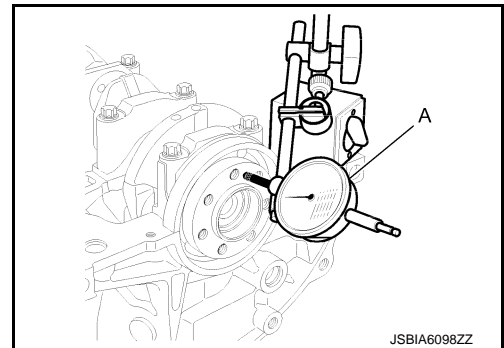
- If it exceeds the standard, replace thrust bearings, and measure again. If it still exceeds the standard, also replace crankshaft.



CRANKSHAFT DEFORMATION OF THE BEARING FACE

- Position the feeler of the dial indicator (A) on the flywheel or drive plate face of the crankshaft avoiding the holes of the flywheel or drive plate bolts.
- Rotate the crankshaft once to measure the mounting flange of the flywheel face.

Standard : Refer to [EM-263, "Cylinder Block"](#)



CRANKSHAFT CONCENTRICITY OF CRANKSHAFT JOURNAL

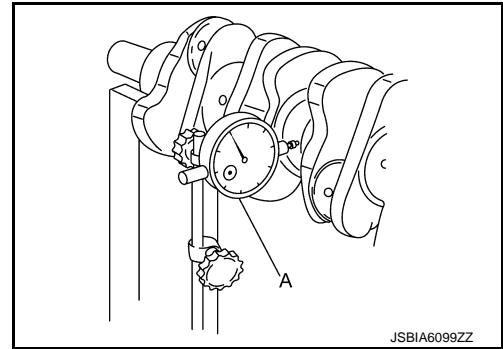
CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]

- Support the feeler of dial indicator (A) on the centre of the mating face of the crankshaft journal check.
- Rotate the crankshaft once to check the concentricity of the journal.

Standard : Refer to [EM-263, "Cylinder Block"](#).

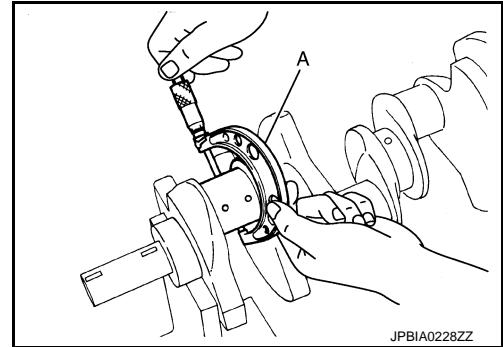


CRANKSHAFT PIN JOURNAL DIAMETER

- Measure the outer diameter of crankshaft pin journal with a micrometer (A).

Standard : Refer to [EM-263, "Cylinder Block"](#).

- If it exceeds the standard, measure the connecting rod bearing oil clearance. Refer to "CONNECTING ROD BEARING OIL CLEARANCE".



CRANKSHAFT MAIN JOURNAL DIAMETER

- Measure the outer diameter of crankshaft main journals with a micrometer.

Standard : Refer to [EM-263, "Cylinder Block"](#).

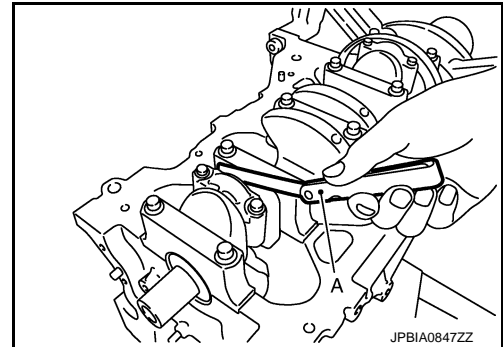
- If it exceeds the standard, measure the main bearing oil clearance. Refer to "MAIN BEARING OIL CLEARANCE".

CONNECTING ROD SIDE CLEARANCE

- Measure the side clearance between connecting rod and crankshaft arm with a feeler gauge (A).

Standard : Refer to [EM-263, "Cylinder Block"](#).

- If it exceeds the standard, replace connecting rod, and measure again. If it still exceeds the standard, also replace crankshaft.



CONNECTING ROD BIG END DIAMETER

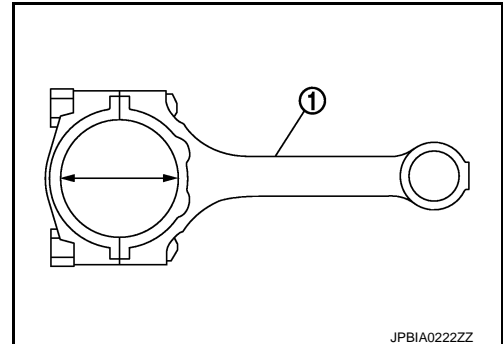
- Install connecting rod cap without connecting rod bearing installed, and tightening connecting rod cap bolts to the specified torque. Refer to [EM-235, "Disassembly and Assembly"](#).

① : Connecting rod

- Measure the inner diameter of connecting rod big end with an inside micrometer.

Standard : Refer to [EM-263, "Cylinder Block"](#).

- If it exceeds the standard, replace connecting rod assembly.



CONNECTING ROD BUSHING OIL CLEARANCE

Connecting Rod Bushing Inner Diameter

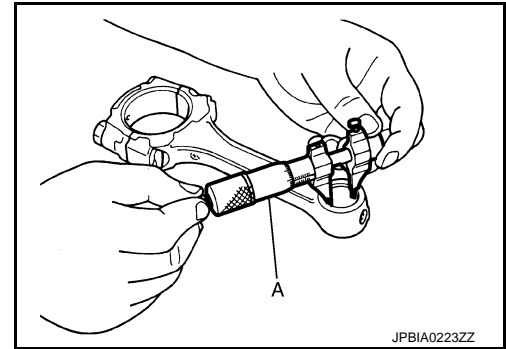
CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]

Measure the inner diameter of connecting rod bushing with an inside micrometer (A).

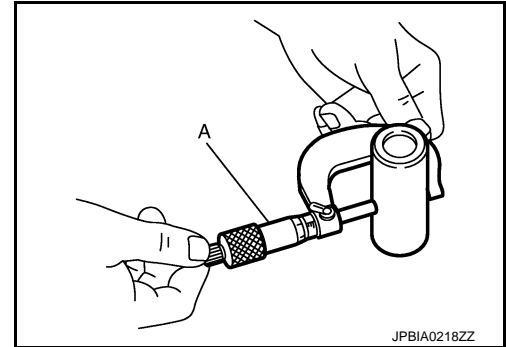
Standard : Refer to [EM-263, "Cylinder Block"](#).



Piston Pin Outer Diameter

Measure the outer diameter of piston pin with a micrometer (A).

Standard : Refer to [EM-263, "Cylinder Block"](#).

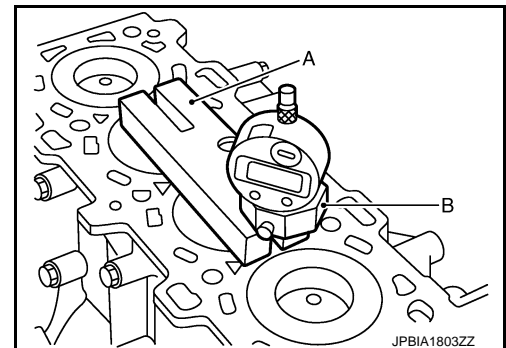


PISTON PROTRUSION

Measure the protrusion of piston with the following procedure:

1. Set piston at a point close to the TDC.
2. Set the dial indicator stand set [SST: KV113B0040 (Mot.251-01)] (B) and [SST: KV113B0050 (Mot.252-01)] (A) at the location as shown in the figure.
3. Set the indicator scale to "0" where the piston protrusion is maximized.
4. Move the dial indicator stand so that the tip of dial indicator can contact the cylinder block. Read the difference.

Standard : Refer to [EM-263, "Cylinder Block"](#).



5. If measured value is out of the standard, replace piston. Select a piston in "Piston Protrusion Grade".

Piston Protrusion Grade:

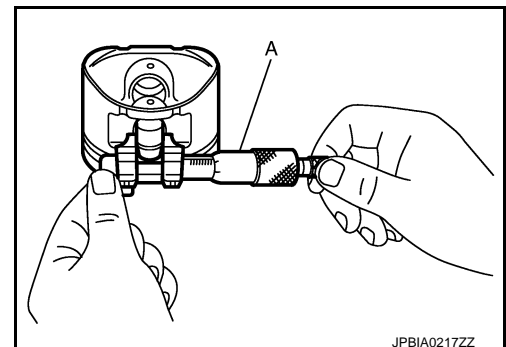
Refer to [EM-263, "Cylinder Block"](#).

PISTON TO PISTON PIN OIL CLEARANCE

Piston Pin Hole Diameter

Measure the inner diameter of piston pin hole with an inside micrometer (A).

Standard : Refer to [EM-263, "Cylinder Block"](#).



CYLINDER BLOCK

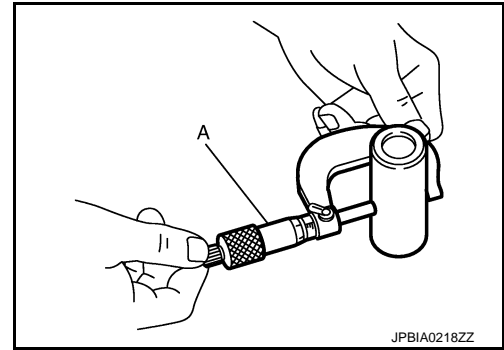
< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]

Piston Pin Outer Diameter

Measure the outer diameter of piston pin with a micrometer (A).

Standard : Refer to [EM-263, "Cylinder Block"](#).



PISTON RING SIDE CLEARANCE

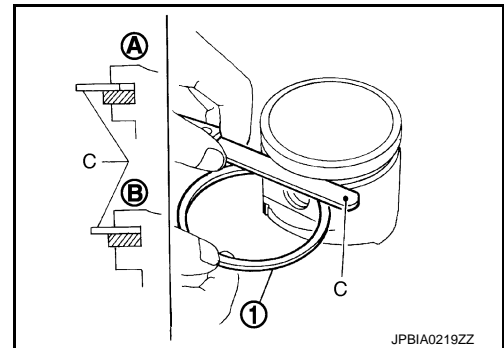
- Measure the side clearance of piston ring ① and piston ring groove with a feeler gauge (C).

Ⓐ : NG

Ⓑ : OK

Standard : Refer to [EM-263, "Cylinder Block"](#).

- If it exceeds the standard, replace piston ring, and measure again.
If it still exceeds the standard, also replace piston.



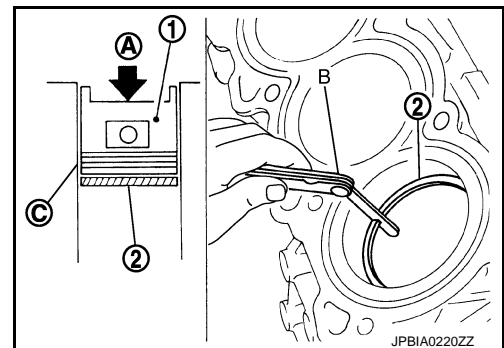
PISTON RING END GAP

- Check that cylinder bore inner diameter is within specification. Refer to "PISTON TO CYLINDER BORE CLEARANCE".
- Lubricate with new engine oil to piston ① and piston ring ②, and then insert Ⓐ piston ring until middle of cylinder with piston, and measure piston ring end gap with a feeler gauge (B).

Ⓒ : Measuring point

Standard : Refer to [EM-263, "Cylinder Block"](#).

- If it exceeds the standard, replace piston ring, and measure again.
If it still exceeds the standard, replace cylinder block and piston rings.



CYLINDER BLOCK TOP SURFACE DISTORTION

- Using a scraper, remove gasket on the cylinder block surface, and also remove engine oil, scale, carbon, or other contamination.

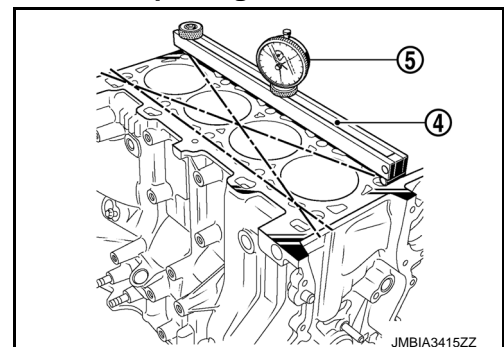
CAUTION:

Be careful not to allow gasket flakes to enter engine oil or engine coolant passages.

- Check using a ruler ④ and a dial gauge - support assembly ⑤ or a cylinder head rule and a set of feeler gauges the flatness of the gasket surfaces of the cylinder block:

Standard : Refer to [EM-263, "Cylinder Block"](#).

- If it exceeds the standard, replace cylinder block.



MAIN BEARING HOUSING INNER DIAMETER

- Install main bearing cap without main bearings installed, and tighten main bearing cap mounting bolts to the specified torque. Refer to [EM-235, "Disassembly and Assembly"](#).

CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]

- Measure the inner diameter of main bearing housing with a bore gauge.

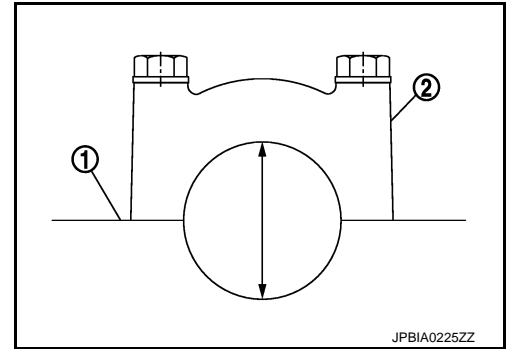
- ① : Cylinder block
② : Main bearing cap

Standard : Refer to [EM-263, "Cylinder Block"](#).

- If it exceeds the standard, replace cylinder block and main bearing caps assembly.

NOTE:

Main bearing caps cannot be replaced individually, because it is machined together with the cylinder block.



PISTON TO CYLINDER BORE CLEARANCE

Cylinder Bore Inner Diameter

- Using a bore gauge, measure the cylinder bore for wear, out-of-round and taper at six different points on each cylinder.

Standard:

Cylinder bore inner diameter

: Refer to [EM-263, "Cylinder Block"](#).

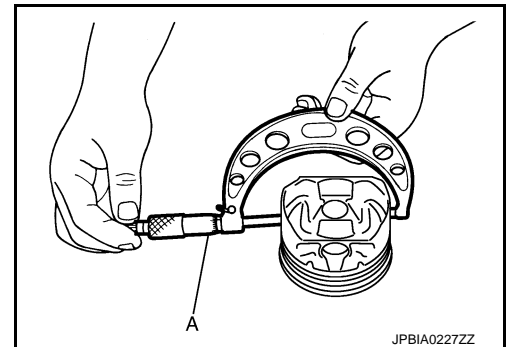
- If it exceeds the standard, or if there are scratches and/or seizure on the cylinder inner wall, replace cylinder block.

Piston Skirt Diameter

Measure the outer diameter of piston skirt with a micrometer (A).

Standard : Refer to [EM-263, "Cylinder Block"](#).

Measurepoint : Refer to [EM-263, "Cylinder Block"](#).



Piston to Cylinder Bore Clearance

Calculate by piston skirt diameter and cylinder bore inner diameter.

(Clearance) = (Cylinder bore inner diameter) – (Piston skirt diameter)

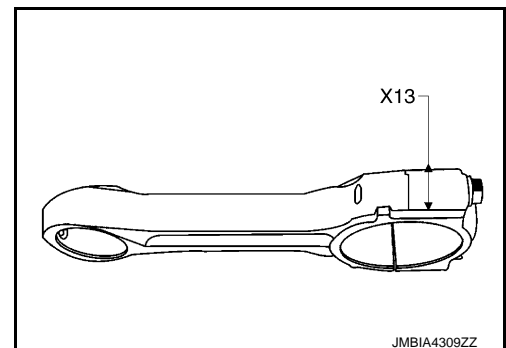
Standard : Refer to [EM-263, "Cylinder Block"](#).

- If it exceeds the standard, replace piston and piston pin assembly and/or cylinder block.

CONNECTING ROD THICKNESS

Measure using a external micrometer the thickness (X13) of the big end flank.

Standard : Refer to [EM-263, "Cylinder Block"](#).



CONNECTING ROD BEARING OIL CLEARANCE

CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]

Method of Using Plastigage

- Remove engine oil and dust on crankshaft pin and the surfaces of each bearing completely.
- Cut a plastigage slightly shorter than the bearing width, and place it in crankshaft axial direction, avoiding oil holes.
- Install connecting rod bearings to connecting rod and cap, and tighten connecting rod cap bolts to the specified torque. Refer to [EM-235, "Disassembly and Assembly"](#).

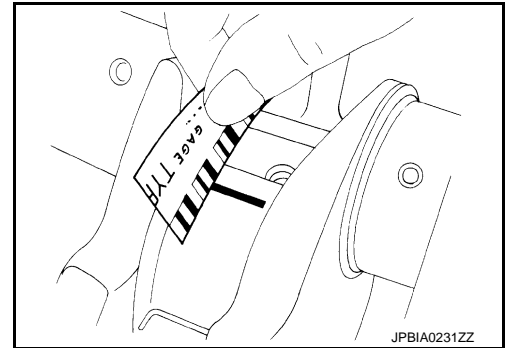
CAUTION:

Never rotate crankshaft.

- Remove connecting rod cap and bearing, and using the scale on the plastigage bag, measure the plastigage width.

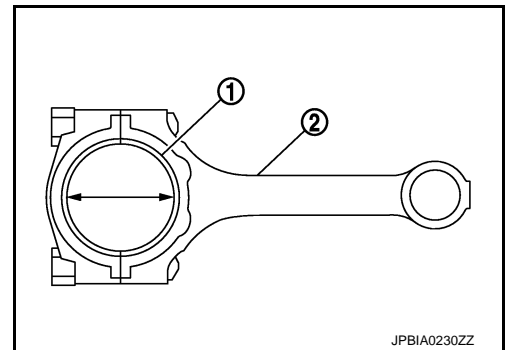
NOTE:

The procedure when the measured value exceeds the standard is the same as that described in "Method by Calculation".



Method by Calculation

- Install connecting rod bearings ① to connecting rod ② and connecting rod bearing cap, and tighten connecting rod cap bolts to the specified torque. Refer to [EM-235, "Disassembly and Assembly"](#).



MAIN BEARING OIL CLEARANCE

Method of Using Plastigage

- Remove engine oil and dust on crankshaft main journal and the surfaces of each bearing completely.
- Cut a plastigage slightly shorter than the bearing width, and place it in the crankshaft axial direction, avoiding oil holes.
- Install main bearings to cylinder block and main bearing cap, and tighten main bearing cap mounting bolts to the specified torque. Refer to [EM-235, "Disassembly and Assembly"](#).

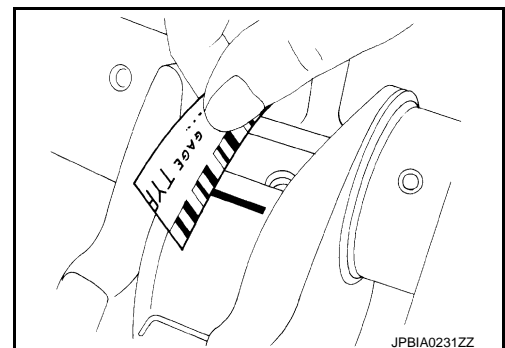
CAUTION:

Never rotate crankshaft.

- Remove main bearing cap and bearings, and using the scale on the plastigage bag, measure the plastigage width.

NOTE:

The procedure when the measured value exceeds the standard is the same as that described in "Method by Calculation".



HOW TO SELECT PISTON AND BEARING

< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]

HOW TO SELECT PISTON AND BEARING

Description

INFOID:0000000011999175

Selection points	Selection parts	Selection items	Selection methods
Between cylinder block and crankshaft	Main bearing	Main bearing grade (bearing thickness)	Determined by match of cylinder block bearing housing grade (inner diameter of housing) and crankshaft journal grade (outer diameter of journal)
Between crankshaft and connecting rod	Connecting rod bearing	Connecting rod bearing grade (bearing thickness)	Combining service grades for connecting rod big end diameter and crankshaft pin outer diameter determine connecting rod bearing selection
Between cylinder block and piston	Piston and piston pin assembly (piston is available together with piston pin as an assembly.)	Piston grade	Piston grade = Piston pin height

- The identification grade stamped on each part is the grade for the dimension measured in new condition. This grade cannot apply to reused parts.
- For reused or repaired parts, measure the dimension accurately. Determine the grade by comparing the measurement with the values of each selection table.
- For details of the measurement method of each part, the reuse standards and the selection method of the selective fitting parts, refer to the text.

Piston

INFOID:0000000011999176

PISTON IDENTIFICATION

- Piston marking

- ① : Date of manufacture
- ② : Piston pin height class
- ③ : Modification in production suffix
- ④ : Piston fitting direction (towards the flywheel or drive plate)
- ⑤ : Piston axis of symmetry
- ⑥ : Axis of the gudgeon pin hole

NOTE:

Piston pin height class which corresponds to the height between the piston pin and the piston crown.

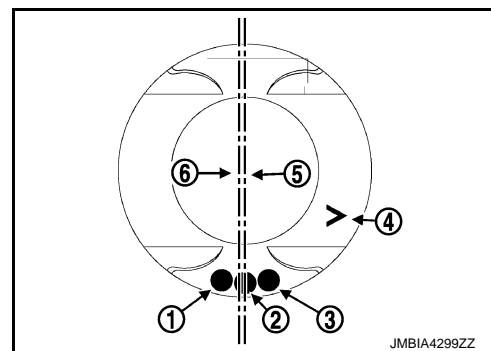
- Piston pin height class

NOTE:

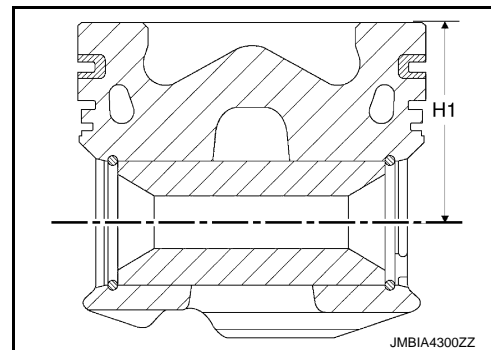
There are two types of piston

- Without piston pin bronze ring

H1 : Piston pin height



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HOW TO SELECT PISTON AND BEARING

< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]

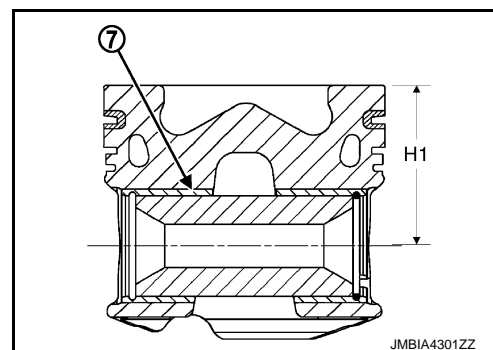
- With piston pin bronze ring

H1 : Piston pin height

⑦ : Piston pin bronze ring

NOTE:

The piston pin bronze ring cannot be replaced.



PISTON SELECTION TABLE

Piston protrusion grade : Refer to [EM-263, "Cylinder Block"](#)

Connecting Rod Bearing

INFOID:0000000011999177

CONNECTING ROD BEARING IDENTICATION

1. Apply connecting rod big end diameter grade stamped on connecting rod side face.

① : Big end diameter value

② : Day

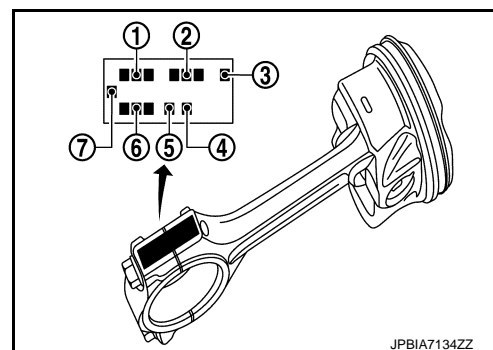
③ : Weighty class

④ : Year

⑤ : Team

⑥ : Centre to centre distance

⑦ : Class of centre to centre distance



Connecting rod big end diameter : Refer to [EM-263, "Cylinder Block"](#)

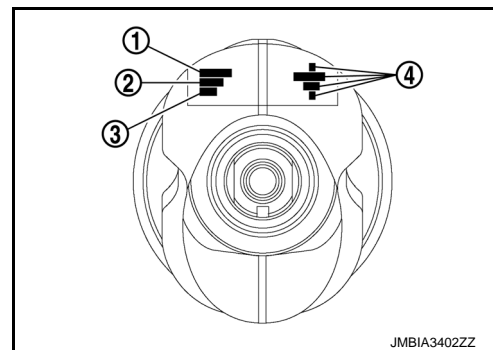
2. Apply crankshaft pin journal diameter grade stamped on crankshaft rear side.

① : Line indicating the diameter class of the journals.

② : Line indicating the diameter class of the crankpins.

③ : Last three numbers of the crankshaft part number.

④ : Line reserved for the factory.



Crankshaft pin journal diameter : Refer to [EM-263, "Cylinder Block"](#)

3. Apply the symbol obtained to the "Connecting Rod Bearing Selection Table" to select connecting rod bearing.

CONNECTING ROD BEARING SELECTION TABLE

Upper bearing shell

HOW TO SELECT PISTON AND BEARING

< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]

Big end diameter grade																					
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
Crankshaft pin grade	A	R				N															
	B	R						N													
	C	R								N											
	D	R										N									
	E	R												N							
	F	R													N						
	G	B	R													N					
	H	B			R													N			
	I	B				R													N		
	J	B						R													N
	K	B								R											
	L	B										R									
	M	B												R							
	N	B													R						
	O	J	B													R					
	P	J			B													R			
	Q	J				B													R		
	R	J						B													R
	S	J								B											
	T	J										B									
U	J												B								

- B: Blue
- R: Red
- J: Yellow
- N: Black

Lower bearing shell

HOW TO SELECT PISTON AND BEARING

< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]

Big end diameter grade																								
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U		
Cr an ksh aft pin gra de	A	R			B									J										
	B	R			B									J										
	C	R				B									J									
	D	R					B									J								
	E	R					B									J								
	F	R						B									J							
	G	R							B									J						
	H	R								B									J					
	I	R								B									J					
	J	N	R								B									J				
	K	N		R								B									J			
	L	N		R								B									J			
	M	N			R									B									J	
	N	N				R									B									J
	O	N				R									B									J
	P	N					R									B								
	Q	N						R									B							
	R	N							R									B						
	S	N							R									B						
	T	N								R									B					

- B: Blue
- R: Red
- J: Yellow
- N: Black

Main Bearing

INFOID:0000000011999178

MAIN BEARING INDETIFICATION

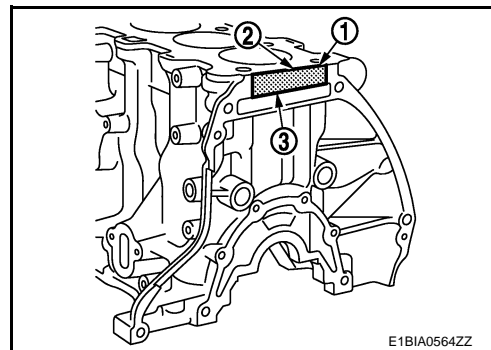
1. "Cylinder Block Bearing Diameter Table" rows correspond to main bearing housing grade on rear side of cylinder block.

- ① : Cylinder block bearing diameter category
- ② : Cylinder diameter category
- ③ : Marking only for factory use

NOTE:

Cylinder block bearing diameter category

- Identification by letter of the crankshaft bearing diameter.
- The order of the marking letters goes from the bearing on the timing end to the bearing on the flywheel end.



HOW TO SELECT PISTON AND BEARING

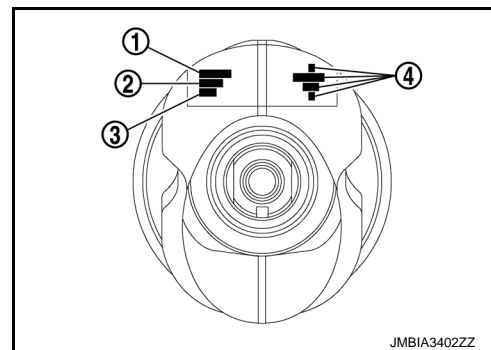
< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]

2. Apply crankshaft journal diameter grade stamped on crankshaft as shown in the figure.

- ① : Line indicating the diameter class of the journals.
- ② : Line indicating the diameter class of the crankpins.
- ③ : Last three numbers of the crankshaft part number.
- ④ : Line reserved for the factory.

Crankshaft journal diameter : Refer to [EM-263, "Cylinder Block"](#)



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CYLINDER BLOCK BEARING DIAMETER TABLE

Unit: mm (in)

Cylinder block bearing diameter category	Cylinder diameter category
A	≥ 63.9975 to < 63.9985 (≥ 2.51958 to < 2.51962)
B	≥ 63.9985 to < 63.9995 (≥ 2.51962 to < 2.51966)
C	≥ 63.9995 to < 64.0005 (≥ 2.51996 to < 2.51969)
E	≥ 64.0005 to < 64.0015 (≥ 2.51969 to < 2.51973)
H	≥ 64.0015 to < 64.0025 (≥ 2.51973 to < 2.51977)
J	≥ 64.0025 to < 64.0035 (≥ 2.51977 to < 2.51981)
K	≥ 64.0035 to < 64.0045 (≥ 2.51981 to < 2.51985)
L	≥ 64.0045 to < 64.0055 (≥ 2.51985 to < 2.51989)
M	≥ 64.0055 to < 64.0065 (≥ 2.51989 to < 2.51993)
P	≥ 64.0065 to < 64.0075 (≥ 2.51993 to < 2.51997)
S	≥ 64.0075 to < 64.0085 (≥ 2.51997 to < 2.52001)
T	≥ 64.0085 to < 64.0095 (≥ 2.52001 to < 2.52005)
U	≥ 64.0095 to < 64.0105 (≥ 2.52005 to < 2.52009)
Z	≥ 64.0105 to < 64.0115 (≥ 2.52009 to < 2.52013)

MAIN BEARING SELECTION TABLE

Upper bearing shell

HOW TO SELECT PISTON AND BEARING

< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]

Cylinder block bearing diameter grade																	
		A	B	C	E	H	J	K	L	M	P	S	T	U	Z		
Crank shaft journal diameter grade	A	R		N													
	B	R			N												
	C	R				N											
	D	R					N										
	E	R						N									
	F	R							N								
	G	R								N							
	H	R									N						
	I	B		R									N				
	J	B			R								N				
	K	B				R											N
	L	B					R										
	M	B						R									
	N	B							R								
	O	B								R							
	P	B									R						
	Q	J		B									R				
	R	J			B								R				
	S	J				B											R
	T	J					B										
	U	J						B									

- B: Blue
- R: Red
- J: Yellow
- N: Black

Lower bearing shell

HOW TO SELECT PISTON AND BEARING

< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]

Cylinder block bearing diameter grade																
		A	B	C	E	H	J	K	L	M	P	S	T	U	Z	
Crank shaft jour- nal di- amet- er grade	A	R						N								
	B	R							N							
	C	R								N						
	D	R										N				
	E	B		R									N			
	F	B			R									N		
	G	B				R										N
	H	B				R										
	I	B				R										
	J	B							R							
	K	B								R						
	L	B									R					
	M	J		B									R			
	N	J			B										R	
	O	J				B										R
	P	J						B								
	Q	J							B							
	R	J								B						
	S	J									B					
	T	J										B				
	U	J											B			

- B: Blue
- R: Red
- J: Yellow
- N: Black

SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[YS23DDT/YS23DDTT]

SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

General Specification

INFOID:0000000011999179

EM

GENERAL SPECIFICATIONS

Engine type	YS23DDT / YS23DDTT	
Cylinder arrangement	In-line 4	
Displacement	cm ³ (cu in)	2,299 (140.28)
Bore and stroke	mm (in)	85.0 x 101.0 (3.346 x 3.976)
Valve arrangement	DOHC	
Firing order	1-3-4-2	
Number of piston rings	Compression	2
	Oil	1
Compression ratio	15.5	

Drive Belts

INFOID:0000000011999180

DRIVE BELT

Tension of drive belt	Belt tensioning is not necessary, as it is automatically adjusted by drive belt auto-tensioner.
Tension of compressor belt	There are no adjustments of compressor belt.

Intake Manifold

INFOID:0000000011999181

INTAKE MANIFOLD

Unit: mm (in)

Items	Standard
Surface distortion	0.05 (0.0020)

Exhaust Manifold

INFOID:0000000011999182

EXHAUST MANIFOLD

Unit: mm (in)

Items	Standard
Surface distortion	0.7 (0.028)

Camshaft

INFOID:0000000011999184

CAMSHAFT

Unit: mm (in)

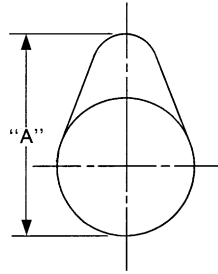
Items	Standard	Limit
Camshaft runout [TIR*]	0.05 (0.002)	—
Camshaft sprocket runout [TIR*]	—	0.15 (0.0059)
Camshaft end play	0.08 - 0.18 (0.0031 - 0.0071)	—
Camshaft journal diameter	24.98 - 25.0 (0.9835 - 0.9846)	—
Crankshaft radial play	0.04 - 0.08 (0.0016 - 0.0031)	—

SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[YS23DDT/YS23DDTT]

Items	Standard	Limit
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SEM671

Cam height "A"	Intake / Exhaust	39.03 - 39.13 (1.5366 - 1.5405)
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*: Total indicator reading

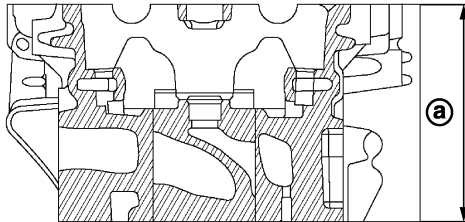
Cylinder Head

INFOID:0000000011999185

CYLINDER HEAD

Unit: mm (in)

Items	Standard
Head surface distortion	0.05 (0.0020)

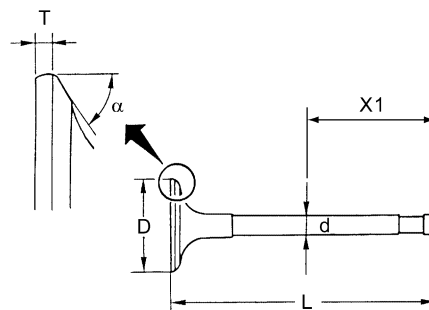


JPBIA0792ZZ

Normal cylinder head height "a"	132.5 (5.22)
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VALVE DIMENSIONS

Unit: mm (in)



JSBIA6458ZZ

Item	Standard
Valve head diameter "D"	Intake 27.58 - 27.82 (1.0858 - 1.0953)
	Exhaust 25.88 - 26.12 (1.0189 - 1.0283)
Valve length "L"	Intake 103.89 (4.090)
	Exhaust 103.78 (4.086)

SERVICE DATA AND SPECIFICATIONS (SDS)

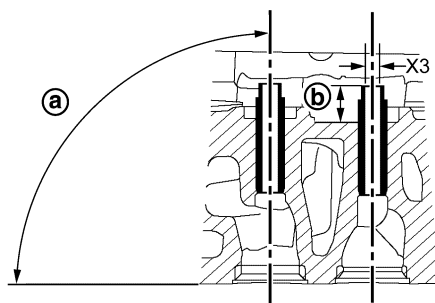
< SERVICE DATA AND SPECIFICATIONS (SDS)

[YS23DDT/YS23DDTT]

Valve stem diameter "d"	Intake	5.970 - 5.990 (0.2350 - 0.2358)
	Exhaust	5.960 - 5.980 (0.2346 - 0.2354)
Measuring point "X1"		35.0 (1.378)
Valve seat angle "α"		45° - 45°15'
Valve margin "T"	Intake	1.1(0.043)
	Exhaust	0.94 (0.037)
Valve lift amount		8.0 (0.315)

VALVE GUIDE

Unit: mm (in)



JSBIA6459ZZ

Items			Standard
Valve guide	Inner diameter (X3)		6.00 - 6.02 (0.2362 - 0.2370)
Valve guide clearance		Intake	0.02 - 0.06 (0.0008 - 0.0024)
		Exhaust	0.03 - 0.07 (0.0012 - 0.0028)
Valve guide angle "Ⓐ"			90°

VALVE SPRING

Unit: mm (in)

Free height		46.70 (1.8390)
Pressure height	200 - 220 N (20.4 - 22.4 kg, 45 - 49 lb)	34.90 (1.3740)
	353 - 387 N (36.0 - 39.5 kg, 79 - 87 lb)	26.90 (1.0591)
Diameter of the wire		2.78 - 2.82 (0.1094 - 0.1110)
Inner diameter		13.90 - 14.30 (0.5472 - 0.5630)
Outer diameter		19.50 - 19.90 (0.7677 - 0.7835)
Valve spring squareness		1.2 (0.047)

Cylinder Block

INFOID:0000000011999186

CRANKSHAFT

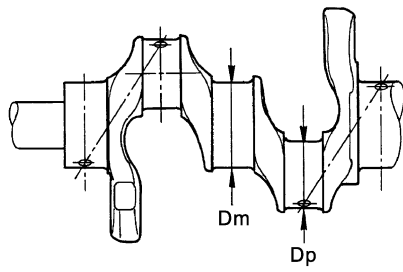
SERVICE DATA AND SPECIFICATIONS (SDS)

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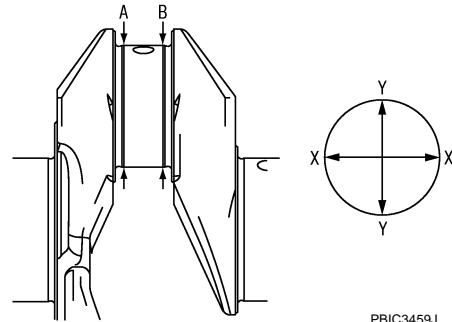
[YS23DDT/YS23DDTT]

Unit: mm (in)

Item	Standard
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E1BIA0067ZZ



PBIC3459J

Crankshaft main journal diameter "Dm"	GRADE mark A	55.985 (2.2041)
	GRADE mark B	55.986 (2.2042)
	GRADE mark C	55.987 (2.2042)
	GRADE mark D	55.988 (2.2042)
	GRADE mark E	55.989 (2.2043)
	GRADE mark F	55.990 (2.2043)
	GRADE mark G	55.991 (2.2044)
	GRADE mark H	55.992 (2.2044)
	GRADE mark I	55.993 (2.2044)
	GRADE mark J	55.994 (2.2045)
	GRADE mark K	55.995 (2.2045)
	GRADE mark L	55.996 (2.2046)
	GRADE mark M	55.997 (2.2046)
	GRADE mark N	55.998 (2.2046)
	GRADE mark O	55.999 (2.2047)
	GRADE mark P	56.000 (2.2047)
	GRADE mark Q	56.001 (2.2048)
	GRADE mark R	56.002 (2.2048)
	GRADE mark S	56.003 (2.2048)
	GRADE mark T	56.004 (2.2049)
	GRADE mark U	56.005 (2.2049)
Crankshaft pin journal diameter "Dp"		52.000 - 52.020 (2.0472 - 2.0480)
Crankshaft end play		0.05 - 0.70 (0.002 - 0.028)
Crankshaft for deformation		Less than 0.03 (0.0012)
Concentricity of the crankshaft journal		Less than 0.02 (0.0008)

CONNECTING ROD

Unit: mm (in)

Item	Standard
Center distance (big end and small end)	157.23 - 157.27 (6.1901 - 6.1917)

SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

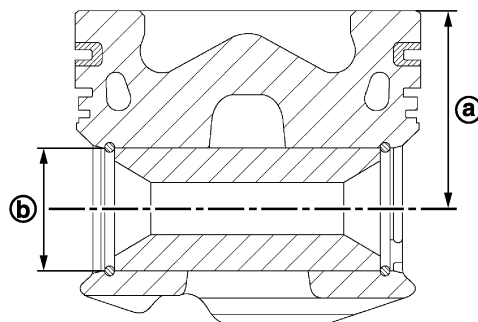
[YS23DDT/YS23DDTT]

Item	Standard
Connecting rod big end diameter	GRADE mark A 55.581 (2.1882)
	GRADE mark B 55.582 (2.1883)
	GRADE mark C 55.583 (2.1883)
	GRADE mark D 55.584 (2.1883)
	GRADE mark E 55.585 (2.1884)
	GRADE mark F 55.586 (2.1884)
	GRADE mark G 55.587 (2.1885)
	GRADE mark H 55.588 (2.1885)
	GRADE mark I 55.589 (2.1885)
	GRADE mark J 55.590 (2.1886)
	GRADE mark K 55.591 (2.1886)
	GRADE mark L 55.592 (2.1887)
	GRADE mark M 55.593 (2.1887)
	GRADE mark N 55.594 (2.1887)
	GRADE mark O 55.595 (2.1888)
	GRADE mark P 55.596 (2.1888)
	GRADE mark Q 55.597 (2.1889)
	GRADE mark R 55.598 (2.1889)
	GRADE mark S 55.599 (2.1889)
	GRADE mark T 55.600 (2.1890)
Connecting rod bushing end diameter	32.02 - 32.04 (1.1819 - 1.1827)
Connecting rod bushing end oil clearance	0.020 - 0.038 (0.0008 - 0.0015)
Connecting rod side clearance	0.021 - 0.48 (0.0083 - 0.0189)

PISTON PROTRUSION GRADE

Unit: mm (in)

Item	Standard
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Piston height "a"	Grade A	47.86 - 47.90 (1.8842 - 1.8858)
	Grade B	47.90 - 47.94 (1.8858 - 1.8874)
	Grade C	47.94 - 47.98 (1.8874 - 1.8890)
	Grade D	47.99 - 48.03 (1.8894 - 1.8909)
	Grade E	48.03 - 48.07 (1.8909 - 1.8952)
Piston pin hole diameter "b"		31.99 - 32.01 (1.2594 - 1.2604)
Piston to cylinder bore clearance		0.192 - 0.236 (0.0076 - 0.0093)

AVAILABLE PISTON

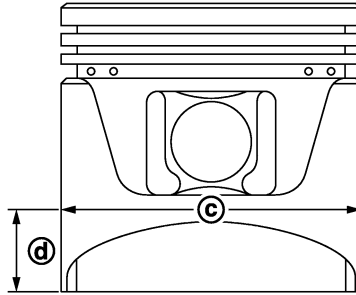
SERVICE DATA AND SPECIFICATIONS (SDS)

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[YS23DDT/YS23DDTT]

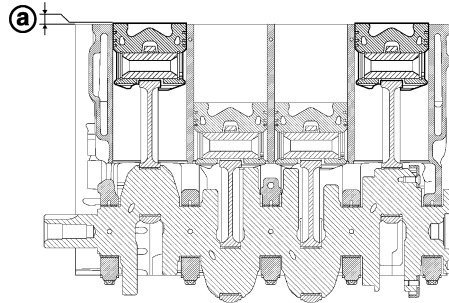
Unit: mm (in)

Item	Standard
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JP8IA0784ZZ

Piston skirt diameter "C"	84.79 - 84.80 (3.3382 - 3.3386)
Measure point "d"	44.0 (1.73)



JP8IA0640ZZ

Piston protrusion "a"	0.36 - 0.52 mm (0.0142 - 0.0205 in)
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PISTON RING

Unit: mm (in)

Items		Standard
Piston ring side clearance	Top	0.09 - 0.13 (0.0035 - 0.0051)
	2nd	0.03 - 0.07 (0.0012 - 0.0028)
	Oil ring	0.05 (0.002)
Piston ring end gap	Top	0.23 - 0.38 (0.0091 - 0.0150)
	2nd	0.60 - 0.80 (0.0236 - 0.0315)
	Oil ring	0.25 - 0.50 (0.0098 - 0.020)

PISTON PIN

Unit: mm (in)

Items	Standard
Length	65.7 - 24.15 (0.9390 - 0.9508)
Piston pin inner diameter	13.8 - 14.1 (0.543 - 0.555)
Piston pin outer diameter	31.99 - 32.01 (1.2594 - 1.2602)

CYLINDER BLOCK

Unit: mm (in)

Item	Standard
Cylinder block top surface distortion	0.05 (0.0020)
Cylinder bore inner diameter	59.998 - 60.012 (2.3621 - 2.3627)

SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[YS23DDT/YS23DDTT]

Cylinder block main bearing housing inner diameter	Grade mark A	59.9975 - 59.9985 (2.36210 - 2.36214)
	Grade mark B	59.9985 - 59.9995 (2.36214 - 2.36218)
	Grade mark C	59.9995 - 60.0005 (2.36218 - 2.36221)
	Grade mark E	60.0005 - 60.0015 (2.36221 - 2.36226)
	Grade mark H	60.0015 - 60.0025 (2.36226 - 2.36230)
	Grade mark J	60.0025 - 60.0035 (2.36230 - 2.36233)
	Grade mark K	60.0035 - 60.0045 (2.36233 - 2.36238)
	Grade mark L	60.0045 - 60.0055 (2.36238 - 2.36242)
	Grade mark M	60.0055 - 60.0065 (2.36242 - 2.36246)
	Grade mark P	60.0065 - 60.0075 (2.36246 - 2.36250)
	Grade mark S	60.0075 - 60.0085 (2.36250 - 2.36253)
	Grade mark T	60.0085 - 60.0095 (2.36253 - 2.36257)
	Grade mark U	60.0095 - 60.0105 (2.36257 - 2.36261)
	Grade mark Z	60.0105 - 60.0115 (2.36261 - 2.36265)

Main Bearing

INFOID:0000000011999187

MAIN BEARING GRADE TABLE

Unit: mm (in)

	Marking	Thickness	Identification color
Lower shell bearing	7943R	1.989 (0.0783)	Black
	6716R	1.984 (0.0781)	Red
	6129R	1.980 (0.0780)	Blue
	1323R	1.976 (0.0778)	Yellow
Upper shell bearing	8933R	1.987 (0.0782)	Black
	5724R	1.983 (0.0781)	Red
	5296R	1.979 (0.0779)	Blue
	2773R	1.975 (0.0778)	Yellow

PRECAUTION

PRECAUTIONS

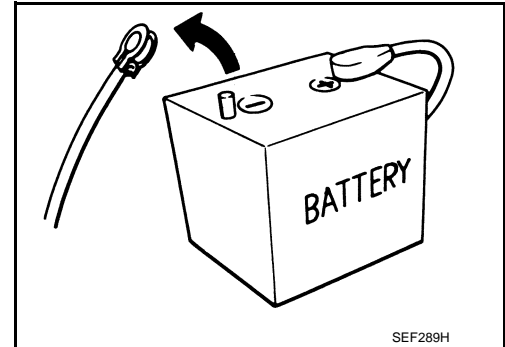
Precautions for Removing Battery Terminal

INFOID:0000000010591728

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.

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

INFOID:0000000010591719

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 "SUPPLEMENTAL RESTRAINT SYSTEM" and "SEAT BELTS" 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, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.
- Improper maintenance, 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 "SUPPLEMENTAL RESTRAINT SYSTEM".
- 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

PRECAUTIONS

[YD25DDTi]

< PRECAUTION >

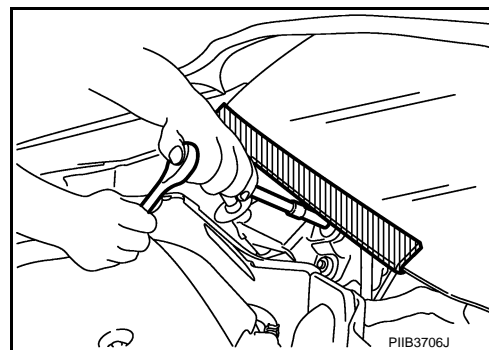
WARNING:

- 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, and wait at least 3 minutes before performing any service.

Precaution for Procedure without Cowl Top Cover

INFOID:0000000010591720

When performing the procedure after removing cowl top cover, cover the lower end of windshield with urethane, etc to prevent damage to windshield.



Precautions For Engine Service

INFOID:0000000010591721

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 and opening the engine, change engine oil and replace oil filter with a new one.

PRECAUTIONS

[YD25DDTi]

< PRECAUTION >

- 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.

Parts Requiring Angle Tightening

INFOID:0000000010591722

- Use an angle wrench [SST: KV10112100] for the final tightening of the following engine parts:
 - Cylinder head bolts
 - Main bearing cap bolts
 - Connecting rod cap nuts
 - Crankshaft pulley bolt (No angle wrench is required as the bolt flange is provided with notches for angle tightening)
- Do not use a torque value for final tightening.
- The torque value for these parts are for a preliminary step.
- Ensure thread and seat surfaces are clean and coated with engine oil.

Liquid Gasket

INFOID:0000000011014487

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.

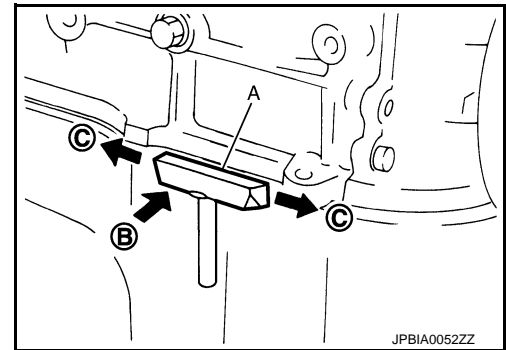
CAUTION:

Never damage the mating surfaces.

- Tap the seal cutter [SST: KV10111100] to insert it (B), and then slide it (C) 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.

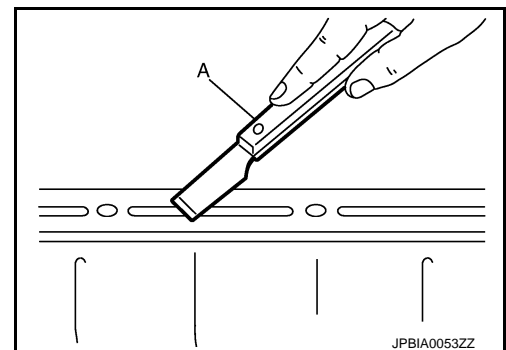
CAUTION:

If for some unavoidable reason tool such as a screwdriver is used, be careful not to damage the mating surfaces.

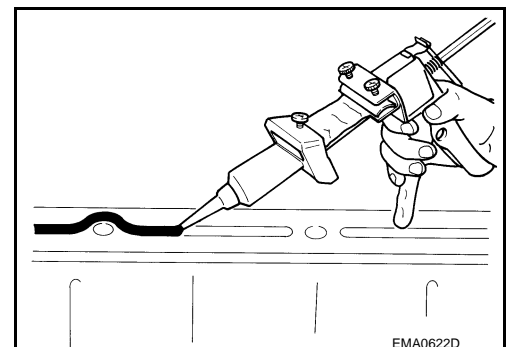


LIQUID GASKET APPLICATION PROCEDURE

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.



PRECAUTIONS

[YD25DDTi]

< PRECAUTION >

- As for bolt holes ②, normally apply liquid gasket inside the holes. Occasionally, it should be applied outside the holes. Check to read the text of this manual.

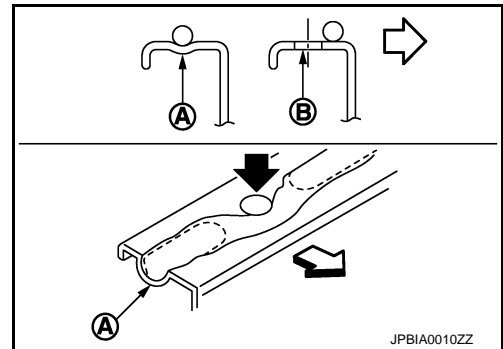
① : Groove

⇐ : 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.



A

EM

C

D

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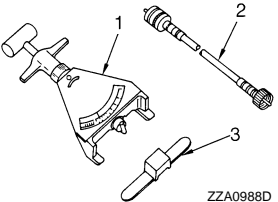
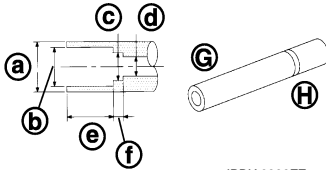
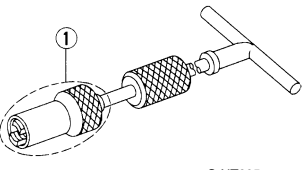
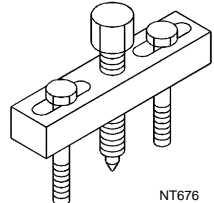
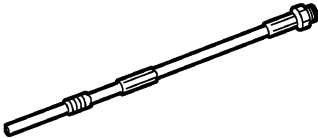
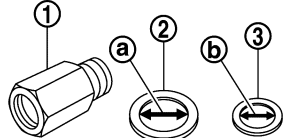
P

PREPARATION

PREPARATION

Special Service Tool

INFOID:000000010519149

Tool number Tool name		Description
KV99105600 Tension gauge set 1. Tension gauge 2. Remote cable 3. Master gauge		Power steering oil pump belt tension check
KV10115600 Valve oil seal drift		Installing valve oil seal Use side A (G). Unit: mm (in)
KV10107902 Valve oil seal puller ① KV10116100 Valve oil seal puller adapter		Removing valve oil seal
KV11103000 Pulley puller		Removing crankshaft pulley
KV11300QAM (RENAUT tool No.: Mot.1772) Compression gauge adapter		Connecting compression gauge and glow plug hole
KV111063S0 Adapter set ① KV11106310 Adapter ② KV11106320 Gasket ③ KV11106330 Gasket		Connecting compression gauge and compression gauge adapter a : φ 16.2 mm (0.64 in) b : φ 13.1 mm (0.52 in)

PREPARATION

[YD25DDTi]

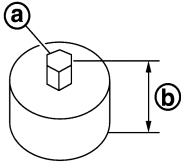
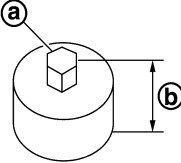
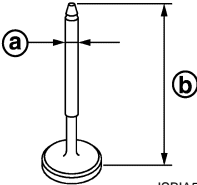
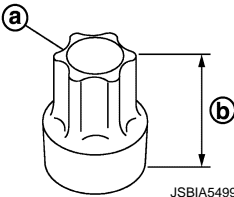
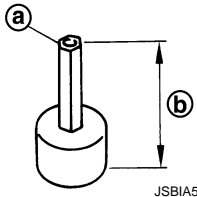
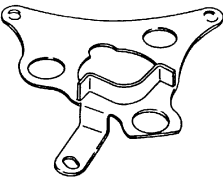
< PREPARATION >

Tool number Tool name		Description	
KV101056S0 Ring gear stopper ① KV10105630 Adapter ② KV10105610 Plate		Preventing crankshaft from rotating ①: 3 (0.12) ②: 6.4 (0.252) ③: 2.8 (0.110) ④: 6.6 (0.260) ⑤: 107 (4.21) ⑥: 14 (0.55) ⑦: 20 (0.79) ⑧: 14 (0.55) dia. Unit: mm (in)	A EM C
KV101151S0 Lifter stopper set ① KV10115110 Camshaft pliers ② KV10115120 Lifter stopper		Changing adjusting shim	D E
KV10116200 Valve spring compressor ① KV10115900 Attachment ② KV10109220 Adapter		Disassembling and assembling valve mechanism Part ① is a component of KV10116200 but Part ② is not so.	F G H
ST16610001 Pilot bushing puller		Removing pilot bushing	I J
KV10111100 Seal cutter		Removing oil pan (lower and upper), front and rear timing chain case, etc.	K L M
KV10112100 Angle wrench		Tightening bolts for connecting rod bearing cap, cylinder head, etc. at an angle	N O
EM03470000 Piston ring compressor		Installing piston assembly into cylinder bore	P

PREPARATION

[YD25DDTi]

< PREPARATION >

Tool number Tool name		Description
KV11106010 Hexagon wrench	 <p>JSBIA5496ZZ</p>	Removing and installing chain tensioner (a): 5 mm (0.20 in) (Face to face) (b): 20 mm (0.79 in)
KV11106020 Hexagon wrench	 <p>JSBIA5497ZZ</p>	Removing and installing slack guide (a): 6 mm (0.24 in) (Face to face) (b): 20 mm (0.79 in)
KV11106030 Positioning stopper pin	 <p>JSBIA5498ZZ</p>	Fixing fuel pump sprocket (a): 6 mm (0.24 in) dia. (b): 80 mm (3.15 in)
KV11106040 TORX wrench	 <p>JSBIA5499ZZ</p>	Removing and installing fuel pump sprocket nut (a): T70 (b): 26 mm (1.02 in)
KV11106050 Hexagonal wrench	 <p>JSBIA5500ZZ</p>	Removing and installing fuel pump sprocket (a): 6 mm (0.24 in) (Face to face) (b): 42 mm (1.65 in)
KV11106060 Sprocket holder	 <p>SBIA0225E</p>	Holding fuel pump sprocket

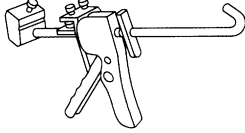
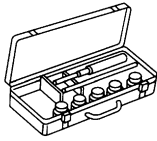
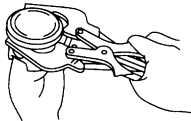
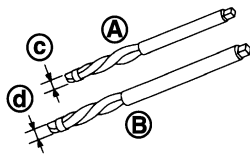
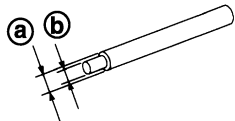
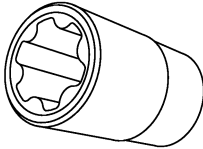
PREPARATION

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[YD25DDTi]

Commercial Service Tool

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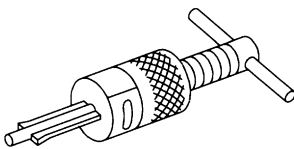
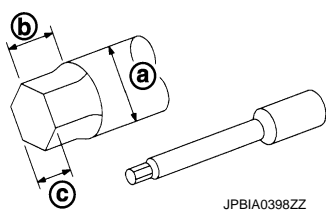
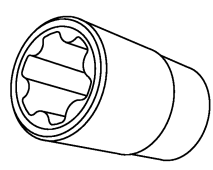

Tool name	Description
<p>Tube presser</p>  <p>NT052</p>	<p>Pressing the tube of liquid gasket</p>
<p>Valve seat cutter set</p>  <p>NT048</p>	<p>Finishing valve seat dimensions</p>
<p>Piston ring expander</p>  <p>NT030</p>	<p>Removing and installing piston ring</p>
<p>Valve guide reamer</p>  <p>JPBIA0401ZZ</p>	<p>Ⓐ: Reaming valve guide inner hole Ⓑ: Reaming hole for oversize valve guide Intake and Exhaust: Ⓒ: 6.0 mm (0.236 in) dia. Ⓓ: 10.2 mm (0.402 in) dia.</p>
<p>Valve guide drift</p>  <p>JPBIA0400ZZ</p>	<p>Removing and installing valve guide Intake and Exhaust: Ⓐ: 9.5 mm (0.374 in) dia. Ⓑ: 5.5 mm (0.217 in) dia.</p>
<p>TORX socket</p>  <p>NT807</p>	<p>Loosening and tightening fuel pump mounting bolt Size: E10</p>

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PREPARATION

< PREPARATION >

[YD25DDTi]

Tool name	Description
Pilot bushing puller	Removing pilot converter
 <p>NT045</p>	
Cylinder head bolt wrench	Loosening and tightening cylinder head bolt, and used with angle wrench [SST: KV10112100]
 <p>JPBIA0398ZZ</p>	<p>Loosening and tightening cylinder head bolt, and used with angle wrench [SST: KV10112100]</p> <p>Ⓐ: 13 (0.51) dia.</p> <p>Ⓑ: 12 (0.47)</p> <p>Ⓒ: 10 (0.39)</p> <p>Unit: mm (in)</p>
TORX socket	Loosening and tightening main bearing cap bolt
 <p>NT807</p>	<p>Loosening and tightening main bearing cap bolt</p> <p>Size: E14</p>
Pulley holder	Crankshaft pulley removing and installing
 <p>ZZA1010D</p>	

Sealant or/and Lubricant

INFOID:0000000011376238

Name	Description	Note
Three bond 1215	Cylinder block	Water drain plug
Three bond 1217H	<ul style="list-style-type: none"> • Rocker cover • Secondary timing chain • Camshaft • Cylinder head • Oil pan and oil strainer • Primary timing chain • Cylinder block 	—

BASIC INSPECTION

CAMSHAFT VALVE CLEARANCE

Inspection and Adjustment

INFOID:0000000010519151

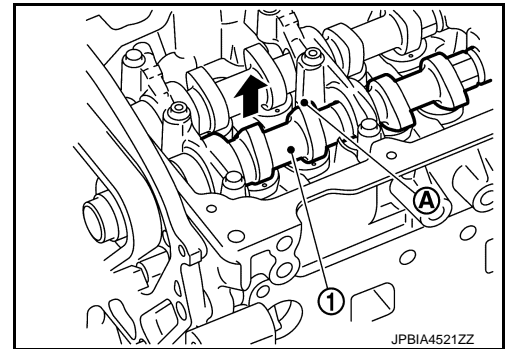
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INSPECTION

- When the camshaft or parts in connection with valves are removed or replaced, and a malfunction has occurred (poor starting, idling, or other malfunction) due to the miss adjustment of the valve clearance, inspect as follows.
- Inspect and adjust when the engine is cool (at normal temperature).

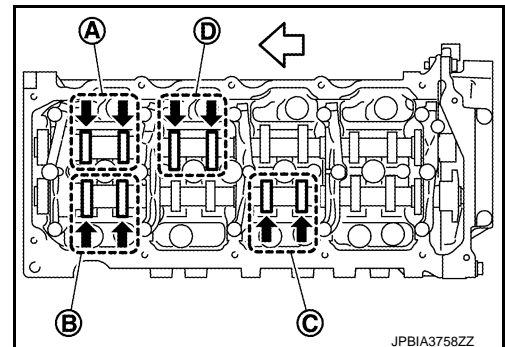
- Remove rocker cover. Refer to [EM-317, "Exploded View"](#).
- Remove fuel injector. Refer to [EM-312, "Exploded View"](#).
- Set the No. 1 piston to TDC on its compression stroke.
 - Turn crankshaft pulley clockwise so that the cam nose (A) on exhaust camshaft ① faces straight above (←). (No position indicator, etc. is provided on the crankshaft pulley.)



- While referring to the figure, measure the valve clearance marked in the table below.

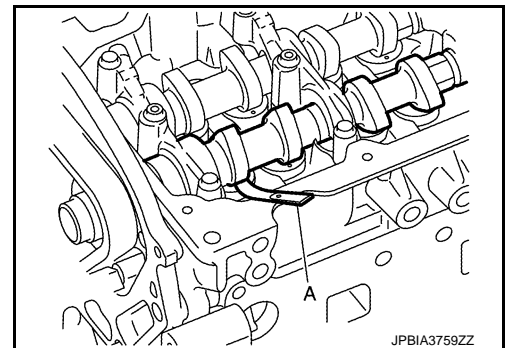
← : Engine front

Measuring position		No.1	No.2	No.3	No.4
No. 1 cylinder at compression TDC	INT	(A)	(D)		
	EXH	(B)		(C)	



NOTE:

Use a feeler gauge (A), measure the clearance between valve lifter and camshaft.



- Set the No. 4 cylinder at TDC by rotating the crankshaft clockwise once. (360 degrees)

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CAMSHAFT VALVE CLEARANCE

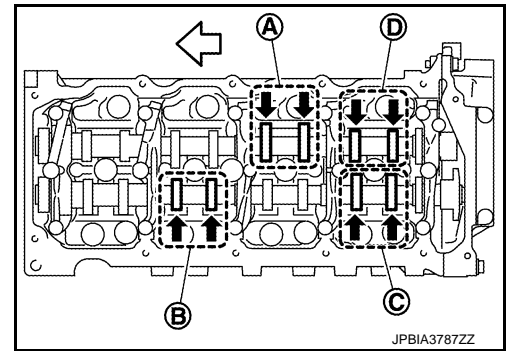
[YD25DDTi]

< BASIC INSPECTION >

6. While referring to the figure, measure the valve clearance marked in the table below.

↶ : Engine front

Measuring position		No.1	No.2	No.3	No.4
No. 4 cylinder at compression TDC	INT			(A)	(D)
	EXH		(B)		(C)

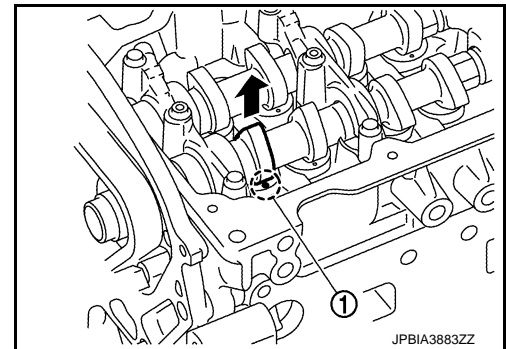


7. If the valve clearance is outside the specification, adjust as follows.

ADJUSTMENTS

- Remove adjusting shim for parts which are outside the specified valve clearance.
- Extract engine oil on the upper side of the cylinder head (for the air blowing in step 6).
 - Rotate crankshaft to face the camshaft for adjusting shims ① that are to be removed upward.

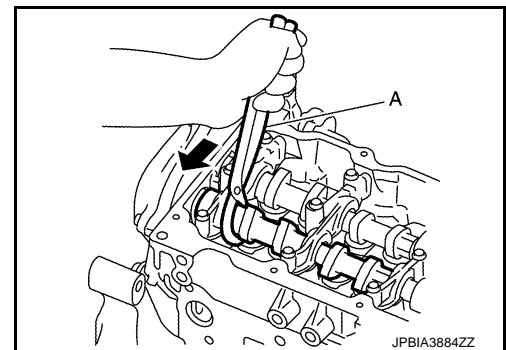
↶ : Facing straight above



- Grip camshaft with the camshaft pliers (A) [SST: KV10115110], then using camshaft as a support point, push adjusting shim downward to compress valve spring. Then move the camshaft pliers handle in the direction of arrow (↶).

CAUTION:

Never damage camshaft, cylinder head and the outer circumference of valve lifter.



