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MENU

FOREWORD

This workshop manual has been prepared to provide information regarding repair procedures on Hino Trucks.

Applicable for J05E engine

When making any repairs on your vehicle, be careful not to be injured through improper procedures.
As for maintenance items, refer to the Owner's Manual.
All information and specifications in this manual are based upon the latest product information available at the time of printing.
Hino Motors Sales U.S.A. , Inc. reserves the right to make changes at any time without prior notice.

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CHAPTER REFERENCES REGARDING THIS WORKSHOP MANUAL

Use this chart to the appropriate chapter numbers for servicing your particular truck.

CHAPTER	MANUAL NO.	S5-LJ05E04A (U.S.A.), S5-LJ05E05A (CANADA)
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HINO

WORKSHOP MANUAL

INDEX: ENGINE GROUP 1/2

GENERAL INTRODUCTION

STANDARD VALUE

REQUIRED ITEMS

TROUBLESHOOTING

MOUNTING AND DISMOUNTING THE ENGINE

ENGINE CONTROL

FUEL SYSTEM

EMISSION CONTROL

INTAKE

ENGINE MECHANICAL

EXHAUST

COOLING

LUBRICATION

SPEED CONTROL SYSTEM

IGNITION

STARTING/CHARGING

TURBOCHARGER

AIR COMPRESSOR

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ENGINE PTO (POWER TAKE-OFF)

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GENERAL INTRODUCTION

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HOW TO IDENTIFY VEHICLE TYPE

VEHICLE MODEL

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①	②	③	④	⑤	⑥	⑦	⑧		⑨	⑩	⑪	⑫	⑬	⑭	⑮
X	J	C	7	0	0		L	—	H	K	T	Q	M	A	3
REPORTED MODEL									CLASSIFICATION						

① ② : ENGINE MODEL

X	F	J05E-UG (HV)
X	J	J05E-TP (Diesel)

③ : VEHICLE MODEL

C	HEAVY DUTY TRACK

⑩ : DECK HEIGHT

K	HIGH FLOOR

④ ⑤ : CAB WIDTH, DRIVE, FRAME FORM, WHEEL BASE

		CAB WIDTH	DRIVE	FRAME FORM	WHEEL BASE	FRAME ASSEMBLY WIDTH
						840 mm {33 in.}
7	0	WIDE	2WD	OPEN	MEDIUM	2,900 mm {114 in.}
7	1	WIDE	2WD	OPEN	LONG	3,500 mm {138 in.}
7	2	WIDE	2WD	OPEN	SUPER LONG	3,800 mm {150 in.}
7	4	WIDE	2WD	OPEN	SUPER LONG	4,400 mm {173 in.}

⑪ : TRANSMISSION

T	6AT

⑫ : LOADING CAPACITY, GVW, REAR TIRES

Q	6.58 t {14,500 lbs}	REAR DOUBLE
T	8.14 t {17,950 lbs} 8.85 t {19,500 lbs}	REAR DOUBLE

⑥ : TYPE OF SUSPENSION

0	FRONT RIGID, REAR RIGID

⑬ : ENGINE HORSEPOWER, FUEL

	FUEL	HORSEPOWER	EXHAUST
M	DIESEL OIL	VERY HIGH	US10

⑧ : STEERING WHEEL POSITION

L	LEFT HAND DRIVE

⑭ : DESTINATION

	DESTINATION
A	U.S., CANADA

⑨ : CAB FORM, BRAKE TYPE

CAB FORM		BRAKE TYPE
H	SINGLE CAB	VACUUM
Q	CREW CAB	VACUUM
C	SINGLE CAB	HYDRAULIC
D	CREW CAB	HYDRAULIC
K	SINGLE CAB	VACUUM
L	SINGLE CAB	HYDRAULIC

⑮ : DECK FORM

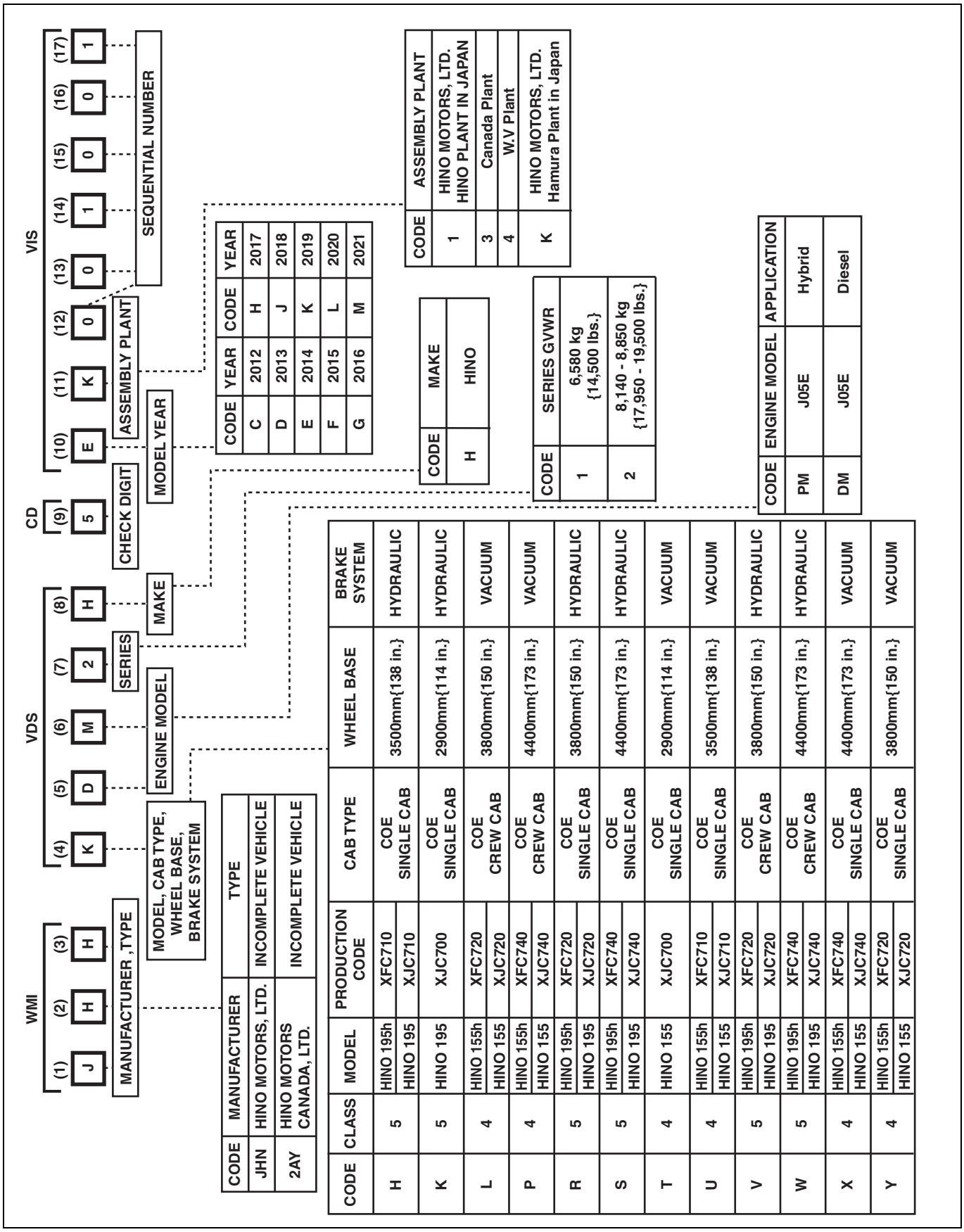
3	CHASSIS WITH CAB

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VEHICLE IDENTIFICATION NUMBER (VIN) STRUCTURE

EN01F01ZZZ000102001002



CODE	CLASS	MODEL	PRODUCTION CODE	CAB TYPE	WHEEL BASE	BRAKE SYSTEM
H	5	HINO 195h	XFC710	COE SINGLE CAB	3500mm{138 in.}	HYDRAULIC
		HINO 195	XJC710			
K	5	HINO 195	XJC700	COE SINGLE CAB	2900mm{114 in.}	HYDRAULIC
L	4	HINO 155h	XFC720	COE CREW CAB	3800mm{150 in.}	VACUUM
		HINO 155	XJC720			
P	4	HINO 155h	XFC740	COE CREW CAB	4400mm{173 in.}	VACUUM
		HINO 155	XJC740			
R	5	HINO 195h	XFC720	COE SINGLE CAB	3800mm{150 in.}	HYDRAULIC
		HINO 195	XJC720			
S	5	HINO 195h	XFC740	COE SINGLE CAB	4400mm{173 in.}	HYDRAULIC
		HINO 195	XJC740			
T	4	HINO 155	XJC700	COE SINGLE CAB	2900mm{114 in.}	VACUUM
U	4	HINO 155h	XFC710	COE SINGLE CAB	3500mm{138 in.}	VACUUM
		HINO 155	XJC710			
V	5	HINO 195h	XFC720	COE CREW CAB	3800mm{150 in.}	HYDRAULIC
		HINO 195	XJC720			
W	5	HINO 195h	XFC740	COE CREW CAB	4400mm{173 in.}	HYDRAULIC
		HINO 195	XJC740			
X	4	HINO 155h	XFC740	COE SINGLE CAB	4400mm{173 in.}	VACUUM
		HINO 155	XJC740			
Y	4	HINO 155h	XFC720	COE SINGLE CAB	3800mm{150 in.}	VACUUM
		HINO 155	XJC720			

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APPEARANCE OF VEHICLE

APPEARANCE OF VEHICLE

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SAFETY INSTRUCTIONS AND READINESS TO WORK

WARNING

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GENERAL PRECAUTIONS

Some recommended and standard maintenance services for your vehicle are included in this section. When performing maintenance on your vehicle be careful not to get injured by improper work. Improper or incomplete work can cause a malfunction of the vehicle which may result in personal injury and/or property damage. If you have any question about performing maintenance, please consult your Hino dealer.

WARNING

When working on your vehicle, observe the following general precautions to prevent death, personal injury and/or property damage in addition to the particular DANGERS, WARNINGS, CAUTIONS and NOTICES in each chapter.

- **Always wear safety glasses or goggles to protect your eyes.**
- **Remove rings, watches, ties, loose hanging jewelry and loose clothing before starting work on the vehicle.**
- **Bind long hair securely behind the head.**
- **When working on the vehicle, apply the parking brake firmly, place the gear shift lever in "Neutral" or "N" and block the wheels.**
- **Always turn off the starter switch to stop the engine, unless the operation requires the engine running. Removing the key from the switch is recommended.**
- **To avoid serious burns, keep yourself away from hot metal parts such as the engine, exhaust manifold, radiator, muffler, exhaust pipe and tail pipe.**
- **Do not smoke while working on the vehicle since fuel, and gas from battery are flammable.**
- **Take utmost care when working on the battery. It contains corrosive sulfuric acid.**
- **Large electric current flows through the battery cable and starter cable. Be careful not to cause a short which can result in personal injury and/or property damage.**
- **Read carefully and observe the instructions specified on the jack before using it.**
- **Use safety stands to support the vehicle whenever you need to work under it. It is dangerous to work under a vehicle supported only by a jack.**
- **If it is necessary to run the engine after the hood is raised (tilted), make sure that the parking brake is firmly applied, the wheels are blocked, and the gear shift lever is positioned in "Neutral" before staring the engine.**
- **Run the engine only in a well-ventilated area to avoid inhalation of carbon monoxide.**
- **Keep yourself, your clothing and your tools away from moving parts such as the cooling fan and V-belts when the engine is running.**
- **Be careful not to damage lines and hoses by stepping or holding your feet on them.**
- **Be careful not to leave any tool in the engine compartment. The tool may be hit by moving parts, which can cause personal injury.**

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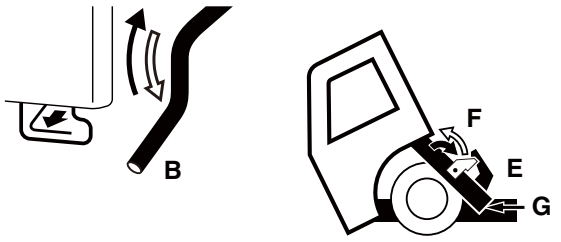
PRECAUTIONS IN TILTING AND LOWERING THE CAB

⚠ WARNING

Be sure to observe the following when tilting and lowering the cab to reduce the risk of an accident which may result in death, serious injury and/or property damage.

- **Park the vehicle on a level place and ensure ample space around the cab before tilting the cab.**
- **Apply the parking brake firmly and place the gearshift lever in "N" position ("P" position if your vehicle is equipped with automatic transmission).**
- **Stop the engine and block the wheels.**
- **Remove any articles in or over the cab and close the doors firmly.**
- **Make sure there is no one in or around the cab and there are no obstacles in front of the vehicle or above the cab.**
- **The catch (E), stopper (F), stay (G) and other parts such as the engine, radiator, and exhaust pipe can be very hot while your vehicle is operated. Be sure to confirm they have been cooled down before you start working under the cab.**
- **Never raise or lower the cab only by yourself if your cab is equipped with heavy component such as a roof rack.**
- **Never put your body under the cab while raising or lowering the cab.**
- **Make sure the cab stopper stay is securely locked by the catch (E) and raise the stopper (F) to lock the catch (E) completely after raising the cab.**
- **Before lowering the cab, make sure that any object such as hand tools, gloves or cloth are not left under the cab.**
- **Make sure the handle (B) is caught by the catch after lowering the cab.**

Read the Owner's manual for details.



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DEFINITION OF SAFETY TERMS

⚠ DANGER	Indicates an extremely hazardous situation if proper procedures are not followed and could result in death or serious injury.
⚠ WARNING	Indicates a potential hazardous situation if proper procedures are not followed and could result in death or serious injury.
⚠ CAUTION	Indicates a hazardous situation if proper procedures are not followed and could result in serious injury or damage to parts/equipment.
NOTICE	Indicates the need to follow proper procedures and to pay attention to precautions so that efficient service is provided.
HINT	Provides additional information to help you to perform the repair efficiently.

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TOWING

- When being towed, always place the gear shift lever in "Neutral" and release the parking brake completely. In order to protect the bumper, fit a protection bar against the lower edge of the bumper and put a wood block under the frame near the No. 1 cross member when attaching the towing chain. Never lift or tow the vehicle if the chain is in direct contact with the bumper.

1. Towing procedures

(1) Make sure that the propeller shaft of the vehicle to be towed is removed. When the differential gear or rear axle shaft is defective, remove both right and left rear axle shafts, then cover the hub opening to prevent loss of axle lubricant and entry of dirt or foreign matter.
(2) Use a heavy duty cable or rope when towing the vehicle. Fasten the cable securely to the towing hook on the frame.
(3) The angle of pulling direction of the cable fastened to the towing hook must not exceed 15° in horizontal and vertical directions from the straight ahead, level direction. Avoid using the hook in a way that subjects it to jerk, as in towing a vehicle trapped in a gutter.
(4) Keep the gear shift lever in Neutral.
(5) Make sure that the starter switch is kept in the "ON" position, if the engine is not running.
(6) Make sure that the engine of the towed vehicle is kept running. If the engine is off, no compressed air/ no vacuum will be available for the brake. This is dangerous, as the brake system does not function if the engine is not running.
In addition, the power steering system will not function. The steering wheel, therefore, will become unusually hard to turn, making it impossible to control the vehicle.
(7) Note that the engine brake and exhaust brake cannot be applied, if the propeller shaft is removed.
(8) Make a slow start to minimize shock. Towing speed should be less than 30 km/h {18 mile/h}.

2. If the engine of the towed vehicle is defective, make sure that the vehicle is towed only by a tow truck designed for that purpose.

(1) Front end towing (with front wheels raised off the ground)
When towing from the front end with the front wheels raised off the ground, remove the rear axle shafts to protect the transmission and differential gears from being damaged. The hub openings should be covered to prevent the loss of axle lubricant or the entry of dirt or foreign matter. The above-mentioned precautions should be observed for vehicles equipped with either manual or automatic transmission, and for even short distance towing. After being towed, check and refill the rear axle housing with lubricant if necessary.
(2) Rear end towing
When being towed with the rear wheels raised off the ground, fasten and secure the steering wheel in a straight-ahead position.

CLEAN AIR ACT

1. Heavy-duty engine rebuilding practices.
§ 86.004-40

- The provisions of this section are applicable to heavy-duty engines subject to model year 2004 or later standards and are applicable to the process of engine rebuilding (or rebuilding a portion of an engine or engine system). The process of engine rebuilding generally includes disassembly, replacement of multiple parts due to wear, and reassembly, and also may include the removal of the engine from the vehicle and other acts associated with rebuilding an engine. Any deviation from the provisions contained in this section is a prohibited act under section 203(a) (3) of the Clean Air Act (42 U.S.C. 7522(a) (3)).

(1) When rebuilding an engine, portions of an engine, or an engine system, there must be a reasonable technical basis for knowing that the resultant engine is equivalent, from an emissions standpoint, to a certified configuration (i.e., tolerances, calibrations, specifications) and the model year(s) of the resulting engine configuration must be identified. A reasonable basis would exist if:
   a. Parts installed, whether the parts are new, used, or rebuilt, are such that a person familiar with the design and function of motor vehicle engines would reasonably believe that the parts perform the same function with respect to emissions control as the original parts; and
   b. Any parameter adjustment or design element change is made only:

- In accordance with the original engine manufacturer's instructions; or
- Where data or other reasonable technical basis exists that such parameter adjustment or design element change, when performed on the engine or similar engines, is not expected to adversely affect in-use emissions.

(2) When an engine is being rebuilt and remains installed or is reinstalled in the same vehicle, it must be rebuilt to a configuration of the same or later model year as the original engine. When an engine is being replaced, the replacement engine must be an engine of (or rebuilt to) a configuration of the same or later model year as the original engine.

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(3) At time of rebuild, emissions-related codes or signals from on-board monitoring systems may not be erased or reset without diagnosing and responding appropriately to the diagnostic codes, regardless of whether the systems are installed to satisfy requirements in § 86.004-25 or for other reasons and regardless of form or interface. Diagnostic systems must be free of all such codes when the rebuilt engine is returned to service. Such signals may not be rendered inoperative during the rebuilding process.

(4) When conducting a rebuild without removing the engine from the vehicle, or during the installation of a rebuilt engine, all critical emissions-related components listed in § 86.004-25(2) not otherwise addressed by paragraphs (1) through (3) of this section must be checked and cleaned, adjusted, repaired, or replaced as necessary, following manufacturer recommended practices.

(5) Records shall be kept by parties conducting activities included in paragraphs (1) through (4) of this section. The records shall include at minimum the mileage and/or hours at time of rebuild, a listing of work performed on the engine and emissions-related control components including a listing of parts and components used, engine parameter adjustments, emissions-related codes or signals responded to and reset, and work performed under paragraph (4) of this section.

a. Parties may keep records in whatever format or system they choose as long as the records are understandable to an EPA enforcement officer or can be otherwise provided to an EPA enforcement officer in an understandable format when requested.

b. Parties are not required to keep records of information that is not reasonably available through normal business practices including information on activities not conducted by themselves or information that they cannot reasonably access.

c. Parties may keep records of their rebuilding practices for an engine family rather than on each individual engine rebuilt in cases where those rebuild practices are followed routinely.

d. Records must be kept for a minimum of two years after the engine is rebuilt.

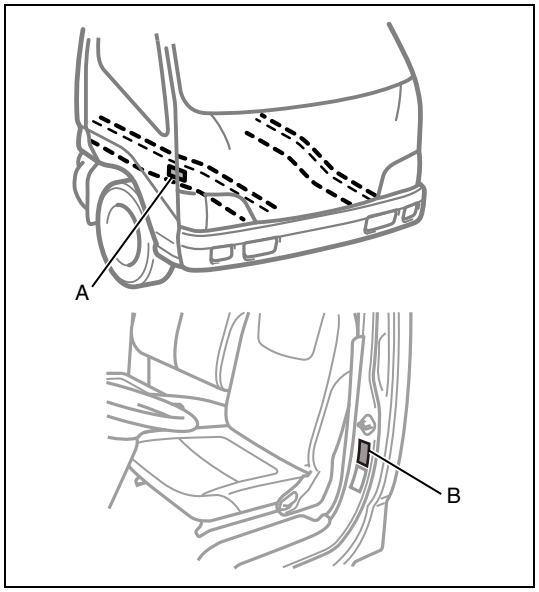
2. Maintenance instructions.
§ 86.010-38

(1) For each new diesel-fueled engine subject to the standards prescribed in § 86.007-11, as applicable, the manufacturer shall furnish or cause to be furnished to the ultimate purchaser a statement that
"This engine must be operated only with ultra low-sulfur diesel fuel (meeting EPA specifications for highway diesel fuel, including a 15 ppm sulfur cap)."

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IDENTIFICATION INFORMATION

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1. VEHICLE IDENTIFICATION NUMBER

(1) The vehicle identification number (VIN) is stamped on the right frame, as shown in the illustration. This number has also been stamped on the manufacture's label.

A: Vehicle Identification Number (VIN)
B: Manufacturer's Label

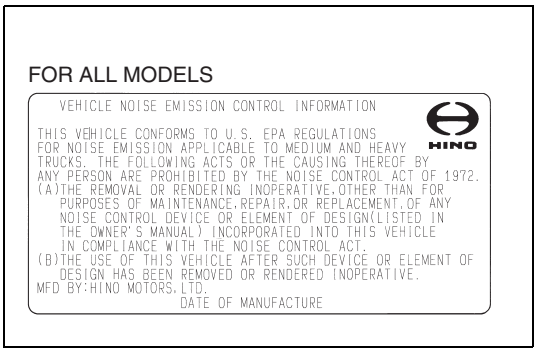
(2) VIN

See VEHICLE IDENTIFICATION NUMBER (VIN) STRUCTURE on the following page.

(3) PRODUCTION CODE AND VEHICLE COMPONENTS

MODEL (CLASS)		HINO 155h (4)	HINO 155 (4)	HINO 195h (5)	HINO 195 (5)
PRODUCTION CODE		XFC710 XFC720 XFC740	XJC700 XJC710 XJC720 XJC740	XFC710 XFC720 XFC740	XJC700 XJC710 XJC720 XJC740
TRANSMISSION SERIES		A465			
TRANSMISSION RATIO	1st	3.742			
	2nd	2.003			
	3rd	1.343			
	4th	1.000			
	5th	0.773			
	6th	0.634			
REAR AXLE SERIES		SH13			
REAR AXLE RATIO		4.333 / 4.625 / 4.875 / 5.142 / 5.571 / 5.857			
SERVICE BRAKE		Vacuum		Hydraulic	
PARKING BRAKE		ACTING ON DIFFERENTIAL OUTPUT SHAFT			
SUSPENSION		LEAF			

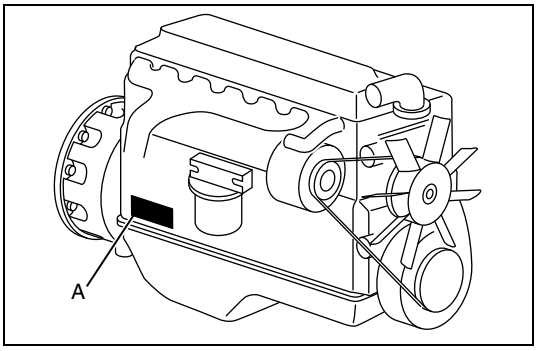
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2. VEHICLE NOISE EMISSION CONTROL INFORMATION

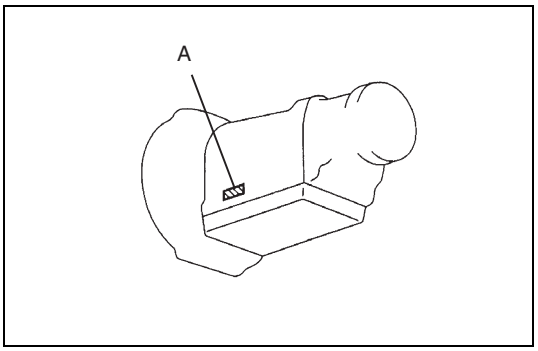
- The Vehicle Noise Emission Control Information is affixed to the left pillar of the cab. The name of manufacturer, production year and month, and noise emission applicable to medium and heavy trucks in conformity with U.S. EPA Regulations are displayed.



SHTS01ZZZ0000012

3. ENGINE SERIAL NUMBER

(1) The engine serial number is stamped on the cylinder block, as shown in the illustration.
A: J05E



SHTS01ZZZ0000013

4. TRANSMISSION SERIAL NUMBER

(1) The transmission serial number is stamped on the transmission, as shown in the illustration.
A: A465



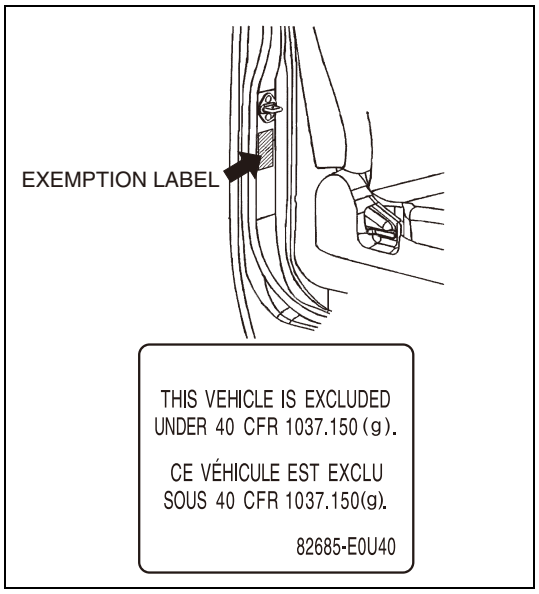
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5. CLEAN IDLE CERTIFIED LABEL FOR U.S.

- Make sure that the following clean engine idling certified label is affixed to the outside of the left door. By the CARB below, the label must be affixed there to prove that the new vehicle with diesel engine manufactured from Jan., 2008 conforms to this low.

CARB § 1956.8. Exhaust Emission Standard and Test Procedure (a) (b) Heavy-Duty Diesel Engine Idling Requirements

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6. EXEMPTION LABEL FOR US GHG REGULATION

HINT

Exemption label fuel economy comes in paste right side of the front passenger seat.

However, this label is limited to one year.

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SAFETY INSTRUCTIONS FOR WORK

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PRECAUTIONS

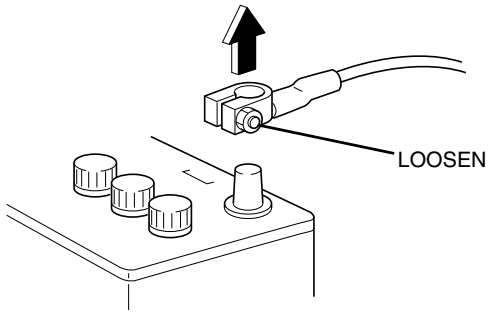
1. SAFETY INSTRUCTIONS FOR HANDLING ELECTRICAL SYSTEMS

(1) Remove the battery cable

⚠ WARNING

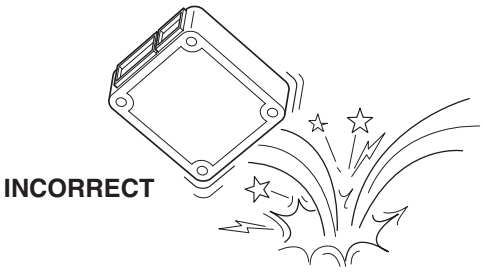
- **Be sure to wait for at least ten minutes after the starter key is turned to "LOCK" position before you disconnect the battery terminals from the battery, as the vehicle data is recorded on ECU and DCU starts working for the exhaust gas after treatment after the starter key is turned to "LOCK" position. Otherwise, the vehicle data will not be recorded on ECU properly and DCU will not complete working properly, which may result in the malfunction of DPR system and DEF-SCR system.**
- **The MIL (malfunction indicator light) may come on when the starter key is turned to "ON" position again, even if you wait for at least ten minutes before disconnecting the battery terminals from the battery after the starter key is turned to "LOCK" position. In this case, use HINO-DX to clear the DTC (P204F and P068A), to turn off the MIL and to conduct DPR regeneration manually.**

a. Before electrical system work, remove the cable from the minus terminal of the battery in order to avoid burning caused by short-circuiting.
b. To remove the battery cable, fully release the nut to avoid damage to the battery terminal. Never twist the terminal.



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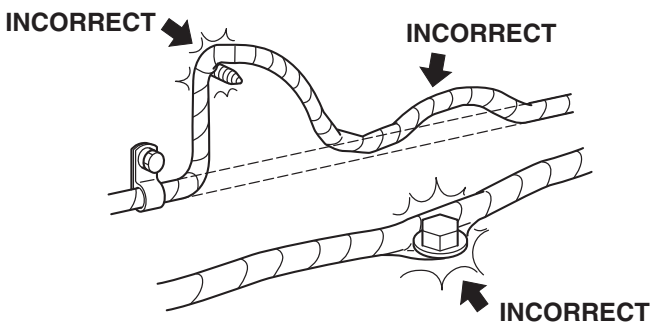
(2) Handling of electronic parts
a. Never give an impact to electronic parts of a computer or relay.
b. Keep electronic parts away from high temperatures and humidity.
c. Never splash water onto electronic parts in washing the vehicle.
d. Do not remove the harness connector, electric component box, and cover except for repair and inspection.
If removal is necessary, pay attention that water and foreign matters do not attach or enter to the connector, terminals, electric component box, and cover.
In restoration, make sure there is no attachment or entry of water and foreign matters and mount them properly, because it causes degradation of waterproof function.



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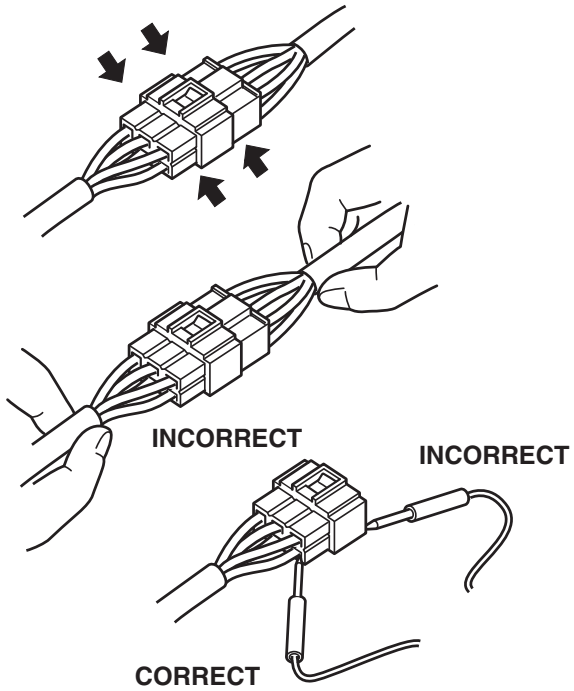
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(3) Handling of wire harness
   a. Perform marking on a clamp and a clip and secure then in original position so that the wire harness will not interfere with the end and acute angle section of the body and a bolt.
   b. To attach a part, take care not to bite the wire harness.



SHTS01ZZZ0000018

(4) Handling of connectors
   a. When removing a connector, hold a connector (area shown in an arrow in the figure) and then pull it off. Do not pull wire harnesses.
   b. Pull off a lockable connector after unlocking.
   c. When connecting a lockable connector, make sure to insert a lockable connector until it makes a click sound.
   d. When inserting a test lead, insert it from the back of a connector.
   e. If it is difficult to insert a test lead from the back of a connector, make and use an inspection harness.



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(5) Installation of battery disconnect switch

⚠ WARNING

- **Installation of the battery disconnect switch on the power supply circuit for the dosing control unit of DEF-SCR (DCU) may damage or result in the malfunction of DEF-SCR system.**
- **Be sure to read and follow the procedures and instructions on the service bulletin before the installation of the battery disconnect switch.**

(6) Handling of battery disconnect switch

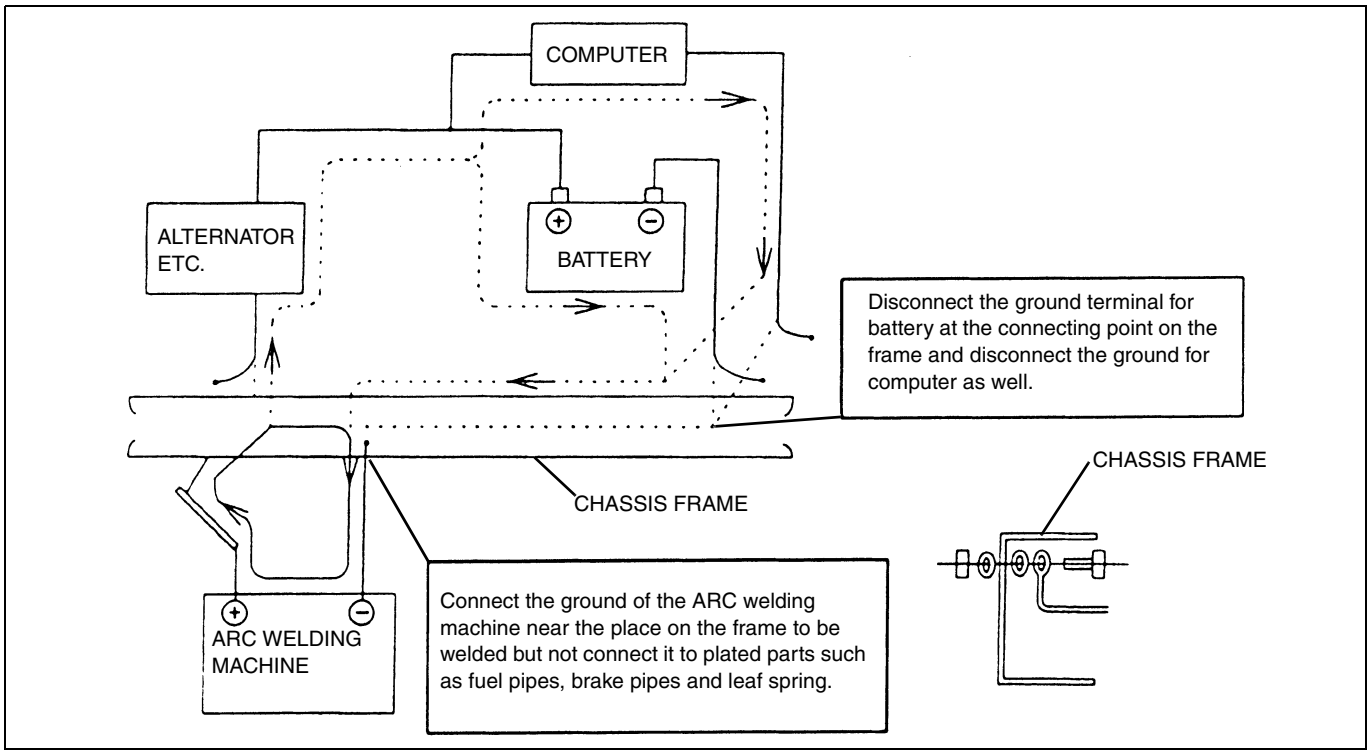
⚠ WARNING

- **Wait for at least ten minute before using the battery disconnect switch after the starter key is turned to "LOCK" position.**
  Otherwise, the vehicle data will not be recorded on ECU properly, which may result in the malfunction of DPR system.

2. PRECAUTION FOR ELECTRIC WELDING

Electrical components such as the alternator and tachograph are directly connected to the battery and one end is earthed to the chassis frame. Under these conditions, welding current will flow back along the earth circuit if electric welding is carried out and damage may be caused to the alternator, tachograph, electrical components, etc. Consequently, the following precautions are always to be taken during welding.

(1) Disconnect the earth terminal of the battery at the frame fitment and earth the welding equipment securely to the frame itself. (Do not fit the welding equipment earth to such things as the tire rims, brake pipes or fuel pipes and leaf spring, etc.)
   a. Turn the starter switch off.
   b. Disconnect the battery's negative terminal of the battery.
   c. Earth welding equipment securely, near to the area to be welded.
   d. Put back battery negative ground as original condition.
   e. Finally check the functioning of all instruments.



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(2) In order to prevent damage to ancillary equipment components from sparks during welding, take steps such as putting fire-resistant covers over things like the engine, meters, steering wheel, hoses, leaf spring and tires.

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INTRODUCTION TO WORKSHOP MANUAL

EN01F01ZZZ000102003004

GENERAL

1. SCOPE OF REPAIR DESCRIPTIONS

(1) There are three major processes in repair work: i.e. "troubleshooting," "removal/installation, replacement, overhaul, assembly, inspection and adjustment" and "final inspection".
(2) This document covers only the first process (troubleshooting) and the second process (removal/installation, replacement, overhaul, assembly, inspection and adjustment) and omits the third process (final inspection).
(3) The element tasks listed below are omitted from this document but must be done in actual repair work.
   a. Jacking and lifting
   b. Cleaning and washing of removed parts as required
   c. Visual check

2. STANDARD VALUE

(1) Standard values, limits, required actions and tightening torques are tabulated in this document.

3. REQUIRED ITEMS

(1) Special tools, tools, instruments, oil and grease and other items to be prepared before starting work are listed in the section titled "REQUIRED ITEMS". Note that general tools, jacks, rigid racks and other required items supposedly available at a general service shop are omitted from the list.

4. REPRESENTATION OF SECTION AND TITLE

(1) Under a title containing a system name such as "ENGINE CONTROL SYSTEM", the descriptions cover "INSPECTION", "ADJUSTMENT", "REPLACEMENT" and "OVERHAUL" of components.
(2) Under a title containing a part name such as "AIR COMPRESSOR ASSEMBLY", the descriptions cover "REPLACEMENT" and "OVERHAUL".

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INTRODUCTION TO DESCRIPTIONS

1. COMPONENT LOCATOR

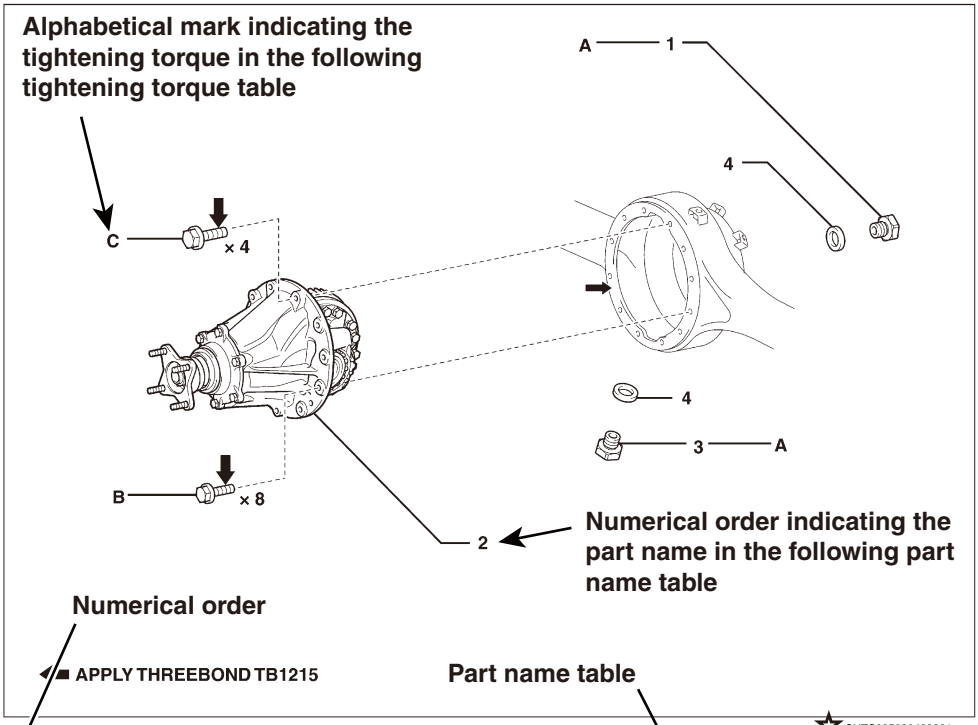
DIFFERENTIAL

DIFFERENTIAL CARRIER

COMPONENT LOCATOR

☆ EN01E08502040402001001

DIFFERENTIAL REAR CARRIER ASSEMBLY



☆ SHTS085020400001

Part name

1	Rear axle housing filler plug	3	Rear axle housing drain plug
2	Rear differential carrier assembly	4	Gasket *

*: Nonreusable part

Tightening torque table

Tightening torque — Unit: N·m {kgf·cm, lbf·ft}

A	98 {999, 72}	C	130 {1,326, 96}
B	96 {979, 71}		

Tightening torque

Alphabetical mark

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☆ : The ID number is given to required items for the purpose of preparing electronic data and is not needed in repair work.

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2. WORK STEPS

REPLACEMENT

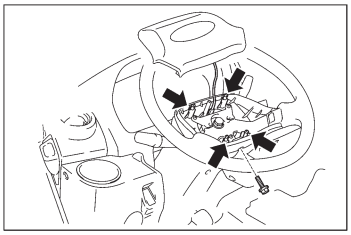
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REMOVING STEERING WHEEL

1. CHECKING THE FRONT TIRES' STRAIGHT-AHEAD CONDITION

2. REMOVING THE HORN BUTTON

(1) Disconnecting the negative battery terminal.
(2) Unfasten the screw.
(3) Releasing 4 tabs to detach the horn button from the steering wheel.
(4) Disconnecting wire harnesses and horn button.

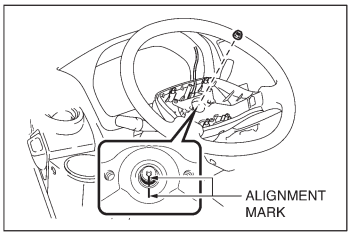


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3. REMOVING STEERING WHEEL

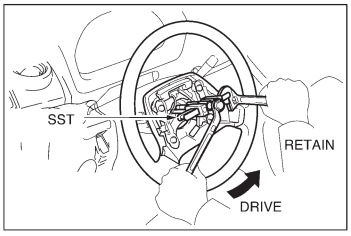
(1) Removing the steering wheel mounting nut.
(2) Putting alignment marks on the steering wheel and main shaft.

NOTICE
Alignment marks are not required if the steering wheel is replaced.



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(3) Using the SST, remove the steering wheel.
SST: 09950-50013
Puller C set
(4) Fixing the spiral cable rotating portion by a tape to prevent its rotation.



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Indicating the work sequence

Descriptive text: Indicating the work method which is gone into detail

Indicating the part number of SST required for work

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DEFINITION OF TERM

Terms used in this document are defined as follows.

DIRECTION

1. CHASSIS RELATED

(1) Longitudinal direction
   a. The forward direction and the reverse direction of a vehicle are respectively defined as front and rear in the installed position in a vehicle.

(2) Rotational direction
   a. The clockwise direction and the counterclockwise direction viewed from the rear side of a vehicle are defined as right-handed and left-handed respectively.

(3) Vertical direction
   a. The upward direction and the downward direction in the installed position in a vehicle are defined as an upper side and a lower side respectively.

(4) Lateral direction
   a. The leftward direction and the rightward direction viewed from the back of a vehicle are respectively defined as a left side and a right side in the installed position in a vehicle.

2. INDIVIDUAL DEVICES

(1) Longitudinal direction
   a. The input side and the output side of motive power are defined as a front side and a rear side respectively.

(2) Rotational direction
   a. The clockwise direction and the counterclockwise direction viewed from the back side are defined as right-handed and left-handed respectively.

(3) Vertical direction
   a. The upward direction and the downward direction of a device in its installed position in a vehicle (chassis) are defined as an upper side and a lower side respectively.

(4) Lateral direction
   a. The leftward direction and the rightward direction as viewed from the back side are defined as a left side and a right side respectively.

STANDARD VALUE

Represents a basic dimension (excluding a tolerance), and a clearance arising from tolerances when two parts are assembled.

REPAIR LIMIT

Represents a numerical value indicating need of correction. A symbol "+" or "-" indicated next to a repair limit represents an increase or a decrease from a standard value.

SERVICE LIMIT

Represents a numerical value indicating need of replacement. A symbol "+" or "-" indicated next to a repair limit represents an increase or a decrease from a standard value.

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TIGHTENING OF BOLTS AND NUTS

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BOLTS AND NUTS

More than hundreds of bolts/nuts are used in a vehicle and improper handling of them will cause damage and looseness. Because tightening torque varies depending on tightening condition, strength class, and surface treatment, etc., make sure to check the types and tightening torques of bolts/nuts and use them properly.

PURPOSES OF TIGHTENING TORQUE

Predefined tightening torque must be applied to ensure sufficient tightening by threads.
It also has purposes to prevent the adverse events below due to excessive or insufficient tightening.

Conditions	Adverse events
Excessive tightening	• Stretch or fracture of bolt • Depression of seat surface and looseness • Gasket damage • Rounding and damage of hexagon part • Opening of spring washer
Insufficient tightening	• Looseness • Gas and liquid Leakages • Continuity failure • Damage by fretting wear

NOTICE
Unique tightening torque may be specified for some parts.
Tighten with the tightening torque specified in the service manual.

HINT
Check the tightening torque list for general torques.

CAUTIONS TO PREVENT LOOSENESS.

When tightening, pay attention to the followings to prevent looseness after tightening.

- Insufficient tightening torque
- Inclusion of foreign matters (burrs and coatings) in the tightening surface.
- Sagging of coat
- Sinking into the seat surface hole by omitting attaching a plain washer.
- Defective seat surface flatness (wear-out during use)

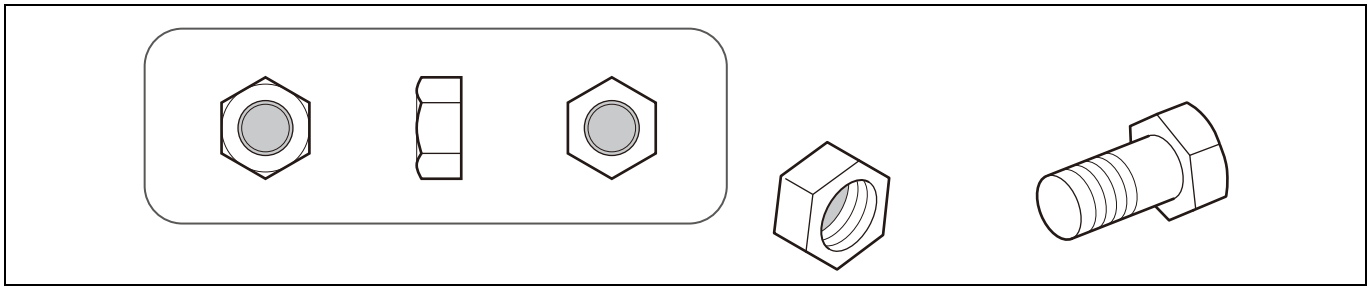
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TYPES AND IDENTIFICATION

There are three types of bolts and nuts.

1. Standard (w/o flange)

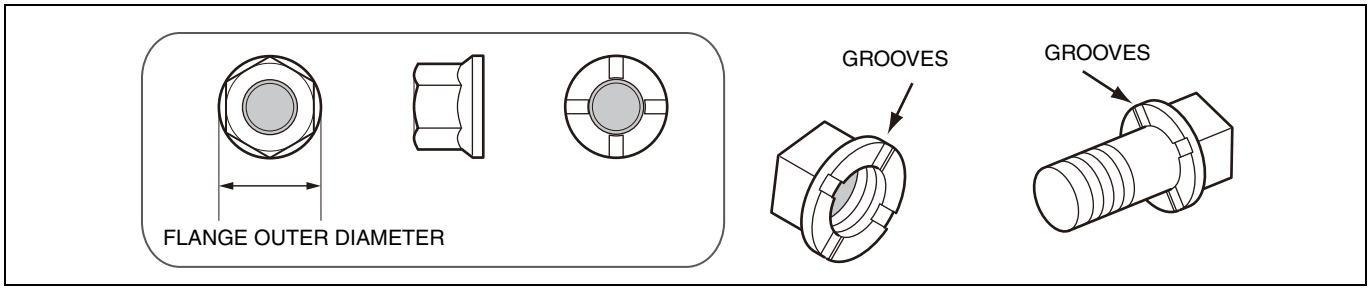
- Bolts/nuts without flange



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2. With old flange (w/grooves)

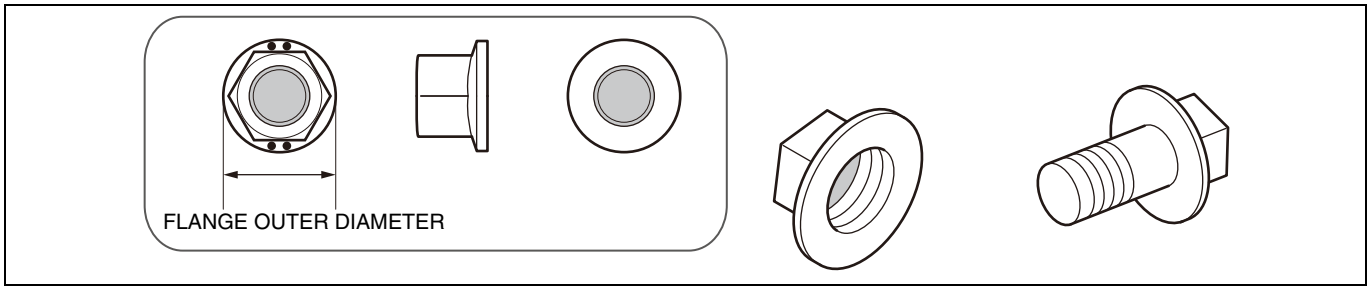
- Flange is small and has grooves on its back.



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3. With new flange (w/o grooves)

- Flange is big and does not have grooves on its back.



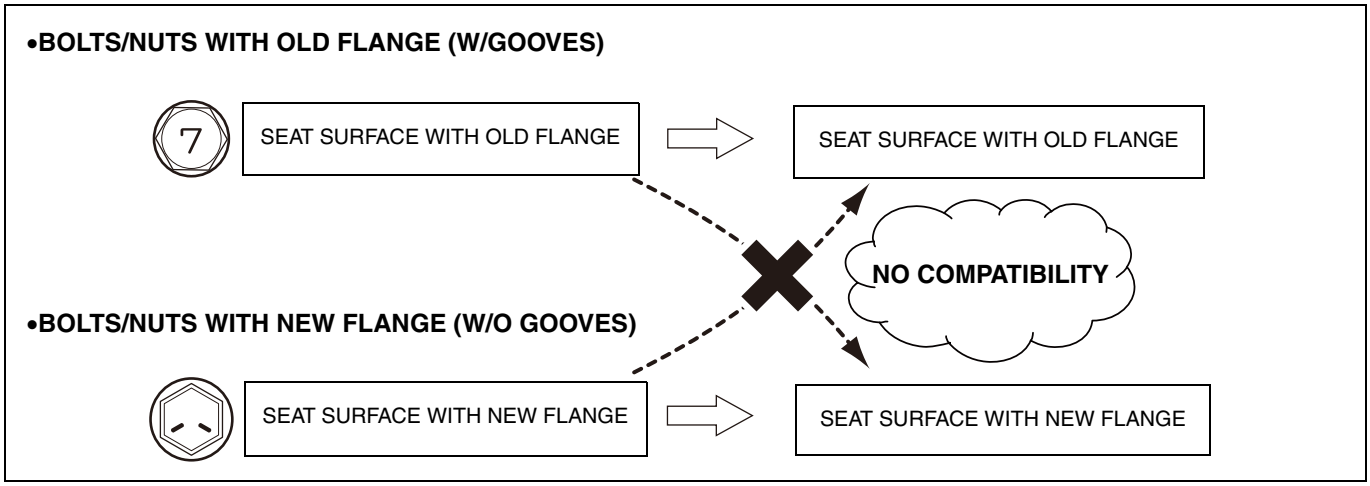
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Comparison of flange outer diameters

Thread diameter	Bolt				Nut			
	With old flange (w/grooves)		With new flange (w/o grooves)		With old flange (w/grooves)		With new flange (w/o grooves)	
	Strength class	Flange outer diameter	Strength class	Flange outer diameter	Strength class	Flange outer diameter	Strength class	Flange outer diameter
M8	7T, 9T	ϕ15.5	8.8, 10.9	ϕ17	7N	ϕ15.5	8	ϕ17
M10	7T, 9T	ϕ18.5	8.8	ϕ20	7N	ϕ18.5	8	ϕ21.5
			10.9	ϕ21.5				
M12	7T, 9T	ϕ21.5	8.8	ϕ24	7N	ϕ21.5	8	ϕ26
			10.9	ϕ26				
M14	—	—	10.9	ϕ30.5	—	—	12	ϕ30

COMPATIBILITY (NO COMPATIBILITY IN BOLTS AND NUTS)



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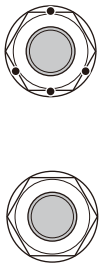
NOTICE

[Bolt/nuts with new flange (w/o grooves)] can not be used on the place where [bolts/nuts with old flange (w/ grooves)] were used. In addition, use care to avoid misassembly because even when nominal sizes and pitches are same, there is no compatibility in strength if types are different.

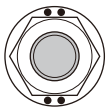
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STRENGTH CLASSES AND SYMBOLS

1. With old flange (w/grooves)

Bolt			Nut	
Strength class	Symbols		Strength class	Symbols
	Carbon steel	Boron steel		
4T		—	7N	
7T				
9T				

2. With new flange (w/o grooves)

Bolt			Nut	
Strength class	Symbols		Strength class	Symbols
	Carbon steel	Boron steel		
8.8			8	
10.9			12	

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PART NO.

1. Standard (w/o flange)

Thread diameter	Bolt			Nut		
	Strength class	Part No.	Surface treatment	Strength class	Part No.	Surface treatment
M8	7T	SH111-****	Plating	8N	SL113-00807	Plating
	9T	SH112-****	Plating			
M10	7T	SH111-****	Plating	8N	SL113-01008	Plating
	9T	SH112-****	Plating			
M12	7T	SH111-****	Plating	8N	SL113-01210	Plating
	9T	SH112-****	Plating			
M14	9T	SH112-****	Plating	8N	SL113-01411	Plating

2. With old flange (w/grooves)

Thread diameter	Bolt			Nut		
	Strength class	Part No.	Surface treatment	Strength class	Part No.	Surface treatment
M8	7T	SH562-****	Plating	7N	SL151-00809	Plating
	9T	SH562-****	Plating			
M10	7T	SH562-****	Torquer	7N	SL151-01011	Plating
	9T	SH562-****	Torquer			
M12	7T	SH562-****	Torquer	7N	SL151-01213	Plating
	9T	SH562-****	Torquer			

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3. With new flange (w/o grooves)

Thread diameter	Bolt			Nut		
	Strength class	Part No.	Surface treatment	Strength class	Part No.	Surface treatment
M8	8.8	91551-808**	Plating	8	94151-80800	Plating
	10.9	91551-008**	Plating			
M10	8.8	91552-E10**	Neotorquer	8	94151-81001	Neotorquer
	10.9	91552-F10**	Neotorquer			
M12	8.8	91552-E12**	Neotorquer	8	94151-81201	Neotorquer
	10.9	91552-F12**	Neotorquer			
M14	10.9	91552-F14**	Neotorquer	12	94151-21401	Neotorquer

NOTICE
Some bolts/nuts are applied friction stabilizer on thread surface. Note that their tightening torques are different from those of plated-only bolts/nuts even if the strength class is same. (Threads with Neotorquer are colored in light red.)

HINT
The * below the hyphen of a part number shows a thread diameter and length under head, so the numbers vary depending on type.

LIST OF TIGHTENING TORQUE

Apply a tightening torque specified in the strength class of the bolt/nut used.

NOTICE
Refer to the service manual because tightening torques of some parts do not conform to it due to their tightening conditions, strength classes, and surface treatments.

1. Standard (w/o flange)

Unit: N·m {kgf·cm, lbf·ft}

Thread diameter	Strength classes	Tightening Torque
M8	7T	22.0±4.0 {224±45, 16.2±2.9}
	9T	29.0±5.5 {296±56, 23.1±4.0}
M10	7T	43.0±8.5 {438±86, 31.7±6.2}
	9T	57.0±11.0 {581±112, 42.0±8.1}
M12	7T	76.0±15.0 {774±152, 56.0±11.0}
	9T	100.0±20.0 {1,019±203, 73.7±14.7}
M14	9T	160.0±32.0 {1,630±326, 117.9±23.5}

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2. With old flange (w/grooves)

Unit: N·m {kgf·cm, lbf·ft}

Thread diameter	Strength classes	Tightening Torque
M8	7T	22.0±4.0 {224±45, 16.2±2.9}
	9T	29.0±5.5 {296±56, 23.1±4.0}
M10	7T	51.5±10.0 {525±101, 37.9±7.3}
	9T	68.5±13.5 {698±137, 50.5±9.9}
M12	7T	91.0±18.0 {927±183, 67.0±13.2}
	9T	120.0±24.0 {1,223±224, 88.4±17.6}

3. With new flange (w/o grooves)

Unit: N·m {kgf·cm, lbf·ft}

Thread diameter	Strength classes	Tightening Torque	
M8	8.8	31.0±9.3 {316±94, 22.8±6.8}	
	10.9	39.0±11.7 {397±119, 28.7±8.6}	
M10	8.8	35.0±10.5 {356±107, 25.8±7.7}	
	10.9	46.5±13.8 {474±140, 34.2±10.1}	
M12	8.8	63.0±18.9 {642±192, 46.4±13.9}	
	10.9	82.0±24.6 {836±250, 60.4±18.1}	
M14	10.9	130.0±39.0 {1,325±397, 95.8±28.7}	130.0±26.0 {1,325±265, 95.8±19.1}*

HINT

***: Value is for usage in the fuel tank.**

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TIGHTENING OF ENGINE BOLTS AND NUTS

1. TIGHTENING TORQUE FOR GENERAL STANDARD BOLTS

(1) Representative tightening torque for shouldered bolts

Unit: N·m {kgf·cm, lbf·ft}

Thread diameter X pitch	7T	9T
M8 X 1.25 (coarse thread)	28.5 {290, 21}	36 {370, 27}
M10 X 1.25 (fine thread)	60 {610, 44}	74.5 {760, 55}
M10 X 1.5 (coarse thread)	55 {560, 40}	68.5 {700, 51}
M12 X 1.25 (fine thread)	108 {1,100, 80}	136 {1,390, 101}
M12 X 1.75 (coarse thread)	97 {990, 72}	125 {1,280, 93}
M14 X 1.5 (fine thread)	171.5 {1,750, 127}	216 {2,210, 160}
M14 X 2 (coarse thread)	154 {1,570, 114}	199 {2,030, 147}
Remark	Bolt with a numerical character "7" indicated on the head	Bolt with a numerical character "9" indicated on the head

(2) Representative torque for washer bolt

Unit: N·m {kgf·cm, lbf·ft}

Thread diameter X pitch	4T	7T	9T
M6 X 1 (coarse thread)	6 {60, 4.3}	10 {100, 7.2}	13 {130, 9.4}
M8 X 1.25 (coarse thread)	14 {140, 10}	25 {250, 18}	31 {320, 23}
M10 X 1.25 (fine thread)	29 {300, 22}	51 {520, 38}	64 {650, 47}
M10 X 1.5 (coarse thread)	26 {270, 20}	47 {480, 35}	59 {600, 43}
M12 X 1.25 (fine thread)	54 {550, 40}	93 {950, 69}	118 {1,200, 87}
M12 X 1.75 (coarse thread)	49 {500, 36}	83 {850, 61}	108 {1,100, 80}
M14 X 1.5 (fine thread)	83 {850, 61}	147 {1,500, 108}	186 {1,900, 137}
M14 X 2 (coarse thread)	74 {750, 54}	132 {1,350, 98}	172 {1,750, 127}
Remark	Bolt with a numerical character "4" indicated on the head Projection bolt. Stud with a rounded free end.	Bolt with a numerical character "7" indicated on the head. Stud with a chamfered free end.	Bolt with a numerical character "9" indicated on the head

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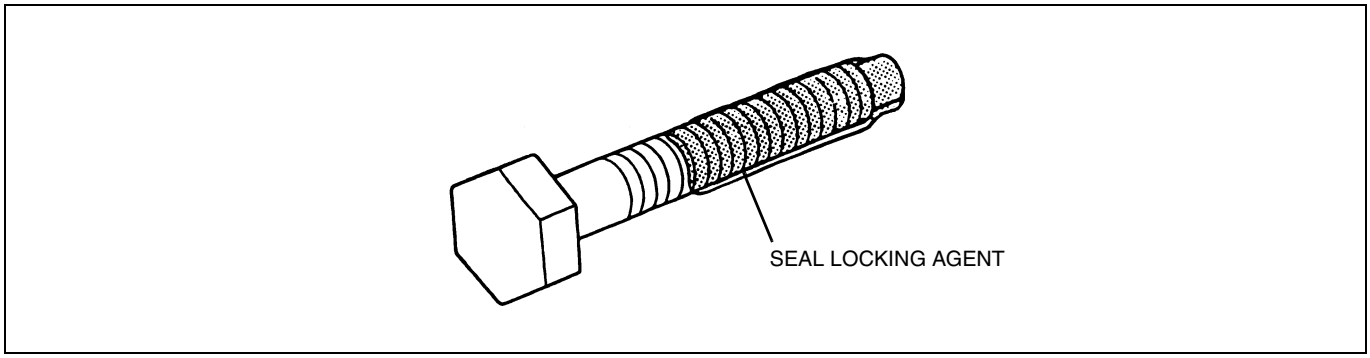
2. PRECOAT BOLT

(1) Reapply locking agent if:
   a. a precoat bolt has been removed, or
   b. a precoat bolt has been turned during a tightening check or other activities. (loosened or tightened)

HINT

- **A precoat bolt is a bolt of which threads are applied with seal locking agent.**
- **Conduct a torque check with the lower limit of a permissible tightening torque range. If a bolt has been turned or rotated, follow the procedures below to retighten a bolt.**

(2) Steps for reusing precoat bolt lock
   a. Clean a bolt and a screw hole. (Also clean a screw hole if replacement is made.)
   b. Use air blower to dry out.
   c. Apply specified seal locking agent to bolt threads.

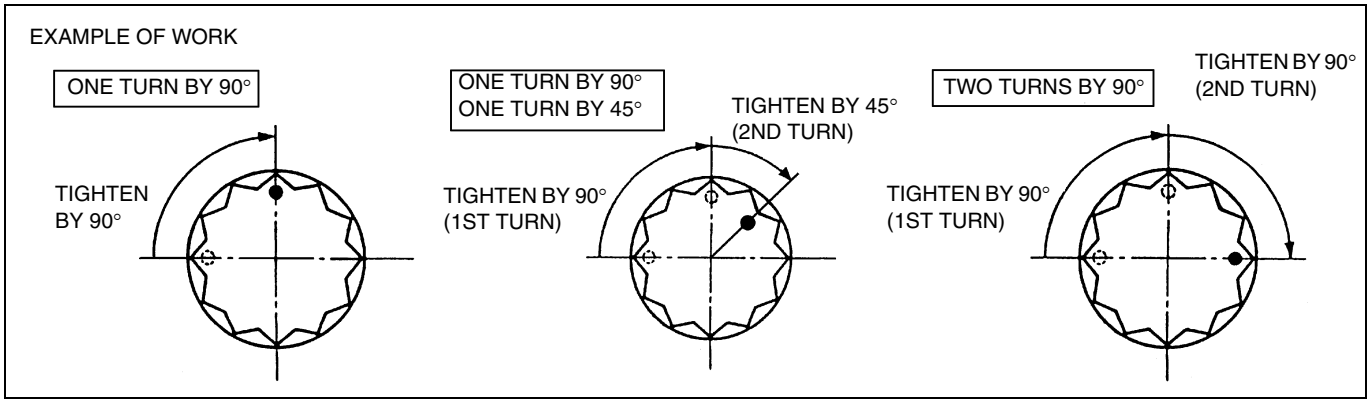


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3. PLASTIC-REGION TIGHTENING METHOD (TURNING ANGLE CONTROL)

NOTICE

- **Some of engine parts employ the plastic-region tightening method.**
- **Said tightening method is different from the conventional tightening method. Follow the instructions described in this document for tightening.**



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(1) Applicable parts
   Cylinder head bolt, crankshaft main bearing cap bolt, connecting rod bearing cap bolt, and etc.

NOTICE

Prior to installation, measure a total length of a bolt. If a measurement reading of a total length exceeds the service limit, replace the bolts.
In installation work, apply engine oil to a bolt seat surface and bolt threads.

(2) Tightening after tightening with seating torque
   Tighten to the angle specified in this document: i.e. tighten another 90°, 135° (90° once and then 45° once) or 180° (90° twice).

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TIGHTENING OF FLARE NUTS AND HOSES

1. TIGHTENING TORQUE FOR PIPE FLARE NUTS

HINT

Steel pipes and copper pipes (excluding power steering pipe).

Unit: N·m {kgf·cm, lbf·ft}

Outer diameter of pipe	ϕ4.76	ϕ6.35	ϕ8	ϕ10	ϕ12	ϕ15
Tightening torque	Brake:15 {153,11}	Clutch:24 {245,18}	32±3 {326±31, 24±2.2}	44±5 {449±51, 32±3.7}	64±5 {653±51, 47±3.7}	66±2.5 {673±25, 49±1.8}
	Except brake: 15±0.5 {153±5.1, 11±0.37}	Except clutch: 21±1 {214±10, 15±0.7}				

TIGHTENING TORQUE FOR POWER STEERING PIPE FLARE NUTS

Unit: N·m {kgf·cm, lbf·ft}

Types	Material quality and shape	Flare configuration	Identification	Tightening torque
Feed pipe (high pressure)	Copper (Outer diameter ϕ10) (Wall thickness t=1.4)	Single flare	Red	44±5 {449±51,32±3.7}
Return pipe (low pressure)	Copper (Outer diameter ϕ10) (Wall thickness t=1)	Single flare	—	44±5 {449±51,32±3.7}

2. TIGHTENING TORQUE FOR HOSES

Unit: N·m {kgf·cm, lbf·ft}

	Outer diameter of hoseϕ13 fittings	Outer diameter of hoseϕ13, ϕ20, ϕ22, packing unit fittings	Outer diameter of hose PF 3/8 fittings
Brake hose	—	46±2.5 {469±25,34±1.8}	—
Power steering oil hose	—	—	44±5 {449±51,32±3.7}

3. TIGHTENING TORQUE FOR STEEL JOINT LOCK NUTS

Unit: N·m {kgf·cm, lbf·ft}

Nominal designation of thread	M14	M16	M20	M22	M24
Tightening torque	48±10 {489±102, 35±7.3}	66±13 {673±204, 49±9.5}	120±36 {1,224±367, 89±26.5}	130±30 {1,346±306, 97±22.1}	150±30 {1,530±306, 111±22.1}

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HANDLING OF LIQUID GASKET

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LIQUID GASKET

1. PROCEDURES FOR APPLYING LIQUID GASKET AND ASSEMBLING PARTS

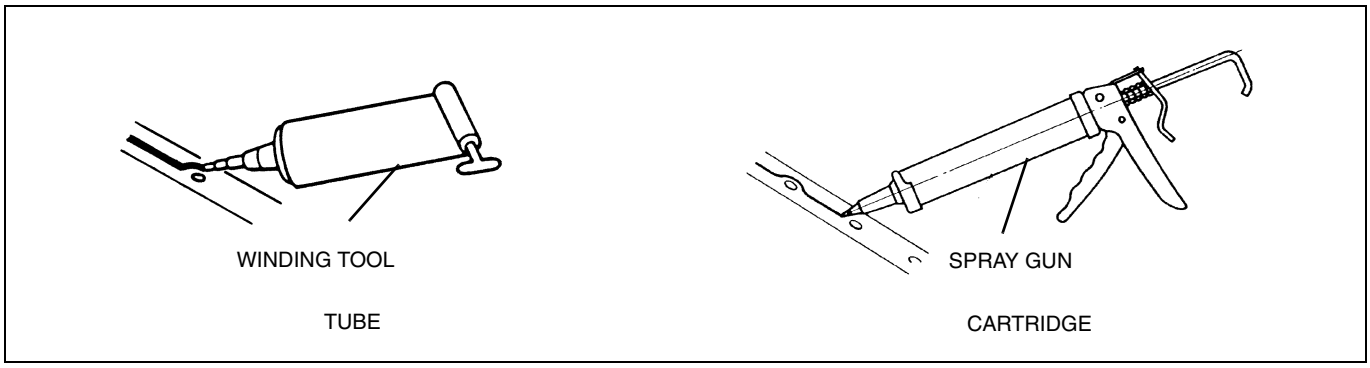
(1) Thoroughly remove old liquid gasket remaining on individual parts and mating parts. Use clean cloth to remove oil, moisture, dirt or other contaminants.
Make sure to overlap the start and end points of liquid gasket.
(2) Use care to avoid misalignment with a mating part when assembling a gasket-applied part. If misalignment is found, reapply liquid gasket.
(3) Install parts within 20 minutes after applying liquid gasket.
If 20 minutes or longer time has elapsed, remove and reapply liquid gasket.
(4) Wait at least 15 minutes after assembling parts and then start the engine.

2. REMOVAL OF PARTS

(1) When removing individual parts, alternately winkle two or more portions in a gap or a collar of a flange. Avoid one-point winkling. When removing a gasket, use care to avoid entry of gasket fragments into the engine.

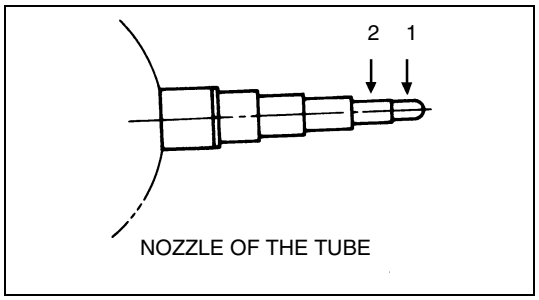
3. OTHERS

(1) If liquid gasket is contained in a tube, use a supplied squeezer. If liquid gasket is contained in a cartridge, use a applicator gun.



SHTS01ZZZ0000042

If liquid gasket is contained in a tube, the nozzle tip can be cut off to the desired application width.



SHTS01ZZZ0000043

1: Cut off the first block will form a application width of approximately 2 mm {0.079 in.}.
2: Cut off the second block will form a application width of approximately 5 mm {0.197 in.}.

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GLOSSARY

DEFINITION OF ABBREVIATION IN THIS MANUAL

EN01F01ZZZ000102006001

LIST OF ABBREVIATION

Abbreviations	Meaning, or Official Name
A/C	Air Conditioner
ABS	Anti-lock Brake System
ACC	Accessory
AMT	Automated Manual Transmission
ATC	After Turbo Catalyst
ATF	Automatic Transmission Fluid
CA	Crank Angle
CAN	Controller Area Network
CD-ROM	Compact Disc Read Only Memory
CPU	Central Processing Unit
dB	Decibel
DC	Direct Current
D-CAT	Diesel-Clean Advanced Technology System
DC motor	Direct Current Motor
DCU	Dosing Control Unit
DEF	Diesel Exhaust Fluid
DPR	Diesel Particulate active Reduction system
DSS	Driving Support System
ECU	Electronic Control Unit
EEPROM	Electronically Erasable and Programmable Read Only Memory
EGR	Exhaust Gas Recirculation
ELR	Emergency Locking Retractor
ENG	Engine
ES START	Easy and Smooth start system
F/A	Front Axle
FCCB	Fuel Control Cylinder Balance
FCV	Fuel Cutoff Valve
FF shift	Feather touch & Finger shift
FL	Fusible link

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Abbreviations	Meaning, or Official Name
Fr	Front
FRP	Fiber Reinforced Plastic
FUP	Front Underrun Protector
GCU	Glow Control Unit
GND	Ground
GVW	Gross Vehicle Weight
Hi	High
HINO-DX	HINO Diagnostic eXplorer
HV	Hybrid Vehicle
HVAC	Heating, Ventilating and Air-Conditioning unit
I.S.C.	Idle Speed Control
IC	Integrated Circuits
ID	Identification
IPD	Intelligent Power Device
IS	Idle Stop
ISO	International Organization for Standardization
JIS	Japanese Industrial Standards
LED	Light Emitting Diode
LEV	Low Emission Vehicle
LH	Left Hand
LLC	Long Life Coolant
Lo	Low
MAX	Maximum
MIN	Minimum
MS evaporator	Multi-tank and Super slim structure evaporator
MT	Manual Transmission
No.	Number
NOx	Nitrogen Oxide
NMR	No load Maximum Revolution
OHC	Over Head Camshaft
PC	Personal Computer
PCD	Pitch Circle Diameter
PCS	Pre-Crash Safety
PCV	Pump Control Valve
PCV valve	Positive Crankcase Ventilation valve

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Abbreviations	Meaning, or Official Name
PM	Particulate Matter
PPG	Glass-fiber-reinforced Polypropylene
ppm	Parts Per Million
PS pump	Power Steering Pump
PTO	Power Take-Off
PVD	Physical Vapor Deposit
PWR	Power
QR code	Quick Response Code
R/A	Rear Axle
RH	Right Hand
SCR	Selective Catalytic Reduction
SST	Special Service Tool
SW	Switch
T/M	Transmission

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GLOSSARY OF SAE AND HINO TERMS

This glossary lists all SAE-J2403 terms and abbreviations used in this manual in compliance with SAE recommendation, as well as their HINO equivalents.

SAE ABBREVIATIONS	SAE TERMS	HINO TERMS( )--ABBREVIATIONS
A/T	AUTOMATIC TRANSMISSION	Automatic transmission
AAT	AMBIENT AIR TEMPERATURE	Ambient Air Temperature
ACL	AIR CLEANER	Air cleaner
ACL Element	ACL (Air Cleaner) Element	Air Cleaner element
ACL Element	AIR CLEANER Element	Air Cleaner element
ACL Housing	AIR CLEANER Housing	Air cleaner body assembly
ACL Housing Cover	AIR CLEANER Housing Cover	Air Cleaner Housing Cover
AFTDEF	AFTERTREATMENT DIESEL EXHAUST FLUID	DEF
AFTDEFDU	AFTERTREATMENT DIESEL EXHAUST FLUID DOSING UNIT	DCU
AFTDOC	AFTERTREATMENT DIESEL OXIDATION CATALYST	DOC (Diesel Oxidation Catalyst)
AFTDOS	AFTERTREATMENT DOSER AFTDOS	Dosing
AFTDPF	AFTERTREATMENT DIESEL PARTICULATE FILTER	DPR filter
AFTDPFDP	AFTERTREATMENT DIESEL PARTICULATE FILTER DIFFERENTIAL PRESSURE	DPR differential pressure
AFTEGT	AFTERTREATMENT EXHAUST GAS TEMPERATURE	Exhaust gas temperature
AP	ACCELERATOR PEDAL	Accelerator pedal
AP Sensor	ACCELERATOR PEDAL Sensor	Accelerator Pedal Position Sensor
APP	ACCELERATOR PEDAL POSITION	Accelerator Pedal Position
CAC	CHARGE AIR COOLER	Intercooler
CPP Switch	CLUTCH PEDAL POSITION Switch	Clutch Switch
DCC	DIAGNOSTIC CONNECTOR, Cab	Diagnosis connector
DCU	DIAGNOSTIC CONNECTOR, Underhood	Diagnosis connector
DRIVER	DRIVER	Driver
DTC	DIAGNOSTIC TROUBLE CODE	Diagnosis Trouble Code
DTM Switch	DIAGNOSTIC TEST MODE Switch	Diagnosis switch
EBP	EXHAUST BACK PRESSURE	Back pressure
EBP	EXHAUST BACK PRESSURE	Exhaust back pressure
EBP Sensor	EXHAUST BACK PRESSURE Sensor	Back Pressure Sensor
EBPR Valve	EXHAUST BACK PRESSURE REGULATOR Valve	Exhaust control valve
EC	ENGINE CONTROL	Engine control

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SAE ABBREVIATIONS	SAE TERMS	HINO TERMS( )--ABBREVIATIONS
ECT	ENGINE COOLANT TEMPERATURE	Coolant Temperature
ECT	ENGINE COOLANT TEMPERATURE	Water Temperature
EFT	ENGINE FUEL TEMPERATURE	Fuel temperature
EFT Sensor	ENGINE FUEL TEMPERATURE Sensor	Fuel temperature sensor
EGR	EXHAUST GAS RECIRCULATION	EGR
EGR Valve	EXHAUST GAS RECIRCULATION Valve	EGR valve
EGRT	EXHAUST GAS RECIRCULATION TEMPERATURE	EGR temperature
EGRT Sensor	EXHAUST GAS RECIRCULATION TEMPERATURE Sensor	EGR exit temperature sensor
EGT	EXHAUST GAS TEMPERATURE	Exhaust gas temperature
EI	ELECTRONIC IGNITION	Ignition coil
EOP	ENGINE OIL PRESSURE	Oil Pressure
EOT	ENGINE OIL TEMPERATURE	Oil Temperature
FP	FUEL PUMP	Fuel pump
FUEL PRESSURE Sensor	FUEL PRESSURE Sensor	Fuel Pressure sensor
GLOW PLUG	GLOW PLUG	Glow plug
GND	GROUND	GROUND
IA	INTAKE AIR	Air Intake
IA System	INTAKE AIR System	Air Intake System
IAT	INTAKE AIR TEMPERATURE	Intake temperature
IAT Sensor	INTAKE AIR TEMPERATURE Sensor	Intake temperature sensor
IDLE	IDLE	Idle
IMAT	INTAKE MANIFOLD AIR TEMPERATURE	Intake manifold Air temperature sensor
IMAT	INTAKE MANIFOLD TEMPERATURE	Intake manifold temperature sensor
INJ	INJECTOR	Injector
MAF Sensor	MASS AIR FLOW Sensor	Air flow sensor
MIL	MALFUNCTION INDICATOR LIGHT	Check engine
OSS Sensor	OUTPUT SHAFT SPEED Sensor	Output Speed Sensor
OSS Sensor	OUTPUT SHAFT SPEED Sensor	Speed Sensor
PC Solenoid Valve	PRESSURE CONTROL Solenoid Valve	Solenoid control valves
PCV	POS CRANKCASE VENTILATION	PCV (Positive Crankcase Vent)
PCV Valve	POS CRANKCASE VENTILATION Valve	PCV (Positive Crankcase Vent) Valve
PCV Valve	POS CRANKCASE VENTILATION Valve	PCV Valve
PCV Valve	POSITIVE CRANKCASE VENT Valve	PCV Valve

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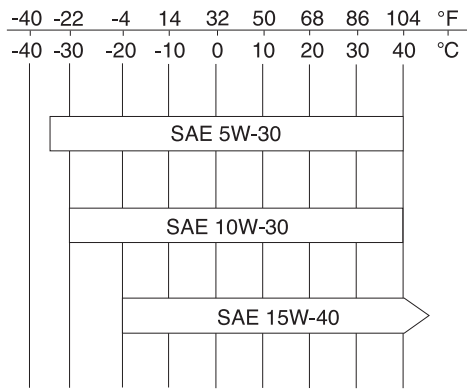
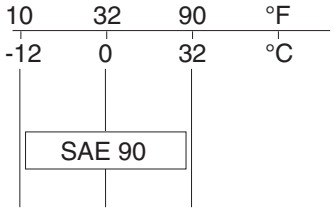
SAE ABBREVIATIONS	SAE TERMS	HINO TERMS( )--ABBREVIATIONS
PNP	PARK/NEUTRAL POSITION	Neutral position
PNP Switch	PARK/NEUTRAL POSITION Switch	Neutral switch
RFP	RAIL FUEL PRESSURE	Common rail Pressure
RFP Sensor	RAIL FUEL PRESSURE Sensor	Common rail pressure sensor
SPARK PLUG	SPARK PLUG	Spark plug
SRI	SERVICE REMINDER INDICATOR	Check engine
ST	SCAN TOOL	Diagnostic tool
TC	TURBOCHARGER	Turbocharger
TCC	TORQUE CONVERTER CLUTCH	Torque Converter
TP Sensor	THROTTLE POSITION Sensor	Throttle Sensor
TSS Sensor	TURBINE SHAFT SPEED Sensor	Turbine Speed Sensor
VAF Sensor	VOLUME AIR FLOW Sensor	Air flow sensor
VLS	VEHICLE LIMITING SPEED	Speed Limiter Upper Limit
VSS	VEHICLE SPEED SENSOR	Vehicle Speed sensor

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LUBRICANTS

RECOMMENDED LUBRICANTS

EN01F01ZZZ000101007001

No.	POSITION	LUBRICANTS	VISCOSITY RECOMMENDATIONS (SAE)
1	Cylinder block	Engine oil (JASO: DH-2) (API: CJ-4) (ACEA: E-6, E-9)	
2	Transmission: A465 Automatic Transmission	Toyota genuine ATF Type T-IV (ATF: JWS3309)	
3	Differential: SH13	HINO GENUINE SERIES Differential gear oil for Hypoid gear (API: GL-5)	

No.	POSITIONS	LUBRICANTS
4	Integral power steering gear	HINO GENUINE SERIES Power steering fluid or ATF DEXRON
5	Brake	HINO GENUINE SERIES Brake and clutch fluid or Brake fluid (DOT-3)
6	Wheel bearing Propeller shaft	HINO GENUINE SERIES Bearing grease or Bearing grease (NLGI No.2 LITHIUM-SOAP)
7	Front and rear suspension spring bracket pins and shackle pins	HINO GENUINE SERIES Multipurpose grease (NLGI No.2 LITHIUM-SOAP)
8	Chassis grease fitting	HINO GENUINE SERIES Chassis grease or Chassis grease (MIL-G-17740)
9	Engine, Radiator	HINO GENUINE SERIES Long life coolant (NILGI No.1 CALCIUM or LITHIUM-SOAP)

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STANDARD VALUE (J05E)

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MOUNTING AND DISMOUNTING THE ENGINE

ENGINE ASSEMBLY

EN01F02127010701001001

STANDARD VALUE, LIMIT AND ACTION

Inspection item		Standard value	Permissible limit	Action
Compression pressure (Per cylinder: Engine revolution 190 r/min)		3.0 MPa {31 kgf/cm^2, 435 lbf/in.^{2}}	2.7 MPa {28 kgf/cm^2, 392 lbf/in.^{2}}	Overhaul
Valve clearance (when cold)	Intake	0.30 mm {0.012 in.}	–	Adjustment
	Exhaust	0.45 mm {0.018 in.}		

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Rocker arm lock nut	25 {255, 18}	
Crosshead lock nut	25 {255, 18}	
Oil pan drain plug	41 {418, 30}	
Engine hanger mounting bolt (front)	125 {1,275, 92}	
Engine hanger mounting bolt (rear)	85 {867, 63}	
Engine mounting nut	96-144 {979-1,468, 71-106}	
Cab mounting bracket bolt	38.4-57.9 {392-587, 29-42}	
Engine side cover bolt	11.5 {117, 8}	

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ENGINE CONTROL

ENGINE ECU

EN01F02127010701002001

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Engine ECU mounting bolt	28.5 {290, 21}	

ENGINE SPEED MAIN SENSOR

EN01F02127010701002002

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Engine speed main sensor mounting bolt	10 {102, 7}	

ENGINE SPEED SUB SENSOR

EN01F02127010701002003

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Engine speed sub sensor mounting bolt	4-6 {41-61, 3.0-4.4}	

IDLE SET VOLUME

EN01F02127010701002004

STANDARD VALUE, LIMIT AND ACTION

Inspection item	Standard value	Action
Resistance between terminals	1,180-1,620 Ω	Replace

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ACCELERATOR PEDAL

EN01F02127010701002005

STANDARD VALUE, LIMIT AND ACTION

Inspection item		Standard value	Action
Accelerator sensor 1 output voltage	Accelerator fully-closed	0.6-1.0 V	Replace
	Accelerator fully open	2.8-3.6 V	Replace
Accelerator sensor 2 output voltage	Accelerator fully-closed	1.4-1.8 V	Replace
	Accelerator fully open	3.6-4.4 V	Replace

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Accelerator pedal assembly mounting nut	5.5 {56, 4}	

BLOCK HEATER

EN01F02127010701002006

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Block heater socket mounting bolt	1.4-1.7 {14-17, 1.0-1.3}	

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FUEL SYSTEM

FUEL TANK

EN01F02127010701003001

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Fuel tank drain plug	24.5-34.3 {250-349, 19-26}	
Fuel tank bracket mounting bolt	96-144 {979-1,468, 71-106}	For 30 gallon
Fuel tank band	10.2-15.0 {105-152, 8-11}	For 33 gallon

FUEL SENDER GAUGE

EN01F02127010701003002

STANDARD VALUE, LIMIT AND ACTION

Inspection item			Standard value	Action
Resistance between terminals	Float height	E	107.5-112.5 Ω	Replace
		F	3-5 Ω	Replace

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Fuel sender gauge mounting bolt	1.5-2.5 {16-25, 1.2-1.8}	

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ENGINE-SIDE FUEL FILTER & CASE

EN01F02127010701003003

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part		Tightening torque	Remarks
Fuel filter drain plug		5-9 {51-91, 3.7-6.6}	
Fuel filter air bleeding plug		5-9 {51-91, 3.7-6.6}	
Fuel filter center bolt		23.1-32.9 {236-335, 18-24}	
Fuel filter mounting bolt		55 {561, 41}	
Fuel feed pipe No.3 mounting union bolt	Fuel filter side	30 {306, 22}	
	Supply pump side	14.8-19.6 {151-199, 11-14}	
	Fuel shutoff valve side	19.6 {200, 14}	
Fuel feed pipe No.1 mounting union bolt	Supply pump side	25 {255, 18}	
	Fuel filter side	30 {306, 22}	
Fuel feed pipe No.2 mounting union bolt	Supply pump side	25 {255, 18}	
	Fuel filter side	30 {306, 22}	
Return pipe No.2 mounting union bolt	Fuel filter side	30 {306, 22}	
	Intake manifold side	24.5 {250, 18}	

WATER LEVEL WARNING SWITCH

EN01F02127010701003004

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Fuel filter drain plug	5-9 {51-91, 3.7-6.6}	
Water level warning switch	2-3 {21-30, 1.5-2.2}	

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SUPPLY PUMP

EN01F02127010701003005

STANDARD VALUE, LIMIT AND ACTION

Inspection item		Standard value	Action
Resistance between terminals of suction control valve	20°C {68°F}	1.6-2.6 Ω	Replace
Resistance between terminals of combustion temperature sensor	–20°C {–4°F}	13.84-16.33 kΩ	Replace
	20°C {68°F}	2.32-2.59 kΩ	Replace
	80°C {176°F}	0.310-0.326 kΩ	Replace
	110°C {230°F}	0.1399-0.1435 kΩ	Replace

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Fuel filter drain plug	5-9 {51-91, 3.7-6.6}	
Bearing holder case mounting bolt	28.5 {291, 21}	
Coupling flange mounting nut	64 {653, 47}	
Coupling and supply pump mounting bolts	28.5 {291, 21}	
Pressure feed pipe	44 {449, 32}	

INJECTOR

EN01F02127010701003006

STANDARD VALUE, LIMIT AND ACTION

Inspection item	Standard value	Action
Insulation resistance of injector (Between one side of terminal and upper body of injector)	10 MΩ or more (at room temperature)	Replace
Resistance value between injector terminals	0.37-0.57 Ω (at 20°C {68°F})	Replace

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Injector clamp mounting bolt	25 {255, 18}	
Injection pipe	44 {449, 32}	Refer to this document.

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COMMON RAIL

EN01F02127010701003007

STANDARD VALUE, LIMIT AND ACTION

Inspection item		Standard value (At 20 °C {68 °F})	Action
Resistance between terminals of common rail pressure sensor	1↔2	1.05-3.55 kΩ	Replace
	5↔6		Replace
	2↔3	6.7-18.7 kΩ	Replace
	4↔5		Replace

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part		Tightening torque	Remarks
Common rail mounting bolt		28.5 {291, 21}	
Injection pipe		44 {449, 32}	Refer to this document.
Return pipe No.1	Pressure limiter side	20 {204, 15}	
	Cluster connector side	20 {204, 15}	
	Cylinder head side	13 {133, 10}	

VEHICLE-SIDE FUEL FILTER

EN01F02127010701003008

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Vehicle-side fuel filter mounting bolts	17.5 {178, 13}	

FUEL COOLER

EN01F02127010701003009

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Fuel cooler mounting bolts	25 {255, 18}	

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EMISSION CONTROL

EGR VALVE & COOLER

EN01F02127010701004001

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
EGR cooler mounting bolt	68.5 {699, 51}	
Bracket mounting bolt	28.5 {291, 21}	
EGR pipe mounting bolt	55 {561, 41}	
Bracket mounting bolt and nut	28.5 {291, 21}	

CLOSED VENTILATOR

EN01F02127010701004002

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Closed ventilator mounting bolt	31 {316, 23}	
Ventilator hose A mounting bolt	31 {316, 23}	

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INTAKE

INTAKE MANIFOLD

EN01F02127010701005001

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Intake manifold mounting bolt and nut	28.5 {291, 21}	

DIESEL THROTTLE

EN01F02127010701005002

TIGHTENING TORQUE

Unit: N·m {kgf·cm lbf·ft}

Tightening part	Tightening torque	Remarks
Diesel throttle mounting bolt and nut	28.5 {291, 21}	

INTAKE PIPE (EXHAUST SIDE)

EN01F02127010701005003

TIGHTENING TORQUE

Unit: N·m {kgf·cm lbf·ft}

Tightening part	Tightening torque	Remarks
Primary intake pipe mounting clamp	6.25 {64, 4.6}	Turbocharger side
	2.4-5.0 {25-50, 1.8-3.6}	Air cleaner side
Secondary intake pipe mounting bolt	28.5 {291, 21}	

STACK DUCT

EN01F02127010701005004

TIGHTENING TORQUE

Unit: N·m {kgf·cm lbf·ft}

Tightening part	Tightening torque	Remarks
Duct to bracket mounting bolt	19.5 {199, 14}	
Duct to cab mounting bolt	19.5 {199, 14}	
Stack duct mounting clamp	2.4-5.0 {25-50, 1.8-3.6}	
Stack duct mounting nut	13 {133, 10}	

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AIR CLEANER

EN01F02127010701005005

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Air cleaner housing mounting nut	19.5 {199, 14}	
Intake hose clamp	2.4-5.0 {25-50, 1.8-3.6}	

INTAKE TEMPERATURE SENSOR

EN01F02127010701005006

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Intake temperature sensor	19.6 {200, 14}	

BOOST PRESSURE SENSOR

EN01F02127010701005007

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Boost pressure sensor mounting bolt	5 {51, 3.7}	

AIR FLOW SENSOR

EN01F02127010701005008

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Air flow sensor mounting screw	0.56-0.82 {5.8-8.3, 0.42-0.60}	

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ENGINE MECHANICAL

HEAD COVER

EN01F02127010701006001

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Head cover mounting bolt	28.5 {291, 21}	

ROCKER ARM ASSEMBLY

EN01F02127010701006002

STANDARD VALUE, LIMIT AND ACTION

Unit: mm {in.}

Inspection item		Standard value	Permissible limit	Action
Rocker arm shaft outer diameter		22 {0.866}	21.92 {0.863}	Replace
Rocker arm bushing inner diameter		22 {0.866}	22.08 {0.869}	Replace
Oil clearance between rocker arm shaft outer diameter and rocker arm bushing inner diameter		0.030-0.101 {0.0012-0.0040}	0.15 {0.0059}	Replace
Valve clearance	Intake	0.30 {0.0118}	–	Adjustment
	Exhaust	0.45 {0.0177}	–	Adjustment

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Rocker arm support mounting bolt	36 {367, 27}	Refer to this document.
Rocker arm adjust screw lock nut	25 {255, 18}	
Crosshead lock nut	25 {255, 18}	

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CAMSHAFT ASSEMBLY

EN01F02127010701006003

STANDARD VALUE, LIMIT AND ACTION

Unit: mm {in.}

Inspection item		Standard value	Permissible limit	Action
Cam height	Intake	50.067 {1.971}	49.987 {1.968}	Replace
	Exhaust	52.104 {2.051}	52.024 {2.048}	Replace
Cam lift	Intake	8.067 {0.318}	(7.987 {0.3144})	Replace
	Exhaust	10.104 {0.398}	(10.024 {0.395})	Replace
Outer diameter of camshaft journal		40 {1.575}	39.85 {1.569}	Replace
Inner diameter of camshaft bearing		40 {1.575}	40.15 {1.581}	Replace
Camshaft bearing oil clearance		0.020-0.063 {0.0008-0.0025}	–	Replace
Runout of camshaft		0.04 {0.0016}	0.1 {0.0039}	Replace
Under head length of camshaft gear mounting bolt		30.0 {1.181}	30.5 {1.201}	Replace

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Camshaft gear mounting bolt	59 {602, 44} + 90°	Refer to this document.
Mounting bolt of camshaft bearing cap	36 {367, 27}	

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CYLINDER HEAD ASSEMBLY

EN01F02127010701006004

STANDARD VALUE, LIMIT AND ACTION

Unit: mm {in.}

Inspection item		Standard value	Permissible limit	Action
Head bolt under head length (M12)		126.0 {4.961}	126.5 {4.980}	Replace
		156.0 {6.142}	156.5 {6.161}	Replace
		187.0 {7.362}	187.5 {7.382}	Replace
Strain of the bottom surface of the cylinder head	Longitudinal direction	0.06 {0.0024}	0.20 {0.0079}	Replace
	Right angle direction	0.03 {0.0012}	0.20 {0.0079}	Replace

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Cylinder head mounting head bolt (M12)	59 {602, 44}	Refer to this document.
Cylinder head mounting head bolt (M10)	59 {602, 44}	Refer to this document.

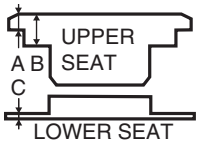
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VALVE SYSTEM

EN01F02127010701006005

STANDARD VALUE, LIMIT AND ACTION

Unit: mm {in.}

Inspection item			Standard value	Permissible limit	Action
Valve sink		Intake	0.55-0.85 {0.0217-0.0335}	1.1 {0.0433}	Replace
		Exhaust	1.15-1.45 {0.0452-0.0571}	1.7 {0.0669}	Replace
Valve seat		Intake	30°	30°-30°35'	Correction
		Exhaust	45°	45°-45°30'	Correction
Valve face		Intake	30°	29°30'-30°	Correction
		Exhaust	45°	44°30'-45°	Correction
Valve spring seat thickness 		A	3.2 {0.1260}	If the wear of A or B added to the wear of C exceeds 1 mm {0.0393 in.}.	Replace
		B	5.5 {0.2165}		
		C	1.0 {0.0393}		
Squareness of valve spring		Inner	–	2.0 {0.0787}	Replace
		Outer	–	2.0 {0.0787}	Replace
Valve spring [Referential values in brackets ( )]	Inner	Set length	44.8 {1.764}	–	Replace
		Set load	128.5 N {13.1 kgf}	118.2 N {12 kgf}	Replace
		Free length	(64.6 {2.543})	61.6 {2.425}	Replace
	Outer	Set length	46.8 {1.843}	–	Replace
		Set load	313.8 N {32 kgf}	288.7 N {29.4 kgf}	Replace
		Free length	(75.7 {2.980})	72.7 {2.862}	Replace
Valve stem outer diameter		Intake	7 {0.276}	–	
		Exhaust	7 {0.276}	–	
Valve guide inner diameter		Intake	7 {0.276}	–	
		Exhaust	7 {0.276}	–	
Oil clearance of valve stem and valve guide		Intake	0.023-0.058 {0.0009-0.0023}	–	Replace
		Exhaust	0.050-0.083 {0.0020-0.0033}	–	Replace
Dimension of tapping in the valve stem seal			22.5-23.0 {0.886-0.906}	–	Adjustment

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CRANKSHAFT PULLEY

EN01F02127010701006006

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Crankshaft pulley mounting bolt	118 {1,203, 87}	

FRONT OIL SEAL RETAINER

EN01F02127010701006007

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Front oil seal retainer mounting bolt	30 {306, 22}	

FLYWHEEL ASSEMBLY

EN01F02127010701006008

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Flywheel assembly mounting bolt	186 {1,897, 137}	Refer to this document.

FLYWHEEL HOUSING

EN01F02127010701006009

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part		Tightening torque	Remarks
Flywheel housing mounting bolt	M8	28.5 {291, 21}	
	M10	55 {561, 41}	
	M16	196 {1,999, 145}	
Housing stay mounting bolt	M12	97 {989, 72}	
	M14	171.5 {1,749, 126}	

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TIMING GEAR & CAM IDLE GEAR

EN01F02127010701006010

STANDARD VALUE, LIMIT AND ACTION

Unit: mm {in.}

Inspection item		Standard value	Permissible limit	Action
Main idle gear	Shaft outer diameter	57 {2.244}	–	
	Bushing inner diameter	57 {2.244}	–	
Sub idle gear	Shaft outer diameter	50 {1.969}	–	
	Bushing inner diameter	50 {1.969}	–	
Cam idle gear	Shaft outer diameter	34 {1.339}	–	
	Bushing inner diameter	34 {1.339}	–	
Idle gear oil clearance	Main idle gear	0.030-0.090 {0.0012-0.0035}	0.20 {0.0079}	Replace
	Sub idle gear	0.025-0.075 {0.0010-0.0030}	0.20 {0.0079}	Replace
	Cam idle gear	0.025-0.075 {0.0010-0.0030}	0.20 {0.0079}	Replace
Injection pump drive idle gear	Shaft outer diameter	34 {1.339}	–	
	Bushing inner diameter	34 {1.339}	–	
	Oil clearance	0.025-0.057 {0.0010-0.0022}	0.10 {0.0039}	Replace
Camshaft end play		0.100-0178 {0.0039-0.0070}	–	Replace
Idle gear backlash	Between camshaft drive gear and cam idle gear	0.084-0.175 {0.0033-0.0069}	0.30 {0.0118}	Replace
	Between main idle gear and injection pump drive idle gear	0.030-0.218 {0.0012-0.0086}	0.30 {0.0118}	Replace
	Between main idle gear and sub idle gear	0.030-0.162 {0.0012-0.0064}	0.30 {0.0118}	Replace
	Between sub idle gear and oil pump drive gear	0.030-0.131 {0.0012-0.0052}	0.30 {0.0118}	Replace
	Between cam idle gear and sub idle gear	0.084 -0.235 {0.0033-0.0093}	0.30 {0.0118}	Replace
Idle gear end play	Main idle gear	0.114-0.160 {0.0045-0.0063}	0.30 {0.0118}	Replace
	Sub idle gear	0.040-0.120 {0.0016-0.0047}	0.30 {0.0118}	Replace
	Cam idle gear	0.040-0.120 {0.0016-0.0047}	0.30 {0.0118}	Replace

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TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Sub idle gear shaft mounting bolt	108 {1,101, 80}	
Main idle gear shaft mounting bolt	172 {1,754, 127}	
Injection pump drive idle gear shaft mounting bolt	108 {1,101, 80}	
Bearing case assembly mounting bolt	28.5 {291, 21}	

PISTON & CONNECTING ROD

EN01F02127010701006011

STANDARD VALUE, LIMIT AND ACTION

Unit: mm {in.}

Inspection item		Standard value	Permissible limit	Action
Cylinder liner inner diameter		112 {4.409}	112.15 {4.415}	
Piston outer diameter (17mm in axial direction to the upper pin from the lower end of the skirt)		111.927-111.943 {4.406-4.407}	–	
Clearance between cylinder liner inner diameter and piston outer diameter		0.053-0.077 {0.0021-0.0030}	–	Replace
Piston ring thickness	Top	2.999 {0.1181}	2.899 {0.1141}	Replace
	Second	2.0 {0.0787}	1.9 {0.0748}	Replace
	Oil	4.0 {0.1575}	3.9 {0.1535}	Replace
Piston ring groove width	Top	Taper	–	Replace
	Second	2.0 {0.0787}	2.2 {0.0866}	Replace
	Oil	4.0 {0.1575}	4.1 {0.1614}	Replace
Piston ring closed gap clearance	Top	0.30-0.40 {0.0118-0.0157}	1.5 {0.0590}	Replace
	Second	0.75-0.90 {0.0295-0.0354}	1.5 {0.0590}	Replace
	Oil	0.15-0.30 {0.0059-0.0118}	1.2 {0.0472}	Replace
Outer diameter of contact surface between piston pin and piston boss		37 {1.457}	36.96 {1.455}	Replace
Piston boss inner diameter		37 {1.457}	37.05 {1.459}	Replace
Clearance between outer diameter of contact surface between piston pin and piston boss and piston boss inner diameter		0.011-0.032 {0.0004-0.0013}	0.05 {0.0020}	Replace
Outer diameter of piston center		37 {1.457}	36.96 {1.455}	Replace
Inner diameter of connecting rod bush		37 {1.457}	37.1 {1.461}	Replace
Clearance between outer diameter of piston center and inner diameter of connecting rod bush		0.035-0.056 {0.0014-0.0022}	0.08 {0.0032}	Replace

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Inspection item	Standard value	Permissible limit	Action
Crankshaft crank pin outer diameter	65 {2.560}	64.3 {2.531}	Replace (Note)
Oil clearance between crankshaft crank pin and connecting rod bearing	0.031-0.082 {0.0012-0.0032}	0.2 {0.0079}	Replace
Under head length of connecting rod bolt	67.0 {2.638}	68.0 {2.677}	Replace
Connecting rod end play	0.20-0.52 {0.0079-0.0205}	1.0 {0.0394}	

(Note) Readjust by grinding for uneven wear 0.1 mm {0.0039 in.} or more, regrind for wear 0.2 mm {0.0079 in.} or more, and replace the crankshaft for wear 0.7 mm {0.0276 in.} or more.

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Connecting rod bolt	69 {704, 51} + 90° + 45°	Refer to this document.

CRANKSHAFT

EN01F02127010701006012

STANDARD VALUE, LIMIT AND ACTION

Unit: mm {in.}

Inspection item	Standard value	Repair limit	Permissible limit	Action
Crankshaft end play	0.050-0.270 {0.0020-0.0106}	0.500 {0.0197}	1.270 {0.05}	Replace
Rotational runout of crankshaft	0-0.1 {0-0.0039}	0.15 {0.0059}	–	Replace
Outer diameter of crankshaft journal	80.0 {3.150}	–	79.3 {3.122}	Replace (Note)
Width of crankshaft center journal	36.0 {1.417}	–	37.0 {1.457}	Replace
Oil clearance between crankshaft journal outer diameter and crankshaft bearing inner diameter	0.051-0.102 {0.0020-0.0040}	0.2 {0.0079}	–	Replace
Crankshaft crank pin outer diameter	65.0 {2.560}	–	64.3 {2.531}	Replace (Note)
Under head length of main bearing cap bolt	106.8 {4.205}	–	108.0 {4.252}	Replace

(Note) Readjust by grinding for uneven wear 0.1 mm {0.0039 in.} or more, regrind for wear 0.2 mm {0.0079 in.} or more, and replace the crankshaft for wear 0.7 mm {0.0276 in.} or more.

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TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Bearing cap bolt	69 {704, 51} + 90° + 45°	Refer to this document.

CYLINDER LINER

EN01F02127010701006013

STANDARD VALUE, LIMIT AND ACTION

Unit: mm {in.}

Inspection item	Standard value	Action
Cylinder liner collar projection	0.01-0.08 {0.0004-0.0032}	

CYLINDER BLOCK

EN01F02127010701006014

STANDARD VALUE, LIMIT AND ACTION

Unit: mm {in.}

Inspection item	Standard value	Repair limit	Permissible limit	Action
Strain of upper surface of cylinder block	0.05 {0.0020}	–	0.20 {0.0079}	Replace

Tightening torque

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Cooling jet mounting bolt	22 {224, 16}	

ENGINE MOUNTING AND BRACKET

EN01F02127010701006015

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Rear engine mounting bracket mounting bolt	103 {1,050, 76}	
Rear engine mounting nut	64 {653, 47}	
Front engine mounting bracket mounting bolt	125 {1,275, 92}	
Front engine mounting nut	98 {999, 72}	

GLOW PLUG

EN01F02127010701006016

STANDARD VALUE, LIMIT AND ACTION

Inspection item	Standard value	Action
Resistance between body and terminal	0.55-0.75 Ω (at 20°C {68°F})	Replace

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TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Glow plug	20-25 {204-254, 15-18}	
Glow plug wire mounting nut	1.0-1.5 {11-15, 0.8-1.1}	

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EXHAUST

EXHAUST MANIFOLD

EN01F02127010701007001

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Stud bolt	30 {305, 22.1}	
Exhaust manifold mounting nut	29 {600, 43.5}	

EXHAUST PIPE

EN01F02127010701007002

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Exhaust-pipe (ATC) -to-front-exhaust-pipe mounting bolt	43 {438, 31.7}	
Front-exhaust-pipe-to-muffler mounting bolt and nut	64 {653, 47.2}	
Muffler mounting nut	82 {836, 60.5}	
Water pipe mounting nut	31 {316, 22.9}	
DEF Injector mounting nut	6-10 {61-102, 4.4-7.4}	
Hose protector mounting bolt	43-59 {438-602, 31.7-43.5}	

EXHAUST PIPE (ATC)

EN01F02127010701007003

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Bracket mounting bolt	55 {560, 40.6}	
Turbo-charger-assembly-to-exhaust-pipe (ATC) mounting nut	70 {714, 51.6}	
Clamp mounting bolt	25.4 {259, 18.7}	

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DEF-SCR

EN01F02127010701007004

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Central-pipe-No.2-to-DEF-SCR mounting bolt and nut	20-30 {204-306, 14.7-22.1}	
DEF-SCR-to-tail-pipe mounting bolt and nut	20-30 {204-306, 14.7-22.1}	
DEF-SCR-to-support-bracket mounting bolt and nut	43-59 {438-602, 438-602}	
Exhaust pipe protector mounting bolt	31 {316, 22.9}	

DPR CLEANER

EN01F02127010701007005

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Central-pipe-No.1-to-DPR-cleaner mounting bolt and nut	20-30 {204-306, 14.7-22.1}	
DPR-cleaner-to-support-bracket mounting bolt and nut	43-59 {438-602, 438-602}	
Differential pressure pipe	30-36 {306-367, 22.1-26.5}	
Clip mounting nut	31 {316, 22.9}	

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FUEL ADDITION VALVE

EN01F02127010701007006

STANDARD VALUE, LIMIT AND ACTION

Inspection item		Standard value	Action
Insulation resistance between the fuel addition valve upper body and connector (part side).		10 MΩ or more (Using the 500 V megohmmeter)	Replace
Resistance between terminals	20°C {68°F}	7.5±0.4kΩ	Replace

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Folder mounting nut	36 {367, 26.5}	
Nozzle clamp mounting bolt	28.5 {290, 21.0}	
Fuel delivery mounting bolt	28.5 {290, 21.0}	
Coolant pipe E mounting union bolt	24.5 {250, 18.1}	
Coolant pipe D mounting union bolt	24.5 {250, 18.1}	
Fuel feed pipe No. 5 mounting union bolt	19.6 {200, 14.5}	
Fuel pressure sensor	19.6 {200, 14.5}	

FUEL CUTOFF VALVE

EN01F02127010701007007

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Fuel cutoff valve mounting bolt	28.5 {290, 21.0}	
Fuel feed pipe No. 3 mounting union bolt	19.6 {200, 14.5}	
Fuel feed pipe No. 5 mounting union bolt	19.6 {200, 14.5}	

DEF PUMP

EN01F02127010701007008

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Filter cover	5-25 {153-255, 11.1-18.4}	
Backflow connector	4-5 {41-51, 2.9-3.7}	
Outlet connector	4-5 {41-51, 2.9-3.7}	
Inlet connector	4-5 {41-51, 2.9-3.7}	
Coolant connector	5-6 {51-61, 3.7-4.4}	
DEF pump mounting bolt	15.2-22.8 {155-232, 11.2-16.8}	

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DEF INJECTOR

EN01F02127010701007009

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Coolant connector	5-6 {51-61, 3.7-4.4}	
DEF Injector mounting nut	6-10 {61-102, 4.4-7.4}	
Hose protector mounting nut	31 {316, 22.9}	

DEF TANK

EN01F02127010701007010

STANDARD VALUE, LIMIT AND ACTION

Inspection item	Concentration	Standard value	Action
DEF analyzer	32.5%	32.5%	Replace
pH test paper	32.5%	number 9	Replace
Refractive index measurement	32.5%	1.3817-1.384%	Replace

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Tank band mounting nut	23.5-36.5 {240-372, 17.3-26.9}	
DEF tank assembly mounting nut	38.4-57.6 {392-587, 28.3-42.5}	

COOLANT CUTOFF VALVE

EN01F02127010701007011

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Harness bracket mounting bolt	31 {316, 22.9}	
Water valve bracket mounting bolt	31 {316, 22.9}	
Coolant cutoff valve mounting bolt	31 {316, 22.9}	

DCU

EN01F02127010701007012

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
DCU mounting nut	10 {102, 7.4}	
DCU bracket mounting nut	22 {224, 16.2}	

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DPR DIFFERENTIAL PRESSURE SENSOR

EN01F02127010701007013

STANDARD VALUE, LIMIT AND ACTION

Inspection item		Standard value	Action
Resistance between terminals	A↔B	15 kΩ	Replace
	B↔C	15 kΩ	Replace

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
DPR differential pressure sensor mounting nut	31 {316, 22.9}	

SCR UPSTREAM NOx SENSOR

EN01F02127010701007014

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
SCR upstream NOx sensor	40-60 {408-612, 29.5-44.2}	
Clip mounting nut	31 {316, 22.9}	
SCR upstream NOx controller mounting nut	5.5 {56, 4.1}	

SCR DOWNSTREAM NOx SENSOR

EN01F02127010701007015

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
SCR downstream NOx sensor	40-60 {408-612, 29.5-44.2}	
SCR downstream NOx controller mounting nut	5.5 {56, 4.1}	

ATC DOWNSTREAM TEMPERATURE SENSOR

EN01F02127010701007016

STANDARD VALUE, LIMIT AND ACTION

Inspection item		Standard value	Action
Resistance between terminals	50 °C {122 °F}	8.0-17.2 kΩ	Replace

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
ATC downstream temperature sensor	25-35 {255-357, 18.4-25.8}	

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DOC UPSTREAM TEMPERATURE SENSOR

EN01F02127010701007017

STANDARD VALUE, LIMIT AND ACTION

Inspection item		Standard value	Action
Resistance between terminals	50 °C {122 °F}	8.0-17.2 kΩ	Replace

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
DOC upstream temperature sensor	25-35 {255-357, 18.4-25.8}	

DPR UPSTREAM TEMPERATURE SENSOR

EN01F02127010701007018

STANDARD VALUE, LIMIT AND ACTION

Inspection item		Standard value	Action
Resistance between terminals	50 °C {122 °F}	8.0-17.2 kΩ	Replace

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
DPR upstream temperature sensor	25-35 {255-357, 18.4-25.8}	

DPR DOWNSTREAM TEMPERATURE SENSOR

EN01F02127010701007019

STANDARD VALUE, LIMIT AND ACTION

Inspection item		Standard value	Action
Resistance between terminals	50 °C {122 °F}	8.0-17.2 kΩ	Replace

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
DPR downstream temperature sensor	25-35 {255-357, 18.4-25.8}	

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SCR UPSTREAM TEMPERATURE SENSOR

EN01F02127010701007020

STANDARD VALUE, LIMIT AND ACTION

Inspection item		Standard value	Action
Resistance between terminals	50 °C {122 °F}	235-244 Ω	Replace

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
SCR upstream temperature sensor	32.5 {331, 24.0}	

EXHAUST BRAKE

EN01F02127010701007021

STANDARD VALUE, LIMIT AND ACTION

Unit: mm {in.}

Inspection item	Minimum clearance	Valve clearance	Standard value	Action
Clearance between valve and body	0.2 {0.0079}	0.2-0.3 {0.0079-0.0118}	—	
Angle between valve and body	—	—	90°	

EXHAUST BRAKE MAGNETIC VALVE

EN01F02127010701007022

STANDARD VALUE, LIMIT AND ACTION

Inspection item		Standard value	Action
Resistance between terminals	20 °C {68 °F}	10.9-16.9 Ω	Replace

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Exhaust magnetic valve mounting bolt	31 {316, 22.9}	

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COOLING

RADIATOR

EN01F02127010701008001

STANDARD VALUE, LIMIT AND ACTION

Unit: kPa {kgf/cm^2, lbf/in^2}

Inspection item	Injection Pressure	Injection Distance	Action
Check for blockage	2,942-4,903 {30-50, 427-711}	300mm {11.811 in.}	Replace
	4,903-7,845 {50-80, 711-1,138}	500mm {19.685 in.}	Replace

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Radiator to radiator mounting bracket mounting bolt	19.5 {199, 14}	
Heater pipe mounting bolt	21.7-40.3 {222-410, 17-29}	
Reserve pipe mounting bolt	19.5 {199, 14}	

RADIATOR CAP

EN01F02127010701008002

STANDARD VALUE, LIMIT AND ACTION

Unit: kPa {kgf/cm^2, lbf/in^2}

Inspection item	Standard value	Action
Radiator cap opening relief valve pressure	93.1-122.9 {0.95-1.25, 13.5-17.8}	Replace
Radiator cap opening relief valve pressure limit value	79 {0.8, 11.4}	Replace

RESERVE TANK

EN01F02127010701008003

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Reserve tank mounting bolt	3.5-6.5 {36-66, 2.6-4.7}	

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INTERCOOLER

EN01F02127010701008004

STANDARD VALUE, LIMIT AND ACTION

Unit: kPa {kgf/cm^2, lbf/in^2}

Inspection item	Injection Pressure	Injection Distance	Action
Check for blockage	2,942-4,903 {30-50, 427-711}	300mm {11.811 in.}	Replace
	4,903-7,845 {50-80, 711-1,138}	500mm {19.685 in.}	Replace

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Radiator to intercooler mounting bolt	14-20 {143-203, 11-14}	
Clamp mounting bolt	6.25 {64, 4.6}	

THERMOSTAT CASE & THERMOSTAT

EN01F02127010701008005

STANDARD VALUE, LIMIT AND ACTION

Inspection item		Standard value	Action
Thermostat injection valve opening temperature		76.5°C {169.7°F}	Replace
Thermostat valve lift amount	90°C {194°F}	10 mm {0.393 in.} or more	Replace

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Thermostat case mounting bolt	28.5 {291, 21}	
Water outlet pipe mounting bolt	28.5 {291, 21}	
Between thermostat case and coolant pipe A mounting bolt	28.5 {291, 21}	
Between coolant pipe A and bracket mounting bolt	28.5 {291, 21}	
Heater pipe mounting bolt	28.5 {291, 21}	
Between coolant pipe F and thermostat mounting nut	24.5 {250, 18}	

COOLANT PUMP

EN01F02127010701008006

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Coolant pump mounting bolt	28.5 {291, 21}	

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COOLING FAN & FAN CLUTCH

EN01F02127010701008007

STANDARD VALUE, LIMIT AND ACTION

Inspection item	Standard value	Action
Cooling fan chip clearance	4-7 mm {0.157-0.276 in.}	Adjustment

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Cooling fan to fan clutch mounting bolt	11 {112, 8}	
Fan clutch to coolant pump pulley mounting nut	28.5 {291, 21}	
Bracket mounting nut	28.5 {291, 21}	
Bracket to fan shroud ring mounting bolt	31 {316, 23}	

COOLANT TEMPERATURE SENSOR

EN01F02127010701008008

STANDARD VALUE, LIMIT AND ACTION

Inspection item			Standard value	Action
Resistance between terminals	A - C	–20°C {–4°F}	13.84-16.33 kΩ	Replace
		20°C {68°F}	2.32-2.59 kΩ	Replace
		80°C {176°F}	0.310-0.326 kΩ	Replace
		110°C {230°F}	0.1399-0.1435 kΩ	Replace

Tightening torque

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Coolant temperature sensor	27.0-31.9 {276-325, 20-23}	

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LUBRICATION

OIL COOLER

EN01F02127010701009001

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Oil pressure switch	24.5 {250, 18}	
Plug (safety valve)	24.5-34.3 {250-349, 19-25}	
Oil cooler element mounting nut	19.6-29.4 {200-299, 15-21}	
Oil cooler assembly mounting bolt	28.5 {291, 21}	

OIL PUMP

EN01F02127010701009002

STANDARD VALUE, LIMIT AND ACTION

Unit: mm {in.}

Inspection item	Standard value	Permissible limit	Action
Width of drive gear	28.5 {1.122}	–	Replace
Depth of cylinder block side pump housing	28.5 {1.122}	–	Replace
Difference between width of drive gear and depth of cylinder block side pump housing	0.047-0.150 {0.0019-0.0060}	0.15 {0.0060}	Replace
Outer diameter of drive gear shaft	18.0 {0.709}	–	Replace
Inner diameter of cylinder block side bush	18.0 {0.709}	–	Replace
Difference between drive gear shaft outer diameter and cylinder block side bush inner diameter	0.040-0.099 {0.0016-0.0039}	–	Replace
Drive gear outer diameter	54.0 {2.126}	–	Replace
Inner diameter of cylinder block side pump housing	54.0 {2.126}	–	Replace
Difference between drive gear outer diameter and cylinder block pump housing inner diameter	0.093-0.252 {0.0037-0.0099}	0.30 {0.012}	Replace
Outer diameter of driven gear shaft	18.0 {0.709}	–	Replace
Inner diameter of driven gear bush	18.0 {0.709}	–	Replace
Difference between driven gear shaft outer diameter and driven gear bush inner diameter	0.040-0.083 {0.0016-0.0033}	0.15 {0.0060}	Replace
Outer diameter of driven gear shaft	18.0 {0.709}	–	Replace
Cylinder block side hole diameter	18.0 {0.709}	–	Replace
Difference between driven gear shaft outer diameter and cylinder block side hole diameter	0.030-0.075 {0.0012-0.0030}	–	Replace

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Inspection item	Standard value	Permissible limit	Action
Backlash between drive gear and driven gear	0.073-0.207 {0.0029-0.0082}	0.30 {0.012}	Replace
Backlash between oil pump drive gear and sub idle gear	0.030-0.131 {0.0012-0.0052}	0.30 {0.012}	Adjustment

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Oil pump mounting bolt	28.5 {291, 21}	

OIL PAN

EN01F02127010701009003

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Oil pan mounting bolt	30 {306, 22}	Refer to this document.

OIL STRAINER

EN01F02127010701009004

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Oil strainer mounting bolt	30 {306, 22}	

OIL PRESSURE SWITCH

EN01F02127010701009005

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Oil pressure switch	24.5 {250, 18}	

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STARTING/CHARGING

STARTER

EN01F02127010701012001

STANDARD VALUE, LIMIT AND ACTION

Inspection item	Standard value	Action
Perform no load performance test	220A or less	

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Starter mounting bolt and nut	154 {1,570, 113.5}	
C terminal mounting bolt	4.5 {46, 3.3}	
B terminal mounting nut	21 {214, 15.4}	
Harness clamp mounting bolt	18 {184, 13.2}	

V-BELT

EN01F02127010701012002

STANDARD VALUE, LIMIT AND ACTION

Unit: mm {in.}

Inspection item	Standard value	Action
V-belt (front) slack	8-10 {0.31-0.39}	

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Alternator mounting bolt and nut	55 {560, 40.5}	
Adjust bolt	6 {60, 4.4}	

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ALTERNATOR (130 A)

EN01F02127010701012003

STANDARD VALUE, LIMIT AND ACTION

Inspection item	Standard value	Action
Verifying the regulators regulated voltage	14.0-14.4V	

TIGHTENING TORQUE

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Bearing cover mounting screw	2.9-4.9 {30-50, 2.1-3.6}	
Pulley mounting nut	117.6-137.2 {1,199-1,399, 87-101}	
Field mounting screw	2.9-4.9 {30-50, 2.1-3.6}	
I terminal mounting nut	1.6-2.0 {16-20, 1.2-1.4}	
Rectifier mounting screw	2.9-4.9 {30-50, 2.1-3.6}	
Rectifier's(-) terminal mounting nut	2.9-4.9 {30-50, 2.1-3.6}	
B terminal mounting nut	7.8-10.8 {80-110, 5.8-7.9}	
Regulator mounting screws	2.9-4.9 {30-50, 2.1-3.6}	
Rectifier and field coil outlet terminal mounting screw	1.6-2.0 {16-20, 1.2-1.4}	
Through bolt	6.5-9.3 {66-95, 4.8-6.9}	
Stator outlet terminal mounting screw	1.9-2.5 {19-25, 1.4-1.8}	

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TURBOCHARGER

TURBOCHARGER ASSEMBLY

EN01F02127010701013001

STANDARD VALUE, LIMIT AND ACTION

Unit: mm {in.}

Inspection item		Permissible limit	Action
Turbocharger assembly	Play in axle (thrust) direction	0.040-0.085 {0.0016-0.0033} or less	Replace
Inspecting the boost pressure		22.1 kPa {0.23 kgf/cm^2, 3.2 lbf·ft/in.^{2}}	Replace

Tightening torque

Unit: N·m {kgf·cm, lbf·ft}

Tightening part	Tightening torque	Remarks
Turbocharger mounting nut	70 {714, 52}	

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REQUIRED ITEMS (J05E)

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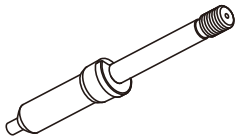
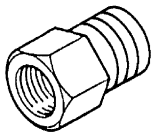
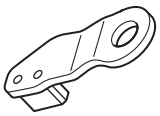
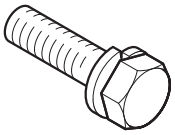
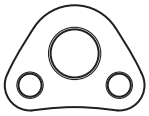
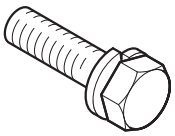
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MOUNTING AND DISMOUNTING THE ENGINE

ENGINE ASSEMBLY

EN01F02127020702001001

SST

Shape	Part No.	Name	Remarks	
	S0955-21110	Compression gauge adapter	For inserting a nozzle	
	S0955-21030	Compression gauge adapter	For 3/4-16UNF thread size	Select according to the thread size of air gauge.
	S0955-21060	Compression gauge adapter	For W16 threads18 thread size	
	12081-E0090	Engine hanger	Mounting on the engine front side	
	SZ105-12024	Bolt	Mounting two pcs. on the engine front side	
	S1228-11901	Engine hanger	Mounting on the engine rear side	
	SH782-41230	Bolt	Mounting two pcs. on the engine rear side	
-	S0949-11010	Wire rope		

INSTRUMENTS

Name	Remarks
Thickness gauge	For measuring valve clearance

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ENGINE CONTROL

ENGINE ECU

EN01F02127020702002001

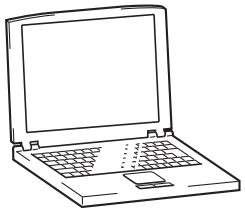
GREASE AND OTHERS

Name	Remarks
Misting	Used by putting water.

ENGINE MAIN REVOLUTION SENSOR

EN01F02127020702002002

SST

Shape	Part No.	Name	Remarks
	–	Computer (DOS/V standard)	• Operating system (OS): Windows2000, WindowsXP, WindowsVista*2, Windows7*2 • CPU and memory: To guarantee proper operations of the operating systems listed above. • Display: 800 x 600 pixel, 256 or more colors
–	09993-E9070*1 The main body and cables (for RS-232C and USB) Cable between vehicle and Hino-Bowie S0904-21220	Hino-Bowie (Interface box)	Computer interface
	Without Bluetooth® 95171-01020 With Bluetooth® 95171-01040	DENSO DST-i Set (without LCD)	
	Without Bluetooth® 95171-01030 With Bluetooth® 95171-01050	DENSO DST-i Set (with LCD)	

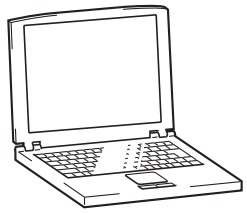
(*1):To use Hino-Bowie (the interface box) "09993-E9070", it is necessary to update the hardware. For details, see the Manual in the HINO-DX CD.
Also keep the firmware (Hino-Bowie internal software) updated by using the software in the HINO-DX CD. For details, see the Manual in the HINO-DX CD.
(*2): When use DST-i, after HINO-DX. (Ver. 3.0.5)

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ENGINE SUB REVOLUTION SENSOR

EN01F02127020702002003

SST

Shape	Part No.	Name	Remarks
	—	Computer (DOS/V standard)	• Operating system (OS): Windows2000, WindowsXP, WindowsVista*2, Windows7*2 • CPU and memory: To guarantee proper operations of the operating systems listed above. • Display: 800 x 600 pixel, 256 or more colors
—	09993-E9070*1 The main body and cables (for RS-232C and USB) Cable between vehicle and Hino-Bowie S0904-21220	Hino-Bowie (Interface box)	Computer interface
	Without Bluetooth® 95171-01020 With Bluetooth® 95171-01040	DENSO DST-i Set (without LCD)	
	Without Bluetooth® 95171-01030 With Bluetooth® 95171-01050	DENSO DST-i Set (with LCD)	

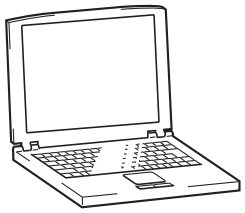
(*1):To use Hino-Bowie (the interface box) "09993-E9070", it is necessary to update the hardware. For details, see the Manual in the HINO-DX CD.
Also keep the firmware (Hino-Bowie internal software) updated by using the software in the HINO-DX CD. For details, see the Manual in the HINO-DX CD.
(*2): When use DST-i, after HINO-DX. (Ver. 3.0.5)

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ACCELERATOR PEDAL

EN01F02127020702002004

SST

Shape	Part No.	Name	Remarks
	—	Computer (DOS/V standard)	• Operating system (OS): Windows2000, WindowsXP, WindowsVista*2, Windows7*2 • CPU and memory: To guarantee proper operations of the operating systems listed above. • Display: 800 x 600 pixel, 256 or more colors
—	09993-E9070*1 The main body and cables (for RS-232C and USB) Cable between vehicle and Hino-Bowie S0904-21220	Hino-Bowie (Interface box)	Computer interface
	Without Bluetooth® 95171-01020 With Bluetooth® 95171-01040	DENSO DST-i Set (without LCD)	
	Without Bluetooth® 95171-01030 With Bluetooth® 95171-01050	DENSO DST-i Set (with LCD)	

(*1):To use Hino-Bowie (the interface box) "09993-E9070", it is necessary to update the hardware. For details, see the Manual in the HINO-DX CD.
Also keep the firmware (Hino-Bowie internal software) updated by using the software in the HINO-DX CD. For details, see the Manual in the HINO-DX CD.
(*2): When use DST-i, after HINO-DX. (Ver. 3.0.5)

IDLE SET VOLUME

EN01F02127020702002005

INSTRUMENTS

Name	Remarks
Circuit tester	For measuring resistance across terminals

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FUEL SYSTEM

FUEL SENDER GAUGE

EN01F02127020702003001

INSTRUMENTS

Name	Remarks
Circuit tester	For measuring resistance across terminals

WATER LEVEL WARNING SWITCH

EN01F02127020702003002

INSTRUMENTS

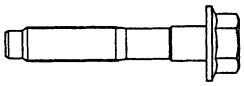
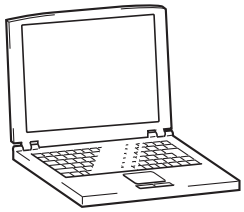
Name	Remarks
Circuit tester	For measuring continuity between terminals

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SUPPLY PUMP

EN01F02127020702003003

SST

Shape	Part No.	Name	Remarks
	SZ105-08067	Guide bolt	For positioning the supply pump
	—	Computer (DOS/V standard)	• Operating system (OS): Windows2000, WindowsXP, WindowsVista*2, Windows7*2 • CPU and memory: To guarantee proper operations of the operating systems listed above. • Display: 800 x 600 pixel, 256 or more colors
—	09993-E9070*1 The main body and cables (for RS-232C and USB) Cable between vehicle and Hino-Bowie S0904-21220	Hino-Bowie (Interface box)	Computer interface
	Without Bluetooth® 95171-01020 With Bluetooth® 95171-01040	DENSO DST-i Set (without LCD)	
	Without Bluetooth® 95171-01030 With Bluetooth® 95171-01050	DENSO DST-i Set (with LCD)	

(*1):To use Hino-Bowie (the interface box) "09993-E9070", it is necessary to update the hardware. For details, see the Manual in the HINO-DX CD.
Also keep the firmware (Hino-Bowie internal software) updated by using the software in the HINO-DX CD. For details, see the Manual in the HINO-DX CD.
(*2): When use DST-i, after HINO-DX. (Ver. 3.0.5)

INSTRUMENTS

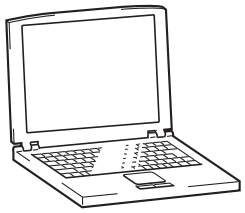
Name	Remarks
Circuit tester	For measuring resistance across terminals

https://truckmanualshub.com/

INJECTOR

EN01F02127020702003004

SST

Shape	Part No.	Name	Remarks
	—	Computer (DOS/V standard)	• Operating system (OS): Windows2000, WindowsXP, WindowsVista*2, Windows7*2 • CPU and memory: To guarantee proper operations of the operating systems listed above. • Display: 800 x 600 pixel, 256 or more colors
—	09993-E9070*1 The main body and cables (for RS-232C and USB) Cable between vehicle and Hino-Bowie S0904-21220	Hino-Bowie (Interface box)	Computer interface
	Without Bluetooth® 95171-01020 With Bluetooth® 95171-01040	DENSO DST-i Set (without LCD)	
	Without Bluetooth® 95171-01030 With Bluetooth® 95171-01050	DENSO DST-i Set (with LCD)	

(*1):To use Hino-Bowie (the interface box) "09993-E9070", it is necessary to update the hardware. For details, see the Manual in the HINO-DX CD.
Also keep the firmware (Hino-Bowie internal software) updated by using the software in the HINO-DX CD. For details, see the Manual in the HINO-DX CD.
(*2): When use DST-i, after HINO-DX. (Ver. 3.0.5)

INSTRUMENTS

Name	Remarks
1,000 V megohmmeter	For measuring insulation resistance between terminal and body
Circuit tester	For measuring resistance across terminals

GREASE AND OTHERS

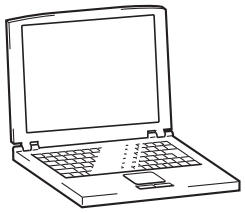
Name	Remarks
Detergent	Sludge washing in the nozzle seat
Red lead	For checking for contact

https://truckmanualshub.com/

COMMON RAIL

EN01F02127020702003005

SST

Shape	Part No.	Name	Remarks
	—	Computer (DOS/V standard)	• Operating system (OS): Windows2000, WindowsXP, WindowsVista*2, Windows7*2 • CPU and memory: To guarantee proper operations of the operating systems listed above. • Display: 800 x 600 pixel, 256 or more colors
—	09993-E9070*1 The main body and cables (for RS-232C and USB) Cable between vehicle and Hino-Bowie S0904-21220	Hino-Bowie (Interface box)	Computer interface
	Without Bluetooth® 95171-01020 With Bluetooth® 95171-01040	DENSO DST-i Set (without LCD)	
	Without Bluetooth® 95171-01030 With Bluetooth® 95171-01050	DENSO DST-i Set (with LCD)	

(*1):To use Hino-Bowie (the interface box) "09993-E9070", it is necessary to update the hardware. For details, see the Manual in the HINO-DX CD.
Also keep the firmware (Hino-Bowie internal software) updated by using the software in the HINO-DX CD. For details, see the Manual in the HINO-DX CD.
(*2): When use DST-i, after HINO-DX. (Ver. 3.0.5)

INSTRUMENTS

Name	Remarks
Circuit tester	For measuring resistance across terminals

https://truckmanualshub.com/

FUEL FILTER AND CASE (VEHICLE SIDE)

EN01F02127020702003006

COMMON TOOLS

Name	Remarks
Mityvac	For inspecting the fuel heater

INSTRUMENTS

Name	Remarks
Cylinder gauge	For measuring resistance across terminals

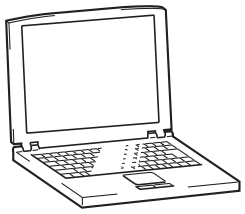
https://truckmanualshub.com/

EMISSION CONTROL

EGR VALVE AND COOLER

EN01F02127020702004001

SST

Shape	Part No.	Name	Remarks
	—	Computer (DOS/V standard)	• Operating system (OS): Windows2000, WindowsXP, WindowsVista*2, Windows7*2 • CPU and memory: To guarantee proper operations of the operating systems listed above. • Display: 800 x 600 pixel, 256 or more colors
—	09993-E9070*1 The main body and cables (for RS-232C and USB) Cable between vehicle and Hino-Bowie S0904-21220	Hino-Bowie (Interface box)	Computer interface
	Without Bluetooth® 95171-01020 With Bluetooth® 95171-01040	DENSO DST-i Set (without LCD)	
	Without Bluetooth® 95171-01030 With Bluetooth® 95171-01050	DENSO DST-i Set (with LCD)	

(*1):To use Hino-Bowie (the interface box) "09993-E9070", it is necessary to update the hardware. For details, see the Manual in the HINO-DX CD.
Also keep the firmware (Hino-Bowie internal software) updated by using the software in the HINO-DX CD. For details, see the Manual in the HINO-DX CD.
(*2): When use DST-i, after HINO-DX. (Ver. 3.0.5)

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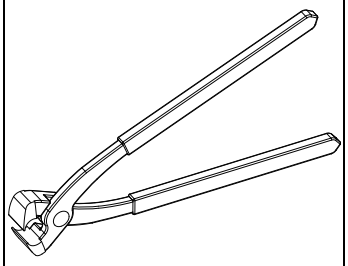
GREASE AND OTHERS

Name	Remarks
Glasses	For protecting eyes from splashed detergent
Rubber gloves	For protecting skin from splashed detergent
Protective garment	For protecting cloth from splashed detergent
Detergent (PK-5300YP)	For cleaning the EGR cooler
Reservoir (metallic)	For cleaning the EGR cooler
General-purpose heater	For cleaning the EGR cooler

CLOSED VENTILATOR

EN01F02127020702004002

SST

Shape	Part No.	Name	Remarks
	S0920-E0010	Vent pipe tool	

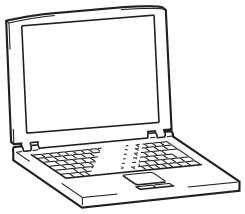
https://truckmanualshub.com/

INTAKE

DIESEL THROTTLE

EN01F02127020702005001

SST

Shape	Part No.	Name	Remarks
	—	Computer (DOS/V standard)	• Operating system (OS): Windows2000, WindowsXP, WindowsVista*2, Windows7*2 • CPU and memory: To guarantee proper operations of the operating systems listed above. • Display: 800 x 600 pixel, 256 or more colors
—	09993-E9070*1 The main body and cables (for RS-232C and USB) Cable between vehicle and Hino-Bowie S0904-21220	Hino-Bowie (Interface box)	Computer interface
	Without Bluetooth® 95171-01020 With Bluetooth® 95171-01040	DENSO DST-i Set (without LCD)	
	Without Bluetooth® 95171-01030 With Bluetooth® 95171-01050	DENSO DST-i Set (with LCD)	

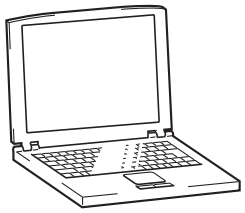
(*1):To use Hino-Bowie (the interface box) "09993-E9070", it is necessary to update the hardware. For details, see the Manual in the HINO-DX CD.
Also keep the firmware (Hino-Bowie internal software) updated by using the software in the HINO-DX CD. For details, see the Manual in the HINO-DX CD.
(*2): When use DST-i, after HINO-DX. (Ver. 3.0.5)

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BOOST PRESSURE SENSOR

EN01F02127020702005002

SST

Shape	Part No.	Name	Remarks
	—	Computer (DOS/V standard)	• Operating system (OS): Windows2000, WindowsXP, WindowsVista*2, Windows7*2 • CPU and memory: To guarantee proper operations of the operating systems listed above. • Display: 800 x 600 pixel, 256 or more colors
—	09993-E9070*1 The main body and cables (for RS-232C and USB) Cable between vehicle and Hino-Bowie S0904-21220	Hino-Bowie (Interface box)	Computer interface
	Without Bluetooth® 95171-01020 With Bluetooth® 95171-01040	DENSO DST-i Set (without LCD)	
	Without Bluetooth® 95171-01030 With Bluetooth® 95171-01050	DENSO DST-i Set (with LCD)	

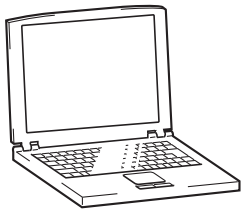
(*1):To use Hino-Bowie (the interface box) "09993-E9070", it is necessary to update the hardware. For details, see the Manual in the HINO-DX CD.
Also keep the firmware (Hino-Bowie internal software) updated by using the software in the HINO-DX CD. For details, see the Manual in the HINO-DX CD.
(*2): When use DST-i, after HINO-DX. (Ver. 3.0.5)

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AIR FLOW SENSOR

EN01F02127020702005003

SST

Shape	Part No.	Name	Remarks
	—	Computer (DOS/V standard)	• Operating system (OS): Windows2000, WindowsXP, WindowsVista*2, Windows7*2 • CPU and memory: To guarantee proper operations of the operating systems listed above. • Display: 800 x 600 pixel, 256 or more colors
—	09993-E9070*1 The main body and cables (for RS-232C and USB) Cable between vehicle and Hino-Bowie S0904-21220	Hino-Bowie (Interface box)	Computer interface
	Without Bluetooth® 95171-01020 With Bluetooth® 95171-01040	DENSO DST-i Set (without LCD)	
	Without Bluetooth® 95171-01030 With Bluetooth® 95171-01050	DENSO DST-i Set (with LCD)	

(*1):To use Hino-Bowie (the interface box) "09993-E9070", it is necessary to update the hardware. For details, see the Manual in the HINO-DX CD.
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(*2): When use DST-i, after HINO-DX. (Ver. 3.0.5)

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ENGINE MECHANICAL

HEAD COVER

EN01F02127020702006001

GREASE AND OTHERS

Name	Remarks
Liquid gasket (ThreeBond TB1207B: Black or equivalent or ThreeBond TB1217G: Gray or equivalent)	Apply to the mating area of the half-round plug.

ROCKER ARM ASSEMBLY

EN01F02127020702006002

INSTRUMENTS

Name	Remarks
Micrometer	For measuring the outer diameter of the rocker arm shaft
Cylinder gauge	For measuring the inner diameter of the rocker arm bush
Thickness gauge	For measuring valve clearance

GREASE AND OTHERS

Name	Remarks
Flexible wire of approximately 0.8 mm {0.0315 in.} in diameter	For mounting the rocker arm

CAMSHAFT ASSEMBLY

EN01F02127020702006003

INSTRUMENTS

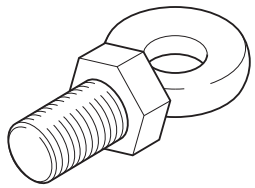
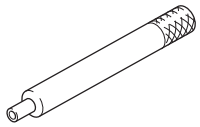
Name	Remarks
Micrometer	For measuring the camshaft cam height and journal outer diameter
Cylinder gauge	For measuring the inner diameter of the camshaft bearing.
Dial gauge	For measuring the camshaft runout, camshaft end play, and backlash
Vernier calipers	For measuring the under head length of cam the shaft gear mounting bolt

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CYLINDER HEAD ASSEMBLY

EN01F02127020702006004

SST

Shape	Part No.	Name	Remarks
	S0943-31070	Eye bolt	For attaching and detaching the cylinder head
	S0947-21210	Bar	For staking the nozzle seat
	SN441-00610	Steel Ball	For staking the nozzle seat (combined use with S0947-21210)

COMMON TOOLS

Name	Remarks
Scraper	For removing liquid gasket

INSTRUMENTS

Name	Remarks
Vernier calipers	For measuring the under head length of the head bolt
Straightedge	Measuring the strain of bottom surface of cylinder head and manifold mounting surface
Thickness gauge	Measuring the strain of bottom surface of cylinder head and manifold mounting surface

GREASE AND OTHERS

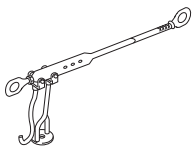
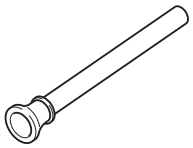
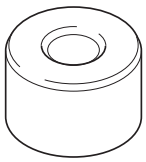
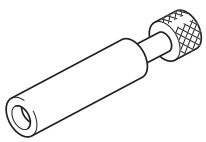
Name	Remarks
Liquid gasket (ThreeBond TB1211: White or equivalent)	Apply to the cylinder block upper surface back end, head gasket mating area of the flywheel housing, and nozzle seat lower side.
Dye penetrant (red check)	For checking the cylinder head for cracks and damage
Liquid gasket (ThreeBond TB1207B: Black or equivalent)	Apply to the mating area of the half-round plug.

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VALVE SYSTEM

EN01F02127020702006005

SST

Shape	Part No.	Name	Remarks
	S0947-01170	Valve spring press	For attaching and detaching the valve spring retainer
	S0943-11020	Valve lapping tool	For valve finishing
	S0947-11520	Guide	For press-fitting the valve guide
	S0947-22100	Bar	For tapping in the valve stem seal

COMMON TOOLS

Name	Remarks
Dolly block (brass bar)	For removing the valve seat
Magnet bar	For removing the valve spring retainer

INSTRUMENTS

Name	Remarks
Straightedge	For measuring valve sink
Thickness gauge	For measuring valve sink and squareness of valve spring
Squareness gauge	For measuring squareness of valve spring
Spring tester	For measuring the valve spring set load
Vernier calipers	For measuring valve spring free length
Micrometer	For measuring the valve spring outer diameter
Cylinder gauge	For measuring the valve guide inner diameter

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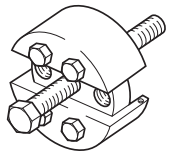
GREASE AND OTHERS

Name	Remarks
Lapping compound	For valve finishing

CRANKSHAFT FRONT OIL SEAL

EN01F02127020702006006

SST

Shape	Part No.	Name	Remarks
	S0942-01731	Oil seal puller	For pulling off a crankshaft front oil seal
	S0940-71030	Oil seal press	For press-fitting the crankshaft front oil seal

FRONT OIL SEAL RETAINER

EN01F02127020702006007

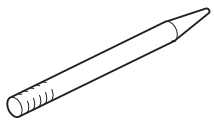
GREASE AND OTHERS

Name	Remarks
Liquid gasket (ThreeBond TB1207B: Black or equivalent or ThreeBond TB1217G: Gray or equivalent)	Apply to the front oil seal retainer mounting surface.

FLYWHEEL ASSEMBLY

EN01F02127020702006008

SST

Shape	Part No.	Name	Remarks
	S0948-11340	Guide	For attaching and detaching the flywheel

COMMON TOOLS

Name	Remarks
Brass bar	For removing the ring gear

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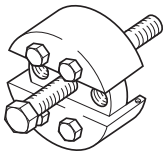
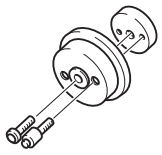
GREASE AND OTHERS

Name	Remarks
Burner	For attaching and detaching the ring gear

CRANKSHAFT REAR OIL SEAL

EN01F02127020702006009

SST

Shape	Part No.	Name	Remarks
	S0942-01742	Oil seal puller	For pulling off a crankshaft rear oil seal
	S0940-71040	Oil seal press	For mounting crankshaft rear oil seal

FLYWHEEL HOUSING

EN01F02127020702006010

COMMON TOOLS

Name	Remarks
Scraper	For removing liquid gasket

GREASE AND OTHERS

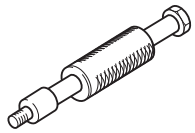
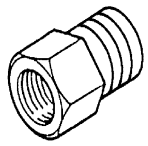
Name	Remarks
Liquid gasket (ThreeBond TB1207D: Silver or equivalent or ThreeBond TB1217G: Gray or equivalent)	Apply to the joint surface of the rear end plate of the flywheel housing.

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TIMING GEAR AND CAM IDLE GEAR

EN01F02127020702006011

SST

Shape	Part No.	Name	Remarks
	S0942-01100	Sliding hammer	For pulling off the main idle gear shaft and sub idle gear shaft
	S0941-11300	Socket wrench	For attaching and detaching the Torx bolt

COMMON TOOLS

Name	Remarks
Scraper	For removing liquid gasket

INSTRUMENTS

Name	Remarks
Micrometer	For measuring the outer diameter of each idle gear shaft
Cylinder gauge	For measuring the inner diameter of each idle gear bush
Thickness gauge	For measuring idle gear end play
Dial gauge	For measuring each gear backlash and camshaft end play

GREASE AND OTHERS

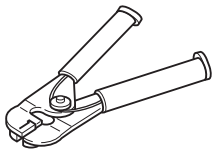
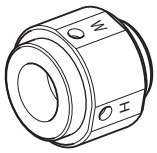
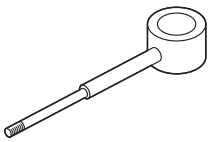
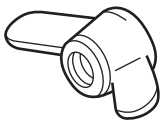
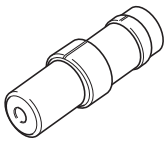
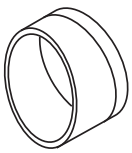
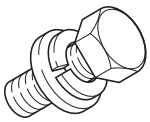
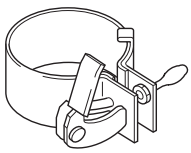
Name	Remarks
Sealant (Thread Lock Super 5M or equivalent)	Apply to the thread of the rear end plate mounting Torx bolt.

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PISTON AND CONNECTING ROD

EN01F02127020702006012

SST

Shape	Part No.	Name	Remarks
	S0944-21011	Piston ring expander	For mounting/dismounting a piston ring
	S0948-11130	Guide	For attaching and detaching the connecting rod small end bush (combined use with S0940-21530)
	S0940-21530	Press subassembly	For attaching and detaching the connecting rod small end bush
	SL271-01036	Wing nut	For attaching and detaching the connecting rod small end bush (combined use with S0940-21530)
	S0940-21540	Spindle	For attaching and detaching the connecting rod small end bush
	S0948-11540	Guide	For attaching and detaching the connecting rod small end bush (combined use with S0940-21540)
	SH691-20825	Bolt	For attaching and detaching the connecting rod small end bush (combined use with S0940-21540)
	S0944-11370	Piston ring holder	For mounting piston

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COMMON TOOLS

Name	Remarks
Scraper	Removing carbon

INSTRUMENTS

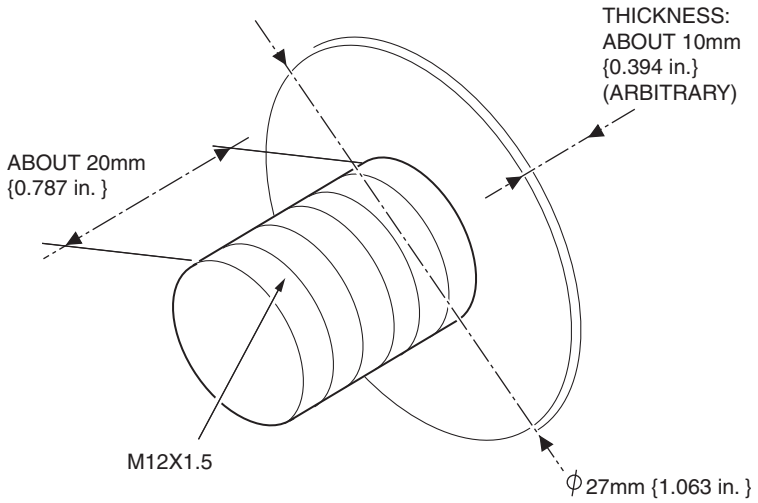
Name	Remarks
Cylinder gauge	For measuring the cylinder liner inner diameter, piston boss inner diameter, connecting rod bush inner diameter, and connecting rod big end bearing inner diameter
Micrometer	For measuring the piston outer diameter, piston ring thickness, piston pin outer diameter, and crank pin outer diameter
Thickness gauge	For measuring the piston ring groove and piston ring end gap clearance
Vernier calipers	For measuring the under head length of the connecting rod bolt
Dial gauge	For measuring connecting rod end play

GREASE AND OTHERS

Name	Remarks
Sandpaper (about No.150)	For removing the carbon adhered to the upper side of inner surface of the cylinder liner
Dye penetrant (red check)	For checking the connecting rod for cracks and damage
Bar of 4 mm {0.1574 in.} in diameter	For checking the connecting rod oil hole

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RECOMMEND SERVICE TOOLS



CRANKSHAFT

EN01F02127020702006013

INSTRUMENTS

Name	Remarks
Dial gauge	For measuring the crankshaft end play and crankshaft rotation runout
Micrometer	For measuring the outer diameters of the crankshaft journal and crank pin
Vernier calipers	For measuring the width of the crankshaft center journal and the under head length of the main bearing cap bolt
Cylinder gauge	For measuring the crankshaft bearing inner diameter

GREASE AND OTHERS

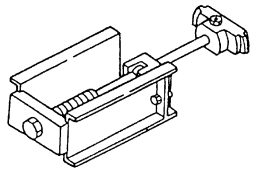
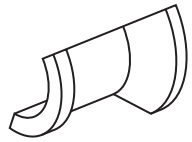
Name	Remarks
Dye penetrant (red check)	For checking the crankshaft for cracks and damage

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CYLINDER LINER

EN01F02127020702006014

SST

Shape	Part No.	Name	Remarks
	S0942-02100	Cylinder liner puller	For removing the cylinder liner
	S0947-11490	Guide	For inserting the cylinder liner

COMMON TOOLS

Name	Remarks
Bearing scraper	Removing rust from the cylinder liner

INSTRUMENTS

Name	Remarks
Dial gauge	For measuring cylinder liner collar projection

GREASE AND OTHERS

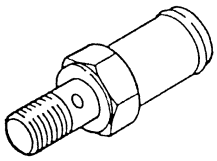
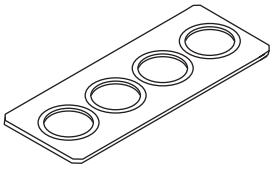
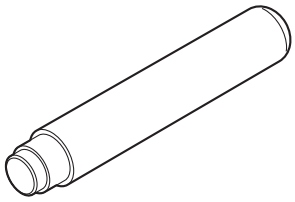
Name	Remarks
Dye penetrant (red check)	For checking the cylinder liner for cracks and damage

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CYLINDER BLOCK

EN01F02127020702006015

SST

Shape	Part No.	Name	Remarks
	SZ910-24098	Bolt for checking	For inspection and adjustment of cooling jet
	09219-E4030	Gauge	For inspection and adjustment of cooling jet
	09211-E4020	Plug A tapping tool	
	09211-E4030	Plug B tapping tool	

COMMON TOOLS

Name	Remarks
Straightedge	For measuring strain of upper surface of cylinder block
Thickness gauge	For measuring strain of upper surface of cylinder block

GREASE AND OTHERS

Name	Remarks
Dye penetrant (red check)	For checking the cylinder block for cracks and damage
Sealant (Loctite 962T or ThreeBond #1211 or #1215)	For checking the cylinder block for cracks and damage

GLOW PLUG

EN01F02127020702006016

INSTRUMENTS

Name	Remarks
Circuit tester	For measuring resistance between terminal and body

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EXHAUST

EXHAUST MANIFOLD

EN01F02127020702007001

COMMON TOOLS

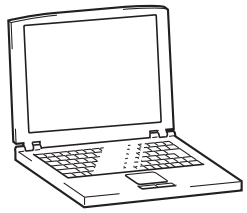
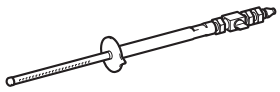
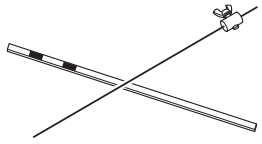
Name	Remarks
Torque socket	For attaching and detaching the stud bolt
Stud bolt remover (commercially available)	For removing the stud bolt

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DPR

EN01F02127020702007002

SST

Configuration	Part Number	Name	Remarks
	—	Computer (DOS/V standard)	• Operating system (OS): Windows2000, WindowsXP, WindowsVista*2, Windows7*2 • CPU and memory: To guarantee proper operations of the operating systems listed above. • Display: 800 x 600 pixel, 256 or more colors
—	09993-E9070*1 The main body and cables (for RS-232C and USB) Cable between vehicle and Hino-Bowie S0904-21220	Hino-Bowie (Interface box)	Computer interface
	Without Bluetooth® 95171-01020 With Bluetooth® 95171-01040	DENSO DST-i Set (without LCD)	
	Without Bluetooth® 95171-01030 With Bluetooth® 95171-01050	DENSO DST-i Set (with LCD)	
	09950-E9010	Cleaning nozzle	Combined use with air hose
	09992-E4010	Filter gauge assembly	Used for inspecting the inside of the DPR cleaner

(*1):To use Hino-Bowie (the interface box) "09993-E9070", it is necessary to update the hardware. For details, see the Manual in the HINO-DX CD.
Also keep the firmware (Hino-Bowie internal software) updated by using the software in the HINO-DX CD. For details, see the Manual in the HINO-DX CD.
(*2): When use DST-i, after HINO-DX. (Ver. 3.0.5)

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FUEL ADDITION VALVE

EN01F02127020702007003

SST

Configuration	Part Number	Name	Remarks
—	09950-E9010	Nozzle for cleaning	Air hose and using together

INSTRUMENTS

Name	Remarks
500 V megohmmeter	For measuring parts
Circuit tester	For measuring resistance across terminals

GREASE AND OTHERS

Name	Remarks
Glasses	For protection of eyes by carbon cleaning agent scattering
Rubber gloves	For protection of skin by carbon cleaning agent scattering
Protective garment	For protection of clothes by carbon cleaning agent scattering

DEF PUMP

EN01F02127020702007004

GREASE AND OTHERS

Name	Remarks
Mobil velocite oil No.6	Apply to the O-ring

DEF INJECTOR

EN01F02127020702007005

GREASE AND OTHERS

Name	Remarks
Mobil velocite oil No.6	Apply to the O-ring

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DEF TANK

EN01F02127020702007006

INSTRUMENTS

Name	Remarks
DEF analyzer	For DEF measurement
Refractive index measurement	For DEF measurement

GREASE AND OTHERS

Name	Remarks
pH test paper	For DEF measurement

DPR DIFFERENTIAL PRESSURE SENSOR

EN01F02127020702007007

INSTRUMENTS

Name	Remarks
Circuit tester	For measuring resistance across terminals

SCR UPSTREAM NOx SENSOR

EN01F02127020702007008

INSTRUMENTS

Name	Remarks
Circuit tester	For measuring resistance across terminals

GREASE AND OTHERS

Name	Remarks
Anti-seizure lubricant (Weicom Anti-Seize ASW "High-Tech" Assembly Paste or equivalent)	Apply to the threaded portion of SCR upstream NOx sensor

SCR DOWNSTREAM NOx SENSOR

EN01F02127020702007009

INSTRUMENTS

Name	Remarks
Circuit tester	For measuring resistance across terminals

GREASE AND OTHERS

Name	Remarks
Anti-seizure lubricant (Weicom Anti-Seize ASW "High-Tech" Assembly Paste or equivalent)	Apply to the threaded portion of SCR downstream NOx sensor

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ATC DOWNSTREAM TEMPERATURE SENSOR

EN01F02127020702007010

INSTRUMENTS

Name	Remarks
Circuit tester	For measuring resistance across terminals

GREASE AND OTHERS

Name	Remarks
Anti-seizure lubricant (equivalent to NEVER-SEEZ Heavy Metal Free manufactured by Bostic, Inc.)	Apply to the threaded portion of ATC downstream temperature sensor

DOC UPSTREAM TEMPERATURE SENSOR

EN01F02127020702007011

INSTRUMENTS

Name	Remarks
Circuit tester	For measuring resistance across terminals

GREASE AND OTHERS

Name	Remarks
Anti-seizure lubricant (equivalent to NEVER-SEEZ Heavy Metal Free manufactured by Bostic, Inc.)	Apply to the threaded portion of DOC upstream temperature sensor

DPR UPSTREAM TEMPERATURE SENSOR

EN01F02127020702007012

INSTRUMENTS

Name	Remarks
Circuit tester	For measuring resistance across terminals

GREASE AND OTHERS

Name	Remarks
Anti-seizure lubricant (equivalent to NEVER-SEEZ Heavy Metal Free manufactured by Bostic, Inc.)	Apply to the threaded portion of DPR upstream temperature sensor

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DPR DOWNSTREAM TEMPERATURE SENSOR

EN01F02127020702007013

INSTRUMENTS

Name	Remarks
Circuit tester	For measuring resistance across terminals

GREASE AND OTHERS

Name	Remarks
Anti-seizure lubricant (equivalent to NEVER-SEEZ Heavy Metal Free manufactured by Bostic, Inc.)	Apply to the threaded portion of DPR downstream temperature sensor

SCR UPSTREAM TEMPERATURE SENSOR

EN01F02127020702007014

INSTRUMENTS

Name	Remarks
Circuit tester	For measuring resistance across terminals

GREASE AND OTHERS

Name	Remarks
Anti-seizure lubricant (equivalent to NEVER-SEEZ Pure Nickel Special Grade manufactured by Bostic, Inc.)	Apply to the threaded portion of SCR upstream temperature sensor

DPR EXHAUST GAS TEMPERATURE SENSOR

EN01F02127020702007015

INSTRUMENTS

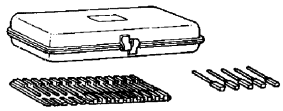
Name	Remarks
Circuit tester	For measuring resistance across terminals

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EXHAUST BRAKE

EN01F021270207020070016

SST

Configuration	Part Number	Name	Remarks
	09240-00020	Wire gauge set	For measuring clearance between the valve and body
	09242-00020	Wire gauge (0.2 mm) (content)	For measuring clearance between the valve and body

COMMON TOOLS

Name	Remarks
Mityvac	For inspecting the exhaust brake

EXHAUST BRAKE MAGNETIC VALVE

EN01F021270207020070017

INSTRUMENTS

Name	Remarks
Circuit tester	For measuring resistance across terminals

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COOLING

RADIATOR CAP

EN01F02127020702008001

INSTRUMENTS

Name	Remarks
Radiator cap tester (commercially available)	For measuring valve opening pressure

THERMOSTAT CASE AND THERMOSTAT

EN01F02127020702008002

INSTRUMENTS

Name	Remarks
Vernier calipers	For measuring valve lift amount

COMMON TOOLS

Name	Remarks
Scraper	For removing liquid gasket

GREASE AND OTHERS

Name	Remarks
Liquid gasket (ThreeBond TB1207B: Black or equivalent)	Apply to the joining surface of the thermostat case.

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COOLANT PUMP

EN01F02127020702008003

COMMON TOOLS

Name	Remarks
Scraper	For removing liquid gasket

GREASE AND OTHERS

Name	Remarks
Liquid gasket (ThreeBond TB1207B: Black or equivalent)	Apply to the coolant pump joint surface.

COOLANT TEMPERATURE SENSOR

EN01F02127020702008004

INSTRUMENTS

Name	Remarks
Circuit tester	For measuring resistance across terminals

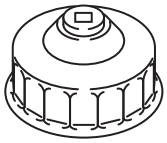
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LUBRICATION

OIL FILTER

EN01F02127020702009001

SST

Shape	Part No.	Name	Remarks
	S0950-31090	Oil filer wrench	For attaching and detaching the oil filter

OIL COOLER

EN01F02127020702009002

COMMON TOOLS

Name	Remarks
Scraper	For removing liquid gasket

GREASE AND OTHERS

Name	Remarks
Kerosene or detergent	For washing the water/oil groove well of the oil cooler element
Dye penetrant (red check)	For checking the oil cooler element for cracks
Liquid gasket (ThreeBond TB1211: White or equivalent)	Apply to the gasket seal surface.
Liquid gasket (ThreeBond TB1207B: Black or equivalent)	Apply to the oil cooler assembly joint surface.

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OIL PUMP

EN01F02127020702009003

INSTRUMENTS

Name	Remarks
Depth gauge	For measuring width of drive gear and depth of cylinder block side pump housing
Micrometer	For measuring the drive gear shaft outer diameter and driven gear shaft outer diameter
Cylinder gauge	For measuring the cylinder block side bush inner diameter, driven gear bush inner diameter, cylinder block side pump housing inner diameter, and cylinder block hole diameter
Vernier calipers	For measuring the drive gear outer diameter
Dial gauge	For measuring the backlashes between the drive gear and driven gear and between the oil pump drive gear and sub-idle gear

OIL PAN

EN01F02127020702009004

COMMON TOOLS

Name	Remarks
Scraper	For removing liquid gasket

GREASE AND OTHERS

Name	Remarks
Liquid gasket (ThreeBond TB1207D: Silver or equivalent or ThreeBond TB1217G: Gray or equivalent)	Apply to each part.

OIL PRESSURE SWITCH

EN01F02127020702009005

INSTRUMENTS

Name	Remarks
Circuit tester	For measuring continuity between terminal and body

GREASE AND OTHERS

Name	Remarks
Liquid gasket (ThreeBond TB1211: White or equivalent)	Apply to the gasket seal surface.

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STARTING/CHARGING

STARTER

EN01F02127020702012001

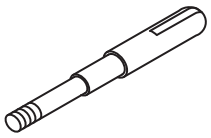
INSTRUMENTS

Name	Remarks
Ammeter	For measuring parts
Circuit tester	For measuring parts
Dial gauge	For measuring parts
Thickness gauge	For measuring parts

V-BELT

EN01F02127020702012002

SST

Shape	Part No.	Name	Remarks
	S0944-41210	Compression gauge	

ALTERNATOR (130A)

EN01F02127020702012003

INSTRUMENTS

Name	Remarks
Circuit tester	For measuring parts
Micrometer	For measuring parts

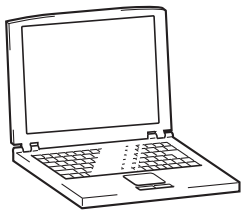
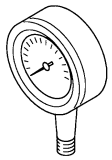
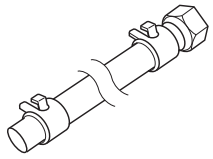
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TURBOCHARGER

TURBOCHARGER ASSEMBLY

EN01F02127020702013001

SST

Shape	Part No.	Name	Remarks
	—	Computer (DOS/V standard)	• Operating system (OS): Windows2000, WindowsXP, WindowsVista*2, Windows7*2 • CPU and memory: To guarantee proper operations of the operating systems listed above. • Display: 800 x 600 pixel, 256 or more colors
—	09993-E9070*1 The main body and cables (for RS-232C and USB) Cable between vehicle and Hino-Bowie S0904-21220	Hino-Bowie (Interface box)	Computer interface
	Without Bluetooth® 95171-01020 With Bluetooth® 95171-01040	DENSO DST-i Set (without LCD)	
	Without Bluetooth® 95171-01030 With Bluetooth® 95171-01050	DENSO DST-i Set (with LCD)	
	S0944-41250	Gauge	For measuring boost pressure (combined use with 09258- E1010)
	09258-E1010	Boost pressure measuring hose	For measuring boost pressure (combined use with S0944-41250)

(*1):To use Hino-Bowie (the interface box) "09993-E9070", it is necessary to update the hardware. For details, see the Manual in the HINO-DX CD.
Also keep the firmware (Hino-Bowie internal software) updated by using the software in the HINO-DX CD. For details, see the Manual in the HINO-DX CD.
(*2): When use DST-i, after HINO-DX. (Ver. 3.0.5)

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COMMON TOOLS

Name	Remarks
Stud bolt remover	For removing the stud bolt

INSTRUMENTS

Name	Remarks
Dial gauge	For measuring play in the axle (thrust) direction of the turbine shaft

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MOUNTING AND DISMOUNTING THE ENGINE (J05E)

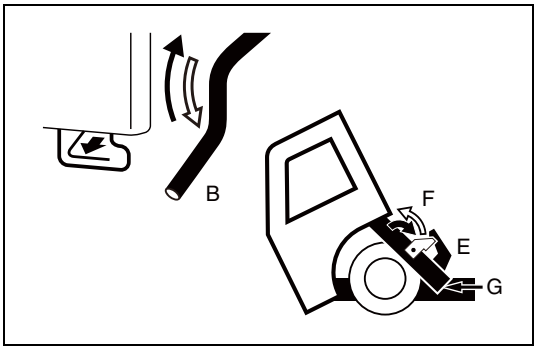
5-001

ENGINE ASSEMBLY.....5-2
PRECAUTIONS IN TILTING AND LOWERING THE CAB 5-2
MEASUREMENT OF COMPRESSION PRESSURE 5-2
ADJUSTING THE VALVE CLEARANCE.....5-5
REPLACEMENT 5-7

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ENGINE ASSEMBLY

PRECAUTIONS IN TILTING AND LOWERING THE CAB



SHTS021270400001

⚠ WARNING

Be sure to observe the following when tilting and lowering the cab to reduce the risk of an accident which may result in death, serious injury and/or property damage.

- **Park the vehicle on a level place and ensure ample space around the cab before tilting the cab.**
- **Apply the parking brake firmly and place the gearshift lever in "N" position ("P" position if your vehicle is equipped with automatic transmission).**
- **Stop the engine and block the wheels.**
- **Remove any articles in or over the cab and close the doors firmly.**
- **Make sure there is no one in or around the cab and there are no obstacles in front of the vehicle or above the cab.**
- **The catch (E), stopper (F), stay (G) and other parts such as the engine, radiator, and exhaust pipe can be very hot while your vehicle is operated. Be sure to confirm they have been cooled down before you start working under the cab.**
- **Never raise or lower the cab only by yourself if your cab is equipped with heavy component such as a roof rack.**
- **Never put your body under the cab while raising or lowering the cab.**
- **Make sure the cab stopper stay is securely locked by the catch (E) and raise the stopper (F) to lock the catch (E) completely after raising the cab.**
- **Before lowering the cab, make sure that any object such as hand tools, gloves or cloth are not left under the cab.**
- **Make sure the handle (B) is caught by the catch after lowering the cab.**

Read the Owner's manual for details.

MEASUREMENT OF COMPRESSION PRESSURE

EN01F02121040706004002

⚠ CAUTION

- **Caution on handling the hybrid system (HV only)**
  Reference: CHASSIS (S1-LXJE03A), HYBRID
  Reference: CHASSIS (S1-LXJE04A), HYBRID
- **Measure the compression pressure and record the result before disassembling the engine. By measuring the compression pressure regularly, you can grasp the state of the engine.**

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1. PREPARATION BEFORE MEASUREMENT

(1) Fully charge the battery.

(2) Inspect the valve clearance. When it exceeds the standard value, adjust it.
Reference: MOUNTING AND DISMOUNTING THE ENGINE (J05E), ENGINE ASSEMBLY, ADJUSTING THE VALVE CLEARANCE (Page 5-5)

(3) Warm up the engine and set the coolant temperature to 80 °C {176 °F}.

(4) Remove the air cleaner.
Reference: INTAKE (J05E), AIR CLEANER, REPLACEMENT, MOUNTING THE AIR CLEANER ELEMENT AND BODY ASSEMBLY (Page 9-23)

(5) Remove the all glow plugs.
Reference: ENGINE MECHANICAL (J05E), GLOW PLUG, REPLACEMENT, REMOVING THE GLOW PLUG (Page 10-129)

(6) Remove the 4 bolts from the glow plug hole.

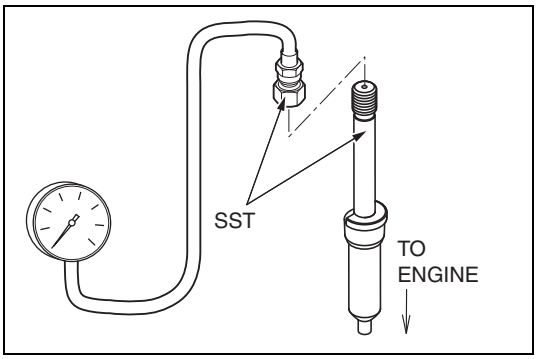
(7) Disconnect the all connectors of each injector.
Reference: FUEL SYSTEM (J05E), INJECTOR, REPLACEMENT, REMOVING THE INJECTOR (Page 7-37)

(8) Connect the battery negative terminal.

⚠ CAUTION
To prevent a short circuit in the wiring, wrap the power wiring with vinyl tape.

(9) Turn the starter to discharge the foreign matter in the cylinder.

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2. MEASUREMENT

(1) Attach the SST to the cylinder nozzle seat for measuring compression pressure by using the nozzle clamp and clamp mounting bolt.

SST: Compression gauge adapter

Part No.	Applicable parts
S0955-21110	Insert to the injector installation area.
S0955-21030	Adapter to be selected according to the thread size of air gauge.
S0955-21060	

(2) Turn the starter to measure the compression pressure.

⚠ CAUTION

- **Do not operate the starter continuously for 15 seconds or more.**
- **The air cleaner is removed; Make sure to avoid entry of dirt.**

(3) Measure the compression pressure of each cylinder continuously.

Engine speed: 190 r/min.

Items	Compression pressure: Unit: MPa {kgf/cm^2, lbf/in.^{2}}
Standard value	**3.0 {31, 435}**
Permissible limit	**2.7 {28, 392}**

(4) Overhaul the engine if the compression pressure is at or below the permissible limit.
(5) Put back the removed parts in place after measurement.
(6) Use the HINO-DX to delete the past malfunctions.
(Refer to the HINO-DX user's manual.)

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ADJUSTING THE VALVE CLEARANCE

EN01F02121040706004003

⚠ CAUTION

- **Before adjustment, make sure that the tightening bolts of the cylinder head, rocker arm support, nozzle clamp, and camshaft bearing cap are tightened with their specified torque.**
- **Make sure that there is no dirt in the crosshead and valve stem head.**

1. VALVE CLEARANCE ADJUSTMENT

(1) Turn the crankshaft forward to align the cylinder for adjustment with the compression stroke top dead center.

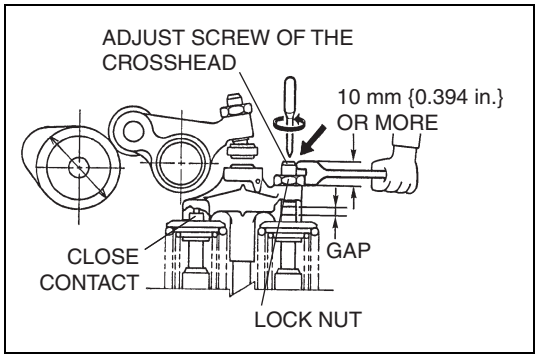
⚠ CAUTION

Check that the rocker arm to be adjusted is not lifted to the cam of the camshaft.

NOTICE

If the No.1 cylinder is at the compression stroke top dead center, the valve clearance with ○ mark in the table can be adjusted. If the No.4 cylinder is at the compression stroke top dead center, the cylinder with Δ mark can be adjusted.

Cylinder number	1		2		3		4	
Valve arrangement	Intake	Exhaust	Intake	Exhaust	Intake	Exhaust	Intake	Exhaust
No.1 cylinder at the compression stroke top dead center	○	○	○			○		
No.4 cylinder at the compression stroke top dead center				Δ	Δ		Δ	Δ



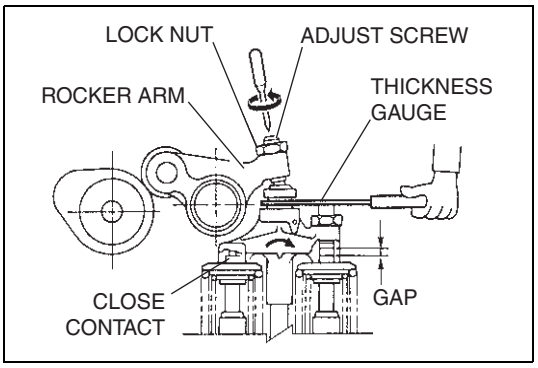
SHTS021270400003

(2) Fully loosen the adjust screw and lock nut of the crosshead.

⚠ CAUTION

Make the adjust screw projecting beyond the upper surface of the crosshead by at least 10 mm {0.394 in.}. Correct adjustment cannot be made unless the adjust screw is completely separated from the valve stem.

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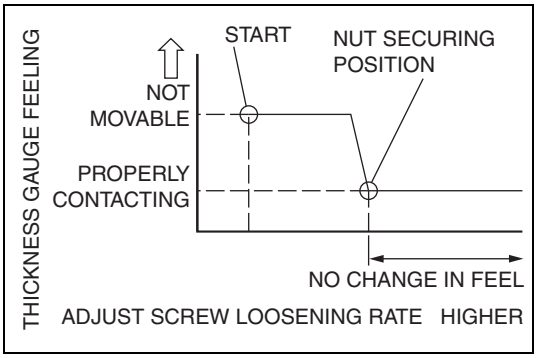


SHTS021270400004

(3) Insert a thickness gauge in between the rocker arm and the crosshead and turn the rocker arm adjust screw to adjust a clearance before tightening the lock nut.
Tightening Torque:
25 N·m {255 kgf·cm, 18 lbf·ft}

NOTICE
It is deemed appropriate if the thickness gauge goes in with some unsmoothness during insertion and then moves smoothly with slight binding feel after insertion.

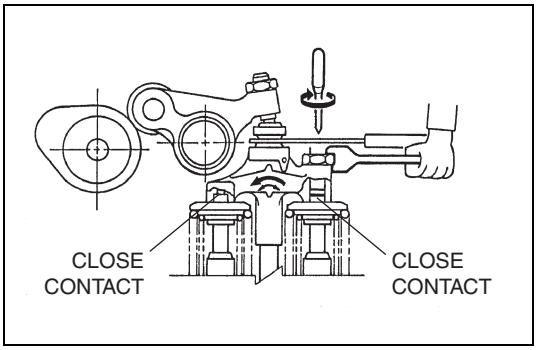
Standard value (During cooling)	**Intake**	**0.30 mm {0.012 in.}**
	Exhaust	**0.45 mm {0.018 in.}**



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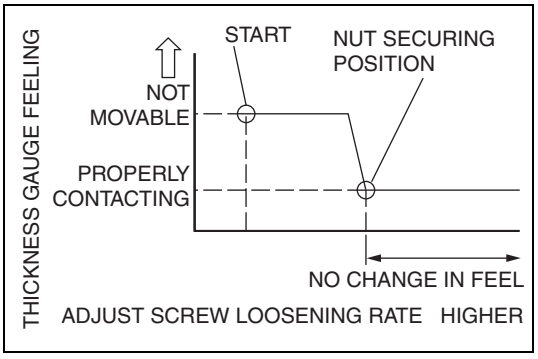
(4) With the thickness gauge inserted, loosen the adjust screw of the crosshead and check that you do not feel the thickness gauge light.

⚠ CAUTION
If you feel it light, repeat the procedure.



SHTS021270400006

(5) Tighten the adjust screw of the crosshead until the thickness gauge does not move.



SHTS021270400007

(6) While gradually loosening the adjust screw of the crosshead, tighten the lock nut of the crosshead at a position where your feel of the thickness gauge becomes proper.
Tightening Torque:
25 N·m {255 kgf·cm, 18 lbf·ft}

⚠ CAUTION
Do not loosen the adjust screw too much. If the adjust screw is made too loose, the former state will be restored. Although you may get proper feel with the thickness gauge, a gap will be produced between the adjust screw of the crosshead and the valve and you cannot make correct adjustment.

NOTICE
It is deemed appropriate if the thickness gauge goes in with some unsmoothness during insertion and then moves smoothly with slight binding feel after insertion.

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REPLACEMENT

EN01F02121040706004004

REMOVING THE ENGINE ASSEMBLY

1. REMOVING THE SERVICE PLUG (HV ONLY)

(1) Wear insulated gloves and remove the service plug from the PCU.
Reference: CHASSIS (S1-LXJE03A), HYBRID
Reference: CHASSIS (S1-LXJE04A), HYBRID

2. DISCONNECTING BATTERY NEGATIVE TERMINAL

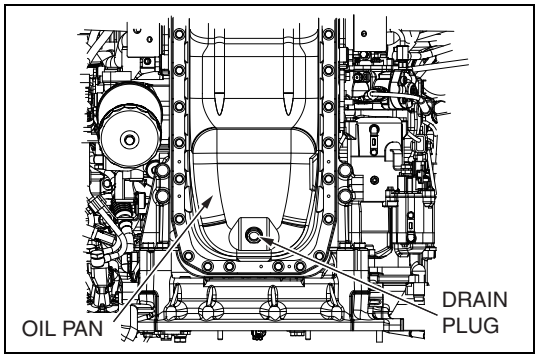
(1) Disconnect the battery negative terminal.

3. COLLECTION OF REFRIGERANT

Reference: CHASSIS (S1-LXJE03A), HEATER & AIR CONDITIONER
Reference: CHASSIS (S1-LXJE04A), HEATER & AIR CONDITIONER

4. DISCHARGING ENGINE OIL

(1) Remove the drain plug and gasket from the oil pan to drain engine oil.



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⚠ CAUTION

- **Drain the engine oil after the oil temperature is lowered enough to prevent burning.**
- **Dispose the engine oil in accordance with the specified procedures (industrial waste disposal) or other environment-friendly practices.**

(2) Replace with a new gasket and mount the drain plug to the oil pan.
Tightening Torque:
41 N·m {418 kgf·cm, 30 lbf·ft}

5. DRAINING THE COOLANT

Reference: COOLING (J05E), RADIATOR, REPLACEMENT, REMOVING THE RADIATOR (Page 12-5)

6. DRAINING POWER STEERING FLUID

Reference: CHASSIS (S1-LXJE03A), STEERING
Reference: CHASSIS (S1-LXJE04A), STEERING

7. REMOVING THE RESERVE TANK

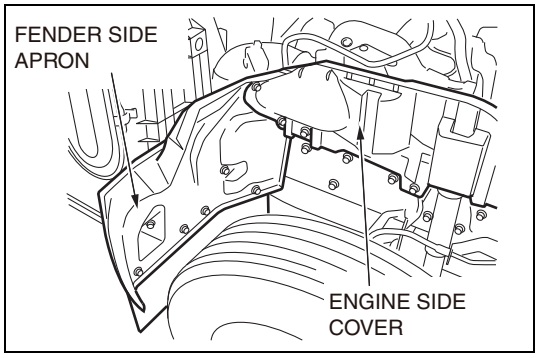
Reference: COOLING (J05E), RESERVE TANK, REPLACEMENT, REMOVING THE RESERVE TANK (Page 12-19)

8. REMOVING FENDER SIDE APRON

(1) Remove the fender side apron (right).
(2) Remove the fender side apron (left).

9. REMOVING ENGINE SIDE COVER

(1) Remove the engine side cover (right).
(2) Remove the engine side cover (left).



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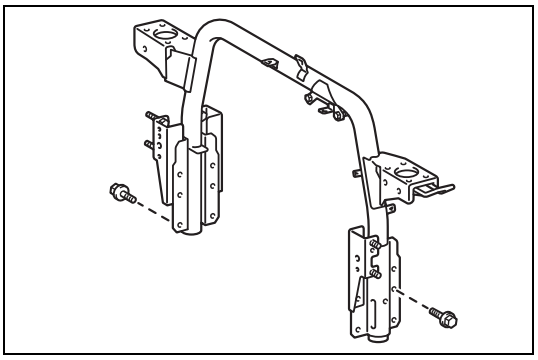
https://truckmanualshub.com/

10. REMOVING VACUUM RESERVOIR
Reference: CHASSIS (S1-LXJE03A), BRAKE
Reference: CHASSIS (S1-LXJE04A), BRAKE

11. REMOVING RELAY BLOCK
(1) Remove the relay block from the cab mounting bracket.

12. REMOVING THE AIR CLEANER BODY ASSEMBLY
Reference: INTAKE (J05E), AIR CLEANER, REPLACEMENT, REMOVING THE AIR CLEANER ELEMENT AND BODY ASSEMBLY (Page 9-21)

13. REMOVING BLOCK HEATER
Reference: ENGINE CONTROL (J05E), BLOCK HEATER, REPLACEMENT, REMOVING BLOCK HEATER (Page 6-21)


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14. REMOVING REAR CAB MOUNTING BRACKET SUB ASSEMBLY
(1) Unfasten 12 bolts and remove the rear cab mounting bracket sub assembly from the frame.

15. REMOVING THE RADIATOR
Reference: COOLING (J05E), RADIATOR, REPLACEMENT, REMOVING THE RADIATOR (Page 12-5)

16. REMOVING THE ALTERNATOR
Reference: STARTING/CHARGING (J05E), ALTERNATOR (130A), OVERHAUL, OVERHAUL (Page 16-13)

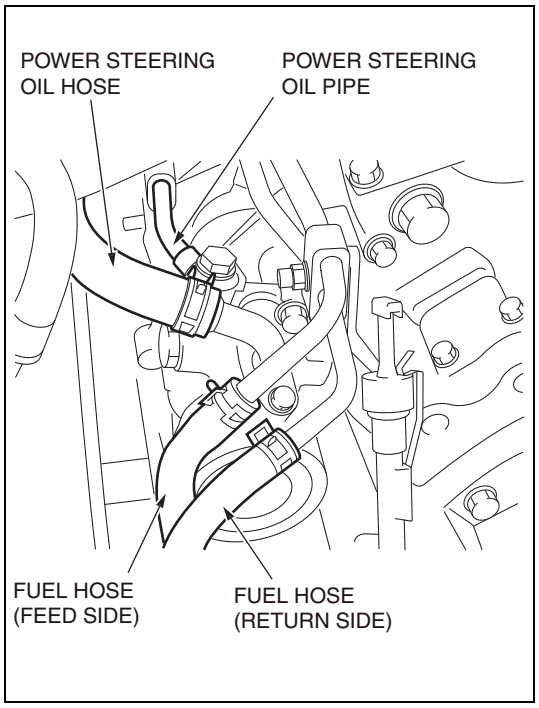
17. DISCONNECTING THE STARTER HARNESS
Reference: STARTING/CHARGING (J05E), STARTER, REPLACEMENT, REMOVING THE STARTER (Page 16-3)

18. DISCONNECTING THE HARNESS AND CABLE CONNECTING TO THE HV MOTER (HV ONLY)
Reference: CHASSIS (S1-LXJE03A), TRANSMISSION
Reference: CHASSIS (S1-LXJE04A), TRANSMISSION

19. REMOVING EXHAUST PIPE
Reference: EXHAUST (J05E), EXHAUST PIPE, REPLACEMENT, REMOVING THE EXHAUST SYSTEM COMPONENT PARTS (Page 11-9)

20. DISCONNECTING OIL RESERVOIR OIL HOSE
(1) Disconnect the oil reservoir oil hose.

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21. DISCONNECTING THE FUEL HOSE

(1) Unfasten the 2 clamps from the fuel pipe at the left rear of the flywheel housing and disconnect the fuel hose (return side) and fuel hose (feed side) from fuel feed pipe No.4 and return pipe No.3.

NOTICE

Fuel will spill when remove the hose. Prepare a reservoir and clean clothes.

22. DISCONNECTING THE POWER STEERING OIL HOSE AND OIL PIPE

(1) Loosen the clamp and separate the power steering oil hose from the power steering pump.

⚠ CAUTION

Check the marking on hose and then disconnect the hoses. If the marking is erased, mark the hose before disconnecting it.

NOTICE

Power steering oil will spill when disconnecting the hose. Prepare a reservoir and clean clothes.

(2) Remove the union bolt and detach the power steering oil pipe and gaskets (2 pcs.) from the power steering pump.

NOTICE

Power steering oil will spill when disconnecting the pipe. Prepare a reservoir and clean clothes.

23. REMOVING THE CLOSED VENTILATOR

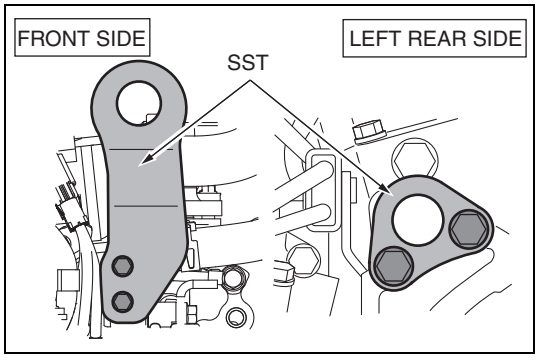
Reference: EMISSION CONTROL (J05E), CLOSED VENTILATOR, REPLACEMENT, REMOVING THE CLOSED VENTILATOR (Page 8-14)

24. REMOVING THE TRANSMISSION

(1) Remove the transmission.
Reference: CHASSIS (S1-LXJE03A), TRANSMISSION
Reference: CHASSIS (S1-LXJE04A), TRANSMISSION

25. LIFTING THE ENGINE

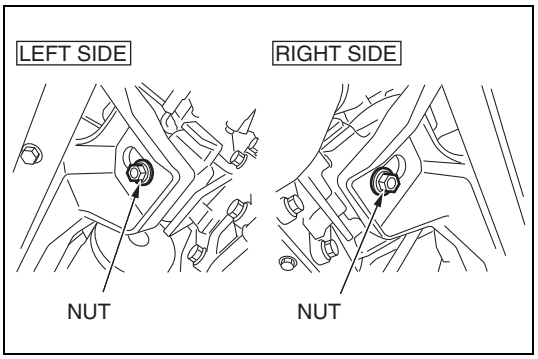
(1) Mount the SST to the engine.
Tightening Torque:
125 N·m {1,275 kgf·cm, 92 lbf·ft}
Engine front side of engine hanger
85 N·m {867 kgf·cm, 63 lbf·ft}
Engine rear side of engine hanger



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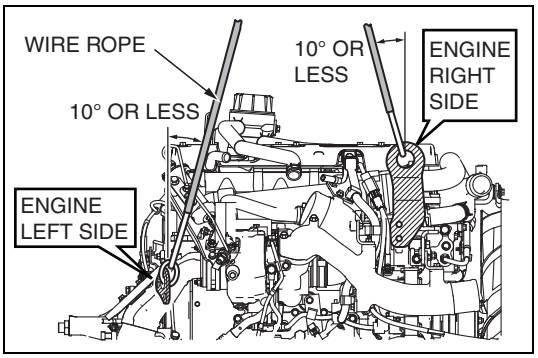
Location	Engine hanger	Bolt
Front side of the engine	12081-E0090	SZ105-12024
Rear side of the engine	S1228-11901	SH782-41230

https://truckmanualshub.com/



SHTS021270400013

(2) Unfasten 2 engine mounting the installation nuts and disconnect the engine mounting and frame.



SHTS021270400014

(3) Completely tighten the commercially available shackle and SST wire. Ensure that the wire is hooked to the engine hanger securely and then lift the engine slowly.
(4) When the engine bottom passes the frame, rotate the engine 90° to the right and thrust it out from the vehicle.

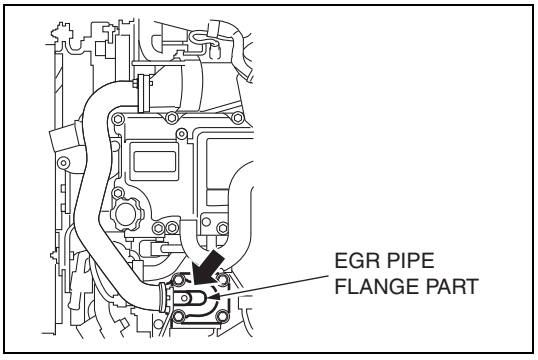
⚠ CAUTION

- **Do not allow the engine to contact with the frame and cab during work.**
- **Handle it with care because it is a heavy load.**
- **Do not allow the engine hoist wire rope to contact with the engine or transmission.**

SST: S0949-11010
Wire rope

NOTICE

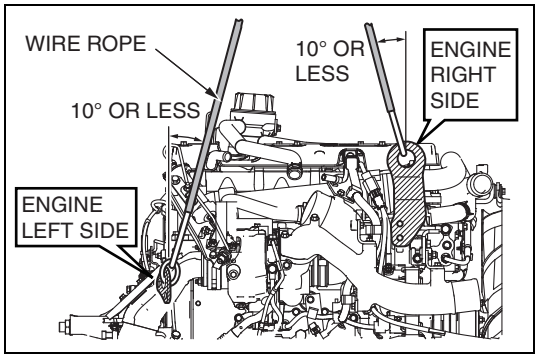
For the 3-point hoist, mount the eye bolt to the EGR pipe flange and then hook the wire rope.



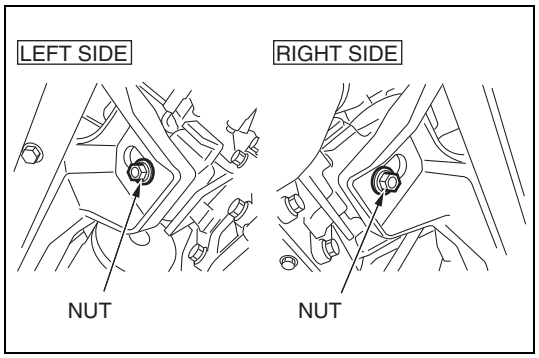
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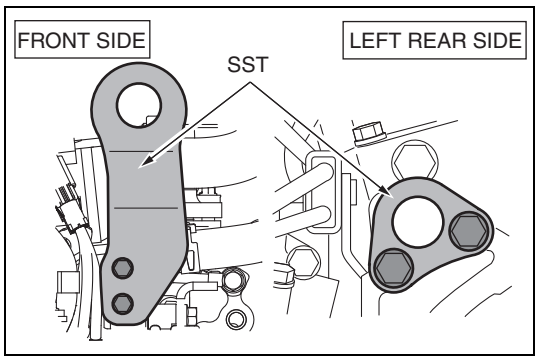
MOUNTING THE ENGINE ASSEMBLY



SHTS021270400016



SHTS021270400017



SHTS021270400018

1. MOUNTING THE ENGINE

(1) Lift the engine in the similar fashion to removing and set the engine to the frame.

⚠ CAUTION

- **Do not allow the engine to contact with the frame and cab during work.**
- **Handle it with care because it is a heavy load.**
- **Do not allow the engine hoist wire rope to contact with the engine or transmission.**

(2) If the engine mounting bolt does not match with the mounting hole, mount the engine while adjusting the engine mounting position by using the tire lever.

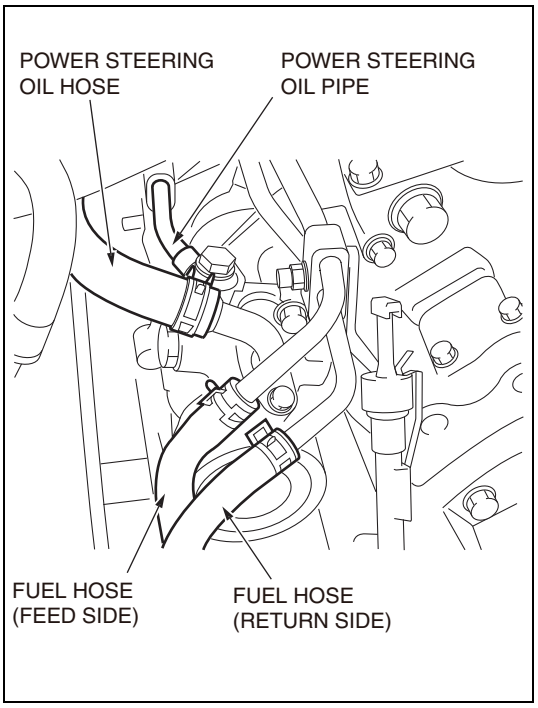
(3) Tighten the 2 mounting nuts of the engine mounting.
Tightening Torque:
98 N·m {999 kgf·cm, 72 lbf·ft}

(4) Remove the SST from the engine.

2. MOUNTING THE TRANSMISSION ASSEMBLY
Reference: CHASSIS (S1-LXJE03A), TRANSMISSION
Reference: CHASSIS (S1-LXJE04A), TRANSMISSION

3. MOUNTING THE CLOSED VENTILATOR
Reference: EMISSION CONTROL (J05E), CLOSED VENTILATOR, REPLACEMENT, MOUNTING THE CLOSED VENTILATOR (Page 8-16)

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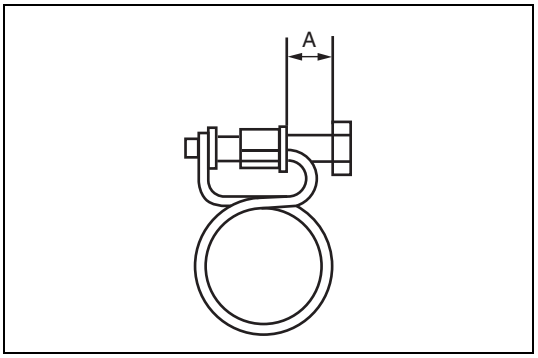


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4. CONNECTING THE POWER STEERING OIL HOSE AND OIL PIPE

(1) Replace with a new gasket and tighten the union bolt to connect the power steering oil pipe to the power steering pump.
Tightening Torque:
71-92 N·m {724-938 kgf·cm, 52-68 lbf·ft}

(2) Align with the marking and tighten with the clamp to connect the power steering oil hose to the power steering pump.



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⚠ CAUTION
Tighten with the clamp until length A becomes 4-5 mm {0.157-0.197 in.}.

5. CONNECTING THE FUEL HOSE

(1) Connect the fuel hose (return side) and fuel hose (feed side) to fuel feed pipe No.4 and return pipe No.3 at the left rear of the flywheel housing with 2 clamps.

⚠ CAUTION
- **Align the marks on the pipe and hose to connect the hoses.**
- **If the chassis side is disconnected to connect the hoses, align the marks to connect them.**

6. CONNECTING OIL RESERVOIR OIL HOSE

(1) Connect the oil reservoir oil hose.

7. MOUNTING EXHAUST PIPE
Reference: EXHAUST (J05E), EXHAUST PIPE, REPLACEMENT, MOUNTING THE EXHAUST SYSTEM COMPONENT PARTS (Page 11-12)

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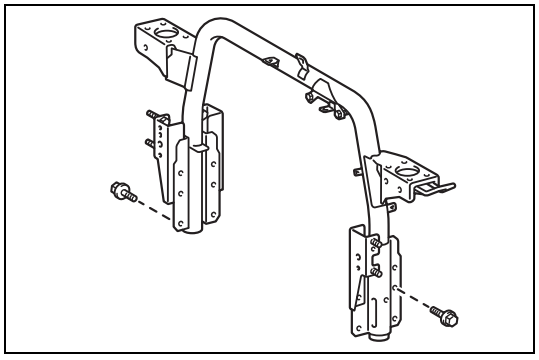
8. CONNECTING THE HARNESS AND CABLE CONNECTING TO THE HV MOTOR (HV ONLY)
Reference: CHASSIS (S1-LXJE03A), TRANSMISSION
Reference: CHASSIS (S1-LXJE04A), TRANSMISSION

9. CONNECTING THE STARTER HARNESS
Reference: STARTING/CHARGING (J05E), STARTER, REPLACEMENT, MOUNTING THE STARTER (Page 16-4)

10. MOUNTING THE ALTERNATOR
Reference: STARTING/CHARGING (J05E), ALTERNATOR (130A), OVERHAUL (Page 16-13)

11. MOUNTING THE RADIATOR
Reference: COOLING (J05E), RADIATOR, REPLACEMENT, MOUNTING THE RADIATOR (Page 12-9)

12. MOUNTING CAB REAR MOUNTING BRACKET SUB ASSEMBLY



SHTS021270400021

(1) Mount the cab rear mounting bracket sub assembly to the frame with the 12 bolts.
Tightening Torque:
38.4-57.6 N·m {392-587 kgf·cm, 29-42 lbf·ft}

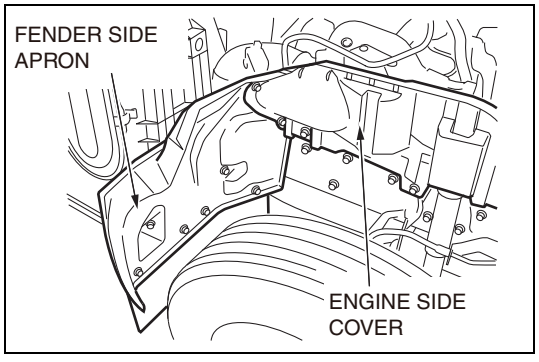
13. MOUNTING BLOCK HEATER
Reference: ENGINE CONTROL (J05E), BLOCK HEATER, REPLACEMENT, MOUNTING BLOCK HEATER (Page 6-21)

14. MOUNTING THE AIR CLEANER BODY ASSEMBLY
Reference: INTAKE (J05E), AIR CLEANER, REPLACEMENT, MOUNTING THE AIR CLEANER ELEMENT AND BODY ASSEMBLY (Page 9-23)

15. MOUNTING RELAY BLOCK
(1) Mount the relay block to the cab mounting bracket.

16. MOUNTING VACUUM RESERVOIR
Reference: CHASSIS (S1-LXJE03A), BRAKE
Reference: CHASSIS (S1-LXJE04A), BRAKE

17. MOUNTING ENGINE SIDE COVER



SHTS021270400022

(1) Mount the engine side cover (right to the frame with the 4 bolts).
(2) Mount the engine side cover (left to the frame with the 4 bolts).
Tightening Torque:
11.5 N·m {117 kgf·cm, 8 lbf·ft}

18. MOUNTING FENDER SIDE APRON
(1) Mount the fender side apron (right).
(2) Mount the fender side apron (left).

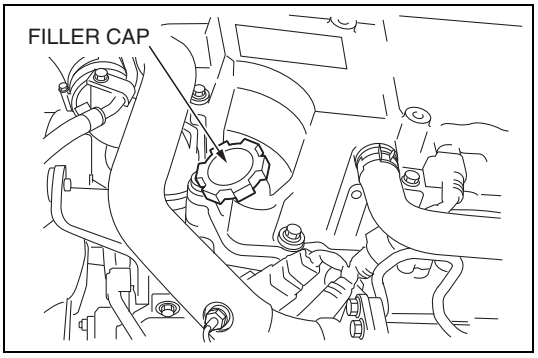
19. MOUNTING THE RESERVE TANK
Reference: COOLING (J05E), RESERVE TANK, REPLACEMENT, MOUNTING THE RESERVE TANK (Page 12-19)

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NEXT STEPS AFTER INSTALLATION

1. ADDING ENGINE OIL

(1) Pour engine oil from filler cap of the engine head cover.

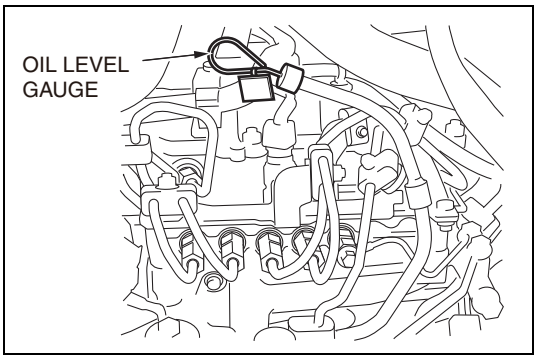


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(2) Add the engine oil from the filler cap while checking the oil level with the oil level gauge at the left of the engine.

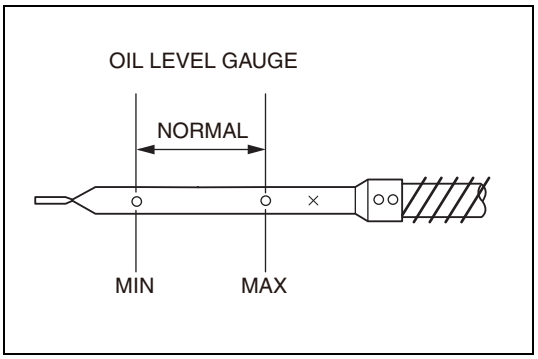
Engine oil level (L {gal (US)})

In oil pan	Oil filter
Approximately 8.0 {2.1}	Approximately 1.4 {0.4}



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⚠ CAUTION
The engine is equipped with DPR (exhaust gas purification unit). Use a specified (recommended) brand engine oil to maintain the functions of the unit for a long time.



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2. INSPECTION FOR ENGINE OIL LEAKAGE
(1) Inspect for engine oil leakage.

3. ADDING THE COOLANT
Reference: COOLING (J05E), RADIATOR, REPLACEMENT, MOUNTING THE RADIATOR (Page 12-9)

4. INSPECTION FOR COOLANT LEAKAGE
Reference: COOLING (J05E), THERMOSTAT CASE AND THERMOSTAT, OVERHAUL, INSPECTING THE COMPONENTS (Page 12-26)

5. ADDING POWER STEERING FLUID
Reference: CHASSIS (S1-LXJE03A), STEERING
Reference: CHASSIS (S1-LXJE04A), STEERING

6. AIR BLEEDING OF FUEL SYSTEM
Reference: FUEL SYSTEM (J05E), FUEL FILTER AND CASE (VEHICLE SIDE), REPLACEMENT, MOUNTING VEHICLE SIDE FUEL FILTER ASSEMBLY (Page 7-60)

7. FUEL LEAK CHECK
(1) Inspect for fuel leakage.

8. AIR BLEEDING OF POWER STEERING
Reference: CHASSIS (S1-LXJE03A), STEERING
Reference: CHASSIS (S1-LXJE04A), STEERING

9. INSPECTION FOR POWER STEERING FLUID LEAKAGE
(1) Inspect for power steering fluid leakage.

10. FILLING REFRIGERANT
Reference: CHASSIS (S1-LXJE03A), HEATER & AIR CONDITIONER
Reference: CHASSIS (S1-LXJE04A), HEATER & AIR CONDITIONER

11. INSPECTION FOR REFRIGERANT GAS LEAKAGE
Reference: CHASSIS (S1-LXJE03A), HEATER & AIR CONDITIONER
Reference: CHASSIS (S1-LXJE04A), HEATER & AIR CONDITIONER

12. CONNECTING BATTERY NEGATIVE TERMINAL
(1) Connect the battery negative terminal.

13. MOUNTING THE SERVICE PLUG (HV ONLY)
(1) Wear insulated gloves and attach the service plug to the PCU.
Reference: CHASSIS (S1-LXJE03A), HYBRID
Reference: CHASSIS (S1-LXJE04A), HYBRID

14. INSPECTING FOR EXHAUST GAS LEAKAGE
(1) Start the engine and inspect for exhaust gas leakage.

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ENGINE CONTROL (J05E)

6-001

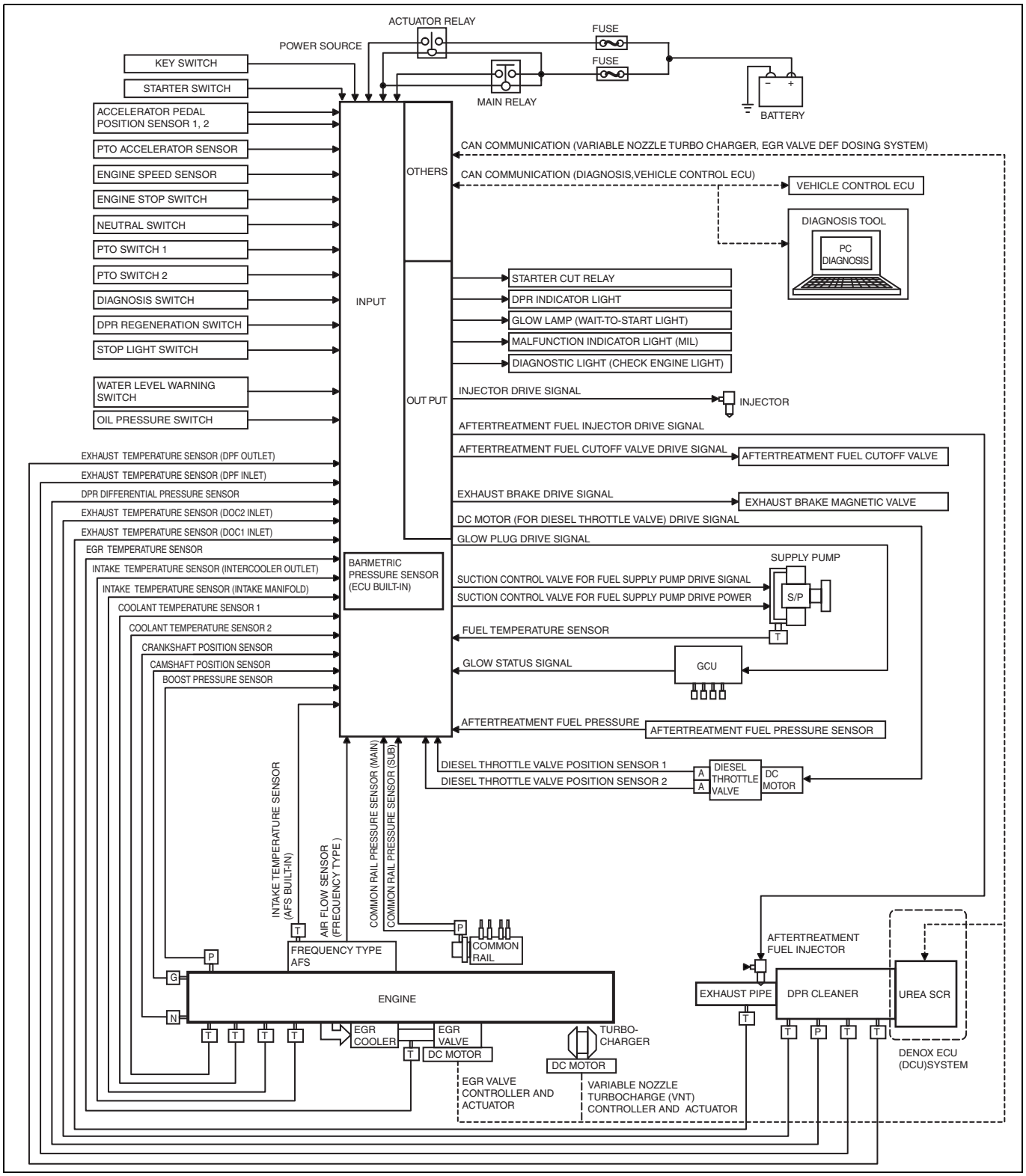
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CONTROL PARTS

SYSTEM BLOCK DIAGRAM

EN01F02127050405019001



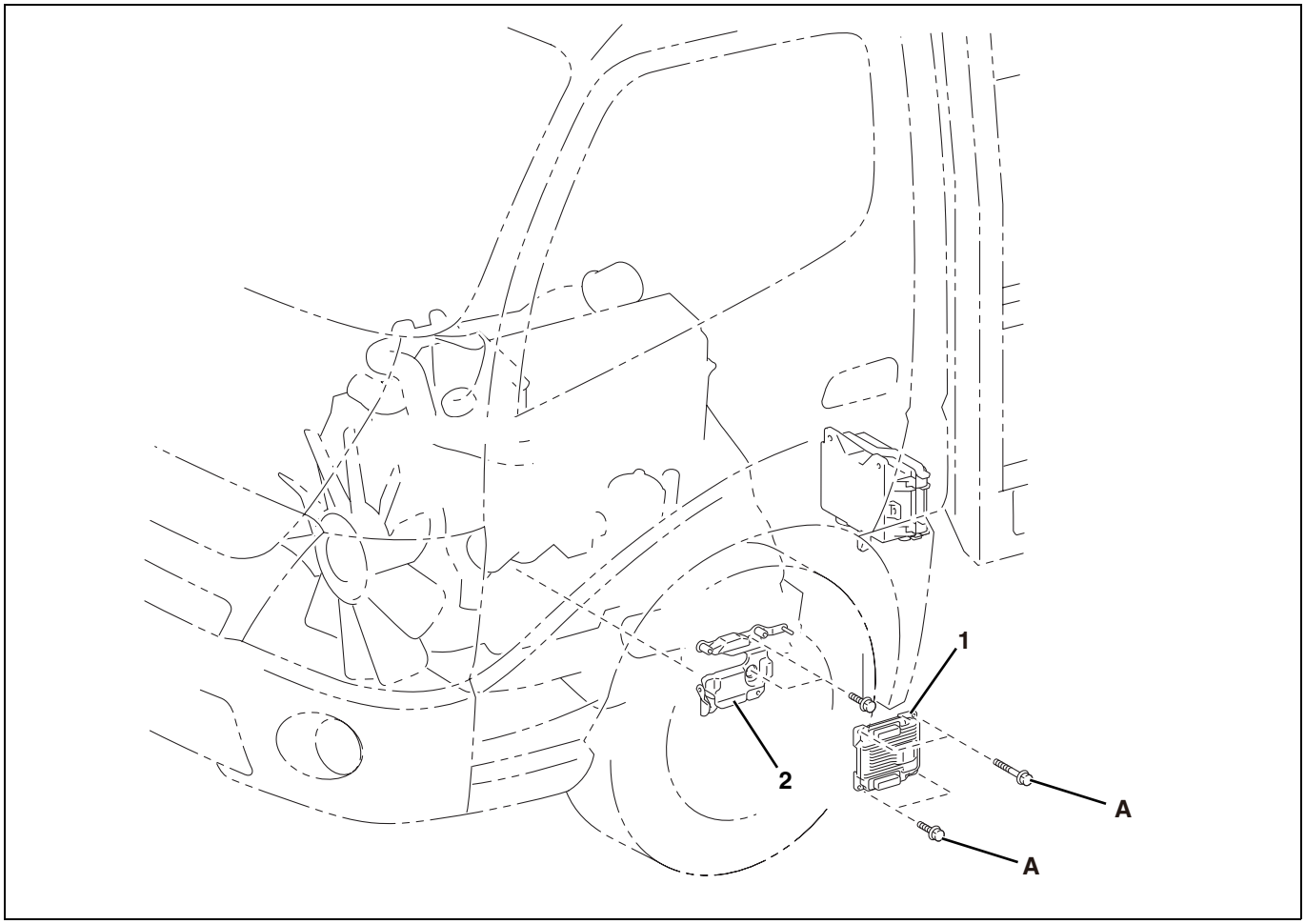
SHTS021270500001

https://truckmanualshub.com/

ENGINE ECU

COMPONENT LOCATOR

EN01F02127050402007001



SHTS021270500002

1	Engine ECU	2	ECU bracket

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	28.5 {290, 21}		

https://truckmanualshub.com/

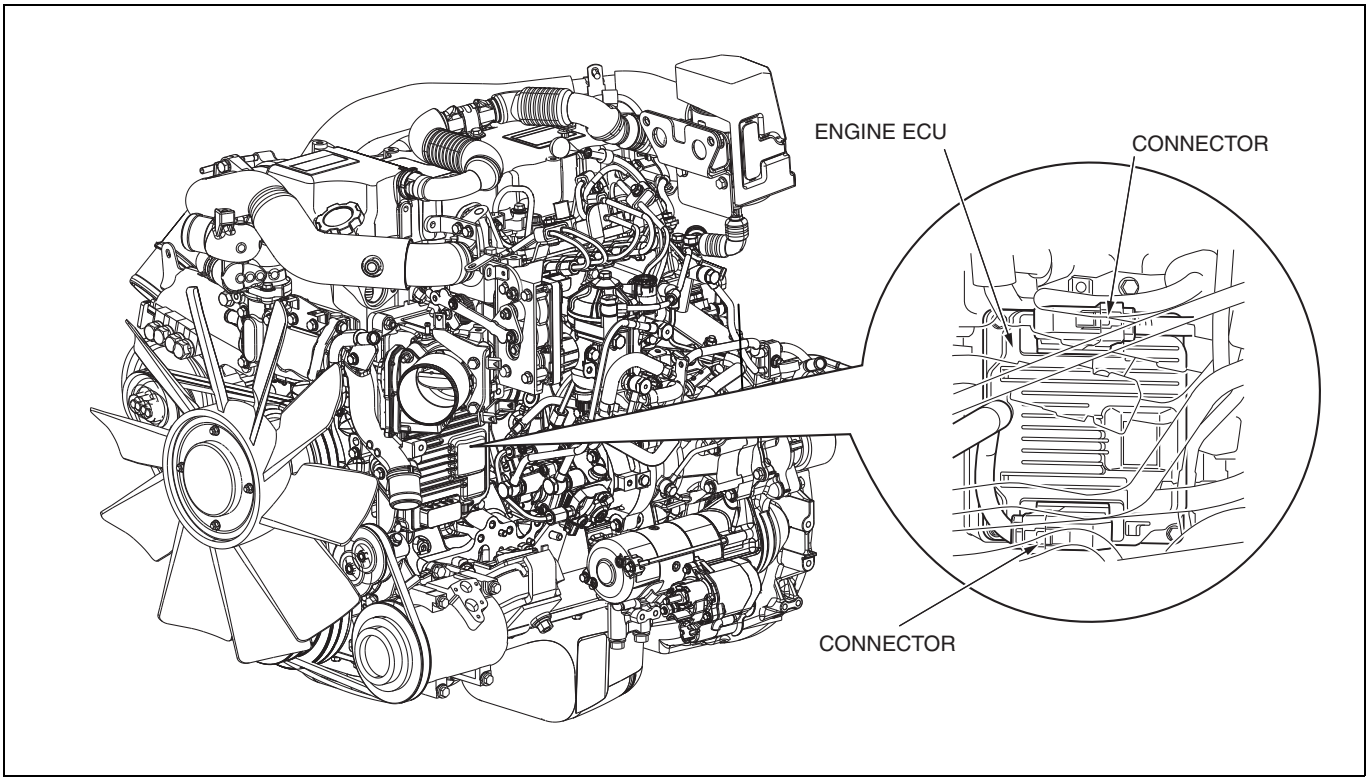
REPLACEMENT

EN01F02127050402007002

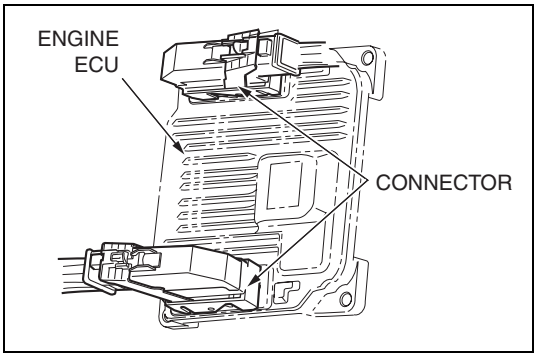
DISCONNECTING THE ENGINE ECU CONNECTOR

1. CAUTIONS

⚠ CAUTION
Perform replace after cooling to prevent burns. (Turn the starter key to the "LOCK" position and leave it for more than 30 minutes to cool.)



