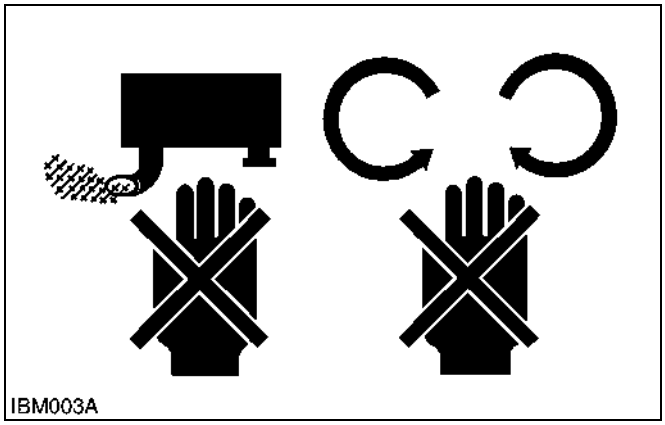
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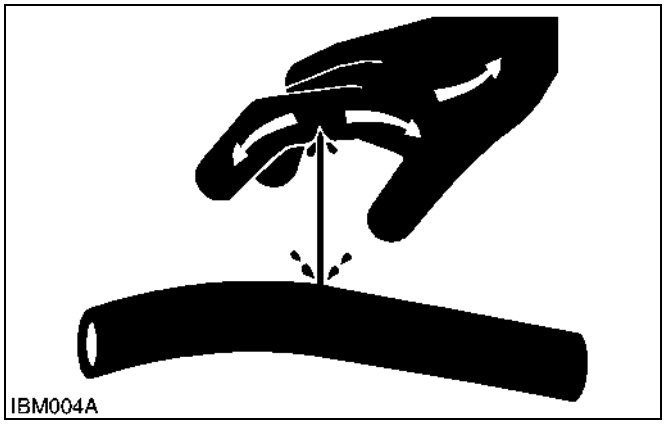
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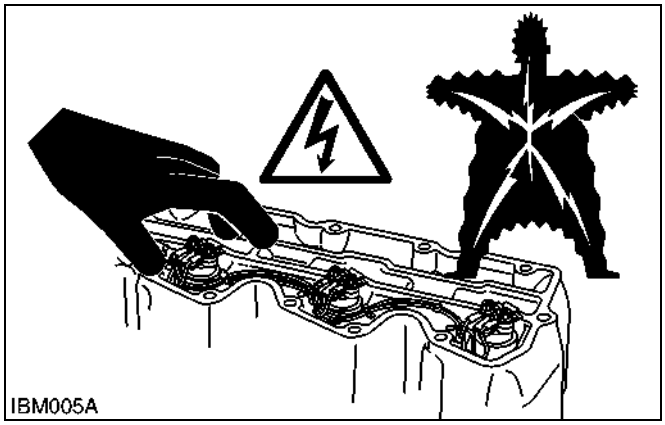
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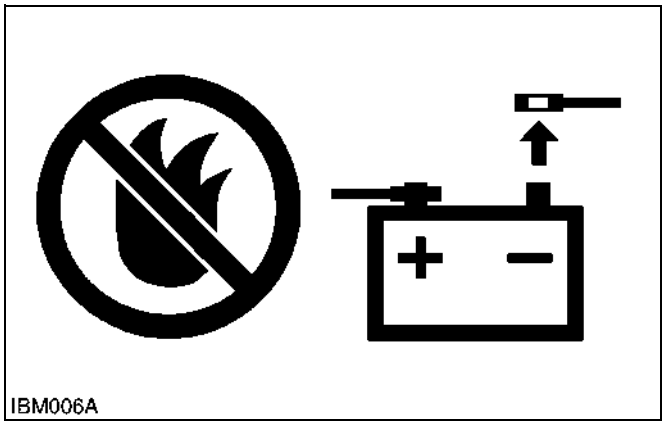
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OPERATE SAFELY

- Do not use the machine after you consume alcohol or medication or when you are tired.
- Put on applicable clothing and safety equipment.
- Use applicable tools only. Do not use alternative tools or parts.
- When 2 or more persons do servicing, make sure that you do it safely.
- Do not operate below the machine that only a jack holds. Always use a safety stand to hold the machine.
- Do not touch the hot parts or parts that turn when the engine operates.
- Do not remove the radiator cap when the engine operates, or immediately after it stops. If not, hot water can spout out from the radiator. Only remove the radiator cap when it is at a sufficiently low temperature to touch with bare hands. Slowly loosen the cap to release the pressure before you remove it fully.
- Released fluid (fuel or hydraulic oil) under pressure can cause damage to the skin and cause serious injury. Release the pressure before you disconnect hydraulic or fuel lines. Tighten all connections before you apply the pressure.
- Do not open a fuel system under high pressure. The fluid under high pressure that stays in fuel lines can cause serious injury. Do not disconnect or repair the fuel lines, sensors, or any other components between the fuel pump and injectors on engines with a common rail fuel system under high pressure.
- Put on an applicable ear protective device (earmuffs or earplugs) to prevent injury against loud noises.
- Be careful about electric shock. The engine generates a high voltage of more than DC100 V in the ECU and is applied to the injector.

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PREVENT A FIRE

- Fuel is very flammable and explosive under some conditions. Do not smoke or let flames or sparks in your work area.
- To prevent sparks from an accidental short circuit, always disconnect the battery negative cable first and connect it last.
- The battery gas can cause an explosion. Keep the sparks and open flame away from the top of battery, especially when you charge the battery.
- Make sure that you do not spill fuel on the engine.

