# SHOP MANUAL

## KOMATSU

# PC280LC-3
# PC280NLC-3

| MACHINE MODEL | SERIAL No. |
|---|---|
| **PC280LC-3** | **10001 and up** |
| **PC280NLC-3** | **10001 and up** |

This shop manual may contain attachments and optional equipment that are not available in your area. Please counsult your local Komatsu distributor for those items you may require. Materials and specifications are subject to change without notice.

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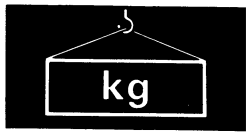
# HOISTING INSTRUCTIONS




⚠ Heavy parts (25 kg or more) must be lifted with a hoist etc. In the **Disassembly and Assembly** section, every part weighing 25 kg or more is indicated clearly with the symbol kg

1. If a part cannot be smoothly removed from the machine by hoisting, the following checks should be made:
   - Check for removal of all bolts fastening the part to the relative parts.
   - Check for existence of another part causing interference with the part to be removed.

**2. Wire ropes**

1) Use adequate ropes depending on the weight of parts to be hoisted, referring to the table below:

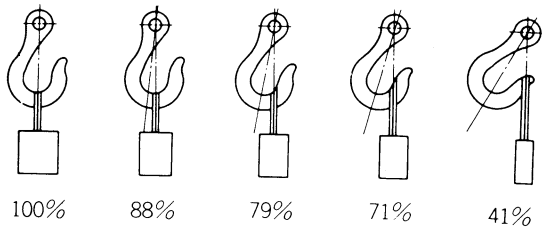
Wire ropes
(Standard "Z" or "S" twist ropes without galvanizing)

| Rope diameter (mm) | Allowable load (tons) |
|---|---|
| 10 | 1.0 |
| 11.2 | 1.4 |
| 12.5 | 1.6 |
| 14 | 2.2 |
| 16 | 2.8 |
| 18 | 3.6 |
| 20 | 4.4 |
| 22.4 | 5.6 |
| 30 | 10.0 |
| 40 | 18.0 |
| 50 | 28.0 |
| 60 | 40.0 |

The allowable load value is estimated to be one-sixth or one-seventh of the breaking strength of the rope used.

2) Sling wire ropes from the middle portion of the hook.

Slinging near the edge of the hook may cause the rope to slip off the hook during hoisting, and a serious accident can result. Hooks have maximum strength at the middle portion.

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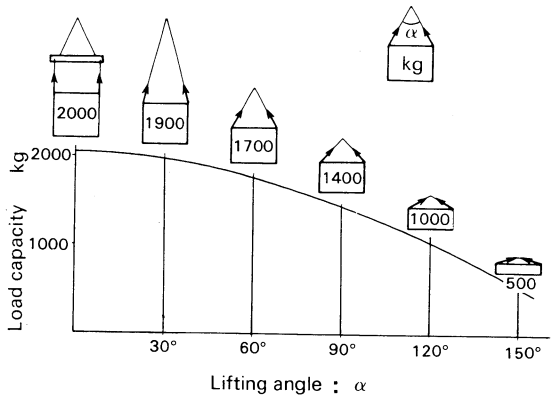
3) Do not sling a heavy load with one rope alone, but sling with two or more ropes symmetrically wound on to the load.

⚠ Slinging with one rope may cause turning of the load during hoisting, untwisting of the rope, or slipping of the rope from its original winding position on the load, which can result in a dangerous accident.

4) Do not sling a heavy load with ropes forming a wide hanging angle from the hook.
When hoisting a load with two or more ropes, the force subjected to each rope will increase with the hanging angles. The table below shows the variation of allowable load (kg) when hoisting is made with two ropes, each of which is allowed to sling up to 1000 kg vertically, at various hanging angles.
When two ropes sling a load vertically, up to 2000 kg of total weight can be suspended. This weight becomes 1000 kg when two ropes make a 120° hanging angle. On the other hand, two ropes are subjected to an excessive force as large as 4000 kg if they sling a 2000 kg load at a lifting angle of 150°.

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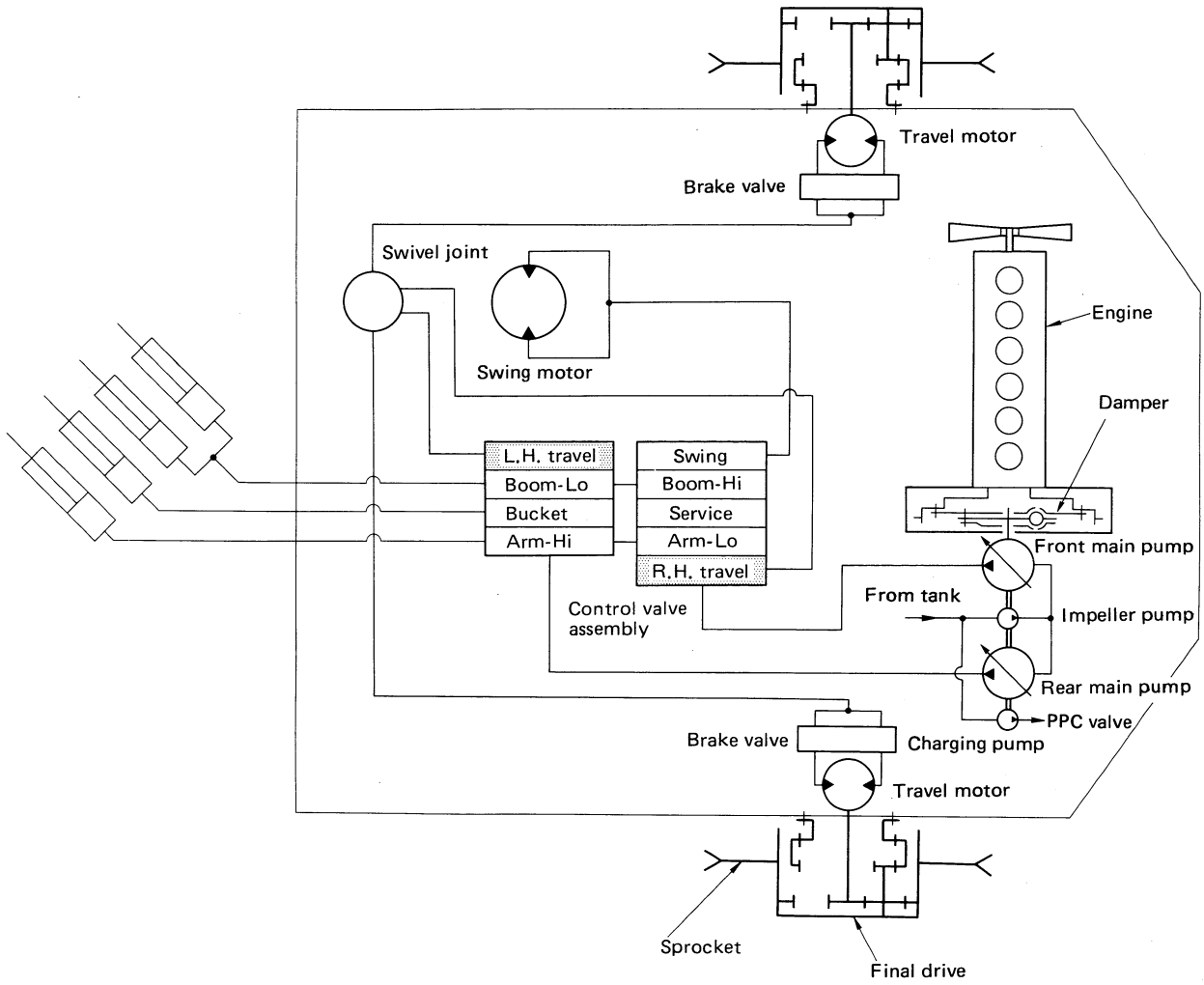


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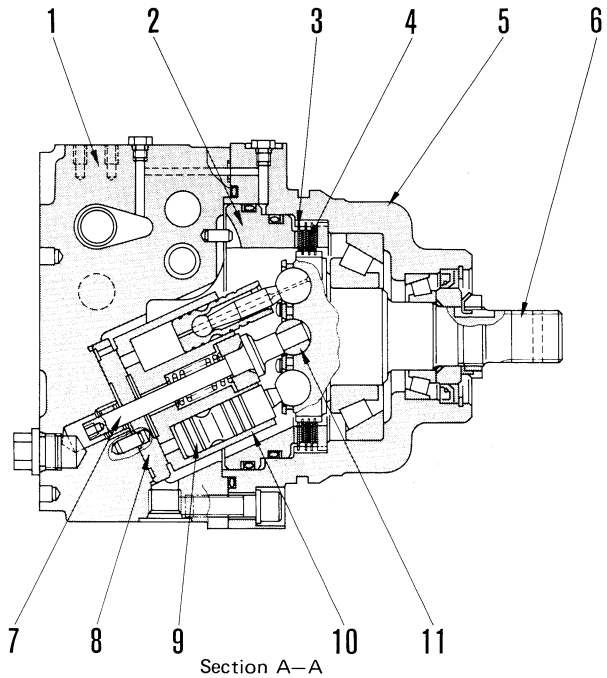
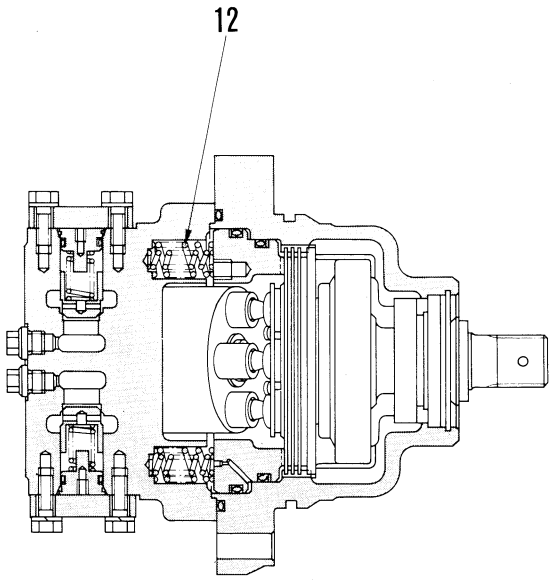
Power from the engine is transmitted to the damper. The damper is mounted with the main pump for traveling, swing and working, and with charging pump. When the main pump runs, hydraulic oil is delivered to both left and right travel motors via the travel control valves.
In this way, the travel motors rotate. The main pump consists of the front main pump and rear main pump, and each pump flows oil to the right and left travel motors independently. The speed of travel motor is reduced with the final drive system, and the motor torque is transmitted to each sprocket. And both sprockets start running.

The main pump is a swash plate variable displacement type pump.
Travel speed is controlled by the fuel control lever. The straight-travel valve is installed to travel the machine straight when operating the swing, boom, arm or bucket control lever during traveling.
The left and right travel levers are each linked to the spool of the left and right travel control valves. The machine can travel forward or rearward and steering can also be controlled with these two travel levers.

## (1) TRAVEL MOTOR (WITH PARKING BRAKE)




Section A–A




Section B–B

1. Housing
2. Brake piston
3. Plate
4. Disc
5. Brake case
6. Output shaft
7. Center shaft
8. Valve plate
9. Piston
10. Cylinder block
11. Center ball
12. Spring

Theoretical delivery: 87.8 cc/rev

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- The travel motor uses the oil sent from the travel control valve, and acts as a piston motor to send the rotation of the output shaft to the final drive.
- The direction of rotation of the travel motor is decided by the travel control valve. That is, the travel control valve changes the inlet port of the motor to which it sends the oil.
- The motor itself acts as the brake for the hydraulic excavator. When the travel control valve is at "NEUTRAL", the circuits for the inlet and outlet port of the motor are closed by the counterbalance valve. As a result, the motor cannot rotate, so it stops.

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## STRUCTURE

- Sun gear (9) is meshed with planet gear (12), and is supported by cover (10).
- Planet gear (12) is assembled to carrier (7) through bearings and pin (11).
- No. 1 ring gear (13) is connected to cover (10) and hub (2) by bolt. No. 1 ring gear (13) is meshed with the large gear of planet gear (12), and the small gear is meshed with No. 2 ring gear (14).
- In addition, No. 2 ring gear (14) is meshed with gear (15), and gear (15) is fixed to shaft (3) by bolt.
- In this way, a 2-stage planetary system is formed by sun gear (9), planet gear (12), pin (11), No. 1 ring gear (13), and No. 2 ring gear (14).

## OPERATION

- The rotation of the travel motor passes through coupling (4) and is transmitted to sun gear (9).
- No. 1 ring gear (13) is connected to cover (10) and hub (2) by bolts, so when sun gear (9) rotates, planet gear (12) rotates about its own axis and moves in orbit along No. 1 ring gear (13).
- Planet gear (12) is assembled to carrier (7), so carrier (7) rotates together with the orbit of planet gear (12).
- At the same time the small gear of planet gear (12) is meshed with No. 2 ring gear (14), so it also tries to rotate about its own axis and move in orbit. However, it is meshed with No. 1 ring gear (13) with a different number of teeth so it tries to rotate more quickly. As a result it tries to rotate No. 2 ring gear (14) but No. 2 ring gear (14) is fixed to shaft (3), so No. 1 ring gear (13) rotates relatively.
- Sprocket (1) is joined by hub (2) and forms one unit with No. 1 ring gear (13) so the sprocket also rotates.

## FUNCTION

- The final drive system reduces the speed of the travel motor and increases the travel power. In this way it provides a suitable travel speed.

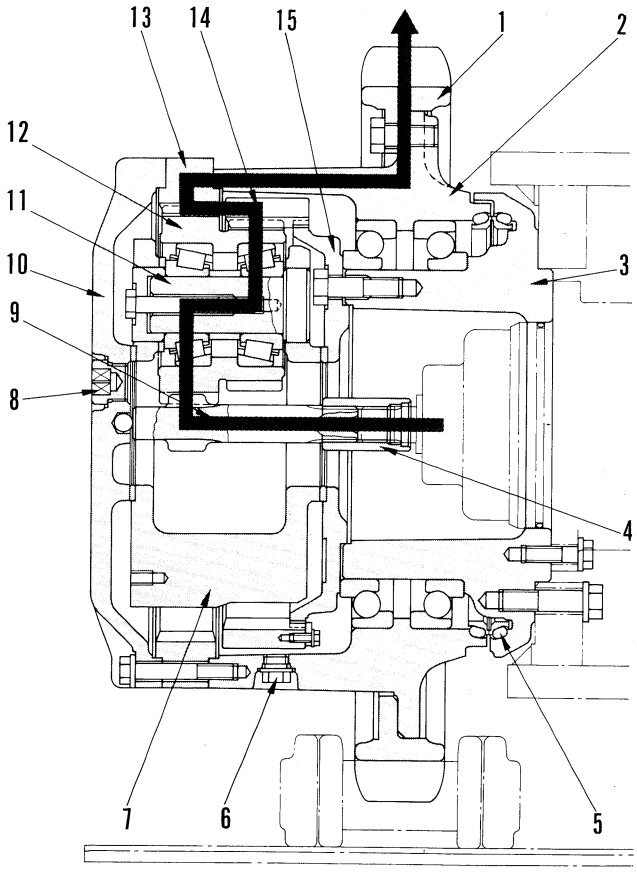
Reduction ratio:

$$\frac{1+\frac{41\times86}{10\times35}}{1-\frac{86\times41}{92\times35}}=116.533$$

Travel speed: **2.5 km/h**

Volume of lubricating oil (each):

**10.5ℓ (engine oil CLASS-CD SAE30)**

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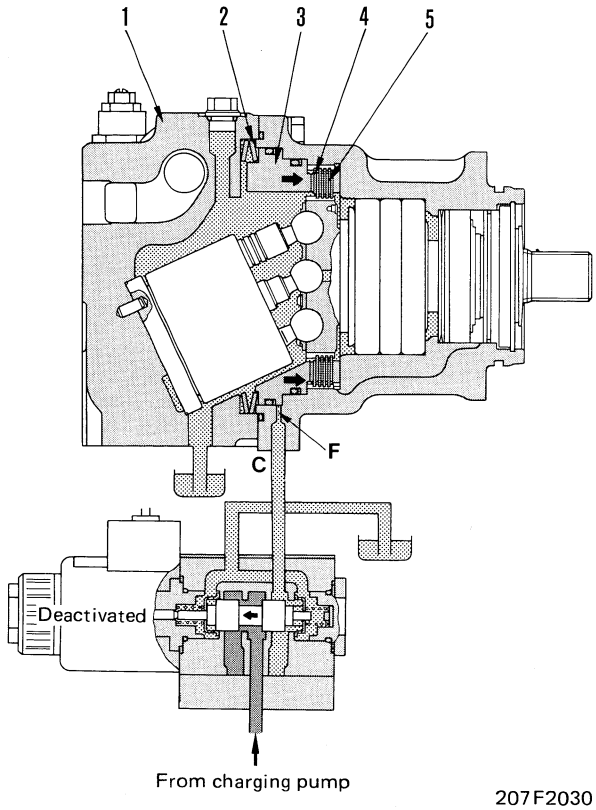
1) **Application of swing mechanical brake**

- When the swing control lever is at neutral:
  When the swing control lever is moved back to "Neutral", no oil in the PPC circuit flows, restoring the oil pressure switch to the original position "OFF".
  Thereby, the solenoid valve is back to original position. The pressure oil from the charging pump does not flow to port **C** any more. Since port **C** is connected to the tank as the drain circuit, the pressure in the swing mechanical brake pressure chamber **F** goes down. Brake piston (3) is pushed back by brake spring (2), which presses plates (4) and discs (5) against each other, causing the swing mechanical brake to be applied.

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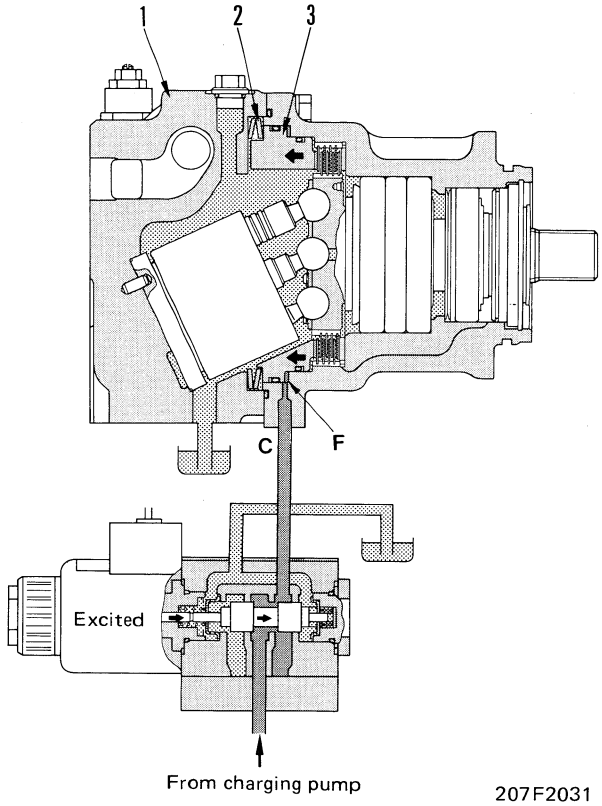
- When operating the swing control lever:
  Operating the swing control lever allows the pressure oil in the swing PPC circuit to push the oil pressure switch at the bottom of the lever, and the current flows to the swing solenoid valve. The swing solenoid valve is switched and the pressure oil from the charging pump will flow into port **C** and go to swing mechanical brake chamber **F**.
  The oil in **F** pushes brake piston (3) against brake spring (2). The brake piston travel will release the swing mechanical brake and allows the motor to start running.

