

[\*8]

- Joint bolt of turbocharger lubrication tube (35): **24.5 – 34.3 Nm {2.5 – 3.5 kgm}**

[\*9]

- Mounting bolt of EGR cooler tube:  
**44.1 – 53.9 Nm {4.5 – 5.5 kgm}**

[\*10]

### Exhaust manifold, turbocharger and connector assembly

- 1) Apply heat-resistant sealant to the fitting parts of the exhaust manifold (between ports No. 2 and No. 3 and between ports No. 4 and No. 5).

Fitting parts:

**Heat-resistant sealant (HOLTS MH705)**

- 2) Fit the gasket and sling and install exhaust manifold (1).
- 3) Tighten the mounting bolts in the following order.

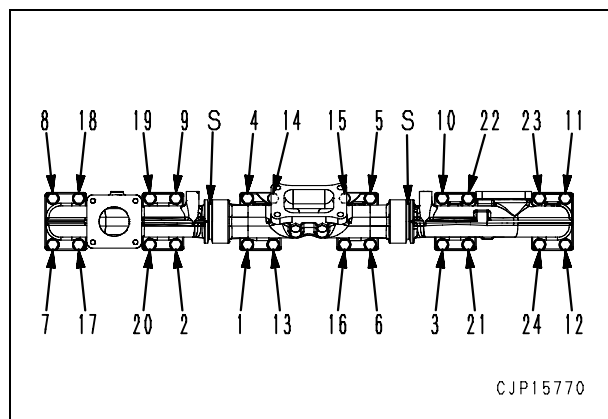
- ★ Tighten the 3 bolts of (1) – (3) shown below temporarily in the numeric order and then tighten other bolts (4) – (24) temporarily in the numeric order. Then, tighten all bolts (1) – (24) to the specified torque in the numeric order.

Mounting bolt:

**Seizure prevention compound (LC-G) (NEVER-SEEZ (Bostik, Inc.) or equivalent)**

Mounting bolt:

**59 – 74 Nm {6 – 7.5 kgm}**



[\*11]

See MIKALOR clamp [\*2].

[\*12]

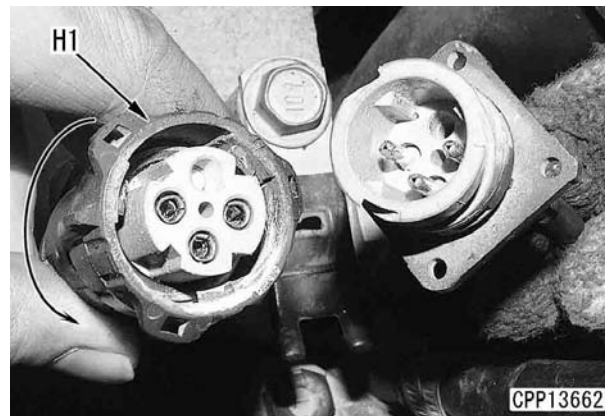
- Corrosion resistor joint bolt:  
**24.5 – 34.3 Nm {2.5 – 3.5 kgm}**

[\*13]

- Fuel return tube joint bolts (48) and (49):  
**9.8 – 12.7 Nm {1.0 – 1.3 kgm}**

[\*14]

- 1) Set the connector groove in position and insert to the end.
- 2) Rotate housing (H1) in the direction of the arrow until it clicks.



[\*15]

- Joint bolt of lubrication tube (56):  
**34.3 – 44.1 Nm {3.5 – 4.5 kgm}**

[\*16] – [\*18]

- Joint bolts of lubrication tubes (60) and (63):  
**24.5 – 34.3 Nm {2.5 – 3.5 kgm}**

- Mounting bolts of EGR valve (64) and bypass valve (61): **59 – 74 Nm {6 – 7.5 kgm}**

[\*19]

- Joint bolt of air vent tube (94):  
**9.8 – 12.7 Nm {1.0 – 1.3 kgm}**

### • Refilling with coolant

Add coolant through the coolant filler to the specified level. Run the engine to circulate the coolant through the system. Then, check the coolant level again.



Coolant: **58 ℓ**

- Bleed air from the fuel system. For details, see Testing and adjusting, "Bleeding air from fuel system".

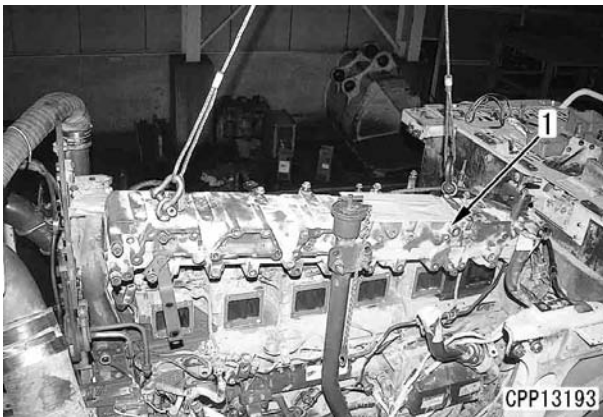


**Before starting the engine, check that the wiring harnesses are at least 10 mm apart from the high-pressure pipe.**

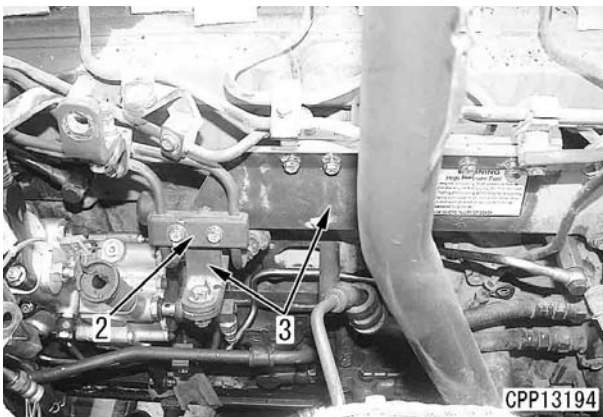
## Removal and installation of fuel injector assembly

