

WORKSHOP MANUAL

N-SERIES

POWER TAKE OFF (with oil pump)

ISUZU

ISUZU



International Service & Parts
Tokyo, Japan

NOTICE

Before using this Workshop Manual to assist you in performing vehicle service and maintenance operations, it is recommended that you carefully read and thoroughly understand the information contained in Section 0A under the headings "GENERAL REPAIR INSTRUCTIONS" and "HOW TO USE THIS MANUAL".

All material contained in this Manual is based on the latest product information available at the time of publication. All rights are reserved to make changes at any time without prior notice.

Applicable Model :

N-Series

This manual is applicable to 1994 year model and later vehicles.

THIS MANUAL INCLUDES THE FOLLOWING SECTIONS:

SECTION NO.	CONTENTS
_____	Power Take Off

POWER TAKE OFF

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GENERAL DESCRIPTION

The side with an oil pump PTO integrates the PTO and the oil pump and installed in the left side of a transmission. The shift rod for switching the "ON" and "OFF" of the hydraulic circuit of the PTO is provided at the bottom of the PTO and the oil pump main unit.

The "ON" and "OFF" of the PTO uses a gear slide system and turn on and off the power by sliding the output gear.

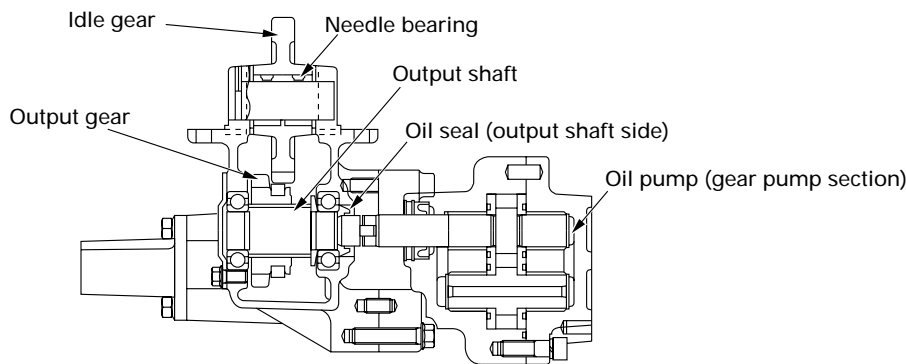
The idle gear bearing uses a needle bearing and the output shaft uses a ball bearing to ensure durability.

The oil pump section consists of the gear pump part and the hydraulic circuit switching part, and the gear pump section fixes efficiency by selecting and assembling the side plate. Further, the hydraulic circuit switching portion switches the three positions of "Up", "Neutral", and "Down" by the spool provided on the rod extension.

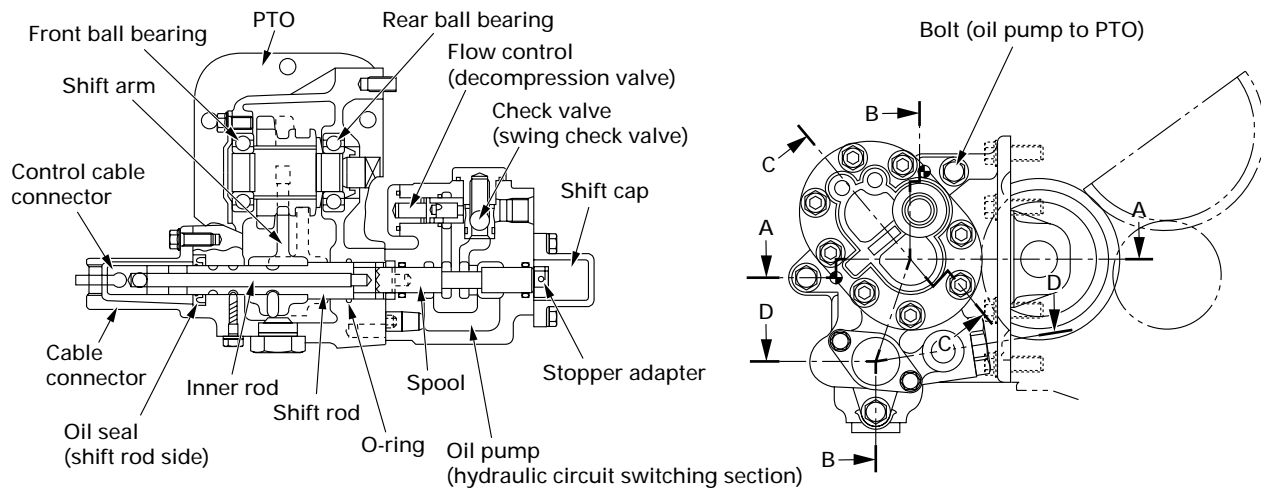
The dump control system uses a cable system.

CROSS-SECTION VIEW

* This illustration is based on a rear dump truck model.

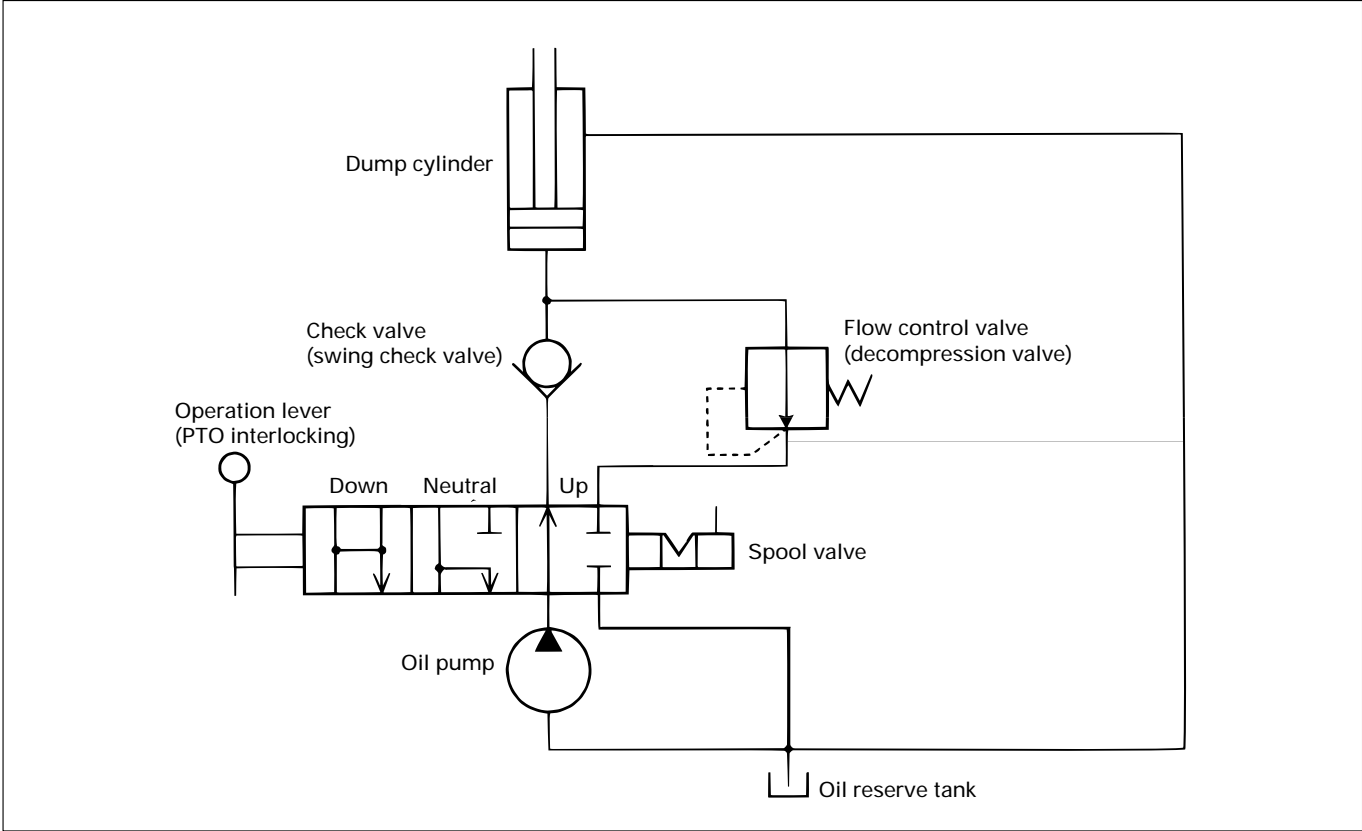


PTO oil pump assembled point assembly drawing
 PTO side Section A-A, Pump side Section C-C (Illustrated by rotating by 90 degrees counterclockwise)

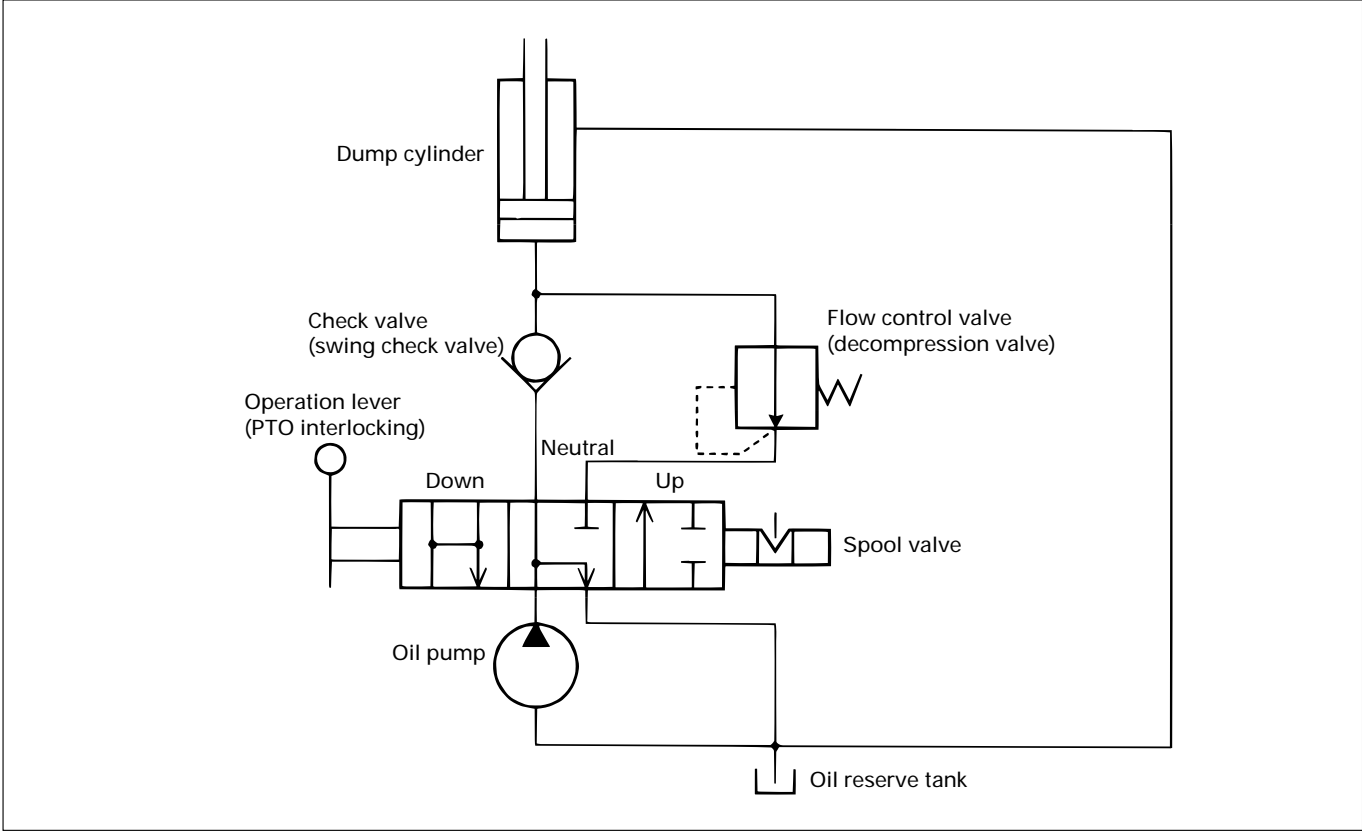


PTO oil pump hydraulic switching assembly drawing
 PTO side Section B-B, Pump side Section D-D

HYDRAULIC CIRCUIT DIAGRAM

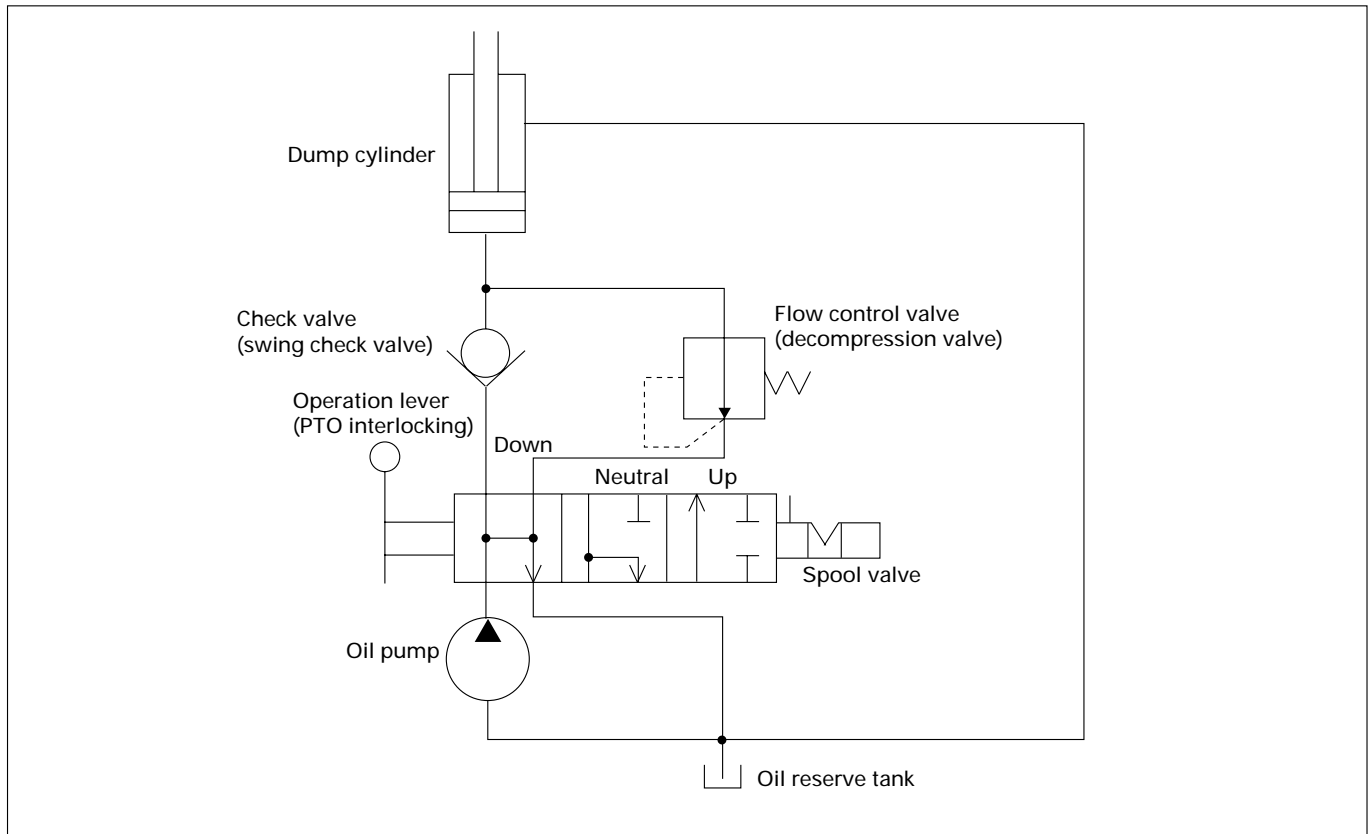


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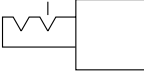
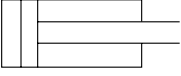
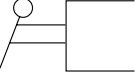
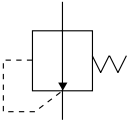

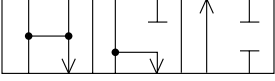

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D08LX00105

SYMBOL FOR HYDRAULIC CIRCUIT

Symbol	Meaning of symbol	Symbol	Meaning of symbol
 D08LX151	Spring	 D08LX156	Check valve (swing check valve)
 D08LX152	Detent (position stop system)	 D08LX157	Cylinder
 D08LX153	Manual lever (dump lever)	 D08LX158	Flow control valve (decompression valve) (internal pilot method)
 D08LX154	Oil tank	 D08LX159	Hydraulic switching valve (three-position valve)
 D08LX155	Oil pump (unidirectional flow)		

ON-VEHICLE SERVICE



Inspection and Supply of The Hydraulic Operating Fluid



NOTE:

When inspecting and supplying hydraulic operating fluid, you might have incurred danger. In that case, inspect and supply hydraulic operating fluid after having fully checked safety.

Symptoms Due to Insufficient Hydraulic Operating Fluid

The following symptoms might have occurred. In that case, inspect and supply hydraulic operating fluid because it may be insufficient.

- (1) The body (cargo deck) is raised only immediately.
- (2) The body (cargo deck) is lugged during rise.
- (3) While the body (cargo deck) is being raised, the oil pump portion causes a large abnormal sound (such as caterwaul or grate).
- (4) After the body (cargo deck) has been raised, it drops generating a knock.



Preparing for Hydraulic Operating Fluid Supply

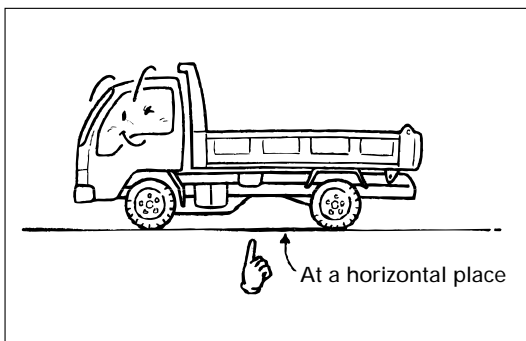
If there is loading, pull down the loading. Then supply hydraulic operating fluid after having safely and more carefully raised the body (cargo deck) and having firmly held the body (cargo deck) by the "safety rod" and the "safety strut" in accordance with the following "How to raise the body (cargo deck)".

How to Raise the Body (Cargo Deck)

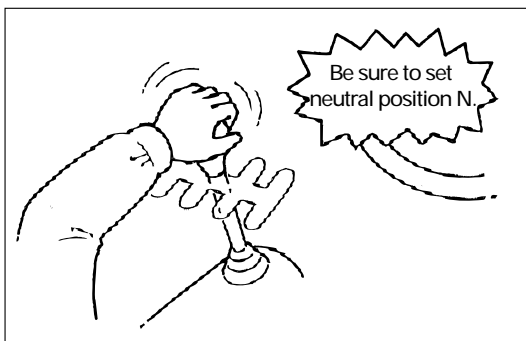
- (1) Put a truck at a horizontal place.

NOTE:

Never raise the body (cargo deck) on tilted ground, soft ground, and unlevelled ground. A truck may be inverted or warp may be generated in functional components.



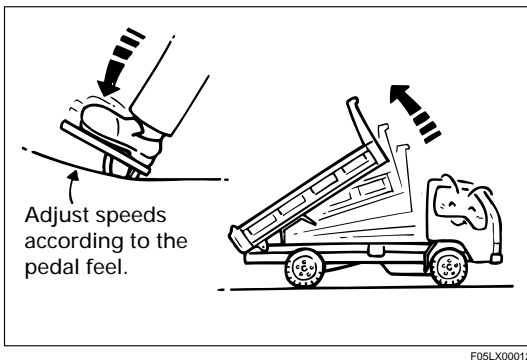
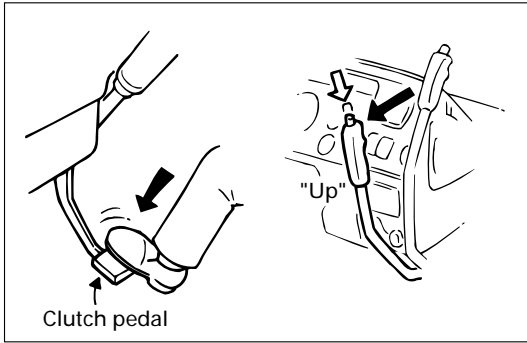
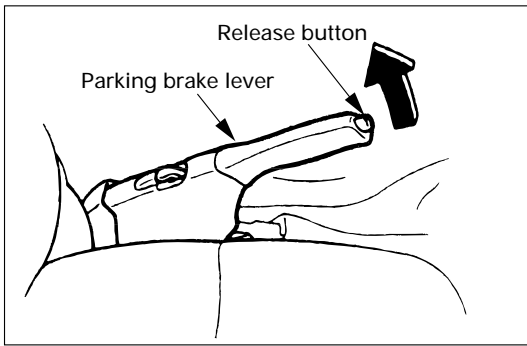
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- (2) Set the shift lever to the "Neutral" position.

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(3) Firmly actuate the parking brake and apply a scotch to the rear tire.

(4) Start the engine and depress the clutch pedal to the floor. Push in the lock button of the dump lever and release the lock to set the "Up" position.

NOTE:

Fully check that there is no person or hindrance around a truck.

When the dump lever is operated, observe the notes of the Note label attached to the driver's seat.

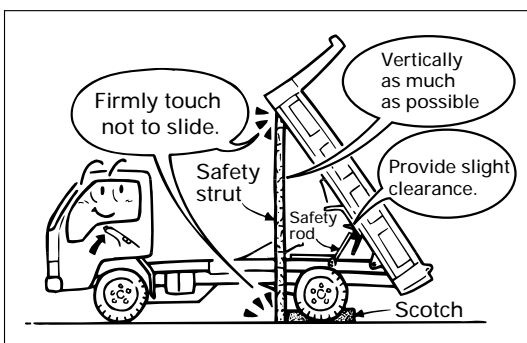
(5) When the clutch pedal is slowly returned, the body (cargo deck) is raised.



- Adjust raised speeds according to the pedal feel of the accelerator.
- When raising the body (cargo deck), be sure to check the lock of the dump lever.
- After having raised the body (cargo deck), held the body by the safety rod and the safety strut and stop the engine.

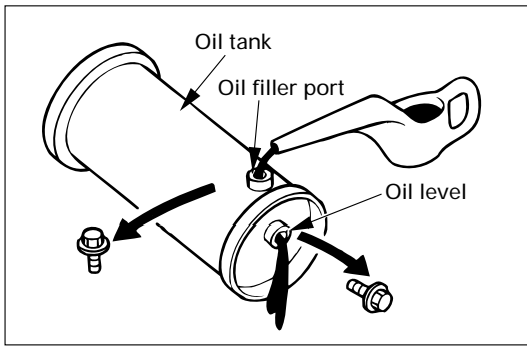
NOTE:

Suddenly returning the clutch pedal is very dangerous. Use the engine at about 1,000 to 1,500 rpm, and do not perform high-speed rotation, sudden acceleration and deceleration, and unnecessary idle rotation.



NOTE:

Raise the body (cargo deck) paying full attention to safety and firmly hold the body (cargo deck) by the safety rod and safety strut.



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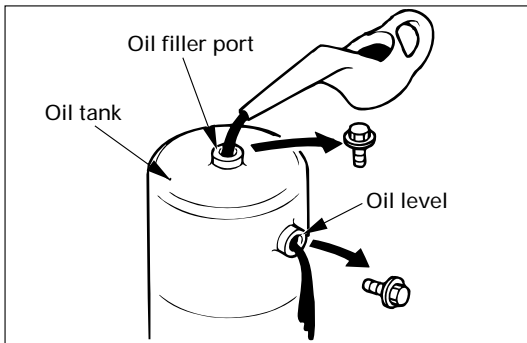


Supply Procedure of Hydraulic Operating Fluid

NOTE:

Be sure to supply a specified amount (check it by the level plug) of hydraulic operating fluid using a cleaned oil supply container paying full attention so that dust or foreign matter will not be mixed in. After having supplied oil, firmly tighten each plug.

When replacing the total amount of hydraulic operating fluid, request a service network (SS store) of a body manufacturer.



