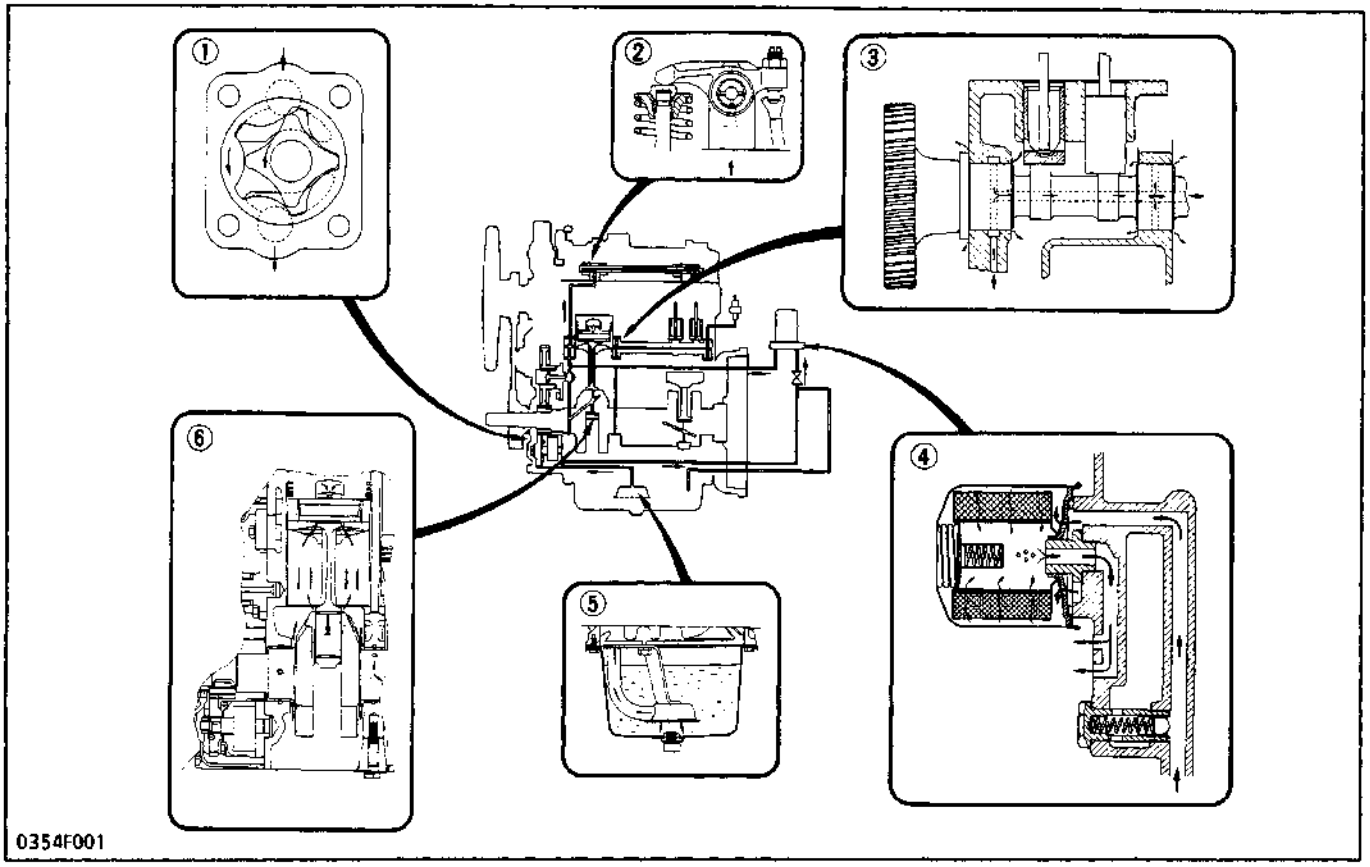
M MECHANISM

CONTENTS

[2] LUBRICATING SYSTEM



(1) Oil Pump
(2) Rocker Arm and Rocker Arm Shaft
(3) Camshaft
(4) Oil Filter Cartridge and Relief Valve
(5) Oil Strainer
(6) Crankshaft and Piston

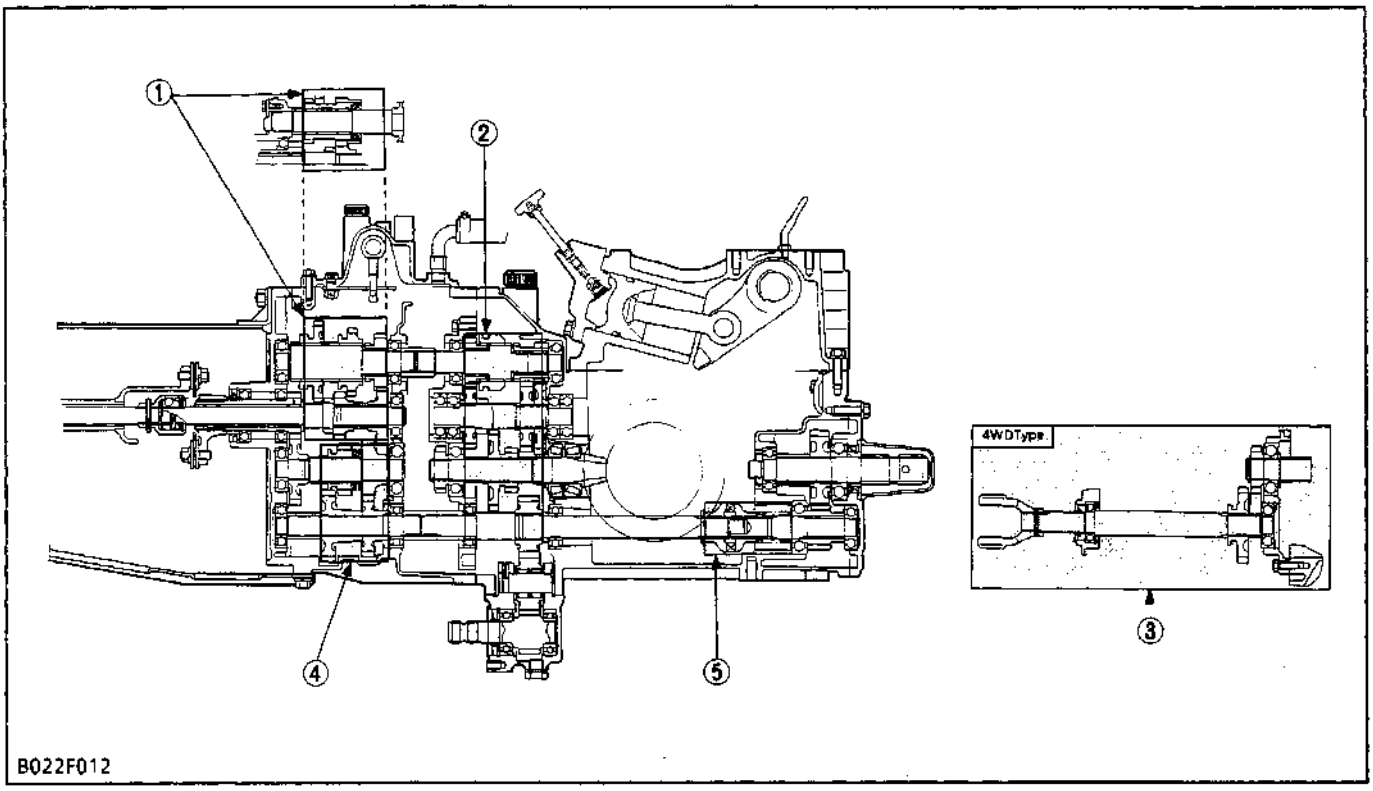
This engine lubricating system consists of oil strainer, oil pump, relief valve, oil filter cartridge and oil switch.