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3. SPECIFICATIONS

[1] L3301/L3901

Model			L3301			L3901		
			Manual Transmission		HST	Manual Transmission		HST
			2WD	4WD	4WD	2WD	4WD	4WD
PTO power*			20.7 kW (27.7 HP)		19.5 kW (26.2 HP)	23.9 kW (32.1 HP)		22.8 kW (30.6 HP)
Engine	Model		D1803-CR-E4					
	Type		Direct injection, vertical, water-cooled, 4-cycle diesel					
	Number of cylinders		3					
	Bore and stroke		87 × 102.4 mm (3.4 × 4.0 in.)					
	Total displacement		1.826 L (111.4 cu.in.)					
	Engine gross power*		24.6 kW (33.0 HP)			28.0 kW (37.5 HP)		
	Engine net power*		23.4 kW (31.4 HP)			27.1 kW (36.3 HP)		
	Rated revolution		45.0 rps (2700 rpm)					
	Low idling revolution		15.0 rps (900 rpm)					
	Maximum torque		101.7 N·m (75.0 lbf·ft)			115.8 N·m (85.4 lbf·ft)		
	Battery		[75D23R] 12 V, RC: 110 min, CCA: 580 A					
Capacities	Fuel tank		42.0 L (11.0 U.S.gals, 9.24 Imp.gals)					
	Engine crankcase (with filter)		6.7 L (7.1 U.S.qts, 5.9 Imp.qts)					
	Engine coolant		6.0 L (6.3 U.S.qts, 5.3Imp.qts)					
	Transmission case		28.0 L (7.4 U.S.gals, 6.16 Imp.gals)	28.5 L (7.5 U.S.gals, 6.27 Imp.gals)	23.5 L (6.2 U.S.gals, 5.17 Imp.gals)	28.0 L (7.4 U.S.gals, 6.16 Imp.gals)	28.5 L (7.5 U.S.gals, 6.27 Imp.gals)	23.5 L (6.2 U.S.gals, 5.17 Imp.gals)
Dimensions	Overall length (without 3p)		2810 mm (110.6 in.)	2740 mm (107.9 in.)		2810 mm (110.6 in.)	2740 mm (107.9 in.)	
	Overall width (min. tread)		1400 mm (55.1 in.)					
	Overall height (with ROPS)		2330 mm (91.7 in.)					
	Overall height (Top of steering wheel)		1475 mm (58.1 in.)					
	Wheel base		1610 mm (63.3 in.)					
	Min. ground clearance		345 mm (13.6 in.)	340 mm (13.4 in.)		345 mm (13.6 in.)	340 mm (13.4 in.)	
	Tread	Front	1050 mm (41.3 in.)	1095 mm (43.1 in.)		1050 mm (41.3 in.)	1095 mm (43.1 in.)	
		Rear	1115 mm (43.8 in.), 1195 mm (47.1 in.), 1290 mm (50.8 in.)					
Weight (with ROPS)			1160 kg (2557 lbs)	1240 kg (2734 lbs)	1260 kg (2778 lbs)	1175 kg (2590 lbs)	1255 kg (2767 lbs)	1260 kg (2778 lbs)
Traveling system	Tire	AG Front	5.00-15	7.2-16		5.00-15	7.2-16	
		AG Rear	11.2-24					
	Industrial (option)	Front	–	27 × 8.50-15		–	27 × 8.50-15	
		Rear	–	15-19.5R4		–	15-19.5R4	
	Clutch		Dry type single stage			Dry type dual stage		Dry type single stage
	Steering		Integral type power steering					
	Transmission		Gear shift, 8 forward and 8 reverse		Hydrostatic transmission, 3 range speed	Gear shift, 8 forward and 8 reverse		Hydrostatic transmission, 3 range speed
	Brake		Wet disk type					
	Min. turning radius (with brake)		2.4 m (7.9 feet)	2.5 m (8.2 feet)		2.4 m (7.9 feet)	2.5 m (8.2 feet)	
Hydraulic unit	Hydraulic control system		Position control					
	Pump capacity (main)		23.9 L/min (6.3 gals/min., 5.26 Imp.gals/min.)					
	Pump capacity (PS)		14.5 L/min (3.8 gals/min, 3.19 Imp.gals/min.)					
	Three point hitch		Category 1					
	Max. lift force	At lift points	906 kg (1998 lbs)					
		24 in. behind lift points	651 kg (1435 lbs)					
	System pressure		16.2 MPa (165 kgf/cm^2, 2349 psi)					

[2] L4701

No.	Place	Capacity	Lubricants, fuel and coolant
		L4701	
1	Fuel	51.0 L 13.5 U.S.gals 11.2 Imp.gals	• No. 2-D S15 diesel fuel • No. 1-D S15 diesel fuel if temperature is below –10 °C (14 °F)
2	Coolant	6.5 L 6.9 U.S.qts 5.7 Imp.qts	Fresh clean soft water with anti-freeze
3	Engine crankcase (with filter)	8.2 L 8.7 U.S.qts 7.2 Imp.qts	Engine oil: Refer to G-12. • Above 25 °C (77 °F) SAE30, SAE10W-30 or 15W-40 • −10 to 25 °C (14 to 77 °F) SAE20, SAE10W-30 or 15W-40 • Below −10 °C (14 °F) SAE10W-30
4	Transmission case	40.0 L 10.6 U.S.gals 8.80 Imp.gals	KUBOTA SUPER UDT-2 fluid
5	Front axle case [4WD]	6.5 L 6.9 U.S.qts 5.7 Imp.qts	KUBOTA SUPER UDT-2 fluid or SAE80, 90 gear oil

■ **NOTE**

- **KUBOTA UDT or SUPER UDT fluid: KUBOTA original transmission hydraulic fluid.**

Greasing				
	Place	No. of greasing point	Capacity	Type of grease
6	Front wheel hub	2 [2WD only]	A small amount	Bearing grease
	Knuckle shaft	2 [2WD only]	Until grease overflows	Multipurpose type grease NLGI-2 or NLGI-1 (GC-LB)
	Front axle support	2 [4WD only]		
	Tie-rod ends	2 [4WD only]		
	Battery terminals	2		
	Lift rod	2		
	Top link	2		
	Hydraulic arm shaft	2		

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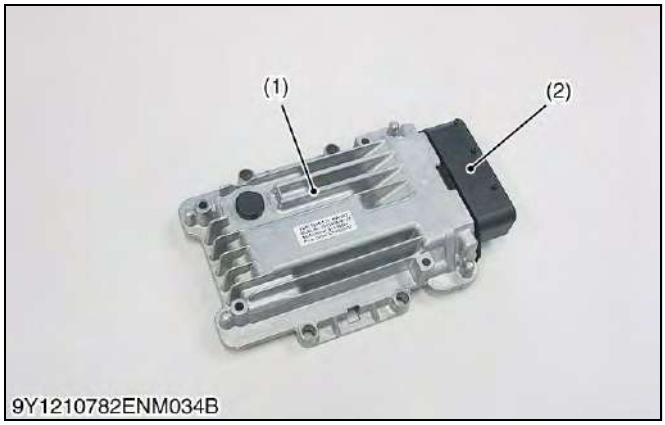
(1) Engine ECU



The engine ECU (1) controls the amount, timing, mixture and pressure of fuel that is injected. The engine ECU (1) operates each kind of control based on the signals from each type of sensor.

The actuator for controlling the amount, timing and mixture of fuel injection is the injector, while the actuator for controlling fuel pressure is the supply pump.

■ **Fuel Quantity Control**

The amount of fuel to be injected is determined using a basic injection amount, which is calculated based on the state of the engine and driving conditions, with corrections added for parameters such as water temperature, intake air temperature, intake pressure, etc.