SHTS021270500003



SHTS021270500004

2. CLEANING AND DISCONNECTING THE ENGINE ECU CONNECTOR

(1) Check that the engine ECU connector is completely connected to the engine ECU.
(2) Directly spray water around the engine ECU connector by using a spray bottle.

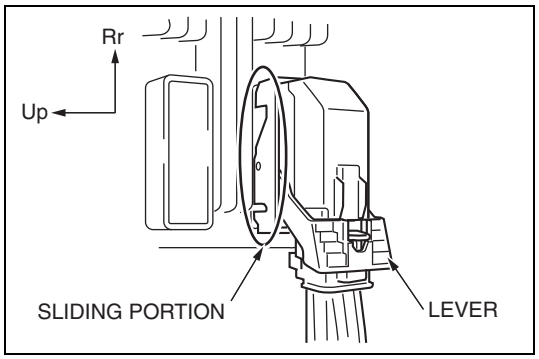
⚠ CAUTION
While working, do not disconnect the connectors.

NOTICE
If it is much dirty, squirt water at the connector sliding portion and connector surface.

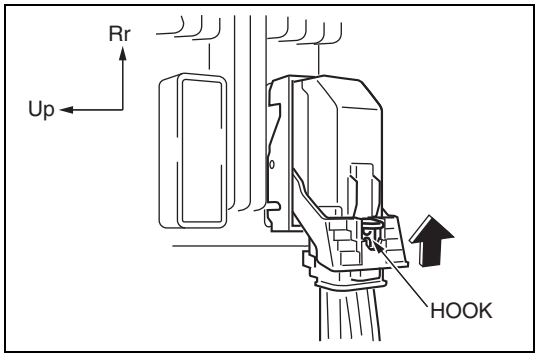
(3) Blow air around the engine ECU connector and engine ECU surface to remove dirt and foreign matter.

⚠ CAUTION
- **While working, do not disconnect the connectors.**
- **Blow off water with air as much as possible for drying.**

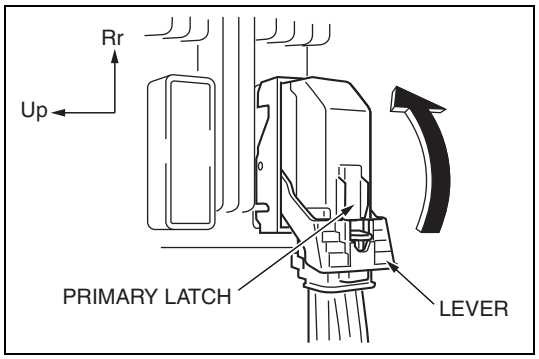
https://truckmanualshub.com/



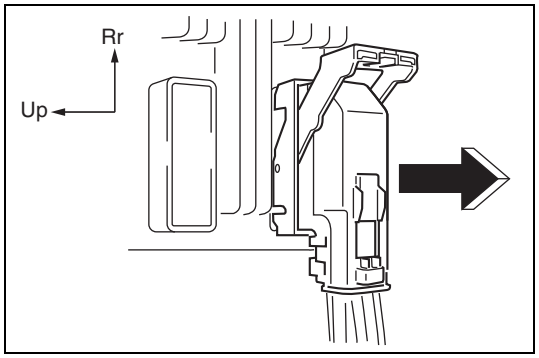
SHTS021270500005



SHTS021270500006



SHTS021270500007



SHTS021270500008

(4) Using the small brush, carefully remove dirt and foreign matter remaining at the sliding portion.

⚠ CAUTION
While working, do not disconnect the connectors.

(5) Using the waste cloth, wipe off around the engine ECU connector and engine ECU surface.

⚠ CAUTION
- **While working, do not disconnect the connectors.**
- **Wipe up water thoroughly.**

(6) If you feel the movement of the lever unsmooth, repeat steps (1) through (5).

(7) Disconnect the engine ECU connector and check it for deposition of dirt and foreign matter.

a. Set the hook of the connector in the direction of the arrow to release the lock.

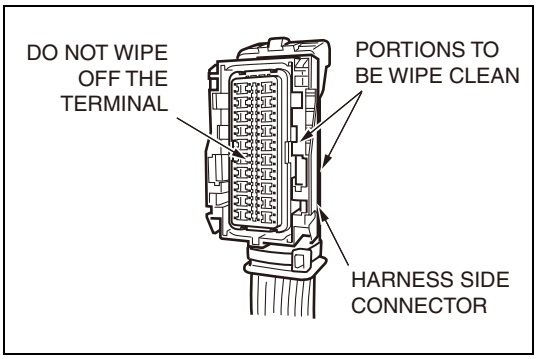
b. While pushing the primary latch of the connector, move the lever in the direction of the arrow as shown in the figure until a "click" is heard and then detach the connector.

c. Pull out the connector straight.

⚠ CAUTION
- **Do not insert and remove the connector more than necessary.**
- **Do not give shocks to the engine ECU.**
- **Never detach the harness by holding and pulling or prying as it may result in wire or terminal deformation.**
- **Never insert a test lead from the rear of the connector.**
- **Do not paint or apply grease or oil to the ECU surface and connector to maintain their functions and durability.**

NOTICE
If it cannot be pulled out with a light force, check if the lever is fully open.

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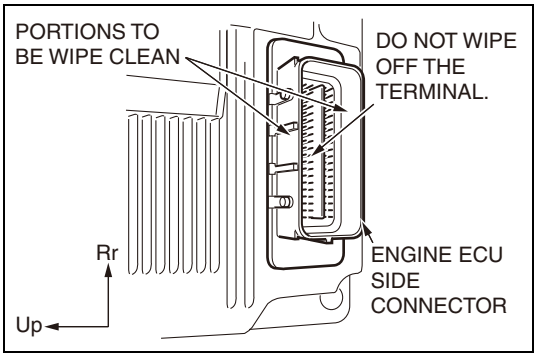


SHTS021270500009

(8) If the side of the harness side connector is found dirty, wipe it off with a moistened waste cloth while being careful not allowing dirt and foreign matter to drop.

⚠ CAUTION

- **Use the thoroughly wrung waste cloth.**
- **Do not wipe off the terminal opening.**
- **Do not directly spray water.**



SHTS021270500010

(9) If the engine ECU side connector is found dirty, wipe off its side with a moistened waste cloth.

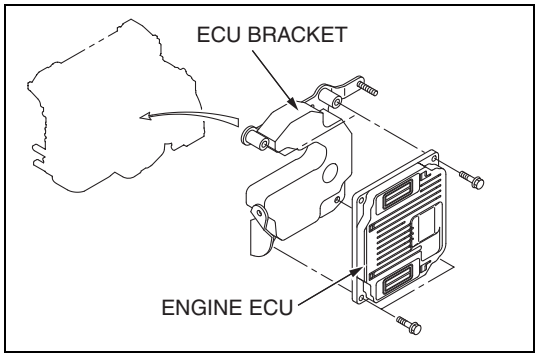
⚠ CAUTION

- **Use the thoroughly wrung waste cloth.**
- **Do not wipe off the terminal opening.**
- **Do not directly spray water.**

(10) Blow the air on the terminal part inside the engine ECU side connector to remove dirt and foreign matter.

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REMOVING THE ENGINE ECU



SHTS021270500011

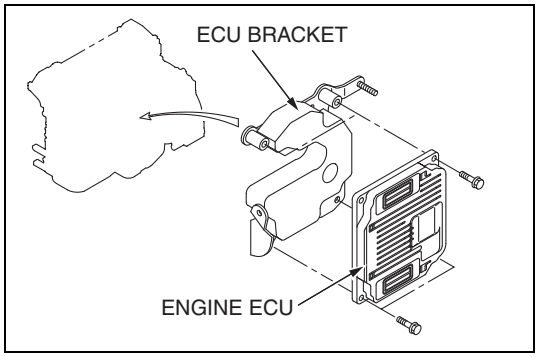
1. REMOVING THE ENGINE ECU

(1) Unfasten the 4 bolts to remove the engine ECU from the ECU bracket.

⚠ CAUTION

- **Protect with plastic covers to avoid entry of dirt and foreign matter into the connectors of the engine ECU.**
- **Do not give shocks to the ECU.**
- **Do not use the engine ECU if dropped.**
- **Do not directly touch the connector terminals by hand.**
- **The engine ECU is impossible of the analyze.**
- **Do not paint or apply grease or oil to the ECU surface and connector to maintain their functions and durability.**

MOUNTING THE ENGINE ECU



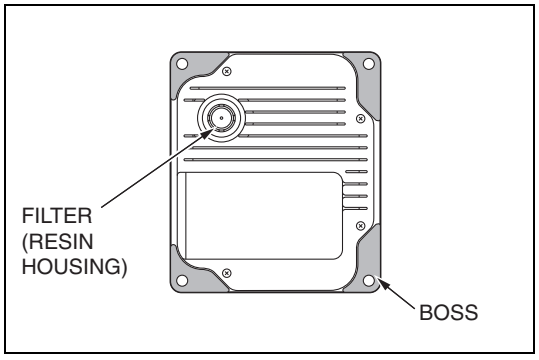
SHTS021270500012

1. MOUNTING THE ENGINE ECU

(1) Mount the engine ECU to the ECU bracket with the 4 bolts. For the tightening order, tighten them diagonally.
Tightening Torque:
28.5 N·m {290 kgf·cm, 21 lbf·ft}

⚠ CAUTION

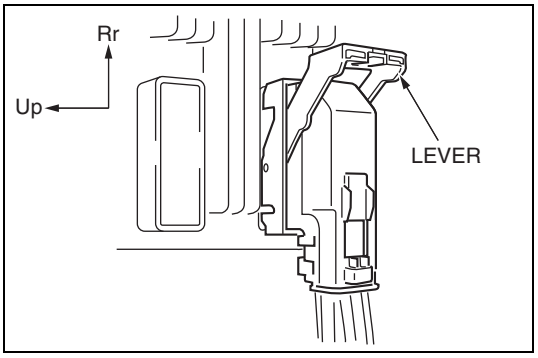
- **Check that there are no dirt and foreign matter in the engine ECU connectors.**
- **Do not give shocks to the ECU.**
- **Do not use the engine ECU if dropped.**
- **Do not directly touch the connector terminals by hand.**
- **The engine ECU is non-dis-assemblable.**
- **Do not paint or apply grease or oil to the ECU surface and connector to maintain their functions and durability.**
- **Check that there is no dirt on the bosses (4 places) on the back of the engine ECU.**
- **Check that there are no grease and damage on the filter (resin housing) on the back of the engine ECU.**



SHTS021270500013

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ATTACHING THE ENGINE ECU CONNECTOR



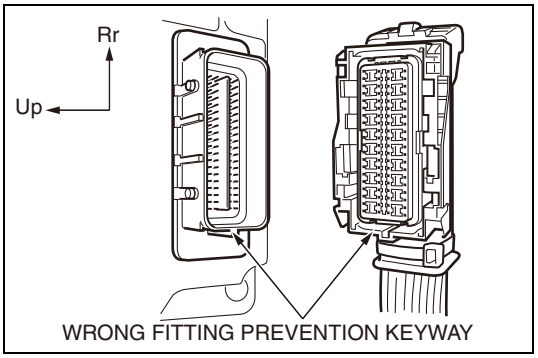
SHTS021270500014

1. ATTACHING THE ENGINE ECU CONNECTOR

(1) Check that the harness side connector lever is fully open and place it straight on the engine ECU side connector.

⚠ CAUTION

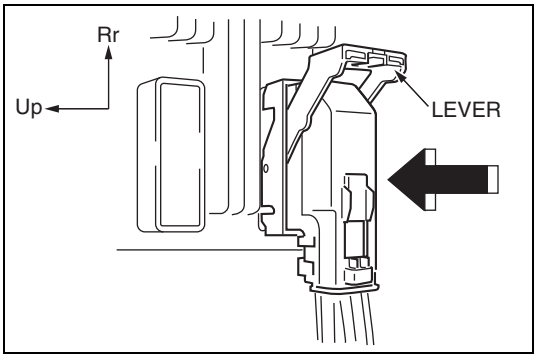
At this time, check that the lever is fully open.



SHTS021270500015

NOTICE

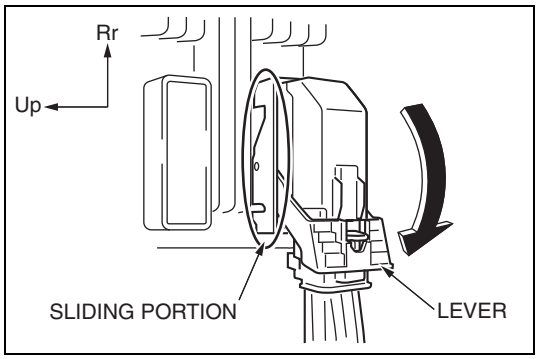
Check that it is inserted along the wrong fitting prevention keyway.



SHTS021270500016

(2) Press the upper part of the harness side connector and insert the connector uniformly.

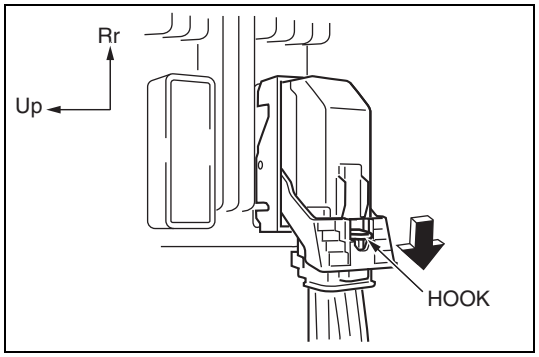
https://truckmanualshub.com/



SHTS021270500017

(3) Move the lever in the direction of the arrow as shown in the figure until a "click" is heard and attach the connector.

⚠ CAUTION
If the lever cannot move smoothly, repeat steps (1) and (2). Also drop a few drops of water to the sliding portion to make it smooth.



SHTS021270500018

(4) Move the hook in the direction of the arrow as shown in the figure until a "click" is heard in order to lock the connector.

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VEHICLE CONTROL ECU

REPLACEMENT

EN01F02127050402022001

REMOVING THE VEHICLE CONTROL ECU

1. **REMOVING THE INSTRUMENT PANELS**
   Reference: CHASSIS (S1-LXJE03A), BODY INSIDE ACCESSORY
   Reference: CHASSIS (S1-LXJE04A), BODY INSIDE ACCESSORY

2. **DISCONNECTING THE HARNESS**
   Reference: CHASSIS (S1-LXJE03A), ELECTRICAL
   Reference: CHASSIS (S1-LXJE04A), ELECTRICAL

3. **REMOVING THE VEHICLE CONTROL ECU**
   Reference: CHASSIS (S1-LXJE03A), ELECTRICAL
   Reference: CHASSIS (S1-LXJE04A), ELECTRICAL

MOUNTING THE VEHICLE CONTROL ECU

1. **MOUNTING THE VEHICLE CONTROL ECU**
   Reference: CHASSIS (S1-LXJE03A), ELECTRICAL
   Reference: CHASSIS (S1-LXJE04A), ELECTRICAL

2. **CONNECTING THE HARNESS**
   Reference: CHASSIS (S1-LXJE03A), ELECTRICAL
   Reference: CHASSIS (S1-LXJE04A), ELECTRICAL

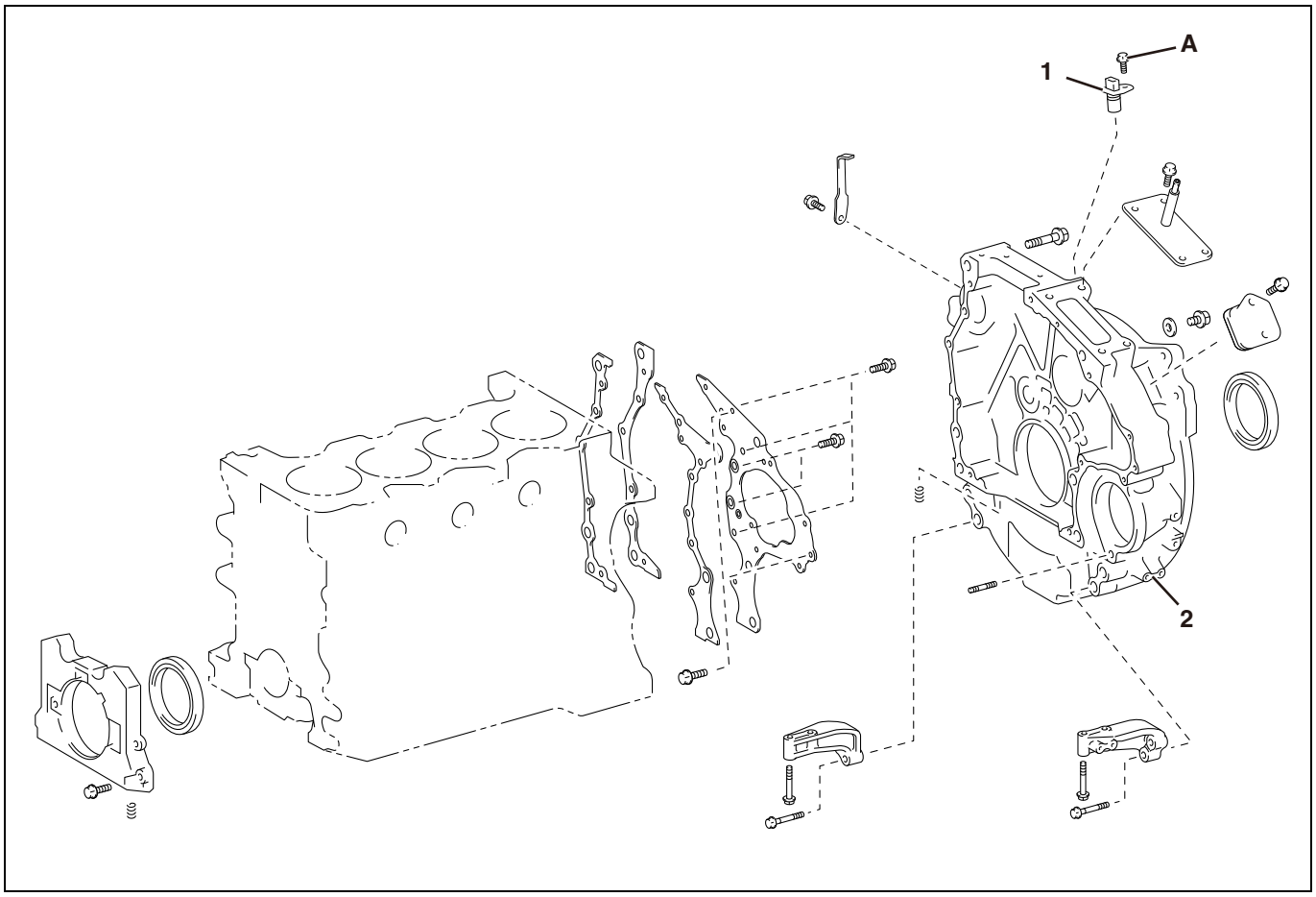
3. **MOUNTING THE INSTRUMENT PANELS**
   Reference: CHASSIS (S1-LXJE03A), BODY INSIDE ACCESSORY
   Reference: CHASSIS (S1-LXJE04A), BODY INSIDE ACCESSORY

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ENGINE SPEED MAIN SENSOR

COMPONENT LOCATOR

EN01F02127050402009001



SHTS021270500019

1	Engine speed main sensor	2	Flywheel housing

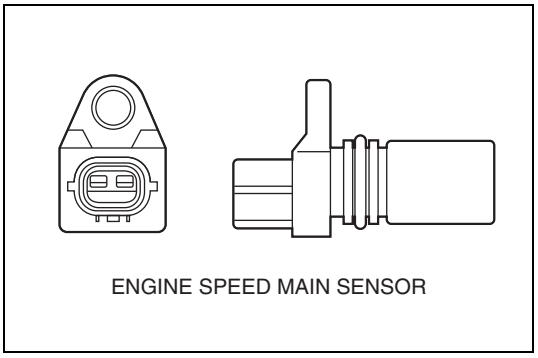
Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	10 {102, 7}		

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INSPECTION

EN01F02127050402009002



SHTS021270500020

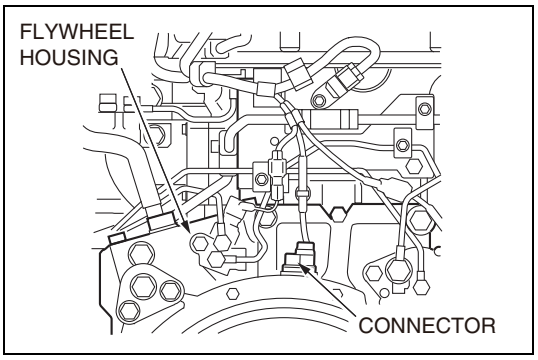
1. INSPECTING THE ENGINE SPEED MAIN SENSOR

(1) Use the HINO-DX, inspect the engine speed main sensor. (Refer to the HINO-DX user's manual.)

REPLACEMENT

EN01F02127050402009003

REMOVING THE ENGINE SPEED MAIN SENSOR



SHTS021270500021

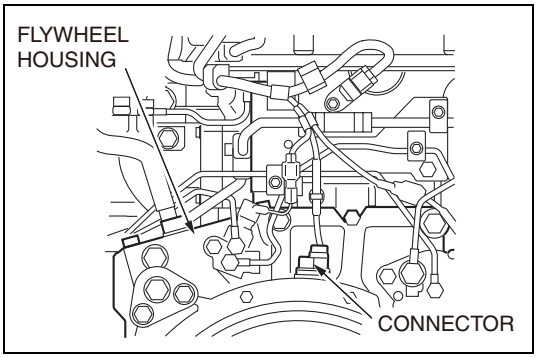
1. DISCONNECTING THE HARNESS

(1) Disconnect the connector connecting to the engine speed main sensor.

2. REMOVING THE ENGINE SPEED MAIN SENSOR

(1) Unfasten the bolt to remove the engine speed main sensor from the flywheel housing.

MOUNTING THE ENGINE SPEED MAIN SENSOR



SHTS021270500022

1. MOUNTING THE ENGINE SPEED MAIN SENSOR

(1) Check that the O-ring is attached to the engine speed main sensor. Mount the engine speed main sensor to the flywheel housing with bolts.
Tightening Torque:
10 N·m {102 kgf·cm, 7 lbf·ft}

⚠ CAUTION
Before reusing the O-ring, check the O-ring for damage, deformation and foreign matter.

NOTICE

- **Gap adjustment is not necessary for this sensor as it is flange type.**
- **The O-ring is reusable.**

2. CONNECTING THE HARNESS

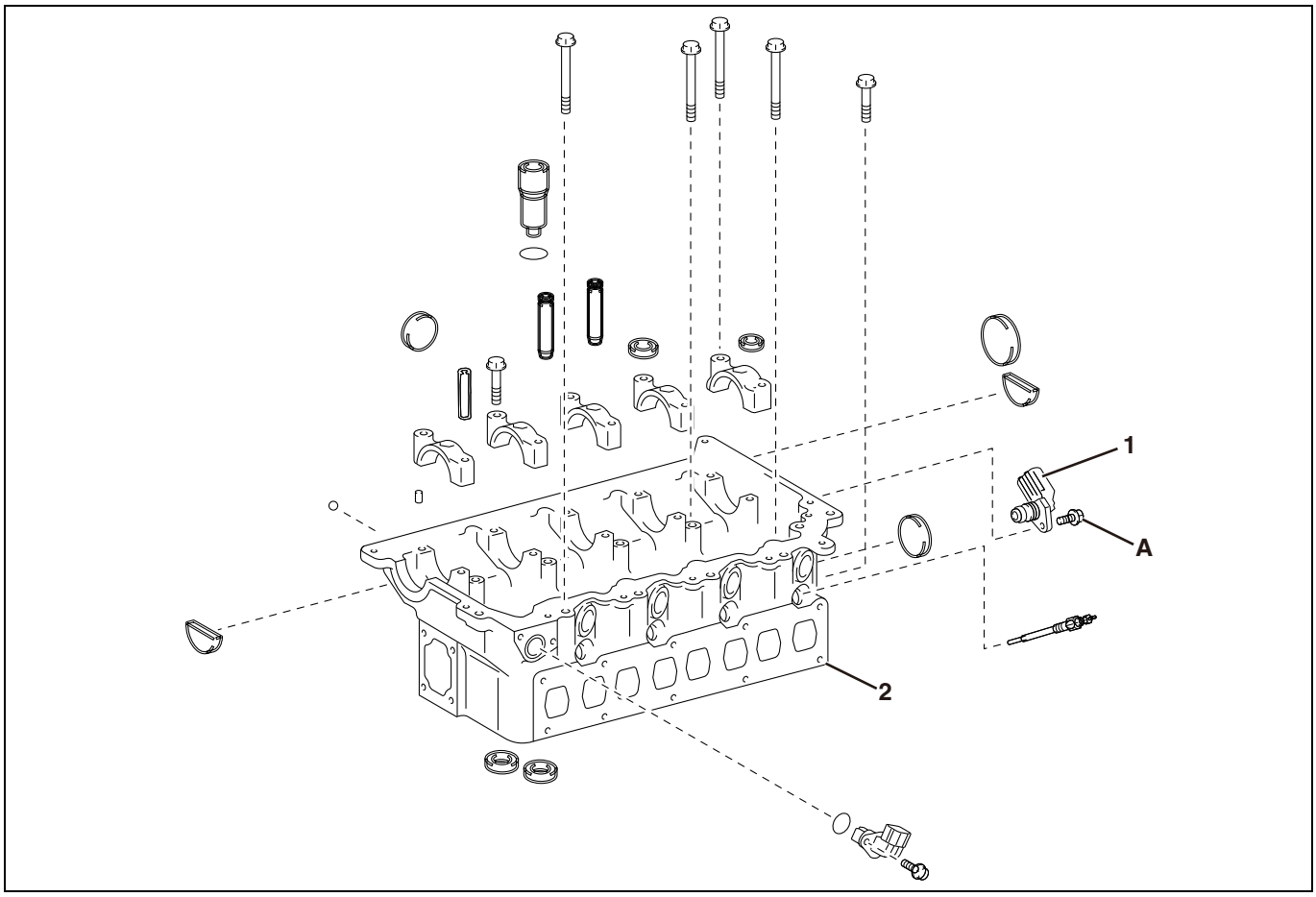
(1) Connect the connector to the engine speed main sensor.

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ENGINE SPEED SUB SENSOR

COMPONENT LOCATOR

EN01F02127050402010001



SHTS021270500023

1	Engine speed sub sensor	2	Cylinder head

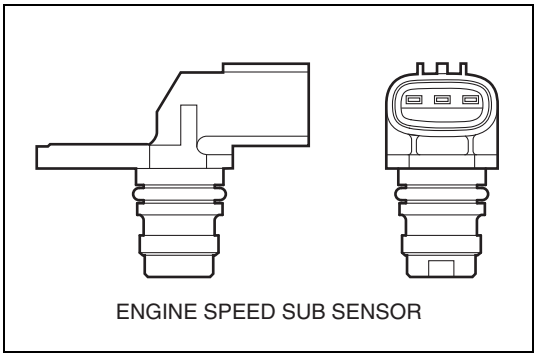
Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	4-6 {41-61, 3.0-4.4}		

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INSPECTION

EN01F02127050402010002



SHTS021270500024

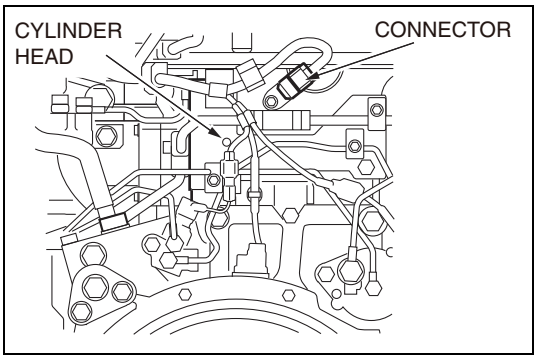
1. INSPECTING THE ENGINE SPEED SUB SENSOR

(1) Use the HINO-DX, inspect the engine speed sub sensor. (Refer to the HINO-DX user's manual.)

REPLACEMENT

EN01F02127050402010003

REMOVING THE ENGINE SPEED SUB SENSOR



SHTS021270500025

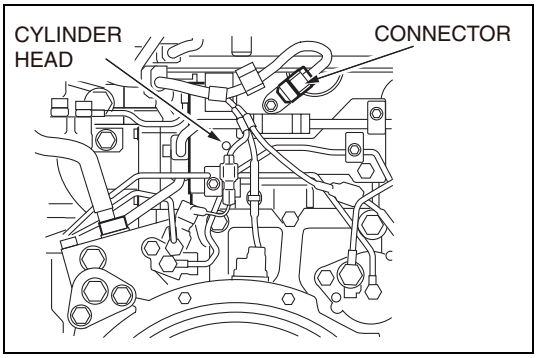
1. DISCONNECTING THE HARNESS

(1) Disconnect the connector connecting to the engine speed sub sensor.

2. REMOVING THE ENGINE SPEED SUB SENSOR

(1) Unfasten the bolt and remove the engine speed sub sensor from the cylinder head.

MOUNTING THE ENGINE SPEED SUB SENSOR



SHTS021270500026

1. MOUNTING THE ENGINE SPEED SUB SENSOR

(1) Check that the O-ring is attached to the engine speed sub sensor and mount the engine speed sub sensor to the cylinder head with the bolt.

Tightening Torque:
4-6 N·m {41-61 kgf·cm, 3.0-4.4 lbf·ft}

⚠ CAUTION

Before reusing the O-ring, check the O-ring for damage, deformation and foreign matter.

NOTICE

- **Gap adjustment is not necessary for this sensor as it is flange type.**
- **The O-ring is reusable.**

2. CONNECTING THE HARNESS

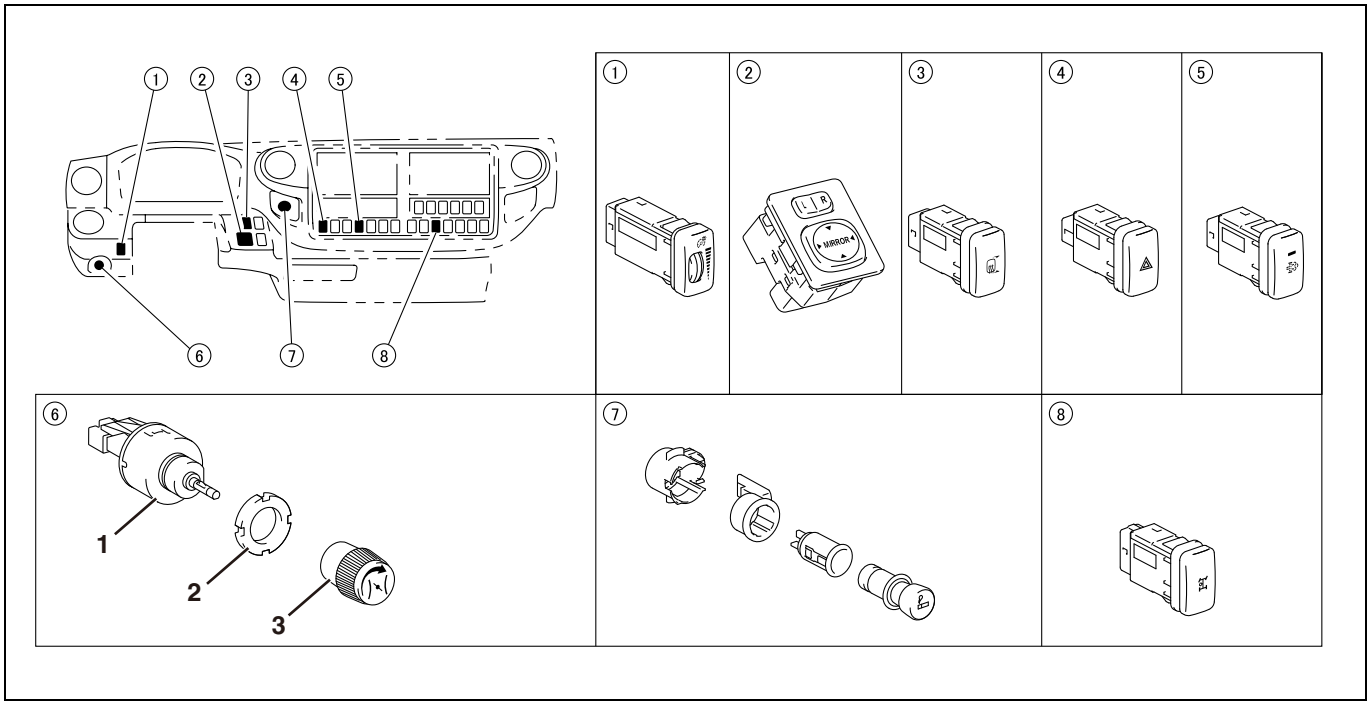
(1) Connect the connector to the engine speed sub sensor.

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IDLE SET VOLUME

COMPONENT LOCATOR

EN01F02127050402023001



SHTS021270500027

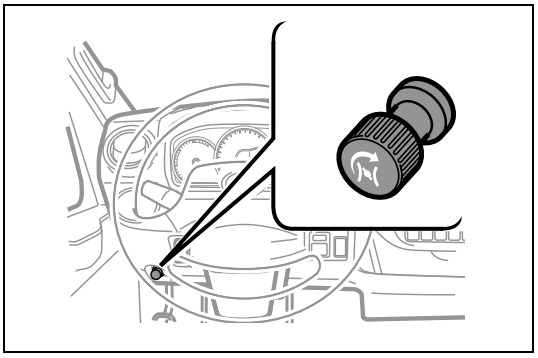
1	Idle set volume	3	Idle set button
2	Ring nut		

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REPLACEMENT

EN01F02127050402023002

REMOVING THE IDLE SET VOLUME



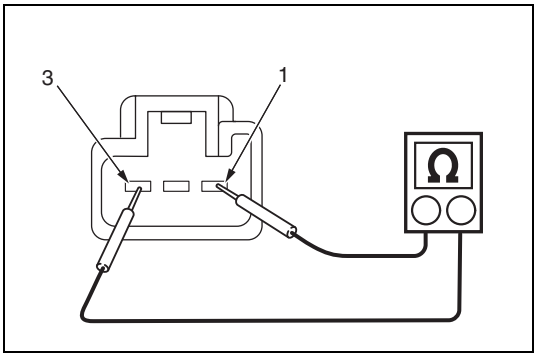
SHTS021270500028

1. REMOVING THE IDLE SET VOLUME

(1) While pressing the idle set volume claw using a flat-blade screwdriver wrapped with protective tape, pull out the idle set button.

(2) Disconnect the connector of the harness and remove the ring nut to detach the idle set volume.

SINGLE UNIT INSPECTION

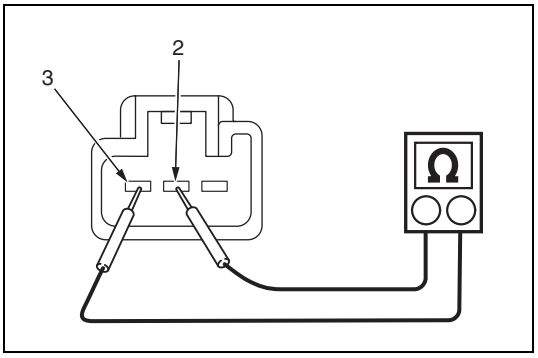


SHTS021270500029

1. INSPECTING THE RESISTANCE OF IDLE SET VOLUME

(1) Using the circuit tester, measure resistance between the 1st and 3rd terminals of the connector (parts side) with the idle set volume shaft fully turned counterclockwise. If the measured value exceeds the standard value, replace the volume.

Standard value (Ω)	1,180-1,620

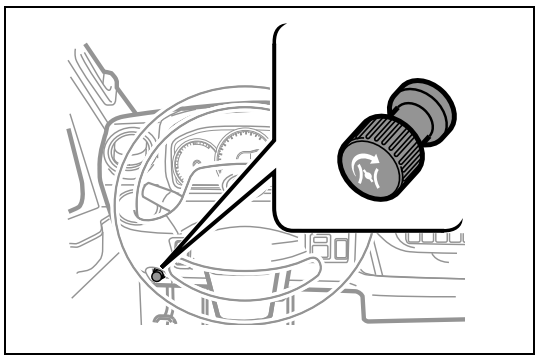


SHTS021270500030

(2) While turning the idle set volume shaft, measure resistance between the 2nd and 3rd terminals. Check that the resistance value smoothly changes as the shaft is turned. In the case of irregular fluctuation or intermittent discontinuity of the resistance value, replace the volume.

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MOUNTING THE IDLE SET VOLUME



SHTS021270500031

1. MOUNTING THE IDLE SET VOLUME

(1) Insert the idle set volume in the same direction as the hole of the instrument panel and fix it with the ring nut.

⚠ CAUTION

- **Do not break the idle set volume.**
- **Check the idle set volume for looseness.**

(2) Fit the idle set button in the direction of the idle set volume claw. Pull the idle set button to make sure that it is fixed and then connect the harness connector.

⚠ CAUTION

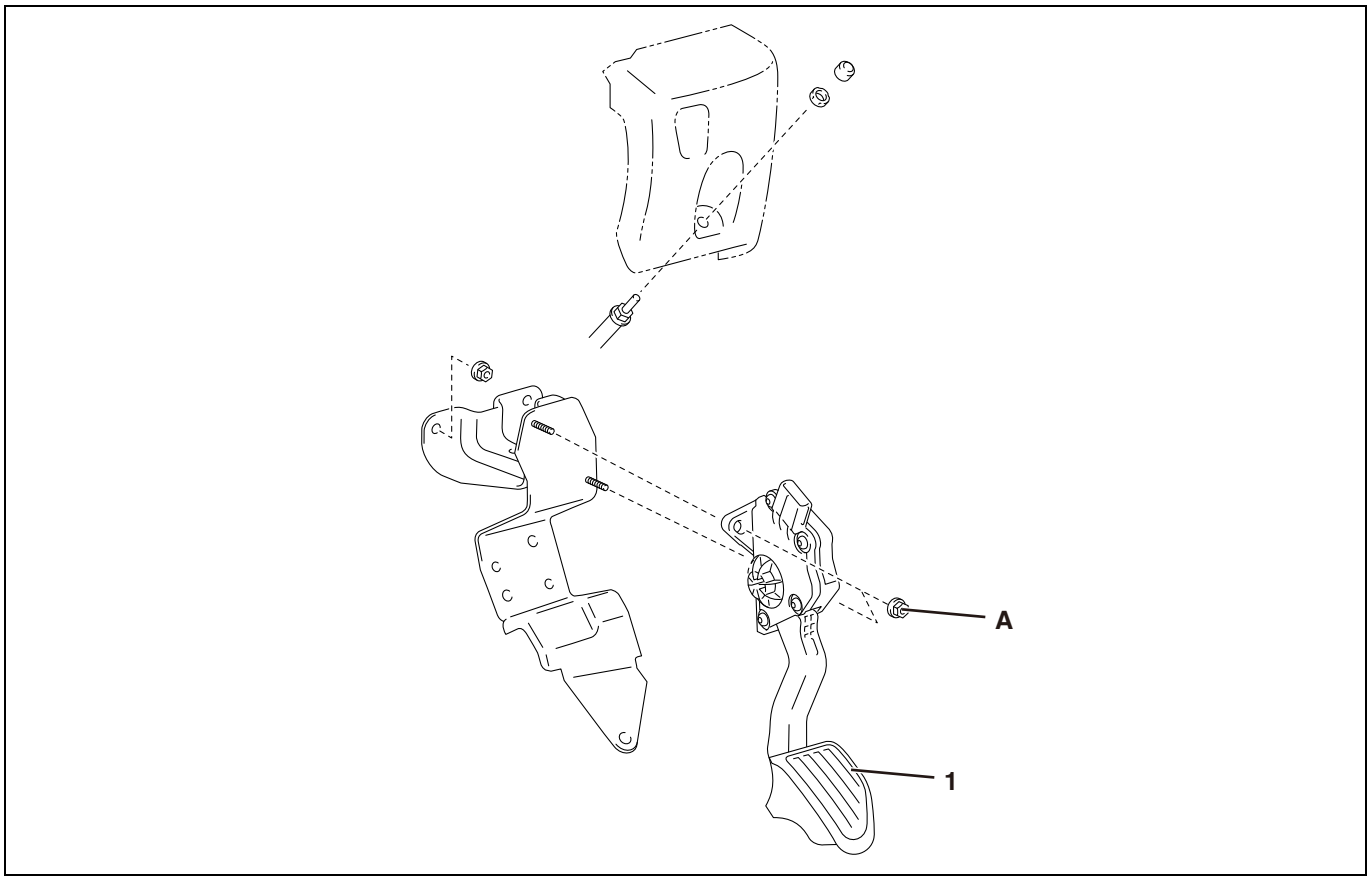
After mounting, pull the button to make sure that it is securely fixed.

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ACCELERATOR PEDAL

COMPONENT LOCATOR

EN01F02127050402003001



SHTS021270500032

1 Accelerator pedal assembly	

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

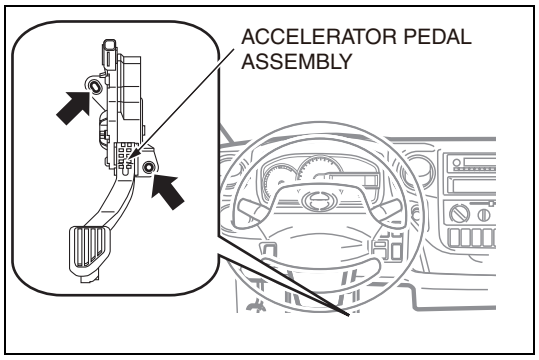
A 5.5 {56, 4}	

https://truckmanualshub.com/

REPLACEMENT

EN01F02127050402003002

REMOVING THE ACCELERATOR PEDAL UNIT ASSEMBLY



SHTS021270500033

1. REMOVING THE ACCELERATOR PEDAL UNIT ASSEMBLY

(1) Disconnect the connector connected to the accelerator pedal assembly.

(2) Unfasten the 2 nuts and remove the accelerator pedal assembly.

SINGLE UNIT INSPECTION

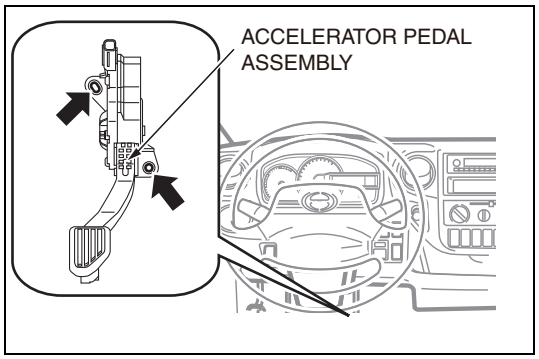
1. INSPECTION OF ACCELERATOR PEDAL ASSEMBLY

(1) Use the HINO-DX, inspect the output voltage.
(Refer to the HINO-DX user's manual.)

(2) If the output voltage does not meet the standard, replace the accelerator pedal assembly.

Measured item		Standard value (V)
Accelerator pedal position sensor 1	Accelerator fully-closed	0.6-1.0
	Accelerator fully open	2.8-3.6
Accelerator pedal position sensor 2	Accelerator fully-closed	1.4-1.8
	Accelerator fully open	3.6-4.4

MOUNTING THE ACCELERATOR PEDAL ASSEMBLY



SHTS021270500034

1. MOUNTING THE ACCELERATOR PEDAL ASSEMBLY

(1) Mount the accelerator pedal assembly with 2 nuts.
Tightening Torque:
5.5 N·m {56 kgf·cm, 4 lbf·ft}

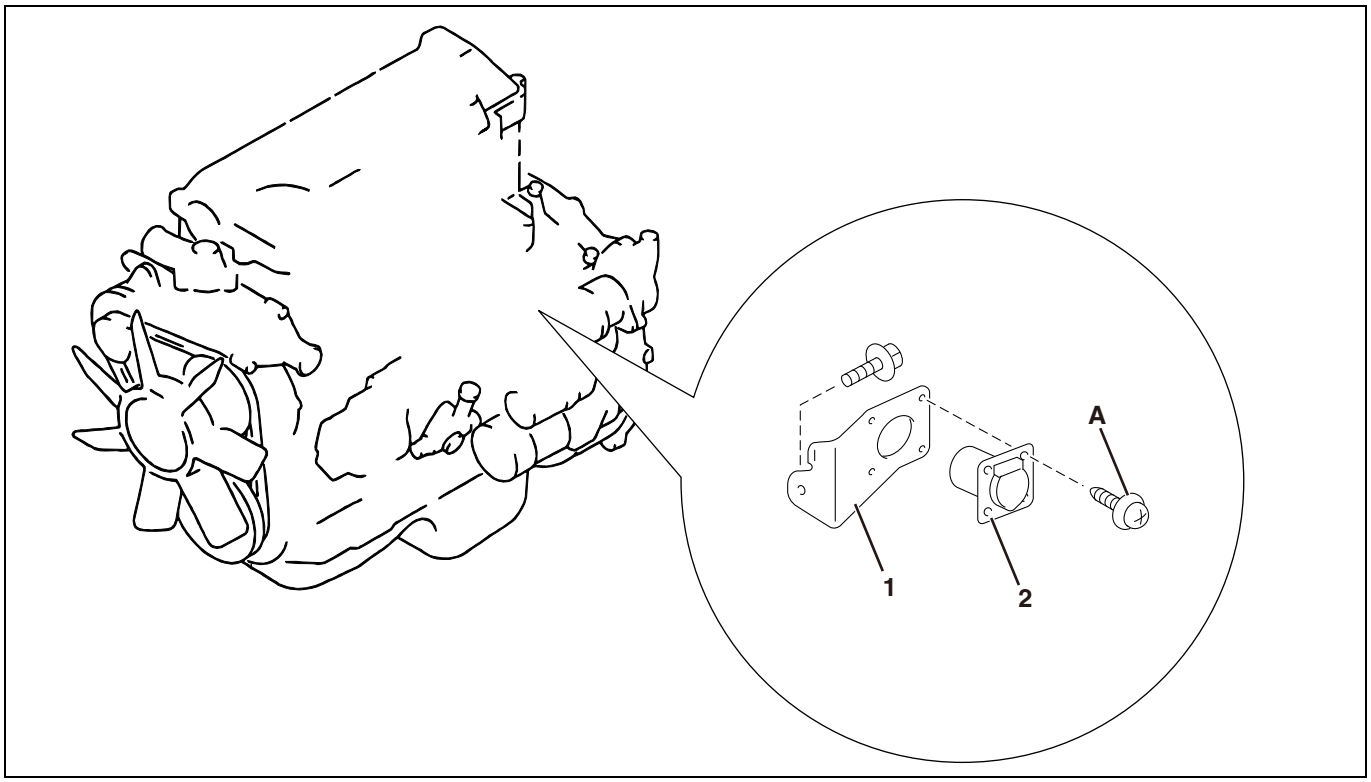
(2) Connect the connector of the accelerator pedal assembly.

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BLOCK HEATER

COMPONENT LOCATOR

EN01F02127050402086001



SHTS021270500035

1	Bracket	2	Socket

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

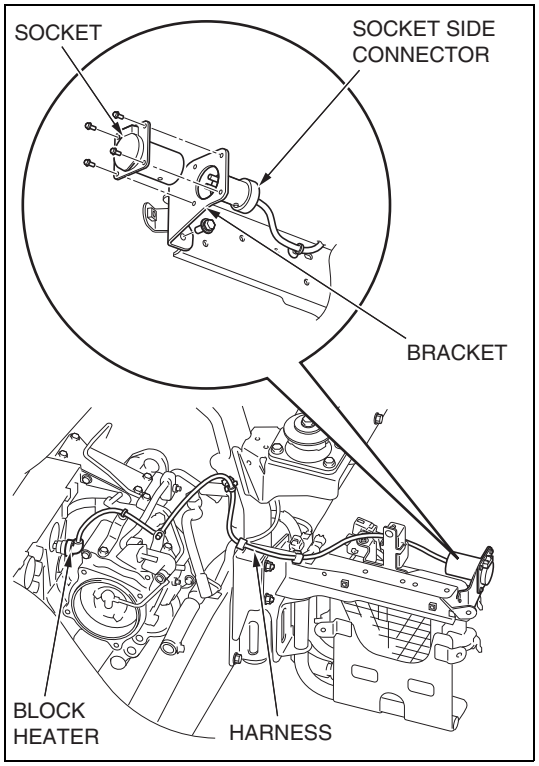
A	1.4-1.7 {14-17, 1.0-1.3}		

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REPLACEMENT

EN01F02127050402086002

REMOVING BLOCK HEATER HARNESS



SHTS021270500036

1. REMOVING THE HARNESS

(1) Disconnect the block heater harness from the block heater or the cylinder block.
(2) Unfasten the clamp and remove the harness.
(3) Remove the socket side connector from the socket.
(4) Unfasten the bolt to remove the socket from the bracket.

MOUNTING BLOCK HEATER HARNESS

1. MOUNTING THE HARNESS

(1) Mount the socket to the bracket with the bolt.
Tightening Torque:
1.4-1.7 N·m {14-17 kgf·cm, 1.0-1.3 lbf·ft}

(2) Mount the socket side connector to the socket.
(3) Fasten the harness with the clamp.
(4) Mount the block heater harness to the block heater or the cylinder block.

REMOVING BLOCK HEATER

1. REMOVING THE BLOCK HEATER

(1) Disconnect the harness from the block heater.
(2) Pullout the block heater from the cylinder block.

MOUNTING BLOCK HEATER

1. MOUNTING THE BLOCK HEATER

(1) Mount the block heater to the cylinder block.
(2) Connect the harness to the block heater.

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FUEL SENDER GAUGE

REPLACEMENT

EN01F02127050402040001

1. **REMOVING THE FUEL SENDER GAUGE**
   Reference: FUEL SYSTEM (J05E), FUEL SENDER GAUGE, REPLACEMENT, REMOVING THE FUEL SENDER GAUGE (Page 7-12)

2. **SINGLE UNIT INSPECTION**
   Reference: FUEL SYSTEM (J05E), FUEL SENDER GAUGE, REPLACEMENT, SINGLE UNIT INSPECTION (Page 7-12)

3. **MOUNTING THE FUEL SENDER GAUGE**
   Reference: FUEL SYSTEM (J05E), FUEL SENDER GAUGE, REPLACEMENT, MOUNTING THE FUEL SENDER GAUGE (Page 7-13)

INTAKE TEMPERATURE SENSOR

REPLACEMENT

EN01F02127050402055001

1. **REMOVING THE INTAKE TEMPERATURE SENSOR**
   Reference: INTAKE (J05E), INTAKE TEMPERATURE SENSOR, REPLACEMENT, REMOVING THE INTAKE TEMPERATURE SENSOR (Page 9-28)

2. **MOUNTING THE INTAKE TEMPERATURE SENSOR**
   Reference: INTAKE (J05E), INTAKE TEMPERATURE SENSOR, REPLACEMENT, MOUNTING THE INTAKE TEMPERATURE SENSOR (Page 9-28)

DIESEL THROTTLE

REPLACEMENT

EN01F02127050402038001

1. **REMOVING THE DIESEL THROTTLE**
   Reference: INTAKE (J05E), DIESEL THROTTLE, REPLACEMENT, REMOVING THE DIESEL THROTTLE (Page 9-9)

2. **SINGLE UNIT INSPECTION**
   (1) Use the HINO-DX for inspection.
   (Refer to the HINO-DX user's manual.)

3. **MOUNTING THE DIESEL THROTTLE**
   Reference: INTAKE (J05E), DIESEL THROTTLE, REPLACEMENT, MOUNTING THE DIESEL THROTTLE (Page 9-10)

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BOOST PRESSURE SENSOR

REPLACEMENT

EN01F02127050402050001

1. REMOVING THE BOOST PRESSURE SENSOR
Reference: INTAKE (J05E), BOOST PRESSURE SENSOR, REPLACEMENT, REMOVING THE BOOST PRESSURE SENSOR (Page 9-30)

2. SINGLE UNIT INSPECTION
(1) Use the HINO-DX for inspection.
(Refer to the HINO-DX user's manual.)

3. MOUNTING THE BOOST PRESSURE SENSOR
Reference: INTAKE (J05E), BOOST PRESSURE SENSOR, REPLACEMENT, MOUNTING THE BOOST PRESSURE SENSOR (Page 9-31)

AIR FLOW SENSOR

REPLACEMENT

EN01F02127050402006001

1. REMOVING THE AIR FLOW SENSOR
Reference: INTAKE (J05E), AIR FLOW SENSOR, REPLACEMENT, REMOVING THE AIR FLOW SENSOR (Page 9-35)

2. SINGLE UNIT INSPECTION
(1) Use the HINO-DX for inspection.
(Refer to the HINO-DX user's manual.)

3. MOUNTING THE AIR FLOW SENSOR
Reference: INTAKE (J05E), AIR FLOW SENSOR, REPLACEMENT, MOUNTING THE AIR FLOW SENSOR (Page 9-35)

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DPR DIFFERENTIAL PRESSURE SENSOR

REPLACEMENT

EN01F02127050402045001

1. **REMOVING THE DPR DIFFERENTIAL PRESSURE SENSOR**
   Reference: EXHAUST (J05E), DPR DIFFERENTIAL PRESSURE SENSOR, REPLACEMENT, REMOVE THE DPR DIFFERENTIAL PRESSURE SENSOR (Page 11-96)

2. **SINGLE UNIT INSPECTION**
   Reference: EXHAUST (J05E), DPR DIFFERENTIAL PRESSURE SENSOR, REPLACEMENT, SINGLE UNIT INSPECTION (Page 11-96)

3. **MOUNTING THE DPR DIFFERENTIAL PRESSURE SENSOR**
   Reference: EXHAUST (J05E), DPR DIFFERENTIAL PRESSURE SENSOR, REPLACEMENT, MOUNTING THE DPR DIFFERENTIAL PRESSURE SENSOR (Page 11-97)

SCR UPSTREAM NOx SENSOR

REPLACEMENT

EN01F02127050402030001

1. **REMOVING THE UPSTREAM NOx SENSOR**
   Reference: EXHAUST (J05E), SCR UPSTREAM NOx SENSOR, REPLACEMENT, REMOVING THE SCR UPSTREAM NOx SENSOR (Page 11-99)

2. **MOUNTING THE UPSTREAM NOx SENSOR**
   Reference: EXHAUST (J05E), SCR UPSTREAM NOx SENSOR, REPLACEMENT, MOUNTING THE SCR UPSTREAM NOx SENSOR (Page 11-100)

SCR DOWNSTREAM NOx SENSOR

REPLACEMENT

EN01F02127050402031001

1. **REMOVING THE DOWNSTREAM NOx SENSOR**
   Reference: EXHAUST (J05E), SCR DOWNSTREAM NOx SENSOR, REPLACEMENT, REMOVING THE SCR DOWNSTREAM NOx SENSOR (Page 11-102)

2. **MOUNTING THE DOWNSTREAM NOx SENSOR**
   Reference: EXHAUST (J05E), SCR DOWNSTREAM NOx SENSOR, REPLACEMENT, MOUNTING THE SCR DOWNSTREAM NOx SENSOR (Page 11-103)

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ATC DOWNSTREAM TEMPERATURE SENSOR

REPLACEMENT

EN01F02127050402032001

1. **REMOVING THE ATC DOWNSTREAM TEMPERATURE SENSOR**
   Reference: EXHAUST (J05E), ATC UPSTREAM TEMPERATURE SENSOR, REPLACEMENT, REMOVING THE ATC UPSTREAM TEMPERATURE SENSOR (Page 11-105)

2. **SINGLE UNIT INSPECTION**
   Reference: EXHAUST (J05E), ATC UPSTREAM TEMPERATURE SENSOR, REPLACEMENT, SINGLE UNIT INSPECTION (Page 11-105)

3. **MOUNTING THE ATC DOWNSTREAM TEMPERATURE SENSOR**
   Reference: EXHAUST (J05E), ATC UPSTREAM TEMPERATURE SENSOR, REPLACEMENT, MOUNTING THE ATC UPSTREAM TEMPERATURE SENSOR (Page 11-106)

DOC UPSTREAM TEMPERATURE SENSOR

REPLACEMENT

EN01F02127050402033001

1. **REMOVING DOC UPSTREAM TEMPERATURE SENSOR**
   Reference: EXHAUST (J05E), DOC UPSTREAM TEMPERATURE SENSOR, REPLACEMENT, REMOVING DOC UPSTREAM TEMPERATURE SENSOR (Page 11-108)

2. **SINGLE UNIT INSPECTION**
   Reference: EXHAUST (J05E), DOC UPSTREAM TEMPERATURE SENSOR, REPLACEMENT, SINGLE UNIT INSPECTION (Page 11-108)

3. **MOUNTING DOC UPSTREAM TEMPERATURE SENSOR**
   Reference: EXHAUST (J05E), DOC UPSTREAM TEMPERATURE SENSOR, REPLACEMENT, MOUNTING DOC UPSTREAM TEMPERATURE SENSOR (Page 11-109)

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DPR UPSTREAM TEMPERATURE SENSOR

REPLACEMENT

EN01F02127050402079001

1. **REMOVING THE DPR UPSTREAM TEMPERATURE SENSOR**
   Reference: EXHAUST (J05E), DPR UPSTREAM TEMPERATURE SENSOR, REPLACEMENT, REMOVING THE DPR UPSTREAM TEMPERATURE SENSOR (Page 11-111)

2. **SINGLE UNIT INSPECTION**
   Reference: EXHAUST (J05E), DPR UPSTREAM TEMPERATURE SENSOR, REPLACEMENT, SINGLE UNIT INSPECTION (Page 11-111)

3. **MOUNTING THE DPR UPSTREAM TEMPERATURE SENSOR**
   Reference: EXHAUST (J05E), DPR UPSTREAM TEMPERATURE SENSOR, REPLACEMENT, MOUNTING THE DPR UPSTREAM TEMPERATURE SENSOR (Page 11-111)

DPR DOWNSTREAM TEMPERATURE SENSOR

REPLACEMENT

EN01F02127050402035001

1. **REMOVING THE DPR DOWNSTREAM TEMPERATURE SENSOR**
   Reference: EXHAUST (J05E), DPR DOWNSTREAM TEMPERATURE SENSOR, REPLACEMENT, REMOVING THE DPR DOWNSTREAM TEMPERATURE SENSOR (Page 11-113)

2. **SINGLE UNIT INSPECTION**
   Reference: EXHAUST (J05E), DPR DOWNSTREAM TEMPERATURE SENSOR, REPLACEMENT, SINGLE UNIT INSPECTION (Page 11-113)

3. **MOUNTING THE DPR DOWNSTREAM TEMPERATURE SENSOR**
   Reference: EXHAUST (J05E), DPR DOWNSTREAM TEMPERATURE SENSOR, REPLACEMENT, MOUNTING THE DPR DOWNSTREAM TEMPERATURE SENSOR (Page 11-114)

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SCR UPSTREAM TEMPERATURE SENSOR

REPLACEMENT

EN01F02127050402036001

1. **REMOVING THE SCR UPSTREAM TEMPERATURE SENSOR**
   Reference: EXHAUST (J05E), SCR UPSTREAM TEMPERATURE SENSOR, REPLACEMENT, REMOVING THE SCR UPSTREAM TEMPERATURE SENSOR (Page 11-116)

2. **SINGLE UNIT INSPECTION**
   Reference: EXHAUST (J05E), SCR UPSTREAM TEMPERATURE SENSOR, REPLACEMENT, SINGLE UNIT INSPECTION (Page 11-117)

3. **MOUNTING THE SCR UPSTREAM TEMPERATURE SENSOR**
   Reference: EXHAUST (J05E), SCR UPSTREAM TEMPERATURE SENSOR, REPLACEMENT, MOUNTING THE SCR UPSTREAM TEMPERATURE SENSOR (Page 11-117)

OUTSIDE TEMPERATURE SENSOR

REPLACEMENT

EN01F02127050402054001

1. **REMOVING THE OUTSIDE TEMPERATURE SENSOR**
   Reference: EXHAUST (J05E), OUTSIDE TEMPERATURE SENSOR, REPLACEMENT, REMOVING THE OUTSIDE TEMPERATURE SENSOR (Page 11-120)

2. **MOUNTING THE OUTSIDE TEMPERATURE SENSOR**
   Reference: EXHAUST (J05E), OUTSIDE TEMPERATURE SENSOR, REPLACEMENT, MOUNTING THE OUTSIDE TEMPERATURE SENSOR (Page 11-120)

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COOLANT TEMPERATURE SENSOR

REPLACEMENT

EN01F02127050402043001

1. **REMOVING THE COOLANT TEMPERATURE SENSOR**
   Reference: COOLING (J05E), COOLANT TEMPERATURE SENSOR, REPLACEMENT, REMOVING THE COOLANT TEMPERATURE SENSOR (Page 12-38)

2. **SINGLE UNIT INSPECTION**
   Reference: COOLING (J05E), COOLANT TEMPERATURE SENSOR, REPLACEMENT, SINGLE UNIT INSPECTION (Page 12-38)

3. **MOUNTING THE COOLANT TEMPERATURE SENSOR**
   Reference: COOLING (J05E), COOLANT TEMPERATURE SENSOR, REPLACEMENT, MOUNTING THE COOLANT TEMPERATURE SENSOR (Page 12-39)

OIL PRESSURE SWITCH

REPLACEMENT

EN01F02127050402044001

1. **REMOVING THE OIL PRESSURE SWITCH**
   Reference: LUBRICATION (J05E), OIL PRESSURE SWITCH, REPLACEMENT, REMOVING THE OIL PRESSURE SWITCH (Page 13-31)

2. **SINGLE UNIT INSPECTION**
   Reference: LUBRICATION (J05E), OIL PRESSURE SWITCH, REPLACEMENT, SINGLE UNIT INSPECTION (Page 13-31)

3. **MOUNTING THE OIL PRESSURE SWITCH**
   Reference: LUBRICATION (J05E), OIL PRESSURE SWITCH, REPLACEMENT, MOUNTING THE OIL PRESSURE SWITCH (Page 13-32)

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FUEL SYSTEM (J05E)

7-001

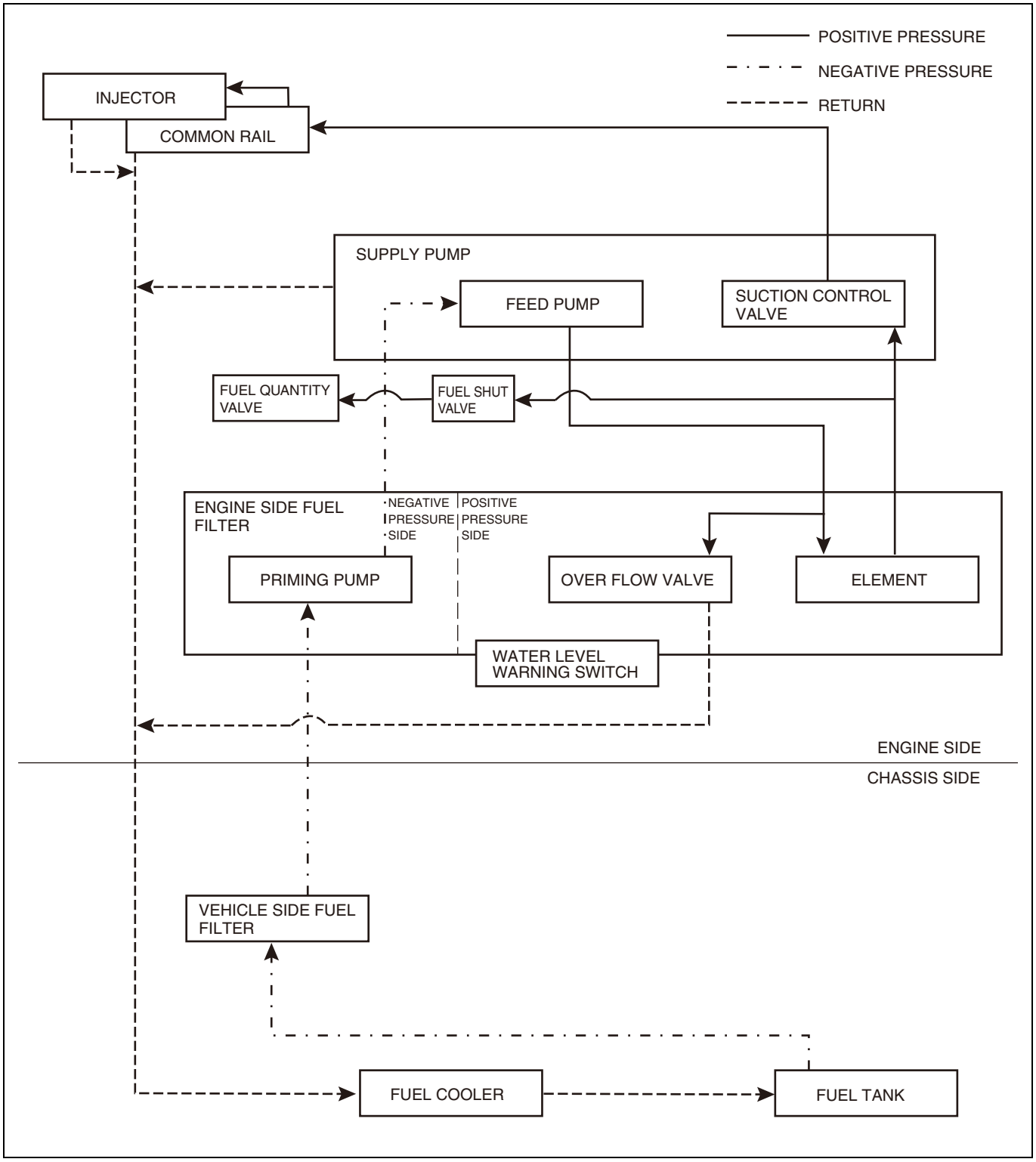
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FUEL SYSTEM DIAGRAM....7-2
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FUEL FILTER AND CASE (ENGINE SIDE)....7-14
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FUEL SYSTEM

FUEL SYSTEM DIAGRAM

EN01F02127060407020001



SHTS021270600001

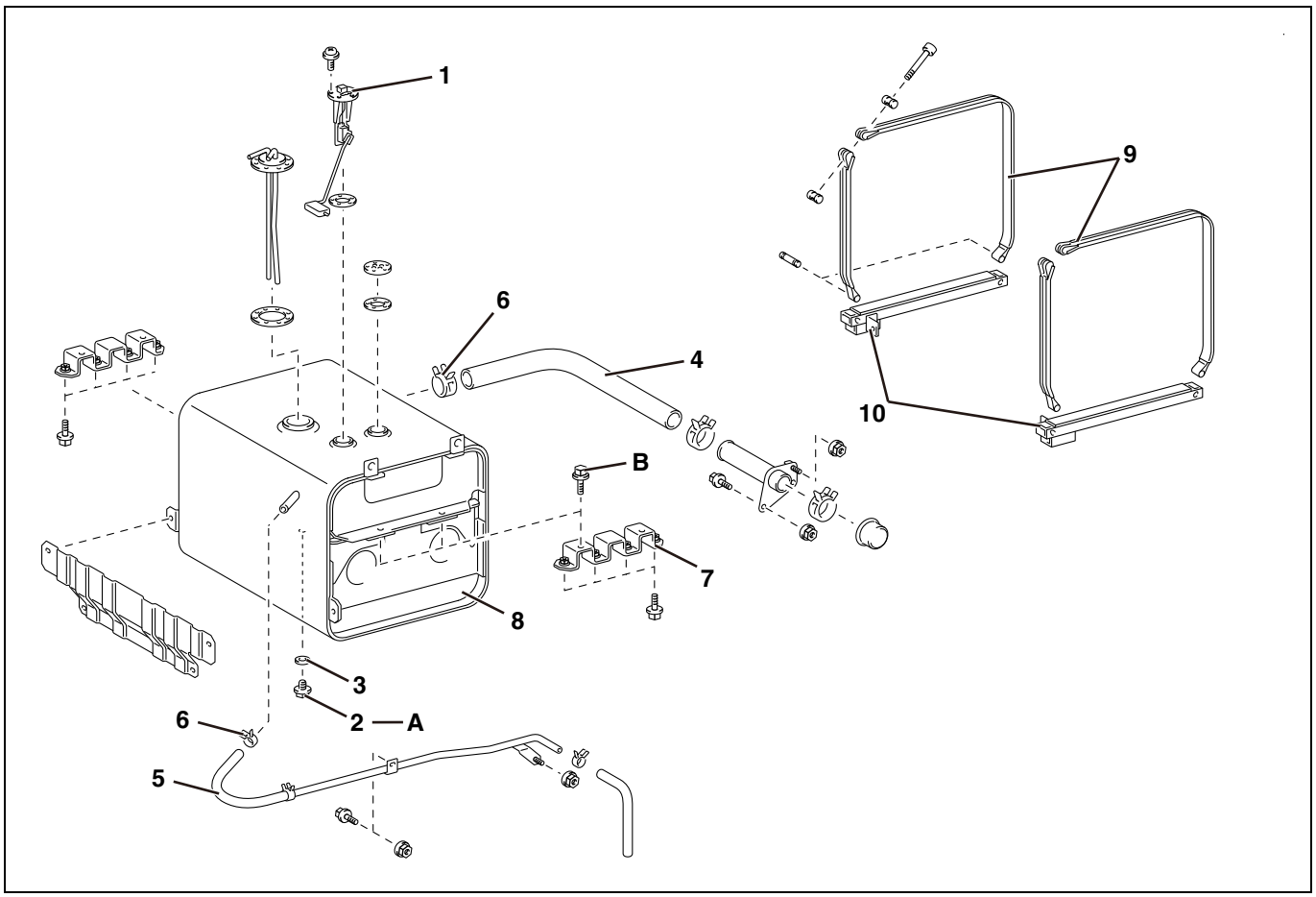
https://truckmanualshub.com/

FUEL TANK

COMPONENT LOCATOR

EN01F02127060402011001

30 GALLON (REPRESENTATIVE EXAMPLE)



SHTS021270600002

1	Fuel sender gauge	6	Clamp
2	Drain plug	7	Fixed bracket
3	Gasket *	8	Fuel tank
4	Fuel hose	9	Fuel tank band
5	Breather hose	10	Fuel tank support

*: Nonreusable part

Tightening torque — Unit: N·m {kgf·cm, lbf·ft}

A	24.5-34.3 {250-349, 19-26}	B	96-144 {979-1,468, 71-106}

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REPLACEMENT (30 GALLON)

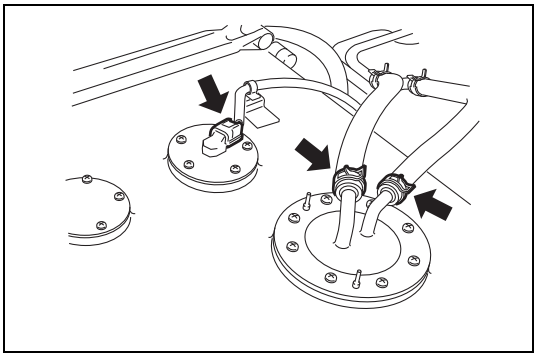
EN01F02127060402011002

REMOVING THE FUEL TANK

1. CAUTIONS

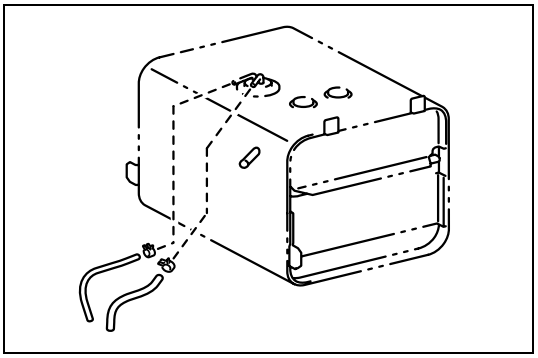
⚠ CAUTION
While working, be careful not to make dirt and water enter parts.

2. REMOVING THE FUEL TANK



SHTS021270600003

(1) Disconnect the connector connected to the fuel sender gauge.
(2) Disconnect the 2 harness clamps.
(3) Loosen the clamp of the feed hose and that of the return hose.



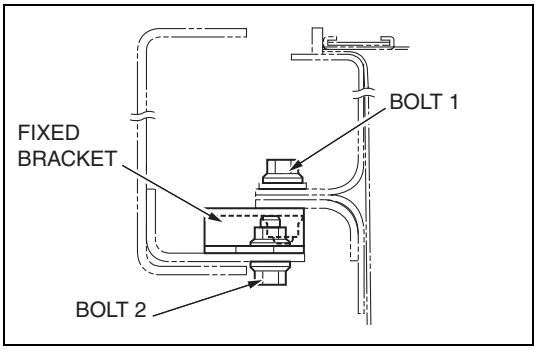
SHTS021270600004

(4) Put alignment marks on the feed hose and the return hose, and disconnect them.

NOTICE
After the fuel hoses are disconnected, stop up both ends to prevent fuel leakage and the ingress of dirt.

(5) Remove the drain plug and the gasket to drain the fuel.

⚠ CAUTION
Dispose of the drained fuel in accordance with the regulation of disposal specified in each region.



SHTS021270600005

(6) Unfasten 2 clamps, then put alignment marks on the fuel hose and breather hose, and disconnect them from the fuel tank.

(7) Remove the bolt (1) and lift the fuel tank to a position where the fixed bracket can be removed, by using a jack or the like.

⚠ CAUTION
When lifting, be careful not to let the fuel tank touch the upper deck.

(8) Remove the bolt (2) and detach the fixed bracket from the frame gusset.
(9) Remove the fuel tank from the lower side of the frame.

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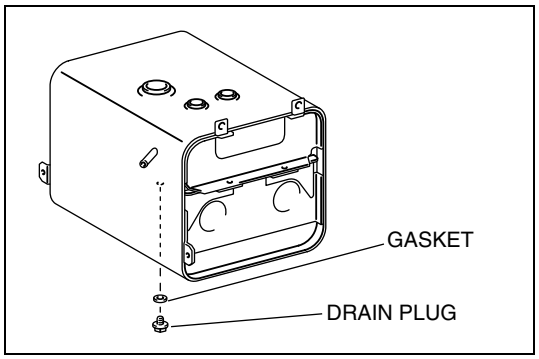
MOUNTING THE FUEL TANK

1. CAUTIONS

⚠ CAUTION

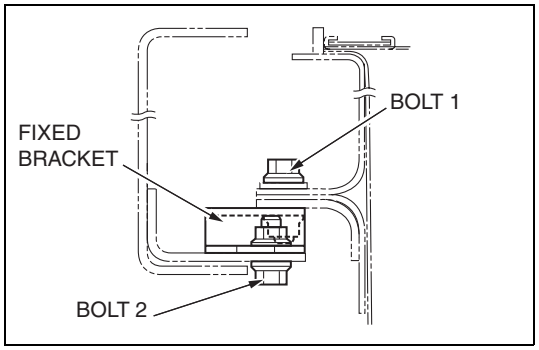
- **While working, be careful not to make dirt and water enter parts.**
- **Before mounting parts, make sure that there is no dirt on the connection between them.**
- **Air enters the fuel pipe in the process of mounting the pre-fuel filter case. After mounting is completed, thoroughly purge air from the fuel pipe.**

2. MOUNTING THE FUEL TANK



SHTS021270600006

(1) Clean the filter of the drain plug and replace with a new gasket before mounting the drain plug.
Tightening Torque:
24.5-34.3 N·m {250-349 kgf·cm, 19-26 lbf·ft}



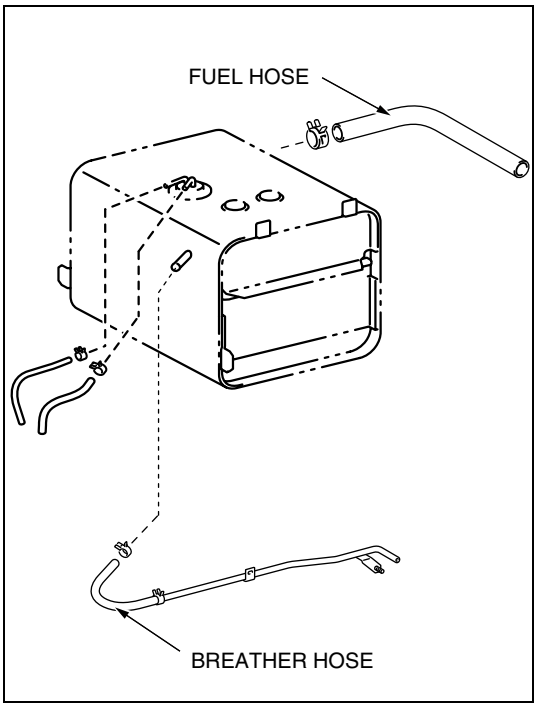
SHTS021270600007

(2) Place the fuel tank into the frame from the lower side and lift it to a position where space to accommodate the fixed bracket is available, by using a jack or the like.

⚠ CAUTION
When lifting, be careful not to let the fuel tank touch the upper deck.

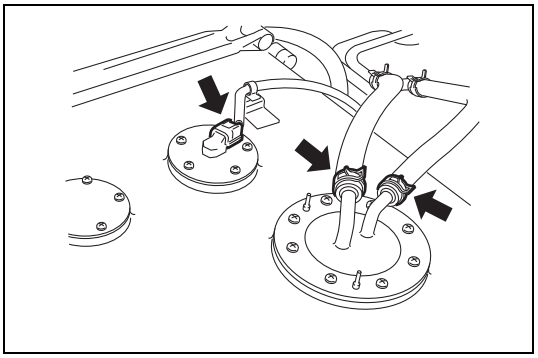
(3) Attach the fixed bracket to the frame gusset with bolt (2).
(4) Mount the fuel tank with bolt (1).
Tightening Torque:
96-144 N·m {979-1,468 kgf·cm, 71-106 lbf·ft}

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SHTS021270600008

(5) Align the alignment marks, connect the feed hose, return hose, fuel hose and breather hose.
(6) Fasten each hose with the clamp.



SHTS021270600009

(7) Connect the connector of the fuel sender gauge, then connect the 2 harness clamps.

3. AIR BLEEDING OF FUEL SYSTEM
Reference: FUEL SYSTEM (J05E), FUEL FILTER AND CASE (ENGINE SIDE), REPLACEMENT, AIR BLEEDING OF FUEL SYSTEM (Page 7-16)

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REPLACEMENT (33 GALLON)

EN01F02127060402011003

REMOVING THE FUEL TANK

1. CAUTIONS

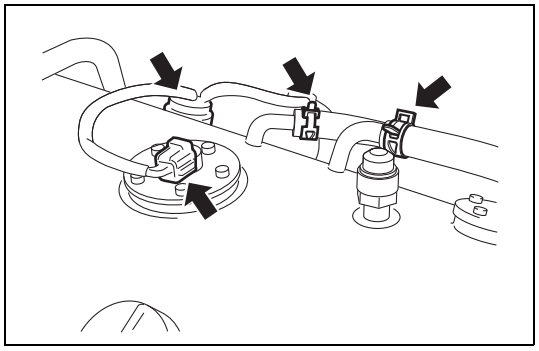
⚠ CAUTION
While working, be careful not to make dirt and water enter parts.

2. REMOVING THE FUEL TANK

(1) Disconnect the connector connected to the fuel sender gauge.

(2) Disconnect the harness clamp.

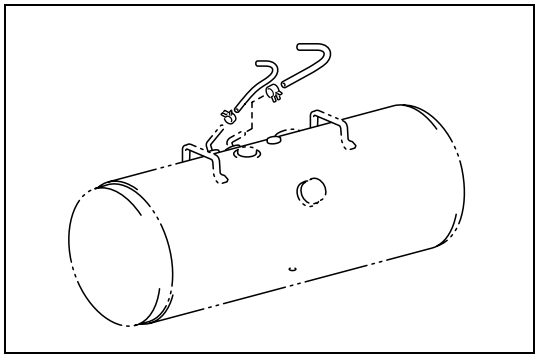
(3) Loosen the clamp of the feed hose and that of the return hose.



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(4) Put the alignment marks on the feed hose and the return hose, and disconnect them.

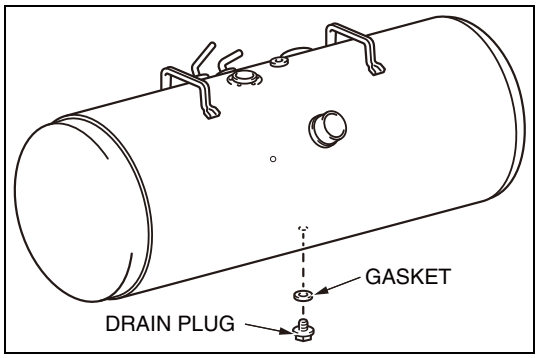
NOTICE
After the fuel hoses are disconnected, stop up both ends to prevent fuel leakage and the ingress of dirt.



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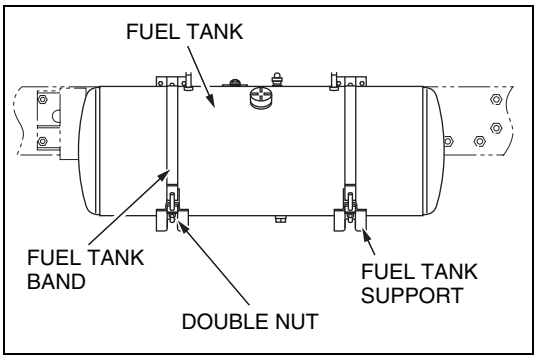
(5) Remove the drain plug and the gasket to drain the fuel.

⚠ CAUTION
Dispose of the drained fuel in accordance with the regulation of disposal specified in each region.



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SHTS021270600013

(6) Unfasten the double nut to remove the fuel tank band.
(7) Remove the fuel tank from the fuel tank support.

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MOUNTING THE FUEL TANK

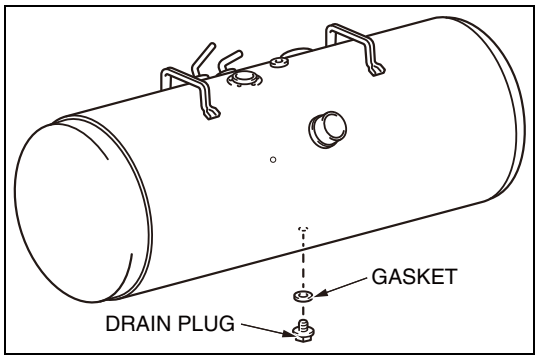
1. CAUTIONS

⚠ CAUTION

- **While working, be careful not to make dirt and water enter parts.**
- **Before mounting parts, make sure that there is no dirt on the connection between them.**
- **Air enters the fuel pipe in the process of mounting the pre-fuel filter case. After mounting is completed, thoroughly purge air from the fuel pipe.**

2. MOUNTING THE FUEL TANK

(1) Clean the filter of the drain plug and replace with a new gasket before mounting the drain plug.
Tightening Torque:
24.5-34.3 N·m {250-349 kgf·cm, 19-26 lbf·ft}

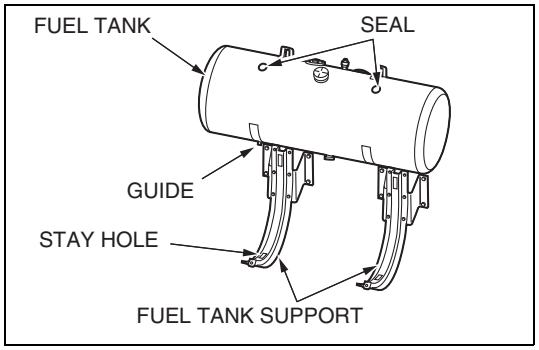


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(2) Place the fuel tank on the fuel tank support.

NOTICE

- **When mounting the fuel tank, align the guide at the lower part of the fuel tank with the stay hole.**
- **Assemble the fuel tank band so as to cover the seal on the top surface of the fuel tank.**

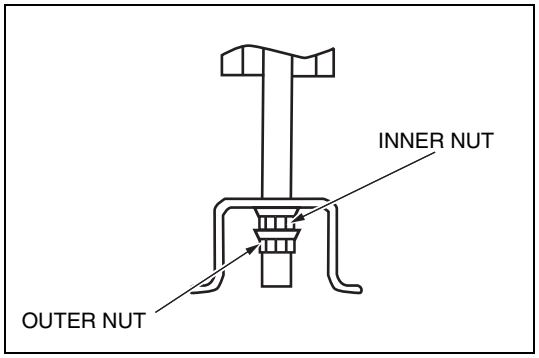


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(3) Mount the fuel tank band with the double nuts.
Tightening Torque:
10.2-15.0 N·m {105-152 kgf·cm, 8-11 lbf·ft}

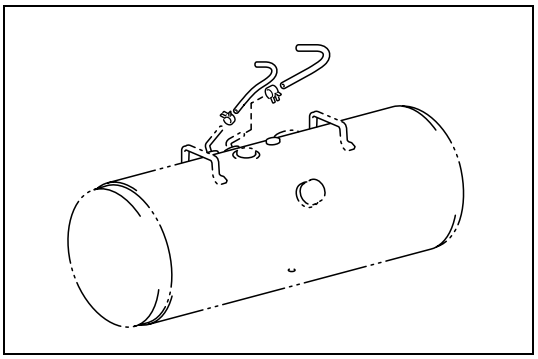
(4) After fastening the fuel tank band, make sure to check that the fuel tank and fuel tank support are in close contact. If any clearance is found there, once loosen the fuel tank band, shake the fuel tank for fitting, and then mount the fuel tank band again.

⚠ CAUTION
If driving with clearance between the fuel tank and fuel tank support, the fastening part of the fuel tank band may loosen.



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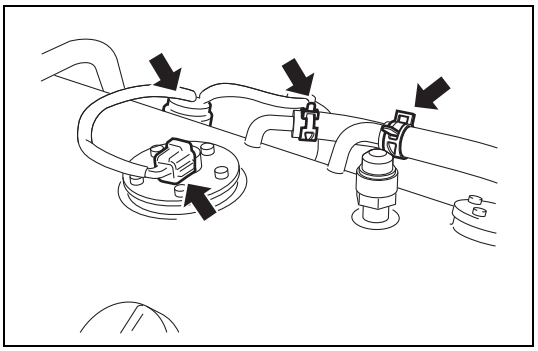


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(5) With the alignment marks aligned with each other, connect the feed hose and the return hose.

⚠ CAUTION
If the fuel tank support is removed, make sure of the correct insert direction of bolt.

(6) Fasten the feed hose and the return hose with the clamps.



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(7) Connect the harness clamp.

(8) Connect the connector of the fuel sender gauge.

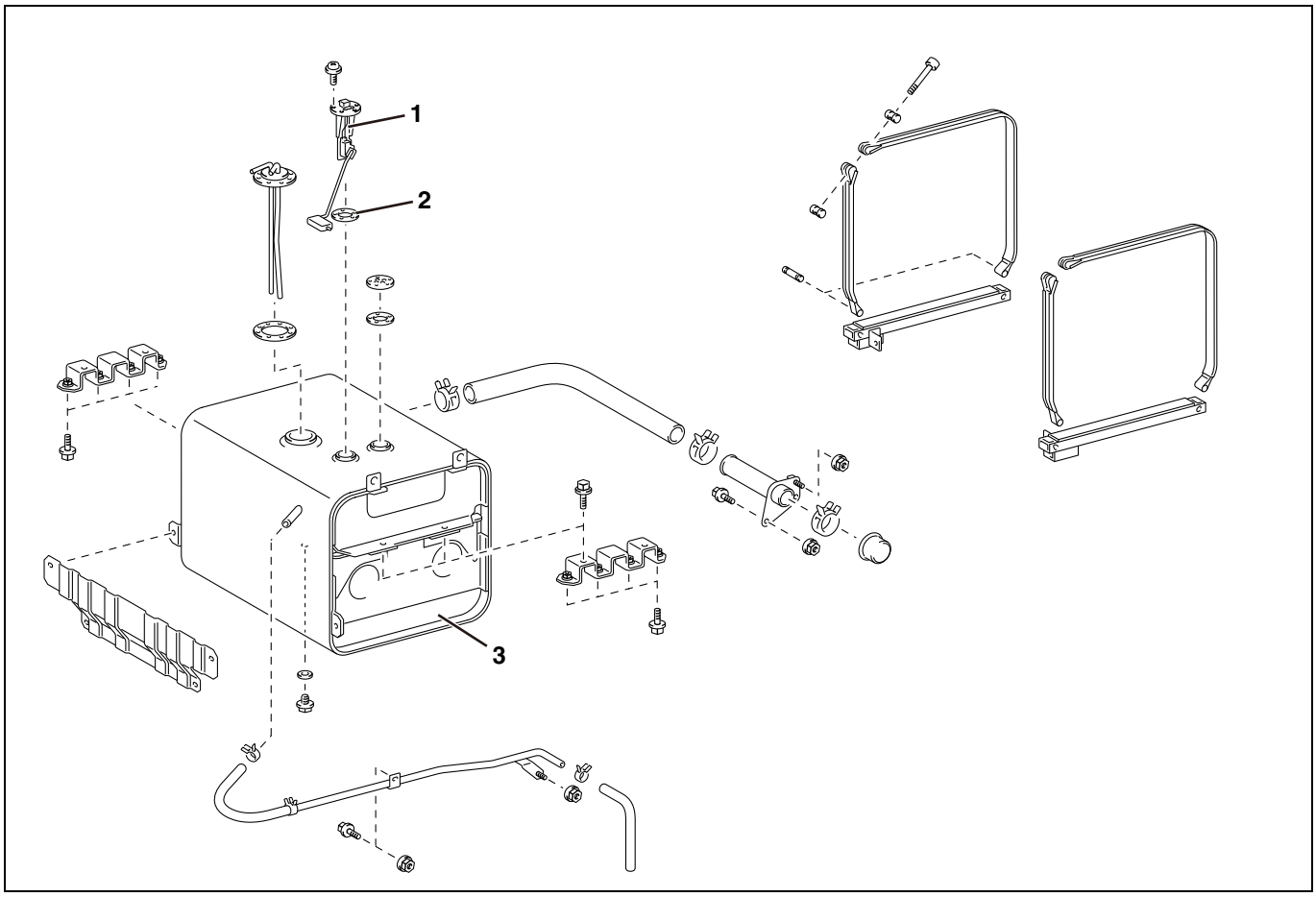
3. AIR BLEEDING OF FUEL SYSTEM
Reference: FUEL SYSTEM (J05E), FUEL FILTER AND CASE (ENGINE SIDE), REPLACEMENT, AIR BLEEDING OF FUEL SYSTEM (Page 7-16)

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FUEL SENDER GAUGE

COMPONENT LOCATOR

EN01F02127060402010001



SHTS021270600019

1	Fuel sender gauge	3	Fuel tank
2	Gasket *		

*: Nonreusable part

Tightening torque — Unit: N·m {kgf·cm, lbf·ft}

A	1.5-2.5 {16-25, 1.2-1.8}		

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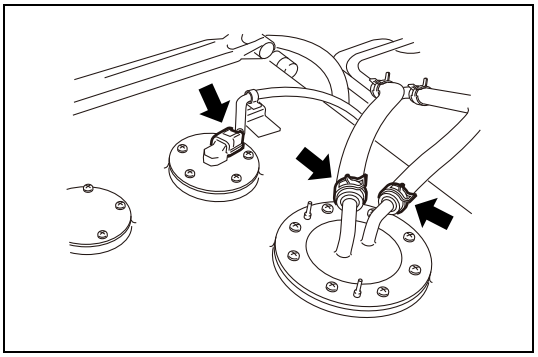
REPLACEMENT

EN01F02127060402010002

REMOVING THE FUEL SENDER GAUGE

1. CAUTIONS

⚠ CAUTION
While working, be careful not to make dirt and water enter parts.



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2. DISCONNECTING THE HARNESS

(1) Disconnect the connector connected to the fuel sender gauge.

3. REMOVING THE FUEL SENDER GAUGE

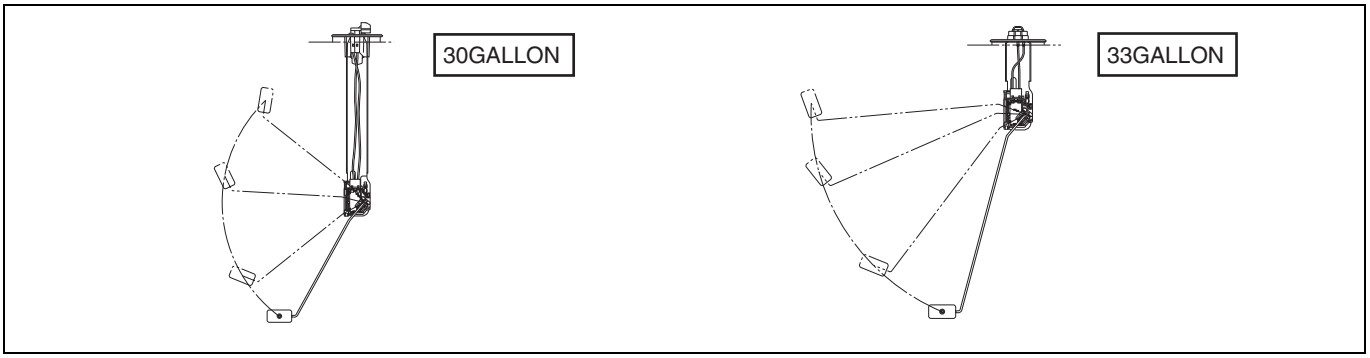
(1) Unfasten the bolts (5 pcs.) securing the fuel sender gauge, and remove the fuel sender gauge and the gasket from the fuel tank.

NOTICE
Prepare a reservoir and a waste cloth because the fuel spills when the fuel sender gauge is removed.

SINGLE UNIT INSPECTION

1. INSPECTING THE RESISTANCE

(1) Make sure that the float of the fuel sender gauge smoothly moves.



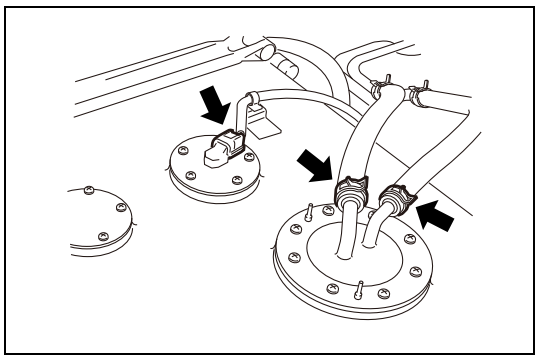
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(2) Use the circuit tester to measure the resistance between terminals when changing the float position between Point E and F. If the measured resistance does not comply with the standard value, replace the fuel sender gauge.

Level	Standard value (Ω)
E	107.5-112.5
F	3-5

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MOUNTING THE FUEL SENDER GAUGE



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1. MOUNTING THE FUEL SENDER GAUGE

(1) Replace the gasket with a new one, and fasten the fuel sender gauge to the fuel tank with the bolts (5 pcs.).
Tightening Torque:
1.5-2.5 N·m {16-25 kgf·cm, 1.2-1.8 lbf·ft}

⚠ CAUTION

- **Note the mounting direction to avoid interference with the buffer plate of the tank interior wall.**
- **After assembly, start the engine for testing and check for fuel leakage from around the fuel sender gauge.**
- **While working, be careful not to make dirt and water enter parts.**
- **Before mounting parts, make sure that there is no dirt on the connection between them.**

2. CONNECTING THE HARNESS

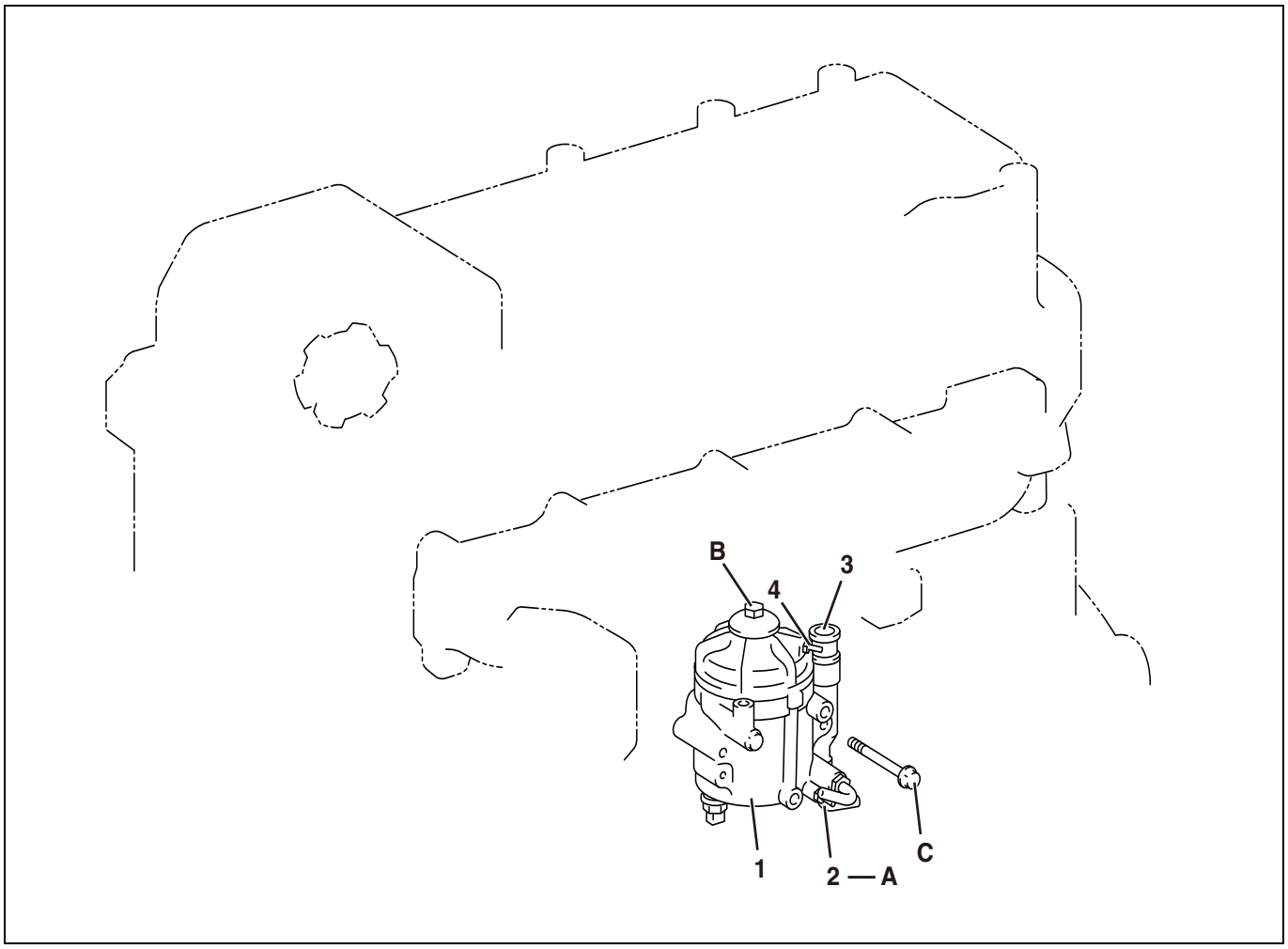
(1) Connect the connector to the fuel sender gauge.

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FUEL FILTER AND CASE (ENGINE SIDE)

COMPONENT LOCATOR

EN01F02127060402042001



SHTS021270600023

1	Fuel filter	3	Priming pump
2	Drain plug	4	Air bleeding plug

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	5-9 {51-91, 3.7-6.6}	C	55 {561, 41}
B	23.1-32.9 {236-335, 18-24}		

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REPLACEMENT

EN01F02127060402042002

DRAINING WATER FROM THE FUEL FILTER (ENGINE SIDE)

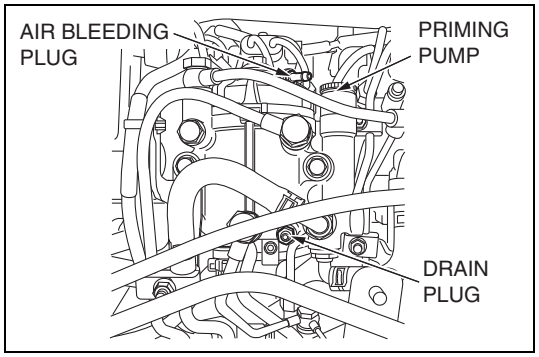
1. CAUTIONS

⚠ CAUTION

- **Air enters the fuel pipe in the process of mounting the pre-fuel filter case. After mounting is completed, thoroughly purge air from the fuel pipe.**
- **While working, be careful not to make dirt and water enter parts.**

2. WATER DRAINING OF THE FUEL FILTER

(1) Prepare a reservoir under the drain plug to receive water.
(2) Loosen the drain plug and then the air bleeding plug, and drain the water trapped at the bottom of the fuel filter case.

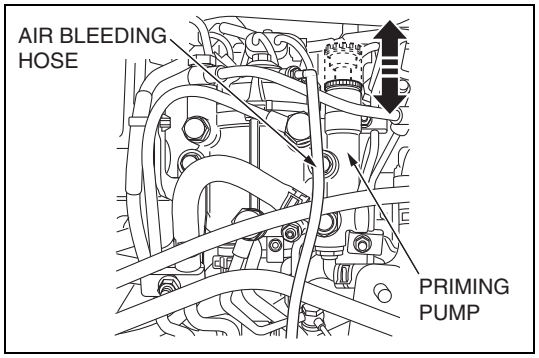


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⚠ CAUTION

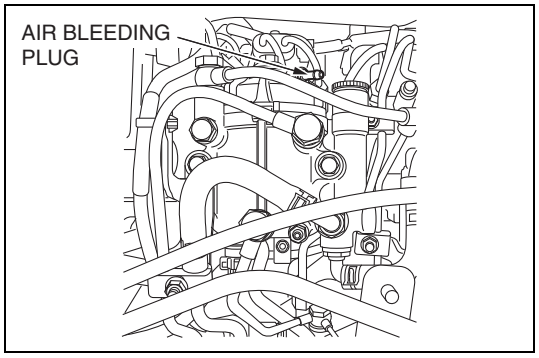
- **The drained water contains fuel. Dispose the drained water in accordance with the regulation of disposal specified in each region.**
- **Do not fail to drain water because the ingress of water into the fuel causes not only poor driving but also damage to the engine.**

(3) Tighten the drain plug of the fuel filter.
Tightening Torque:
5-9 N·m {51-91 kgf·cm, 3.7-6.6 lbf·ft}



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(4) Connect the hose to the air bleeding plug.
(5) Turn the priming pump to the left to lift it up and then move it up and down.
(6) Operate the priming pump up and down continuously to pump the fuel so that no air is bled from the air bleeding hose.



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(7) Remove the hose and tighten the air bleeding plug of the fuel filter.
Tightening Torque:
5-9 N·m {51-91 kgf·cm, 3.7-6.6 lbf·ft}

⚠ CAUTION
After operation, wipe out leaked water or fuel and check again for fuel leakage after the engine is started.

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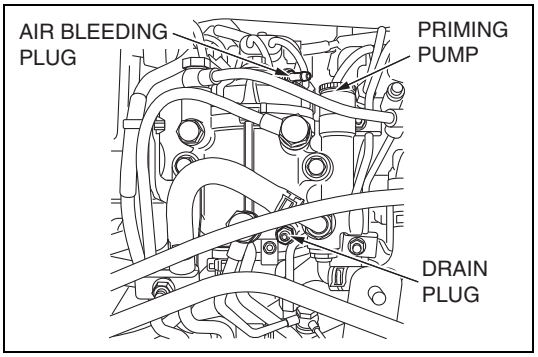
AIR BLEEDING OF FUEL SYSTEM

1. CAUTIONS

⚠ CAUTION
While working, be careful not to make dirt and water enter parts.

2. AIR BLEEDING OF FUEL SYSTEM

(1) Connect the hose to the air bleeding plug and prepare a container under the air bleeding hose to catch the drained fuel.

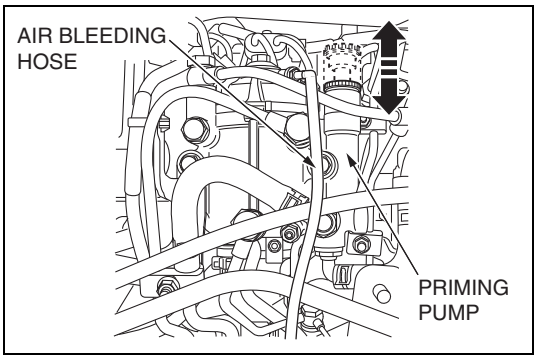


SHTS021270600027

⚠ CAUTION
Drain the fuel in accordance with the regulation of disposal specified in each region.

(2) Unfasten air bleeding plug of the fuel filter.

(3) Turn the priming pump to the left to lift it up and then move it up and down.

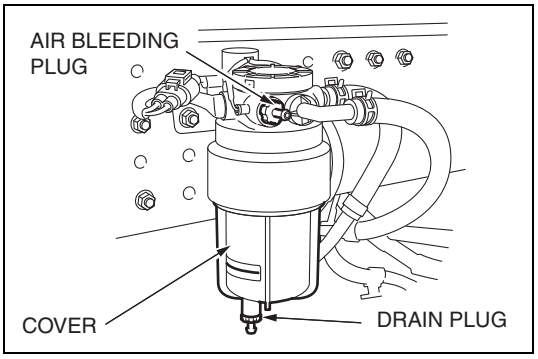


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(4) Operate the priming pump up and down continuously to pump the fuel so that no air is bled from the air bleeding hose.

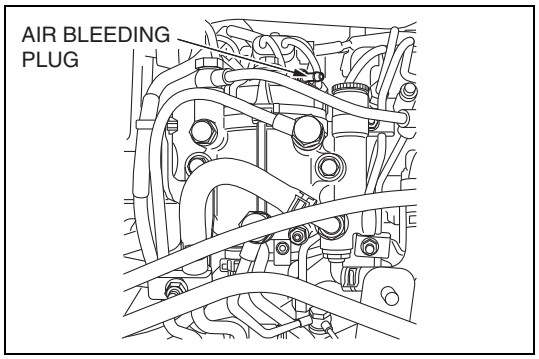
⚠ CAUTION

- **Check that the air bleeding plug of the fuel filter is loosened.**
- **Check that the air bleeding plug of the vehicle side fuel filter is tightened.**
- **Keep the cover free from brake fluid or other substances containing organic solvent (parts cleaner, coat, etc.). If the cover comes in contact with those substances, a crack may result.**



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SHTS021270600030

(5) Remove the hose and tighten the air bleeding plug of the fuel filter with a new O-ring.
Tightening Torque:
5-9 N·m {51-91 kgf·cm, 3.7-6.6 lbf·ft}

(6) Tighten the plug fully clockwise with the priming pump pressed down.

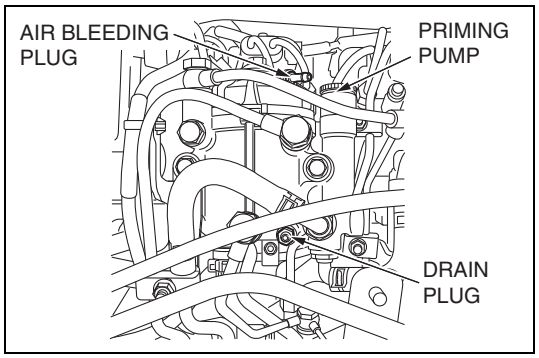
⚠ CAUTION
- **Note that squeezing the priming pump forcibly for stowing may cause jamming.**
- **Check that the priming pump is securely tightened.**
- **After operation, wipe out leaked water or fuel and check again for fuel leakage after the engine is started.**

REPLACE THE ELEMENT

1. CAUTIONS

⚠ CAUTION
- **Use Hino's genuine fuel filter element.**
- **While working, be careful not to make dirt and water enter parts.**
- **Before mounting parts, make sure that there is no dirt on the connection between them.**
- **Air enters the fuel pipe in the process of mounting the pre-fuel filter case. After mounting is completed, thoroughly purge air from the fuel pipe.**

2. FUEL DISCHARGE

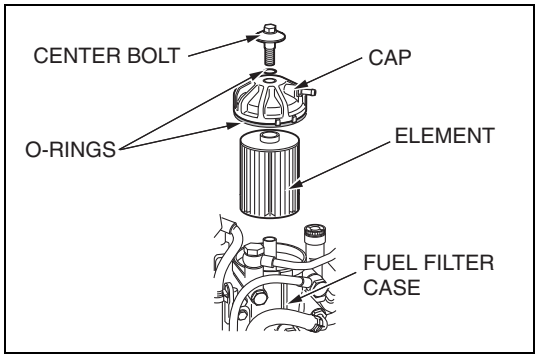


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(1) Prepare the reservoir under the drain plug to receive the drained fuel.
(2) Loosen the drain plug and then the air bleeding plug of the fuel filter, and drain the fuel from the drain plug.
Check that the fuel is no longer drained from the drain plug and then tighten the drain plug.
Tightening Torque:
5-9 N·m {51-91 kgf·cm, 3.7-6.6 lbf·ft}

⚠ CAUTION
- **Drain the fuel in accordance with the regulation of disposal specified in each region.**
- **Make sure that the drain plug is free of damage or corrosion.**

3. REMOVING THE ELEMENT

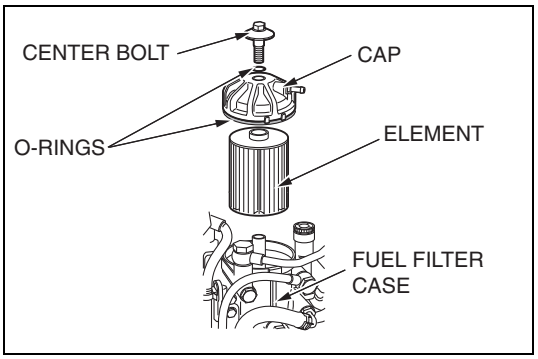


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(1) Unfasten the center bolt securing the cap, and remove the O-rings (2 pcs.) and the cap from the fuel filter case.
(2) Remove the element.

⚠ CAUTION
- **When draining fuel, drain all the fuel in the filter. If the element is replaced without draining all the fuel, unfiltered fuel may remain inside the filter and flow into the engine side.**
- **Fuel is in the fuel filter case. Prepare a tray not to spill the fuel adhered to the element.**

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4. MOUNTING THE ELEMENT

(1) Replace the O-rings of the air bleeding plug and drain plug with new ones.

(2) Clean the element setting face inside the fuel filter case and inside the cap.

(3) Insert a new element into the fuel filter case.

⚠ CAUTION

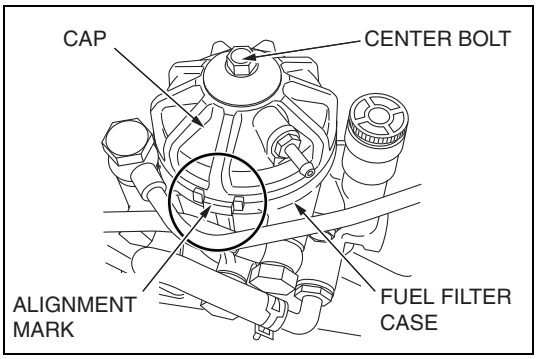
If the element is replaced with the fuel remained in the fuel filter case, unfiltered fuel will remain in the fuel filter case. Check for residual fuel.

(4) Apply fuel to new O-rings, and set one in the groove of the fuel filter case and the other on the seating face of the center bolt.

⚠ CAUTION

- **Do not reuse the element.**
- **Replace the O-ring with a new one included in the element kit.**

(5) Set the cap on the fuel filter case with the alignment marks aligned with each other, and tighten the center bolt.
Tightening Torque:
23.1-32.9 N·m {236-335 kgf·cm, 18-24 lbf·ft}



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⚠ CAUTION

- **Be careful not to damage the O-ring by twisting it.**
- **Check that the O-ring is in correct contact with the sealing surface.**
- **Align the alignment mark on the cap with that on the fuel filter case.**

5. AIR BLEEDING OF FUEL SYSTEM
Reference: FUEL SYSTEM (J05E), FUEL FILTER AND CASE (ENGINE SIDE), REPLACEMENT, AIR BLEEDING OF FUEL SYSTEM (Page 7-16)

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REMOVING THE FUEL FILTER

1. CAUTIONS

⚠ CAUTION

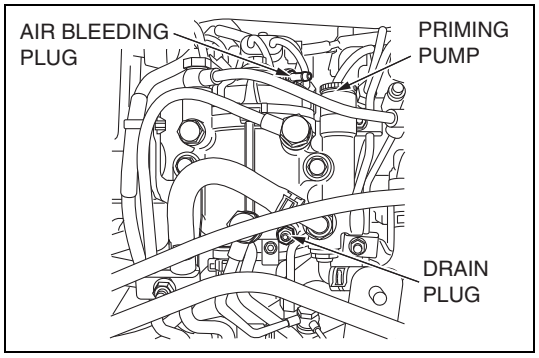
- **While working, be careful not to make dirt and water enter parts.**
- **Be careful when disconnecting the fuel pipe because the fuel may run out.**

2. FUEL DISCHARGE

(1) Prepare reservoir under the drain plug to receive the drained fuel.

(2) Loosen the drain plug and then the air bleeding plug of the fuel filter, and drain the fuel from the drain plug. Check that the fuel is no longer drained from the drain plug and then tighten the drain plug with a new O-ring.

Tightening Torque:
5-9 N·m {51-91 kgf·cm, 3.7-6.6 lbf·ft}



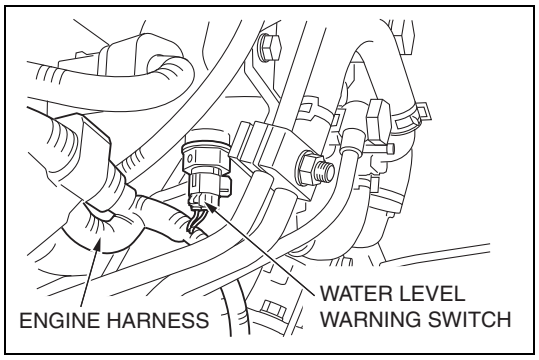
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⚠ CAUTION

Drain the fuel in accordance with the regulation of disposal specified in each region.

3. DISCONNECTING THE HARNESS

(1) Disconnect the connector connected to the water level warning switch.



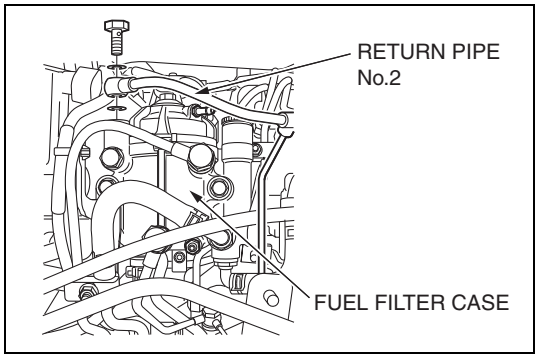
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4. REMOVING THE FUEL PIPE

(1) Unfasten 2 union bolts to disconnect return pipe No.2 from the fuel filter case.

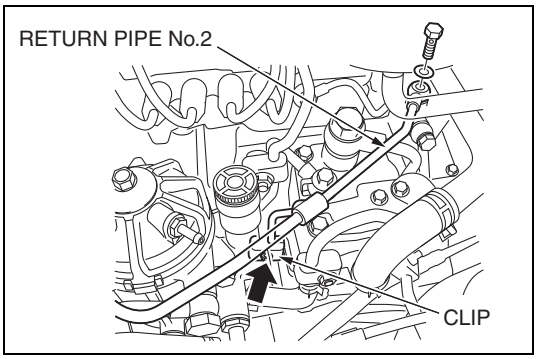
NOTICE

Prepare a reservoir and a waste cloth because fuel spills when disconnecting the fuel pipe.



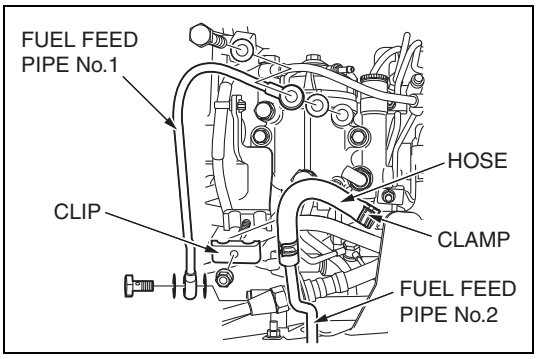
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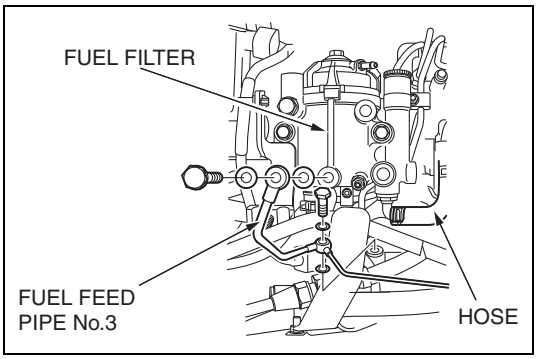
(2) Remove the nut and then the clip.



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(3) Remove the nut and then the clip.
(4) Unfasten 2 clamps to remove the hose from the fuel filter.
(5) Unfasten 3 union bolts to disconnect fuel feed pipe No.1 and fuel feed pipe No.2 from the fuel filter and supply pump.

NOTICE
Prepare a reservoir and a waste cloth because fuel spills when disconnecting the fuel pipe.



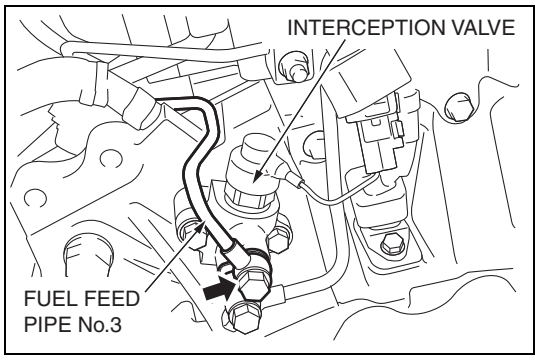
SHTS021270600040

(6) Unfasten 3 union bolts to remove fuel feed pipe No.3 and the gasket from the fuel filter case and supply pump.

NOTICE
Prepare a reservoir and a waste cloth because fuel spills when disconnecting the fuel pipe.

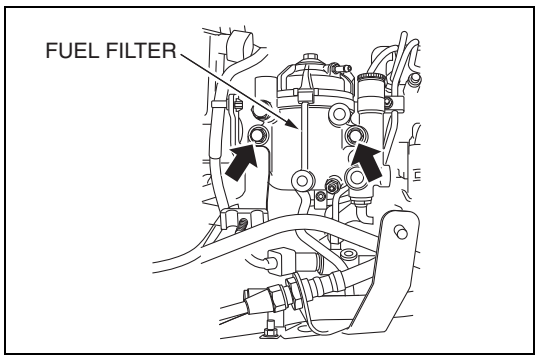
(7) Unfasten the clamp to disconnect the hose from the fuel filter case.

https://truckmanualshub.com/



SHTS021270600041

(8) Remove the nut and then the clip.



SHTS021270600042

5. REMOVING THE FUEL FILTER

(1) Remove the bolts (2 pcs.) and remove the fuel filter.

⚠ CAUTION

Be careful not to spill the residual fuel in the fuel filter case.

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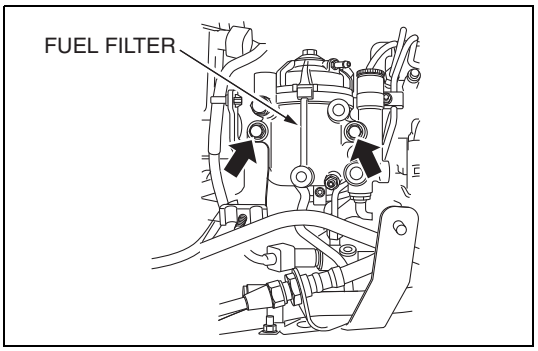
MOUNTING THE FUEL FILTER (ENGINE SIDE)

1. CAUTIONS

⚠ CAUTION

- **While working, be careful not to make dirt and water enter parts.**
- **Before mounting parts, make sure that there is no dirt on the connection between them.**
- **Air enters the fuel pipe in the process of mounting the pre-fuel filter case. After mounting is completed, thoroughly purge air from the fuel pipe.**

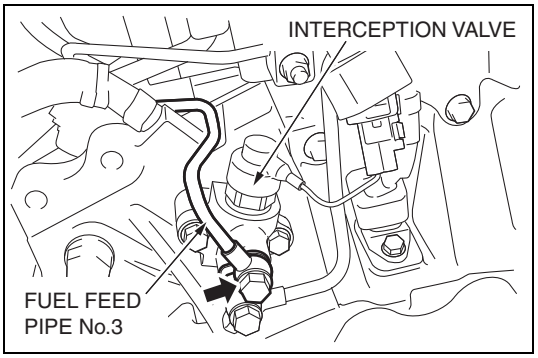
2. MOUNTING THE FUEL FILTER



SHTS021270600043

(1) Mount the fuel filter with the bolts (2 pcs.).
Tightening Torque:
55 N·m {561 kgf·cm, 41 lbf·ft}

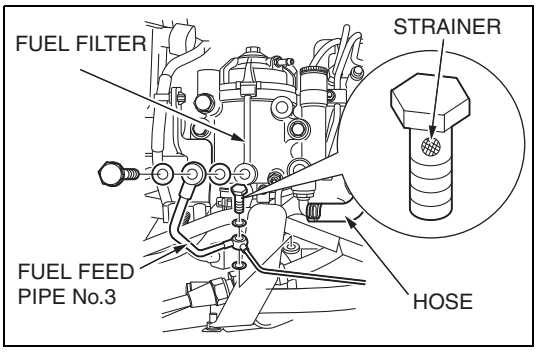
3. MOUNTING THE FUEL PIPE



SHTS021270600044

(1) Attach the clip with the nut, and fix fuel feed pipe No.3.

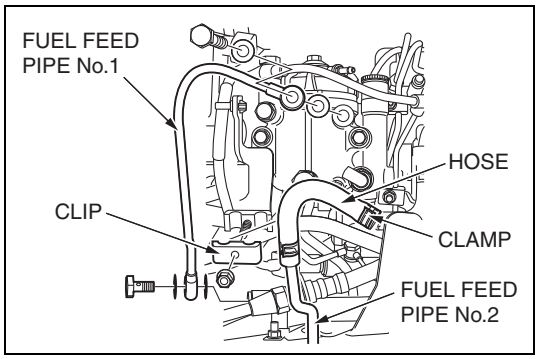
(2) Connect the hose to the fuel filter with the clamp.
(3) Connect fuel feed pipe No.3 to the fuel filter, supply pump and fuel shutoff valve with a new gasket and 3 union bolts.
Tightening Torque:
30 N·m {306 kgf·cm, 22 lbf·ft}
Fuel filter side
14.8-19.6 N·m {151-199 kgf·cm, 11-14 lbf·ft}
Supply pump side
19.6 N·m {200 kgf·cm, 14 lbf·ft}
Fuel shutoff valve side



SHTS021270600045

⚠ CAUTION
A strainer is attached to the supply pump union bolt. Assemble the union bolts correctly.

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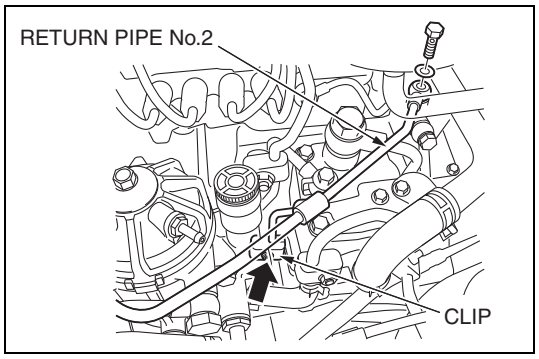


SHTS021270600046

(4) Connect fuel feed pipe No.1 and fuel feed pipe No.2 to the fuel filter and supply pump with a new gasket and 3 union bolts.

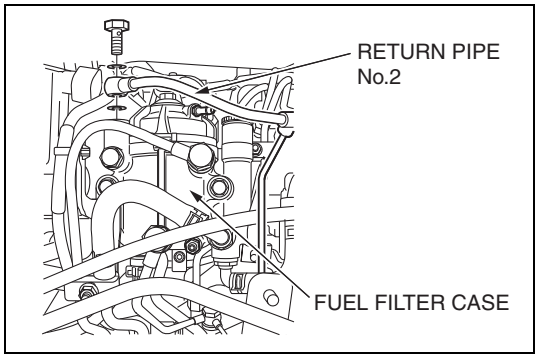
Tightening Torque:
25 N·m {255 kgf·cm, 18 lbf·ft}
Supply pump side
30 N·m {306 kgf·cm, 22 lbf·ft}
Fuel filter side

(5) Mount the hose to the fuel filter with 2 clamps.
(6) Mount the clip with the nut and fix fuel feed pipe No.1.



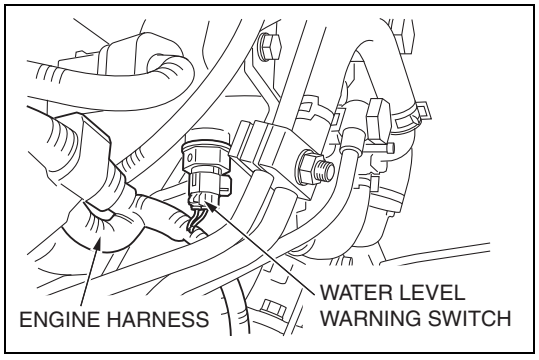
SHTS021270600047

(7) Mount the clip with the nut and fix return pipe No.2.



SHTS021270600048

(8) Connect return pipe No.2 to the fuel filter case with a new gasket and 2 union bolts.
Tightening Torque:
30 N·m {306 kgf·cm, 22 lbf·ft}
Fuel filter side
24.5 N·m {250 kgf·cm, 18 lbf·ft}
Intake manifold side



SHTS021270600049

4. CONNECTING THE HARNESS
(1) Connect the connector to the water level warning switch.

⚠ CAUTION
Before connecting the connectors, make sure that the terminals are free of a spark mark.

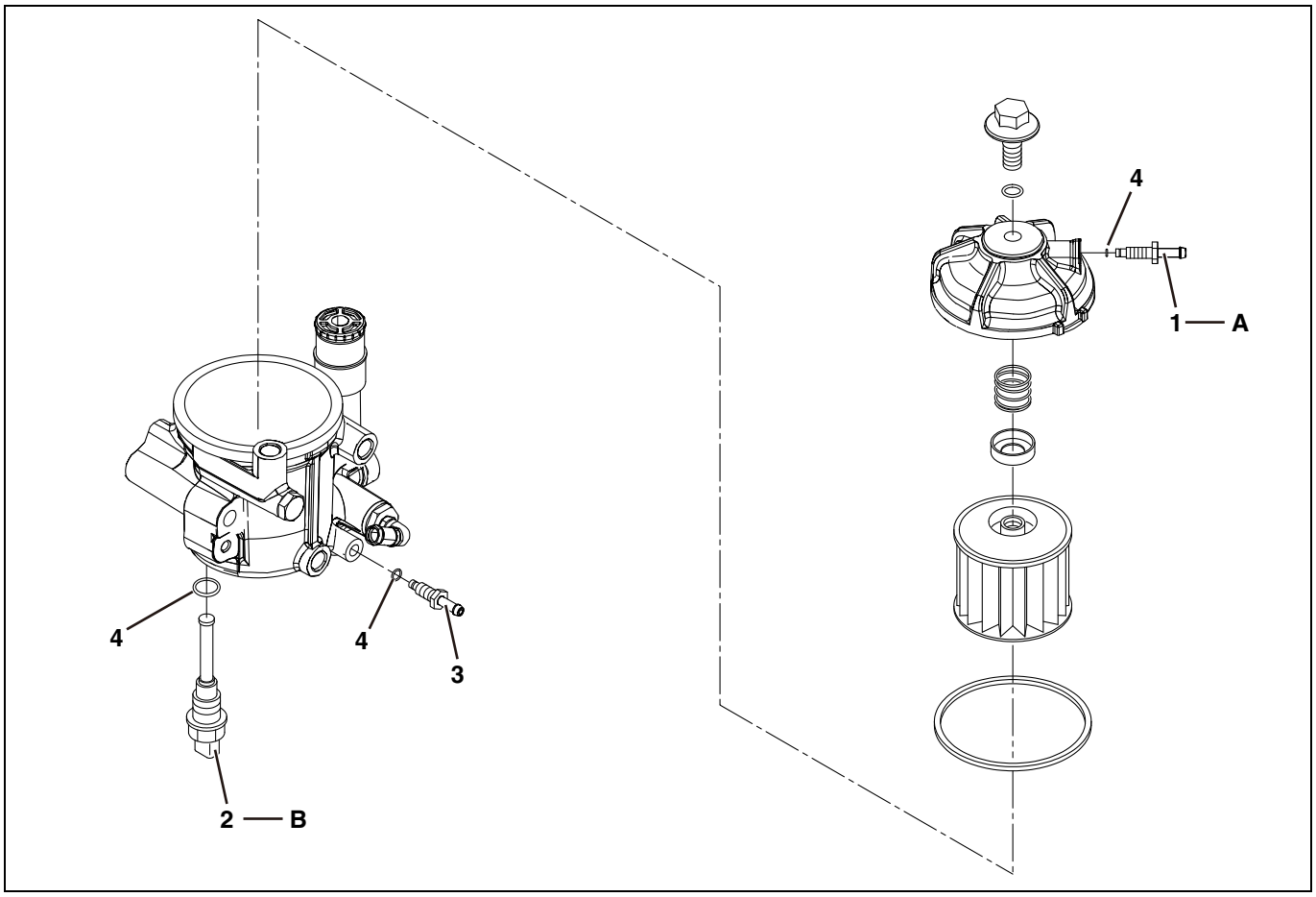
5. AIR BLEEDING OF FUEL SYSTEM
Reference: FUEL SYSTEM (J05E), FUEL FILTER AND CASE (ENGINE SIDE), REPLACEMENT, AIR BLEEDING OF FUEL SYSTEM (Page 7-16)

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WATER LEVEL WARNING SWITCH

COMPONENT LOCATOR

EN01F02127060402022001



SHTS021270600050

1	Air bleeding plug	3	Drain plug
2	Water level warning switch	4	O-ring *

*: Nonreusable part

Tightening torque — Unit: N·m {kgf·cm, lbf·ft}

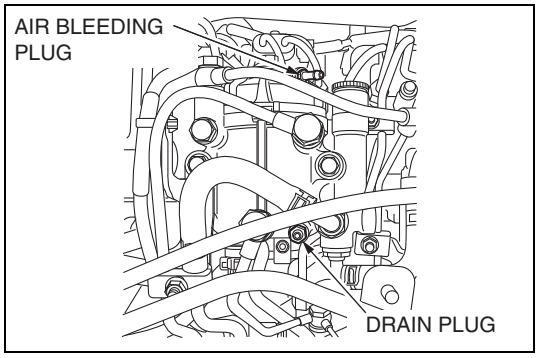
A	5-9 {51-91, 3.7-6.6}	B	2-3 {21-30, 1.5-2.2}

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REPLACEMENT

EN01F02127060402022002

REMOVING THE WATER LEVEL WARNING SWITCH

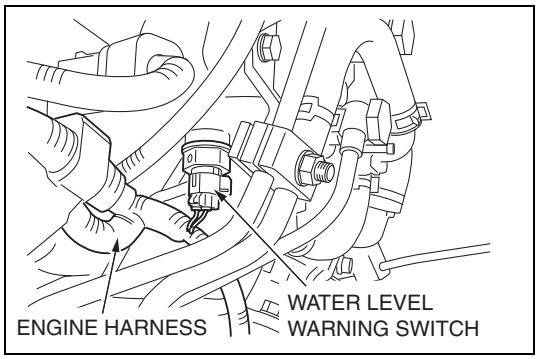


SHTS021270600051

1. FUEL DISCHARGE

(1) Prepare reservoir under the drain plug to receive the drained fuel.
(2) Loosen the drain plug and then the air bleeding plug of the fuel filter, and drain the fuel from the drain plug. Check that the fuel is no longer drained from the drain plug and then tighten the drain plug with a new O-ring.
Tightening Torque:
5-9 N·m {51-91 kgf·cm, 3.7-6.6 lbf·ft}

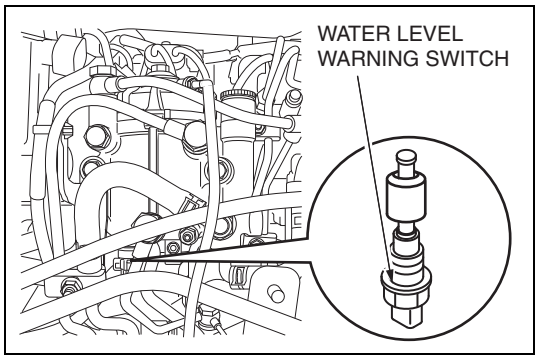
⚠ CAUTION
Drain the fuel in accordance with the regulation of disposal specified in each region.



SHTS021270600052

2. DISCONNECTING THE HARNESS

(1) Disconnect the connector connected to the water level warning switch.



SHTS021270600053

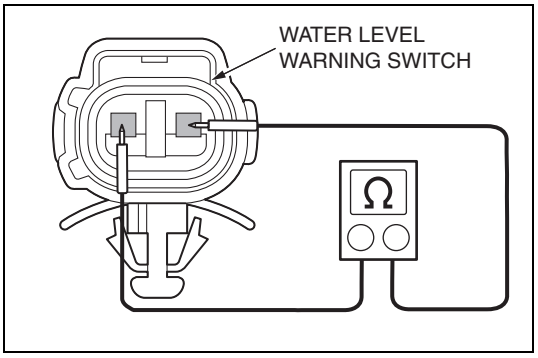
3. REMOVING THE WATER LEVEL WARNING SWITCH

(1) Remove the water level warning switch from the fuel filter case.

NOTICE
Prepare a reservoir and a waste cloth because fuel spills when removing the water level warning switch.

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SINGLE UNIT INSPECTION



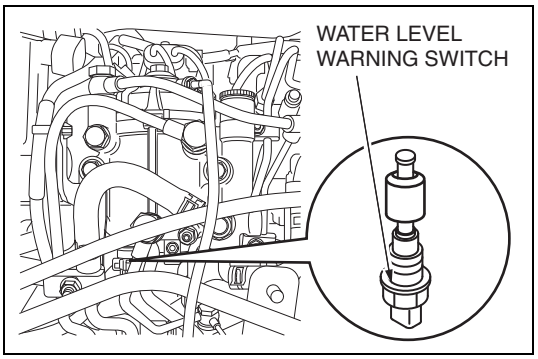
SHTS021270600054

1. INSPECTING CONTINUITY

(1) Move the float of the water level warning switch up and down by hand. Using the circuit tester, measure continuity between terminals. If any problem is found, replace the water level warning switch.

Float position	Continuity
Up	Yes
Down	No

MOUNTING THE WATER LEVEL WARNING SWITCH

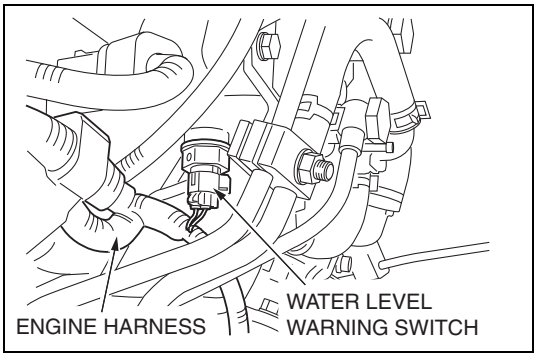


SHTS021270600055

1. MOUNTING THE WATER LEVEL WARNING SWITCH

(1) Mount the water level warning switch to the fuel filter case with a new O-ring.
Tightening Torque:
2-3 N·m {21-30 kgf·cm, 1.5-2.2 lbf·ft}

⚠ CAUTION
After the water level warning switch is attached, start the engine for a trial run to check for fuel leakage from around the switch.



SHTS021270600056

2. CONNECTING THE HARNESS

(1) Connect the connector to the water level warning switch.

⚠ CAUTION
Before connecting the connectors, make sure that the terminals are free of a spark mark.

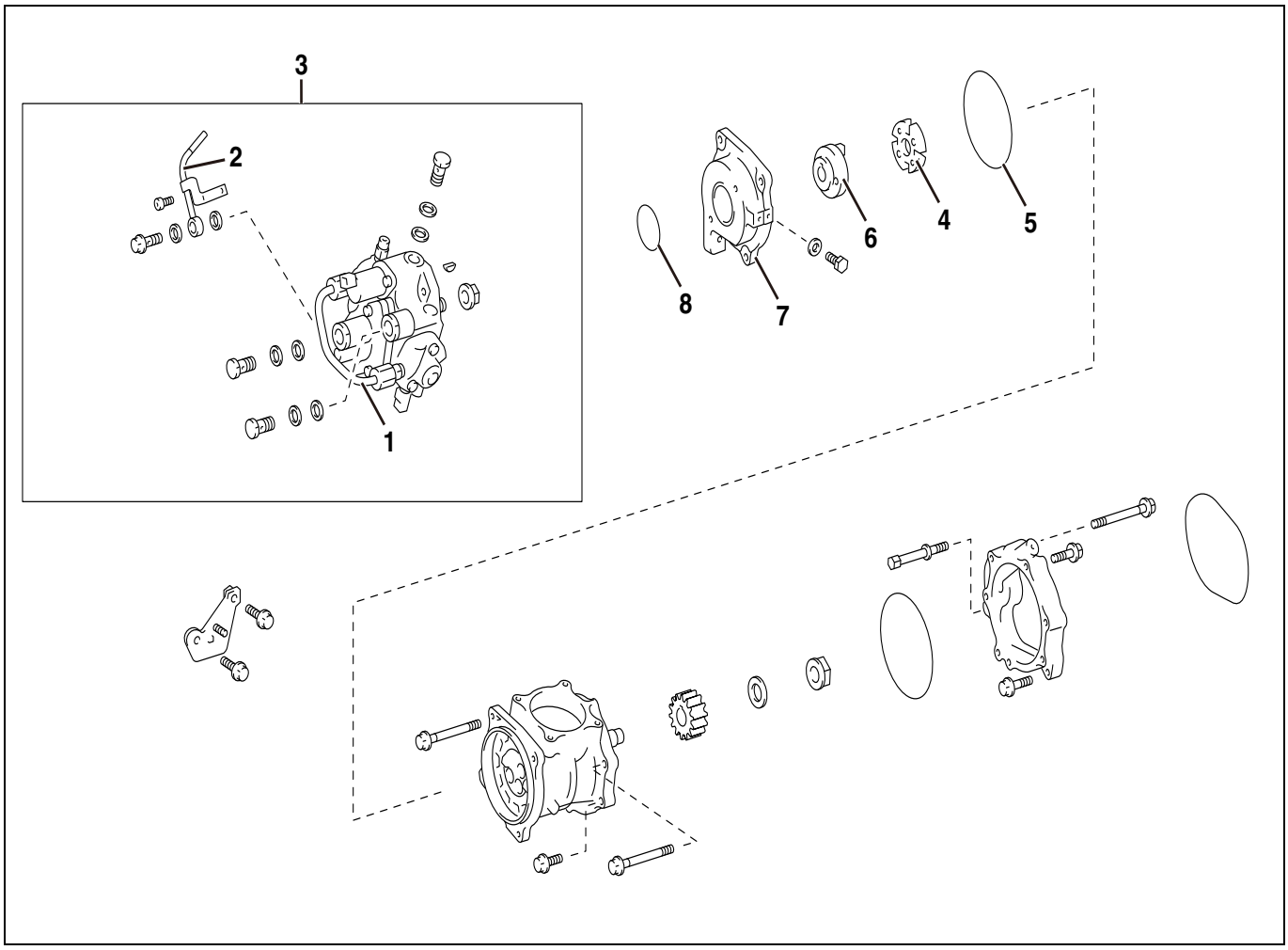
3. AIR BLEEDING OF FUEL SYSTEM
Reference: FUEL SYSTEM (J05E), FUEL FILTER AND CASE (ENGINE SIDE), REPLACEMENT, AIR BLEEDING OF FUEL SYSTEM (Page 7-16)

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SUPPLY PUMP

COMPONENT LOCATOR

EN01F02127060402007001



SHTS021270600057

1	Pipe A	5	O-ring *
2	Pipe B	6	Cup ring flange
3	Supply pump	7	Bearing holder case
4	Cut ring	8	O-ring *

*: Nonreusable part

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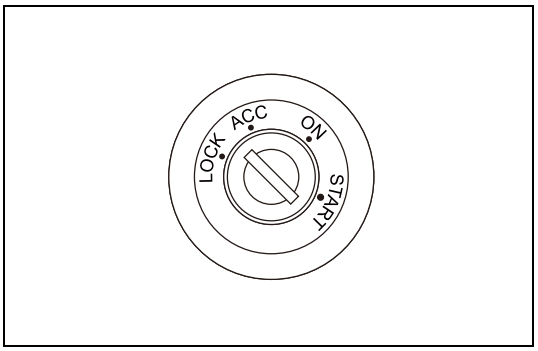
REPLACEMENT

EN01F02127060402007002

REMOVING THE SUPPLY PUMP

⚠ CAUTION
While working, be careful not to make dirt and water enter parts.

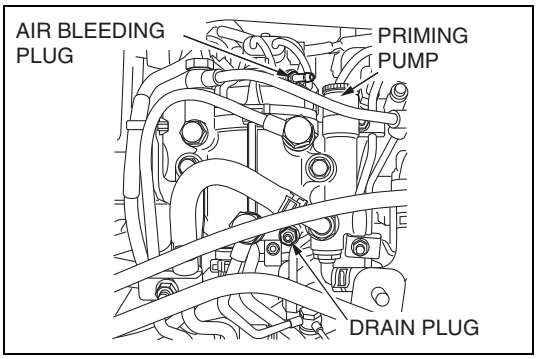
1. TURNING THE STARTER SWITCH TO THE LOCK POSITION



SHTS021270600058

⚠ CAUTION
Perform the following work after the engine cools off to avoid fire or burning. The fuel in the common rail could have a high temperature (approximately 100°C {212°F}) immediately after driving.

2. FUEL DISCHARGE



SHTS021270600059

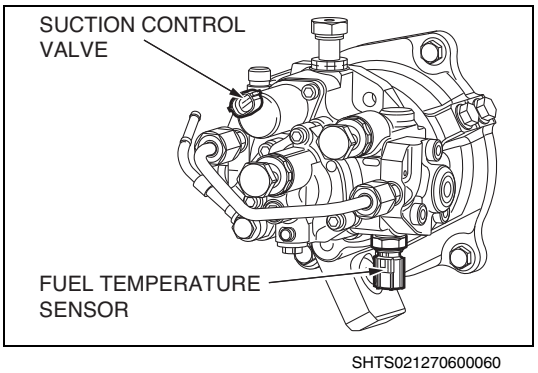
(1) Prepare reservoir under the drain plug to receive the drained fuel.
(2) Loosen the drain plug and then the air bleeding plug of the fuel filter, and drain the fuel from the drain plug. Check that the fuel is no longer drained from the drain plug and then tighten the drain plug with a new O-ring.
Tightening Torque:
5-9 N·m {51-91 kgf·cm, 3.7-6.6 lbf·ft}

⚠ CAUTION
Drain the fuel in accordance with the regulation of disposal specified in each region.

3. REMOVING THE FUEL FILTER CASE

(1) Remove the fuel filter case and the fuel pipe.
Reference: FUEL SYSTEM (J05E), FUEL FILTER AND CASE (ENGINE SIDE), REPLACEMENT, REMOVING THE FUEL FILTER (Page 7-19)

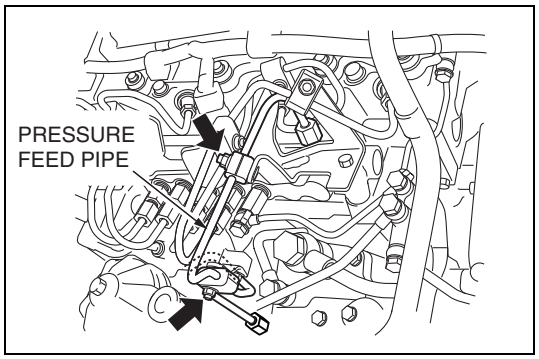
4. DISCONNECTING THE HARNESS



SHTS021270600060

(1) Disconnect the connector connected to each of the suction control valve of the supply pump and the fuel temperature sensor.

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SHTS021270600061

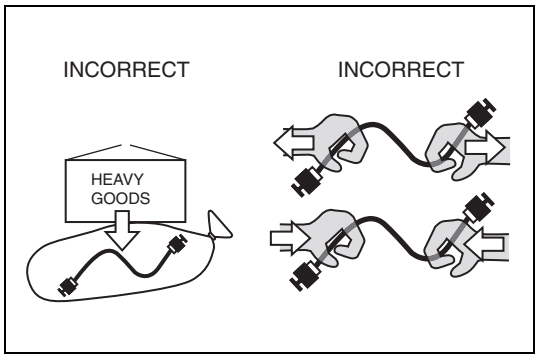
5. REMOVING THE PRESSURE FEED PIPE

(1) Unfasten the nuts (2 pcs.), and remove the clips (2 pcs.).

(2) Loosen the nut to remove the pressure feed pipe from the common rail and supply pump.

⚠ CAUTION

- **The pressure feed pipes are nonreusable.**

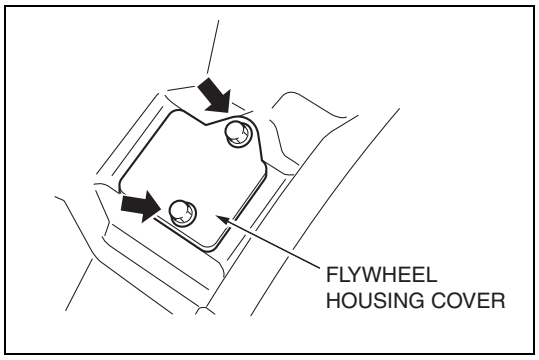


SHTS021270600062

- **Be careful when handling the pipe because the fuel pipe may be deformed.**

NOTICE

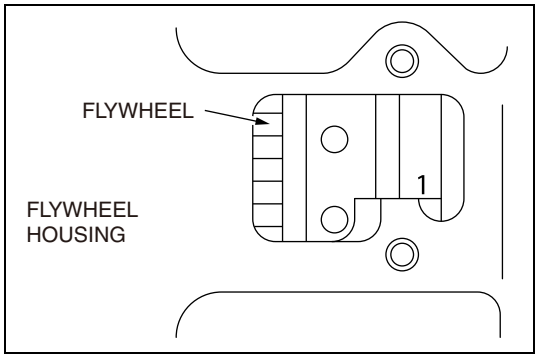
Prepare a reservoir and a waste cloth because fuel spills when removing the pressure feed pipe.



SHTS021270600063

6. SETTING THE COMPRESSION STROKE TOP DEAD CENTER OF No.1 CYLINDER

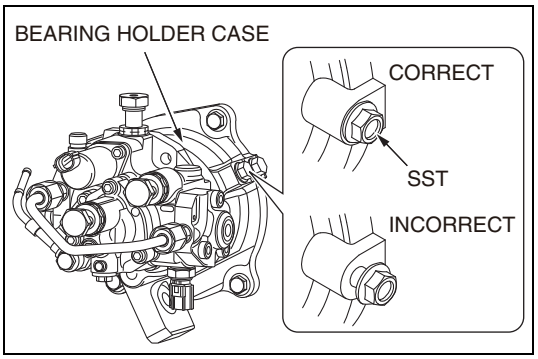
(1) Unfasten the bolts (2 pcs.) securing the flywheel housing cover, and remove the flywheel housing cover from the flywheel housing.



SHTS021270600064

(2) Turn the crankshaft in the running direction of the engine (counterclockwise viewed from the flywheel side) to align the timing mark put on the periphery of the flywheel with "1" through the check window of the flywheel housing.

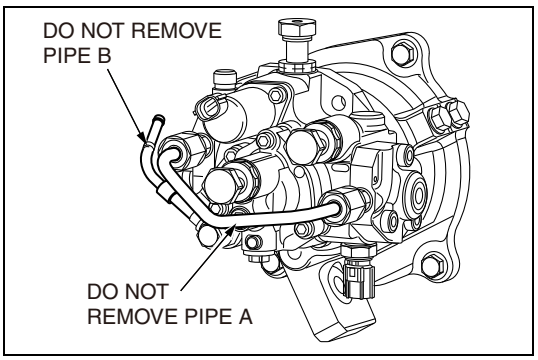
https://truckmanualshub.com/



SHTS021270600065

(3) Remove the timing check window plug from the bearing holder case of the supply pump.
(4) Attach the SST specified below to the timing check window of the bearing holder case to see that the bearing surface of the SST is seated on the supply pump.
SST: SZ105-08067
Guide bolt

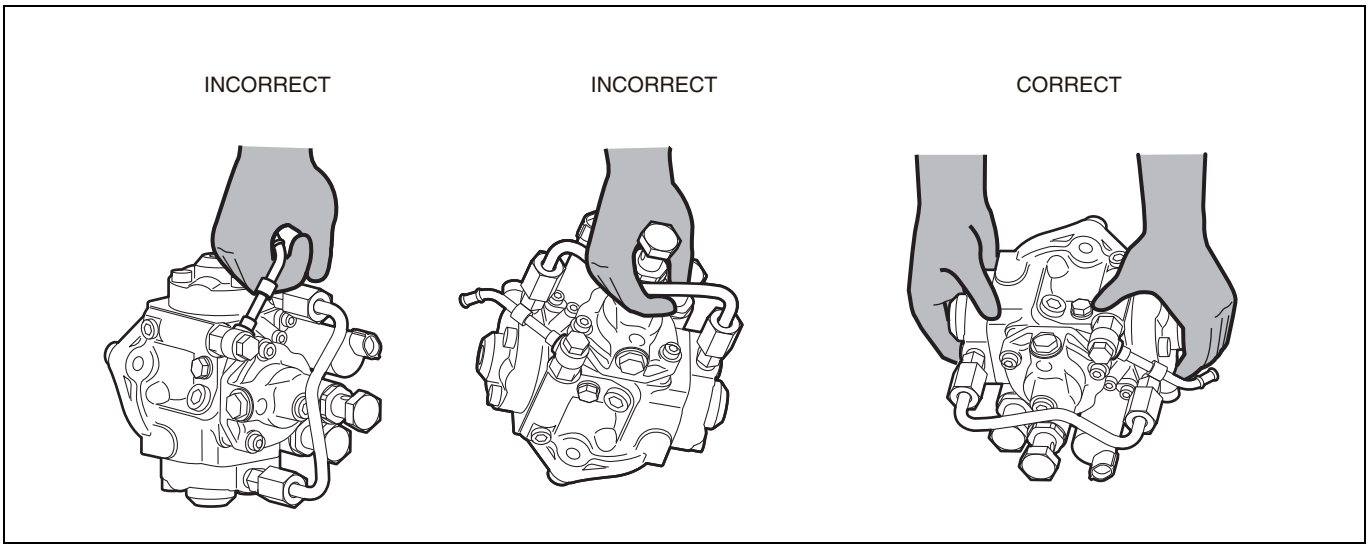
⚠ CAUTION
- **If the SST is not seated, it is in contact with a part other than the detent of the coupling flange. Do not forcibly tighten the SST.**
- **If the SST is not seated, the No.1 cylinder is not set at the compression stroke top dead center. In this case, detach the SST, turn the crankshaft, and attach the SST again to see if it is seated.**
- **Before turning the crankshaft, do not fail to pull out the SST.**
- **Do not perform cranking with the SST inserted.**



SHTS021270600066

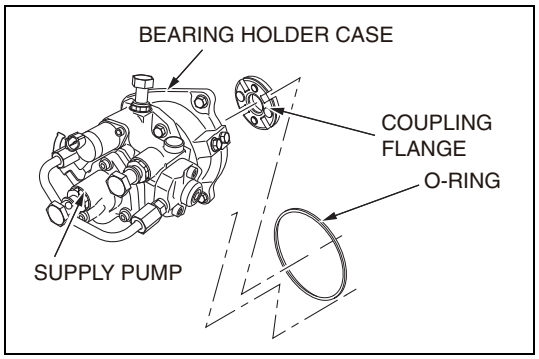
7. REMOVING THE SUPPLY PUMP

⚠ CAUTION
- **While working, be careful not to make dirt or water enter the parts.**
- **Do not remove pipe A or B.**
- **Hold the pipe not to apply load to the supply pump.**
- **Example: Do not carry the supply pump by holding the pipe. (Twist of the pipe may cause fuel leakage.)**



SHTS021270600067

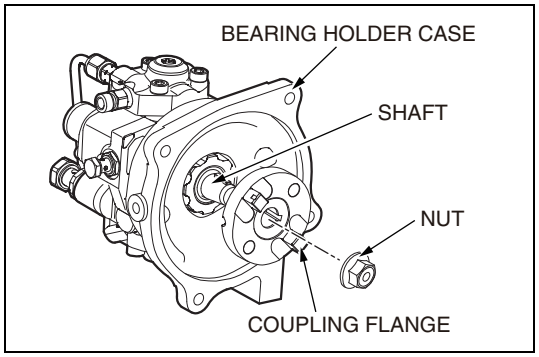
https://truckmanualshub.com/



SHTS021270600068

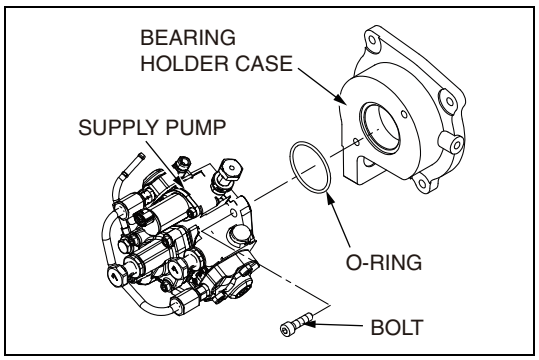
(1) Unfasten 4 bolts to remove the supply pump, coupling and O-ring from the engine.

⚠ **CAUTION**
Remove the supply pump and the bearing holder case together.



SHTS021270600069

(2) Unfasten the nut with the coupling flange locked with a vase, and remove the coupling flange.

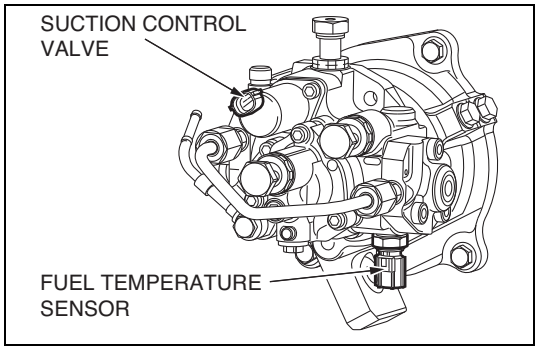


SHTS021270600070

(3) Unfasten 2 bolts to remove the bearing holder case and O-ring from the supply pump.

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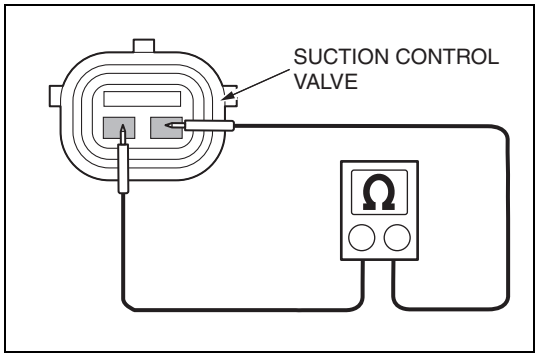
INSPECTING THE COMPONENTS



SHTS021270600071

1. INSPECTING THE SUCTION CONTROL VALVE AND THE FUEL TEMPERATURE SENSOR

(1) Using the HINO-DX, inspect the suction control valve and the fuel temperature sensor. If any abnormality is found in either of the parts, replace the supply pump. (Refer to the HINO-DX user's manual.)

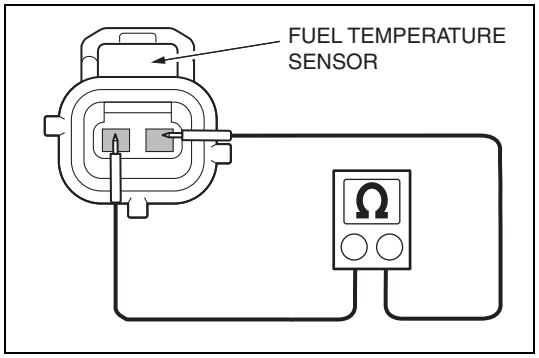


SHTS021270600072

2. INSPECTING THE RESISTANCE OF THE SUCTION CONTROL VALVE

(1) Using the circuit tester, measure the resistance between the terminals. If the measured value is in excess of the standard value, replace the supply pump.

Standard value (at 20°C {68°F})	1.6-2.6 Ω



SHTS021270600073

3. INSPECTING THE RESISTANCE OF THE FUEL TEMPERATURE SENSOR

(1) Using the circuit tester, measure the resistance between the terminals. If the measured value is in excess of the standard value, replace the supply pump.

Temperature (at 20°C {68°F})	Resistance (kΩ)
–20 {–4}	13.84-16.33
20 {68}	2.32-2.59
80 {176}	0.310-0.326
110 {230}	0.1399-0.1435

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MOUNTING THE SUPPLY PUMP

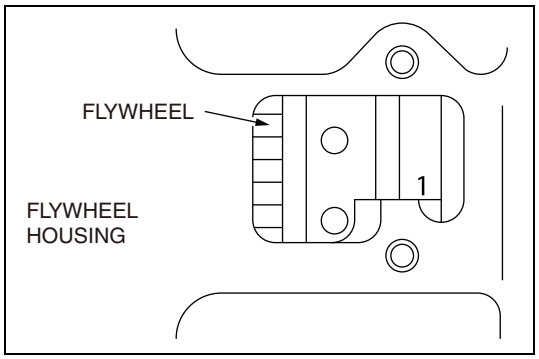
1. CAUTIONS

⚠ CAUTION

- **While working, be careful not to make dirt and water enter parts.**
- **Before mounting parts, make sure that there is no dirt on the connection between them.**
- **Air enters the fuel pipe in the process of mounting the pre-fuel filter case. After mounting is completed, thoroughly purge air from the fuel pipe.**

2. SETTING THE COMPRESSION STROKE TOP DEAD CENTER OF No.1 CYLINDER

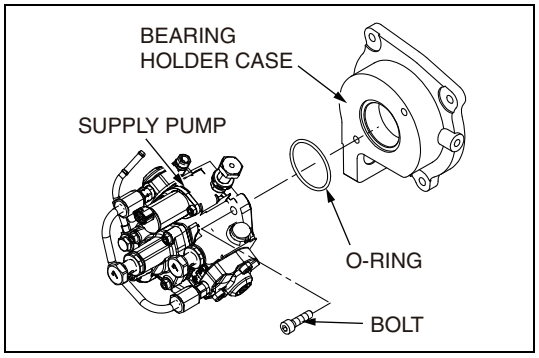
(1) Turn the crankshaft in the running direction of the engine (counterclockwise viewed from the flywheel side) to align the timing mark put on the periphery of the flywheel with "1" through the check window of the flywheel housing.



SHTS021270600074

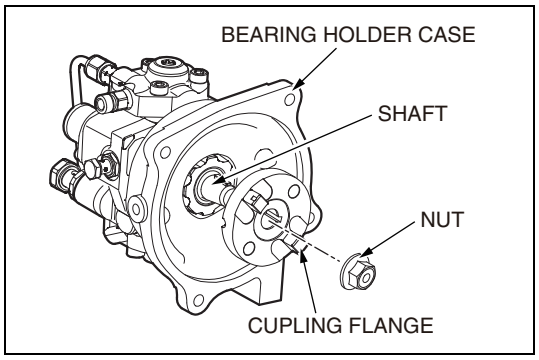
3. MOUNTING THE SUPPLY PUMP

(1) Mount the bearing holder case to the supply pump with a new O-ring and 2 bolts.
Tightening Torque:
28.5 N·m {291 kgf·cm, 21 lbf·ft}



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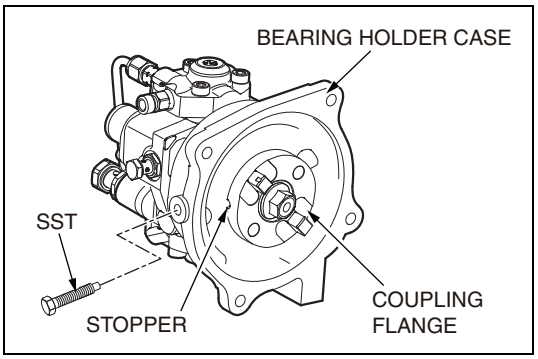
(2) Mount the coupling flange to the shaft.
(3) Fix the supply pump and tighten the nuts while preventing the coupling flange from rotating using a vise.
Tightening Torque:
64 N·m {653 kgf·cm, 47 lbf·ft}



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⚠ CAUTION
Do not use the SST to lock the shaft.

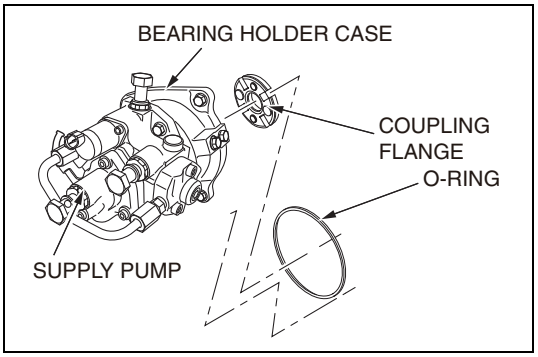
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SHTS021270600077

(4) Insert the SST specified below into the bearing holder case and bring it into close contact with the detent of the coupling flange.
SST: SZ105-08067
Guide bolt

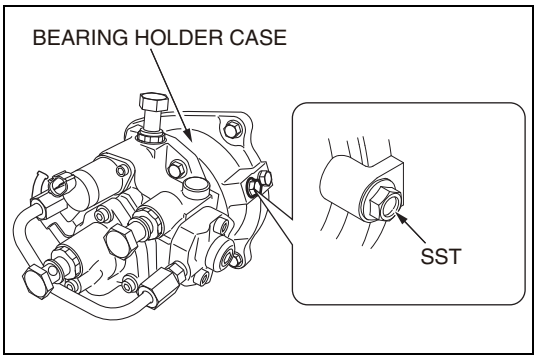
⚠ CAUTION
- **Do not tighten the SST by applying it to a part other than the detent of the coupling, or do not use a tool other than the SST for locking.**
- **The SST is not designed to allow its tip to come into contact with the end of the detent hole. (The clearance at the tip is 2 mm {0.079 in.}.)**



SHTS021270600078

(5) Mount the coupling and supply pump to the engine with a new O-ring and 4 bolts.
Tightening Torque:
28.5 N·m {291 kgf·cm, 21 lbf·ft}

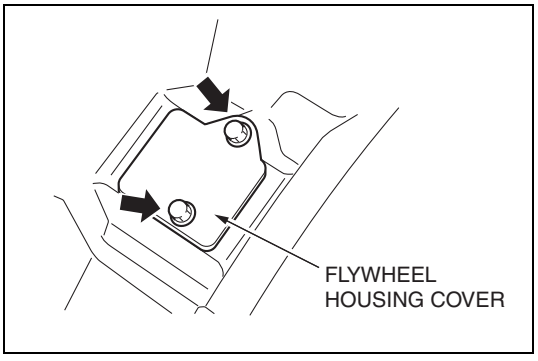
⚠ CAUTION
Mount the coupling and the supply pump with the No.1 cylinder set at the compression stroke top dead center, and the cast mark and "0" mark stamped on the front face of the coupling aligned with each other.



SHTS021270600079

(6) Make sure that the No.1 cylinder is set at the compression stroke top dead center, and then remove the SST and attach the timing checking window plug.

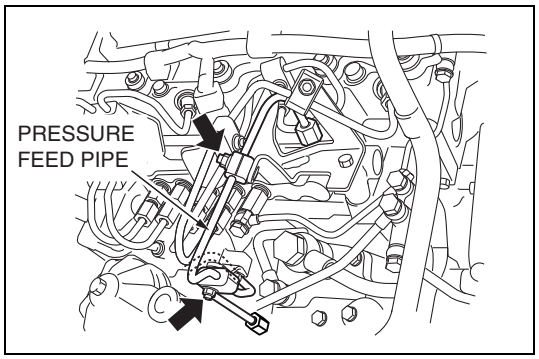
⚠ CAUTION
- **After all parts are assembled, do not fail to remove the SST and mount the timing checking window plug.**
- **Before turning the crankshaft, do not fail to pull out the SST.**
- **Do not perform cranking with the SST inserted.**



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(7) Mount the flywheel housing cover to the flywheel housing with the bolts (2 pcs.).

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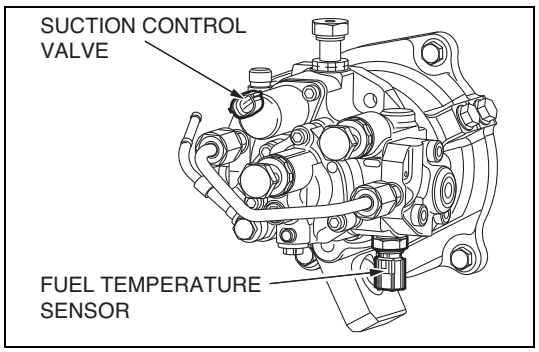
SHTS021270600081

4. MOUNTING THE PRESSURE FEED PIPE

(1) Mount the new pressure feed pipe to the supply pump and common rail.
Tightening Torque:
44 N·m {449 kgf·cm, 32 lbf·ft}

(2) Mount the 2 clips with 2 nuts and fix the pressure feed pipe.

⚠ CAUTION
Always replace the pressure feeding pipe by a new one because the pipe is subjected to high pressure; reusing the same pipe result in a fuel leak.



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5. CONNECTING THE HARNESS

(1) Connect the connector to the fuel temperature sensor and suction control valve of the supply pump.

⚠ CAUTION
Before connecting the connectors, make sure that the terminals are free of a spark mark.

6. MOUNTING THE FUEL FILTER CASE
Reference: FUEL SYSTEM (J05E), FUEL FILTER AND CASE (ENGINE SIDE), REPLACEMENT, MOUNTING THE FUEL FILTER (ENGINE SIDE) (Page 7-22)

7. AIR BLEEDING OF FUEL SYSTEM
Reference: FUEL SYSTEM (J05E), FUEL FILTER AND CASE (ENGINE SIDE), REPLACEMENT, AIR BLEEDING OF FUEL SYSTEM (Page 7-16)

8. UPDATING THE SUPPLY PUMP LEARNED VALUE

(1) When replacing the supply pump, update the learned value recorded in the engine ECU by using HINO-DX.
(Refer to the HINO-DX user's manual.)

⚠ CAUTION

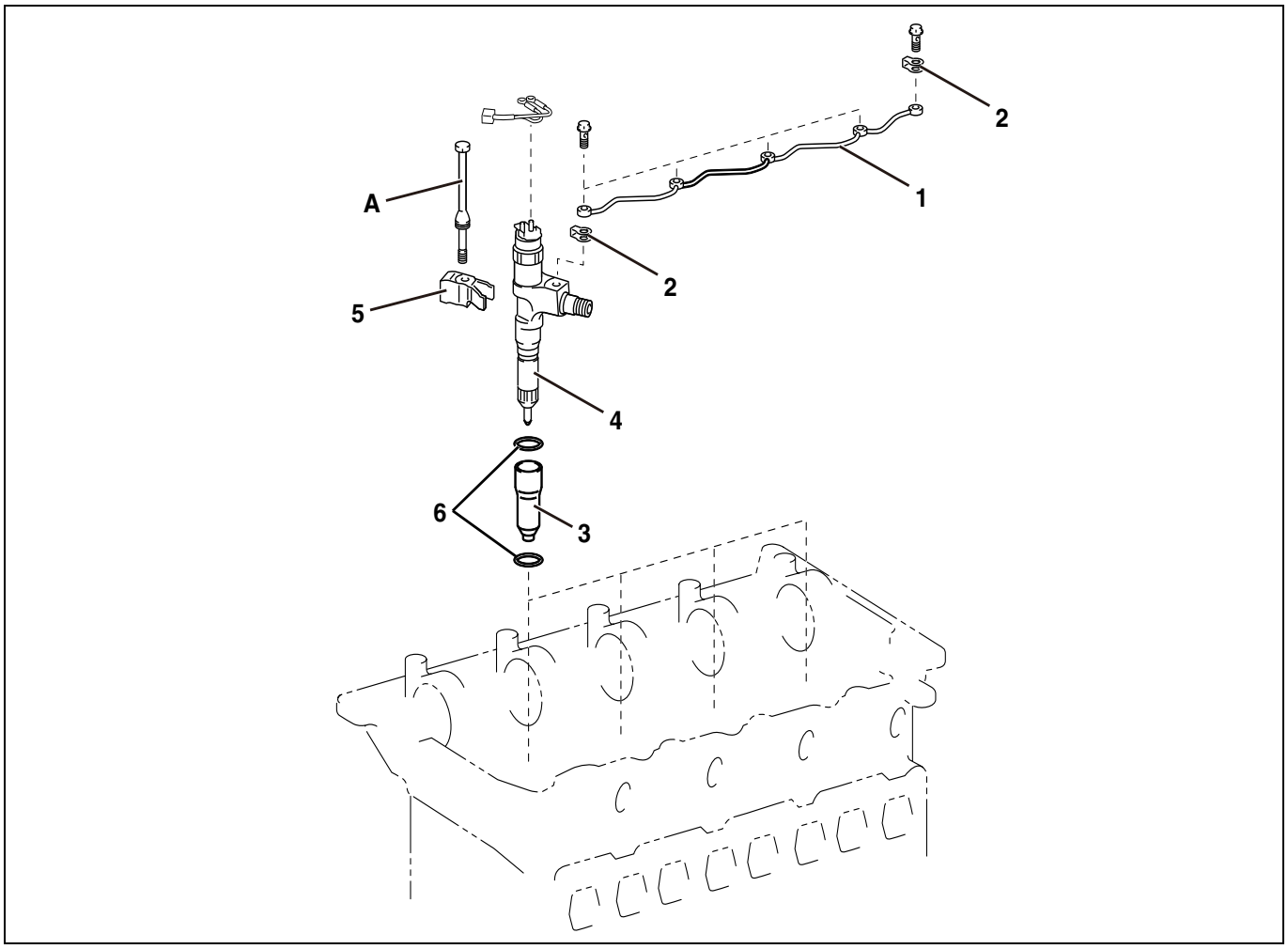
- **When the learned value is not updated, common rail pressure control cannot be performed correctly. This may cause engine stall and/or excessively high common rail pressure. Therefore, make sure to update the learned value when replacing the supply pump.**
- **After the supply pump is mounted, start the engine for a trial run to check for fuel leakage from around the supply pump.**

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INJECTOR

COMPONENT LOCATOR

EN01F02127060402004001



SHTS021270600083

1	Leakage pipe	4	Injector
2	Gasket *	5	Injector clamp
3	Injection pipe oil seal	6	O-ring *

*: Nonreusable part

Tightening torque — Unit: N·m {kgf·cm, lbf·ft}

A	25 {255, 18}		

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REPLACEMENT

EN01F02127060402004002

REMOVING THE INJECTOR

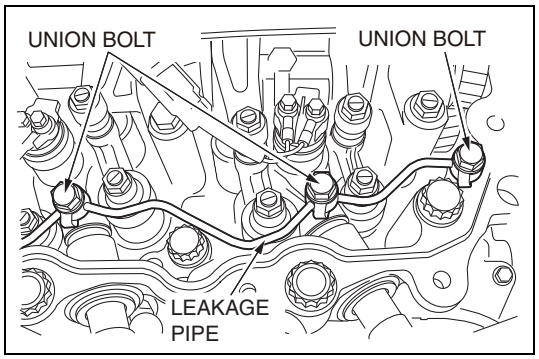
⚠ CAUTION

- **While working, be careful not to make dirt and water enter parts.**
- **Clean off surrounding area of the injectors and fuel line connectors.**

1. REMOVING THE HEAD COVER
Reference: ENGINE MECHANICAL (J05E), HEAD COVER, REPLACEMENT, REMOVING THE HEAD COVER (Page 10-3)

2. REMOVING THE LEAKAGE PIPE
(1) Unfasten 5 union bolts to remove the leakage pipe and 5 gaskets.

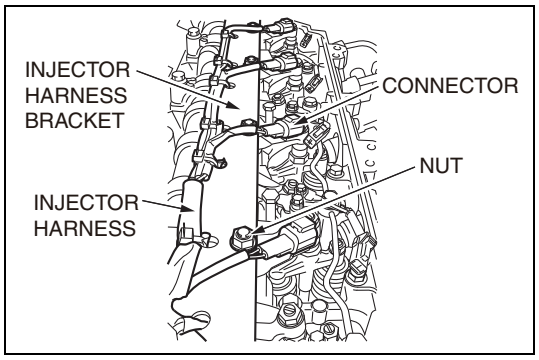
⚠ CAUTION
The leakage pipe can be twisted easily. Use care in handling.



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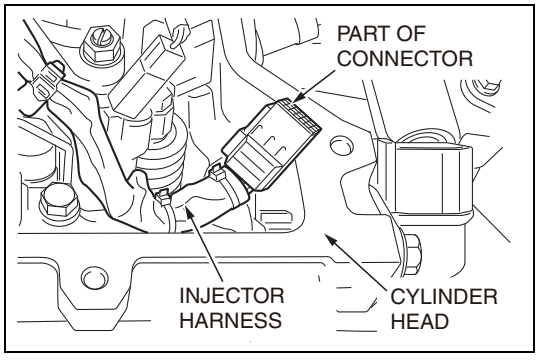
3. REMOVING THE INJECTOR HARNESS
(1) Disconnect each connector connected to the injector.
(2) Unfasten 5 nuts to remove the injector harness together with the injector harness bracket.

⚠ CAUTION
The injector harness bracket can be twisted easily. Use care in handling.



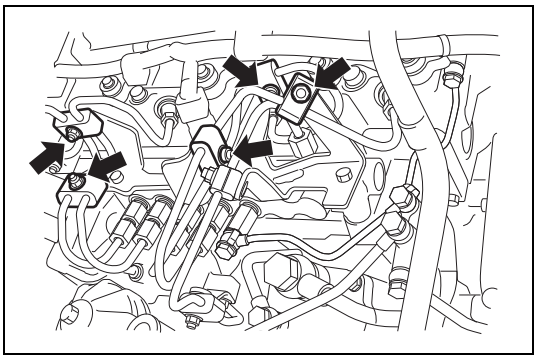
SHTS021270600085

NOTICE
For easy removal, detach the connector of the cylinder head lastly.



SHTS021270600086

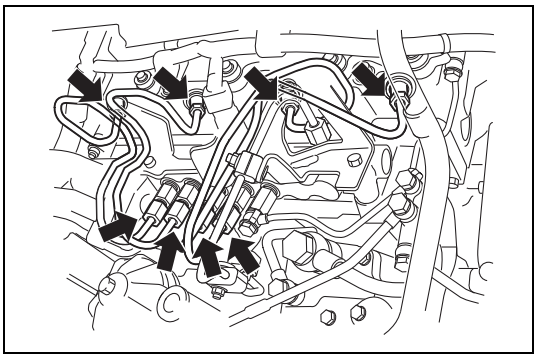
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4. REMOVING THE INJECTION PIPE

(1) Unfasten 5 nuts to remove 5 clips.

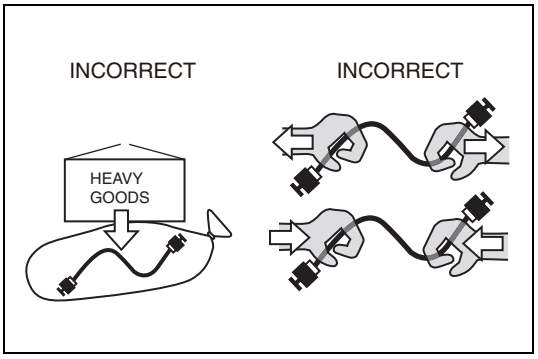


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(2) Loosen the nuts securing the injection pipes (4 pcs.), and remove them from the injector and the common rail.

⚠ CAUTION

- **Do not reuse the injection pipes.**

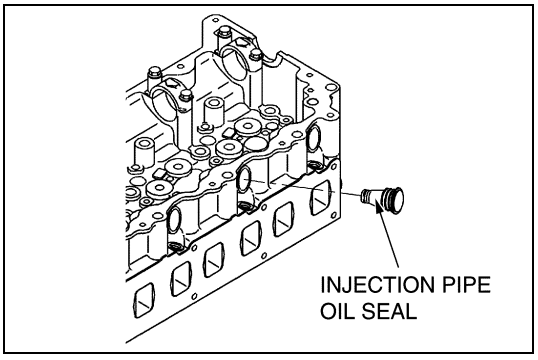


SHTS021270600089

- **Be careful when handling the pipe because the fuel pipe may be deformed.**

NOTICE

Prepare the reservoir and a waste cloth because fuel spills when removing the injection pipes.

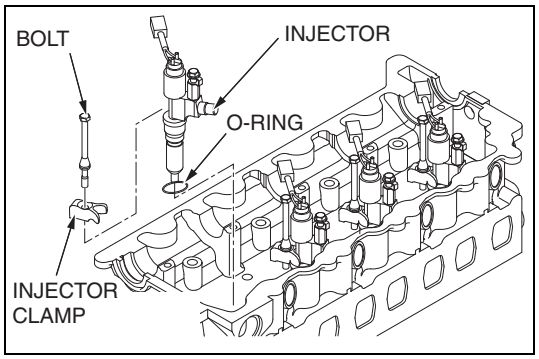


SHTS021270600090

5. REMOVING THE INJECTOR

(1) Remove the 4 injection pipe oil seals from the cylinder head.

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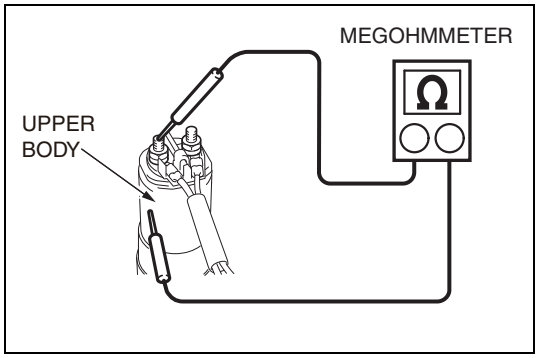
(2) Unfasten the injector clamp mounting bolts to remove the injector and injector clamp.
(3) Remove the O-ring.

NOTICE
Replace the O-ring with a new one.

SINGLE UNIT INSPECTION

1. INSPECTING THE RESISTANCE

(1) Use the 1,000 V megohmmeter, measure the insulation resistance between either of 2 terminals (no polarity) to which the injector harness is connected and the upper body of the injector.

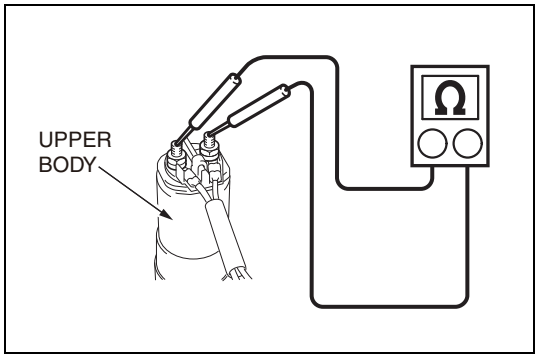


SHTS021270600092

⚠ CAUTION
Never measure between the terminals, or the injector will be damaged.

Standard value (Room temperature)	**10 MΩ or more (Using the 1,000 V megohmmeter)**

(2) Use the circuit tester, measure the resistance between terminals.



SHTS021270600093

Standard value (at 20°C {68°F})	**0.37-0.57 Ω**

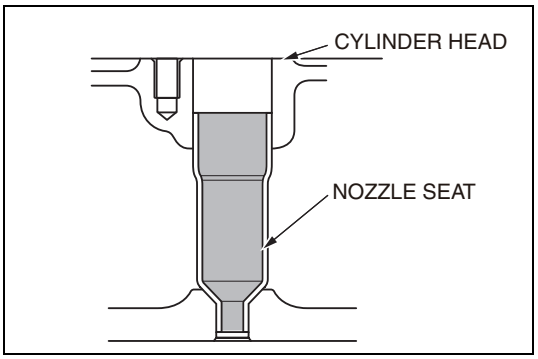
(3) The resistance values of (1) and (2) exceed the standard value, replace the injector.

2. CLEANING THE INJECTOR

(1) Use the clean clothes to remove sludge adhered to the terminal part and its perimeter.

⚠ CAUTION
- **Use the clean clothes to wipe off sludge without using any detergent.**
- **Use of detergent causes it to penetrate, which may lead to electric failure.**

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3. CLEANING THE INSIDE OF THE NOZZLE SEAT

(1) If sludge sticks to the inside of the nozzle seat, spray a detergent over it, wipe it off with a waste cloth, and wash it out with the detergent.

NOTICE

- **If sludge sticks hard to the inside of the nozzle seat, remove it with brush and a detergent.**
- **It is advisable to perform a contact check using red lead.**

(2) Make sure that the inside of the nozzle seat is free of sludge or foreign matters.

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MOUNTING THE INJECTOR

1. CAUTIONS

⚠ CAUTION

- **While working, be careful not to make dirt and water enter parts.**
- **Before mounting parts, make sure that there is no dirt on the connection between them.**
- **Air enters the fuel pipe in the process of mounting the pre-fuel filter case. After mounting is completed, thoroughly purge air from the fuel pipe.**

2. MOUNTING THE INJECTOR AND THE INJECTION PIPE

(1) Apply engine oil to a new O-ring and mount it to the injector. Then temporarily fit the injector clamp and injector at the same time.

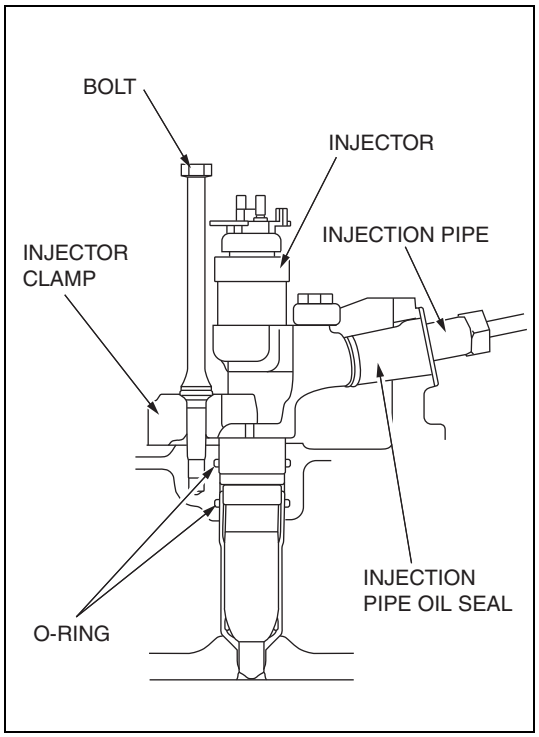
⚠ CAUTION

- **Apply engine oil to the O-ring. Use care not to get the O-ring jammed when inserting it.**
- **Note that if the O-ring is damaged, fuel will leak out and the engine will fail to start to run.**
- **Do not fix the injector clamp until the injection pipe is fit temporarily.**

(2) Set the new injection pipe oil seal to the injector.

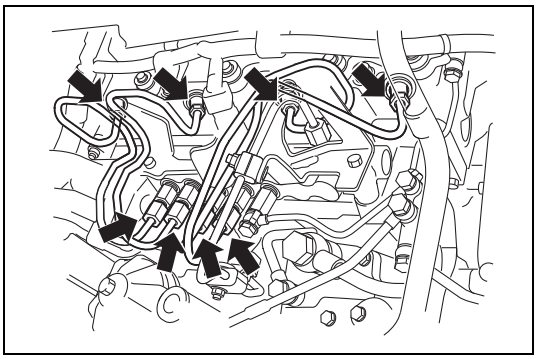
⚠ CAUTION

Mount the injection pipe oil seal so that excessive force will not be applied to the injection nozzle. (If the injection pipe oil seal and the injection nozzle are out of position, oil leakage or improper assembly of the injection pipe will result.)



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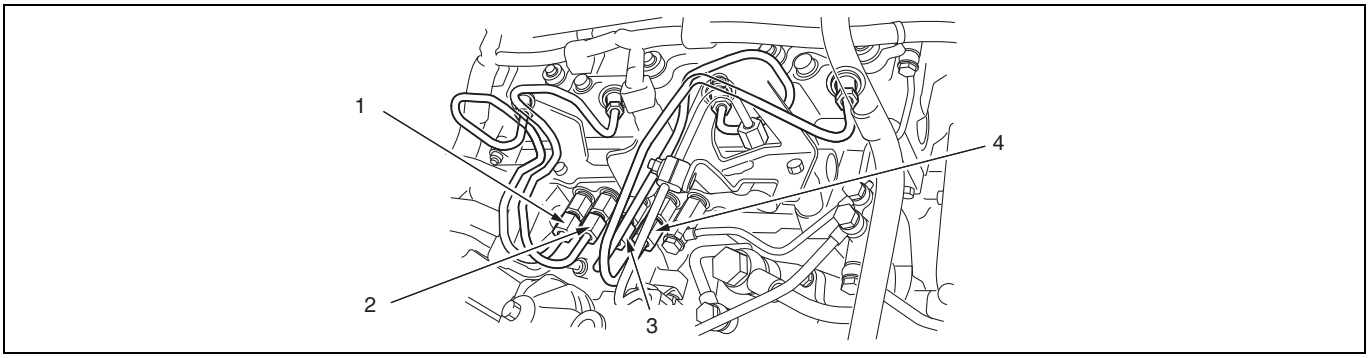
(3) Temporarily mount new injection pipes (4 pcs.) on the injector and the common rail.

⚠ CAUTION

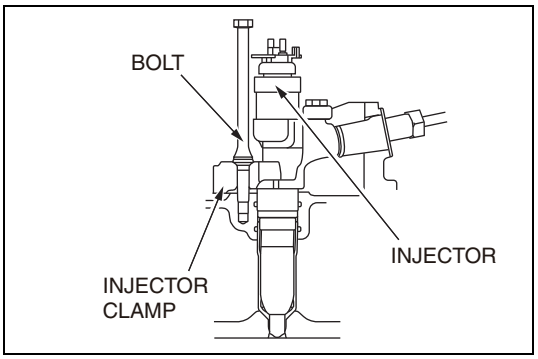
- **Do not fail to replace the injection pipes with new ones because they are subjected to high pressure and may cause fuel leakage.**
- **Fuel will leak out if the injection pipes are not properly connected. Follow the procedure.**
- **Fuel leakage will cause damage to the engine.**

NOTICE

Mount the injection pipes so that the flare tightening nuts of the injection pipes will be arranged in the order of the numbers engraved on the nuts shown in the figure below.



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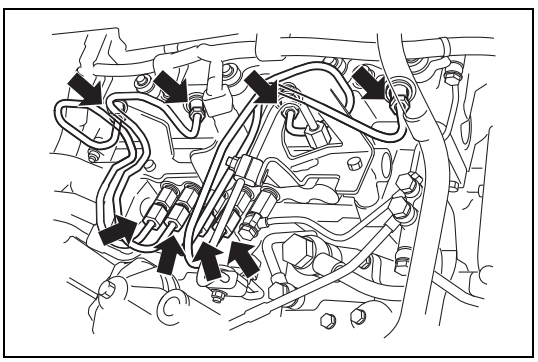


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(4) Tighten the injector clamp mounting bolt.
Tightening Torque:
25 N·m {255 kgf·cm, 18 lbf·ft}

⚠ CAUTION

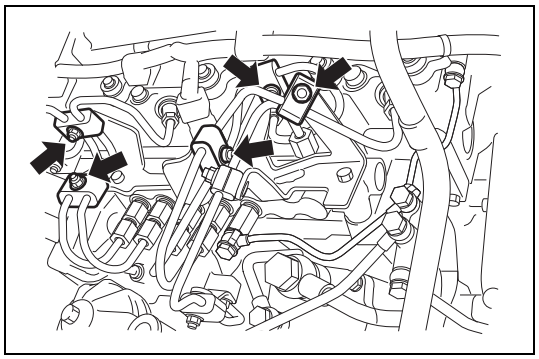
- **Insufficient tightening will cause gas leakage, which will result in the seizure of the nozzle.**
- **Before reusing the injector clamp bolt, be sure to apply oil to its washer and thread.**
- **Use the torque wrench to tighten the bolt with the specified torque.**



SHTS021270600099

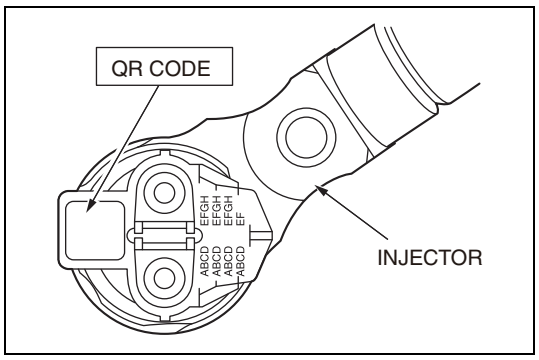
(5) Tighten the injection pipe to the specified torque.
Tightening Torque:
44 N·m {449 kgf·cm, 32 lbf·ft}

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SHTS021270600100

(6) Mount the 5 clips with 5 nuts and fix the injection pipe.



SHTS021270600101

3. WRITING OF THE INJECTOR COMPENSATION VALUE TO THE ENGINE ECU (WRITING BY MEANS OF RE-PROGRAMMING)

⚠ CAUTION

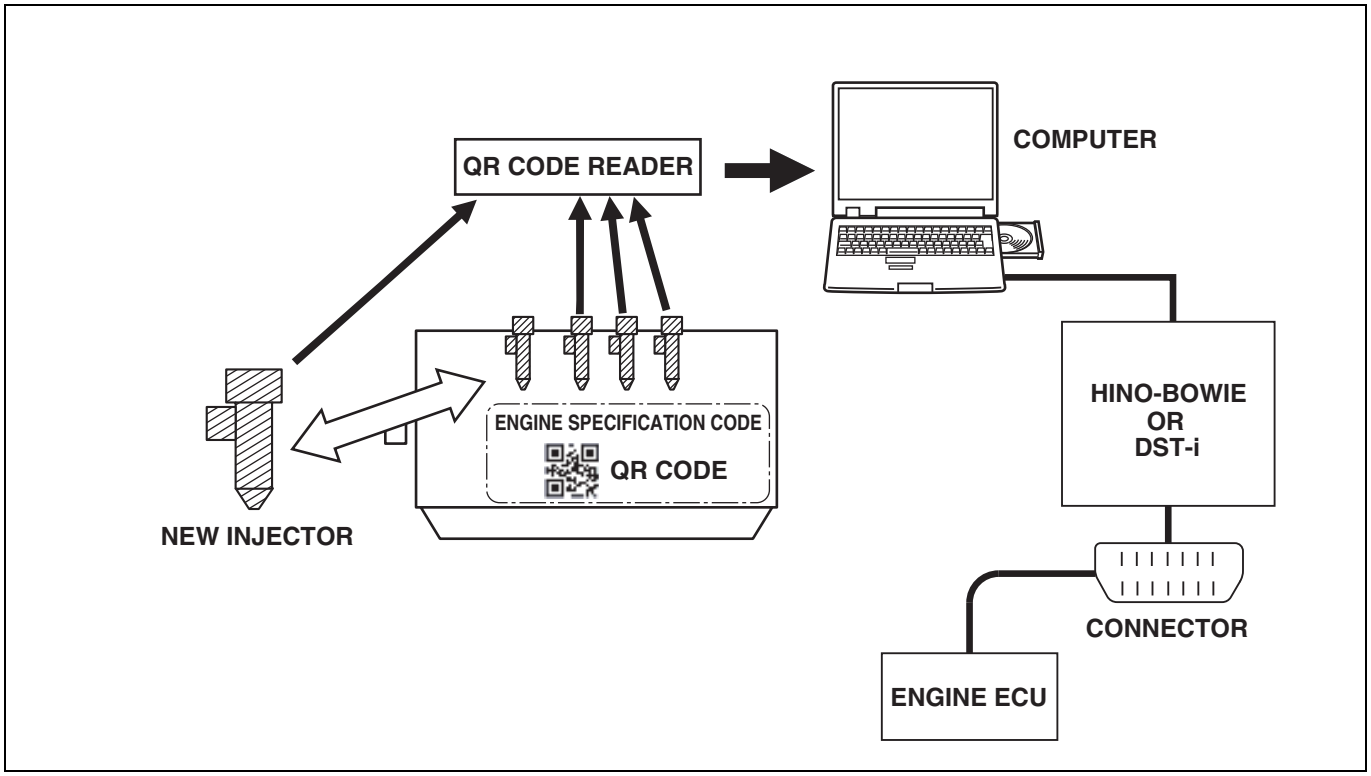
- **If an injector is replaced, write an injector compensation value (QR code) indicated on a new injector in the engine ECU.**
- **Write the incorrect compensation value may cause engine troubles.**

NOTICE

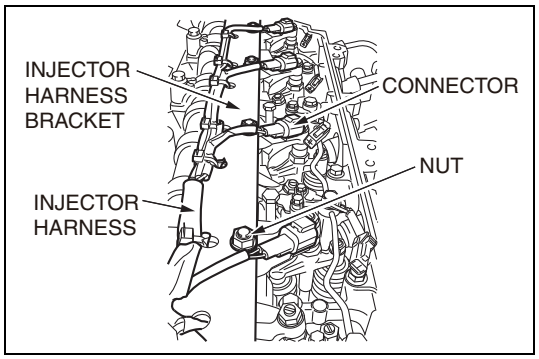
- **Injector compensation value can be written by means of a combined use of the PC tool and QR code reader.**
- **The work flow is indicated below. For the detailed procedure, see the HINO-DX instruction manual.**

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(1) Read the QR code of the injector by using the scanner of the QR code reader to create a compensation data file.
(2) Write the injector compensation value in the engine ECU from a computer.



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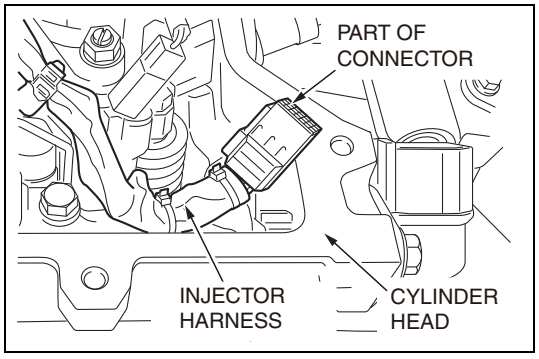
SHTS021270600103

4. MOUNTING THE INJECTOR HARNESS

(1) Mount the injector harness together with the injector bracket with 5 bolts.
(2) Connect each connector of the injector harness.

⚠ CAUTION

Before connecting the connectors, make sure that the terminals are free of a spark mark.

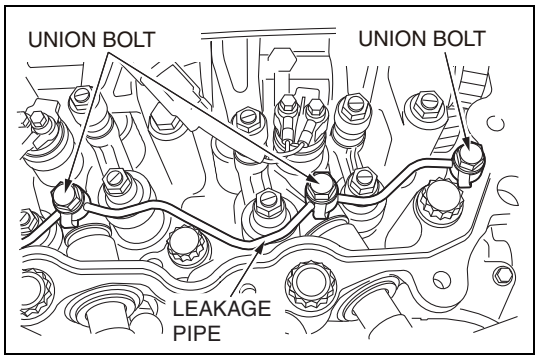


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NOTICE

For easy installation, attach the connector of the cylinder head first.

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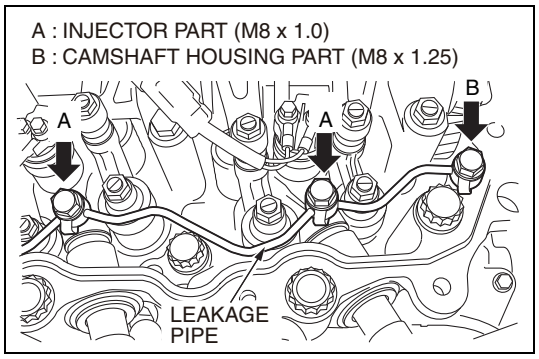
5. MOUNTING THE LEAKAGE PIPE

(1) Remove dirt or foreign matters from the gasket mounting surface.

(2) Mount the leakage pipe to the injector and cylinder head with a new gasket and 5 union bolts.
Tightening Torque:
9.8-4.7 N·m {100-149 kgf·cm, 7.3-10.8 lbf·ft}

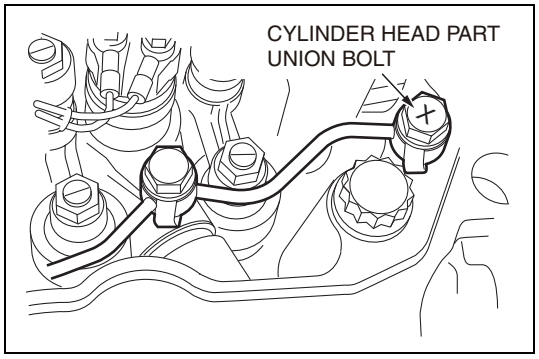
⚠ CAUTION

- **Do not reuse the old gasket.**
- **The leakage pipe can be twisted easily. Use care in handling.**



SHTS021270600106

- **Note that the screw pitch is different between 4 injector union bolts and the cylinder head union bolt.**



SHTS021270600107

- **An "X" mark is put on the cylinder head union bolt.**

6. MOUNTING THE HEAD COVER
Reference: ENGINE MECHANICAL (J05E), HEAD COVER, REPLACEMENT, MOUNTING THE HEAD COVER (Page 10-4)

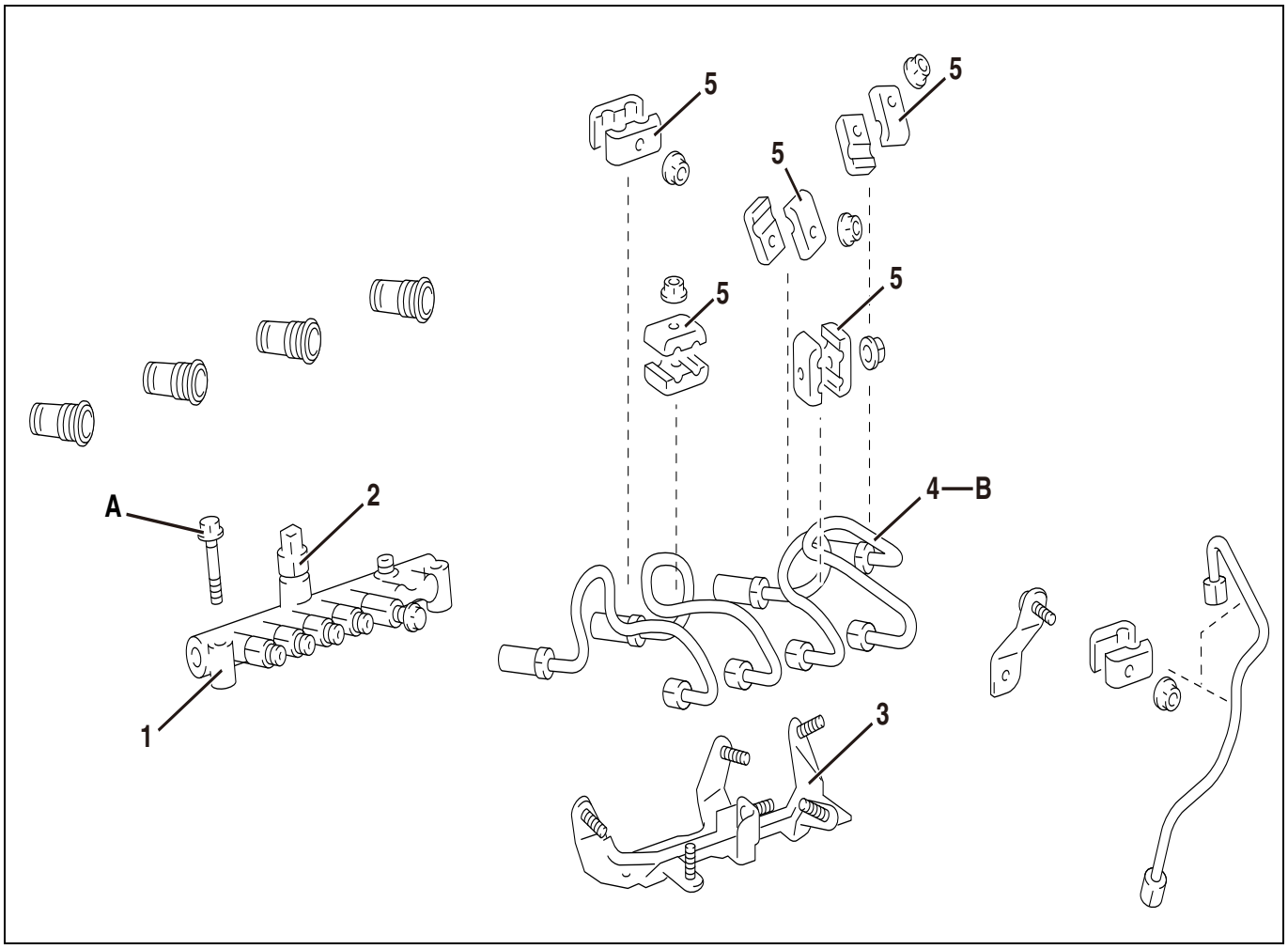
7. AIR BLEEDING OF FUEL SYSTEM
Reference: FUEL SYSTEM (J05E), FUEL FILTER AND CASE (ENGINE SIDE), REPLACEMENT, AIR BLEEDING OF FUEL SYSTEM (Page 7-16)

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COMMON RAIL

COMPONENT LOCATOR

EN01F02127060402005001



SHTS021270600108

1	Common rail	4	Injection pipe *
2	Common rail pressure sensor	5	Clip
3	Bracket		

*: Nonreusable part

Tightening torque — Unit: N·m {kgf·cm, lbf·ft}

A	28.5 {291, 21}	B	44 {449, 32}

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INSPECTION

EN01F02127060402005002

INSPECTING THE COMMON RAIL

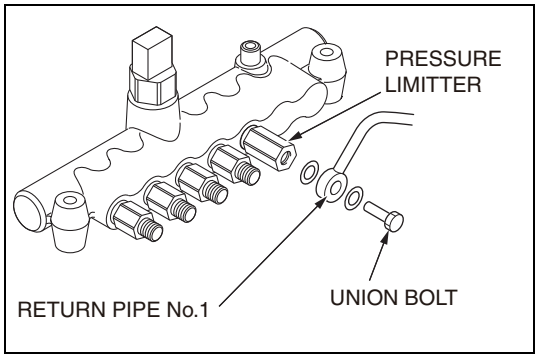
1. INSPECTING THE FLOW DAMPER

(1) Start the engine and change the engine revolution from idling to full throttle. Use HINO-DX to check the diagnosis code of the "flow damper operation."
(2) If the diagnosis code of the "flow damper operation" is detected, replace the relevant injector and inspect it again.
(3) If the same phenomenon occurs even after the injector is replaced, replace the flow damper with a common rail assembly.

2. INSPECTING THE PRESSURE LIMITER

(1) Unfasten the union bolt securing the pressure limiter.
(2) Stop the return pipe No.1 side with a blank cap to prevent the outflow of fuel.

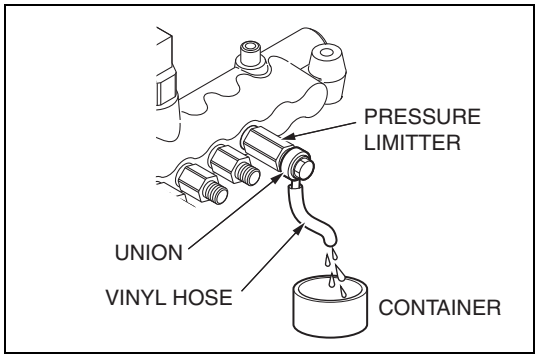
⚠ CAUTION
While working, be careful not to make dirt and water enter parts.



SHTS021270600109

(3) Attach the union to the pressure limiter, and connect a vinyl hose to the end of the union.
(4) Place the fuel reservoir under the free end of the vinyl hose.
(5) Start the engine. If the fuel continuously flows out, replace the pressure limiter with a common rail assembly.

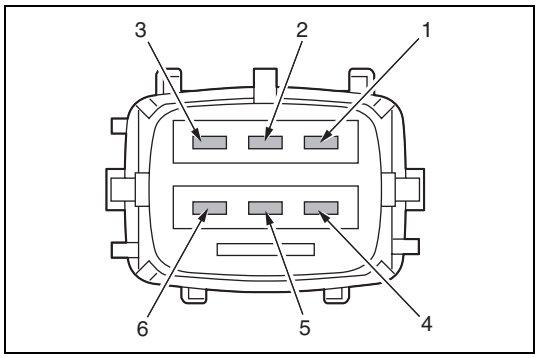
⚠ WARNING
When the pressure limiter is working, fuel flow out at a high temperature and pressure, serious injury like scalding could result from this hot fuel being blown under pressure.



SHTS021270600110

3. INSPECTING THE COMMON RAIL PRESSURE SENSOR

(1) Use the circuit tester, measure the resistance between the terminals. If the measured value is in excess of the standard value, replace the common rail assembly.



SHTS021270600111

Terminal to be measured	Standard value (kΩ) At 20°C {68°F} with the engine turned off
1↔2	1.05-3.55
5↔6	
2↔3	6.7-18.7
4↔5	

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REPLACEMENT

EN01F02127060402005003

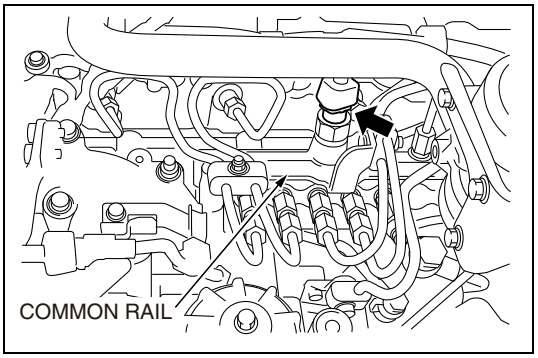
REMOVING THE COMMON RAIL

⚠ CAUTION

- **While working, be careful not to make dirt and water enter parts.**
- **Clean off surrounding area of the injectors and fuel line connectors.**

1. DISCONNECTING THE HARNESS

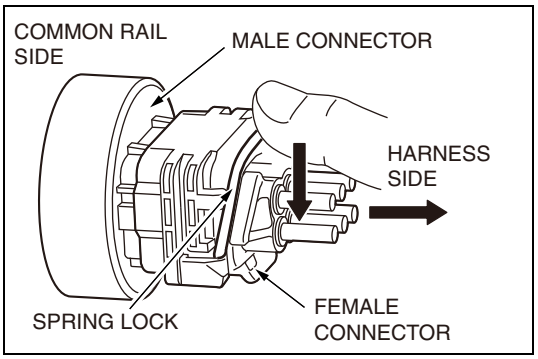
(1) Disconnect the connector connected to the common rail pressure sensor.



SHTS021270600112

⚠ CAUTION

Press the spring lock of the female connector, disengage the female connector from the male connector.



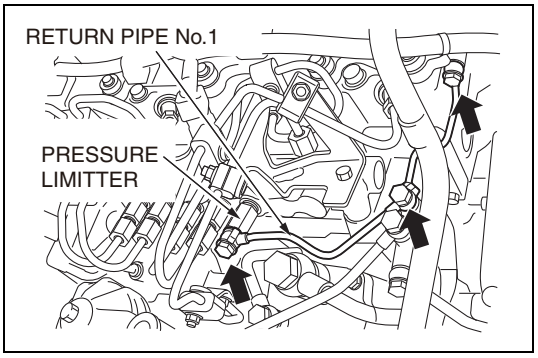
SHTS021270600113

2. DISCONNECTING THE FUEL PIPE

(1) Unfasten 3 union bolts to remove 3 gaskets. Then, disconnect return pipe No.1 from the pressure limiter and cylinder head.

NOTICE

Prepare a reservoir and a waste cloth because fuel spills when disconnecting the fuel pipe.



SHTS021270600114

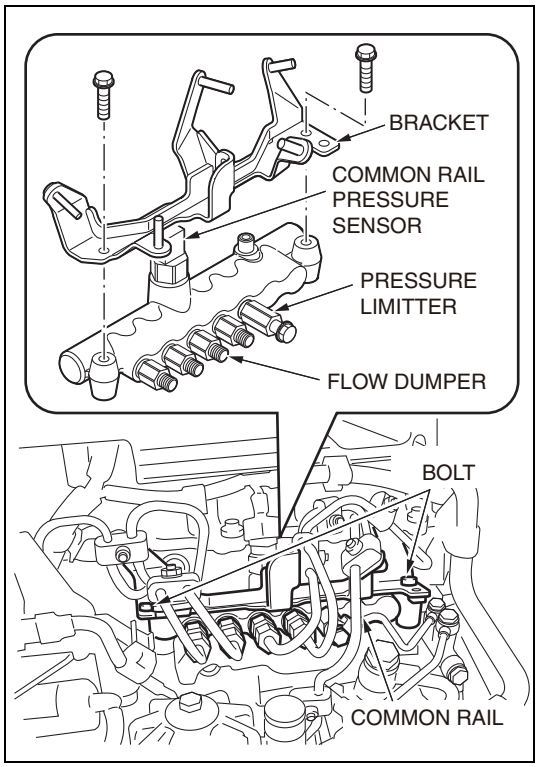
3. REMOVING THE INJECTION PIPE

Reference: FUEL SYSTEM (J05E), INJECTOR, REPLACEMENT, REMOVING THE INJECTOR (Page 7-37)

4. REMOVING THE PRESSURE FEED PIPE

Reference: FUEL SYSTEM (J05E), COMMON RAIL, REPLACEMENT, REMOVING THE COMMON RAIL (Page 7-48)

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SHTS021270600115

5. REMOVING THE COMMON RAIL

(1) Unfasten the bolts (2 pcs.) securing the common rail, and remove the common rail and the bracket from the intake manifold.

⚠ CAUTION

- **Protect with clean vinyl to avoid entry of dirt into the common rail.**
- **Remove dirt from around each part, and detach the common rail.**
- **Remove the common rail together with the flow damper, the common rail pressure sensor, and the pressure limiter.**

NOTICE

Prepare the reservoir and a waste cloth because fuel spills when removing the common rail.

