275 Tractor
Service Manual

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Rac 8-93530

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ENGINE STOP SYSTEM

This system uses a solenoid switch which acts, when the engine starting switch key is turned to OFF, on the fuel injection pump control rack to push it to the "non-injection" position to stop the engine.

Combinations of switch positions

State of engine	Key switch	Oil pressure switch	Electro-magnetic solenoid	Fuel injection pump control rack	Function
Start	ON	ON	ON	STOP	MS resetting
	START	OFF	OFF	MS	Automatic increase of fuel injection quantity for engine start
Running	ON	OFF	OFF	(SS)	Nomal operation
	ON	ON	ON	STOP	Emergency stop caused by an lowering of oil pressure
	OFF	OFF	ON	STOP	Stopping the engine with key switch turned to OFF

Function

(1) MS resetting

When starting the engine, turning the key switch to ON will close a circuit through which current flows to the oil pressure switch. This will cause transistors Tr5 and Tr4 to become conductive, thus allowing current to flow from terminal B of the key switch to transistors Tr3, Tr2 and Tr1. As the solenoid is excited, the control rack of fuel injection pump is placed in the MS reset position.

(2) Automatic increase of fuel injection quantity for engine start

When the engine starting key switch is turned to START, a short-circuit current will flow to the condenser C1 from ST terminal of the switch. Since the timer function is accelerated, the action of the solenoid will be terminated instantaneously and the fuel injection pump control rack will be set to the MS position automatically.

(3) Normal engine operation

After the engine starts, increase of oil pressure will turn the oil pressure switch to OFF, thus opening the oil pressure switch circuit. Transistors Tr5 and Tr4 will become non-conductive (no current flows from the key switch terminal B to the transistors Tr3, Tr2 and Tr1), thus preventing the solenoid from acting.

(4) Stopping the engine with key switch turned to OFF

When the key switch is turned to OFF, discharge current of the condenser C2 which has been charged during engine operation will make the transistors Tr5 and Tr4 conductive. Resulting current flow from terminal B of the key switch to the transistors Tr3, Tr2 and Tr1 will excite the solenoid to stop the engine.

(5) Emergency stop caused by an excessive lowering of oil pressure

If oil pressure lowers excessively during engine operation, the oil pressure switch will be turned on to close a circuit through which current flows from terminal B of the key switch to the transistors Tr3, Tr2 and Tr1. As the result, the solenoid will be excited to stop the engine.

After the engine stopped, all transistors are kept in non-conductive condition and no current flows in the timer circuit.

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REASSEMBLY

Reassembling the front axle center.

1) Insert bushings and grease nipple to the axle center on each side, and apply surff-icient grease to the grease chamber.
2) Put "O" rings to axle center front and rear side.
3) Push in the greased axle center pin from the front side through the front bracket.
4) Then install the rear bracket with spacer to the axle center pin from the rear side.
5) Select such a spacer as will produce 0.1~ 0.3 mm (0.004~ 0.012 in.) clearance between the axle center boss and rear bracket. Insert the spacer into between the axle center and rear bracket, and tighten the set bolt.

mm (in.)

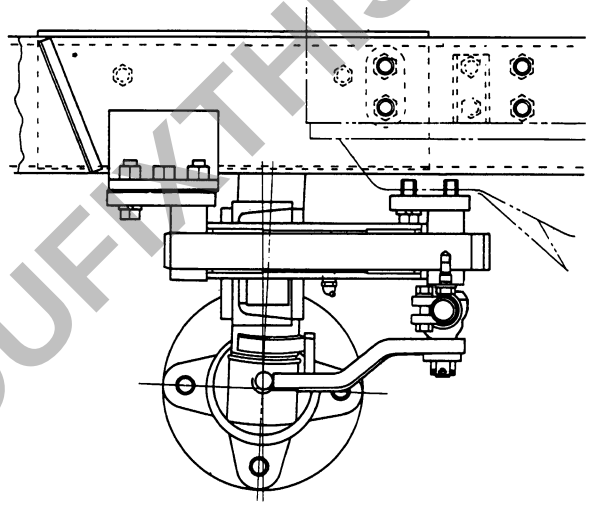
	Thickness
Shim Size	5.0 (0.197) 5.2 (0.205) 5.4 (0.213) 5.7 (0.224)

6) Install the front axle ass'y to the chassis by using bolts which fix the front and rear brackets.

Tightening torque	5.5 ~ 6.6 kg-m(39.8~47.7 ft-lb)

NOTE

Make sure the front axle center swing smoothly without end play.