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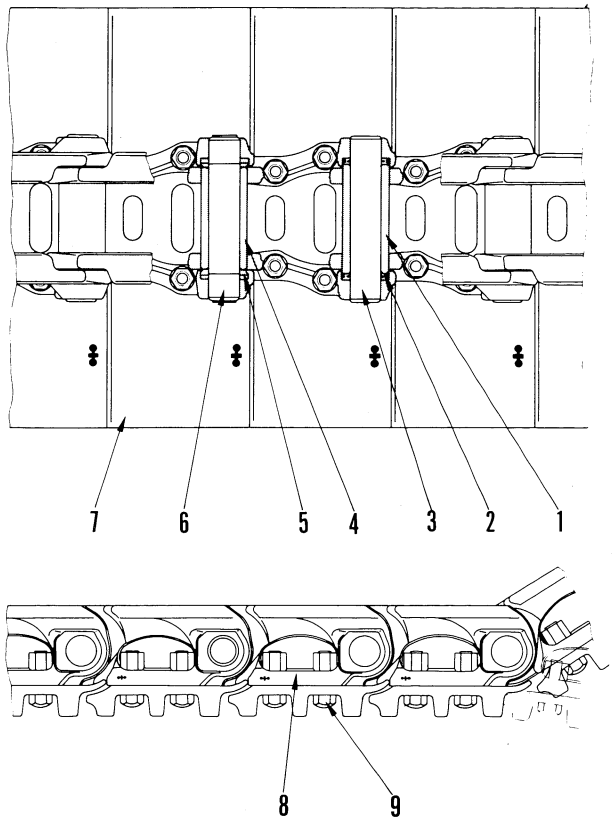
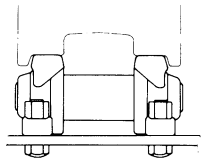
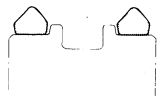
# TRACK SHOE

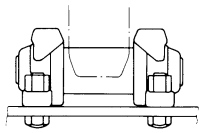


Relation of idler



Relation of carrier roller



Relation of sprocket

Relation of idler

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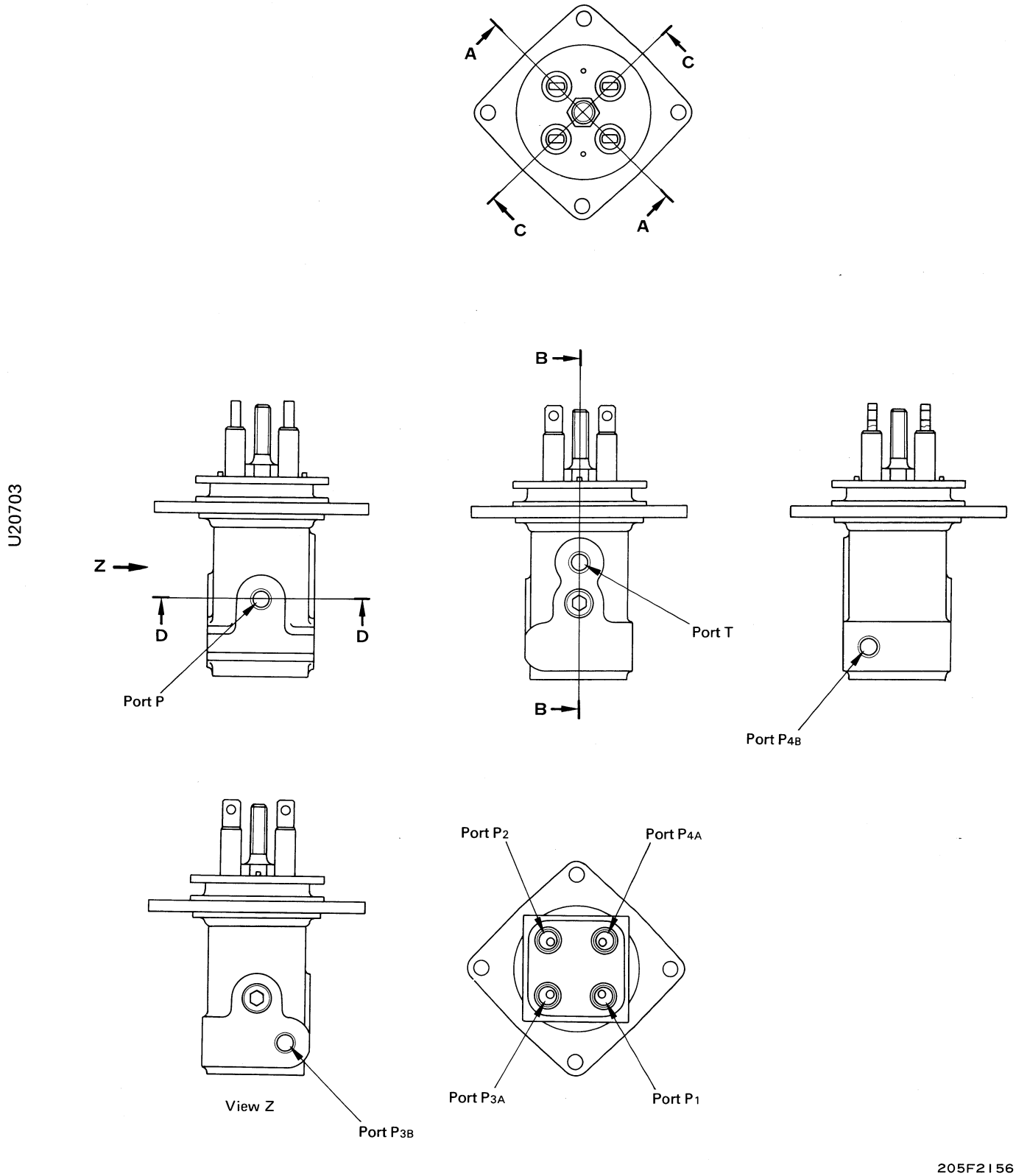
1. Master bushing
2. Master dust deal
3. Master pin
4. Regular bushing
5. Regular dust seal
6. Regular pin
7. Shoe
8. Link
9. Shoe bolt

**Standard shoe specifications**

| | | | |
|---|---|---|---|
| PC280LC-3 | 710 mm triple-shoe<br>Link pitch: 203 mm<br>Number of shoes: 102 | PC280NLC-3 | 710 mm triple-shoe<br>Link pitch: 203 mm<br>Number of shoes: 102 |

## LONG LEVER CONTROL TYPE

### (2) PPC (Proportional Pressure Control) VALVE (in swing, arm, bucket control circuits)

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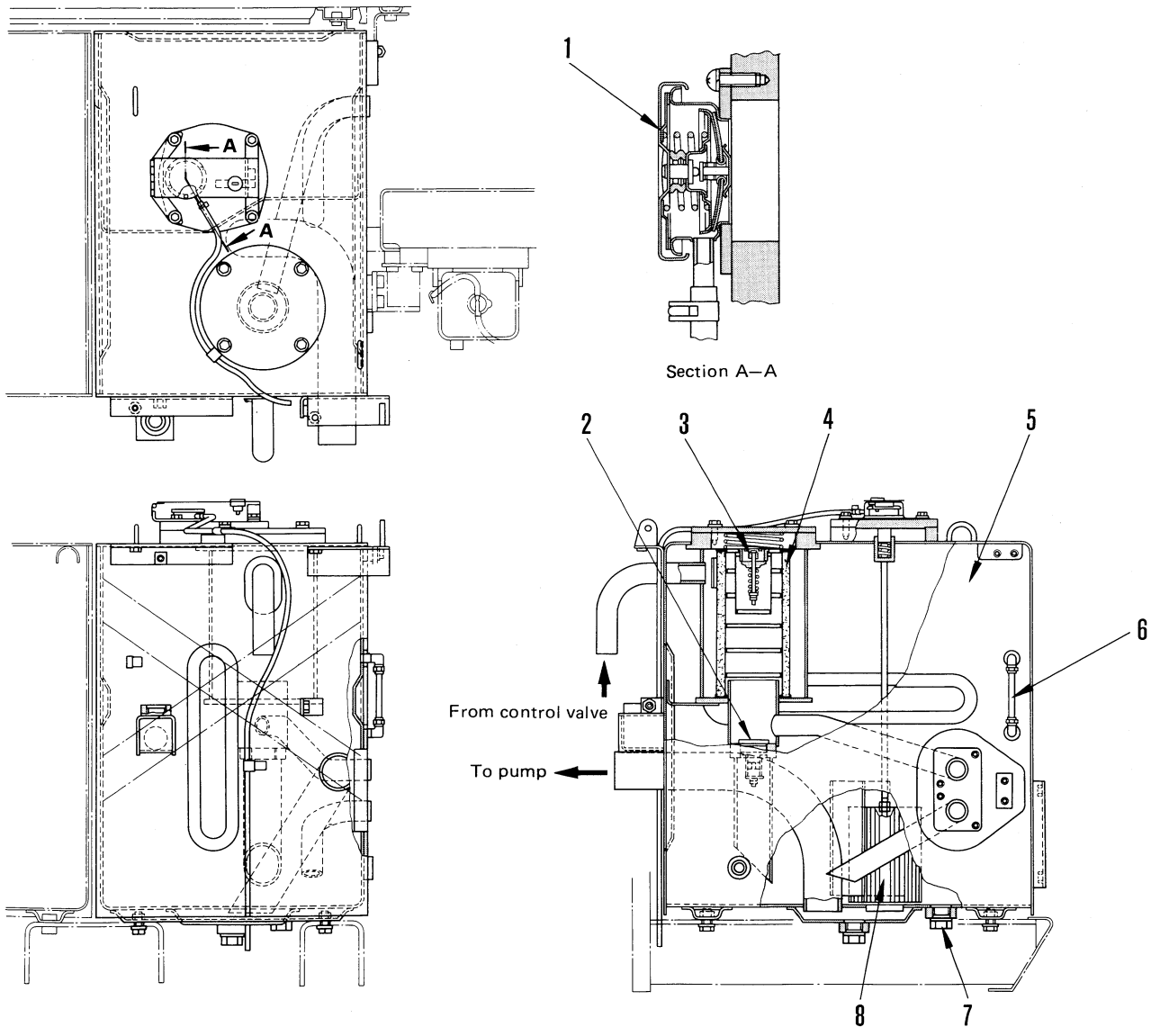
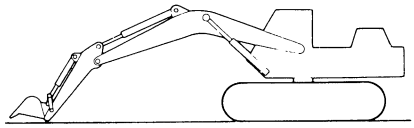
# HYDRAULIC TANK



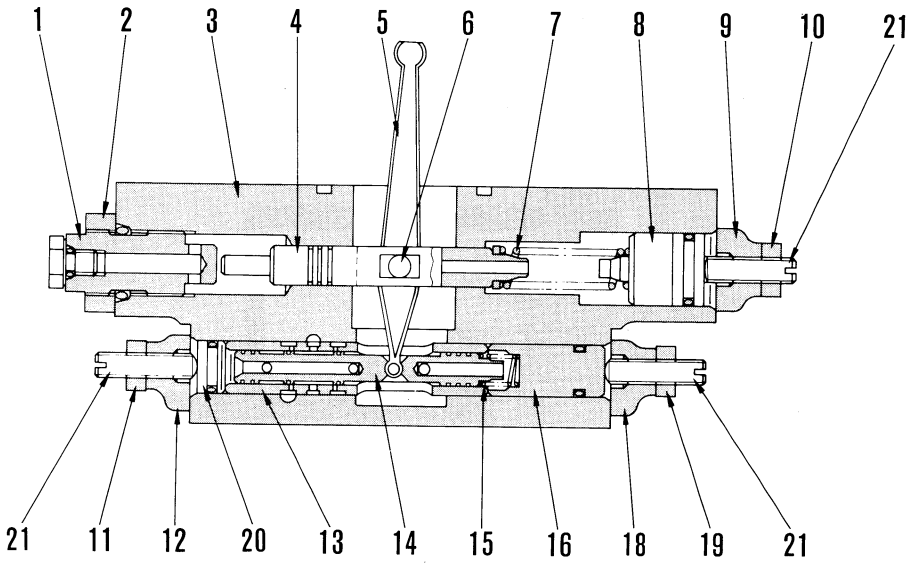

★ When checking the oil level, fully retract the arm and bucket, lower the bucket to the ground as shown in the drawing, and stop the engine.



1. Filler cap (with lock device)
2. Bypass check valve
3. Bypass valve
4. Filter element
5. Tank
6. Sight-gauge
7. Drain plug
8. Strainer

- Pressure to open the bypass valve:
  $1.27 \pm 0.3$ kg/cm$^2$
- Pressure valve
  Pressure to open the valve: $0.39 \pm 0.15$ kg/cm$^2$
  Operating pressure on vacuum valve:
  0 to 0.046 kg/cm$^2$

Tank capacity
- Specified: 250ℓ
- Refilled: 150ℓ




Section A – A

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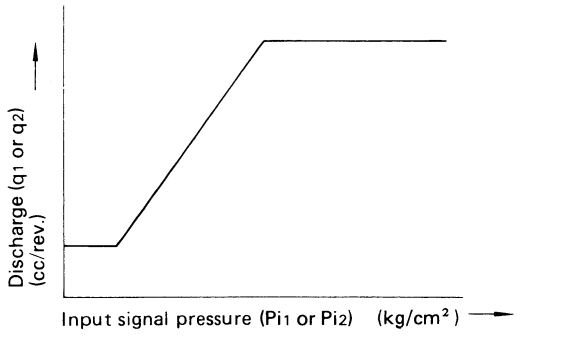


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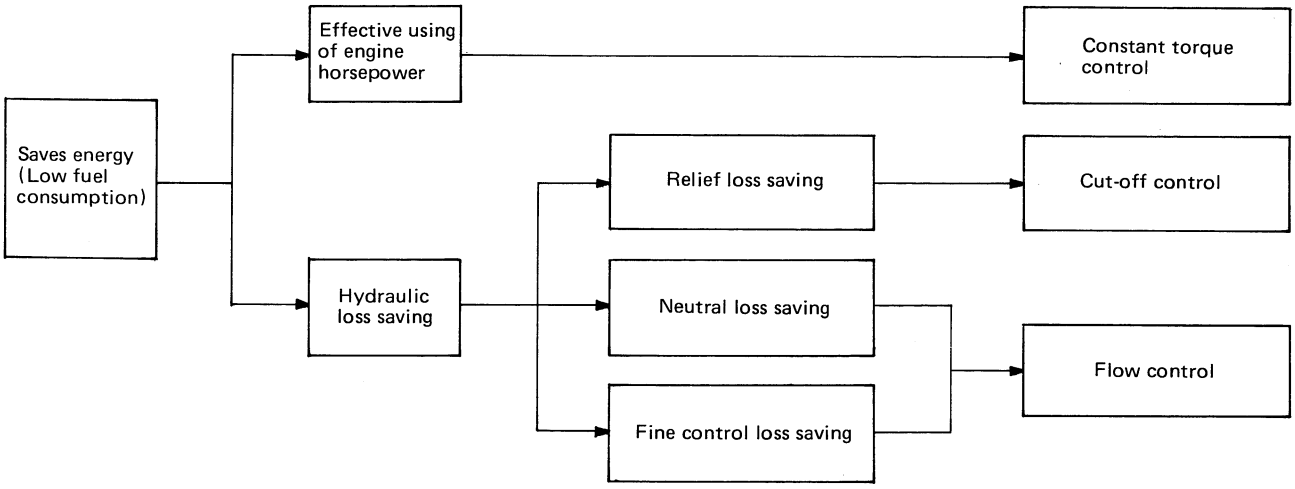
1. Plug
2. Lock nut
3. Valve body
4. Control piston
5. Arm
6. Pin
7. Piston spring
8. Plug
9. Cover
10. Lock nut
11. Lock nut
12. Cover
13. Sleeve
14. Guide spool
15. Spring
16. Spacer
17. Plug
18. Cover
19. Lock nut
20. Plug
21. Screw

**Function**

The function is the same as for the servo valve of the 2-stage mode selector OLSS.

The relationship between the delivery amounts $\mathbf{q}_1$ (or $\mathbf{q}_2$) of the pump and the input signal pressure $\mathbf{Pi}_1$ (or $\mathbf{Pi}_2$) to the servo valve is as shown in the graph on the above.

## 2. FUNCTION OF 2-STAGE AND 3-STAGE MODE SELECTOR OLSS

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**1) Effective using of engine horsepower:**

**a. 2-stage type**

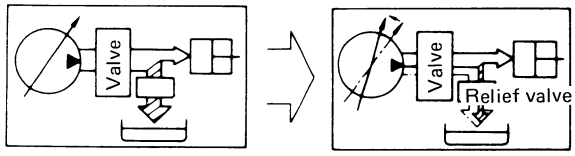
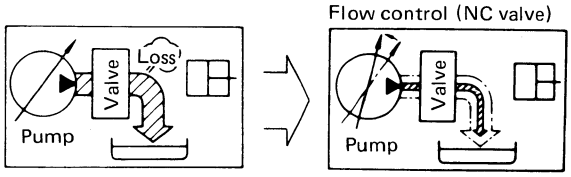
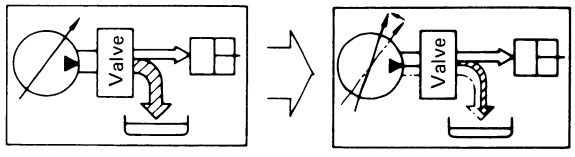
In order to use the engine horsepower effectively, the delivery of the pumps automatically decreases as the load pressure on the pumps goes up and increases as the load pressure goes down. That is, the constant torque control function is applied to keep the load imposed on the engine constant by means of the automatic speed change action.

**b. 3-stage type**

**Engine speed·oil pressure sensing system control (constant torque control)**

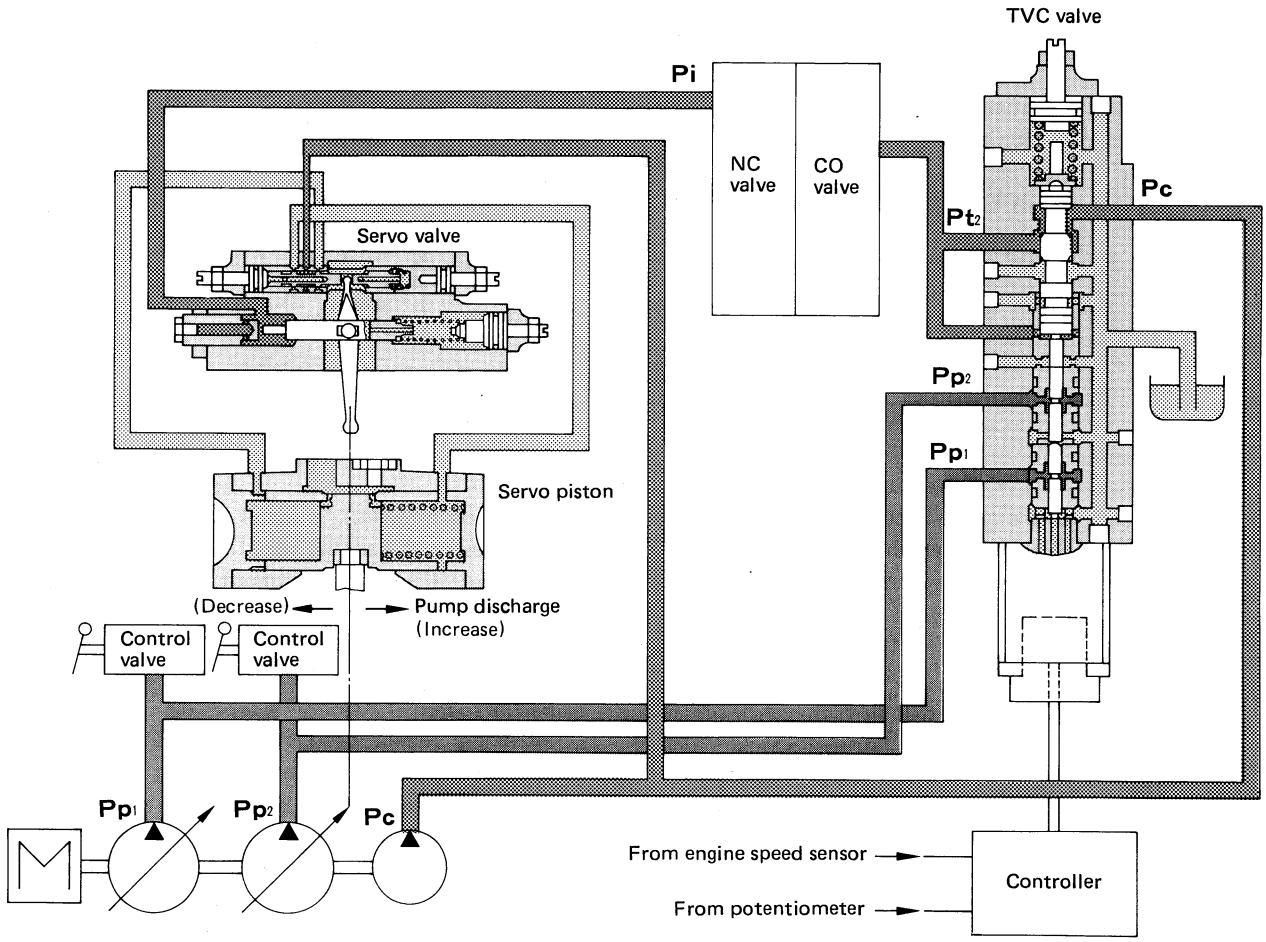
It always detects the set speed of the engine and the actual engine speed, so even if the load changes during the operation, the engine load (engine speed) is always maintained constant. It does this by controlling the load pressure (swash plate angle) of the pump, so the engine horsepower can always be used effectively.

