

FOREWORD

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

Applicable for J08E 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 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 vehicle.

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ENGINE INTRODUCTION		2-001
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EXHAUST SYSTEM		5-001
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FUEL SYSTEM		8-001
TURBOCHARGER		9-001
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GENERAL INTRODUCTION

1-001

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GENERAL INTRODUCTION

WARNING

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In order to ensure safety in work and avoid possible damage to vehicle, strictly observe the following precautions:

Audience of this manual is a qualified service engineer who has acquired expertise. In case an unqualified service engineer or a service engineer without appropriate training has performed maintenance, or in case maintenance is performed without using appropriate tools and units or in accordance with the method described in this manual, the vehicle under maintenance could be damaged as well as do harm to the service engineer and the people in the maintenance site.

- Appropriate maintenance and repairs are a must for assurance of safety of the service engineer as well as the safety and reliability of the vehicle. Replace parts of the vehicle with HINO genuine parts. Avoid using degraded parts.
- This manual contains the procedures to follow in performing maintenance and repairs. When performing maintenance and repairs in accordance with the procedures, use special tools designed to meet specific needs in a proper way.
- Never use a non-recommended work method or tool; this could impair the safety of the service engineer as well as the safety and reliability of your vehicle.
- This manual contains various items classified into "DANGERS", "WARNINGS", "CAUTIONS" and "NOTICES" in order to avoid accidents during maintenance and repairs or damage to the vehicle resulting in impairment of its safety and reliability.

Note that these instructions described as "DANGERS", "WARNINGS", "CAUTIONS" and "NOTICES" are not the minimum requirements to observe in order to avoid possible dangers.

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HOW TO USE THIS MANUAL

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1. REPAIR WORK

- (1) The repair work is roughly classified into the three processes: "diagnosis", "mounting/dismounting, replacement, assembly/disassembly and inspection/adjustment work" and "final inspection".
- (2) This manual describes the first process "diagnosis" and the second process "mounting/dismounting, replacement, assembly/disassembly and inspection/adjustment work". Description on the third process "final inspection" is omitted.
- (3) While this manual does not describe the following element work, the work is to be performed in practical cases:
 - a. Jack work and lift work
 - b. Cleaning of removed parts as required
 - c. Visual inspection

2. TROUBLESHOOTING IN THIS MANUAL

- (1) This manual describes the following steps 2 and 3.

(1) Interview	"Step 1"	Thoroughly listen to the conditions and environment for the trouble and confirm the fact.
(2) Pre-inspection (3) Replication method	"Step 2"	Perform diagnostic inspection, checkup of the symptom, function inspection and basic inspection to confirm the trouble. If the trouble hardly recurs, use the replication method.
(4) Troubleshooting by diagnosis code (5) Troubleshooting by trouble	"Step 3"	Classify the inspection results obtained in step 2 to systematically perform inspection accordance with the troubleshooting procedure by diagnosis code or trouble.
(6) Checkup test	"Step 4"	Check for the trouble after the trouble is removed. In case the trouble is hardly replicated, conduct a checkup test under the conditions and environment for the trouble.

- (2) Pre-inspection

Pre-inspection	<ul style="list-style-type: none"> • Execute the following steps to perform pre-inspection. Diagnostic inspection → diagnosis code erasure → trouble check (If the trouble does not recur, use the replication method.) → Diagnosis code re-check • Assume the faulty system before the replication test. Connect a tester and determine a probable cause of trouble together with checkup of the trouble. For a probable cause of trouble, refer to the troubleshooting chart. • In case the trouble is momentary or in case an error code is displayed but no special trouble takes place, execute related troubleshooting procedures while using the replication method. • Trouble checkup In case the trouble recurs, follow steps 2, 3 and 4 in this order. Otherwise, use the replication method, that is, reproduce the external conditions, and inspect each wire harness and connector parts.
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3. DESCRIPTION IN THIS MANUAL

(1) Component locator

5-54

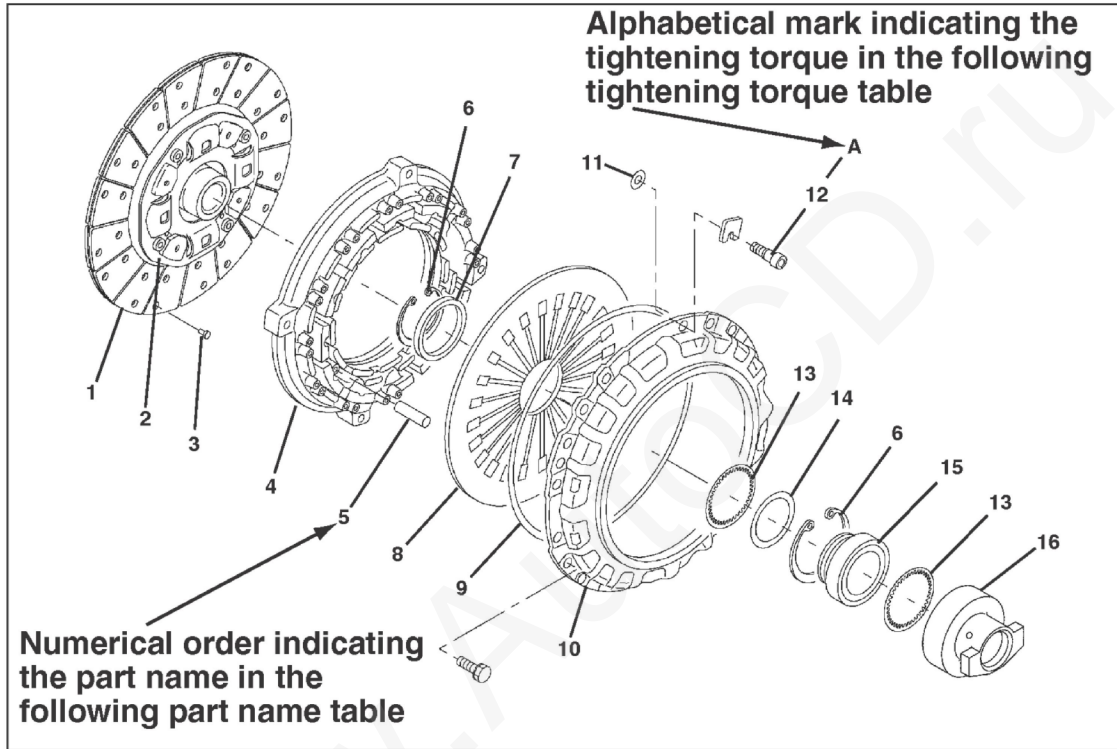
CLUTCH/CLUTCH MECHANICAL

Example

CLUTCH COVER ASSEMBLY

COMPONENT LOCATOR

☆ EN01E05307050401001001



Numerical order		Part name table	
1	Clutch facing	9	Pivot ring
2	Clutch disc hub	10	Clutch cover
3	Rivet	11	Washer
4	Pressure plate	12	Strap plate bolt
5	Stopper pin	13	Friction spring
6	Retainer ring	14	Release lever support plate
7	Release lever support	15	Release bearing
8	Diaphragm spring	16	Release bearing hub

☆ SHTS053070500020

Tightening torque		Tightening torque table		Unit: N·m {kgf·cm, lbf·ft}
A	58.8-78.5 {600-800, 44-57}			

Alphabetical mark Tightening torque

SHTS00ZZZ0100001

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

(2) Work steps

Example

Indicating the work sequence OVERHAUL

EN01E09ZZZ150703003001

REMOVING THE AUTO SLACK ADJUSTER

- 1. REMOVING THE AUTO SLACK ADJUSTER**
 (1) Remove the auto slack adjuster from the wheel brake.

DISASSEMBLING THE AUTO SLACK ADJUSTER

- 2. DISASSEMBLING THE RACK AND SPRING SECTION**
 (1) Remove the 6 torx screws with the special tool.

NOTICE

When the 6 torx screws have been tightened strongly, using the special impact screwdriver and hammer.

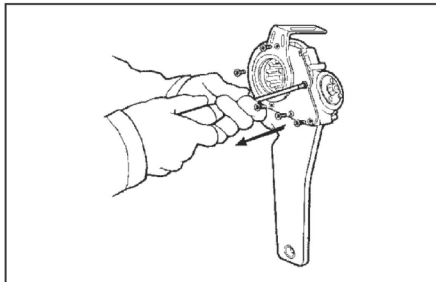
SST: S0963-02350

Special parts assembly

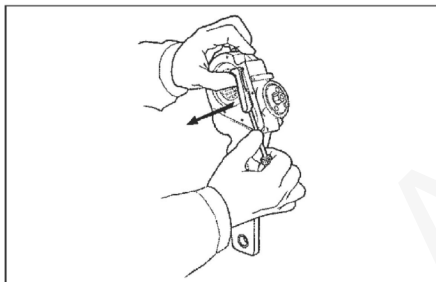
Indicating the part number of special tool required for work

- (2) Remove the holder and gasket.
 (3) Remove the rack using the screwdriver.

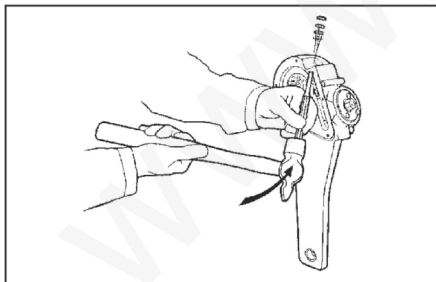
**Descriptive text:
 Indicating the work method which is gone into detail**



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SHTS09ZZZ1500029



SHTS09ZZZ1500030




- (4) Push and shrink the spring with screwdriver and bring the tapping rod into contact with plug.
 (5) Remove the plug using the tapping rod and hammer.
 (6) Remove the spring.

4. DEFINITION OF TERM

This manual defines the terms used herein as follows:

- (1) Direction
 - a. Chassis
 - To-and-fro direction
The direction of forward travel of the vehicle while mounted on the vehicle is forward direction; the direction of backward travel of the vehicle while mounted on the vehicle is backward direction.
 - Direction of rotation
The clockwise direction as seen from the rear of the vehicle is clockwise direction; the counterclockwise direction as seen from the rear of the vehicle is counterclockwise direction. (In case of engine, the clockwise direction as seen from the flywheel side is clockwise direction; the counterclockwise direction as seen from the flywheel side is counterclockwise direction.)
 - Upward/Downward direction
The upward direction while mounted on the vehicle is upward, and downward direction while mounted on the vehicle is downward.
 - Right/Left direction
The right direction as seen from the rear of the vehicle while mounted on the vehicle is right direction; the left direction as seen from the rear of the vehicle while mounted on the vehicle is left direction. (In case of engine, the right direction as seen from the flywheel side is right direction; the left direction as seen from the flywheel side is left direction.)
 - b. Standalone unit
 - To-and-fro direction
The direction of input of power is forward direction; the direction of output of power is backward direction.
 - Direction of rotation
The clockwise direction as seen from the rear of the unit is clockwise direction; the counterclockwise direction as seen from the rear of the unit is counterclockwise direction.
 - Upward/Downward direction
The upward direction while the unit is mounted on the vehicle (chassis) is upward, and downward direction while the unit is mounted on the vehicle (chassis) is downward.
 - Right/Left direction
The right direction as seen from the rear of the unit is right direction; the left direction as seen from the rear of the unit is left direction.
- (2) Standard value (Assembly standard):
Indicates a basic dimension or including the tolerance and the clearance generated by the clearance of a combination of two parts
- (3) Limit (Service limit):
Indicates a numeric value which requires correction or replacement.

5. 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.

6. UNIT

- (1) This manual uses the SI unit system. The SI unit is an international unit which is based on one unit per quantity unlike the conventional unit system which differs from country to country, in order to facilitate technology exchange.
- (2) This manual writes the SI unit and a conventional unit side by side, the conventional unit enclosed in parentheses { }.

Item	SI unit	Traditional unit	Conversion*1 (1 [traditional unit] = X [SI unit])
Force	N	kgf	1 kgf=9.80665 N
Torque*2	N·m	kgf·cm	1 kgf·cm=0.0980665 N·m
Pressure	Pa	kgf/cm ²	1 kgf/cm ² =98.0665 kPa=0.0980665 MPa
		mmHg	1 mmHg=0.133322 kPa
Revolving speed	r/min.	rpm	1 rpm=1 r/min.
	min. ⁻¹		1 rpm=1 min. ⁻¹
Spring constant	N/mm	kgf/mm	1 kgf/mm = 9.80665 N/mm
Volume	L	cc	1 cc = 1 mL
Efficiency	W	PS	1 PS = 0.735499 kW
Calorie	W·h	cal	1 kcal = 1.13279 W·h
Fuel consumption rate	g/W·h	g/PS·h	1 g/PS·h = 1.3596 g/kW·h

*1: X is a value converted from 1 [traditional unit] into the SI unit and is also used as a conversion rate between the traditional unit and a SI unit.

*2: The torque conversion may vary depending on the device. In proceeding with work, use the standard value defined for each device.

PRECAUTIONS FOR WORK

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GENERAL PRECAUTIONS

To assure safety in work and prevent possible danger, observe the following:

1. CLOTHES AND APPEARANCE

- (1) Use safety glasses.
- (2) To prevent injury, remove a watch, necktie, ring, bracelet and necklace.
- (3) Bind long hair behind.
- (4) Wear a cap and safety boots.

2. SAFETY WORK

- (1) To prevent burns, never touch a radiator, muffler, exhaust pipe, and tail pipe just after the engine is turned off.
- (2) While the engine is rotating, keep your clothes and tools off the rotating sections, in particular the cooling fan and V-belt.
- (3) Remove the starter key except when starting the engine.
- (4) Provide good ventilation to avoid excessive CO when starting the engine.
- (5) The fuel/battery gas is flammable. Never make a spark or light a cigarette.
- (6) Take utmost care when working on the battery. It contains corrosive sulfuric acid.
- (7) 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.
- (8) Leaving a tool or waste in the engine room causes the tool or waste to touch the rotating section of the engine and pop out, which could result in an injury.

3. 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 crossmember when attaching the towing chain. Never lift or tow the vehicle if the chain is in direct contact with the bumper.

(1) Towing procedures

- a. 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.
- b. Use a heavy duty cable or rope when towing the vehicle. Fasten the cable securely to the towing hook on the frame. The hook should be used only if the towed vehicle is not loaded.
- c. 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.
- d. Keep the gear shift lever in "Neutral". In case of ZF transmission, keep the gear shift lever in the high range "Neutral" position.
- e. Make sure that the starter switch is kept in the "ON" position.
- f. 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.
- g. Note that the engine brake and exhaust brake cannot be applied, if the propeller shaft is removed.
- h. Make a slow start to minimize shock. Towing speed should be less than 30 km/h {18 mile/h}. In case of ZF transmission, towing speed should be less than 10 km/h {6 mile/h}.
- i. In case of ZF transmission, towing distance maximum 100 km {60 miles}.

(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.

a. 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 automatic or manual transmission, and for even short distance towing. After being towed, check and refill the rear axle housing with lubricant if necessary.

b. 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.

PRECAUTIONS ON MAINTENANCE

Observe following before maintenance:

1. PREPARATIONS FOR DISASSEMBLY

- (1) Prepare general tools, special tools and instruments before work.
- (2) Before disassembling complicated sections, make a fitting mark where functions are not affected to facilitate the assembly work. Before repair of the electrical system, remove the cable from the minus terminal of the battery.
- (3) Follow the inspection procedure in this manual before disassembly

2. INSPECTION DURING DISASSEMBLY

- (1) Each time you remove a part, inspect the state of the assembly of the part, deformation, damage, wear and flaws.

3. ARRANGEMENT OF DISASSEMBLED PARTS

- (1) Arrange the disassembled parts in order. Discriminate parts to be reused from replacement parts.

4. CLEANING OF DISASSEMBLED PARTS

- (1) Thoroughly clean the parts to be reused.

5. INSPECTION AND MEASUREMENT

- (1) Inspect and measure the parts to be reused as required.

6. ASSEMBLY

- (1) Observe the specified values (tightening torque, adjustment value) to assemble conforming parts in a correct procedure.
- (2) Use genuine parts for replacement.
- (3) Use new packing, gasket, O-ring and cotter pin.
- (4) Use a seal gasket depending on the location of gasket. Apply specified oil or grease to a sliding section where indicated. Apply specified grease to the lip of the oil seal.