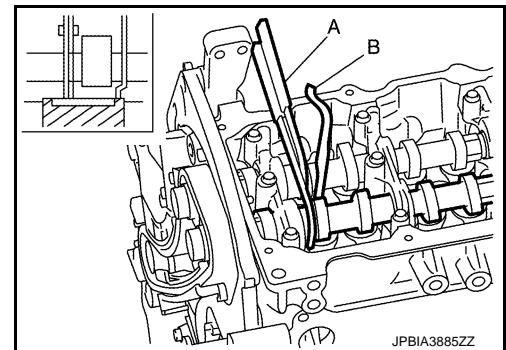
- With valve spring in a compressed state, remove the camshaft pliers (A) [SST: KV10115110] by securely setting the outer circumference of the valve lifter with the end of the lifter stopper (B) [SST: KV10115120].

NOTE:

Hold the lifter stopper by hand until the shim is removed.

CAUTION:

Never retrieve the camshaft pliers forcefully, as camshaft will be damaged.



- Move the round hole of adjusting shim to the front with the very thin screwdriver or like that.

NOTE:

When adjusting shim on valve lifter will not rotate smoothly, restart from step 3 to release the end of the lifter stopper [SST: KV10115120] from touching adjusting shim.

CAMSHAFT VALVE CLEARANCE

[YD25DDTi]

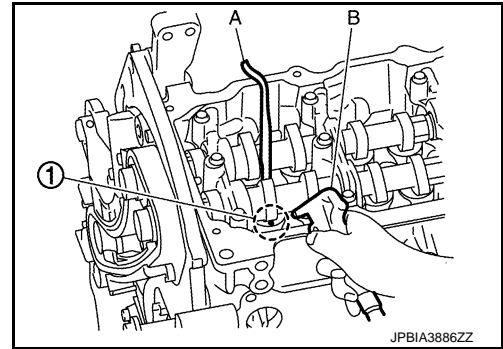
< BASIC INSPECTION >

- Remove adjusting shim from valve lifter by blowing air through the round hole ① of the adjusting shim with the air gun (B).

A : Lifter stopper

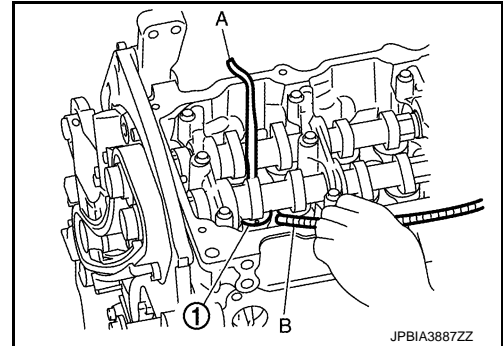
CAUTION:

To prevent any remaining engine oil from being blown around, thoroughly wipe the area clean and wear protective goggles.

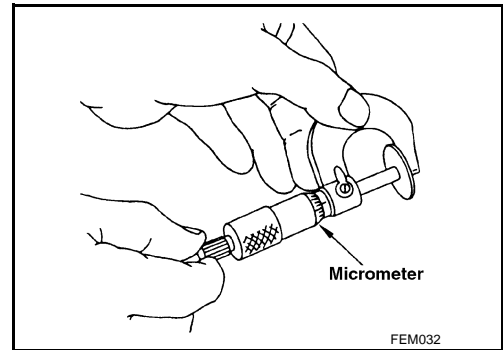


- Remove adjusting shim ① by using the magnet hand (B).

A : Lifter stopper



- Measure the thickness of adjusting shim using the micrometer.
 - Measure near the center of the shim (the part that touches camshaft).



- Select the new adjusting shim from the following methods.

Calculation method of the adjusting shim thickness:

R = Thickness of removed shim

N = Thickness of new shim

M = Measured valve clearance

Intake

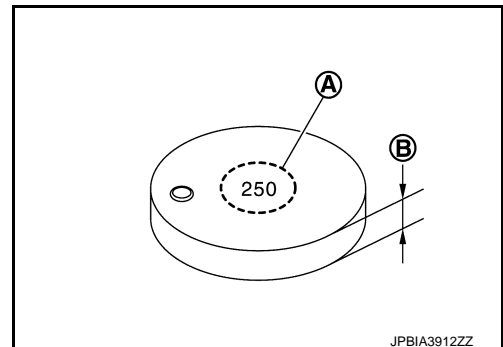
$$N = R + [M - 0.28 \text{ mm (0.0110 in)}]$$

Exhaust

$$N = R + [M - 0.30 \text{ mm (0.0118 in)}]$$

- New adjusting shims have the thickness stamped (A) on the rear side.
- Shims are available in 33 size from 2.10 mm (0.0827 in) to 2.74 mm (0.1079 in), in steps of 0.02 mm (0.0008 in). Refer to [EM-414, "Camshaft"](#).

(B) : Thickness



CAMSHAFT VALVE CLEARANCE

< BASIC INSPECTION >

[YD25DDTi]

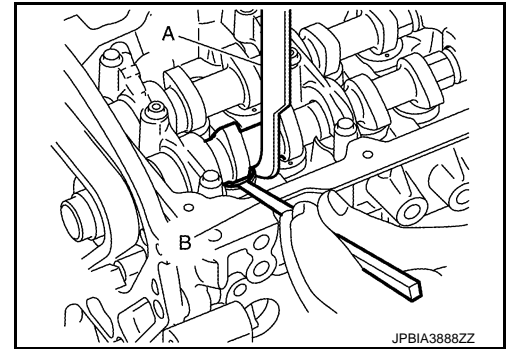
10. Fit the selected adjusting shim to valve lifter.

A : Lifter stopper

B : Suitable tool

CAUTION:

Place the stamped side of adjusting shim to valve lifter.



11. Compress valve spring using the camshaft pliers [SST: KV10115110] and remove the lifter stopper [SST: KV10115120].
12. Rotate crankshaft 2 to 3 turns by hand.
13. Confirm that the valve clearance is within the specification.
14. Install remaining parts in the reverse order of removal.
15. Warm up engine, and check for unusual noise and vibration.

COMPRESSION PRESSURE

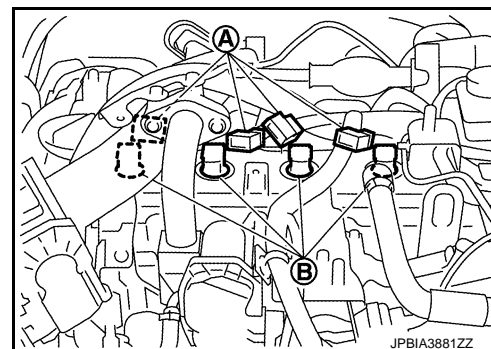
Inspection

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CHECKING COMPRESSION PRESSURE

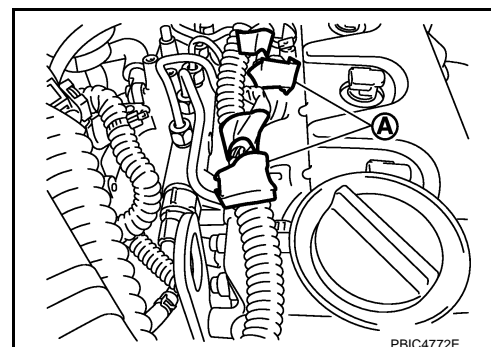
1. Warm up engine thoroughly. Then, stop it.
2. Using CONSULT, check no error codes are indicated for self-diagnosis items. Refer to [EC-549, "Work Flow"](#).
 - Do not disconnect CONSULT until the end of this operation, it will be used to check engine rpm and for error detection at the end of this operation.
3. Disconnect the battery cable from the negative terminal.
4. Remove the engine cover. Refer to [EM-290, "Exploded View"](#).
5. To prevent fuel from being injected during inspection, disconnect all the connectors of the fuel injector.

- Ⓐ : Connector
Ⓑ : Injector



6. Wind the insulating tape around the electrode of the disconnected connectors. Tie them together and fix them on the harness side.

- Ⓐ : Connector



7. Remove glow plugs from all the cylinders. Refer to [EM-311, "Exploded View"](#).

CAUTION:

 - Before removal, clean the surrounding area to prevent entry of any foreign materials into engine.
 - Carefully remove glow plugs to prevent any damage or breakage.
 - Handle with care to avoid applying any shock to glow plugs.

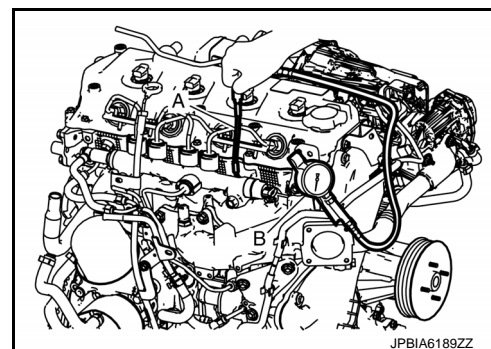
8. Install compression gauge adapter [SST: KV11300QAM (Mot.1772)] (A) to installation holes of glow plugs and connect compression gauge for diesel engine (Commercial service tools) (B).

NOTE:

If compression gauge for diesel engine cannot connect to the compression gauge adapter, use the adapter [SST: KV111063S0].

Compression gauge adapter

-  : 20 N·m (2.0 kg-m, 15 ft-lb)



9. Connect the battery cable to the negative terminal.
10. Turn ignition switch to "START" for cranking. When the gauge pointer stabilizes, read the compression pressure and engine rpm. Perform these steps to check each cylinder.

< BASIC INSPECTION >

- Always use a fully-charged battery to obtain specified engine speed.

Compression pressure : Refer to [EM-413, "General Specification"](#).

- When engine rpm is out of the specified range, check the specific gravity of battery liquid. Measure again under corrected conditions.
 - If engine rpm exceeds the limit, check valve clearance and combustion chamber components (valves, valve seats, cylinder head gaskets, piston rings, pistons, cylinder bores, cylinder block upper and lower surfaces) and measure again.
 - If compression pressure is low in some cylinders, apply engine oil from glow plug installation hole. Then check pressure again.
 - If compression pressure becomes normal after applying engine oil, piston ring may be worn or damaged. Check piston ring for malfunction. If any, replace piston ring.
 - If compression pressure is still low after applying engine oil, valve may be malfunctioning. Check valve for malfunction. If contact malfunction is found, replace valve or valve seat.
 - If compression pressure in adjacent two cylinders is low after applying engine oil, pressure may be leaking from gasket. In this case, replace cylinder head gasket.
11. Complete this operation as follows:
- a. Turn the ignition switch to "OFF".
 - b. Disconnect the battery cable from the negative terminal.
 - c. Install glow plug and install all the parts removed in step 4.
 - d. Connect all the connectors of the fuel injector.
 - e. Connect the battery cable to the negative terminal.
 - f. Check DTC. If DTC is displayed, erase it.

SYMPTOM DIAGNOSIS

NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

NVH Troubleshooting - Engine Noise

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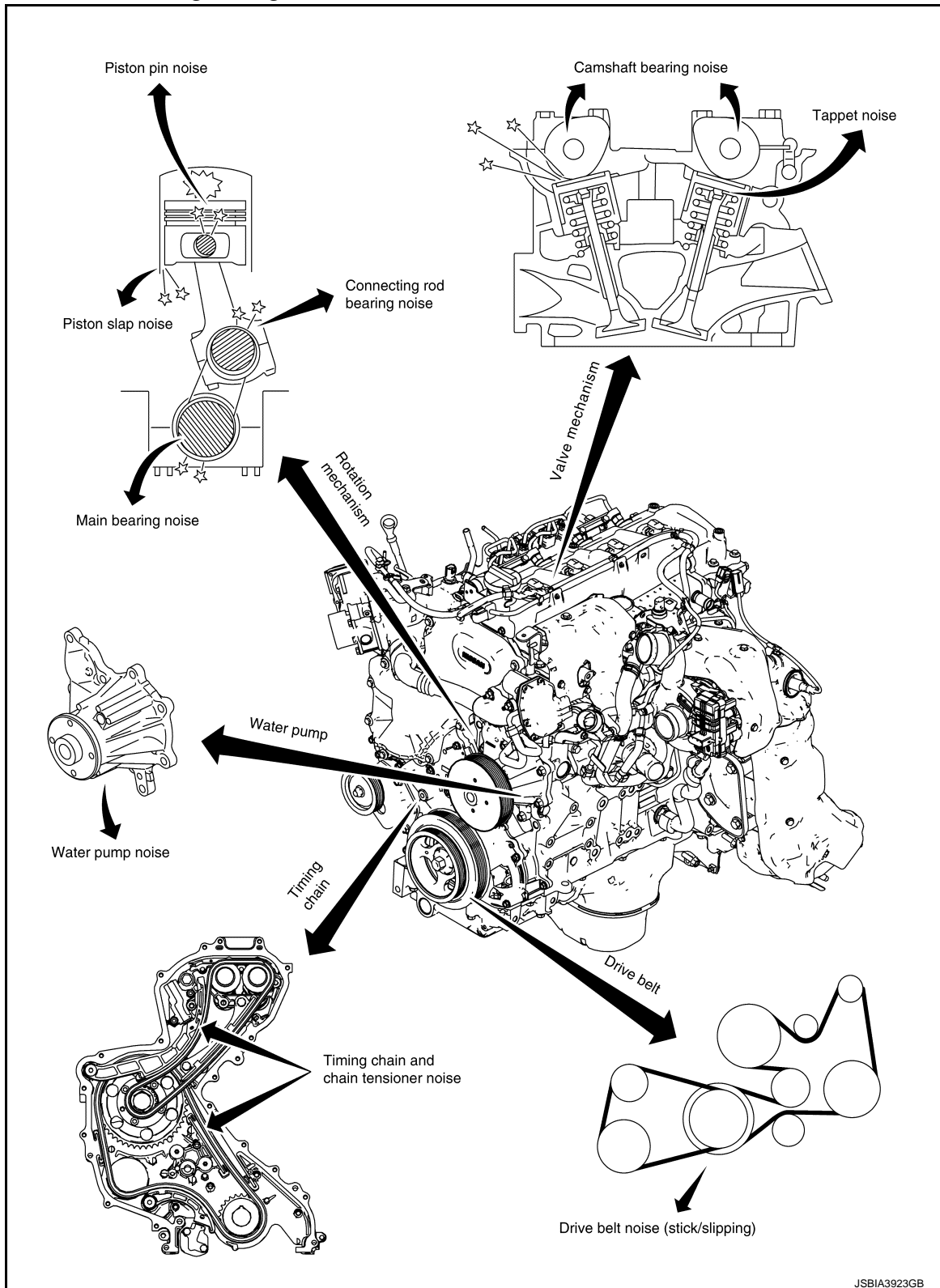
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NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

< SYMPTOM DIAGNOSIS >

[YD25DDTi]

Use the Chart Below to Help You Find the Cause of the Symptom

INFOID:000000010519434

1. Locate the area where noise occurs.
2. Confirm the type of noise.
3. Specify the operating condition of engine.
4. Check specified noise source.

If necessary, repair or replace these parts.

Location of noise	Type of noise	Operating condition of engine						Source of noise	Check item	Reference page
		Before warm-up	After warm-up	When starting	When idling	When racing	While driving			
Top of engine Rocker cover Cylinder head	Ticking or clicking	C	A	—	A	B	—	Tappet noise	Valve clearance	EM-277
	Rattle	C	A	—	A	B	C	Camshaft bearing noise	Camshaft oil clearance Camshaft runout	EM-337
Crankshaft pulley Cylinder block (Side of engine) Oil pan	Slap or knock	—	A	—	B	B	—	Piston pin noise	Piston to piston pin clearance Connecting rod bushing oil clearance	EM-397
	Slap or rap	A	—	—	B	B	A	Piston slap noise	Piston to cylinder bore clearance Piston ring side clearance Piston ring end gap Connecting rod bend and torsion	EM-397
	Knock	A	B	C	B	B	B	Connecting rod bearing noise	Connecting rod bushing oil clearance Connecting rod bearing oil clearance (Big end)	EM-397
	Knock	A	B	—	A	B	C	Main bearing noise	Main bearing oil clearance Crankshaft runout	EM-397
Front of engine Timing chain case	Tapping or ticking	A	A	—	B	B	B	Timing chain and chain tensioner noise	Timing chain cracks and wear Timing chain tensioner operation	*
Front of engine	Squeaking or fizzing	A	B	—	B	—	C	Drive belts (Sticking or slipping)	Drive belts deflection	EM-286
	Creaking	A	B	A	B	A	B	Drive belts (Slipping)	Idler pulley bearing operation	
	Squall Creak	A	B	—	B	A	B	Water pump noise	Water pump operation	CO-81

A: Closely related B: Related C: Sometimes related —: Not related

- *: Refer to the following list.
- Primary timing chain: Refer to [EM-369, "Inspection"](#).
- Secondary timing chain: Refer to [EM-324, "Inspection"](#).

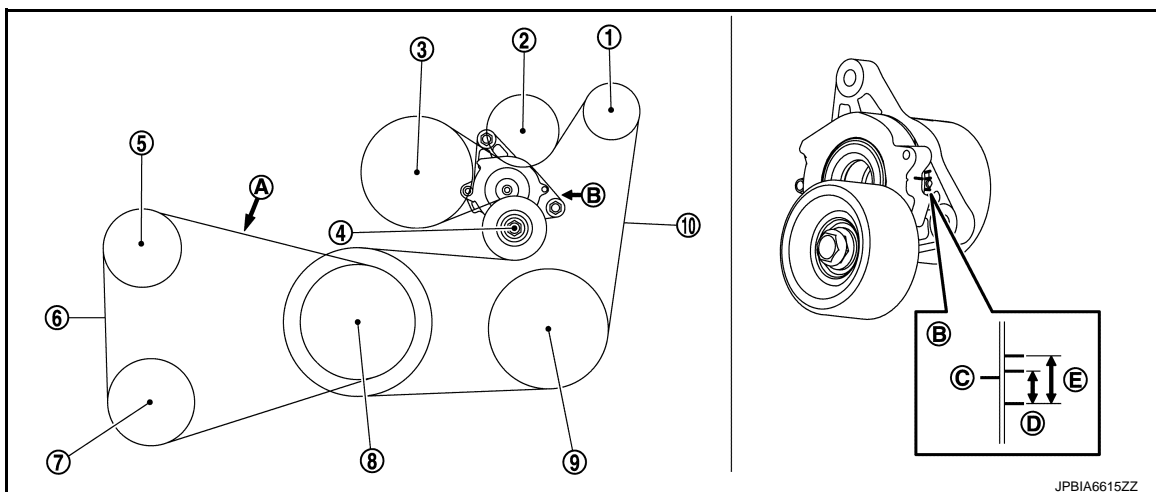
PERIODIC MAINTENANCE

DRIVE BELT

Exploded View

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|--|------------------------|--------------------------------|
| ① Alternator | ② Idler pulley | ③ Water pump |
| ④ Drive belt auto-tensioner | ⑤ Idler pulley | ⑥ Power steering oil pump belt |
| ⑦ Power steering oil pump | ⑧ Crankshaft pulley | ⑨ A/C compressor |
| ⑩ Drive belt | | |
| (A) Inspection position | (B) View (B) | (C) Indicator |
| (D) Range when new drive belt is installed | (E) Possible use range | |

Removal and Installation

INFOID:0000000010519437

REMOVAL

1. Remove the air duct. Refer to [EM-292, "Exploded View"](#).
2. Remove the power steering belt as per the following procedures:
 - Loosen idler pulley lock nut ①.

② : Adjusting bolt

- Loosen adjusting bolt, and remove power steering oil pump belt.

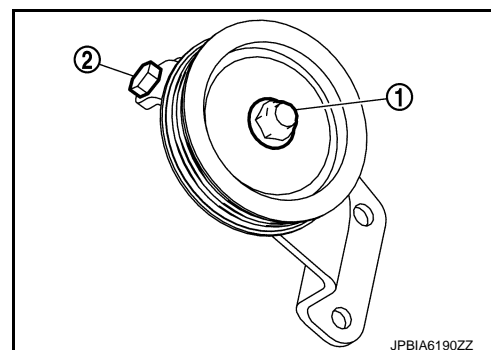
CAUTION:

Adjusting bolts are applied with grease. Never allow the grease to adhere to the belt.

3. Remove front under cover. Refer to [EXT-24, "Exploded View"](#).
4. Remove the radiator hose (lower) connector pipe mounting bolts. Refer to [CO-73, "Exploded View"](#).
5. Remove radiator fan shroud (lower). Refer to [CO-73, "Exploded View"](#).
6. Hold the hexagonal part in center of drive belt auto-tensioner pulley with a wrench securely. Then move the wrench handle in the loosening direction of drive belt (clockwise).

CAUTION:

- Avoid placing hand in a location where pinching may occur if the holding tool accidentally comes off.



DRIVE BELT

[YD25DDTi]

< PERIODIC MAINTENANCE >

- **Never loosen the hexagonal part in center of drive belt auto-tensioner pulley (Never turn it counterclockwise). If turned counterclockwise, the complete drive belt auto-tensioner must be replaced as a unit, including the pulley.**

7. Insert a stopper pin in diameter such as short-length screwdriver into the hole of the retaining boss to fix drive belt auto-tensioner pulley.

- Keep drive belt auto-tensioner pulley arm locked after drive belt is removed.

NOTE:

Use approximately 5.0 mm (0.20 in) dia. hard metal pin as a stopper pin.

INSTALLATION

1. Install drive belt.

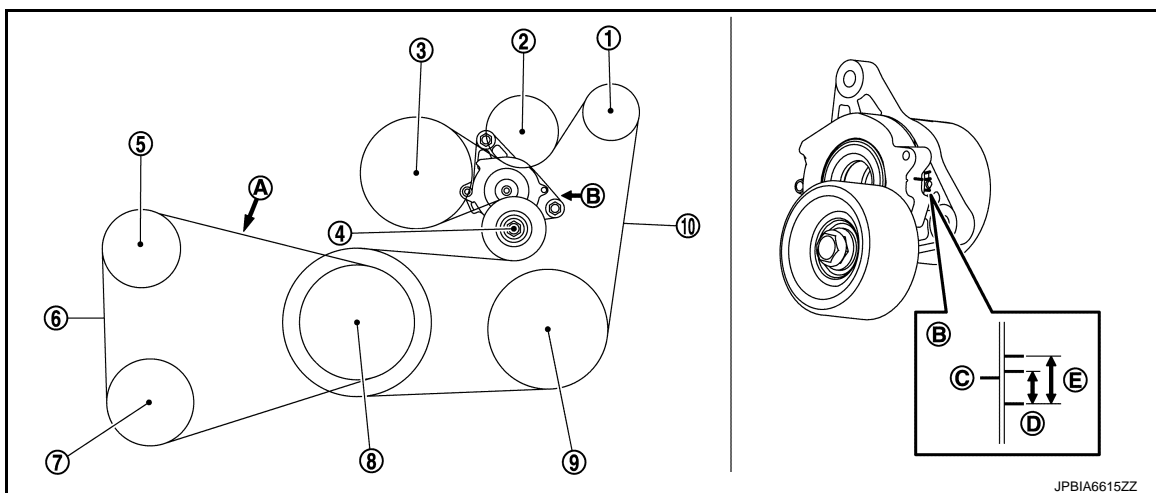
CAUTION:

- **Check that drive belt is completely set to pulleys.**
- **Check for engine oil, working fluid and engine coolant are not adhered to drive belt and each pulley groove.**

2. Release drive belt auto-tensioner, and apply tension to drive belt.
3. Install power steering oil pump belt.
4. Adjust belt tension. Refer to [EM-287, "Adjustment"](#).
5. Turn crankshaft pulley clockwise several times to equalize tension between each pulley.
6. Check that the indicator (notch on fixed side) of drive belt auto-tensioner is within the range when new drive belt is installed. Refer to [EM-286, "Inspection"](#).
7. Install in the reverse order of removal.

Inspection

INFOID:000000010519438



- | | | |
|--|----------------------|--------------------------------|
| ① Alternator | ② Idler pulley | ③ Water pump |
| ④ Drive belt auto-tensioner | ⑤ Idler pulley | ⑥ Power steering oil pump belt |
| ⑦ Power steering oil pump | ⑧ Crankshaft pulley | ⑨ A/C compressor |
| ⑩ Drive belt | | |
| Ⓐ Inspection position | Ⓑ View Ⓑ | Ⓒ Indicator |
| Ⓓ Range when new drive belt is installed | Ⓔ Possible use range | |

WARNING:

Be sure to perform this step when the engine is stopped.

DRIVE BELT

- Check that the indicator ③ (notch on fixed side) of drive belt auto-tensioner is within the possible use range ⑤.

NOTE:

DRIVE BELT

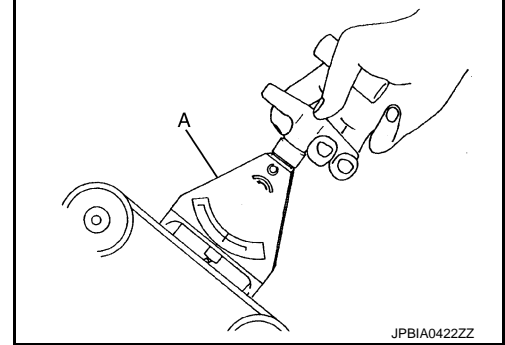
[YD25DDTi]

< PERIODIC MAINTENANCE >

- Check the drive belt auto-tensioner indication when the engine is cold.
- When new drive belt is installed, the indicator (notch on fixed side) should be within the range ① in the figure.
- Visually check entire drive belt for wear, damage or cracks.
- If the indicator (notch on fixed side) is out of the possible use range or belt is damaged, replace drive belt.

POWER STEERING OIL PUMP BELT

- Check the belt with the engine cold or after a lapse of 30 minutes or more after the engine is stopped.
- Measure belt tension at the position as shown in the figure with the tension gauge [SST: KV99105600] (A). If it is difficult to measure the tension at the position, then a nearby position can be measured.
- Apply the force of 98.1 N (10kg) at the position ① shown in the figure also when measuring by deflection amount.



CAUTION:

- To check belt tension right after belt installation, adjust belt tension to the reference value and rotate the crankshaft twice or more to prevent variations in the tension between pulleys. Measure belt tension again and adjust to the reference value.
- Tighten Idler pulley lock nut by hand and measure tension in backlash-free condition.

Auxiliary machine belt tension
Deflection amount of auxiliary
machine belt

: Refer to [EM-413, "Drive belt"](#).

Adjustment

INFOID:0000000010519439

Portion	Belt tightening method for adjustment
Drive belt	Belt tension is not necessary, as it is automatically adjusted by drive belt auto-tensioner.
Power steering oil pump belt	Adjusting bolt of idler pulley.

CAUTION:

- After replacing belt with a new one, adjust it to the value of "NEW" since new ones do not sufficiently fit in with pulley grooves.
- If the belt in use exceeds the value of "Limit of Retightening" adjust the belt to the value of "For Adjustment"
- To check belt tension right after belt installation, adjust belt tension to the reference value and rotate the crankshaft twice or more to prevent variations in the tension between pulleys. Measure belt tension again and adjust to the reference value.
- After installing belt, check that it is completely fit into the pulley groove.
- Never allow oil and coolant to adhere to the belt.
- Never twist or bend the belt.

POWER STEERING OIL PUMP BELT

1. Loosening idler pulley rock nut ①.

② : Adjusting bolt

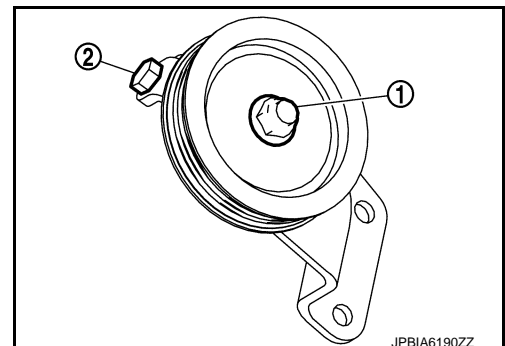
2. Adjust tension by turning adjusting bolt.

CAUTION:

Adjusting bolts are applied with grease. Never allow the grease to adhere to the belt.

- For adjustment value, refer to [EM-413, "Drive belt"](#).

3. Tightening idler pulley rock nut.



Tightening torque : Refer to [EM-291, "Exploded View"](#).

AIR CLEANER FILTER

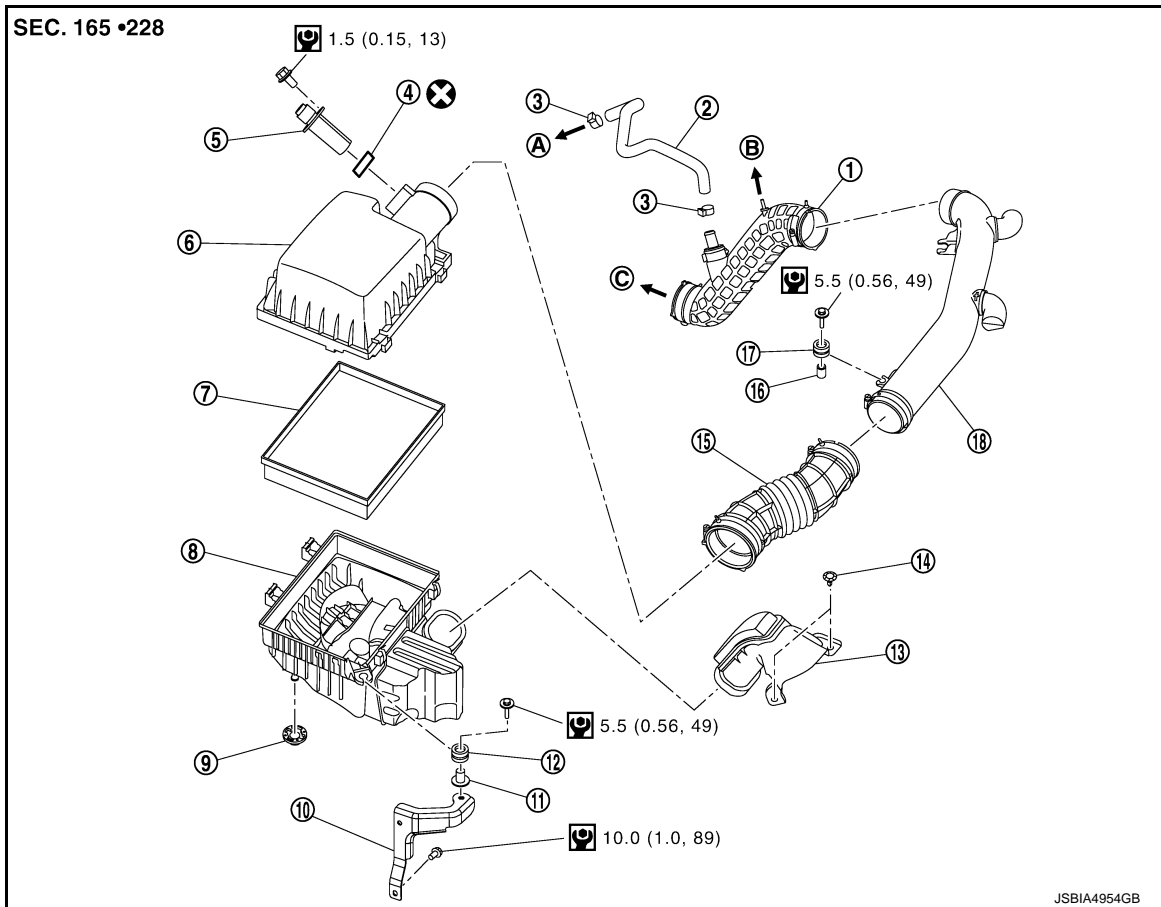
[YD25DDTi]

< PERIODIC MAINTENANCE >

AIR CLEANER FILTER

Exploded View

INFOID:000000010519440



- | | | |
|----------------------|---|----------------------------|
| ① Air duct | ② Blow-by hose | ③ Clamp |
| ④ Gasket | ⑤ Mass air flow sensor (with intake air temperature sensor 1) | ⑥ Air cleaner case (upper) |
| ⑦ Air cleaner filter | ⑧ Air cleaner case (lower) | ⑨ Mounting rubber |
| ⑩ Bracket | ⑪ Retainer | ⑫ Mounting rubber |
| ⑬ Air duct (inlet) | ⑭ Clip | ⑮ Air duct |
| ⑯ Retainer | ⑰ Mounting rubber | ⑱ Air duct |
| Ⓐ To rocker cover | Ⓑ To EGR cooler bypass valve control solenoid valve | Ⓒ To turbocharger |

⊗ : Always replace after every disassembly.

⌚ : N·m (kg-m, in-lb)

Removal and Installation

INFOID:000000010519441

REMOVAL

CAUTION:

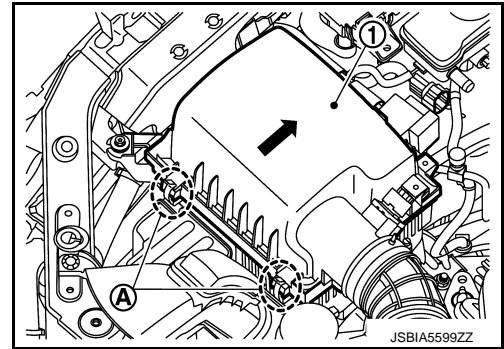
- Never shock mass air flow sensor.
- Never disassemble mass air flow sensor.
- Never touch mass air flow sensor element.

AIR CLEANER FILTER

[YD25DDTi]

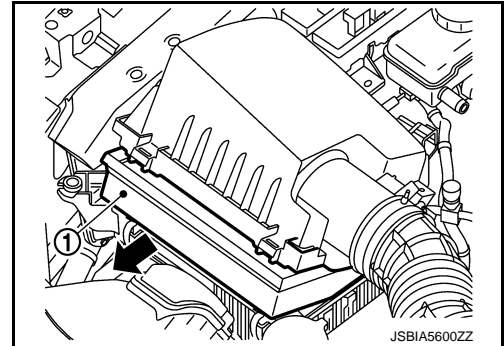
< PERIODIC MAINTENANCE >

1. Unhook clips ① and pull up the air cleaner case (upper) ① upward (←).



2. Remove air cleaner filter ① from the air cleaner case (lower).

← : Removing direction



INSTALLATION

Install in the reverse order of removal.

A

EM

C

D

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M

N

O

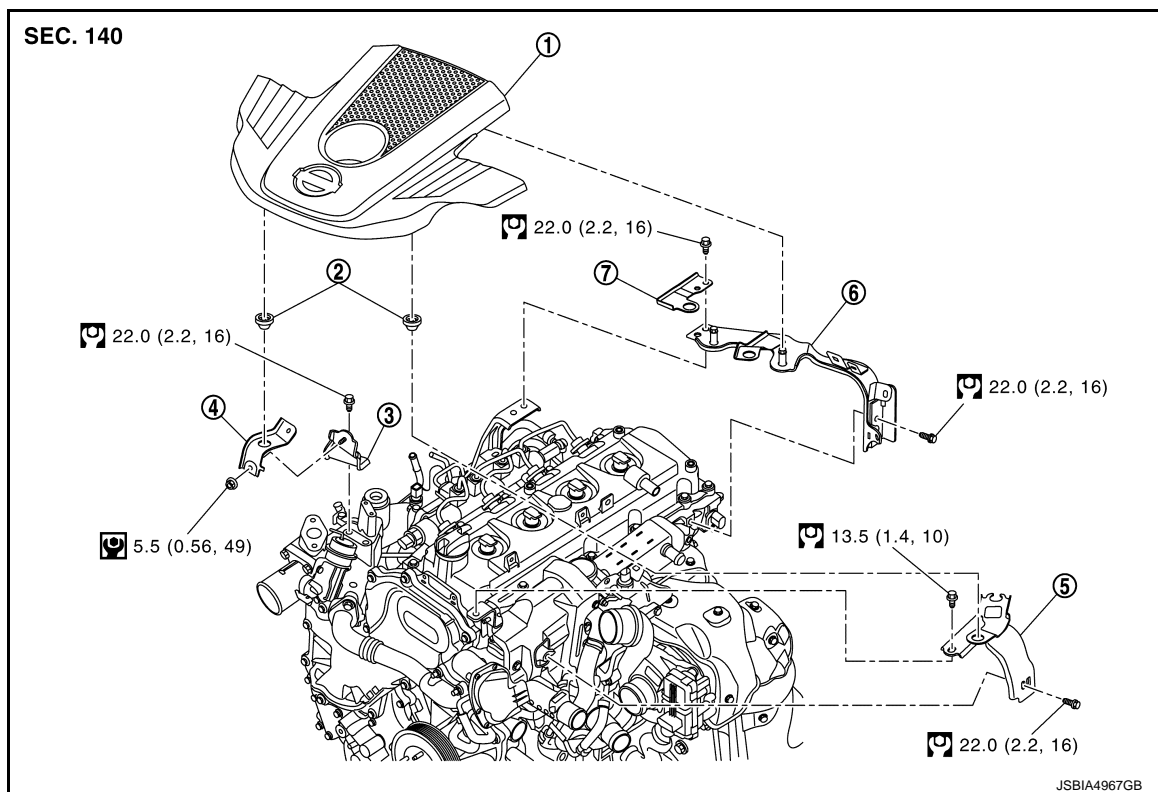
P

REMOVAL AND INSTALLATION

ENGINE COVER

Exploded View

INFOID:000000010519456



- | | | |
|---|-------------------|-----------|
| ① Engine cover (except for king cab low grade models) | ② Mounting rubber | ③ Bracket |
| ④ Bracket | ⑤ Bracket | ⑥ Bracket |
| ⑦ Bracket | | |

: N·m (kg-m, in-lb)

: N·m (kg-m, ft-lb)

Removal and Installation

INFOID:000000010519457

REMOVAL

Remove engine cover.

CAUTION:

Never damage or scratch engine cover when installing or removing.

INSTALLATION

Install in the reverse order of removal.

DRIVE BELT AUTO TENSIONER AND IDLER PULLEY

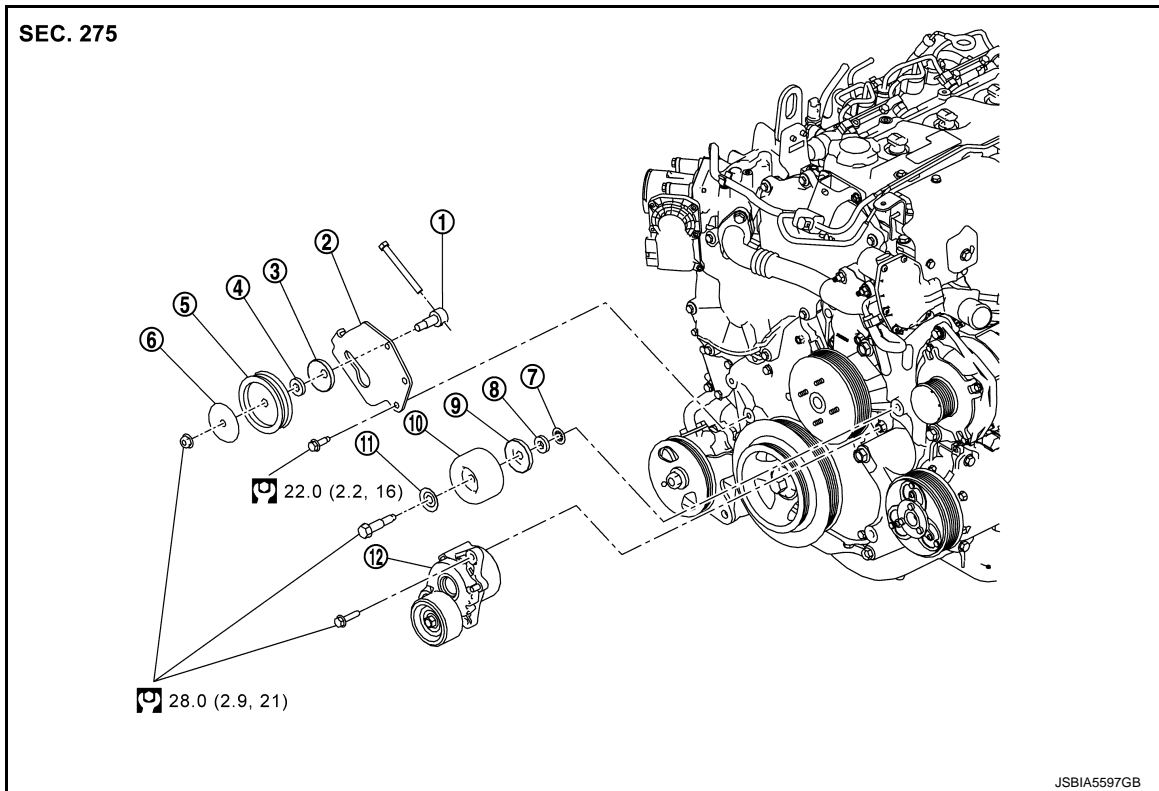
< REMOVAL AND INSTALLATION >

[YD25DDTi]


DRIVE BELT AUTO TENSIONER AND IDLER PULLEY

Exploded View

INFOID:0000000010519458



- | | | |
|----------------------|----------------------------|-----------------------------|
| ① Idler pulley shaft | ② Idler pulley bracket | ③ Idler pulley rear cover |
| ④ Collar | ⑤ Idler pulley | ⑥ Idler pulley front cover |
| ⑦ Stopper | ⑧ Collar | ⑨ Idler pulley rear cover |
| ⑩ Idler pulley | ⑪ Idler pulley front cover | ⑫ Drive belt auto-tensioner |

 : N·m (kg-m, ft-lb)

Removal and Installation

INFOID:0000000010519459

REMOVAL

1. Remove the radiator fan shroud (upper and lower). Refer to [CO-73, "Exploded View"](#).
2. Remove drive belt and power steering oil pump belt. Refer to [EM-285, "Removal and Installation"](#).

NOTE:

To remove auto tensioner, insert a hard metal pin of 5.0 mm (0.20 in) dia. into the retaining boss.

3. Remove drive belt auto-tensioner and idler pulleys.

NOTE:

Keep drive belt auto-tensioner pulley arm locked to install or remove drive belt auto-tensioner.

CAUTION:

The disassemble prohibition part. Never disassemble the drive belt auto-tensioner, because the worker shall injure by the spring jumped out.

INSTALLATION

Install in the reverse order of removal.

CAUTION:

If there is damage greater than peeled paint, replace drive belt auto-tensioner.

AIR CLEANER AND AIR DUCT

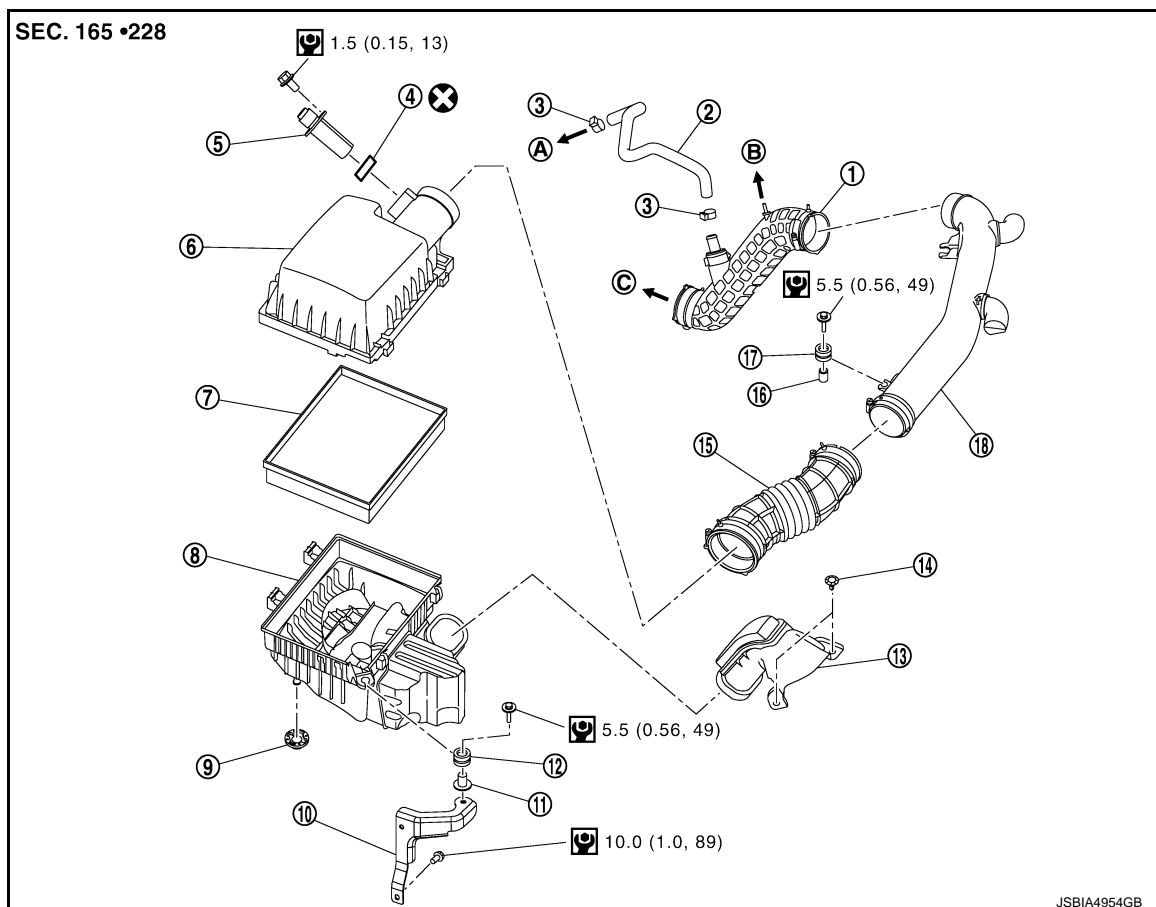
< REMOVAL AND INSTALLATION >

[YD25DDTi]

AIR CLEANER AND AIR DUCT

Exploded View

INFOID:000000010519460



- | | | |
|----------------------|---|----------------------------|
| ① Air duct | ② Blow-by hose | ③ Clamp |
| ④ Gasket | ⑤ Mass air flow sensor (with intake air temperature sensor 1) | ⑥ Air cleaner case (upper) |
| ⑦ Air cleaner filter | ⑧ Air cleaner case (lower) | ⑨ Mounting rubber |
| ⑩ Bracket | ⑪ Retainer | ⑫ Mounting rubber |
| ⑬ Air duct (inlet) | ⑭ Clip | ⑮ Air duct |
| ⑯ Retainer | ⑰ Mounting rubber | ⑱ Air duct |
| Ⓐ To rocker cover | Ⓑ To EGR cooler bypass valve control solenoid valve | Ⓒ To turbocharger |

⊗ : Always replace after every disassembly.

Ⓐ : N·m (kg-m, in-lb)

Removal and Installation

INFOID:000000010519461

REMOVAL

1. Remove air duct (inlet).
2. Disconnect mass air flow sensor and intake air temperature sensor harness connector.
3. Remove the air cleaner case assembly with air cleaner filter.
4. Remove air duct.

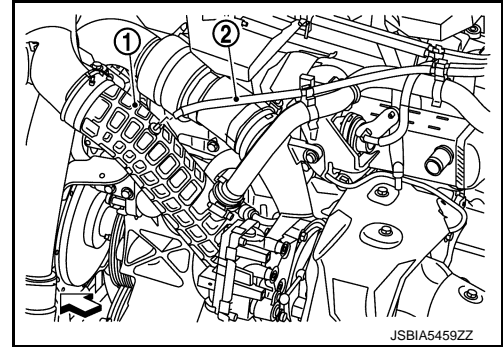
AIR CLEANER AND AIR DUCT

[YD25DDTi]

< REMOVAL AND INSTALLATION >

5. Disconnect EGR cooler bypass valve control solenoid valve hose ② from air duct ①.

↶ : Vehicle front



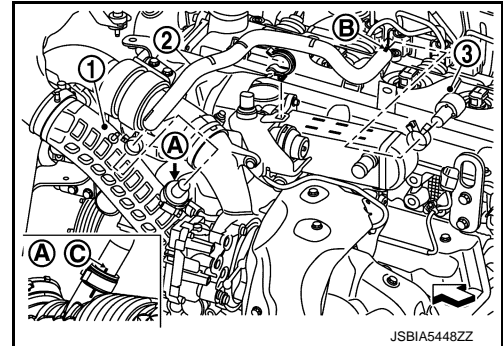
6. Disconnect Blow-by hose ② from air duct ① and rocker cover ③.

Ⓐ : View Ⓐ

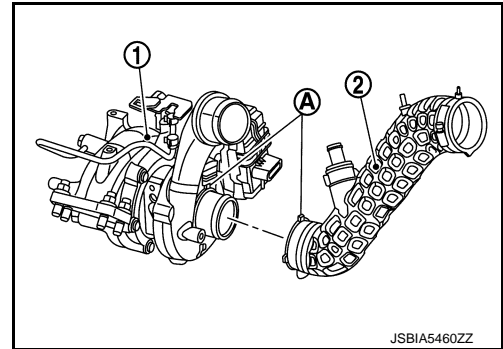
↶ : Vehicle front

Air duct side : White paint mark ③ align with air duct slot.

Rocker cover side : White paint mark ③ faces upward direction of the vehicle.



7. Disconnect air duct ② from turbocharger ①.
- By matching with matching marks ④ of both parts align while installation.



8. Remove mass air flow sensor from air cleaner case, if necessary.

CAUTION:

- Never shock mass air flow sensor.
- Never disassemble mass air flow sensor.
- Never touch mass air flow sensor element.
- Do not reuse gasket.

INSTALLATION

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

- Align marks. Attach each joint. Screw clamps firmly.

Inspection

INFOID:000000010588818

INSPECTION AFTER REMOVAL

Inspect air duct and air cleaner case (upper and lower) for crack or tear.

- If anything found, replace air duct and air cleaner case (upper and lower).

CHARGE AIR COOLER

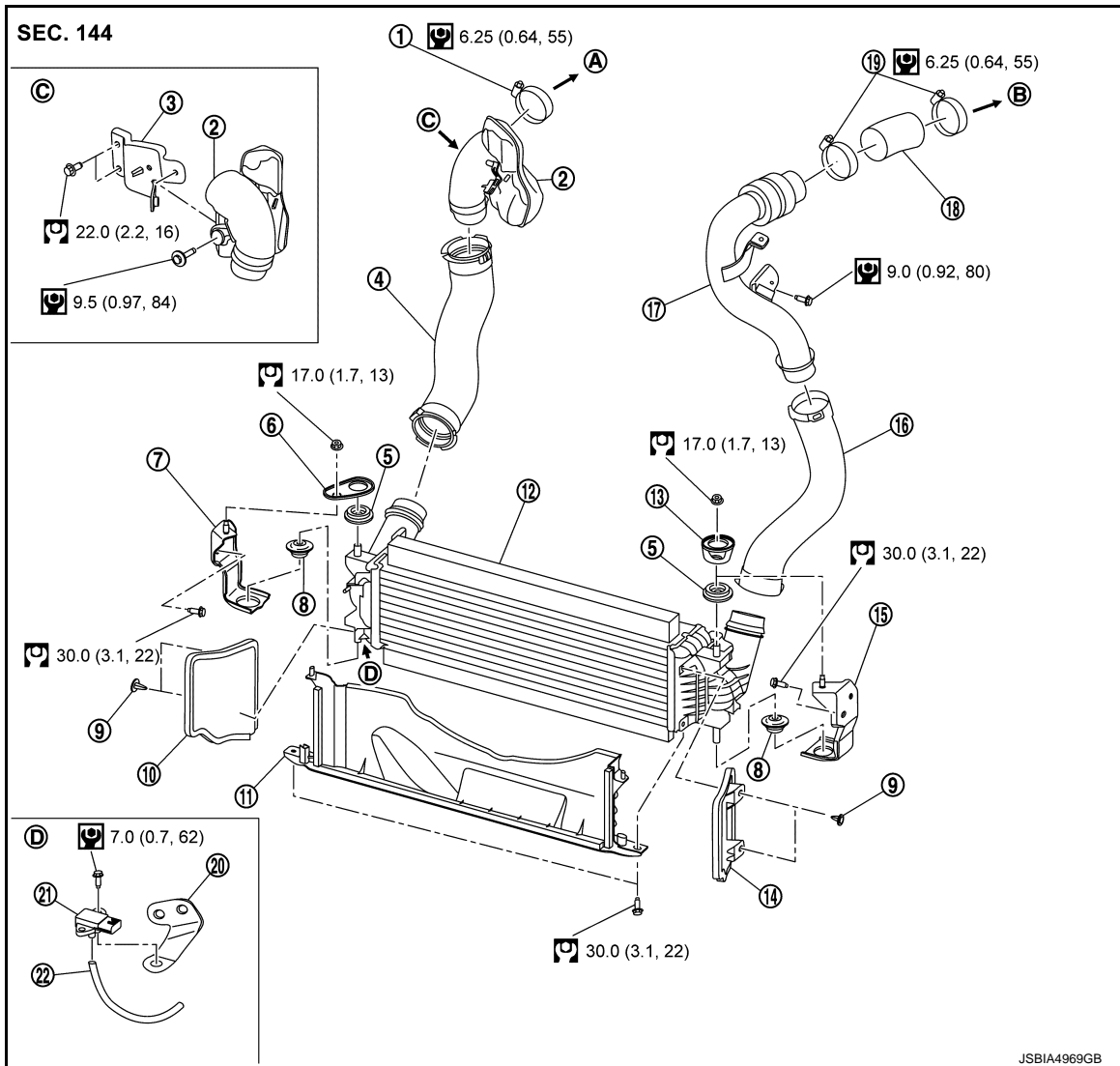
< REMOVAL AND INSTALLATION >

[YD25DDTi]

CHARGE AIR COOLER

Exploded View

INFOID:000000010519462



JSBIA4969GB

- | | | |
|-------------------------------|-------------------------------|-----------------------------|
| ① Clamp | ② Air inlet tube | ③ Bracket |
| ④ Air inlet hose | ⑤ Mounting rubber (upper) | ⑥ Bracket (RH upper) |
| ⑦ Bracket (RH lower) | ⑧ Mounting rubber (lower) | ⑨ Clip |
| ⑩ Charge air cooler seal (RH) | ⑪ Charge air cooler cover | ⑫ Charge air cooler |
| ⑬ Bracket (LH upper) | ⑭ Charge air cooler seal (LH) | ⑮ Bracket (LH lower) |
| ⑯ Air inlet hose | ⑰ Air inlet tube | ⑱ Air inlet hose |
| ⑲ Clamp | ⑳ Bracket | ㉑ Turbocharger boost sensor |
| ㉒ Vacuum hose | | |
| Ⓐ To throttle chamber | Ⓑ To turbocharger | Ⓒ View C |
| Ⓓ View D | | |

: N-m (kg-m, in-lb)

: N-m (kg-m, ft-lb)

CHARGE AIR COOLER

< REMOVAL AND INSTALLATION >

[YD25DDTi]

Removal and Installation

INFOID:000000010519463

REMOVAL

Charge air cooler

CAUTION:

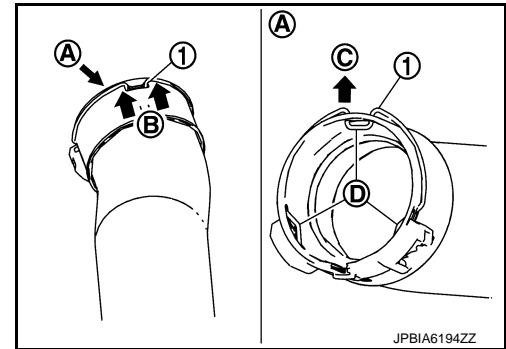
When removing charge air cooler, close opening on turbocharger and on intake manifold with shop cloth or other suitable material.

1. Remove front under cover. Refer to [EXT-24. "Exploded View"](#).
2. Remove the radiator lower hose connector pipe mounting bolt. Refer to [CO-73. "Exploded View"](#).
3. Remove charge air cooler cover.
4. Remove air inlet tube and air inlet hose.
 - Add marks as necessary for easier installation.
 - Remove quick joint as follows:
 - Insert suitable tool between air inlet hose and retainer ①.

- ① : View ①
② : Insert position
③ : Movement direction of the retainer
④ : Projection

- Unlock the retainer and pull out hose.

5. Remove charge air cooler seal(RH) (LH).
6. Remove vacuum hose in charge air cooler side.
7. Remove the mounting bolt of (RH lower) bracket (LH lower) bracket, remove charge air cooler.



Turbocharger boost sensor

1. Remove the front grill. Refer to [EXT-19. "Exploded View"](#).
2. Disconnect turbocharger boost sensor harness connector.
3. Remove turbocharger boost sensor bracket mounting bolt.
4. Remove vacuum hose.

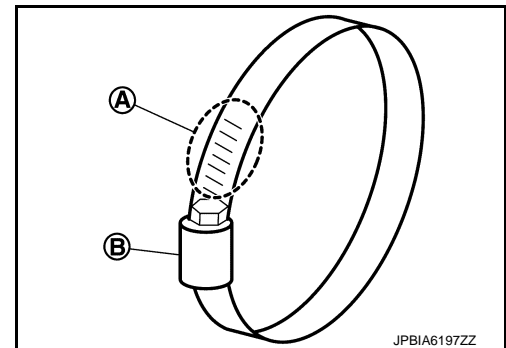
INSTALLATION

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

- When installing hoses, insert hose all the way to the end.
- When installing clamps, check that the screw ② and band ① of clamp have no damage and permanent strain. Replace with a new one if the clamp has damage of permanent strain.
- When installing air inlet hose, align identification marks (color and direction).
- Align marks. Attach each joint. Screw clamps firmly.
- Do not retighten clamp.

CAUTION:

If it is necessary to retighten a clamp, loosen it and visually check that there is no damage. After this, tighten the clamp to the specified torque.



Inspection

INFOID:000000010519464

INSPECTION AFTER REMOVAL

Check air passages of charge air cooler core and fins for clogging, leaks or deformation. Clean or replace charge air cooler if necessary.

- Be careful not to deform core fins.

INTAKE MANIFOLD

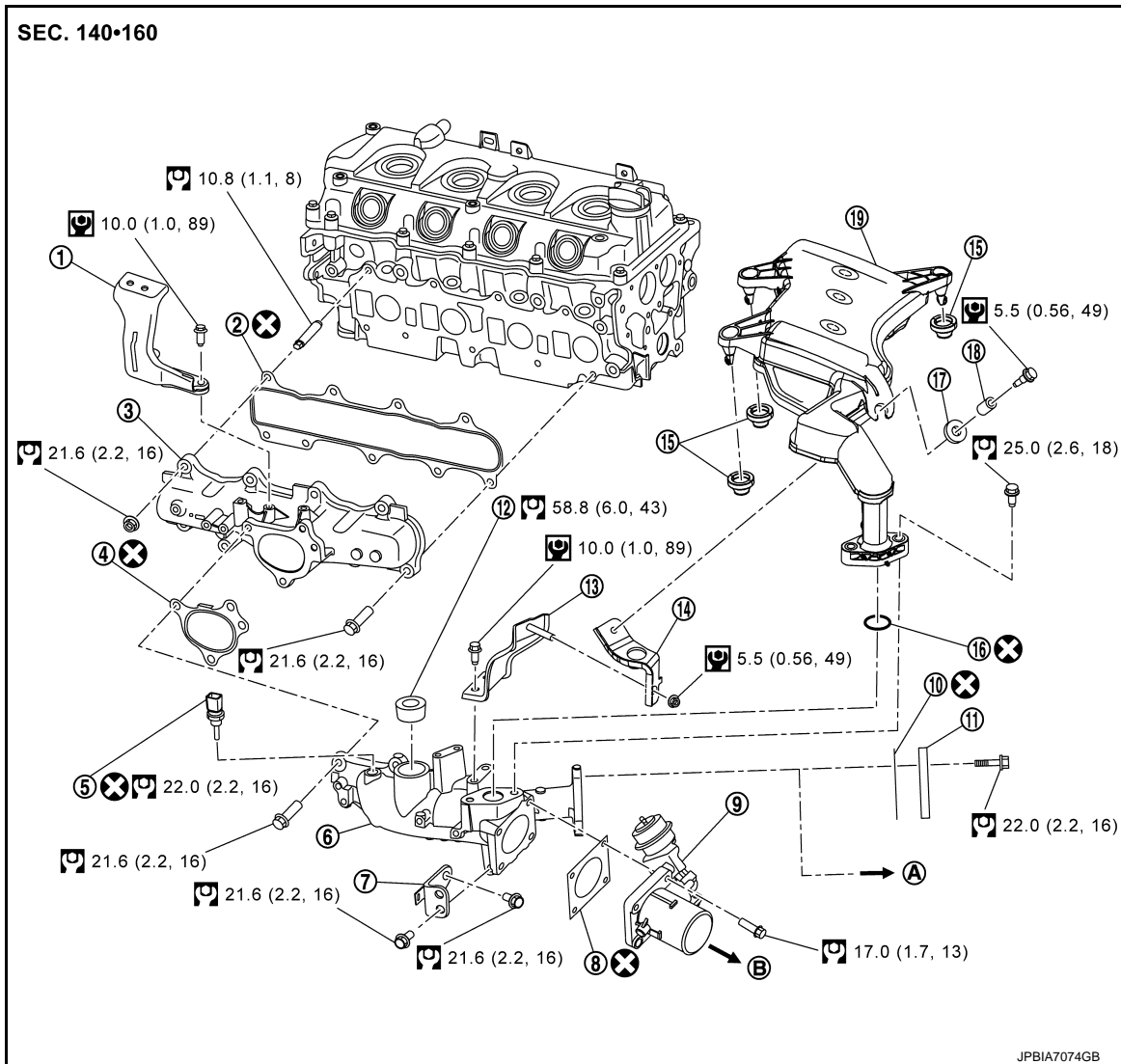
< REMOVAL AND INSTALLATION >

[YD25DDTi]

INTAKE MANIFOLD

Exploded View

INFOID:000000010519465



- | | | |
|---------------------------------|-----------------------------------|-----------------------------|
| ① Bracket | ② Gasket | ③ Intake manifold |
| ④ Gasket | ⑤ Intake air temperature sensor 2 | ⑥ Collector intake manifold |
| ⑦ Intake manifold support | ⑧ Gasket | ⑨ Throttle chamber |
| ⑩ Gasket (without EGR system) | ⑪ Cover (without EGR system) | ⑫ Plug |
| ⑬ Bracket | ⑭ Bracket | ⑮ Mounting rubber |
| ⑯ Gasket | ⑰ Mounting rubber | ⑱ Retainer |
| ⑲ Resonator | | |
| Ⓐ To EGR tube (with EGR system) | Ⓑ To charge air cooler | |

⊗ : Always replace after every disassembly.

Ⓜ : N·m (kg-m, in-lb)

Ⓜ : N·m (kg-m, ft-lb)

Removal and Installation

INFOID:000000010519466

REMOVAL

1. Remove engine cover. Refer to [EM-290, "Exploded View"](#).
2. Remove air duct. Refer to [EM-292, "Exploded View"](#).
3. Remove air cleaner case (lower). Refer to [EM-292, "Exploded View"](#).
4. Remove engine harness connector (RH side).
5. Remove the harness connector and clamps around the intake manifold.
6. Remove the (RH side) engine harness clamps and move engine harness to the position without interfere of the work.
7. Remove air inlet tube. Refer to [EM-294, "Exploded View"](#).
8. Disconnect air inlet hose from throttle chamber unit. Refer to [EM-294, "Exploded View"](#).
9. Remove vacuum hoses and throttle chamber.
10. Remove EGR tube. Refer to [EM-299, "Exploded View"](#).
11. Remove intake manifold collector.
12. Remove oil level gauge guide mounting bolts.
13. Remove fuel gallery. Refer to [EM-312, "Exploded View"](#).
 - To prevent fuel from flowing out, plug the opening of the hose with plug after disconnection.

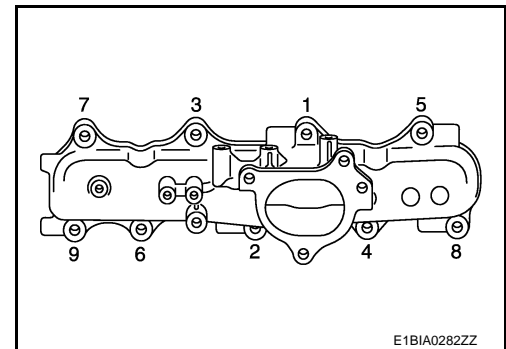
CAUTION:
Be careful not to spill fuel in the engine component.

 - Add marks as necessary for easier installation.
14. Remove fuel hose.
15. Remove fuel filter harness connector.
16. Remove the fuel filter mounting bolts, to move to the position does not interfere with the working of the fuel filter assembly.
17. Remove oil filter. Refer to [LU-40, "Removal and Installation"](#).
18. Remove injection tube 5. Refer to [EM-312, "Exploded View"](#).

CAUTION:
Be careful not to spill fuel in the engine component.
19. Loosen bolts and nuts in the order from 9 to 1 as shown in the figure, and remove intake manifold.

CAUTION:

 - Disregard the order No.6 and 9 in removal.
 - Cover engine openings to avoid entry of foreign materials.



INSTALLATION

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

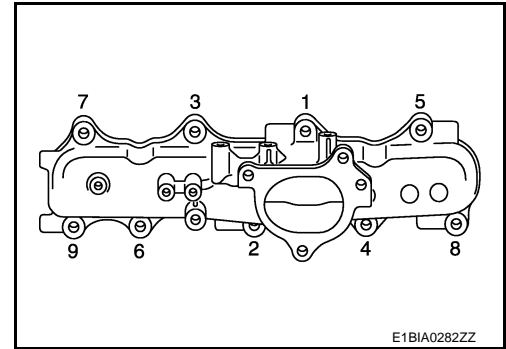
1. Install intake manifold.

INTAKE MANIFOLD

[YD25DDTi]

< REMOVAL AND INSTALLATION >

- Tighten fixing bolts and nuts in the order from 1 to 9 as shown in the figure.
 - If stud bolts were removed, tighten them to the specified torque. Refer to [EM-296, "Exploded View"](#).
2. Before starting engine, bleed from fuel piping. Refer to [FL-48, "Air Bleeding"](#).



INFOID:000000010519467

Inspection

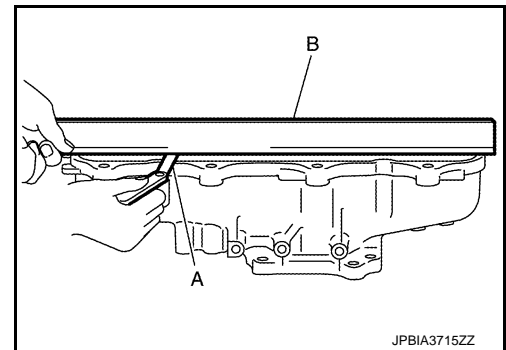
INSPECTION AFTER REMOVAL

Surface Distortion

- Check distortion on the mounting surface with a straightedge (B) and feeler gauge (A).

Limit : Refer to [EM-414, "Intake Manifold"](#).

- If it exceeds the limit, replace intake manifold.