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- (1) Remove the oil supply plug and level plug of the oil tank in the engine stopped state.
- (2) While supplying hydraulic operating fluid from the oil filler port, supply it until the hydraulic operating fluid flows out from the level plug.
- (3) Remove the "Safety strut" once and raise the body (cargo deck) to the most raised position, then re-hold it by the "Safety strut and safety rod".
- (4) Additionally supply hydraulic operating fluid. When the hydraulic operating fluid flows out from the level plug, install and firmly tighten the level plug and the oil filler port plug.
- (5) After having supplied hydraulic operating fluid, remove the "Safety strut" and store the "safety rod". Subsequently firmly drop the body (cargo deck) and stop the engine.

NOTE:

Supply the hydraulic operating fluid used with reference to the following table.

Hydraulic Operating Fluid (Turbine Oil)

Manufactured by ShinMaywa Industries Co., Ltd.	0 to 30°C: VG32
	20°C or more: VG56
	less than 10°C: VG22

If the Dump Rise Operation is Disabled by Itself

If the body (cargo deck) is kept being dropped and the "Rise" operation of the body (cargo deck) is disabled by itself, inspect the cause of rise disabled, fully identify the status, and execute maintenance and repair in accordance with the flowchart of the "Defect 1". Dump body rise disabled" (Page 52) of Chapter "Troubleshooting".

After maintenance and repair, if there is a hindrance in subsequent work advance because the "Rise" operation is disabled by itself or when the hydraulic circuit is in the following states (1) and (2) after maintenance and repair, raise the body (cargo deck), take safety measures for preventing drop, and continue the work according to the following (item of the existence of hoist or crane equipment) methods.

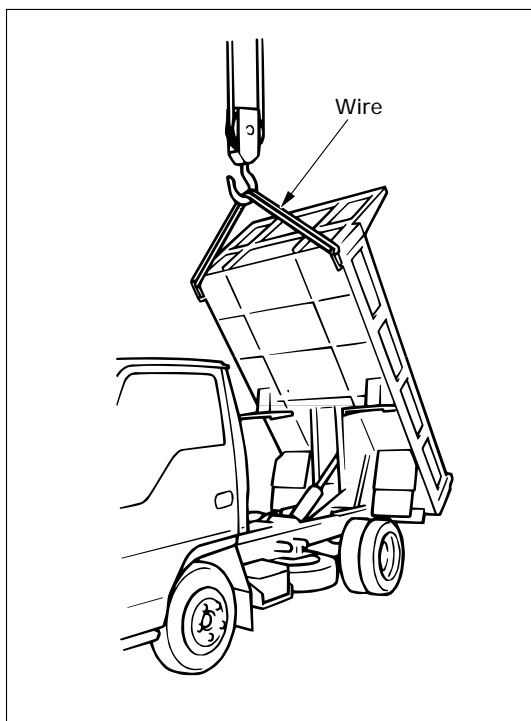
- (1) The body (cargo deck) rise is disabled due to the air mixture into the hydraulic circuit resulting from insufficient hydraulic operating fluid immediately after repair for oil pump replacement
- (2) The body (cargo deck) rise is disabled due to the air mixture into the hydraulic circuit resulting from insufficient hydraulic operating fluid immediately after repair for leak of hydraulic operating fluid.

When hoist or crane equipment is provided

- (1) Firmly actuate the parking brake and apply a scotch to the rear tire.
- (2) Set the engine to the stopped state.
- (3) Set the dump lever to the "Up" position and apply a wire with ample strength to the front of the body (cargo deck).
- (4) Slowly hang a wire (tensile strength of 1,000 kg (9,807N)) by a hoist or crane.
- (5) After having drawn up the body (cargo deck) to the most raised position, prevent the drop of the body (cargo deck) by the safety rod and the safety strut and check safety.

NOTE:

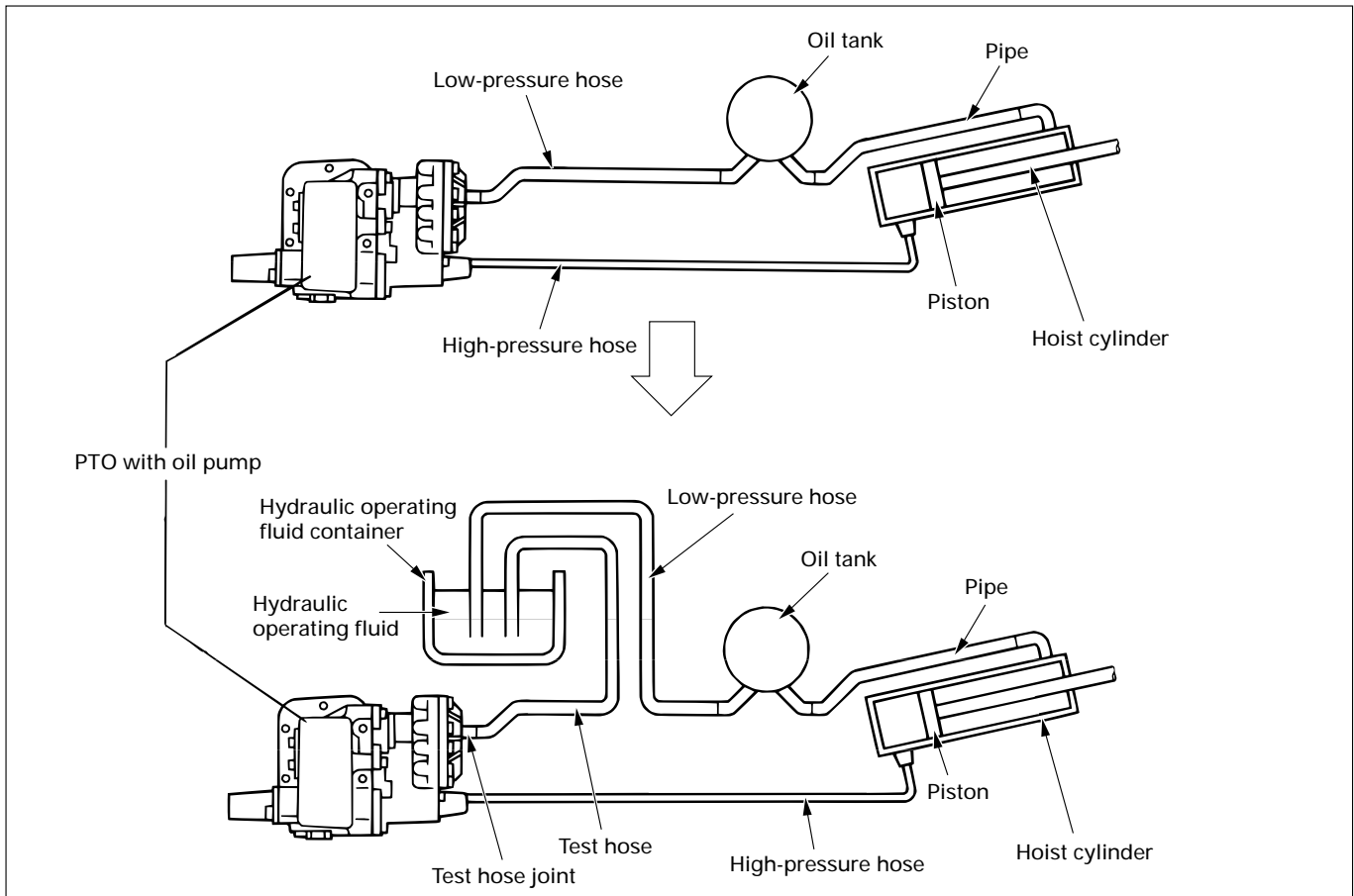
For the subsequent work procedure, supply hydraulic operating fluid or perform air bleeding of the hydraulic operating fluid in accordance with each item of the text in the "Supply Procedure of Hydraulic Operating Fluid" (Page 7) or the "Air Bleeding Procedure of Hydraulic Operating Fluid" (Page 12) in the next chapter.



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If neither hoist nor crane is provided

If the body (cargo deck) is kept being dropped and the "Up" operation of the dump is disabled by itself or if neither hoist nor crane is provided, raise the body (cargo deck) according to the following work procedure.



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Preparation

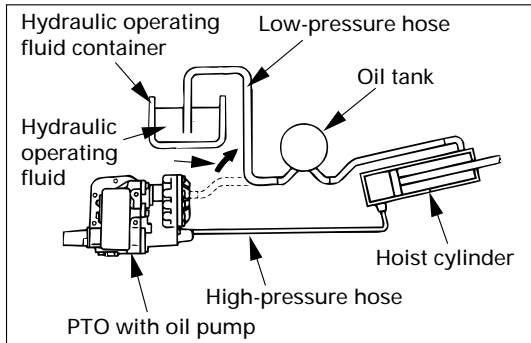
- (1) Because removal of a spare tire makes work easier according to a truck, previously check the truck.
- (2) Remove the intermediate fixed clip on the truck side between the oil pump and the oil tank of the low-pressure side hose and set the low-pressure hose free.
- (3) Prepare a cleaned hydraulic operating fluid container (a 20ℓ can will do), a funnel, hydraulic operating fluid, a test hose for a special tool, and a test hose joint.
- (4) Prepare the hydraulic operating fluid of about 10ℓ in the cleaned hydraulic operating fluid container.

Hydraulic Operating Fluid (Turbine Oil)

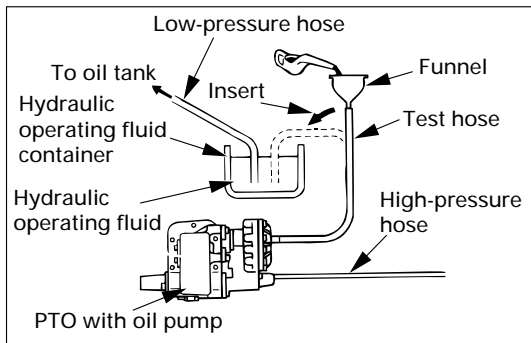
Manufactured by ShinMaywa Industries Co., Ltd.	0 to 30°C: VG32
	20°C or more: VG56
	less than 10°C: VG22

NOTE:

Carefully control the prepared hydraulic operating fluid so that dust or foreign matter will not be mixed in it. Besides, if the dust or foreign matter is mixed in the hydraulic operating fluid, carefully handle it because it becomes the first cause of a dump mechanism fault.



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Work Procedure

- (1) With reference to the piping rough sketch on the preceding page, remove the low-pressure side hose of the oil pump and insert the port for removal in the prepared hydraulic operating fluid container.

NOTE:

Be sure to install the hydraulic oil fluid container at a higher position than the tank pump. If it is installed at a lower position, the oil pump may be damaged because the hydraulic operating fluid applied in Item (4) flows in the hydraulic operating fluid container and air is mixed in the hose.

NOTE:

When inserting the removed low-pressure hose in the hydraulic operating fluid, remove the hose band, be sure to clean the hose port, and handle the hose so that dust or foreign matter will not be mixed in the hydraulic operating fluid.

- (2) Remove the low-pressure side hose joint of the oil pump.
- (3) Install the test hose and connecting joint on the low-pressure side of the oil pump.



Joint (low-pressure side): 5-8840-2439-0

Test hose: 5-8840-2435-0

- (4) Use the funnel from the fluid container insertion side of the test hose to fill the hose with the hydraulic operating fluid and insert the hose port in the hydraulic operating fluid container.

NOTE:

The test hose is filled with hydraulic operating fluid to minimize the mixture of air in the hydraulic circuit. Further, fix the two hoses inserted in the fluid container not to jump out from the hydraulic operating fluid.

- (5) Start the engine and depress the clutch pedal in the idling state, then set the dump lever to the "Up" position.
- (6) When slowly releasing the clutch pedal and operating the oil pump, the body (cargo deck) starts being raised.

NOTE:

At this time, check that the air mixed in the hydraulic circuit is discharged in the hydraulic operating fluid as blow holes.

- (7) Raise the body (cargo deck) up to the most raised position in the idling state and apply the safety rod and the safety strut to the body (cargo deck). Then prevent drop and check safety.
- (8) After having the body (cargo deck), stop the engine and remove the test hose installed in Item (3) from the oil pump, then release it from the fluid container.
- (9) Remove the test hose connecting joint from the low-pressure side of the oil pump and install the joint for connecting the original low-pressure hose.
- (10) Release the low-pressure side hose removed from the oil pump and soaked in the fluid container in Item (1) and install it on the low-pressure side of the oil pump as before, then firmly tighten the hose band.

NOTE:

For the subsequent work procedure, supply hydraulic operating fluid or perform the air bleeding of hydraulic operating fluid in accordance with each item of the text in the "Supply Procedure of Hydraulic Operating Fluid" (Page 7) or the "Air Bleeding Procedure of Hydraulic Operating Fluid" (Page 12) in the next chapter.

Be careful of excessive supply of hydraulic operating fluid.

If an excessive amount of hydraulic operating fluid exceeding the specified amount is supplied when supplying the hydraulic operating fluid at the rise of the body (cargo deck), the hydraulic circuit will be filled with the hydraulic operating fluid because the volume of the fluid in the oil tank is increased more than necessary at the drop of the body (cargo deck). According, the body (cargo deck) will not be dropped from a predetermined place. If it is dropped forcibly, excessive pressure applies to the hydraulic circuit (consisting of the hose, pipe, and tank) resulting in its damage or a leak of oil.



Total Replacement of Hydraulic Operating Fluid

Request a service network (SS store) of a body manufacturer of the total replacement of hydraulic operating fluid.

Air Bleeding Procedure of Hydraulic Operating Fluid

NOTE:

Be sure to supply a specified amount of hydraulic operating fluid using a cleaned oil supply container paying full attention so that dust or foreign matter will not be mixed in. After having supplied oil, firmly tighten each plug.

[Rear Dump Truck]

<Manufactured by Shin Maywa Industries, Co., Ltd.>

Hydraulic Operating Fluid Supply

- (1) Raise the body (cargo deck) in accordance with the "How to raise the body (cargo deck) (Page 5) described previously.
- (2) Remove oil filler plug ① and level plug ② of the oil tank and supply oil from the oil filler port until the hydraulic operating fluid flows out from level plug ①, then tighten plug ②.
- (3) Remove oil filler port plug ③ from the cylinder head, supply the hydraulic operating fluid to "Chamber A" so that no air will be left to fill the chamber with the fluid, and tighten oil filler port plug ③.

Air Bleeding Method

- (1) Raise the body (cargo deck) in accordance with the "How to raise the body (cargo deck) (Page 5) described previously.
- (2) At the maximum rise, cylinder shaded portions "Chamber A" and "Chamber B" shown in the drawing are fully filled with hydraulic operating fluid and Section "C" is filled with the hydraulic operating fluid up to its level position.

NOTE:

Supplying hydraulic operating fluid more than necessary will cause a fault.

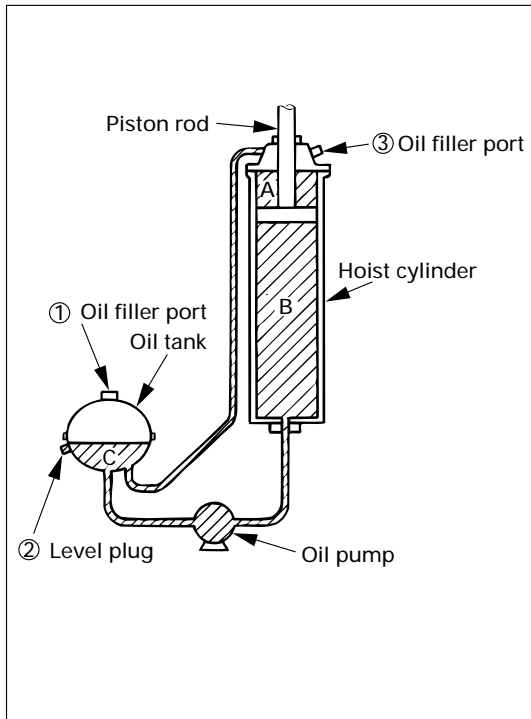
- (3) First remove the oil tank oil filler port plug of ①. Then start the engine, operate the dump lever, and drop and raise the body (cargo deck) several times. Consequently, air is naturally released usually.
- (4) Tighten the oil tank oil filler port plug of ①.

NOTE:

If the work of Item ② is performed with plug ① tightened, air may not be released.

NOTE:

When air is mixed in hydraulic operating fluid and becomes whitely foamy, the air will not be released. So raise the body (cargo deck) and remove plugs ① and ③. When the hydraulic operating fluid is left alone about for 30 to 60 minutes, the air is naturally separated. Re-supply oil in accordance with the procedure of Items (2) and (3) of the "Supply Procedure of Hydraulic Operating Fluid" (Page 7).



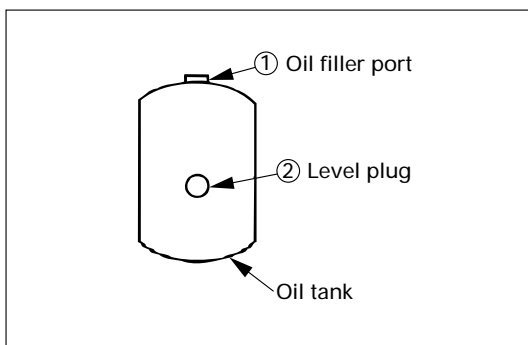
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Principles Under Which Air is Released Between "B" and "C"

For Chamber "B" filled with hydraulic operating fluid, when the body (cargo deck) is dropped, the piston rod is dropped and the hydraulic operating fluid in "Chamber B" passes through the oil pump and is returned to the oil tank. At this time, if air is mixed in, it is discharged from "Surface C" in the oil tank as blow holes.

Between "A" and "C"

The hydraulic operating fluid pressurized and sent via the oil pump is sent from "Chamber C" to "Chamber B". The piston cylinder is raised and the hydraulic operating oil in "Chamber A" is sent to "Chamber C", and then the air is discharged for the same reason as between "B" and "C".



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[Three-Rotation Dump Truck]

<Manufactured by Shin Maywa Industries, Co., Ltd.]

Hydraulic Operating Fluid Supply

- (1) Raise the body (cargo deck) in accordance with the "How to raise the body (cargo deck) (Page 5) described previously.
- (2) Remove oil filler plug ① and level plug ② of the oil tank and supply oil from the oil filler port until the hydraulic operating fluid flows out from level plug ②, then tighten plug ②.

NOTE:

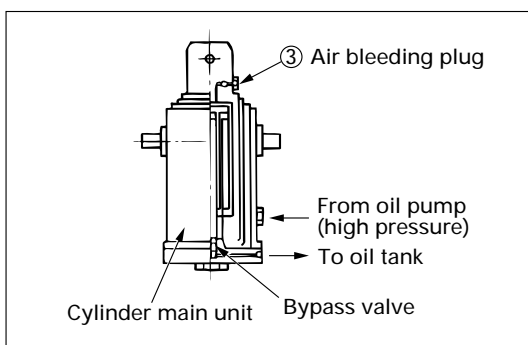
Supplying hydraulic operating fluid more than necessary will cause a fault.

- (3) Set the dump lever to the "Up" position with the engine in the idling state.
- (4) When loosening the air bleeding plug ③ of the cylinder about once or twice, air is discharged and then hydraulic operating fluid is ejected. So quickly tighten the plug.

NOTE:

When air is mixed in hydraulic operating fluid and becomes whitely foamy, the air is not released. So raise the body (cargo deck) and leave the hydraulic operating fluid alone about for one hour. The air in the hydraulic operating fluid is naturally separated and subsequently air can be released.

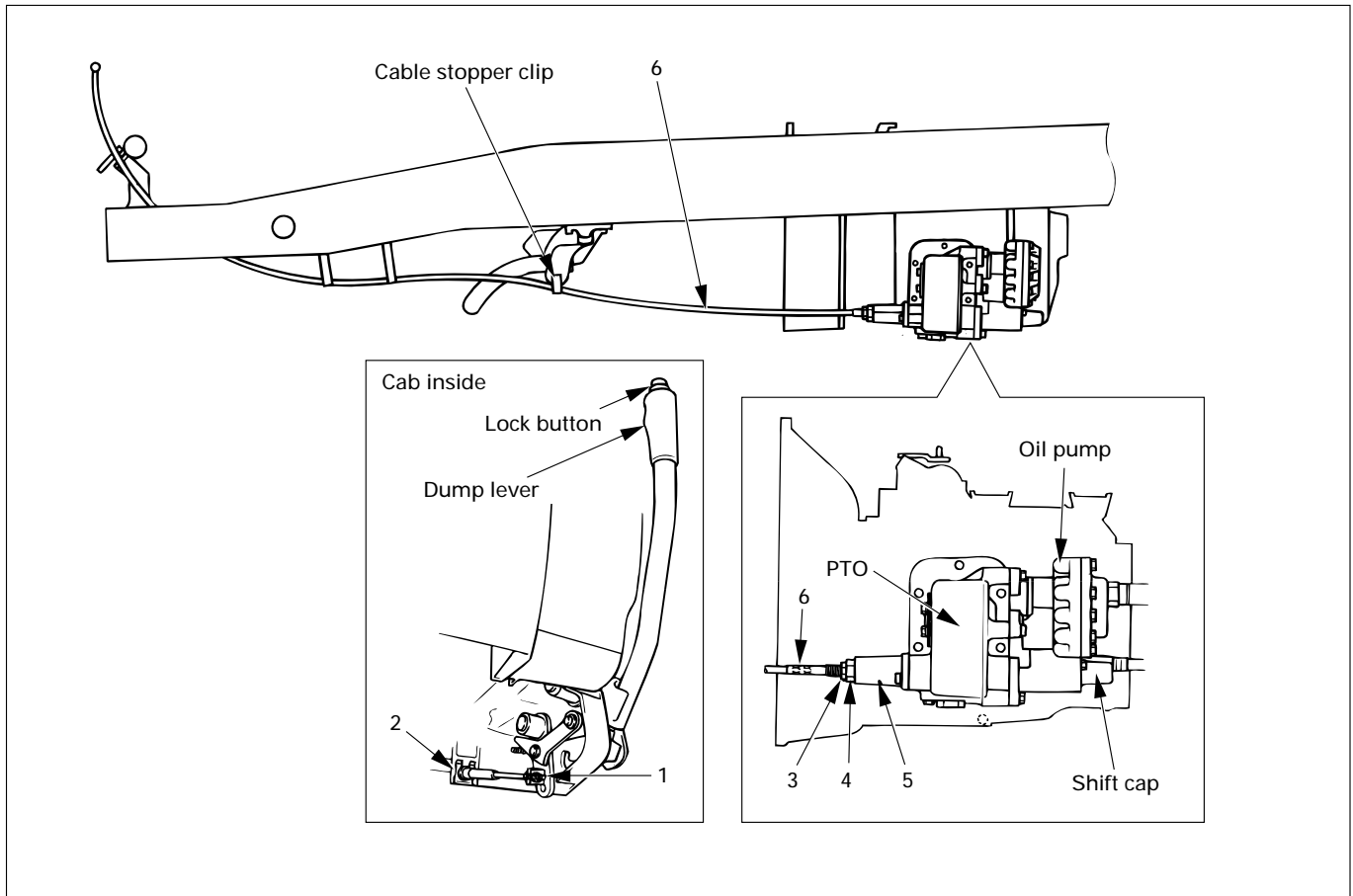
Even when performing air bleeding work, raise the body (cargo deck) in accordance with the "How to Raise The Body (cargo deck)" (Page 5) described previously.



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CONTROL CABLE (FOR REAR DUMP TRUCK)

REMOVAL AND INSTALLATION



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Removal Steps

1. Lock nut (dump lever side)
2. Clip (inside cap)
3. Lock nut (PTO side)
4. Special nut
5. Cable holder
6. Control cable

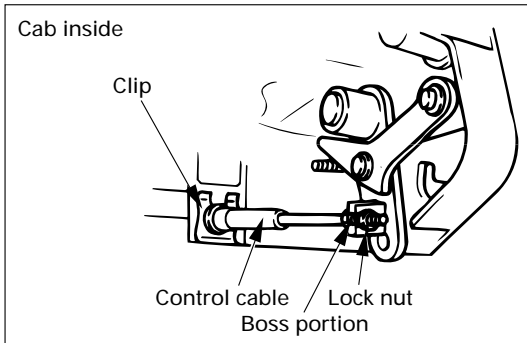
Installation Steps

To install, follow the removal steps in the reverse order.