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MOUNTING THE COMMON RAIL

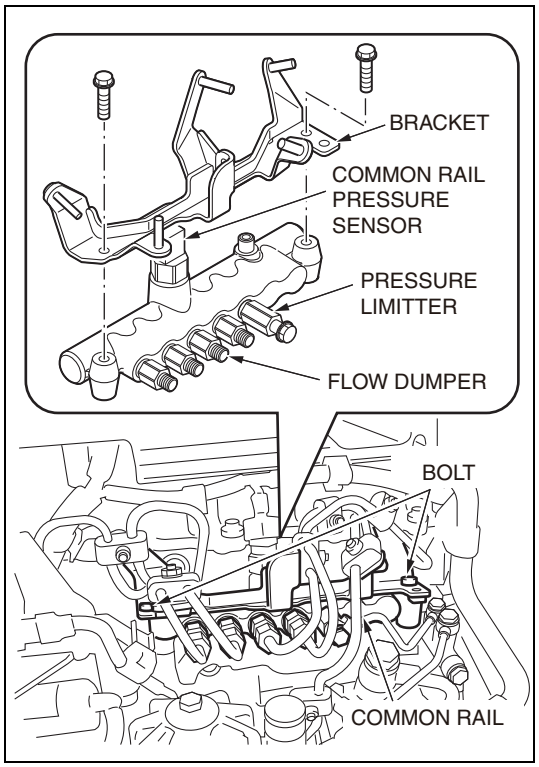
1. CAUTIONS

⚠ CAUTION

- **While working, be careful not to make dirt and water enter parts.**
- **Before mounting parts, make sure that there is no dirt on the connection between them.**
- **Air enters the fuel pipe in the process of mounting the pre-fuel filter case. After mounting is completed, thoroughly purge air from the fuel pipe.**

2. MOUNTING THE COMMON RAIL

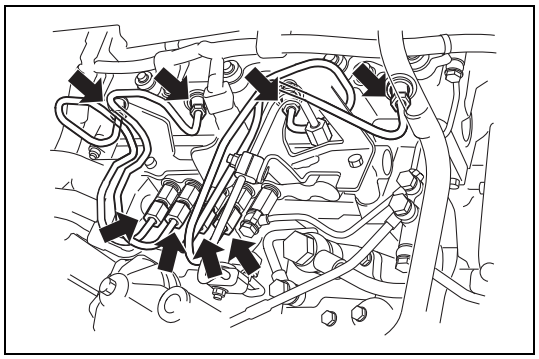
(1) Mount the common rail and bracket to the intake manifold with 2 bolts.
Tightening Torque:
28.5 N·m {291 kgf·cm, 21 lbf·ft}



SHTS021270600116

3. MOUNTING THE PRESSURE FEED PIPE
Reference: FUEL SYSTEM (J05E), COMMON RAIL, REPLACEMENT, MOUNTING THE COMMON RAIL (Page 7-50)

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SHTS021270600117

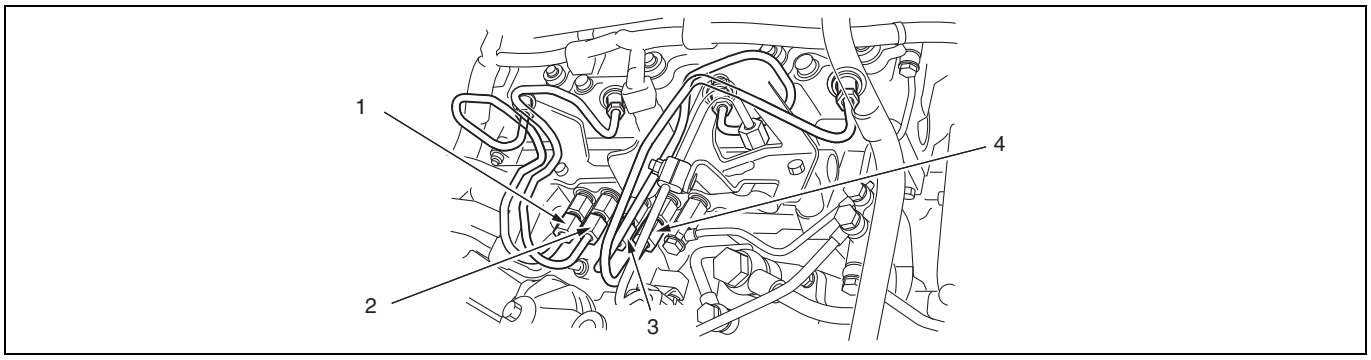
4. MOUNTING THE INJECTION PIPE

(1) Mount the new injection pipes (4 pcs.) on the injector and the common rail.
Tightening Torque:
44 N·m {449 kgf·cm, 32 lbf·ft}

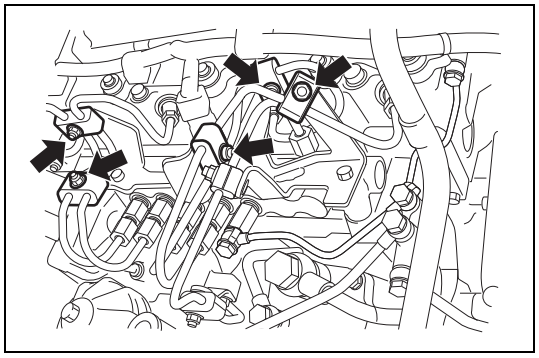
⚠ CAUTION

- **Do not fail to replace the injection pipes with new ones because they are subjected to high pressure and may cause fuel leakage.**
- **Fuel will leak out if the injection pipes are not properly connected. Follow the procedure.**
- **Fuel leakage will cause damage to the engine.**

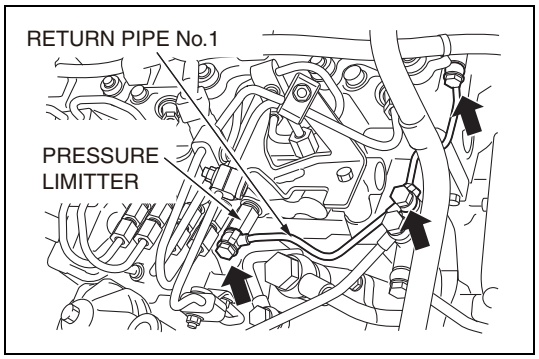
NOTICE
Mount the injection pipes so that the flare tightening nuts of the injection pipes will be arranged in the order of the numbers engraved on the nuts shown in the figure below.



SHTS021270600118


SHTS021270600119

(2) Mount the 5 clips with 5 nuts and fix the injection pipe.

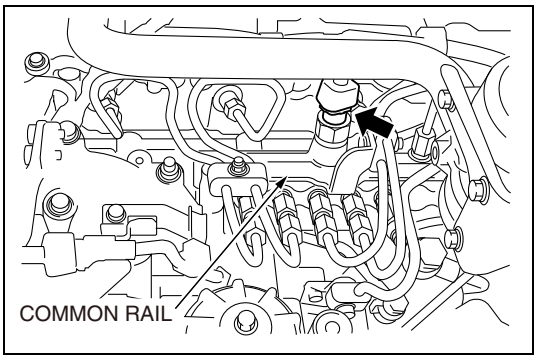


SHTS021270600120

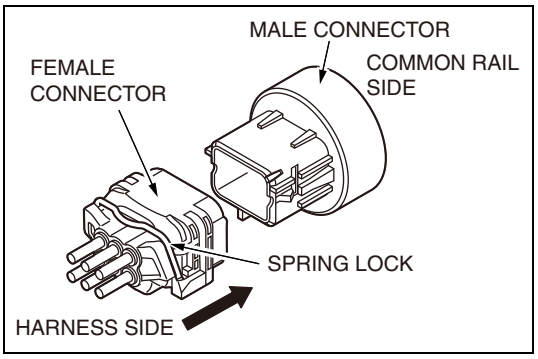
5. MOUNTING THE FUEL PIPE

(1) Mount the return pipe No.1 to the pressure limiter and cylinder head with 3 new gaskets and 3 union bolts.
Tightening Torque:
20 N·m {204 kgf·cm, 15 lbf·ft}
Pressure limiter side
20 N·m {204 kgf·cm, 15 lbf·ft}
Cluster connector side
13 N·m {133 kgf·cm, 10 lbf·ft}
Cylinder head side

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SHTS021270600121



SHTS021270600122

6. CONNECTING THE HARNESS

(1) Connect the connector to the common rail pressure sensor.

⚠ CAUTION

- **Engage the female connector with the male connector until the spring lock "clicks" and returns.**
- **Before connecting the connectors, make sure that the terminals are free of a spark mark.**

7. AIR BLEEDING OF FUEL SYSTEM

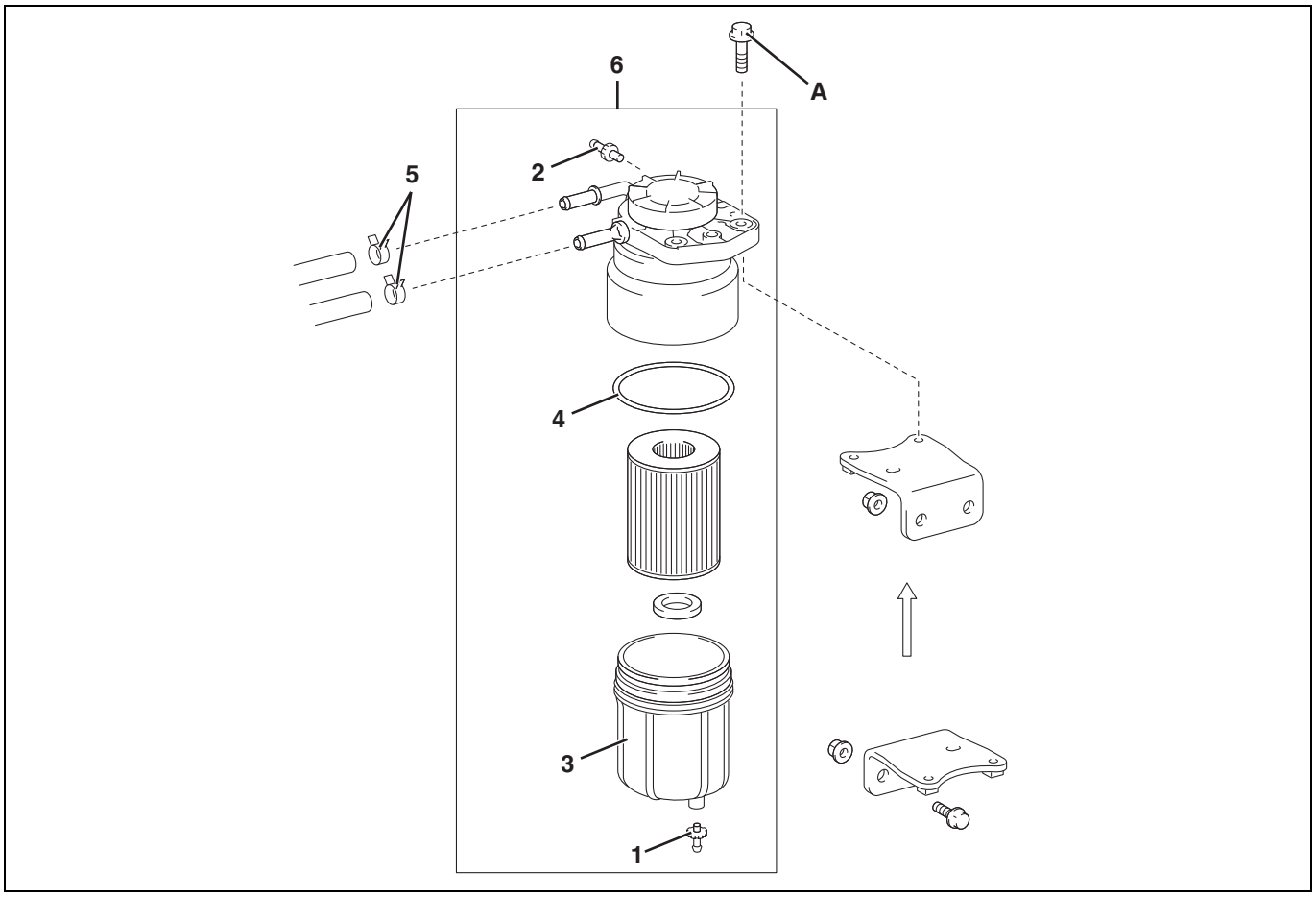
Reference: FUEL SYSTEM (J05E), FUEL FILTER AND CASE (ENGINE SIDE), REPLACEMENT, AIR BLEEDING OF FUEL SYSTEM (Page 7-16)

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FUEL FILTER AND CASE (VEHICLE SIDE)

COMPONENT LOCATOR

EN01F02127060402041001



SHTS021270600123

1	Drain plug	4	O-ring
2	Air bleeding plug	5	Clamp
3	Cover	6	Fuel filter

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	17.5 {178, 13}		

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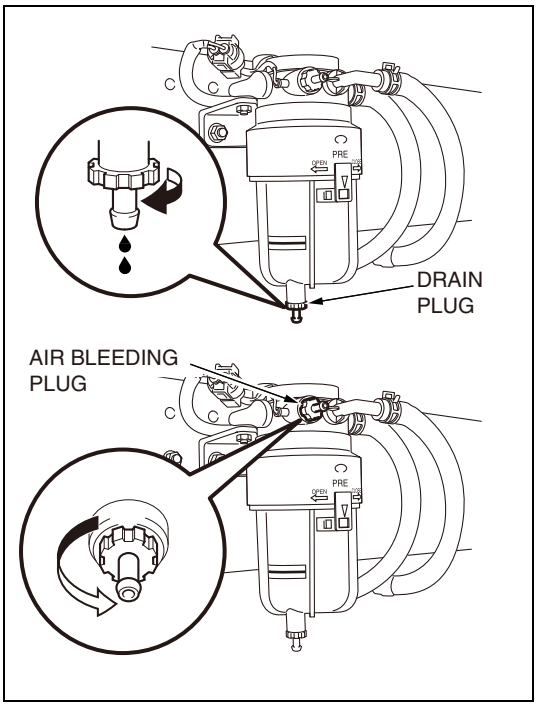
REPLACEMENT

EN01F02127060402041002

REPLACE THE ELEMENT

⚠ CAUTION

- **While working, be careful not to make dirt and water enter parts.**
- **Before mounting parts, make sure that there is no dirt on the connection between them.**
- **Air enters the fuel pipe in the process of mounting the pre-fuel filter case. After mounting is completed, thoroughly purge air from the fuel pipe.**
- **Use Hino's genuine fuel filter element.**



SHTS021270600124

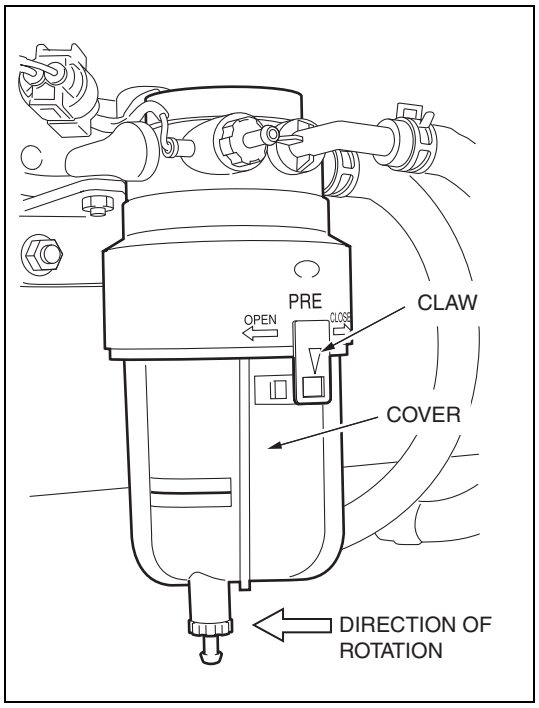
1. FUEL DISCHARGE

(1) Prepare reservoir under the drain plug to receive the drained fuel.
(2) Loosen the drain plug and then the air bleeding plug of the fuel filter, and drain the fuel from the drain plug. Check that the fuel is no longer drained from the drain plug and then tighten the drain plug.

⚠ CAUTION

- **Do not use a tool to tighten it.**
- **Drain the fuel in accordance with the regulation of disposal specified in each region.**
- **Make sure that the drain plug is free of damage or corrosion.**

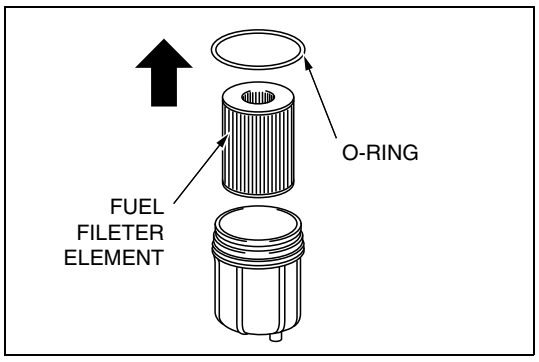
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SHTS021270600125

2. REMOVING THE ELEMENT

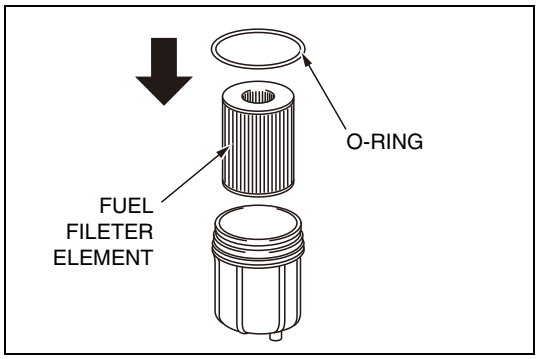
(1) Disengage the claw and loosen the fuel filter cover to remove it.



SHTS021270600126

(2) Remove the fuel filter element from the fuel filter cover.
(3) Remove the O-ring from the fuel filter cover.

⚠ CAUTION
Prepare a tray to catch the fuel remaining in the fuel filter cover.



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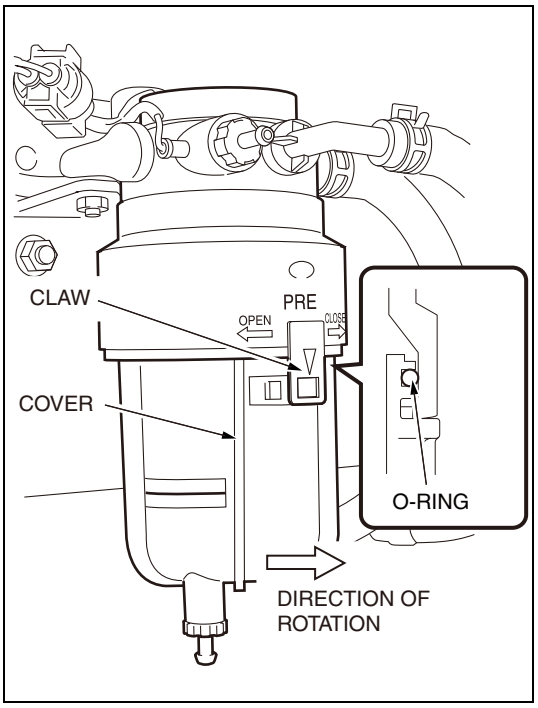
3. MOUNTING THE ELEMENT

(1) Clean the element setting faces inside the fuel filter cover and inside the fuel filter body.
(2) Replace the element with a new one and insert it into the fuel filter cover.
(3) Apply fuel to the new O-ring and mount it into the groove of the fuel filter cover.

⚠ CAUTION

- **Do not reuse the element.**
- **Replace the O-ring with a new one included in the element kit.**

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SHTS021270600128

(4) Tighten the fuel filter cover by hand until the claw is engaged as shown in the figure.

⚠ CAUTION

- **Be careful not to damage the O-ring by twisting it.**
- **Check that the O-ring is in correct contact with the sealing surface.**
- **Do not use a tool to tighten it.**

4. AIR BLEEDING OF FUEL SYSTEM
Reference: FUEL SYSTEM (J05E), FUEL FILTER AND CASE (ENGINE SIDE), REPLACEMENT, AIR BLEEDING OF FUEL SYSTEM (Page 7-16)

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REMOVING VEHICLE SIDE FUEL FILTER ASSEMBLY

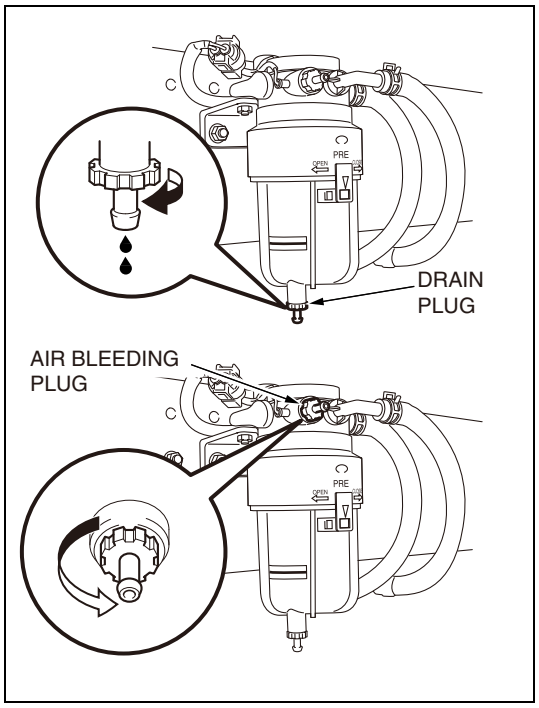
1. CAUTIONS

⚠ CAUTION

- **While working, be careful not to make dirt and water enter parts.**
- **Before mounting parts, make sure that there is no dirt on the connection between them.**
- **Air enters the fuel pipe in the process of mounting the pre-fuel filter case. After mounting is completed, thoroughly purge air from the fuel pipe.**

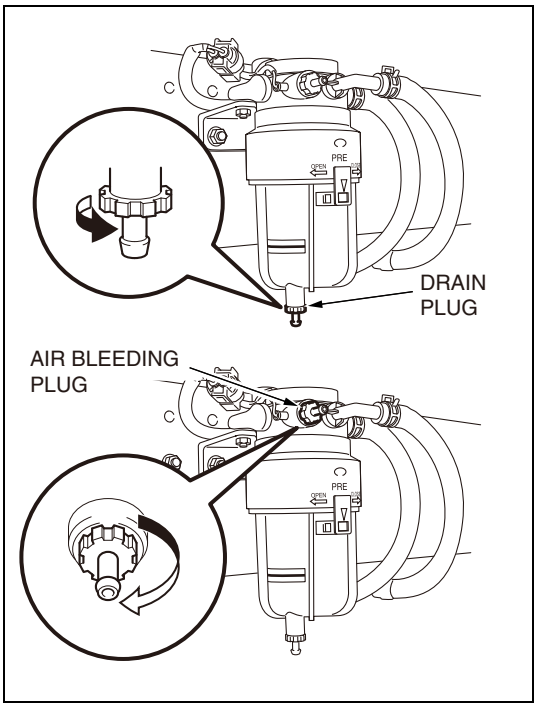
2. FUEL DISCHARGE

(1) Prepare reservoir under the drain plug to receive the drained fuel.
(2) Loosen the drain plug and then the air bleeding plug of the fuel filter, and drain the fuel from the drain plug.



SHTS021270600129

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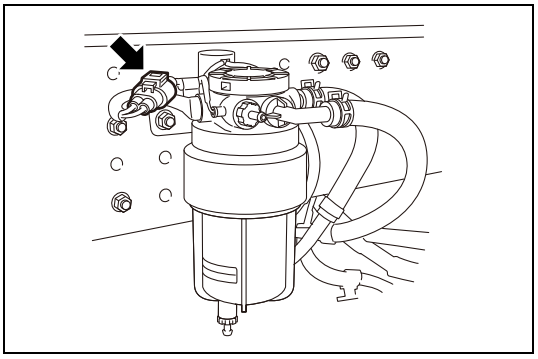


SHTS021270600130

(3) Check that the fuel is no longer drained from the drain plug and then tighten the drain plug and air bleeding plug.

⚠ CAUTION

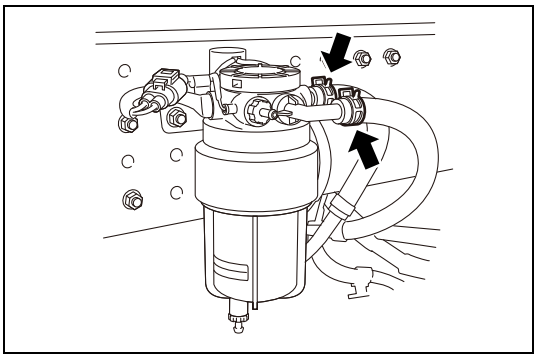
- **Do not use a tool to tighten it.**
- **Drain the fuel in accordance with the regulation of disposal specified in each region.**



SHTS021270600131

3. DISCONNECTING THE HARNESS

(1) Disconnect the connector connected to the fuel heater. (Vehicle with fuel heater)



SHTS021270600132

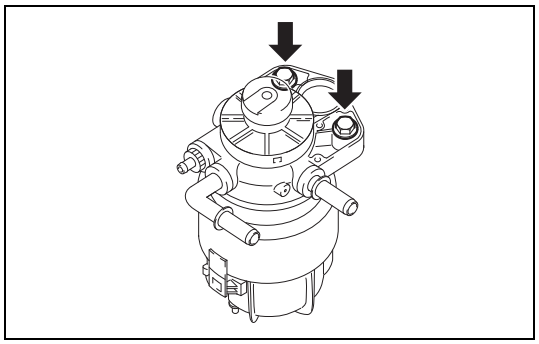
4. REMOVING THE FUEL HOSES

(1) Unfasten 2 clamps to disconnect 2 fuel hoses from the fuel filter body.

NOTICE

Prepare the reservoir and a waste cloth because fuel spills when disconnecting the fuel hoses.

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SHTS021270600133

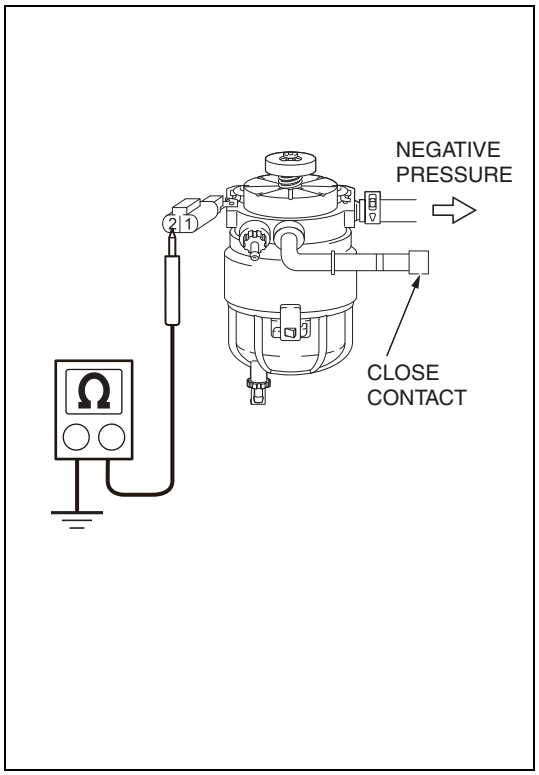
5. REMOVING FUEL FILTER ASSEMBLY

(1) Unfasten 2 bolts to remove the fuel filter assembly.

⚠ CAUTION

- **Be careful not to spill the fuel remaining in the fuel filter cover.**
- **Return the fuel remaining in the fuel filter cover into the fuel tank. If the element is installed without returning the remaining fuel into the fuel tank, unfiltered fuel may be sent to the supply pump.**

SINGLE UNIT INSPECTION



SHTS021270600134

1. INSPECTION OF FUEL HEATER (VEHICLE WITH FUEL HEATER)

(1) Seal the fuel IN side. Using a mityvac, apply a vacuum of 30.8-31.8 kPa {231-238 mmHg} to the fuel out side.

(2) Using the circuit tester, measure the resistance between the terminals.

Terminals to be inspected	Temperature	Standard value (Ω)
Terminal 2 - Body ground	20°C {68°F}	Approximately 4

⚠ CAUTION

Note that the value may vary according to the temperature or measurement method.

NOTICE

Measure the resistance with the fuel filter installed to the vehicle.

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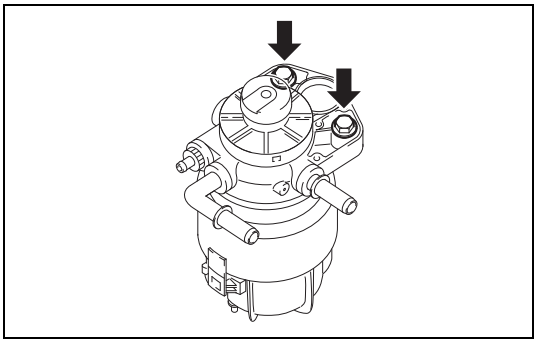
MOUNTING VEHICLE SIDE FUEL FILTER ASSEMBLY

1. CAUTIONS

⚠ CAUTION

- **While working, be careful not to make dirt and water enter parts.**
- **Before mounting parts, make sure that there is no dirt on the connection between them.**
- **Air enters the fuel pipe in the process of mounting the pre-fuel filter case. After mounting is completed, thoroughly purge air from the fuel pipe.**

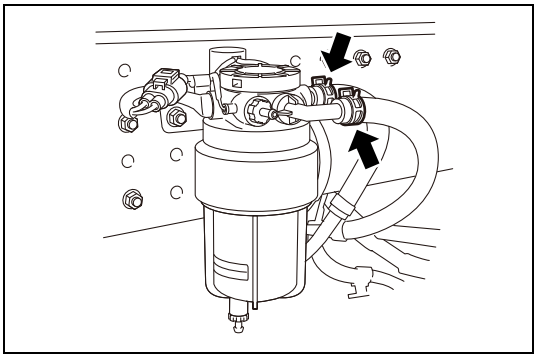
2. MOUNTING FUEL FILTER ASSEMBLY



SHTS021270600135

(1) Mount the fuel filter assembly with 2 bolts.
Tightening Torque:
17.5 N·m {178 kgf·cm, 13 lbf·ft}

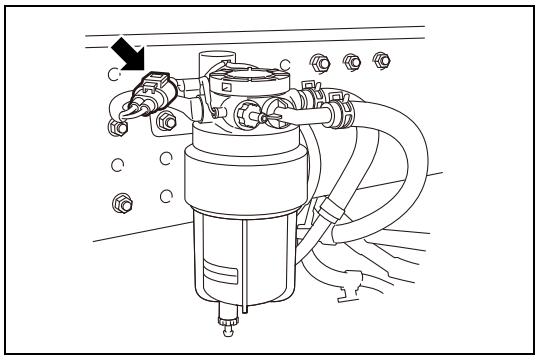
3. MOUNTING THE FUEL HOSE



SHTS021270600136

(1) Connect the 2 fuel hoses to the fuel filter body with 2 clamps.

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SHTS021270600137

4. CONNECTING THE HARNESS

(1) Connect the connector to the fuel heater. (Vehicle with fuel heater)

⚠ CAUTION

Before connecting the connectors, make sure that the terminals are free of a spark mark.

5. AIR BLEEDING OF FUEL SYSTEM

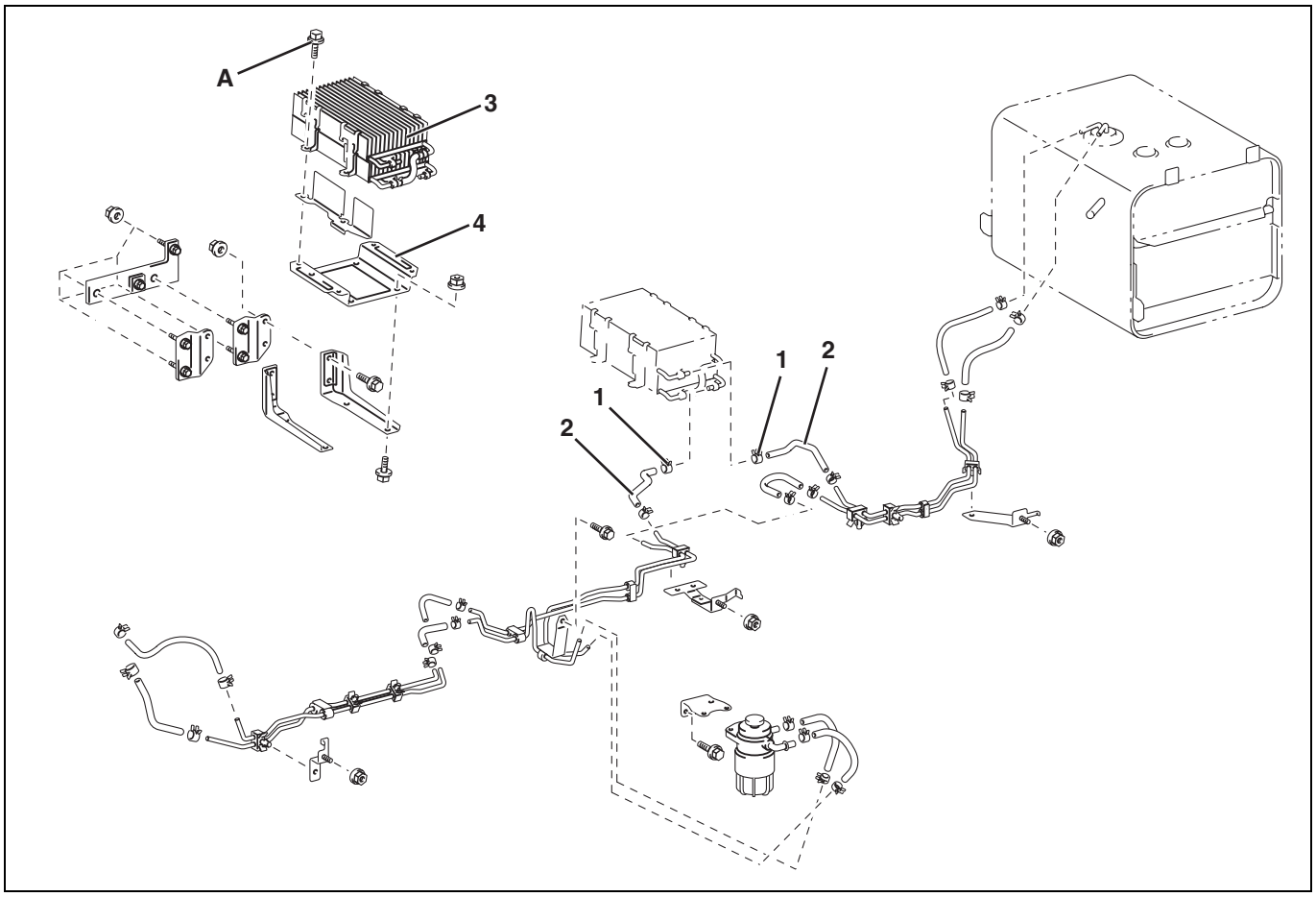
Reference: FUEL SYSTEM (J05E), FUEL FILTER AND CASE (ENGINE SIDE), REPLACEMENT, AIR BLEEDING OF FUEL SYSTEM (Page 7-16)

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FUEL COOLER

COMPONENT LOCATOR

EN01F02127060402027001



SHTS021270600138

1	Clamp	3	Fuel cooler
2	Fuel hose	4	Bracket

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	25{255, 18}		

https://truckmanualshub.com/

REPLACEMENT

EN01F02127060402027002

REMOVING FUEL COOLER

1. CAUTIONS

⚠ CAUTION

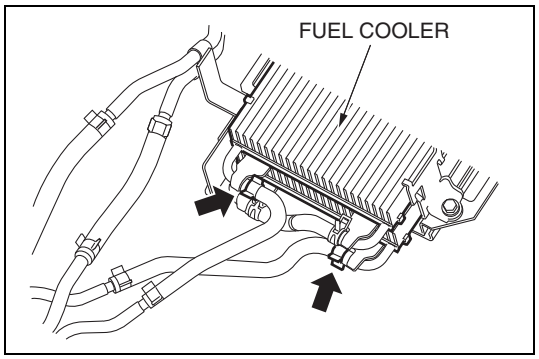
- **While working, be careful not to make dirt and water enter parts.**
- **Before mounting parts, make sure that there is no dirt on the connection between them.**
- **Air enters the fuel pipe in the process of mounting the pre-fuel filter case. After mounting is completed, thoroughly purge air from the fuel pipe.**

2. REMOVING THE FUEL HOSES

(1) Unfasten 2 clamps to disconnect 2 fuel hoses from the fuel cooler.

NOTICE

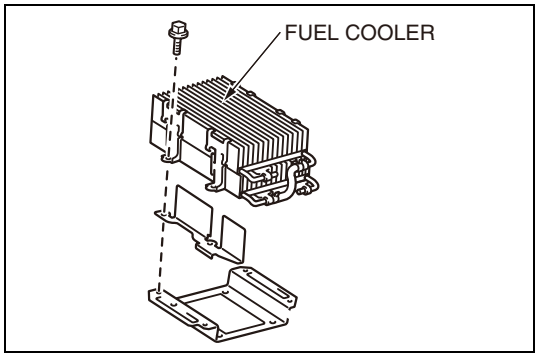
- **Prepare the reservoir and a waste cloth because fuel spills when disconnecting the fuel hoses.**
- **For easy disconnection, slightly twist the fuel hose when pulling it out.**



SHTS021270600139

3. REMOVING FUEL COOLER

(1) Unfasten 4 bolts to remove the fuel cooler from the bracket.



SHTS021270600140

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MOUNTING FUEL COOLER

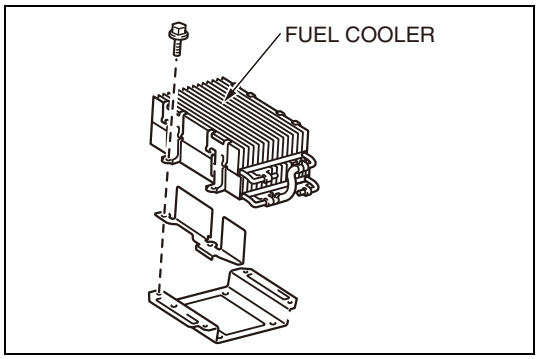
1. CAUTIONS

⚠ CAUTION

- **While working, be careful not to make dirt and water enter parts.**
- **Before mounting parts, make sure that there is no dirt on the connection between them.**
- **Air enters the fuel pipe in the process of mounting the pre-fuel filter case. After mounting is completed, thoroughly purge air from the fuel pipe.**

2. MOUNTING THE FUEL COOLER

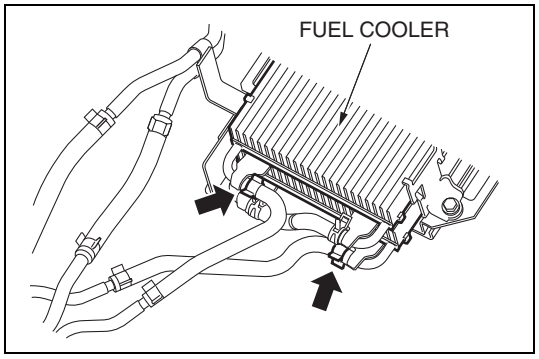
(1) Mount the fuel cooler to the bracket with 4 bolts.
Tightening Torque:
25 N·m {255 kgf·cm, 18 lbf·ft}



SHTS021270600141

3. CONNECTING THE FUEL HOSE

(1) Connect the 2 fuel hoses to the fuel cooler with 2 clamps.



SHTS021270600142

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EMISSION CONTROL (J05E)

8-001

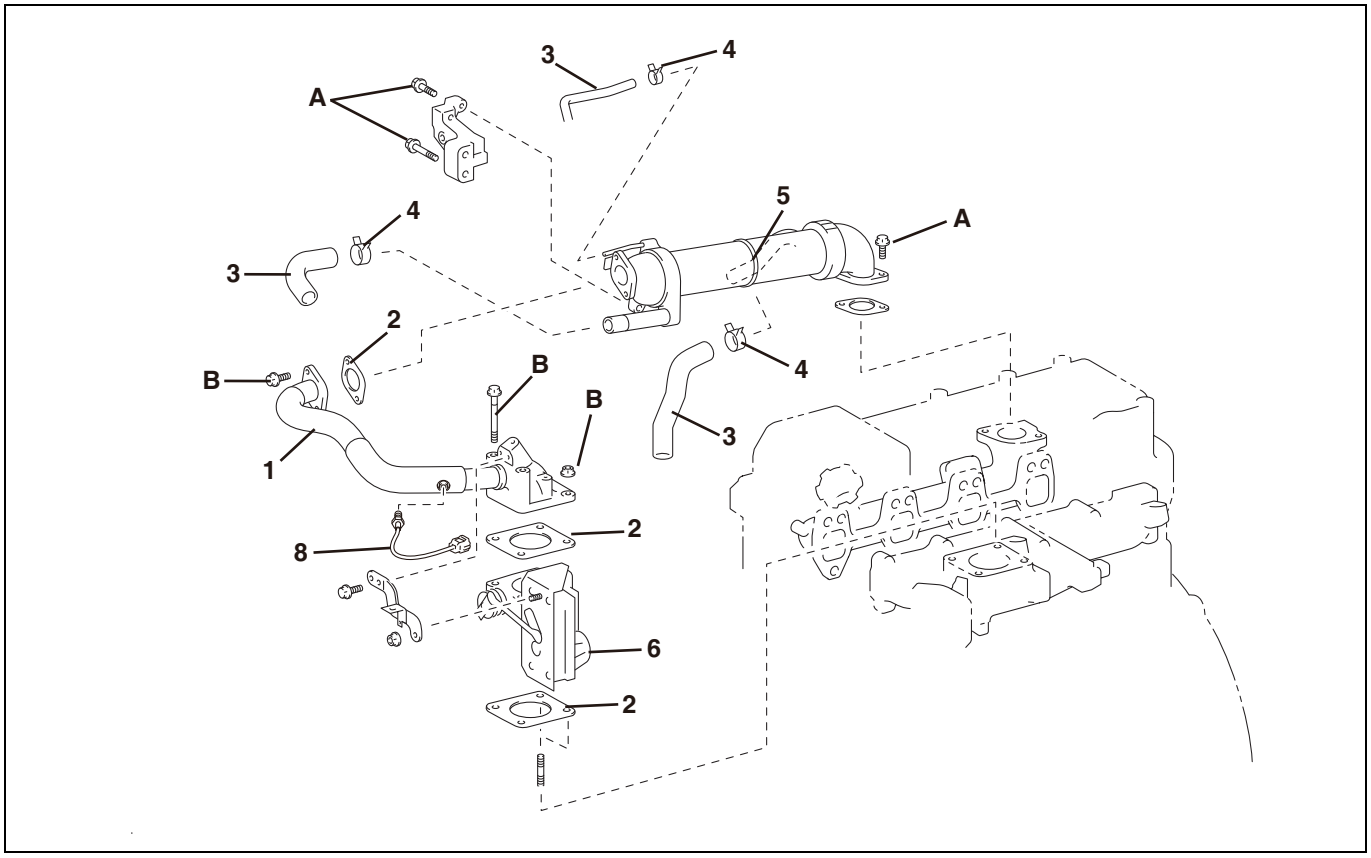
EGR VALVE & COOLER 8-2
COMPONENT LOCATOR 8-2
INSPECTION 8-3
REPLACEMENT 8-3
CLOSED VENTILATOR 8-10
COMPONENT LOCATOR 8-10
REPLACEMENT 8-12

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EGR VALVE & COOLER

COMPONENT LOCATOR

EN01F02114070402016001



SHTS021270700001

1	EGR pipe	5	EGR cooler
2	Gasket *	6	EGR valve
3	Coolant hose	7	Gasket *
4	Clamp		

*: Nonreusable part

Tightening torque — Unit: N·m {kgf·cm, lbf·ft}

A	68.5 {699, 51}	B	55 {561, 41}

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INSPECTION

EN01F02114070402016002

1. INSPECTION BEFORE SERVICING
Reference: INTAKE (J05E), AIR FLOW SENSOR, REPLACEMENT, REMOVING THE AIR FLOW SENSOR (Page 9-35)

(1) Using the HINO-DX for operation check of the EGR valve on board. (Refer to the HINO-DX user's manual.)

REPLACEMENT

EN01F02114070402016003

REMOVING THE EGR VALVE & COOLER

1. CAUTIONS

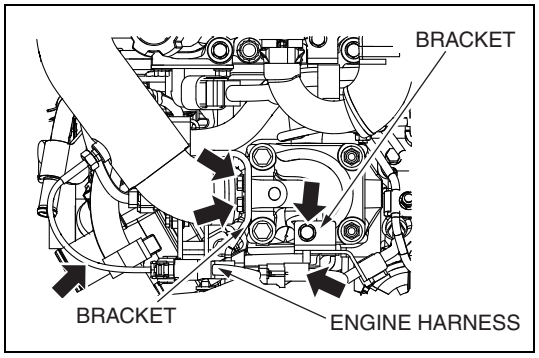
⚠ CAUTION
Perform replacement after cooling to prevent burns. (Turn the starter key to the "LOCK" position and leave it for more than 30 minutes to cool.)

2. DRAINING THE COOLANT
Reference: COOLING (J05E), RADIATOR, REPLACEMENT, REMOVING THE RADIATOR (Page 12-5)

3. REMOVING THE EGR PIPE

(1) Remove the engine harness from 2 brackets.

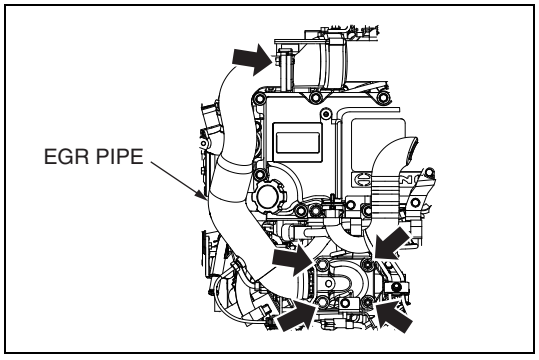
(2) Unfasten the 3 bolts and nut to remove 2 brackets from the EGR pipe.



SHTS021270700002

⚠ CAUTION
Do not touch the EGR pipe with bare hands while it is hot immediately after running.

(3) Unfasten the 4 bolts and 2 nuts to remove the EGR pipe and 2 gaskets.



SHTS021270700003

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4. DISCONNECTING THE COOLANT HOSE

(1) Unfasten the 3 clamps to disconnect 2 coolant hoses from the EGR cooler and coolant pipe.

(2) Unfasten the 2 clamps to disconnect the coolant hose from the EGR cooler and thermostat case.

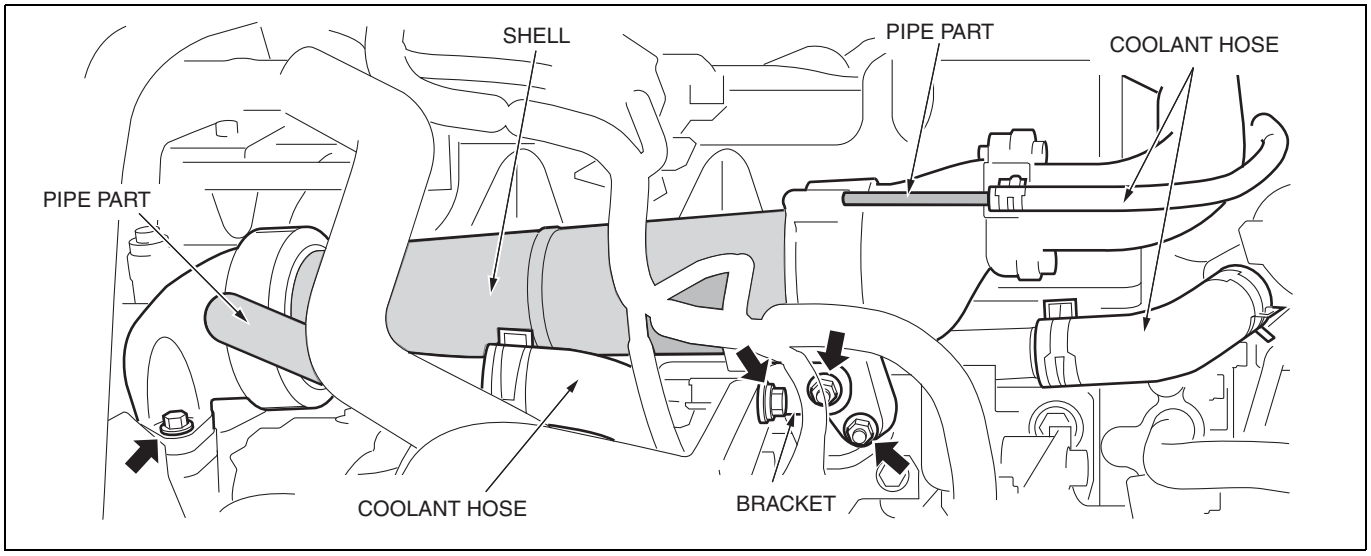
5. REMOVING THE EGR COOLER

(1) Unfasten the 2 bolts to remove the bracket from the EGR cooler.

(2) Unfasten the 3 bolts to remove the EGR cooler and gasket from the exhaust manifold.

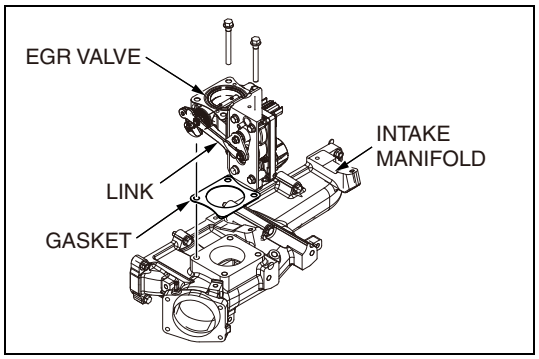
⚠ CAUTION

- **Do not hold the pipe and shell while working to avoid defects such as dent and water leakage.**
- **Do not touch the EGR cooler with bare hands while it is hot immediately after running.**



SHTS021270700004

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SHTS021270700005

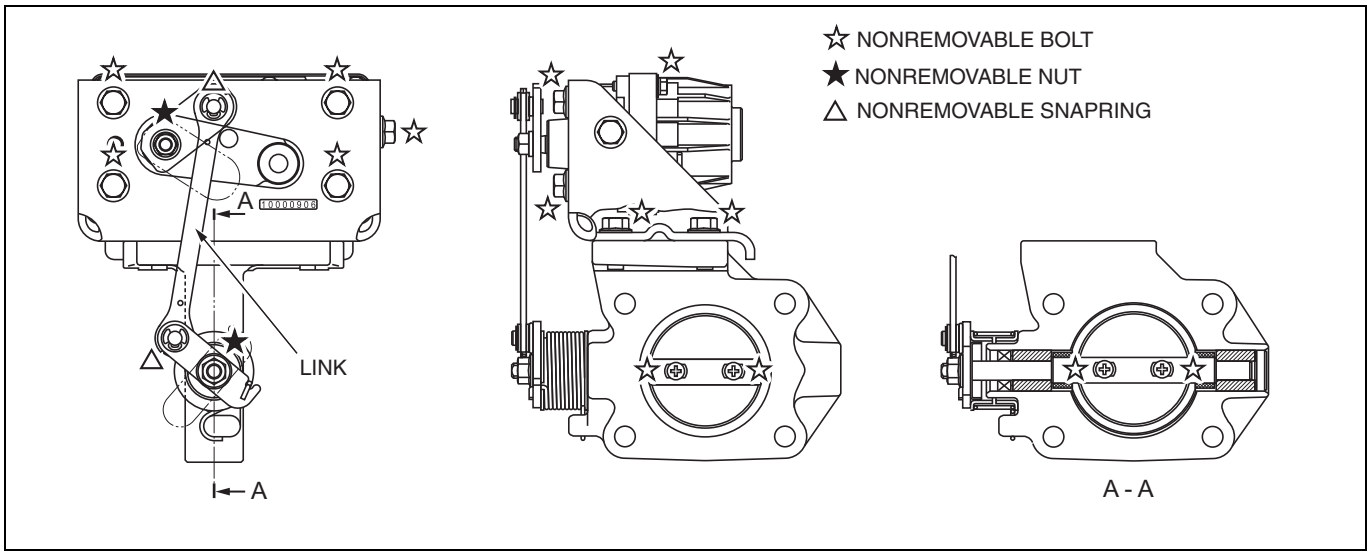
6. REMOVING THE EGR VALVE

(1) Disconnect the connector from the EGR valve.

(2) Remove the EGR valve and gasket from the intake manifold.

⚠ CAUTION

- **Do not step on the EGR valve during engine service work.**
- **Do not remove or loosen the bolts, nuts, and snap rings that are components of the EGR valve.**
  If any of these components is removed or loosened, the EGR valve will deteriorate in performance.
  If the bolts, nuts, and snap rings are removed and the EGR valve is disassembled, do not reassemble the EGR valve. Replace it with a new one.
- **Do not hold the link when replacing the EGR valve assembly. If the link is held, it may bend and cause a malfunction.**



SHTS021270700006

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INSPECTING THE COMPONENTS

1. INSPECTING THE EGR COOLER

(1) Visually inspect the EGR cooler for cracks and clogging. If there is something wrong with the EGR cooler, replace it.

CLEANING THE EGR COOLER

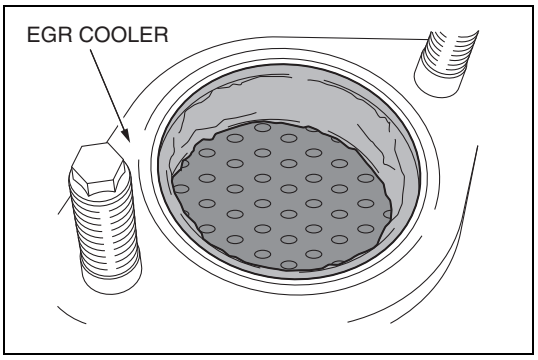
1. CAUTIONS

⚠ CAUTION

- **This agent is alkali. Wear protective equipment (glasses, rubber gloves, and protective garment) to prevent it from contacting eyes, skin, and cloth.**
- **If it contact the skin, wash it off with running water immediately. If it should get into eyes, rinse thoroughly with running water and consult a physician.**
- **Make sure to check the "Material Safety Data Sheet" of Parker Corporation in the MSDS (Material Safety Data Sheet) before use.**

2. JUDGMENT OF CLEANING

(1) If the EGR valve is found stuck, check soot accumulation in the EGR cooler. If it is 2 mm {0.079 in.} or more, clean the EGR cooler.



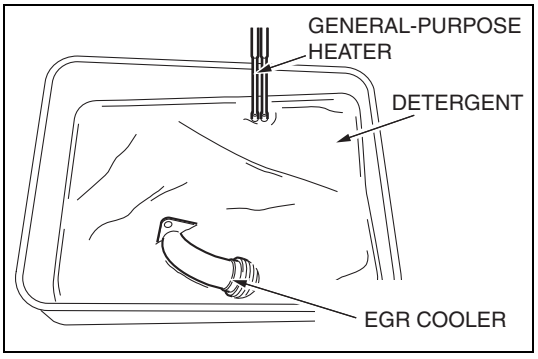
SHTS021270700007

⚠ CAUTION

Remove the coolant hose in advance to avoid possible damage due to immersion in the detergent.

3. CLEANING THE EGR COOLER

(1) Prepare the reservoir (metallic) that is deep enough to immerse the EGR cooler. Put detergent (PK-5300YP) into the reservoir and warm it to 50-60°C {122-140°F} with a general-purpose heater. Immerse the EGR cooler for about 1 hour.

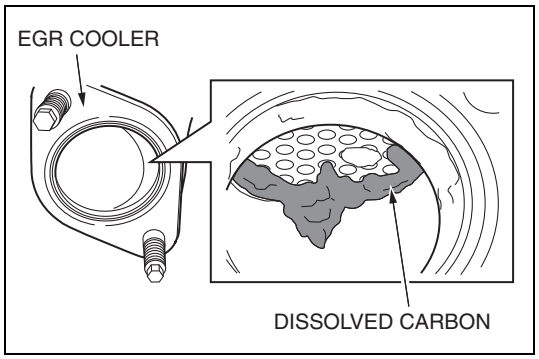


SHTS021270700008

⚠ CAUTION

- **Immerse the whole EGR cooler into the detergent so that no air remains in the cooler.**
- **As a guide, replace the detergent after cleaning 5 EGR coolers or about 3 weeks.**

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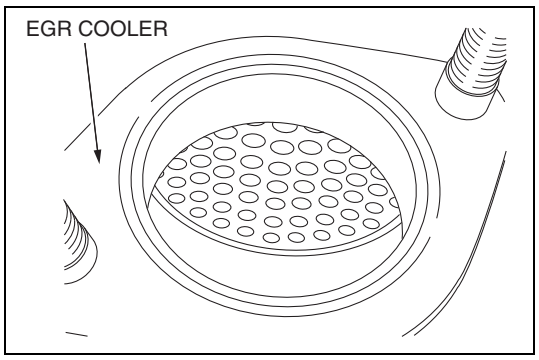
SHTS021270700009

4. RINSING AFTER CLEANING THE EGR COOLER

(1) After immersing for about 1 hour, pour new detergent (PK-5300YP) into the EGR cooler. Cover both ends with packing tape, shake it about 10 times, and then let the inside detergent out. (Repeat this 2-3 times.)

NOTICE

Dissolved carbon inside the EGR cooler flows out. If carbon stain cannot be removed easily, use a nylon brush.



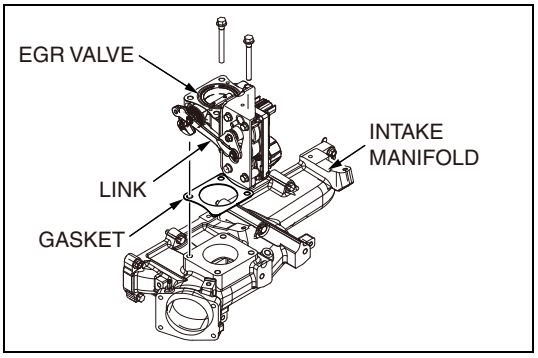
SHTS021270700010

5. DRYING THE EGR COOLER

(1) After all carbon stains are removed by rinsing, blow off water inside the EGR cooler with an air blower. Dry it for about 10 minutes. Shake the body 2-3 times to check if no carbon lump comes out, and reuse it.

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MOUNTING THE EGR VALVE & COOLER



SHTS021270700011

1. MOUNTING THE EGR VALVE

(1) Replace with a new gasket and temporarily attach the EGR valve to the intake manifold.

(2) Connect the EGR valve to the connector.

2. MOUNTING THE EGR COOLER

(1) Replace with a new gasket and mount the EGR cooler to the exhaust manifold with 3 bolts.
Tightening Torque:
68.5 N·m {699 kgf·cm, 51 lbf·ft}

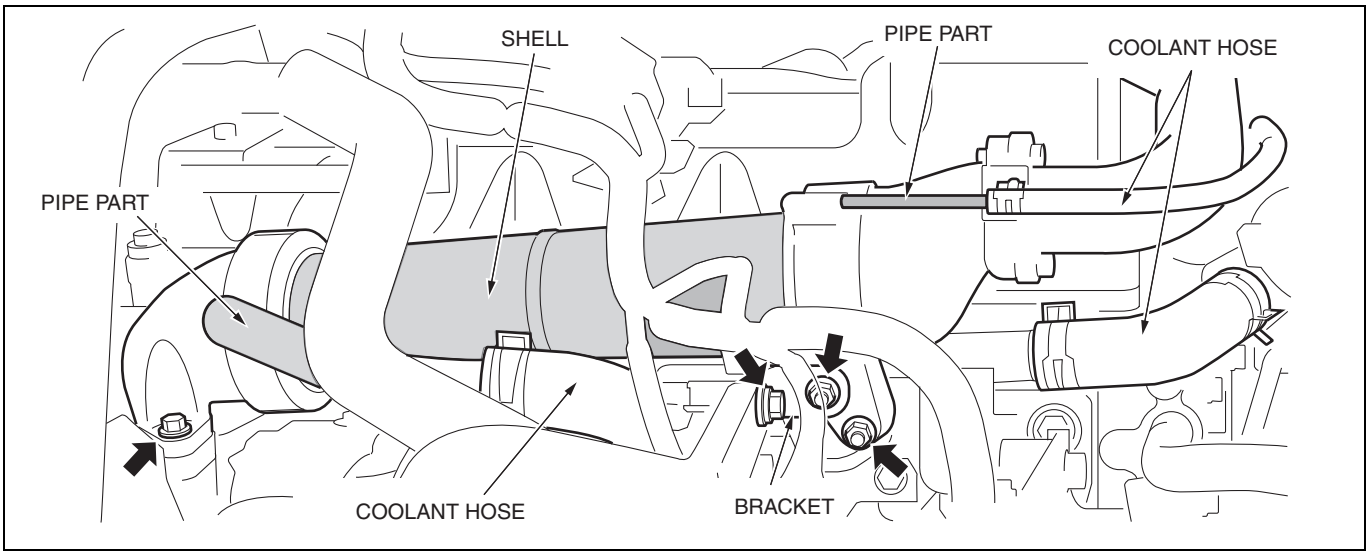
⚠ CAUTION
Do not hold the pipe and shell while working to avoid defects such as dent and water leakage.

(2) Mount the bracket to the EGR cooler with 2 bolts.
Tightening Torque:
28.5 N·m {291 kgf·cm, 21 lbf·ft}

3. CONNECTING THE COOLANT HOSE

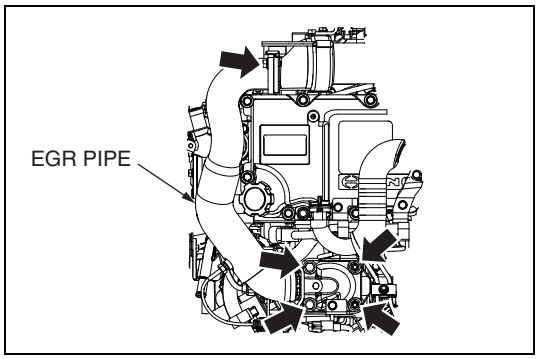
(1) Connect the coolant hose to the EGR cooler and thermostat case with 2 clamps.

(2) Connect the coolant hose to the EGR cooler and coolant pipe with 3 clamps.



SHTS021270700012

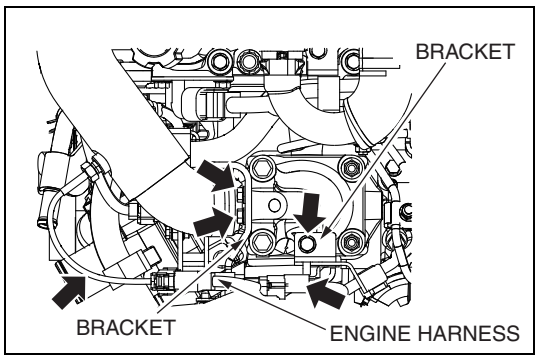
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SHTS021270700013

4. MOUNTING THE EGR PIPE

(1) Replace with a new gasket and mount the EGR pipe with 4 bolts and 2 nuts.
Tightening Torque:
55 N·m {561 kgf·cm, 41 lbf·ft}



SHTS021270700014

(2) Mount the 2 brackets to the EGR pipe with 3 bolts and a nut.
Tightening Torque:
28.5 N·m {291 kgf·cm, 21 lbf·ft}

(3) Mount the engine harness to 2 brackets.

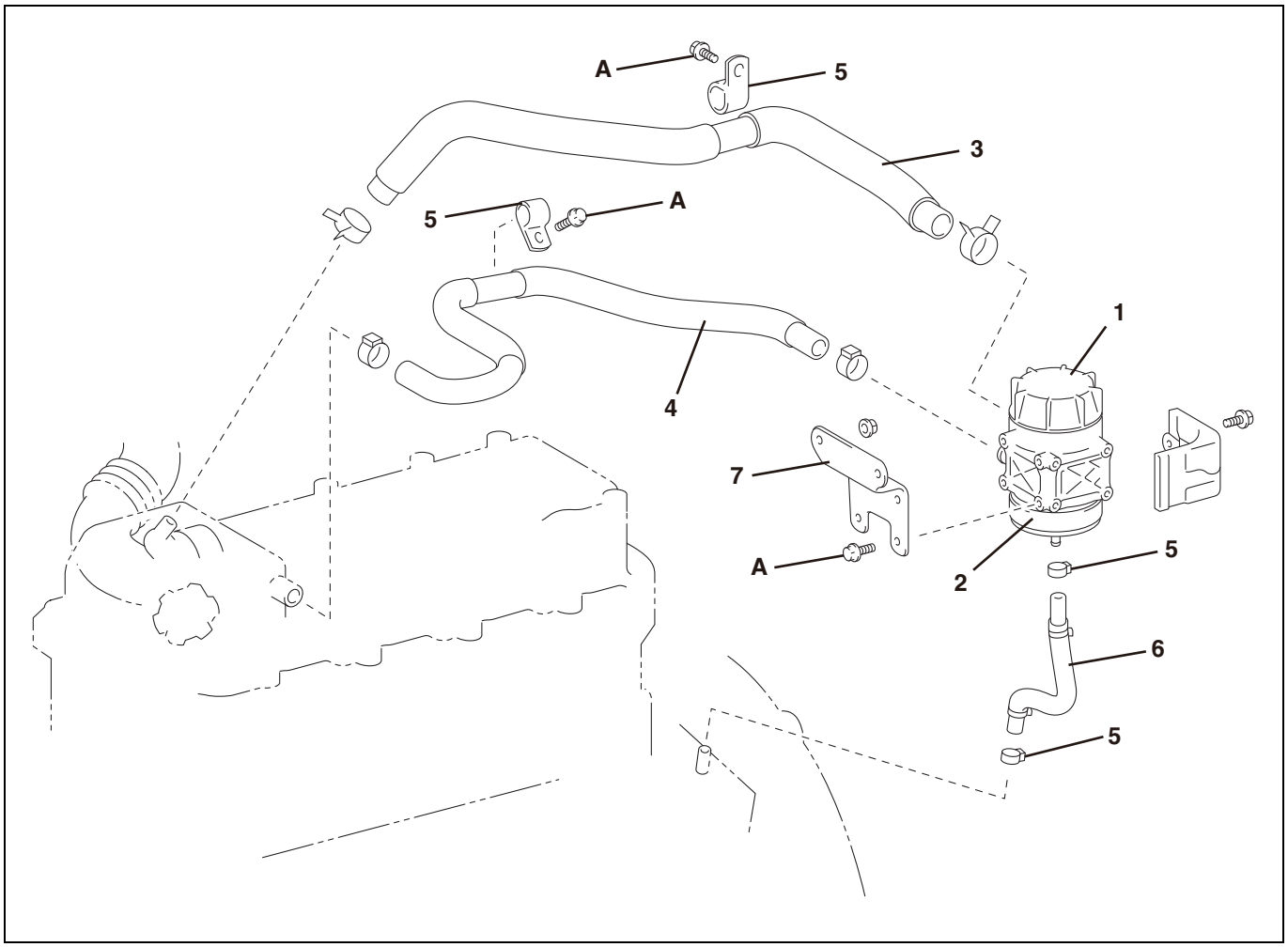
5. ADDING THE COOLANT
Reference: COOLING (J05E), RADIATOR, REPLACEMENT, MOUNTING THE RADIATOR (Page 12-9)

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CLOSED VENTILATOR

COMPONENT LOCATOR

EN01F02114070402011001



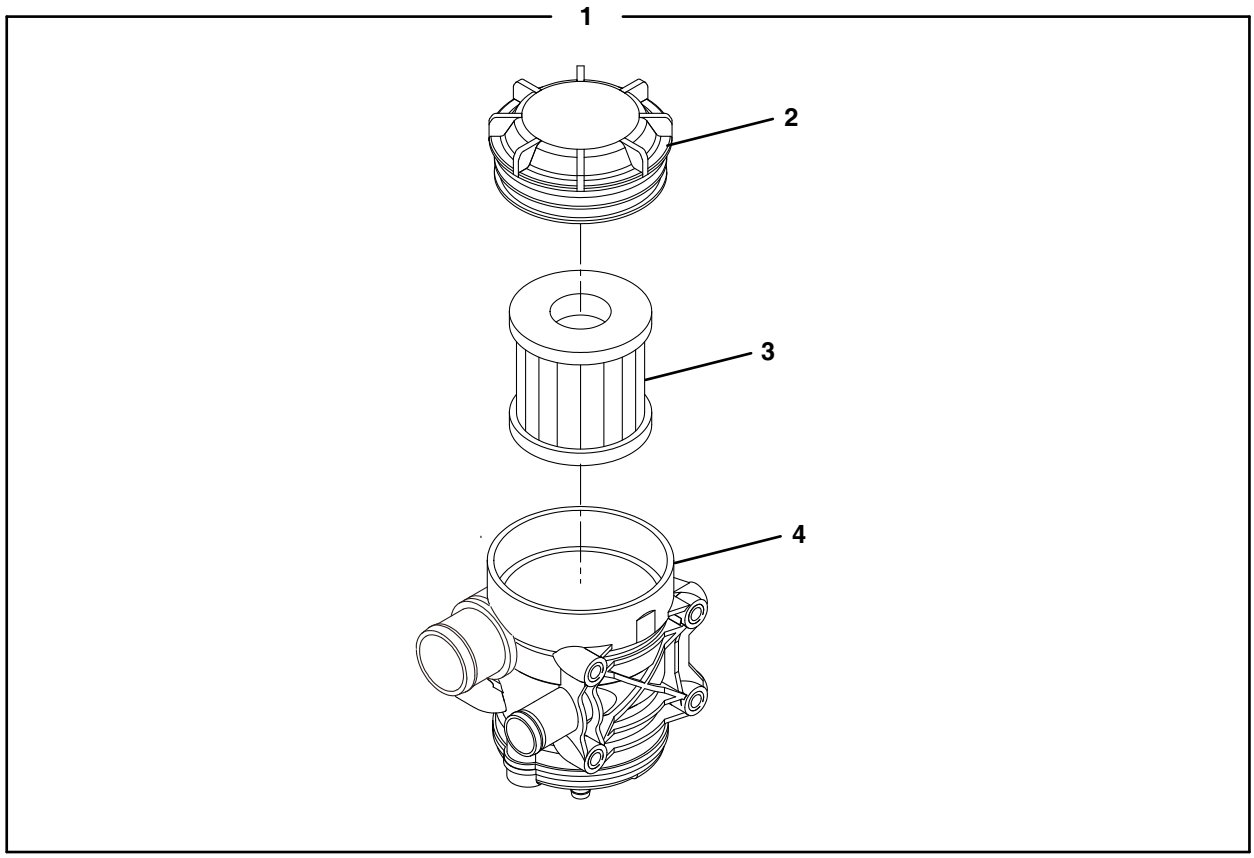
SHTS021270700015

1	Cap	5	Clamp
2	Closed ventilator	6	Oil pipe
3	Ventilator hose A	7	Bracket
4	Ventilator hose B		

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	31 {316, 23}	

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SHTS021270700016

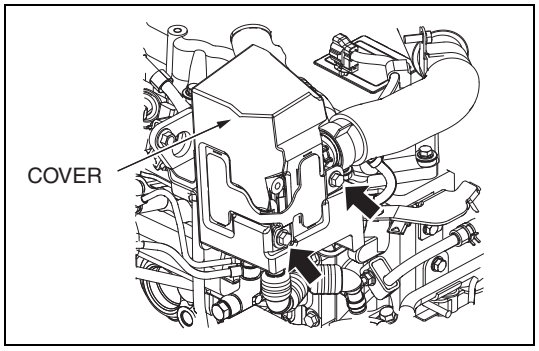
1	Closed ventilator	3	Element
2	Cap	4	Body

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REPLACEMENT

EN01F02114070402011002

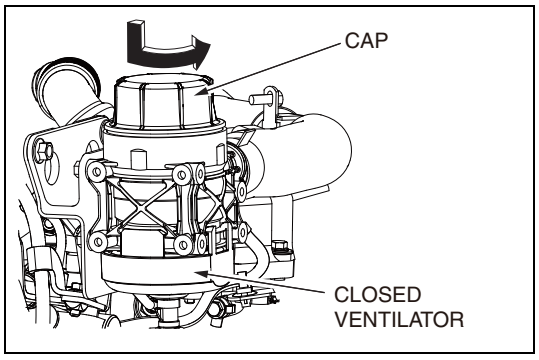
REPLACE THE ELEMENT



SHTS021270700017

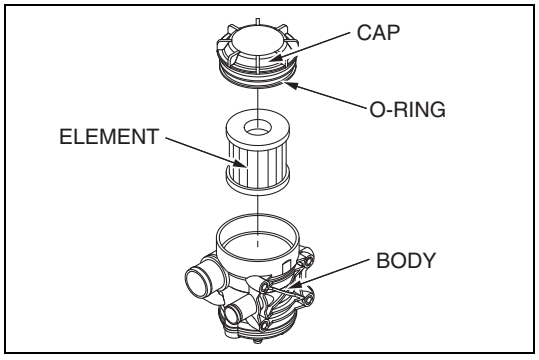
1. REMOVING THE ELEMENT

(1) Remove the 2 bolts and remove the closed ventilator cover.



SHTS021270700018

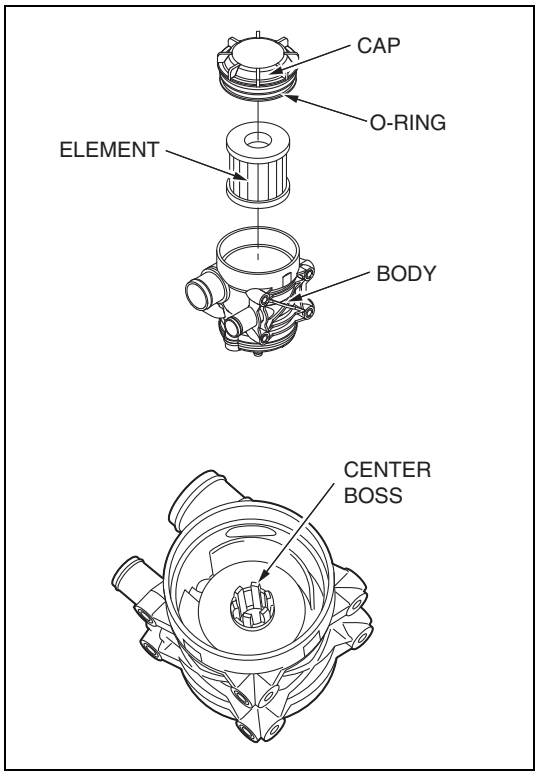
(2) Remove the cap while pressing and turning it counterclockwise.



SHTS021270700019

(3) Remove the element from the body.
(4) Remove the O-ring from the cap.

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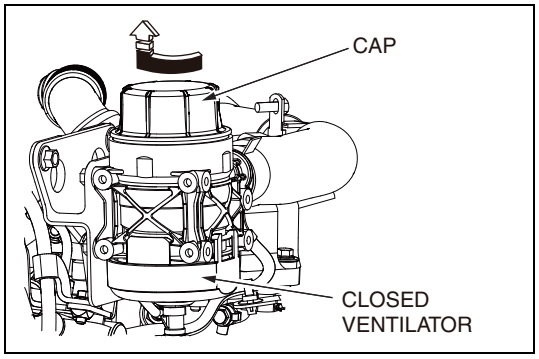


SHTS021270700020

2. MOUNTING THE ELEMENT

(1) Replace with a new O-ring and apply engine oil. Mount it to the cap.

(2) Replace with a new element and mount it by aligning with the body center boss.



SHTS021270700021

(3) Mount the cap by turning clockwise until it lifts up.

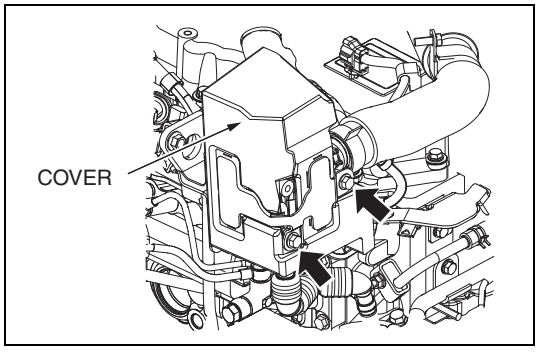
⚠ CAUTION

- **Do not tighten the cap excessively.**
- **The O-ring is nonreusable.**
- **Remove the dirt or foreign matter on the O-ring mounting surface.**

NOTICE

It is recommended that the element of the closed ventilator be replaced once after replacing the oil filter twice.

Reference: LUBRICATION (J05E), OIL FILTER, REPLACEMENT, REMOVING THE OIL FILTER (Page 13-4)



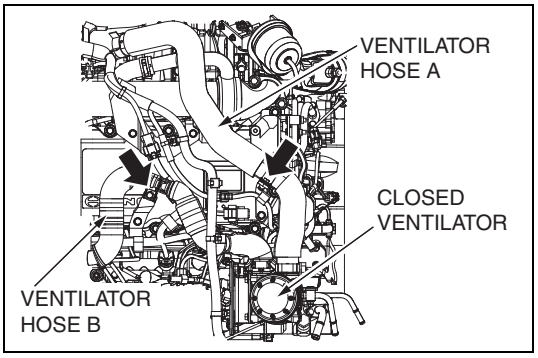
SHTS021270700022

(4) Mount the closed ventilator cover from the 2 bolts.

Tightening Torque:
31 N·m {316 kgf·cm, 23 lbf·ft}

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REMOVING THE CLOSED VENTILATOR

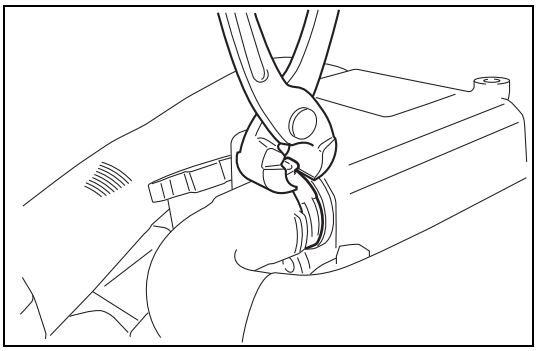


SHTS021270700023

1. REMOVING THE HOSE

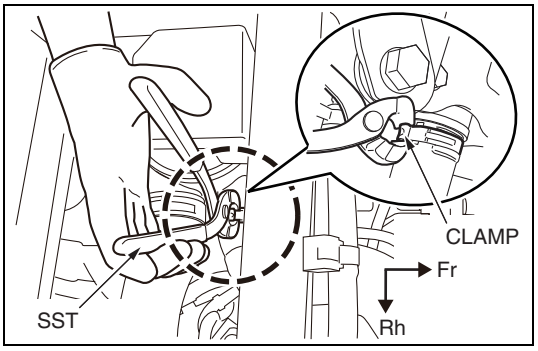
(1) Unfasten the 2 clamps and bolt to disconnect the ventilator hose A from the closed ventilator and intake hose.

(2) Unfasten the 2 clamps and bolt to disconnect the ventilator hose B from the closed ventilator and cylinder head.


SHTS021270700024

(3) Using the SST, remove the clamp on the engine side break.
SST: S0920-E0010
Vent pipe tool

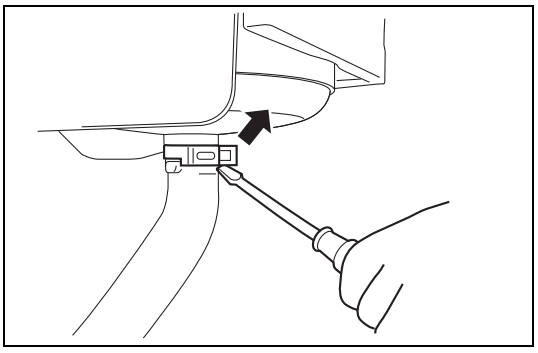
HINT
For non-reusable clamp, the clamp break when you remove them.



SHTS021270700025

(4) Using the SST, remove the clamp on the vehicle side break.
SST: S0920-E0010
Vent pipe tool

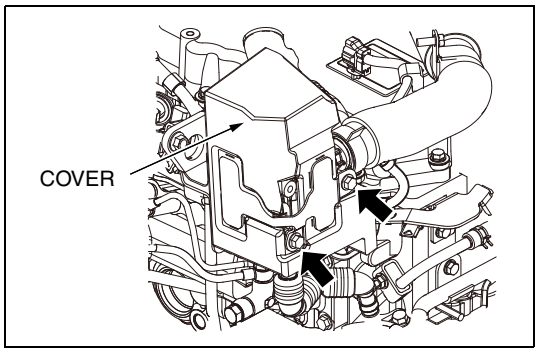
HINT
For non-reusable clamp, the clamp break when you remove them.


SHTS021270700026

(5) Using the flat-blade screwdriver, etc., break out of the clamp closed ventilator under body.

HINT
For non-reusable clamp, the clamp break when you remove them.

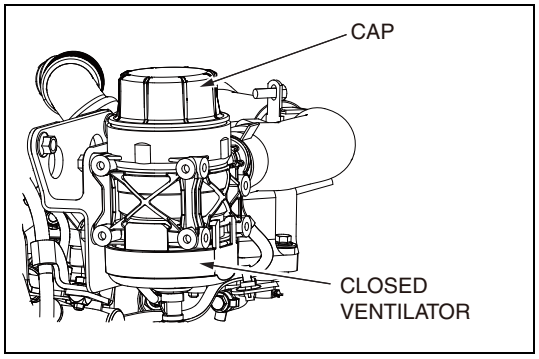
https://truckmanualshub.com/



SHTS021270700027

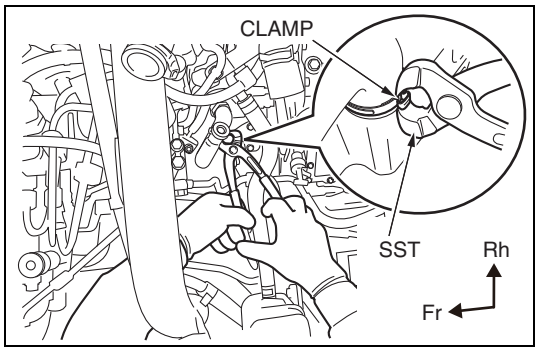
2. REMOVING THE CLOSED VENTILATOR

(1) Remove the 2 bolts and remove the closed ventilator cover.



SHTS021270700028

(2) Unfasten the 4 bolts to remove the closed ventilator from the bracket.



SHTS021270700029

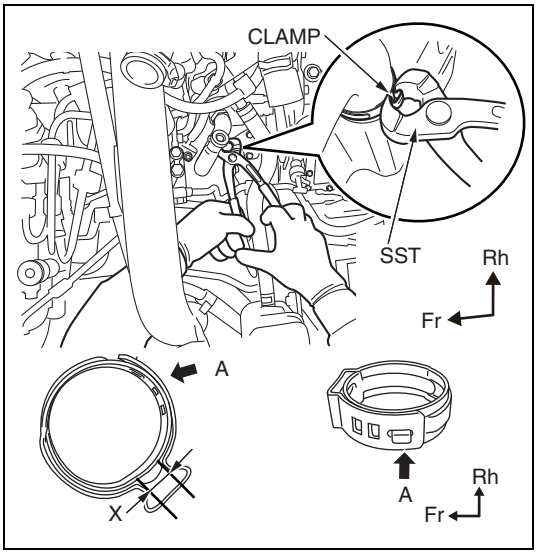
(3) Using the SST, remove the clamp on the flywheel housing side break.
SST: S0920-E0010
Vent pipe tool

NOTICE

Prepare the reservoir and clean clothes to collect dripping engine oil when disconnecting the oil hose.

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MOUNTING THE CLOSED VENTILATOR



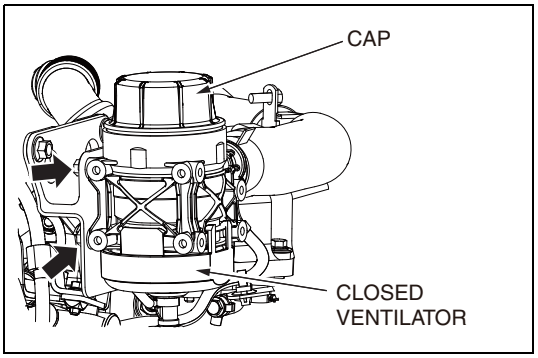
SHTS021270700030

1. MOUNTING THE CLOSED VENTILATOR

(1) Hose attached to the flywheel housing, attach the clamp is crimped using a SST.
Standard value: (X) 6 mm {0.236 in.} or less
SST: S0920-E0010
Vemt pipe tool

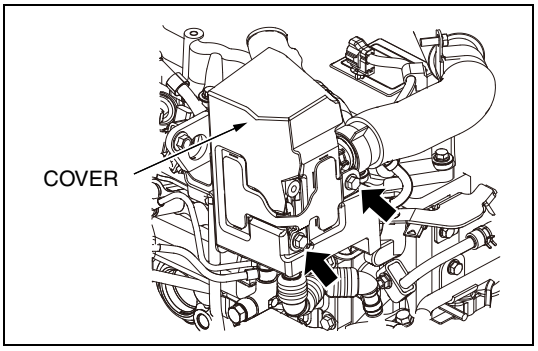
NOTICE

- **Installed so that the clamp claw in the direction of A.**
- **Install the new clamp.**



SHTS021270700031

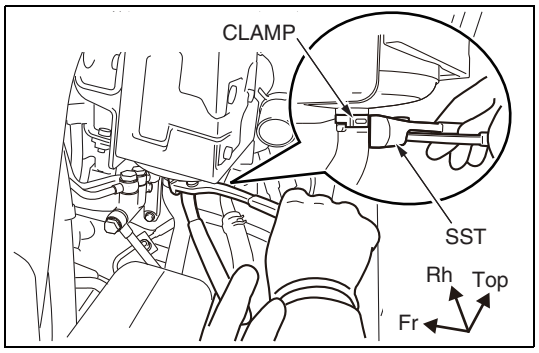
(2) Mount the closed ventilator to the bracket with the 4 bolts.
Tightening Torque:
31 N·m {316 kgf·cm, 23 lbf·ft}



SHTS021270700032

(3) Mount the closed ventilator cover from the 2 bolts.
Tightening Torque:
31 N·m {316 kgf·cm, 23 lbf·ft}

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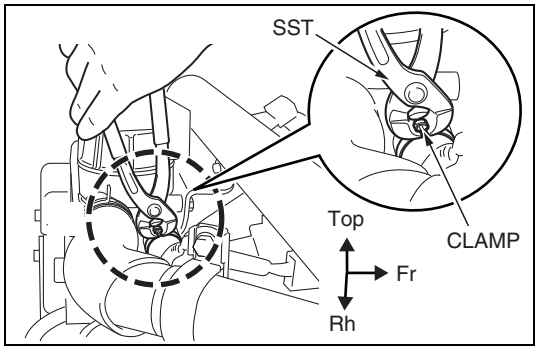
SHTS021270700033

(4) Connect the oil hose to the closed ventilator and flywheel housing with 2 clamps.

NOTICE

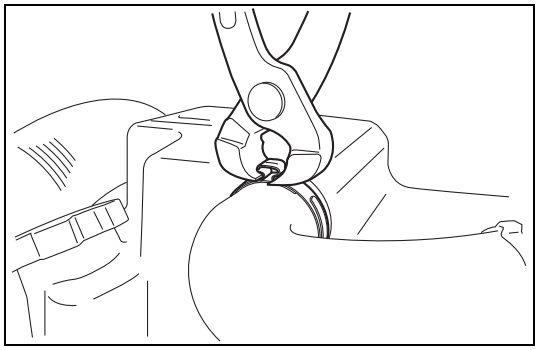
- **Install the new clamp.**
- **Do not twist the oil hose.**
- **Connect it in a way that the white mark is positioned on the vehicle rear side. (upper oil hose)**
- **Insert it in a way that the yellow mark is positioned on the vehicle rear side and mount it by aligning with the engine mark. (lower oil hose)**

Standard value: (X) 6 mm {0.236 in.} or less
SST: S0920-E0010
Vent pipe tool

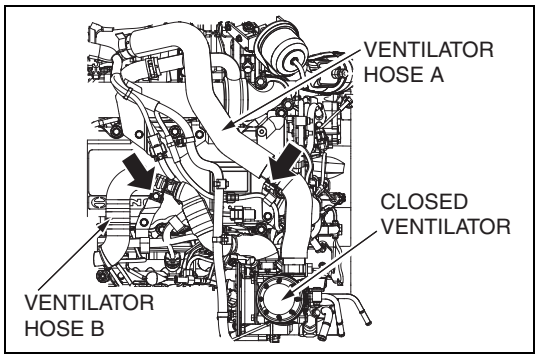


SHTS021270700034

(5) Attach the hose of the vehicle, install the clamp is crimped using a SST.
Standard value: (X) 6 mm {0.236 in.} or less
SST: S0920-E0010
Vent pipe tool


SHTS021270700035

(6) Attach the hose on the engine side, attach the clamp is crimped using a SST.
Standard value: (X) 6 mm {0.236 in.} or less
SST: S0920-E0010
Vent pipe tool



SHTS021270700036

(7) Connect the ventilator hose B to the closed ventilator and cylinder head with 2 clamps and the bolt.
Tightening Torque:
31 N·m {316 kgf·cm, 23 lbf·ft}

NOTICE
Do not twist the ventilator hose.

(8) Connect the ventilator hose A to the closed ventilator and intake hose with 2 clamps and the bolt.
Tightening Torque:
31 N·m {316 kgf·cm, 23 lbf·ft}

NOTICE
Do not twist the ventilator hose.

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INTAKE (J05E)

9-001

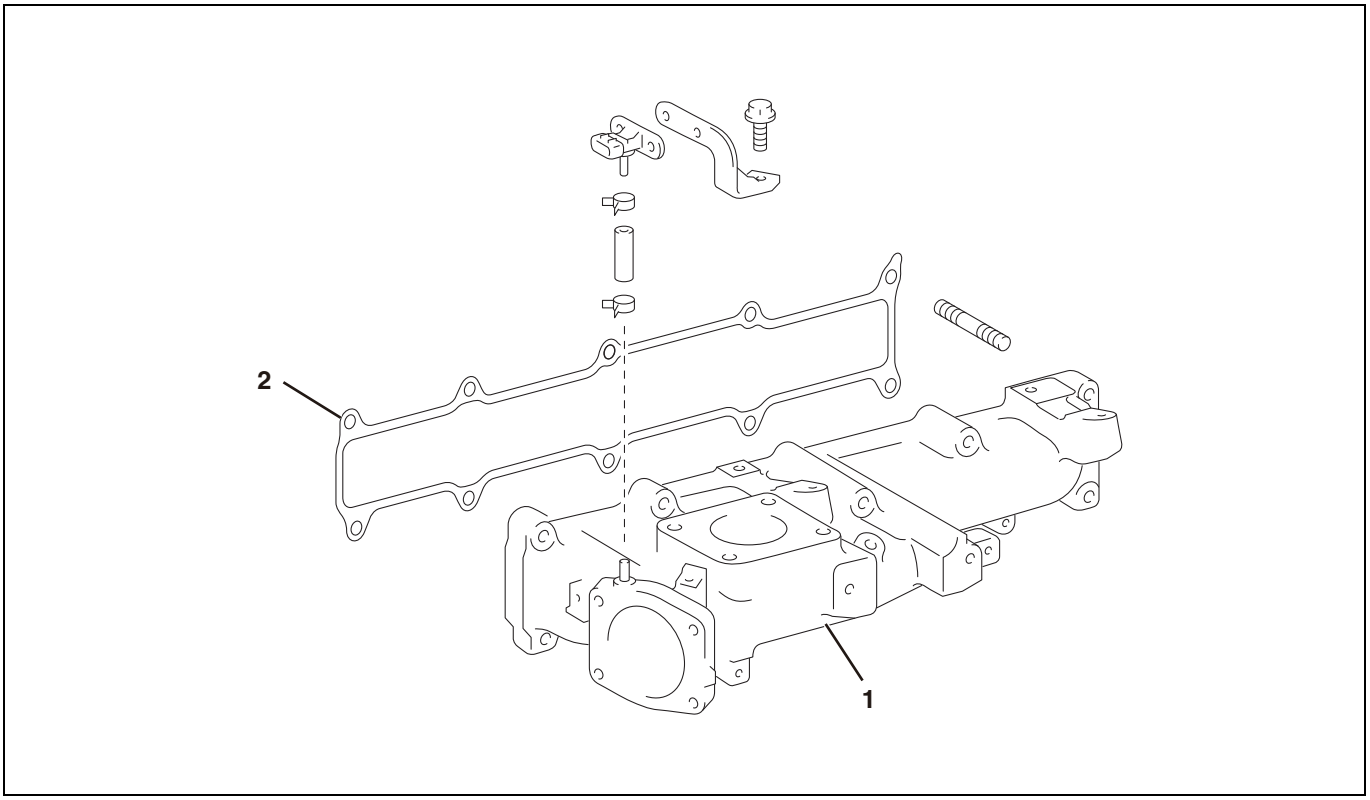
INTAKE MANIFOLD 9-2
COMPONENT LOCATOR 9-2
REPLACEMENT 9-3
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COMPONENT LOCATOR 9-8
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INTAKE MANIFOLD

COMPONENT LOCATOR

EN01F02114080402004001



SHTS021270800001

1 Intake manifold	2 Gasket *

*: Nonreusable part

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REPLACEMENT

EN01F02114080402004002

REMOVING THE INTAKE MANIFOLD

1. DISCONNECTING THE HARNESS

(1) Remove the connector and clip and disconnect the engine harness around the intake manifold.

2. REMOVING THE EGR PIPE

Reference: EMISSION CONTROL (J05E), EGR VALVE & COOLER, REPLACEMENT, REMOVING THE EGR VALVE & COOLER (Page 8-3)

3. REMOVING THE CLOSED VENTILATOR

Reference: EMISSION CONTROL (J05E), CLOSED VENTILATOR, REPLACEMENT, REMOVING THE CLOSED VENTILATOR (Page 8-14)

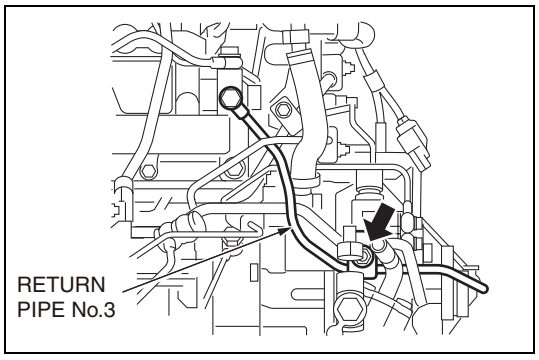
4. REMOVING THE FUEL FILTER CASE

Reference: FUEL SYSTEM (J05E), FUEL FILTER AND CASE (ENGINE SIDE), REPLACEMENT, REMOVING THE FUEL FILTER (Page 7-19)

5. DISCONNECTING THE RETURN PIPE No.3

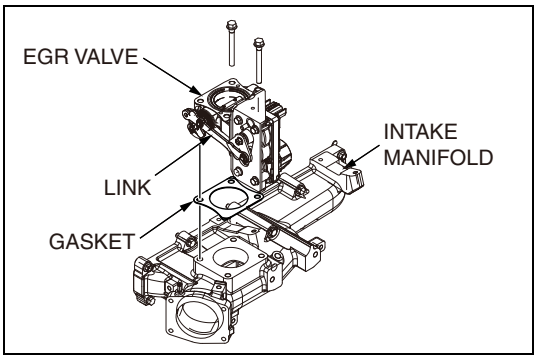
(1) Remove the nut and then the clip.

(2) Unfasten the bolts and gasket to remove the return pipe No.3 from the pressure limiter.



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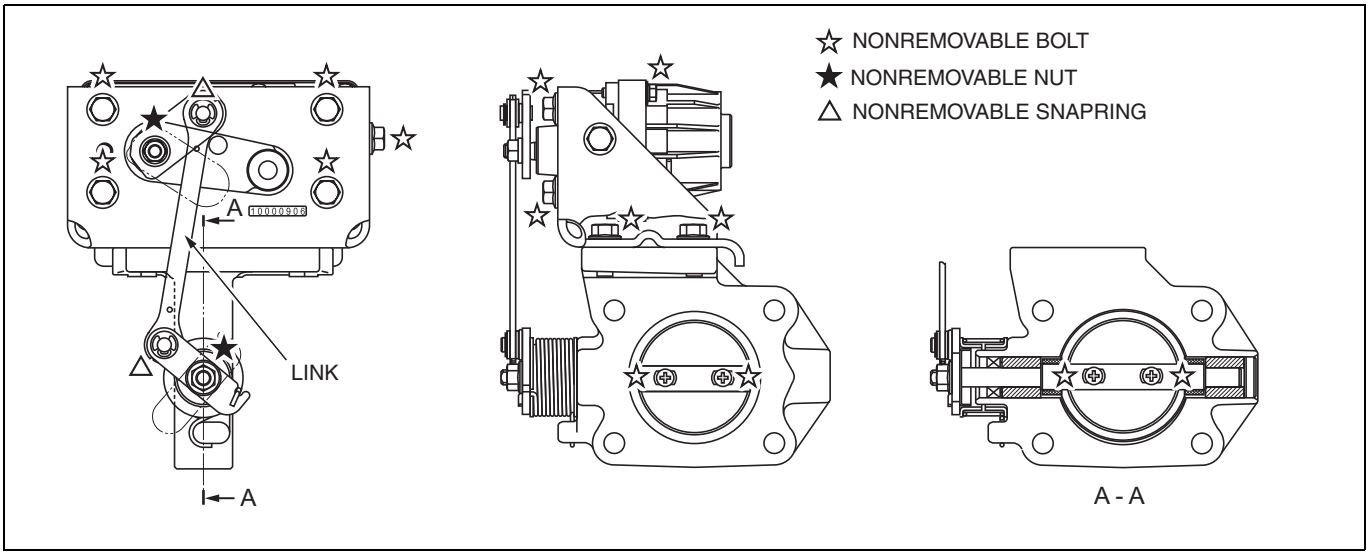
SHTS021270800003

6. REMOVING THE EGR VALVE

(1) Remove the EGR valve and gasket from intake manifold.

⚠ CAUTION

- **Do not step on the EGR valve during engine service work.**
- **Do not remove or loosen the bolts, nuts, and snap rings that are components of the EGR valve.**
  If any of these components is removed or loosened, the EGR valve will deteriorate in performance.
  If the bolts, nuts, and snap rings are removed and the EGR valve is disassembled, do not reassemble the EGR valve. Replace it with a new one.
- **Do not hold the link when replacing the EGR valve assembly. If the link is held, it may bend and cause a malfunction.**



SHTS021270800004

7. REMOVING THE COMMON RAIL

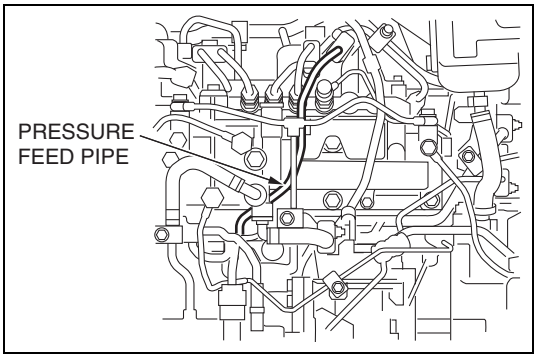
Reference: FUEL SYSTEM (J05E), COMMON RAIL, REPLACEMENT, REMOVING THE COMMON RAIL (Page 7-48)

8. REMOVING THE GLOW PLUG (VEHICLE EQUIPPED WITH A GLOW PLUG)

Reference: ENGINE MECHANICAL (J05E), GLOW PLUG, REPLACEMENT, REMOVING THE GLOW PLUG (Page 10-129)

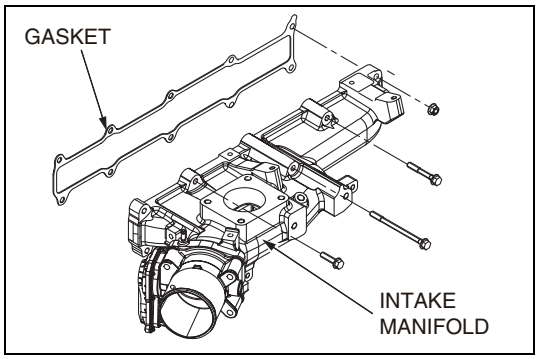
9. REMOVING THE INTAKE MANIFOLD

(1) Unfasten the nuts (2 pcs.), and remove the clips (2 pcs.).
(2) Loosen the nut to remove the pressure feed pipe from the common rail and supply pump.



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SHTS021270800006

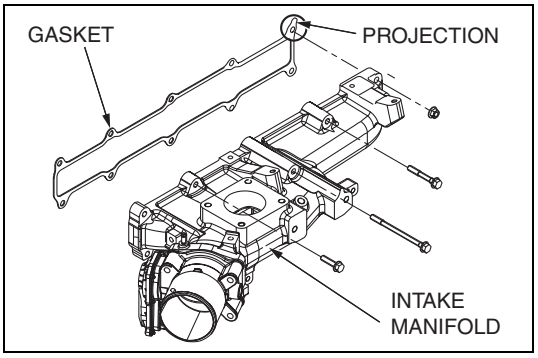
(3) Unfasten the 8 bolts and 2 nuts to remove the intake manifold and gasket from the cylinder head.

NOTICE

Block the openings of the intake manifold with gummed tape to prevent the ingress of dirt into it.

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MOUNTING THE INTAKE MANIFOLD



SHTS021270800007

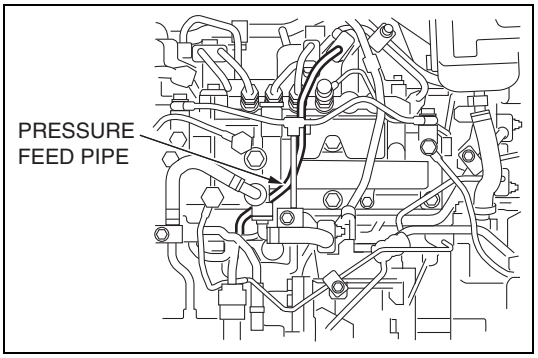
1. MOUNTING THE INTAKE MANIFOLD

(1) Clean the inside of the intake manifold and cylinder head.

(2) Replace the gasket with a new one, and mount the intake manifold on the cylinder head with 8 bolts and 2 nuts that secured the intake manifold.

Tightening Torque:
28.5 N·m {291 kgf·cm, 21 lbf·ft}

⚠ CAUTION
Mount the gasket so that the lug of the gasket is positioned on the rearmost stud bolt side of the cylinder head.



SHTS021270800008

(3) Mount the new pressure feed pipe to the supply pump and common rail.

(4) Mount the 2 clips with 2 nuts and fix the pressure feed pipe.

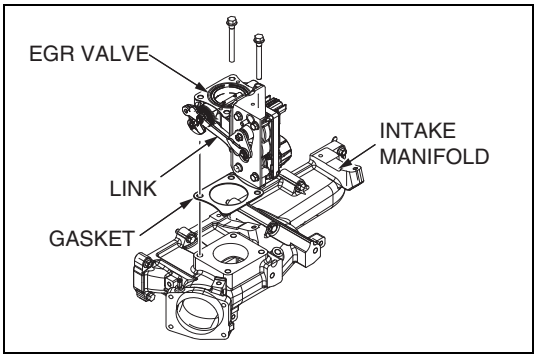
2. MOUNTING THE GLOW PLUG
Reference: ENGINE MECHANICAL (J05E), GLOW PLUG, REPLACEMENT, MOUNTING THE GLOW PLUGS (Page 10-130)

3. MOUNTING THE COMMON RAIL
Reference: FUEL SYSTEM (J05E), COMMON RAIL, REPLACEMENT, MOUNTING THE COMMON RAIL (Page 7-50)

4. MOUNTING THE EGR VALVE

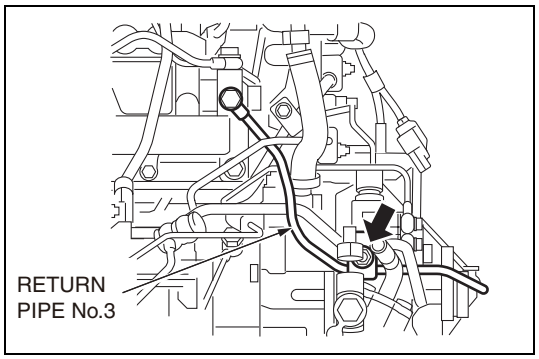
(1) Replace the gasket with a new one, and temporarily attach the EGR valve to the intake manifold.

⚠ CAUTION
Do not hold the link when replacing the EGR valve assembly. If the link is held, it may bend and cause a malfunction.



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SHTS021270800010

5. CONNECTING THE RETURN PIPE No.3

(1) Replace with a new gasket and connect the return pipe No.3 with bolts.

(2) Mount the clip with the nut, and fix the return pipe No.3.

6. MOUNTING THE FUEL FILTER CASE

Reference: FUEL SYSTEM (J05E), FUEL FILTER AND CASE (ENGINE SIDE), REPLACEMENT, MOUNTING THE FUEL FILTER (ENGINE SIDE) (Page 7-22)

7. MOUNTING THE CLOSED VENTILATOR

Reference: EMISSION CONTROL (J05E), CLOSED VENTILATOR, REPLACEMENT, MOUNTING THE CLOSED VENTILATOR (Page 8-16)

8. MOUNTING THE EGR PIPE

Reference: EMISSION CONTROL (J05E), EGR VALVE & COOLER, REPLACEMENT, MOUNTING THE EGR VALVE & COOLER (Page 8-8)

9. CONNECTING THE HARNESS

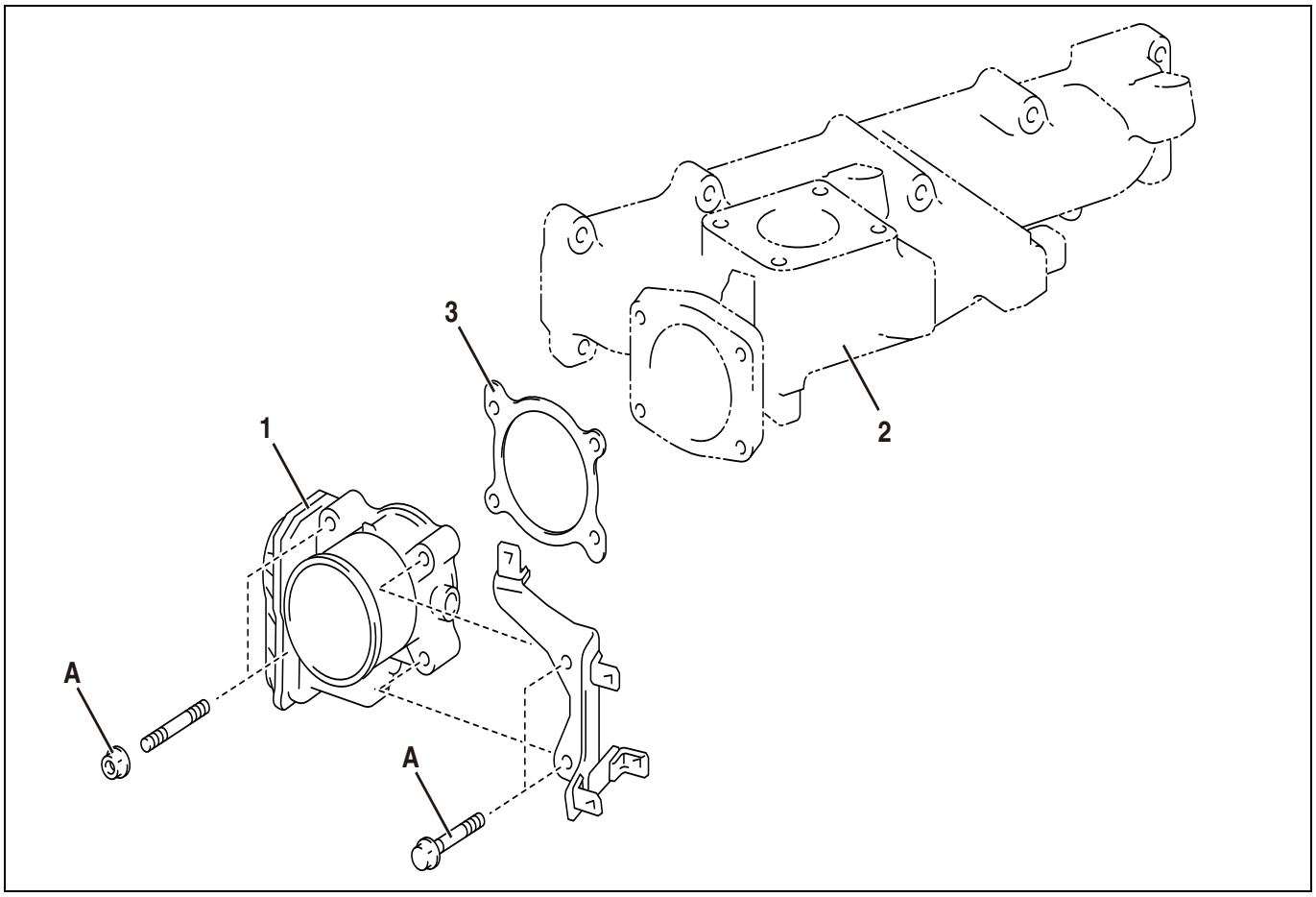
(1) Mount the engine harness around the intake manifold with the clips, and connect the connector.

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DIESEL THROTTLE

COMPONENT LOCATOR

EN01F02114080402017001



SHTS021270800011

1 Intake manifold	3 Gasket *
2 Diesel throttle	

*: Nonreusable part

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A 28.5 {291, 21}	

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INSPECTION

EN01F02114080402017002

1. INSPECTING THE DIESEL THROTTLE

(1) Use the HINO-DX, inspect the diesel throttle. (See the HINO-DX manual.)

REPLACEMENT

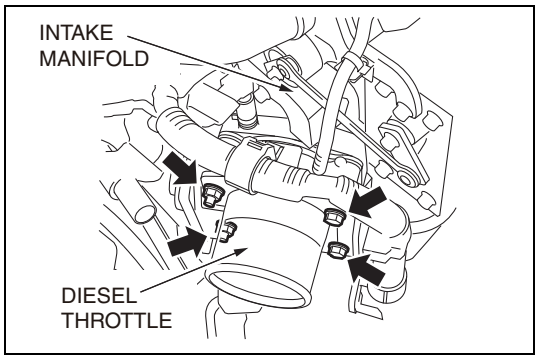
EN01F02114080402017003

REMOVING THE DIESEL THROTTLE

1. REMOVING THE INTERCOOLER HOSE (OUTLET HOSE)
Reference: COOLING (J05E), INTERCOOLER, OVERHAUL, REMOVING THE INTERCOOLER (Page 12-21)

2. REMOVING THE DIESEL THROTTLE

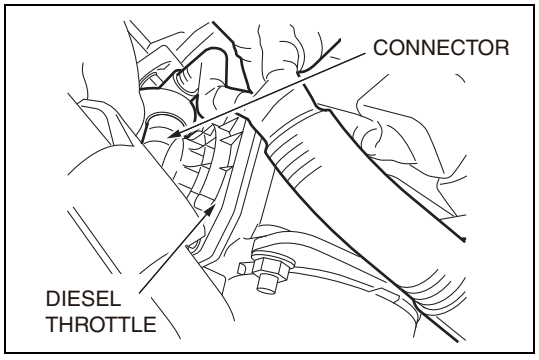
(1) Unfasten the 2 bolts and 2 nuts and remove the diesel throttle and gasket from the intake manifold.



SHTS021270800012

3. DISCONNECTING THE HARNESS

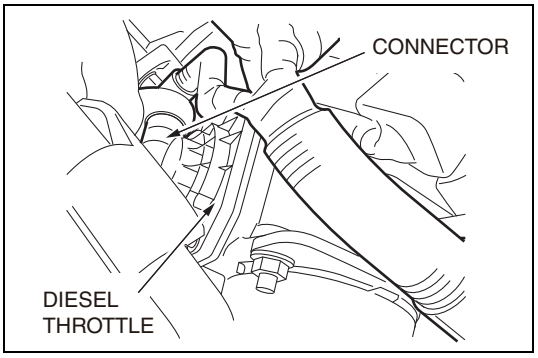
(1) Disconnect the connector from the diesel throttle.



SHTS021270800013

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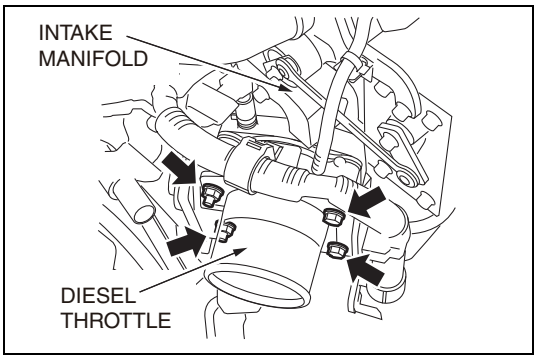
MOUNTING THE DIESEL THROTTLE



SHTS021270800014

1. CONNECTING THE HARNESS

(1) Connect the connector to the diesel throttle.



SHTS021270800015

2. MOUNTING THE DIESEL THROTTLE

(1) Replace the gasket with a new one, temporarily fasten the diesel throttle to intake manifold with 2 bolts and 2 nuts, and tighten them to the specified torque in a crisscross pattern.
Tightening Torque:
28.5 N·m {291 kgf·cm, 21 lbf·ft}

⚠ CAUTION

- **When assembling the diesel throttle, exercise care not to impose an impact on the valve. Do not use the diesel throttle if an impact is imposed on the valve.**
- **If any portion of the gasket remains on the diesel throttle setting face of the intake pipe, remove it before attaching the diesel throttle.**

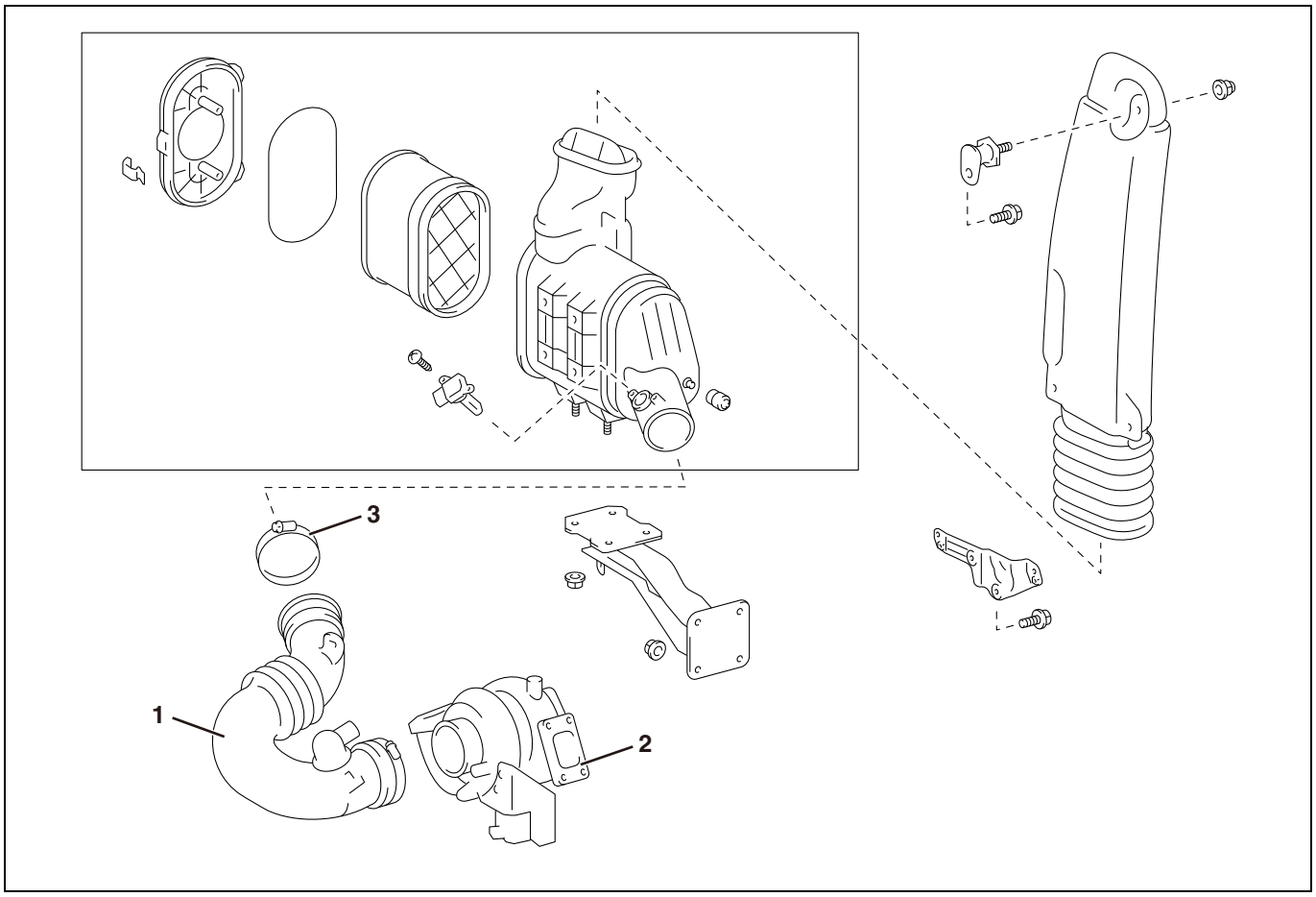
3. MOUNTING THE INTERCOOLER HOSE (OUTLET HOSE)
Reference: COOLING (J05E), INTERCOOLER, OVERHAUL, MOUNTING THE INTERCOOLER (Page 12-22)

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INTAKE PIPE (EXHAUST SIDE)

COMPONENT LOCATOR

EN01F02114080402020001



SHTS021270800016

1	Primary intake hose	3	Clamp
2	Turbocharger		

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REPLACEMENT

EN01F02114080402020002

REMOVING THE INTAKE PIPE (EXHAUST SIDE)

1. DISCONNECTING THE HARNESS

(1) Remove the joint connector and clip, and disconnect the engine harness from the primary intake hose and secondary intake pipe.

2. REMOVING THE INTERCOOLER HOSE (INLET HOSE)

Reference: COOLING (J05E), INTERCOOLER, OVERHAUL, REMOVING THE INTERCOOLER (Page 12-21)

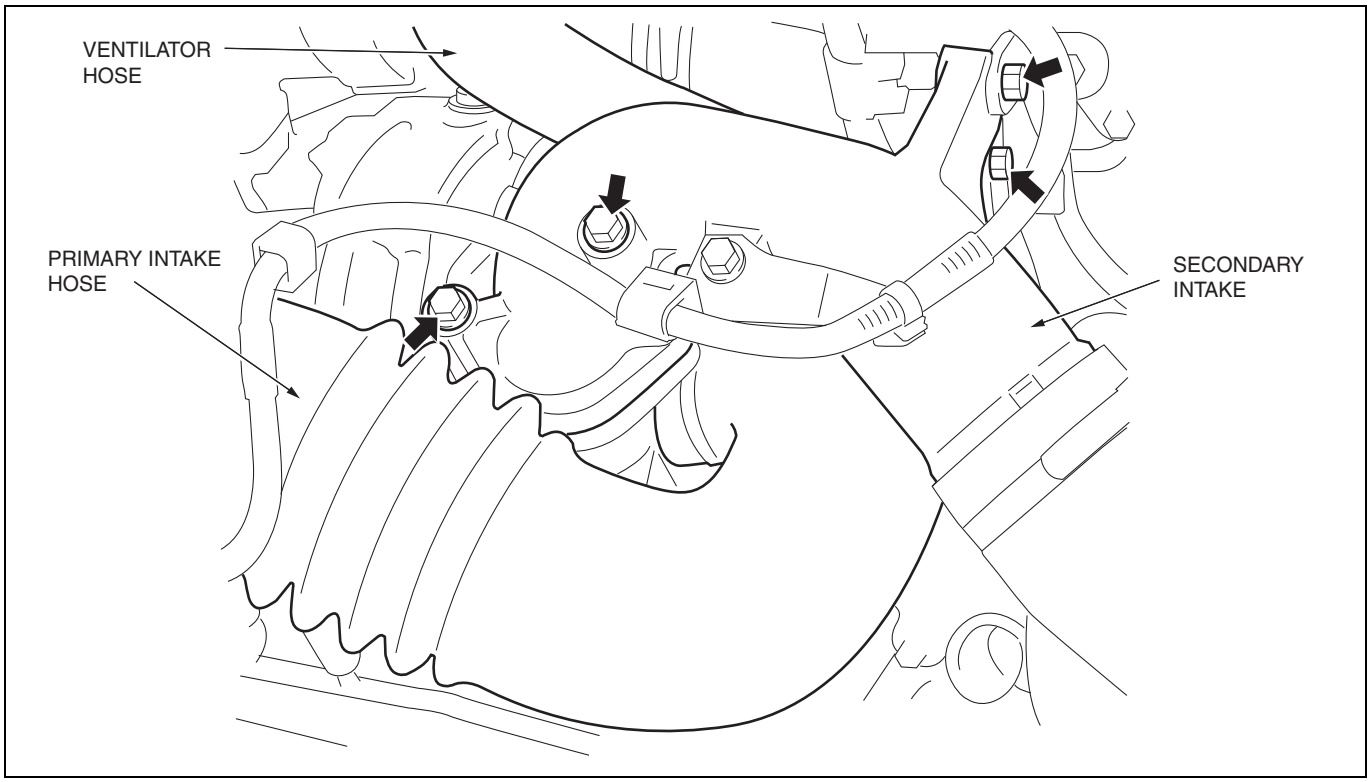
3. REMOVING THE INTAKE PIPE (EXHAUST SIDE)

(1) Unfasten the 4 bolts to remove the secondary intake pipe and gasket from the turbocharger assembly.

(2) Loosen the clamp of the primary intake hose and ventilator hose to remove the primary intake hose.

NOTICE

Block the opening of the turbocharger with gummed tape to prevent the ingress of dirt into it.



SHTS021270800017

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MOUNTING THE INTAKE PIPE (EXHAUST SIDE)

1. MOUNTING THE INTAKE PIPE (EXHAUST SIDE)

(1) Check the intake system for dirt or foreign matter.

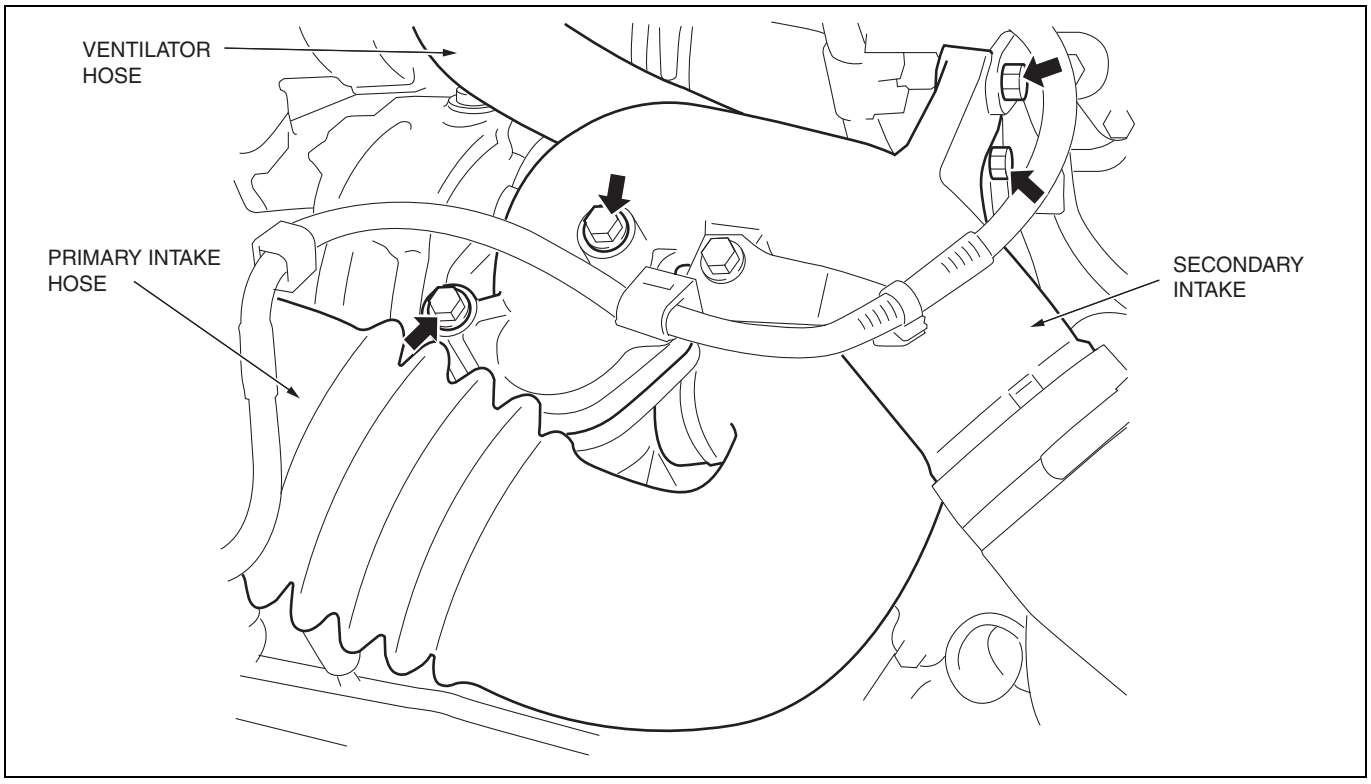
(2) Wash off oil on the intake hose insertion part and inner side of the hose inlet.

(3) Insert the primary intake hose to the turbocharger assembly.

(4) Tighten the 2 clamps, and mount the primary intake hose to the turbocharger assembly.
Tightening Torque:
Turbocharger side:
6.25 N·m {64 kgf·cm, 4.6 lbf·ft}
Air cleaner side:
2.4-5.0 N·m {25-50 kgf·cm, 1.8-3.6 lbf·ft}

⚠ CAUTION
No sealing agent must be used at the air inlet and outlet to prevent defects such as breakage due to clogging or looseness in the tightening area.

(5) Replace with a new gasket and mount the secondary intake pipe to the turbocharger assembly with 4 bolts.
Tightening Torque:
28.5 N·m {291 kgf·cm, 21 lbf·ft}



SHTS021270800018

2. MOUNTING THE INTERCOOLER HOSE (INLET HOSE)
Reference: COOLING (J05E), INTERCOOLER, OVERHAUL, MOUNTING THE INTERCOOLER (Page 12-22)

3. CONNECTING THE HARNESS

(1) Fasten the engine harness to the secondary intake pipe and primary intake hose with the clips, and connect the joint connector.

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INTERCOOLER

OVERHAUL

EN01F02114080402018001

1. REMOVING THE INTERCOOLER
Reference: COOLING (J05E), INTERCOOLER, REMOVING THE INTERCOOLER (Page 12-21)

2. INSPECTING THE INTERCOOLER
(1) Inspect the radiator core for dirt or crushing. If found defective, clean or adjust or replace it.

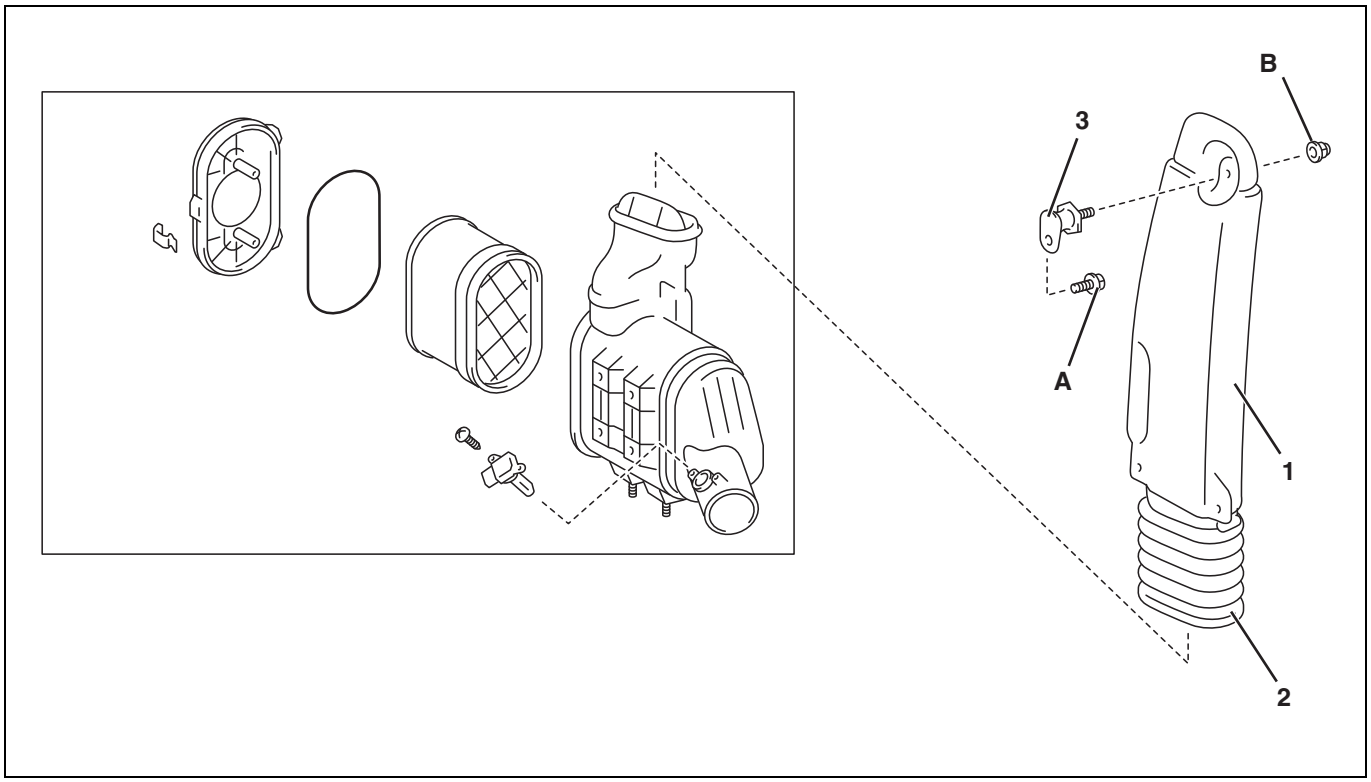
3. MOUNTING THE INTERCOOLER
Reference: COOLING (J05E), INTERCOOLER, MOUNTING THE INTERCOOLER (Page 12-22)

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STACK DUCT

COMPONENT LOCATOR

EN01F02114080402011001



SHTS021270800019

1	Stack duct	3	Duct mount
2	Intake hose		

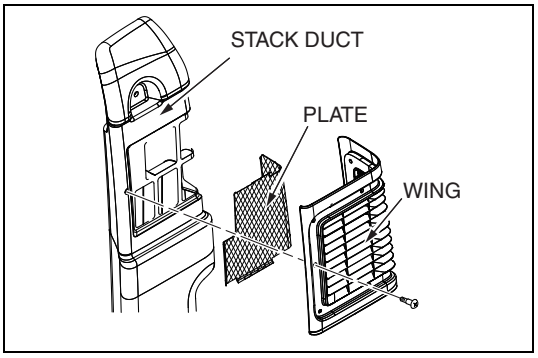
Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	19.5 {199, 14}	B	13 {133, 10}

https://truckmanualshub.com/

CLEANING THE PRECLEANER HOUSING

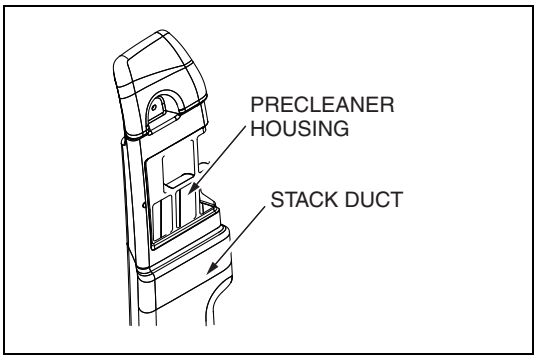
EN01F02114080402011002



SHTS021270800020

1. REMOVING THE WING

(1) Unfasten the 8 screws, and remove the wing and plate from the stack duct.



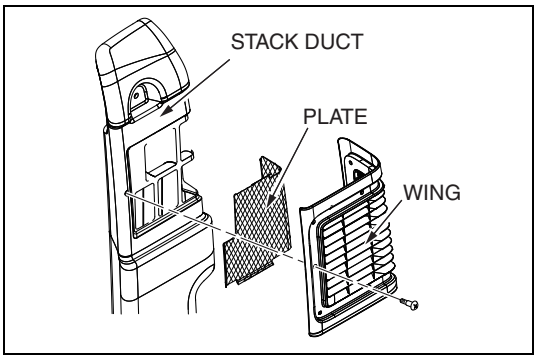
SHTS021270800021

2. CLEANING THE PRECLEANER HOUSING

(1) Clean the inside of the precleaner housing with a cloth.

⚠ CAUTION

When cleaning the precleaner housing, exercise care not to allow water to enter the air cleaner.



SHTS021270800022

3. MOUNTING THE WING

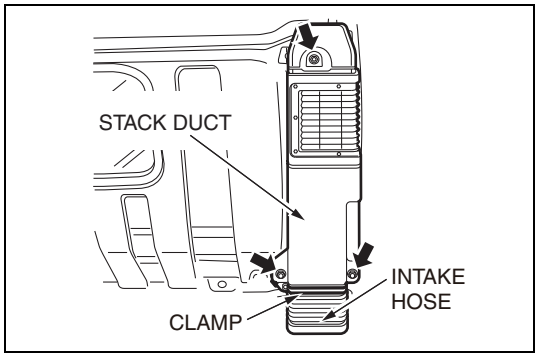
(1) Mount the plate and the wing to the stack duct with 8 screws.

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REPLACEMENT

EN01F02114080402011003

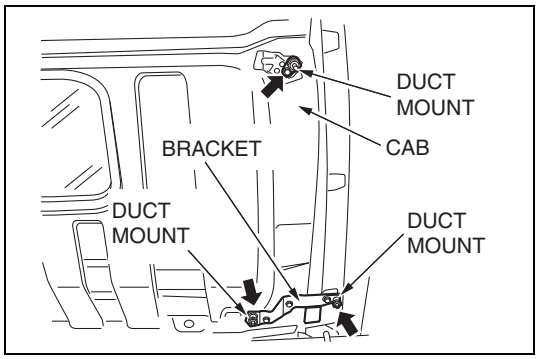
REMOVING THE STACK DUCT



SHTS021270800023

1. REMOVING THE STACK DUCT

(1) Unfasten the 3 nuts to remove the stack duct from the duct mount.
(2) Loosen the clamp, and disconnect the intake hose from the bottom of the stack duct.



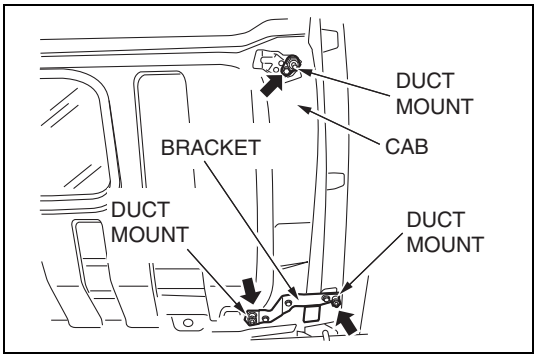
SHTS021270800024

2. REMOVING THE DUCT MOUNT

(1) Unfasten the bolt to remove the duct mount from the cab.
(2) Unfasten the 2 bolts to remove 2 duct mounts from the bracket.

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MOUNTING THE STACK DUCT

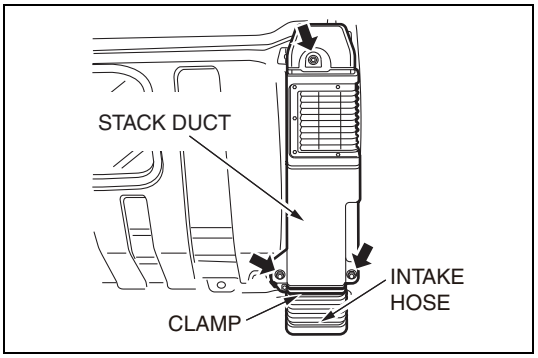


SHTS021270800025

1. MOUNTING THE DUCT MOUNT

(1) Mount the 2 duct mounts to the bracket with 2 bolts.
Tightening Torque:
19.5 N·m {199 kgf·cm, 14 lbf·ft}

(2) Mount the duct mount to the cab with the bolt.
Tightening Torque:
19.5 N·m {199 kgf·cm, 14 lbf·ft}



SHTS021270800026

2. MOUNTING THE STACK DUCT

(1) Insert the intake hose to the lower part of the stack duct and tighten the clamp.
Tightening Torque:
2.4-5.0 N·m {25-50 kgf·cm, 1.8-3.6 lbf·ft}

(2) Mount the stack duct to the duct mount with 3 nuts.
Tightening Torque:
13 N·m {133 kgf·cm, 10 lbf·ft}

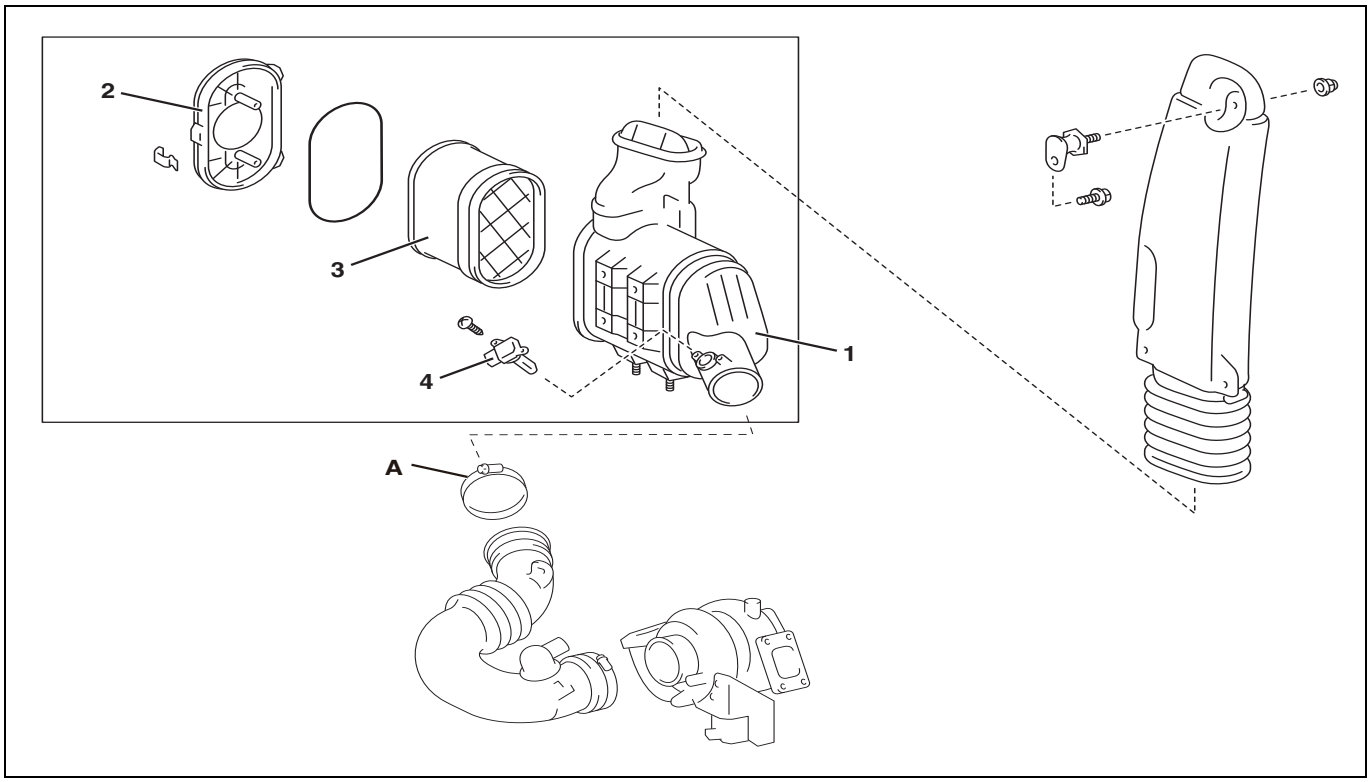
https://truckmanualshub.com/

AIR CLEANER

COMPONENT LOCATOR

EN01F02114080402008001

WIDE CAB (SINGLE CAB)



SHTS021270800027

1	Air cleaner body assembly	3	Air cleaner element
2	Cover	4	Air flow sensor

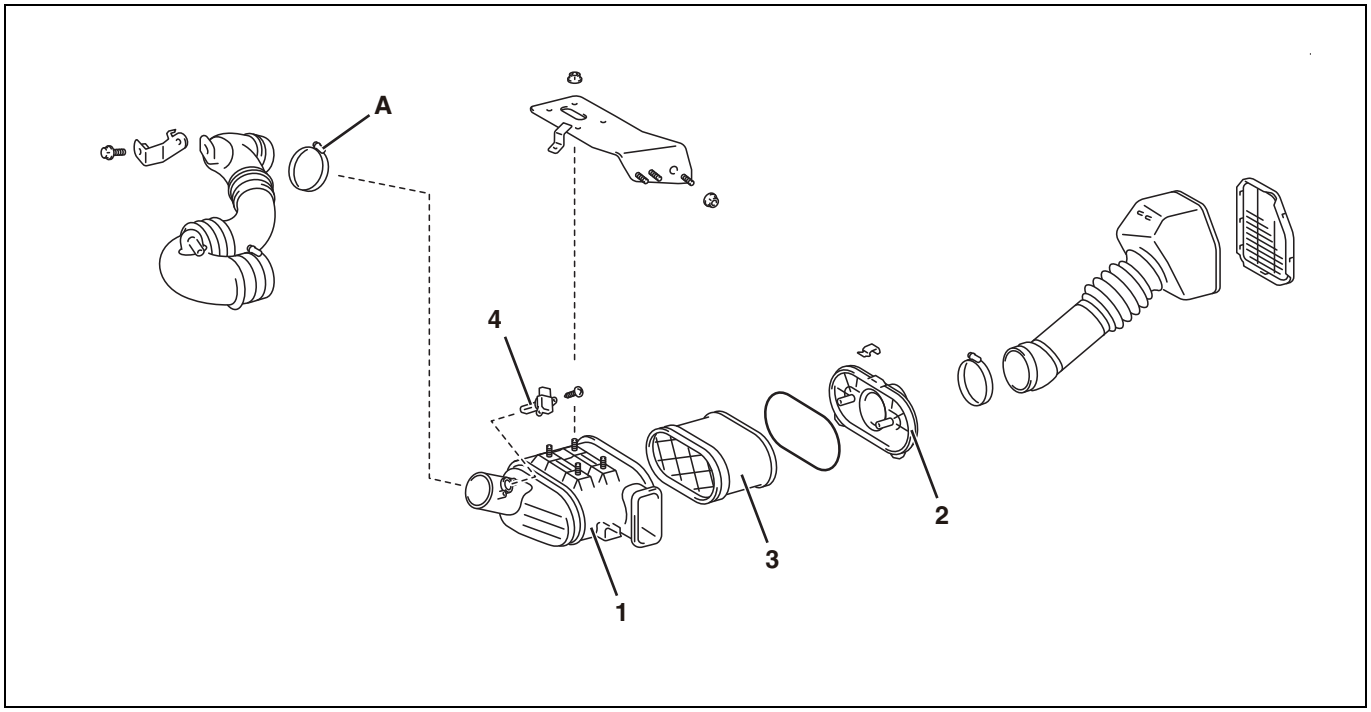
*: Nonreusable part

Tightening torque — Unit: N·m {kgf·cm, lbf·ft}

A	2.4-5.0 {25-50, 1.8-3.6}	

https://truckmanualshub.com/

WIDE CAB (CREW CAB)



SHTS021270800028

1	Air cleaner body assembly	3	Air cleaner element
2	Cover	4	Air flow sensor

*: Nonreusable part

Tightening torque — Unit: N·m {kgf·cm, lbf·ft}

A	2.4-5.0 {25-50, 1.8-3.6}	

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REPLACEMENT

EN01F02114080402008002

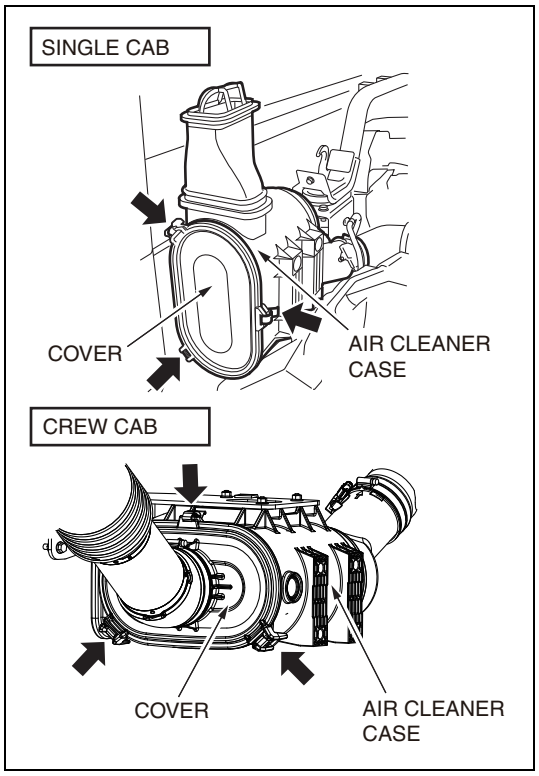
REMOVING THE AIR CLEANER ELEMENT AND BODY ASSEMBLY

1. REMOVING THE AIR CLEANER ELEMENT

(1) Remove the clamps (3 pcs.) and remove the cover from the air cleaner body assembly.

NOTICE

When removing the air cleaner of the crew cab model, pull off the cover toward the vehicle rear side and press the cover to the inboard side.

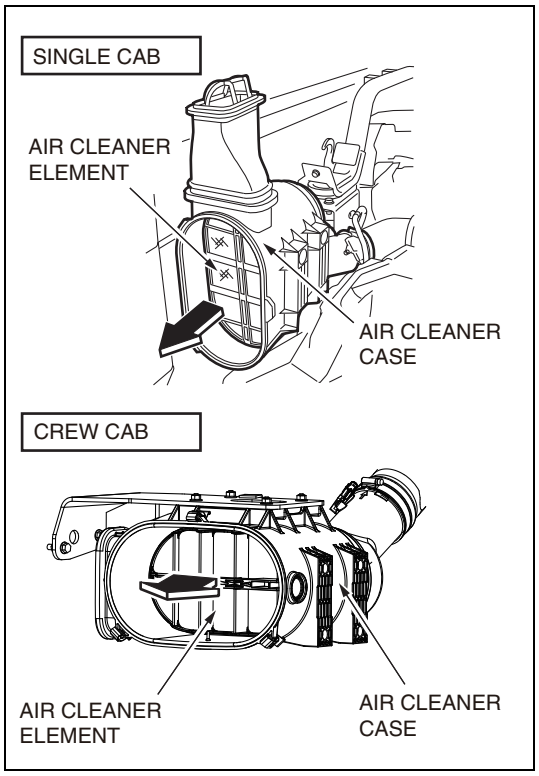


SHTS021270800029

(2) Hold the grip at the center of the air cleaner element, and remove the air cleaner element from the air cleaner body assembly.

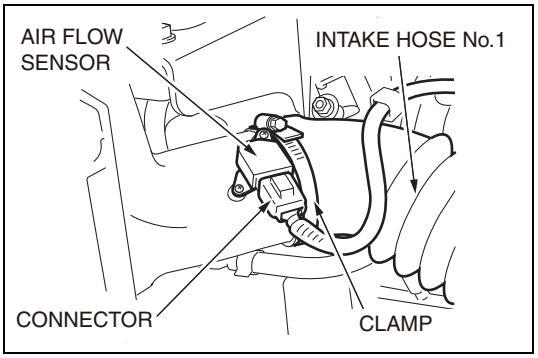
NOTICE

To remove the air cleaner element of the crew cab model, draw it out to the vehicle rear side, rotate it 90° to the right side of the vehicle, and pull it off toward the vehicle lower side.



SHTS021270800030

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SHTS021270800031

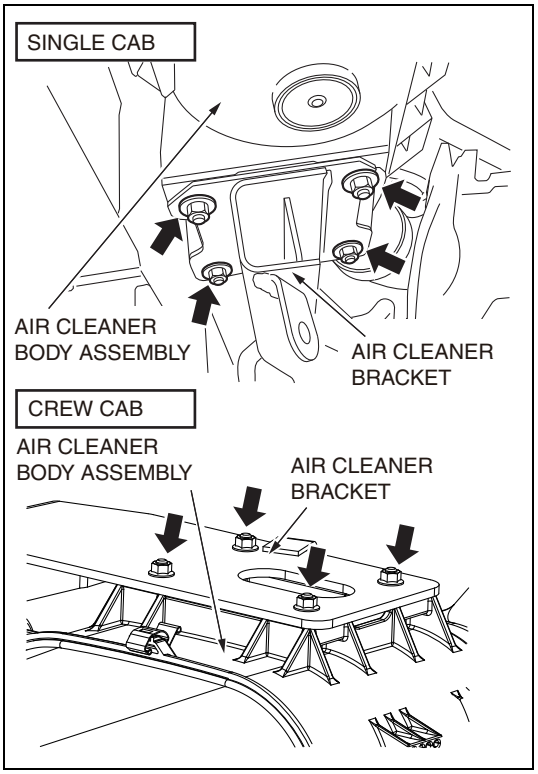
2. REMOVING THE AIR CLEANER BODY ASSEMBLY

(1) Disconnect the connector from the air flow sensor.

(2) Loosen the clamp, and disconnect the intake hose No.1 from the air cleaner body assembly.

(3) Remove the fender side apron (right).
Reference: MOUNTING AND DISMOUNTING THE ENGINE (J05E), ENGINE ASSEMBLY, REPLACEMENT, REMOVING THE ENGINE ASSEMBLY (Page 5-7)

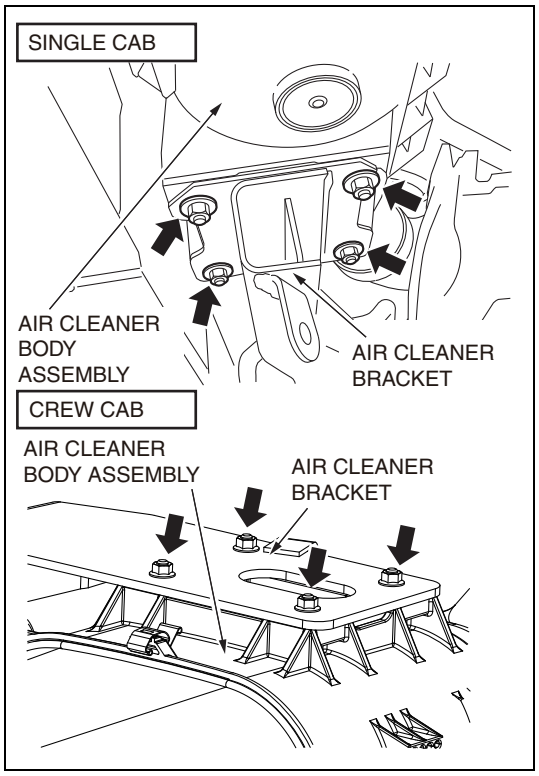
(4) Unfasten the 4 nuts securing the air cleaner body assembly, and remove the air cleaner body assembly from the air cleaner bracket.



SHTS021270800032

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MOUNTING THE AIR CLEANER ELEMENT AND BODY ASSEMBLY



SHTS021270800033

1. MOUNTING THE AIR CLEANER BODY ASSEMBLY

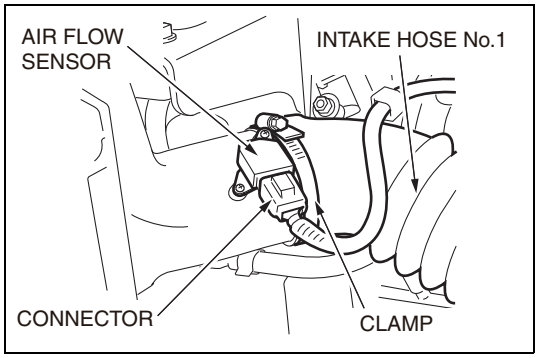
(1) Clean the inside of the cover of the air cleaner and of the air cleaner body assembly with a waste cloth.

(2) Mount the air cleaner body assembly to the air cleaner bracket with 4 nuts.
Tightening Torque:
19.5 N·m {199 kgf·cm, 14 lbf·ft}

(3) Mount the fender side apron (right).
Reference: MOUNTING AND DISMOUNTING THE ENGINE (J05E), ENGINE ASSEMBLY, REPLACEMENT, MOUNTING THE ENGINE ASSEMBLY (Page 5-11)

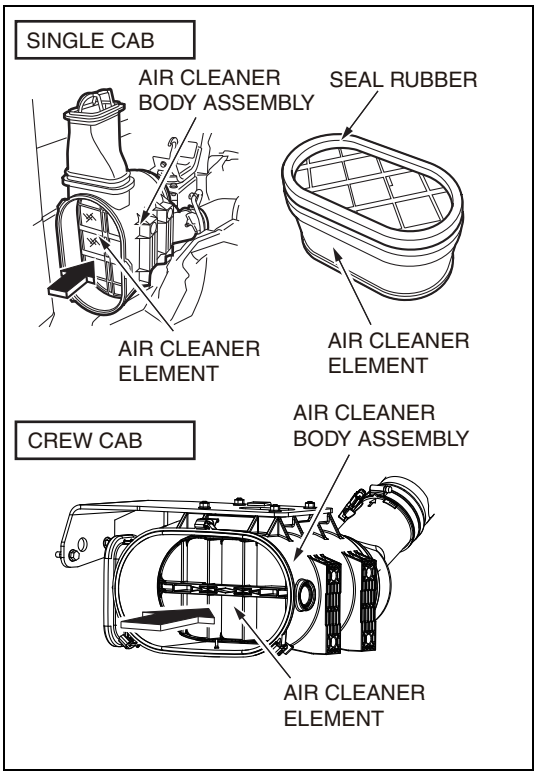
(4) Match the alignment marks before connecting the intake hose No.1 to the air cleaner body assembly.
Tightening Torque:
2.4-5.0 N·m {25-50 kgf·cm, 1.8-3.6 lbf·ft}

(5) Connect the connector to the air flow sensor.



SHTS021270800034

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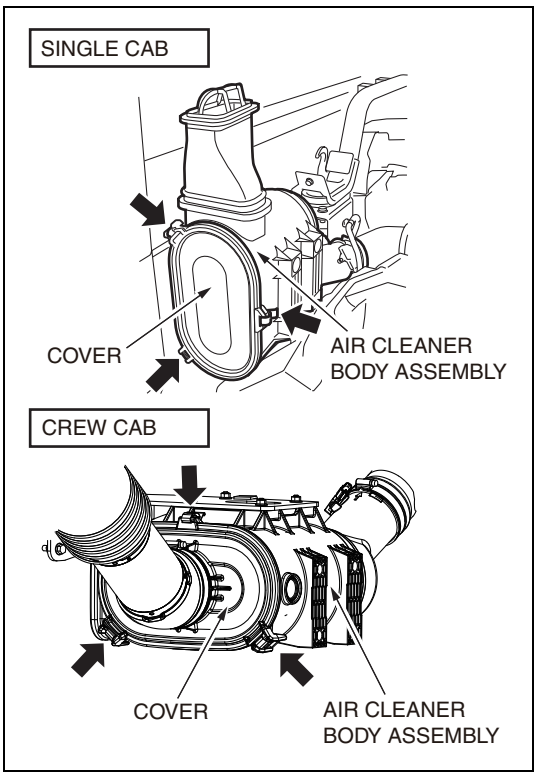
SHTS021270800035

2. MOUNTING THE AIR CLEANER ELEMENT

(1) Hold the grip at the center of the air cleaner element and insert the seal rubber of the air cleaner element to the air cleaner body assembly securely.

NOTICE

Before mounting the air cleaner element of the crew cab model, insert it from the vehicle lower side, rotate it 90° to the left of the vehicle around the air cleaner body assembly, and insert it to the case.



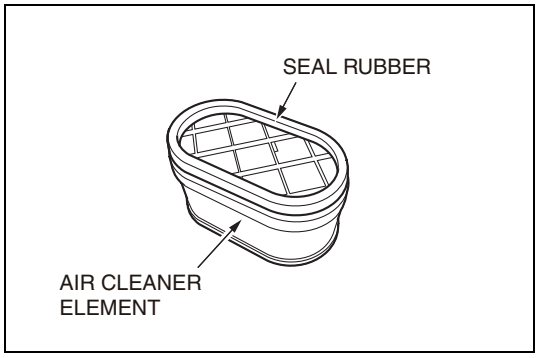
SHTS021270800036

(2) Mount the cover on the air cleaner body assembly with the clamps (3 pcs.) that secured the cover.

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CLEANING THE AIR CLEANER ELEMENT

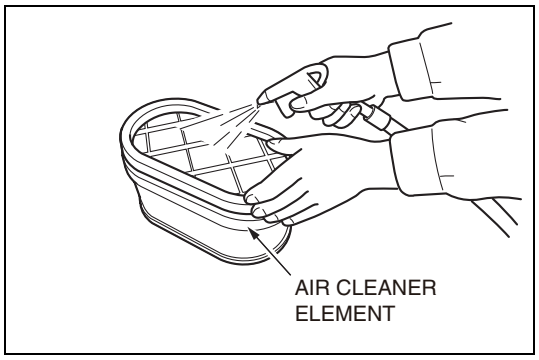
EN01F02114080402008003



SHTS021270800037

1. CLEANING THE AIR CLEANER ELEMENT

(1) Check the seal rubber for damage. If found defective, replace the air cleaner element.



SHTS021270800038

(2) If dry dust is adhered, blow compressed air (690 kPa {7.0 kgf/cm^2, 100 lbf/in.^{2}} or less) from the upper flow side of the air cleaner element to remove dust.

⚠ CAUTION

Do not hit the air cleaner element or throw it down to the floor when removing dust.

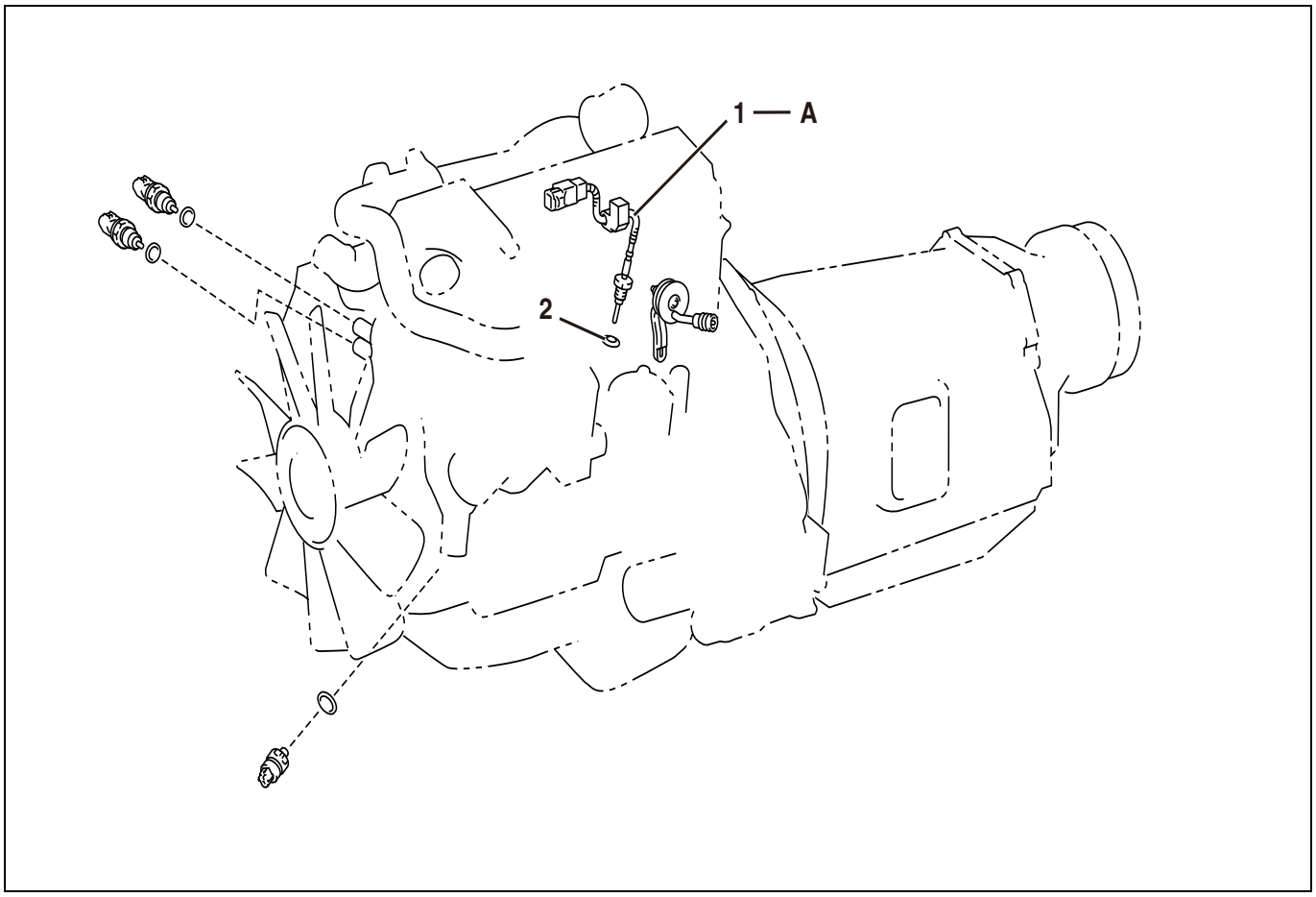
https://truckmanualshub.com/

INTAKE TEMPERATURE SENSOR

COMPONENT LOCATOR

EN01F02114080402026001

INTAKE MANIFOLD



SHTS021270800039

1 Intake temperature sensor	2 Washer *

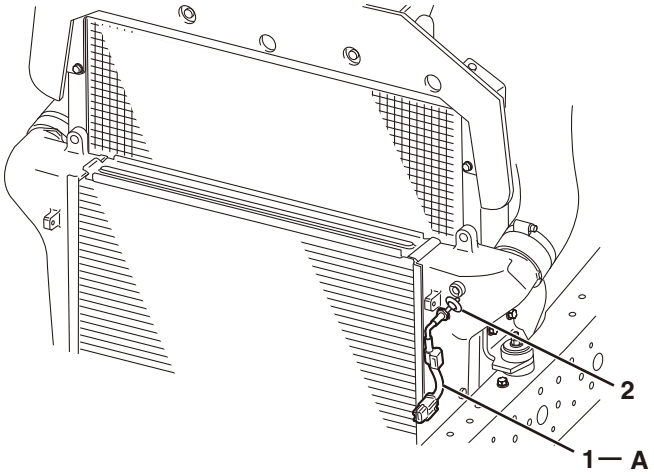
*: Nonreusable part

Tightening torque — Unit: N·m {kgf·cm, lbf·ft}

A 19.6 {200, 14}	

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INTERCOOLER



SHTS021270800040

1 Intake temperature sensor	2 Washer *

*: Nonreusable part

Tightening torque — Unit: N·m {kgf·cm, lbf·ft}

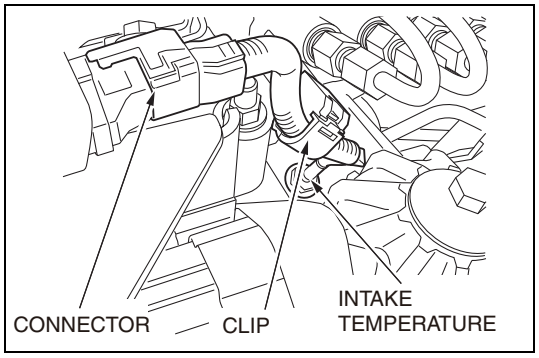
A 19.6 {200, 14}	

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REPLACEMENT

EN01F02114080402026002

REMOVING THE INTAKE TEMPERATURE SENSOR



SHTS021270800041

1. DISCONNECTING THE HARNESS

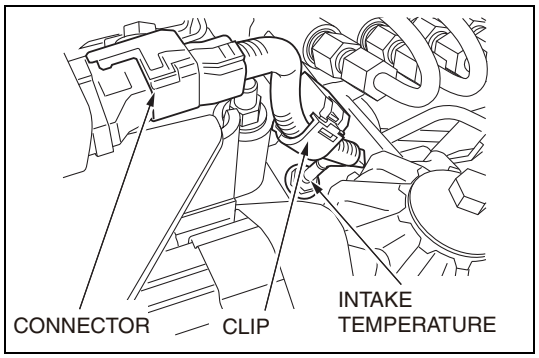
(1) Disconnect the connector connected to the intake temperature sensor.

(2) Remove the clip from the bracket.

2. REMOVING THE INTAKE TEMPERATURE SENSOR

(1) Remove the intake temperature sensor and washer from the intake manifold and intercooler.

MOUNTING THE INTAKE TEMPERATURE SENSOR



SHTS021270800042

1. MOUNTING THE INTAKE TEMPERATURE SENSOR

(1) Replace with a new washer and attach the intake temperature sensor to the intake manifold and intercooler.
Tightening Torque:
19.6 N·m {200 kgf·cm, 14 lbf·ft}

2. CONNECTING THE HARNESS

(1) Mount the clip to the bracket.

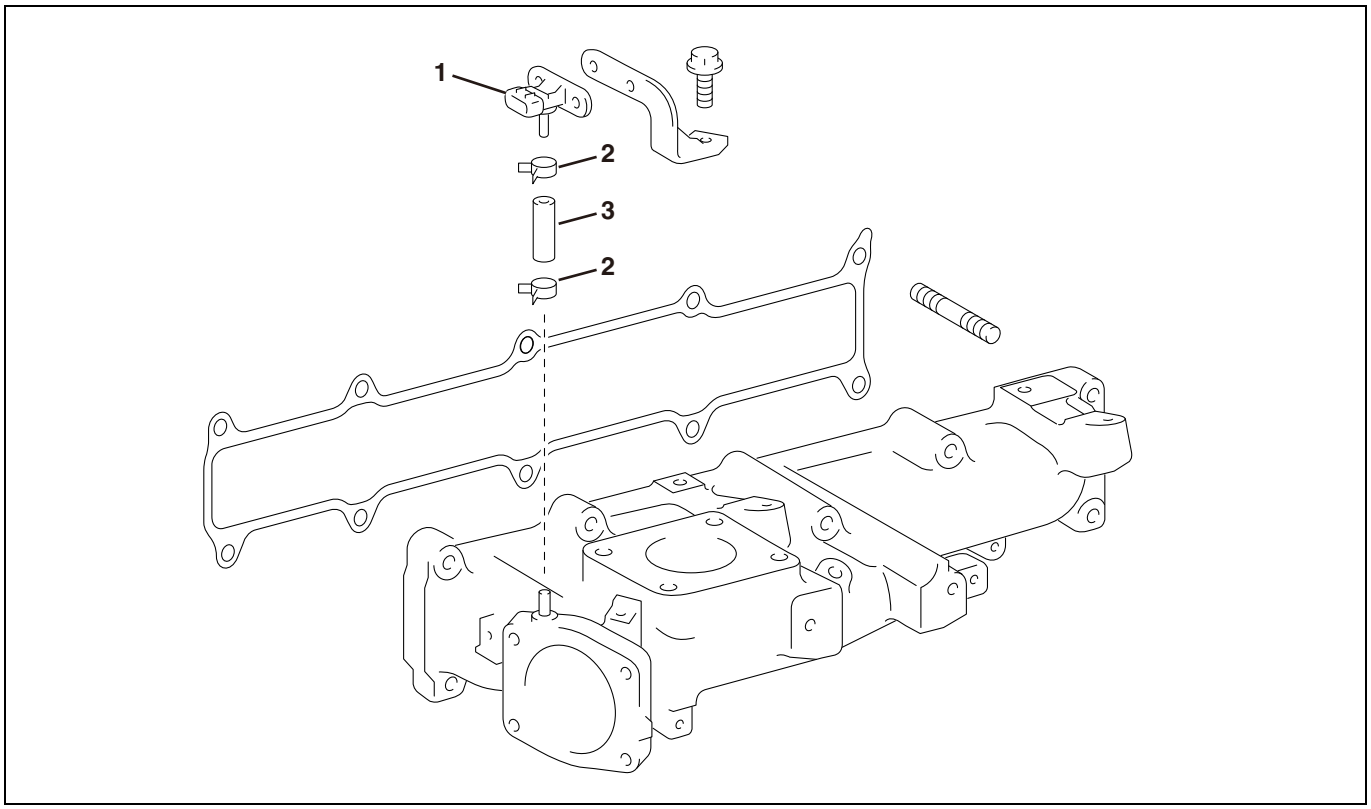
(2) Connect the connector to the intake temperature sensor.

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BOOST PRESSURE SENSOR

COMPONENT LOCATOR

EN01F02114080402021001



SHTS021270800043

1	Boost pressure sensor	3	Hose
2	Clamp		

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INSPECTION

EN01F02114080402021002

1. INSPECTING THE BOOST PRESSURE SENSOR

(1) Using the HINO-DX, inspect the boost pressure sensor. (See the HINO-DX manual.)

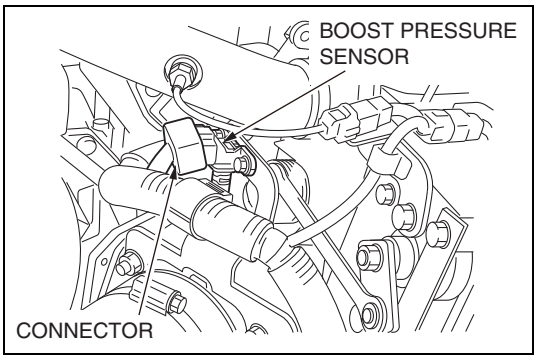
REPLACEMENT

EN01F02114080402021003

REMOVING THE BOOST PRESSURE SENSOR

1. DISCONNECTING THE HARNESS

(1) Disconnect the connector connected to the boost pressure sensor.

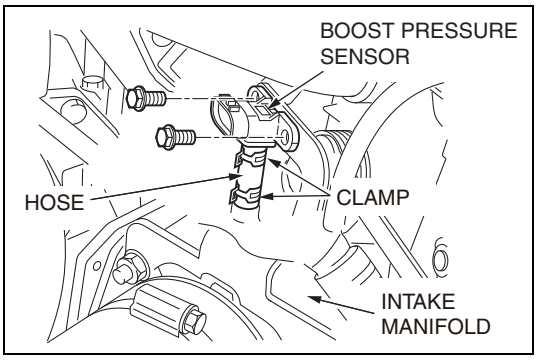


SHTS021270800044

2. REMOVING THE BOOST PRESSURE SENSOR

(1) Unfasten the 2 bolts to remove the boost pressure sensor from the intake manifold.

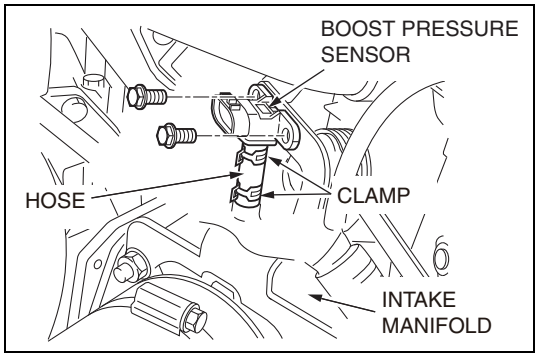
(2) Unfasten the clamps (2 pcs.) securing the hose, and remove the hose from the boost pressure sensor.



SHTS021270800045

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MOUNTING THE BOOST PRESSURE SENSOR



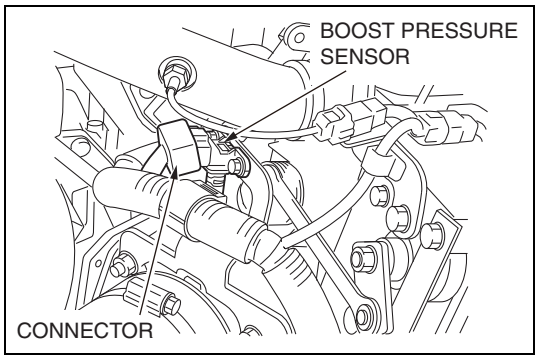
SHTS021270800046

1. MOUNTING THE BOOST PRESSURE SENSOR

(1) Mount the hose to the boost pressure sensor with the clamps (2 pcs.) that secured the hose.

(2) Mount the boost pressure sensor on the intake manifold with 2 bolts.

Tightening Torque:
5 N·m {51 kgf·cm, 3.7 lbf·ft}



SHTS021270800047

2. CONNECTING THE HARNESS

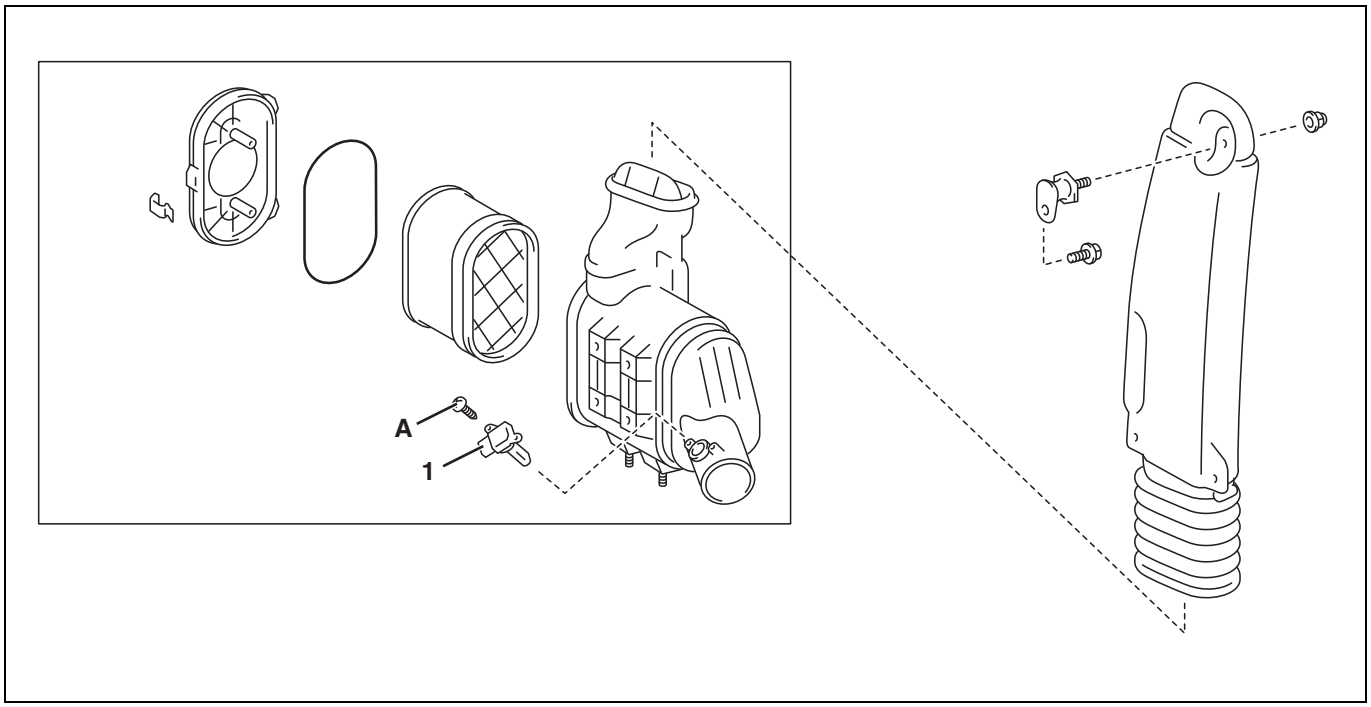
(1) Connect the connector to the boost pressure sensor.

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AIR FLOW SENSOR

COMPONENT LOCATOR

EN01F02114080402009001



SHTS021270800048

1 Air flow sensor	

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A 0.56-0.82 {5.8-8.3, 0.42-0.60}	

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INSPECTION

EN01F02114080402009002

1. INSPECTING THE AIR FLOW SENSOR (INSPECTING AND ADJUSTING INTAKE AIR FLOW USING HINO-DX)

⚠ CAUTION
The air flow sensor is one of the fundamental parts of the "exhaust gas purification device (EGR system)." Ensure to implement inspection when storing the vehicle (12-month inspection).

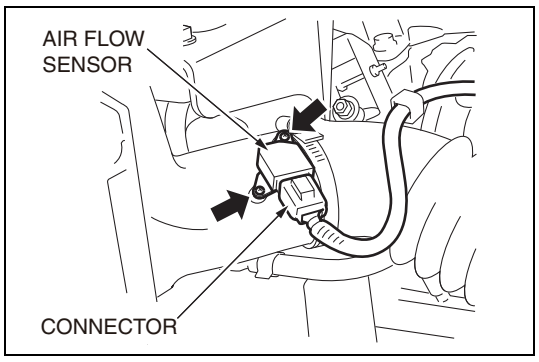
NOTICE

- **An air flow sensor is adopted with this vehicle as a component part of the exhaust gas purification system.**
- **Replace with a new air flow sensor if the inspection result of this method is not within the specified range.**
- **Before implementing the "EGR solenoid valve operation check by using the HINO-DX," inspect this air flow sensor.**

(1) Before inspection, clean the air cleaner element or replace with a new one. Prepare a new air flow sensor aside from the one mounted to the vehicle.
(2) Mount the HINO-DX.
(3) Measure the intake air volume at NMR (see the following) by using the "air flow sensor mounted to the vehicle" in accordance with "measurement of intake air volume" of the HINO-DX.... (A)

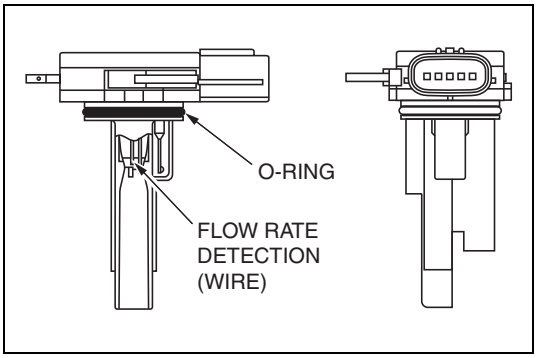
NOTICE
NMR (No Load Maximum Revolution)

(4) Warm up the engine fully first. After confirming the safety of surroundings, depress the accelerator fully with the engine at idle to stabilize the revolution. (Keep depressing down on the accelerator.)
Read the "engine revolution (r/min.)" and "intake air volume (g/sec)" from the computer screen.
(5) Stop the engine and put the starter key at the LOCK position. Separate the air flow sensor connector and remove the air flow sensor from the intake pipe.
(6) After mounting the prepared new air flow sensor, connect the connector securely.
(7) By using the new air flow sensor, measure the intake air volume as in the step (3) above.... (B)



SHTS021270800049

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SHTS021270800050

(8) Judgment of presence or absence of deteriorated characteristics of the air flow sensor
   a. If the detected air flow rate of the air flow sensor mounted to the vehicle shows a decrease by 10% or more in comparison with that of a new air flow sensor (See the following for the calculating formula), the air flow sensor mounted to the vehicle is deteriorated. Restore the vehicle with a new air flow sensor mounted before finishing the inspection.
   Calculation formula: {(B)-(A)}/(B) × 100 >10
   b. If the both air flow sensors show an equal flow rate, the air flow sensor mounted to the vehicle functions normally. Mount the original air flow sensor again before finishing the inspection.

Tightening Torque:
0.56-0.82 N·m {5.8-8.3 kgf·cm, 0.42-0.60 lbf·ft}

⚠ CAUTION

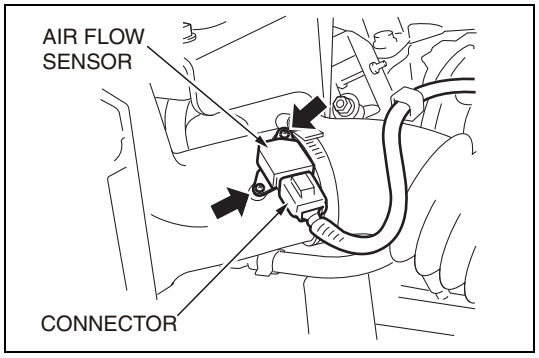
- **The flow rate detecting element (wire) is processed with extreme ingenuity. Do not directly touch the detecting element (wire) to prevent breakage.**
- **Do not apply excessive torque to the air flow sensor mounting screw (M 3.5) when tightening it.**

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REPLACEMENT

EN01F02114080402009003

REMOVING THE AIR FLOW SENSOR



SHTS021270800051

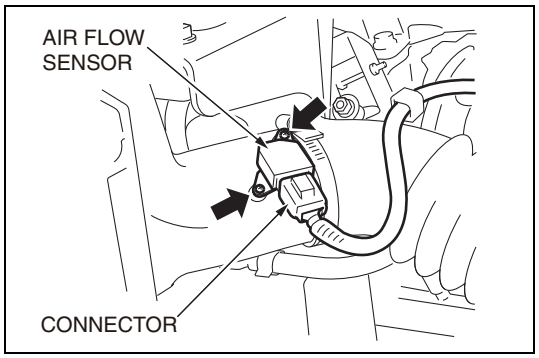
1. DISCONNECTING THE HARNESS

(1) Disconnect the connector connected to the air flow sensor.

2. Removing the air flow sensor

(1) Unfasten the screws (2 pcs.) securing the air flow sensor, and remove it.

MOUNTING THE AIR FLOW SENSOR



SHTS021270800052

1. MOUNTING THE AIR FLOW SENSOR

(1) Make sure that the O-ring is attached to the air flow sensor, and mount the air flow sensor with screws (2 pcs.).
Tightening Torque:
0.56-0.82 N·m {5.8-8.3 kgf·cm, 0.42-0.60 lbf·ft}

⚠ CAUTION
Do not apply excessive torque to the air flow sensor mounting screw (M 3.5) when tightening it.

2. CONNECTING THE HARNESS

(1) Connect the connector to the air flow sensor.

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ENGINE MECHANICAL (J05E)

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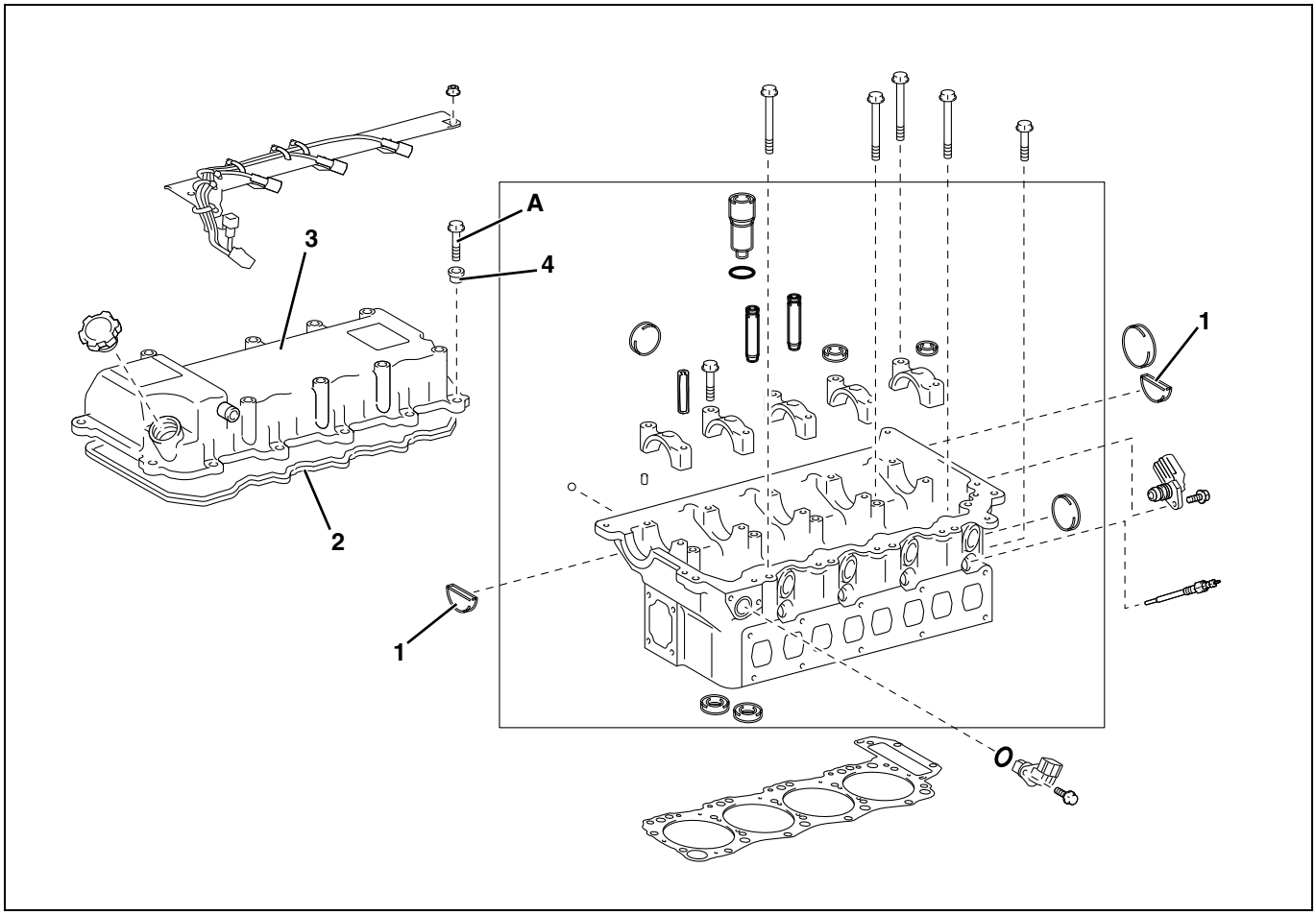
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COMPONENT LOCATOR 10-132
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HEAD COVER

COMPONENT LOCATOR

EN01F02127090402013001



SHTS021270900001

1	Half-round plugs	3	Head cover
2	Head cover gasket *	4	Silent block

*: Nonreusable part

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	28.5 {291, 21}		

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REPLACEMENT

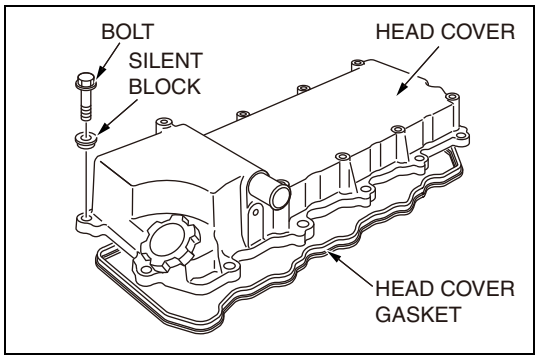
EN01F02127090402013002

REMOVING THE HEAD COVER

1. REMOVING THE CLOSED VENTILATOR HOSE
Reference: EMISSION CONTROL (J05E), CLOSED VENTILATOR, REPLACEMENT, REMOVING THE CLOSED VENTILATOR (Page 8-14)

2. DISCONNECTING THE HARNESS
(1) Disconnect the connector, then detach the harness from top of the cylinder head.

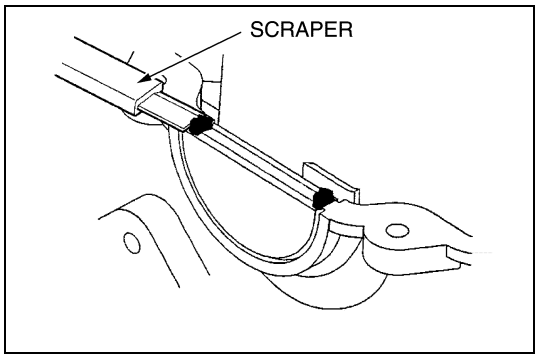
3. REMOVING THE HEAD COVER
(1) Unfasten the 13 bolts to remove 13 silent blocks and a head cover.
(2) Remove the head cover gasket from the head cover.



SHTS021270900002

(3) If oil leak is found from the half-round plug, remove the half-round plugs at the cylinder head front and rear ends (2 pcs.).

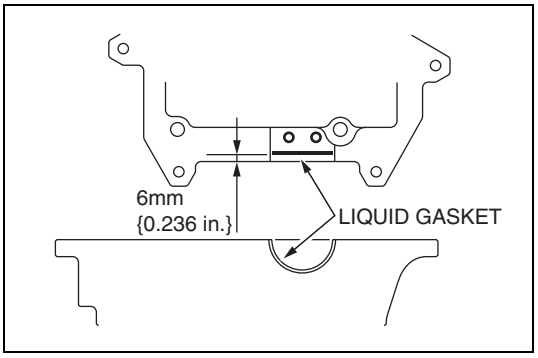
⚠ CAUTION
Do not remove the half-round plugs unless oil leak is found.



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MOUNTING THE HEAD COVER



SHTS021270900004

1. MOUNTING THE HALF-ROUND PLUG (ONLY IF THE HALF-ROUND PLUG IS REMOVED)

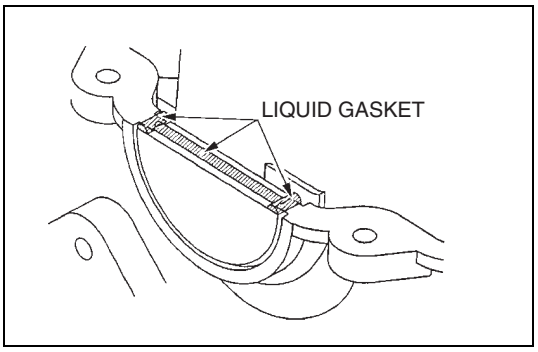
(1) Remove the all oil and dirt on the half-round plug and cylinder head.

(2) Apply liquid gasket (ThreeBond TB1207B: Black or equivalent or ThreeBond TB1217G: Gray or equivalent) to the half-round areas at the cylinder head front and rear ends as shown in the figure.

⚠ CAUTION

- **Apply the liquid gasket with 1.5-2.5 mm {0.0590-0.0984 in.} width.**
- **Apply the liquid gasket seamlessly.**
- **Mount the case within 20 minutes after applying the liquid gasket.**

(3) Mount the new half-round plug to the upper side of the cylinder head parallel and ensure that the plug comes in contact with the head at the bottom.

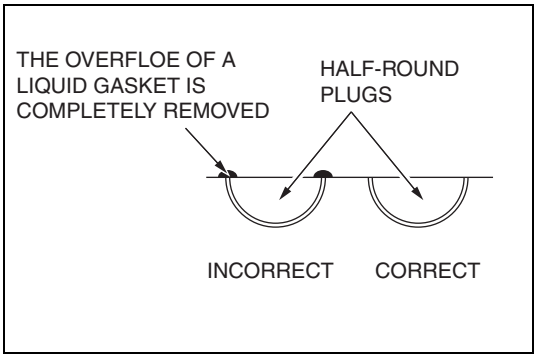


SHTS021270900005

(4) After mounting the half-round plug, wipe out the liquid gasket that swells out of the upper surface of the cylinder head immediately.

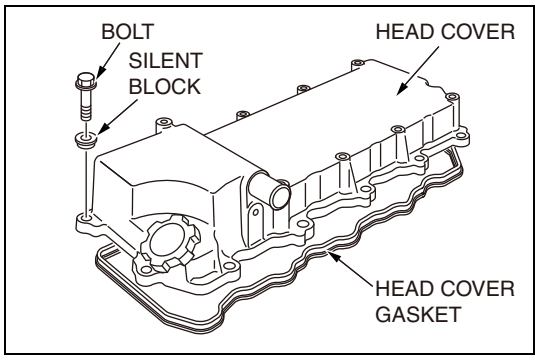
⚠ CAUTION

Do not pry or tilt the half-round plug.



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SHTS021270900007

2. MOUNTING THE HEAD COVER

(1) Remove the dirt (including the liquid gasket) or oil on the joint surface of the head cover and cylinder head.

(2) Mount the new head cover gasket to the head cover groove.

(3) Set the head cover to the cylinder head mounting position and mount it with 13 bolts through the silent block.

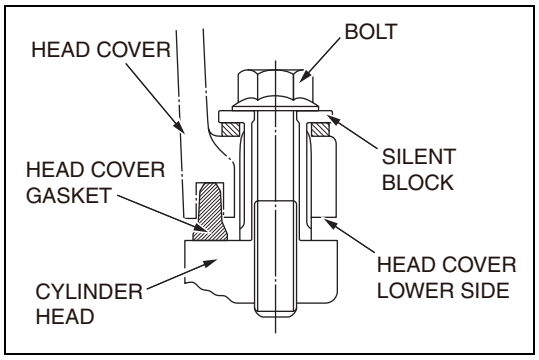
Tightening Torque:
28.5 N·m {291 kgf·cm, 21 lbf·ft}

⚠ CAUTION

- **The head cover has a floating mount structure. Do not tighten the bolts too tight.**
- **To avoid interference or contact with harnesses, harness brackets, and other cylinder head inner parts, carefully mount the head cover without applying excessive force.**
- **Wait at least 15 minutes after assembly before start of driving.**

(4) Remove the swollen liquid gasket completely.

NOTICE
Rubber spacers are attached to the silent block.



SHTS021270900008

3. CONNECTING THE HARNESS

(1) Mount the harness to the cylinder head, then connect the connector.

4. MOUNTING THE CLOSED VENTILATOR HOSE

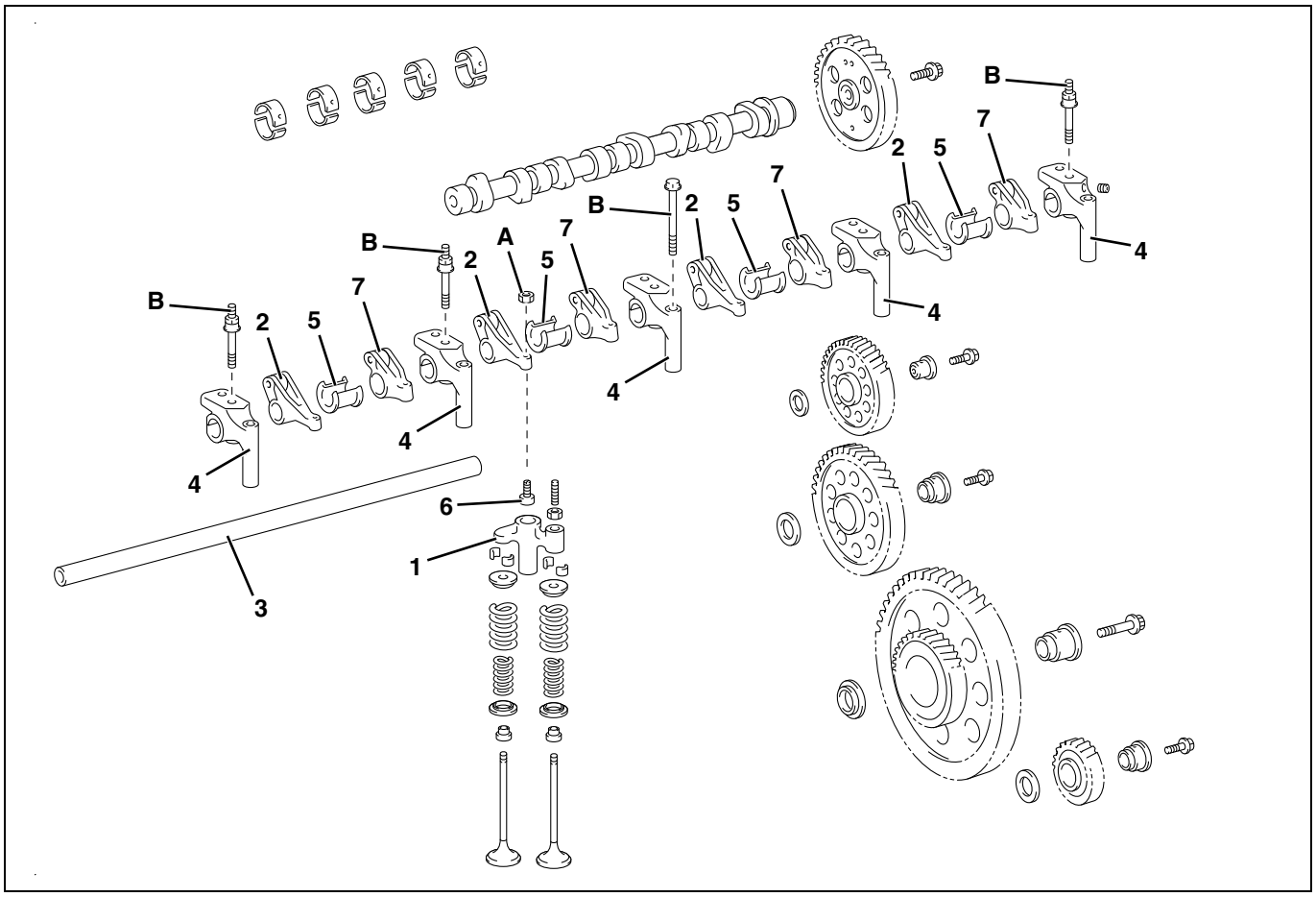
Reference: EMISSION CONTROL (J05E), CLOSED VENTILATOR, REPLACEMENT, MOUNTING THE CLOSED VENTILATOR (Page 8-16)

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ROCKER ARM ASSEMBLY

COMPONENT LOCATOR

EN01F02127090402014001



SHTS021270900009

1	Crosshead	5	Spacer
2	Rocker arm (intake)	6	Adjust screw
3	Rocker arm shaft	7	Rocker arm (exhaust)
4	Rocker support		

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	25 {255, 18}	B	36 {367, 27}

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OVERHAUL

EN01F02127090402014002

REMOVING THE ROCKER ARM ASSEMBLY

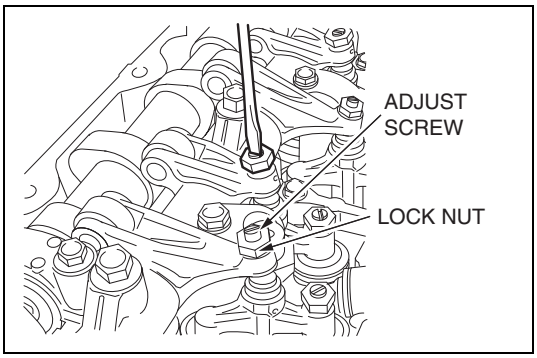
1. REMOVING THE HEAD COVER
Reference: ENGINE MECHANICAL (J05E), HEAD COVER, REPLACEMENT, REMOVING THE HEAD COVER (Page 10-3)

2. REMOVING THE INJECTOR HARNESS
Reference: FUEL SYSTEM (J05E), INJECTOR, REPLACEMENT, REMOVING THE INJECTOR (Page 7-37)

3. REMOVING THE ROCKER ARM ASSEMBLY

(1) Loosen the lock nut to wind up the adjust screw completely.

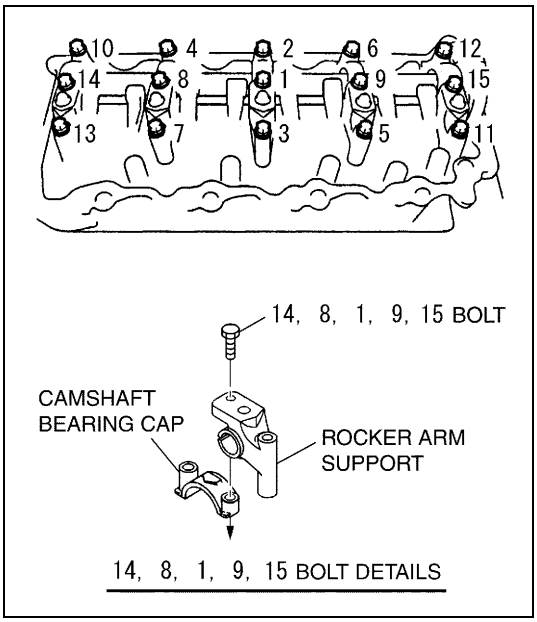
⚠ CAUTION
Remove the adjust screw without winding may cause the rocker arm shaft to bend.



SHTS021270900010

(2) Gradually loosen the rocker arm support bolts and camshaft bearing cap mounting bolts from the center to remove the rocker arm and camshaft.

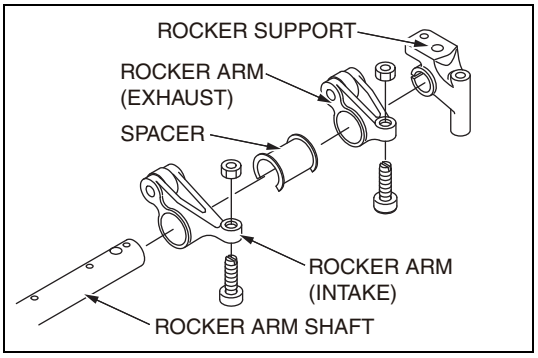
NOTICE
The camshaft bearing caps and rocker arm supports are jointly fastened with the bolts 14, 8, 1, 9, 15.



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DISASSEMBLING THE ROCKER ARM ASSEMBLY

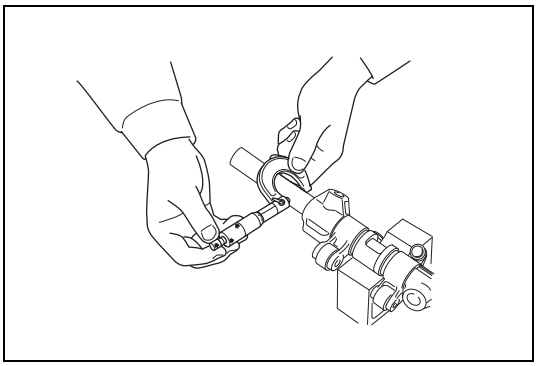


SHTS021270900012

1. REMOVING THE ROCKER ARM

(1) Remove the rocker support, rocker arm (exhaust), spacer and rocker arm (intake) in the sequential order from the rocker arm shaft.

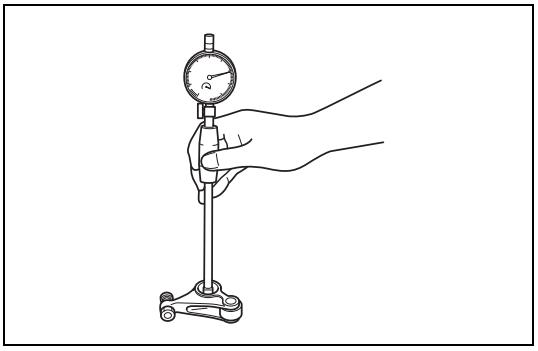
INSPECTING THE COMPONENTS


SHTS021270900013

1. OIL CLEARANCE INSPECTION OF THE ROCKER ARM SHAFT AND ROCKER ARM

(1) Use the micrometer to measure the outer diameter of the rocker arm shaft.

Standard value (mm {in.})	Permissible limit (mm {in.})
22 {0.866}	21.92 {0.863}


SHTS021270900014

(2) Use the cylinder gauge to measure the inner diameter of the rocker arm bush.

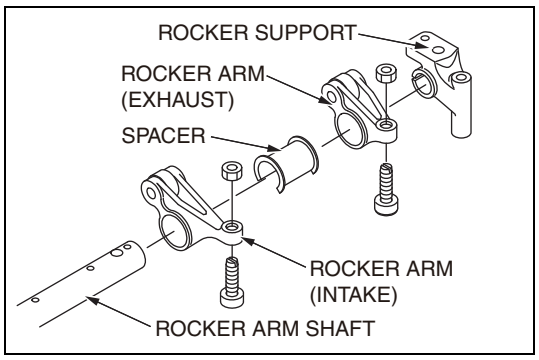
Standard value (mm {in.})	Permissible limit (mm {in.})
22 {0.866}	22.08 {0.869}

(3) Calculate the gap between the outer diameter of the rocker arm shaft and the inner diameter of the rocker arm bush. If a calculated value exceeds the permissible limit, replace the rocker arm shaft or rocker arm bush.

Standard value (mm {in.})	Permissible limit (mm {in.})
0.030-0.101 {0.0012-0.0040}	0.15 {0.0059}

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ASSEMBLING THE ROCKER ARM ASSEMBLY



SHTS021270900015

1. MOUNTING THE ROCKER ARM

(1) Apply engine oil to the rocker arm shaft and the inner surfaces of the rocker support, rocker arm (exhaust), spacer and rocker arm (intake).

(2) Insert and install the rocker support, rocker arm (exhaust), spacer and rocker arm (intake) to the rocker arm shaft.

MOUNTING THE ROCKER ARM ASSEMBLY

1. PRIOR CHECK

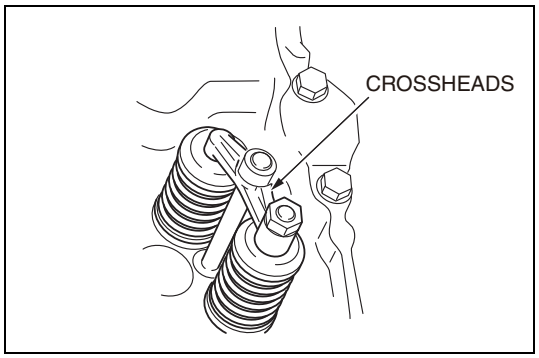
(1) Check that crossheads are properly seated on (or over) individual valves.

⚠ CAUTION

Off-position of the crossheads on individual valves will cause the upper seat to lift, resulting in valve dislodgement.

NOTICE

To check whether the crossheads are properly seated in place, manually move each crosshead to right and left to aurally check a clicking sound.

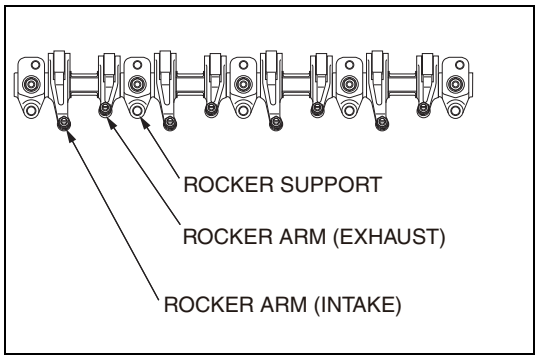


SHTS021270900016

(2) Check that the rocker arms are properly assembled to the rocker arm shaft.

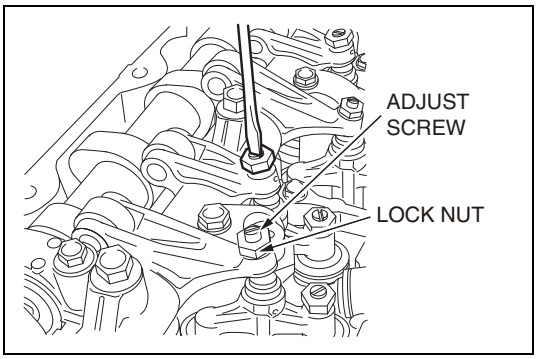
⚠ CAUTION

Apply engine oil to the contact surface of each part before assembly.



SHTS021270900017

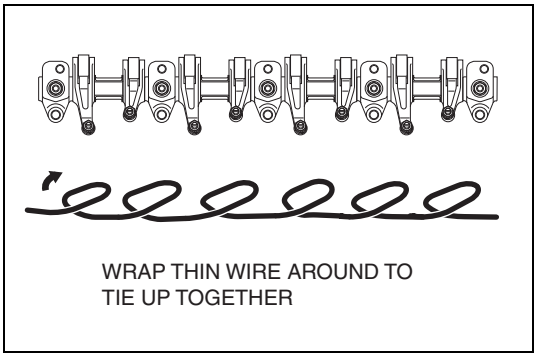
https://truckmanualshub.com/



SHTS021270900018

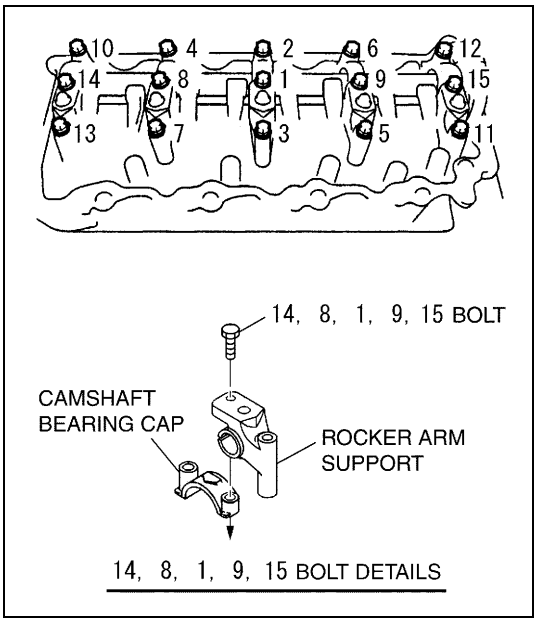
(3) Check that the adjust screw of the rocker arm is wound up.

⚠ CAUTION
Failure to wind up the adjust screw may cause the shaft to bend when tightening the rocker support bolt.



SHTS021270900019

NOTICE
To facilitate this work step, use a piece of flexible wire of approximately 0.8 mm {0.0315 in.} in diameter to bind rocker arms together for intake and exhaust respectively.



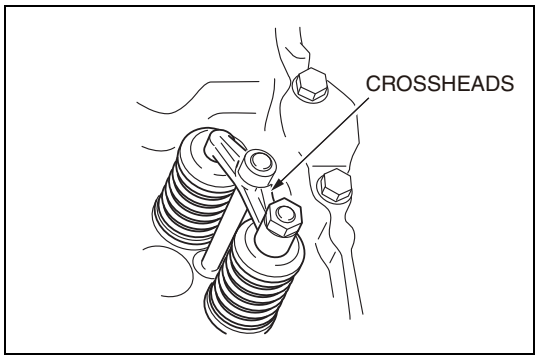
SHTS021270900020

2. MOUNTING THE ROCKER ARM ASSEMBLY

(1) Apply engine oil to the cam ridge and set the rocker arm and rocker arm shaft on the crosshead properly. Gradually tighten the bolts in the order as shown in the figure.
Tightening Torque:
36 N·m {367 kgf·cm, 27 lbf·ft}

⚠ CAUTION
After tightening, check that the rocker arms move smoothly.

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SHTS021270900021

(2) Check the crossheads for dislodgement or off-position.

(3) Adjust the valve clearance.
Reference: ENGINE MECHANICAL (J05E), ROCKER ARM ASSEMBLY, OVERHAUL, ADJUSTING THE VALVE CLEARANCE (Page 10-12)

3. MOUNTING THE INJECTOR HARNESS
Reference: FUEL SYSTEM (J05E), INJECTOR, REPLACEMENT, MOUNTING THE INJECTOR (Page 7-41)

4. MOUNTING THE HEAD COVER
Reference: ENGINE MECHANICAL (J05E), HEAD COVER, REPLACEMENT, MOUNTING THE HEAD COVER (Page 10-4)

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ADJUSTING THE VALVE CLEARANCE

1. CAUTIONS

⚠ CAUTION

- **Before adjustment, make sure that the tightening bolts of the rocker arm support, nozzle clamp, cylinder head, and camshaft bearing cap are tightened with the specified torque.**
- **Make sure that there is no dirt in the crosshead and valve stem head.**

2. VALVE CLEARANCE ADJUSTMENT

(1) Turn the crankshaft forward to align the cylinder for adjustment with the compression stroke top dead center.

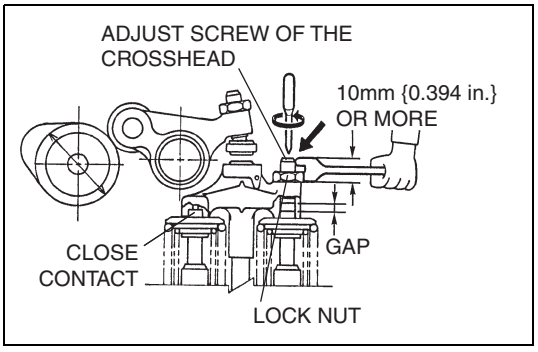
⚠ CAUTION

Check that the rocker arm to be adjusted is not lifted to the cam of the camshaft.

NOTICE

If the No.1 cylinder is at the compression stroke top dead center, you can adjust the valve clearance with a mark on the table. If the No.4 cylinder is at the compression stroke top dead center, the cylinder with mark can be adjusted.

Cylinder number	1		2		3		4	
Valve arrangement	Intake	Exhaust	Intake	Exhaust	Intake	Exhaust	Intake	Exhaust
No.1 cylinder at the compression stroke top dead center	○	○	○			○		
No.4 cylinder at the compression stroke top dead center				Δ	Δ		Δ	Δ



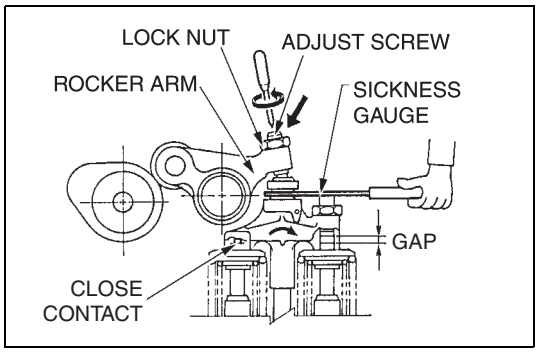
SHTS021270900022

(2) Fully loosen the adjust screw and lock nut of the crosshead.

⚠ CAUTION

Make the adjust screw projecting beyond the upper surface of the crosshead by at least 10mm {0.394 in.}. Correct adjustment cannot be made unless the adjust screw is completely separated from the valve stem.

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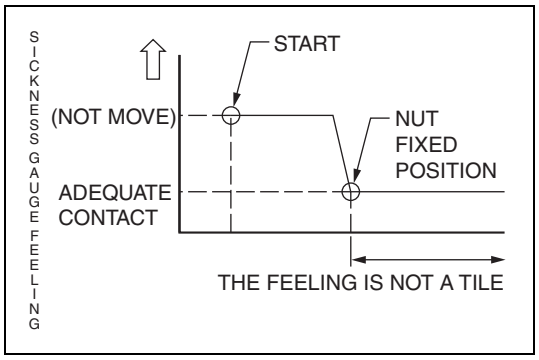


SHTS021270900023

(3) Insert the thickness gauge in between the rocker arm and the crosshead and turn the rocker arm adjust screw to adjust a clearance before tightening the lock nut.
Tightening Torque:
25 N·m {255 kgf·cm, 18 lbf·ft}

NOTICE
It is deemed appropriate if the thickness gauge goes in with some unsmoothness during insertion and then moves smoothly with slight binding feel after insertion.