**2) HYDRAULIC LOSS SAVING**

| | |
|---|---|
| **Relief loss**<br>When bucket hits something hard during digging operations, a large quantity of oil is uselessly drained to the hydraulic tank to protect hydraulic equipment from damage. | Cut-off control (CO valve)<br>  <br><br>205F2097 |
| **Neutral loss**<br>Unused hydraulic oil is drained to the hydraulic tank when waiting for successive dumps and control levers are positioned in neutral. | Flow control (NC valve)<br>  <br><br>205F2098 |
| **Fine control loss**<br>During precise controls, oil flow is regulated by a control lever. The regulated oil is drained uselessly. | Flow control (NC valve)<br>  <br><br>205F2099 |

★ FOR MACHINES EQUIPPED WITH 3-STAGE MODE SELECTOR OLSS

**(2) Engine speed · oil pressure sensing system control**

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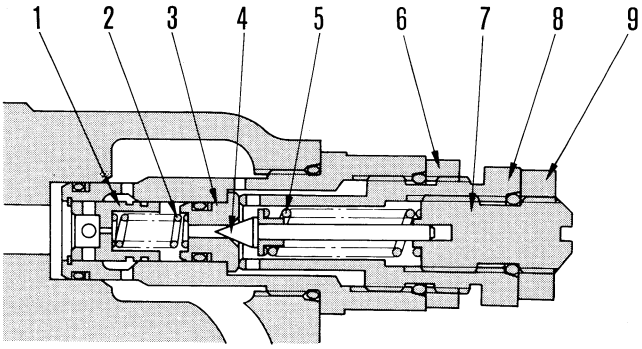
**Engine speed · oil pressure sensing system control (Constant torque control)**

1) Engine speed sensing system (H-mode)
This system acts to control the load pressure (swash plate angle) of the pump in order to keep the engine load (engine speed) constant even when the load changes during operation. It consists of the following components.
- TVC (Torque Variable Control) valve
- Servo valve
- Electronic control system (potentiometer, engine speed sensor, electronic controller)

2) Oil pressure sensing system (S-mode, L-mode)
In L-mode during light load operations, the system controls to a low delivery pressure by "oil pressure sensing system". This is selected by the mode selector switch.
To ensure that it operates properly even if the controller and sensors should break down, there is a "prolix circuit". It uses "oil pressure sensing system".

## MAIN RELIEF VALVE

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1. Main valve
2. Main valve spring
3. Valve seat
4. Pilot valve
5. Pilot valve spring
6. Lock nut
7. Plug
8. Holder
9. Lock nut

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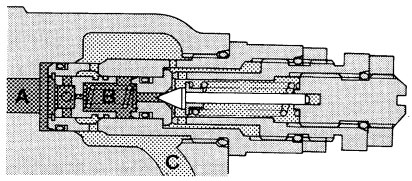
**Function**

The main relief valve is in the circuit between the pump and the control valve. This valve acts to protect the pump from damage from any abnormal oil pressure. When abnormal pressure is produced or when the hydraulic cylinder reaches the end of its stroke during operations, the oil sent from the pump is relieved through the main relief valve.
(It sets the maximum high pressure in the circuit during operations)

**Flow of the oil**

- Chamber **A** forms a pump circuit and chamber **C** forms a tank drain circuit. The oil flows into chamber **B** through the main relief valve orifice to keep the chamber filled.
  Pilot valve is set in the valve seat.

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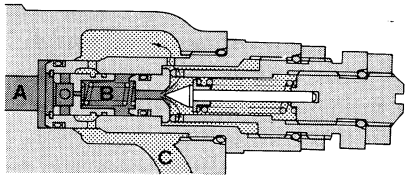
- If the pressure in chamber **B** reaches the pilot valve spring force (set pressure), the pilot valve moves, allowing the oil in chamber **B** to flow into chamber **C** through orifice. In addition, the oil flows from chamber **A** to **B** through orifices.

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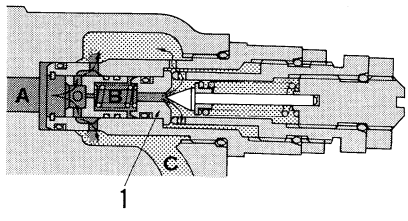
- If the oil flows through the orifice of valve (1), a differential pressure occurs between the chambers **A** and **B**, moving valve (1) to the right. This allows the oil in chamber **A** to flow into chamber **C**.

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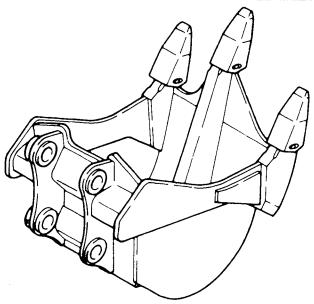
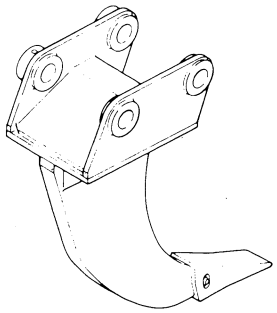
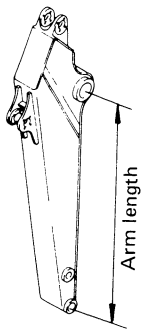
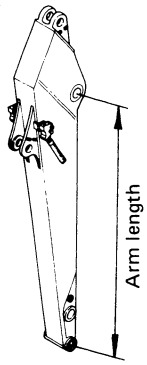
| Name | Style | Application | Specification | | |
|---|---|---|---|---|---|
| Ripper bucket |  206F133 | Used for digging hard ground rockbed and pavements | Capacity ($m^3$) | 0.56 | |
| | | | Bucket (mm) | 950 | |
| | | | Weight (kg) | 935 | |
| | | | Reversible | No | |
| Ripper |  206F134 | Suitable for digging rocks and pavements and tree roots | Shank width (mm) | 1-shank | 3-shank |
| | | | | 76 | 50 |
| | | | Ripper digging force (bucket) (kg) | 15,400 | 15,500 |
| | | | Weight (kg) | 363 | 620 |
| Short arm |   206F135A | Suitable for digging on general purpose | Arm length (Overall) (mm) | 2,000 | |
| | | | Maximum digging depth (mm) | 5,665 | |
| | | | Weight (kg) | 650 | |
| Long arm |   206F265A | Used for deep excavation work | Arm length (mm) | 3,045 | 3,500 |
| | | | Max. digging depth (mm) | 6,590 | 7,160 |
| | | | Weight (kg) | 705 | 760 |

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## 3. ENGINE SPEED SENSOR ★ FOR MACHINES EQUIPPED WITH 3-STAGE MODE SELECTOR OLSS

The engine speed sensor is installed to the ring gear of the engine. This sensor works electrically and counts the number of times the gear passes in front of the sensor. Magnetism is used for detecting.
The center of the sensor contains a magnet and a detector coil.

★ The sensor looks like a thick bolt. However, it is not strong.
For the sensor to count the number of teeth correctly, the sensor must be installed correctly. (In particular, the clearance between the tip of the sensor and the gear is very important.)

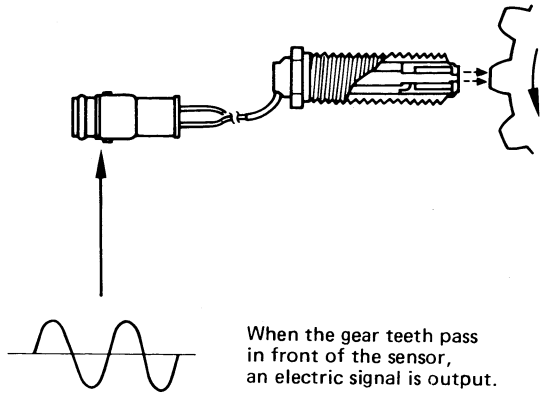
**Installing sensor**

1) Screw in the sensor until its tip is in contact with the gear.
2) Turn the sensor back one turn.
3) Tighten the lock nut to hold the sensor in position (5 – 7 kgm).

★ Steps (1) and (2) are vital for obtaining the correct clearance, so they must be carried out correctly.

Note:
Even if the sensor is installed in this way, the mounting position may not match the previous mounting position exactly.
For this reason, it is necessary to deal with the lead wire with special care.

• The tip of the sensor uses magnetism, as can be seen from the explanation of the structure. If any iron filings or metal dust are stuck to the tip, it will be unable to count the gear teeth. When storing or transporting, be particularly careful to protect this part from iron filings or damage.

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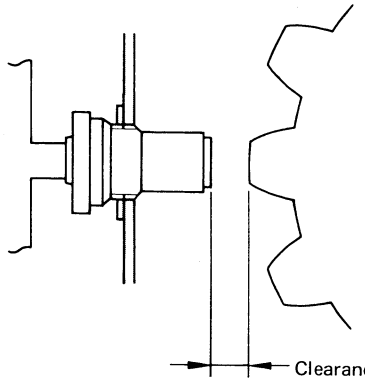


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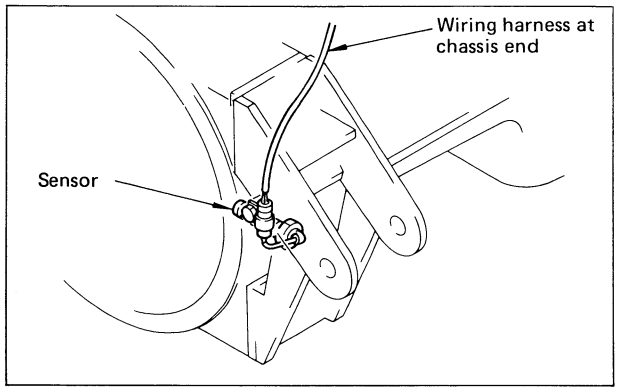


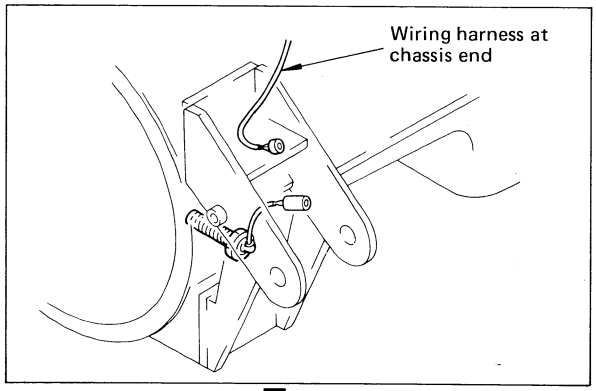


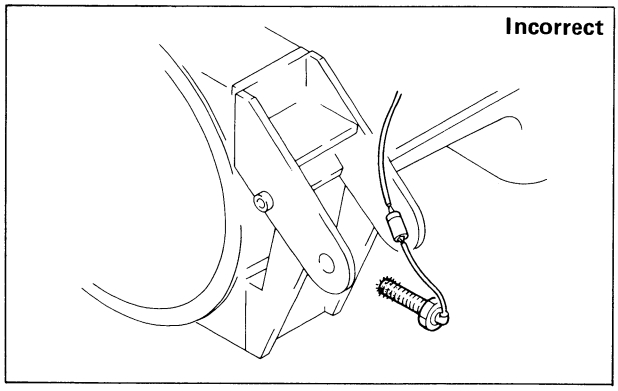


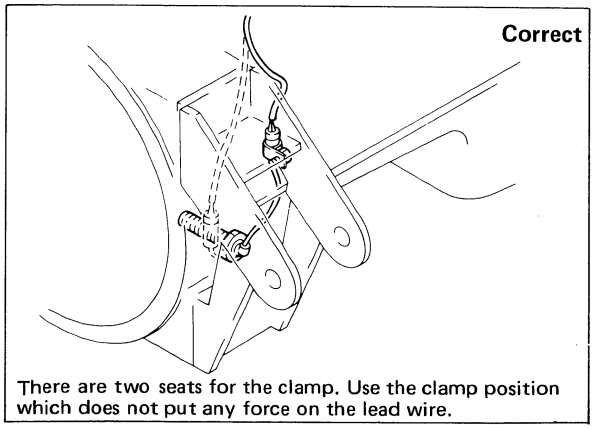


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(For engine on chassis)

| Engine | | | S6D110-1 | |
|---|---|---|---|---|
| Check item | Conditions | Unit | Standard value | Permissible value |
| Engine speed | High idling<br>Low idling<br>At rated speed | rpm<br>rpm<br>rpm | | |
| Exhaust color | Sudden acceleration<br>At high idling | Bosch index<br>Bosch index | | |
| Valve clearance | Intake valve (20°C)<br>Exhaust valve (20°C) | mm<br>mm | | –<br>– |
| Compression pressure | Oil temp.: 40 – 60°C<br>( ): Engine speed<br>SAE30 oil | kg/cm$^2$<br>(rpm) | | |
| Blow-by pressure | (Water temperature inside operating range)<br>At high idling, SAE30 oil | mm$H_2O$ | Note)<br>Max. | Note) |
| Oil pressure | (Water temperature inside operating range)<br>At high idling<br>At low idling (SAE30, min. 80°C)<br>At low idling (SAE10W, min. 80°C) | <br>kg/cm$^2$<br>kg/cm$^2$<br>kg/cm$^2$ | | |
| Oil temperature | Whole speed range (inside oil pan) | °C | 80 – 110 | 120 |
| Fuel injection timing | Compression B.T.D.C. | degree | | ± 1 |
| Fan belt tension (Alternator) | Slack when pushed with finger force of 6 kg | mm | 10 | 5 – 15 |

Note: Values are at rated speed.

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⚠ When carrying cut testing, adjusting or troubleshooting, stop the machine on level ground, install the safety bar on the frame, lower the bucket to the ground, and stop the engine.
Then apply the parking brake and block the tires.

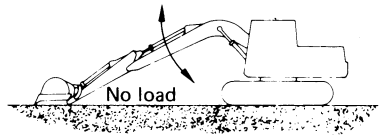
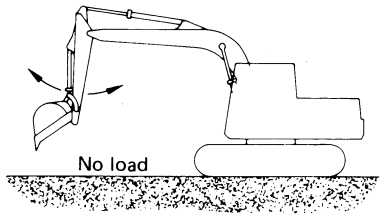
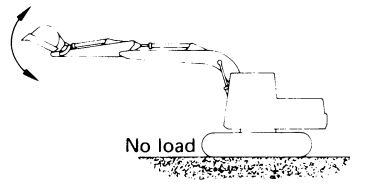
⚠ Do not allow unauthorized persons near the machine.

⚠ When measuring the engine speed, one worker hould measure the engine speed while the other sits in the operator's seat to operate the controls. Always check that the operation is safe, and use agreed signals.

⚠ Be careful not to get caught in rotating parts.

## TABLE OF L POSITION VALUE

★ The following table indicates the reference values for various actions when the mode selector switch is changed over from S position to L position.

| Classification | | Item | Condition | | Unit | L position | |
|---|---|---|---|---|---|---|---|
| Work equipment | Work equipment speed | Boom<br>Bucket teeth on the ground<br>↕<br>Cylinder fully extended | Posture of work equipment<br>  <br><br>205F2421<br>• Engine speed: High idling<br>• Oil temperature: 45–55°C | RAISE | sec | 3.7 ± 0.4 | |
| | | | | LOWER | | 3.4 ± 0.3 | |
| | | Arm<br>Cylinder fully retracted<br>↕<br>Cylinder fully extended | Posture of work equipment<br>  <br><br>205F2422<br>• Engine speed: High idling<br>• Oil temperature: 45–55°C | IN | | 5.4 ± 0.5 | |
| | | | | OUT | | 3.6 ± 0.4 | |
| | | Bucket<br>Cylinder fully retracted<br>↕<br>Cylinder fully extended | Posture of work equipment<br>  <br><br>205F2423<br>• Engine speed: High idling<br>• Oil temperature: 45–55°C | CURL | | 4.2 ± 0.4 | |
| | | | | DUMP | | 2.7 ± 0.5 | |

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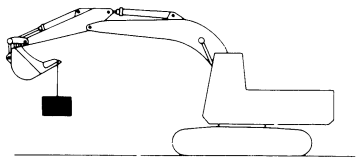
| Classification | Item | Condition | Unit | Standard value | Permissible value |
|---|---|---|---|---|---|
| Work equipment | Entire work equipment (Hydraulic drift at the tip of bucket teeth) | Posture of BACK HOE  200F1001 | mm | Max. 960 (600) | 1440 (960) |
| | Boom cylinder (Retraction of cylinder) | • In the posture shown above, measure the extension and retraction of each cylinder as well as the hydraulic drift at the tip of the bucket teeth.<br>• Work equipment rated load BACK HOE: 1620 kg<br>• Flat level surface<br>• Control levers in neutral<br>• Engine: Stopped<br>• Oil temperature: 45–55°C<br>• Start measuring immediately after setting<br>• Measure the hydraulic drift every 5 minutes, and make judgement after 15 minutes.<br>( ): Unloaded<br>• Blade: Set cylinder fully retracted. Leave for 5 minutes after stopping engine, then measure amount h blade tip moves during next 15 minutes. | | Max. 50 (30) | 60 (45) |
| | Arm cylinder (Extension of cylinder) | | | Max. 248 (110) | 300 (165) |
| | Bucket cylinder (Retraction of cylinder) | | | Max. 30 (20) | 45 (30) |
| | Blade cylinder (Extension of cylinder) | | | – | – |
| | Boom swing cylinder (Extension and retraction of cylinder) | • Engine: Stopped<br>• Hydraulic oil temperature: 45–55°C<br>• Bucket: Rated load ( kg)<br>• Place the machine in the same posture and stop it on a 15° slope with upper structure turned at right angles to the side.<br>• Measure the amount of movement of the cylinder for the next 15 minutes.<br>• ( ): Unloaded | | – | – |

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| System | Component | Connector No. | Testing method | Judgement table | Measurement conditions |
|---|---|---|---|---|---|
| Machine monitor | Gauge module | Engine cooling water gauge Measure resistance between CNP12 (female) (10) – (8). | Position of gauge display | Display level resistance (kΩ) (module input resistance) | 1) Measure resistance with starting switch turned OFF.<br>2) Check display with starting switch turned ON.<br>3) Connect socket. |
| | | | Starting switch ON | Starting switch OFF | |
| | | | Position of display | Minimum – Maximum | |
| | | | Top ↑ 7 | 0.28 – 2.62 | |
| | | | 6 | 2.48 – 3.67 | |
| | | | 5 | 3.46 – 4.19 | |
| | | | 4 | 3.95 – 5.07 | |
| | | | 3 | 4.78 – 6.75 | |
| | | | 2 | 6.36 – 10.05 | |
| | | | ↓ Bottom 1 | 9.47 – Disconnected | |
| | | Fuel level gauge Measure resistance of CNP12 (female) (3) – (16). | Top ↑ 7 | 0 – 1 | |
| | | | 6 | 12.0 – 27.2 | |
| | | | 5 | 24.6 – 37.8 | |
| | | | Position of display 4 | 34.2 – 42.8 | |
| | | | 3 | 38.7 – 51.9 | |
| | | | 2 | 47.0 – 82.0 | |
| | | | ↓ Bottom 1 | 72.6 – 726 | |
| | | | All out | 594 – Disconnected | |
| | | Between pins CNP12 (female) (7) – (16) (GND) (night lighting input) | Measuring voltage | Lamp switch OFF: 0V<br>Lamp switch I: 20 – 30V | 1) Starting switch ON<br>2) Connect T-adapter |
| | | CNP12 (9) – (16) (GND) (Emergency output) | Measuring voltage | For 3 sec. after turning starting switch ON: 0V<br>Connect short connector to CN5.: 3.5 – 6V<br>Disconnect short connector from CN5: Approx. 0V | 1) Starting switch ON<br>2) Connect short connector to CN5 (coolant temperature sensor).<br>3) Connect T-adapter |

Table 4

# TESTING AND ADJUSTING FUEL INJECTION TIMING

## TESTING OF FUEL INJECTION TIMING

1. Disconnect fuel injection pipe (1) of No. 1 cylinder.
2. Remove delivery valve holder (2). Remove delivery valve (3) and spring (4) from holder, then install holder (2) again.
3. Place fuel control lever at FULL position.
4. Operate priming pump and rotate crankshaft slowly in normal direction. Examine point where fuel stops flowing from delivery valve holder (2).
5. Check that pointer (6) and "16° I.J." line on crankshaft pulley (5) are aligned when fuel stops flowing.
   - ★ BEYOND injection timing line: Timing RETARDED
   - ★ BEFORE injection timing line: Timing ADVANCED
   - ★ To adjust injection timing, move position of injection pump.
     To ADVANCE, move to CYLINDER BLOCK.
     To RETARD, move to OUTSIDE.