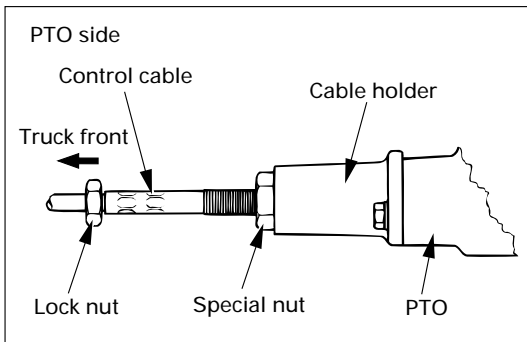
↔ Removal Steps

NOTE:

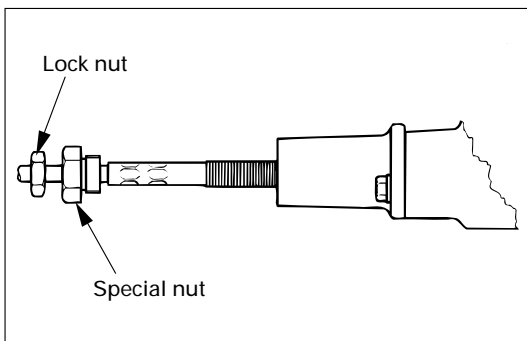
Because a three-rotation dump truck differs in the wiring of a control cable from a rear dump truck, refer to the notes on the replacement and adjustment of the control cable for the three-rotation dump truck.



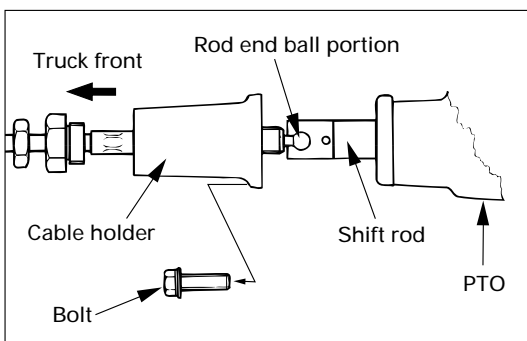
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281LX00004



281LX00005



281LX00006

1. Lock Nut (Dump Lever Side)

- Set the dump lever to the "Down" position and firmly lock the lever.
- Loosen the lock nut of the control cable and remove the cable tip from the boss portion of the dump lever.

2. Clip (Inside Cab)

- Remove the clip from the instrument panel bottom inside the cab.

3. Lock Nut (PTO Side)

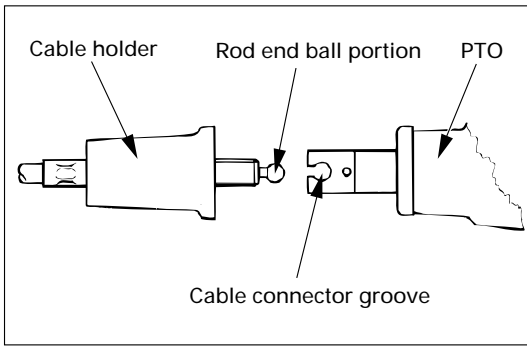
- Loosen the lock nut and move it toward the truck front.

4. Special Nut

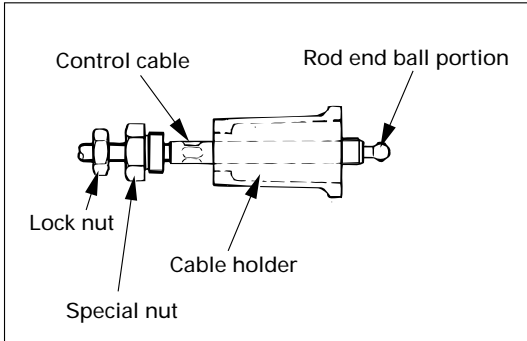
- Loosen the special nut and move it toward the truck front.

5. Cable Holder

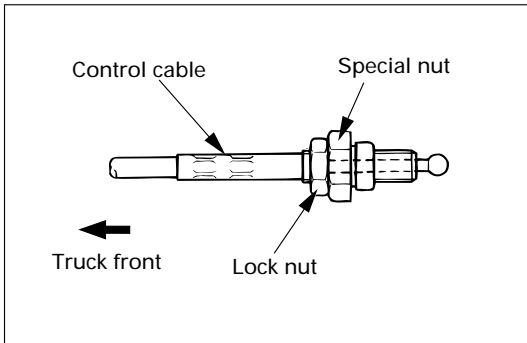
- Remove the bolt and remove the cable holder from the PTO.
- Move the cable holder to the truck front and provide clearance between the cable holder and PTO.



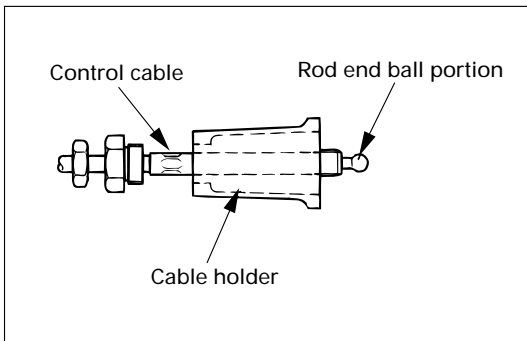
281LX00007



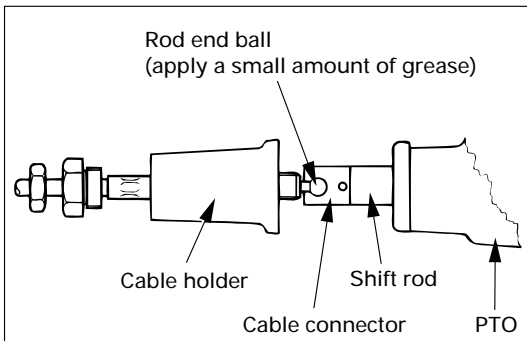
281LX00008



281LX00009



281LX00010



281LX00011

6. Control Cable

- Because the tip portion (PTO side) of the control cable is of a rod end ball type as shown in the drawing, remove the cable end portion from the cable connector groove on the PTO side sliding it along the groove.

- Remove the cable holder from the control cable.
- Remove the control cable assembly from the truck.



Installation Steps

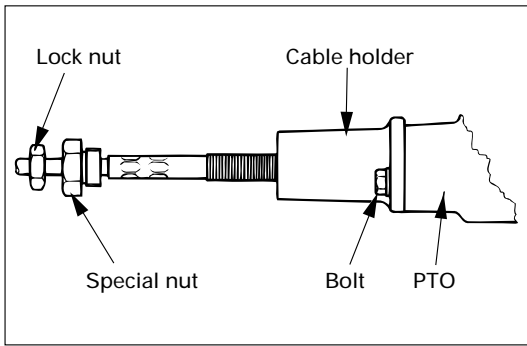
6. Control Cable

- Set the dump lever to the "Down" position and lock it.
- Install the control cable assembly in the truck.
- Move the lock nut (PTO side) and special nut of the cable top the truck front side.

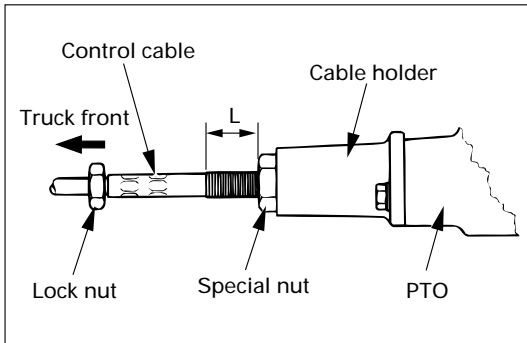
5. Cable Holder

- Assemble the cable holder in the control cable.

- Coat the rod end ball of the cable tip with a small amount of grease and assemble it in the groove of the control cable connector on the PTO side.



281LX00012



281LX00013



- Install the cable holder in the PTO and temporarily tighten the bolt.

NOTE:

Tighten the bolt after having adjusted it in accordance with the work procedure of the "Control Cable Adjustment" (Page 18) in the next item.

4. Special Nut

- Tighten the special nut to the cable holder at a specified torque pressing down the control cable to the PTO side lightly.

Special Nut Torque	N-m (kg-m / lb-ft)
	147 (15 / 108)

- At this time, check that the "L" dimension is 34 ± 1 mm (1.339 ± 0.039 inch.)
- If the "L" dimension does not satisfy the specified value, remove the cable holder from the PTO and rotate the cable holder to adjust the dimension.

NOTE:

Both "clockwise rotation" and "counterclockwise rotation" indicate that the cable moves by about 0.75 mm (0.0295 inch) every time the cable holder rotates by 180 degrees.

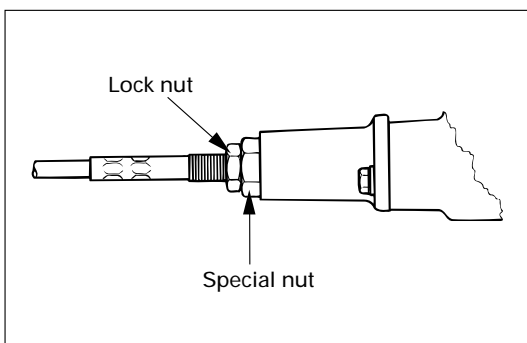
- Re-install the cable holder on the PTO and temporarily tighten the bolt.

3. Lock Nut (PTO Side)

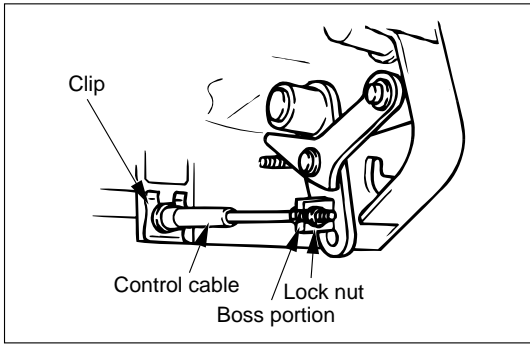
- After having checked the specified value dimensions of the cable outer threaded portion, temporarily tighten the lock nut.

NOTE:

Tighten the special nut and lock nut after having adjusted it in accordance with the work procedure of the "Control Cable Adjustment" (Page 18) in the next item.



281LX00014



281LX00015

2. Clip (Cab Inside)

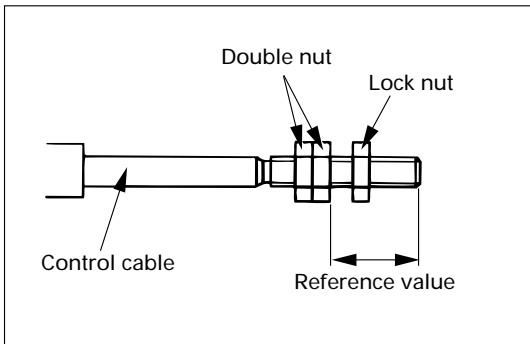
- Draw the control cable in the instrument panel bottom inside the cab and firmly install the grommet.
- Firmly install and fix the clip in the cable flange portion groove.

1. Lock Nut (Dump Lever Side)

- Assemble the control cable tip in the boss portion of the dump lever and tighten the lock nut at a specified torque.



Lock Nut Torque	N·m (kg·m / lb·in)
6 (0.6 / 52)	



281LX00016

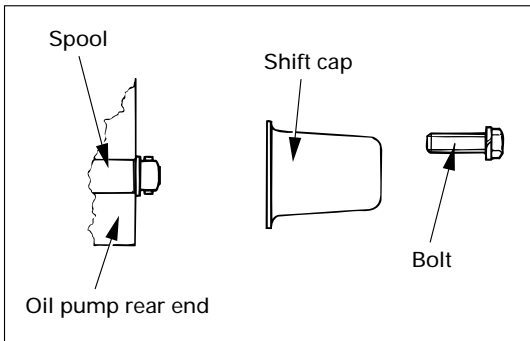


NOTE:

If the double nut position of the control cable is not fixed, it is fixed to a reference value.



Control Cable Length (Reference)	mm(in.)
18±1 (0.709±0.039)	



281LX00017



Control Cable Adjustment

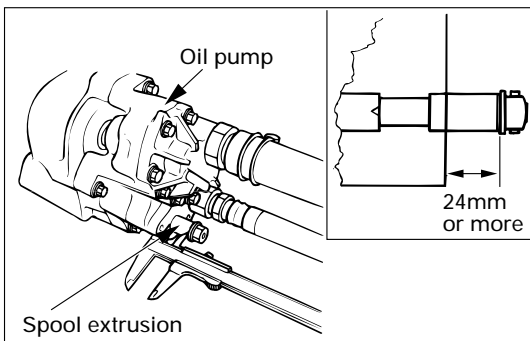
Inspecting the Amount of Spool Extrusion

After having installed the control cable, inspect the amount of spool extrusion according to the following procedure.

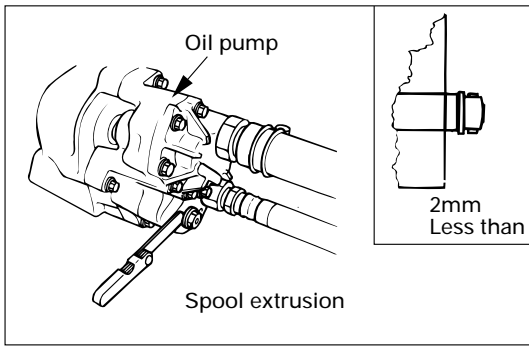
- (1) Remove the shift cap tightening bolt of the oil pump rear and remove the shift cap.
- (2) Repeat the "Up" and "Down" operations of the dump lever twice or three times and slowly set the dump lever to the "Up" position as much as possible.
- (3) Measure the amount of spool extrusion of the oil pump rear and check that it is a specified amount.



Amount of Spool Extrusion	mm(in.)
24 (0.945) or more	



281LX00018



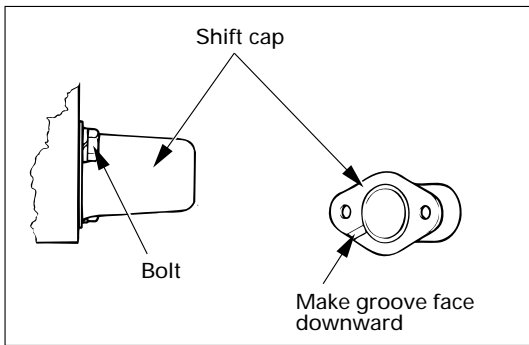
- (4) Repeat the "Up" and "Down" operations of the dump lever twice or three times and slowly set the dump lever to the "Up" position as much as possible.
- (5) Measure the amount of spool extrusion of the oil pump rear and check that it is a specified amount.



Amount of Spool Extrusion	mm(in.)
less than 2 (0.0787)	

NOTE:

Both amounts of spool extrusion at "Up" and "Down" shall be within a standard value.



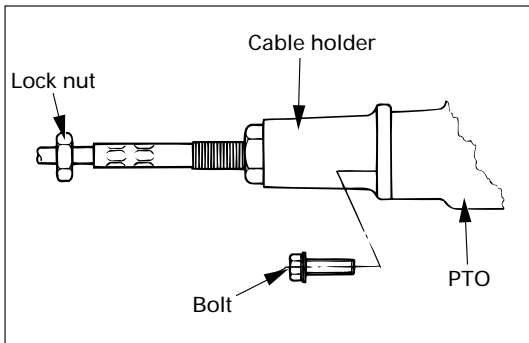
- (6) If the amount of spool extrusion is within a specified dimension, install the shift cap and tighten the bolt at a specified torque.



Shift Cap Fixing Bolt Torque	N-m (kg-m / lb-ft)
24 (2.4 / 17)	

NOTE:

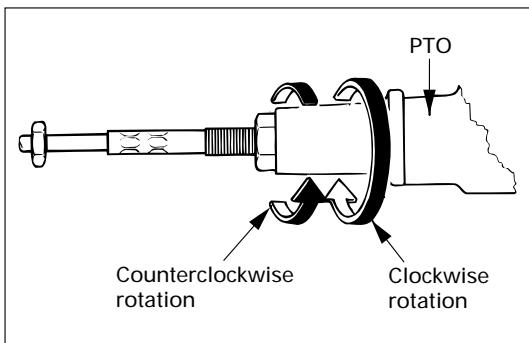
If the groove is not installed facing downward, the water intruded in the shift cap is not ejected but collected. Rusting and freezing will cause an incorrect actuation.



Cable Adjustment (PTO Side)

If no specified extrusion dimensions can be obtained as a result of measuring the amount of spool extrusion described previously, adjust (PTO side) the cable so that the specified amount of spool extrusion can be obtained according to the following procedure.

- (1) Loosen the lock nut of the control cable.
- (2) Remove the tightening bolt of the cable holder.

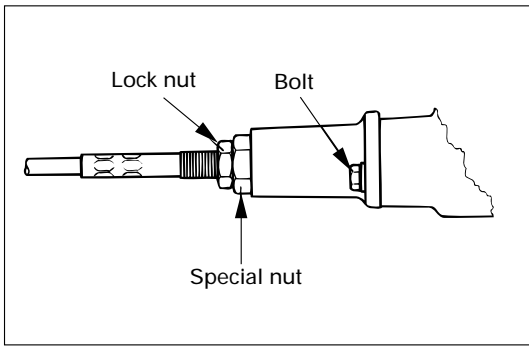


- (3) Adjust the cable rotating the cable holder.
 - If the amount of spool extrusion is improper (insufficient) at "Dump lever Up", rotate the cable holder toward "Counterclockwise rotation" shown by the arrow mark of the drawing.
 - If the amount of spool extrusion is improper (excessive) at "Dump lever Down", rotate the cable holder toward "Clockwise rotation" shown by the arrow mark of the drawing.

NOTE:

Both "clockwise rotation" and "counterclockwise rotation" indicate that the cable moves by about 0.75 mm (0.0295 inch) every time the cable holder rotates by 180 degrees.

20 POWER TAKE-OFF



- (4) If the cable is adjusted in the aforementioned method and the amount of spool extrusion cannot be obtained, repeat Items (2) and (3) and adjust the cable so that the amount of spool extrusion will reach a specified extrusion dimension.
- (5) If a spool extrusion dimension can be obtained, tighten the cable holder tightening bolt and lock nut at a specified torque in this order.



Cable Holder Bolt Torque	N·m (kg·m / lb·ft)
23 (2.3 / 17)	



Lock Nut Torque	N·m (kg·m / lb·ft)
21 (2.1 / 15)	

Operability of the dump lever, rise of the body (cargo deck), and inspection and adjustment of the rise and fall reference times

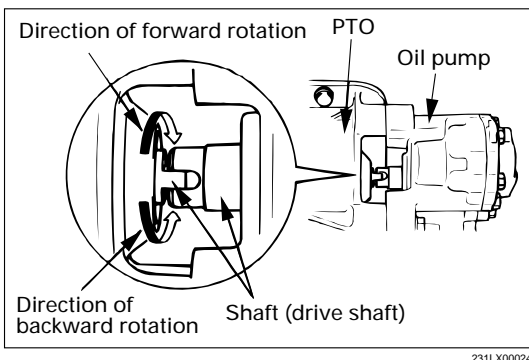
- (1) Check that the engine revolution per minute is 1,250 rpm and the rise and fall operations of the body (cargo deck) are performed within the following reference times.

	Rise Time And Fall Time		Sec.
	Rise	Fall	
Single Cab	within 20	within 20	
Double Cab		within 25	

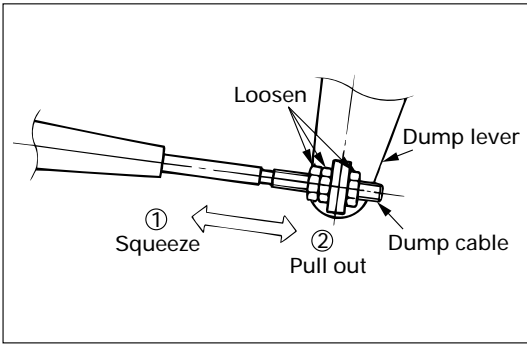
- (2) Inspection of the dump lever control force and moderation

- Inspect that the operation of the dump lever can lightly and smoothly be performed.

Basic Value (On the Dump Lever Knob)	kgf (N)
10 (98)	



- When the dump lever is in the "Up" and "Down" positions, inspect that the lock operation can be performed without a feeling of physical disorder.
- (3) After having repeated the "Up" and "Down" positions of the dump lever and slowly set them to the "Down" position as much as possible, inspect the shaft (driving shaft) between the PTO and oil pump.
 - Inspect that the shaft (driving shaft) rotates forward or backward.
 - If the shaft slowly rotates backward, it is normal.



231LX00025



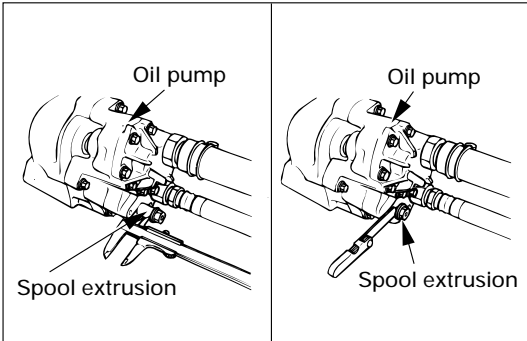
Cable Adjustment (Dump Lever Side)

If a defect is found as a result of the inspection of the aforementioned items (1) to (3), adjust the control cable in the dump lever portion inside the cab according to the following procedure.

- (1) Set the dump lever to the "Down" position.
- (2) Loosen the lock nut of the control cable and adjust the cable as follows:

When the rise time is improper or when the shaft is inverted at "Down" time or when the dump lever is hard to lock at "Down" time, move the inner cable to Direction (1) of the drawing.

When the fall time is improper or when the dump lever is hard to lock at "Up" time or when the shaft rotates forward at "Down" time, move the inner cable to Direction (2) of the drawing.



231LX00026

NOTE:

If the cable is adjusted on the dump lever side, be sure to re-inspect the amount of spool extrusion.

- (3) After adjustment, tighten the lock nut at a specified torque.

