# HYDRAULIC EXCAVATOR

# SHOP MANUAL model SK200-8 SK210LC-8

# INDEX





KOBELCO


改訂 03 REV

Book Code No.S5YN0018E03

5) For parts which are required to use jig and tools, don't fail to use the specified jig and tools.
6) For parts which can not be removed in the specified procedure, never force removal. First check for the cause.
7) The removed parts should be put in order and tagged so as to install on proper places without confusion.
8) For common parts, pay attention to the quantity and places.

(3) Inspecting parts
1) Check that the disassembled parts are free from adherence, interference and uneven working face.
2) Measure the wear of parts and clearance, and record the measured values.
3) If an abnormality is detected, repair or replace the parts.

(4) Reassembling hydraulic equipment
1) During the parts cleaning, ventilate the room.
2) Before assembly, clean parts roughly first, and then completely.
3) Remove adhering oil by compressed air, and apply hydraulic oil or gear oil, and then assemble them.
4) Replace the removed O-ring, back-up rings and oil seal with new ones, and apply grease oil on them before assembling.
5) Removes dirt and water on the surface on which liquid sealant are applied, decrease them, and apply liquid sealant on them.
6) Before assembling, remove rust preventives on new parts.
7) Use special tools to fit bearings, bushing and oil seal.
8) Assemble parts matching to the marks.
9) After completion, check that there is no omission of parts.

(5) Installing hydraulic equipment
1) Confirm hydraulic oil and lubrication oil.
2) Air release is required in the following cases ;
1. Change of hydraulic oil
2. Replacement of parts on suction pipe side
3. Removing and attaching hydraulic pump
4. Removing and attaching swing motor
5. Removing and attaching travel motor
6. Removing and attaching hydraulic cylinder

**⚠WARNING**

**If hydraulic oil and lubricating oil are not filled and also air bleed is not performed, the hydraulic equipment may be damaged.**

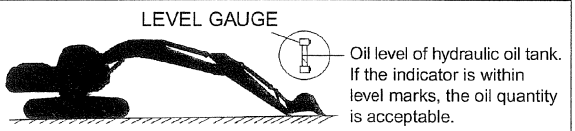
3) For air bleed of hydraulic pump and swing motor, loosen drain plug on the upper part, start engine, and run in low idling, then bleed air until hydraulic oil is comes out. After completion of comes, tighten plug securely.
4) For air bleed of travel motor and hydraulic cylinder, starts engine and operate it for 10 minutes or more at no-load and low speed.

**⚠WARNING**

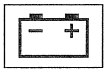
**For cylinder, don't move it to the stroke end at beginning.**

5) Air in pilot circuit can be bleed out by only operating digging, swing and traveling motions thoroughly.
6) Check hydraulic oil level.
Move attachments to hydraulic oil check position, and check hydraulic oil level of tank. Refill oil if the oil level is lower than the specified level.
How to check oil level of hydraulic oil tank