INSPECTION AFTER INSTALLATION

Start engine and increase engine speed to check for fuel leak.

CAUTION:

Never touch the engine immediately after stopped as engine becomes extremely hot.

NOTE:

Use mirrors for checking at points out of clear sight.

EGR SYSTEM

< REMOVAL AND INSTALLATION >

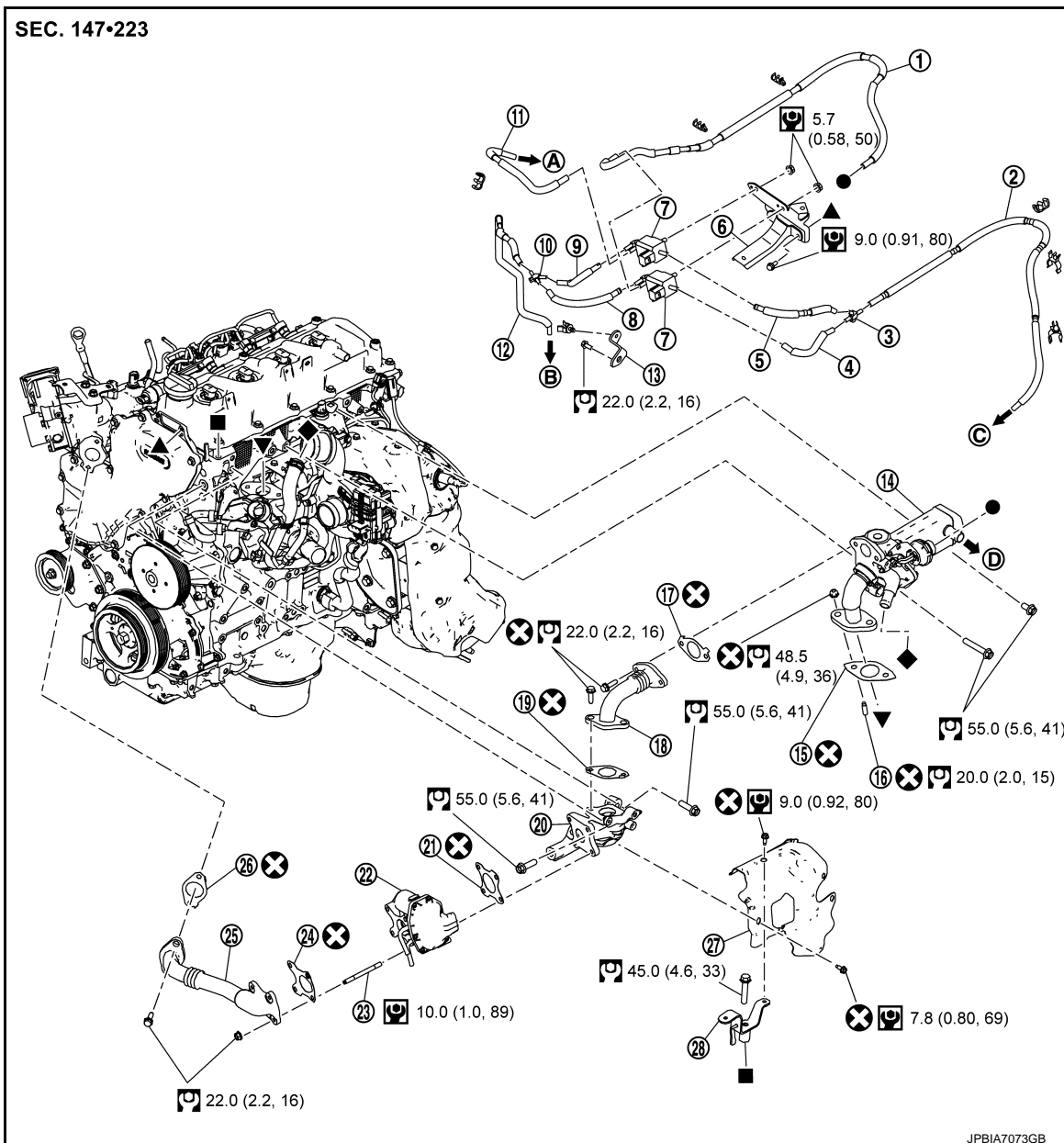
[YD25DDTi]

EGR SYSTEM

Exploded View

INFOID:000000010519468

Models with EGR cooler



- | | | |
|--|-----------------|------------------|
| ① Vacuum hose 1 | ② Vacuum hose 3 | ③ Connector |
| ④ Vacuum hose 2 | ⑤ Vacuum hose 4 | ⑥ Bracket |
| ⑦ EGR cooler bypass valve control solenoid valve | ⑧ Vacuum hose 5 | ⑨ Vacuum hose 6 |
| ⑩ Connector | ⑪ Vacuum hose 8 | ⑫ Vacuum hose 7 |
| ⑬ Bracket | ⑭ EGR cooler | ⑮ Gasket |
| ⑯ Stud bolt | ⑰ Gasket | ⑱ EGR guide tube |
| ⑲ Gasket | ⑳ EGR spacer | ㉑ Gasket |
| ㉒ EGR volume control valve assembly | ㉓ Stud bolt | ㉔ Gasket |
| ㉕ EGR tube | ㉖ Gasket | ㉗ Cover |
| ㉘ Bracket | | |

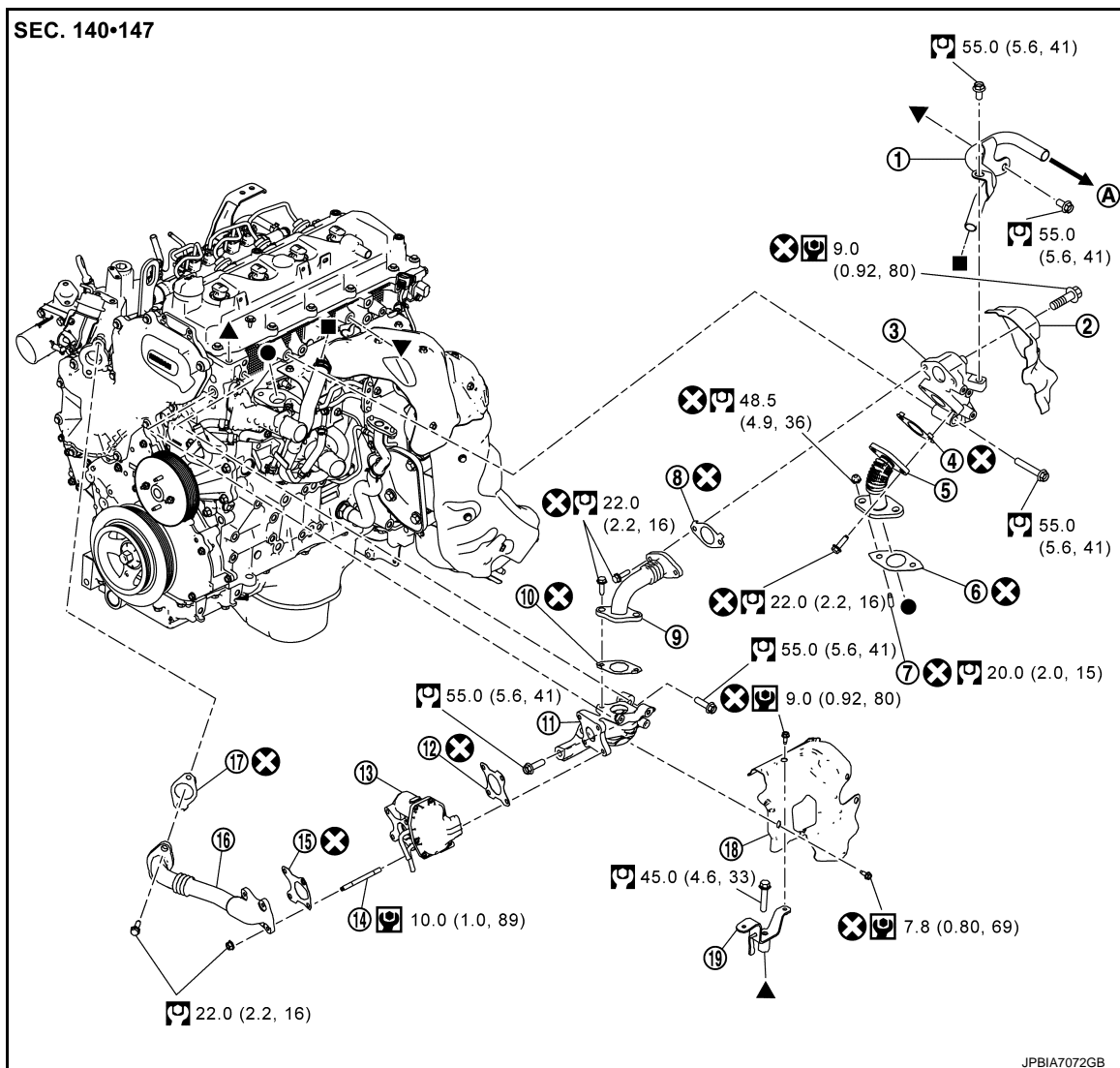
EGR SYSTEM

[YD25DDTi]


< REMOVAL AND INSTALLATION >

- (A) To air duct
 (B) To vacuum pump
 (C) To water hose
 (D) To water hose
 ⊗ : Always replace after every disassembly.
 [] : N·m (kg-m, in-lb)
 [] : N·m (kg-m, ft-lb)
 ●, ▲, ■, ▼, ◆: Indicates that the parts is connected at points with same symbols in actual vehicle.

Models without EGR cooler



- | | | |
|---|--------------|------------------|
| ① Water pipe | ② Insulator | ③ EGR bracket |
| ④ Gasket | ⑤ Guide tube | ⑥ Gasket |
| ⑦ Stud bolt | ⑧ Gasket | ⑨ EGR guide tube |
| ⑩ Gasket | ⑪ EGR spacer | ⑫ Gasket |
| ⑬ EGR volume control valve assembly | ⑭ Stud bolt | ⑮ Gasket |
| ⑯ EGR tube | ⑰ Gasket | ⑱ Cover |
| ⑲ Bracket | | |
| (A) To water hose | | |
| ⊗ : Always replace after every disassembly. | | |
| [] : N·m (kg-m, in-lb) | | |

 : N·m (kg-m, ft-lb)

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

Removal and Installation

INFOID:0000000010519469

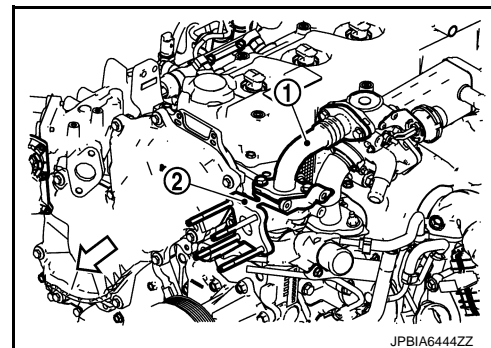
EM

REMOVAL

1. Drain engine coolant. Refer to [CO-68, "Draining"](#).
CAUTION:
Perform this step when the engine is cold.
2. Remove engine cover. Refer to [EM-290, "Exploded View"](#).
3. Remove air duct. Refer to [EM-292, "Exploded View"](#).
4. Remove air inlet hose and air inlet tube.
5. Remove EGR tube.
6. Remove EGR volume control valve assembly harness connector.
7. Disconnect water hoses from EGR volume control valve assembly and remove EGR volume control valve assembly.
8. Remove bracket.
9. Disconnect the vacuum hose. (With EGR cooler)
10. Remove EGR cover.
11. Remove water hose from EGR cooler or water pipe.
12. Remove EGR guide tube ①.

② : EGR spacer

⇐ : Vehicle front



13. Remove EGR spacer.
14. Remove EGR cooler. (With EGR cooler)
15. Remove EGR cooler bypass valve control solenoid valve, if necessary. (With EGR cooler)
16. Remove EGR bracket, guide tube, and water pipe. (Without EGR cooler)

INSTALLATION

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

CAUTION:

- Clean each joint surface before installation.
- Do not reuse gasket.

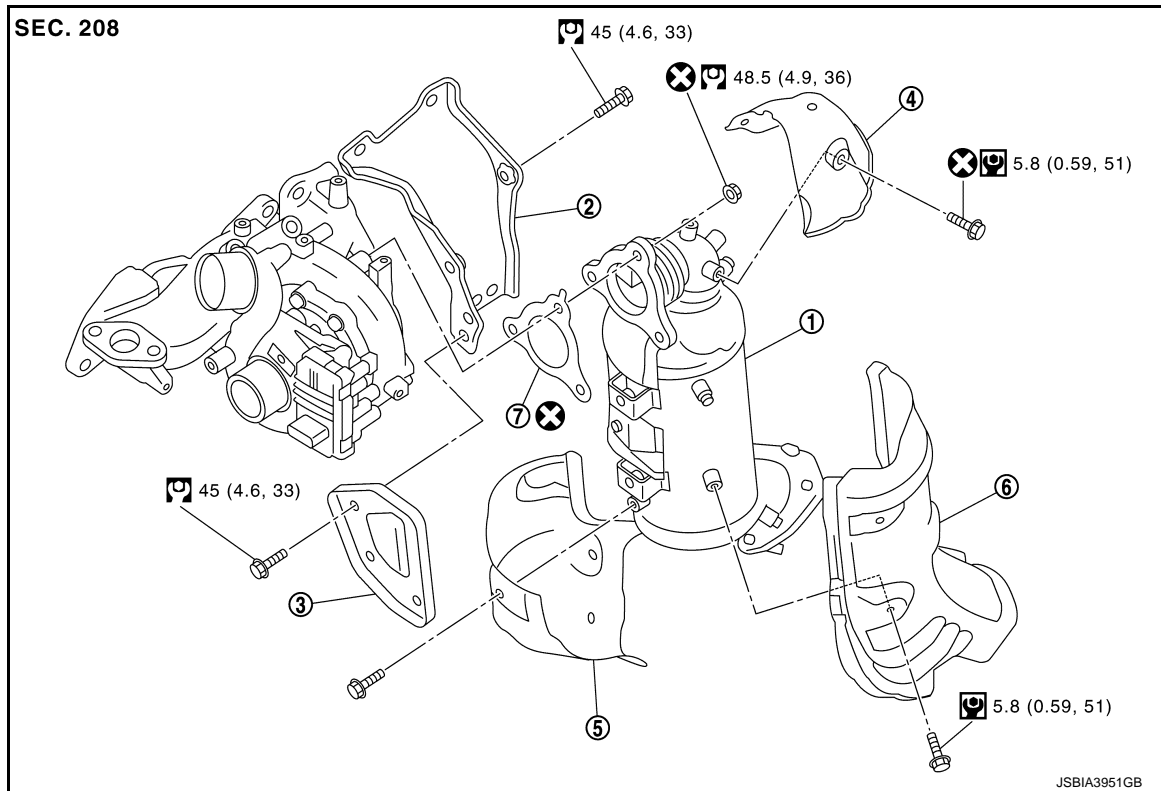
EGR Volume Control Valve

Perform "EGR Volume Control Valve Closed Position Learning Value Clear" and "EGR Volume Control Valve Closed Position Learning" after repair when removing or replacing EGR volume control valve. Refer to [EC-557, "Description"](#) and [EC-558, "Description"](#).

CATALYST

Exploded View

INFOID:000000010519470



- | | | |
|--------------------------|--------------------------|--------------------------|
| ① Catalyst | ② Bracket | ③ Bracket |
| ④ Catalyst cover (upper) | ⑤ Catalyst cover (lower) | ⑥ Catalyst cover (lower) |
| ⑦ Gasket | | |

⊗ : Always replace after every disassembly.

⊙ : N·m (kg-m, in-lb)

⊙ : N·m (kg-m, ft-lb)

Removal and Installation

INFOID:000000010519471

REMOVAL

1. Remove catalyst cover (upper).
2. Remove exhaust front tube. Refer to [EX-15, "Exploded View"](#)
3. Remove air inlet hose and air inlet tube. Refer to [EM-294, "Exploded View"](#).
4. Remove bracket.
5. Remove catalyst mounting nut (turbocharger side).
6. Remove catalyst.

INSTALLATION

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

CAUTION:

- If stud bolts of turbocharger were removed, tighten them to the specified torque. Refer to [EM-304, "Exploded View"](#).
- If stud bolts of catalyst were removed, tighten them to the specified torque.



: 18.0 N·m (1.8 kg-m, 13 ft-lb)

A

- Pushing bracket against the cylinder block and the catalyst, temporarily tighten the mounting bolt. And then tighten it to the specified torque.

EM

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TURBOCHARGER

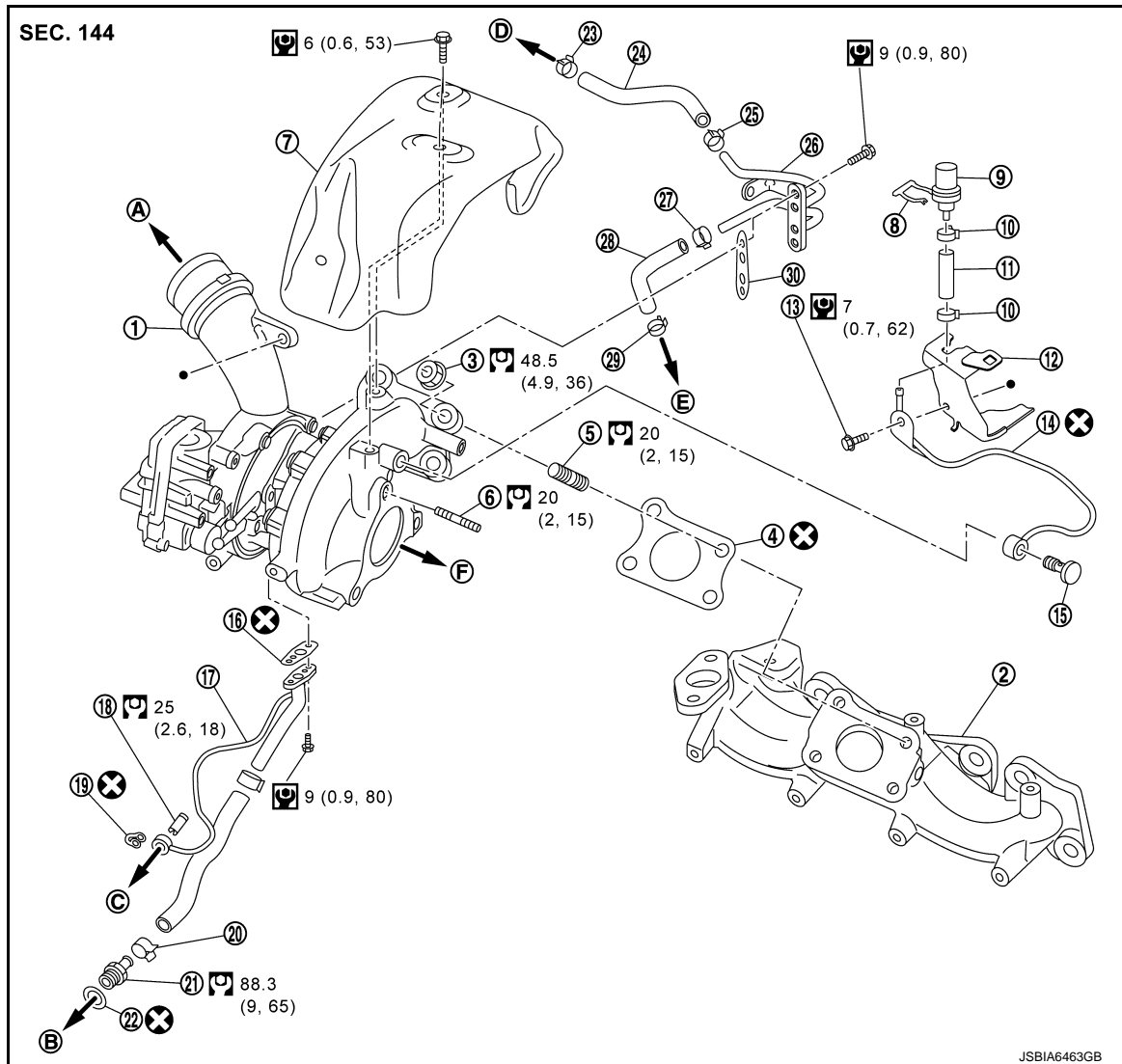
< REMOVAL AND INSTALLATION >

[YD25DDTi]

TURBOCHARGER


Exploded View


INFOID:000000010519472



- | | | |
|---------------------|---------------------|--------------------------------|
| ① Turbocharger | ② Exhaust manifold | ③ Nut |
| ④ Gasket | ⑤ Stud bolt | ⑥ Stud bolt |
| ⑦ Heat insulator | ⑧ Clip | ⑨ Turbocharger pressure sensor |
| ⑩ Clamp | ⑪ Hose | ⑫ Bracket |
| ⑬ Bolt | ⑭ Tube | ⑮ Bolt |
| ⑯ Gasket | ⑰ Oil pipe | ⑱ Eye-bolt |
| ⑲ Gasket | ⑳ Clamp | ㉑ Oil connector |
| ㉒ Gasket | ㉓ Clamp | ㉔ Water hose |
| ㉕ Clamp | ㉖ Water pipe | ㉗ Clamp |
| ㉘ Water hose feed | ㉙ Clamp | ㉚ Gasket |
| Ⓐ To air inlet hose | Ⓑ To cylinder block | Ⓒ To cylinder block |
| Ⓓ To Water outlet | Ⓔ To water pipe | Ⓕ To catalyst |

⊗ : Always replace after every disassembly.

 : N·m (kg-m, in-lb)

 : N·m (kg-m, ft-lb)

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

Removal and Installation

INFOID:0000000010519473

REMOVAL

- After applying penetrative lubricant to the mounting nuts, check for the penetration of the lubricant, and then loosen the nuts to remove.
- 1. Drain engine coolant. Refer to [CO-68, "Draining"](#).
- 2. Remove engine cover. Refer to [EM-290, "Exploded View"](#).
- 3. Remove air duct. Refer to [EM-292, "Exploded View"](#).
- 4. Remove air inlet hose and air inlet tube. Refer to [EM-294, "Exploded View"](#).
- 5. Remove catalyst. Refer to [EM-302, "Exploded View"](#).
- 6. Remove tube.
- 7. Remove heat insulator.
- 8. Remove eye bolts and water hose from water tube and oil feed tube and oil return tube.
- 9. Remove the turbocharger mounting nuts.
- 10. Remove turbocharger with water tube and oil feed tube and oil return tube.
- CAUTION:**
 - Be careful not to deform water tube and oil-feed-and-return tube.
 - Never disassemble or adjust the turbocharger.
 - Be careful not to contact with the vehicle.
 - Never hold turbocharger boost control actuator and actuator rod.
- 11. Remove water tube and oil feed tube and oil return tube from turbocharger.
- 12. Remove turbocharger.
- CAUTION:**
 - Never disassemble or adjust the turbocharger.
 - Never hold turbocharger boost control actuator and actuator rod.

Oil Tube and Water Tube

- Clean inside of oil feed tube and oil return tube and water tube, and check tubes for clogging.
- Replace oil feed tube and oil return tube and/or water tube if clogging still exists after cleaning.

INSTALLATION

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

- CAUTION:**
 - When a stud bolt is pulled out, replace it with a new one and tighten it to the specified torque.
 - Do not reuse gaskets.

Inspection

INFOID:0000000010519474

TROUBLE DIAGNOSIS OF TURBOCHARGER

Preliminary check:

- Check that the engine oil level is between MIN and MAX of the oil level gauge. (When engine oil amount is more than MAX, engine oil flows into the inlet duct through blow-by gas passage, and turbocharger is misjudged malfunction.)
- Ask the customer if he/she always runs the vehicle in idle engine speed to cool the engine oil down after driving.
- Replace the turbocharger assembly when any malfunction is found after unit inspections specified in the table below.
- If no malfunction is found after the unit inspections, judge that the turbocharger body has no malfunction. Check the other parts again.

TURBOCHARGER

< REMOVAL AND INSTALLATION >

[YD25DDTi]

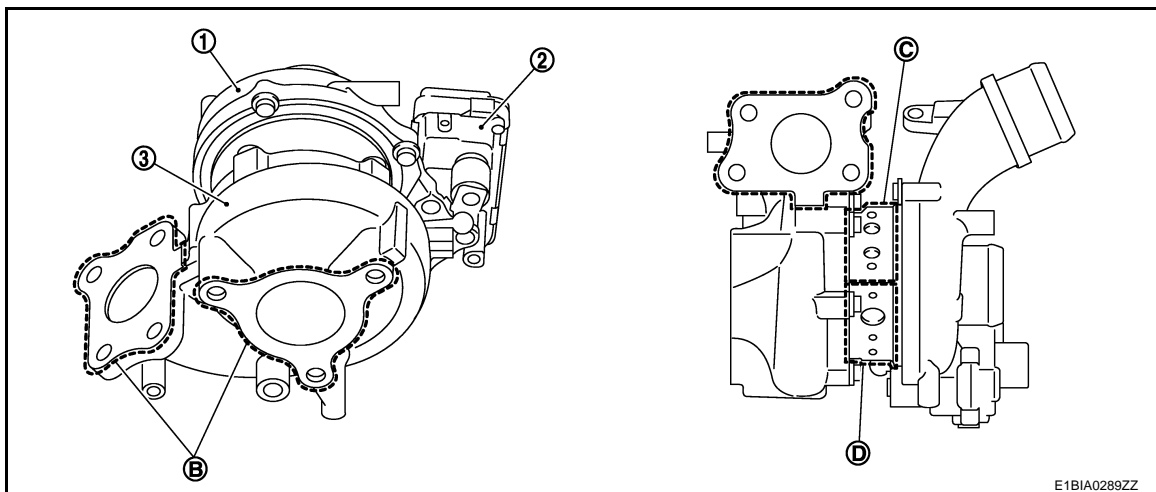
Inspection item	Inspection result	Symptom (when each inspection item meets each inspection result)			
		Engine oil leakage	Smoke	Noise	Insufficient power/acceleration malfunction
Turbine wheel	Engine oil leaks	C	A	C	C
	Carbon is accumulated	C	A	B	B
	Friction with housing	C	B	A	B
	Blades are bent or broken	—	—	A	A
Compressor wheel	Inside the air inlet is seriously contaminated by engine oil.	B	B	—	—
	Friction with housing	C	B	A	B
	Blades are bent or broken	—	—	A	A
After checking both turbine and compressor, inspect rotor shaft end play.	There is resistance when the rotor shaft is rotated by your fingertips.	—	C	C	B
	The rotor shaft sometimes does not rotate by your fingertips.	—	—	—	A
	There is too much play in the bearing.	C	C	B	C
Oil return port	Carbon or sludge is accumulated in the waste oil hole.	C	A	C	C

A: Large possibility

B: Medium possibility

C: Small possibility

INSPECTION AFTER REMOVAL



① Compressor housing

② Turbocharger boost control actuator

③ Turbine housing

Ⓑ Check for exhaust gas leaks

Ⓒ Check for engine coolant leaks

Ⓓ Check for engine oil leaks

CAUTION:

When the compressor wheel turbine, wheel or rotor shaft is damaged, remove all the fragments and foreign matter left in the following passages in order to prevent a secondary malfunction:

Suction side : Between turbocharger and charge air cooler

Exhaust side : Between turbocharger and catalyst

Rotor Shaft Clearance

TURBOCHARGER

[YD25DDTi]

< REMOVAL AND INSTALLATION >

- Check that the rotor shaft ① rotates smoothly without any resistance when it is rotated by your fingertips.
- Check that the rotor shaft is not loose when it is moved vertically or horizontally.
- Measure looseness with a dial gauge inserting its measuring rod through oil drain hole of turbocharger.

Standard : 0.086 - 0.111 mm (0.0034 - 0.0044 in)

- Replace turbocharger if out of standard.

Rotor Shaft End Play

- Place a dial gauge ① at the rotor shaft ① end in the axial direction to measure the end play.

Standard : 0.030 - 0.111 mm (0.0012 - 0.0044 in)

- Replace turbocharger if out of standard.

Turbine Wheel

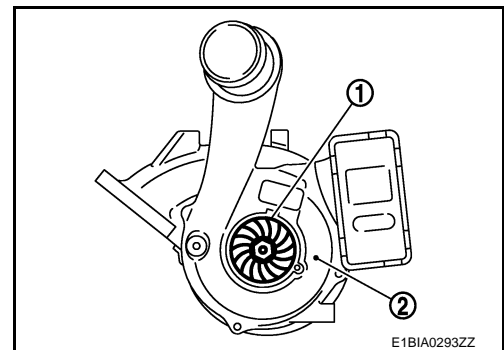
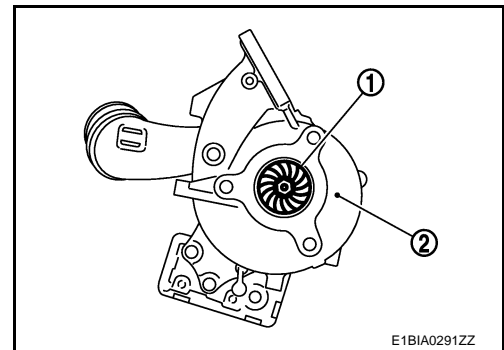
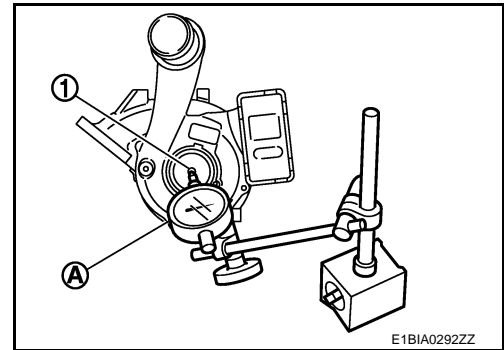
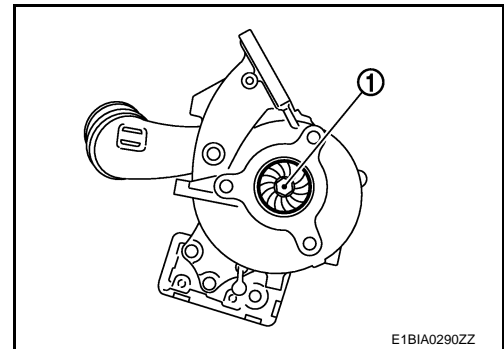
- Check that there is no engine oil adhesion.
- Check that there is no carbon accumulation.
- Check that blades of turbine wheel ① are not bent or broken.
- Check that turbine wheel does not interfere with turbine housing ②.

Compressor Wheel

- Check that there is no engine oil adhesion inside the air inlet.
- Check that compressor wheel ① does not interfere with compressor housing ②.
- Check that compressor wheel is not bent or broken.

Turbocharger Boost Control Actuator:

Inspect turbocharger boost control actuator. Refer to [EC-668. "DTC Description"](#).

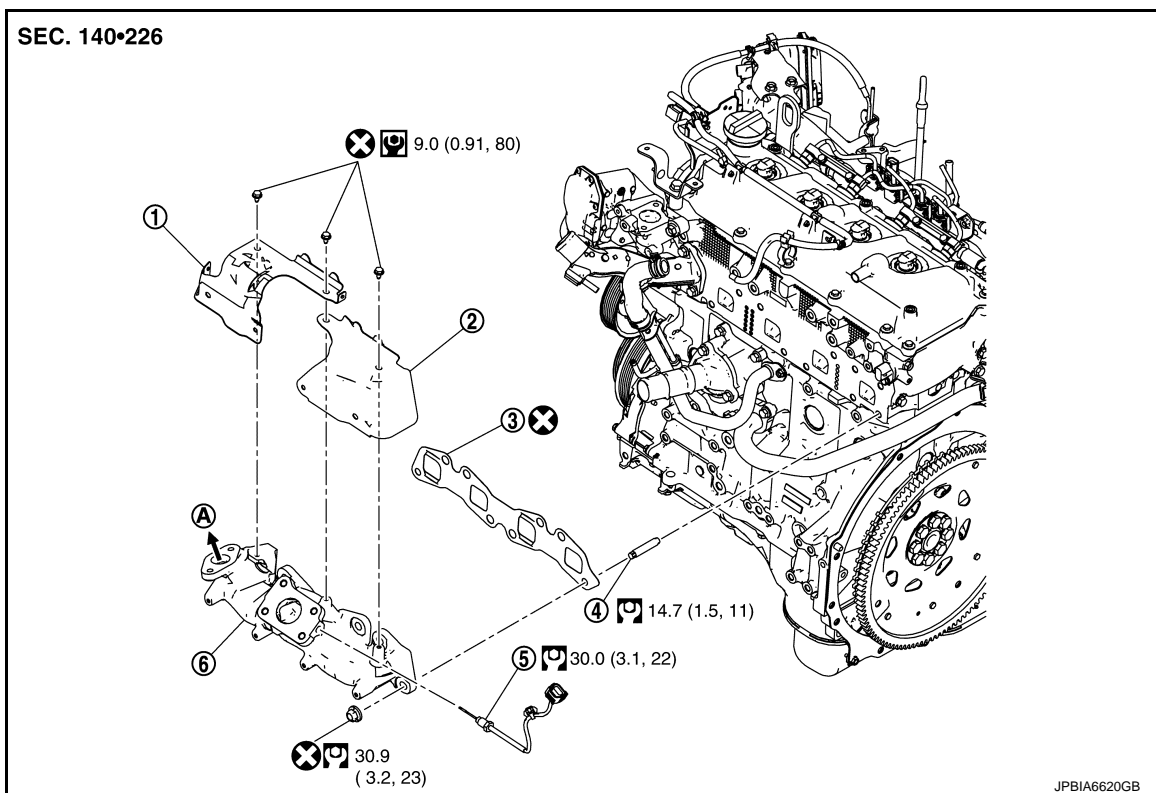


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EXHAUST MANIFOLD

Exploded View

INFOID:000000010519475



- | | | |
|--------------------------|------------------------------------|--------------------|
| ① Exhaust manifold cover | ② Exhaust manifold cover | ③ Gasket |
| ④ Stud bolt | ⑤ Exhaust gas temperature sensor 1 | ⑥ Exhaust manifold |

Ⓐ To EGR system

⊗ : Always replace after every disassembly.

Ⓜ : N·m (kg-m, in-lb)

Ⓜ : N·m (kg-m, ft-lb)

Removal and Installation

INFOID:000000010519476

REMOVAL

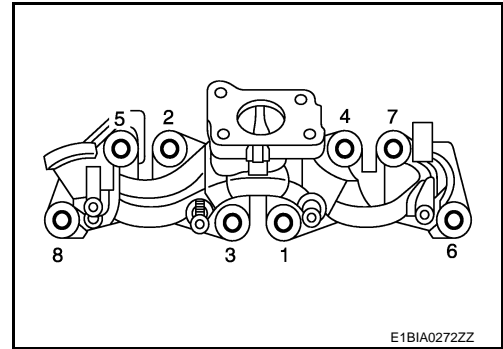
1. Drain engine coolant. Refer to [CO-68. "Draining"](#).
2. Remove EGR cooler. Refer to [EM-299. "Exploded View"](#).
3. Remove catalyst. Refer to [EM-302. "Exploded View"](#).
4. Remove turbocharger. Refer to [EM-304. "Exploded View"](#).
5. Remove exhaust manifold cover.

EXHAUST MANIFOLD

[YD25DDTi]

< REMOVAL AND INSTALLATION >

6. Loosen exhaust manifold mounting nuts in the order from 8 to 1 as shown in the figure.
7. Remove exhaust manifold.
8. Remove exhaust gas temperature sensor 1, if necessary.
9. Remove stud bolt from cylinder head, if necessary.



INSTALLATION

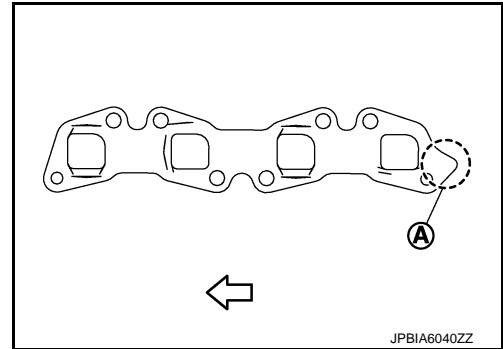
Note the following, and install in the reverse order of removal.

CAUTION:

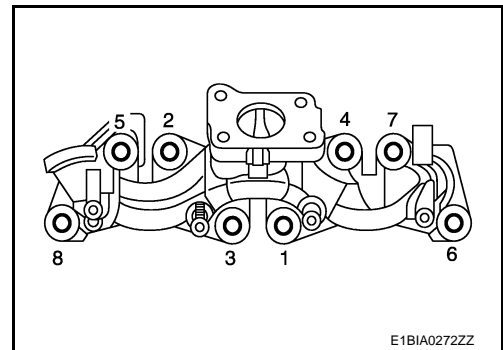
- If stud bolts were removed, replace them with new ones, and tighten them to the specified torque. Refer to [EM-308, "Exploded View"](#).
- Do not reuse gaskets.
- Tighten the exhaust manifold mounting nuts in the following procedure:

1. Install gasket to cylinder head as shown in the figure.

- Ⓐ : Identification
← : Engine front



2. Tighten the nuts in order specified in the figure.
3. Re-tighten the nuts 1 to 8.
4. Install in the reverse order of removal.



Inspection

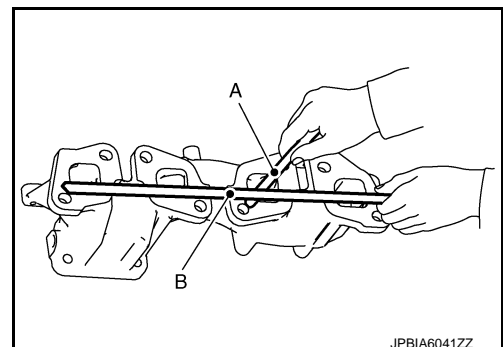
INSPECTION AFTER REMOVAL

Surface Distortion

- Use a reliable straight edge (B) and feeler gauge (A) to check the flatness of exhaust manifold fitting surface.

Limit : Refer to [EM-414, "Exhaust Manifold"](#).

- If it exceeds the limit, replace exhaust manifold.



INSPECTION AFTER INSTALLATION

EXHAUST MANIFOLD

< REMOVAL AND INSTALLATION >

[YD25DDTi]

Start engine and raise engine speed to check no exhaust gas and engine oil leaks.

GLOW PLUG

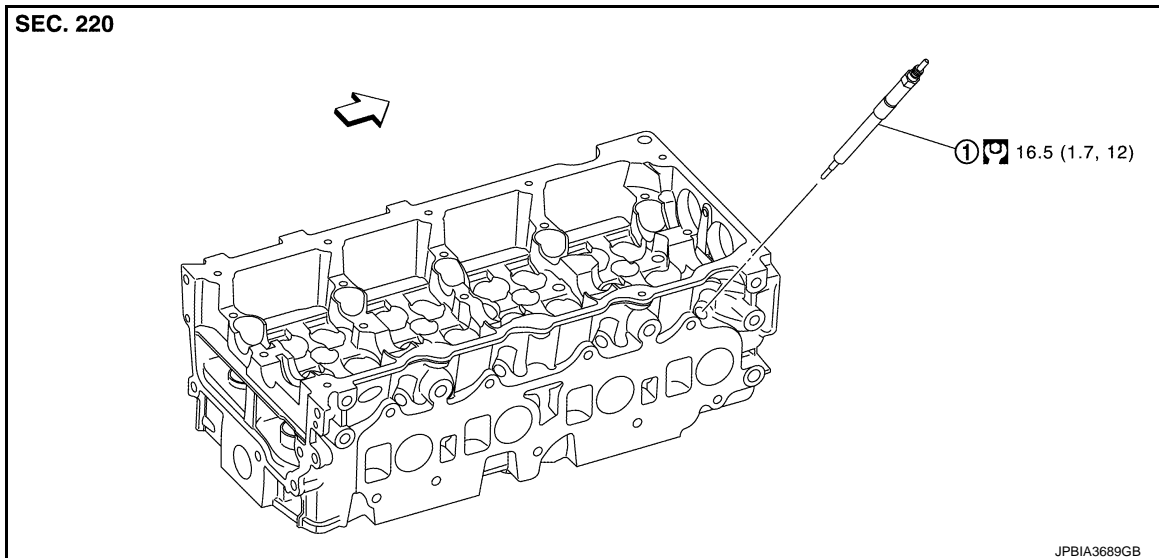
< REMOVAL AND INSTALLATION >

[YD25DDTi]

GLOW PLUG

Exploded View

INFOID:0000000010520864



① Glow plug

⇐ : Engine front

Ⓐ : N-m (kg-m, ft-lb)

Removal and Installation

INFOID:0000000010520865

REMOVAL

CAUTION:

Remove glow plug only if necessary. If carbon adheres, it may be stuck and broken.

1. Remove engine cover. Refer to [EM-290, "Exploded View"](#).
2. Disconnect glow plug connector.
3. Remove glow plug.

CAUTION:

- When removing or installing, never use such tools as an air impact wrench.
- Handle it carefully without giving any impact, even after removal. [As a guide, if it drops from height of 10 cm (3.94 in) or higher, always replace it.]

INSTALLATION

1. Remove adhered carbon from glow plug installation hole with a reamer.
2. Install glow plug.
3. Install remaining parts in the reverse order of removal.

INJECTION TUBE AND FUEL INJECTOR

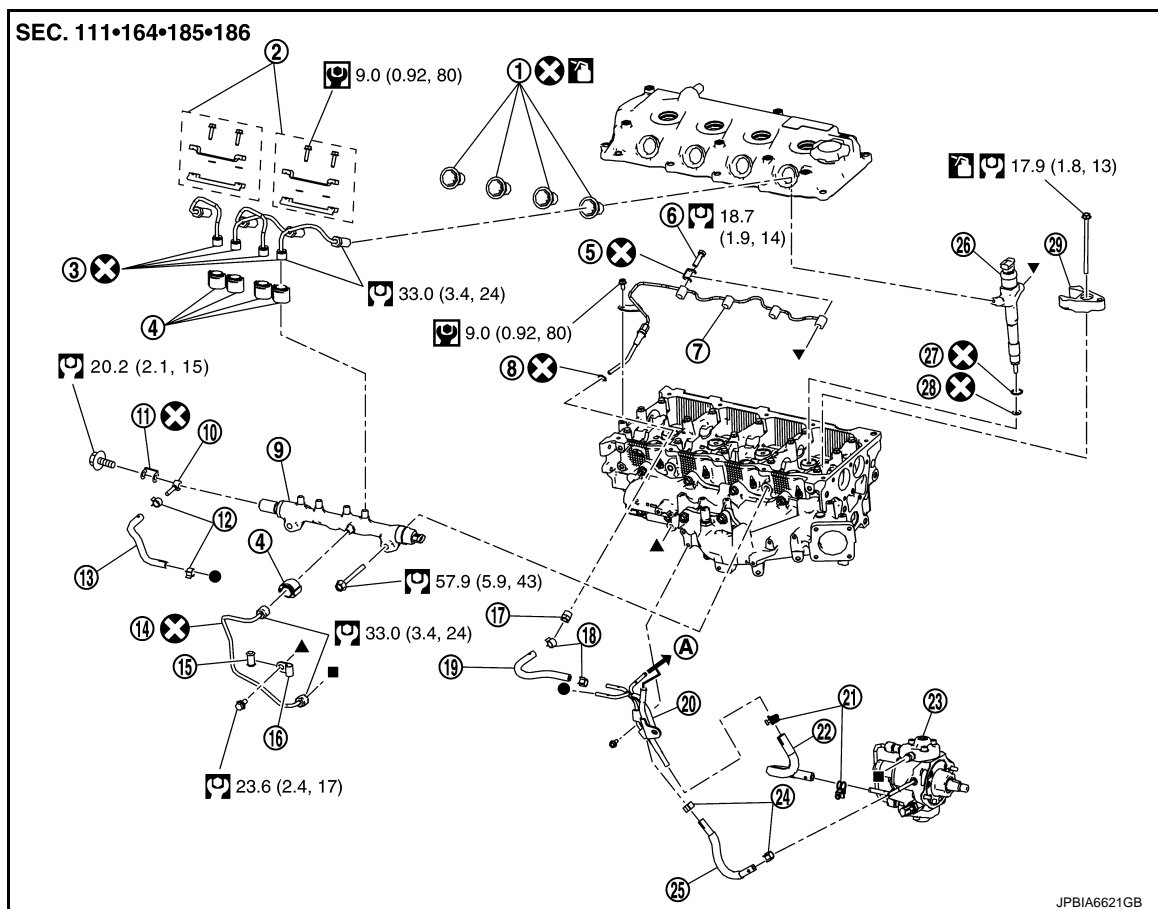
< REMOVAL AND INSTALLATION >

[YD25DDTi]

INJECTION TUBE AND FUEL INJECTOR

Exploded View

INFOID:000000010520866



- | | | |
|--------------------|-----------------------------|------------------------------|
| ① Nozzle oil seal | ② Clip (if equipped) | ③ Injection tube (No. 1 - 4) |
| ④ Protector | ⑤ Cooper washer | ⑥ Eye-bolt |
| ⑦ Spill tube | ⑧ Gasket | ⑨ Fuel rail |
| ⑩ Connector tube | ⑪ Gasket | ⑫ Clamp |
| ⑬ Return hose | ⑭ Injection tube (No. 5) | ⑮ Rubber mounting |
| ⑯ Clip | ⑰ Spill tube retaining bolt | ⑱ Clamp |
| ⑲ Spill hose | ⑳ Fuel gallery | ㉑ Clamp |
| ㉒ Fuel feed hose | ㉓ Fuel pump | ㉔ Clamp |
| ㉕ Fuel return hose | ㉖ Fuel injector | ㉗ O-ring |
| ㉘ Nozzle gasket | ㉙ Nozzle support | |

Ⓐ To fuel filter

⊗ : Always replace after every disassembly.

Ⓜ : N·m (kg·m, in·lb)

Ⓢ : N·m (kg·m, ft·lb)

Ⓛ : Should be lubricated with oil.

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

INJECTION TUBE AND FUEL INJECTOR

< REMOVAL AND INSTALLATION >

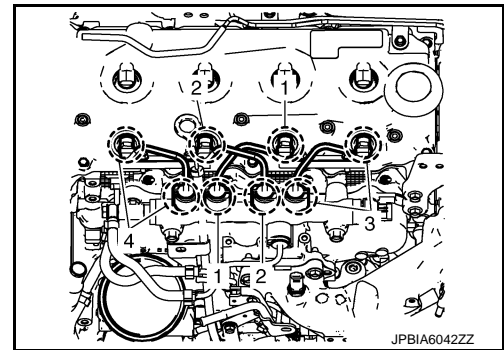
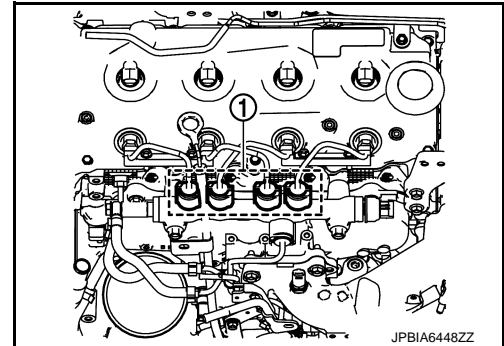
[YD25DDTi]

Removal and Installation

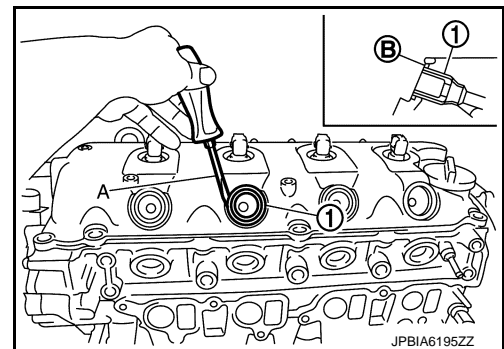
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REMOVAL

1. Remove protector ①.
2. Remove injection tube clips.
3. Disconnect harness connector from fuel injector.
4. Remove spill hose.
CAUTION:
Be careful not to spill fuel in the engine component.
5. Following steps below, remove injection tubes (No.1 - 4).
 - a. Put a paint mark or tag on injection tubes to identify each cylinder.
 - Use a fuel-resistant method.
 - b. Remove injection tubes in order of 3-2-1-4 individually.
CAUTION:
Be careful not to allow leaked fuel to contaminate engine room. Especially, ensure to keep engine mounting insulator clear of fuel.
6. Remove injection tube (No.5)
7. Remove fuel hoses.
8. Remove oil level gauge guide mounting bolts.
9. Remove fuel rail.



10. Remove nozzle oil seal ①.
 - Using the flat-bladed screwdriver (A), pry flange ② to remove oil seal.**NOTE:**
Nozzle oil seal seals between fuel injector and rocker cover. If only injection tube shall be removed and installed, nozzle oil seal replacement is not required.
11. Remove rocker cover. Refer to [EM-317, "Exploded View"](#).



INJECTION TUBE AND FUEL INJECTOR

[YD25DDTi]

< REMOVAL AND INSTALLATION >

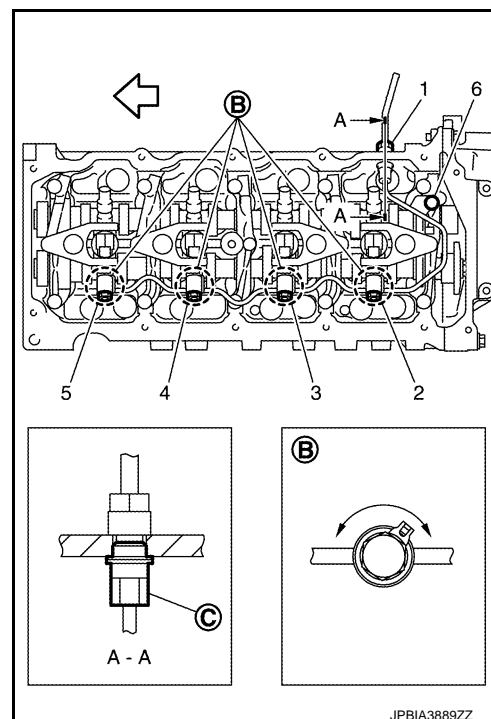
12. Remove spill tube mounting bolts and nut.

- Loosen bolts and nut to the order from 6 to 1 as shown in the figure and remove them.

CAUTION:

When loosening nut, fix spill tube retaining bolt with spanner.

- Ⓑ : Gasket position
- Ⓒ : Spill tube retaining bolt
- ← : Engine front



13. Remove fuel injector as follows.

- ① : Fuel injector
- ② : O-ring
- ③ : Nozzle gasket
- ④ : Nozzle support

a. Remove nozzle support.

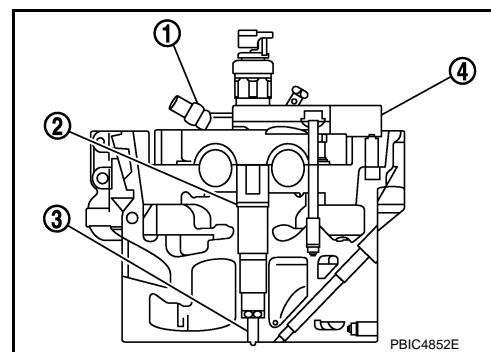
b. Remove fuel injector. While rotating it to left and right, raise it to remove.

CAUTION:

- Handle fuel injector carefully without giving any impact.
- Never disassemble fuel injector.

c. If nozzle gasket remains in cylinder head, hook it with tip of a flat-bladed screwdriver and pull it out.

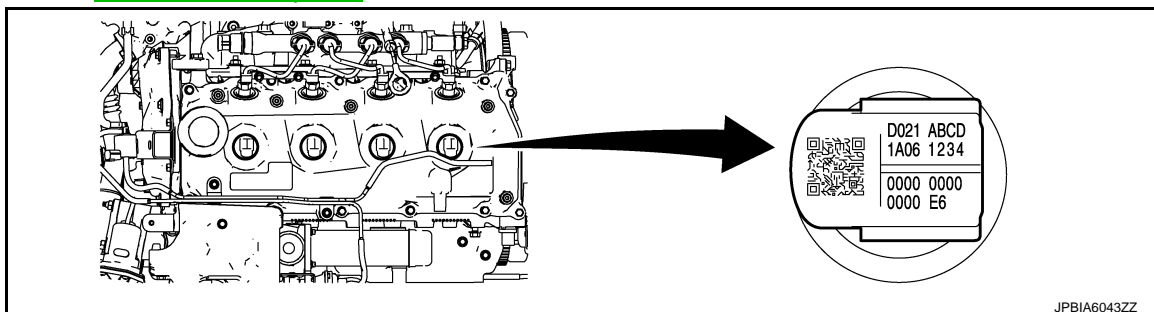
d. Remove O-ring from fuel injector.



INSTALLATION

1. Record "INJECTOR ADJUSTMENT VALUE" on the top surface when replacing fuel injector.

- Refer to [EC-562, "Description"](#).



Example: Injector Adjustment value = D021ABCD1A061234000000000000E6

2. Following steps below, install fuel injector.

a. Install O-ring and nozzle gasket to fuel injector, and insert them into cylinder head.

CAUTION:

Do not reuse O-rings and gaskets.

INJECTION TUBE AND FUEL INJECTOR

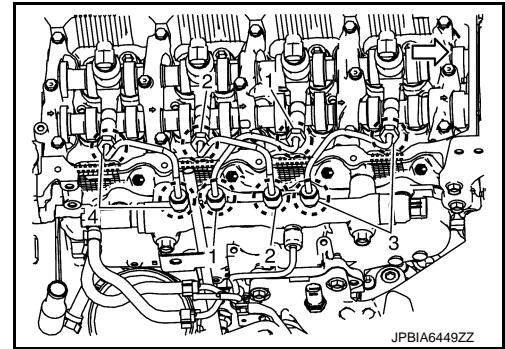
[YD25DDTi]

< REMOVAL AND INSTALLATION >

- b. Tighten injection tubes temporarily in the order of 1-2-3-4.

← : Vehicle front

- c. Be sure to fit nozzle support and pin without looseness.
d. Tighten nozzle support bolts.
• Apply engine oil to the bolts.
e. Loosen injection tubes in the order of 3-2-1-4.



3. Connect spill tube.
• Tighten fixing bolts and nut in the order from 1 to 6 as shown in the figure.

CAUTION:

- When tightening nut, fix spill tube retaining bolt with spanner.
- Do not reuse copper washers and gaskets.

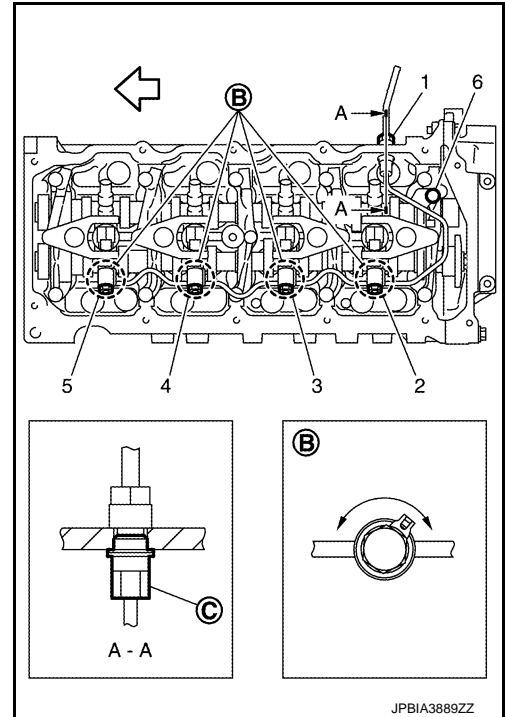
NOTE:

Connection of spill tube gasket may be broken, even if it is tighten to the specified torque. It does not affect performance.

Ⓑ : Gasket position

Ⓒ : Spill tube retaining bolt

← : Engine front

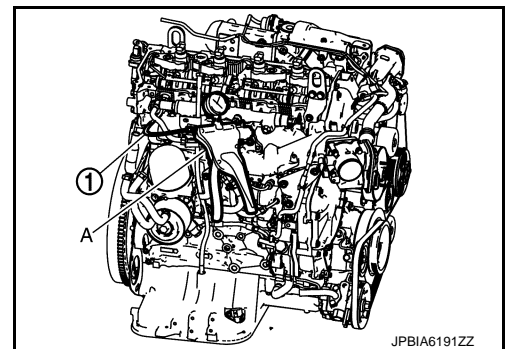


4. Perform air tightness test for spill tube.
• Connect a handy vacuum pump (A) to spill hose ①. Check that vacuum is retained while applying following vacuum.

Standard:

–53.3 to –66.7 kPa (–533 to –667 mbar, –400 to –500 mmHg, –15.75 to –19.69 inHg)

- If outside of standard, reconnect spill tube. (Replace gasket in this case.)
5. Install rocker cover. Refer to [EM-317. "Removal and Installation"](#).
6. Install nozzle oil seal.
• Apply engine oil to the rocker cover nozzle oil seal contact surface and the nozzle oil seal fuel injector contact surface before installation.
• Insert it straight until its flange fully contacts rocker cover.
- CAUTION:**
- Check gutter spring in nozzle oil seal on fuel injector for missing.
 - Do not reuse nozzle oil seal.

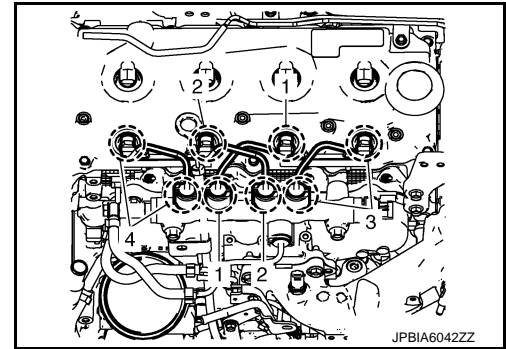


INJECTION TUBE AND FUEL INJECTOR

[YD25DDTi]

< REMOVAL AND INSTALLATION >

7. Connect injection tubes individually to each cylinder in order of 1-2-3-4.
8. Install in the reverse order of removal after this step.
9. Before start engine, bleed fuel piping. Refer to [FL-48, "Air Bleeding"](#).

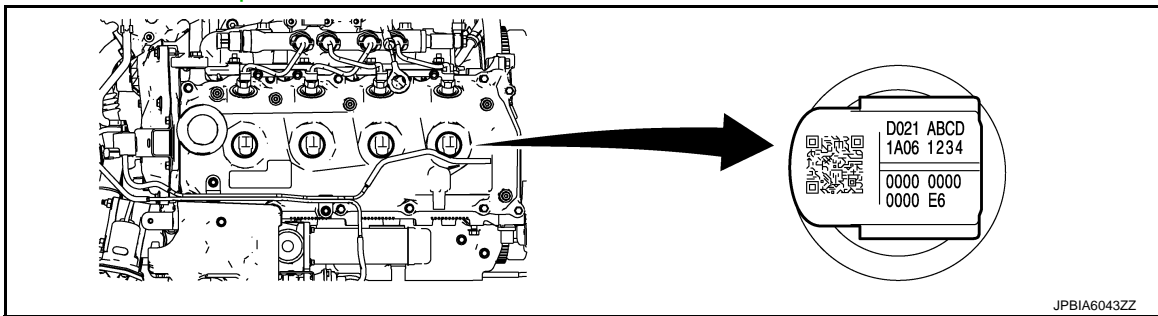


Inspection

INFOID:000000010520868

INSPECTION AFTER INSTALLATION

- Input "INJECTOR ADJUSTMENT VALUE" to ECM after installing to the vehicle when replacing fuel injector. Refer to [EC-562, "Description"](#).



Example: Injector Adjustment value = D021ABCD1A061234000000000000E6

- Perform "FUEL INJECTION QUANTITY LEARNING" after replacing fuel injector. Refer to [EC-559, "Description"](#).
- Start engine and increase engine speed to check for fuel leak.

CAUTION:

- **After any operation, check that there are no diesel leaks.**
- **Never touch engine immediately after stopped as engine becomes extremely hot.**

ROCKER COVER

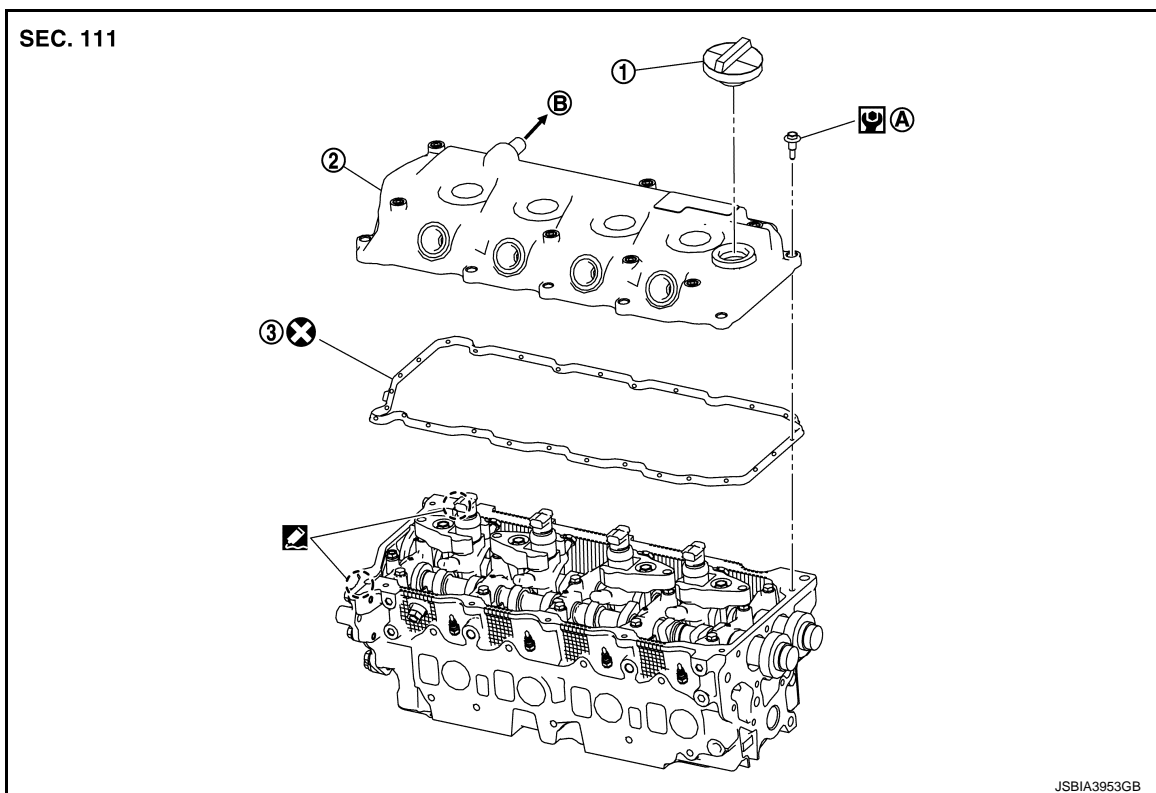
< REMOVAL AND INSTALLATION >

[YD25DDTi]

ROCKER COVER

Exploded View

INFOID:000000010520869



Removal and Installation

INFOID:000000010520870

REMOVAL

1. Remove engine cover and brackets. Refer to [EM-290. "Exploded View"](#).
2. Remove vacuum hoses and bracket. Refer to [EM-299. "Exploded View"](#).
3. Disconnect harness connector from fuel injector. Refer to [EM-312. "Exploded View"](#).
4. Following steps below, remove injection tubes (No.1 - 4). Refer to [EM-313. "Removal and Installation"](#).
 - a. Put a paint mark or tag on injection tubes to identify each cylinder.
 - Use a fuel-resistant method.

ROCKER COVER

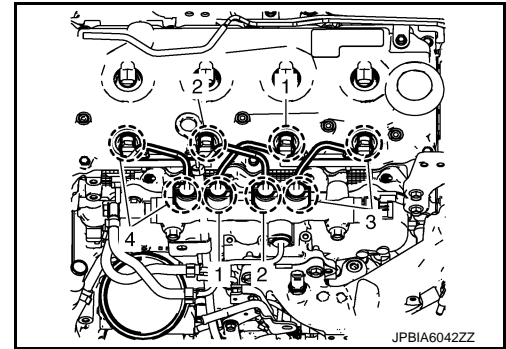
< REMOVAL AND INSTALLATION >

[YD25DDTi]

- b. Remove injection tubes in order of 3-2-1-4 individually.

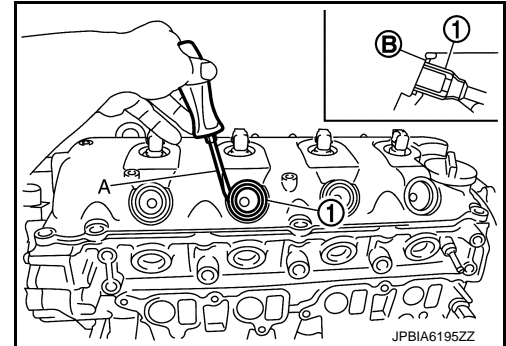
CAUTION:

Be careful not to allow leaked fuel to contaminate engine room. Especially, ensure to keep engine mounting insulator clear of fuel.



5. Remove injection nozzle oil seal ①.

- Using the flat-bladed screwdriver (A), pry flange ② to remove nozzle oil seal.

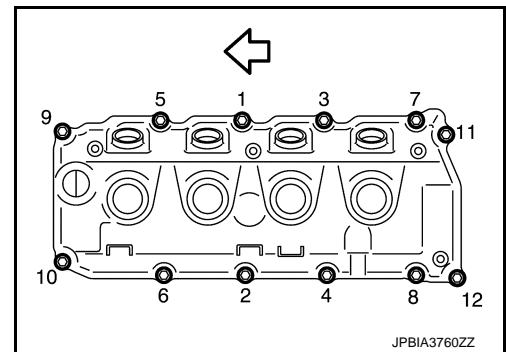


6. Remove rocker cover.

- Loosen holding bolts in the order from 12 to 1 as shown in the figure and remove.

← : Engine front

7. Remove gasket from rocker cover.

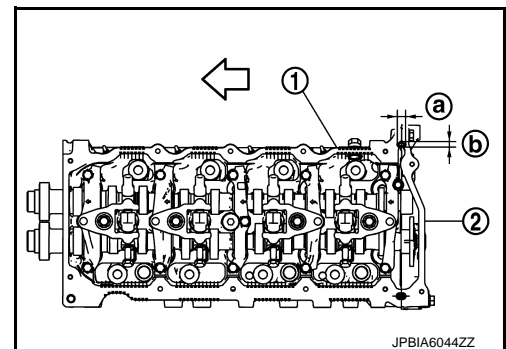


INSTALLATION

1. Install new gasket to rocker cover.
2. Apply liquid gasket with tube presser (commercial service tool) on locations shown in the figure.