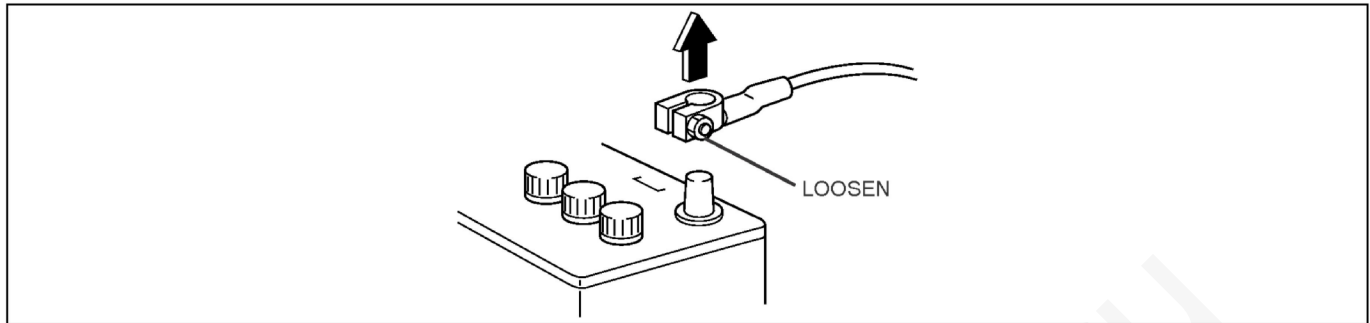
7. ADJUSTMENT WORK CHECK

- (1) Use a gauge and a tester to adjust to the specified maintenance value.

PRECAUTIONS FOR ELECTRICAL SYSTEM

1. REMOVING THE BATTERY CABLE

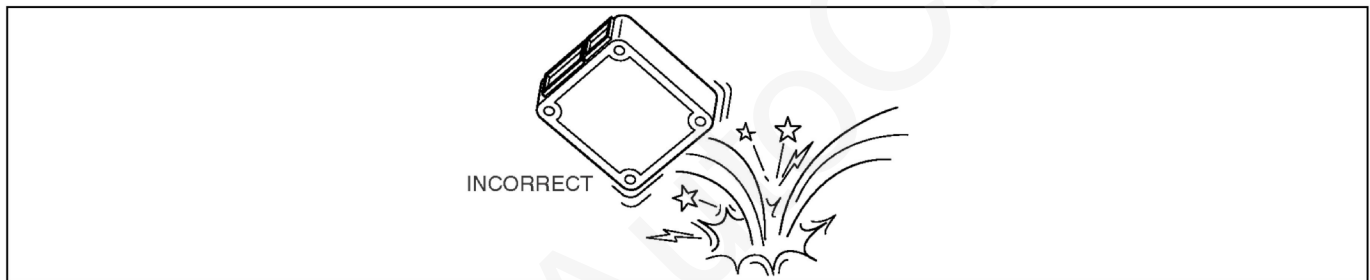
- (1) Before electrical system work, disconnect the cable from the negative (minus) terminal of the battery in order to avoid burning caused by short-circuiting.
- (2) To remove the battery cable, fully release the nut to avoid damage to the battery terminal. Never twist the terminal.



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2. HANDLING OF ELECTRONIC PARTS

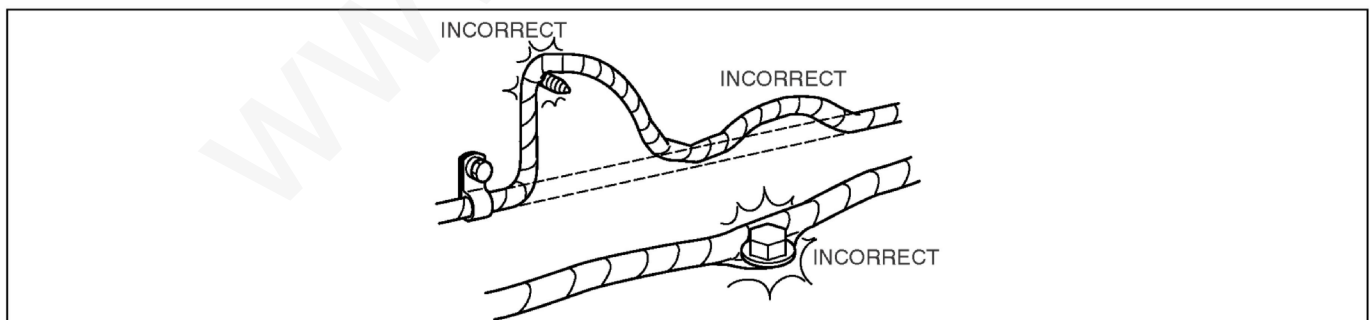
- (1) Never give an impact to electronic parts of a computer or relay.
- (2) Keep electronic parts away from high temperatures and humidity.
- (3) Never splash water onto electronic parts in washing the vehicle.



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3. HANDLING OF WIRE HARNESS

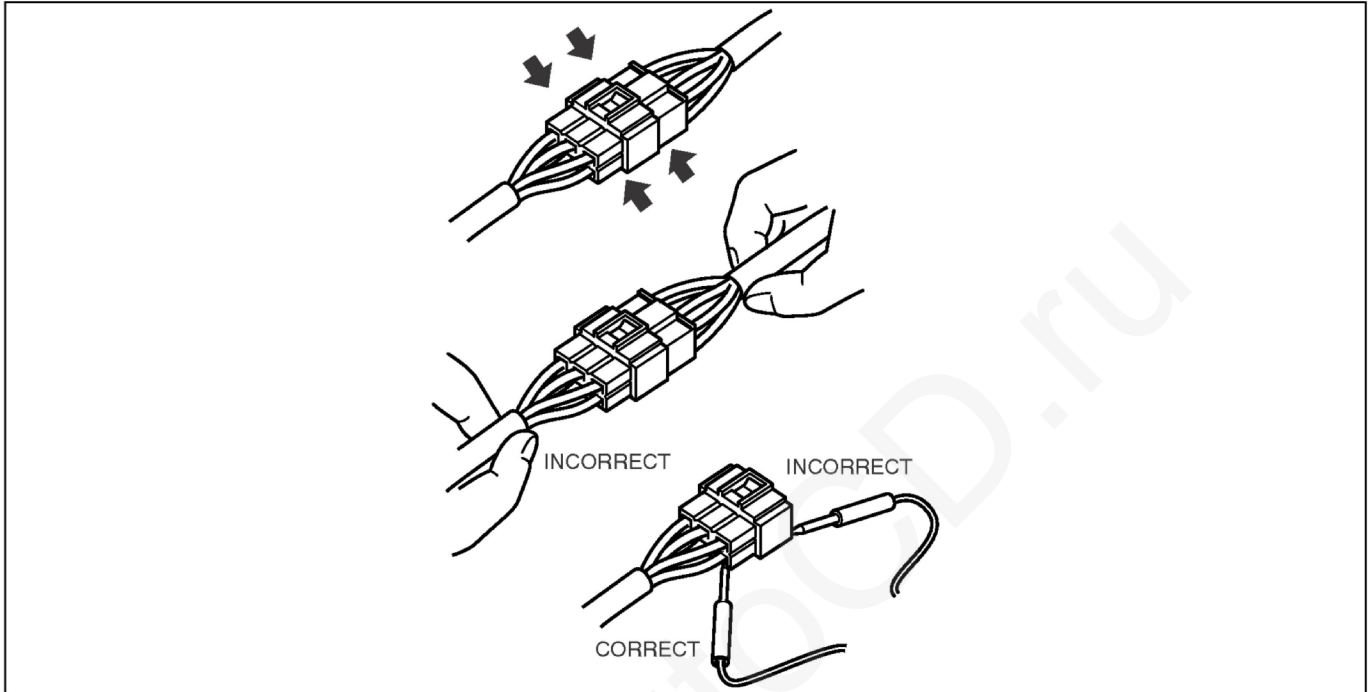
- (1) Perform marking on a clamp and a clip and secure them in original position so that the wire harness will not interfere with the end and acute angle section of the body and a bolt.
- (2) To attach a part, take care not to bite the wire harness.



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4. HANDLING OF CONNECTOR

- (1) To disconnect a connector, hold the connector (indicated by an arrow in the figure) to pull it out. Never pull the harness.
- (2) To remove a connector with lock, release the lock then pull it out.
- (3) To connect a connector with lock, insert it until it clicks.
- (4) To insert a test lead into the connector, insert it from behind the connector.
- (5) In case it is difficult to insert a test lead from behind the connector, prepare a harness for inspection and perform inspection.



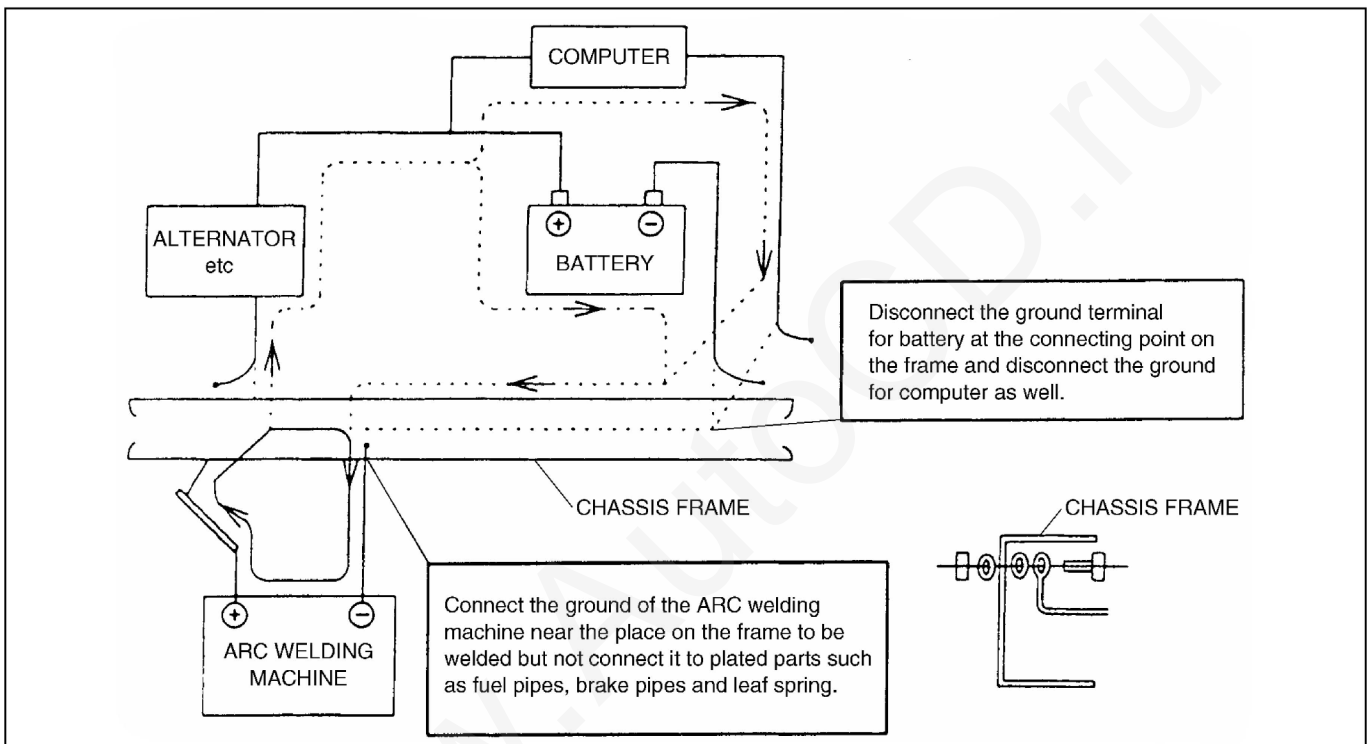
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PRECAUTION FOR ELECTRIC WELDING

1. PRECAUTION FOR ELECTRIC WELDING

Electrical components such as the alternator and tachograph are directly connected to the battery and one end is grounded to the chassis frame. Under these conditions, welding current will flow back along the ground 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 ground terminal of the battery at the frame fitment and ground the welding equipment securely to the frame itself. (Do not fit the welding equipment ground 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. Ground welding equipment securely, near to the area to be welded.
 - d. Put back battery negative ground as original condition.
 - e. Finally check the function 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.

TIGHTENING OF BOLTS AND NUTS FOR ENGINE

EN01F00ZZZ010A02001003

1. TIGHTENING TORQUE OF GENERAL STANDARD

(1) Washer based bolt

Unit: N·m {kgf·cm, lbf·ft}

Screw 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}
Remarks	Bolt with the numeral "7" on its head	Bolt with the numeral "9" on its head

NOTICE

8T bolt conforms to the standard of 7T bolt.

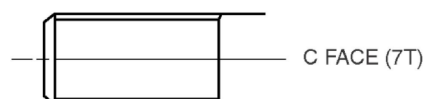
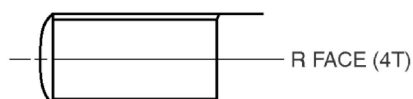
(2) With washer

Unit: N·m {kgf·cm, lbf·ft}

Screw 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}
Remarks	Bolt with the numeral "4" on its head Projection bolt Stud with rounded free end face	Bolt with the numeral "7" on its head Stud with chamfered free end face	Bolt with the numeral "9" on its head

NOTICE

8T bolt conforms to the standard of 7T bolt.



2. PRECOATED BOLT

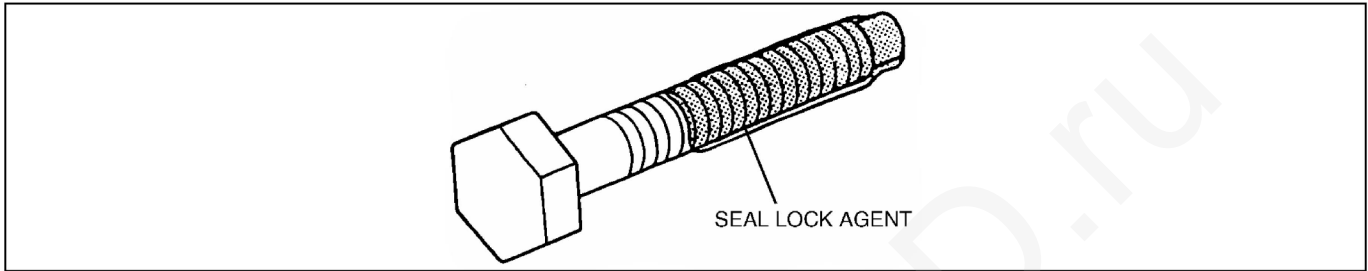
A precoated bolt is a bolt having a thread coated with seal lock agent.

- (1) Cases where seal lock agent must be applied again
 - a. A precoated bolt has been removed, or
 - b. A precoated 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 lock 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) How to reuse precoated bolt
 - a. Clean the bolt and the screw hole (clean the tapped hole also when the bolt is to be replaced).
 - b. Blow air to dry up the bolt.
 - c. Apply a specified seal lock agent to the thread of the bolt.

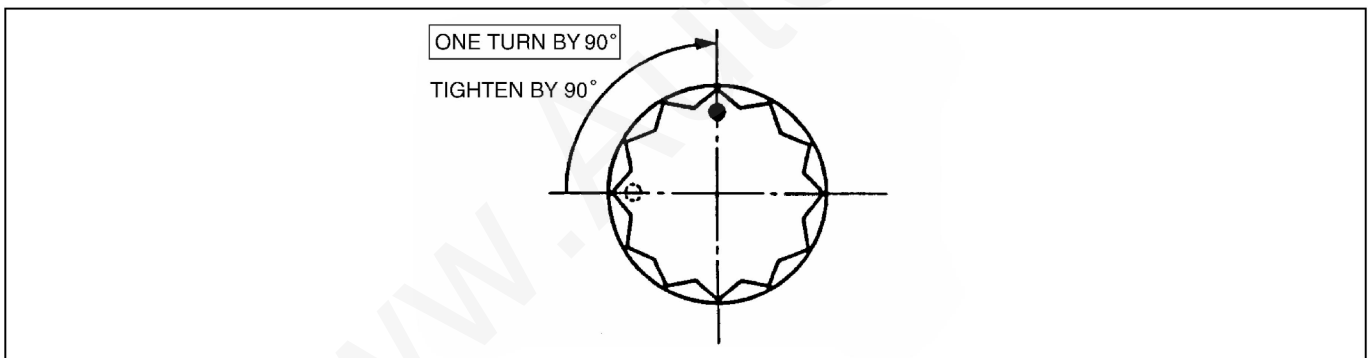


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3. TENSION CONTROL WITH ANGULAR TORQUING METHOD IN PLASTIC REGION OF MATERIAL

- (1) Precautions

Part of an engine uses the tension control with angular torquing method in plastic region of material. This is different from the conventional tightening method. Follow the instructions in each chapter.



