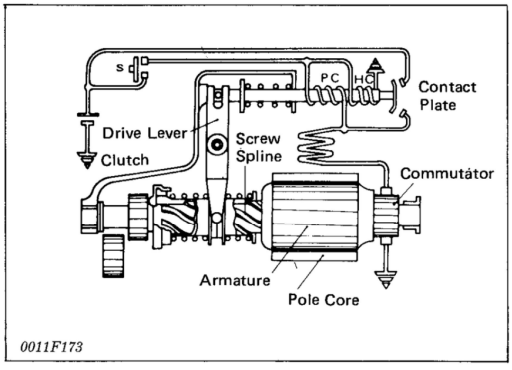


PC: Pull-in Coil HC: Holding Coil S : Switch

Fig. N-31 Starter Circuit

When Key Switch Is On:

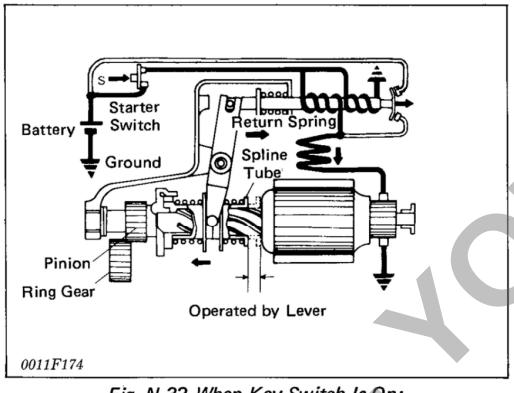


Fig. N-32 When Key Switch Is On:

When the key switch is turned on, a current flows from the battery through the pull-in coil in the magnet switch section to the holding coil, energizing the plunger to pull it in.
At this time, the pinion moves by the drive lever to engage with the ring gear.

When Contact Plate Is Closed:

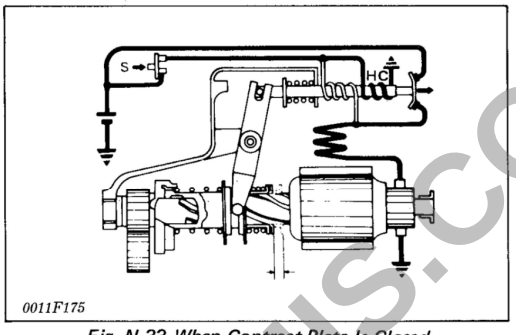


Fig. N-33 When Contract Plate Is Closed.

When the contact plate is closed, a large current flows through the motor section to generate a large mechanical power which turns the engine crankshaft.
At this time, the pinion is moved forward by the screw spline for more contact.
Since the pull-in coil ends are short-circuited by the contact plate, the plunger is held only by the force of the holding coil.

When Key Switch Is Released:

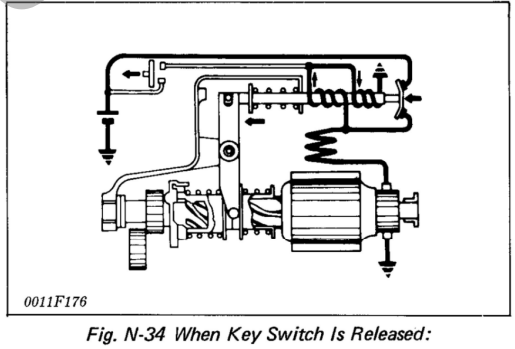


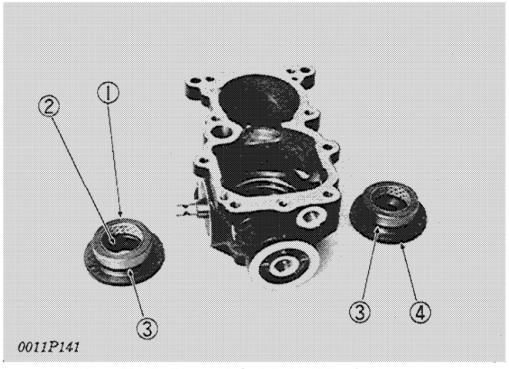
Fig. N-34 When Key Switch Is Released:

When the key switch is released, a current flows instantaneously through the pull-in coil in the opposite direction as shown in Fig. N-34. Therefore, the forces of the holding coil and pull-in coil are balanced. As a result, the plunger is returned by the return spring. Simultaneously, the pinion is disengaged from the ring gear, the contact plate is disconnected, and the starter is promptly stopped by the armature brake.

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11. Inspecting Trunnion Shaft Covers

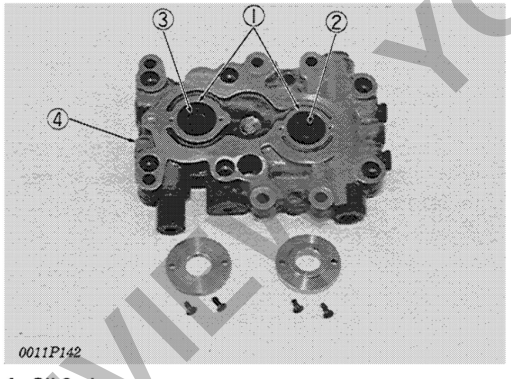


1. Trunnion Shaft Cover 1 (with bushing)
2. Oil Seal
3. O-rings
4. Trunnion Shaft Cover 2 (with bushing)

Fig. G-70 Inspecting Trunnion Shaft Covers

Inspect the trunnion shaft cover (1) and (2) for scratches and heavy wear, and replace if necessary. Inspect the oil seal (2) and O-rings (3) for damage, and replace them if necessary.