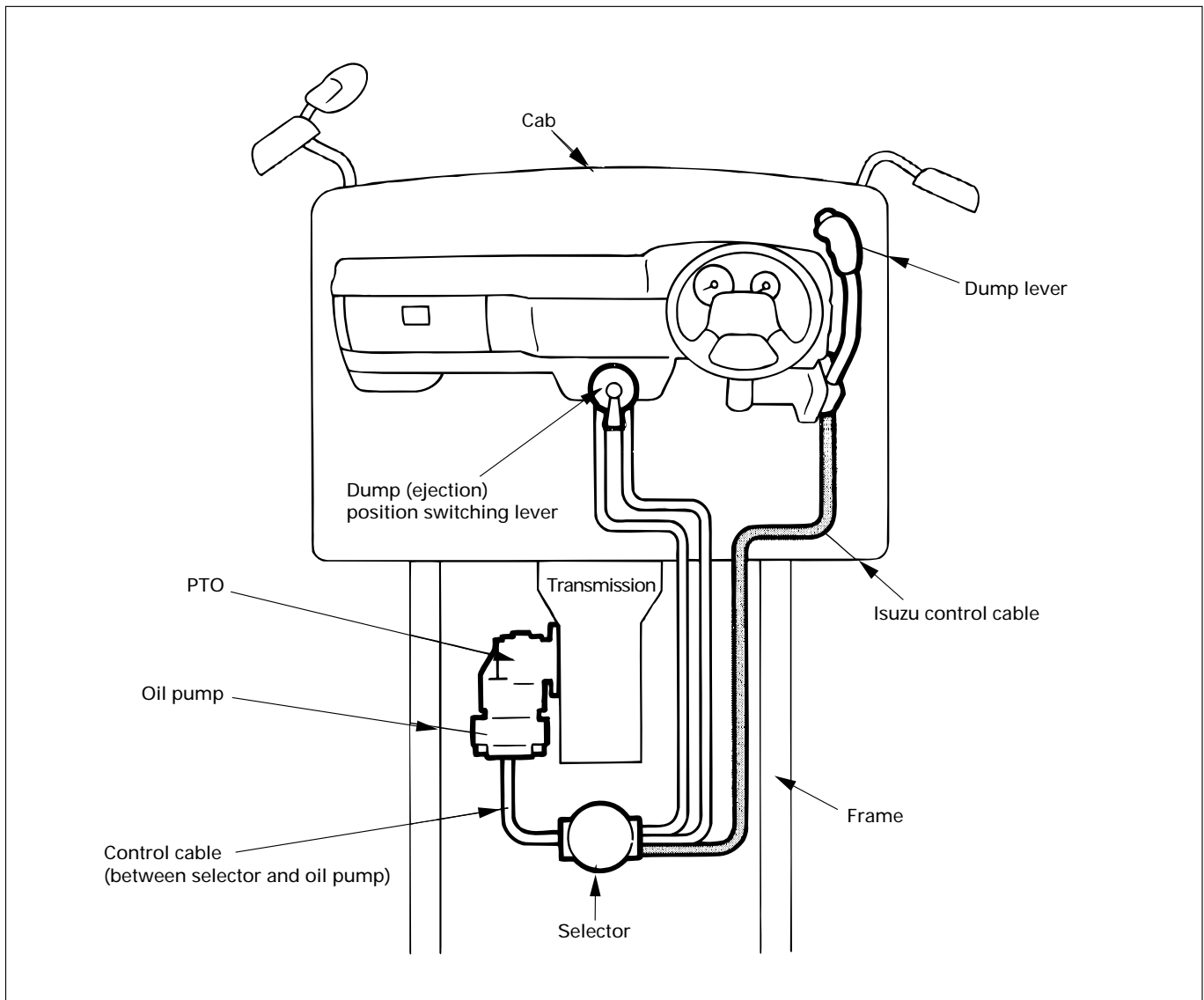


Lock Nut Torque	N·m (kg·m / lb·in)
	6 (0.6 / 52)

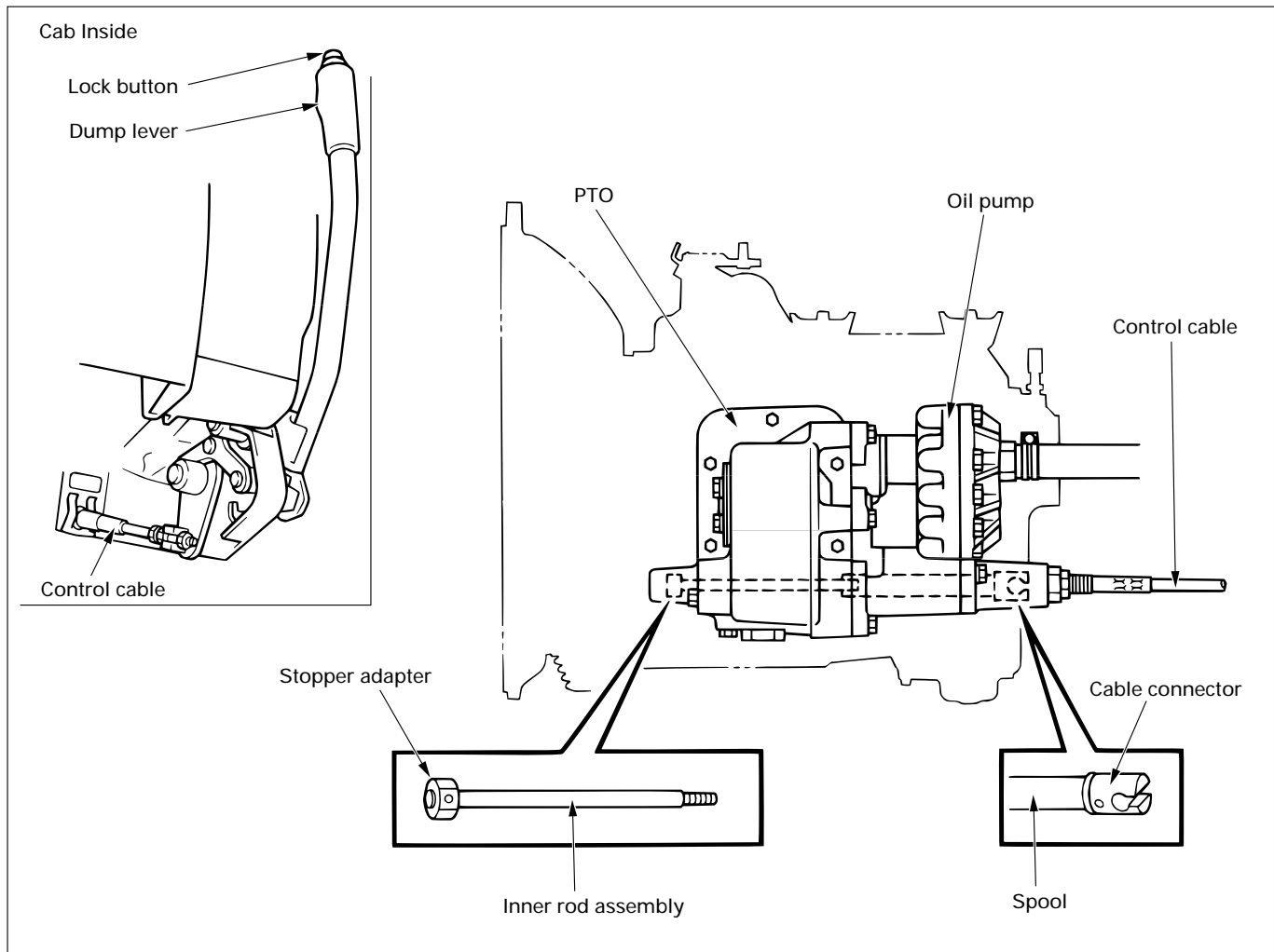
NOTES ON REPLACING AND ADJUSTING CONTROL CABLE FOR THREE-ROTATION DUMP TRUCK

1. The control cable between the "Dump lever and selector" of the three-rotation dump truck is manufactured by ISUZU MOTORS LIMITED. This control cable is sent for (at replacement) in the Isuzu Motors Service Network, and because the selector need be disassembled, assembled, and adjusted, request a service network (SS store) of a body manufacturer of the replacement work.
2. The selector main unit for the three-rotation dump truck and the control cable between the "Selector and PTO (with oil pump) are manufactured by a body manufacturer. Request a service network (SS store) of a body manufacturer of the replacement work of the selector main unit and the aforementioned control cable.
3. First adjust the control cable at the dump lever bottom, adjust the control cable in the cable holder portion of the PTO (oil pump portion), and check that the shaft (driving shaft) of the oil pump will not rotate concurrently. Then because the adjustment of the selector main unit is necessary (only at down lever down, the ejection direction of the cargo deck can be selected. If this adjustment is improper, the cargo deck may fall off.), request a service network of a body manufacturer of the adjustment.

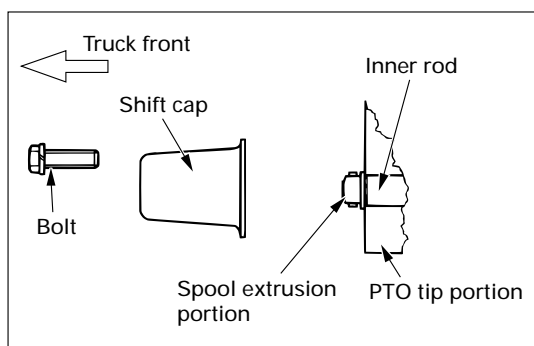
Control Cable Rough Layout Drawing for Three-Rotation Dump Truck



CONTROL CABLE ADJUSTMENT FOR THREE-ROTATION DUMP TRUCK



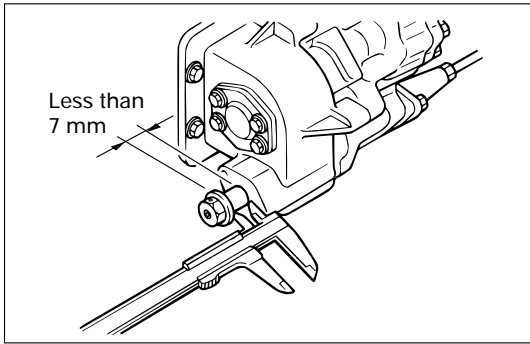
281LX00028



231LX00029

Replacement

- (1) The control cable between the "Dump lever and selector" of the three-rotation dump truck is manufactured by Isuzu Motors Ltd. This control cable is sent for (at replacement) in the Isuzu Motors Service Network, and because the selector need be disassembled, assembled, and adjusted, request a service network (SS store) of a body manufacturer of the replacement work.
- (2) The selector main unit for the three-rotation dump truck and the control cable between the "Selector and PTO (with oil pump)" are manufactured by a body manufacturer. Request a service network (SS store) of a body manufacturer of the replacement work of the selector main unit and the aforementioned control cable.



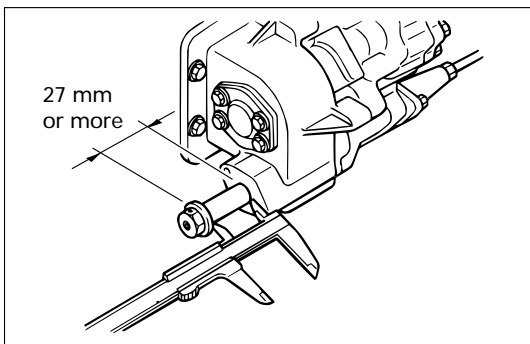
231LX00030

Measurement of the Amount of Spool Extrusion (PTO Tip Portion)

- (1) Remove the shift cap tightening bolt of the PTO tip portion and remove the shift cap.
- (2) Operate the dump lever twice or three times and slowly set it to the "Up" position as much as possible, then firmly lock the dump lever.
- (3) Measure the amount of spool extrusion at "Up" time at the PTO tip portion and check that it is a basic value.



Amount of Spool Extrusion	mm (in.)
less than 7 (0.276)	



231LX00031

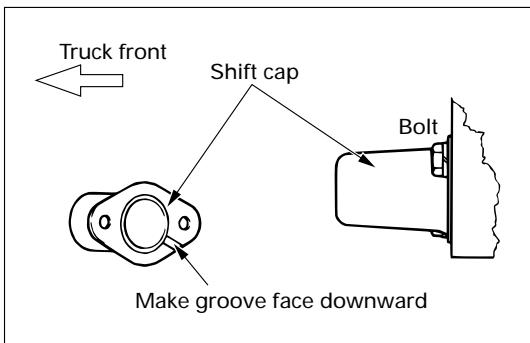
- (4) Operate the dump lever twice or three times and slowly set it to the "Down" position as much as possible, then firmly lock the dump lever.
- (5) Measure the amount of spool extrusion at "Down" time at the PTO tip portion and check that it is a basic value.



Amount of Spool Extrusion	mm (in.)
27 (1.063) or more	

NOTE:

Be sure check that both amounts of spool extrusion at "Up" and "Down" times are within basic values.



231LX00032

- (6) As a result of measurement, if the amount of spool extrusion is within a basic value, install the shift cap and tighten the bolt at a specified torque.



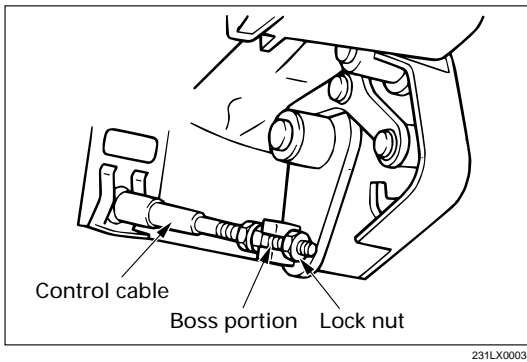
- Install the shift cap so that the groove on the locating plane can locate downward.



Shift Cap Bolt Torque	N·m (kg·m / lb·ft)
24 (2.4 / 17)	

NOTE:

If the groove is not installed facing downward, the water intruded in the shift cap is not ejected but collected. Rusting and freezing will cause an incorrect actuation.



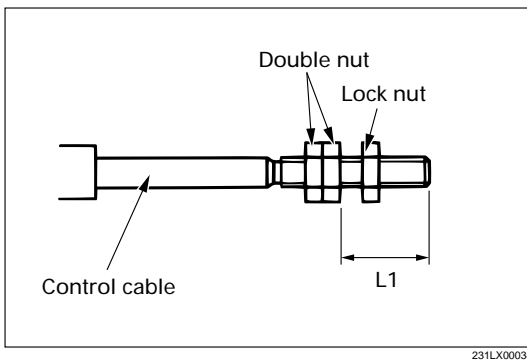
Adjustment of the Amount of Spool Extrusion (Control Cable Adjustment)

NOTE:

As a result of the "Measurement of The Amount of Spool Extrusion" described previously, if a specified extrusion dimension cannot be obtained, adjust the control cables on the dump lever side inside the cab and the dump lever side according to the following procedure.

Control Cable Adjustment (Dump Lever Side Inside Cab)

- (1) Operate the dump lever twice or three times with the engine in the stopped state and slowly set it to the "Up" position, then firmly lock the dump lever.
- (2) Measure the length "L1" on the control cable tip and double nut side shown in the drawing and check that it is within the following basic value.

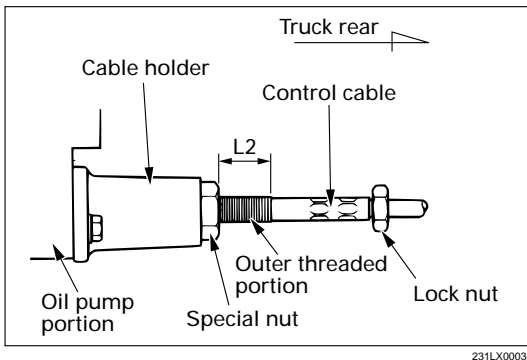


Length "L1"	mm (in.)
$14 \pm 1 (0.55 \pm 0.039)$	

- (3) As a result of measurement, if the length "L1" does not satisfy a basic value, loosen the lock nut and adjust the control cable so that the length "L1" will be set to a specified length "L1", then tighten the lock nut at a specified torque.



Lock Nut Torque	N·m (kg·m / lb·in)
$6 (0.6 / 52)$	



Control Cable Adjustment (Oil Pump Side)

- (1) Tighten the special nut in the cable holder loosening the lock nut, moving it to the truck rear, and lightly pushing the control cable against the PTO side.
- (2) Measure the length "L2" between the outer screw tip portion and special nut end of the control cable shown in the drawing and check that it is within a basic value.

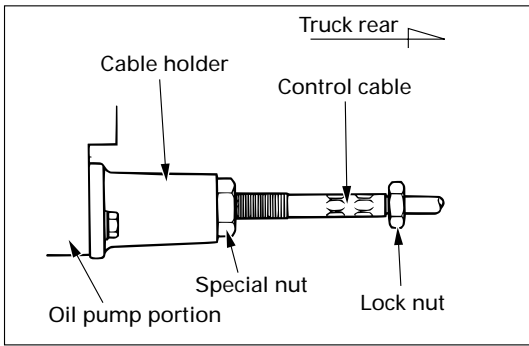


Length "L2" (Reference)	mm (in.)
$24 \begin{matrix} +1 \\ -0 \end{matrix} (0.945 \begin{matrix} +0.039 \\ -0 \end{matrix})$	

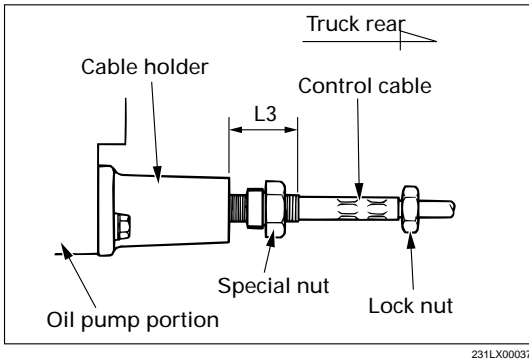
- As a result of check, if the length "L2" is satisfied, tighten the lock nut at a specified torque.



Lock Nut Torque	N·m (kg·m / lb·ft)
$20 (2.0 / 14)$	

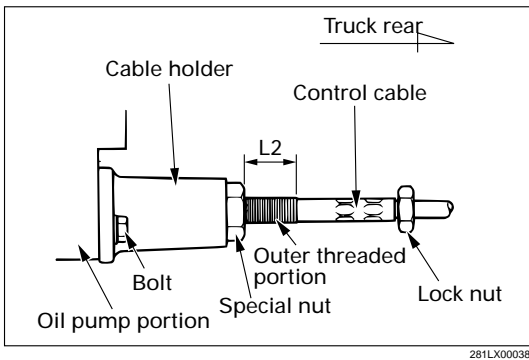


3) As a result of measurement, if the length "L2" does not satisfy a basic value, adjust the control cable according to the following procedure.



- ① Loosen the special nut and move it toward the truck rear, then set the control cable free.
- ② Manually holding the control cable, take in and out the cable to the front and rear. Obtain the length "L3" and temporarily tighten the special nut securing the control cable manually.

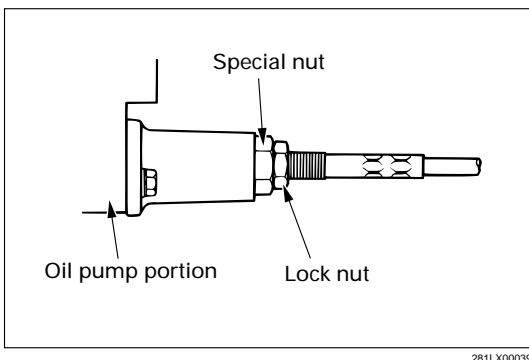
"L3" = "L2" basic value + Special Nut Thickness (10 mm)



- ③ Measure the length "L2" in the state of ②. If the dimension does not satisfy a basic value, repeat Items ② and ③ and adjust so that the "L2" will be set to the basic value.
- ④ After having the length "L2", tighten the special nut at a specified torque.



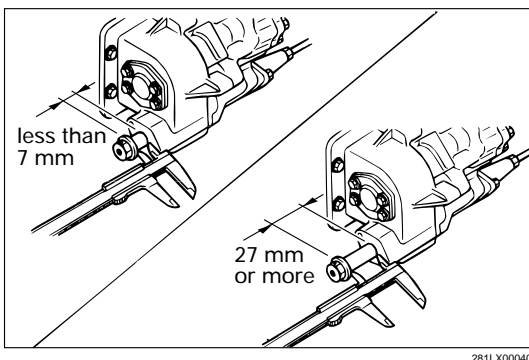
Special Nut Torque	N·m (kg·m / lb-ft)
	142 (14.5 / 105)



- ⑤ After having tightened the special nut, tighten the lock nut at a specified torque.



Lock Nut Torque	N·m (kg·m / lb-ft)
	20 (2.0 / 14)



- (4) After having adjusted the control cable, slowly operate the dump lever twice or three times and recheck the spool extrusion dimension.
(Refer to the item of Measurement of The Amount of Spool Extrusion on Page 24.)

- (5) After having completed all measurement and adjustments, set the dump lever to the "Down" position and start the engine.

Operability of the Dump Lever, Rise of the Body (Cargo Deck), and Inspection and Adjustment of the Rise and Fall Reference Times

- (1) Check that the engine revolution per minute is 1,250 rpm and the rise and fall operations of the body (cargo deck) are performed within the following reference times.

Rise time = within 20 seconds

Fall time = within 20 seconds

- (2) Inspection of the dump lever control force and moderation

- Inspect that the operation of the dump lever can lightly and smoothly be performed.

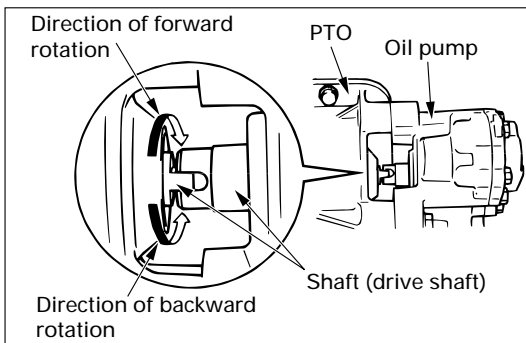
Basic value = less than 10 kgf (98N) on the dump lever knob

- When the dump lever is in the "Up" and "Down" positions, inspect that the lock operation can be performed without a feeling of physical disorder.

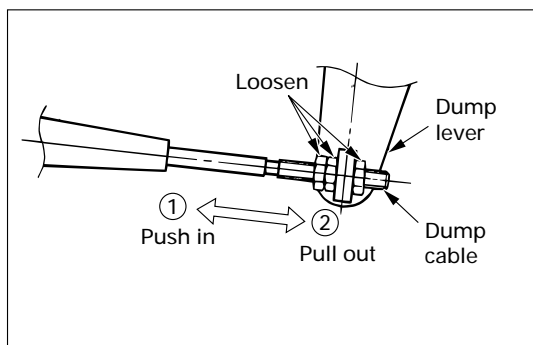
- (3) After having repeated the "Up" and "Down" positions of the dump lever and slowly set them to the "Down" position as much as possible, inspect the shaft (driving shaft) between the PTO and oil pump.

- Inspect that the shaft (driving shaft) rotates forward or backward.

If the shaft slowly rotates backward, it is normal.



281LX00041



281LX00042

(4) If a defect is found as a result of the inspection of the aforementioned items (1) to (3), adjust the control cable in the dump lever portion inside the cab according to the following procedure.

- ① Set the dump lever to the "Down" position.
- ② Loosen the lock nut of the control cable and adjust the cable as follows:

When the rise time is improper or when the dump lever is hard to lock at "Down" time, move the inner cable to Direction ② of the drawing on the preceding page.

When the fall time is improper or when the dump lever is hard to lock at "Up" time or when the shaft rotates forward at "Down" time, move the inner cable to Direction ① of the drawing on the preceding page.

NOTE:

If the cable is adjusted on the dump lever side, be sure to re-inspect the amount of spool extrusion.

After adjustment, tighten the lock nut at a specified torque.



Lock Nut Torque	N·m (kg·m / lb·in)
	6 (0.6 / 52)

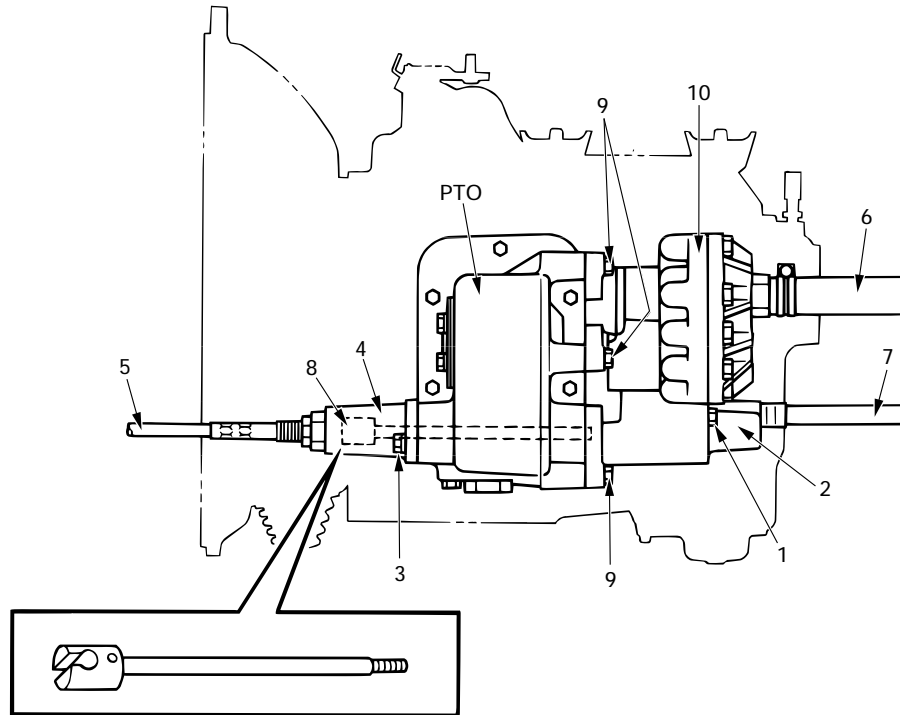
*** Selector**

The selector is adjusted so that the ejection direction of the cargo deck can be selected only at dump lever "Down". If this adjustment is improper, the cargo deck may slide from the truck at rise. Accordingly, because the adjustment of the selector main unit is also needed after the replacement, adjustment, and inspection of the control cable, request a nearest service network (SS store) of a body builder of the adjustment.

OIL PUMP UNIT (REPLACEMENT)

REMOVAL AND INSTALLATION

* This illustration is based on a rear dump truck model.