**Important imformation**



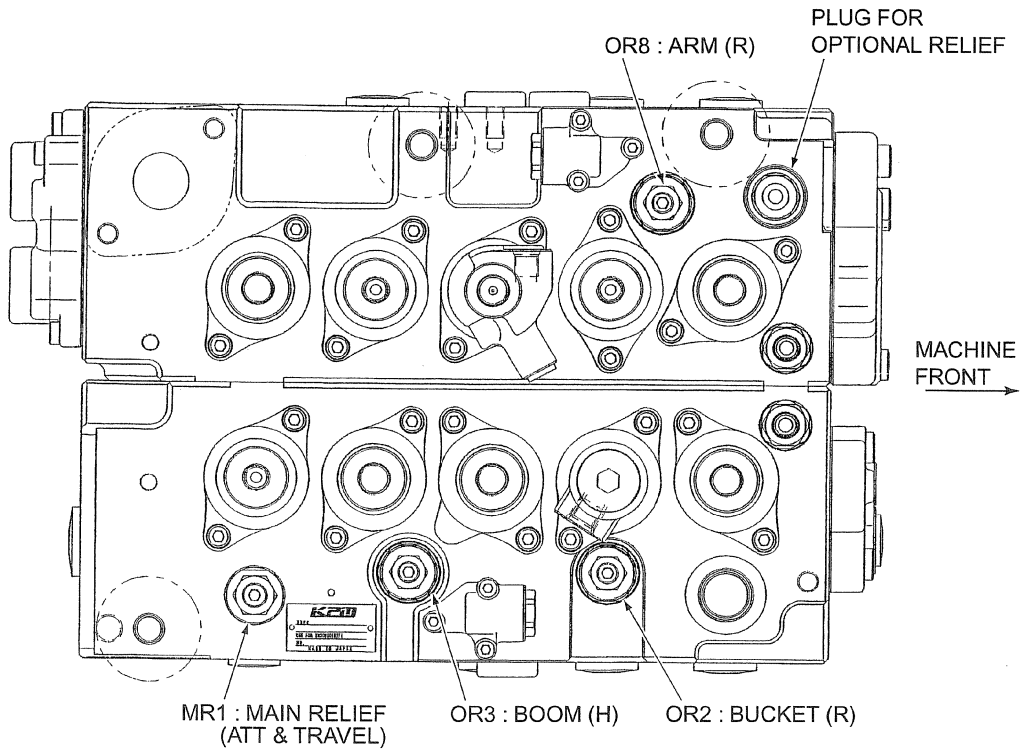

### 1.1.4 ELECTRICAL EQUIPMENT



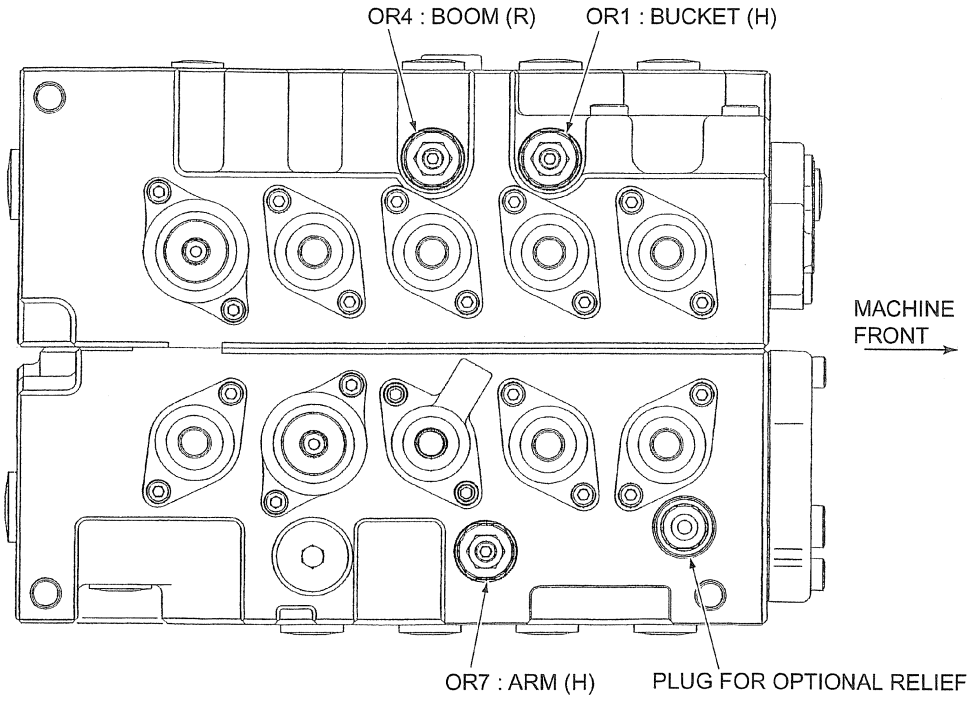

(1) The disassembly of electrical equipment is not allowed.
(2) Handle equipment with care so as not to drop it or bump it.
(3) Connector should be removed by unlocking while holding the connector.
Never stress in tension to the caulked section by pulling wire.
(4) Check that connector is connected and locked completely.
(5) Engine key off before removing and connecting connector.

