POWER TAKE OFF

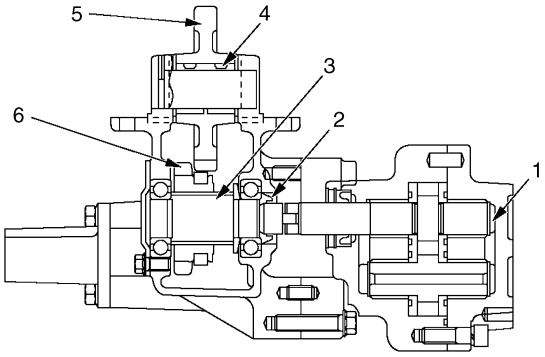
SECTION 00
POWER TAKE OFF

Contents

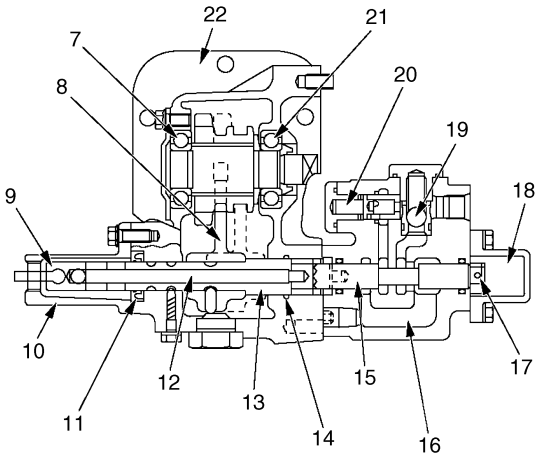
GENERAL DESCRIPTION

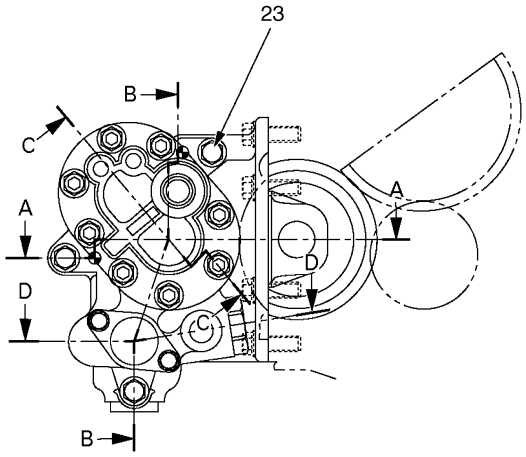
The side with an oil pump PTO integrates the PTO and the oil pump and installed in the left side of a transmission.
The shift rod for switching the “ON” and “OFF” of the hydraulic circuit of the PTO is provided at the bottom of the PTO and the oil pump main unit.
The “ON” and “OFF” of the PTO uses a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



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





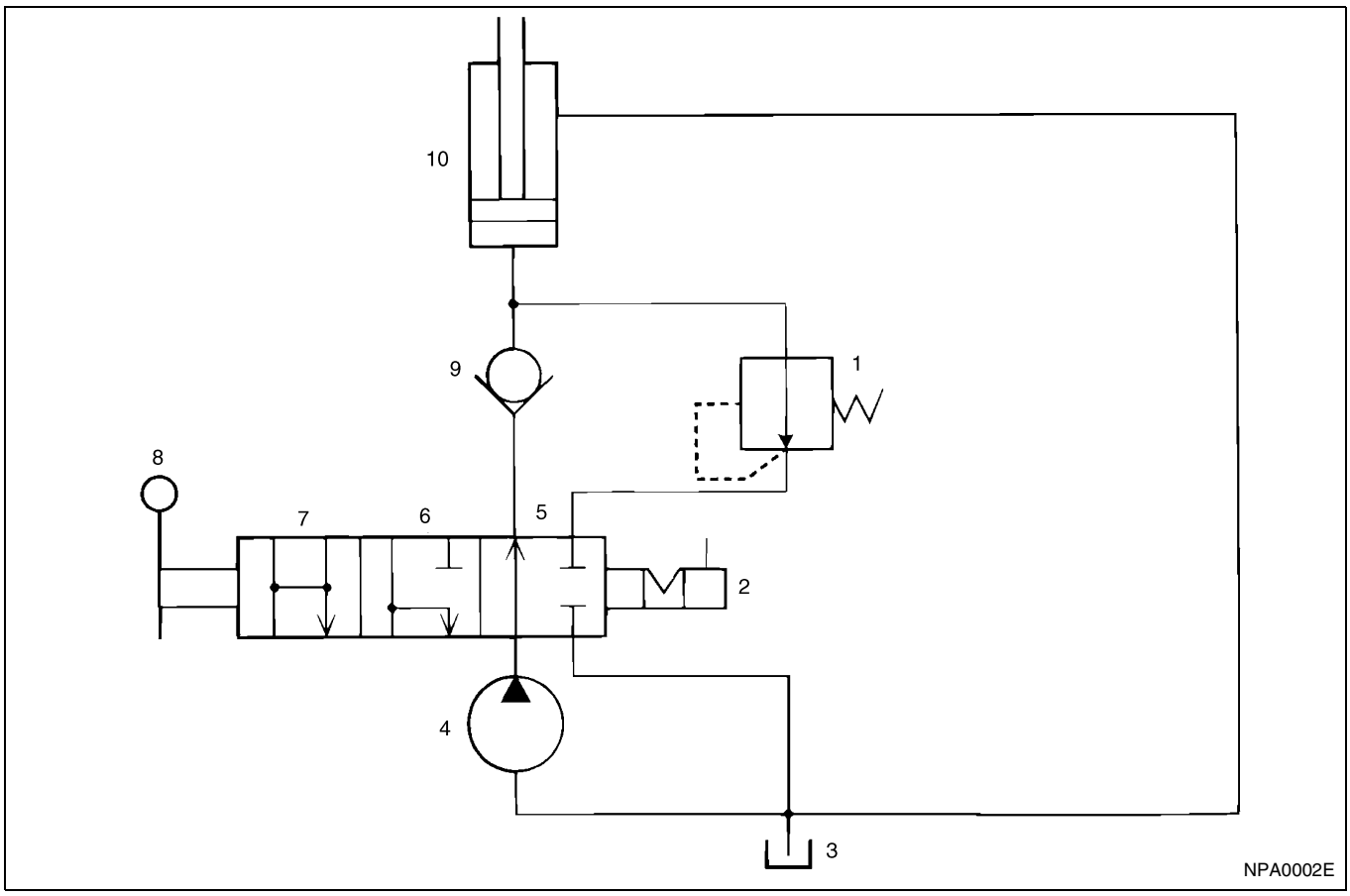
PTO oil pump hydraulic switching assembly drawing)
PTO side Section B-B, Pump side Section D-D

NPA0001E

Legend

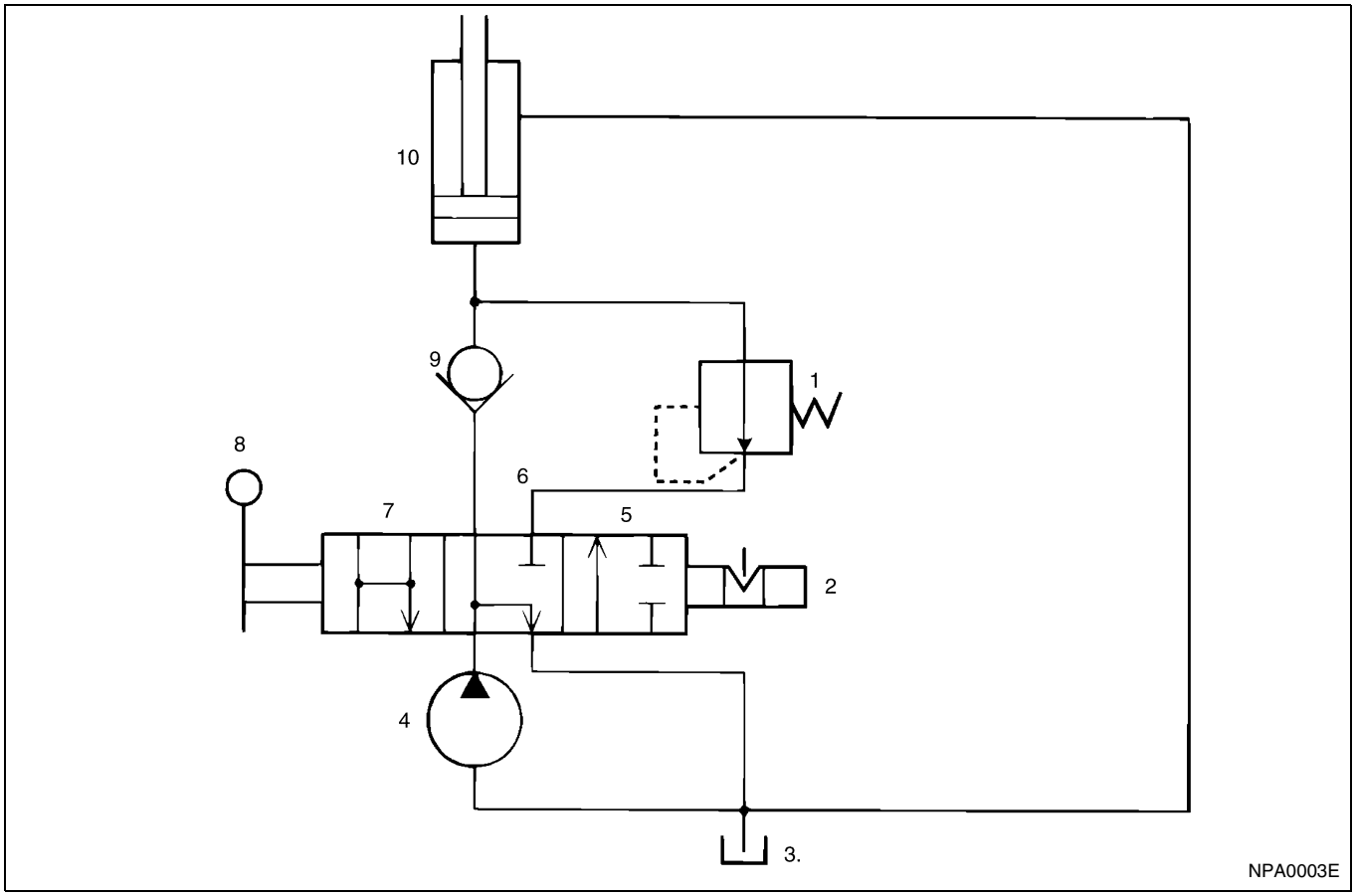
1. Oil pump (gear pump section)
2. Oil seal (output shaft side)
3. Output shaft
4. Needle bearing
5. Idle gear
6. Output gear
7. Front ball bearing
8. Shift arm
9. Control cable connector
10. Cable connector
11. Oil seal (shift rod side)
12. Inner rod
13. Shift rod
14. O-ring
15. Spool
16. Oil pump (hydraulic circuit switching section)
17. Stopper adapter
18. Shift cap
19. Check valve (swing check valve)
20. Flow control (decompression valve)
21. Rear ball bearing
22. PTO
23. Bolt (oil pump to PTO)

Hydraulic Circuit Diagram



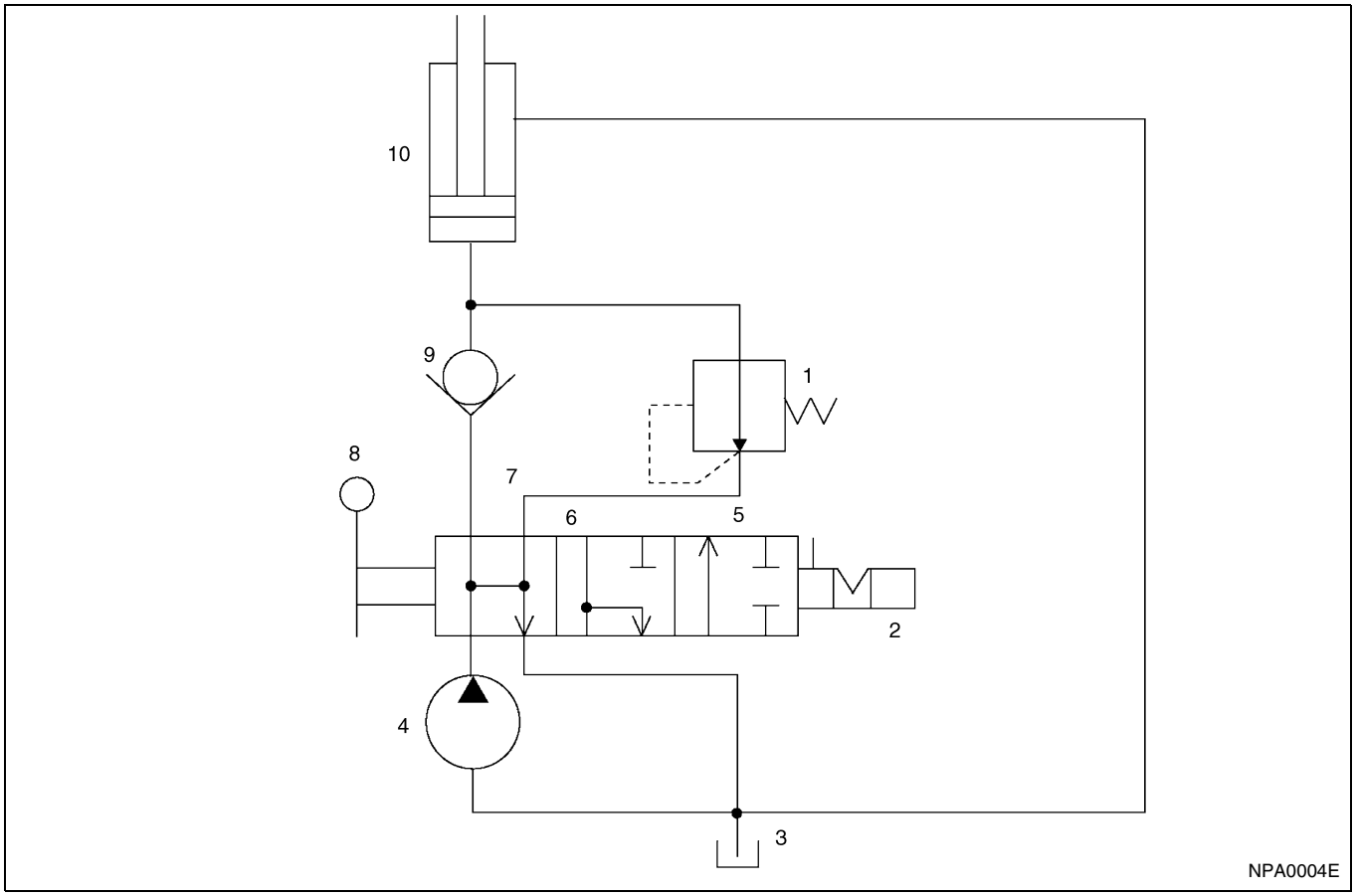
Legend

1. Flow control valve (decompression valve)
2. Spool valve
3. Oil reserve tank
4. Oil pump
5. Up
6. Neutral
7. Down
8. Operation lever (PTO interlocking)
9. Check valve (swing check valve)
10. Dump cylinder



Legend

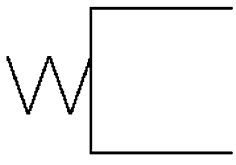
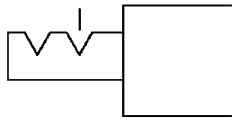
1. Flow control valve (decompression valve)
2. Spool valve
3. Oil reserve tank
4. Oil pump
5. Up
6. Neutral
7. Down
8. Operation lever (PTO interlocking)
9. Check valve (swing check valve)
10. Dump cylinder

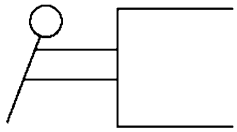
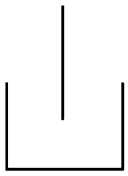


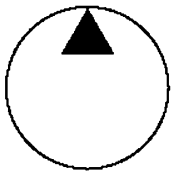
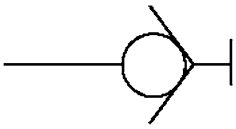
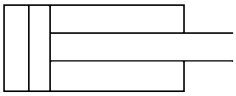
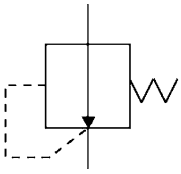
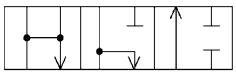
Legend

1. Flow control valve (decompression valve)
2. Spool valve
3. Oil reserve tank
4. Oil pump
5. Up
6. Neutral
7. Down
8. Operation lever (PTO interlocking)
9. Check valve (swing check valve)
10. Dump cylinder

Symbol for Hydraulic Circuit

Symbol	Meaning of symbol
 NPA0005E	Spring
 NPA0006E	Detent (position stop system)

Symbol	Meaning of symbol
 NPA0007E	Manual lever (dump lever)
 NPA0008E	Oil tank

Symbol	Meaning of symbol
 NPA0009E	Oil pump (unidirectional flow)
 NPA0010E	Check valve (swing check valve)
 NPA0011E	Cylinder
 NPA0012E	Flow control valve (decompression valve) (internal pilot method)
 NPA0013E	Hydraulic switching valve (three-position valve)

ON-VEHICLE SERVICE

Inspection and Supply of The Hydraulic Operating Fluid

Notice:
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.

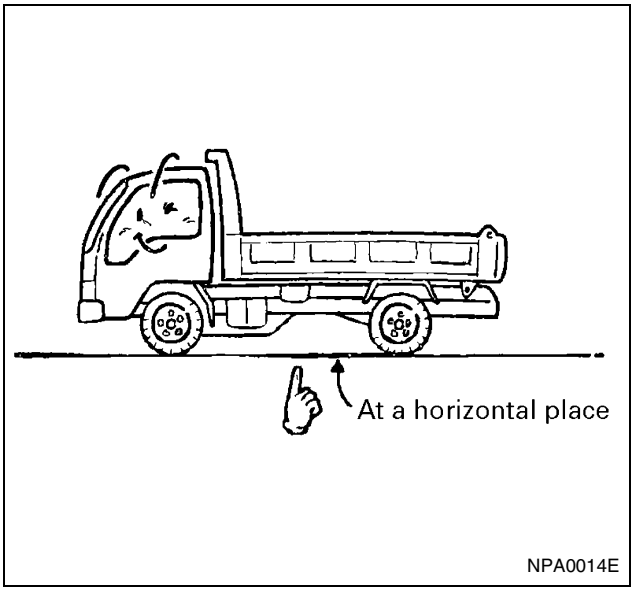
Preparing for Hydraulic Operating Fluid Supply

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)”.

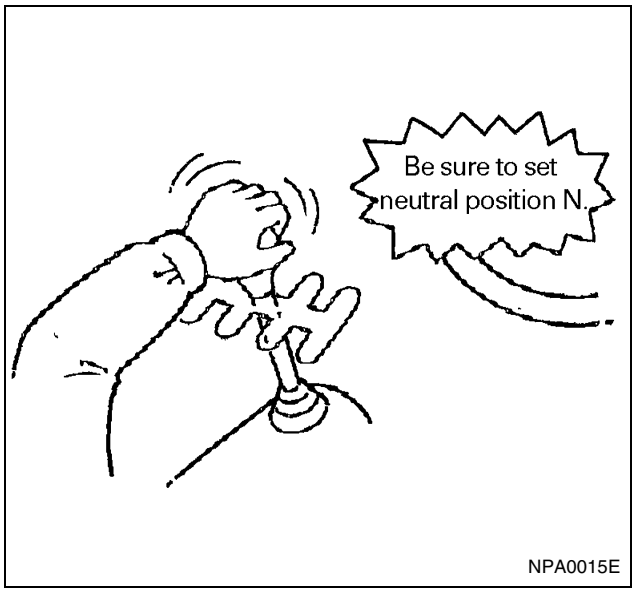
How to Raise the Body (Cargo Deck)

1. Put a truck at a horizontal place.

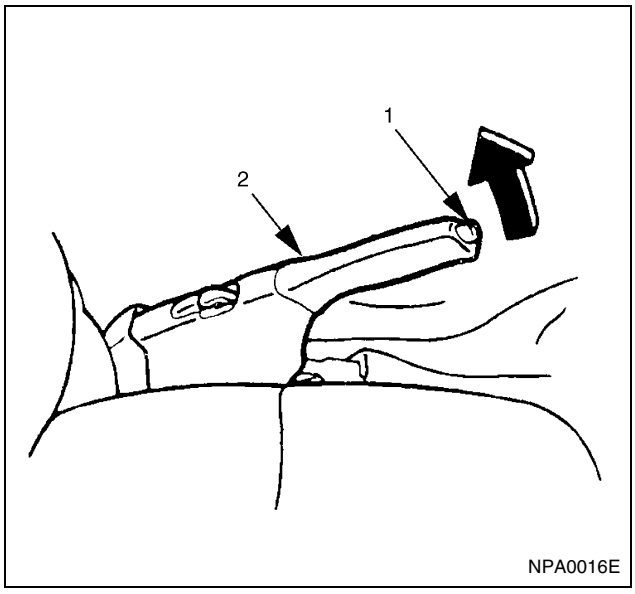
Notice:
Never raise the body (cargo deck) on tilted ground, soft ground, and unleveled ground. A truck may be inverted or warp may be generated in functional components.



2. Set the shift lever to the “Neutral” position.



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

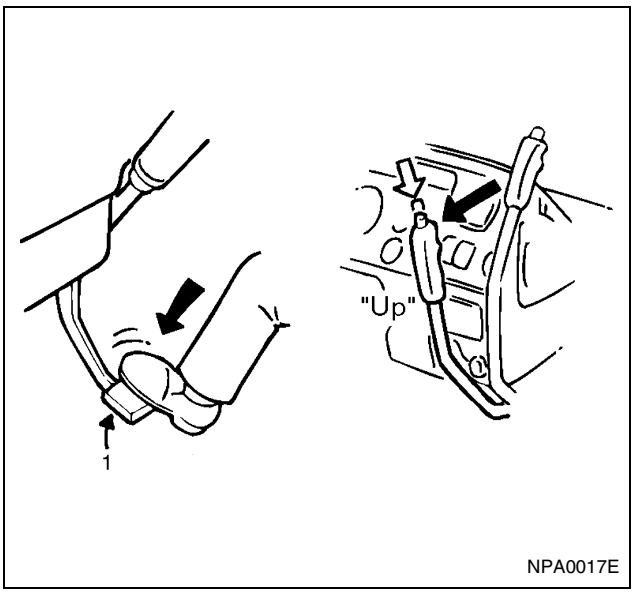


Legend
1. Release button
2. Parking brake lever

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.

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

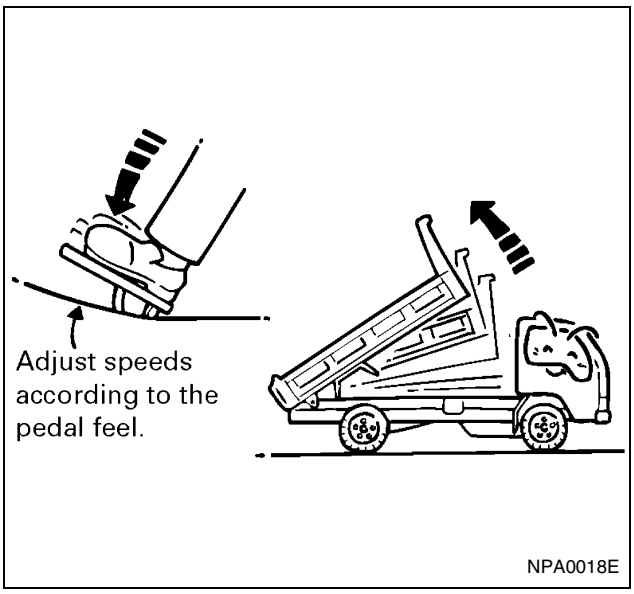
When the dump lever is operated, observe the notes of the Note label attached to the driver's seat.



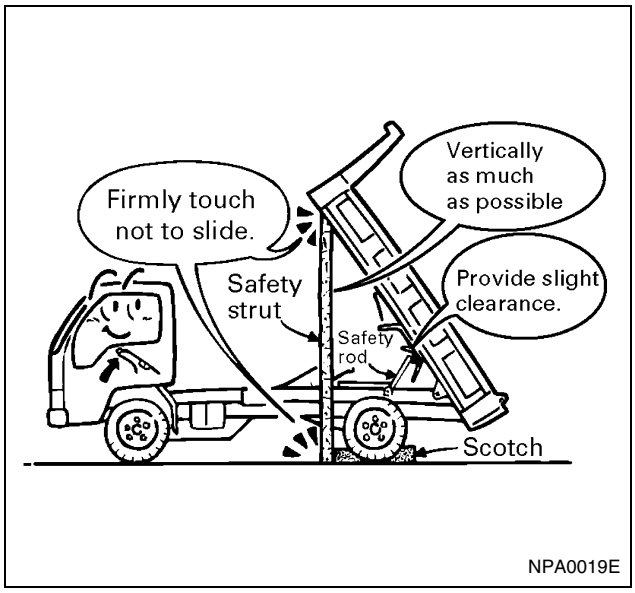
Legend
1. Clutch pedal

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.

Notice:
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.



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



Supply Procedure of Hydraulic Operating Fluid

Notice:
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.

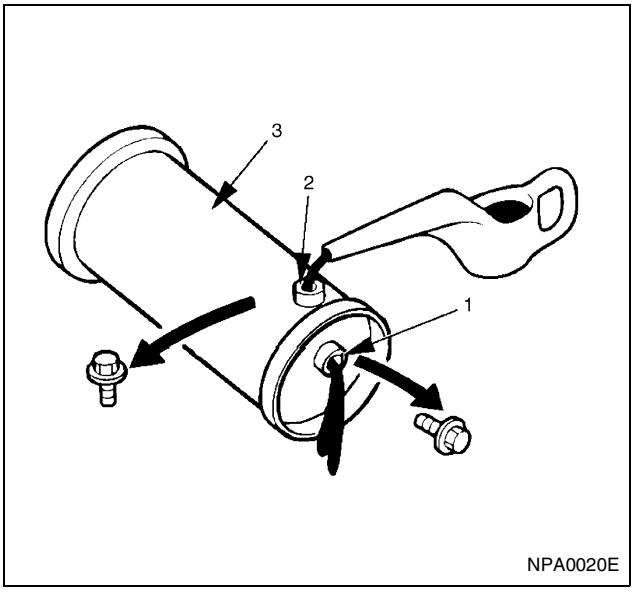
When replacing the total amount of hydraulic operating fluid, request a service network (SS store) of a body manufacturer.

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.

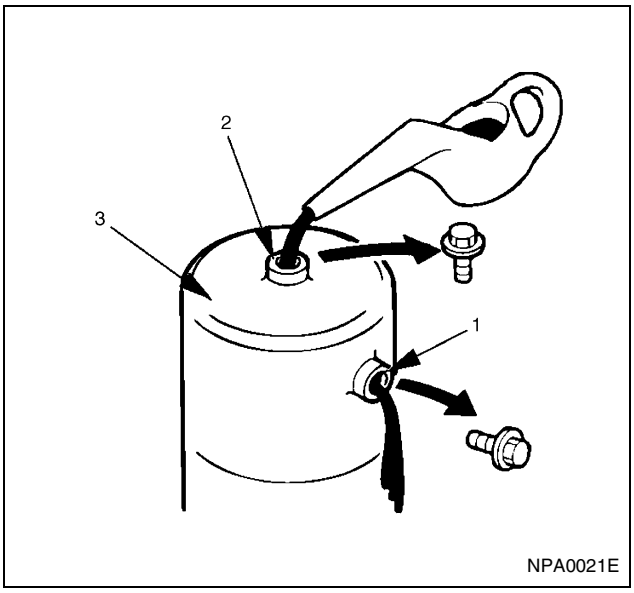
Notice:
Supply the hydraulic operating fluid used with reference to the following table.

Hydraulic Operating Fluid (Turbine Oil)

Manufactured by ShinMaywa Industries Co., Ltd.	0 to 30°C (86°F): VG32
	20°C (68°F) or more: VG56
	less than 10°C (50°F): VG22



Legend
1. Oil level
2. Oil filler port
3. Oil tank



Legend
1. Oil level
2. Oil filler port
3. Oil tank

If the Dump Rise Operation is Disabled by Itself

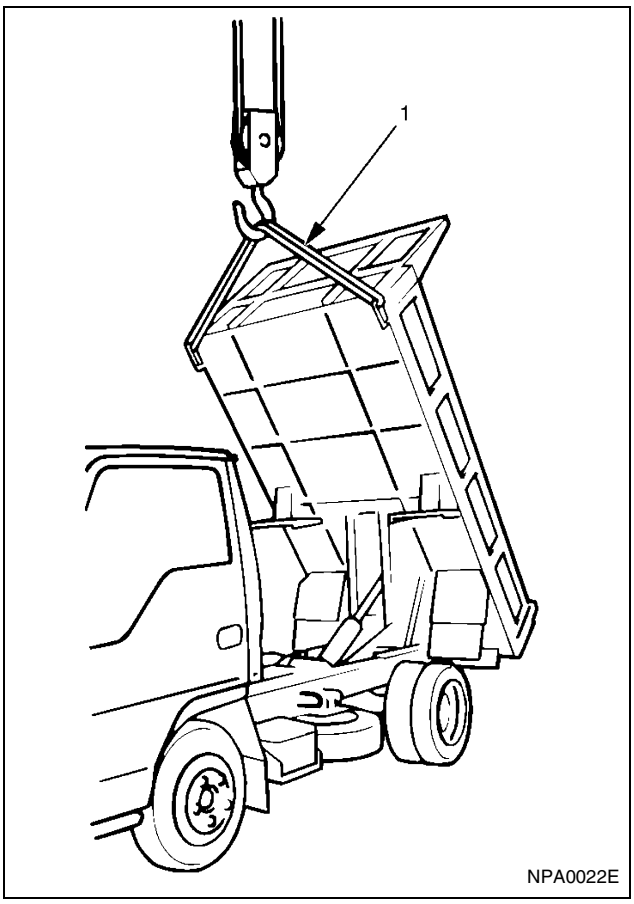
If the body (cargo deck) is kept being dropped and the “Rise” operation of the body (cargo deck) is disabled by itself, inspect the cause of rise disabled, fully identify the status, and execute maintenance and repair in accordance with the flowchart of the “Defect 1”. Dump body rise disabled” of Chapter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

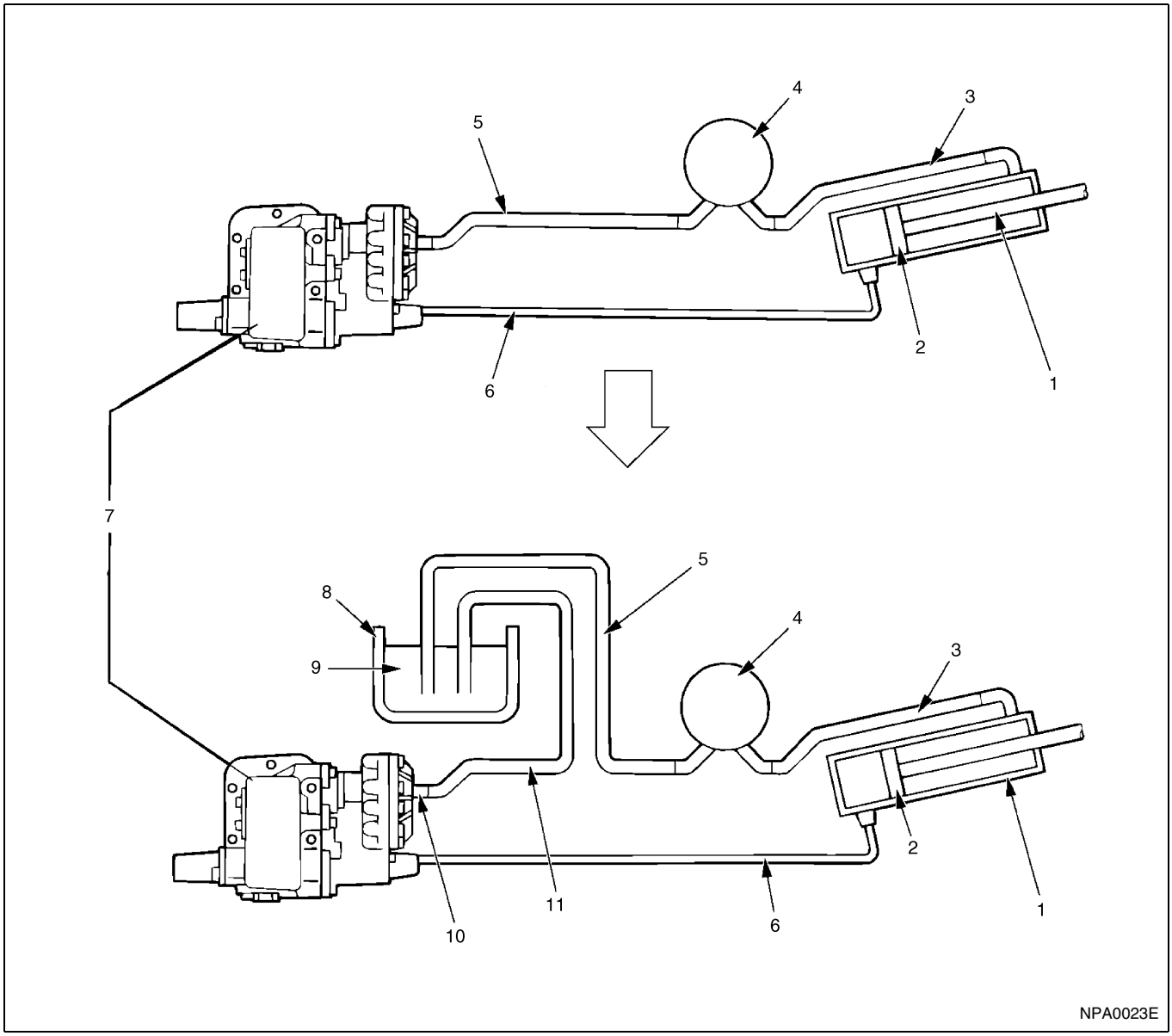
1. Firmly actuate the parking brake and apply a scotch to the rear tire.
2. Set the engine to the stopped state.
3. Set the dump lever to the “Up” position and apply a wire with ample strength to the front of the body (cargo deck).
4. Slowly hang a wire (tensile strength of 1,000 kg (9,807 N)) by a hoist 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.

Notice:
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” or the “Air Bleeding Procedure of Hydraulic Operating Fluid”.



Legend
1. Wire

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.



Legend

1. Hoist cylinder
2. Piston
3. Pipe
4. Oil tank
5. Low-pressure hose
6. High-pressure hose
7. PTO with oil pump
8. Hydraulic operating fluid container
9. Hydraulic operating fluid
10. Test hose joint
11. Test hose

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 20 L 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 10 L in the cleaned hydraulic operating fluid container.

Hydraulic Operating Fluid (Turbine Oil)

Manufactured by ShinMaywa Industries Co., Ltd.	0 to 30°C (86°F): VG32
	20°C (68°F) or more: VG56
	less than 10°C (50°F): VG22

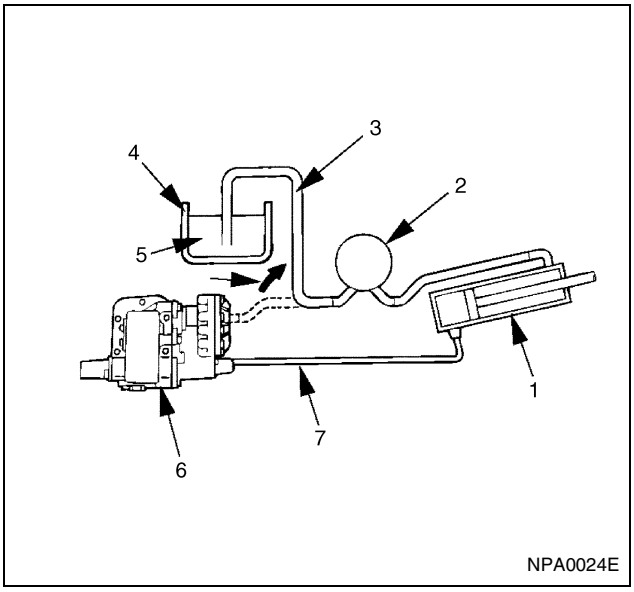
Notice:
Carefully control the prepared hydraulic operating fluid so that dust or foreign matter will not be mixed in it. Be-

sides, 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.

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.

Notice:
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.



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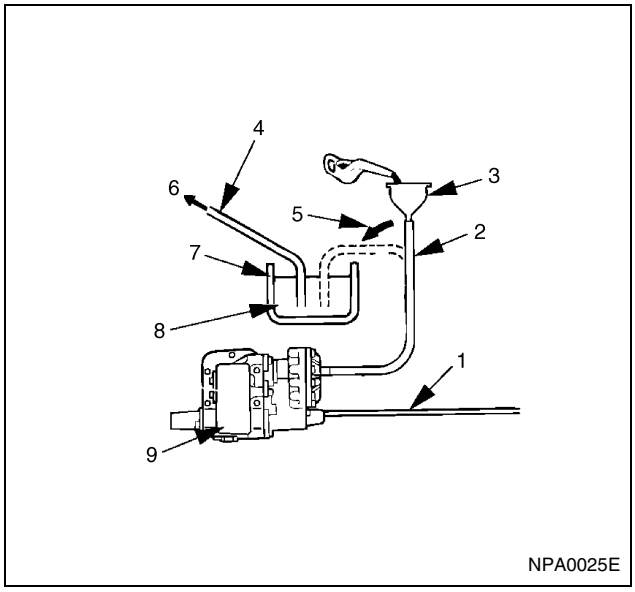
Legend

1. Hoist cylinder
2. Oil tank
3. Low-pressure hose
4. Hydraulic operating fluid container
5. Hydraulic operating fluid
6. PTO with oil pump
7. High-pressure hose

Notice:
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.