- ① : Cylinder head
- ② : Cylinder head rear cover
- (a) : 10 mm (0.394 in)
- (b) : ϕ 3.0 mm (0.118 in)
- ← : Engine front

- Use Genuine Liquid Gasket (TB 1217H) or equivalent.



3. Tighten holding bolts.

ROCKER COVER

[YD25DDTi]

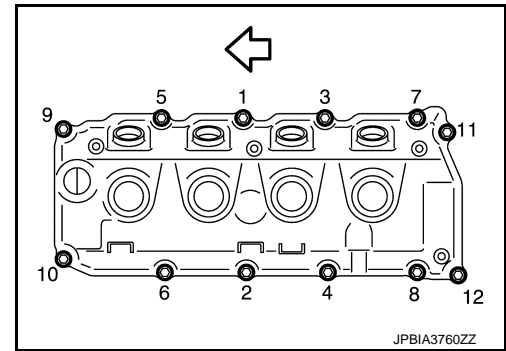
< REMOVAL AND INSTALLATION >

- Tighten all bolts in the order from 1 to 12 as shown in the figure.

← : Engine front

 : 7.8 N·m (0.8 kg-m, 69 in-lb)

- Re-tighten to the same torque in the same order as above.
4. Install nozzle oil seal.
 - Insert it straight until flange fully contacts rocker cover.
 5. Install remaining parts in the reverse order of removal.
 6. Before starting engine, bleed from fuel piping. Refer to [FL-48. "Air Bleeding"](#).



Inspection

INFOID:0000000010520871

INSPECTION AFTER INSTALLATION

Start engine and increase engine speed to check for fuel leak and engine oil leak.

CAUTION:

Never touch the engine immediately after stopped as engine becomes extremely hot.

SECONDARY TIMING CHAIN

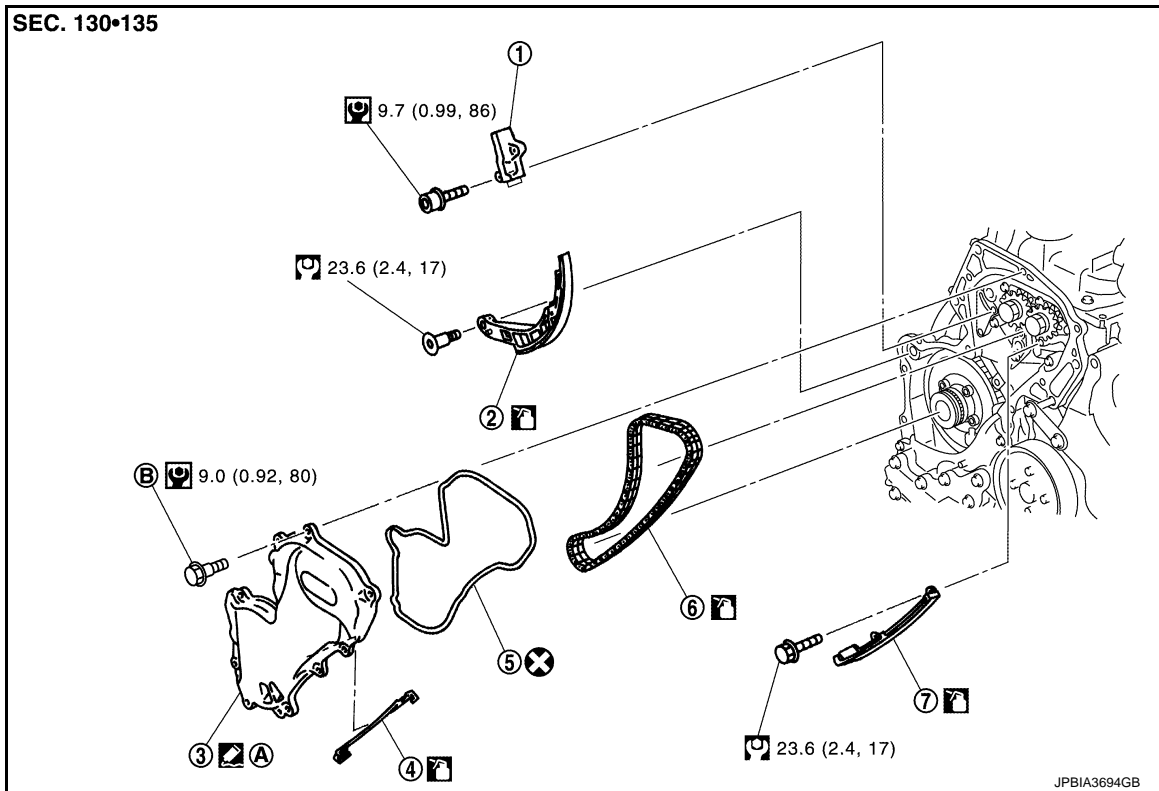
[YD25DDTi]

< REMOVAL AND INSTALLATION >

SECONDARY TIMING CHAIN

Exploded View

INFOID:000000010520933



- | | | |
|-------------------------|---|--------------------------|
| ① Chain tensioner 2 | ② Slack guide 2 | ③ Front chain case |
| ④ Tension guide 4 | ⑤ Gasket | ⑥ Secondary timing chain |
| ⑦ Tension guide 5 | | |
| Ⓐ Oil pump housing side | Ⓑ Comply with the installation procedure when tightening. Refer to EM-320 . | |

⊗ : Always replace after every disassembly.

Ⓐ : N·m (kg-m, in-lb)

Ⓑ : N·m (kg-m, ft-lb)

Ⓐ : Sealing point

Ⓑ : Should be lubricated with oil.

Removal and Installation

INFOID:000000010520934

CAUTION:

- After removing timing chain, never turn crankshaft and camshaft separately, or valves will strike piston heads.
- When installing camshafts, chain tensioners, oil seals, or other sliding parts, lubricate contacting surfaces with new engine oil.

REMOVAL

1. Remove drive belt. Refer to [EM-285, "Exploded View"](#).
2. Remove cooling fan. Refer to [CO-78, "Exploded View"](#).
3. Remove EGR cooler bypass valve control solenoid valve harness connector.

SECONDARY TIMING CHAIN

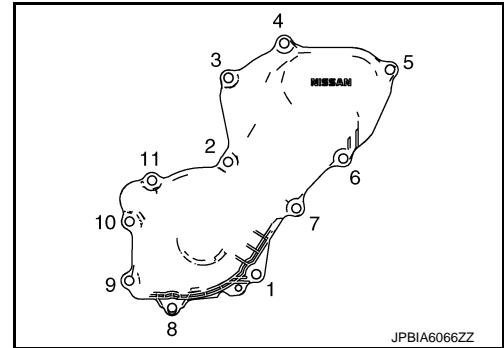
[YD25DDTi]

< REMOVAL AND INSTALLATION >

4. Remove EGR cooler bypass valve control solenoid valve bracket mounting bolts and Move to the position which does not interfere the work of EGR cooler bypass valve control solenoid valve.
5. Remove EGR tube. Refer to [EM-299, "Exploded View"](#).
6. Remove front chain case.
 - Loosen fixing bolts in the order from 11 to 1 as shown in the figure and remove them.

CAUTION:

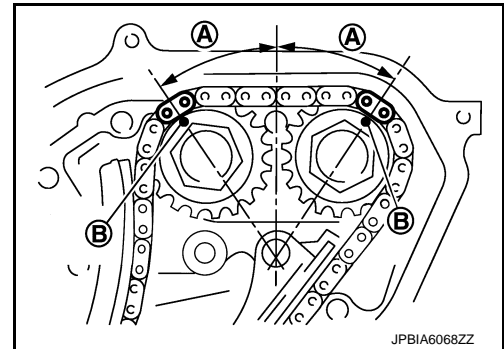
- While front chain case is removed, cover openings to prevent entry of foreign material into engine.



7. Set the No. 1 piston to TDC on its compression stroke.
 - Turn crankshaft pulley clockwise so that the alignment mark (punched mark) (B) on each camshaft sprocket is positioned as shown in the figure.

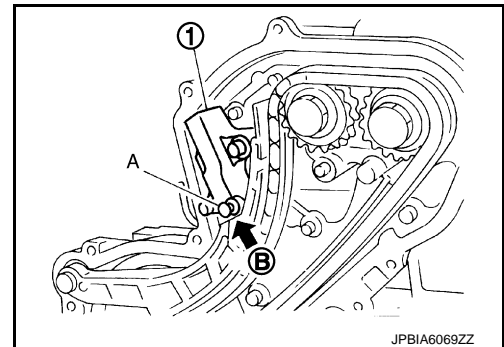
(A) : Same angle

- No position indicator is provided on crankshaft pulley.
- When installing, color coded links on secondary timing chain can be used as alignment marks. Marking may not be necessary for removal, however, make alignment marks as required because the alignment mark on fuel pump sprocket may not be easy to see.

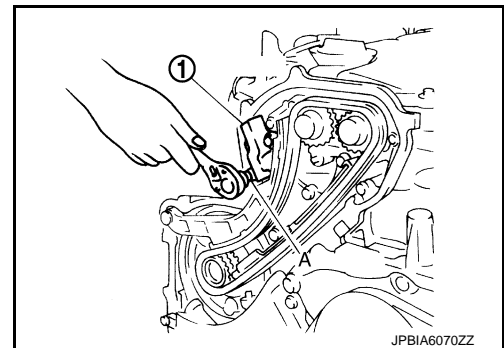


8. Remove chain tensioner 2.
 - a. Push the plunger of chain tensioner 2 (1) and keep it pressed with a push pin (A).

(B) : Press



- b. Using the hexagon wrench [SST: KV11106010] (A), remove bolts to remove chain tensioner 2 (1).



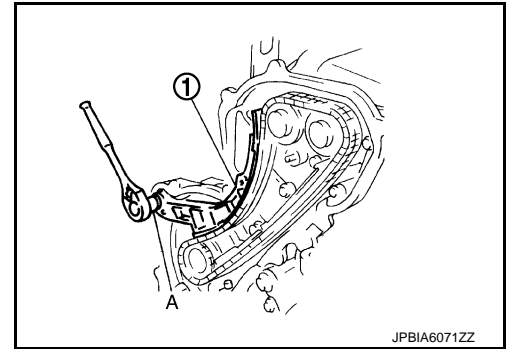
9. Remove slack guide 2.

SECONDARY TIMING CHAIN

[YD25DDTi]

< REMOVAL AND INSTALLATION >

- Using the hexagon wrench [SST: KV11106020] (A), remove bolt to remove slack guide 2 ①.

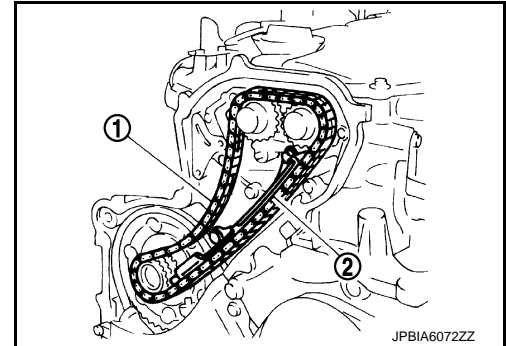


10. Remove tension guide 4 ②.

① : Secondary timing chain

11. Remove secondary timing chain.

- Timing chain alone can be removed without removing sprockets.



INSTALLATION

1. Install secondary timing chain.

- When installing, match the alignment marks on sprockets with color coded alignment marks (colored links) on the timing chain.

① : Secondary timing chain

② : Chain tensioner 2

③ : Slack guide 2

④ : Fuel pump sprocket

⑤ : Tension guide 4

⑥ : Camshaft sprocket

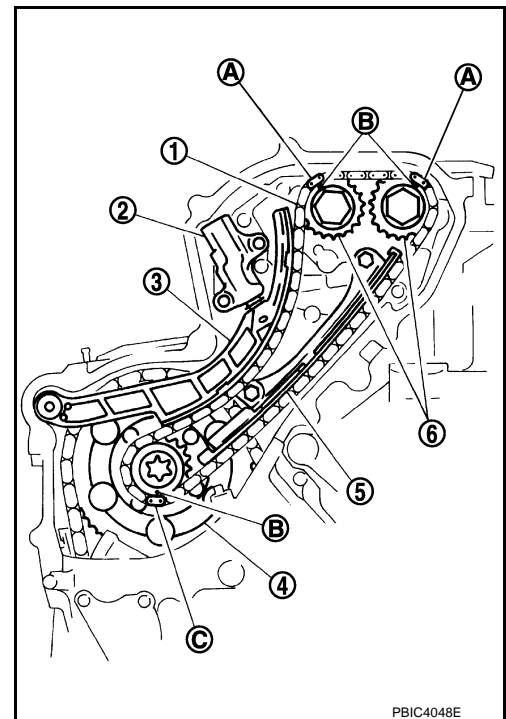
(A) : Alignment mark (dark blue link)

(B) : Alignment mark (punched mark)

(C) : Alignment mark (yellow link)

2. Install tension guide 4.

- The upper bolt has a longer shank than the lower bolt.

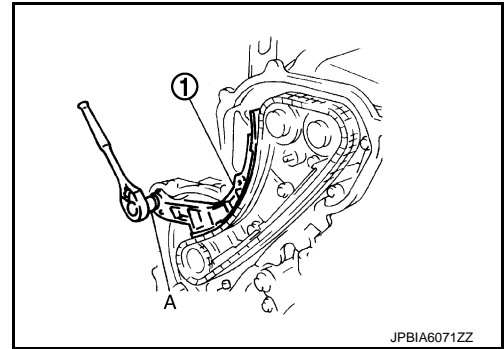


SECONDARY TIMING CHAIN

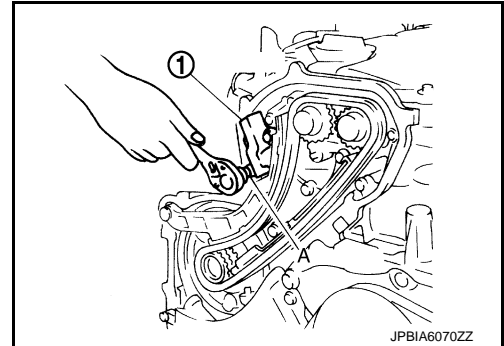
[YD25DDTi]

< REMOVAL AND INSTALLATION >

3. Using the hexagon wrench [SST: KV11106020] (A), install slack guide 2 ①.



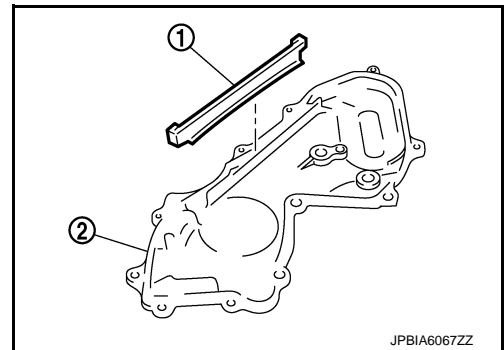
4. Install chain tensioner 2 ①.
 - a. Push the plunger of chain tensioner 2. While holding it with a push pin, install chain tensioner 2.
 - b. Using the hexagon wrench [SST: KV11106010] (A), tighten bolts.
 - c. Pull out the push pin, etc. holding the plunger.
 - **Check again that the alignment marks on the sprockets and the colored alignment marks on the timing chain are aligned.**



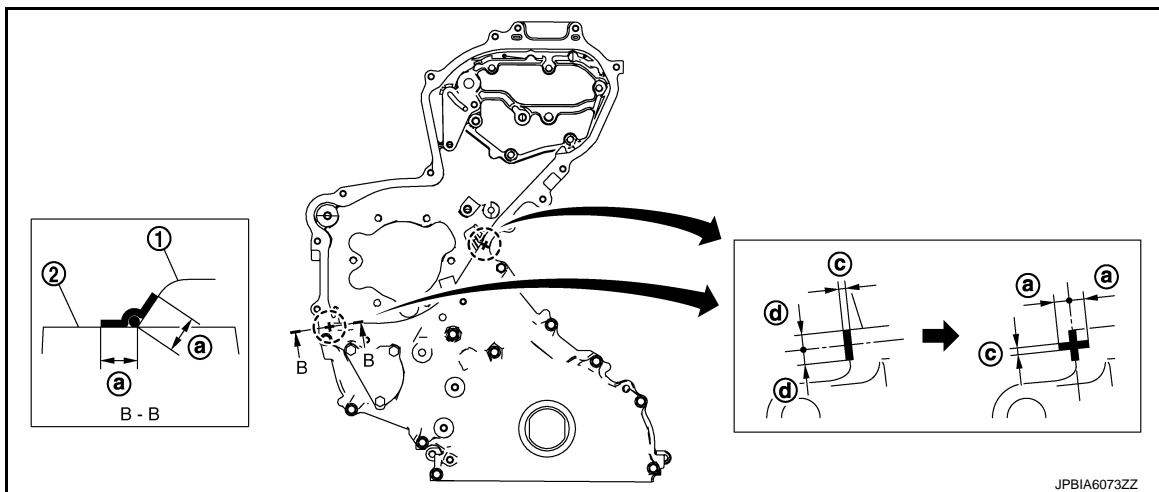
5. Install front chain case.

CAUTION:
Do not reuse gasket.

- a. Install tension guide 5 ① on the back surface of front chain case ②.
 - Hold front chain case vertically when installing. Tension guide may come off if front chain case is tilted.



- b. Apply a continuous bead of liquid gasket on both ends of arched area (locations where rear chain case is adjoined) as shown in the figure.



SECONDARY TIMING CHAIN

[YD25DDTi]

< REMOVAL AND INSTALLATION >

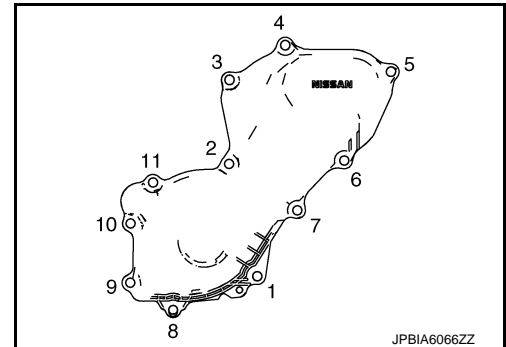
- | | | |
|--------------------|--|------------------|
| ① Oil pump housing | ② Rear chain case | |
| Ⓐ 10 mm (0.39 in) | Ⓒ ϕ 3.4 - 4.4 mm (0.13 - 0.17 in) | Ⓓ 5 mm (0.20 in) |

CAUTION:

- For (A), the overlap of the liquid gasket starting point and end-point must be minimized and faced outward.

Use Genuine Liquid Gasket (TB1217H) or equivalent.

- Install front chain case.
 - When installing, align dowel pin on oil pump housing with the pin hole.
- Tighten fixing bolts in the order from 1 to 11 as shown in the figure.
- After tightening all the bolts, re-tighten in the same order.



- Install in the reverse order of removal after this step.

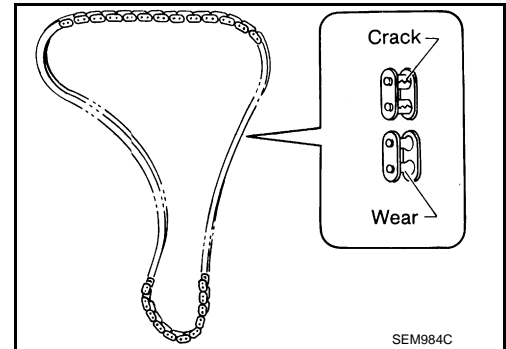
Inspection

INFOID:000000010520935

INSPECTION AFTER REMOVAL

Timing Chain

Check for cracks and excessive wear at roller links. Replace timing chain if necessary.



INSPECTION AFTER INSTALLATION

Inspection for Leakage

1. Check the engine oil level and adjust engine oil. Refer to [LU-37. "Inspection"](#).
2. Start engine, and check there is no leak of engine oil.
3. Stop engine and wait for 10 minutes.
4. Check the engine oil level again. Refer to [LU-37. "Inspection"](#).

Inspection for Noise and Vibration

Run engine to check for unusual noise and vibration.

NOTE:

If hydraulic pressure inside chain tensioner drops after removal/installation, slack in guide may generate a pounding noise during and just after the engine start. However, this does not indicate a malfunction. The noise will stop after hydraulic pressure rises.

FUEL PUMP

< REMOVAL AND INSTALLATION >

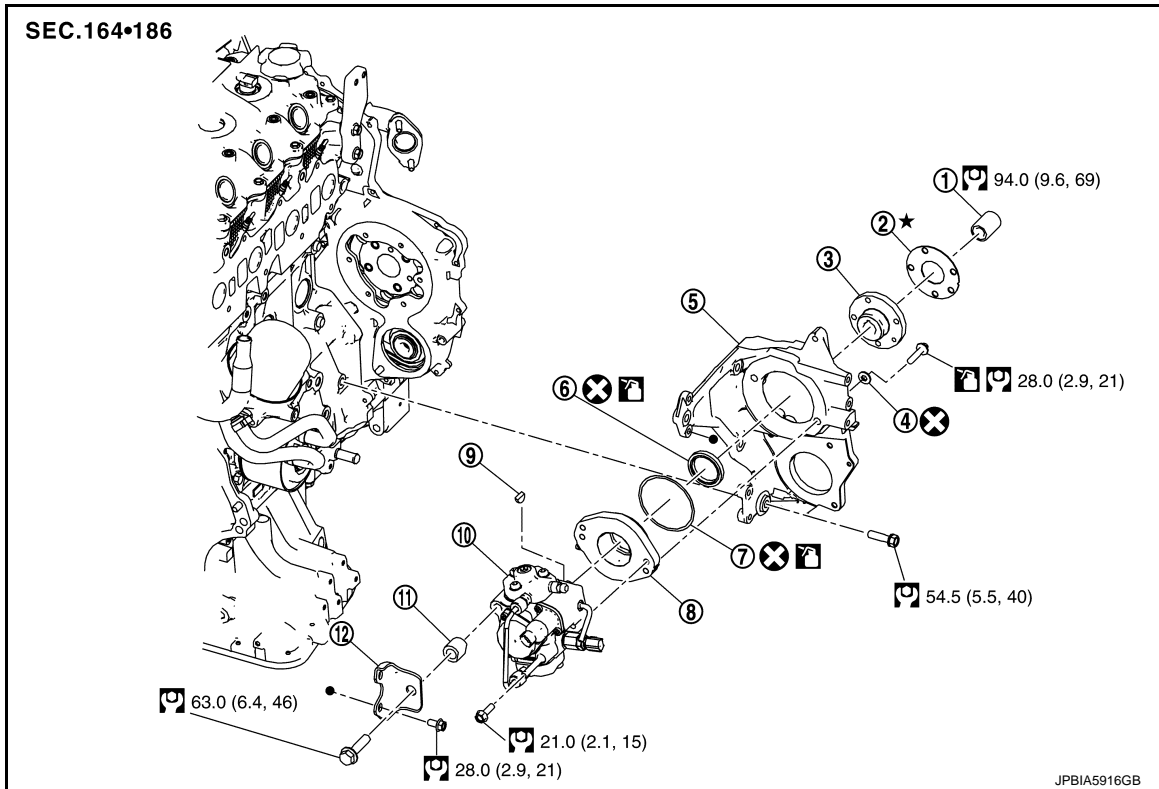
[YD25DDTi]

FUEL PUMP

Exploded View

INFOID:0000000010520936

REMOVAL



- | | | |
|----------------|---------------------|------------|
| ① Sprocket nut | ② Adjusting shim | ③ Coupling |
| ④ Washer | ⑤ Fuel pump bracket | ⑥ Oil seal |
| ⑦ O-ring | ⑧ Spacer | ⑨ Key |
| ⑩ Fuel pump | ⑪ Spacer | ⑫ Bracket |

✕ : Always replace after every disassembly.

🔧 : N·m (kg-m, ft-lb)

🛢 : Should be lubricated with oil.

★ : Select with proper thickness.

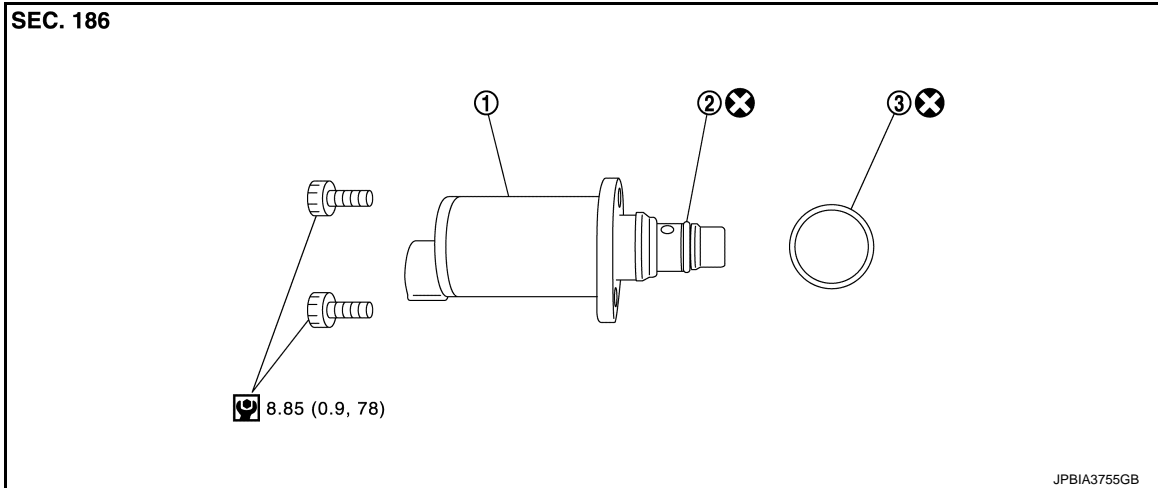
● : Indicates that the parts is connected at points with same symbols in actual vehicle.

DISASSEMBLY

FUEL PUMP

< REMOVAL AND INSTALLATION >

[YD25DDTi]



- ① Fuel pump suction control valve ② Small O-ring ③ Large O-ring
- ⊗ : Always replace after every disassembly.
- Ⓜ : N·m (kg·m, in·lb)

Removal and Installation

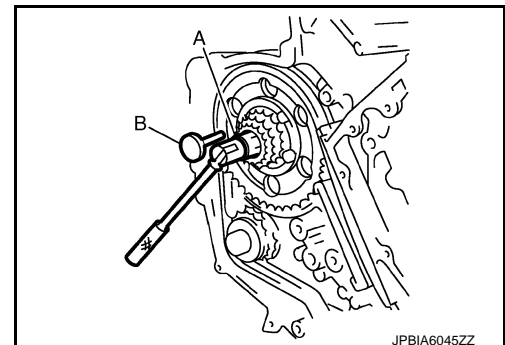
INFOID:0000000010520937

CAUTION:

- After removing timing chain, never turn crankshaft and camshaft separately, or valves will strike piston heads.
- When installing camshafts, chain tensioners, oil seals, or other sliding parts, lubricate contacting surfaces with new engine oil.
- When fuel pump is replaced with new one or another one, perform fuel pump learning value clearing before starting engine. Refer to [EC-561, "Description"](#).

REMOVAL

1. Remove engine cover. Refer to [EM-290, "Exploded View"](#).
2. Remove fuel feed hose, fuel return hose. Refer to [EM-312, "Exploded View"](#).
CAUTION:
Be careful not to spill fuel in the engine component.
3. Disconnect harness connectors from fuel pump.
4. Remove injection tube (No.5), clip and insert rubber. Refer to [EM-313, "Removal and Installation"](#).
CAUTION:
Be careful not to spill fuel in the engine component.
5. Remove collector intake manifold. Refer to [EM-296, "Exploded View"](#).
6. Remove secondary timing chain. Refer to [EM-320, "Exploded View"](#).
7. Hold fuel pump sprocket and remove bolt.
 - a. Insert the positioning stopper pin [SST: KV11106030] (B) into the hole 6 mm (0.24 in) in the diameter on the fuel pump sprocket.
 - b. Using the TORX wrench (T70) [SST: KV11106040] (A), turn pump shaft little by little to adjust the position of fuel pump sprocket so that the holes align.
 - c. Push the positioning stopper pin [SST: KV11106030] through fuel pump sprocket to fuel pump body to hold fuel pump sprocket.



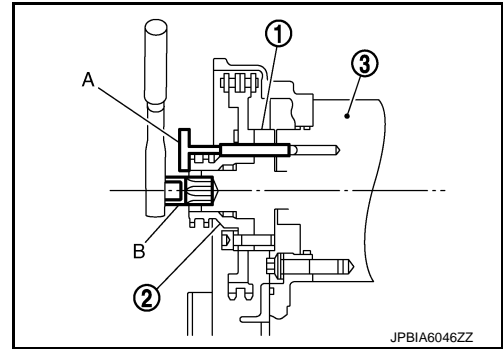
FUEL PUMP

[YD25DDTi]

< REMOVAL AND INSTALLATION >

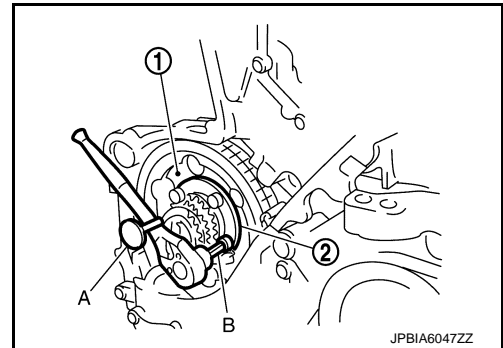
- Insert the positioning stopper pin [SST: KV11106030] (A) until its flange contacts the fuel pump sprocket ②.

- ① : Coupling
- ③ : Fuel pump
- B : TORX wrench (T70) [SST: KV11106040]



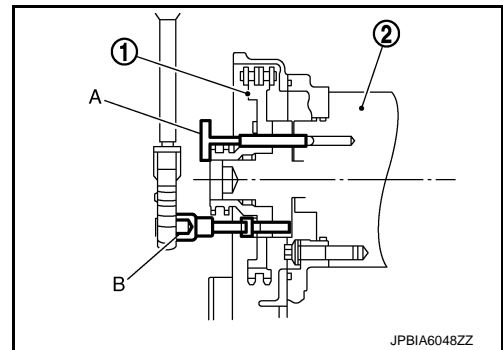
- Using the hexagon wrench [SST: KV11106050] (B) remove tightening bolts of fuel pump sprocket.

- ① : Fuel pump sprocket
- ② : Washer
- A : Positioning stopper pin [SST: KV11106030]



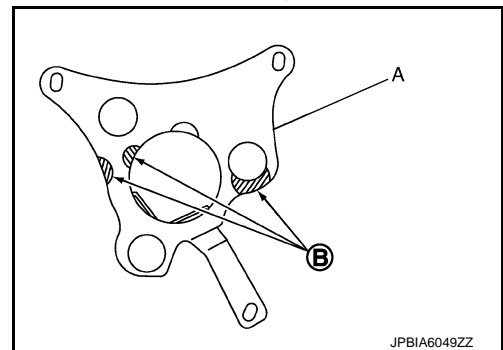
- Insert the positioning stopper pin [SST: KV11106030] (A) until its flange contacts the fuel pump sprocket ①.

- ② : Fuel pump
- B : Hexagon wrench [SST: KV11106050]



- Using the sprocket holder [SST: KV11106060], hold fuel pump sprocket to prevent falling.
 - Rework sprocket holder (A) to use, as shown in the figure.

- Ⓑ : Additional machining area

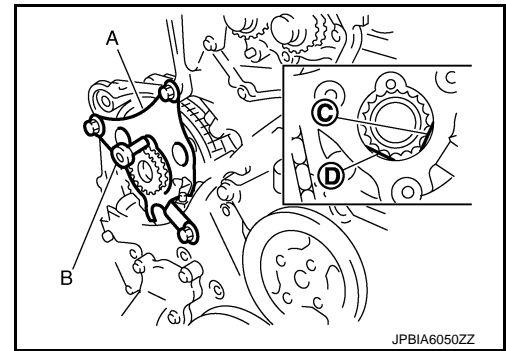


FUEL PUMP

[YD25DDTi]

< REMOVAL AND INSTALLATION >

- When the sprocket holder [SST: KV11106060] (A) is installed, if the positioning stopper pin [SST: KV11106030] (B) interferes, pull out the positioning stopper pin approximately 10 mm (0.39 in), then install it.
- After the sprocket holder is installed temporarily, tighten the sprocket holder after making extension bar and TORX socket (size: E10) (commercial service tool) insert into the machined bore.
- The length of the sprocket holder mounting bolts should be approximately 15 mm (0.59 in) (M6 thread length).
- Check that the ③ and ④ faces of the sprocket holder contact the bottom side of the sprocket (small diameter side).



CAUTION:

Never remove the sprocket holder [SST: KV11106060] until fuel pump is installed.

- After the sprocket holder is installed, pull out the positioning stopper pin from fuel pump sprocket.

10. Using the extension bar and the TORX socket (size: E10) (commercial service tool) (A), remove the tightening bolts.

① : Fuel pump

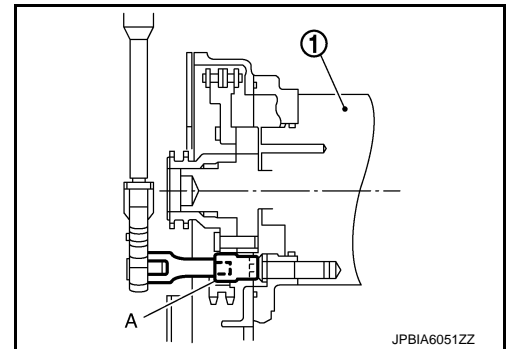
CAUTION:

For removal, be careful not to drop the seal washer into the engine.

NOTE:

The seal washer of the tightening bolts cannot be reused.

11. Remove the fuel pump toward the rear of engine.
12. Remove adjusting shim.
13. Attach a suitable pulley holder (A) in the M8 bolt hole on coupling ②.

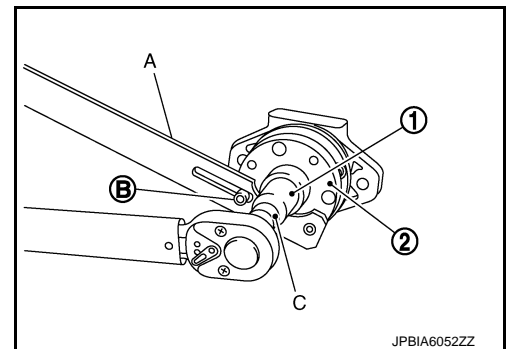


① : Sprocket nut

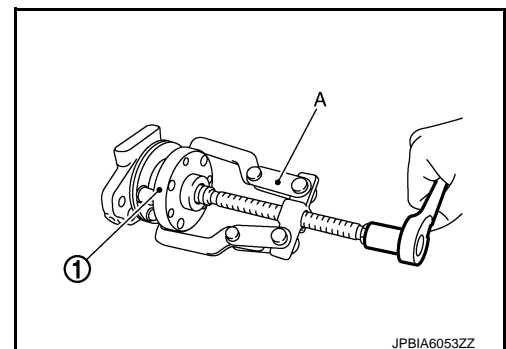
② : Bolt (M8)

C : TORX wrench (T70) [SST: KV11106040]

14. Loosen sprocket nut with the TORX wrench (T70) [SST: KV11106040].



15. Remove coupling ① with a suitable puller (A).
16. Remove spacer from fuel pump.
17. Remove oil seal from spacer.



INSTALLATION

FUEL PUMP

[YD25DDTi]

< REMOVAL AND INSTALLATION >

1. Install new oil seal ② to spacer ①.

② : 2 - 2.5 mm (0.08 - 0.09 in)

← : Spacer side

CAUTION:

- Do not reuse oil seal.
- Apply engine oil to oil seal lip.

2. Install O-ring to spacer.

CAUTION:

- Apply engine oil to O-ring.

3. Install spacer to fuel pump.

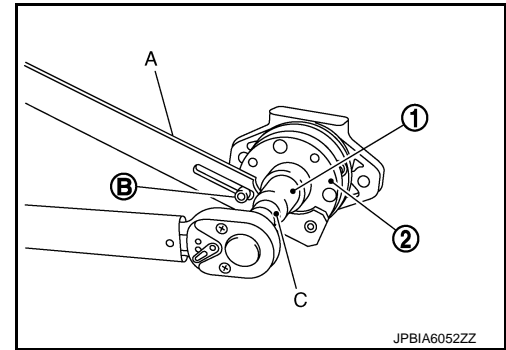
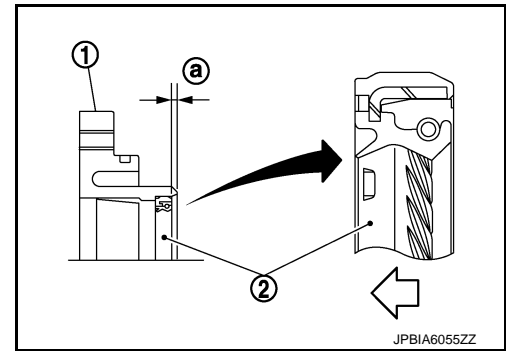
4. Install coupling ② to fuel pump of spacer.

① : Sprocket nut

A : Pulley holder (suitable tool)

② : Bolt (M8)

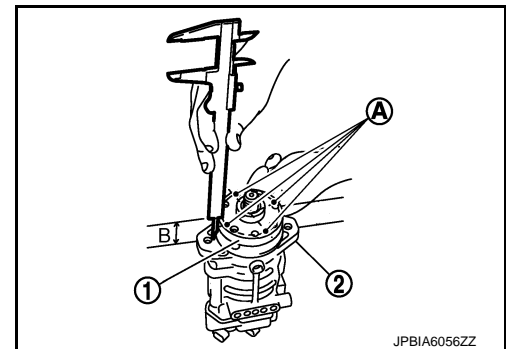
- Using the TORX wrench (T70) [SST: KV11106040] (C), tighten the sprocket nut to fix the coupling.



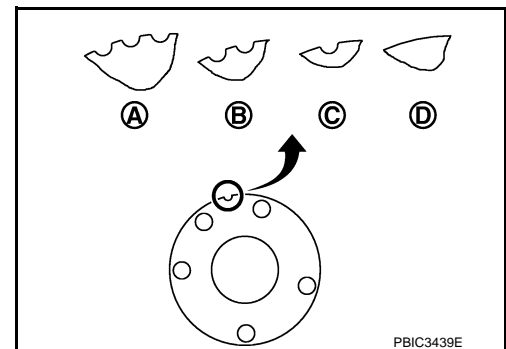
5. Install adjusting shim.

- For shim adjustment, measure dimension (B) [Distance between front surface of coupling ① and spacer ②] at two opposing points near the coupling bolt center. Use the average of these two measurements to select the shim grade that marked on adjusting shim.

① : Measuring point



- The shim adjustment is required only when the fuel pump is replaced.



Part No. of adjusting shim	Grade number	Measuring dimension B [mm (in)]	Type
16614 8H800	0.5 t	39.23 - 39.77 (1.5445 - 1.5657)	①
16614 8H810	1.0 t	38.76 - 39.23 (1.5260 - 1.5445)	②
16614 8H860	1.2 t	38.57 - 38.76 (1.5185 - 1.5260)	③
16614 8H820	1.6 t	38.18 - 38.57 (1.5031 - 1.5185)	④

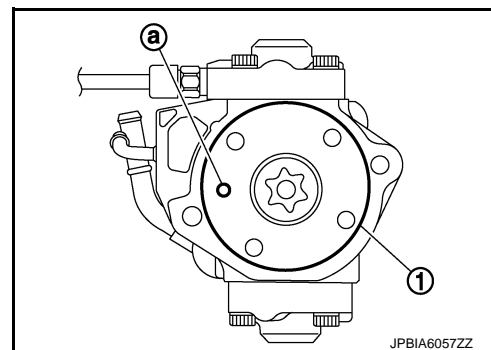
FUEL PUMP

< REMOVAL AND INSTALLATION >

[YD25DDTi]

Part No. of adjusting shim	Grade number	Measuring dimension B [mm (in)]	Type
16614 8H800 + 16614 8H860	0.5 t + 1.2 t	38.09 - 38.18 (1.4996 - 1.5031)	Ⓐ + Ⓒ
16614 8H810 + 16614 8H810	1.0 t + 1.0 t	37.80 - 38.09 (1.4882 - 1.4996)	Ⓑ + Ⓑ
16614 8H860 + 16614 8H810	1.2 t + 1.0 t	37.60 - 37.80 (1.4803 - 1.4882)	Ⓒ + Ⓑ
16614 8H820 + 16614 8H810	1.6 t + 1.0 t	37.21 - 37.60 (1.4650 - 1.4803)	Ⓓ + Ⓑ

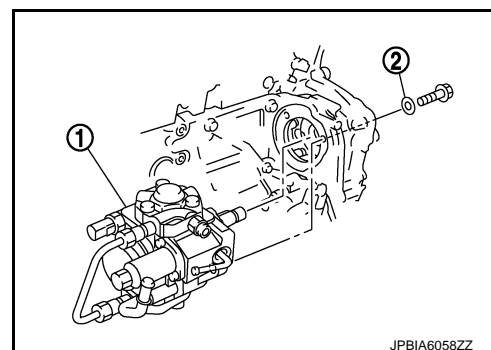
6. Before fuel pump is installed, check that spacer and the 6 mm (0.24 in) dia. hole Ⓐ on coupling ① are aligned.



7. Insert fuel pump ① to the mounting position from the rear side of the engine, and install the tightening bolts with washer ②.

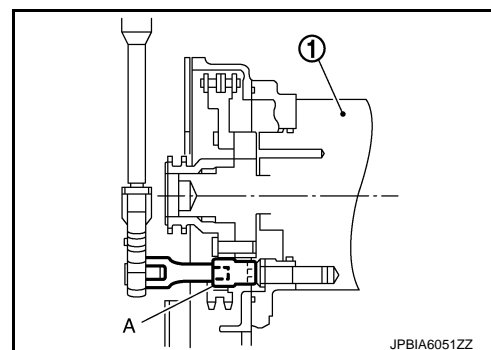
CAUTION:

- Be careful not to drop the seal washer into engine.
- Do not reuse washers.

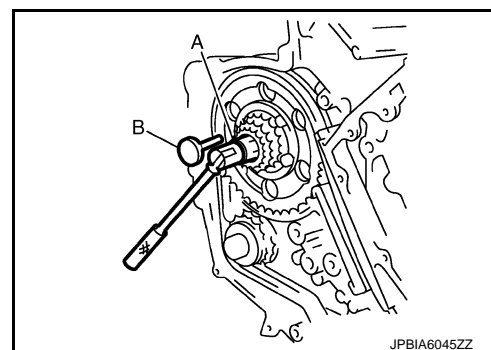


8. Using the extension bar and the TORX socket (size: E10) (commercial service tool) (A), tighten the tightening bolts of fuel pump ①.

9. Remove the sprocket holder [SST: KV11106060].



10. Using the TORX wrench (T70) [SST: KV11106040] (A), turn the pump shaft gradually to adjust the position of fuel pump sprocket. Then, insert the positioning stopper pin [SST: KV11106030] (B) to the 6 mm (0.24 in) dia. hole of the fuel pump sprocket through the pump body.



FUEL PUMP

[YD25DDTi]

< REMOVAL AND INSTALLATION >

- Using the hexagon wrench [SST: KV11106050] (B), tighten the sprocket tightening bolt.

① : Fuel pump sprocket

② : Washer

A : Positioning stopper pin [SST: KV11106030]

- When the washer of the fuel pump sprocket is removed, install it with the marking "○" facing the front of the engine.

- Pull out the positioning stopper pin [SST: KV11106030].

- Install secondary timing chain. Refer to [EM-320, "Exploded View"](#).

- Install in the reverse order of removal.

- Before starting engine, bleed from fuel piping. Refer to [FL-48, "Air Bleeding"](#).

CAUTION:

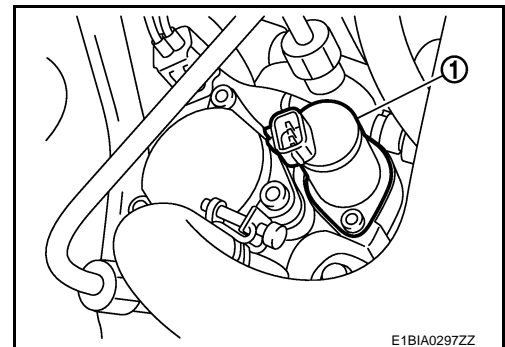
When fuel pump is replaced with new one or another one, perform fuel pump learning value clearing before starting engine. Refer to [EC-561, "Description"](#).

Disassembly and Assembly

INFOID:0000000010520938

DISASSEMBLY

- Disconnect harness connector from fuel pump suction control valve ①.



- Take note of the connector's orientation. The new valve will have to be fitted in the same way as the old one.
- Clean the pump with brake cleaner around fuel pump suction control valve contact surface.
- Remove fixating bolt of the suction valve, and remove the suction valve.

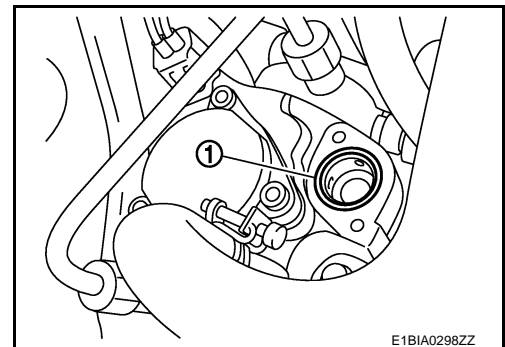
CAUTION:

- The large O-ring says inside. Do not pull the valve with twisting or try pying it out with any tool. Carefully pull the valve straight up.
- Do not use work gloves to prevent foreign substances entering the fuel injection pump.

- Remove large O-ring ①.

CAUTION:

- Do not use any tool to remove the O-ring.
- Do not allow any foreign substances to enter into the fuel injection pump.



ASSEMBLY

FUEL PUMP

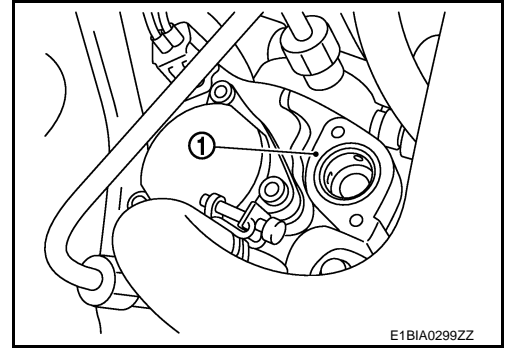
< REMOVAL AND INSTALLATION >

[YD25DDTi]

1. Ensure that the groove of the pump side housing is contamination free, then place the new large O-ring ① into the groove.

NOTE:

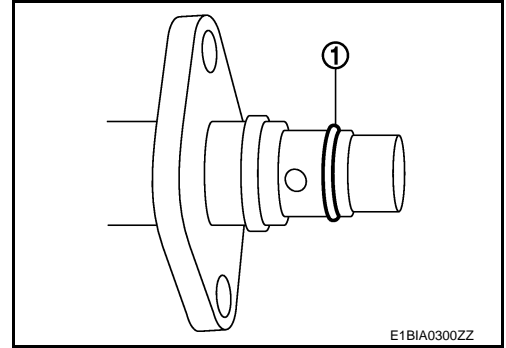
- Apply clean engine oil around the small O-ring, then fit it to the groove. Otherwise the O-ring may fall off.



2. Apply clean engine oil around the small O-ring ① on the new fuel pump suction control valve for sealing.

CAUTION:

Make sure the fuel pump suction control valve is clean and no debris sticks to the O-ring. Any contamination or damage to the O-ring will cause the fuel injection pump not to work properly.

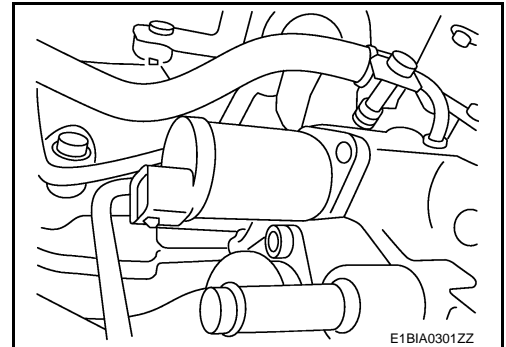


3. Insert the new fuel pump suction control valve by hand until you feel a click. Make sure the connector faces into the same direction as before removal.

CAUTION:

Do not try to twist the fuel pump suction control valve in, just push it straight.

4. Tighten bolt by hand and then use the torque wrench. Refer to [EM-325, "Exploded View"](#).
5. Connect the fuel pump suction control valve to the wiring harness.
6. Clean the fuel pump suction control valve fitting area with a degreasing spray.
7. Bleed fuel lines.
8. Start engine and check there is no fuel leakage.



Inspection

INFOID:0000000010520939

INSPECTION AFTER INSTALLATION

Start engine and increase engine speed to check for fuel leak.

CAUTION:

- After any operation, check that there are no diesel leaks.
- Never touch engine immediately after stopped as engine becomes extremely hot.

CAMSHAFT

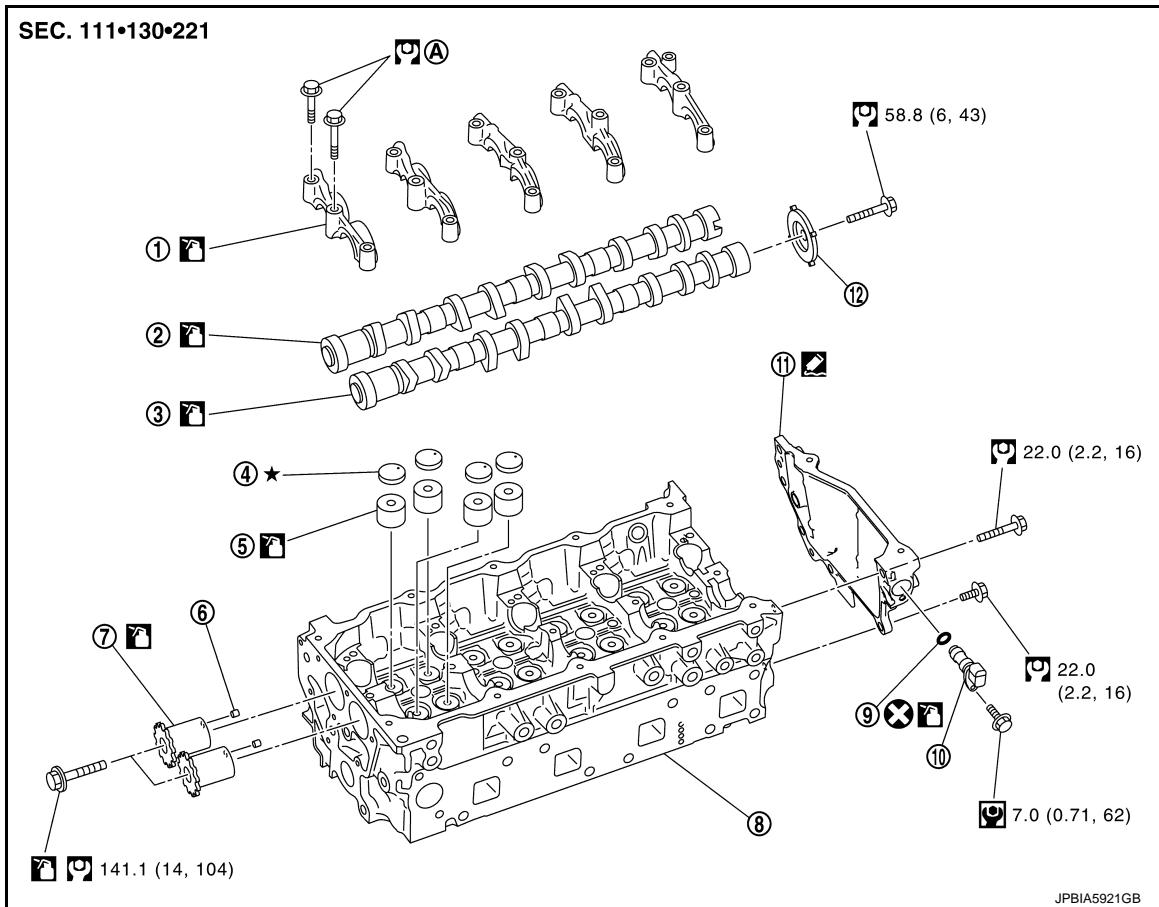
< REMOVAL AND INSTALLATION >

[YD25DDTi]

CAMSHAFT

Exploded View

INFOID:000000010520940



- | | | |
|----------------------------|----------------------------|--------------------|
| ① Camshaft bracket | ② Intake camshaft | ③ Exhaust camshaft |
| ④ Adjusting shim | ⑤ Valve lifter | ⑥ Knock pin |
| ⑦ Camshaft sprocket | ⑧ Cylinder head | ⑨ O-ring |
| ⑩ Camshaft position sensor | ⑪ Cylinder head rear cover | ⑫ Signal plate |

(A) Comply with the installation procedure when tightening. Refer to [EM-333](#)

(X) : Always replace after every disassembly.

(N-m) : N·m (kg-m, in-lb)

(N-m) : N·m (kg-m, ft-lb)

(L) : Should be lubricated with oil.

(S) : Sealing point

(★) : Select with proper thickness.

Removal and Installation

INFOID:000000010520941

REMOVAL

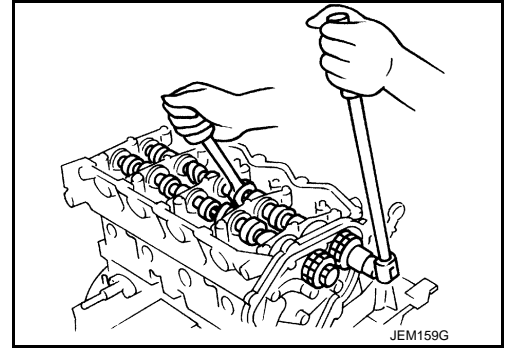
1. Drain engine oil. Refer to [LU-38, "Draining"](#).
2. Remove the following parts:
 - Fuel injector. Refer to [EM-312, "Exploded View"](#).

CAMSHAFT

[YD25DDTi]

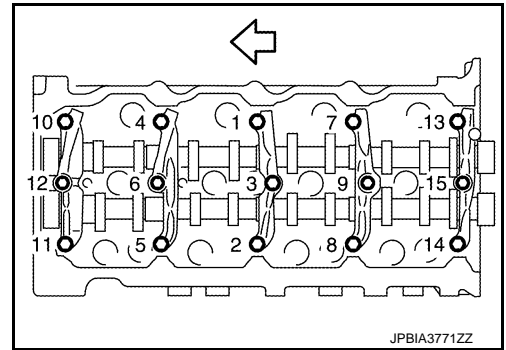
< REMOVAL AND INSTALLATION >

- Rocker cover. Refer to [EM-317, "Exploded View"](#).
- Secondary timing chain. Refer to [EM-320, "Exploded View"](#).
3. Remove camshaft position sensor.
4. Remove camshaft sprockets.
 - Loosen the camshaft sprocket mounting bolts by fixing the hexagonal portion of camshaft.

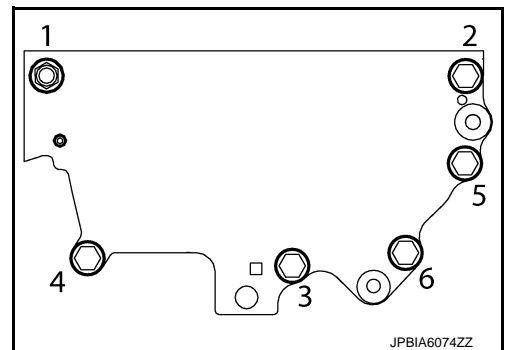


5. Remove camshaft.
 - Place distinguishing marks on the right and left sides with paint.
 - Loosen and remove the camshaft sprocket bolts in the order from 15 to 1 as shown in the figure.

⇐ : Engine front



6. Remove adjusting shim and valve lifter.
 - Remove by taking notice of the installation position, and place outside engine in order to prevent confusion.
7. Loosen cylinder head rear cover mounting bolts in the order from 6 to 1 as shown in the figure.
8. Remove signal plate, if necessary.



INSTALLATION

CAUTION:

Do not reuse O-rings.

1. Install signal plate, if removed.
2. Install cylinder head rear cover, if removed.

CAMSHAFT

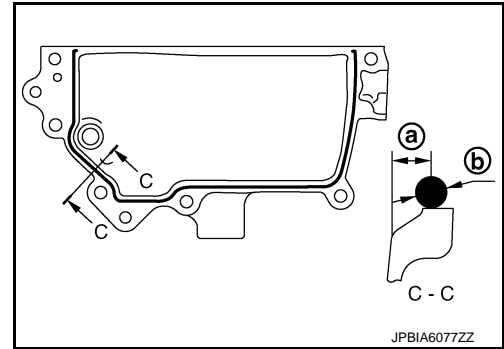
< REMOVAL AND INSTALLATION >

[YD25DDTi]

- a. Apply liquid gasket to cylinder head rear cover as shown in the figure.

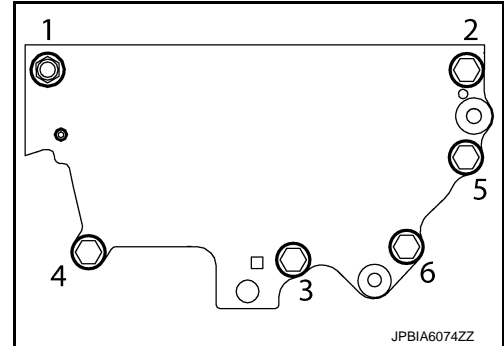
- Ⓐ : 4.0 - 5.6 mm (0.157 - 0.220 in)
 Ⓑ : ϕ 3.4 - 4.4 mm (0.134 - 0.173 in)

Use Genuine Liquid Gasket (TB1217H) or Equivalent.



- b. Install cylinder head rear cover and tighten mounting bolts in the order from 1 to 6 as shown in the figure.

- M8 × 50 mm (1.97 in) : Bolt No. 1**
M8 × 20 mm (0.79 in) : Bolt No. 2 - 6

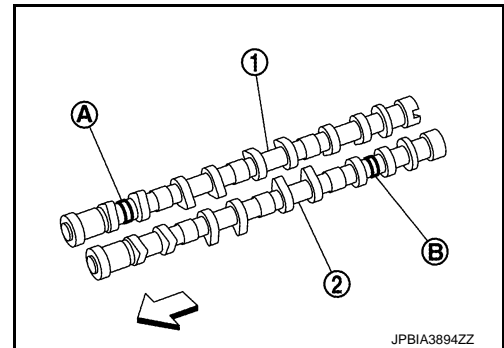


3. Install valve lifter and adjusting shim.
 • Check that these are installed in the same position as before the removal process.
4. Install camshaft.

- ① : Intake camshaft
 ② : Exhaust camshaft
 ⇐ : Engine front

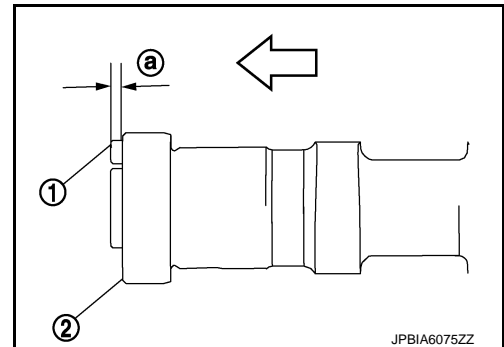
- Identify camshafts by the paint position.

- Ⓐ : **White**
 Ⓑ : **Green**



- When replace camshaft ②, install knock pin ① shown un the figure.

- Ⓐ : 3.6 - 4.2 mm (0.142 - 0.165 in)
 ⇐ : Engine front



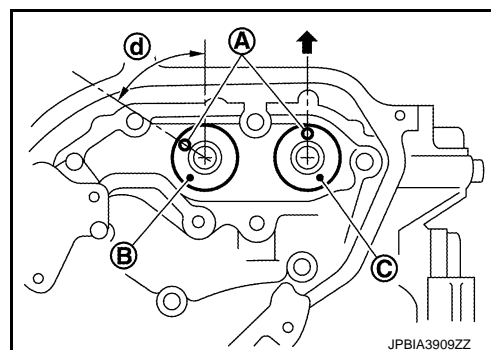
CAMSHAFT

[YD25DDTi]

< REMOVAL AND INSTALLATION >

- Install so that knock pins (A) are positioned in the directions shown in the figure.

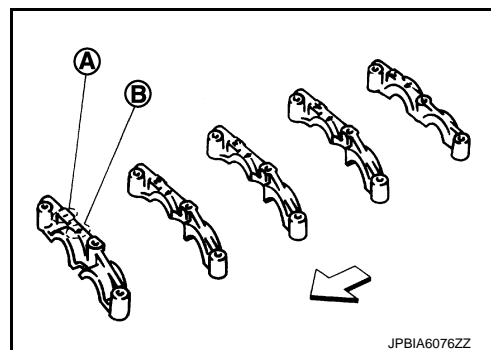
- (B) : Intake camshaft
- (C) : Exhaust camshaft
- (d) : Approx. 65°
- ← : Up



5. Install camshaft brackets.

- Completely remove any foreign material on back surfaces of camshaft brackets and top surface of cylinder head.
- Install correctly, identifying brackets by the journal No. (A) and front mark (B) on top surface.

← : Engine front



6. Tighten camshaft bolts in the order from 1 to 15 as shown in the figure according to the following procedure:

← : Engine front

a. Tighten No. 13 to 15.

 : 1.96 N·m (0.20 kg-m, 17 in-lb)

- Check camshaft thrusting parts (on rear side) securely fit in their mating parts on the cylinder head.


b. Tighten No. 1 to 12.

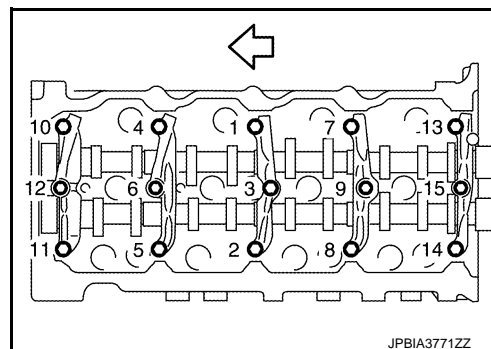
 : 1.96 N·m (0.20 kg-m, 17 in-lb)

c. Tighten all bolts.

 : 5.88 N·m (0.60 kg-m, 52 in-lb)

d. Tighten all bolts.

 : 12.8 N·m (1.3 kg-m, 9 ft-lb)



7. Install camshaft sprockets.

- Camshaft sprockets are commonly used for right side and left side.
- Align camshaft sprocket and knock pin on camshaft, and install.
- Holding the hexagonal part of camshaft with a wrench, tighten bolt securing camshaft sprockets.

8. Before installing spill tube after installing secondary timing chain, check and adjust valve clearance. Refer to [EM-277, "Inspection and Adjustment"](#).

9. Install in the reverse order of removal after this step.

Inspection

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INSPECTION AFTER REMOVAL

Visual Check of Camshaft

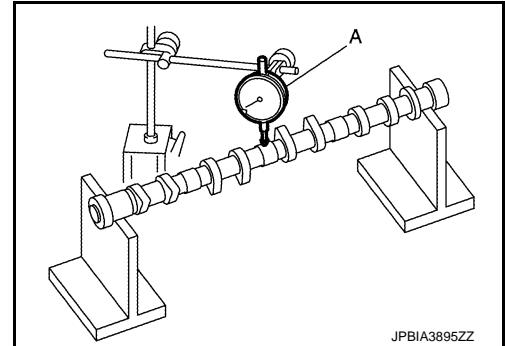
- Check the camshaft for one sided wear or scratches.
- Replace the camshaft if there are abnormalities.

Camshaft Runout

- Prepare V-block on a flat surface and secure camshaft journals No. 2 and No. 5.
- Set the dial gauge (A) vertically on journal No. 3.
- Rotate camshaft in one direction by hand, then read needle movement on dial gauge. (Total indicator reading)

Limit : Refer to [EM-414, "Camshaft"](#).

- If it exceeds the limit, replace camshaft.

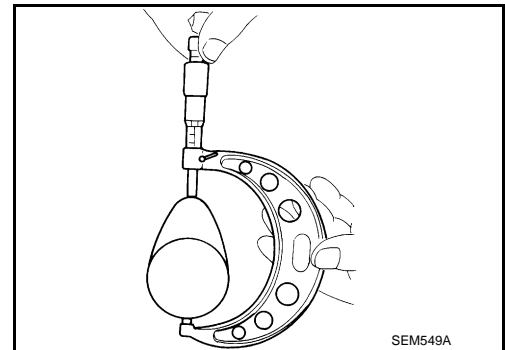


Height of Cam Nose

- Measure the height of cam nose using the micrometer.

Standard : Refer to [EM-414, "Camshaft"](#).

- If out of the standard, replace camshaft.

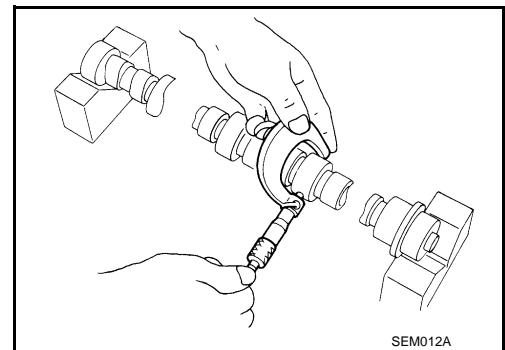


Camshaft Journal Oil Clearance

CAMSHAFT JOURNAL OUTER DIAMETER

- Measure outer diameter of camshaft journal with micrometer.

Standard : Refer to [EM-414, "Camshaft"](#).



CAMSHAFT BRACKET INNER DIAMETER

- Install camshaft bracket and tighten bolts to the specified torque. Refer to "INSTALLATION" for the tightening procedure.

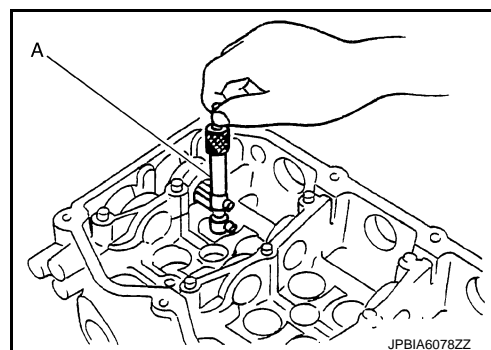
CAMSHAFT

[YD25DDTi]

< REMOVAL AND INSTALLATION >

- Measure inner diameter of camshaft bracket using the inside micrometer (A).

Standard : Refer to [EM-414, "Camshaft"](#).