The oil pump sucks lubricating oil from the oil pan through the oil strainer and the oil flows down to the filter cartridge, where it is further filtered.

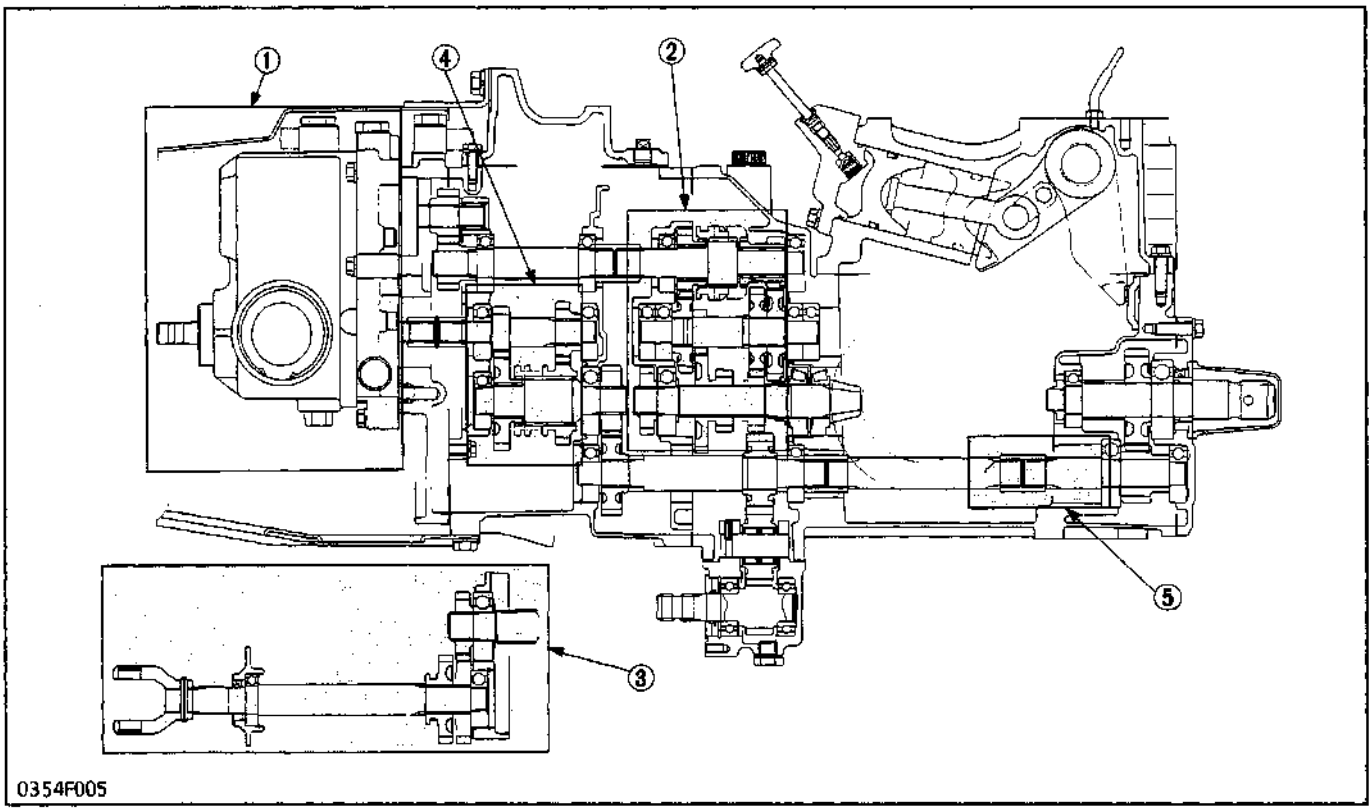
Then the oil is force-fed to crankshaft, connecting rods, idle gear, camshaft and rocker arm shaft to lubricate each part.

Some part of oil, splashed by the crankshaft or leaking and dropping from gaps of each part, lubricates these parts: pistons, cylinders, small ends of connecting rods, tappets, push rods, inlet and exhaust valves and timing gears.