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Legend

1. High-pressure hose
2. Test hose
3. Funnel
4. Low-pressure hose
5. Insert
6. To oil tank
7. Hydraulic operating fluid container
8. Hydraulic operating oil pump
9. PTO with oil pump

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.

Notice:
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.

Notice:
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.

Notice:
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" or the "Air Bleeding Procedure of Hydraulic Operating Fluid".

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.

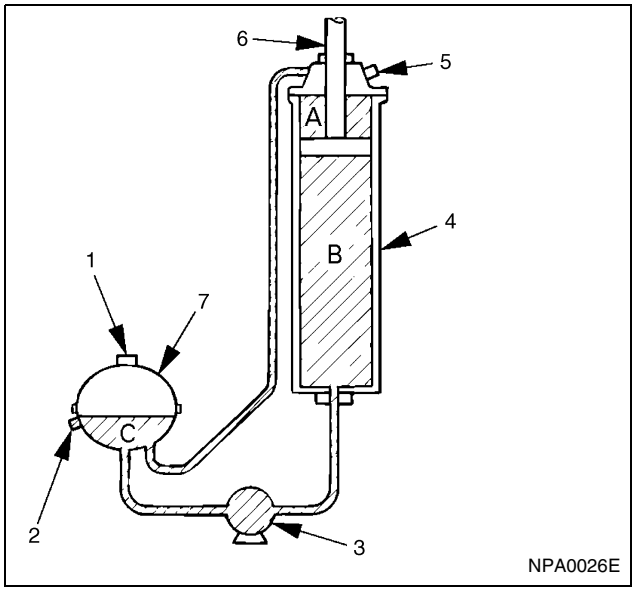
Air Bleeding Procedure of Hydraulic Operating Fluid

Notice:
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)" 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 (5) 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 (5).



Legend
1. Oil filler port
2. Level plug
3. Oil pump
4. Hoist cylinder
5. Oil filler port
6. Piston rod
7. Oil tank

Air Bleeding Method

1. Raise the body (cargo deck) in accordance with the "How to raise the body (cargo deck)" 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.

Notice:
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).

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

Notice:
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 (5). 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”.

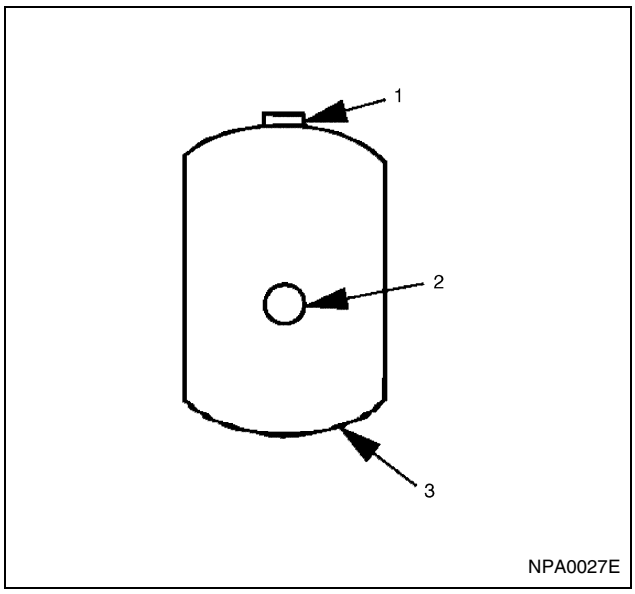
Principles Under Which Air Is Released
Between “B” and “C”
For Chamber “B” filled with hydraulic operating fluid, when the body (cargo deck) is dropped, the piston rod is dropped and the hydraulic operating fluid in “Chamber B” passes through the oil pump and is returned to the oil tank. At this time, 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”.

[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)” 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).

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

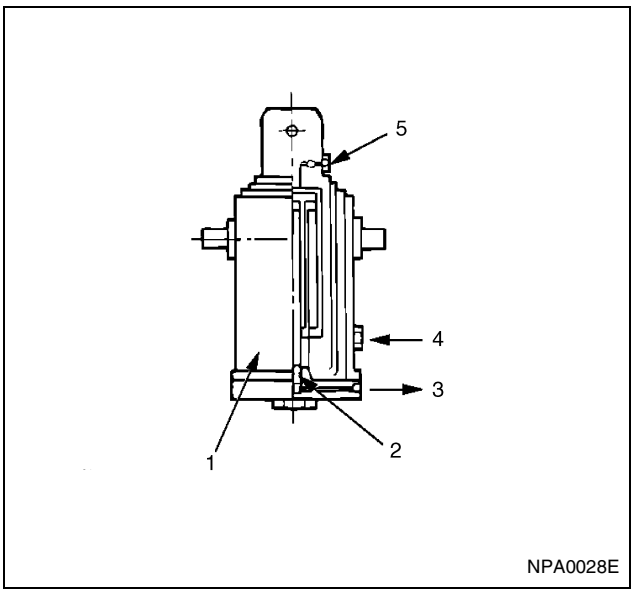


Legend
1. Oil filler port
2. Level plug
3. Oil tank

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.

Notice:
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)” described previously.

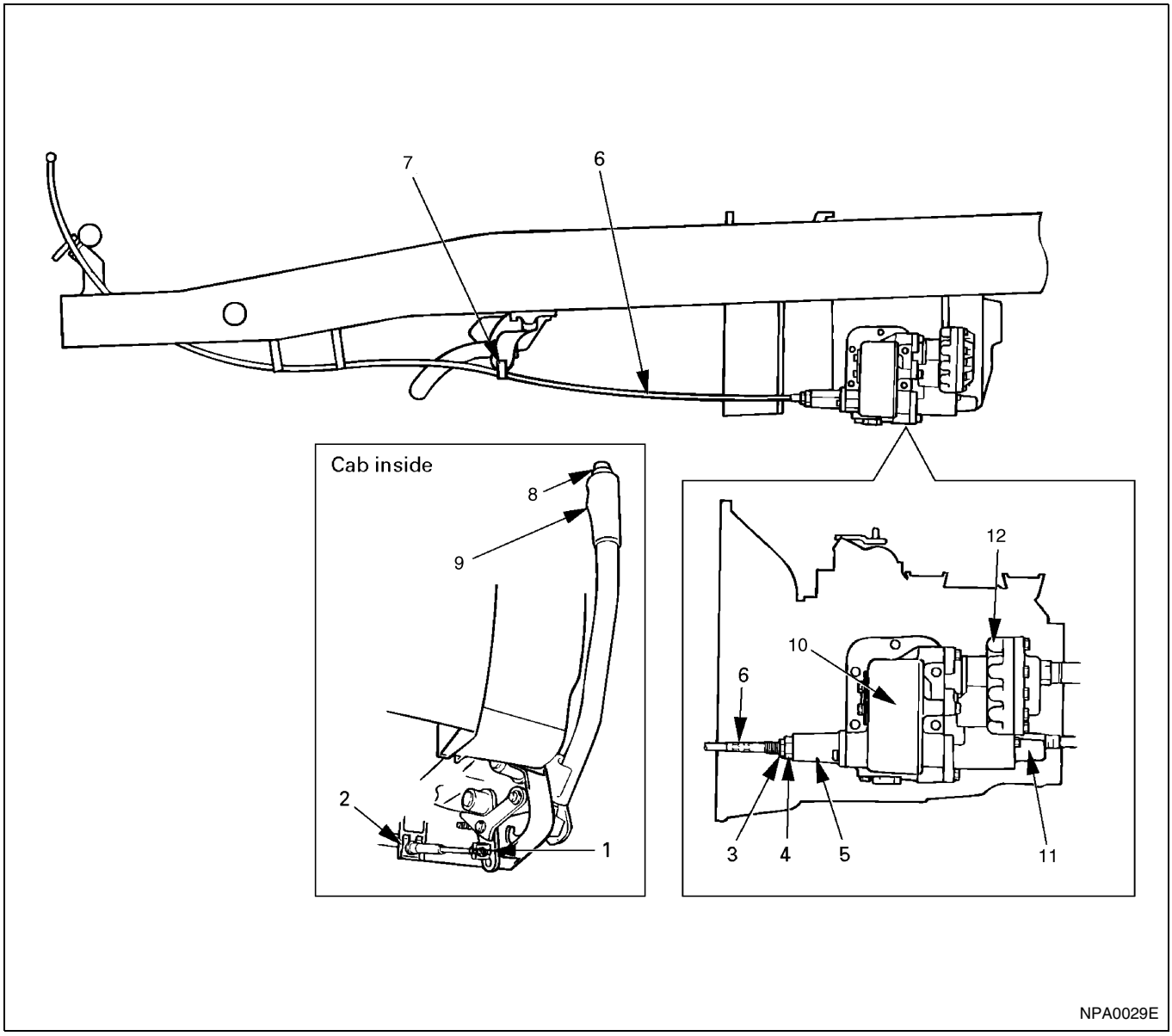


Legend

1. Cylinder main unit
2. Bypass valve
3. To oil tank
4. From oil pump (high pressure)
5. Air bleeding plug

CONTROL CABLE (FOR REAR DUMP TRUCK)

Removal and Installation



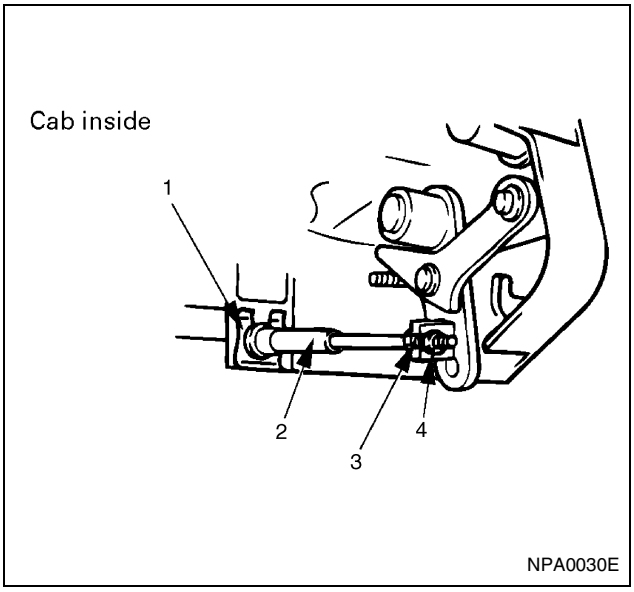
Legend

1. Lock nut (dump lever side)
2. Clip (inside cap)
3. Lock nut (PTO side)
4. Special nut
5. Cable holder
6. Control cable
7. Cable stopper clip
8. Lock button
9. Dump lever
10. PTO
11. Shift cap
12. Oil pump

Removal Steps

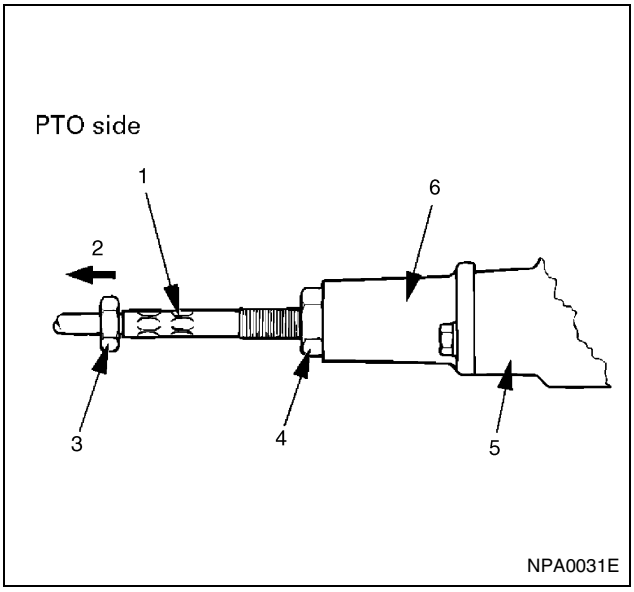
Notice:
Because a three-rotation dump truck differs in the wiring of a control cable from a rear dump truck, refer to the notes on the replacement and adjustment of the control cable for the three-rotation dump truck.

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.



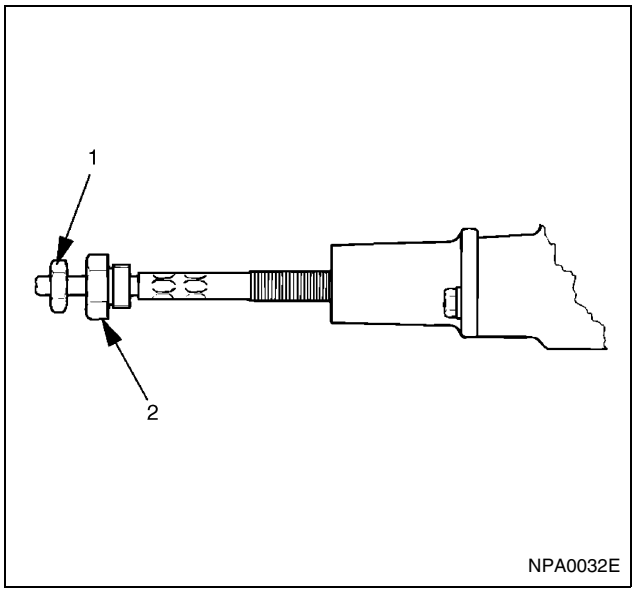
Legend
1. Clip
2. Control cable
3. Boss portion
4. Lock nut

3. Lock Nut (PTO Side)
   - Loosen the lock nut and move it toward the truck front.



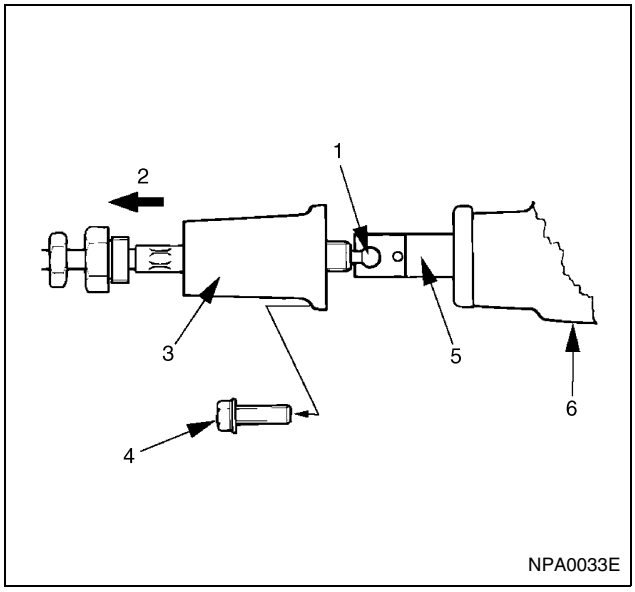
Legend
1. Control cable
2. Truck front
3. Lock nut
4. Special nut
5. PTO
6. Cable holder

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



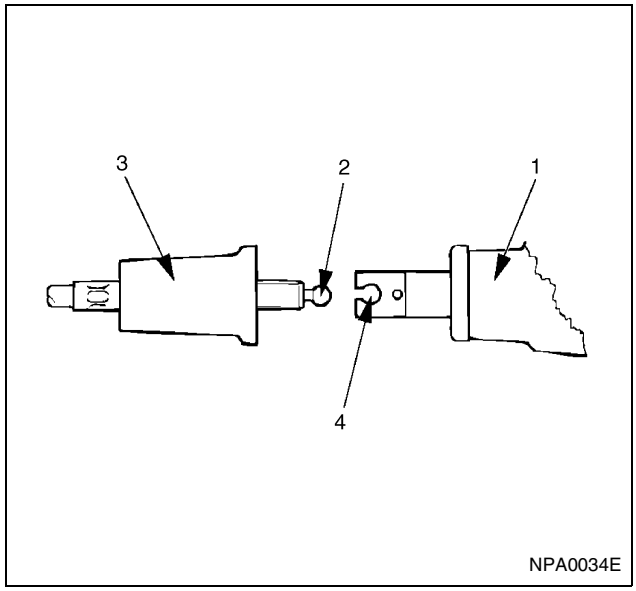
Legend
1. Lock nut
2. Special nut

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.



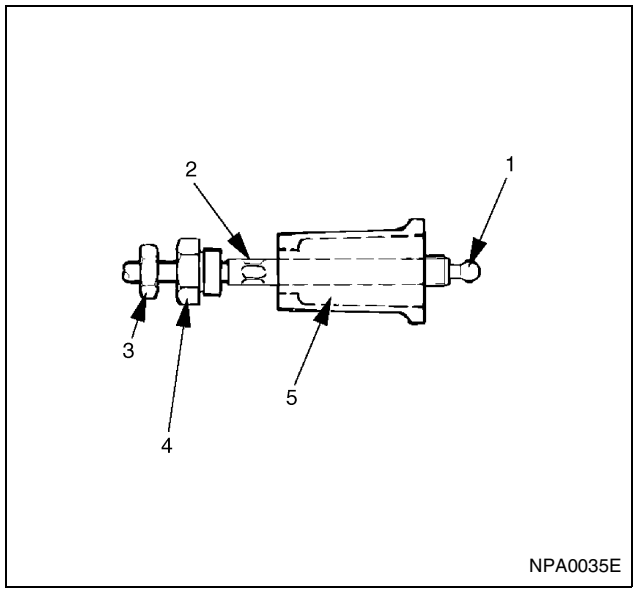
Legend
1. Rod end ball portion
2. Truck front
3. Cable holder
4. Bolt
5. Shift rod
6. PTO

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.



Legend
1. PTO
2. Rod end ball portion
3. Cable holder
4. Cable connector groove

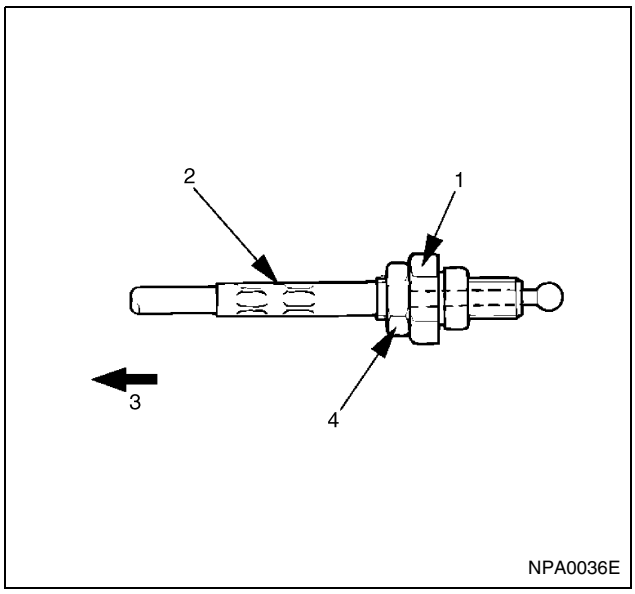
   - Remove the cable holder from the control cable.
   - Remove the control cable assembly from the truck.



Legend
1. Rod end ball portion
2. Control cable
3. Lock nut
4. Special nut
5. Cable holder

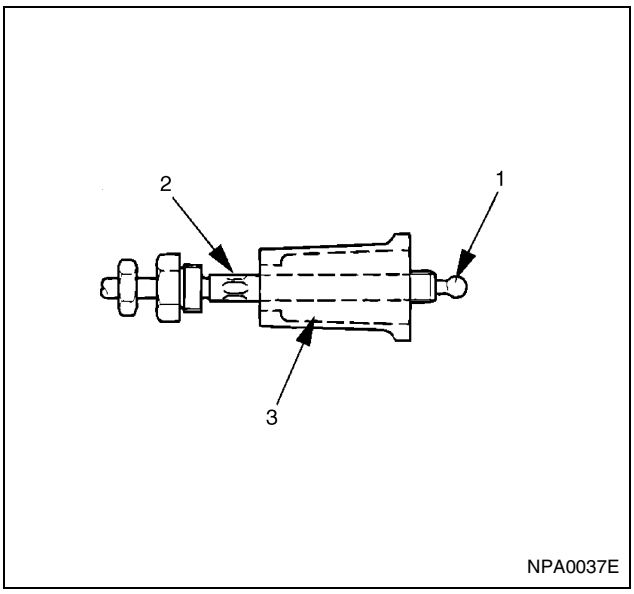
Installation Steps

1. 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.



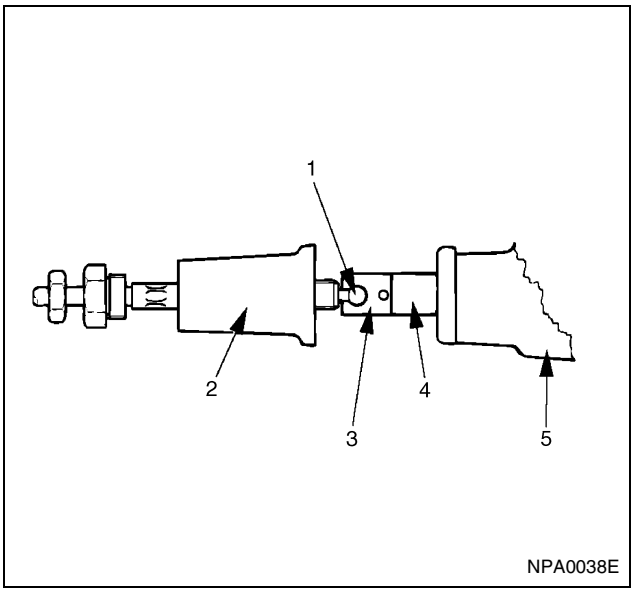
Legend
1. Special nut
2. Control cable
3. Truck front
4. Lock nut

2. Cable Holder
   - Assemble the cable holder in the control cable.



Legend
1. Rod end ball portion
2. Control cable
3. Cable holder

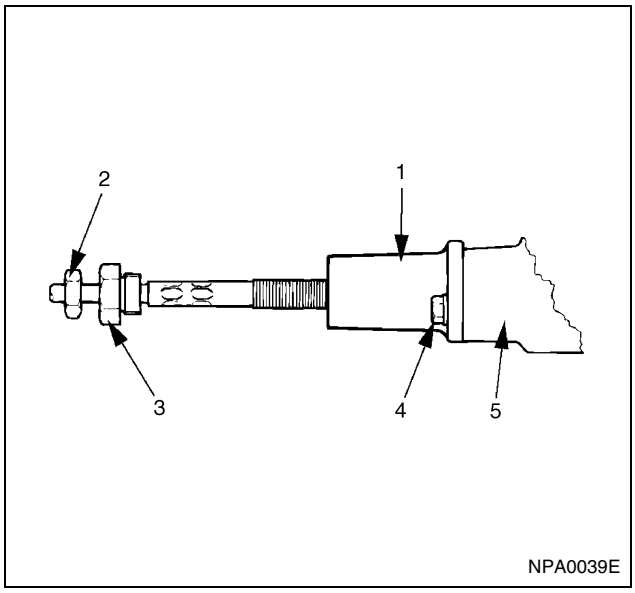
- Coat the rod end ball of the cable tip with a small amount of grease and assemble it in the groove of the control cable connector on the PTO side.



Legend
1. Rod end ball (apply a small amount of grease)
2. Cable holder
3. Cable connector
4. Shift rod
5. PTO

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

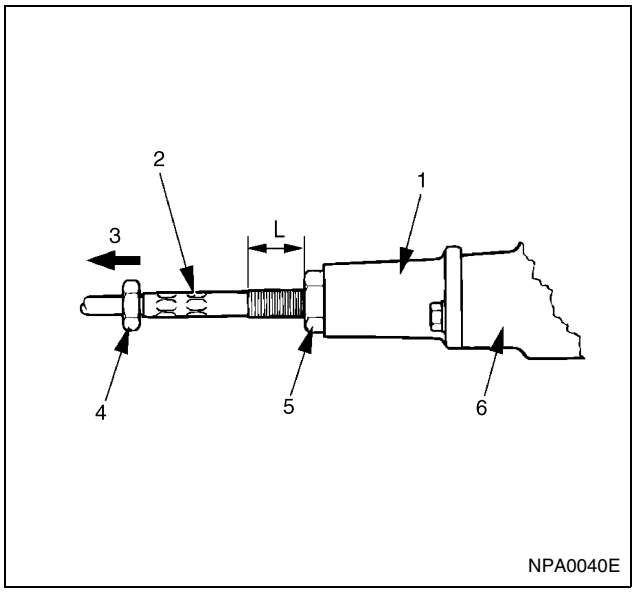
Notice:
Tighten the bolt after having adjusted it in accordance with the work procedure of the “Control Cable Adjustment”.



Legend
1. Cable holder
2. Lock nut
3. Special nut
4. Bolt
5. PTO

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

Tighten:
Special nut to 147 N·m (15 kg·m / 108 lb·ft)



Legend
1. Cable holder
2. Control cable
3. Truck front
4. Lock nut
5. Special nut
6. PTO

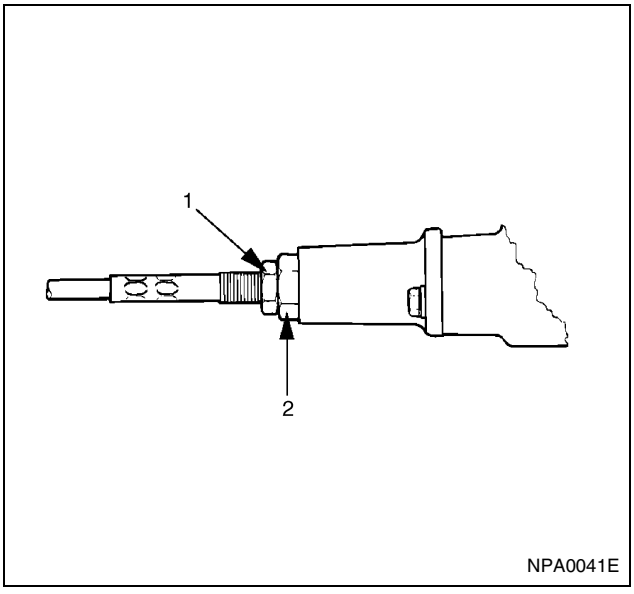
- At this time, check that the “L” dimension is 34±1 mm (1.339±0.039 inch.)
- If the “L” dimension does not satisfy the specified value, remove the cable holder from the PTO and rotate the cable holder to adjust the dimension.

Notice:
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.

4. Lock Nut (PTO Side)
   - After having checked the specified value dimensions of the cable outer threaded portion, temporarily tighten the lock nut.

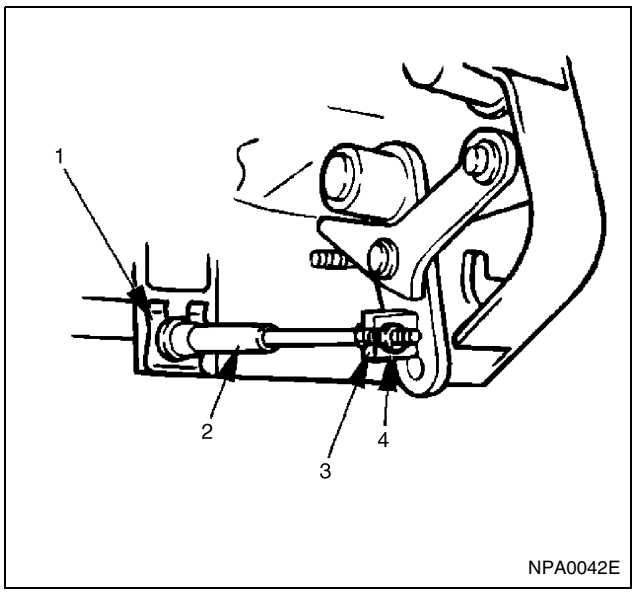
Notice:
Tighten the special nut and lock nut after having adjusted it in accordance with the work procedure of the “Control Cable Adjustment”.



Legend
1. Lock nut
2. Special nut

5. 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.
6. 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.

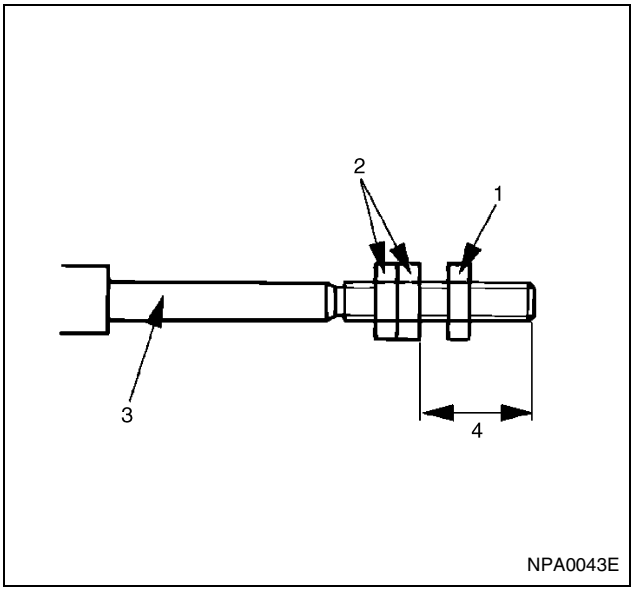
Tighten:
Lock nut to 6 N·m (0.6 kg·m / 52 lb·in)



Legend
1. Clip
2. Control cable
3. Boss portion
4. Lock nut

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

Control cable length (Reference): 18±1 mm (0.709±0.039 in)



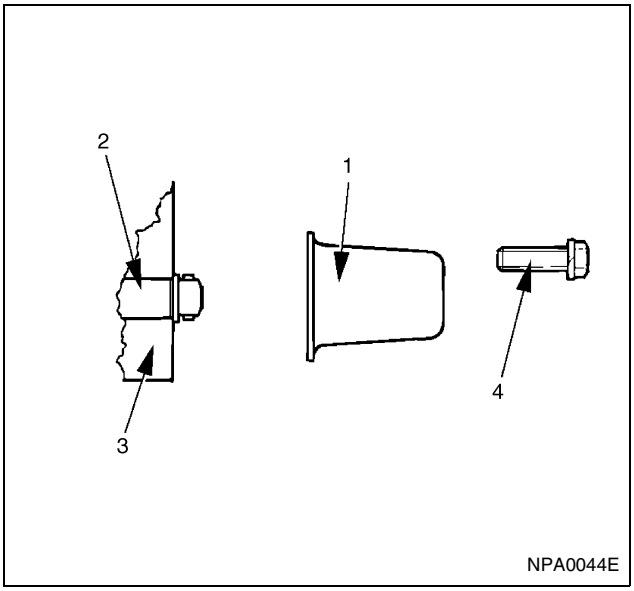
Legend
1. Lock nut
2. Double nut
3. Control cable
4. Reference valve

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.

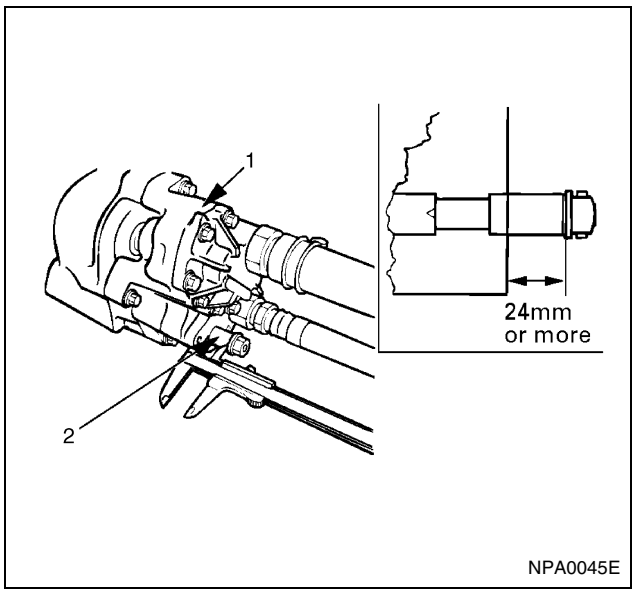
1. Remove the shift cap tightening bolt of the oil pump rear and remove the shift cap.



Legend
1. Shift cap
2. Spool
3. Oil pump rear end
4. Bolt

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: 24 mm (0.945 in) or more

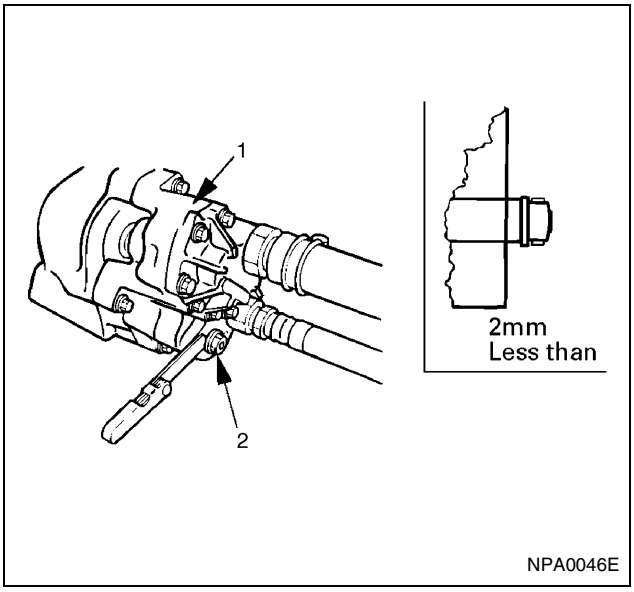


Legend
1. Oil pump
2. Spool extrusion

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: less than 2 mm (0.0787 in)

Notice:
Both amounts of spool extrusion at “Up” and “Down” shall be within a standard value.

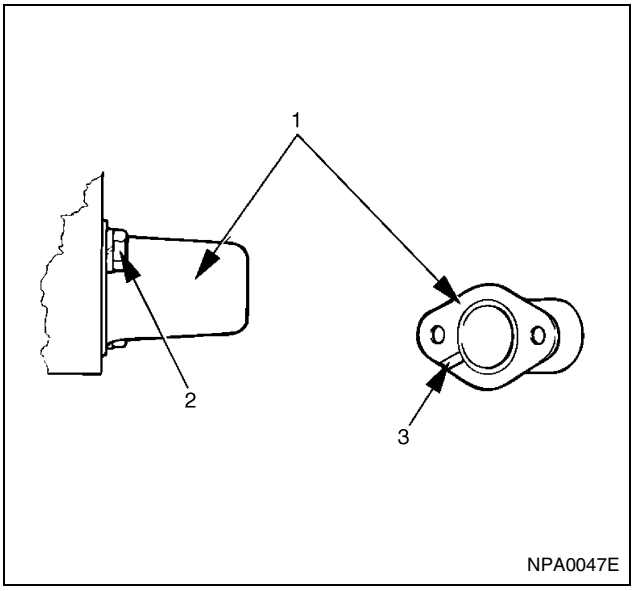


Legend
1. Oil pump
2. Spool extrusion

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

Tighten:
Shift cap fixing bolt to 24 N·m (2.4 kg·m / 17 lb·ft)

Notice:
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.

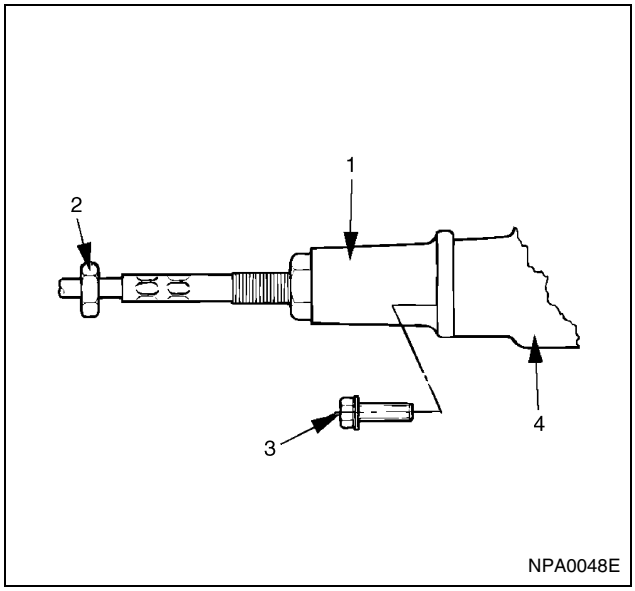


Legend
1. Shift cap
2. Bolt
3. Make groove face downward

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.

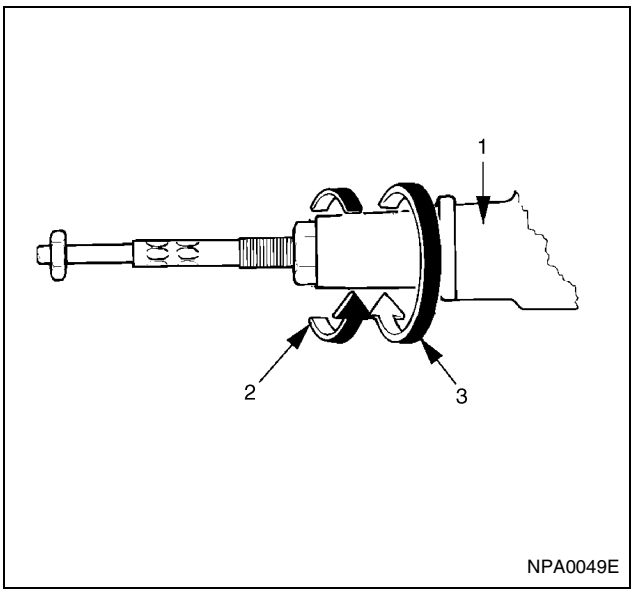
1. Loosen the lock nut of the control cable.
2. Remove the tightening bolt of the cable holder.