### Removal

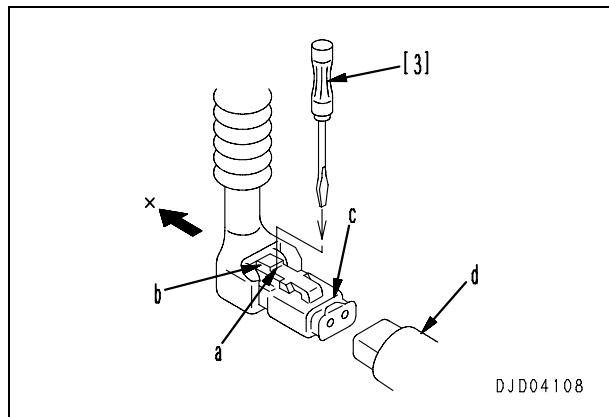
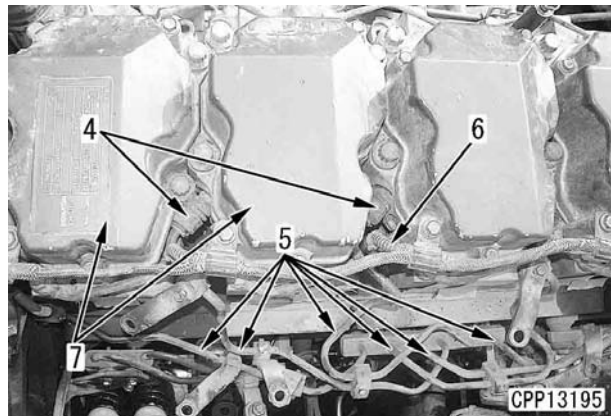
1. Remove the counterweight assembly. For details, see "Removal and installation of counterweight assembly".  
(The counterweight must be removed to bar the engine.)
2. Remove the air intake manifold assembly (1). For details, see "Removal and installation of cylinder head assembly".



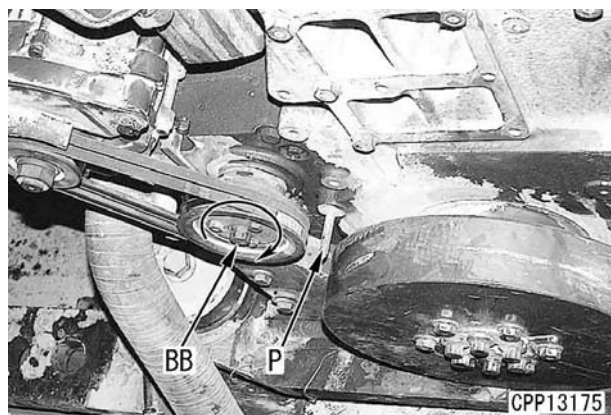
3. Remove clamp (2).
4. Remove brackets (3).



5. Remove covers (4).  
★ Remove the common rail side, too.
6. Remove the clamp and high-pressure pipes (5).
7. Disconnect connector (6) of the injector wiring.  
★ Insert flat-head screwdriver [3] in shoulder (a). While pressing stopper (b), move the screwdriver in direction (X), and connector (c) is disconnected.  
(d): Fuel injector wiring side
8. Remove cylinder head covers (7).

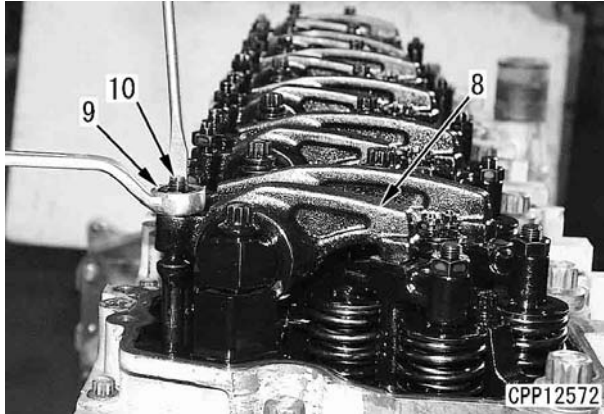


9. By barring the engine with bolt (BB), set stamp 1-6TOP of the damper to pointer (P).



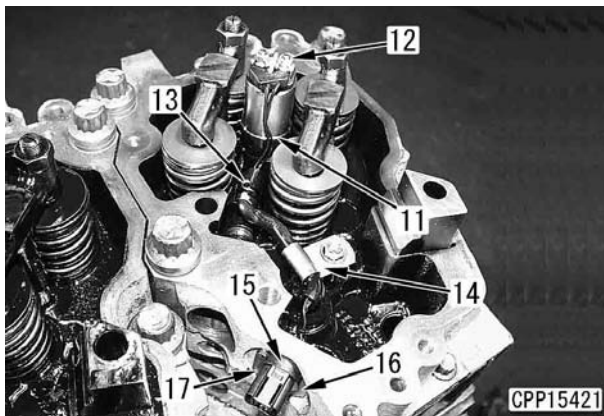
10. Remove the mounting bolts and rocker arm assembly (8).

★ Loosen locknut (9), and then loosen adjustment screw (10) by 2 – 3 turns so that an excessive force will not be applied to the push rod when the rocker arm assembly is installed.



11. Disconnect the injector wiring harness according to the following procedure.

- 1) Remove 2 nuts (12) of the upper solenoid valve of fuel injector (11).
  - 2) Pull out spring clamp (13).
  - 3) Disconnect clamp (14).
- ★ Remove the injector wiring harness according to the following procedure.
- 1) Remove 1 mounting bolt (hexagon socket head bolt) (17) of holder (16) of connector (having an O-ring) (15).
  - 2) Remove holder (16) and push in connector (15) to remove. [\*1]



12. Remove holder mounting bolt (19) of fuel injector assembly (11).

★ Insert small L-shaped bar [2] under the connection of the fuel injector and pry off the injector slowly.

★ Do not grip the solenoid valve on the fuel injector with pliers etc. to remove.