281LX080

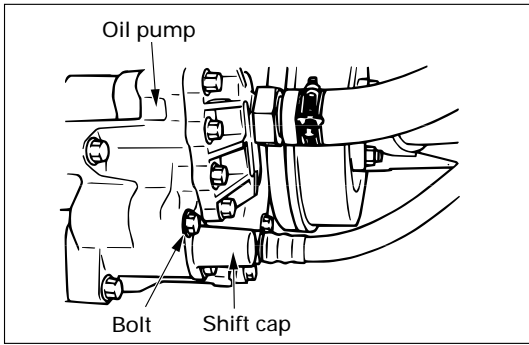
Removal Steps

1. Bolt (shift cap)
2. Shift cap
3. Bolt (cable holder)
4. Cable holder
5. Control cable
6. Low-pressure hose
7. High-pressure hose
8. Inner rod assembly
9. Bolt (oil pump)
10. Oil pump

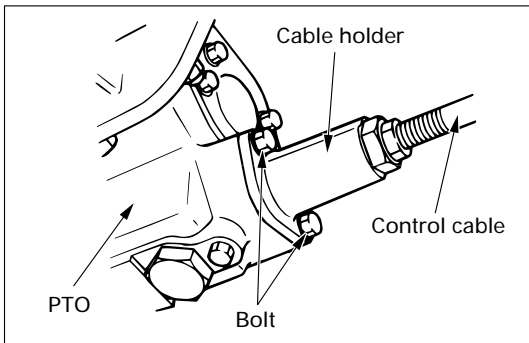
Installation Steps

To install, follow the removal steps in the reverse order.

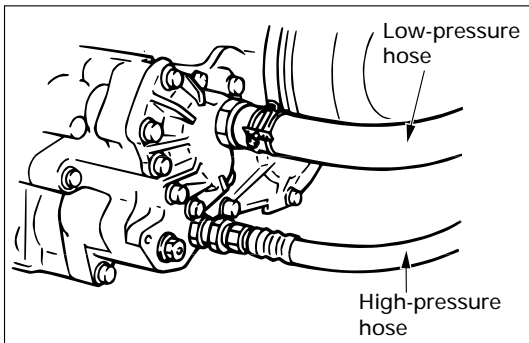
↔ Removal Steps



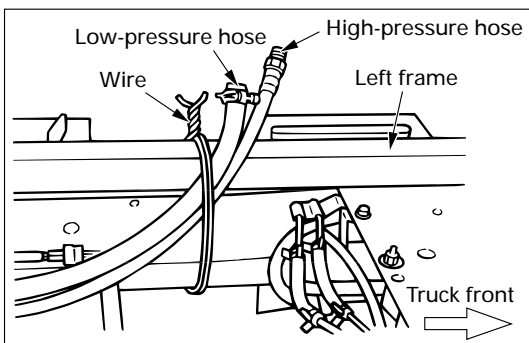
285LX00001



285LX00002



285LX00003



285LX00004

NOTE:

Set the dump lever inside the cab to the "Down" position and check the lever lock.

1. Bolt (Shift Cap)
2. Shift Cap
 - Remove the bolt and remove the shift cap from the oil pump.

3. Bolt (Cable Holder)
4. Cable Holder
5. Control Cable

NOTE:

Before removing the control cable, be sure to refer to Items 3 to 6 of "Removal" of the "Control Cable Replacement and Adjustment for Rear Dump Truck" described previously and perform work in accordance with the items.

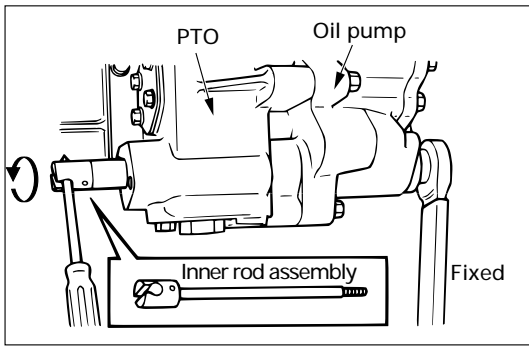
6. Low-Pressure Hose
 - Loosen the hose band and remove the hose from the oil pump.
7. High-Pressure Hose
 - Loosen the hose joint and remove the hose from the oil pump.

NOTE:

For the high-pressure hose, the joint may not be removed in the oil pump fixed state according to the type of the truck and equipment. In that case, slightly loosen the joint to set the state. At the stage where the rear oil pump is removed (Item 10), remove the high-pressure hose rotating the oil pump.

NOTE:

Because hydraulic operating fluid flows out when the hose is removed, quickly make the hose port face upward and protect the hose so that dust or foreign matter will not be mixed in, then fix it to the frame with a wire.



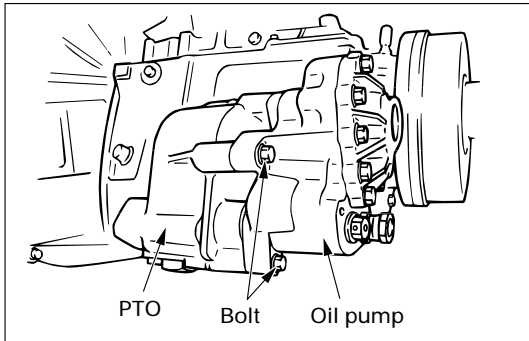
281LX00044

8. Inner Rod Assembly

- To remove the inner rod assembly, as shown in the drawing, press the stopper adapter side by a wrench and insert a Phillips screwdriver (large) in the groove of the control cable connector. Then rotate it counterclockwise, loosen it, and remove it.

NOTE:

Be sure to press the stopper adapter side and loosen it on the control cable connector side. (Press the stopper adapter side not to rotate the spool valve. Besides, the three-rotation dump truck is in contrast with this.)



281LX00045

9. Bolt (Oil Pump)

10. Oil Pump

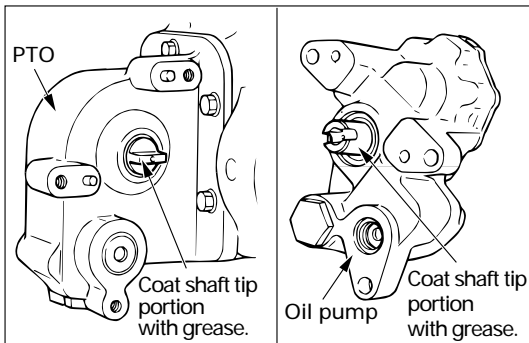
- Remove three oil pump tightening bolts and strike them with a plastic hammer (or a wooden hammer) from the truck front side, then remove the oil pump from the PTO.
- Remove the joint from the oil pump.

NOTE:

If the high-pressure hose could not be removed in Item 7 described previously, remove the oil pump from the high-pressure hose rotating the oil pump at this time.



Installation Steps



281LX00046

10. Oil Pump

9. Bolt (Oil Pump)



- Fully coat the oil pump shaft tip groove portion and PTO shaft tip with lithium grease (BESCO L-2 or equivalent).
- Install the oil pump in the joint.

NOTE:

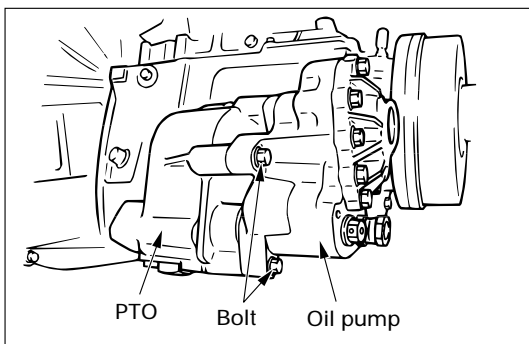
If the oil pump is rotated and removed from the high-pressure hose when the oil pump is removed, install the oil pump in the high-pressure hose rotating the oil pump and slightly tighten it.



- Align and install the oil pump groove and the shaft width across flats of the PTO and tighten the bolt at a specified torque.



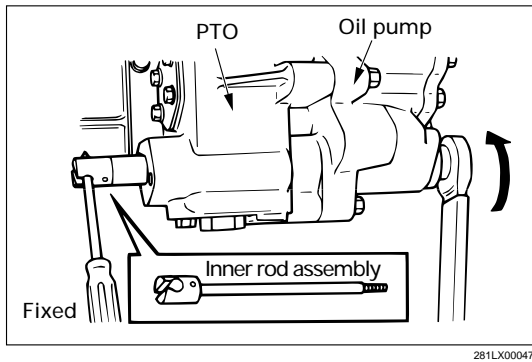
PTO Bolt Torque	N·m (kg·m / lb·ft)
	53 (5.4 / 39)



281LX00045

NOTE:

Be fully careful so that dust or foreign matter will not be mixed in from the hose installation port of the oil pump.

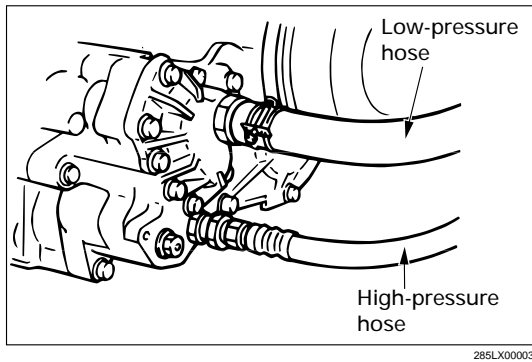


8. Inner Rod Assembly

- Coat the threaded portion of the inner rod assembly tip with liquid gasket (LOCTITE 242 or equivalent) and insert and screw the tip from the front side of the PTO, then tighten it at a specified torque.
- When tightening the inner rod assembly, insert a Phillips screwdriver (large) in the control cable connector groove, press it so that the spool valve will not rotate, then apply a wrench to the stopper adapter on the oil pump side to tighten it. (Besides, the three-rotation dump truck is in contrast with this.)



Inner Rod Torque	N·m (kg·m / lb·ft)
19 (1.9 / 14)	



7. High-Pressure Hose

- Install the high-pressure hose in the oil pump and firmly tighten the joint.

NOTE:

If the oil pump is rotated and installed in the high-pressure hose in Item 10 described previously, firmly tighten the joint.

6. Low-Pressure Hose

- Install the hose and firmly tighten the hose band.

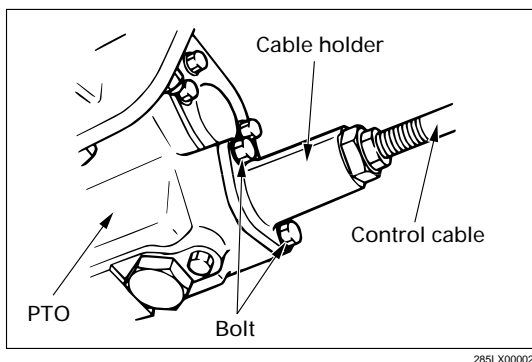
NOTE:

When installing both the high-pressure and low-pressure hoses, be fully careful so that dust or foreign matter will not be mixed in the hose port and oil pump.



Joint Torque	N·m (kg·m / lb·ft)	
Item	Size	Torque
High-pressure side	PF1/2	103 (10.5 / 76)
Low-pressure side	PF3/4	147 (15 / 108)

* After having tightened the joint using a recommended value, additionally tighten it if there is a leak of oil.



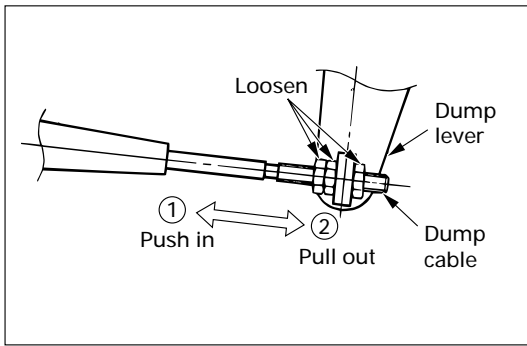
5. Control Cable

4. Cable Holder

3. Bolt (Cable Holder)

NOTE:

Install the control cable and cable holder in the PTO in accordance with Items 6 to 3 of "Installation Steps" (Page 16) of Removal and Installation of Control Cable for Rear Dump Truck, and after installation, inspect and adjust the spool amount in accordance with the "Amount of Spool Extrusion" (Page 18) described previously.



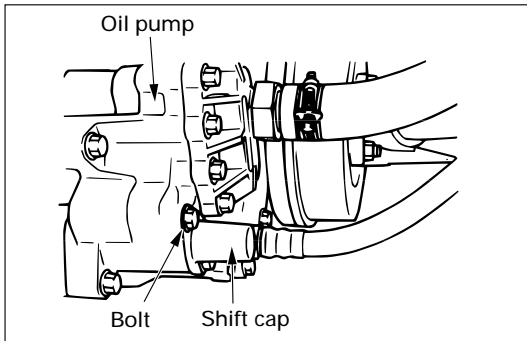
281LX00042



- After having adjusted the control cable and having inspected or adjusted the amount of spool extrusion, tighten the bolt and the special nut and lock nut of the control cable at a specified torque.



Tightening Torque	N·m (kg·m / lb·ft)
Bolt	24 (2.4 / 17)
Special Nut	206 (21 / 152)
Lock Nut	21 (2.1 / 15)



285LX00001



2. Shift Cap

1. Bolt (Shift Cap)

- Install the shift cap in the oil pump making its grooved side face upward and tighten the bolt at a specified torque

Shift Cap Bolt Torque	N·m (kg·m / lb·ft)
	24 (2.4 / 17)

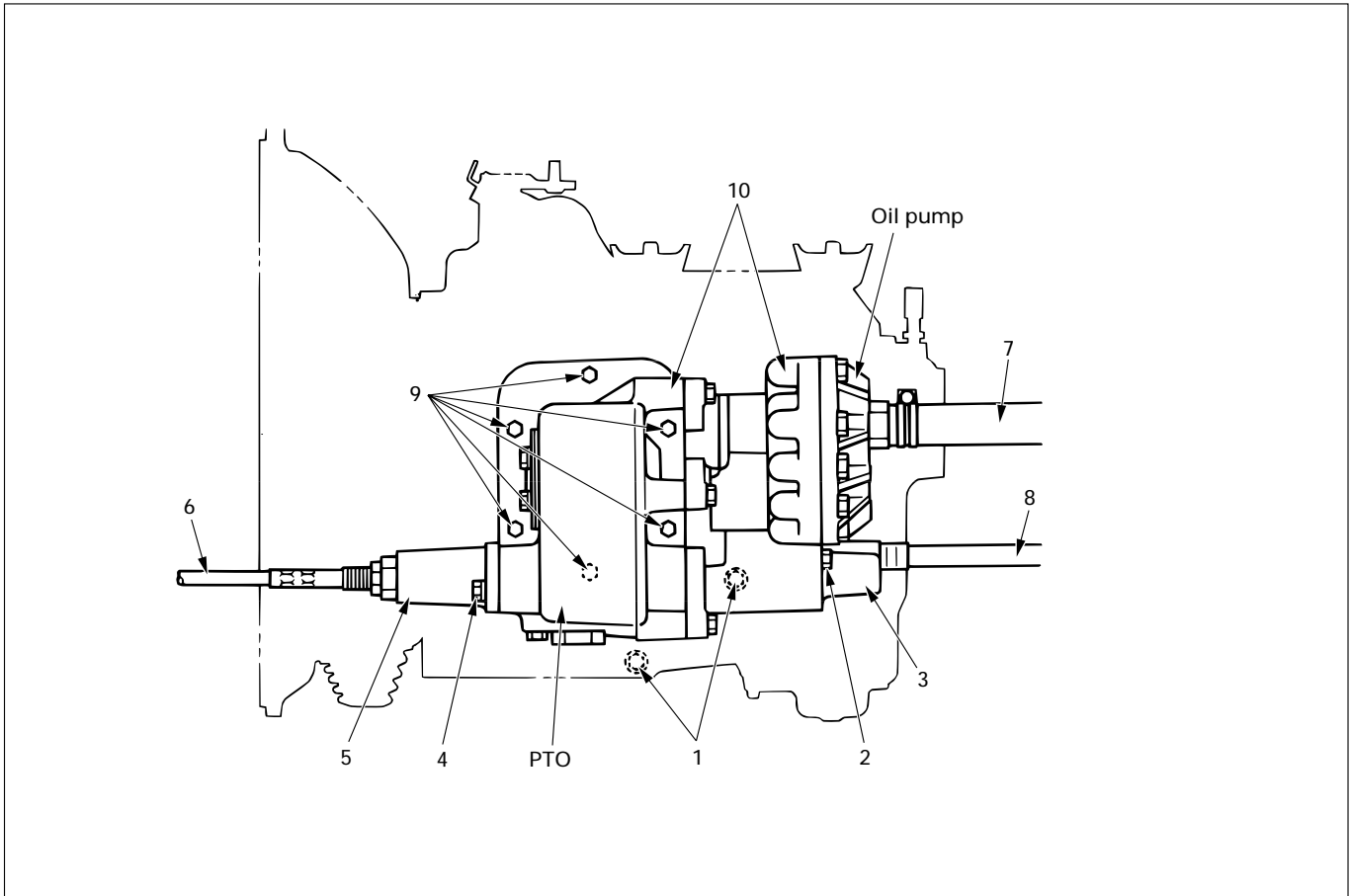
NOTE:

If the groove is not installed facing downward, the water intruded in the shift cap is not ejected but collected. Rusting and freezing will cause an incorrect actuation.

Supply and Air Bleeding of Hydraulic Operating Fluid

After having installed the oil pump, supply hydraulic operating fluid and release air as requested. Supply the hydraulic operating fluid and release air in accordance with the "Inspection and Supply of The Hydraulic Operating Fluid" (Page 5) and the "Air Bleeding Procedure of Hydraulic Operating Fluid" (Page 12) described previously.

PTO (With OIL PUMP) ASSEMBLY REMOVAL AND INSTALLATION



281LX00048

Removal Steps

1. Drain plug, filler plug
2. Bolt (shift cap)
3. Shift cap
4. Bolt (cable holder)
5. Cable holder
6. Control cable
7. Low-pressure hose
8. High-pressure hose
9. Bolt (PTO)
10. PTO (with oil pump)

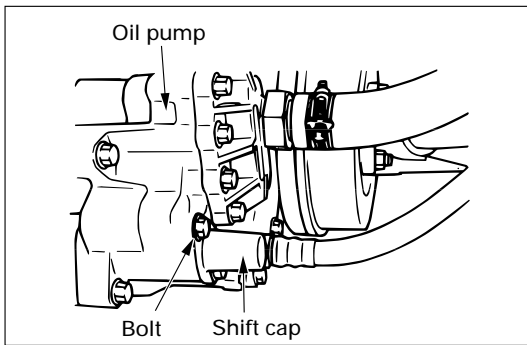
Installation Steps

To install, follow the removal steps in the reverse order.

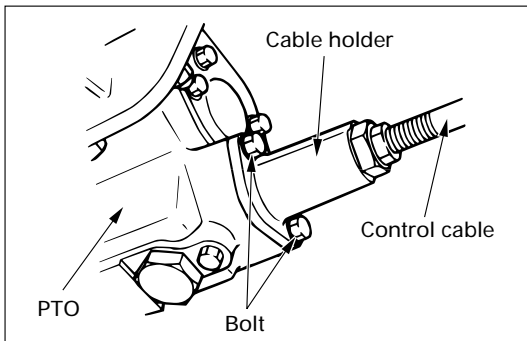
NOTE:

For the three-rotation dump truck, refer to the notes of the "Control Cable Adjustment for Three-Rotation Dump Truck" (Page 23) in the preceding chapter before that.

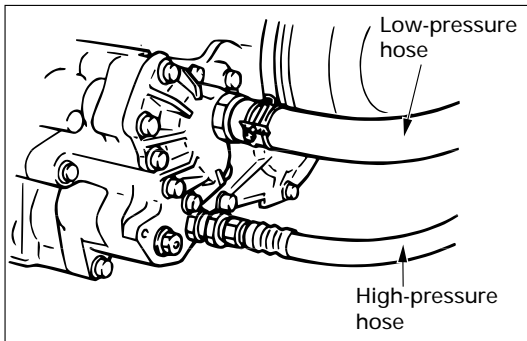
↔ Removal Steps



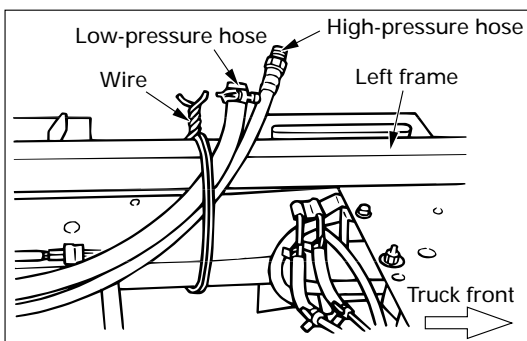
285LX00001



285LX00002



285LX00003



285LX00004

NOTE:

Set the dump lever inside the cab to the "Down" position and check the lever lock.

1. Drain Plug, Filler Plug

- Remove the drain plug and filler plug of the transmission and remove the transmission oil.

2. Bolt (Shift Cap)

3. Shift Cap

- Remove the bolt and remove the shift cap from the oil pump.

4. Bolt (Cable Holder)

5. Cable Holder

6. Control Cable

NOTE:

Before removing the control cable, be sure to refer to Items 3 to 6 of "Removal Steps" (Pages 15 and 16) in the "Removal and Installation of Control Cable for Rear Dump Truck" in the chapter described previously and perform work in accordance with the items.

7. Low-Pressure Hose

- Loosen the hose band and remove the hose from the oil pump.

8. High-Pressure Hose

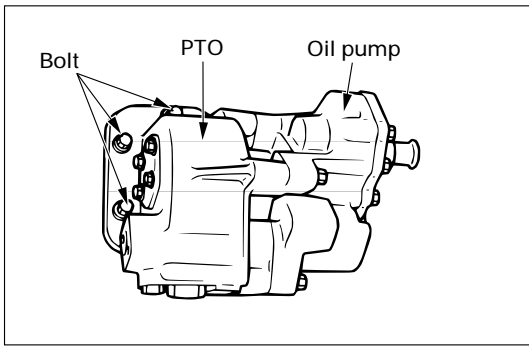
- Loosen the hose joint and remove the hose from the oil pump.

NOTE:

For the high-pressure hose, a part of the joint may not be removed according to the type of the truck and equipment. In that case, slightly loosen the joint to set the state. At the stage where the rear PTO is removed (Item 10), remove the high-pressure hose rotating the PTO (with oil pump).

NOTE:

Because hydraulic operating fluid flows out when the hose is removed, quickly make the hose port face upward and protect the hose so that dust or foreign matter will not be mixed in, then fix it to the frame with a wire.



281LX00049

- 9. Bolt (PTO)
- 10. PTO (with Oil Pump)

- Remove the six tightening bolts around the PTO and remove the PTO (with oil pump) from the transmission.

NOTE:

If the high-pressure hose could not be removed in Item 8 described previously, remove the PTO (with oil pump) from the high-pressure hose rotating the PTO at this time.

Besides, because this PTO (with oil pump) weighs 15kg (147N), be fully careful of its drop at attachment and detachment.

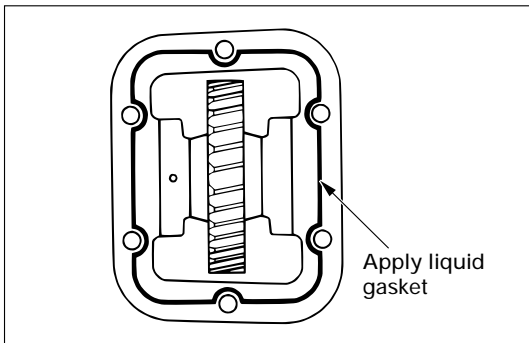


Installation Steps



NOTE:

Before installing the PTO, cleanly remove the liquid gasket left on the PTO installation side of the transmission case and clean and degrease the transmission case by waste cloth so that oil will not adhere to it.



281LX00050

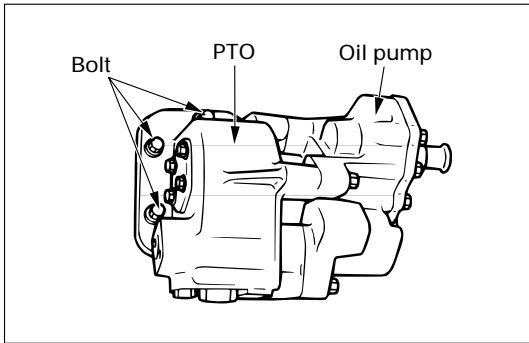
- 10. PTO (with Oil Pump)



- After having cleaned and fully degreased the transmission installation side of the PTO, coat it with liquid gasket (LOCTITE 17430 or equivalent).

NOTE:

When removing the PTO side from the high-pressure hose rotating the PTO side at PTO (with oil pump) removal, install the PTO (with oil pump) in the high-pressure hose and lightly tighten it.



281LX00049

- 9. Bolt (PTO)

- Install the PTO (with oil pump) in the transmission and tighten the bolt at a specified torque.



PTO Bolt Torque N·m (kg·m / lb·ft)

45 (4.6 / 33)

- 8. High-Pressure Hose

- Install the high-pressure hose in the oil pump and firmly tighten the joint.