■ **Injection Timing Control**

The ECU controls the timing for starting to energize the injectors, first determining the timing for the main injection and then setting the timing of other injections, such as pilot injections.

■ **Fuel Mixture Control**

By conducting a pilot injection, the initial fuel mixture is kept to a minimum, mitigating the explosive initial combustion and reducing NOx and noise.

■ **Fuel Pressure Control**

The ECU calculates the set fuel injection pressure based on the engine load (last injection amount and engine RPM) and controls the amount the supply pump supplies and the fuel pressure inside the rail.

(1) Engine ECU (2) ECU Connector

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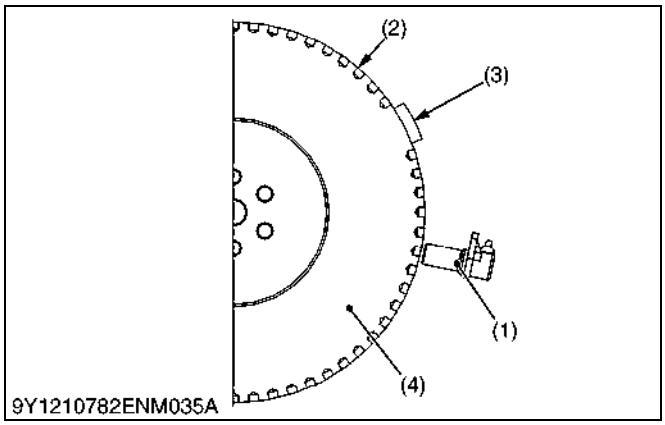
(2) Sensor



Crankshaft Position Sensor

The crank position sensor (1) is mounted on the flywheel housing and the sensor body uses a hall element type.

When pulse holes (2) provided on the outer edge of the flywheel (4) pass through the sensor, the internal magnetic field changes and this is output to the engine ECU.

Also, a no hole part (3) is provided in a part and this detects the crank position each rotation and outputs this to the engine ECU.

The engine ECU uses the signals to calculate the crank angle and engine speed.

(1) Crankshaft Position Sensor (3) Part without a Hole
(2) Pulse Hole (4) Flywheel

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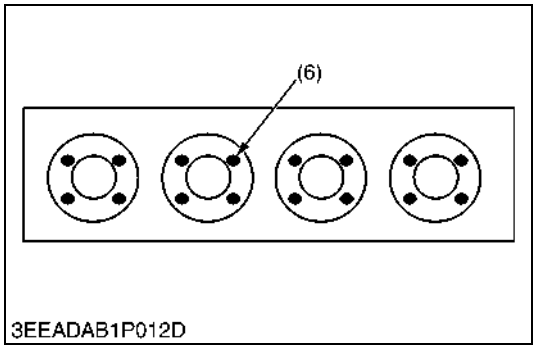
(Continued)



■ **IMPORTANT**

- **After you replace an item below, you have to select a cylinder head gasket.**
  - **Piston**
  - **Piston pin**
  - **Small end bushing**
  - **Connecting rod**
  - **Crankpin bearings**

To select the cylinder head gasket

1. Measure the protrusion or recess of the piston head from the level of crankcase cylinder face at 4 points per each piston with a dial gauge.
2. Get the average of the measurements.
3. Use the table below to select an applicable cylinder head gasket.

Gasket Dimension (Number)	Piston Protrusion
15	0.475 to 0.525 mm 0.0187 to 0.0206 in.
20	0.525 to 0.575 mm 0.0206 to 0.0227 in.
25	0.575 to 0.625 mm 0.0227 to 0.0246 in.
30	0.625 to 0.675 mm 0.0246 to 0.0266 in.
35	0.675 to 0.725 mm 0.0266 to 0.0285 in.

(6) Points of Measurement

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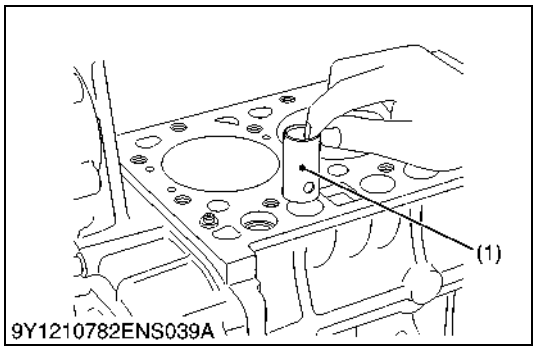

Tappets

1. Remove the tappets (1) from the crankcase.

(When reassembling)

- Before you install the tappets, apply a thin layer of engine oil around them.
- Check the contact between tappets and cams that it turns correctly. If it is damaged, replace the tappets.

■ **IMPORTANT**

- **Do not change the combination of tappet and tappet guide.**

(1) Tappet

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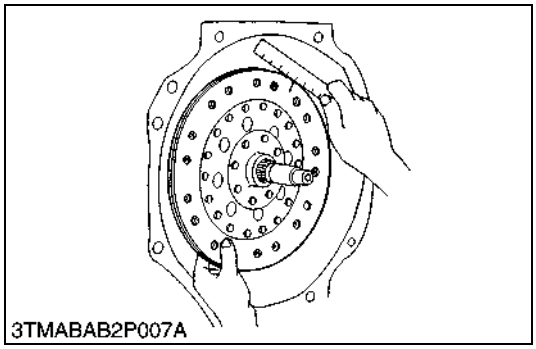
[2] DUAL STAGE CLUTCH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Backlash between Clutch Disc Boss and Shaft

1. Mount the PTO clutch disc to the 16T gear shaft.
2. Hold the gear 16T gear shaft so that it does not turn.
3. Rotate disc lightly and measure the displacement around the disc edge.
4. If the measurement exceeds the allowable limit, replace.

Backlash (Displacement around disc edge (PTO))	Allowable limit	2.0 mm 0.079 in.

5. Perform measurement for the traveling clutch disc and the main shaft in the same way as a above.

Backlash (Displacement around disc edge (Travelling))	Allowable limit	2.0 mm 0.079 in.

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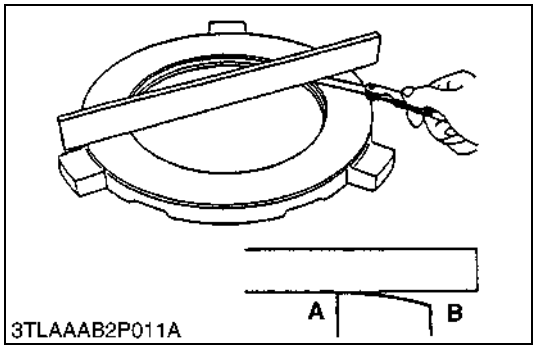

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Pressure Plate Flatness

1. Place a straightedge on the pressure plate and measure clearance with a feeler gauge at several points.
2. If the clearance exceeds the allowable limit, replace it.
3. When the pressure plate is worn around its outside and its inside surface only is in contact with the straightedge, replace even if the clearance is within the allowable limit.