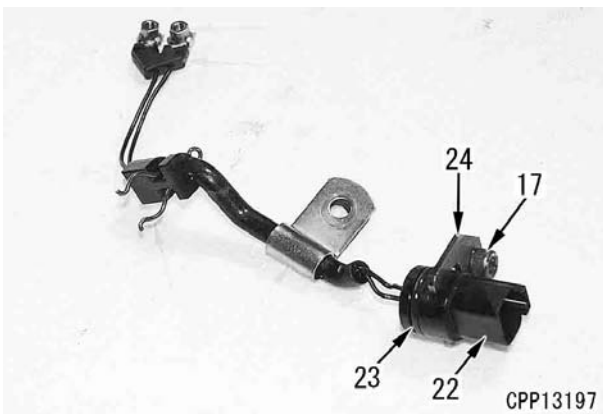
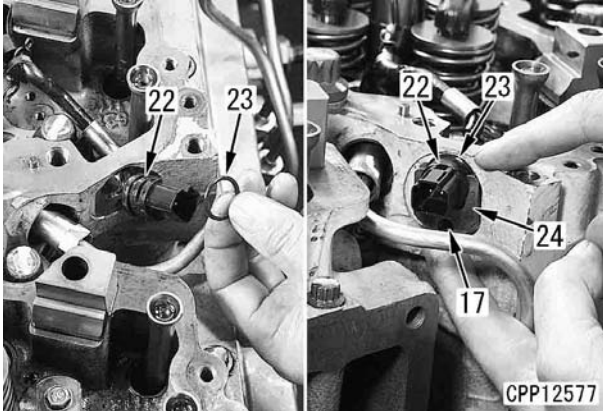
## Installation

1. Referring to installation step 4 and after in "Removal and installation of cylinder head assembly", install the removed parts up to the air intake manifold.
- **Carry out the following installation in the reverse order to removal.**
- ★ When installing the parts, observe the precautions described in "Removal and installation of cylinder head assembly".

[\*1]

### Procedure for installing fuel injector wiring harness assembly

- ★ It is difficult to install the connector having the O-ring from inside.
- 1) Remove O-ring (23) and take wiring harness connector (22) out of the connector insertion opening.
  - 2) Fit O-ring (23) and apply engine oil (SAE30) to its outside.
  - 3) Install connector holder (24) and push it in.
  - 4) Fix connector holder (24) with mounting bolt (17).



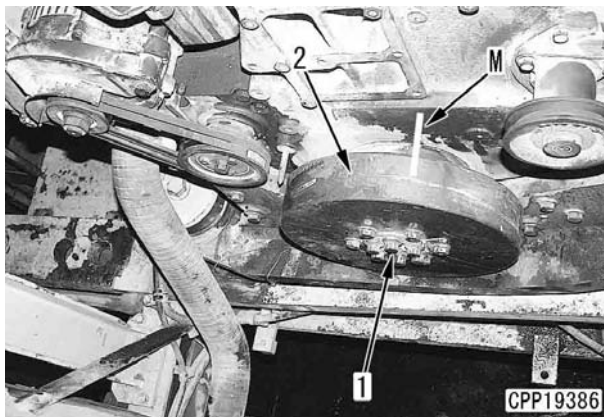
## Removal and installation of engine front seal

### Special tools

Symbol	Part number	Part name	Necessity	Q'ty	N/R	Sketch
A	3	795-931-1100	Seal puller	■	1	
		795T-521-1111	Push tool	■	1	N ○
	4	01050-31655	Bolt	■	3	
		01050-31635	Bolt	■	3	
	5	795T-521-1150	Push tool	■	1	N ○
		01050-31635	Bolt	■	3	

### Removal

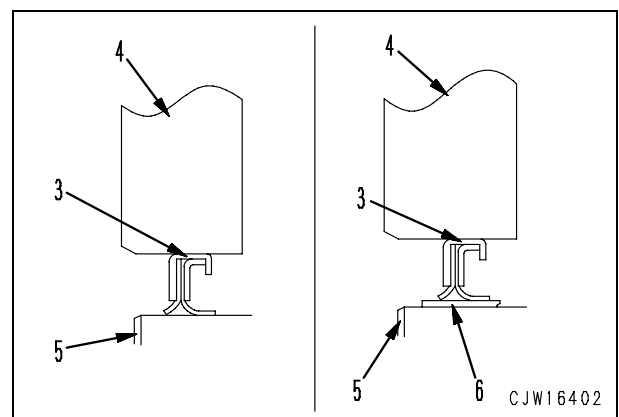
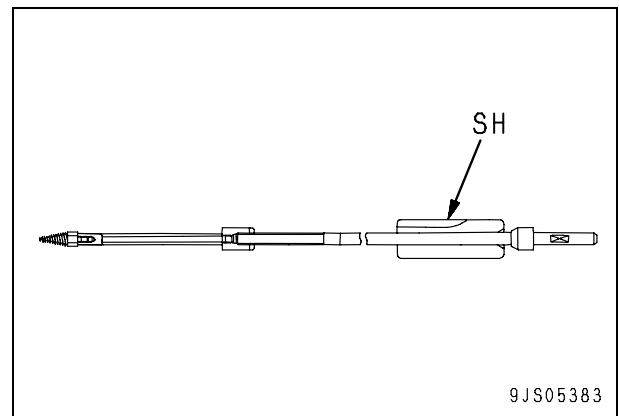
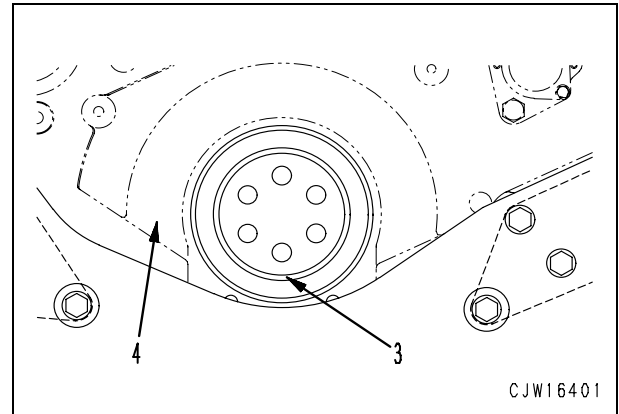
1. Remove the fan and fan shroud assembly. For details, see "Removal and installation of fan motor assembly".
2. Remove inside 6 mounting bolts (1) and pulley and damper assembly (2).
  - ★ Since there are stamps on damper (2), make a match mark (M) on it and the front cover.



3. Remove front seal (3) from housing (4) according to the following procedure.
  - ★ Take care in the removal not to damage front seal (3) installation position on housing (4) and the seal contact face on crankshaft (5).
  - ★ Before removing, slightly drive the front seal in once to free it from fixation.
  - ★ When front seal (3) is fixed too hard to the housing (4), carry out the following procedure.
    - 1) Drill through a hole of approx. 3 mm dia. on front seal (3).
    - 2) Replace the tip of tool **A3** with the drill type one.