12. Inspecting Oil Seals and Bearings in Port Block



1. Oil Seals
2. Needle Bearing (Pump side)
3. Needle Bearing (Motor side)
4. Port Block

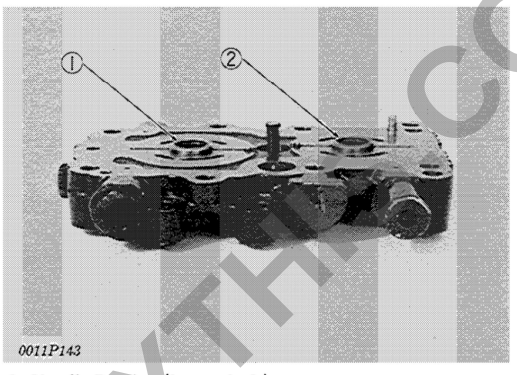
Fig. G-71 Inspecting Oil Seals and Bearings in Port Block

Inspect the oil seals (1) for damage. Inspect the needle bearings (2) and (3) for wear and the roller for jolt. If there are any suspicion of bearing defects, they should be replaced: When reassembling, always replace new oil seals for reducing cost and improving performance.

Assembly

After all parts are washed and inspected, apply hydrostatic transmission oil to worked surfaces.

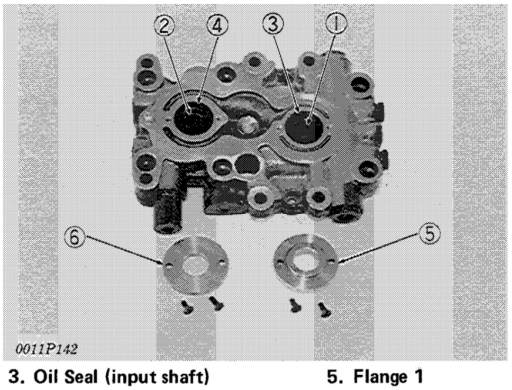
1. Installing Seals and Bearings



1. Needle Bearing (input shaft)
2. Needle Bearing (output shaft)

Fig. G-72 Installing Bearings to Port Block

Press the new needle bearings (1) and (2) into the port block so that the maked side of the needle bearing is 3.5mm (9/64 in.) above the worked surface.



3. Oil Seal (input shaft) **5. Flange 1**
4. Oil Seal (output shaft) **6. Flange 2**

Fig. G-73 Installing Oil Seals to Port Block

Use the flange 1 (5) for pressing the new oil seal (3) so that it is 3mm (1/8 in.) low below the worked surface. Apply a thin coat of grease to section (A) (Fig. G-74).

Press the new oil seal (4) so that it is 0.5 mm (1/64 in.) above the worked surface. Apply a thin coat of grease to section (B) (Fig. G-74).
Mount and fix the flange 2 (6) with two screws. Oil seal (3) and oil seal (4) are identical.

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Group 3

Fuel and Lubricants

Fuel

KUBOTA Diesel Engines will not perform at peak efficiency unless the fuel listed below are used:

CAUTION:

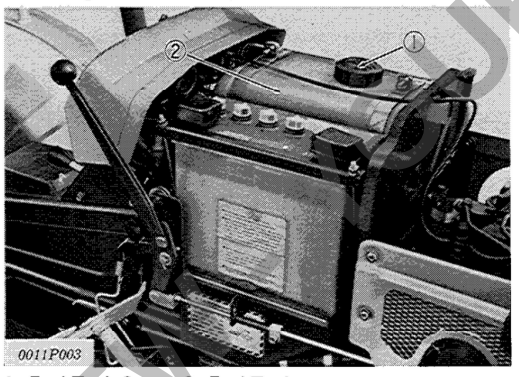
Do not fill fuel tank when engine is running or hot. Do not smoke when filling fuel tank.

Wipe dust and dirt from around filler cap before removing it. Place cap in clean area.

IMPORTANT:

Do not permit dirt or other foreign matter to enter the fuel system. This may cause hard starting, poor performance and engine damage. Always use clean fuel storage cans and funnels.

Checking and Refueling



1. Fuel Tank Cap 2. Fuel Tank

Fig. A-3 Checking and Refueling Fuel Tank

IMPORTANT:

Stop the engine before filling with fuel. Keep away from sparks and flames.

(1) Check the fuel level. Make sure the fuel level does not fall below the prescribed lower limit.

(2) Use grade No. 2-D fuel as defined by ASTM D975 for diesel fuel oil.

Fuel tank capacity: 13 ℓ (3.4 U.S. gals.)

NOTE:

- Always use a strainer when refueling, or dust and sand may enter to damage the fuel injection pump.
- If the fuel tank becomes empty, air enters the fuel system. If this happens, the fuel system must be vented.

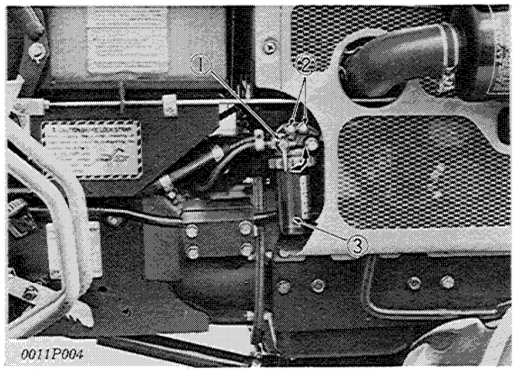
Venting the Fuel System

Air must be vented when:
The fuel filter and piping are removed.
The fuel tank becomes completely empty.
The tractor has not been used for an extended time.
Venting procedure is as follows:

IMPORTANT:

Do not perform venting when the engine is hot.