### 13.4.3 PRESSURE ADJUSTMENT POSITION

(1) Main control valve



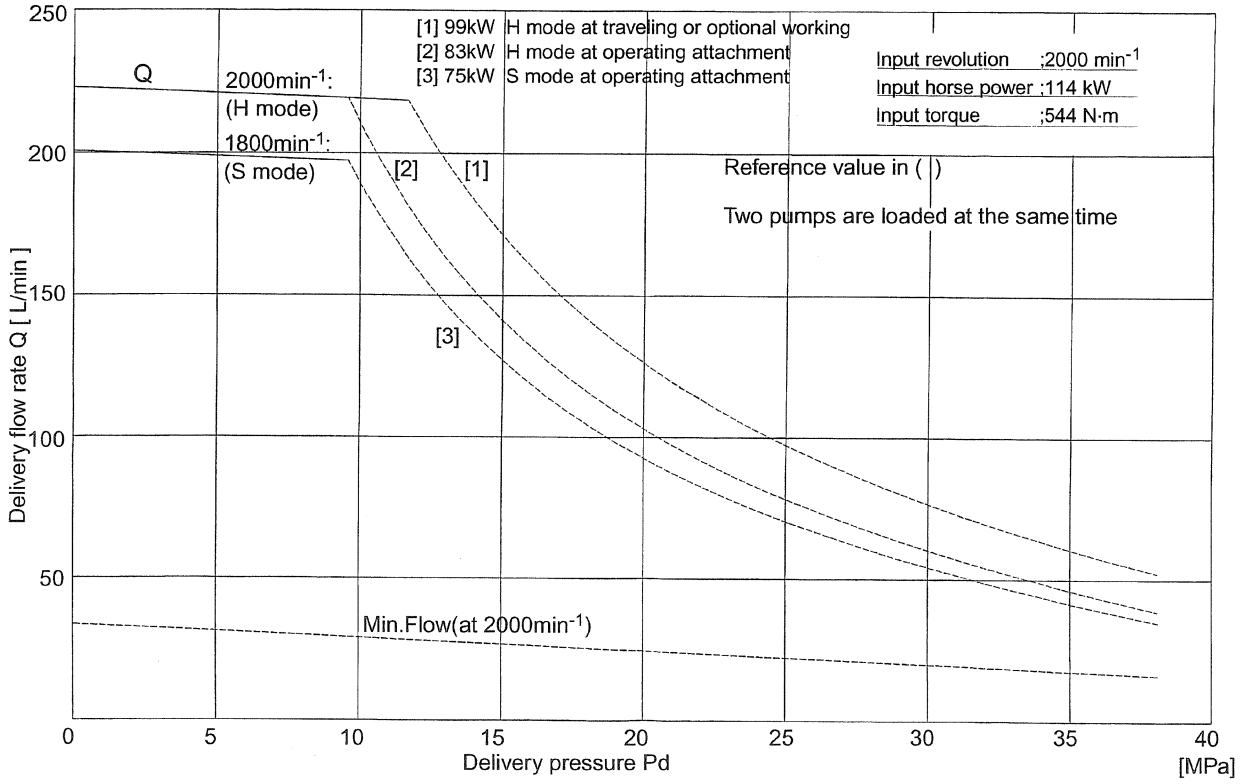

VIEW FROM THE TOP OF THE MACHINE

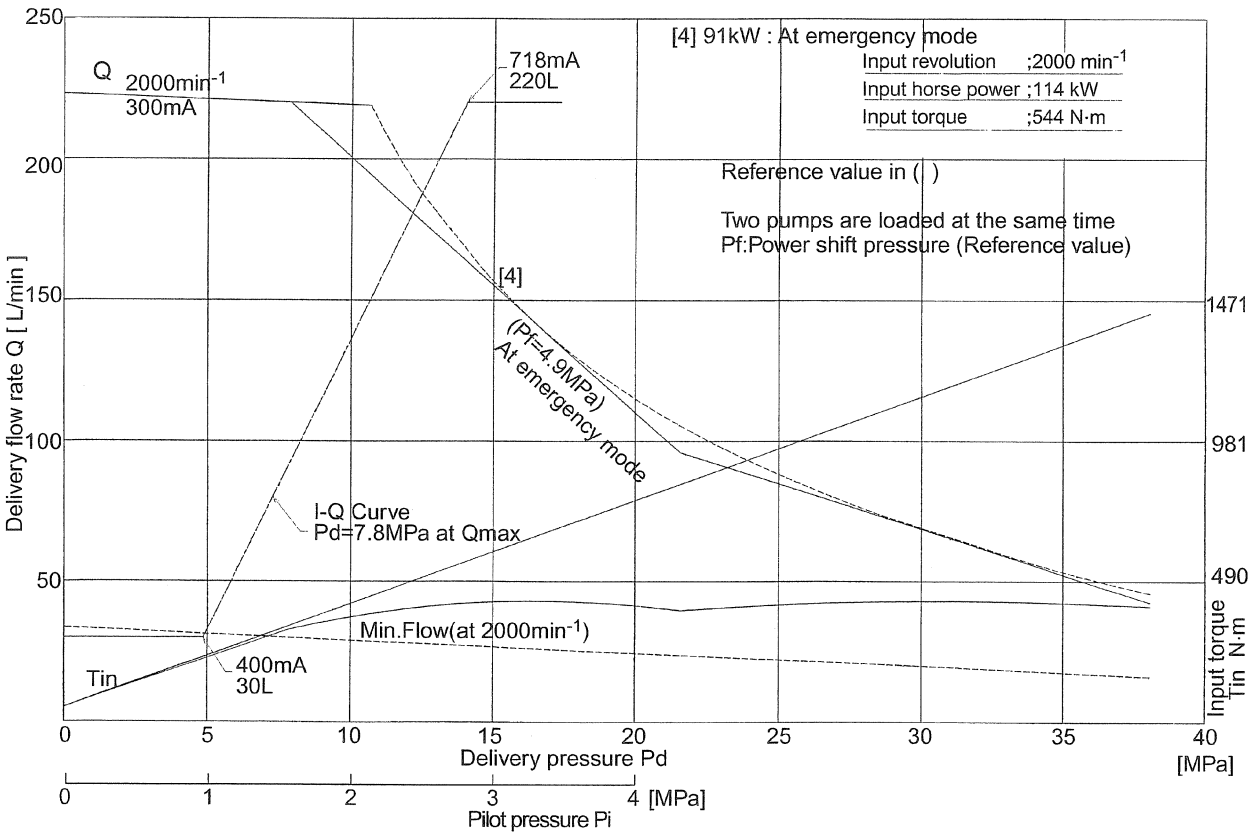



VIEW FROM THE BOTTOM OF THE MACHINE

**Fig. 13-4 Relief valve position on main control valve**

### 24.1.1.4 CONTROL CURVE OF PUMP



8) Installing valve block
Install valve block (312) to pump casing (271) and fasten them together with socket bolts (401).
: 17 mm
Tightening torque ; 430 N•m (320 lbf•ft)

- Work will be promoted if assembly is started from the rear pump.
- Exercise care so as not to mistake the direction of the valve block (312). (Install it so the regulator comes up as seen from the front side and the suction flange comes on the right.)
- Insert the 1st gear into the valve block beforehand and connect it with the spline of the shaft.

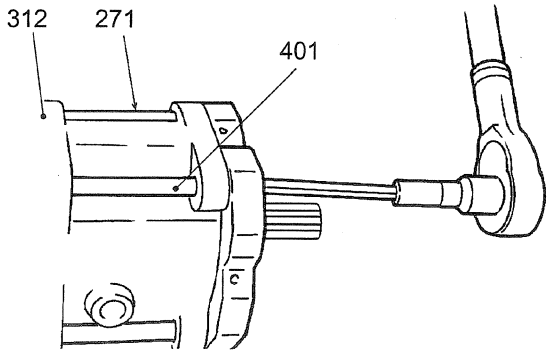


Fig. 33-109 Installing valve block (312)

9) Installing gear pump
Install gear pump (04) and fasten them together with socket bolts (435).
: 6 mm,
Tightening torque ; 17 N•m (12.5 lbf•ft)

10) Installing regulator and PTO cover
Pinch feedback pin of tilting pin in feedback lever of the regulator and PTO cover (326), install the regulator and fasten socket bolt.
(412)(413) (See Fig. 33-111]
Socket bolt (412)(413) ..... For regulator
: 6 mm,
Tightening torque ; 29 N•m (21 lbf•ft)
Socket bolt (414) ..... PTO Cover (326)
: 8 mm,
Tightening torque ; 57 N•m (42 lbf•ft)

- Do not mistake the front regulator for the rear regulator.

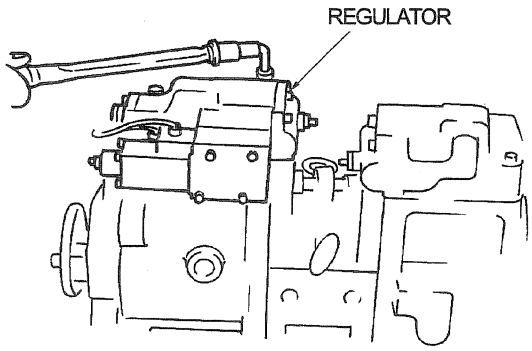


Fig. 33-110 Installing regulator and PTO cover

11) Installing drain port plug
The work is complete when drain port VP plugs (466), (468) have been set.
: 19 mm, 36 mm
Tightening torque ; 36 N•m (27 lbf•ft)
Tightening torque ; 170 N•m (125 lbf•ft)

3) Removing ring gear (6)
Attach eye bolts (M10) to the top surface of ring gear (6) and lift the ring gear lightly by a wire sling.
Put a flat-blade screwdriver (n) into the matching surface of ring gear (6) and housing (13) and remove ring gear (6) by lightly tapping the outer circumference of the ring gear with a plastic mallet (k).