Legend
1. Cable holder
2. Lock nut
3. Bolt
4. PTO

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.

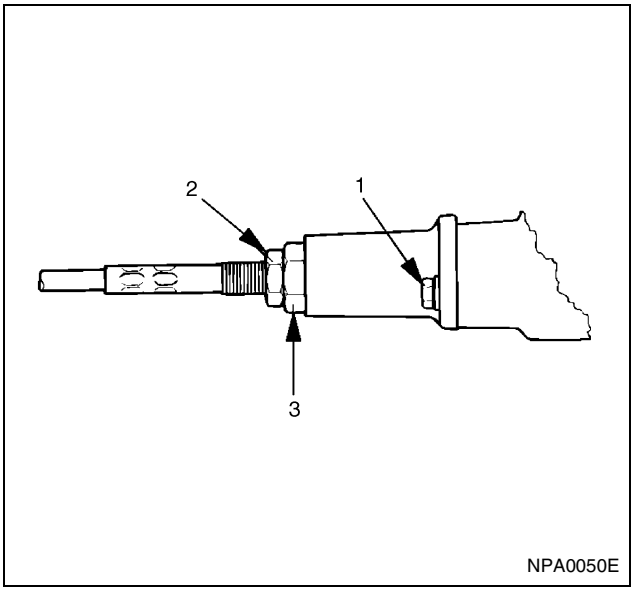
Notice:
Both “clockwise rotation” and “counterclockwise rotation” indicate that the cable moves by about 0.75 mm (0.0295 inch) every time the cable holder rotates by 180 degrees.



Legend
1. PTO
2. Counterclockwise rotation
3. Clockwise rotation

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.

Tighten:
- Cable holder bolt to 23 N·m (2.3 kg·m / 17 lb·ft)
- Lock nut to 21 N·m (2.1 kg·m / 15 lb·ft)



Legend
1. Bolt
2. Lock nut
3. Special nut

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

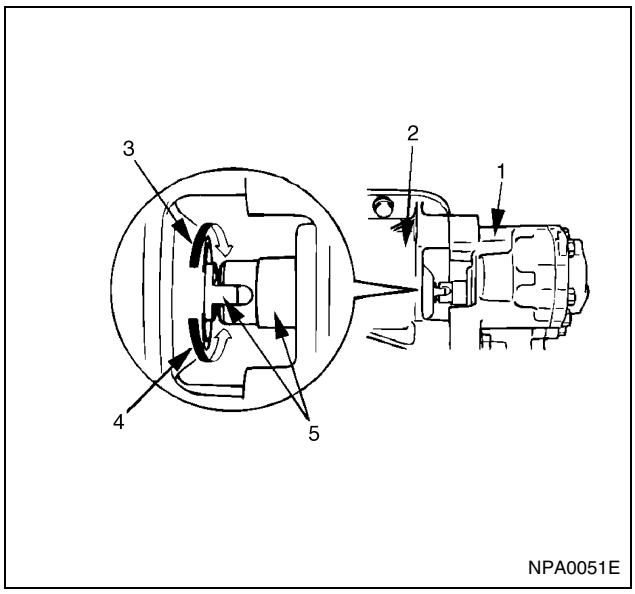
1. Check that the engine revolution per minute is 1,250 rpm and the rise and fall operations of the body (cargo deck) are performed within the following reference times.

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): 10 kgf (98 N)

   - 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.

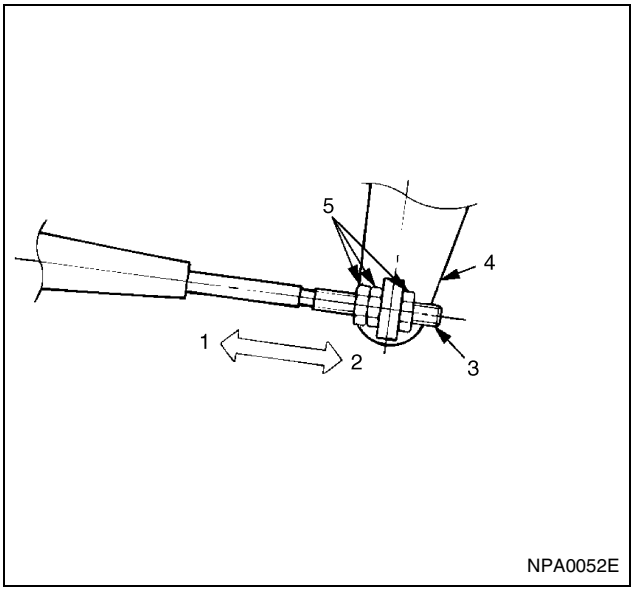


Legend
1. Oil pump
2. PTO
3. Direction of forward rotation
4. Direction of backward rotation
5. Shaft (drive shaft)

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:

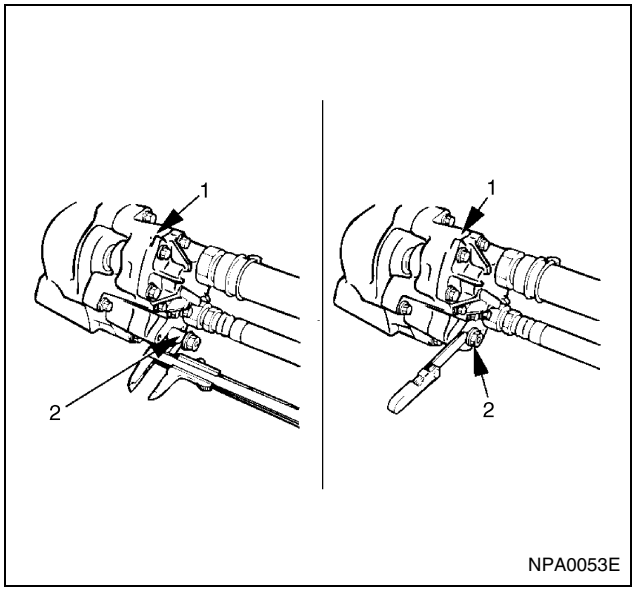


NPA0052E

Legend
1. Squeeze
2. Pull out
3. Dump cable
4. Dump lever
5. Loosen

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.

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



NPA0053E

Legend
1. Oil pump
2. Spool extrusion

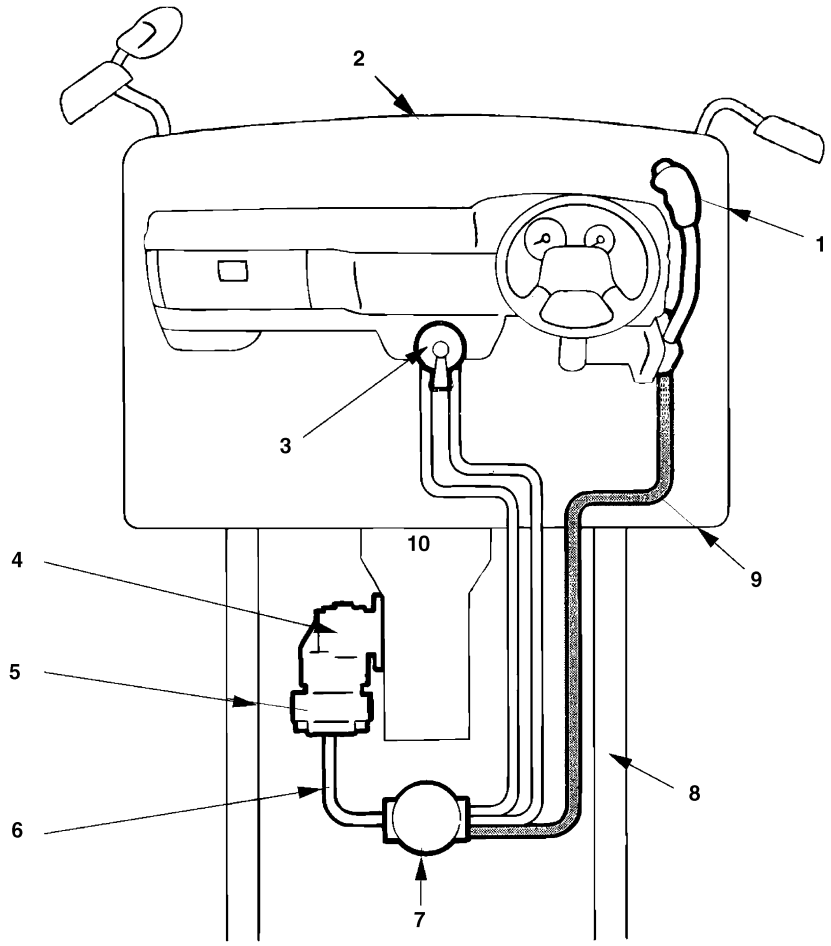
3. After adjustment, tighten the lock nut at a specified torque.

Tighten:
Lock nut to 6 N·m (0.6 kg·m / 52 lb·in)

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 LIMTED.
   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.

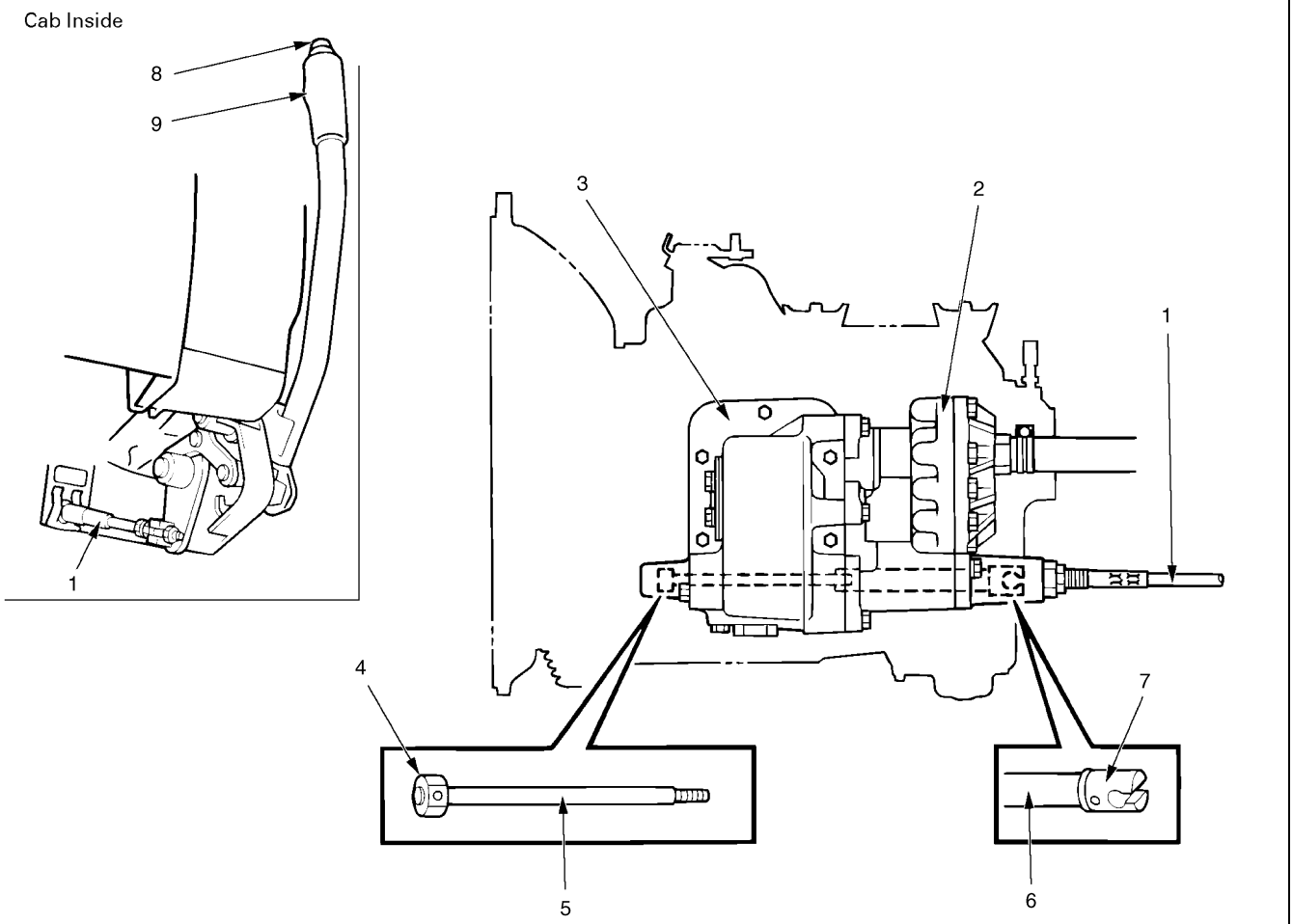
Control Cable Rough Layout Drawing for Three-Rotation Dump Truck



Legend

1. Dump lever
2. Cab
3. Dump (ejection) position switching lever
4. PTO
5. Oil pump
6. Control cable (between selector and oil pump)
7. Selector
8. Frame
9. Isuzu control cable
10. Transmission

Control Cable Adjustment for Three-rotation Dump Truck

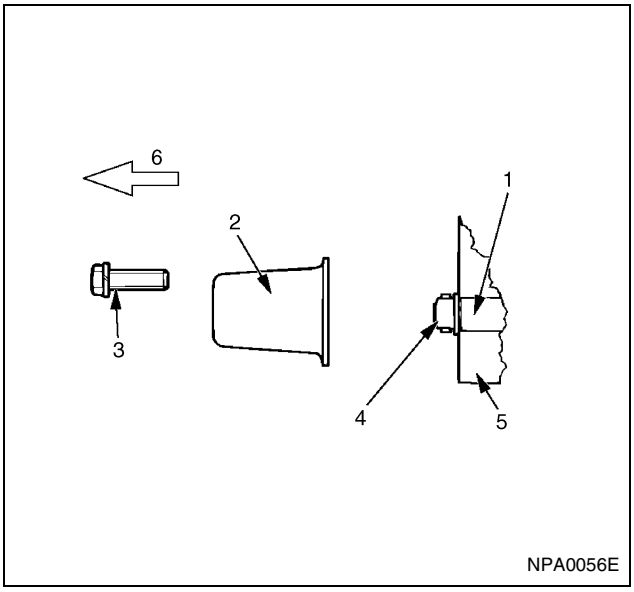


Legend

1. Control cable
2. Oil pump
3. PTO
4. Stopper adapter
5. Inner rod assembly
6. Spool
7. Cable connector
8. Lock button
9. Dump lever

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.



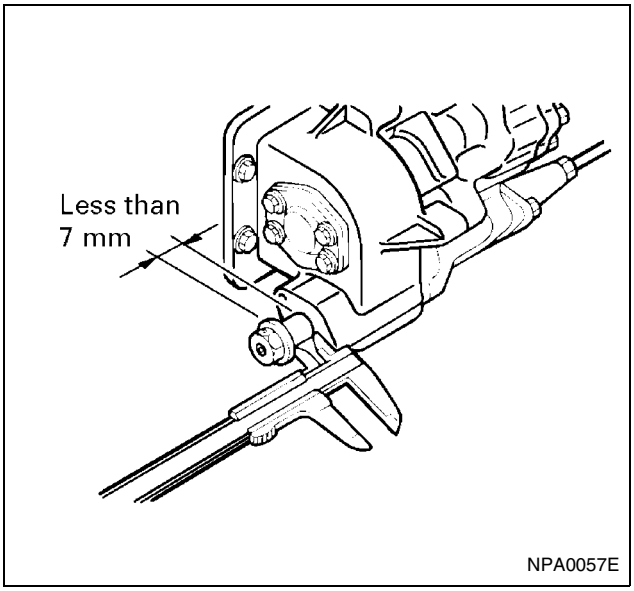
Legend

1. Inner rod
2. Shift cap
3. Bolt
4. Spool extrusion portion
5. PTO tip portion
6. Truck front

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.

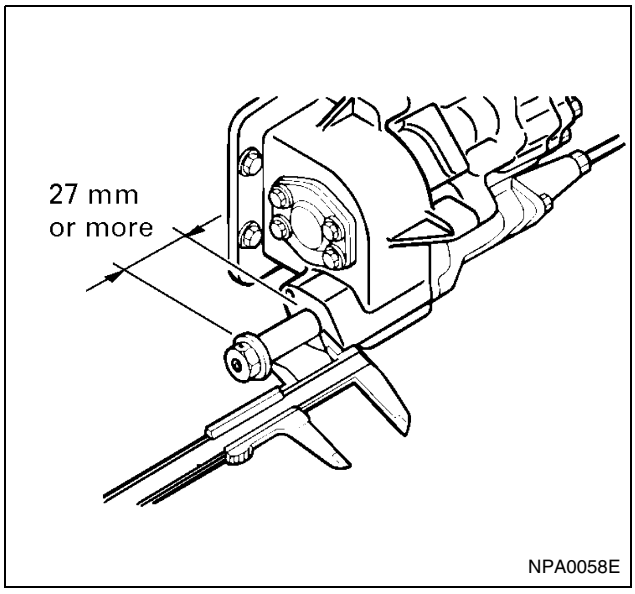
Amount of spool extrusion: less than 7 mm (0.276 in)



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: 27 mm (1.063 in) or more

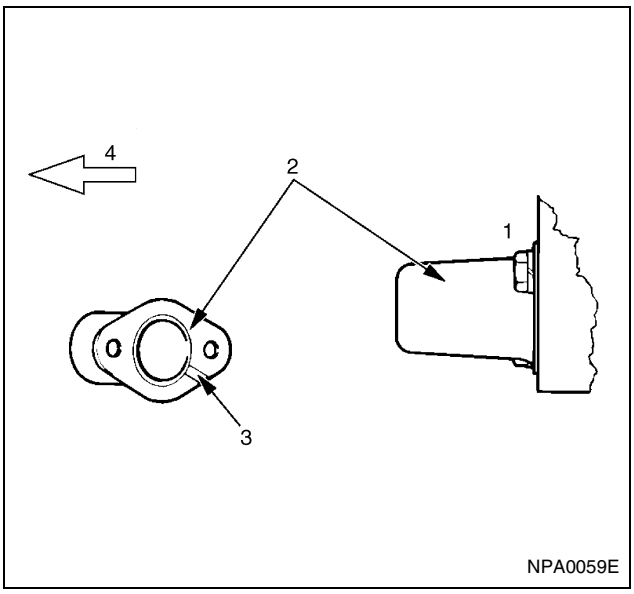
Notice:
Be sure check that both amounts of spool extrusion at “Up” and “Down” times are within basic values.



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.

Tighten:
Shift cap bolt to 24 N·m (2.4 kg·m / 17 lb·ft)

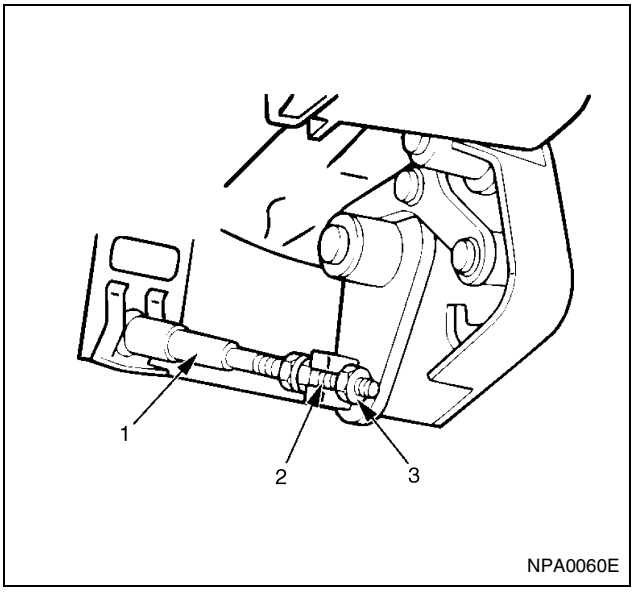
Notice:
If the groove is not installed facing downward, the water intruded in the shift cap is not ejected but collected. Rusting and freezing will cause an incorrect actuation.



Legend
1. Bolt
2. Shift cap
3. Make groove face downward
4. Truck front

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

Notice:
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.



Legend
1. Control cable
2. Boss portion
3. Lock nut

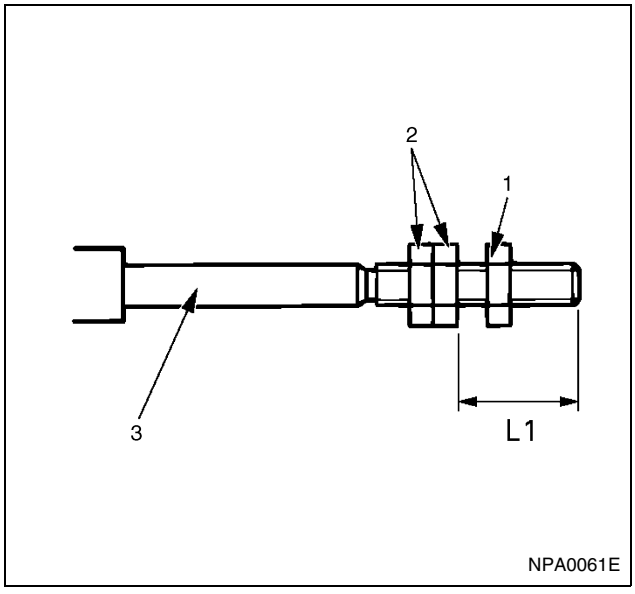
Control Cable Adjustment (Dump Lever Side Inside Cab)

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": 14±1 mm (0.55±0.039 in)

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.

Tighten:
Lock nut to 6 N·m (0.6 kg·m / 52 lb·in)



Legend
1. Lock nut
2. Double nut
3. Control cable

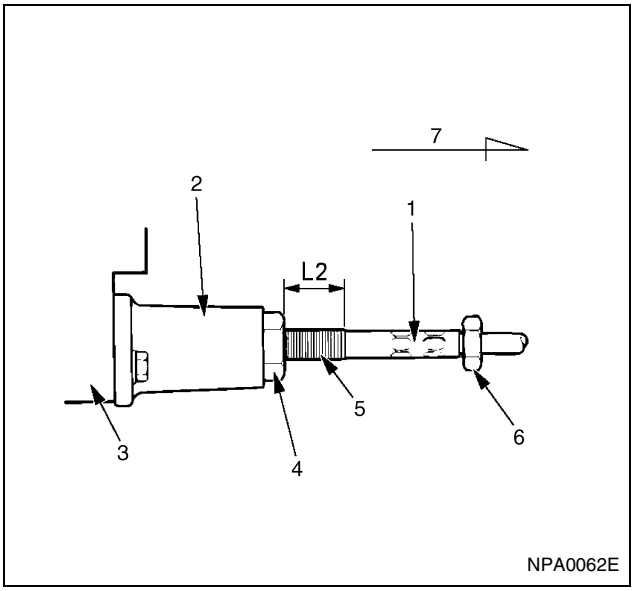
Control Cable Adjustment (Oil Pump Side)

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): 24^{+1}_{-0} mm ($0.945^{+0.039}_{-0}$ in)

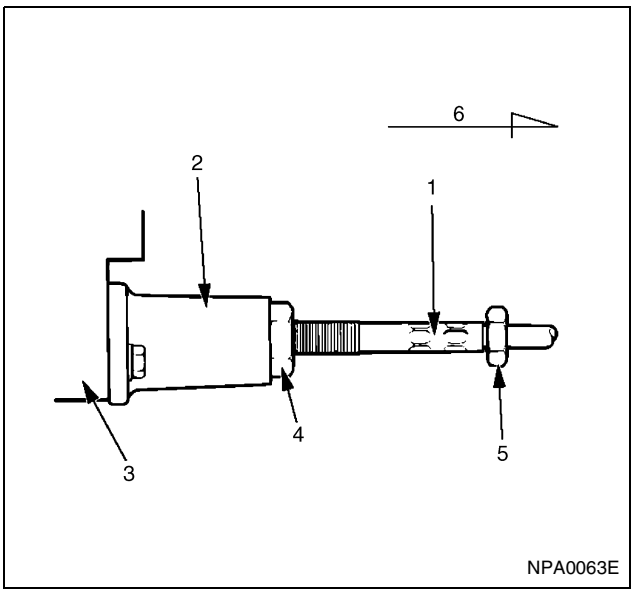
- As a result of check, if the length "L2" is satisfied, tighten the lock nut at a specified torque.

Tighten:
Lock nut to 20 N·m (2.0 kg·m / 14 lb·ft)



Legend
1. Control cable
2. Cable holder
3. Oil pump portion
4. Special nut
5. Outer threaded portion
6. Lock nut
7. Truck front

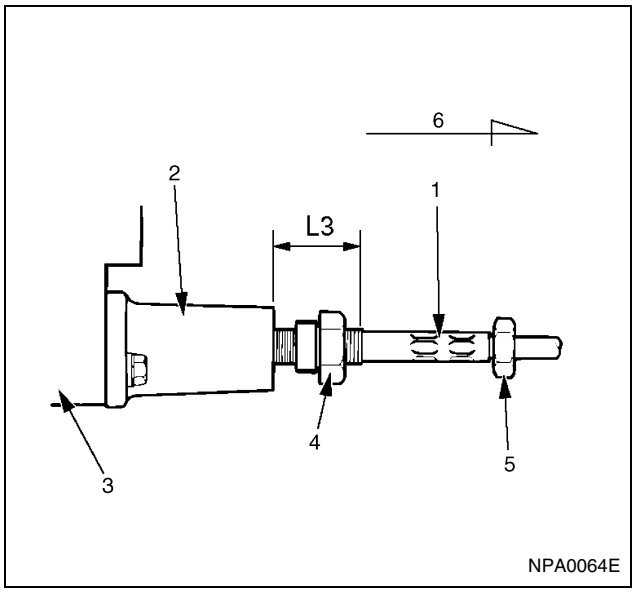
3. As a result of measurement, if the length “L2” does not satisfy a basic value, adjust the control cable according to the following procedure.



Legend
1. Control cable
2. Cable holder
3. Oil pump portion
4. Special nut
5. Lock nut
6. Truck rear

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.

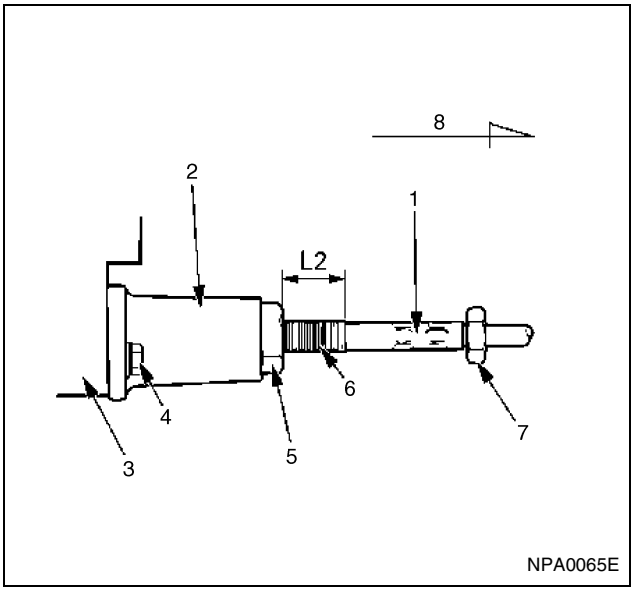
“L3” = “L2” basic value + Special Nut Thickness (10 mm)



Legend
1. Control cable
2. Cable holder
3. Oil pump portion
4. Special nut
5. Lock nut
6. Truck rear

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.

Tighten:
Special nut to 142 N·m (14.5 kg·m / 105 lb·ft)

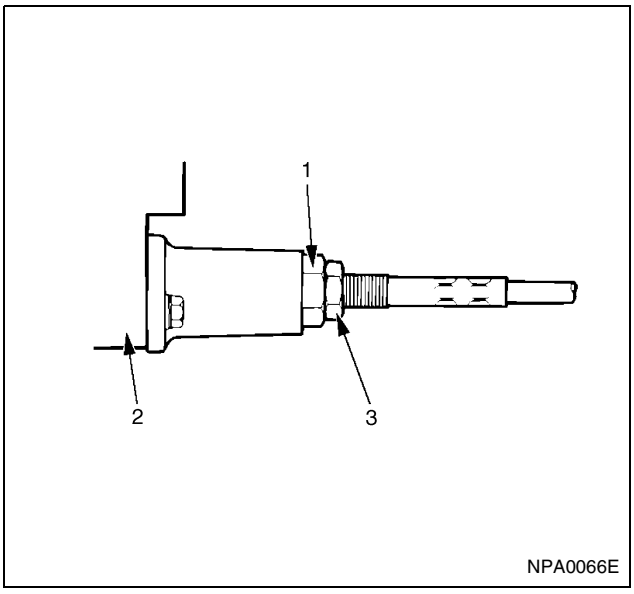


Legend

1. Control cable
2. Cable holder
3. Oil pump portion
4. Bolt
5. Special nut
6. Outer threaded portion
7. Lock nut
8. Truck rear

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

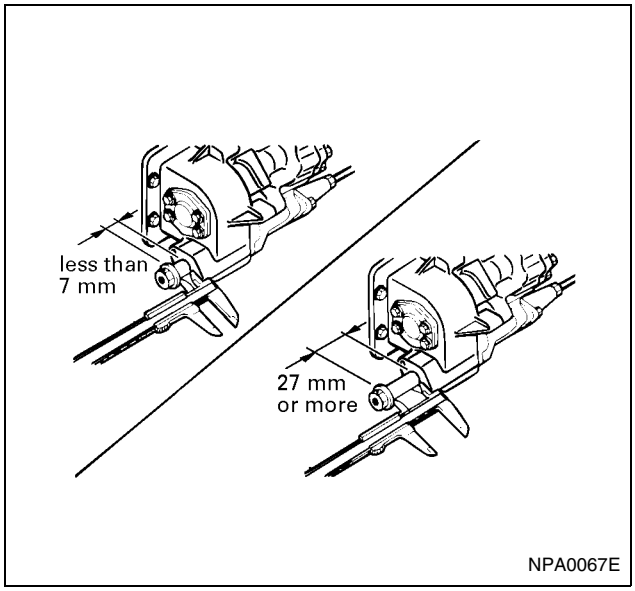
Tighten:
Lock nut to 20 N·m (2.0 kg·m / 14 lb·ft)



Legend

1. Special nut
2. Oil pump portion
3. Lock nut

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.)

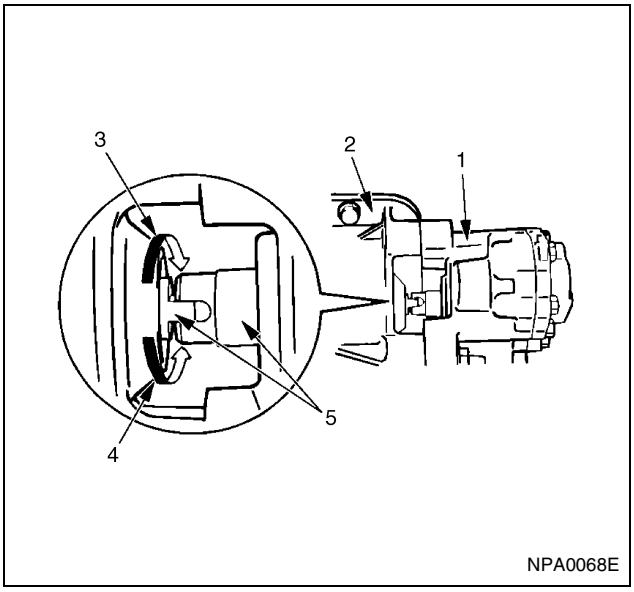


5. After having completed all measurement and adjustments, set the dump lever to the “Down” position and start the engine.

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 (98 N) 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.

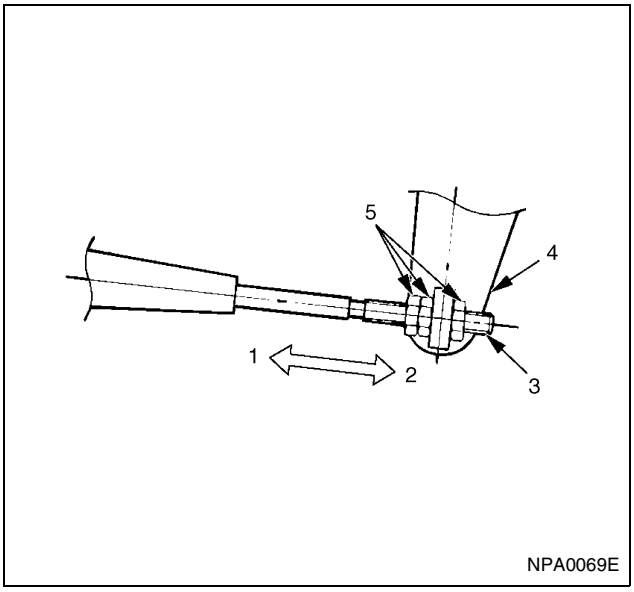


Legend

1. Oil pump
2. PTO
3. Direction of forward rotation
4. Direction of backward rotation
5. Shaft (drive shaft)

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.



Legend

1. Push in
2. Pull out
3. Dump cable
4. Dump lever
5. Loosen

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.

Notice:
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.

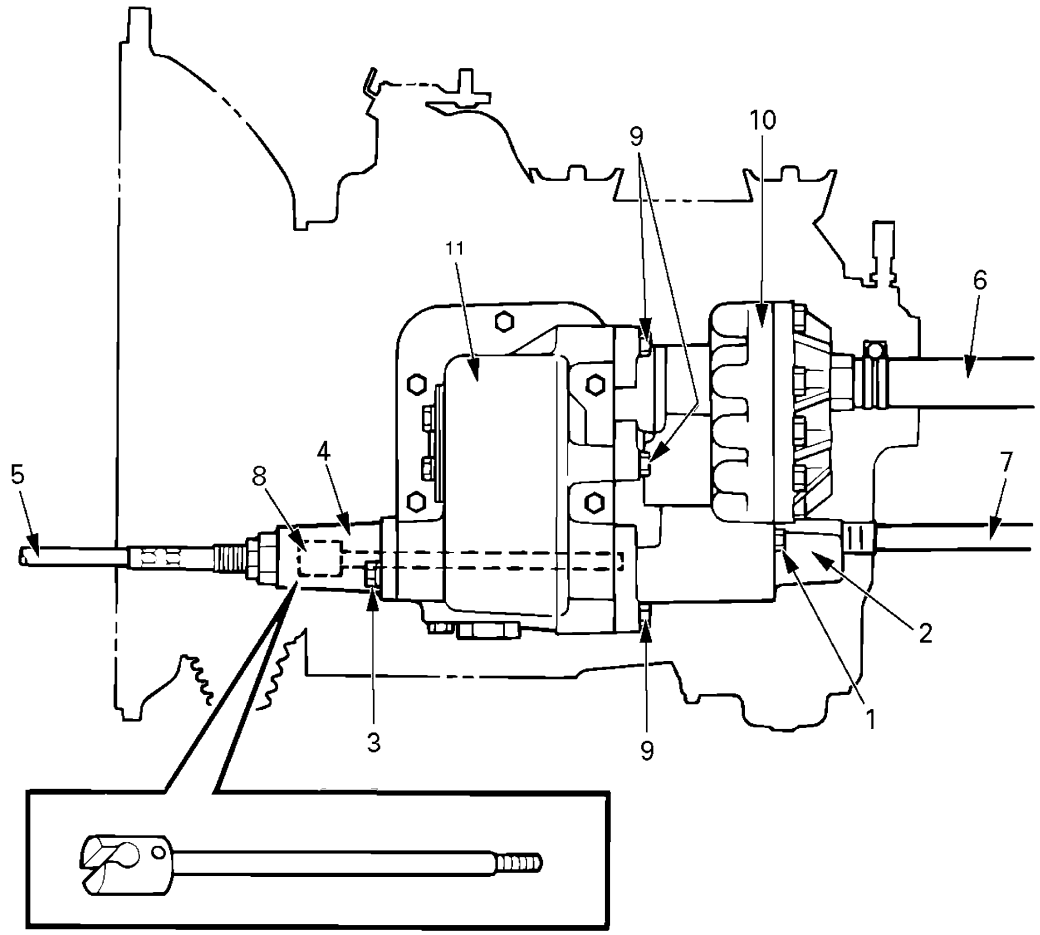
Tighten:
Lock nut to 6 N·m (0.6 kg·m / 52 lb·in)

***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.



NPA0070E

Legend

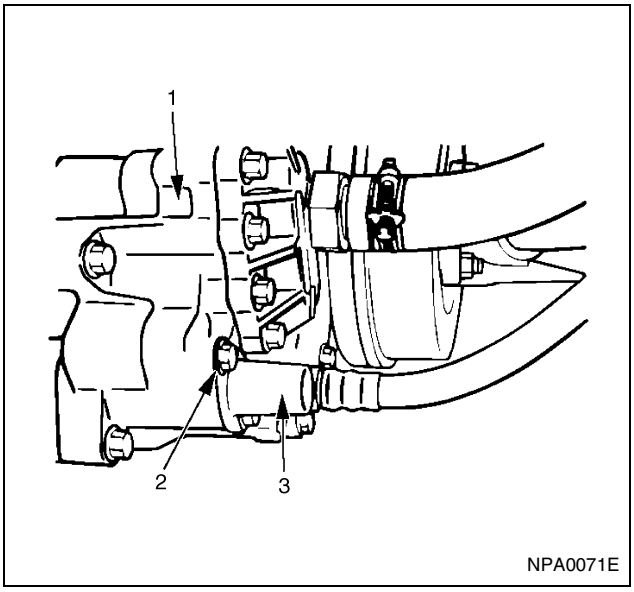
1. Bolt (shift cap)
2. Shift cap
3. Bolt (cable holder)
4. Cable holder
5. Control cable
6. Low-pressure hose
7. High-pressure hose
8. Inner rod assembly
9. Bolt (oil pump)
10. Oil pump
11. PTO

Removal Steps

Notice:
Set the dump lever inside the cab to the “Down” position and check the lever lock.