- 3) Insert the top end of tool **A3** into the drilled hole, and remove the front seal by the impact of slide hammer (SH). (Apply the slide hammer evenly not to tilt the front seal.)

- ★ Remove the metal powders completely.
- ★ When the sleeve is attached, cut sleeve (6) using a gad and hammer to remove it.
- ★ Take care not to damage crankshaft (5).

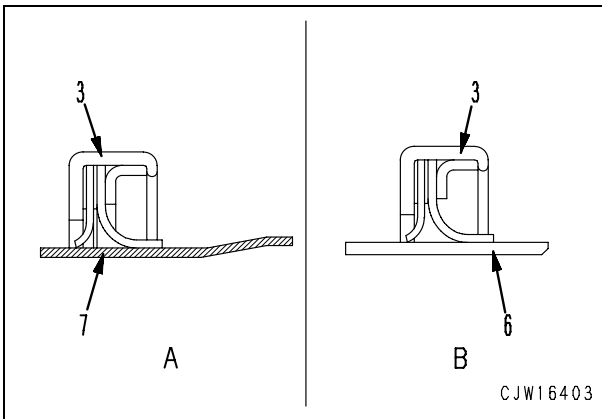


## Installation

- ★ Check the seal by checking the wear of the shaft and replace it with the "standard seal" or "sleeved seal".  
If the shaft is worn to the degree of luster (If wear which you feel with your finger is less than 10  $\mu\text{m}$ ) and does not have any flaw, install "standard seal A". In other cases, install "sleeved seal B".
- ★ (7): Plastic inside cylinder which is also used as installation guide.
- ★ (6): Sleeve.
- ★ Do not remove installation guide (7) from front seal (3) before installing the front seal.
- ★ Handle front seal (3) and sleeve (6) as an assembly and never separate them from each other.

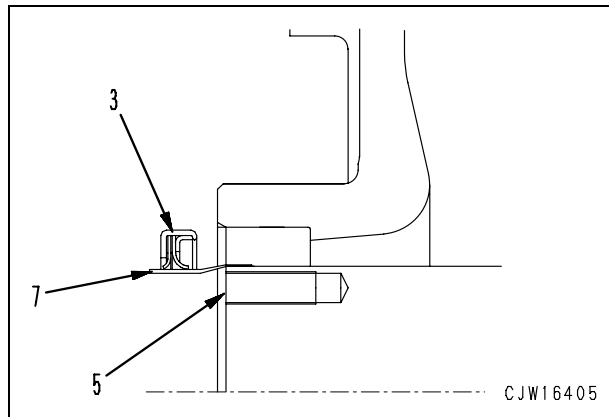
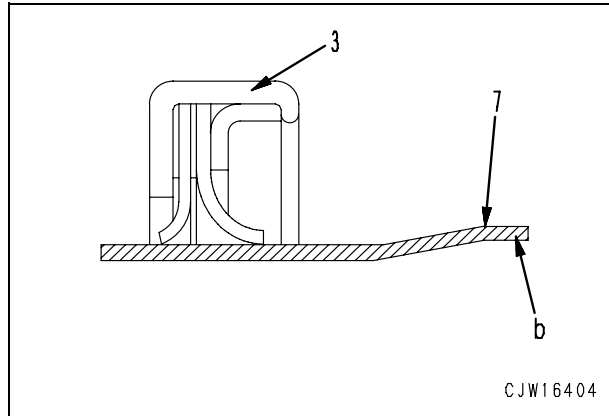
Standard spare seal

Sleeved seal

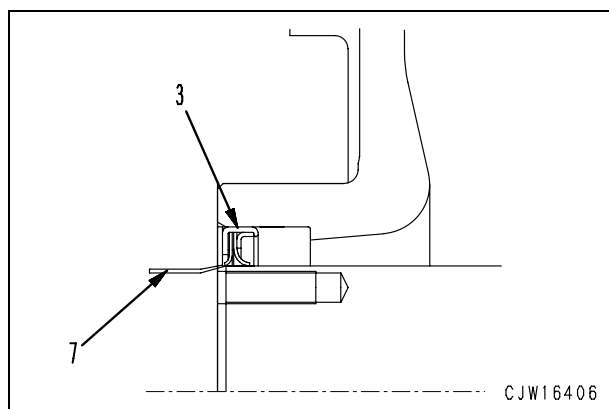


### 1. Procedure for installing standard seal

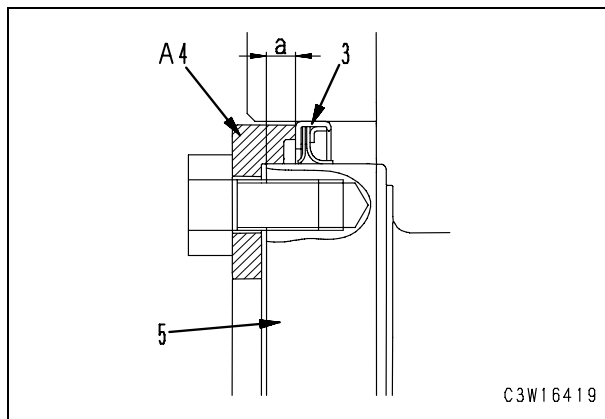
- ★ Before installing the seal, check that the end corners and lip sliding surfaces of the crankshaft are free from flaw, burr, and rust of the housing.
  - ★ When installing the seal, do not apply oil or grease to the shaft and seal lip. Wipe off the oil from the shaft.
  - ★ Never remove inside plastic cylinder (7) of the replacement seal before installing the seal.
- 1) Set large inside diameter side (b) of plastic inside cylinder (7) to the end of crankshaft (5).
    - ★ Take care not to mistake the direction of the plastic inside cylinder.



- 2) Push the metal ring of front seal (3) evenly as if you are passing over the large inside diameter side of plastic inside cylinder (7).
  - ★ Hit the metal ring of front seal with plastic hammer evenly.
  - ★ Do not hit it strongly.
- 3) After pushing in the seal, remove plastic inside cylinder (7).
  - ★ When removing the inside cylinder, take care not to damage the seal lip.