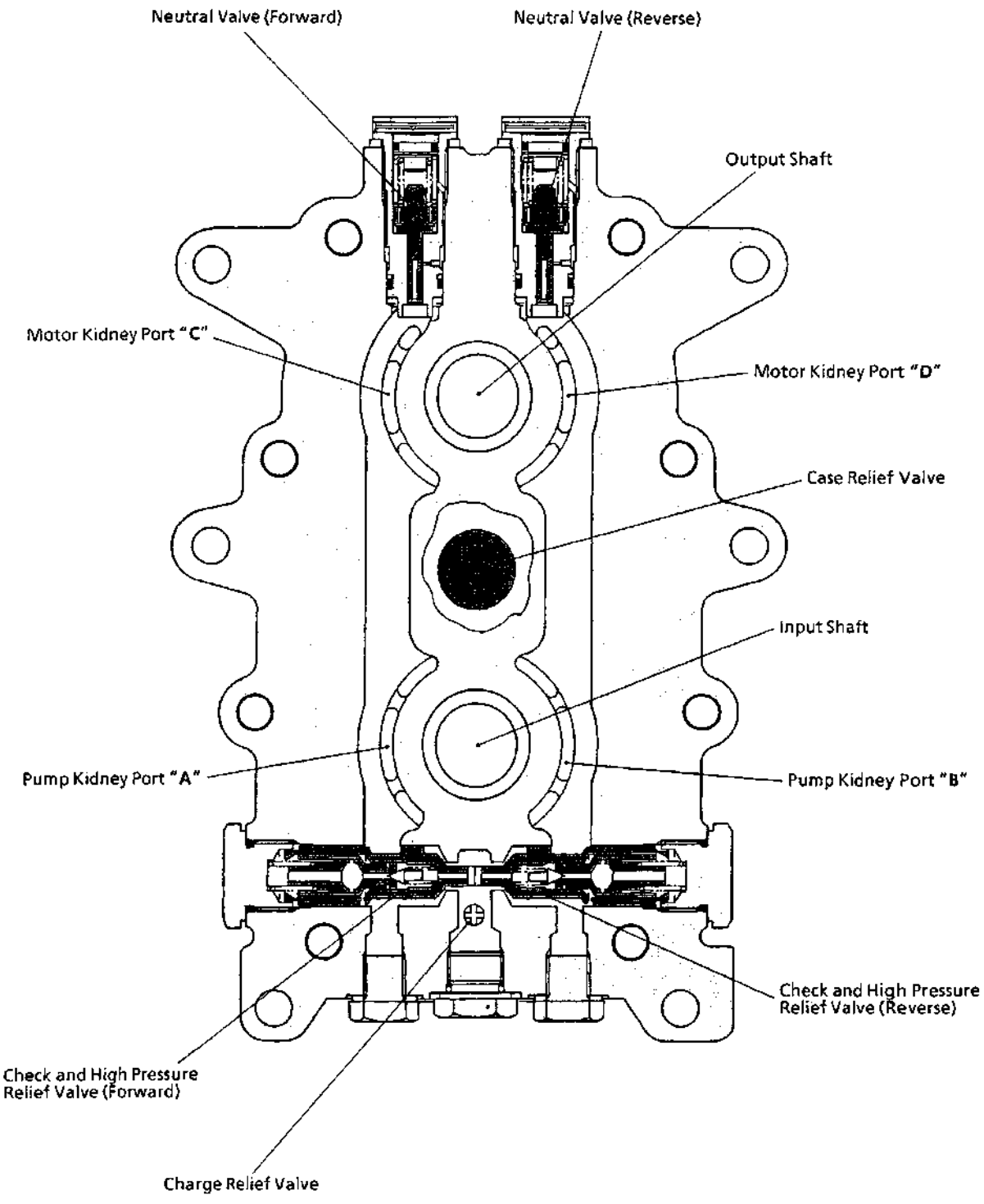
■ B2150



■ B2150HST



(1) Main Gear Shift Section or Hydrostatic Transmission
(2) Aux. Gear Shift Section
(3) Front Wheel Drive Section
(4) PTO Shift Section
(5) One-way Clutch Section or Coupling

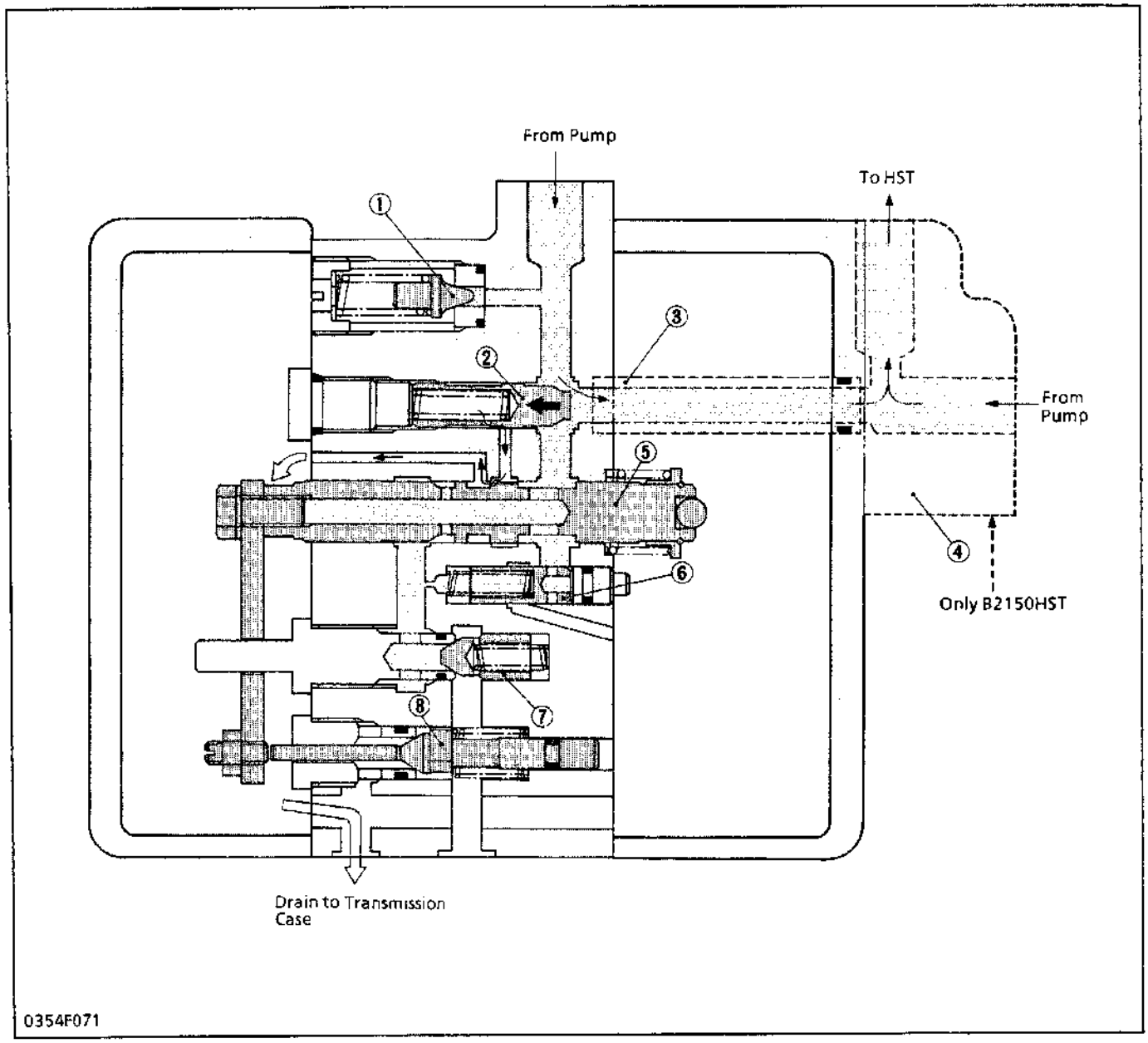


Viewed from rear

0354F022

[2]-1 OIL FLOW

■ Neutral

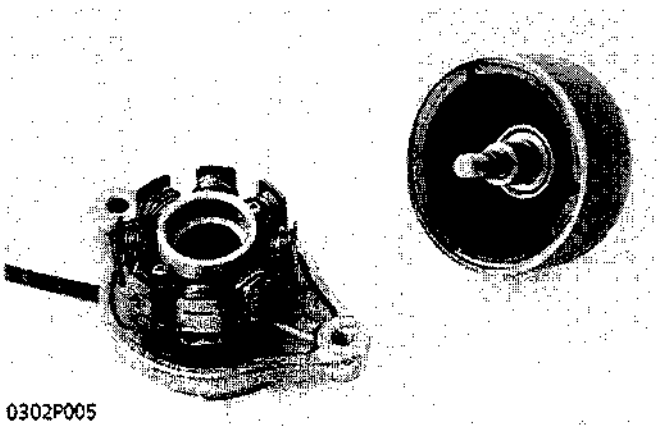


(1) Relief Valve
(2) Unload Valve 1
(3) Pipe (for B2150HST)
(4) Valve Cover (for B2150HST)
(5) Spool
(6) Unload Valve 2
(7) Check Valve 1
(8) Check Valve 2

In neutral, unload valve 1 (2) is opened by the pressure-fed oil against the spring since the back pressure side is opened to the tank port connected to transmission case to drain through the small groove of the spool (5).