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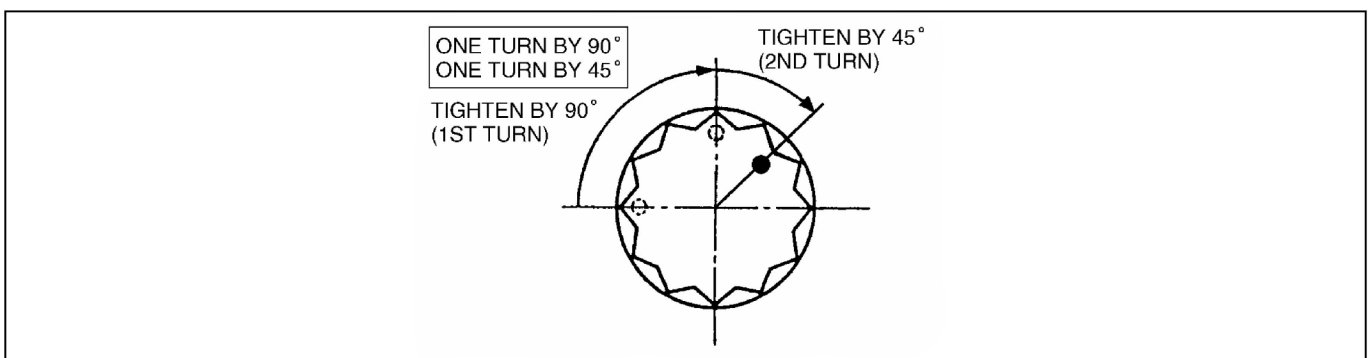
- (2) Target region

Cylinder head bolt, crankshaft main bearing cap bolt, connecting rod bearing, cap bolt and so on.

⚠ CAUTION

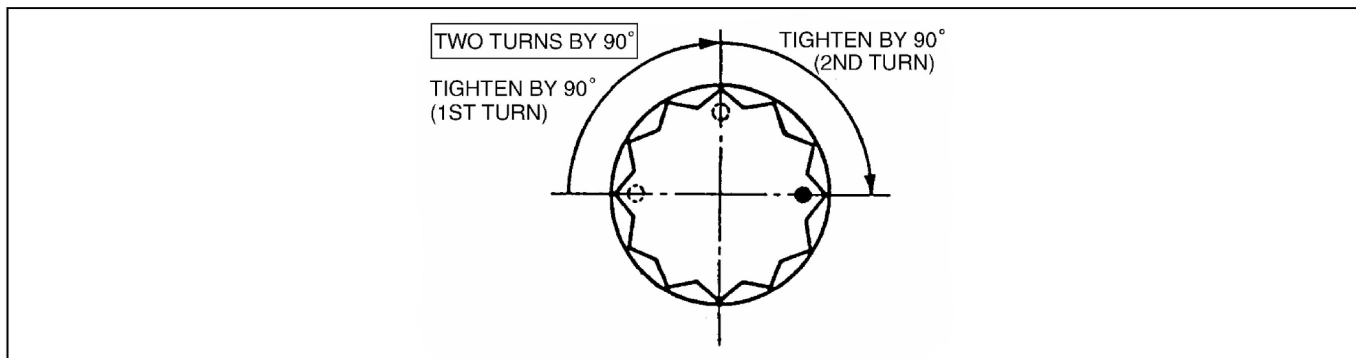
Before assembly, measure the entire length of the bolt and if the use limit is exceeded, replace the bolt with new one.

Apply engine oil to the bolt seat face and bolt thread.



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- (3) Tightening after tightening at the pre-set seating torque.
Further tighten by 90° or 135° (a turn by 90° and another by 45°) or 180° (two turns by 90°).



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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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Looseness • Gas and liquid Leakages • Continuity malfunction • 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.

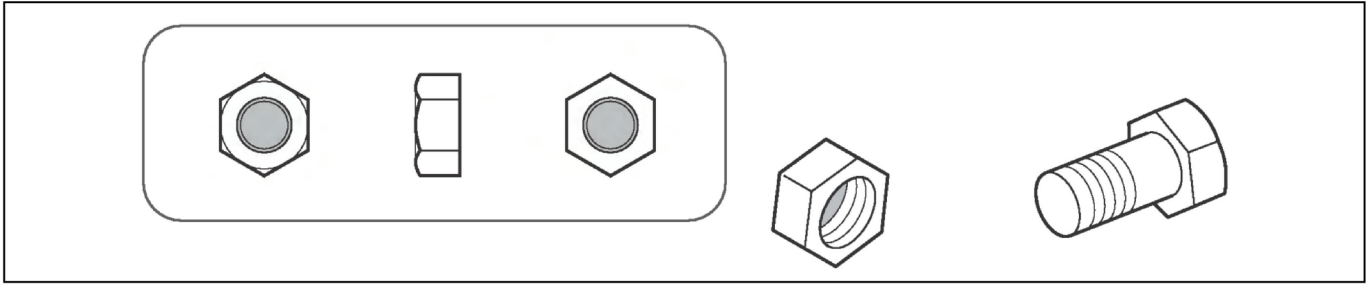
- Insufficient tightening torque
- Inclusion of foreign matters (burrs and coatings) in the tightening surface.
- Sagging of coat
- Sinking into the seat surface hole by omitting installing a plain washer.
- Defective seat surface flatness (wear-out during use)

TYPES AND IDENTIFICATION

There are 3 types of bolts and nuts.

1. STANDARD (W/O FLANGE)

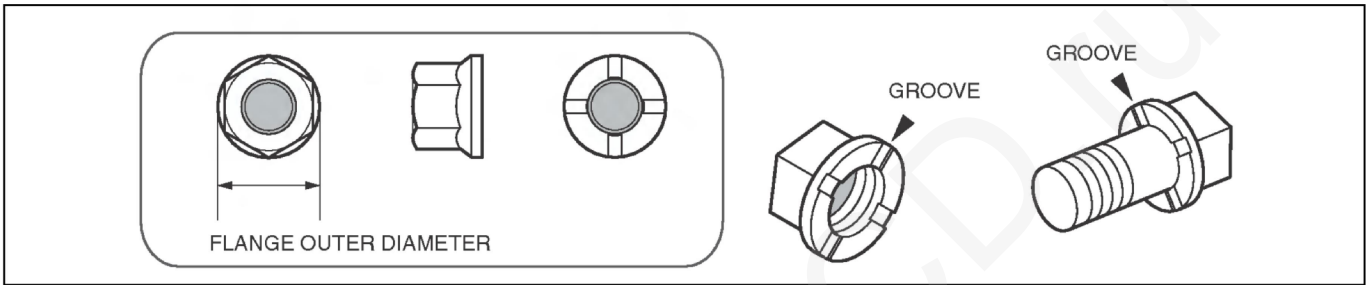
(1) Bolt/Nut without flange



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2. WITH OLD FLANGE (W/GROOVE)

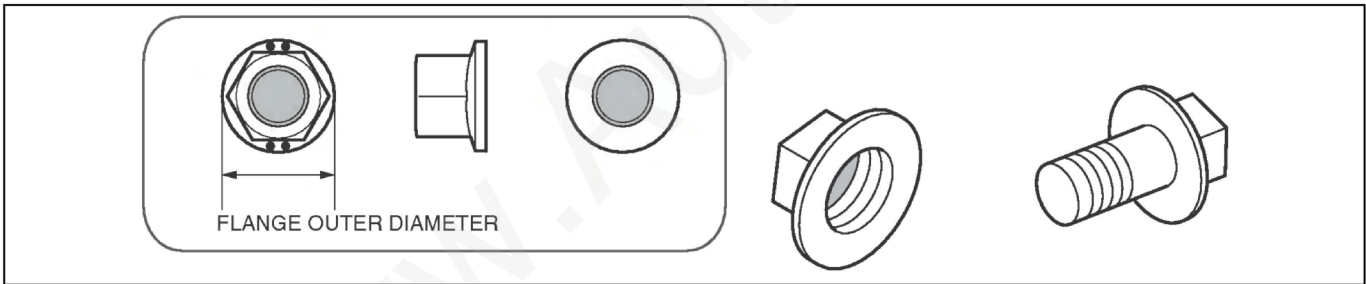
(1) Flange is small and has grooves on its back.



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3. WITH NEW FLANGE (W/O GROOVE)

(1) Flange is big and does not have grooves on its back.

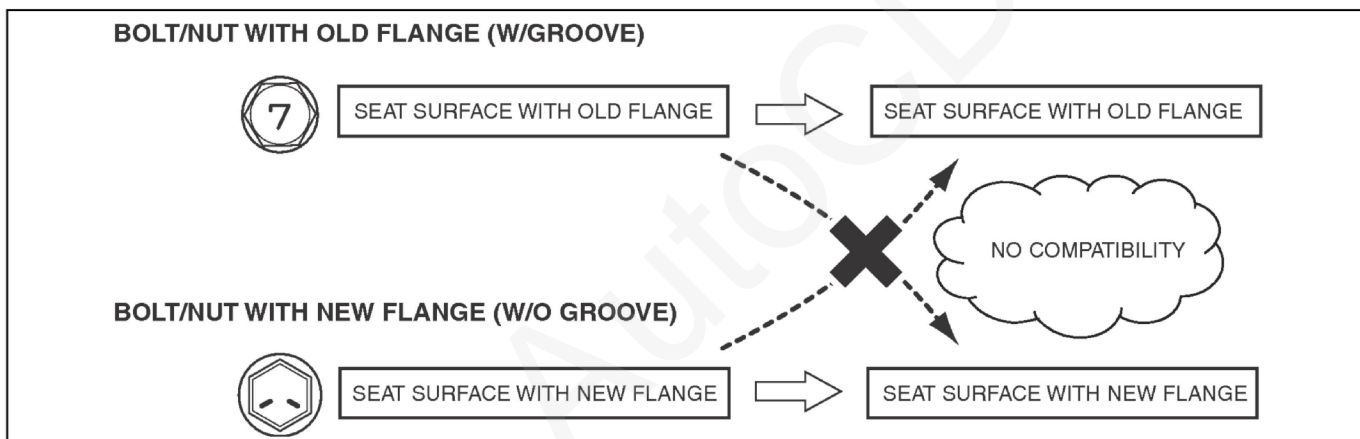


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Comparison of flange outer diameters

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 BOLT AND NUT)









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NOTICE







[Bolt/Nut with new flange (w/o groove)] can not be used on the place where [Bolt/Nut with old flange (w/groove)] 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.

STRENGTH CLASSES AND SYMBOLS

1. WITH OLD FLANGE (W/GROOVE)

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

2. WITH NEW FLANGE (W/GROOVE)

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

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/GROOVE)

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			

3. WITH NEW FLANGE (W/O GROOVE)

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.)
- Do not reuse the bolts/nuts with Neotorquer surface treatment.

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	18.0-26.0 {184-265, 14-19}
	9T	23.5-34.5 {240-351, 18-25}
M10	7T	34.5-51.5 {352-525, 26-37}
	9T	46.0-68.0 {470-693, 34-50}
M12	7T	61.0-91.0 {623-927, 45-67}
	9T	80.0-120.0 {816-1,223, 59-88}
M14	9T	128-192 {1,306-1,957, 95-141}

2. WITH OLD FLANGE (W/GROOVE)

Unit: N·m {kgf·cm, lbf·ft}

Thread diameter	Strength classes	Tightening Torque
M8	7T	18.0-26.0 {184-265, 14-19}
	9T	23.5-34.5 {240-351, 18-25}
M10	7T	41.5-61.5 {424-627, 31-45}
	9T	55.0-82.0 {561-836, 41-60}
M12	7T	73.0-109.0 {745-1,111, 54-80}
	9T	96.0-144.0 {979-1,468, 71-106}

3. WITH NEW FLANGE (W/O GROOVE)

Unit: N·m {kgf·cm, lbf·ft}

Thread diameter	Strength classes	Tightening Torque
M8	8.8	21.7-40.3 {222-410, 16-29}
	10.9	27.3-50.7 {279-516, 21-37}
M10	10.9	24.5-45.5 {250-463, 19-33}
M12	8.8	44.1-81.9 {450-835, 33-60}
	10.9	57.4-106.6 {586-1,087, 43-78}
M14	10.9	91-169 {928-1,723, 68-124}

TIGHTENING OF FLARE NUTS AND HOSES

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1. TIGHTENING TORQUE OF PIPE FLARE NUT

Unit: N·m {kgf·cm, lbf·ft}

Outer diameter of pipe	$\phi 4.76$	$\phi 6.35$	$\phi 10$	$\phi 12$	$\phi 15$
Material					
Steel pipe and copper pipe	10-20 {102-203, 8-14}	20-30 {204-305, 15-22}	45-59 {459-601, 34-43}	60-74 {612-754, 45-54}	80-96 {816-978, 59-70}

2. TIGHTENING TORQUE OF AIR HOSE JOINT

Unit: N·m {kgf·cm, lbf·ft}

Nominal designation of thread	M20	M22	M28
Tightening torque	39-44 {398-448, 29-32}	39-44 {398-448, 29-32}	39-44 {398-448, 29-32}

3. TIGHTENING TORQUE OF HOSE

Unit: N·m {kgf·cm, lbf·ft}

	Outer diameter of hose $\phi 10.5, \phi 12$ fittings	Outer diameter of hose $\phi 22$ packing fittings	Outer diameter of hose PF 3/8 fittings
Air hose	20-23 {204-234, 15-16}	39-44 {398-448, 29-32}	—
Brake hose	—	39-44 {398-448, 29-32}	—
PS fluid hose	—	—	39-49 {398-499, 29-36}

4. TIGHTENING TORQUE OF COPPER-PACKING FITTING FOR BRAKE HOSE

Unit: N·m {kgf·cm, lbf·ft}

Tightening torque	27-35 {275-357, 20-26}
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5. TIGHTENING TORQUE OF THE NYLON TUBE CONNECTOR

Unit: N·m {kgf·cm, lbf·ft}

Nominal designation of thread	PT1/8	PT1/4	PT3/8	PT1/2
Tightening torque	15-25 {153-254, 12-18}	20-30 {204-305, 15-22}	29-39 {296-397, 22-28}	39-49 {398-499, 29-36}

Nominal designation of thread	NPTF1/8	NPTF1/4	NPTF3/8	NPTF1/2
Tightening torque	15-25 {153-254, 12-18}	20-30 {204-305, 15-22}	29-39 {296-397, 22-28}	39-49 {398-499, 29-36}

6. TIGHTENING TORQUE OF THE SLEEVE NUT FOR THE RE-TIGHTENING TYPE NYLON TUBE CONNECTOR

Unit: N·m {kgf·cm, lbf·ft}

Diameter	$\phi 6$	$\phi 8$	$\phi 10$	$\phi 12$
Tightening torque	12.3-18.3 {126-186, 10-13}	13.9-21.9 {142-223, 11-16}	18.0-28.0 {184-285, 14-20}	23.0-33.0 {235-336, 17-24}

Diameter	$\phi 1/4$	—	$\phi 3/8$	$\phi 1/2$
Tightening torque	20-26 {203-266, 14-20}	—	35-45 {356-459, 25-34}	50-60 {509-612, 36-45}

7. TIGHTENING TORQUE OF THE FLARE TYPE NYLON TUBE CONNECTOR

Unit: N·m {kgf·cm, lbf·ft}

Nominal designation of thread	M12	M16	M20
Tightening torque	12.7-16.7 {130-170, 9-12}	24.4-34.4 {249-351, 18-25}	46.9-56.9 {478-580, 35-42}

8. TIGHTENING TORQUE OF THE LOCK NUT FOR THE BRASS CONNECTOR

Unit: N·m {kgf·cm, lbf·ft}

Nominal designation of thread	M12	M14	M16	M20	M27
Tightening torque	13-17 {133-173, 10-13}	18-22 {183-225, 13-17}	60-72 {612-734, 44-53}	88-106 {897-1,081, 65-78}	190-228 {1,937-2,325, 140-168}

9. TIGHTENING TORQUE OF THE LOCK NUT FOR THE THROUGH CONNECTOR

Unit: N·m {kgf·cm, lbf·ft}

Nominal designation of thread	M12	M14	M20	M22	M24	M25
Tightening torque	55-75 {560-765, 41-55}	62-92 {632-939, 45-68}	84-156 {856-1,591, 61-116}	102-162 {1,041-1,651, 76-119}	120-180 {1,224-1,835, 89-132}	124-186 {1,264-1,897, 91-138}

10. TIGHTENING TORQUE OF FLARE NUTS FOR THE COPPER PIPE

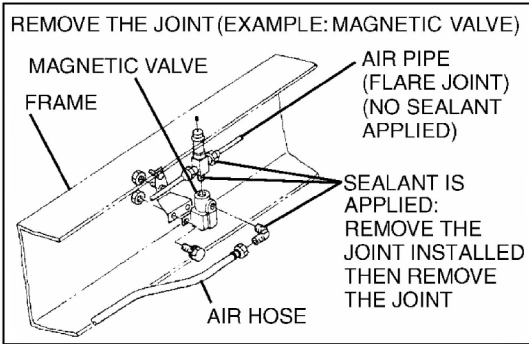
Unit: N·m {kgf·cm, lbf·ft}

Outer diameter of pipe	ϕ 4.76	ϕ 6.35	ϕ 8	ϕ 10	ϕ 12	ϕ 15
Material						
Torque for copper pipe	15-16 {152-164, 11-12}	16-17 {163-174, 11-13}	19.5-24.5 {198-250, 14-19}	32-40 {326-408, 23-30}	37-55 {377-561, 27-41}	53-59 {540-602, 39-44}

SEALANT ON THE TAPERED SCREW FOR PIPING

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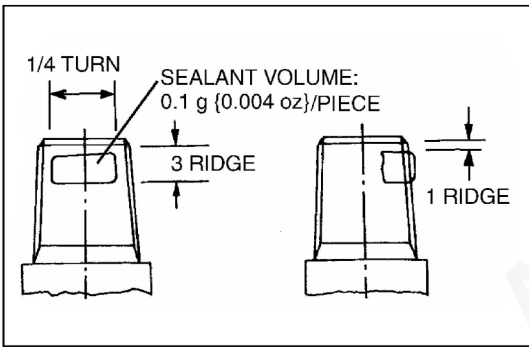
To the tapered thread of the air pipe joint is applied the sealant (LOCTITE No.575, No. 572 or equivalent). Follow the procedure below to remove/attach the piping.