- 4) Using tool **A4**, tighten the 3 bolts evenly to press fit seal (3) until the end of tool **A4** reaches the end of crankshaft (5).
  - ★ Tighten tool **A4** first until the 55-mm bolts stop and then replace the 55-mm bolts with the 35-mm bolts and tighten them.
  - ★ Seal driving distance (a) from crankshaft: **9.1 – 10.1 mm**
  - ★ When press fitting the seal, take care not to damage the lip of the seal with the tool set etc.
  - ★ After press fitting the seal, remove the red sealant layer from its periphery.

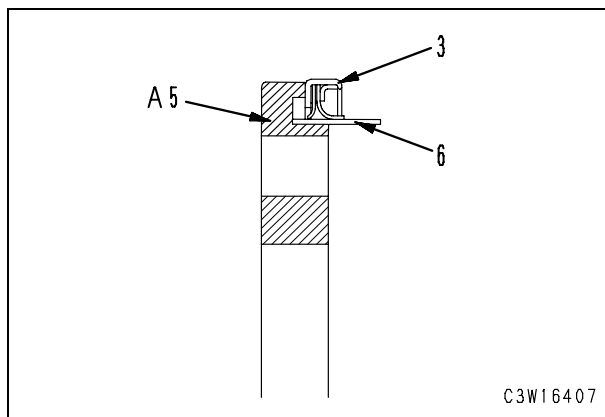


## 2. Procedure for installing sleeved seal

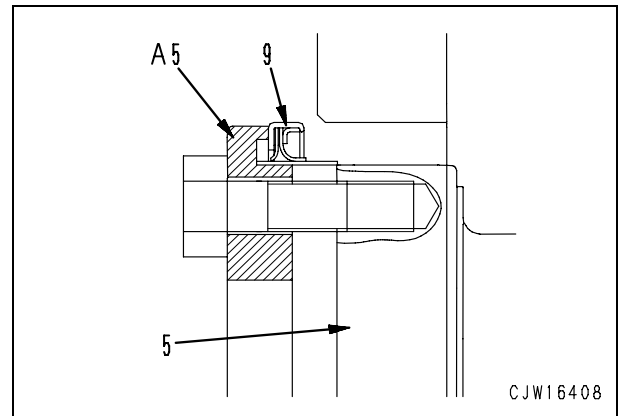
- ★ When installing the front seal, do not apply oil or grease to the shaft, inside cylinder surface of sleeve (6) and seal lip.
- 1) Set sleeve (6) and front seal (3) assembly to tool **A5** (for fitting the sleeved seal).

 Sleeve (6) inside cylinder surface:

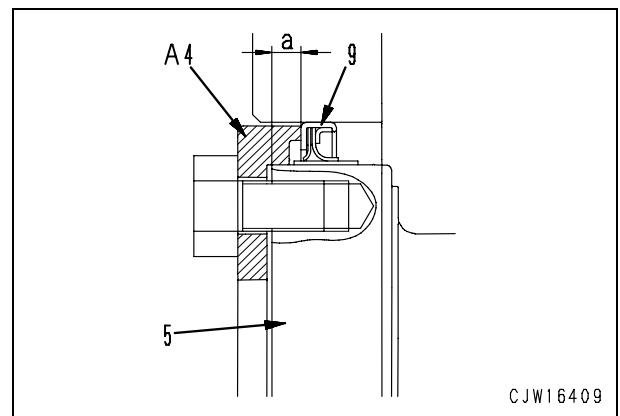
**Gasket sealant (LG-7)**



- 2) Set the sleeve of the front seal to the end of crankshaft (5) and tighten the 3 bolts evenly to press fit sleeve and front seal assembly (9) until the end of tool **A5** reaches the end of crankshaft (5).
  - ★ Tighten tool **A5** (for press fitting the sleeved seal) until the **35-mm** bolt stops.



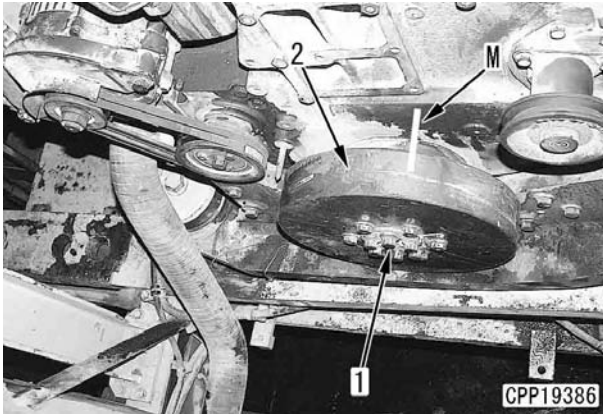
- 3) Remove tool **A5** (for press fitting the sleeved seal) and install tool **A4** (for press fitting the seal).
- 4) Tighten the 35-mm bolts of tool **A4** evenly to press fit seal and sleeve assembly (9) until the end of tool **A4** reaches the end of crankshaft (5).
  - ★ Seal driving distance (a) from crankshaft: **9.1 – 10.1 mm**
  - ★ When press fitting the seal, take care not to damage the lip of the seal with the tool set etc.
  - ★ After press fitting the seal, remove the red sealant layer from its periphery.



3. While setting match mark (M), install pulley and damper assembly (2) and tighten the mounting bolt (1).

🔧 Mounting bolt:

**245 – 308.7 Nm {25 – 31.5 kgm}**






## Removal and installation of engine rear seal

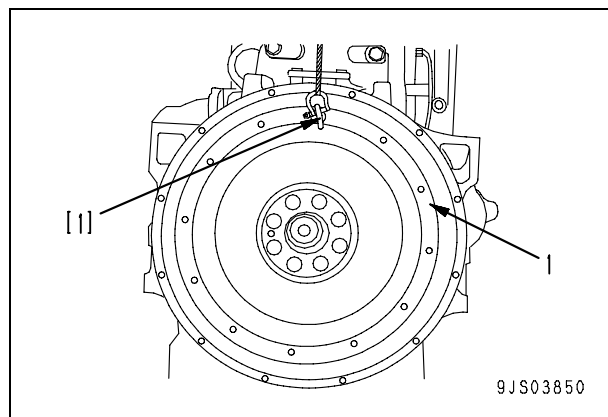
### Special tools

Symbol	Part number	Part name	Necessity	Q'ty	N/R	Sketch
A	3	795-931-1100	Seal puller	■	1	
		795T-421-1270	Push tool	■	1	○
	6	01050-31645	Bolt	■	4	
		01643-31645	Washer	■	8	
		795T-421-1240	Push tool	■	1	○
	7	01050-31645	Bolt	■	4	
		01643-31645	Washer	■	4	
		795T-421-1250	Push tool	■	1	○
	8	01050-31645	Bolt	■	4	
		01643-31645	Washer	■	8	