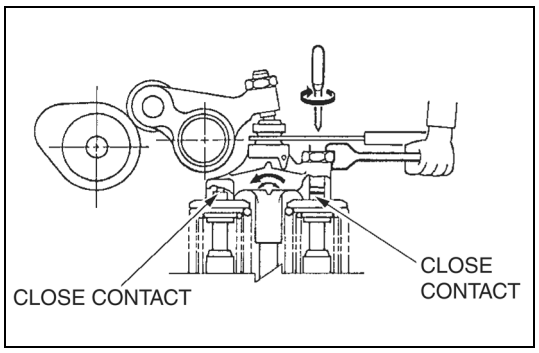
Standard value (During cooling)	**Intake**	**0.30 mm {0.0118 in.}**
	Exhaust	**0.45 mm {0.0177 in.}**



SHTS021270900024

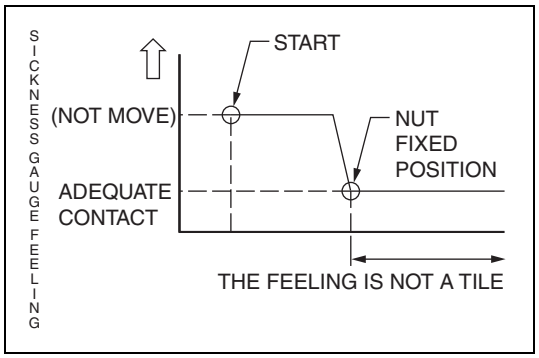
(4) With the thickness gauge inserted, loosen the adjust screw of the crosshead and check that you do not feel the thickness gauge light.

⚠ CAUTION
If you feel it light, repeat the procedure.



SHTS021270900025

(5) Tighten the adjust screw of the crosshead until the thickness gauge does not move.



SHTS021270900026

(6) While gradually loosening the adjust screw of the crosshead, tighten the lock nut of the crosshead at a position where your feel of the thickness gauge becomes proper.
Tightening Torque:
25 N·m {255 kgf·cm, 18 lbf·ft}

⚠ CAUTION
Do not loosen the adjust screw too much. Excessive loosening of the adjust screw will set the condition back to the original state. Sensory detection with the thickness gauge may be proper but there will be an excessive gap between the crosshead adjust screw and the valve, which will obstruct proper adjustment.

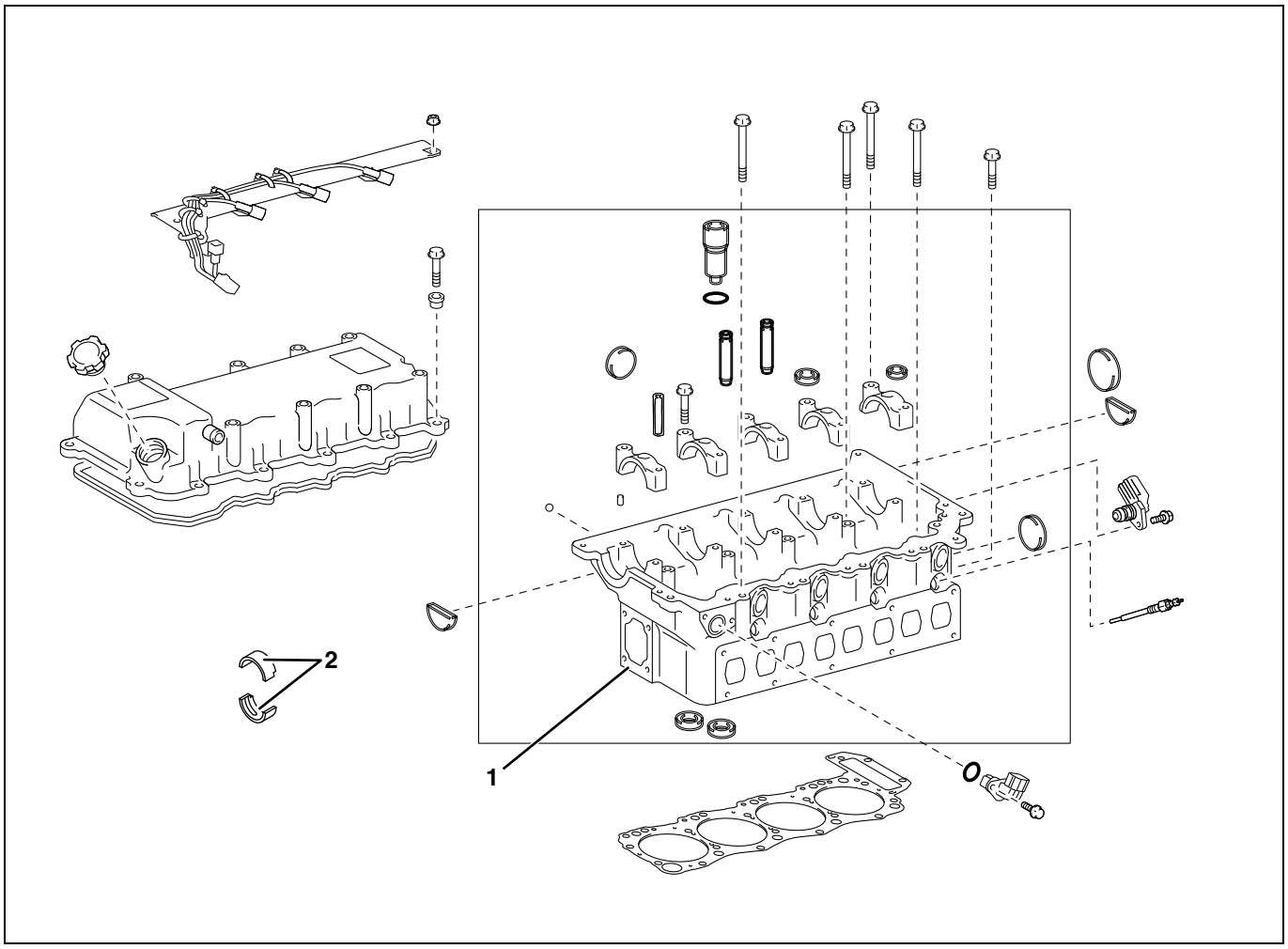
NOTICE
It is deemed appropriate if the thickness gauge goes in with some unsmoothness during insertion and then moves smoothly with slight binding feel after insertion.

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CAMSHAFT ASSEMBLY

COMPONENT LOCATOR

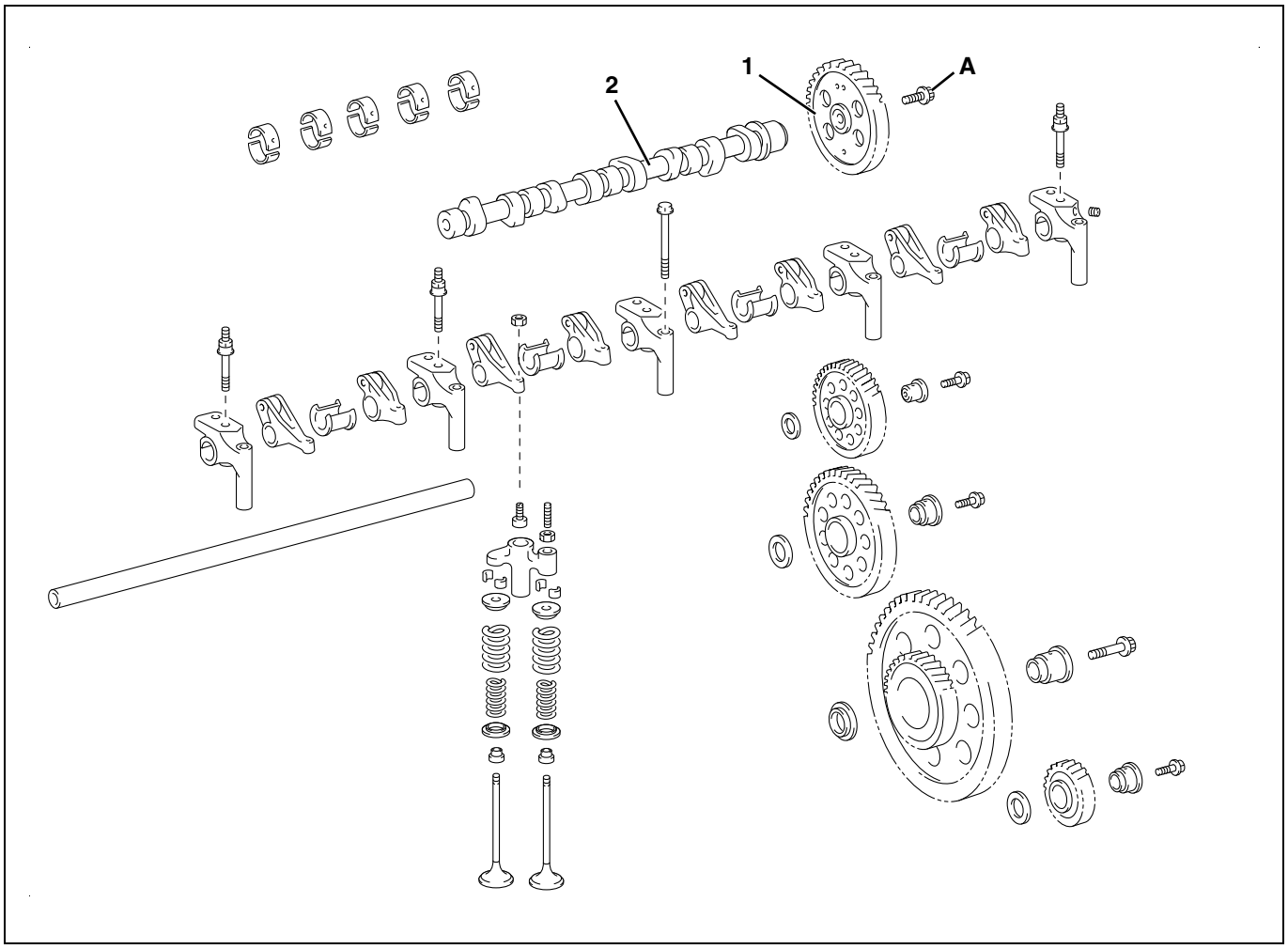
EN01F02127090402015001



SHTS021270900027

1	Cylinder head	2	Camshaft bearings

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SHTS021270900028

1 Camshaft drive gear	**2 Camshaft**

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A 59 {602, 44}	

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OVERHAUL

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REMOVING THE CAMSHAFT ASSEMBLY

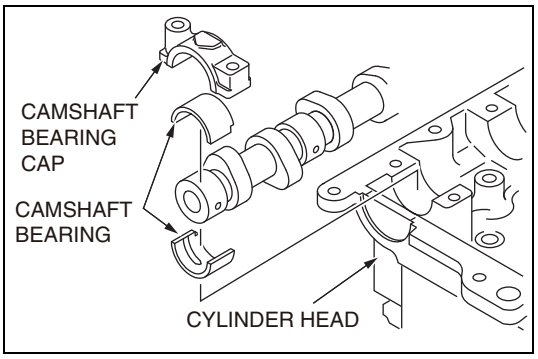
1. REMOVING THE HEAD COVER
Reference: ENGINE MECHANICAL (J05E), HEAD COVER, REPLACEMENT, REMOVING THE HEAD COVER (Page 10-3)

2. REMOVING THE INJECTOR HARNESS
Reference: FUEL SYSTEM (J05E), INJECTOR, REPLACEMENT, REMOVING THE INJECTOR (Page 7-37)

3. REMOVING THE ROCKER ARM ASSEMBLY
(1) Loosen the lock nut and wind up the adjust screw completely to remove the rocker arm assembly.
Reference: ENGINE MECHANICAL (J05E), ROCKER ARM ASSEMBLY, OVERHAUL, REMOVING THE ROCKER ARM ASSEMBLY (Page 10-7)

4. REMOVING THE
(1) Remove the camshaft bearing from the camshaft bearing cap and cylinder head.

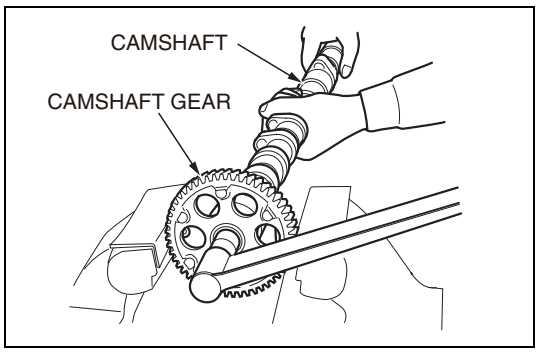
NOTICE
Push either of camshaft bearing halves with a finger will facilitate this removal work.



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DISASSEMBLING THE CAMSHAFT ASSEMBLY



SHTS021270900030

1. REMOVING THE CAMSHAFT DRIVE GEAR

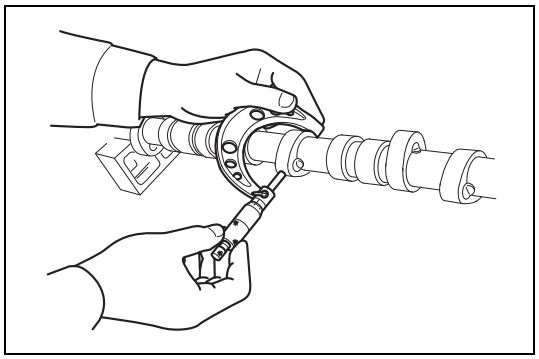
(1) Use the vise to fix the camshaft drive gear.

⚠ CAUTION

Be careful that the gear is free from deformation, dent or damage during work.

(2) Unbolt and remove the camshaft drive gear from the camshaft.

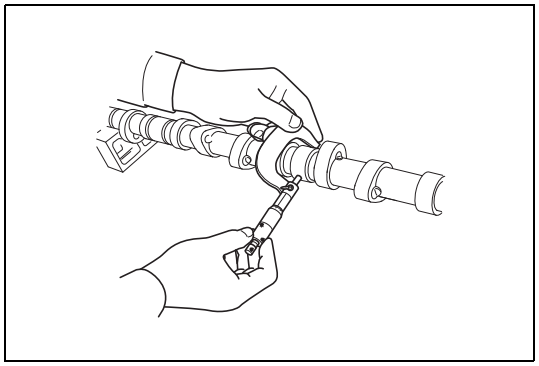
INSPECTING THE COMPONENTS


SHTS021270900031

1. INSPECTING THE CAMSHAFT CAM HEIGHT

(1) Use the micrometer to measure the cam height. If the value exceeds the permissible limit, replace the camshaft.

Measured item		Standard value (mm {in.})	Permissible limit (mm {in.})
Cam height	Intake	50.067 {1.971}	49.987 {1.968}
	Exhaust	52.104 {2.051}	52.024 {2.048}
Cam lift	Intake	8.067 {0.318}	(7.987 {0.3144})
	Exhaust	10.104 {0.398}	(10.024 {0.395})

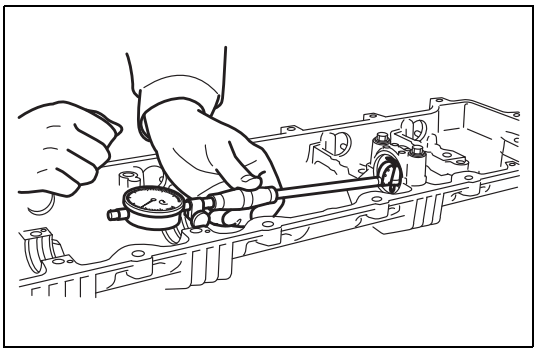

SHTS021270900032

2. INSPECTING THE CAMSHAFT BEARING OIL CLEARANCE

(1) Use the micrometer to measure the outer diameter of the camshaft journal.

Standard value (mm {in.})	Permissible limit (mm {in.})
40 {1.575}	39.85 {1.569}

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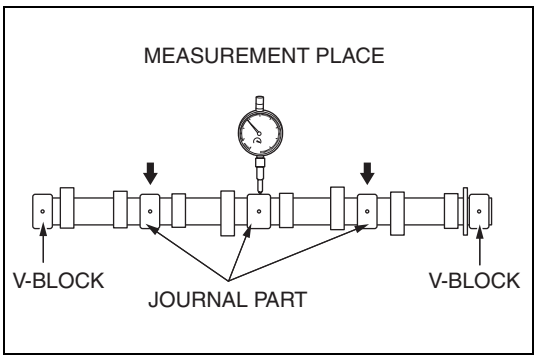
SHTS021270900033

(2) Set the camshaft bearing cap with the camshaft bearing to the cylinder head and tighten them with the specified torque.
(3) Use the cylinder gauge to measure the inner diameter of the camshaft bearing.

Standard value (mm {in.})	Permissible limit (mm {in.})
40 {1.575}	40.15 {1.581}

(4) Calculate the difference between the camshaft journal outer diameter and the camshaft bearing inner diameter. If the value exceeds the standard value, replace the camshaft or camshaft bearing.

Standard value (mm {in.})	0.020-0.063 {0.0008-0.0025}



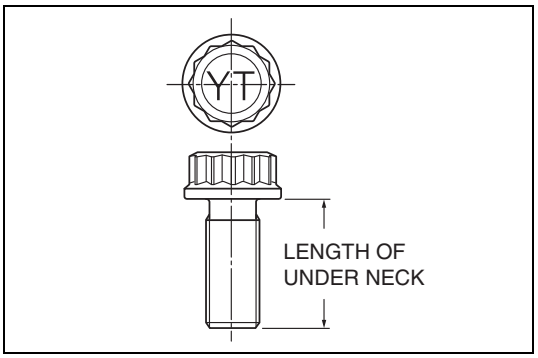
SHTS021270900034

3. INSPECTING THE CAMSHAFT RUNOUT
(1) Place the journals at the both ends of the camshaft on the V-block.
(2) Place the dial gauge on the journals of the camshaft to measure the runout of the camshaft. If the value exceeds the permissible limit, replace the camshaft.

Standard value (mm {in.})	Permissible limit (mm {in.})
0.04 {0.0016}	0.1 {0.0039}

4. INSPECTING THE CAMSHAFT END PLAY
(1) Use the dial gauge to measure end play of the camshaft.
Reference: ENGINE MECHANICAL (J05E), CAMSHAFT ASSEMBLY, OVERHAUL, INSPECTING THE COMPONENTS (Page 10-17)

5. INSPECTING FOR BACKLASH BETWEEN THE CAMSHAFT DRIVE GEAR AND CAM IDLE GEAR
(1) Use the dial gauge to measure the backlash between the camshaft drive gear and cam idle gear.
Reference: ENGINE MECHANICAL (J05E), TIMING GEAR & CAM IDLE GEAR, OVERHAUL, INSPECTING THE COMPONENTS (Page 10-73)



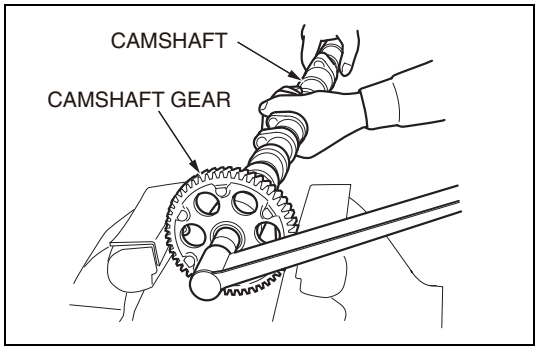
SHTS021270900035

6. INSPECTING CAMSHAFT DRIVE GEAR MOUNTING BOLT
(1) Use the vernier calipers to measure an under head length of a camshaft drive gear mounting bolt. If a measurement reading exceeds the permissible limit, replace the bolt.

Standard value (mm {in.})	Permissible limit (mm {in.})
30.0 {1.181}	30.5 {1.201}

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ASSEMBLING THE CAMSHAFT ASSEMBLY



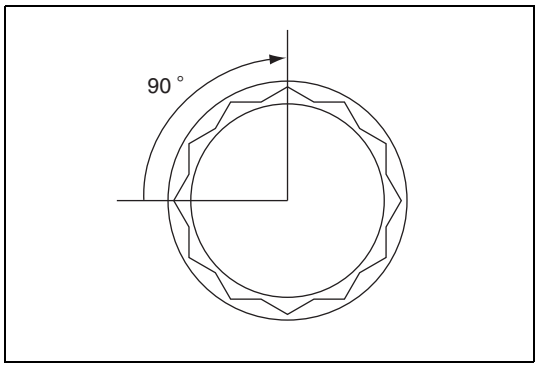
SHTS021270900036

1. MOUNTING THE CAMSHAFT DRIVE GEAR

(1) Use the vise to fix the camshaft drive gear. Apply engine oil to the seat surface and bolt of the camshaft drive gear mounting bolt.

⚠ CAUTION
Be careful that the gear is free from deformation, dent or damage during work.

(2) Align the dowel pin with the camshaft and camshaft drive gear and tighten the camshaft drive gear mounting bolt.
Tightening Torque:
59 N·m {602 kgf·cm, 44 lbf·ft}



SHTS021270900037

(3) Retighten the bolt by another 90° (1/4 turns).

⚠ CAUTION
- **Do not loosen the bolt even if it is overtightened.**
- **Be careful that the gear is free from deformation, dent or damage during work.**

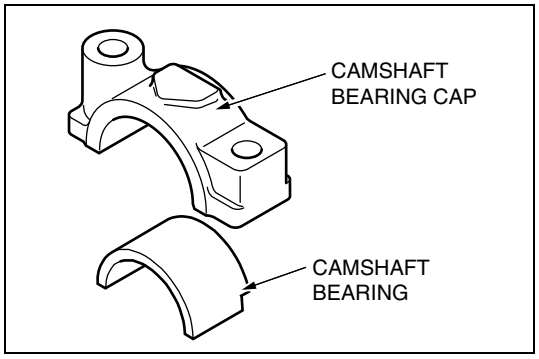
MOUNTING THE CAMSHAFT ASSEMBLY

1. SETTING THE COMPRESSION STROKE TOP DEAD CENTER OF No.1 CYLINDER

(1) Set the No.1 cylinder at the compression stroke top dead center.
Reference: FUEL SYSTEM (J05E), SUPPLY PUMP, REPLACEMENT, MOUNTING THE SUPPLY PUMP (Page 7-33)

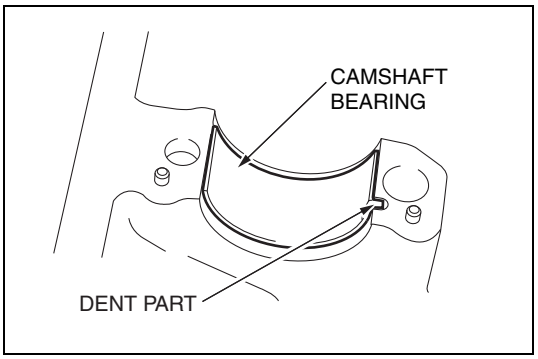
2. MOUNTING THE CAMSHAFT BEARING

(1) Mount the camshaft bearing by aligning with the concave of the camshaft bearing cap and apply engine oil.



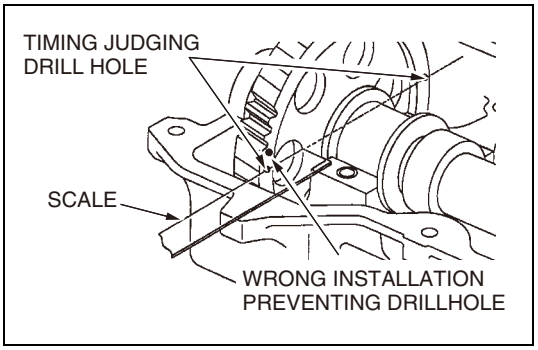
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(2) Mount the camshaft bearing by aligning with the cylinder head concave and apply engine oil.



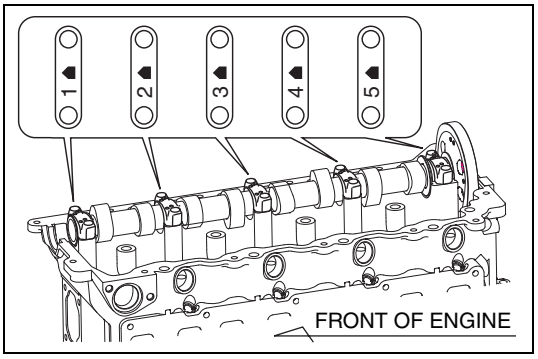
SHTS021270900040

3. MOUNTING THE CAMSHAFT

(1) Place the camshaft assembly in a way that the 2 drill holes positioned at 180° (timing judging drill holes) out of the 3 holes of the camshaft gear are kept level to the cylinder head upper surface.

⚠ CAUTION

Set the clear plastic scale or edged scale against the upper surface of the cylinder head and the side of the camshaft gear. Check that the wrong mounting preventing drill hole is located above the scale.



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(2) Place the camshaft bearing caps in a way that the marks face to the engine front side and the engraved numbers are positioned in the order of 1-5 from front to back.
Tightening Torque:
36 N·m {367 kgf·cm, 27 lbf·ft}

(3) Check that the end play of the camshaft is within the standard value.
Reference: ENGINE MECHANICAL (J05E), TIMING GEAR & CAM IDLE GEAR, OVERHAUL, INSPECTING INSTALLATION OF EACH GEAR (Page 10-80)

4. MOUNTING THE ROCKER ARM ASSEMBLY

(1) Loosen the lock nut and wind up the adjust screw completely, mounting the rocker arm assembly.
Reference: ENGINE MECHANICAL (J05E), ROCKER ARM ASSEMBLY, OVERHAUL, MOUNTING THE ROCKER ARM ASSEMBLY (Page 10-9)

5. MOUNTING THE INJECTOR HARNESS
Reference: FUEL SYSTEM (J05E), INJECTOR, REPLACEMENT, MOUNTING THE INJECTOR (Page 7-41)

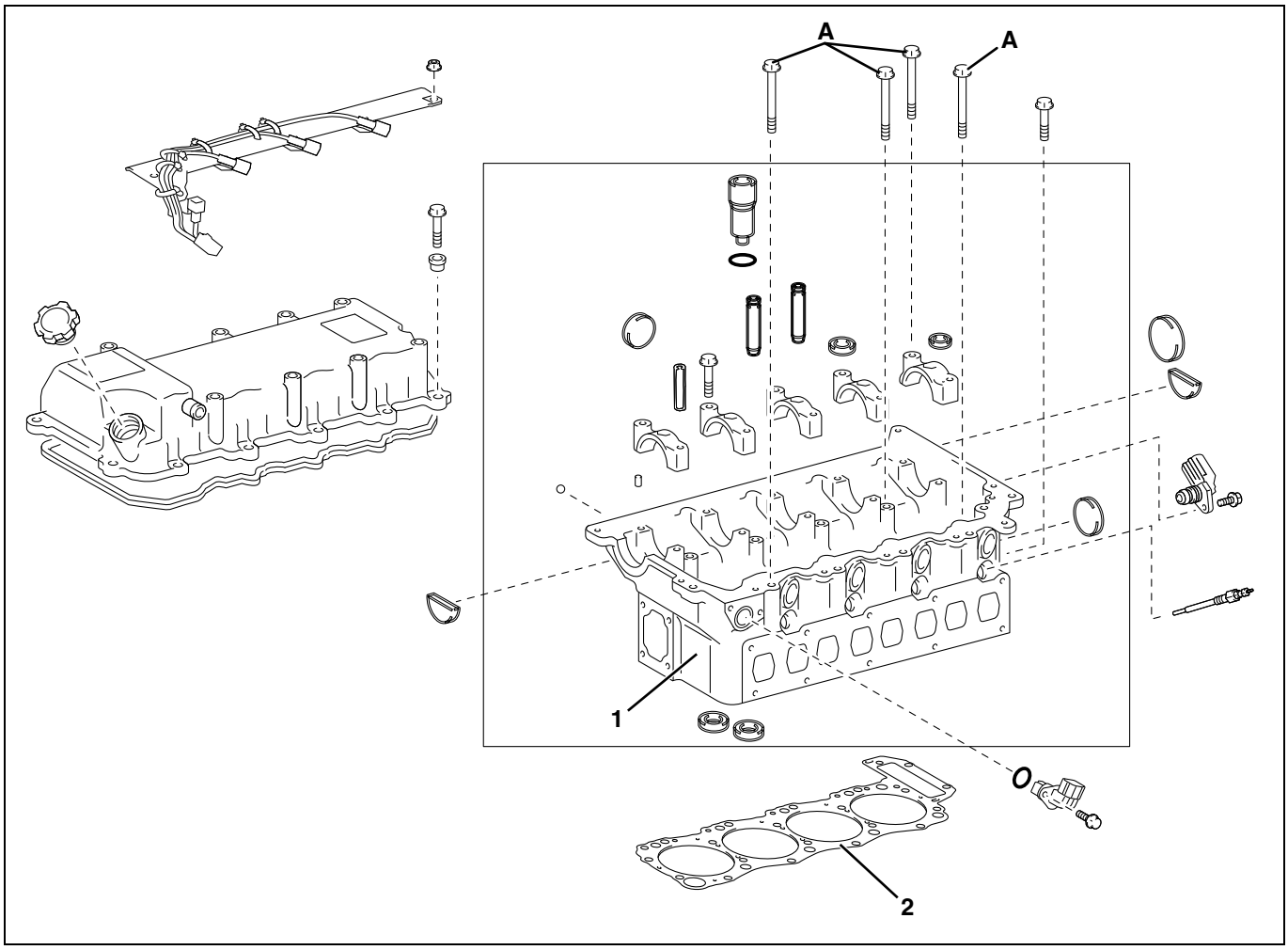
6. MOUNTING THE HEAD COVER
Reference: ENGINE MECHANICAL (J05E), HEAD COVER, REPLACEMENT, MOUNTING THE HEAD COVER (Page 10-4)

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CYLINDER HEAD ASSEMBLY

COMPONENT LOCATOR

EN01F02127090402016001



SHTS021270900042

1 Cylinder head	2 Gasket *

*: Nonreusable part

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A 59 {602, 44}	

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REPLACEMENT

EN01F02127090402016002

REMOVING PERIPHERAL PARTS AROUND THE CYLINDER HEAD ASSEMBLY

1. **REMOVING THE CLOSED VENTILATOR HOSE**
   Reference: EMISSION CONTROL (J05E), CLOSED VENTILATOR, REPLACEMENT, REMOVING THE CLOSED VENTILATOR (Page 8-14)

2. **DISCONNECTING THE HARNESS**

3. **REMOVING THE INTAKE PIPE (EXHAUST SIDE)**
   Reference: INTAKE (J05E), INTAKE PIPE (EXHAUST SIDE), REPLACEMENT, REMOVING THE INTAKE PIPE (EXHAUST SIDE) (Page 9-12)

4. **REMOVING THE EXHAUST PIPE (ATC)**
   Reference: EXHAUST (J05E), EXHAUST PIPE (ATC), REPLACEMENT, REMOVING THE EXHAUST PIPE (ATC) (Page 11-17)

5. **REMOVING THE TURBOCHARGER ASSEMBLY**
   Reference: TURBOCHARGER (J05E), TURBOCHARGER ASSEMBLY, REPLACEMENT, REMOVING THE TURBOCHARGER ASSEMBLY (Page 17-5)

6. **REMOVING THE EXHAUST MANIFOLD**
   Reference: EXHAUST (J05E), EXHAUST MANIFOLD, REPLACEMENT, REMOVING THE EXHAUST MANIFOLD (Page 11-4)

7. **REMOVING THE EGR VALVE AND COOLER**
   Reference: EMISSION CONTROL (J05E), EGR VALVE & COOLER, REPLACEMENT, REMOVING THE EGR VALVE & COOLER (Page 8-3)

8. **REMOVING THERMOSTAT CASE AND THERMOSTAT**
   Reference: COOLING (J05E), THERMOSTAT CASE AND THERMOSTAT, OVERHAUL, REMOVING THERMOSTAT CASE & THERMOSTAT (Page 12-24)

9. **REMOVING THE FUEL FILTER CASE**
   Reference: FUEL SYSTEM (J05E), FUEL FILTER AND CASE (ENGINE SIDE), REPLACEMENT, REMOVING THE FUEL FILTER (Page 7-19)

10. **REMOVING THE SUPPLY PUMP**
    Reference: FUEL SYSTEM (J05E), SUPPLY PUMP, REPLACEMENT, REMOVING THE SUPPLY PUMP (Page 7-28)

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11. REMOVING THE COMMON RAIL
Reference: FUEL SYSTEM (J05E), COMMON RAIL, REPLACEMENT, REMOVING THE COMMON RAIL (Page 7-48)

12. REMOVING THE GLOW PLUG
Reference: ENGINE MECHANICAL (J05E), GLOW PLUG, REPLACEMENT, REMOVING THE GLOW PLUG (Page 10-129)

13. REMOVING THE INTAKE MANIFOLD
Reference: INTAKE (J05E), INTAKE MANIFOLD, REPLACEMENT, REMOVING THE INTAKE MANIFOLD (Page 9-3)

REMOVING THE CYLINDER HEAD ASSEMBLY

1. REMOVING THE HEAD COVER
Reference: ENGINE MECHANICAL (J05E), HEAD COVER, REPLACEMENT, REMOVING THE HEAD COVER (Page 10-3)

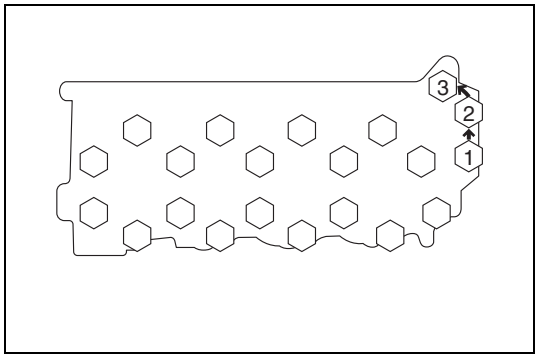
2. REMOVING THE INJECTOR HARNESS
Reference: FUEL SYSTEM (J05E), INJECTOR, REPLACEMENT, REMOVING THE INJECTOR (Page 7-37)

3. REMOVING THE ROCKER ARM ASSEMBLY
Reference: ENGINE MECHANICAL (J05E), ROCKER ARM ASSEMBLY, OVERHAUL, REMOVING THE ROCKER ARM ASSEMBLY (Page 10-7)

4. REMOVING THE CAMSHAFT ASSEMBLY
Reference: ENGINE MECHANICAL (J05E), CAMSHAFT ASSEMBLY, OVERHAUL, REMOVING THE CAMSHAFT ASSEMBLY (Page 10-16)

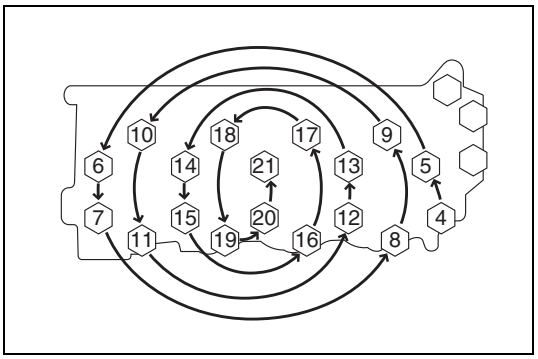
5. REMOVING THE INJECTOR
Reference: FUEL SYSTEM (J05E), INJECTOR, REPLACEMENT, REMOVING THE INJECTOR (Page 7-37)

6. REMOVING THE CYLINDER HEAD ASSEMBLY
(1) Remove the bolts, 1, 2, 3, shown in the figure first.



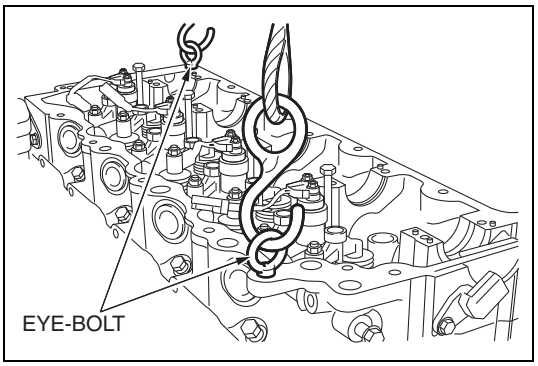
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SHTS021270900044

(2) Loosen the head bolts gradually from outside to inside in order as shown in the figure (rotate to a 1/4 turn at a time) to remove them.



SHTS021270900045

(3) Mount the SST to the cylinder head.
SST: S0943-31070
Eye bolt

⚠ CAUTION
When using SST, use the washer not to damage the upper surface of cylinder block.

(4) Set the wire to SST and use the hoist to lift the cylinder head to remove it.
(5) Before placing the cylinder head assembly on the workbench, prepare a foundation or a base by assembling the bench to protect peripheral parts against any load.

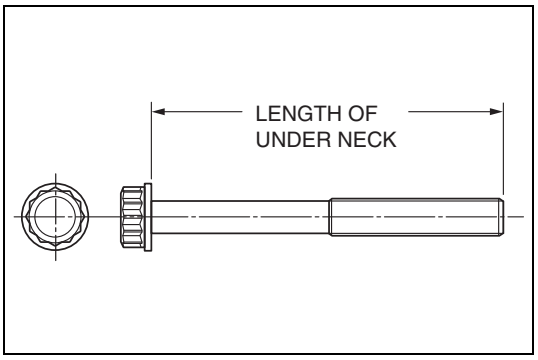
⚠ CAUTION
If the injector is mounted, be careful not to damage the nozzle end.

(6) Remove the head gasket from the cylinder head or cylinder block.

INSPECTING THE COMPONENTS

1. INSPECTING LENGTH OF HEAD BOLTS

(1) Use the vernier calipers to measure the head bolt under head (M12 only). If the measurement reading exceeds the permissible limit, replace the head bolt.



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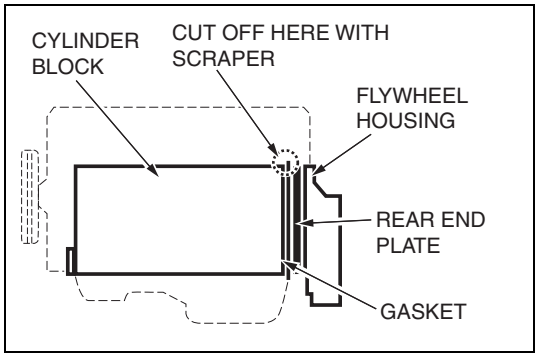
Standard value (mm {in.})	Permissible limit (mm {in.})	Bolt No.
126.0 {4.961}	126.5 {4.980}	5, 6, 7, 12, 13, 14, 15, 20, 21
156.0 {6.142}	156.5 {6.161}	9, 10, 17, 18
187.0 {7.362}	187.5 {7.382}	4, 8, 11, 16, 19

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MOUNTING THE CYLINDER HEAD ASSEMBLY

1. MOUNTING THE HEAD GASKET

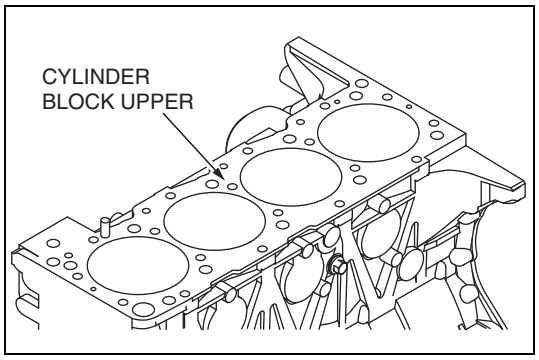
(1) Use the scraper to cut off an excessive protruding portion of the gasket for the rear end plate so that the gasket will be flush with the upper surface of the cylinder block.



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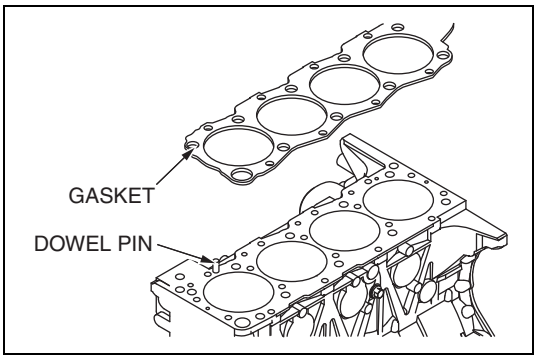
(2) Clean the upper surface of cylinder block.

⚠ CAUTION
Before working, remove dirt, water or oil on the cylinder head and cylinder block.



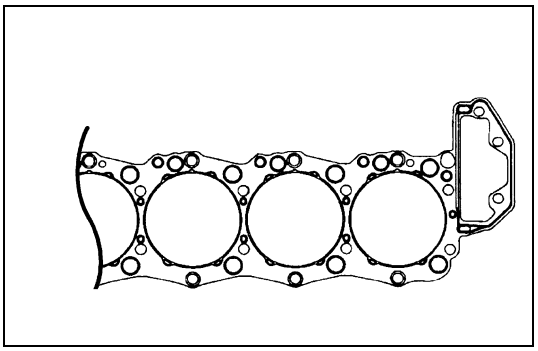
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SHTS021270900049

(3) Set the new head gasket to the dowel pin and place the gasket on the upper surface of cylinder block.



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⚠ CAUTION

- **Never reuse the gasket, or the engine will be broken.**
- **Avoid any physical contact of hands and materials with the seal rings around the bores.**

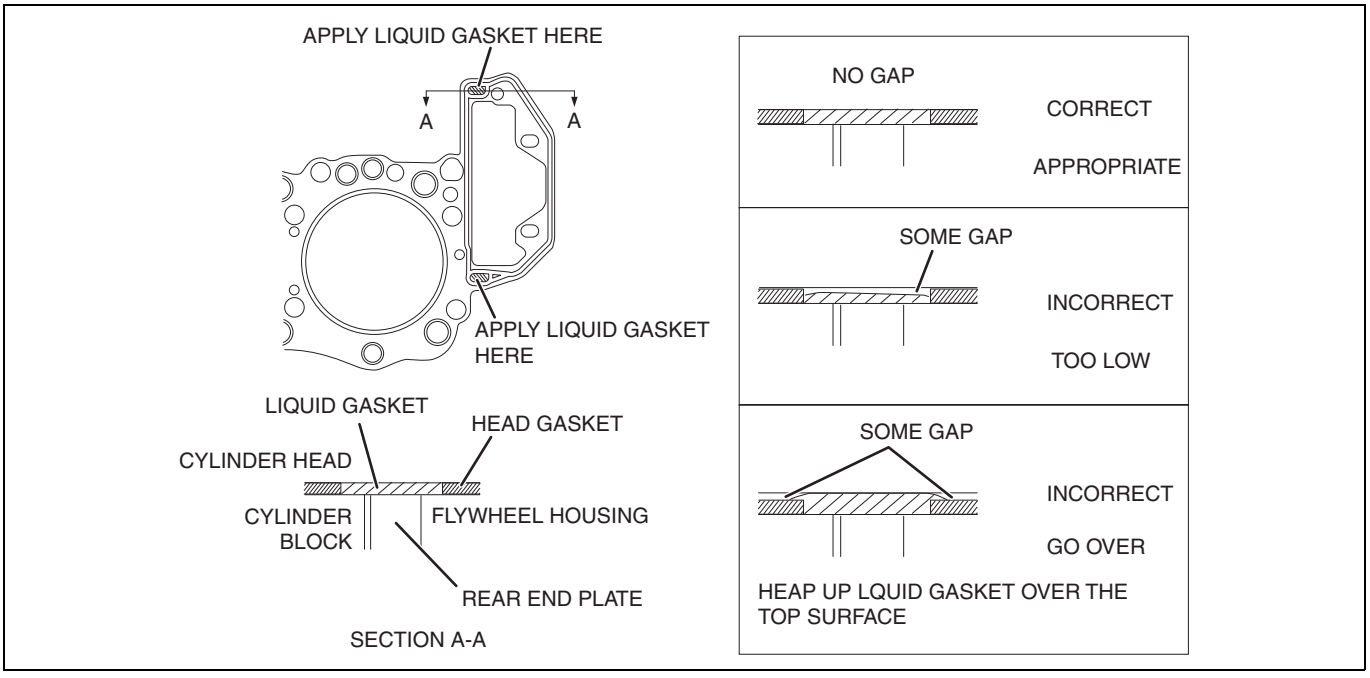
NOTICE

Before mounting the head gasket, check the seal ring for falling or damage.

(4) Apply liquid gasket (ThreeBond TB1211: White or equivalent) to the cylinder block upper surface rear end and head gasket mating area of the flywheel housing (2 places).

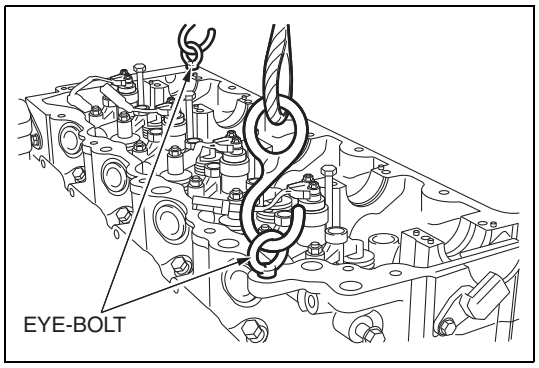
NOTICE

- **When applying liquid gasket, use care not to allow the surface of liquid gasket to go over the upper surface of the head gasket.**
- **Install the case within 20 minutes after applying the liquid gasket.**



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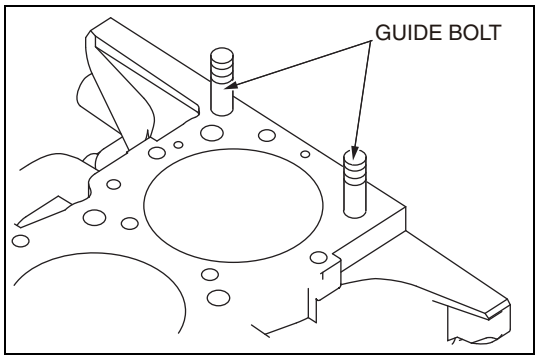
SHTS021270900052

2. MOUNTING THE CYLINDER HEAD ASSEMBLY

(1) Clean the head bolt seat surface on the upper surface of the cylinder head and the bottom surface of cylinder head.

(2) After mounting the SST, use the hoist to lift the cylinder head assembly.
SST: S0943-31070
Eye bolt

⚠ CAUTION
When the SST are used, mount the SST via washers and use care not to cause a potential risk of damaging the upper surface of the cylinder head.

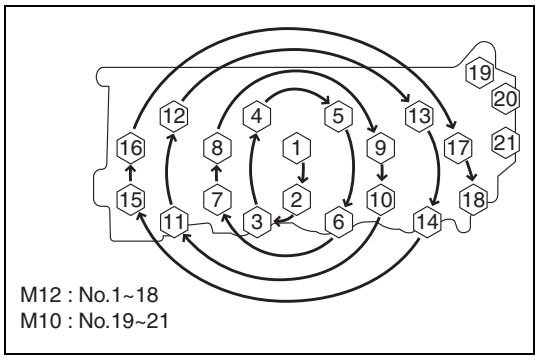


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(3) Insert some guide bolts into the bolt holes in the cylinder block and align dowel pins before setting on the cylinder block.

⚠ CAUTION
- **Before placing on the cylinder block, check that the cylinder is free from foreign matter.**
- **When setting the cylinder head in place, use care to avoid improper engagement of a cam idle gear with a sub idle gear. (Forced engagement of gear teeth may cause dent or chipping, resulting in troubles such as abnormal noise or chipped teeth.)**

NOTICE
When setting the cylinder head in place, use of guide bolts can prevent off-position of liquid gasket.



SHTS021270900054

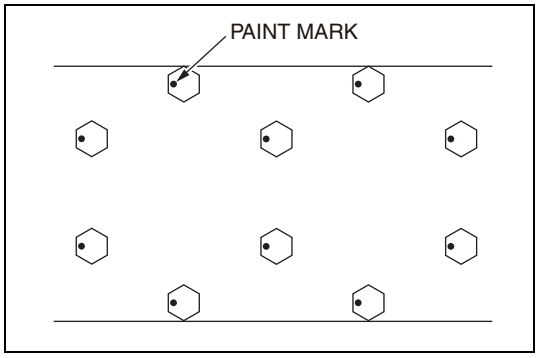
(4) Apply engine oil to the bolt seat surface and threaded part of head bolts.

(5) Tighten the 18 head bolts (M12 only) (cylinder head to cylinder block) in the order as shown in the figure.
Tightening Torque:
59 N·m {602 kgf·cm, 44 lbf·ft}

⚠ CAUTION
Do not tighten the bolts No. 19, 20, 21.

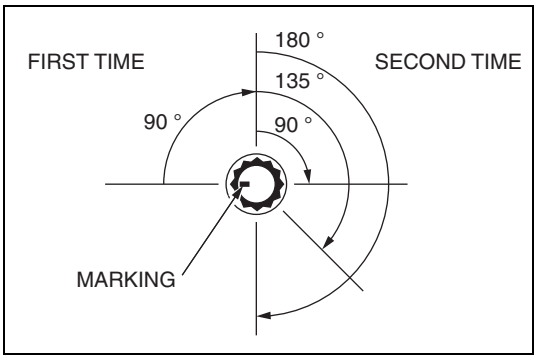
(6) Tighten the 18 head bolts (M12 only) again (cylinder head to cylinder block) in the order as shown in the figure.
Tightening Torque:
59 N·m {602 kgf·cm, 44 lbf·ft}

(7) Paint marks on the heads of the 18 head bolts (M12 only) in the same direction as shown in the figure.



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https://truckmanualshub.com/



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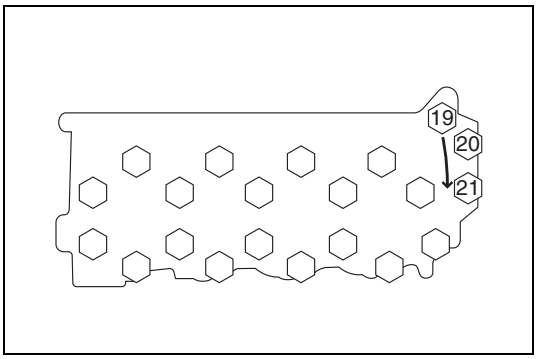
(8) Tighten the 18 head bolts (M12 only) by 90° (1/4 turns) in the rotational direction in the same order as in Step (5), and check that all paint marks face to the same direction.

(9) Retighten the head bolts (M12 only) in the same order following the angles in the table.

Tightening angle	Head bolt No.
90°	1, 2, 7, 8, 9, 10, 15, 16, 17
135°	4, 5, 12, 13
180°	3, 6, 11, 14, 18

⚠ CAUTION
Do not loosen the bolt even when it is over tightened during retightening.

(10) After tightening the 18 head bolts (M12 only) (cylinder head to cylinder block), tighten the remaining head bolts No. 19, 20, 21.
Tightening Torque:
59 N·m {602 kgf·cm, 44 lbf·ft}



SHTS021270900057

3. MOUNTING THE INJECTOR
Reference: FUEL SYSTEM (J05E), INJECTOR, REPLACEMENT, MOUNTING THE INJECTOR (Page 7-41)

4. MOUNTING THE CAMSHAFT ASSEMBLY
Reference: ENGINE MECHANICAL (J05E), CAMSHAFT ASSEMBLY, OVERHAUL, MOUNTING THE CAMSHAFT ASSEMBLY (Page 10-19)

5. MOUNTING THE ROCKER ARM ASSEMBLY
Reference: ENGINE MECHANICAL (J05E), ROCKER ARM ASSEMBLY, OVERHAUL, MOUNTING THE ROCKER ARM ASSEMBLY (Page 10-9)

6. MOUNTING THE INJECTOR HARNESS
Reference: FUEL SYSTEM (J05E), INJECTOR, REPLACEMENT, MOUNTING THE INJECTOR (Page 7-41)

7. MOUNTING THE HEAD COVER
Reference: ENGINE MECHANICAL (J05E), HEAD COVER, REPLACEMENT, MOUNTING THE HEAD COVER (Page 10-4)

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MOUNTING PERIPHERAL PARTS AROUND THE CYLINDER HEAD ASSEMBLY

1. **MOUNTING THE INTAKE MANIFOLD**
   Reference: INTAKE (J05E), INTAKE MANIFOLD, REPLACEMENT, MOUNTING THE INTAKE MANIFOLD (Page 9-6)

2. **MOUNTING THE GLOW PLUG**
   Reference: ENGINE MECHANICAL (J05E), GLOW PLUG, REPLACEMENT, MOUNTING THE GLOW PLUGS (Page 10-130)

3. **MOUNTING THE COMMON RAIL**
   Reference: FUEL SYSTEM (J05E), COMMON RAIL, REPLACEMENT, MOUNTING THE COMMON RAIL (Page 7-50)

4. **MOUNTING THE SUPPLY PUMP**
   Reference: FUEL SYSTEM (J05E), SUPPLY PUMP, REPLACEMENT, MOUNTING THE SUPPLY PUMP (Page 7-33)

5. **MOUNTING THE FUEL FILTER CASE**
   Reference: FUEL SYSTEM (J05E), FUEL FILTER AND CASE (ENGINE SIDE), REPLACEMENT, MOUNTING THE FUEL FILTER (ENGINE SIDE) (Page 7-22)

6. **MOUNTING THERMOSTAT CASE AND THERMOSTAT**
   Reference: COOLING (J05E), THERMOSTAT CASE AND THERMOSTAT, OVERHAUL, MOUNTING THERMOSTAT CASE AND THERMOSTAT (Page 12-27)

7. **MOUNTING THE EGR VALVE AND COOLER**
   Reference: EMISSION CONTROL (J05E), EGR VALVE & COOLER, REPLACEMENT, MOUNTING THE EGR VALVE & COOLER (Page 8-8)

8. **MOUNTING THE EXHAUST MANIFOLD**
   Reference: INTAKE (J05E), INTAKE PIPE (EXHAUST SIDE), REPLACEMENT, MOUNTING THE INTAKE PIPE (EXHAUST SIDE) (Page 9-13)

9. **MOUNTING THE TURBOCHARGER ASSEMBLY**
   Reference: TURBOCHARGER (J05E), TURBOCHARGER ASSEMBLY, REPLACEMENT, MOUNTING THE TURBOCHARGER ASSEMBLY (Page 17-9)

10. **MOUNTING THE EXHAUST PIPE (ATC)**
    Reference: EXHAUST (J05E), EXHAUST PIPE (ATC), REPLACEMENT, MOUNTING THE EXHAUST PIPE (ATC) (Page 11-18)

11. **MOUNTING THE INTAKE PIPE (EXHAUST SIDE)**
    Reference: INTAKE (J05E), INTAKE PIPE (EXHAUST SIDE), REPLACEMENT, MOUNTING THE INTAKE PIPE (EXHAUST SIDE) (Page 9-13)

12. **CONNECTING THE HARNESS**

13. **INSTALLING CLOSED VENTILATOR HOSE**
    Reference: EMISSION CONTROL (J05E), CLOSED VENTILATOR, REPLACEMENT, MOUNTING THE CLOSED VENTILATOR (Page 8-16)

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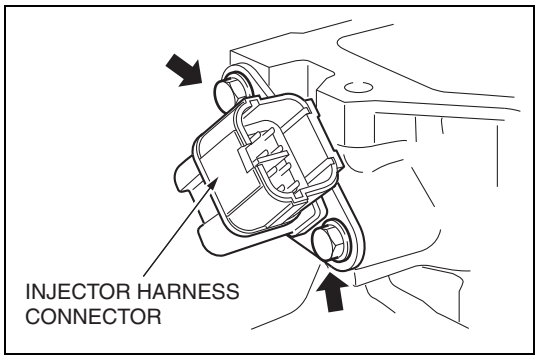
OVERHAUL

EN01F02127090402016003

DISASSEMBLING CYLINDER HEAD ASSEMBLY AND CAMSHAFT HOUSING

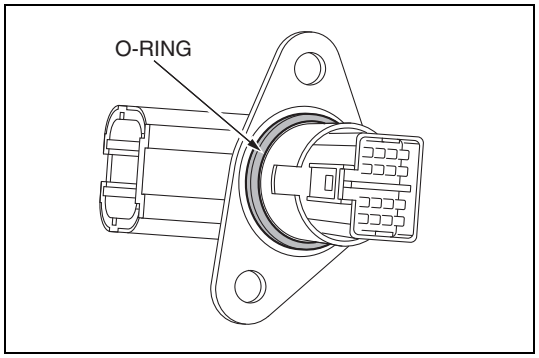
1. REMOVING THE INJECTOR HARNESS CONNECTOR

(1) Unfasten the 2 bolts to remove the injector harness connector from the cylinder head.



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(2) Remove the O-ring from the injector harness connector.

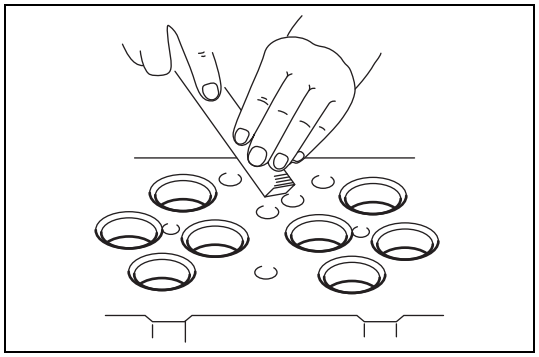


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2. CLEANING THE CYLINDER HEAD

(1) Use the scraper to remove carbon and other adherents.
(2) Wash the cylinder head.

⚠ CAUTION
When removing carbon and other adherents, do not damage the bottom surface of the cylinder head.

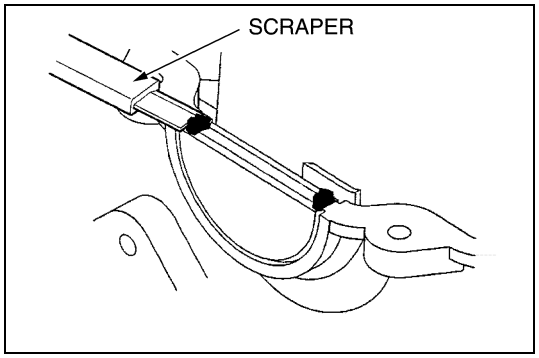


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3. REMOVING THE HALF-ROUND PLUG

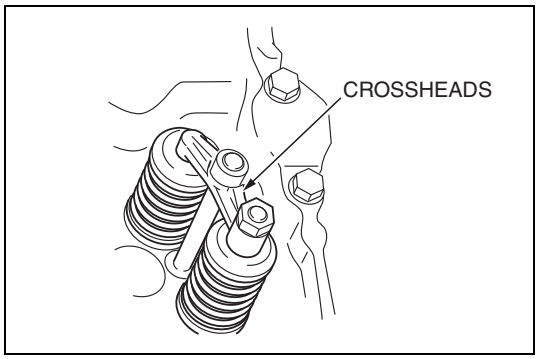
(1) If oil leak is found from the half-round plug, remove the half-round plugs at the cylinder head front and rear ends (2 pcs.).

⚠ CAUTION
Do not remove the half-round plugs unless oil leak is found.



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SHTS021270900062

4. REMOVING THE CROSSHEAD

(1) Remove the crossheads from individual valves.

NOTICE

For storage, sort by cylinder number and by intake and exhaust.

5. REMOVING THE VALVE AND VALVE SPRING

Reference: ENGINE MECHANICAL (J05E), VALVE SYSTEM, OVERHAUL, DISASSEMBLING THE VALVE SYSTEM (Page 10-37)

6. REMOVING THE VALVE STEM SEAL

Reference: ENGINE MECHANICAL (J05E), VALVE SYSTEM, OVERHAUL, DISASSEMBLING THE VALVE SYSTEM (Page 10-37)

7. REMOVING THE VALVE GUIDE

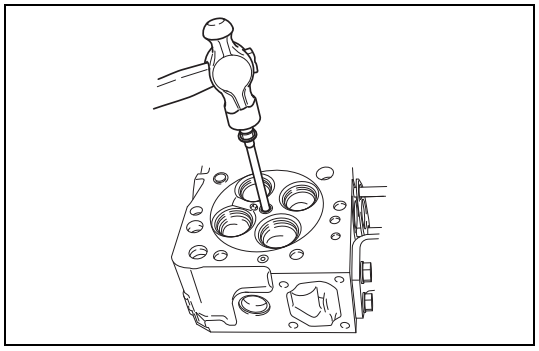
Reference: ENGINE MECHANICAL (J05E), VALVE SYSTEM, OVERHAUL, DISASSEMBLING THE VALVE SYSTEM (Page 10-37)

8. REMOVING THE VALVE SEAT

Reference: ENGINE MECHANICAL (J05E), VALVE SYSTEM, OVERHAUL, DISASSEMBLING THE VALVE SYSTEM (Page 10-37)

9. REMOVING THE CAM IDLE GEAR

Reference: ENGINE MECHANICAL (J05E), TIMING GEAR & CAM IDLE GEAR, OVERHAUL, REMOVING THE CAMSHAFT DRIVE GEAR AND CAM IDLE GEAR (Page 10-71)


SHTS021270900063

10. REMOVING NOZZLE SEATS

(1) Tap nozzle seats from the lower side of the cylinder head. Then, screw in appropriate bolts.

(2) Use the hammer to tap the bolt head and pull up the nozzle seat out of the cylinder head.

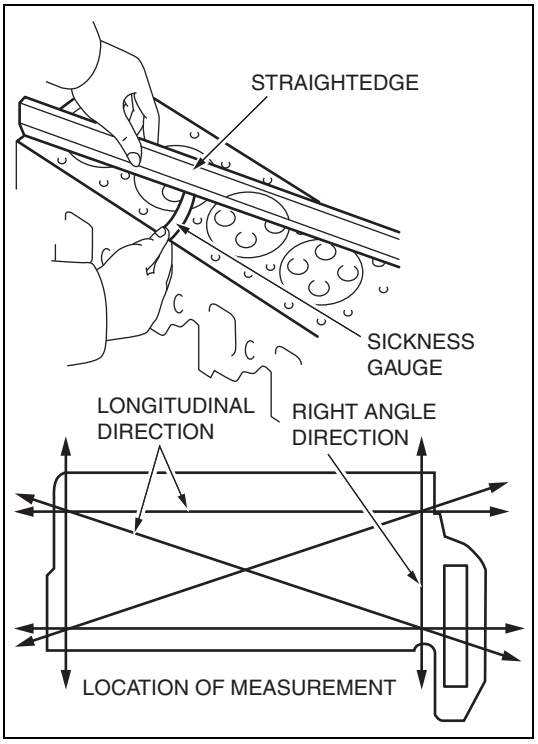
(3) Remove the O-ring from the cylinder head.

⚠ CAUTION

After pulling out the nozzle seats, remove all and any residual liquid gasket, dirt or other deposits.

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INSPECTING THE COMPONENTS



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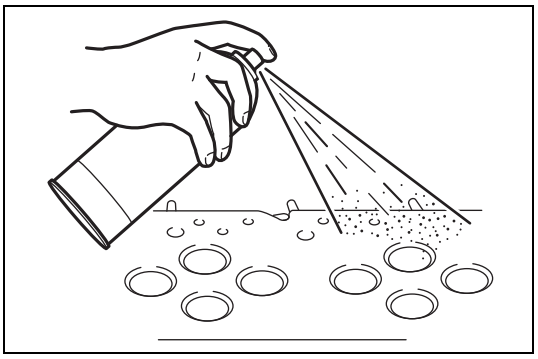
1. INSPECTING THE CYLINDER HEAD

(1) Use the straightedge and a thickness gauge to measure strains in the lower surface of the cylinder head and in the manifold mounting surface. Replace if a measurement reading exceeds the permissible limit.

Measurement point	Standard value (mm {in.})	Permissible limit (mm {in.})
Longitudinal direction	0.06 {0.0024}	0.20 {0.0079}
Right angle direction	0.03 {0.0012}	0.20 {0.0079}

⚠ CAUTION

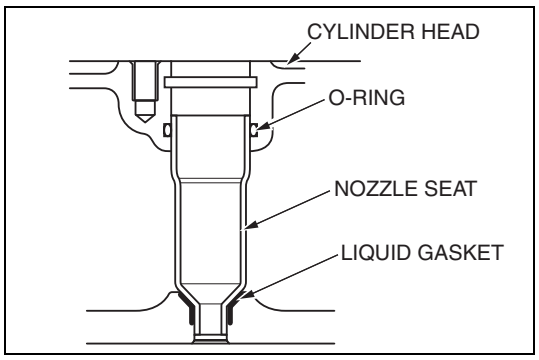
- **Perform measurement on a flat surface such as a surface plate to prevent the deformation in the head.**
- **Do not adjust the bottom surface by grinding or the timing gear backlash will be changed.**


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(2) Use the dye penetrant testing (red check) to inspect for crack and damage on the cylinder head. If found defective, replace the cylinder head.

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ASSEMBLING THE CYLINDER HEAD ASSEMBLY



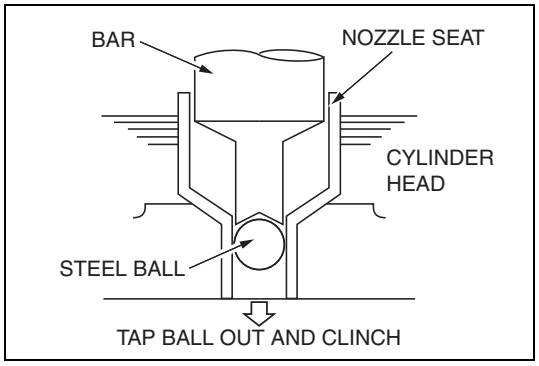
SHTS021270900066

1. MOUNTING THE NOZZLE SEATS

(1) After inserting the new O-ring into a nozzle seat insertion hole in the cylinder head, apply liquid gasket (ThreeBond TB1211 or equivalent: White) to the bottom of a new nozzle seat before installing it to the cylinder head.

⚠ CAUTION

Make sure to replace with new O-rings. Reuse of O-rings may cause coolant or gas leakage, resulting in overheat and/or cracks in the cylinder head.



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(2) To clinch the nozzle seat, use the SST bar to tap the SST steel ball out through the nozzle seat.

SST: S0947-21210
Bar
SN441-00610
Steel Ball

2. MOUNTING THE CAM IDLE GEAR

Reference: ENGINE MECHANICAL (J05E), TIMING GEAR & CAM IDLE GEAR, OVERHAUL, MOUNTING THE CAMSHAFT DRIVE GEAR AND CAM IDLE GEAR (Page 10-77)

3. MOUNTING THE VALVE SEAT

Reference: ENGINE MECHANICAL (J05E), VALVE SYSTEM, OVERHAUL, ASSEMBLING THE VALVE SYSTEM (Page 10-42)

4. MOUNTING THE VALVE GUIDE

Reference: ENGINE MECHANICAL (J05E), VALVE SYSTEM, OVERHAUL, ASSEMBLING THE VALVE SYSTEM (Page 10-42)

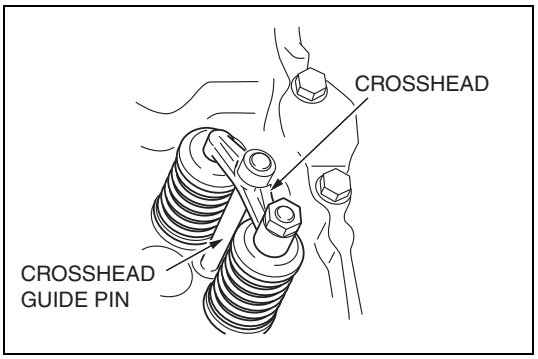
5. MOUNTING THE VALVE STEM SEAL

Reference: ENGINE MECHANICAL (J05E), VALVE SYSTEM, OVERHAUL, ASSEMBLING THE VALVE SYSTEM (Page 10-42)

6. MOUNTING THE VALVE AND VALVE SPRING

Reference: ENGINE MECHANICAL (J05E), VALVE SYSTEM, OVERHAUL, ASSEMBLING THE VALVE SYSTEM (Page 10-42)

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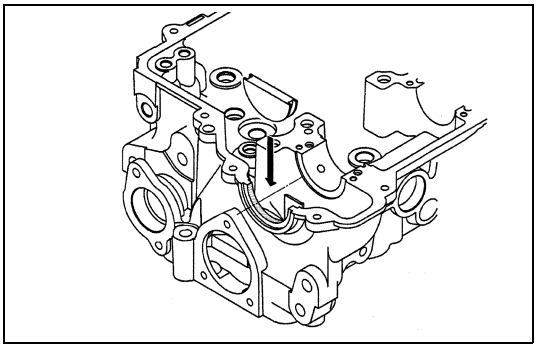


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7. MOUNTING THE CROSSHEAD

(1) Apply engine oil to crosshead guide pins and install the crossheads.

(2) Check that crossheads are properly seated on (or over) individual valves and apply engine oil to the heads of the crossheads.



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8. MOUNTING THE HALF-ROUND PLUG (ONLY IF THE HALF-ROUND PLUG IS REMOVED)

(1) Remove all oil and dirt on the half-round plug and cylinder head.

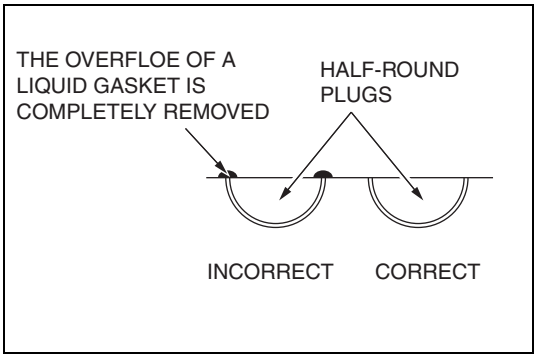
(2) Apply liquid gasket (ThreeBond TB1207B: Black or equivalent) to the half-round areas at the cylinder head front and rear ends as shown in the figure.

⚠ CAUTION

- **Apply the liquid gasket seamlessly.**
- **Mount the case within 20 minutes after applying the liquid gasket.**

(3) Mount the new half-round plug to the upper side of the cylinder head parallel and ensure that the plug comes in contact with the head at the bottom.

(4) After mounting the half-round plug, wipe out the liquid gasket that swells out of the upper surface of the cylinder head immediately.

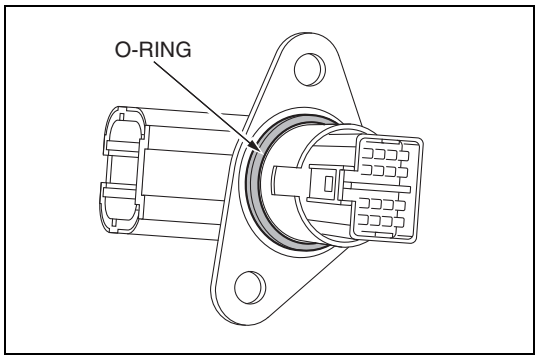


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⚠ CAUTION

Do not pry or tilt the half-round plug.

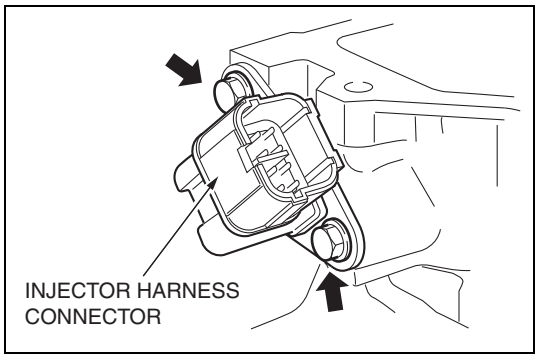
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9. MOUNTING THE INJECTOR HARNESS CONNECTOR

(1) Replace with the new O-ring and fit it to the injector harness connector.



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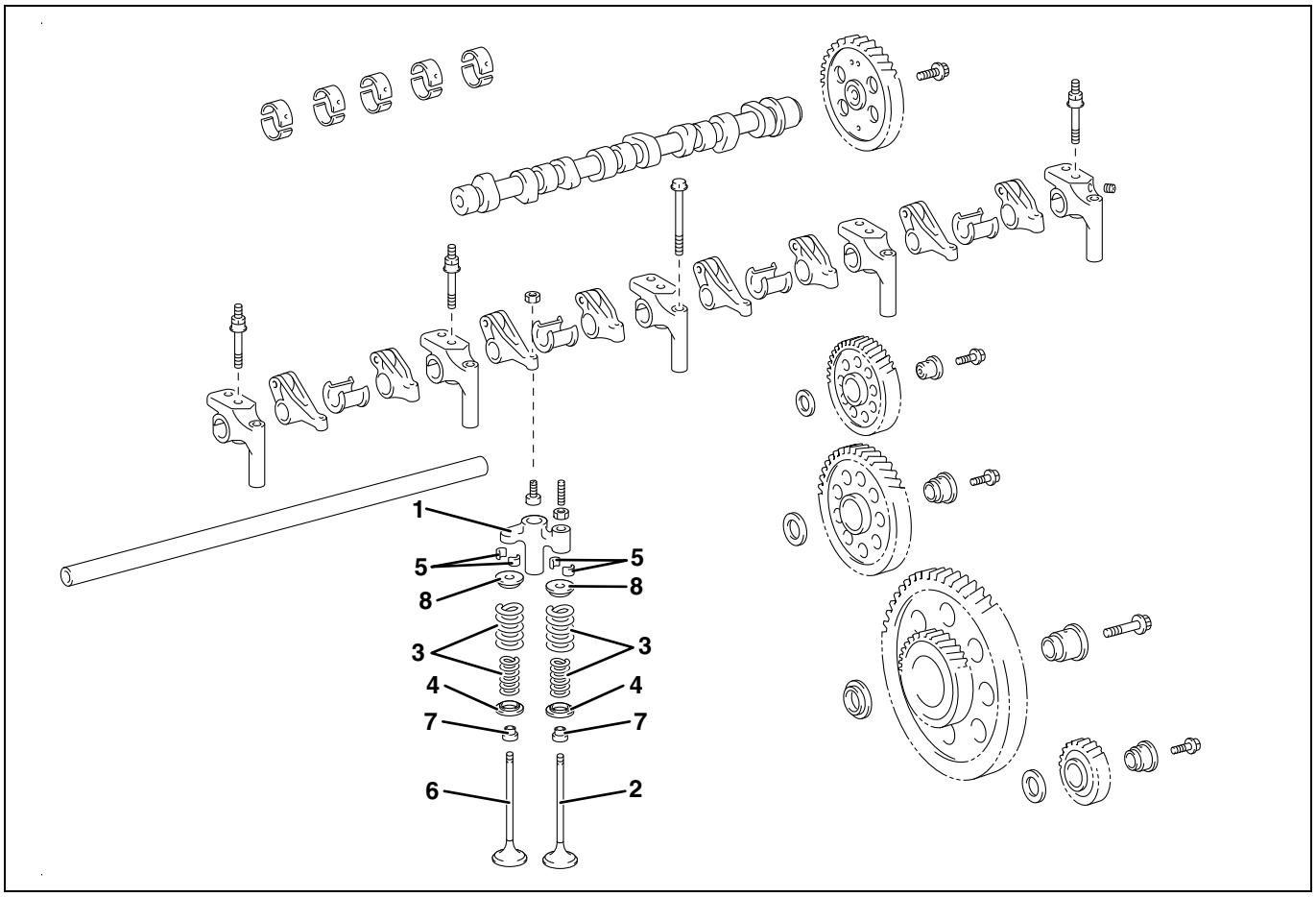
(2) Mount the injector harness connector to the cylinder head with 2 bolts.

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VALVE SYSTEM

COMPONENT LOCATOR

EN01F02127090402009001



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1	Crosshead	5	Valve spring retainer
2	Intake valve	6	Exhaust valve
3	Spring	7	Valve stem seal
4	Spring seat (lower)	8	Spring seat (upper)

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OVERHAUL

EN01F02127090402009002

DISASSEMBLING THE VALVE SYSTEM

1. REMOVING THE CYLINDER HEAD ASSEMBLY
Reference: ENGINE MECHANICAL (J05E), CYLINDER HEAD ASSEMBLY, REPLACEMENT, REMOVING THE CYLINDER HEAD ASSEMBLY (Page 10-23)

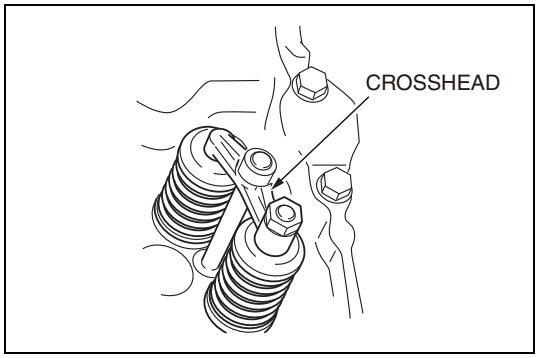
2. PREPARATION
(1) Set the wooden board on the workbench and place the cylinder head assembly on it.

⚠ CAUTION
If the injector is mounted, be careful not to damage the nozzle end.

NOTICE
When compressing the valve spring, place the valve flat to prevent it from going down.

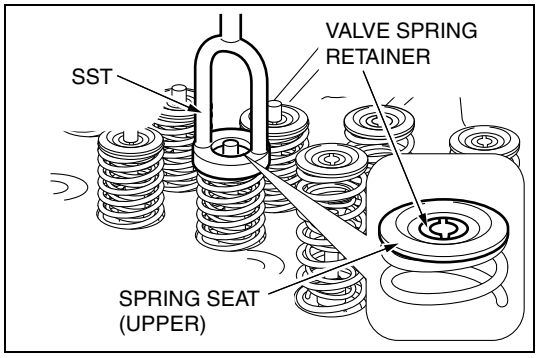
3. REMOVING THE CROSSHEAD
(1) Remove the crossheads from individual valves.

NOTICE
For storage, sort by cylinder number and by intake and exhaust.



SHTS021270900074

4. REMOVING THE VALVE AND VALVE SPRING
(1) Use the SST to remove the valve spring retainer while compressing the valve spring, removing the spring seat (upper) and valve spring.
SST: S0947-01170
Valve spring press

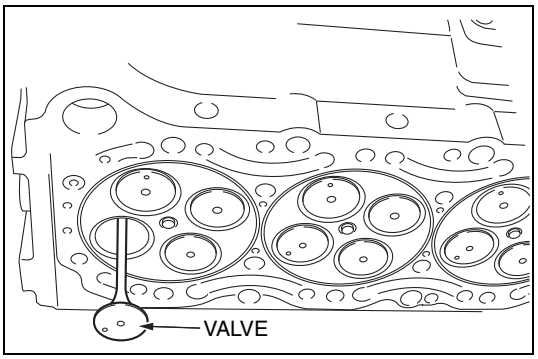


SHTS021270900075

⚠ CAUTION
If eye bolts are used, fasten them via washers and use care not to cause a potential risk of damaging the upper surface of the cylinder head.

NOTICE
- **The use of a magnet bar facilitates the removal of the valve spring retainer.**
- **Tap the spring seat (upper) with a plastic hammer before work will unstick the seat, facilitating the removal.**
- **Replace the spring seat (lower) after removing the valve stem seal.**

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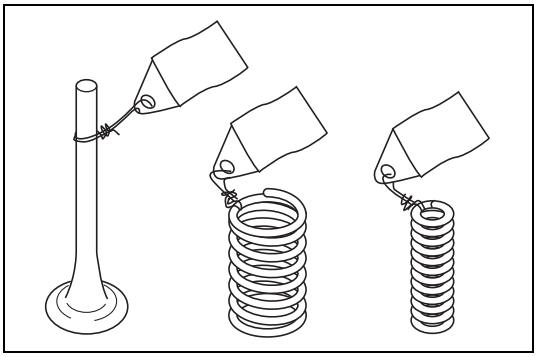


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(2) Face the cylinder head assembly sideways and remove the intake and exhaust valve.

NOTICE

There is an engraving of I (intake) or E (exhaust) at the center of the valve bottom.

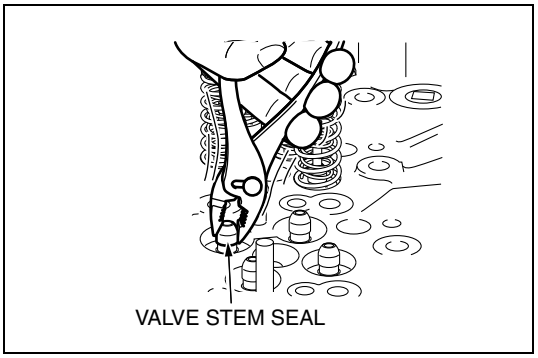

SHTS021270900077

⚠ CAUTION

- **The cylinder head assembly can be faced sideways by using manpower. However, handle it with care because it is a heavy load.**
- **Put tags with relevant cylinder numbers to the valves and valve springs so that the combination of the valve and cylinder head will not be changed.**

5. REMOVING THE VALVE STEM SEAL

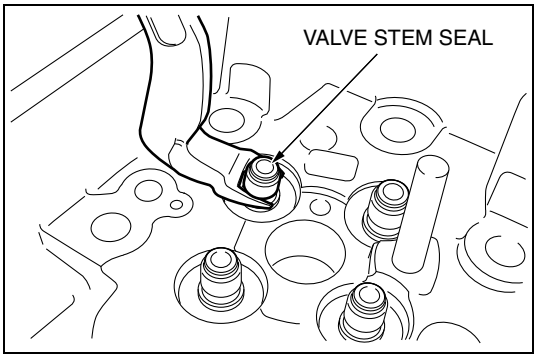
(1) Use the pliers to pull off the valve stem seal while shaking it right-to-left.



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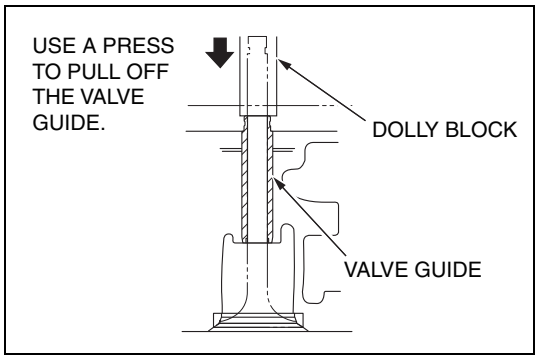
NOTICE

Pull out the seal with a bar- shaped tool by using leverage will facilitate the work.



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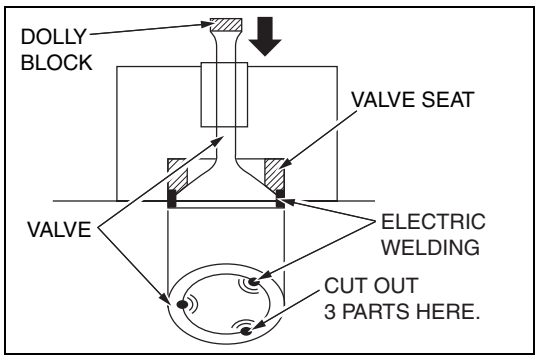
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SHTS021270900080

6. REMOVING THE VALVE GUIDE

(1) Use the dolly block or press to pull off the valve guide.



SHTS021270900081

7. REMOVING THE VALVE SEAT

⚠ CAUTION

Replace the valve seat in the following procedure may damage the cylinder head. For secure replacement, we recommend you to ask a machine processor.

(1) Use the unnecessary valve to replace the valve seat. After cutting out three parts from the valve periphery, weld to the valve seat.

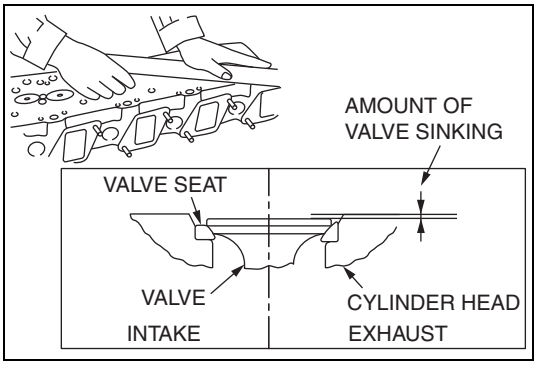
⚠ CAUTION

Before welding, apply grease to the bottom surface of the cylinder head to protect from spatter.

(2) Place the dolly block (such as a brass bar) to the valve stem head and pull off the valve seat by using the press.

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INSPECTING THE COMPONENTS

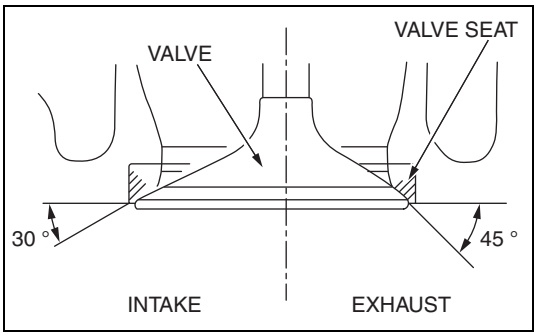


SHTS021270900082

1. INSPECTING THE VALVE AND VALVE SEAT

(1) Use the straightedge and thickness gauge to measure the valve sink. If a measurement reading exceeds the permissible limit, replace the valve and valve seat.

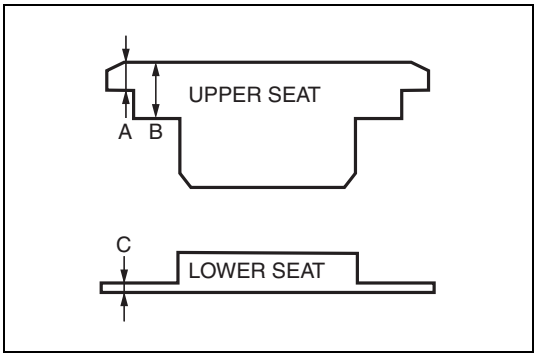
Measured item	Standard value (mm {in.})	Permissible limit (mm {in.})
Intake	0.55-0.85 {0.0217-0.0335}	1.1 {0.0433}
Exhaust	1.15-1.45 {0.0452-0.0571}	1.7 {0.0669}



SHTS021270900083

(2) Measure the angle of the valve seat and valve. If a measurement value exceeds the permissible angle, adjust it.

Measured item		Standard value	Permissible angle
Valve seat	Intake	30°	30°-30°35’
	Exhaust	45°	45°-45°30’
Valve face	Intake	30°	29°30’-30°
	Exhaust	45°	44°30’-45°

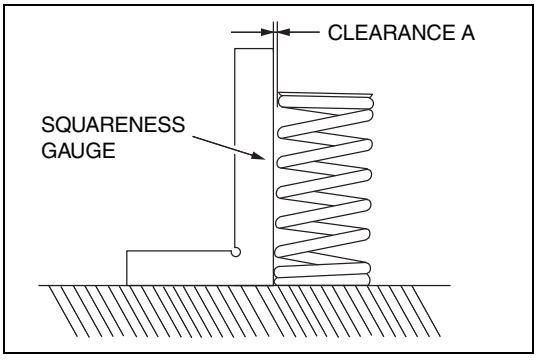


SHTS021270900084

2. INSPECTING THE VALVE SPRING SEAT

(1) Measure the wear of spring seats (upper and lower). If the permissible limit is exceeded, replace the seats.

Measurement area	Standard value (mm {in.})	Permissible limit
Thickness A	3.2 {0.1260}	If the wear of A or B added to the wear of C exceeds 1 mm {0.0393 in.}
Thickness B	5.5 {0.2165}	
Thickness C	1.0 {0.0393}	



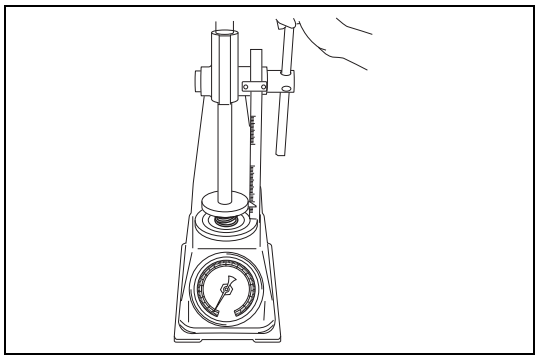
SHTS021270900085

3. INSPECTING THE VALVE SPRING

(1) Use the squareness gauge and thickness gauge to measure the clearance A of the valve spring. If a measured clearance exceeds the permissible limit, replace the valve spring.

Measured item	Permissible limit (clearance A)
Inner spring	2.0 mm {0.0787 in.}
Outer spring	2.0 mm {0.0787 in.}

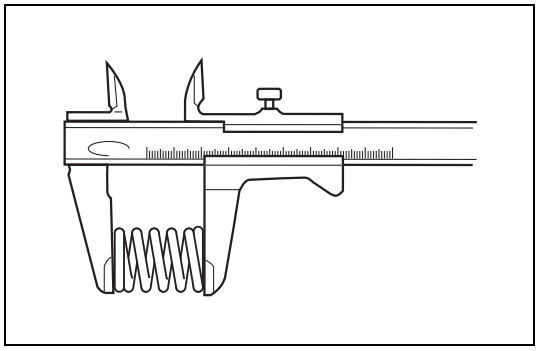
https://truckmanualshub.com/



SHTS021270900086

(2) Use the spring tester to measure the set load of the valve spring. If a measured load exceeds the permissible limit, replace the valve spring.

Measured item		Standard value	Permissible limit
Inner spring	Set length (mm {in.})	44.8 {1.764}	–
	Set load (N {kgf})	128.5 {13.1}	118.2 {12}
Outer spring	Set length (mm {in.})	46.8 {1.843}	–
	Set load (N {kgf})	313.8 {32}	288.7 {29.4}

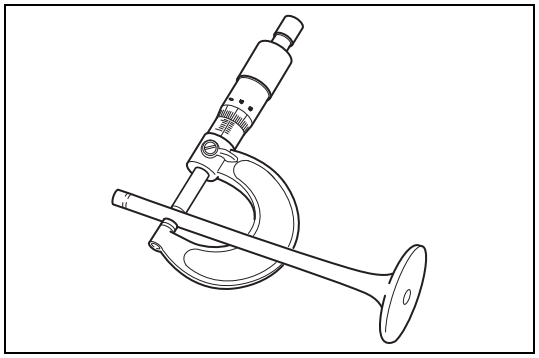


SHTS021270900087

(3) Use the vernier calipers to measure a free length of a valve spring. If a measurement reading exceeds the permissible limit, replace the valve spring.

Measured item	Standard value (mm {in.})	Permissible limit (mm {in.})
Inner spring	[64.6 {2.543}]	61.6 {2.425}
Outer spring	[75.7 {2.980}]	72.7 {2.862}

Referential values in brackets []



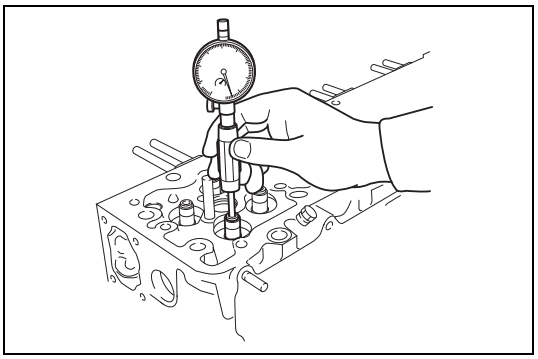
SHTS021270900088

4. INSPECTING THE OIL CLEARANCE OF THE VALVE GUIDE AND VALVE STEM

(1) Use the micrometer to measure the outside diameter of the valve stem.

Measured item	Standard value (mm {in.})
Intake valve stem	7 {0.276}
Exhaust valve stem	7 {0.276}

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SHTS021270900089

(2) Use the cylinder gauge to measure the inner diameter of the valve guide.

Measured item	Standard value (mm {in.})
Intake valve guide	7 {0.276}
Exhaust valve guide	7 {0.276}

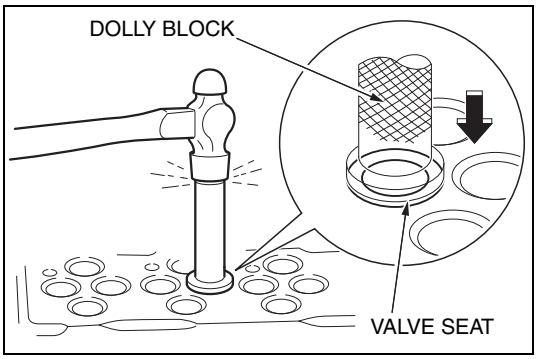
(3) Calculate the difference between the outer diameter of the valve stem and the inner diameter of the valve guide. If a measurement reading exceeds the standard value, replace the valve and valve guide.

Measured item	Standard value (mm {in.})
Intake valve oil clearance	0.023-0.058 {0.0009-00023}
Exhaust valve oil clearance	0.050-0.083 {0.0020-0.0033}

ASSEMBLING THE VALVE SYSTEM

1. MOUNTING THE VALVE SEAT

(1) Remove the welding spatter or dirt on the valve seat surface.
(2) Heat the cylinder head in hot water to about 80°C-100°C {176°F - 212°F}. Tap in the cooled valve seat to the cylinder head mounting area using the dolly block and hammer.



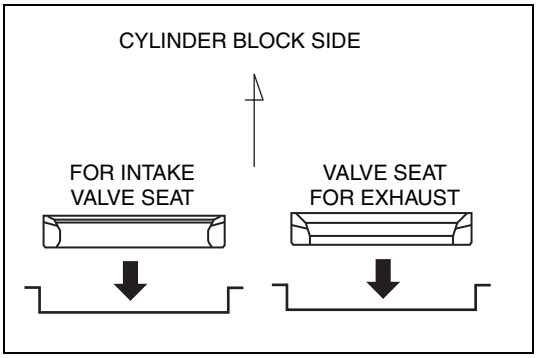
SHTS021270900090

⚠ CAUTION

- **Make sure of orientation (face side and back side) of a valve seat.**
- **Be careful not to break the valve seat because it is sintered part.**

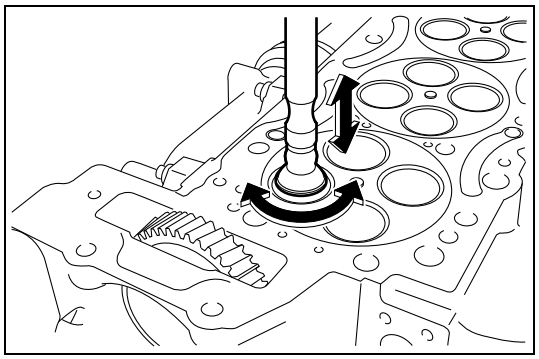
NOTICE

The valve seat with an outer diameter of 41 mm {1.614 in.} is for intake and 39 mm {1.535 in.} for exhaust.



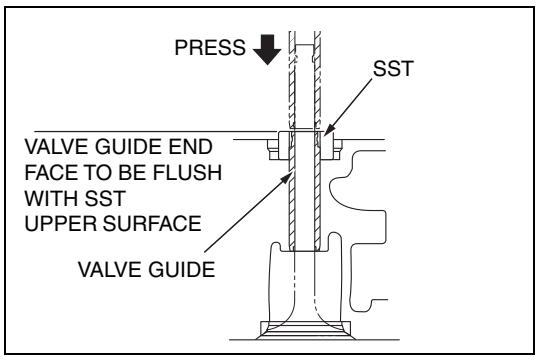
SHTS021270900091

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SHTS021270900092

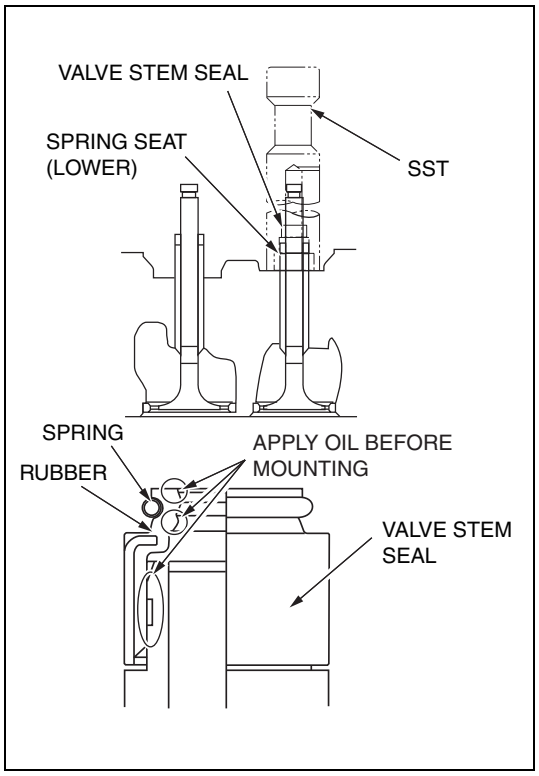
(3) Apply the small amount of lapping compound on the contact surface of the valve and valve seat.
(4) Use the SST to tap and lap the valve while rotating it.
SST: S0943-11020
Valve lapping tool



SHTS021270900093

2. MOUNTING THE VALVE GUIDE
(1) Apply engine oil to the periphery of the valve guide.
(2) If a new valve guide is installed, set the SST to the valve seat to prevent slanted insertion of the valve guide during press-fitting.
SST: S0947-11520
Guide

⚠ CAUTION
- **During press-fitting with the SST, use care not to damage a valve stem of the valve guide.**
- **Before press-fitting, make sure to apply engine oil to the periphery of the valve guide.**
- **Be careful not to pry the valve guide end when press-fitting.**

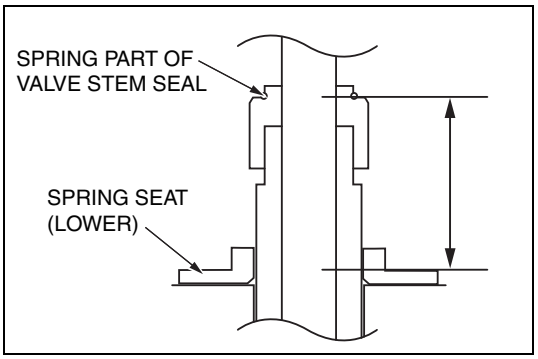


SHTS021270900094

3. MOUNTING THE VALVE STEM SEAL
(1) Mount the spring seat (lower) before the valve stem seal.
(2) Apply engine oil to the lip and inner surface of the valve stem seal. Use the SST to tap in the valve stem seal until the SST comes in contact with the spring seat (lower).
SST: S0947-22100
Bar

⚠ CAUTION
- **After assembling the valve stem seal, check for deformation, crack and inclination of rubber and detached spring.**
- **After fitting valve stem seals, check rubbers for deformation, cracks, inclination or spring dislodgement.**
- **Note that dirt or fouling on the valve or in the valve guide may damage a valve stem seal during insertion of the valve.**

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SHTS021270900095

(3) After tapping in the valve stem seal, check the height from the spring seat (lower) to the spring of the valve stem seal.

Standard value (mm {in.})	**22.5-23.0 {0.886-0.906}**

4. MOUNTING THE VALVE AND VALVE SPRING

⚠ CAUTION

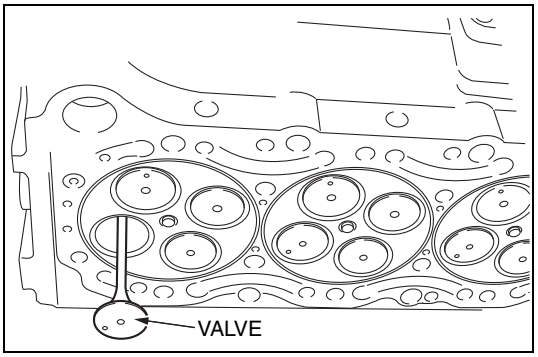
- **Apply engine oil to the contact surface of each part before assembly.**
- **Mount each valve securely to the original cylinder position.**

(1) Face the cylinder head assembly sideways and insert the intake and exhaust valves to the valve guides.

⚠ CAUTION

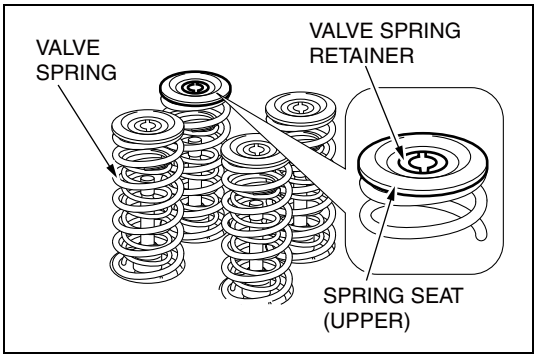
- **The cylinder head assembly can be faced sideways by using manpower. However, handle it with care because it is a heavy load.**
- **When reusing the valve, check that the valve stem is free from damage.**

NOTICE
There is an engraving of I (intake) or E (exhaust) at the center of the valve bottom.



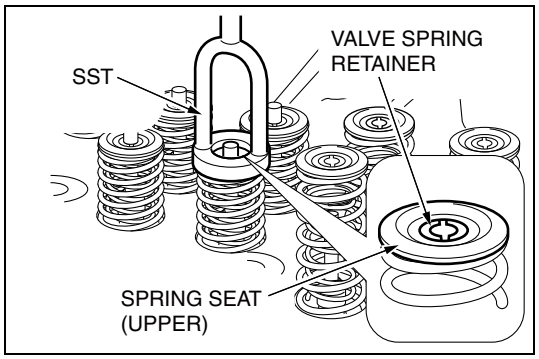
SHTS021270900096

(2) Check that the spring seat (lower) is mounted and place the valve spring and then spring seat (upper) on the cylinder head.
(3) Insert the valve spring retainer to the hole of the spring seat (upper).



SHTS021270900097

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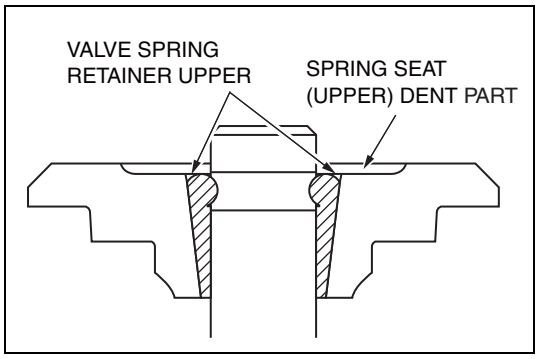


SHTS021270900098

(4) Use the SST to compress the valve spring to fit in the valve spring retainer.
SST: S0947-01170
Valve spring press

⚠ CAUTION

- **If eye bolts are used, fasten them via washers and use care not to cause a potential risk of damaging the upper surface of the cylinder head.**
- **When compressing the valve spring, be careful not to allow the valve spring upper seat to touch the valve stem seal.**

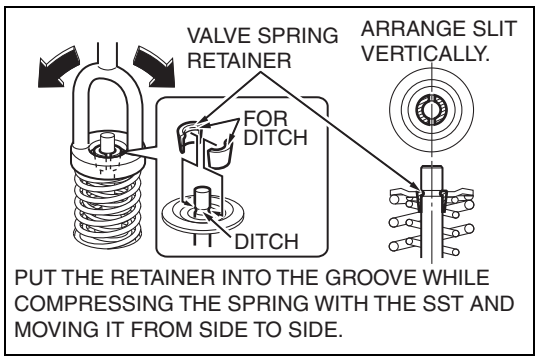


SHTS021270900099

- **Make sure that the upper surfaces of two valve spring retainers are level with each other as well as a concave in the spring seat (upper).**

NOTICE

- **Shake the spring in lateral direction while compressing with the SST so that the valve spring retainer will fall, which facilitates the work.**
- **Lay out the slit of the valve spring retainer vertically to the SST will facilitate the work.**
- **Constant pitch valve springs do not require vertical orientation (top and bottom) prior to mount.**

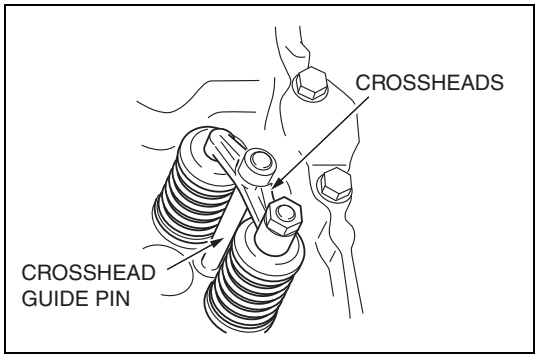


SHTS021270900100

5. MOUNTING THE CROSSHEAD

(1) Apply engine oil to crosshead guide pins and install the crossheads.

(2) Check that crossheads are properly seated on (or over) individual valves and apply engine oil to the heads of the crossheads.



SHTS021270900101

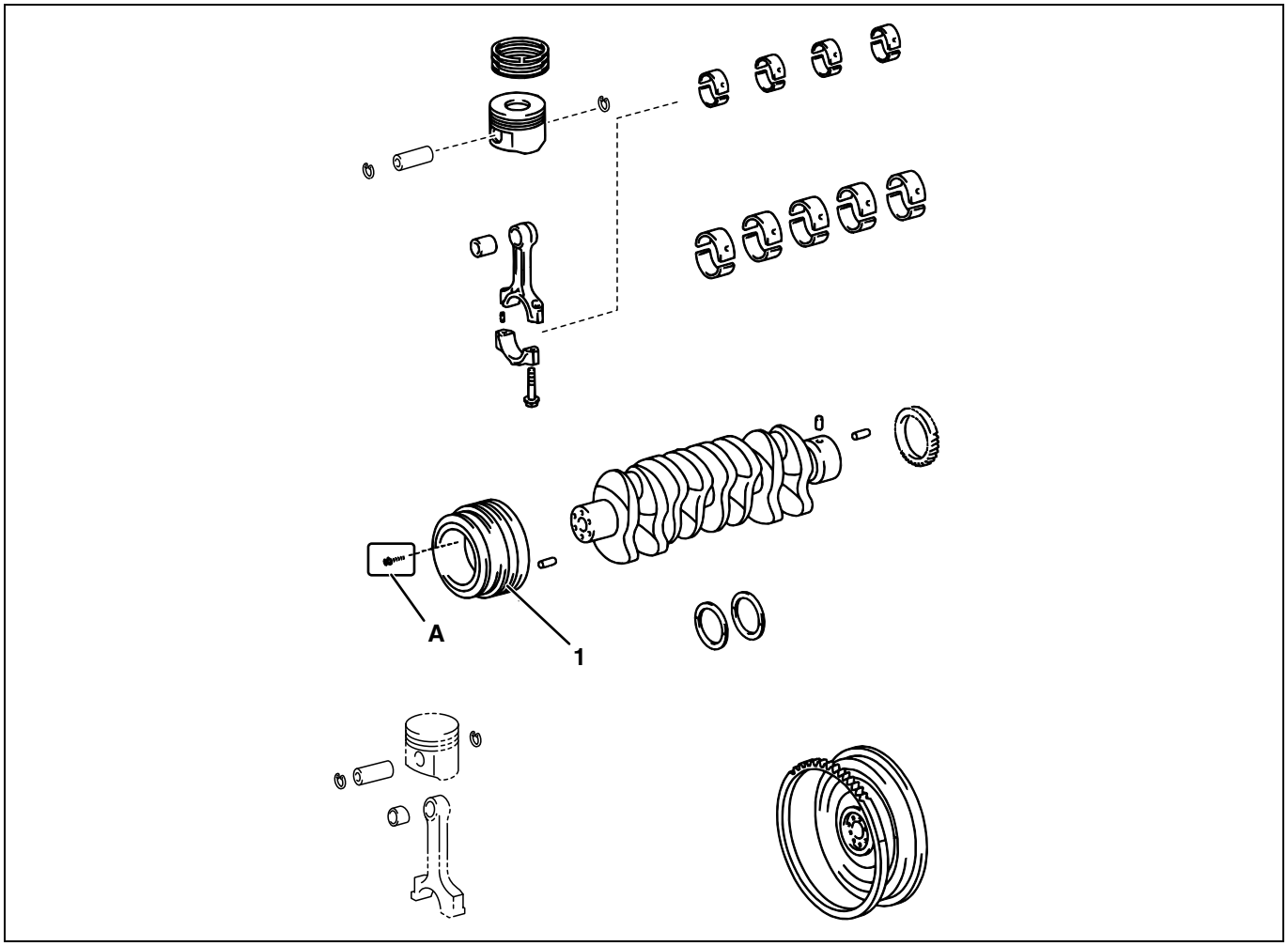
6. MOUNTING THE CYLINDER HEAD ASSEMBLY
Reference: ENGINE MECHANICAL (J05E), CYLINDER HEAD ASSEMBLY, REPLACEMENT, MOUNTING THE CYLINDER HEAD ASSEMBLY (Page 10-25)

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CRANKSHAFT PULLEY

COMPONENT LOCATOR

EN01F02127090402048001



SHTS021270900102

1 Crankshaft pulley	

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A 118 {1,203, 87}	

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REPLACEMENT

EN01F02127090402048002

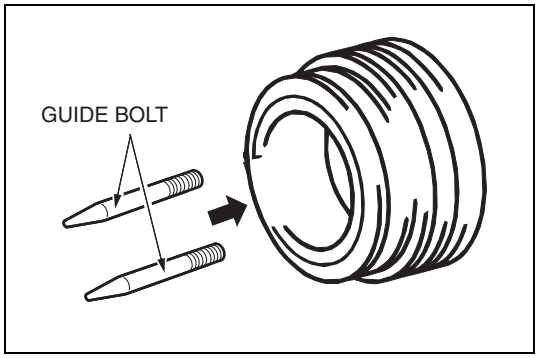
REMOVING THE CRANKSHAFT PULLEY

1. REMOVING THE COOLING FAN ASSEMBLY AND FAN SHROUD RING
Reference: COOLING (J05E), COOLING FAN AND FAN CLUTCH, OVERHAUL, REMOVING THE COOLING FAN & FAN CLUTCH (Page 12-34)

2. REMOVING THE V-BELT
Reference: STARTING/CHARGING (J05E), V-BELT, REPLACEMENT, REMOVING THE V-BELT (Page 16-9)

3. REMOVING THE CRANKSHAFT PULLEY

(1) Remove the 2 horizontal crankshaft pulley mounting bolts first and then mount guide bolts to prevent drop-off.



SHTS021270900103

NOTICE
To prevent the co-rotation of the crankshaft, insert a large flat-blade screwdriver into the flywheel gear from the inspection hole of the flywheel housing and stop the rotation of the crankshaft.

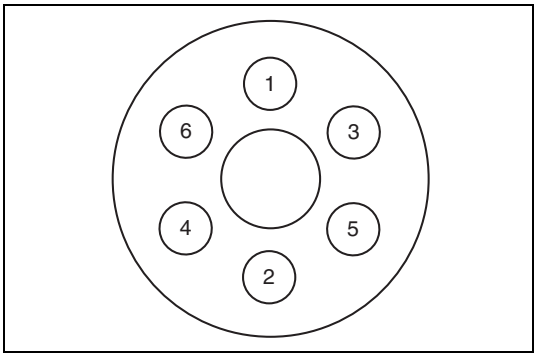
(2) Unfasten the remaining bolts while supporting the crankshaft pulley and remove the crankshaft pulley.

⚠ CAUTION
- **Handle it with care because it is a heavy load.**
- **Do not reuse the dropped crankshaft pulley which is out-of-balance.**

NOTICE
- **To prevent the co-rotation of the crankshaft, insert a large flat-blade screwdriver into the flywheel gear from the inspection hole of the flywheel housing and stop the rotation of the crankshaft.**
- **There is a dowel pin at the joint part with the crankshaft. If the crankshaft pulley is stuck and cannot be removed, tap it from the back using the plastic hammer.**

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MOUNTING THE CRANKSHAFT PULLEY



SHTS021270900104

1. MOUNTING THE CRANKSHAFT PULLEY

(1) Tighten the crankshaft pulley mounting bolts in the order as shown in the figure.
Tightening Torque:
118 N·m {1,203 kgf·cm, 87 lbf·ft}

NOTICE
To prevent the co-rotation of the crankshaft, insert a large flat-blade screwdriver into the flywheel gear from the inspection hole of the flywheel housing and stop the rotation of the crankshaft.

2. MOUNTING THE V-BELT
Reference: STARTING/CHARGING (J05E), V-BELT, REPLACEMENT, MOUNTING THE V-BELT (Page 16-9)

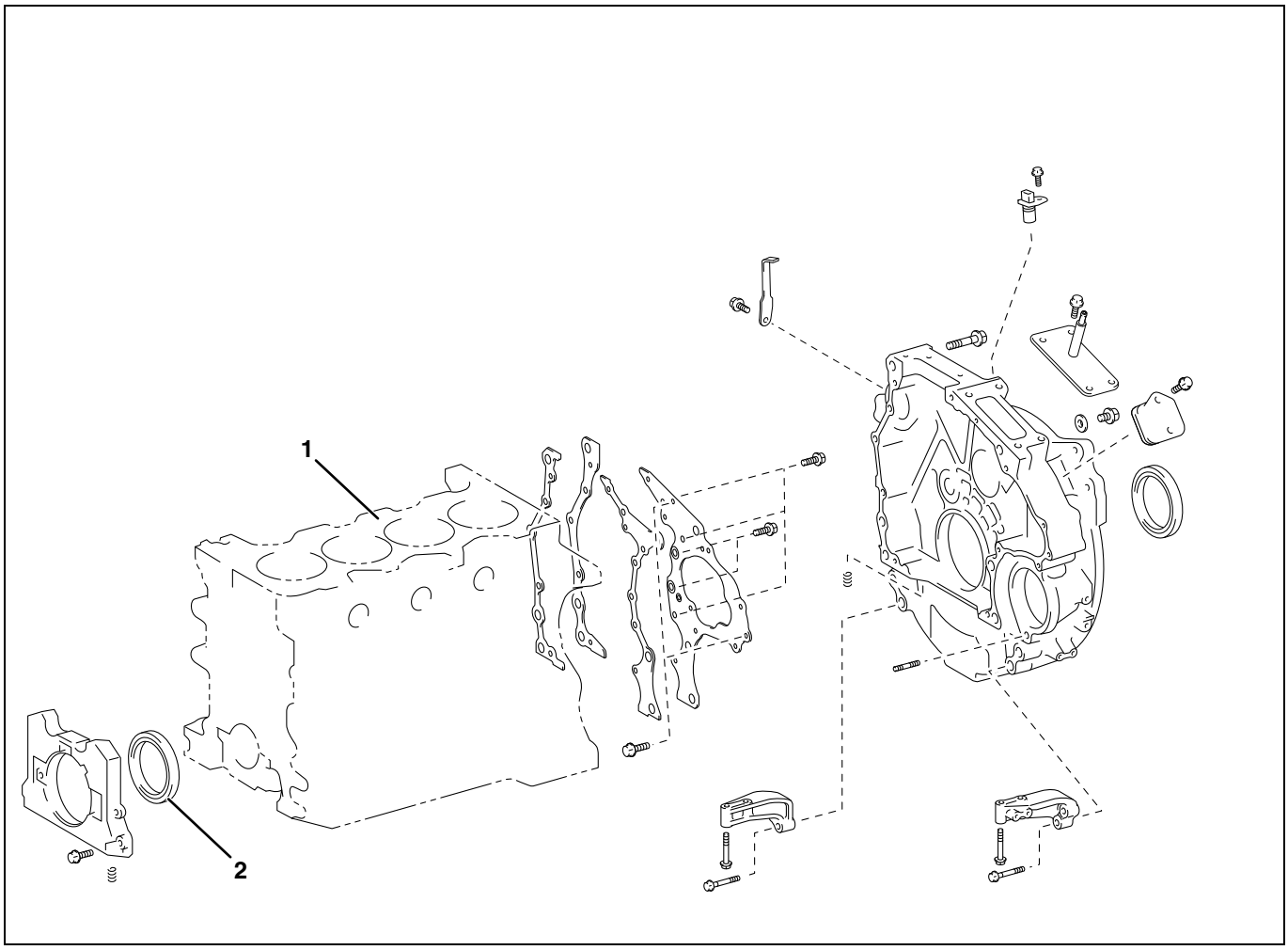
3. MOUNTING THE COOLING FAN ASSEMBLY AND FAN SHROUD RING
Reference: COOLING (J05E), COOLING FAN AND FAN CLUTCH, OVERHAUL, MOUNTING THE COOLING FAN & FAN CLUTCH (Page 12-36)

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CRANKSHAFT FRONT OIL SEAL

COMPONENT LOCATOR

EN01F02127090402018001



SHTS021270900105

1	Cylinder block	2	Crankshaft front oil seal

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REPLACEMENT

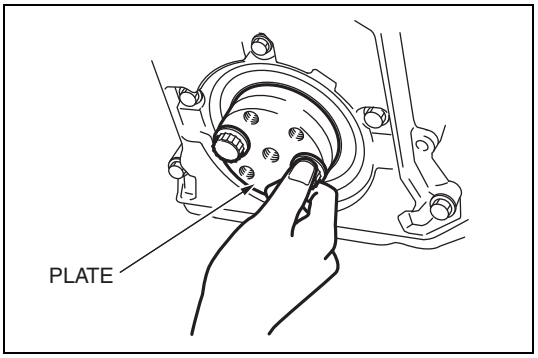
EN01F02127090402018002

REMOVING THE CRANKSHAFT FRONT OIL SEAL

1. REMOVING THE CRANKSHAFT PULLEY
Reference: ENGINE MECHANICAL (J05E), CRANKSHAFT PULLEY, REPLACEMENT, REMOVING THE CRANKSHAFT PULLEY (Page 10-47)

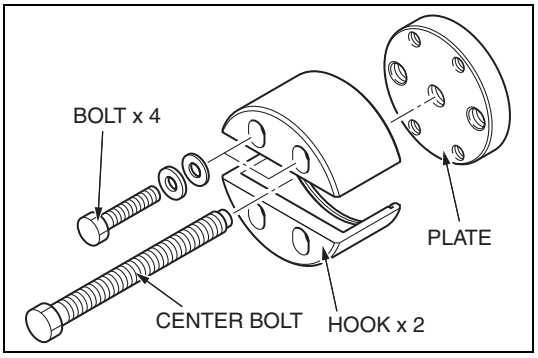
2. REMOVING THE CRANKSHAFT FRONT OIL SEAL

(1) Mount the SST plate to the crankshaft with 2 crankshaft pulley mounting bolts.
SST: S0942-01731
Oil seal puller



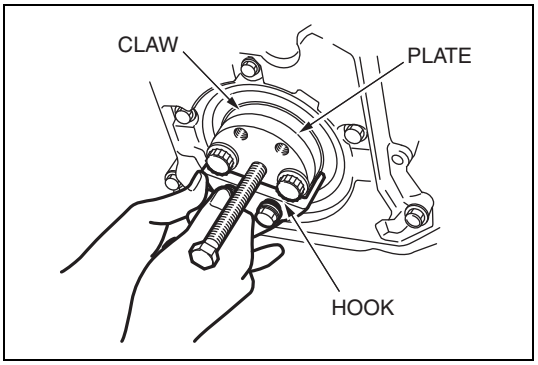
SHTS021270900106

NOTICE
SST kit



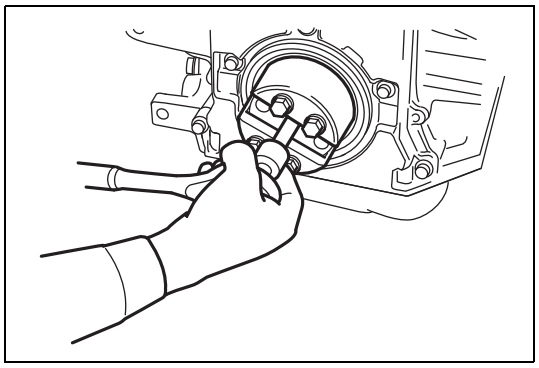
SHTS021270900107

(2) Hook the SST hooks (2 pcs.) on the chuck of the crankshaft front oil seal and fasten SST bolts to secure the hooks onto the SST plate.
(3) From the crankshaft, remove 2 crankshaft pulley mounting bolts securing the SST plate.



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SHTS021270900109

(4) Fit and gradually tighten the SST center bolt to pull off the crankshaft front oil seal.

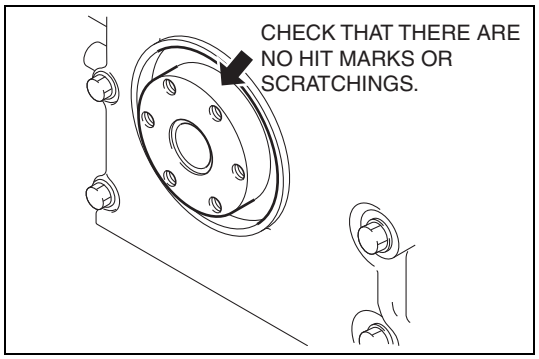
⚠ CAUTION

- **Inspect the engagement of the SST and oil seal half way through the work and pull off the seal without removing the SST.**
- **The crankshaft front oil seal is nonreusable.**

MOUNTING THE CRANKSHAFT FRONT OIL SEAL

1. MOUNTING THE CRANKSHAFT FRONT OIL SEAL

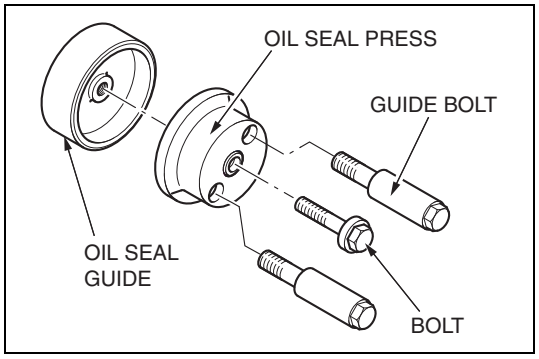
(1) Check that there is no dent or dirt in the oil seal insertion part of the front oil seal retainer and crankshaft.



SHTS021270900110

(2) Remove dirt from the SST.
SST: S0940-71030
Oil seal press

NOTICE
SST kit



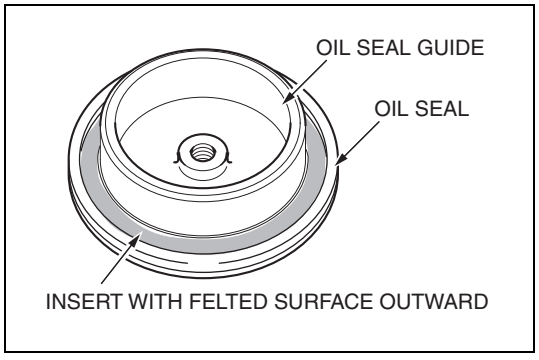
SHTS021270900111

(3) Apply the small amount of engine oil to the interference and circumference surfaces of a new crankshaft front oil seal.

(4) Note the direction of the oil seal and insert it to the oil seal guide of the SST.

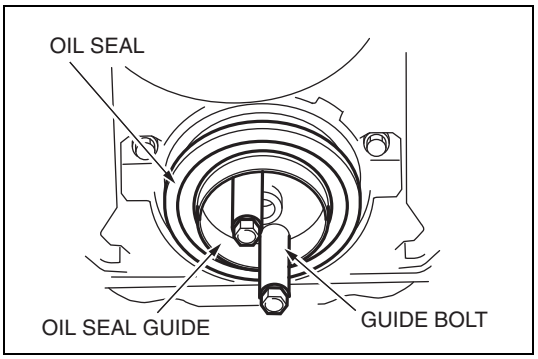
⚠ CAUTION

- **Use care to have correct longitudinal orientation of the crankshaft front oil seal. (The felted side must face to the crankshaft pulley side.)**
- **Mount the oil seal so that is not inclined.**



SHTS021270900112

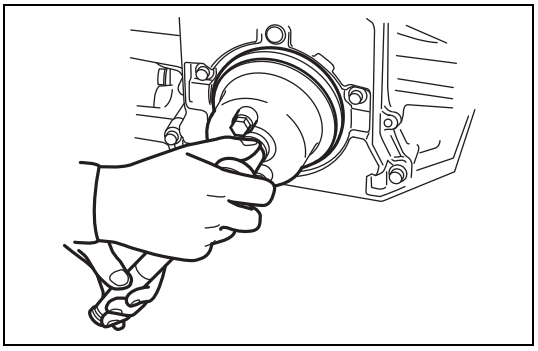
https://truckmanualshub.com/



SHTS021270900113

(5) Remove the dirt from the joint surfaces of the crankshaft front oil seal and cylinder block.
(6) After inserting the new crankshaft front oil seal into the oil seal guide, fasten SST guide bolts to secure the oil seal guide on the crankshaft.

⚠ CAUTION
After tightening the guide bolts, check that a height difference or a step between the crankshaft and the oil seal guide is consistent all around the circumference.


SHTS021270900114

(7) Align holes in the oil seal press with the guide bolts and insert the oil seal press.
(8) Fit the SST center bolt into the oil seal press and tighten it until it stops. Then, press-fit the crankshaft front oil seal.

⚠ CAUTION
Press-fit evenly around the circumference.

(9) Tighten the center bolt until the press comes in contact and check that the oil seal is press-fit evenly around the circumference.
(10) Remove the SST.

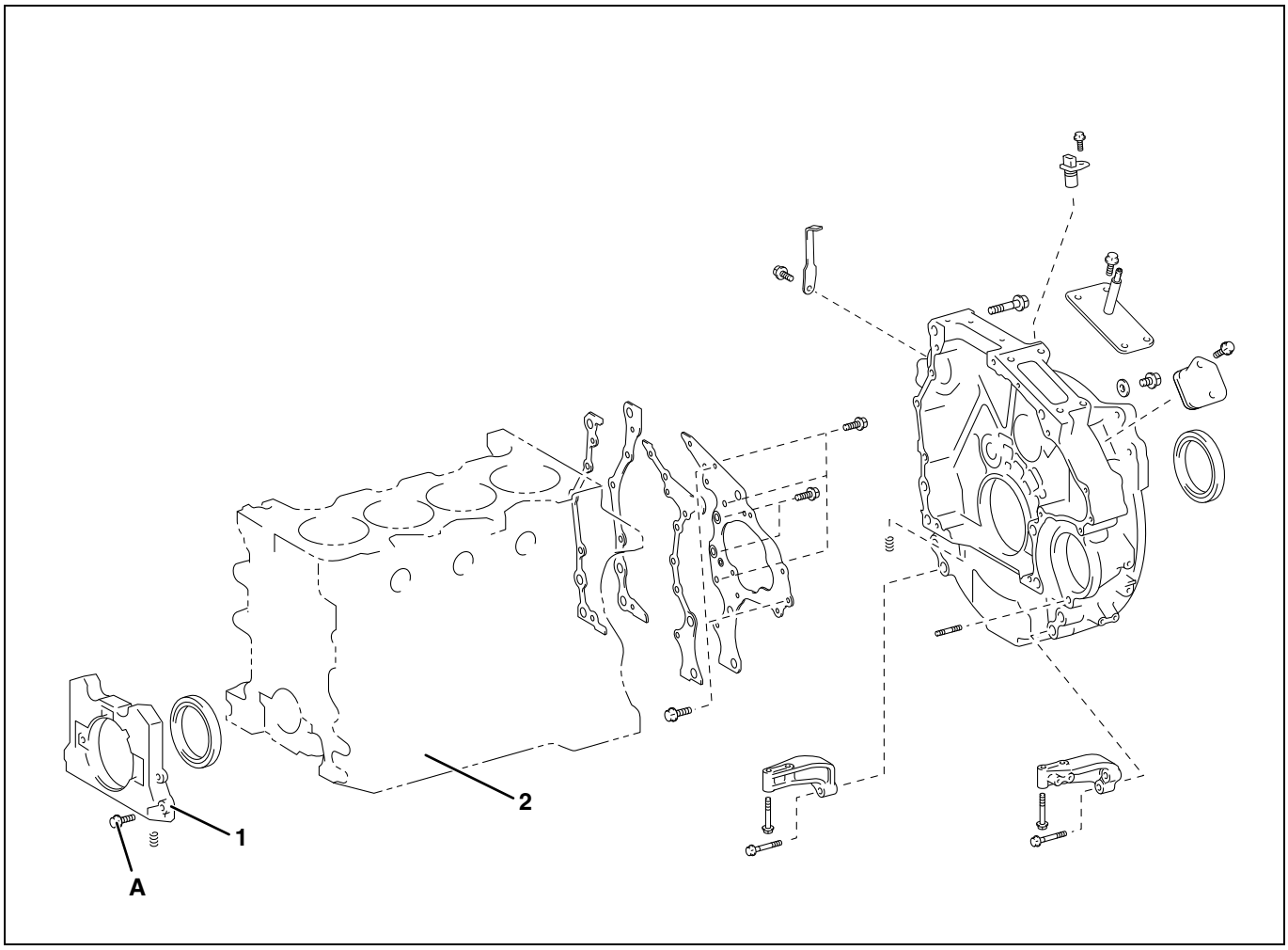
2. MOUNTING THE CRANKSHAFT PULLEY
Reference: ENGINE MECHANICAL (J05E), CRANKSHAFT PULLEY, REPLACEMENT, MOUNTING THE CRANKSHAFT PULLEY (Page 10-48)

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FRONT OIL SEAL RETAINER

COMPONENT LOCATOR

EN01F02127090402025001



SHTS021270900115

1	Front oil seal retainer	2	Cylinder block

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	30 {306, 22}		

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REPLACEMENT

EN01F02127090402025002

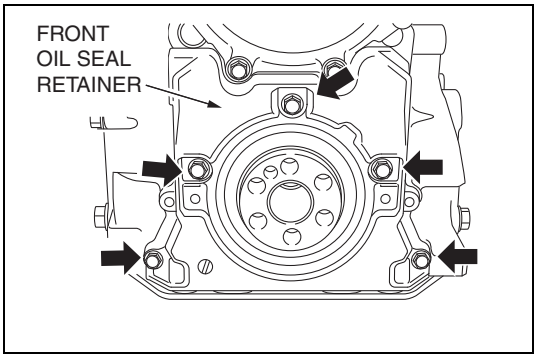
REMOVING THE FRONT OIL SEAL RETAINER

1. REMOVING THE OIL PAN
Reference: LUBRICATION (J05E), OIL PAN, REPLACEMENT, REMOVING THE OIL PAN (Page 13-24)

2. REMOVING THE CRANKSHAFT PULLEY
Reference: ENGINE MECHANICAL (J05E), CRANKSHAFT PULLEY, REPLACEMENT, REMOVING THE CRANKSHAFT PULLEY (Page 10-47)

3. REMOVING THE CRANKSHAFT FRONT OIL SEAL
Reference: ENGINE MECHANICAL (J05E), CRANKSHAFT FRONT OIL SEAL, REPLACEMENT, REMOVING THE CRANKSHAFT FRONT OIL SEAL (Page 10-50)

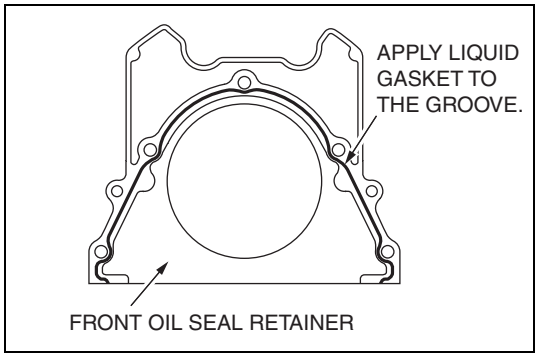
4. REMOVING THE FRONT OIL SEAL RETAINER
(1) Unfasten the 5 bolts to remove the front oil seal retainer from the cylinder block.



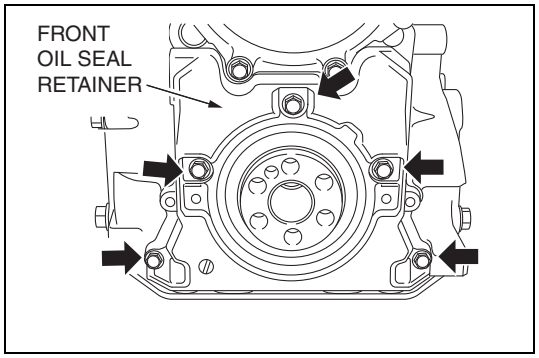
SHTS021270900116

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MOUNTING THE FRONT OIL SEAL RETAINER



SHTS021270900117



SHTS021270900118

1. MOUNTING THE FRONT OIL SEAL RETAINER

(1) Remove oil and dirt from the joint surface of the front oil seal retainer.

(2) Apply liquid gasket (ThreeBond TB1207B: Black or equivalent or ThreeBond TB1217G: Gray or equivalent) to the front oil seal retainer groove.

⚠ CAUTION

- **Apply the liquid gasket seamlessly.**
- **Apply the liquid gasket with a 1.5 mm {0.0591 in.} width.**
- **Mount the case within 20 minutes after applying the liquid gasket.**

(3) Mount the front oil seal retainer to the cylinder block with 5 bolts.
Tightening Torque:
30 N·m {306 kgf·cm, 22 lbf·ft}

2. MOUNTING THE CRANKSHAFT FRONT OIL SEAL
Reference: ENGINE MECHANICAL (J05E), CRANKSHAFT FRONT OIL SEAL, REPLACEMENT, MOUNTING THE CRANKSHAFT FRONT OIL SEAL (Page 10-51)

3. MOUNTING THE CRANKSHAFT PULLEY
Reference: ENGINE MECHANICAL (J05E), CRANKSHAFT PULLEY, REPLACEMENT, MOUNTING THE CRANKSHAFT PULLEY (Page 10-48)

4. MOUNTING THE OIL PAN
Reference: LUBRICATION (J05E), OIL PAN, REPLACEMENT, MOUNTING THE OIL PAN (Page 13-25)

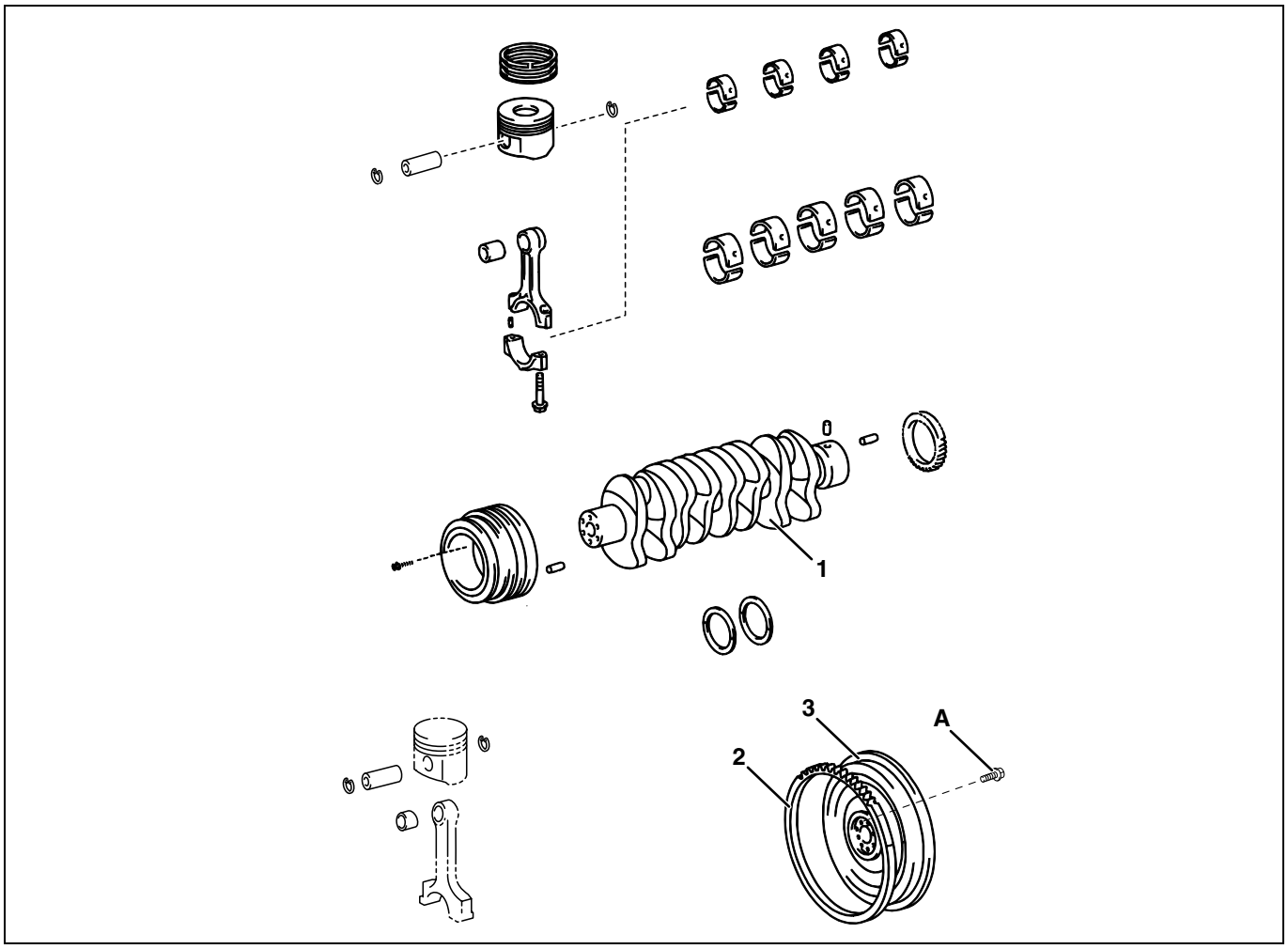
5. FEEDING ENGINE OIL
Reference: MOUNTING AND DISMOUNTING THE ENGINE (J05E), ENGINE ASSEMBLY, REPLACEMENT, MOUNTING THE ENGINE ASSEMBLY (Page 5-11)

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FLYWHEEL ASSEMBLY

COMPONENT LOCATOR

EN01F02127090402020001



SHTS021270900119

1	Crankshaft	3	Flywheel
2	Ring gear		

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	186 {1,897, 137}	

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OVERHAUL

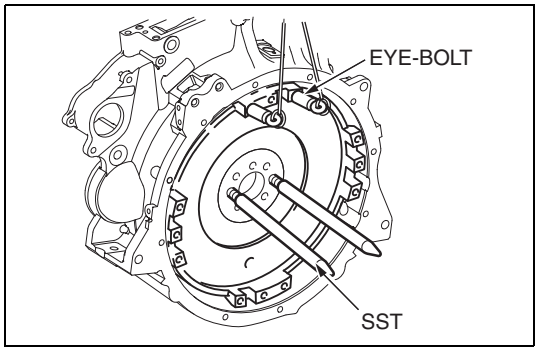
EN01F02127090402020002

REMOVING THE FLYWHEEL ASSEMBLY

1. REMOVING THE ENGINE MAIN REVOLUTION SENSOR
Reference: ENGINE CONTROL (J05E), ENGINE SPEED MAIN SENSOR, REPLACEMENT, REMOVING THE ENGINE SPEED MAIN SENSOR (Page 6-12)

2. REMOVING THE FLYWHEEL ASSEMBLY

(1) Remove the two horizontal flywheel mounting bolts first and then fasten SST to prevent drop-off.
SST: S0948-11340
Guide



SHTS021270900120

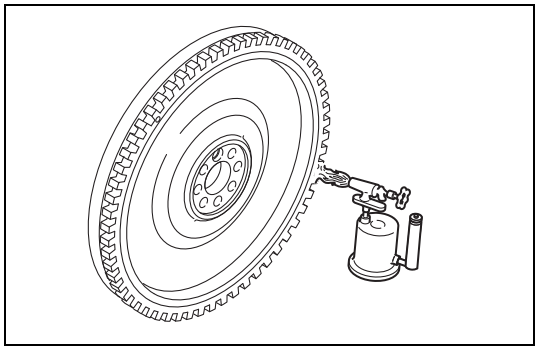
NOTICE
To prevent the co-rotation of the crankshaft, insert a large flat-blade screwdriver into the flywheel gear from the inspection hole of the flywheel housing and stop the rotation of the crankshaft.

(2) Mount the eyebolts at the clutch mounting threaded parts and remove the remaining bolts while lifting the flywheel assembly with the hoist. Remove the flywheel as sliding it with SST.

⚠ CAUTION
Handle it with care because it is a heavy load.

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DISASSEMBLING FLYWHEEL ASSEMBLY

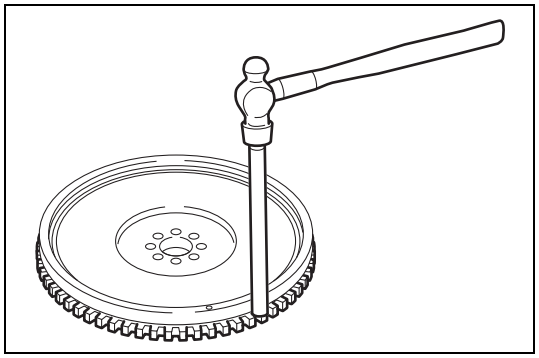


SHTS021270900121

1. REMOVING THE RING GEAR

(1) Use the burner to heat the periphery of a ring gear to approximately 20°C {68°F}.

⚠ CAUTION
Do not touch with bare hands while the ring gear and flywheel are hot.

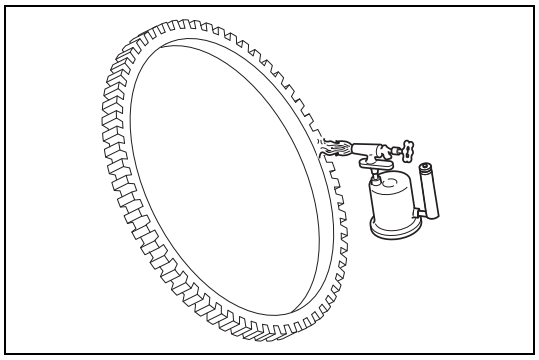


SHTS021270900122

(2) Use the brass bar and a hammer to tap the periphery around the ring gear to remove the ring gear from the flywheel.

⚠ CAUTION
Do not touch with bare hands while the ring gear and flywheel are hot.

ASSEMBLING FLYWHEEL ASSEMBLY

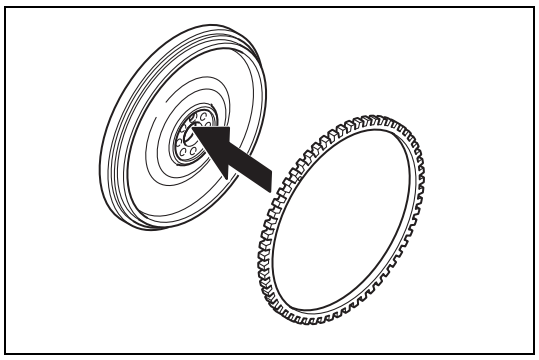


SHTS021270900123

1. MOUNTING THE RING GEAR

(1) Use the burner to heat the periphery of a ring gear to approximately 200°C {392°F}.

⚠ CAUTION
Do not touch with bare hands while the ring gear and flywheel are hot.



SHTS021270900124

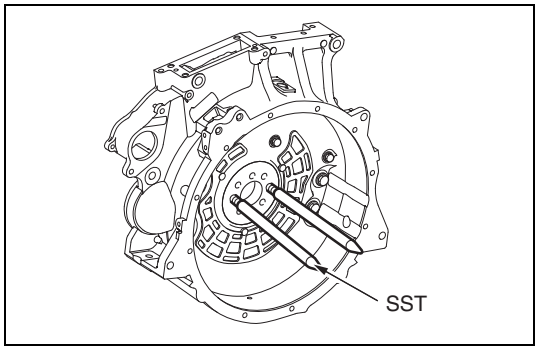
(2) Quickly mount the ring gear to the flywheel with a chamfered face positioned to face the flywheel.

⚠ CAUTION
Do not touch with bare hands while the ring gear and flywheel are hot.

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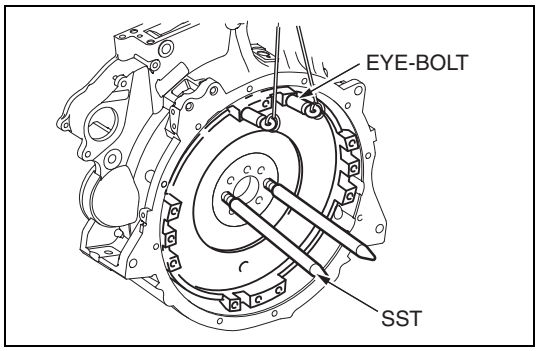
MOUNTING THE FLYWHEEL ASSEMBLY

1. MOUNTING THE FLYWHEEL ASSEMBLY



SHTS021270900125

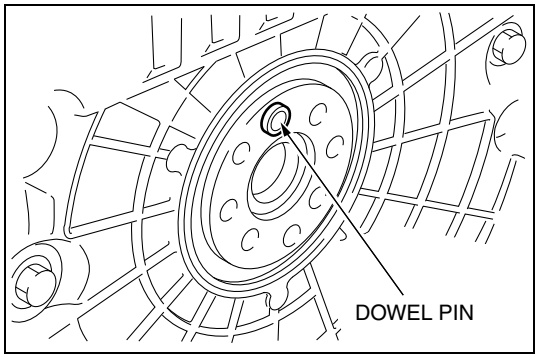
(1) Check that there are no burrs or dirt on the joint surface between the crankshaft and flywheel and the screw holes.
(2) Mount the 2 SST horizontally to the crankshaft.
SST: S0948-11340
Guide



SHTS021270900126

(3) Fasten eye bolts to clutch mounting threads and use a hoist to lift up and set the flywheel assembly to the mounting position.

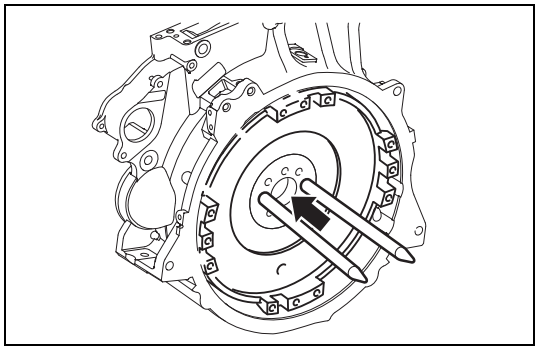
⚠ CAUTION
- **Handle it with care because it is a heavy load.**
- **Before removing SST, temporarily tighten the bolt.**



SHTS021270900127

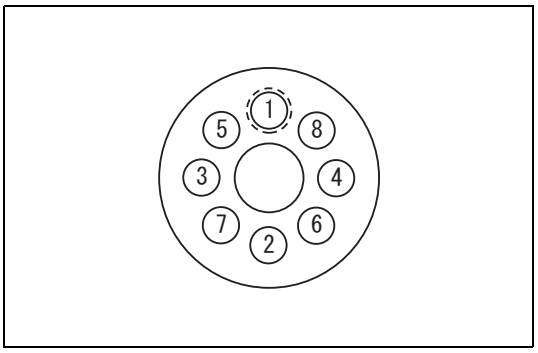
NOTICE
Set the dowel pin to the mounting position while checking the dowel hole.

(4) Insert the flywheel assembly until it contacts with the crankshaft.


SHTS021270900128

(5) Apply engine oil to the bolt seat surface and bolt threaded part of the flywheel assembly mounting bolt.
(6) Fit the six bolts into bolt holes not occupied by the SST and manually tighten them by a couple of turns.
(7) Gradually pre tighten six bolts.
(8) Unfasten the SST and pre tighten the remaining two bolts in the similar fashion.

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SHTS021270900129

(9) Tighten the flywheel assembly mounting bolts with the specified tightening torque in the sequential order as shown in the figure.
Tightening Torque:
186 N·m {1,897 kgf·cm, 137 lbf·ft}

NOTICE
To prevent the co-rotation of the crankshaft, insert a large flat-blade screwdriver into the flywheel gear from the inspection hole of the flywheel housing and stop the rotation of the crankshaft.

(10) Loosen the all the bolts once.
(11) Tighten the bolts again in order as shown in the figure.
Tightening Torque:
186 N·m {1,897 kgf·cm, 137 lbf·ft}

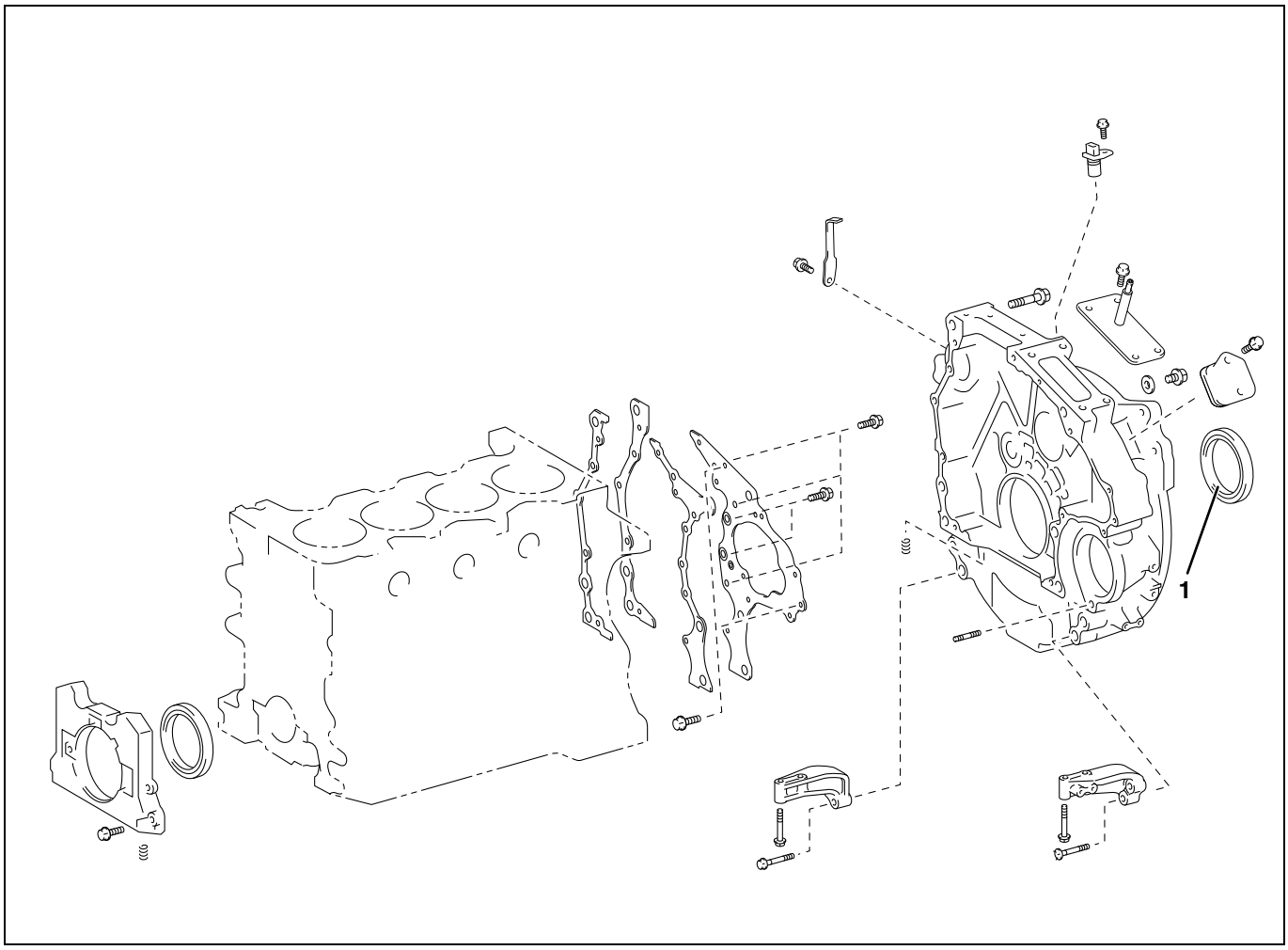
2. MOUNTING THE ENGINE MAIN REVOLUTION SENSOR
Reference: ENGINE CONTROL (J05E), ENGINE SPEED MAIN SENSOR, REPLACEMENT, MOUNTING THE ENGINE SPEED MAIN SENSOR (Page 6-12)

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CRANKSHAFT REAR OIL SEAL

COMPONENT LOCATOR

EN01F02127090402021001



SHTS021270900130

1 Crankshaft rear oil seal *	

*: Nonreusable part

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REPLACEMENT

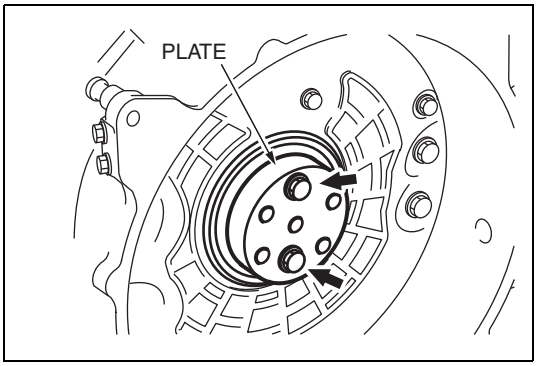
EN01F02127090402021002

REMOVING CRANKSHAFT REAR OIL SEAL

1. REMOVING THE FLYWHEEL ASSEMBLY
Reference: ENGINE MECHANICAL (J05E), FLYWHEEL ASSEMBLY, OVERHAUL, REMOVING THE FLYWHEEL ASSEMBLY (Page 10-57)

2. REMOVING CRANKSHAFT REAR OIL SEAL

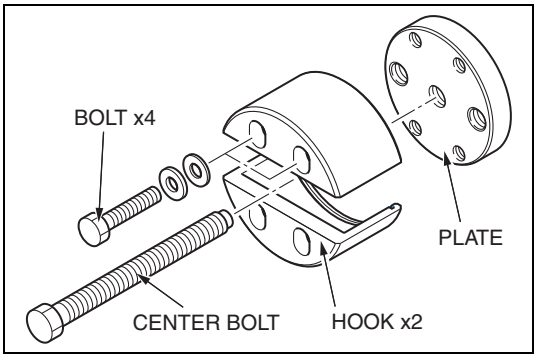
(1) Fasten the flywheel assembly mounting bolts (2 pcs.) to secure the SST plate on the crankshaft.
SST: S0942-01742
Oil seal puller



SHTS021270900131

⚠ CAUTION
Align the large hole of the plate with the collar knock of the crankshaft.

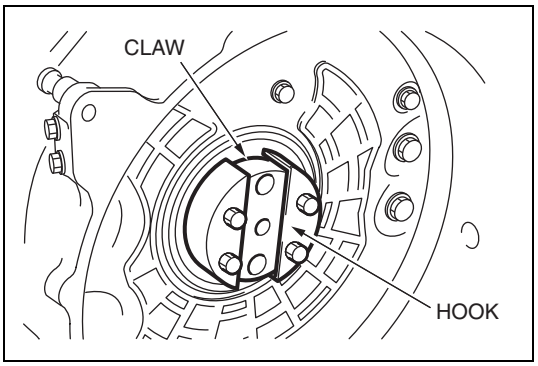
NOTICE
SST kit



SHTS021270900132

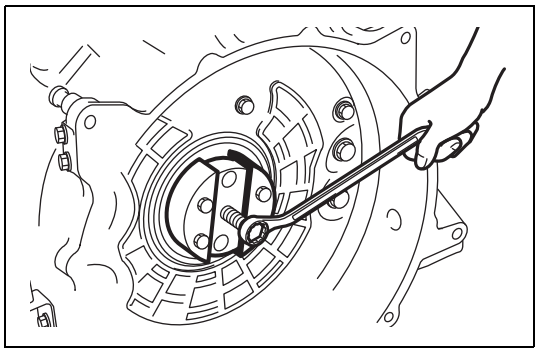
(2) Hook the 2 SST hooks on the claw of the crankshaft rear oil seal and secure the hooks to the SST plate with the SST bolts.

(3) From the crankshaft, remove the flywheel assembly mounting bolts (2 pcs.) securing the SST plate.



SHTS021270900133

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SHTS021270900134

(4) Fit and gradually tighten the SST center bolt to pull off the crankshaft rear oil seal.

⚠ CAUTION

- **Inspect the engagement of the SST and oil seal half way through the work and pull off the seal without removing the SST.**
- **The crankshaft rear oil seal is nonreusable.**

MOUNTING THE CRANKSHAFT REAR OIL SEAL

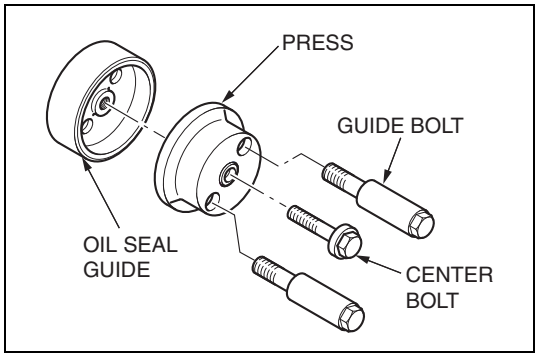
1. MOUNTING THE CRANKSHAFT REAR OIL SEAL

(1) Check that there is no dent or dirt on the oil seal insertion part of the flywheel housing and crankshaft.

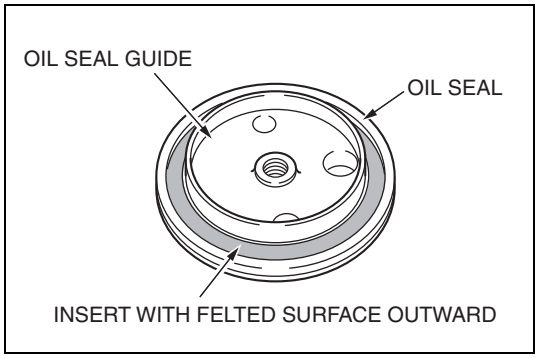
(2) Remove the dirt from the SST.

SST: S0940-71040
Oil seal press

NOTICE
SST kit



SHTS021270900135



SHTS021270900136

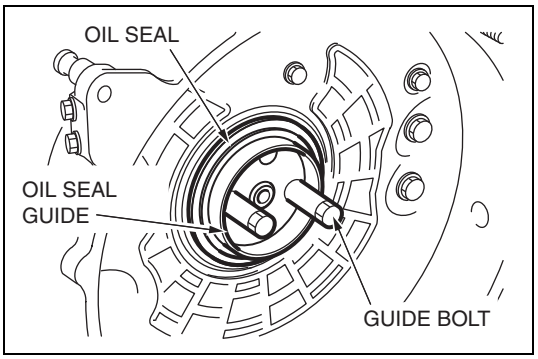
(3) Apply the small amount of engine oil to the interference and circumference surfaces of a new crankshaft rear oil seal.

(4) Note the direction of the oil seal and insert it to the oil seal guide of the SST.

⚠ CAUTION

- **Note the front and rear direction of the crankshaft rear oil seal. (The felt surface is the flywheel side)**
- **Mount the oil seal so that is not inclined.**

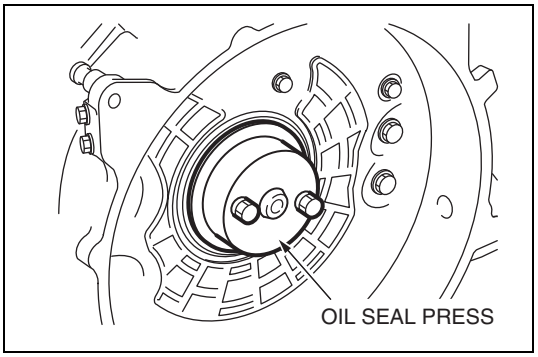
https://truckmanualshub.com/



SHTS021270900137

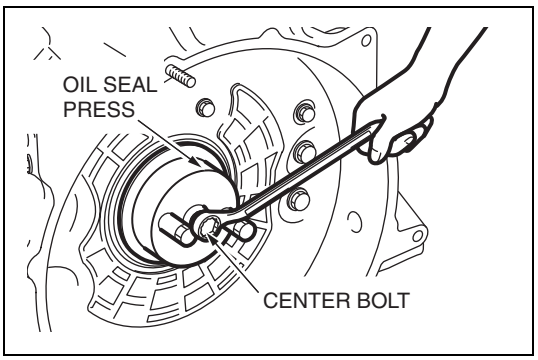
(5) After inserting the new crankshaft rear oil seal into the oil seal guide, fasten SST guide bolts to secure the oil seal guide on the crankshaft.

⚠ CAUTION
- **Align the large hole of the oil seal guide with the collar knock of the crankshaft.**
- **After tightening the guide bolts, check that a height difference or a step between the crankshaft and the oil seal guide is consistent all around the circumference.**



SHTS021270900138

(6) Align the holes in the oil seal press with the guide bolts and insert the oil seal press.



SHTS021270900139

(7) Attach the accompanying center bolt to the oil seal press and tighten it until it stops to press-fit the crankshaft rear oil seal.

⚠ CAUTION
Press-fit evenly around the circumference.

(8) Tighten the center bolt until the press comes in contact and check that the oil seal is press-fit evenly around the circumference.
(9) Remove the SST.

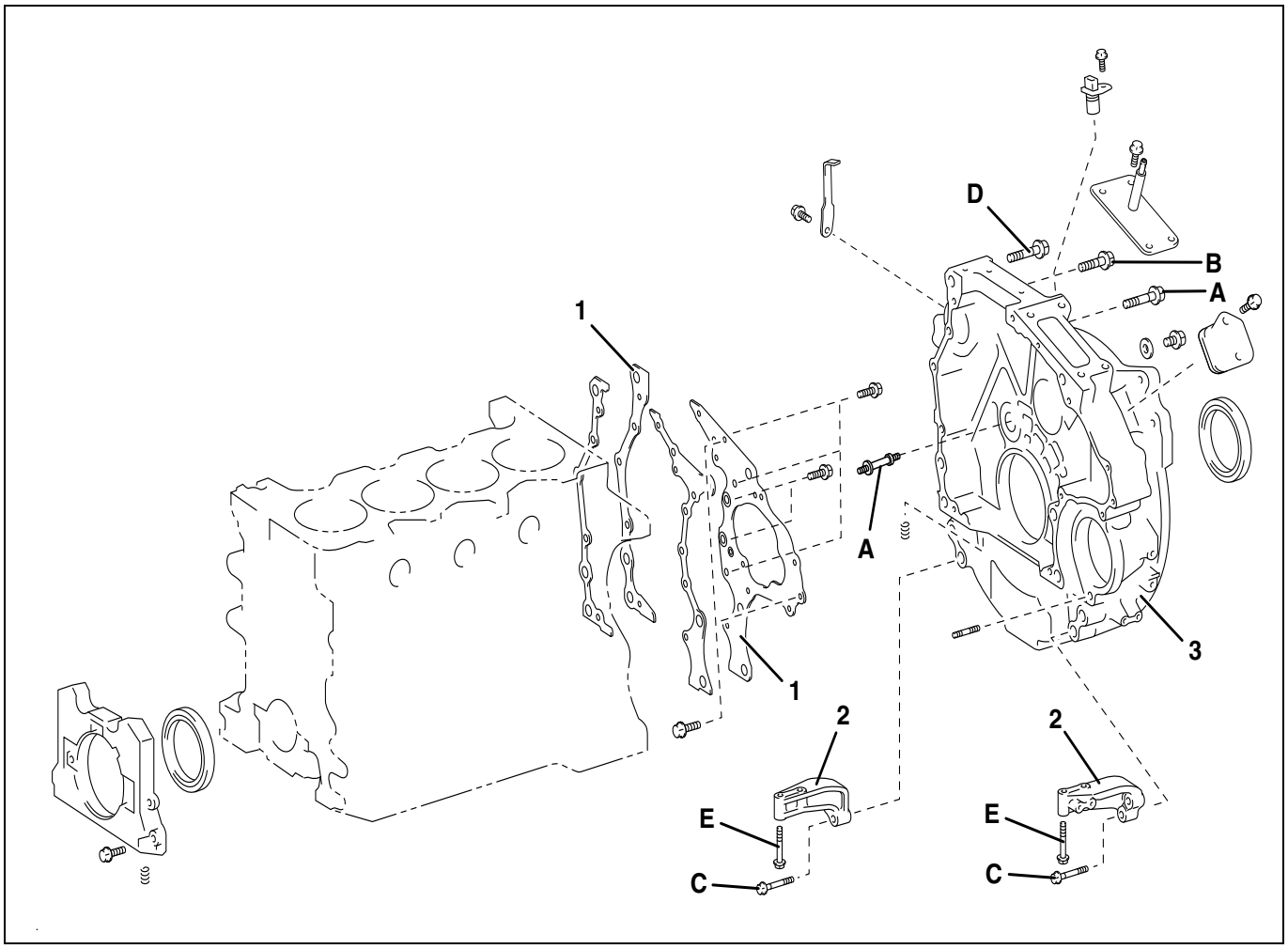
2. MOUNTING THE FLYWHEEL ASSEMBLY
Reference: ENGINE MECHANICAL (J05E), FLYWHEEL ASSEMBLY, OVERHAUL, MOUNTING THE FLYWHEEL ASSEMBLY (Page 10-59)

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FLYWHEEL HOUSING

COMPONENT LOCATOR

EN01F021270904020220001



SHTS021270900140

1	Rear end plate	3	Flywheel housing
2	Housing stay		

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	55 {561, 41}	D	196 {1,999, 145}
B	28 {291, 21}	E	171.5 {1,749, 126}
C	97 {989, 72}		

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REPLACEMENT

EN01F02127090402022002

REMOVING THE FLYWHEEL HOUSING

1. REMOVING THE CYLINDER HEAD ASSEMBLY
Reference: ENGINE MECHANICAL (J05E), CYLINDER HEAD ASSEMBLY, REPLACEMENT, REMOVING THE CYLINDER HEAD ASSEMBLY (Page 10-23)

2. REMOVING THE STARTER
Reference: STARTING/CHARGING (J05E), STARTER, REPLACEMENT, REMOVING THE STARTER (Page 16-3)

3. REMOVING THE POWER STEERING PUMP
Reference: CHASSIS (S1-LXJE03A), STEERING
Reference: CHASSIS (S1-LXJE04A), STEERING

4. REMOVING THE VACUUM PUMP
Reference: CHASSIS (S1-LXJE03A), BRAKE
Reference: CHASSIS (S1-LXJE04A), BRAKE

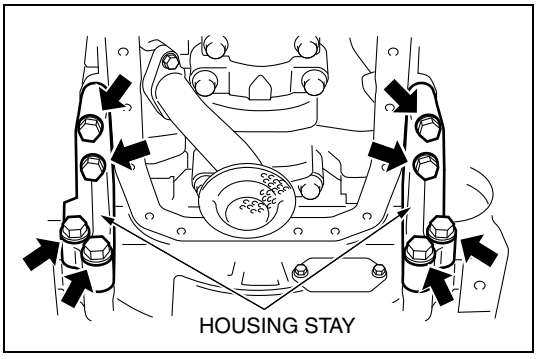
5. REMOVING THE HYDRAULIC PUMP
Reference: CHASSIS (S1-LXJE03A), BRAKE
Reference: CHASSIS (S1-LXJE04A), BRAKE

6. REMOVING THE OIL PAN
Reference: LUBRICATION (J05E), OIL PAN, REPLACEMENT, REMOVING THE OIL PAN (Page 13-24)

7. REMOVING THE FLYWHEEL ASSEMBLY
Reference: ENGINE MECHANICAL (J05E), FLYWHEEL ASSEMBLY, OVERHAUL, REMOVING THE FLYWHEEL ASSEMBLY (Page 10-57)

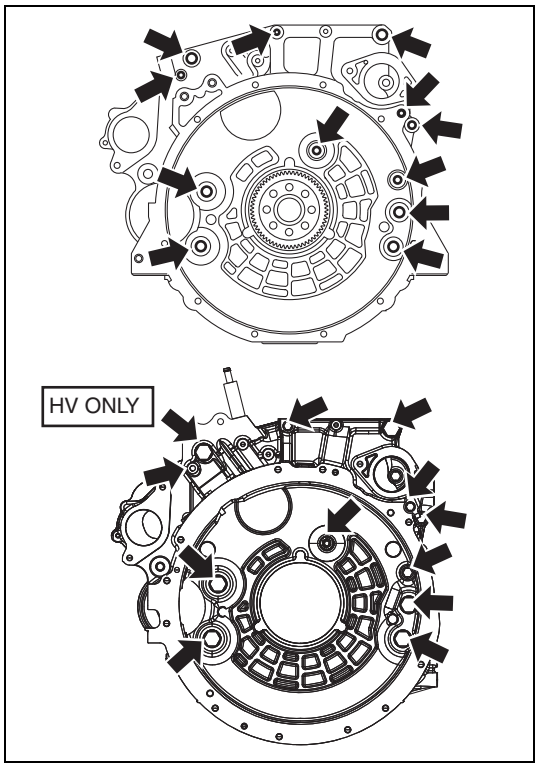
8. REMOVING THE CRANKSHAFT REAR OIL SEAL
Reference: ENGINE MECHANICAL (J05E), CRANKSHAFT REAR OIL SEAL, REPLACEMENT, REMOVING CRANKSHAFT REAR OIL SEAL (Page 10-62)

9. REMOVING THE FLYWHEEL HOUSING
(1) Unbolt and remove housing stays from the flywheel housing and cylinder block.



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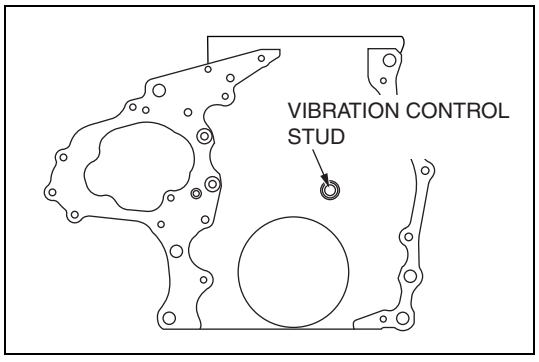


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(2) Unfasten the bolts and nuts to remove the flywheel housing.

NOTICE

- **If there is no dedicated engine bench, the engine cannot be supported. In this case, turn over the engine and place the cylinder block joint surface on the wooden workbench during work.**
- **If the flywheel housing does not come off smoothly, temporarily fasten one mounting nut in the center of the flywheel housing and use a plastic hammer to tap the back face to remove the flywheel housing.**

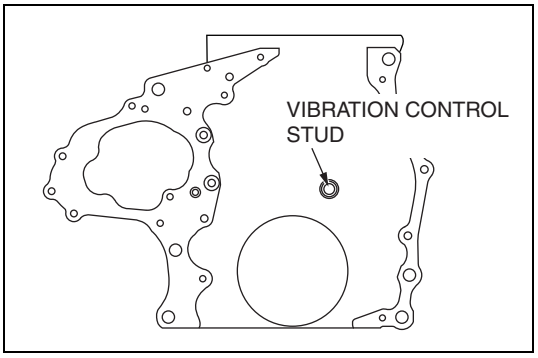


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(3) Unfasten the damping stud from the flywheel housing.

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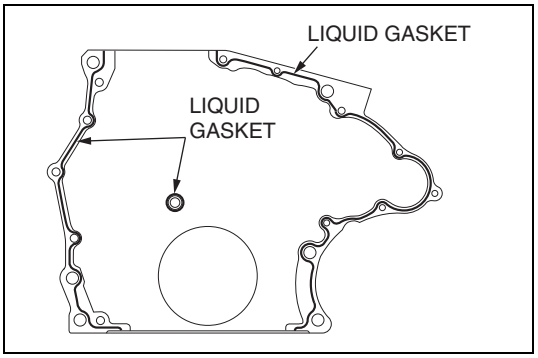
MOUNTING THE FLYWHEEL HOUSING



SHTS021270900144

1. MOUNTING THE FLYWHEEL HOUSING

(1) Fasten the damping stud onto the flywheel housing.
Tightening Torque:
55 N·m {561 kgf·cm, 41 lbf·ft}



SHTS021270900145

(2) Use the scraper to remove dirt and fouling from the joint surfaces of the flywheel housing and rear end plate.

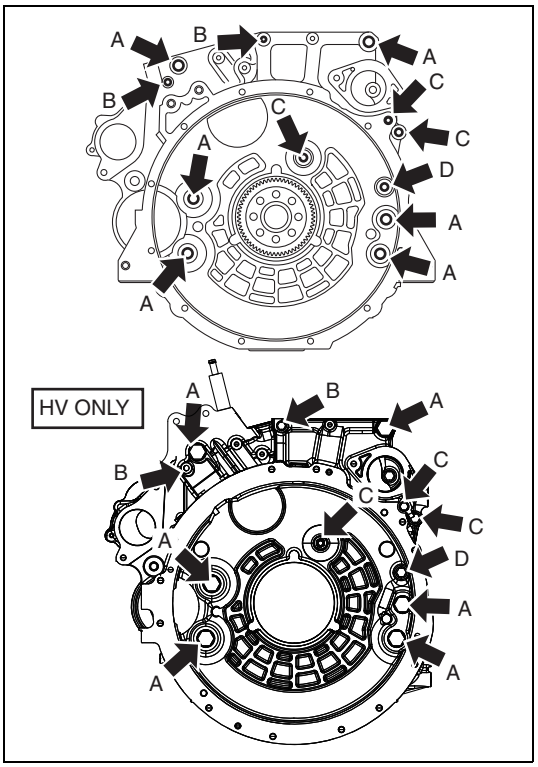
(3) Apply liquid gasket (ThreeBond TB1207D: Silver or equivalent or ThreeBond TB1217G: Gray or equivalent) to the flywheel housing as shown in the figure.

⚠ CAUTION

- **Apply the liquid gasket seamlessly.**
- **Apply the liquid gasket with 1.5-2.5 mm {0.0590-0.0984 in.} width.**
- **Mount the case within 20 minutes after applying the liquid gasket.**

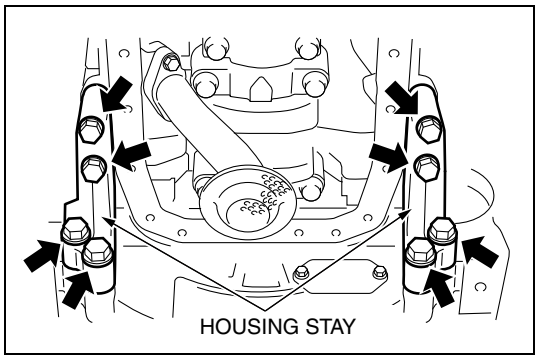
(4) Fasten 2-4 guide bolts and align the flywheel housing with the cylinder block mounting position along the guide bolts.

(5) Tighten the bolts and nuts with the specified tightening torques to secure the flywheel housing.
Tightening Torque:
196 N·m {1,999 kgf·cm, 145 lbf·ft}
Part A: M16
28.5 N·m {291 kgf·cm, 21 lbf·ft}
Part B: M8
55 N·m {561 kgf·cm, 41 lbf·ft}
Part C: M10
55 N·m {561 kgf·cm, 41 lbf·ft}
Part D: M10



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(6) Pre tightening bolts for tight fitting to the flywheel housing and cylinder block and tighten them with the specified tightening torques.
Tightening Torque:
97 N·m {989 kgf·cm, 72 lbf·ft}
M12
171.5 N·m {1,749 kgf·cm, 126 lbf·ft}
M14

2. MOUNTING THE CRANKSHAFT REAR OIL SEAL
Reference: ENGINE MECHANICAL (J05E), CRANKSHAFT REAR OIL SEAL, REPLACEMENT, MOUNTING THE CRANKSHAFT REAR OIL SEAL (Page 10-63)

3. MOUNTING THE FLYWHEEL ASSEMBLY
Reference: ENGINE MECHANICAL (J05E), FLYWHEEL ASSEMBLY, OVERHAUL, MOUNTING THE FLYWHEEL ASSEMBLY (Page 10-59)

4. MOUNTING THE OIL PAN
Reference: LUBRICATION (J05E), OIL PAN, REPLACEMENT, MOUNTING THE OIL PAN (Page 13-25)

5. MOUNTING THE HYDRAULIC PUMP
Reference: CHASSIS (S1-LXJE03A), BRAKE
Reference: CHASSIS (S1-LXJE04A), BRAKE

6. MOUNTING THE VACUUM PUMP
Reference: CHASSIS (S1-LXJE03A), BRAKE
Reference: CHASSIS (S1-LXJE04A), BRAKE

7. MOUNTING THE POWER STEERING PUMP
Reference: CHASSIS (S1-LXJE03A), STEERING
Reference: CHASSIS (S1-LXJE04A), STEERING

8. MOUNTING THE STARTER
Reference: STARTING/CHARGING (J05E), STARTER, REPLACEMENT, MOUNTING THE STARTER (Page 16-4)

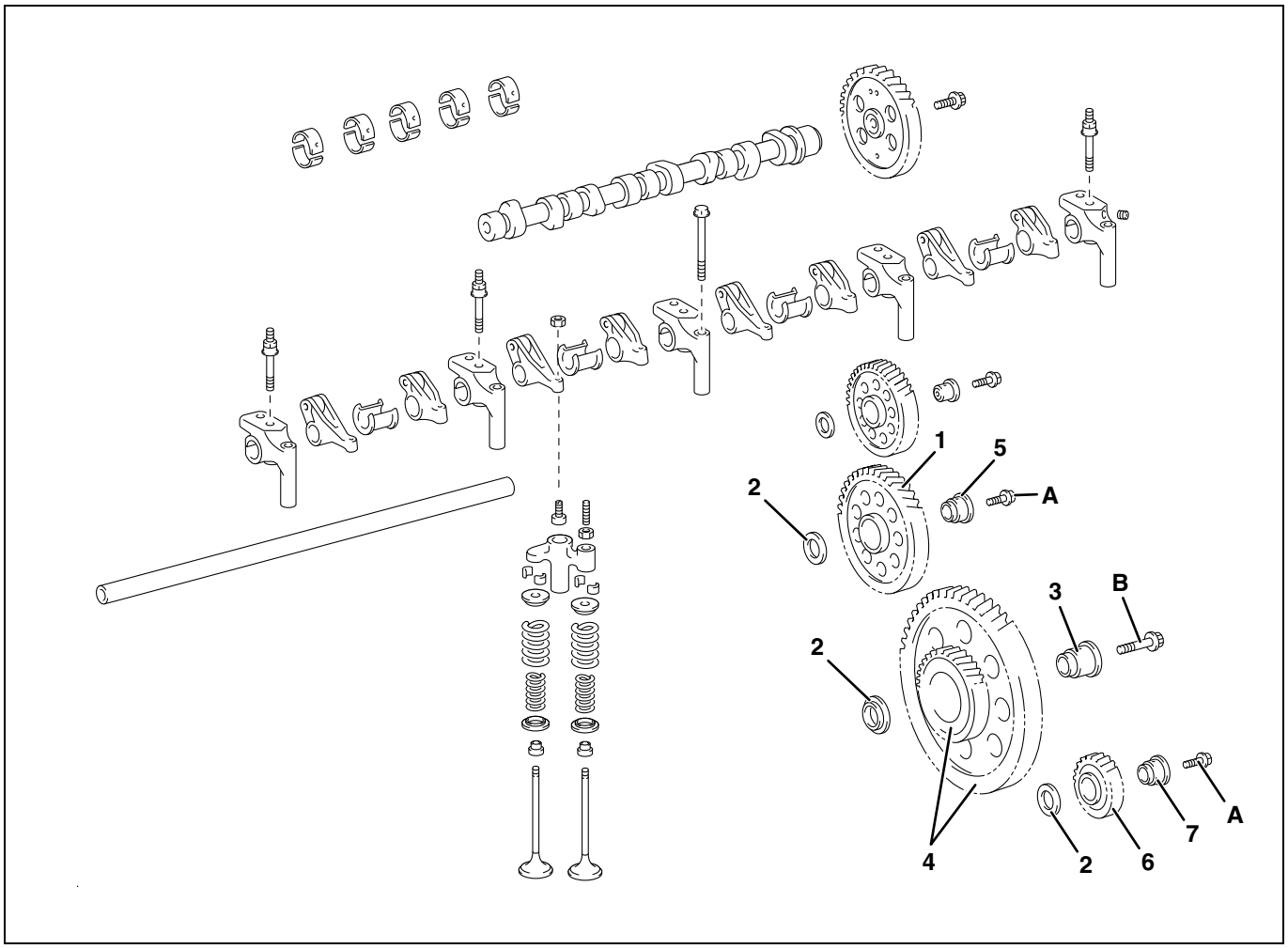
9. MOUNTING THE CYLINDER HEAD ASSEMBLY
Reference: ENGINE MECHANICAL (J05E), CYLINDER HEAD ASSEMBLY, REPLACEMENT, MOUNTING THE CYLINDER HEAD ASSEMBLY (Page 10-25)

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TIMING GEAR & CAM IDLE GEAR

COMPONENT LOCATOR

EN01F02127090402024001



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1	Sub idle gear	5	Thrust plate
2	Thrust plate	6	Sub idle gear shaft
3	Main idle gear shaft	7	Injection pump idle gear
4	Main idle gear	8	Injection pump idle gear shaft

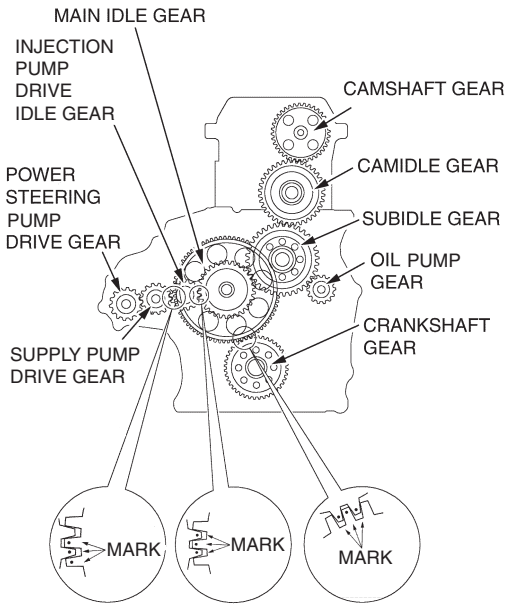
Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	108 {1,101, 80}	D	172 {1,754, 127}

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CONFIGURATION DIAGRAM

EN01F02127090402024002



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OVERHAUL

EN01F02127090402024003

REMOVING THE CAMSHAFT DRIVE GEAR AND CAM IDLE GEAR

1. REMOVING THE CAMSHAFT ASSEMBLY
Reference: ENGINE MECHANICAL (J05E), CAMSHAFT ASSEMBLY, OVERHAUL, REMOVING THE CAMSHAFT ASSEMBLY (Page 10-16)

2. REMOVING THE CAMSHAFT DRIVE GEAR
Reference: ENGINE MECHANICAL (J05E), CAMSHAFT ASSEMBLY, OVERHAUL, REMOVING THE CAMSHAFT ASSEMBLY (Page 10-16)

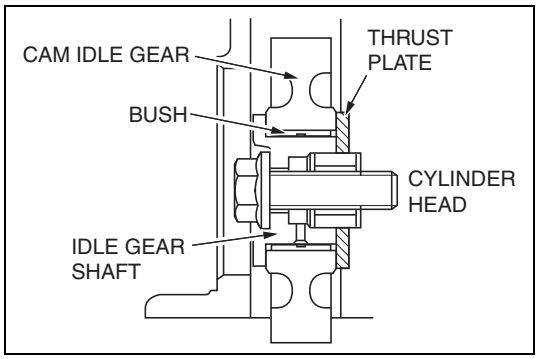
3. REMOVING THE CYLINDER HEAD
Reference: ENGINE MECHANICAL (J05E), CYLINDER HEAD ASSEMBLY, REPLACEMENT, REMOVING THE CYLINDER HEAD ASSEMBLY (Page 10-23)

4. REMOVING THE CAM IDLE GEAR

(1) Unbolt an idle gear shaft to remove a cam idle gear, the idle gear shaft and a thrust plate from the cylinder head.

⚠ CAUTION
Be careful not to drop the thrust plate in the flywheel housing.

NOTICE
Turn over the engine vertically or turn it onto the side during work. This prevents workers from dropping parts in the flywheel housing.



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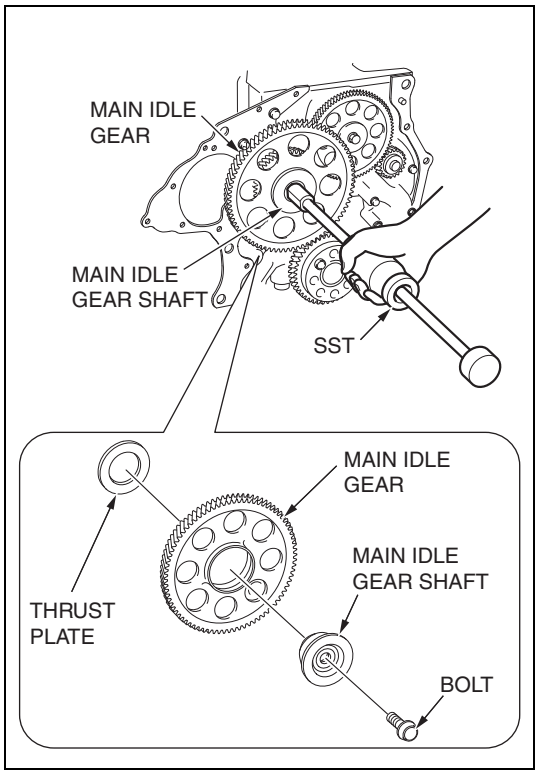
REMOVING THE TIMING GEARS AND THE REAR END PLATE FROM FLYWHEEL HOUSING

1. REMOVING THE FLYWHEEL HOUSING
Reference: ENGINE MECHANICAL (J05E), FLYWHEEL HOUSING, REPLACEMENT, REMOVING THE FLYWHEEL HOUSING (Page 10-66)

2. REMOVING THE MAIN IDLE GEAR

(1) Unfasten the bolt of the main idle gear shaft.

(2) Use the SST to pull off the main idle gear shaft and remove the main idle gear shaft, a main idle gear and a thrust plate.
SST: S0942-01100
Sliding hammer

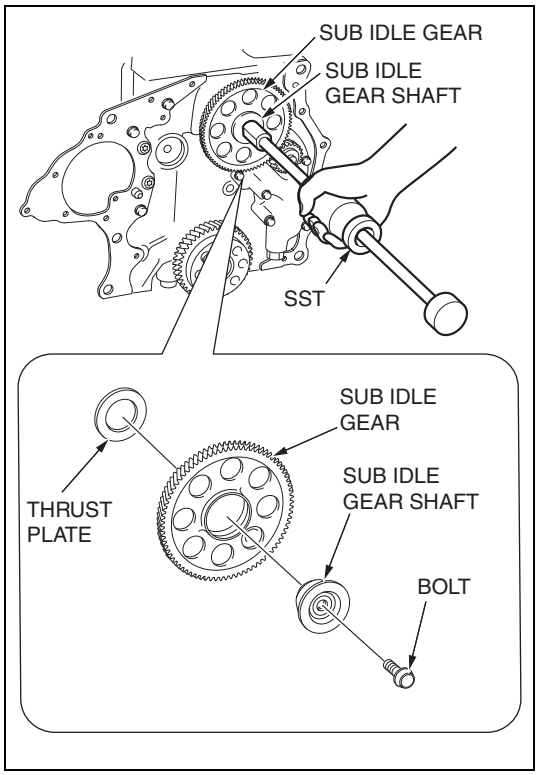


SHTS021270900151

⚠ CAUTION
Use care not to drop the main idle gear and thrust plate.

(3) Remove the main idle gear shaft and thrust plate from the main idle gear.

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3. REMOVING SUB IDLE GEAR

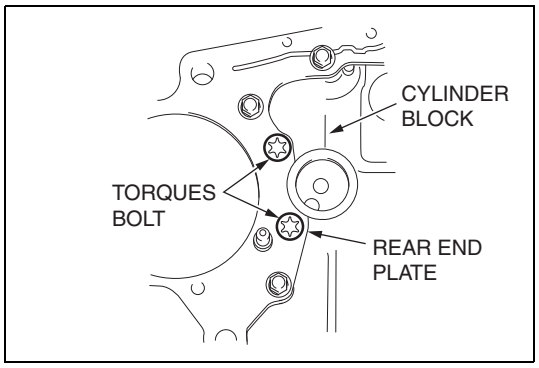
(1) Unfasten the bolt of the sub idle gear shaft.

(2) Use the SST to pull off the sub idle gear shaft and remove the sub idle gear shaft, sub idle gear, and thrust plate.

SST: S0942-01100
Sliding hammer

⚠ CAUTION
Be careful not to drop the thrust plate and idle gear.

(3) Remove the sub idle gear shaft and thrust plate from the sub idle gear.



SHTS021270900153

4. REMOVING REAR END PLATE

(1) Use the SST to unfasten Torque bolts on the rear end plate.

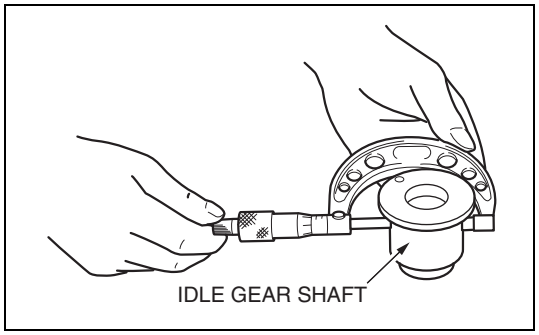
SST: S0941-11300
Socket wrench

(2) Unfasten the remaining bolts and remove the rear end plate.

INSPECTING THE COMPONENTS

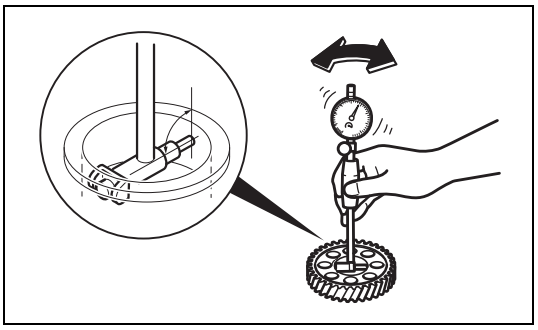
1. INSPECTING IDLE GEAR OIL CLEARANCE

(1) Use the micrometer to measure the idle gear shaft outer diameter.



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SHTS021270900155

(2) Use the cylinder gauge to measure the inner diameter of the idle gear bushing.

Measured item		Standard value (mm {in.})
Main idle gear	Shaft outer diameter	57 {2.244}
	Bushing inner diameter	57 {2.244}
Sub idle gear	Shaft outer diameter	50 {1.969}
	Bushing inner diameter	50 {1.969}
Cam idle gear	Shaft outer diameter	34 {1.339}
	Bushing inner diameter	34 {1.339}

(3) Calculate the difference between the outer diameter of the idle gear shaft and the inner diameter of the idle gear bush. If the measurement reading exceeds the permissible limit, replace the idle gear shaft and idle gear.

Measured item	Standard value (mm {in.})	Permissible limit (mm {in.})
Main idle gear	0.030-0.090 {0.0012-0.0035}	0.20 {0.0079}
Sub idle gear	0.025-0.075 {0.0010-0.0030}	0.20 {0.0079}
Cam idle gear	0.025-0.075 {0.0010-0.0030}	0.20 {0.0079}

MOUNTING THE TIMING GEARS IN THE FLYWHEEL HOUSING AND THE REAR END PLATE

1. MOUNTING REAR END PLATE

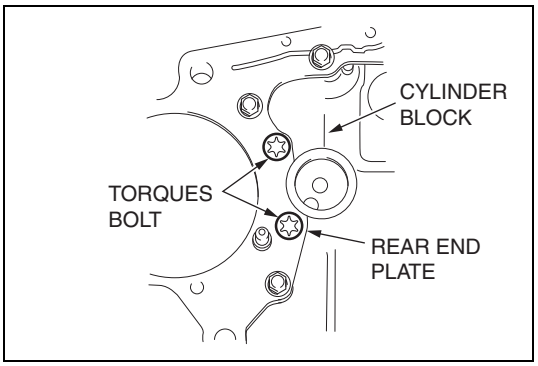
(1) Replace with the new gasket and install the rear end plate.

⚠ CAUTION
Check that no dirt, fouling or foreign matters remain in the threaded holes or on the mounting surface on the cylinder block.

(2) Apply the sealant (Thread Lock Super 5M or equivalent) to threads of the torque bolts.

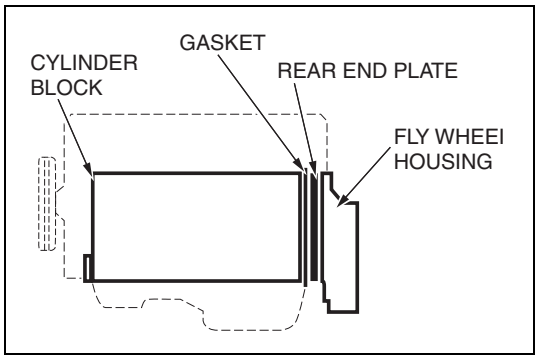
(3) Use the SST, mount the torque bolts.
SST: S0941-11300
Socket wrench

Tightening Torque:
55 N·m {561 kgf·cm, 41 lbf·ft}



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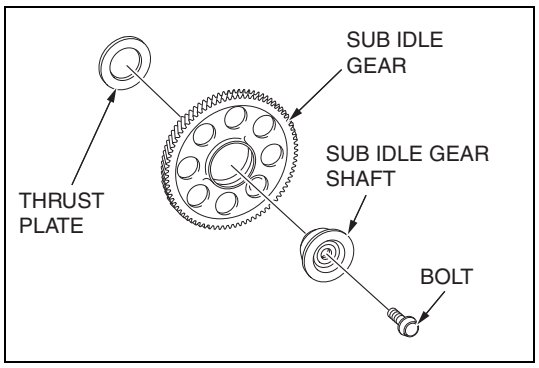
SHTS021270900157

(4) Use the scraper to cut off excessive upper and lower protruding portions of the gasket so that the gasket will be flush with the upper and lower surfaces of the cylinder block.

2. MOUNTING SUB IDLE GEAR

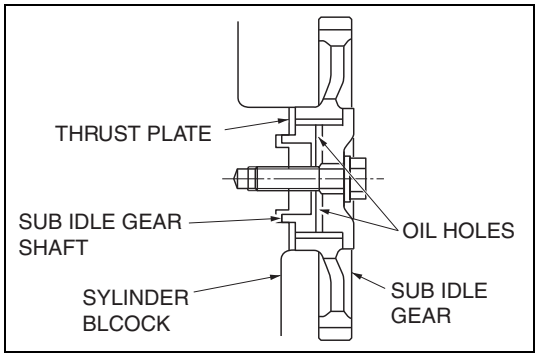
(1) Insert the sub idle gear shaft into the sub idle gear.

(2) Mount the thrust plate.



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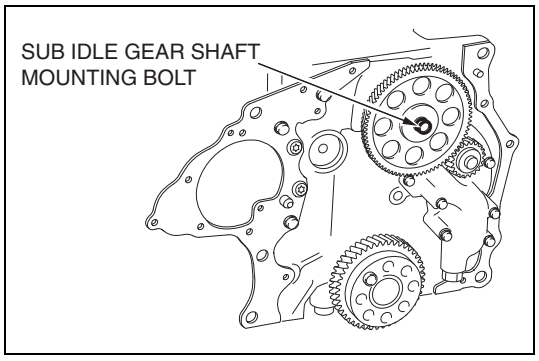
(3) After applying engine oil to the seating surface and threads of the sub idle gear shaft mounting bolt, vertically orient oil holes in the sub idle gear shaft before installation to the cylinder block.



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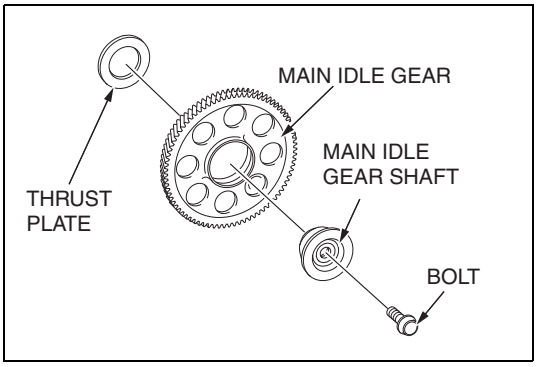
(4) Fasten the sub idle gear shaft mounting bolt to secure the sub idle gear on the cylinder block.

Tightening Torque:
108 N·m {1,101 kgf·cm, 80 lbf·ft}

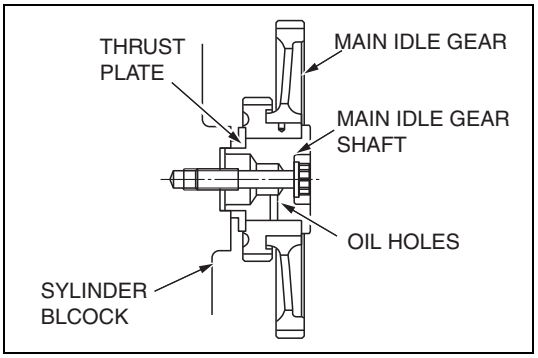


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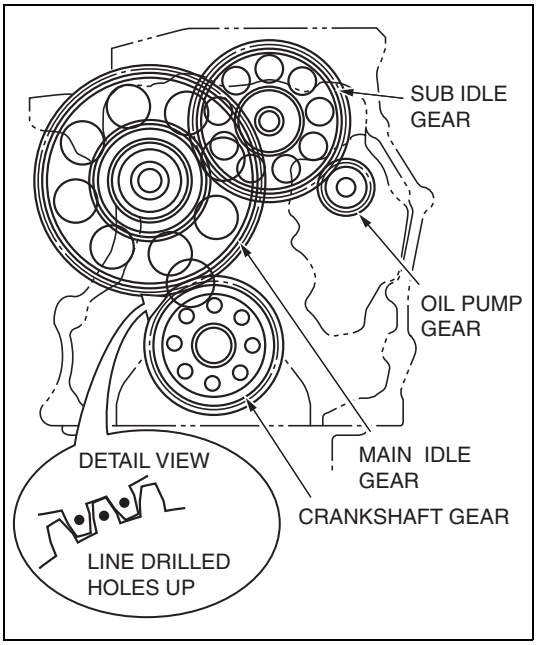
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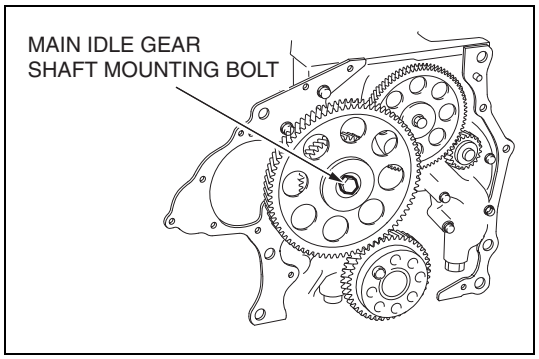
3. MOUNTING THE MAIN IDLE GEAR

(1) Mount the main idle gear shaft to the main idle gear.

(2) Mount the thrust plate.

(3) After applying engine oil to the seating surface and threads of the idle gear shaft mounting bolt, orient an oil hole in the idle gear shaft to the oil pan (downward direction) and synchronize timing between the crankshaft gear and the main idle gear before installation.

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(4) Fasten the main idle gear shaft mounting bolt to secure the main idle gear on the cylinder block.
Tightening Torque:
172 N·m {1,754 kgf·cm, 127 lbf·ft}

4. INSPECTING EACH IDLE GEAR

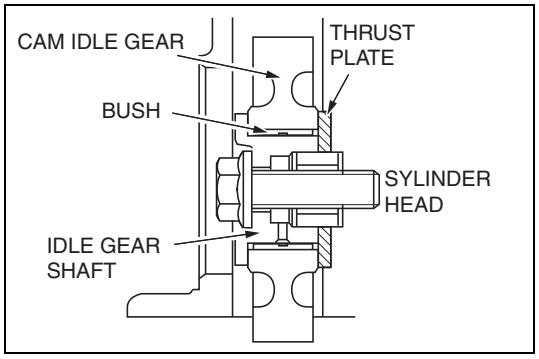
(1) Use the thickness gauge to measure the thrust play of each idle gear and use dial gauge to measure the backlash of each idle gear. Check that measurement values are within the standard value.
Reference: ENGINE MECHANICAL (J05E), TIMING GEAR & CAM IDLE GEAR, OVERHAUL, INSPECTING INSTALLATION OF EACH GEAR (Page 10-80)

5. MOUNTING THE FLYWHEEL HOUSING
Reference: ENGINE MECHANICAL (J05E), FLYWHEEL HOUSING, REPLACEMENT, MOUNTING THE FLYWHEEL HOUSING (Page 10-68)

MOUNTING THE CAMSHAFT DRIVE GEAR AND CAM IDLE GEAR

1. MOUNTING THE CAM IDLE GEAR

(1) After applying engine oil to the thrust plate, cam idle gear bush, idle gear shaft and the seating surface and bolt threads of the idle gear shaft, orient an oil hole in the idle gear shaft to the downward direction and assemble them as shown in the figure.



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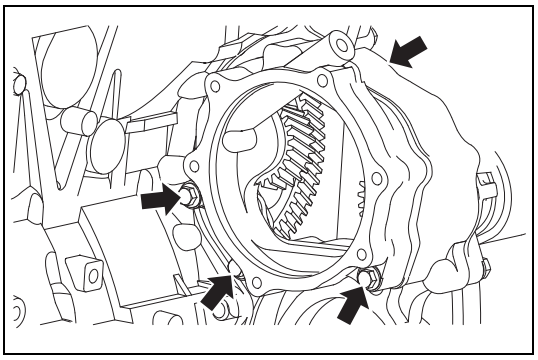
2. MOUNTING THE CYLINDER HEAD
Reference: ENGINE MECHANICAL (J05E), CYLINDER HEAD ASSEMBLY, REPLACEMENT, MOUNTING THE CYLINDER HEAD ASSEMBLY (Page 10-25)

3. MOUNTING THE CAMSHAFT DRIVE GEAR
Reference: ENGINE MECHANICAL (J05E), CYLINDER HEAD ASSEMBLY, REPLACEMENT, MOUNTING THE CYLINDER HEAD ASSEMBLY (Page 10-25)

4. MOUNTING THE CAMSHAFT ASSEMBLY
Reference: ENGINE MECHANICAL (J05E), CAMSHAFT ASSEMBLY, OVERHAUL, ASSEMBLING THE CAMSHAFT ASSEMBLY (Page 10-19)

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OVERHAULING INJECTION PUMP DRIVE IDLE GEAR



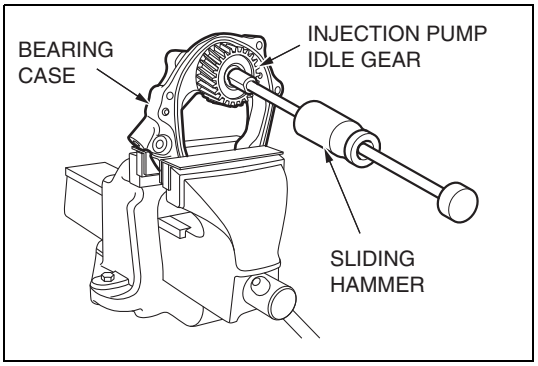
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1. REMOVING BEARING CASE ASSEMBLY

(1) Unfasten the 4 bolts to remove the bearing case assembly from the flywheel housing.

⚠ CAUTION

Note that one of the bolts is tightened from the flywheel housing side.

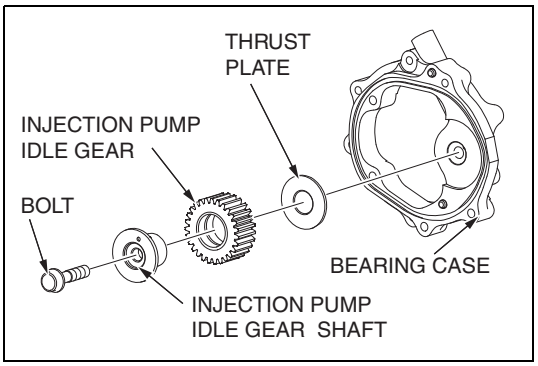


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2. REMOVING INJECTION PUMP DRIVE IDLE GEAR

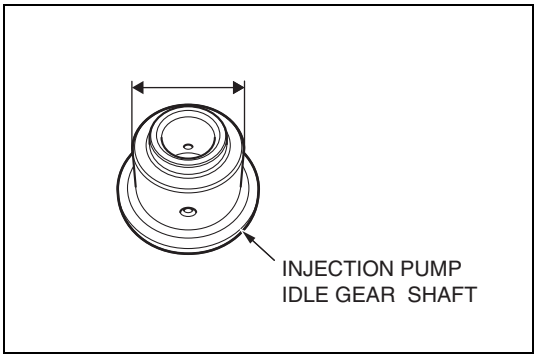
(1) Use the vise to hold the bearing case assembly.

(2) Unfasten the injection pump drive idle gear shaft mounting bolt on the bearing case.



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(3) Use the sliding hammer or other similar tools to pull off the idle gear shaft and remove the injection pump drive idle gear and thrust plate.



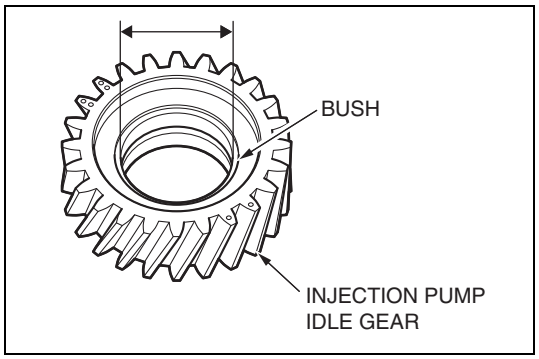
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3. INSPECTING INJECTION PUMP DRIVE IDLE GEAR CLEARANCE

(1) Use the micrometer to measure the injection pump drive idle gear shaft outer diameter.

Standard value (mm {in.})	34 {1.339}

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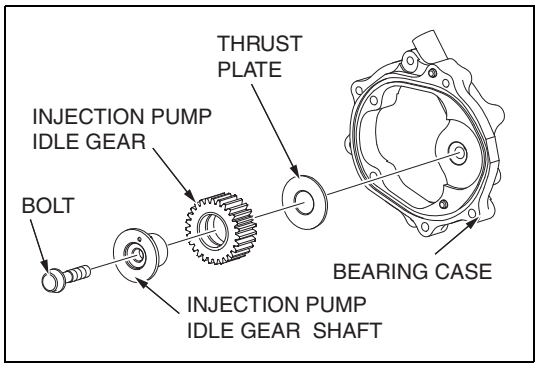
SHTS021270900170

(2) Use the cylinder gauge to measure the injection pump drive idle gear shaft inner diameter.

Standard value (mm {in.})	34 {1.339}

(3) Calculate the gap between the outer diameter of the injection pump drive idle gear shaft and the inner diameter of the injection pump drive idle gear bush. If a calculated value exceeds the permissible limit, replace the injection pump drive idle gear shaft and the injection pump drive idle gear bush.

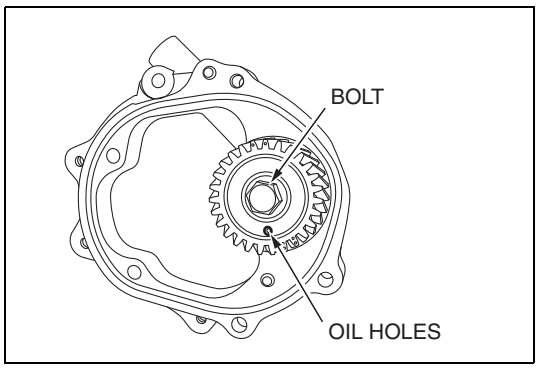
Standard value (mm {in.})	Permissible limit (mm {in.})
0.025-0.057 {0.0010-0.0022}	0.10 {0.0039}



SHTS021270900171

4. MOUNTING THE INJECTION PUMP DRIVE IDLE GEAR

(1) Mount the thrust plate, injection pump drive idle gear and injection pump drive idle gear shaft to the bearing case.

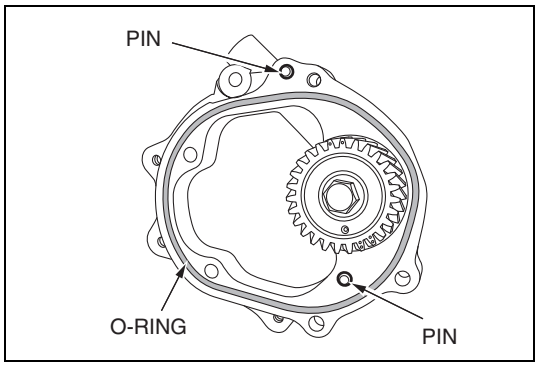


SHTS021270900172

(2) Orient the oil hole in the injection pump drive idle gear shaft to the downward direction before installation to the bearing case.

(3) Use the vise to hold the bearing case and fasten the injection pump drive idle gear shaft mounting bolt to secure the injection pump drive idle gear on the bearing case.

Tightening Torque:
108 N·m {1,101 kgf·cm, 80 lbf·ft}



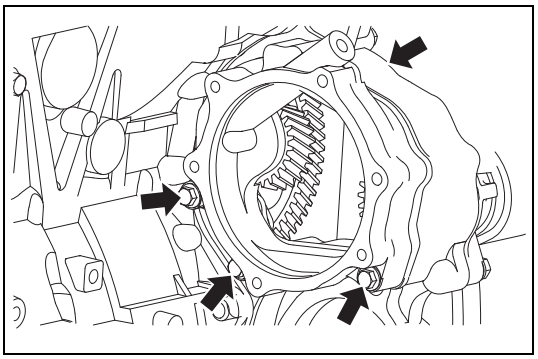
SHTS021270900173

5. MOUNTING BEARING CASE ASSEMBLY

(1) Replace with the new O-ring and set the pins (2 places) of the bearing case assembly to the flywheel housing concaves.

⚠ CAUTION
Be careful not to drop the O-ring.

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SHTS021270900174

(2) Fasten the 4 bolts to secure the bearing case assembly on the flywheel housing.
Tightening Torque:
28.5 N·m {291 kgf·cm, 21 lbf·ft}

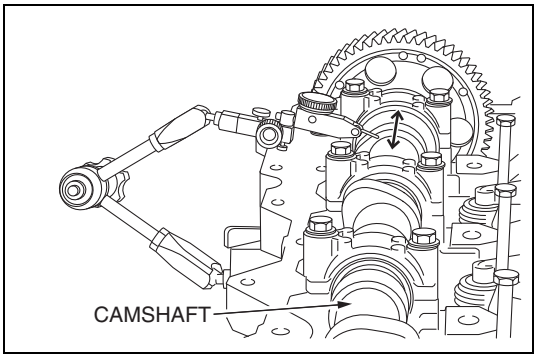
⚠ CAUTION
Note that one of the bolts is tightened from the flywheel housing side.

INSPECTING INSTALLATION OF EACH GEAR

1. INSPECTING THE CAMSHAFT END PLAY

(1) Set the camshaft assembly to the cylinder head. Tighten the mounting bolt of the camshaft bearing cap with the specified torque.
Reference: ENGINE MECHANICAL (J05E), CAMSHAFT ASSEMBLY, OVERHAUL, INSPECTING THE COMPONENTS (Page 10-17)

(2) Use the dial gauge to measure the end play of the camshaft. If the value exceeds the standard value, replace the camshaft.



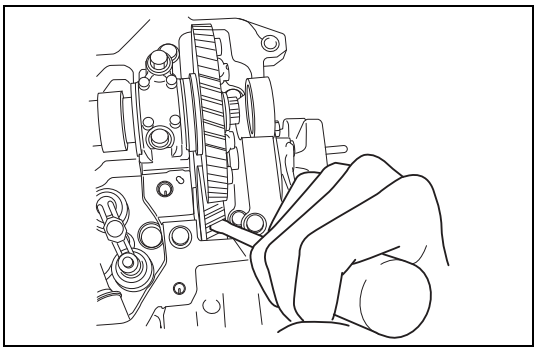
SHTS021270900175

Standard value (mm {in.})	0.100-0.178 {0.0039-0.0070}

2. INSPECTING FOR BACKLASH BETWEEN THE CAMSHAFT DRIVE GEAR AND CAM IDLE GEAR

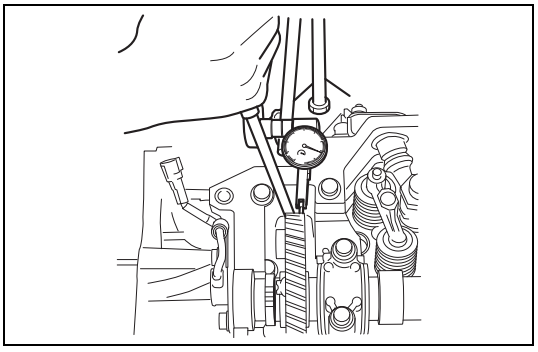
(1) Set the camshaft assembly to the cylinder head. Tighten the mounting bolt of the camshaft bearing cap with the specified torque.
Reference: ENGINE MECHANICAL (J05E), CAMSHAFT ASSEMBLY, OVERHAUL, INSPECTING THE COMPONENTS (Page 10-17)

(2) To prevent rotation of the cam idle gear, insert a large flat-blade screwdriver into the cam idle gear through a gap around the cylinder head camshaft gear.



SHTS021270900176

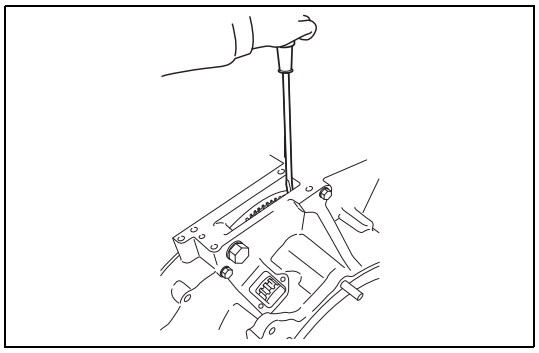
(3) Use the dial gauge to measure backlash between the camshaft drive gear and the cam idle gear. If a measurement reading exceeds the permissible limit, replace a set of the gears.