And the oil in the hydraulic cylinder is kept by the check valve 1 (7) and check valve 2 (8) so that the implement does not lower or lift.

(1) AC Dynamo



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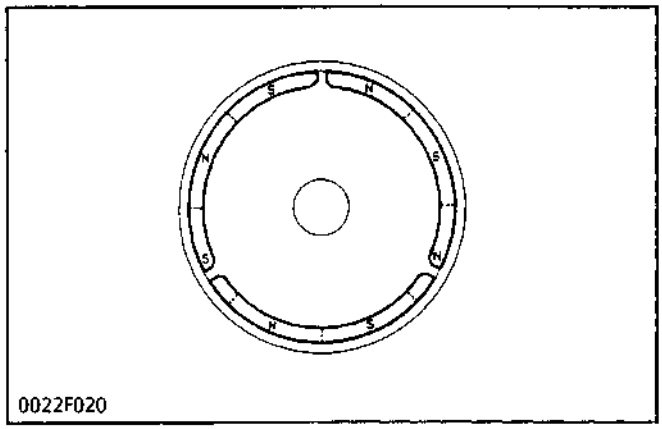
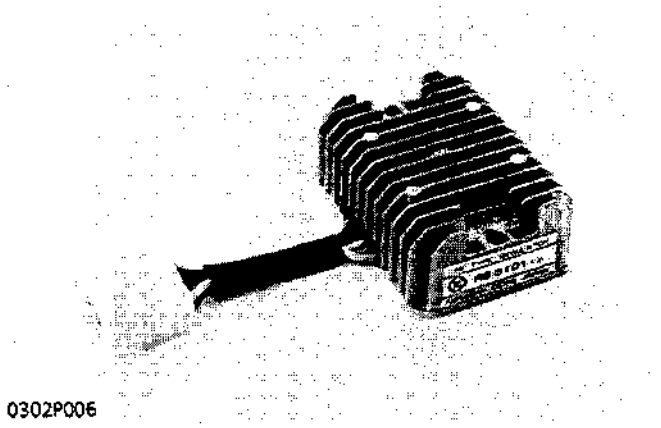


0022F020

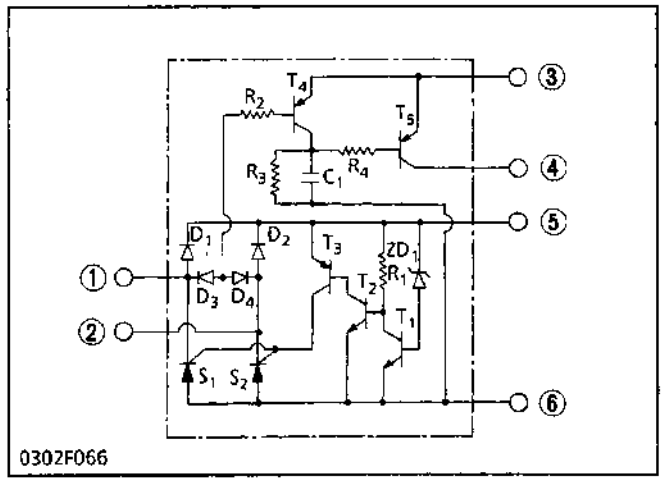
This dynamo is an 8-8 pole rotating magnet type generator. It is simple in construction, consisting of a stator and rotor. The rotor is made up of eight permanent magnet pole pieces assembled on a shaft and rotates on the center of the stator around which eight electromagnetic coils are provided for.

This dynamo produces higher voltage in slow speed rotation, and charges electric current to the battery during engine idling.

(2) Regulator



0302P006



0302F066

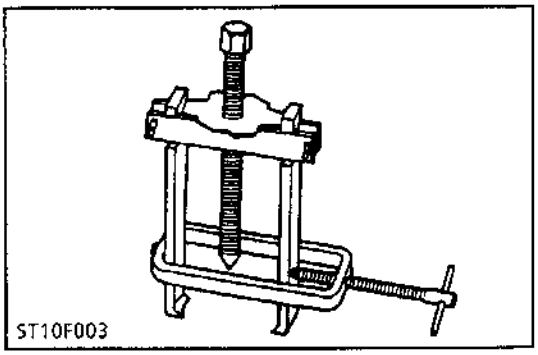
A regulator has two functions:

1. When the battery voltage is low, it turns the SCR on to form a charging circuit to the battery.
2. During charging, it turns the charging lamp off.

(1) Light Blue (AC Dynamo)
(2) Light Blue (AC Dynamo)
(3) Yellow (Main Switch Terminal AC)
(4) Green (Charge Lamp)
(5) Red (Main Switch Terminal No.30)
(6) Black (Ground)
C1: Capacitor
D1: Diode
D2: Diode
D3: Diode
D4: Diode
R1: Resistor
R2: Resistor
R3: Resistor
R4: Resistor
S1: SCR (Silicon Controlled Rectifier)
S2: SCR (Silicon Controlled Rectifier)
T1: Transistor
T2: Transistor
T3: Transistor
T4: Transistor
T5: Transistor
ZD1: Zener Diode

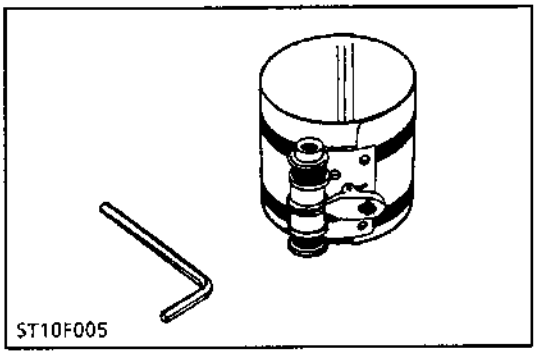
[8] SPECIAL TOOLS

(1) Special Tools for Engine



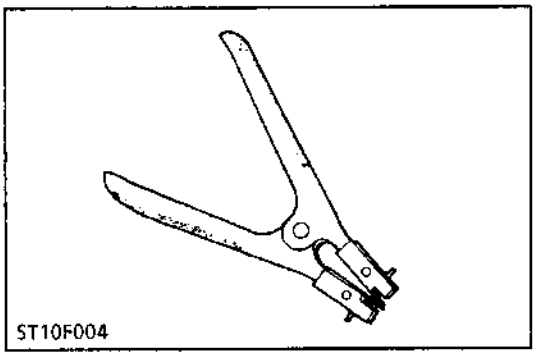
Special Use Puller Set

Code No.: 07916-09032
Application: Use exclusively for pulling out bearing, gears and other parts with ease.