1. Bolt (Shift Cap)
2. Shift Cap

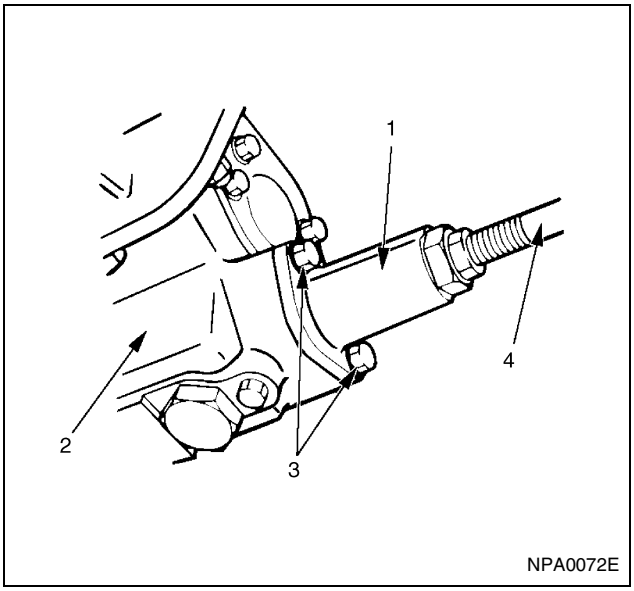
- Remove the bolt and remove the shift cap from the oil pump.



Legend
1. Oil pump
2. Bolt
3. Shift cap

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

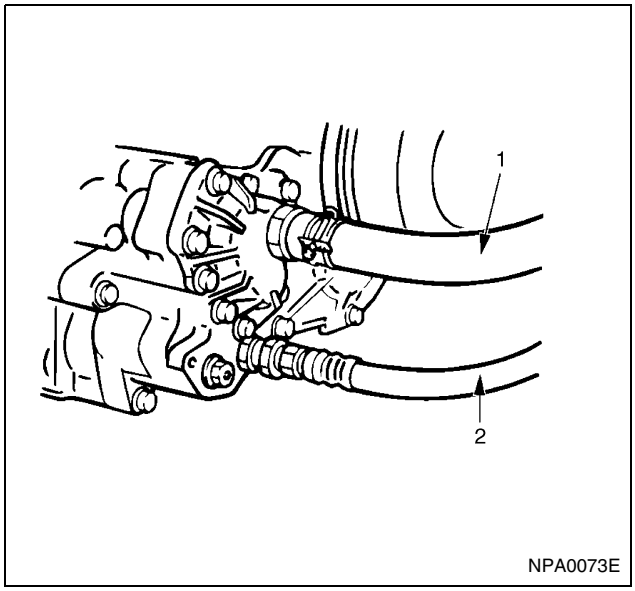
Notice:
Before removing the control cable, be sure to refer to Items 3 to 6 of “Removal” of the “Control Cable for Rear Dump Truck” described previously and perform work in accordance with the items.



Legend
1. Cable holder
2. PTO
3. Bolt
4. Control cable

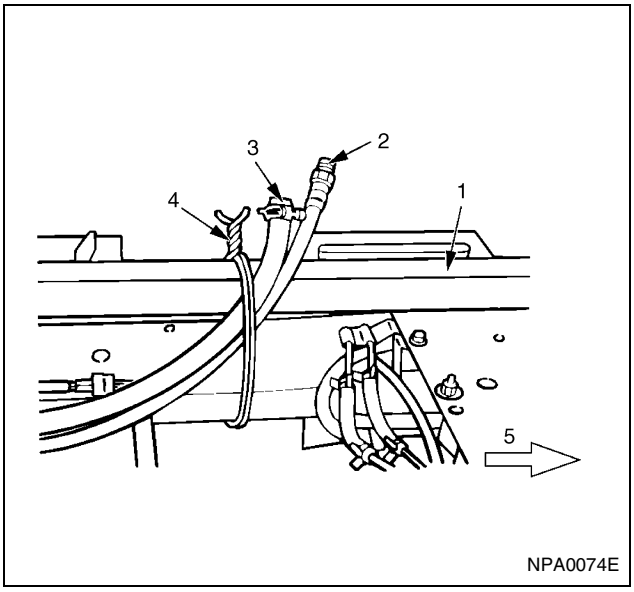
6. Low-Pressure Hose
   - Loosen the hose band and remove the hose from the oil pump.
7. High-Pressure Hose
   - Loosen the hose joint and remove the hose from the oil pump.

Notice:
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.



Legend
1. Low-pressure hose
2. High-pressure hose

Notice:
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.

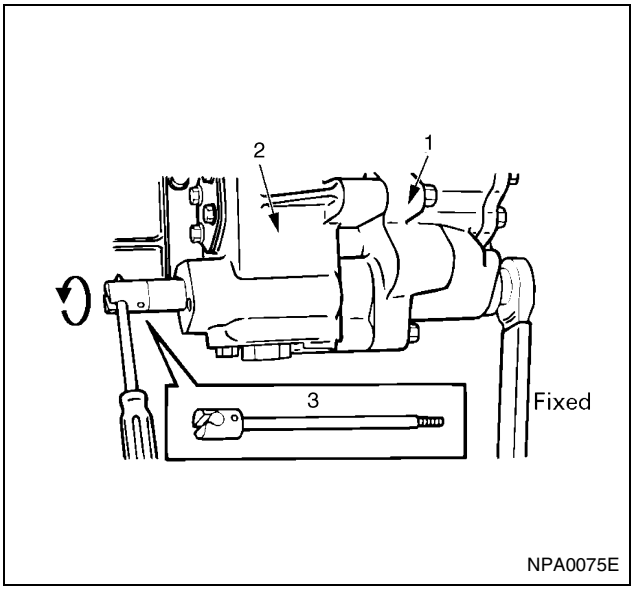


NPA0074E

Legend
1. Left frame
2. High-pressure hose
3. Low-pressure hose
4. Wire
5. Truck front

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.

Notice:
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.)

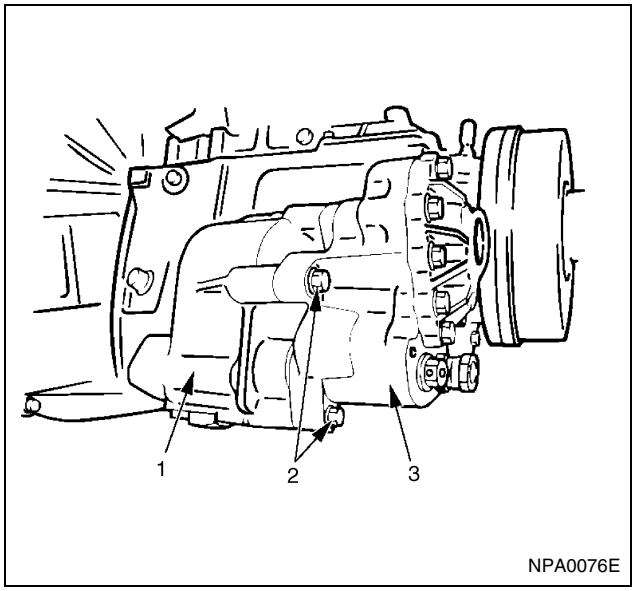


NPA0075E

Legend
1. Oil pump
2. PTO
3. Inner rod assembly

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.

Notice:
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.



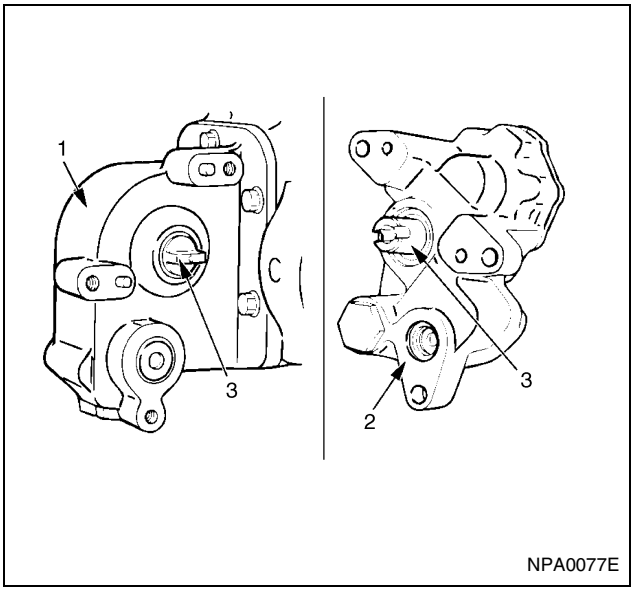
NPA0076E

Legend
1. PTO
2. Bolt
3. Oil pump

Installation Steps

1. Oil Pump
2. 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.

Notice:
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.

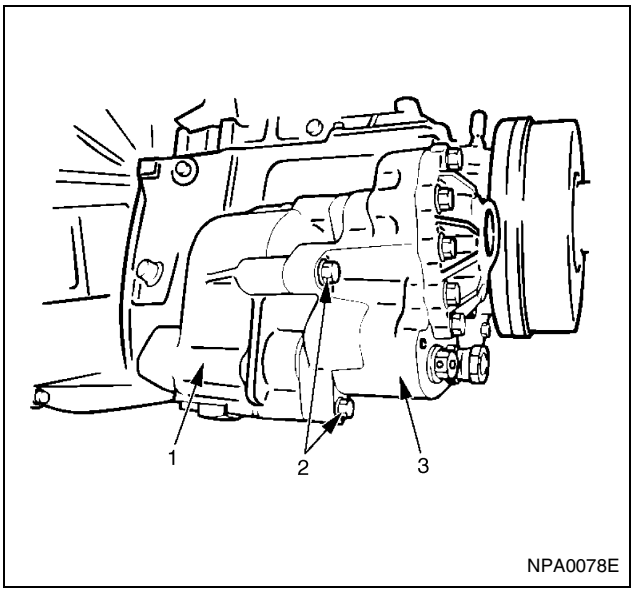


Legend
1. PTO
2. Oil pump
3. Coat shaft tip portion with grease

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

Tighten:
PTO bolt to 53 N·m (5.4 kg·m / 39 lb·ft)

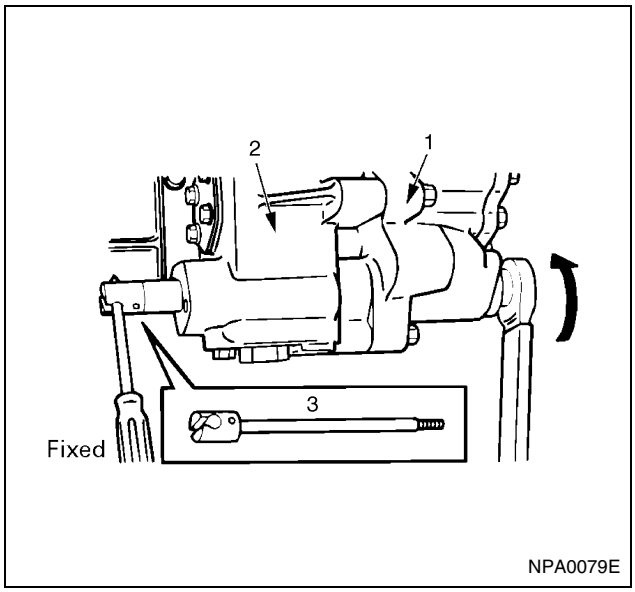
Notice:
Be fully careful so that dust or foreign matter will not be mixed in from the hose installation port of the oil pump.



Legend
1. PTO
2. Bolt
3. Oil pump

3. 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.)

Tighten:
Inner rod to19 N·m (1.9 kg·m / 14 lb·ft)



Legend
1. Oil pump
2. PTO
3. Inner rod assembly

4. High-Pressure Hose
   - Install the high-pressure hose in the oil pump and firmly tighten the joint.

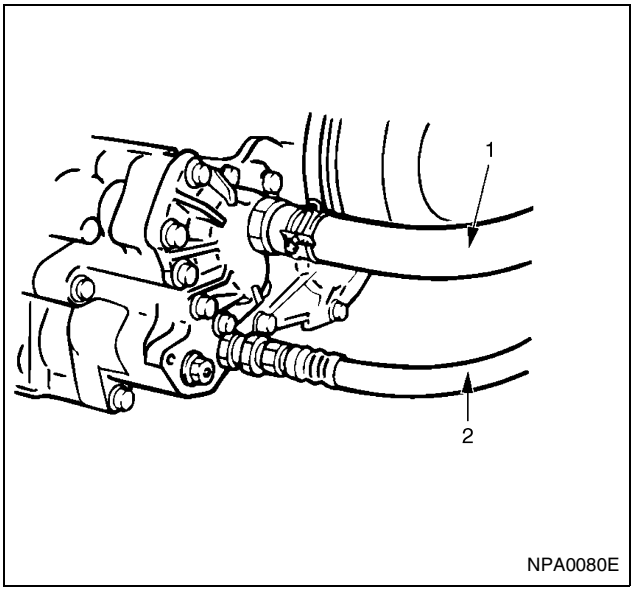
Notice:
If the oil pump is rotated and installed in the high-pressure hose in Item 10 described previously, firmly tighten the joint.

5. Low-Pressure Hose
   - Install the hose and firmly tighten the hose band.

Notice:
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)

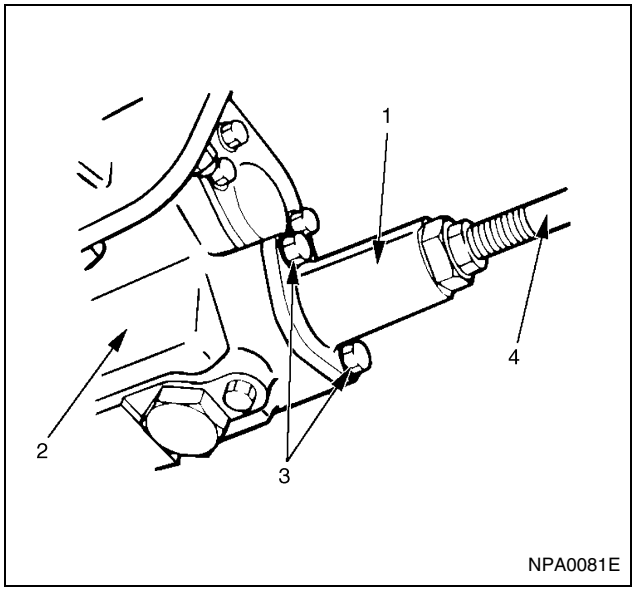
* After having tightened the joint using a recommended value, additionally tighten it if there is a leak of oil.



Legend
1. Low-pressure hose
2. High-pressure hose

6. Control Cable
7. Cable Holder
8. Bolt (Cable Holder)

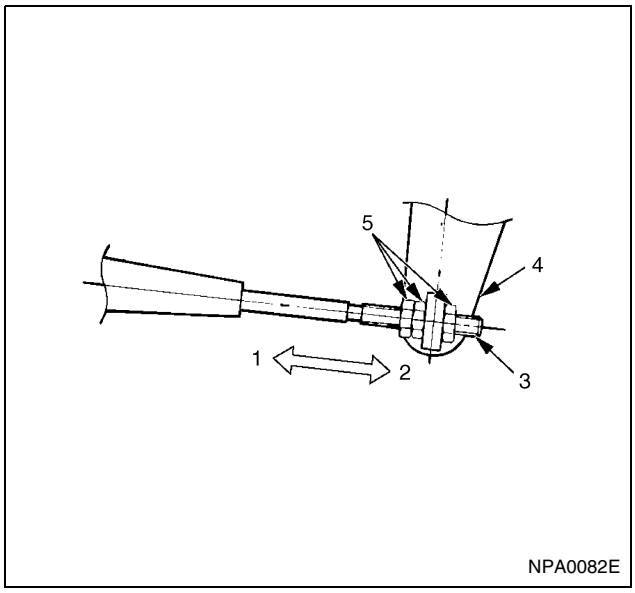
Notice:
Install the control cable and cable holder in the PTO in accordance with Items 1 to 4 of “Installation” of Removal and Installation of Control Cable for Rear Dump Truck, and after installation, inspect and adjust the spool amount in accordance with the “Amount of Spool Extrusion” described previously.



Legend
1. Cable holder
2. PTO
3. Bolt
4. Control cable

- 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.

Tighten:
- Bolt to 24 N·m (2.4 kg·m / 17 lb·ft)
- Special nut to 206 N·m (21 kg·m / 152 lb·ft)
- Lock nut to 21 N·m (2.1 kg·m / 15 lb·ft)



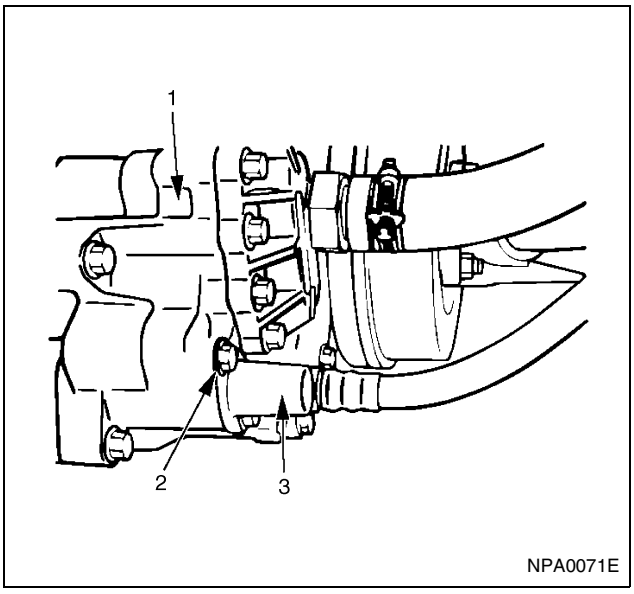
Legend

1. Push in
2. Pull out
3. Dump cable
4. Dump lever
5. Loosen

9. Shift Cap
10. 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.

Tighten:
Shift cap bolt to 24 N·m (2.4 kg·m / 17 lb·ft)

Notice:
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.



Legend

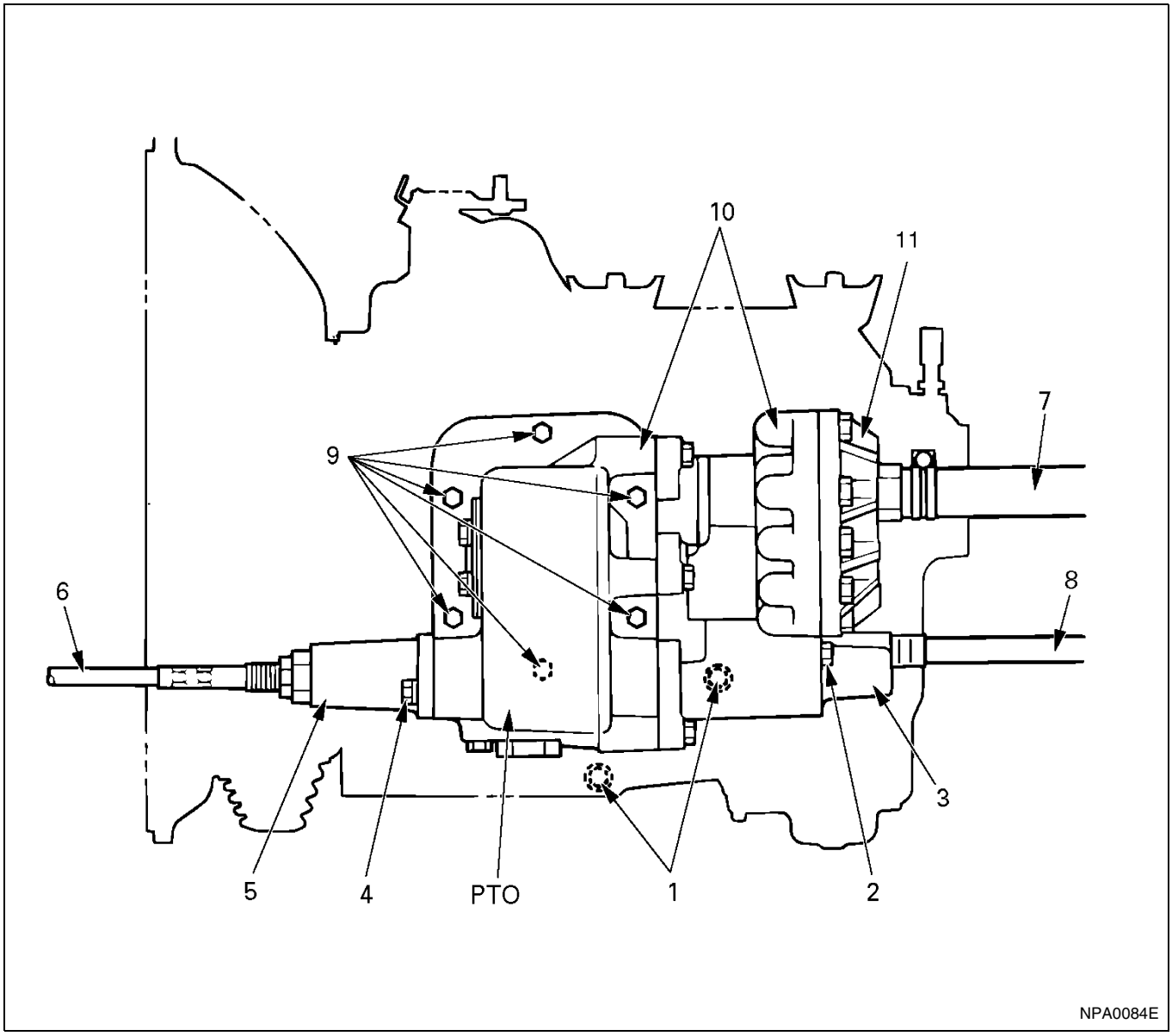
1. Oil pump
2. Bolt
3. Shift cap

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” and the “Air Bleeding Procedure of Hydraulic Operating Fluid” described previously.

PTO (WITH OIL PUMP) ASSEMBLY

Removal and Installation



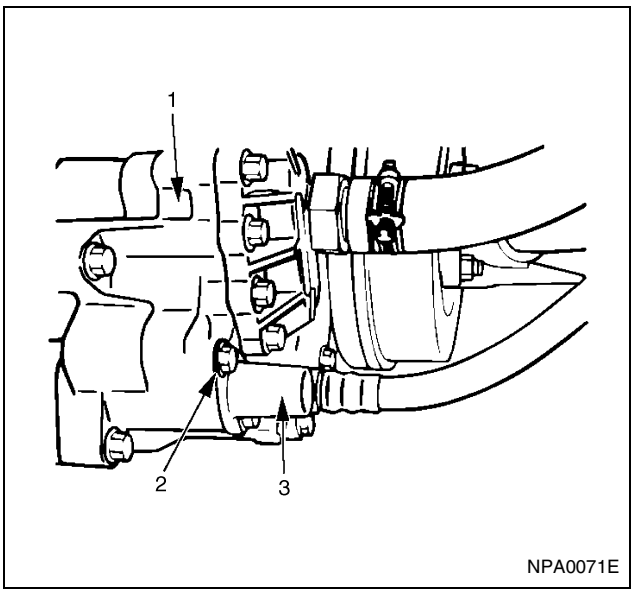
Legend

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)
11. Oil pump

Removal Steps

Notice:
Set the dump lever inside the cab to the “Down” position and check the lever lock.

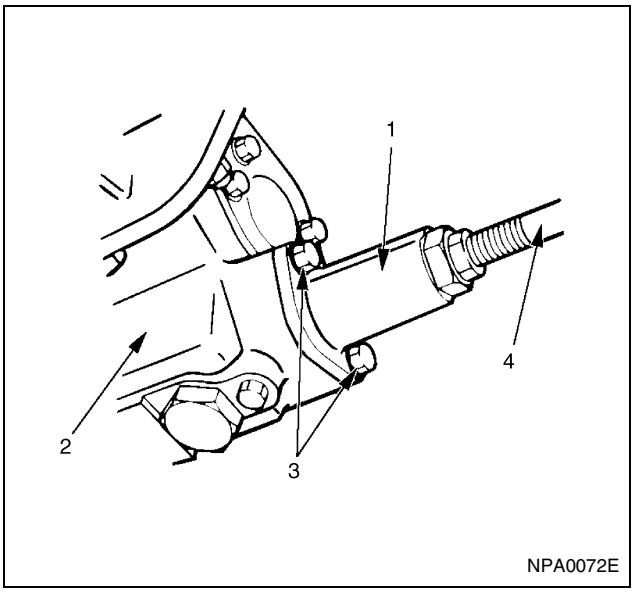
1. Drain Plug, Filler Plug
   - Remove the drain plug and filler plug of the transmission and remove the transmission oil.
2. Bolt (Shift Cap)
3. Shift Cap
   - Remove the bolt and remove the shift cap from the oil pump.



Legend
1. Oil pump
2. Bolt
3. Shift cap

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

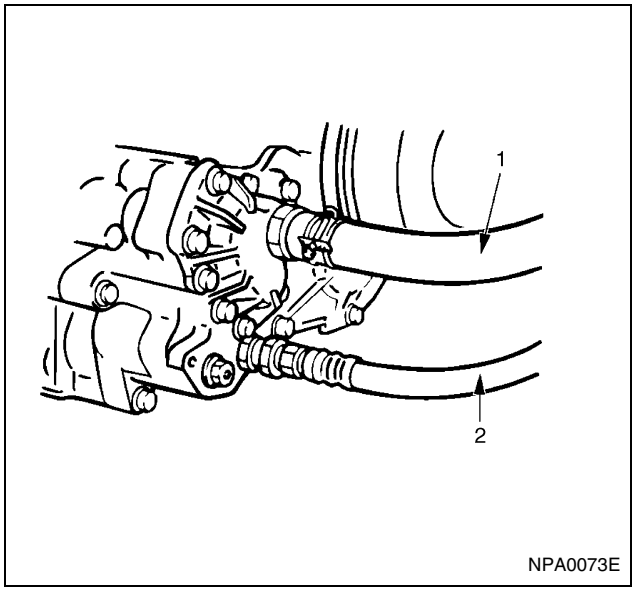
Notice:
Before removing the control cable, be sure to refer to Items 3 to 6 of “Removal” in the “Removal and Installation of Control Cable for Rear Dump Truck” in the chapter described previously and perform work in accordance with the items.



Legend
1. Cable holder
2. PTO
3. Bolt
4. Control cable

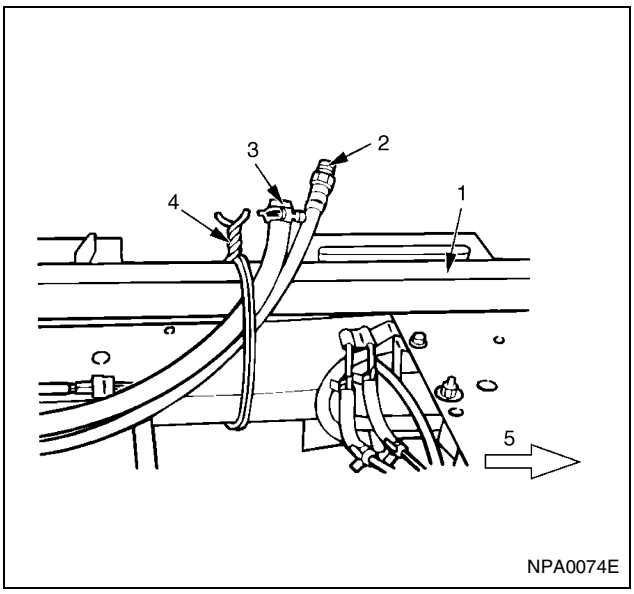
7. Low-Pressure Hose
   - Loosen the hose band and remove the hose from the oil pump.
8. High-Pressure Hose
   - Loosen the hose joint and remove the hose from the oil pump.

Notice:
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).



Legend
1. Low-pressure hose
2. High-pressure hose

Notice:
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.

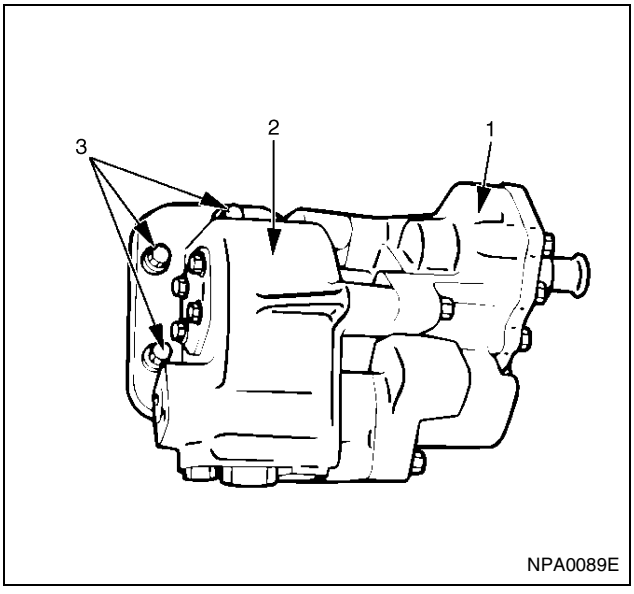


Legend
1. Left frame
2. High-pressure hose
3. Low-pressure hose
4. Wire
5. Truck front

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.

Notice:
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 15 kg (147 N), be fully careful of its drop at attachment and detachment.

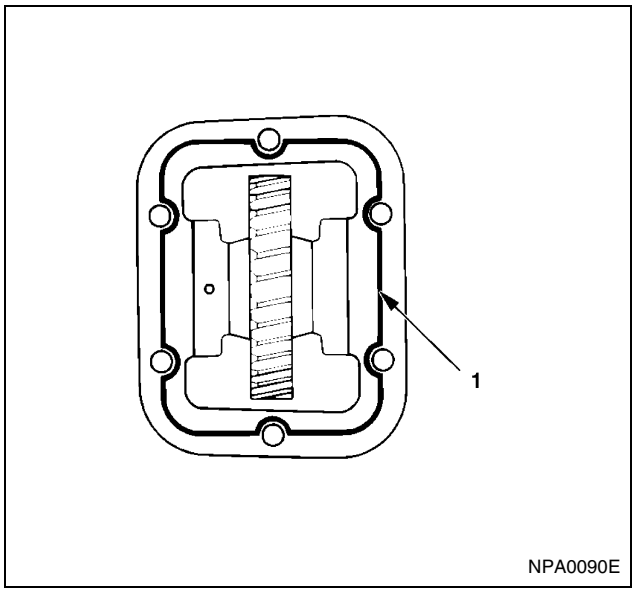


Legend
1. Oil pump
2. PTO
3. Bolt

Installation

Notice:
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.

1. 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).

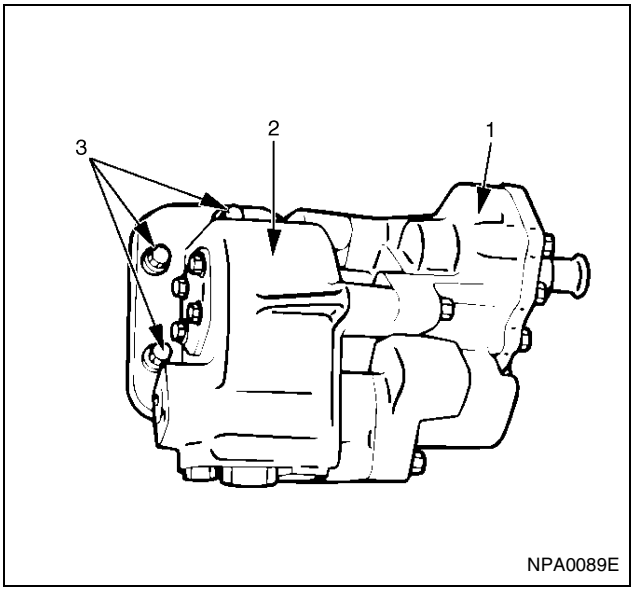


Legend
1. Apply liquid gasket

Notice:
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.

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

Tighten:
PTO bolt to 45 N·m (4.6 kg·m / 33 lb·ft)



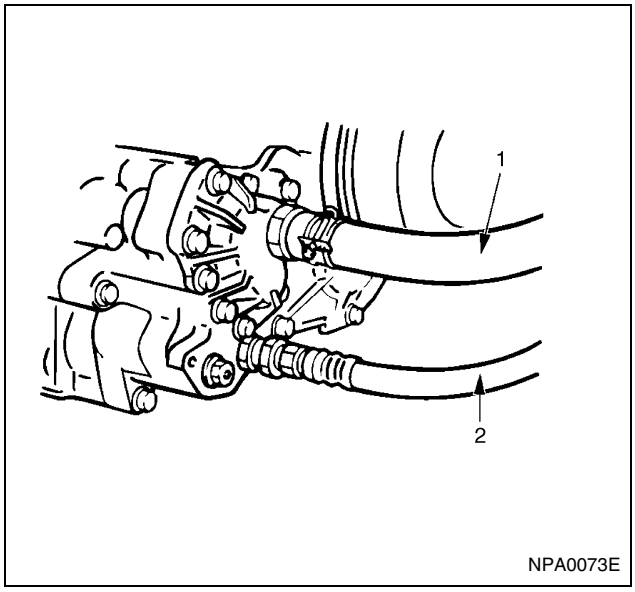
Legend
1. Oil pump
2. PTO
3. Bolt

3. High-Pressure Hose
   - Install the high-pressure hose in the oil pump and firmly tighten the joint.

Notice:
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.

4. Low-Pressure Hose
   - Install the hose and firmly tighten the hose band.

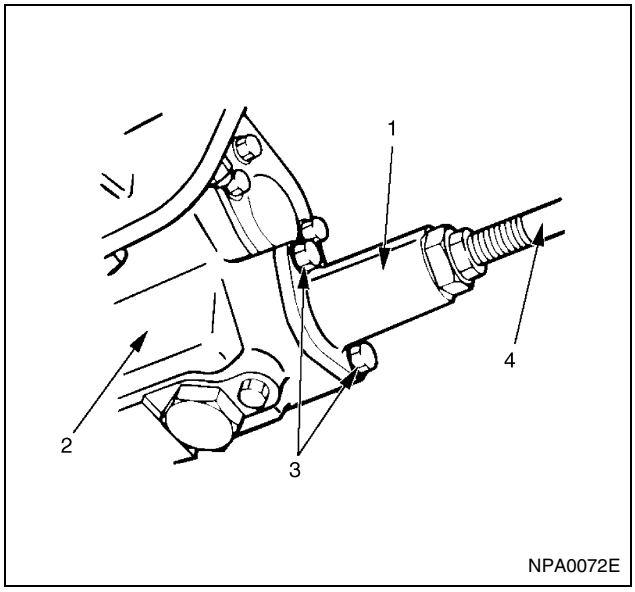
Notice:
When installing the high-pressure hose and the low-pressure hose, be fully careful so that dust or foreign matter will not be mixed in the pose port and the oil pump.



Legend
1. Low-pressure hose
2. High-pressure hose

5. Control Cable
6. Cable Holder
7. Bolt (Cable Holder)

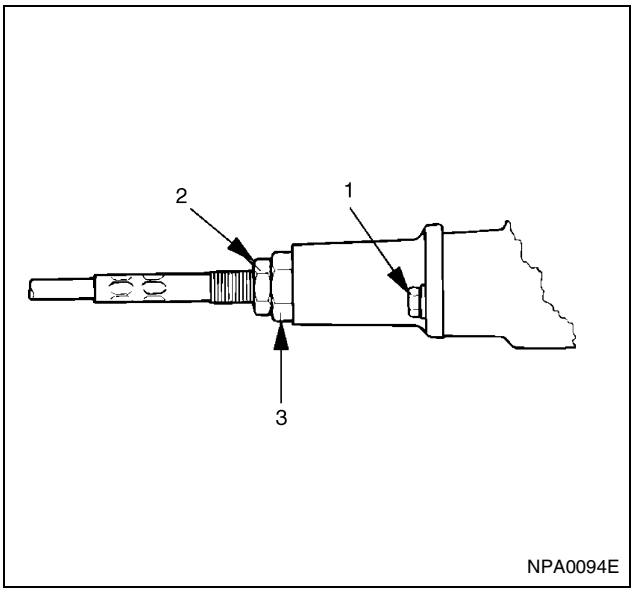
Notice:
Install the control cable and cable holder in the PTO in accordance with Items 1 to 4 of “Installation” in the “Removal and Installation of Control Cable for Rear Dump Truck”, and after installation inspect and adjust it in accordance with the “Amount of Spool Extrusion”.



Legend
1. Cable holder
2. PTO
3. Bolt
4. Control cable

- 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.