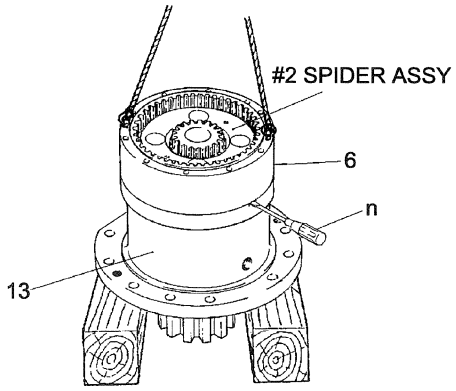



Fig. 33-246 Removing ring gear (6)

4) Remove #2 sun gear and #2 spider assy.
Draw out #2 sun gear (4) and remove the #2 spider assy.
Regarding the disassembly of the #2 assy, refer to par. (4) which will come up later.

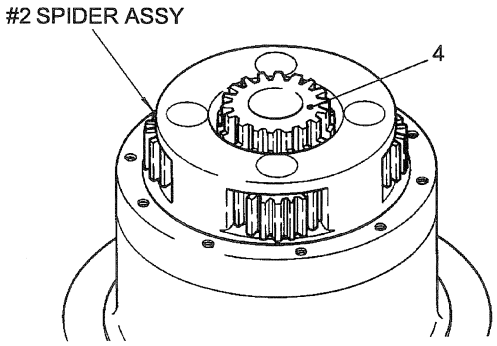



Fig. 33-247 Removing #2 spider assy

- Particularly if no failure is found, the further disassembly (under condition shown in Fig. 33-248) is not allowed.
  Check on parts for possible failure according to the inspection procedure shown in item 33.2.5.4.2 separately in this condition.
  And we recommend that the pinion shaft and housing assy are replaced together as one set. But if it is unavoidably necessary to replace a part of them, follow the procedure shown below.
- If no failure is found in this step, the disassembly later is not required.

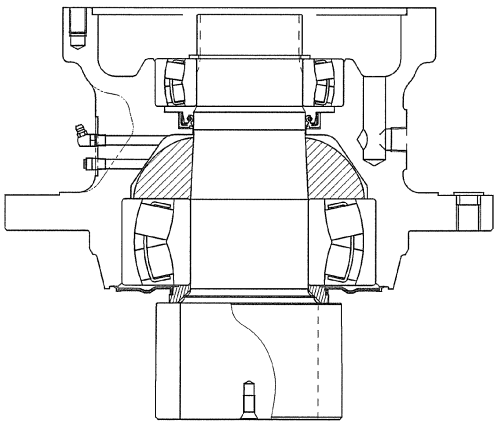


Fig. 33-248

5) Remove retaining ring (20) from pinion shaft (1).

**Table47-1 Action of optional selector solenoid valve**

| No. | Engine condition | Safety lock lever SW's input | Safety lock lever relay's output | Work mode | Optional selector valve COMP. MEAS. | Spool position | Selector valve detecting pressure sensor | Warning display | Failure diagnosis display |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Running | ON | OFF | A | OFF | Nibbler | Normal | — | — |
| 2 | Running | ON | OFF | A | ON | Breaker | Normal | "SELECTOR VALVE FAILURE" | [F042] displayed simultaneously |
| 3 | Running | ON | OFF | A | OFF | Breaker | Normal | "SELECTOR VALVE FAILURE" | — |
| 4 | Running | ON | OFF | A | ON | Nibbler | Normal | — | [F042] displayed |
| 5 | Running | ON | OFF | B | ON | Breaker | Normal | — | — |
| 6 | Running | ON | OFF | B | OFF | Nibbler | Normal | "SELECTOR VALVE FAILURE" | [F043] displayed simultaneously |
| 7 | Running | ON | OFF | B | ON | N&B | Normal | "SELECTOR VALVE FAILURE" | — |
| 8 | Running | ON | OFF | B | OFF | Breaker | Normal | — | [F043] displayed |
| 9 | Running | ON | OFF | — | — | — | Failure | "SELECTOR VALVE FAILURE" | [B113] displayed |
| 10 | Stopping | — | — | — | — | — | — | — | — |
| 11 | — | OFF | — | — | — | — | — | — | — |
| 12 | — | — | ON | — | — | — | — | — | — |