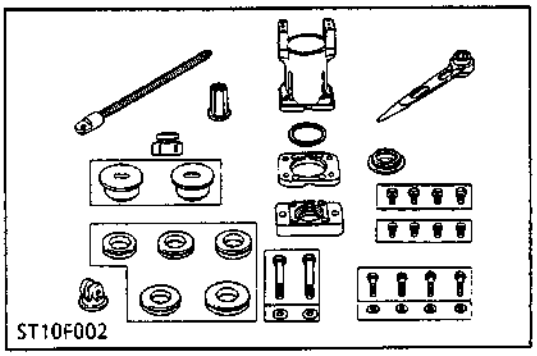
Piston Ring Compressor

Code No.: 07909-32111
Application: Use exclusively for pushing in the piston with ease.



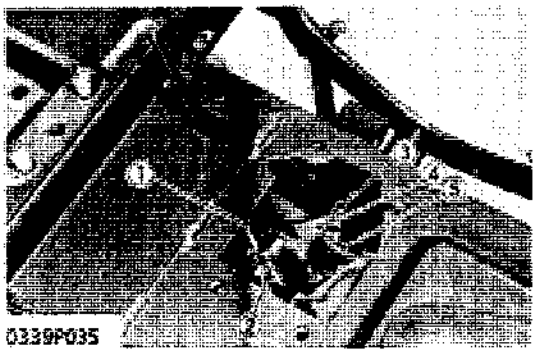
Piston Ring Tool

Code No.: 07909-32121
Application: Use exclusively for removing or installing the piston ring with ease.



Dry Liner Changer - II

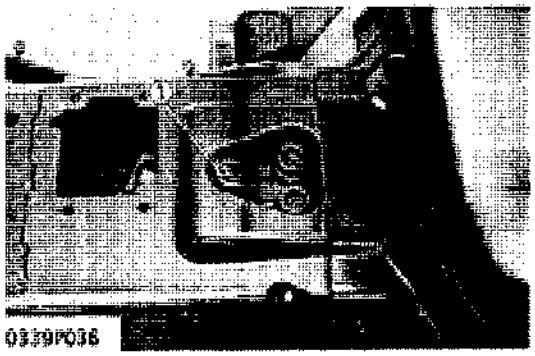
Code No.: 07916-33081
Application: A puller for pulling out the dry liner. It combines with a presser for pushing in the dry liner.
*Dry Liner Changer (07916-30043) is available. Adaptor (Dia. 64 mm) (07916-32981) and centering adaptor (07916-32991) are added to Dry Liner Changer II .


0339P035

Rod

1. Remove the spring lock pin (2) and remove the rod (1).
2. Remove the spring lock pin (3), and disconnect the speed control rod (5) from the rod guide (4).

(1) Rod
(2) Spring Lock Pin
(3) Spring Lock Pin
(4) Rod Guide
(5) Speed Control Rod


0339P036

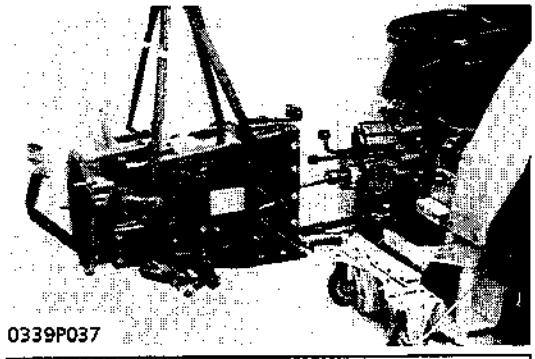
Joint Bolt

1. Remove the rubber cover.
2. Remove the joint bolt (1) connecting the suction pipe and HST.
3. Remove the suction pipe.

(When reassembling)

Tightening torque	Joint bolt	53.9 to 68.6 N·m 5.5 to 7.0 kgf·m 39.8 to 50.6 ft-lbs

(1) Joint Bolt


0339P037

Separating Clutch Housing

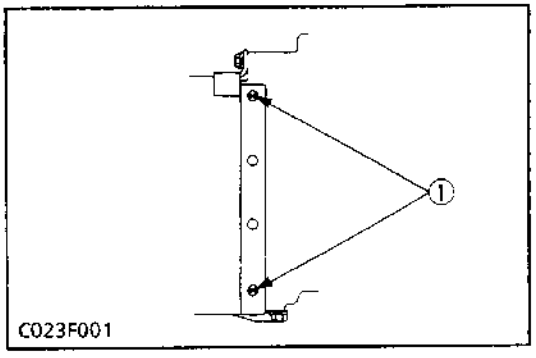
1. Remove the clutch housing mounting screws and nuts, and separate the clutch housing from transmission.

(When reassembling)

- Replace the reamer screws (1) at their original positions.

Tightening torque	Clutch housing mounting screw	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs

(1) Reamer Screws



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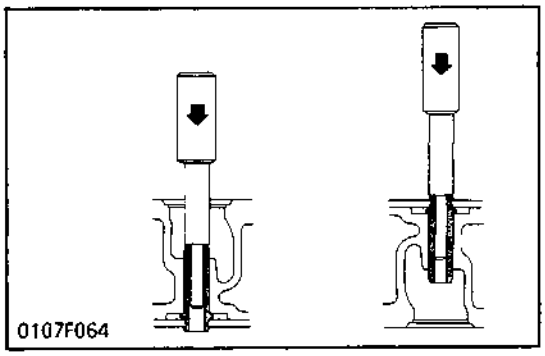
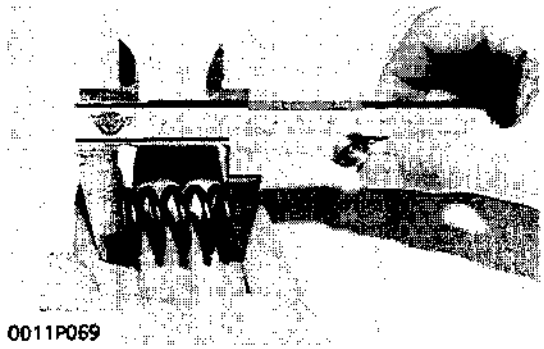

0107F064

Replacing Valve Guide

1. Press the used valve guide out from the cylinder head's lower side using a valve guide replacing tool (See page S.G-26).
2. Apply engine oil to the outer surface of the new valve guide, and press fit the valve guide from the cylinder head's upper side until the flange part of the valve guide contacts the cylinder head.
3. After press-fitting, finish the valve guide by means of reaming to dimensions shown in previous table.