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CONSTRUCTION

CYLINDER HEAD ASSEMBLY

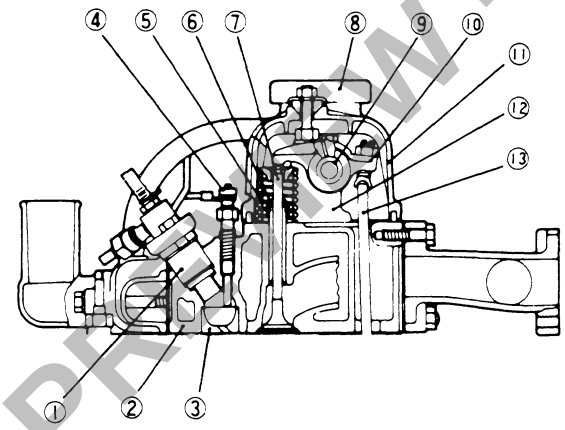
Cylinder head

(1) The cylinder head is an overhead valve head produced from a high-rigidity special cast iron having an excellent cool-effect. Intake and exhaust ports are of a cross-flow type which insures good intake and exhaust efficiency: the intake ports are arranged on the right-hand side of the head and the exhaust ports, on the left-hand side.

(2) The combustion chamber is a swirl chamber produced from heat-resisting steel and is press-fitted in the cylinder head. This chamber, therefore, requires no disassembly.

(3) Intake and exhaust valve guides are made of sintered alloy and are commonly usable in either ports. The valve guides are oil-impregnated to provide greater wear resistance.

(4) The valve seat is integral with the cylinder head, but, depending on specifications, the valve seat with a sintered alloy valve seat ring is used.

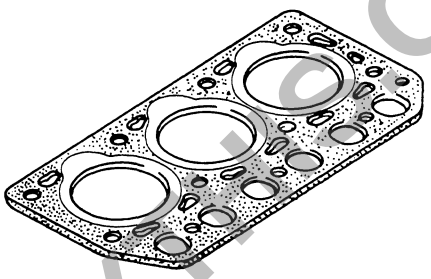


1-Nozzle holder
2-Cylinder head
3-Mouthpiece
4-Glow plug
5-Valve spring
6-Valve stem seal
7-Valve
8-Oil filler cap
9-Rocker shaft
10-Rocker arm
11-Rocker cover
12-Rocker shaft stay
13-Push rod

Cylinder head — Cross section

Cylinder head gasket

The cylinder head gasket is a carbon graphite gasket and is fitted with stainless steel sheet grommets around the bores to provide greater heat and pressure resistance. The gasket requires no application of sealant for installation.

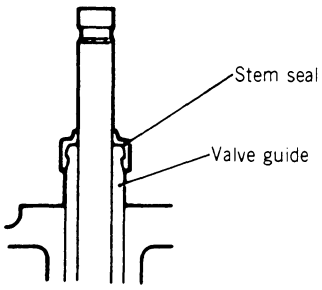


Cylinder head gasket

Valve and valve spring

The intake valve is a heat-resisting steel valve having a large-diameter head to provide great intake efficiency. The exhaust valve has a special heat-resisting steel head welded to the valve stem so the valve may have adequate resistance to high temperatures.

Valve springs are made of spring steel and are closed at the upper end. They carry a red enamel mark on the upper part (rocker arm side) for easy identification of the upper and lower ends. The retainer, retainer lock and valve guide are usable in common between intake and exhaust valves. In the top of the valve guide, a valve stem seal is fitted to prevent downward seepage of oil along the valve stem.



Valve stem seal

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TIGHTENING TORQUE CHART

Description		Tightening torque	
		kg-m	ft. lbs.
Cylinder head bolt	M14 screws 8	15 to 16	108 to 116
	M14 screws 3 (tappet side)	10 to 11	72 to 80
Crank pulley nut		20 to 25	145 to 181
Main bearing cap bolt		5 to 5.5	36 to 40
Connecting rod cap nut		4 to 4.3	29 to 31
Flywheel mounting bolt (8T)		11.5 to 12.5	83 to 90
Oil pan drain plug		5 to 6	36 to 43
Oil filter		1.1 to 1.3	8 to 9
Fuel injection pump			
Delivery valve holder		4 to 5	29 to 36
Nozzle holder			
Holder mounting bolt		1.5 to 2	10.8 to 14.5
Holder body and retaining nut		6 to 8	43.4 to 57.8
Glow plug		1.5 to 2	10.8 to 14.5

General screws	Head Mark (material)		
Screw dia.	4	7	10
M6	0.3–0.5 (2.2–3.6)	0.8–1.0 (5.8–7.2)	1.0–1.3 (7.2–9.4)
M8	1.0–1.3 (7.2–9.4)	1.5–2.2 (10.8–15.9)	2.5–3.5 (18.1–25.3)
M10	1.8–2.5 (13.0–18.1)	3.0–4.2 (21.7–30.4)	5.0–7.0 (36.2–50.6)
M12	3.0–4.2 (21.7–30.4)	5.5–7.5 (39.8–54.2)	9.5–12.0 (68.7–86.8)
M14	5.0–7.0 (36.2–50.6)	8.0–11.0 (57.9–79.6)	16.0–19.0 (115.7–137.4)

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TROUBLESHOOTING

Commonly encountered engine troubles, their causes and corrective actions are shown in the following table.