CAMSHAFT OIL CLEARANCE CALCULATIONS

- (Oil clearance) = (Camshaft bracket inner diameter) – (Camshaft journal outer diameter)

Standard : Refer to [EM-414, "Camshaft"](#).

- If out of standard, refer to the standard value of each unit, then replace the camshaft and/or cylinder head.

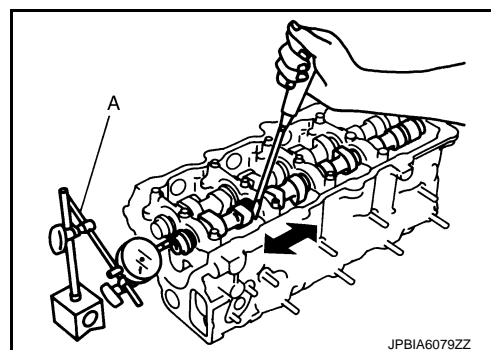
NOTE:

As the camshaft bracket is manufactured with the cylinder head, it is impossible to replace only the camshaft bracket.

Camshaft End Play

- Install dial gauge in thrust direction on front end of camshaft. Measure end play of dial gauge (A) when camshaft is moved forward/backward (in direction to axis).

Standard and limit : Refer to [EM-414, "Camshaft"](#).



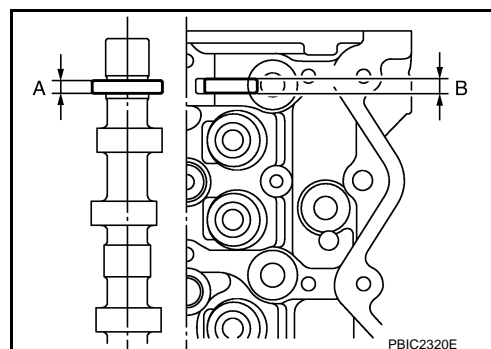
- Measure the following parts if out of the standard.
 - Dimension "A" for camshaft

Standard : 6.882 - 6.930 mm (0.2709 - 0.2728 in)

- Dimension "B" for cylinder head

Standard : 7.000 - 7.030 mm (0.2756 - 0.2768 in)

- Refer to the standards above, and then replace camshaft and/or cylinder head.



Camshaft Sprocket Runout

1. Install camshaft in cylinder head. Refer to [EM-333, "Removal and Installation"](#) for the tightening procedure.
2. Install sprocket on camshaft. Refer to [EM-333, "Removal and Installation"](#).

CAMSHAFT

[YD25DDTi]

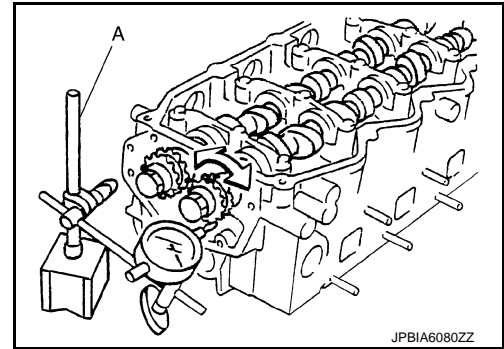
< REMOVAL AND INSTALLATION >

3. Measure camshaft sprocket runout. (Total indicator reading)

A : Dial gauge

Limit : Refer to [EM-414, "Camshaft"](#).

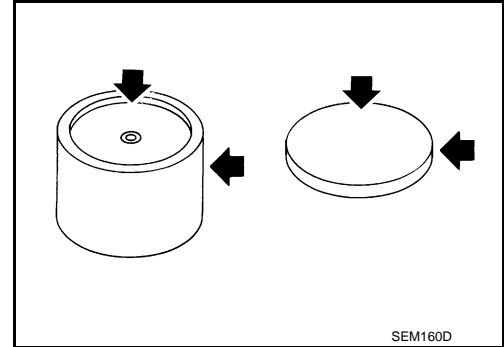
- If it exceeds the limit, replace camshaft sprocket.



Visual Inspection of Valve Lifter and Adjusting Shim

Check if surface of valve lifter and adjusting shim has any wear or cracks.

- If anything above is found, replace valve lifter or adjusting shim.

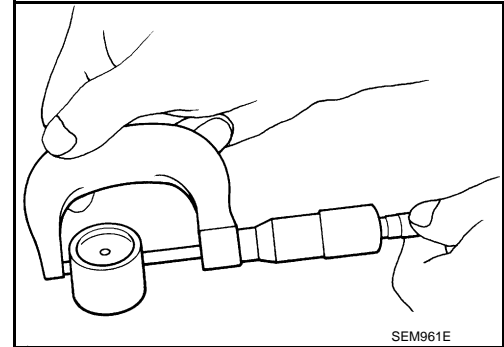


Valve Lifter Clearance

VALVE LIFTER OUTER DIAMETER

- Measure the outer diameter of the valve lifter with the micrometer.

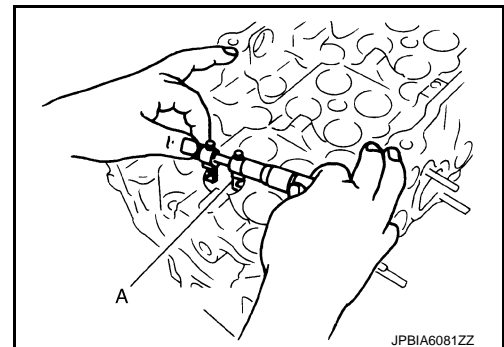
Standard : Refer to [EM-414, "Camshaft"](#).



VALVE LIFTER BORE DIAMETER

- Measure the bore diameter of the cylinder head valve lifter with the inside micrometer (A).

Standard : Refer to [EM-414, "Camshaft"](#).



VALVE LIFTER CLEARANCE CALCULATIONS

- (Clearance) = (Valve lifter bore diameter) – (Valve lifter outer diameter)

Standard : Refer to [EM-414, "Camshaft"](#).

- If out of standard, refer to the outer diameter and bore diameter standard values and replace valve lifter and/or cylinder head.

< REMOVAL AND INSTALLATION >

INSPECTION AFTER INSTALLATION

Inspection for Leakage

The following are procedures for checking fluid leakage, lubricant leakage.

- Before starting engine, check oil/fluid levels including engine coolant and engine oil. If any are less than the required quantity, fill them to the specified level. Refer to [MA-32, "Fluids and Lubricants"](#).
- Follow the procedure below to check for fuel leakage.
- Turn ignition switch to the "ON" position (with engine stopped). With fuel pressure applied to fuel piping, check for fuel leakage at connection points.
- Start engine. With engine speed increased, check again for fuel leakage at connection points.
- Run engine to check for unusual noise and vibration.

NOTE:

If hydraulic pressure inside chain tensioner drops after removal/installation, slack in guide may generate a pounding noise during and just after the engine start. However, this does not indicate a malfunction. The noise will stop after hydraulic pressure rises.

- Warm up engine thoroughly to check that there is no leakage of fuel, or any oil/fluids including engine oil and engine coolant.
- Bleed air from lines and hoses of applicable lines, such as in cooling system.
- After cooling down engine, again check oil/fluid levels including engine oil and engine coolant. Refill them to the specified level, if necessary.

Summary of the inspection items:

Items		Before starting engine	Engine running	After engine stopped
Engine coolant		Level	Leakage	Level
Engine oil		Level	Leakage	Level
Transmission / transaxle fluid	AT & CVT Models	Leakage	Level / Leakage	Leakage
	MT Models	Level / Leakage	Leakage	Level / Leakage
Other oils and fluids*		Level	Leakage	Level
Fuel		Leakage	Leakage	Leakage
Exhaust gases		—	Leakage	—

*: Power steering fluid, brake fluid, etc.

CYLINDER HEAD

< REMOVAL AND INSTALLATION >

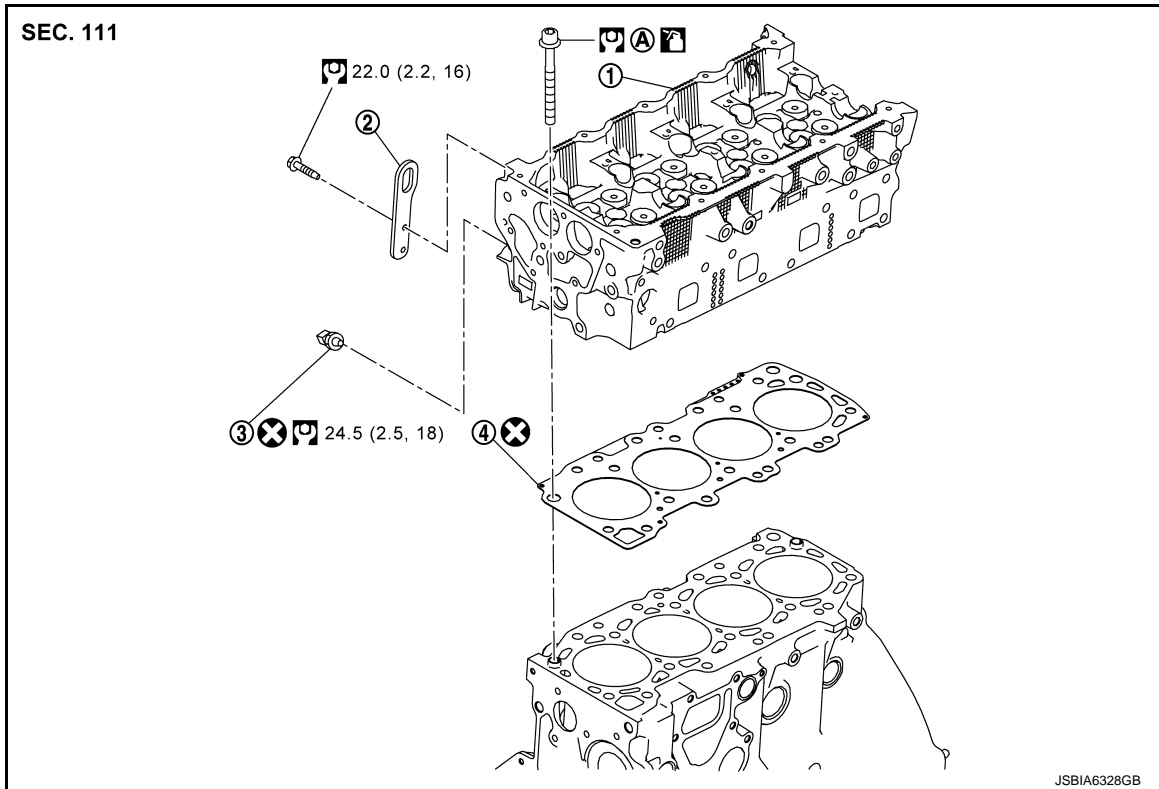
[YD25DDTi]

CYLINDER HEAD

Exploded View

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REMOVAL



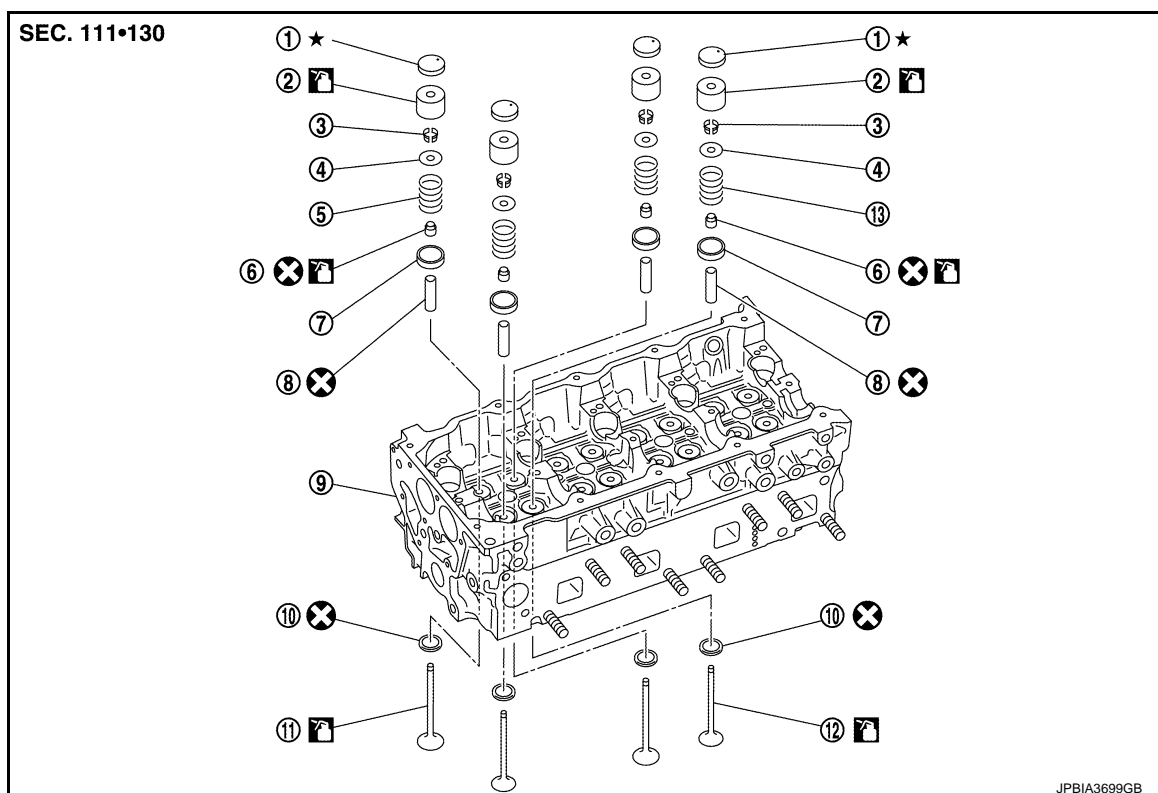
- ① Cylinder head assembly
- ② Slinger
- ③ Engine coolant temperature sensor
- ④ Cylinder head gasket
- Ⓐ Comply with the installation procedure when tightening. Refer to [EM-342](#).
- ⊗ : Always replace after every disassembly.
- Ⓜ : N·m (kg-m, ft-lb)

DISASSEMBLY

CYLINDER HEAD

< REMOVAL AND INSTALLATION >

[YD25DDTi]



- | | | |
|--------------------------|-------------------------|-------------------|
| ① Adjusting shim | ② Valve lifter | ③ Valve collet |
| ④ Valve spring retainer | ⑤ Valve spring (intake) | ⑥ Valve oil seal |
| ⑦ Valve spring seat | ⑧ Valve guide | ⑨ Cylinder head |
| ⑩ Valve seat | ⑪ Valve (intake) | ⑫ Valve (exhaust) |
| ⑬ Valve spring (exhaust) | | |

⊗ : Always replace after every disassembly.

🛢 : Should be lubricated with oil.

★ : Select with proper thickness.

Removal and Installation

INFOID:0000000010520944

REMOVAL

1. Drain engine coolant from radiator and cylinder block. Refer to [CO-68, "Draining"](#) and [EM-388, "Setting"](#).
2. Remove the following parts:
 - EGR system. Refer to [EM-299, "Exploded View"](#).
 - Turbocharger. Refer to [EM-304, "Exploded View"](#).
 - Exhaust manifold. Refer to [EM-308, "Exploded View"](#).
 - Intake manifold. Refer to [EM-296, "Exploded View"](#).
 - Glow plug. Refer to [EM-311, "Exploded View"](#).
 - Injection tube and fuel injector. Refer to [EM-312, "Exploded View"](#).
 - Rocker cover. Refer to [EM-317, "Exploded View"](#).
 - Secondary timing chain. Refer to [EM-320, "Exploded View"](#).
 - Camshaft. Refer to [EM-333, "Exploded View"](#).
3. Remove cylinder head assembly.
 - a. Remove bolts between rear chain case and cylinder head. Refer to [EM-357, "Exploded View"](#).

CYLINDER HEAD

[YD25DDTi]

< REMOVAL AND INSTALLATION >

- b. Remove cylinder head bolts in the order from 18 to 1 as shown in the figure with the cylinder head bolt wrench (commercial service tool).

← : Engine front

- c. Lift up cylinder head assembly to avoid interference with dowel pins located between the cylinder block and cylinder head, and remove cylinder head assembly.

CAUTION:

Remove glow plug in advance to avoid damage as the tip of the glow plug projects from the bottom of cylinder head, or, place wood blocks beneath both ends of cylinder head to keep the cylinder bottom from any contact.

4. Remove engine coolant temperature sensor, if necessary.

INSTALLATION

Before installation, remove old liquid gasket from mating surface of all liquid gasket applied parts.

1. Install cylinder head gasket.

CAUTION:

Do not reuse cylinder head gasket.

- Cylinder head gasket to be installed is selected by its thickness through the following procedure.
- **When replacing gasket alone:**
- Install a gasket with same thickness as that of the one removed.
- Identify the thickness of gasket by the number of ID marks on the front LH side.

← : Engine front

Gasket thickness* [mm (in)]	Number of grade	Number of ID marks
0.900 (0.0354)	1	0
0.925 (0.0364)	2	1
0.950 (0.0374)	3	1+2
0.975 (0.0384)	4	1+2+3
1.000 (0.0394)	5	1+2+3+4
1.025 (0.0404)	6	1+2+3+4+5

*: Measured with head bolts tightened

- Heater return tube is omitted for explanation.

NOTE:

Use mirrors for checking at points out of clear sight.

- **When the following parts have been repaired/replaced:**

- With cylinder block upper surface and/or crankshaft pin journal ground.
- With cylinder block, pistons, connecting rods, and/or crankshaft replaced.

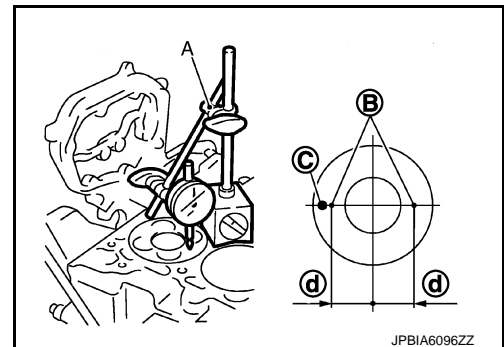
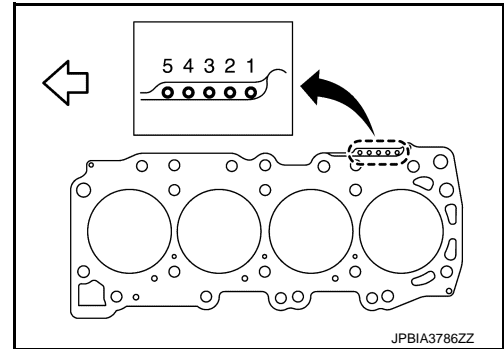
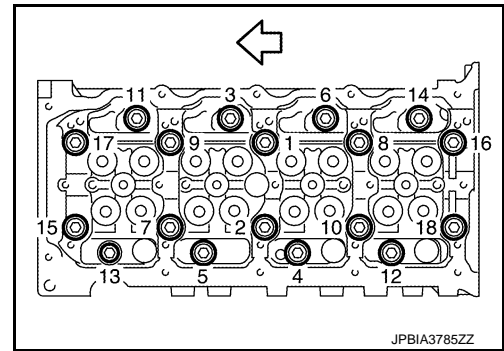
- a. Set piston at a point close to TDC.
- b. Set the dial gauge (A) at the location as shown in the figure. Turning crankshaft gradually, set the gauge scale to "0" where the piston protrusion is maximized.

(B) : Measuring point

(C) : Front mark

(d) : 39.5 mm (1.555 in)

- c. Move the dial gauge stand so that the tip of dial gauge can contact cylinder block. Read the difference.



CYLINDER HEAD

< REMOVAL AND INSTALLATION >

[YD25DDTi]

- d. Measure two points from each cylinder in order to obtain each mean value of them. Choose a properly thick gasket corresponding the highest number of the four values.

Piston protrusion [mm (in)]	Gasket thickness* [mm (in)]	Identification
		Number of ID marks
0.161 - 0.186 (0.0063 - 0.0073)	0.900 (0.0354)	0
0.186 - 0.211 (0.0073 - 0.0083)	0.925 (0.0364)	1
0.211 - 0.236 (0.0083 - 0.0093)	0.950 (0.0374)	1+2
0.236 - 0.261 (0.0093 - 0.0103)	0.975 (0.0384)	1+2+3
0.261 - 0.286 (0.0103 - 0.0113)	1.000 (0.0394)	1+2+3+4
0.286 - 0.331 (0.0113 - 0.0130)	1.025 (0.0404)	1+2+3+4+5

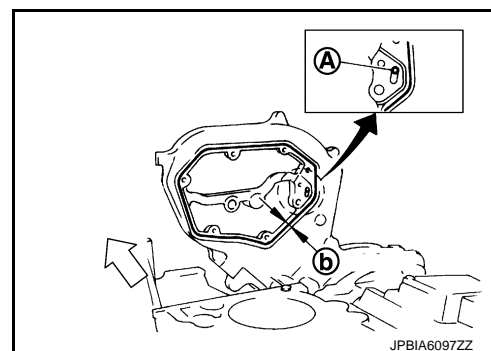
*: Measured with head bolts tightened

- e. If out of above protrusion, check replaced parts.
2. Apply a continuous bead of liquid gasket with the tube presser (commercial service tool) as shown in the figure.

ⓑ : ϕ 2.6 - 3.6 mm (0.102 - 0.142 in)

↔ : Engine front

- Apply bead so that it does not protrude into oil passage Ⓐ.
- Use Genuine Liquid Gasket (TB1217H) or equivalent.**

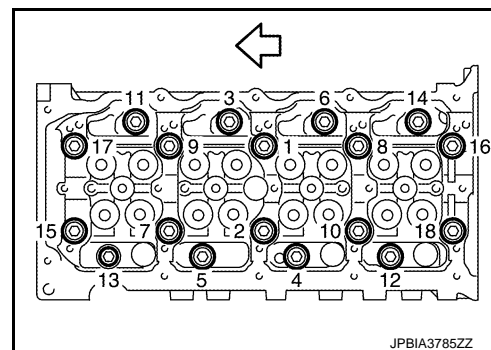


3. Install cylinder head assembly.
• Tighten bolts in the order from 1 to 18 as shown in the figure according to the following procedure:

↔ : Engine front

- a. Apply engine oil to bolt threads and seat surfaces.
b. Tighten all bolts.

: 39.2 N·m (4.0 kg-m, 29 ft-lb)



- c. Tighten all cylinder head bolts (clockwise) using a cylinder head bolt wrench (commercial service tool) (A).

Angle tightening : 180 degrees

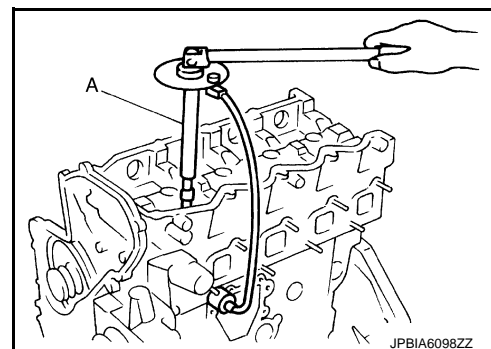
CAUTION:

- When the angle wrench [SST: KV10112100] is not used, paint an alignment mark on the head of cylinder head bolt and cylinder head surface before tightening. Check the angle with a protractor.

- d. Loosen completely in the reverse order of that shown in the figure.

: 0 N·m (0 kg-m, 0 ft-lb)

- e. Tighten all bolts.



CYLINDER HEAD

< REMOVAL AND INSTALLATION >

[YD25DDTi]

 : 39.2 N-m (4.0 kg-m, 29 ft-lb)

- f. Tighten all cylinder head bolts (clockwise).

Angle tightening : 90 degrees

- g. Tighten all cylinder head bolts (clockwise).

Angle tightening : 90 degrees

CAUTION:

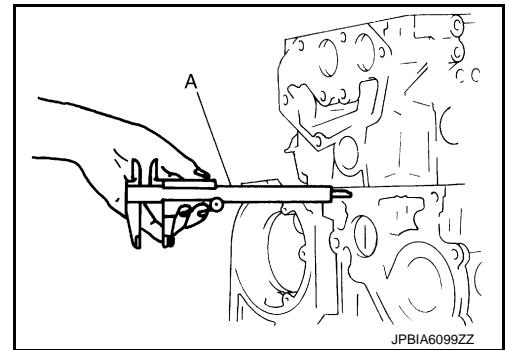
- When the angle wrench [SST: KV10112100] is not used, paint an alignment mark on the head of cylinder head bolt and cylinder head surface before tightening. Check the angle with a protractor.

4. Tighten bolts between rear chain case and cylinder head. Refer to [EM-357, "Exploded View"](#).
5. After installing cylinder head, measure dimension from the front end surface of cylinder block to that of cylinder head (If rear chain case is removed).

A : Vernier caliper

Standard : 23.53 - 24.07 mm (0.9264 - 0.9476 in)

- If out of the standard, check fitting of dowel pins and cylinder head.
6. Install glow plug. Refer to [EM-311, "Removal and Installation"](#).
7. Install engine coolant temperature sensor, if removed. Refer to [EM-341, "Exploded View"](#).
8. Install in the reverse order of removal.



Disassembly and Assembly

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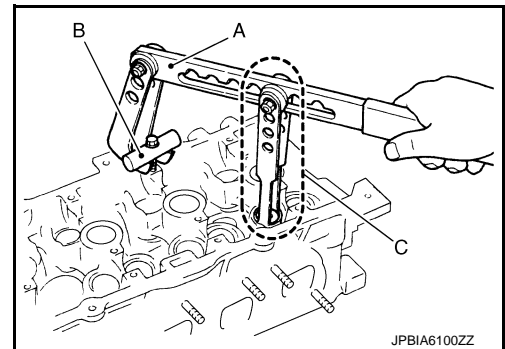
DISASSEMBLY

1. Remove adjusting shims and valve lifters.
- Check the installation positions, and keep them to avoid being confused.
2. Remove valve collet.
- Using the valve spring compressor [SST: KV10116200] (A), compress valve spring. Using magnet hand, remove valve collets.

B : Adapter [SST: KV10109220]

C : Attachment [SST: KV10115900]

3. Remove valve spring retainers and valve springs.
4. Remove valves as pressing valve stems toward combustion chamber.
- Before removing valve, check the valve guide clearance. Refer to [EM-346, "Inspection"](#).



CYLINDER HEAD

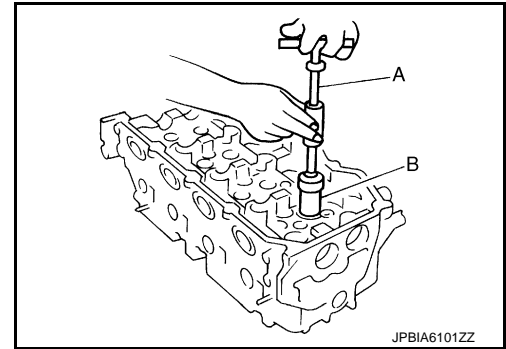
[YD25DDTi]

< REMOVAL AND INSTALLATION >

5. Remove valve oil seals using the valve oil seal puller [SST: KV10107902] (A).

B : Valve oil seal puller adapter [SST: KV10116100]

6. Remove valve spring seats.
7. Remove valve seats.
 - Before removing valve seats, perform valve seat contact check. Refer to [EM-346, "Inspection"](#).
8. Remove valve guides.

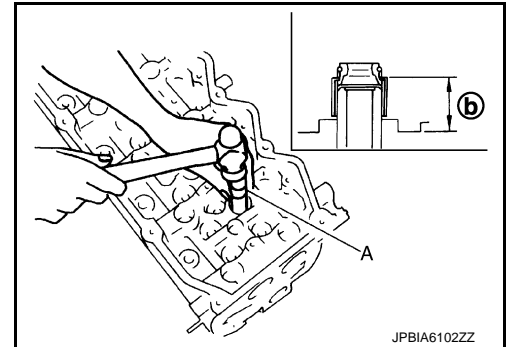


ASSEMBLY

1. Install valve guides. Refer to [EM-346, "Inspection"](#).
2. Install valve seats. Refer to [EM-346, "Inspection"](#).
3. Using the valve oil seal drift [SST: KV10115600] (A), install valve oil seals referring to the dimension shown in the figure.

ⓑ : 12.1 - 12.7 mm (0.476 - 0.500 in)

4. Install valve spring seats.



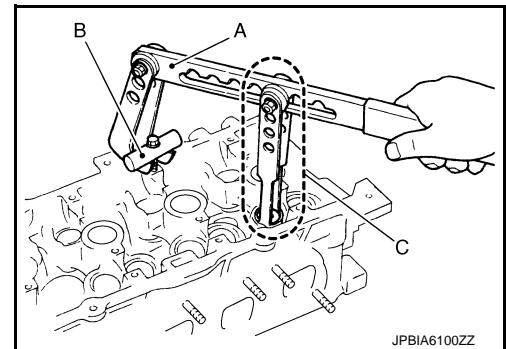
5. Install valves.
 - Install the valves with bigger outer diameter to intake valve side.
6. Install valve spring.
7. Install valve spring retainers.
8. Using the valve spring compressor [SST: KV10116200] (A), compress valve springs.

B : Adapter [SST: KV10109220]

C : Attachment [SST: KV10115900]

Then install valve collets using magnet hand.

- After installing valve collets, tap the stem end using the plastic hammer, and check the installation status.



9. Install valve lifters and adjusting shims to the same positions as before.

Inspection

INFOID:0000000010520946

INSPECTION AFTER REMOVAL

Cylinder Head Bolt Deformation

CYLINDER HEAD

[YD25DDTi]

< REMOVAL AND INSTALLATION >

- Using micrometer, measure the outer diameters (A) and (B) of bolt thread as shown in the figure.

(C) : 65 mm (2.56 in)

(d) : 11 mm (0.43 in)

- If the necking point can be identified, set it as measuring point (A).
- Calculate the difference between (A) and (B).

Limit : 0.15 mm (0.0059 in)

- If it exceeds the limit, replace cylinder head bolt.

Cylinder Head Distortion

- Wipe off oil and remove water scale (like deposit), gasket, sealer, carbon, etc. with scraper.

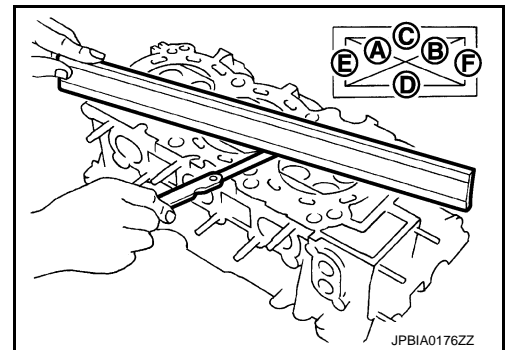
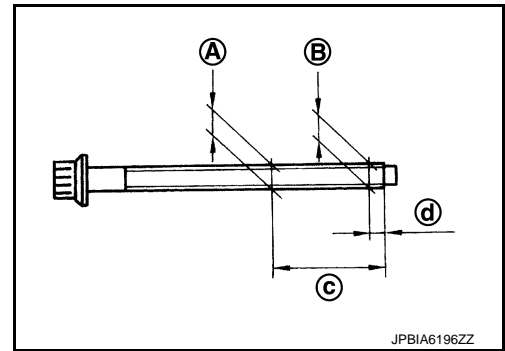
CAUTION:

Use utmost care not to allow gasket debris to enter passages for oil or water.

- At each of several locations on bottom surface of cylinder head, measure distortion in six directions (A - F).

Limit : Refer to EM-416, "Cylinder Head".

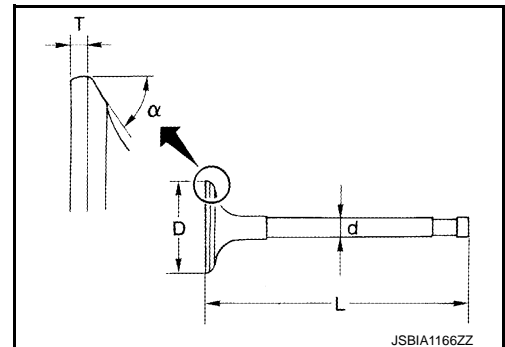
- If it exceeds the limit, replace cylinder head.



INSPECTION AFTER DISASSEMBLY

Valve Dimension

- Check dimensions of each valve. For dimensions, refer to [EM-416, "Cylinder Head"](#).
- If dimensions are out of the standard, replace valve.

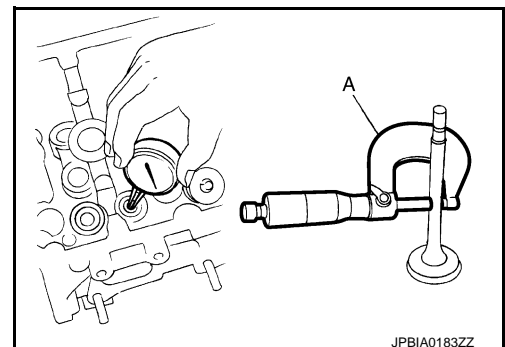


Valve Guide Clearance

Valve Stem Diameter

- Measure diameter of valve stem with micrometer (A).

Standard : Refer to EM-416, "Cylinder Head".



Valve Guide Inner Diameter

- Measure inner diameter of valve guide with inside micrometer.

CYLINDER HEAD

< REMOVAL AND INSTALLATION >

[YD25DDTi]

Standard : Refer to [EM-416, "Cylinder Head"](#).

Valve Guide Clearance

- (Valve guide clearance) = (Valve guide inner diameter) – (Valve stem diameter).

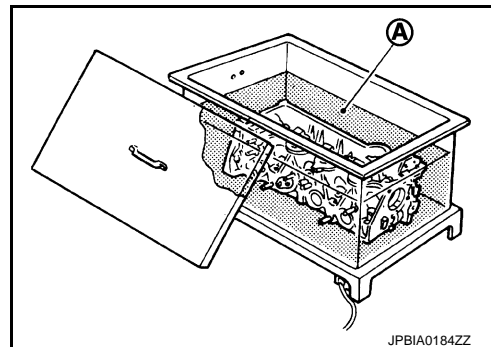
Standard and limit : Refer to [EM-416, "Cylinder Head"](#).

- If it exceeds the limit, replace valve and/or valve guide.

Valve Guide Replacement

When removing valve guide, replace it with oversized [0.2 mm (0.008 in)] valve guide.

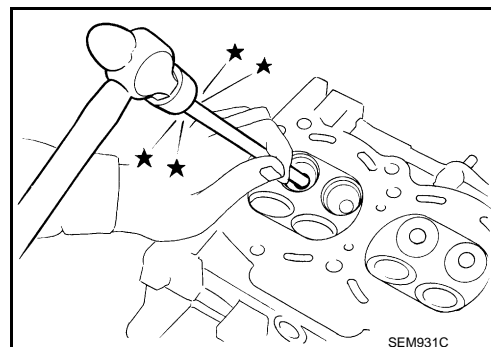
1. Heat cylinder head to 110 to 130°C (230 to 266°F) by soaking in heated oil (A).



2. Using the valve guide drift (commercial service tool), tap valve guides out from the combustion chamber side.

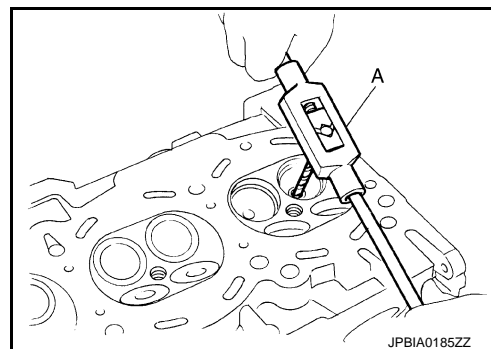
WARNING:

Cylinder head contains heat, when working, wear protective equipment to avoid getting burned.

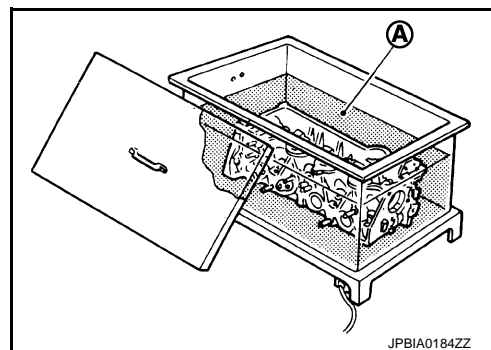


3. Ream cylinder head valve guide hole with the valve guide reamer (commercial service tool) (A).

Valve guide hole diameter (for service parts) : Refer to [EM-416, "Cylinder Head"](#).



4. Heat cylinder head to 110 to 130°C (230 to 266°F) by soaking in heated oil (A).



CYLINDER HEAD

< REMOVAL AND INSTALLATION >

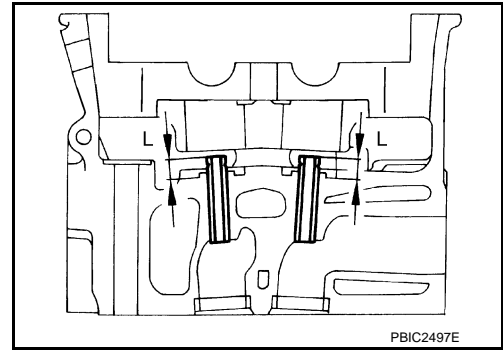
[YD25DDTi]

5. Using the valve guide drift (commercial service tool), press fit valve guides from camshaft side, referring to the dimension shown in the figure.

Projection (L) : Refer to [EM-416, "Cylinder Head"](#).

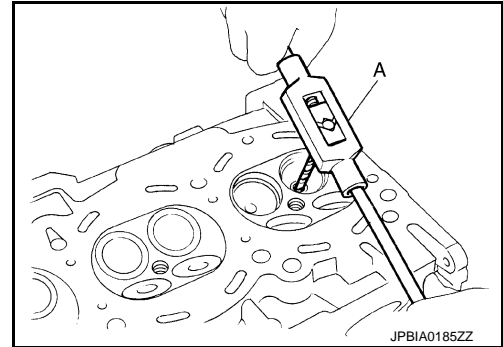
WARNING:

Cylinder head contains heat, when working, wear protective equipment to avoid getting burned.



6. Using the valve guide reamer (commercial service tool) (A), perform reaming to the press-fitted valve guides.

Reaming specifications : Refer to [EM-416, "Cylinder Head"](#).

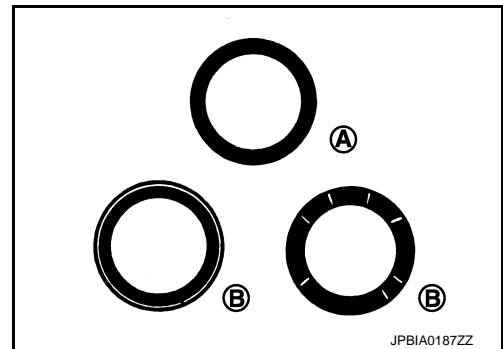


Valve Seat Contact

- Before starting this check, confirm that the dimension of valve guide and valves are as specified.

A : OK
B : NG

- Apply red lead primer on contacting surfaces of valves seat and of valve face to examine the conditions of contacting surfaces.
- Check that the paint on contacting surfaces is continuous along the entire circumference.
- If there are abnormal indications, grind the valve and check the contact again. If malfunction indications still persist, replace valve seat.



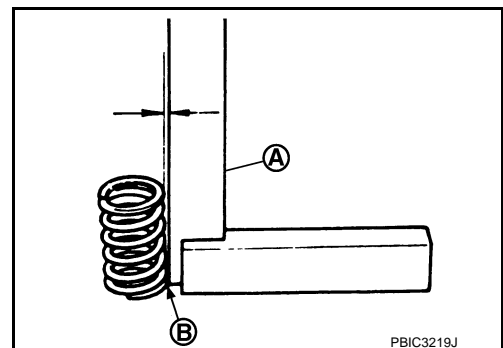
Valve Spring Square

- Position the try square (A) to valve spring, turn the spring, and measure the maximum clearance value between top surface of spring and the try square.

(B) : Contact

Limit : Refer to [EM-416, "Cylinder Head"](#).

- If it exceeds the limit, replace valve spring.



Valve Seat Replacement

When removing valve seat, replace it with oversized [0.5 mm (0.020 in)] valve seat.

- Bore out old seat until it collapses. Boring should not continue beyond the bottom face of the seat recess in cylinder head. Set the machine depth stop to ensure this. Refer to [EM-416, "Cylinder Head"](#).

CYLINDER HEAD

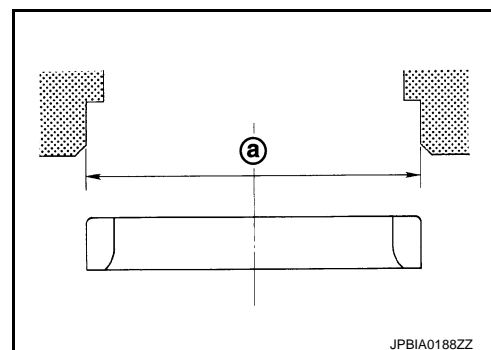
< REMOVAL AND INSTALLATION >

[YD25DDTi]

2. Ream cylinder head recess diameter (a) for service valve seat.

Oversize [0.5 mm (0.020 in)] : Refer to [EM-416, "Cylinder Head"](#).

- Be sure to ream in circles concentric to the valve guide center.
- This will enable valve seat to fit correctly.



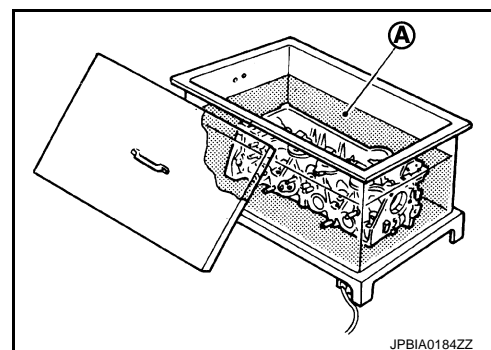
3. Heat cylinder head to 110 to 130°C (230 to 266°F) by soaking in heated oil (A).
4. After cooling valve seats sufficiently with dry ice, press fit it to cylinder head.

WARNING:

Cylinder head contains heat, when working, wear protective equipment to avoid getting burned.

CAUTION:

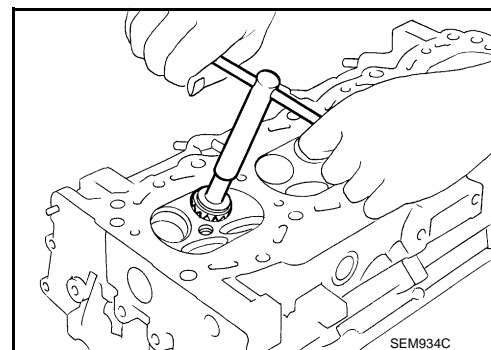
Never touch the cooled valve seats directly by hand.



5. Using the valve seat cutter set (commercial service tool), finish processing referring to the dimensions shown in the figure. Refer to [EM-416, "Cylinder Head"](#).

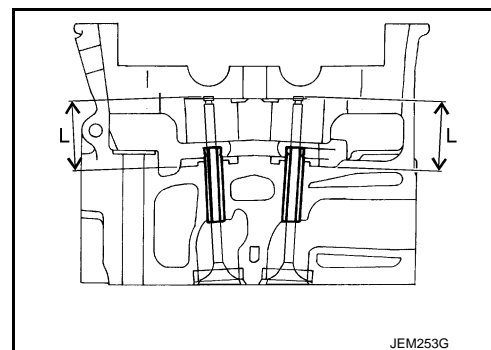
CAUTION:

When using the valve seat cutter set, grasp cutter handle with both hands, press cutter onto contacting face all around, and cut thoroughly. If cutter is pressed unevenly or repeatedly, the valve seat surface may be damaged.



6. Using compound, perform valve fitting.
7. Check again to check that contacting status is satisfactory. For details, refer to "Valve Seat Contact".
8. Use the depth gauge to measure the distance between the mounting surface of cylinder head spring seat and the valve stem end. If the distance is shorter than specified, repeat step 5 above to adjust it. If it is longer, replace valve seat with a new one.

Valve seat resurface limit (L) : Refer to [EM-416, "Cylinder Head"](#).



Valve Spring Dimensions and Valve Spring Pressure Load

CYLINDER HEAD

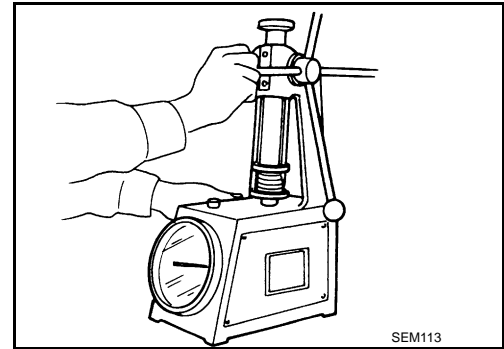
< REMOVAL AND INSTALLATION >

[YD25DDTi]

- Using intake valve spring tester, check the following.

Standard : Refer to [EM-416, "Cylinder Head"](#).

- If out of the standard, replace the valve spring.



INSPECTION AFTER INSTALLATION

Inspection for Leakage

The following are procedures for checking fluid leakage, lubricant leakage.

- Before starting engine, check oil/fluid levels including engine coolant and engine oil. If any are less than the required quantity, fill them to the specified level. Refer to [MA-32, "Fluids and Lubricants"](#).
- Follow the procedure below to check for fuel leakage.
 - Turn ignition switch to the "ON" position (with engine stopped). With fuel pressure applied to fuel piping, check for fuel leakage at connection points.
 - Start engine. With engine speed increased, check again for fuel leakage at connection points.
- Run engine to check for unusual noise and vibration.

NOTE:

If hydraulic pressure inside chain tensioner drops after removal/installation, slack in guide may generate a pounding noise during and just after the engine start. However, this does not indicate a malfunction. The noise will stop after hydraulic pressure rises.

- Warm up engine thoroughly to check that there is no leakage of fuel, or any oil/fluids including engine oil and engine coolant.
- Bleed air from lines and hoses of applicable lines, such as in cooling system.
- After cooling down engine, again check oil/fluid levels including engine oil and engine coolant. Refill them to the specified level, if necessary.

Summary of the inspection items:


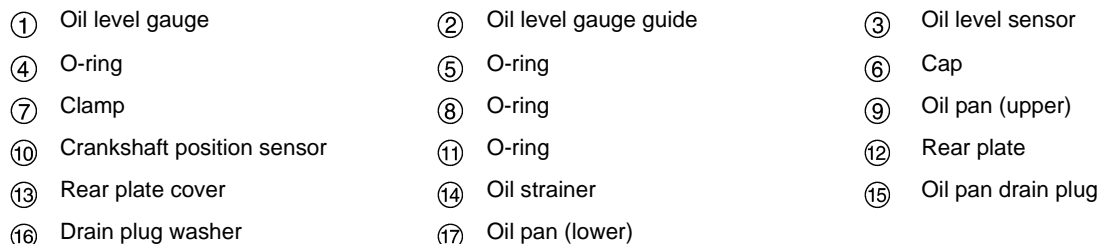
Items		Before starting engine	Engine running	After engine stopped
Engine coolant		Level	Leakage	Level
Engine oil		Level	Leakage	Level
Transmission / transaxle fluid	AT & CVT Models	Leakage	Level / Leakage	Leakage
	MT Models	Level / Leakage	Leakage	Level / Leakage
Other oils and fluids*		Level	Leakage	Level
Fuel		Leakage	Leakage	Leakage
Exhaust gases		—	Leakage	—

*: Power steering fluid, brake fluid, etc.

[YD25DDTi]

Exploded View

INFOID:0000000010520960

 : Sealing point

INFOID:0000000010520961

WARNING:
To avoid the danger of being scalded, never drain engine oil when engine is hot.

1. Drain engine oil. Refer to [LU-38, "Draining"](#).

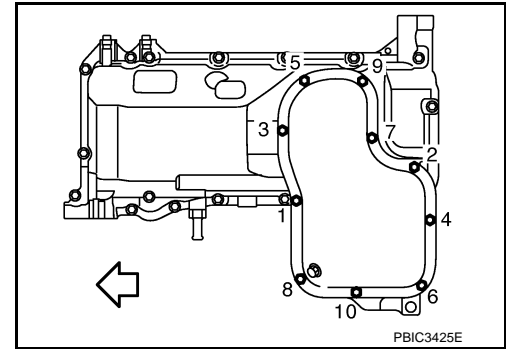
OIL PAN AND OIL STRAINER

< REMOVAL AND INSTALLATION >

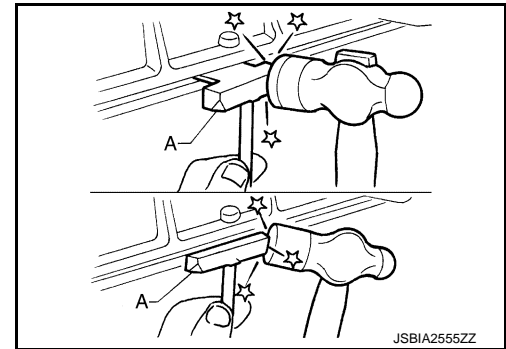
[YD25DDTi]

2. Remove oil pan lower bolts. Loosen bolts in the order from 10 to 1 as shown in the figure.

← : Vehicle front

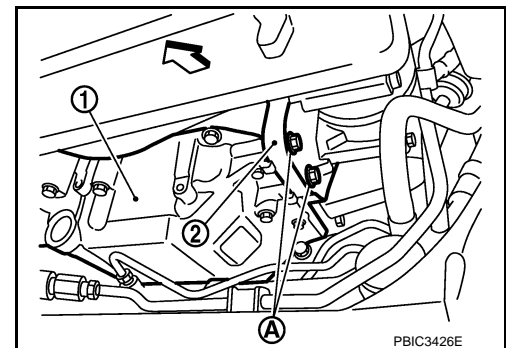


3. Remove oil pan lower.
 - a. Insert the seal cutter [SST: KV10111100] (A) between oil pan upper and oil pan lower.
CAUTION:
 - Be careful not to damage aluminum mating surface.
 - Never insert screwdriver, or oil pan flange will be deformed.
 - b. Slide the seal cutter by tapping on the side of the seal cutter with a hammer.
 - c. Remove oil pan lower.



4. Remove oil strainer.
5. Remove power steering oil pump belt. Refer to [EM-285. "Removal and Installation"](#).
6. Remove power steering oil pump bracket and move power steering oil pump aside with its piping connected. Temporarily secure it on the vehicle side with a rope to avoid putting load on it.
7. Remove the oil level gauge guide.
8. Remove A/T fluid cooler tube bracket and harness clips (A/T models). Refer to [TM-638. "Exploded View"](#).
9. Remove A/C compressor bracket mounting bolts (A).

① : Oil pan upper
② : A/C compressor bracket
← : Vehicle front



10. Remove the drive belt. Refer to [EM-285. "Removal and Installation"](#)
11. Remove the crankshaft pulley. Refer to [EM-357. "Exploded View"](#).
12. Remove the front cross member.
13. Remove the oil level sensor.
CAUTION:
 - Avoid impacts such as a dropping.
 - Never disassemble.
 - Keep it away from metal particles.
 - Never place sensor close to magnetic materials.
14. Remove front propeller shaft (4WD models).
15. Remove RH and LH front drive shaft (4WD models).
16. Remove front final drive assembly (4WD models).
17. Remove rear plate cover and transmission joint bolts.

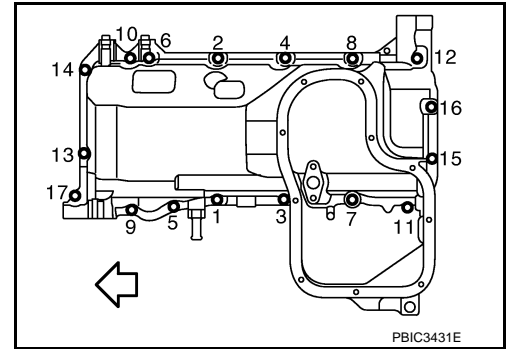
OIL PAN AND OIL STRAINER

[YD25DDTi]

< REMOVAL AND INSTALLATION >

18. Remove oil pan upper bolts. Loosen bolts in the order from 17 to 1 as shown in the figure.

← : Vehicle front

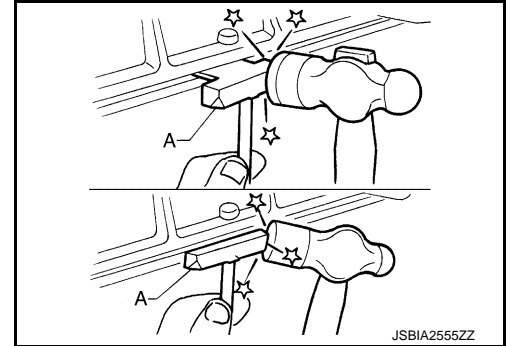


19. Remove oil pan upper.

- Insert the seal cutter [SST: KV10111100] (A) between oil pan upper and cylinder block. Slide the seal cutter by tapping on the side of the seal cutter with a hammer. Remove oil pan upper.

CAUTION:

- Be careful not to damage aluminum mating surface.
- Never insert screwdriver, or oil pan flange will be deformed.



INSTALLATION

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

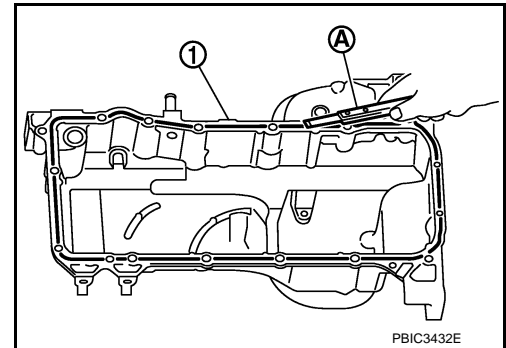
CAUTION:

Do not reuse O-rings and drain plug washer.

- Install oil pan upper with the following procedure.
- Use the scraper (A) to remove old liquid gasket from mating surface of oil pan upper (1).

CAUTION:

- Also remove old liquid gasket from mating surface of cylinder block and rear chain case.
- Remove old liquid gasket from the bolt hole and thread.



- Apply a continuous bead of liquid gasket with the tube presser (commercial service tool) to areas shown in the figure.

(a) : ϕ 4.5 - 5.5 mm (0.177 - 0.217 in)

(b) : ϕ 3.5 - 4.5 mm (0.138 - 0.177 in)

← : Engine front

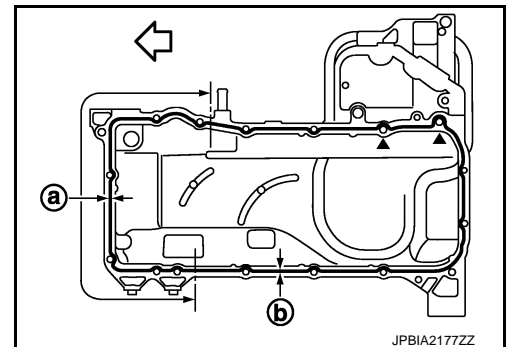
Use Genuine Liquid Gasket (TB1217H) or equivalent.

CAUTION:

- At the 2 bolt holes marked ▲, liquid gasket should be applied outside holes.
- Attaching should be done within 5 minutes after coating.
- Install oil pan upper.

CAUTION:

Install avoiding misalignment of O-ring.



OIL PAN AND OIL STRAINER

[YD25DDTi]

< REMOVAL AND INSTALLATION >

- Tighten bolts in the order from 1 to 17 as shown in figure with the specified torque.

← : Engine front

- Bolt dimensions vary depending on the installation location. Refer to the following and use appropriate bolts.

M6 x 30 mm (1.18 in) : Bolt No. 15, 16

M8 x 25 mm (0.98 in) : Bolt No. 2, 4, 5, 8, 9, 10, 14

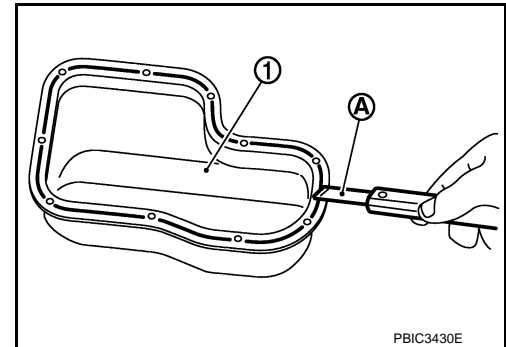
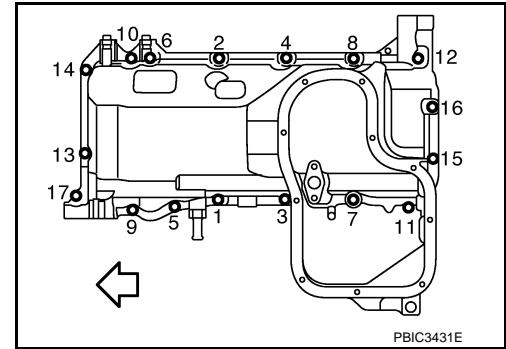
M8 x 60 mm (2.36 in) : Bolt No. 1, 3, 6, 7, 11, 12, 13, 17

- The shank length under the bolt neck above is the length of the threaded part (pilot portion not included).
- Install oil pan lower with the following procedure.

- Use a scraper (A) to remove old liquid gasket from mating surface of oil pan lower ①.

CAUTION:

- Also remove old liquid gasket from mating surface of oil pan upper.
- Remove old liquid gasket from bolt hole and thread.



- Apply a continuous bead of liquid gasket with the tube presser (commercial service tool) as shown in the figure.

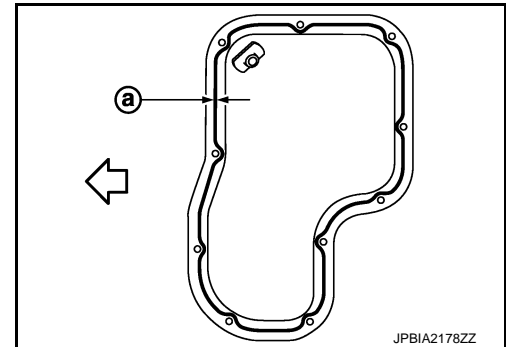
Ⓐ : ϕ 3.5 - 4.5 mm (0.138 - 0.177 in)

← : Engine front

Use Genuine Liquid Gasket (TB1217H) or equivalent.

CAUTION:

Attaching should be done within 5 minutes after coating.

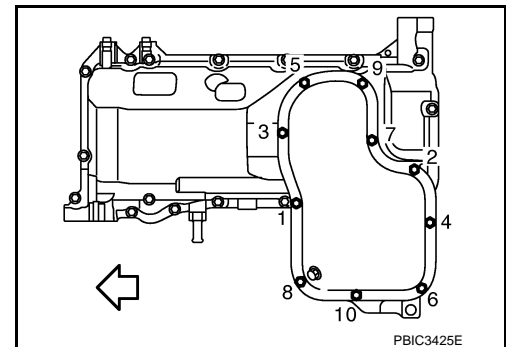


- Install oil pan lower.
- Tighten bolts in the order from 1 to 10 as shown in figure with the specified torque.

← : Engine front

NOTE:

Pour engine oil or start engine at least 30 minutes after oil pan is installed.



Inspection

INSPECTION AFTER REMOVAL

Clean oil strainer if any object attached.

INSPECTION AFTER INSTALLATION

- Check engine oil level and add engine oil. Refer to [LU-37, "Inspection"](#).
- Check for leakage of engine oil when engine is warmed.

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OIL PAN AND OIL STRAINER

[YD25DDTi]

< REMOVAL AND INSTALLATION >

3. Stop engine and wait for 10 minutes.
4. Check engine oil level again. Refer to [LU-37, "Inspection"](#).

PRIMARY TIMING CHAIN

< REMOVAL AND INSTALLATION >

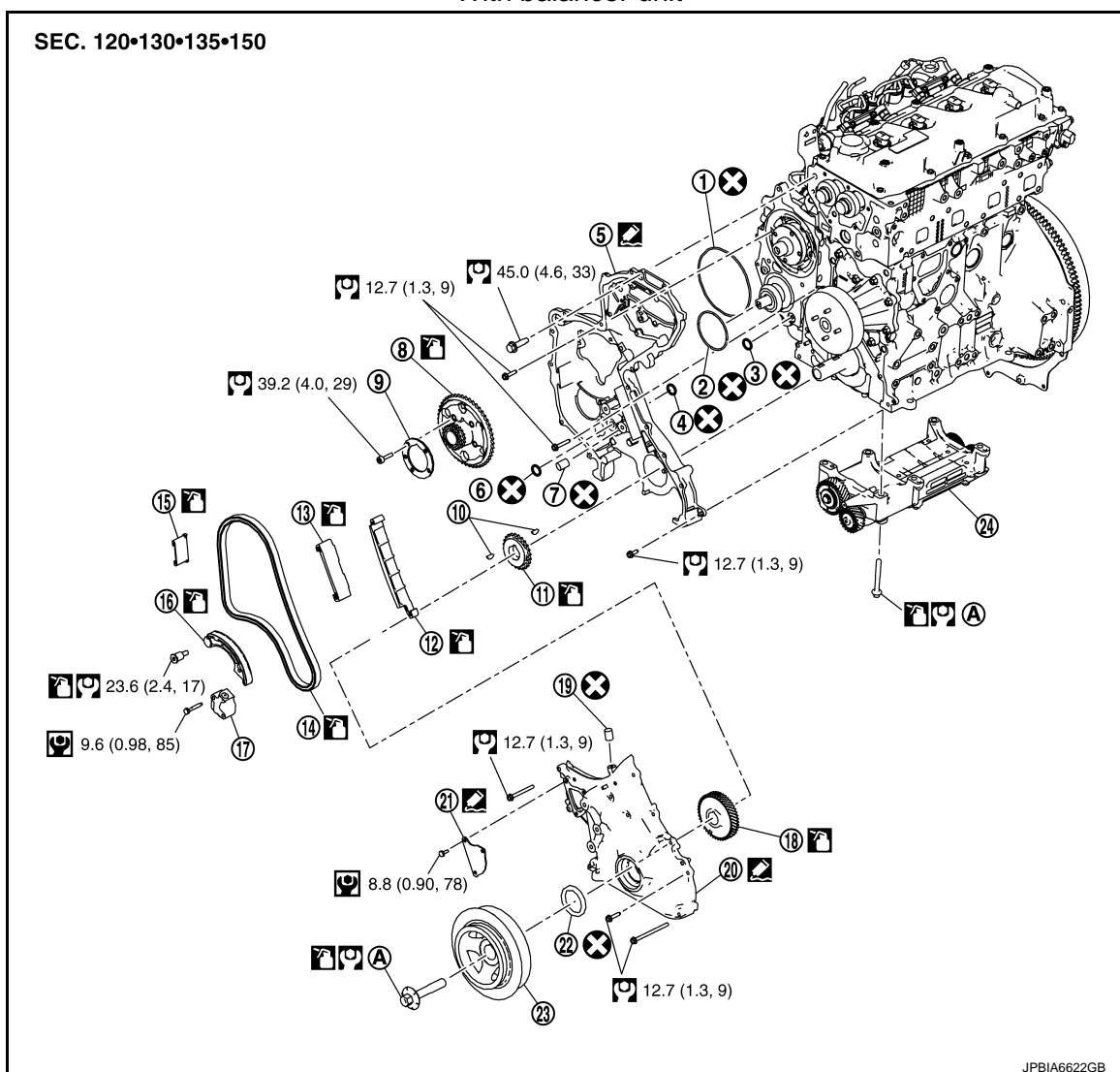
[YD25DDTi]

PRIMARY TIMING CHAIN

Exploded View

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With balancer unit



- | | | |
|-------------------|------------------------|-------------------|
| ① O-ring | ② O-ring | ③ O-ring |
| ④ O-ring | ⑤ Rear chain case | ⑥ O-ring |
| ⑦ Oil jet | ⑧ Fuel pump sprocket | ⑨ Spacer |
| ⑩ Key | ⑪ Crankshaft sprocket | ⑫ Tension guide 1 |
| ⑬ Tension guide 2 | ⑭ Primary timing chain | ⑮ Tension guide 3 |
| ⑯ Slack guide 1 | ⑰ Chain tensioner 1 | ⑱ Crankshaft gear |
| ⑲ Oil jet* | ⑳ Oil pump housing* | ㉑ Cover |
| ㉒ Front oil seal | ㉓ Crankshaft pulley | ㉔ Balancer unit |

(A) Comply with the installation procedure when tightening. Refer to [EM-359](#).

⊗ : Always replace after every disassembly.

⊙ : N·m (kg-m, in-lb)

⊙ : N·m (kg-m, ft-lb)

PRIMARY TIMING CHAIN

< REMOVAL AND INSTALLATION >

[YD25DDTi]



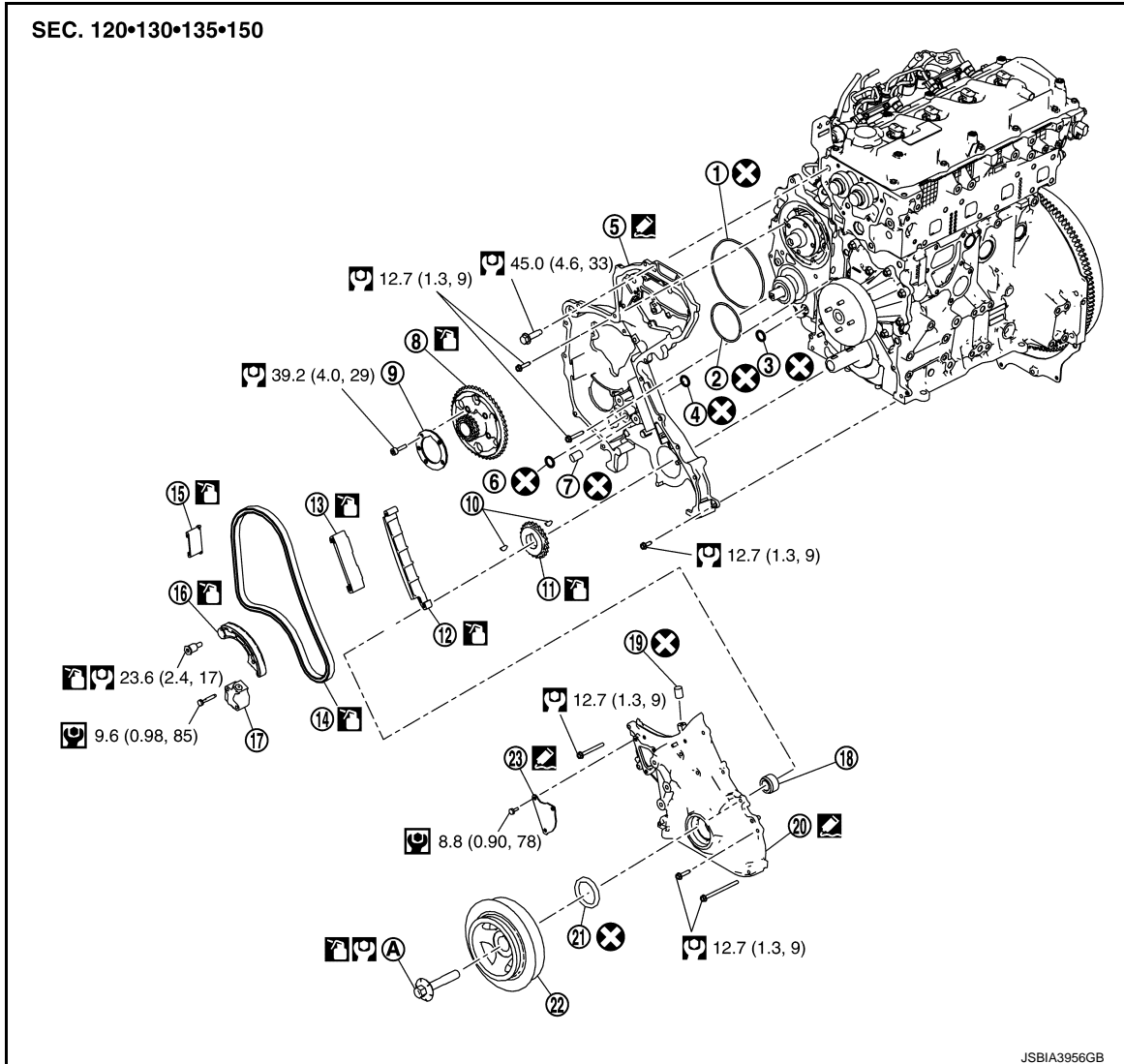
: Should be lubricated with oil.