(1) Fill the fuel tank with fuel, and open the fuel cock.



1. Fuel Cock 2. Vent Screw 3. Fuel Filter Pot

Fig. A-4 Venting Air from Fuel Filter

(2) Twist off the air vent screw at the top of the filter by turning it twice.

(3) When bubbles disappear from fuel coming out of the plug, twist it back on.

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Bolt Torques

Material Grade / Nominal Dia. (mm)	Standard Bolt	Special Bolt	Special Bolt
	SS41, S20C	S43C, S48C (Refined)	SCR3, SCM 3 (Refined)
M 6	7.9 to 9.4 Nm 0.80 to 0.95 kgf·m 5.8 to 6.9 ft-lbs	9.8 to 11.3 Nm 1.00 to 1.15 kgf·m 7.2 to 8.3 ft-lbs	12.2 to 14.2 Nm 1.25 to 1.45 kgf·m 9.0 to 10.5 ft-lbs
M 8	17.6 to 20.6 Nm 1.80 to 2.10 kgf·m 13.0 to 15.2 ft-lbs	23.6 to 27.5 Nm 2.40 to 2.80 kgf·m 17.4 to 20.3 ft-lbs	29.4 to 34.3 Nm 3.00 to 3.50 kgf·m 21.7 to 25.3 ft-lbs
M10	39.2 to 45.1 Nm 4.00 to 4.60 kgf·m 28.9 to 33.3 ft-lbs	48.0 to 55.9 Nm 4.90 to 5.70 kgf·m 35.4 to 41.2 ft-lbs	60.7 to 70.6 Nm 6.20 to 7.20 kgf·m 44.8 to 52.1 ft-lbs
M12	62.8 to 72.5 Nm 6.40 to 7.40 kgf·m 46.3 to 53.5 ft-lbs	77.4 to 90.2 Nm 7.90 to 9.20 kgf·m 57.1 to 66.5 ft-lbs	102.9 to 117.7 Nm 10.50 to 12.00 kgf·m 75.9 to 86.8 ft-lbs
M14	107.9 to 125.5 Nm 11.00 to 12.80 kgf·m 79.6 to 92.6 ft-lbs	123.5 to 147.1 Nm 12.60 to 15.00 kgf·m 91.1 to 108.5 ft-lbs	166.8 to 196.2 Nm 17.00 to 20.00 kgf·m 123.0 to 144.7 ft-lbs
M16	166.8 to 191.2 Nm 17.00 to 19.50 kgf·m 123.0 to 141.0 ft-lbs	196.2 to 225.6 Nm 20.00 to 23.00 kgf·m 144.7 to 166.4 ft-lbs	259.9 to 304.0 Nm 26.50 to 31.00 kgf·m 191.7 to 224.2 ft-lbs
M18	245.1 to 284.4 Nm 25.00 to 29.00 kgf·m 180.8 to 209.8 ft-lbs	274.5 to 318.7 Nm 28.00 to 32.50 kgf·m 202.5 to 235.1 ft-lbs	343.3 to 402.0 Nm 35.00 to 41.00 kgf·m 253.2 to 296.5 ft-lbs
M20	333.4 to 392.2 Nm 34.00 to 40.00 kgf·m 245.9 to 289.3 ft-lbs	367.7 to 431.4 Nm 37.50 to 44.00 kgf·m 271.2 to 318.2 ft-lbs	490.3 to 568.8 Nm 50.00 to 58.00 kgf·m 361.6 to 419.5 ft-lbs

Bolt material grades are shown by numbers punched on the bolt heads.
Prior to tightening, be sure to check out the number as shown below:

Punched Number	Bolt Material Grade	
None	Standard Bolts	SS41, S20C
7	Special Bolts	S43C, S48C (Refined)
9	Special Bolts	SCM3, SCR3 (Refined)

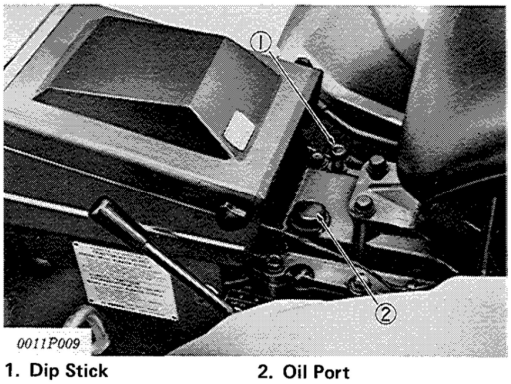
IMPORTANT:

When tightening bolts for aluminum parts, (ex. differential gear case) tightening torques are 65% of the values shown in the table.