SHTS021270900177

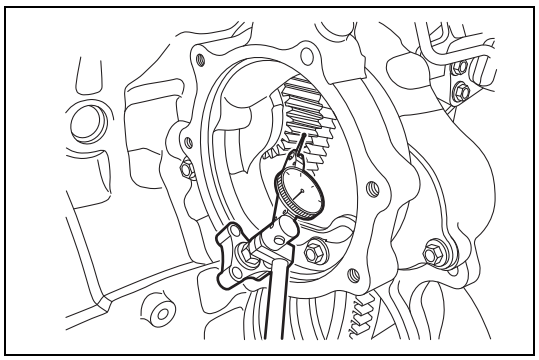
Standard value (mm {in.})	Permissible limit (mm {in.})
0.084-0.175 {0.0033-0.0069}	0.30 {0.0118}

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SHTS021270900178

3. INSPECTING BACKLASH BETWEEN MAIN IDLE GEAR AND INJECTION PUMP DRIVE IDLE GEAR

(1) To prevent rotation of the main idle gear, insert a large flat-blade screwdriver into the main idle gear through the dust cover port on the timing gear side in the flywheel housing.

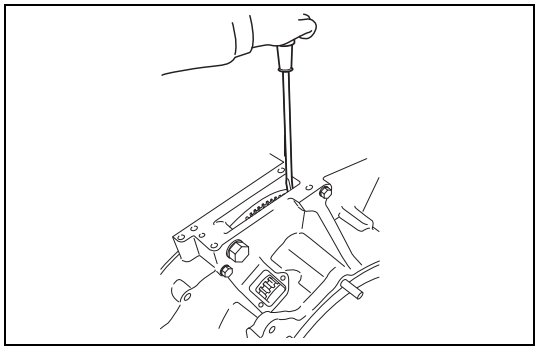

SHTS021270900179

(2) Use the dial gauge to measure backlash between the main idle gear and the injection pump drive idle gear. If a measurement reading exceeds the permissible limit, replace individual gears.

NOTICE

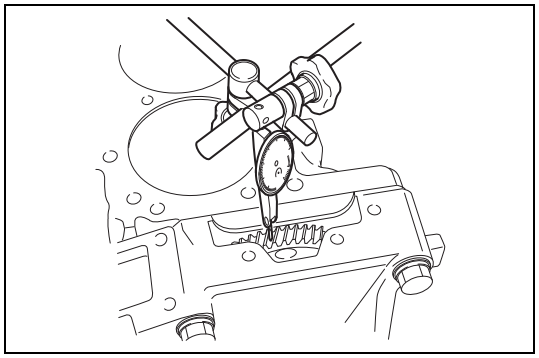
If a dial gauge magnet stand cannot stand still, utilize bolt holes in the cylinder block to temporarily mount a metal plate for measurement.

Standard value (mm {in.})	Permissible limit (mm {in.})
0.030-0.218 {0.0012-0.0086}	0.30 {0.0118}


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4. INSPECTING BACKLASH BETWEEN MAIN IDLE GEAR AND SUB IDLE GEAR

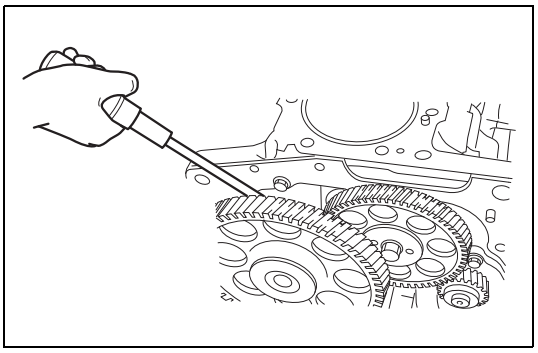
(1) To prevent rotation of the main idle gear, insert a large flat-blade screwdriver into the main idle gear through the dust cover port on the timing gear side in the flywheel housing.


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(2) Use the dial gauge to measure backlash between the main idle gear and the sub idle gear. If a measurement reading exceeds the permissible limit, replace individual gears.

Standard value (mm {in.})	Permissible limit (mm {in.})
0.030-0.162 {0.0012-0.0064}	0.30 {0.0118}

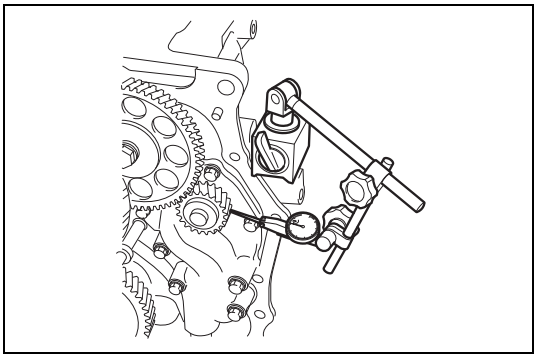
https://truckmanualshub.com/



SHTS021270900182

5. INSPECTING BACKLASH BETWEEN SUB IDLE GEAR AND OIL PUMP DRIVE GEAR

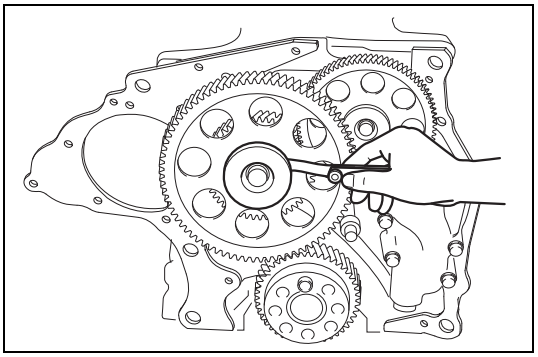
(1) To prevent rotation of the sub idle gear, insert a large flat-blade screwdriver into the sub idle gear.



SHTS021270900183

(2) Use the dial gauge to measure backlash between the sub idle gear and the oil pump drive gear. If a measurement reading exceeds the permissible limit, replace the sub idle gear and the oil pump.

Standard value (mm {in.})	Permissible limit (mm {in.})
0.030-0.131 {0.0012-0.0052}	0.30 {0.0118}



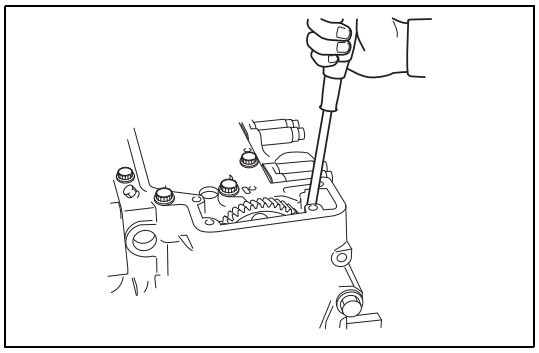
SHTS021270900184

6. INSPECTING THE IDLE GEAR END PLAY

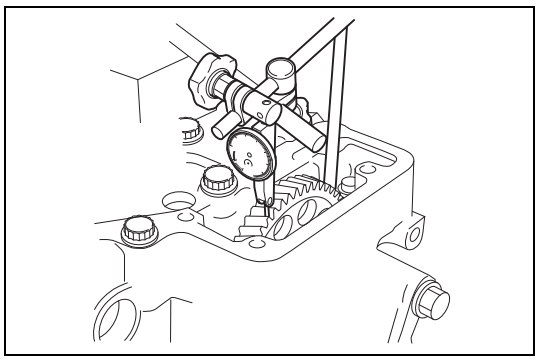
(1) Use the thickness gauge to measure the end play of each idle gear. If a measurement reading exceeds the permissible limit, replace the gear and thrust plate.

Measured item	Standard value (mm {in.})	Permissible limit (mm {in.})
Main idle gear	0.114-0.160 {0.0045-0.0063}	0.30 {0.0118}
Sub idle gear	0.040-0.120 {0.0016-0.0047}	0.30 {0.0118}
Cam idle gear	0.040-0.120 {0.0016-0.0047}	0.30 {0.0118}

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SHTS021270900186

7. INSPECTING BACKLASH BETWEEN CAM IDLE GEAR AND SUB IDLE GEAR

(1) To prevent rotation of the sub idle gear, insert a large flat-blade screwdriver into the sub idle gear through a gap around the cylinder head cam idle gear.

(2) Use the dial gauge to measure backlash between the cam idle gear and the sub idle gear. If a measurement reading exceeds the permissible limit, replace individual gears.

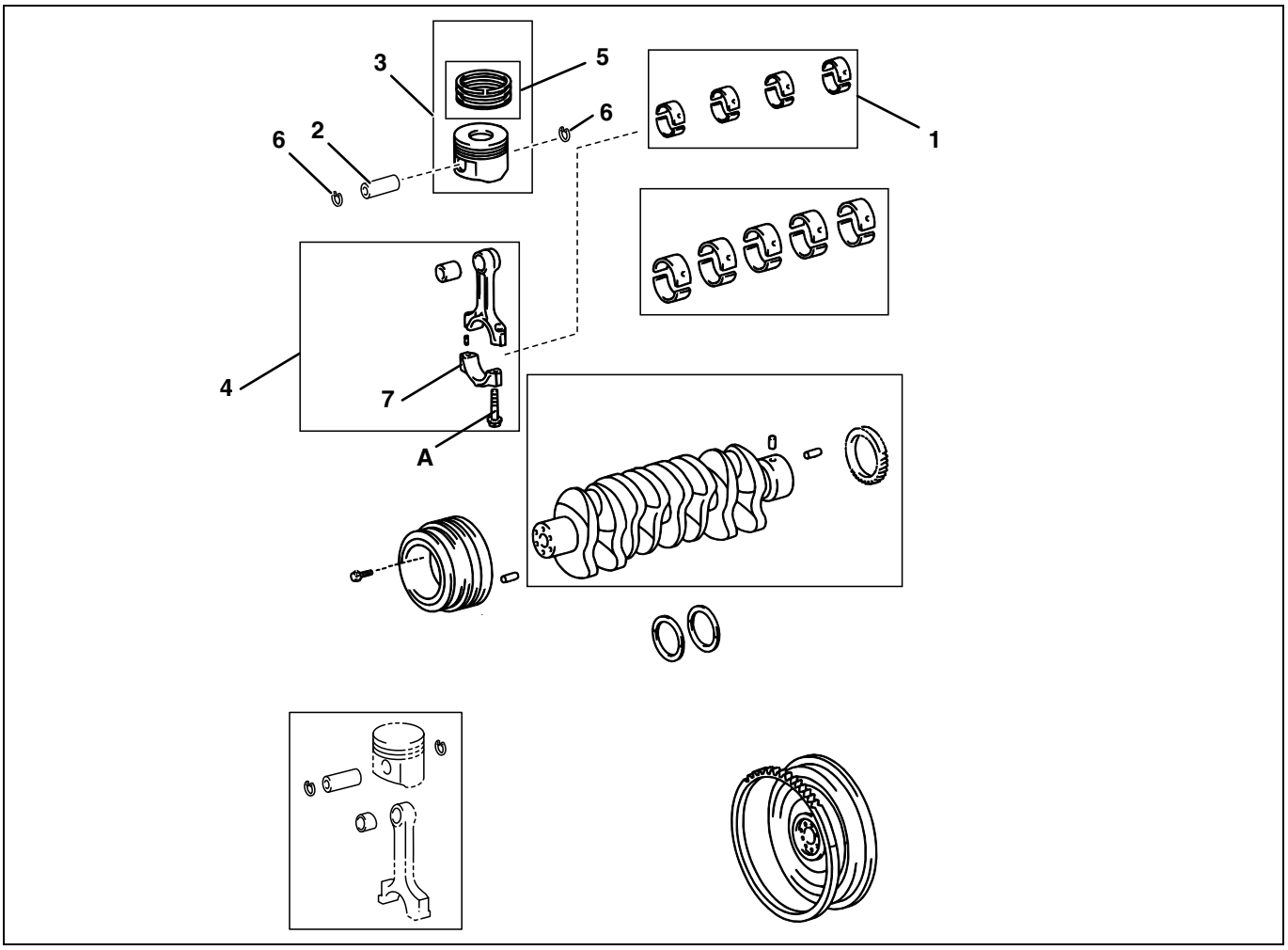
Standard value (mm {in.})	Permissible limit (mm {in.})
0.084-0.235 {0.0033-0.0093}	0.30 {0.0118}

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PISTON AND CONNECTING ROD

COMPONENT LOCATOR

EN01F02127090402027001



SHTS021270900187

1	Connecting rod bearing	5	Piston ring
2	Piston pin	6	Retainer ring *
3	Piston	7	Connecting rod cap
4	Connecting rod cap		

*: Nonreusable part

Tightening torque — Unit: N·m {kgf·cm, lbf·ft}

A	69 {704, 51}+90°+45°	

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OVERHAUL

EN01F02127090402027002

REMOVING THE PISTON AND CONNECTING ROD

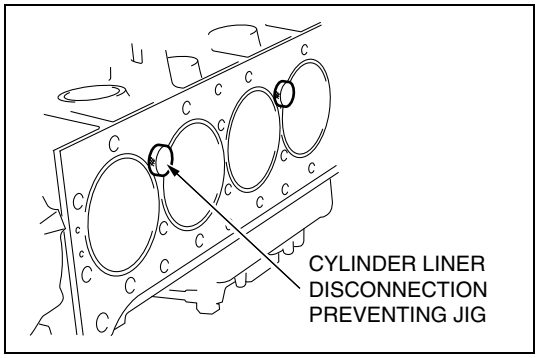
1. REMOVING THE CYLINDER HEAD ASSEMBLY
Reference: ENGINE MECHANICAL (J05E), CYLINDER HEAD ASSEMBLY, REPLACEMENT, REMOVING THE CYLINDER HEAD ASSEMBLY (Page 10-23)

2. REMOVING THE OIL PAN
Reference: LUBRICATION (J05E), OIL PAN, REPLACEMENT, REMOVING THE OIL PAN (Page 13-24)

3. REMOVING THE OIL STRAINER
Reference: LUBRICATION (J05E), OIL STRAINER, REPLACEMENT, REMOVING THE OIL STRAINER (Page 13-29)

4. REMOVING THE PISTON AND CONNECTING ROD

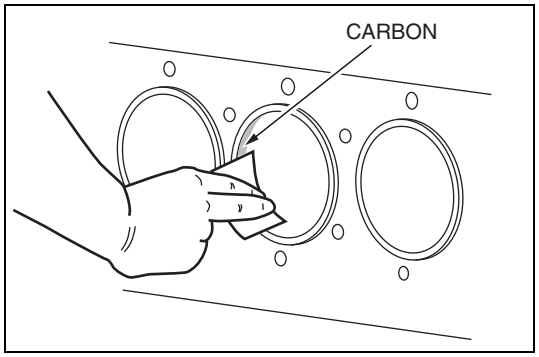
(1) To prevent the cylinder liner from coming off, mount the cylinder liner disconnection preventing jig to the upper surface of cylinder block.



SHTS021270900188

(2) Use the scraper or sandpaper (No.150 or equivalent) to scrape off carbon deposits on the inner upper surface of the cylinder liner, along the circumferential direction.

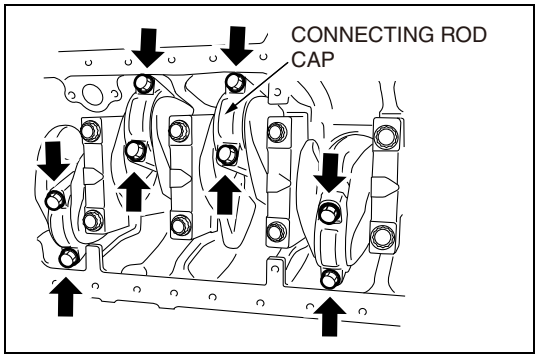
⚠ CAUTION
Make sure not to damage the lower part of the carbon adhered area.



SHTS021270900189

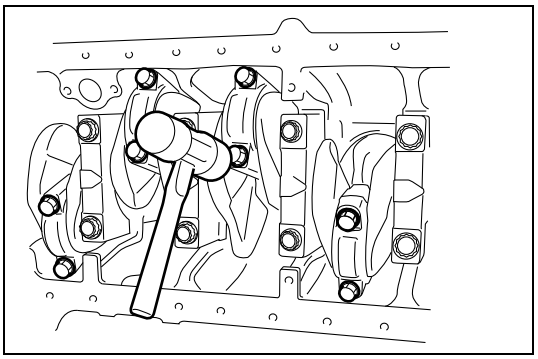
(3) Loosen the bolts on the connecting rod cap.

NOTICE
Do not unfasten but just loosen the bolts.



SHTS021270900190

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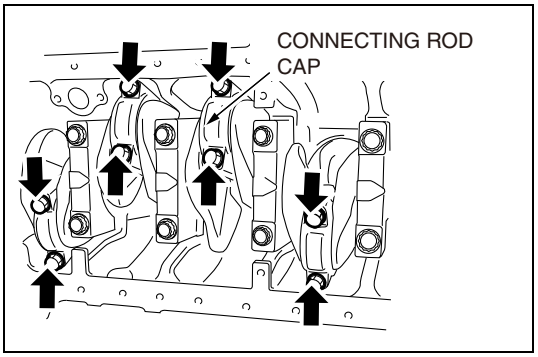


SHTS021270900191

(4) Use the plastic hammer to tap the bolt head of the connecting rod cap to separate the connecting rod from the cap.

⚠ CAUTION
Use care not to damage bolt heads.

NOTICE
The connecting rod cap is connected with the dowel pin. However, the rod and the cap can be separated easily by hammering the bolt head.

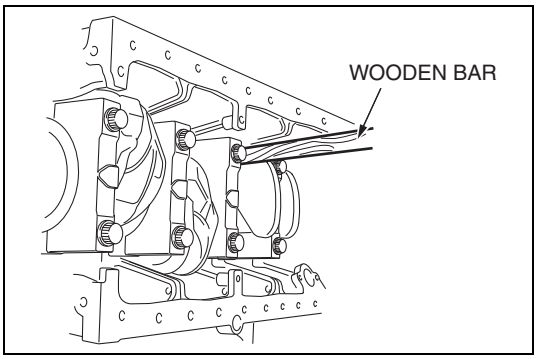


SHTS021270900192

(5) Unfasten the bolts on the connecting rod cap to remove the connecting rod cap.

⚠ CAUTION
- **Note that the connecting rod bearings mounted to the connecting rod caps may fall off due to applied impact.**
- **Not to change the combination of the connecting rod and connecting rod cap, the removed connecting rod caps must be identified and stored in order of cylinder number.**

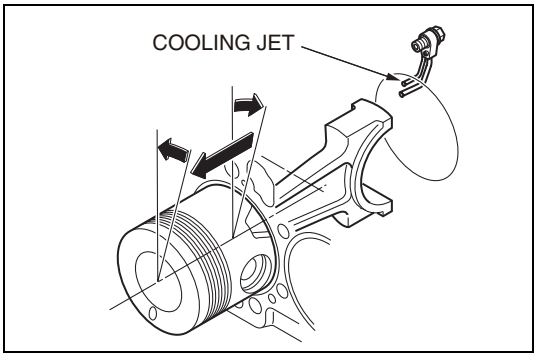
NOTICE
- **To prevent the crankshaft from rotating, set the bar to the adjustment hole of the balance weight and attach it to the oil pan mounting flange.**
- **When removing the piston, set the crankshaft to the top dead center in the applicable cylinder.**



SHTS021270900193

(6) Use the wooden bar to push (tap) the connecting rod from the lower of the engine to pull off the piston and connecting rod above the engine as a unit.

⚠ CAUTION
- **Note that the connecting rod bearings mounted to the connecting rod caps may fall off due to applied impact.**



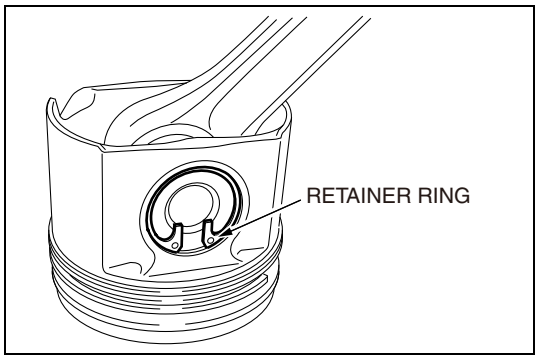
SHTS021270900194

- **When pulling out the piston, rotate the connecting rod and be careful not to bend the cooling jet.**
- **The removed pistons and connecting rods must be identified and stored in order of cylinder number.**

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DISASSEMBLING THE PISTON AND CONNECTING ROD

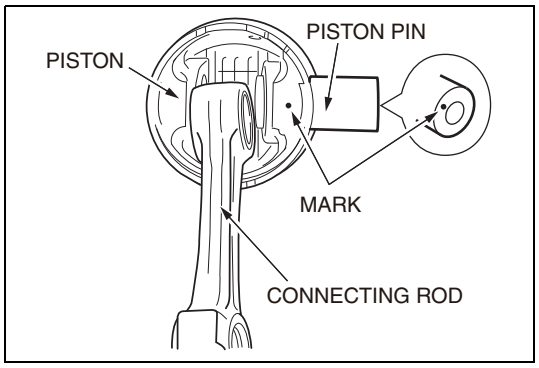
1. REMOVING THE PISTON AND CONNECTING ROD



SHTS021270900195

(1) Use the pliers to remove the retainer ring.

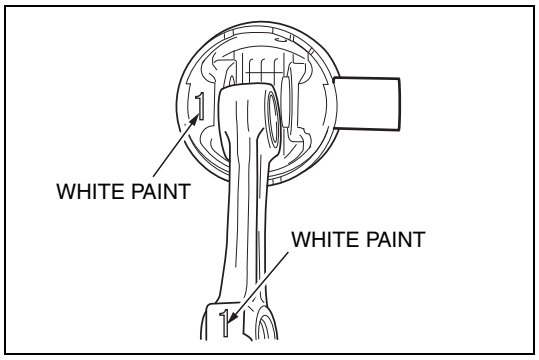
⚠ CAUTION
While working, wear safety glasses because the retainer ring may come out.



SHTS021270900196

(2) Put alignment marks on the back and side of the piston before pulling it out and separate the piston from the connecting rod.

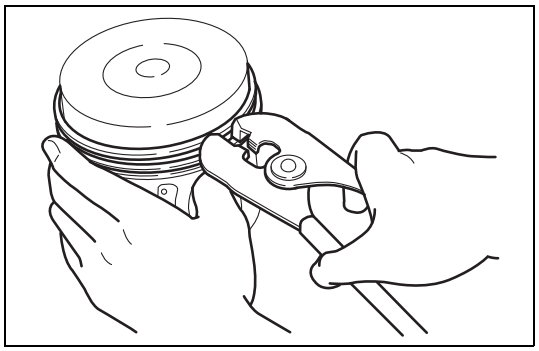
⚠ CAUTION
The removed pistons and connecting rods must be identified and stored in order of cylinder number.



SHTS021270900197

NOTICE
When writing cylinder numbers on the piston and connecting rod, use white paint to place markings at the positions indicated in the figure.

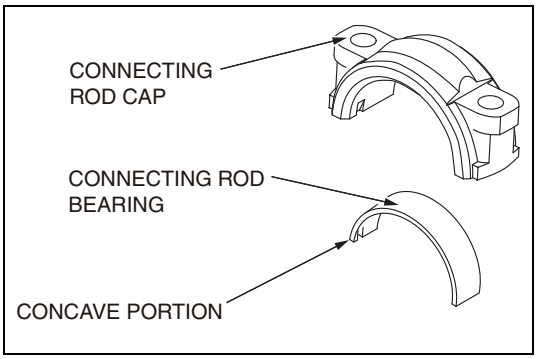
2. REMOVING THE PISTON RING


SHTS021270900198

(1) Use the SST to remove the piston ring.
SST: S0944-21011
Piston ring expander

⚠ CAUTION
- **Handle the piston ring with care because it can be easily damaged.**
- **The piston rings must be identified and stored in order of cylinder number.**
- **Store the piston rings without mixing the upper surface and bottom surface.**

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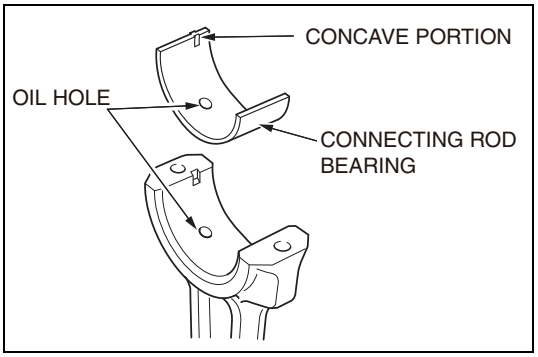
SHTS021270900199

3. REMOVING THE CONNECTING ROD BEARING

(1) Remove the connecting rod bearing connected to the connecting rod cap.

NOTICE

Press the one end of the connecting rod bearing at the opposite side of the concave to facilitate removal.

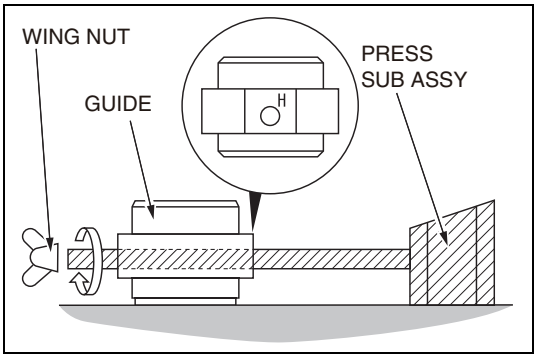


SHTS021270900200

(2) Remove the connecting rod bearing connected to the connecting rod.

NOTICE

Press the one end of the connecting rod bearing at the opposite side of the concave to facilitate removal.



SHTS021270900201

4. REMOVING THE CONNECTING ROD BUSH

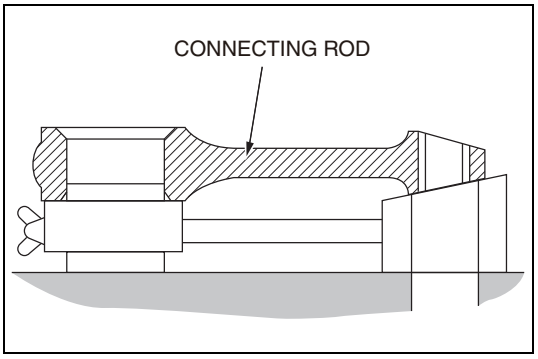
(1) Assemble the SST (press subassembly and guide) on the level bench and use the other SST (wing nut) to secure the assembly.

SST: S0948-11130
Guide
S0940-21530
Press subassembly
SL271-01036
Wing nut

⚠ CAUTION

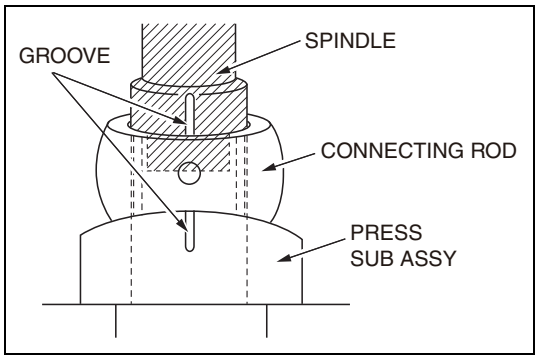
- **Orient the "H" mark engraved on the guide to the top before assembly.**
- **Make sure that the lower ends of the guide and the press subassembly are level.**

(2) With a bearing removed from a large end of a connecting rod, assemble the connecting rod and set it on the SST assembly.



SHTS021270900202

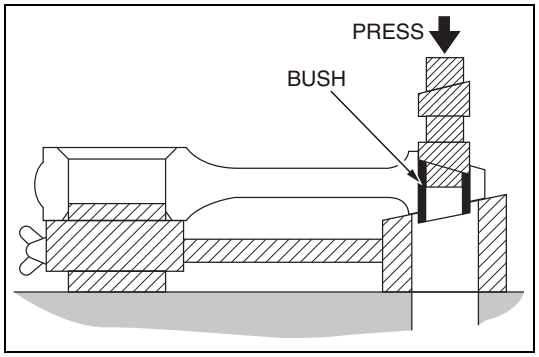
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SHTS021270900203

(3) Mount the SST (spindle) to a connecting rod bush.
SST: S0940-21540
Spindle

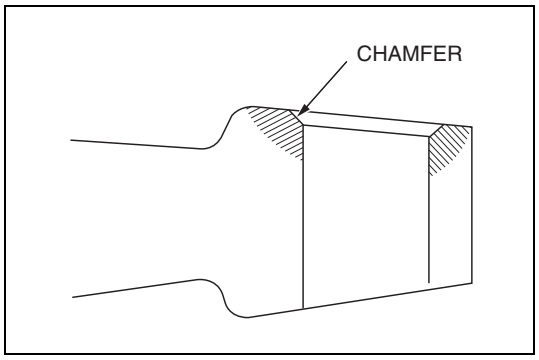
⚠ CAUTION
Align the groove in the SST press subassembly with a groove in the SST spindle before mounting.



SHTS021270900204

(4) Use the press to pull off the connecting rod bush.

⚠ CAUTION
Carefully operate the press.



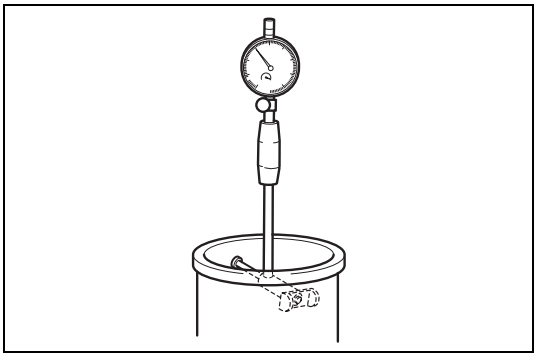
SHTS021270900205

(5) Evenly chamfer one side of the small end of the connecting rod as shown in the figure.

⚠ CAUTION
- **Remove all burrs.**
- **After chamfering, remove dirt from the oil hole and the inner surface of the small end.**

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INSPECTING THE COMPONENTS

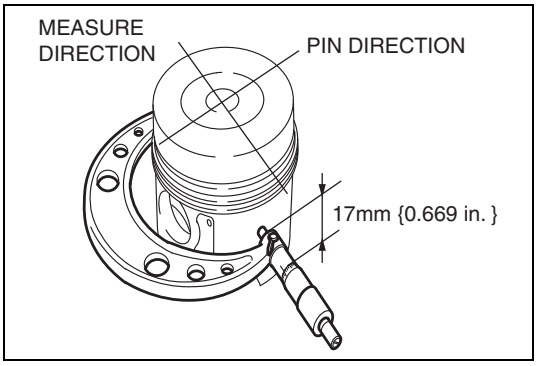


SHTS021270900206

1. INSPECTING THE PISTON CLEARANCE

(1) Use the cylinder gauge to measure the inner diameter of the sliding surface of cylinder liner.

Standard value (mm {in.})	Permissible limit (mm {in.})
112 {4.409}	112.15 {4.415}



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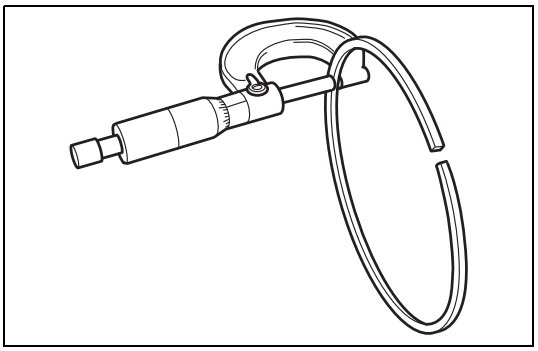
(2) Use the micrometer to measure the outer diameter of the piston.

⚠ CAUTION
Measurement position is 17 mm {0.669 in.} above the lower end of the piston in axial direction to the pin hole.

Standard value (mm {in.})	111.927-111.943 {4.406-4.407}

(3) Calculate the difference between the cylinder liner inner diameter and the piston outer diameter. If a measurement reading exceeds the standard value, replace the cylinder liner and piston.

Standard value (mm {in.})	0.053-0.077 {0.0021-0.0030}

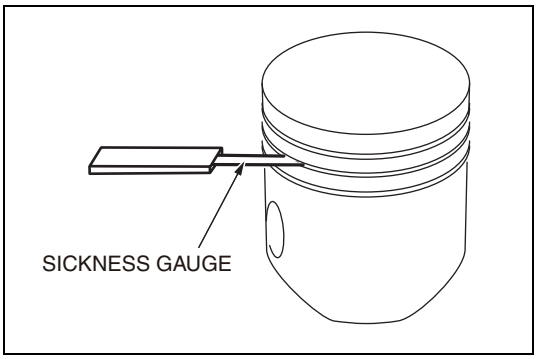


SHTS021270900208

2. INSPECTING THE PISTON RING

(1) Use the micrometer to measure the thickness of the piston ring. If a measurement reading exceeds the permissible limit, replace the piston ring.

Measured item	Standard value (mm {in.})	Permissible limit (mm {in.})
Top ring	2.999 {0.1181}	2.899 {0.1141}
Second ring	2.0 {0.0787}	1.9 {0.00748}
Oil ring	4.0 {0.1575}	3.9 {0.1535}



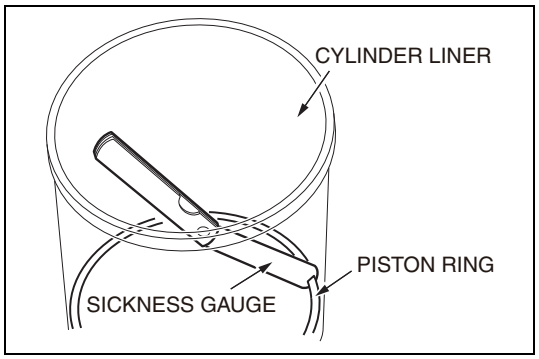
SHTS021270900209

3. INSPECTING THE PISTON RING GROOVE

(1) Use the thickness gauge to measure the piston ring groove. If a measurement reading exceeds the permissible limit, replace the piston.

Measured item	Standard value (mm {in.})	Permissible limit (mm {in.})
Top ring groove	Taper	–
Second ring groove	2.0 {0.0787}	2.2 {0.0866}
Oil ring groove	4.0 {0.1575}	4.1 {0.1614}

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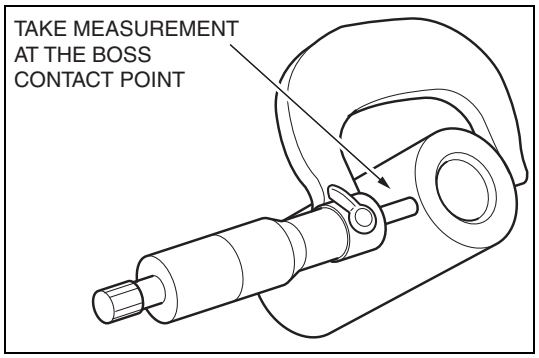
SHTS021270900210

4. INSPECTING THE PISTON RING CLOSED GAP CLEARANCE

(1) Use the piston to insert the piston ring horizontally to the cylinder liner until it passes through the sliding surface.

(2) Use the thickness gauge to measure the closed gap clearance of the piston ring. If a measurement reading exceeds the permissible limit, replace the piston ring.

Measured item	Standard value (mm {in.})	Permissible limit (mm {in.})
Top ring	0.30-0.40 {0.0118-0.0157}	1.5 {0.0590}
Second ring	0.75-0.90 {0.0295-0.0354}	1.5 {0.0590}
Oil ring	0.15-0.30 {0.0059-0.0118}	1.2 {0.0472}

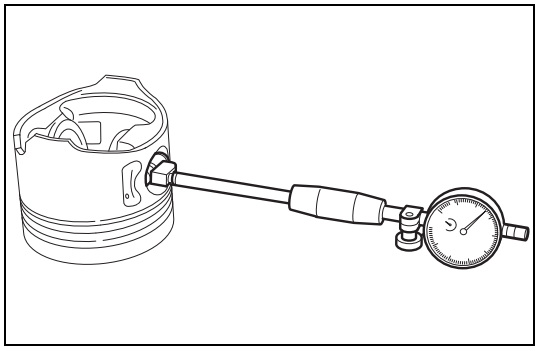


SHTS021270900211

5. INSPECTING THE PISTON PIN OUTER DIAMETER AND PISTON BOSS INNER DIAMETER

(1) Use the micrometer to measure the outer diameter of contact surface between the piston pin and the piston boss. If a measurement reading exceeds the permissible limit, replace the piston pin.

Standard value (mm {in.})	Permissible limit (mm {in.})
37 {1.457}	36.96 {1.455}


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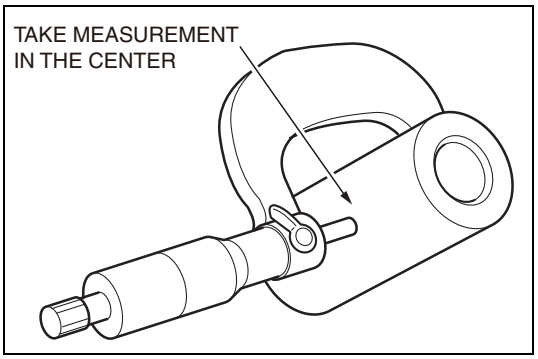
(2) Use the cylinder gauge to measure the piston boss inner diameter. If a measurement reading exceeds the permissible limit, replace the piston.

Standard value (mm {in.})	Permissible limit (mm {in.})
37 {1.457}	37.05 {1.459}

(3) Calculate the gap between the outer diameter of the contact surface of the piston pin with the piston boss and the piston boss inner diameter. If a calculated value exceeds the permissible limit, replace the piston pin.

Standard value (mm {in.})	Permissible limit (mm {in.})
0.011-0.032 {0.0004-0.0013}	0.05 {0.0020}

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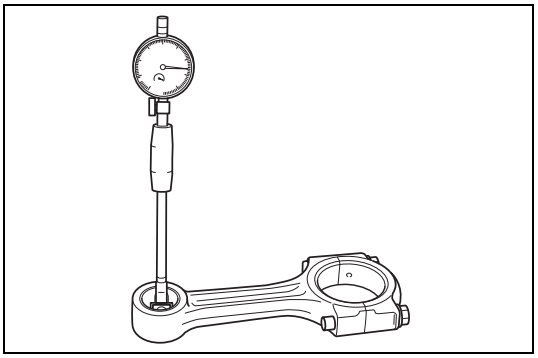


SHTS021270900213

6. INSPECTING THE PISTON PIN AND CONNECTING ROD BUSH

(1) Use the micrometer to measure the outer diameter of the piston pin center. If a measurement reading exceeds the permissible limit, replace the piston pin.

Standard value (mm {in.})	Permissible limit (mm {in.})
37 {1.457}	36.96 {1.455}


SHTS021270900214

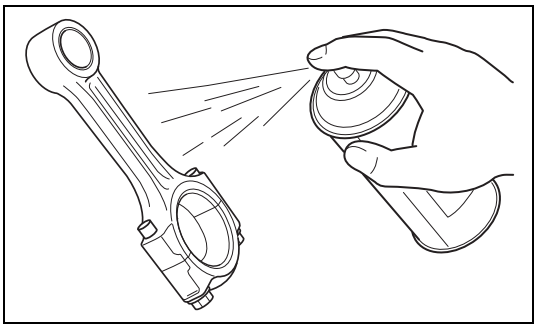
(2) Use the cylinder gauge to measure the inner diameter of the connecting rod bush. If a measurement reading exceeds the permissible limit, replace the bush.

Standard value (mm {in.})	Permissible limit (mm {in.})
37 {1.457}	37.1 {1.461}

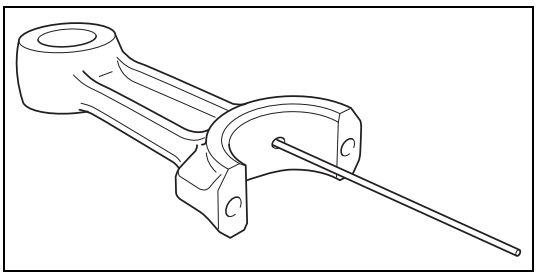
(3) Calculate the gap between the outer diameter of the piston pin center and the inner diameter of the connecting rod bush. If a calculated value exceeds the permissible limit, replace the connecting rod bush.

Standard value (mm {in.})	Permissible limit (mm {in.})
0.035-0.056 {0.0014-0.0022}	0.08 {0.0032}

7. INSPECTING THE CONNECTING ROD


SHTS021270900215

(1) Use the dye penetrant testing (red check) to inspect the connecting rod for crack and damage. If found defective, replace the connecting rod.

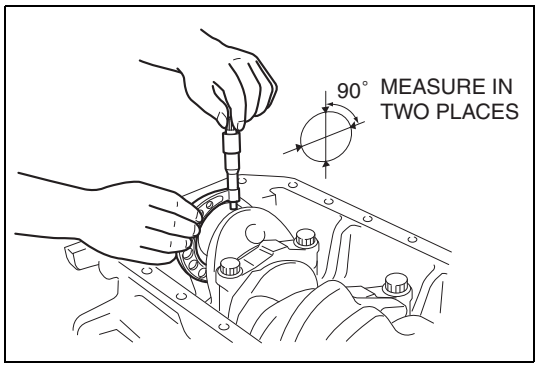

SHTS021270900216

(2) Insert the bar of 4 mm {0.1575 in.} in diameter into an oil hole in the large end of the connecting rod and check if the bar goes through the oil hole to the small end. If clogging in the oil hole prevents the bar of 4 mm {0.1575 in.} in diameter from going through, replace the connecting rod.

⚠ CAUTION
Clogging in the oil hole may cause insufficient oiling, resulting in seizure.

(3) Insert the new piston pin to check for unsmoothness or backlash.

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SHTS021270900217

8. INSPECTING THE CONNECTING ROD OIL CLEARANCE

(1) Use the micrometer to measure an outer diameter of a crank pin on the crankshaft. If a measurement reading exceeds the permissible limit, grind or replace the crankshaft.

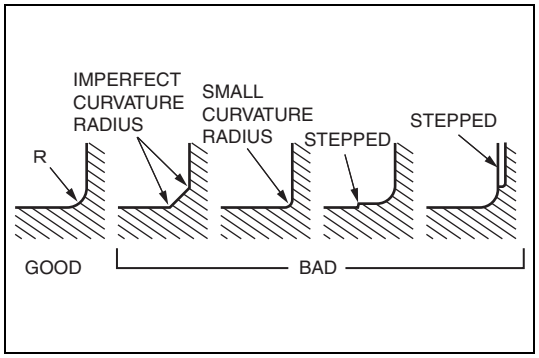
Standard value (mm {in.})	Permissible limit (mm {in.})
65 {2.560}	64.3 {2.531}

⚠ CAUTION

- **If the crankshaft is ground, use an undersize bearing.**

Bearing size	Outside diameter of crank pin
Standard	64.94-64.96 mm {2.5567-2.5574 in.}
0.25US	64.69-64.71 mm {2.5469-2.5476 in.}
0.50US	64.44-64.46 mm {2.5371-2.5377 in.}

- **If uneven wear is 0.1 mm {0.0039 in.} or larger, regrind for correction. If wear is 0.2 mm {0.0079 in.} or larger, regrind. If wear is 0.7 mm {0.0276 in.} or larger, replace the crankshaft.**

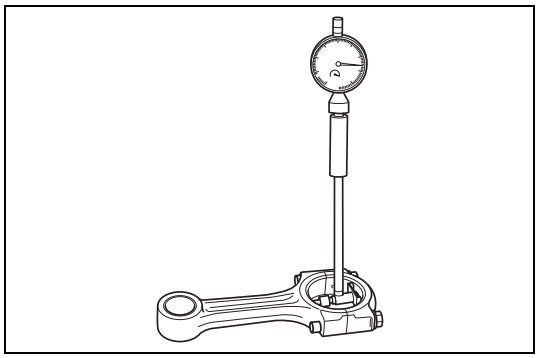


SHTS021270900218

NOTICE

When grinding the crankshaft, adjust a fillet radius dimension as indicated below.

Crank pins: 2.5-3.0 mm {0.0984-0.1181 in.}



SHTS021270900219

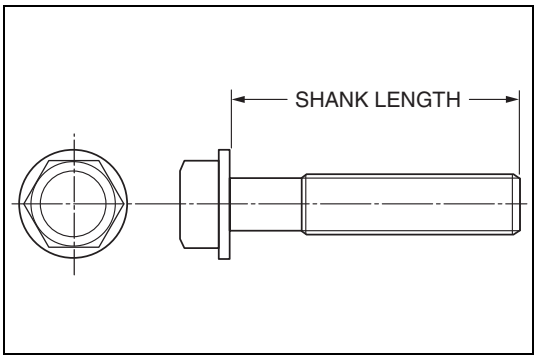
(2) Mount the bearing to the connecting rod large end. After mounting the cap, tighten the connecting rod bolt with the specified torque.

(3) Use the cylinder gauge to measure the bearing inner diameter of the connecting rod large end.

(4) Calculate the difference between the crank pin outer diameter of crankshaft and the connecting rod bearing inner diameter. If a measurement reading exceeds the permissible limit, replace the connecting rod bearing or crankshaft.

Standard value (mm {in.})	Permissible limit (mm {in.})
0.031-0.082 {0.0012-0.0032}	0.2 {0.0079}

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SHTS021270900220

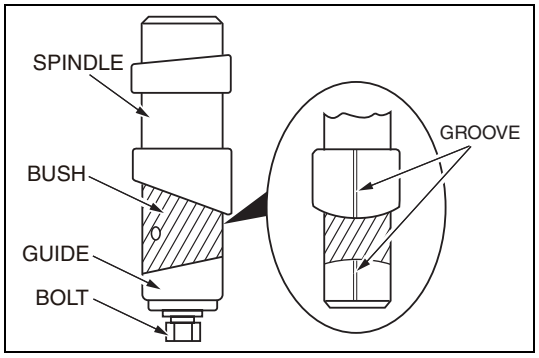
9. INSPECTING THE LENGTH OF CONNECTING ROD BOLT

(1) Use the vernier calipers to measure the connecting rod bolt under head. If a measurement reading exceeds the permissible limit, replace the head bolt.

Standard value (mm {in.})	Permissible limit (mm {in.})
67.0 {2.638}	68.0 {2.677}

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ASSEMBLING THE PISTON AND CONNECTING ROD



SHTS021270900221

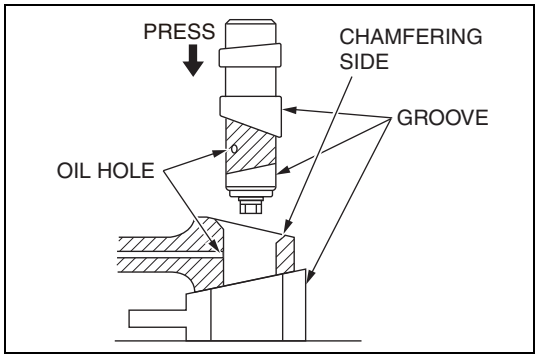
1. MOUNTING THE CONNECTING ROD BUSH

(1) Fit the new bush to the SST spindle and mount the SST (guide and bolt).

SST: S0940-21540
Spindle
S0948-11540
Guide
SH691-20825
Bolt
Tightening Torque:
5-6 N·m {51-61 kgf·cm, 3.7-4.4 lbf·ft}

⚠ CAUTION

- **Align grooves in the SST (guide and spindle) with each other before mounting.**
- **Make sure of tight fit between the end faces of the SST (spindle and guide).**



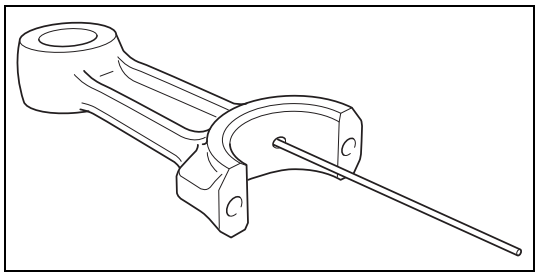
SHTS021270900222

(2) Align the oil hole in the bush assembled to the SST with an oil hole in the connecting rod and check that a groove in the SST spindle is aligned with an groove in the SST press subassembly.

⚠ CAUTION

- **Orient the connecting rod in the proper direction so that the chamfered inner diameter of the small end of the connecting rod faces the bush.**
- **Apply engine oil to the inner diameter surfaces of the connecting rods.**

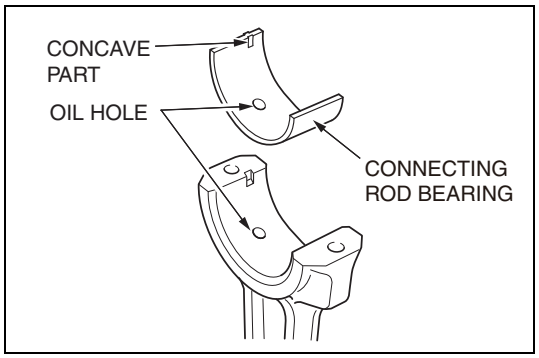
(3) Use the press to press-fit the bush into the connecting rod.


SHTS021270900223

(4) Insert the bar with a diameter of 4 mm {0.1575 in.} from the oil hole on the large end of the connecting rod and check that the bar passes through to the oil hole on the small end.

⚠ CAUTION
Off-position of the oil hole may cause insufficient oiling, resulting in seizure.

(5) Insert the new piston pin to check for unsmoothness or backlash.



SHTS021270900224

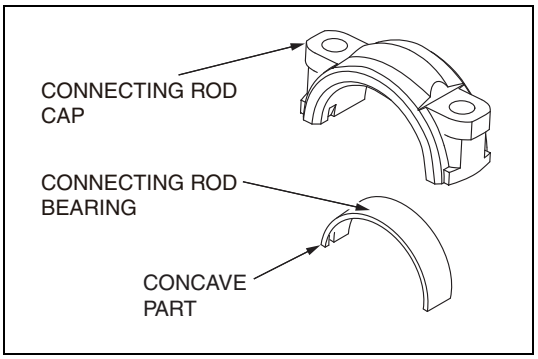
2. MOUNTING THE CONNECTING ROD BEARING

(1) Mount the connecting rod bearing by aligning with the connecting rod concave and apply engine oil.

⚠ CAUTION

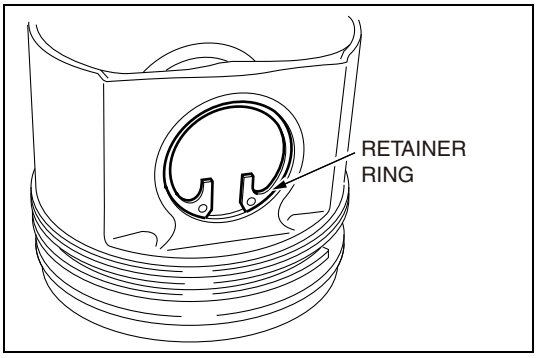
- **Check the oil hole for alignment.**
- **Off-position of the oil hole may cause insufficient oiling, resulting in seizure.**

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SHTS021270900225

(2) Mount the connecting rod bearing by aligning with the connecting rod gap concave and apply engine oil.



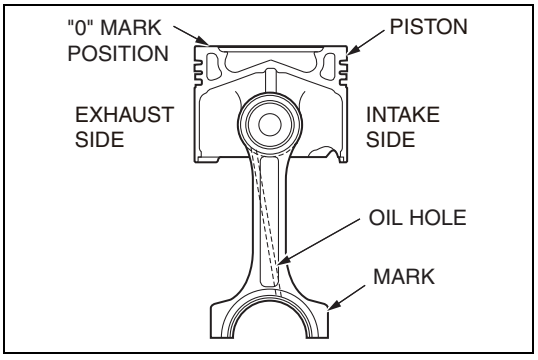
SHTS021270900226

3. MOUNTING THE PISTON AND CONNECTING ROD

(1) Use the pliers to mount a new retainer ring to only one side of the piston.

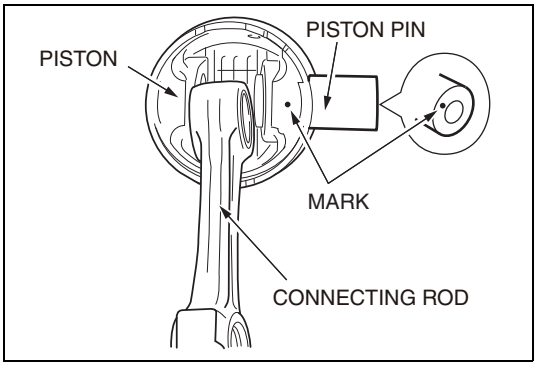
⚠ CAUTION

- **While working, wear safety glasses because the retainer ring may come out.**
- **Make sure that the retainer ring is correctly put in the groove.**
- **Check the retainer ring for play or looseness.**



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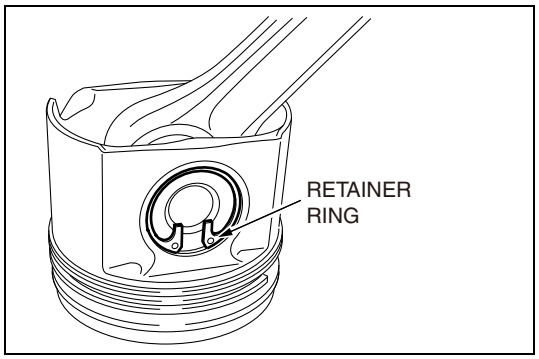
(2) Orient the "0" mark indicated on the piston to the opposite direction of the alignment mark indicated on the connecting rod when fitting the piston to the connecting rod.



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(3) After applying engine oil to the piston pin, align the alignment mark on the piston with the one on the piston pin before inserting the piston pin.

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SHTS021270900229

(4) Use the pliers to mount a new retainer ring to the other side of the piston.

⚠ CAUTION

- **While working, wear safety glasses because the retainer ring may come out.**
- **Make sure that the retainer ring is correctly put in the groove.**
- **Check the retainer ring for play or looseness.**

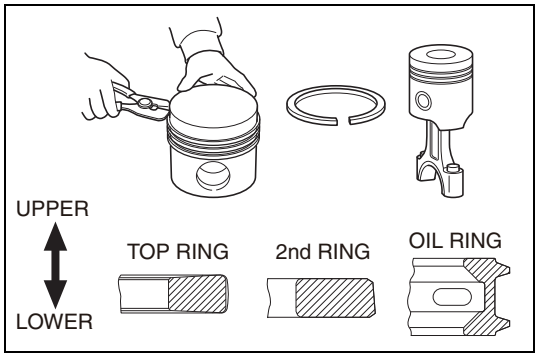
4. MOUNTING THE PISTON RING

(1) Orient the identification print indicated on the piston ring to the upward direction and use the SST to fit an oil ring, a second ring and a top ring in this sequential order.

NOTICE

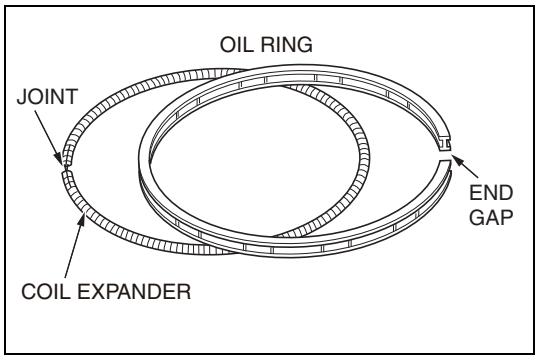
The identification print is given only to the second ring while there is no vertical identification given to the top and oil rings.

SST: S0944-21011
Piston ring expander



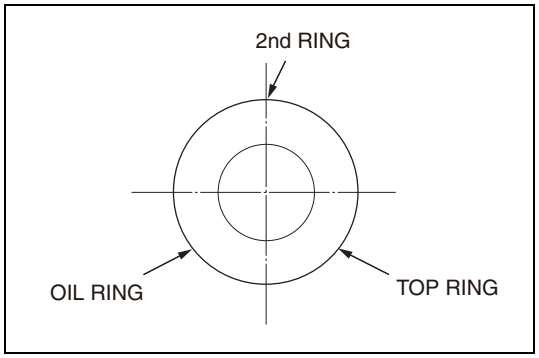
SHTS021270900230

(2) Connect the joint of the coil expander and then set it inside the oil ring. Stagger the coil expander joint and ring closed gap 180° apart.



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(3) Position the piston rings with the ring ends positioned at an equal interval away from one another as shown in the figure.



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MOUNTING THE PISTON AND CONNECTING ROD

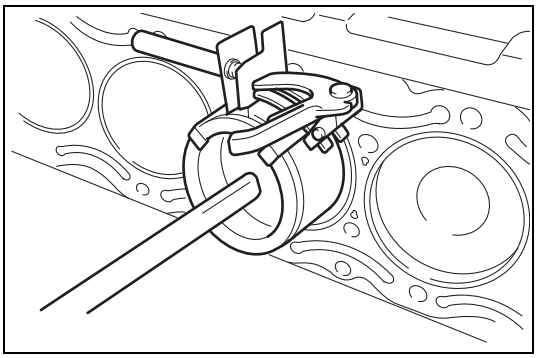
1. MOUNTING THE PISTON AND CONNECTING ROD

(1) The crankshaft of the cylinder to which the piston & connecting rod are inserted must be at the top dead center.

⚠ CAUTION
If the crankshaft is not at the top dead center, the connecting rod touches the cooling jet.

(2) Apply engine oil to the piston periphery, cylinder liner inner surface and connecting rod bearing. Add engine oil into the connecting rod oil hole.

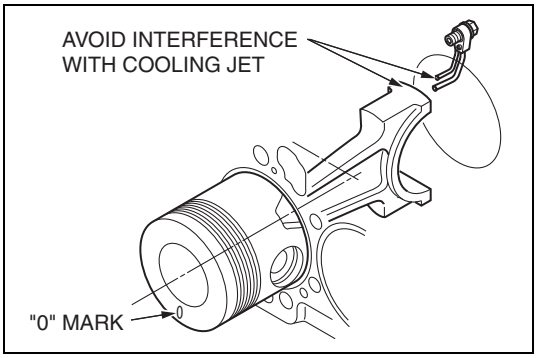
(3) Use the SST to compress the piston ring and set it to the cylinder liner.
SST: S0944-11370
Piston ring holder



SHTS021270900233

⚠ CAUTION
- **Assemble the pistons and connecting rods in the order of cylinder numbers as identified before removal.**
- **Check the SST for deformation or scratches.**

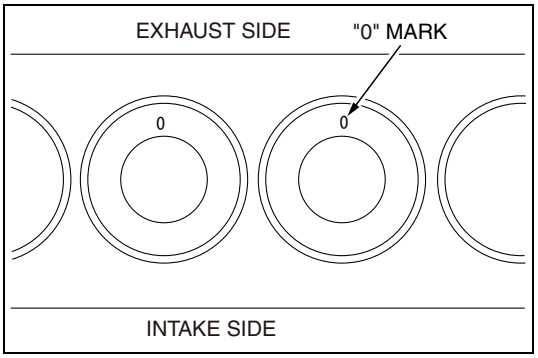
(4) Use care to avoid interference of the connecting rod with a cooling jet when using the wooden rod or other similar tools to insert the piston.



SHTS021270900234

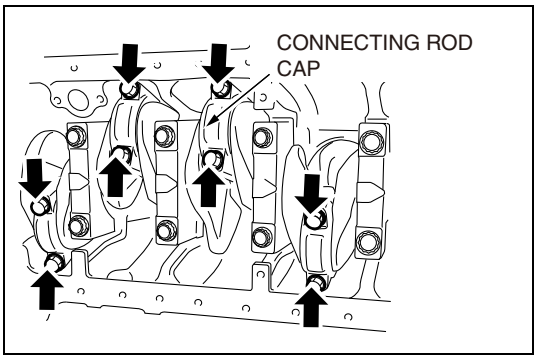
⚠ CAUTION
- **Before insertion, orient a "0" mark indicated on the piston to the exhaust side.**
- **Be careful not to damage the cylinder liner, crankshaft and cooling jet during work.**

(5) Make sure that "0" marks indicated on the pistons rest on the exhaust side.



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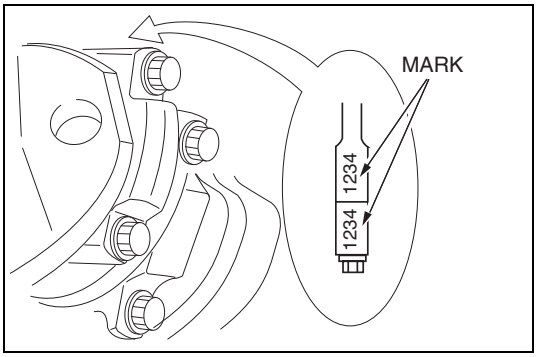


SHTS021270900236

(6) Apply engine oil to the threaded part and seat surface of the bolts. Align with identification with the connecting rod cap and connecting rod removed before tightening the bolts temporarily.

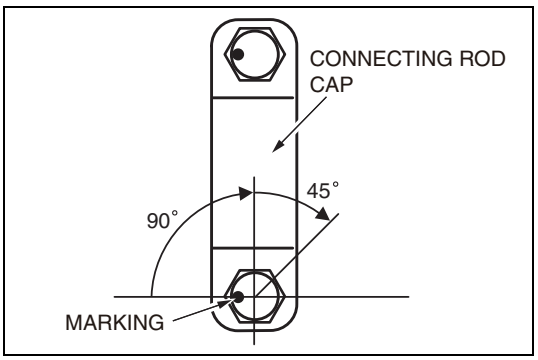
⚠ CAUTION
Do not change the combination of the connecting rod and connecting rod cap.

NOTICE
The cap is provided with a misassembly-preventing dowel pin. Mount with the pin.



SHTS021270900237

(7) Rotate the crankshaft to set it at the bottom dead center.
(8) Check that the engraved alignment mark directions and Nos. of the connecting rod cap and connecting rod match.



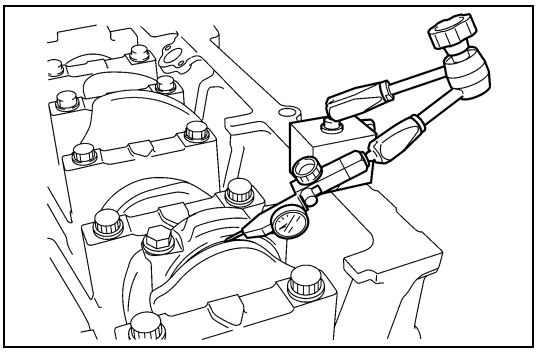
SHTS021270900238

(9) Tighten the connecting rod bolt.
Tightening Torque:
69 N·m {704 kgf·cm, 51 lbf·ft}

(10) Use the paint to mark the bolt heads in the same direction.
(11) Tighten the bolts by 90° (1/4 turns) in the rotational direction and check that all the paint marks face to the same direction.
(12) Retighten the bolt by 45° (1/8 turn) in the rotation direction and check that all the paint marks face in the same direction.

⚠ CAUTION
Do not loosen the bolt even when it is over tightened during retightening.

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SHTS021270900239

(13) After mounting, use the dial gauge to check that end play meets the standard value.

Standard value (mm {in.})	Permissible limit (mm {in.})
0.20-0.52 {0.0079-0.0205}	1.0 {0.0394}

2. MOUNTING THE OIL STRAINER
Reference: LUBRICATION (J05E), OIL STRAINER, REPLACEMENT, MOUNTING THE OIL STRAINER (Page 13-29)

3. MOUNTING THE OIL PAN
Reference: LUBRICATION (J05E), OIL PAN, REPLACEMENT, MOUNTING THE OIL PAN (Page 13-25)

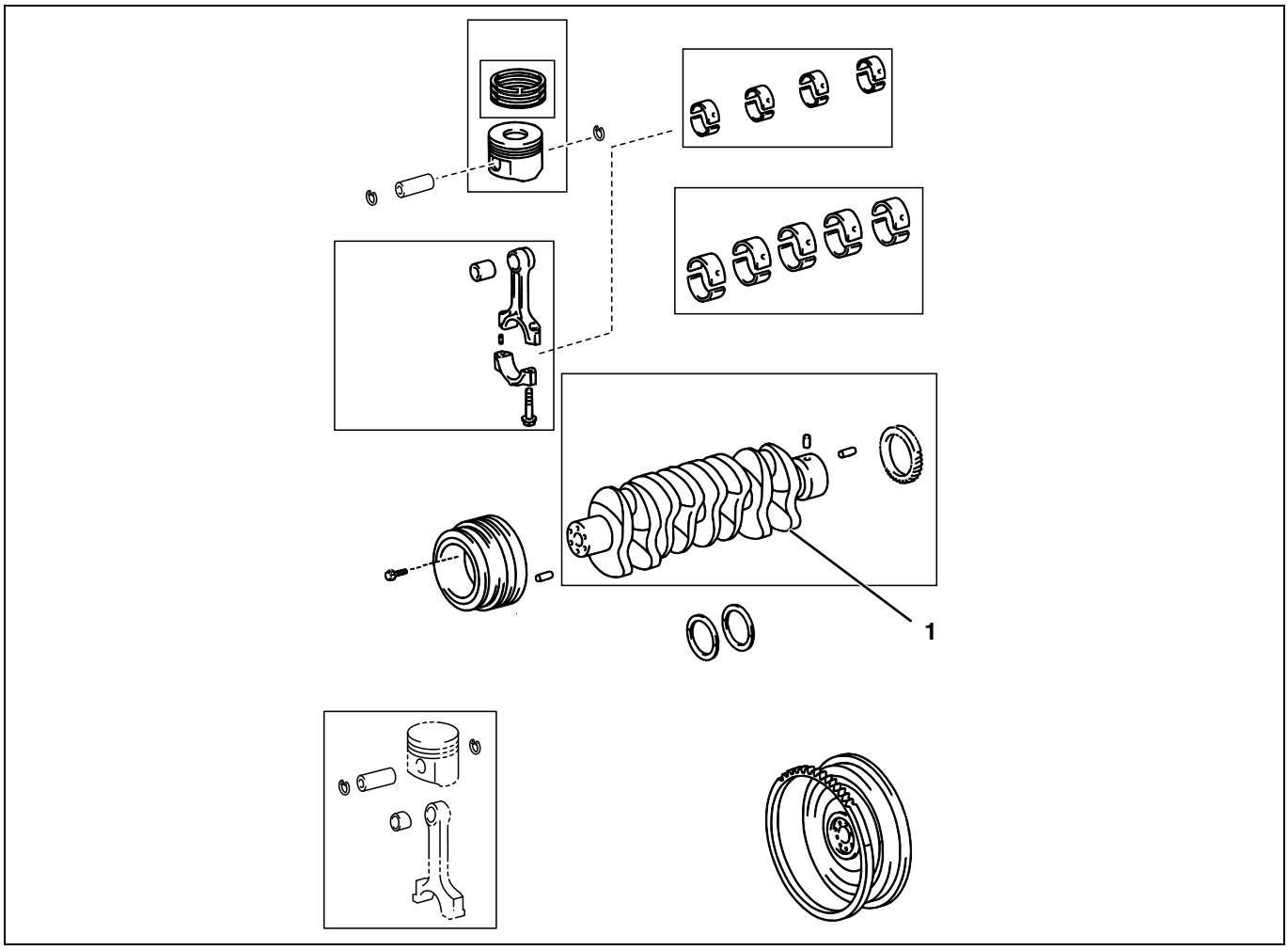
4. MOUNTING THE CYLINDER HEAD ASSEMBLY
Reference: ENGINE MECHANICAL (J05E), CYLINDER HEAD ASSEMBLY, REPLACEMENT, MOUNTING THE CYLINDER HEAD ASSEMBLY (Page 10-25)

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CRANKSHAFT

COMPONENT LOCATOR

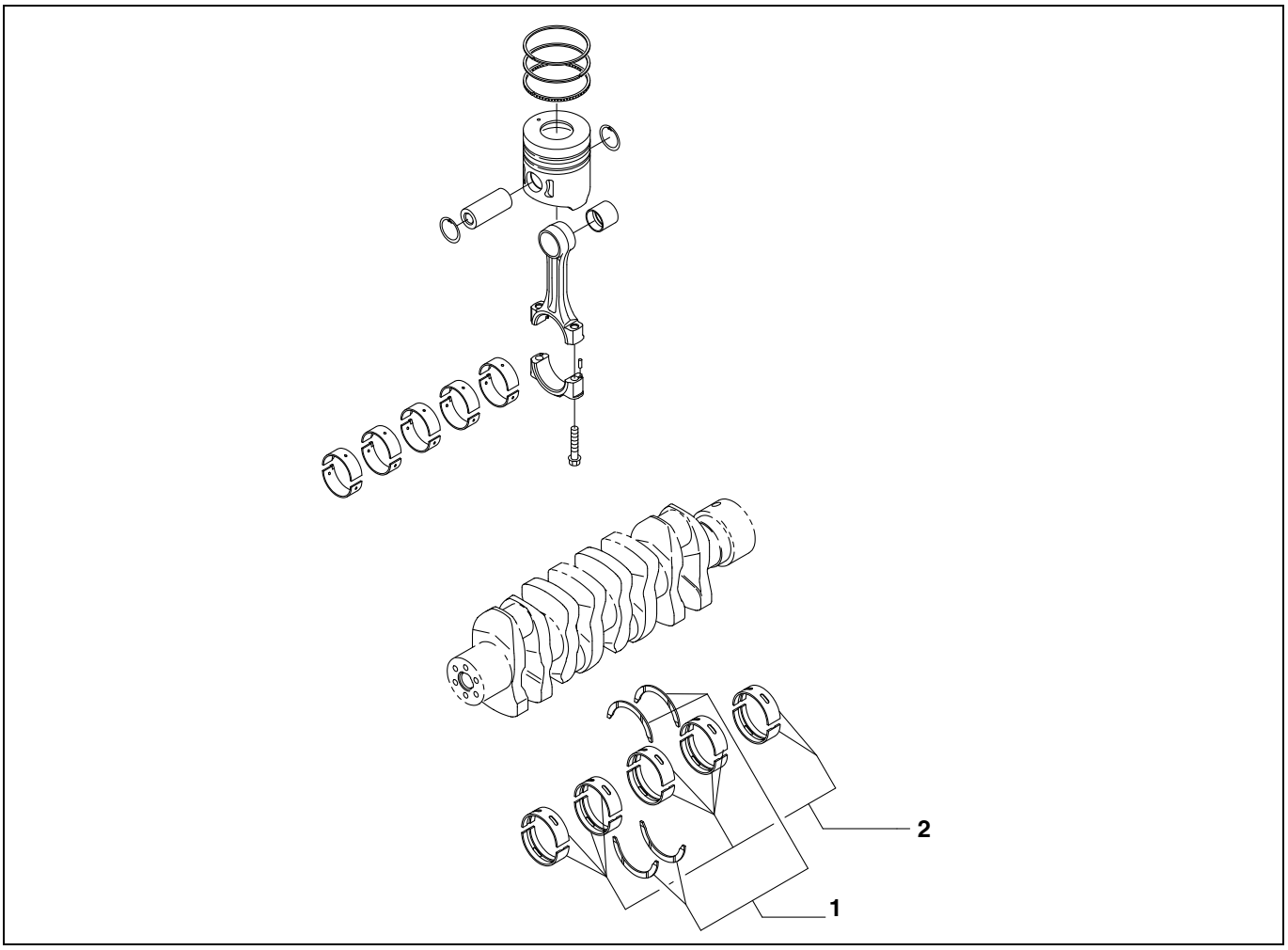
EN01F02127090402028001



SHTS021270900240

1 Crankshaft	

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SHTS021270900241

1 Thrust bearing	2 Crankshaft bearing

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REPLACEMENT

EN01F02127090402028002

REMOVING THE CRANKSHAFT

1. REMOVING THE CYLINDER HEAD ASSEMBLY
Reference: ENGINE MECHANICAL (J05E), CYLINDER HEAD ASSEMBLY, REPLACEMENT, REMOVING THE CYLINDER HEAD ASSEMBLY (Page 10-23)

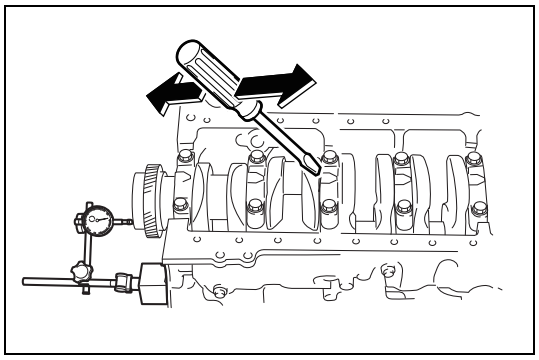
2. REMOVING THE PISTON AND CONNECTING ROD
Reference: ENGINE MECHANICAL (J05E), PISTON AND CONNECTING ROD, OVERHAUL, DISASSEMBLING THE PISTON AND CONNECTING ROD (Page 10-87)

3. REMOVING THE FRONT OIL SEAL RETAINER
Reference: ENGINE MECHANICAL (J05E), CRANKSHAFT FRONT OIL SEAL, REPLACEMENT, REMOVING THE CRANKSHAFT FRONT OIL SEAL (Page 10-50)

4. REMOVING THE FLYWHEEL HOUSING
Reference: ENGINE MECHANICAL (J05E), FLYWHEEL HOUSING, REPLACEMENT, REMOVING THE FLYWHEEL HOUSING (Page 10-66)

5. INSPECTING THE END PLAY

(1) Use the dial gauge to measure end play of the crankshaft. If a measurement reading exceeds the repair limit, replace the thrust bearings. If a measurement reading exceeds the permissible limit, replace the thrust bearings and crankshaft.



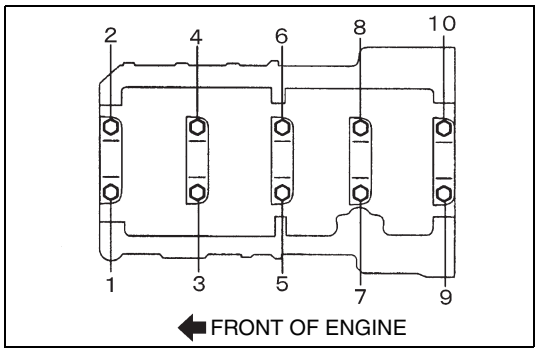
SHTS021270900242

Standard value (mm {in.})	Repair limit (mm {in.})	Permissible limit (mm {in.})
0.050-0.270 {0.0020-0.0106}	0.500 {0.0197}	1.270 {0.05}

NOTICE
Thrust bearing standard width: 2.5 mm {0.0984 in.}

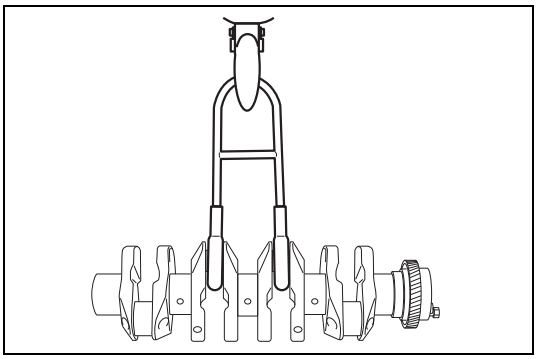
6. REMOVING THE CRANKSHAFT

(1) Loosen the main bearing cap bolt gradually in the sequential order shown in the figure (rotate to a 1/4 turn at a time) and remove it.



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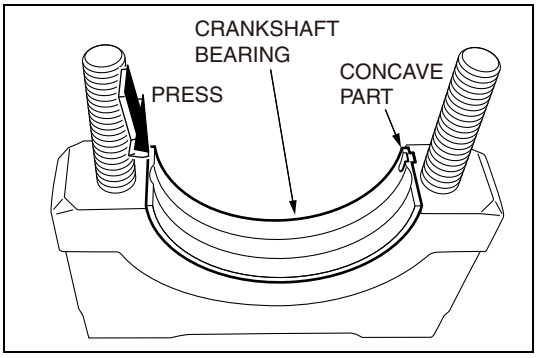


SHTS021270900244

(2) Remove the main bearing cap and dismount the crankshaft by using the hoist.

⚠ CAUTION

- **Handle it with care because it is a heavy load.**
- **Note that the crankshaft bearings and thrust bearings mounted to the main bearing caps and cylinder block may fall off due to applied impact.**



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7. REMOVING THE CRANKSHAFT BEARING AND THRUST BEARING

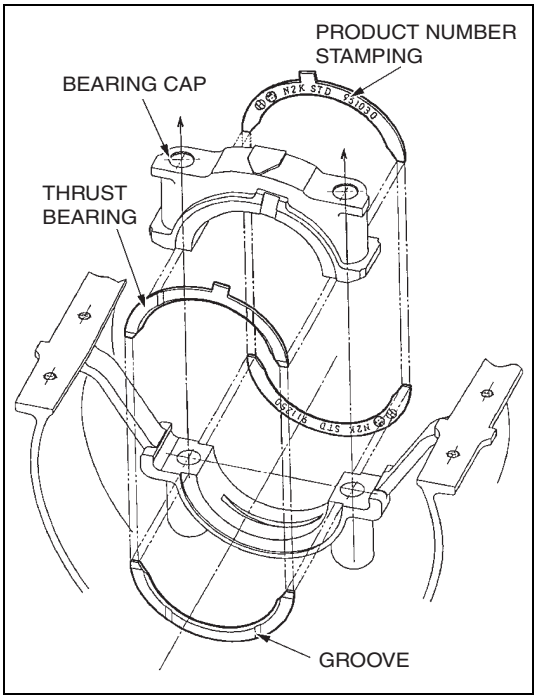
(1) Remove the crankshaft bearing mounted to the main bearing cap.

⚠ CAUTION

The removed crankshaft bearings must be identified and stored in order of cylinder number.

NOTICE

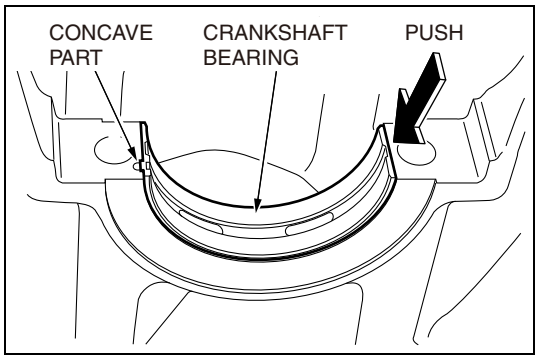
Press the one end of the crankshaft bearing at the opposite side of the concave with fingers to facilitate removal.



SHTS021270900246

(2) Remove the thrust bearing mounted to the cylinder block and main bearing cap.

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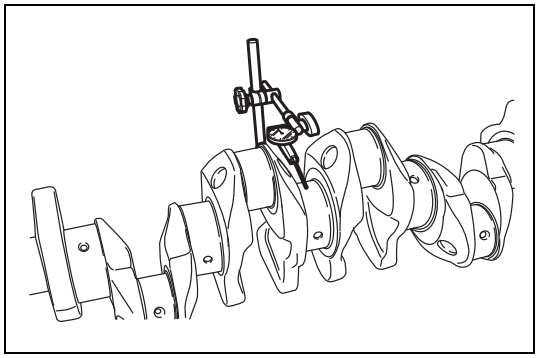
SHTS021270900247

(3) Remove the crankshaft bearing mounted to the cylinder block.

⚠ CAUTION
The removed crankshaft bearings must be identified and stored in order of cylinder number.

NOTICE
Press the one end of the crankshaft bearing at the opposite side of the concave with fingers to facilitate removal.

INSPECTING THE COMPONENTS

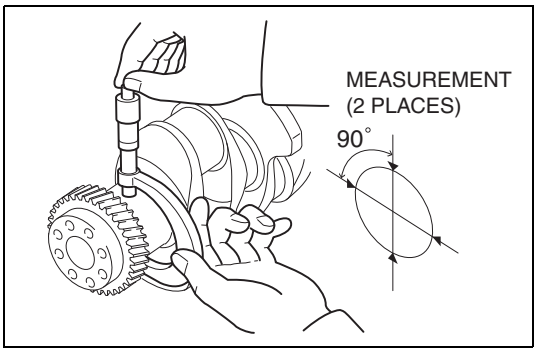

SHTS021270900248

1. INSPECTING THE ROTATION RUNOUT

(1) Use the dial gauge to measure crankshaft revolution runout. If a measurement reading exceeds the repair limit, replace the crankshaft.

Standard value (mm {in.})	Repair limit (mm {in.})
0-0.1 {0-0.0039}	0.15 {0.0059}

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SHTS021270900249

2. INSPECTING WEAR IN JOURNALS

(1) Use the micrometer to measure an outer diameter of a crankshaft journal. If a measurement reading exceeds the permissible limit, grind or replace the crankshaft.

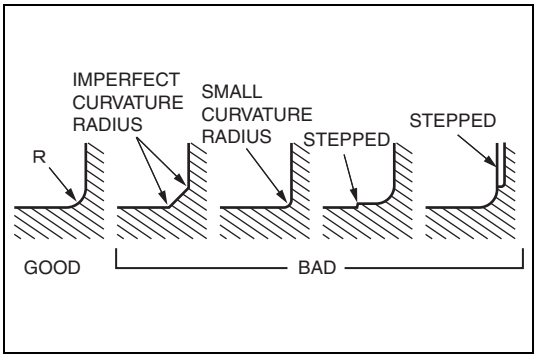
Standard value (mm {in.})	Permissible limit (mm {in.})
80.0 {3.150}	79.3 {3.122}

⚠ CAUTION

- **If the crankshaft is ground, use an undersize bearing.**

Bearing size	Outside diameter of journal
Standard	79.94-79.96 mm {3.1473-3.1480 in.}
0.25US	79.69-79.71 mm {3.1375-3.1381 in.}
0.50US	79.44-79.46 mm {3.1276-3.1283 in.}

- **If uneven wear is 0.1 mm {0.0039 in.} or larger, regrind for correction. If wear is 0.2 mm {0.0079 in.} or larger, regrind. If wear is 0.7 mm {0.0276 in.} or larger, replace the crankshaft.**

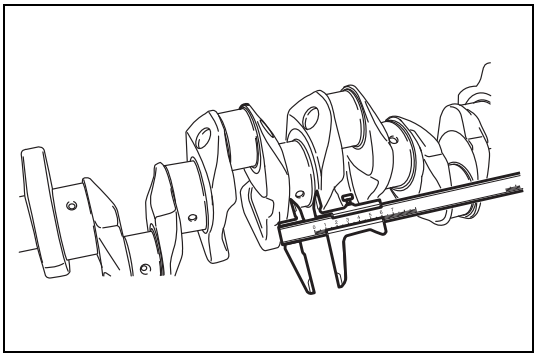


SHTS021270900250

NOTICE

When grinding the crankshaft, adjust a fillet radius dimension as indicated below.

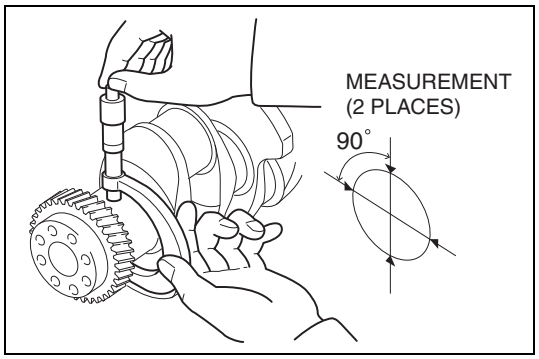
Journals: 2.5-3.0 mm {0.0984-0.1181 in.}


SHTS021270900251

(2) Use the vernier calipers to measure a width of the crankshaft center journal. If a measurement reading exceeds the permissible limit, replace the crankshaft.

Standard value (mm {in.})	Permissible limit (mm {in.})
36.0 {1.417}	37.0 {1.457}

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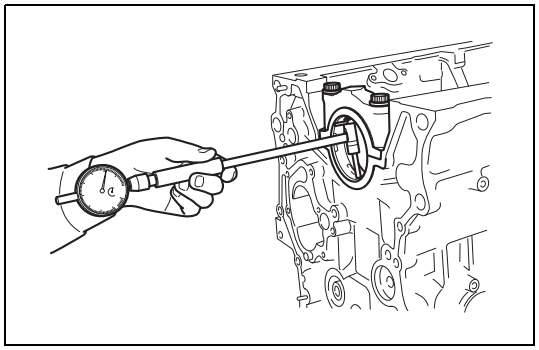


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3. INSPECTING THE CRANKSHAFT OIL CLEARANCE

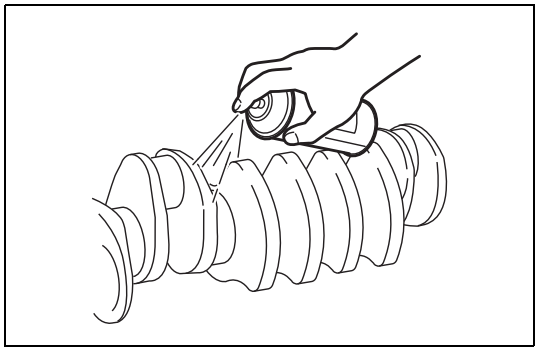
(1) Use the micrometer to measure the outer diameter of crankshaft journal.

Standard value (mm {in.})	80.0 {3.150}


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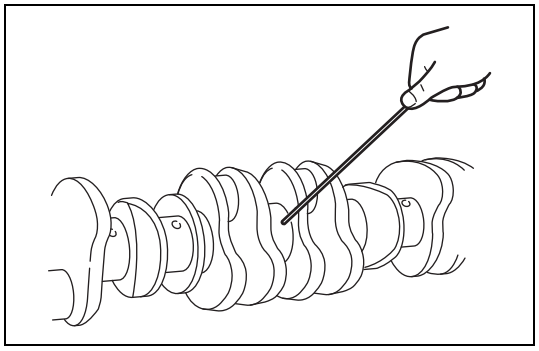
(2) Without mounting the crankshaft, mount the crankshaft bearing and main bearing cap to the cylinder block.
(3) Use the cylinder gauge to measure the inner diameter of the crankshaft bearing.
(4) Calculate the difference between the outer diameter of the crankshaft journal and the crankshaft bearing inner diameter. If a measurement reading exceeds the repair limit, replace the crankshaft bearing or crankshaft.

Standard value (mm {in.})	Repair limit (mm {in.})
0.051-0.102 {0.0020-0.0040}	0.2 {0.0079}


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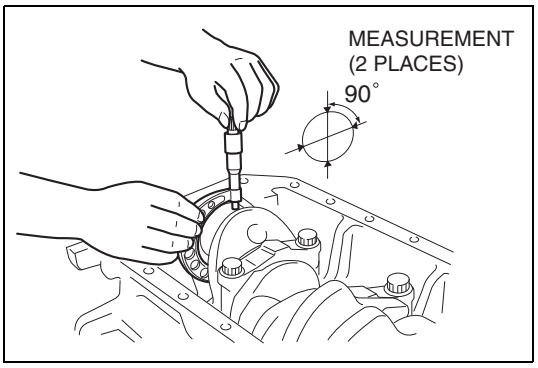
4. INSPECTING THE CRANKSHAFT FOR CRACK, DAMAGE AND OIL HOLE

(1) Use the dye penetrant testing (red check) to check the crankshaft for crack and damage. If found defective, replace the crankshaft.


SHTS021270900255

(2) Check the crankshaft for clogged oil hole. If found defective, replace the crankshaft.

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SHTS021270900256

5. INSPECTING WEAR IN CRANK PINS

(1) Use the micrometer to measure an outer diameter of a crank pin on the crankshaft. If a measurement reading exceeds the permissible limit, grind or replace the crankshaft.

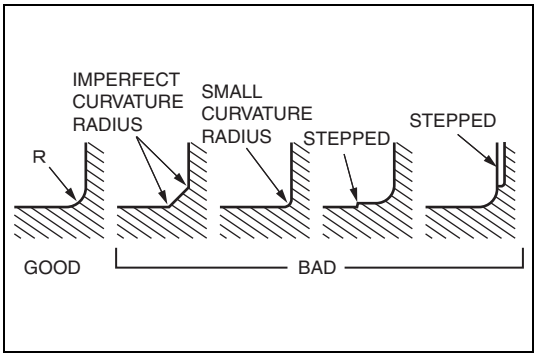
Standard value (mm {in.})	Permissible limit (mm {in.})
65.0 {2.560}	64.3 {2.531}

⚠ CAUTION

- **If the crankshaft is ground, use an undersize bearing.**
- **If uneven wear is 0.1 mm {0.0039 in.} or larger, regrind for correction. If wear is 0.2 mm {0.0079 in.} or larger, regrind. If wear is 0.7 mm {0.0276 in.} or larger, replace the crankshaft.**

NOTICE

When grinding the crankshaft, adjust a fillet radius dimension as indicated below.
Crank pins: 2.5-3.0 mm {0.0984-0.1181 in.}
Journals: 2.5-3.0 mm {0.0984-0.1181 in.}

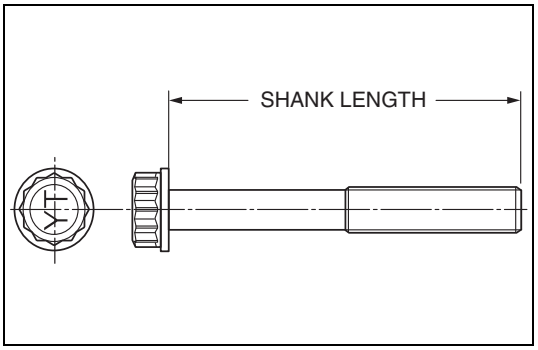


SHTS021270900257

6. INSPECTING THE LENGTH OF MAIN BEARING CAP BOLT

(1) Use the vernier calipers to measure the under head of the main bearing cap bolt. If a measurement reading exceeds the permissible limit, replace the bolt.

Standard value (mm {in.})	Permissible limit (mm {in.})
106.8 {4.205}	108.0 {4.252}

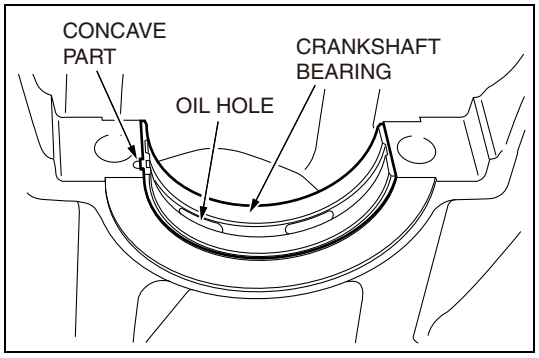


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MOUNTING THE CRANKSHAFT

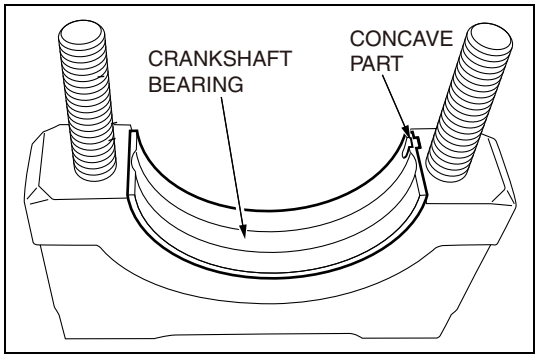
1. MOUNTING THE CRANKSHAFT BEARING AND THRUST BEARING



SHTS021270900259

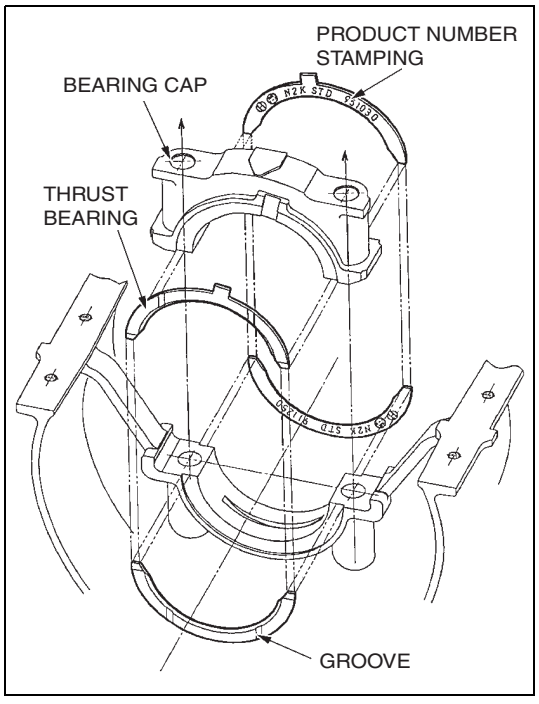
(1) Mount the crankshaft bearing by aligning with the cylinder block concave and then apply engine oil.

⚠ CAUTION
- **Check the oil hole for alignment.**
- **Off-position of the oil hole may cause insufficient oiling, resulting in seizure.**



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(2) Mount the crankshaft bearing by aligning with the main bearing cap concave and then apply engine oil.



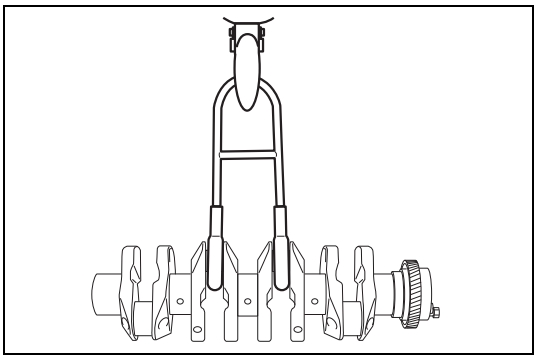
SHTS021270900261

(3) Mount the thrust bearing to the main bearing cap with the groove side (front side) facing to the crank arm side and the part No. side (back side) to the main bearing cap side before applying engine oil.

⚠ CAUTION
Apply engine oil or grease to the back side of the thrust bearing to prevent it from falling off during assembly.

NOTICE
Do not mount the thrust bearing on the cylinder block side now because it must be inserted after the crankshaft is placed.

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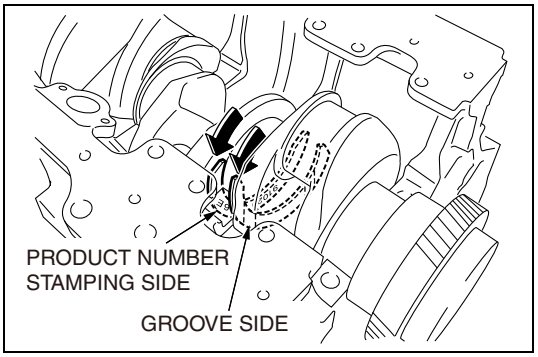
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2. MOUNTING THE CRANKSHAFT

(1) Use the hoist to set the crankshaft to the cylinder block.

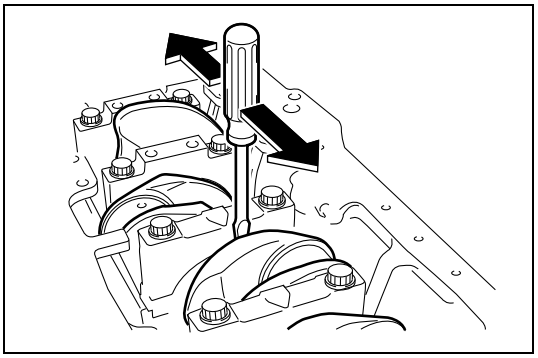
⚠ CAUTION

Handle it with care because it is a heavy load.



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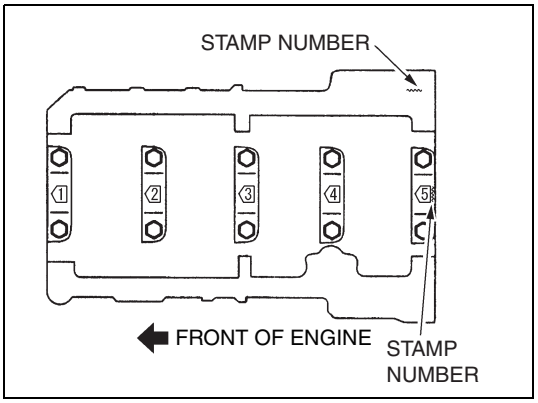
(2) Insert the thrust bearing on the cylinder block into the gap between the crankshaft and cylinder block with the groove side (front side) facing to the crank arm side and the part No. side (back side) to the cylinder block side.



SHTS021270900264

NOTICE

To facilitate this work, use a flat-blade screwdriver or other similar tools to keep an enough gap for inserting the thrust bearing. During this step, use care not to cause any scratches or damages.



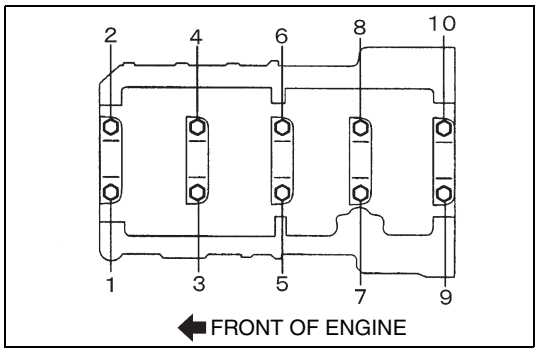
SHTS021270900265

(3) Set the main bearing cap mounted with the thrust bearing and main bearing to the cylinder block.

⚠ CAUTION

- **Make sure that the pentagon-shaped marks indicated on the main bearing caps face to the engine front side in the order of 1-5 from front to back.**
- **Check the engraving No. on the main bearing cap against the engraving No. on the cylinder block.**

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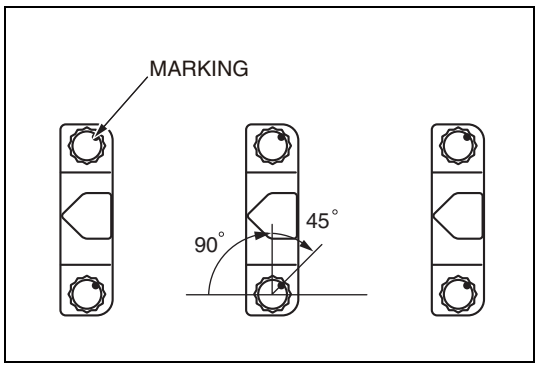
SHTS021270900266

(4) Apply engine oil to bolt seat surfaces and threads of the bearing cap bolts.

(5) Tighten the bearing cap bolts in order as shown in the figure.
Tightening Torque:
69 N·m {704 kgf·cm, 51 lbf·ft}

(6) Loosen the bearing cap mounted with the thrust bearing and use the plastic hammer to tap the crankshaft at its front and back ends.
(7) Loosen the all the bearing cap bolts.
(8) Tighten the bearing cap bolt as in the case with (5).
Tightening Torque:
69 N·m {704 kgf·cm, 51 lbf·ft}

(9) Use the paint to mark the bearing cap bolt heads in the same direction.
(10) Tighten the bolts by 90° (1/4 turns) in the same order as in Step (5).
(11) Retighten the bolts by another 45° (1/8 turns) in the same order as in Step (5).
(12) Check that all the paint markings face the same direction.



SHTS021270900267

⚠ CAUTION
Do not loosen the bolt even when it is over tightened during retightening.

(13) After completion of tightening, tap the front and back ends of the crankshaft with the plastic hammer so that crankshaft fits the assembly.

⚠ CAUTION
- **Check the crankshaft for smooth rotation.**
- **Measure the crankshaft end play and check that a measurement reading is within the standard value.**

Standard value (mm {in.})	Repair limit (mm {in.})	Permissible limit (mm {in.})
0.050-0.270 {0.0020-0.0106}	0.500 {0.0197}	1.270 {0.05}

3. MOUNTING THE FLYWHEEL HOUSING
Reference: ENGINE MECHANICAL (J05E), FLYWHEEL HOUSING, REPLACEMENT, MOUNTING THE FLYWHEEL HOUSING (Page 10-68)

4. MOUNTING THE FRONT OIL SEAL RETAINER
Reference: ENGINE MECHANICAL (J05E), FRONT OIL SEAL RETAINER, REPLACEMENT, MOUNTING THE FRONT OIL SEAL RETAINER (Page 10-55)

5. MOUNTING THE PISTON AND CONNECTING ROD
Reference: ENGINE MECHANICAL (J05E), PISTON AND CONNECTING ROD, OVERHAUL, MOUNTING THE PISTON AND CONNECTING ROD (Page 10-98)

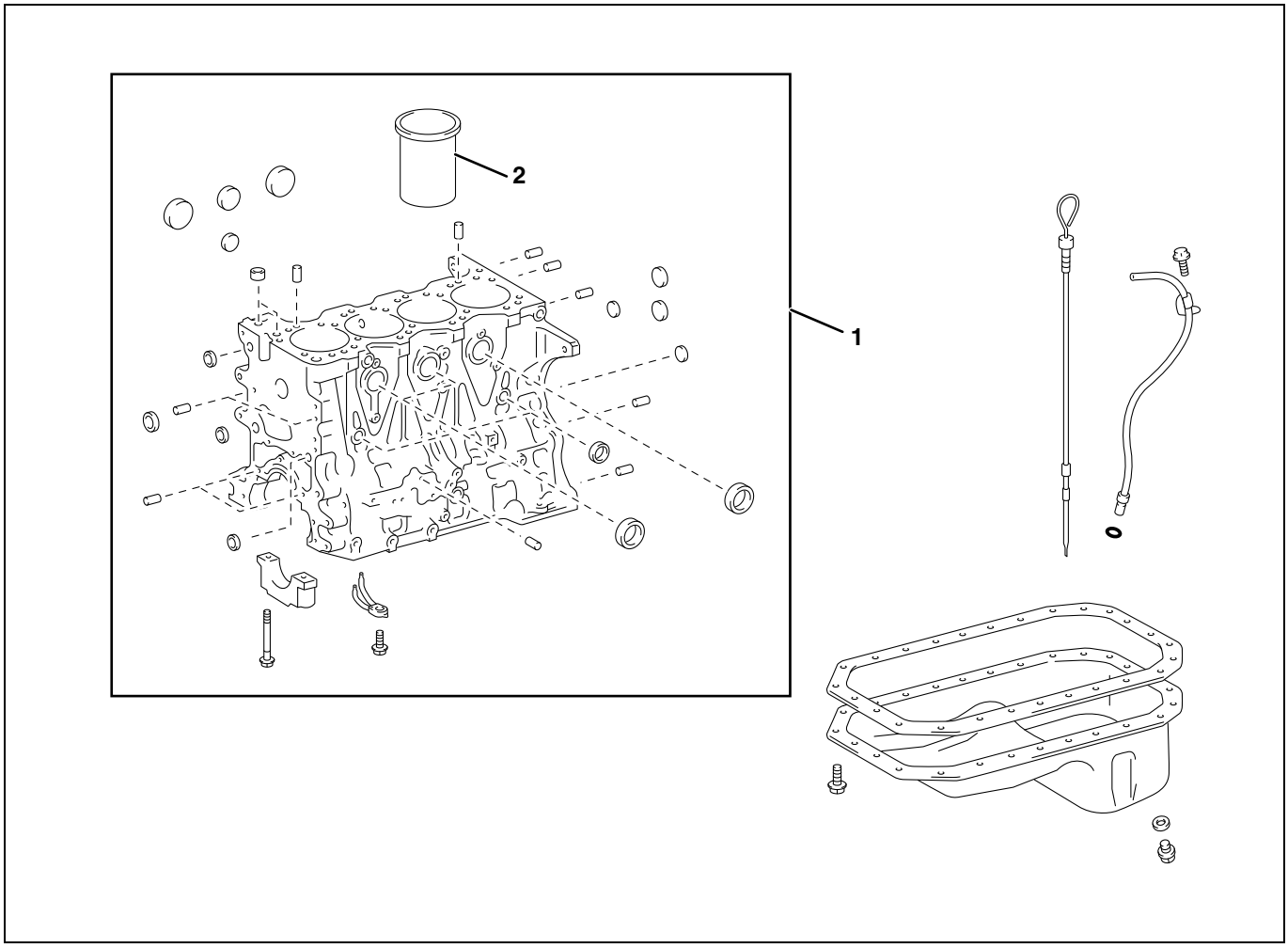
6. MOUNTING THE CYLINDER HEAD ASSEMBLY
Reference: ENGINE MECHANICAL (J05E), CYLINDER HEAD ASSEMBLY, REPLACEMENT, MOUNTING THE CYLINDER HEAD ASSEMBLY (Page 10-25)

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CYLINDER LINER

COMPONENT LOCATOR

EN01F02127090402029001



SHTS021270900268

1	Cylinder block assembly	2	Cylinder liner

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REPLACEMENT

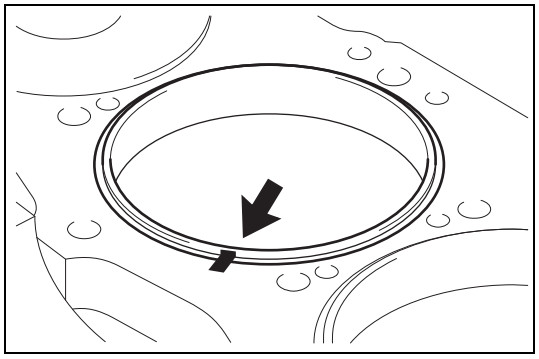
EN01F02127090402029002

REMOVING THE CYLINDER LINER

1. REMOVING THE CYLINDER HEAD ASSEMBLY
Reference: ENGINE MECHANICAL (J05E), CYLINDER HEAD ASSEMBLY, REPLACEMENT, REMOVING THE CYLINDER HEAD ASSEMBLY (Page 10-23)

2. REMOVING THE PISTON AND CONNECTING ROD
Reference: ENGINE MECHANICAL (J05E), PISTON AND CONNECTING ROD, OVERHAUL, REMOVING THE PISTON AND CONNECTING ROD (Page 10-85)

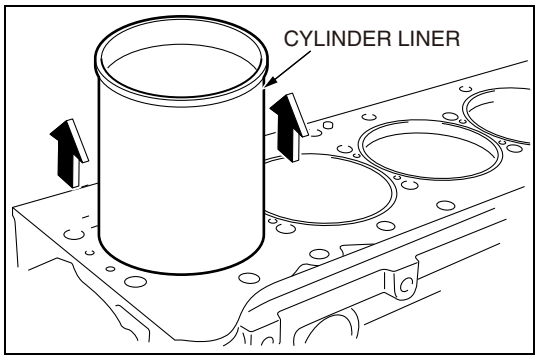
3. REMOVING THE CYLINDER LINER



SHTS021270900269

(1) Use the oil pen to put alignment marks on the flange surface of the cylinder block and cylinder liner.

⚠ CAUTION
Never use the punch to put alignment marks.

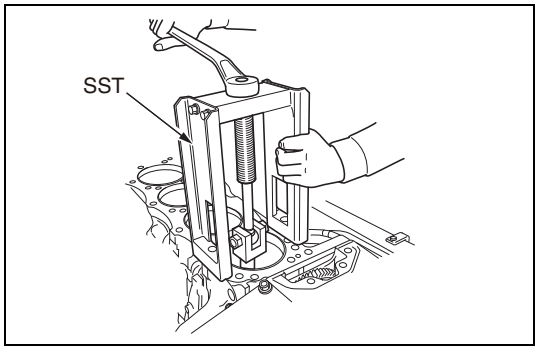


SHTS021270900270

(2) Hold the cylinder liner end with both hands and pull it off over the cylinder block at a stroke.

⚠ CAUTION
- **Use the particular care in handling the cylinder liner. No dropped cylinder liners are reusable.**
- **The removed cylinder liners must be identified and stored in order of cylinder number.**

NOTICE
Pull off the cylinder liner vertically at a stroke. Otherwise it gets caught with the cylinder block and will not be removed easily.



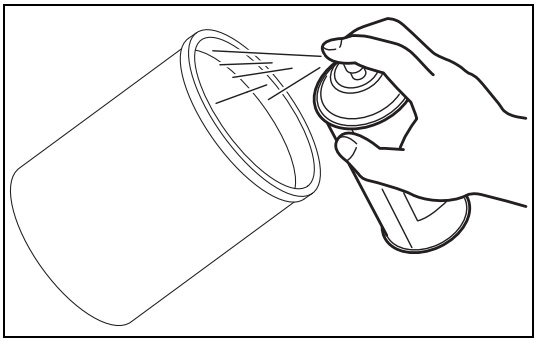
SHTS021270900271

(3) If the damaged cylinder liner or cylinder block cannot be pulled off with hands, use the SST to pull off the cylinder liner above the cylinder block.
SST: S0942-02100
Cylinder liner puller

⚠ CAUTION
Use care to avoid the SST from contacting the cooling jet.

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INSPECTING THE COMPONENTS



SHTS021270900272

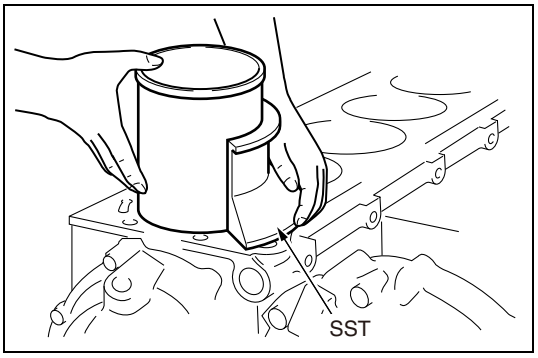
1. INSPECTING THE CYLINDER LINER FOR CRACK AND DAMAGE

(1) Use the dye penetrant testing (red check) to inspect the cylinder liner for crack and damage. If found defective, replace the cylinder liner.

⚠ CAUTION

After cleaning the cylinder liners, prevent rusts. Use a bearing scraper or other similar tools to scrape off rusts if any.

MOUNTING THE CYLINDER LINER



SHTS021270900273

1. MOUNTING THE CYLINDER LINER

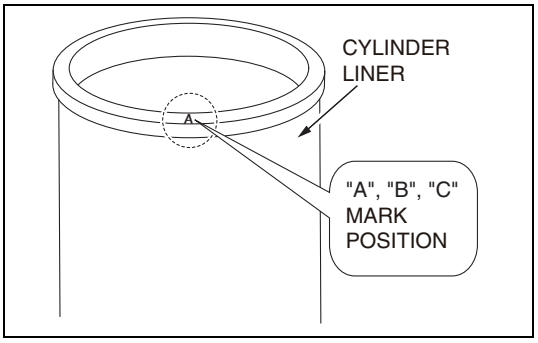
(1) Apply engine oil to the inner surface of the cylinder block bore.

(2) Align the alignment mark indicated on the cylinder liner and the one indicated on the cylinder block and use the SST to insert the cylinder liner in the vertical posture.

SST: S0947-11490
Guide

NOTICE

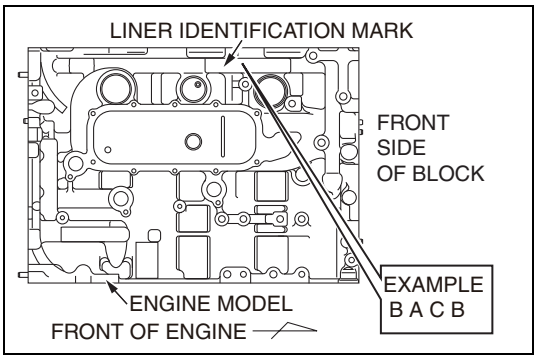
Vertical insertion can be performed with or without using the SST.



SHTS021270900274

⚠ CAUTION

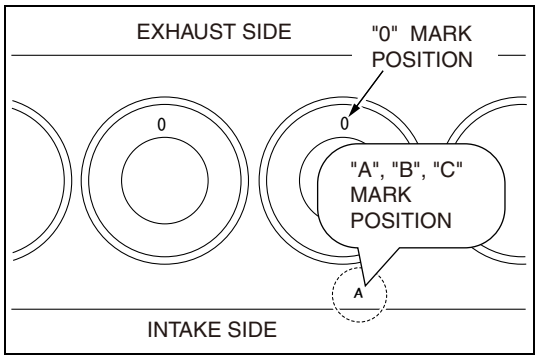
- **When mounting new cylinder liners, select appropriate cylinder liners that have the same identification mark (A, B or C) as the liner identification mark engraved on the cylinder block in the order of cylinders.**



SHTS021270900275

- **The figure shows that the No.1 cylinder has liner B.**

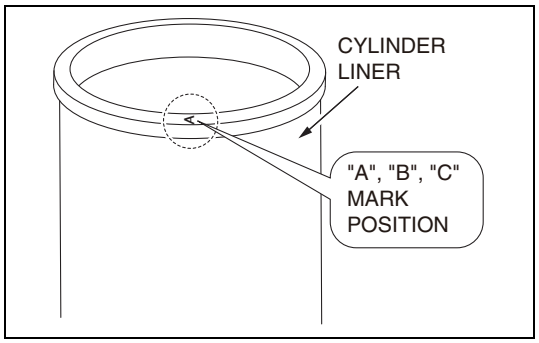
https://truckmanualshub.com



SHTS021270900276

NOTICE

- **The liner identification mark (A, B or C) is also engraved on the upper surface of the cylinder block intake side.**



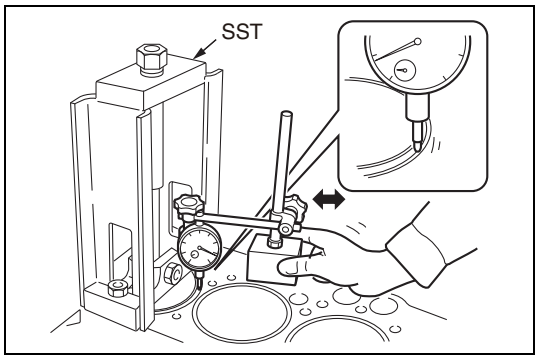
SHTS021270900277

- **Mount the cylinder liner with the liner identification mark (A, B or C) facing to the intake side.**

2. INSPECTING THE CYLINDER LINER COLLAR PROJECTION

(1) Use the SST to fix the cylinder liner.
Tightening Torque:
9.8 N·m {100 kgf·cm, 7 lbf·ft}

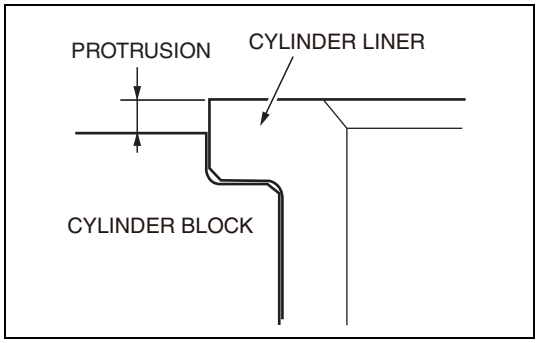
SST: S0942-02100
Cylinder liner puller



SHTS021270900278

(2) Use the dial gauge to measure the collar projection.

Standard value (mm {in.})	**0.01-0.08 {0.0004-0.0032}**



SHTS021270900279

3. MOUNTING THE PISTON AND CONNECTING ROD
Reference: ENGINE MECHANICAL (J05E), PISTON AND CONNECTING ROD, OVERHAUL, MOUNTING THE PISTON AND CONNECTING ROD (Page 10-98)

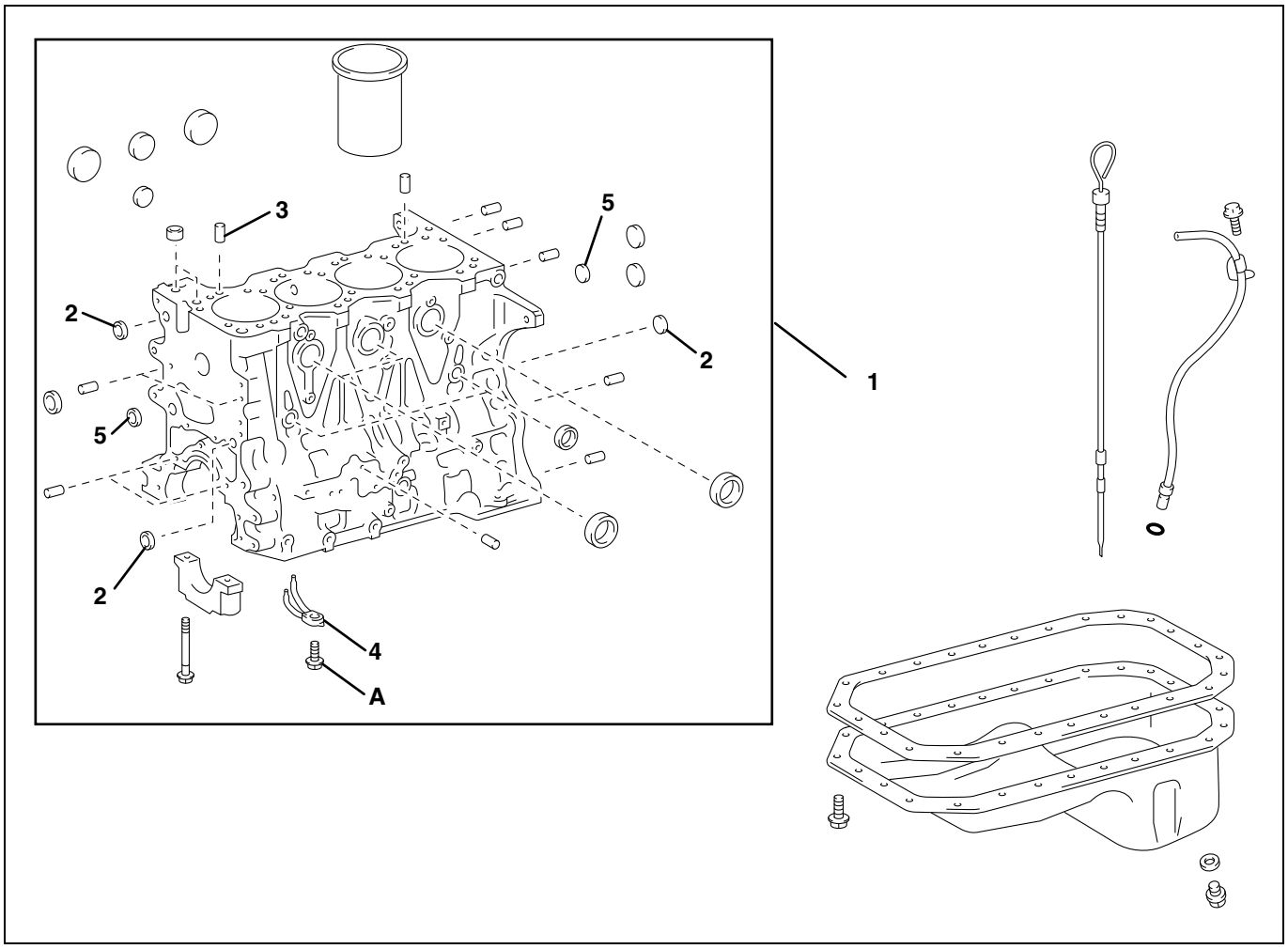
4. MOUNTING THE CYLINDER HEAD ASSEMBLY
Reference: ENGINE MECHANICAL (J05E), CYLINDER HEAD ASSEMBLY, REPLACEMENT, MOUNTING THE CYLINDER HEAD ASSEMBLY (Page 10-25)

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CYLINDER BLOCK

COMPONENT LOCATOR

EN01F02127090402030001



SHTS021270900280

1	Cylinder block assembly	4	Cooling jet
2	Plug A	5	Plug B
3	Dowel pins		

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	22 {224, 16}		

https://truckmanualshub.com

OVERHAUL

EN01F02127090402030002

REMOVING THE CYLINDER BLOCK

1. **REMOVING THE COOLING FAN ASSEMBLY AND FAN SHROUD RING**
   Reference: COOLING (J05E), COOLING FAN AND FAN CLUTCH, OVERHAUL, REMOVING THE COOLING FAN & FAN CLUTCH (Page 12-34)

2. **REMOVING THE CYLINDER HEAD ASSEMBLY**
   Reference: ENGINE MECHANICAL (J05E), CYLINDER HEAD ASSEMBLY, REPLACEMENT, REMOVING THE CYLINDER HEAD ASSEMBLY (Page 10-23)

3. **REMOVING THE ALTERNATOR**
   Reference: STARTING/CHARGING (J05E), ALTERNATOR (130A), OVERHAUL, IMPORTANT POINTS - DISASSEMBLY (Page 16-13)

4. **REMOVING THE AIR CONDITIONER COMPRESSOR**
   Reference: CHASSIS (S1-LXJE03A), HEATER & AIR CONDITIONER
   Reference: CHASSIS (S1-LXJE04A), HEATER & AIR CONDITIONER

5. **REMOVING THE CRANKSHAFT PULLEY**
   Reference: ENGINE MECHANICAL (J05E), CRANKSHAFT PULLEY, REPLACEMENT, REMOVING THE CRANKSHAFT PULLEY (Page 10-47)

6. **REMOVING THE COOLANT PUMP**
   Reference: COOLING (J05E), COOLANT PUMP, REPLACEMENT, REMOVING THE COOLANT PUMP (Page 12-31)

7. **REMOVING THE CRANKSHAFT FRONT OIL SEAL**
   Reference: ENGINE MECHANICAL (J05E), CRANKSHAFT FRONT OIL SEAL, REPLACEMENT, REMOVING THE CRANKSHAFT FRONT OIL SEAL (Page 10-50)

8. **REMOVING THE OIL COOLER ASSEMBLY**
   Reference: LUBRICATION (J05E), OIL COOLER, OVERHAUL, DISASSEMBLING THE OIL COOLER ASSEMBLY (Page 13-9)

9. **REMOVING THE ENGINE ECU**
   Reference: ENGINE CONTROL (J05E), ENGINE ECU, REPLACEMENT, REMOVING THE ENGINE ECU (Page 6-7)

10. **REMOVING THE ENGINE MOUNTING AND BRACKET**
    Reference: ENGINE MECHANICAL (J05E), ENGINE MOUNTING AND BRACKET, REPLACEMENT, REMOVING THE ENGINE MOUNTING AND BRACKET (Page 10-126)

11. **REMOVING THE STARTER**
    Reference: STARTING/CHARGING (J05E), STARTER, REPLACEMENT, REMOVING THE STARTER (Page 16-3)

12. **REMOVING THE OIL LEVEL GAUGE AND GUIDE**
    Reference: LUBRICATION (J05E), OIL LEVEL GAUGE AND GUIDE, REPLACEMENT, REMOVING THE OIL LEVEL GAUGE AND GUIDE (Page 13-34)

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13. **REMOVING THE POWER STEERING PUMP**
    Reference: CHASSIS (S1-LXJE03A), STEERING
    Reference: CHASSIS (S1-LXJE04A), STEERING

14. **REMOVING THE INJECTION PUMP DRIVE**
    Reference: ENGINE MECHANICAL (J05E), TIMING GEAR & CAM IDLE GEAR, OVERHAUL, REMOVING THE TIMING GEARS AND THE REAR END PLATE FROM FLYWHEEL HOUSING (Page 10-72)

15. **REMOVING THE OIL PAN**
    Reference: LUBRICATION (J05E), OIL PAN, REPLACEMENT, REMOVING THE OIL PAN (Page 13-24)

16. **REMOVING THE OIL STRAINER**
    Reference: LUBRICATION (J05E), OIL STRAINER, REPLACEMENT, REMOVING THE OIL STRAINER (Page 13-29)

17. **REMOVING THE PISTON AND CONNECTING ROD**
    Reference: ENGINE MECHANICAL (J05E), PISTON AND CONNECTING ROD, OVERHAUL, REMOVING THE PISTON AND CONNECTING ROD (Page 10-85)

18. **REMOVING THE CYLINDER LINER**
    Reference: ENGINE MECHANICAL (J05E), CYLINDER LINER, REPLACEMENT, REMOVING THE CYLINDER LINER (Page 10-113)

19. **REMOVING THE FLYWHEEL ASSEMBLY**
    Reference: ENGINE MECHANICAL (J05E), FLYWHEEL ASSEMBLY, OVERHAUL, REMOVING THE FLYWHEEL ASSEMBLY (Page 10-57)

20. **REMOVING THE CRANKSHAFT REAR OIL SEAL**
    Reference: ENGINE MECHANICAL (J05E), CRANKSHAFT REAR OIL SEAL, REPLACEMENT, REMOVING CRANKSHAFT REAR OIL SEAL (Page 10-62)

21. **REMOVING THE FRONT OIL SEAL RETAINER**
    Reference: ENGINE MECHANICAL (J05E), FRONT OIL SEAL RETAINER, REPLACEMENT, REMOVING THE FRONT OIL SEAL RETAINER (Page 10-54)

22. **REMOVING THE TIMING GEAR**
    Reference: ENGINE MECHANICAL (J05E), TIMING GEAR & CAM IDLE GEAR, OVERHAUL, REMOVING THE TIMING GEARS AND THE REAR END PLATE FROM FLYWHEEL HOUSING (Page 10-72)

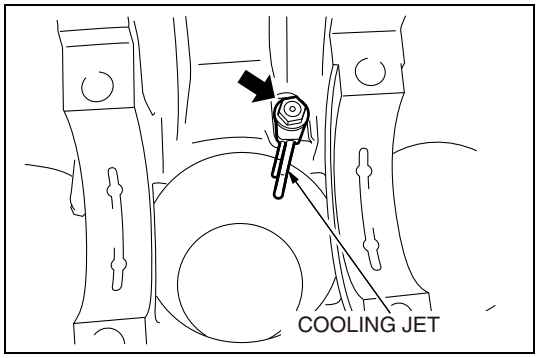
23. **REMOVING THE FLYWHEEL HOUSING**
    Reference: ENGINE MECHANICAL (J05E), FLYWHEEL HOUSING, REPLACEMENT, REMOVING THE FLYWHEEL HOUSING (Page 10-66)

24. **REMOVING THE OIL PUMP**
    Reference: LUBRICATION (J05E), OIL PUMP, OVERHAUL, REMOVING THE OIL PUMP (Page 13-15)

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25. REMOVING THE CRANKSHAFT
Reference: ENGINE MECHANICAL (J05E), CRANKSHAFT, REPLACEMENT, REMOVING THE CRANKSHAFT (Page 10-103)

26. REMOVING THE COOLING JET
(1) Unfasten the union bolts and remove the cooling jet from the cylinder block.



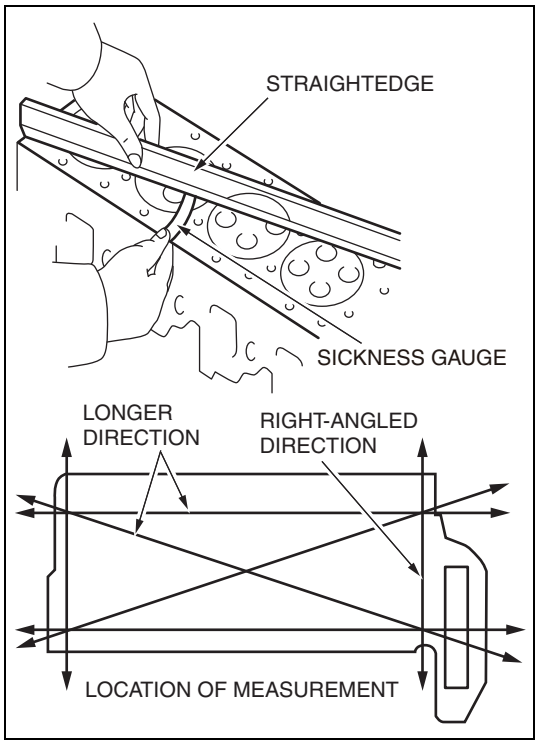
SHTS021270900281

INSPECTING THE COMPONENTS

1. INSPECTING THE CYLINDER BLOCK
(1) Use the straightedge and thickness gauge to measure the strain of the upper surface of cylinder block. If a measurement reading exceeds the permissible limit, replace it.

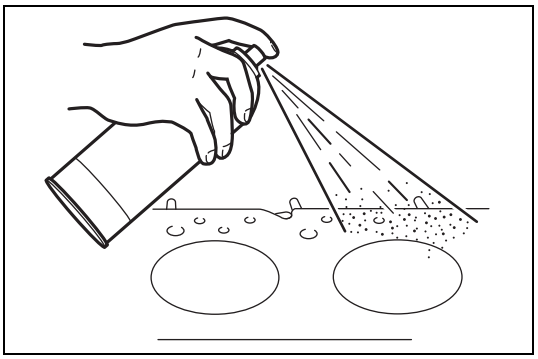
Standard value (mm {in.})	Permissible limit (mm {in.})
0.05 {0.0020}	0.20 {0.0079}

⚠ CAUTION
Do not grind or blend the surface. Otherwise, backlash in timing gears may change.



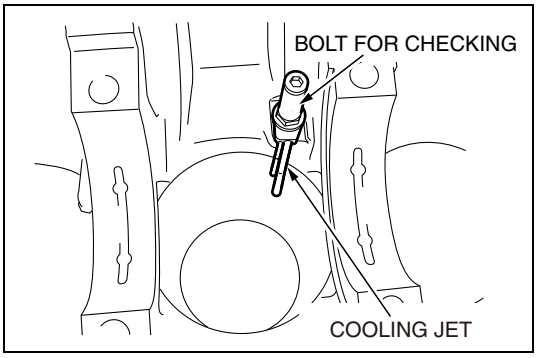
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SHTS021270900283

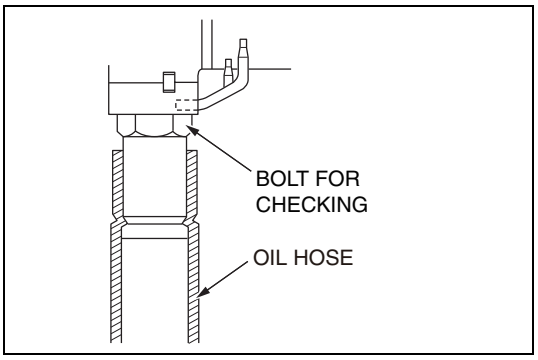
(2) Use the dye penetrant testing (red check) to inspect the cylinder block for crack and damage. If found defective, replace the cylinder block.



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2. INSPECTING COOLING JET INJECTION POSITION

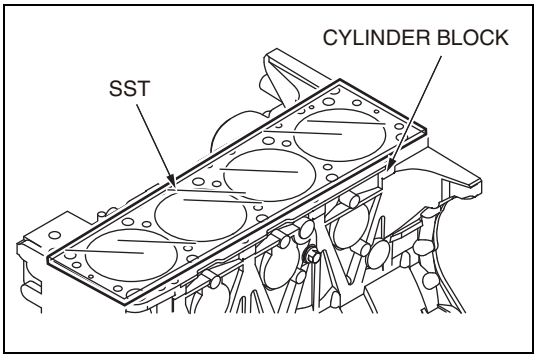
(1) Unfasten the standard union bolt and use the SST to mount the cooling jet to the cylinder block.
SST: SZ910-24098
Bolt for checking



SHTS021270900285

(2) Connect the oil hose for injection test to the SST from under the cylinder block.

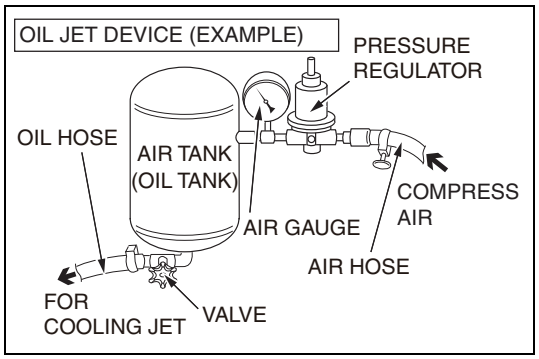
⚠ CAUTION
Use new engine oil for injection.



SHTS021270900286

(3) Set the SST to the upper surface of cylinder block.
SST: 09219-E4030
Gauge

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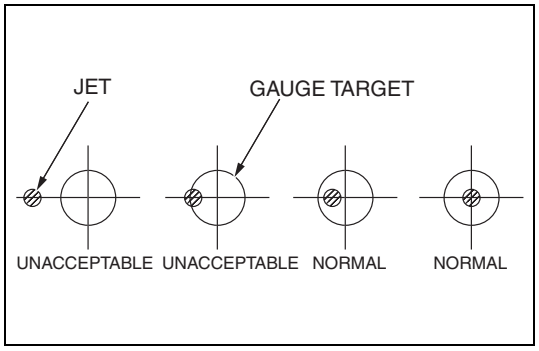


SHTS021270900287

(4) Inject oil from the cooling jet nozzle at 196 kPa {2 kgf/cm^2, 28 lbf/in^2}.

NOTICE

See the figure for the oil injection device.



SHTS021270900288

(5) If the center of injection does not cross a gauge datum line, injection is deemed normal.

⚠ CAUTION

- **Oil may splash and catch fire, causing fire. Keep from flame.**
- **Working in a well-ventilated area.**

(6) If the injection does not hit the target circle, replace with a new cooling jet.

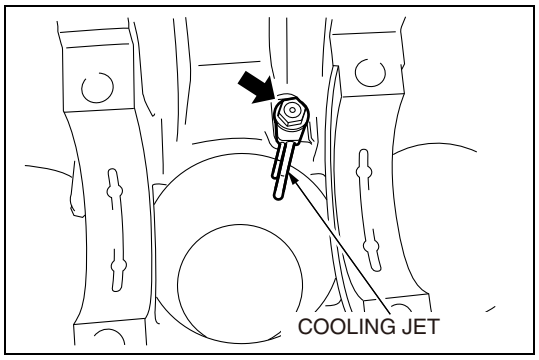
(7) Unfasten the SST (bolt for checking) and use a proper union bolt to secure the cooling jet on the cylinder block.
Tightening Torque:
22 N·m {224 kgf·cm, 16 lbf·ft}

(8) After mounting the piston, check that the cooling jet does not interfere with the piston at the piston bottom dead center.

MOUNTING THE CYLINDER BLOCK

1. MOUNTING THE COOLING JET

(1) Mount the cooling jet to the cylinder block.
Tightening Torque:
22 N·m {224 kgf·cm, 16 lbf·ft}



SHTS021270900289

(2) After mounting the piston, check that the cooling jet does not interfere with the piston at the piston bottom dead center.

2. MOUNTING THE CRANKSHAFT
Reference: ENGINE MECHANICAL (J05E), CRANKSHAFT, REPLACEMENT, MOUNTING THE CRANKSHAFT (Page 10-109)

3. MOUNTING THE OIL PUMP
Reference: LUBRICATION (J05E), OIL PUMP, OVERHAUL, MOUNTING THE OIL PUMP (Page 13-20)

4. MOUNTING THE FLYWHEEL HOUSING
Reference: ENGINE MECHANICAL (J05E), FLYWHEEL HOUSING, REPLACEMENT, MOUNTING THE FLYWHEEL HOUSING (Page 10-68)

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5. **MOUNTING THE TIMING GEAR**
   Reference: ENGINE MECHANICAL (J05E), TIMING GEAR & CAM IDLE GEAR, OVERHAUL, MOUNTING THE TIMING GEARS IN THE FLYWHEEL HOUSING AND THE REAR END PLATE (Page 10-74)

6. **MOUNTING THE FRONT OIL SEAL RETAINER**
   Reference: ENGINE MECHANICAL (J05E), FRONT OIL SEAL RETAINER, REPLACEMENT, MOUNTING THE FRONT OIL SEAL RETAINER (Page 10-55)

7. **MOUNTING THE CRANKSHAFT REAR OIL SEAL**
   Reference: ENGINE MECHANICAL (J05E), CRANKSHAFT REAR OIL SEAL, REPLACEMENT, REMOVING CRANKSHAFT REAR OIL SEAL (Page 10-62)

8. **MOUNTING THE FLYWHEEL ASSEMBLY**
   Reference: ENGINE MECHANICAL (J05E), FLYWHEEL ASSEMBLY, OVERHAUL, MOUNTING THE FLYWHEEL ASSEMBLY (Page 10-59)

9. **MOUNTING THE CYLINDER LINER**
   Reference: ENGINE MECHANICAL (J05E), CYLINDER LINER, REPLACEMENT, MOUNTING THE CYLINDER LINER (Page 10-114)

10. **MOUNTING THE PISTON AND CONNECTING ROD**
    Reference: ENGINE MECHANICAL (J05E), PISTON AND CONNECTING ROD, OVERHAUL, MOUNTING THE PISTON AND CONNECTING ROD (Page 10-98)

11. **MOUNTING THE OIL STRAINER**
    Reference: LUBRICATION (J05E), OIL STRAINER, REPLACEMENT, MOUNTING THE OIL STRAINER (Page 13-29)

12. **MOUNTING THE OIL PAN**
    Reference: LUBRICATION (J05E), OIL PAN, REPLACEMENT, MOUNTING THE OIL PAN (Page 13-25)

13. **MOUNTING THE INJECTION PUMP DRIVE**
    Reference: ENGINE MECHANICAL (J05E), TIMING GEAR & CAM IDLE GEAR, OVERHAUL, MOUNTING THE TIMING GEARS IN THE FLYWHEEL HOUSING AND THE REAR END PLATE (Page 10-74)

14. **MOUNTING THE OIL LEVEL GAUGE & GUIDE**
    Reference: LUBRICATION (J05E), OIL LEVEL GAUGE AND GUIDE, REPLACEMENT, MOUNTING THE OIL LEVEL GAUGE AND GUIDE (Page 13-35)

15. **MOUNTING THE POWER STEERING PUMP**
    Reference: CHASSIS (S1-LXJE03A), STEERING
    Reference: CHASSIS (S1-LXJE04A), STEERING

16. **MOUNTING THE STARTER**
    Reference: STARTING/CHARGING (J05E), STARTER, REPLACEMENT, MOUNTING THE STARTER (Page 16-4)

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17. **MOUNTING THE ENGINE MOUNTING AND BRACKET**
    Reference: ENGINE MECHANICAL (J05E), ENGINE MOUNTING AND BRACKET, REPLACEMENT, MOUNTING THE ENGINE MOUNTING AND BRACKET (Page 10-127)

18. **MOUNTING THE ENGINE ECU**
    Reference: ENGINE CONTROL (J05E), ENGINE ECU, REPLACEMENT, MOUNTING THE ENGINE ECU (Page 6-7)

19. **MOUNTING THE OIL COOLER ASSEMBLY**
    Reference: LUBRICATION (J05E), OIL COOLER, OVERHAUL, MOUNTING THE OIL COOLER ASSEMBLY (Page 13-12)

20. **MOUNTING THE CRANKSHAFT FRONT OIL SEAL**
    Reference: ENGINE MECHANICAL (J05E), FRONT OIL SEAL RETAINER, REPLACEMENT, MOUNTING THE FRONT OIL SEAL RETAINER (Page 10-55)

21. **MOUNTING THE COOLANT PUMP**
    Reference: COOLING (J05E), COOLANT PUMP, REPLACEMENT, MOUNTING THE COOLANT PUMP (Page 12-32)

22. **MOUNTING THE CRANKSHAFT PULLEY**
    Reference: ENGINE MECHANICAL (J05E), CRANKSHAFT PULLEY, REPLACEMENT, MOUNTING THE CRANKSHAFT PULLEY (Page 10-48)

23. **MOUNTING THE AIR CONDITIONER COMPRESSOR**
    Reference: CHASSIS (S1-LXJE03A), HEATER & AIR CONDITIONER
    Reference: CHASSIS (S1-LXJE04A), HEATER & AIR CONDITIONER

24. **MOUNTING THE ALTERNATOR**
    Reference: STARTING/CHARGING (J05E), ALTERNATOR (130A), OVERHAUL, IMPORTANT POINTS - MOUNTING (Page 16-13)

25. **MOUNTING THE CYLINDER HEAD ASSEMBLY**
    Reference: ENGINE MECHANICAL (J05E), CYLINDER HEAD ASSEMBLY, REPLACEMENT, MOUNTING THE CYLINDER HEAD ASSEMBLY (Page 10-25)

26. **MOUNTING THE COOLING FAN ASSEMBLY AND FAN SHROUD RING**
    Reference: COOLING (J05E), COOLING FAN AND FAN CLUTCH, OVERHAUL, MOUNTING THE COOLING FAN & FAN CLUTCH (Page 12-36)

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MOUNTING THE PLUGS

1. TAPPING IN THE DOWEL PIN AND PLUG

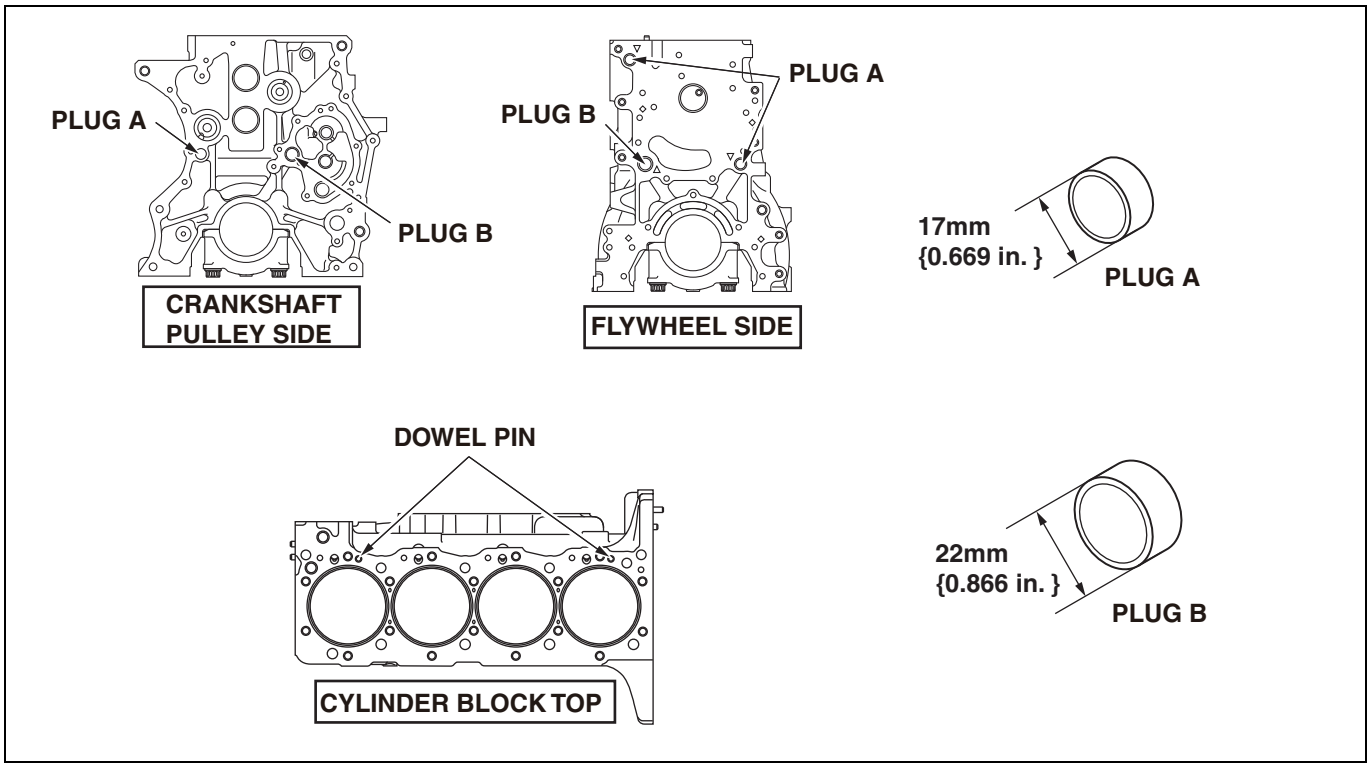
(1) Tap in 2 dowel pins to the cylinder block upper surface.

⚠ CAUTION

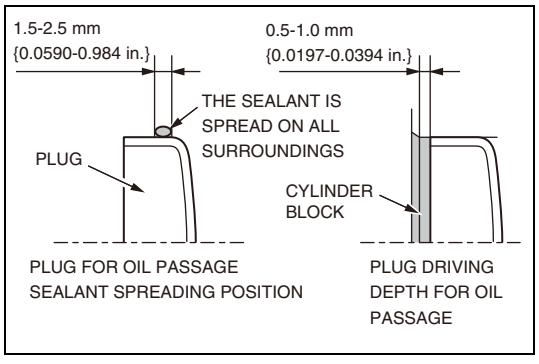
Tap in the dowel pin until it hits the bottom.

(2) Apply the sealant (Loctite 962T or ThreeBond #1211 or #1215) to the plug As (3 pcs.) and plug Bs (2 pcs.) and tap them into the cylinder block with a tapping tool.

SST: 09211-E4020
Plug A tapping tool
09211-E4030
Plug B tapping tool



SHTS021270900290



SHTS021270900291

⚠ CAUTION

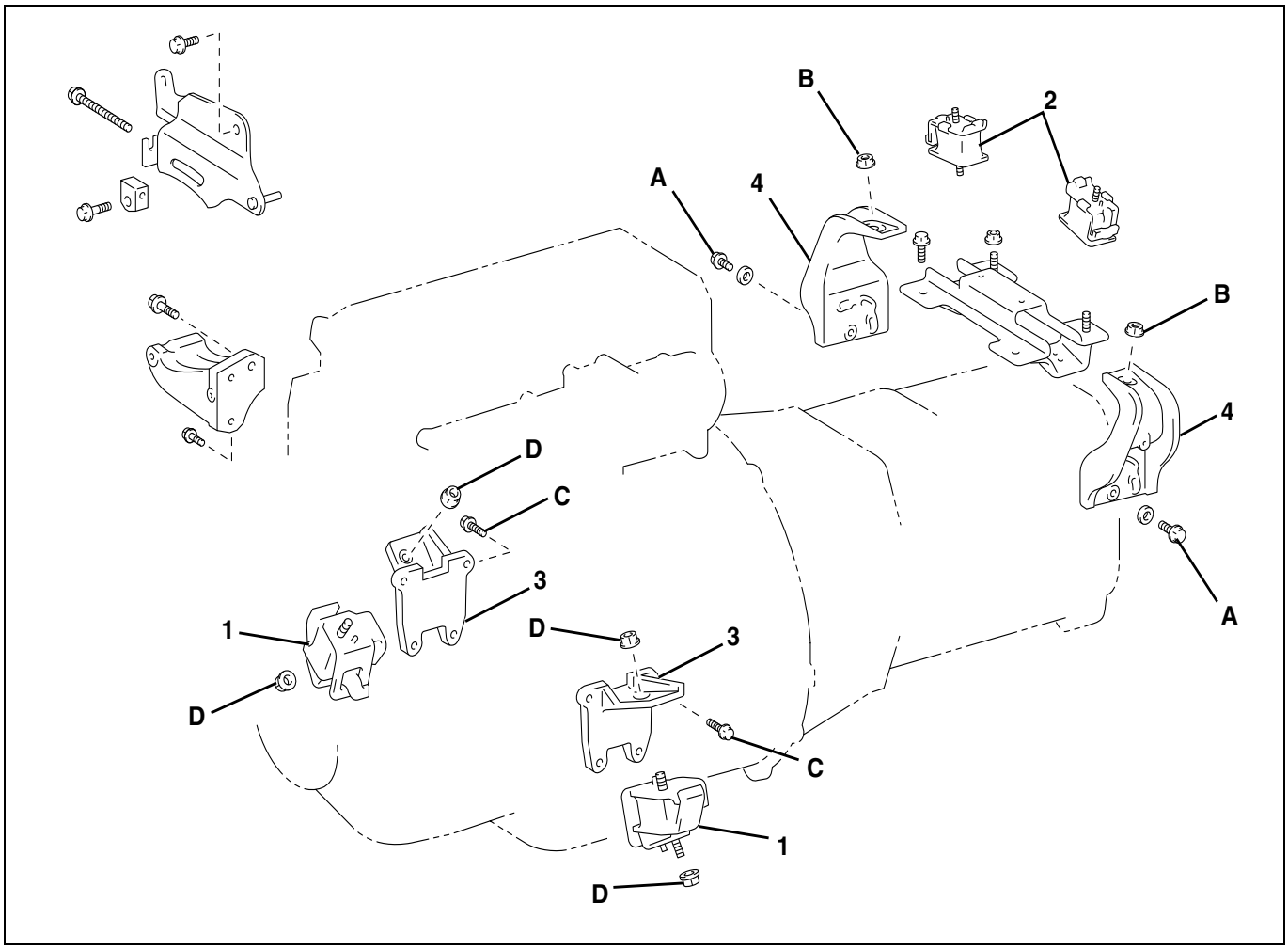
- **Apply the sealant with 1.5-2.5 mm {0.0590-0.0984 in.} width.**
- **Tap in the plugs to a depth of 0.5-1.0 mm {0.0197-0.0394 in} from the cylinder block end.**
- **When tapping, do not allow the sealant to run over to the oil groove.**
- **When tapping, make sure not to crack the cylinder block by applying excessive impact.**

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ENGINE MOUNTING AND BRACKET

COMPONENT LOCATOR

EN01F02127090402031001



SHTS021270900292

1	Front engine mounting	3	Front engine mounting bracket
2	Rear engine mounting	4	Rear engine mounting bracket

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	103 {1,050, 76}	C	125 {1,275, 92}
B	64 {653, 47}	D	98 {999, 72}

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REPLACEMENT

EN01F02127090402031002

INSPECTION BEFORE SERVICING

1. INSPECTING THE ENGINE MOUNTING

(1) Check the engine mounting for crack, damage and looseness. If found defective, replace it.

REMOVING THE ENGINE MOUNTING AND BRACKET

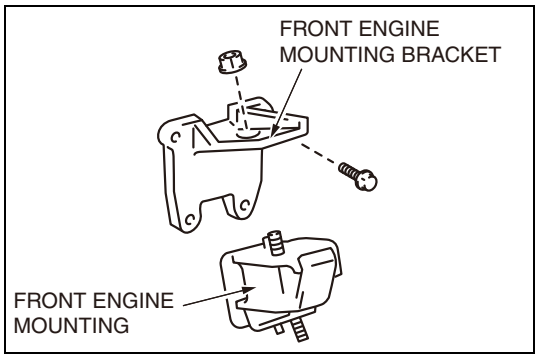
1. LIFTING THE ENGINE ASSEMBLY

(1) Before removing the engine mounting, lift up and hold the engine assembly.
Reference: MOUNTING AND DISMOUNTING THE ENGINE (J05E), ENGINE ASSEMBLY, REPLACEMENT, REMOVING THE ENGINE ASSEMBLY (Page 5-7)

2. REMOVING THE ENGINE MOUNTING AND BRACKET

(1) Unfasten the nut to remove a front engine mounting from a front engine mounting bracket.

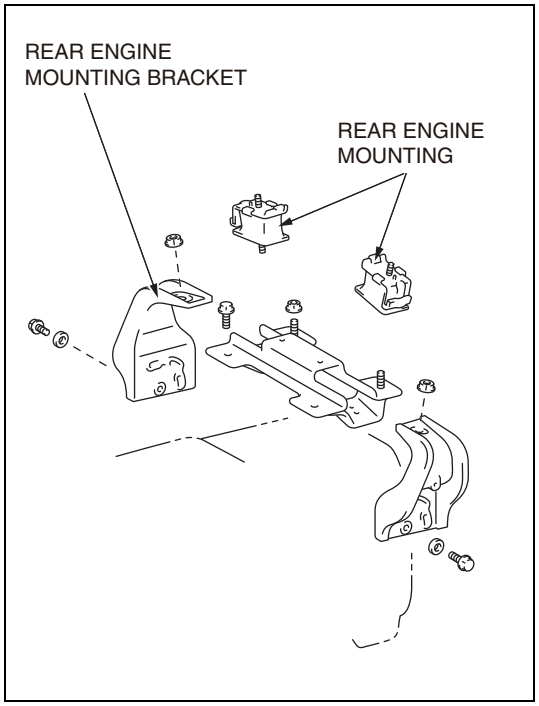
(2) Unfasten the bolts (4 pcs.) to remove the front engine mounting bracket from the cylinder block.



SHTS021270900293

(3) Unfasten the nut to remove the rear engine mounting from the rear engine mounting bracket.

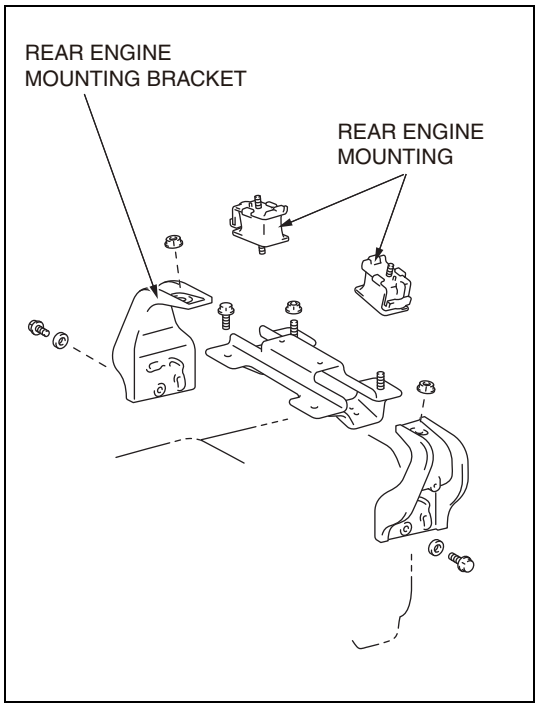
(4) Unfasten the bolt and nut to remove the rear engine mounting bracket.



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MOUNTING THE ENGINE MOUNTING AND BRACKET

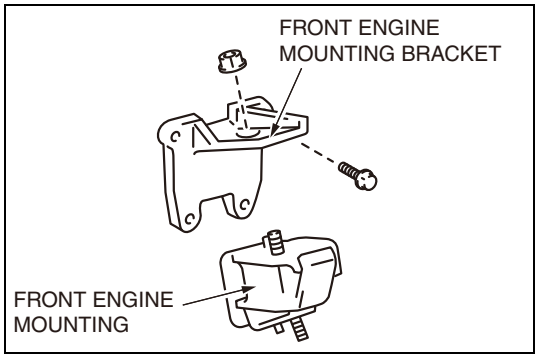


SHTS021270900295

1. MOUNTING THE ENGINE MOUNTING AND BRACKET

(1) Use the bolt and nut, attach the rear engine mounting bracket to the flywheel housing.
Tightening Torque:
103 N·m {1,050 kgf·cm, 76 lbf·ft}

(2) Mount the rear engine mounting to the rear engine mounting bracket with the nut.
Tightening Torque:
64 N·m {653 kgf·cm, 47 lbf·ft}



SHTS021270900296

(3) Mount the front engine mounting bracket to the cylinder block with 4 bolts.
Tightening Torque:
125 N·m {1,275 kgf·cm, 92 lbf·ft}

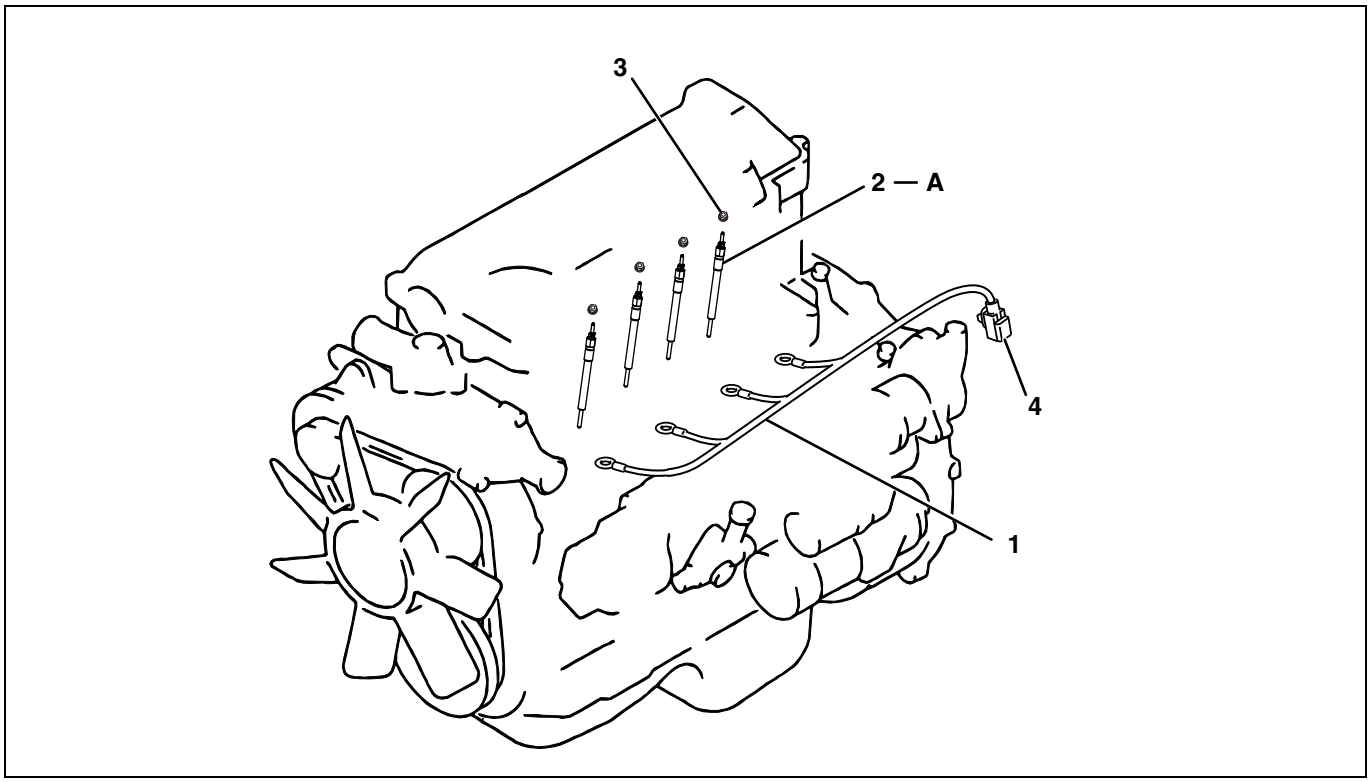
(4) Fasten the nut to secure the front engine mounting on the front engine mounting bracket.
Tightening Torque:
98 N·m {999 kgf·cm, 72 lbf·ft}

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GLOW PLUG

COMPONENT LOCATOR

EN01F02127090402037001



SHTS021270900297

1	Glow harness	3	Nut
2	Glow plug	4	Connector

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

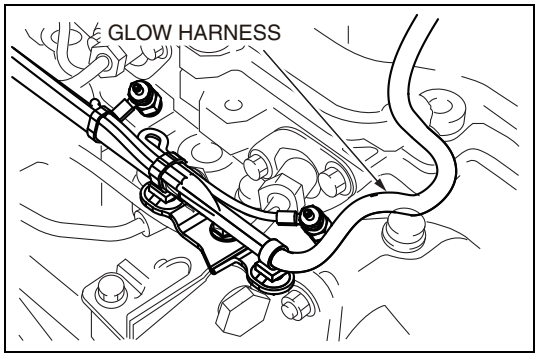
A	20-25 {204-254, 15-18}		

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REPLACEMENT

EN01F02127090402037002

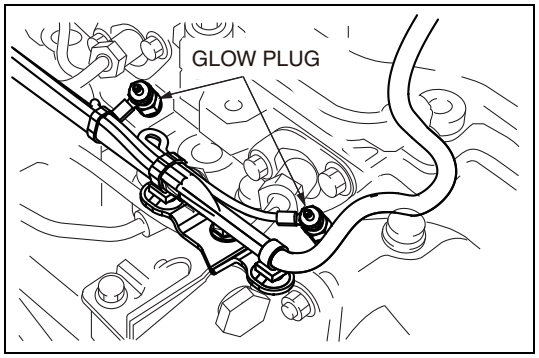
REMOVING THE GLOW PLUG



SHTS021270900298

1. DISCONNECTING THE HARNESS

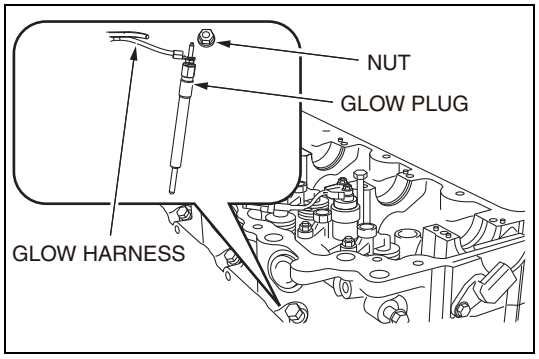
(1) Disconnect the glow harness connector from a glow plug.



SHTS021270900299

2. REMOVING THE GLOW PLUG

(1) Unfasten the nuts (4 pcs.) from glow plugs.



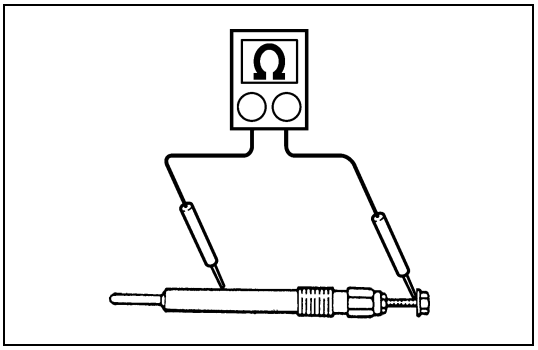
SHTS021270900300

(2) Unfasten the nuts (4 pcs.) to disconnect the glow plug wire and glow harness from the glow plugs.

(3) Remove the glow plugs from the cylinder head.

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SINGLE UNIT INSPECTION



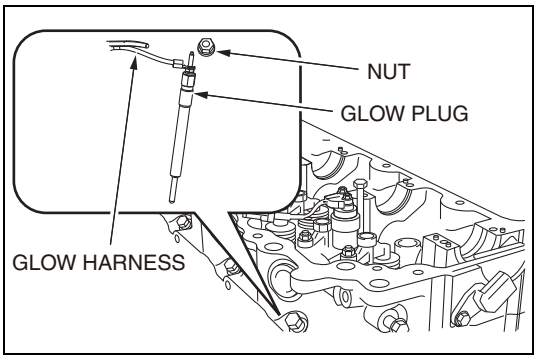
SHTS021270900301

1. INSPECTING GLOW PLUGS

(1) Use the circuit tester to measure resistance between a body and a terminal. Replace if a failure is found.

Standard value (at 20°C {68°F})	**0.55-0.75 Ω**

MOUNTING THE GLOW PLUGS



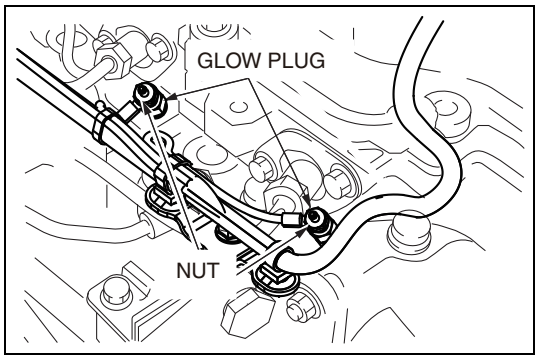
SHTS021270900302

1. MOUNTING THE GLOW PLUGS

(1) Mount the glow plugs to the cylinder block.
Tightening Torque:
20-25 N·m {204-254 kgf·cm, 15-18 lbf·ft}

(2) Connect the glow plug wire and sub harness to the glow plugs and tighten the nuts (4 pcs.).
Tightening Torque:
1.0-1.5 N·m {11-15 kgf·cm, 0.8-1.1 lbf·ft}

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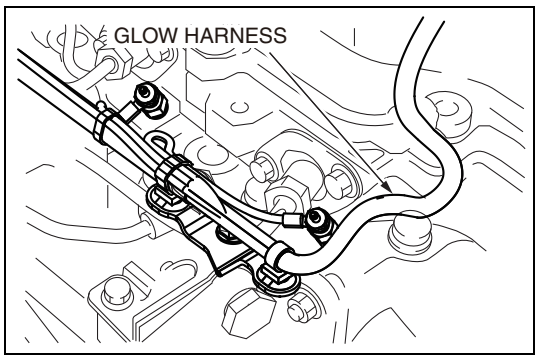


SHTS021270900303

(3) Mount the caps to the glow plugs.

2. CONNECTING THE HARNESS

(1) Connect the sub harness connector to the glow plug.

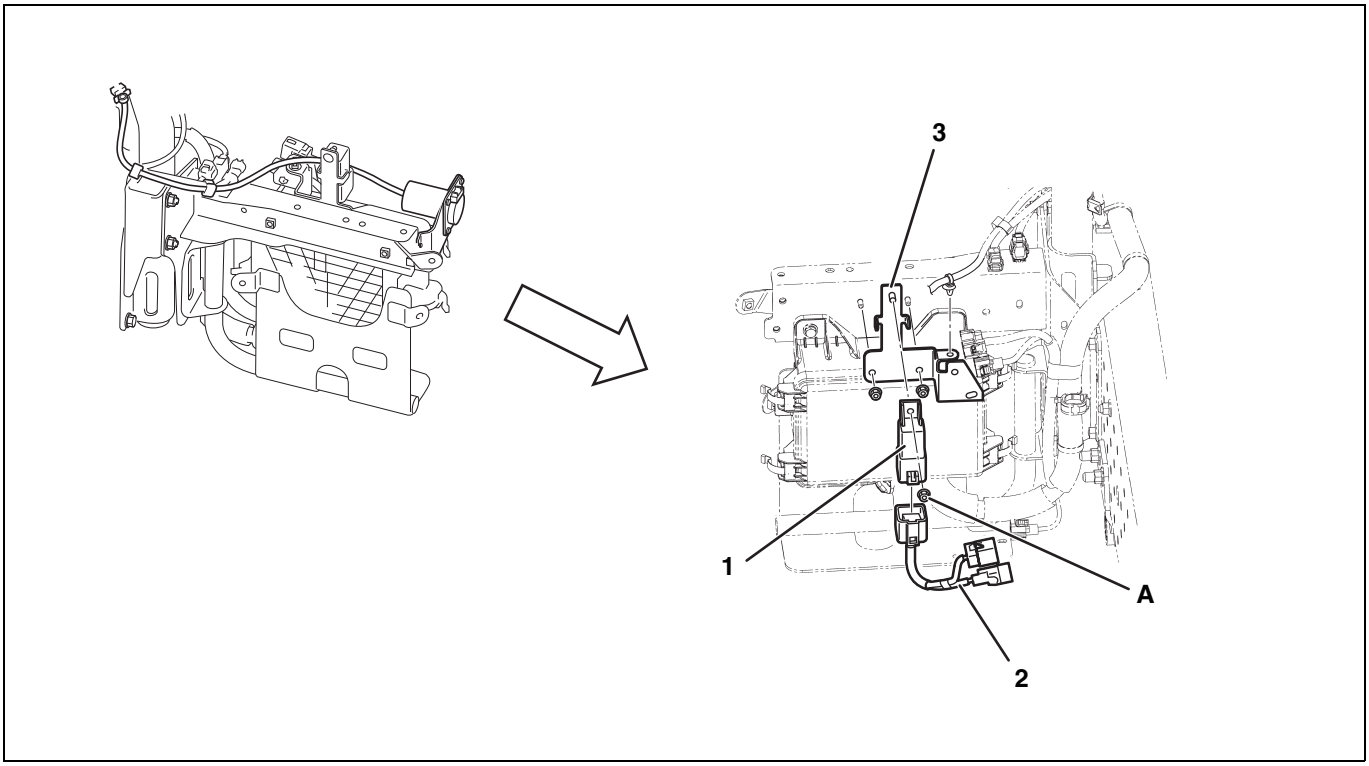


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GCU

COMPONENT LOCATOR



SHTS021270900305

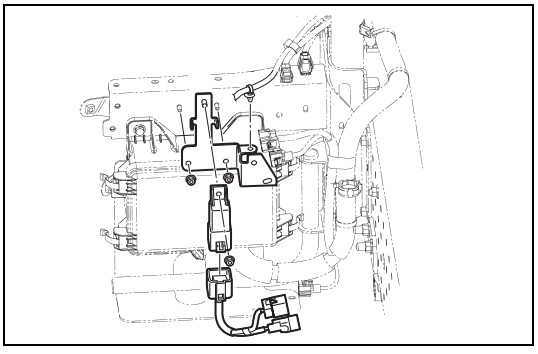
1	GCU	3	Bracket
2	Connector		

*: Nonreusable part

Tightening torque — Unit: N·m {kgf·cm, lbf·ft}

A	8.0 {82, 5.9}		

REPLACEMENT



SHTS021270900306

1. REMOVING THE GCU

(1) Disconnect the connector from the GCU.

(2) Unfasten the nut and remove the GCU.

2. MOUNTING THE GCU

(1) Mount the nut and remove the GCU.

(2) Connect the connector from the GCU.

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EXHAUST (J05E)

11-001

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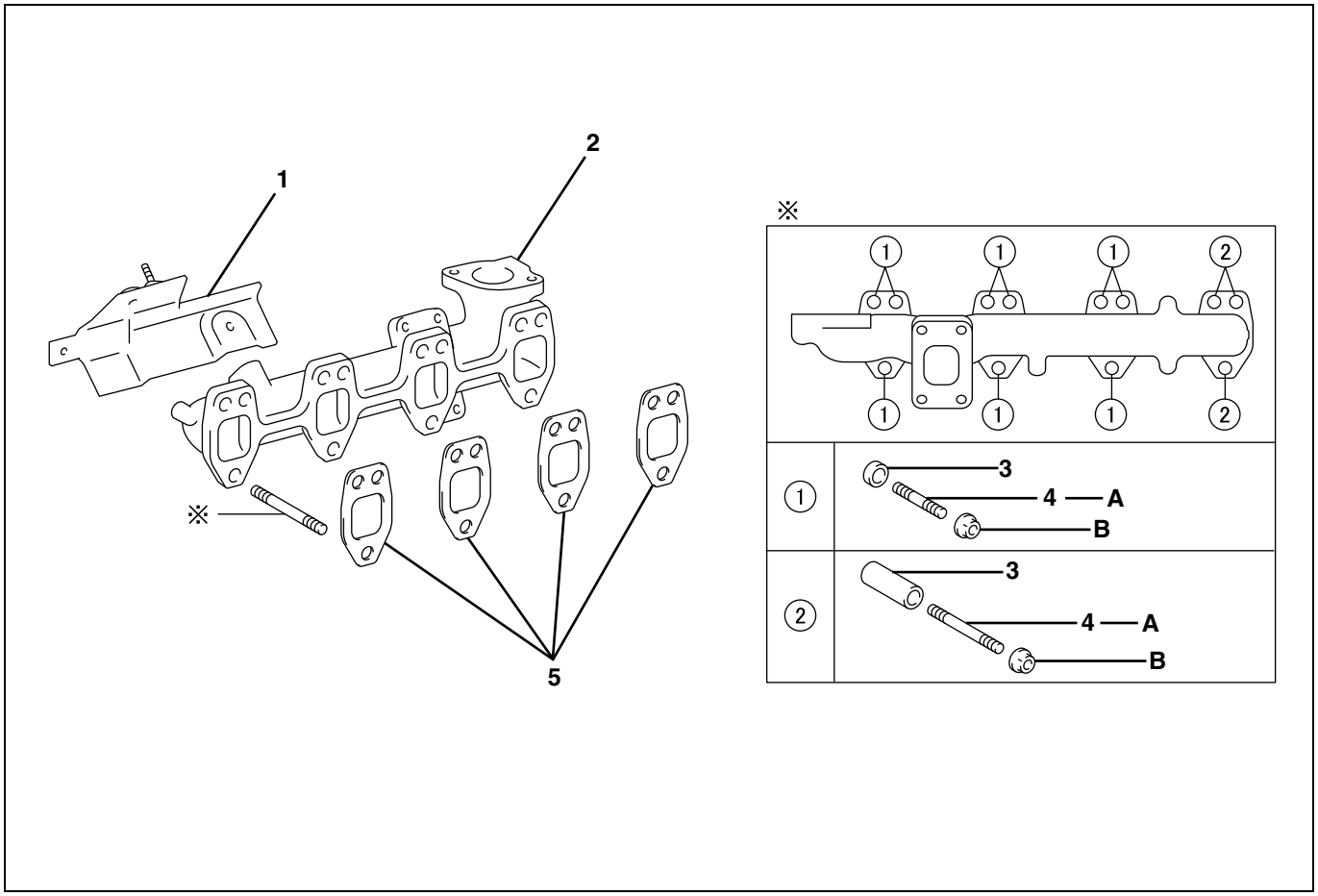
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EXHAUST MANIFOLD

COMPONENT LOCATOR

EN01F02127100402009001



SHTS021271000001

1	Insulator	4	Stud bolt
2	Exhaust manifold	5	Gasket *
3	Spacer		

*: Nonreusable part

Tightening torque — Unit: N·m {kgf·cm, lbf·ft}

A	30 {305, 22.1}	B	59 {600, 43.5}

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REPLACEMENT

EN01F02127100402009002

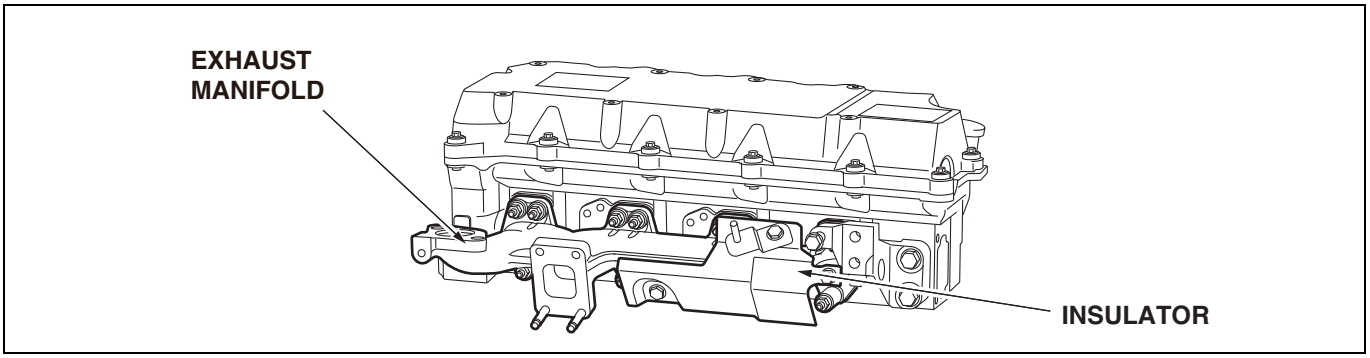
REMOVING THE EXHAUST MANIFOLD

1. REMOVING THE INTAKE PIPE (EXHAUST SIDE)
Reference: INTAKE (J05E), INTAKE PIPE (EXHAUST SIDE), REPLACEMENT, REMOVING THE INTAKE PIPE (EXHAUST SIDE) (Page 9-12)

2. REMOVING THE EGR COOLER
Reference: EMISSION CONTROL (J05E), EGR VALVE & COOLER, REPLACEMENT, REMOVING THE EGR VALVE & COOLER (Page 8-3)

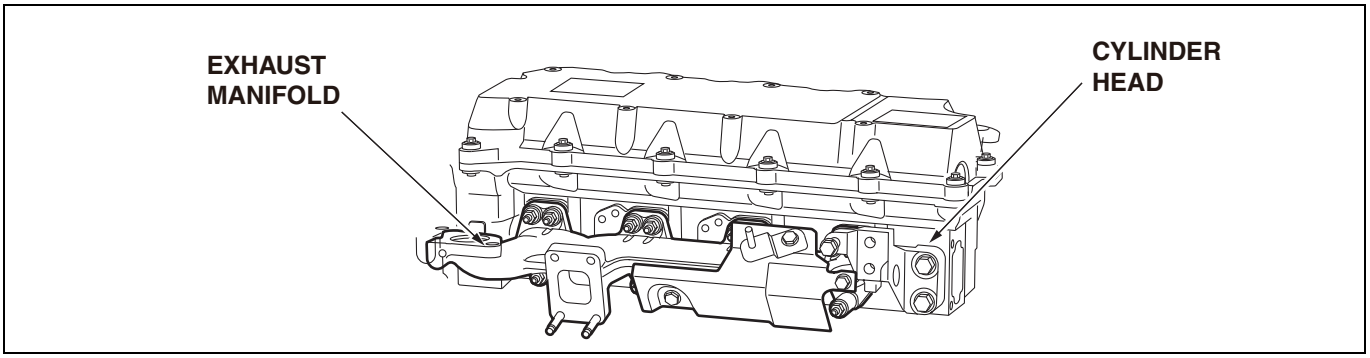
3. REMOVING THE TURBOCHARGER ASSEMBLY
Reference: TURBOCHARGER (J05E), TURBOCHARGER ASSEMBLY, REPLACEMENT, REMOVING THE TURBOCHARGER ASSEMBLY (Page 17-5)

4. REMOVING THE EXHAUST MANIFOLD
(1) Unfasten the 3 bolts to remove the insulator from the exhaust manifold.



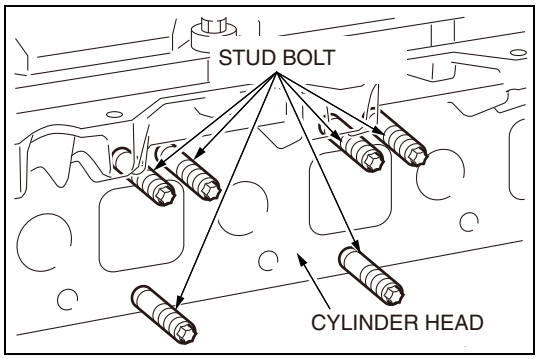
SHTS021271000002

(2) Unfasten the 12 nuts to remove the exhaust manifold, 4 gaskets, and 12 spacers from the cylinder head.



SHTS021271000003

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SHTS021271000004

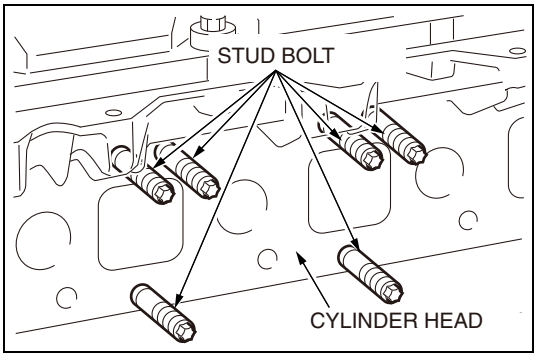
5. REMOVING STUD BOLTS

(1) If corrosion or other failures are found in the stud bolts (12 pcs.), unfasten them with a Torx socket or commercially available stud bolt remover.

(2) Remove dirt on the female threads on the cylinder head side (including sealant) and then clean the threads again with the tap (M10 x 1.5).

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MOUNTING THE EXHAUST MANIFOLD



SHTS021271000005

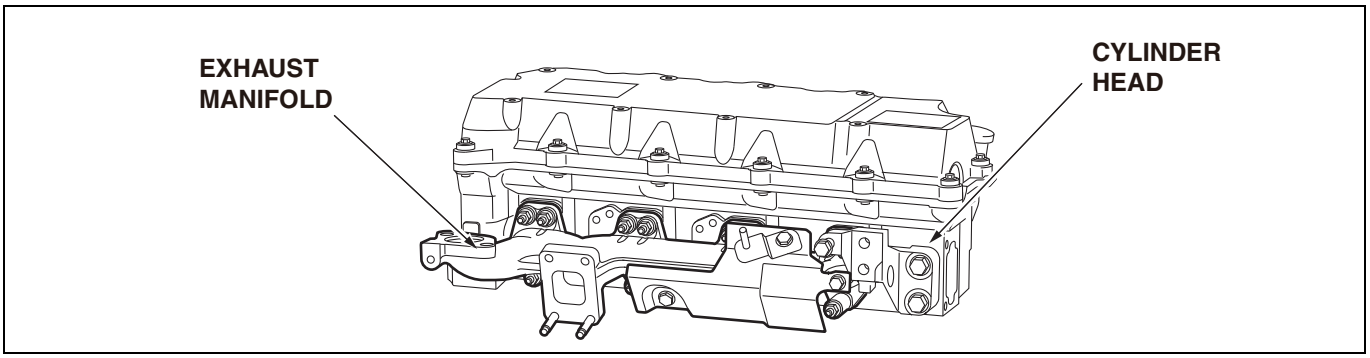
1. MOUNTING STUD BOLTS

(1) Use the torque socket to tighten with a new stud bolt.
Tightening Torque:
30 N·m {305 kgf·cm, 22.1 lbf·ft}

⚠ CAUTION
Note that overtightening with excessive torque may cause cracks in the cylinder head.

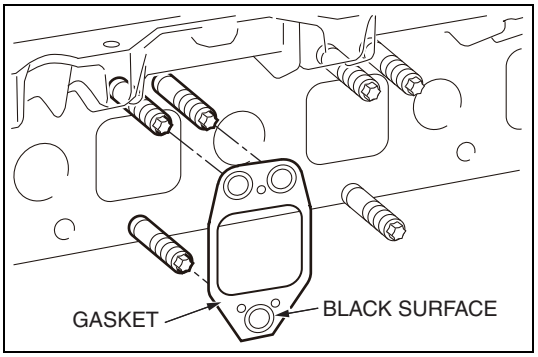
2. MOUNTING THE EXHAUST MANIFOLD

(1) Replace with 4 new gaskets and fit the exhaust manifold to the cylinder head mounting position.



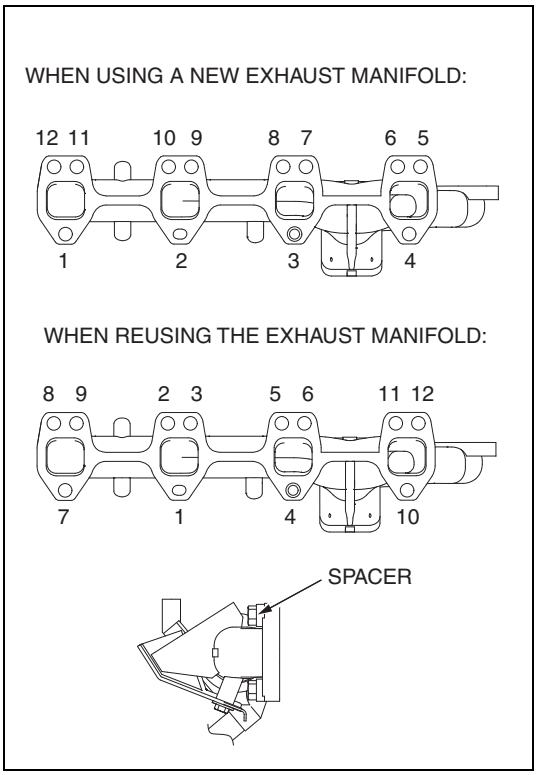
SHTS021271000006

⚠ CAUTION
Mount the gasket with the coating surface (black surface) facing to the exhaust manifold side.



SHTS021271000007

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SHTS021271000008

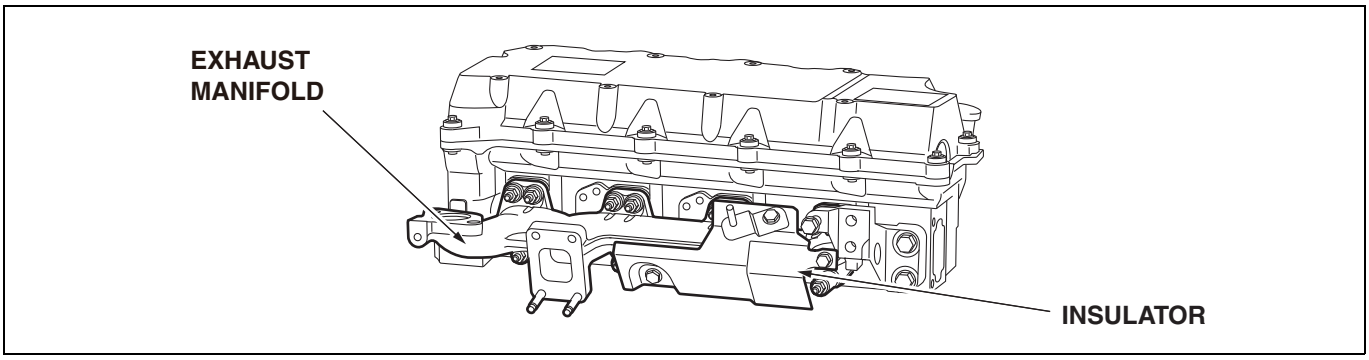
(2) Mount the 12 spacers and tighten 12 nuts in the order as shown in the figure.
Tightening Torque:
59 N·m {600 kgf·cm, 43.5 lbf·ft}

⚠ CAUTION
- **When tightening the nuts, use care to avoid interference of individual spacers with the counterbore areas of the exhaust manifold flange.**
- **The sequential order of tightening is determined depending on whether a new or a reused exhaust manifold is installed.**
- **Spacers come with 2 different lengths. Do not misassemble them.**

(3) Tighten the 12 nuts in the order as shown in the figure again.
Tightening Torque:
59 N·m {600 kgf·cm, 43.5 lbf·ft}

⚠ CAUTION
Make sure to tighten twice.

(4) Fasten the 3 bolts to secure the insulator on the exhaust manifold.



SHTS021271000009

3. MOUNTING THE TURBOCHARGER ASSEMBLY
Reference: TURBOCHARGER (J05E), TURBOCHARGER ASSEMBLY, REPLACEMENT, MOUNTING THE TURBOCHARGER ASSEMBLY (Page 17-9)

4. MOUNTING THE EGR COOLER
Reference: EMISSION CONTROL (J05E), EGR VALVE & COOLER, REPLACEMENT, MOUNTING THE EGR VALVE & COOLER (Page 8-8)

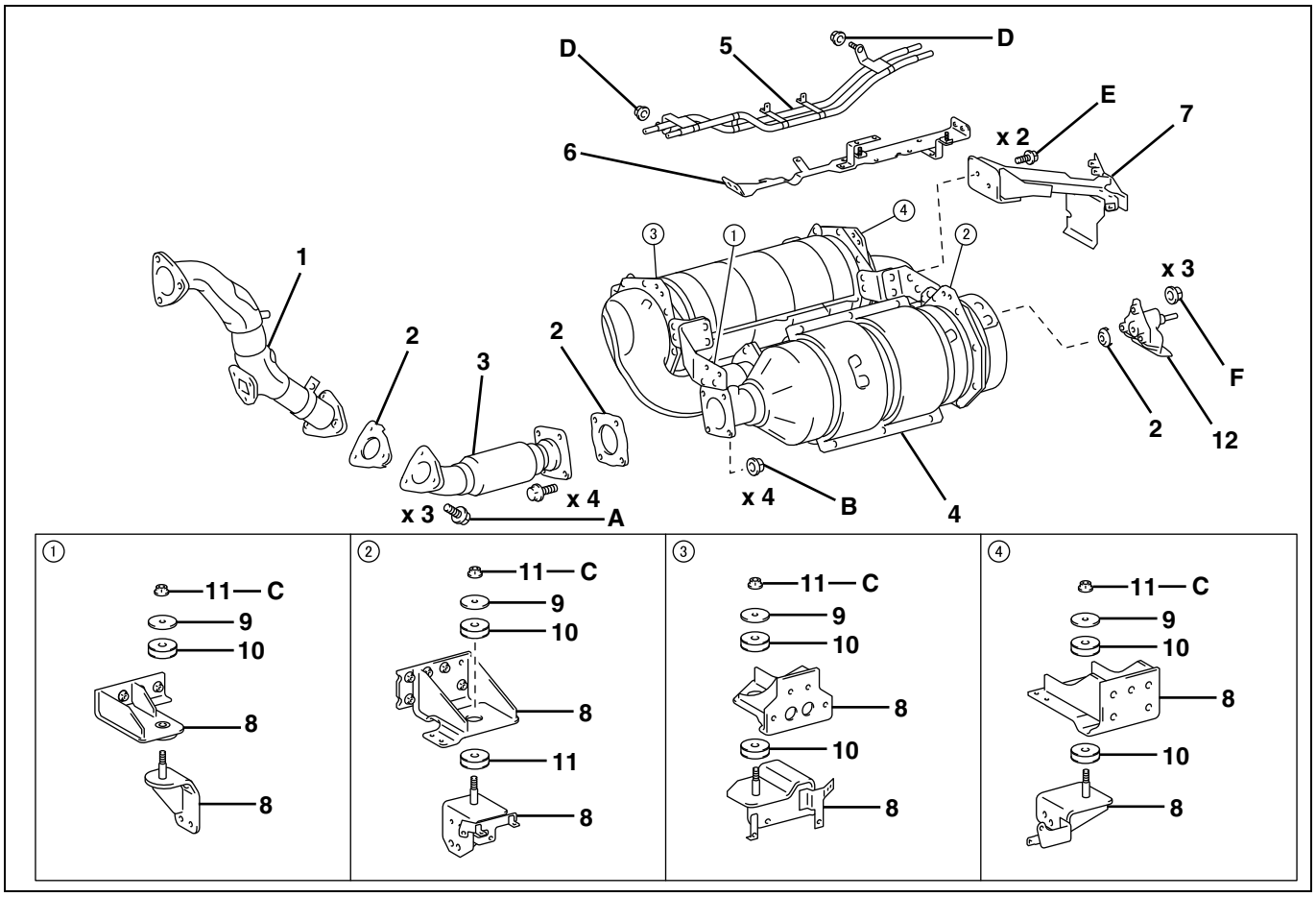
5. MOUNTING THE INTAKE PIPE (EXHAUST SIDE)
Reference: INTAKE (J05E), INTAKE PIPE (EXHAUST SIDE), REPLACEMENT, MOUNTING THE INTAKE PIPE (EXHAUST SIDE) (Page 9-13)

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EXHAUST PIPE

COMPONENT LOCATOR

EN01F02127100402005001



SHTS021271000010

1	Exhaust pipe (ATC)	7	Hose protector
2	Gasket *	8	Muffler bracket
3	Front exhaust pipe	9	Plate
4	Muffler	10	Cushion
5	Water pipe	11	Nut*
6	Harness bracket		

*: Nonreusable part

Tightening torque — Unit: N·m {kgf·cm, lbf·ft}

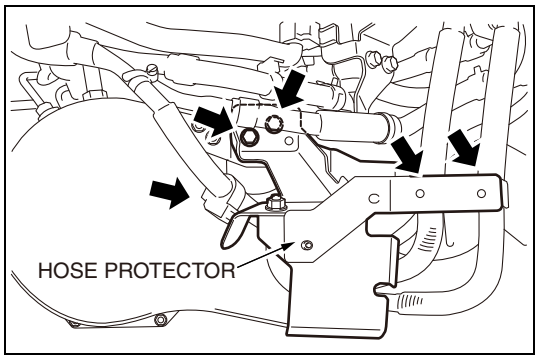
A	43 {438, 31.7}	D	31 {316, 22.9}
B	64 {653, 47.2}	E	43-59 {438-602, 31.7-43.5}
C	82 {836, 60.5}	F	6-10 {61-102, 4.4-7.4}

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REPLACEMENT

EN01F02127100402005002

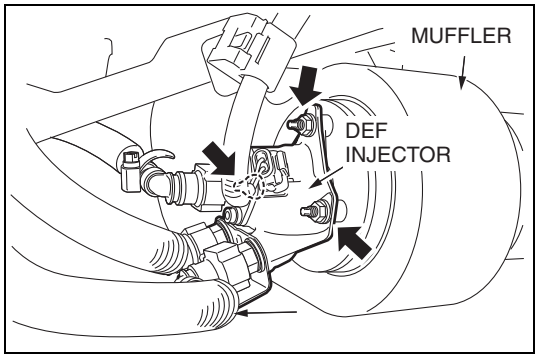
REMOVING THE EXHAUST SYSTEM COMPONENT PARTS



SHTS021271000011

1. REMOVING THE HOSE PROTECTOR

(1) Remove the hose clip from the hose protector.
(2) Unfasten the bolts (2 pcs.) to remove the hose protector from the muffler bracket.



SHTS021271000012

2. REMOVING THE DEF INJECTOR

(1) Unfasten the 3 nuts to remove the DEF injector from the muffler.

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3. DISCONNECTING SENSORS

NOTICE

Remove the connectors and clips from the vehicle side. Sensors do not need to be removed from the muffler.

(1) Remove the DPR differential pressure sensor.
Reference: EXHAUST (J05E), DPR DIFFERENTIAL PRESSURE SENSOR, REPLACEMENT, REMOVE THE DPR DIFFERENTIAL PRESSURE SENSOR (Page 11-96)

(2) Remove the SCR upstream NOx controller.
Reference: EXHAUST (J05E), SCR UPSTREAM NOx SENSOR, REPLACEMENT, REMOVING THE SCR UPSTREAM NOx SENSOR (Page 11-99)

(3) Remove the SCR downstream NOx controller.
Reference: EXHAUST (J05E), SCR DOWNSTREAM NOx SENSOR, REPLACEMENT, REMOVING THE SCR DOWNSTREAM NOx SENSOR (Page 11-102)

(4) Disconnect the DOC upstream temperature sensor.
Reference: EXHAUST (J05E), DOC UPSTREAM TEMPERATURE SENSOR, REPLACEMENT, REMOVING DOC UPSTREAM TEMPERATURE SENSOR (Page 11-108)

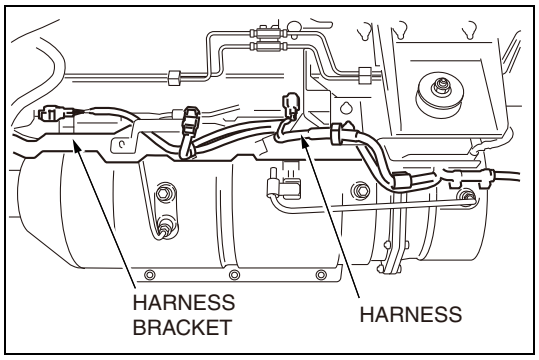
(5) Disconnect the DPR upstream temperature sensor.
Reference: EXHAUST (J05E), DPR UPSTREAM TEMPERATURE SENSOR, REPLACEMENT, REMOVING THE DPR UPSTREAM TEMPERATURE SENSOR (Page 11-111)

(6) Disconnect a DPR downstream temperature sensor.
Reference: EXHAUST (J05E), DPR DOWNSTREAM TEMPERATURE SENSOR, REPLACEMENT, REMOVING THE DPR DOWNSTREAM TEMPERATURE SENSOR (Page 11-113)

(7) Disconnect the SCR upstream temperature sensor.
Reference: EXHAUST (J05E), SCR UPSTREAM TEMPERATURE SENSOR, REPLACEMENT, REMOVING THE SCR UPSTREAM TEMPERATURE SENSOR (Page 11-116)

4. REMOVING THE HARNESS

(1) Remove the harness from the harness bracket.



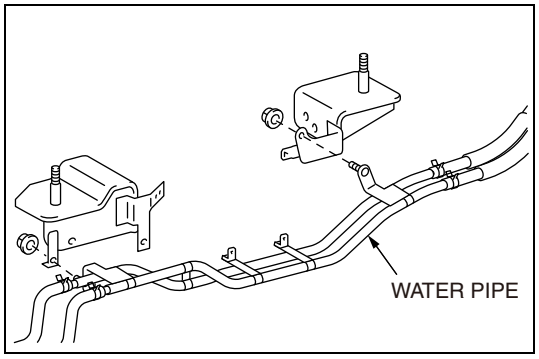
SHTS021271000013

5. REMOVING THE WATER PIPE

(1) Unfasten the 2 nuts to remove the water pipe from the muffler bracket.

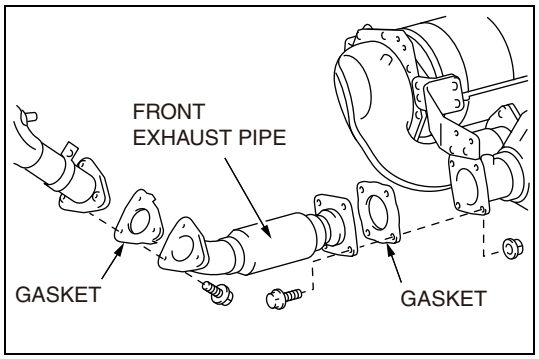
NOTICE

The hose does not need to be removed.



SHTS021271000014

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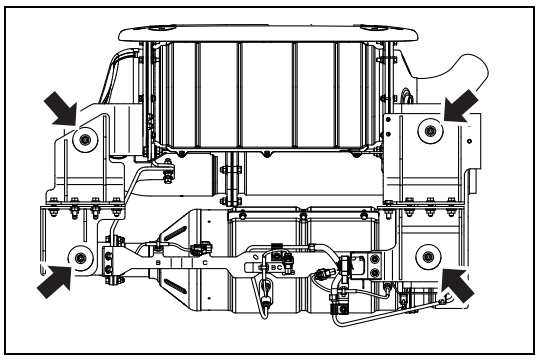


SHTS021271000015

6. REMOVING THE FRONT EXHAUST PIPE

(1) Unfasten the 7 bolts and 4 nuts to remove the front exhaust pipe and 2 gaskets from the muffler and exhaust pipe (ATC).

⚠ CAUTION
Before disconnecting the front exhaust pipe, put alignment marks.



SHTS021271000016

7. REMOVING MUFFLER

(1) Set the transmission jack under the muffler and use a lashing belt to lash the muffler.

⚠ CAUTION
To hold and stabilize the muffler, make sure to use a lashing belt to lash the muffler before installation or removal.

(2) Unfasten the 4 nuts to remove the muffler, 4 plates, and 7 cushions from the muffler bracket.

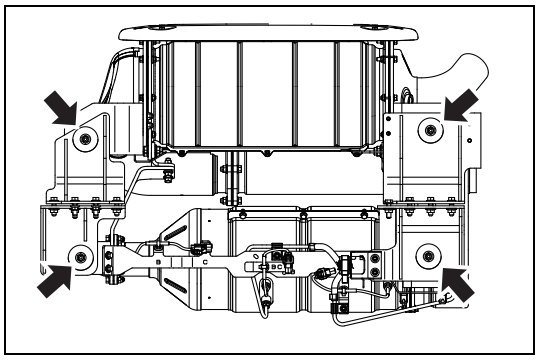
⚠ CAUTION
Handle the DPR cleaner and DEF-SCR with particular care because they are heavy made of ceramic and can be easily broken.

(3) While holding the muffler to prevent it from rolling over, pull it off from the vehicle.

⚠ CAUTION
Pay attention to weight balance.

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MOUNTING THE EXHAUST SYSTEM COMPONENT PARTS



SHTS021271000017

1. PRECONNECTING MUFFLER

(1) Set the transmission jack under the muffler and use a lashing belt to lash the muffler.

⚠ CAUTION

To hold and stabilize the muffler, make sure to use a lashing belt to lash the muffler before installation or removal.

(2) While holding the muffler to prevent it from rolling over, set the muffler to the mounting position.

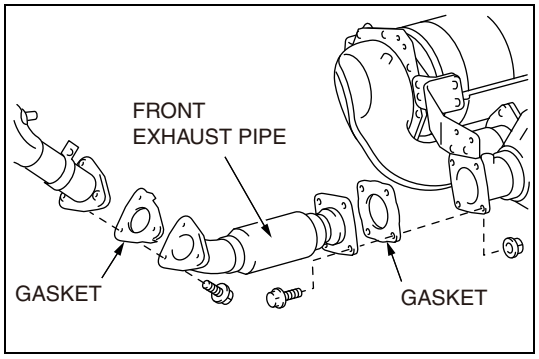
⚠ CAUTION

Pay attention to weight balance.

(3) Temporarily tighten the muffler, 4 plates, and 7 cushions to the muffler bracket with 4 nuts.

⚠ CAUTION

- **Handle the DPR cleaner and DEF-SCR with particular care because they are heavy made of ceramic and can be easily broken.**
- **Temporarily tighten to avoid play in vertical direction.**



SHTS021271000018

2. TEMPORARY MOUNTING OF THE FRONT EXHAUST PIPE

(1) Replace with 2 new gaskets, 7 bolts, and 4 nuts. Align alignment marks and temporarily tighten the front exhaust pipe to the muffler and exhaust pipe (ATC).

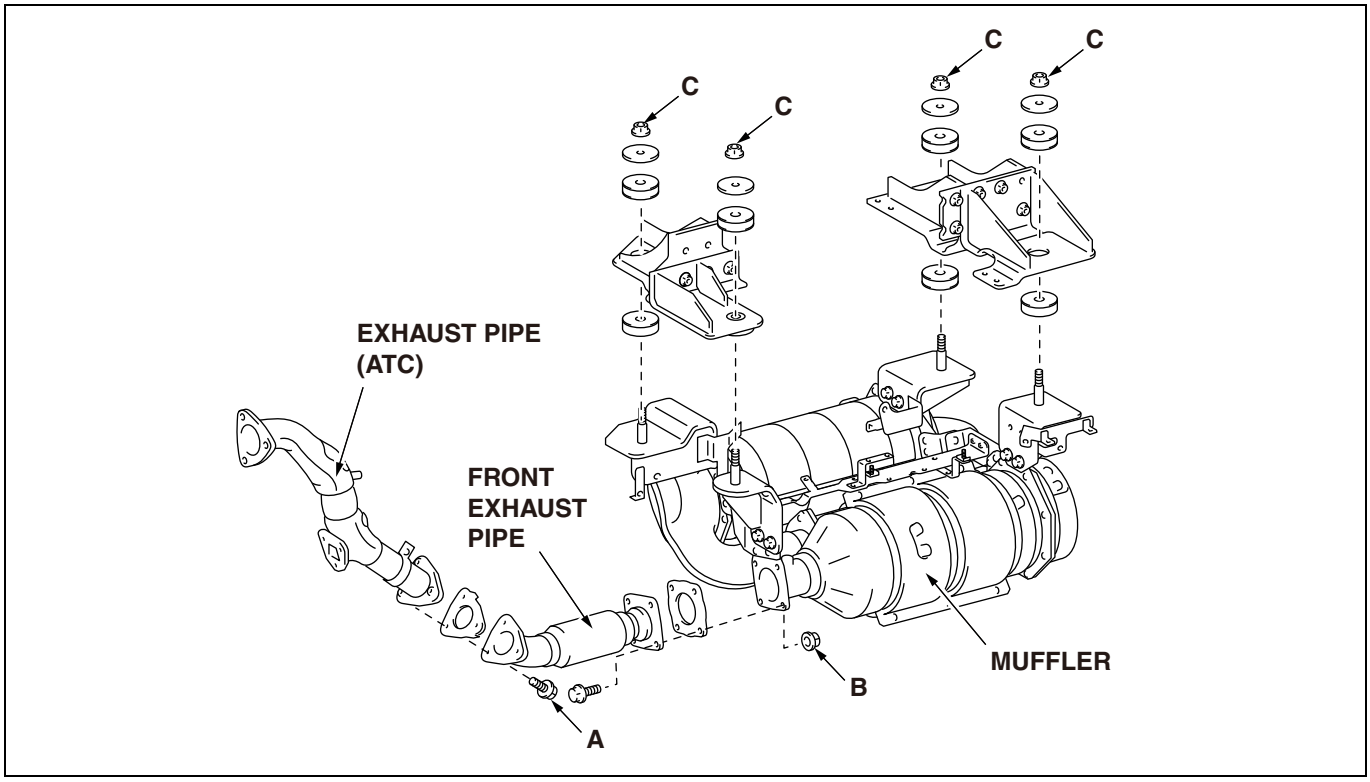
⚠ CAUTION

To prevent exhaust gas leakage, make sure to replace with a new gasket, bolts, and nuts.

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3. FULLY TIGHTENING EXHAUST SYSTEM COMPONENTS

(1) Fully tighten the connecting bolts between the pipes from the engine side in order.



SHTS021271000019

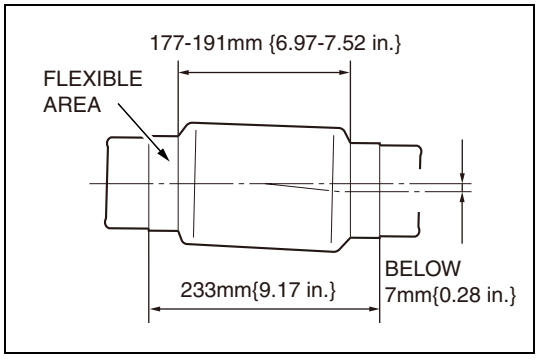
a. Exhaust pipe (ATC) to front exhaust pipe (part A)
Tightening Torque:
43 N·m {438 kgf·cm, 31.7 lbf·ft}

b. Front exhaust pipe to muffler (part B)
Tightening Torque:
64 N·m {653 kgf·cm, 47.2 lbf·ft}

(2) Tighten the muffler fully.
a. Muffler (part C)
Tightening Torque:
82 N·m {836 kgf·cm, 60.5 lbf·ft}

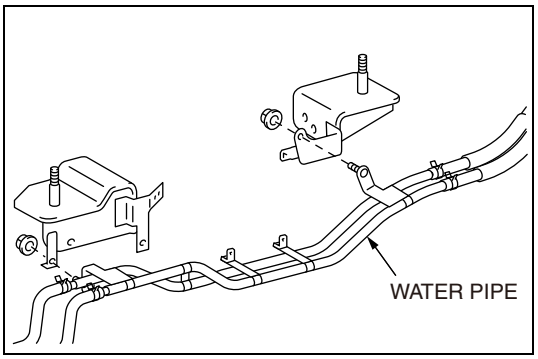
4. INSPECTING THE EXHAUST FLEXIBLE AREA MOUNTING CONDITION

(1) Check if the exhaust flexible area is mounted as shown in the figure.



SHTS021271000020

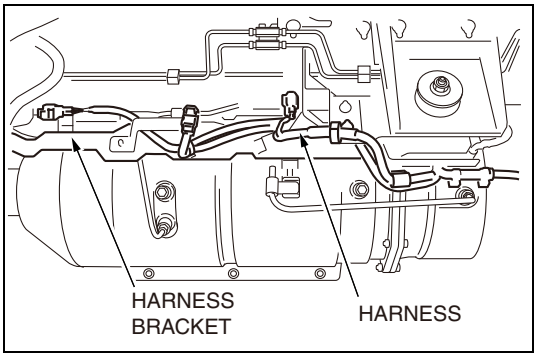
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SHTS021271000021

5. MOUNTING THE WATER PIPE

(1) Mount the water pipe to the muffler bracket with 2 nuts.
Tightening Torque:
31 N·m {316 kgf·cm, 22.9 lbf·ft}



SHTS021271000022

6. MOUNT THE HARNESS

(1) Mount the harness to the harness bracket.

7. CONNECTING SENSORS

(1) Mount the DPR differential pressure sensor.
Reference: EXHAUST (J05E), DPR DIFFERENTIAL PRESSURE SENSOR, REPLACEMENT, MOUNTING THE DPR DIFFERENTIAL PRESSURE SENSOR (Page 11-97)

(2) Mount the SCR upstream NOx controller.
Reference: EXHAUST (J05E), SCR UPSTREAM NOx SENSOR, REPLACEMENT, MOUNTING THE SCR UPSTREAM NOx SENSOR (Page 11-100)

(3) Mount the SCR downstream NOx controller.
Reference: EXHAUST (J05E), SCR DOWNSTREAM NOx SENSOR, REPLACEMENT, MOUNTING THE SCR DOWNSTREAM NOx SENSOR (Page 11-103)

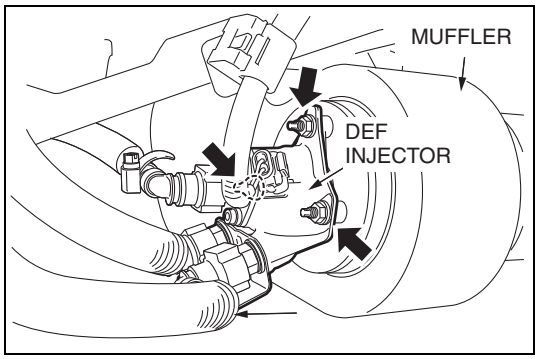
(4) Connect the DOC upstream temperature sensor.
Reference: EXHAUST (J05E), DOC UPSTREAM TEMPERATURE SENSOR, REPLACEMENT, MOUNTING DOC UPSTREAM TEMPERATURE SENSOR (Page 11-109)

(5) Connect the DPR upstream temperature sensor.
Reference: EXHAUST (J05E), DPR UPSTREAM TEMPERATURE SENSOR, REPLACEMENT, MOUNTING THE DPR UPSTREAM TEMPERATURE SENSOR (Page 11-111)

(6) Connect the DPR downstream temperature sensor.
Reference: EXHAUST (J05E), DPR DOWNSTREAM TEMPERATURE SENSOR, REPLACEMENT, MOUNTING THE DPR DOWNSTREAM TEMPERATURE SENSOR (Page 11-114)

(7) Connect the SCR upstream temperature sensor.
Reference: EXHAUST (J05E), SCR UPSTREAM TEMPERATURE SENSOR, REPLACEMENT, MOUNTING THE SCR UPSTREAM TEMPERATURE SENSOR (Page 11-117)

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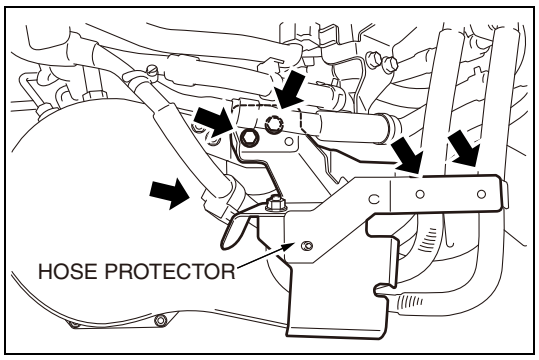
SHTS021271000023

8. MOUNTING THE DEF INJECTOR

(1) Replace with a new gasket.
Reference: EXHAUST (J05E), DEF INJECTOR, REPLACEMENT, REMOVING THE DEF INJECTOR (Page 11-67)

(2) Mount the DEF injector to the muffler with 3 nuts.
Tightening Torque:
6-10 N·m {61-102 kgf·cm, 4.4-7.4 lbf·ft}

(3) Mount the DEF injector harness clip.



SHTS021271000024

9. MOUNTING THE HOSE PROTECTOR

(1) Mount the hose protector to the muffler bracket with the bolts (2 pcs.).
Tightening Torque:
43-59 N·m {438-602 kgf·cm, 31.7-43.5 lbf·ft}

(2) Mount the hose clip to the hose protector.

10. INSPECTING FOR EXHAUST GAS LEAKAGE

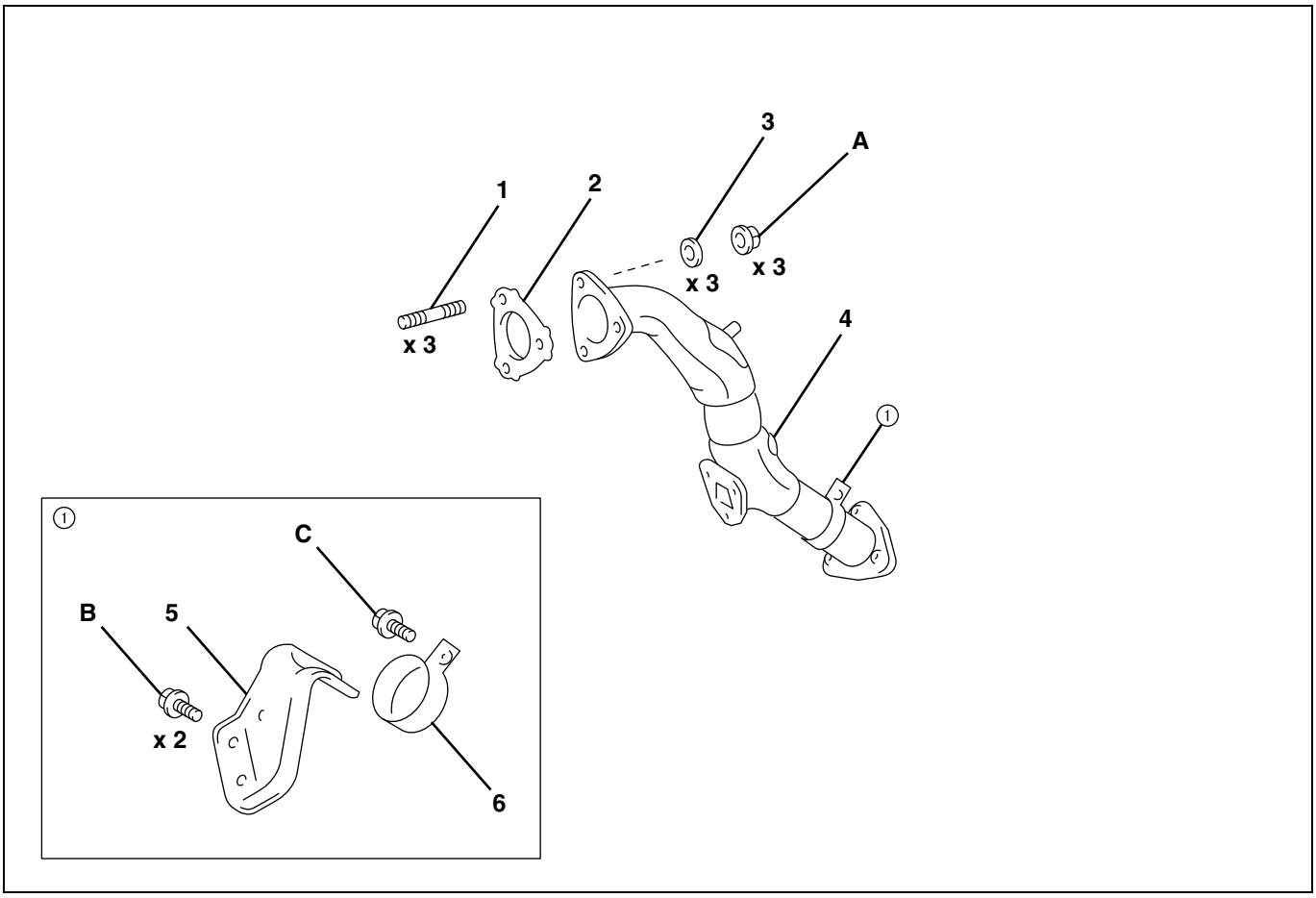
(1) Start the engine and inspect for exhaust gas leakage.