: Sealing point

*: When the oil pump replacement or the oil jet damage, change both parts for a new. When damage occurred in press fitting, reexchange is needed for both parts.

Without balancer unit



- | | | |
|---------------------|------------------------|-------------------|
| ① O-ring | ② O-ring | ③ O-ring |
| ④ O-ring | ⑤ Rear chain case | ⑥ O-ring |
| ⑦ Oil jet | ⑧ Fuel pump sprocket | ⑨ Spacer |
| ⑩ Key | ⑪ Crankshaft sprocket | ⑫ Tension guide 1 |
| ⑬ Tension guide 2 | ⑭ Primary timing chain | ⑮ Tension guide 3 |
| ⑯ Slack guide 1 | ⑰ Chain tensioner 1 | ⑱ Spacer |
| ⑲ Oil jet* | ⑳ Oil pump housing* | ㉑ Front oil seal |
| ㉒ Crankshaft pulley | ㉓ Cover | |

Ⓐ Comply with the installation procedure when tightening. Refer to [EM-359](#).





: Always replace after every disassembly.



: N·m (kg·m, in·lb)

< REMOVAL AND INSTALLATION >

 : N·m (kg-m, ft-lb)

 : Should be lubricated with oil.

 : Sealing point

*: When the oil pump replacement or the oil jet damage, change both parts for a new. When damage occurred in press fitting, reexchange is needed for both parts.

Removal and Installation

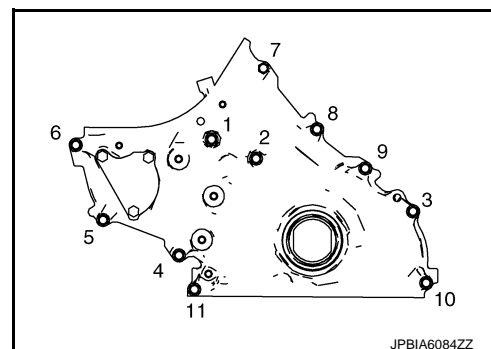
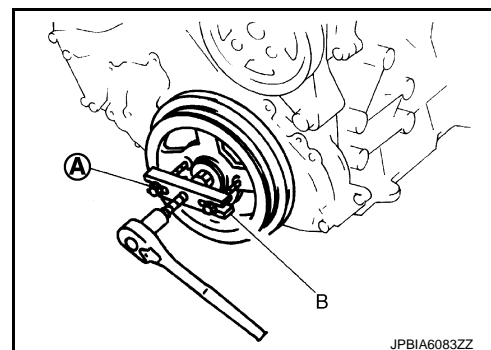
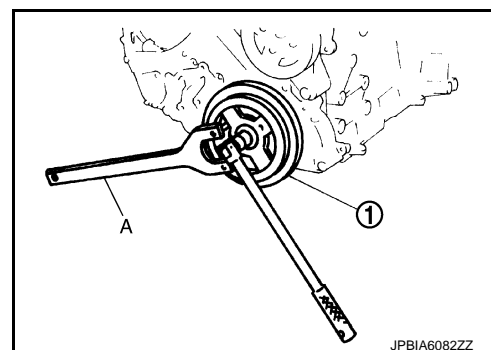
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CAUTION:

- After removing timing chain, never turn crankshaft and camshaft separately, or valves will strike piston heads.
- When installing camshafts, chain tensioners, oil seals or other sliding parts, lubricate contacting surfaces with new engine oil.

REMOVAL

1. Drain engine oil. Refer to [LU-38, "Draining"](#).
2. Remove the following parts:
 - Drive belt auto-tensioner and idler pulley. Refer to [EM-291, "Exploded View"](#).
 - Secondary timing chain. Refer to [EM-320, "Exploded View"](#).
 - Oil pan (upper and lower). Refer to [EM-352, "Exploded View"](#).
3. Remove crankshaft pulley.
 - a. Hold crankshaft pulley ① with the pulley holder (commercial service tool) (A).
 - b. Loosen crankshaft pulley fixing bolt and pull out the bolt approximately 10 mm (0.39 in).
- c. Using the pulley puller [SST: KV11103000] (B), remove crankshaft pulley.
 - Use two M6 bolts ② with approx. 60 mm (2.36 in) shank length for securing crankshaft pulley.
4. Remove oil pump housing.
 - Loosen bolts in the order from 11 to 1 as shown in the figure and remove them.
 - Use the seal cutter [SST: KV10111100] etc. for removal.



PRIMARY TIMING CHAIN

[YD25DDTi]

< REMOVAL AND INSTALLATION >

5. Remove front oil seal from oil pump housing.
- Punch out the seal off from the back surface of the oil pump housing using a flat-bladed screwdriver.

CAUTION:

Be careful not to damage oil pump housing.

6. Remove crankshaft gear ① with the following procedure. (with balancer unit)
- a. Check that No.1 piston is TDC on its compression stroke.
- b. Turn the idler sub gear ③ counterclockwise with snap ring pliers (B) or suitable tool for aligning idler sub gear and idler main gear ②.
- If idler gear rotates, hold the flat faces on balancer drive shaft front end ④.
- c. Install internal mechanism securing bolt and plate (Service part: 13012 EB30A and 13013 EB30A) ⑤ and tighten to the specified torque.

 : 4.0 N·m (0.41 kg·m, 35 in-lb)

CAUTION:

- **Never loosen idler gear mounting bolt ⑤.**
- **Only use the genuine internal mechanism securing bolt and plate, or the idler gear and will be damaged.**
- **Never remove internal mechanism securing bolt and plate from idler gear and until crankshaft gear and all of the parts in connection have been installed.**
- **If internal mechanism securing bolt and plate is not installed, internal mechanism of idler gear and will disengage after crankshaft gear is removed. This will prohibit the balancer unit from being reusable.**

- d. Apply mating marks © to crankshaft gear and idler sub gear.
- e. Remove crankshaft gear.
7. Remove chain tensioner 1 ②.

① : Slack guide 1

- When removing chain tensioner, push the plunger of chain tensioner and keep it pressed with a push pin (A).

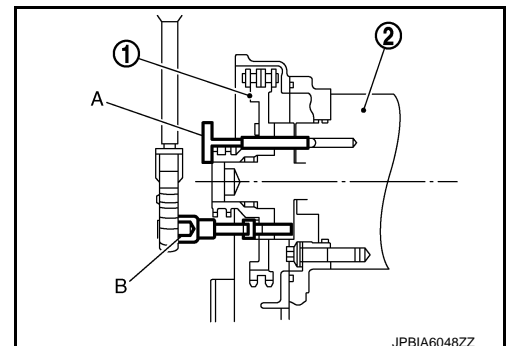
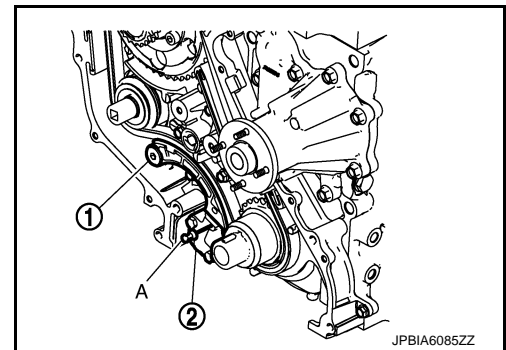
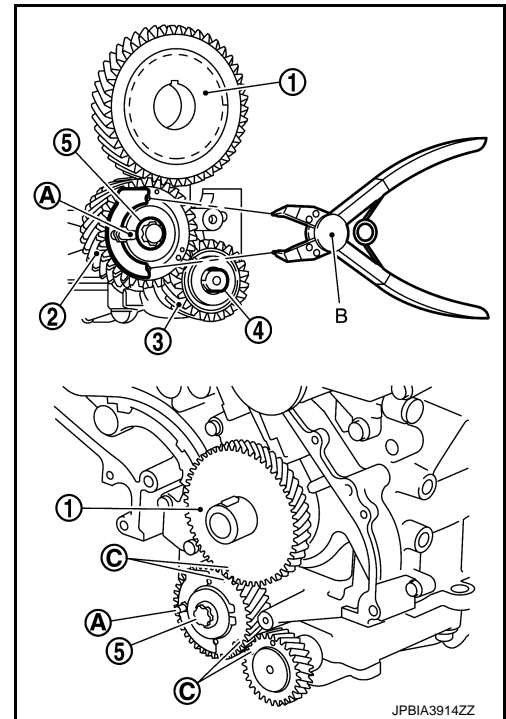
8. Remove slack guide 1.

9. Hold fuel pump sprocket and remove bolt.

- a. Insert positioning stopper pin [SST: KV11106030] (A) on fuel pump sprocket ①.

② : Fuel pump

B : Hexagon wrench [SST: KV11106050]



PRIMARY TIMING CHAIN

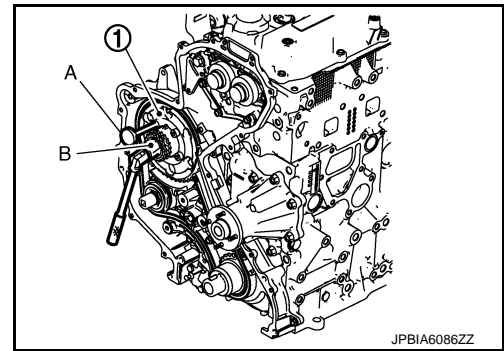
[YD25DDTi]

< REMOVAL AND INSTALLATION >

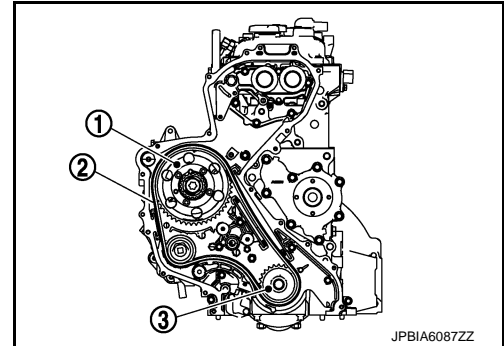
- b. Using the TORX wrench (T70) [SST: KV11106040] (B), turn pump shaft little by little to adjust the position of fuel pump sprocket ① so that the holes align.

A : Positioning stopper pin [SST: KV11106030]

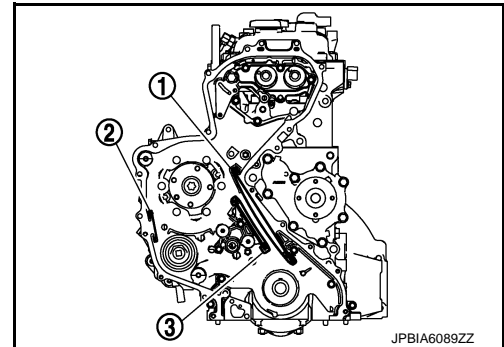
- c. Push positioning stopper pin [SST: KV11106030] through fuel pump sprocket to fuel pump body to hold fuel pump sprocket.



10. Remove primary timing chain ② with fuel pump sprocket ① and crankshaft sprocket ③.



11. Remove tension guide 1 ①, tension guide 2 ③ and tension guide 3 ②.



12. Remove fuel pump. Refer to [EM-325, "Exploded View"](#).
13. Remove vacuum pump. Refer to [EM-371, "Exploded View"](#).
14. Remove camshaft sprockets. Refer to [EM-333, "Exploded View"](#).

A

EM

C

D

E

F

G

H

I

J

K

L

M

N

O

P

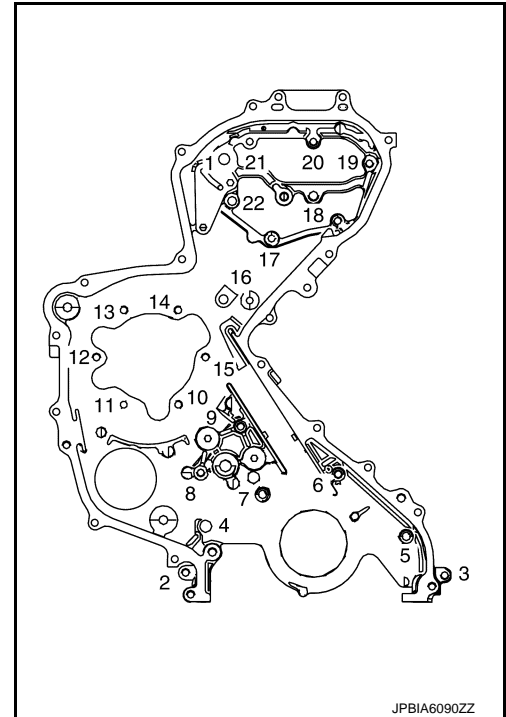
PRIMARY TIMING CHAIN

[YD25DDTi]

< REMOVAL AND INSTALLATION >

15. Remove rear chain case.

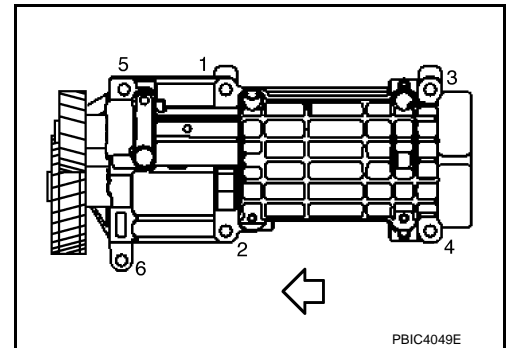
- Loosen fixing bolts in the order from 22 to 1 as shown in the figure and remove them.
- Use the seal cutter [SST: KV10111100] for removal.



16. Remove balancer unit. (with balancer unit)

- Loosen mounting bolts in the order from 6 to 1 as shown in the figure.

⇐ : Engine front



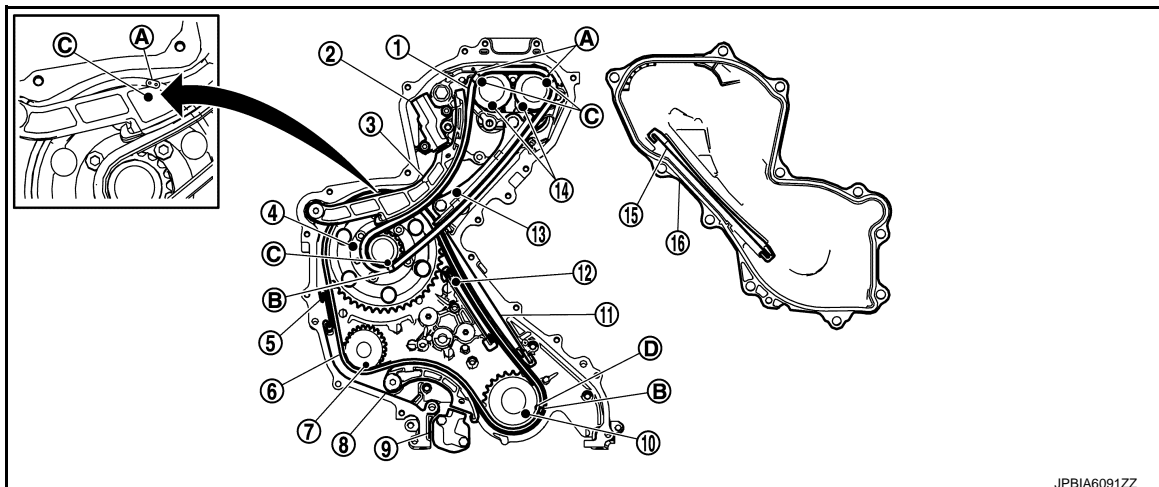
INSTALLATION

CAUTION:

Do not reuse O-rings.

NOTE:

The figure shows the relationship between the mating mark on each timing chain and that on the corresponding sprocket, with the components installed.



PRIMARY TIMING CHAIN

[YD25DDTi]

< REMOVAL AND INSTALLATION >

- | | | |
|-----------------------------------|--------------------------------|---------------------------------|
| ① Secondary timing chain | ② Chain tensioner 2 | ③ Slack guide 2 |
| ④ Fuel pump sprocket | ⑤ Tension guide 3 | ⑥ Primary timing chain |
| ⑦ Vacuum pump sprocket | ⑧ Slack guide 1 | ⑨ Chain tensioner 1 |
| ⑩ Crankshaft sprocket | ⑪ Tension guide 1 | ⑫ Tension guide 2 |
| ⑬ Tension guide 4 | ⑭ Camshaft sprocket | ⑮ Tension guide 5 |
| ⑯ Front chain case | | |
| Ⓐ Alignment mark (dark blue link) | Ⓑ Alignment mark (yellow link) | Ⓒ Alignment mark (punched mark) |
| Ⓓ Alignment mark (punched mark) | | |

CAUTION:

Before starting work, check that No. 1 piston is on its compression stroke.

1. Install balancer unit, and tighten mounting bolts in the order from 1 to 6 as shown in the figure. (with balancer unit)

← : Engine front

CAUTION:

If mounting bolts are re-used, check their outer diameter before installation. Refer to "Balancer Unit Mounting Bolt Outer Diameter".

- a. Apply new engine oil to threads and seat surfaces of mounting bolts.
- b. Tighten all bolts.

: 29.4 N·m (3.0 kg-m, 22 ft-lb)

- c. Turn all bolts 65 degrees clockwise (angle tightening).

① : Balancer unit

CAUTION:

Check tightening angle with an angle wrench [SST: KV10112100] Ⓐ or a protractor. Never make judgement by visual check alone.

- d. Completely loosen.

: 0 N·m (0 kg-m, 0 ft-lb)

CAUTION:

In this step, loosen bolts in the reverse order as shown in the figure.

- e. Tighten all bolts.

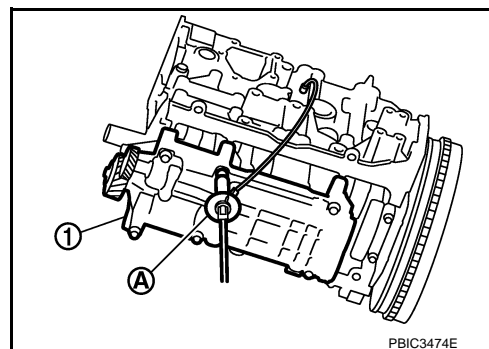
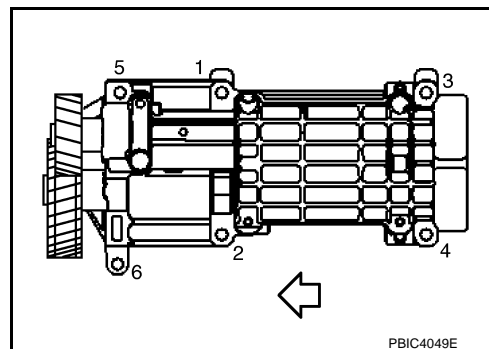
: 29.4 N·m (3.0 kg-m, 22 ft-lb)

- f. Turn them another 65 degrees clockwise (angle tightening).

CAUTION:

Check tightening angle with an angle wrench [SST: KV10112100] or a protractor. Never make judgement by visual check alone.

2. Install rear chain case.



PRIMARY TIMING CHAIN

[YD25DDTi]

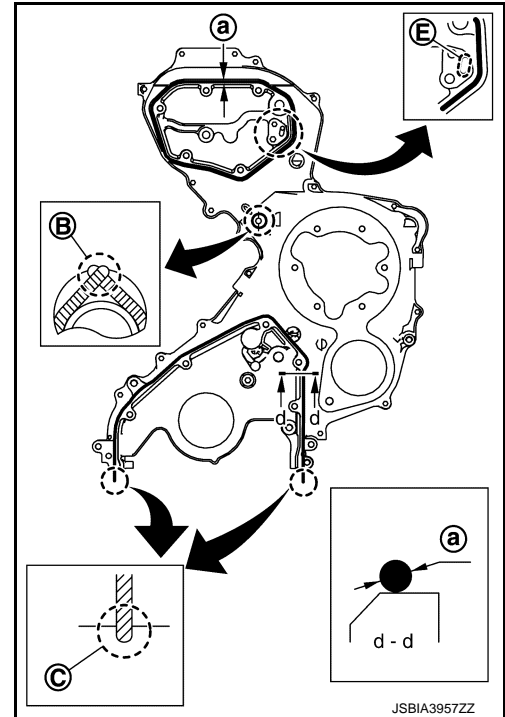
< REMOVAL AND INSTALLATION >

- a. Apply a continuous bead of liquid gasket with the tube presser (commercial service tool) on locations shown in the figure.
Use **Genuine Liquid Gasket (TB1217H)** or equivalent.

CAUTION:

- Do not reuse O-ring.
- Never allow liquid gasket to stick out to the oil passage ⑤.
- For area ⑥, the overlap of the liquid gasket starting point and end-point must be minimized and faced outward.
- For area ⑦, the starting point and the end-point of the liquid gasket must stick out from the case rim.

⑧ : $\phi 3.4 - 4.4$ mm (0.13 - 0.17 in)

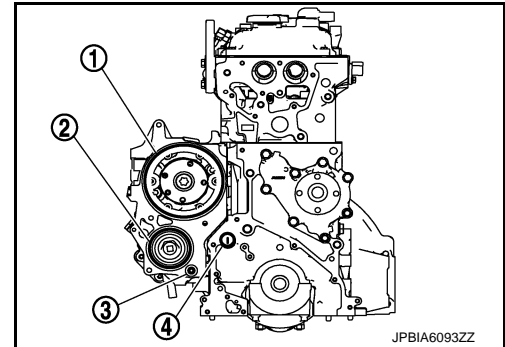


- b. Install new O-rings to the grooves.

- ① : For fuel pump
- ② : For vacuum pump
- ③ : For slack guide 1
- ④ : For main gallery

CAUTION:

Do not reuse O-ring.



- c. Install rear chain case.
- When installing, align the dowel pin with the pin hole.

PRIMARY TIMING CHAIN

[YD25DDTi]

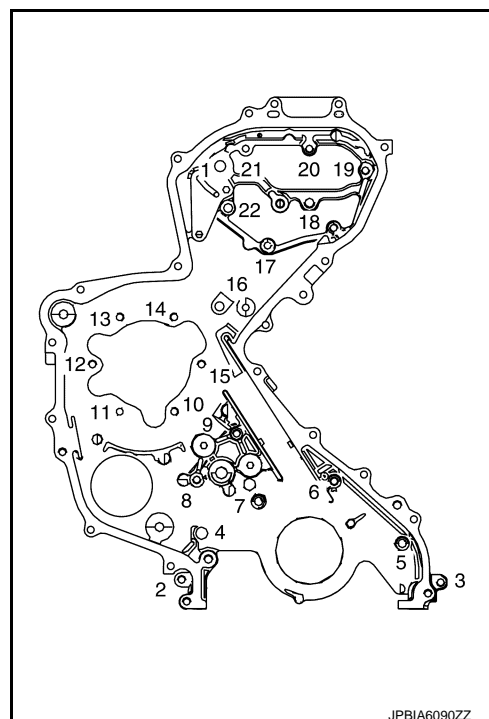
< REMOVAL AND INSTALLATION >

- d. Tighten bolts in the order from 1 to 22 as shown in the figure.
 - Install the following two types of bolts, referring to the figure.

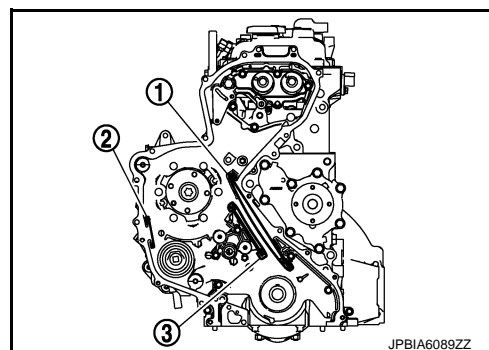
M8×16 mm (0.63 in) : Bolt No. 1, 2, 8 - 13, 17, 18

M8×20 mm (0.79 in) : Bolt No. 3 - 7, 14 - 16, 19 - 22

- The shank length under the bolt neck above is the length of threaded part (pilot portion not included).
- e. After tightening all the bolts, re-tighten in the same order.



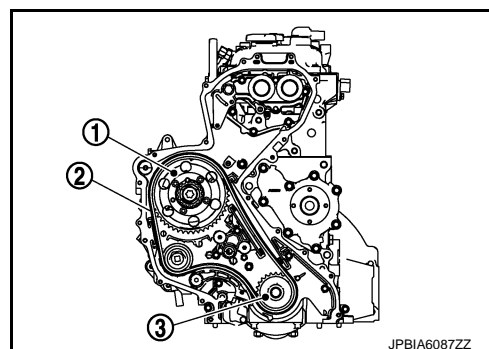
3. Install fuel pump. Refer to [EM-325, "Exploded View"](#).
 - Before installing, check that spacer and the hole 6 mm (0.24 in) in diameter on coupling are aligned.
4. Install tension guide 1 ①, tension guide 2 ③ and tension guide 3 ②.



5. Install crankshaft sprocket, aligning it with crankshaft key on the far side.
6. Install primary timing chain ② with fuel pump sprocket ①.

③ : Crankshaft sprocket

- When installing, match the alignment marks on sprockets with color coded alignment marks (colored links) on primary timing chain.
- Install fuel pump sprocket washer with the surface marked "◎" (front mark) facing the front of the engine.



PRIMARY TIMING CHAIN

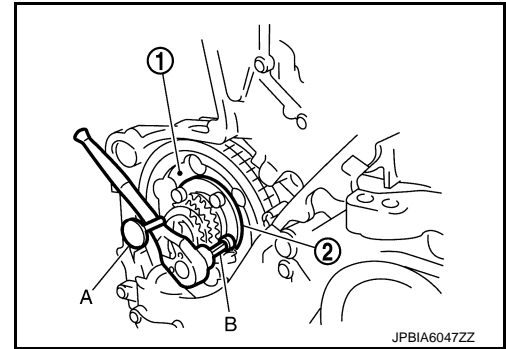
[YD25DDTi]

< REMOVAL AND INSTALLATION >

7. Use the positioning stopper pin [SST: KV11106030] (A) to hold the fuel pump sprocket ① and install the bolt.

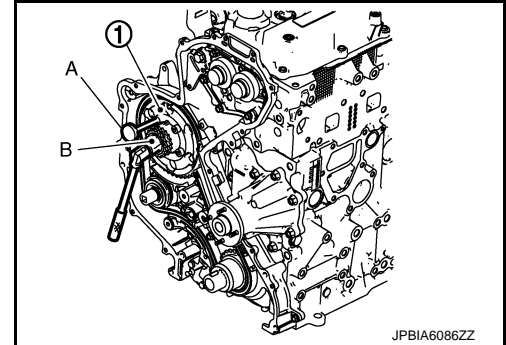
② : Spacer

B : Hexagon wrench [SST: KV11106050]



- a. Using the TORX wrench (T70) [SST: KV11106040] (B), turn the fuel pump shaft little by little to adjust the position of the fuel pump sprocket ①.

A : Positioning stopper pin [SST: KV11106030]



- b. Insert positioning stopper pin [SST: KV11106030] into the hole 6 mm (0.24 in) in diameter on fuel pump sprocket so that the stopper pin goes through the fuel pump body. While the stopper pin is in place, install the bolt.

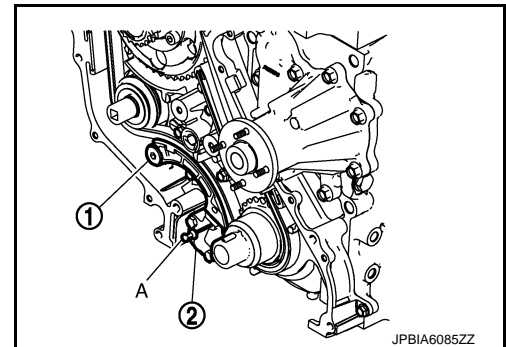
8. Install timing chain slack guide 1.
9. Install chain tensioner 1 ②.

① : Slack guide 1

- Push the plunger of the chain tensioner. While keeping plunger pressed down with a push pin (A), install chain tensioner.
- After installation, pull out the push pin holding the plunger.

CAUTION:

Check again that the alignment marks on sprockets and the colored alignment marks on timing chain are aligned.



10. Install crankshaft gear. (with balancer unit)

PRIMARY TIMING CHAIN

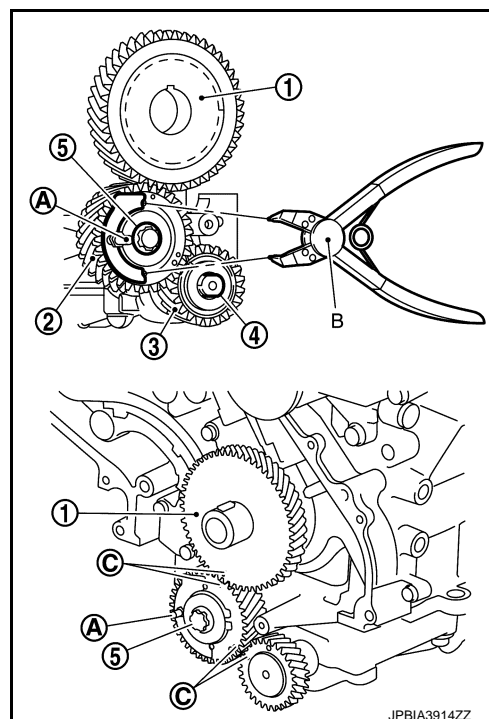
[YD25DDTi]

< REMOVAL AND INSTALLATION >

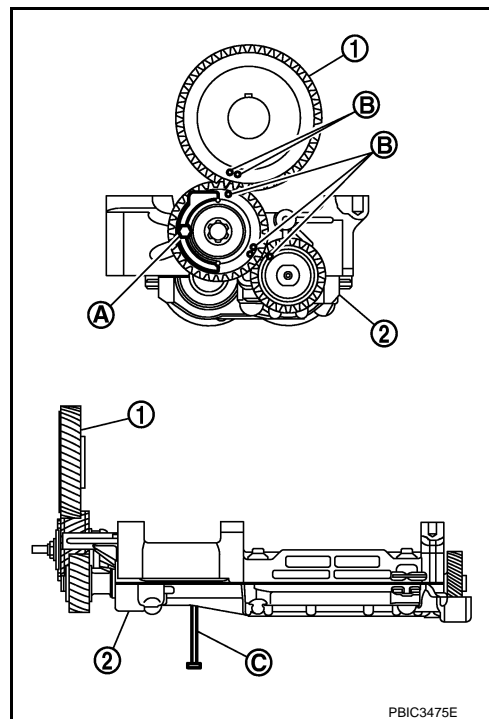
- Align crankshaft gear ① mating mark and idler sub gear ③ mating mark ㉔.

- ② : Idler main gear
- ④ : Balancer drive shaft front end
- ⑤ : Idler gear mounting bolt (do not loosen)
- B : Snap ring pliers

- Remove internal mechanism securing bolt and plate (Service part: 13012 EB30A and 13013 EB30A) ㉑.



- If new balancer unit ② is used, align matching marks ㉑ of each gear as shown in the figure.
- Remove securing-bolt-and-plate (A) and securing pin (C) after installing crankshaft gear ①.

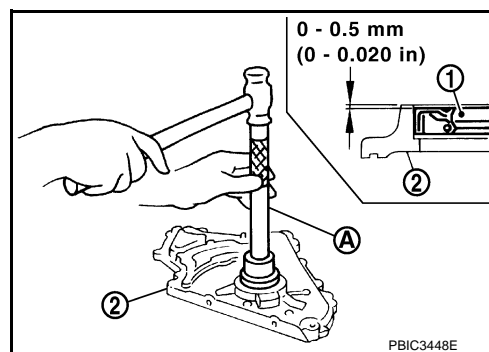


11. Install front oil seal ① to oil pump housing ②.

- Using the suitable drift (A) [62 mm (2.44 in) dia.], force fit the seal until it hits the bottom.
- Apply new engine oil to new front oil seal joint surface and seal lip.

CAUTION:

- Never touch lips of oil seal. Check seal surfaces are free of foreign materials.
- Do not reuse front oil seal.



PRIMARY TIMING CHAIN

[YD25DDTi]

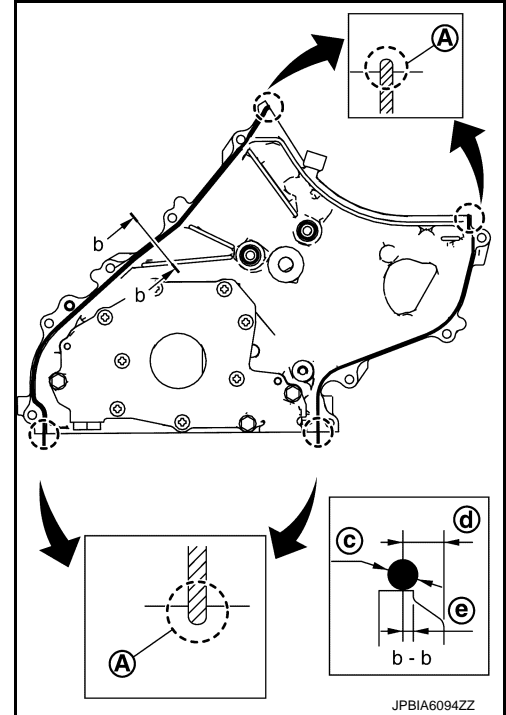
< REMOVAL AND INSTALLATION >

12. Install oil pump housing.

- a. Apply a continuous bead of liquid gasket with the tube presser (commercial service tool) as shown in the figure.

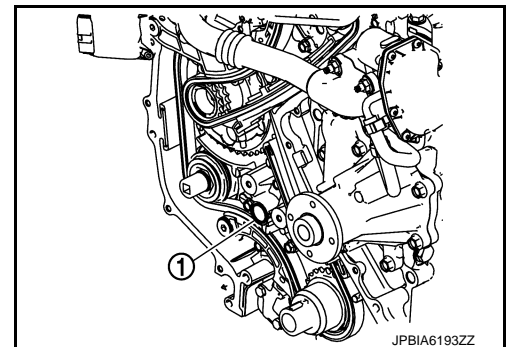
- Leave the start and end areas (A) of the bead slightly protruding from the surface.
- Apply liquid gasket along upper end surface of oil pump housing.

- (c) : ϕ 3.4 - 4.4 mm (0.13 - 0.17 in)
 (d) : 4.0 - 5.6 mm (0.16 - 0.22 in)
 (e) : 0.5 - 2.1 mm (0.02 - 0.08 in)



- b. Install new O-ring (1) into the groove of rear chain case.

CAUTION:
 Do not reuse O-ring.

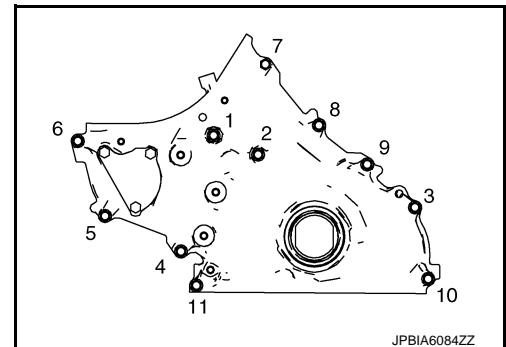


- c. Install oil pump housing.

- When installing, align the inner rotor in the direction of the two facing flats of oil pump drive spacer.
- When installing, align the dowel pin with the pin hole.

- d. Tighten fixing bolts in the order from 1 to 11 as shown in the figure.

- e. After tightening all the bolts, re-tighten in the same order.



PRIMARY TIMING CHAIN

[YD25DDTi]

< REMOVAL AND INSTALLATION >

13. Check gaps on oil pan upper mounting surface.

- ① : Cylinder block
- ② : Rear chain case
- ③ : Oil pump housing

- Using straightedge (A) and feeler gauge (B), measure gaps between the locations of the following parts:

Oil pump housing and rear chain case:

Standard : $(-0.09) - (+0.09)$ mm [$(-0.0035) - (+0.0035)$ in]

Rear chain case and cylinder block:

Standard : $(-0.19) - (+0.07)$ mm [$(-0.0075) - (+0.0028)$ in]

- If the measured value is out of the standard, install again.

14. Install crankshaft pulley, refer to the following:

CAUTION:

Be careful not to damage front oil seal.


- a. Install crankshaft pulley to crankshaft.
- b. Apply new engine oil to thread and seat surfaces of crankshaft pulley bolt.
- c. Hold crankshaft pulley ① with the pulley holder (commercial service tool) (A).
- d. Tighten crankshaft pulley fixing bolt.

 : 75.0 N·m (7.7 kg-m, 55 ft-lb)

- e. Completely loosen.

 : 0 N·m (0 kg-m, 0 ft-lb)

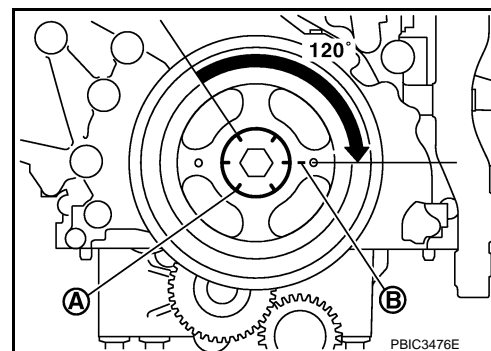
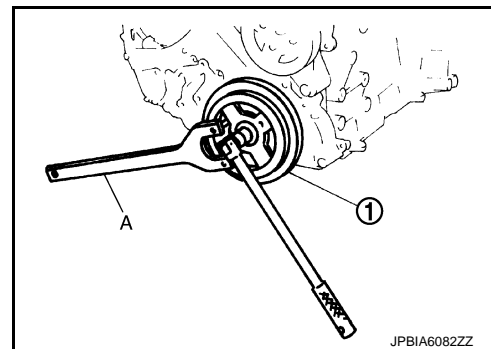
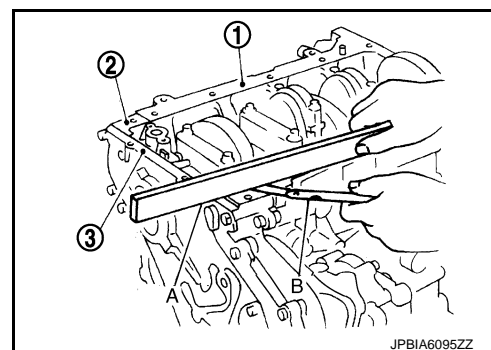
- f. Tighten crankshaft pulley bolt.

 : 75.0 N·m (7.7 kg-m, 55 ft-lb)

- g. Put an alignment mark on crankshaft pulley that aligns with one of the punched marks on the bolt.

- h. Tighten fixing bolt another 120 degrees (angle tightening) (turn by 2 notch).

- (A) : Indicate embossments
- (B) : Alignment mark



15. Install in the reverse order of removal.

Inspection

INFOID:0000000010520965

INSPECTION AFTER REMOVAL

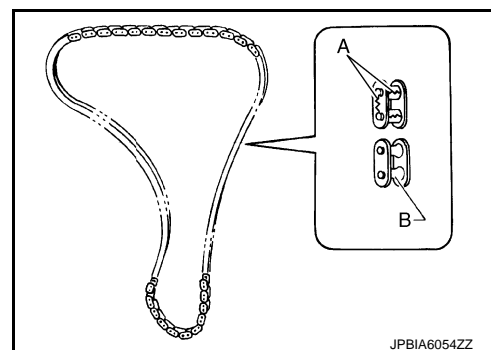
Timing Chain

PRIMARY TIMING CHAIN

< REMOVAL AND INSTALLATION >

[YD25DDTi]

Check for cracks (A) and excessive wear (B) at roller links.
Replace timing chain if necessary.

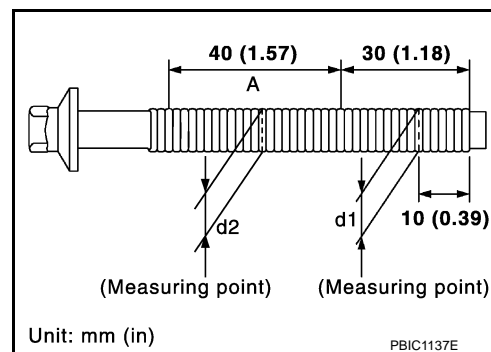


Balancer Unit Mounting Bolt Outer Diameter

- Measure the outer diameters ("d1", "d2") at two positions as shown in the figure.
- If reduction appears in "A" range, regard it as "d2".

Limit ("d1" - "d2") : 0.15 mm (0.0059 in)

- If it exceeds the limit (large difference in dimensions), replace it with a new one.



VACUUM PUMP

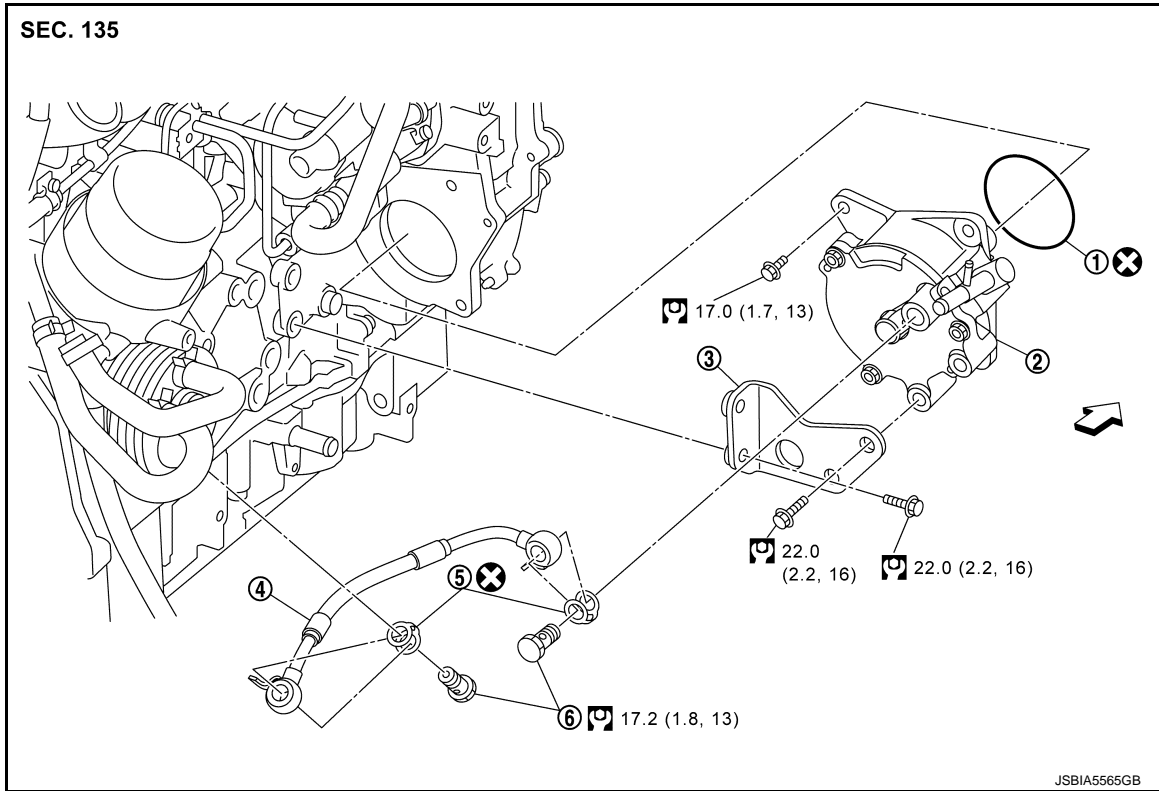
< REMOVAL AND INSTALLATION >

[YD25DDTi]

VACUUM PUMP

Exploded View

INFOID:0000000010520966



- | | | |
|--|-----------------|------------|
| ① O-ring | ② Vacuum pump | ③ Bracket |
| ④ Oil feed tube | ⑤ Copper washer | ⑥ Eye-bolt |
| <p>⇐ : Vehicle front</p> <p>⊗ : Always replace after every disassembly.</p> <p>⌚ : N·m (kg-m, ft-lb)</p> | | |

Removal and Installation

INFOID:0000000010520967

REMOVAL

1. Remove primary timing chain. Refer to [EM-357, "Exploded View"](#).
2. Remove fuel pump. Refer to [EM-325, "Exploded View"](#).
3. Remove oil feed tube.
4. Remove bracket.
5. Remove vacuum pump and O-ring.

INSTALLATION

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

CAUTION:

Do not reuse O-ring and copper washers.

Bracket

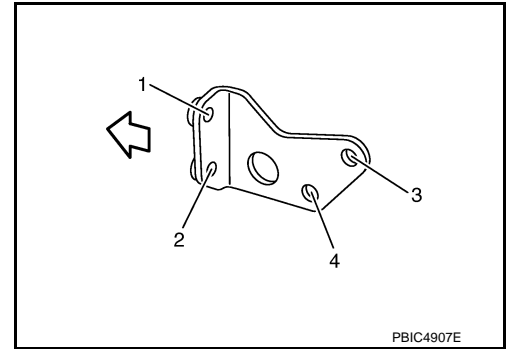
VACUUM PUMP

[YD25DDTi]

< REMOVAL AND INSTALLATION >

Tighten fixing bolts in the order from 1 to 4 as shown in the figure.

⇐ : Cylinder block side



Inspection

INFOID:0000000010520968

INSPECTION BEFORE REMOVAL

1. Disconnect vacuum hose, and connect a vacuum gauge via 3-way connector.
 - Disconnect point where vacuum from vacuum pump can be measured directly and install 3-way connector.
2. Start engine and measure generated vacuum at idle speed.

Standard:

-93.3 to -101 kPa (-933 to -1010 mbar, -700 to -760 mmHg, -27.55 to -29.83 inHg)

- If out of standard, check for air suction in vacuum route, and measure again.
- If still outside of standard, replace vacuum pump.

DRIVE PLATE

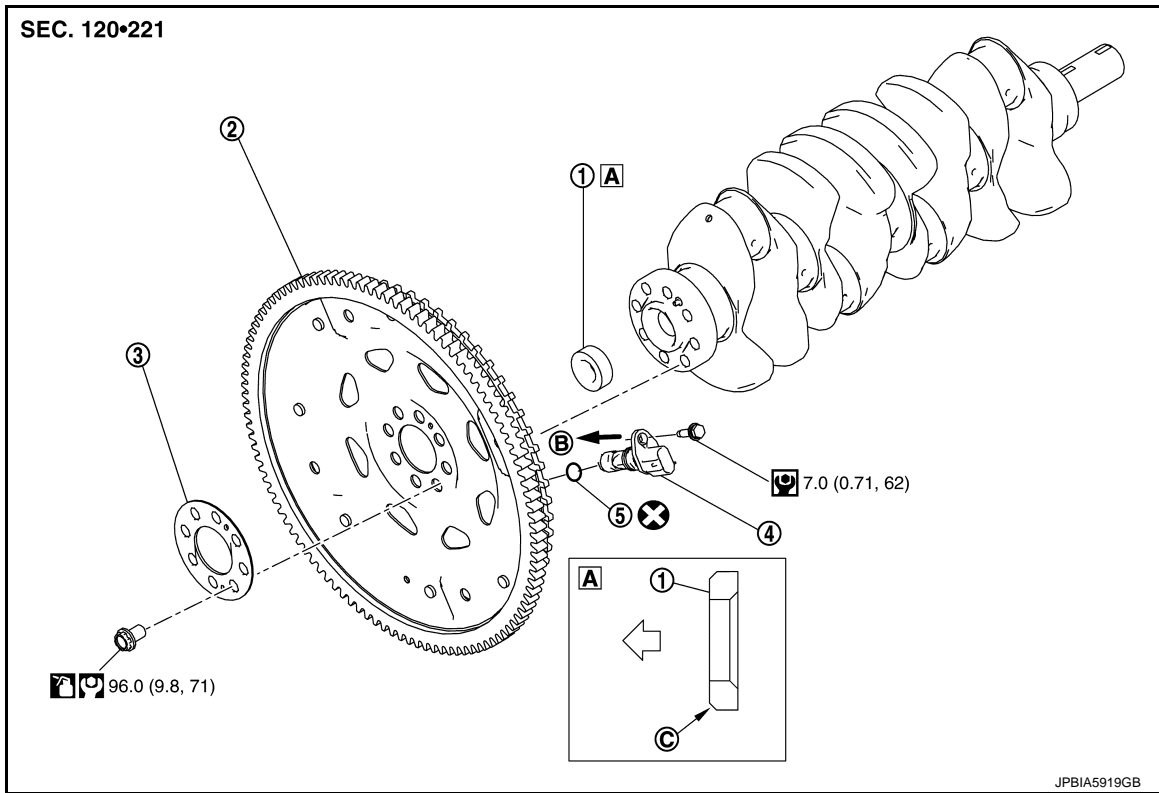
< REMOVAL AND INSTALLATION >

[YD25DDTi]

DRIVE PLATE

Exploded View

INFOID:0000000010520969



- | | | |
|------------------------------------|-----------------------------|-----------------------|
| ① Pilot converter | ② Drive plate | ③ Reinforcement plate |
| ④ Crankshaft position sensor (POS) | ⑤ O-ring | |
| A Chamfered | B Installed on transmission | C Chanfer |

← : Crankshaft side

⊗ : Always replace after every disassembly.

Ⓐ : N·m (kg-m, in-lb)

Ⓑ : N·m (kg-m, ft-lb)

Ⓒ : Should be lubricated with oil.

Removal and Installation

INFOID:0000000010520970

REMOVAL

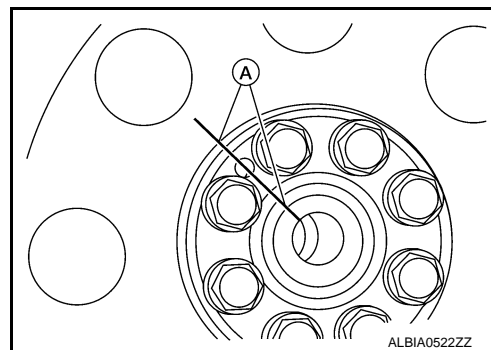
1. Remove transmission assembly. Refer to [TM-644, "2WD : Exploded View"](#) (2WD) or [TM-649, "4WD : Exploded View"](#) (4WD).

DRIVE PLATE

[YD25DDTi]

< REMOVAL AND INSTALLATION >

2. Before removing the drive plate, put a match mark (A) on the crankshaft and drive plate for alignment during installation.



3. Remove drive plate as per the following procedure.
 - a. Set the ring gear stopper [SST: KV10105630] (C) as shown in the figure.

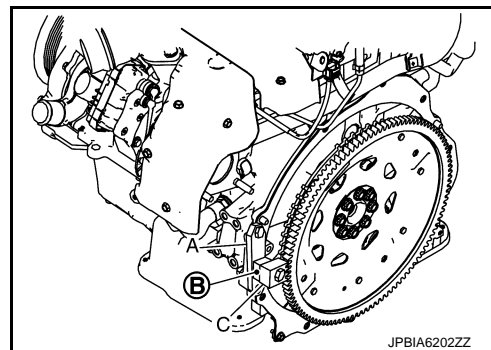
A : Plate [SST: KV10105610]

(B) : Spacer (suitable one)

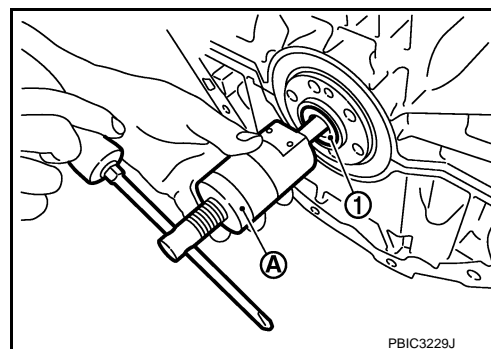
- b. Loosen the bolts diagonally, and then pull drive plate with both hands to remove it.

CAUTION:

- Never disassemble them.
- Never place them with signal plate facing down.
- When handling signal plate, take care not to damage or scratch them.
- Handle signal plate in a manner that prevents them from becoming magnetized.
- Take care not to damage the periphery of the sensing area.
- Any dropped drive plate shall not be used. (The drive plate to which the sensing area shall not be placed on the floor.)
- Never touch drive plate with bare hands. Always use urethane coating gloves or skin gloves when removing these parts.
- Never use torn glove.



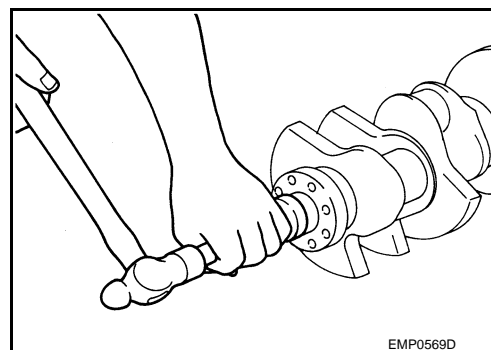
4. Remove pilot converter (1) using the pilot bush puller (commercial service tool) (A), if necessary.



INSTALLATION

1. Install pilot converter to the crankshaft using suitable tool, if removed.
 - With a drift of the following outer diameter, press-fit as far as it will go.

Pilot converter : Approx. 33 mm (1.30 in)



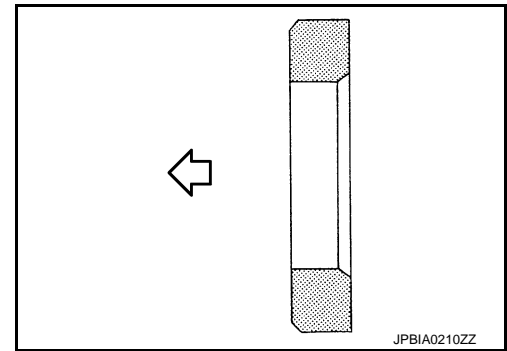
DRIVE PLATE

[YD25DDTi]

< REMOVAL AND INSTALLATION >

- Press-fit pilot converter with its chamfering side facing crankshaft shown in the figure.

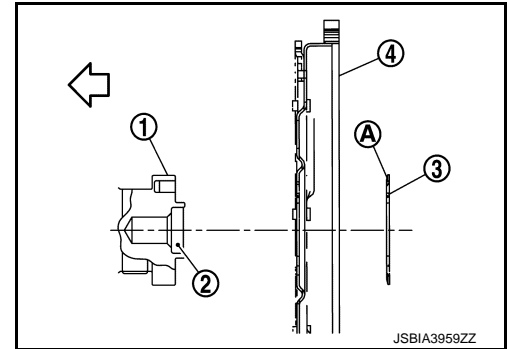
↩ : Crankshaft side



2. Install drive plate in the reverse order of removal.

- Install drive plate ④ and reinforcement plate ③ as shown in the figure.

- ① : Crankshaft
- ② : Pilot converter
- Ⓐ : Rounded
- ↩ : Engine front



- When installing drive plate to crankshaft, be sure to correctly align crankshaft side dowel pin and drive plate side dowel pin hole.

CAUTION:

If these are not aligned correctly, engine runs roughly and "MIL" illuminates.

- Holding ring gear with the ring gear stopper [SST: KV101056S0].
- Tighten the mounting bolts crosswise over several times.
- Apply engine oil to mounting bolts.

Inspection

INFOID:0000000010520971

DRIVE PLATE DEFLECTION

- Check drive plate and signal plate Ⓐ for deformation or damage.

- Ⓑ : Ring gear
- ↩ : Engine front

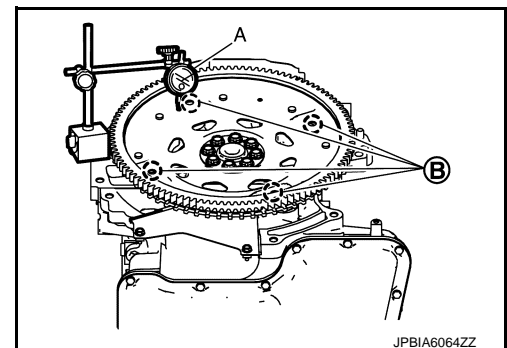
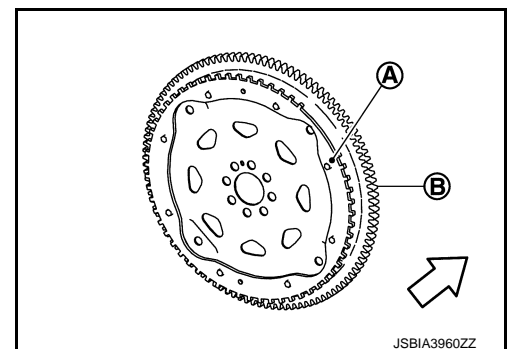
CAUTION:

- Never disassemble drive plate.
- Never place drive plate with signal plate facing down.
- When handling signal plate, take care not to damage or scratch it.
- Handle signal plate in a manner that prevents it from becoming magnetized.
- If damage is found, replace drive plate.
- Measure the deflection of drive plate contact surface to torque converter with a dial indicator (A).
- Measure the deflection at the area Ⓑ.

Ⓑ : ϕ 11.0 - 20.6 mm (0.43 - 0.81 in)

Limit : 0.35 mm (0.0138 in) or less.

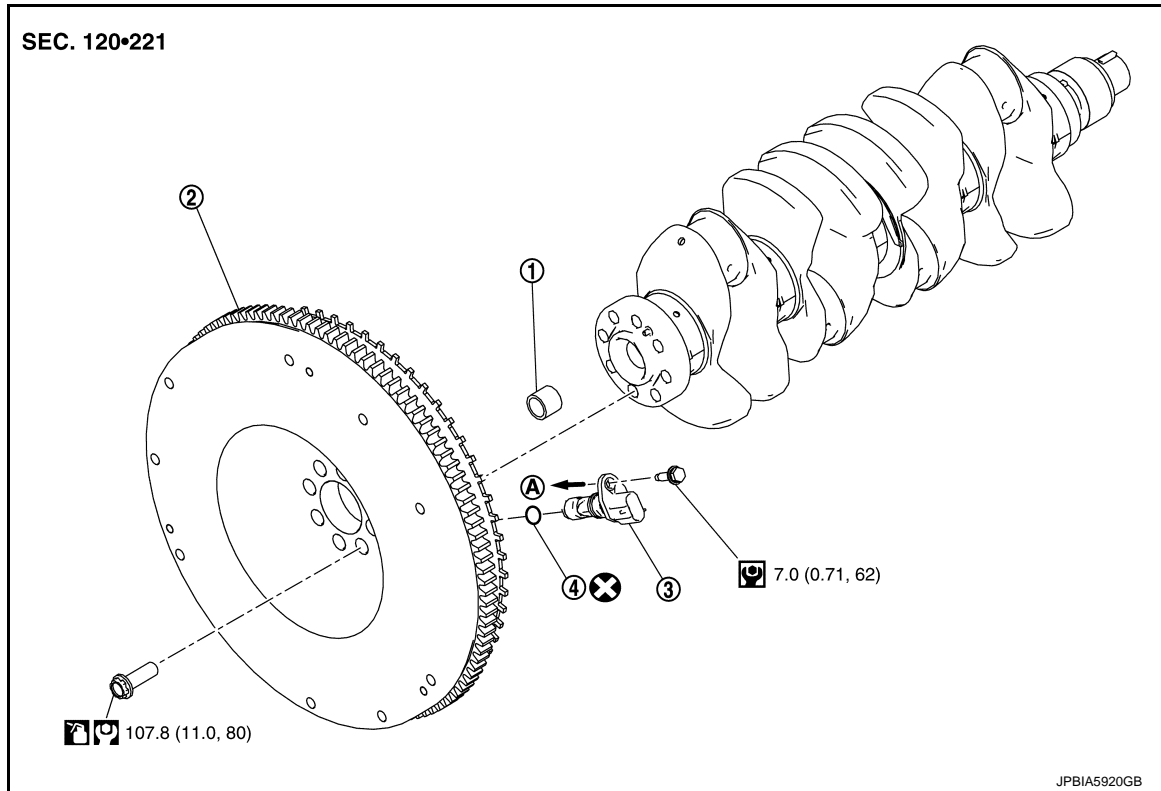
- If measured value is out of the standard, replace drive plate.



FLYWHEEL

Exploded View

INFOID:0000000011014854



- ① Pilot bush
- ② Flywheel
- ③ Crankshaft position sensor (POS)
- ④ O-ring
- Ⓐ Installed on transmission
- ⓧ : Always replace after every disassembly.
- Ⓛ : N·m (kg-m, in-lb)
- Ⓛ : N·m (kg-m, ft-lb)
- Ⓛ : Should be lubricated with oil.

Removal and Installation

INFOID:0000000011014855

REMOVAL

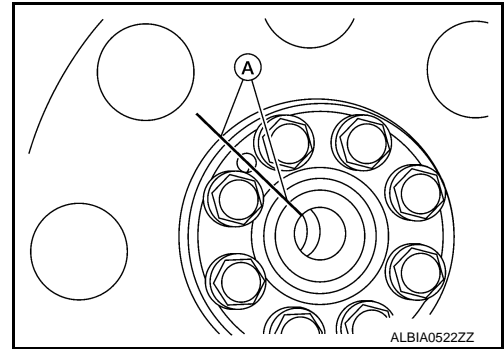
1. Remove transmission assembly. Refer to [TM-36, "2WD : Exploded View"](#) (2WD) or [TM-41, "4WD : Exploded View"](#) (4WD).

FLYWHEEL

[YD25DDTi]

< REMOVAL AND INSTALLATION >

2. Before removing the flywheel, put a match mark (A) on the crankshaft and flywheel for alignment during installation.



3. Remove flywheel as per the following procedure.
 - a. Set the ring gear stopper [SST: KV10105630] (C) as shown in the figure.

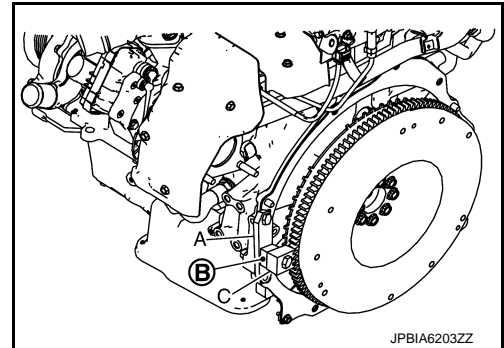
A : Plate [SST: KV10105610]

(B) : Spacer (suitable one)

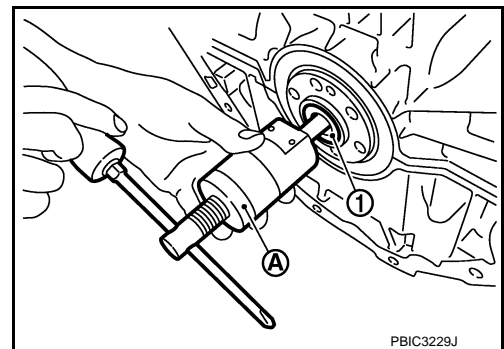
- b. Loosen the bolts diagonally, and then pull flywheel with both hands to remove it.

CAUTION:

- Never disassemble them.
- Never place them with signal plate facing down.
- When handling signal plate, take care not to damage or scratch them.
- Handle signal plate in a manner that prevents them from becoming magnetized.
- Take care not to damage the periphery of the sensing area.
- Any dropped flywheel shall not be used. (The flywheel to which the sensing area shall not be placed on the floor.)
- Never touch flywheel with bare hands. Always use urethane coating gloves or skin gloves when removing these parts.
- Never use torn glove.



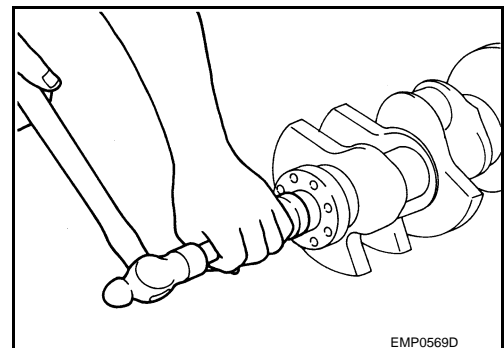
4. Remove pilot bush (1) using the pilot bush puller [SST: ST16610001] (A), if necessary.



INSTALLATION

1. Install pilot bush to the crankshaft using suitable tool.
 - With a drift of the following outer diameter, press-fit as far as it will go.

Pilot bush : Approx. 20.6 mm (0.81 in)



2. Install in the reverse order of removal.
 - Apply engine oil to mounting bolts.

FLYWHEEL

< REMOVAL AND INSTALLATION >

[YD25DDTi]

CAUTION:

Be careful not to damage or scratch and contact surface for clutch disc of flywheel.

Inspection

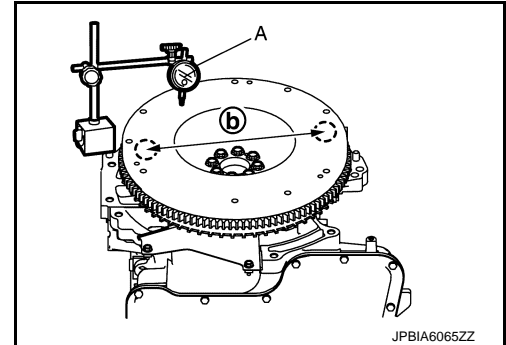
INFOID:0000000011014856

FLYWHEEL DEFLECTION

- Measure the deflection of flywheel contact surface to torque with a dial indicator (A).
- Measure the deflection at 225 mm (8.86 in) diameter (b).

Limit : 0.10 mm (0.0039 in) or less.

- If measured value is out of the standard, replace flywheel.
- If a trace of burn or discoloration is found on the surface, repair it with sandpaper.