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Checking Transmission Oil Level

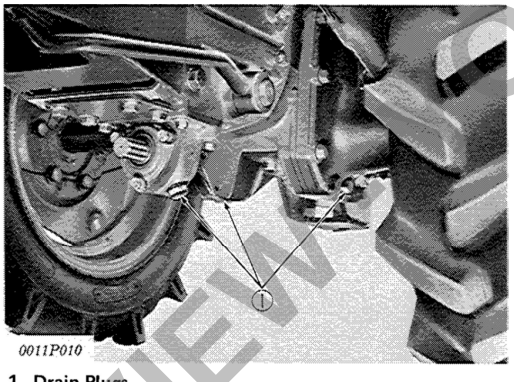


1. Dip Stick 2. Oil Port

Fig. A-10 Checking Transmission Oil Level

With the tractor on level ground, run the engine for a minute to fill the filter. Stop the engine and check the hydraulic system oil level with the dip stick. If the oil level is below the lower line on the dip stick, remove the filter cap and add KUBOTA Genuine Hydrostatic Transmission Oil or its equivalent to bring the oil level up to the upper line.

Changing Transmission Oil



1. Drain Plugs

Fig. A-11 Changing Transmission Oil

The oil in the transmission case is also used for the hydrostatic drive system.
To drain the transmission oil, place a oil pan underneath the transmission case and remove the drain plugs at the rear axle cases and mid PTO case.
After draining, disassemble and clean the strainers and change the oil filter cartridge. After reassembling fill with new hydrostatic transmission oil.

IMPORTANT:

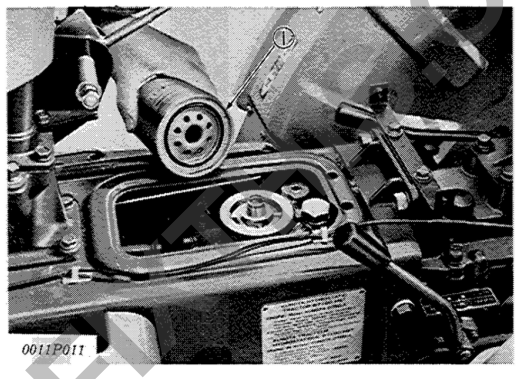
Be sure to stop the engine before changing the transmission oil.

Transmission Oil Capacity:
13.5ℓ (3.6 U.S. gals.)

IMPORTANT:

Never operate the tractor immediately after changing the transmission oil and filter cartridge. Keeping the engine at medium speed for a few minutes prevents damage to transmission.

Changing Transmission Oil Filter Cartridge



1. Oil Filter Cartridge

Fig. A-12 Changing Transmission Oil Filter Cartridge

(1) Remove the 4 bolts which secure the cover. Detach the knob of the speed set device to remove the cover.
(2) Remove the oil filter cartridge by using the filter wrench.
(3) Lightly tighten the joint screw A by using a screwdriver.
(4) Apply a slight coat of oil onto the cartridge gasket.
(5) Screw the new cartridge in by hand. Over tightening may cause deformation of rubber gasket.
(6) After the cartridge has been replaced, the transmission oil will decrease a little. Make sure that the transmission oil does not leak through the seal, and check the oil level.

IMPORTANT:

Be sure to stop the engine before changing the oil filters.

SERVICE INTERVAL:

At initial 50 hours and then after every 200 hours.

IMPORTANT:

To prevent serious damage to hydraulic system, replacement of filter must be a highly efficient, 10 μm filter. Use only a KUBOTA genuine filter or its equivalent.

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Group 2

Specifications

General Specifications

Engine

Max. output/speed	12 kW/46.7 rps (16 HP/2800 rpm)
Max. torque/speed	50 Nm (5.1 kgf·m, 37 ft-lbs)/1800 rpm
Model	KUBOTA D750-AH
Type	Vertical, water-cooled 4 cycle diesel engine
Number of cylinders	3
Bore and stroke	68 mm x 70 mm ($2^{43}/_{64}$ in. x $2^{3}/_{4}$ in.)
Total cubic capacity	762 cm^3 (46.5 cu.in.)
Compression ratio	22
Direction of rotation	Counterclockwise, viewed from flywheel
Dimensions (Length x Width x Height)	721 mm x 697.5 mm x 631 mm ($28^{25}/_{64}$ in. x $27^{15}/_{32}$ in. x $24^{27}/_{32}$ in.)
Weight	93 kg (205 lbs.)
Combustion chamber	Spherical combustion chamber type
Fuel injection pump type (Model)	Bosch Type K Mini Pump (NP-PFR3KD50/2NP4)
Fuel injection nozzle type (Model)	Throttle Type (ND-DN12SD12)
Injection pressure	13.7 to 14.7 MPa (140 to 150 kgf/cm^2, 1988 to 2130 psi)
Injection timing	0.401 to 0.436 rad. (23° to 25°) before T.D.C.
Fuel	
Type	Diesel fuel No. 2-D (ASTM D975)
Consumption	200 g/ps·h (0.446 lbs./Hp·h)
Fuel supply pump normal operating pressure	20 kPa (0.2 kgf/cm^2, 2.8 psi)
Cooling	With pressurized radiator
Lubrication	Forced lubrication by trochoid pump and full-flow micronic oil filter with bypass valve.
Starting	Electric starter with glow plug, compression release

Clutch

Type	Dry, single plate type

Steering

Type	Ball screw type, manual steering
Gear ratio	15.4 : 1

Transmission

Type	Hydrostatic transmission and gear shift (high, low)

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WSM

WORKSHOP MANUAL
TRACTOR

B6100HST,B7100HST

Kubota

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GENERAL

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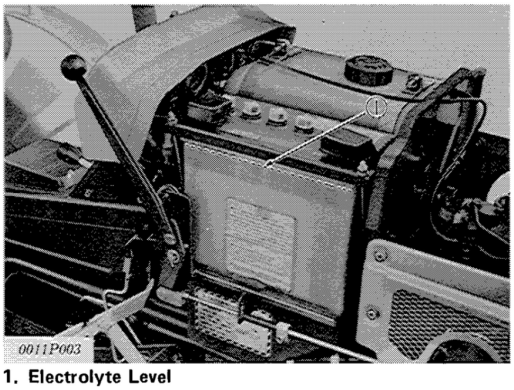
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10. Checking Battery



1. Electrolyte Level

Fig. A-59 Checking Battery

Check electrolyte level. If it is lower than the indicated line, add distilled water.