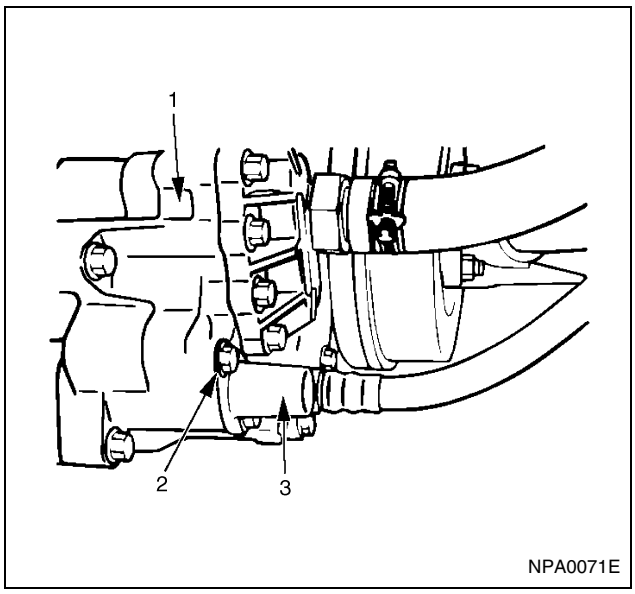
Tighten:
- Bolt to 24 N·m (2.4 kg·m / 17 lb·ft)
- Special nut to 147 N·m (15 kg·m / 108 lb·ft)
- Lock nut to 20 N·m (2.0 kg·m / 14lb·ft)



Legend
1. Bolt
2. Lock nut
3. Special nut

8. Shift Cap
9. 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.

Tighten:
Shift cap bolt to 24 N·m (2.4 kg·m / 17 lb·ft)



Legend
1. Oil pump
2. Bolt
3. Shift cap

10. Drain Plug, Filler Plug
    - Firmly tighten the drain plug of the transmission.
    - Supply the transmission oil (BESCO gear oil transaxle (5W-30) or equivalent) until it flows out from the filler plug hole and firmly tighten the filler plug.

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

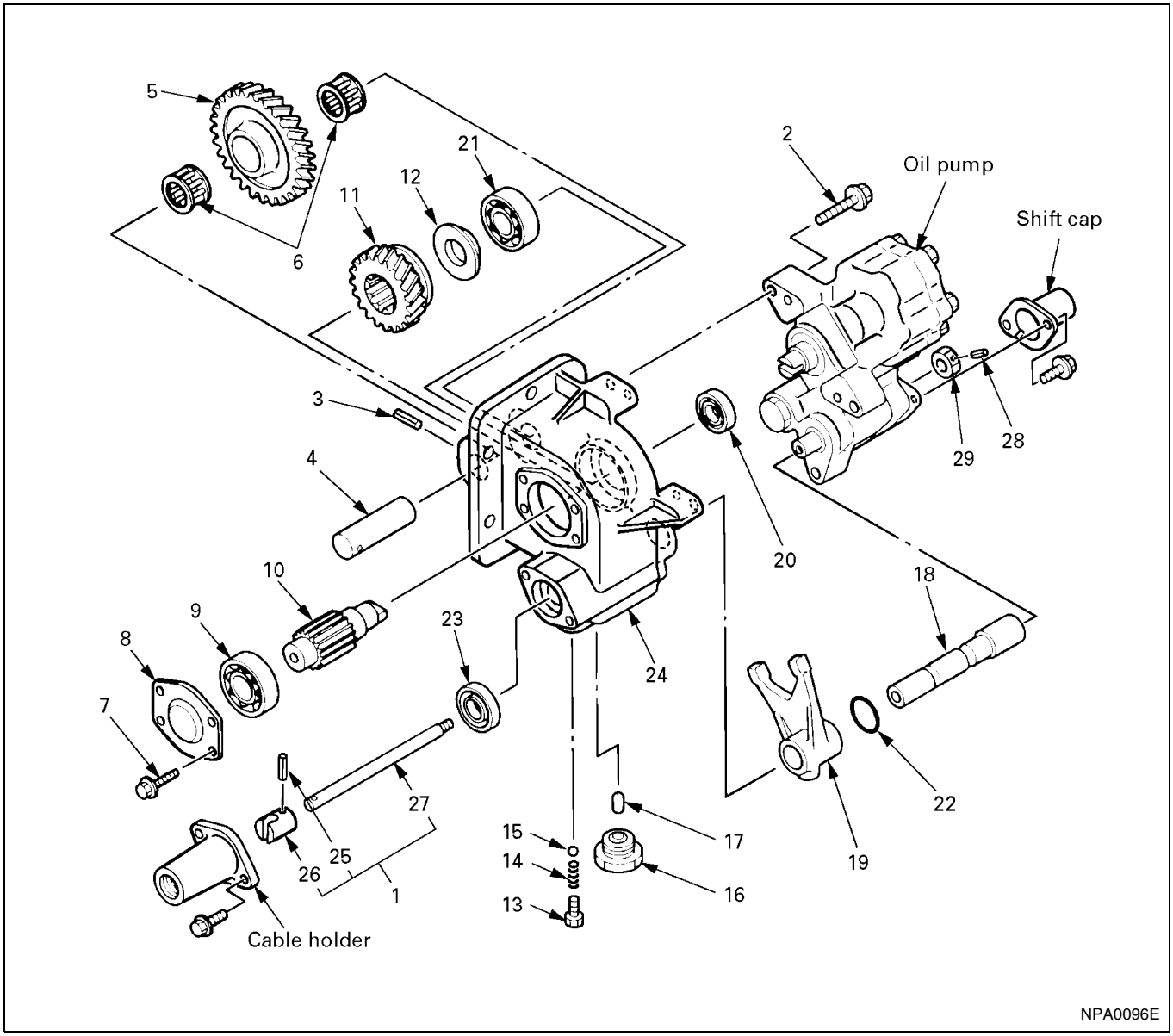
Tighten:
Drain plug and filler plug to 49 N·m (5.0 kg·m / 36 lb·ft)

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” and the “Air Bleeding Procedure of the Hydraulic Operating Fluid” described previously.

Unit Repair

PTO Assembly



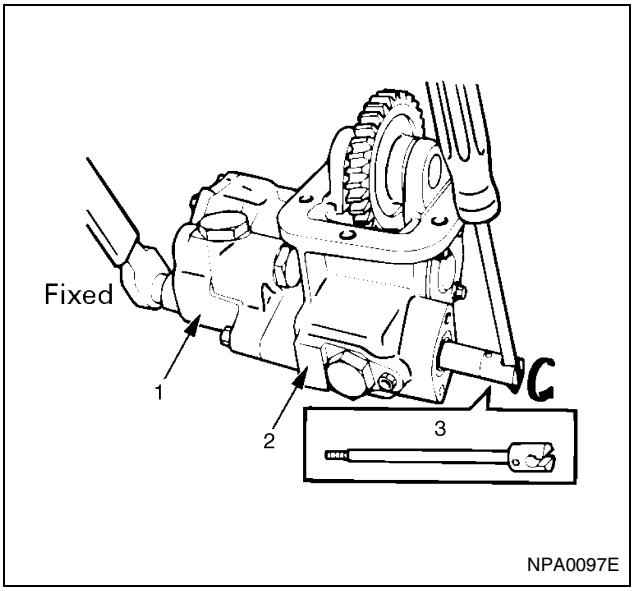
Legend

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

Disassembly Steps

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.

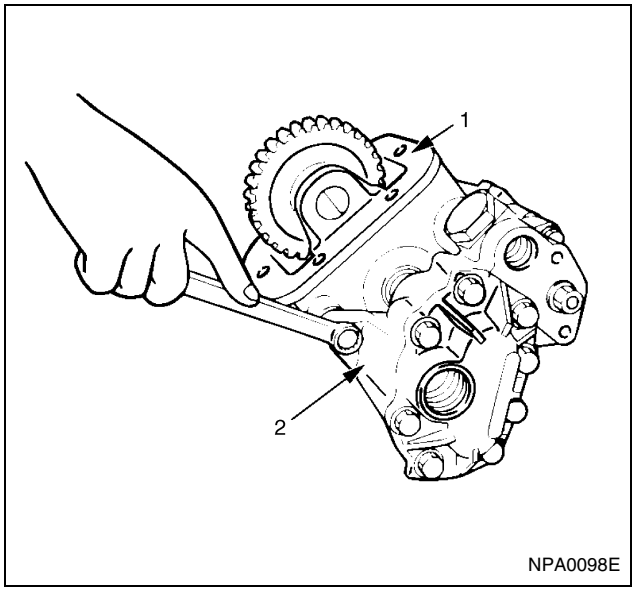
Notice:
Be sure to press the stopper adapter side and loosen it on the control cable connector side. (Press the stopper adapter side not to rotate the spool valve. Besides, the three-rotation dump truck is in contrast with this.)



Legend
1. Oil pump
2. PTO
3. Inner rod assembly

---

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

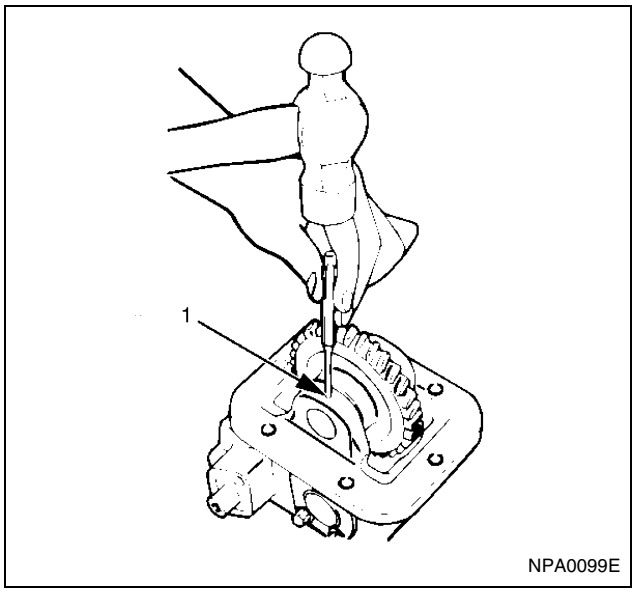


Legend
1. PTO
2. Oil pump

---

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.)

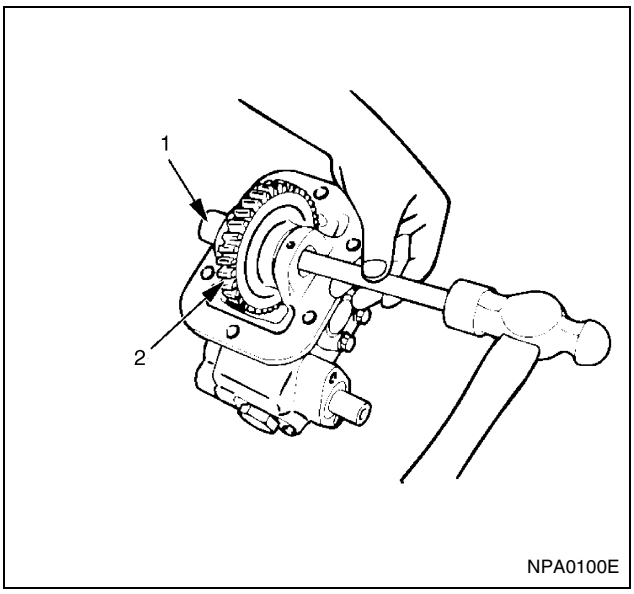
   Spring pin bar: 9-8529-2201-0



Legend
1. Spring pin

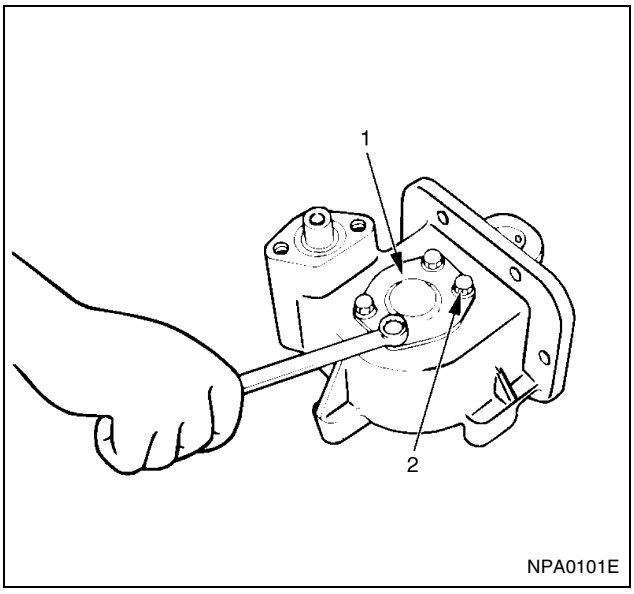
---

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.



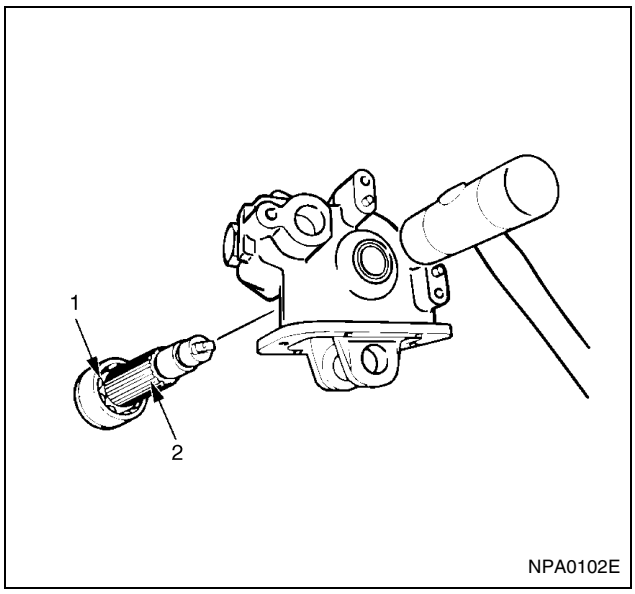
Legend
1. Idle gear shaft
2. Idle gear

7. Bolt
8. Case Cover
   - Remove the bolt and remove the case cover.



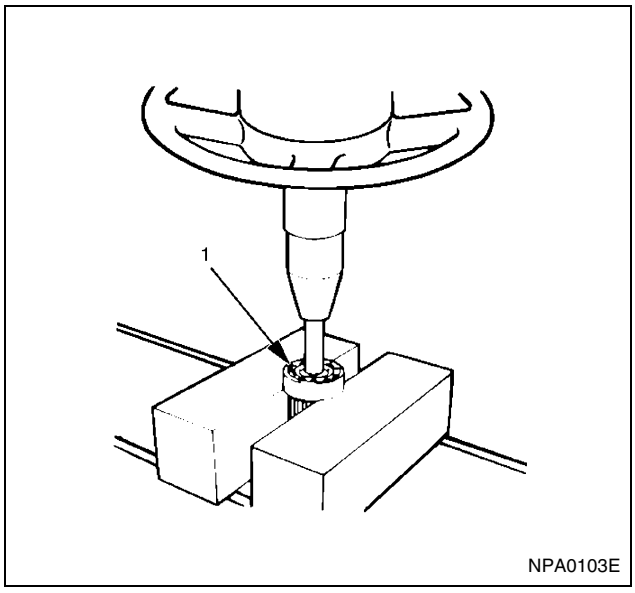
Legend
1. Case cover
2. Bolt

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.



Legend
1. Front ball bearing
2. Output shaft

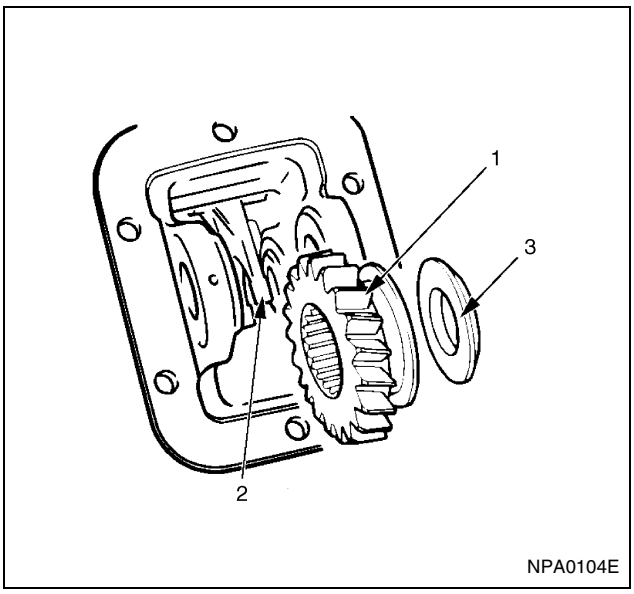
- Remove the front ball bearing from the output shaft.



Legend
1. Front ball bearing

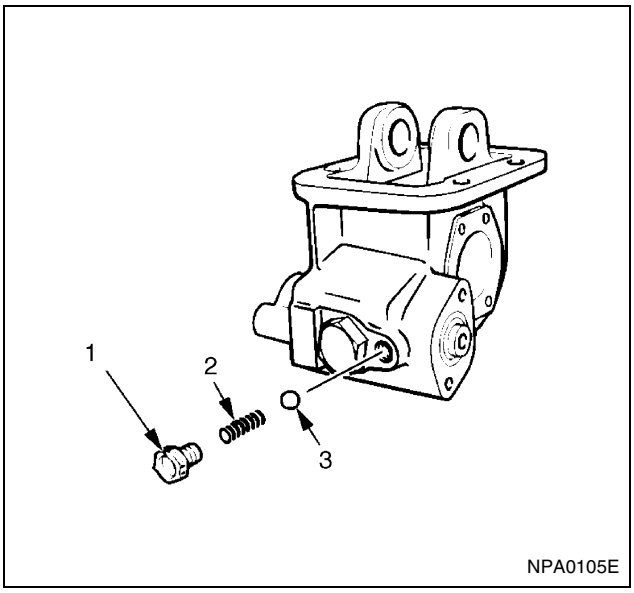
11. Output Gear
12. Thrust Collar
    - Remove the output gear and the thrust collar from the gear case.

Notice:
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.



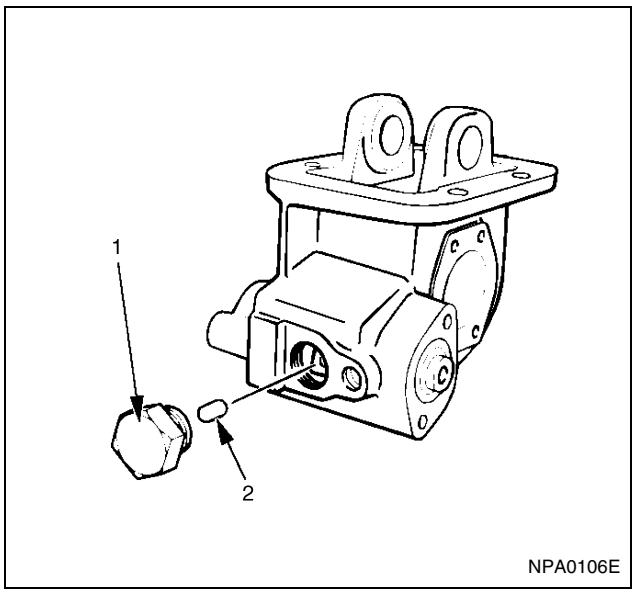
Legend
1. Output gear
2. Shift arm
3. Thrust collar

13. Spring Set Bolt
14. Spring
15. Ball
    - Remove the spring set bolt and remove the spring and ball.



Legend
1. Spring set bolt
2. Spring
3. Ball

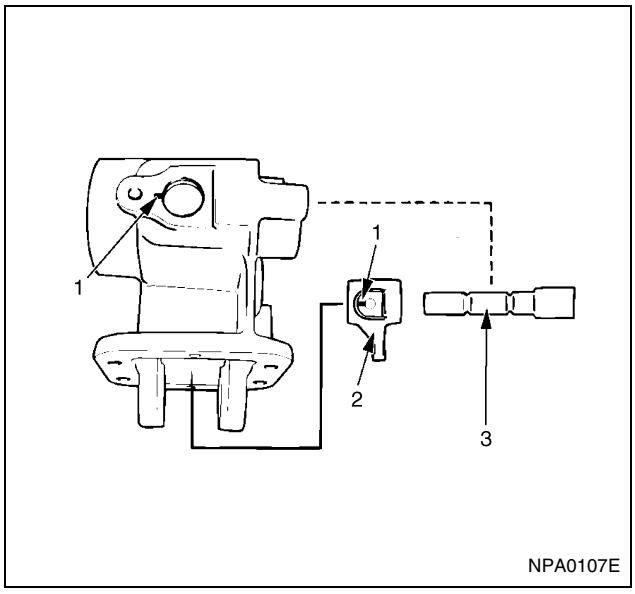
16. Interlock Plug
17. Interlock Pin
    - Remove the interlock plug and remove the interlock pin from the shift arm.



Legend
1. Interlock plug
2. Interlock pin

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.

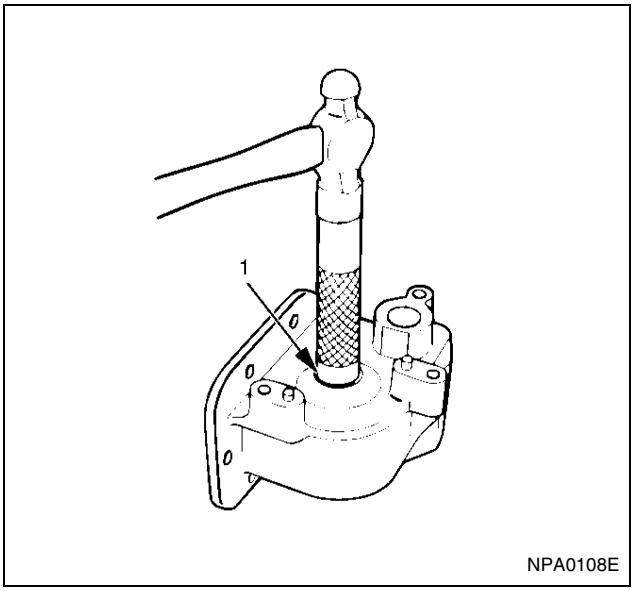
Notice:
When removing the shift arm, be sure to check the installation direction of the arm and apply the assignment mark. In that case, incorrect assembly can be prevented at subsequent assembly.



Legend
1. Alignment mark
2. Shift arm
3. Shift rod

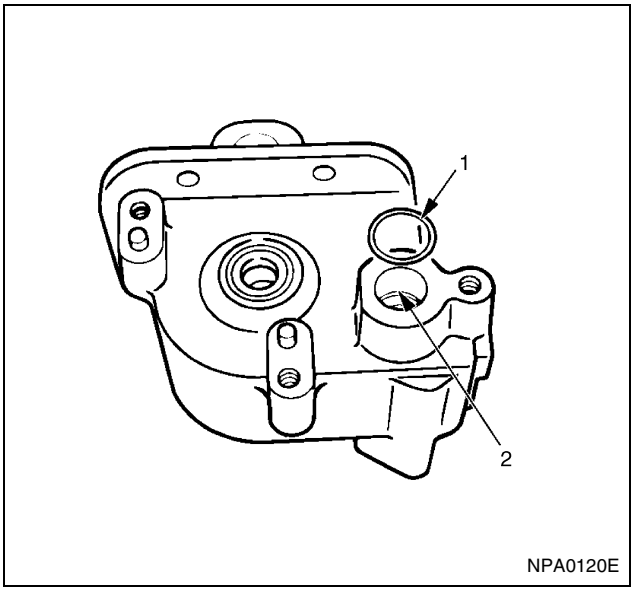
20. Oil Seal (Output Shaft Side)
21. Rear Ball Bearing
    - Pry the oil seal by a screwdriver and remove it, then strike the rear ball bearing from the rear side of the gear case and remove it.

    Bearing installer: 5-8840-2432-0



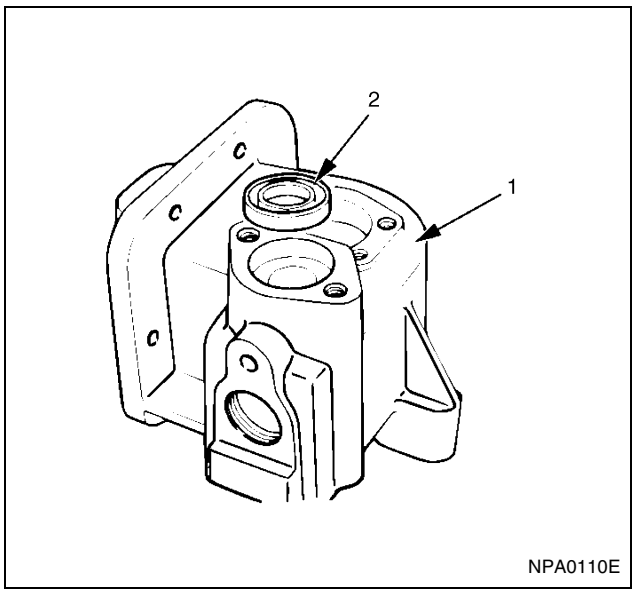
Legend
1. Rear ball bearing

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



Legend
1. O-ring
2. O-ring groove

23. Oil Seal (Shift Rod Side)
    - Remove the oil seal from the gear case.
24. Gear Case



Legend
1. Rear case
2. Oil seal

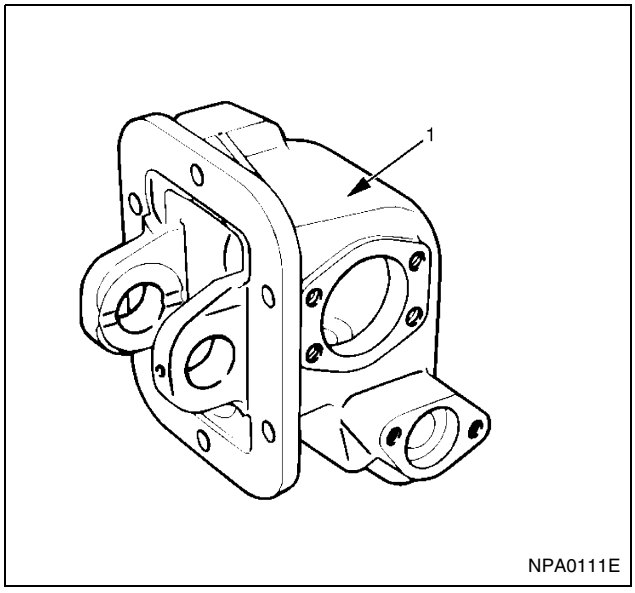
25. Spring Pin
26. Cable Connector
27. Inner Rod
28. Spring Pin
29. Stopper Adapter
    - Remove the cable connector or stopper adapter from the inner rod as requested.

Inspection and Repair

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

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.

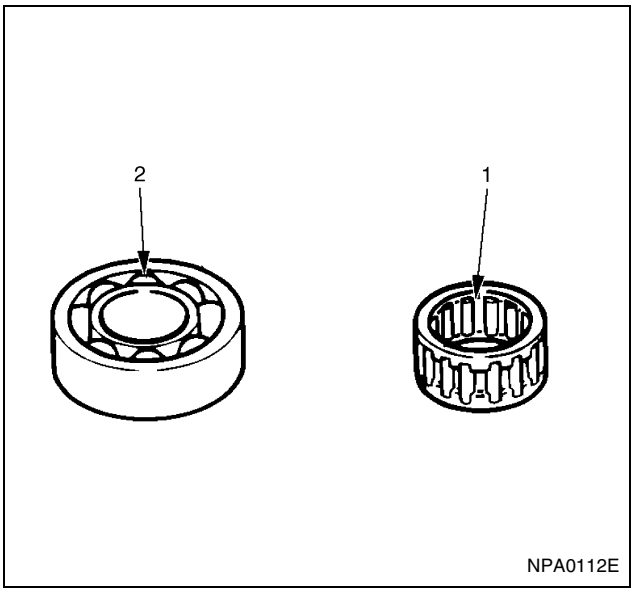


Legend
1. Gear case

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.

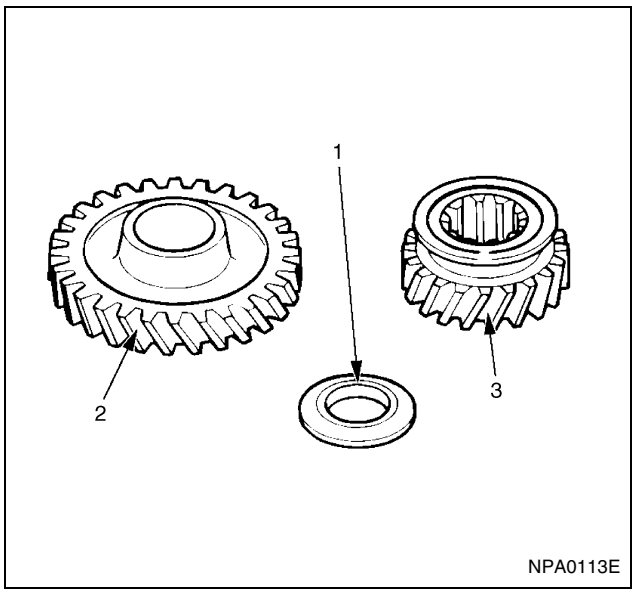
Notice:
If the ball bearing is removed, replace it by a new one.



Legend
1. Needle bearing
2. Ball bearing

Gears and Thrust Collar

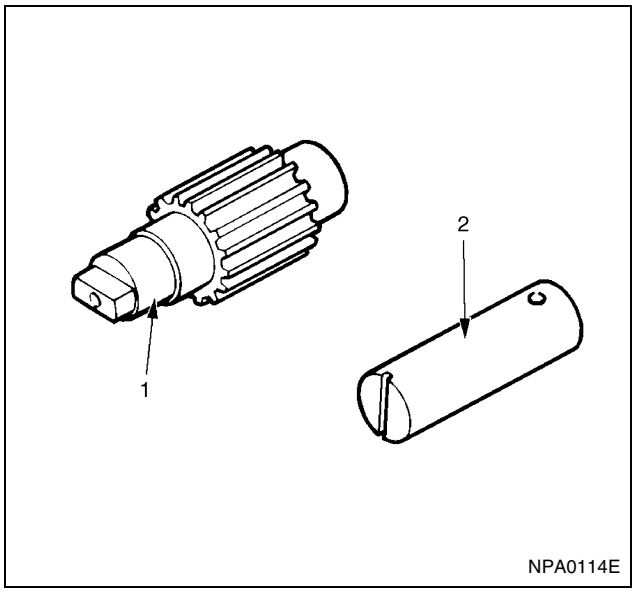
- Inspect the tooth surface of each gear and replace what has remarkable wear or damage. Further, correct lightly staged wear or a rough surface with an oil stone.
- Inspect both surfaces of the thrust collar and replace the thrust collar if there is a remarkable surface roughness or wear.



Legend
1. Thrust collar
2. Idle gear
3. Output gear

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.



Legend
1. Output shaft
2. Idle gear shaft

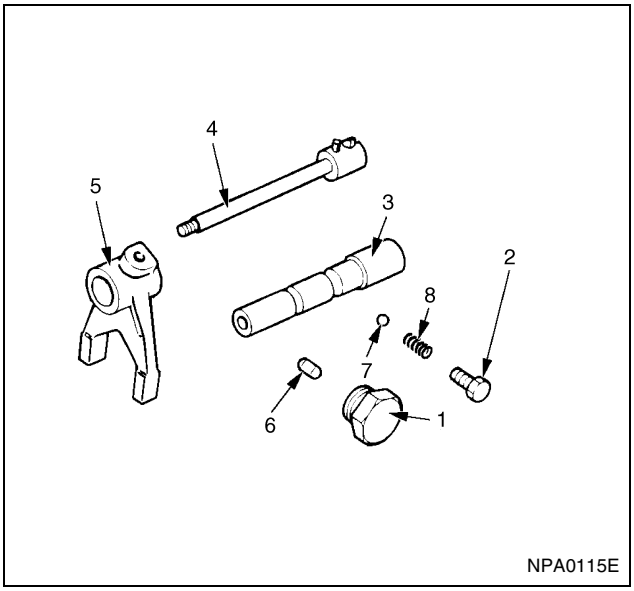
Shift Mechanism

- 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
Standard: 9.0 mm (0.354 in)
Limit: 8.5 mm (0.335 in)

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

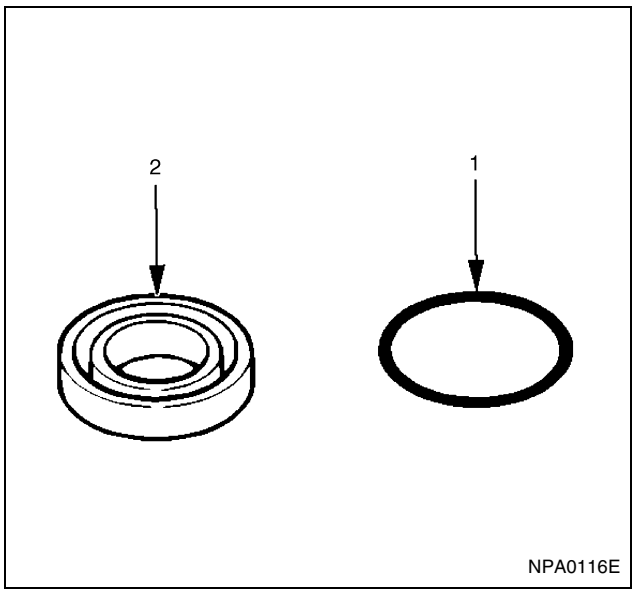


Legend
1. Interlock plug
2. Spring set bolt
3. Shift rod
4. Inner rod assembly
5. Shift arm
6. Interlock pin
7. Ball
8. Spring

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.

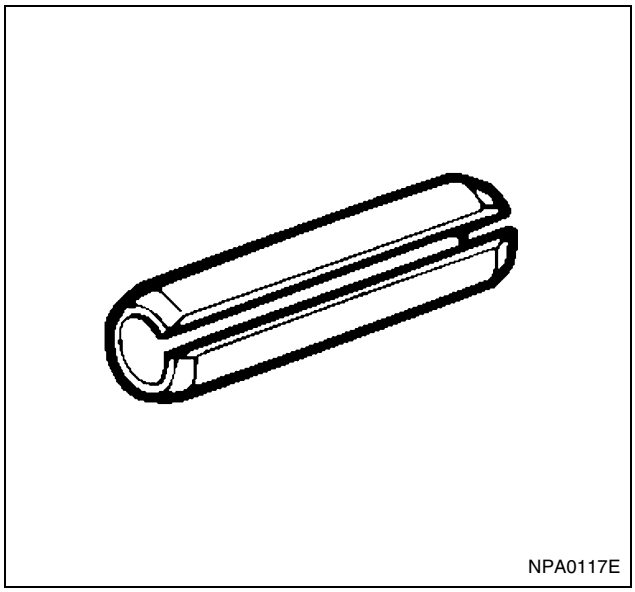
Notice:
If the PTO is disassembled, replace the oil seal and the O-ring by new ones in principle. Further, if the oil seal and the O-ring are removed, they cannot be reused.



Legend
1. O-ring
2. Oil seal

Spring Pin

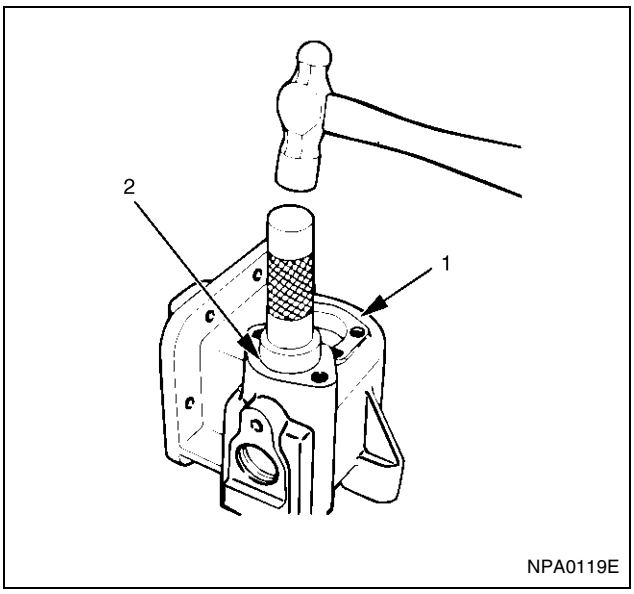
Notice:
Be sure to replace the spring pin by a new one.



Reassembly Steps

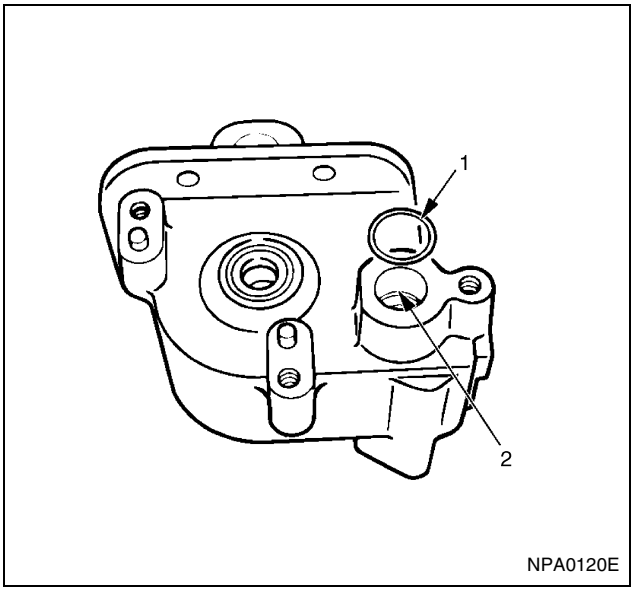
1. Gear Case
2. Oil Seal (Shift Rod Side)
   - Coat the lip portion of the oil seal with lithium grease (BESCO L-2 or equivalent), the periphery portion of the seal with liquid gasket (LOCTITE 518 or equivalent).
   - Install the lip portion of the oil seal in the shift rod side (front side) of the gear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

   Oil seal installer: 5-8840-2433-0



Legend
1. Gear case
2. Oil seal

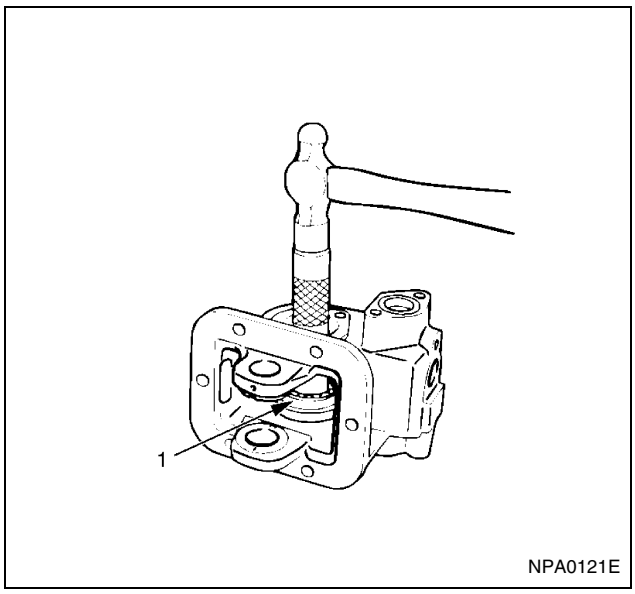
3. O-Ring
   - Thinly coat the O-ring and the O-ring groove of the gear case with lithium grease (BESCO L-2 or equivalent) and firmly assemble them in the groove so that there will be no damage and torsion.