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EXHAUST PIPE (ATC)

COMPONENT LOCATOR

EN01F02127100402041001



SHTS021271000025

1	Stud bolt	4	Exhaust pipe (ATC)
2	Gasket *	5	Bracket
3	Spacer	6	Clamp

*: Nonreusable part

Tightening torque — Unit: N·m {kgf·cm, lbf·ft}

A	70 {714, 51.6}	C	25.4{259, 18.7}
B	55 {560, 40.6}		

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REPLACEMENT

EN01F02127100402041002

REMOVING THE EXHAUST PIPE (ATC)

1. REFERENCE

NOTICE

The ATC will have to be replaced together with the exhaust pipe (ATC).

2. DISCONNECTING THE FRONT EXHAUST PIPE
Reference: EXHAUST (J05E), EXHAUST PIPE, REPLACEMENT, REMOVING THE EXHAUST SYSTEM COMPONENT PARTS (Page 11-9)

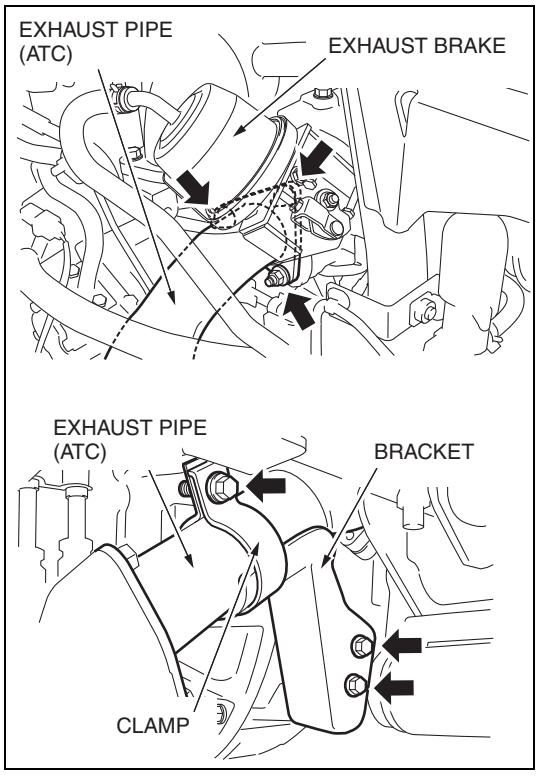
3. REMOVING THE FUEL ADDITION VALVE
Reference: EXHAUST (J05E), FUEL ADDITION VALVE, REPLACEMENT, REMOVING THE FUEL ADDITION VALVE (Page 11-50)

4. REMOVING THE ATC UPSTREAM TEMPERATURE SENSOR
Reference: EXHAUST (J05E), ATC UPSTREAM TEMPERATURE SENSOR, REPLACEMENT, REMOVING THE ATC UPSTREAM TEMPERATURE SENSOR (Page 11-105)

5. REMOVING THE EXHAUST PIPE (ATC)

(1) Unfasten the bolts (3 pcs.) to remove the bracket and clamp from the exhaust pipe (ATC).

(2) Unfasten the 3 nuts to remove the exhaust pipe (ATC) and gasket from the exhaust brake.



SHTS021271000026

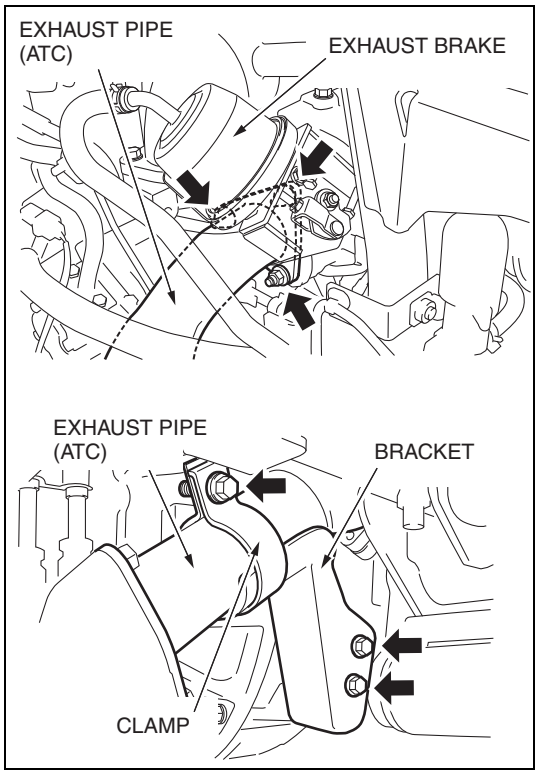
https://truckmanualshub.com/

MOUNTING THE EXHAUST PIPE (ATC)

1. REFERENCE

NOTICE

The ATC will have to be replaced together with the exhaust pipe (ATC).



SHTS021271000027

2. MOUNTING THE EXHAUST PIPE (ATC)

(1) Replace with a new gasket and temporarily tighten the exhaust pipe (ATC) to the exhaust brake with 3 nuts.

(2) Temporarily tighten the bracket and clamp with the bolts (3 pcs.).

(3) Tighten the bracket fully.
Tightening Torque:
55 N·m {560 kgf·cm, 40.6 lbf·ft}

(4) Tighten the exhaust pipe (ATC) fully.
Tightening Torque:
70 N·m {714 kgf·cm, 51.6 lbf·ft}

(5) Tighten the clamp fully.
Tightening Torque:
25.4 N·m {259 kgf·cm, 18.7 lbf·ft}

⚠ CAUTION

When tightening the clamp, do not allow clearance with the pipe.

3. MOUNTING THE ATC UPSTREAM TEMPERATURE SENSOR
Reference: EXHAUST (J05E), ATC UPSTREAM TEMPERATURE SENSOR, REPLACEMENT, MOUNTING THE ATC UPSTREAM TEMPERATURE SENSOR (Page 11-106)

4. MOUNTING THE FUEL ADDITION VALVE
Reference: EXHAUST (J05E), FUEL ADDITION VALVE, REPLACEMENT, MOUNTING THE FUEL ADDITION VALVE (Page 11-55)

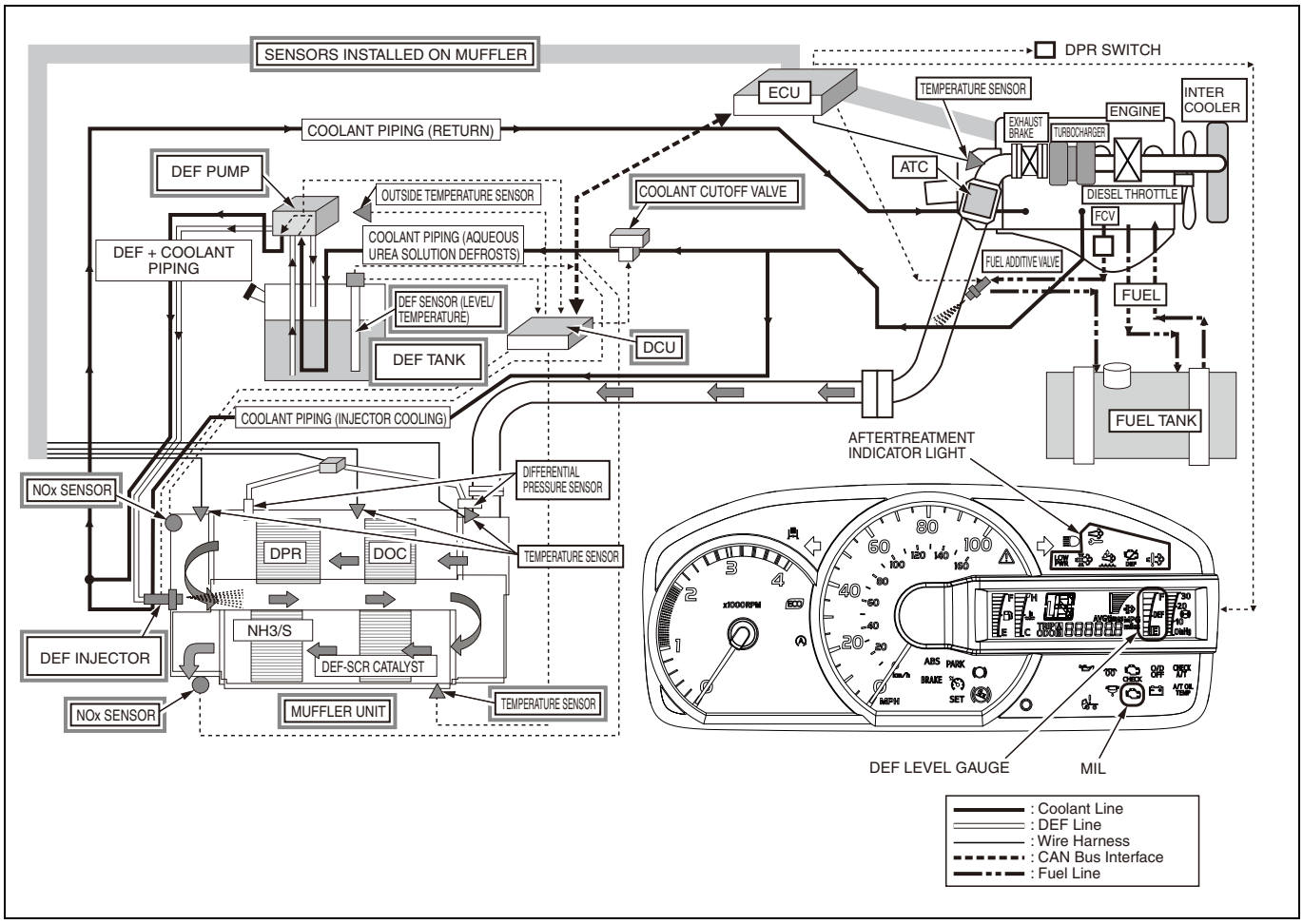
5. CONNECTING THE FRONT EXHAUST PIPE
Reference: EXHAUST (J05E), EXHAUST PIPE, REPLACEMENT, MOUNTING THE EXHAUST SYSTEM COMPONENT PARTS (Page 11-12)

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DEF-SCR & DPR

CONFIGURATION DIAGRAM

EN01F02127100402052001



SHTS021271000028

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CAUTIONS ON DEF/COOLANT PIPING ATTACHING AND DETACHING

EN01F02127100402052002

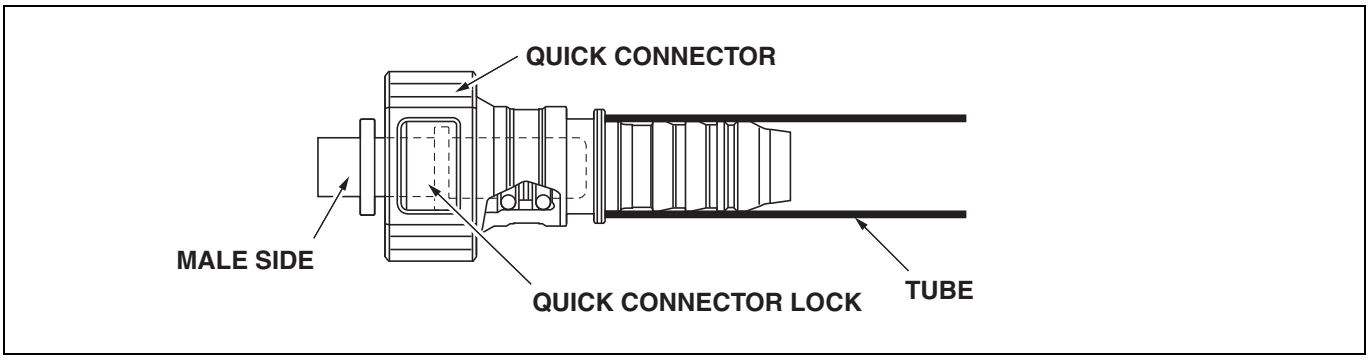
1. CAUTIONS ON DEF/COOLANT PIPING ATTACHING AND DETACHING

(1) If the quick joint used in the DEF piping is once removed, DEF powder precipitates on the seal area and leakage may occur after reconnection. Before reconnecting, thoroughly check the seal area for deposition of DEF powder and other foreign matter. If deposition of DEF powder is found, wash it with hot water.
(2) If you perform work with after-run not finished, DEF filled in the pipe will flow out when the quick connector is disconnected. Be sure that after-run is finished.

NOTICE

DEF is remained in the DEF pump and pipe in the condition where DEF injection is finished. After-run is a system which brings DEF back to the DEF tank after the engine is turned off so that remaining DEF will not be frozen in cold weather or dried and crystallized.

(3) If you perform work immediately after the engine is stopped, hot coolant may spout and you may get burned. Before performing work, be sure that engine coolant is thoroughly cooled.
(4) Do not apply an excessive force to tubes when working since formed tubes are used for piping.
(5) Do not directly touch DEF or coolant flowing out from the pipe. If you have touched it, thoroughly rinse it out.
(6) After removal, place a plastic cover to avoid entry of foreign matter into the pipe.
(7) Place the cover immediately after removing the joint to avoid entry of foreign matter into the DEF tank, DEF pump, and DEF injector.
(8) When covering, use separate covers to avoid mixing of DEF and coolant.
(9) If removal is difficult, do not apply an excessive force since it may damage the quick connector but remove dust adhered around the joint and remove the quick connector.
(10) The coolant pipe and DEF pipe are assembled for piping but do not disassemble it.
(11) Do not use tools when disconnecting the quick connector.
(12) Perform work with all the harness connectors fitted. If you perform work with connectors removed, rusting may result. Cover the connectors to avoid splashing of coolant and DEF.



SHTS021271000029

2. REMOVING THE QUICK CONNECTOR

(1) Press the lock from both sides to remove the quick connector.

⚠ CAUTION

- **It may get damaged if it is not removed by properly pressing in the lock.**
- **Do not force open with a screw driver and other tools.**

3. MOUNTING THE QUICK CONNECTOR

(1) Check that no dust or dirt remains on the connector end when mounting the quick connector. Clean deposits, if found, with hot water. Mount the quick connector securely until it makes a click sound.

⚠ CAUTION

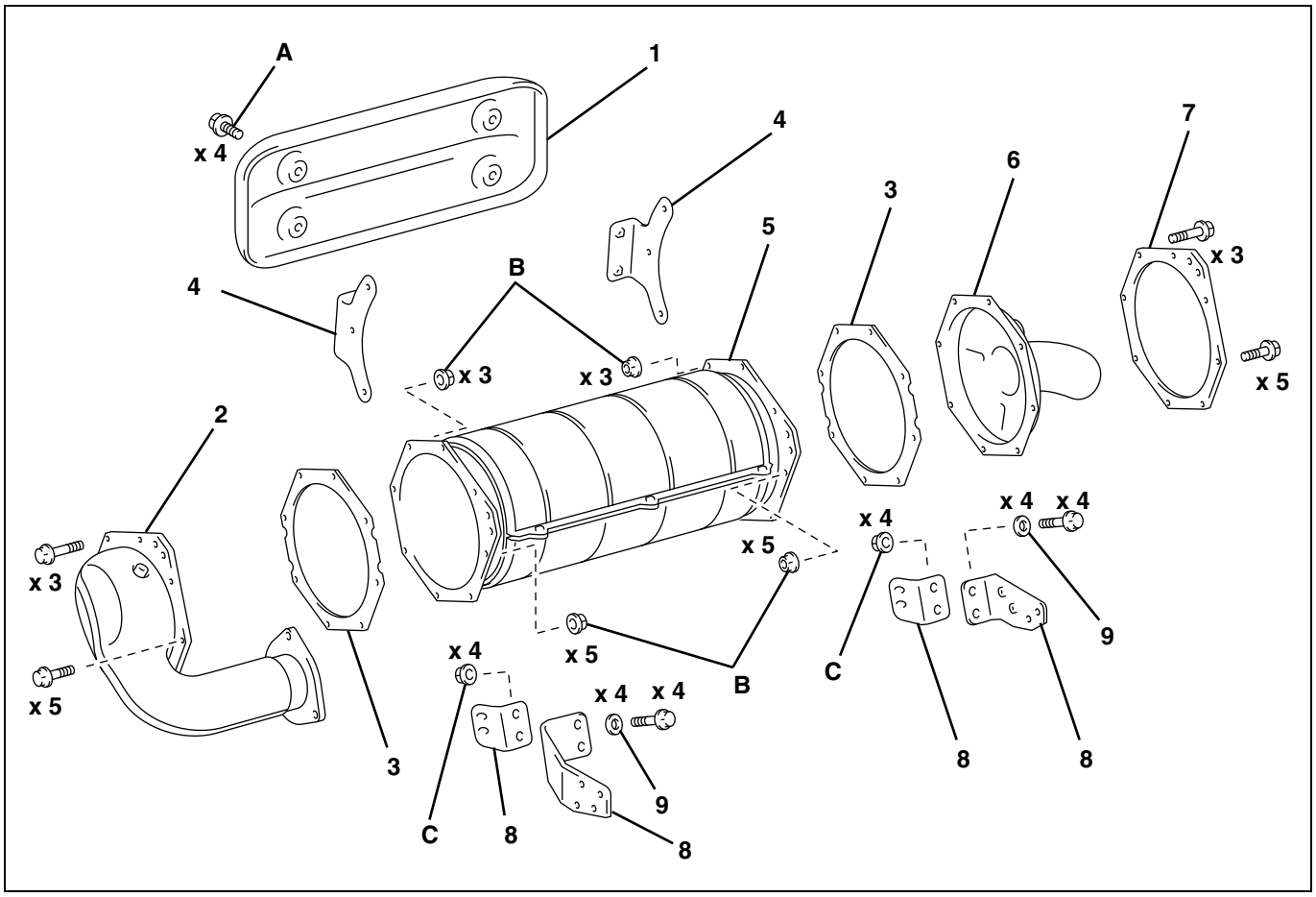
When crystallized DEF is adhered to the DEF piping, remove the crystals by a waste soaked in warm water or wash it off by warm water.

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DEF-SCR

COMPONENT LOCATOR

EN01F02127100402053001



SHTS021271000030

1	Exhaust pipe protector	6	Tail pipe
2	Center pipe No.2	7	Stay
3	Gasket *	8	Support bracket
4	Exhaust pipe protector stay	9	Washer
5	DEF-SCR		

*: Nonreusable part

Tightening torque — Unit: N·m {kgf·cm, lbf·ft}

A	31 {316, 22.9}	C	43-59 {438-602, 31.7-43.5}
B	20-30 {204-306, 14.7-22.1}		

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REPLACEMENT

EN01F02127100402053002

REMOVING THE DEF-SCR

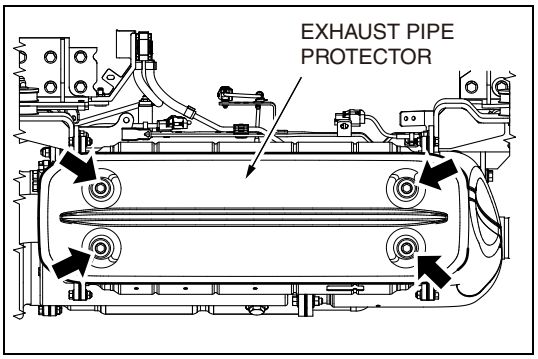
1. CAUTIONS

⚠ CAUTION

- **Perform replacement after cooling to prevent burns. (Turn the starter key to the "LOCK" position and leave it for more than 30 minutes to cool.)**
- **Handle the DPR cleaner and DEF-SCR with particular care because they are heavy made of ceramic and can be easily broken.**

2. REMOVING THE EXHAUST PIPE PROTECTOR

(1) Unfasten the bolts (4 pcs.) to remove the exhaust pipe protector from the muffler.



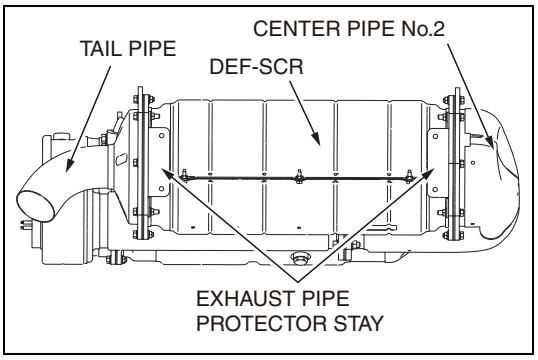
SHTS021271000031

3. REMOVING THE DEF-SCR

(1) Set the transmission jack under the DEF-SCR and lash with a lashing device.

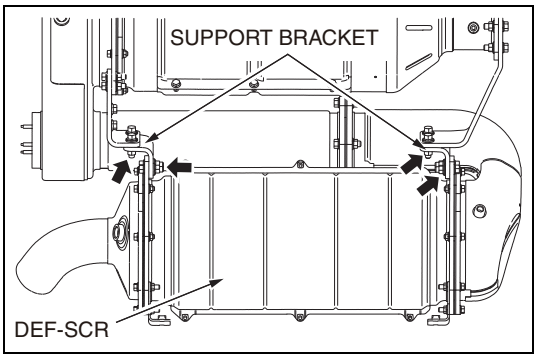
⚠ CAUTION

To hold and stabilize the DEF-SCR, make sure to lash it with a lashing device before installation or removal.



SHTS021271000032

(2) Put alignment marks on the DEF-SCR joining areas.
(3) Unfasten the 16 bolts and 14 nuts to remove the DEF-SCR, 2 gaskets, and 2 exhaust pipe protector stays from the center pipe No.2 and tail pipe.



SHTS021271000033

(4) Unfasten the 8 bolts and 8 nuts to remove 2 support brackets and 8 washers from the DEF-SCR.
(5) Pull off the DEF-SCR from the vehicle while supporting it to prevent falling.

⚠ CAUTION

Pay attention to weight balance.

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MOUNTING THE DEF-SCR

1. CAUTIONS

⚠ CAUTION
Handle the DPR cleaner and DEF-SCR with particular care because they are heavy made of ceramic and can be easily broken.

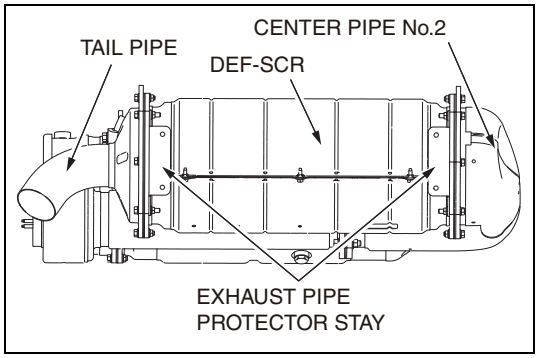
2. TEMPORARY MOUNTING OF THE DEF-SCR

(1) Set the transmission jack under the DEF-SCR and lash with a lashing device.

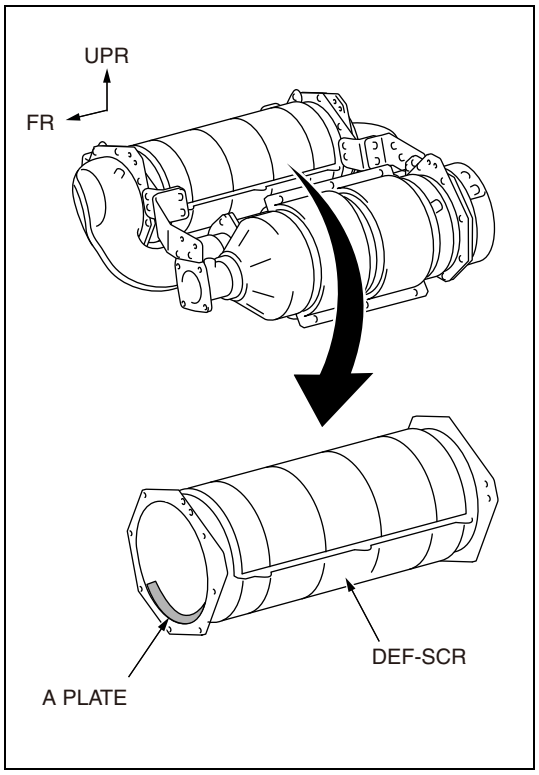
⚠ CAUTION
To hold and stabilize the DEF-SCR, make sure to lash it with a lashing device before installation or removal.

(2) Set the DEF-SCR to the mounting position while supporting it to prevent falling.
(3) Replace with new 2 gaskets, 16 bolts, and 14 nuts. Align alignment marks and temporarily tighten the DEF-SCR and 2 exhaust pipe protector stays to the center pipe No.2 and tail pipe.

⚠ CAUTION
- **To prevent exhaust gas and DEF leakage, make sure to replace with new gaskets, bolts, and nuts.**
- **When mounting the DEF-SCR, note the longitudinal and vertical directions.**
- **Mount the DEF-SCR in a way that the plate A-welded side faces to the vehicle front side and comes under the vehicle.**

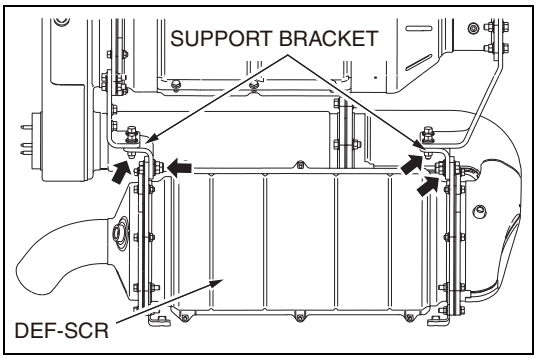


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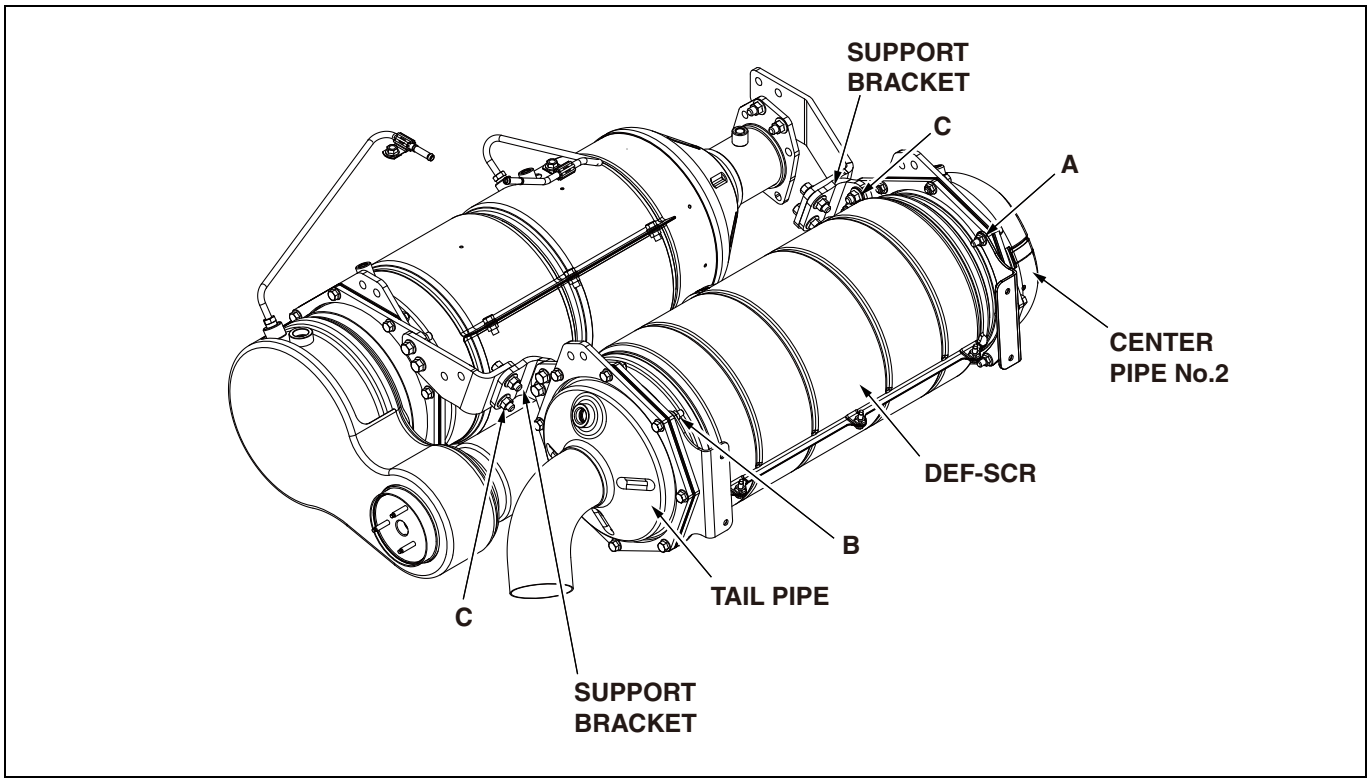


SHTS021271000036

(4) Temporarily tighten 2 support brackets and 8 washers to the DEF-SCR with 8 bolts and 8 nuts.

3. TIGHTENING THE DEF-SCR FULLY

(1) Permanently tighten the temporarily tightened bolts and nuts.



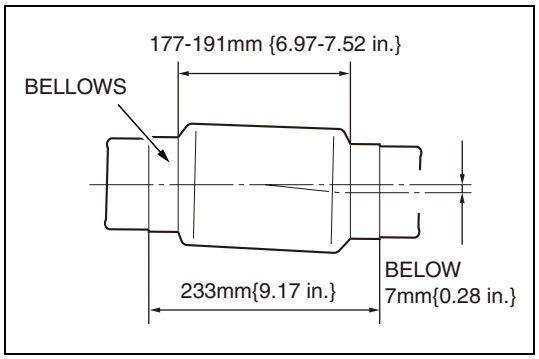
SHTS021271000037

a. Center pipe No.2 - DEF-SCR (part A)
Tightening Torque:
20-30 N·m {204-306 kgf·cm, 14.7-22.1 lbf·ft}

b. DEF-SCR - tail pipe (part B)
Tightening Torque:
20-30 N·m {204-306 kgf·cm, 14.7-22.1 lbf·ft}

c. DEF-SCR - support bracket (part C)
Tightening Torque:
43-59 N·m {438-602 kgf·cm, 31.7-43.5 lbf·ft}

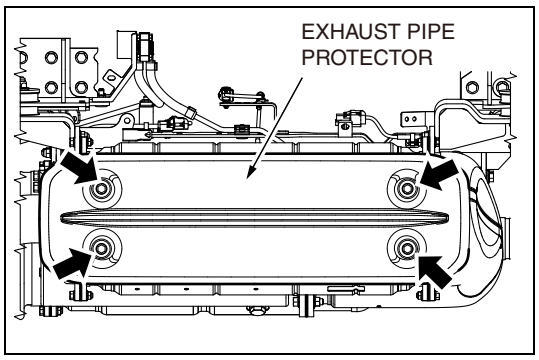
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4. INSPECTING THE EXHAUST FLEXIBLE AREA MOUNTING CONDITION

(1) Check if the exhaust flexible area is mounted as shown in the figure.



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5. MOUNTING THE EXHAUST PIPE PROTECTOR

(1) Mount the exhaust pipe protector to the muffler with the bolts (4 pcs.).
Tightening Torque:
31 N·m {316 kgf·cm, 22.9 lbf·ft}

6. INSPECTING FOR EXHAUST GAS LEAKAGE

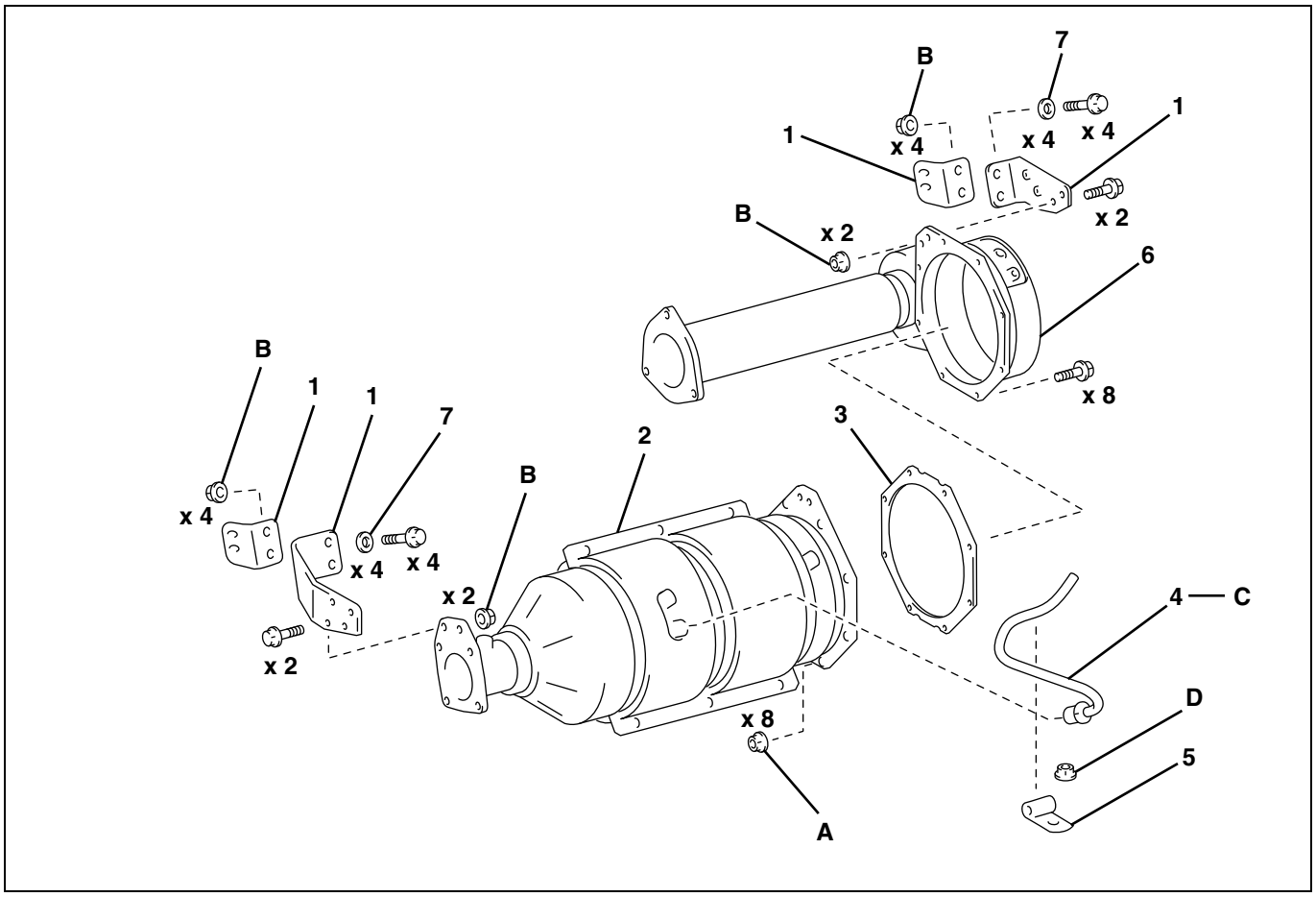
(1) Start the engine and inspect for exhaust gas leakage.

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DPR CLEANER

COMPONENT LOCATOR

EN01F02127100402002001



SHTS021271000040

1	Support bracket	5	Clip
2	DPR cleaner	6	Center pipe No.1
3	Gasket *	7	Washer
4	Differential pressure pipe		

*: Nonreusable part

Tightening torque — Unit: N·m {kgf·cm, lbf·ft}

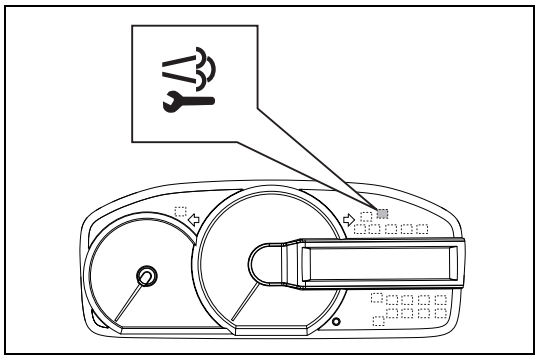
A	20-30 {204-306, 14.7-22.1}	C	30-36 {306-367, 22.1-26.5}
B	43-59 {438-602, 31.7-43.5}	D	31 {316, 22.9}

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DPR MAINTENANCE

EN01F02127100402002002

- If "Exhaust gas after treatment system maintenance requirement light" is light up on the meter, DPR maintenance is required.
  If the DPR back pressure value is below the specified value, no maintenance is required.
  If the DPR back pressure value exceeds the specified value, clean or replace the filter.



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1. NOTIFICATION TO DRIVER

(1) It informs with the exhaust gas after treatment system maintenance requirement light.

DPR INSPECTION

EN01F02127100402002003

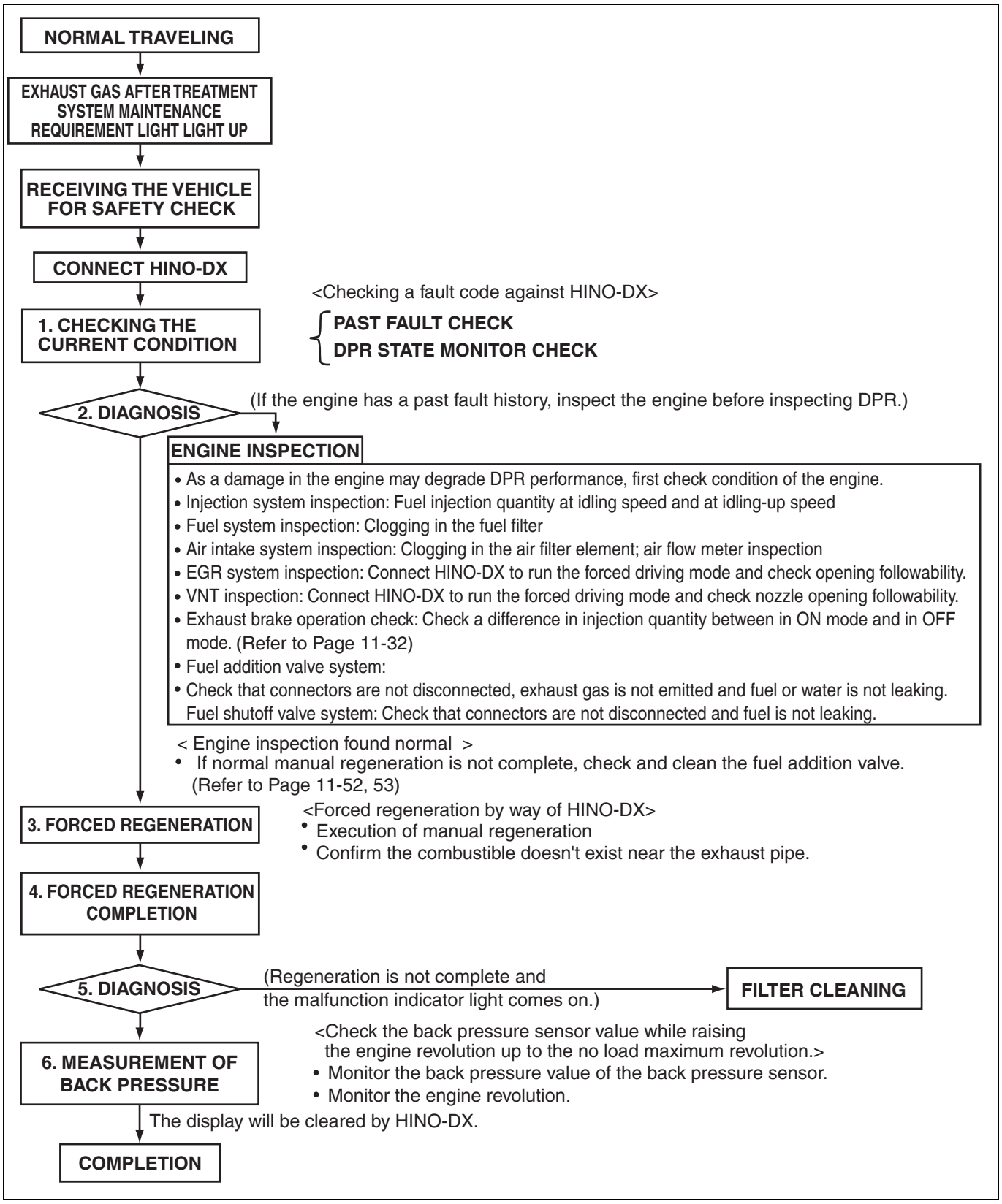
1. ROUTINE INSPECTION ITEMS

(1) Check the exhaust system tightening portions (exhaust pipe, main unit flange) for looseness or exhaust leakage.
(2) Check external appearance of the harness of the exhaust temperature sensor for trouble (cracks in coating or missing clip).
(3) Inspect the hose of the back pressure sensor and check the hose for deterioration or cracks. Replace a hose which has been used for three years or more with a new one.
(4) Check for a blown indicator light or wire break in the DPR-cleaner switch and meter. (Stop the engine, turn ON the starter switch, and press the DPR-cleaner switch. If both the light in the switch and indicator light in the meter illuminate, the lights are normal.)

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INSPECTION PROCEDURE FOLLOWED WHEN “EXHAUST GAS AFTER TREATMENT SYSTEM MAINTENANCE REQUIREMENT LIGHT” LIGHT UP

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INSPECTION BY WAY OF HINO-DX

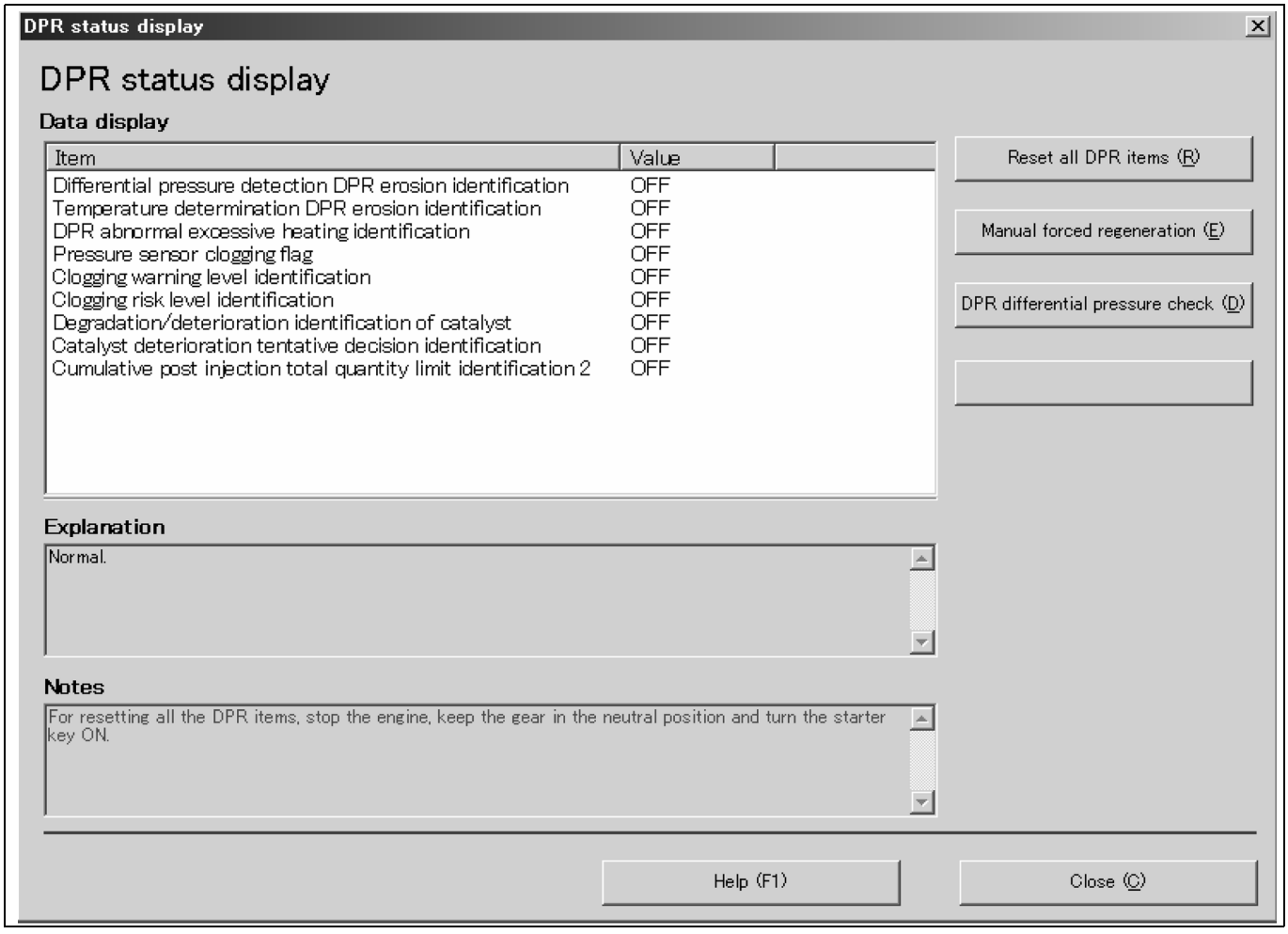
EN01F02127100402002005

1. DPR STATUS CHECK

(1) Select the "DPR Reset confirmation" in the "Check function" menu of HINO-DX.

(2) Confirm Data View of the "DPR status display"display (monitor), if the value for all the items are "OFF", DPR functions normally. Then "Manual forced regeneration" and "DPR differential pressure check" can be done.

(3) In case "ON" is displayed in Data View of the "DPR status display" display (monitor), check according to the procedure on page.
Reference: EXHAUST (J05E), DPR CLEANER, DETERMINATION BY WAY OF DPR STATE DETERMINATION MONITOR OF HINO-DX (Page 11-36)



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2. FORCED REGENERATION

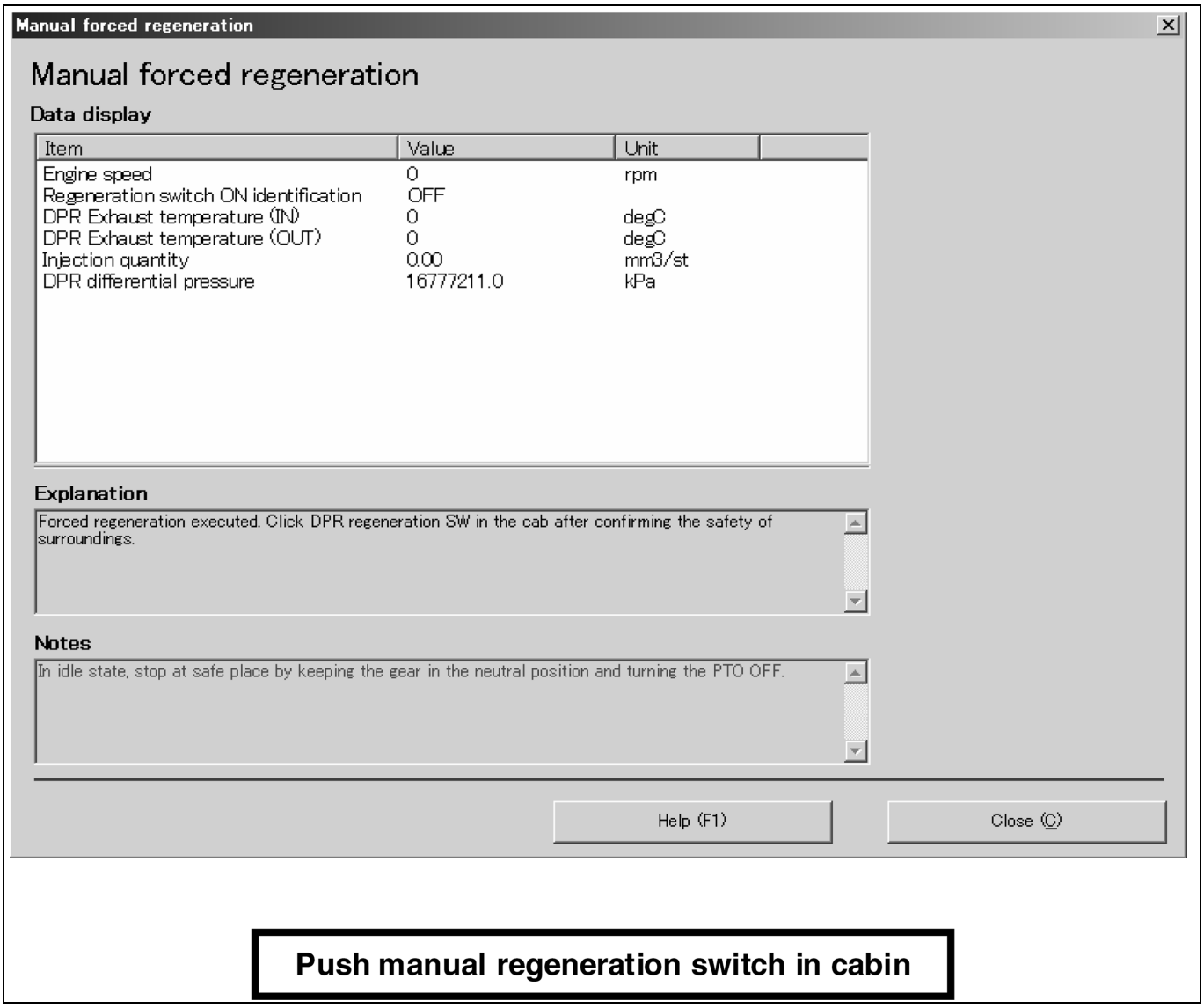
(1) Forced regeneration is done by the "Manual forced regeneration" screen.

⚠ CAUTION

- **Confirm safety of the surrounding area, then press DPR regeneration switch inside the cabin to execute the regeneration.**
- **Confirm the PTO switch is OFF.**

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(2) When the "Regeneration switch ON identification" value is ON, wash or replace the filter.
When the value is OFF, DPR functions normally.



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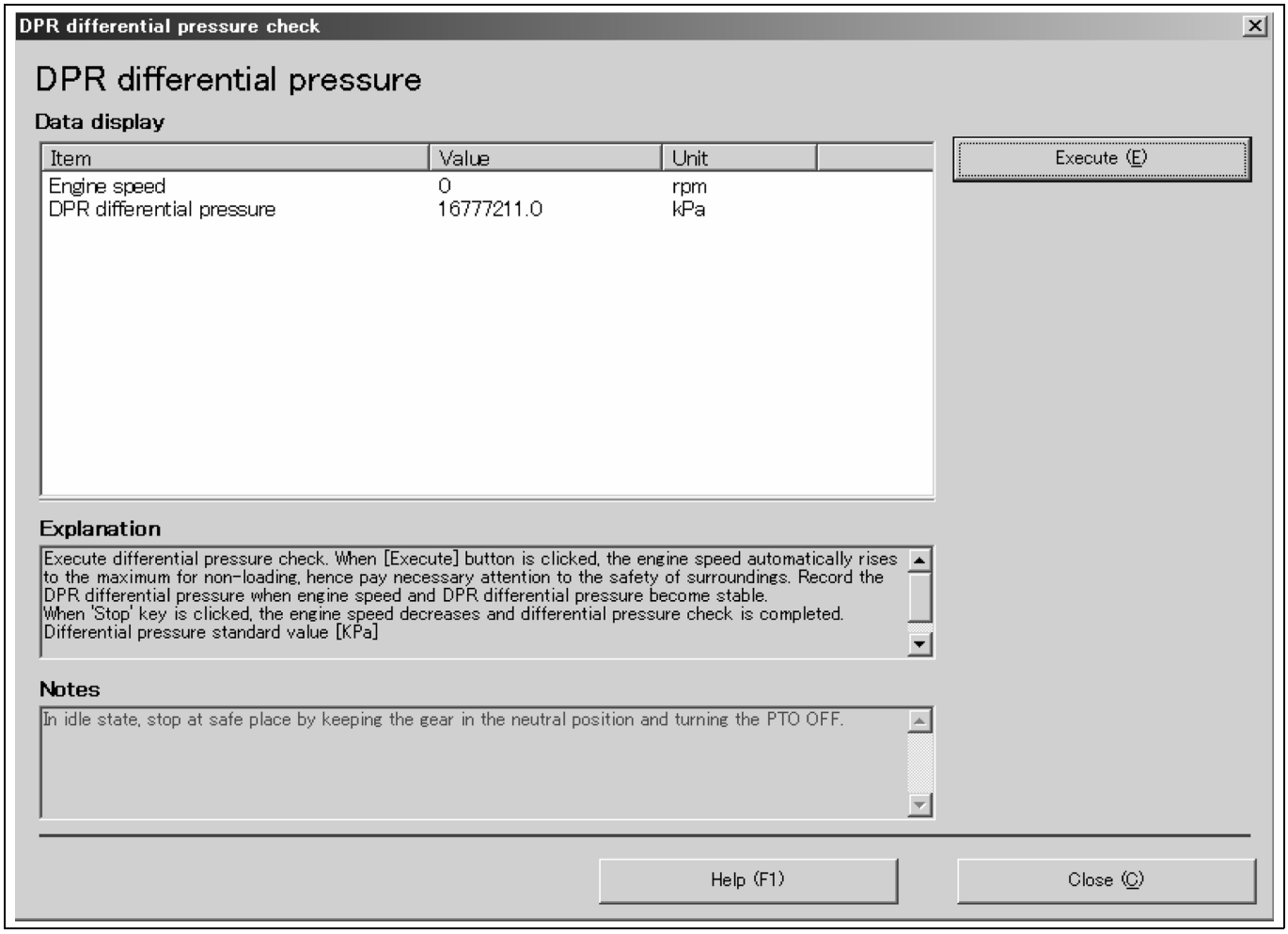
3. DPR DIFFERENTIAL PRESSURE CHECK

(1) Check the DPR differential pressure through the "DPR Status" display.
(2) Check and confirm the exhaust gas temperature (in and out) is less than 200°C {392°F}.
(3) Engine speed will rise automatically, then record the indicated maximum DPR differential pressure.
(4) In case the central value of the recorded DPR differential pressure value exceeds the specific value, clean or replace the filter.
Then "Stop" the DPR differential pressure check.

Engine speed (no load maximum revolution)	Differential pressure inspection standard value (kPa {kgf/cm^2, lbf/in.^{2}})
2,800 r/min.	5.0 {0.05, 0.7}

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(5) When the differential pressure is unchanged check the following. If the following are normal, the differential pressure sensor should be replaced.
   a. Check the differential pressure hose for cracks or hole openings.
   b. Check that the hose clamp is neither loose nor disconnected.
   c. Check whether there is clogging in the differential pressure pipe (DPR cleaner side).
      Use the compressed air from one end of the pipe to check for clogging. If the air passes to the other side easily, it is clear.

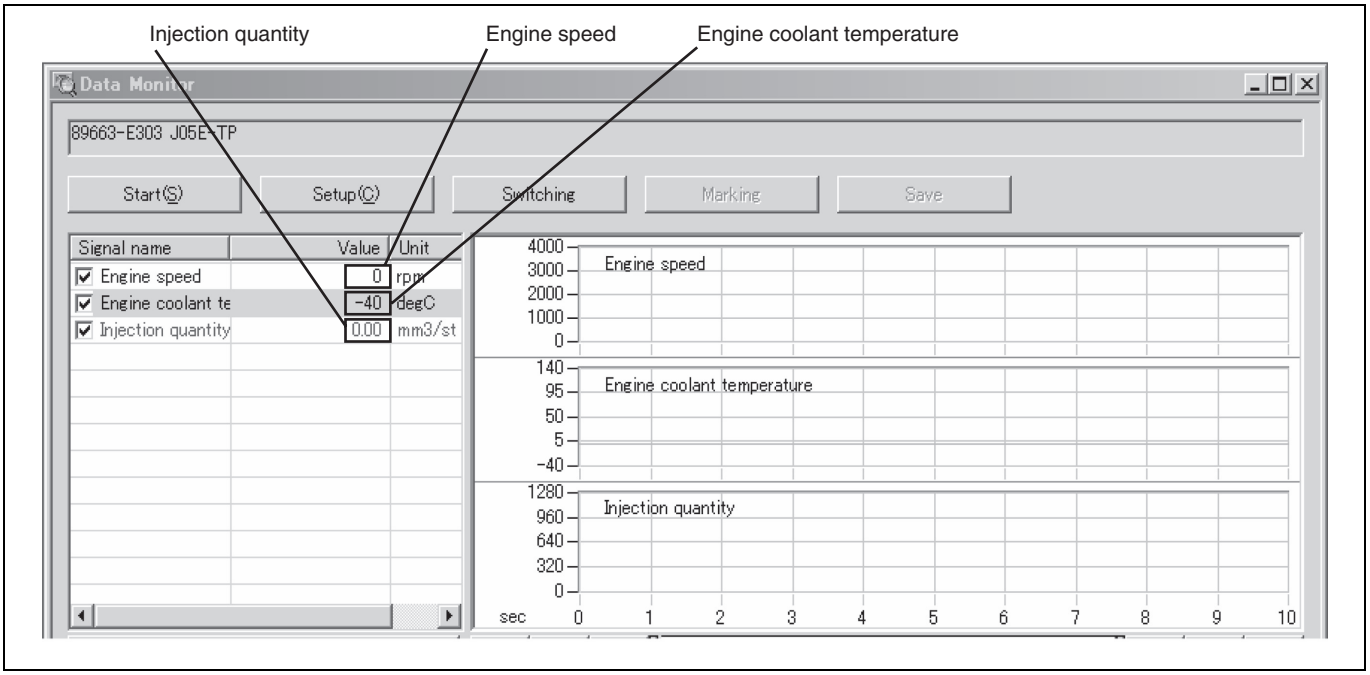


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4. EXHAUST BRAKE OPERATION CHECK

(1) Check the difference in injection quantity with ON mode and OFF mode by data monitor.



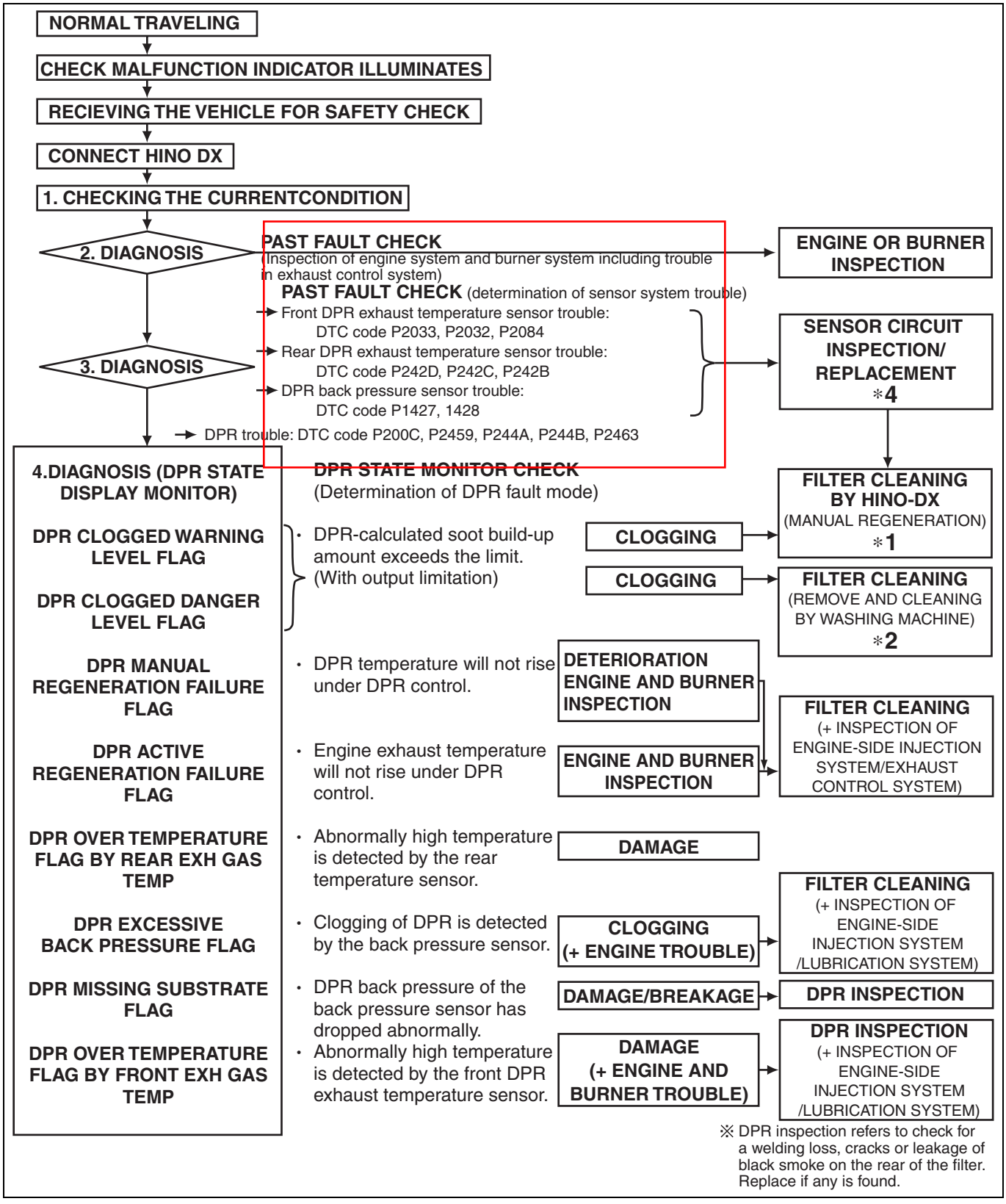
SHTS021271000046

Engine coolant temperature	More than 82°C {180°F}	
Exhaust brake valve to OFF (Adjust the engine speed by idle set knob)	Engine speed	980 rpm
	Injection quantity	B mm^3/st
Exhaust brake valve to ON	Engine speed	980 rpm
	Injection quantity	A mm^3/st
Difference of adjustable range of fuel injection (A-B)	Optimum injection quantity	8-12 mm^3/st
	Adjustment target quantity	10 mm^3/st

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INSPECTION PROCEDURE FOLLOWED WHEN MALFUNCTION INDICATOR LIGHT ILLUMINATES (ABNORMAL)

EN01F02127100402002006



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*1 Additional information for inspections with HINO-DX

Light cases of DPR clogging can be treated without removing the housing.
The procedure is shown below.

The "DPR STATUS" can be checked with the HINO-DX, and when only the "DPR clogged warning level flag" is "ON", regeneration processing can be performed with the DPR SW or the tool.

Confirmation method:
Use the HINO-DX, perform System Fix, then open screens in the order of Check function (E) →DPR Reset Confirmation (D) →DPR Status, and confirm that "status" is "ON" for the item "DPR clogged warning level flag" of the DPR Status. Only when this is "ON" can manual regeneration by pressing the DPR manual regeneration switch or manual regeneration by HINO-DX setting be performed.

1. Press the DPR Manual regeneration switch. When manual regeneration has started, wait until regeneration has been completed and confirm that the engine check light has gone out.
2. If the operation by means of the DPR SW is not accepted, connect the HINO-DX to the vehicle, record the "HINO-DX Report", erase the trouble code, and then perform manual regeneration according to the following procedure. When manual regeneration has started, wait until regeneration has been completed and confirm that the engine check light has gone out.

   Confirmation method:
   Use the HINO-DX, perform System Fix, and then continue in the order of Check Function (E) →DPR Reset Confirmation (D) →Manual regeneration (E).

Recording method for the "HINO-DX Report":

a. Connect the HINO-DX to the vehicle and execute System Fix.
b. Click the Equipment DTC button and then click Load (L).
c. Click System Fix (W) after the DTC code has been put out.
d. Enter Work memorandum (information), Customer Name, License Plate, and Mileage information at the pop-up screen.
e. Click the OK button.
f. Click the Close Work (C) button of the pull-down menu File (F) for Close Work.
g. Click Past work information (O) of the File (F) pull-down menu.
h. Select the files when System Fix was performed in items d and e from the pop-up screen and click the Print button.
i. Click the Print button on the pop-up screen.
j. When the HINO-DX Report image screen appears, click the Print button.
k. Click the Printer Name pull-down button on the Print pop-up screen.
l. Select Microsoft Office Document Image Writer from the Printer pull-down menu.
m. Click the OK button.
n. Save the data in any folder (example: Save to the desktop).
o. When the folder is clicked, the contents of the HINO-DX Report can be confirmed and sent by e-mail or can be printed out.

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3. After completion of manual regeneration by (1) or (2), keep the engine running and wait for the exhaust temperature (IN side) to drop. Confirm a drop to 200 degrees or lower and then inspect the exhaust gas back pressure according to the following procedure.

   Confirmation method:
   Execute in the order of DPR Reset Confirmation → Back pressure Check (D) → Start (E).
4. Confirm that the values of the exhaust gas back pressure are at or below the standard.

Engine model	DPR Back pressure (Units: kPa {kgf/cm^2, lbf/in.^{2}})
J05E	5.0 {0.05, 0.7}

5. When the confirmation result in (4) is at or below the standard, DPR manual regeneration and the confirmation work have been completed. Click "Stop" on the DPR Back pressure Check screen to end the work with the HINO-DX.
6. If the exhaust gas back pressure with the inspection in (5) exceeds the standard, repeat the steps (2), (3), (4), and (5).
7. If the exhaust gas back pressure with the work in (6) is within the standard, DPR manual regeneration and the confirmation work have been completed. Click "Stop" on the DPR Back pressure Check screen to end the work with the HINO-DX.
8. If the exhaust gas back pressure still exceeds the standard with the second manual regeneration, the DPR filter is defective and must be replaced.

*2 Additional information for filter cleaning with a washing machine

Confirm the following for filter cleaning with a washing machine.
Use a washing machine from a manufacturer recommended by Hino Motors.
Perform cleaning with correct installation of the attachment for DPR filters made by Hino Motors.
In the following instances the filter cannot be cleaned. In these cases, the filter must be replaced.

1. Cleaning is not possible for filters where soot has escaped and the surroundings have turned black when the filter body is seen from the gas flow outlet side.
2. Cleaning is not possible when a large quantity of oil adheres to the filter body as seen from the gas flow inlet side.
3. Cleaning is not possible when the filter or the catalyst shows cracks or damage seen from any side.
   When cleaning has been completed and the filter has been installed again, perform the following inspections.
4. Use the HINO-DX to perform DPR forced regeneration, then confirm normal completion.
5. In this condition, wait for the exhaust gas temperature to drop to 200°C or lower, perform the back pressure inspection, and confirm that the inspection value is at or below the standard.
6. If the back pressure value is high, the filter is defective and must be replaced.

*3 Check for sensor coupler disconnection even when DPR DTC code is displayed.

*4 Pay attention to the following when the temperature sensor is inspected because of DPR DTC code or a temperature sensor DTC code.

1. Replace if the tip is bent.
2. Do not bend the tip when it is normal.
3. When the sensor tip is bent, normal control may not be possible and this can lead to DPR trouble.
4. When disconnecting the sensor, remove the sensor body from the muffler after completely removing the harness fixing clips. If this is not done, the sensor tip could get damaged.

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DETERMINATION BY WAY OF DPR STATE DETERMINATION MONITOR OF HINO-DX

EN01F02127100402002007

1. CHECK THAT THE MALFUNCTION INDICATOR LIGHT COMES ON.

2. CONNECT HINO-DX.

3. CHECK PAST FAULTS.

(1) Check past faults by way of HINO-DX. In case a general engine fault such as a trouble of an exhaust control system is displayed, inspect and repair the pertinent section.

(2) Inspect and repair general engine faults and check past faults again. In case a code indicating a sensor system trouble is displayed, inspect and replace the sensor circuit.

	DTC code
Front DPR exhaust temperature sensor trouble	P2033, P2032, P2084
Rear DPR exhaust temperature sensor trouble	P242D, P242C, P242B
DPR back pressure sensor trouble	P1426, P1427, P1428

(3) Check past faults. In case DPR trouble (DTC code: P200C, P2459, P244A, P244B, P2463) is displayed, check the DPR state monitor.

CHECKING THE DPR STATE

EN01F02127100402002008

1. CHECK THE DPR STATE MONITOR.

(1) Refer to "INSPECTION BY WAY OF HINO-DX" and check the DPR state monitor. Perform inspection as per the procedure under "INSPECTION BY WAY OF HINO-DX".

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REPLACEMENT

EN01F02127100402002009

REMOVING DPR CLEANER

1. CAUTIONS

⚠ CAUTION

- **Perform replacement after cooling to prevent burns. (Turn the starter key to the "LOCK" position and leave it for more than 30 minutes to cool.)**
- **Handle the DPR cleaner and DEF-SCR with particular care because they are heavy made of ceramic and can be easily broken.**

2. DISCONNECTING SENSORS

NOTICE

Remove connectors and clips from the vehicle side. Sensors do not need to be removed from the muffler.

(1) Remove the DPR differential pressure sensor.
Reference: EXHAUST (J05E), DPR DIFFERENTIAL PRESSURE SENSOR, REPLACEMENT, REMOVE THE DPR DIFFERENTIAL PRESSURE SENSOR (Page 11-96)

(2) Disconnect the DOC upstream temperature sensor.
Reference: EXHAUST (J05E), DOC UPSTREAM TEMPERATURE SENSOR, REPLACEMENT, REMOVING DOC UPSTREAM TEMPERATURE SENSOR (Page 11-108)

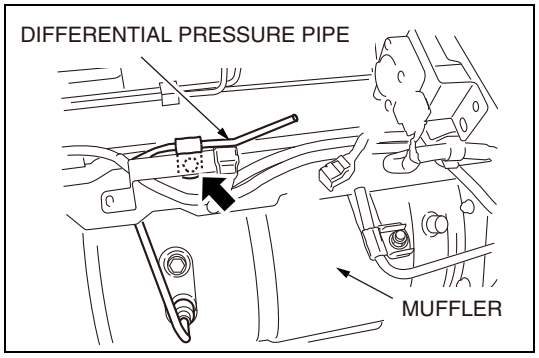
(3) Disconnect the DPR upstream temperature sensor.
Reference: EXHAUST (J05E), DPR UPSTREAM TEMPERATURE SENSOR, REPLACEMENT, REMOVING THE DPR UPSTREAM TEMPERATURE SENSOR (Page 11-111)

(4) Disconnect the DPR downstream temperature sensor.
Reference: EXHAUST (J05E), DPR DOWNSTREAM TEMPERATURE SENSOR, REPLACEMENT, REMOVING THE DPR DOWNSTREAM TEMPERATURE SENSOR (Page 11-113)

3. REMOVING THE DIFFERENTIAL PRESSURE PIPE

(1) Unfasten the nut to remove the clip from the differential pressure pipe.

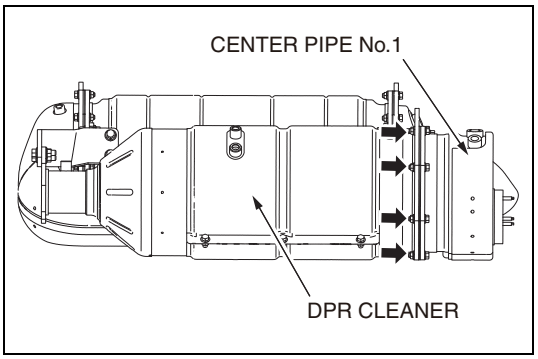
(2) Loosen the flare nut to disconnect the differential pressure pipe from the muffler.



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4. REMOVING THE FRONT EXHAUST PIPE
Reference: EXHAUST (J05E), EXHAUST PIPE, REPLACEMENT, REMOVING THE EXHAUST SYSTEM COMPONENT PARTS (Page 11-9)

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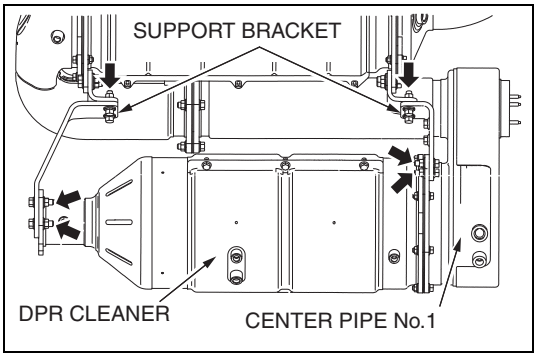
SHTS021271000049

5. REMOVING THE DPR

(1) Unfasten the 8 bolts and 8 nuts to remove the DPR cleaner and gasket from the center pipe No.1.

(2) Set the transmission jack under the DPR cleaner and lash with a lashing device.

⚠ CAUTION
To hold and stabilize the DPR cleaner, make sure to lash it with a lashing device before installation or removal.



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(3) Unfasten the 8 bolts and 8 nuts to remove 2 support brackets and 8 washers from the DPR cleaner.

(4) Pull off the DPR cleaner from the vehicle while supporting it to prevent falling.

⚠ CAUTION
Pay attention to weight balance.

MOUNTING DPR CLEANER

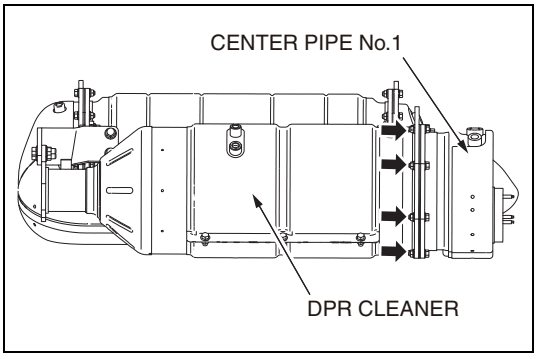
1. TEMPORARY MOUNTING OF THE DPR CLEANER

(1) Set a transmission jack under the DPR cleaner and lash with a lashing device.

⚠ CAUTION
To hold and stabilize the DPR cleaner, make sure to lash it with a lashing device before installation or removal.

(2) Set the DPR cleaner to the mounting position while supporting it to prevent falling.

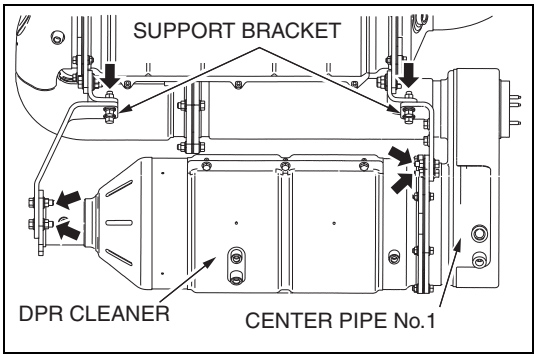
(3) Replace with a new gasket, 8 bolts, and 8 nuts and temporarily tighten the DPR cleaner to the center pipe No.1.



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⚠ CAUTION
To prevent exhaust gas leakage, make sure to replace with a new gasket, bolts, and nuts.

(4) Temporarily tighten 2 support brackets and 8 washers to the DPR cleaner with 8 bolts and 8 nuts.

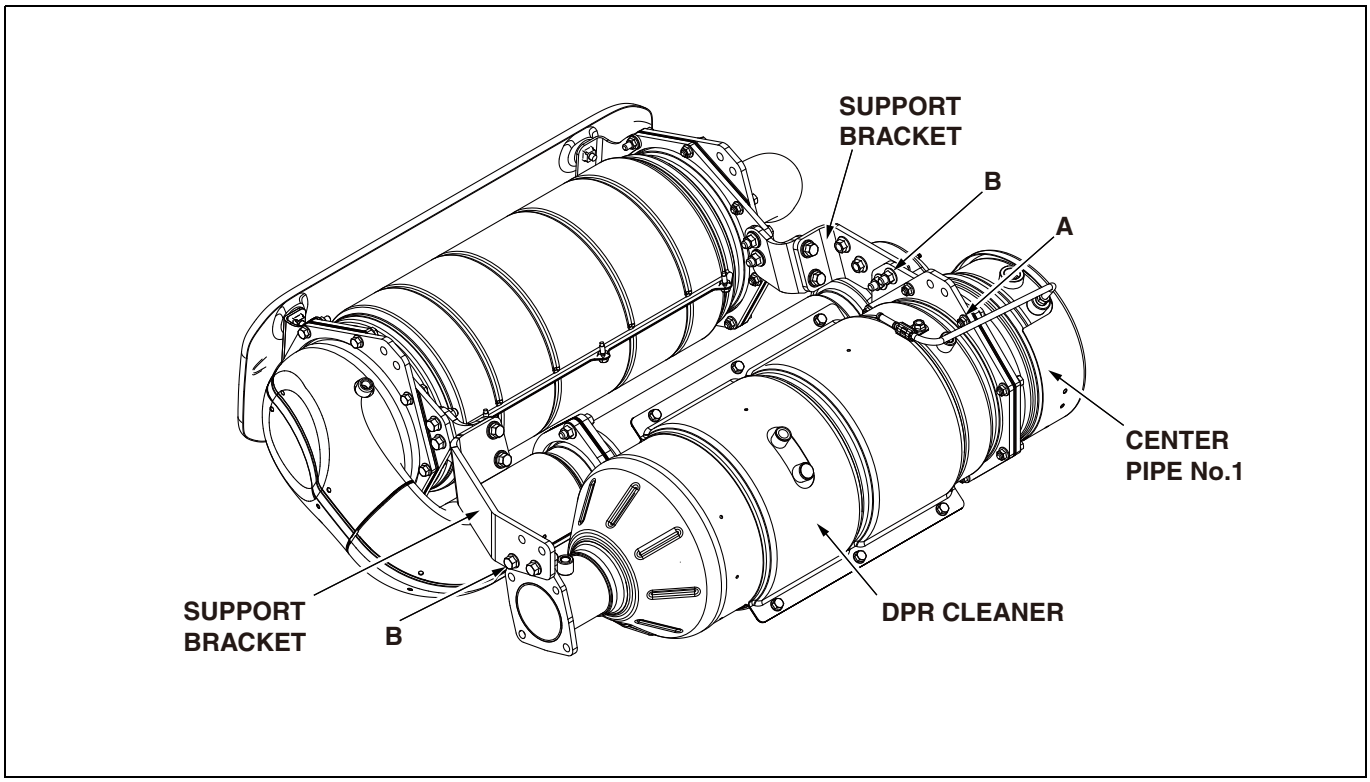


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2. TIGHTENING THE DPR CLEANER FULLY

(1) Permanently tighten the temporarily tightened bolts and nuts.



SHTS021271000053

a. Center pipe No.1 - DPR cleaner (part A)
Tightening Torque:
20-30 N·m {204-306 kgf·cm, 14.7-22.1 lbf·ft}

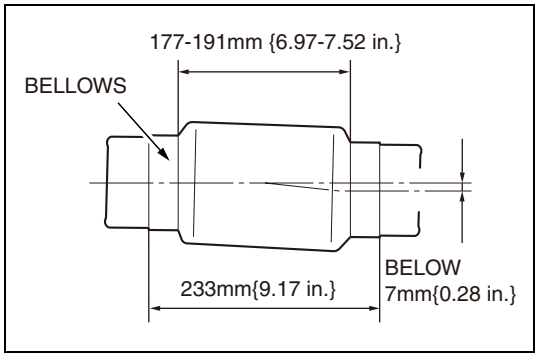
b. DPR cleaner - support bracket (part B)
Tightening Torque:
43-59 N·m {438-602 kgf·cm, 31.7-43.5 lbf·ft}

3. MOUNTING THE FRONT EXHAUST PIPE

Reference: EXHAUST (J05E), EXHAUST PIPE, REPLACEMENT, MOUNTING THE EXHAUST SYSTEM COMPONENT PARTS (Page 11-12)

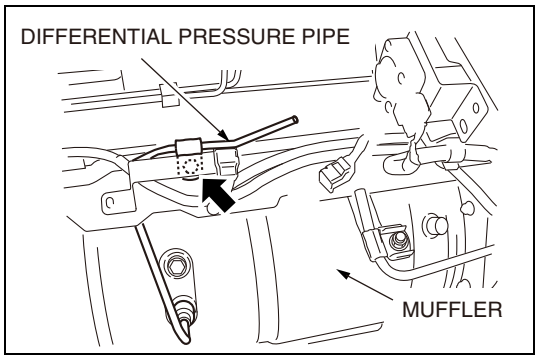
4. INSPECTING THE EXHAUST FLEXIBLE AREA MOUNTING CONDITION

(1) Check and confirm if the exhaust flexible area is mounted as shown in the figure.



SHTS021271000054

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SHTS021271000055

5. MOUNTING THE DIFFERENTIAL PRESSURE PIPE

(1) Insert the differential pressure pipe into the muffler. After finger-tightening the flare nut, tighten it to the muffler with the specified torque.
Tightening Torque:
30-36 N·m {306-367 kgf·cm, 22.1-26.5 lbf·ft}

⚠ CAUTION
Wipe off old anti-seizure lubricant on the differential pressure pipes and apply new anti-seizure lubricant (equivalent to NEVER-SEEZ Pure Nickel Special Grade manufactured by Bostic, Inc.) to threads.

(2) Mount the clip to the differential pressure pipe with a nut.
Tightening Torque:
31 N·m {316 kgf·cm, 22.9 lbf·ft}

6. CONNECTING SENSORS

(1) Mount the DPR differential pressure sensor.
Reference: EXHAUST (J05E), DPR DIFFERENTIAL PRESSURE SENSOR, REPLACEMENT, MOUNTING THE DPR DIFFERENTIAL PRESSURE SENSOR (Page 11-97)

(2) Connect the DOC downstream temperature sensor.
Reference: EXHAUST (J05E), DOC UPSTREAM TEMPERATURE SENSOR, REPLACEMENT, MOUNTING DOC UPSTREAM TEMPERATURE SENSOR (Page 11-109)

(3) Connect the DPR upstream temperature sensor.
Reference: EXHAUST (J05E), DPR UPSTREAM TEMPERATURE SENSOR, REPLACEMENT, MOUNTING THE DPR UPSTREAM TEMPERATURE SENSOR (Page 11-111)

(4) Connect the DPR downstream temperature sensor.
Reference: EXHAUST (J05E), DPR DOWNSTREAM TEMPERATURE SENSOR, REPLACEMENT, MOUNTING THE DPR DOWNSTREAM TEMPERATURE SENSOR (Page 11-114)

7. INSPECTING FOR EXHAUST GAS LEAKAGE

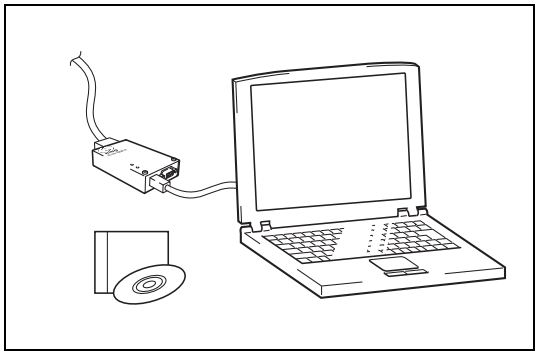
(1) Start the engine and inspect for exhaust gas leakage.

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OVERALL OPERATION FLOW

EN01F02127100402002010

1 VEHICLE RECEIPT FOR INSPECTION



SHTS021271000056

1. Check the malfunction code with the HINO-DX.
   Standard value: No malfunction code

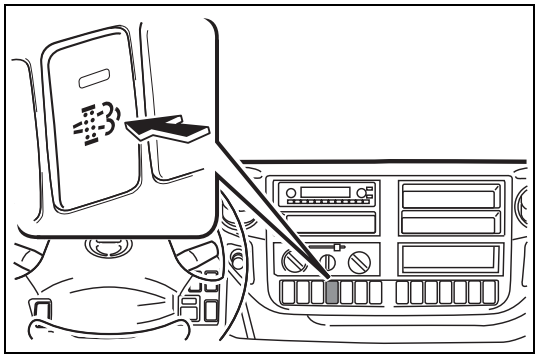
NO

4. For P200C, P244B, P244A, P2459, P2463
5. For others than above

YES

2. MANUAL REGENERATION

2 MANUAL REGENERATION



SHTS021271000057

1. After a manual regeneration, check the differential pressure with the HINO-DX.
   Standard value:
   Reference: EXHAUST (J05E), DPR CLEANER, OVERALL OPERATION FLOW, LIST OF STANDARD VALUES FOR DIFFERENTIAL PRESSURE INSPECTION (Page 11-44)

NO

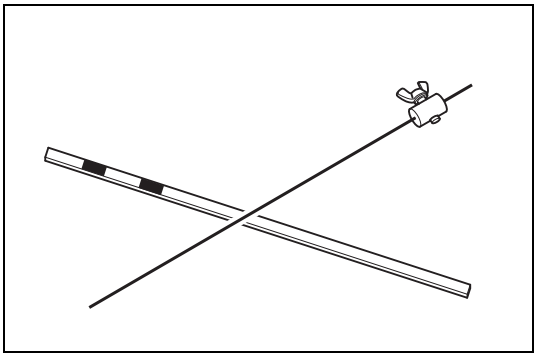
3. INSPECT THE DPR FILTER.

YES

No clean up necessary
Vehicle delivery

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3	INSPECT THE DPR FILTER



SHTS021271000058

1. Dismount the DPR filter from the vehicle.
   Reference: EXHAUST (J05E), DPR CLEANER, REPLACEMENT, REMOVING DPR CLEANER (Page 11-37)
2. Inspect the status of the DPR filter rear surface.
   Reference: EXHAUST (J05E), DPR CLEANER, OVERALL OPERATION FLOW, INSPECT INSIDE THE DPR FILTER (Page 11-45)
   Standard value: No soot escape

NO

Replace with a new DPR filter and install it on the vehicle.
Reference: EXHAUST (J05E), DPR CLEANER, REPLACEMENT, MOUNTING DPR CLEANER (Page 11-38)

⚠ CAUTION
Recheck the differential pressure after the installation. Make sure it is within the standard value and deliver the vehicle.

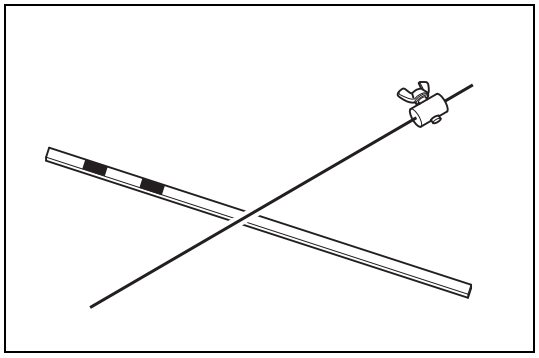
YES

Perform ash cleaning to the DPR filter and then install it on the vehicle.
Reference: EXHAUST (J05E), DPR CLEANER, REPLACEMENT, MOUNTING DPR CLEANER (Page 11-38)

⚠ CAUTION
Recheck the differential pressure after the installation. Make sure it is within the standard value and deliver the vehicle.

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4	IN CASE THAT DPR DTC CODE IS DISPLAYED



SHTS021271000059

1. Dismount the DPR filter from the vehicle.
   Reference: EXHAUST (J05E), DPR CLEANER, REPLACEMENT, REMOVING DPR CLEANER (Page 11-37)
2. Inspect the status of the DPR filter rear surface.
   Reference: EXHAUST (J05E), DPR CLEANER, OVERALL OPERATION FLOW, INSPECT INSIDE THE DPR FILTER (Page 11-45)
   Standard value: No soot escape

NO

Replace with a new DPR filter and install it on the vehicle.
Reference: EXHAUST (J05E), DPR CLEANER, REPLACEMENT, MOUNTING DPR CLEANER (Page 11-38)

⚠ CAUTION
After the installation, regenerate the DPR filter manually and recheck the differential pressure. Make sure it is within the standard value and deliver the vehicle.

YES

Perform soot cleaning to the DPR filter and then install it on the vehicle.
Reference: EXHAUST (J05E), DPR CLEANER, REPLACEMENT, MOUNTING DPR CLEANER (Page 11-38)

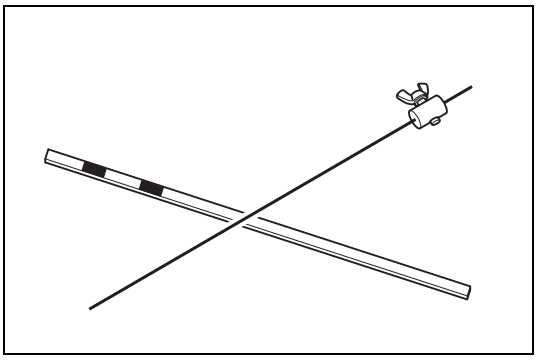
⚠ CAUTION
After the installation, regenerate the DPR cleaner manually and recheck the differential pressure. Make sure it is within the standard value and deliver the vehicle.

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5	FOR OTHERS THAN DPR DTC CODE IS DISPLAYED

1. Checking the engine and repair or replace defective parts if any.

2. Dismount the DPR filter from the vehicle.
   Reference: EXHAUST (J05E), DPR CLEANER, REPLACEMENT, REMOVING DPR CLEANER (Page 11-37)
3. Inspect the status of the DPR filter rear surface.
   Reference: EXHAUST (J05E), DPR CLEANER, OVERALL OPERATION FLOW, INSPECT INSIDE THE DPR FILTER (Page 11-45)
   Standard value: No soot escape



SHTS021271000060

NO

Replace with a new DPR filter and install it on the vehicle.
Reference: EXHAUST (J05E), DPR CLEANER, REPLACEMENT, MOUNTING DPR CLEANER (Page 11-38)

⚠ CAUTION
After the installation, regenerate the DPR cleaner manually and recheck the differential pressure. Make sure it is within the standard value and deliver the vehicle.

YES

Perform soot cleaning to the DPR filter and then install it on the vehicle.
Reference: EXHAUST (J05E), DPR CLEANER, REPLACEMENT, MOUNTING DPR CLEANER (Page 11-38)

⚠ CAUTION

- **After the installation, regenerate the DPR cleaner manually and recheck the differential pressure. Make sure it is within the standard value and deliver the vehicle.**
- **If the differential pressure is out of the standard value, perform ash cleaning.**

LIST OF STANDARD VALUES FOR DIFFERENTIAL PRESSURE INSPECTION

Engine model	Engine no load maximum revolution speed	Differential pressure (kPa {kgf/cm^2, lbf/in.^{2}})
J05E	2,800 r/min.	5.0 {0.05, 0.7}

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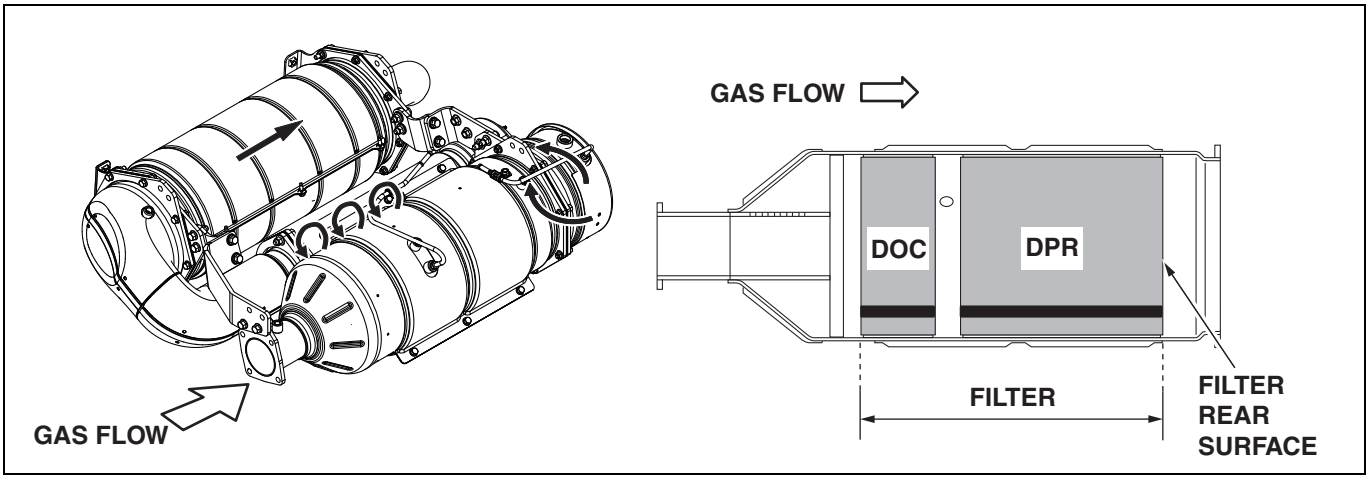
INSPECT INSIDE THE DPR FILTER

NOTICE

This is for detecting abnormalities inside the DPR filter.

1	VISUALLY INSPECT THE FILTER REAR SURFACE.

1. Visually inspect the filter rear surface to detect soot escapes (black part).



SHTS021271000061

Standard value: No soot escape

NO → **3. INSPECT THE DPR FILTER WITH THE DEDICATED CHECK PROBE.**

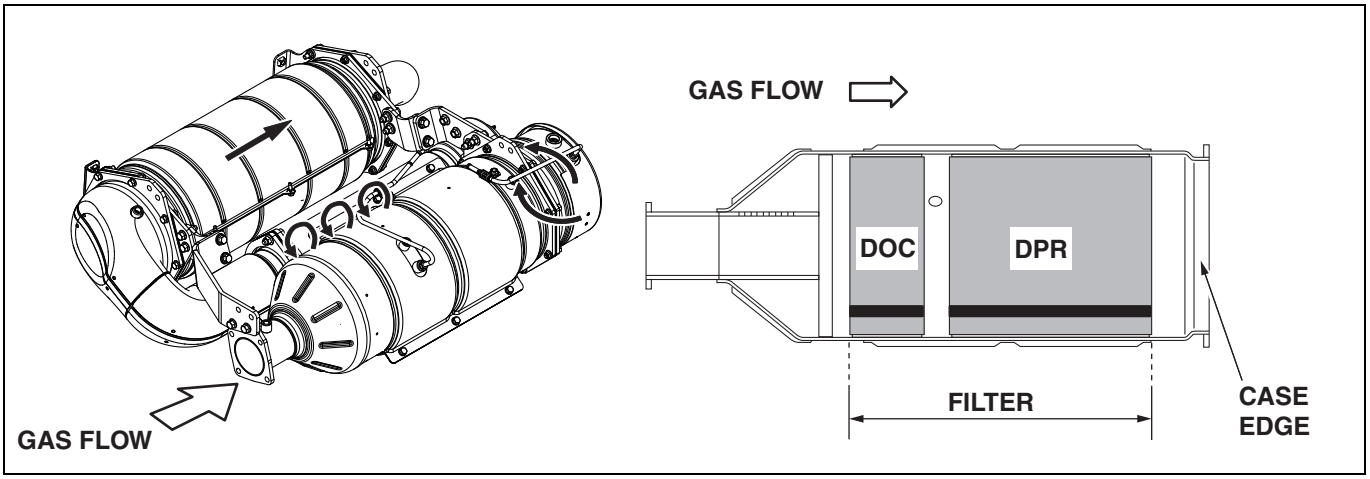
YES

2. VISUALLY INSPECT THE CASE EDGE.

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2	VISUALLY INSPECT THE CASE EDGE.

1. Visually inspect the case edge to detect soot escapes (black part).



SHTS021271000062

Standard value: No soot escape

NO → **3. INSPECT THE DPR FILTER WITH THE DEDICATED CHECK PROBE.**

YES

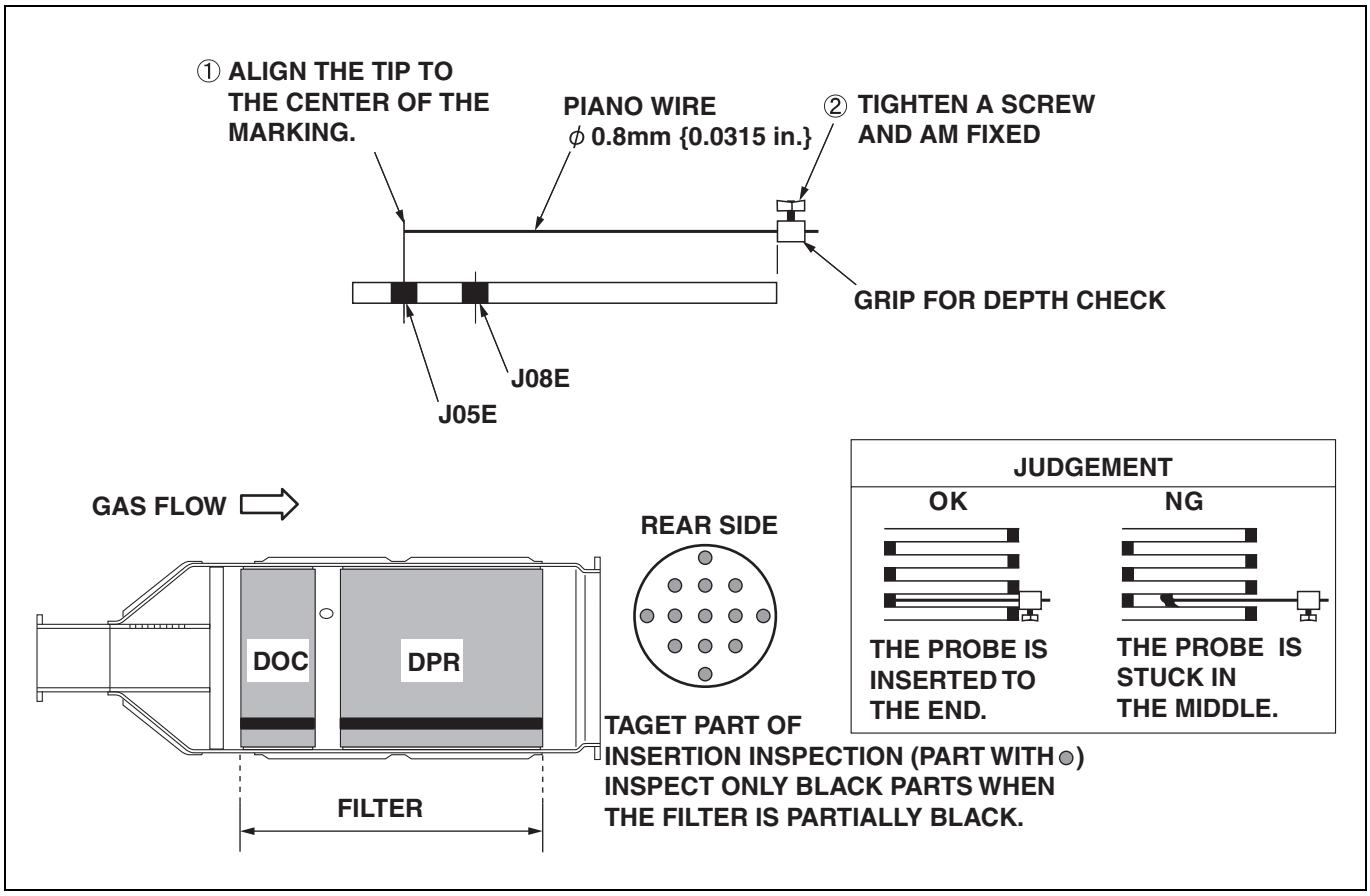
The DPR filter is normal.

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3	INSPECT THE DPR FILTER WITH THE DEDICATED CHECK PROBE.

1. Insert the check probe from the rear surface to inspect the inside.

SST: 09992-E4010
FILTER GAUGE ASSEMBLY



SHTS021271000063

Standard value: Insert the check probe to the specified position.

NO

Replace with a new DPR filter and install it on the vehicle.
Reference: EXHAUST (J05E), DPR CLEANER, REPLACEMENT, MOUNTING DPR CLEANER (Page 11-38)

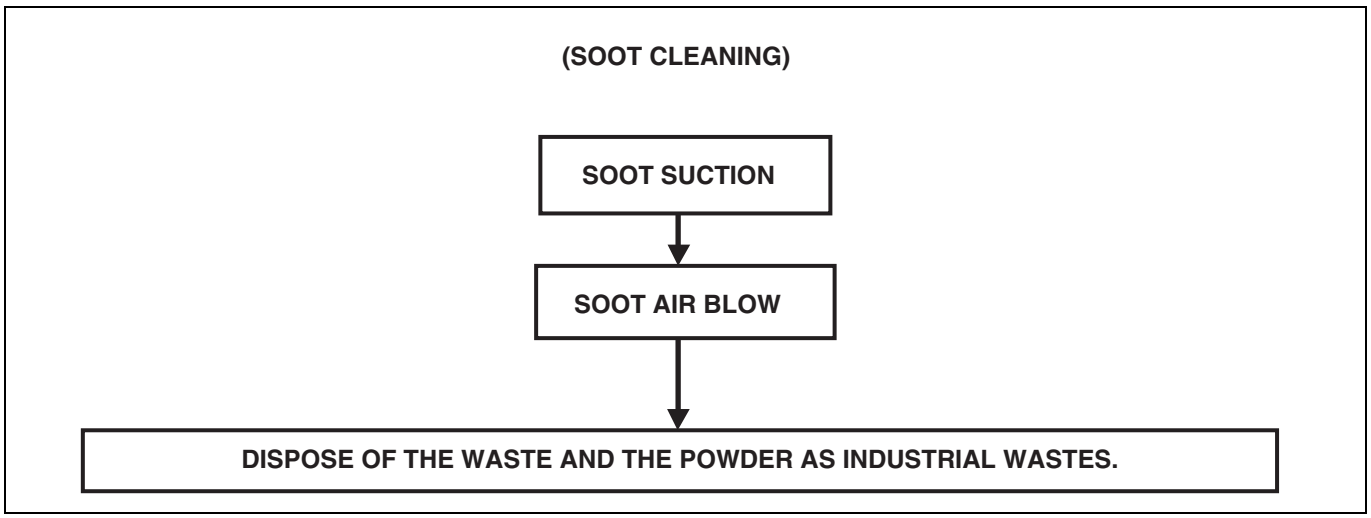
YES

Clean it and then install it on the vehicle.
Reference: EXHAUST (J05E), DPR CLEANER, REPLACEMENT, MOUNTING DPR CLEANER (Page 11-38)

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AIR CLEANING FLOW

EN01F02127100402002011



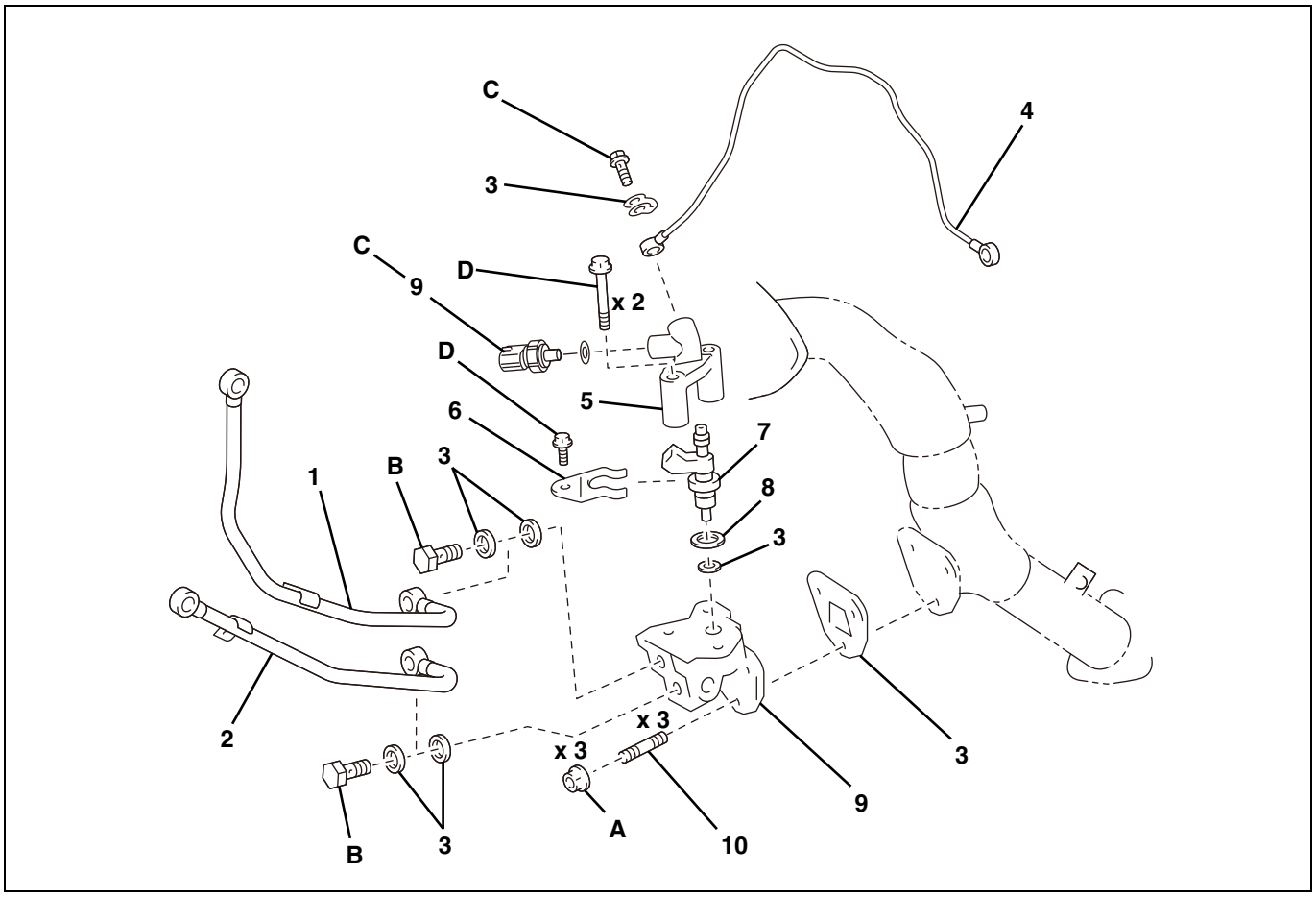
SHTS021271000064

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FUEL ADDITION VALVE

COMPONENT LOCATOR

EN01F02127100402035001



SHTS021271000065

1	Coolant pipe D	6	Nozzle clamp
2	Coolant pipe E	7	Fuel addition valve
3	Gasket *	8	O-ring *
4	Fuel feed pipe No.5	9	Folder
5	Fuel delivery	10	Stud Bolt

*: Nonreusable part

Tightening torque — Unit: N·m {kgf·cm, lbf·ft}

A	36 {367, 26.5}	C	19.6 {200, 14.5}
B	24.5 {250, 18.1}	D	28.5{290, 21.0}

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REPLACEMENT

EN01F02127100402035002

REMOVING THE FUEL ADDITION VALVE

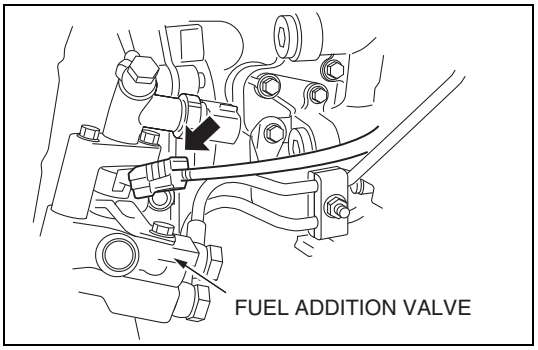
1. CAUTIONS

⚠ CAUTION
Perform replacement after cooling to prevent burns. (Turn the starter key to the "LOCK" position and leave it for at least 30 minutes as a guide.)

2. DRAINING THE COOLANT
Reference: COOLING (J05E), RADIATOR, REPLACEMENT, DRAINING THE COOLANT (Page 12-5)

3. DISCONNECTING THE HARNESS
(1) Disconnect the connector from the fuel addition valve.

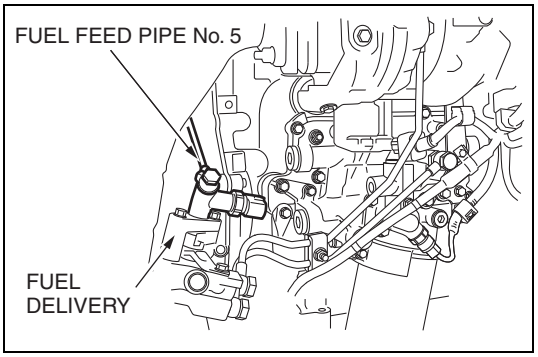
⚠ CAUTION
When disconnecting, do not apply excessive force to the connector on the fuel addition valve side. The connector may be damaged.



SHTS021271000066

4. DISCONNECTING PIPES
(1) Unfasten the union bolt to remove the fuel feed pipe No.5 and 2 gaskets from the fuel delivery.

NOTICE
Prepare the reservoir and waste to collect dripping fuel when disconnecting the pipe.



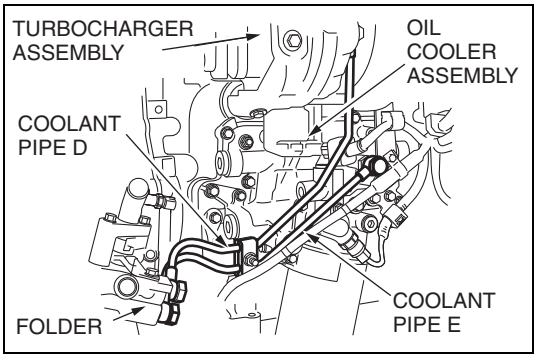
SHTS021271000067

(2) Remove the nut and then the clip.
(3) Unfasten the 2 union bolts to remove the coolant pipe D and 4 gaskets from the folder and turbocharger assembly.

NOTICE
Prepare the reservoir and clean clothes to collect dripping coolant when disconnecting the pipe.

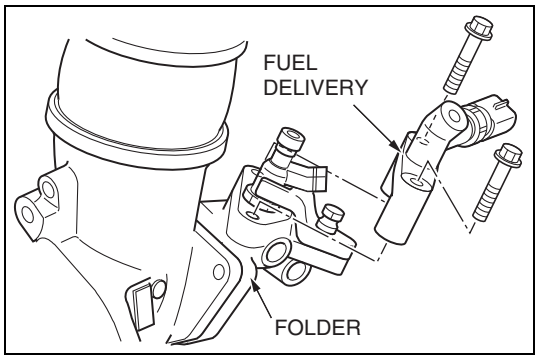
(4) Unfasten the 2 union bolts to remove the coolant pipe E and 4 gaskets from the folder and oil cooler assembly.

NOTICE
Prepare the reservoir and clean clothes to collect dripping coolant when disconnecting the pipe.



SHTS021271000068

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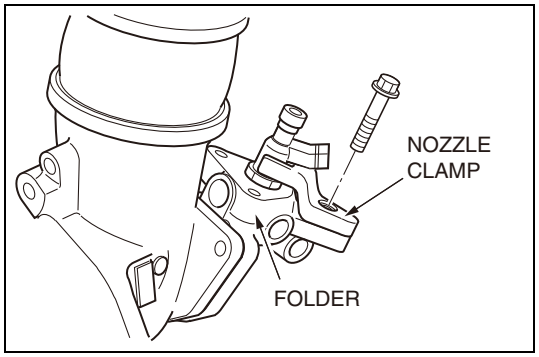
SHTS021271000069

5. REMOVING THE FUEL ADDITION VALVE

(1) Unfasten the bolts (2 pcs.) to remove the fuel delivery from the folder.

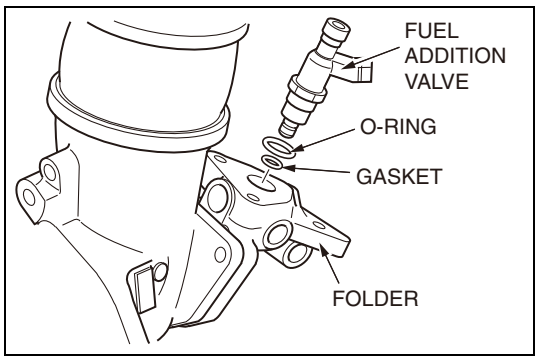
⚠ CAUTION

- **Do not allow the O-ring on the fuel addition valve to come off. If it came off, mount the O-ring following "How to mount the fuel addition valve O-ring".**
- **If it did not come off, it can be reused.**



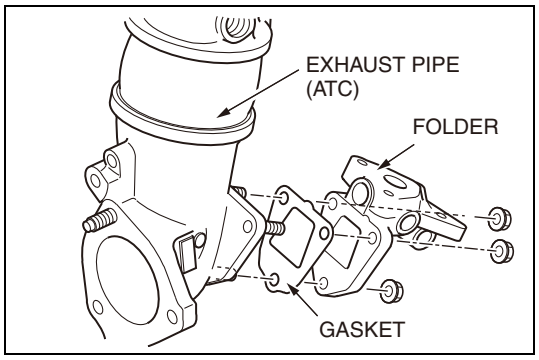
SHTS021271000070

(2) Unfasten the bolt to remove the nozzle clamp from the folder.



SHTS021271000071

(3) Remove the fuel addition valve, O-ring, and gasket from the folder.

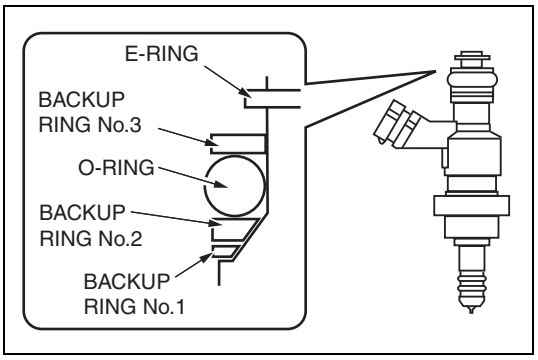


SHTS021271000072

(4) Unfasten the 3 nuts to remove the folder and gasket from the exhaust pipe (ATC).

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HOW TO MOUNT THE FUEL ADDITION VALVE O-RING



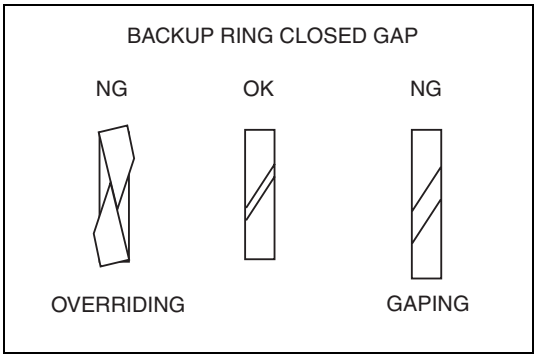
SHTS021271000073

1. MOUNTING THE FUEL ADDITION VALVE O-RING

(1) Replace with a new O-ring, backup ring, and E-ring and mount them as shown in the figure.

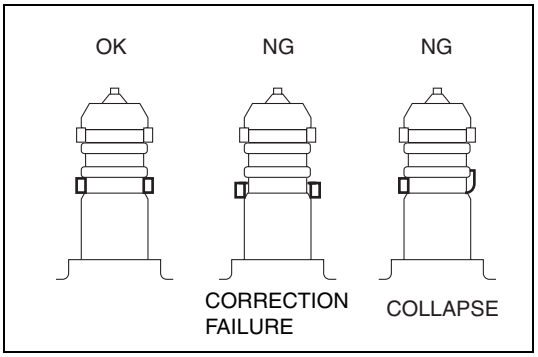
⚠ CAUTION

- **Mount the backup ring No.1 and No.2 paying attention to their directions.**
- **Mount the backup ring and O-ring in the right order.**



SHTS021271000074

- **Check the backup ring closed gap for overriding and gaping as shown in the figure.**



SHTS021271000075

2. CHECKING AFTER MOUNTING

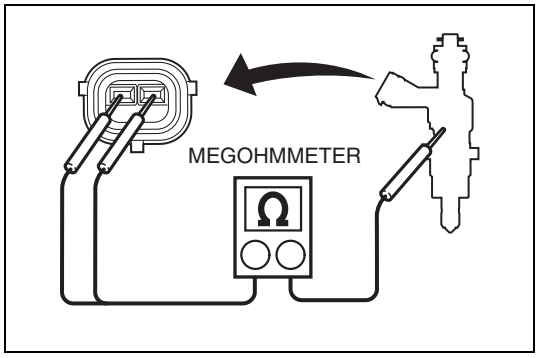
(1) After mounting the O-ring, backup ring, and E-ring to the fuel addition valve, check the seal for damage, collapse, and protrusion from the seal groove.

⚠ CAUTION

Check the O-ring groove of the fuel addition valve for foreign matter or damage.

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SINGLE UNIT INSPECTION



SHTS021271000076

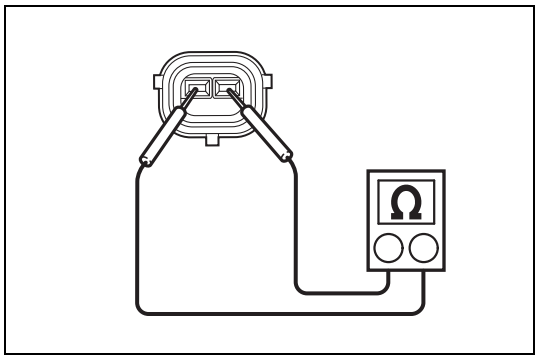
1. INSULATION RESISTANCE TEST

(1) Using the 500 V megohmmeter, measure the insulation resistance between the fuel addition valve upper body and connector (part side). Replace if the measurement reading exceeds the standard value.

Standard value (Room temperature)	**10MΩ or more (Using the 500 V megohmmeter)**

⚠ CAUTION

Never measure between the terminals, or the fuel addition valve will be damaged.



SHTS021271000077

2. RESISTANCE TEST BETWEEN TERMINALS

(1) Using the circuit tester, measure the resistance between the fuel addition valve terminals. Replace if the measurement reading exceeds the standard value.

Standard value (20°C {68°F})	**7.1-7.9Ω**

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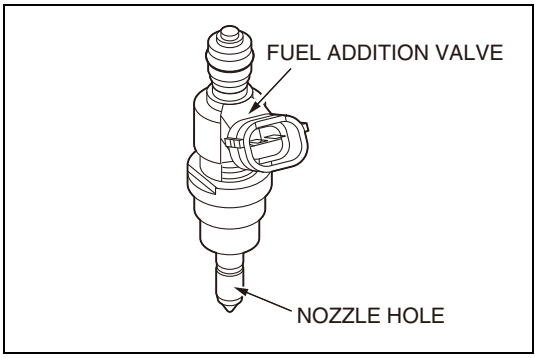
CLEANING CARBON

1. CLEANING CARBON

⚠ CAUTION

- **The carbon cleaner is alkali. Wear protective equipment (glasses, rubber gloves, and protective garment) to prevent it from contacting eyes, skin, and clothes.**
  If it should contact the skin, wash it off with running water immediately. If it should get into eyes, rinse thoroughly with running water and consult a physician.
- **Do not allow the carbon cleaner to adhere to the resin parts, terminals, and O-ring of the fuel addition valve. If adhered, immediately wipe it off.**

(1) Spray the carbon cleaner to the fuel addition valve nozzle hole.
SST: S0826-E3065
Carbon cleaner



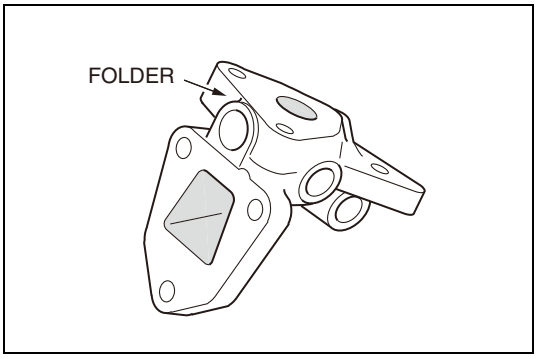
SHTS021271000078

⚠ CAUTION

- **Do not touch the nozzle hole with hands or wipe it with a waste.**
- **Do not apply excessive force or weight to the connector to avoid the risk of breakage.**

(2) Leave it for a while until carbon is dissolved and then blow it off by an air blower.

(3) Similarly, remove the carbon deposited inside the folder by air blowing after spraying the carbon cleaner.



SHTS021271000079

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MOUNTING THE FUEL ADDITION VALVE

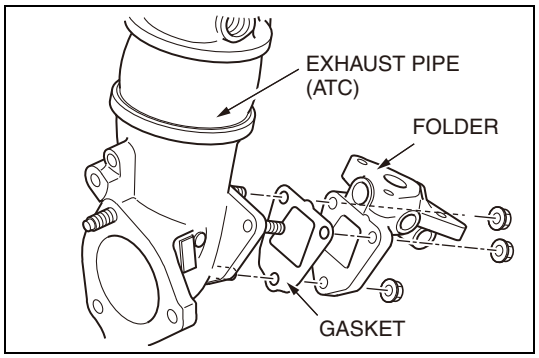
1. CAUTIONS

⚠ CAUTION

- **While working, do not allow dirt and water to enter the parts.**
- **Before mounting parts, make sure that there is no dirt on the connection between them.**
- **Air enters the fuel pipe in the process of mounting the pre-fuel filter case. After mounting is completed, thoroughly purge air from the fuel pipe.**

2. MOUNTING THE FUEL ADDITION VALVE

(1) Replace with a new gasket and mount the folder to the exhaust pipe (ATC) with 3 nuts.
Tightening Torque:
36 N·m {367 kgf·cm, 26.5 lbf·ft}

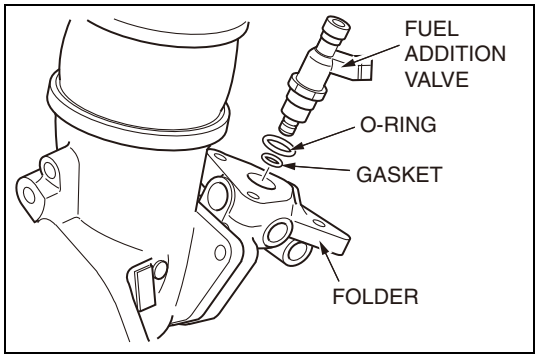


SHTS021271000080

(2) Replace with a new O-ring and gasket and mount the fuel addition valve to the folder.

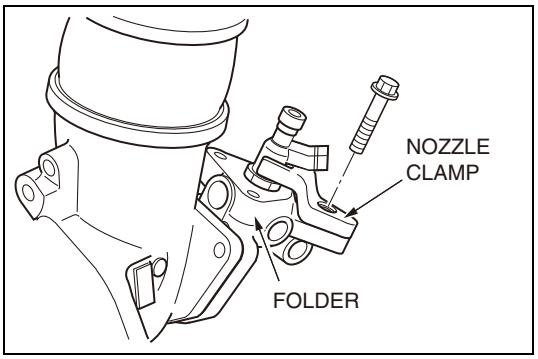
⚠ CAUTION

- **Apply engine oil to the O-ring. Use care not to get the O-ring jammed when inserting.**
- **Do not apply excessive force or weight to the connector to avoid the risk of breakage.**
- **Check the O-ring seal for dirt before mounting.**



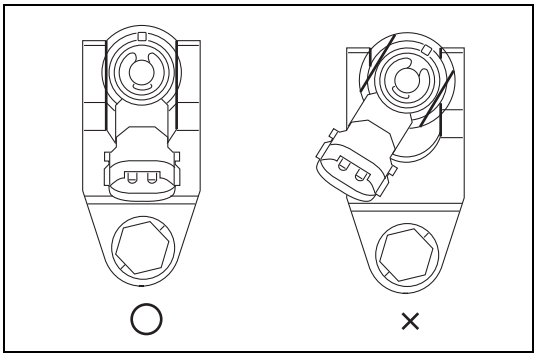
SHTS021271000081

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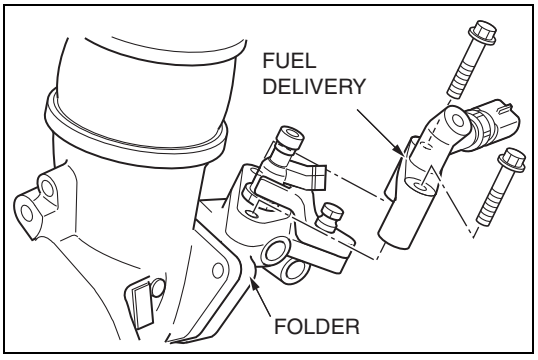
SHTS021271000082

(3) Mount the nozzle clamp to the folder with the bolt.
Tightening Torque:
28.5 N·m {290 kgf·cm, 21.0 lbf·ft}



SHTS021271000083

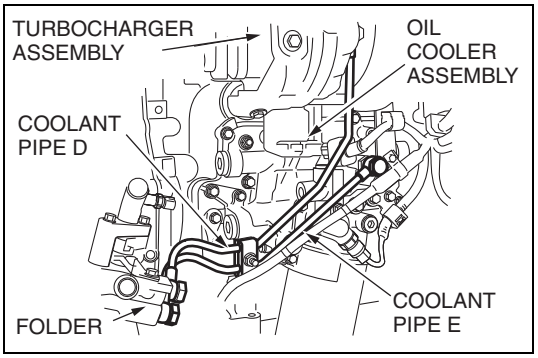
⚠ CAUTION
- **When mounting the nozzle clamp to the folder, align the nozzle clamp with the fuel addition valve groove.**
- **If the nozzle clamp is mounted without aligning with the fuel addition valve, it cannot be reused.**



SHTS021271000084

(4) Mount the fuel delivery to the folder with the bolts (2 pcs.).
Tightening Torque:
28.5 N·m {290 kgf·cm, 21.0 lbf·ft}

⚠ CAUTION
- **Apply engine oil to the O-ring. Use care not to get the O-ring jammed when inserting the fuel delivery.**
- **Check the O-ring seal for dirt before mounting.**



SHTS021271000085

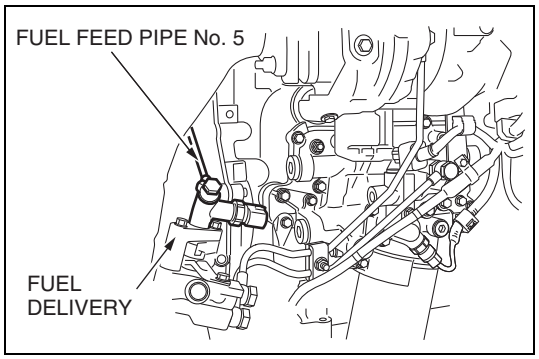
3. CONNECTING PIPES

(1) Replace with 4 new gaskets and connect the coolant pipe E to the folder and oil cooler assembly with 2 union bolts.
Tightening Torque:
24.5 N·m {250 kgf·cm, 18.1 lbf·ft}

(2) Replace with 4 new gaskets and connect the coolant pipe D to the folder and turbocharger assembly with 2 union bolts.
Tightening Torque:
24.5 N·m {250 kgf·cm, 18.1 lbf·ft}

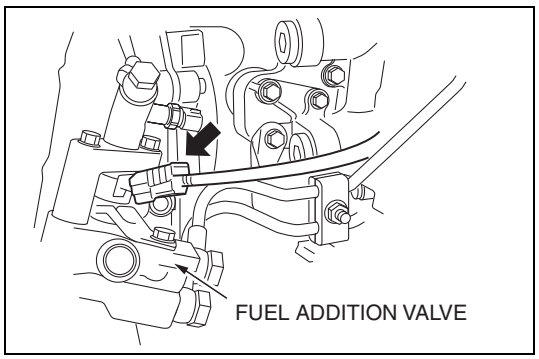
(3) Mount the clip with the nut and secure the coolant pipe D and coolant pipe E.

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SHTS021271000086

(4) Replace with 2 new gaskets and connect the fuel feed pipe No.5 to the fuel delivery with the union bolt.
Tightening Torque:
19.6 N·m {200 kgf·cm, 14.5 lbf·ft}



SHTS021271000087

4. CONNECTING THE HARNESS

(1) Connect the connector to the fuel addition valve.

⚠ CAUTION

- **Before inserting the connector, check that there are no spark traces on the terminals.**
- **When connecting, do not apply excessive force to the connector on the fuel addition valve side. The connector may be damaged.**

5. ADDING THE COOLANT

Reference: COOLING (J05E), RADIATOR, REPLACEMENT, ADDING THE COOLANT (Page 12-13)

6. AIR BLEEDING OF FUEL SYSTEM

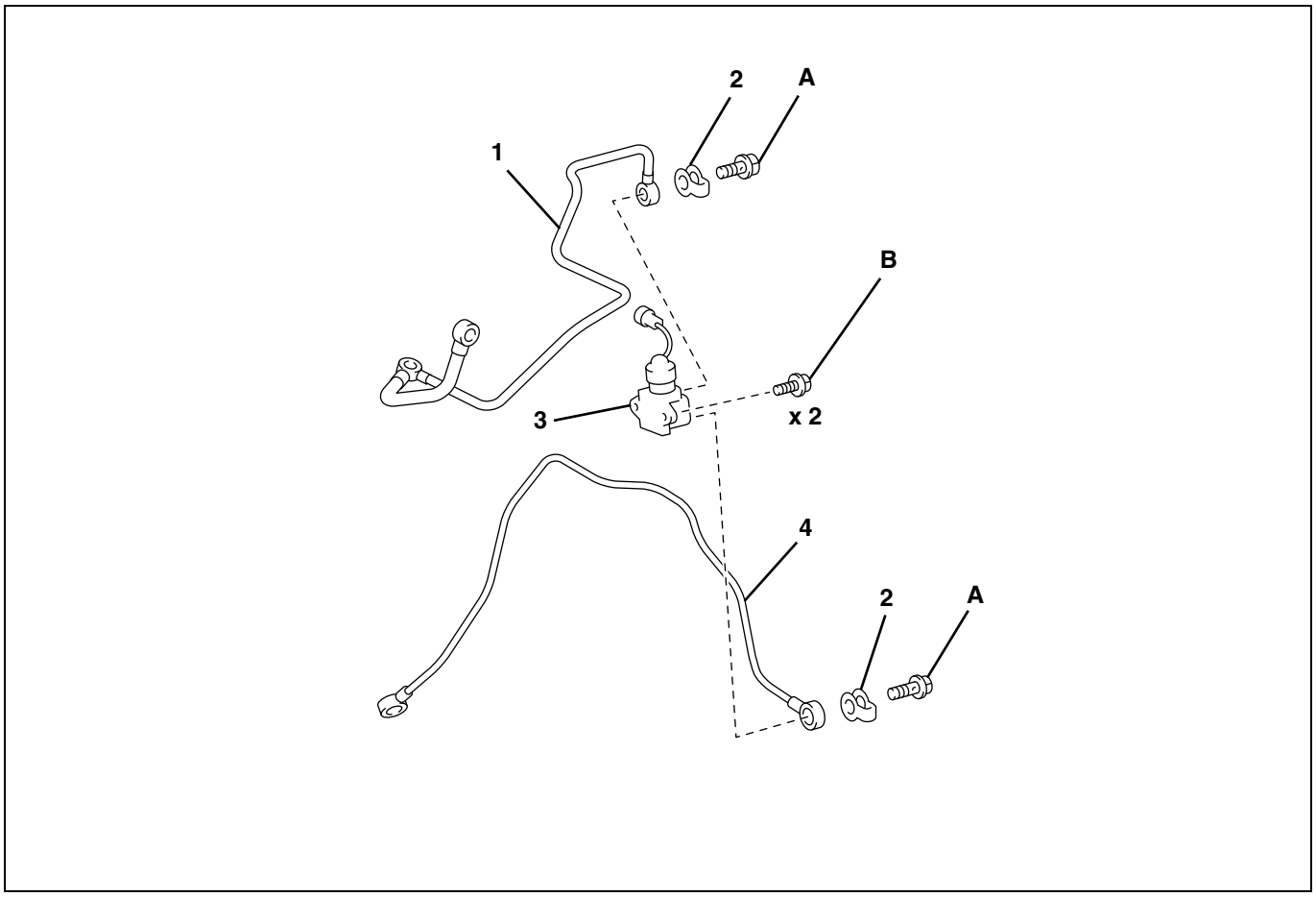
Reference: FUEL SYSTEM (J05E), FUEL FILTER AND CASE (ENGINE SIDE), REPLACEMENT, AIR BLEEDING OF FUEL SYSTEM (Page 7-16)

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FUEL CUTOFF VALVE

COMPONENT LOCATOR

EN01F02127100402037001



SHTS021271000088

1	Fuel feed pipe No.3	3	Fuel cutoff valve
2	Gasket *	4	Fuel feed pipe No.5

*: Nonreusable part

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

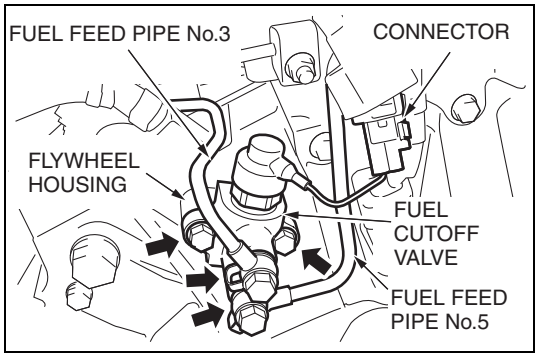
A	19.6 {200, 14.5}	B	28.5{290, 21.0}

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REPLACEMENT

EN01F02127100402037002

REMOVING THE FUEL CUTOFF VALVE



SHTS021271000089

1. DISCONNECTING THE HARNESS

(1) Disconnect the connector from the fuel cutoff valve.

2. DISCONNECTING PIPES

(1) Unfasten the 2 union bolts to disconnect the fuel feed pipe No.3, fuel feed pipe No.5, and 2 gaskets from the fuel cutoff valve.

NOTICE

Prepare the reservoir and waste to collect dripping fuel when disconnecting the pipe.

3. REMOVING THE FUEL CUTOFF VALVE

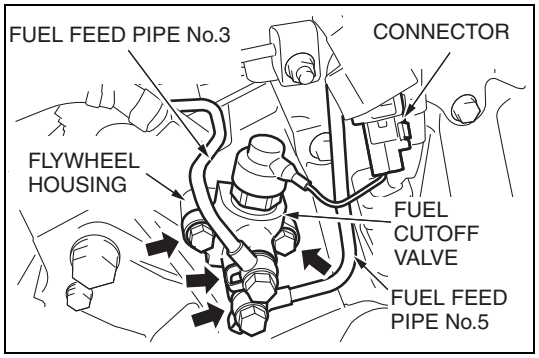
(1) Unfasten the bolts (2 pcs.) to remove the fuel cutoff valve from the flywheel housing.

MOUNTING THE FUEL CUTOFF VALVE

1. CAUTIONS

⚠ CAUTION

- **While working, do not allow dirt and water to enter the parts.**
- **Before mounting parts, make sure that there is no dirt on the connection between them.**
- **Air enters the fuel pipe in the process of mounting the pre-fuel filter case. After mounting is completed, thoroughly purge air from the fuel pipe.**



SHTS021271000090

2. MOUNTING THE FUEL CUTOFF VALVE

(1) Mount the fuel cutoff valve to the flywheel housing with the bolts (2 pcs.).
Tightening Torque:
28.5 N·m {290 kgf·cm, 21.0 lbf·ft}

3. CONNECTING PIPES

(1) Replace with 2 new gaskets and connect the fuel feed pipe No.3 and fuel feed pipe No.5 to the fuel cutoff valve with 2 union bolts.
Tightening Torque:
19.6 N·m {200 kgf·cm, 14.5 lbf·ft}

⚠ CAUTION

Before mounting the parts, check the joints for dirt.

4. CONNECTING THE HARNESS

(1) Connect the connector to the fuel cutoff valve.

5. AIR BLEEDING OF FUEL SYSTEM

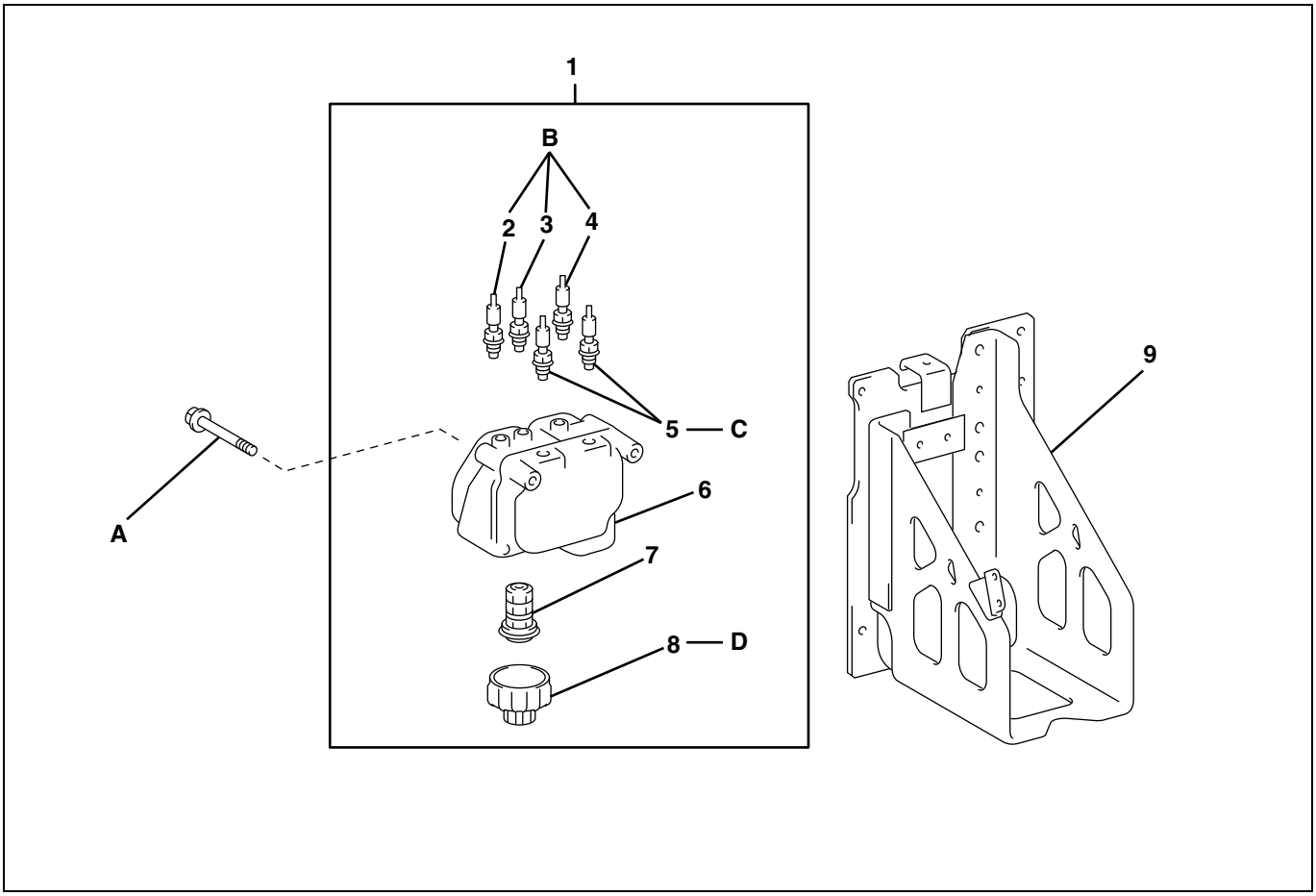
Reference: FUEL SYSTEM (J05E), FUEL FILTER AND CASE (ENGINE SIDE), REPLACEMENT, AIR BLEEDING OF FUEL SYSTEM (Page 7-16)

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DEF PUMP

COMPONENT LOCATOR

EN01F02127100402054001



SHTS021271000091

1	DEF pump assembly	6	DEF pump
2	Outlet connector *	7	Filter
3	Backflow connector *	8	Filter cover
4	Inlet connector *	9	Tank bracket
5	Coolant connector *		

*: Nonreusable part

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	15.2-22.8 {155-232, 11.2-16.8}	C	5-6 {51-61, 3.7-4.4}
B	4-5 {41-51, 2.9-3.7}	D	15-25 {153-255, 11.1-18.4}

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REPLACEMENT

EN01F02127100402054002

REPLACING THE FILTER

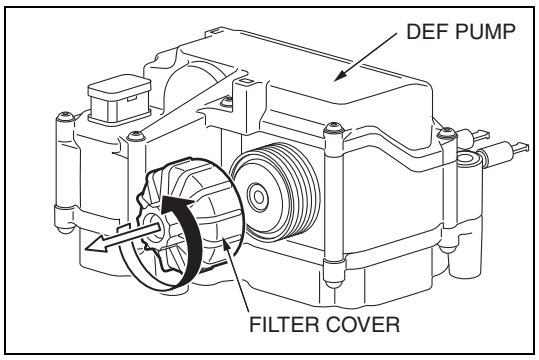
1. CAUTIONS

⚠ CAUTION
After-run (DEF drawn back to the DEF tank) is performed after the starter key is turned to "LOCK" and the muffler temperature drops. Before starting work, wait for at least 10 minutes after turning the starter key to "LOCK."

2. REMOVING THE FILTER

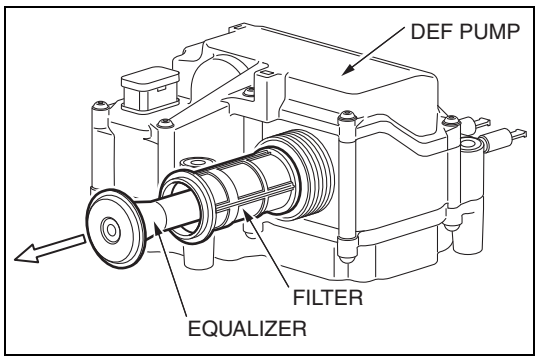
(1) Turn the filter cover counterclockwise using the 27 mm {1.06 in.} box (dodecagon) to remove it from the DEF pump.

⚠ CAUTION
Prepare the reservoir and waste to collect dripping DEF when removing the fuel cover.



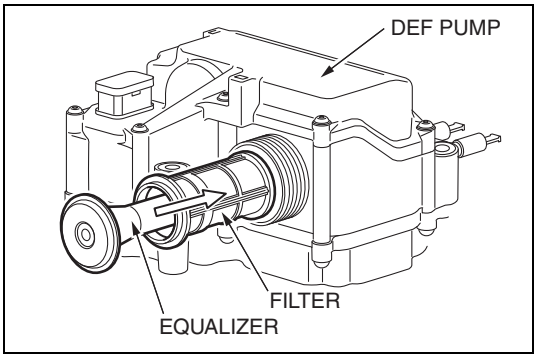
SHTS021271000092

(2) Remove the filter and equalizer from the DEF pump.



SHTS021271000093

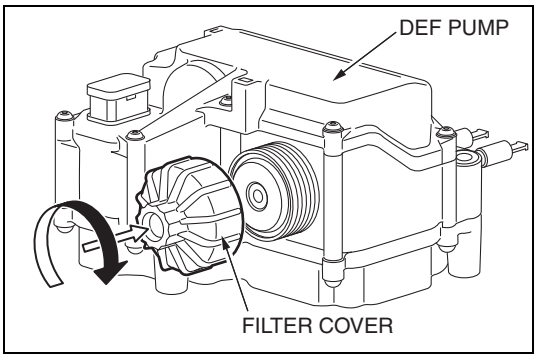
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SHTS021271000094

3. MOUNTING THE FILTER

(1) Replace with a new filter and equalizer and mount them to the DEF pump.



SHTS021271000095

(2) Turn the filter cover clockwise using a 27 mm {1.06 in.} box (dodecagon) to mount it to the DEF pump.
Tightening Torque:
15-25 N·m {153-255 kgf·cm, 11.1-18.4 lbf·ft}

REMOVING THE DEF PUMP

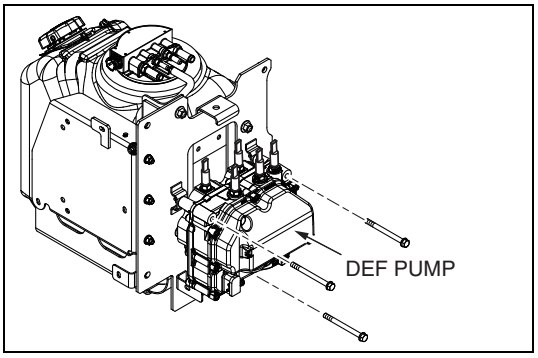
1. CAUTIONS

⚠ CAUTION
After-run (DEF drawn back to the DEF tank) is performed after the starter key is turned to "LOCK" and the muffler temperature drops. Before starting work, wait for at least 10 minutes after turning the starter key to "LOCK."

2. REMOVING THE DEF TANK ASSEMBLY
Reference: EXHAUST (J05E), DEF TANK, REPLACEMENT, REMOVING THE DEF TANK ASSEMBLY (Page 11-79)

3. REMOVING THE DEF PUMP

(1) Unfasten the bolts (3 pcs.) to remove the DEF pump from the tank bracket.

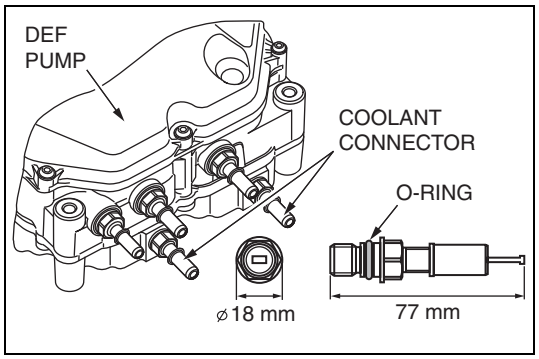


SHTS021271000096

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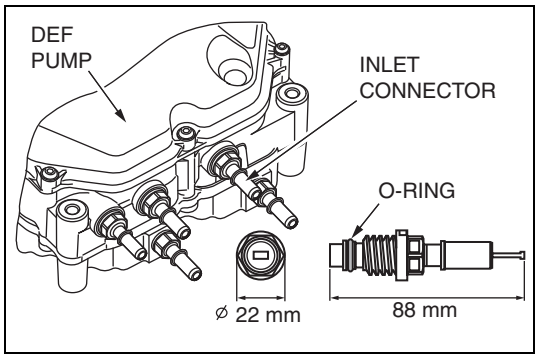
4. DISCONNECTING THE CONNECTOR

(1) Disconnect the 2 coolant connectors from the DEF pump using a 15 mm {0.59 in.} spanner.



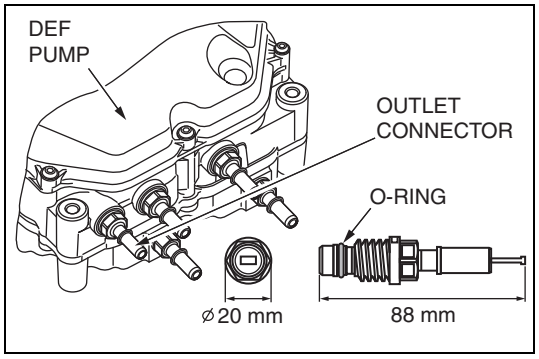
SHTS021271000097

(2) Disconnect the inlet connector from the DEF pump using a 17 mm {0.67 in.} spanner.



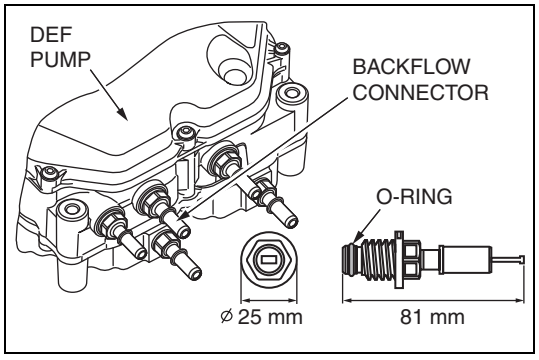
SHTS021271000098

(3) Disconnect the outlet connector from the DEF pump using a 17 mm {0.67 in.} spanner.



SHTS021271000099

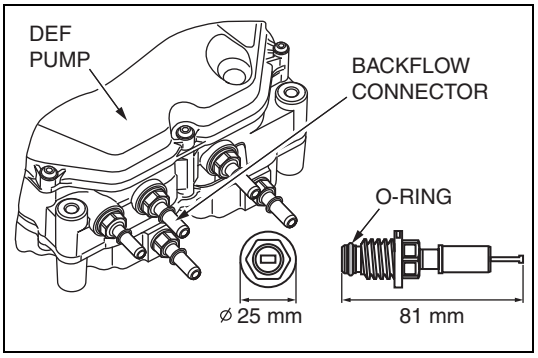
(4) Disconnect the backflow connector from the DEF pump using a 17 mm {0.67 in.} spanner.



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MOUNTING THE DEF PUMP



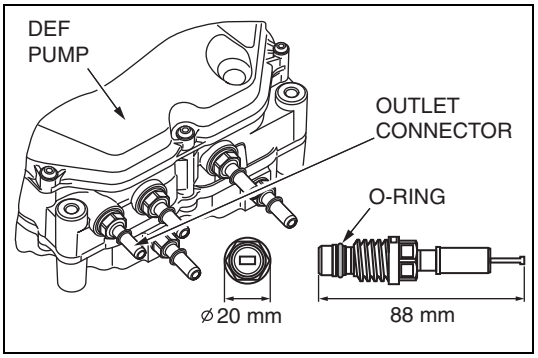
SHTS021271000101

1. CONNECTING THE CONNECTOR

(1) Apply Mobil Velocite Oil No.6 to the O-ring of the backflow connector.

(2) Connect the backflow connector to the DEF pump using a 17 mm {0.67 in.} spanner.
Tightening Torque:
4-5 N·m {41-51 kgf·cm, 2.9-3.7 lbf·ft}

⚠ CAUTION
Be careful not to get crystallized DEF jammed.

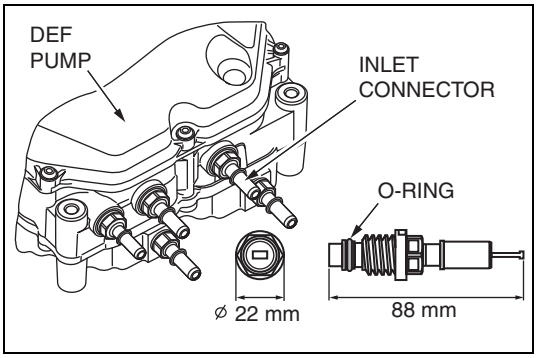


SHTS021271000102

(3) Apply Mobil Velocite Oil No.6 to the O-ring of the outlet connector.

(4) Connect the outlet connector to the DEF pump using a 17 mm {0.67 in.} spanner.
Tightening Torque:
4-5 N·m {41-51 kgf·cm, 2.9-3.7 lbf·ft}

⚠ CAUTION
Be careful not to get crystallized DEF jammed.

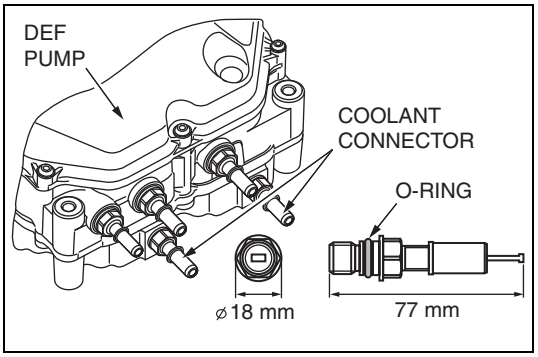


SHTS021271000103

(5) Apply Mobil Velocite Oil No.6 to the O-ring of the inlet connector.

(6) Connect the inlet connector to the DEF pump using a 17 mm {0.67 in.} spanner.
Tightening Torque:
4-5 N·m {41-51 kgf·cm, 2.9-3.7 lbf·ft}

⚠ CAUTION
Be careful not to get crystallized DEF jammed.

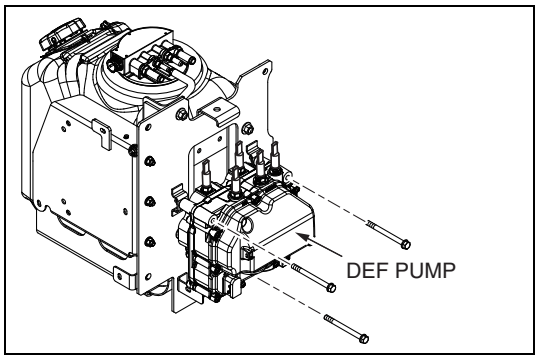


SHTS021271000104

(7) Apply Mobil Velocite Oil No.6 to the O-ring of the coolant connector.

(8) Connect the coolant connector to the DEF pump using a 15 mm {0.59 in.} spanner.
Tightening Torque:
5-6 N·m {51-61 kgf·cm, 3.7-4.4 lbf·ft}

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SHTS021271000105

2. MOUNTING THE DEF PUMP

(1) Mount the DEF pump to the tank bracket with the bolts (3 pcs.).
Tightening Torque:
15.2-22.8 N·m {155-232 kgf·cm, 11.2-16.8 lbf·ft}

3. MOUNTING THE DEF TANK ASSEMBLY

Reference: EXHAUST (J05E), DEF TANK, REPLACEMENT, MOUNTING THE DEF TANK ASSEMBLY (Page 11-81)

4. ADDING THE COOLANT

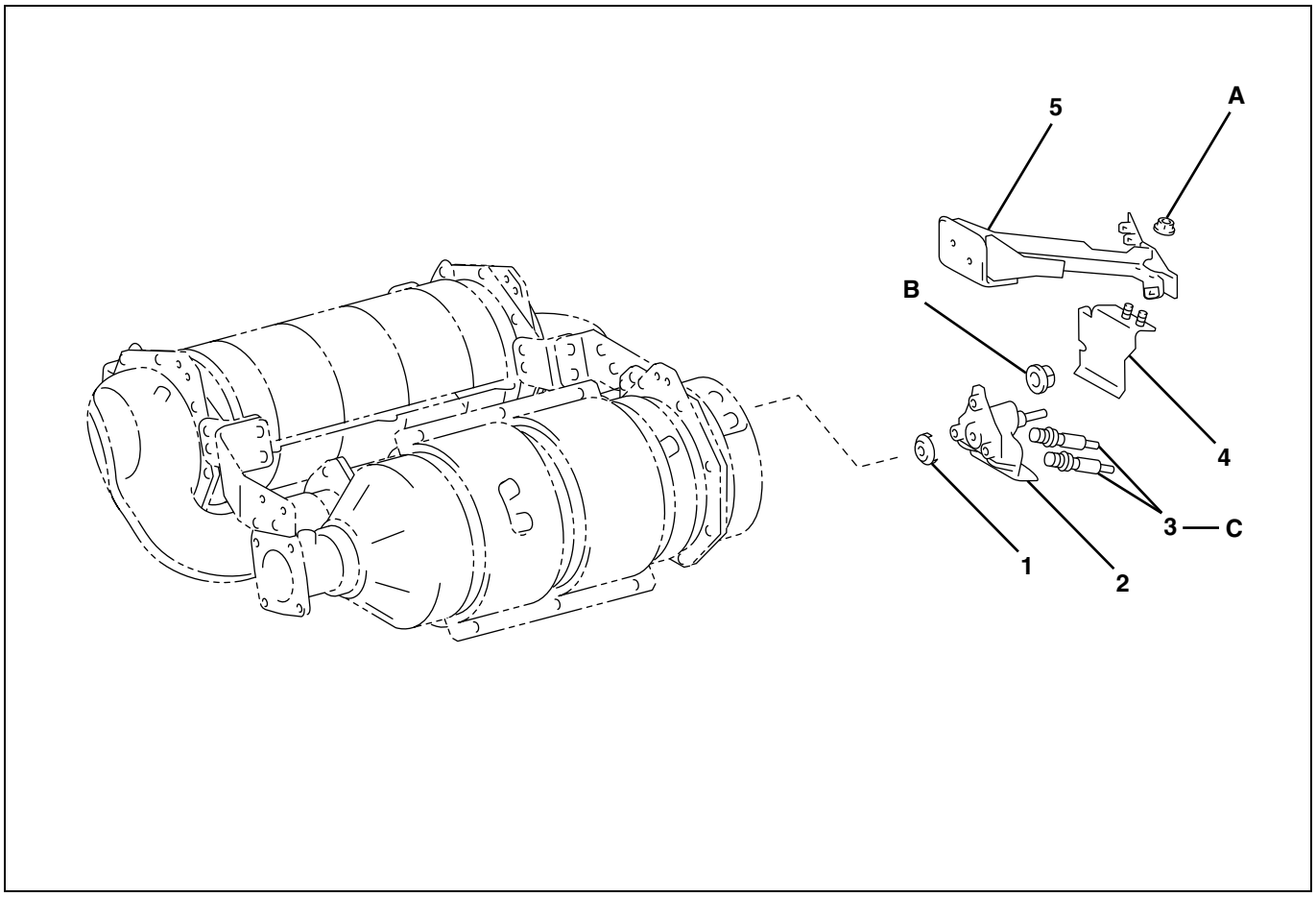
(1) Inspect the coolant level and if insufficient, pour coolant.
Reference: COOLING (J05E), RADIATOR, REPLACEMENT, ADDING THE COOLANT (Page 12-13)

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DEF INJECTOR

COMPONENT LOCATOR

EN01F02127100402055001



SHTS021271000106

1	Gasket *	4	Hose bracket
2	DEF injector	5	Hose protector
3	Coolant connector *		

*: Nonreusable part

Tightening torque — Unit: N·m {kgf·cm, lbf·ft}

A	31 {316, 22.9}	C	5-6 {51-61, 3.7-4.4}
B	6-10 {61-102, 4.4-7.4}		

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REPLACEMENT

EN01F02127100402055002

REMOVING THE DEF INJECTOR

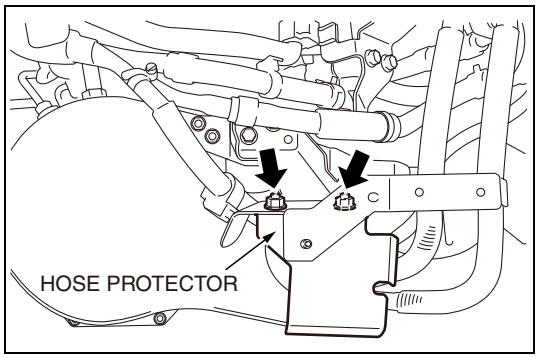
1. CAUTIONS

⚠ CAUTION

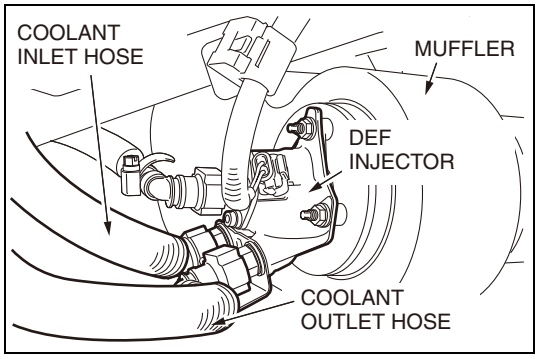
- **Perform replacement after cooling to prevent burns. (Turn the starter key to the "LOCK" position and leave it for more than 30 minutes to cool.)**
- **After-run (DEF drawn back to the DEF tank) is performed after the starter key is turned to "LOCK" and the muffler temperature drops. Before starting work, wait for at least 10 minutes after turning the starter key to "LOCK."**

2. REMOVING THE HOSE PROTECTOR

(1) Unfasten the 2 nuts to remove the hose protector.



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SHTS021271000108

3. DISCONNECTING THE HOSE

⚠ CAUTION

Refer to "Cautions on DEF/coolant piping attaching and detaching".

Reference: EXHAUST (J05E), DEF-SCR & DPR, CAUTIONS ON DEF/COOLANT PIPING ATTACHING AND DETACHING (Page 11-20)

(1) Disconnect the coolant inlet hose and coolant outlet hose from the DEF injector.

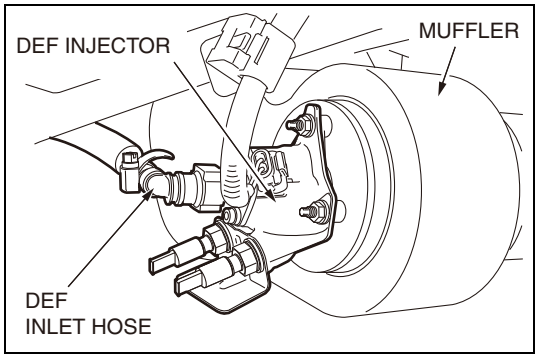
NOTICE

- **Prepare the reservoir and clean clothes to collect dripping coolant when disconnecting the hose.**
- **Block with vice clip to prevent coolant outflow from the hose.**
- **Mount the protection cap to the DEF injector.**

(2) Disconnect the DEF inlet hose from the DEF injector.

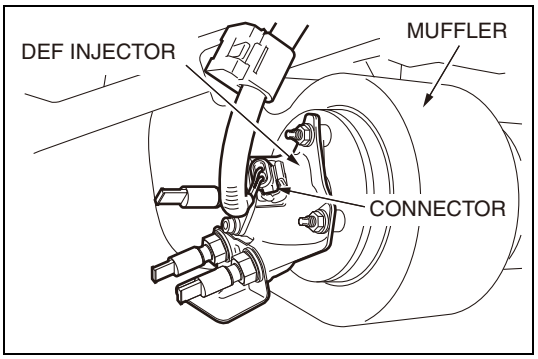
NOTICE

- **Prepare a reservoir and waste to collect dripping DEF when disconnecting the hose.**
- **Mount the protection cap to the DEF injector.**



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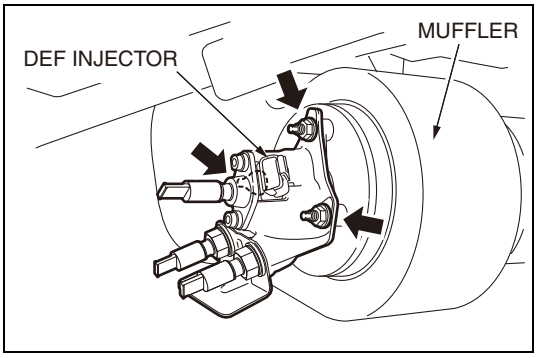
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SHTS021271000110

4. DISCONNECTING THE HARNESS

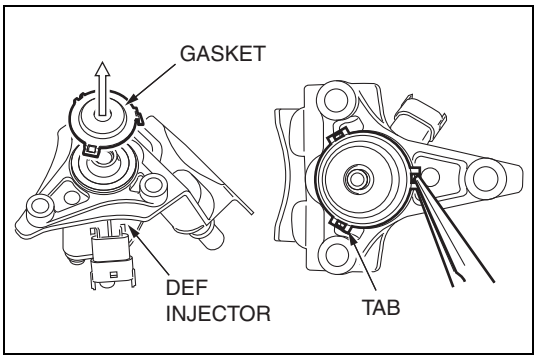
(1) Disconnect the connector from the DEF injector.



SHTS021271000111

5. REMOVING THE DEF INJECTOR

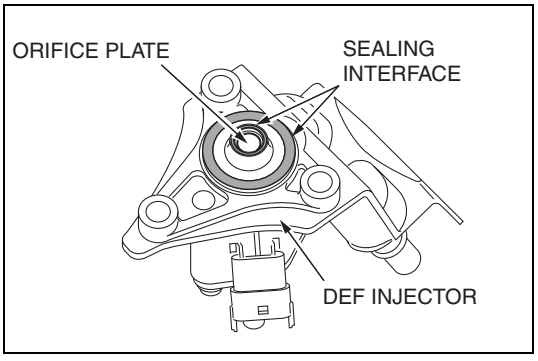
(1) Unfasten the 3 nuts to remove the DEF injector from the muffler.



SHTS021271000112

(2) Lift the tabs (3 places) of the gasket with pliers and remove the gasket from the DEF injector.

⚠ CAUTION
Do not use a pliers with sharp end.



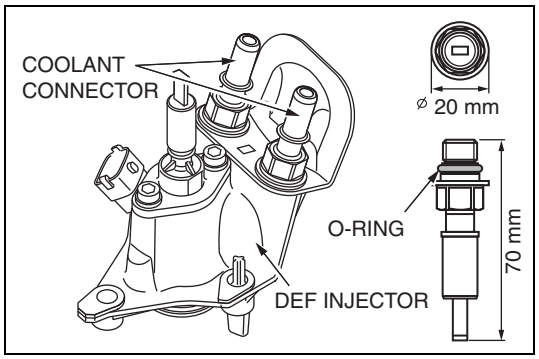
SHTS021271000113

(3) Clean the surface of the DEF injector sealing interface.

⚠ CAUTION

- **Pay attention not to scratch the sealing interface surface.**
- **Do not touch the orifice plate.**

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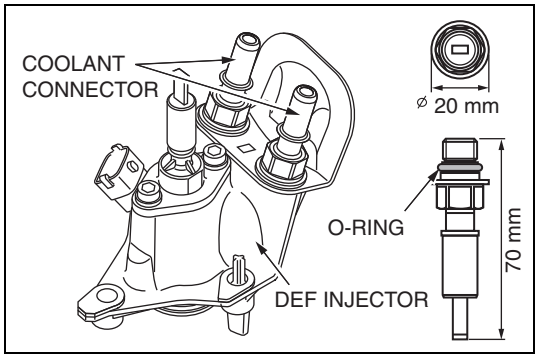


SHTS021271000114

6. DISCONNECTING THE CONNECTOR

(1) Disconnect the 2 coolant connectors from the DEF injector using a 15 mm spanner.

MOUNTING THE DEF INJECTOR

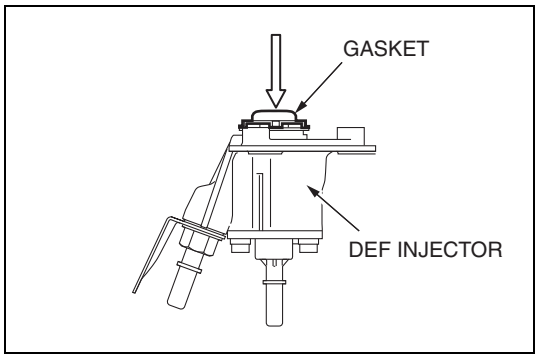


SHTS021271000115

1. CONNECTING THE CONNECTOR

(1) Apply Mobil Velocite Oil No.6 to the O-ring of the coolant connector.

(2) Connect the coolant connector to the DEF injector using a 15 mm spanner.
Tightening Torque:
5-6 N·m {51-61 kgf·cm, 3.7-4.4 lbf·ft}



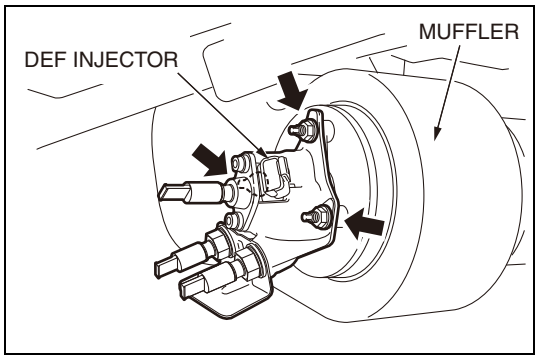
SHTS021271000116

2. MOUNTING THE DEF INJECTOR

(1) Replace with a new gasket and mount the gasket by placing and pressing on the sealing interface.

⚠ CAUTION

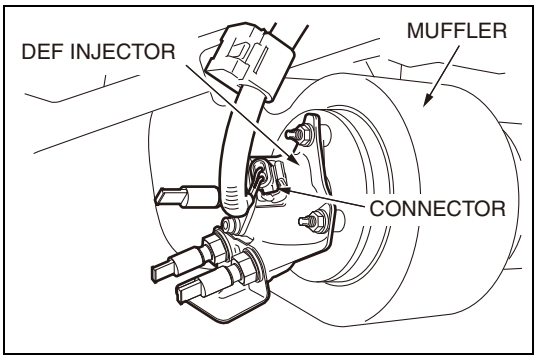
- **The gasket is nonreusable because of the deformation of tabs.**
- **Pay attention not to scratch the gasket.**
- **Check that the tabs (3 places) of the gasket are engaged with the tabs of the DEF injector.**



SHTS021271000117

(2) Mount the DEF injector to the muffler with 3 nuts.
Tightening Torque:
6-10 N·m {61-102 kgf·cm, 4.4-7.4 lbf·ft}

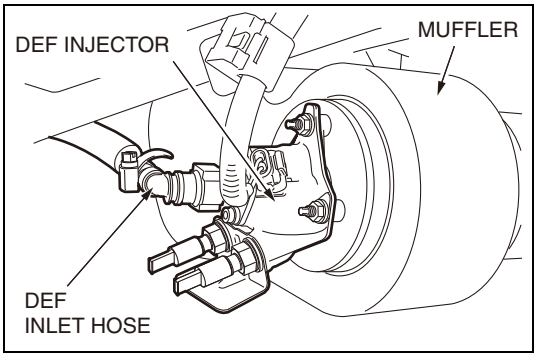
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SHTS021271000118

3. CONNECTING THE HARNESS

(1) Connect the connector to the DEF injector.



SHTS021271000119

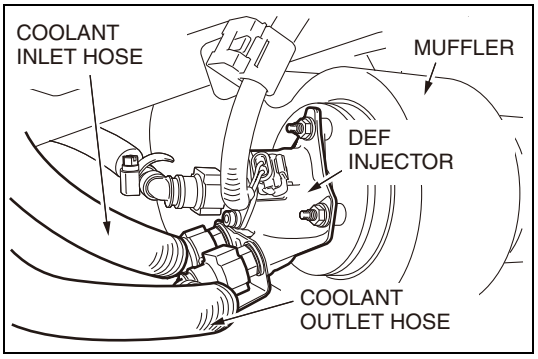
4. CONNECTING THE HOSE.

⚠ CAUTION

Refer to "Cautions on DEF/coolant piping attaching and detaching".

Reference: EXHAUST (J05E), DEF-SCR & DPR, CAUTIONS ON DEF/COOLANT PIPING ATTACHING AND DETACHING (Page 11-20)

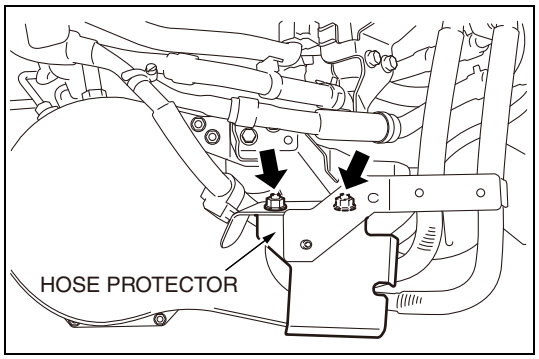
(1) Connect the DEF inlet hose to the DEF injector.



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(2) Connect the coolant inlet hose and coolant outlet hose to the DEF injector.

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5. MOUNTING THE HOSE PROTECTOR

(1) Mount the hose protector to the hose bracket with 2 nuts.
Tightening Torque:
31 N·m {316 kgf·cm, 22.9 lbf·ft}

6. ADDING THE COOLANT

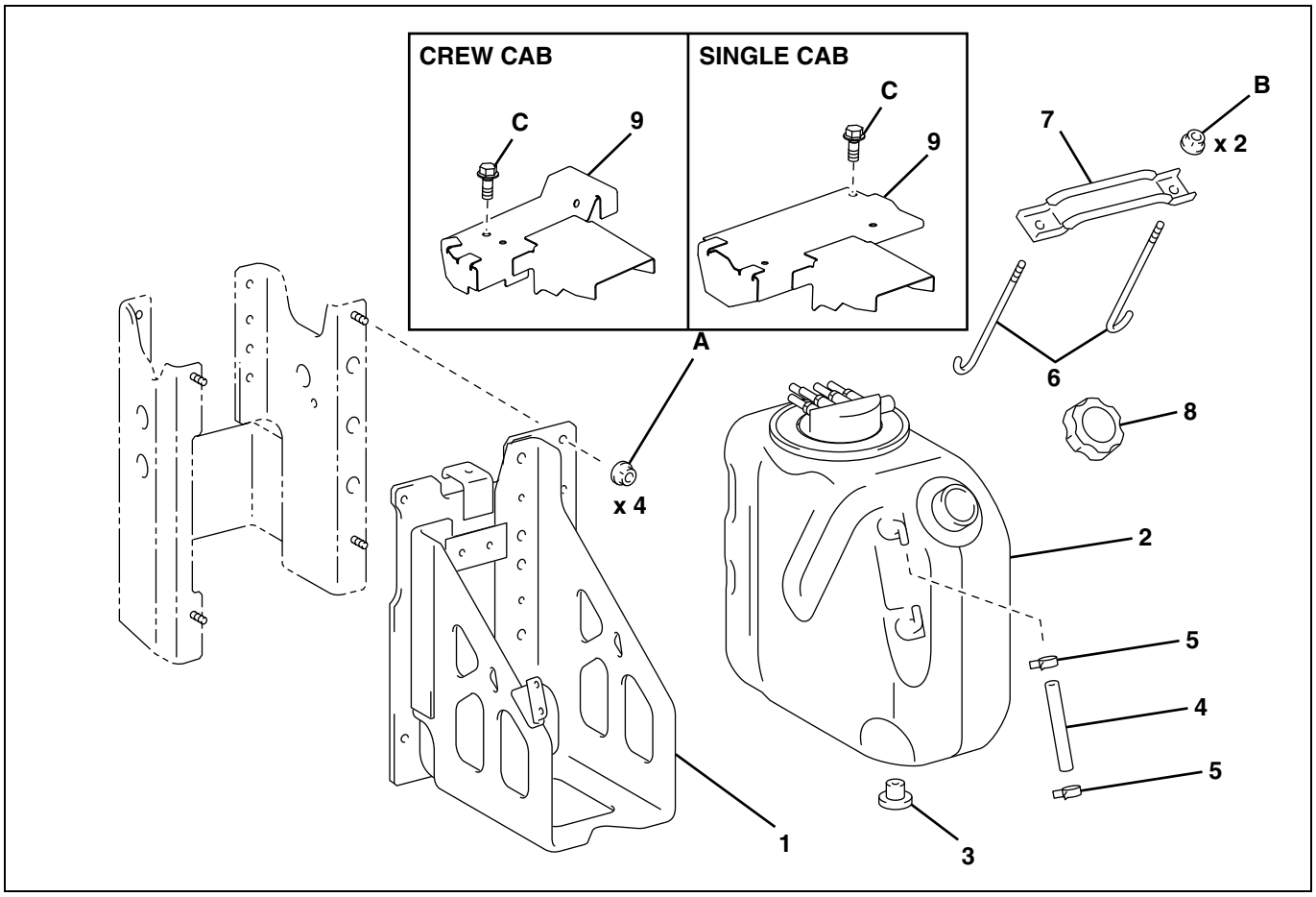
(1) Inspect the coolant level and if insufficient, pour coolant.
Reference: COOLING (J05E), RADIATOR, REPLACEMENT, ADDING THE COOLANT (Page 12-13)

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DEF TANK

COMPONENT LOCATOR

EN01F02127100402056001



SHTS021271000122

1	Tank bracket	6	J-bolt
2	DEF tank	7	Tank band
3	Drain plug	8	Filler cap
4	Water level gauge	9	DEF tank cover
5	Clamp		

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	38.4-57.6 {392-587, 28.3-42.5}	C	32 {326, 23.6}
B	23.5-36.5 {240-372, 17.3-26.9}		

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INSPECTION

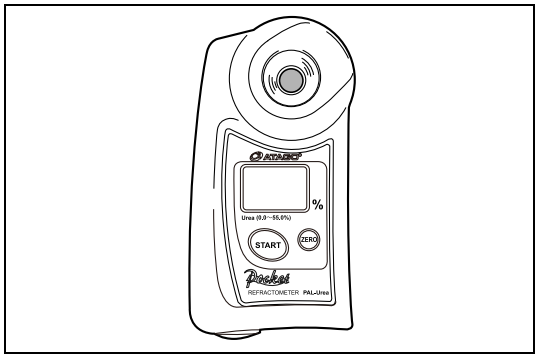
EN01F02127100402056002

INSPECTING DEF CONCENTRATION

1. CAUTIONS

⚠ CAUTION
There are 3 inspection methods for DEF; DEF analyzer inspection, pH test paper inspection, and refractive index measurement inspection. Use one method from three for inspection.

2. DEF ANALYZER INSPECTION

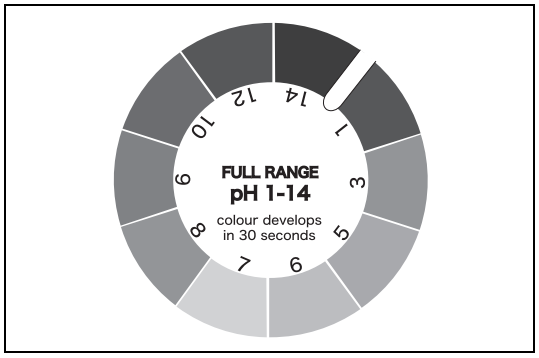


SHTS021271000123

(1) Extract the DEF and put a few drops on the DEF analyzer to measure DEF concentration. Replace the DEF if the measurement reading exceeds the standard value.

Standard value (%)	32.5

3. PH TEST PAPER INSPECTION

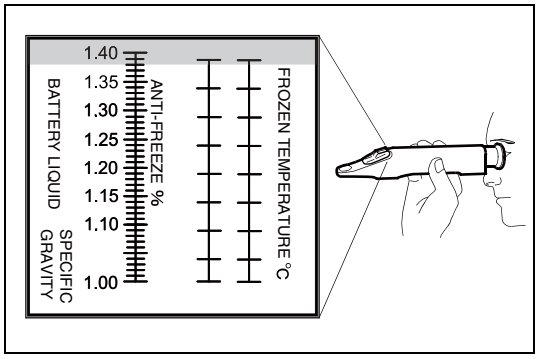


SHTS021271000124

(1) Extract the DEF and put a few drops on the pH test paper to check color change. Replace the DEF if the measurement reading exceeds the standard value.

Concentration (%)	Standard value (number)
32.5	9

4. REFRACTIVE INDEX MEASUREMENT INSPECTION



SHTS021271000125

(1) Extract the DEF and put a few drops on the refractometer to measure refractive index. Replace the DEF if the measurement reading exceeds the standard value.

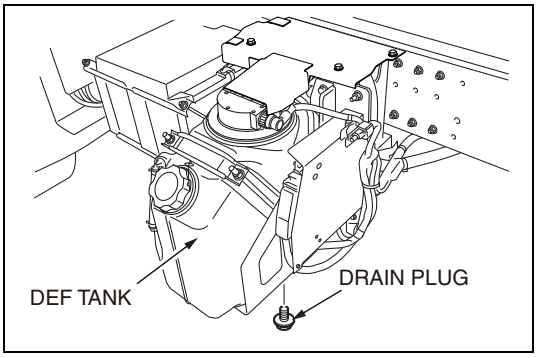
Concentration (%)	Standard value (%)
32.5	1.3817 - 1.384

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REPLACEMENT

EN01F02127100402056003

REPLACING DEF



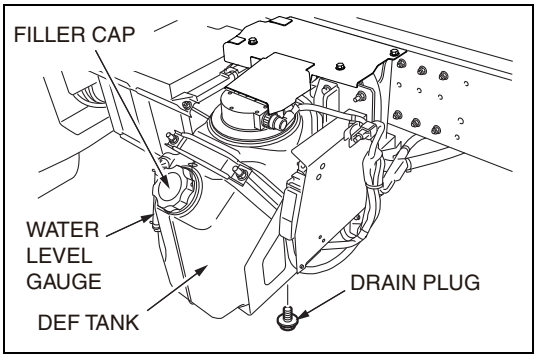
SHTS021271000126

1. DRAINING DEF

(1) Turn the starter key to “ON”, remove the drain plug, and discharge DEF from the DEF tank.

⚠ CAUTION

- **If the starter key is turned to “LOCK” with nothing left in the tank, the engine cannot be restarted. Before starting work, be sure to turn the starter key to “ON.”**
- **Dispose the DEF in accordance with the specified procedures (industrial waste disposal) or by other environment-friendly methods.**



SHTS021271000127

2. ADDING DEF

(1) Mount the drain plug to the DEF tank.
(2) Remove the filler cap and add DEF while checking the water level gauge until it reaches the specified amount.

⚠ CAUTION

- **Do not add any other material than DEF to the tank.**
- **When adding DEF to the DEF tank, do not add above the F line of the water level gauge on the left side of the tank It overflows from the breather hose and is crystallized at the tank bottom.**
- **DEF expands when frozen. The DEF tank filled above the full level may burst when frozen.**
- **Promptly wipe off DEF with a waste if it overflowed from the DEF tank or adhered to the tank or peripheral parts when adding. Wipe it off while it is in liquid form since it will crystallize and whiten when left unattended and become difficult to be removed. Use a cloth soaked in warm water to wipe off crystallized urea.**
- **Avoid entry of dust and foreign matter into the DEF tank when adding DEF. Entry of dust and foreign matter may cause DEF pump malfunction and pipe and DEF injector clogging.**
- **When it is difficult to tighten the filler cap due to adhesion of DEF crystals on the filler cap or inlet of the DEF tank, do not forcedly tighten the cap but remove the crystals by a waste first and then tighten the cap. Avoid entry of waste lint into the DEF tank when removing crystals.**
- **Dispose the DEF in accordance with the specified procedures (industrial waste disposal) or by other environment-friendly methods.**
- **DEF may overflow before reaching the full level if it is added to the vehicle in inclined condition.**

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- **If diesel fuel has been mistakenly added into the DEF tank. Once the engine is started and the DEF pump is activated, diesel fuel will enter the DEF piping, DEF pump and DEF injector. If diesel fuel has entered the DEF piping, DEF pump and DEF injector, replace them along with the DEF tank and DEF sensor. If the engine has not yet been started, the areas exposed to diesel fuel are only the DEF tank and the DEF piping inside the tank. Disconnect the piping from the DEF tank and replace the DEF tank and DEF sensor. In this case, no other parts need to be replaced.**

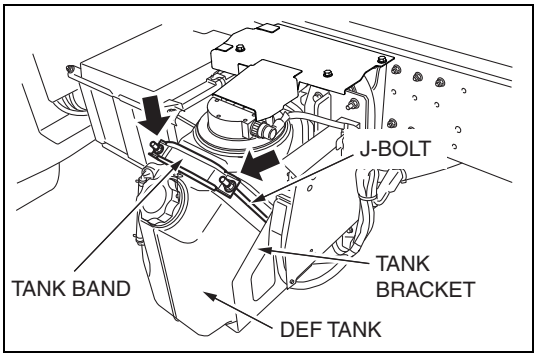
REMOVING THE DEF TANK

1. CAUTIONS

⚠ CAUTION
After-run (DEF drawn back to the DEF tank) is performed after the starter key is turned to "LOCK" and the muffler temperature drops. Before starting work, wait for at least 10 minutes after turning the starter key to "LOCK."

2. REMOVING THE TANK BAND

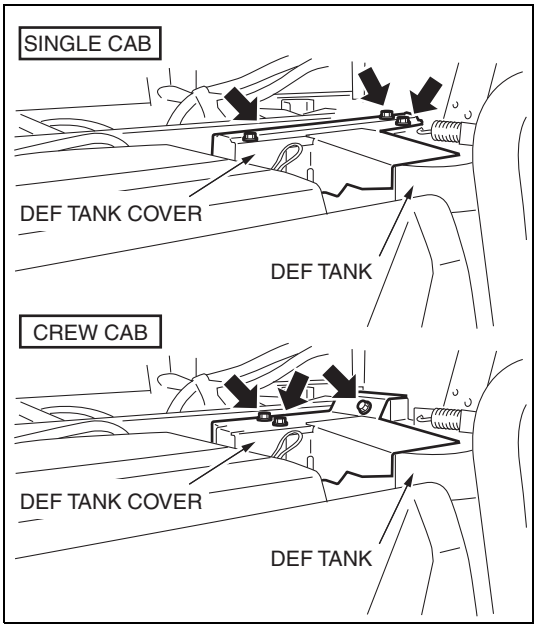
(1) Unfasten the 2 J-bolts and 2 nuts to remove the tank band from the tank bracket and DEF tank.



SHTS021271000128

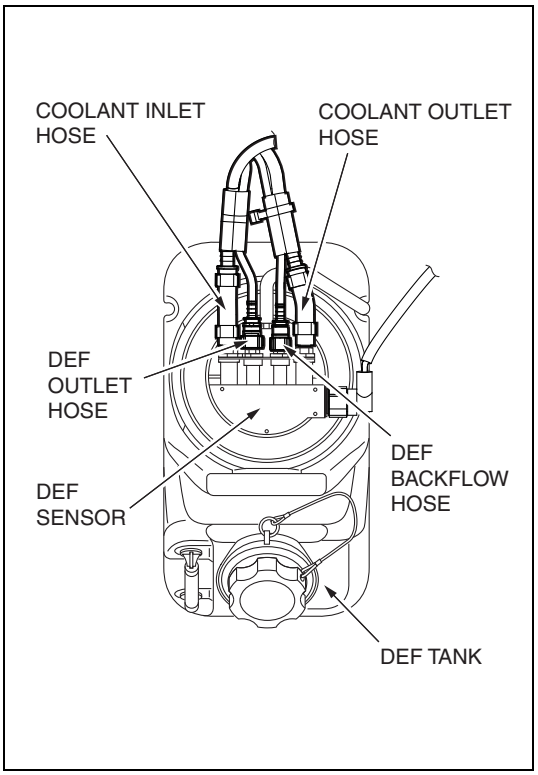
3. REMOVING THE DEF TANK COVER

(1) Unfasten the bolts (3 pcs.) to remove the DEF tank cover from the DEF tank.



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SHTS021271000130

4. DISCONNECTING THE HOSE.

⚠ CAUTION

Refer to "Cautions on DEF/coolant piping attaching and detaching".

Reference: EXHAUST (J05E), DEF-SCR & DPR, CAUTIONS ON DEF/COOLANT PIPING ATTACHING AND DETACHING (Page 11-20)

(1) Disconnect the DEF backflow hose and DEF outlet hose from the DEF sensor.

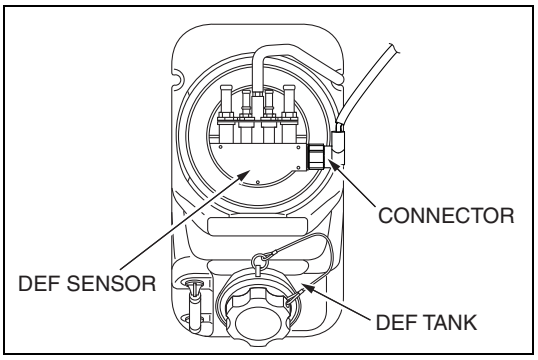
NOTICE

- **Prepare the reservoir and waste to collect dripping DEF when disconnecting the hose.**
- **Block with vice clip to prevent DEF from flowing out from the hoses.**
- **Mount the protection cap to the DEF sensor.**

(2) Unfasten the 2 clamps to disconnect the coolant inlet hose and coolant outlet hose from the DEF sensor.

NOTICE

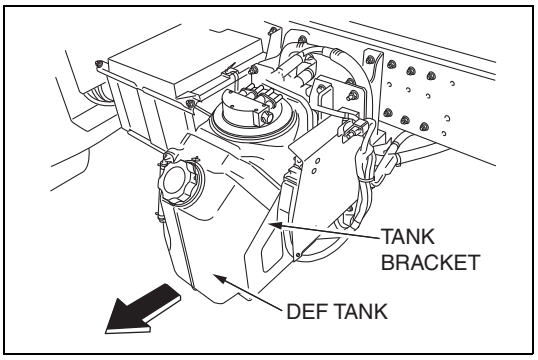
- **Prepare the reservoir and clean clothes to collect dripping coolant when disconnecting the hose.**
- **Block with vice clip to prevent coolant outflow from the hose.**
- **Mount the protection cap to the DEF sensor.**



SHTS021271000131

5. DISCONNECTING THE HARNESS

(1) Disconnect the connector from the DEF sensor.



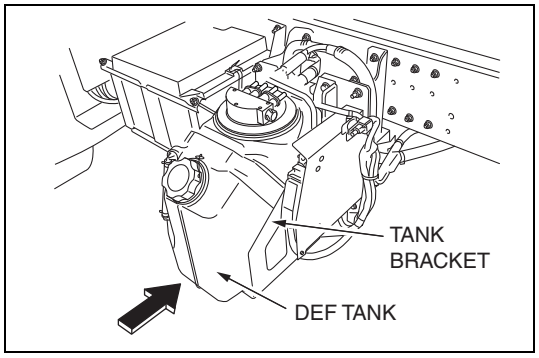
SHTS021271000132

6. REMOVING THE DEF TANK.

(1) Remove the DEF tank from the tank bracket.

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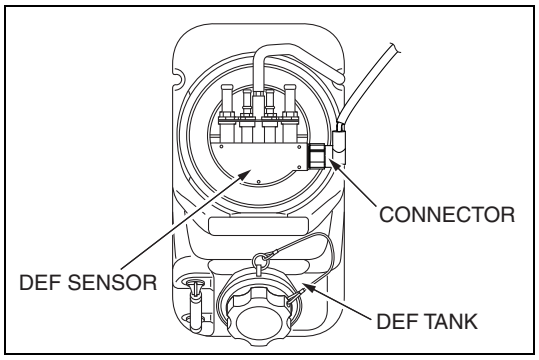
MOUNTING THE DEF TANK



SHTS021271000133

1. MOUNTING THE DEF TANK

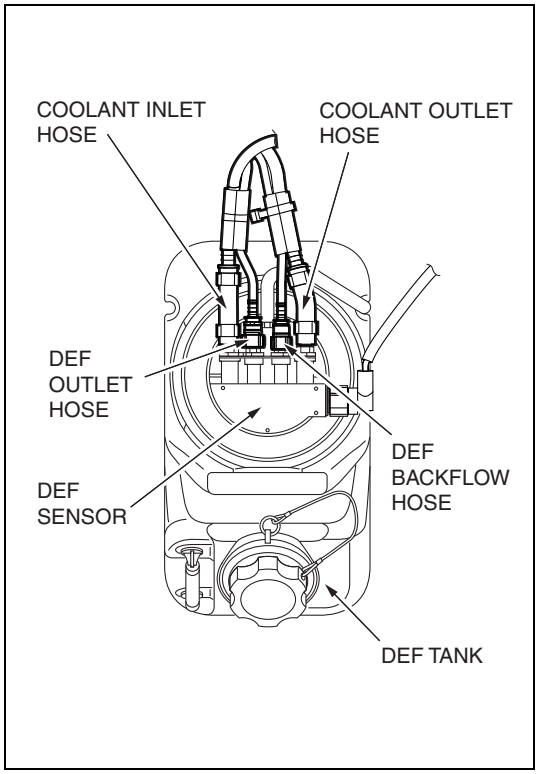
(1) Mount the DEF tank to the tank bracket.



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2. CONNECTING THE HARNESS

(1) Connect the connector to the DEF sensor.



SHTS021271000135

3. CONNECTING THE HOSE

⚠ CAUTION

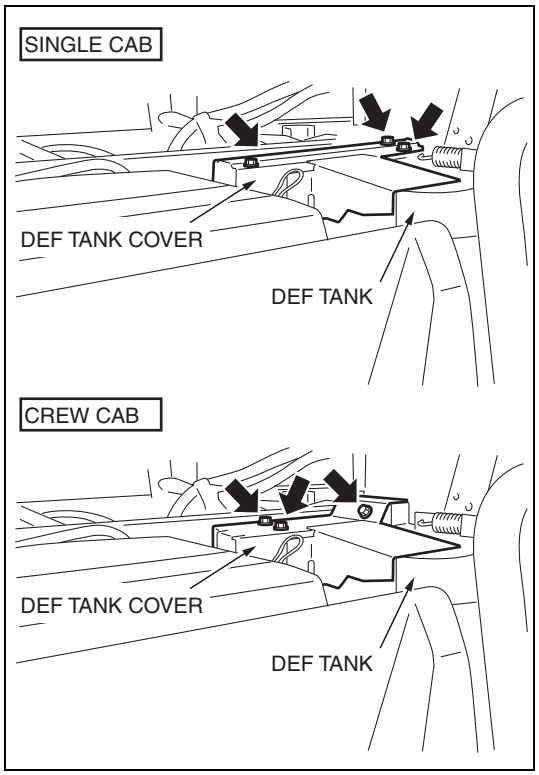
Refer to "Cautions on DEF/coolant piping attaching and detaching".

Reference: EXHAUST (J05E), DEF-SCR & DPR, CAUTIONS ON DEF/COOLANT PIPING ATTACHING AND DETACHING (Page 11-20)

(1) Connect the coolant inlet hose and coolant outlet hose to the DEF sensor with 2 clamps.

(2) Connect the DEF backflow hose and DEF outlet hose to the DEF sensor.

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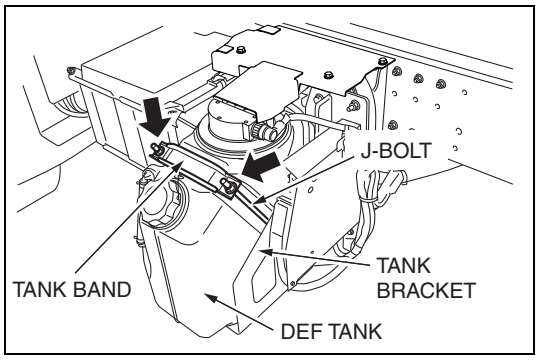


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4. MOUNTING THE DEF TANK COVER

(1) Mount the DEF tank cover to the DEF tank with the bolts (3 pcs.).

Tightening Torque:
32 N·m {326 kgf·cm, 23.6 lbf·ft}



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5. MOUNTING THE TANK BAND

(1) Hook 2 J-bolts to the tank bracket holes and mount the tank band to the tank bracket and DEF tank with 2 nuts. At this time, tighten the J-bolts to make the protrusion amount of the screws even.
Tightening Torque:
23.5-36.5 N·m {240-372 kgf·cm, 17.3-26.9 lbf·ft}

6. ADDING THE COOLANT

(1) Inspect the coolant level and if insufficient, pour coolant.
Reference: COOLING (J05E), RADIATOR, REPLACEMENT, ADDING THE COOLANT (Page 12-13)

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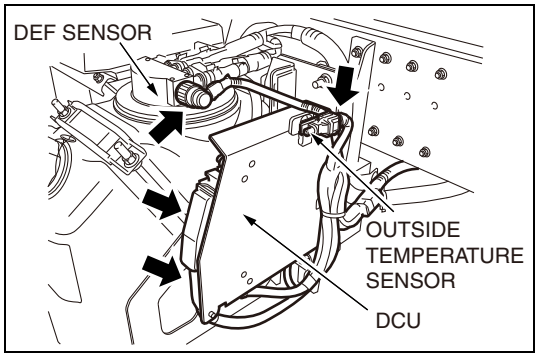
REMOVING THE DEF TANK ASSEMBLY

1. CAUTIONS

⚠ CAUTION
After-run (DEF drawn back to the DEF tank) is performed after the starter key is turned to "LOCK" and the muffler temperature drops. Before starting work, wait for at least 10 minutes after turning the starter key to "LOCK."

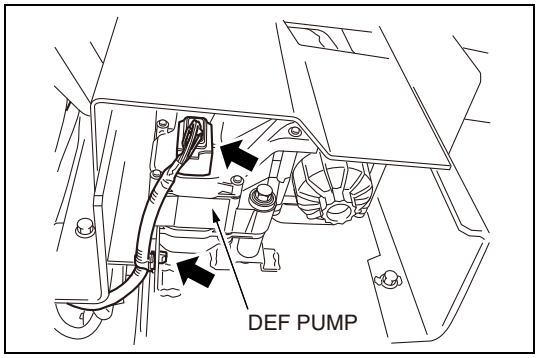
2. DISCONNECTING THE HARNESS

(1) Disconnect the connector from the DCU.
Reference: EXHAUST (J05E), DCU, REPLACEMENT, REMOVING THE DCU (Page 11-90)
(2) Disconnect the connector from the DEF sensor.
(3) Disconnect the connector from the outside temperature sensor.



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(4) Disconnect the connector from the DEF pump.
(5) Remove the harness clip.



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3. DISCONNECT THE HOSE

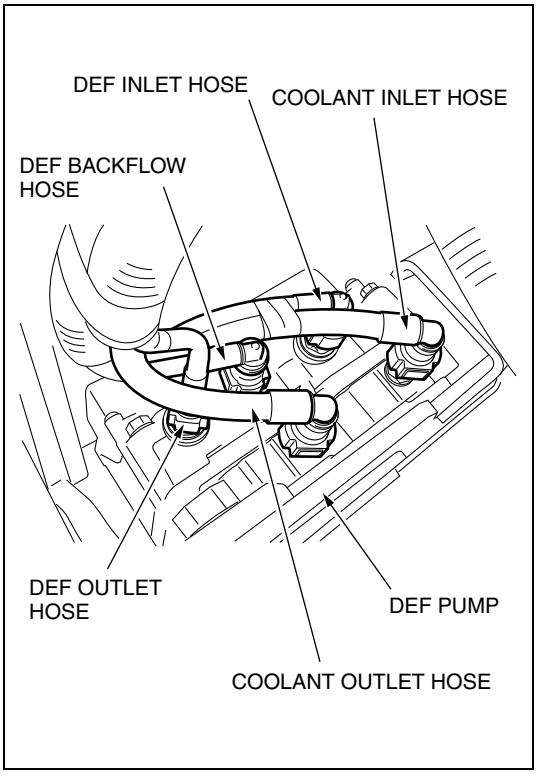
⚠ CAUTION
Refer to "Cautions on DEF/coolant piping attaching and detaching".
Reference: EXHAUST (J05E), DEF-SCR & DPR, CAUTIONS ON DEF/COOLANT PIPING ATTACHING AND DETACHING (Page 11-20)

(1) Disconnect the hose from the DEF sensor.
Reference: EXHAUST (J05E), DEF TANK, REPLACEMENT, REMOVING THE DEF TANK (Page 11-75)
(2) Disconnect the DEF inlet hose, DEF outlet hose, and DEF backflow hose from the DEF pump.

NOTICE
- **Prepare the reservoir and waste to collect dripping DEF when disconnecting the hose.**
- **Mount the protection cap to the DEF pump.**

(3) Disconnect the coolant inlet hose and coolant outlet hose from the DEF pump.

NOTICE
- **Prepare the reservoir and clean clothes to collect dripping coolant when disconnecting the hose.**
- **Block with vice clip to prevent coolant outflow from the hose.**
- **Mount the protection cap to the DEF pump.**



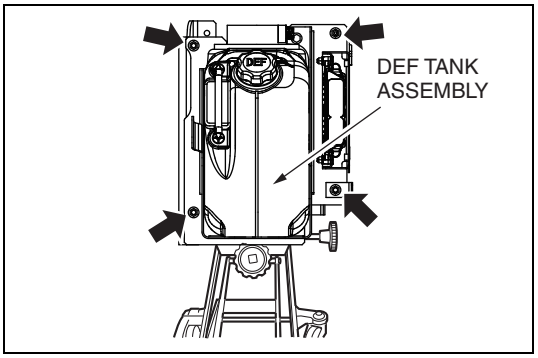
SHTS021271000140

4. REMOVING THE DEF TANK ASSEMBLY
(1) Lash the transmission jack and DEF tank assembly with a lashing device.

⚠ CAUTION
Pay attention to weight balance.

(2) Unfasten the 4 nuts to remove the DEF tank assembly from the bracket.
(3) Pull off the DEF tank assembly from the vehicle while supporting it to prevent falling.

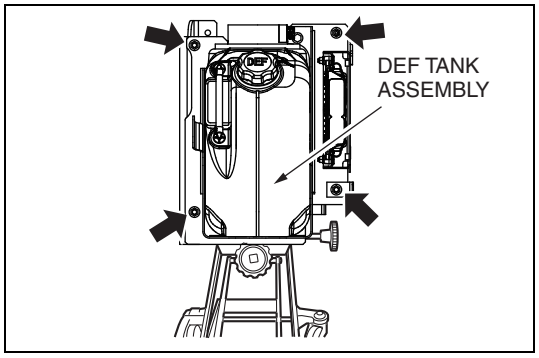
⚠ CAUTION
Pay attention to weight balance.



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MOUNTING THE DEF TANK ASSEMBLY



SHTS021271000142

1. MOUNTING THE DEF TANK ASSEMBLY

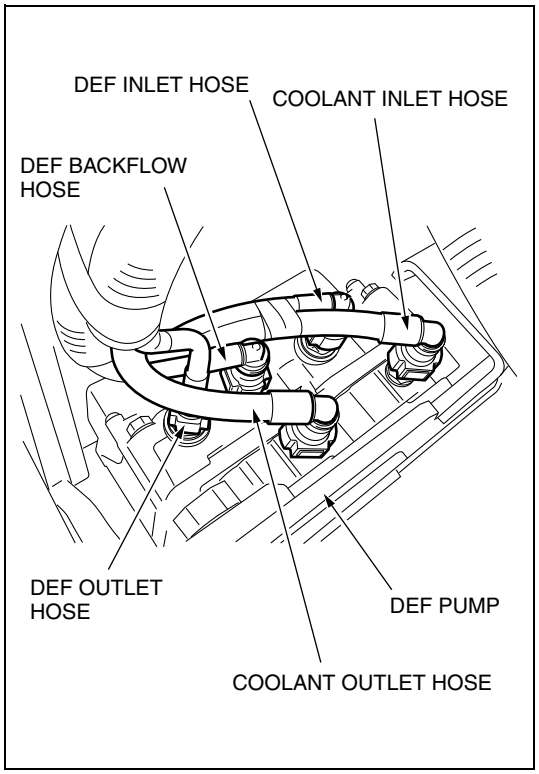
(1) Lash the transmission jack and DEF tank assembly with a lashing device.

⚠ CAUTION
Pay attention to weight balance.

(2) Set the DEF tank assembly to the DEF tank mounting position while supporting it to prevent falling.

⚠ CAUTION
Pay attention to weight balance.

(3) Mount the DEF tank assembly to the bracket with 4 nuts.
Tightening Torque:
38.4-57.6 N·m {392-587 kgf·cm, 28.3-42.5 lbf·ft}



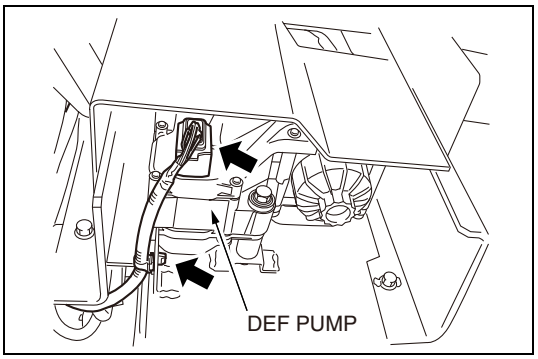
SHTS021271000143

2. CONNECT THE HOSE

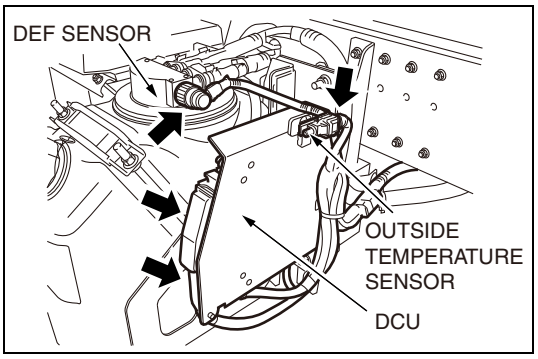
⚠ CAUTION
Refer to "Cautions on DEF/coolant piping attaching and detaching".
Reference: EXHAUST (J05E), DEF-SCR & DPR, CAUTIONS ON DEF/COOLANT PIPING ATTACHING AND DETACHING (Page 11-20)

(1) Connect the coolant inlet hose and coolant outlet hose to the DEF pump.
(2) Connect the DEF inlet hose, DEF outlet hose, and DEF backflow hose to the DEF pump.
(3) Connect the hose to the DEF sensor.
Reference: EXHAUST (J05E), DEF TANK, REPLACEMENT, MOUNTING THE DEF TANK (Page 11-77)

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SHTS021271000145

3. CONNECTING THE HARNESS

(1) Connect the connector to the DEF pump.

(2) Connect the connector to the outside temperature sensor.

(3) Connect the connector to the DEF sensor.

(4) Connect the connector to the DCU.

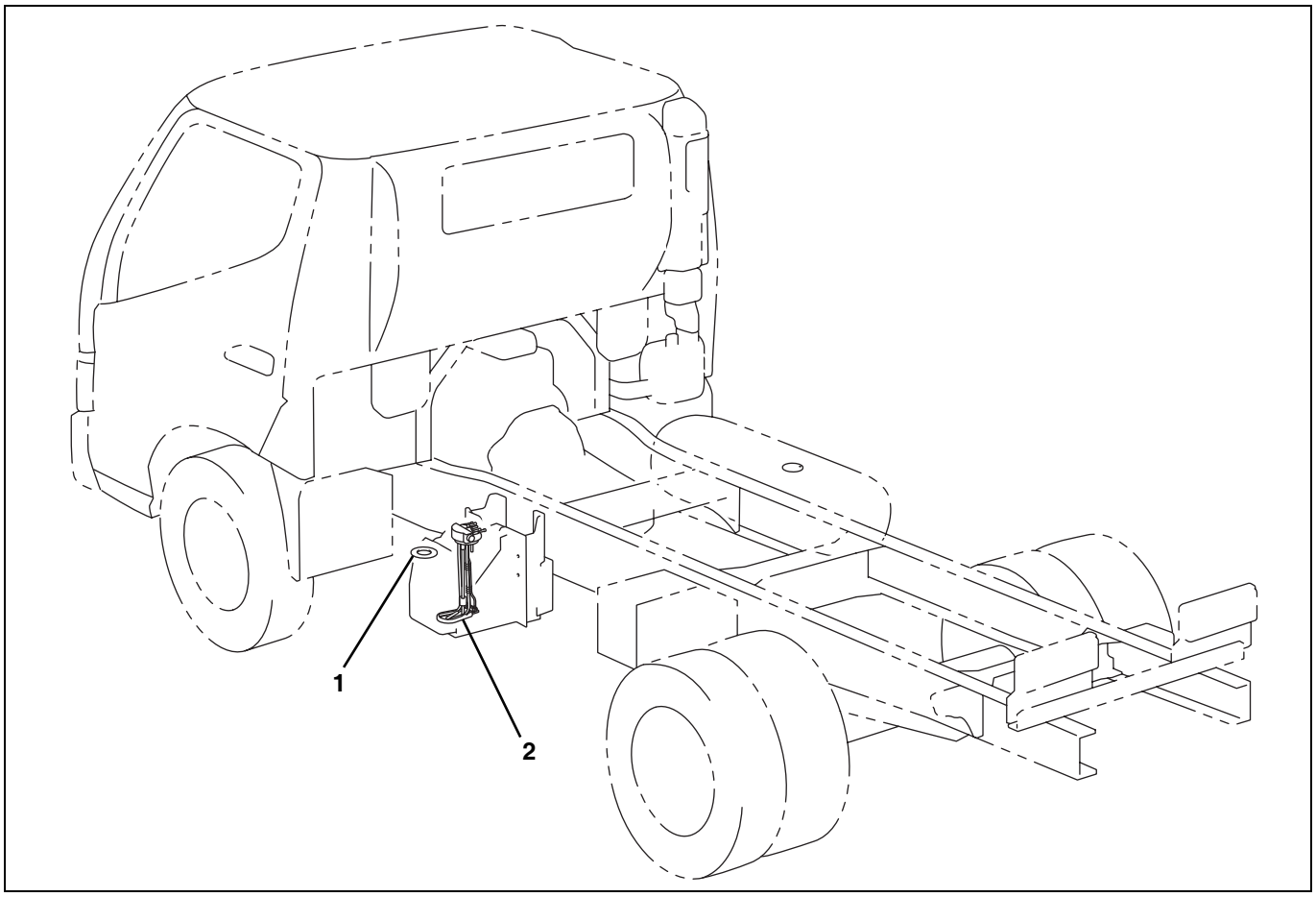
Reference: EXHAUST (J05E), DCU, REPLACEMENT, MOUNTING THE DCU (Page 11-92)

https://truckmanualshub.com/

DEF SENSOR

COMPONENT LOCATOR

EN01F02127100402057001



SHTS021271000146

1 O-ring *	2 DEF sensor

*: Nonreusable part

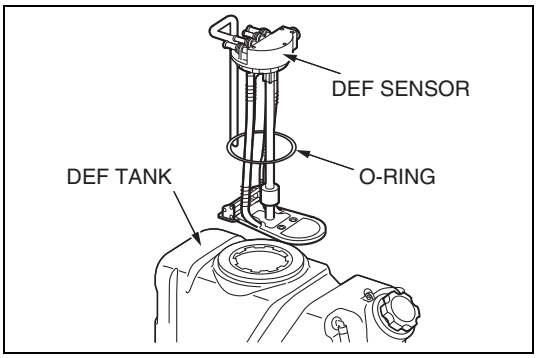
https://truckmanualshub.com/

REPLACEMENT

EN01F02127100402057002

REMOVING THE DEF SENSOR

1. REMOVING THE DEF TANK
Reference: EXHAUST (J05E), DEF TANK, REPLACEMENT, REMOVING THE DEF TANK (Page 11-75)



SHTS021271000147

2. REMOVING THE DEF SENSOR

(1) Turn the DEF sensor counterclockwise to remove it from the DEF tank.

⚠ CAUTION

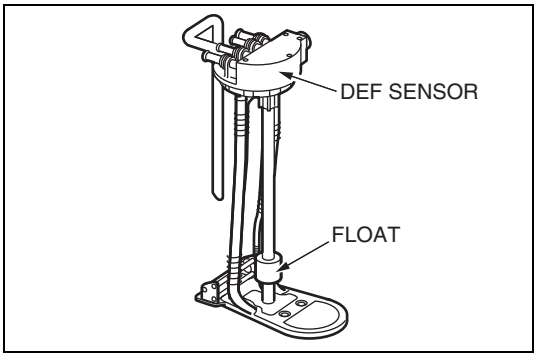
- **When removing, be careful not to bend the water level sensor pipe.**
- **When taking out the sensor from inside the tank, be careful not to damage the sensor by hitting the tank edge.**

(2) Remove the O-ring from the DEF sensor.

SINGLE UNIT INSPECTION

1. INSPECTING A FLOAT

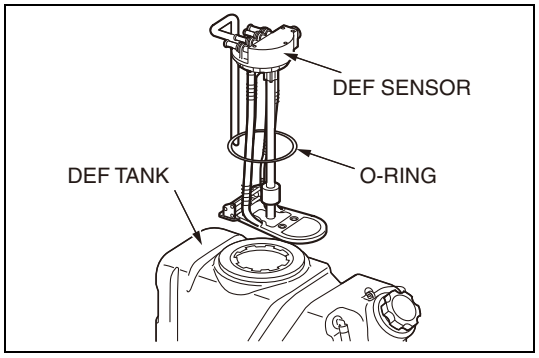
(1) Check if the DEF sensor float moves smoothly.



SHTS021271000148

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MOUNTING THE DEF SENSOR



SHTS021271000149

1. MOUNTING THE DEF SENSOR

(1) Replace with a new O-ring and mount it to the DEF sensor.
(2) Fix the DEF tank and turn the DEF sensor clockwise to mount it to the DEF tank.