### Removal

1. Remove the PTO assembly and hub assembly.  
For details, see "Removal and installation of PTO assembly".
2. Remove 1 mounting bolt of flywheel (1) and install guide bolt.
3. Using eyebolt [1] (12 mm, P = 1.75), sling flywheel (1) temporarily and remove the 8 mounting bolts.
4. Move flywheel (1) toward this side and lift it off.  
**⚠ Since the socket part of the flywheel is shallow, it may fall suddenly. Take care not to catch your fingers in the flywheel.**

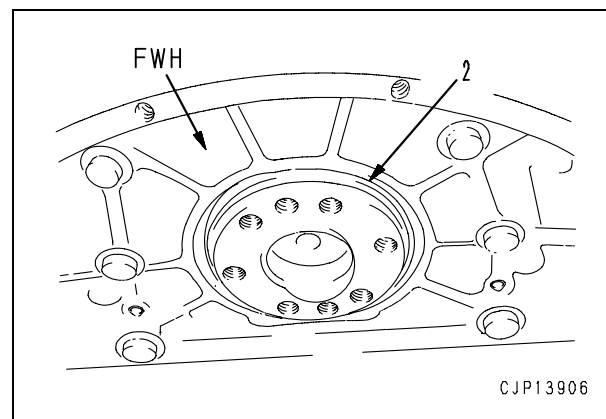
 Flywheel: 65 kg



5. Remove rear seal (2) according to the following procedure.

★ Measure the distance from the end of the housing.

- 1) Before pulling out rear seal (2), drive in it a little to separate it from the flywheel housing (FWH).



- 2) If the seal is sleeved, cut and remove sleeve (5) with a chisel and a hammer.

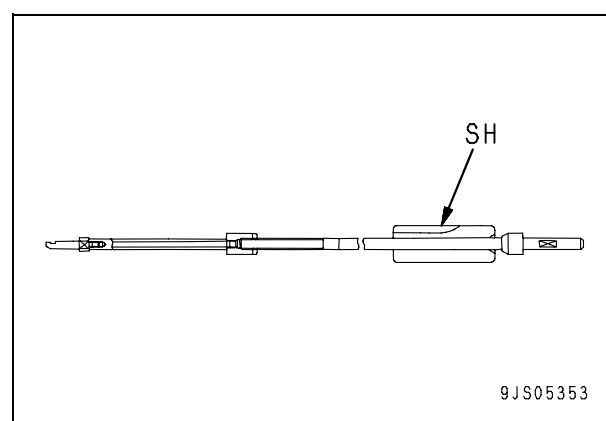
★ When cutting, take care extremely not to damage crankshaft (4).

- 3) Hitch the end of tool A3 to the metal ring of rear seal (2) and pull out the seal with impacts of slide hammer (SH).

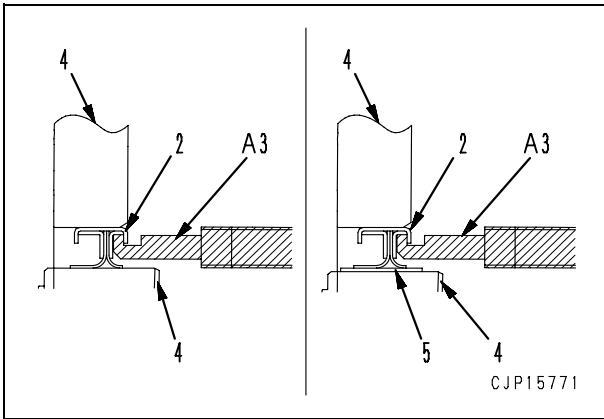
★ Do not use a drill etc. since chips may enter the engine.

★ If chips were made, remove all of them.

- Tool A3



★ Left: Standard seal, Right: Sleeved seal

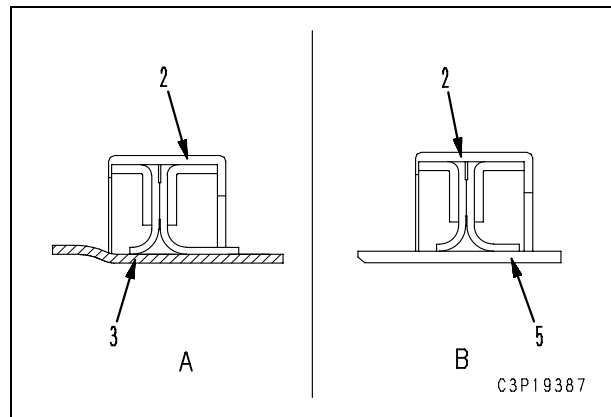


### Installation

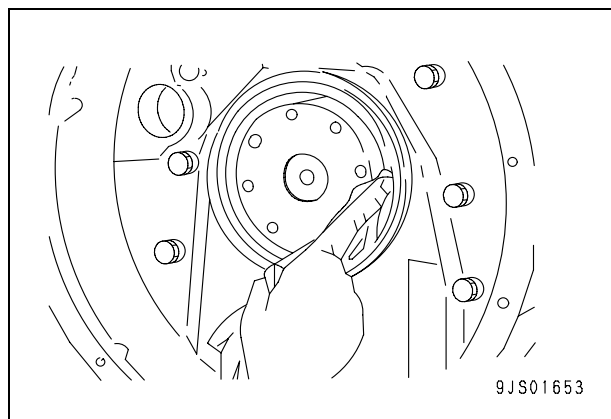
- ★ Check the Teflon seal (Laydown lip seal) by checking the wear of the crankshaft and replace it with the "standard seal" or "sleeved seal".
- If the shaft is worn to the degree of luster (If wear which you feel with your finger is less than 10  $\mu\text{m}$ ) and does not have any flaw, install standard seal (A). In other cases, install sleeved seal (B).
- ★ (3): Plastic inside cylinder which is also used as installation guide.
- ★ (5): Sleeve.
- ★ Do not remove installation guide (3) from rear seal (2) before installing the rear seal.
- ★ Handle rear seal (2) and sleeve (5) as an assembly and never separate them from each other.