★ When injection timing is incorrect, adjust as follows.

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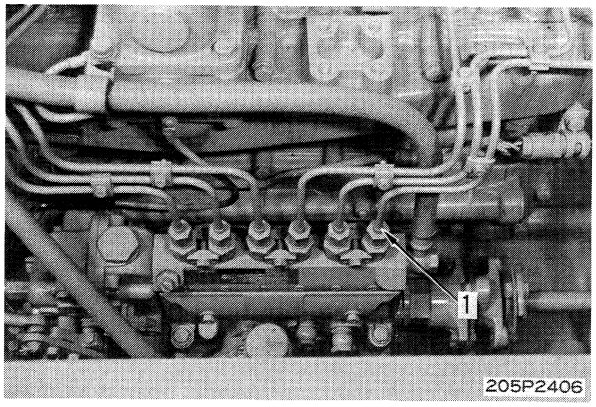
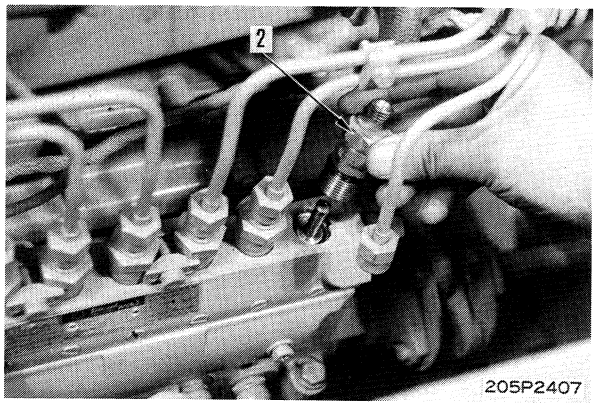
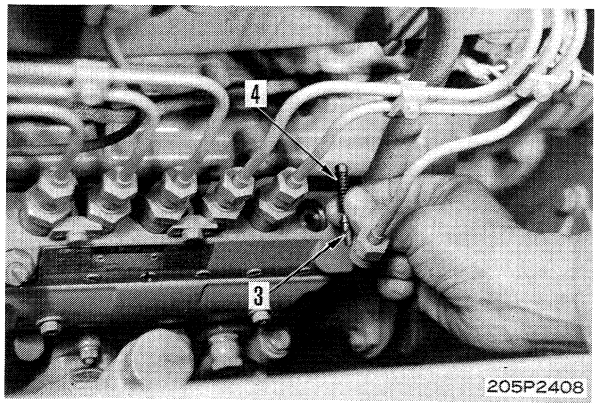
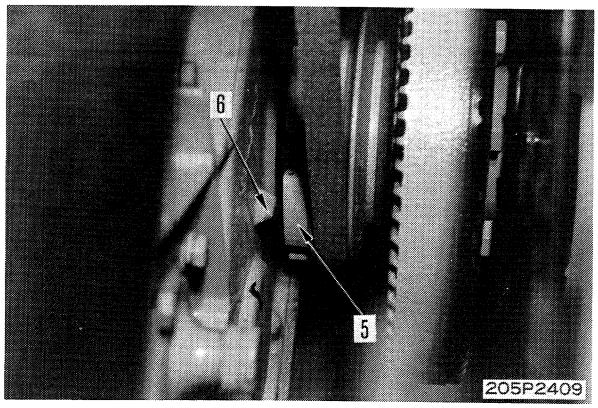


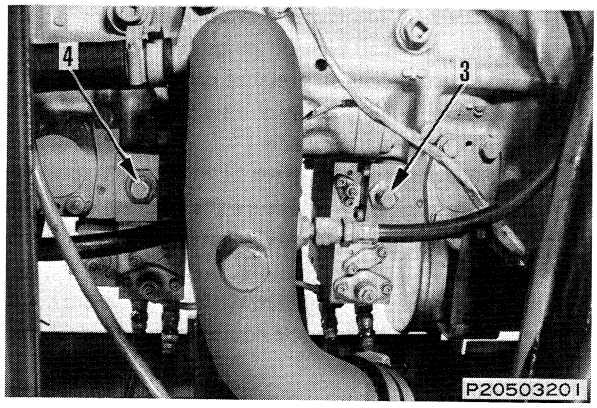



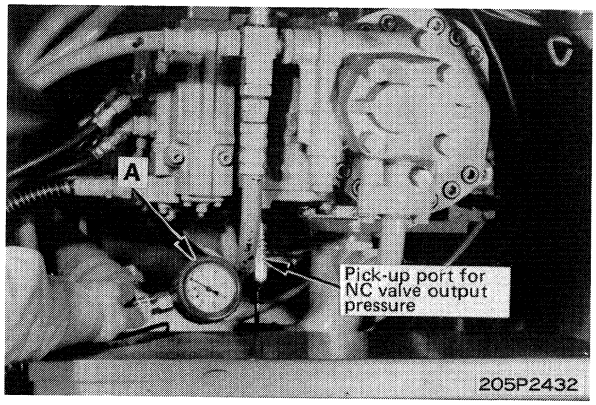



## NC VALVE OUTPUT PRESSURE

1) Remove pressure pick-up plugs (3) or (4) (Dia. = 10 mm, Pitch = 1.5), then install hydraulic pressure gauge A (60 kg/cm$^2$).
   ★ Front pump: (3)
   Rear pump: (4)
2) Raise the track on one side, rotate the track and measure the hydraulic pressure with the engine running at full throttle.
   ★ NC valve for front pump: R.H. travel motor
   ★ NC valve for rear pump: L.H. travel motor
   ★ Oil temperature when measuring: 45 – 55°C

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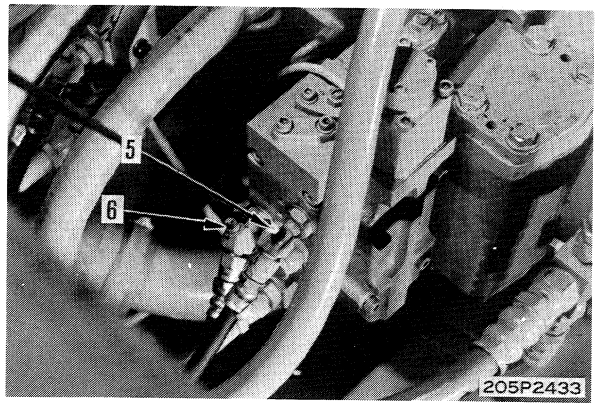
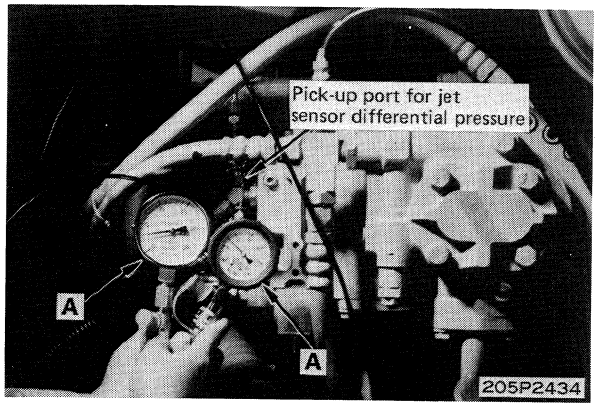
## DIFFERENTIAL PRESSURE OF JET SENSOR

1) Remove high pressure pick-up plug (6) (PT1/8) and low pressure pick-up plug (5) (PT1/8), then install hydraulic pressure gauge A (high pressure: 60 kg/cm$^2$; low pressure: 25 kg/cm$^2$).
   ★ There are two hydraulic pressure pick-up plugs: one for the front pump and one for the rear pump. In both cases, the engine side is the high pressure side.
2) Start the engine and measure with the engine running at full throttle and the control levers at NEUTRAL.
3) Operate the control levers, and measure the pressure at relief of either the front pump or the rear pump.
   ★ For details of the control actuator of each pump, see TESTING AND ADJUSTING MAIN RELIEF VALVE.
   ★ Oil temperature when measuring: 45 – 55°C



# TROUBLESHOOTING



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# CHECKS BEFORE TROUBLESHOOTING

**(1. Checks before starting, 2. Other check items)**

| | | Item | Judgement standard | Remedy |
|---|---|---|---|---|
| Checks before starting | Lubricating oil, cooling water | 1. Check fuel level | – | Add fuel |
| | | 2. Check for dirt or water in fuel | – | Clean, drain |
| | | 3. Check hydraulic oil level | – | Add oil |
| | | 4. Check hydraulic oil strainer | – | Clean, drain |
| | | 5. Check swing machinery oil level | – | Add oil |
| | | 6. Check engine oil level (Level of oil in oil pan) | – | Add oil |
| | | 7. Check cooling water level | – | Add water |
| | | 8. Check condition of dust indicator | – | Clean or replace |
| Item | Electrical equipment | 9. Check for loose or corroded battery terminals | – | Tighten or replace |
| | | 10. Check for loose or corroded alternator terminals | – | Tighten or replace |
| | | 11. Check for loose or corroded starting motor terminals | – | Tighten or replace |
| Other check items | Hydraulic, mechanical components | 12. Check for abnormal noise or smell | – | Repair |
| | | 13. Check for oil leakage | – | Repair |
| | | 14. Bleed air from system | – | Bleed air |
| | Electrical components | 15. Check battery voltage (engine stopped) | 20 – 30 V | Replace |
| | | 16. Check level of battery electrolyte | – | Add or replace |
| | | 17. Check for discolored, burnt, or bare wiring | – | Replace |
| | | 18. Check for missing wiring clamps, hanging wires | – | Repair |
| | | 19. Checks for water leaking onto wiring (check carefully water leakage at connectors and terminals) | – | Disconnect connector and dry connection |
| | | 20. Check for broken or corroded fuses | – | Replace |
| | | 21. Check alternator voltage (engine running at over half throttle) | 27.5 – 29.5 V | Replace |
| | | 22. Noise when battery relay is operated (switch starting switch from on to off) | – | Replace |

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**2. Checking by switching over prolix circuit**

Switch over the prolix circuit switch (located at the side of the control box) and see if the problem is corrected. Depending on the result, proceed to diagnosing processes E–XΔ or H–O by following the indication . . . . . in the Troubleshooting Table.

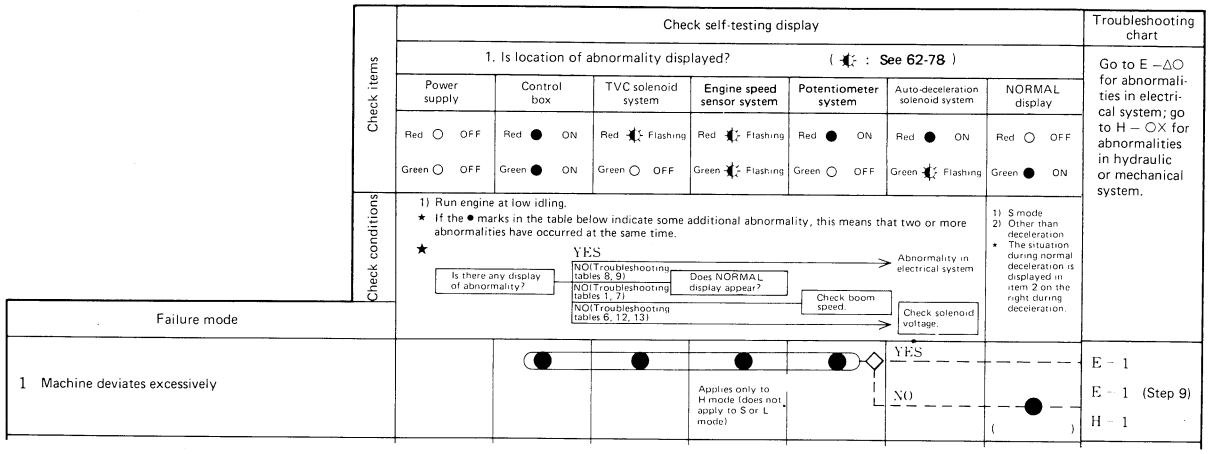
**3. Checking voltage of swing brake solenoid**

Run the engine for about 10 seconds to charge the accumulator pressure, then stop the engine, turn the starting switch to ON, and check if the voltage at the chassis wiring end of the connector for the swing brake solenoid is normal or not.

Example Failure mode (machine deviates excessively)

Step 1 Does the self-testing display indicate any abnormality?

Check the red and green LEDs on the control box to see if the self-testing display indicates any abnormality.




Judgement If the abnormality display corresponds to the ● mark in the above table → abnormality in electrical system. Go to troubleshooting table E–1.

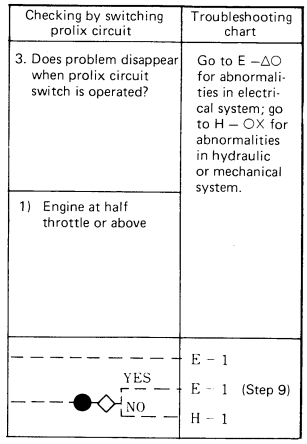
If NORMAL display appears in other than S mode and during deceleration → check next ● mark (checking by switching to prolix circuit).

Step 2 Checking by switching to prolix circuit

Operate to prolix circuit switch, operate in the same way as when the failure symptom appears, and check that the same symptoms appears.

Judgement If symptoms do not appear → abnormality in electrical circuit. Go to E–1 step 9.

If sumptoms appears → abnormality in hydraulic or mechanical system. Go to H–1.

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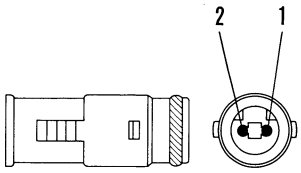
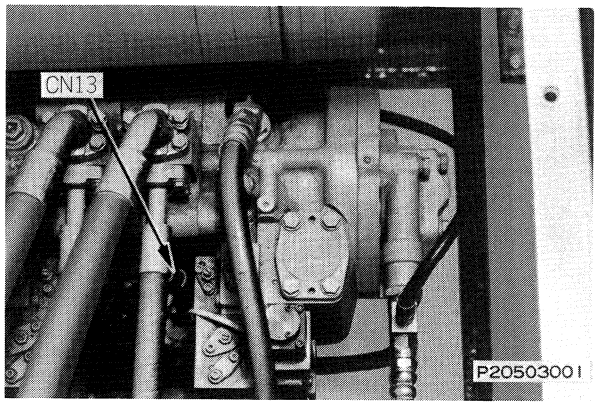
## POSITION OF CONNECTORS FOR TROUBLESHOOTING

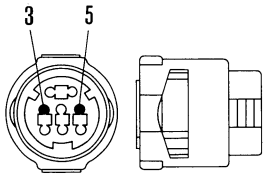
**E-1 (Troubleshooting of TVC valve)**

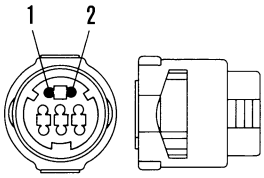
1. Measure resistance between CN13 (male) (1) and (2).
2. Check for short circuit between CN13 (male) (1), (2) and chassis ground.

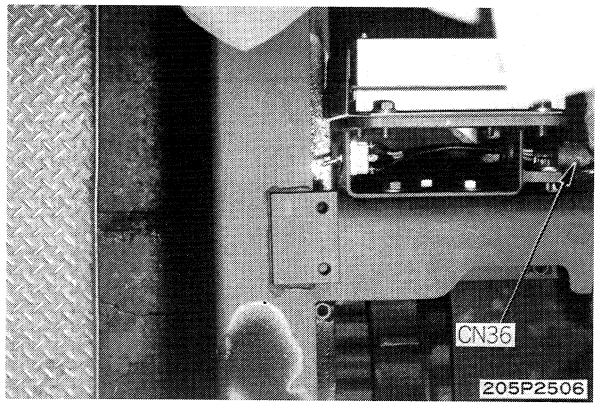



3. Measure resistance between CN36 (female) (3) and (5). Check for short circuit between CN36 (female) (3), (5) and chassis ground.
4. Measure resistance between CN36 (female) (1) and (2). Check for short circuit between CN36 (female) (1), (2) and chassis ground.

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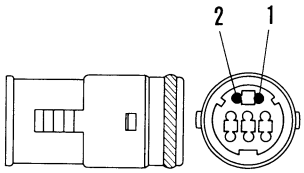
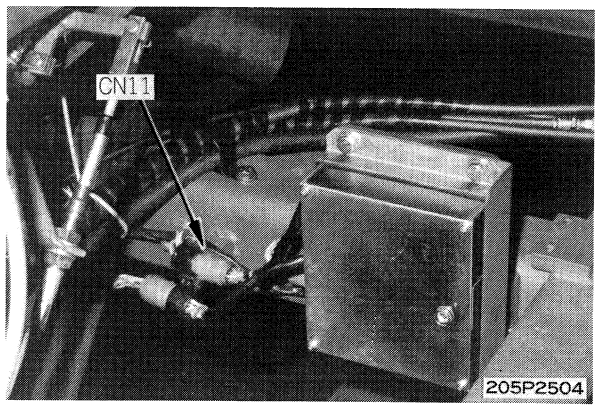
5. Measure resistance between CN11 (male) (1) and (2). Check for short circuit between CN11 (male) (1), (2) and chassis ground.