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1. TO REMOVE

- (1) The sealant (LOCTITE No.575, No. 572 or equivalent) has a high sealing capability. The return torque of taper joint is about 1.5 times as high as the initial tightening torque. To remove the joint, use a longer wrench.
- (2) For replacement of joint in a place with poor workability, remove the auxiliaries with the joint attached then remove the joint.



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2. TO INSTALL

- (1) To apply sealant (LOCTITE No.575, No. 572 or equivalent), use waste and thinner to wipe the dirt off the sealing section, directly apply the sealant by a quarter turn (3 ridges) starting from the second ridge from the tip, then assemble in accordance with the tightening torque table below. Wipe dirt off the mating part (female threads) before tightening it.

⚠ WARNING

In case the sealant has entered your eye or attached to your skin, wash it away in running water.

TIGHTENING TORQUE FOR TAPER JOINTS

Unit: N·m {kgf·cm, lbf·ft}

Material	Thread diameter			
	1/8	1/4	3/8	1/2
Steel	15-25 {153-254, 12-18}	39-59 {398-601, 29-43}	49-79 {500-805, 37-58}	
Aluminum, brass	15-25 {153-254, 12-18}	20-30 {204-305, 15-22}	29-39 {296-397, 22-28}	39-49 {398-499, 29-36}

- (2) If tape seal is replaced with sealant, take the similar step as in the step (1) above after removing all tape seal.

NOTICE

Use particular care to avoid entry of dirt or contaminant into a pipe.

- (3) If air leak is found after applying sealant and assembling, repeat the steps (1) and (2). Retightening will not remedy air leak.

NYLON TUBE

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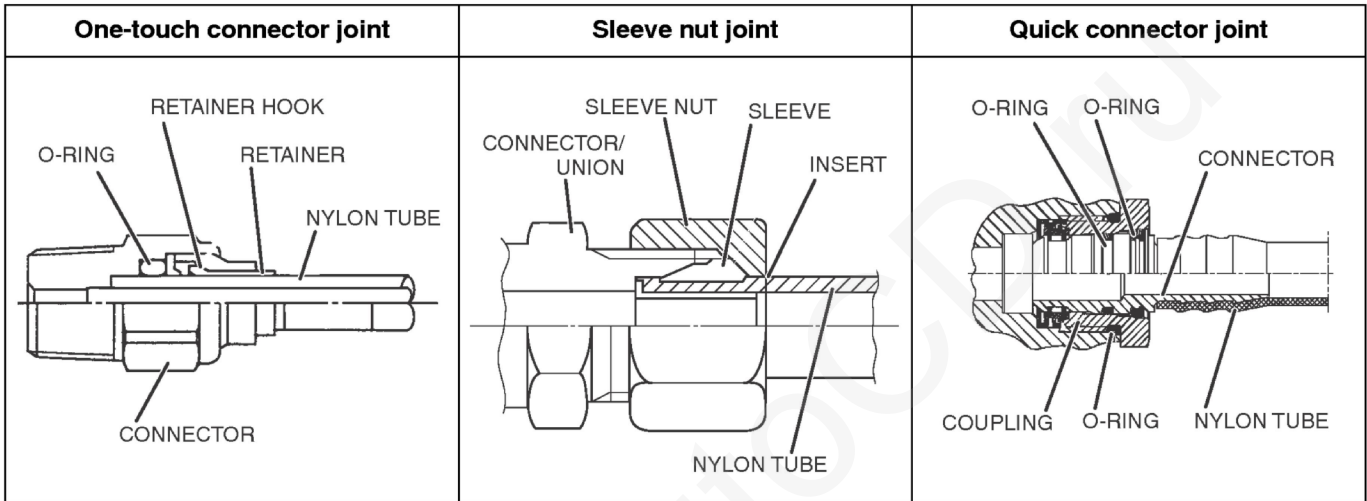
1. TYPES OF JOINT

- (1) Nylon tube joints have 3 types: one-touch connector joint, sleeve nut joint and quick connector joint.

⚠ CAUTION

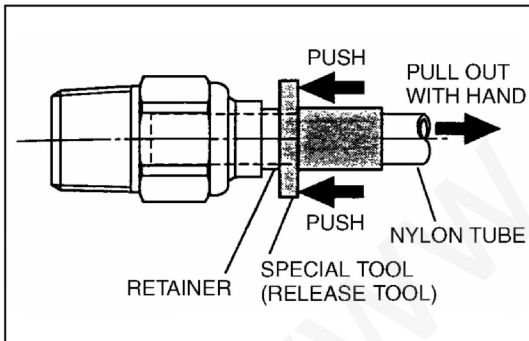
Function and quality of a nylon tube and each joint are guaranteed as a set. Use HINO genuine parts. Otherwise a burst or break may result.

Structure of joint and components

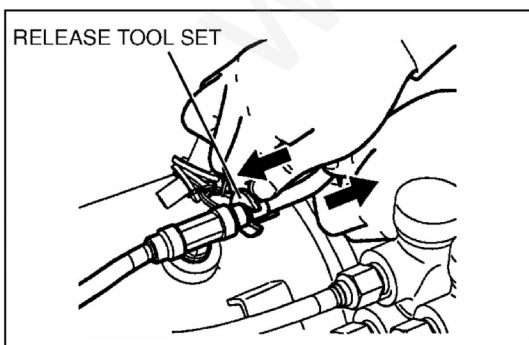


2. ONE-TOUCH CONNECTOR JOINT

- (1) Remove the one-touch connector joint.

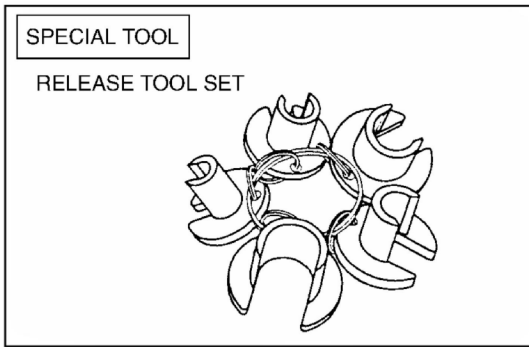


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SHTS00ZZZ0100041

- a. Check that there is no dust or dirt in the proximity of the connector end. If any, use air blow to remove dust or dirt before removal.

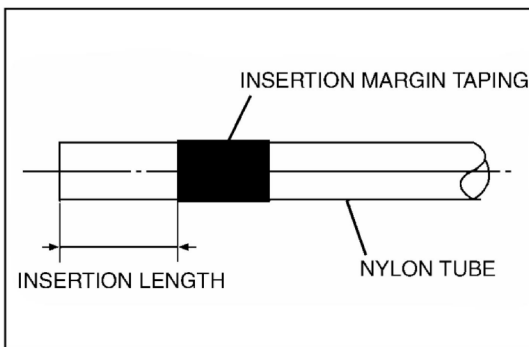


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- b. To remove the connector, pull out the nylon tube at a stroke in the axial direction while holding down the retainer of the connector. Use a dedicated special tool to hold down the retainer of the connector.

Size of special tool

Tube outer diameter	Part No.	Name
φ6	S0942-11510	Release tool
φ8	S0942-11520	
φ10	S0942-11530	
φ12	S0942-11540	
φ15	S0942-11550	
Set in above 5 sizes	S0942-11560	Release tool set



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- c. To connect the connector joint, give a mark such as taping at the tube insertion length and insert the tube to the position of the mark.

CAUTION

Fully insert the nylon tube to the position although shock is felt 2 times as the nylon tube passes through the retainer hook and O-ring.

Tube outer diameter	Tube insertion length (mm {in.})
φ6	21.5-22.5 {0.847-0.885}
φ8, φ10	22.0-23.0 {0.867-0.905}
φ12	22.5-23.5 {0.886-0.925}
φ15	24.0-25.0 {0.945-0.984}

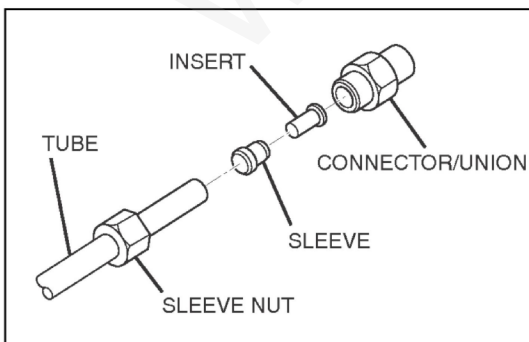
- d. After connection, pull the tube and check that the distance from the connector end (retainer) to the taping at the insertion length position is 5 mm {0.197 in.} or less.

3. SLEEVE NUT JOINT

- (1) Connection of sleeve nut
 - a. Thread the sleeve nut and sleeve in this order into the tube. Then push in the insert at the tip.

CAUTION

Take care of the assembling direction.

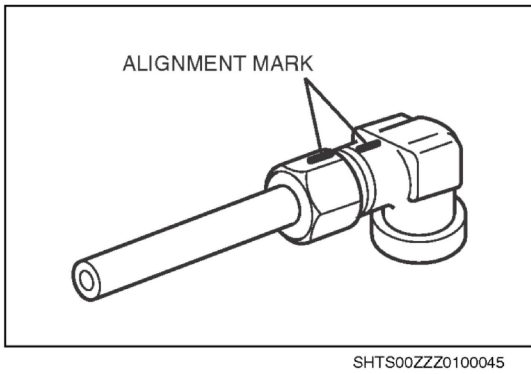


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- b. For connection, push the insert until its end strikes the connector/union while taking care not to let the sleeve nut, sleeve and insert drop. In this state, fully tighten the sleeve nut with hand. The position of sleeve nut is referred to as the "hand-tightening position".
- c. Hold down the tube so that it will not move (come loose) and tighten the sleeve nut in accordance with the torque in the table below.

Tightening torque of sleeve nut Unit: N·m {kgf·cm, lbf·ft}

Nominal diameter of screw x pitch	Tightening torque
M12 x 1 (φ6)	12.3-18.3 {126-186, 10-13}
M14 x 1.5 (φ8)	13.9-21.9 {142-223, 11-16}
M16 x 1.5 (φ10)	18.0-28.0 {184-285, 14-20}
M18 x 1.5 (φ12)	23.0-33.0 {235-336, 17-24}



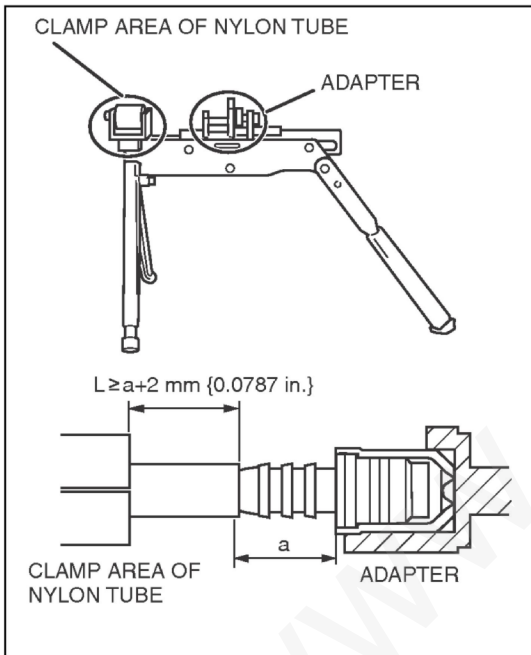
- (2) Assembly of sleeve nut (removing the tube from the joint and reinstalling it in the same position)
 - a. Give a match mark between the connector/union and the sleeve nut before loosening the sleeve nut so as to memorize the position.
 - b. For reassembly, tighten the sleeve nut up to the previous position (alignment mark position). After that, retighten by 60°.
 - c. After reassembly, check for air leakage, if any, retighten until the leakage stops.
 - d. If the leakage persists, replace the tube, sleeve and insert with new ones. If this does not stop the leakage, replace the sleeve nut and connector/union as well.

4. QUICK CONNECTOR JOINT

- (1) Press-fit of nylon tube

NOTICE

- Before press-fitting, make sure that there are no adherents such as a flaw, crushing, stain and dirt in the press-fit area of the connector.
- Before press-fitting, make sure that there are no adherents such as crushing, stain and dirt in the press-fit area of the nylon tube.

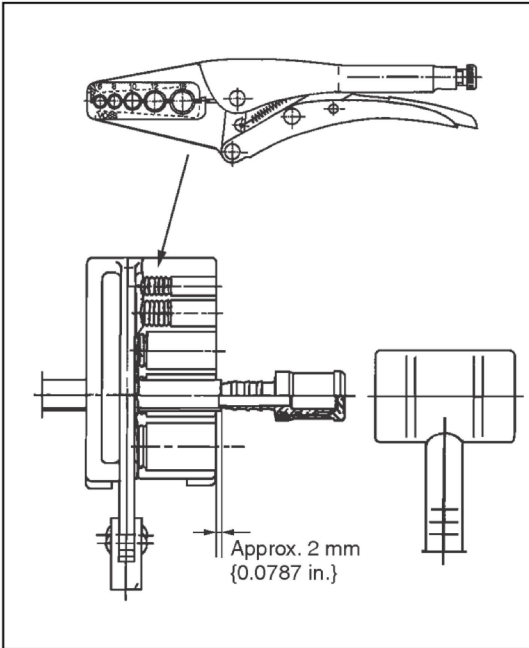


- a. When press-fitting using the hand tool

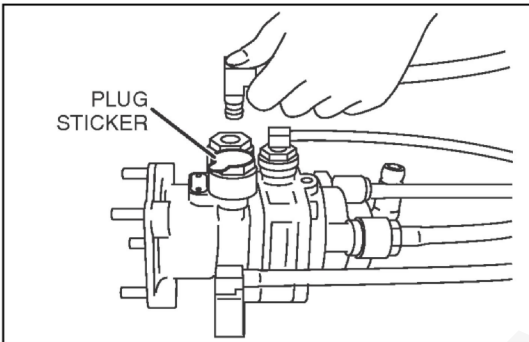
Pull out the nylon tube from the fixing clamp by at least "a+2 mm {0.0787 in.}" as shown in the illustration, and securely fix it so that it does not move. Use an appropriate mating adapter for the connector shown in the table depending on the type of the connector to be press-fitted, insert the connector with the dust-proof cap fitted straight into the nylon tube, and move the lever to press-fit. Press-fit the connector until the clearance between the nylon tube end and the connector becomes 2 mm {0.0787 in.} or less.

**Hand tool exclusive for press fit (VOSS made)
(For φ6, 8, 10, 12, 15: S0911-E0010)**

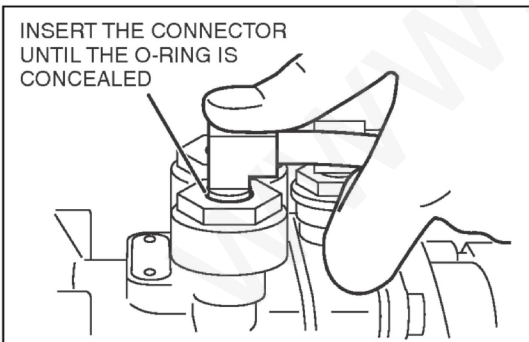
	Nylon tube	a (mm {in.})	Adapter		
			Straight	Elbow	Elbow with test connection
NG8 (M16)	φ6	16 {0.630}	S0911-E0040	S0911-E0060	—
	φ8	16 {0.630}			—
NG12 (M22)	φ6	16 {0.630}	S0911-E0050	S0911-E0070	—
	φ8	16 {0.630}			—
	φ10	22 {0.866}		S0911-E0080	—
	φ12	22 {0.866}			S0911-E0110
	φ15	25 {0.984}			—
			S0911-E0090 S0911-E0110 (135°)	—	



SHTS00ZZZ0100047



SHTS00ZZZ0100048



SHTS00ZZZ0100049

- b. When press-fitting by striking with a plastic hammer In the case of a brass connector, pull out the nylon tube from the fixing tool clamp by approx. 2 mm {0.0787 in.} as shown in the illustration and fix the fixing tool in the vise so that it does not move. Insert the connector with the dust-proof cap fitted straight into the nylon tube and strike it with a plastic hammer to press-fit.