OIL SEAL

VALVE OIL SEAL

VALVE OIL SEAL : Removal and Installation

INFOID:000000010520975

EM

REMOVAL

1. Remove camshafts. Refer to [EM-333. "Exploded View"](#).
2. Remove valve lifters. Refer to [EM-341. "Exploded View"](#).
3. Rotate crankshaft, and set piston whose valve oil seal is to be removed to TDC. This will prevent valve from dropping into cylinder.

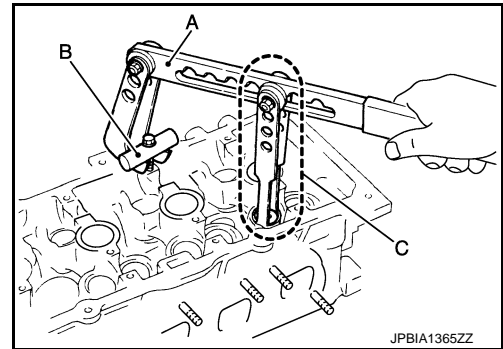
CAUTION:

When rotating crankshaft, be careful to avoid scarring front cover with timing chain.

4. Remove valve collet.
 - Compress valve spring with the valve spring compressor [SST: KV10116200] (A), the attachment [SST: KV10115900] (C), and the adapter [SST: KV10109220] (B). Remove valve collet with magnet hand.

CAUTION:

- Be careful not to damage valve lifter holes.

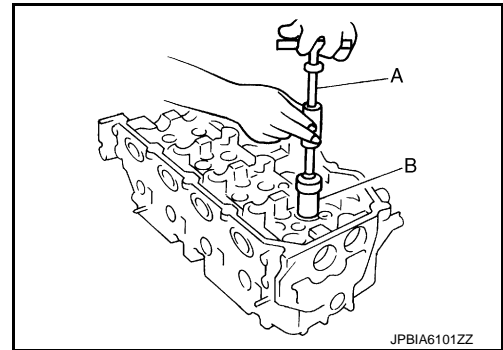


5. Remove valve spring retainer and valve spring (with valve spring seat).

CAUTION:

Never remove valve spring seat from valve spring.

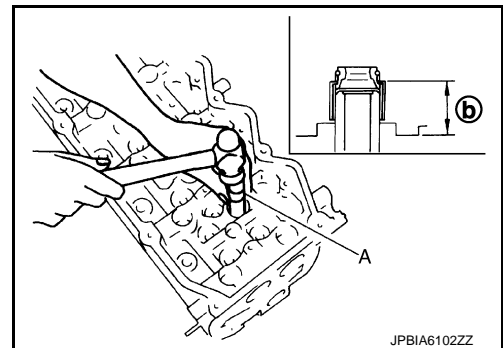
6. Remove valve oil seal with the valve oil seal puller [SST: KV10107902] (A) and attachment [SST: KV10116100] (B).



INSTALLATION

1. Apply new engine oil to valve oil seal joint surface and seal lip.
 - CAUTION:**
 - Do not reuse valve oil seal.**
2. Press in valve oil seal to the height (H) shown in the figure with the valve oil seal drift [SST: KV10115600] (A).

ⓑ : 12.1 - 12.7 mm (0.476 - 0.500 in)



3. Install in the reverse order of removal, for the rest of parts.

< REMOVAL AND INSTALLATION >

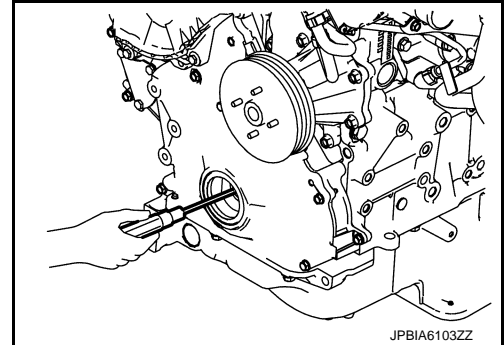
FRONT OIL SEAL

FRONT OIL SEAL : Removal and Installation

INFOID:000000010520976

REMOVAL

1. Remove the following parts.
 - Drive belt. Refer to [EM-285, "Removal and Installation"](#).
 - Crankshaft pulley. Refer to [EM-357, "Exploded View"](#).
2. Remove front oil seal with a suitable tool.

CAUTION:**Be careful not to damage oil pump housing and crankshaft.**

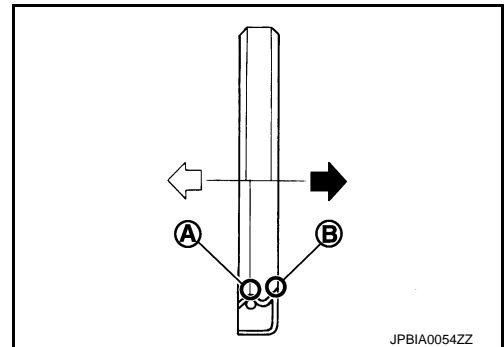
INSTALLATION

1. Apply new engine oil to new front oil seal joint surface and seal lip.

CAUTION:**Do not reuse front oil seal.**

2. Install front oil seal so that each seal lip is oriented as shown in the figure.

- (A) : Oil seal lip
 (B) : Dust seal lip
 ⇐ : Engine inside
 ⇐ : Engine outside



OIL SEAL

< REMOVAL AND INSTALLATION >

[YD25DDTi]

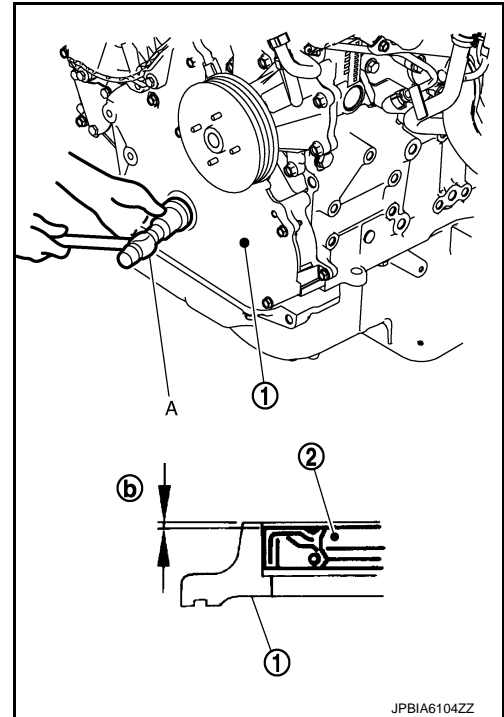
- Using the suitable drift [62 mm (2.44 in) dia.] (A), press fit the oil seal ② so that the dimension is as specified in the figure.

① : Oil pump housing

② : 0 - 0.5 mm (0 - 0.020 in)

CAUTION:

Never touch lips of oil seal. Check seal surfaces are free of foreign materials.



JPBIA6104ZZ

- Install in the reverse order of removal.

REAR OIL SEAL

REAR OIL SEAL : Removal and Installation

INFOID:0000000010520977

REMOVAL

- Remove transmission.
 - A/T models (2WD): Refer to [TM-644, "2WD : Exploded View"](#).
 - A/T models (4WD): Refer to [TM-649, "4WD : Exploded View"](#).
 - M/T models (2WD): Refer to [TM-36, "2WD : Exploded View"](#).
 - M/T models (4WD): Refer to [TM-41, "4WD : Exploded View"](#).
- Remove drive plate or flywheel. Refer to [EM-373, "Exploded View"](#) (drive plate) or [EM-376, "Exploded View"](#) (flywheel).
- Remove rear oil seal with a suitable tool.

CAUTION:

Be careful not to damage crankshaft and cylinder block.

INSTALLATION

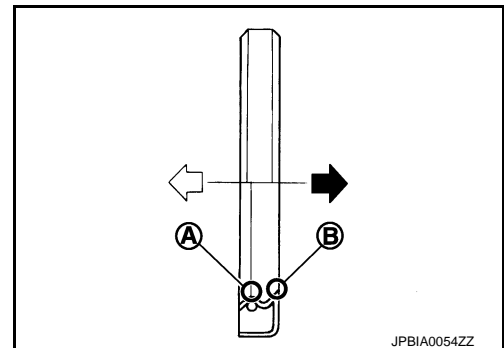
- Apply new engine oil to new rear oil seal joint surface and seal lip.
 - CAUTION:**
Do not reuse rear oil seal.
- Install rear oil seal so that each seal lip is oriented as shown in the figure.

Ⓐ : Oil seal lip

Ⓑ : Dust seal lip

⇐ : Engine inside

⇐ : Engine outside



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OIL SEAL

[YD25DDTi]

< REMOVAL AND INSTALLATION >

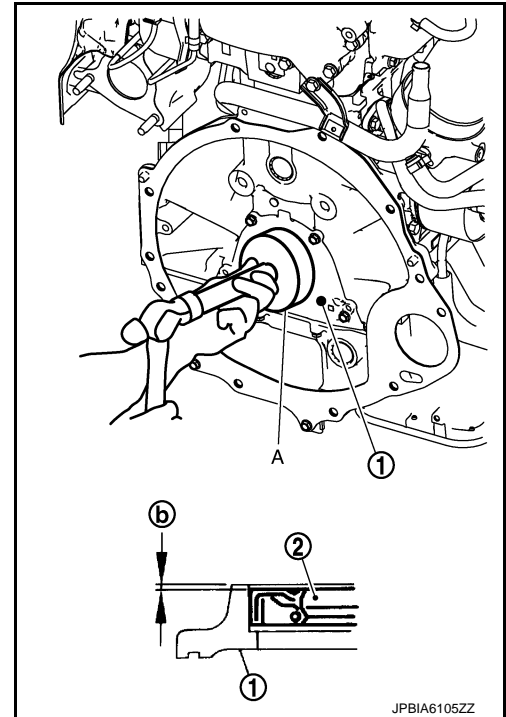
- Press in rear oil seal ② to rear oil seal retainer ① as shown in the figure.

② : 0 - 0.5 mm (0 - 0.020 in)

- Using the drift [105 mm (4.13 in) dia.] (A), press fit so that the dimension is as specified in the figure.
- Avoid inclined fitting. Force fit perpendicularly.

CAUTION:

Never touch lips of oil seal. Check seal surfaces are free of foreign materials.



- Install in the reverse order of removal after this step.

UNIT REMOVAL AND INSTALLATION

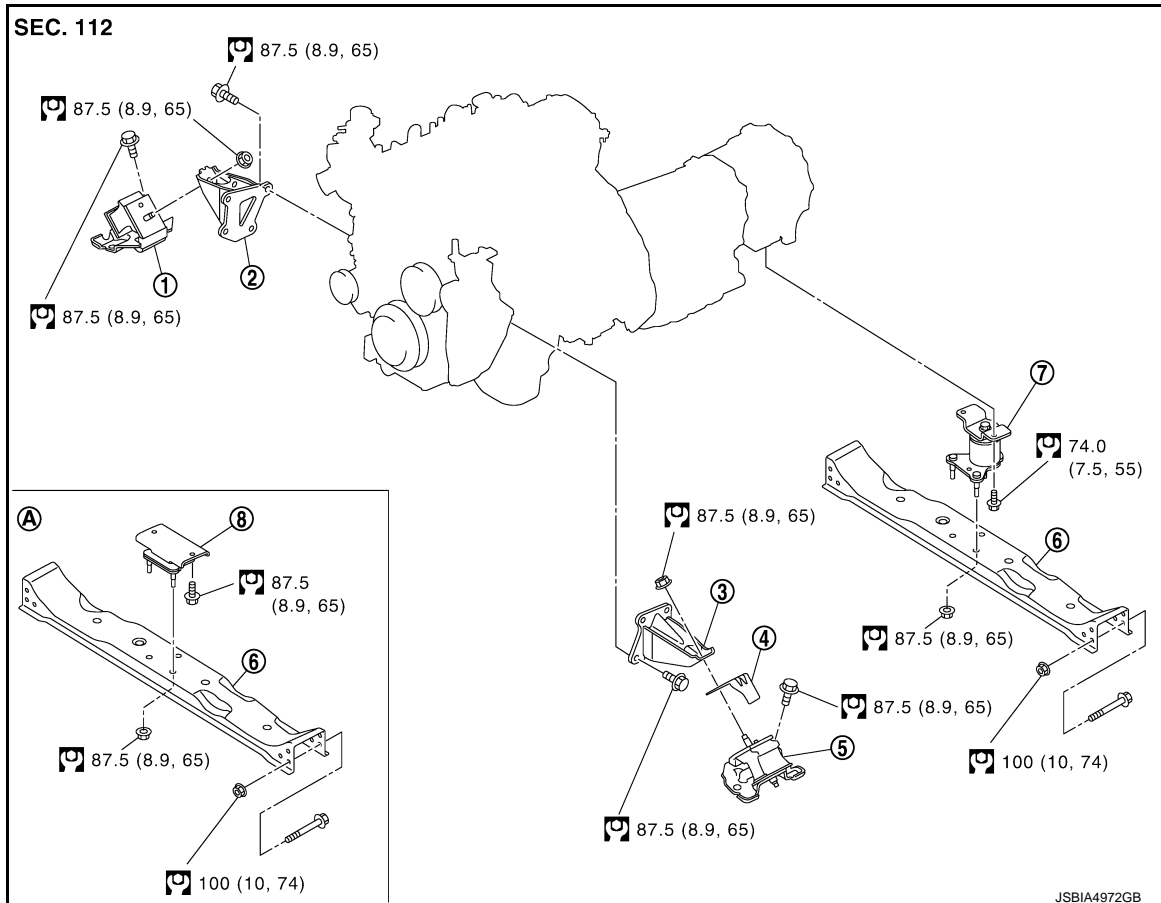
ENGINE ASSEMBLY


Exploded View

INFOID:0000000010521015

EM

2WD models



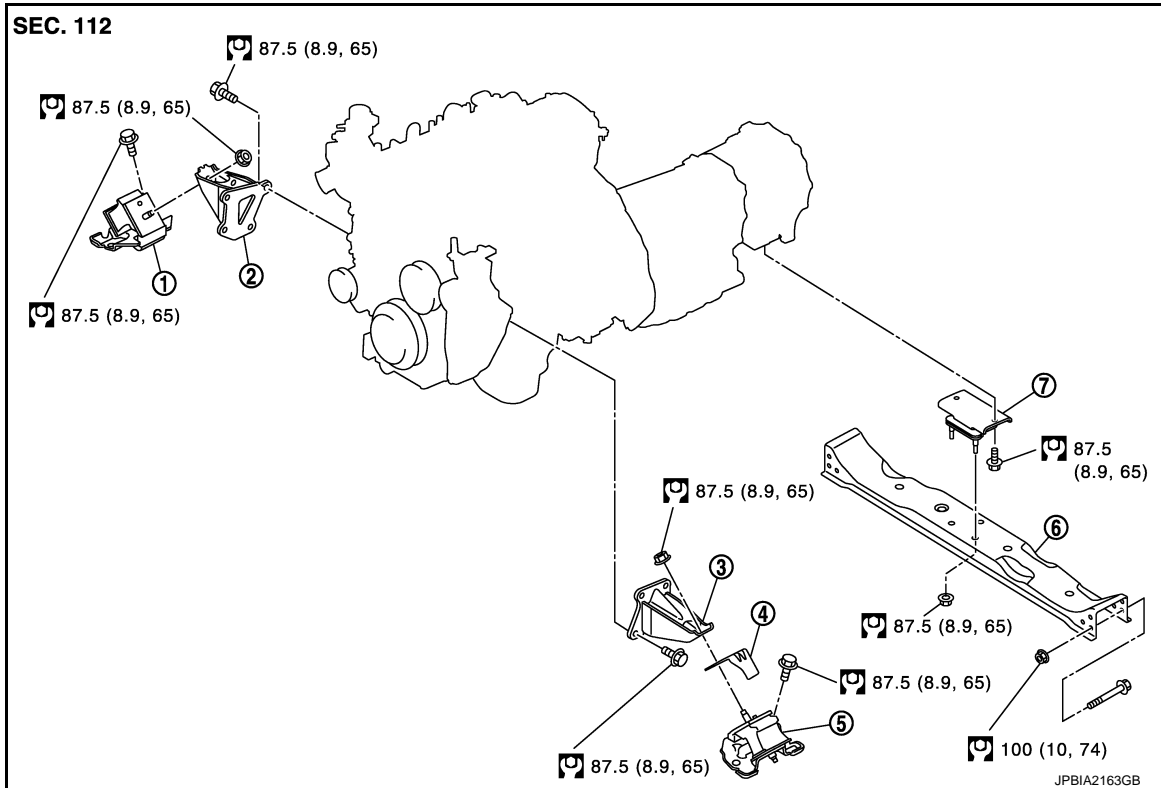
- | | | |
|---|------------------------------------|------------------------------|
| ① RH engine mounting insulator | ② RH engine mounting bracket | ③ LH engine mounting bracket |
| ④ Heat insulator | ⑤ LH engine mounting insulator | ⑥ Transmission cross member |
| ⑦ Engine mounting insulator (rear) | ⑧ Engine mounting insulator (rear) | |
| Ⓐ A/T models | | |
|  : N·m (kg-m, ft-lb) | | |

ENGINE ASSEMBLY

< UNIT REMOVAL AND INSTALLATION >

[YD25DDTi]

4WD models



- | | | |
|------------------------------------|--------------------------------|------------------------------|
| ① RH engine mounting insulator | ② RH engine mounting bracket | ③ LH engine mounting bracket |
| ④ Heat insulator | ⑤ LH engine mounting insulator | ⑥ Transmission cross member |
| ⑦ Engine mounting insulator (rear) | | |

: N·m (kg-m, ft-lb)

Removal and Installation

INFOID:0000000010587103

WARNING:

- Situate vehicle on a flat and solid surface.
- Place chocks at front and back of rear wheels.
- For engines not equipped with engine slingers, attach proper slingers and bolts described in PARTS CATALOG.

CAUTION:

- Always be careful to work safely, avoid forceful or uninstructed operations.
- Never start working until exhaust system and engine coolant are cool enough.
- If items or work required are not covered by the engine main body section, refer to the applicable sections.
- Always use the support point specified for lifting.
- Use either 2-pole lift type or separate type lift as best you can. If board-on type is used for unavoidable reasons, support at the rear axle jacking point with transmission jack or similar tool before starting work, in preparation for the backward shift of center of gravity.
- For supporting points for lifting and jacking point at rear axle, refer to [GI-30, "2-Pole Lift"](#) (for 2-pole lift) or [GI-29, "Garage Jack and Safety Stand"](#) (except for 2-pole lift).

NOTE:

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

REMOVAL

Description of work

Remove transmission assembly from vehicle downward. Then hoist the engine from vehicle upward.

Preparation

ENGINE ASSEMBLY

[YD25DDTi]

< UNIT REMOVAL AND INSTALLATION >

1. Disconnect battery cable from negative terminal.
2. Drain engine coolant from radiator. Refer to [CO-68, "Draining"](#).
3. Remove the following parts.
 - Front under cover. Refer to [EXT-24, "Exploded View"](#).
 - Hood assembly: Refer to [DLK-162, "HOOD ASSEMBLY : Removal and Installation"](#) (WITH INTELLIGENT KEY SYSTEM) or [DLK-372, "HOOD ASSEMBLY : Removal and Installation"](#) (WITHOUT INTELLIGENT KEY SYSTEM).
 - Front grill. Refer to [EXT-19, "Exploded View"](#).
 - Engine cover: Refer to [EM-290, "Exploded View"](#).
 - Resonator: Refer to [EM-296, "Exploded View"](#).
 - Air duct and air cleaner case: Refer to [EM-292, "Exploded View"](#).
 - Brake pipe lines, fuel pipe lines brackets:
 - Radiator hose (upper and lower): Refer to [CO-73, "Exploded View"](#).
4. Discharge refrigerant from A/C circuit. Refer to [HA-24, "Recycle Refrigerant"](#).
5. Disconnect engine room harness from the engine side and set it aside for easier work.
6. Disconnect all the body-side vacuum hoses and air hoses at engine side.

Engine room front

1. Remove power steering reservoir tank mounting bolt and move power steering reservoir tank to the position without interfere of the work.
2. Remove the radiator shroud (upper and lower). Refer to [CO-73, "Exploded View"](#).
3. Remove power steering belt and driver belt. Refer to [EM-285, "Exploded View"](#).
4. Remove the cooling fan assembly. Refer to [CO-78, "Exploded View"](#).
5. Remove the water pump pulley. Refer to [CO-78, "Exploded View"](#).
6. Separate the cooler pipe (HI) (LOW) from condenser side. Refer to [HA-37, "Exploded View"](#).
7. Remove the refrigerant pressure sensor harness connector. Refer to [HA-45, "REFRIGERANT PRESSURE SENSOR : Removal and Installation"](#).
8. Separate A/T fluid cooler from the condenser (A/T models). Refer to [TM-639, "Removal and Installation"](#).
9. Separate A/T fluid cooler hose from the radiator (A/T models). Refer to [TM-639, "Removal and Installation"](#).
10. Remove radiator assembly along with condenser.
11. Remove air inlet hose. Refer to [EM-294, "Exploded View"](#).
12. Remove power steering oil pump mounting bolt, move to the position which does not interfere the work of power steering oil pump. Refer to [ST-31, "Exploded View"](#).

Engine room RH

1. Disconnect fuel feed hose and return hose, and plug it to prevent fuel from draining. Refer to [EM-312, "Exploded View"](#).
2. Disconnect fuel filter harness connector.
3. Remove fuel filter bracket mounting bolt and move fuel filter assembly to the position without interfere of the work. Refer to [FL-50, "Exploded View"](#).
4. Remove brake booster hose in engine side.
5. Remove the engine ground cable in engine side.

Engine room LH

1. Disconnect A/C piping from heater unit. Refer to [HA-37, "Exploded View"](#).
2. Disconnect heater hose, and install plug it to prevent engine coolant from draining. Refer to [HA-57, "HEATER & COOLING UNIT ASSEMBLY : Removal and Installation"](#).

Vehicle underbody

1. Remove exhaust front tube. Refer to [EX-15, "Exploded View"](#).
2. Remove front propeller shaft. Refer to [DLN-132, "Exploded View"](#).
3. Remove rear propeller shaft. Refer to [DLN-143, "Exploded View"](#) (2WD) or [DLN-154, "Exploded View"](#) (4WD).
4. Separate the lower joint from the steering gear assembly. Refer to [ST-20, "Exploded View"](#).

ENGINE ASSEMBLY

[YD25DDTi]

< UNIT REMOVAL AND INSTALLATION >

5. Remove clutch operating cylinder from transmission, and move it aside (M/T models). Refer to [CL-25. "YD25DDTi : Exploded View"](#).
6. Remove starter motor. Refer to [STR-48. "YD25DDTi : Exploded View"](#).
7. Remove A/T fluid cooler pipe. Refer to [TM-638. "Exploded View"](#).
8. Remove transmission assembly.
 - A/T models (2WD): Refer to [TM-644. "2WD : Exploded View"](#).
 - A/T models (4WD): Refer to [TM-649. "4WD : Exploded View"](#).
 - M/T models (2WD): Refer to [TM-36. "2WD : Exploded View"](#).
 - M/T models (4WD): Refer to [TM-41. "4WD : Exploded View"](#).

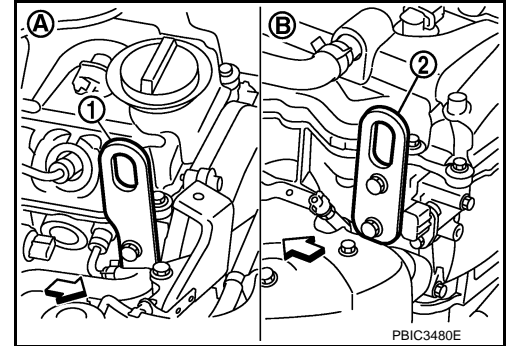
Removal

1. In order to attach the (rear) engine slinger, remove the engine cover bracket.
2. Install engine slingers into front right of cylinder head ① and rear left of cylinder head ②.

- ① : Engine slinger (front)
② : Engine slinger (rear)
⇐ : Engine front

Engine slinger bolts:

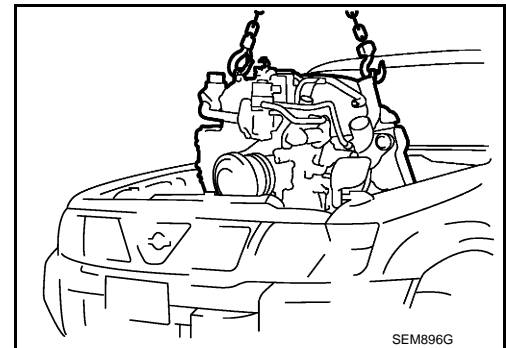
: 22.0 N·m (2.2 kg-m, 16 ft-lb)



3. Lift with hoist and secure engine in position.
4. Loosen LH and RH engine mounting insulator mounting nuts.
5. Remove engine.

CAUTION:

- During the operation, check that no part interferes with body side.
- Before and during this lifting, always check if any harnesses are left connected.



INSTALLATION

Install in the reverse order of removal.

- Do not allow engine oil to get on mounting insulator. Be careful not to damage mounting insulator.
- When installation directions are specified, install parts according to the direction marks on them referring to figure of components.
- Check that each mounting insulator is seated properly, and tighten mounting bolts and nuts.
- Insert vacuum hose to vacuum gallery until vacuum hose comes in contact with the stopper when a stopper is provided at vacuum gallery.
- Insert vacuum hose up to 15 mm (0. 59 in) when a stopper is not provided at vacuum gallery.

Inspection

INFOID:0000000010521017

INSPECTION AFTER INSTALLATION

Inspection for Leakage

The following are procedures for checking fluid leakage, lubricant leakage.

- Before starting engine, check oil/fluid levels including engine coolant and engine oil. If any are less than the required quantity, fill them to the specified level. Refer to [MA-32. "Fluids and Lubricants"](#).
- Follow the procedure below to check for fuel leakage.
 - Turn ignition switch to the "ON" position (with engine stopped). With fuel pressure applied to fuel piping, check for fuel leakage at connection points.

ENGINE ASSEMBLY

[YD25DDTi]

< UNIT REMOVAL AND INSTALLATION >

- Start engine. With engine speed increased, check again for fuel leakage at connection points.
- Run engine to check for unusual noise and vibration.

NOTE:

If hydraulic pressure inside chain tensioner drops after removal/installation, slack in guide may generate a pounding noise during and just after the engine start. However, this does not indicate a malfunction. The noise will stop after hydraulic pressure rises.

- Warm up engine thoroughly to check that there is no leakage of fuel, or any oil/fluids including engine oil and engine coolant.
- Bleed air from lines and hoses of applicable lines, such as in cooling system.
- After cooling down engine, again check oil/fluid levels including engine oil and engine coolant. Refill them to the specified level, if necessary.

Summary of the inspection items:

Items		Before starting engine	Engine running	After engine stopped
Engine coolant		Level	Leakage	Level
Engine oil		Level	Leakage	Level
Transmission / transaxle fluid	AT & CVT Models	Leakage	Level / Leakage	Leakage
	MT Models	Level / Leakage	Leakage	Level / Leakage
Other oils and fluids*		Level	Leakage	Level
Fuel		Leakage	Leakage	Leakage
Exhaust gases		—	Leakage	—

*: Power steering fluid, brake fluid, etc.

A

EM

C

D

E

F

G

H

I

J

K

L

M

N

O

P

UNIT DISASSEMBLY AND ASSEMBLY

ENGINE STAND SETTING

Setting

INFOID:0000000010521018

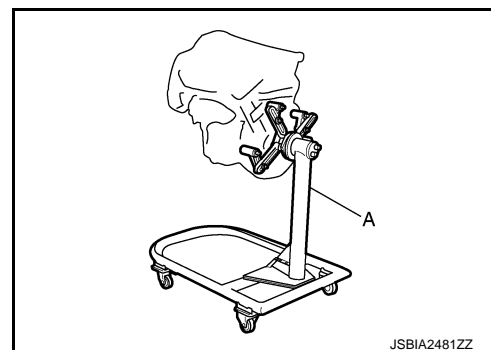
NOTE:

Explained here is how to disassemble with engine stand supporting transaxle surface. When using different type of engine stand, note with difference in steps and etc.

1. Remove engine from the vehicle. Refer to [EM-383, "Exploded View"](#).
2. Install engine to engine stand as follows.
 - a. Remove drive plate or flywheel. Refer to [EM-373, "Exploded View"](#) (A/T models) or [EM-376, "Exploded View"](#) (M/T models).
 - b. Hoist engine and install it to the engine stand (A) (commercial service tool).

NOTE:

The figure shows an example of general-purpose engine stand that can hold mating surface of transmission with drive plate and rear plate removed.



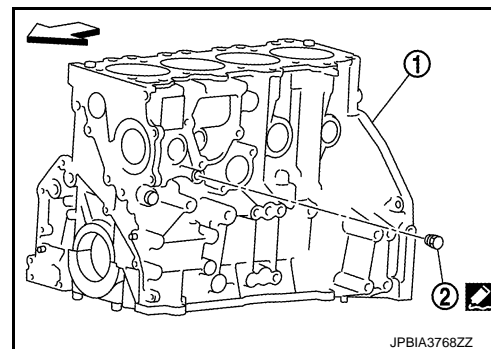
3. Drain engine oil. Refer to [LU-38, "Draining"](#).
4. Drain engine coolant by removing drain plug ② from inside of engine.

① : Cylinder block

⇐ : Engine front

■ : Sealing point

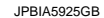
Tightening torque : Refer to [EM-390, "Disassembly and Assembly"](#).



[YD25DDTi]

CYLINDER BLOCK

INFOID:0000000010521019








- Ⓐ Comply with the installation procedure when tightening. Refer to [EM-390](#).

CYLINDER BLOCK

[YD25DDTi]

< UNIT DISASSEMBLY AND ASSEMBLY >

-  : Always replace after every disassembly.
-  : N·m (kg-m, in-lb)
-  : N·m (kg-m, ft-lb)
-  : Should be lubricated with oil.
-  : Sealing point
- ★ : Select with proper thickness.

Disassembly and Assembly

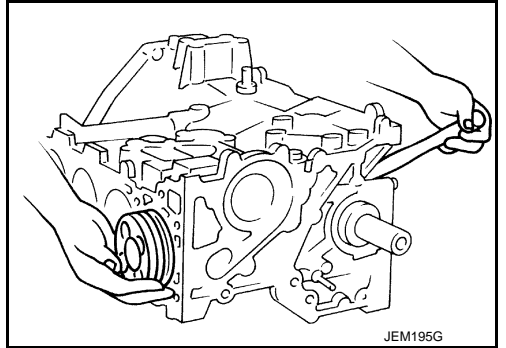
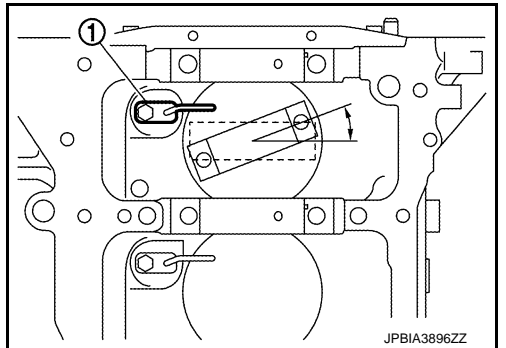
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DISASSEMBLY

1. Remove fuel pump bracket. Refer to [EM-325. "Exploded View"](#).
 2. Remove rear oil seal retainer.
 - Insert a flat-bladed screwdriver between main bearing cap and rear oil seal retainer to remove retainer.
 3. Remove rear oil seal from rear oil seal retainer. Refer to [EM-381. "REAR OIL SEAL : Removal and Installation"](#).
 - Punch out with a flat-bladed screwdriver.

CAUTION:
Be careful not to damage rear oil seal retainer.
 4. Remove piston and connecting rod assembly.
 - Before removing piston and connecting rod assembly, check connecting rod side clearance. Refer to [EM-397. "Inspection"](#).
 - a. Move crankshaft pin to be removed to approximately BDC.
 - b. Remove connecting rod caps.
 - c. Using the grip of a hammer, press the piston and connecting rod assembly out to cylinder head side.

CAUTION:

 - **Be careful not to damage the cylinder wall and crankshaft pin, resulting from an interference of the connecting rod big end.**
 - **When removing piston and connecting rod assembly, prevent the big end of connecting rod from interfering with oil jet ①.**
- 
- 
5. Remove connecting rod bearings from connecting rods and caps.

CAUTION:

 - **Be careful not to drop connecting rod bearing, and to scratch the surface.**
 - **Identify installation positions, and store them without mixing them up.**

CYLINDER BLOCK

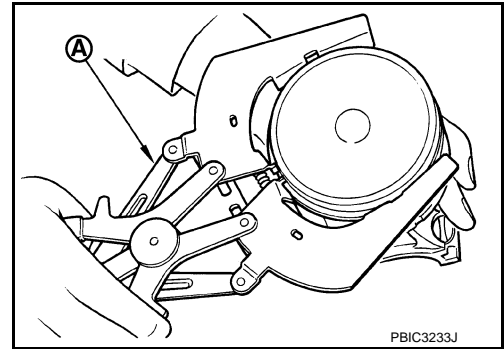
< UNIT DISASSEMBLY AND ASSEMBLY >

[YD25DDTi]

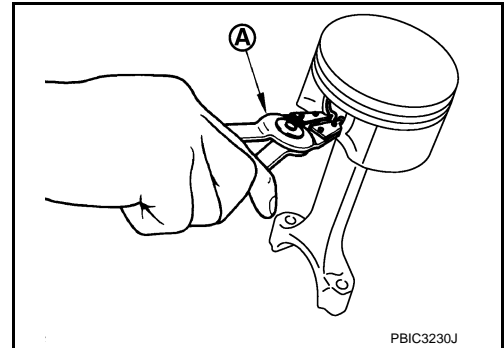
6. Remove piston rings from pistons using the piston ring expander (commercial service tool) (A).

CAUTION:

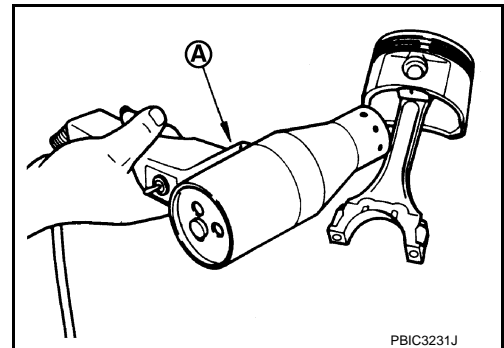
- When removing, prevent pistons from being damaged.
- Never expand piston rings excessively. This may damage piston rings.



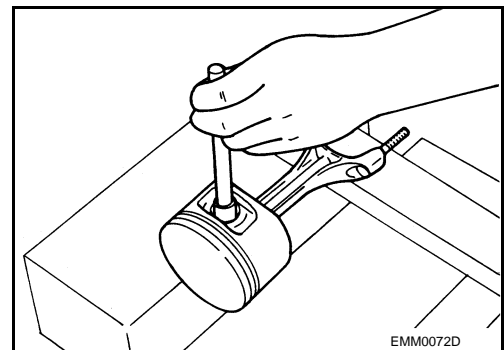
7. Remove pistons from connecting rods.
a. Using the snap ring pliers (A), remove snap rings.



- b. Using the industrial use dryer (A), heat pistons up to 60 to 80°C (140 to 176°F).



- c. Using rod with outer diameter of 26 mm (1.02 in), press piston pins out.



A

EM

C

D

E

F

G

H

I

J

K

L

M

N

O

P

CYLINDER BLOCK

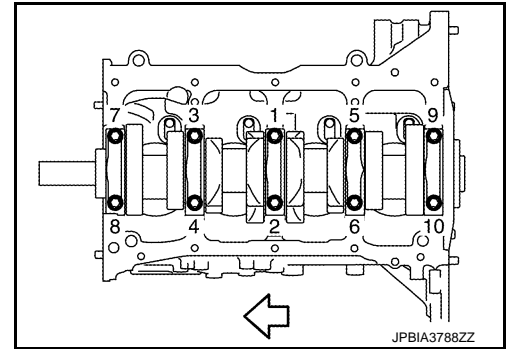
[YD25DDTi]

< UNIT DISASSEMBLY AND ASSEMBLY >

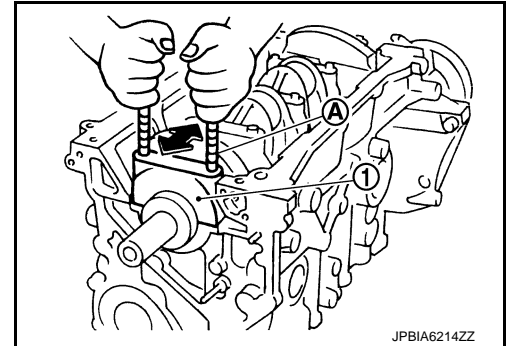
8. Loosen and remove main bearing cap bolts in the order from 10 to 1 as shown in the figure.

⇐ : Engine front

- Use TORX socket (size: E14) (commercial service tool).
- Before loosening main bearing cap bolts, measure crankshaft end play. Refer to [EM-419, "Cylinder Block"](#).



9. Remove main bearing caps.
- Insert bolts (A) into bolt holes, and then remove main bearing cap ① by lifting up and shaking forward and backward.



10. Remove crankshaft.
11. Remove main bearings and thrust bearings from cylinder block and main bearing caps.

CAUTION:

Check the correct installation locations of removed parts. Store them so they never get mixed up.

12. Remove oil jet.
13. Remove oil jet relief valve.

ASSEMBLY

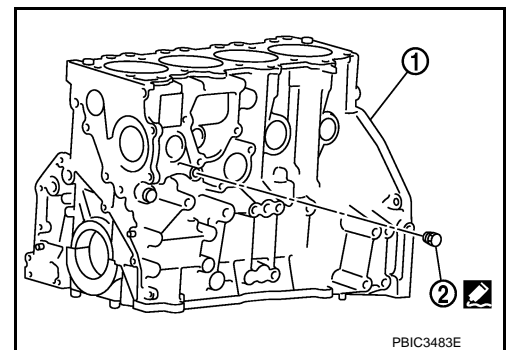
1. Blow air sufficiently to inside engine coolant passage, engine oil passage, crankcase and cylinder bore to remove foreign matter.

CAUTION:

Use a goggles to protect your eye.

2. Install drain plug to cylinder block ①.
- Apply liquid gasket to drain plug ②.
 - **Use Genuine Liquid Gasket (TB1215) or equivalent**
 - Tighten drain plug.

 : 46.6 N·m (4.8 kg-m, 34 ft-lb)



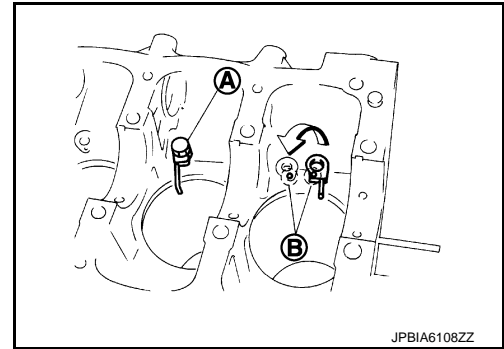
3. Install oil jet relief valve.

CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

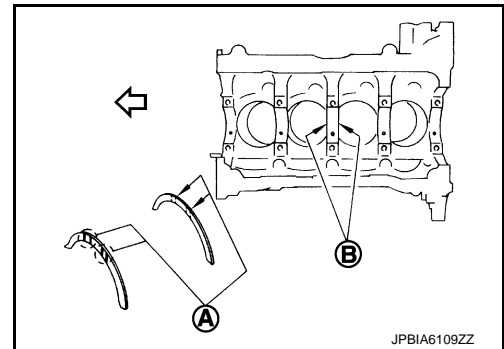
[YD25DDTi]

4. Install oil jet (A).
 - Align (B) knock pin on back of oil jet with hole on block when installing oil jet.

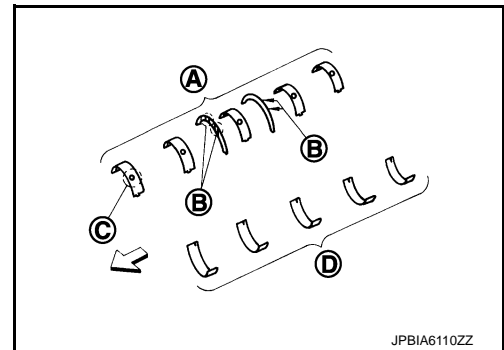


5. Install main bearings and thrust bearings.
 - a. Remove contamination, dust and engine oil from bearing mounting positions on cylinder block and main bearing caps.
 - b. Install thrust bearings on both sides of No. 3 housing (B) on cylinder block.
 - Install thrust bearings with oil groove (A) facing to crankshaft arm (outside).

← : Engine front



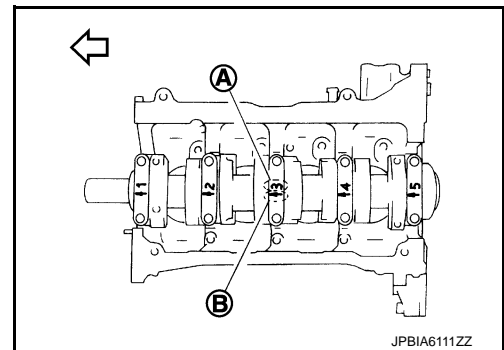
- c. Being careful with the direction, install main bearings.
 - Install main bearings with the oil holes (C) and grooves (B) onto the cylinder block side (A), and those without oil holes and grooves onto the main cap side (D).
 - While installing bearings, apply engine oil to bearing surfaces (inside). Do not apply engine oil to rear surfaces, but clean them completely.
 - Align stopper notches on bearings to install them.
 - Check that the oil holes on the cylinder block body are mated with the oil hole positions on the bearings.



6. Install crankshaft to cylinder block.
 - Check crankshaft rotates smoothly by hand.
7. Install main bearing caps.
 - Identify main bearing caps by the punched mark. Install correctly matching the journal No. on the bearing cap (A) and the journal with the front mark (B) facing forward.

← : Engine front

- Main bearing caps are commonly processed with the cylinder block. Therefore, caps and cylinder block should be replaced as a set.
8. Check the main bearing cap bolts for deformation. Refer to [EM-397, "Inspection"](#).



CYLINDER BLOCK

[YD25DDTi]

< UNIT DISASSEMBLY AND ASSEMBLY >

9. With the TORX socket (size: E14) (commercial service tool), tighten the main bearing cap bolts according to the following procedure:

⇐ : Engine front

- Apply engine oil to the threaded part and seat surface of each bolt.
- Tighten all bolts in the order from 1 to 10 as shown in the figure.

 : 27.0 N·m (2.8 kg-m, 20 ft-lb)

- Put alignment marks (with paint) on each bolt and the main bearing cap, all in the same direction. (When using a protractor)
- Then, tighten 90 degrees. (angle tightening)

CAUTION:

Always use either the angle wrench [SST: KV10112100] or protractor during angular tightening. Avoid tightening based on visual checks alone.

- After tightening bolts to specified torque, check that crankshaft rotates smoothly.
- Check crankshaft end play. Refer to [EM-419. "Cylinder Block"](#).

10. Check the outer diameter of connecting rod bolts. Refer to [EM-397. "Inspection"](#).

11. Install piston to connecting rod.

- Using the snap ring pliers, install snap rings to groove on piston rear side.
 - Fit snap ring correctly into grooves.
- Install pistons to connecting rods.
 - Using the industrial use dryer (A), heat pistons up to approx. 60 to 80°C (140 to 176°F) until piston pin can be pressed down by finger touch. Then insert piston pin into piston and connecting rod from front side of piston toward rear.

- Assemble piston and connecting rod with front mark (A) of piston head and cylinder No. (C) stamped on connecting rod being positioned as shown in the figure.

(B) : Oil hole

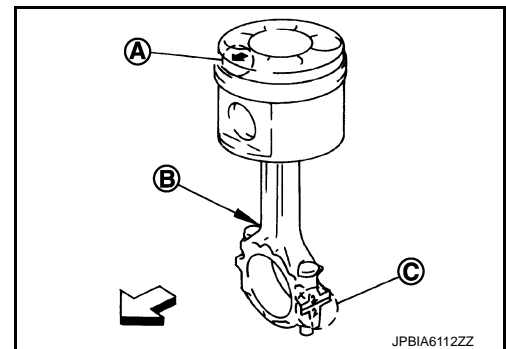
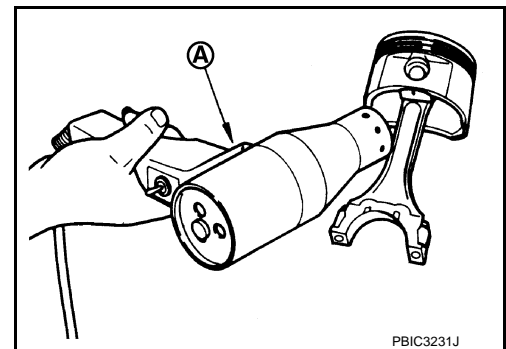
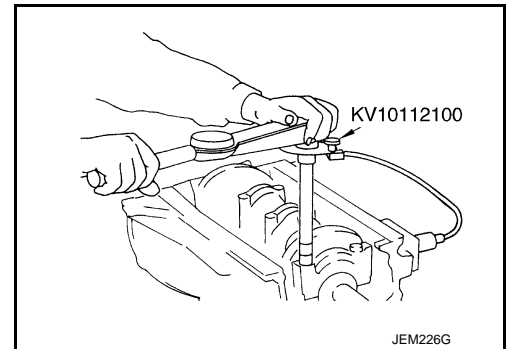
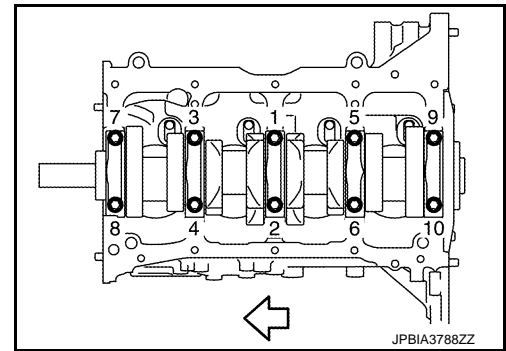
⇐ : Engine front

- Install snap ring to front side of piston.
 - Refer to above step a for precaution on snap ring installation.
 - After installation, check connecting rods for smooth movement.

12. Use the piston ring expander (commercial service tool) to install piston rings.

CAUTION:

When installing, prevent piston from being damaged.



CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

[YD25DDTi]

- Install top ring ① and second ring ③ with punched mark ④ surfaces facing upward.

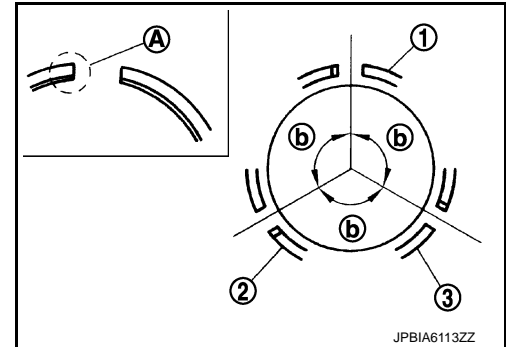
② : Oil ring

Punched mark:

Top ring : RTOP

Second ring : R2ND

- Install rings so that three closed gap position 120 degrees ⑤ apart one another.
- Closed gaps do not need to face in a specific directions, as long as each are positioned 120 degrees apart.



13. Install connecting rod bearing to connecting rod and cap.

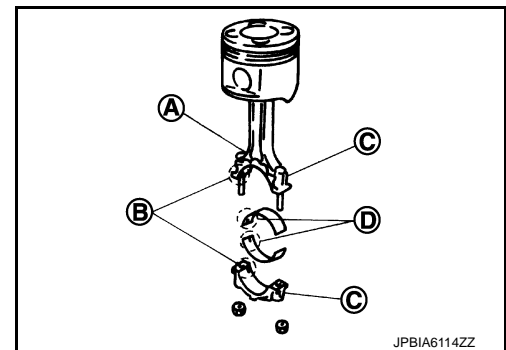
① : Oil hole

② : Cut-out area

③ : Cylinder No.

④ : Protrusions

- While installing connecting rod bearing, apply engine oil to bearing surfaces (inside). Do not apply engine oil to rear surfaces, but clean them completely.
- Align protrusions on connecting rod bearings with connecting rod cut-outs to install connecting rod bearings.

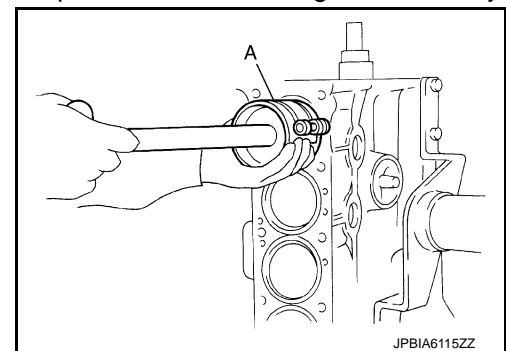


14. Install piston and connecting rod assembly to crankshaft.

- Move crankshaft pin to be assembled to BDC.
- Align cylinder position with cylinder No. on connecting rod to install piston and connecting rod assembly.
- Using the piston ring compressor [SST: EM03470000] (A) or suitable tool, install piston and connecting rod assembly with front mark on piston head facing toward the front side of engine.

CAUTION:

When installing piston and connecting rod assembly, prevent the big end of connecting rod from interfering with oil jet.



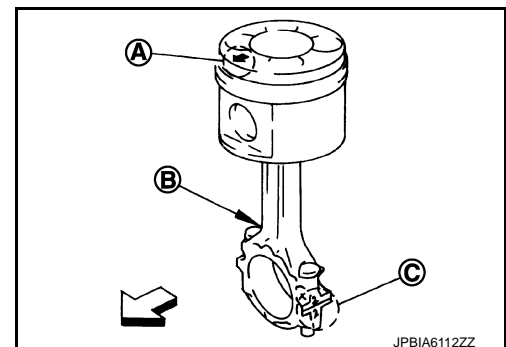
15. Install connecting rod caps and mounting nuts.

- Align cylinder No. stamped ③ on connecting rod with that on cap to install connecting rod cap.

① : Oil hole

⇐ : Engine front

- Check that the front mark ① on piston faces towards the front of the engine.



16. Tighten connecting rod nuts according to the following procedure:

- Apply engine oil on bolt threads and seat surface of nuts.
- Tighten bolts.

CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

[YD25DDTi]

 : 29.4 N·m (3.0 kg-m, 22 ft-lb)

c. Loosen completely.

 : 0 N·m (0 kg-m, 0 in-lb)

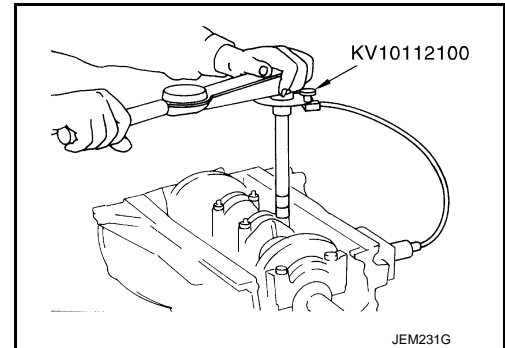
d. Tighten bolts.

 : 19.6 N·m (2.0 kg-m, 14 ft-lb)

e. Tighten bolts.

Angle tightening : 120 degrees

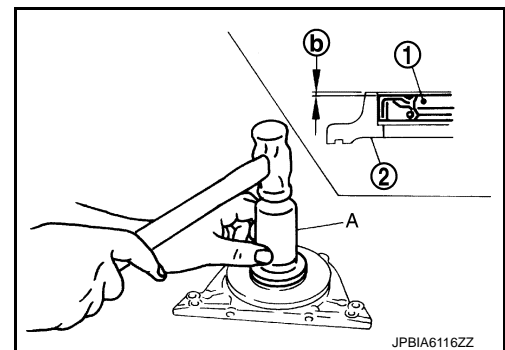
- Always use either the angle wrench [SST: KV10112100] or protractor during angular tightening. Avoid tightening based on visual checks alone.
- After tightening nuts, check that crankshaft rotates smoothly.
- Check connecting rod side clearance. Refer to [EM-419. "Cylinder Block"](#).



17. Press fit rear oil seal ① into rear oil seal retainer ②.

② : 0 – 0.5 mm (0 – 0.020 in)

- Using the drift [105 mm (4.13 in) dia.] ④, press fit so that the dimension is as specified in the figure.
- Avoid inclined fitting. Force fit perpendicularly.

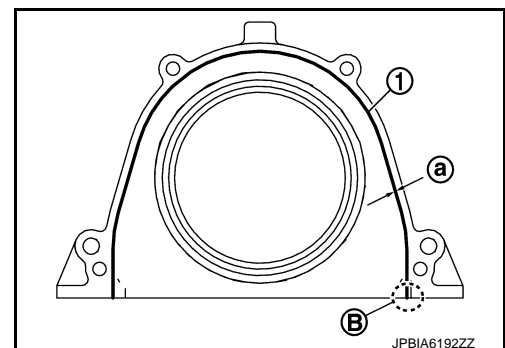


18. Install rear oil seal retainer to cylinder block.

- Apply new engine oil to the oil and dust seal lips.
- Apply liquid gasket ① to rear oil seal retainer using the tube presser (commercial service tool) as shown in the figure. **Use Genuine Liquid Gasket (TB1217H) or equivalent.**

① : ϕ 2.0 – 3.0 mm (ϕ 0.079 – 0.118 in)

- **CAUTION:**
For the area ②, the starting point and the end-point of the liquid gasket must stick out from the rear oil seal retainer rim.



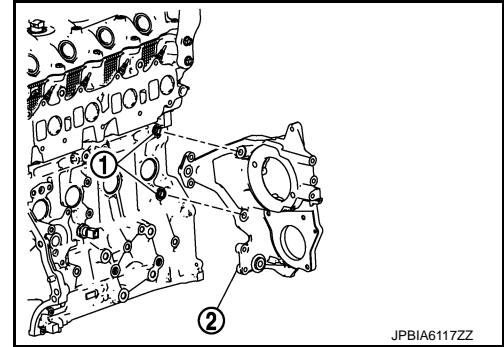
CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

[YD25DDTi]

19. Install fuel pump bracket ②.

- Align the bracket with the dowel pins ① on cylinder block to install.



20. Assemble in the reverse order of disassembly.

21. Remove engine from engine stand in the reverse order of assembly.

22. Install in the reverse order of removal.

Inspection

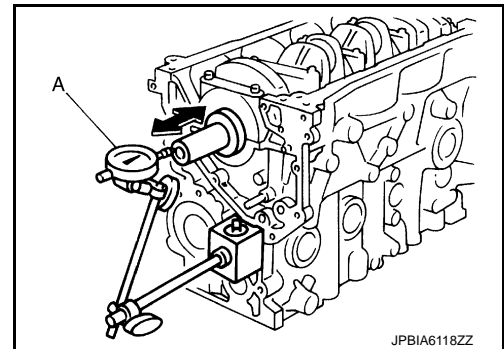
INFOID:000000010521021

CRANKSHAFT END PLAY

- Using dial gauge (A), measure crankshaft travel amount by moving the crankshaft forward or backward.

Standard and limit : Refer to [EM-419, "Cylinder Block"](#).

- If the value exceeds the limit, replace thrust bearings with new ones and measure again.
If the measurement exceeds the limit again, replace crankshaft with a new one.

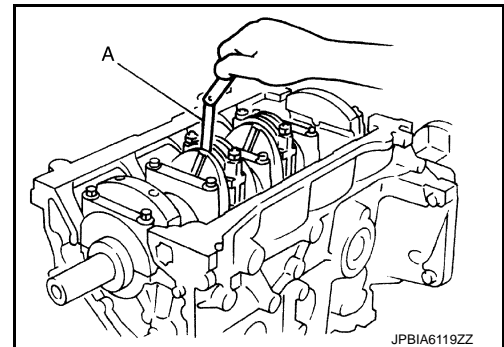


CONNECTING ROD SIDE CLEARANCE

- Using feeler gauge (A), measure side clearance between connecting rod and crankshaft arm.

Standard and limit : Refer to [EM-419, "Cylinder Block"](#).

- If measured value exceeds the limit, replace connecting rod and repeat measurement.
If measured value still exceeds the limit, replace crankshaft.

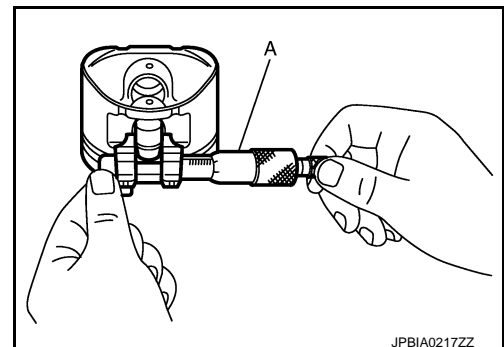


PISTON TO PISTON PIN CLEARANCE

Piston Pin Bore Diameter

Measure the inner diameter of piston pin hole with an inside micrometer (A).

Standard : Refer to [EM-419, "Cylinder Block"](#).



Piston Pin Outer Diameter

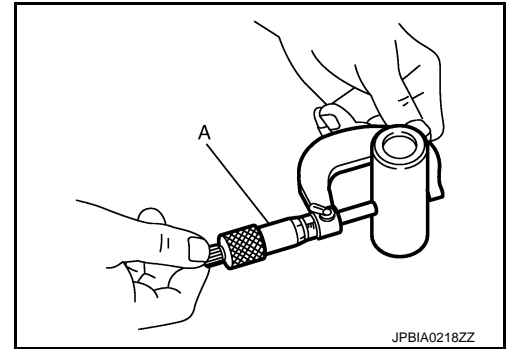
CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

[YD25DDTi]

Measure the outer diameter of piston pin with a micrometer (A).

Standard : Refer to [EM-419, "Cylinder Block"](#).



Calculation of Piston to Piston Pin Clearance

(Piston pin clearance) = (Piston pin bore diameter) – (Piston pin outer diameter)

Standard : Refer to [EM-419, "Cylinder Block"](#).

- If out of the standard, replace piston/piston pin assembly.

NOTE:

Piston is available together with piston pin as assembly.

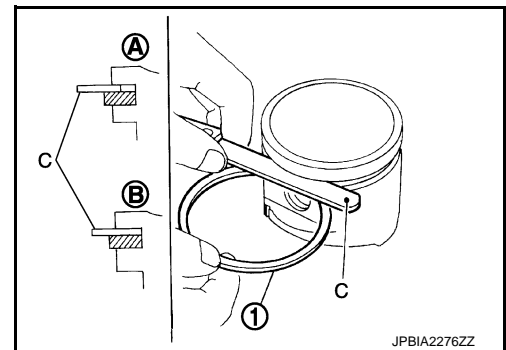
PISTON RING SIDE CLEARANCE

- Measure the side clearance of piston ring ① and piston ring groove with a feeler gauge (C).

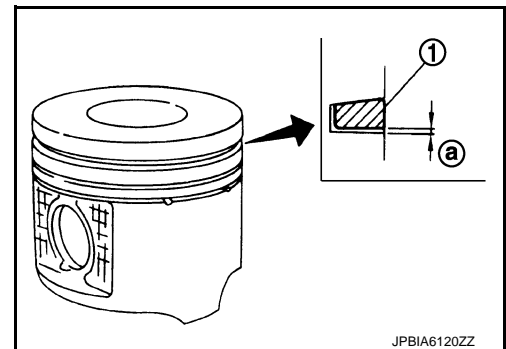
Ⓐ : NG

Ⓑ : OK

Standard and limit : Refer to [EM-419, "Cylinder Block"](#).



- Align top ring ① and external surface of piston. Measure lower side clearance of top ring Ⓐ with top ring pressed onto upper side of ring groove.
- If side clearance exceeds the limit, replace piston ring.
- Check clearance again. If side clearance still exceeds the limit, replace piston.

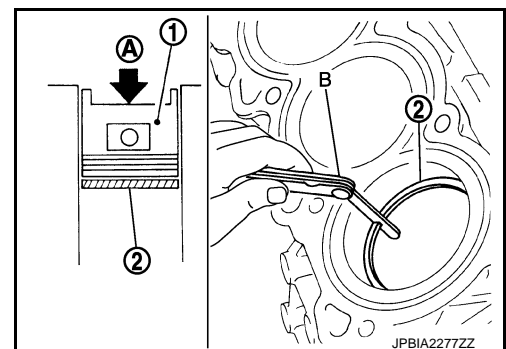


PISTON RING END GAP

- Check that the cylinder bore inner diameter is within the specification.
- Lubricate with new engine oil to piston ① and piston ring ②, and then insert piston ring until middle of cylinder with piston, and measure the piston ring end gap with a feeler gauge (B).

Ⓐ : Press-fit

Standard and limit : Refer to [EM-419, "Cylinder Block"](#).



- If the measured value exceeds the limit, replace piston ring, and measure again. If it still exceeds the limit, re-bore cylinder and use oversize piston and piston rings.

CYLINDER BLOCK

[YD25DDTi]

< UNIT DISASSEMBLY AND ASSEMBLY >

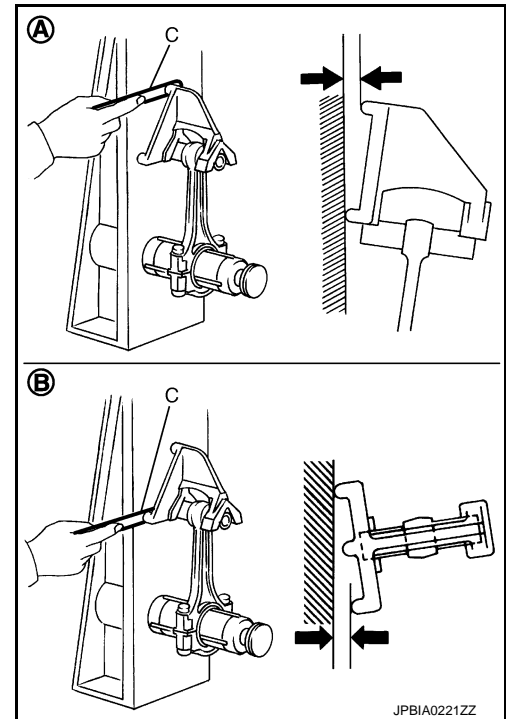
CONNECTING ROD BEND AND TORSION

- Check with a connecting rod aligner.

- Ⓐ : Bend
Ⓑ : Torsion
C : Feeler gauge

Bend limit : Refer to [EM-419, "Cylinder Block"](#).
Torsion limit

- If it exceeds the limit, replace connecting rod assembly.



CONNECTING ROD BIG END DIAMETER

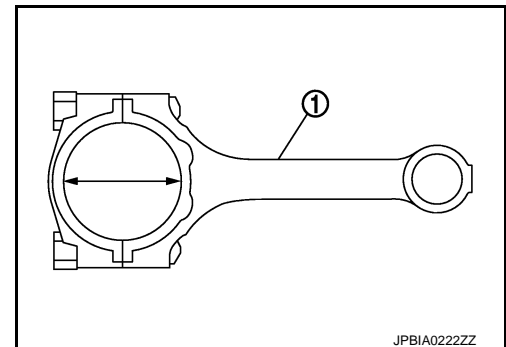
- Install connecting rod bearing cap without installing connecting rod bearing, and tighten connecting rod bolts to the specified torque. Refer to [EM-390, "Disassembly and Assembly"](#) for the tightening procedure.

- ① : Connecting rod

- Measure the inner diameter of connecting rod big end with an inside micrometer.

Standard : Refer to [EM-419, "Cylinder Block"](#).

- If out of the standard, replace connecting rod assembly.

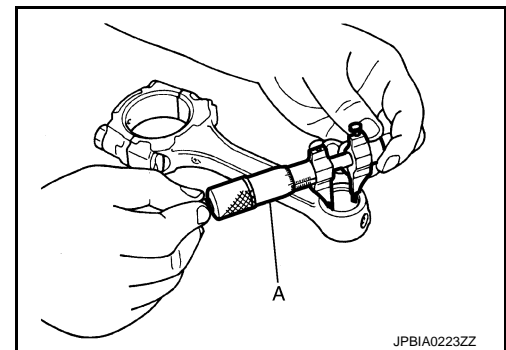


CONNECTING ROD BUSHING OIL CLEARANCE

Connecting Rod Bushing Inner Diameter

Measure the inner diameter of connecting rod bushing with an inside micrometer (A).

Standard : Refer to [EM-419, "Cylinder Block"](#).



Piston Pin Outer Diameter

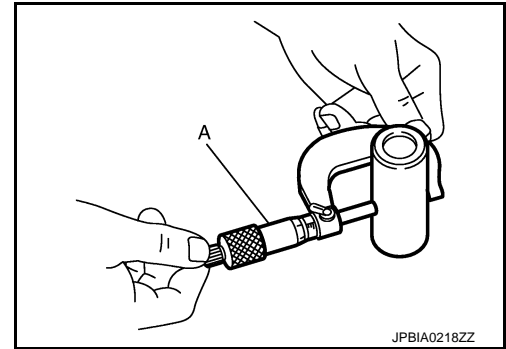
CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

[YD25DDTi]

Measure the outer diameter of piston pin with a micrometer (A).

Standard : Refer to [EM-419, "Cylinder Block"](#).



Connecting Rod Bushing Oil Clearance

(Connecting rod bushing oil clearance) = (Connecting rod bushing inner diameter) – (Piston pin outer diameter)

Standard and limit : Refer to [EM-419, "Cylinder Block"](#).

- If the calculated value exceeds the limit, replace connecting rod assembly and/or piston and piston pin assembly.
- If replacing piston and piston pin assembly, refer to [EM-407, "Description"](#).
- If replacing connecting rod assembly, refer to [EM-408, "Connecting Rod Bearing"](#) to select the connecting rod bearing.

CYLINDER BLOCK DISTORTION

- Using a scraper, remove gasket on the cylinder block surface, and also remove engine oil, scale, carbon, or other contamination.

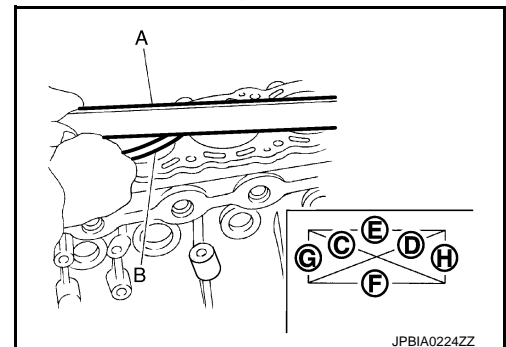
CAUTION:

Be careful not to allow gasket flakes to enter engine oil or engine coolant passages.