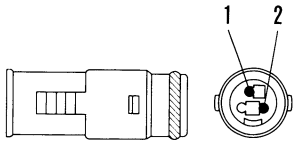


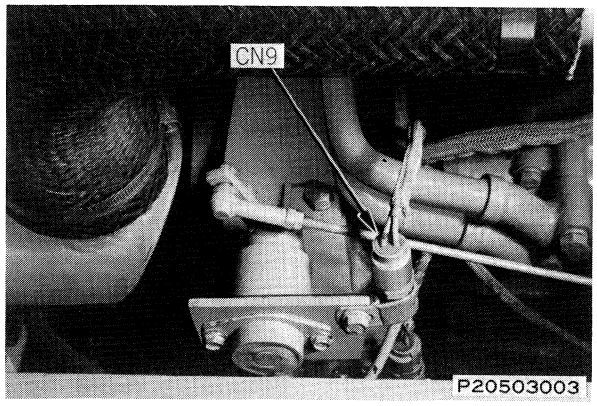



## POSITION OF CONNECTORS FOR TROUBLESHOOTING

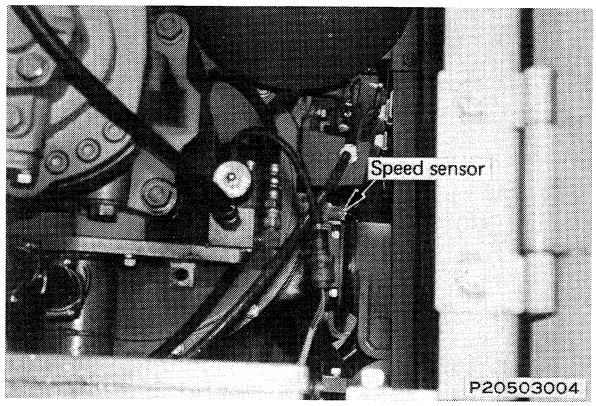
**E-2 (If problem is removed when switching to prolix circuit)**

1. Measure resistance between CN9 (male) (1) and (2).




2. Check mounting of speed sensor.

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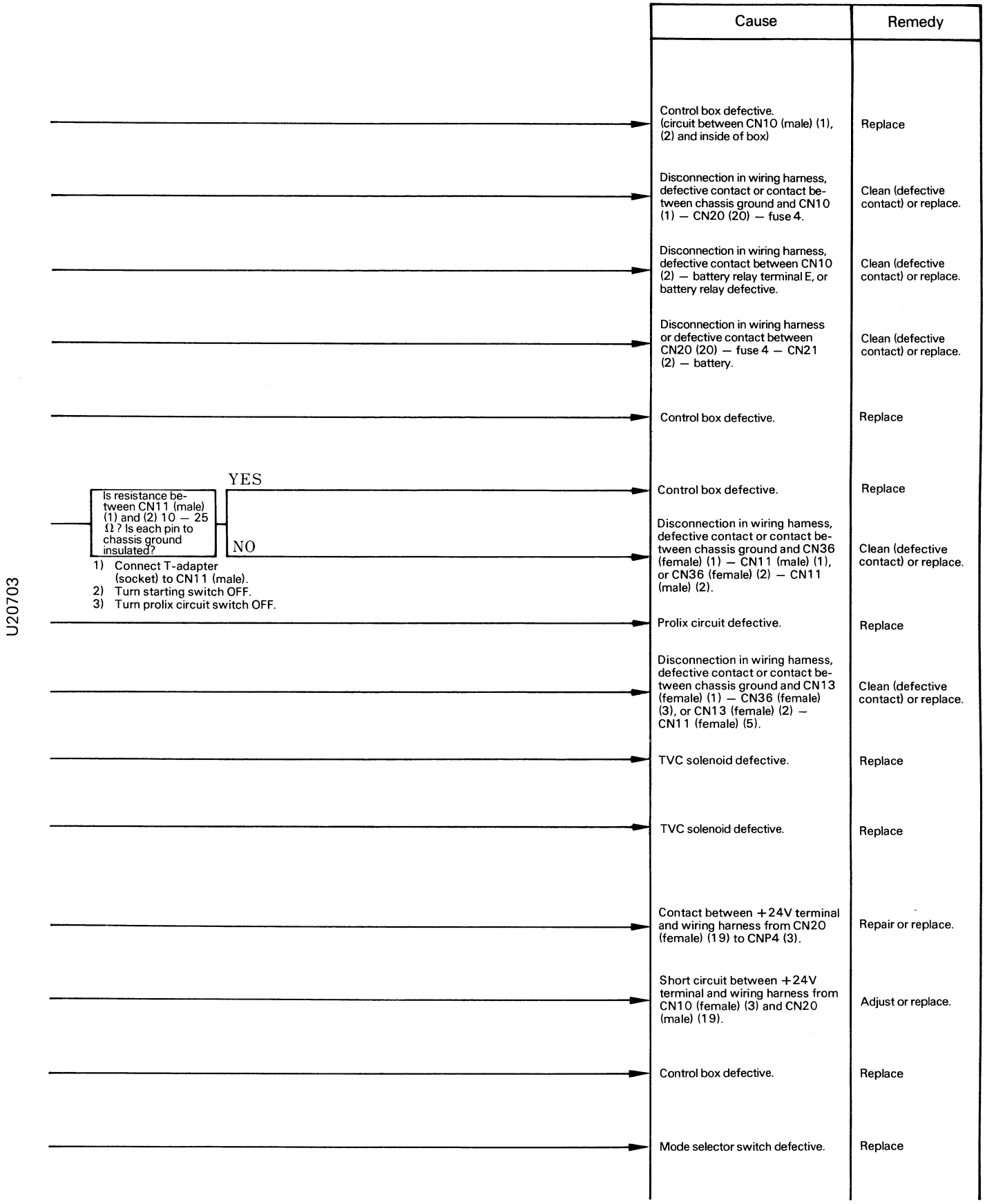
Cause
Remedy
Control box defective. (circuit between CN10 (male) (1), (2) and inside of box)
Replace
Disconnection in wiring harness, defective contact or contact between chassis ground and CN10 (1) — CN20 (20) — fuse 4.
Clean (defective contact) or replace.
Disconnection in wiring harness, defective contact between CN10 (2) — battery relay terminal E, or battery relay defective.
Clean (defective contact) or replace.
Disconnection in wiring harness or defective contact between CN20 (20) — fuse 4 — CN21 (2) — battery.
Clean (defective contact) or replace.
Control box defective.
Replace
YES
Is resistance between CN11 (male) (1) and (2) 10 — 25 Ω? Is each pin to chassis ground insulated?
Control box defective.
Replace
NO
Disconnection in wiring hamess, defective contact or contact between chassis ground and CN36 (female) (1) — CN11 (male) (1), or CN36 (female) (2) — CN11 (male) (2).
Clean (defective contact) or replace.
1) Connect T-adapter (socket) to CN11 (male).
2) Turn starting switch OFF.
3) Turn prolix circuit switch OFF.
Prolix circuit defective.
Replace
Disconnection in wiring hamess, defective contact or contact between chassis ground and CN13 (female) (1) — CN36 (female) (3), or CN13 (female) (2) — CN11 (female) (5).
Clean (defective contact) or replace.
TVC solenoid defective.
Replace
TVC solenoid defective.
Replace
Contact between +24V terminal and wiring harness from CN20 (female) (19) to CNP4 (3).
Repair or replace.
Short circuit between +24V terminal and wiring harness from CN10 (female) (3) and CN20 (male) (19).
Adjust or replace.
Control box defective.
Replace
Mode selector switch defective.
Replace

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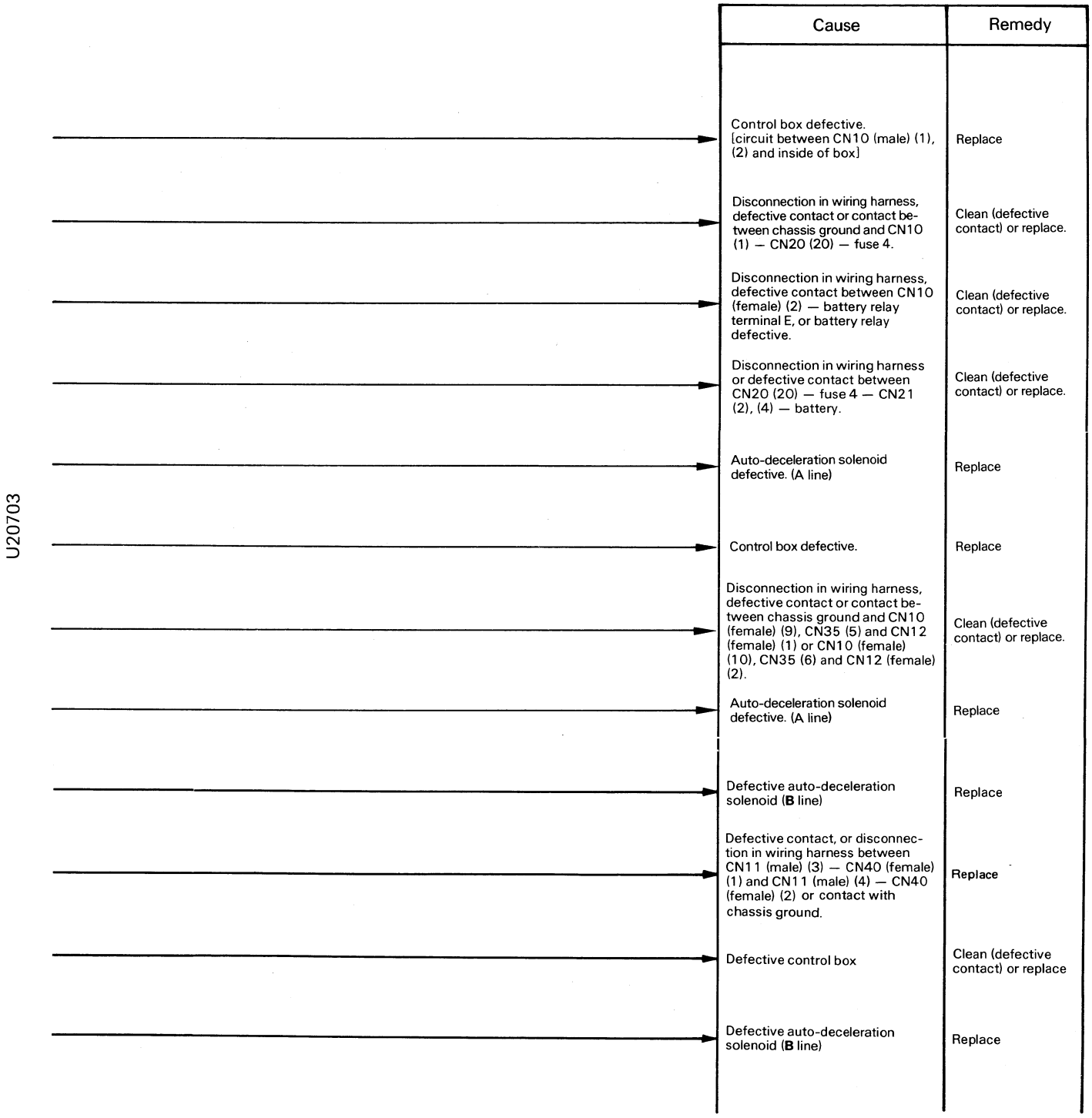

| Cause | Remedy |
|---|---|
| Control box defective. [circuit between CN10 (male) (1), (2) and inside of box] | Replace |
| Disconnection in wiring harness, defective contact or contact between chassis ground and CN10 (1) — CN20 (20) — fuse 4. | Clean (defective contact) or replace. |
| Disconnection in wiring harness, defective contact between CN10 (female) (2) — battery relay terminal E, or battery relay defective. | Clean (defective contact) or replace. |
| Disconnection in wiring harness or defective contact between CN20 (20) — fuse 4 — CN21 (2), (4) — battery. | Clean (defective contact) or replace. |
| Auto-deceleration solenoid defective. (A line) | Replace |
| Control box defective. | Replace |
| Disconnection in wiring harness, defective contact or contact between chassis ground and CN10 (female) (9), CN35 (5) and CN12 (female) (1) or CN10 (female) (10), CN35 (6) and CN12 (female) (2). | Clean (defective contact) or replace. |
| Auto-deceleration solenoid defective. (A line) | Replace |
| Defective auto-deceleration solenoid (**B** line) | Replace |
| Defective contact, or disconnection in wiring harness between CN11 (male) (3) — CN40 (female) (1) and CN11 (male) (4) — CN40 (female) (2) or contact with chassis ground. | Replace |
| Defective control box | Clean (defective contact) or replace |
| Defective auto-deceleration solenoid (**B** line) | Replace |

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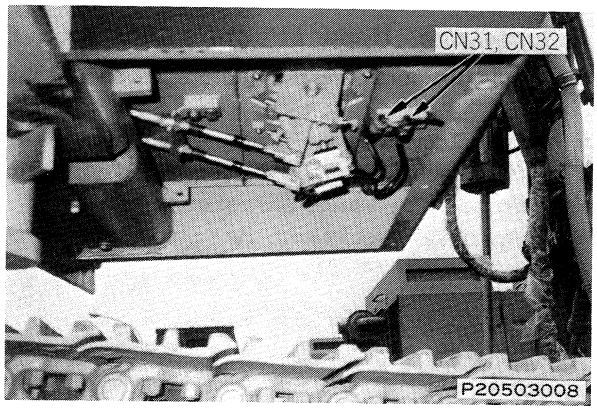
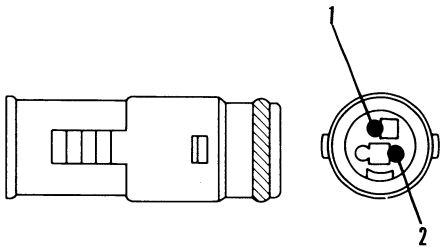
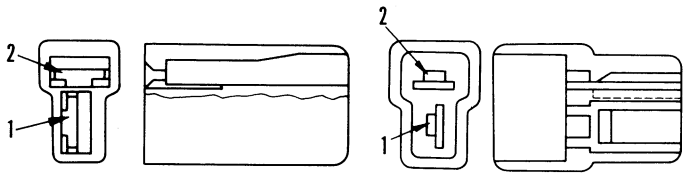
a-4. Check for continuity between CN31 (male) (1) – (2), CN32 (male) (1) – (2).
a-5 Check for short circuit between CN31 (male) (1), (2) – chassis ground, CN32 (male) (1), (2) – chassis ground.




a-6 Check for continuity between CNP8 (male) (1) and (2).
a-7 Check for short circuit between CNP8 (female) (1), (2) and chassis ground.

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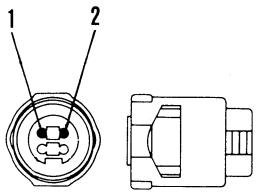
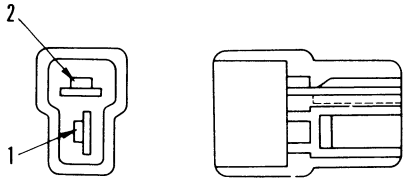
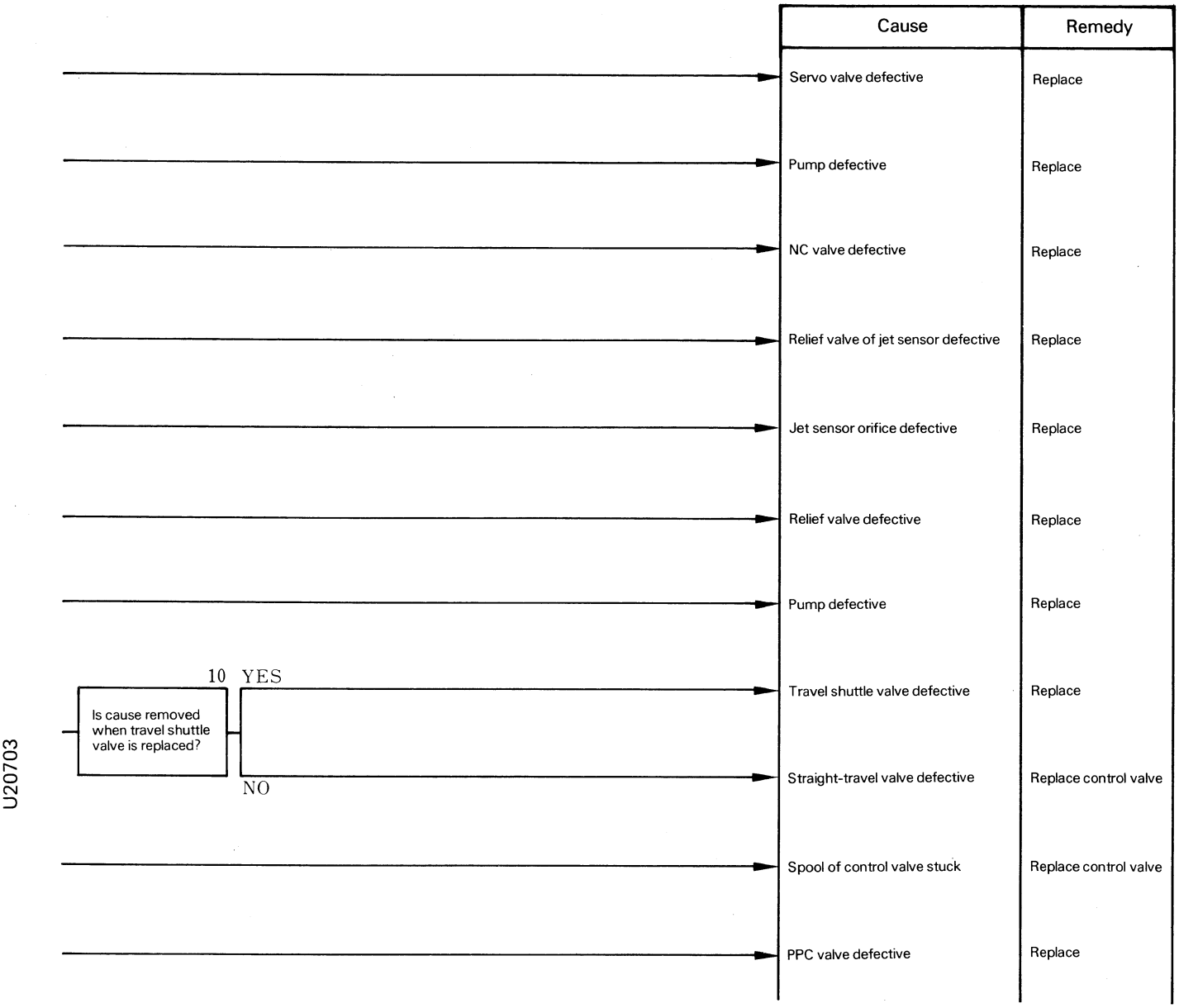
a-8 Measure voltage between CN60 (female) (1) and (2).




b-2 Check for continuity between CNP8 (female) (1) and (2).



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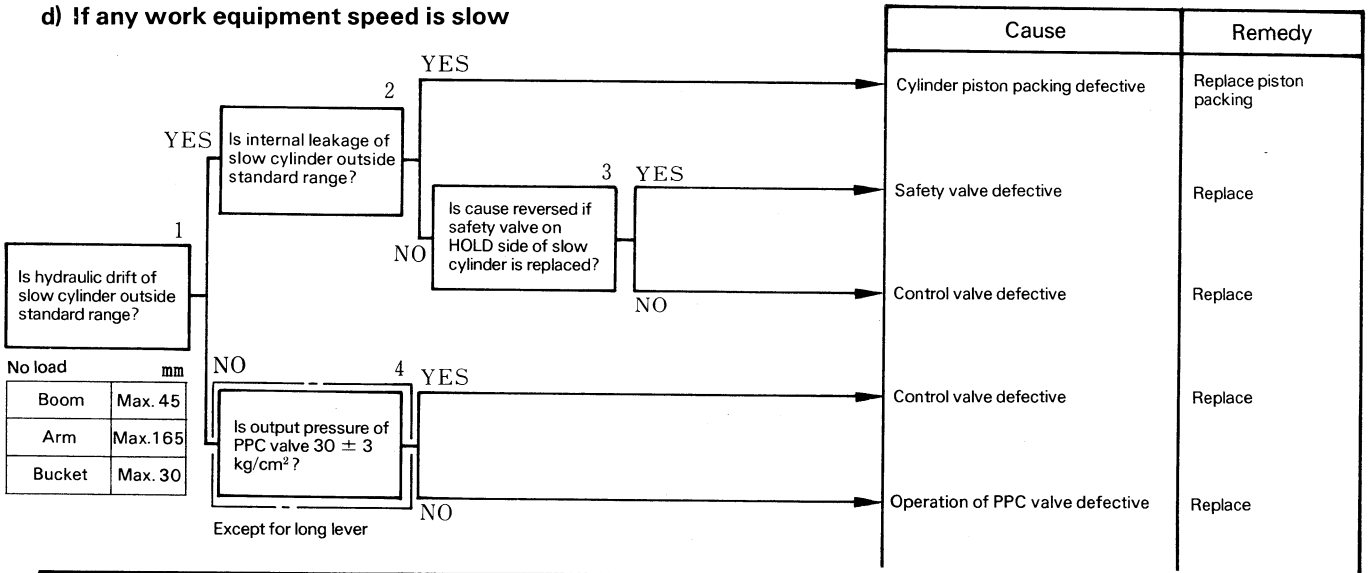
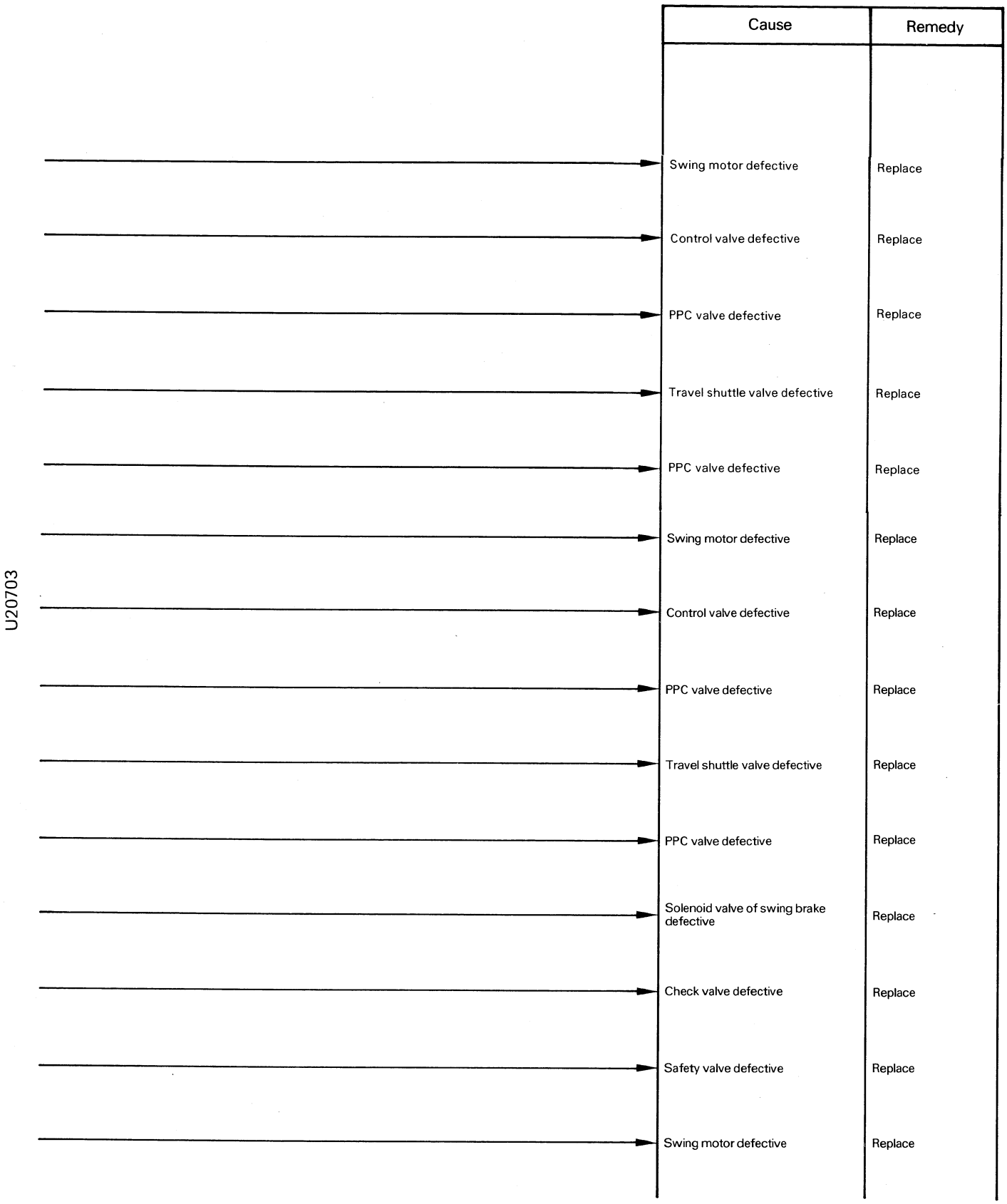
**d) If any work equipment speed is slow**




| Trouble-shooting tools | Scale | Measuring cylinder | Stop watch |
|---|---|---|---|
| | Oil pressure gauge (60 kg/cm²) | Sleeve nut, plug | — |



| Cause | Remedy |
|---|---|
| Swing motor defective | Replace |
| Control valve defective | Replace |
| PPC valve defective | Replace |
| Travel shuttle valve defective | Replace |
| PPC valve defective | Replace |
| Swing motor defective | Replace |
| Control valve defective | Replace |
| PPC valve defective | Replace |
| Travel shuttle valve defective | Replace |
| PPC valve defective | Replace |
| Solenoid valve of swing brake defective | Replace |
| Check valve defective | Replace |
| Safety valve defective | Replace |
| Swing motor defective | Replace |