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4. Checking Oil Clearance between Crankpins and Bearings.

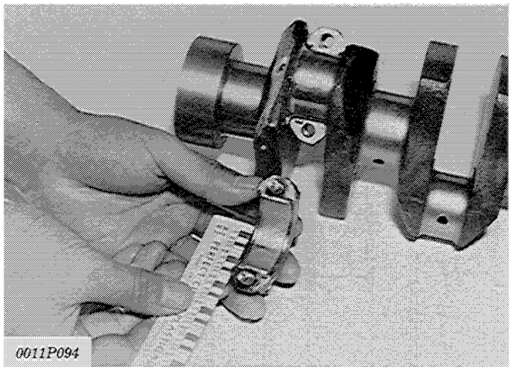


Fig. B-70 Checking Oil Clearance between Crankpins and Bearings

(1) Attach a press gauge on the crankpin bearing with grease.
TEST EQUIPMENT: Press Gauge

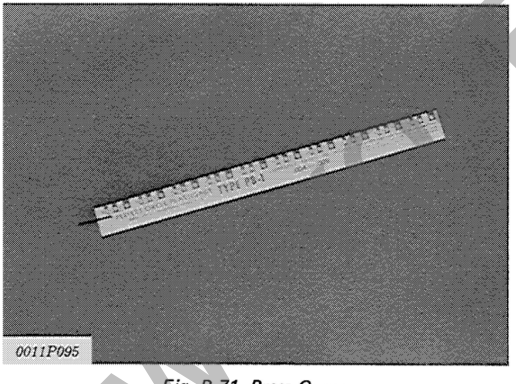


Fig. B-71 Press Gauge

(2) Tighten the connecting rod onto the crankpin to the specified torque.
(3) Remove the large end-cap gently, and measure the width of the press gauge with a sheet gauge (paper).
(4) If the measurement exceeds the allowable limit, replace the crankpin bearing (undersize). (See page 3-14)
- Reference value:
  0.029 to 0.087 mm (0.0011 to 0.0034 in.)
- Allowable limit:
  0.20 mm (0.008 in.)

5. Checking End Play of Crankshaft

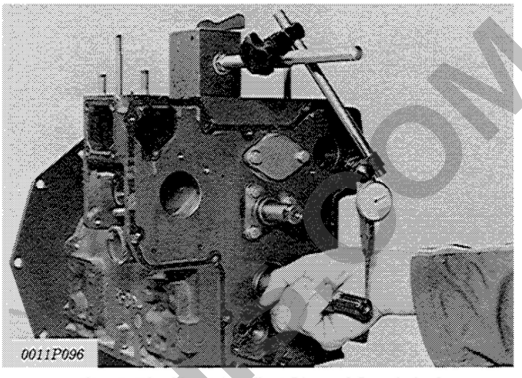


Fig. B-72 Checking End Play of Crankshaft

(1) Set a lever type indicator at the top of the crankshaft.
(2) Measure by pushing and pulling the front end of the crankshaft manually.
(3) If the measurement exceeds the allowable limit, replace the crank side bearing (oversize). (See page 3-14)
- Reference value:
  0.15 to 0.31 mm (0.0059 to 0.0122 in.)
- Allowable limit:
  0.5 mm (0.02 in.)

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The radiator cap is a pressure type, which opens the pressure valve to reduce internal pressure when internal pressure is increased beyond a certain point due to increase in water temperature. When water temperature is reduced (and its volume is reduced) pressure in the radiator becomes negative, and the vacuum valve opens and introduces air into the radiator to prevent distortion of the radiator. The normal valve actuating pressure of the radiator cap is 88 kPa (0.9 kgf/cm², 13 psi).

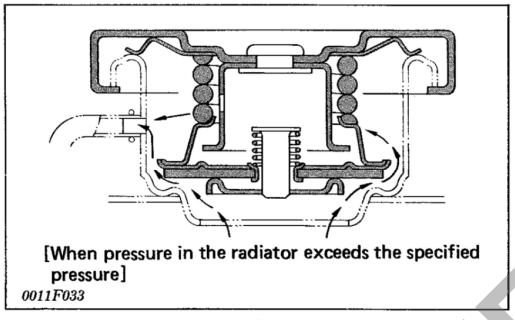


Fig. D-3 Radiator Cap (upper specified pressure)

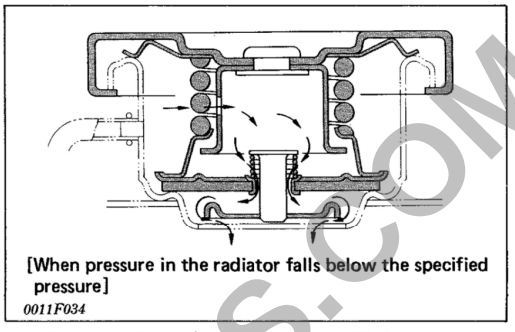


Fig. D-4 Radiator Cap (lower specified pressure)