Clearance between pressure plate and straightedge	Allowable limit	2.0 mm 0.008 in.

A: Inside **B: Outside**

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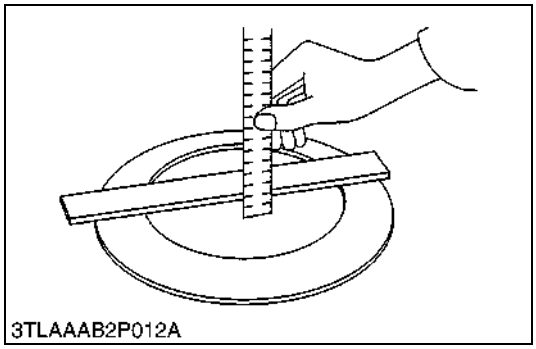
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Belleville Spring Free Height

1. Put the belleville spring on the surface plate.
2. Place a straightedge on the belleville spring and measure the free height.
3. If the measurement is less than the allowable limit, replace.
4. Check for cracks, if problems are found, replace.

Belleville spring free height	Factory specification	7.24 mm 0.285 in.
	Allowable limit	6.76 mm 0.266 in.

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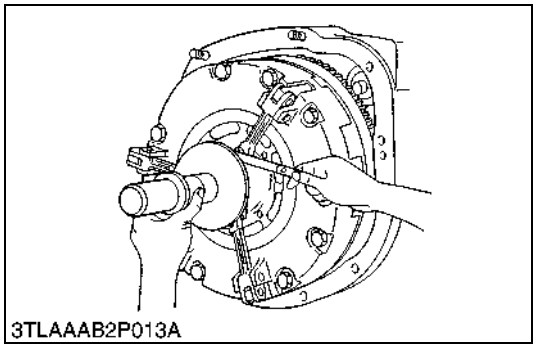
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Mutual DIfference of Release Lever

1. Insert the dual stage clutch exclusive tool (Code No, 07916-90052).
2. Measure the clearance between gauge ring and the top of adjusting screw with a feeler gauge.
3. If the clearance is not within the factory specifications, adjust with the adjusting screws.

Mutual difference of release lever	Factory specification	0 to 0.2 mm 0 to 0.008 in.

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1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Excessive Transmission Noise	Transmission fluid insufficient	Fill	G-37, G-65
	Gear worn or backlash improper	Replace	3-S100, 3-S104, 3-S108, 3-S113
	Bearing worn or broken	Replace	3-S104, 3-S108, 3-S113
	Shift fork worn	Replace	3-S100, 3-S104, 3-S108, 3-S114
	Spline worn	Replace	3-S100, 3-S104, 3-S108, 3-S113
	Snap rings on the shaft come off	Repair or replace	–
	Spiral bevel pinion staking nut improperly tightened	Tighten	3-S46, 3-S80, 3-S96
	Improper backlash between spiral bevel pinion and spiral bevel gear	Adjust	3-S105, 3-S115
	Improper backlash between differential pinion and differential side gear	Adjust	3-S107, 3-S117
	Synchronizer unit damaged	Repair or replace	3-S101
Gear Slip Out of Mesh	Shift linkages rusted	Repair	–
	Shifter or shift fork damaged	Replace	3-S100, 3-S104, 3-S108, 3-S114
	Shift fork interlock ball spring weaken or damaged	Replace	–
	Interlock ball fallen	Reassemble	–
	Gears worn or broken	Replace	3-S100, 3-S104, 3-S108, 3-S113
	Synchronizer unit damaged	Repair or replace	3-S101

Battery Negative Cable Connector

1. Open bonnet.
2. Disconnect battery negative cable connector (1).

(1) Battery Negative Cable Connector

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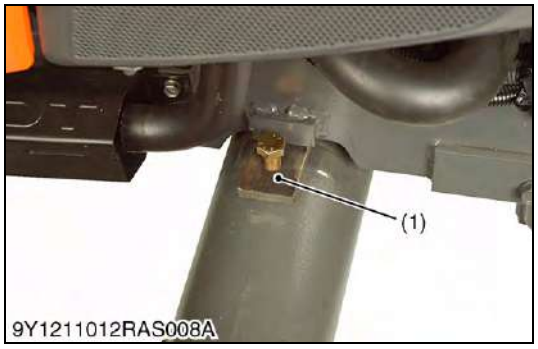

Front Axle Rocking Restrictor

1. Install the front axle rocking restrictor (1) (refer to "SPECIAL TOOLS" (see page G-95.)) to the front axle bracket and chock wheels.

(1) Front Axle Rocking Restrictor

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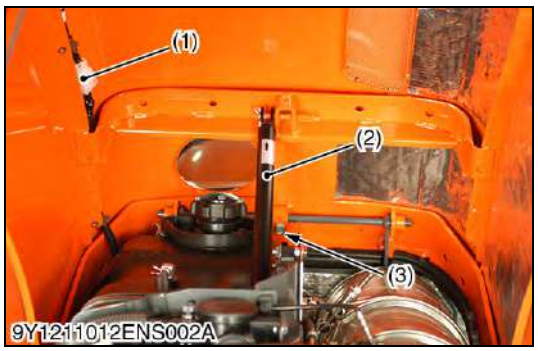

Bonnet and Side Covers

1. Disconnect the headlight connector (1).
2. Remove the damper (2) from the bonnet.
3. Disconnect the bolt (3) from the bonnet.
4. Remove the bonnet (4).
5. Remove the R.H. and L.H. side covers (5).

(1) Headlight Connector
(2) Damper
(3) Bolt
(4) Bonnet
(5) Side Cover

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Brake Case

1. Loosen the remove the brake case mounting screws and nut.
2. Separate the brake case, tapping the brake case lever lightly.

(When reassembling)

- Apply grease to the brake ball seats. (Do not grease excessively.)
- Apply liquid gasket (Three Bond 1206C or equivalent) to joint face of the brake case and transmission case, after eliminating the water, oil and stuck liquid gasket.
- Before installing the brake case to the transmission case, install the cam plate to the transmission case.
- Apply liquid lock (Three Bond 1324 or equivalent) to **(A)**, **(B)**, **(C)**, **(D)** portions of the stud bolts, R.H. and L.H..