Pull out the nylon tube from the fixing clamp by at least "a+2 mm {0.0787 in.}" as shown in the illustration, and securely fix it so that it does not move. Use an appropriate mating adapter for the connector shown in the table depending on the type of the connector to be press-fitted, insert the connector with the dust-proof cap fitted straight into the nylon tube, and move the lever to press-fit. Press-fit the connector until the clearance between the nylon tube end and the connector becomes 2 mm {0.0787 in.} or less.

**Special tool for fixing nylon tube (VOSS made)
(For $\phi 6, 8, 10, 12$: S0911-E0020)**

(2) Assembly procedures

- a. Method of assembling the connector and coupling
Assemble the coupling to the mating part to the tightening torque of 10 to 17 N·m {102 to 173 kgf·cm, 7.4 to 12.5 lbf·ft} (M16, M22).

NOTICE

- Peel off the plug sticker of the coupling immediately before inserting the connector.
- Remove the dust-proof cap of the connector also immediately before inserting the connector.

Make sure that there are no adherents such as dirt in the O-ring and the mating press-fitting area, and insert the connector until the O-ring on the tree side of the connector is concealed in the coupling.

NOTICE

- At this time, do not touch the insertion area with fibrous cloth such as cotton work gloves.
- After insertion, pull the connector to make sure that it is securely connected.

- b. When re-assembling the coupling with the connector inserted When any flaw or crack is recognized, replace the O-ring with a new one.

Fix the nylon tube near the press-fit area so that it does not turn together and is twisted, turn only the coupling at the base with a tool, and assemble it to the tightening torque of 10 to 17 N·m {102 to 173 kgf·cm, 7.4 to 12.5 lbf·ft} (M16, M22).

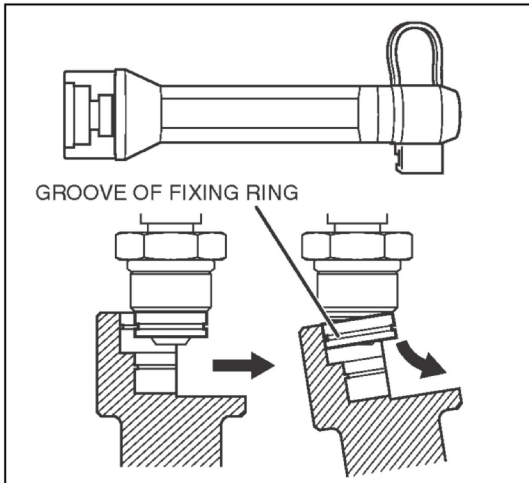
Insert the coupling until the O-ring is concealed.

- (3) Removal procedures
- a. When removing the whole coupling with the nylon tube press-fitted into the connector
Make sure that there are no adherents such as dirt and stains around.
If adherents are recognized, remove all of them with air blow.
Fix the nylon tube near the press-fitting area so that it does not turn together and is twisted, and turn only the coupling at the base with a tool to remove.
 - b. When removing the connector from the coupling
Tilt the tool with the special tool for removal fitted into the groove of the fixing ring of the coupling as shown in the illustration, and remove the resin ring.
Pull out 2 clips using the hook area of the special tool as shown in the illustration, remove the clip holding ring, and then remove the connector. It is not permissible to reuse a coupling from which a fixing ring is removed.

**Special tool for disassembling coupling (VOSS made)
(S0911-E0030)**

NOTICE

- In the case of both a. and b., store them so that no dirt, stain and flaw adhere to either inner or outer surface of the connector.
- It is not permissible to remove the press-fitted nylon tube from the connector and to reuse the connector because it cannot be guaranteed against air leak.

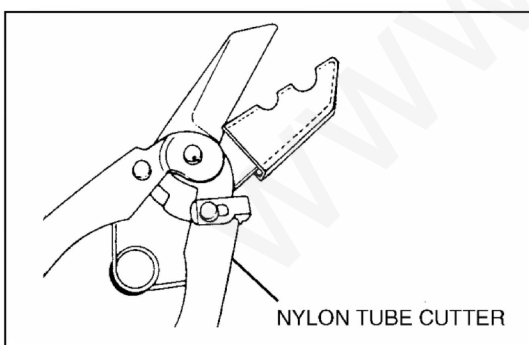


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5. HANDLING OF NYLON TUBE

- (1) Types of nylon tube

	Tube indication	Tube outer diameter	Operating temperature range
DIN tube	DIN 74324 6X1 PA11PL NITTA MOORE YY123456789101112 JAPAN	φ6, φ8, φ10, φ12, φ15	-40-90°C {-40-194°F}



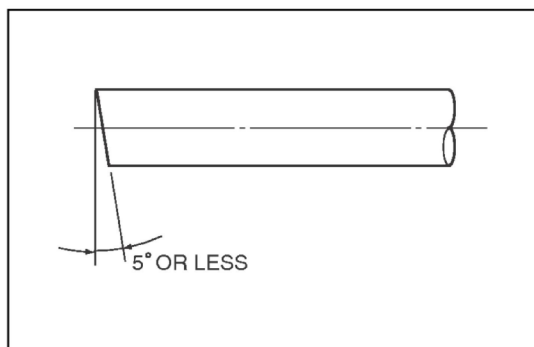
SHTS00ZZZ0100052

- (2) Cut the nylon tube.
- a. To cut a nylon tube in a predetermined length, use a dedicated special tool.

**SST: Nylon Tube Cutter
S0946-01020**

⚠ CAUTION

- Cut a tube only when there is extra length or when using the new tube.
- When cutting a nylon tube, set the squareness of the tube end with respect to the axis core within 90±5°.

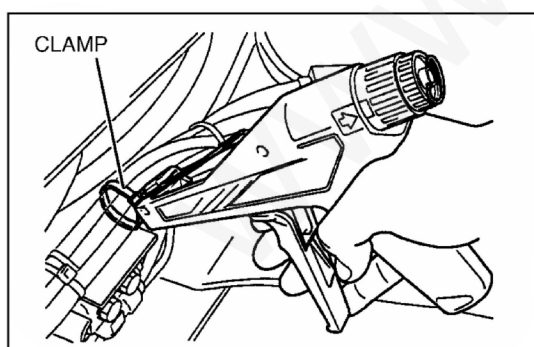


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⚠ CAUTION

- **Never repair a nylon tube under high temperatures exceeding the operating temperature range, in particular when drying the coating.**
- **For punching, welding and sanding, protect a nylon tube from tools, cutting, heat source or spark or remove the nylon tube.**
- **Never install the clamp of the welder near the tube.**
- **Never splash acidic liquid such as battery liquid onto the tube.**
- **Never exceed the minimum bending radius R of the nylon tube listed in the table below. Avoid using the tube with trace of bending line.**

Tube outer diameter		Minimum bending radius in use: R (mm {in.})
mm	inch	
φ6	φ1/4	30 {1.181}
φ8	—	50 {1.969}
φ10	φ3/8	65 {2.559}
φ12	φ1/2	70 {2.756}
φ15	φ5/8	90 {3.543}



SHTS00ZZZ0100054

- (3) Fixing the nylon tube
- To fix the nylon tube to a vehicle, use a dedicated clamp and a dedicated special tool or clamping tool available on the market.
SST: S4783-71230
Clamp
S0962-01010
Nylon Tube Tensioning Tool Assembly
Tool available on the market: Clamping tool (Tyton MK6)
Clamping torque (reference): 166.6 N {17 kgf, 37.5 lbf}

⚠ CAUTION

- **Set the tool clamping force to "3" on the dial.**
- **If the nylon tube is fixed with nonconforming clamping force, the nylon tube may be damaged.**

ASSEMBLY OF JOINT/GASKET FOR PIPING

EN01F00ZZZ010A02001008

1. TIGHTENING TORQUE OF JOINT

Unit: N·m {kgf·cm, lbf·ft}

Size of tightening thread	Types of sealing		
	Gasket sealing type (Aluminum + rubber or copper)	Metal sealing type (Flare pipe or nipple connector)	
		Type A	Type B
M8	13 {130, 9.4}		
M10	20 {200, 14}		11 {110, 8.0}
M12	25 {250, 18}	20 {200, 14}	
M14	25 {250, 18}	31 {320, 23}	
M16	29 {300, 22}	39 {400, 29}	
M18	39 {400, 29}	59 {600, 43}	
M20	39 {400, 29}	64 {650, 47}	
M24	69 {700, 51}		20 {200, 14}
M28	127 {1,300, 94}		

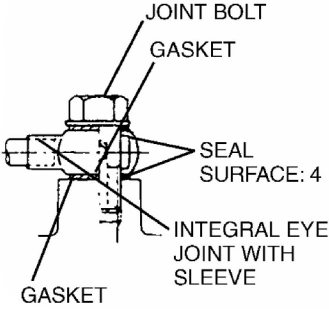
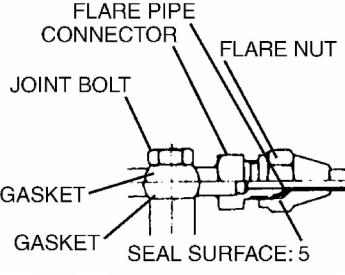
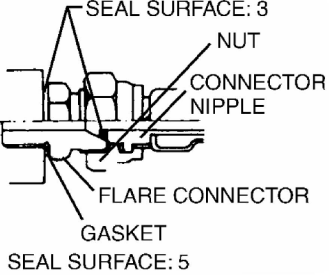
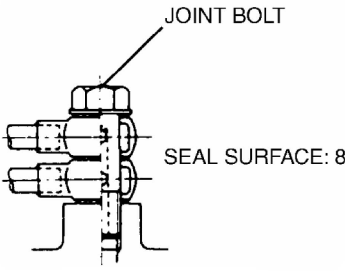
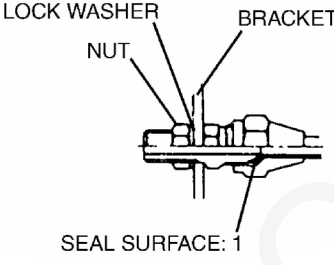
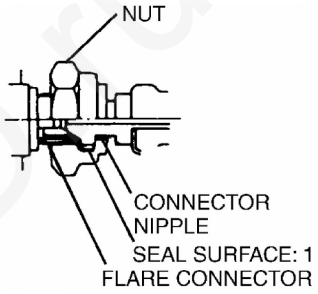
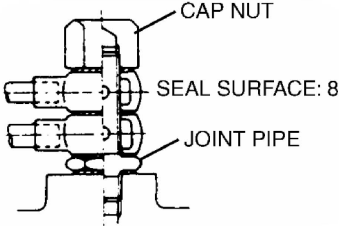
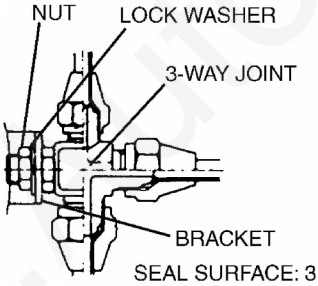
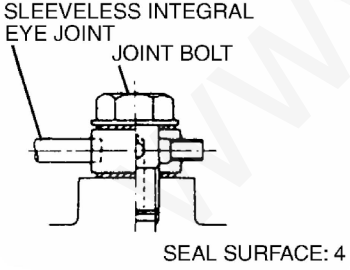
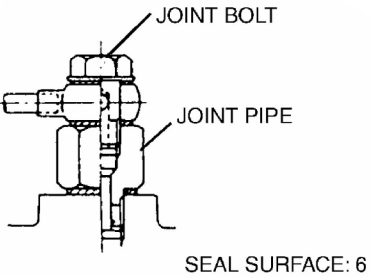
2. JOINT ASSEMBLY PROCEDURE AND POST-INSPECTION

- (1) Before starting assembly, check that there is no dust or burr on each seat surface (mating part, pipe joint, gasket).
- (2) Pipes are provided with the degree of freedom in assembly. The seat face is likely to be tilted. Temporarily tighten the pipe then perform final tightening in order to avoid leakage.
- (3) When the tightening is complete, apply a regular pressure to each pipe joint and check that there is no leakage.
- (4) Observe the above tightening torque values.

NOTICE

When a soft washer of the aluminum plus rubber carbon press-fitting type is once mounted then loosened or removed, replace it with a new one. This does not apply to normal retightening.

3. EXAMPLES OF JOINT SYSTEM FOR PIPING

Gasket seal system	Metal seal system	
	Type A (Flare pipe system)	Type B (Nipple connector system)
 <p>JOINT BOLT GASKET SEAL SURFACE: 4 INTEGRAL EYE JOINT WITH SLEEVE GASKET</p>	 <p>FLARE PIPE CONNECTOR FLARE NUT JOINT BOLT GASKET GASKET SEAL SURFACE: 5</p>	 <p>SEAL SURFACE: 3 NUT CONNECTOR NIPPLE FLARE CONNECTOR GASKET SEAL SURFACE: 5</p>
 <p>JOINT BOLT SEAL SURFACE: 8</p>	 <p>LOCK WASHER NUT BRACKET SEAL SURFACE: 1</p>	 <p>NUT CONNECTOR NIPPLE SEAL SURFACE: 1 FLARE CONNECTOR</p>
 <p>CAP NUT SEAL SURFACE: 8 JOINT PIPE</p>	 <p>NUT LOCK WASHER 3-WAY JOINT BRACKET SEAL SURFACE: 3</p>	
 <p>SLEEVELESS INTEGRAL EYE JOINT JOINT BOLT SEAL SURFACE: 4</p>		
 <p>JOINT BOLT JOINT PIPE SEAL SURFACE: 6</p>		

HANDLING OF LIQUID GASKET

EN01F00ZZZ010A02001009

1. APPLICATION OF LIQUID GASKET AND ASSEMBLY OF PARTS

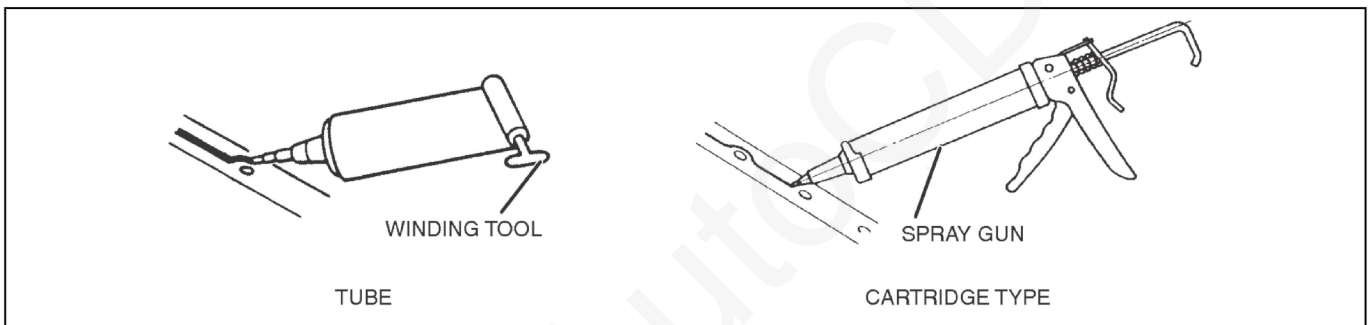
- (1) Thoroughly remove the old liquid gasket on each part and mating part and clean the parts by using waste to wipe off oil, water and dust.
Overlap the coating at the beginning and end of coating.
- (2) To assemble coated part, beware of any dislocation from the mating part. If any dislocation is found, coat the part again.
- (3) Finish assembly within 20 minutes of completion of liquid gasket application.
If 20 minutes is exceeded, remove the liquid gasket and apply it again.
- (4) Wait at least 15 minutes after assembly of parts before starting the engine.

2. REMOVING PARTS

- (1) To remove each part, never twist a single section but twist the part in alternate directions at the collar or clearance on the flange. When removing gasket, take care not to let the refuse of gasket enter the engine.

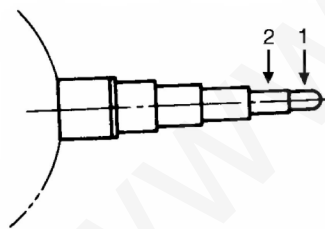
3. OTHER

- (1) When the liquid gasket comes in a tube, use the supplied winding tool. When the gasket comes in a cartridge, use a spray gun.



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Note that the cutting position of the nozzle of the tube provides necessary width of application.



NOZZLE OF THE TUBE

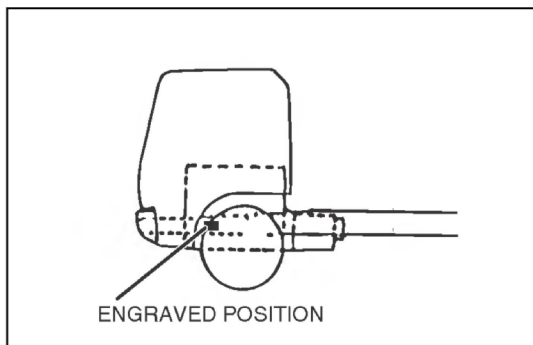
- 1: Approx. 2 mm {0.079 in.} when cut at the first segment
- 2: Approx. 5 mm {0.197 in.} when cut at the second segment

CHASSIS SERIAL NUMBER, VEHICLE IDENTIFICATION NUMBER AND ENGINE SERIAL NUMBER

EN01F00ZZZ010A02001010

1. VEHICLE IDENTIFICATION SERIAL NUMBER

- (1) Vehicle identification serial number is stamped near the front wheel on the RH or LH of the chassis frame.