Legend
1. O-ring
2. O-ring groove

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

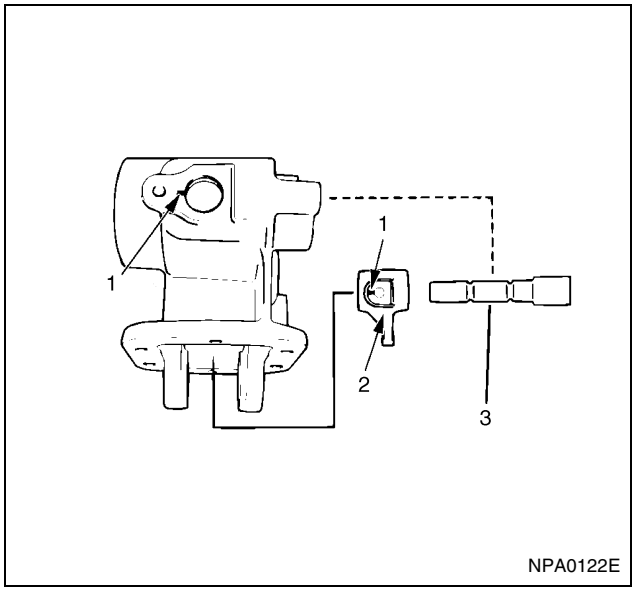
   Bearing installer: 5-8840-2432-0



Legend
1. Rear ball bearing

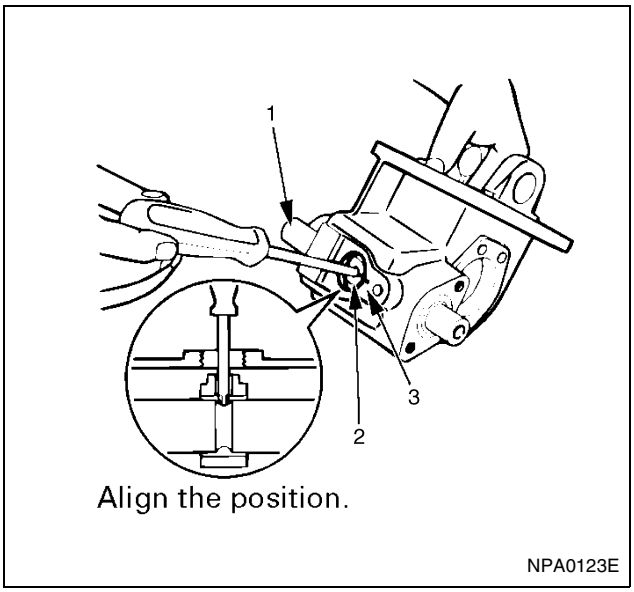
5. Shift Arm
   - Assemble the shift arm in the gear case.
6. Shift Rod
   - Thinly coat the shift rod with lithium grease (BESCO L-2 or equivalent) and insert it in the gear case, then assemble it in the shift arm.

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



Legend
1. Alignment mark
2. Shift arm
3. Shift rod

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



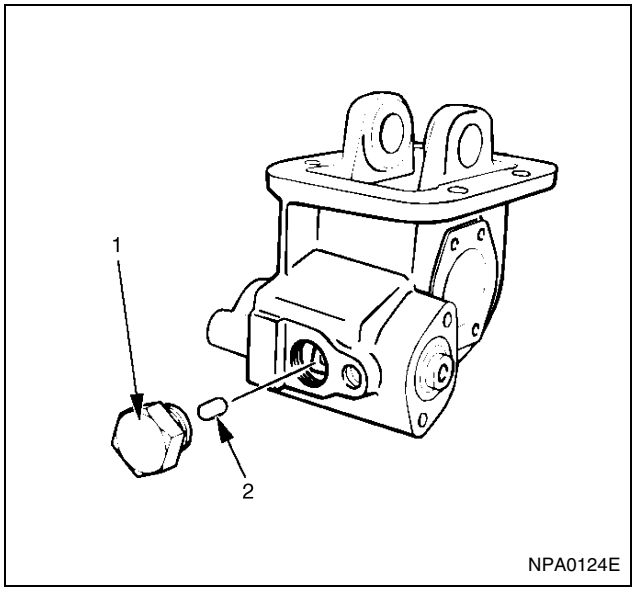
Legend
1. Shift rod
2. Shift arm
3. Alignment mark

---

7. Interlock Pin
8. 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.

Tighten:
Interlock plug to 60 N·m (6.1 kg·m / 44 lb·ft)

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

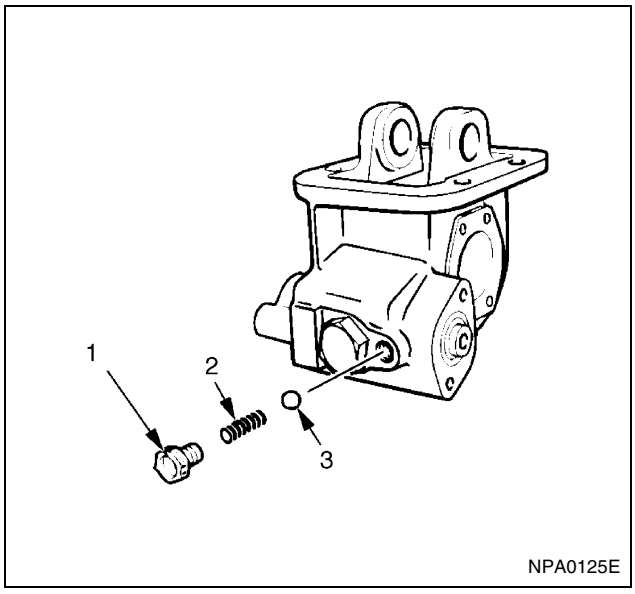


Legend
1. Interlock plug
2. Interlock pin

---

9. Ball
10. Spring
11. 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.

Tighten:
Set bolt to 19 N·m (1.9 kg·m / 14 lb·ft)

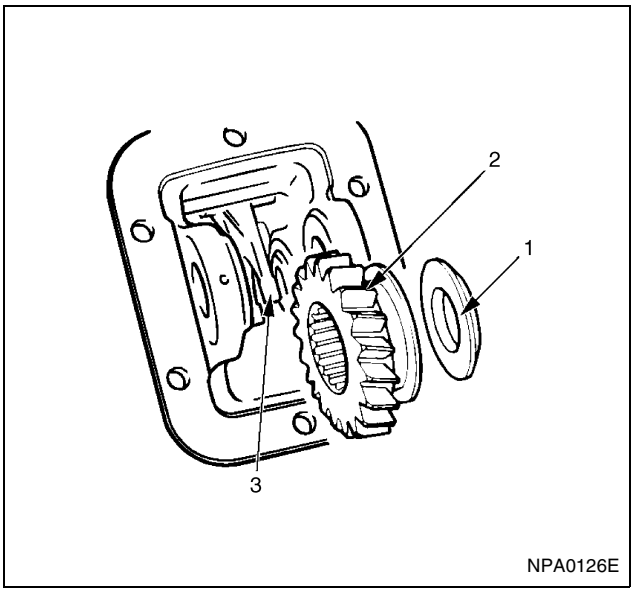


Legend
1. Spring set bolt
2. Spring
3. Ball

---

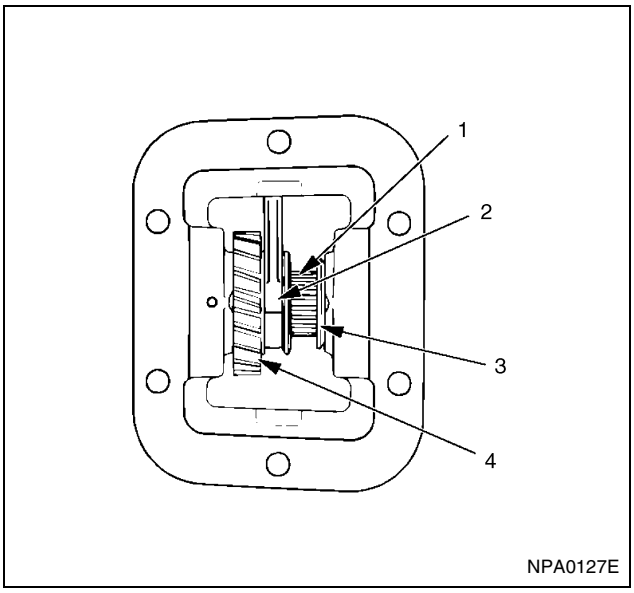
12. Output Gear

13. 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.



Legend
1. Thrust collar
2. Output gear
3. Shift arm

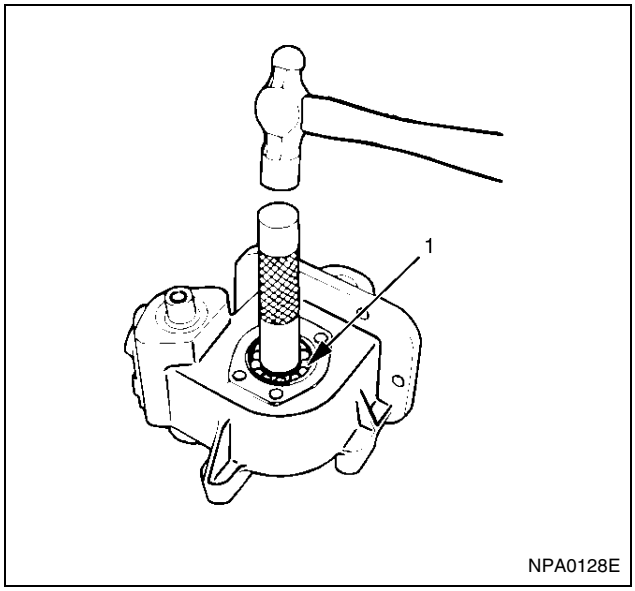
14. Output Shaft
    - Insert the output gear engaging its spline and align the output shaft tip to the inner lace of the rear bearing, then strike and install the output shaft by applying a splint to its front side head portion.



Legend
1. Output shaft
2. Shift arm
3. Thrust collar
4. Output gear

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

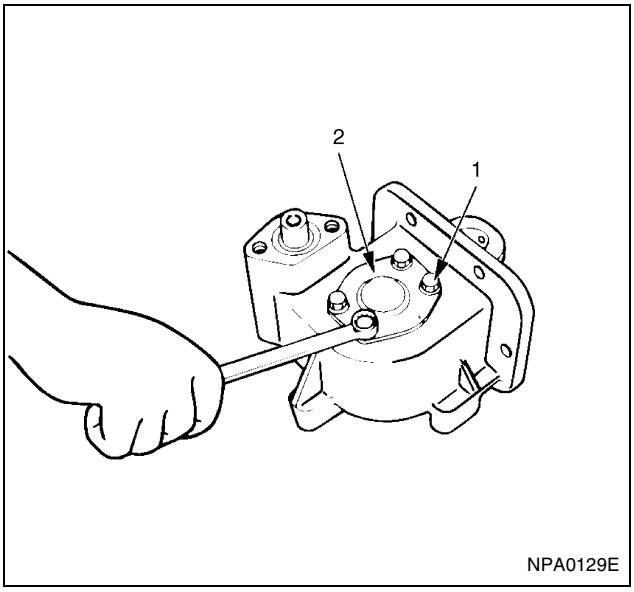


Legend
1. Front ball bearing

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.

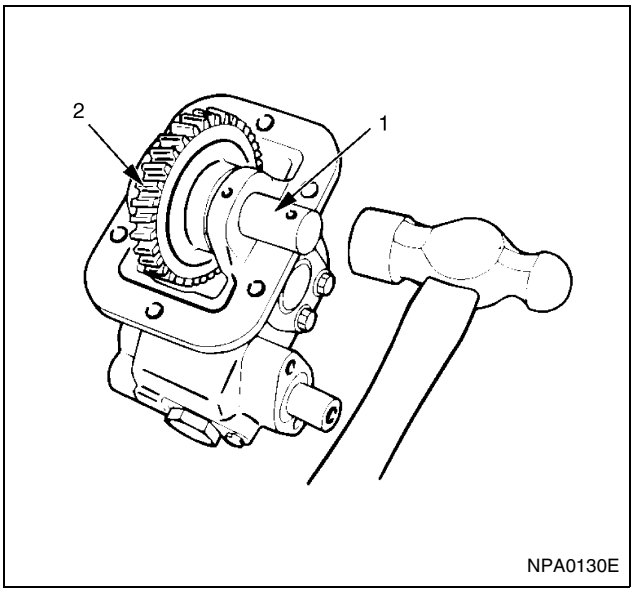
Tighten:
Case cover bolt to 24 N·m (2.4 kg·m / 17 lb·ft)

Notice:
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.



Legend
1. Bolt
2. Case cover

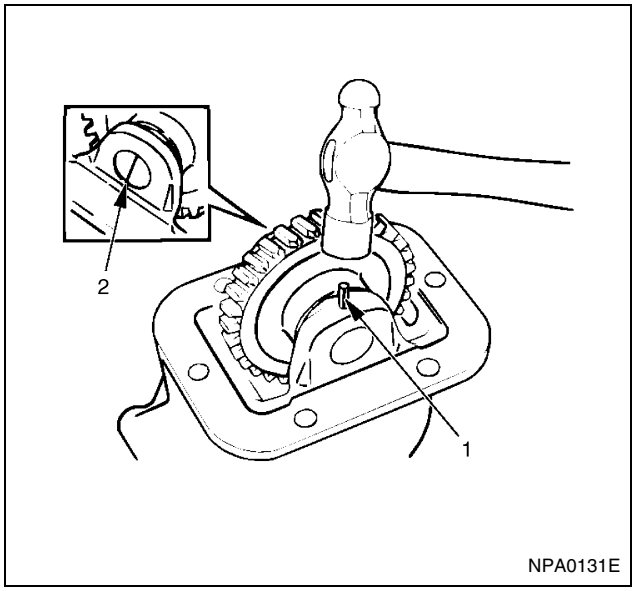
18. Needle Bearing
19. Idle Gear
    - Coat the needle bearing with assembly all amount of lithium grease (BESCO L-2 or equivalent) and assemble the needle bearing in the idle gear.
20. Idle Gear Shaft
    - Assemble the tooth round portion of the idle gear facing the front side and assemble the pin hole of the idle gear shaft facing the front side.



Legend
1. Idle gear shaft
2. Idle gear

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.

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

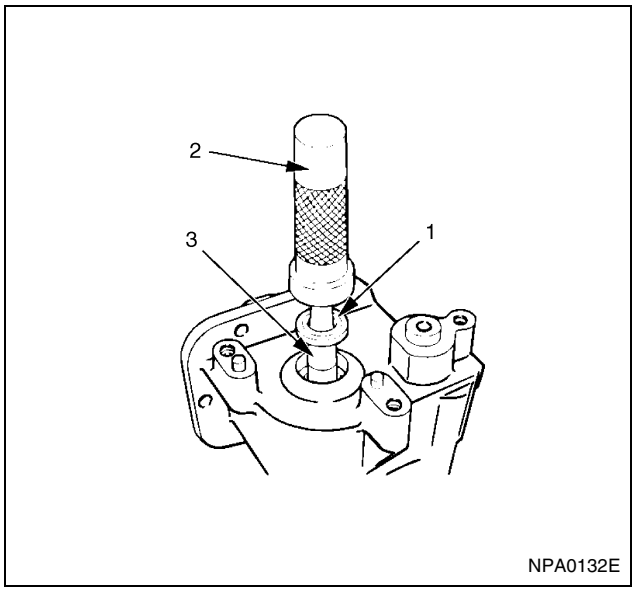


Legend
1. Spring pin
2. Slit

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.

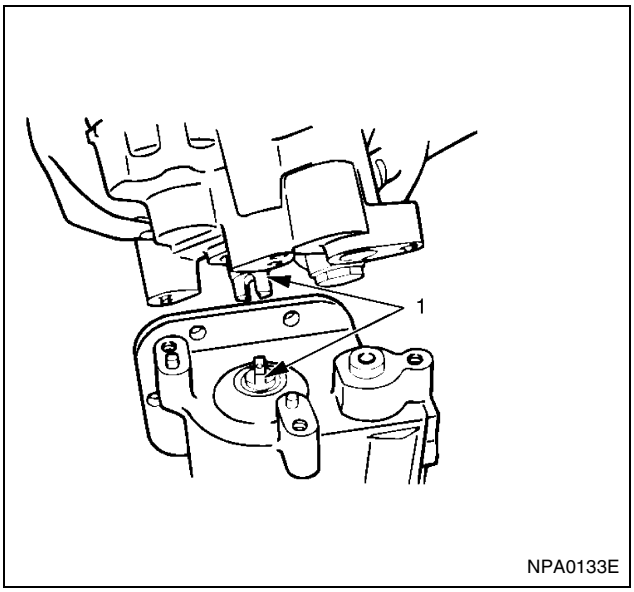
    Oil seal installer: 5-8840-2433-0

    Oil seal guide: 5-8840-2564-0



Legend
1. Oil seal
2. Oil seal installer
3. Oil seal guide

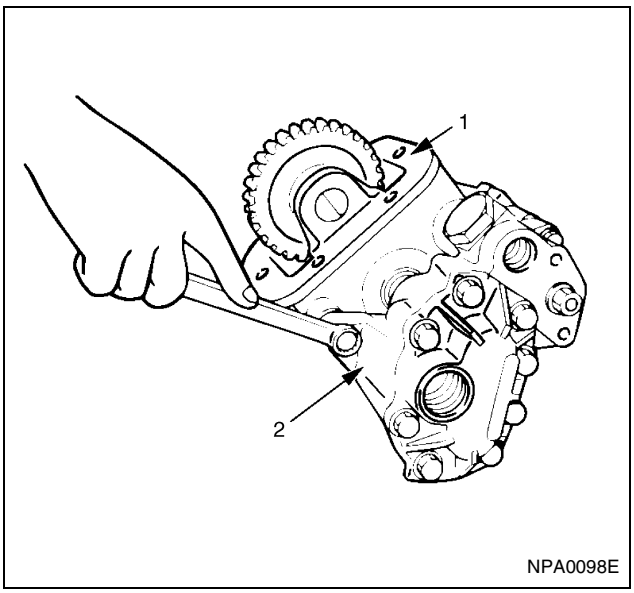
23. Bolt
    - To install the oil pump in the PTO, fully coat the shaft tip portion of the PTO and the oil pump shaft groove portion with the lithium grease (BESCO L-2 or equivalent) for rust prevention.



Legend
1. Coated with grease

    - 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.

Tighten:
PTO bolt to 53 N·m (5.4 kg·m / 39 lb·ft)

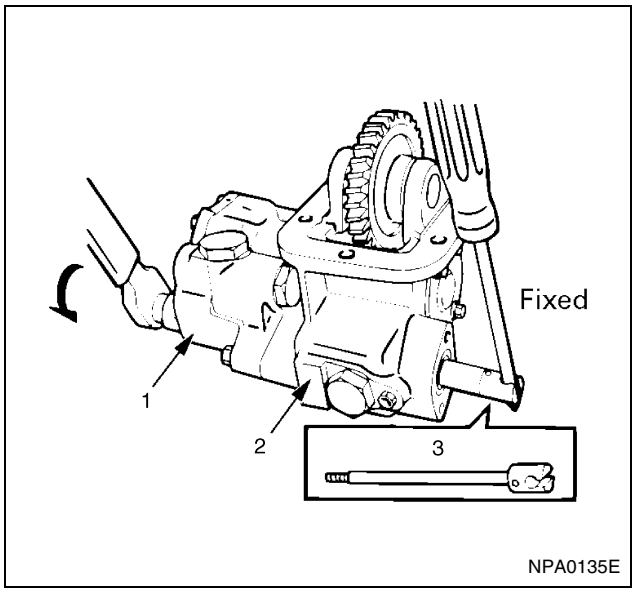


Legend
1. PTO
2. Oil pump

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.

Notice:
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.)

Tighten:
Inner rod to 19 N·m (1.9 kg·m / 14 lb·ft)

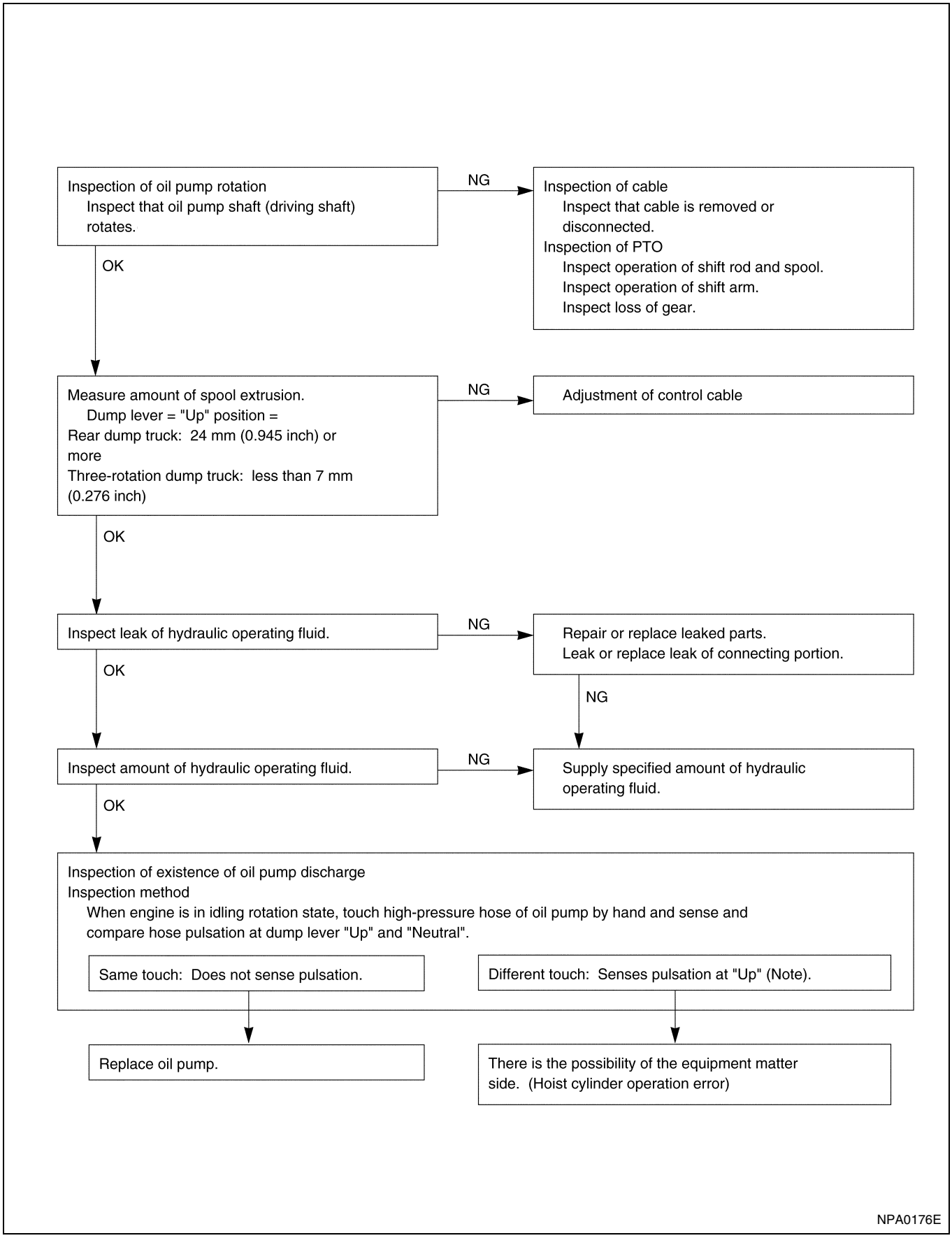


Legend
1. Oil pump
2. PTO
3. Inner rod assembly

Troubleshooting

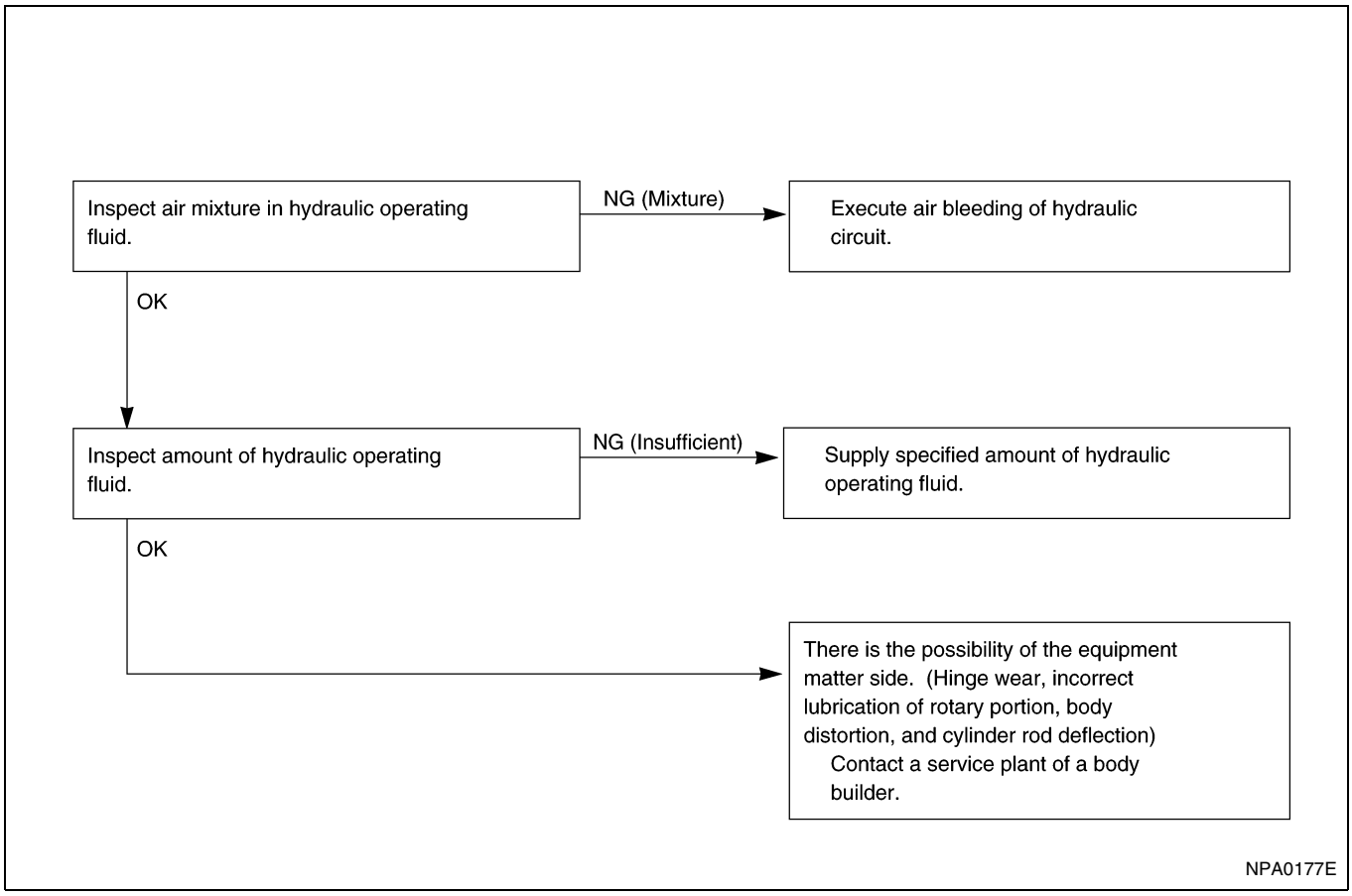
Inspection Based on Defect Symptoms

Defect 1. The Dump Body Rise is Disabled.

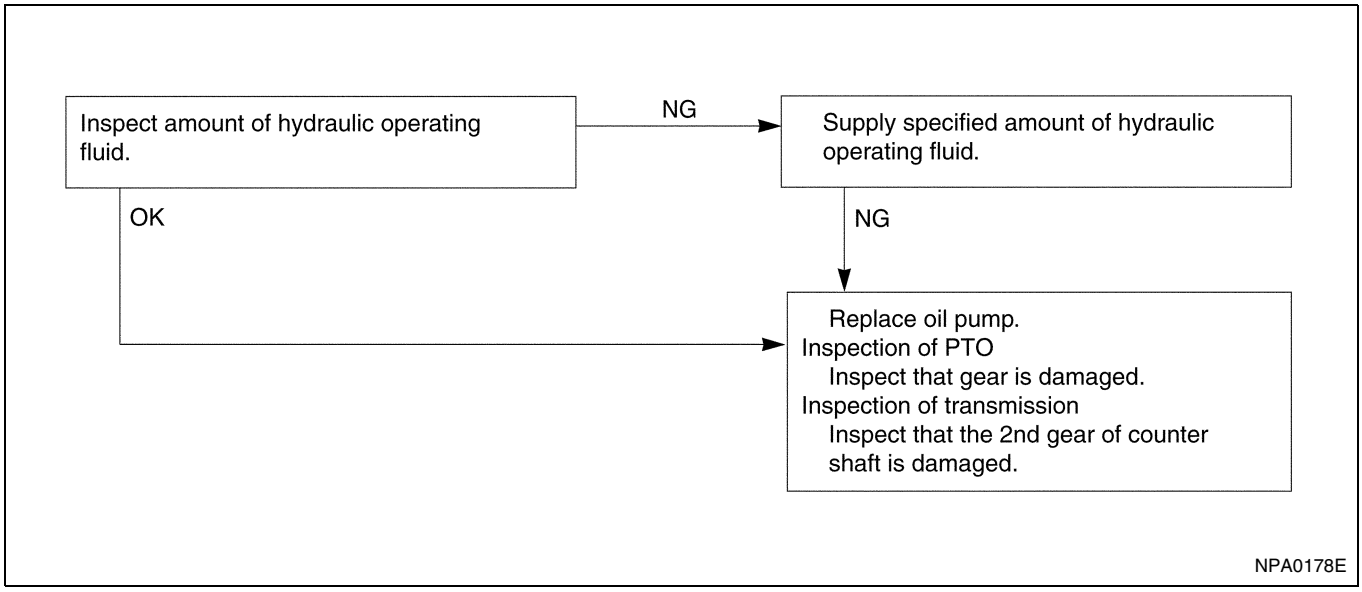


Notice:
For examination by touch on hose, be careful not to mix this pulsation with engine vibration.

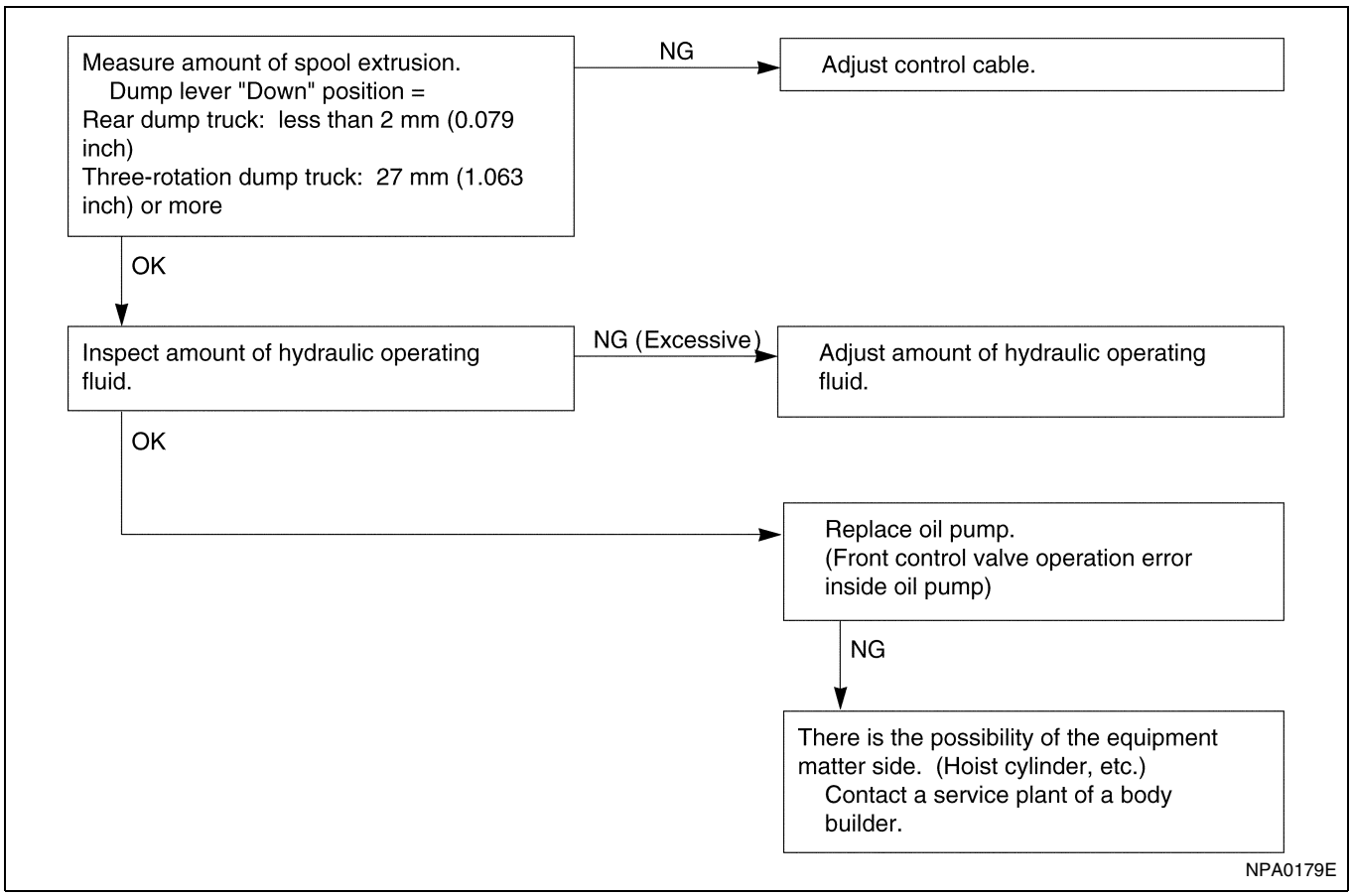
Defect 2. The Body (Cargo Deck) is Lugged During Rise.



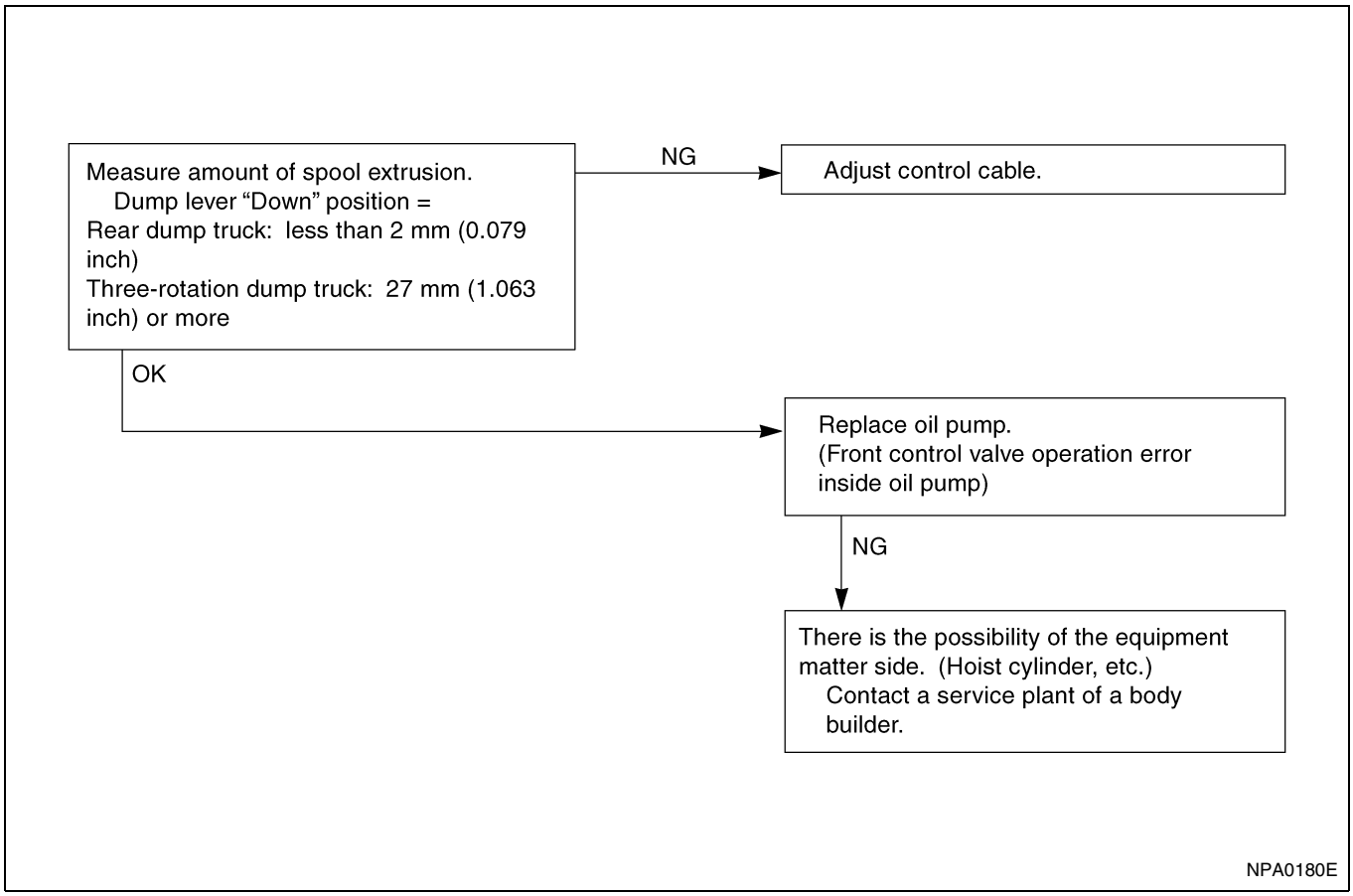
Defect 3. While the Body (Cargo Deck) is Being Raised, The Oil Pump Portion Causes a Large Abnormal Sound (Such As Caterwaul or Grate).