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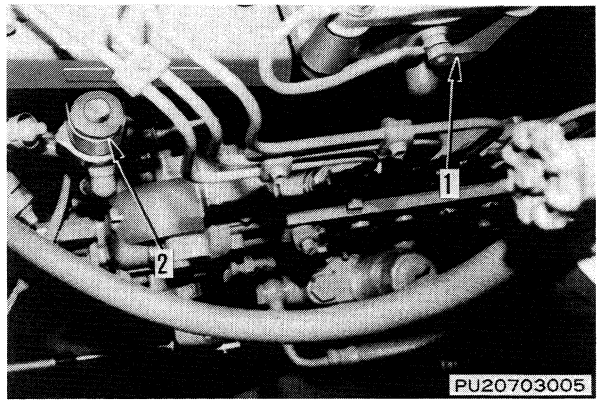
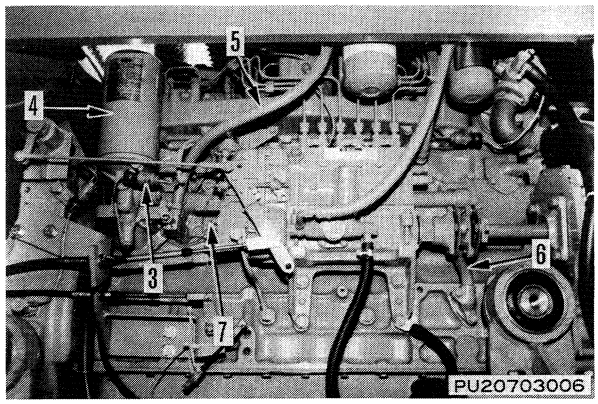
# REMOVAL OF ENGINE OIL COOLER ASSEMBLY




1. Loosen drain valves, and drain cooling water.
   ★ If the coolant contains antifreeze, dispose of it correctly.
2. Remove fuel injection pump assembly.
   For details, see REMOVAL OF FUEL INJECTION PUMP.
3. Disconnect wiring (1), then remove relay (2) of electrical intake air heater.
4. Disconnect connector (3) of hydraulic pressure sensor wiring, then remove oil filter (4).
5. Remove hose (5) between cylinder block and corrosion resistor.
6. Remove tube (6) between oil cooler and adapter.
7. Remove engine oil cooler assembly (7).

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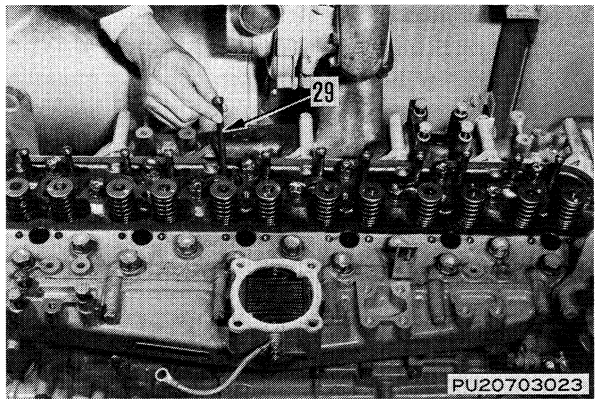
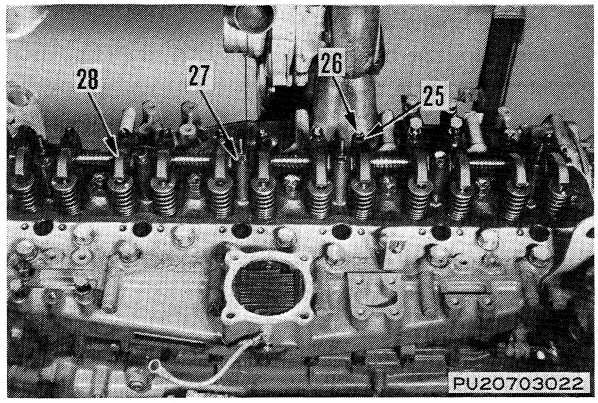
# INSTALLATION OF ENGINE OIL COOLER ASSEMBLY

1. Fit gasket and intall engine oil cooler assembly (7) to block.
2. Fit O-ring and install tube (6) between oil cooler and adapter.
   ★ Insert a flat washer between the tube and the cooler.
3. Install hose (5) between cylinder block and corrosion resistor.
4. Fit O-ring and install oil filter (4), then connect connector (3) of hydraulic pressure sensor wiring.
   ★ Fix the connector securely with the clip.
5. Install relay (2) of electrical intake air heater, then connect wiring (1).
6. Install fuel injection pump assembly.
   For details, see INSTALLATION OF FUEL INJECTION PUMP.
7. Tighten drain valves and add water through water filler to the specified level.
   ★ Run the engine to circulate the water through the system. Then check the water level again.

2. **Push rod**
   Install push rod (29).
   ★ Check that the push rod is fitted completely into the socket of the tappet.




3. **Rocker arm assembly**
   1) Set rocker arm assembly (28) on cylinder head.
      ★ Check that the ball of the adjustment screw is fitted properly into the socket of the push rod.
   2) Tighten 6 mounting bolts (27).
      ★ To prevent the push rod from protruding too far and putting strain on the rocker arm when assembling, loosen locknut (25) and turn adjustment screw (26) back 2 to 3 turns.

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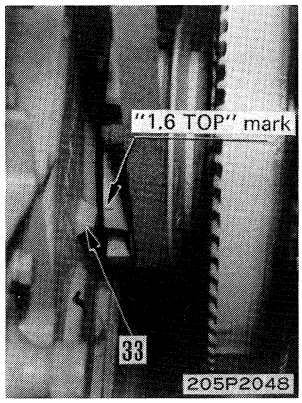
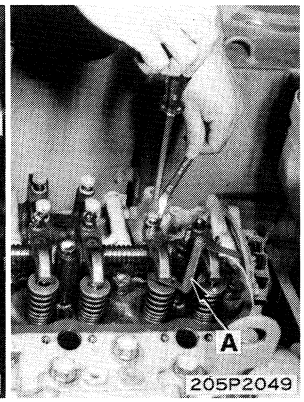
4. **Adjusting valve clearance**
   ★ Adjust clearance between valve and rocker lever as follows.

Unit: mm

| Temp. in oil pan: (20°C) | Intake valve | Exhaust valve |
|---|---|---|
| | 0.25 | 0.45 |




   1) Rotate the crankshaft in the normal direction to align pointer (33) with the 1.6 TOP mark on crankshaft pulley. When rotating, check the movement of the valves.
   2) Insert tool **A** between rocker lever and valve stem and turn adjustment screw until clearance is a sliding fit. Then tighten locknut to hold adjustment screw in position.
      kgm Locknut: 3.2 ± 0.3 kgm
      ★ After tightening the locknut, check the clearance again.
      ★ When No. 1 cylinder is at compression top dead center, adjust the valves marked ●. When No. 6 cylinder is at compression top dead center, adjust the valves marked ○.

| Cylinder No. | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Intake valve | ● | ● | ○ | ● | ○ | ○ |
| Exhaust valve | ● | ○ | ● | ○ | ● | ○ |

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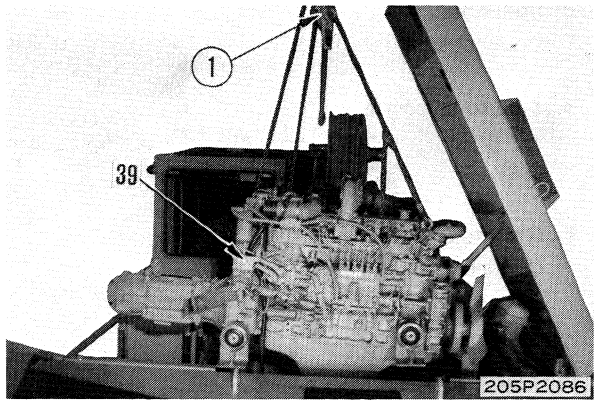
# INSTALLATION OF ENGINE AND HYDRAULIC PUMP ASSEMBLY

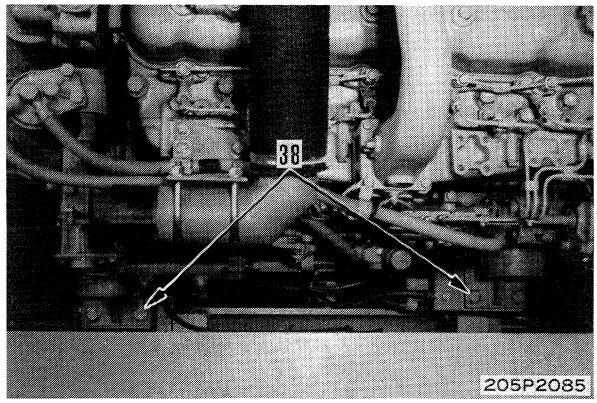
**1. Engine and main pump assembly**

1) Using lever block ①, raise engine and main pump assembly (39) horizontally, then set in position on frame.




2) Tighten 8 mounting bolts (38) of engine at left, right, front and rear.

kgm Mounting bolt: 28 ± 3 kgm

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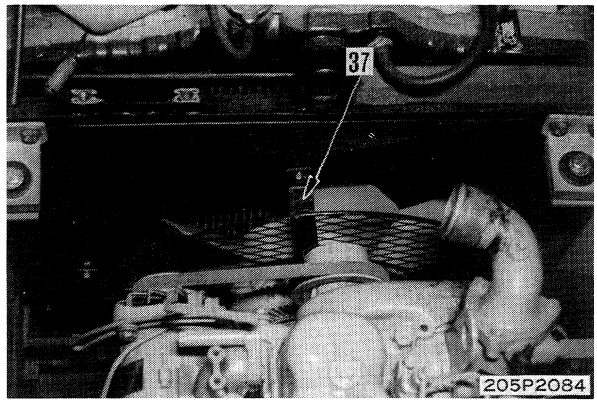
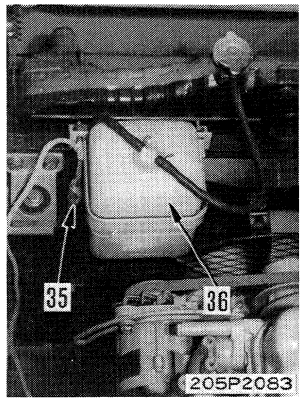
**2. Fan guard**

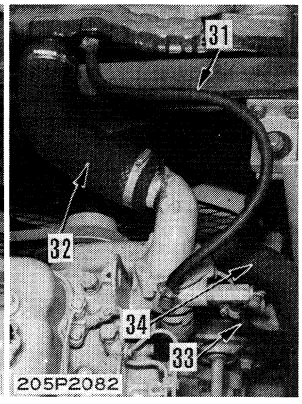
Install fan gurard (37).




**3. Sub-tank, radiator piping**

1) Install cooling water sub-tank (36) on frame, then connect wiring connector (35) of water temperature sensor.
2) Connect water pump inlet hose (34).
3) Connect heater hose (33).
4) Install radiator inlet hose (32).
5) Connect aeration hose (31).



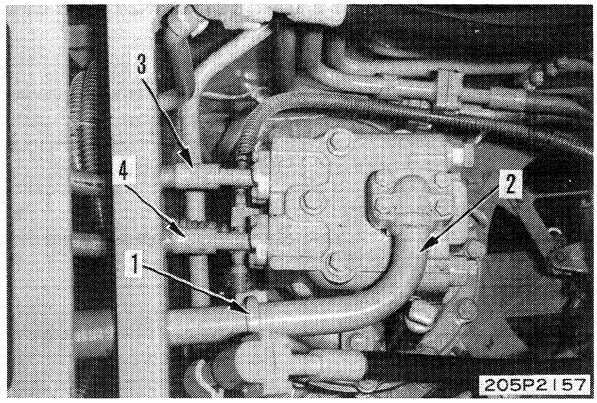



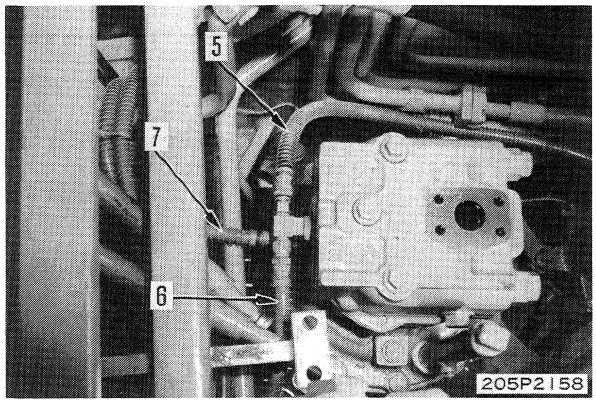
# REMOVAL OF SWING MOTOR ASSEMBLY

Lower the work equipment completely to the ground and stop the engine. Operate the control lever several times to release the remaining pressure in the hydraulic piping. Then loosen the oil filler cap slowly to release the pressure inside the hydraulic tank.

1. Remove intermediate U-bolt (1), then remove tube (2) between swing motor and tank.
2. Disconnect hoses (3) and (4) between control valve and swing motor.
3. Disconnect hose (5) between swivel joint and swing motor.
4. Disconnect hose (6) between swing motor and tank.
5. Disconnect hose (7) between solenoid valve and swing motor.
6. Remove 2 mounting bolts, then using eye bolts ① (Dia. = 12 mm, Pitch = 1.75 mm), remove swing motor assembly (8).

kg Swing motor assembly: 65 kg

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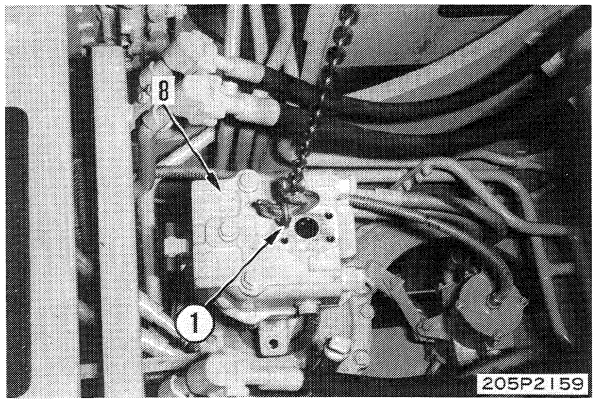
# INSTALLATION OF SWING MOTOR ASSEMBLY

★ Tighten the hose joints to the following tightening torque.
★ Install hose without twisting or interference.

kgm Sleeve nut: 5 ± 2 kgm
(Width across flats: 24 mm)

1. Fit O-ring, then using eye bolts ① (Dia. = 12 mm, Pitch = 1.75 mm), raise swing motor assembly (8) and install to swing machinery.
2. Connect hose (7) between solenoid valve and swing motor.
3. Connect hose (6) between swing motor and tank.
4. Connect hose (5) between swivel joint and swing motor.
5. Fit O-rings and connect hoses (4) and (3) between control valve and swing motor.
6. Fit O-ring and install tube (2) between swing motor and tank, then secure with intermediate U-bolt (1).

★ Run the engine to circulate the oil through the system. Then add oil to the hydraulic tank to the specified level.



# ASSEMBLY OF SWING MOTOR ASSEMBLY (WITH SWING MECHANICAL BRAKE)

**Special tools**

| No. | Part No. | Part Name | Q'ty |
|---|---|---|---|
| A | 790-501-5000 | Unit repair stand | 1 |
| $A_1$ | 790-901-2230 | Plate | 1 |
| B | 795-630-1803 | Torque wrench set | 1 |
| $B_1$ | 796-720-2220 | Socket | 1 |
| $B_2$ | 796-730-2120 | Screwdriver | 1 |
| C | 796-730-2000 | Wrench | 1 |
| D | 796-750-1500 | Holder | 1 |

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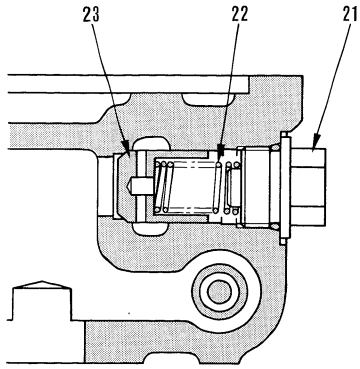
1. **Check valve**
   Assemble valve (23) and spring (22), then fit O-ring and install plug (21).
   kgm Plug: 8 ± 1 kgm



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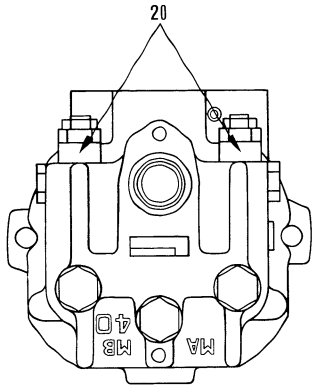
2. **Safety valve**
   Fit O-ring, and install safety valve (20).
   kgm Safety valve: 26 ± 3 kgm



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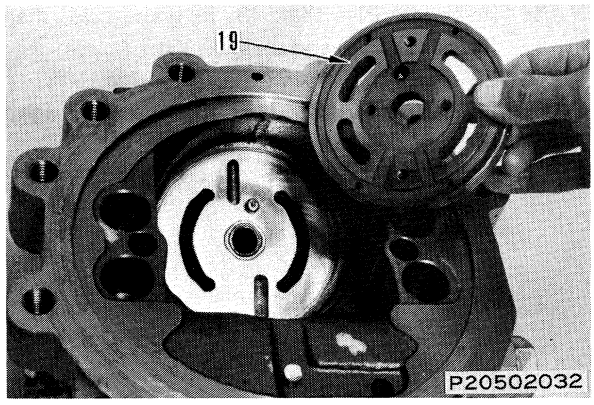
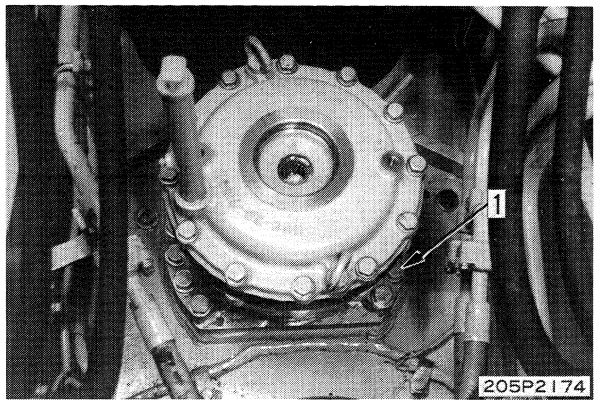
3. **Valve plate**
   Turn over housing, align dowel, then install valve plate (19).