Tightening torque	Brake case mounting stud bolts	39 to 45 N·m 3.5 to 5.0 kgf·m 26 to 36 lbf·ft

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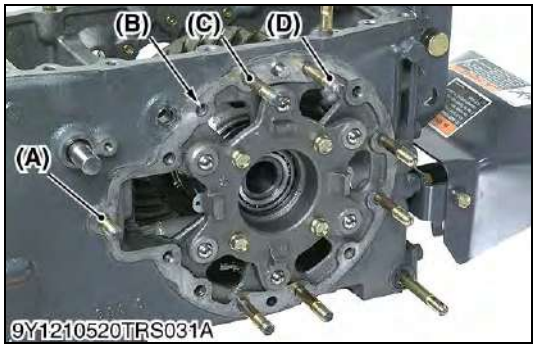

Differential Lock

1. Remove the clevis pin (1).
2. Draw out the differential lock fork shaft (2).
3. Remove the shift fork (3).

(1) Clevis Pin
(2) Fork Shaft
(3) Shift Fork

9Y1211012TRS0069US0

Differential Gear Assembly

1. Remove the differential bearing case (1) mounting screws.
2. Remove the differential bearing case (1), noting the number of left and right shims.
3. Remove the differential gear assembly (2) from transmission case.

(When reassembling)

- Use same number of shim as before disassembling.
- Replace the left and right bearing cases on the same sides as before.
- Apply grease to ball and ball seats.

Tightening torque	Differential bearing case mounting screw	48 to 55 N·m 4.9 to 5.7 kgf·m 36 to 41 lbf·ft

(1) Differential Bearing Case
(2) Differential Gear Assembly

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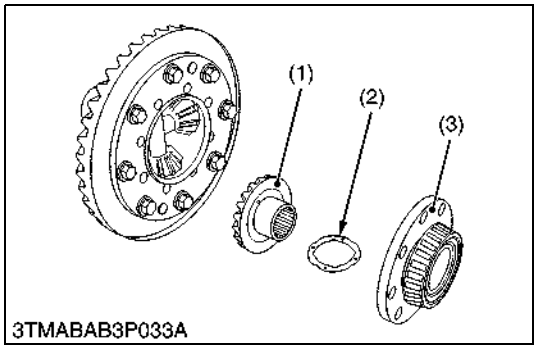

Differential Case Cover and Differential Side Gear

1. Remove the differential case cover (3).
2. Remove the differential side gear (1) and differential side gear washer (2).

(When reassembling)

- Apply molybdenum disulfide (Three Bond 1901 or equivalent) to the inner circumferential surface of the differential side gear boss.

Tightening torque	Differential case cover mounting screw	48.1 to 55.8 N·m 4.9 to 5.7 kgf·m 35.4 to 41.2 lbf·ft

(1) Differential Side Gear
(2) Differential Side Gear Washer
(3) Differential Case Cover

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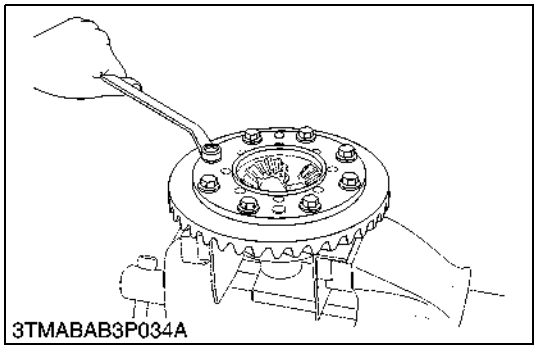

Spiral Bevel Gear

1. Remove the spiral bevel gear.

(When reassembling)

- Check the spiral bevel gear for wear or damage. If it is no longer serviceable, replace it. Then, also replace the spiral bevel pinion.
- Apply liquid lock (Three Bond 1372 or equivalent) to the spiral bevel gear UBS screws.

Tightening torque	Spiral bevel gear UBS screw	68.6 to 88.3 N·m 7.0 to 9.0 kgf·m 50.6 to 65.1 lbf·ft

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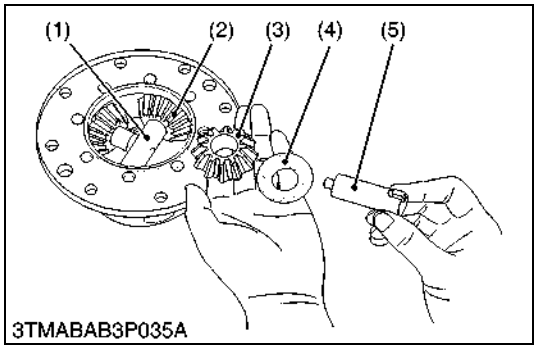


Differential Pinion Shaft and Differential Pinion

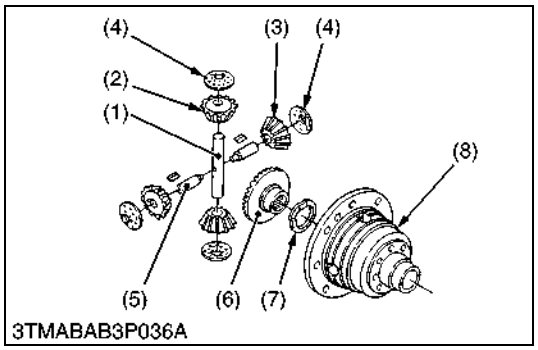
1. Draw out the differential pinion shaft 2 (5), and remove the differential pinion (3) and differential pinion washer (4).
2. Draw out the differential pinion shaft (1), and remove the differential pinion (2) and differential pinion washer.

■ **NOTE**

- **Arrange the parts to note their original position.**

(When reassembling)

- Check the differential pinions (2) and (3), and pinion shaft (1) and (5) for excessive wear. If these parts are damaged or excessively worn, replace the parts they are in mesh with, or they slide on.
- Apply molybdenum disulfide (Three Bond 1901 or equivalent) to the inner circumferential surface of the differential pinions.
- Install the parts to their original position.
- Install the differential pinion washers (4), noting its groove position.



(1) Differential Pinion Shaft
(2) Differential Pinion
(3) Differential Pinion
(4) Differential Pinion Washer
(5) Differential Pinion Shaft 2
(6) Differential Side Gear
(7) Differential Side Gear Washer
(8) Differential Case

A: Fit Groove

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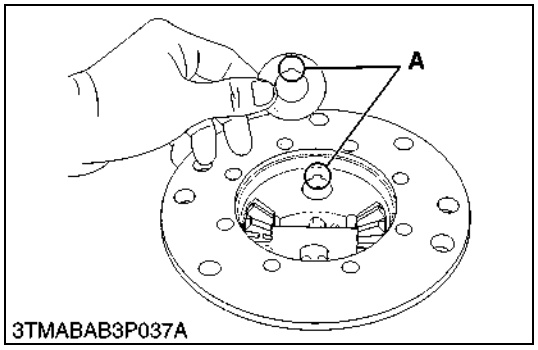

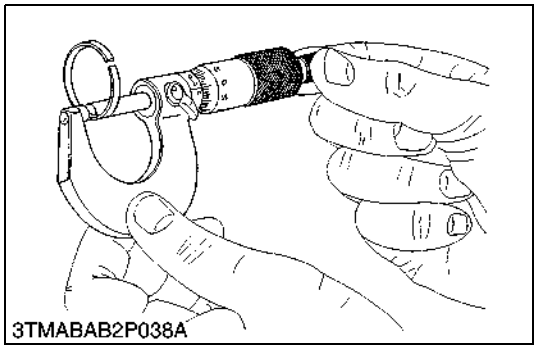
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Thickness of Seal Ring

1. Measure the thickness of seal rings (1) with an outside micrometer.
2. If the measurement is less than the allowable limit, replace it.