■ **NOTE**

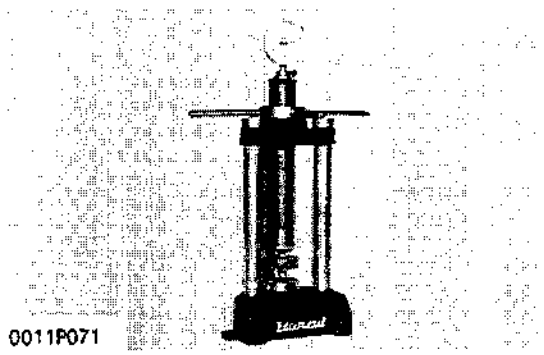
- **Be careful not to strike valve guide with a hammer, etc. during replacement.**


0011P069

Valve Spring Free Length

1. Measure the free length of the valve spring with varnier calipers.
2. If the measurement is less than the allowable limit, replace the valve spring.

Valve spring free length	Factory spec.	35.1 to 35.6 mm 1.382 to 1.401 in.
	Allowable limit	34.8 mm 1.370 in.


0011P071

Valve Spring Setting Load

1. Place the valve spring on the tester, and compress it to setting length (31 mm, 1.22 in.).
2. Read the compression load on the gauge.
3. If the mesurement is less than the allowable limit, replace the valve spring.

Valve spring setting load	Factory spec.	73.5 N·m 7.5 kgf-m 16.5ft-lbs
	Factory spec.	62.8 N·m 6.4 kgf-m 14.1 ft-lbs

SERVICING SPECIFICATIONS (Continued)

Item		Factory Specification	Allowable Limit
Gears	Backlash	0.10 to 0.20 mm 0.004 to 0.008 in.	0.4 mm 0.016 in.
Gear to Spline	Clearance	0.03 to 0.08 mm 0.0012 to 0.0031 in.	0.20 mm 0.0079 in.
① Sift Fork to Shift Gear Groove (B1550HST, B1750HST)	Clearance	0.10 to 0.35 mm 0.004 to 0.014 in.	0.50 mm 0.020 in.
29T-14T-18T Gear to 2nd Shaft (B1550HST, B1750HST)	Clearance	0.007 to 0.053 mm 0.0003 to 0.0021 in.	0.10 mm 0.0039 in.
2nd Shaft	O.D.	21.987 to 22.000 mm 0.8656 to 0.8661 in.	—
29T- 14T-18T Gear	I.D.	28.007 to 28.028 mm 1.1026 to 1.1035 in.	—
Needle	O.D.	2.994 to 3.000 mm 0.1179 to 0.1181 in.	—
② 16T-20T Gear to Reverse Shaft (B1550, B1750)	Clearance	0.07 to 0.045 mm 0.0003 to 0.0018 in.	
Reverse Shaft	O.D.	21.967 to 21.980 mm 0.8648 to 0.8654 in.	0.10 mm 0.0039 in.
16T-20T Gear	I.D.	25.987 to 26.000 mm 1.0231 to 1.0236 in.	—
Needle	O.D.	1.994 to 2.000 mm 0.0785 to 0.0787 in.	—
17T, 21T Gear to 3rd Shaft (B1550HST, B1750HST)	Clearance	0.007 to 0.047 mm 0.0003 to 0.0019 in.	0.10 mm 0.0039 in.
3rd Shaft	O.D.	24.987 to 25.000 mm 0.9837 to 0.9842 in.	—
17T, 21T Gear	I.D.	29.007 to 29.028 mm 1.1420 to 1.1428 in.	—
Needle	O.D.	1.997 to 2.000 mm 0.0786 to 0.0787 in.	—
PTO Shaft	Initial Turning Torque	0.49 to 1.47 N-m 0.05 to 0.15 kgf-m 0.36 to 1.08 ft-lbs	—
Adjusting Shim	Thickness	0.3 mm, 0.012 in. 0.4 mm, 0.016 in. 0.5 mm, 0.020 in.	— — —
Ring Gear to Spiral Bevel Pinion Shaft	Backlash	0.10 tp 0.20 mm 0.004 to 0.008 in.	0.4 mm 0.016 in.
Adjusting Shim	Thickness	0.2 mm, 0.008 in. 0.3 mm, 0,012 in. 0.5 mm, 0.020 in.	— — —

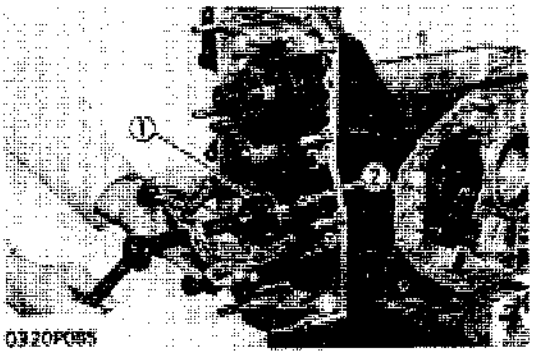
TROUBLESHOOTING

■ MECHANICAL TRANSMISSION [B2150]

Symptom	Probable Cause	Solution	Reference Page
Noise from Transmission	● Transmission oil insufficient	Refill	S.G-8
	● Gear worn or broken	Replace	—
	● Improper backlash between spiral bevel pinion and spiral bevel gear	Adjust	S.3-71
	● Improper backlash between differential pinion and differential side gear	Adjust	S.4-5
	● Bearings worn	Replace	S.3-67
Gear Slip Out of Mesh	● Shift fork spring tension insufficient	Replace	—
	● Shift fork or shifter worn	Replace	S.3-68
	● Shift fork bent	Replace	S.3-68
Hard Shifting	● Shifter or shift fork worn or damaged	Replace	S.3-68
	● Shift fork bent	Replace	S.3-68
Gears Clash When Shifting	● Clutch does not release	Adjust or Repair	S.2-9

SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Case Relief Valve	Setting Pressure	98 to 294 kPa 1 to 3 kgf/cm² 14 to 43 psi (Oil temperature at 50°C, 122°F)	—
	Spring Length	(free) 23.0 mm 0.906 in.	—
		load 29.4 N, 3.0 kgf, 6.6 lbs 15.0 mm 0.591 in.	—
Check and High Pressure Relief Valve	Setting Pressure [Relief Valve]	27.5 to 28.4 MPa 280 to 290 kgf/cm² 3983 to 4125 psi (Oil temperature at 50°C, 122°F)	—
	Spring Length(short) [Relief Valve]	(free) 12.4 mm 0.488 in.	—
		load 41.84 N, 4.27 kgf, 9.41 lbs 10.5 mm 0.413 in.	—
	Spring Length(long) [Check Valve]	(free) 18.2 mm 0.717 in.	—
		load 3.43 N, 0.35 kgf, 0.77 lbs 14.5 mm 0.571 in.	—