Troubleshooting

SYMPTOM	PROBLEM	SOLUTION
Engine overheating	Insufficient water	Add water
	Clogged radiator net or radiator fins	Clean
	Rusty radiator	Clean by flushing or replace
	Water leakage from pipes	Tighten connections or replace pipes
	Loose fan belt	Tension properly or replace

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TRANSMISSION

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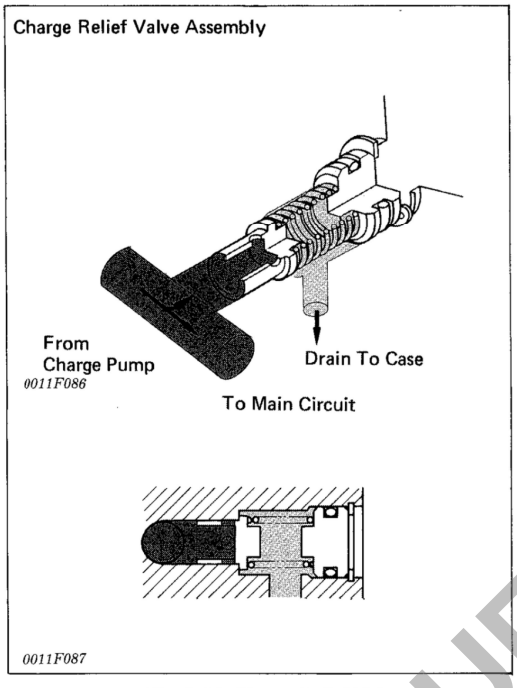


Fig. G-36 Charge Relief Valve

The charge relief valve drains the rest of the oil to the case, which has been used for compensating oil shortage in the main oil circuit.

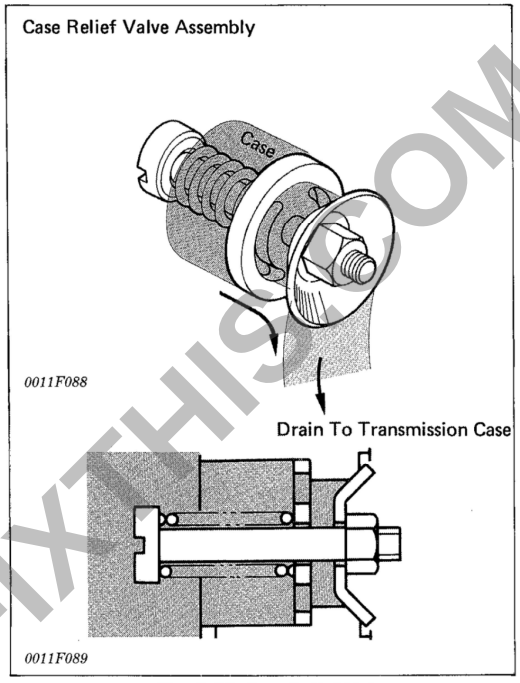


Fig. G-37 Case Relief Valve

The case relief valve drains oil to the transmission case when case pressure reaches approx. 200 kPa (2kgf/cm², 28 psi). This case relief valve sets pressure to feed case oil to the cooler, and prevents oil leakage from the oil seals in the hydrostatic transmission.

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Group 5

Specifications

(R.V.) . . . . . Reference Value
(A.L.) . . . . . Allowable Limit

Transmission (Gear)

Gear backlash			
	(R.V.)	0.1 to 0.2 mm	(0.004 to 0.008 in.)
	(A.L.)	0.4 mm	(0.016 in.)
Spline backlash between gear and shaft			
	(R.V.)	0.030 to 0.078 mm	(0.0012 to 0.0031 in.)
	(A.L.)	0.2 mm	(0.008 in.)
Shift fork width			
	(R.V.)	6.8 to 6.9 min	(0.268 to 0.272 in.)
Shift gear groove width			
	(R.V.)	7.0 to 7.1 mm	(0.276 to 0.280 in.)
Shift fork side clearance in shifter groove			
	(R.V.)	0.1 to 0.3 mm	(0.004 to 0.012 in.)
	(A.L.)	0.6 mm	(0.024 in.)
Shift fork spring free length			
	(R.V.)	22 mm	(0.866 in.)
	(A.L.)	20 mm	(0.787 in.)
Transmission case to hydrostatic transmission case tightening torque		48 to 56 Nm	(4.9 to 5.7 kgf·m, 35 to 41 ft-lbs)
Transmission case to clutch housing tightening torque.		61 to 107 Nm	(6.2 to 10.9 kgf·m, 45 to 79 ft-lbs)
Transmission case to differential gear case tightening torque	(M8)	19 to 32 Nm	(1.9 to 3.3 kgf·m, 14 to 24 ft-lbs)
	(M10)	25 to 39 Nm	(2.5 to 4.0 kgf·m, 18 to 29 ft-lbs)
Mid PTO case to transmission case tightening torque.	(M10)	48 to 56 Nm	(4.9 to 5.7 kgf·m, 35 to 41 ft-lbs)

Hydrostatic Transmission

Model	HVFD-16C4-M	
Maker	Kayaba Industry Co. Ltd.	
Clearance between piston and cylinder block bore		
(R.V.)	0.02 mm	(0.0008 in.)
(A.L.)	0.04 mm	(0.0016 in.)
Piston slipper thickness		
(R.V.)	3.00 mm	(0.118 in.)
(A.L.)	2.90 mm	(0.114 in.)