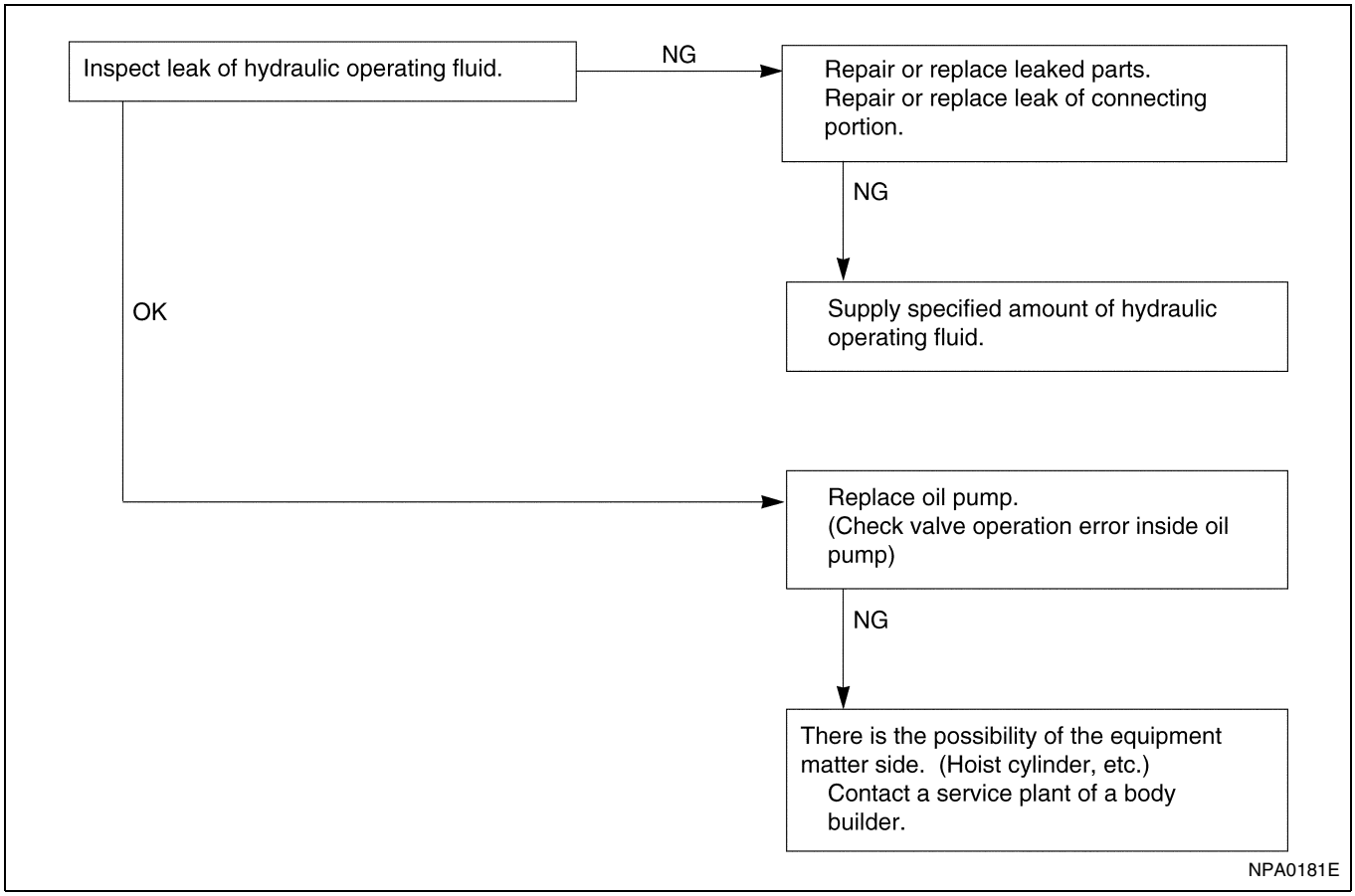
Defect 4. The Dump Body is Kept Being Raised or Does Not Drop Intermediately.



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

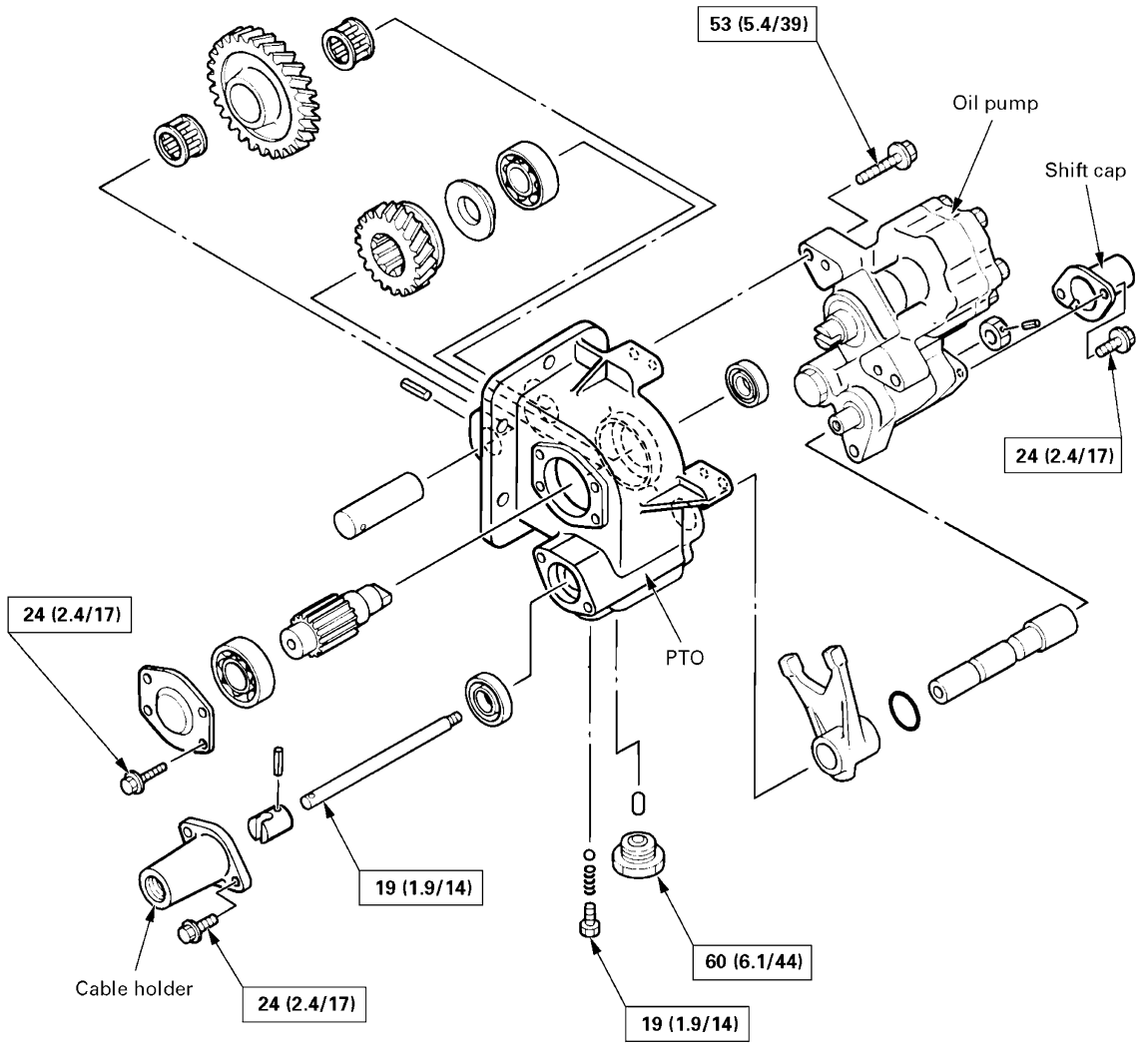
PTO with Oil Pump Assembly

Item	Specifications
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

This illustration is based on a rear dump truck model.

N·m (kg·m / lb·ft)



NPA0136E

Special Tools

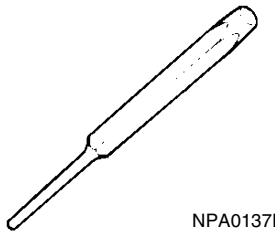
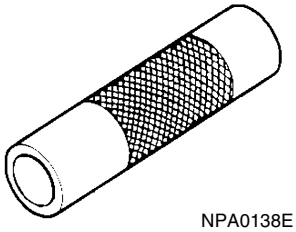
Illustration	Tool Number / Description / Remarks
 NPA0137E	9-8529-2201-0 / Spring pin bar
 NPA0138E	5-8840-2432-0 / Bearing installer

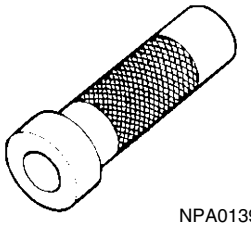
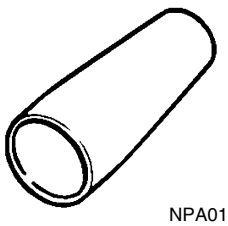
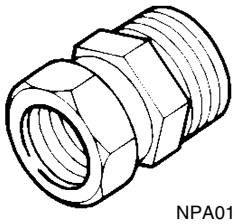
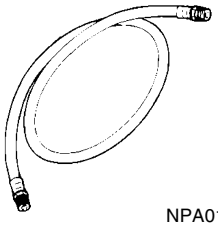
Illustration	Tool Number / Description / Remarks
 NPA0139E	5-8840-2433-0 / Oil seal installer
 NPA0140E	5-8840-2564-0 / Oil seal guide

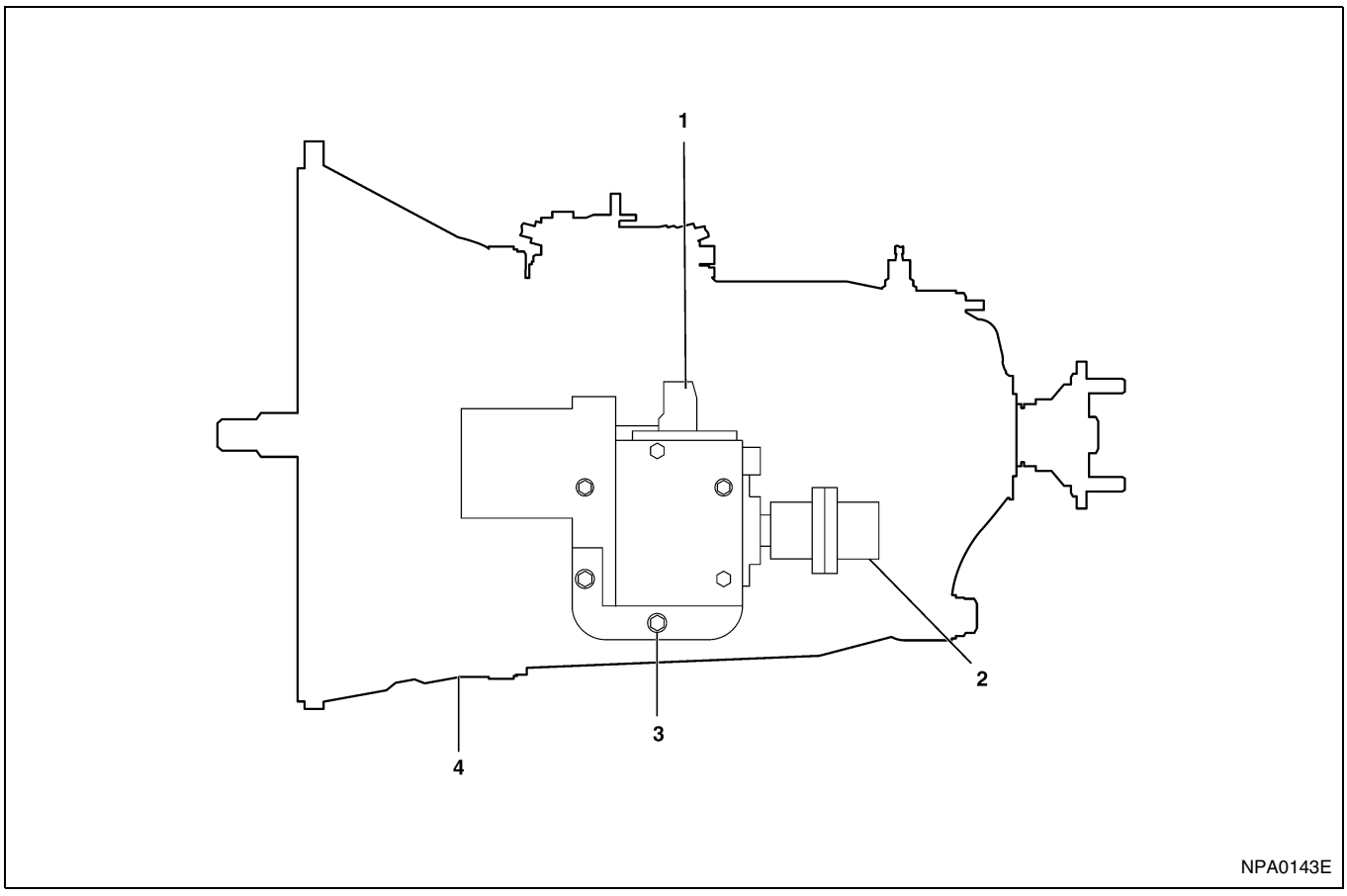
Illustration	Tool Number / Description / Remarks
 NPA0141E	5-8840-2439-0 / Joint (low-pressure side) PF3/ 4 male screw/PF1/2 nut
 NPA0142E	5-8840-2435-0 / Test hose (2 m long) (Between oil pump and oil container) Metal cap PF1/2 male screw ×2)

ELECTRONIC CONTROL TYPE PTO ASSEMBLY

Removal and Installation

Removal

1. PTO Output Propeller Shaft
   - Remove the propeller shaft, which is connected to equipment, at the flange portion of PTO.
   - Turn the PTO switch to ON, engage the gears, and loosen the nut which tightens the PTO output flange so that it can be rotated by hand at disassembly.
2. Battery Terminal
   - Disconnect the negative (–) terminal of battery terminal.
3. Transmission Oil
   - Remove the drain plug of the transmission to drain oil.
4. Wiring Connector
   - Disconnect the two wiring connectors.
5. PTO
   - Remove the bolts and nuts at six locations, which install the PTO to the transmission, and remove the PTO.



Legend

1. Wiring connector
2. PTO output propeller shaft
3. PTO
4. Transmission oil

Installation

1. PTO
   - Apply liquid gasket (THREE BOND TB1215 or equivalent) to the mating surface of the transmission case and PTO.
   - Install the PTO assembly to the transmission and tighten the bolts and nuts to the specified torque. (Apply LOCTITE 242 to the bolt threads.)

Tighten:
Bolt and nut to 37 N·m (3.8 kg·m / 27 lb·ft)

2. Wiring Connector
   - Connect wiring connector and secure them at the bracket portion.
3. Transmission Oil
   - Pour oil to the transmission.
     Specified oil: BESCO gear oil transaxle (5W-30)

4. Battery Terminal
   - Install the battery terminal securely and tighten it.
5. PTO Output Propeller Shaft
   - Turn the PTO to ON and tighten the tightening nut of PTO output flange to the specified torque.

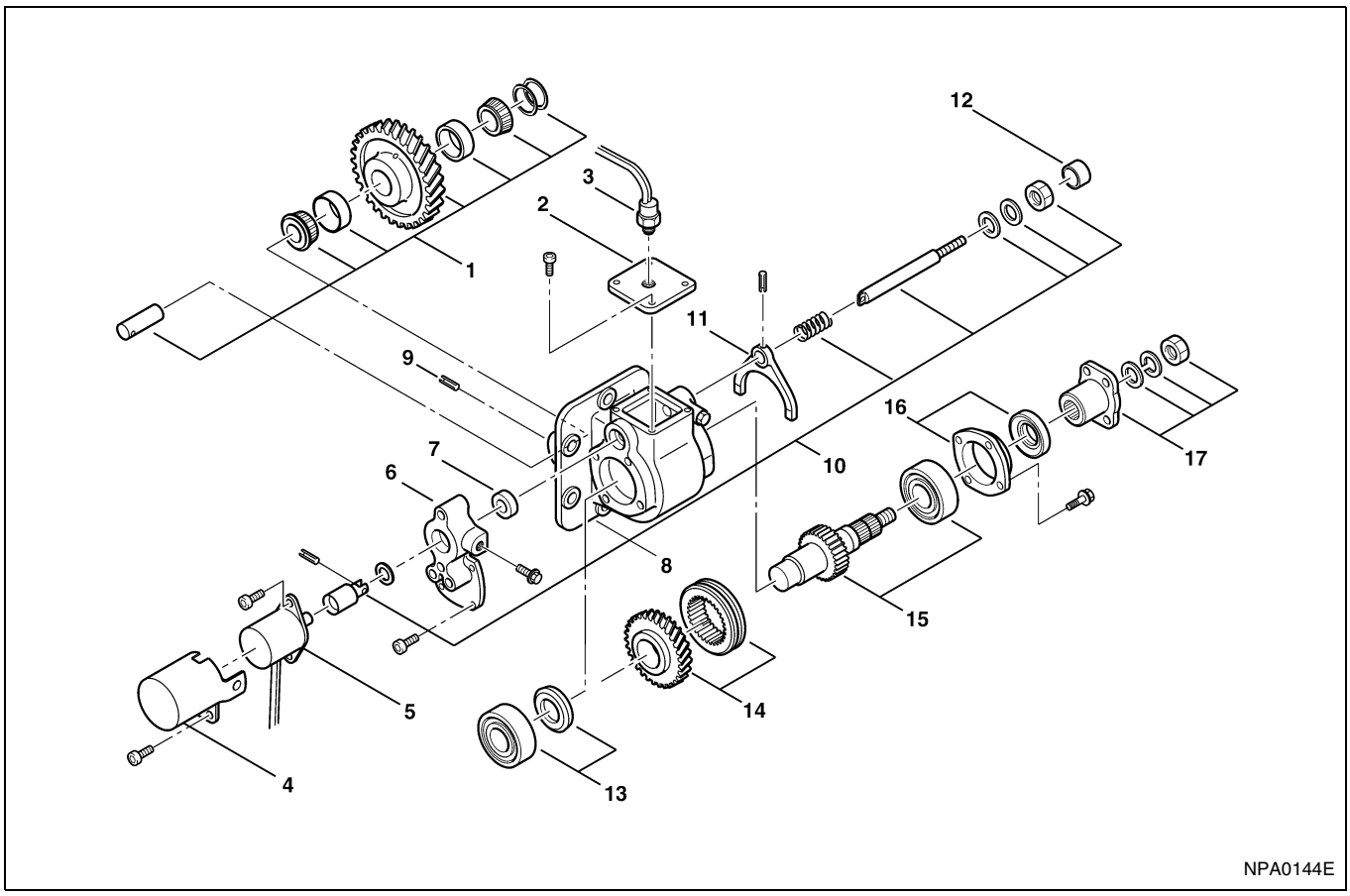
Tighten:
PTO output flange nut to 105 N·m (10.7 kg·m / 77 lb·ft)

   - Install the propeller shaft, which is connected to equipment, to the flange portion of PTO.

Tighten:
Propeller shaft to 17 N·m (1.7 kg·m / 13 lb·ft)

Unit Repair

Electronic Control Type PTO Body



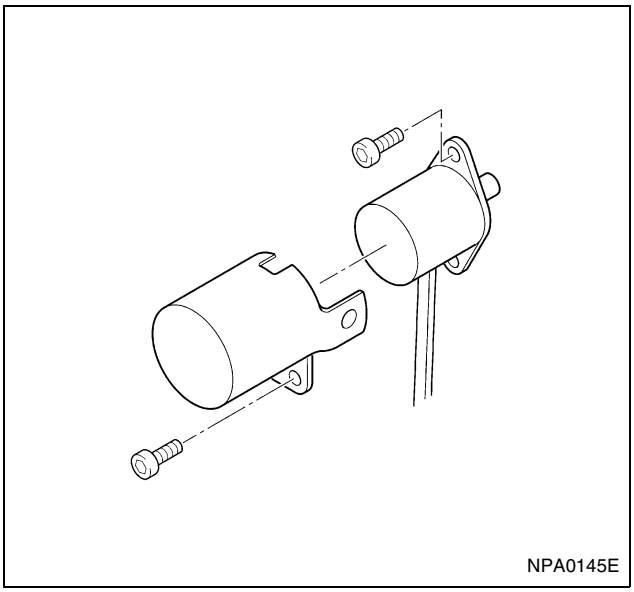
Legend

1. Idle shaft, idle gear, taper roller bearing
2. Upper cover
3. PTO switch
4. Solenoid cover
5. Solenoid assembly
6. Adapter
7. Oil seal
8. Gear case
9. Spring pin
10. Solenoid plunger, washer, shift rod, spring (plain washer, nut)
11. Shift fork
12. Plug
13. Front bearing, thrust collar
14. Gear, sleeve
15. Output shaft, rear bearing
16. Rear cover, oil seal
17. Nut, washer, flange

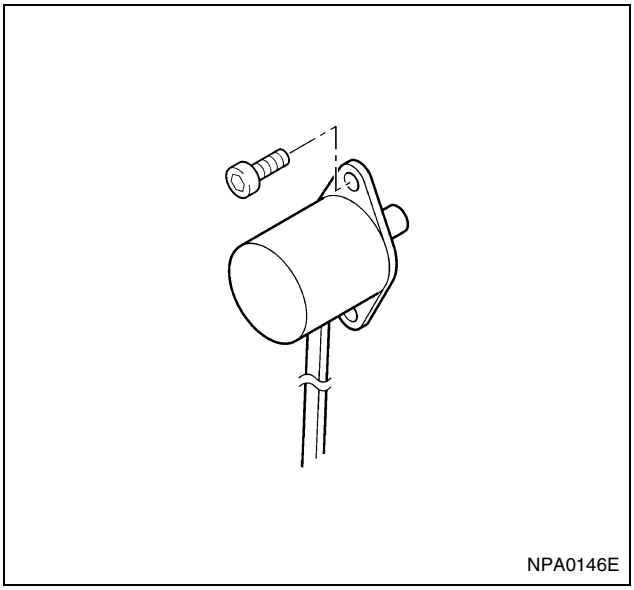
Disassembly

Disassembly Steps

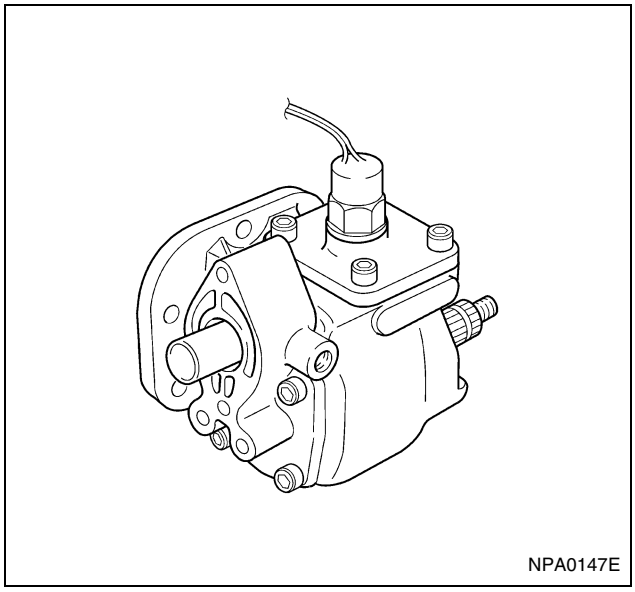
1. Cover, Solenoid
   - Remove the three bolts and remove the cover.


NPA0145E

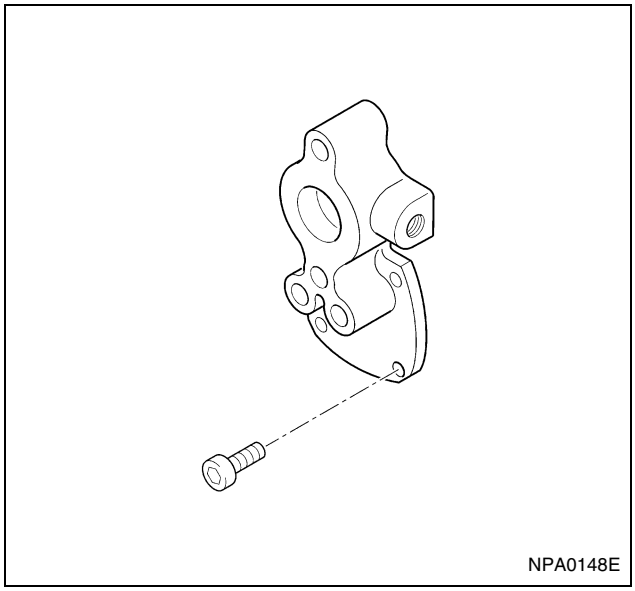
2. Solenoid
   - Disconnect the harness connector and remove the two bolts. Remove the solenoid.


NPA0146E

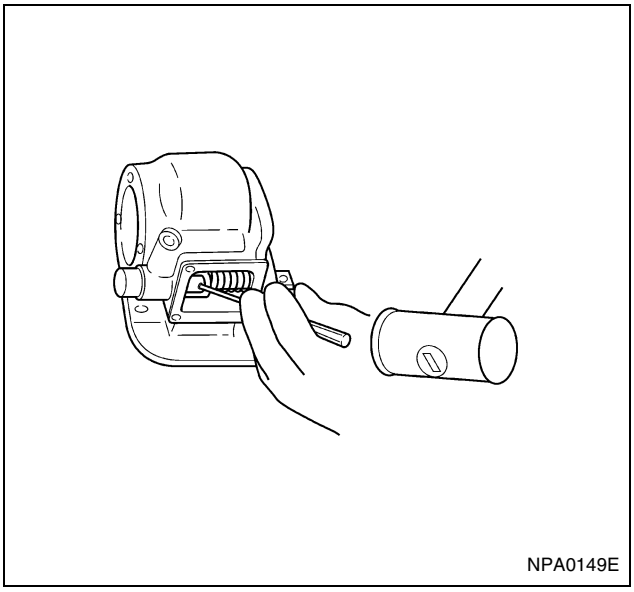
3. PTO Switch
4. Upper Cover
   - Remove the four bolts and remove the upper cover.


NPA0147E

5. Adapter
   - Remove the four bolts and remove the adapter.

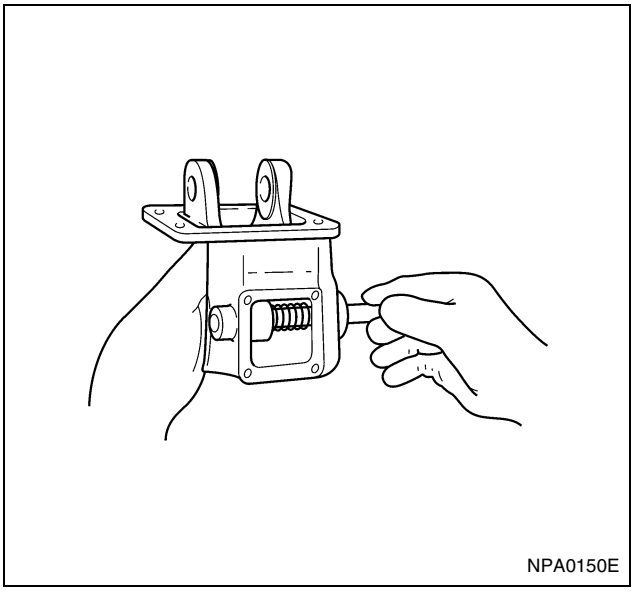

NPA0148E

6. Spring Pin
   - Punch out the spring pin of shift fork.


NPA0149E

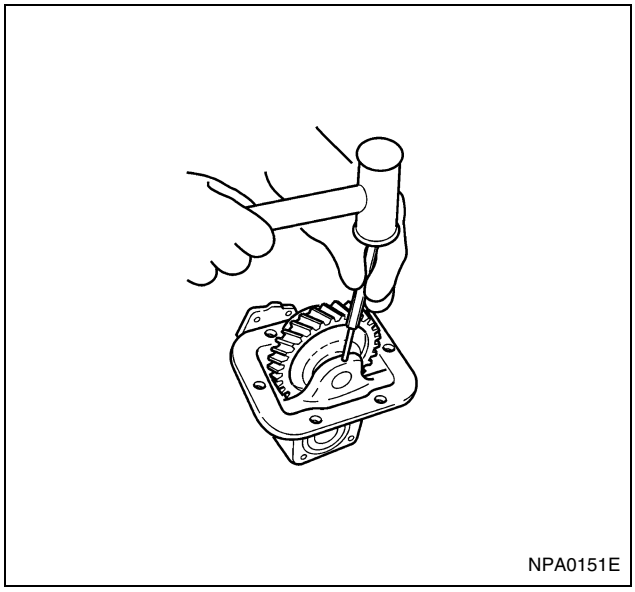
7. Shift Rod, Shift Fork, Spring Pin, Solenoid, Plunger, Washer
   - Pull out the shift rod and remove the shift fork and spring washer.
8. Oil Seal
9. Plug

Caution:
If the plug and oil seal are not faulty, removal of them is not necessary.

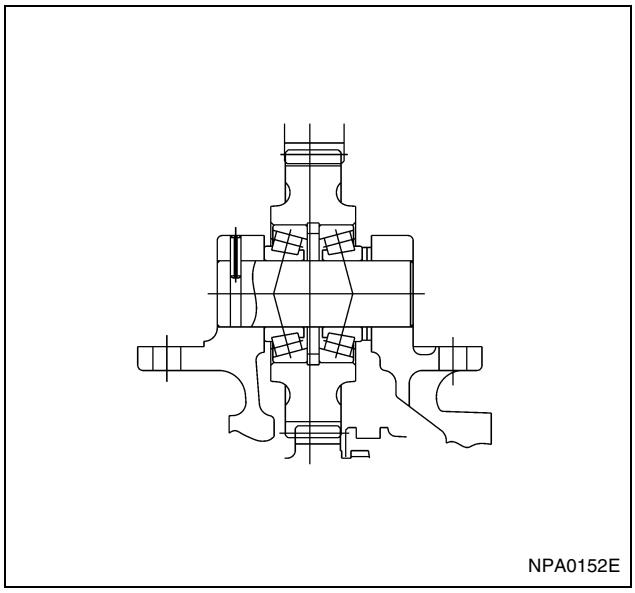

NPA0150E

10. Spring Pin
    - Punch the spring pin into the idle gear shaft. (After removing the idle gear shaft, pull the spring pin out from the shaft.)

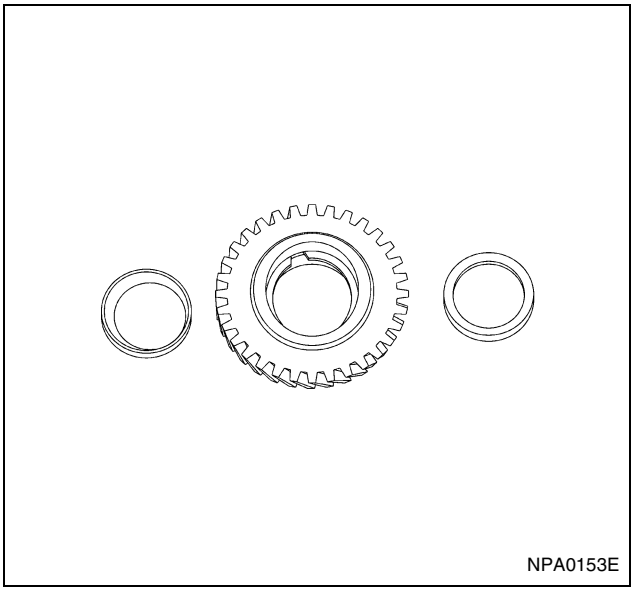
Special Tool
Spring pin remover; 9-8529-2201-0


NPA0151E

11. Idle Gear, Taper Roller Bearing, Shim, Shaft
    - Pull out the idle gear shaft and remove the idle gear (with snap ring), the taper roller bearings (two) and the shim.

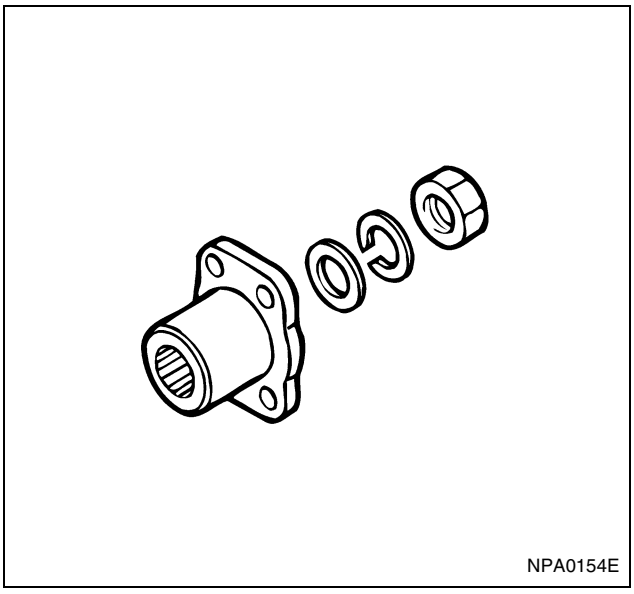

NPA0152E

- If replacing the taper roller bearing, pull out the taper roller bearing outer races (two) from the idle gear using a brass stick and a hammer. (Do not remove the snap ring.)

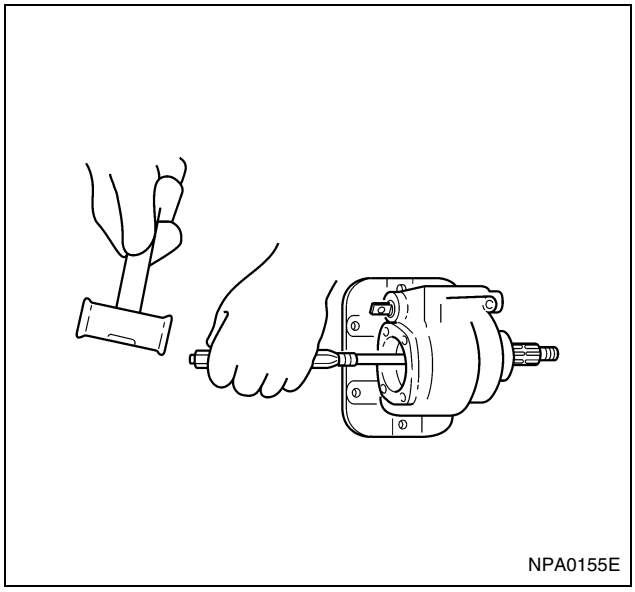

NPA0153E

12. Nut, Washer, Flange
    - Remove the tightening nut of output flange and remove the spring washer and flange.
13. Rear Cover, Oil Seal
    - Remove the rear cover (with oil seal).
    - Remove the oil seal from the rear cover.

Caution:
If the oil seal is not faulty, removal of it is not necessary.

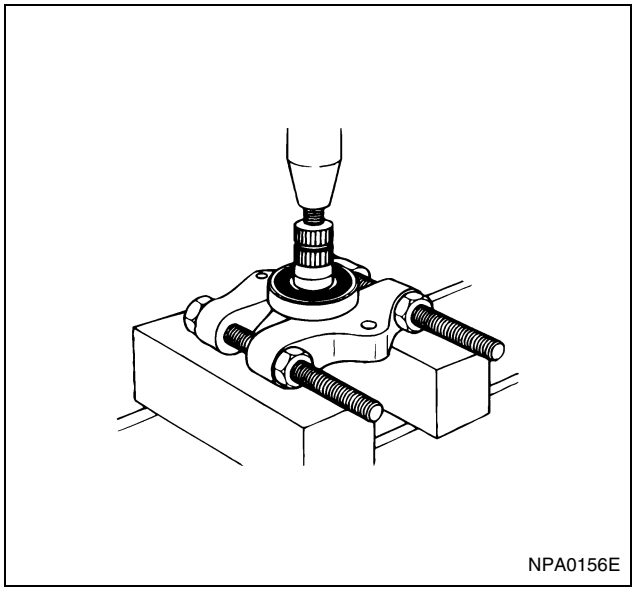

NPA0154E

14. Output Shaft, Rear Bearing, Gear, Sleeve
15. Front Bearing, Thrust Collar
    - Tap the output shaft axis from the front side, and remove the front bearing, output gear, thrust collar and sleeve. Then pull out the output shaft and rear bearing from the gear case as a unit.
    - Remove the output gear (with bushing), sleeve, thrust collar and front bearing from the inside of gear case.