NOTE:

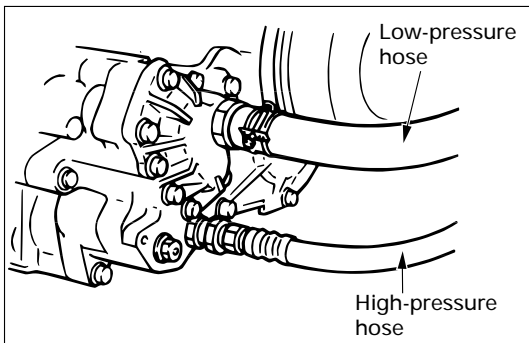
When the PTO (with oil pump) is installed in the high-pressure hose rotating the PTO in Item 10 described previously, firmly tighten the joint.

- 7. Low-Pressure Hose

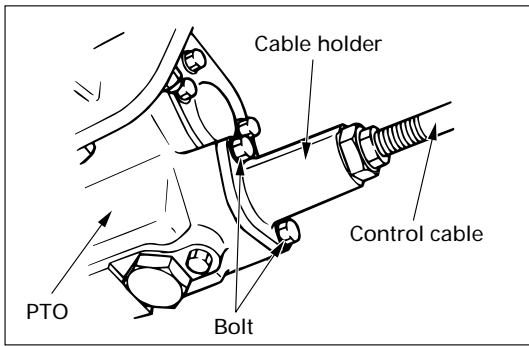
- Install the hose and firmly tighten the hose band.

NOTE:

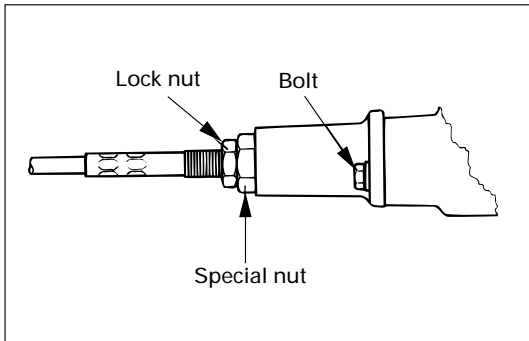
When installing the high-pressure hose and the low-pressure hose, be fully careful so that dust or foreign matter will not be mixed in the pose port and the oil pump.



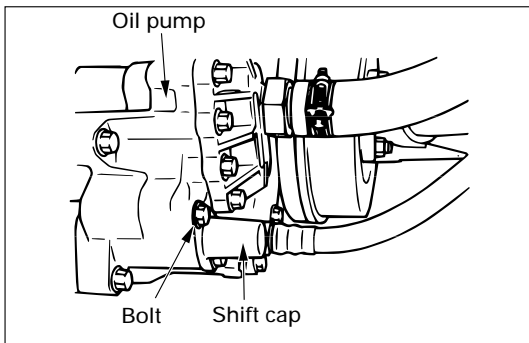
285LX00003



285LX00002



281LX00023



285LX00001

- 6. Control Cable
- 5. Cable Holder
- 4. Bolt (Cable Holder)

NOTE:

Install the control cable and cable holder in the PTO in accordance with Items 6 to 3 of "Installation Steps" (Pages 16 and 17) in the "Removal and Installation of Control Cable for Rear Dump Truck", and after installation inspect and adjust it in accordance with the "Amount of Spool Extrusion" (Page 18).

- After having adjusted the control cable and having inspected or adjusted the amount of spool extrusion, tighten the bolt and the special nut and lock nut of the control cable at a specified torque.



Tightening Torque	N·m (kg·m / lb·ft)
Bolt	24 (2.4 / 17)
Special Nut	147 (15 / 108)
Lock Nut	20 (2.0 / 14)

- 3. Shift Cap
- 2. Bolt (Shift Cap)



- Install the shift cap in the oil pump making its grooved side face upward and tighten the bolt at a specified torque.



Shift Cap Bolt Torque	N·m (kg·m / lb·ft)
	24 (2.4 / 17)

- 1. Drain Plug, Filler Plug

- Firmly tighten the drain plug of the transmission.
- Supply the transmission oil (BESCO gear oil trans-axle (5W-30) or equivalent) until it flows out from the filler plug hole and firmly tighten the filler plug.



Amount of Oil (Reference)	Liters (US gal / Imp. gal)
5 speed	3.2 (0.85 / 0.70)
6 speed	4.0 (1.06 / 0.88)



Drain Plug and Filler Plug Torque	N·m (kg·m / lb·ft)
	49 (5.0 / 36)



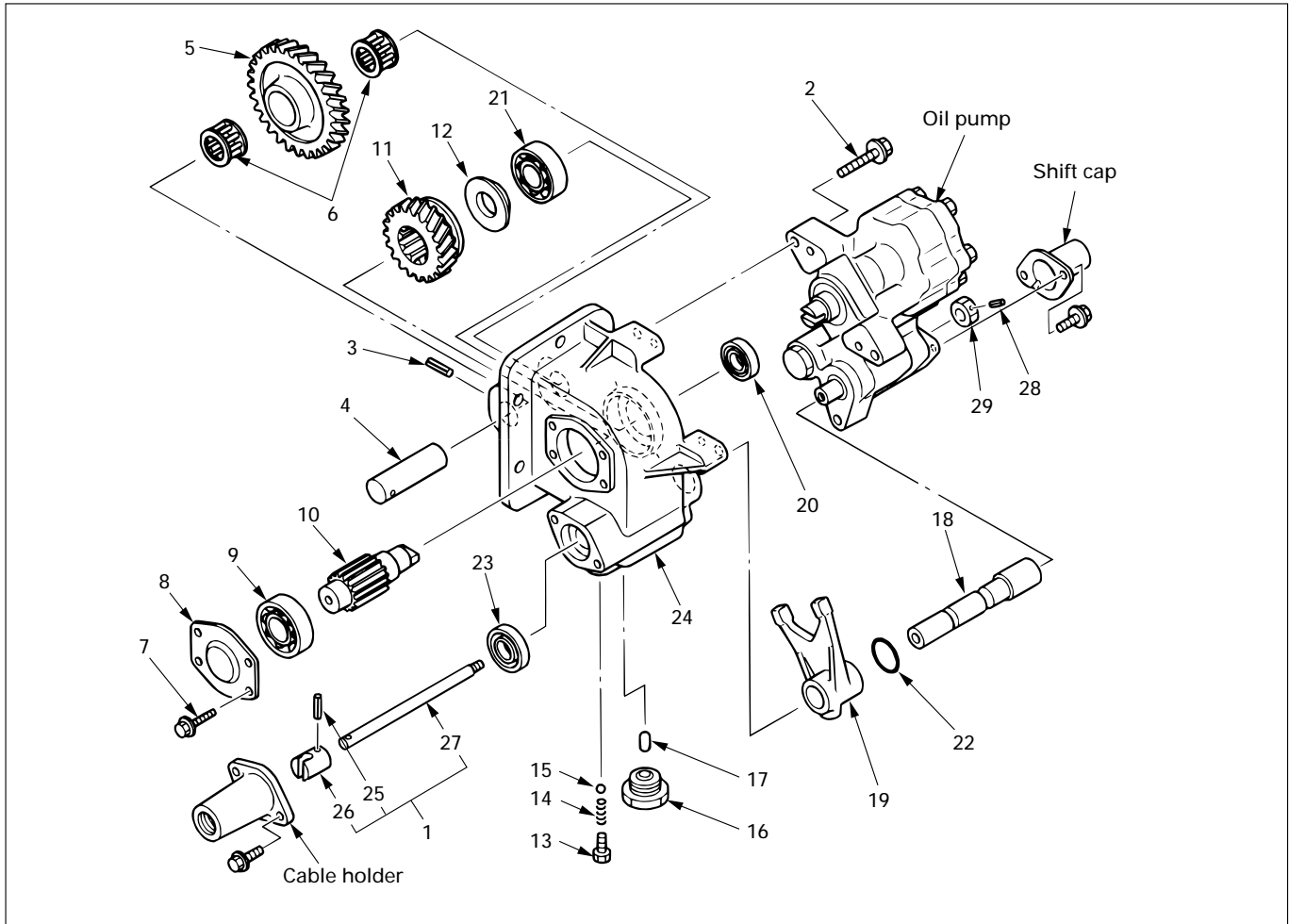
Supply and Air Bleeding of Hydraulic Operating Fluid

After having installed the oil pump, supply hydraulic operating fluid and release air as requested. Supply the hydraulic operating fluid and release air in accordance with the "Inspection and Supply of The Hydraulic Operating Fluid" (Page 5) and the "Air Bleeding Procedure of the Hydraulic Operating Fluid" (Page 12) described previously.

UNIT REPAIR

PTO ASSEMBLY

DISASSEMBLY



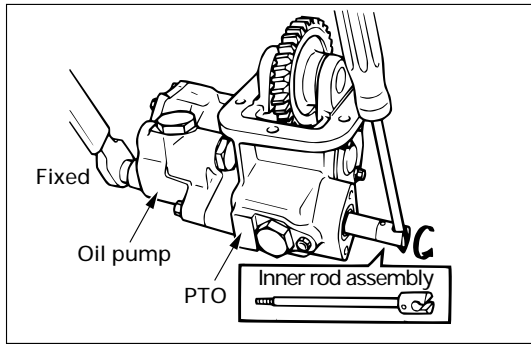
281LX00051

Disassembly Steps

- | | |
|-----------------------|----------------------------------|
| 1. Inner rod assembly | 16. Interlock plug |
| 2. Bolt | 17. Interlock pin |
| 3. Spring pin | 18. Shift rod |
| 4. Idle gear shift | 19. Shift arm |
| 5. Idle gear | 20. Oil seal (output shaft side) |
| 6. Needle bearing | 21. Rear ball bearing |
| 7. Bolt | 22. O-ring |
| 8. Case cover | 23. Oil seal (shift rod side) |
| 9. Front ball bearing | 24. Gear case |
| 10. Output shaft | 25. Spring pin |
| 11. Output gear | 26. Cable connector |
| 12. Thrust collar | 27. Inner rod |
| 13. Spring set bolt | 28. Spring pin |
| 14. Spring | 29. Stopper adapter |
| 15. Ball | |



Disassembly Steps



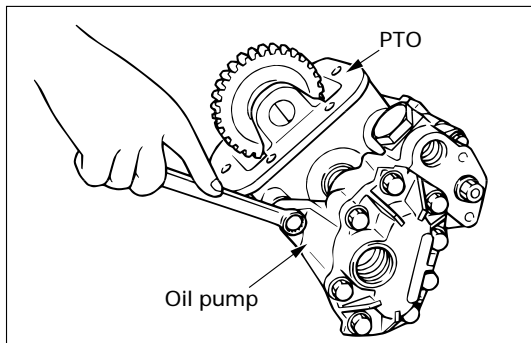
281LX00052

1. Inner Rod Assembly

- Press the stopper adapter side by a wrench and insert a Phillips screwdriver (large) in the groove of the control cable connector. Then rotate it counterclockwise, loosen it, and remove it.

NOTE:

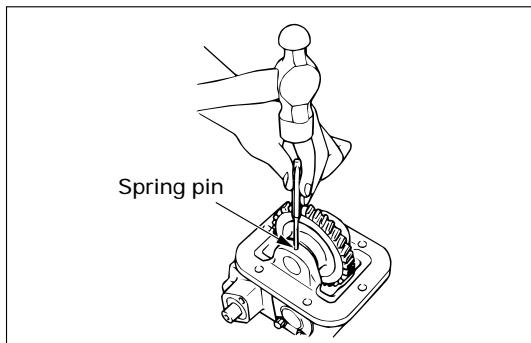
Be sure to press the stopper adapter side and loosen it on the control cable connector side. (Press the stopper adapter side not to rotate the spool valve. Besides, the three-rotation dump truck is in contrast with this.)



281LX00053

2. Bolt

- Remove three bolts and separate the oil pump and PTO striking the oil pump by a plastic hammer (or wooden hammer).



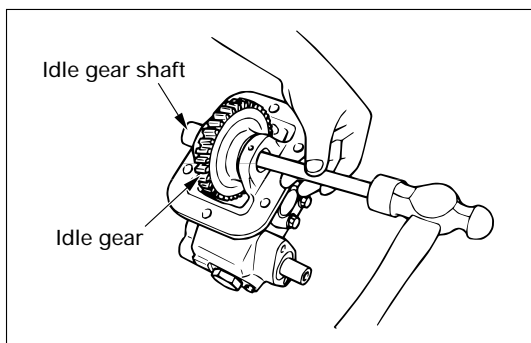
281LX00054

3. Spring Pin

- Punch the spring pin in the idle gear shaft. (After having removed the idle gear shaft, punch the spring pin from the shaft.)



Spring pin bar: 9-8529-2201-0



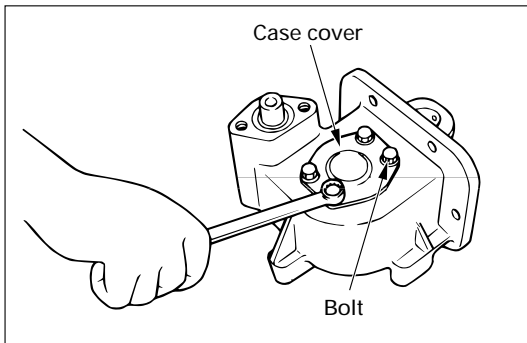
281LX00055

4. Idle Gear Shaft

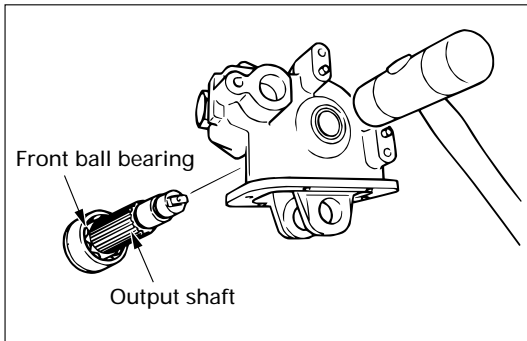
5. Idle Gear

6. Needle Bearing

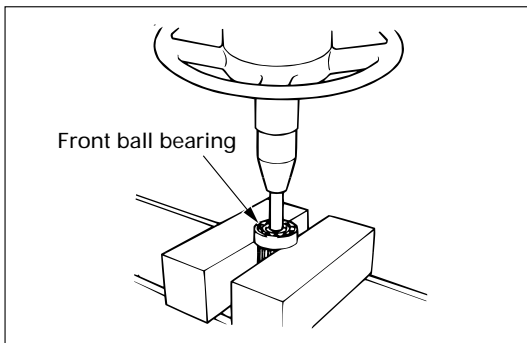
- Strike and remove the idle gear shaft and remove the idle gear, then remove the needle bearing.



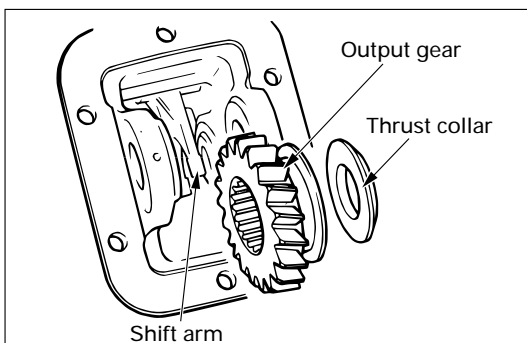
281LX00056



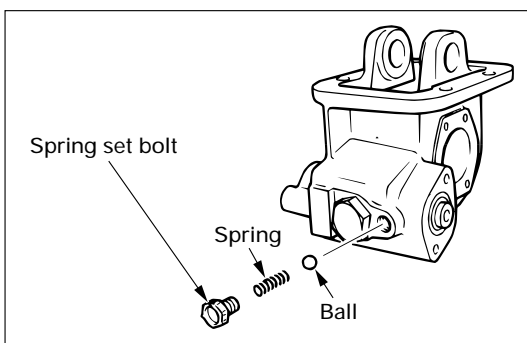
281LX00057



F08LX00002



281LX00058



281LX00059

7. Bolt**8. Case Cover**

- Remove the bolt and remove the case cover.

9. Front Ball Bearing**10. Output Shaft**

- Strike the end face of the output shaft from the rear side and remove the front ball bearing while it is being installed in the output shaft.

- Remove the front ball bearing from the output shaft.

11. Output Gear**12. Thrust Collar**

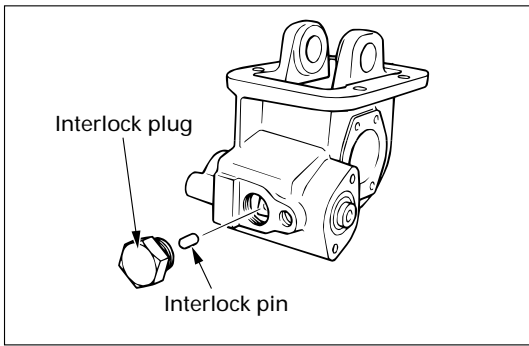
- Remove the output gear and the thrust collar from the gear case.

**NOTE:**

Check the orientation of the output gear and the thrust collar. The side in which the shift arm groove of the gear and the taper of the thrust collar exist is the rear side.

13. Spring Set Bolt**14. Spring****15. Ball**

- Remove the spring set bolt and remove the spring and ball.

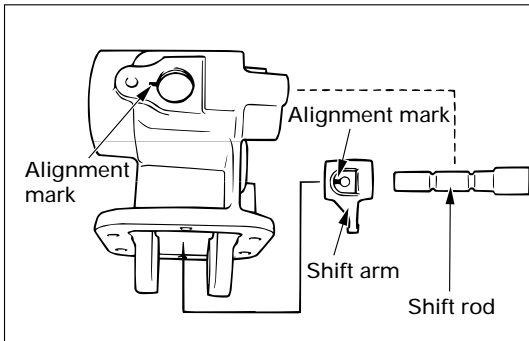


281LX00060

16. Interlock Plug

17. Interlock Pin

- Remove the interlock plug and remove the interlock pin from the shift arm.



281LX00061

18. Shift Rod

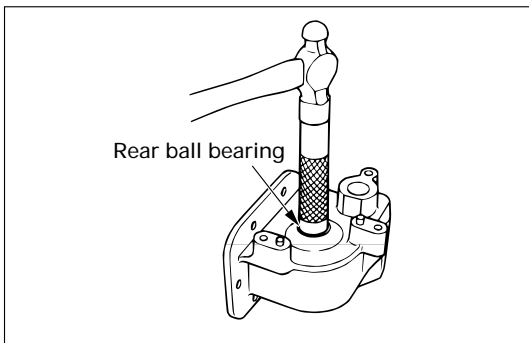
19. Shift Arm

- Pull out the shift rod to the rear side of the gear case and remove the shift arm from the inside of the gear case.



NOTE:

When removing the shift arm, be sure to check the installation direction of the arm and apply the assignment mark. In that case, incorrect assembly can be prevented at subsequent assembly.



281LX00062

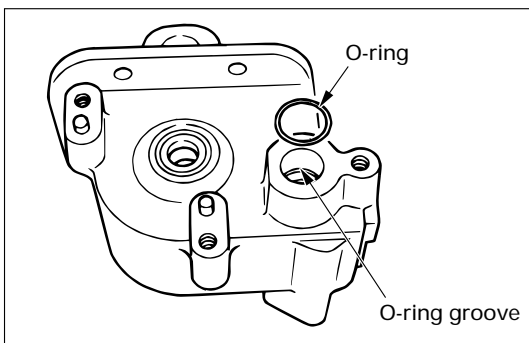
20. Oil Seal (Output Shaft Side)

21. Rear Ball Bearing

- Pry the oil seal by a screwdriver and remove it, then strike the rear ball bearing from the rear side of the gear case and remove it.



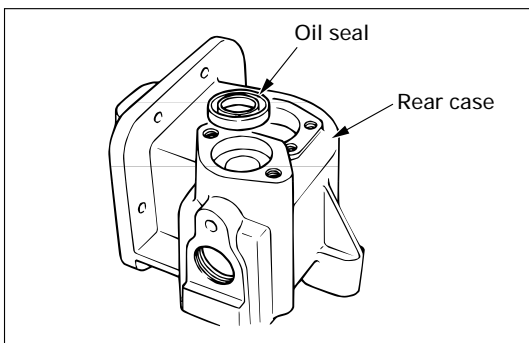
Bearing installer : 5-8840-2432-0



281LX00063

22. O-Ring

- Remove the O-ring from the shift rod hole of the gear case.



281LX00064

23. Oil Seal (Shift Rod Side)

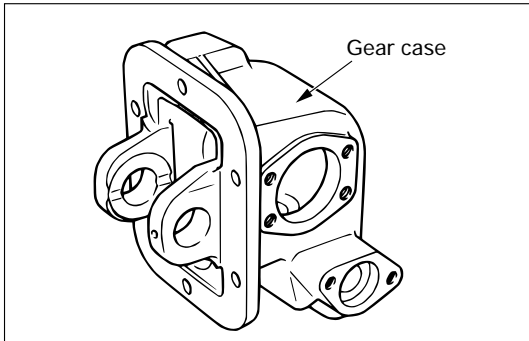
- Remove the oil seal from the gear case.

24. Gear Case

25. Spring Pin
26. Cable Connector
27. Inner Rod
28. Spring Pin
29. Stopper Adapter
 - Remove the cable connector or stopper adapter from the inner rod as requested.

INSPECTION AND REPAIR

Make necessary correction or parts replacement if wear damage, or any other abnormal conditions are found through inspection.

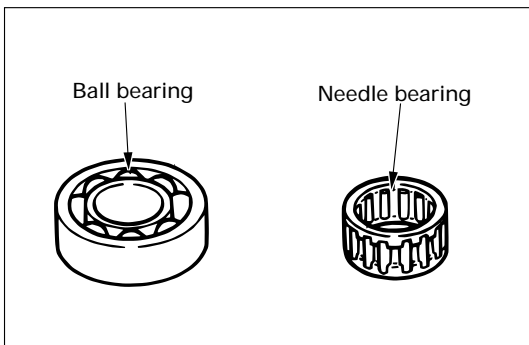


281LX00065

Gear Case



- Inspect that there is a crack, a wear, or a scratch in each portion of the gear case and replace the gear case if there is a remarkable wear or scratch.



281LX00066

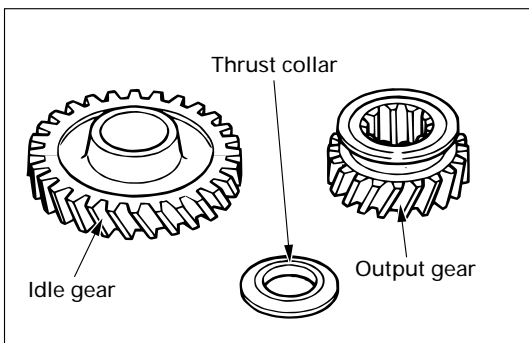
Bearings



- Inspect each bearing, and replace it if the following defects are found.
 - (1) The rotation is not smooth.
 - (2) A remarkable noise is generated.
 - (3) There is damage or rust in the inner and outer laces.
 - (4) There is an abnormal play in the thrust direction.
 - (5) There is discoloration, remarkable wear, or hitting on the body of rotation and surface of rotation of the needle roller.

NOTE:

If the ball bearing is removed, replace it by a new one.



281LX00067

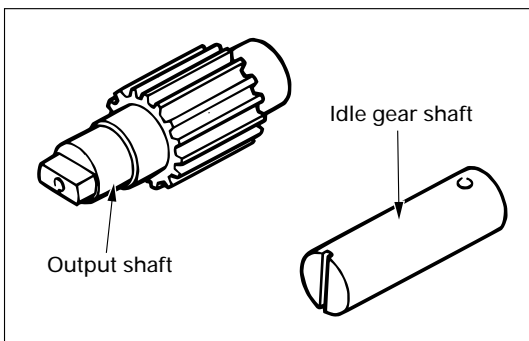
Gears and Thrust Collar



- Inspect the tooth surface of each gear and replace what has remarkable wear or damage. Further, correct lightly staged wear or a rough surface with an oil stone.



- Inspect both surfaces of the thrust collar and replace the thrust collar if there is a remarkable surface roughness or wear.