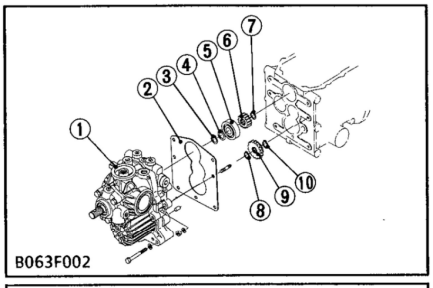
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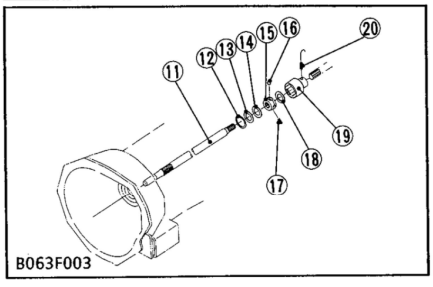
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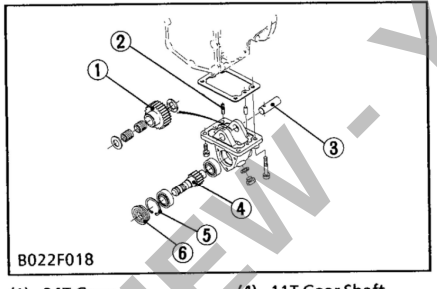




Assembling New Hydrostatic Transmission

1. Set the neutral holder assembly and the front wheel drive shaft 1 to new HST (1).
2. Install the external snap ring (3), back shaft collar (4), ball bearing (5), 13T gear (6) and the external snap ring (7) on the input shaft.
3. Install the external snap ring (8), 16T gear (9) and the external snap ring (10) on the HST output shaft.
4. Install the HST gasket (2) and HST (1) to the transmission case and tighten the HST mounting screws and nuts.
5. Install the inlet pipe joint and hose on HST and tighten the hose clamp.
6. Reconnect the drive shaft with the front wheel drive shaft. (4WD only)
7. Install the retainer (13), gasket (14) and the inner ball coupler (15) on the new type of the propeller shaft (11) and set the spring pin (17) to fix the coupler (15) with it.
8. Mount the ball (16) on the coupler and insert it into the outer ball coupler (19) with the gasket (18) and set the internal snap ring (12) to the coupler (19).
9. Reconnect new propeller shaft with the input shaft by the spring pin (20).

(1) HST
(2) Gasket
(3) External Snap Ring
(4) Back Shaft Collar
(5) Ball Bearing
(6) 13T Gear
(7) External Snap Ring
(8) External Snap Ring
(9) 16T Gear
(10) External Snap Ring
(11) Propeller Shaft
(12) Internal Snap Ring
(13) Retainer
(14) Gasket
(15) Inner Ball Coupler
(16) Ball
(17) Spring Pin
(18) Gasket
(19) Outer Ball Coupler
(20) Spring Pin



(1) 24T Gear
(2) Spring Pin
(3) Shaft
(4) 11T Gear Shaft
(5) Snap Ring
(6) Oil Seal

Mid-PTO

1. Separate the mid-PTO case from the transmission case.
2. After tapping the spring pin (2) into the shaft (3), remove the shaft (3) and the 24T gear (1).
3. Remove the oil seal (6) and the external snap ring (5).
4. Draw out the 11T gear shaft (4) with the bearing on it.

Tightening torque	Plug	32.5 to 36.2 N·m 4.5 to 5.0 kgf·m 44 to 49 ft-lbs
	Mid-PTO case to transmission case	48.0 to 55.9 N·m 4.9 to 5.7 kgf·m 35 to 41 ft-lbs

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Backlash between differential side gear and pinion gear		
(R.V.)	0.13 to 0.33 mm	(0.0051 to 0.0130 in.)
(A.L.)	0.4 mm	(0.016 in.)
Center pin O.D.		
(R.V.)	19.88 to 20.03 mm	(0.7827 to 0.7965 in.)
(A.L.)	19.70 mm	(0.7756 in.)
Bushing I.D.		
(R.V.)	20.10 to 20.15 mm	(0.7913 to 0.7933 in.)
(A.L.)	20.40 mm	(0.8031 in.)
Clearance between center pin and bushing		
(R.V.)	0.07 to 0.27 mm	(0.0028 to 0.0106 in.)
Front axle arm end play		
(R.V.)	0.2 mm	(0.008 in.)
(A.L.)	1 mm	(0.04 in.)
Nut for front drive pinion shaft tightening torque		
(M22)	98 to 147 Nm	(10 to 15 kgf·m, 72 to 108 ft-lbs)
Spiral bevel gear to differential case tightening torque		
(M8)	29 to 34 Nm	(3.0 to 3.5 kgf·m, 22 to 25 ft-lbs)
Front axle case 1 to front axle case 2 tightening torque		
(M8)	24 to 27 Nm	(2.4 to 2.8 kgf·m, 17 to 20 ft-lbs)
Front axle case 1 to front axle case 3 tightening torque		
(M10)	48 to 56 Nm	(4.9 to 5.7 kgf·m, 35 to 41 ft-lbs)
Front gear case to front gear case cover		
(M8)	18 to 21 Nm	(0.8 to 1.0 kgf·m, 6 to 7 ft-lbs)
Spiral bevel gear adjusting shim thickness		
(R.V.)	0.2 mm, 0.5 mm	(0.008 in., 0.020 in.)
Differential side gear adjusting shim thickness		
(R.V.)	1.0 mm, 1.2 mm	(0.039 in., 0.047 in.)