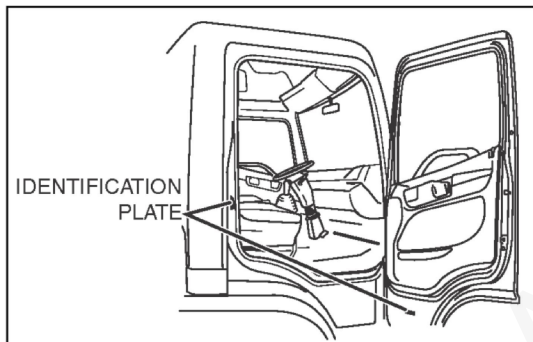
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2. VEHICLE IDENTIFICATION NUMBER PLATE

- (1) An identification plate having stamped production number, production series code (P.S. Code) and the vehicle identification number are fitted on the pillar or lower part of the door.

NOTICE

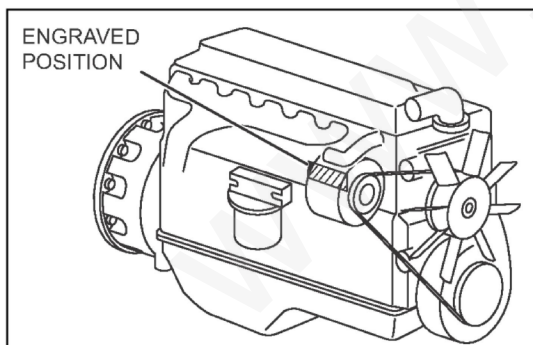
According to the country, the production series code (P.S. Code) may not be stamped on the identification plate.



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3. ENGINE MODEL AND ENGINE SERIAL NUMBER

- (1) Engine model and engine serial number are engraved on the right side of the cylinder block. When ordering parts, notify us of these numbers for quick support.



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GLOSSARY

EN01F00ZZZ010A02001011

LIST OF ABBREVIATION

Abbreviations	Meaning, or Official Name
A/C	Air Conditioner
ABS	Anti-lock Brake System
ACC	Accessory
ACU	Auto Clutch Unit
ADR	Australian Design Rule
AMT	Automated Manual Transmission
AT	Automatic 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
Fr	Front
FRP	Fiber Reinforced Plastic

Abbreviations	Meaning, or Official Name
FUP	Front Underrun Protector
GND	Ground
GVW	Gross Vehicle Weight
Hi	High
HINO DX II	HINO Diagnostic eXplorer II
HSC	HINO Signal Converter
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
PM	Particulate Matter
PPG	Glass-fiber-reinforced Polypropylene
ppm	Parts Per Million
PS	Power Steering
PTO	Power Take-Off

Abbreviations	Meaning, or Official Name
PVD	Physical Vapor Deposit
PWR	Power
QR code	Quick Response Code
R/A	Rear Axle
RH	Right Hand
SCR	Selective Catalytic Reduction
SCV	Suction Control Valve
SST	Special Service Tool
SW	Switch
T/M	Transmission
VCS	Vehicle Control System
VNT	Variable Nozzle Turbine
VSS	Vehicle Speed control System

RECOMMENDED LUBRICANTS

EN01F00ZZZ010A02001012

No.	LUBRICANTS	POSITIONS	VISCOSITY RECOMMENDATIONS (SAE)
1	Engine oil (API: CI-4, CI-4 PLUS, CJ-4) (JASO: DH-1, DH-2) (ACEA: E-4, E-6, E-7, E-9)	Cylinder block	<p>Temperature scales: -40 -22 -4 14 32 50 68 86 104 °F and -40 -30 -20 -10 0 10 20 30 40 °C</p> <p>SAE 5W-30 range: -40 to 104 °F</p> <p>SAE 10W-30 range: -30 to 104 °F</p> <p>SAE 15W-40 range: -20 to 104 °F</p>
2	Gear oil [API: GL-4 (SAE 90)] (API: GL-5)	Transmission: MX06	<p>Temperature scales: 10 32 90 °F and -12 0 32 °C</p> <p>SAE 90 range: 10 to 90 °F</p> <p>SAE 80W-90 range: -12 to 90 °F</p>
	Lubricants: ZF-Ecofluid M Refer to "TRANSMISSION (ZF 9S1110)"	Transmission: ZF 9S1110	For a complete information on ZF transmission, see "List of Lubricants" in this manual.
3	Hypoid gear oil (API: GL-5)	Differential (Rear): SH16, SH17, THD17	<p>Temperature scales: 10 32 90 °F and -12 0 32 °C</p> <p>SAE 140 range: 32 to 90 °F</p> <p>SAE 90 range: 10 to 90 °F</p> <p>SAE 80W-90 range: -12 to 90 °F</p>
4	Gear oil (API: GL-4)	Steering	

No.	LUBRICANTS	POSITIONS
5	Power steering fluid (ATF DEXRON®)	Integral power steering gear
6	Brake fluid (DOT-3 or DOT-4)	Brake
7	Clutch fluid (DOT-3 or DOT-4)	Clutch
8	Wheel bearing grease Lithium base wheel bearing grease NLGI No.2 LITH-IUM-SOAP	Wheel hub
9	Chassis grease Lithium base multipurpose grease, NLGI No.2	Steering, suspension, etc.
10	Cab tilt oil (MIL-H-5606G or MIL-H-5606E)	Cab tilt cylinder

ENGINE INTRODUCTION (J08E)

2-001

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ENGINE ASSEMBLY

DATA AND SPECIFICATIONS

EN01F01103010102001001

ENGINE SERIES: J08E-WB

Type		Diesel, 4 cycle, vertical, 6 cylinder, in-line overhead camshaft, water-cooled, direct injection
Aspiration		Turbocharged with intercooler
Bore and stroke		112 x 130 mm {4.41 x 5.11 in.}
Piston displacement		7.684 L {468.9 cu.in.}
Compression ratio		18: 1
Firing order		1-4-2-6-3-5 (The cylinder numbers are counted in order from the crankshaft pulley side)
Direction of rotation		Counterclockwise viewed from flywheel
Compression pressure		3.4-3.6 MPa {35-36 kgf/cm ² , 494-522 lbf/in. ² } at 150 r/min.
Maximum revolution (at full load)		2,500 r/min.
Idling revolution		500 r/min.
Dry weight		Approximately 600 kg {1,323 lb.}
Valve seat angle	Intake	30°
	Exhaust	45°
Valve face angle	Intake	30°
	Exhaust	45°
Valve timing (flywheel travel)	Intake opens	14° before top dead center
	Intake closes	30° after bottom dead center
	Exhaust opens	54° before bottom dead center
	Exhaust closes	13° after top dead center
Valve clearance (when cold)	Intake	0.30 mm {0.0118 in.}
	Exhaust	0.45 mm {0.0177 in.}
Engine oil pump	Type	Full forced pressure feed by gear pump
	Drive	By gear
Engine oil cooler		Multi-plate type, water cooled
Injector	Type	Multi-hole nozzle type
Coolant pump	Type	Forced circulation by volute pump
	Drive	By V-ribbed belt
Thermostat type		Wax.type, bottom bypass system
Injection timing (flywheel travel)		0° before top dead center for No.1 cylinder of the compression stroke

ENGINE TUNEUP

EN01F01103010H03001001

VALVE CLEARANCE CHECKING AND ADJUSTING PROCEDURES

⚠ CAUTION

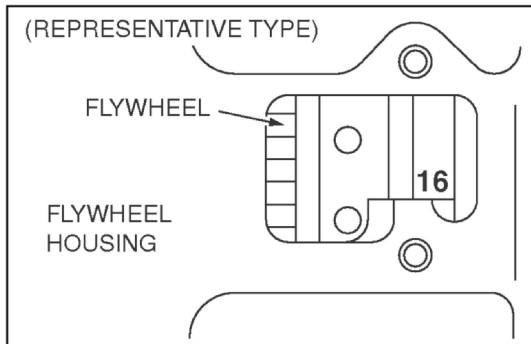
Valve clearance adjustment is performed only when the checking result is not within the specified value.

1. PREPARATION OF CHECKING AND ADJUSTMENT

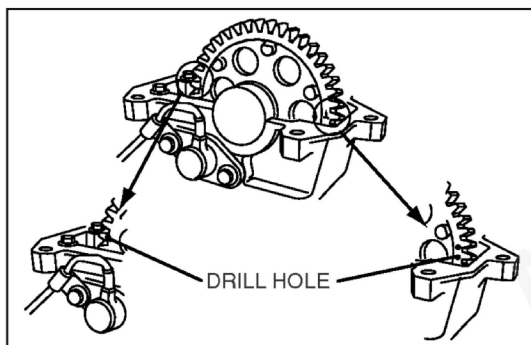
- (1) Turn the crankshaft counterclockwise (viewed from the flywheel side) to align mark "16" on the outer periphery of the flywheel with the pointer of the flywheel housing.

NOTICE

- Always turn the crankshaft counterclockwise (viewed from the flywheel side).
- In this position the No.1 or No.6 piston is at the Top Dead Center of the compression stroke.



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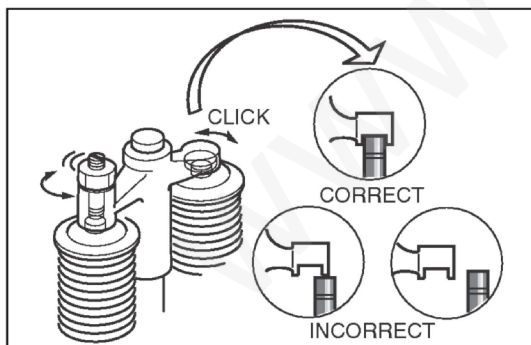


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- (2) Among three drill holes on the camshaft gear, when two drill holes are on horizontal position, and the rest of the drill hole is visible, the No.1 piston is at the Top Dead Center of the compression stroke.

NOTICE

If the rest of drill hole is invisible by camshaft housing, the No.6 piston is at the Top Dead Center of the compression stroke.



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- (3) Make sure that the valve stem is correctly inserted in the cross head.

NOTICE

Move the cross head with fingers right and left to confirm the valve stem is correctly inserted in the cross head by listening to the clicking sound.

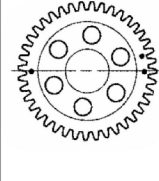
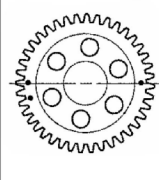
- (4) Confirm that there are no foreign particles or dust between the cross head and the valve stem.

2. VALVE CLEARANCE CHECKING

NOTICE

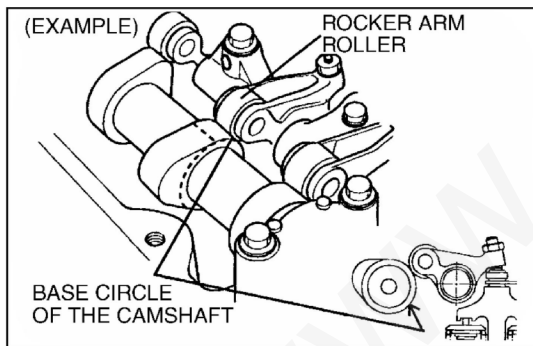
Before beginning the checking, you must perform "PREPARATION OF CHECKING AND ADJUSTMENT" described on page 2-3.

- (1) You can understand which valve to adjust when No.1 or No.6 piston is at the Top Dead Center of the compression stroke by the following chart.

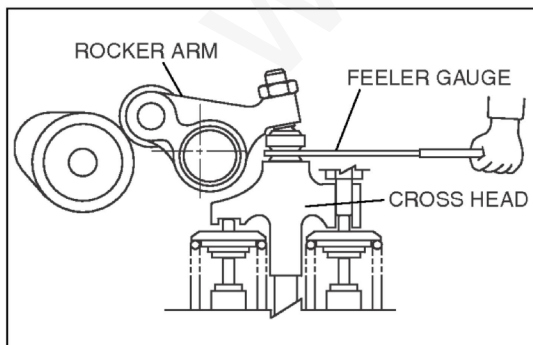
	Cylinder			1		2		3		4		5		6	
	Valve			IN	EX	IN	EX	IN	EX	IN	EX	IN	EX	IN	EX
With No.1 piston at T.D.C. on compression stroke	Camshaft gear condition		Two drill holes and camshaft housing is horizontal. The rest of drill hole is visible. #1	○	○		○	○			○	○			
With No.6 piston at T.D.C. on compression stroke			Two drill holes and camshaft housing is horizontal. The rest of drill hole is invisible. #1				○		○	○			○	○	○

- #1= View from rear side of camshaft housing
- ○Mark: Possible to check valve clearance
- Firing order: 1-4-2-6-3-5
- T.D.C.: Top Dead Center

- (2) Before checking the valve clearance, make sure that the roller is on the base circle of the camshaft.



SHTS011030100006



SHTS011030100007

- (3) Insert a feeler gauge of the specified thickness as below between the rocker arm and the cross head to check the valve clearance.

VALVE CLEARANCE (when cold)

Intake valve	0.30 mm {0.0118 in.}
Exhaust valve	0.45 mm {0.0177 in.}

⚠ CAUTION

Valve clearance adjustment is performed only when the checking result is outside the specified value.

3. VALVE CLEARANCE ADJUSTMENT

⚠ CAUTION

Valve clearance adjustment is performed only when the checking result is outside the specified value.

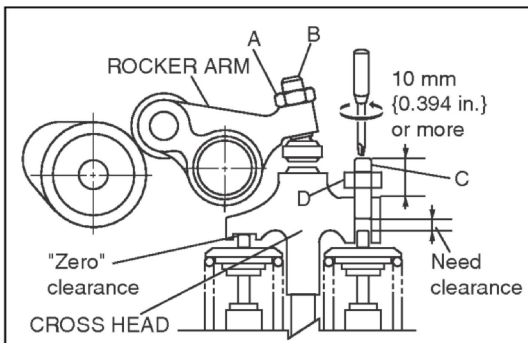
NOTICE

- Before beginning the adjustment you must perform "PREPARATION OF CHECKING AND ADJUSTMENT" described on page 2-3.
- As for the valve which can adjust the valve clearance refer to the chart on page 2-4.
- Make sure that the cylinder head bolt, rocker arm support bolt, nozzle clamp bolt, cam housing bolt and cam bearing cap bolt are tightened to the specified torque.

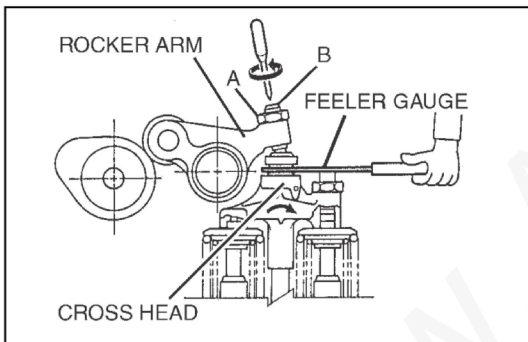
- (1) Loosen the adjusting screw lock nut A, D of the rocker arm and cross head fully.
- (2) The cross head adjusting screw must protrude 10 mm {0.394 in.} or more from the cross head upper face.

NOTICE

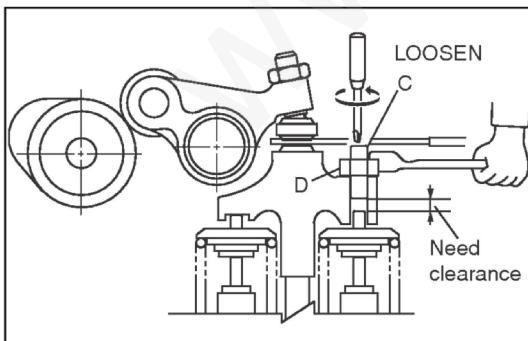
Unless the adjusting screw is completely loose to the valve stem head, the following adjustments may be adversely affected.



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SHTS011030100009



SHTS011030100010

- (3) Insert a feeler gauge of the specified thickness shown below between the rocker arm and the cross head, and adjust the valve clearance with the adjust screw of the rocker arm.

VALVE CLEARANCE (when cold)

Intake valve	0.30 mm {0.0118 in.}
Exhaust valve	0.45 mm {0.0177 in.}

- (4) After completion of the adjustment, tighten the lock nut A securely with the specified tightening torque.