⚠ CAUTION

- **Thoroughly wipe off DEF crystals precipitated on the mounting surface with a clean waste.**
- **When inserting the sensor inside the tank, be careful not to damage the sensor by hitting the tank edge.**
- **Check that the tank center and DEF sensor pipe are mounted in parallel position.**
- **Do not tighten the DEF sensor excessively.**

2. MOUNTING THE DEF TANK

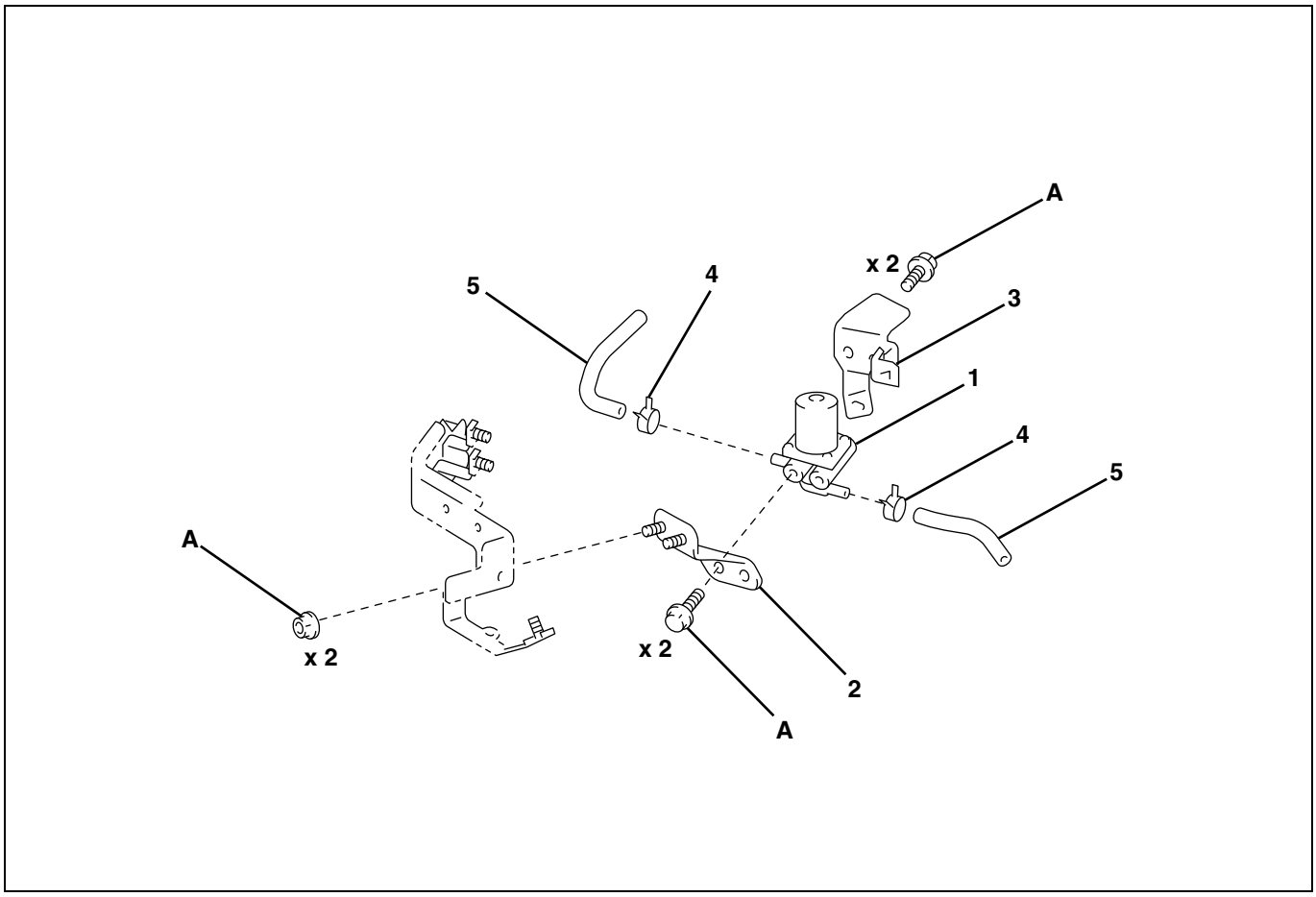
Reference: EXHAUST (J05E), DEF TANK, REPLACEMENT, MOUNTING THE DEF TANK (Page 11-77)

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COOLANT CUTOFF VALVE

COMPONENT LOCATOR

EN01F02127100402019001



SHTS021271000150

1	Coolant cutoff valve	4	Clamp
2	Water valve bracket	5	Hose
3	Harness bracket		

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

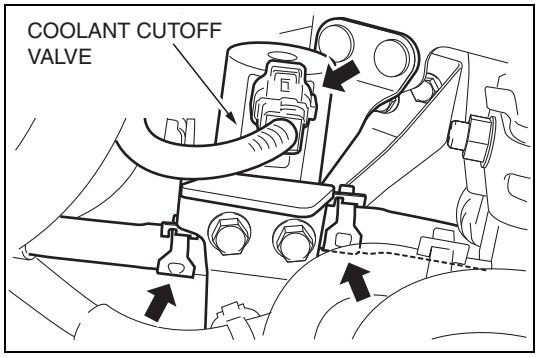
A	31 {316, 22.9}		

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REPLACEMENT

EN01F02127100402019002

REMOVING THE COOLANT CUTOFF VALVE



SHTS021271000151

1. DISCONNECTING THE HOSE

⚠ CAUTION

Refer to "Cautions on DEF/coolant piping attaching and detaching".

Reference: EXHAUST (J05E), DEF-SCR & DPR, CAUTIONS ON DEF/COOLANT PIPING ATTACHING AND DETACHING (Page 11-20)

(1) Remove the 2 clamps and disconnect 2 hoses from the coolant cutoff valve.

NOTICE

- **Prepare the reservoir and clean clothes to collect dripping coolant when disconnecting the hose.**
- **Block with vice clip to prevent coolant outflow from the hose.**
- **Close the vice clip since the coolant flows out from the coolant cutoff valve.**

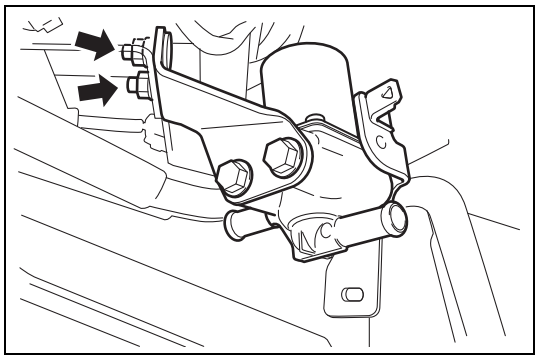
2. DISCONNECTING THE HARNESS

(1) Disconnect the connector connected to the coolant cutoff valve.

3. REMOVING THE COOLANT CUTOFF VALVE

(1) Remove the harness clamp.

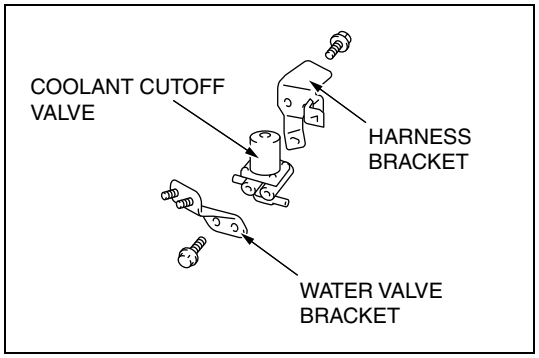
(2) Unfasten the nuts (2 pcs.) and remove the coolant cutoff valve with the bracket.



SHTS021271000152

(3) Unfasten the bolts (2 pcs.) to remove the water valve bracket from the coolant cutoff valve.

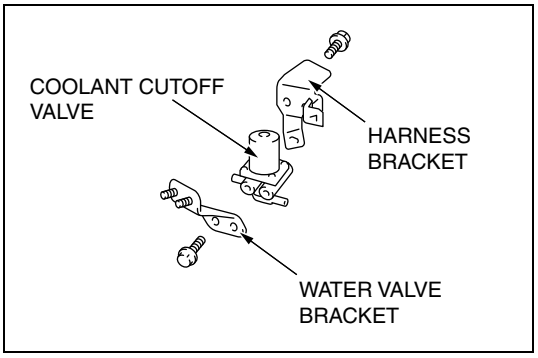
(4) Unfasten the bolts (2 pcs.) to remove the harness bracket from the coolant cutoff valve.



SHTS021271000153

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MOUNTING THE COOLANT CUTOFF VALVE

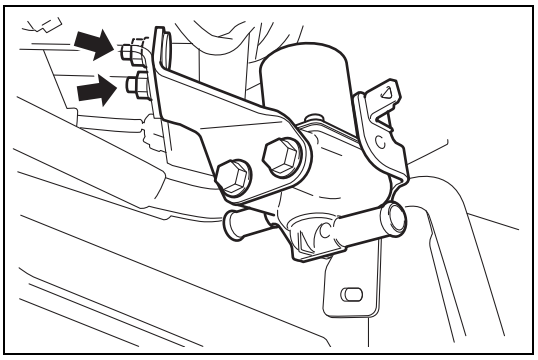


SHTS021271000154

1. MOUNTING THE COOLANT CUTOFF VALVE

(1) Mount the harness bracket to the coolant cutoff valve with the bolts (2 pcs.).
Tightening Torque:
31 N·m {316 kgf·cm, 22.9 lbf·ft}

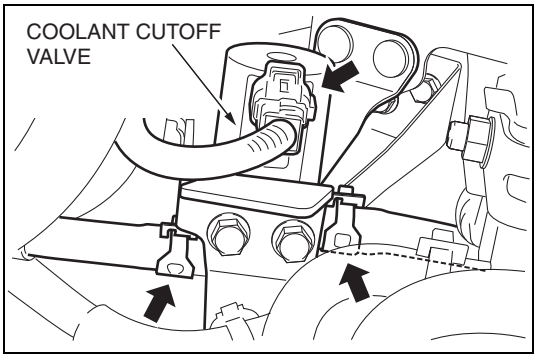
(2) Mount the water valve bracket to the coolant cutoff valve with the bolts (2 pcs.).
Tightening Torque:
31 N·m {316 kgf·cm, 22.9 lbf·ft}



SHTS021271000155

(3) Mount the coolant cutoff valve with the bracket with 2 nuts.
Tightening Torque:
31 N·m {316 kgf·cm, 22.9 lbf·ft}

(4) Mount the harness clamp.



SHTS021271000156

2. CONNECTING THE HARNESS

(1) Connect the connector to the coolant cutoff valve.

3. CONNECTING THE HOSE

⚠ CAUTION
Refer to "Cautions on DEF/coolant piping attaching and detaching".
Reference: EXHAUST (J05E), DEF-SCR & DPR, CAUTIONS ON DEF/COOLANT PIPING ATTACHING AND DETACHING (Page 11-20)

(1) Connect the 2 hoses to the coolant cutoff valve with 2 clamps.

4. ADDING THE COOLANT

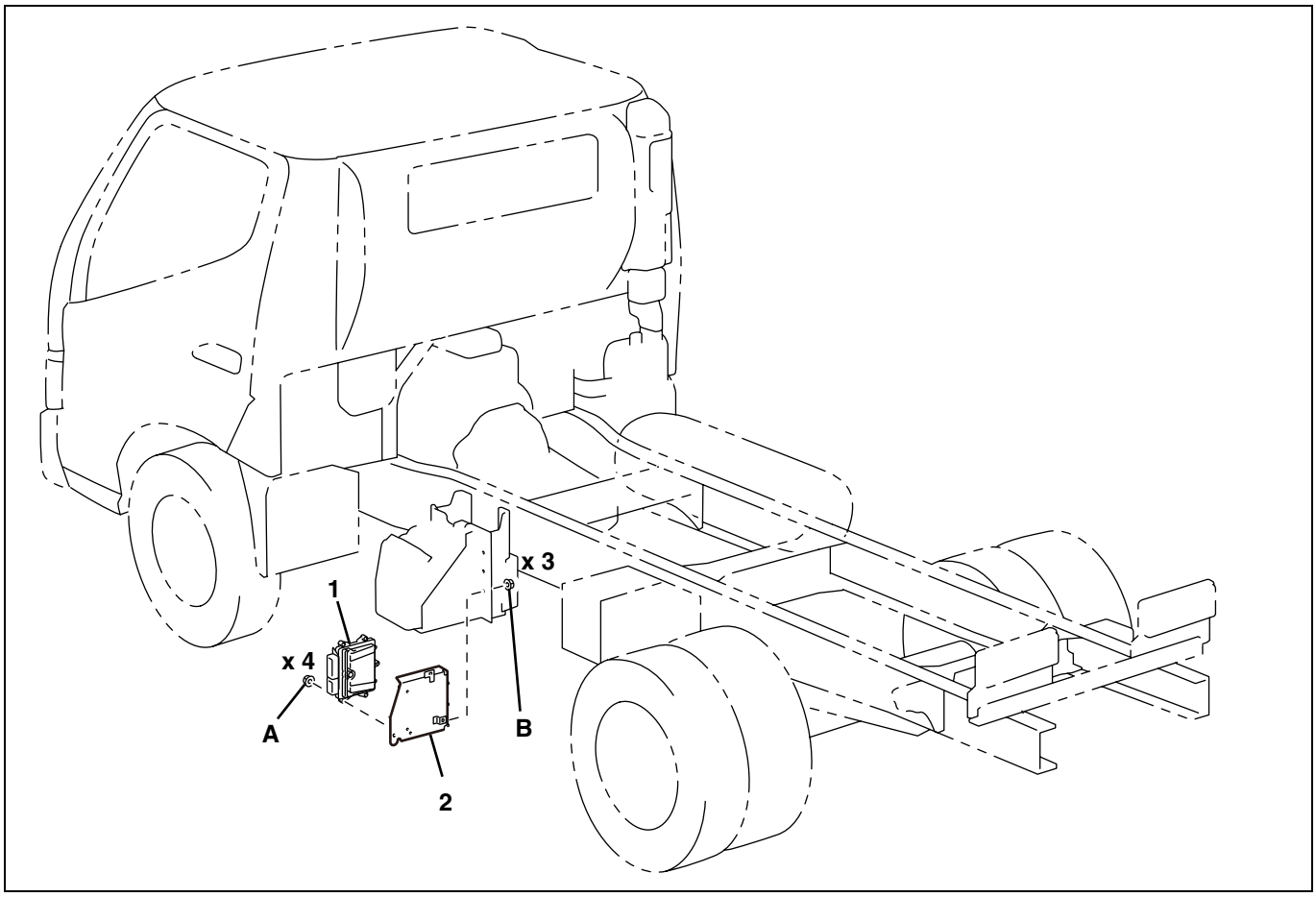
(1) Inspect the coolant level and if insufficient, pour coolant.
Reference: COOLING (J05E), RADIATOR, REPLACEMENT, ADDING THE COOLANT (Page 12-13)

https://truckmanualshub.com/

DCU

COMPONENT LOCATOR

EN01F02127100402021001



SHTS021271000157

1	DCU	2	DCU bracket

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	10 {102, 7.4}	B	22 {224, 16.2}

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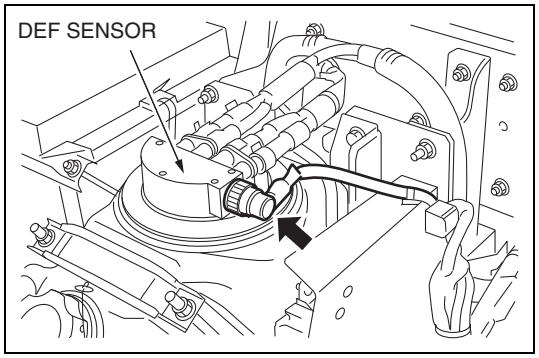
REPLACEMENT

EN01F02127100402021002

REMOVING THE DCU

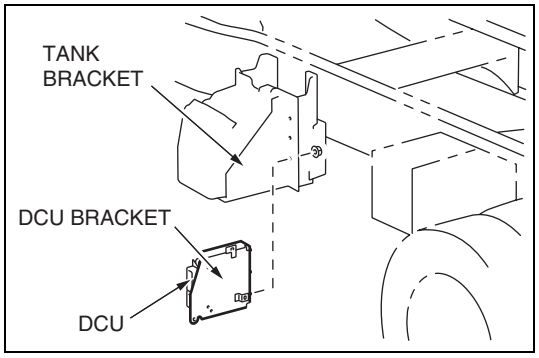
1. REMOVING THE OUTSIDE TEMPERATURE SENSOR
Reference: EXHAUST (J05E), OUTSIDE TEMPERATURE SENSOR, REPLACEMENT, REMOVING THE OUTSIDE TEMPERATURE SENSOR (Page 11-120)

2. DISCONNECTING THE DEF SENSOR CONNECTOR
(1) Disconnect the connector from the DEF sensor.



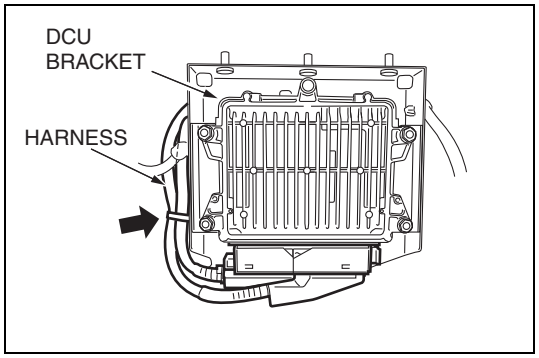
SHTS021271000158

3. REMOVING THE DCU BRACKET
(1) Unfasten the nuts (3 pcs.) and remove the DCU with the DCU bracket from the tank bracket.



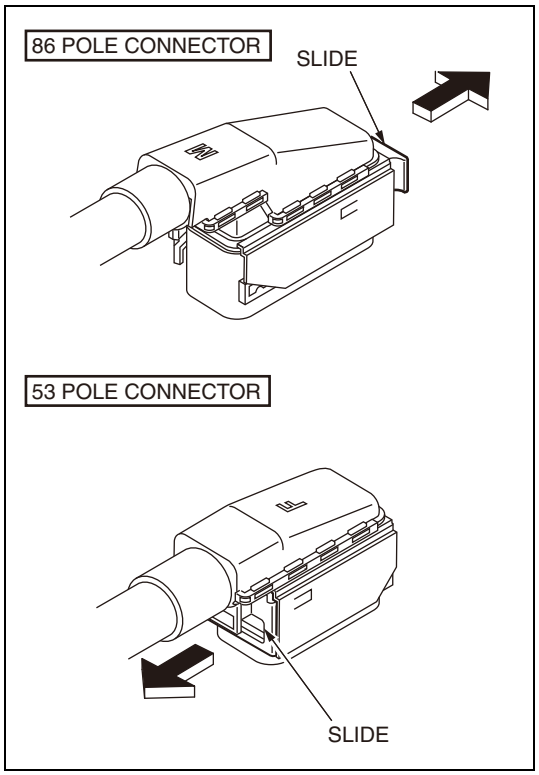
SHTS021271000159

(2) Remove the harness clamp from the DCU bracket.



SHTS021271000160

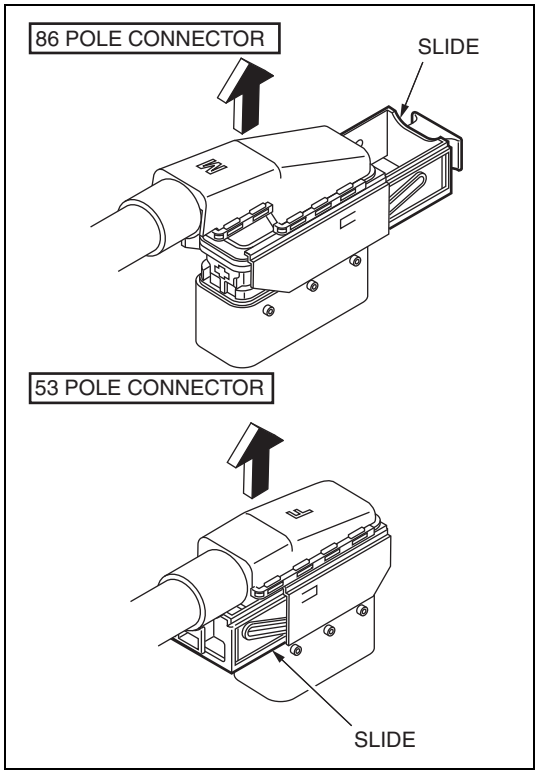
https://truckmanualshub.com/



SHTS021271000161

4. DISCONNECTING THE DCU CONNECTOR

(1) Disconnect the connector by moving the slide in the direction of the arrow as shown in the figure until a "click" is heard.



SHTS021271000162

(2) Pull out the connector straight.

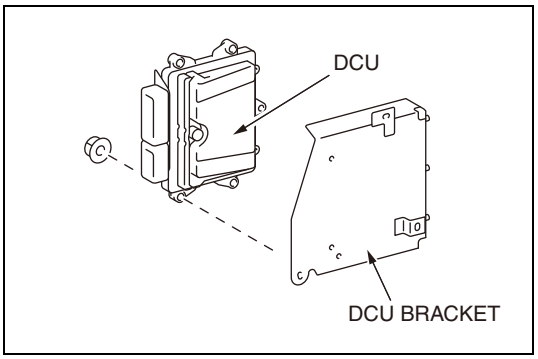
⚠ CAUTION

- **Do not insert and remove the connector more than necessary.**
- **Never detach the harness by holding and pulling or prying as it may result in wire or terminal deformation.**
- **Never insert a test lead from the rear of the connector.**
- **Do not paint or apply grease or oil to the connector to maintain its function and durability.**

NOTICE

If it cannot be pulled out with a light force, check if the slide is fully open.

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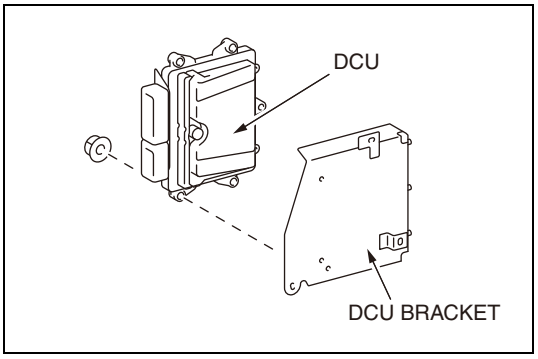


SHTS021271000163

5. REMOVING THE DCU

(1) Unfasten the nuts (4 pcs.) and remove the DCU from the DCU bracket.

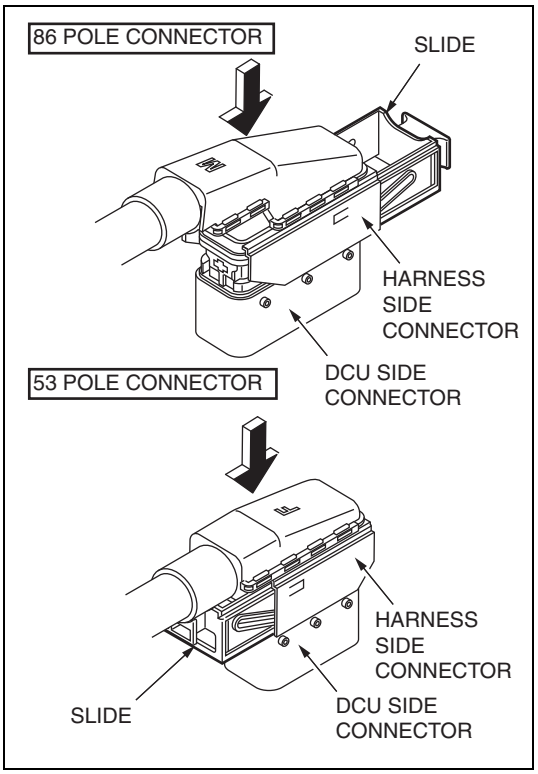
MOUNTING THE DCU



SHTS021271000164

1. MOUNTING THE DCU

(1) Mount the DCU to the DCU bracket with 4 nuts.
Tightening Torque:
10 N·m {102 kgf·cm, 7.4 lbf·ft}



SHTS021271000165

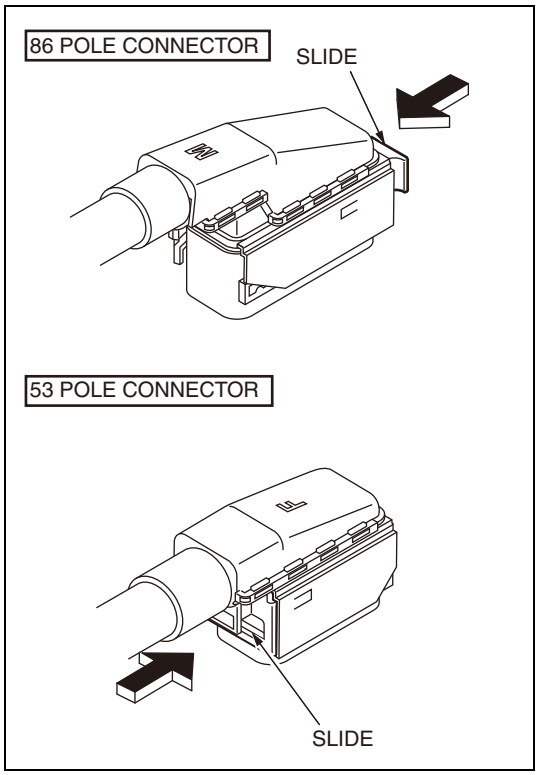
2. CONNECTING THE DCU CONNECTOR

(1) Check that the harness side connector slide is fully open and place it straight on the DCU side connector.

⚠ CAUTION
At this time, check that the slide is fully open.

(2) Press the upper part of the harness side connector and insert the connector uniformly.

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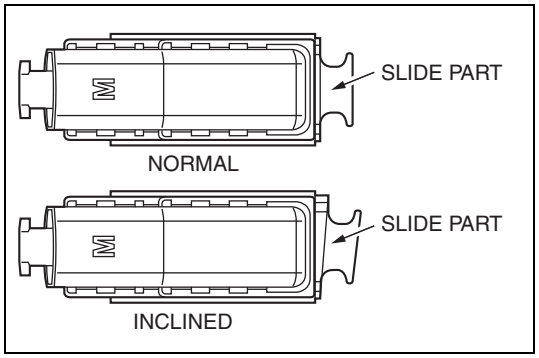


SHTS021271000166

(3) Connect the connector by moving the slide in the direction of the arrow as shown in the figure until a "click" is heard.

⚠ CAUTION

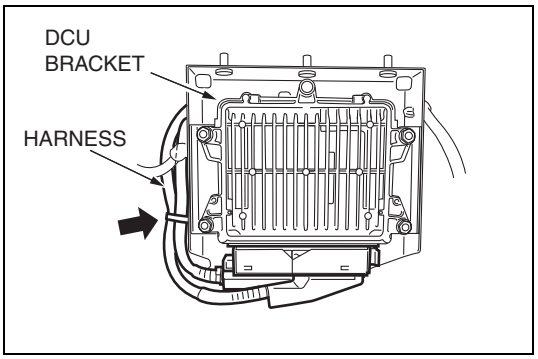
- **If the slide cannot move smoothly, repeat steps (1) and (2).**



SHTS021271000167

- **Securely insert the slide part and the connector in parallel since the slide part may tilt causing a gap between the slide and the connector.**

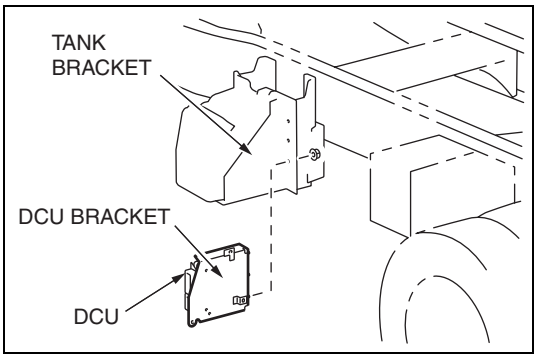
https://truckmanualshub.com/



SHTS021271000168

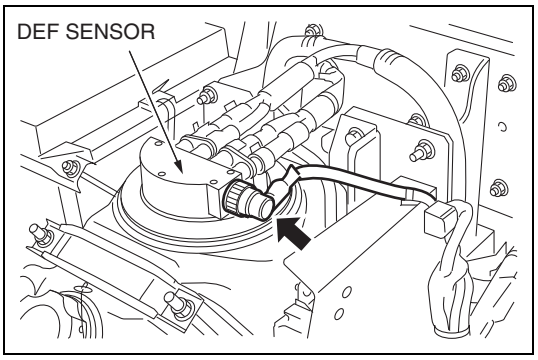
3. MOUNTING THE DCU BRACKET

(1) Mount the harness clamp to the DCU bracket.



SHTS021271000169

(2) Mount the DCU with DCU bracket to the tank bracket with 3 nuts.
Tightening Torque:
22 N·m {224 kgf·cm, 16.2 lbf·ft}



SHTS021271000170

4. CONNECTING THE DEF SENSOR CONNECTOR

(1) Connect the connector to the DEF sensor.

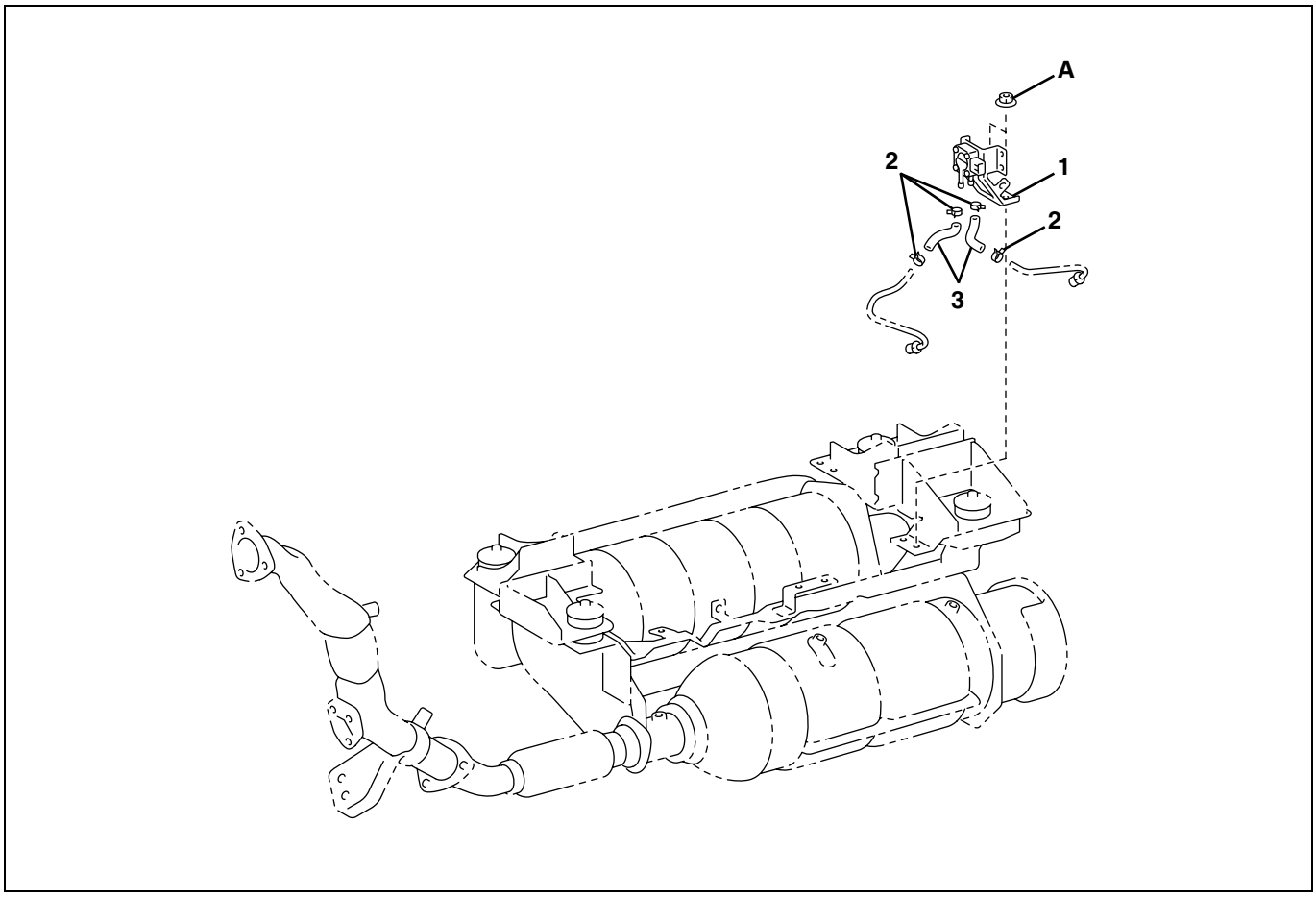
5. MOUNTING THE OUTSIDE TEMPERATURE SENSOR
Reference: EXHAUST (J05E), OUTSIDE TEMPERATURE SENSOR, REPLACEMENT, MOUNTING THE OUTSIDE TEMPERATURE SENSOR (Page 11-120)

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DPR DIFFERENTIAL PRESSURE SENSOR

COMPONENT LOCATOR

EN01F02127100402003001



SHTS021271000171

1	DPR differential pressure sensor	3	Hose
2	Clamp		

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

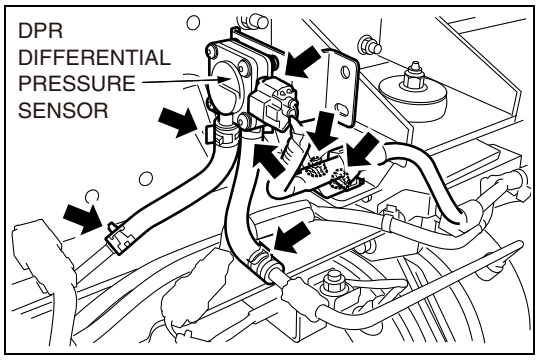
A	31 {316, 22.9}		

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REPLACEMENT

EN01F02127100402003002

REMOVE THE DPR DIFFERENTIAL PRESSURE SENSOR



SHTS021271000172

1. DISCONNECTING THE HARNESS

(1) Remove the harness clamp.

(2) Disconnect the connector attached to the DPR differential pressure sensor.

2. DISCONNECT THE HOSE

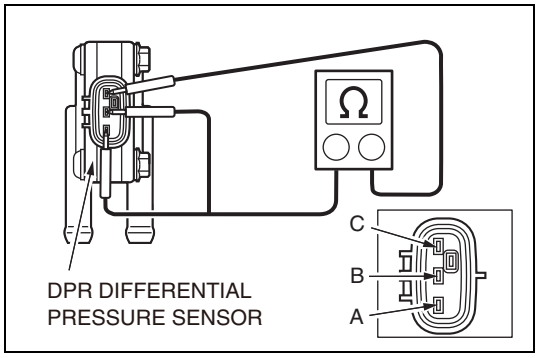
(1) Indicate alignment marks on the DPR differential pressure sensor and 2 hoses.

(2) Unfasten the 4 clamps to disconnect 2 hoses from the DPR differential pressure sensor and differential pressure pipe.

3. REMOVE THE DPR DIFFERENTIAL PRESSURE SENSOR

(1) Unfasten the 2 nuts to remove the DPR differential pressure sensor from the bracket.

SINGLE UNIT INSPECTION



SHTS021271000173

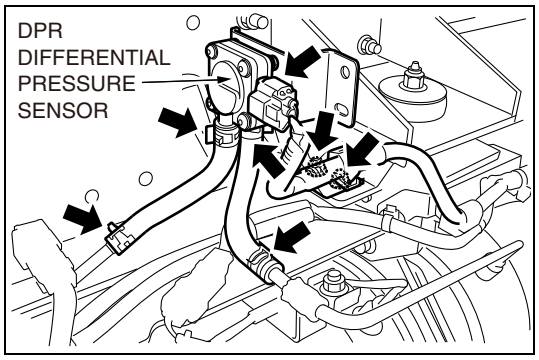
1. INSPECTING THE RESISTANCE

(1) Measure the resistance of the DPR differential pressure sensor with a circuit tester. If the value exceeds the standard value, replace it.

Measured item	Standard value (kΩ)
A↔B	15
B↔C	15

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MOUNTING THE DPR DIFFERENTIAL PRESSURE SENSOR



SHTS021271000174

1. MOUNTING THE DPR DIFFERENTIAL PRESSURE SENSOR

(1) Mount the DPR differential pressure sensor to the bracket with 2 nuts.
Tightening Torque:
31 N·m {316 kgf·cm, 22.9 lbf·ft}

2. CONNECTING THE HOSE

(1) Align the markings on the hoses, differential pressure sensor, and muffler. Mount 2 hoses to the DPR differential pressure sensor and differential pressure pipe with 4 clamps.

⚠ CAUTION

- **If the DPR differential pressure sensor hose is inserted incorrectly, the DPR will not operate properly.**
- **Use care to avoid twisting or kink of the hoses.**
- **Insert the hoses to the end at which they come in contact with the DPR differential pressure sensor body.**
- **Insert the hoses to the end at which they come in contact with the spools on the differential pressure pipes.**

3. CONNECTING THE HARNESS

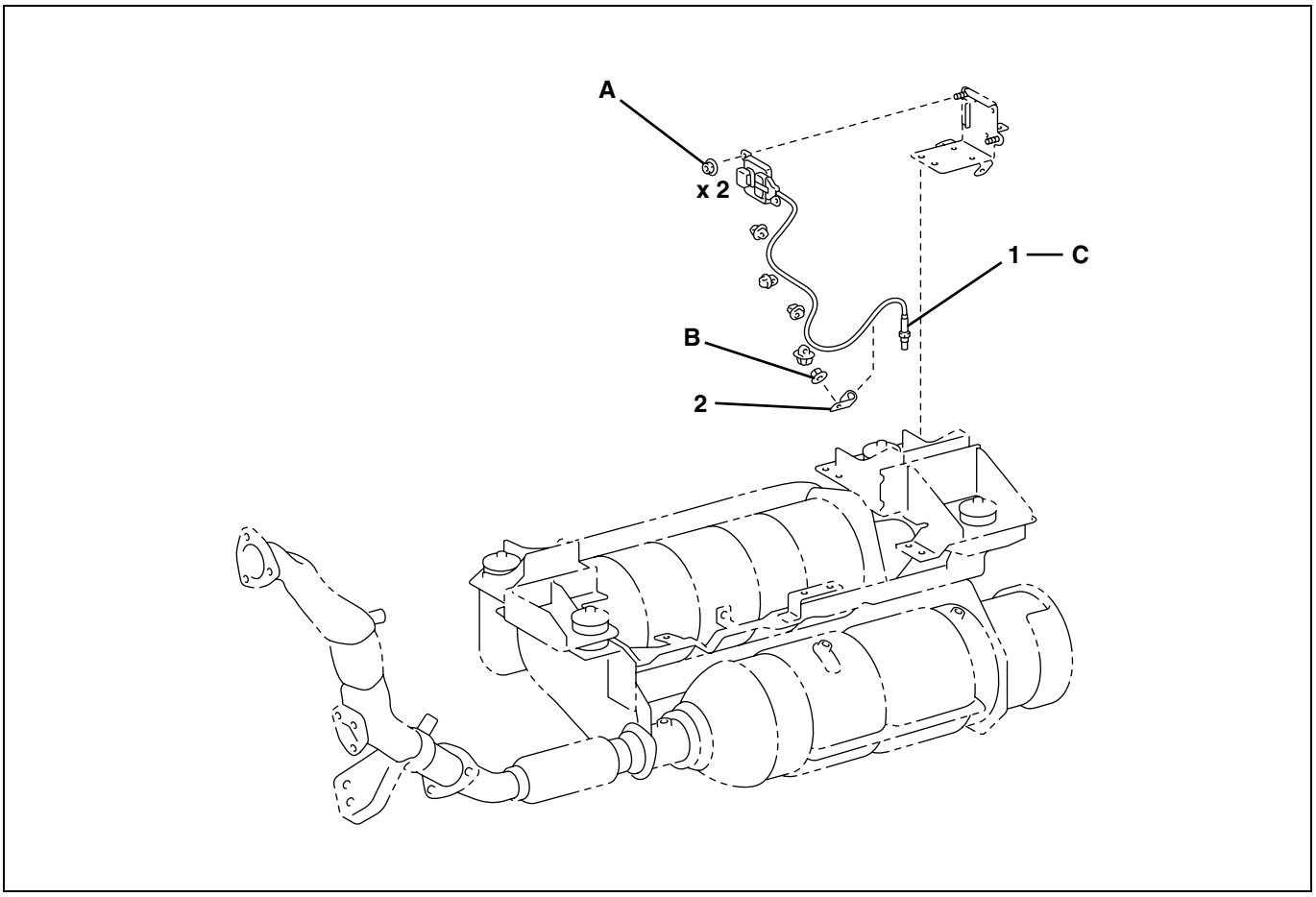
(1) Connect the connector to the DPR differential pressure sensor.
(2) Mount the harness clamp.

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SCR UPSTREAM NOx SENSOR

COMPONENT LOCATOR

EN01F02127100402022001



SHTS021271000175

1	SCR upstream NOx sensor	2	Clip

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

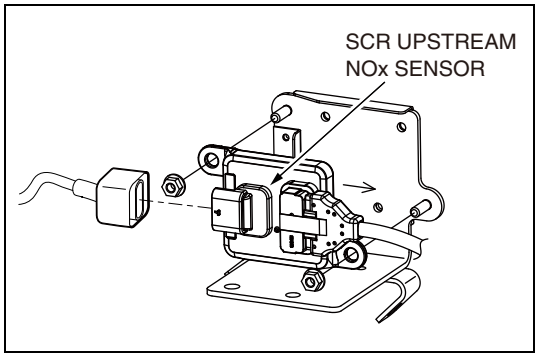
A	5.5 {56, 4.1}	C	40-60 {408-612, 29.5-44.2}
B	31 {316, 22.9}		

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REPLACEMENT

EN01F02127100402022002

REMOVING THE SCR UPSTREAM NOx SENSOR



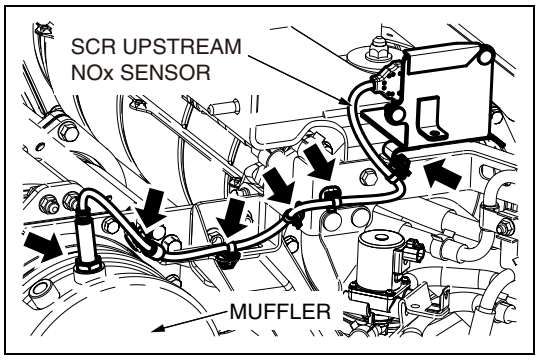
SHTS021271000176

1. DISCONNECTING THE HARNESS

(1) Disconnect the connector connected to the SCR upstream NOx controller.

2. REMOVING THE SCR UPSTREAM NOx SENSOR

(1) Unfasten the 2 nuts and remove SCR upstream NOx controller from the bracket.



SHTS021271000177

(2) Remove the nut and then the clip.

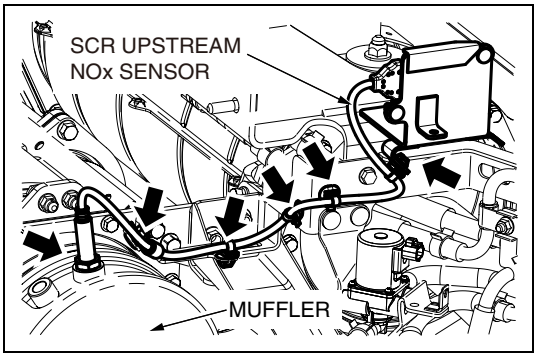
(3) Remove the SCR upstream NOx sensor together with the harness clamp from the muffler.

⚠ CAUTION

If the harness clamp is damaged, mount a new clamp to the original place correctly and securely.

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MOUNTING THE SCR UPSTREAM NOx SENSOR



SHTS021271000178

1. MOUNTING THE SCR UPSTREAM NOx SENSOR

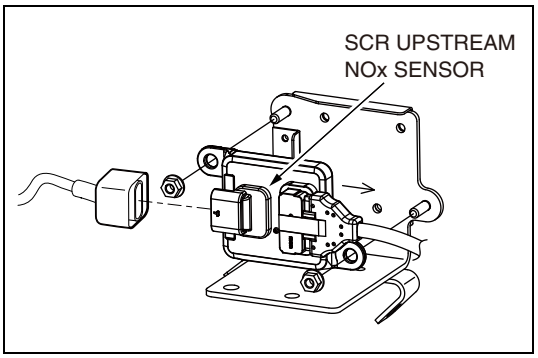
(1) Connect the SCR upstream NOx sensor to the muffler and then the harness clamp.
Tightening Torque:
40-60 N·m {408-612 kgf·cm, 29.5-44.2 lbf·ft}

⚠ CAUTION

- **When reusing, clean the old anti-seizure lubricant on the SCR upstream NOx sensor and apply anti-seizure lubricant (WEICOM Anti-Seize ASW "High Tech" Assembly Paste or equivalent) to the thread area.**
- **A new upstream NOx sensor has anti-seizure lubricant applied.**
- **Pay attention not to twist the harness of the SCR upstream NOx sensor.**
- **Do not allow the harness to interfere with the bracket or bolt.**

(2) Mount the clip with a nut.
Tightening Torque:
31 N·m {316 kgf·cm, 22.9 lbf·ft}

(3) Mount the SCR upstream NOx controller to the bracket with 2 nuts.
Tightening Torque:
5.5 N·m {56 kgf·cm, 4.1 lbf·ft}



SHTS021271000179

2. CONNECTING THE HARNESS

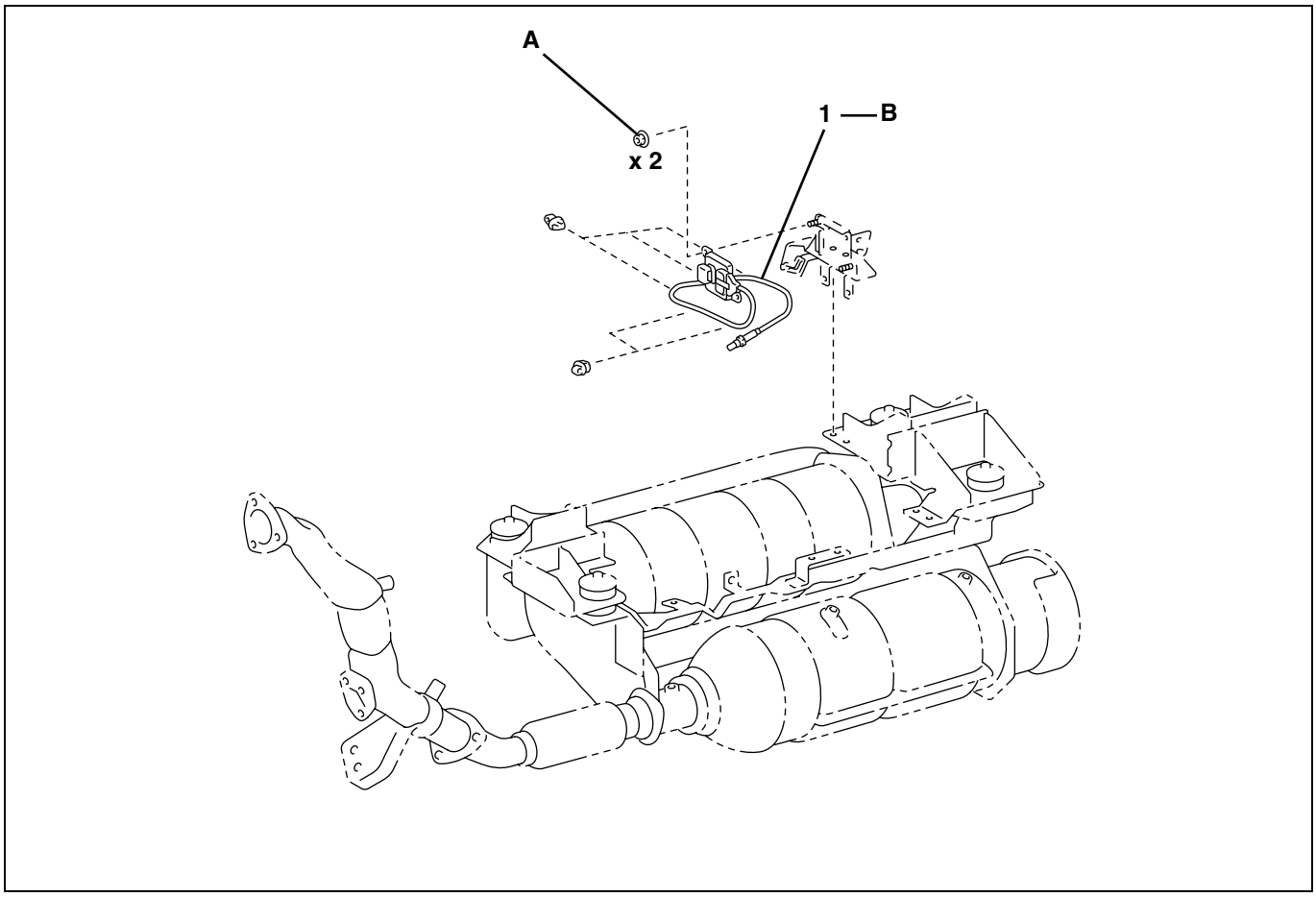
(1) Connect the connector to the SCR upstream NOx controller.

https://truckmanualshub.com/

SCR DOWNSTREAM NOx SENSOR

COMPONENT LOCATOR

EN01F02127100402023001



SHTS021271000180

1 SCR downstream NOx controller	

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

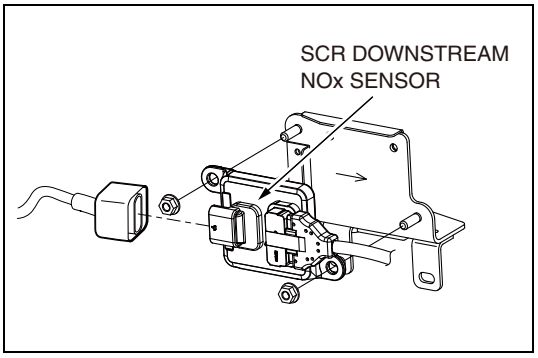
A 5.5 {56, 4.1}	B 40-60 {408-612, 29.5-44.2}

https://truckmanualshub.com/

REPLACEMENT

EN01F02127100402023002

REMOVING THE SCR DOWNSTREAM NOx SENSOR



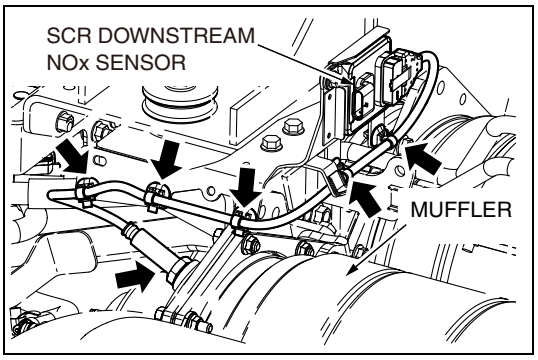
SHTS021271000181

1. DISCONNECTING THE HARNESS

(1) Disconnect the connector connected to the SCR downstream NOx controller.

2. REMOVING THE SCR DOWNSTREAM NOx SENSOR

(1) Unfasten the 2 nuts and remove SCR downstream NOx controller from the bracket.



SHTS021271000182

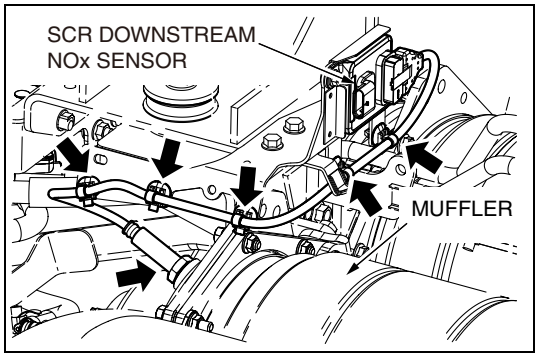
(2) Remove the SCR downstream NOx sensor together with the harness clamp from the muffler.

⚠ CAUTION

If the harness clamp is damaged, mount a new clamp to the original place correctly and securely.

https://truckmanualshub.com/

MOUNTING THE SCR DOWNSTREAM NOx SENSOR



SHTS021271000183

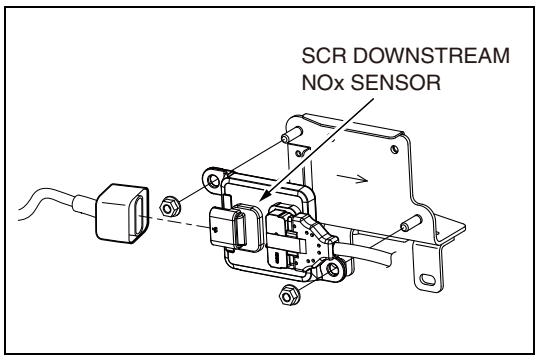
1. MOUNTING THE SCR DOWNSTREAM NOx SENSOR

(1) Connect the SCR downstream NOx sensor to the muffler and then the harness clamp.
Tightening Torque:
40-60 N·m {408-612 kgf·cm, 29.5-44.2 lbf·ft}

⚠ CAUTION

- **When reusing, clean the old anti-seizure lubricant on the SCR downstream NOx sensor and apply anti-seizure lubricant (WEICOM Anti-Seize ASW "High Tech" Assembly Paste or equivalent) to the thread area.**
- **A new downstream NOx sensor has anti-seizure lubricant applied.**
- **Pay attention not to twist the harness of the SCR downstream NOx sensor.**
- **Do not allow the harness to interfere with the bracket or bolt.**

(2) Mount the SCR downstream NOx controller to the bracket with 2 nuts.
Tightening Torque:
5.5 N·m {56 kgf·cm, 4.1 lbf·ft}



SHTS021271000184

2. CONNECTING THE HARNESS

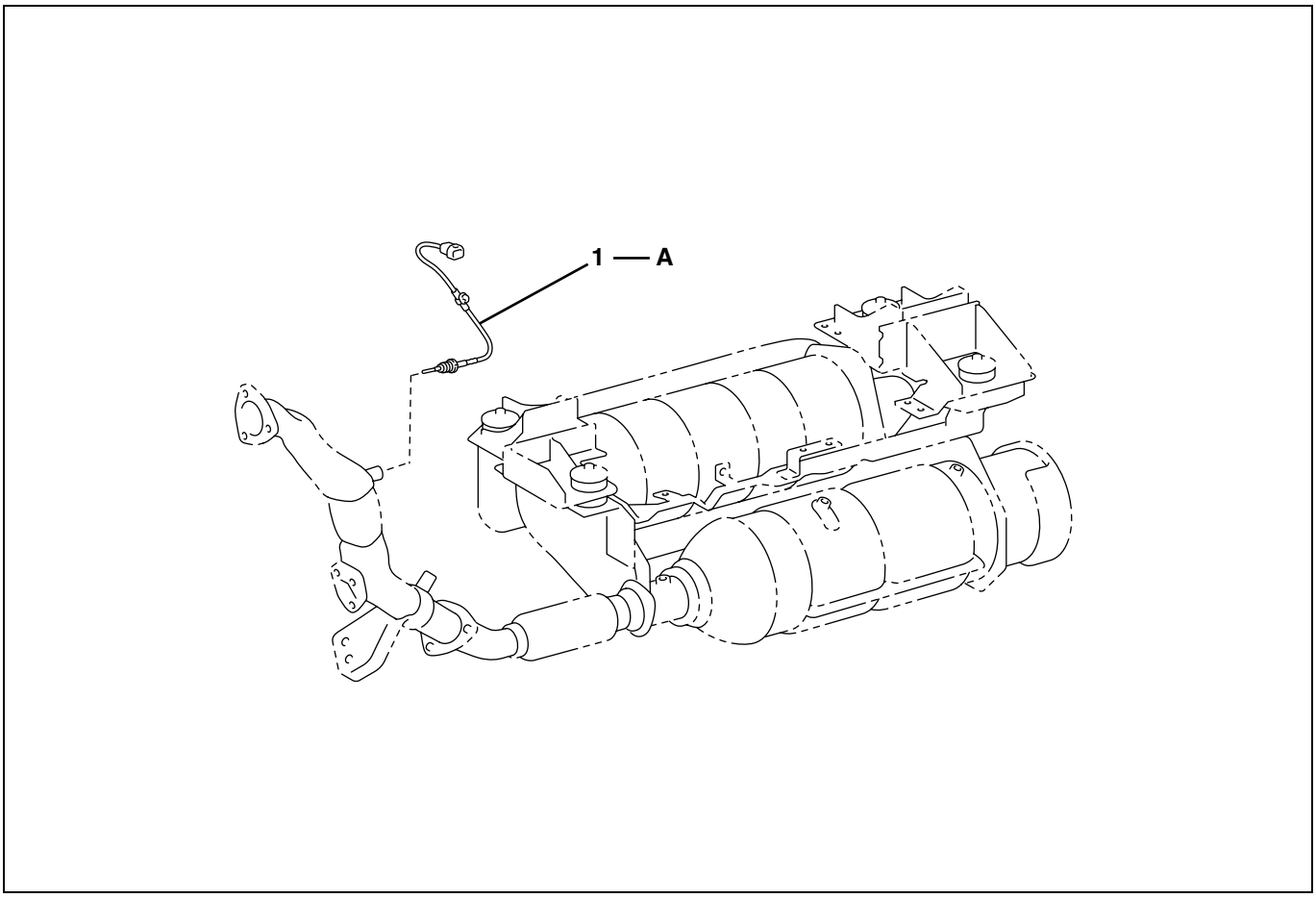
(1) Connect the connector to the SCR downstream NOx controller.

https://truckmanualshub.com/

ATC UPSTREAM TEMPERATURE SENSOR

COMPONENT LOCATOR

EN01F02127100402058001



SHTS021271000185

1 ATC upstream temperature sensor	

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

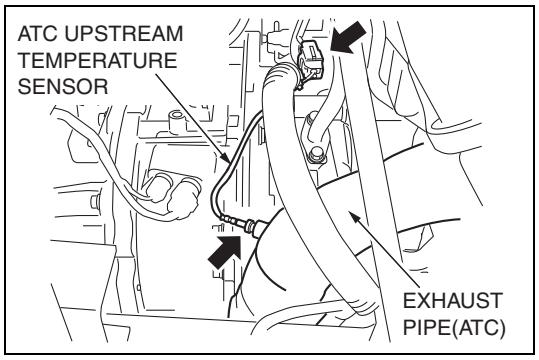
A 25-35 {255-357, 18.4-25.8}	

https://truckmanualshub.com/

REPLACEMENT

EN01F02127100402058002

REMOVING THE ATC UPSTREAM TEMPERATURE SENSOR



SHTS021271000186

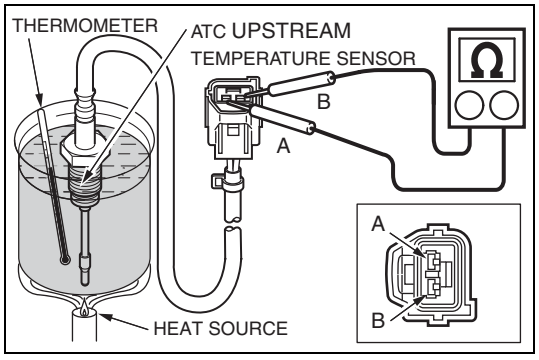
1. DISCONNECTING THE HARNESS

(1) Disconnect a connector from the ATC upstream temperature sensor.

2. REMOVING THE ATC UPSTREAM TEMPERATURE SENSOR

(1) Remove the ATC upstream temperature sensor together with a harness clamp from the exhaust pipe (ATC).

SINGLE UNIT INSPECTION



SHTS021271000187

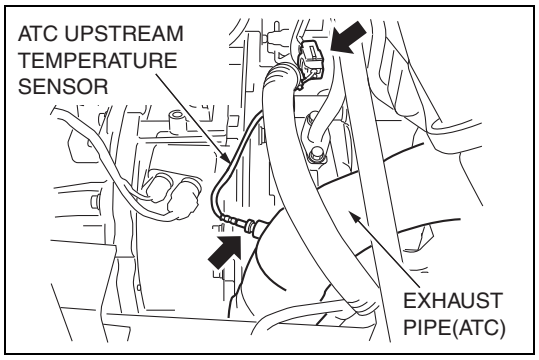
1. INSPECTING THE RESISTANCE

(1) Use water and a circuit tester to measure resistance between terminals. Replace if a measurement reading exceeds the standard value.

Temperature	Standard value
50°C {122°F}	8.0-17.2kΩ

https://truckmanualshub.com/

MOUNTING THE ATC UPSTREAM TEMPERATURE SENSOR



SHTS021271000188

1. MOUNTING THE ATC UPSTREAM TEMPERATURE SENSOR

(1) Connect the ATC upstream temperature sensor to the exhaust pipe (ATC) and fasten a harness clamp.
Tightening Torque:
25-35 N·m {255-357 kgf·cm, 18.4-25.8 lbf·ft}

⚠ CAUTION

- **If the ATC upstream temperature sensor is reused, wipe off old anti-seizure lubricant and apply new anti-seizure lubricant (equivalent to NEVER-SEEZ Heavy Metal Free manufactured by Bostic, Inc.) to threads.**
- **A new ATC upstream temperature sensor has anti-seizure lubricant applied.**
- **Use care to avoid twisting or kink of an ATC upstream temperature sensor harness.**

2. CONNECTING THE HARNESS

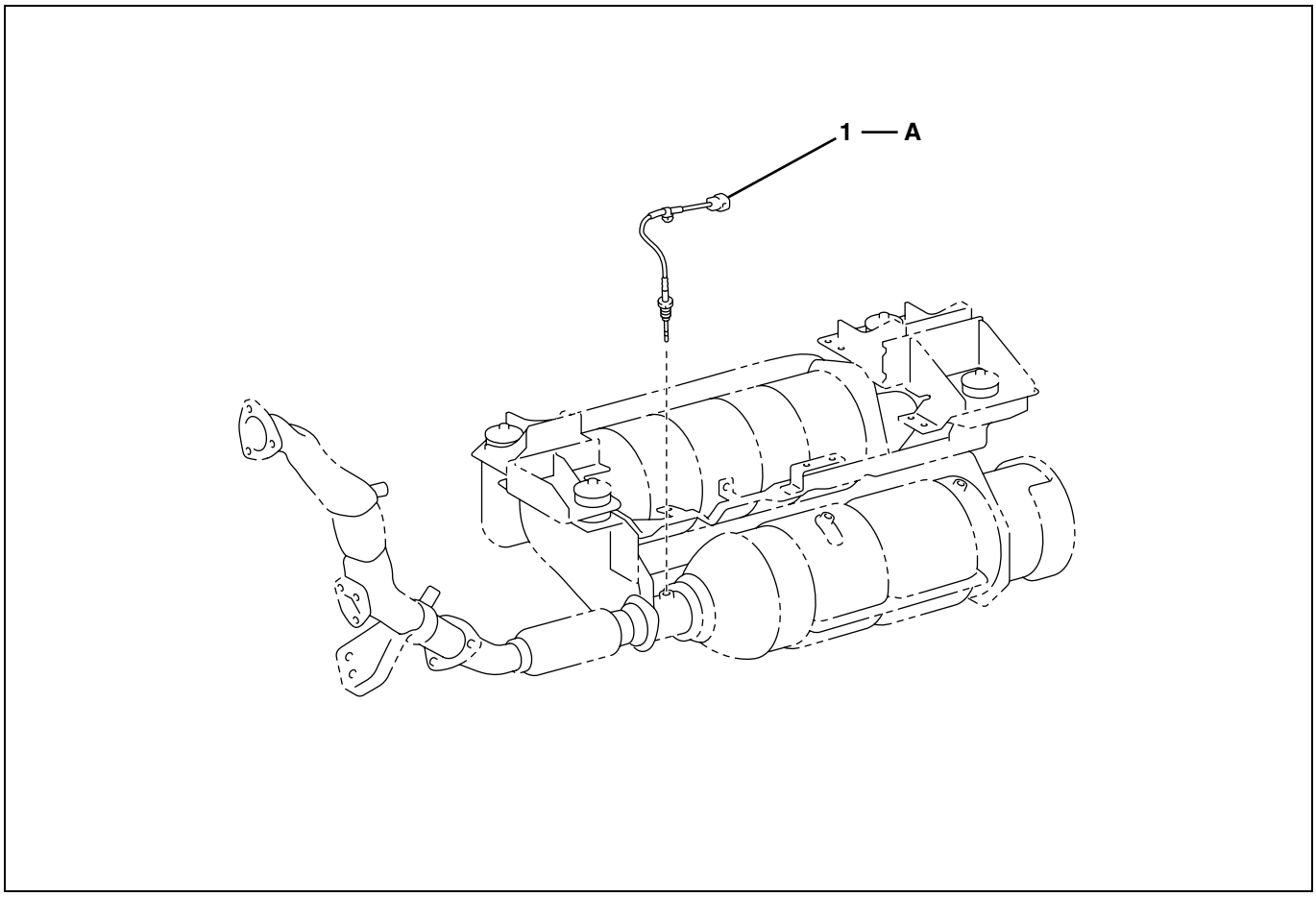
(1) Connect a connector to the ATC upstream temperature sensor.

https://truckmanualshub.com/

DOC UPSTREAM TEMPERATURE SENSOR

COMPONENT LOCATOR

EN01F02127100402025001



SHTS021271000189

1	DOC upstream temperature sensor	

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

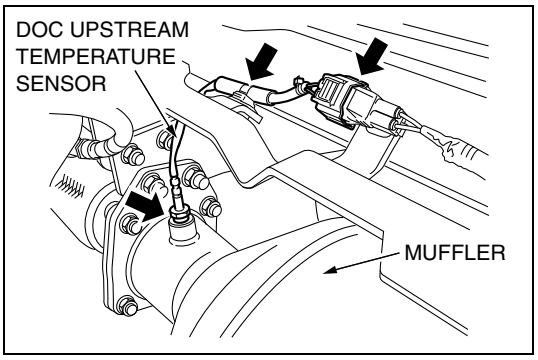
A	25-35 {255-357, 18.4-25.8}	

https://truckmanualshub.com/

REPLACEMENT

EN01F02127100402025002

REMOVING DOC UPSTREAM TEMPERATURE SENSOR



SHTS021271000190

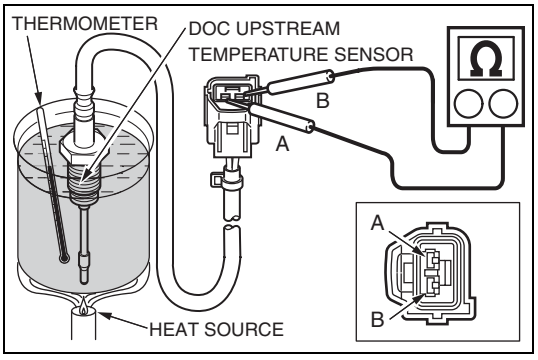
1. DISCONNECTING THE HARNESS

(1) Disconnect a connector from the DOC upstream temperature sensor.

2. REMOVING DOC UPSTREAM TEMPERATURE SENSOR

(1) Remove the DOC upstream temperature sensor together with a harness clamp from the muffler.

SINGLE UNIT INSPECTION



SHTS021271000191

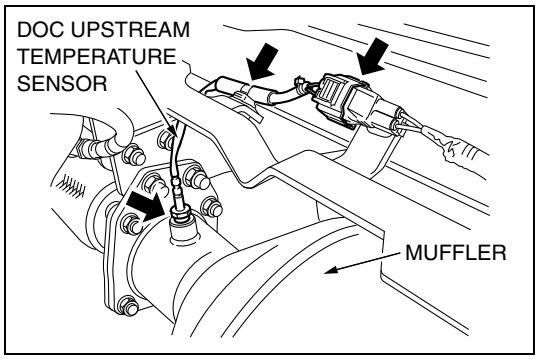
1. INSPECTING THE RESISTANCE

(1) Use water and a circuit tester to measure resistance between terminals. Replace if a measurement reading exceeds the standard value.

Temperature	Standard value
50°C {122°F}	8.0-17.2kΩ

https://truckmanualshub.com/

MOUNTING DOC UPSTREAM TEMPERATURE SENSOR



SHTS021271000192

1. MOUNTING DOC UPSTREAM TEMPERATURE SENSOR

(1) Connect the DOC upstream temperature sensor to the muffler and fasten a harness clamp.
Tightening Torque:
25-35 N·m {255-357 kgf·cm, 18.4-25.8 lbf·ft}

⚠ CAUTION

- **When reusing, clean the old anti-seizure lubricant on the DOC upstream temperature sensor and apply anti-seizure lubricant (equivalent to NEVER-SEEZ Heavy Metal Free manufactured by Bostic, Inc.) to the thread area.**
- **A new DOC upstream temperature sensor has anti-seizure lubricant applied.**
- **Use care to avoid twisting or kink of a DOC upstream temperature sensor harness.**

2. CONNECTING THE HARNESS

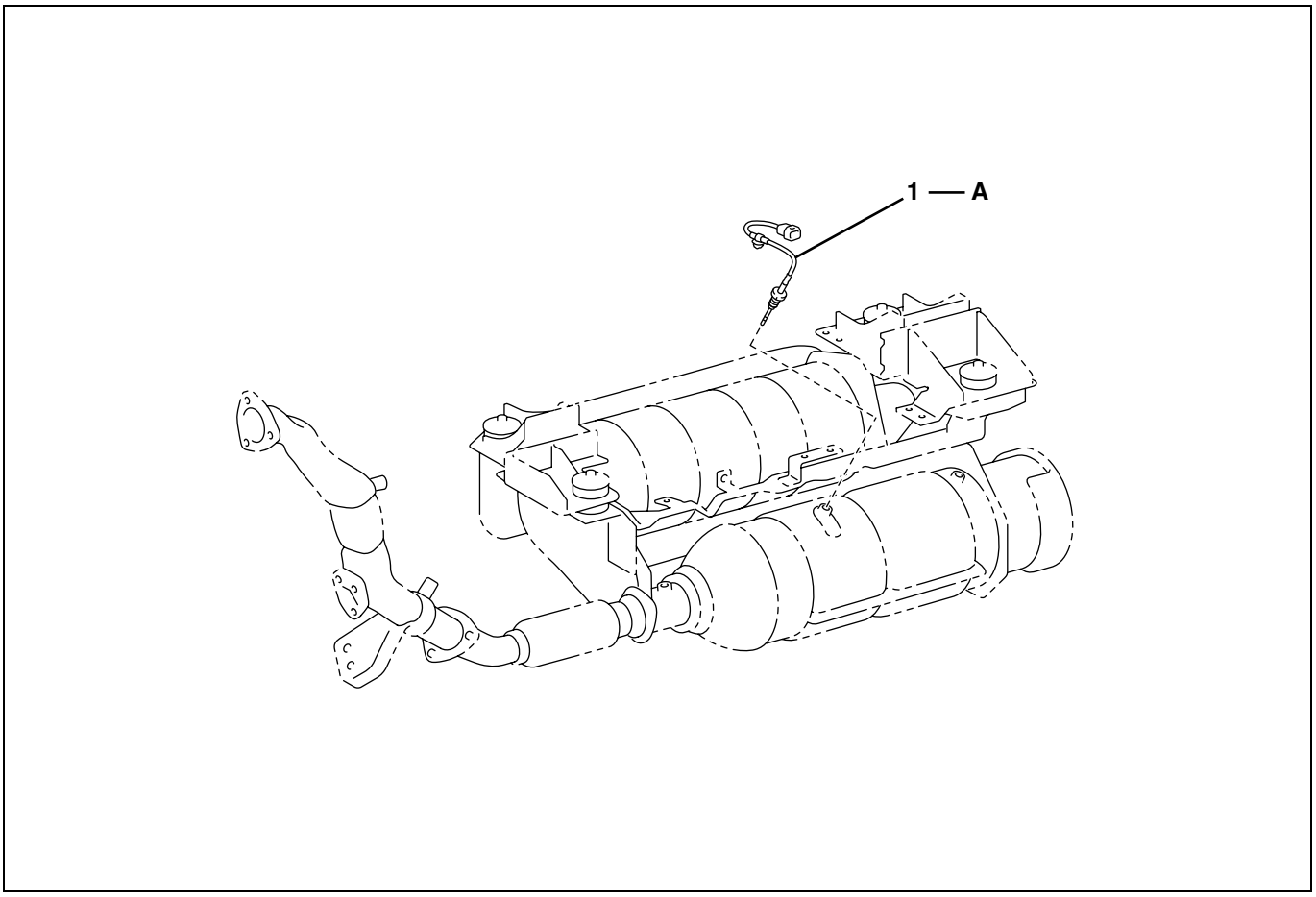
(1) Connect the connector to the DOC upstream temperature sensor.

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DPR UPSTREAM TEMPERATURE SENSOR

COMPONENT LOCATOR

EN01F02127100402044001



SHTS021271000193

1 DPR upstream temperature sensor	

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

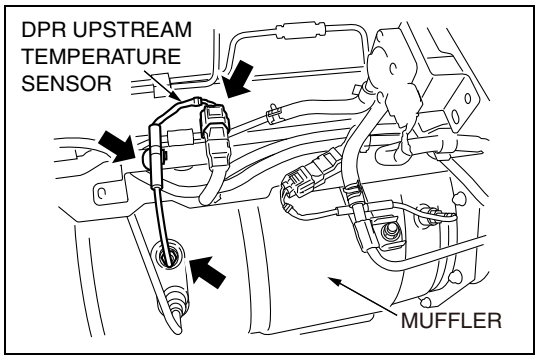
A 25-35 {255-357, 18.4-25.8}	

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REPLACEMENT

EN01F02127100402044002

REMOVING THE DPR UPSTREAM TEMPERATURE SENSOR



SHTS021271000194

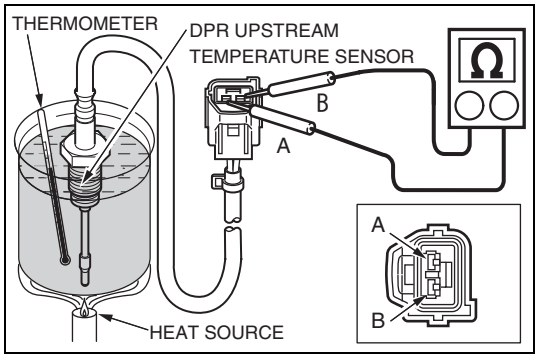
1. DISCONNECTING THE HARNESS

(1) Disconnect the connector from the DPR upstream temperature sensor.

2. REMOVING THE DPR UPSTREAM TEMPERATURE SENSOR

(1) Remove the DPR upstream temperature sensor together with the harness clamp from the muffler.

SINGLE UNIT INSPECTION



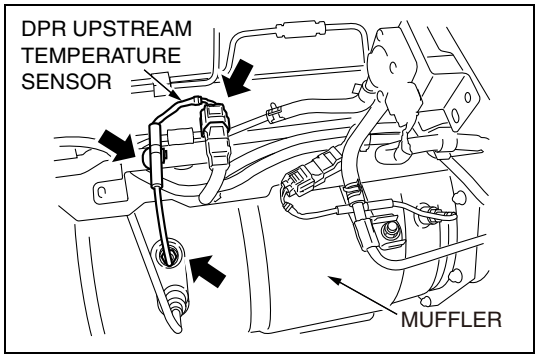
SHTS021271000195

1. INSPECTING THE RESISTANCE

(1) Use the water and a circuit tester to measure resistance between terminals. Replace if a measurement reading exceeds the standard value.

Temperature	Standard value
50°C {122°F}	8.0-17.2kΩ

MOUNTING THE DPR UPSTREAM TEMPERATURE SENSOR



SHTS021271000196

1. MOUNTING THE DPR UPSTREAM TEMPERATURE SENSOR

(1) Connect the DPR upstream temperature sensor to the muffler and then the harness clamp.
Tightening Torque:
25-35 N·m {255-357 kgf·cm, 18.4-25.8 lbf·ft}

⚠ CAUTION

- **When reusing, clean the old anti-seizure lubricant on the DPR upstream temperature sensor and apply anti-seizure lubricant (equivalent to NEVER-SEEZ Heavy Metal Free manufactured by Bostic, Inc.) to the thread area.**
- **A new DPR upstream temperature sensor has anti-seizure lubricant applied.**
- **Do not twist the DPR upstream temperature sensor harness.**

2. CONNECTING THE HARNESS

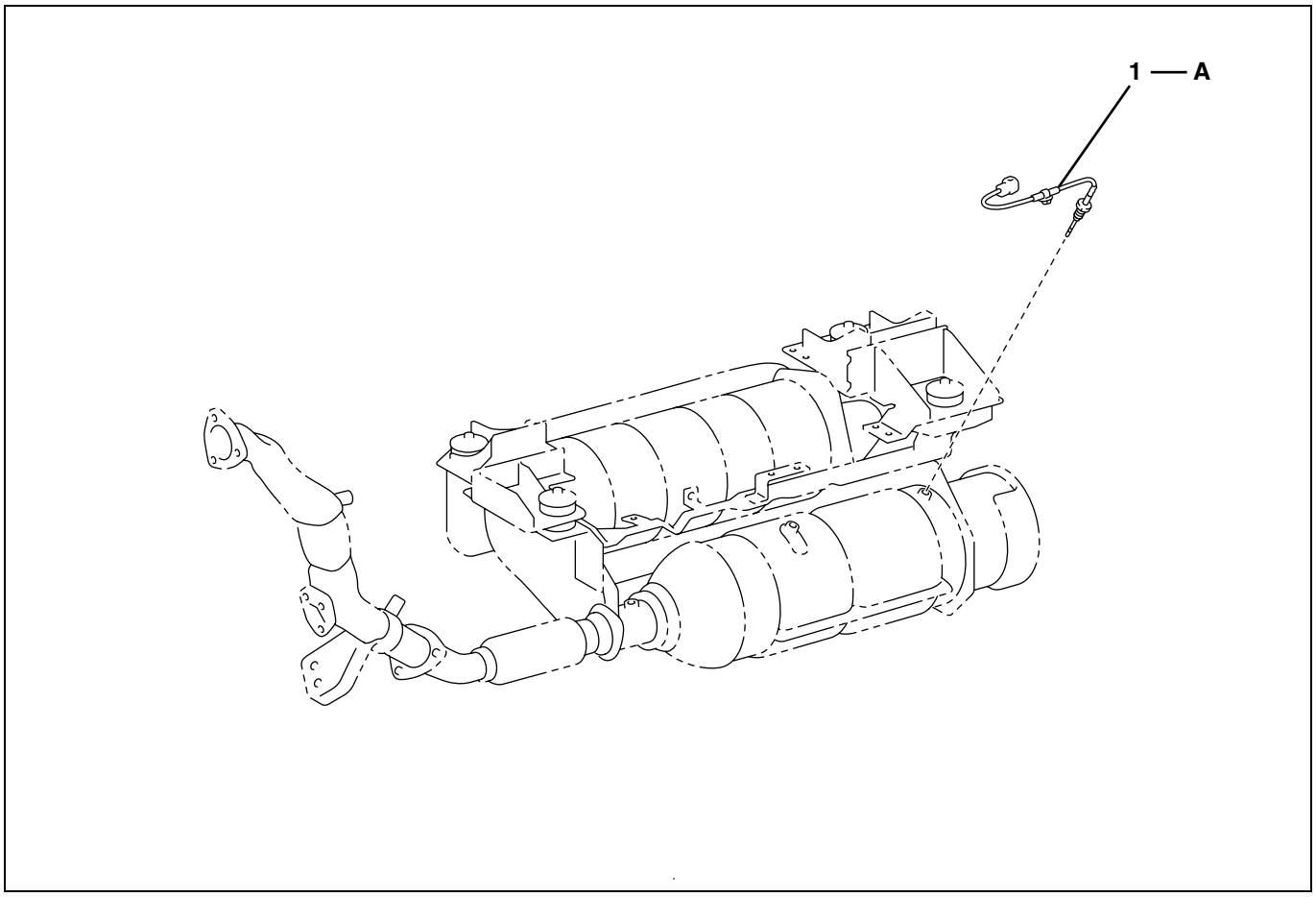
(1) Connect the connector to the DPR upstream temperature sensor.

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DPR DOWNSTREAM TEMPERATURE SENSOR

COMPONENT LOCATOR

EN01F02127100402027001



SHTS021271000197

1 DPR downstream temperature sensor	

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

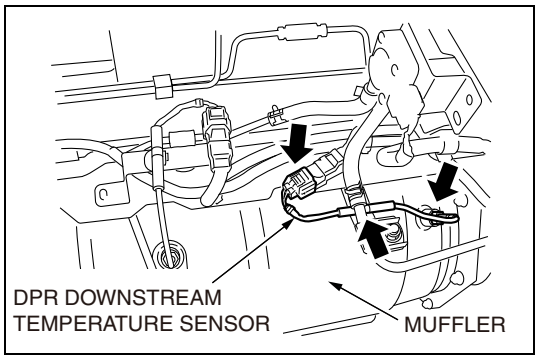
A 25-35 {255-357, 18.4-25.8}	

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REPLACEMENT

EN01F02127100402027002

REMOVING THE DPR DOWNSTREAM TEMPERATURE SENSOR



SHTS021271000198

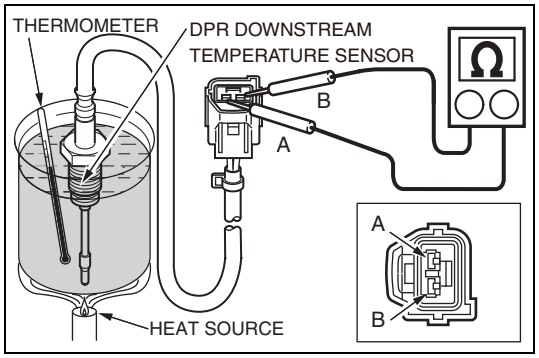
1. DISCONNECTING THE HARNESS

(1) Disconnect the connector from the DPR downstream temperature sensor.

2. REMOVING THE DPR DOWNSTREAM TEMPERATURE SENSOR

(1) Remove the DPR downstream temperature sensor together with a harness clamp from the muffler.

SINGLE UNIT INSPECTION



SHTS021271000199

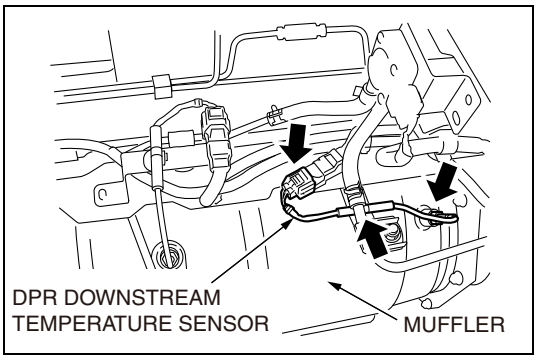
1. INSPECTING THE RESISTANCE

(1) Use the water and a circuit tester to measure resistance between terminals. Replace if a measurement reading exceeds the standard value.

Temperature	Standard value
50°C {122°F}	8.0-17.2kΩ

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MOUNTING THE DPR DOWNSTREAM TEMPERATURE SENSOR



SHTS021271000200

1. MOUNTING THE DPR DOWNSTREAM TEMPERATURE SENSOR

(1) Mount the DPR downstream temperature sensor to the muffler and fasten a harness clamp.
Tightening Torque:
25-35 N·m {255-357 kgf·cm, 18.4-25.8 lbf·ft}

⚠ CAUTION

- **When reusing, clean the old anti-seizure lubricant on the DPR downstream temperature sensor and apply anti-seizure lubricant (equivalent to NEVER-SEEZ Heavy Metal Free manufactured by Bostic, Inc.) to the thread area.**
- **A new DPR downstream temperature sensor has anti-seizure lubricant applied.**
- **Use care to avoid twisting or kink of a DPR downstream temperature sensor harness.**

2. CONNECTING THE HARNESS

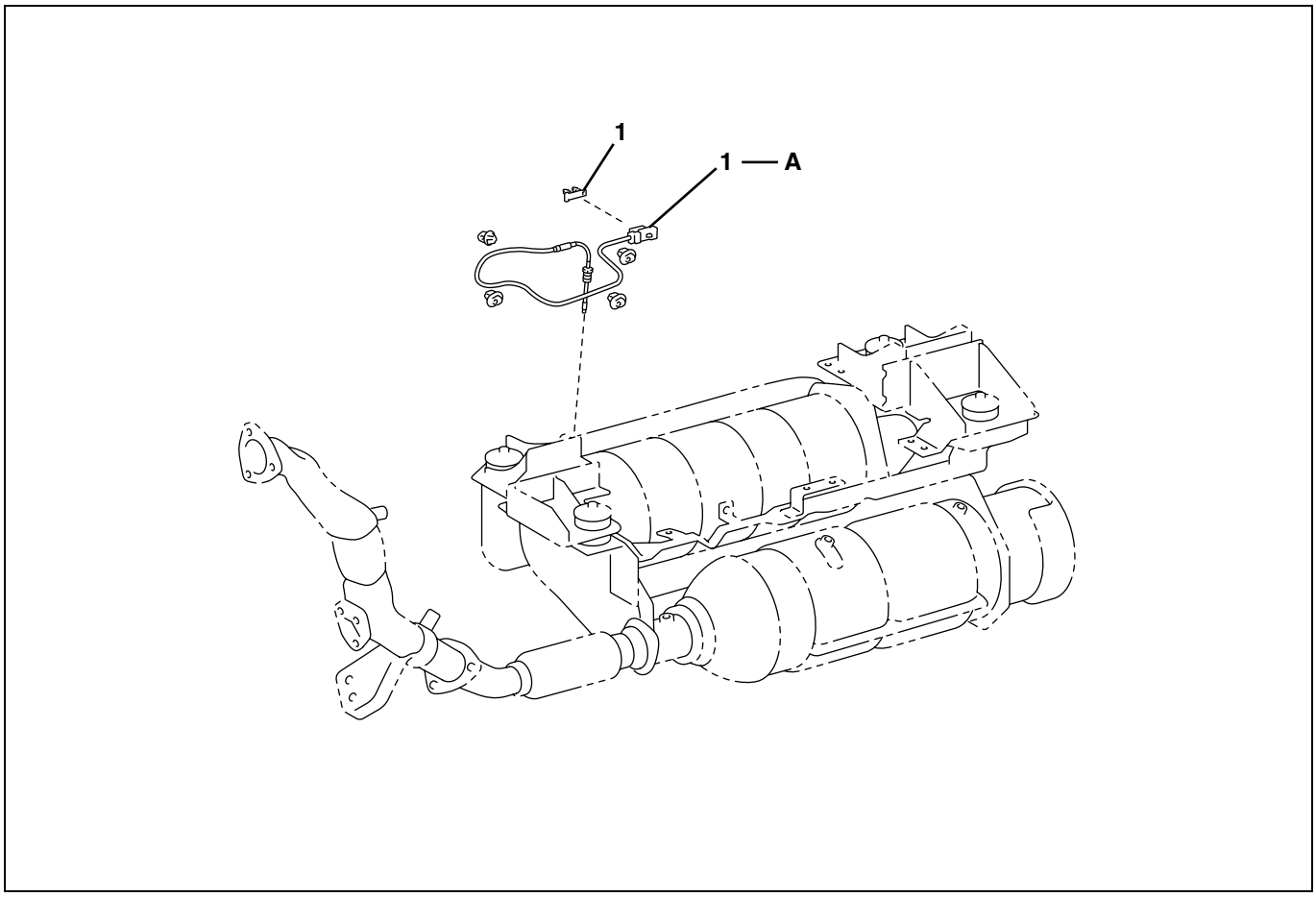
(1) Connect a connector to the DPR downstream temperature sensor.

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SCR UPSTREAM TEMPERATURE SENSOR

COMPONENT LOCATOR

EN01F02127100402028001



SHTS021271000201

1	SCR upstream temperature sensor	2	Christmas tree

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

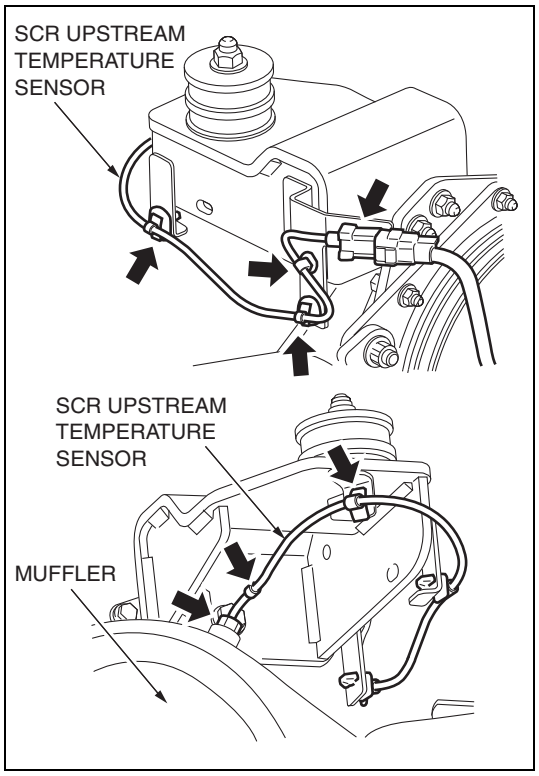
A	32.5 {331, 24.0}		

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REPLACEMENT

EN01F02127100402028002

REMOVING THE SCR UPSTREAM TEMPERATURE SENSOR



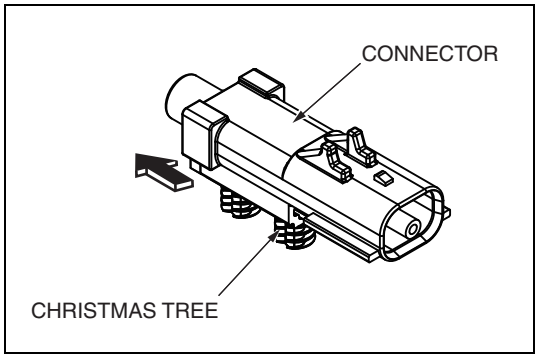
SHTS021271000202

1. DISCONNECTING THE HARNESS

(1) Disconnect the connector connected to the SCR upstream temperature sensor.

2. REMOVING THE SCR UPSTREAM TEMPERATURE SENSOR

(1) Remove the SCR upstream temperature sensor together with the harness clamp from the muffler.

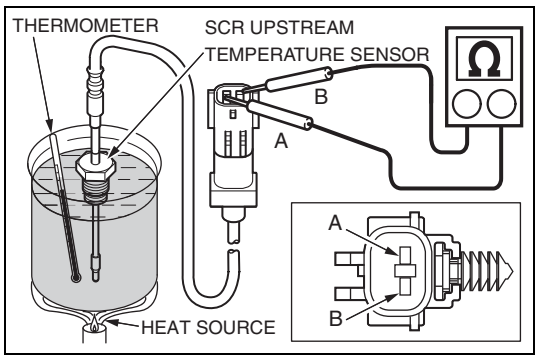


SHTS021271000203

(2) Remove the Christmas tree from the connector of the SCR upstream temperature sensor.

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SINGLE UNIT INSPECTION



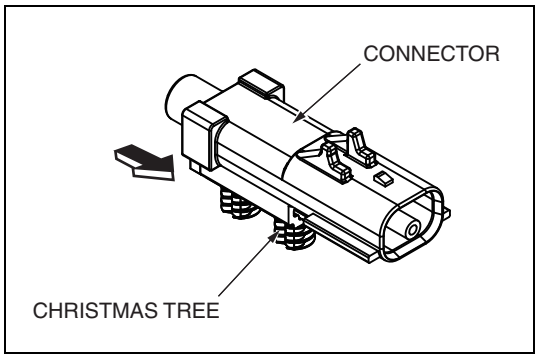
SHTS021271000204

1. INSPECTING THE RESISTANCE

(1) Use the water and a circuit tester to measure resistance between terminals. Replace if a measurement reading exceeds the standard value.

Temperature	Standard value
50°C {122°F}	235-244Ω

MOUNTING THE SCR UPSTREAM TEMPERATURE SENSOR

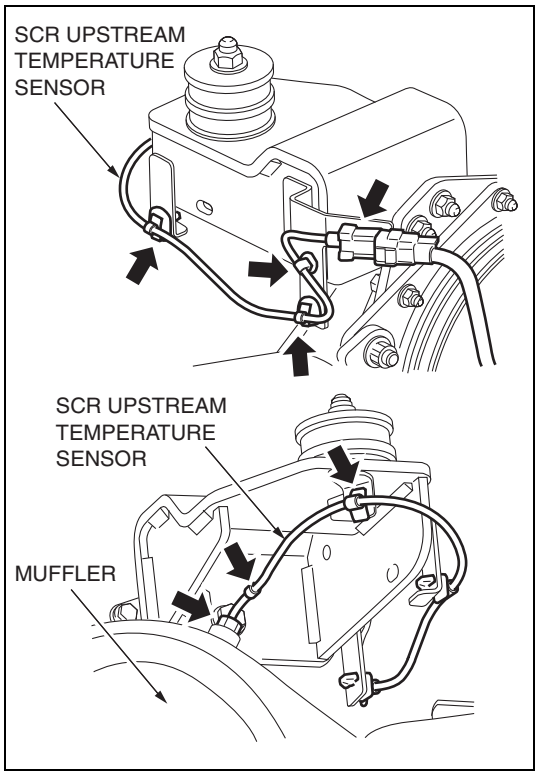


SHTS021271000205

1. MOUNTING THE SCR UPSTREAM TEMPERATURE SENSOR

(1) Mount the Christmas tree to the connector of the SCR upstream temperature sensor.

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SHTS021271000206

(2) Connect the SCR upstream temperature sensor to the muffler and then the harness clamp.
Tightening Torque:
32.5 N·m {331 kgf·cm, 24.0 lbf·ft}

⚠ CAUTION

- **When reusing, clean the old anti-seizure lubricant on the SCR upstream temperature sensor and apply anti-seizure lubricant (equivalent to NEVER-SEEZ Pure Nickel Special Grade manufactured by Bostic, Inc.) to the thread area.**
- **A new SCR upstream temperature sensor has anti-seizure lubricant applied.**
- **Pay attention not to twist the harness of the SCR upstream temperature sensor.**

2. CONNECTING THE HARNESS

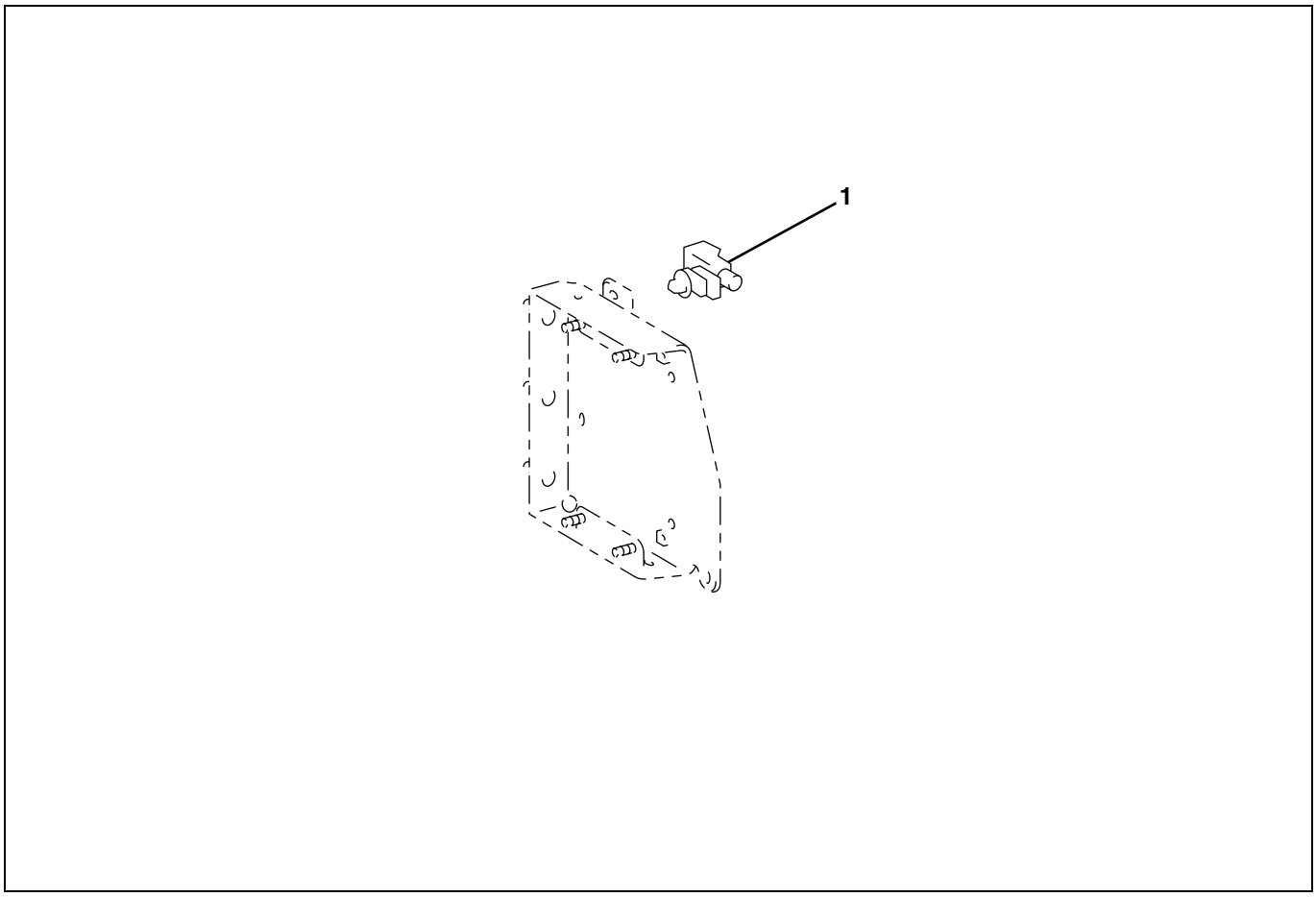
(1) Connect the connector to the SCR upstream temperature sensor.

https://truckmanualshub.com/

OUTSIDE TEMPERATURE SENSOR

COMPONENT LOCATOR

EN01F02127100402038001



SHTS021271000207

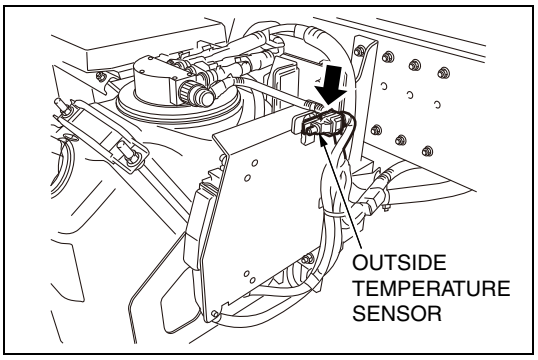
1 Outside temperature sensor	

https://truckmanualshub.com/

REPLACEMENT

EN01F02127100402038002

REMOVING THE OUTSIDE TEMPERATURE SENSOR



SHTS021271000208

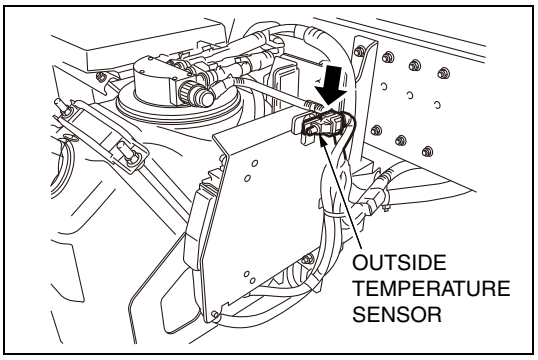
1. DISCONNECTING THE HARNESS

(1) Disconnect the connector connected to the outside temperature sensor.

2. REMOVING THE OUTSIDE TEMPERATURE SENSOR

(1) Unfasten the clamp to remove the outside temperature sensor from the bracket.

MOUNTING THE OUTSIDE TEMPERATURE SENSOR



SHTS021271000209

1. MOUNTING THE OUTSIDE TEMPERATURE SENSOR

(1) Mount the outside temperature sensor to the bracket with the clamp.

2. CONNECTING THE HARNESS

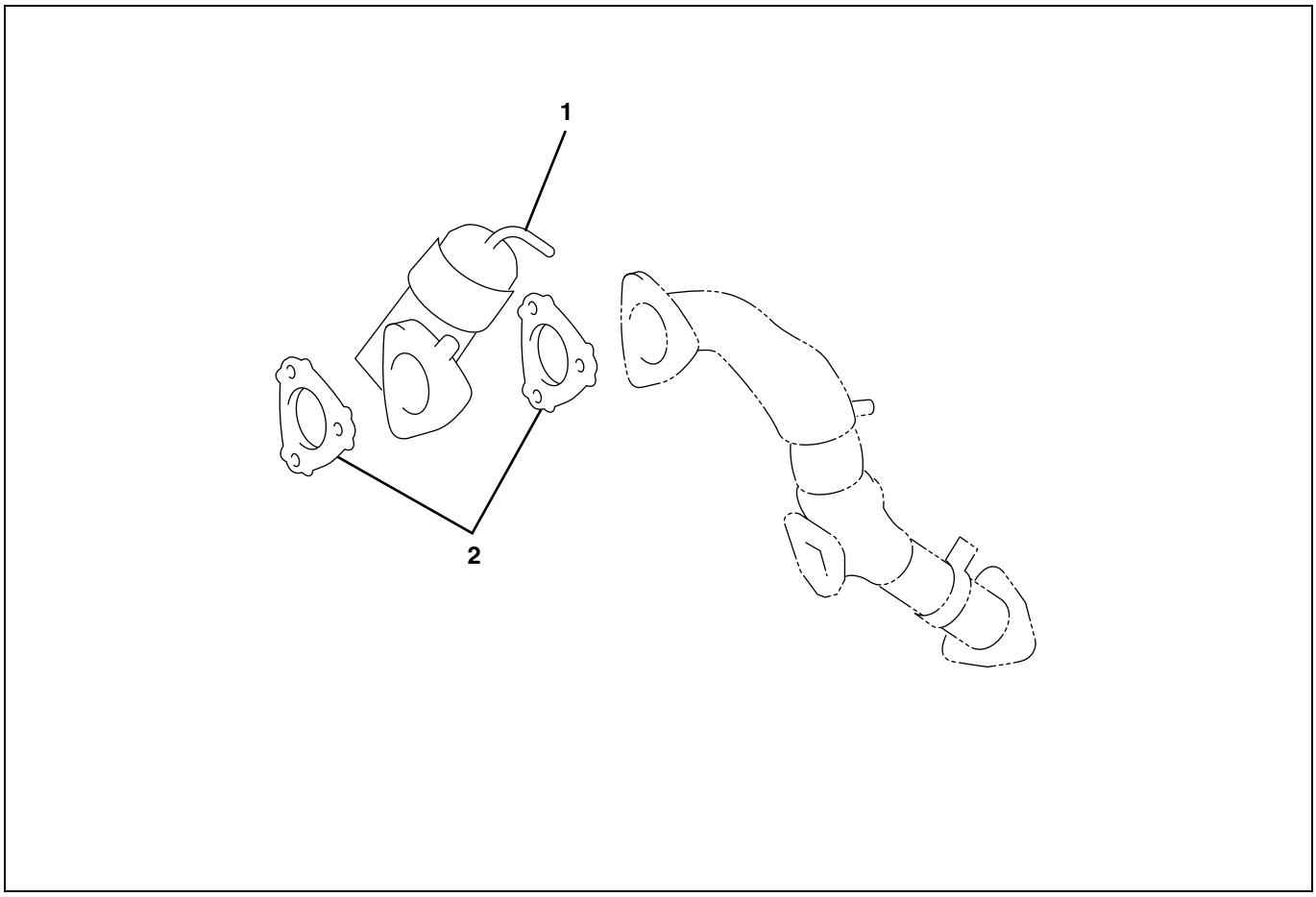
(1) Connect the connector to the outside temperature sensor.

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EXHAUST BRAKE

COMPONENT LOCATOR

EN01F02127100402008001



SHTS021271000210

1 Exhaust brake	2 Gasket *

*: Nonreusable part

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REPLACEMENT

EN01F02127100402008002

REMOVING THE EXHAUST BRAKE

1. CAUTIONS

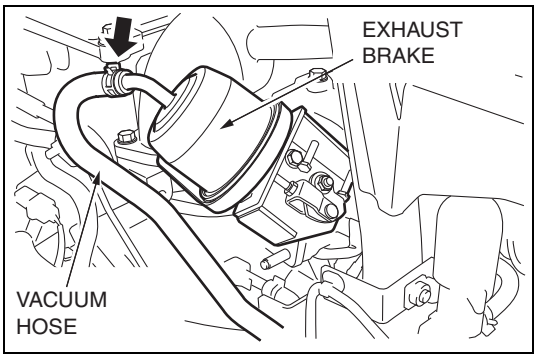
⚠ CAUTION
Perform replacement after cooling to prevent burns. (Turn the starter key to the "LOCK" position and leave it for more than 30 minutes to cool.)

2. REMOVING THE EXHAUST PIPE (ATC)

Reference: EXHAUST (J05E), EXHAUST PIPE (ATC), REPLACEMENT, REMOVING THE EXHAUST PIPE (ATC) (Page 11-17)

3. DISCONNECTING THE VACUUM HOSE

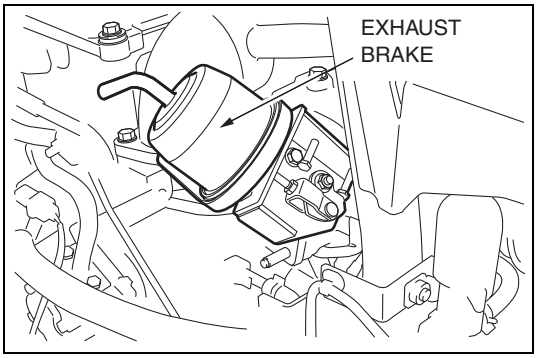
(1) Disconnect the vacuum hose from the exhaust brake.



SHTS021271000211

4. REMOVING THE EXHAUST BRAKE

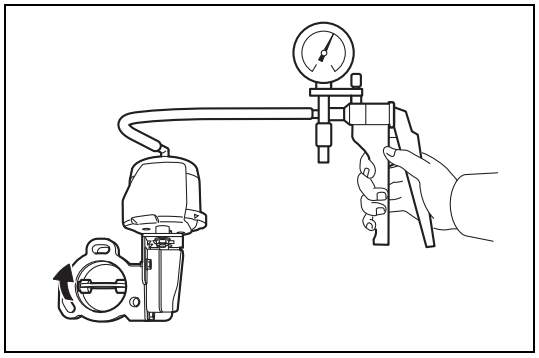
(1) Remove the exhaust brake and gasket from the turbocharger assembly.



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SINGLE UNIT INSPECTION

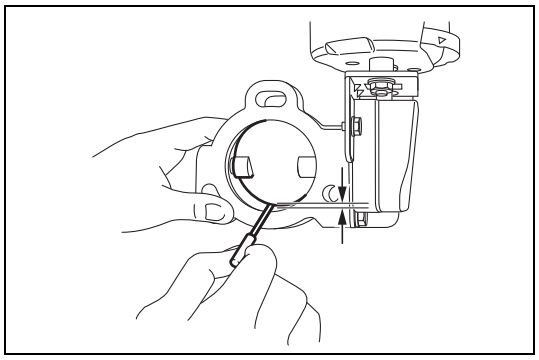


SHTS021271000213

1. INSPECTING THE EXHAUST BRAKE

(1) Check the valve for smooth and complete closing when a load of 80 kPa {600 mmHg, 11.6 inHg} is applied using the exhaust brake valve Mityvac.

(2) Check the valve for smooth and complete opening when atmospheric pressure is applied to the exhaust brake.



SHTS021271000214

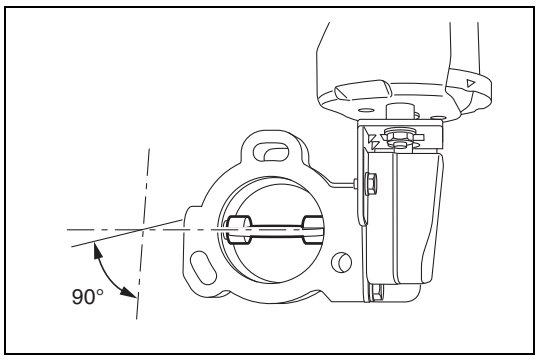
2. INSPECTING THE VALVE BODY

(1) Close the valve completely by applying a load of 80 kPa {600 mmHg, 11.6 inHg} using the Mityvac.

(2) Inspect the clearance between the valve and body using the SST.

SST: 09240-00020
Wire gauge set
09242-00020
Wire gauge (0.2 mm) (contained in kit)

Minimum clearance	Valve clearance (mm)
0.2 mm {0.0079 in.}	0.2 - 0.3 {0.0079 - 0.018 in.}



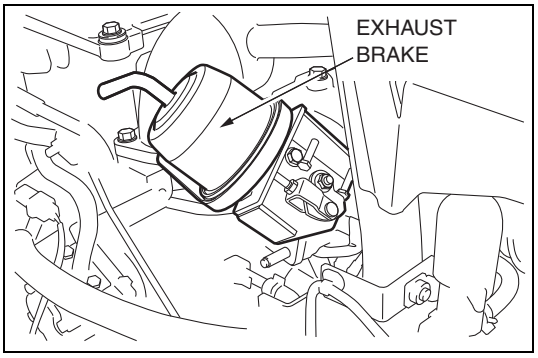
SHTS021271000215

(3) Open the valve completely by applying atmospheric pressure to the exhaust brake and inspect the angle between the valve and body.

Standard value	90°

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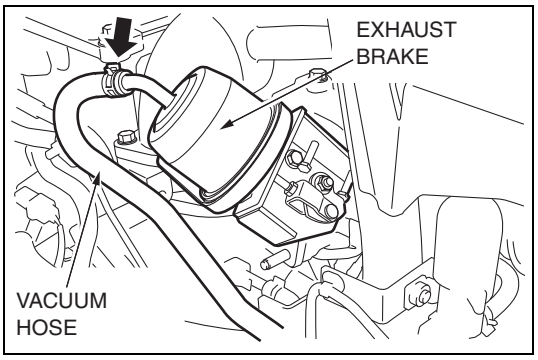
MOUNTING THE EXHAUST BRAKE



SHTS021271000216

1. MOUNTING THE EXHAUST BRAKE

(1) Replace with a new gasket and mount the exhaust brake to the turbocharger assembly.



SHTS021271000217

2. CONNECTING THE VACUUM HOSE

(1) Connect the vacuum hose to the exhaust brake.

3. MOUNTING THE EXHAUST PIPE (ATC)

Reference: EXHAUST (J05E), EXHAUST PIPE (ATC), REPLACEMENT, MOUNTING THE EXHAUST PIPE (ATC) (Page 11-18)

4. INSPECTING FOR EXHAUST GAS LEAKAGE

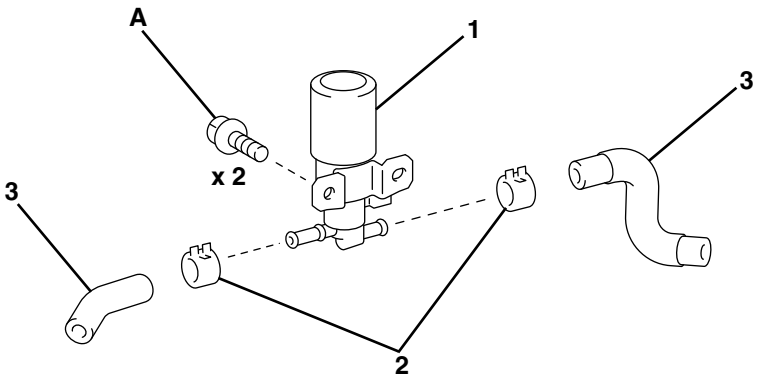
(1) Start the engine and inspect for exhaust gas leakage.

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EXHAUST BRAKE MAGNETIC VALVE

COMPONENT LOCATOR

EN01F02127100402045001



SHTS021271000218

1	Exhaust brake magnetic valve	3	Hose
2	Clamp		

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

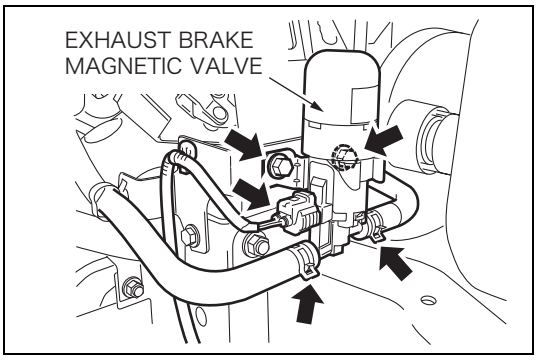
A	31 {316, 22.9}		

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REPLACEMENT

EN01F02127100402045002

REMOVING THE EXHAUST BRAKE MAGNETIC VALVE



SHTS021271000219

1. DISCONNECTING THE HOSE

(1) Unfasten the 2 clamps to disconnect 2 hoses from the exhaust brake magnetic valve.

⚠ CAUTION

Before disconnecting the hoses, put alignment marks.

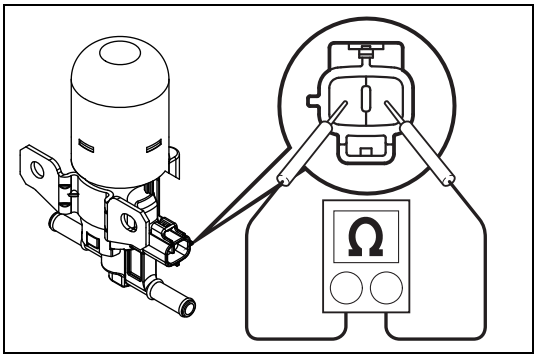
2. DISCONNECTING THE HARNESS

(1) Disconnect the connector from the exhaust brake magnetic valve.

3. REMOVING THE EXHAUST BRAKE MAGNETIC VALVE

(1) Unfasten the bolts (2 pcs.) to remove the exhaust brake magnetic valve from the bracket.

SINGLE UNIT INSPECTION

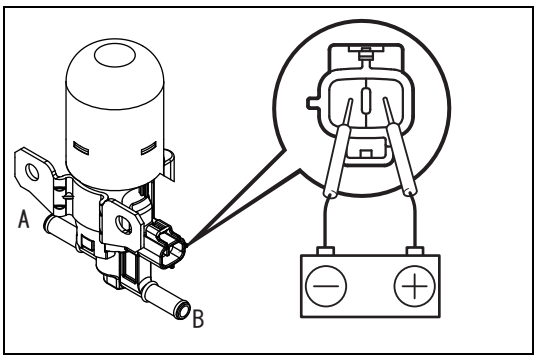


SHTS021271000220

1. RESISTANCE TEST BETWEEN TERMINALS

(1) Use the circuit tester, measure the resistance between the exhaust brake magnetic valve terminals. Replace if the measurement reading exceeds the standard value.

Standard value (20°C {68°F})	**10.9 - 16.9 Ω**



SHTS021271000221

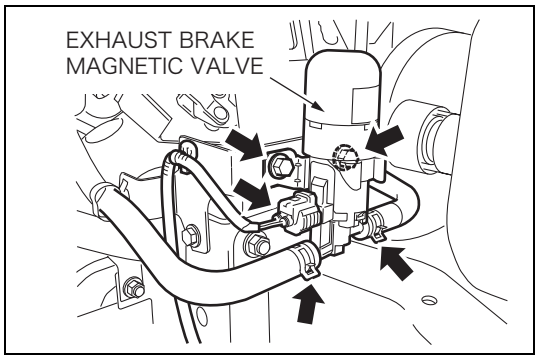
2. VENTILATION TEST

(1) Apply a battery voltage (12 V) between the exhaust brake magnetic valve terminals and inspect ventilation.

Inspection conditions	Ventilation
Energized	**With ventilation between A and B**

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MOUNTING THE EXHAUST BRAKE MAGNETIC VALVE



SHTS021271000222

1. MOUNTING THE EXHAUST BRAKE MAGNETIC VALVE

(1) Mount the exhaust brake magnetic valve with the bolts (2 pcs.).
Tightening Torque:
31 N·m {316 kgf·cm, 22.9 lbf·ft}

2. CONNECTING THE HARNESS

(1) Connect the connector to the exhaust brake magnetic valve.

3. CONNECT THE HOSE

(1) Align the markings and connect the hoses (2 pcs.) to the exhaust brake magnetic valve.

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COOLING (J05E)

12-001

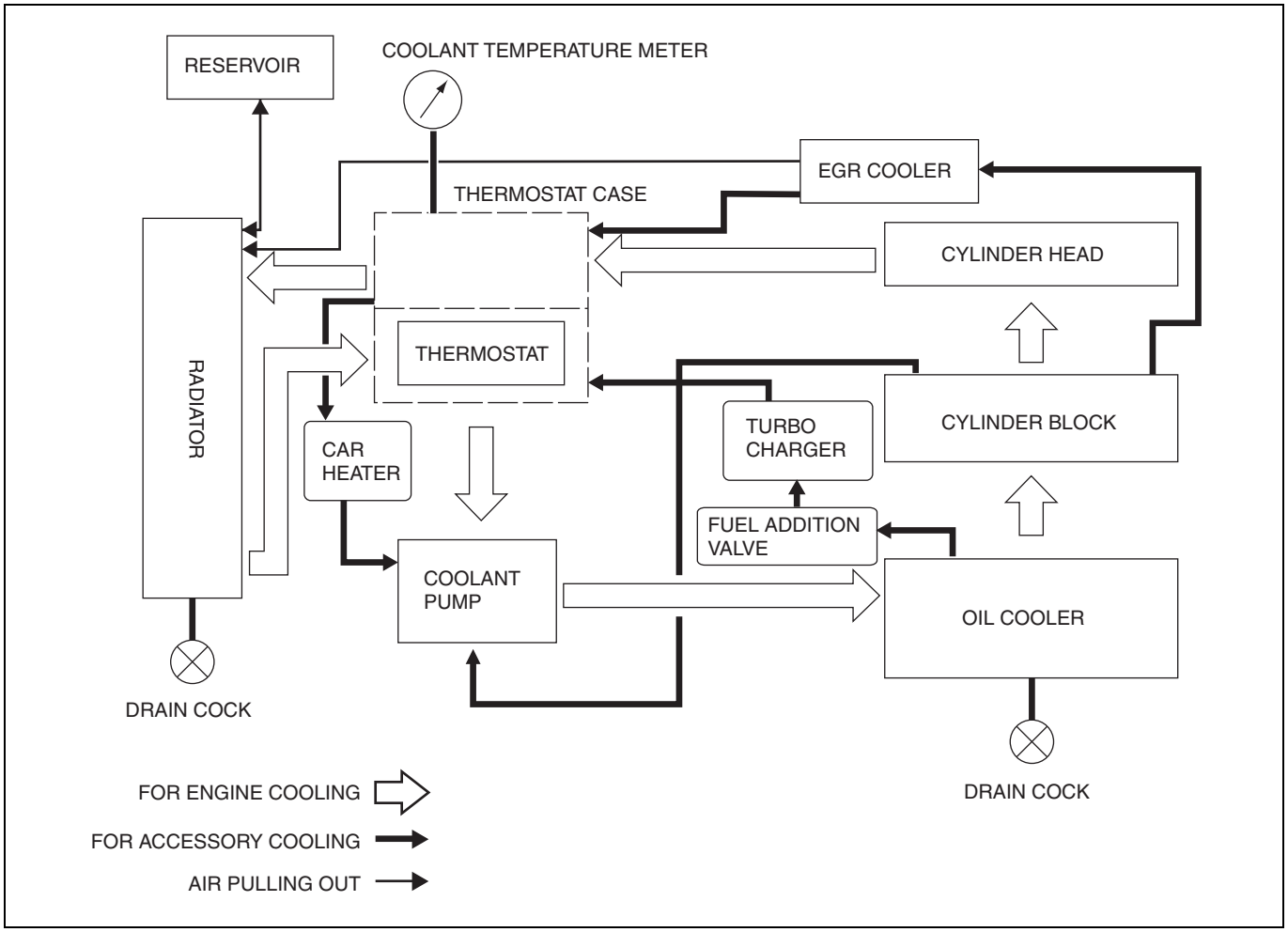
COOLING SYSTEM 12-2
COOLING SYSTEM DIAGRAM 12-2
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INSPECTION 12-4
REPLACEMENT 12-5
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COMPONENT LOCATOR 12-15
REPLACEMENT 12-16
RESERVE TANK 12-18
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COOLING SYSTEM

COOLING SYSTEM DIAGRAM

EN01F02127110405009001



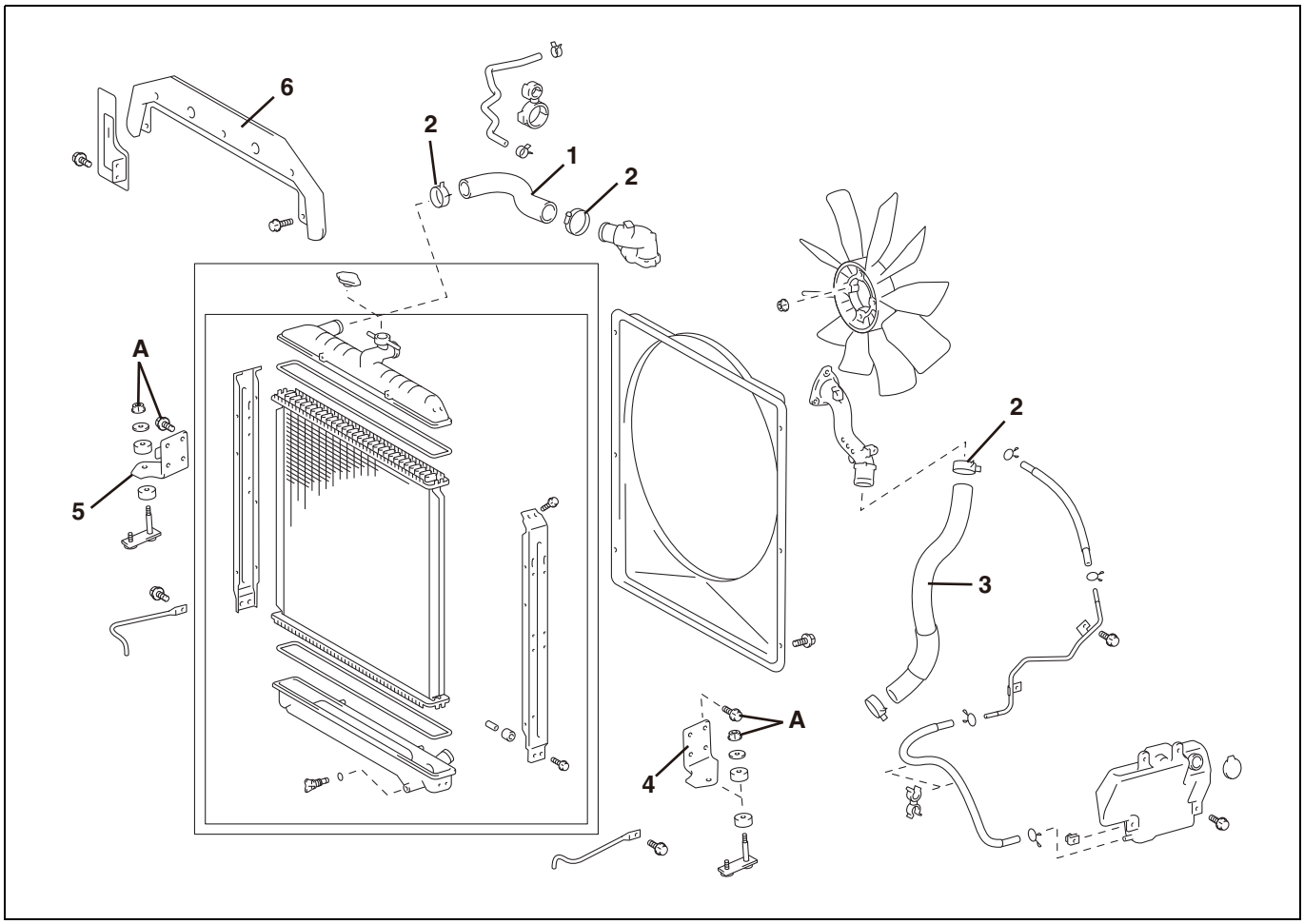
SHTS021271100001

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RADIATOR

COMPONENT LOCATOR

EN01F021271104020190001



SHTS021271100002

1	Radiator inlet hose	4	Radiator bracket No. 3
2	Clamp	5	Radiator bracket No. 4
3	Radiator outlet hose	6	Radiator support seal No. 1

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	19.5 {199, 14}		

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INSPECTION

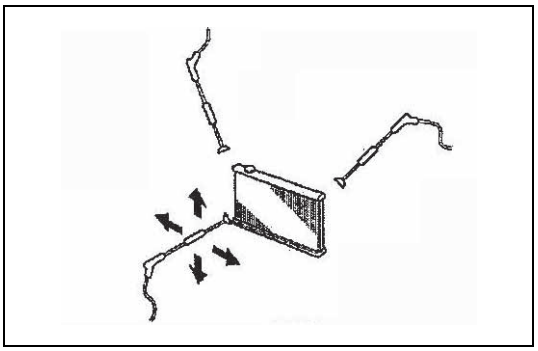
EN01F02127110402019002

INSPECTION BEFORE SERVICING

1. INSPECTING THE RADIATOR

(1) Inspect the radiator visually for coolant leakage, crack and damage. If found defective, replace the radiator. If the coolant decreases frequently and requires refilling, inspect the radiator, hose and pipe for coolant leakage.

ON-VEHICLE CLEANING



SHTS021271100003

1. CHECK FIN FOR BLOCKAGE

(1) If the fins are clogged, wash them with water or a steam cleaner, then dry them with compressed air.

NOTICE

- **If the steam cleaner is too close to the core, there is a possibility of damaging the fins, so keep the following injection distances.**

Injection Pressure kPa {kgf/cm^2, lbf/in^2}	Injection Distance mm {in.}
2,942-4,903 {30-50, 427-711}	300 {11.811}
4,903-7,845 {50-80, 711-1,138}	500 {19.685}

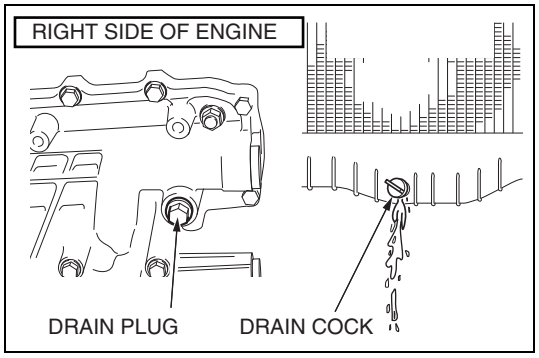
- **If the fins are bent, straighten them with a screwdriver or pliers.**
- **Do not expose electronic components to water.**

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REPLACEMENT

EN01F02127110402019003

REMOVING THE RADIATOR



SHTS021271100004

1. DRAINING THE COOLANT

(1) Drain coolant from the drain cock of the radiator and the drain plug of the oil cooler.

⚠ WARNING

To avoid burns, do not remove the radiator cap when the engine and the radiator are hot. Pressure causes the liquid and vapor to burst forth.

⚠ CAUTION

Dispose the coolant in accordance with the specified procedures (industrial waste disposal) or other environment-friendly practices.

NOTICE

With the radiator cap removed, coolant can be drained faster.

2. COLLECTION OF REFRIGERANT

Reference: CHASSIS (S1-LXJE03A), HEATER & AIR CONDITIONER

Reference: CHASSIS (S1-LXJE04A), HEATER & AIR CONDITIONER

3. REMOVING THE INTERCOOLER

Reference: COOLING (J05E), INTERCOOLER, OVERHAUL, REMOVING THE INTERCOOLER (Page 12-21)

4. DISCONNECTING THE OIL COOLER HOSE

(1) Remove the drain plug on the oil pan lower surface to drain automatic transmission oil.

⚠ CAUTION

- **When draining automatic transmission oil, check for oil quantity and quality and presence of metallic fragments.**
- **Dispose the automatic transmission oil in accordance with the specified procedures (industrial waste disposal) or by other environment-friendly methods. (For details, refer to RZT-0010 "Environment Manual.")**

NOTICE

Automatic transmission oil is easily drained when it is warm.

(2) Remove the clamp, and disconnect the oil cooler inlet hose No.1 from the radiator lower tank.

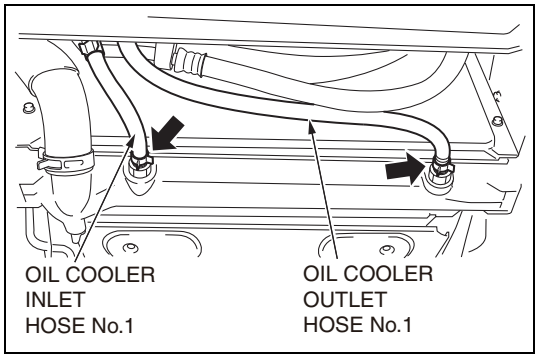
⚠ CAUTION

Prepare the reservoir and clean clothes to collect dripping automatic transmission oil when disconnecting the hose.

(3) Remove the clamp, and disconnect the oil cooler outlet hose No. 1 from the radiator lower tank.

⚠ CAUTION

Prepare the reservoir and clean clothes to collect dripping automatic transmission oil when disconnecting the hose.



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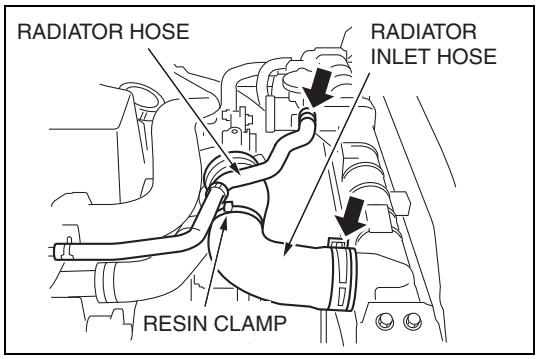
5. DISCONNECTING THE RADIATOR HOSE

⚠ CAUTION

- **Check for the locating markings at the both ends of the radiator hose before removing the hose. If the marking is erased, mark the hose before disconnecting it.**
- **Mark the clamp position on the hose before removing.**
- **Protect the radiator with a plastic cover to avoid dirt or foreign matters.**

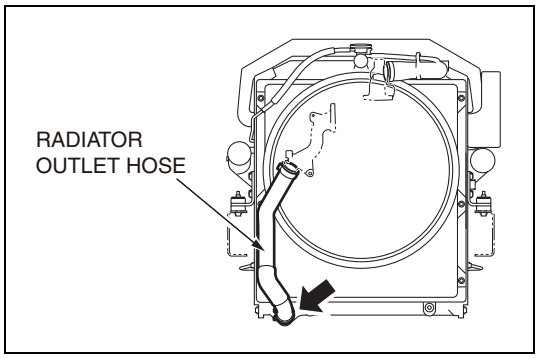
NOTICE
Prepare the reservoir and clean clothes to collect dripping coolant when disconnecting the hose.

(1) Remove the resin clamp from the radiator inlet hose.
(2) Loosen the 2 clamps, and disconnect the radiator inlet hose and radiator hose from the radiator.



SHTS021271100006

(3) Remove the clamp, and disconnect the radiator outlet hose from the radiator lower tank.



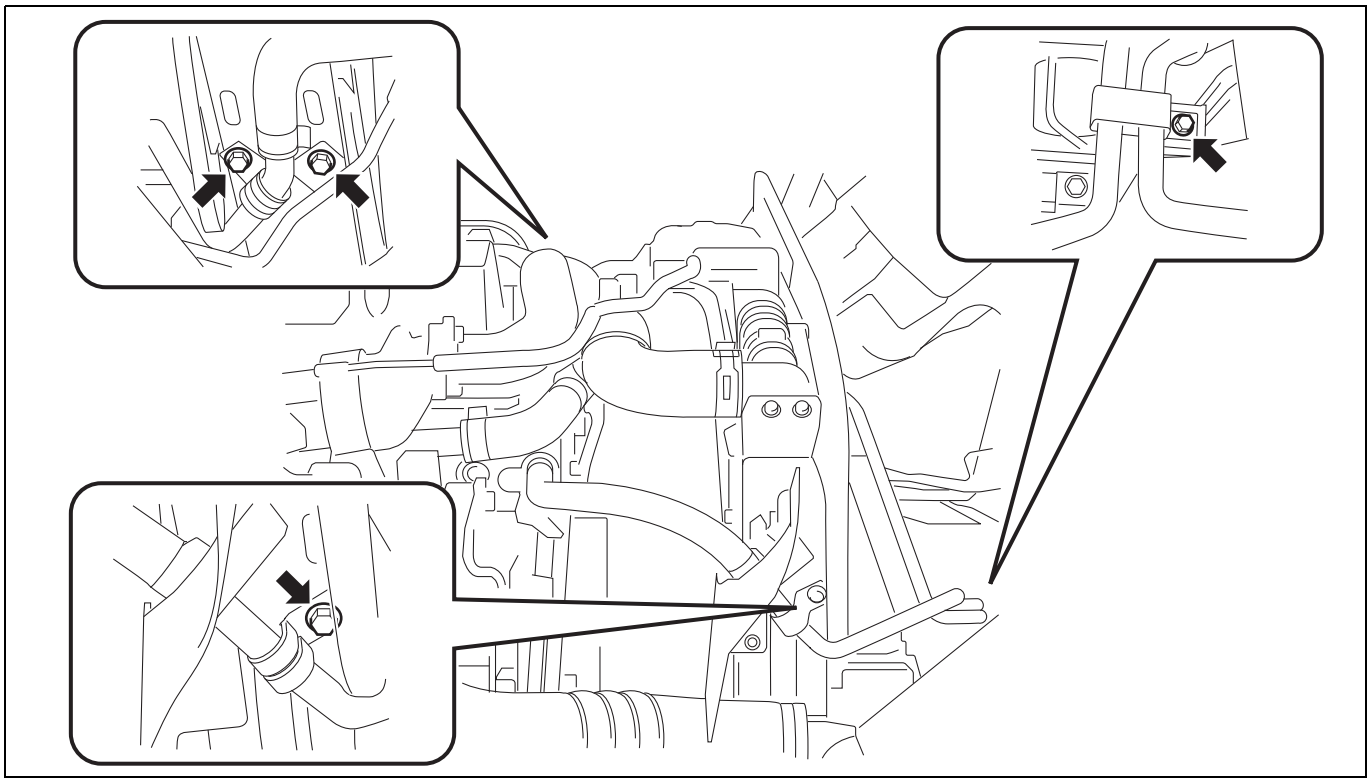
SHTS021271100007

6. REMOVING THE COOLING FAN AND FAN PULLEY
Reference: COOLING (J05E), COOLING FAN AND FAN CLUTCH, OVERHAUL, REMOVING THE COOLING FAN & FAN CLUTCH (Page 12-34)

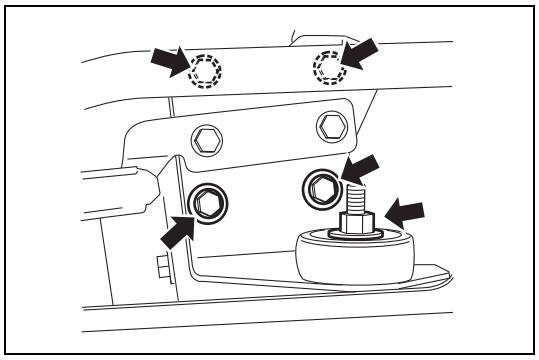
https://truckmanualshub.com/

7. REMOVING THE HEATER PIPE AND RADIATOR BRACKET

(1) Unfasten the bolt to remove the heater pipe and reserve pipe.

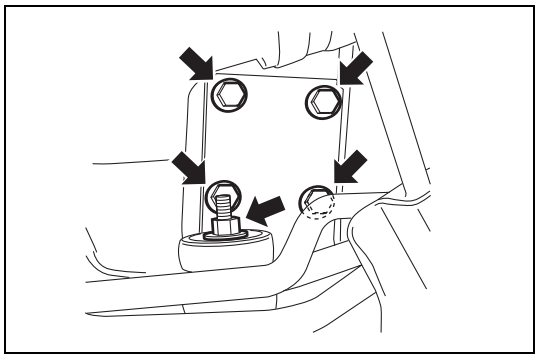


SHTS021271100008



SHTS021271100009

(2) Unfasten the 4 bolts and nuts to remove the radiator bracket No.3 from the radiator.



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(3) Unfasten the 4 bolts and nuts to remove the radiator bracket No.4 from the radiator.

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8. REMOVING THE RADIATOR

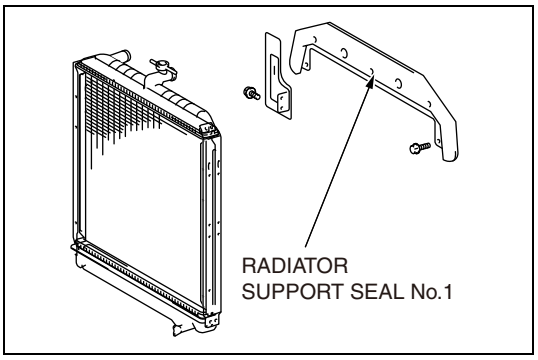
(1) Pull out the radiator toward the upper side from the vehicle.

⚠ CAUTION

Be careful not to damage the fin of the radiator core during work.

9. REMOVING THE RADIATOR SUPPORT SEAL No.1

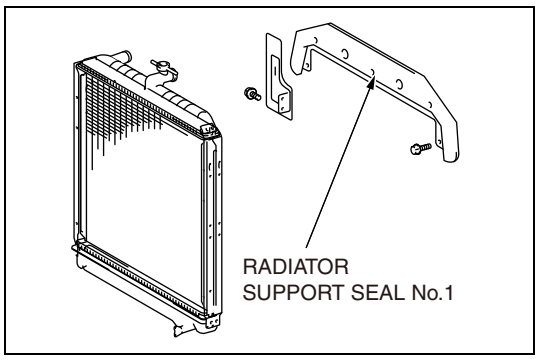
(1) Unfasten the 6 bolts to remove the radiator support seal No.1 from the radiator.



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MOUNTING THE RADIATOR



SHTS021271100012

1. MOUNTING THE RADIATOR SUPPORT SEAL No.1

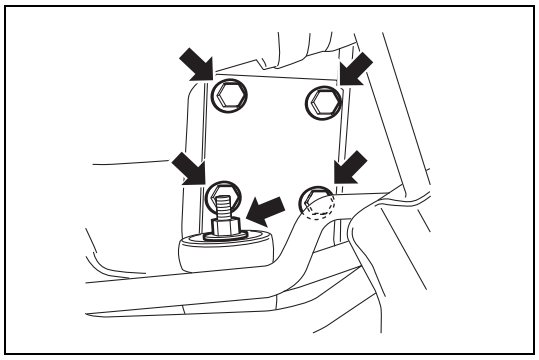
(1) Mount the radiator support seal No.1 to the radiator with 6 bolts.

2. MOUNTING THE RADIATOR

(1) Insert the radiator from the vehicle upper side and set it to mounting position.

⚠ CAUTION

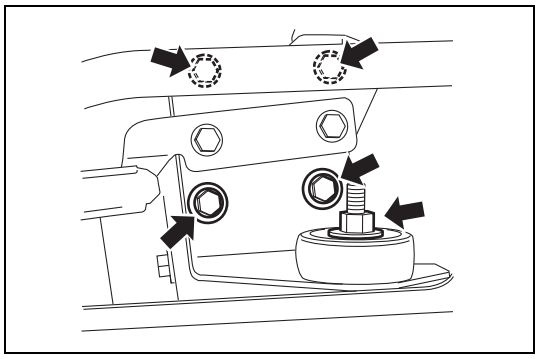
Be careful not to damage the fin of the radiator core during work.


SHTS021271100013

3. MOUNTING THE HEATER PIPE AND RADIATOR BRACKET

(1) Mount the radiator bracket No.4 to the radiator with 4 bolts and nuts.

Tightening Torque:
19.5 N·m {199 kgf·cm, 14 lbf·ft}


SHTS021271100014

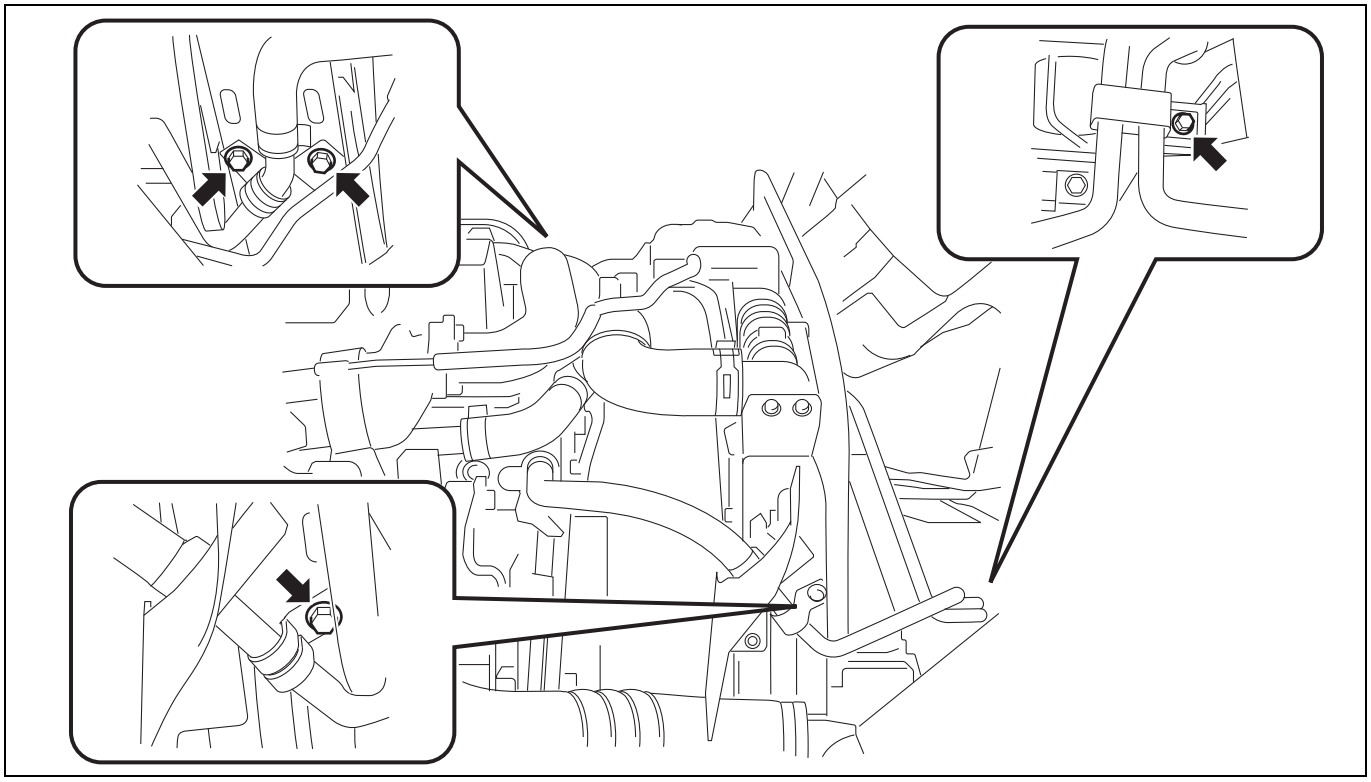
(2) Mount the radiator bracket No.3 to the radiator with 4 bolts and nuts.

Tightening Torque:
19.5 N·m {199 kgf·cm, 14 lbf·ft}

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(3) Mount the heater pipe with the bolts.
Tightening Torque:
21.7-40.3 N·m {222-410 kgf·cm, 17-29 lbf·ft}

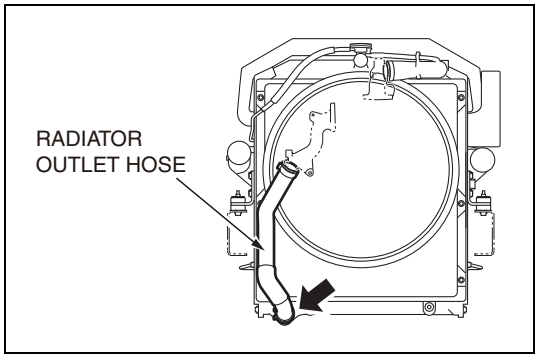
(4) Mount the reserve pipe with the bolt.
Tightening Torque:
19.5 N·m {199 kgf·cm, 14 lbf·ft}



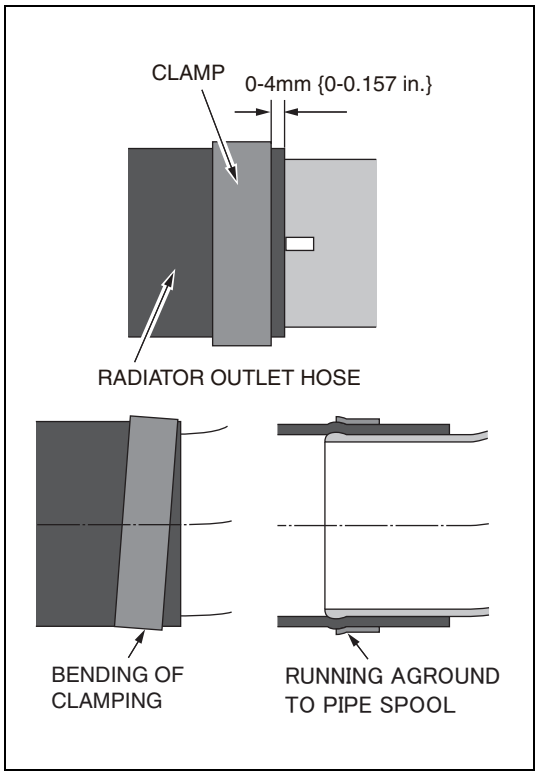
SHTS021271100015

4. MOUNTING THE COOLING FAN AND FAN PULLEY
Reference: COOLING (J05E), COOLING FAN AND FAN CLUTCH, OVERHAUL, MOUNTING THE COOLING FAN & FAN CLUTCH (Page 12-36)

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SHTS021271100016



SHTS021271100017

5. CONNECTING THE RADIATOR HOSE

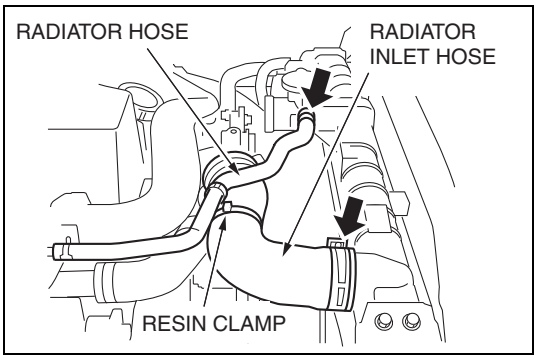
(1) Align the markings, and connect the radiator outlet hose to the radiator lower tank with the clamp.

⚠ CAUTION

- **If crack or peeling is found with the inner surface of the radiator outlet hose inserting area, replace it.**
- **Do not use soap water to radiator outlet hose inserting area.**
- **Do not reuse the clamp.**

- **Be sure that the distance between the hose end and the clamp is 0-4 mm {0-0.157 in.} when mounting the clamp.**
- **Insert the hose to the stopper.**
- **Check that there is no bending of the clamp and landing upon the pipe spool.**
- **If the clamp is installed at an unspecified location, the clamp will land on the pipe spool, resulting in coolant leakage.**

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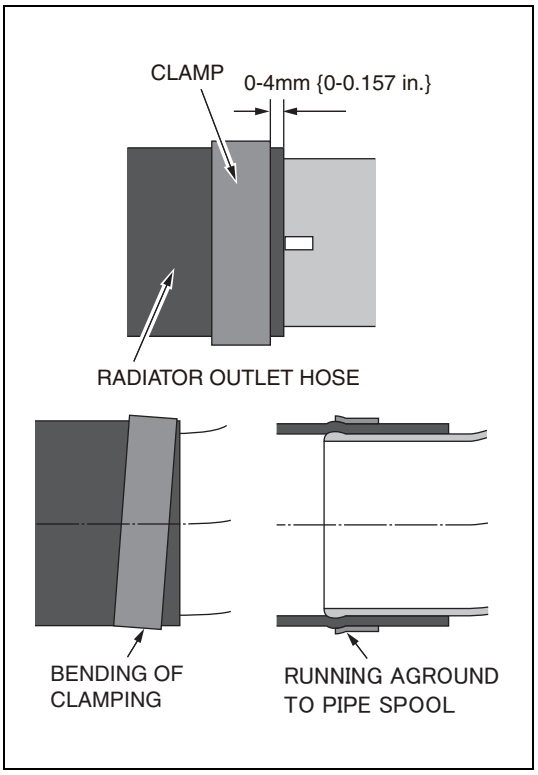


SHTS021271100018

(2) Align the markings and connect the radiator inlet hose and radiator hose to the radiator with 2 clamps.
(3) Replace with a new tie wrap and then mount it to the radiator inlet hose.

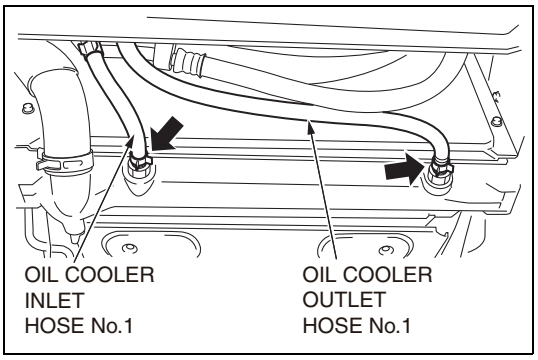
⚠ CAUTION

- **If crack or peeling is found with the inner surface of the radiator inlet hose inserting area, replace it.**
- **Do not use soap water to radiator inlet hose inserting area.**
- **Do not reuse the clamp.**



SHTS021271100019

- **Be sure that the distance between the hose end and the clamp is 0-4 mm {0-0.157 in.} when mounting the clamp.**
- **Insert the hose to the stopper.**
- **Check that there is no bending of the clamp and landing upon the pipe spool.**
- **If the clamp is installed at an unspecified location, the clamp will land on the pipe spool, resulting in coolant leakage.**



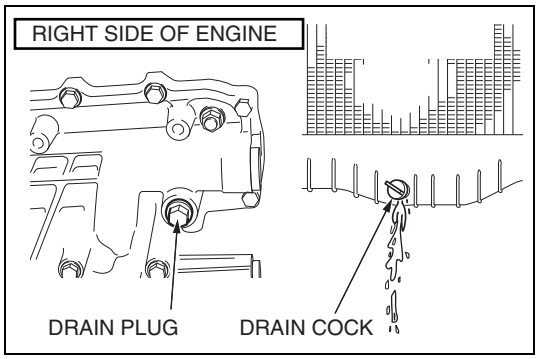
SHTS021271100020

6. CONNECTING THE OIL COOLER HOSE

(1) Connect the oil cooler outlet hose No.1 to the radiator lower tank with the clamp.
(2) Connect the oil cooler inlet hose No.1 to the radiator lower tank with the clamp.
(3) Add automatic transmission oil.
Reference: CHASSIS (S1-LXJE03A), TRANSMISSION
Reference: CHASSIS (S1-LXJE04A), TRANSMISSION

7. MOUNTING THE INTERCOOLER
Reference: COOLING (J05E), INTERCOOLER, OVERHAUL, MOUNTING THE INTERCOOLER (Page 12-22)

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SHTS021271100021

8. ADDING THE COOLANT

(1) Tighten the drain cock of the radiator and the drain plug of the oil cooler.

(2) Remove the radiator cap.

⚠ CAUTION

Improper or careless removal of the radiator cap may cause burns from spewing hot water or vapor. Remove the cap after the coolant temperature meter reads below the specified temperature.

(3) Top up with coolant to the inlet.

⚠ CAUTION

- **A sudden injection prevents air in the cooling pipe system from bleeding smoothly, resulting in a prolonged injection.**
- **If air blows back, once stop adding coolant and wait for a while before resuming.**

NOTICE

Bring pressure on the two radiator hoses for a few times with hands. If the coolant level of the radiator inlet decreases, add coolant.

(4) Mount the radiator cap.

(5) Add the coolant into the reserve tank to FULL, and tighten the cap.

(6) Warm up the engine until the thermostat injection valve opens.

NOTICE

Bring pressure on the 2 radiator hoses for a few times during engine warming up

(7) After stopping the engine, check the water level. If the water level has decreased, add coolant by following steps (3) through (7). Repeat it until the water level no longer lowers and bleed air in the radiator and engine.

⚠ CAUTION

Entry of air causes overheat and coolant leakage from the coolant pump.

NOTICE

Check that hot air flows out from the foot duct during engine racing.

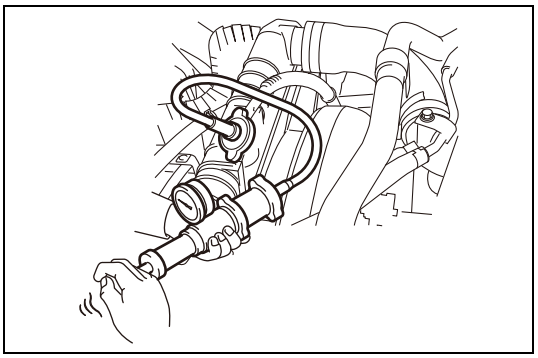
(8) Add the coolant into the reserve tank to FULL, and tighten the cap.

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9. INSPECTION FOR COOLANT LEAKAGE

⚠ DANGER

To avoid burns, do not remove the radiator cap when the engine and the radiator are hot. Pressure causes the liquid and vapor to burst forth.



SHTS021271100022

(1) Remove the radiator cap, and mount the radiator cap tester.
(2) Perform pumping up to 137 kPa {1.4 kgf/cm^2, 20 lbf/in.^{2}} and check that pressure does not decrease.

NOTICE

If the pressure decreases, check the hose, radiator, or coolant pump for leakage. If leakage to the outside is not found, check the heater core, cylinder block, or cylinder head.

10. FILLING REFRIGERANT

Reference: CHASSIS (S1-LXJE03A), HEATER & AIR CONDITIONER

Reference: CHASSIS (S1-LXJE04A), HEATER & AIR CONDITIONER

11. WARMING UP ENGINE

(1) Warm up the engine.

12. INSPECTION FOR REFRIGERANT GAS LEAKAGE

Reference: CHASSIS (S1-LXJE03A), HEATER & AIR CONDITIONER

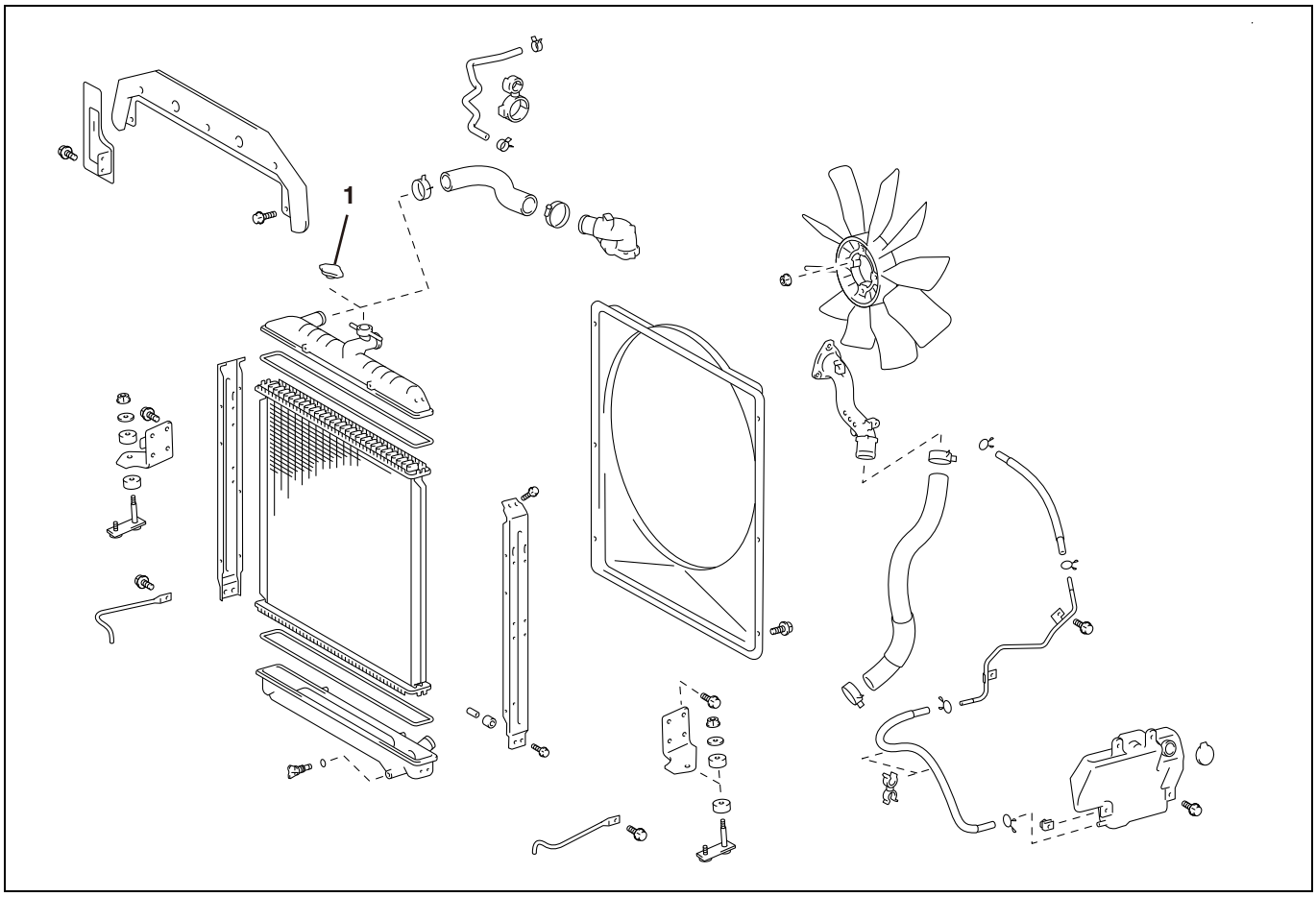
Reference: CHASSIS (S1-LXJE04A), HEATER & AIR CONDITIONER

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RADIATOR CAP

COMPONENT LOCATOR

EN01F02127110402020001



SHTS021271100023

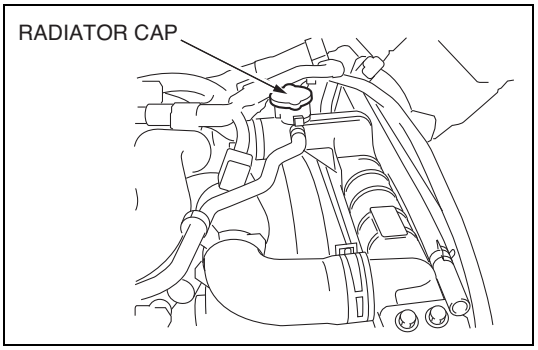
1 Radiator cap	

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REPLACEMENT

EN01F02127110402020002

REMOVING THE RADIATOR CAP



SHTS021271100024

1. REMOVING THE RADIATOR CAP

(1) Stop the engine and check that the coolant temperature meter reads below the gauge center. Then, rotate the radiator cap to left and remove it.

(2) If the coolant is hot, work with a few thick clothes overlapped. If steam bursts forth excessively, retighten the cap immediately and wait until the coolant temperature is lowered before starting operation.

⚠ CAUTION

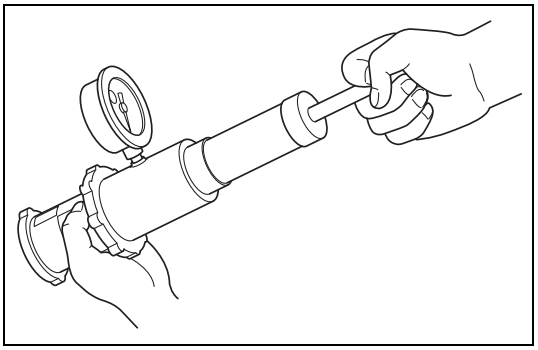
Do not remove the radiator cap with the needle of the coolant temperature meter indicating above the center.

INSPECTING THE RADIATOR CAP

1. CAUTIONS

⚠ CAUTION

- **If the radiator cap is not clean, make sure to wash it with water.**
- **Before use of a radiator cap tester, soak the relief valve and pressure valve with coolant or water.**



SHTS021271100025

2. INSPECTING THE RADIATOR CAP

(1) Use the commercially available radiator cap tester. Carefully pump the tester to check whether air comes out from the vacuum valve.

⚠ CAUTION

Pump the tester at a constant pumping speed.

NOTICE

If no air comes out of the vacuum valve, replace the radiator cap.

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(2) Pump the tester and measure opening pressure of the relief valve.

⚠ CAUTION
This pumping speed applies only to initial pumping. (For the purpose of closing the vacuum valve.) Subsequent pumping may be performed at a lower speed.

Standard value	Limit
93.1-122.9 kPa {0.95-1.25 kgf/cm^2, 13.5-17.8 lbf/in.^{2}}	79 kPa {0.8 kgf/cm^2, 11.4 lbf/in.^{2}}

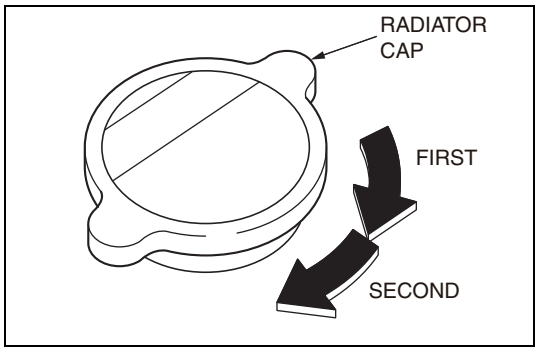
NOTICE

- **Use the highest measurement value read by the tester as opening pressure.**
- **If opening pressure falls below the limit, replace the radiator cap.**

MOUNTING THE RADIATOR CAP

1. MOUNTING THE RADIATOR CAP

(1) Mounting the radiator cap by rotating it right to the second block.



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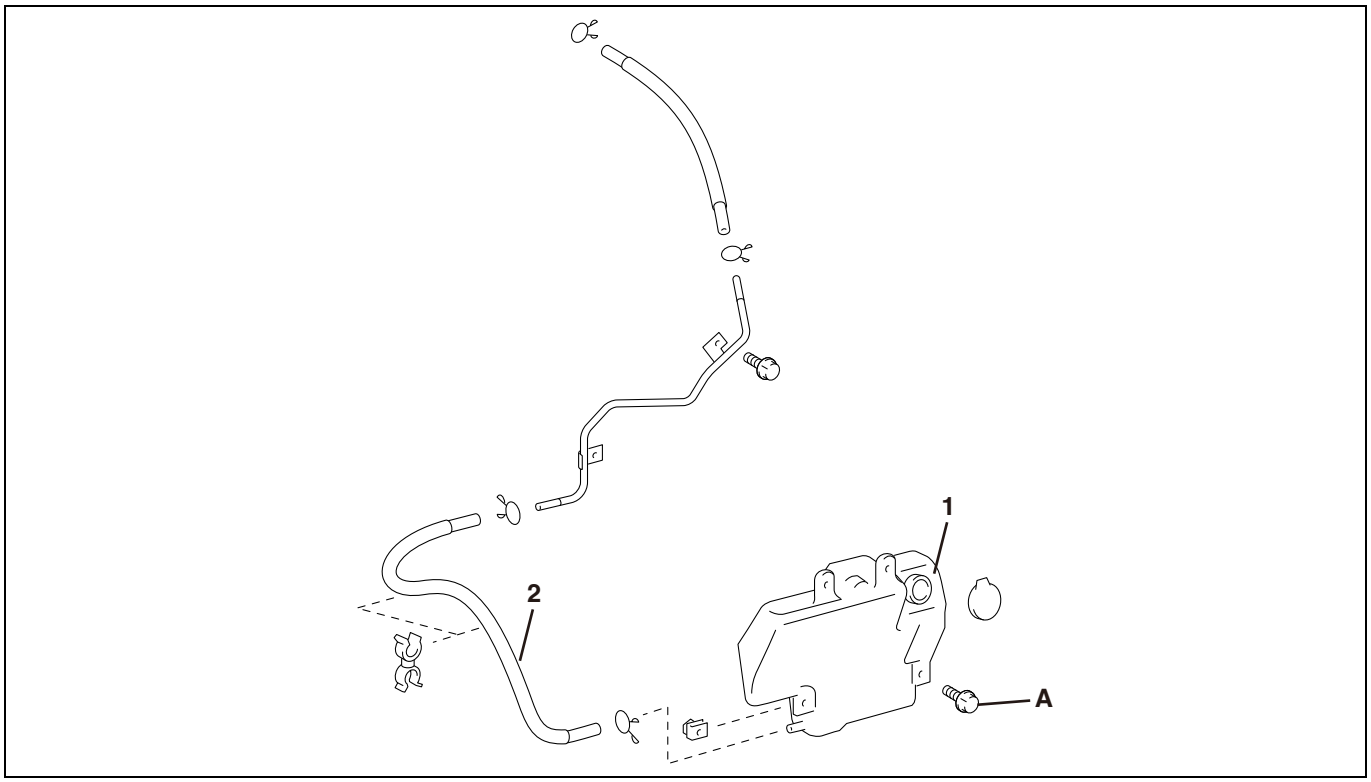
⚠ CAUTION
If the cap is not mounted securely, high-temperature coolant will spray out at the time of overheat.

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RESERVE TANK

COMPONENT LOCATOR

EN01F02127110402021001



SHTS021271100027

1	Reserve tank	2	Hose

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	3.5-6.5 {36-66, 2.6-4.7}		

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REPLACEMENT

EN01F02127110402021002

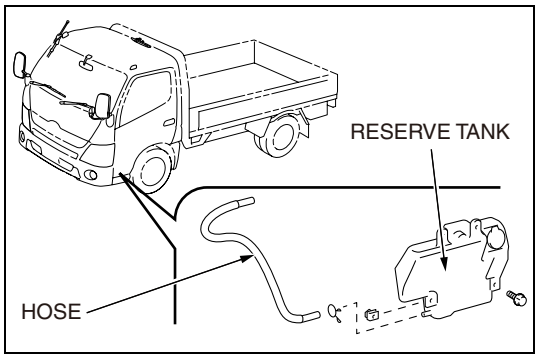
REMOVING THE RESERVE TANK

1. DRAINING THE COOLANT
Reference: COOLING (J05E), RADIATOR, REPLACEMENT, REMOVING THE RADIATOR (Page 12-5)

2. REMOVING THE RESERVE TANK
(1) Disconnect the hose from the reserve tank.

NOTICE
Prepare a reservoir and clean clothes to collect coolant dripping from the reserve tank when disconnecting the hose.

(2) Unfasten the 4 bolts to remove the reserve tank.

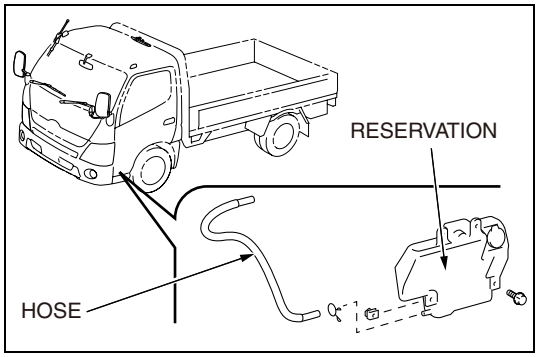


SHTS021271100028

MOUNTING THE RESERVE TANK

1. MOUNTING THE RESERVE TANK
(1) Mount the reserve tank with 4 bolts.
Tightening Torque:
3.5-6.5 N·m {36-66 kgf·cm, 2.6-4.7 lbf·ft}

(2) Mount the hose to the reserve tank.



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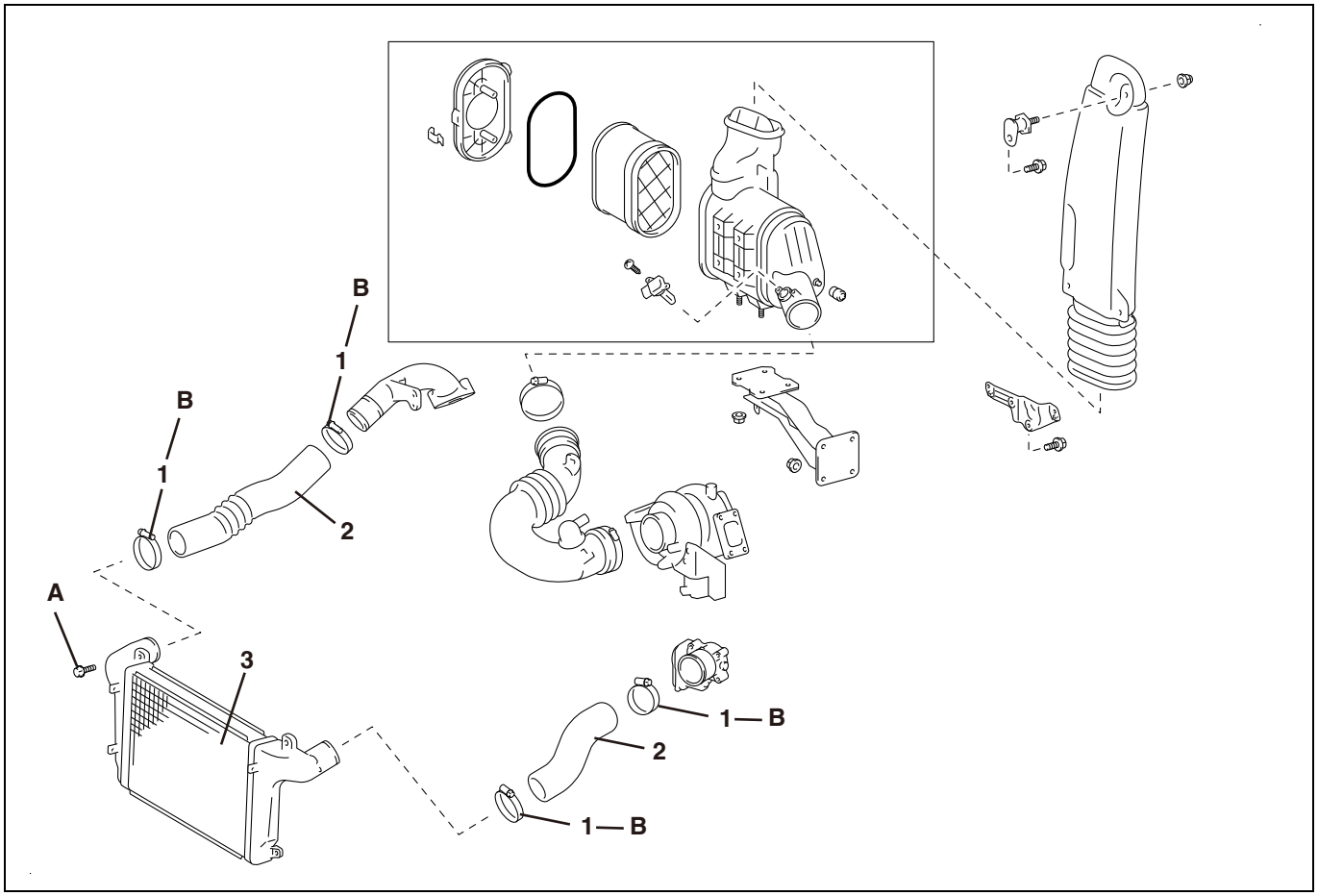
2. ADDING THE COOLANT
(1) Add the coolant.
Reference: COOLING (J05E), RADIATOR, REPLACEMENT, MOUNTING THE RADIATOR (Page 12-9)

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INTERCOOLER

COMPONENT LOCATOR

EN01F02127110402039001



SHTS021271100030

1	Clamp	3	Intercooler
2	Intercooler hose		

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

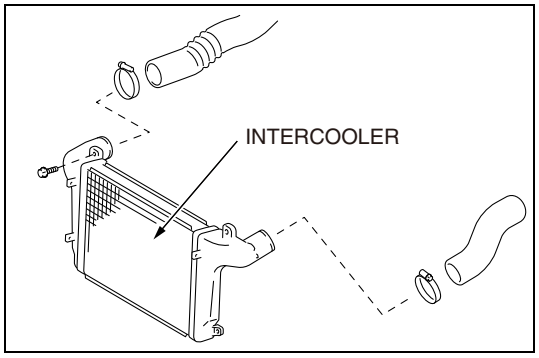
A	14-20 {143-203, 11-14}	B	6.25 {64, 4.6}

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OVERHAUL

EN01F02127110402039002

REMOVING THE INTERCOOLER



SHTS021271100031

1. DISCONNECTING THE INTERCOOLER HOSE

(1) Unfasten the clamp to disconnect the Intercooler hose from the Intercooler.

2. REMOVING THE INTERCOOLER

(1) Unfasten the 4 bolts to remove the intercooler from the radiator.

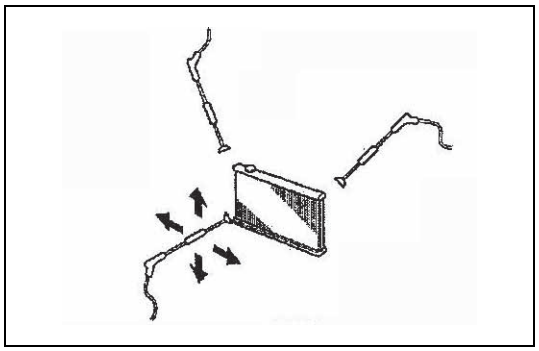
⚠ CAUTION

Use care not to damage the fins of the radiator core and intercooler core.

SINGLE UNIT INSPECTION

1. INSPECTING THE INTERCOOLER

(1) Inspect the intercooler core for dirt or crushing. If found defective, clean, adjust, or replace it.



SHTS021271100032

2. CHECK FIN FOR BLOCKAGE

(1) If the fins are clogged, wash them with water or a steam cleaner, then dry them with compressed air.

NOTICE

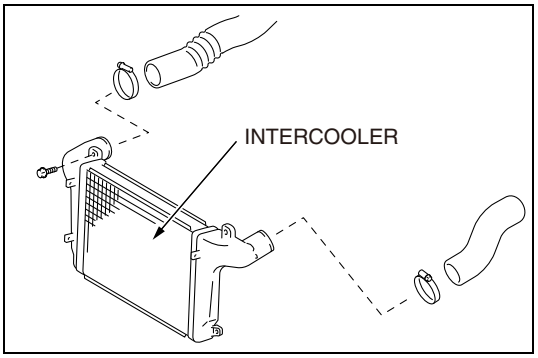
- **If the steam cleaner is too close to the core, there is a possibility of damaging the fins, so keep the following injection distances.**

Injection Pressure kPa {kgf/cm^2, lbf/in^2}	Injection Distance mm {in.}
2,942-4,903 {30-50, 427-711}	300 {11.811}
4,903-7,845 {50-80, 711-1,138}	500 {19.685}

- **If the fins are bent, straighten them with a screwdriver or pliers.**
- **Do not expose electronic components to water.**

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MOUNTING THE INTERCOOLER



SHTS021271100033

1. MOUNTING THE INTERCOOLER

(1) Mount the intercooler to the radiator with bolts (4 pcs.).
Tightening Torque:
14-20 N·m {143-203 kgf·cm, 11-14 lbf·ft}

⚠ CAUTION
Use care not to damage the fins of the radiator core and intercooler core.

2. CONNECTING THE INTERCOOLER

(1) Connect the Intercooler hose to the Intercooler with the clamp.
Tightening Torque:
6.25 N·m {64 kgf·cm, 4.61 lbf·ft}

(2) After 10 minutes re-tighten the clamp.
Tightening Torque:
6.25 N·m {64 kgf·cm, 4.61 lbf·ft}

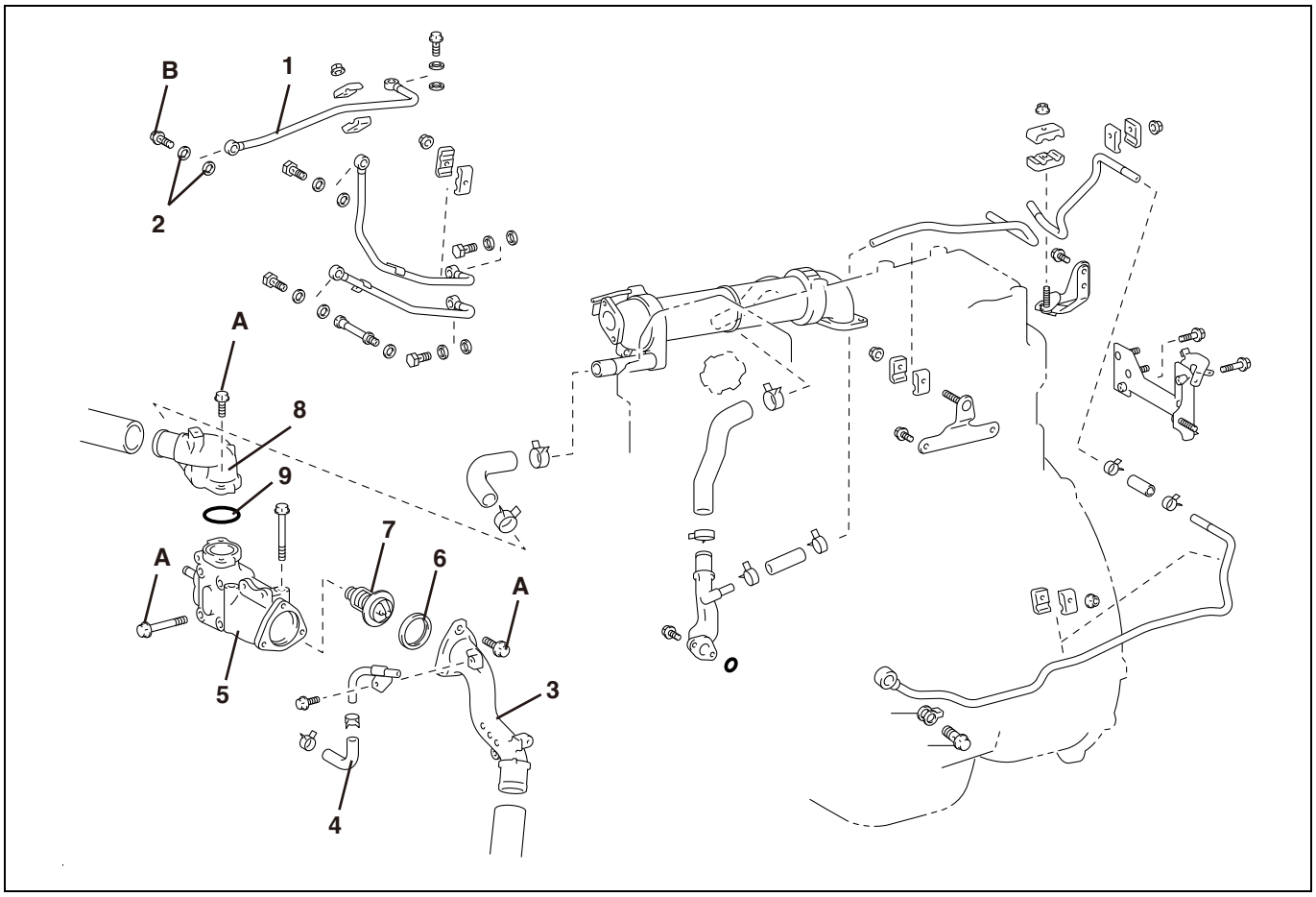
NOTICE
When assembling the intercooler hose, it fully degreased inner hose, the outer surface of the intercooler pipe.

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THERMOSTAT CASE AND THERMOSTAT

COMPONENT LOCATOR

EN01F02127110402011001



SHTS021271100034

1	Coolant pipe F	6	Gasket *
2	Gasket *	7	Thermostat
3	Coolant pipe A	8	Water outlet pipe
4	Heater pipe	9	O-ring *
5	Thermostat case		

*: Nonreusable part

Tightening torque — Unit: N·m {kgf·cm, lbf·ft}

A	285 {291, 21}	B	24.5 {250, 18}

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OVERHAUL

EN01F02127110402011002

REMOVING THERMOSTAT CASE & THERMOSTAT

1. DRAINING THE COOLANT
Reference: COOLING (J05E), RADIATOR, REPLACEMENT, REMOVING THE RADIATOR (Page 12-5)

2. REMOVING THE COOLING FAN & FAN CLUTCH
Reference: COOLING (J05E), COOLING FAN AND FAN CLUTCH, OVERHAUL, REMOVING THE COOLING FAN & FAN CLUTCH (Page 12-34)

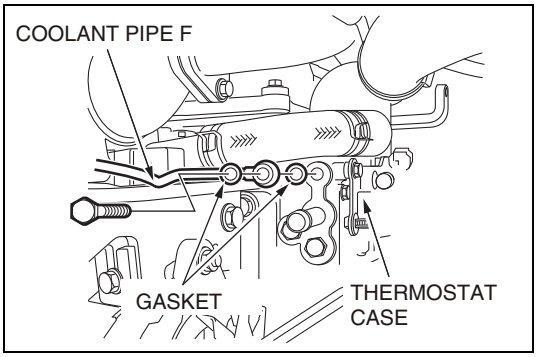
3. REMOVING THE EGR COOLER
Reference: EMISSION CONTROL (J05E), EGR VALVE & COOLER, REPLACEMENT, REMOVING THE EGR VALVE & COOLER (Page 8-3)

4. DISCONNECTING THE RADIATOR HOSE
Reference: COOLING (J05E), RADIATOR, REPLACEMENT, REMOVING THE RADIATOR (Page 12-5)

5. REMOVING THE COOLANT TEMPERATURE SENSOR
Reference: COOLING (J05E), COOLANT TEMPERATURE SENSOR, REPLACEMENT, REMOVING THE COOLANT TEMPERATURE SENSOR (Page 12-38)

6. REMOVING THE THERMOSTAT

(1) Unfasten the union bolt to remove the coolant pipe F and 2 gaskets from the thermostat case.



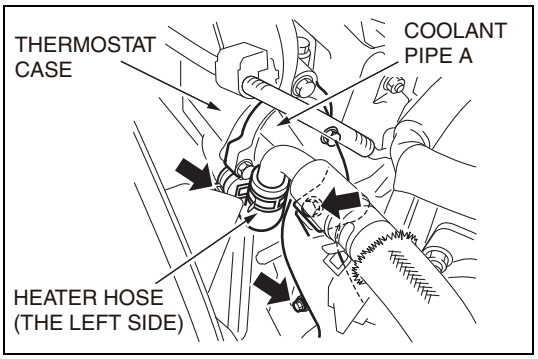
SHTS021271100035

(2) Unfasten the bolt and clamp to disconnect the heater pipe from the coolant pipe A.

⚠ CAUTION
Check the marking on hose and then disconnect the hoses. If the marking is erased, mark the hose before disconnecting it.

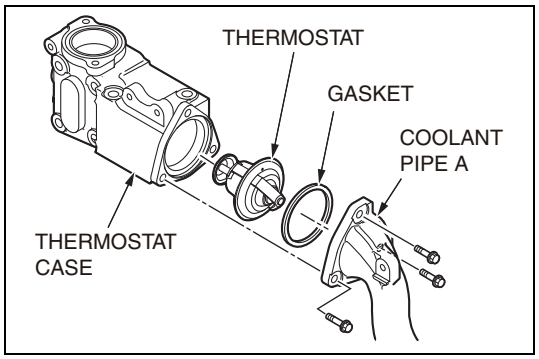
NOTICE
Prepare the reservoir and clean clothes to collect dripping coolant when disconnecting the hose.

(3) Unfasten the bolt to remove the coolant pipe A from the bracket.



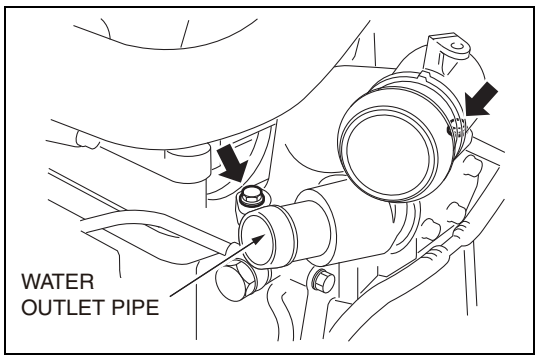
SHTS021271100036

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SHTS021271100037

(4) Unfasten the 3 bolts to remove the coolant pipe A, thermostat and gasket from the thermostat case.



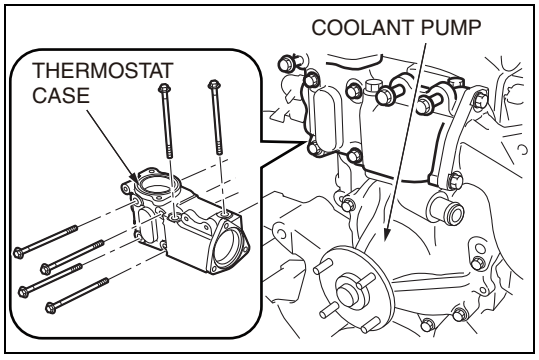
SHTS021271100038

7. REMOVING THE THERMOSTAT CASE

(1) Unfasten the 2 bolts to remove the water outlet pipe and O-ring from the thermostat case.

NOTICE

Prepare the reservoir and clean clothes to collect dripping coolant when removing the water outlet pipe.



SHTS021271100039

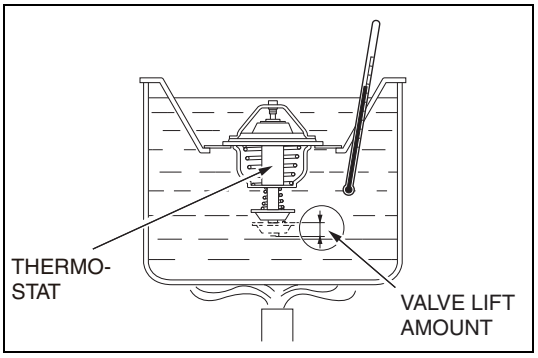
(2) Unfasten the 6 bolts to remove the thermostat case and O-ring from the cylinder head and coolant pump.

NOTICE

Prepare the reservoir and clean clothes to collect dripping coolant when removing the thermostat case.

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INSPECTING THE COMPONENTS



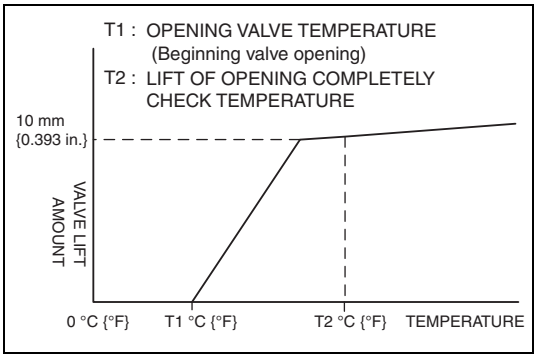
SHTS021271100040

1. INSPECTING THE THERMOSTAT

(1) Submerge the thermostat in water for heating as shown in the figure.

⚠ CAUTION

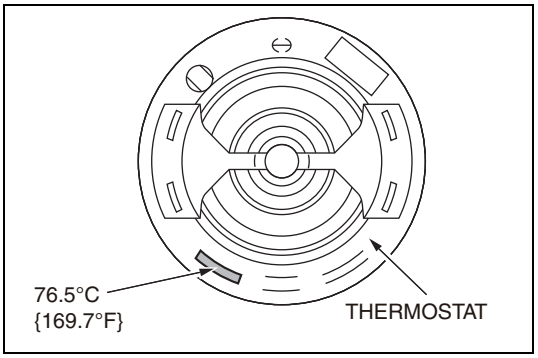
- **To keep the thermostat away from the heat sources, support it at the center with wire.**
- **Stir the water in the reservoir well to keep the coolant temperature equal.**



SHTS021271100041

(2) Measure the temperature at which the thermostat valve starts to open (opening valve temperature: T1).

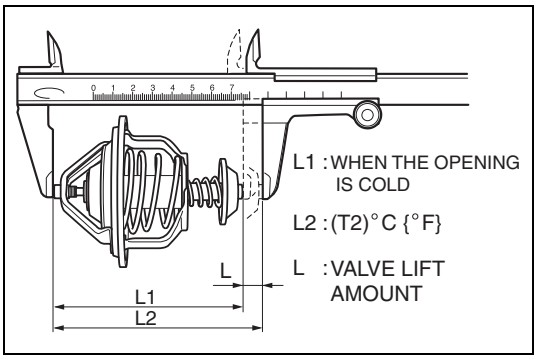
Thermostat valve standard opening temperature: T1	**76.5°C {169.7°F}**



SHTS021271100042

NOTICE

The thermostat valve opening valve temperature (T1) is engraved on the thermostat seat.



SHTS021271100043

(3) Increase the coolant temperature to the full-open lift temperature (T2) to measure the lift amount of the thermostat valve.

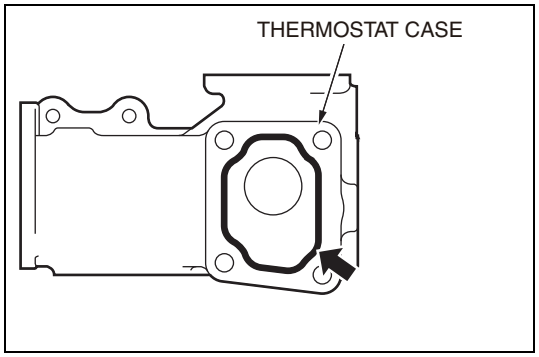
Thermostat valve inspection full-open lift temperature: T2	Valve lift amount: L
90°C {194°F}	**10mm {0.393in.} or more**

(4) Submerge the thermostat into water at ordinary temperature with the valve fully opened. Check that the thermostat valve closes completely within five minutes.

(5) If found defective in inspection above, replace the thermostat.

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MOUNTING THERMOSTAT CASE AND THERMOSTAT



SHTS021271100044

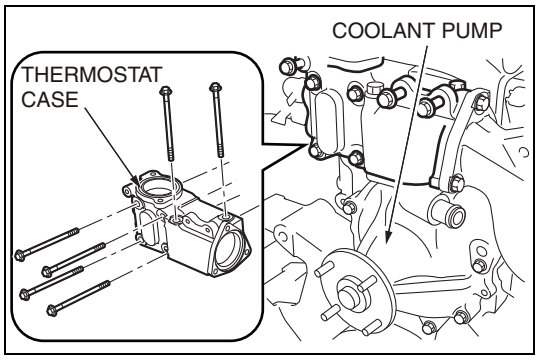
1. MOUNTING THE THERMOSTAT CASE

(1) Use the scraper, remove dirt on the joint surface between the thermostat case and cylinder head.

(2) Apply liquid gasket (ThreeBond TB1207B: Black or equivalent) to the thermostat case as shown in the figure.

⚠ CAUTION

- **Apply it seamlessly.**
- **Apply the liquid gasket with 1.5-2.5 mm {0.060-0.100 in.} width.**
- **Mount the case within 20 minutes after applying the liquid gasket.**



SHTS021271100045

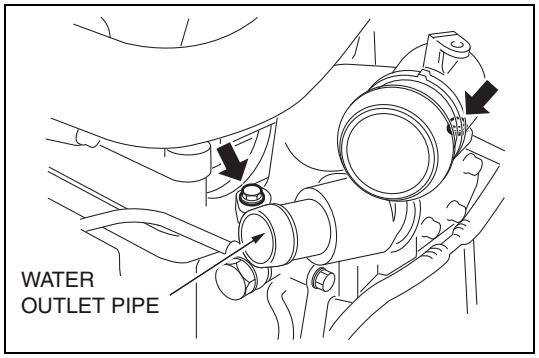
(3) Mount the new O-ring to the upper coolant pump groove.

(4) Fit the thermostat case mounting bolts 1 (4 pcs.) to the thermostat case in advance.

(5) Align the thermostat case with the mounting position and temporarily tighten the mounting bolts 1 (4 pcs.) to the cylinder head.

(6) Temporarily tighten the mounting bolts 2 (2 pcs.) to the coolant pump.

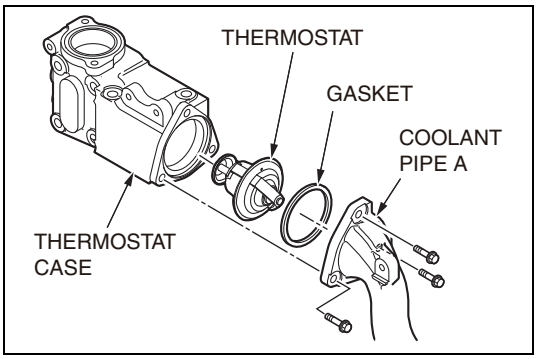
(7) Tighten the mounting bolts 1 (4 pcs.) to the cylinder head and then the mounting bolts 2 (2 pcs.) to the coolant pump.
Tightening Torque:
28.5 N·m {291 kgf·cm, 21 lbf·ft}



SHTS021271100046

(8) Replace with the new O-ring and mount the water outlet pipe to the thermostat case with 2 bolts.
Tightening Torque:
28.5 N·m {291 kgf·cm, 21 lbf·ft}

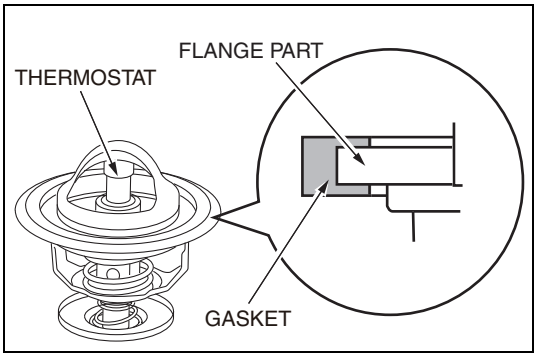
https://truckmanualshub.com/



SHTS021271100047

2. MOUNTING THE THERMOSTAT

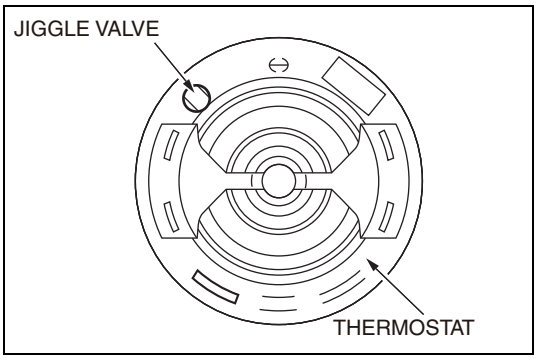
(1) Replace with the new gasket and mount the thermostat and coolant pipe A to the thermostat case with 3 bolts.
Tightening Torque:
28.5 N·m {291 kgf·cm, 21 lbf·ft}



SHTS021271100048

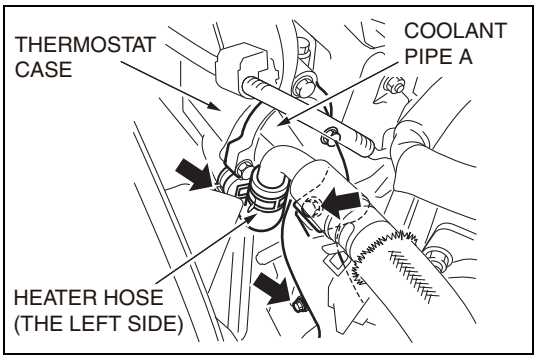
⚠ CAUTION

- **A wrongly-mounted gasket causes coolant leakage. Make sure that the gasket sandwiches the thermostat flange when mounting.**



SHTS021271100049

- **Assemble the thermostat with its jiggle valve facing up.**

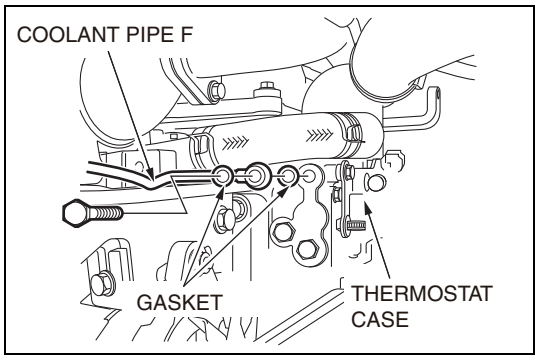


SHTS021271100050

(2) Mount the coolant pipe A to the bracket with the bolt.
Tightening Torque:
28.5 N·m {291 kgf·cm, 21 lbf·ft}

(3) Connect the heater pipe to the heater hose (left side) with the bolt and clamp.
Tightening Torque:
28.5 N·m {291 kgf·cm, 21 lbf·ft}

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SHTS021271100051

(4) Replace with the new 2 gaskets and connect the coolant pipe F to the thermostat case with a union bolt.
Tightening Torque:
24.5 N·m {250 kgf·cm, 18 lbf·ft}

3. MOUNTING THE COOLANT TEMPERATURE SENSOR
Reference: COOLING (J05E), COOLANT TEMPERATURE SENSOR, REPLACEMENT, MOUNTING THE COOLANT TEMPERATURE SENSOR (Page 12-39)

4. CONNECTING THE RADIATOR HOSE
Reference: COOLING (J05E), RADIATOR, REPLACEMENT, MOUNTING THE RADIATOR (Page 12-9)

5. MOUNTING THE EGR COOLER
Reference: EMISSION CONTROL (J05E), EGR VALVE & COOLER, REPLACEMENT, MOUNTING THE EGR VALVE & COOLER (Page 8-8)

6. MOUNTING THE COOLING FAN & FAN CLUTCH
Reference: COOLING (J05E), COOLING FAN AND FAN CLUTCH, OVERHAUL, MOUNTING THE COOLING FAN & FAN CLUTCH (Page 12-36)

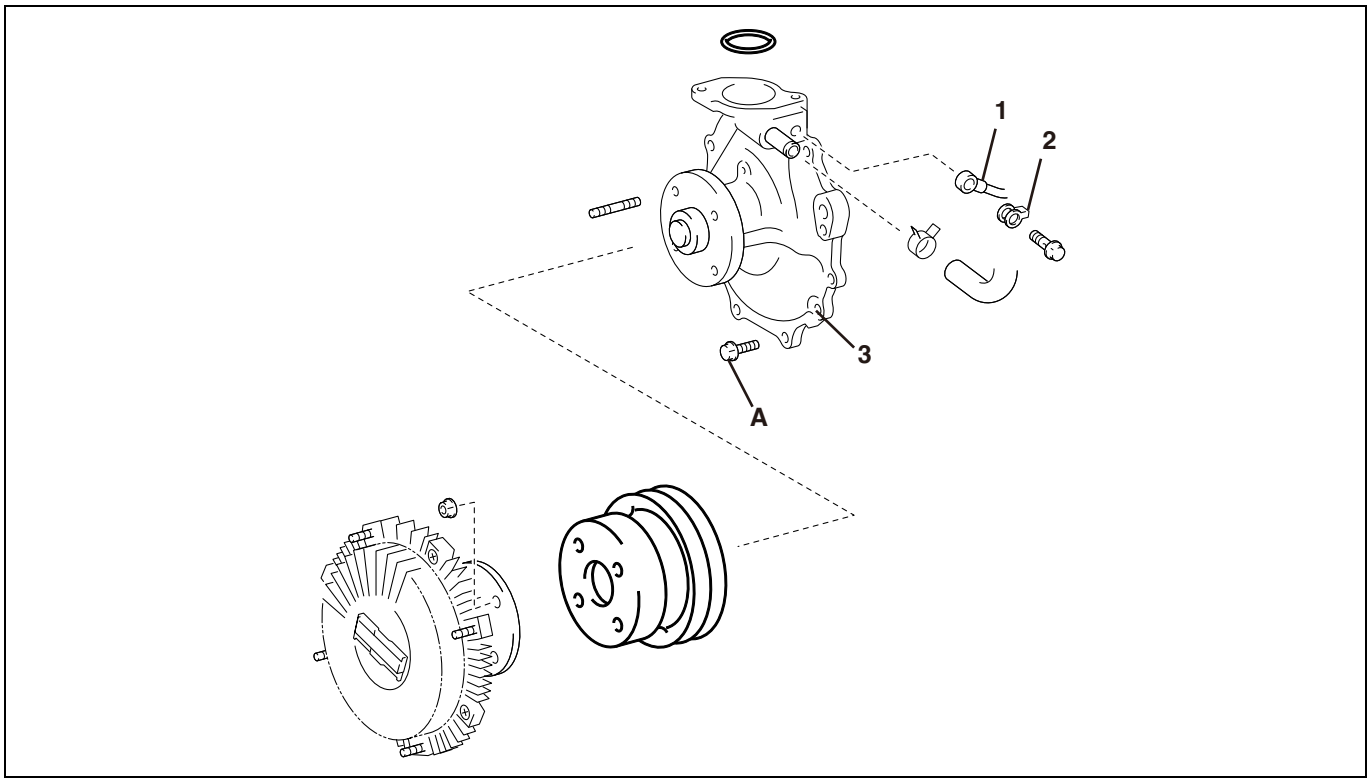
7. ADDING THE COOLANT
Reference: COOLING (J05E), RADIATOR, REPLACEMENT, MOUNTING THE RADIATOR (Page 12-9)

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COOLANT PUMP

COMPONENT LOCATOR

EN01F02127110402008001



SHTS021271100052

1	Coolant pipe B	3	Coolant pump
2	Gasket *		

*: Nonreusable part

Tightening torque — Unit: N·m {kgf·cm, lbf·ft}

A	28.5 {291, 21}		

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REPLACEMENT

EN01F02127110402008002

REMOVING THE COOLANT PUMP

1. DRAINING THE COOLANT
Reference: COOLING (J05E), RADIATOR, REPLACEMENT, REMOVING THE RADIATOR (Page 12-5)

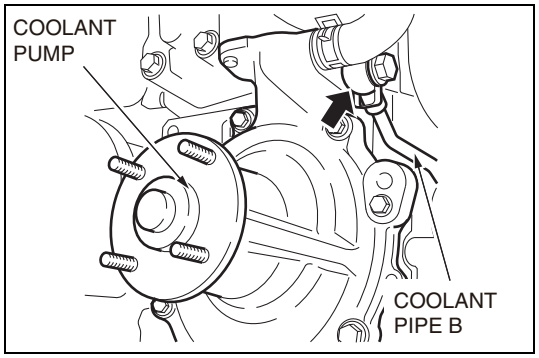
2. REMOVING THERMOSTAT CASE & THERMOSTAT
Reference: COOLING (J05E), THERMOSTAT CASE AND THERMOSTAT, OVERHAUL, REMOVING THERMOSTAT CASE & THERMOSTAT (Page 12-24)

3. REMOVING THE CRANKSHAFT PULLEY
Reference: ENGINE MECHANICAL (J05E), CRANKSHAFT PULLEY, REPLACEMENT, REMOVING THE CRANKSHAFT PULLEY (Page 10-47)

4. DISCONNECTING THE COOLANT PIPE

(1) Unfasten the union bolt and the gasket to disconnect the coolant pipe B from the coolant pump.

NOTICE
Prepare the reservoir and clean clothes to collect dripping coolant when disconnecting the pipe.

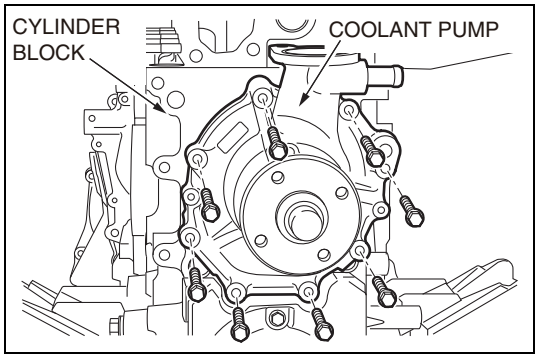


SHTS021271100053

5. REMOVING THE COOLANT PUMP

(1) Unfasten the bolts (8 pcs.) to remove the coolant pump from the cylinder block.

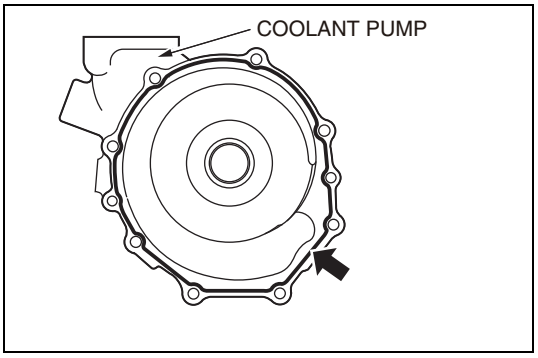
NOTICE
Prepare the reservoir and clean clothes to collect dripping coolant when removing the coolant pump.



SHTS021271100054

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MOUNTING THE COOLANT PUMP



SHTS021271100055

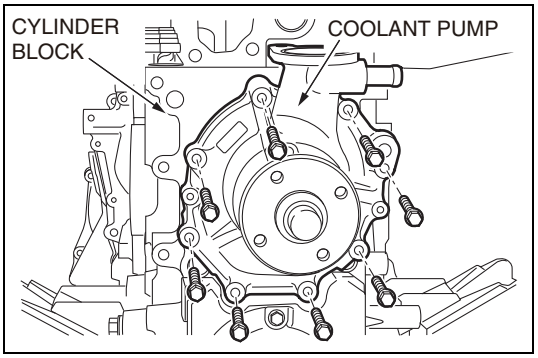
1. MOUNTING THE COOLANT PUMP

(1) Use the scraper, remove dirt on the joint surface between the coolant pump and cylinder block.

(2) Apply liquid gasket (ThreeBond TB1207B: Black or equivalent) to the coolant pump as shown in the figure.

⚠ CAUTION

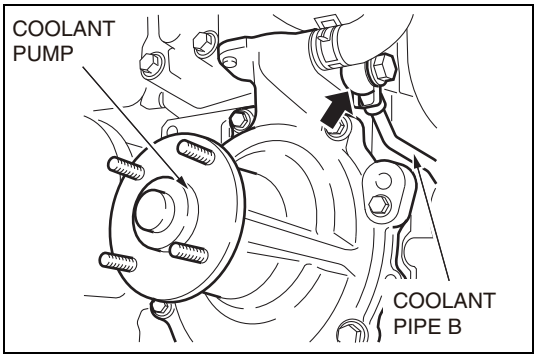
- **Apply the liquid gasket seamlessly.**
- **Apply the liquid gasket with a 1.5 mm {0.060 in.} width.**
- **Mount the case within 20 minutes after applying the liquid gasket.**



SHTS021271100056

(3) Align with the cylinder block dowel pin, mount the coolant pump with bolts (8 pcs.).
Tightening Torque:
28.5 N·m {291 kgf·cm, 21 lbf·ft}

NOTICE
Mount the coolant pump using guide bolts to avoid misalignment of the liquid gasket.



SHTS021271100057

2. CONNECTING THE COOLANT PIPE

(1) Replace with the new gasket and mount the coolant pipe B to the coolant pump with a union bolt.

3. MOUNTING THE CRANKSHAFT PULLEY
Reference: ENGINE MECHANICAL (J05E), CRANKSHAFT PULLEY, REPLACEMENT, MOUNTING THE CRANKSHAFT PULLEY (Page 10-48)

4. MOUNTING THERMOSTAT CASE AND THERMOSTAT
Reference: COOLING (J05E), THERMOSTAT CASE AND THERMOSTAT, OVERHAUL, MOUNTING THERMOSTAT CASE AND THERMOSTAT (Page 12-27)

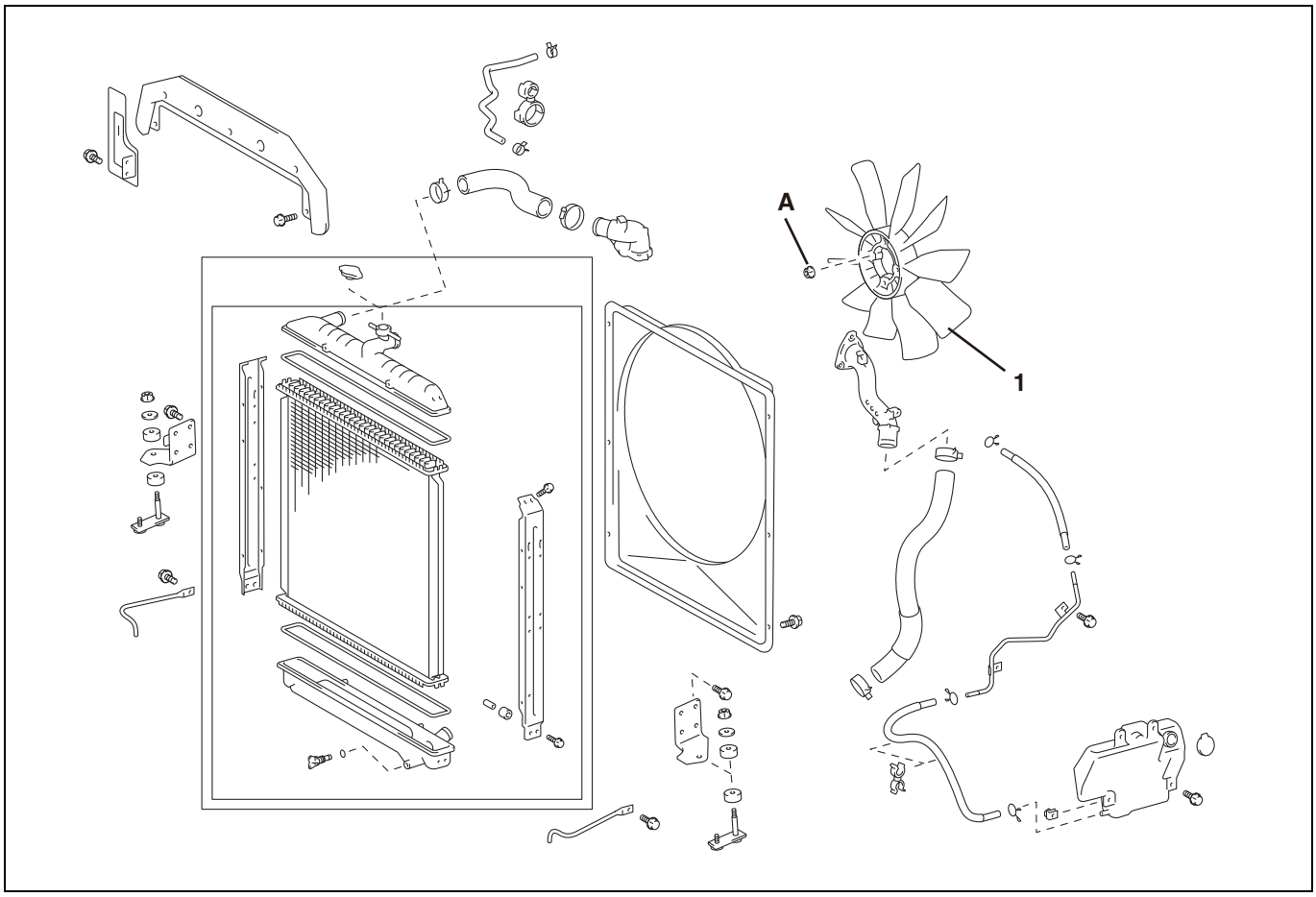
5. ADDING THE COOLANT
Reference: COOLING (J05E), RADIATOR, REPLACEMENT, MOUNTING THE RADIATOR (Page 12-9)

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COOLING FAN AND FAN CLUTCH

COMPONENT LOCATOR

EN01F02127110402031001



SHTS021271100058

1 Cooling fan	

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A 11 {112, 8}	

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OVERHAUL

EN01F02127110402031002

REMOVING THE COOLING FAN & FAN CLUTCH

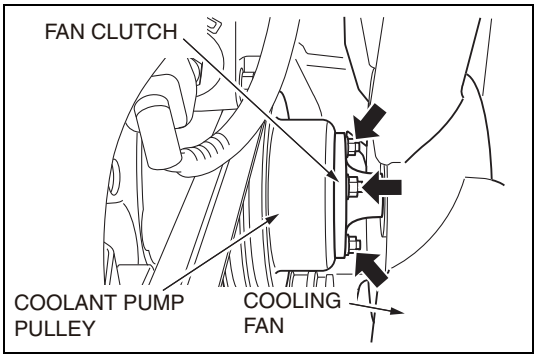
1. DISCONNECTING THE RADIATOR INLET HOSE AND RADIATOR HOSE
Reference: COOLING (J05E), RADIATOR, REPLACEMENT, REMOVING THE RADIATOR (Page 12-5)

2. REMOVING THE COOLING FAN

⚠ CAUTION
Place a corrugated board on the radiator core not to damage it.

(1) Remove the intercooler hose.
Reference: COOLING (J05E), INTERCOOLER, OVERHAUL, REMOVING THE INTERCOOLER (Page 12-21)

(2) Unfasten the 4 nuts to remove the cooling fan and fan clutch together from the coolant pump pulley.



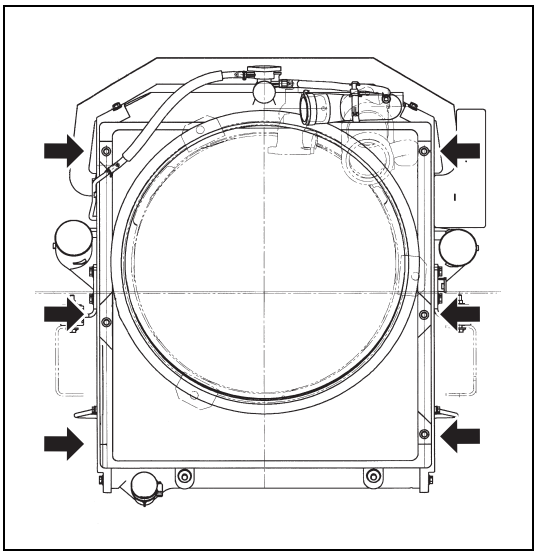
SHTS021271100059

NOTICE

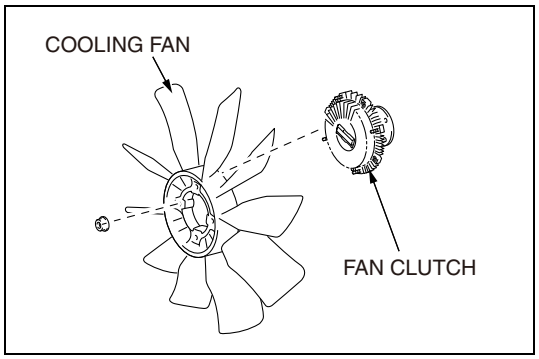
- **To prevent the co-rotation of the crankshaft, insert a large flat-blade screwdriver into the flywheel gear from the inspection hole of the flywheel housing and stop the rotation of the crankshaft.**
- **To prevent dislocation of the coolant pump pulley, mounting the fan fastening bolts (2 places) will facilitate this work.**

(3) Unfasten the 6 bolts and remove the fan shroud.

(4) Pull out the fan clutch to take out the upper fan shroud and cooling fan.