Hard starting

Symptoms and possible causes		Remedy
Low starting speed	1. Engine oil viscosity too high	Replace engine oil with less viscous oil.
	2. Run-down battery	Charge battery.
	3. Worn battery	Replace battery.
	4. Battery terminals loosely connected	Clean terminals and correct cables.
	5. Defective starter	Disassemble and repair or replace starter.
	6. Defective main drive section	Check clutch for disengagement.
Defective injection system	1. Air trapped in fuel passage	Bleed air from fuel system.
	2. Clogged fuel filter	Clean or replace filter.
	3. Low injection pressure	Adjust injection pressure.
	4. Inadequate spray	Clean or replace nozzle.
	5. Injection pump delivering insufficient fuel	Disassemble and repair or replace injection pump.
	6. Improper fuel	Replace with diesel fuel (JIS No.2) (JIS No. 3 in very cold weather).
	7. Injection too early	Adjust injection timing.
Engine body troubles	1. Low compression	
	a. Incorrect valve clearance	Adjust valve clearance.
	b. Inadequate contact of valve seat	Lap valve.
	c. Valve stem seizure	Replace valve and valve guide.
	d. Broken valve spring	Replace valve spring.
	e. Compression leaks through cylinder head gasket	Replace gasket.
	f. Piston ring seizure	Replace piston and piston ring.
	g. Worn piston ring and cylinder	Overhaul engine.

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SPECIFICATIONS

Tractor model				275-2WD	275-4WD	
Type				All purpose wheel tractor		
Body structure				Monocoque type		
Dimensions	Overall length	To end of rear tire	mm (in.)	2740 (107.9)	←	
		To end of 3-point linkage		2935 (115.6)	←	
	Overall width			1400 (55.1)		
	Overall height	To top of steering wheel		1425 (56.1)	1420 (55.9)	
		To top of Muffler		2020 (79.5)	2010 (79.1)	
	Wheelbase			1575 (60.0)	1595 (62.2)	
	Ground clearance			345 (13.6)	275 (10.8)	
	Gross weight		kg (lb)	1040 (2,293)	1140 (2,513)	
	Load distribution (without load)	Front axle		435 (959)	520 (1146)	
		Rear axle		605 (1334)	620 (1367)	
	Turning radius (with brakes)		mm (in.)	2400 (94.5)	←	
Engine	Model			MITSUBISHI K3M-11A		
	Type			Water cooled vertical 4 cycle overhead value in line diesel engine		
	Number of cylinders			3		
	Combustion chamber type			Swirl combustion chamber with preheater		
	Cylinder liner			Non-liner		
	Bore and stroke		mm (in.)	84x90 (3.30x3.54)		
	Piston displacement		cc (cu in.)	1496 (91.26)		
	Compression ratio			23 : 1		
	Injection order			1 – 3 – 2		
	Rated rpm		rpm	2700		
	Max. rpm			2900		
	Idling rpm			800		
	Max. bare HP (SAE)		HP/rpm	30/2700		
	Max. torque		kg-m/rpm (ft-lb/rpm)	8.5/1900 (61.5/1900)		
	Compression pressure		kg/cm^2 (psi)/rpm	32/260 (455/260)		
	Number of piston rings			2 compression rings and 1 oil ring		
	Intake valves	Open	deg	BTDC 20°		
		Close		ABDC 44°		
	Exhaust valves	Open		BBDC 44°		
		Close		ATDC 20°		
	Injection timing			at 21° before TDC		
	Valve clearance	Intake valves (at cold)	mm (in.)	0.25 (0.01)		
		Exhaust valves (at cold)		0.25 (0.01)		

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PERIODICAL MAINTENANCE SERVICES

● = replacement ○ = clean-up ⊕ = check

No.	Items	Maintenance interval								Thereafter every
		50	100	150	200	250	300	350	400	
1	Engine oil replacement	●	●		●		●		●	100
2.	Engine oil filter element replacement	●	●		●		●		●	100
3.	Engine fuel filter element clean-up and replacement	○	○		○		○		●	○ 100 ● 400
4.	Air cleaner element clean-up and replacement	○	○	○	○	○	○	○	●	○ 50 ● 400
5	Power steering oil replacement				●				●	200
6	Nozzle injection pressure check								⊕	400
7	Main and Sub transmission oil replacement	●	⊕		●		⊕		●	● 200 ⊕ 100
8	Valve clearance	⊕							⊕	400
9	Hydraulic oil filter clean-up	○	○	○	○	○	○	○	○	50
10	Front drive differential gear case	●	⊕		●		⊕		●	⊕ 100 ● 200
11	Cooling water	●	⊕	⊕	⊕	⊕	⊕	⊕	●	● 400 ⊕ 50
12	Rear axle case oil replacement		⊕		⊕		●		⊕	● 300 ⊕ 100
13	Specific gravity of battery electrolyte inspection	⊕	⊕		⊕		⊕		⊕	100