● Standard spare seal

● Sleeved seal

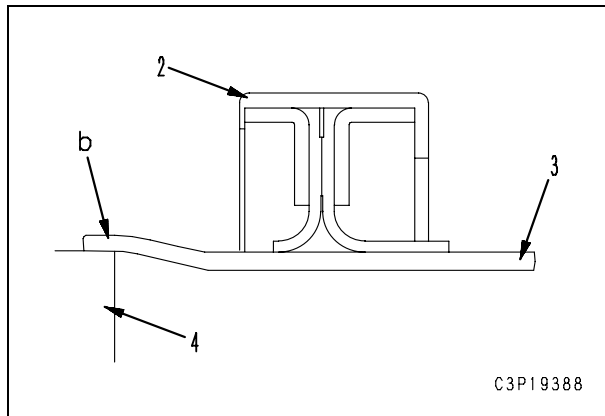


- ★ Clean, degrease, and dry the seal surface on the flywheel housing side.
- ★ Clean, degrease, and dry the seal lip surface (periphery of the crankshaft).
- ★ Before installing the seal, check that the end corners and lip sliding surfaces of the crankshaft are free from flaw, burr, and rust of the housing.

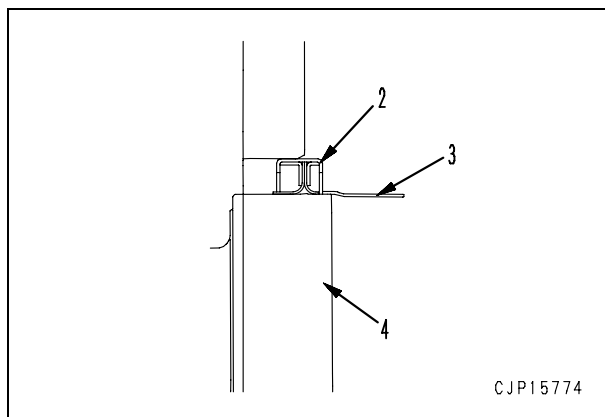


### 1. Procedure for installing standard seal

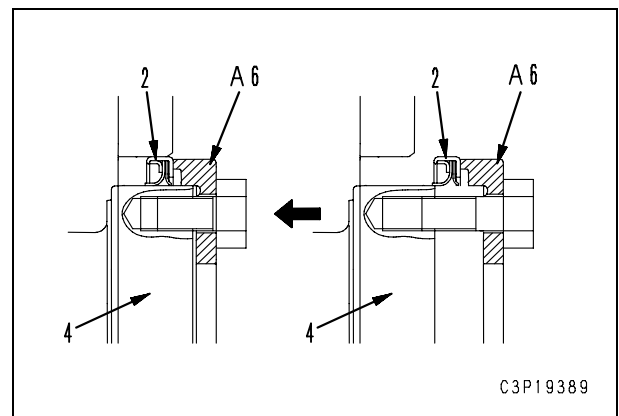
- ★ When installing rear seal (2), do not apply oil or grease to the shaft and seal lip.
- 1) Set large inside diameter side (b) of plastic inside cylinder (3) of rear seal (2) to the end of crankshaft (4).
  - ★ Take care not to mistake the direction of the plastic inside cylinder.



- 2) Hold the metal ring of rear oil seal (2) with both hands and push it in evenly.
- 3) After pushing in the seal, remove plastic inside cylinder (3).
  - ★ When removing the inside cylinder, take care not to damage the seal lip.



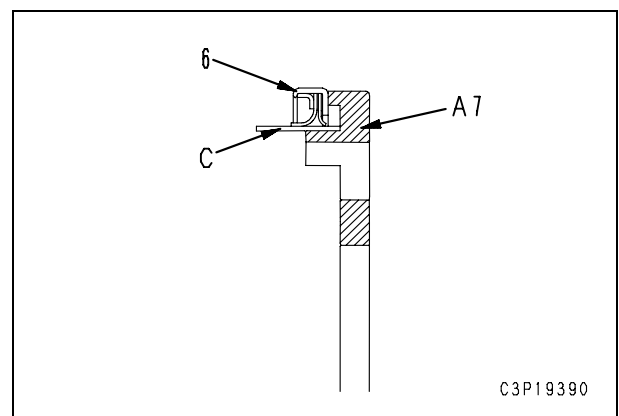
- 4) Tighten the 3 bolts evenly to press fit rear seal (2) until the end of tool A6 (for press fitting the seal) reaches the end of crankshaft (4).
  - ★ Tighten tool A6 (for press fitting the seal) first until it reaches the bolt (45 mm) and then tighten the bolt (25 mm).
  - ★ When press fitting the seal, take care not to damage the lip on the PTO side with the tool set etc.
  - ★ After press fitting the seal, remove the red sealant layer from its periphery.



### 2. Procedure for installing sleeved seal

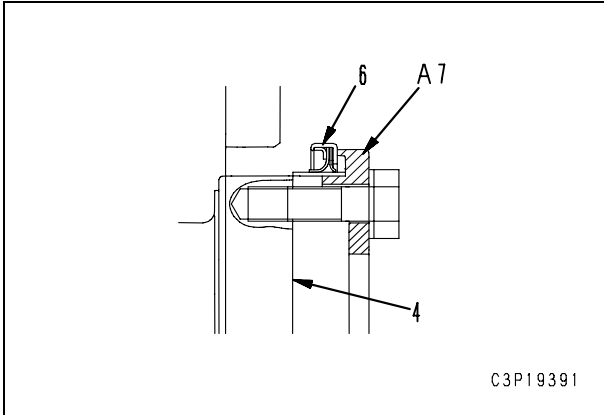
- ★ When installing the rear seal, do not apply oil or grease to the shaft and sleeve inside cylinder surface (C).
- 1) Set sleeve and rear seal assembly (6) to tool A7 (for press fitting the sleeved seal).
  - ✎ Sleeve inside cylinder surface (C):

**Gasket sealant (LG-7)**



- 2) Set sleeve of the rear seal to the end of crankshaft (4) and tighten the 4 bolts of tool **A7** evenly to press fit sleeve and rear seal assembly (6).