## 6. How to read explanation details

(1) Part layout

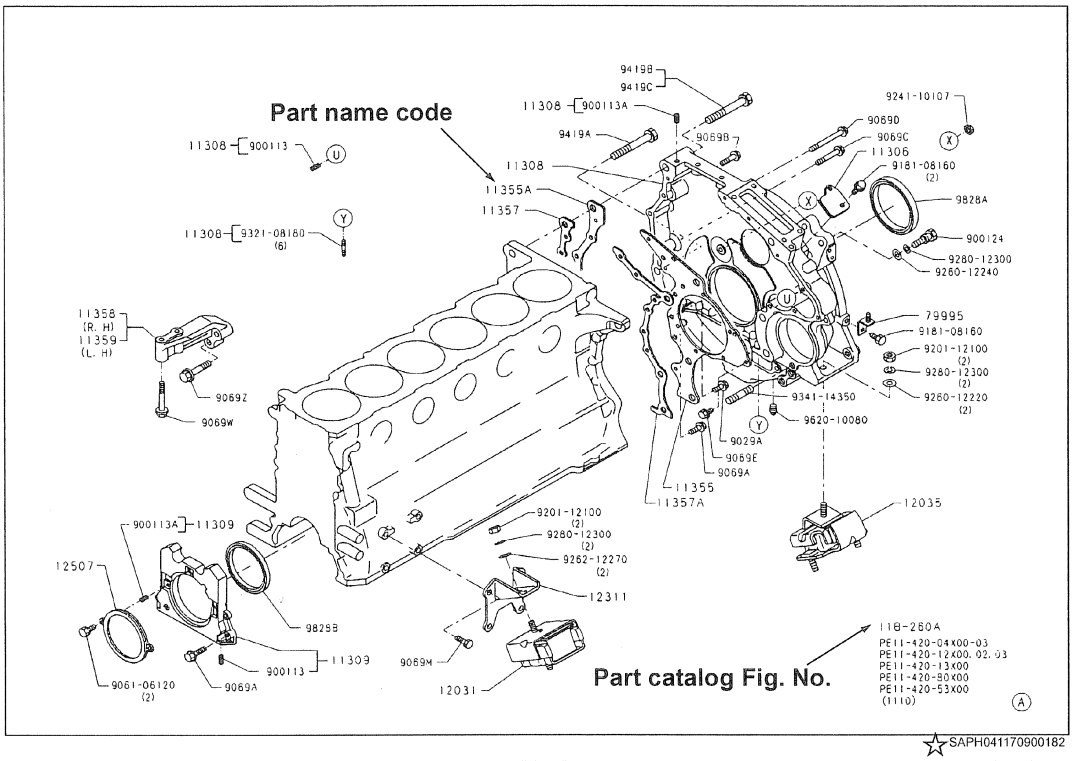
**Example**

ENGINE MECHANICAL [J08E] 9–17

### Timing Gear Cover and Flywheel Housing

#### Part layout

☆JP04117090402003




☆SAPH041170900182

| | | | |
|---|---|---|---|
| 11308 | Flywheel housing | 11390 | End plate |
| 11309 | Oil seal retainer | 9828A | Front oil seal* |
| 11357 | Gasket* | 9828B | Rear oil seal* |
| 11357A | Gasket* | | |

Description of part name code

*Parts not to be reused.

Left: Part name code (nut)

**Tightening torque**

| | | | |
|---|---|---|---|
| 9069H | M14 : 171.5N m{1, 750kgf cm} | 9419A | M16 : 196N m{2, 000kgf cm} |
| 9069J | M12 : 97N m{990kgf cm} | 9419B | M16 : 196N m{2, 000kgf cm} |

SAPH311990100001

☆:It is the ID number for parts to prepare electronic data. It is not required for repair work.

### 3. Installation of fuel filter element

⚠ CAUTION • **Fuel filter element is not reused.**

(1) The soiling and the foreign material of the clamp face are removed.

(2) Install the fuel filter element with according to tightening angle in the table below of a turn after the O-ring of the fuel filter element comes into contact with the fuel filter head.

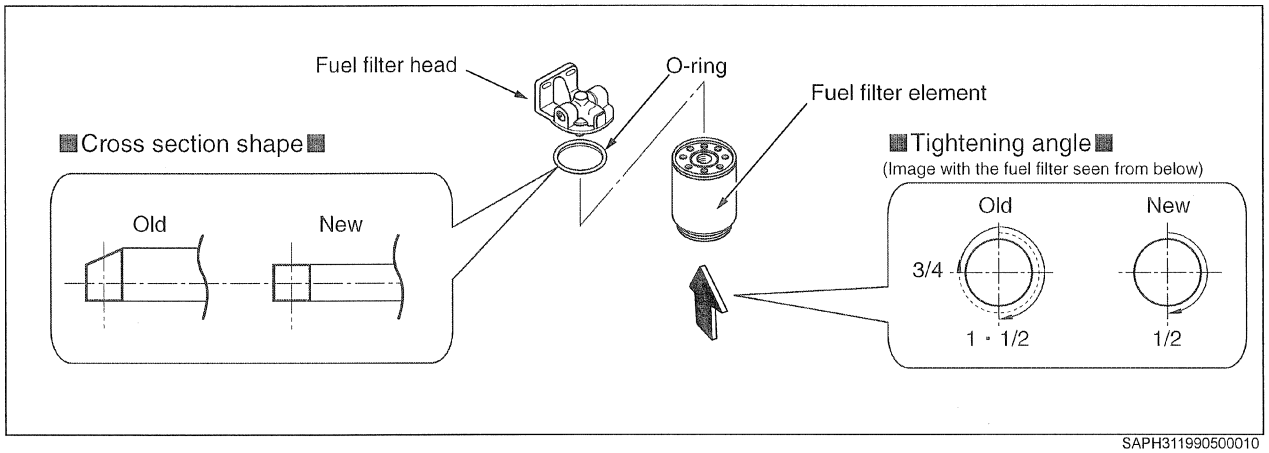
NOTICE • **The cross-section shape of the O-ring on the side of the fuel filter element has been changed.**

⚠ CAUTION • **Tighten after confirming whether the O-ring is a new or an old one.**

• **As the O-ring is included in the element kit, do not use an O-ring again after it has been removed once.**

• **Install the O-ring after applying fuel to the surface of the O-ring.**

• **Do not use a tool, but tighten by hand.**

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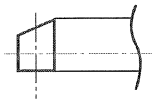
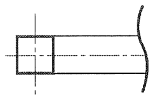
| New/Old | Cross section shape | Tightening angle |
|---|---|---|
| **Old supply part** |  | **3/4 to 1.5 turns** |
| **New supply part** |  | **1/2 turn** |

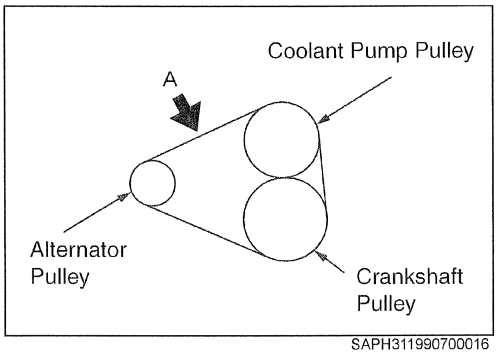
## Installation of alternator

JP31199070702004

**1. Installation of alternator**

(1) Tighten the alternator temporarily using through bolts and nuts.

(2) Tighten the adjusting bolts and fixing bolts temporarily.