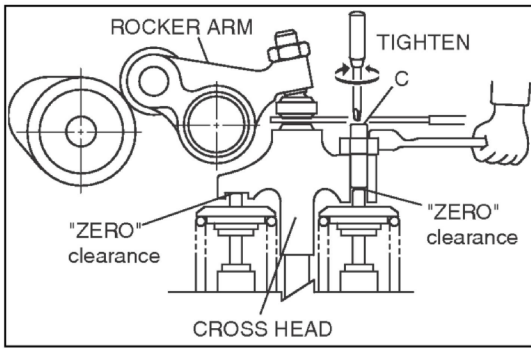
Tightening Torque:

25 N·m {250 kgf·cm, 18 lbf·ft}

- (5) The condition of inserted feeler gauge, loosen the adjusting screw of the cross head, make sure that the feeler gauge does not feel loose.

NOTICE

If the feeling of the feeler gauge becomes loose, repeat steps from (1).

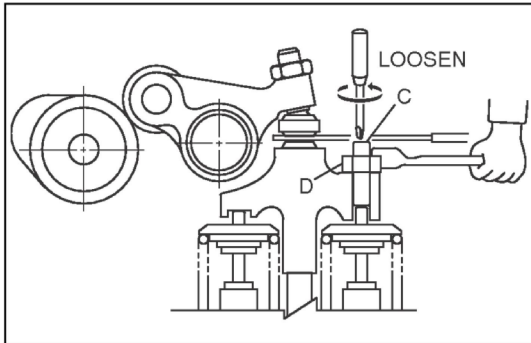


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- (6) Tighten the adjusting screw C of the cross head until the feeler gauge does not move.

NOTICE

In this situation, clearance between adjusting screw C and valve stem head is zero.

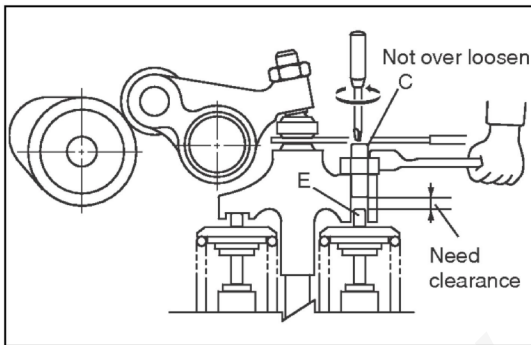


SHTS011030100012

- (7) While loosening the adjusting screw C of the cross head gradually, adjust the valve clearance. Tighten the lock nut D of the cross head securely with the specified tightening torque when the feeler gauge feels correct.

Tightening Torque:

25 N·m {250 kgf·cm, 18 lbf·ft}



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NOTICE

- Do not over loosen the adjusting screw.
- Over loosening of the adjusting screw C will cause the same condition as in step (3) again. The feeler gauge may feel correct, but there may be excessive clearance between the adjusting screw C of the cross head and the valve stem head E. This does not allow for correct adjustment.

- (8) Position each piston at Top Dead Center of compression stroke by turning the crankshaft counterclockwise viewed from flywheel side. Then adjust the valve clearance for each cylinder in the firing order.

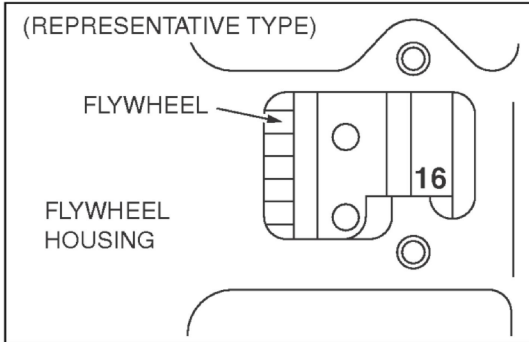
INJECTION TIMING INSPECTION PROCEDURES

1. INSPECT THE INJECTION TIMING.

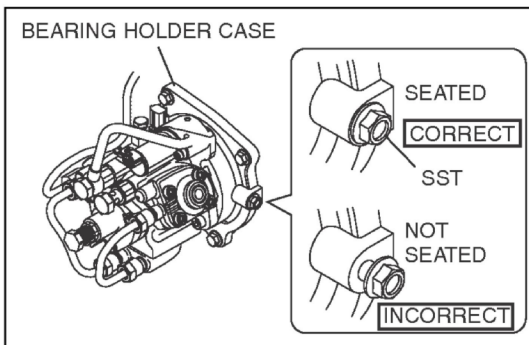
- (1) Turn the crankshaft counterclockwise (viewed from the flywheel side) to align mark "16" on the outer periphery of the flywheel with the pointer of the flywheel housing.

NOTICE

Always turn the crankshaft counterclockwise (viewed from the flywheel side).



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SHTS011030100015

- (2) Taking off the inspection hole plug, located at bearing holder case of supply pump and tightening slightly the special tool therein, check that the seat face of tool is seated with the bearing holder.

SST: SZ105-08067
Guide bolt

NOTICE

When it is not seated, it means it is contacting with other parts than the turning stopper hole of coupling flange. Therefore, do not tighten in too much. In this case, the timing is not fit. So, perform again the setting for Top Dead Center of No.1 cylinder compression stroke in above (1).

START THE ENGINE

⚠ WARNING

Do not leave tools on or around the engine. Contact of tools with moving parts may result in personal injury or damage to equipment.

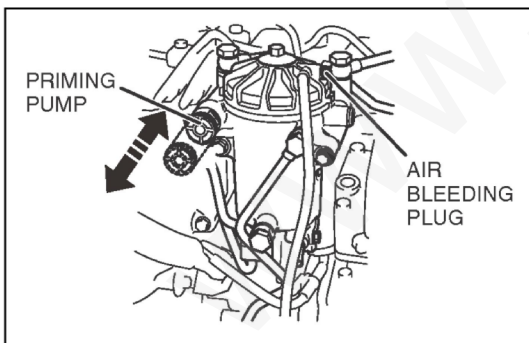
1. PREPARATION

- (1) Supply engine oil.
- (2) Supply cooling water and bleed air from it.
- (3) Bleed air from the fuel system.
- (4) Check connection to the alternator.

NOTICE

Starting the engine without wiring in place may burn out the alternator.

- (5) Check the engine stopping performance.



SHTS011030100016

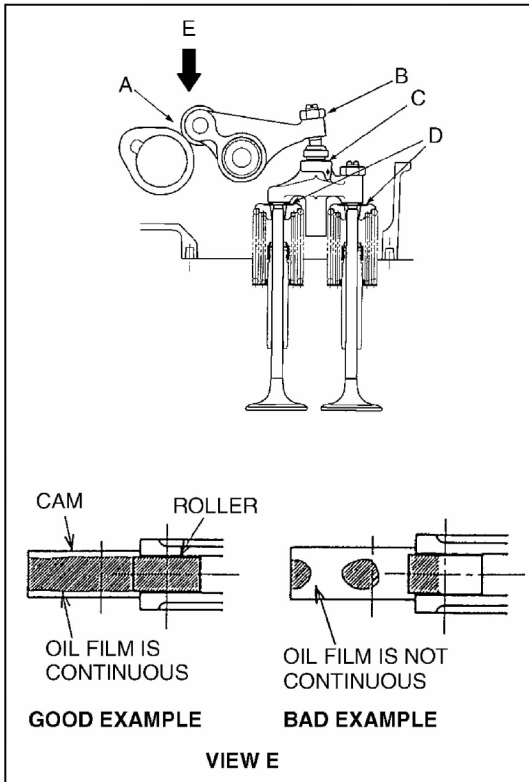
LUBRICATION

1. CHECK THE ROCKER ARM.

- (1) Remove the head cover.
- (2) Set the engine revolution to the specified idling revolution.
- (3) After the engine starts, check that oil is supplied to the following locations of all rocker arms within approximately 10 seconds.
 - a. Roller and cam face A
 - b. Cross head top C and spring upper seat top face D through adjusting screw B

NOTICE

If the supply of oil is delayed or not happening, hydraulic pressure may be low or the oil gallery may be clogged. Insufficient supply of oil may lead to seizure, abnormal wear or abnormal noise. Recheck the assembly.

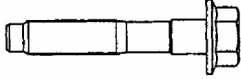

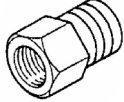


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SPECIAL TOOL

EN01F01103010K01001001

Prior to starting an engine overhaul, it is necessary to have these special tools.

Illustration	Part No.	Name	Remarks
	SZ105-08067	GUIDE BOLT	For " ENGINE TUNEUP "
	S0955-21110	COMPRESSION GAUGE ADAPTER (A)	For " OVERHAUL CRITERIA "
	S0955-21030	COMPRESSION GAUGE ADAPTER (B)	For 3/4-16UNF thread size
	S0955-21060	COMPRESSION GAUGE ADAPTER (B)	For W16 threads 18 threads size
			Select according to the thread size of air gauge.

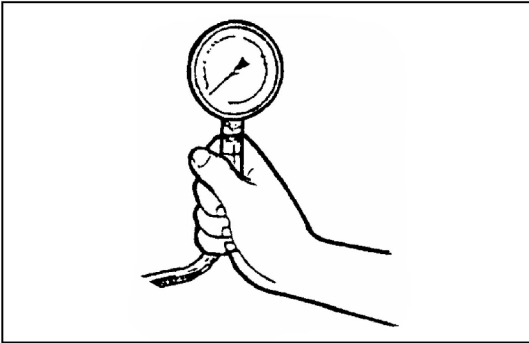
OVERHAUL CRITERIA

EN01F01103010H03001002

FACTORS TO DETERMINE THE ENGINE OVERHAUL

1. LOW COMPRESSION PRESSURE

- (1) Before measurement
 - a. Charge the battery completely.
 - b. Set the valve clearance to the correct value.
 - c. Idle the engine (Coolant temperature at 80°C {176°F}).
 - d. Remove the air cleaner.
 - e. Remove all injectors.
- (2) Measurement
 - a. Insert the gauge adaptor into the nozzles.
 - SST: S0955-21110**
Compression gauge adaptor (A)
S0955-21030
Compression gauge adaptor (B)
S0955-21060
Compression gauge adaptor (B)
 - b. Run the engine with the starter and measure the compression pressure.



SHTS011030100021

Standard	Limit	Difference between each cylinder
2.9-3.1 MPa {30-31 kgf/cm ² , 421-449 lbf/in. ² }	2.3 MPa {24 kgf/cm ² , 334 lbf/in. ² }	0.3 MPa {3 kgf/cm ² , 43 lbf/in. ² }
Engine revolution 150 r/min.		

NOTICE

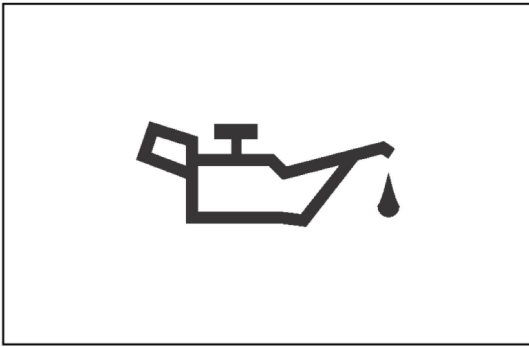
Do not operate the starter for more than 15 seconds.

- c. Measure the compression pressure of each cylinder.

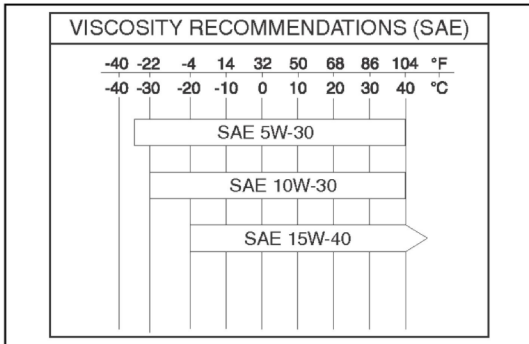
NOTICE

Do not allow gas leakage from the seal face.

- (3) Reassemble the removed parts.



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SHTS011030100023

2. ENGINE OIL PRESSURE

- (1) Check the oil pressure warning light when the oil and coolant temperature is hot [about 80°C {176°F}].
 - a. If the warning light lightens, check the oil level.
 - b. Check oil deterioration.
If oil quality is poor, replace with a suitable grade oil.
 - c. Remove the oil pressure switch and install the oil pressure gauge.

- d. Measure the oil pressure at a coolant temperature of 80°C {176°F} or more.

Oil pressure

Standard	Limit
49-490 kPa {0.5-5.0 kgf/cm ² , 7.11-71.10 lbf/in. ² }	Less than 49 kPa {0.5 kgf/cm ² , 7.11 lbf/in. ² }

3. OTHER FACTORS

- (1) Increase of blowby gas
- (2) Defective engine start
- (3) Decrease of engine output
- (4) Increase of fuel consumption
- (5) Increase of engine noise
- (6) Increase of oil consumption

DISMOUNTING AND MOUNTING

EN01F01103010H01001001

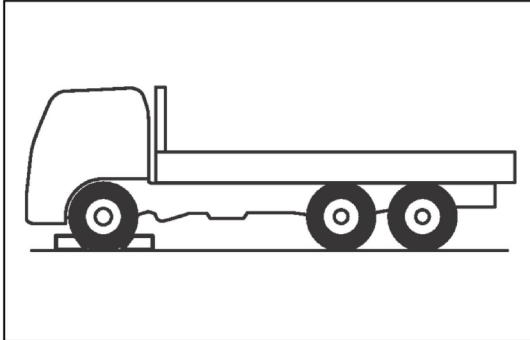
IMPORTANT POINT - DISMOUNTING

1. DISMOUNT THE ENGINE ASSEMBLY.

- (1) Park the vehicle on level ground and then block the wheels.
- (2) Disconnect a battery cable from the negative battery terminal.

HINT

- For a vehicle equipped with an electric tilt device, tilt the cab before disconnecting the battery cable.
- Over tilt work is not required for a vehicle equipped with an electric tilt device.



SHTS011030100024

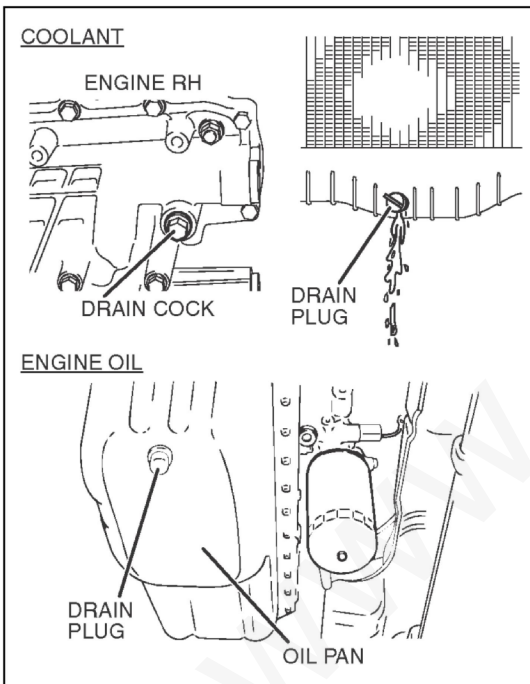
- (3) Remove the oil pan cover.

Reference: ENGINE MECHANICAL (J08E), MAIN MOVING PARTS AND CYLINDER BLOCK, MAIN MOVING PARTS AND CYLINDER BLOCK (Page 3-37)

- (4) Drain coolant from the radiator and cylinder block, and engine oil from the oil pan.

⚠ WARNING

To avoid the danger of burns, do not drain the coolant and engine oil while the engine and radiator are still hot.



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- (5) Disconnect the power steering piping and hose.
- (6) Disconnect the electric lines, fuel lines and air lines.

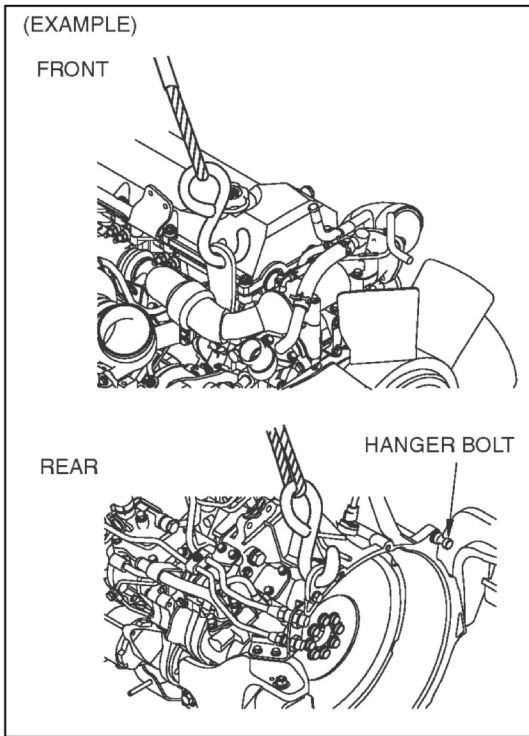
NOTICE

- Disconnect the battery cable from the negative terminal (-) of the battery and disconnect the electric lines.
- Cover open ends of the pipes, hoses and pumps to prevent entry of dirt.

- (7) Disconnect the hoses (coolant, heater and air intake) and remove the radiator.

NOTICE

Do not damage the radiator.