Thickness of seal ring	Factory specification	2.45 to 2.50 mm 0.096 to 0.098 in.
	Allowable limit	2.0 mm 0.079 in.

(1) Seal Ring

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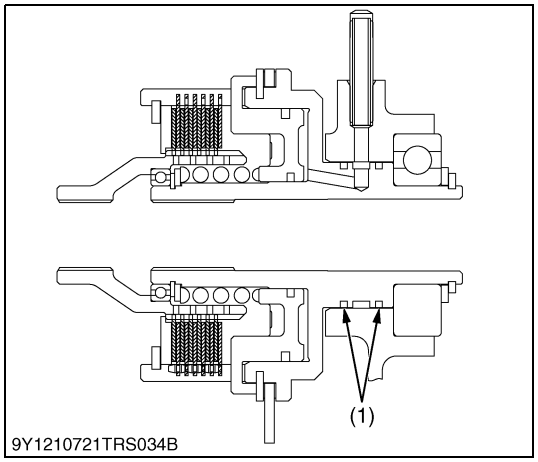

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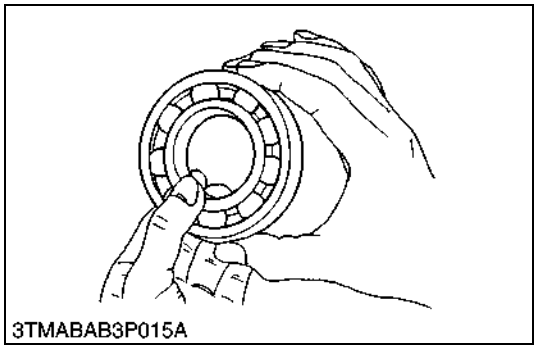
(3) Transmission Case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Checking Bearing

1. Hold the inner race, and push and pull the outer race in all directions to check for wear and roughness.
2. Apply transmission fluid to the bearing, and hold the inner race. Then turn the outer race to check rotation.
3. If there is any problem, replace it.

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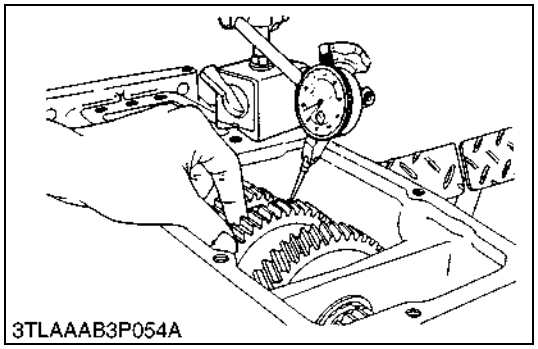
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Gear Backlash

1. Set a dial indicator (lever type) on one of the tooth faces.
2. Clamp the mating gear.
3. Measure backlash by turning the gear to be measured.
4. If the reading exceeds the allowable limit, replace the gear.

Gear backlash	Factory specification	0.1 to 0.3 mm 0.004 to 0.01 in.
	Allowable limit	0.4 mm 0.02 in.

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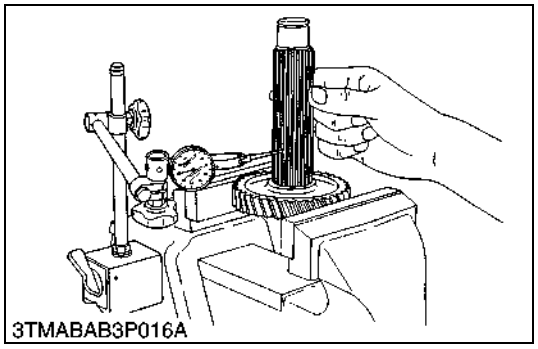
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Clearance between Gear and Spline

1. Secure the gear with a vise.
2. Set a dial indicator (lever type) with its finger on the spline.
3. Move the shaft to measure the clearance.
4. If the clearance exceeds the allowable limit, replace them.

Clearance between gear and spline	Factory specification	0.030 to 0.078 mm 0.0012 to 0.0030 in.
	Allowable limit	0.2 mm 0.008 in.

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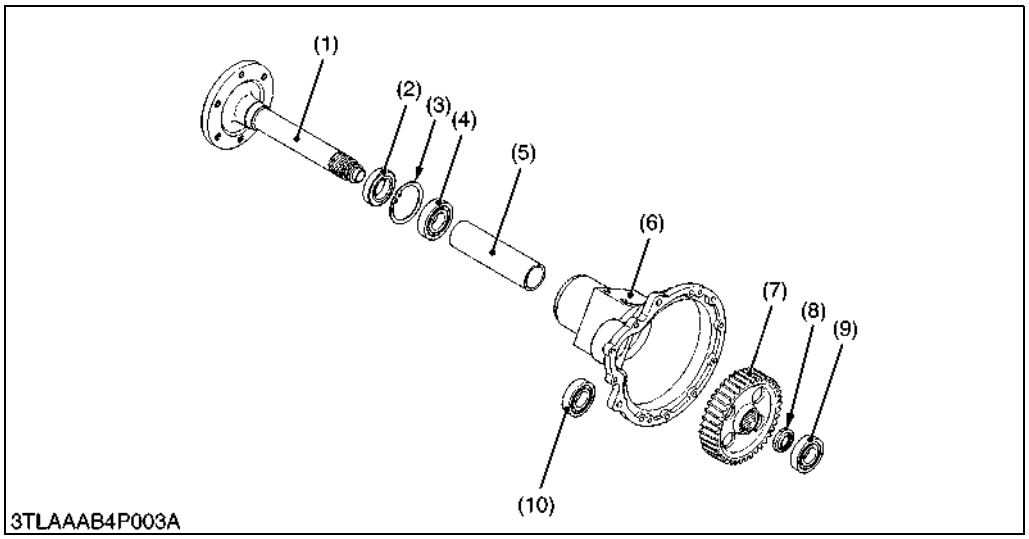
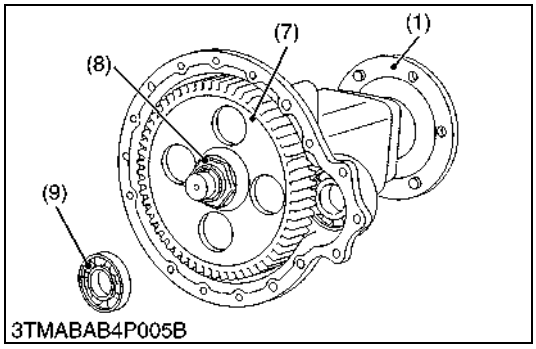
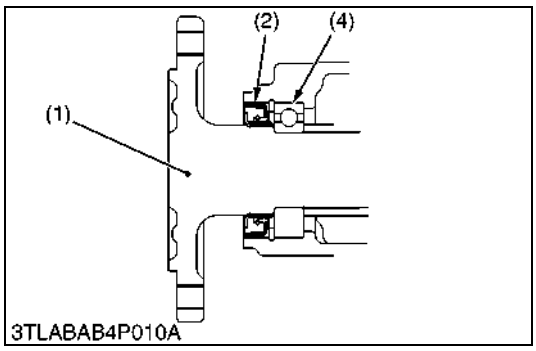
[2] DISASSEMBLING REAR AXLE