# REMOVAL OF SWING MACHINERY ASSEMBLY

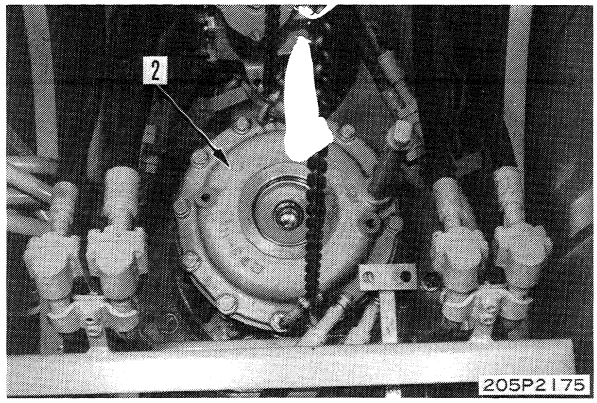
1. Remove swing motor assembly.
   For details, see REMOVAL OF SWING MOTOR ASSEMBLY.
2. Remove 12 mounting bolts (1).
3. Lift off swing machinery assembly (2).

   kg Swing machinery assembly: 190 kg




# INSTALLATION OF SWING MACHINERY ASSEMBLY

1. Fit O-ring and raise swing machinery assembly (2). Lower slowly, align pinion and inner teeth of swing circle and set in position on frame.
2. Tighten 12 mounting bolts (1).
3. Install swing motor assembly.
   For details, see INSTALLATION OF SWING MOTOR ASSEMBLY.

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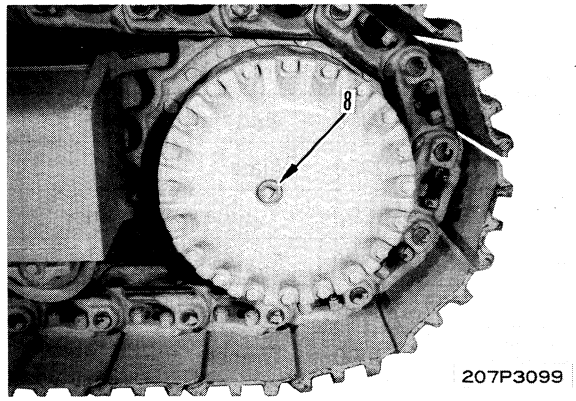
# INSTALLATION OF TRAVEL MOTOR ASSEMBLY




1. Fit O-ring, then using lifting tool ② (Thread dia. = 10 mm, Pitch = 1.5 mm), raise travel motor assembly (7) by crane.
2. Fit guide bolt ① (Thread dia. = 16 mm, Pitch = 2.0 mm, Length = 300 mm) to mounting hole of travel motor, push in travel motor assembly and set.
   ★ With the spline dose not fit in rotate sprocket and align spline.
3. Tighten 2 mounting bolts (6).
4. Fit O-rings and connect hoses (5) and (4) between travel motor and swivel joint.
5. Connect drain hose (3) between travel motor and swivel joint.

   kgm Sleeve nut: **5 ± 2 kgm**
   (Width across flats: 24 mm)
6. Install cover (2).
7. Tighten drain plug (1) and add engine oil through oil filler (8) to the specified level.

   Final drive case: **Approx. 10.5** ℓ (each side)

★ Run the engine to circulate the oil through the system. Then add oil to the hydraulic tank to the specified level. Bleed the air from the motor.
★ For details, see BLEEDING AIR FROM TRAVEL MOTOR.
★ After bleeding the air, check the oil level again.

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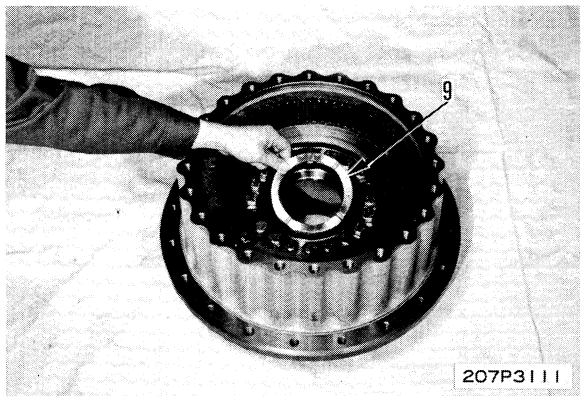
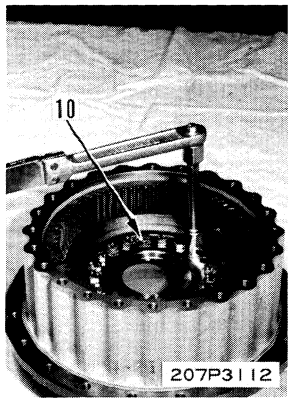
**6. Thrust washer**

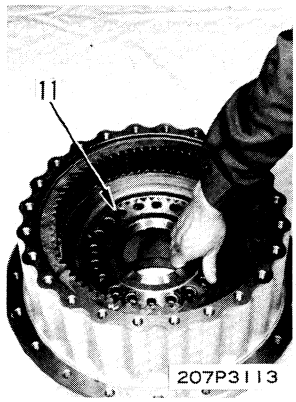
Remove thrust washer (9).



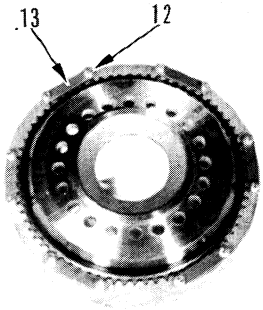

**7. Gear assembly**

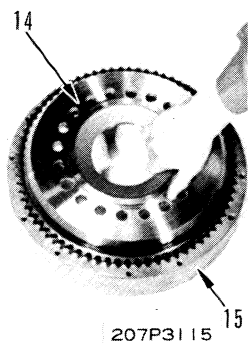
1) Remove 16 mounting bolts (10).
2) Take out gear assembly (11).
   ★ There are dowel pins fitted in the gear assembly, so if it is difficult to remove the assembly, put a block in contact with the dowel pin position and fit with a hammer to remove.




3) Disassemble gear assembly as follows.
   i) Remove mounting bolts (12), then remove plate (13).
   ii) Remove inner gear (14) from outer gear (15).

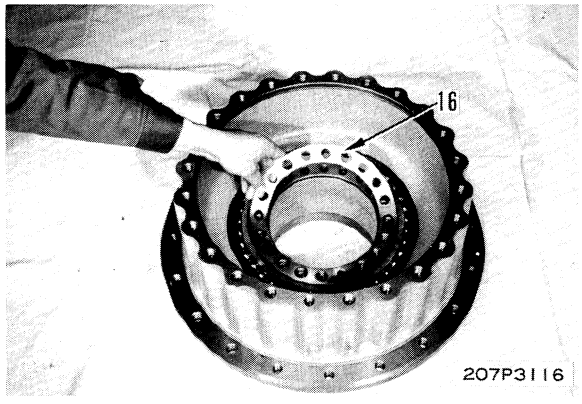



**8. Shim**

Remove shim (16).

★ Check the number and thickness of the shims, and keep in a safe place.

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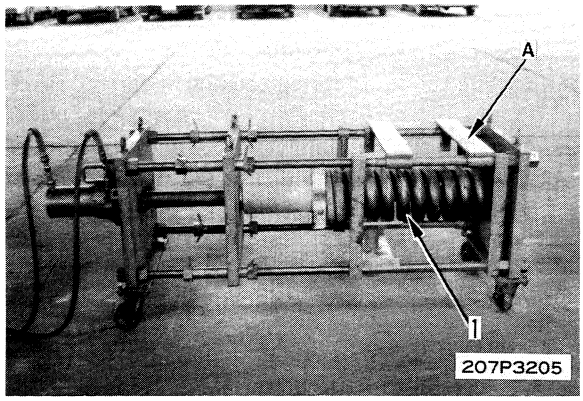
# DISASSEMBLY OF RECOIL SPRING ASSEMBLY

**Special tools**

| | Part number | Part name | Q'ty |
|---|---|---|---|
| A | 791-600-2001 or 790-635-8003 | Compressor | 1 |
| $A_1$ | 790-101-1600 | Cylinder (70t) | 1 |
| $A_2$ | 790-101-1102 | Pump | 1 |

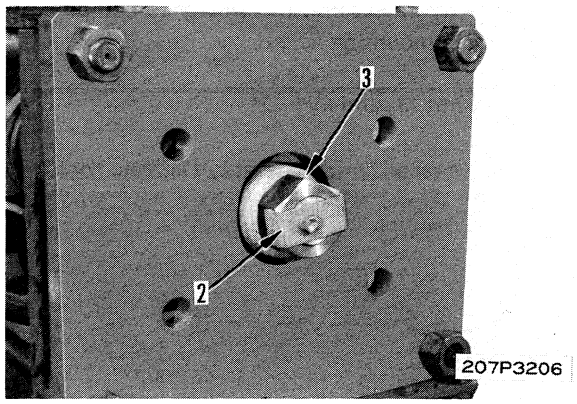



1. Set recoil spring assembly (1) on tool **A**.

   The spring under high installed load, so be careful to set securely.

   ★ Installed load of spring: **17750 kg**

2. Apply hydraulic pressure slowly to compress spring, then remove lock (2) and nut (3).
   ★ Compress spring until nut loosens.



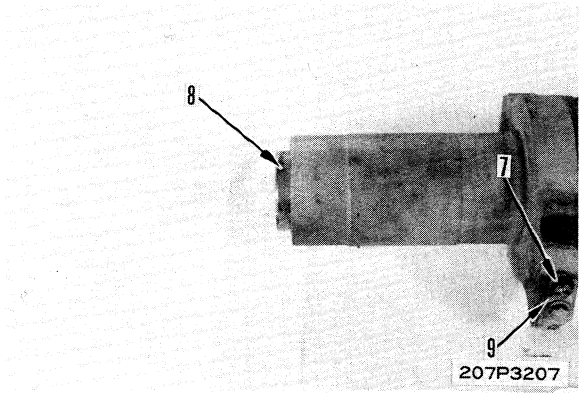

3. Slowly relieve hydraulic pressure to remove spring compression.
   ★ Free length of spring: **827 mm**

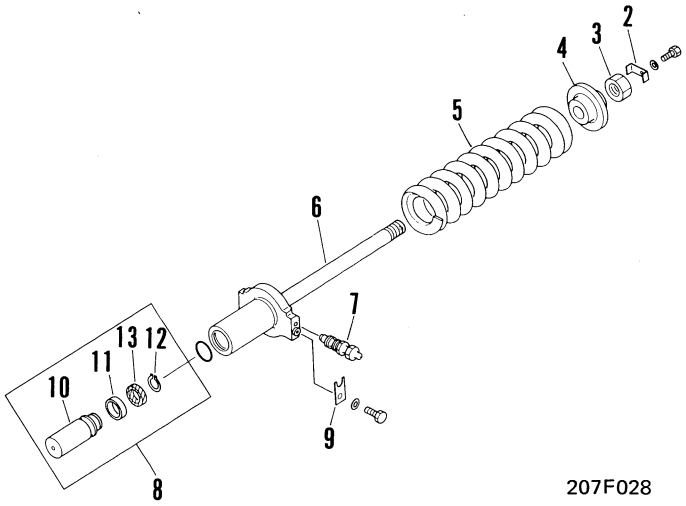
4. Disassemble recoil spring assembly into collar (4), spring (5) and cylinder (6).

5. Remove O-ring, fill grease through lubricator (7), and pull out piston assembly (8).

6. Remove plate (9), then remove lubricator (7).

7. Remove wear ring (11) from piston (10), then remove snap ring (12) and packing (13).

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# INSTALLATION OF HYDRAULIC PUMP ASSEMBLY

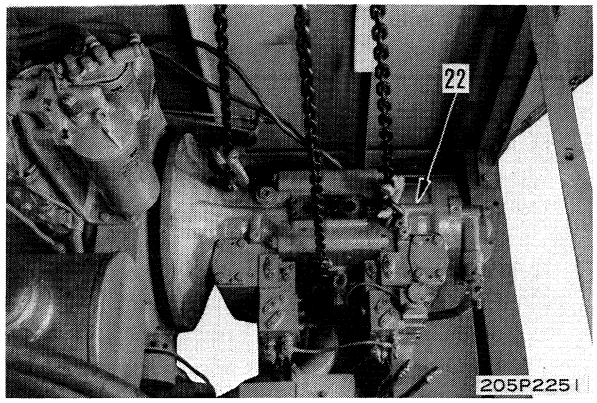
★ Tighten the hose joints (at taper seal) to the following torques.
★ Install hose without twisting or interference.

kgm Sleeve nut of hose

| | | |
|---|---|---|
| Width across flats of nut | 19 mm | 2.5 ± 0.5 kgm |
| | 27 mm | 8 ± 2 kgm |
| | 32 mm | 18 ± 3 kgm |

**1. Main pump assembly**

1) Raise main pump assembly (22) horizontally, align with spline for damper, then set in position on housing.
   ★ Coat the spline with grease (LM-G)
2) Tighten 12 mounting bolts.

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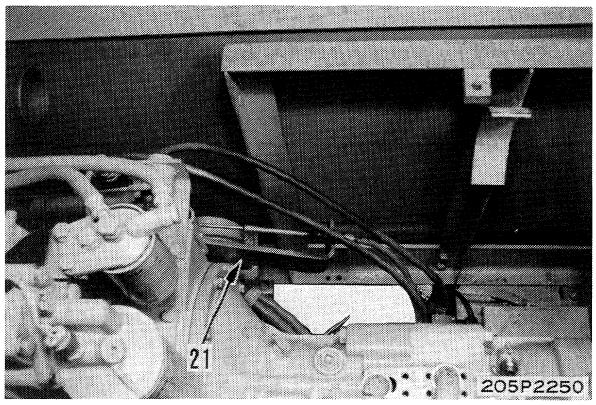
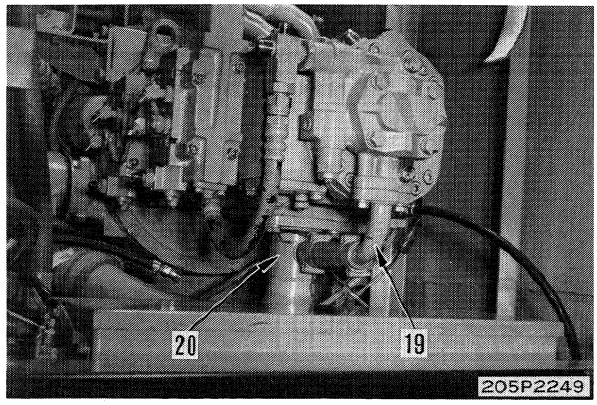
**2. Bracket**

Set bracket (21) for fuel control cable in position, then tighten 2 mounting bolts.

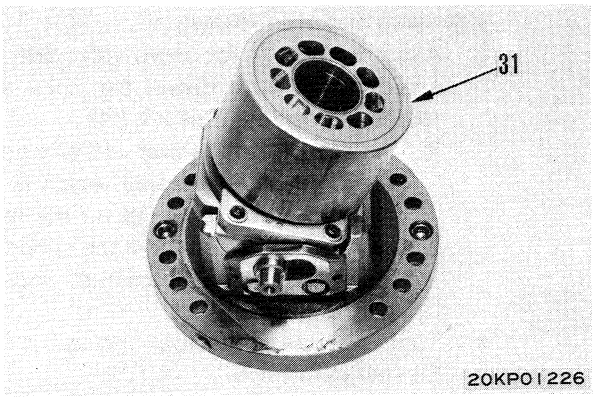



**3. Suction tubes**

Fit O-rings and connect suction tube (20) and charging pump inlet tube (19).



P1

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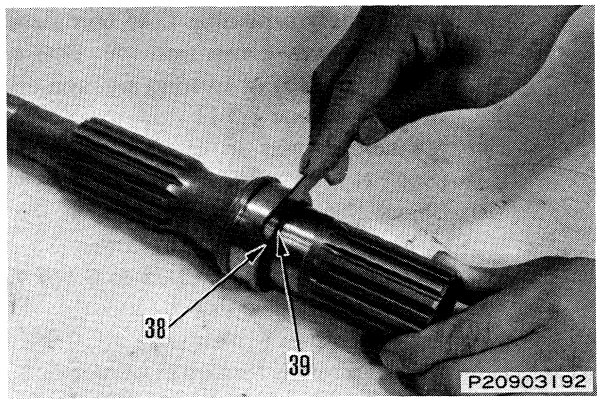


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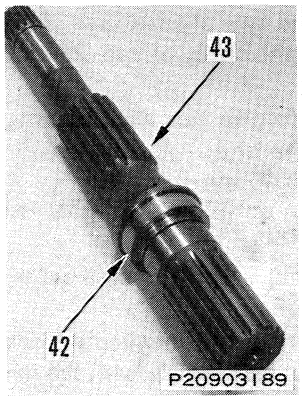


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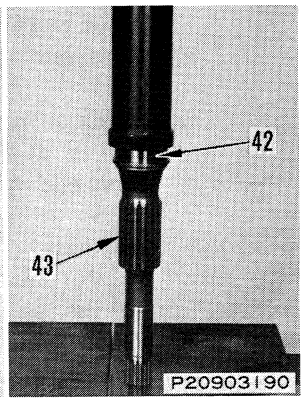


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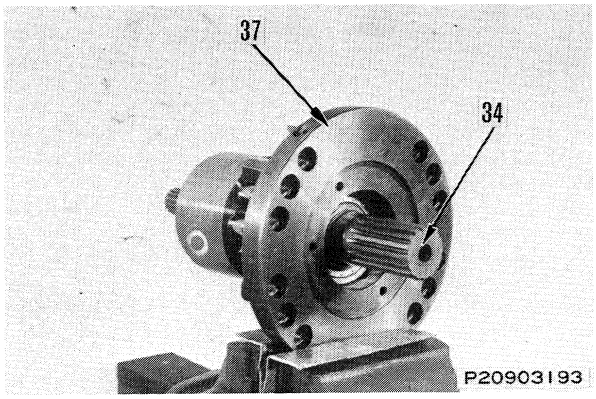


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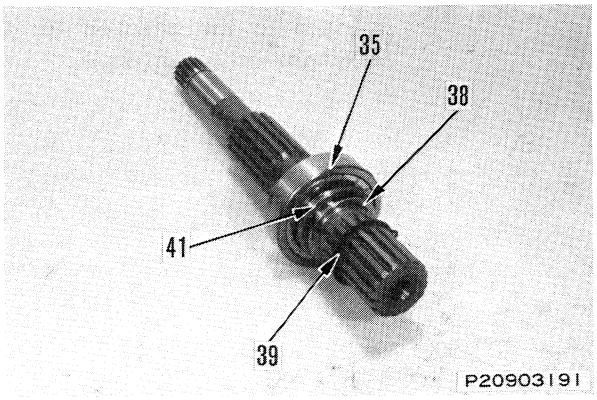
P4

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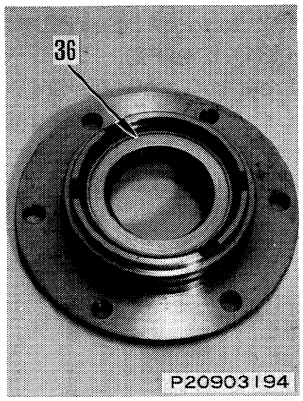