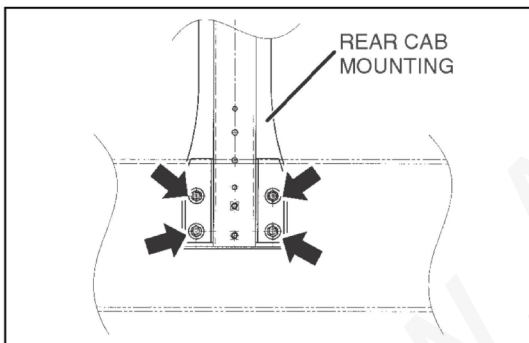


SHTS011030100026

- (8) Disconnect the air intake and exhaust lines.
- (9) Disconnect the propeller shaft.
- (10) Disconnect the transmission control and transmission with clutch housing from the flywheel housing.
- (11) Remove the cab mounting member from the frame.
- (12) Connect a cable from an engine hanger to the generator brace (1 point) on the front of the engine, and to the hanger bracket (1 point) on the flywheel housing at the rear of the engine. Using a hoist, raise the hanger until there is a bit of slack in the cables.
Engine weight: **Refer to the section "DATA AND SPECIFICATIONS"**.
- (13) Remove the engine mounting fitting nuts (front and rear, both sides).
- (14) Lift the engine hanger so that the cables are fully tightened, then, after checking that the cables are securely, lift gently and remove the engine from the vehicle.

NOTICE

When the transmission is attached to the engine, attach the third cable to the hanger bolt.



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- (15) Remove the power steering oil reservoir.
Reference: CHASSIS, POWER STEERING
- (16) Remove the 8 bolts. Using the hoist crane, remove the rear cab mounting from the frame.

⚠ CAUTION

Handle it with care because it is a heavy load.

IMPORTANT POINTS - MOUNTING

1. MOUNT THE ENGINE ASSEMBLY.

- (1) Mount the engine assembly in the reverse order of dismounting.

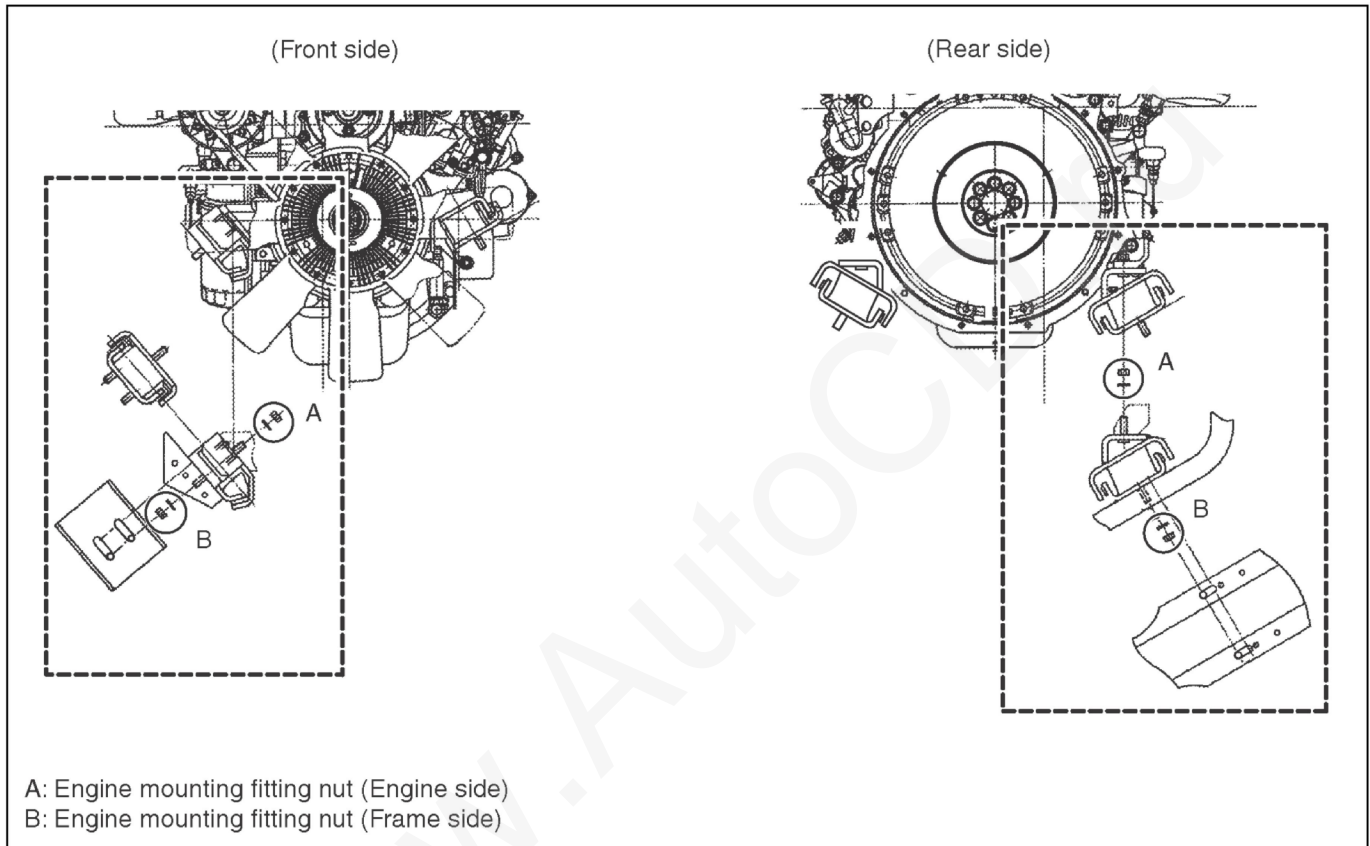
Tightening Torque:

A: 118 N·m {1200 kgf·cm, 87 lbf·ft}

B: 63 N·m {642 kgf·cm, 46 lbf·ft}

NOTICE

Check to see that there are no oil leaks, fuel leaks, coolant leaks, or air leaks.



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- (2) Lift the rear cab mounting by using the hoist crane and mount it to the frame with the 8 bolts.

Tightening Torque:

125-169 N·m {1,275-1,725 kgf·cm, 93-124 lbf·ft}

⚠ CAUTION

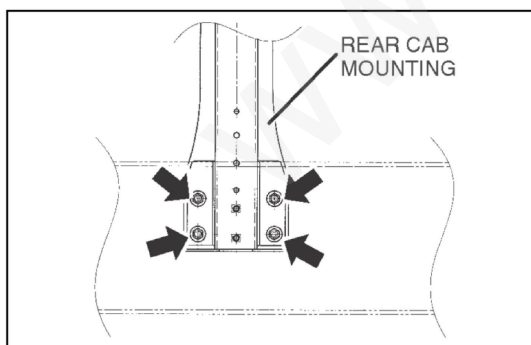
Handle it with care because it is a heavy load.

NOTICE

Use the new bolts with reassembling.

HINT

Returning to the standard tilt is not required for a vehicle equipped with an electric tilt device.



SHTS011030100029

LIQUID GASKET AND APPLICATION POINTS

EN01F01103010H02001001

- Liquid gasket is used at the following positions for the J08E series engine.

Liquid gasket specification

ThreeBond TB1207B or equivalent: Black

Liquid gasket specification

ThreeBond TB1207D or equivalent: Silver

Liquid gasket specification

ThreeBond TB1211 or equivalent: White

1. LIQUID GASKET APPLICATION AND PART ASSEMBLY PROCEDURE

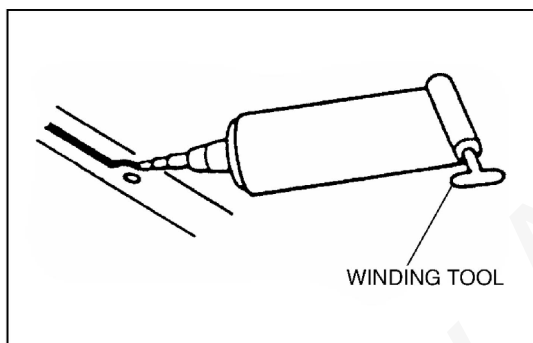
- (1) Remove old liquid gasket from each part and matching parts and wipe off oil, moisture or dirt with a rag.
- (2) Overlap the liquid gasket at the start and end of application.
- (3) Be careful of misalignment when assembling parts with liquid gasket. If they are misaligned, reapply the liquid gasket.
- (4) Assemble parts within 20 minutes of application. If more than 20 minutes have passed, remove and reapply the liquid gasket.
- (5) Wait for at least 15 minutes or more after assembly of parts before starting the engine.

2. REMOVE PARTS

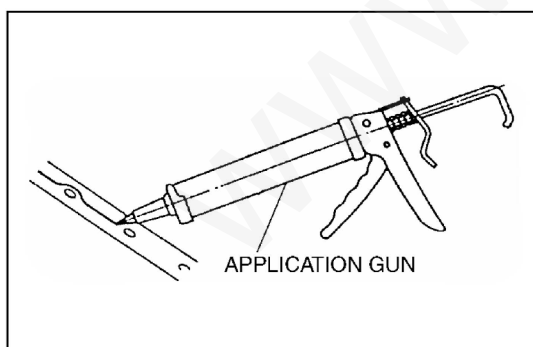
- (1) When removing parts, do not use a tool for removal at one location only. Use the tool at various locations such as a flange step or gap for removal. When removing the gasket, be careful that gasket residue does not enter the engine.

3. OTHERS

- (1) For tube-type liquid gasket, use the winding tool that comes with the liquid gasket.
- (2) For cartridge-type gasket, use an application gun.



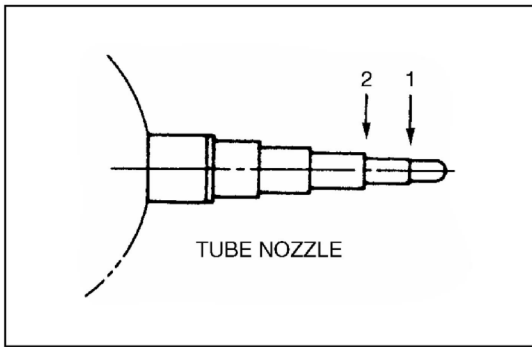
SHTS011030100030



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(3) For tube-type liquid gasket, required width of application can be obtained by cutting the nozzle to suit.

- 1: Approximately 2 mm {0.079 in.} wide when cut at the 1st step
- 2: Approximately 5 mm {0.197 in.} wide when cut at the 2nd step



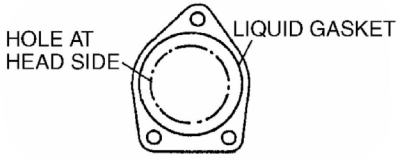
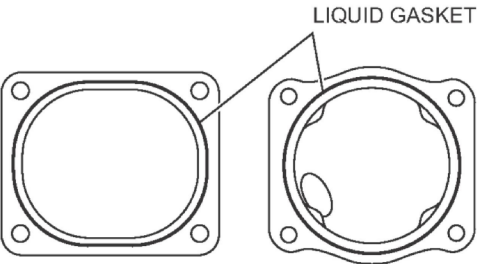
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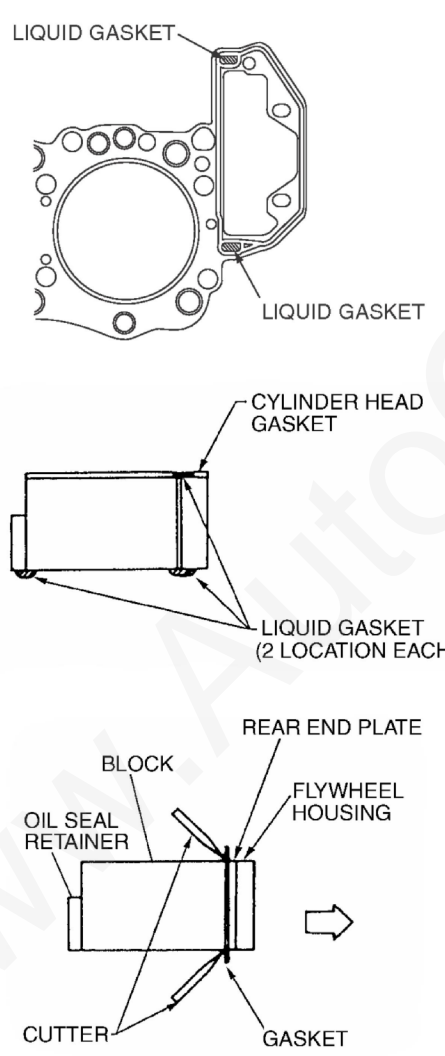
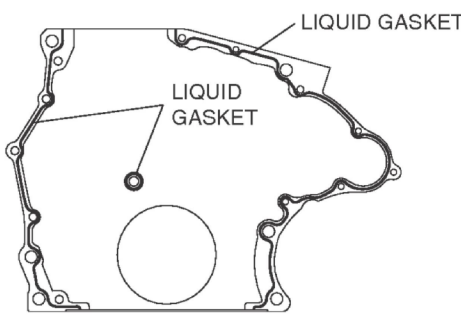
4. PARTS AND POSITIONS FOR LIQUID GASKET

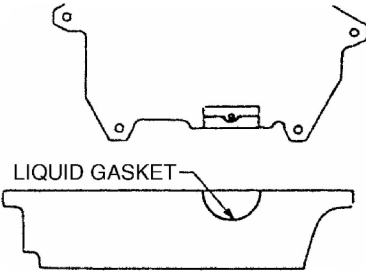
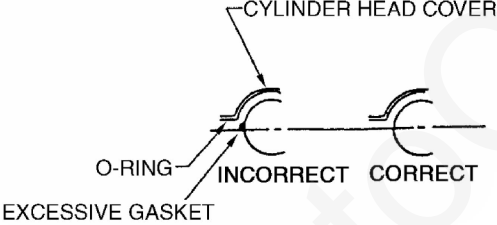
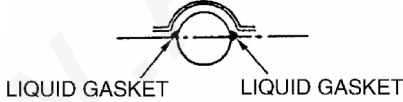
(1) Apply liquid gasket to positions and types of gasket according to the table shown below.
Follow the application pattern at each position shown in the figures.

Unit: mm {in.}

No.	Part name	Application position and pattern	Application width	Gasket to be used	Remarks
1	Oil seal retainer	<p>Matching flange face with the block</p>	<p>1.5-2.5 {0.0591-0.0984}</p>	Black	
2	Coolant pump	<p>Matching flange face with the block</p>	<p>1.5-2.5 {0.0591-0.0984}</p>	Black	
3	Oil cooler	<p>Matching flange face with the block</p>	<p>1.5-2.5 {0.0591-0.0984}</p>	Black	
4	Thermostat case	<p>Matching flange face with the cylinder head</p>	<p>1.5-2.5 {0.0591-0.0984}</p>	Black	

No.	Part name	Application position and pattern	Application width	Gasket to be used	Remarks
5	Flange	<p>Matching face with the rear edge</p>  <p>HOLE AT HEAD SIDE</p> <p>LIQUID GASKET</p>	1.5-2.5 {0.0591-0.0984}	Silver	
6	Intake pipe	<p>Matching face with the intake manifold</p>  <p>LIQUID GASKET</p>	1.5-2.5 {0.0591-0.0984}	Black	

No.	Part name	Application position and pattern	Application width	Gasket to be used	Remarks
7	Front and rear ends of upper/lower faces of block	<p>Matching parts of block upper face rear end, gasket, rear end plate, flywheel housing, cylinder head gasket</p> <p>Matching parts of oil seal retainer and block lower face front end</p> <p>Matching parts of block lower front end, gasket, rear end plate and flywheel housing</p>  <p>NOTICE Cut the rear end plate gasket with a craft knife flush with the block upper face.</p>	<p>—</p> <p>1.5-2.5 {0.0591-0.0984}</p> <p>1.5-2.5 {0.0591-0.0984}</p>	<p>White</p> <p>Black</p> <p>Silver</p>	
8	Flywheel housing	<p>Matching face of rear end plate</p> 	<p>1.5-2.5 {0.0591-0.0984}</p>	<p>Silver</p>	

No.	Part name	Application position and pattern	Application width	Gasket to be used	Remarks
9	Cam housing	<p>1. Matching faces with cam housing and plug 2. Matching parts of cam housing, plug, cylinder head cover and gasket</p>  <p>LIQUID GASKET</p> <p>NOTICE</p> <ul style="list-style-type: none"> • Application area of liquid gasket is half circle of cam housing. Never apply it to the upper half circle of the plug. • Remove the excessive gasket completely.  <p>CYLINDER HEAD COVER O-RING INCORRECT CORRECT EXCESSIVE GASKET</p> <ul style="list-style-type: none"> • When the cylinder head cover is assembled, reapply the liquid gasket. (Assembly must be done within 20 minutes.)  <p>LIQUID GASKET LIQUID GASKET</p>	1.5-2.5 {0.0591-0.0984}	Black	2 locations at front and rear ends
<p>NOTICE Figure on the right shows application "pattern" of the liquid gasket. Apply the liquid gasket to the center of seal flange inside whenever possible.</p>					