● . . . . Replacement

○ . . . . Clean-up

⊕ . . . . Check

NOTE

The intervals mentioned in the above list regarding replacing, cleaning-up and checking are for the standard cases. You can be flexible so as to meet the requirement depending upon the operating condition of the tractors.

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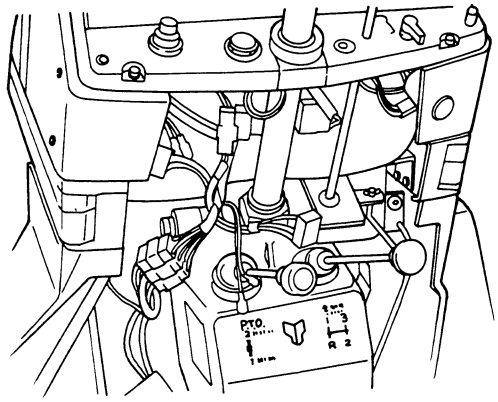
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(6) Loosen the clamp securing the air cleaner lower hose to the intake manifold of the engine, and remove the hose.

NOTE

The air cleaner body is to be removed as mounted on the bonnet.

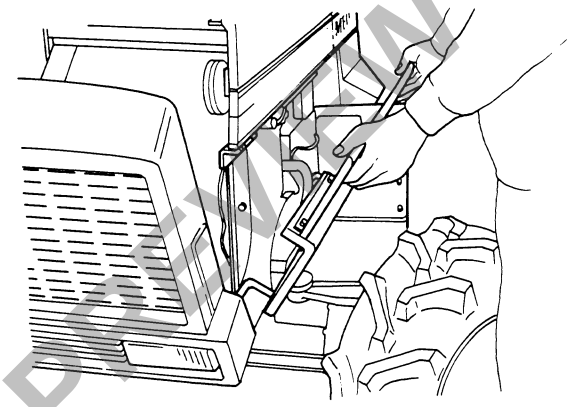
(7) Unscrew the bolts securing the rear body cover, and remove the connectors for harnesses.



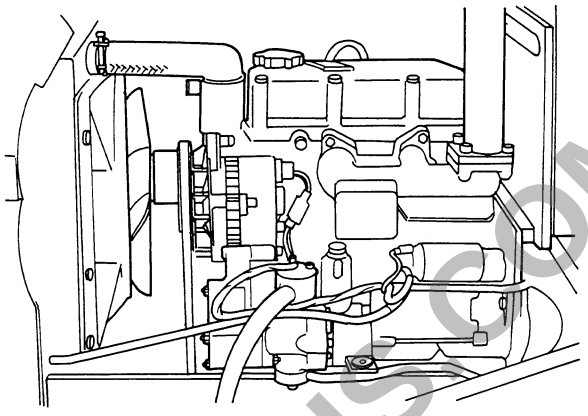
NOTE

Remove the connector for fuel gauge.

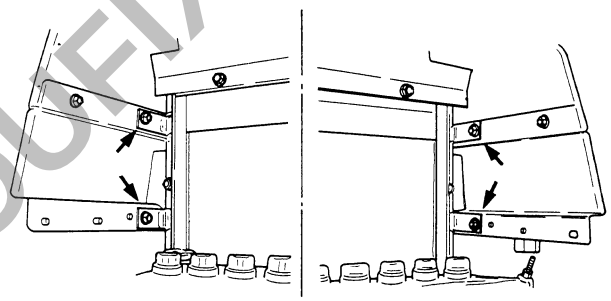
(8) Remove the body covers, right and left.



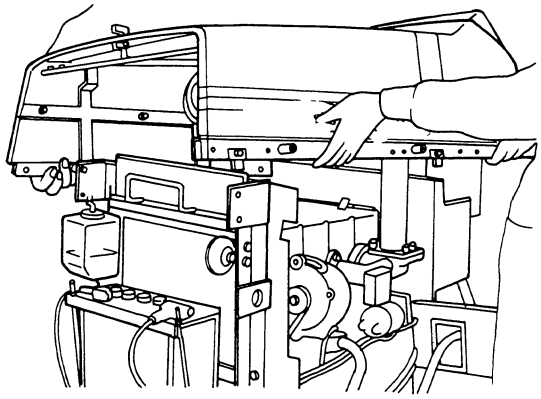
(9) Disconnect the tachometer drive cable at the engine side.