(1) Rear Axle
(2) Oil Seal
(3) Internal Snap Ring
(4) Ball Bearing
(5) Spacer
(6) Rear Axle Case
(7) Gear
(8) Lock Nut
(9) Ball Bearing
(10) Ball Bearing





1. Remove the ball bearing (9) with a puller.
2. Remove the stake of lock nut (8).
3. Secure the rear axle (1) in a vise and remove the lock nut.
4. Remove the gear (7) and spacer (5).
5. Tap out the rear axle (1).

(When reassembling)

- Apply grease to the oil seal (2) and install it.
- Replace the lock nut with new one, and after tightening it to specified torque, stake it firmly.
- Assemble the oil seal (2) with correct direction. (See figure on the left.)

Tightening torque	Lock nut	200 to 240 N·m 20 to 25 kgf·m 150 to 180 lbf·ft

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3. TIGHTENING TORQUES

Tightening torques of screws, bolts and nuts on the table below are especially specified.
(For general use screws, bolts and nuts: Refer to "5. TIGHTENING TORQUES" on page G-13.)

[2WD]

Item	N·m	kgf·m	lbf·ft
Tie-rod lock nut (L3301/L3901)	112.7 to 122.5	11.5 to 12.5	83.2 to 90.4
Tie-rod lock nut (L4701)	83.3 to 88.2	8.5 to 9.0	62 to 65
Front axle rocking force adjusting bolt [L3301/L3901]	23 to 27	2.4 to 2.7	17 to 19
Lock nut (front axle rocking force) [L4701]	98 to 147	10.0 to 14.9	72.3 to 108
Tie-rod end nut (L3301/L3901)	49 to 68	5.0 to 7.0	37 to 50
Tie-rod end nut (L4701)	35 to 44	3.5 to 4.5	26 to 32
Shaft brackets (front) mounting bolt	166 to 196	17.0 to 20.0	123 to 144
Shaft bracket (rear) mounting bolt	103 to 118	10.5 to 12.0	76.0 to 86.7
Front wheel mounting lug nuts (L3301/L3901)	137	14.0	101
Front wheel mounting stud bolt (L4701)	64 to 73	6.5 to 7.5	47 to 54
Front wheel hub slotted nut	49 to 68	5.0 to 7.0	37 to 50
Front wheel hub slotted nut	29.4 to 39.2	3.0 to 4.0	21.7 to 28.9
Knuckle arm mounting bolt and nut	77.5 to 90.2	7.9 to 9.2	57.2 to 66.5
Outer front axle mounting bolt and nut	124 to 147	12.6 to 15.0	91.1 to 108

[4WD]

Item	N·m	kgf·m	lbf·ft
Tie-rod lock nut (L4701)	166.7 to 196.1	17.0 to 20.0	123 to 144
Front axle adjusting bolt	49 to 117	5.00 to 12.0	36.2 to 86.7
Front axle rocking force adjusting bolt [L3301/L3901]	23 to 27	2.4 to 2.7	17 to 19
Lock nut (front axle rocking force) [L4701]	98 to 147	10.0 to 14.9	72.3 to 108
Tie-rod end nut	35 to 44	3.5 to 4.5	26 to 32
Shaft bracket (front) mounting bolt	240 to 260	24.5 to 26.5	177 to 181
Shaft bracket (rear) mounting bolt	78 to 90	7.9 to 9.2	58 to 66
Front wheel mounting lug nuts	137	14.0	101
Axle flange mounting stud bolt	12 to 15	1.2 to 1.6	8.7 to 11
Axle flange mounting screws and nuts	24 to 27	2.4 to 2.8	18 to 20
Power steering hose retaining nut	24.5 to 29.4	2.5 to 3.0	18.1 to 21.7
Front wheel mounting nut	124 to 147	12.6 to 15.0	92 to 108
Bracket mounting bolt	78 to 90	7.9 to 9.2	58 to 66
Bracket mounting nut	78 to 90	7.9 to 9.2	58 to 66
Bevel gear case mounting screw	166.7 to 196.1	17.0 to 20.0	122.9 to 144.6
Axle flange mounting bolts and nuts [L3301/L3901]	23.6 to 27.5	2.4 to 2.8	18 to 20
Axle flange mounting bolts [L4701]	29.4 to 34.3	3.0 to 3.5	22 to 25
Axle flange mounting nuts [L4701]	23.6 to 27.5	2.4 to 2.8	18 to 20
Tie-rod joint and steering cylinder mounting screw	166.7 to 196.1	17.0 to 20.0	122.9 to 144.6
Cylinder set bolt	16 to 17	1.6 to 1.8	12 to 13
Differential case cover mounting screw	48.0 to 58.8	4.9 to 6.0	35.4 to 43.4

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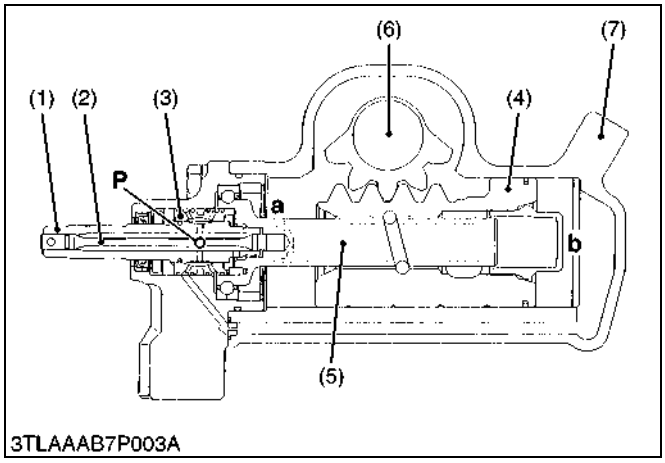
(2) OPERATION