SHTS021271100060

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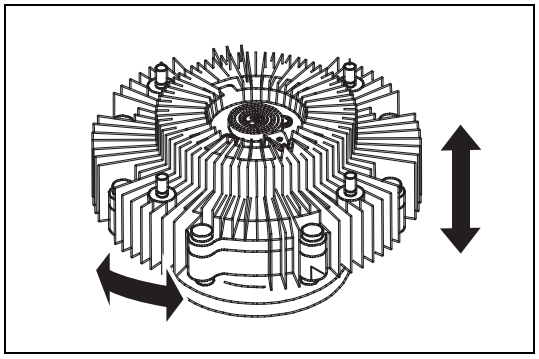


SHTS021271100061

3. REMOVING THE FAN CLUTCH

(1) Unfasten the 4 nuts to remove the fan clutch from the cooling fan.

INSPECTING THE COMPONENTS


SHTS021271100062

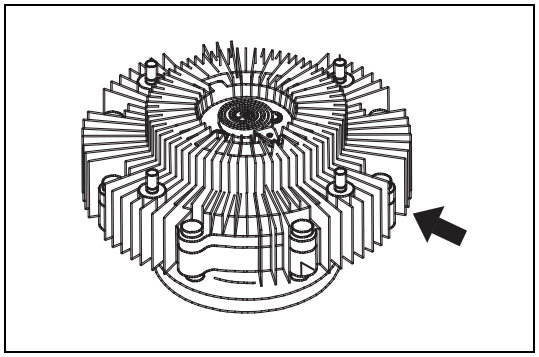
1. INSPECTING THE FAN CLUTCH BEARING

(1) Inspect the fan clutch for axial backlash. If found defective, replace the fan clutch.

(2) Inspect the fan clutch for improper rotation. If found defective, replace the fan clutch.

⚠ CAUTION

The fan clutch is not detachable. So if found defective, replace it as assembly.

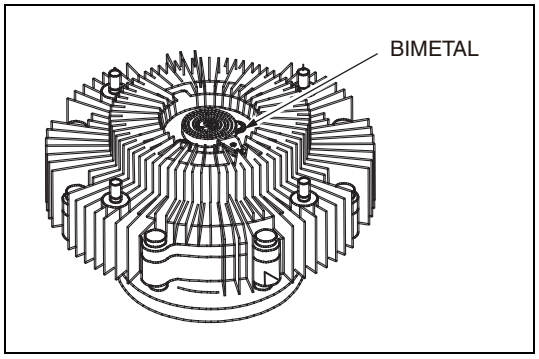

SHTS021271100063

2. INSPECTING FOR SILICONE OIL LEAKAGE

(1) Inspect the fan clutch for adherence and bleeding of silicone oil. If found defective, replace the fan clutch.

⚠ CAUTION

The fan clutch is not detachable. So if found defective, replace it as assembly.



SHTS021271100064

3. INSPECTING THE BIMETAL

(1) Remove the dirt and dust on the bimetal if any.

⚠ CAUTION

Do not apply excessive force to the bimetal to prevent deformation.

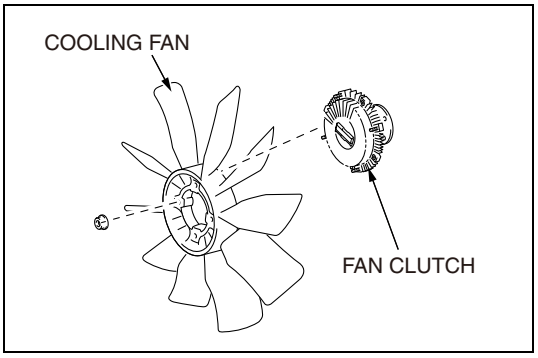
(2) If crack and damage is found with the bimetal, replace the fan clutch.

⚠ CAUTION

The fan clutch is not detachable. So if found defective, replace it as assembly.

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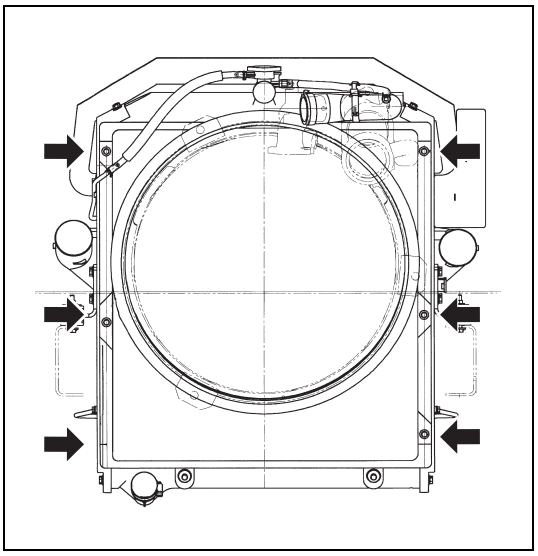
MOUNTING THE COOLING FAN & FAN CLUTCH



SHTS021271100065

1. MOUNTING THE FAN CLUTCH

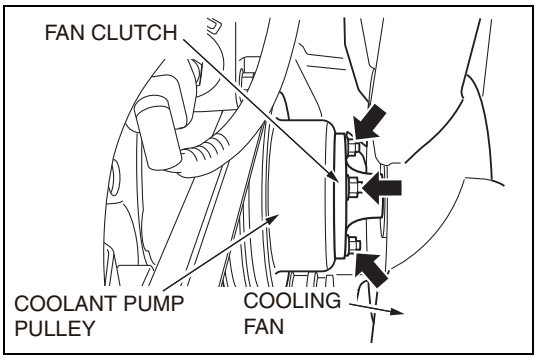
(1) Mount the fan clutch to the cooling fan with 4 nuts.
Tightening Torque:
11 N·m {112 kgf·cm, 8 lbf·ft}


SHTS021271100066

2. MOUNTING THE COOLING FAN

(1) Put from the top fan clutch, fan shroud and cooling fan.

(2) Mount the radiator fan shroud with 6 bolts.
Tightening Torque:
19.5 N·m {199 kgf·cm, 14 lbf·ft}



SHTS021271100067

(3) Mount the cooling fan and the fan clutch to the coolant pump pulley with 4 nuts.
Tightening Torque:
28.5 N·m {291 kgf·cm, 21 lbf·ft}

NOTICE
To prevent the co-rotation of the crankshaft, insert a large flat-blade screwdriver into the flywheel gear from the inspection hole of the flywheel housing and stop the rotation of the crankshaft.

(4) Mount the intercooler hose.
Reference: COOLING (J05E), INTERCOOLER, OVERHAUL, MOUNTING THE INTERCOOLER (Page 12-22)

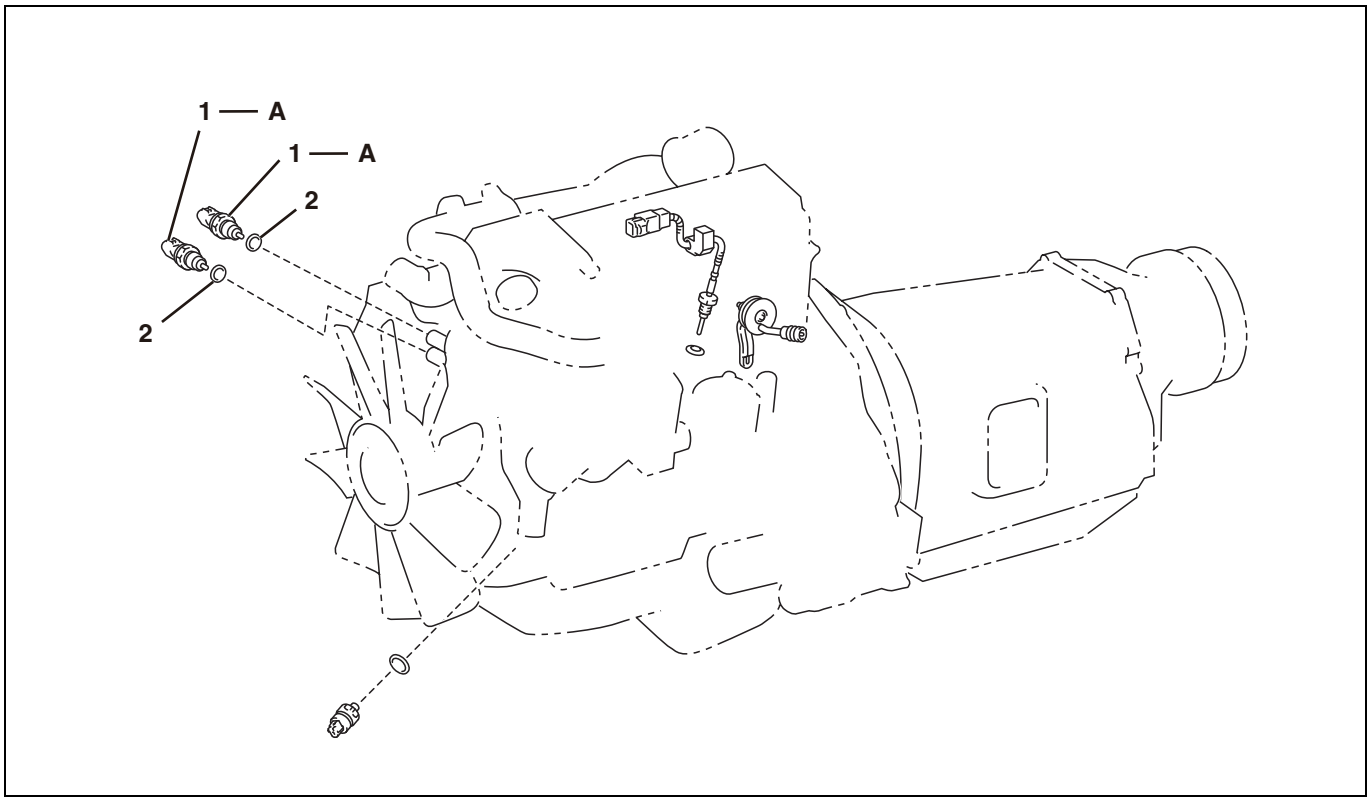
3. CONNECTING THE RADIATOR INLET HOSE AND RADIATOR HOSE
Reference: COOLING (J05E), RADIATOR, REPLACEMENT, MOUNTING THE RADIATOR (Page 12-9)

https://truckmanualshub.com/

COOLANT TEMPERATURE SENSOR

COMPONENT LOCATOR

EN01F02127110402012001



SHTS021271100068

1	Coolant temperature sensor	2	Gasket *

*: Nonreusable part

Tightening torque — Unit: N·m {kgf·cm, lbf·ft}

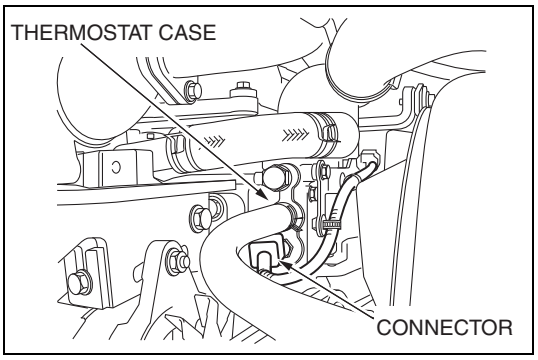
A	27.0-31.9 {276-325, 20-23}		

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REPLACEMENT

EN01F02127110402012002

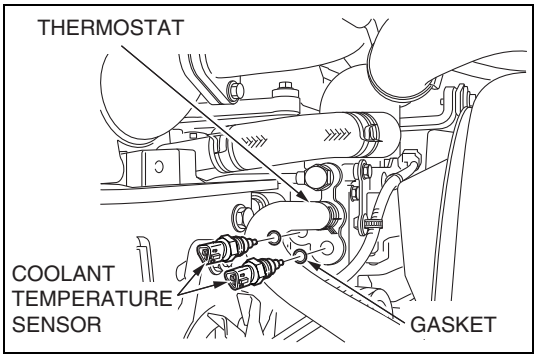
REMOVING THE COOLANT TEMPERATURE SENSOR



SHTS021271100069

1. REMOVING THE COOLANT TEMPERATURE SENSOR

(1) Disconnect the connector from the coolant temperature sensor.



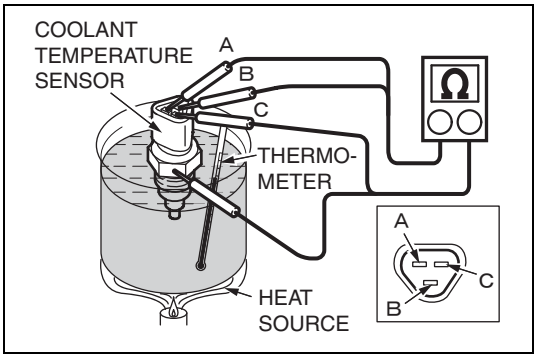
SHTS021271100070

(2) Remove the coolant temperature sensor and gasket from the thermostat case.

NOTICE

Prepare a reservoir and clean clothes to collect dripping coolant when removing the coolant temperature sensor.

SINGLE UNIT INSPECTION



SHTS021271100071

1. INSPECTING THE RESISTANCE

(1) Warm the coolant temperature sensor using water or coolant (stock solution).

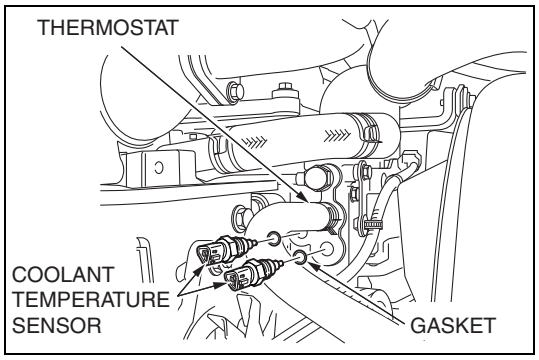
(2) Use the circuit tester to measure the resistance between the terminals. If the value exceeds the standard value, replace it.

Between A terminal and C terminal

Temperature (°C {°F})	Standard value (kΩ)
–20 {–4}	13.84-16.33
20 {68}	2.32-2.59
80 {176}	0.310-0.326
110 {230}	0.1399-0.1435

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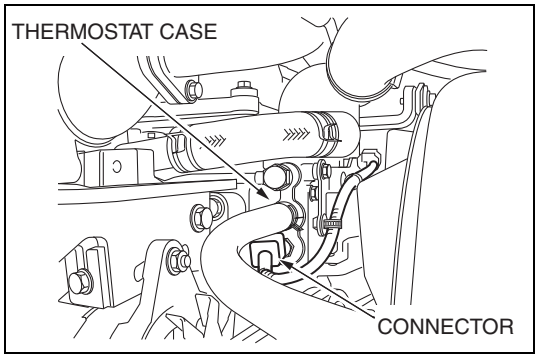
MOUNTING THE COOLANT TEMPERATURE SENSOR



SHTS021271100072

1. MOUNTING THE COOLANT TEMPERATURE SENSOR

(1) Replace with the new gasket and mount the coolant temperature sensor to the thermostat case.
Tightening Torque:
27.0-31.9 N·m {276-325 kgf·cm, 20-23 lbf·ft}



SHTS021271100073

(2) Connect the connector to the coolant temperature sensor.

2. ADDING THE COOLANT
Reference: COOLING (J05E), RADIATOR, REPLACEMENT, MOUNTING THE RADIATOR (Page 12-9)

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LUBRICATION (J05E)

13-001

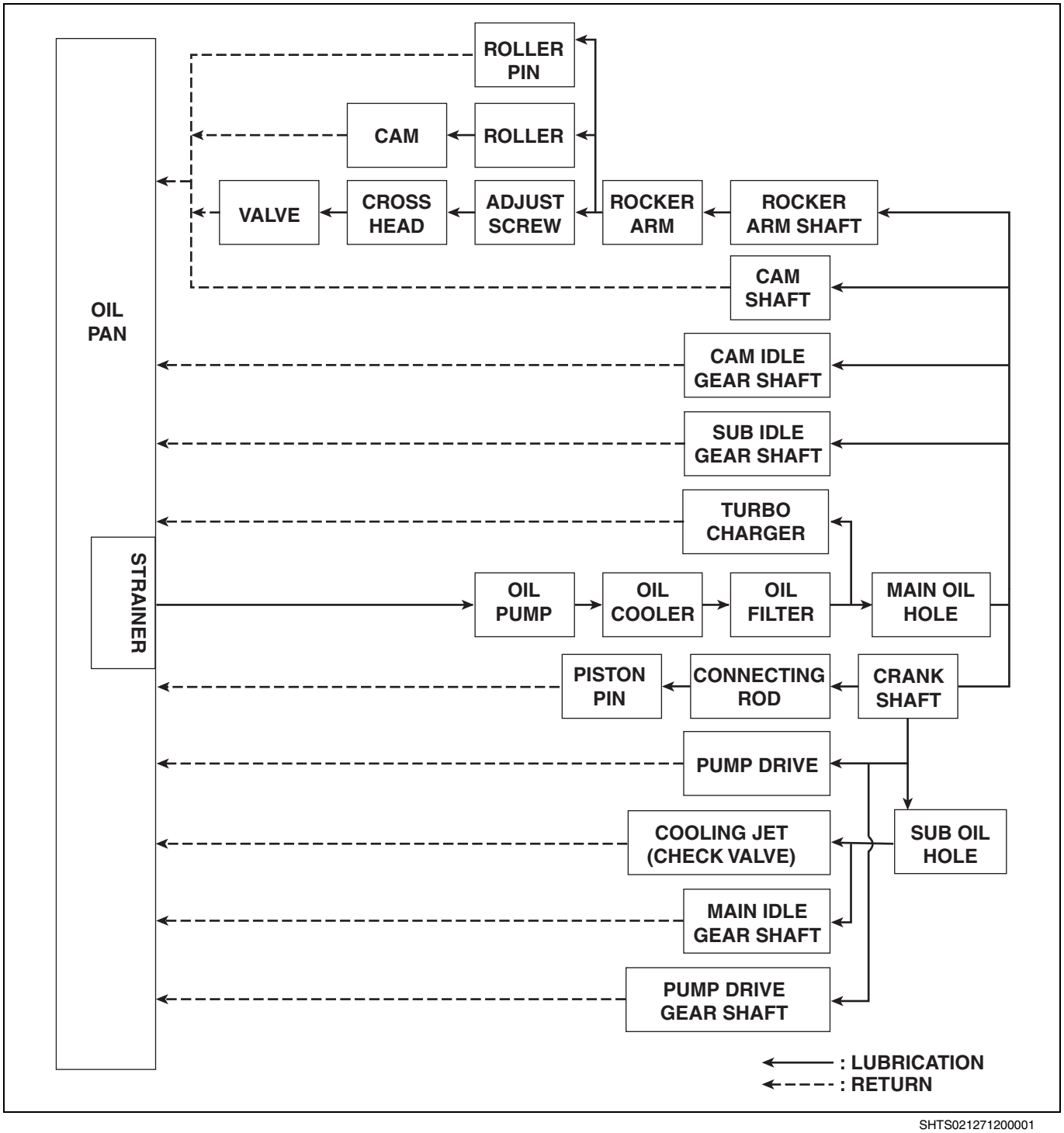
LUBRICATION SYSTEM....13-2
LUBRICATION SYSTEM DIAGRAM....13-2
OIL FILTER....13-3
COMPONENT LOCATOR....13-3
REPLACEMENT....13-4
OIL COOLER....13-6
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OVERHAUL....13-7
OIL PUMP....13-14
COMPONENT LOCATOR....13-14
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LUBRICATION SYSTEM

LUBRICATION SYSTEM DIAGRAM

EN01F02114120402011001



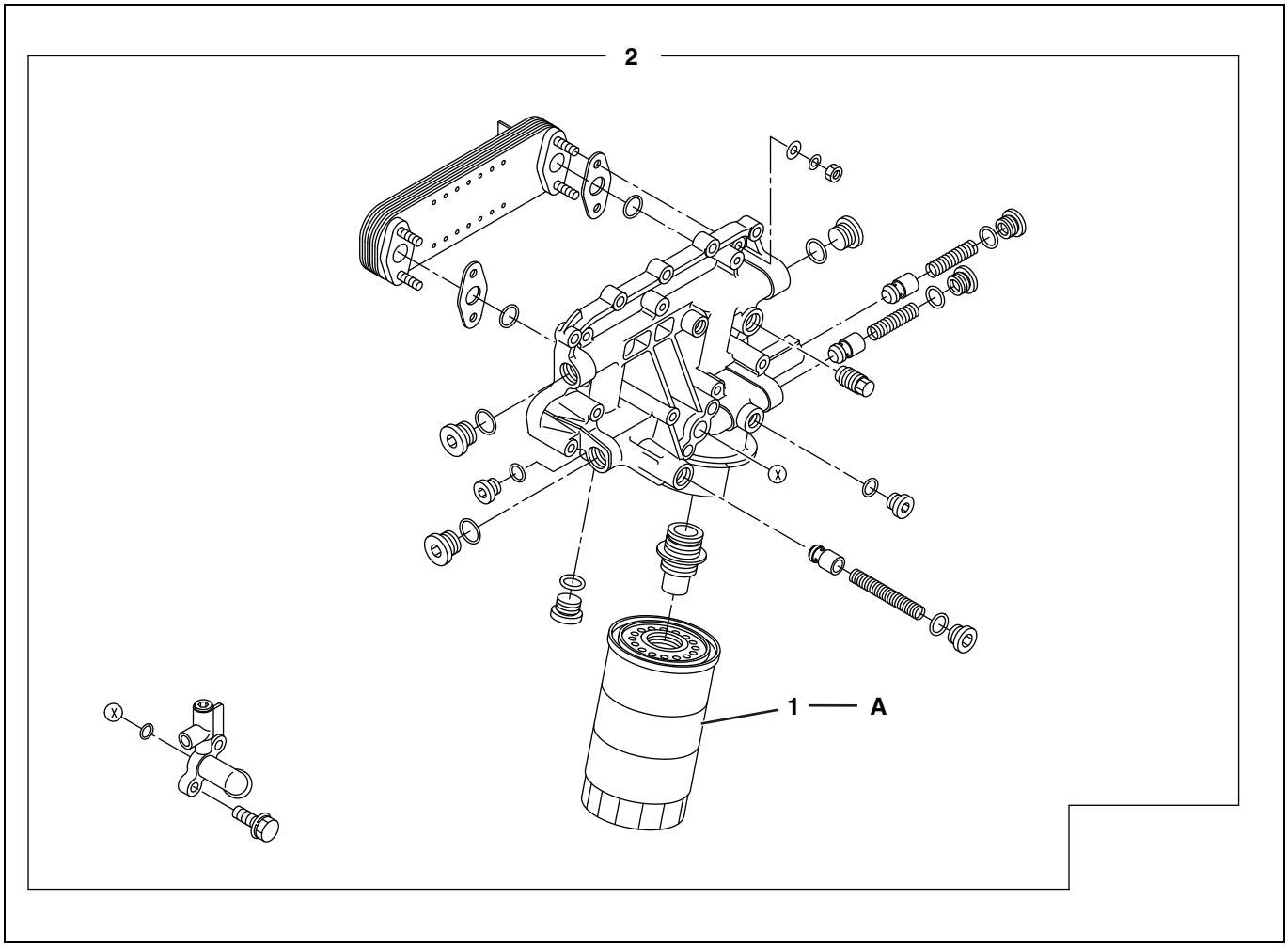
SHTS021271200001

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OIL FILTER

COMPONENT LOCATOR

EN01F02114120402006001



SHTS021271200002

1 Oil filter *	2 Oil cooler assembly

*: Nonreusable part

Tightening torque — Unit: N·m {kgf·cm, lbf·ft}

A 39.2-49.0 {400-499, 29-36}	

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REPLACEMENT

EN01F02114120402006002

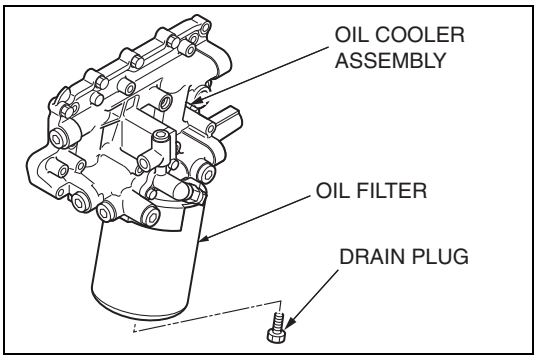
REMOVING THE OIL FILTER

1. DISCHARGING ENGINE OIL

(1) Remove the drain plug of the oil pan to drain engine oil.
Reference: MOUNTING AND DISMOUNTING THE ENGINE (J05E), ENGINE ASSEMBLY, REPLACEMENT, REMOVING THE ENGINE ASSEMBLY (Page 5-7)

2. REMOVING THE OIL FILTER

(1) Remove the drain plug at the oil filter lower end to drain engine oil.

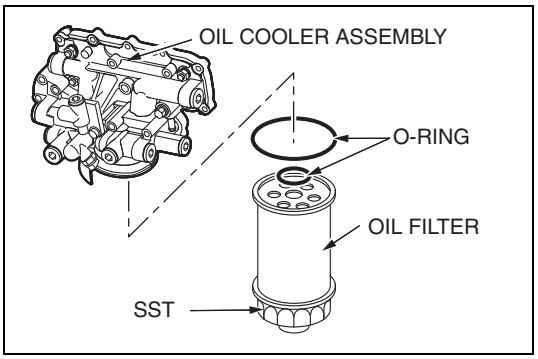


SHTS021271200003

⚠ CAUTION
Dispose the engine oil in accordance with the specified procedures (industrial waste disposal) or other environment-friendly practices.

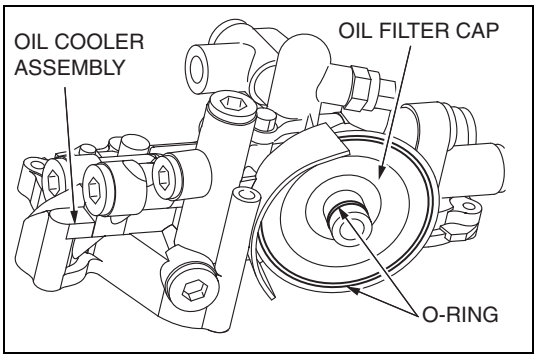
NOTICE
Prepare the reservoir and clean clothes to collect dripping engine oil when removing the drain plug.

(2) Use the SST, remove the oil filter and O-rings (2 pcs.) from the oil cooler assembly.
SST: S0950-31090
Oil filer wrench



SHTS021271200004

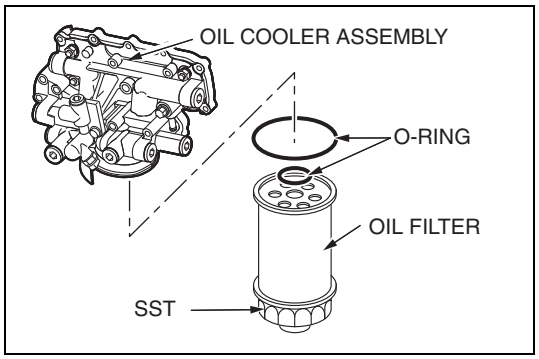
⚠ CAUTION
- **Make sure that no O-ring is left on the oil filter cap side.**
- **Remove dirt on the O-ring mounting surface.**
- **The O-ring is nonreusable.**



SHTS021271200005

NOTICE
It is recommended that the element of the closed ventilator be replaced once after replacing the oil filter fourth. For replacing the element of the closed ventilator.
Reference: EMISSION CONTROL (J05E), CLOSED VENTILATOR, REPLACEMENT, MOUNTING THE CLOSED VENTILATOR (Page 8-16)

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SHTS021271200006

MOUNTING THE OIL FILTER

1. MOUNTING THE OIL FILTER

(1) Remove dirt on the oil filter cap mounting surface.
(2) Apply engine oil lightly to the 2 O-rings of a new oil filter element.
(3) Use the SST, mount the oil filter to the oil cooler assembly.
Tightening Torque:
39.2-49.0 N·m {400-499 kgf·cm, 29-36 lbf·ft}

SST: S0950-31090
Oil filer wrench

⚠ CAUTION
Be careful not to damage the O-ring by twisting it.

2. ADDING ENGINE OIL

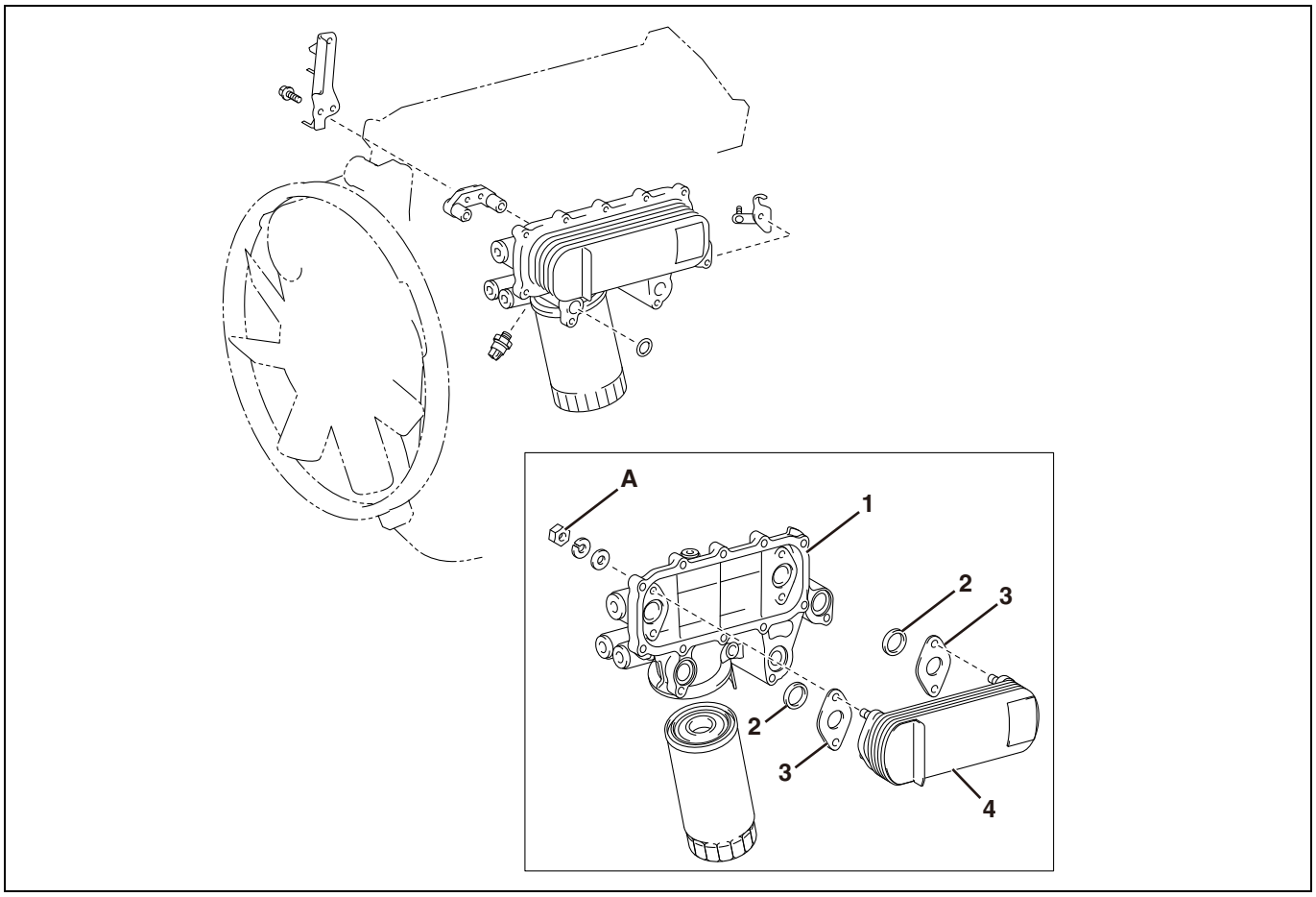
(1) Add engine oil through an oil filler.
Reference: MOUNTING AND DISMOUNTING THE ENGINE (J05E), ENGINE ASSEMBLY, REPLACEMENT, NEXT STEPS AFTER INSTALLATION (Page 5-14)

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OIL COOLER

COMPONENT LOCATOR

EN01F021141204020020001



SHTS021271200007

1	Oil cooler	3	Gasket
2	O-ring *	4	Oil cooler element

*: Nonreusable part

Tightening torque — Unit: N·m {kgf·cm, lbf·ft}

A	19.6-29.4 {200-299, 15-21}	

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OVERHAUL

EN01F02114120402002002

REMOVING THE OIL COOLER ASSEMBLY

1. DRAINING THE COOLANT

(1) Drain the coolant.
Reference: COOLING (J05E), RADIATOR, REPLACEMENT, REMOVING THE RADIATOR (Page 12-5)

2. DISCHARGING ENGINE OIL

(1) Remove the drain plug of the oil pan to drain engine oil.
Reference: MOUNTING AND DISMOUNTING THE ENGINE (J05E), ENGINE ASSEMBLY, REPLACEMENT, REMOVING THE ENGINE ASSEMBLY (Page 5-7)

3. REMOVING THE OIL FILTER

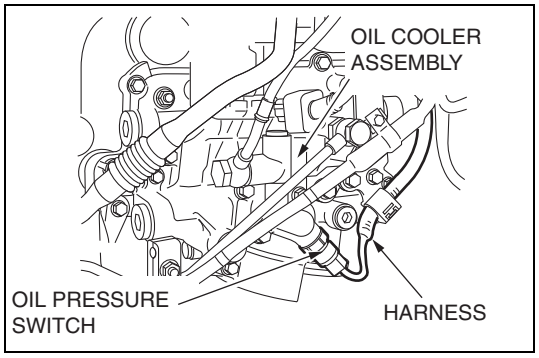
(1) Use the SST, remove the oil filter from the oil cooler assembly.
Reference: LUBRICATION (J05E), OIL FILTER, REPLACEMENT, REMOVING THE OIL FILTER (Page 13-4)

4. REMOVING THE TURBOCHARGER ASSEMBLY

(1) Remove the turbocharger assembly.
Reference: TURBOCHARGER (J05E), TURBOCHARGER ASSEMBLY, REPLACEMENT, REMOVING THE TURBOCHARGER ASSEMBLY (Page 17-5)

5. DISCONNECTING THE HARNESS

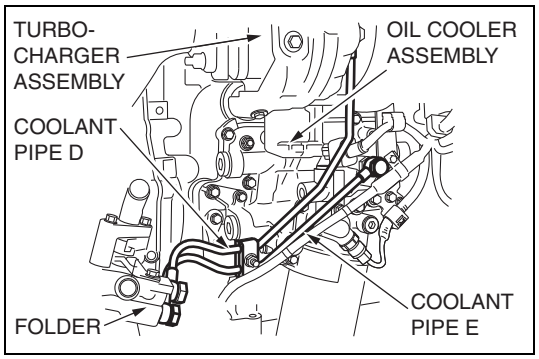
(1) Disconnect the connector from the oil pressure switch.
(2) Remove the harness around the oil cooler assembly.



SHTS021271200008

6. REMOVING THE COOLANT PIPE

(1) Remove the nut and then the clip.
(2) Unfasten the 2 union bolts to remove coolant pipe D and 4 gaskets from the folder and turbocharger assembly.
(3) Unfasten the 2 union bolts and detach the coolant pipe E and 4 gaskets from the folder and oil cooler assembly.

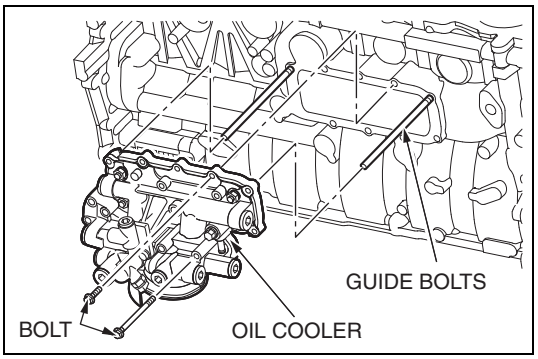


SHTS021271200009

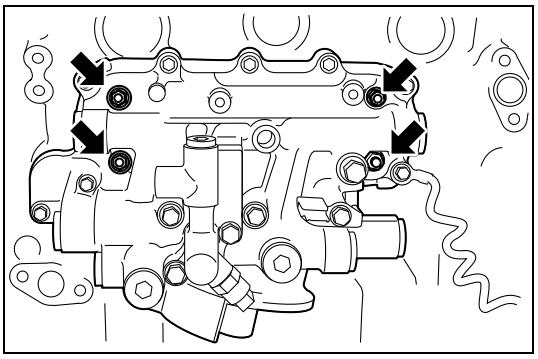
https://truckmanualshub.com/

7. REMOVING THE OIL COOLER ASSEMBLY

(1) Unfasten the 2-4 bolts and mount 2-4 guide bolts to the oil cooler assembly to prevent dropping.



SHTS021271200010



SHTS021271200011

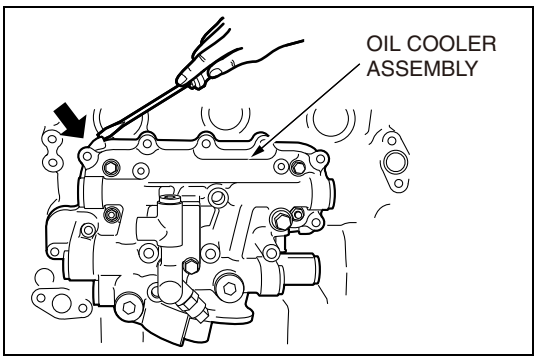
(2) Unfasten the remaining 9-11 bolts to remove the oil cooler assembly straight from the cylinder block.

NOTICE

Prepare the reservoir and clean clothes to collect dripping engine oil and coolant when removing the oil cooler assembly.

⚠ CAUTION

To avoid the oil cooler element from dropping off, do not unfasten the oil cooler element mounting nuts.



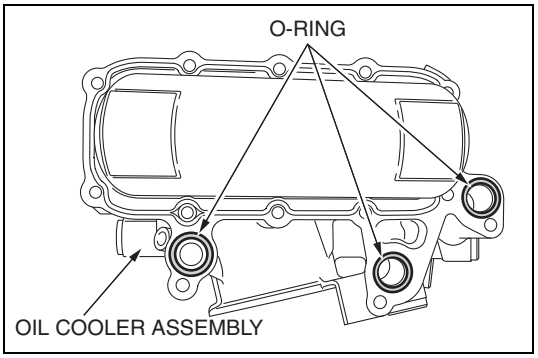
SHTS021271200012

NOTICE

If the liquid gasket is stuck to the cylinder block and it is hard to remove the oil cooler assembly, remove it by placing the flat-blade screwdriver to the protrusion shown in the figure.

(3) Remove the O-rings (3 pcs.) from the oil cooler assembly.

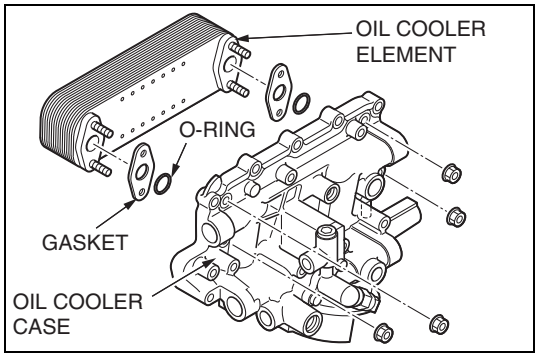
(4) Remove the guide bolts from the cylinder block.



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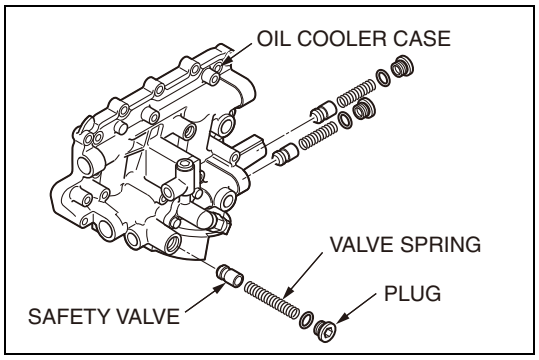
DISASSEMBLING THE OIL COOLER ASSEMBLY



SHTS021271200014

1. REMOVING THE OIL COOLER ELEMENT

(1) Unfasten the nuts (4 pcs.) to remove the oil cooler element, gaskets (2 pcs.), and O-rings (2 pcs.) from the oil cooler case.



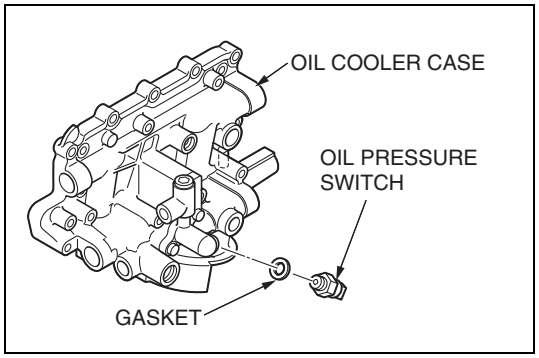
SHTS021271200015

2. REMOVING THE SAFETY VALVE

(1) Remove each plug to remove the valve spring and safety valve from the oil cooler case.

⚠ CAUTION

Note that residual pressure in the oil cooler may cause the engine oil to spew out when disassembling immediately after the engine stops.



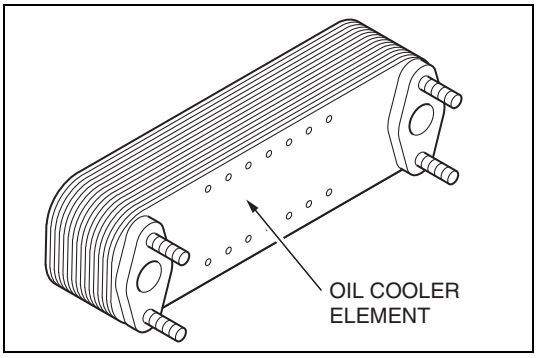
SHTS021271200016

3. REMOVING THE OIL PRESSURE SWITCH

(1) Remove the oil pressure switch and gasket from the oil cooler case.

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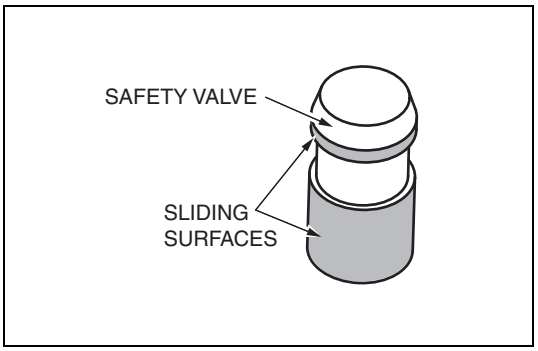
INSPECTING THE COMPONENTS



SHTS021271200017

1. INSPECTING THE OIL COOLER ELEMENT

(1) Visually check the oil cooler element for crack or damage. If any, replace it.



SHTS021271200018

2. INSPECTING THE SAFETY VALVE

(1) Inspect the safety valve sliding surface for wear and damage. If found defective, replace it.

3. INSPECTING THE OIL PRESSURE SWITCH

(1) Inspect the oil pressure switch.
Reference: LUBRICATION (J05E), OIL PRESSURE SWITCH, REPLACEMENT, SINGLE UNIT INSPECTION (Page 13-31)

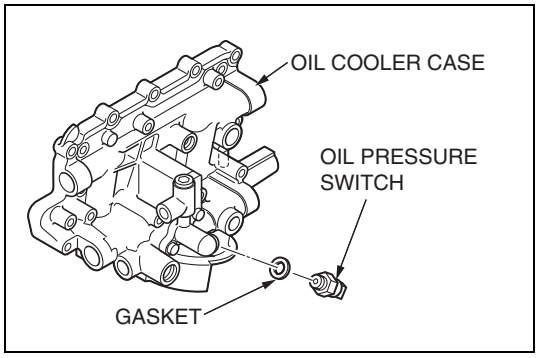
CLEANING THE OIL COOLER ELEMENT

1. CLEANING THE OIL COOLER ELEMENT

(1) Wash the water/oil groove well with kerosene or detergent.
(2) Check the stud bolt installation area and element for crack or deformation by using the dye penetrant testing (red check) and visual check.
(3) Pass the air of about 51 kPa {0.5 kgf/cm^2, 7.4 lbf/in.^{2}} through the oil groove to check the parts for leakage. Replace with a new part if crack, leakage, or deformation is found.

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ASSEMBLING THE OIL COOLER ASSEMBLY

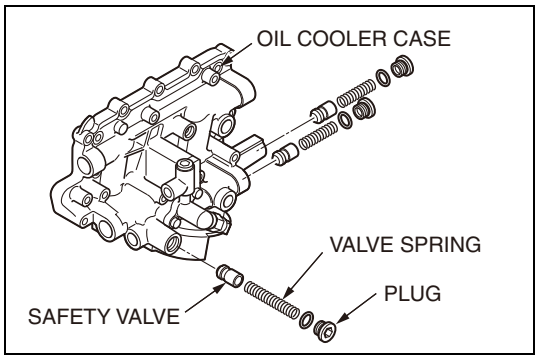


SHTS021271200019

1. MOUNTING THE OIL PRESSURE SWITCH

(1) Apply liquid gasket (ThreeBond TB1211: White or equivalent) to the sealing surface of a new gasket.

(2) Mount the gasket and oil pressure switch to the oil cooler case.
Tightening Torque:
29 N·m {296 kgf·cm, 21 lbf·ft}

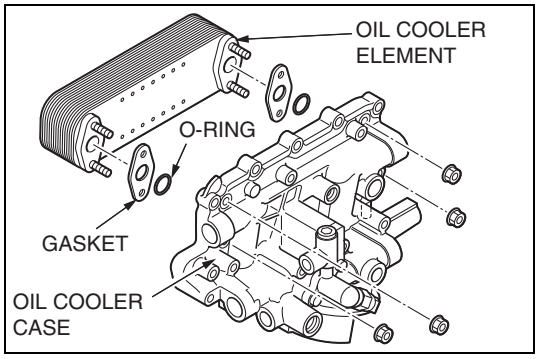


SHTS021271200020

2. MOUNTING THE SAFETY VALVE

(1) Mount the new O-ring to each plug.

(2) Insert the safety valve and valve spring to the oil cooler case and mount each plug.
Tightening Torque:
24.5-34.3 N·m {250-349 kgf·cm, 19-25 lbf·ft}



SHTS021271200021

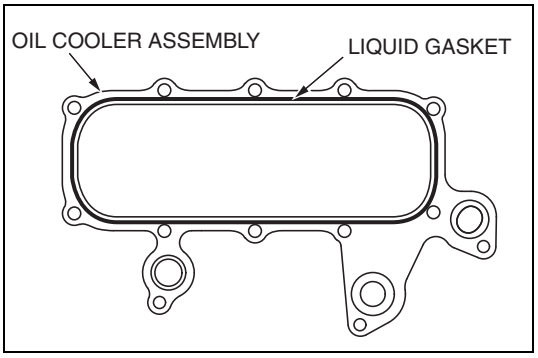
3. MOUNTING THE OIL COOLER ELEMENT

(1) Replace with the new gaskets (2 pcs.) and O-rings (2 pcs.) and mount the oil cooler element to the oil cooler case with nuts (4 pcs.).
Tightening Torque:
19.6-29.4 N·m {200-299 kgf·cm, 15-21 lbf·ft}

⚠ CAUTION
Use care not to damage the oil cooler element when handling.

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MOUNTING THE OIL COOLER ASSEMBLY



SHTS021271200022

1. MOUNTING THE OIL COOLER ASSEMBLY

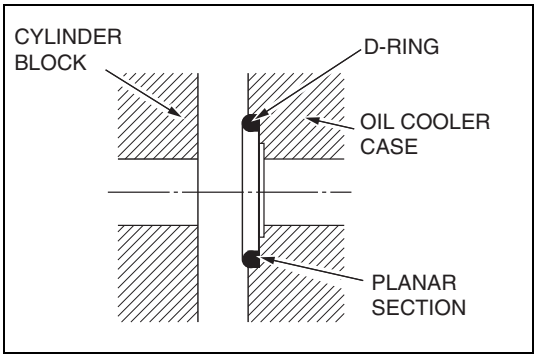
(1) Using the scraper, remove dirt (including liquid gasket) and oil on the joint surface between the oil cooler assembly and cylinder block.

(2) Apply the liquid gasket (ThreeBond TB1207B: Black or equivalent) to the oil cooler assembly.

⚠ CAUTION

- **Apply the liquid gasket seamlessly.**
- **Apply the liquid gasket with 1.5-2.5 mm {0.059-0.098 in.} width.**
- **Mount the case within 20 minutes after applying the liquid gasket.**

(3) Mount the new D-ring to the D-ring mounting groove of the oil cooler assembly.

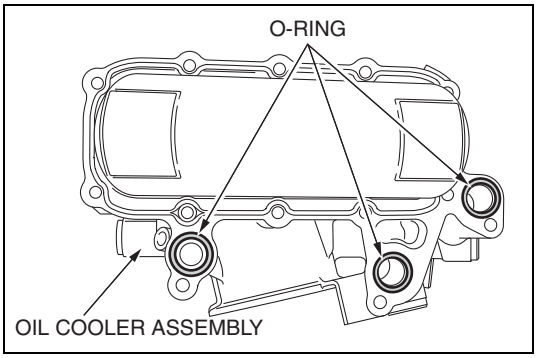


SHTS021271200023

⚠ CAUTION

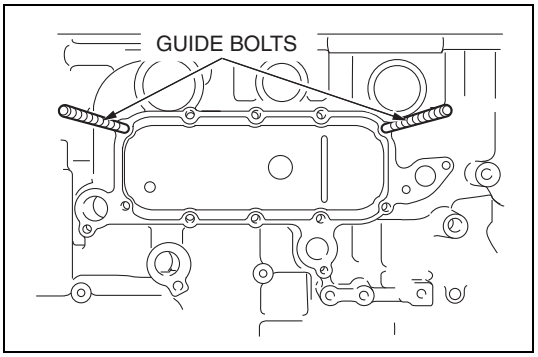
Assemble the flat side of the D-ring to the oil cooler assembly side.

(4) Mount the new O-rings (3 pcs.) to the oil cooler assembly.



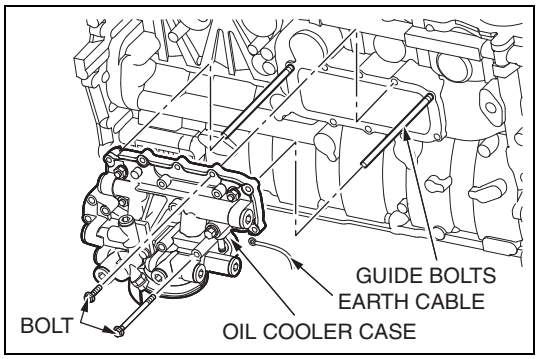
SHTS021271200024

(5) Mount the 2-4 guide bolts to the cylinder block.



SHTS021271200025

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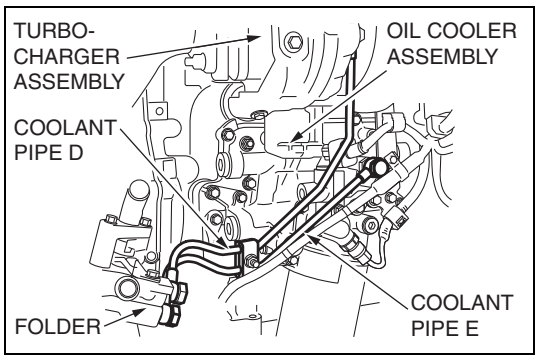


SHTS021271200026

(6) Mount the oil cooler assembly to the cylinder block with 13 bolts.
Tightening Torque:
28.5 N·m {291 kgf·cm, 21 lbf·ft}

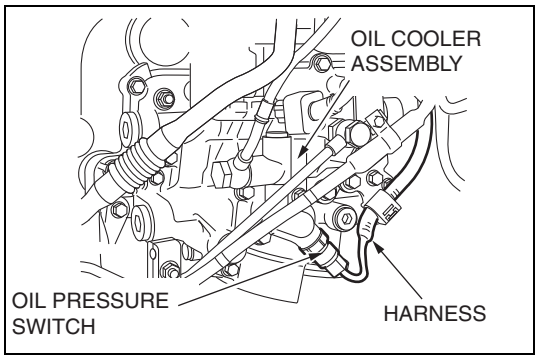
⚠ CAUTION
Unfasten the 2 - 4 guide bolts after temporarily tightening 9 - 11 oil cooler assembly mounting bolts.

NOTICE
Tighten together with the alternator earth cable at one place.



SHTS021271200027

2. MOUNTING THE COOLANT PIPE
(1) Replace with the new gaskets (4 pcs.) and connect the coolant pipe E to the folder and oil cooler assembly with union bolts (2 pcs.).
(2) Replace with the new gaskets (4 pcs.) and connect the coolant pipe D to the folder and turbocharger assembly with union bolts (2 pcs.).
(3) Mount the clip with the nut and secure coolant pipe D and the coolant pipe E.



SHTS021271200028

3. CONNECTING THE HARNESS
(1) Mount the harness to the oil cooler assembly.
(2) Connect the connector to the oil pressure switch.

4. MOUNTING THE TURBOCHARGER ASSEMBLY
(1) Mount the turbocharger assembly.
Reference: TURBOCHARGER (J05E), TURBOCHARGER ASSEMBLY, REPLACEMENT, MOUNTING THE TURBO-CHARGER ASSEMBLY (Page 17-9)

5. MOUNTING THE OIL FILTER
(1) Using the SST, mount the oil filter to the oil cooler assembly.
Reference: LUBRICATION (J05E), OIL FILTER, REPLACE-MENT, MOUNTING THE OIL FILTER (Page 13-5)

6. FEEDING ENGINE OIL
(1) Add engine oil through an oil filler.
Reference: MOUNTING AND DISMOUNTING THE ENGINE (J05E), ENGINE ASSEMBLY, REPLACEMENT, NEXT STEPS AFTER INSTALLATION (Page 5-14)

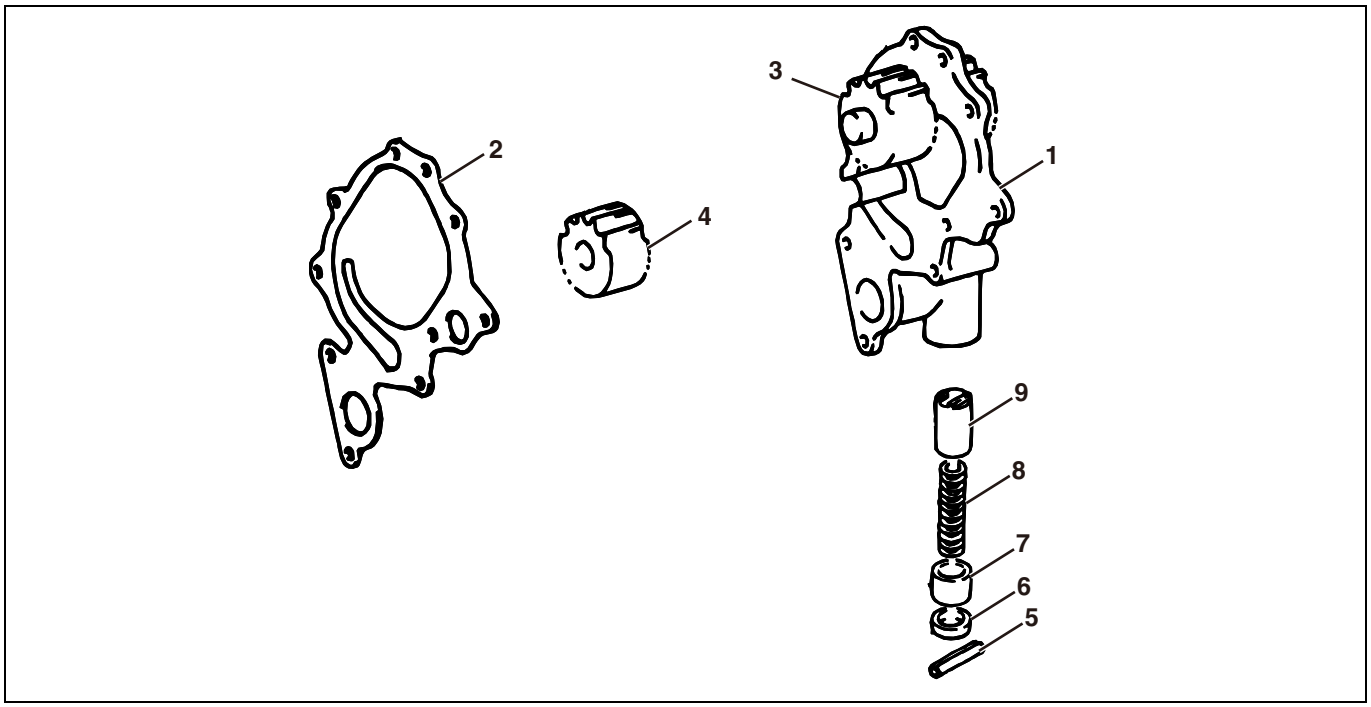
7. ADDING THE COOLANT
(1) Add the coolant.
Reference: COOLING (J05E), RADIATOR, REPLACEMENT, MOUNTING THE RADIATOR (Page 12-9)

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OIL PUMP

COMPONENT LOCATOR

EN01F02114120402008001



SHTS021271200029

1	Oil pump	6	Seat 1
2	Gasket *	7	Seat 2
3	Drive gear	8	Valve spring
4	Driven gear	9	Safety valve
5	Cotter pin *		

***: Nonreusable part**

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OVERHAUL

EN01F02114120402008002

REMOVING THE OIL PUMP

1. REMOVING THE FLYWHEEL HOUSING

(1) Remove the flywheel housing.
Reference: ENGINE MECHANICAL (J05E), FLYWHEEL ASSEMBLY, OVERHAUL, REMOVING THE FLYWHEEL ASSEMBLY (Page 10-57)

2. REMOVING THE TIMING GEAR

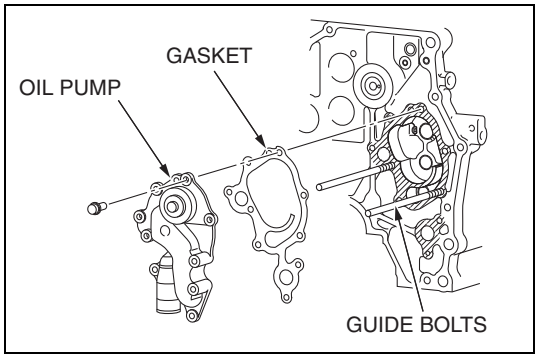
(1) Remove the main idle gear and sub idle gear.
Reference: ENGINE MECHANICAL (J05E), TIMING GEAR & CAM IDLE GEAR, OVERHAUL, REMOVING THE TIMING GEARS AND THE REAR END PLATE FROM FLYWHEEL HOUSING (Page 10-72)

3. REMOVING THE OIL PUMP

(1) Unfasten the 2 bolts and mount 2 guide bolts to the oil pump to prevent dropping.
(2) Unfasten the remaining bolts (7 pcs.) to remove the oil pump from the cylinder block.

NOTICE

- **To loosen the adherence and facilitate the removal, tap the oil pump mounted with guide bolts using the plastic hammer in advance.**
- **Prepare the reservoir and clean clothes to collect dripping engine oil when removing the oil pump.**



SHTS021271200030

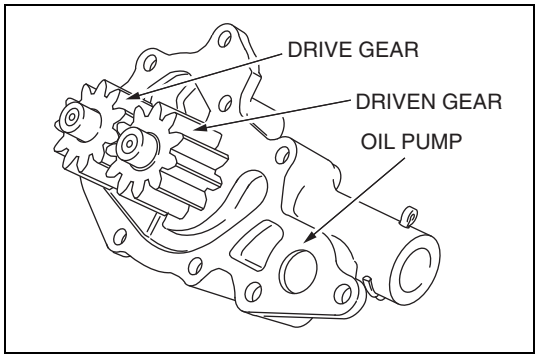
DISASSEMBLING THE OIL PUMP

1. REMOVING THE DRIVEN GEAR

(1) Remove the driven gear from the oil pump.

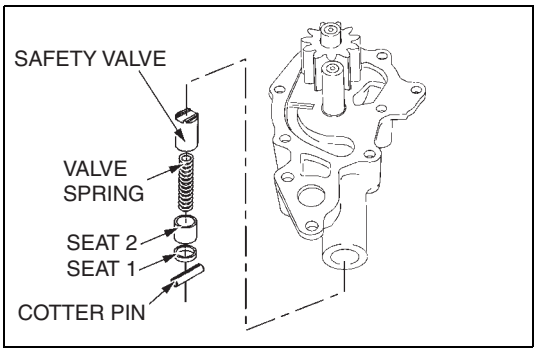
NOTICE

The drive gear is press-fitted into the shaft and nonremovable.



SHTS021271200031

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SHTS021271200032

2. REMOVING THE SAFETY VALVE

(1) Remove the cotter pin to remove the seat 1, seat 2, valve spring, and safety valve.

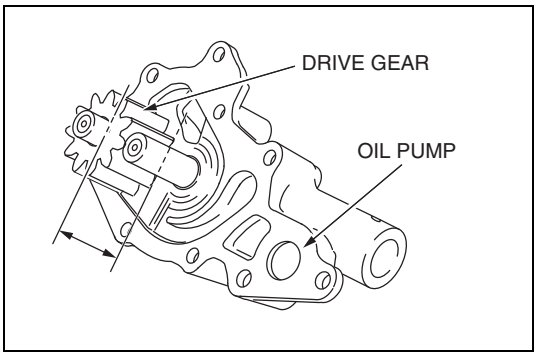
⚠ CAUTION

Note that the seat 1, seat 2, and valve spring jump out when the cotter pin is removed.

INSPECTING THE COMPONENTS

1. INSPECTING THE END PLAY OF THE DRIVE GEAR AND CYLINDER BLOCK

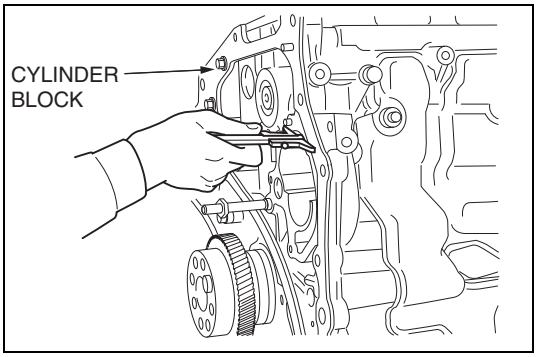
(1) Using the depth gauge, measure the drive gear width.



SHTS021271200033

Standard value (mm {in.})	28.5 {1.122}

(2) Using the depth gauge, measure the pump chamber depth on the cylinder block side.



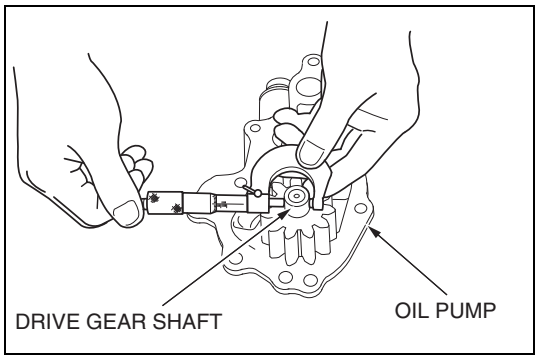
SHTS021271200034

Standard value (mm {in.})	28.5 {1.122}

(3) Calculate the difference between the drive gear width and pump chamber depth on the cylinder block side. If exceeding the permissible limit, replace the oil pump.

	Standard value (mm {in.})	Permissible limit (mm {in.})
With gasket	0.047-0.150 {0.0019-0.0060}	0.15 {0.0060}
Without gasket	-0.013-0.050 {-0.0005-0.0020}	–

https://truckmanualshub.com/

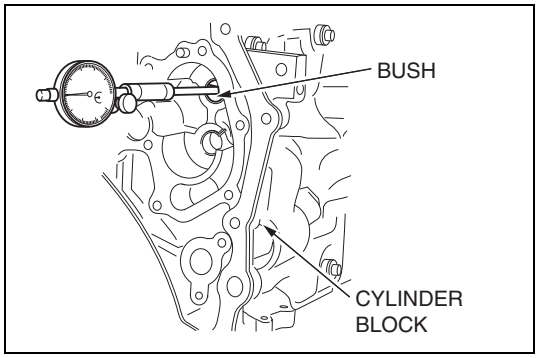


SHTS021271200035

2. INSPECTING THE CLEARANCE BETWEEN THE DRIVE GEAR SHAFT OUTER DIAMETER AND BUSHING INNER DIAMETER ON THE CYLINDER BLOCK SIDE

(1) Using the micrometer, measure the drive gear shaft outer diameter.

Standard value (mm {in.})	18.0 {0.709}



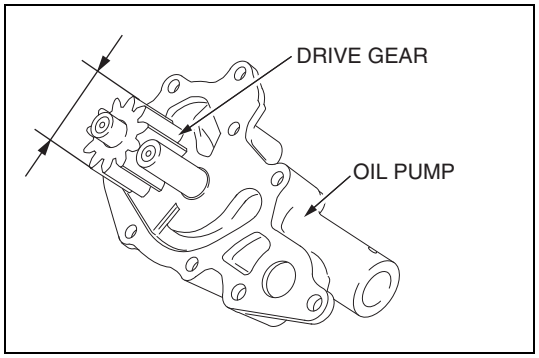
SHTS021271200036

(2) Using the cylinder gauge, measure the bushing inner diameter on the cylinder block side.

Standard value (mm {in.})	18.0 {0.709}

(3) Calculate the difference between the drive gear shaft outer diameter and bushing inner diameter on the cylinder block side. When it exceeds the standard value, replace the bushing on the cylinder block side or oil pump.

Standard value (mm {in.})	0.040-0.099 {0.0016-0.0039}

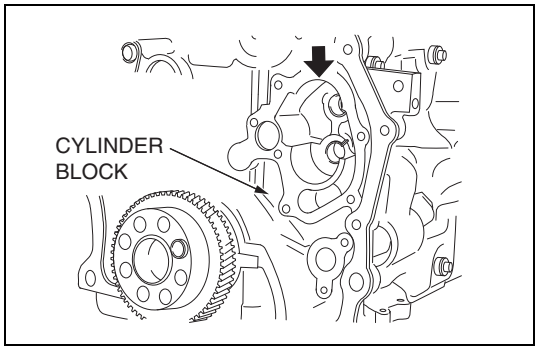


SHTS021271200037

3. INSPECTING THE CLEARANCE BETWEEN THE DRIVE GEAR OUTER DIAMETER AND PUMP CHAMBER INNER DIAMETER ON THE CYLINDER BLOCK SIDE

(1) Using the vernier calipers, measure the drive gear outer diameter.

Standard value (mm {in.})	54.0 {2.126}



SHTS021271200038

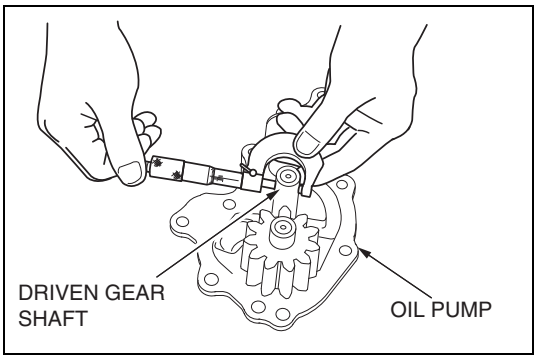
(2) Using the cylinder gauge, measure the pump chamber inner diameter on the cylinder block side.

Standard value (mm {in.})	54.0 {2.126}

(3) Calculate the difference between the drive gear outer diameter and pump chamber inner diameter on the cylinder block side. If exceeding the permissible limit, replace the oil pump.

Standard value (mm {in.})	Permissible limit (mm {in.})
0.093-0.252 {0.0037-0.0099}	0.30 {0.012}

https://truckmanualshub.com/

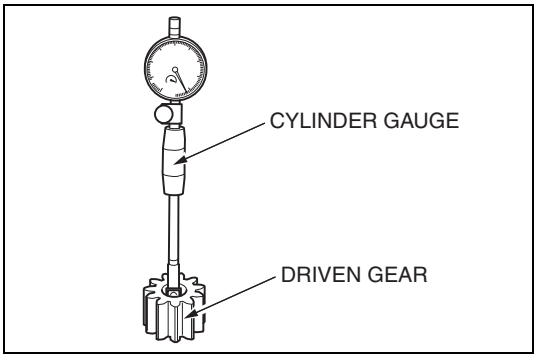


SHTS021271200039

4. INSPECTING THE CLEARANCE BETWEEN THE DRIVEN GEAR SHAFT OUTER DIAMETER AND DRIVEN GEAR BUSHING INNER DIAMETER

(1) Using the micrometer, measure the driven gear shaft outer diameter.

Standard value (mm {in.})	18.0 {0.709}



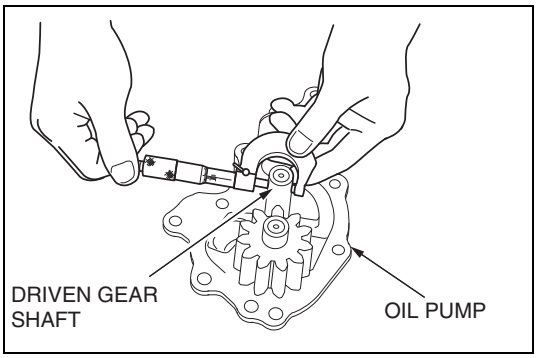
SHTS021271200040

(2) Using the cylinder gauge, measure the driven gear bushing inner diameter.

Standard value (mm {in.})	18.0 {0.709}

(3) Calculate the difference between the driven gear shaft outer diameter and driven gear bushing inner diameter. If exceeding the permissible limit, replace the oil pump or driven gear.

Standard value (mm {in.})	Permissible limit (mm {in.})
0.040-0.083 {0.0016-0.0033}	0.15 {0.0060}

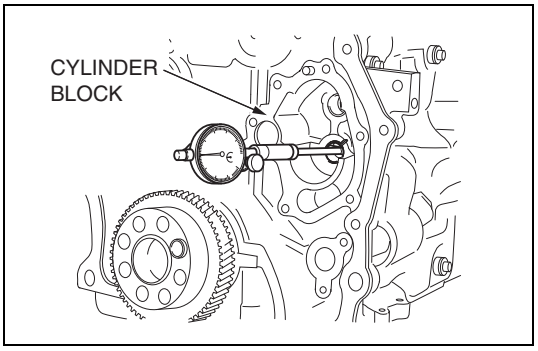


SHTS021271200041

5. INSPECTING THE CLEARANCE BETWEEN THE DRIVEN GEAR SHAFT OUTER DIAMETER AND CYLINDER BLOCK SIDE HOLE DIAMETER

(1) Using the micrometer, measure the driven gear shaft outer diameter.

Standard value (mm {in.})	18.0 {0.709}



SHTS021271200042

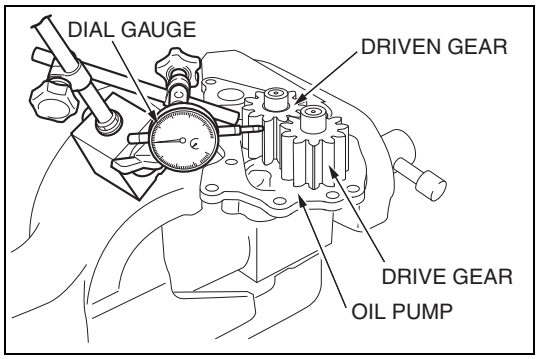
(2) Using the cylinder gauge, measure the cylinder block side hole diameter.

Standard value (mm {in.})	18.0 {0.709}

(3) Calculate the difference between the outer diameter of the driven gear shaft and the cylinder block side hole diameter. If the value exceeds the standard value, replace the oil pump.

Standard value (mm {in.})	0.030-0.075 {0.0012-0.0030}

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SHTS021271200043

6. INSPECTING THE BACKLASH OF THE DRIVE GEAR

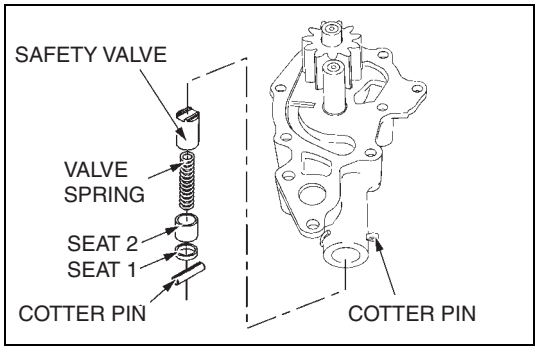
(1) Using the vise, secure the oil pump.

(2) Using the dial gauge, measure the backlash between the drive gear and driven gear. If exceeding the permissible limit, replace the oil pump.

Standard value (mm {in.})	Permissible limit (mm {in.})
0.073-0.207 {0.0029-0.0082}	0.30 {0.012}

https://truckmanualshub.com/

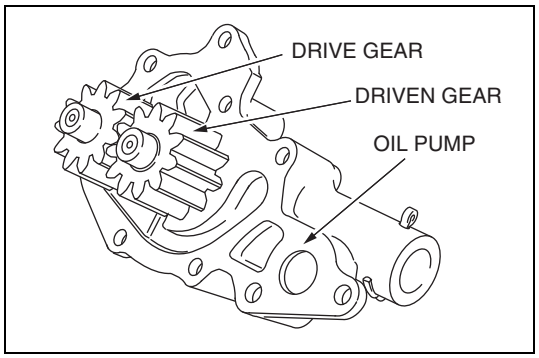
ASSEMBLING THE OIL PUMP



SHTS021271200044

1. MOUNTING THE SAFETY VALVE

(1) Insert the safety valve, valve spring, seat 2, and then seat 1 to the oil pump, and fix them with a new cotter pin.

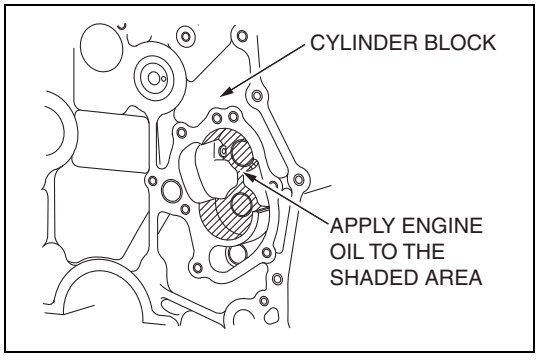


SHTS021271200045

2. MOUNTING THE DRIVEN GEAR

(1) Mount the driven gear to the oil pump.

MOUNTING THE OIL PUMP



SHTS021271200046

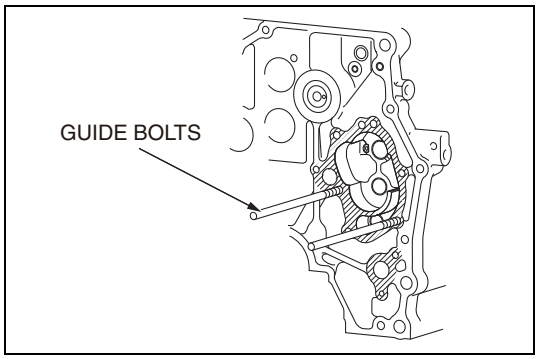
1. MOUNTING THE OIL PUMP

(1) Apply engine oil to the pump case and bearing of the cylinder block.

⚠ CAUTION

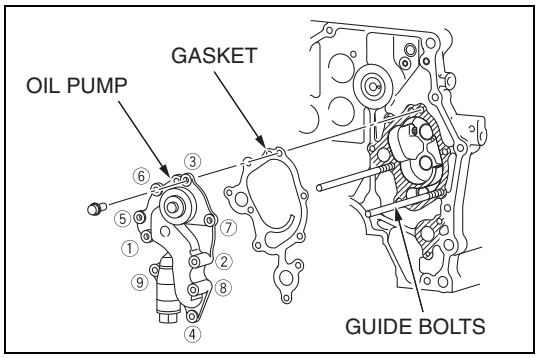
Without engine oil, defective oil suction may occur when the engine is initially started, which results in seizure and abnormal wear.

https://truckmanualshub.com/



SHTS021271200047

(2) Mount the guide bolts (2 pcs.) to the cylinder block.



SHTS021271200048

(3) Replace with the new gasket and align the oil pump with the cylinder block mounting position.

(4) Mount the oil pump to the cylinder block with bolts (9 pcs.) in the order shown in the figure.
Tightening Torque:
28.5 N·m {291 kgf·cm, 21 lbf·ft}

⚠ CAUTION

- **A misaligned gasket may cause defective sealing, which results in outflow of all engine oil in the oil pump when the engine is stopped. Defective sealing may also result in an insufficient engine oil suction quantity in the initial rotation when the engine is restarted, which leads to seizure or abnormal wear.**
- **Unfasten the guide bolts (2 pcs.) after temporarily tightening the oil pump mounting bolts (7 pcs.).**
- **Note that failure to observe the tightening order may damage the oil pump.**
- **After tightening, make sure that the gear turns easily by hand.**

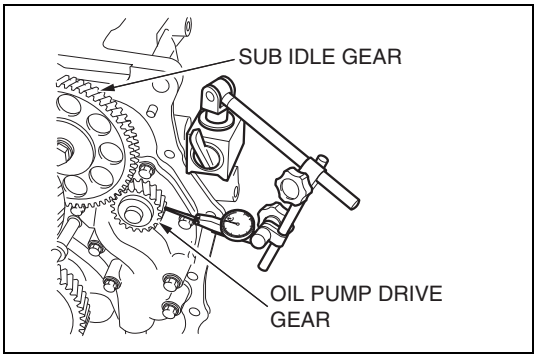
https://truckmanualshub.com/

2. MOUNTING THE TIMING GEAR

(1) Mount the main idle gear and sub idle gear.
Reference: ENGINE MECHANICAL (J05E), TIMING GEAR & CAM IDLE GEAR, OVERHAUL, MOUNTING THE TIMING GEARS IN THE FLYWHEEL HOUSING AND THE REAR END PLATE (Page 10-74)

3. INSPECTING THE BACKLASH

(1) Using the dial gauge, measure the backlash between the oil pump drive gear and sub idle gear. When it exceeds the standard value, mount the oil pump again.



SHTS021271200049

NOTICE
When mounting the oil pump, the backlash may fluctuate due to the looseness of the oil pump mounting bolt hole.

Standard value (mm {in.})	Permissible limit (mm {in.})
0.030-0.131 {0.0012-0.0052}	0.30 {0.012}

4. MOUNTING THE FLYWHEEL HOUSING

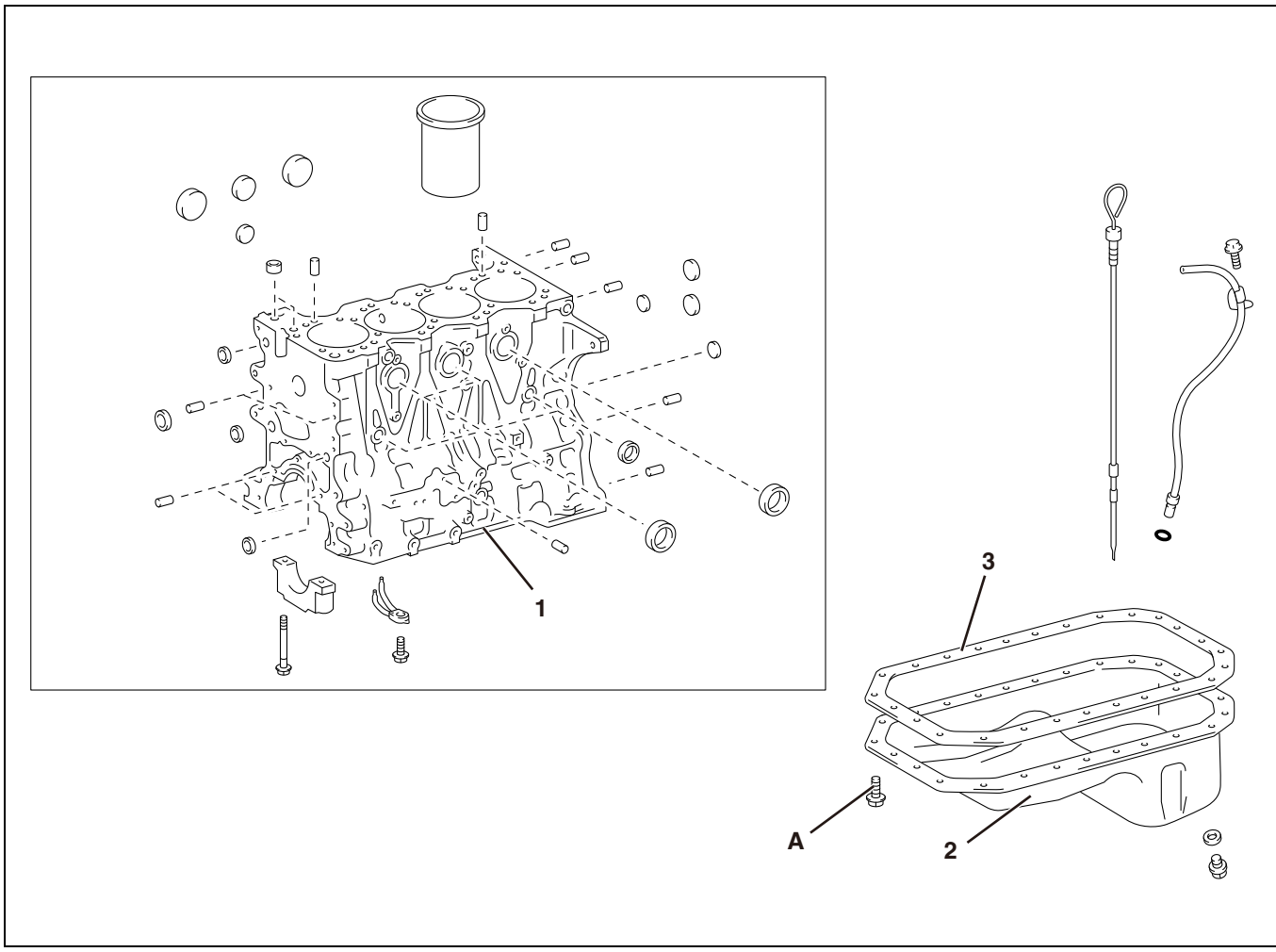
(1) Mount the flywheel housing to the cylinder block.
Reference: ENGINE MECHANICAL (J05E), FLYWHEEL ASSEMBLY, OVERHAUL, MOUNTING THE FLYWHEEL ASSEMBLY (Page 10-59)

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OIL PAN

COMPONENT LOCATOR

EN01F02114120402005001



SHTS021271200050

1	Cylinder block	3	Gasket *
2	Oil pan		

*: Nonreusable part

Tightening torque — Unit: N·m {kgf·cm, lbf·ft}

A	30 {306, 22}		

https://truckmanualshub.com/

REPLACEMENT

EN01F02114120402005002

REMOVING THE OIL PAN

1. DISCHARGING ENGINE OIL

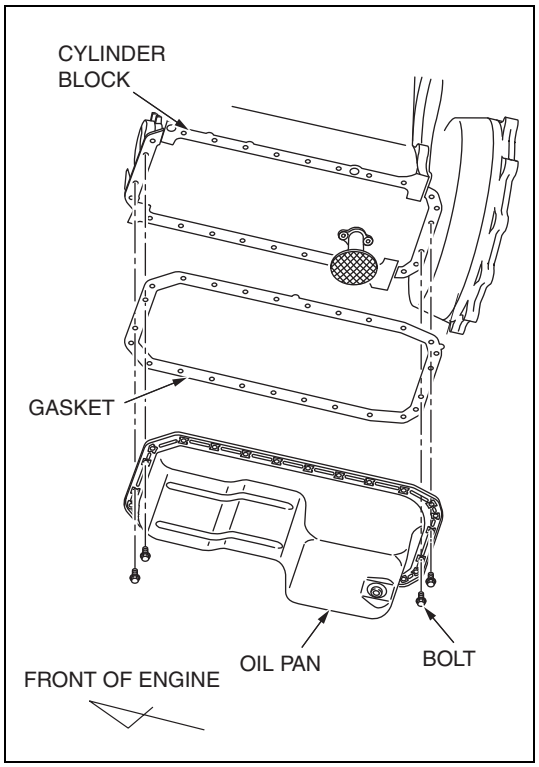
(1) Remove the drain plug of the oil pan to drain engine oil.
Reference: MOUNTING AND DISMOUNTING THE ENGINE (J05E), ENGINE ASSEMBLY, REPLACEMENT, REMOVING THE ENGINE ASSEMBLY (Page 5-7)

2. REMOVING THE OIL PAN

(1) Unfasten the 26 bolts to remove the oil pan and gasket from the cylinder block.

NOTICE

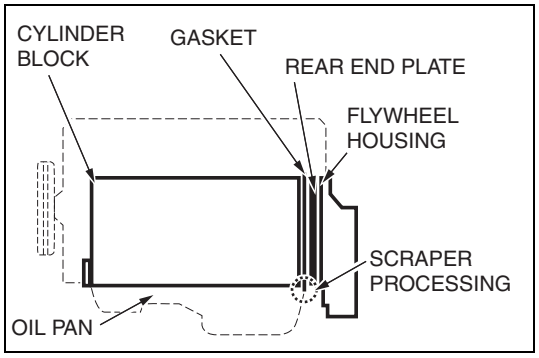
- **If the gasket is stuck and hard to separate, use a scraper to peel it off.**
- **Prepare the reservoir and clean clothes oil pan because the engine oil will spill when removing the oil pan.**



SHTS021271200051

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MOUNTING THE OIL PAN



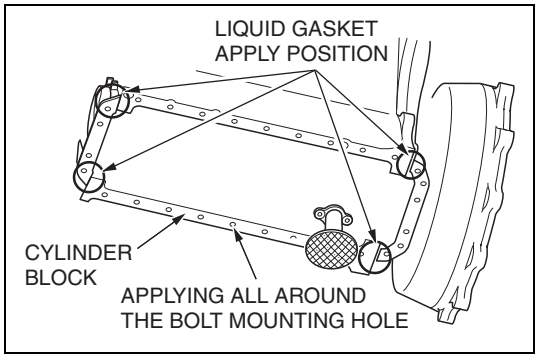
SHTS021271200052

1. MOUNTING THE OIL PAN

(1) Using the scraper, cut the rear end plate gasket to make it flush with the cylinder block lower surface.

NOTICE

Not necessary when attaching and detaching the single oil pan.



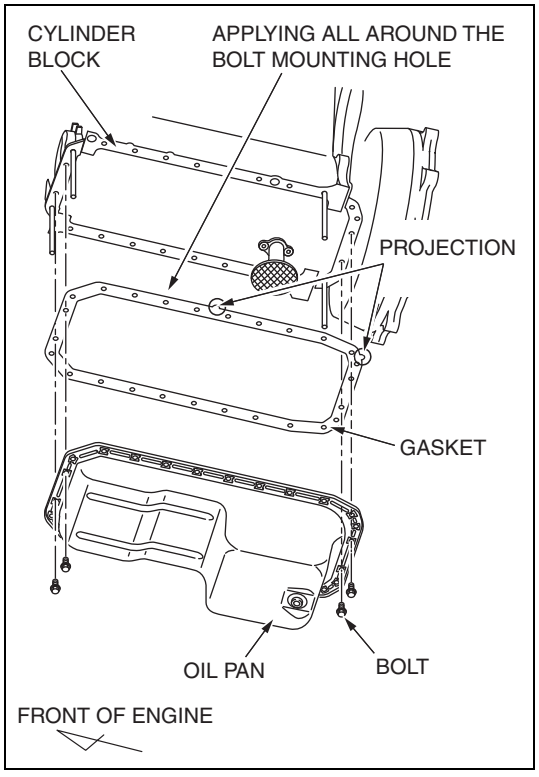
SHTS021271200053

(2) Check the joint surface between the cylinder block and oil pan for deformation, dirt, or oil.

(3) Then, apply the small quantity of liquid gasket (ThreeBond TB1207D: Silver or equivalent, or ThreeBond TB1217G: Grey or equivalent) to the step areas of the joint parts between the front oil seal retainer and cylinder block/flywheel housing and around the bolt mounting hole.

⚠ CAUTION

- **Apply the liquid gasket seamlessly.**
- **Apply the liquid gasket with 1.5-2.5 mm {0.059-0.098 in.} width.**
- **Mount the case within 20 minutes after applying the liquid gasket.**



SHTS021271200054

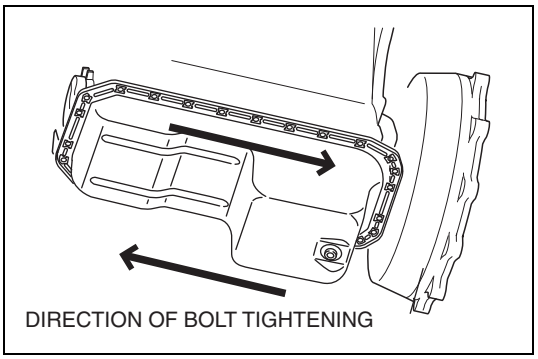
(4) Then, apply the small quantity of liquid gasket (ThreeBond TB1207D: Silver or equivalent, or ThreeBond TB1217G: Grey or equivalent) to around the bolt mounting hole on the oil pan side.

(5) Mount the guide bolts (70 mm {2.756 in.} or more) to the cylinder block. Align the new gasket with the mounting position in a way that its protrusions are set on the intake and flywheel housing sides (the print seal surface is on the cylinder block side).

⚠ CAUTION

- **Unfasten the guide bolts after temporarily tightening the oil pan mounting bolts.**
- **Before mounting the gasket, check the print seal for peeling or damage.**

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SHTS021271200055

(6) Align the new gasket and oil pan with the cylinder block lower surface and tighten 26 bolts in the order of the arrows shown in the figure.
Tightening Torque:
19.6-24.5 N·m {200-249 kgf·cm, 15-18 lbf·ft}

(7) Remove the guide bolt and tighten 26 bolts again.
Tightening Torque:
30 N·m {306 kgf·cm, 22 lbf·ft}

⚠ CAUTION

- **Handle the gasket of the oil pan with care because it can be easily broken.**
- **Check that the washer does not run on the flange.**

2. ADDING ENGINE OIL

(1) Add engine oil through an oil filler.
Reference: MOUNTING AND DISMOUNTING THE ENGINE (J05E), ENGINE ASSEMBLY, REPLACEMENT, NEXT STEPS AFTER INSTALLATION (Page 5-14)

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INSPECTING THE LUBRICATION AFTER A LUBRICATION OVERHAUL

1. INSPECTING THE VALVE SYSTEM

⚠ CAUTION

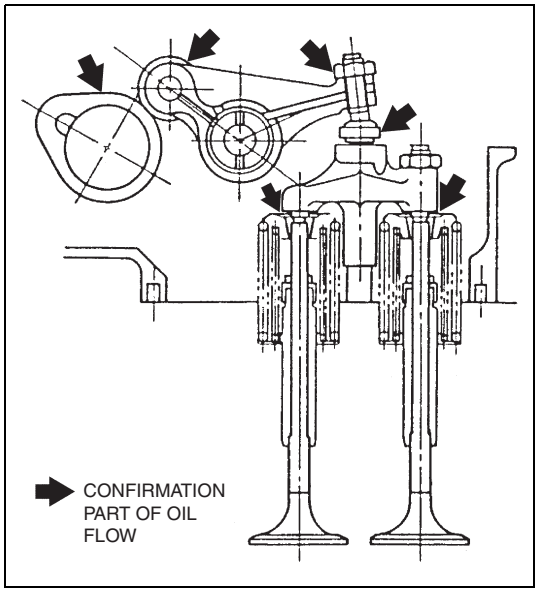
- **Make sure to perform an inspection after a lubrication overhaul.**
- **Perform the inspection at the coolant temperature about 60°C {140°F}.**

(1) Remove the head cover.
Reference: ENGINE MECHANICAL (J05E), HEAD COVER, REPLACEMENT, REMOVING THE HEAD COVER (Page 10-3)

⚠ CAUTION
For inspection, mount a jig of which head cover is cut in half to prevent engine oil from splashing. (Perform cutting enough so that the camshaft is covered.)

(2) Adjust the engine speed at the standard idling speed (750 r/min.).
(3) Check if oil is supplied to all rocker arm parts below within about 10 seconds after the engine start.

a. The roller and cam surfaces
b. The crosshead head and spring upper seat upper surface via the adjust screw



SHTS021271200056

⚠ CAUTION
If the duration before the oil supply is long or no oil is supplied, dropped oil pressure or clogged oil groove is considered possible reasons, which may cause troubles such as seizure, abnormal wear, and abnormal noise due to defective oil supply.

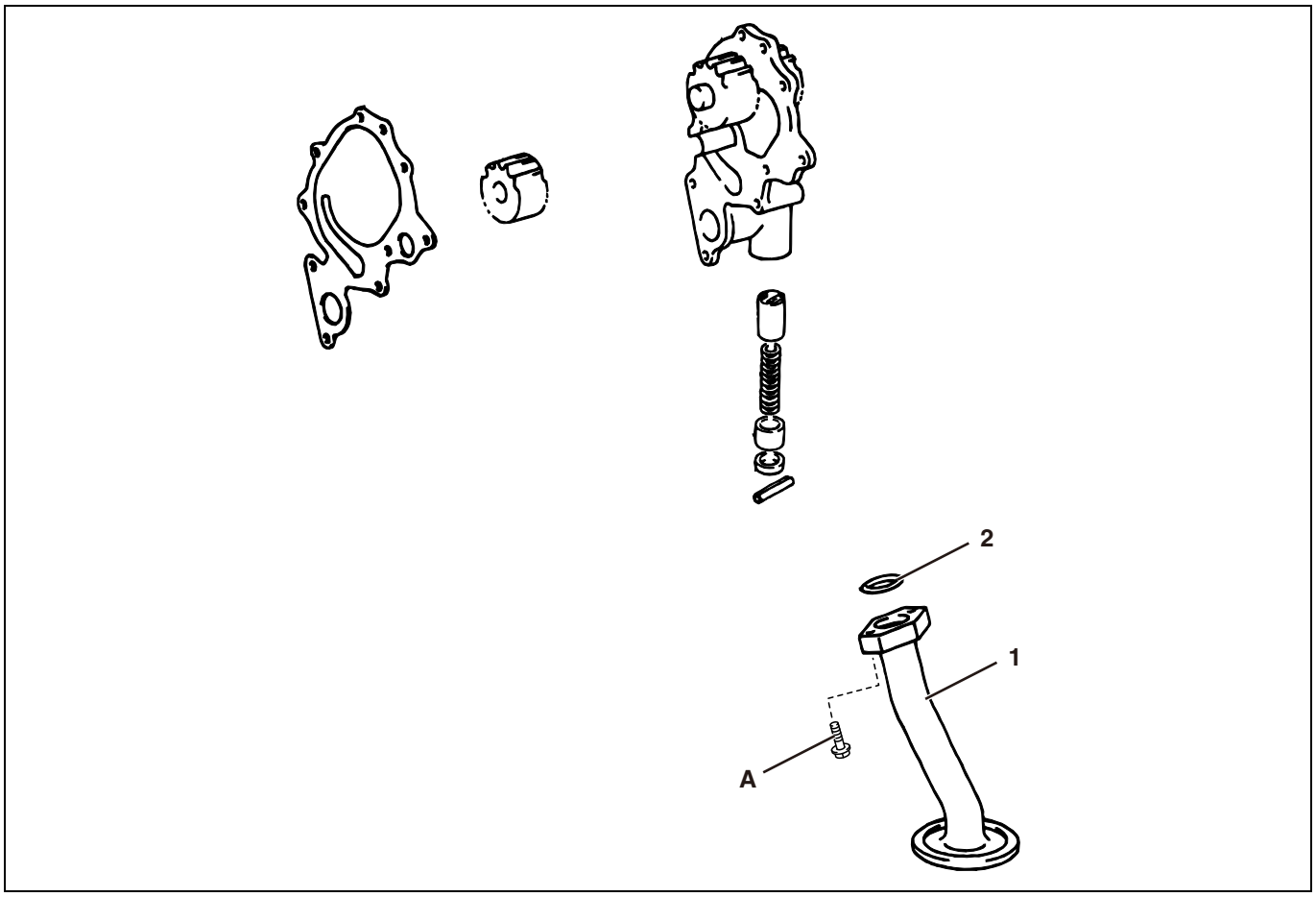
(4) Mount the head cover.
Reference: ENGINE MECHANICAL (J05E), HEAD COVER, REPLACEMENT, MOUNTING THE HEAD COVER (Page 10-4)

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OIL STRAINER

COMPONENT LOCATOR

EN01F02114120402003001



SHTS021271200057

1 Oil strainer	2 O-ring *

*: Nonreusable part

Tightening torque — Unit: N·m {kgf·cm, lbf·ft}

A 30 {306, 22}	

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REPLACEMENT

EN01F02114120402003002

REMOVING THE OIL STRAINER

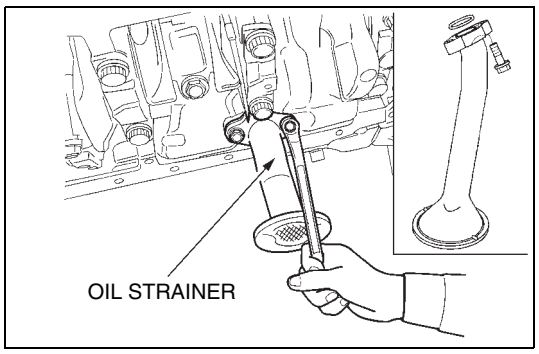
1. REMOVING THE OIL PAN

(1) Remove the oil pan from the cylinder block.
Reference: LUBRICATION (J05E), OIL PAN, REPLACEMENT, REMOVING THE OIL PAN (Page 13-24)

2. REMOVING THE OIL STRAINER

(1) Unfasten the 2 bolts to remove the oil strainer and O-ring from the cylinder block.

NOTICE
Prepare the reservoir and clean clothes to collect dripping engine oil when removing the oil strainer.



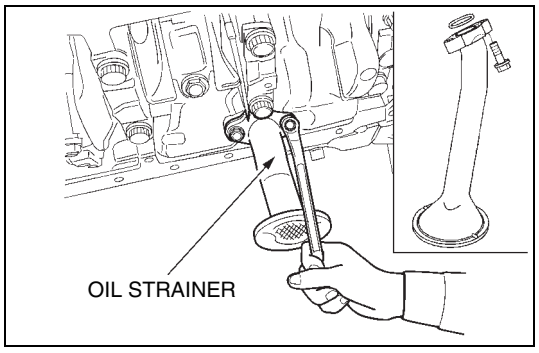
SHTS021271200058

MOUNTING THE OIL STRAINER

1. MOUNTING THE OIL STRAINER

(1) Replace with the new O-ring and mount the oil strainer to the cylinder block with bolts (2 pcs.).

Tightening Torque:
30 N·m {306 kgf·cm, 22 lbf·ft}



SHTS021271200059

2. MOUNTING THE OIL PAN

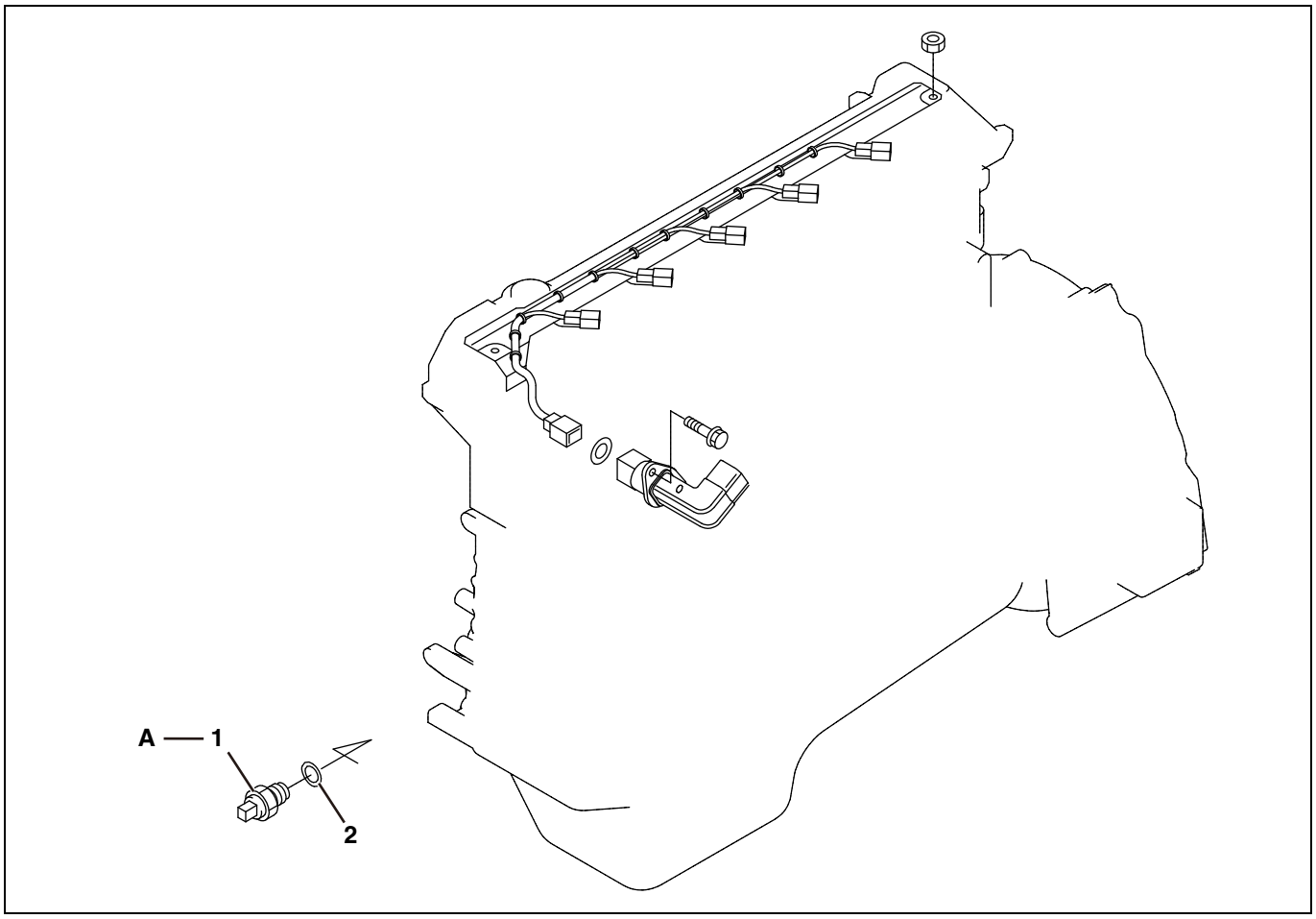
(1) Mount the oil pan to the cylinder block.
Reference: LUBRICATION (J05E), OIL PAN, REPLACEMENT, MOUNTING THE OIL PAN (Page 13-25)

https://truckmanualshub.com/

OIL PRESSURE SWITCH

COMPONENT LOCATOR

EN01F02114120402016001



SHTS021271200060

1 Oil pressure switch	2 Gasket *

*: Nonreusable part

Tightening torque — Unit: N·m {kgf·cm, lbf·ft}

A 24.5 {250, 18}	

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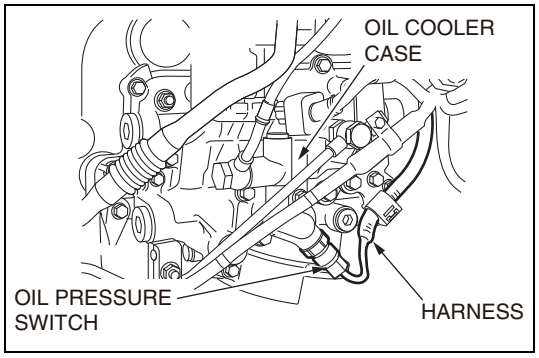
REPLACEMENT

EN01F02114120402016002

REMOVING THE OIL PRESSURE SWITCH

1. REMOVING THE OIL PRESSURE SWITCH

(1) Disconnect the connector from the oil pressure switch.

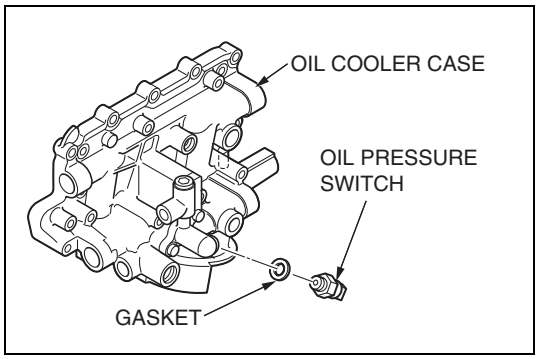


SHTS021271200061

(2) Remove the oil pressure switch and gasket from the oil cooler case.

NOTICE

Prepare the reservoir and clean clothes to collect dripping engine oil when removing the oil pressure switch.

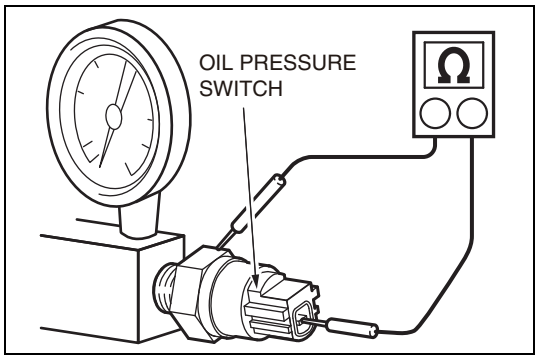


SHTS021271200062

SINGLE UNIT INSPECTION

1. INSPECTING THE OIL PRESSURE SWITCH

(1) Apply air or oil pressure to measure the continuity between the terminal and body using the circuit tester. If found defective, replace it.

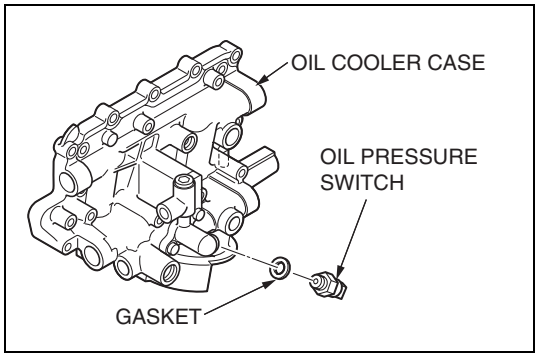


SHTS021271200063

Pressure	Continuity
When no load is applied or the pressure is less than 39.2 kPa {0.4 kgf/cm^2, 5.7 lbf/in.^{2}}	**Yes**
When pressure is 58.8kPa {0.6 kgf/cm^2, 8.5 lbf/in.^{2}} or more	**No**

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MOUNTING THE OIL PRESSURE SWITCH

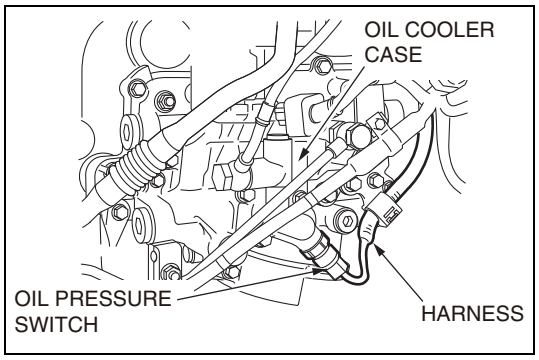


SHTS021271200064

1. MOUNTING THE OIL PRESSURE SWITCH

(1) Apply liquid gasket (ThreeBond TB1211: White or equivalent) to the sealing surface of a new gasket.

(2) Mount the gasket and oil pressure switch to the oil cooler case.
Tightening Torque:
24.5 N·m {250 kgf·cm, 18 lbf·ft}



SHTS021271200065

(3) Connect the connector to the oil pressure switch.

2. ADDING ENGINE OIL

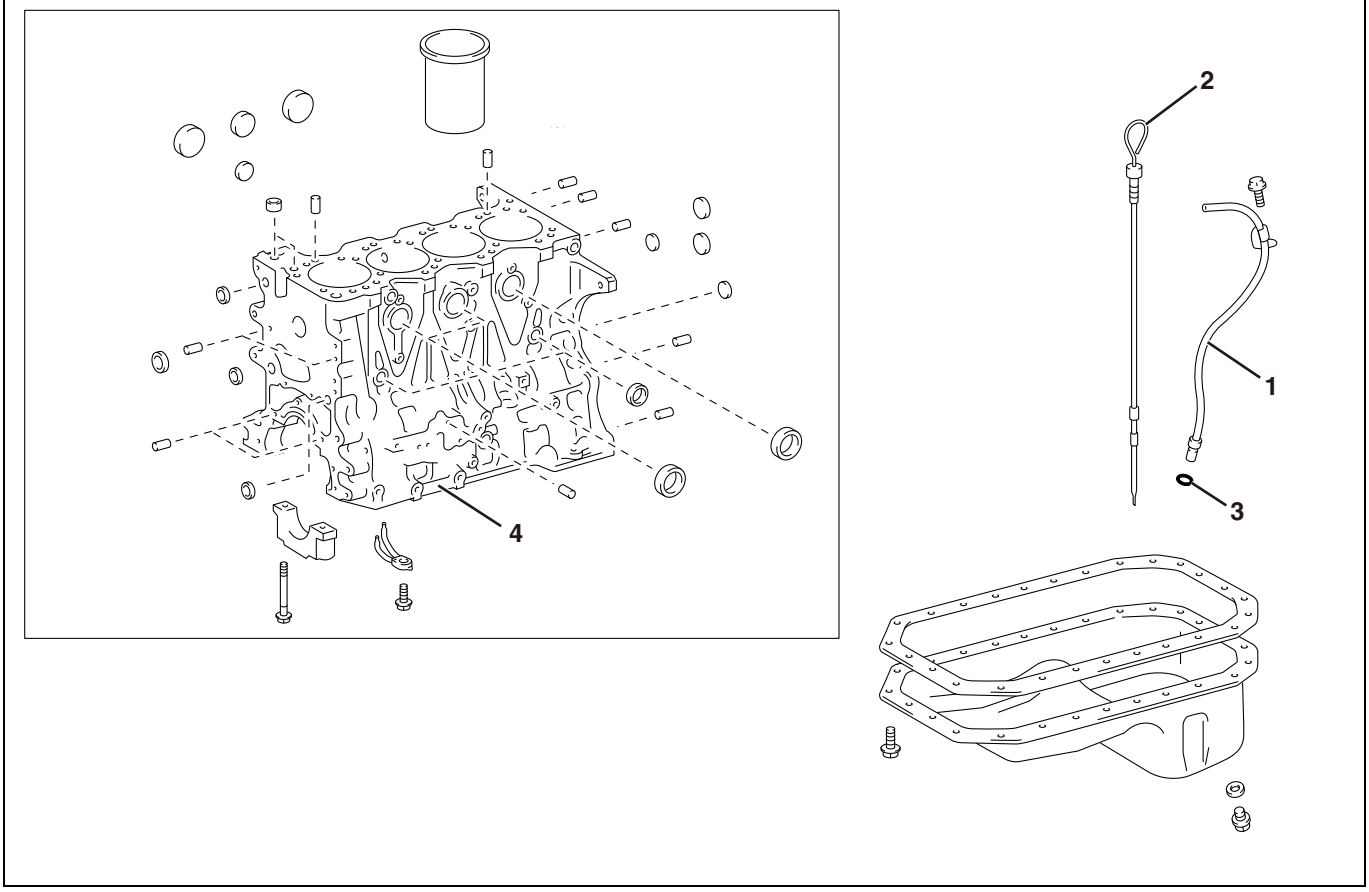
(1) Inspect the engine oil level. If insufficient, add engine oil.
Reference: MOUNTING AND DISMOUNTING THE ENGINE (J05E), ENGINE ASSEMBLY, REPLACEMENT, NEXT STEPS AFTER INSTALLATION (Page 5-14)

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OIL LEVEL GAUGE AND GUIDE

COMPONENT LOCATOR

EN01F02114120402017001



SHTS021271200066

1	Oil level gauge and guide	3	O-ring *
2	Oil level gauge	4	Cylinder block

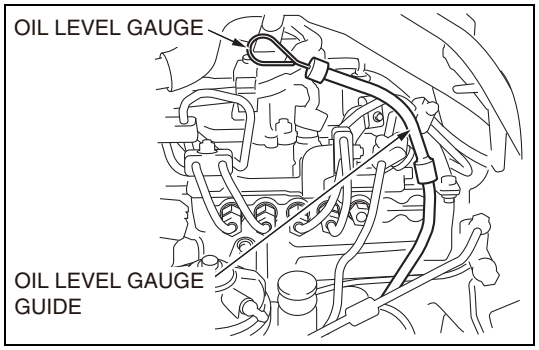
*: Nonreusable part

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REPLACEMENT

EN01F02114120402017002

REMOVING THE OIL LEVEL GAUGE AND GUIDE



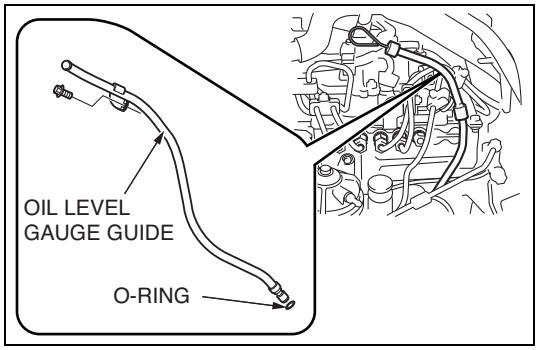
SHTS021271200067

1. REMOVING THE OIL LEVEL GAUGE

(1) Pull out the oil level gauge from the oil level gauge guide.

NOTICE

Prepare the clean clothes to receive dripping engine oil when pulling out the oil level gauge.



SHTS021271200068

2. REMOVING THE OIL LEVEL GAUGE GUIDE

(1) Remove the nut and then the clip.

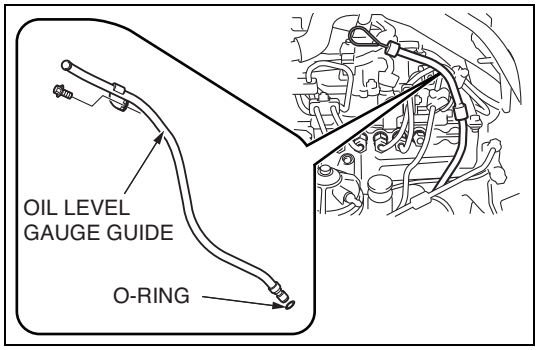
(2) Remove the oil level gauge guide and O-ring from the cylinder block.

NOTICE

Prepare the reservoir and clean clothes to collect dripping engine oil when removing the oil level gauge guide.

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MOUNTING THE OIL LEVEL GAUGE AND GUIDE

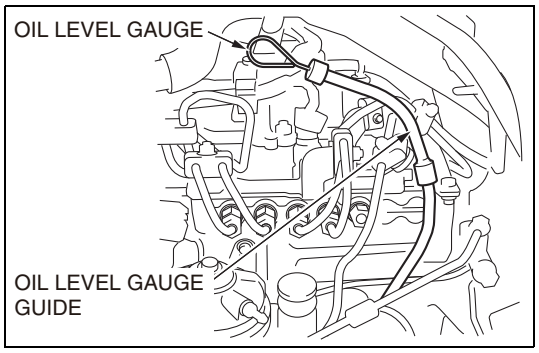


SHTS021271200069

1. MOUNTING THE OIL LEVEL GAUGE GUIDE

(1) Replace with the new O-ring and mount the oil level gauge guide to the cylinder block.

(2) Mount the clip with the nut and secure the oil level gauge guide.



SHTS021271200070

2. MOUNTING THE OIL LEVEL GAUGE

(1) Insert the oil level gauge to the oil level gauge guide.

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STARTING/CHARGING (J05E)

16-001

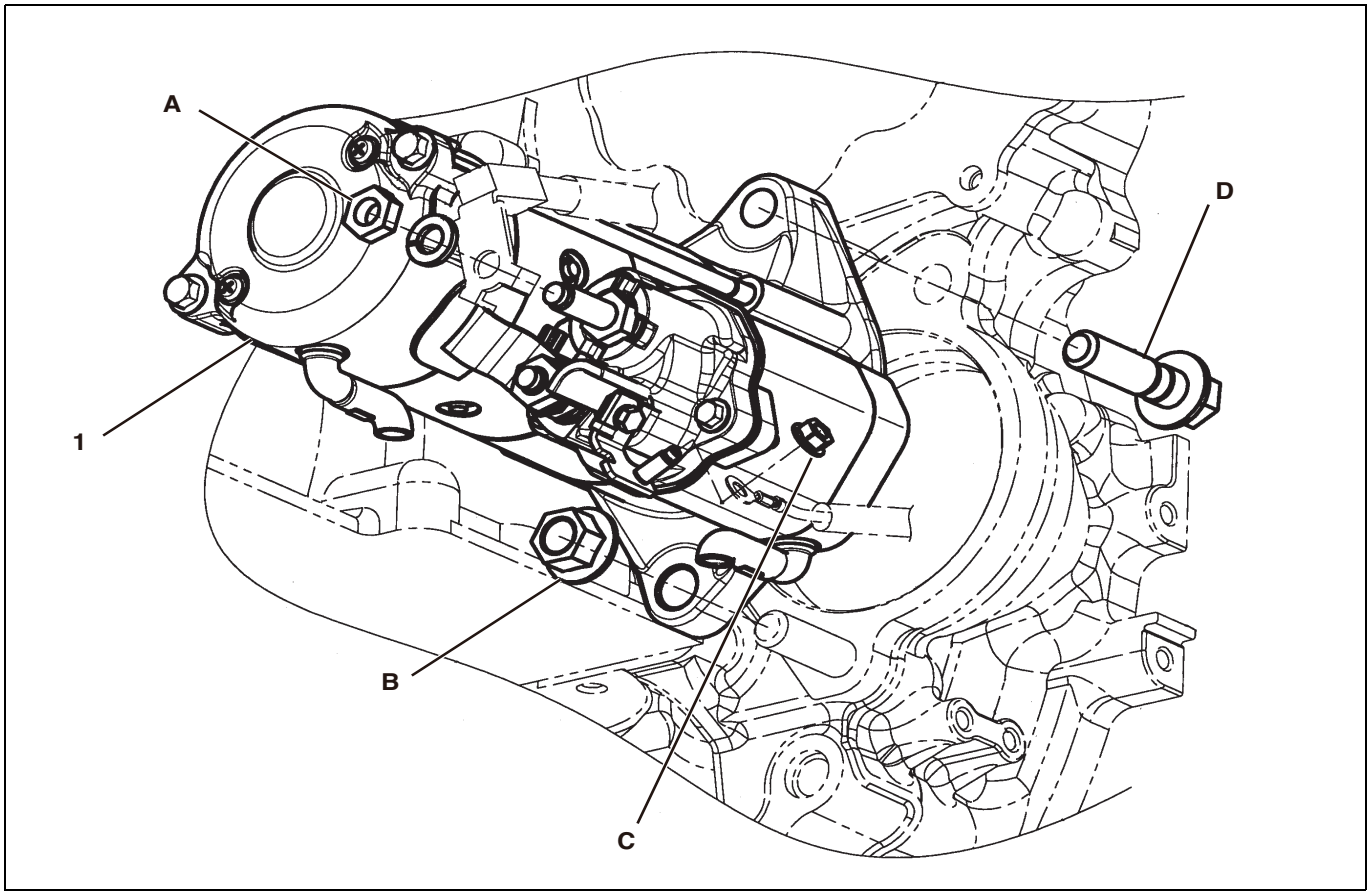
STARTER 16-2
COMPONENT LOCATOR 16-2
REPLACEMENT 16-3
V-BELT 16-8
COMPONENT LOCATOR 16-8
REPLACEMENT 16-9
ALTERNATOR (130A) 16-12
COMPONENT LOCATOR 16-12
OVERHAUL 16-13

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STARTER

COMPONENT LOCATOR

EN01F02127150407006001



SHTS021271500001

1	Starter assembly		

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	21 {214, 15.4}	C	4.5 {46, 3.3}
B	154 {1,570, 113.5}	D	154 {1,570, 113.5}

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REPLACEMENT

EN01F02127150407006002

REMOVING THE STARTER

1. REMOVING OF BATTERY CABLE

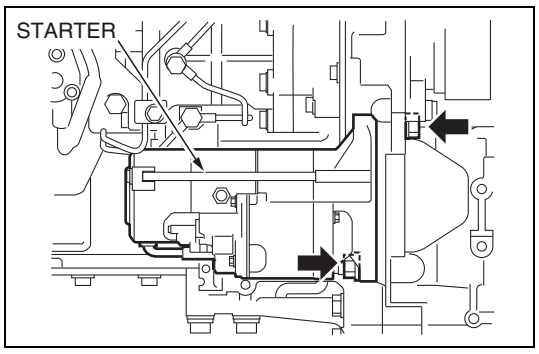
(1) Disconnect the battery earth cable from the negative battery terminal.

2. DISCONNECTING THE HARNESS

(1) Disconnect the 2 wire harness clamps.
(2) Remove the bolt and the wire harness clamp bracket.
(3) Pull off the terminal cap and remove the nut, and disconnect the starter wire from terminal B.
(4) Pull off the terminal cap and remove the nut, and disconnect the starter wire from terminal C.

3. REMOVING THE STARTER

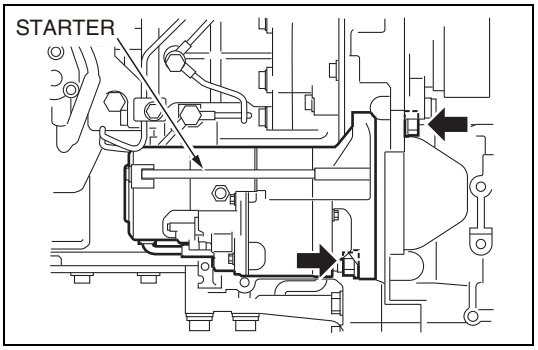
(1) Remove the nut, bolt and the starter assembly.



SHTS021271500002

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MOUNTING THE STARTER



SHTS021271500003

1. MOUNTING THE STARTER

(1) Install the starter assembly with the bolt and nut.
Tightening Torque:
154 N·m {1,570 kgf·cm, 113.5 lbf·ft}

2. CONNECTING THE HARNESS

(1) Connect the C terminal with the nut.
Tightening Torque:
4.5 N·m {46 kgf·cm, 3.3 lbf·ft}

(2) Install the starter wire to terminal B with the nut, and install the terminal cap.
Tightening Torque:
21 N·m {214 kgf·cm, 15.4 lbf·ft}

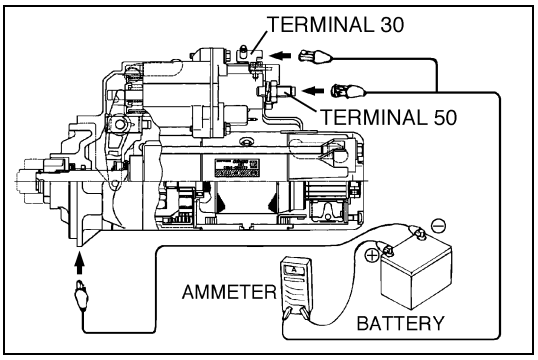
(3) Install the wire harness clamp bracket with the bolt.
Tightening Torque:
18 N·m {184 kgf·cm, 13.2 lbf·ft}

IMPORTANT POINTS - INSPECTION

1. MATTER FOR REFERENCE

NOTICE

These tests must be performed within 3 to 5 seconds to avoid burning out the coil.



SHTS021271500004

2. PERFORM NO LOAD PERFORMANCE TEST

(1) Connect battery and ammeter to the starter as shown.

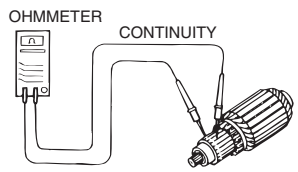
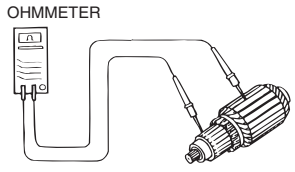
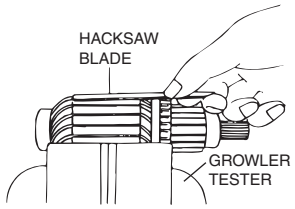
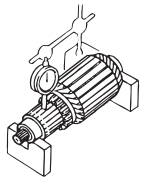
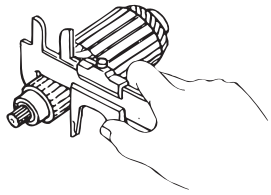
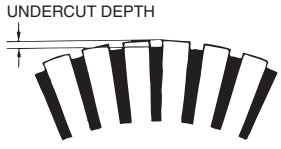
(2) Check that the starter rotates smoothly and steadily with the pinion gear moving out. Check the reading on the ammeter.

Standard value	220 A or less/11 V

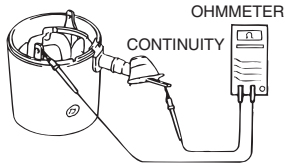
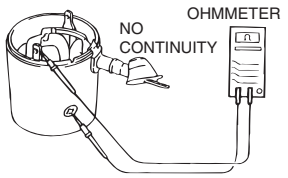
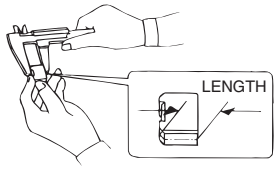
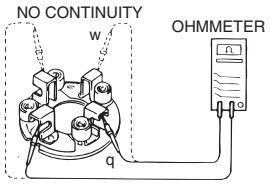
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STARTER UNIT INSPECTION

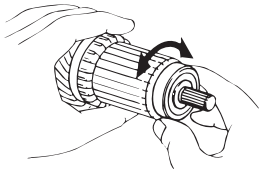
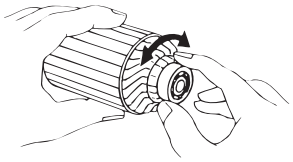
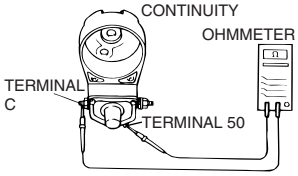
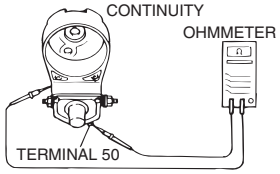
Unit: mm {in.}

Inspection item	Standard	Limit	Remedy	Inspection procedure
Continuity between the segments of the commutator	1 Ω or less	1 Ω	Replace.	Measure 
No continuity between the connector and armature coil core.	10 kΩ or more	10 kΩ	Replace.	Measure 
Armature short circuit test (Using the growler tester)	If the iron piece does not vibrate, the armature is good.	—	Replace.	Measure 
Measure the circle run-out	—	0.05 {0.0020}	Replace.	Measure 
Outside diameter of the commutator	34.0 {1.338}	33.0 {1.299}	Replace.	Measure 
Depth between the mica and the commutator (Under cut depth)	0.7 {0.028}	0.2 {0.008}	Replace or repair.	Measure 

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Inspection item	Standard	Limit	Remedy	Inspection procedure
Continuity between the field coil end and the read wire.	**1 Ω or less**	**1 Ω**	**Replace.**	**Measure** 
No continuity between the field coil end and yoke out side	**10 kΩ or more**	**10 kΩ**	**Replace.**	**Measure** 
Brush length	**20.5 {0.807}**	**11 {0.433}**	**Replace.**	**Measure** 
Brush spring load	**45 N {162 oz}**	**17 N {61.20 oz}**	**Replace.**	**Measure** 
Insulation between the brush and brush holder	**10 kΩ or more**	**10 kΩ**	**Replace.**	**Measure** 
Rotating of pinion	**—**	**—**	**Replace.**	**Visual check** 

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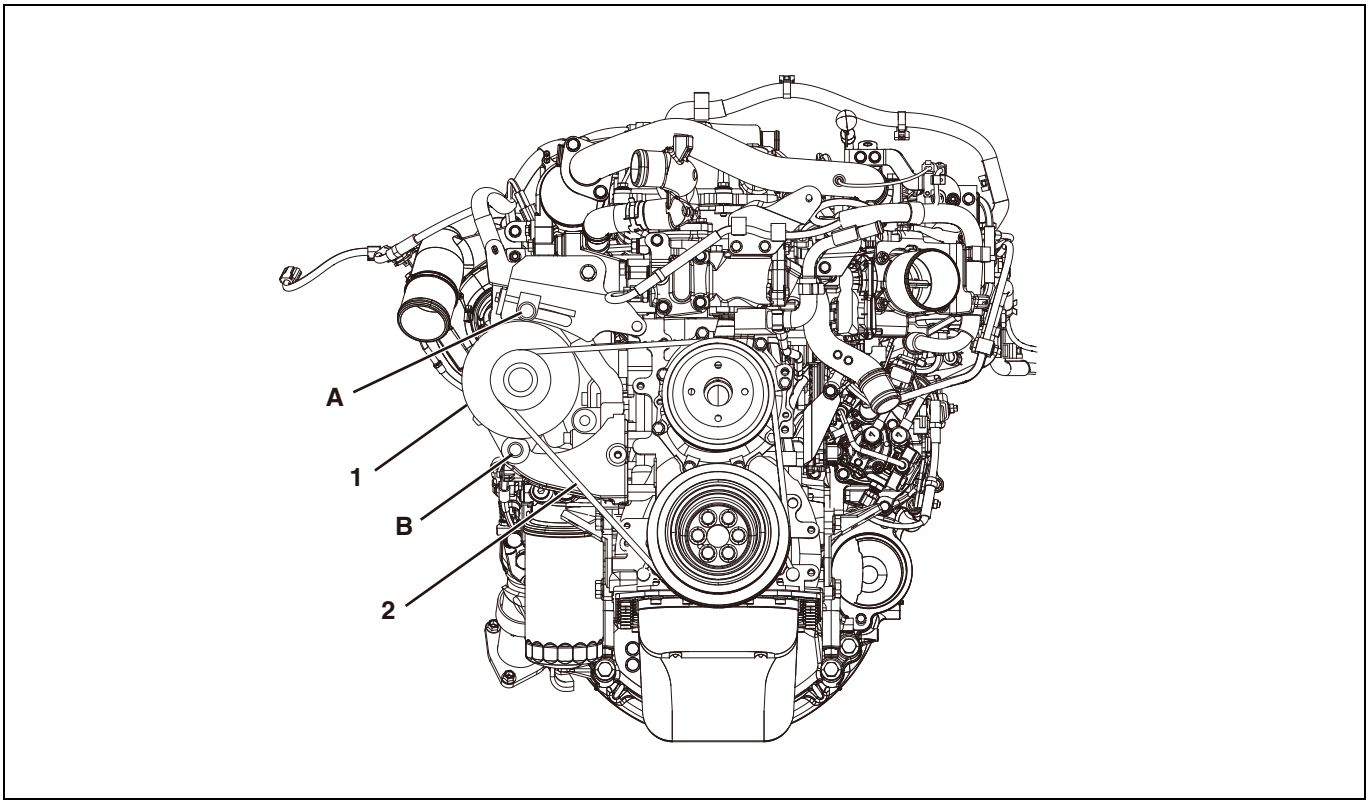
Inspection item	Standard	Limit	Remedy	Inspection procedure
Rotating of needle roller front bearing	**—**	**Sticks or does not rotate**	**Replace.**	**Visual check** 
Rotating of needle roller rear bearing	**—**	**Sticks or does not rotate**	**Replace.**	**Visual check** 
Continuity between terminals 50 and C	**1 Ω or less**	**1 Ω**	**Replace.**	**Measure** 
Continuity between terminal 50 and the switch body	**2 Ω or less**	**2 Ω**	**Replace.**	**Measure** 

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V-BELT

COMPONENT LOCATOR

EN01F02127150407001001



SHTS021271500021

1 Alternator	2 V-belt

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

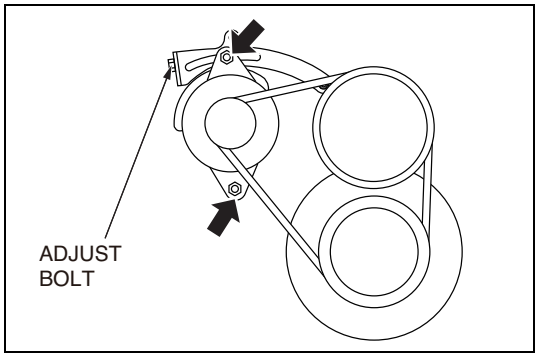
A 6 {60, 4.4}	B 55 {560, 40.5}

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REPLACEMENT

EN01F02127150407001002

REMOVING THE V-BELT



SHTS021271500022

1. REMOVING THE V-BELT (FRONT SIDE)

(1) Loosen the nuts, bolts and through bolt of the alternator.

(2) Loosen the adjusting bolt to remove the V-belt (front side).

2. REMOVING THE V-BELT (REAR SIDE)

Reference: CHASSIS (S1-LXJE03A), HEATER AND AIR CONDITIONER

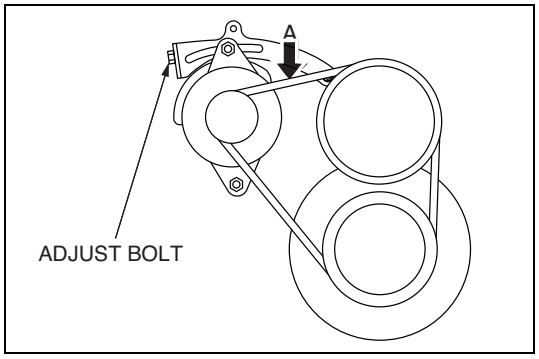
Reference: CHASSIS (S1-LXJE04A), HEATER AND AIR CONDITIONER

MOUNTING THE V-BELT

1. MOUNTING THE V-BELT (REAR SIDE)

Reference: CHASSIS (S1-LXJE03A), HEATER AND AIR CONDITIONER

Reference: CHASSIS (S1-LXJE04A), HEATER AND AIR CONDITIONER



SHTS021271500023

2. MOUNTING THE V-BELT (FRONT SIDE)

(1) Mount the V-belt to each pulley (front side)

(2) Tighten the V-belt (front side) with an adjusting bolt.

⚠ CAUTION

Make sure that the V-belt (front side) is not off each pulley groove.

(3) Press the belt center (A in the figure) with a finger at about 98 N {10 kgf}. Or adjust the belt deflection to the standard value using the SST (compression gauge), or adjust the belt tension to the standard value using the SST (belt tension gauge).

SST: S0944-41210

Compression gauge

Standard value	**8-10 mm {0.31-0.39 in.}**

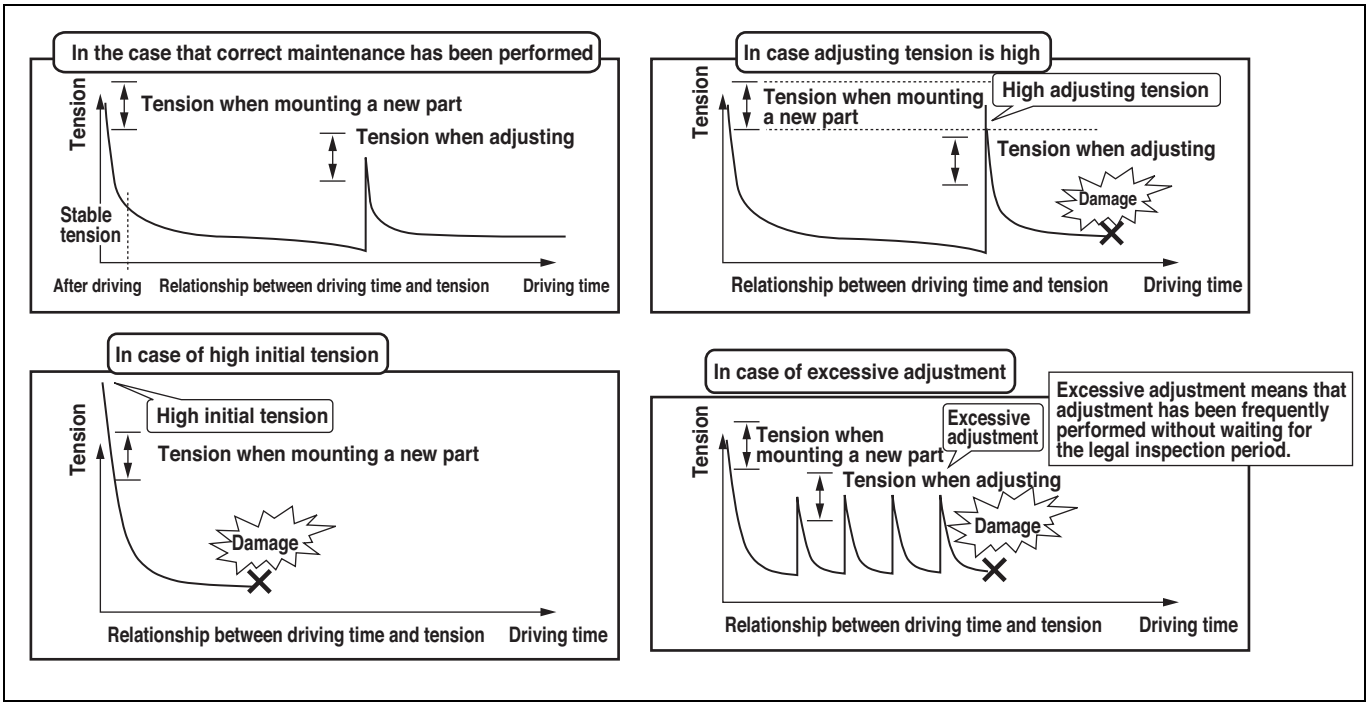
⚠ CAUTION

- **Excessively stretching the V-belt reduces its service life. Exercise care not to stretch the V-belt in excess of the specified tension.**
- **If the slack in the V-belt is 15 mm {0.591 in.} over (tension: 150 N {15 kgf}) in an inspection, the V-belt may slip. Readjust the tension of the V-belt when "restricting it." (Repeated restricting reduces the service life of the V-belt.)**
- **Visually check the V-belt for cracks and damage. Replace it if found abnormal.**

NOTICE

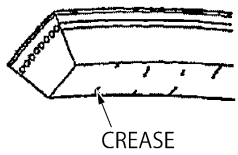
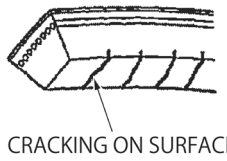
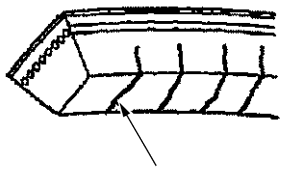
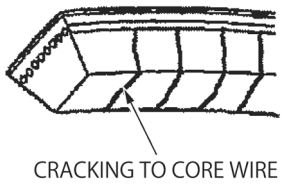
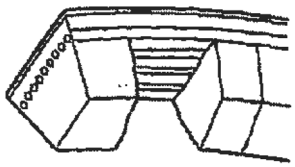
The tension of the V-belt decreases after operation. This phenomenon occurs in the process of initial contouring. This is not a problem.

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SHTS021271500024

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Condition of the V-belt	Remaining life (for reference)
	Same distance as the travel distance from the time of a new vehicle or replacement to inspection, or more
	Half of the travel distance from the time of a new vehicle or replacement to inspection
	One fourth of the travel distance from the time of a new vehicle or replacement to inspection
 	Service life

(4) Tighten the bolts and nuts of the alternator.
Tightening Torque:
55 N·m {560 kgf·cm, 40.5 lbf·ft}

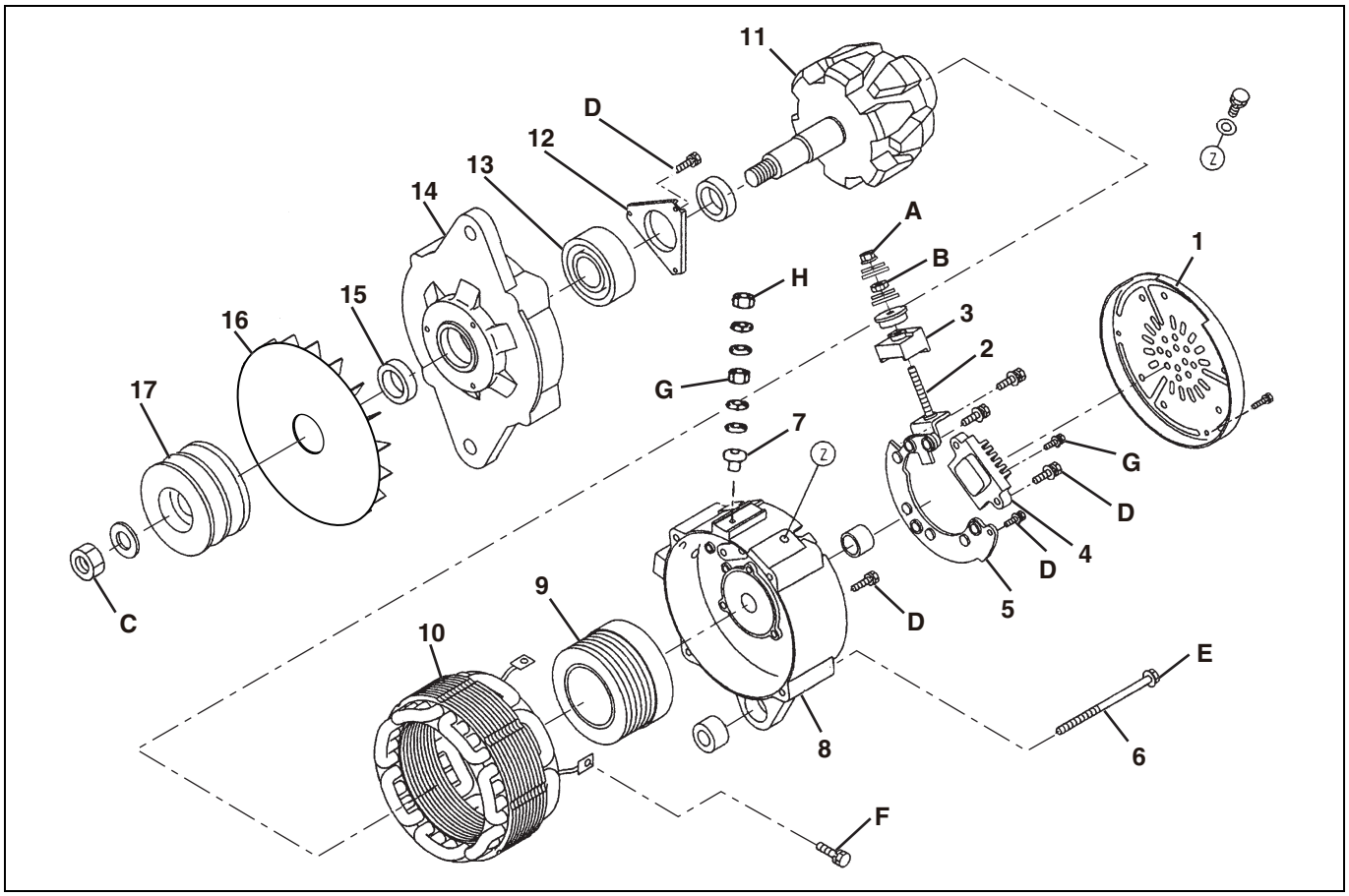
(5) Retighten the adjusting bolt.
Tightening Torque:
6 N·m {60 kgf·cm, 4.4 lbf·ft}

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ALTERNATOR (130A)

COMPONENT LOCATOR

EN01F02127150407028001



SHTS021271500029

1	Cover	10	Stator
2	Terminal B sub assembly	11	Rotor
3	Insulator (inner)	12	Cover bearing
4	Regulator	13	Bearing
5	Rectifier	14	Drive frame
6	Through bolt	15	Collar
7	Insulator (outer)	16	Fan
8	Rear frame	17	Pulley
9	Field coil		

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	15.7-20.6 {160-210, 12-15}	E	6.5-9.3 {66-95, 4.8-6.9}
B	7.8-10.8 {80-110, 5.8-7.9}	F	1.9-2.5 {19-25, 1.4-1.8}
C	117.6-137.2 {1,199-1,399, 87-101}	G	1.6-2.0 {16-20, 1.2-1.4}
D	2.9-4.9 {30-50, 2.1-3.6}	H	2.5-3.0 {25-31, 1.8-2.2}

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OVERHAUL

EN01F02127150407028002

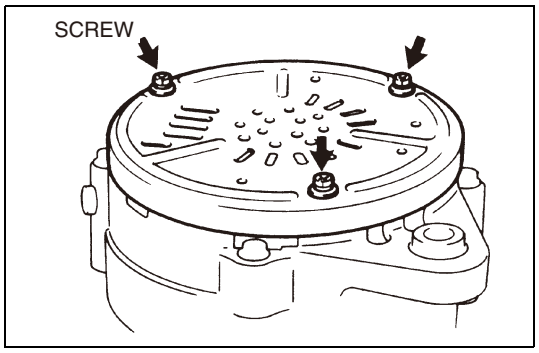
IMPORTANT POINTS - MOUNTING

1. MOUNTING THE V-BELT
Reference: STARTING/CHARGING (J05E), V-BELT, REPLACEMENT, MOUNTING THE V-BELT (Page 16-9)

IMPORTANT POINTS - DISASSEMBLY

1. REMOVING THE REAR COVER

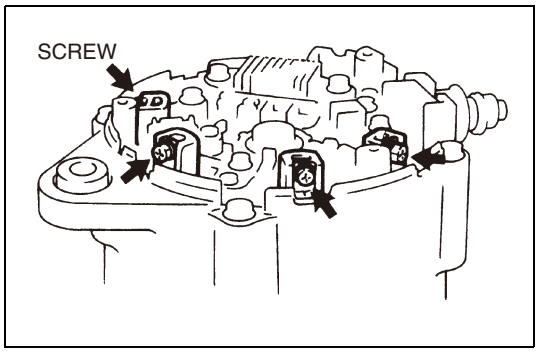
(1) Remove the 3 screws to remove the rear cover.



SHTS021271500030

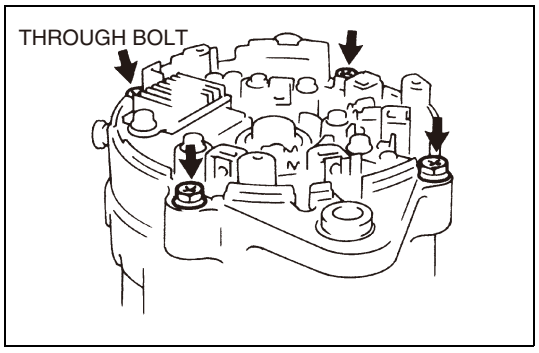
2. SEPARATE THE FRONT AND REAR PORTIONS

(1) Remove the 4 screws and separate the stator outlet terminal and the rectifier.



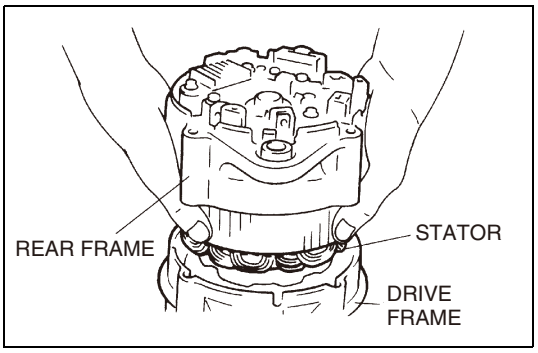
SHTS021271500031

(2) Remove the 4 through bolts.



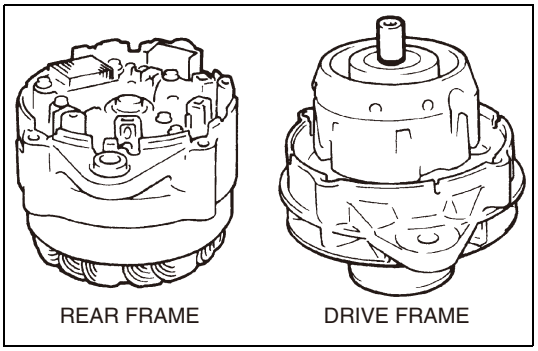
SHTS021271500032

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SHTS021271500033

(3) While keeping the stator and the rear frame together, lift them away from the drive frame.

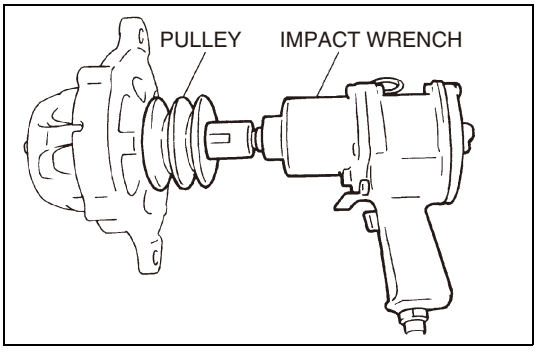


SHTS021271500034

(4) Drive and rear frames separated.

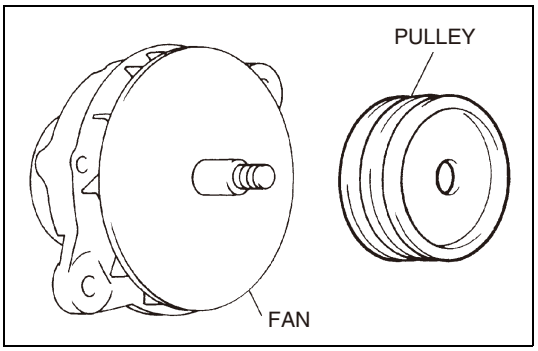
3. REMOVING THE PULLEY

(1) Remove the pulley lock nut using an impact wrench.



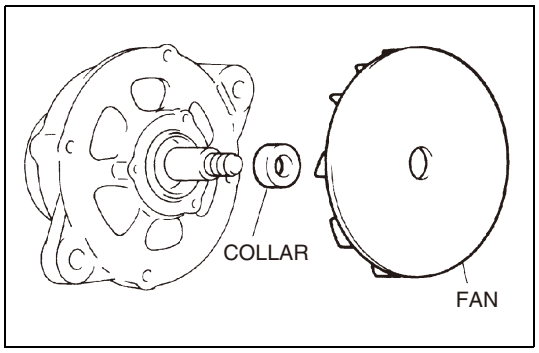
SHTS021271500035

(2) Remove the pulley from the shaft.



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SHTS021271500037

4. REMOVING THE FAN

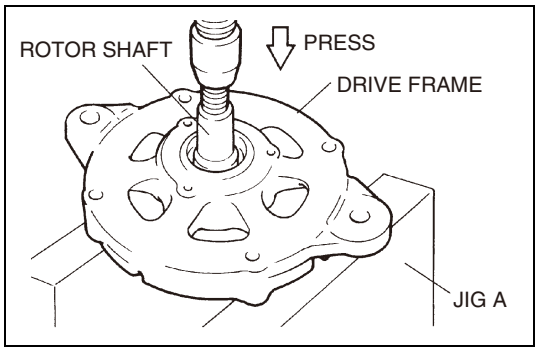
5. REMOVING THE COLLAR

6. REMOVING THE ROTOR

(1) Using the JIG A and press, remove the rotor from the drive frame.

NOTICE

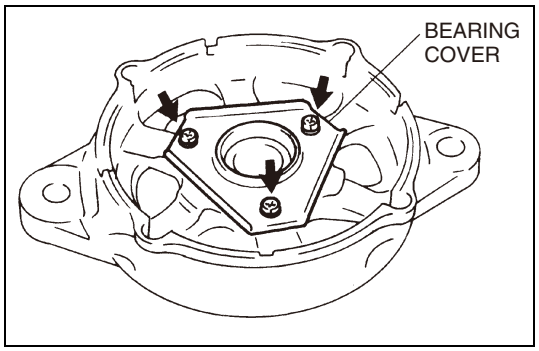
Do not drop the rotor.



SHTS021271500038

7. REMOVING THE FRONT BEARING

(1) Remove the 3 screws to remove the bearing cover.

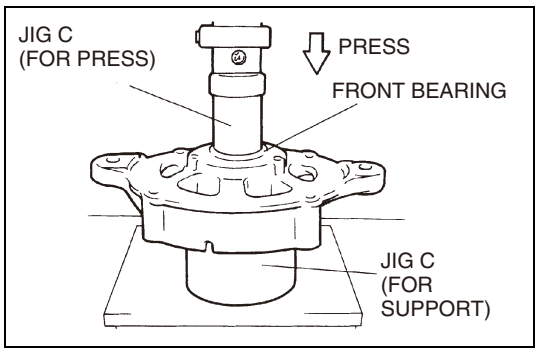


SHTS021271500039

(2) Using the JIG C and press, remove the front bearing from the drive frame.

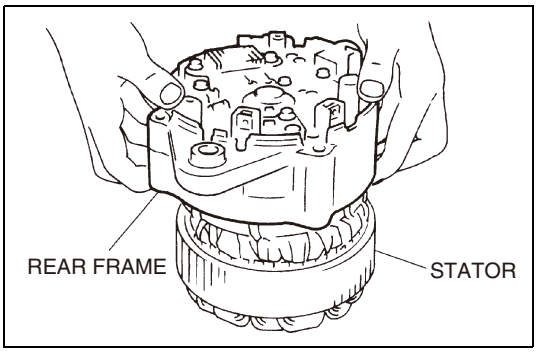
NOTICE

Do not drop the front bearing.



SHTS021271500040

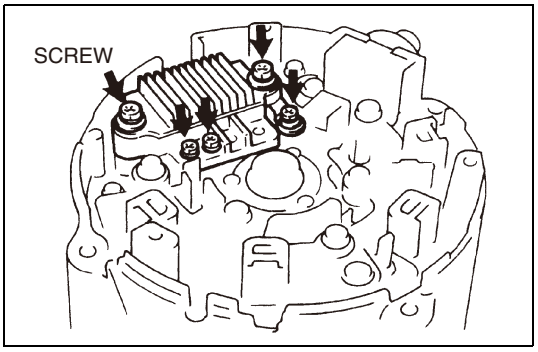
https://truckmanualshub.com/



SHTS021271500041

8. SEPARATING THE REAR FRAME AND STATOR

(1) Pull out the rear frame to separate it from the stator.

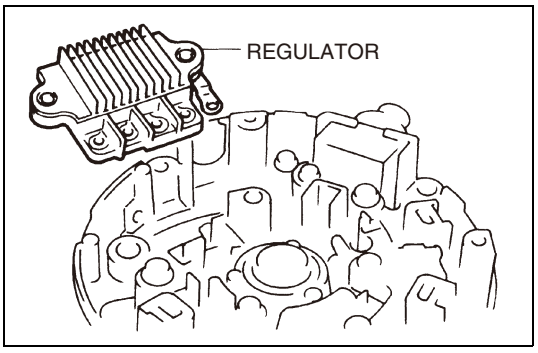


SHTS021271500042

9. REMOVING THE REGULATOR

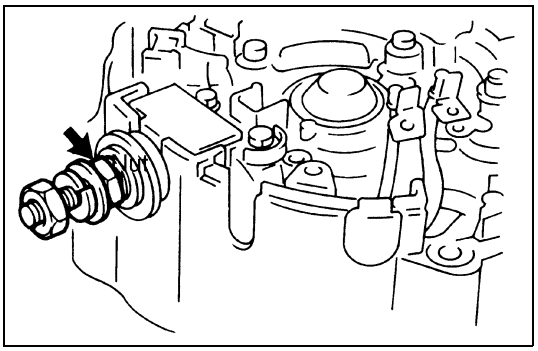
(1) Remove the 3 screws to separate the rectifier, the exciting coil outlet terminal, and the regulator.

(2) Remove the 2 screws to remove the regulator.



SHTS021271500043

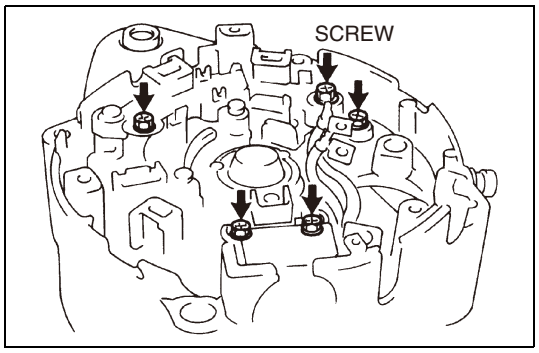
(3) Regulator removed.


SHTS021271500044

10. REMOVING THE RECTIFIER

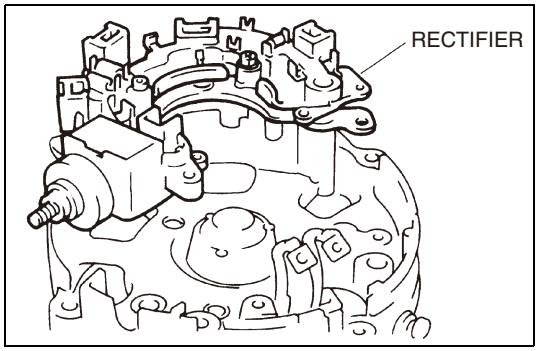
(1) Loosen the B terminal nut.

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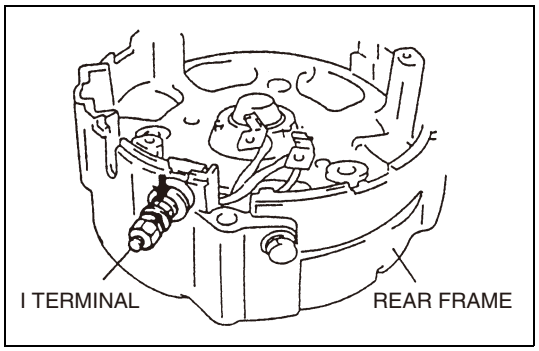
(2) Remove the screw from the rectifier's (-) terminal.
(3) Remove the 4 screws to remove the rectifier.



SHTS021271500046

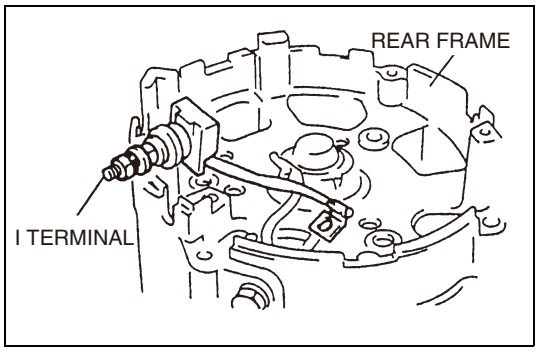
(4) Rectifier removed.

11. REMOVING THE I TERMINAL



SHTS021271500047

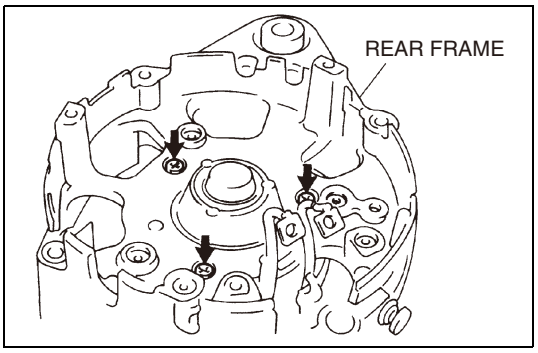
(1) Loosen the I terminal nut to remove the I terminal.



SHTS021271500048

(2) I terminal removed.

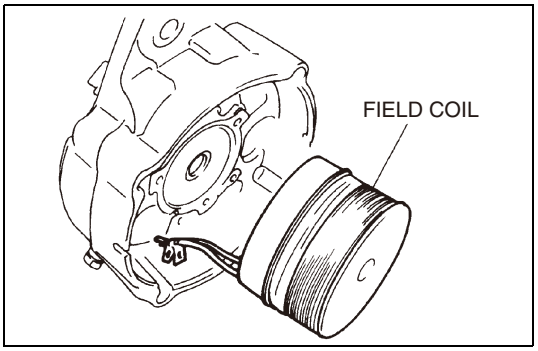
https://truckmanualshub.com/



SHTS021271500049

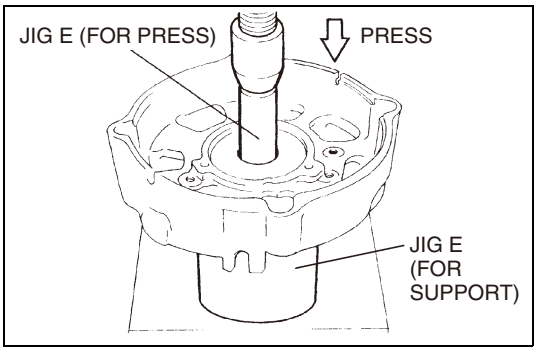
12. REMOVING THE FIELD COIL

(1) Remove the 3 screws to remove the field coil from the rear frame.



SHTS021271500050

(2) Field coil removed.



SHTS021271500051

13. REMOVING THE REAR BEARING

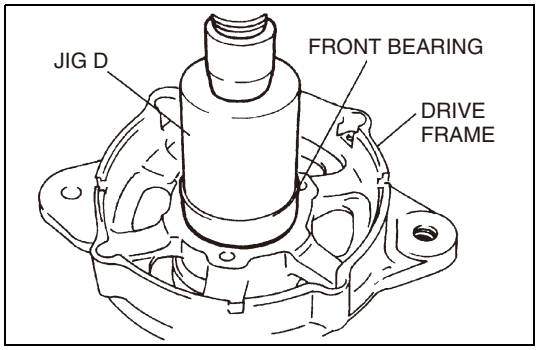
(1) Using the JIG E and press, remove the rear bearing from the rear frame.

NOTICE

Do not reuse the rear bearing.

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IMPORTANT POINTS - ASSEMBLY



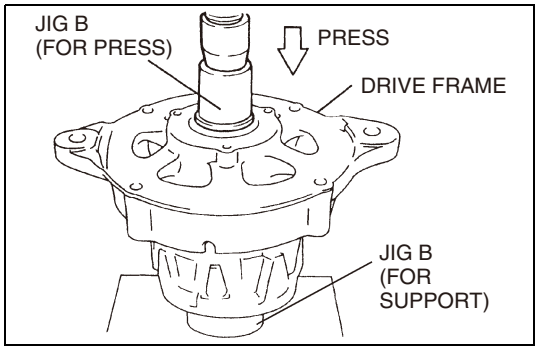
SHTS021271500052

1. INSTALL THE FRONT BEARING

(1) Using the JIG D and press, press the front bearing into the drive frame.

(2) Using the 3 screws, install the bearing cover.

Tightening Torque:
2.9-4.9 N·m {30-50 kgf·cm, 2.1-3.6 lbf·ft}



SHTS021271500053

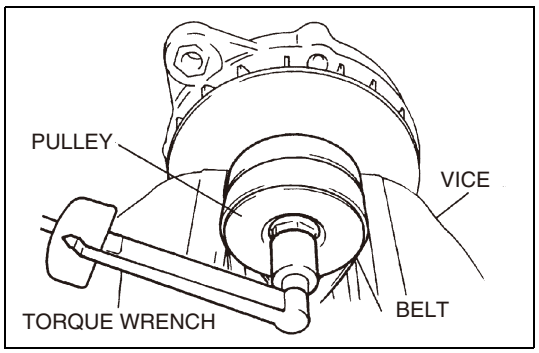
2. INSTALL THE ROTOR

(1) Insert the collar to the rotor shaft.

(2) Using the JIG B and press, press the rotor into the bearing in the drive frame.

NOTICE

- **Press the rotor while making sure that the rotor's shaft is perpendicular to the bearing.**
- **During pressing, make sure not to damage the portion of the rotor that presses into the rear bearing.**



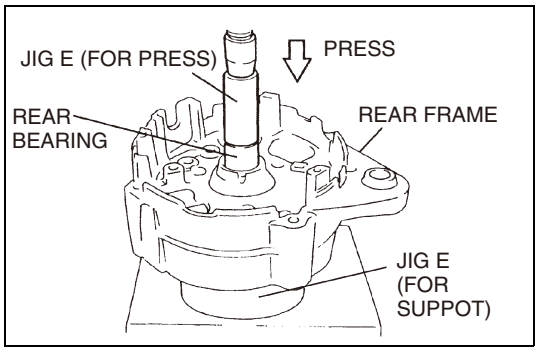
SHTS021271500054

3. TIGHTENING THE PULLEY

(1) Insert the collar and fan to the rotor shaft.

(2) Secure the pulley with belt using the vice as shown in the figure, tighten the pulley lock nut with specified torque.

Tightening Torque:
117.6-137.2 N·m {1,199-1,399 kgf·cm, 87-101 lbf·ft}



SHTS021271500055

4. INSTALL THE REAR BEARING

(1) Using the JIG E and press, press a new rear bearing into the rear frame.

NOTICE

Once a bearing is removed, do not reuse it.

5. INSTALL THE FIELD COIL

(1) Using the 3 screws, install the field coil on the rear frame.

Tightening Torque:
2.9-4.9 N·m {30-50 kgf·cm, 2.1-3.6 lbf·ft}

6. ASSEMBLING THE I TERMINAL

(1) Install the I terminal on the rear frame and tight the nut (inside).

Tightening Torque:
1.6-2.0 N·m {16-20 kgf·cm, 1.2-1.4 lbf·ft}

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7. ASSEMBLING THE RECTIFIER

(1) Using the 4 screws, install the rectifier.
Tightening Torque:
2.9-4.9 N·m {30-50 kgf·cm, 2.1-3.6 lbf·ft}

(2) Using the screw, install the rectifier's (-) terminal.
Tightening Torque:
2.9-4.9 N·m {30-50 kgf·cm, 2.1-3.6 lbf·ft}

(3) Tighten the B terminal nut (inside).
Tightening Torque:
7.8-10.8 N·m {80-110 kgf·cm, 5.8-7.9 lbf·ft}

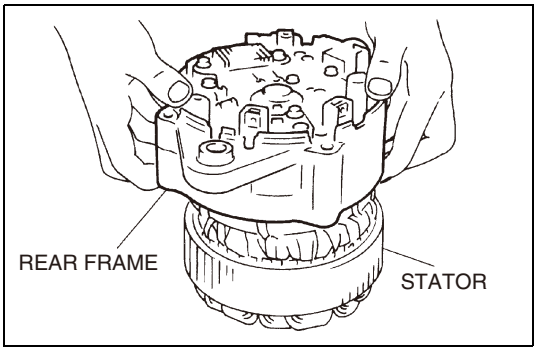
8. ASSEMBLING THE REGULATOR

(1) Using the 2 screws, install the rectifier.
Tightening Torque:
2.9-4.9 N·m {30-50 kgf·cm, 2.1-3.6 lbf·ft}

(2) Using the 3 screws, install the rectifier and the field coil outlet terminal to the regulator.
Tightening Torque:
1.6-2.0 N·m {16-20 kgf·cm, 1.2-1.4 lbf·ft}

9. INSTALLING THE STATOR AND THE REAR FRAME

(1) Slow the insert the stator while maintaining it perpendicular to the rear frame.

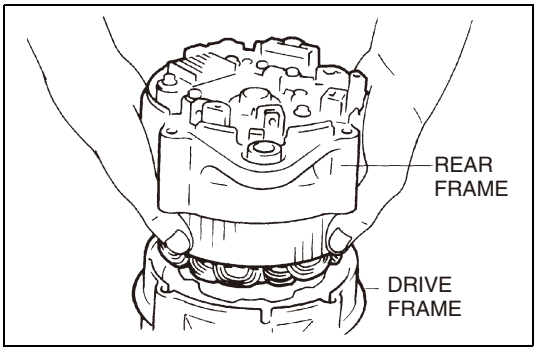


SHTS021271500056

10. ASSEMBLING THE DRIVE AND REAR FRAME

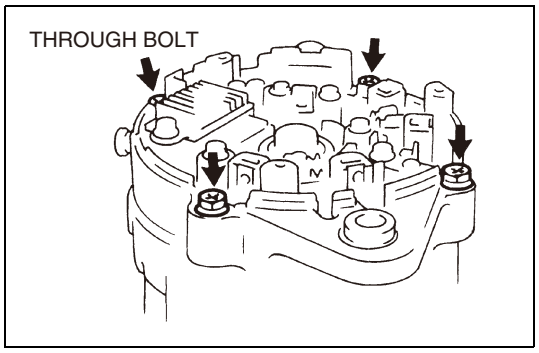
(1) Apply the thin coat of NSK EA5 grease on the rear bearing portion of the rotor shaft.
(2) Slowly insert the rear frame while maintaining it perpendicular to rotor shaft.

NOTICE
To prevent damage to the rear bearing, do not apply excessive force during the insertion.



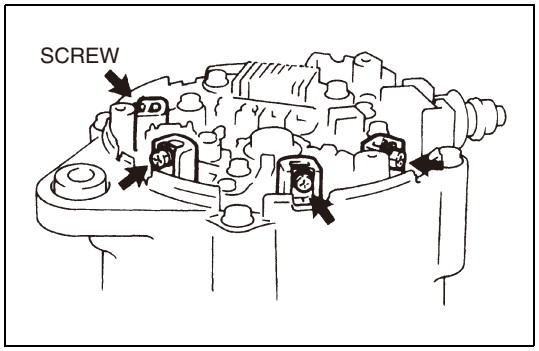
SHTS021271500057

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SHTS021271500058

(3) Install the 4 through bolts.
Tightening Torque:
6.5-9.3 N·m {66-95 kgf·cm, 4.8-6.9 lbf·ft}



SHTS021271500059

(4) Using the 4 screws, install the stator outlet terminal to the rectifier.
Tightening Torque:
1.9-2.5 N·m {19-25 kgf·cm, 1.4-1.8 lbf·ft}

(5) Using the 3 screws, install the rear cover.

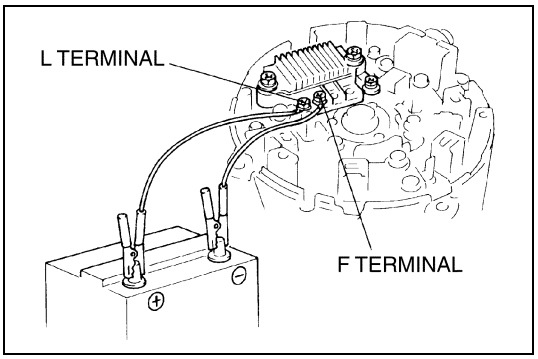
PERFORMANCE TEST

1. MATTER FOR REFERENCE

NOTICE

- **Using the bench tester, perform a performance test according to the procedure described below.**
- **Note the battery polarity carefully so as not to make reverse connections.**
  If the connections are reversed, the rectifier will short the circuit and allow a large current to flow through and damage the diodes and I.C. regulator as well as burning the wiring harness.
- **Take care not to make wrong connections of terminals.**
- **When charging the battery with a quick charge, disconnect the battery terminals.**
- **Do not perform tests with high voltage insulation resistance tester.**
- **In operation, never disconnect the battery.**
- **During this inspection, make sure to use a fully charged battery.**

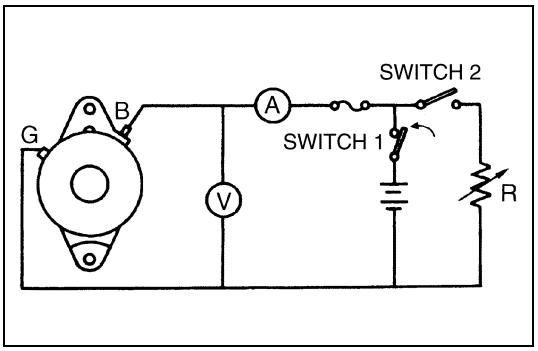
https://truckmanualshub.com/



SHTS021271500060

2. MAGNETIZING

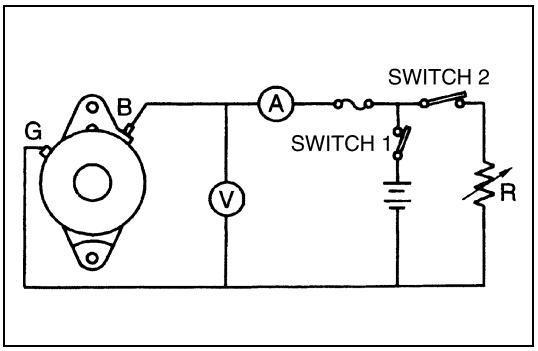
(1) Apply the battery (12V) to the L terminal (positive) and F terminal (negative) of the regulator as shown in the figure.



SHTS021271500061

3. MEASURING THE SELF-EXCITED STARTING RPM

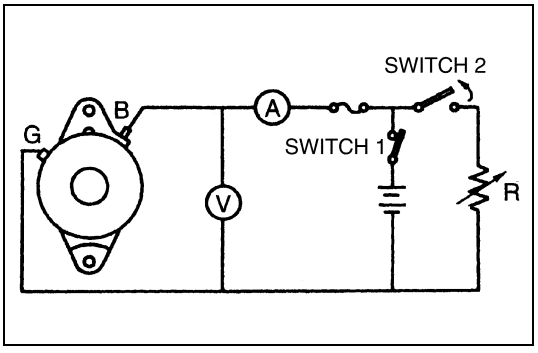
(1) Turn Switch 1 ON.
(2) Gradually increase the alternator rpm.
(3) Measure the rpm (starting rpm) at which the charging current starts to flow. (it is normal if under 1,500 rpm)



SHTS021271500062

4. MEASURING THE RATED OUTPUT

(1) Turn Switch 1 and Switch 2 ON.
(2) Maintain the alternator rpm at a constant 5,000 rpm.
(3) While observing the voltmeter, regulate the load (variable resistance: R) so that a 12V system outputs 13.5V.
(4) At this time, measure the output current (it is normal if more than the rated output current is obtained).



SHTS021271500063

5. VERIFYING THE REGULATOR'S REGULATED VOLTAGE

(1) In the state in which the rated output was measured, turn Switch 2 OFF.

NOTICE

At this time, reduce the current that flows to the load (variable resistance: R) to the minimum and turn Switch 2 OFF.

(2) When the output current is less than 10A (the charging current to the battery is reduced), measure the voltage.

Standard value (V)	14.0-14.4

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PRECAUTIONS

1. PRECAUTIONS DURING OPERATION

- Do not disconnect the battery while the alternator is rotating.
- Do not operate the alternator with the alternator's B terminal (output terminal) disconnected.
- Do not expose the alternator to water.

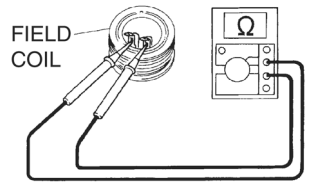
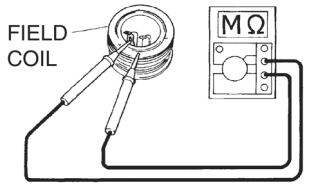
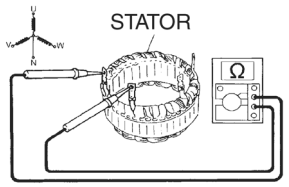
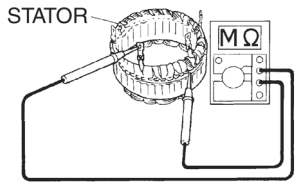
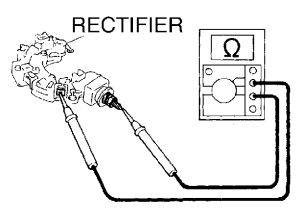
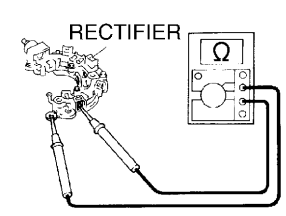
2. OTHER PRECAUTIONS

- Make sure to disconnect the battery terminal before inspecting the alternator.
- Do not interchange the polarity of the battery cables when replacing the battery.
- Make sure to disconnect the cables and charge the battery separately when using the quick charger.
- Never perform a megohmmeter on the alternator assembly.
- Make sure to disconnect the wiring to the alternator when performing the megohmmeter on the vehicle's wiring.

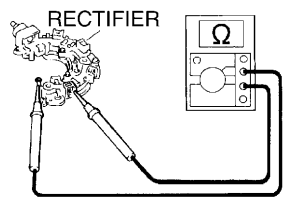
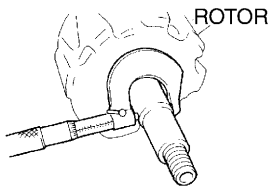
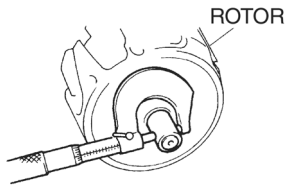
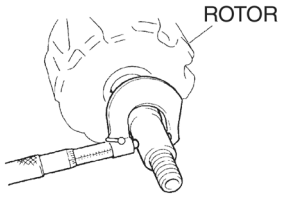
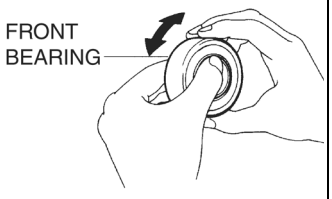
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INSPECTION AND REPAIR

Unit: mm {in.}

Inspection item	Standard	Limit	Remedy	Inspection procedure
Resistance of field coil	**2-3Ω**	**—**	**Replace.**	**Measure** 
Insulation resistance of field coil	**1MΩ min.**	**—**	**Replace.**	**Measure** 
Resistance of stator coil	**0.01-0.10Ω**	**—**	**Replace.**	**Measure** 
Insulation resistance of stator	**1MΩ min.**	**—**	**Replace.**	**Measure** 
Resistance of rectifier (between B terminal and heat sink)	**When polarity is changed, there is continuity in one direction but not in the opposite direction.**	**—**	**Replace.**	**Measure** 
Resistance of rectifier (between (-) terminal and heat sink)	**When polarity is changed, there is continuity in one direction but not in the opposite direction.**	**—**	**Replace.**	**Measure** 

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Inspection item	Standard	Limit	Remedy	Inspection procedure
Resistance of rectifier (between diode terminal and heat sink)	When polarity is changed, there is continuity in one direction but not in the opposite direction.	—	Replace.	Measure 
Rotor shaft outside diameter (front bearing portion)	25.00-25.01 {0.9843-0.9846}	24.99 {0.9839}	Replace.	Measure 
Rotor shaft outside diameter (rear bearing portion)	16.99-17.00 {0.6689-0.6693}	16.98 {0.6685}	Replace.	Measure 
Rotor shaft outside diameter (pulley portion)	22.189-22.202 {0.8739-0.8741}	22.18 {0.8732}	Replace.	Measure 
Bearing wear or damage	Rotates smoothly with no abnormal noise	—	Replace. Also, replace every 2 years.	Visual check 

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TURBOCHARGER (J05E)

17-001

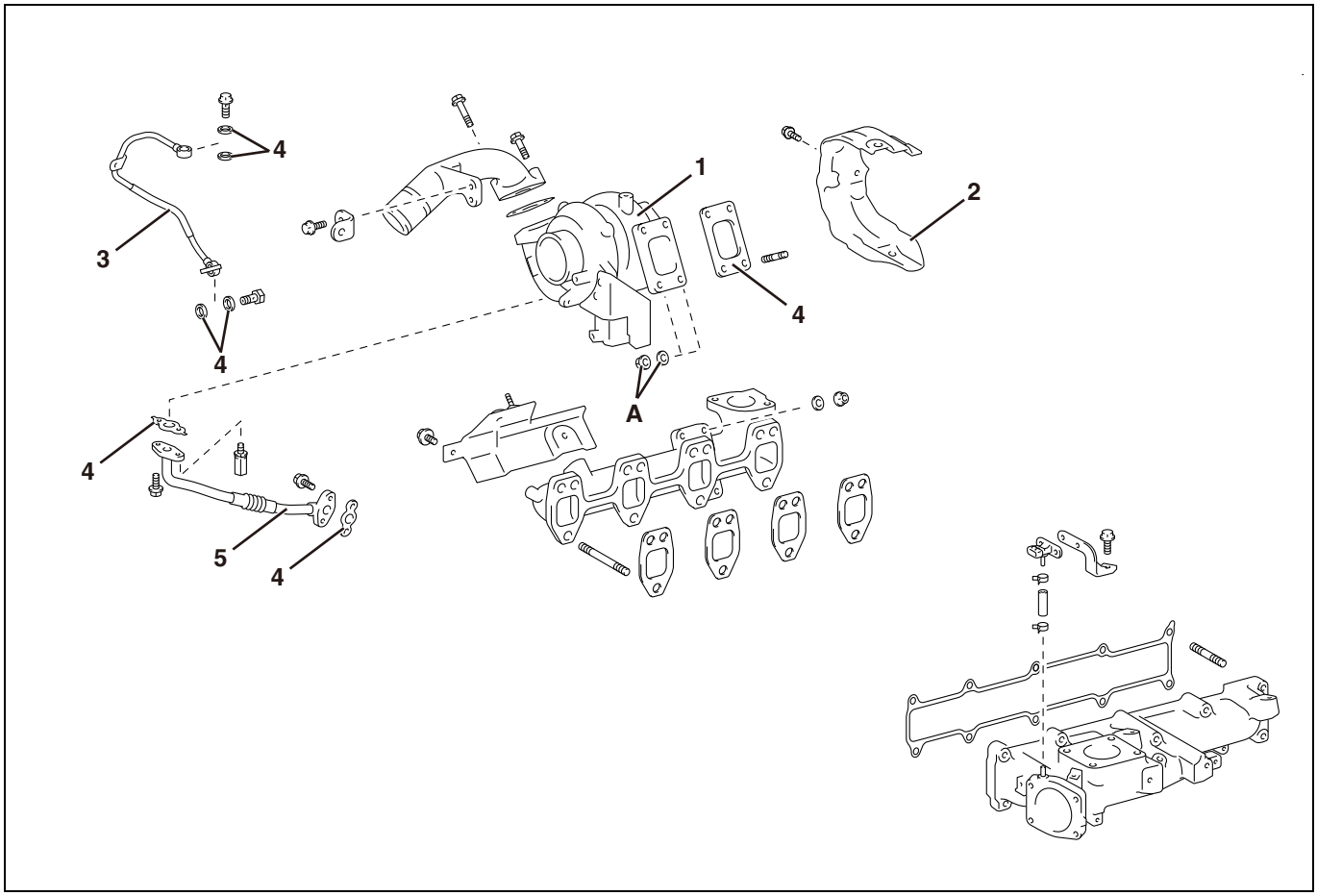
TURBOCHARGER ASSEMBLY 17-2
COMPONENT LOCATOR 17-2
INSPECTION 17-3
REPLACEMENT 17-5

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TURBOCHARGER ASSEMBLY

COMPONENT LOCATOR

EN01F02114160704005001



SHTS021271600001

1	Turbocharger assembly	4	Gasket *
2	Turbocharger insulator	5	Oil pipe B
3	Oil pipe A		

*: Nonreusable part

Tightening torque — Unit: N·m {kgf·cm, lbf·ft}

A	70 {714, 52}		

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INSPECTION

EN01F02114160704005002

INSPECTION WITH HINO-DX

1. INSPECTING THE OPERATION OF THE TURBOCHARGER ASSEMBLY

(1) Using the HINO-DX, inspect the operation of the turbocharger assembly. (Refer to the HINO-DX user's manual.)

2. INSPECTING THE ELECTRIC ACTUATOR

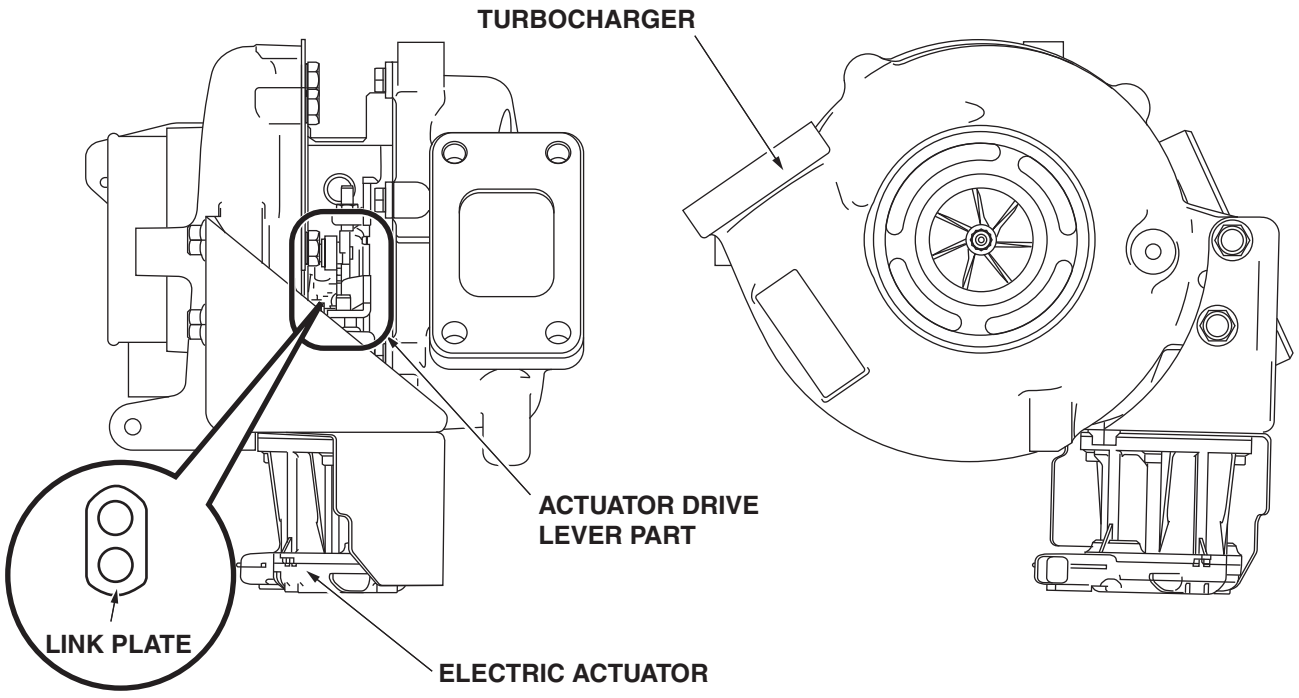
(1) Using the HINO-DX, operate the electric actuator and check for operation follow-up. (Refer to the HINO-DX user's manual.)

⚠ CAUTION

- **The adjusting screw for opening/closing operation of the turbocharger assembly has been adjusted. Do not loosen it.**
- **Do not remove the link plate of the turbocharger assembly.**

(2) If the electric actuator does not operate, inspect the wiring up to it for disconnection or short circuit. If no defect is found in the wiring, replace the electric actuator along with the whole turbocharger assembly.

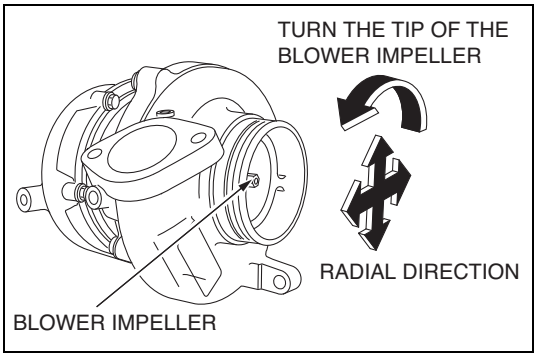
TURBOCHARGER ASSEMBLY



SHTS021271600002

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INSPECTING THE TURBINE SHAFT

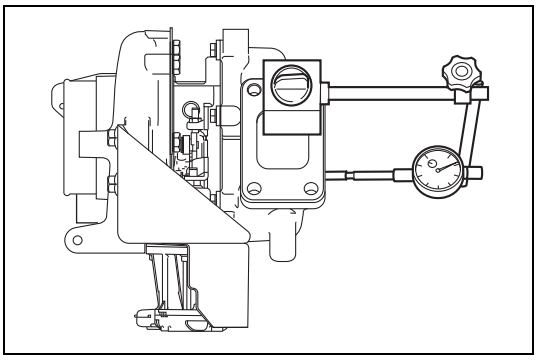


SHTS021271600003

1. SIMPLIFIED INSPECTION

(1) Holding the blower impeller tip, inspect for rotating condition by lightly rotating the turbine shaft by hand.

(2) If the turbine shaft does not rotate or does not rotate smoothly, or the blower impeller contacts with the blower case, replace the turbocharger assembly.



SHTS021271600004

2. INSPECTING THE TURBINE SHAFT PLAY IN THE AXLE (THRUST) DIRECTION

(1) Inspect the turbine shaft play on the exhaust side.

(2) If a measurement reading exceeds the standard value, replace the turbocharger assembly.

Standard value (mm {in.})	**0.040-0.085 {0.0016-0.0033} or less**

⚠ CAUTION

Turbocharger is replaced as assembly. Do not overhaul.

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REPLACEMENT

EN01F02114160704005003

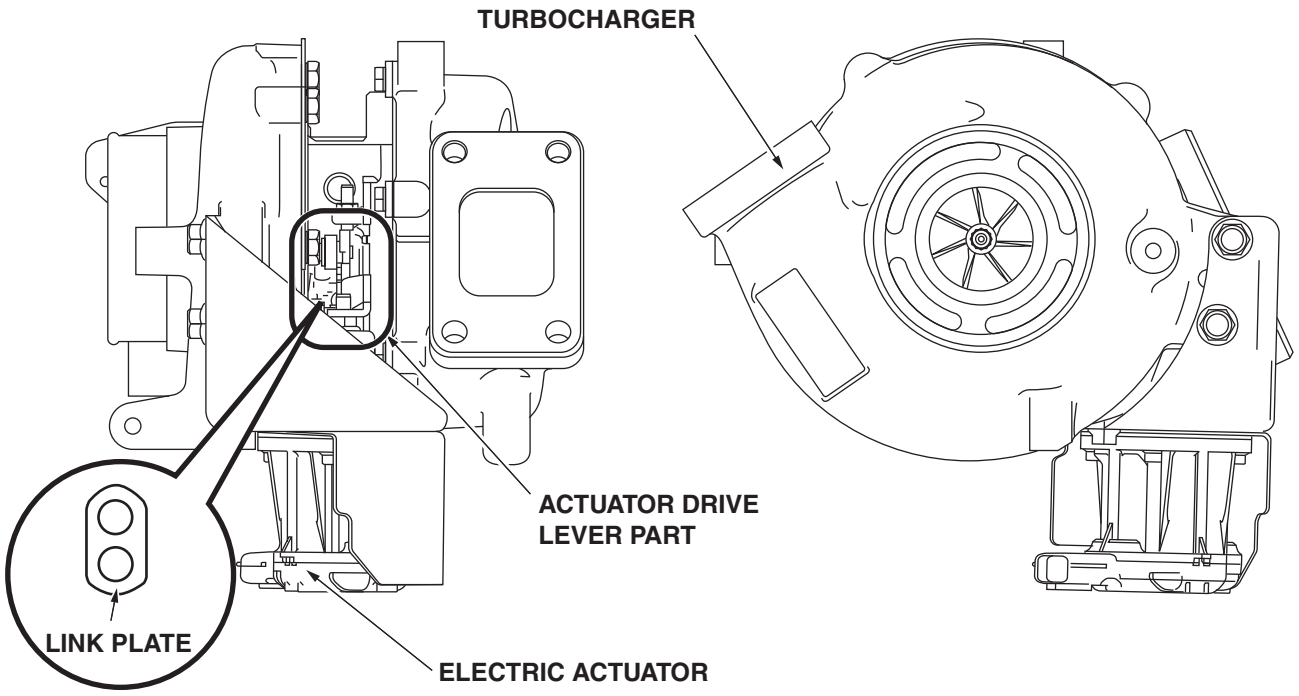
REMOVING THE TURBOCHARGER ASSEMBLY

1. CAUTIONS

⚠ CAUTION

- **Use care not to touch the link plate and adjusting screw during work.**
- **Do not remove the link plate of the turbocharger assembly.**
- **The adjusting screw for opening/closing operation of the turbocharger assembly has been adjusted. Do not loosen it.**

TURBOCHARGER ASSEMBLY



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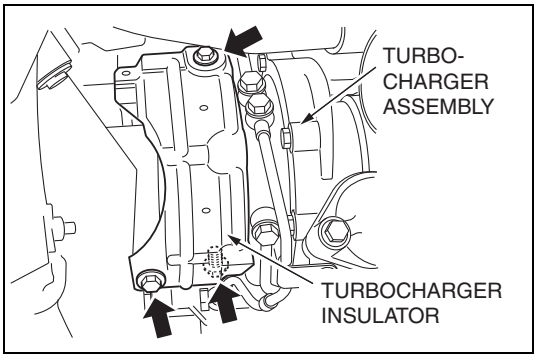
2. DRAINING THE COOLANT
Reference: COOLING (J05E), RADIATOR, REPLACEMENT, REMOVING THE RADIATOR (Page 12-5)

3. REMOVING THE INTAKE HOSE
Reference: INTAKE (J05E), INTAKE PIPE (EXHAUST SIDE), REPLACEMENT, REMOVING THE INTAKE PIPE (EXHAUST SIDE) (Page 9-12)

4. REMOVING THE INTAKE PIPE
Reference: INTAKE (J05E), INTAKE PIPE (EXHAUST SIDE), REPLACEMENT, REMOVING THE INTAKE PIPE (EXHAUST SIDE) (Page 9-12)

5. DISCONNECTING THE HARNESS
(1) Disconnect the electric actuator connector.

6. REMOVING THE TURBOCHARGER INSULATOR
(1) Unfasten the 3 bolts to remove the turbocharger insulator from the turbocharger assembly.

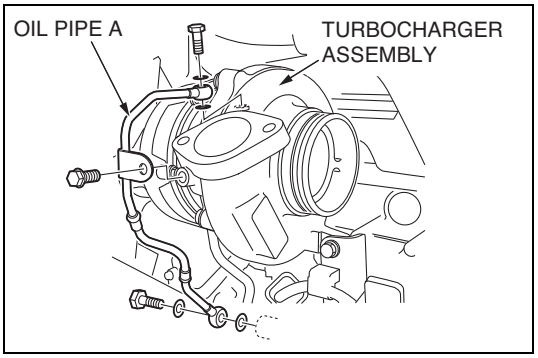


SHTS021271600006

7. DISCONNECTING THE OIL PIPE
(1) Unfasten the bolt and 2 union bolts to remove the oil pipe A and gaskets from the turbocharger assembly and oil cooler assembly.

⚠ CAUTION
Use care not to splash the oil in the pipes and turbocharger assembly.

NOTICE
When disconnecting the oil pipe, engine oil will spill. Prepare a reservoir and clean clothes.



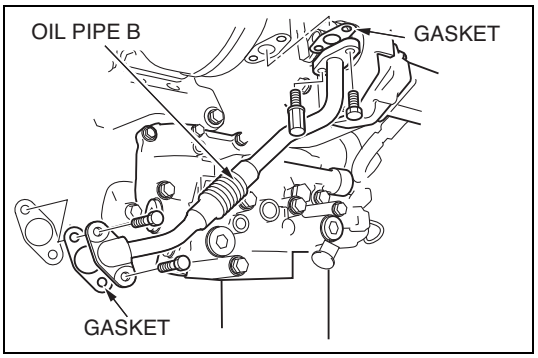
SHTS021271600007

(2) Unfasten the 4 bolts to remove the oil pipe B and gaskets from the turbocharger assembly and cylinder block.

⚠ CAUTION
Use care not to splash the oil in the pipes and turbocharger assembly.

NOTICE
When disconnecting the oil pipe, engine oil will spill. Prepare a reservoir and clean clothes.

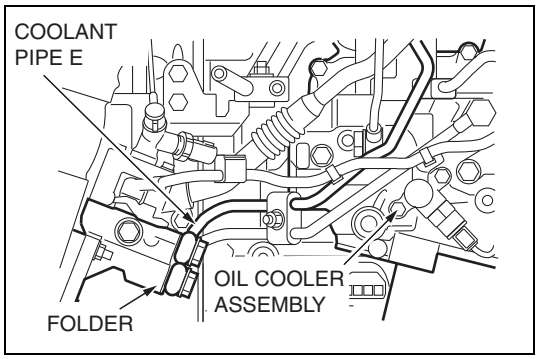
(3) Block oil holes of the turbocharger assembly to prevent entry of foreign matters.



SHTS021271600008

⚠ CAUTION
Use special care to prevent the entry of foreign matter into the turbocharger assembly.

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8. DISCONNECTING THE COOLANT PIPE

(1) Remove the nut and then the clip.

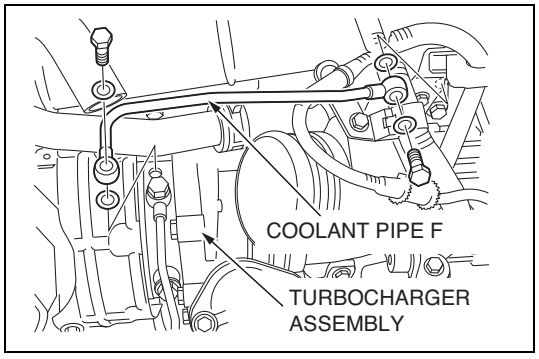
(2) Unfasten the 2 union bolts and detach the coolant pipe E and 4 gaskets from the folder and turbocharger assembly.

⚠ CAUTION

Use care not to splash the coolant in the pipes and turbocharger assembly.

NOTICE

Use the container and a waste cloth to avoid spillage of coolant when disconnecting the coolant pipe.



SHTS021271600010

(3) Remove the nut and then the clip.

(4) Unfasten the 2 union bolts to remove the coolant pipe F and gaskets from the turbocharger assembly and thermostat case.

⚠ CAUTION

Use care not to splash the coolant in the pipes and turbocharger assembly.

NOTICE

Use the container and a waste cloth to avoid spillage of coolant when disconnecting the coolant pipe.

(5) Block water holes of the turbocharger assembly to prevent entry of foreign matters.

⚠ CAUTION

Use special care to prevent the entry of foreign matter into the turbocharger assembly.

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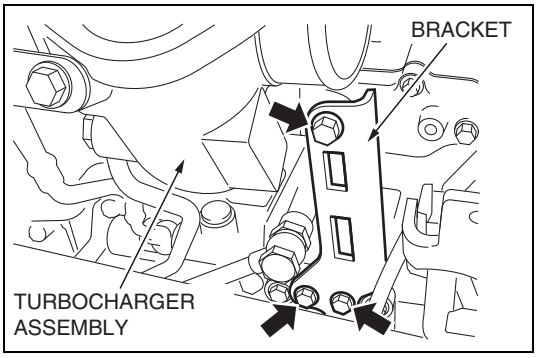
9. REMOVING THE FLEXIBLE
Reference: EXHAUST (J05E), EXHAUST PIPE, REPLACEMENT, REMOVING THE EXHAUST SYSTEM COMPONENT PARTS (Page 11-9)

10. REMOVING THE EXHAUST PIPE (ATC)
Reference: EXHAUST (J05E), EXHAUST PIPE (ATC), REPLACEMENT, REMOVING THE EXHAUST PIPE (ATC) (Page 11-17)

11. REMOVING EXHAUST BRAKE
Reference: EXHAUST (J05E), EXHAUST BRAKE, REPLACEMENT, REMOVING THE EXHAUST BRAKE (Page 11-122)

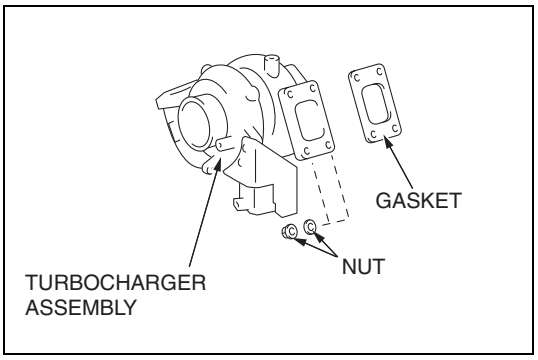
12. REMOVING THE TURBOCHARGER ASSEMBLY

(1) Unfasten the 3 bolts to remove the bracket from the turbocharger assembly and oil cooler assembly.



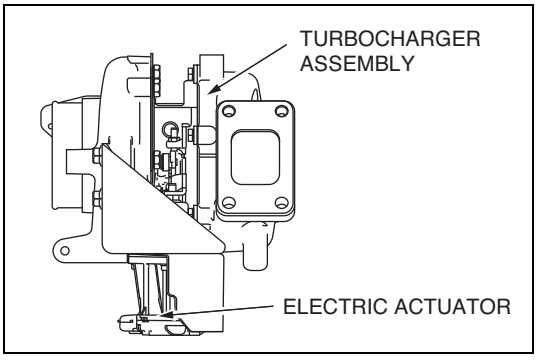
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(2) Unfasten the nuts (4 pcs.) to remove the turbocharger assembly and gasket from the exhaust manifold.



SHTS021271600012

⚠ CAUTION
- **The electric actuator is plastic and easily damaged. Use care to place it in an appropriate direction for storage after removal.**
- **Heat-resisting steel is used for bolts and nuts. Do not mix them with ordinary bolts and nuts when mounting.**



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(3) After removing the turbocharger assembly, block the exhaust manifold port to prevent entry of foreign matters.

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MOUNTING THE TURBOCHARGER ASSEMBLY

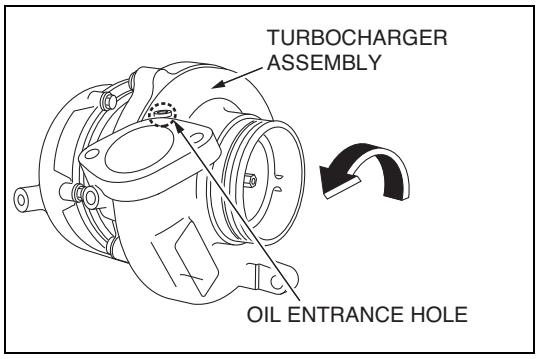
1. CAUTIONS

⚠ CAUTION
Observe the following instructions when mounting the turbocharger assembly to the engine or handling after installation. Use special care to prevent the entry of foreign matter into the turbocharger assembly.

2. MOUNTING THE TURBOCHARGER ASSEMBLY

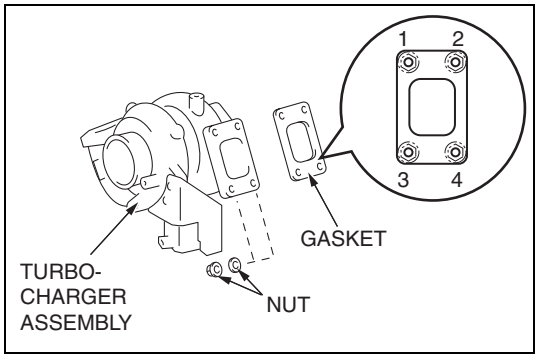
(1) Before mounting, add engine oil from the oil inlet. Rotate the turbocharger assembly by hand for lubrication.

(2) Check the exhaust pipe system for dirt or foreign matter.



SHTS021271600014

(3) Replace with the new gasket and mount the turbocharger assembly to the exhaust manifold with 4 nuts in the order shown in the figure.
Tightening Torque:
70 N·m {714 kgf·cm, 52 lbf·ft}



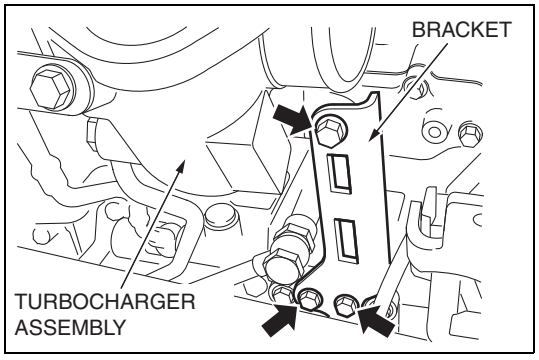
SHTS021271600015

⚠ CAUTION
- **If the stud bolt of the exhaust flange is stuck, use a commercially available stud bolt remover to remove and replace the stuck stud bolt.**
- **Heat-resisting steel is used for bolts and nuts. Do not mix them with ordinary bolts and nuts when mounting.**
- **Mount the turbocharger securely so that there is no gas leakage from the connections of the exhaust pipe.**

(4) Tighten the 4 nuts in the order shown in the figure again.
Tightening Torque:
70 N·m {714 kgf·cm, 52 lbf·ft}

⚠ CAUTION
Make sure to tighten twice.

(5) Mount the bracket to the turbocharger assembly and oil cooler assembly with 3 bolts.



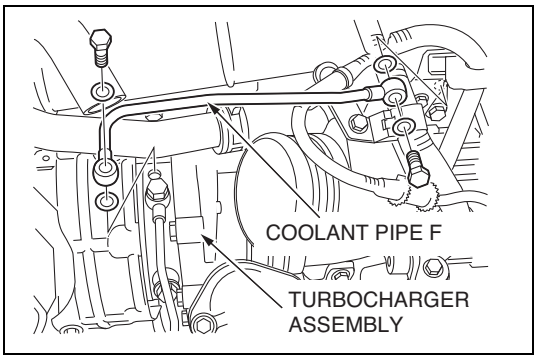
SHTS021271600016

3. MOUNTING THE EXHAUST BRAKE
Reference: EXHAUST (J05E), EXHAUST BRAKE, REPLACEMENT, MOUNTING THE EXHAUST BRAKE (Page 11-124)

4. MOUNTING THE EXHAUST PIPE (ATC)
Reference: EXHAUST (J05E), EXHAUST PIPE (ATC), REPLACEMENT, MOUNTING THE EXHAUST PIPE (ATC) (Page 11-18)

5. MOUNTING THE FLEXIBLE
Reference: EXHAUST (J05E), EXHAUST PIPE, REPLACEMENT, MOUNTING THE EXHAUST SYSTEM COMPONENT PARTS (Page 11-12)

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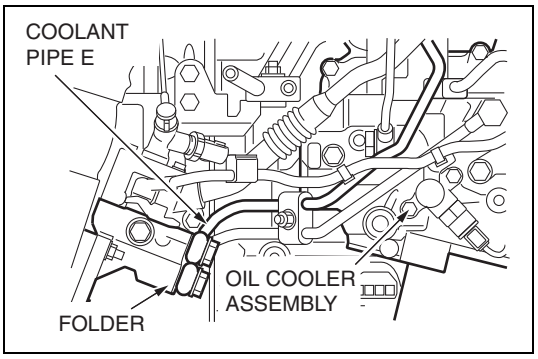
6. MOUNTING THE COOLANT PIPE

(1) Replace with the new gaskets and mount the coolant pipe F to the turbocharger assembly and thermostat case with 2 union bolts.

⚠ CAUTION

- **Clean the coolant pipe and check the pipe for collapse and dirt and foreign matters inside.**
- **Do not use any sealant on the coolant pipe installation surface to avoid defects such as damage by clogging or loosening at the tightening portion.**

(2) Mount the clip with the nut and secure coolant pipe F.



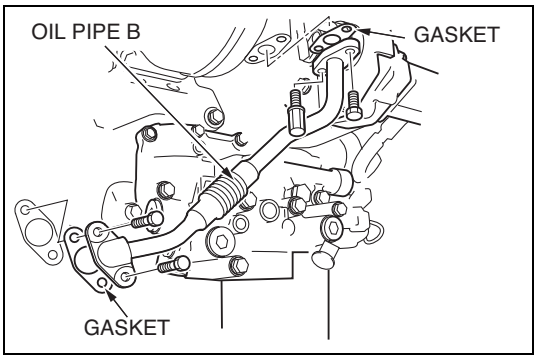
SHTS021271600018

(3) Replace with the new gaskets and connect the coolant pipe E to the folder and turbocharger assembly with 2 union bolts.

⚠ CAUTION

- **Clean the coolant pipe and check the pipe for collapse and dirt and foreign matters inside.**
- **Do not use any sealant on the coolant pipe installation surface to avoid defects such as damage by clogging or loosening at the tightening portion.**

(4) Mount the clip with the nut and secure coolant pipe E.



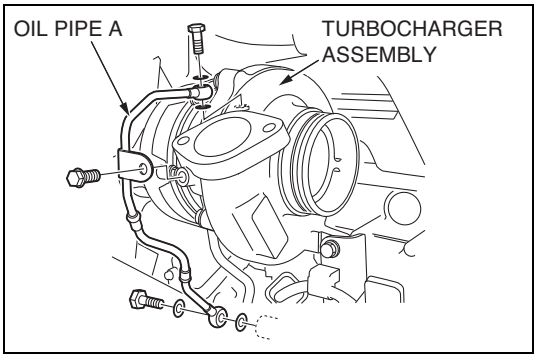
SHTS021271600019

7. MOUNTING THE OIL PIPE

(1) Replace with the new gaskets and connect the oil pipe B to the turbocharger assembly and cylinder block with 4 bolts.

⚠ CAUTION

- **Clean the oil pipe and check the pipe for collapse and dirt and foreign matters inside.**
- **Do not use any sealant on the oil pipe installation surface to avoid defects such as damage by clogging or loosening at the tightening portion.**



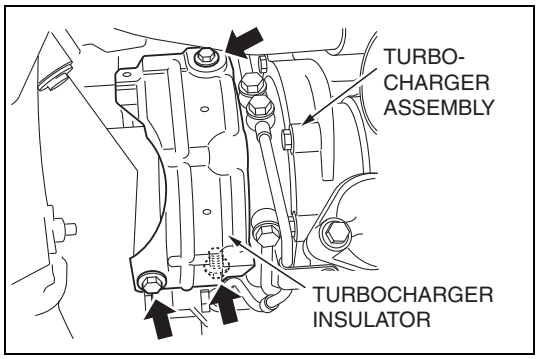
SHTS021271600020

(2) Replace with the new gaskets and connect the oil pipe A to the turbocharger assembly and oil cooler assembly with a bolt and 2 union bolts.

⚠ CAUTION

- **Clean the oil pipe and check the pipe for collapse and dirt and foreign matters inside.**
- **Do not use any sealant on the oil pipe installation surface to avoid defects such as damage by clogging or loosening at the tightening portion.**

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SHTS021271600021

8. MOUNTING THE TURBOCHARGER INSULATOR

(1) Replace with the 3 new bolts and mount the turbocharger insulator to the turbocharger assembly.

9. CONNECTING THE HARNESS

(1) Connect the connector to the electric actuator.

10. MOUNTING THE INTAKE PIPE

Reference: INTAKE (J05E), INTAKE PIPE (EXHAUST SIDE), REPLACEMENT, MOUNTING THE INTAKE PIPE (EXHAUST SIDE) (Page 9-13)

11. MOUNTING THE INTAKE HOSE

Reference: INTAKE (J05E), INTAKE PIPE (EXHAUST SIDE), REPLACEMENT, MOUNTING THE INTAKE PIPE (EXHAUST SIDE) (Page 9-13)

12. ADDING ENGINE OIL

Reference: MOUNTING AND DISMOUNTING THE ENGINE (J05E), ENGINE ASSEMBLY, REPLACEMENT, NEXT STEPS AFTER INSTALLATION (Page 5-14)

13. ADDING THE COOLANT

Reference: COOLING (J05E), RADIATOR, REPLACEMENT, MOUNTING THE RADIATOR (Page 12-9)

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INSPECTION AFTER MOUNTING

1. PROCEDURES FOR OPERATION

(1) After mounting the turbocharger assembly to the engine, start the engine and inspect each part for leakage of oil, coolant and exhaust gas.

⚠ CAUTION

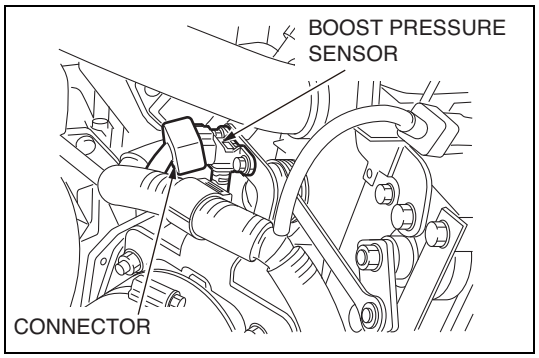
- **Do not run engine at a high speed immediately after starting the engine. If the turbocharger is operated without sufficient lubrication at the beginning of engine start, it may cause bearing seizure.**
- **Run the engine at idle for about 5 minutes before stopping the engine.**
- **If the engine is stopped suddenly, the turbocharger keeps rotating with no oil pressure applied, which may result in a worn bearing due to absence of oil film.**

2. INSPECTING THE BOOST PRESSURE

(1) Using the HINO-DX, inspect the boost pressure. (Refer to the HINO-DX user's manual.)

Correct boost pressure

Standard value (at maximum engine speed)	**22.1 kPa {0.23 kgf/cm^2, 3.2 lbf/in.^{2}} or more**



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⚠ CAUTION

When using the HINO-DX, the boost pressure is added to the atmospheric pressure. (Check the pressure when engine is stopped.)

(2) Remove the boost pressure sensor of the intake pipe and connect the SST (boost pressure measuring hose).
SST: S0944-41250
Gauge
09258-E1010
Boost pressure measuring hose

(3) Pull in the SST (gauge) into the cab.

(4) After warming up the engine fully, put the shift lever in neutral.

(5) Press down the accelerator pedal fully and measure the boost pressure at maximum engine speed by using the SST (gauge).

⚠ CAUTION

Hold the SST (gauge) upright, or the needle becomes unstable and measurement cannot be done accurately.

(6) If the measured value is below the correct boost pressure, air leakage from the air seal in the air intake system, clogged air cleaner and intercooler, and malfunction of the VN mechanism inside the turbocharger are considered possible reasons. Perform inspection.

(7) After measurement, put back the boost pressure removing part.

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