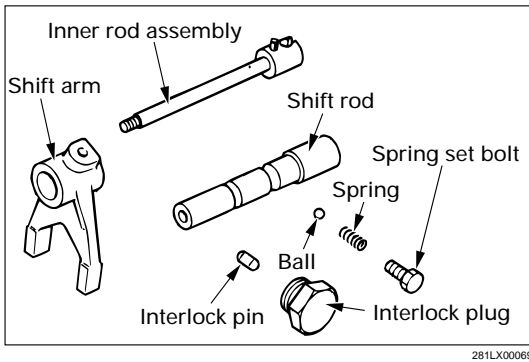


281LX00068

Shafts



- Inspect the damage and wear on the external surface of each shaft and the wear and damage of the spline portion and replace them if there are remarkable.



Shift Mechanism



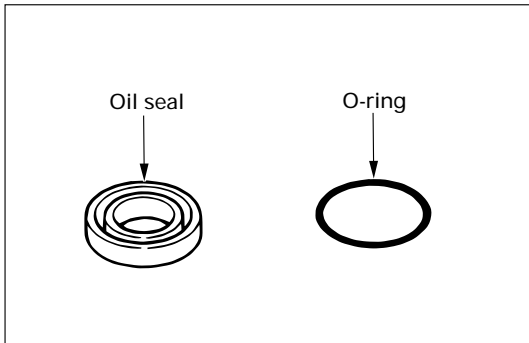
- Inspect each portion of the shift mechanism and replace it if there is remarkable damage, deflection, or staged wear.

- (1) Deflection and wear of the shift rod
- (2) Deformation and wear of the shift rod



Shift Arm Thickness		mm (in.)
Standard	Limit	
9.0 (0.354)	8.5 (0.335)	

- (3) The backlash or operation between the shift rod and gear case is not smooth.
- (4) Wear of the ball for a detent of the shift rod and the fatigue of the spring
- (5) Wear of the lock pin sliding portion for the lock pin and plug
- (6) Deflection of the inter rod and wear of the cable connector portion

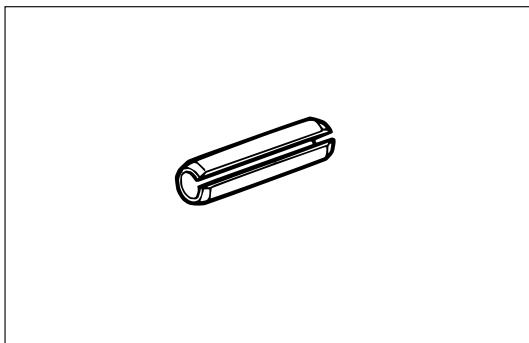


Oil Seal and O-ring

- Replace the oil seal and O-ring if there is damage, wear, or aging in the lip portion of the oil seal and the O-ring.

NOTE:

If the PTO is disassembled, replace the oil seal and the O-ring by new ones in principle. Further, if the oil seal and the O-ring are removed, they cannot be reused.



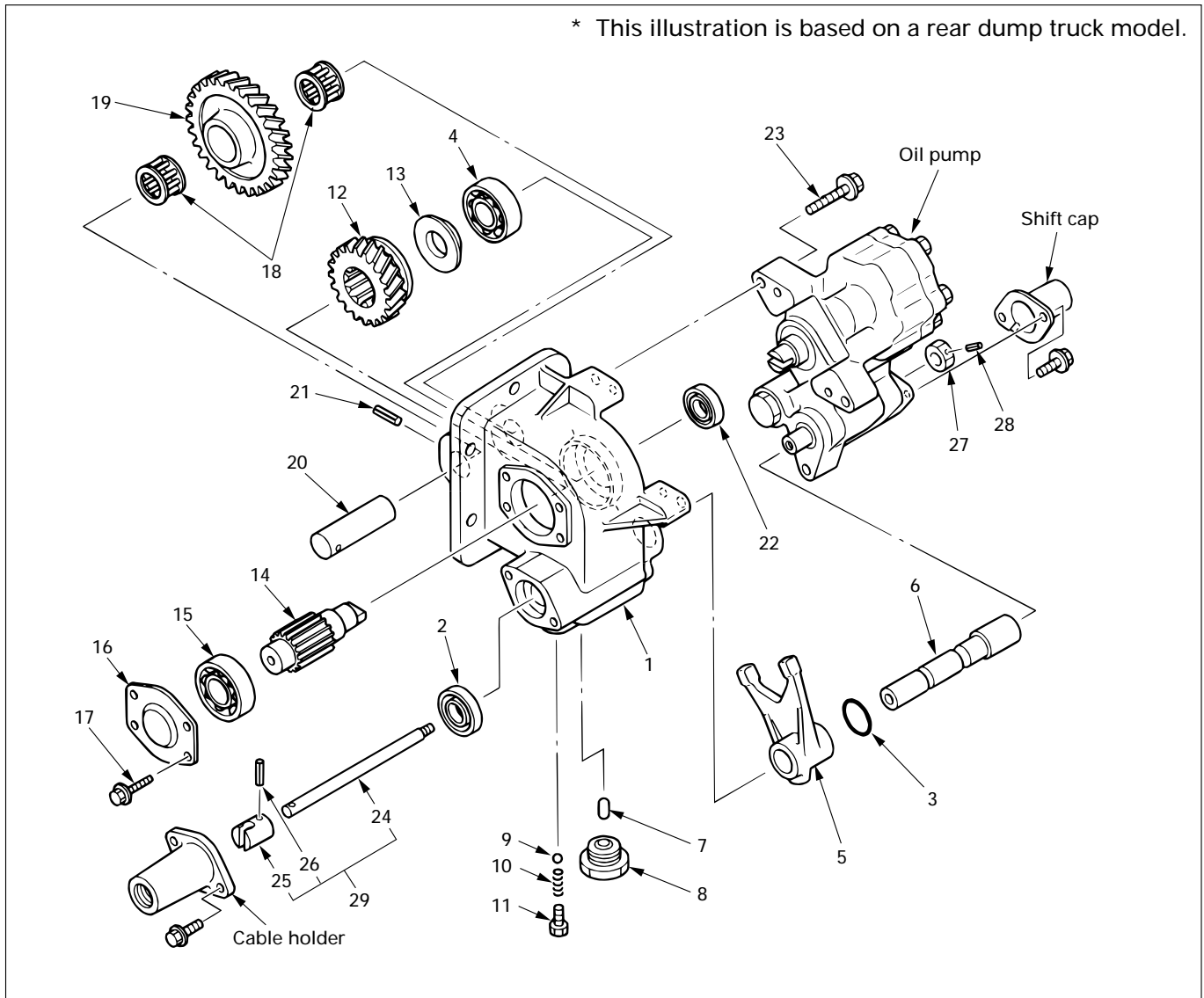
Spring Pin

NOTE:

Be sure to replace the spring pin by a new one.

REASSEMBLY

* This illustration is based on a rear dump truck model.



281LX00072

Reassembly Steps

- | | |
|------------------------------|----------------------------------|
| 1. Gear case | 16. Case cover |
| 2. Oil seal (shift rod side) | 17. Bolt |
| 3. O-ring | 18. Needle bearing |
| 4. Rear ball bearing | 19. Idle gear |
| 5. Shift arm | 20. Idle gear shaft |
| 6. Shift rod | 21. Spring pin |
| 7. Interlock pin | 22. Oil seal (output shaft side) |
| 8. Interlock plug | 23. Bolt |
| 9. Ball | 24. Inner rod |
| 10. Spring | 25. Cable connector |
| 11. Spring set bolt | 26. Spring pin |
| 12. Output gear | 27. Stopper adapter |
| 13. Thrust collar | 28. Spring pin |
| 14. Output shaft | 29. Inner rod Assembly |
| 15. Front ball bearing | |



Reassembly Steps

1. Gear Case
2. Oil Seal (Shift Rod Side)



- Coat the lip portion of the oil seal with lithium grease (BESCO L-2 or equivalent), the periphery portion of the seal with liquid gasket (LOCTITE 518 or equivalent).
- Install the lip portion of the oil seal in the shift rod side (front side) of the gear case so that the lip portion will not be damaged.



Oil seal installer : 5-8840-2433-0

3. O-Ring



- Thinly coat the O-ring and the O-ring groove of the gear case with lithium grease (BESCO L-2 or equivalent) and firmly assemble them in the groove so that there will be no damage and torsion.

4. Rear Ball Bearing

- Strike and install the rear ball bearing in the gear case from the inner side of the case.



Bearing installer : 5-8840-2432-0

5. Shift Arm

- Assemble the shift arm in the gear case.

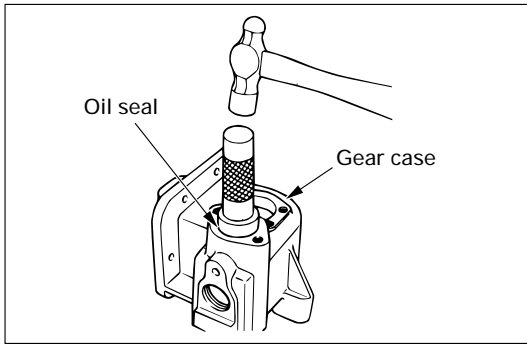
6. Shift Rod

- Thinly coat the shift rod with lithium grease (BESCO L-2 or equivalent) and insert it in the gear case, then assemble it in the shift arm.

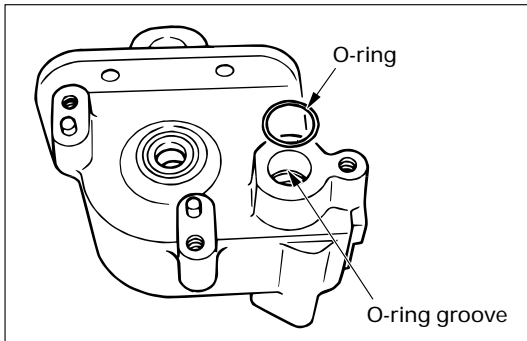


NOTE:

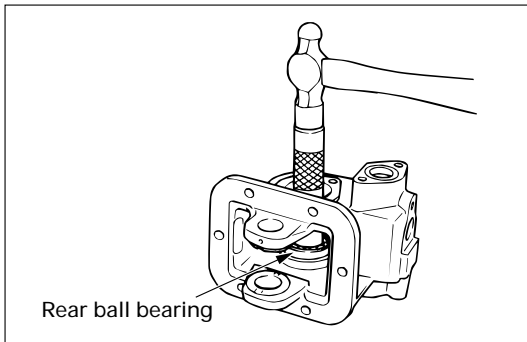
Align the assembly direction of the shift arm to the alignment mark at disassembly.



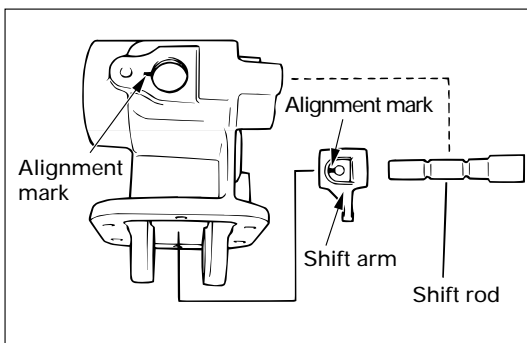
281LX00073



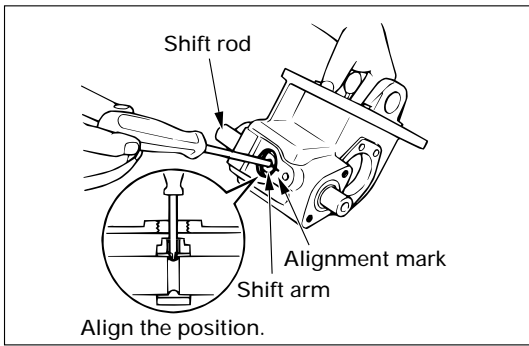
281LX00063



281LX00074



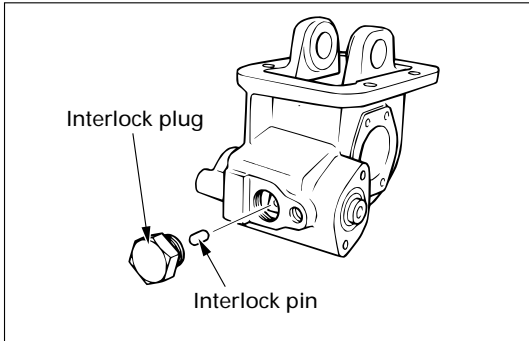
281LX00075



281LX00076



- Align the position between the lock pin hole of the shift arm and the lock pin groove of the shift rod.



281LX00077



- Interlock Pin
- Interlock Plug

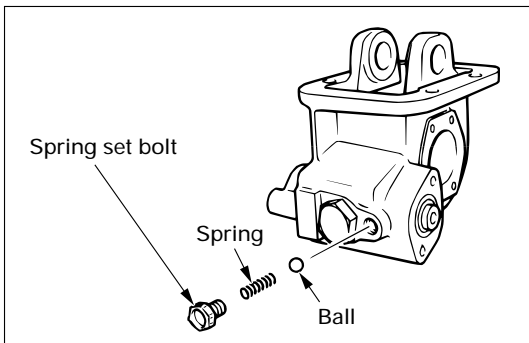
- Assemble the interlock pin in the shift arm and coat the interlock plug threaded portion with liquid gasket (LOCTITE 242 or equivalent), then tighten the interlock plug at a specified torque.



Interlock Plug Torque	N·m (kg·m / lb·ft)
	60 (6.1 / 44)

NOTE:

After having tightened the interlock plug, do not move the shift rod. Moving the shift rod may remove the interlock pin.



281LX00078

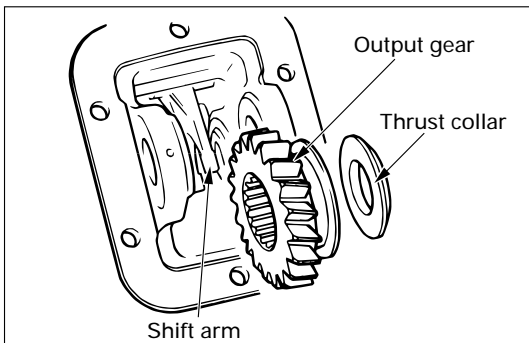


- Ball
- Spring
- Spring Set Bolt

- Assemble the ball and spring in the gear case and coat the spring set bolt threaded portion with liquid gasket (LOCTITE 242 or equivalent), then tighten the spring set bolt.



Set Bolt Torque	N·m (kg·m / lb·ft)
	19 (1.9 / 14)

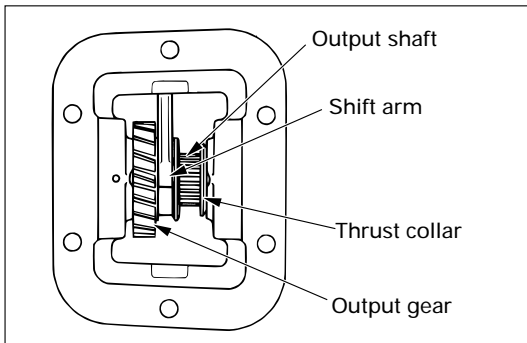


281LX00079



- Output Gear
- Thrust Collar

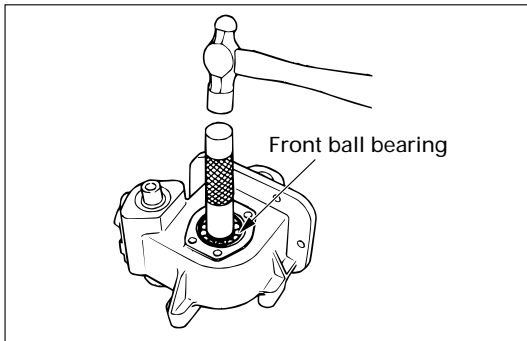
- Assemble the groove (the orientation is the rear side) of the output gear in the shift arm and assemble the taper portion of the thrust collar facing the rear side.



281LX00080

14. Output Shaft

- Insert the output gear engaging its spline and align the output shaft tip to the inner lace of the rear bearing, then strike and install the output shaft by applying a splint to its front side head portion.



281LX00081

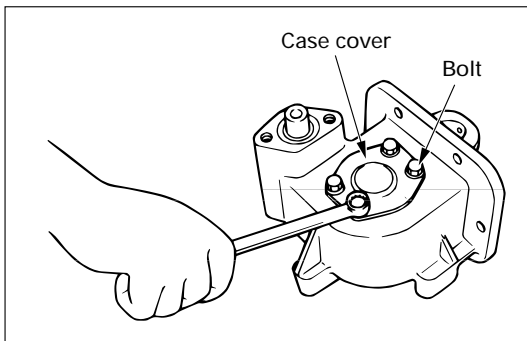
15. Front Ball Bearing



- Align the inner lace side of the front ball bearing to the output shaft and strike and install the outer side of the bearing aligning it to the gear case.



Bearing installer : 5-8840-2432-0



281LX00082

16. Case Cover

17. Bolt



- Assemble the bolt by coating the match line for the gear case of the case cover with liquid gasket (LOCTITE 518 or equivalent) and the bolt threaded portion with liquid gasket (LOCTITE 242 or equivalent), then tighten the bolt at a specified torque.

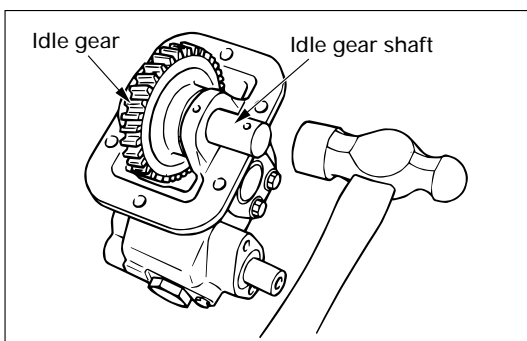


Case Cover Bolt Torque	N·m (kg·m / lb·ft)
24 (2.4 / 17)	



NOTE:

Cleanly remove the liquid gasket adhering to the cover installation side of the case cover and gear case and clean and fully degrease the case by waste cloth so that no oil will adhere to.



281LX00083

18. Needle Bearing

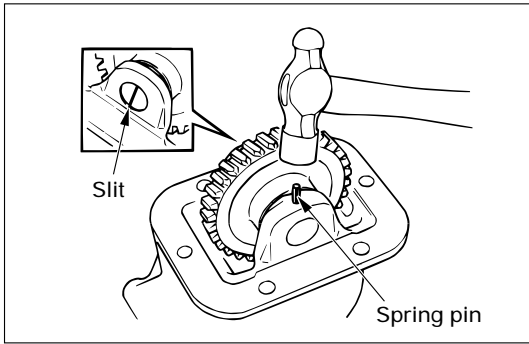
19. Idle Gear



- Coat the needle bearing with assembly all amount of lithium grease (BESCO L-2 or equivalent) and assemble the needle bearing in the idle gear.

20. Idle Gear Shaft

- Assemble the tooth round portion of the idle gear facing the front side and assemble the pin hole of the idle gear shaft facing the front side.



281LX00084

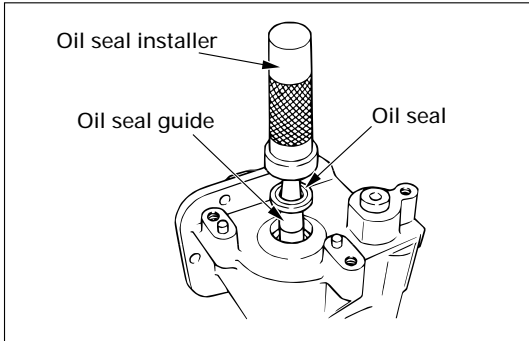
21. Spring Pin



- Align the spring pin hole of the gear case and the pin hole of the idle gear shaft and strike the spring pin.

NOTE:

When the slit on the rear side of the idle gear shaft is set in the vertical direction, the pin hole will be aligned.



281LX00085

22. Oil Seal (Output Shaft Side)

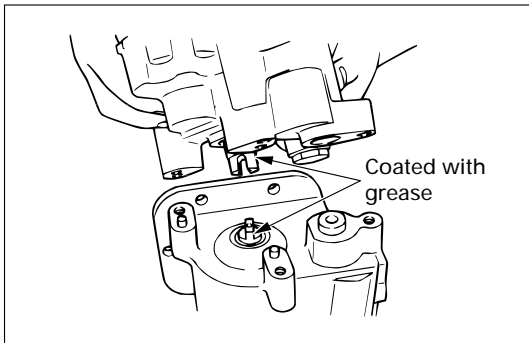


- Coat the oil seal lip portion with lithium grease (BESCO L-2 or equivalent) and coat the seal periphery portion with liquid gasket (LOCTITE 518 or equivalent).
- To prevent the seal lip portion from being damaged, install it in the seal guide and press-fit it in the gear case by the oil seal installer.



Oil seal installer : 5-8840-2433-0

Oil seal guide : 5-8840-2564-0

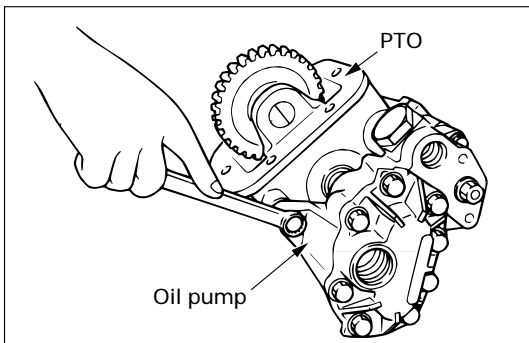


281LX00086

23. Bolt



- To install the oil pump in the PTO, fully coat the shaft tip portion of the PTO and the oil pump shaft groove portion with the lithium grease (BESCO L-2 or equivalent) for rust prevention.



281LX00087



- Align and install the shaft width across flats portion on the PTO side and the shaft groove on the oil pump side and tighten the bolt at a specified torque.



PTO Bolt Torque	N·m (kg·m / lb·ft)
	53 (5.4 / 39)

24. Inner rod

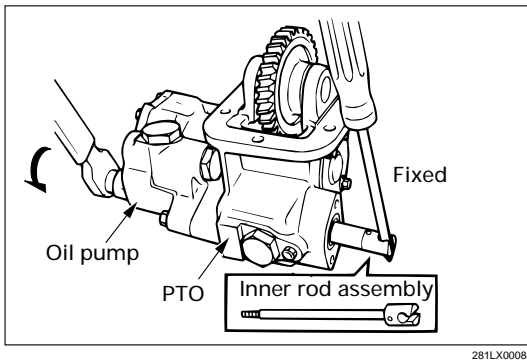
25. Cable connector

26. Spring pin

27. Stopper adapter

28. Spring pin

- If the cable connector or stopper adapter is removed, install it in the inner rod.



29. Inner rod assembly



- Coat the threaded portion of the inner rod tip with liquid gasket (LOCTITE 242 or equivalent) and insert and screw it from the front side of the PTO, and tighten the inner rod assembly at a specified torque.

NOTE:

Tighten the inner rod assembly by inserting a Phillips screwdriver in the groove of the control cable connector and pressing it, then applying a wrench to the stopper adapter on the oil pump side. (The three-rotation dump truck is in contrast with this.)