Front Axle (B6100 HST-E, 2WD)

Center pin O.D.		
(R.V.)	19.88 to 20.03 mm	(0.7827 to 0.7886 in.)
(A.L.)	19.70 mm	(0.7756 in.)
Bushing (fitted) I.D.		
(R.V.)	20.10 to 20.15 mm	(0.7913 to 0.7933 in.)
(A.L.)	20.40 mm	(0.8031 in.)
Clearance between center pin and bushing		
(R.V.)	0.07 to 0.27 mm	(0.0028 to 0.0106 in.)

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HYDRAULIC SYSTEM

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Electrolyte

Electrolyte is a mixture of distilled water and sulfuric acid. It is transparent, colorless and odorless. Specific gravity is 1.26 at 20°C (68°F) when fully charged (1.28 in cold weather).

The pole plates are completely immersed in the electrolyte, and active material and electrolyte react chemically to charge and discharge electricity.

Discharge

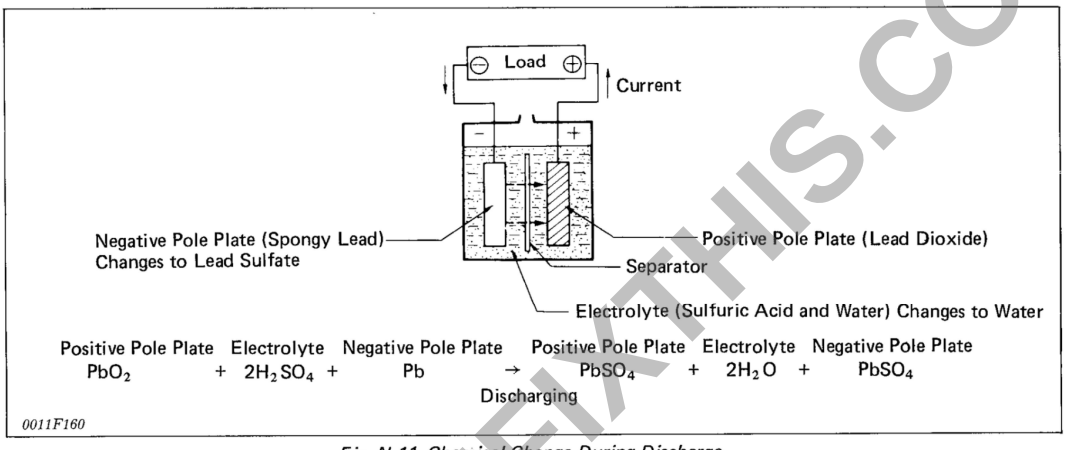


Fig. N-11 Chemical Change During Discharge

When the engine is started or a light is turned on (discharge), the sulfate radical in the electrolyte reacts with the positive and negative pole plates to form lead sulfate. As a result, the sulfate radical in the electrolyte decreases to decrease concentration (specific gravity).

The positive and negative pole plates and electrolyte change as follows:

- Positive Pole Plates (Lead Dioxide) → Lead Sulfate
- Negative Pole Plates (Spongy Lead) → Lead Sulfate
- Electrolyte (Sulfuric Acid Solution) → Water

Charge

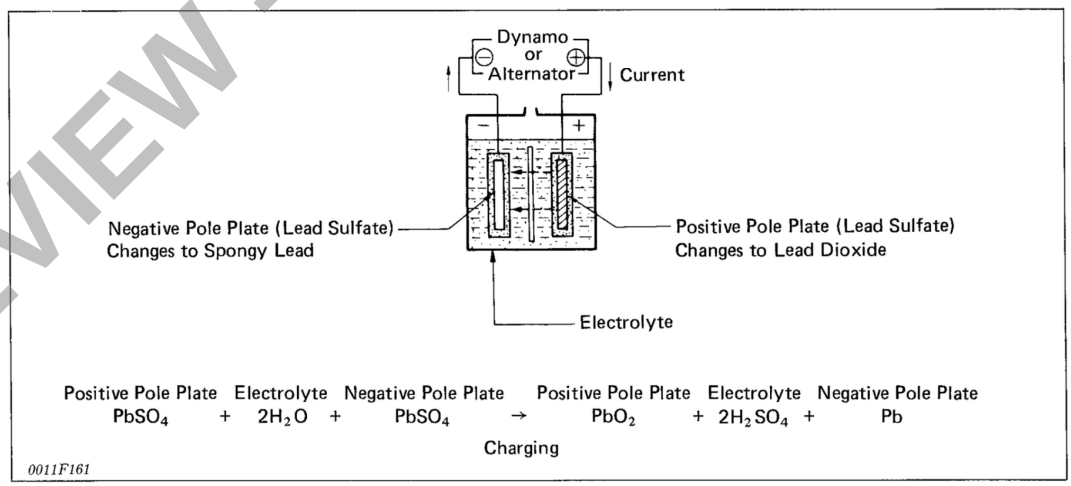


Fig. N-12 Chemical Changes During Charging

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