SAPH311990700016

**2. V–belt tension adjustment**

| Item | When installing a new belt | At the time of inspection |
|---|---|---|
| Deflection | 8 - 10mm {0.3152 - 0.394in.} | 10 - 12mm {0.394 - 0.472in.} |
| Tension | 490 - 570 N {50 - 58 kgf, 110 - 128 lbf} | 320 - 400 N {33 - 41 kgf, 72 - 90 lbf} |

**Special tool : 09444-1210 Compression gauge (used at the time of measuring the deflection amount) [Reference push force 98N {10kgf, 22lbf}]**
**95506-00090 (Denso part No.) Belt tension gauge (used at the time of measuring the tension force)**

⚠ CAUTION
- **If the V-belt is replaced with a new one, it becomes loose due to initial fitting. Run the engine for three to five minutes and adjust the tension of the belt again.**

NOTICE
- **At the time of inspection, the new V-belt has reached the value after complete initial stretching. A new V-belt completes initial stretching after running the engine for approximately two hours.**

(1) Tighten the through bolt of the commutator end frame.
**Tightening torque : Through bolt**
**83 N·m {850 kgf·cm, 61 lbf·ft}**

(2) Tighten the lock nut on the brace side.
**Tightening torque : Adjusting bolt**
**51 N·m {520 kgf·cm, 38 lbf·ft}**

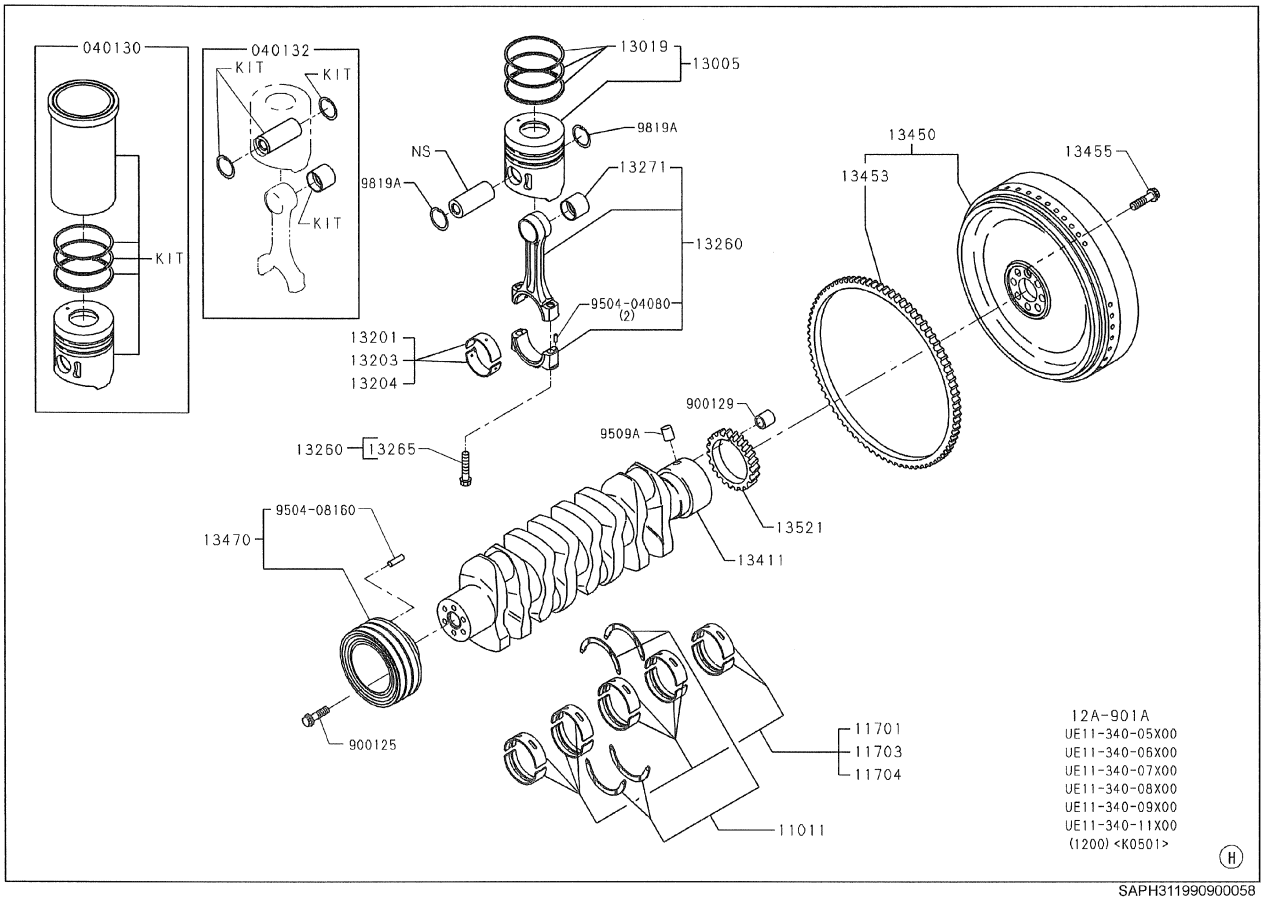
(3) Tighten the adjusting bolt and make sure the bolt is locked.
**Tightening torque : Adjusting bolt**
**5.9 N·m {60 kgf·cm, 4 lbf·ft}**

(4) Securely connect the ground wire terminal for the alternator.
**Tightening torque : Adjusting bolt**
**4 N·m {40 kgf·cm, 3 lbf·ft}**

# Main Moving Parts

## Part layout

JP31199090402004



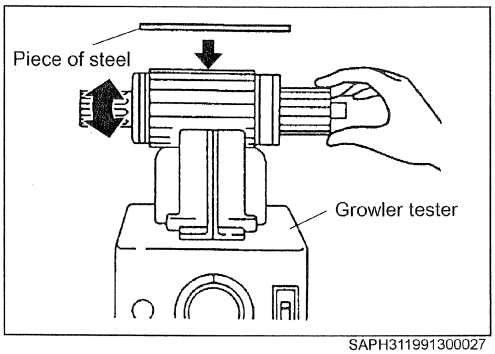

SAPH311990900058

| | | | |
|---|---|---|---|
| 11011 | Thrust bearing | 13260 | Connecting rod assembly |
| 11701 | Main bearing | 13271 | Connecting rod bush |
| 11703 | Main bearing US 0.25 | 13411 | Crankshaft |
| 11704 | Main bearing US 0.50 | 13450 | Flywheel assembly |
| 13005 | Piston, Piston ring set | 13453 | Ring gear |
| 13201 | Connecting rod bearing | 13470 | Crankshaft pulley |
| 13203 | Connecting rod bearing US 0.25 | 13521 | Crankshaft gear |
| 13204 | Connecting rod bearing US 0.50 | 9819A | Retainer ring* |

*Parts not to be reused.