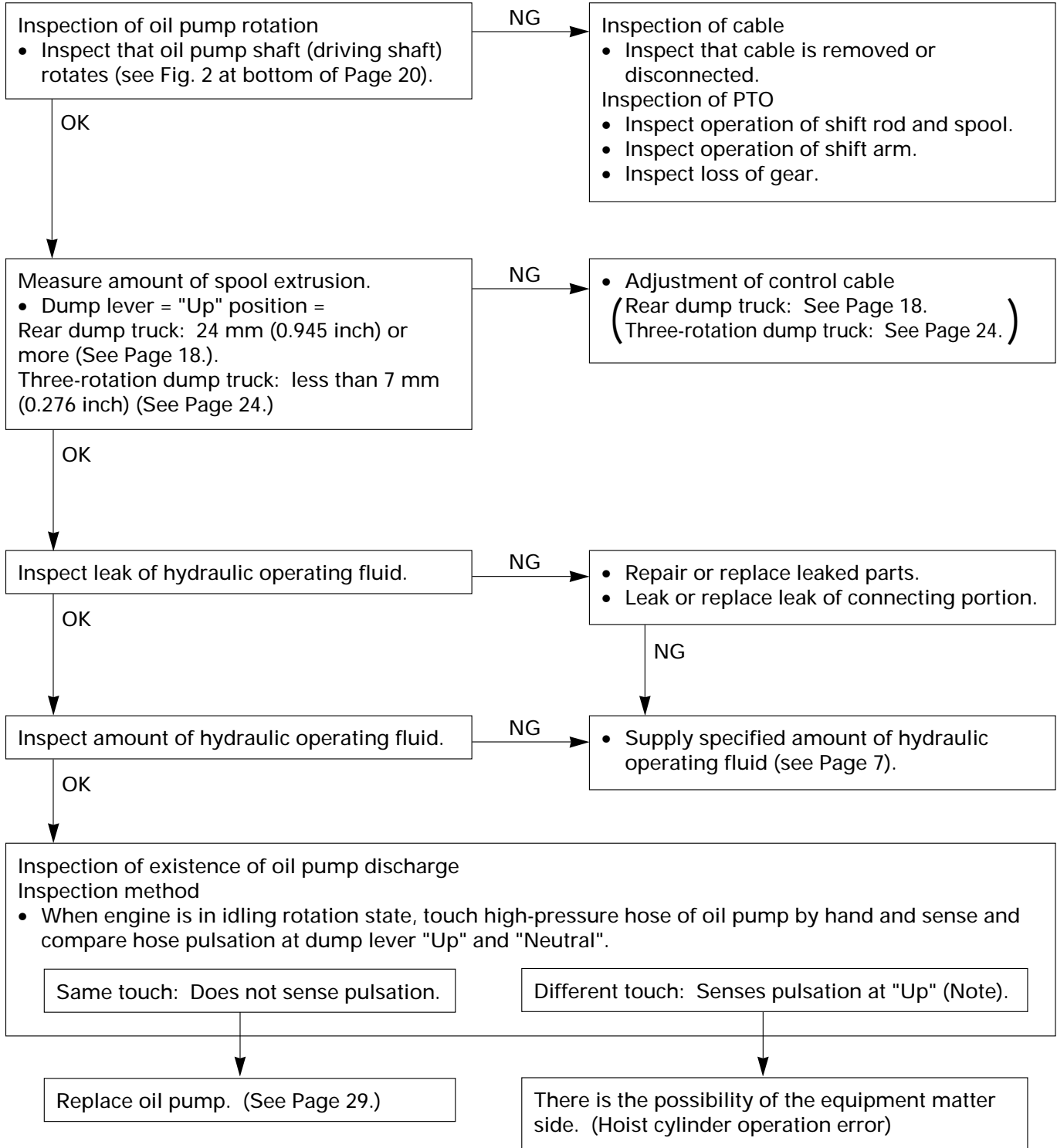
Inner Rod Torque	N·m (kg·m / lb·ft)
------------------	---------------------

19 (1.9 / 14)

TROUBLESHOOTING

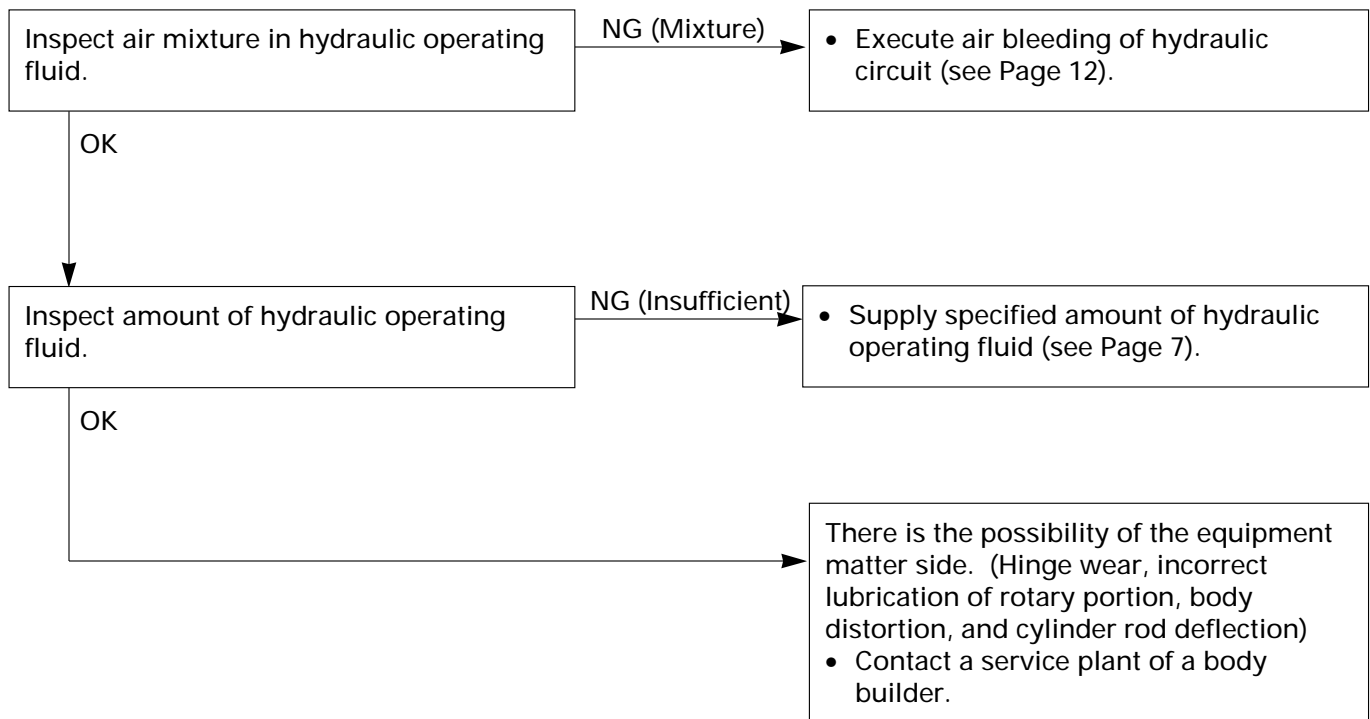
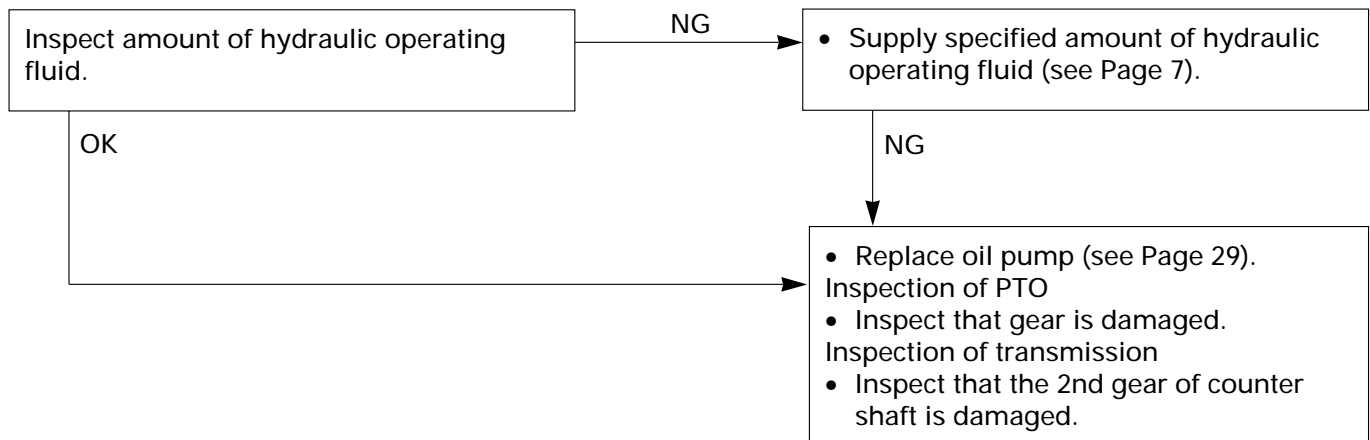
Inspection Based on Defect Symptoms

Defect 1. The Dump Body Rise is Disabled.

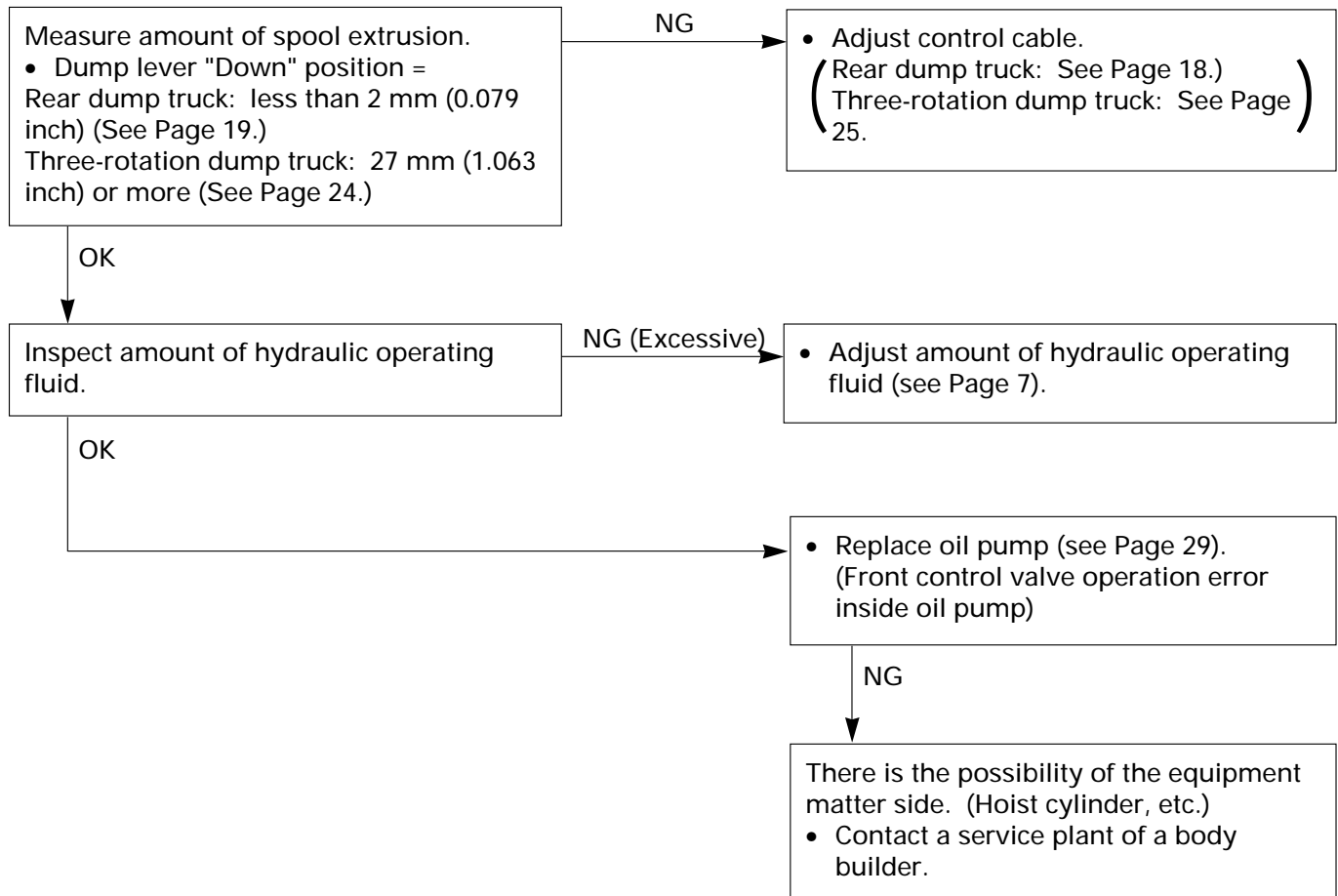


NOTE:

For examination by touch on hose, be careful not to mix this pulsation with engine vibration.

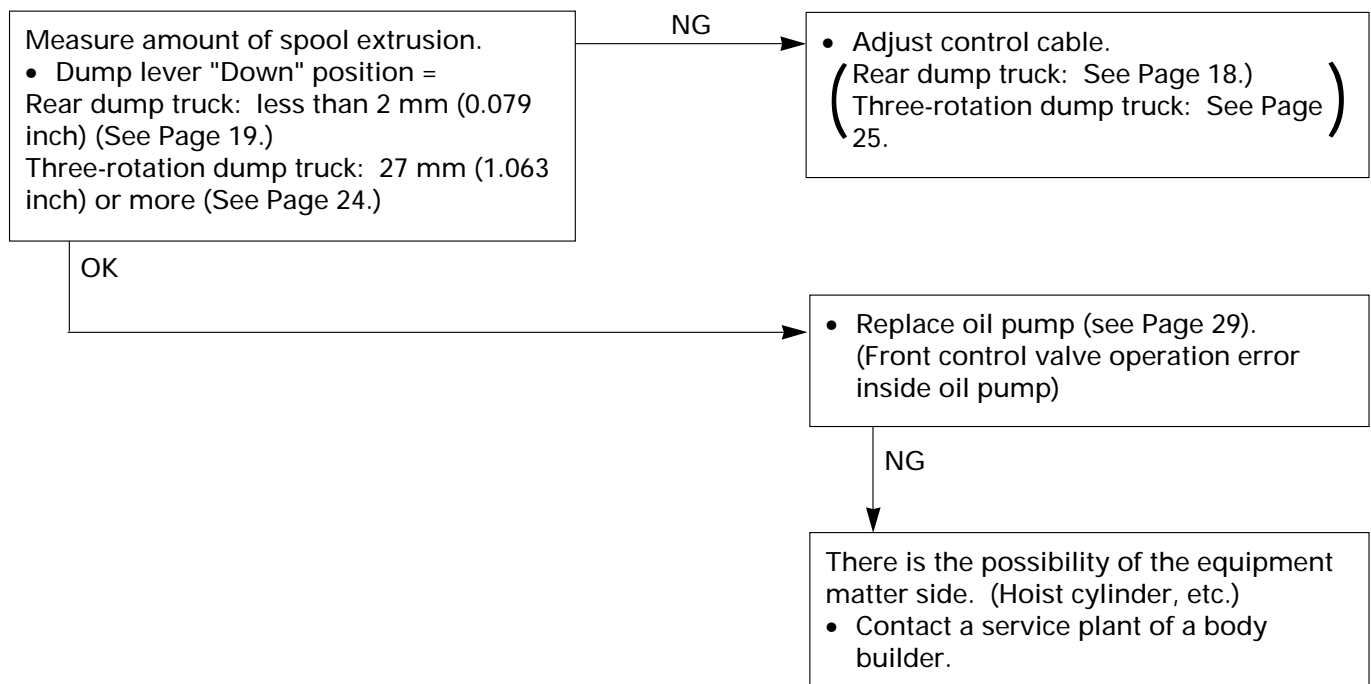
Defect 2. The Body (Cargo Deck) is Lugged During Rise.**Defect 3. While the Body (Cargo Deck) is Being Raised, The Oil Pump Portion Causes a Large Abnormal Sound (Such As Caterwaul or Grate).**

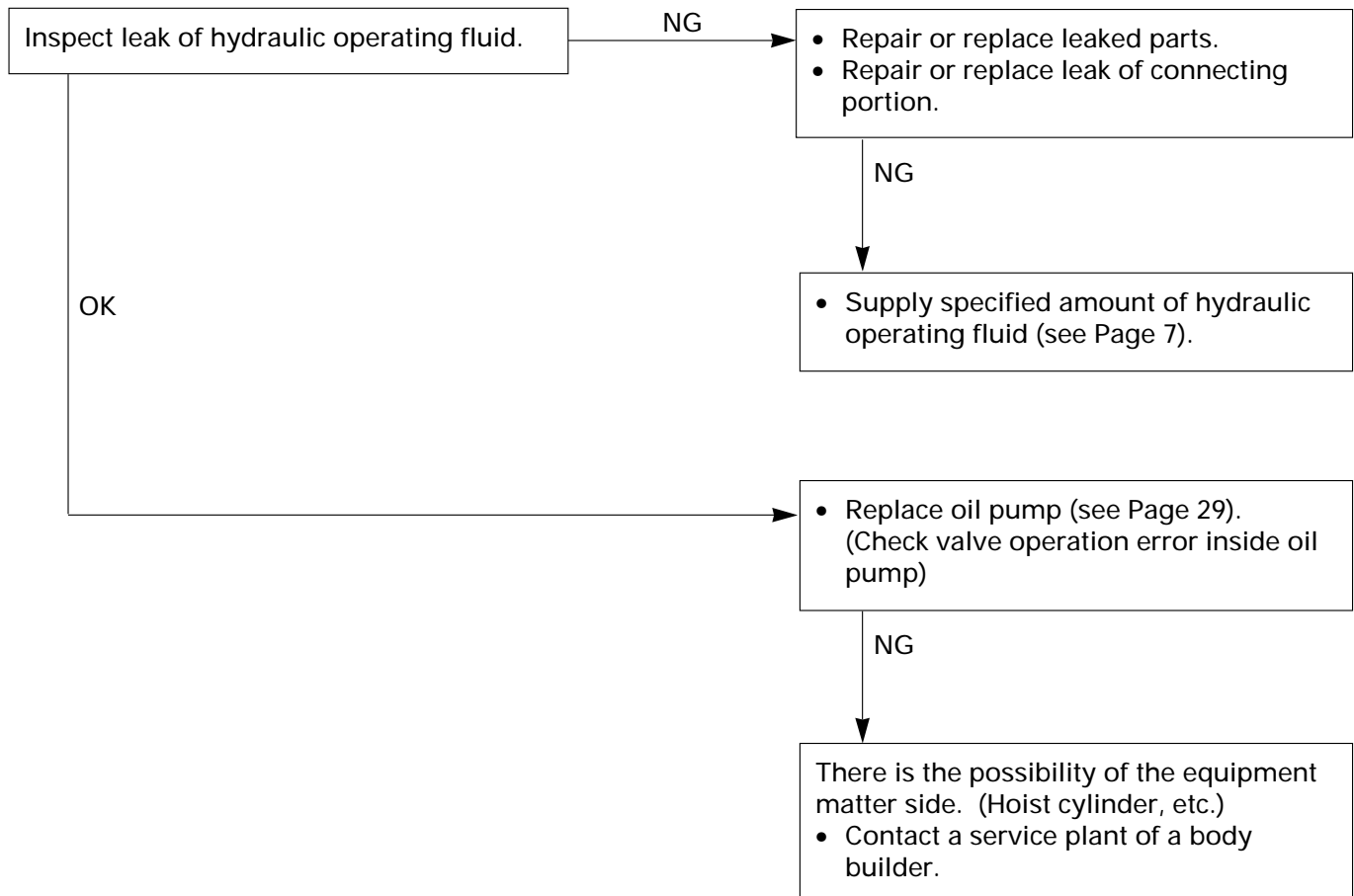
Defect 4. The Dump Body is Kept Being Raised or Does Not Drop Intermediately.



Defect 5. The Fall Speed of The Dump Body is Slow.

(Basic Value: within 20 seconds for single cab, within 25 seconds for double cab (only for rear dump truck))



Defect 6. When a Load is Applied, The Dump Body Drops.

MAIN DATA AND SPECIFICATIONS

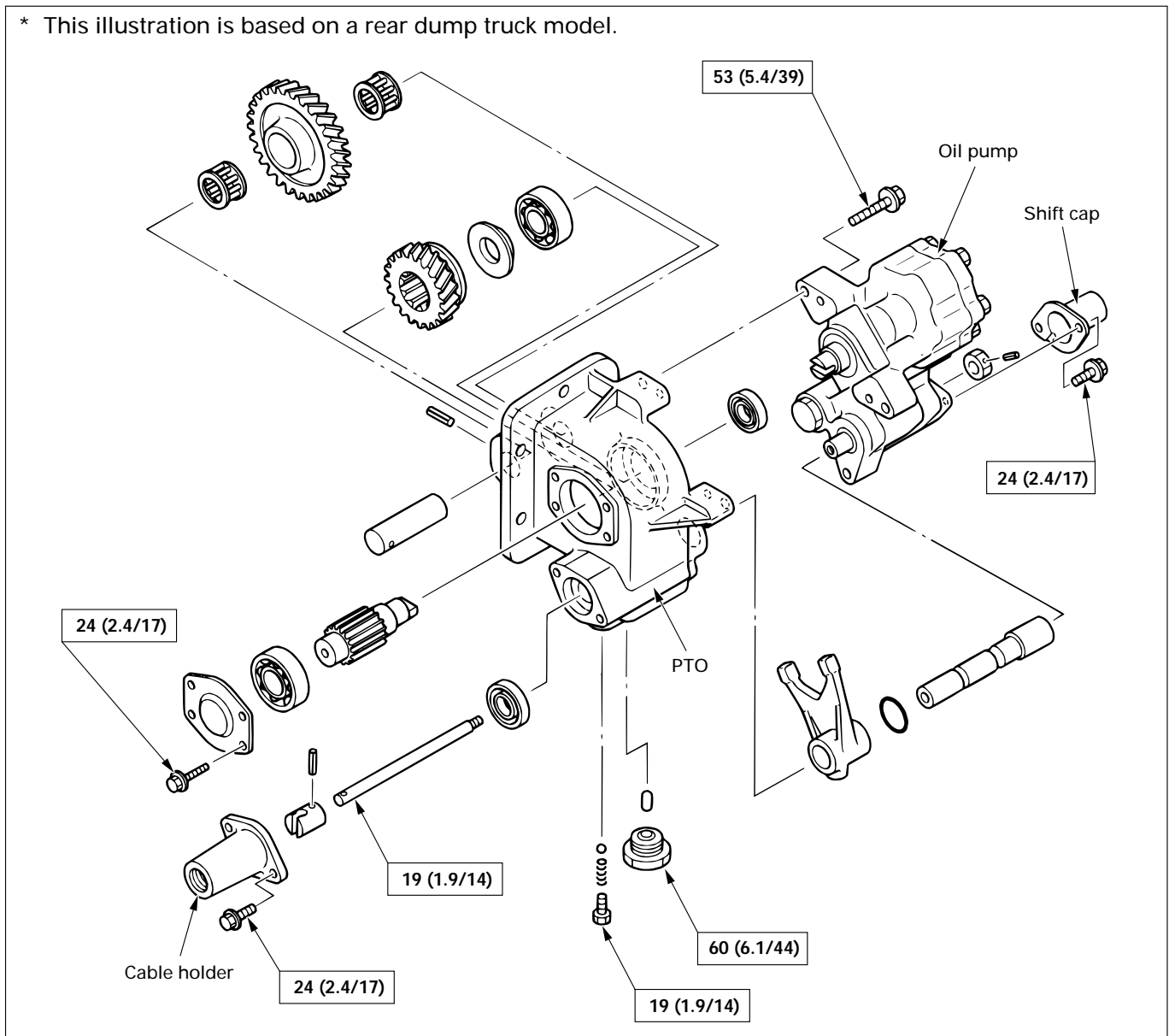
PTO with Oil Pump Assembly

Item	Specification
Allowable maximum output torque N·m/rpm (kg·m/rpm)	98/1000 (10/1000)
Deceleration ratio (speed ratio for engine)	0.678
Direction of rotation (viewed from the rear of the PTO)	Clockwise rotation

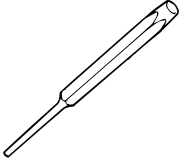
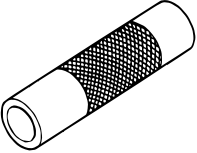

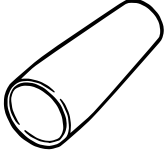
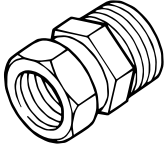
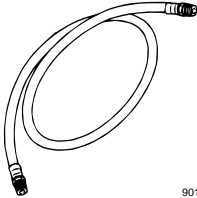
FIXING TORQUE

N·m (kg·m / lb-ft)

* This illustration is based on a rear dump truck model.



SPECIAL TOOLS

Illustration	Tool No.	Tool Name
 <p style="text-align: right; font-size: small;">901LX084</p>	9-8529-2201-0	Spring pin bar
 <p style="text-align: right; font-size: small;">901LX085</p>	5-8840-2432-0	Bearing installer
 <p style="text-align: right; font-size: small;">901LX086</p>	5-8840-2433-0	Oil seal installer
 <p style="text-align: right; font-size: small;">901LX087</p>	5-8840-2564-0	Oil seal guide
 <p style="text-align: right; font-size: small;">901LX088</p>	5-8840-2439-0	Joint (low-pressure side) PF3/4 male screw/PF1/2 nut
 <p style="text-align: right; font-size: small;">901LX089</p>	5-8840-2435-0	Test hose (2 m long) (Between oil pump and oil container) Metal cap PF1/2 male screw x 2)

MEMO

A series of horizontal dotted lines for writing.

LGPTO-WE-0091

You are requested to order this manual using the manual number that is shown above.

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