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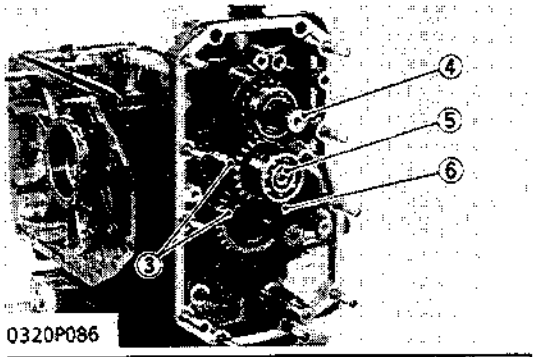

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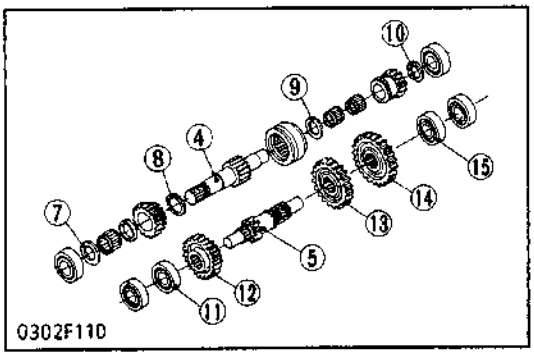


0302F110

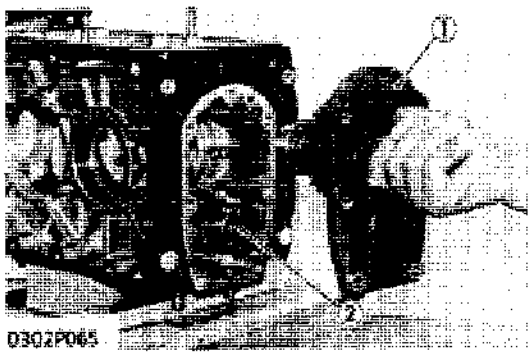
3rd Shaft, 4th Shaft and Spiral Bevel Pinion Shaft

1. Pull out the bearing (1) from the spiral bevel pinion shaft (2).
2. Draw out the 3rd shaft (4), 4th shaft (5) and 29-16T gear (6) with shift fork and shaft (3).

(When reassembling)

- Install the thrust collars (7), (8), (9), (10) to the 3 rd shaft (4) so that their oil grooves face the needle bearing.
- Install the 4th shaft (5) so that the 27T gear (14) boss faces the bearing (15), the 24T gear (13) boss faces the bearing (15), and the 21T gear (12) boss faces the bearing (11).

(1) Ball Bearing
(2) Spiral Bevel Pinion Shaft
(3) Shaft
(4) 3rd Shaft
(5) 4th Shaft
(6) 29-16T Gear
(7) Thrust Collar
(8) Thrust Collar
(9) Thrust Collar
(10) Thrust Collar
(11) Ball Bearing
(12) 21T Gear
(13) 24T Gear
(14) 27T Gear
(15) Ball Bearing



0302P065

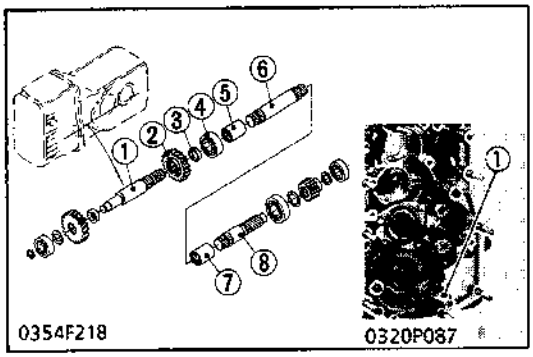
PTO Shaft and 7th Shaft Rear

1. Remove the rear cover mounting screw.
2. Remove the PTO shaft with rear cover (1).
3. Draw out the 7th shaft rear (2) from the differential gear case.

(When reassembling)

Tightening torque	Rear cover mounting screw	48.1 to 55.9 N·m 4.9 to 5.7 kgf·m 35.4 to 41.2 ft-lbs

(1) Rear Cover
(2) 7th Shaft Rear



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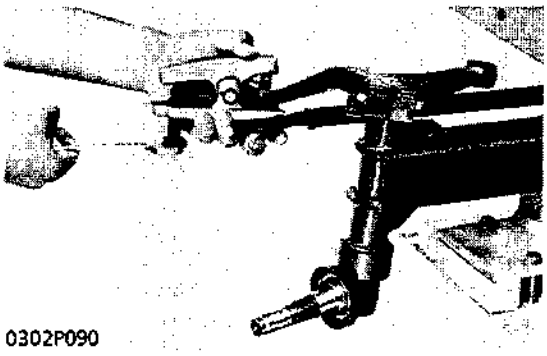
0320P087

7th Shaft

1. Draw out the 7th Shaft front (1), 27T gear (2), collar (3), bearing (4), coupling (5) and 7th shaft middle (6) as a unit.

(1) 7th Shaft Front
(2) 27T Gear
(3) Collar
(4) Bearing
(5) Coupling
(6) 7th Shaft Middle
(7) Coupling
(8) 7th Shaft Rear


0302P090

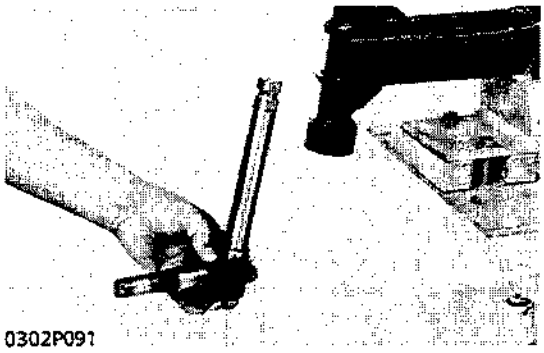
Tie Rod and Knuckle Arm

1. Pull out the cotter pins, and remove the slotted nuts.
2. Remove the tie rod with the tie rod end lifter. (Code No. 07909-39021)
3. Remove the knuckle arm.

(When reassembling)

- Lift the knuckle shaft first to eliminate any gap in the vertical direction before tightening the knuckle arm bolts and nuts.

Tightening torque	Knuckle arm mounting bolt and nut	B1550, B1750 B1550HST B1750HST	20.6 to 29.4 N·m 2.1 to 3.0 kgf·m 15.2 to 21.7 ft-lbs
		B2150 B2150HST	77.4 to 90.2 N·m 7.9 to 9.2 kgf·m 57.2 to 66.5 ft-lbs
	Slotted nut for tie rod end	B1550, B1750 B1550HST B1750HST	17.7 to 34.3 N·m 1.8 to 3.5 kgf·m 13.0 to 25.3 ft-lbs
		B2150 B2150HST	48.1 to 55.9 N·m 4.9 to 5.7 kgf·m 35.5 to 41.2 ft-lbs


0302P091

Knuckle Shaft

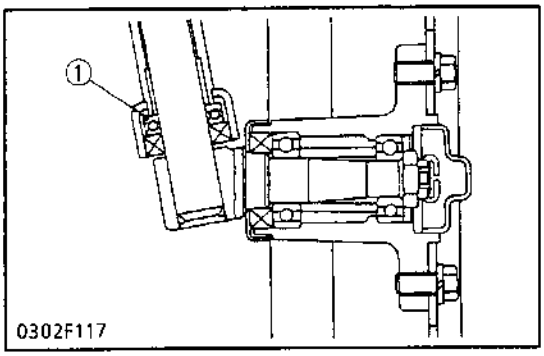
1. Remove the knuckle shaft from the front axle assembly.