★ Tighten tool **A7** (for press fitting the sleeved seal) with 1 washer inserted in each bolt until the bolts reach the end.

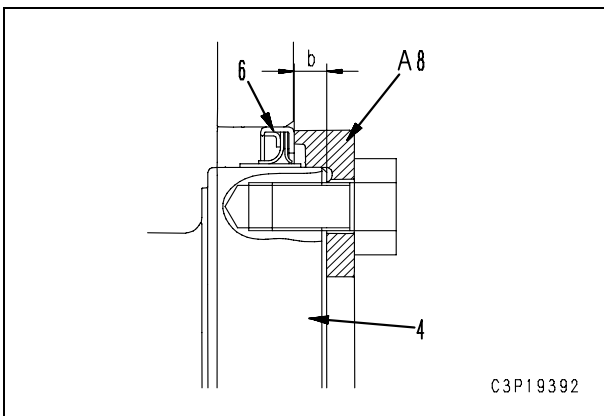


- 3) Remove tool **A7** (for press fitting the sleeved seal) and install tool **A8** (for press fitting the seal).
- 4) Tighten the 4 bolts evenly to press fit sleeve and rear seal assembly (6) until the end of tool **A8** (for press fitting the seal) reaches the end of crankshaft (4).

★ Tighten the bolt of tool **A8** (for press fitting the seal) without washer until it reaches, and then tighten the bolt using 2 washers (for each bolt).

★ After press fitting the seal, remove the red sealant layer from its periphery.

★ Seal driving depth (b) from the end of crankshaft:  $13.2 \pm 0.2$  mm



### 3. Flywheel

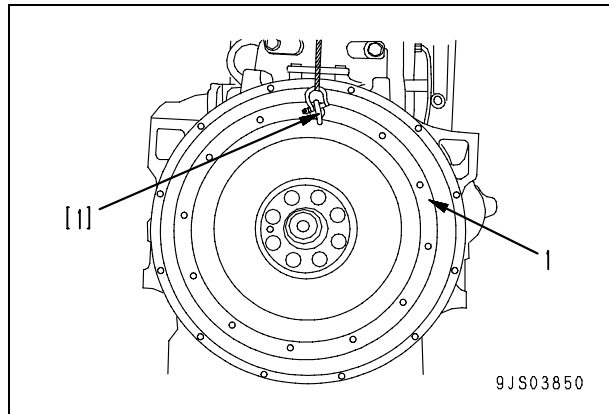
Using eyebolt [1] (12 mm, P = 1.75), sling flywheel (1), install it to the crankshaft, and tighten the bolts.

★ If there are 5 punch marks on a bolt, do not use that bolt but replace it.

Threads and seat of bolt:

**Engine oil (EO30-DH)**

Flywheel: **65 kg**



★ Tighten the mounting bolts according to the following procedure.

Flywheel mounting bolts

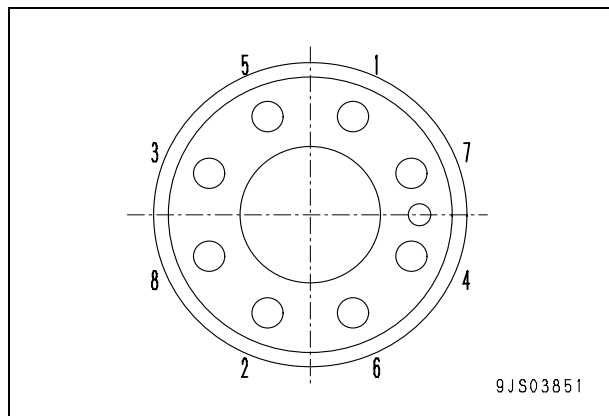
1st time:  $118 \pm 4.9$  Nm  $\{12 \pm 0.5$  kgm}

2nd time: 1) When using tool **A2** (See the tools list)

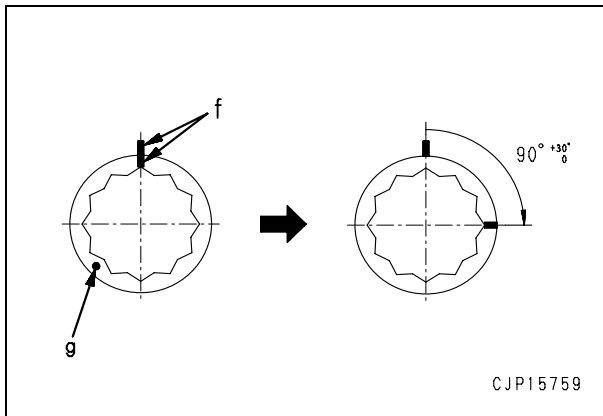
Retighten each bolt by  $90^\circ +30^\circ_0$  in the order of [1] – [8].

2) When not using tool **A2**

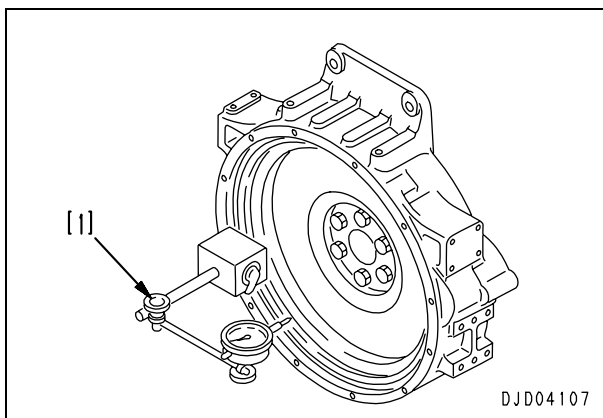
Make marks (f) on each bolt and flywheel with paint, then retighten each bolt by  $90^\circ +30^\circ_0$  in the order of [1] – [8].



- ★ After tightening, make 1 punch mark (g) on each bolt head to indicate the number of tightening time.



- ★ After installing the flywheel, measure the facial runout and radial runout with tool [1].
  - ★ Radial runout: Max. 0.30 mm
  - ★ Facial runout: Max. 0.30 mm



- Carry out the following installation in the reverse order to removal.

PC600, 600LC-8 Hydraulic excavator

Form No. SEN01063-02

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