(10) Unscrew the bolts securing the bonnet at the following parts:



Front right and left sides of radiator



Rear right and left sides of bonnet

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Crankshaft

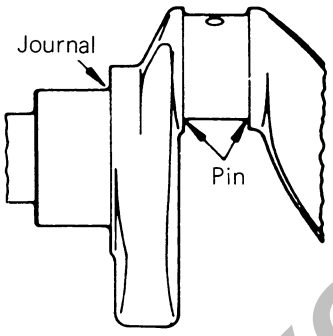
(1) Measure crankshaft bend. If excessive, repair or replace the crankshaft.

(2) Check the journals and pins for damage, seizure and other faults. If the journals and pins are seriously worn or damaged, correct them to undersize.

Important

a) Undersizes for correcting journals and pins are shown in the table of Specifications.

b) Finish each fillet of journal or pin to the radius of 2.5 mm (0.0984 in.).

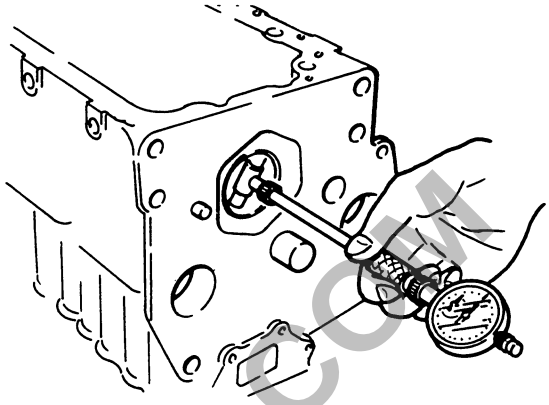


Fillet radius for all pins and journals should be 2.5 mm (0.0984 in.)

Fillet radius

Item	Standard value	Service limit
Bend of crankshaft	0.03 mm (0.0012 in.) max.	
End play of crankshaft	0.06 to 0.3 mm (0.0024 to 0.0118 in.)	0.5 mm (0.0197 in.)

(3) Check the crankshaft end play. If the end play exceeds the specified value, replace No. 3 main bearing. To check the end play, first install the main bearings, crankshaft, and main bearing caps, then tighten the cap bolts to the specified torque. Using a dial indicator on the forward end of the crankshaft, measure the end play.



Measuring crankshaft end play

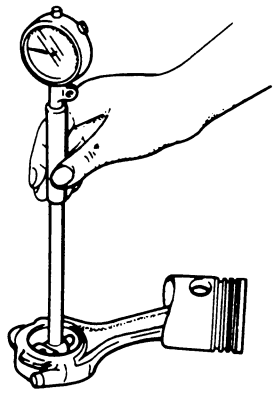
Main bearings and connecting rod bearings

(1) Check the bearing surface for spalling, melt, seizure and incorrect contact. If defective, replace.

(2) Install the main bearings and connecting rod bearings to the cylinder block and connecting rod respectively. Measure the bearing ID. Subsequently measure the crankshaft journal and pin OD to obtain an oil clearance. (A plastigauge may be used.) In case of too large oil clearance, replace the bearing. If the standard clearance cannot be obtained even after the replacement of the bearing, grind the crankshaft to undersize and install bearings of the same undersize.

Important

Before measuring the ID of main bearing and connecting rod bearing, be sure to tighten their bolts to the specified torque.



Measuring connecting rod bearing ID

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Description	Type	Standard value	Repair limits	Service limit
Oil pump	Trochoid type			
Check valve opening pressure		4 kg/cm² (56.9 psi)		
Clearance between outer rotor and body		0.15 to 0.2 (0.0059 to 0.0079)		0.3 (0.0118)
Clearance between rotor and cover		0.03 to 0.07 (0.0012 to 0.0028)		0.2 (0.0079)
Oil pressure switch				
Contact closing pressure		0.15 to 0.3 kg/cm² (2.13 to 4.27 psi)		

Fuel system

Description	Type	Standard value	Repair limits	Service limit
Fuel used				
Fuel filter	Filter paper type			
Fuel pump	Electromagnetic type			
Delivery		225cc (13.73 cu.in.) min./15 sec. 12V		
Fuel injection pump	ND-PFR3M			
Fuel injection rate				
At smoke set (SS)	K3H	1350 rpm: 30.5 ±1.0 mm³/st		
	K3M	1350 rpm: 33 ±1.0 mm³/st		
At start set (MS)	K3H	150 rpm: 53.5 ±7.5 mm³/st		
	K3M	150 rpm: 66 ±7.5 mm³/st		
Difference from reference cylinder		2 mm³ (0.00012 cu.in.) /rev. cyl. max.		
Prestroke		2.2 ±0.1 (0.0866 ±0.0039)		
Nozzle	Throttle type ND-DN4SD24			
Injection starting		160^{+10}_{-0} kg/cm² ($2276 \pm^{142}_{0}$ psi)		160 ±10 kg/cm² (2276 ±142 psi)