(When reassembling)

- Install the thrust bearing (1) in its proper direction.

■ IMPORTANT

- **After reassembling, be sure to adjust the clearance between the front axle and knuckle arm. (See page S.6-16)**



0302F117

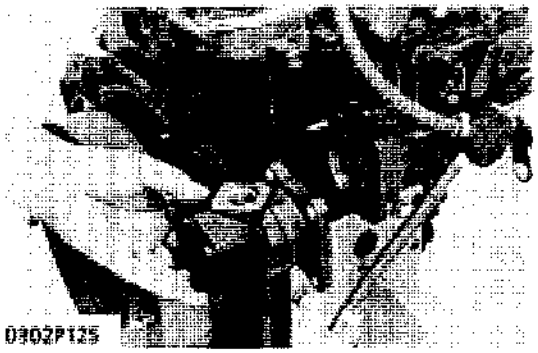
(1) Thrust Bearing

POWER STEERING TYPE
[B2150-B2150HST]

Item		Factory Specification	Allowable Limit
Steering Wheel	Play	Less than 30 mm 1.2 in.	–
	Operation Force Condition: • Engine Speed Approx. 2600 rpm	Less than 5.9 N 0.6 kgf. 1.3 lbs.	–
Relief Valve	Setting Pressure Condition: • Engine Speed: Approx. 2600 rpm • Oil Temperature: 40 to 50° 104 to 122°F	12.75 to 13.24 MPa 130 to 135 kgf/cm^2 1849 to 1920 psi	–
Steering Gear Box to Ball Nut	Clearance	0.030 to 0.079 mm 0.00118 to 0.00311 in.	0.15 mm 0.0059 in.
Gear Box Bore	I.D.	61.000 to 61.030 mm 2.40158 to 2.402761 in.	–
Ball Nut	O.D.	60.951 to 60.970 mm 2.39965 to 2.40040 in.	–
Ball Nut Assembly	Axial Play	Less than 0.020 mm 0.00079 in.	–
Worm Shaft Top Cover Side	O.D.	19.996 to 20.009 mm 0.78724 to 0.78776 in.	19.900 mm 0.78346 in.
Ball Nut Side	O.D.	24.996 to 25.009 mm 0.98410 to 0.98461 in.	24.900 mm 0.98031 in.
End Cover Side	O.D.	24.996 to 25.009 mm 0.98410 to 0.98461 in.	24.900 mm 0.98031 in.
Valve Housing to Spool	Clearance	0.008 to 0.015 mm 0.00031 to 0.00059 in.	0.025 mm 0.00098 in.
Sector Gear Shaft Steering Gear Box Side	O.D.	34.957 to 35.000 mm 1.37626 to 1.37795 in.	34.900 mm 1.37402 in.
Side Cover Side	O.D.	27.987 to 28.000 mm 1.10185 to 1.10236 in.	27.900 mm 1.09843 in.
Sector Gear Shaft to Ball Nut	Backlash Deflection measured at pitman arm end	Less than 0.30 mm 0.0118 in.	–
Worm Shaft	Turning Torque	Less than 1.18 N·m 0.12 kgf·m 0.87 ft-lbs	–

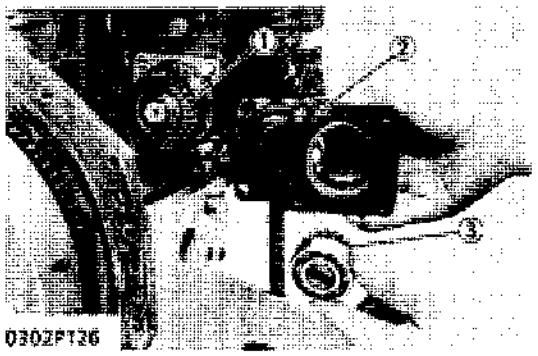
DISASSEMBLING AND ASSEMBLING

[B1550-B1750-B1550HST-B1750HST]



Removing Gear Pump

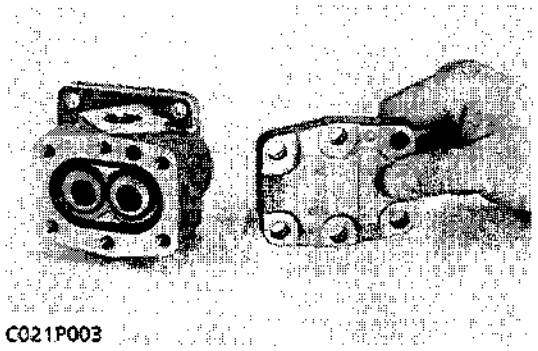
1. Remove the gear pump mounting screws and separate the pump from the engine.



Gear Pump Holder

1. Remove the gear pump holder mounting screws.
2. Remove the gear pump holder (2) with 20T gear (3).
3. Remove the external snap ring, and remove the 27T gear (1) and collar from the fuel cam shaft.

(1) 27T Gear
(2) Gear Pump Holder
(3) 20T Gear



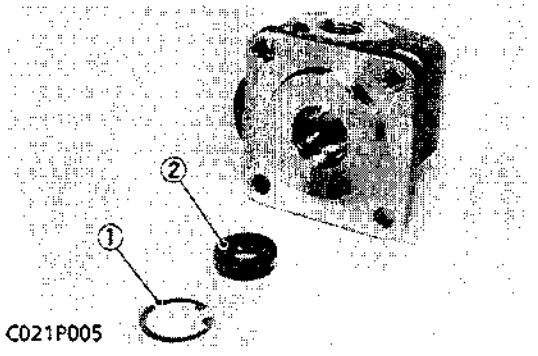
End Cover

1. Secure the gear pump with a vise, and remove the end cover mounting screw.
2. Remove the end cover.

(When reassembling)

- Install the end cover to the casing, using care not to damage the O-ring.
- Align drain holes of the end cover and casing.

Tightening torque	End cover mounting screw	29.4 to 34.3 N·m 3.0 to 3.5 kgf·m 21.7 to 25.3 ft-lbs



Oil Seal

1. Remove the internal snap ring (1), and remove the oil seal (2).

(When reassembling)

- If the oil seal is defective, worn or scratched, replace it.

(1) Snap Ring
(2) Oil Seal