- Measure the distortion on the cylinder block upper face at some different points in six directions (C, D, E, F, G and H) with a straightedge (A) and a feeler gauge (B).

Limit : Refer to [EM-419, "Cylinder Block"](#).

- If it exceeds the limit, replace cylinder block.



MAIN BEARING HOUSING INNER DIAMETER

- Install main bearing cap ② without installing main bearings, and tighten main bearing cap bolts to the specified torque. Refer to [EM-390, "Disassembly and Assembly"](#) for the tightening procedure.

① : Cylinder block

- Measure the inner diameter of main bearing housing with a bore gauge.

Standard : Refer to [EM-419, "Cylinder Block"](#).

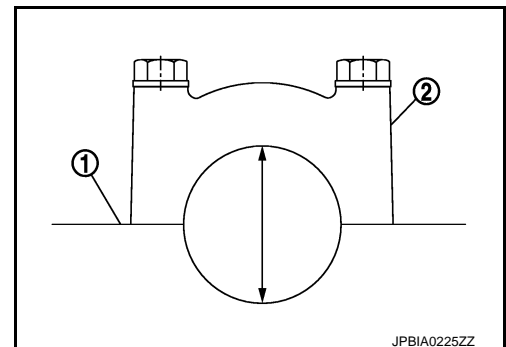
- If out of the standard, replace cylinder block and main bearing cap as assembly.

NOTE:

Cylinder block cannot be replaced as a single part, because it is machined together with main bearing cap.

PISTON TO CYLINDER BORE CLEARANCE

Cylinder Bore Inner Diameter



CYLINDER BLOCK

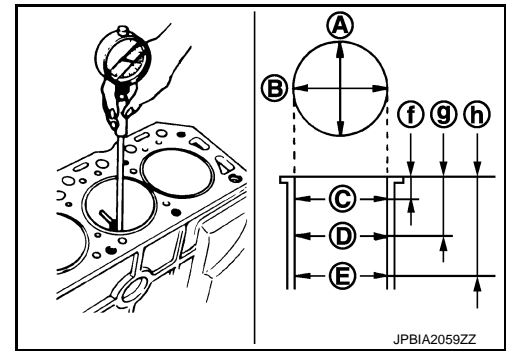
[YD25DDTi]

< UNIT DISASSEMBLY AND ASSEMBLY >

- Using a bore gauge, measure the cylinder bore for wear, out-of-round and taper at six different points on each cylinder. [A and B directions at C, D and E] [A is in longitudinal direction of engine]

- (f) : 10 mm (0.39 in)
(g) : 85 mm (3.35 in)
(h) : 160 mm (6.30 in)

Standard and limit : Refer to [EM-419, "Cylinder Block"](#).



- If the measured value exceeds the limit, or if there are scratches and/or seizure on the cylinder inner wall, hone or bore the inner wall.
- Oversize piston is provided. When using oversize piston, hone the cylinder so that the clearance between piston and cylinder satisfies the standard.

CAUTION:

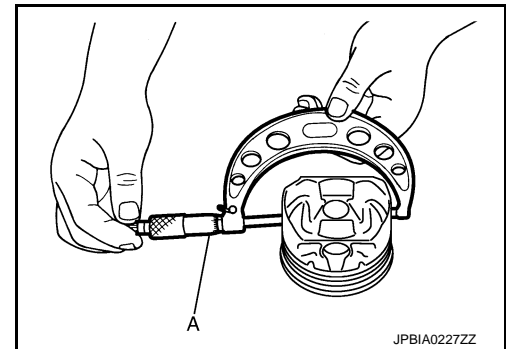
If oversize piston is used, use it for all cylinders with oversize piston rings.

Oversize (O/S) : Refer to [EM-419, "Cylinder Block"](#).

Piston Outer Diameter

Measure the outer diameter of piston skirt with a micrometer (A).

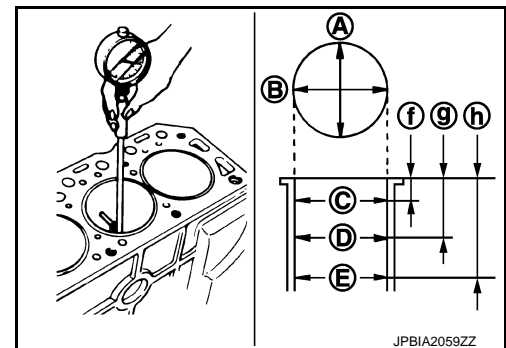
Measurement position : Refer to [EM-419, "Cylinder Block"](#).



Piston to Cylinder Bore Clearance

- Calculate by piston skirt diameter and cylinder bore inner diameter [direction B, position D].

- (A) : Direction A
(C) : Position C
(E) : Position E
(f) : 10 mm (0.39 in)
(g) : 85 mm (3.35 in)
(h) : 160 mm (6.30 in)



(Clearance) = (Cylinder bore inner diameter) – (Piston outer diameter)

Standard and limit : Refer to [EM-419, "Cylinder Block"](#).

- If it exceeds the limit, replace piston and piston pin assembly. Refer to [EM-407, "Description"](#).

Re-boring Cylinder Bore

- Cylinder bore size is determined by adding piston to cylinder bore clearance to piston skirt diameter.

Re-bore size calculation:

$$D = A + B - C$$

Where,

D: Bored diameter

A: Piston outer diameter as measured

B: Piston-to-cylinder bore clearance

C: Honing allowance 0.02 mm (0.0008 in)

2. Install main bearing cap, and tighten to the specified torque. Otherwise, cylinder bores may be distorted in final assembly.

3. Cut cylinder bore.

NOTE:

- When any cylinder needs boring, all other cylinders must also be bored.
- Do not cut too much out of cylinder bore at a time. Cut only 0.05 mm (0.0020 in) or so in diameter at a time.

4. Hone cylinders to obtain the specified piston-to-cylinder bore clearance.

5. Measure finished cylinder bore for the out-of-round and taper.

NOTE:

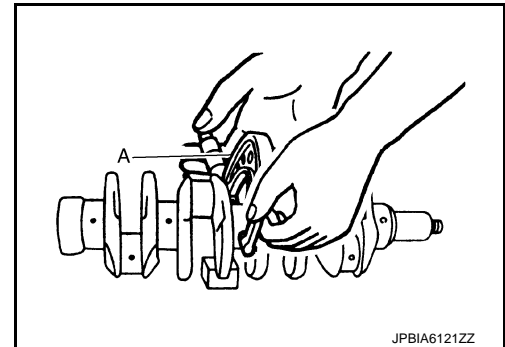
- Perform measurement after cylinder bore cools down.

CRANKSHAFT MAIN JOURNAL DIAMETER

- Measure the outer diameter of crankshaft main journals with a micrometer (A).

Standard : Refer to [EM-419, "Cylinder Block"](#).

- If out of the standard, measure the main bearing oil clearance. Then use the under size bearing. Refer to [EM-410, "Main Bearing"](#).



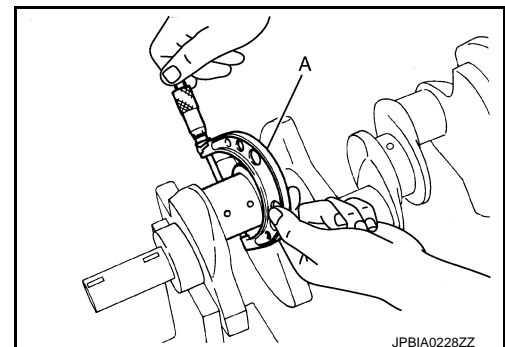
JPBIA6121ZZ

CRANKSHAFT PIN JOURNAL DIAMETER

- Measure the outer diameter of crankshaft pin journal with a micrometer (A).

Standard : Refer to [EM-419, "Cylinder Block"](#).

- If out of the standard, measure the connecting rod bearing oil clearance. Then use under size bearing. Refer to [EM-408, "Connecting Rod Bearing"](#).



JPBIA0228ZZ

CRANKSHAFT OUT-OF-ROUND AND TAPER

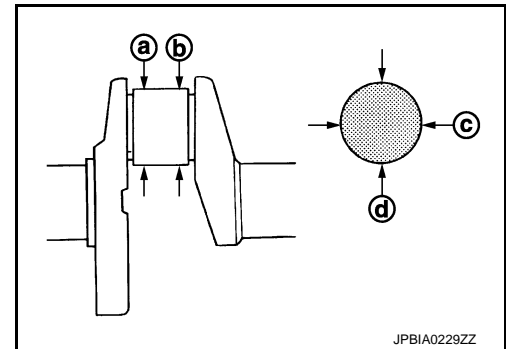
CYLINDER BLOCK

[YD25DDTi]

< UNIT DISASSEMBLY AND ASSEMBLY >

- Measure the dimensions at four different points as shown in the figure on each main journal and pin journal with a micrometer.
- Out-of-round is indicated by the difference in the dimensions between ④ and ③ at ① and ②.
- Taper is indicated by the difference in the dimensions between.

Out-of-round (Difference between c and d) : Refer to [EM-419, "Cylinder Block"](#).
Taper (Difference between a and b)



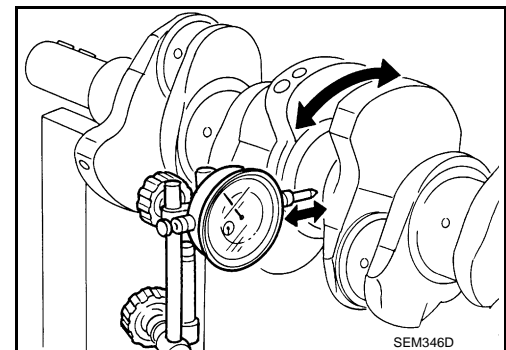
- If the measured value exceeds the limit, correct or replace crankshaft.
- If corrected, measure the bearing oil clearance of the corrected journal and/or pin. Then select the main bearing or connecting rod bearing. Refer to [EM-410, "Main Bearing"](#) and/or [EM-408, "Connecting Rod Bearing"](#).

CRANKSHAFT RUNOUT

- Place V-block on precise flat table, and support the journals on both ends of crankshaft.
- Place a dial indicator straight up on the No. 3 journal.
- While rotating crankshaft, read the movement of the pointer on a dial indicator. (Total indicator reading)

Standard and limit : Refer to [EM-419, "Cylinder Block"](#).

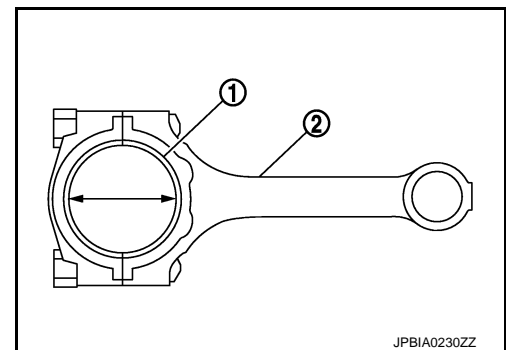
- If it exceeds the limit, replace crankshaft.



CONNECTING ROD BEARING OIL CLEARANCE

Method by Calculation

- Install connecting rod bearings ① to connecting rod ② and connecting rod cap, and tighten connecting rod bolts to the specified torque. Refer to [EM-390, "Disassembly and Assembly"](#) for the tightening procedure.



- Measure the inner diameter of connecting rod bearing with an inside micrometer.
(Oil clearance) = (Connecting rod bearing inner diameter) – (Crankshaft pin journal diameter)

Standard and limit : Refer to [EM-408, "Connecting Rod Bearing"](#).

- If the calculated value exceeds the limit, select proper connecting rod bearing according to connecting rod big end diameter and crankshaft pin journal diameter to obtain the specified bearing oil clearance. Refer to [EM-407, "Description"](#).

Method of Using Plastigage

- Remove oil and dust on crankshaft pin journal and the surfaces of each bearing completely.
- Cut a plastigage slightly shorter than the bearing width, and place it in crankshaft axial direction, avoiding oil holes.
- Install connecting rod bearings to connecting rod and connecting rod bearing cap, and tighten connecting rod bolts to the specified torque. Refer to [EM-390, "Disassembly and Assembly"](#) for the tightening procedure.

CAUTION:

CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

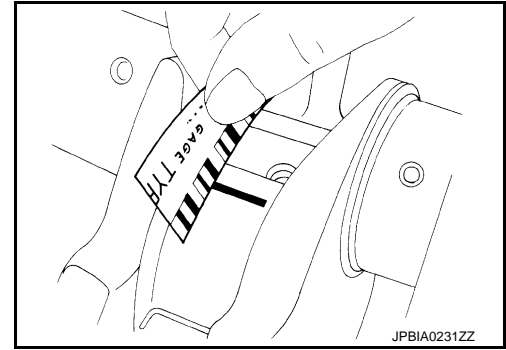
[YD25DDTi]

Never rotate crankshaft.

- Remove connecting rod bearing cap and bearings, and using the scale on the plastigage bag, measure the plastigage width.

NOTE:

The procedure when the measured value exceeds the limit is the same as that described in the “Method by Calculation”.

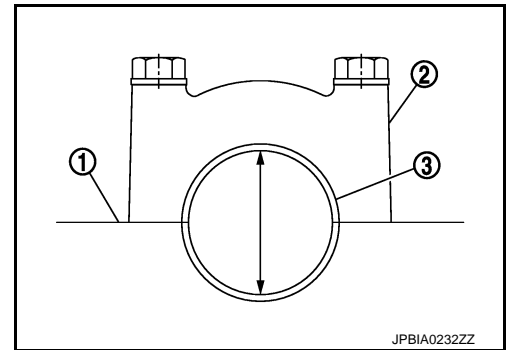


MAIN BEARING OIL CLEARANCE

Method by Calculation

- Install main bearings ③ to cylinder block ① and main bearing cap ②, and tighten main bearing cap bolts to the specified torque. Refer to [EM-390, "Disassembly and Assembly"](#) for the tightening procedure.
- Measure the inner diameter of main bearing with a bore gauge.

$$(\text{Oil clearance}) = (\text{Main bearing inner diameter}) - (\text{Crankshaft main journal diameter})$$



Standard and limit : Refer to EM-421, "Main Bearing".

- If the calculated value exceeds the limit, select proper main bearing according to main bearing inner diameter and crankshaft main journal diameter to obtain the specified bearing oil clearance. Refer to [EM-407, "Description"](#).

Method of Using Plastigage

- Remove engine oil and dust on crankshaft journal and the surfaces of each bearing completely.
- Cut a plastigage slightly shorter than the bearing width, and place it in crankshaft axial direction, avoiding oil holes.
- Install main bearing to cylinder block and main bearing cap, and tighten main bearing cap bolts with main bearing cap to the specified torque. Refer to [EM-390, "Disassembly and Assembly"](#) for the tightening procedure.

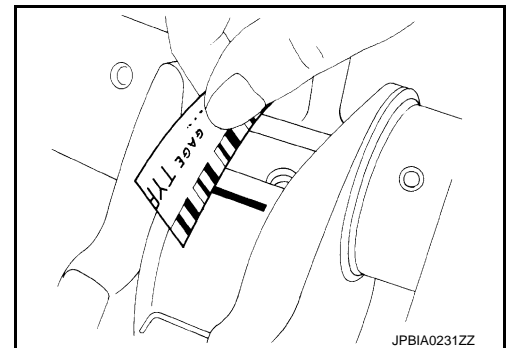
CAUTION:

Never rotate crankshaft.

- Remove main bearing cap and bearings, and using the scale on the plastigage bag, measure the plastigage width.

NOTE:

The procedure when the measured value exceeds the limit is the same as that described in the "Method by Calculation".



MAIN BEARING CRUSH HEIGHT

CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

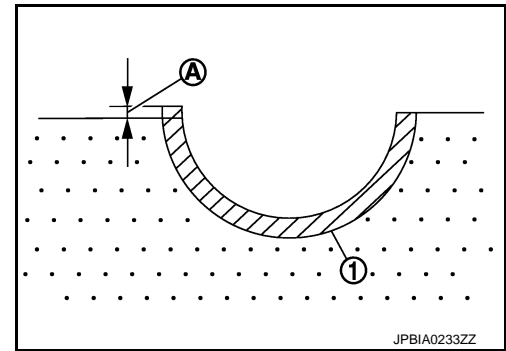
[YD25DDTi]

- When main bearing cap is removed after being tightened to the specified torque with main bearings ① installed, the tip end of bearing must protrude. Refer to [EM-390, "Disassembly and Assembly"](#) for the tightening procedure.

Ⓐ : Crush height

Standard : There must be crush height.

- If the standard is not met, replace main bearings.



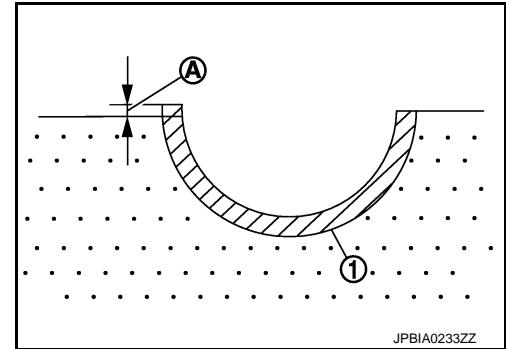
CONNECTING ROD BEARING CRUSH HEIGHT

- When connecting rod bearing cap is removed after being tightened to the specified torque with connecting rod bearings ① installed, the tip end of bearing must protrude. Refer to [EM-390, "Disassembly and Assembly"](#) for the tightening procedure.

Ⓐ : Crush height

Standard : There must be crush height.

- If the standard is not met, replace connecting rod bearings.



MAIN BEARING CAP BOLT DEFORMATION

- Measure the outer diameter of threaded area, Ⓑ and Ⓐ, at the points specified in the figure.

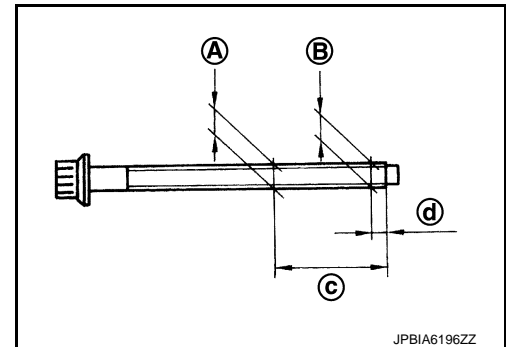
Ⓒ : 35 mm (1.38 in)

Ⓓ : 5 mm (0.20 in)

- When the necked point is identified at a point other than where specified, measure at the point as Ⓐ.
- Calculate the difference between Ⓑ and Ⓐ.

Limit : 0.13 mm (0.0051 in)

- If it exceeds the limit, replace main bearing cap bolt.



CONNECTING ROD BOLT DEFORMATION

- Install nuts to connecting rod bolts ①. Check that the nut can be screwed smoothly on bolt threads by hand to the last thread on the bolt.

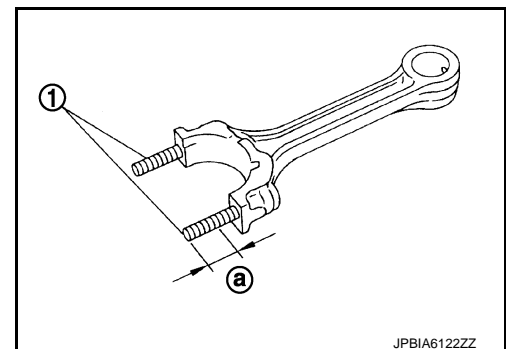
Ⓐ : 19 mm (0.75 in)

- If the nut does not screw in smoothly, measure the outer diameter of the bolt thread at the point specified in the figure.
- If a necked point is identified, measure at that point.

Standard : 8.90 - 9.00 mm (0.3504 - 0.3543 in) dia.

Limit : 8.75 mm (0.3445 in) dia.

- If it exceeds the limit, replace connecting rod bolts and nuts.



OIL JET

CYLINDER BLOCK

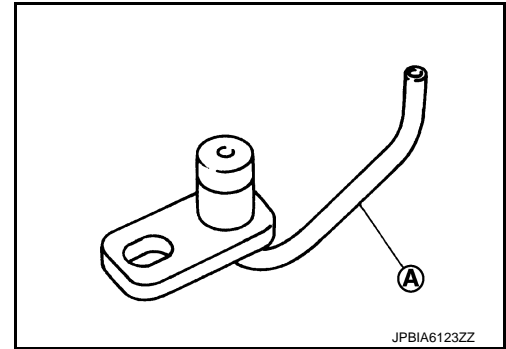
[YD25DDTi]

< UNIT DISASSEMBLY AND ASSEMBLY >

- Check nozzle (A) for deformation and damage.
- Blow compressed air from nozzle, and check for clogs.

Standard : No deformation and no damage.

- If out of the standard, replace oil jet.



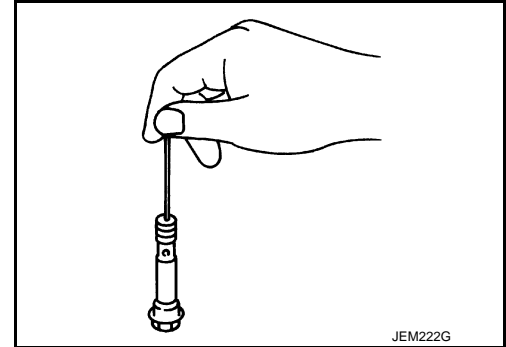
OIL JET RELIEF VALVE

- Using clean plastic stick, press check valve in oil jet relief valve. Check that valve moves smoothly with proper reaction force.

Standard:

Valve moves smoothly with proper reaction force.

- If out of the standard, replace oil jet relief valve.



HOW TO SELECT PISTON AND BEARING

< UNIT DISASSEMBLY AND ASSEMBLY >

[YD25DDTi]

HOW TO SELECT PISTON AND BEARING

Description

INFOID:0000000010521022

Selection points	Selection parts	Selection items	Selection methods
Between cylinder block to piston	Piston and piston pin assembly The piston is available together with piston pin as an assembly.	Piston grade (piston outer diameter)	Piston grade = cylinder bore grade (inner diameter of bore)
Between crankshaft to connecting rod	Connecting rod bearing	Connecting rod bearing grade (bearing thickness)	Combining service grades for connecting rod big end diameter and crankshaft pin outer diameter determine connecting rod bearing selection.
Between cylinder block to crankshaft	Main bearing	Main bearing grade (bearing thickness)	Determined by match of cylinder block bearing housing grade (inner diameter of housing) and crankshaft journal grade (outer diameter of journal)

- The identification grade stamped on each part is the grade for the dimension measured in new condition. This grade cannot apply to reused parts.
- For reused or repaired parts, measure the dimension accurately. Determine the grade by comparing the measurement with the values of each selection table.
- For details of the measurement method of each part, the reuse standards and the selection method of the selective fitting parts, refer to the text.

Piston

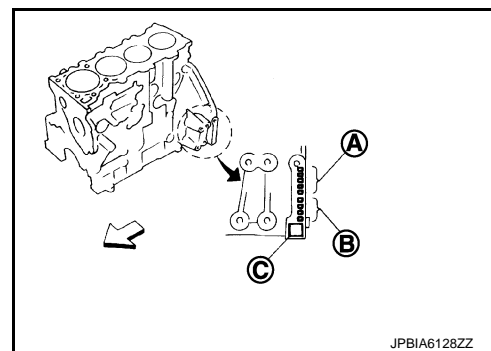
INFOID:0000000010521023

WHEN NEW CYLINDER BLOCK IS USED

1. Identify the cylinder bore grade (No. 1, 2, or 3) ② on LH surface at the rear of cylinder block.

- ① : Crank journal grade
③ : Control code
← : Engine front

2. Select piston of the same grade.
 - The part No. of piston is specified together with piston pin as an assembly.

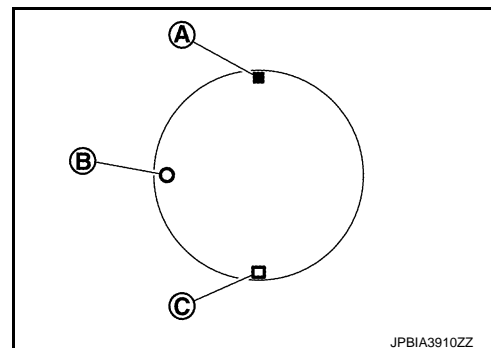


WHEN CYLINDER BLOCK IS REUSED

1. Measure cylinder bore inner diameter. Refer to [EM-397. "Inspection"](#).
2. Referring to "Cylinder bore inner diameter" in "Piston Selection Table", determine the bore grade.

- ① : Identification code
② : Front mark
③ : Piston grade number

3. Select piston of the same grade.



PISTON SELECTION TABLE

HOW TO SELECT PISTON AND BEARING

< UNIT DISASSEMBLY AND ASSEMBLY >

[YD25DDTi]

Unit: mm (in)

Grade (punched)	1	2	3
Cylinder bore inner diameter	89.000 - 89.010 (3.5039 - 3.5043)	89.010 - 89.020 (3.5043 - 3.5047)	89.020 - 89.030 (3.5047 - 3.5051)
Piston outer diameter	88.806 - 88.820 (3.4963 - 3.4968)	88.816 - 88.830 (3.4967 - 3.4972)	88.826 - 88.840 (3.4971 - 3.4976)

NOTE:

Piston is available together with piston pin as an assembly.

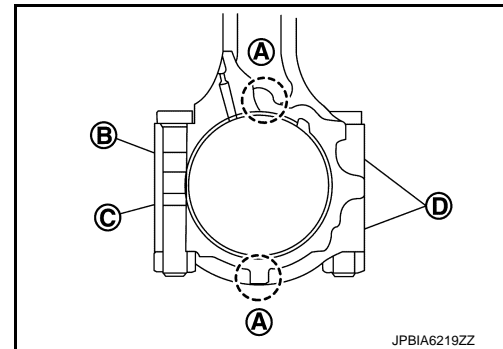
Connecting Rod Bearing

INFOID:000000010521024

WHEN NEW CONNECTING ROD AND CRANKSHAFT ARE USED

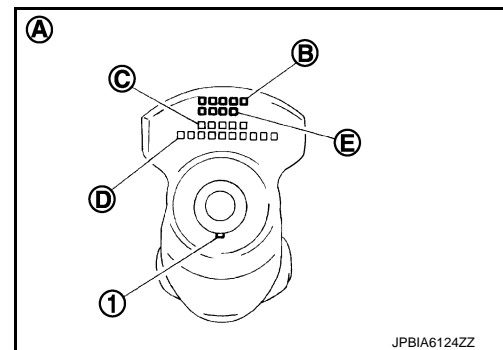
1. Identify connecting rod big end diameter grade stamped (B) on connecting rod side face to the row in the "CONNECTING ROD BEARING SELECTION TABLE".

- (A) : Front mark
- (C) : Management code
- (D) : Cylinder No.



2. Identify pin journal diameter grade stamped (from left No. 1 to 4) (E) on crankshaft front side (A) to the column in the "CONNECTING ROD BEARING SELECTION TABLE".

- (1) : Key
- (B) : Journal grade No. (From left No. 1 to 5)
- (C) : Identification code
- (D) : Lot No.



3. Select connecting rod bearings of the same grade.

NOTE:

There is no grading for the inner diameter of the big end of the connecting rod.

WHEN CONNECTING ROD AND CRANKSHAFT ARE REUSED

1. Measure the inner diameter of the big end of connecting rod and check it is within the specified range. Refer to [EM-397, "Inspection"](#).
2. Measure the outer diameter of the crankshaft pin. Refer to [EM-397, "Inspection"](#).
3. Determine the crankshaft pin grade by comparing the measurement with the values under the column "Crankshaft pin outer diameter" in "Selection Table of connecting Rod Bearing".
4. Choose bearings of the same grade.

HOW TO SELECT PISTON AND BEARING

< UNIT DISASSEMBLY AND ASSEMBLY >

[YD25DDTi]

CONNECTING ROD BEARING SELECTION TABLE

I.D. mark	Outer diameter Unit: mm (in)	Connecting rod big end inner diameter	Crankshaft pin outer diameter	I.D. mark	inner diameter Unit: mm (in)	A	B	C	D	E	F	G	H	J	K	L	M	N
						55.000 - 55.001 (2.1654 - 2.1654)	55.001 - 55.002 (2.1654 - 2.1654)	55.002 - 55.003 (2.1654 - 2.1655)	55.003 - 55.004 (2.1655 - 2.1655)	55.004 - 55.005 (2.1655 - 2.1655)	55.005 - 55.006 (2.1655 - 2.1656)	55.006 - 55.007 (2.1656 - 2.1656)	55.007 - 55.008 (2.1656 - 2.1657)	55.008 - 55.009 (2.1657 - 2.1657)	55.009 - 55.010 (2.1657 - 2.1657)	55.010 - 55.011 (2.1657 - 2.1658)	55.011 - 55.012 (2.1658 - 2.1658)	55.012 - 55.013 (2.1658 - 2.1659)
A	51.974 - 51.973 (2.0462 - 2.0462)	0	0	0	0	01	01	01	01	01	01	1	1	1	12	12	12	12
B	51.973 - 51.972 (2.0462 - 2.0461)	0	0	0	01	01	01	01	01	01	1	1	1	12	12	12	12	2
C	51.972 - 51.971 (2.0461 - 2.0461)	0	0	01	01	01	01	01	1	1	1	1	12	12	12	2	2	2
D	51.971 - 51.970 (2.0461 - 2.0461)	0	01	01	01	1	1	1	1	12	12	12	12	2	2	2	2	2
E	51.970 - 51.969 (2.0461 - 2.0460)	01	01	01	1	1	1	1	12	12	12	12	2	2	2	23	23	23
F	51.969 - 51.968 (2.0460 - 2.0460)	01	01	1	1	1	1	12	12	12	12	2	2	2	2	23	23	23
G	51.968 - 51.967 (2.0460 - 2.0459)	01	1	1	1	12	12	12	2	2	2	23	23	23	23	3	3	3
H	51.967 - 51.966 (2.0459 - 2.0459)	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34
J	51.966 - 51.965 (2.0459 - 2.0459)	1	12	12	2	2	2	23	23	23	3	3	3	34	34	4	4	4
K	51.965 - 51.964 (2.0459 - 2.0458)	12	12	2	2	2	23	23	23	3	3	3	34	34	4	4	4	4
L	51.964 - 51.963 (2.0458 - 2.0458)	12	2	2	2	23	23	23	3	3	3	34	34	4	4	4	4	4
M	51.963 - 51.962 (2.0458 - 2.0457)	12	2	2	2	23	23	23	3	3	3	34	34	4	4	4	4	4
N	51.962 - 51.961 (2.0457 - 2.0457)	2	2	23	23	23	3	3	3	34	34	4	4	4	4	4	4	4
P	51.961 - 51.960 (2.0457 - 2.0457)	2	23	23	3	3	3	34	34	4	4	4	4	4	4	4	4	4
R	51.960 - 51.959 (2.0457 - 2.0456)	2	23	23	3	3	3	34	34	4	4	4	4	4	4	4	4	4
S	51.959 - 51.958 (2.0456 - 2.0456)	23	23	3	3	3	34	34	4	4	4	4	4	4	4	4	4	4
T	51.958 - 51.957 (2.0456 - 2.0455)	23	23	3	3	34	34	4	4	4	4	4	4	4	4	4	4	4
U	51.957 - 51.956 (2.0455 - 2.0455)	23	23	3	3	34	34	4	4	4	4	4	4	4	4	4	4	4

JPBIA3907GB

UNDERSIZE BEARING USAGE GUIDE

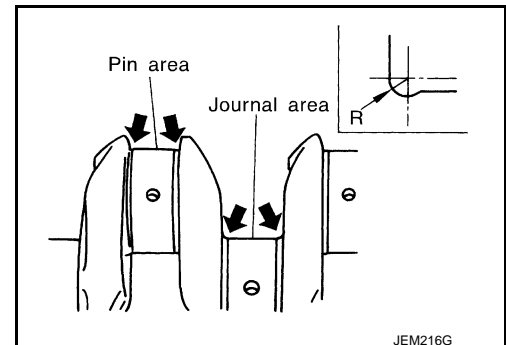
- If bearing clearance is out of the specifications for connecting rod bearings in standard size, use under size bearings.
- When using under size bearings, measure bearing inner diameter with bearing installed, and grind crankshaft pins to adjust clearance to specification.

Connecting rod bearing under size : Refer to [EM-422, "Connecting Rod Bearing"](#).

CAUTION:

When grinding the crankshaft pin to use an under size bearing, avoid damaging the fillet R.

Standard dimension R : 1.5 - 1.7 mm (0.059 - 0.067 in)



JEM216G

HOW TO SELECT PISTON AND BEARING

< UNIT DISASSEMBLY AND ASSEMBLY >

[YD25DDTi]

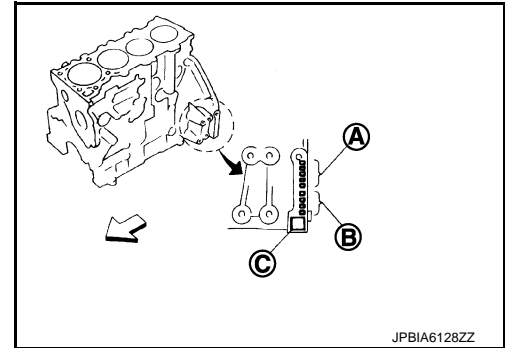
Main Bearing

INFOID:000000010521025

WHEN NEW CYLINDER BLOCK AND CRANKSHAFT ARE USED

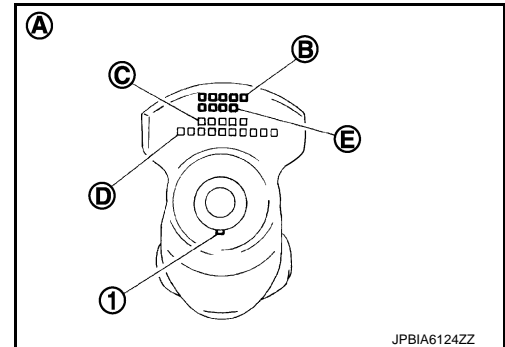
1. Identify the crank journal grade (from bottom No. 1 to 5) (A) on LH surface at the rear of the cylinder block, and locate the applicable grade on the "Grade" row in the "Main Bearing Grade Table".

- (B) : Bore grade No. (From bottom No. 1 to 4)
- (C) : Control code
- ↶ : Engine front



2. Identify the journal grade on the front surface of crankshaft (A), and locate the applicable grade under the "Grade" column in the "Main Bearing Grade Table".

- (1) : Key
- (B) : Journal grade No. (From left No. 1 to 5)
- (C) : Identification code
- (D) : Lot No.
- (E) : Pin grade No. (From left No. 1 to 4)



3. The main bearing to be used can be located in the cell where the row and column cross.

WHEN CYLINDER BLOCK AND CRANKSHAFT ARE REUSED

1. Measure the inner diameter of cylinder block main bearing housing. Refer to [EM-397, "Inspection"](#).
2. Locate the applicable cell where the measurement falls, on "Cylinder block main bearing housing inner diameter" row in the "MAIN BEARING SELECTION TABLE".
3. Measure the outer diameter of crankshaft journal. Refer to [EM-397, "Inspection"](#).
4. Locate the applicable cell where the measurement falls, under "Crankshaft main journal diameter" column in the "MAIN BEARING SELECTION TABLE".
5. The main bearing to be used can be located in the cell where the row and column cross.

HOW TO SELECT PISTON AND BEARING

< UNIT DISASSEMBLY AND ASSEMBLY >

[YD25DDTi]

MAIN BEARING SELECTION TABLE

Cylinder block main bearing housing inner diameter		I.D. mark																															
			Hole diameter Unit: mm (in)																														
Crankshaft main journal diameter	I.D. mark	Axle diameter Unit: mm (in)																															
			A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	U	V	W	X	Y	4	7							
A	62.975 - 62.974 (2.4793 - 2.4793)	0	0	01	01	01	1	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4						
B	62.974 - 62.973 (2.4793 - 2.4792)	0	01	01	01	1	1	1	1	12	12	12	2	2	2	2	23	23	23	3	3	3	34	34	34	4	4						
C	62.973 - 62.972 (2.4792 - 2.4792)	01	01	01	1	1	1	1	12	12	12	2	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4						
D	62.972 - 62.971 (2.4792 - 2.4792)	01	01	1	1	1	1	12	12	12	2	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45						
E	62.971 - 62.970 (2.4792 - 2.4791)	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	4	4	45	45						
F	62.970 - 62.969 (2.4791 - 2.4791)	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	4	45	45	45	45						
G	62.969 - 62.968 (2.4791 - 2.4791)	1	1	12	12	12	2	2	2	23	23	23	3	3	3	3	34	34	34	4	4	4	4	45	45	45	5						
H	62.968 - 62.967 (2.4791 - 2.4790)	1	12	12	12	2	2	2	2	23	23	23	3	3	3	3	34	34	34	4	4	4	4	45	45	45	5	5					
J	62.967 - 62.966 (2.4790 - 2.4790)	12	12	12	2	2	2	2	23	23	23	3	3	3	3	34	34	34	4	4	4	4	45	45	45	5	5	5					
K	62.966 - 62.965 (2.4790 - 2.4789)	12	12	2	2	2	2	23	23	23	3	3	3	3	34	34	34	4	4	4	4	45	45	45	5	5	5	56					
L	62.965 - 62.964 (2.4789 - 2.4789)	12	2	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	4	45	45	45	5	5	5	5	56	56					
M	62.964 - 62.963 (2.4789 - 2.4789)	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	4	45	45	45	5	5	5	5	56	56	56	56					
N	62.963 - 62.962 (2.4789 - 2.4788)	2	2	23	23	23	3	3	3	34	34	34	4	4	4	4	45	45	45	5	5	5	5	56	56	56	6	6					
P	62.962 - 62.961 (2.4788 - 2.4788)	2	23	23	23	3	3	3	3	34	34	34	4	4	4	4	45	45	45	5	5	5	5	56	56	56	6	6					
R	62.961 - 62.960 (2.4788 - 2.4787)	23	23	23	3	3	3	3	34	34	34	4	4	4	4	45	45	45	5	5	5	5	56	56	56	6	6	6					
S	62.960 - 62.959 (2.4787 - 2.4787)	23	23	3	3	3	3	34	34	34	4	4	4	4	45	45	45	5	5	5	5	56	56	56	6	6	6	67					
T	62.959 - 62.958 (2.4787 - 2.4787)	23	3	3	3	3	34	34	34	4	4	4	4	45	45	45	5	5	5	5	56	56	56	6	6	6	6	67	67				
U	62.958 - 62.957 (2.4787 - 2.4786)	3	3	3	34	34	34	4	4	4	4	45	45	45	5	5	5	5	56	56	56	6	6	6	6	6	6	67	67	67			
V	62.957 - 62.956 (2.4786 - 2.4786)	3	3	34	34	34	4	4	4	4	45	45	45	5	5	5	5	56	56	56	6	6	6	6	6	6	6	67	67	67	7		
W	62.956 - 62.955 (2.4786 - 2.4785)	3	34	34	34	4	4	4	4	45	45	45	5	5	5	5	56	56	56	6	6	6	6	6	6	6	6	67	67	67	7	7	
X	62.955 - 62.954 (2.4785 - 2.4785)	34	34	34	4	4	4	4	4	45	45	45	5	5	5	5	56	56	56	6	6	6	6	6	6	6	6	67	67	67	7	7	7
Y	62.954 - 62.953 (2.4785 - 2.4785)	34	34	4	4	4	4	4	45	45	45	5	5	5	5	56	56	56	6	6	6	6	6	6	6	6	6	67	67	67	7	7	7
4	62.953 - 62.952 (2.4785 - 2.4784)	34	4	4	4	4	45	45	45	5	5	5	5	56	56	56	6	6	6	6	6	6	6	6	6	6	6	67	67	67	7	7	7
7	62.952 - 62.951 (2.4784 - 2.4784)	4	4	4	4	45	45	45	5	5	5	5	56	56	56	6	6	6	6	6	6	6	6	6	6	6	6	67	67	67	7	7	7

JPBIA3906GB

JPBIA3906GB

MAIN BEARING GRADE TABLE (ALL JOURNALS)

Main bearing grade table (All journals) : Refer to [EM-421, "Main Bearing"](#).

UNDERSIZE BEARING USAGE GUIDE

- If bearing clearance is out of the specifications for main bearings in standard size, use under size bearings.
- When using under size bearings, measure bearing inner diameter with bearing installed, and grind crankshaft journals to adjust clearance to the specification.

Main bearing under size : Refer to [EM-421, "Main Bearing"](#).

CAUTION:

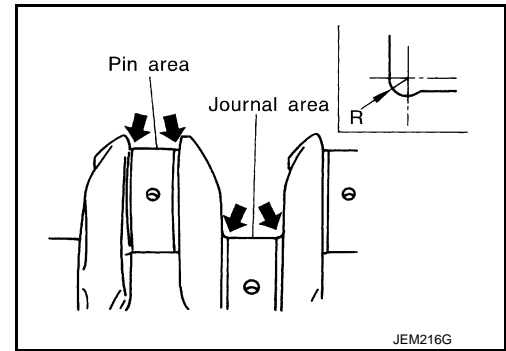
HOW TO SELECT PISTON AND BEARING

< UNIT DISASSEMBLY AND ASSEMBLY >

[YD25DDTi]

When grinding crank journals to use under size bearings, keep corners radius of fillet R. (All journals)

Standard dimension R : 1.5 - 1.7 mm (0.059 - 0.067 in)



SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[YD25DDTi]

SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

General Specification

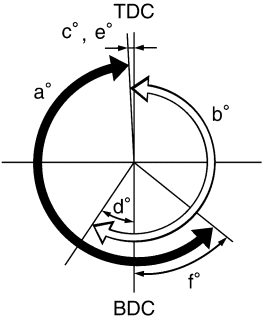
INFOID:0000000010521060

GENERAL SPECIFICATION

Cylinder arrangement		In-line 4
Displacement	Unit: cm ³ (cu in)	2,488 (151.82)
Bore and stroke	Unit: mm (in)	89.0 x 100 (3.504 x 3.937)
Valve arrangement		DOHC
Firing order		1-3-4-2
Number of piston rings	Compression	2
	Oil	1
Number of main bearings		5
Compression ratio		15
Compression pressure Unit: kPa (bar, kg/cm ² , psi)/200 rpm	Standard	2,800 (28, 28.56, 406)
	Minimum	2,200 (22, 22.44, 319)
	Differential limit between cylinders	450 (4.5, 4.59, 65.3)

Valve Timing

Unit: degree

Valve timing ↶: Intake valve ↷: Exhaust valve	 <p>JSBIA3273GB</p>					
	a EXH valve open- ing angle	b INT valve open- ing angle	c INT open	d INT close	e EXH close	f EXH open
	224	212	2 BTDC	30 ABDC	2 BTDC	46 BBDC

Drive belt

INFOID:0000000010521061

Belt Tension and Frequency

Location	Tension adjustment *		Unit: N (kg)	Frequency adjustment *			Unit: Hz
	Used belt		New belt	Used belt		New belt	
	Limit	After adjusted		Limit	After adjusted		
Drive belt	Belt tension is not necessary, as it is automatically adjusted by drive belt auto-tensioner.						
Power steering oil pump belt	240 (24.5)	532 - 588 (54.3 - 60.0)	760 - 840 (77.5 - 85.7)	162	245	290	

*: When engine is cold.

SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[YD25DDTi]

Intake Manifold

INFOID:0000000010521062

Unit: mm (in)

Items		Limit
Surface distortion	Intake manifold	0.1 (0.004)
	Collector intake manifold	0.1 (0.004)

Exhaust Manifold

INFOID:0000000010521063

Unit: mm (in)

Items		Limit
Surface distortion	Exhaust manifold	0.3 (0.012)

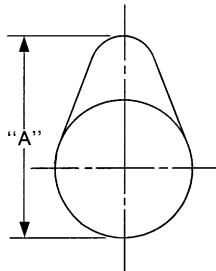
Camshaft

INFOID:0000000010521064

CAMSHAFT

Unit: mm (in)

Items		Standard	Limit
Camshaft journal oil clearance		0.045 - 0.086 (0.0018 - 0.0034)	—
Camshaft bracket inner diameter	No. 1	30.500 - 30.521 (1.2008 - 1.2016)	
	No. 2, 3, 4, 5	24.000 - 24.021 (0.9449 - 0.9457)	
Camshaft journal outer diameter	No. 1	30.435 - 30.455 (1.1982 - 1.1990)	
	No. 2, 3, 4, 5	23.935 - 23.955 (0.9423 - 0.9431)	
Camshaft runout [TIR*]		—	0.02 (0.0008)
Camshaft sprocket runout [TIR*]		—	0.15 (0.0059)
Camshaft end play		0.070 - 0.148 (0.0028 - 0.0058)	0.24 (0.0094)



SEM671

Cam height "A"	Intake	39.505 - 39.695 (1.5553 - 1.5628)
	Exhaust	39.905 - 40.095 (1.5711 - 1.5785)

*: Total indicator reading

VALVE LIFTER

Unit: mm (in)

Items	Standard
Valve lifter outer diameter	29.960 - 29.975 (1.1795 - 1.1801)
Valve lifter bore diameter	30.000 - 30.021 (1.1811 - 1.1819)
Valve lifter clearance	0.025 - 0.061 (0.0010 - 0.0024)

VALVE CLEARANCE

SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[YD25DDTi]

Unit: mm (in)

Items	Cold	Hot* (Reference data)
Intake	0.24 - 0.32 (0.009 - 0.013)	0.274 - 0.386 (0.011 - 0.015)
Exhaust	0.26 - 0.34 (0.010 - 0.013)	0.308 - 0.432 (0.012 - 0.017)

*: Approximately 80°C (176°F)

AVAILABLE VALVE LIFTER

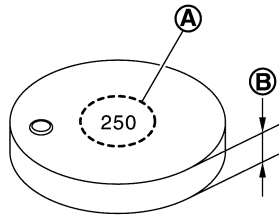
Stamped mark (A)	Thickness (B) mm (in)
210	2.10 (0.0827)
212	2.12 (0.0835)
214	2.14 (0.0843)
216	2.16 (0.0850)
218	2.18 (0.0858)
220	2.20 (0.0866)
222	2.22 (0.0874)
224	2.24 (0.0882)
226	2.26 (0.0890)
228	2.28 (0.0898)
230	2.30 (0.0906)
232	2.32 (0.0913)
234	2.34 (0.0921)
236	2.36 (0.0929)
238	2.38 (0.0937)
240	2.40 (0.0945)
242	2.42 (0.0953)
244	2.44 (0.0961)
246	2.46 (0.0969)
248	2.48 (0.0976)
250	2.50 (0.0984)
252	2.52 (0.0992)
254	2.54 (0.1000)
256	2.56 (0.1008)
258	2.58 (0.1016)
260	2.60 (0.1024)
262	2.62 (0.1031)
264	2.64 (0.1039)
266	2.66 (0.1047)
268	2.68 (0.1055)
270	2.70 (0.1063)
272	2.72 (0.1071)

SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[YD25DDTi]

Stamped mark (A)	Thickness (B) mm (in)
274	2.74 (0.1079)



JPBIA3912ZZ

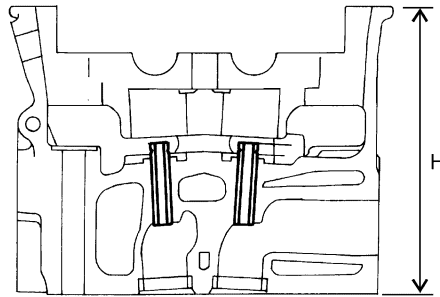
Cylinder Head

INFOID:0000000010521065

CYLINDER HEAD

Unit: mm (in)

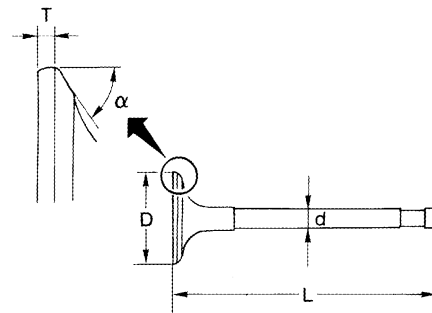
Items	Standard	Limit
Cylinder head distortion	Less than 0.04 (0.0016)	0.1 (0.004)
Cylinder head hight	153.9 - 154.1 (6.059 - 6.067)	—



JPBIA6139ZZ

VALVE DIMENSIONS

Unit: mm (in)



JSBIA1166ZZ

Valve head diameter "D"	Intake	28.4 - 28.7 (1.1181 - 1.1299)
	Exhaust	25.8 - 26.1 (1.0157 - 1.0276)
Valve length "L"	Intake	105.93 (4.1705)
	Exhaust	105.48 (4.1527)
Valve stem diameter "d"	Intake	5.965 - 5.980 (0.2348 - 0.2354)
	Exhaust	5.945 - 5.960 (0.2341 - 0.2346)

SERVICE DATA AND SPECIFICATIONS (SDS)

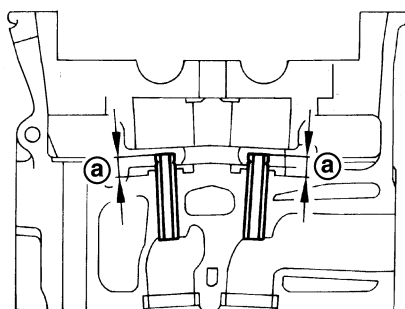
< SERVICE DATA AND SPECIFICATIONS (SDS)

[YD25DDTi]

Valve seat angle "α"	Intake and exhaust	45 degrees 15' - 45 degrees 45'
Valve margin "T"	Intake	1.08 (0.0425)
	Exhaust	1.38 (0.0543)
Valve margin "T" limit		More than 1.0 (0.039)
Valve stem end surface grinding limit		Less than 0.2 (0.008)

VALVE GUIDE

Unit: mm (in)



JPBIA6140ZZ

Items		Standard	Service
Valve guide	Outer diameter	10.023 - 10.034 (0.3946 - 0.3950)	10.223 - 10.234 (0.4025 - 0.4029)
	Inner diameter (Finished size)	6.000 - 6.018 (0.2362 - 0.2369)	
Cylinder head valve guide hole diameter		9.975 - 9.996 (0.3927 - 0.3935)	10.175 - 10.196 (0.4006 - 0.4014)
Interference fit of valve guide		0.027 - 0.059 (0.0011 - 0.0023)	
Items		Standard	Limit
Valve guide clearance	Intake	0.020 - 0.053 (0.0008 - 0.0021)	0.2 (0.008)
	Exhaust	0.040 - 0.073 (0.0016 - 0.0029)	0.2 (0.008)
Projection length		10.4 - 10.6 (0.409 - 0.417)	

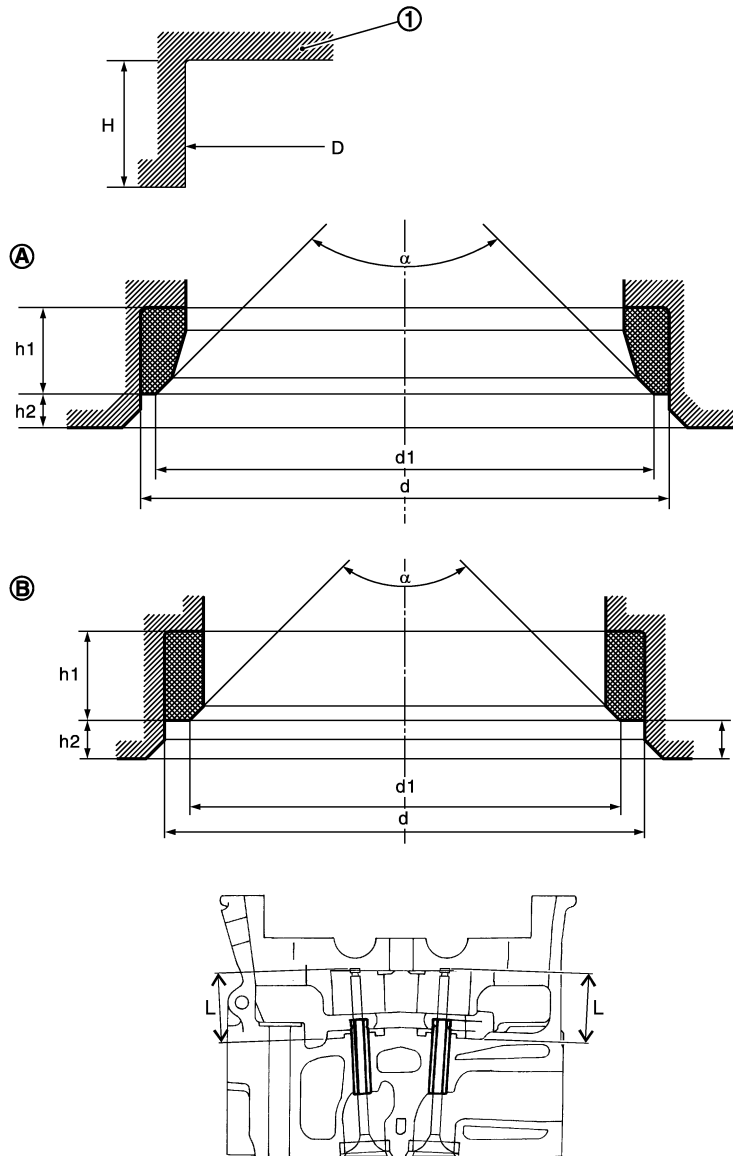
VALVE SEAT

SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[YD25DDTi]

Unit: mm (in)



E1BIA0294ZZ

JEM253G

Items		Standard	Oversize (Service) [0.5 (0.020)]
Cylinder head seat ① recess diameter (D)	Intake	30.4 - 30.416 (1.1968 - 1.1975)	30.9 - 30.916 (1.2165 - 1.2171)
	Exhaust	28.200 - 28.216 (1.1102 - 1.1109)	28.7 - 28.716 (1.1299 - 1.1305)
Valve seat outer diameter (d)	Intake ②	30.48 - 30.5 (1.2 - 1.2008)	30.98 - 31.0 (1.2197 - 1.2205)
	Exhaust ③	28.28 - 28.296 (1.1134 - 1.1140)	28.78 - 28.796 (1.1331 - 1.1337)
Valve seat interference fit	Intake ②	0.064 - 0.100 (0.0025 - 0.0039)	
	Exhaust ③	0.064 - 0.096 (0.0025 - 0.0038)	
Diameter (d1)	Intake ②	27.7 - 28.2 (1.0689 - 1.0886)	27.7 - 28.2 (1.0689 - 1.0886)
	Exhaust ③	25.1 - 25.6 (0.9882 - 1.0079)	25.1 - 25.6 (0.9882 - 1.0079)
Angle (α)		89.5°±45'	
Height (h1)	Intake ②	6.40 - 6.90 (0.252 - 0.272)	6.40 - 6.90 (0.252 - 0.272)
	Exhaust ③	6.19 - 6.69 (0.244 - 0.263)	6.19 - 6.69 (0.244 - 0.263)

SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[YD25DDTi]

Height (h2)	Intake (A)	2.25 - 2.45 (0.089 - 0.096)	2.15 - 2.55 (0.085 - 0.1004)
	Exhaust (B)	2.9 - 3.1 (0.1142 - 0.1220)	2.8 - 3.2 (0.1102 - 0.1260)
Depth (H)	Intake	8.85 - 9.15 (0.3484 - 0.3602)	
	Exhaust	9.29 - 9.59 (0.3657 - 0.3776)	
Projection (L)	Intake	36.18 - 36.78 (1.4382 - 1.4559)	
	Exhaust	36.16 - 36.96 (1.4236 - 1.4551)	

VALVE SPRING

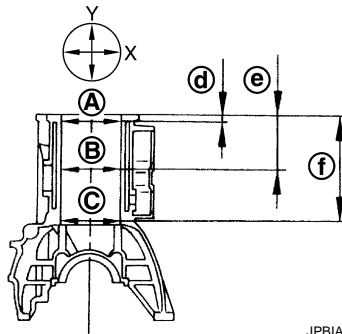
Valve spring square		mm (in)	1.8 (0.071)
Freeheight	mm (in)	Intake	44.8 (1.764)
		Exhaust	49.0 (1.929)
Pressure	N (kg, lb) at height mm (in)	Intake	138 - 152 (14.08 - 15.50, 31.0 - 34.2) at 32.8 (1.29)
		Exhaust	186 - 206 (18.97 - 21.01, 41.8 - 46.3) at 32.8 (1.29)
Height during valve open	mm (in)	Intake	24.95 (0.982)
		Exhaust	24.66 (0.971)
Load with valve open	N (kg, lb)	Intake	250 - 274 (25.5 - 27.9, 56.2 - 61.6)
		Exhaust	308 - 336 (31.4 - 34.3, 69.2 - 75.5)

Cylinder Block

INFOID:0000000010521066

CYLINDER BLOCK

Unit: mm (in)



Top surface distortion		Standard		Less than 0.03 (0.0012)
		Limit		0.1 (0.004)
Cylinder bore	Inner diameter	Standard	Grade No. 1	89.000 - 89.010 (3.5039 - 3.5043)
			Grade No. 2	89.010 - 89.020 (3.5043 - 3.5047)
			Grade No. 3	89.020 - 89.030 (3.5047 - 3.5051)
		Wear limit		0.07 (0.0028)
Out-of-round (Difference between X and Y)		Limit	0.015 (0.0006)	
Taper (Difference between Ⓐ and Ⓒ)			0.010 (0.0004)	
Main bearing housing inner diameter (Without bearing)				66.656 - 66.680 (2.6242 - 2.6252)
Difference in inner diameter between cylinders		Limit		Less than 0.05 (0.0020)

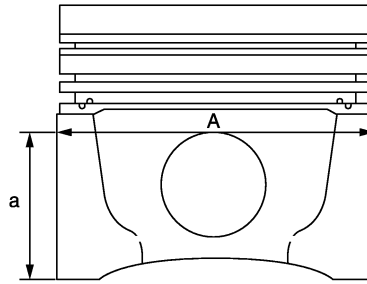
AVAILABLE PISTON

SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[YD25DDTi]

Unit: mm (in)



E1BIA0295ZZ

Piston outer diameter “A”	Standard	Grade No. 1	88.806 - 88.820 (3.496 - 3.4968)
		Grade No. 2	88.816 - 88.830 (3.4967 - 3.4972)
		Grade No. 3	88.826 - 88.840 (3.4971 - 3.4976)
		Oversize (Service) [0.25]	89.066 - 89.080 (3.5065 - 3.5071)
		Oversize (Service) [0.5]	89.316 - 89.330 (3.5164 - 3.5169)
“a” dimension			43.0 (1.63)
Piston pin bore diameter			28.008 - 28.013 (1.1027 - 1.1029)
Piston to cylinder bore clearance			0.18 - 0.204 (0.0071 - 0.008)

PISTON RING

Unit: mm (in)

Items		Standard	Limit
Side clearance	Top	0.04 - 0.06 (0.0016 - 0.0024)	0.17 (0.007)
	2nd	0.08 - 0.12 (0.0031 - 0.0047)	0.13 (0.005)
	Oil ring	0.030 - 0.070 (0.0012 - 0.0028)	-
End gap	Top	0.18 - 0.28 (0.0071 - 0.0110)	1.0 (0.039)
	2nd	0.32 - 0.47 (0.0126 - 0.0185)	
	Oil ring	0.30 - 0.55 (0.0118 - 0.0217)	

PISTON PIN

Unit: mm (in)

Piston pin outer diameter		27.995 - 28.000 (1.1022 - 1.1024)
Piston to piston pin clearance		0.008 - 0.018 (0.0003 - 0.0007)
Connecting rod bushing clearance	Standard	0.026 - 0.043 (0.0010 - 0.0017)
	Limit	0.057 (0.0022)

CONNECTING ROD

Unit: mm (in)

Center distance		154.47 - 154.53 (6.0815 - 6.0838)
Bend [per 100 (3.94)]	Limit	0.35 (0.0138)
Torsion [per 100 (3.94)]	Limit	0.25 (0.0098)
Connecting rod bushing inner diameter*		28.026 - 28.038 (1.1034 - 1.1039)
Connecting rod big end inner diameter*		55.000 - 55.013 (2.1654 - 2.1659)
Side clearance	Standard	0.20 - 0.35 (0.0079 - 0.0138)
	Limit	0.40 (0.0157)

*: After installing in connecting rod

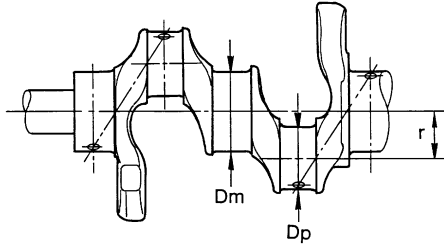
CRANKSHAFT

SERVICE DATA AND SPECIFICATIONS (SDS)

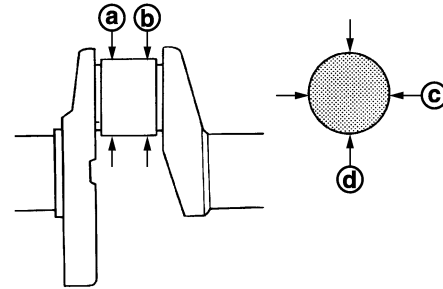
< SERVICE DATA AND SPECIFICATIONS (SDS)

[YD25DDTi]

Unit: mm (in)



SEM645



JPBIA0229ZZ

Main journal dia. "Dm"		62.951 - 62.975 (2.4784 - 2.4793)
Pin journal dia. "Dp"		51.956 - 51.974 (2.0455 - 2.0462)
Center distance "r"		49.97 - 50.03 (1.9673 - 1.9697)
Out-of-round (Difference between ③ and ④)	Standard	0.003 (0.0001)
	Limit	0.005 (0.0002)
Taper (Difference between ① and ②)	Standard	0.003 (0.0001)
	Limit	0.005 (0.0002)
Runout [TIR*]	Standard	0.05 (0.0020)
	Limit	0.10 (0.0039)
End play	Standard	0.085 - 0.25 (0.0033 - 0.0098)
	Limit	0.30 (0.0118)

*: Total indicator reading

Main Bearing

INFOID:0000000010521067

MAIN BEARING

Unit: mm (in)

Grade number	Thickness	Width	Identification color	Remarks
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SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[YD25DDTi]

0		1.812 - 1.809 (0.0713 - 0.0712)		Black	
1		1.815 - 1.812 (0.0715 - 0.0713)		Brown	
2		1.818 - 1.815 (0.0716 - 0.0715)		Green	
3		1.821 - 1.818 (0.0717 - 0.0716)		Yellow	
4		1.824 - 1.821 (0.0718 - 0.0717)		Blue	
5		1.827 - 1.824 (0.0719 - 0.0718)		Pink	
6		1.830 - 1.827 (0.0720 - 0.0719)		Purple	
7		1.833 - 1.830 (0.0722 - 0.0720)		Red	
01	UPR	1.812 - 1.809 (0.0715 - 0.0712)		Black	
	LWR	1.815 - 1.812 (0.0715 - 0.0713)		Brown	
12	UPR	1.815 - 1.812 (0.0715 - 0.0713)	19.9 - 20.1 (0.783 - 0.791)	Brown	
	LWR	1.818 - 1.815 (0.0716 - 0.0715)		Green	
23	UPR	1.818 - 1.815 (0.0716 - 0.0715)		Green	
	LWR	1.821 - 1.818 (0.0717 - 0.0716)		Yellow	
34	UPR	1.821 - 1.818 (0.0717 - 0.0716)		Yellow	
	LWR	1.824 - 1.821 (0.0718 - 0.0717)		Blue	
45	UPR	1.824 - 1.821 (0.0718 - 0.0717)		Blue	
	LWR	1.827 - 1.824 (0.0719 - 0.0718)		Pink	
56	UPR	1.827 - 1.824 (0.0719 - 0.0718)		Pink	
	LWR	1.830 - 1.827 (0.0720 - 0.0719)		Purple	
67	UPR	1.830 - 1.827 (0.0720 - 0.0719)		Purple	
	LWR	1.833 - 1.830 (0.0722 - 0.0720)		Red	

Grade and color are the same for upper and lower bearings.

Grade and color are different between upper and lower bearings.

UNDERSIZE

Unit: mm (in)

Size	Thickness	Main journal diameter "Dm"
0.25 (0.0098)	1.949 - 1.953 (0.0767 - 0.0769)	Grind so that bearing clearance is the specified value.

MAIN BEARING OIL CLEARANCE

Unit: mm (in)

Items	Standard	Limit
Main bearing oil clearance	0.056 - 0.066 (0.0022 - 0.0026)*	0.066 (0.0026)

*: Actual clearance

Connecting Rod Bearing

INFOID:0000000010521068

CONNECTING ROD BEARING

Grade number	Thickness mm (in)	Width	Identification color	Remarks
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SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[YD25DDTi]

0		1.488 - 1.485 (0.0586 - 0.0585)	22.9 - 23.1 (0.902 - 0.909)	Green	Grade and color are the same for upper and lower bearings.
1		1.491 - 1.488 (0.0585 - 0.0587)		Yellow	
2		1.494 - 1.491 (0.0588 - 0.0585)		Blue	
3		1.497 - 1.494 (0.0589 - 0.0588)		Pink	
4		1.500 - 1.497 (0.0591 - 0.0589)		Purple	
01	UPR	1.488 - 1.485 (0.0586 - 0.0585)		Green	Grade and color are different between upper and lower bearings.
	LWR	1.491 - 1.488 (0.0585 - 0.0587)		Yellow	
12	UPR	1.491 - 1.488 (0.0585 - 0.0587)		Yellow	
	LWR	1.494 - 1.491 (0.0588 - 0.0585)		Blue	
23	UPR	1.494 - 1.491 (0.0588 - 0.0585)		Blue	
	LWR	1.497 - 1.494 (0.0589 - 0.0588)		Pink	
34	UPR	1.497 - 1.494 (0.0589 - 0.0588)		Pink	
	LWR	1.500 - 1.497 (0.0591 - 0.0589)		Purple	

UNDERSIZE

Unit: mm (in)

Size		Thickness	Crank pin journal diameter "Dp"
0.08 (0.0031)	UPR	1.534 - 1.542 (0.0604 - 0.0607)	Grind so that bearing clearance is the specified value.
	LWR	1.536 - 1.540 (0.0605 - 0.0606)	
0.12 (0.0047)	UPR	1.554 - 1.562 (0.0612 - 0.0615)	
	LWR	1.556 - 1.560 (0.0613 - 0.0614)	
0.25 (0.0098)	UPR	1.619 - 1.627 (0.0637 - 0.0641)	
	LWR	1.621 - 1.625 (0.0638 - 0.0640)	

CONNECTING ROD BEARING OIL CLEARANCE

Unit: mm (in)

Items	Standard	Limit
Connecting rod bearing oil clearance	0.051 - 0.061 (0.002 - 0.0024)*	0.061 (0.0024)

*: Actual clearance