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Section

5005

STEERING SYSTEM

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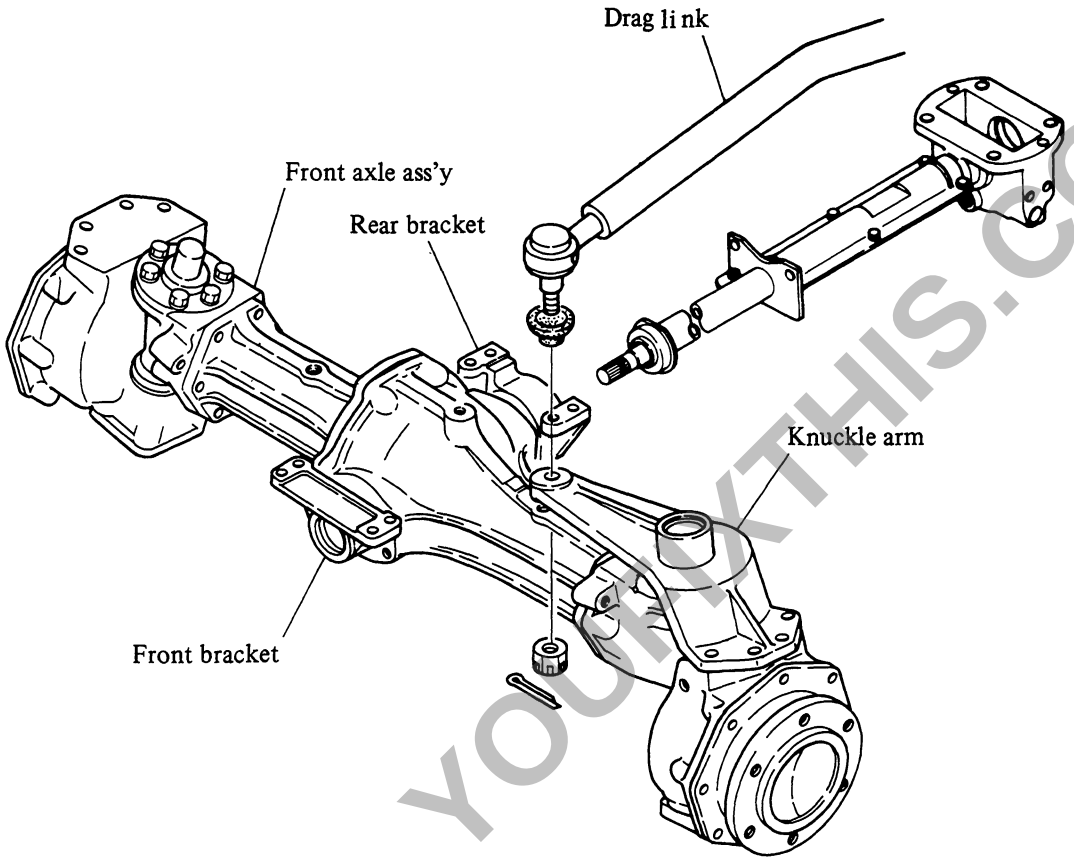
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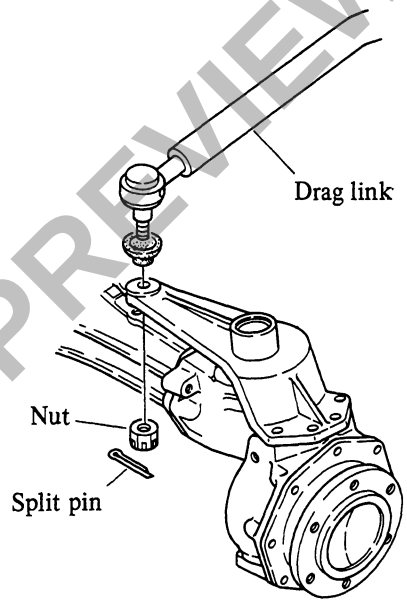
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Removing front axle ass'y.

1) Disassemble 4WD propeller shaft parts.
(See paragraph on 4WD PTO)



2) Remove drag link from arm L.H



3) Jack-up at clutch housing bottom.

NOTE

Be sure to have parking brake applied.

4) Demount tires.

5) With front bracket as well as rear bracket mounting bolts removed, take off front axle ass'y.

NOTE

Use caution because it is heavy.