### Tightening torque

| | | | |
|---|---|---|---|
| 13266 | 69N·m{700kgf·cm, 51lbf·ft}+90°+45° | 900125 | 118N·m {1, 200 kgf·cm, 87lbf·ft} |
| 13455 | 186N·m {1, 900 kgf·cm, 137lbf·ft} | | |



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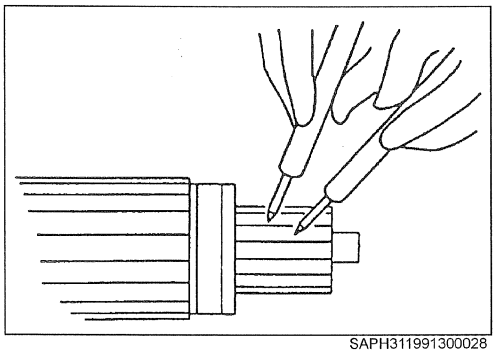
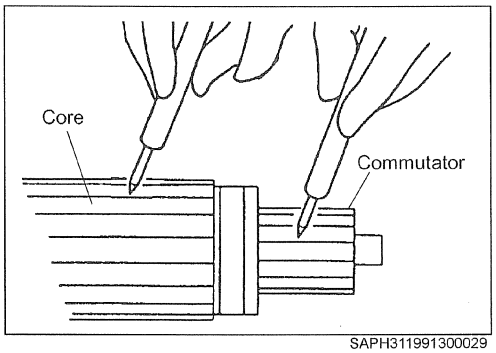

SAPH311991300028



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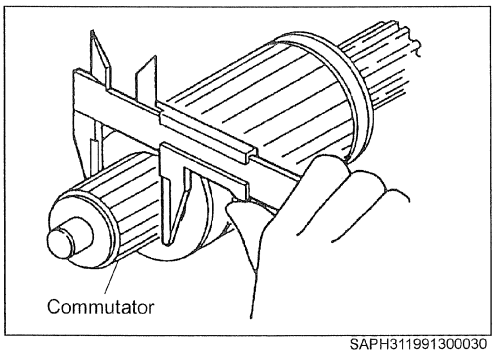


SAPH311991300030

**2. Inspection of armature assembly**

(1) Turn the armature assembly using a commercially available growler tester and put a piece of steel on the armature assembly. Make sure that the steel piece is not vibrating on the core circumference.

(2) Make sure that adjacent segments of the commutator have electric continuity using a circuit tester.

(3) Make sure that there is no discoloration at the coil.

(4) Measure the resistance between the commutator and the core using a circuit tester and check insulation.
When the value is below the service limit, replace it.

| Standard value | Service limit |
|---|---|
| 1MΩor more | 1kΩor less |

⚠ **CAUTION** • **After cleaning and drying, take measurements.**

(5) Measure the commutator outer diameter using vernier calipers.
When the value is below the service limit, replace it.

⚠ **CAUTION** • **After removing roughness on the surface (after polishing), take measurements.**

**Commutator outer diameter**

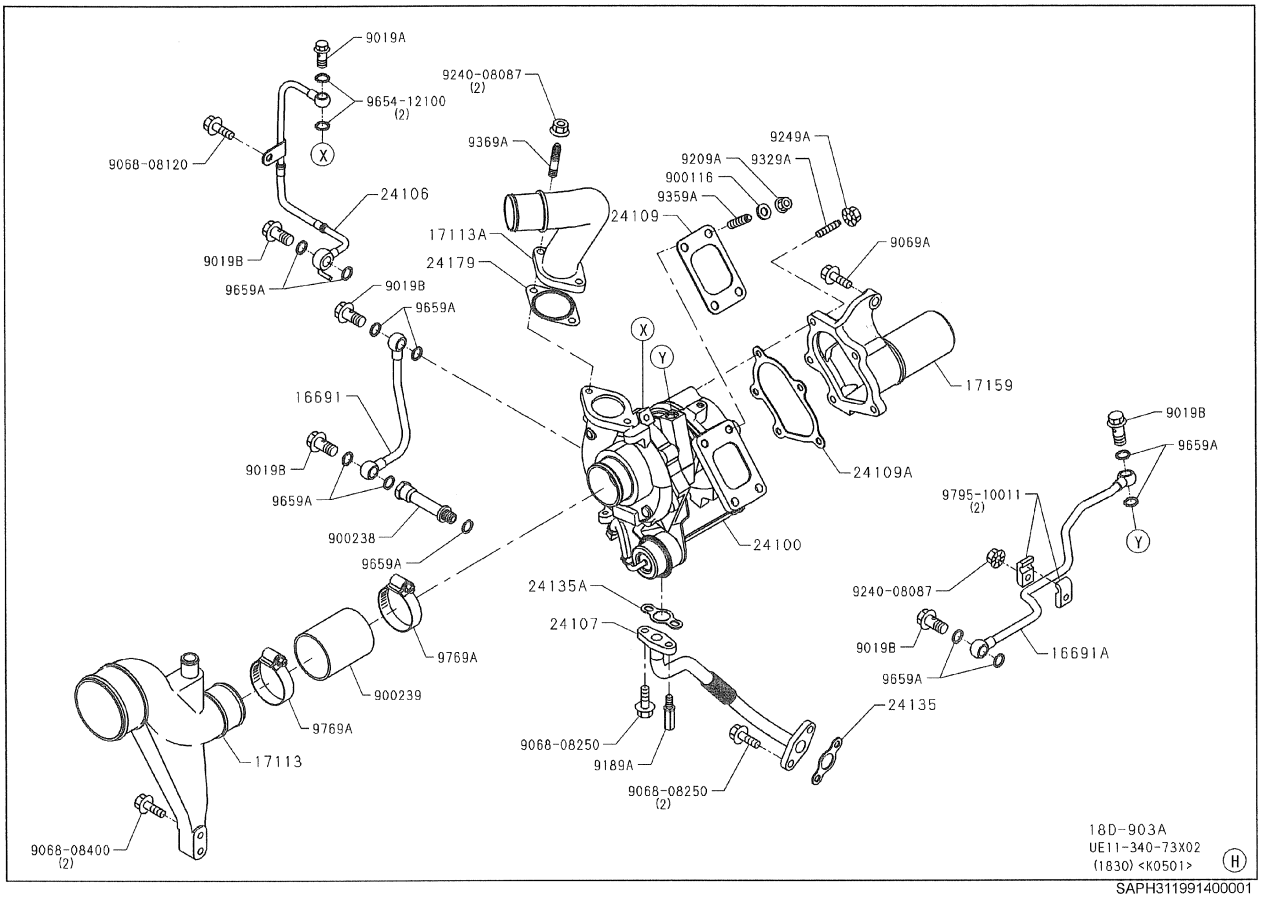
| Standard value (mm{in.}) | Service limit (mm{in.}) |
|---|---|
| 36{1.4173} | 34{1.3386} or less |