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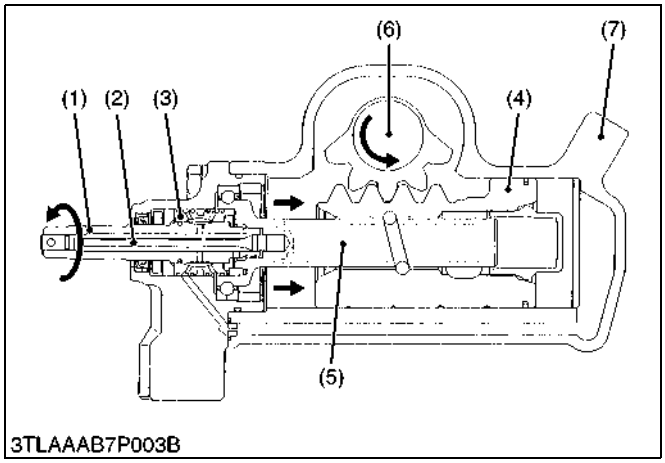

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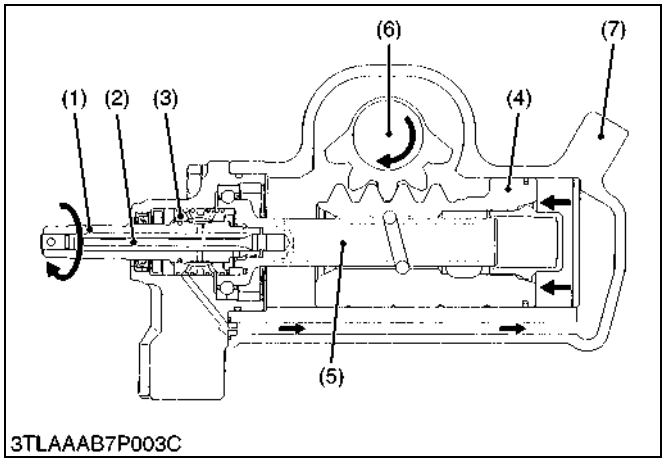

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Neutral Position

While the steering wheel is not moved, the torsion bar (2) is not twisted. There is no gap between the input shaft (1) and sleeve (3). This makes no pressure difference between the chambers **"a"** and **"b"** of the cylinder, which keeps the ball nut (4) and sector shaft (6) in their positions.

(1) Input Shaft
(2) Torsion Bar
(3) Sleeve
(4) Ball Nut
(5) Main Shaft
(6) Sector Shaft
(7) Gear Box

a: Chamber
b: Chamber
P: Pump Port

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Left Turn

When the steering wheel is turned left, the initial friction between the tires and the road surface keeps the ball nut (4) and sector shaft (6) in their positions. The torsion bar (2) alone is twisted to produce a gap between the input shaft (1) and sleeve (3) and to activate the valve. By so doing, the cylinder's chamber **"a"** comes under high pressure and the ball nut (4) is moved to the right. Finally the sector shaft (6) gets turned to turn the machine to the left.

(1) Input Shaft
(2) Torsion Bar
(3) Sleeve
(4) Ball Nut
(5) Main Shaft
(6) Sector Shaft
(7) Gear Box

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Right Turn

The operating principle is the same as with the left turn. For the right turn, however, the gap between the input shaft (1) and sleeve (3) is in the direction opposite to that of left turn. By so doing, the cylinder's chamber **"b"** comes under high pressure and the ball nut (4) is moved to the left. Finally the sector shaft (6) gets turned to turn the machine to the right.

(1) Input Shaft
(2) Torsion Bar
(3) Sleeve
(4) Ball Nut
(5) Main Shaft
(6) Sector Shaft
(7) Gear Box

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Manual Operation in Case of Hydraulic System Failure

Let's suppose that the hydraulic system gets in trouble due to a damaged pump, damaged pipe or the like and that the steering resistance is too high to use the power steering system. In such case, the steering wheel can be in the manual mode. When the steering wheel is turned, the torsion bar is twisted for the valve's stroke and from now on the steering wheel functions in the manual mode. It should be noted that the steering wheel's play becomes larger than that in the power steering mode.

9Y1211012STM0008US0

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Implement Does Not Rise (Not Noise)	Control linkage improperly adjusted	Adjust	8-S15, 8-S16
	Control linkage improperly assembled or damaged	Repair or replace	8-S24
	Position control valve malfunctioning (unload poppet, spool, poppet 1, 2)	Repair or replace	8-S24
	Relief valve spring weaken or broken	Replace	8-S25
Implement Does Not Rise (Noise)	Hydraulic piston O-ring, cylinder damaged	Replace	8-S22
	Hydraulic oil filter clogged	Replace	G-37, G-65
	Relief valve setting pressure too low	Adjust	8-S11
	Hydraulic pump malfunctioning	Repair or replace	8-S26
Implement Does Not Reach Maximum Height	Position control improperly adjusted	Adjust	8-S15, 8-S16
	Position control valve spool joint 1 improperly adjusted	Adjust	8-S24
	Hydraulic arm shaft, hydraulic arm, lift arm improperly assembled	Adjust	8-S22
Implement Does Not Lower	Control valve malfunctioning (Spool damaged)	Replace	8-S24
	Poppet valve adjusting nut improperly adjusted	Adjust	8-S24
Implement Drops by Weight	Hydraulic cylinder worn or damaged	Replace	8-S27
	Hydraulic piston and O-ring worn or damaged	Replace	8-S22
	Poppet 1 seat surface damaged (control valve)	Replace	8-S24
	Poppet 1 O-ring damaged (control valve)	Replace	8-S24
	Poppet 2 seat surface damaged (control valve)	Replace	8-S24
	Poppet 2 O-ring damaged (control valve)	Replace	8-S24
Implement Hunts (Moves Up and Down)	Poppet 1, poppet 2, poppet 3 seat surface damaged	Replace	8-S24
	Control valve O-rings worn or damaged	Replace	8-S24
Oil Temperature Increases Rapidly	Relief valve operating	Adjust	8-S11
	Hydraulic pump leak or damaged	Replace or repair	8-S26
	Oil leaks from valves	Replace or repair	8-S24
	Gear or bearing damaged in the transmission case	Replace	–

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