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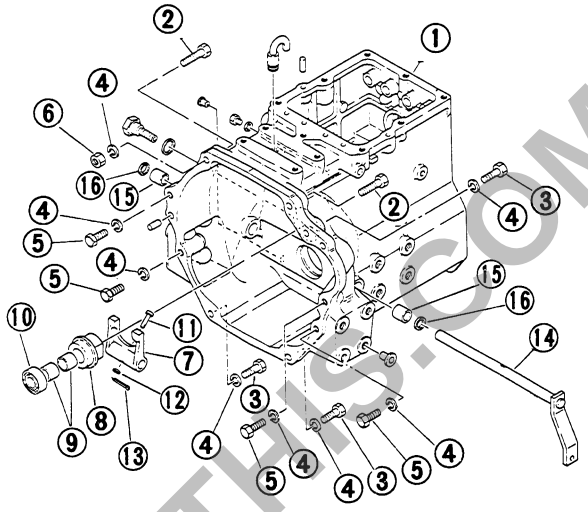
1) With clutch pedal (19), oil seal (5) and washer (4) installed to brake pedal shaft (3) insert the shaft to center case from left end.

NOTE

Be careful not to cause the oil seal lip to turn up during installation.

2) Install spring (20).
3) With oil seal (5), washer (4) and left-hand brake pedal (1) inserted, install left-hand brake pedal by means of spring pin (8).
4) Install right-hand brake pedal (2) by means of snap ring (7).
5) Connect clutch rod (21) and clutch pedal (19) with pin (26).
6) Insert brake rod (6) to right-hand brake pedal (2) and brake arm and install spring (10).
7) Enter transmission oil through filler port underneath the seat front to specified level (17 ℓ). Check the level with level gauge. See instruction manual for level checking procedure.

Assembling the Release Shaft.

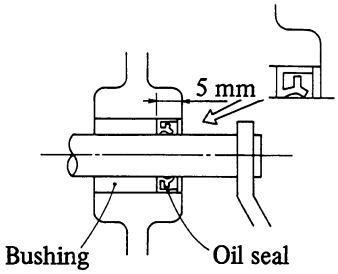


1- Clutch housing
2- Bolt
3- Bolt
4- Spring washer
5- Bolt
6- Nut
7- Release fork
8- Hub
9- Bushing
10- Bearing
11- Clevis pin
12- Washer
13- Split pin
14- Clutch pedal shaft
15- Bushing
16- Oil seal

1) Install bushing (15) and oil seal (16). The oil seal prevents water from entering.

NOTE

a) Drive in the bushing to 5mm deeper than clutch housing end surface.
b) Coat internal surface of the bushing with grease.
c) Be sure to install the oil seal in proper direction.



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1) Remove needle bearing (1).
2) With clutch (B) (2), bearing (3) remaining as they are, pull the joint shaft (5) back ward and remove collar, gear, needle bearing and bearing holder.
3) With snap ring for spline boss A (4) at housing front removed, take off gear (5).
4) Remove spline boss A (4) forward.

NOTE

Be careful not to loose adjust liner.

5) If necessary, remove snap ring from housing or remove ball bearing and needle bearing from spline boss A (4).
6) [In case of 2WD model]

   Pull out boss D (6) forward with bearing remaining on it, and remove snap ring off the housing and bearing off boss D as necessary.

   [In case of 4WD model]

   Pull out spline boss B (7) with gear and bearing remaining, and if needed, remove snap ring off the housing and bearing off the boss.
7) With snap ring removed from joint shaft, take off the clutch B and bearing.

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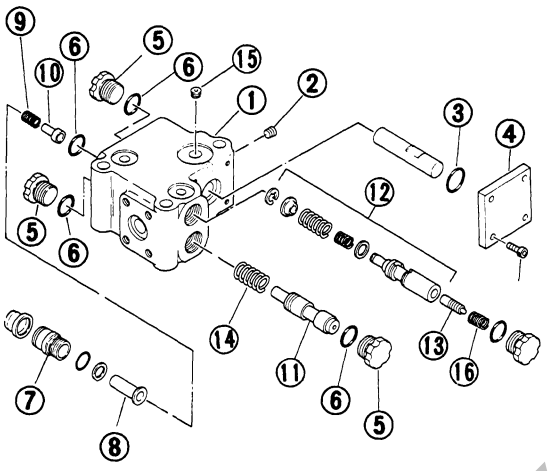
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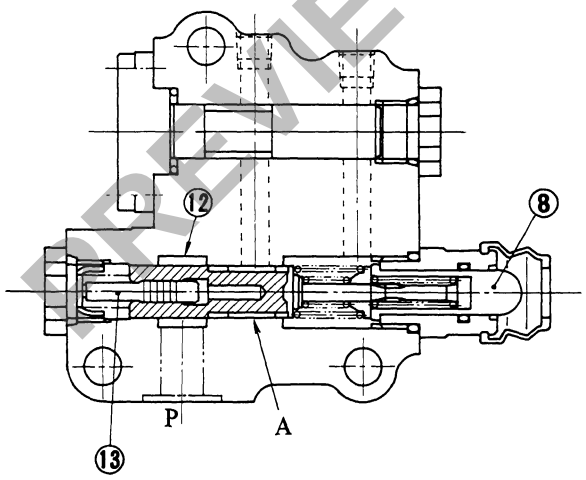
Check of pressure at clutch port

The pressure is normal if 53^{+5}_{-10} kg/cm² is measured in stop state. If the pressure is insufficient, carry out inspection in the following sequence.