# Turbocharger Assembly

## Part layout (With air compressor example)

JP31199140402001

**NOTICE** • **The wheel shovel has with the air compressor.**




SAPH311991400001

| | | | |
|---|---|---|---|
| 16691 | Coolant pipe | 24109 | Gasket* |
| 16691A | Coolant pipe | 24109A | Gasket* |
| 17159 | Exhaust manifold connector | 24135 | Gasket* |
| 24100 | Turbocharger assembly | 24135A | Gasket* |
| 24106 | Oil inlet pipe | 9654-12100 | Gasket* |
| 24107 | Oil outlet pipe | 9659A | Gasket* |

*Parts not to be reused.

### Tightening torque

| | | |
|---|---|---|
| 9209A | 56 N·m {570 kgf·cm, 41lbf·ft} | |

# Signal check harness

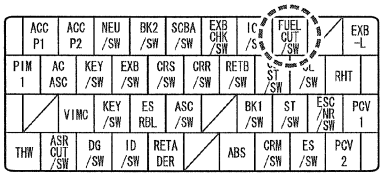
JP31199170301001

## 1. Signal check harness

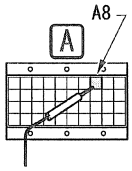
⚠ CAUTION
- **When measuring terminal of the engine ECU, connect the signal check harness to prevent damage to the connector. Place the tester rod on the contact box of the signal check harness for measurement.**

NOTICE
- **Terminal numbers in the text and the illustrations correspond as shown below in the "Computer pin arrangement".**

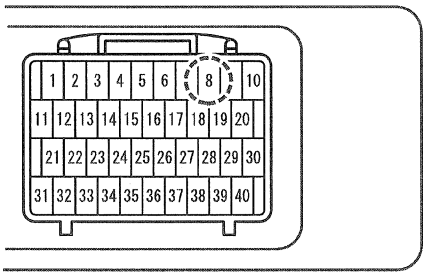
ECU terminal name



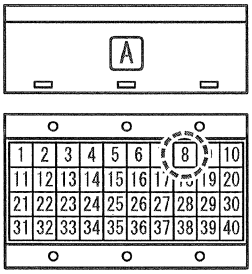

[Example] For A8 terminal




ECU terminal number




Signal check harness (contact box)

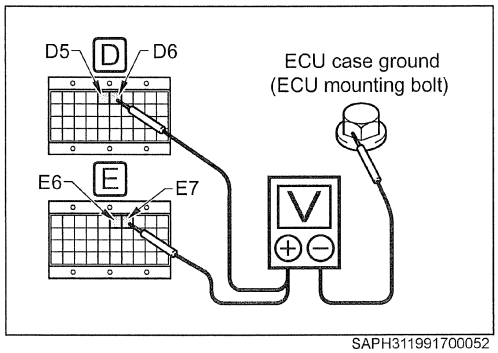



SAPH311991700006

# Injector common 1 power source line short (DTC code P1212), Injector common 2 power source line short (DTC code P1215)

JP31199170601022

| 1 | Measurement of voltage between terminals |
|---|---|



SAPH311991700052

1. Set the starter key to "OFF" and connect the signal check harness.
2. Disconnect the ECU side connector of the signal check harness and set the starter key to "ON".
3. Measure the voltage between each terminal of the signal check harness and the ECU case ground.

⚠ **CAUTION** • **Never start the engine because it may cause failure of the unit or electric shock.**

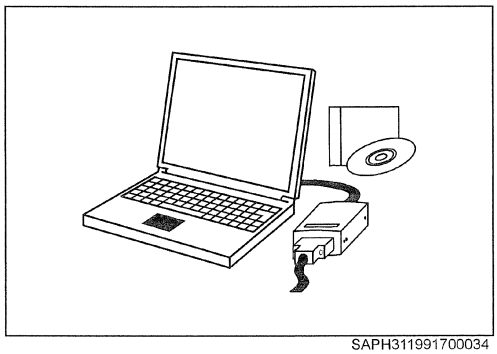
| DTC code | Terminal to measure voltage | |
|---|---|---|
| | + side | – side |
| P1212 | D5, D6 | ECU case ground |
| P1215 | E6, E7 | ECU case ground |

**Standard value : 14 V or less**

NG → [3] Go to measurement of voltage between injector terminals.

OK

| 2 | Check of diagnosis code |
|---|---|


SAPH311991700034

1. Set the starter key to "OFF" and connect the ECU side connector of the signal check harness.
2. Start the engine and delete the past failures with the failure diagnosis tool (HinoDX) using PC.
3. If the same failure code is output again, replace the common rail ECU. If the normal code is output, it is considered that a temporary error has occurred.