NPA0155E

    - Remove the rear bearing from the output shaft.

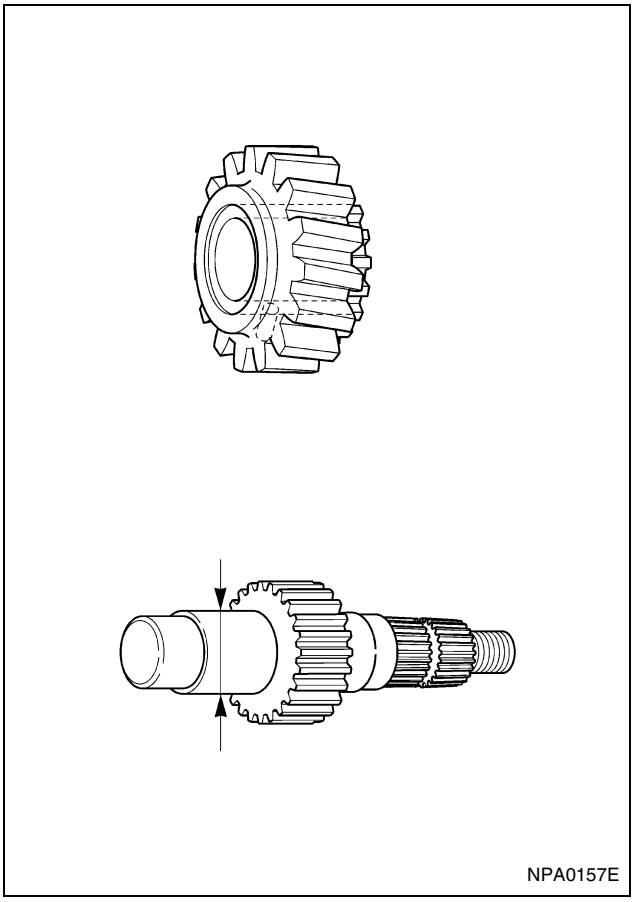
Special tool
Bearing remover; 5-8840-0015-0


NPA0156E

Assembly

- Make sure that each part has been washed. Especially, remove metal particles or cleaning solvent at the bottom of gear case.
- Right before assembly, apply engine oil to the sliding portion and the fitting portion of each part.
- Bearings
  – Check each bearing. Replace it if there is one of the following faults.
    - Its rotation is not smooth.
    - Extreme noise occurs.
    - There is extreme damage or rust.
    - There is abnormal play in the thrust direction.

  - There is discoloration, extreme wear or pitching on the rolling body and rolling surface of the needle bearing or taper roller.
  - There is extreme backlash in the output shaft and the bearing (front and rear)
    Service limit; 0.2 mm (0.008 in)
- Gears
  – Check each gear. Replace it if there is extreme fault. For minor stepped wear or rough surface, repair it using oil stone or pencil grinder.
    - Breakage, damage or wear on the cross-section
    - Wear on idle gear and shaft
      Replace the idle gear (with snap ring), the needle bearing or the taper roller bearing if there is extreme wear.
    - Gap between output shaft and output gear (with bushing)
      Service limit; 0.2 mm (0.008 in)
      Replace the output gear (with bushing) if its gap exceeds the service limit.
- Idle and output shaft
  – Check for the damage or wear on the outside surfaces of idle shaft and output shaft, wear or damage on the spline portion, bent shaft, etc. Replace it if the fault is extreme.

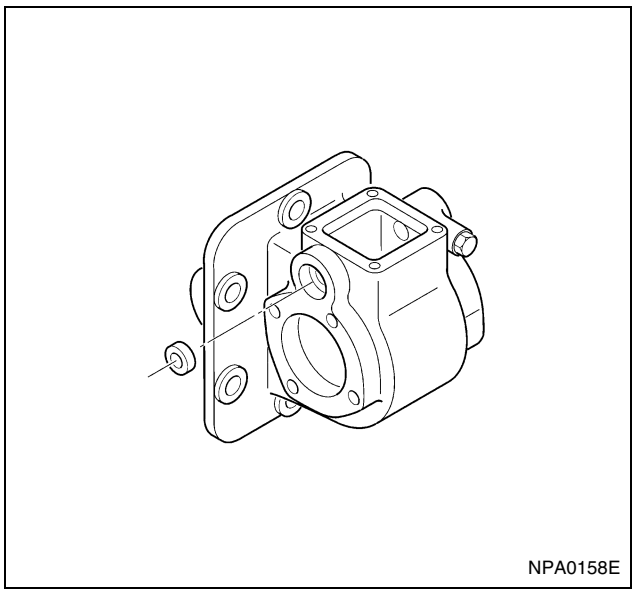

NPA0157E

- Shift mechanism
  – Check each part of shift mechanism for damage, bent, stepped wear, etc. and replace it if the fault is extreme.
    - Bent or wear of shift rod
    - Deformation or wear of shift arm
      Thickness of shift arm
      Specification; 9 mm (0.354 in)
      Service limit; 8 mm (0.315 in)
    - Backlash or rough movement of shift rod and gear case
- Oil seal
  – Replace the output shaft or shift rod if its contact surface is damaged or deteriorated.
  – Do not reuse the removed oil seal.
- Clutch
  – For minor stepped wear or damage, repair it using oil stone or pencil grinder. Replace it if there is extreme fault.
- For assembly direction of parts, refer to cross-section diagram.

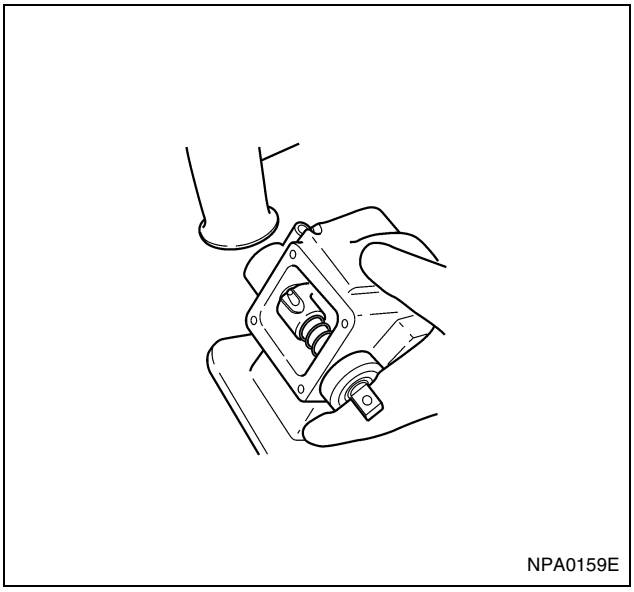
Assembly

1. Gear Case
2. Oil Seal
   - Apply liquid gasket (THREE BOND 1141E) to the circumference of oil seal and grease (BESCO L2 or equivalent) to the lip, and punch it into gear case slot portion (front side).

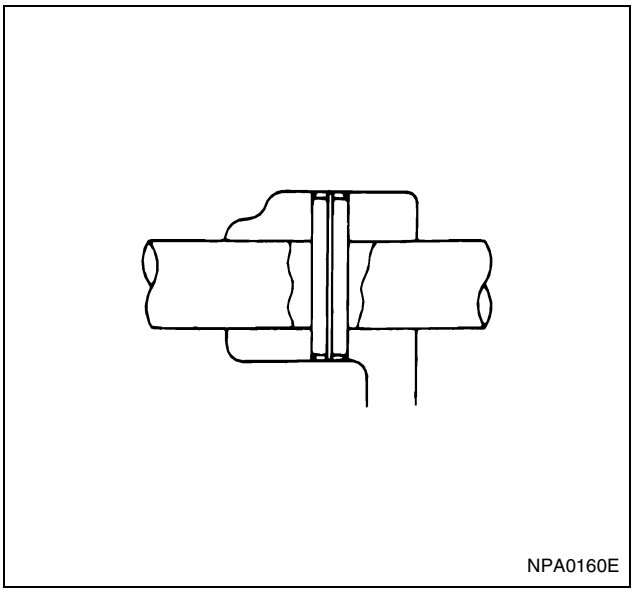
Special tool
Oil seal installer; 5-8840-2065-0


NPA0158E

3. Shift Rod, Shift Fork, Spring, Washer
   - Put the spring and the shift fork into gear case and pass the shift rod through them.

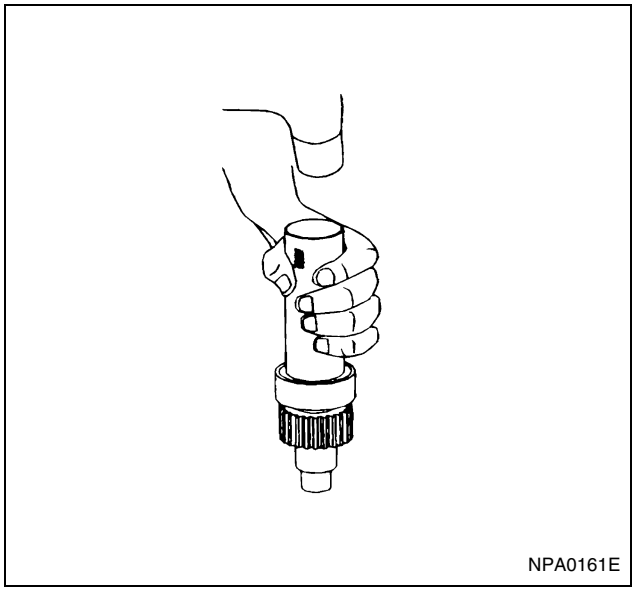

NPA0159E

4. Spring Pin
   - Punch the spring pin so that the pin is flush with the shift fork.

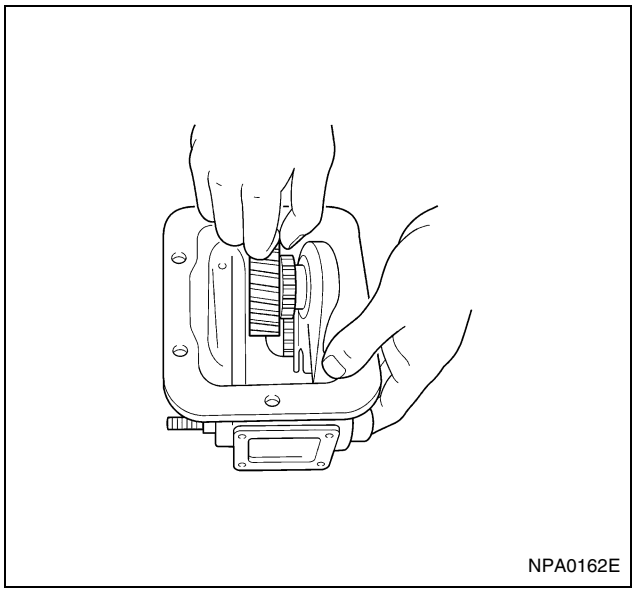

NPA0160E

5. Output Shaft, Rear Bearing
   - Press-fit the rear bearing into output shaft.

Special tool
Bearing installer; 5-8840-2066-0

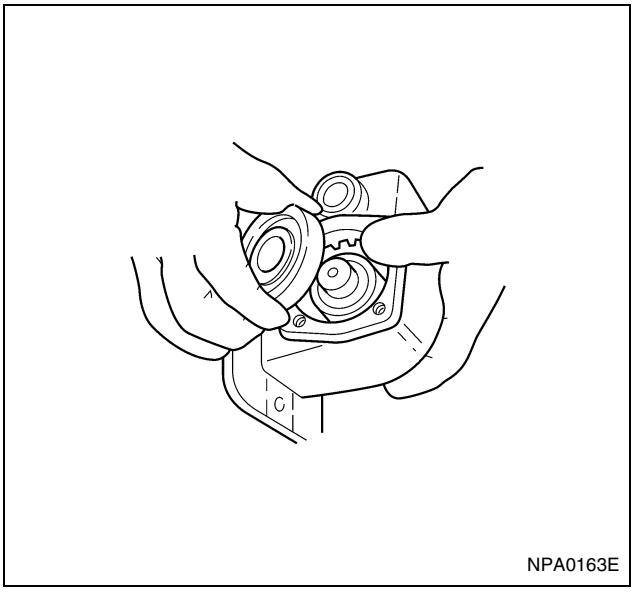

NPA0161E

6. Output Gear (with Bushing), Sleeve
   - Insert the shift fork into the sleeve groove in the gear case and assemble the output shaft (with rear bearing) to the sleeve and output gear.


NPA0162E

7. Thrust Collar, Front Bearing
   - Install the thrust collar to the front side of output shaft and press-fit the front bearing.

Special tool
Bearing installer; 5-8840-2066-0

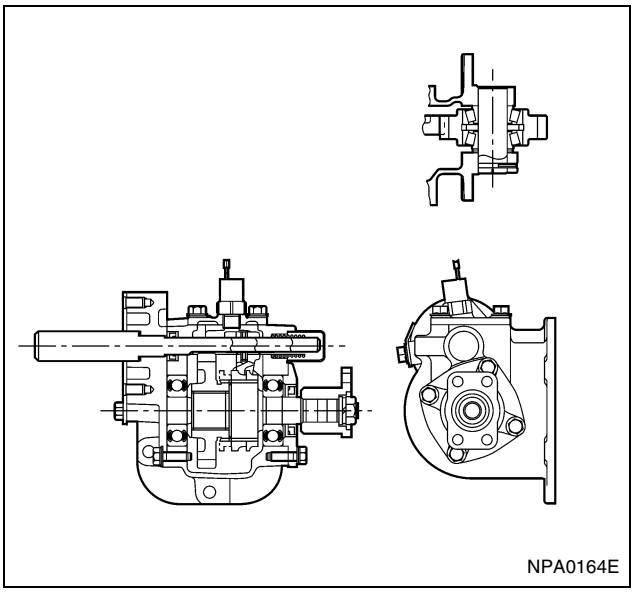

NPA0163E

8. Adapter, Solenoid
   - Apply liquid gasket (THREE BOND TB1215) to the mounting surfaces of adapter and solenoid. Let the cores of solenoid in-low portion and case slot portion of adapter come out. Assemble the bolt. Apply LOCTITE 242 to the bolt.

Caution:
Be careful not to damage the oil seal when the cores come out.

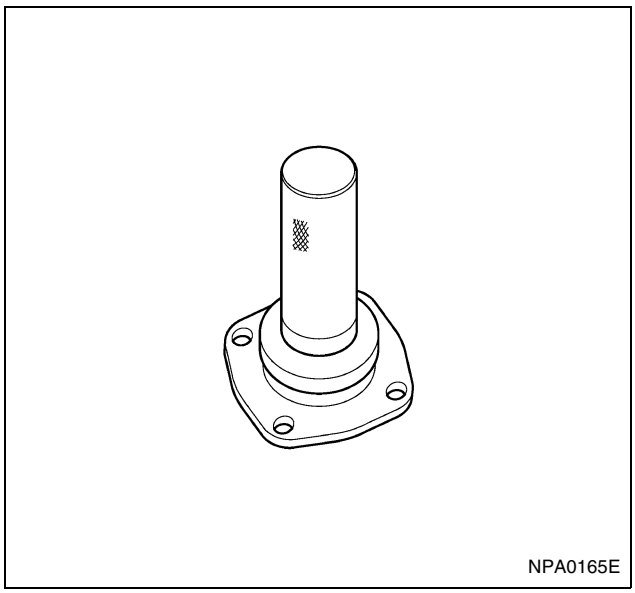
Tighten:
Bolt to 25 N·m (2.5 kg·m / 18 lb·ft)

Special tool
Setting tool; 5-8840-2452-1


NPA0164E

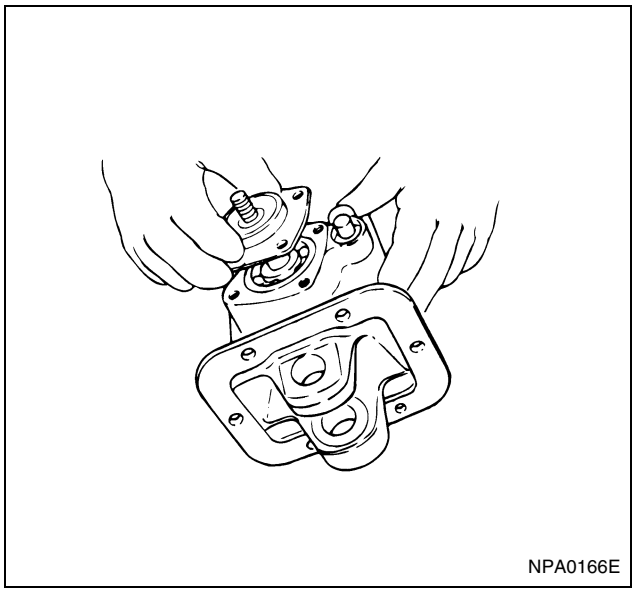
9. Rear Cover, Oil Seal
   - Fill with grease (BESCO L2 or equivalent) of approx. 3 g to the lip of oil seal and apply liquid gasket (THREE BOND 1141E) to the circumference and assemble it to the rear cover.

Special tool
Oil seal installer; 5-8840-2064-0


NPA0165E

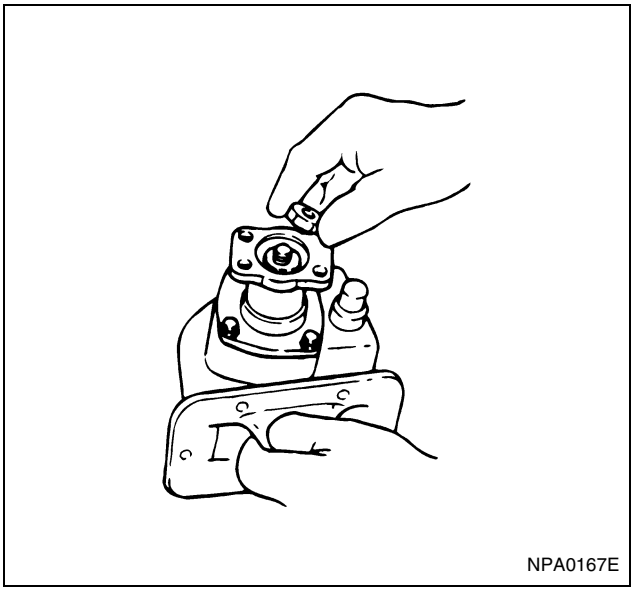
   - Apply liquid gasket (THREE BOND TB1215) to the mounting surface of rear cover and LOCTITE 242 to the bolt threads, and assemble it.

Tighten:
Bolt to 25 N·m (2.5 kg·m / 18 lb·ft)


NPA0166E

10. Flange, Washer, Nut
    - Assemble the flange to output shaft.
    - Install the plain washer and spring washer, and temporarily tighten the nut. After installing the PTO to the transmission, tighten it to the specified torque.

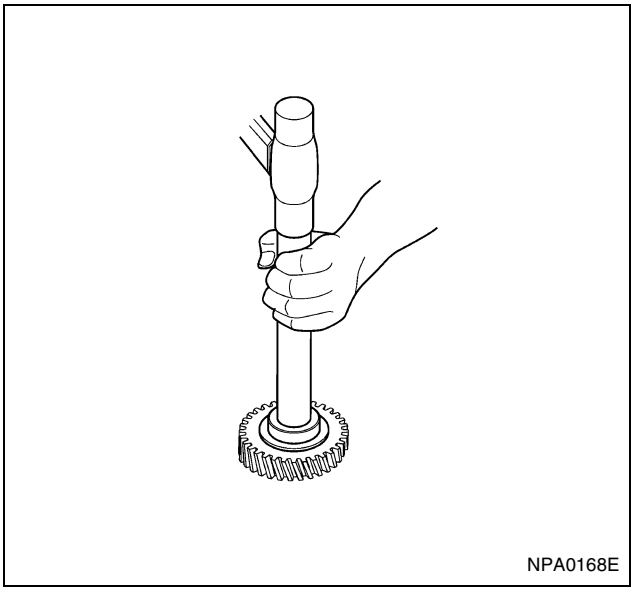
Tighten:
Nut to 105 N·m (10.7 kg·m / 77 lb·ft)


NPA0167E

11. Idle Gear, Taper Roller Bearing, Shim, Shaft
    - To replace the taper roller bearing, punch out the taper roller bearing outer races (two) from the both sides of idle gear.

Special tool
Bearing installer; 5-8522-0035-0
Grip; 5-8840-0007-0

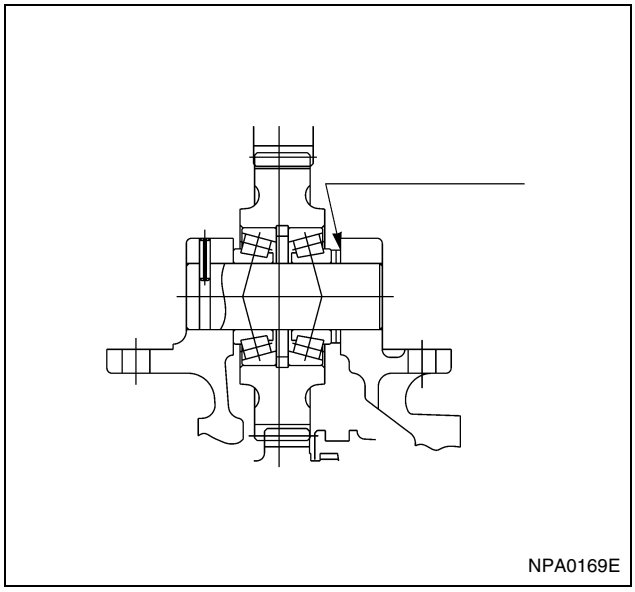
- Install the idle gear taper roller bearings (two) and shim.


NPA0168E

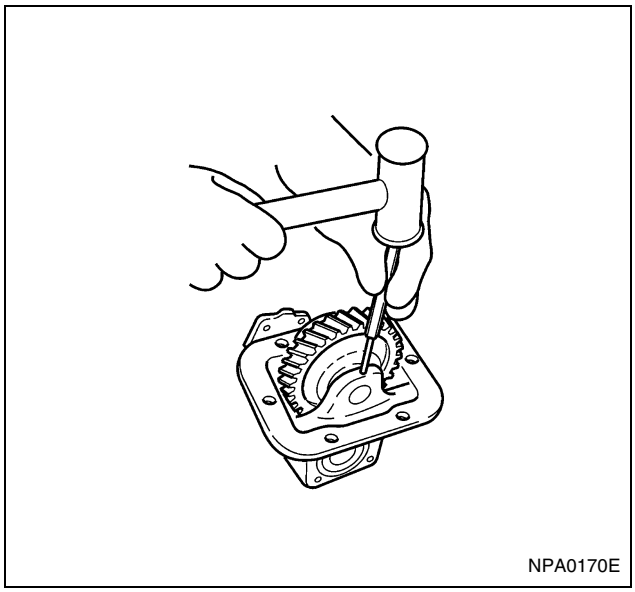
- Select the shim so that the gap shown in the illustration is specification, insert the shim between the back side taper roller bearing and the gear case, and install the idle shaft.

Gap specification between shim and case = Less than 0.08 mm (0.003 in)

Shim thickness to be selected	mm (in)
1.50 (0.059)	1.70 (0.067)
1.60 (0.063)	1.80 (0.071)
1.65 (0.065)	1.85 (0.073)

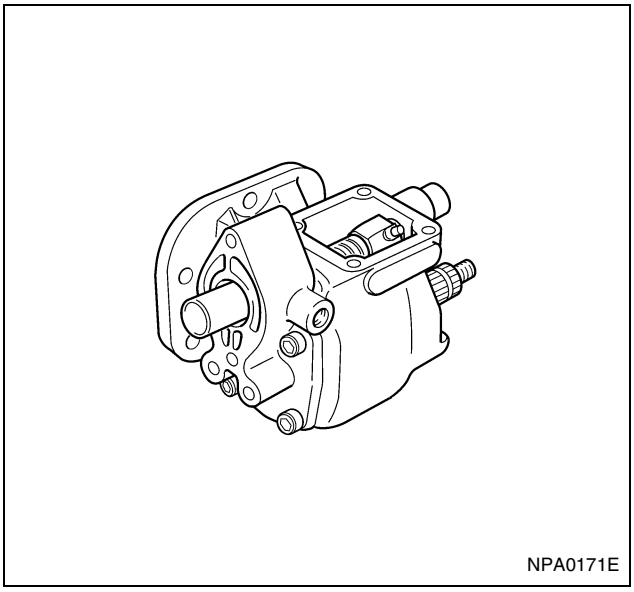

NPA0169E

12. Spring Pin
    - Punch the spring pin so that it is flush with the gear case.


NPA0170E

13. Upper Cover
    - Apply THREE BOND TB1215 to the mounting surface and LOCTITE 242 to the bolt threads, and assemble it to the case.

Tighten:
Bolt to 25 N·m (2.5 kg·m / 18 lb·ft)

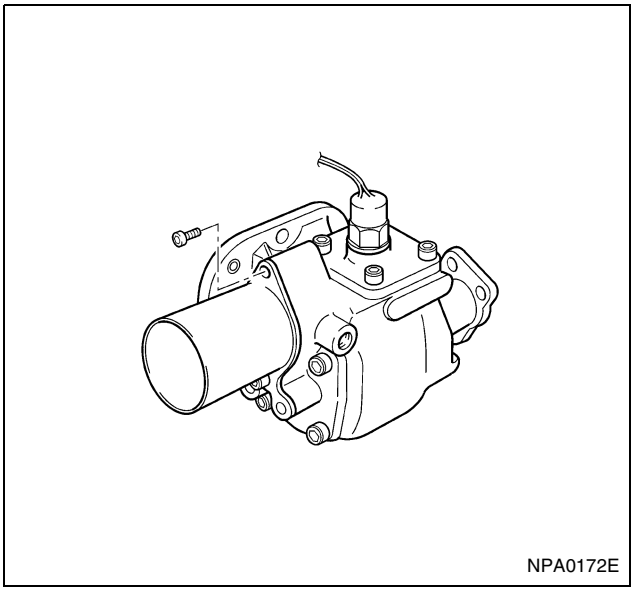

NPA0171E

14. PTO Switch
    - Apply LOCTITE 242 to the threads and assemble it.

Tighten:
PTO switch to 44 N·m (4.5 kg·m / 32 lb·ft)

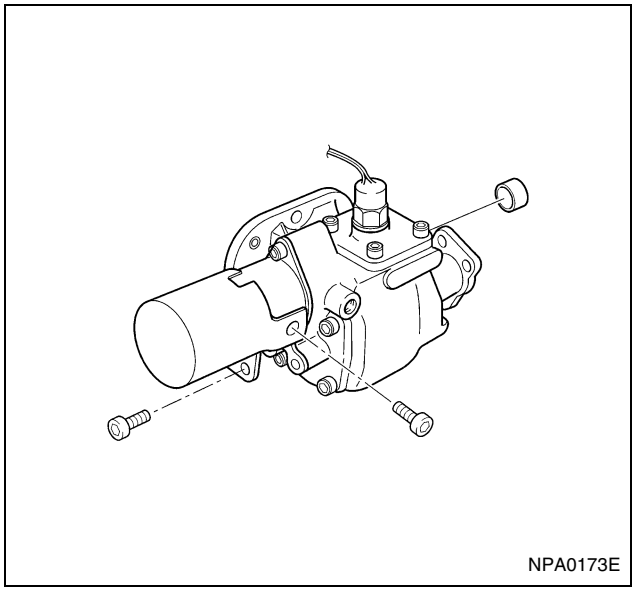
15. Solenoid Assembly
    - Apply LOCTITE 242 to the bolt threads and assemble it.

Tighten:
Bolt to 25 N·m (2.5 kg·m / 18 lb·ft)


NPA0172E

16. Cover Solenoid Plug
    - Apply LOCTITE 242 to the bolt threads of cover and solenoid and assemble them.

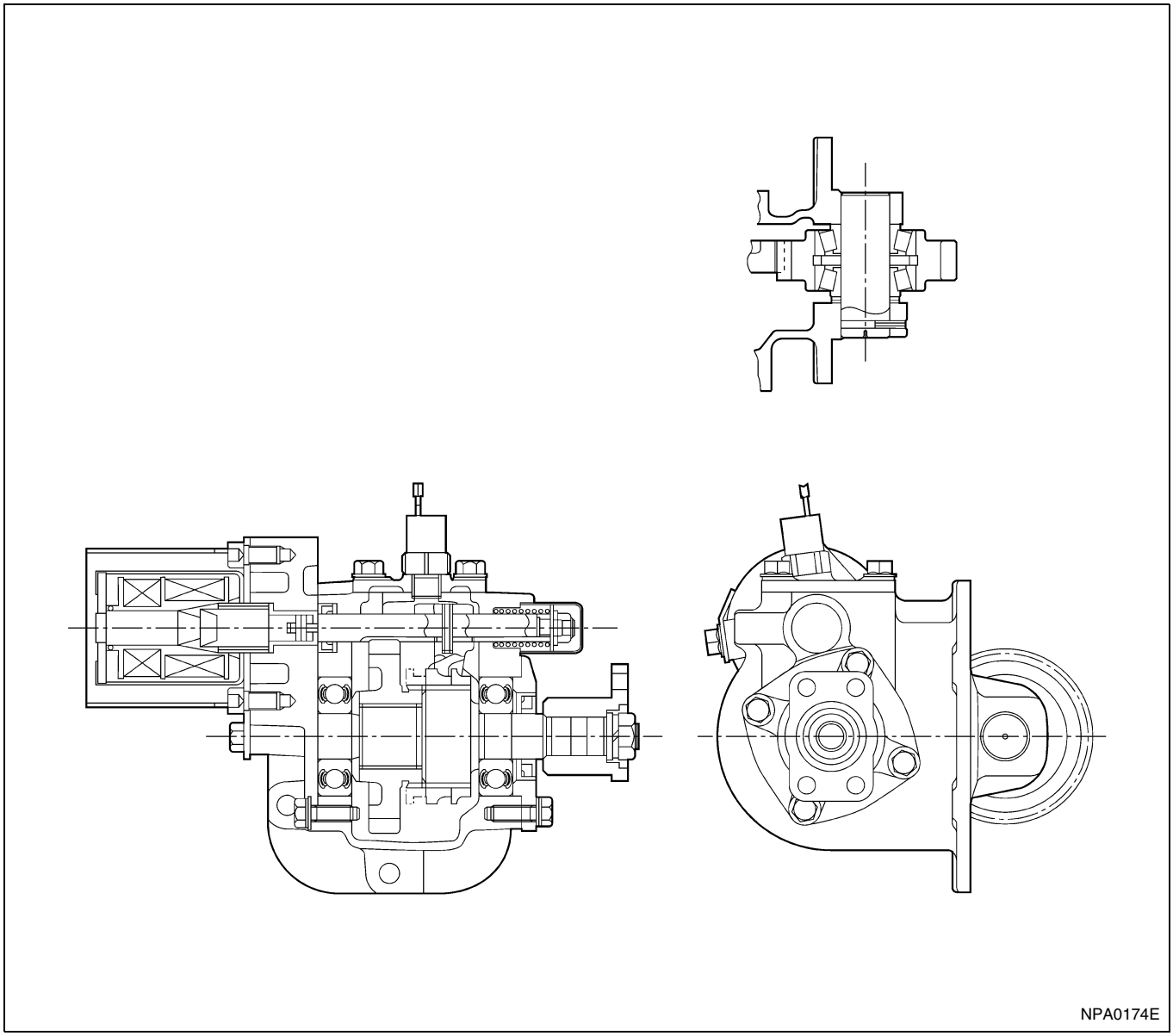
Tighten:
Bolt to 25 N·m (2.5 kg·m / 18 lb·ft)


NPA0173E

Description of function and operation

The electronic control type side PTO of MYY transmission is installed on the left side of transmission.
The gear of PTO is engaged at all times. The solenoid shifts the sleeve on output axis by the shift rod and shift arm to transmit or cut the power to the gear. The gear is the helical type as well as transmission and has a silent effect.
To maintain durability, the idle gear bearing uses the taper roller bearing, and the output axis uses the ball bearing.

Cross-section diagram

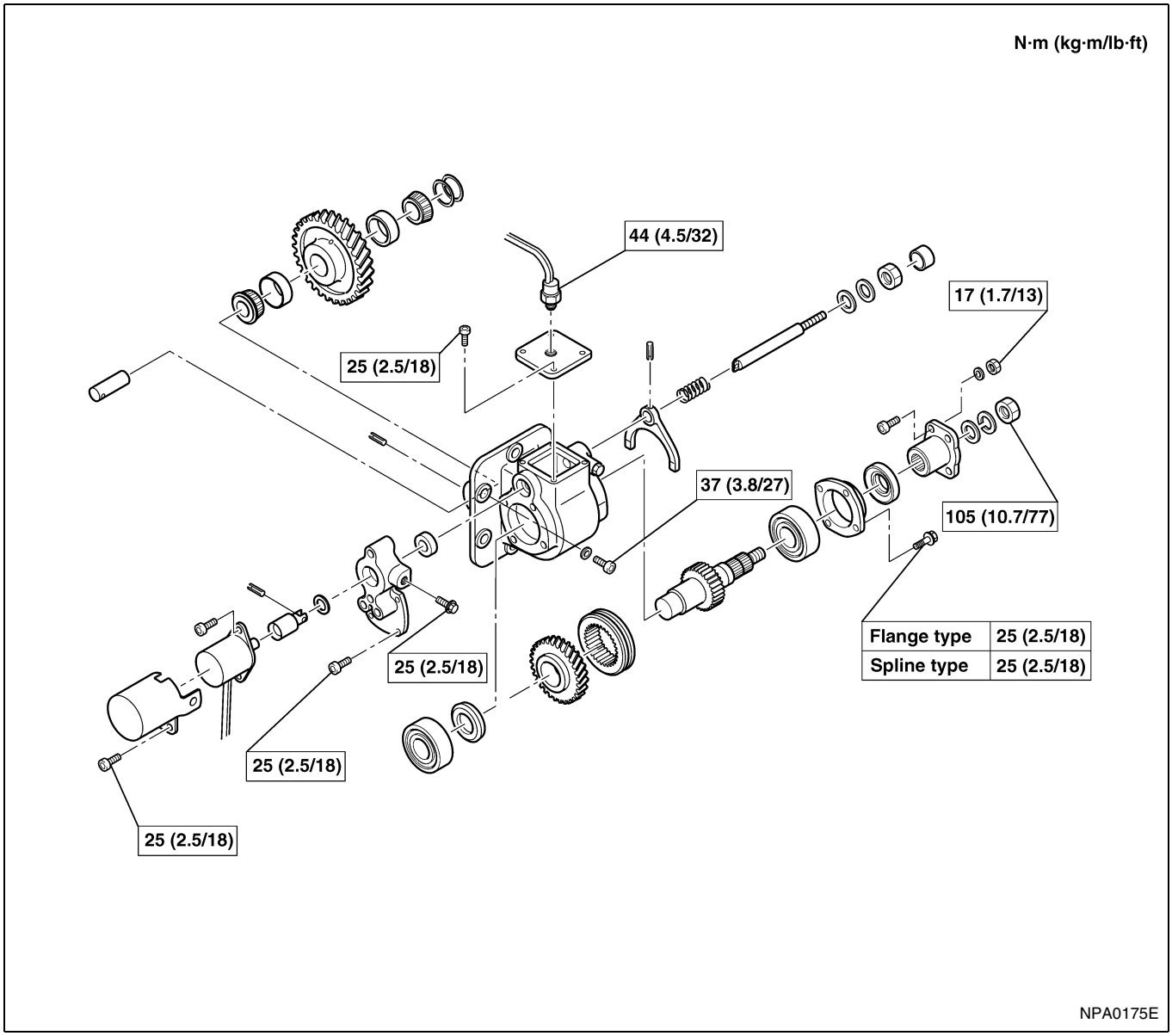


Main Data and Specifications

Electronic control type PTO

Item	Specifications
Allowance output torque N·m/rpm (kg·m/rpm)	196/1000 (20/1000)
Acceleration ratio: PTO output speed/Engine speed	5 steps 0.684 6 steps 0.676
Rotation direction (viewed from rear)	Right

Fixing Torque



Special Tools

Illustration	Tool Number / Description / Remarks
 9852922010	9-8529-2201-0 / Spring pin remover
 5884000150	5-8840-0015-0 / Bearing remover/Installer

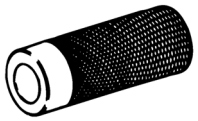
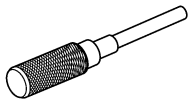
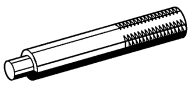
Illustration	Tool Number / Description / Remarks
 5884020650	5-8840-2065-0 / Oil seal installer
 5884020660	5-8840-2066-0 / Bearing installer

Illustration	Tool Number / Description / Remarks
 5884024521	5-8840-2452-1 / Setting tool
 5884020640	5-8840-2064-0 / Oil seal installer
 5852200350	5-8522-0035-0 / Bearing installer
 5884000070	5-8840-0007-0 / Grip