1) Remove the union bolt (on the lower side out of two union bolts) from the center case and check the O ring for damage.
2) Cleaning of live PTO control valve



Remove plug (7) and take out push rod (8), spring seat (10), spool assy (12), piston (13) and spring (16). This work can be easily performed if the valve is located so that plug (7) faces the bottom side.

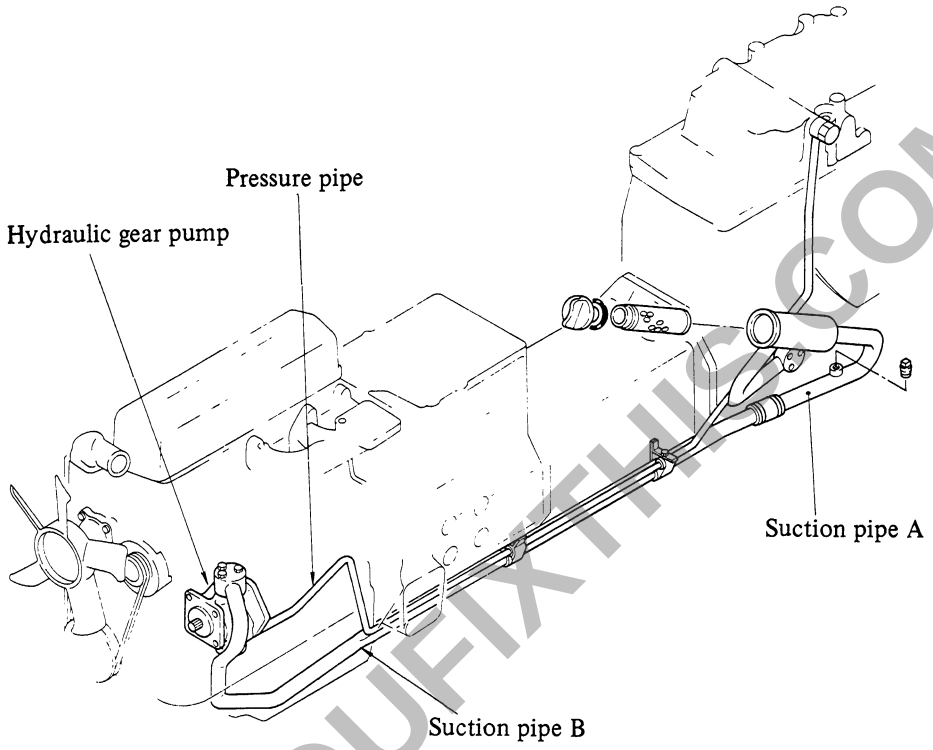


Wash the taken out spool assy (12), piston (13) and push rod (8). Breathe through hole a in spool assy (12) and assure that it is not plugged with dust and that piston (13) smoothly moves.

Disassembly and cleaning have been completed. Carry out assembly in accordance with instructions given in the section of assembly.

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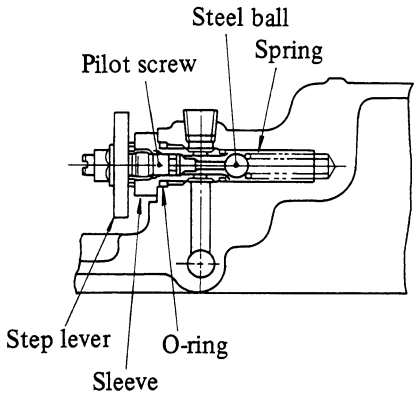


Control valve.

The control valve is mounted under the hydraulic lift lock valve and has a linkage connected to the control lever. In this valve are built the spool valves, check valve, unload valve and poppet.

Lift lock valve.

The lift lock valve is an in-line check valve. When the oil enters the cylinder, it pushes the lock valve to open. Once the oil enters the cylinder, it forces the lock valve against the seat by means of the pressure generated by the weight of the implement and spring pressure. Accordingly, the heavier the weight of the implement, the greater the pressure against the lock valve. While in farming operations, the lock valve opening can be easily adjusted by the lever. This makes it possible to regulate the implement lowering speed ranging from "slow down" (while seeding) to "quick down" (while plowing).



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