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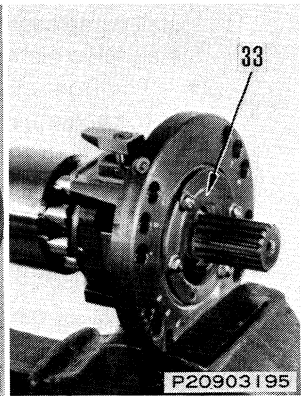
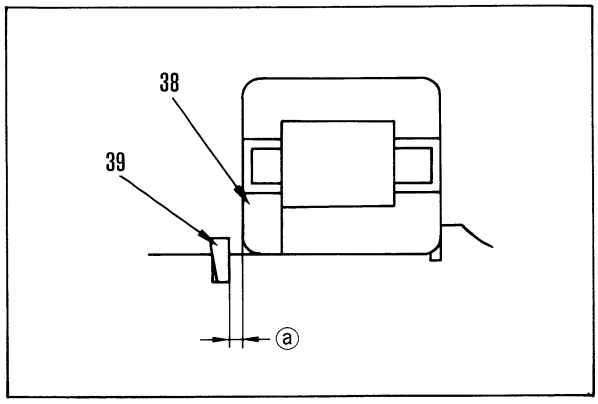
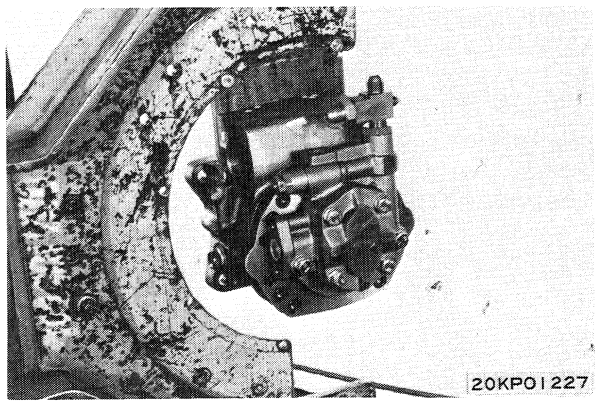



F1

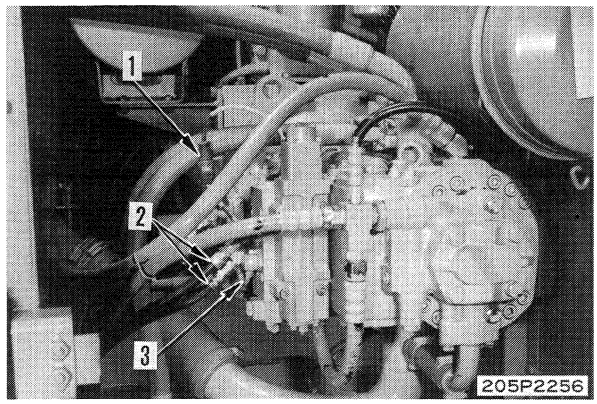


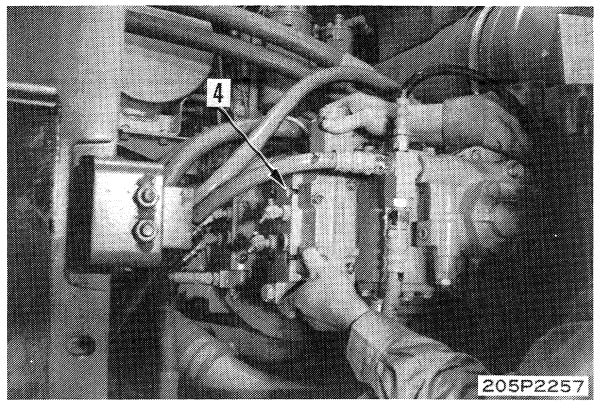

P9



# REMOVAL OF CO·NC VALVE ASSEMBLY

1. Open L.H. side cover.
2. Disconnect wire (1) OF TVC valve at connector.
   ★ Cover the wiring connector with a vinyl bag to protect it from oil or dust.
3. Disconnect 2 hoses (2) between CO·NC valve and control valve.
   ★ Mark the hoses with tags to show their mounting position.
4. Remove tube (3) between left and right CO·NC valve.
5. Remove 4 mounting bolts with a hexagonal wrench, then remove CO·NC valve assembly (4).



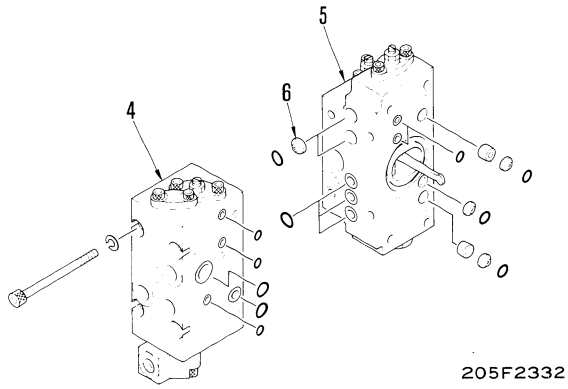



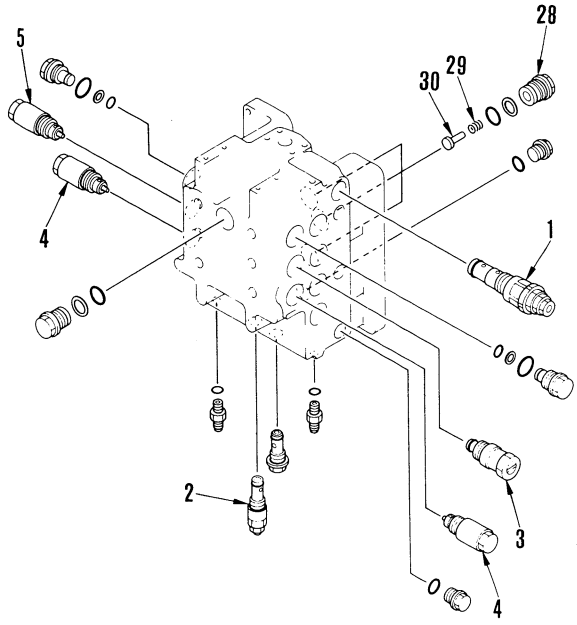

# INSTALLATION OF CO · NC VALVE ASSEMBLY

U20703

1. Install filter (6) and O-ring on servo valve assembly (5).
2. Set CO·NC valve assembly (4) on servo valve assembly (5), then tighten 4 mounting bolts.
   kgm Mounting bolt: 3.15 ± 0.35 kgm
3. Fit O-ring and install tube (3).
4. Connect 2 hoses (2) between CO·NC valve and control valve.
   kgm Sleeve nut: 2.5 ± 0.5 kgm
   (Width across flats: 19 mm)
   ★ Install hose without twisting or interference.
5. Connect wire (1) of TVC valve at connector.
6. Close L.H. side cover.

★ Run the engine to circulate the oil through the system. Then add oil to the hydraulic tank to the specified level.



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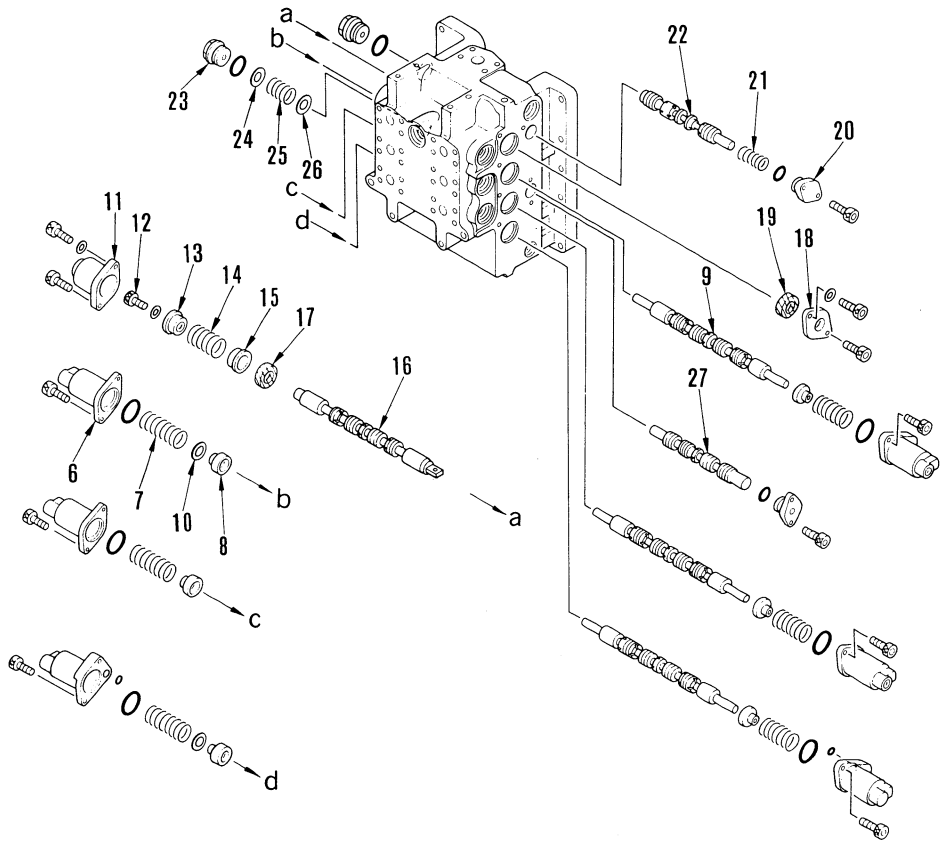
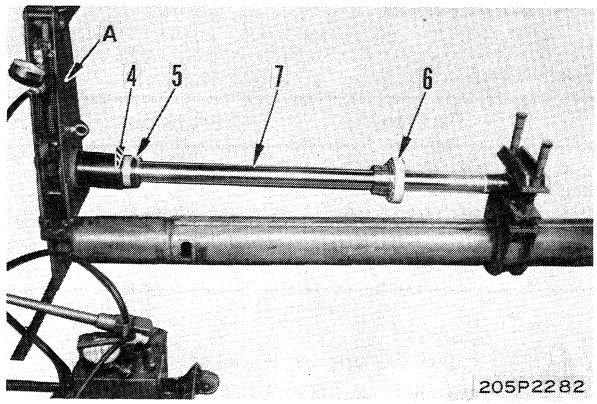



205F2334

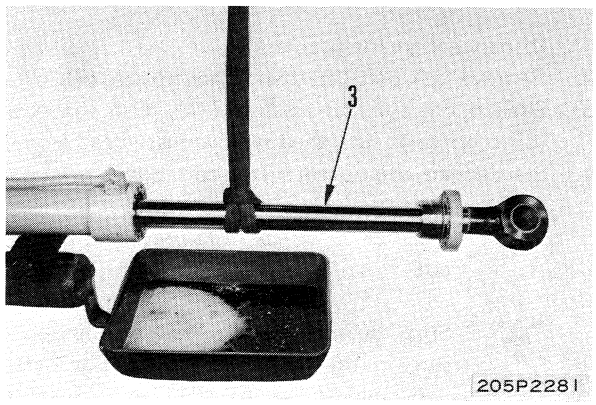
- Bucket cylinder
  1) Set piston rod (7) in tool **A**.
  2) Install cylinder head assembly (6) and piston assembly (5) on piston rod.
  3) Using tool **A**, tighten nut (4).

     kgm Nut: 1040 ± 104 kgm
     (Width across flats: 95 mm)




4. Set cylinder in tool **A**.

5. Raise cylinder head and piston rod assembly (3), and assemble in cylinder.
   ★ Coat the inside face of the cylinder and the outside face of the piston with engine oil when installing.

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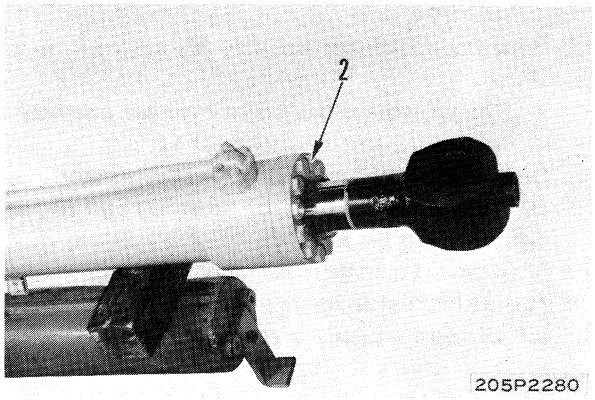
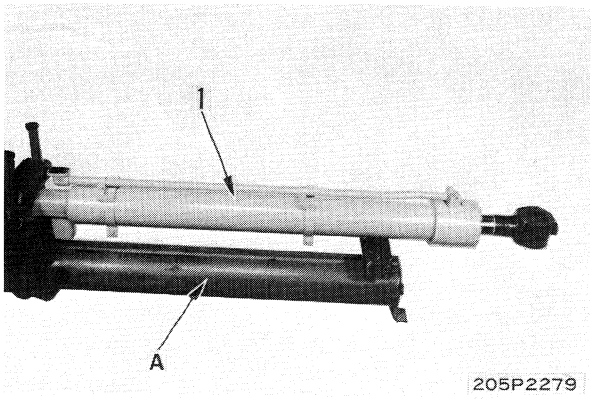
6. Assemble cylinder head assembly in cylinder, then tighten head bolts (2).
   ★ Align the punch marks and ports when assembling.
   (There is no punch mark on the bucket cylinder.)

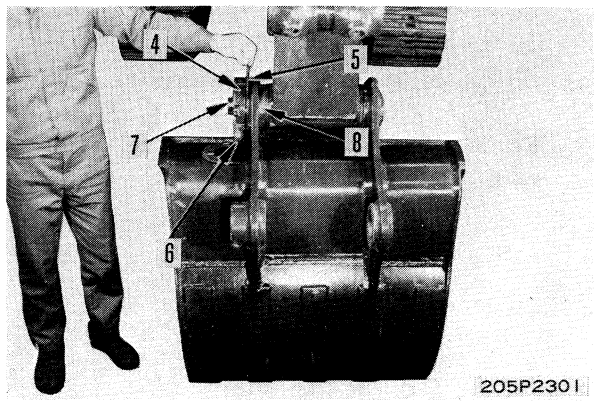



7. Remove cylinder assembly (1) from tool **A**.

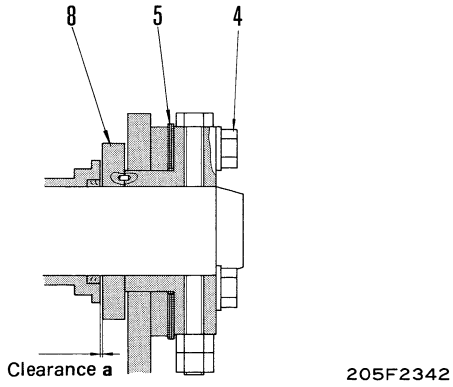


**8. Bucket**

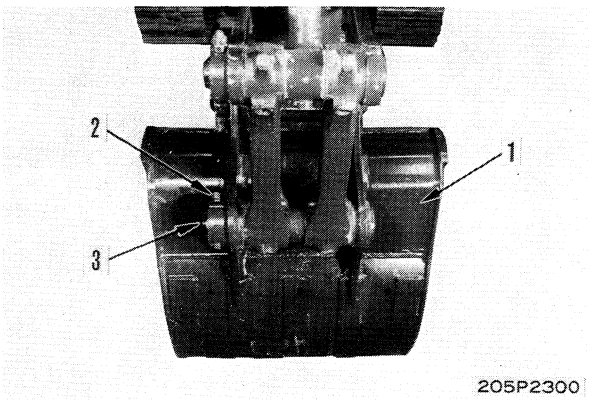
1) Set bottom of bucket (1) on ground.
2) Operate control levers, and align bucket (1) and retainer (8) with arm pin hole. Knock in arm connecting pin (7), then secure with lock bolt (6).




3) Adjust with shim (5) so that clearance "a" between arm and retainer (8) is 0.5 – 1.0 mm, then tighten 4 mounting bolts of cover (4).




4) Extend bucket cylinder rod and align pin hole. Knock in cylinder connecting pin (3), then secure with lock bolt (2).

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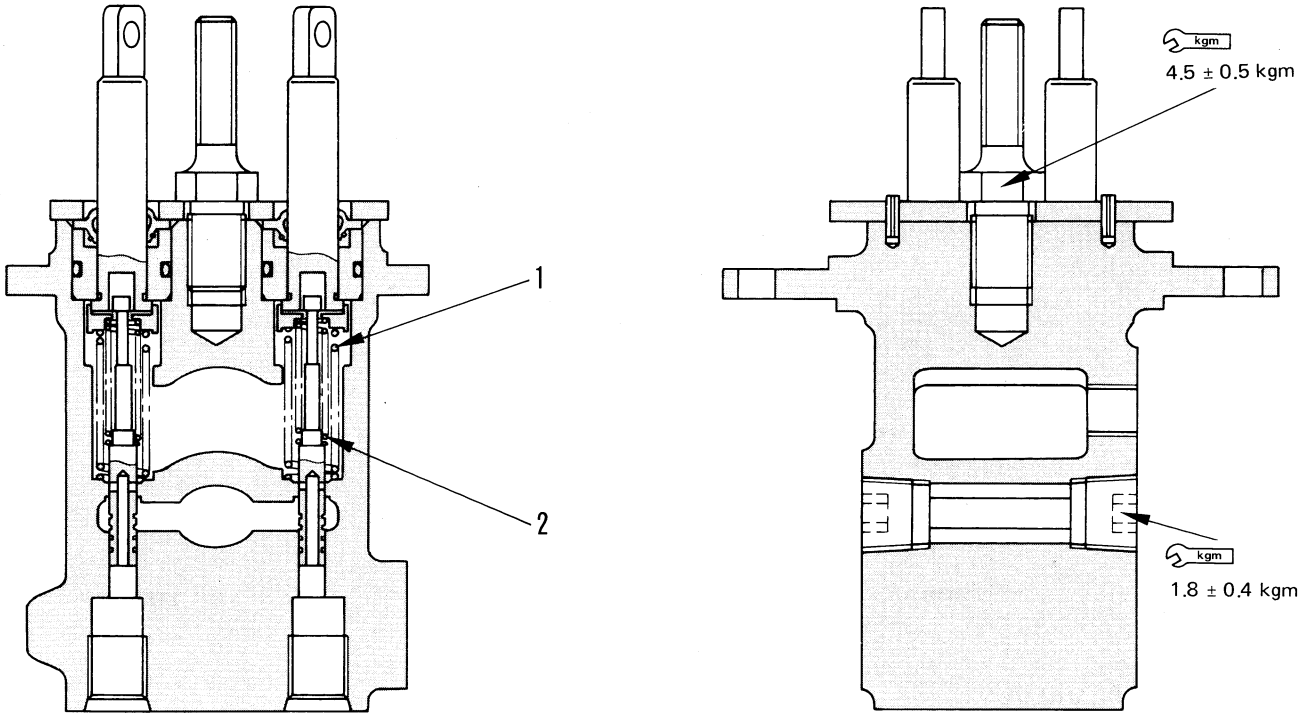
Unit: mm

| No. | Check Item | Criteria | | Remedy |
|---|---|---|---|---|
| 1 | Backlash between sun gear and planet gear | Standard clearance | Clearance limit | Replace |
| | | 0.13 – 0.49 | 1.00 | |
| 2 | Backlash between planet gear and No. 1 ring gear | 0.16 – 0.58 | 1.10 | |
| 3 | Backlash between planet gear and No. 2 ring gear | 0.15 – 0.53 | 1.00 | |
| 4 | Backlash between No. 2 ring gear and gear | 0.2 – 0.6 | 1.10 | Adjust |
| 5 | Backlash between output shaft (pinion) and swing circle | 0.24 – 1.29 | 2.00 | |
| 6 | End play of swing pinion | 1.78 – 2.22 | – | |
| 7 | Wear of output shaft collar surface contacting with oil seal | Standard size | Repair limit | Apply hard-chrome plating, recondition or replace |
| | | $\phi 125\ ^{0}_{-0.100}$ | 124.7 | |
| 8 | Clearance between sun gear and swing motor output shaft spline in rotating direction. | Standard clearance | Clearance limit | Replace |
| | | 0.06 – 0.15 | – | |
| 9 | Clearance between output shaft and idle gear spline in rotating direction | 0.09 – 0.27 | – | |

# LONG LEVER CONTROL

## 1. PPC VALVE FOR ARM, SWING AND BUCKET LEVER

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205F2223

Unit: mm

| No. | Check Item | Criteria | | | | | Remedy |
|---|---|---|---|---|---|---|---|
| | | Standard size | | | Repair limit | | |
| 1 | Center spring | Free length x O.D. | Installed length | Installed load | Free length | Installed load | Replace spring if any damages or deformations are found |
| | | 44.8 x 12.2 | 36.0 | 0.9 kg | – | 0.7 kg | |
| 2 | Spring | 31.4 x 7.4 | 29.4 | 1.7 kg | – | 1.4 kg | |